General catalogue





Aragonesa de Componentes Pasivos

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

Albert Einstein

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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)

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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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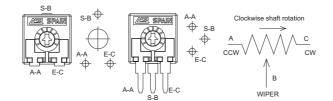


GENERAL CONCEPTS

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).

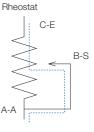
Depending on where in the resistor the wiper is placed, it indicates a lower resistive value than the whole resistor would (we say it is used as variable resistor or rheostat). Voltage divider

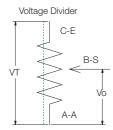
When a voltage is applied between the ends of the resistor (A and C), the current goes through the resistor, not the wiper.

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 (RT):

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

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

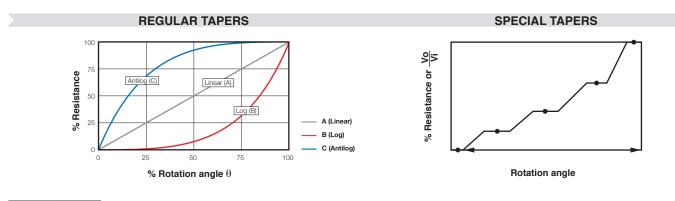
25K	47K	50K	100K	200K	220	x 2	250K	470K	500K	1M	2M	2M5	4M7	5M
25KΩ	47KΩ	50KΩ	100KΩ	200KΩ	220K	Ω 2	50KΩ	470KΩ	500KΩ	1MΩ	2MΩ	2.5MΩ	4.7MΩ	5MΩ
100	200	220	250	470	500	1K	2K	2K2	2K5	4K7	5K	10K	20K	22K
100Ω	200Ω	220Ω	250Ω	470Ω	500Ω	1ΚΩ	2ΚΩ	2.2KΩ	2.5KΩ	4.7KΩ	5ΚΩ	10KΩ	20KΩ	22KΩ

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.

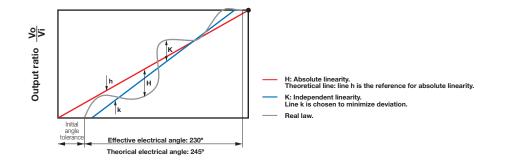
It is expressed as a percentage of the total voltage applied.

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
(C)	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.
6		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.







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

Standard features				Extra fe	Extra features				Assembled accessory							
Series	Rotor	Model	Packg.	Ohm value	Taper	Tol.	Life	Track	Snap in	Housing	Rotor	Wiper	Assembly	Ref #	Color	Flam.
1	2	3	4	5	6	7	8	9	10	11	12	13		14		
CA6	Х	V2,5		- 10K	А	2020			SNP			PI	WT	-6030	-BA	
andard	configu	ration:			(CA6 Thr	ough-he	ole				с	A6 SMD			
mensions	6:									6mm						
otection:								On rec		54 (dust-proof) inguishable, to		V-0				
ubstrate:					(Carbon t	echnolo	gy			Carbon t	echnology, :	special for h	nigh tem	perature	
olor:					Blue housing + white rotor Brown housing + grey rotor											
ackaging:									Bulk	or Tape & Ree	el					
iper posit	ion:								6	at 50% ±15°						
rminals:					Snap in	P (excep	ot model	I CA6VS5)								
arking:					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: CA6XH2,5-10K CODE C00120.

1 - Series				
CA6				
2 - Rotors				
D	М		Ν	X
3 - Model a	nd pitch			
H2,5	HSMD	V2,5	V5	VS5
VSMD	VESMD	VSMD	WT	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	1KΩ	2KΩ	500KΩ	1MΩ	2MΩ	2M2Ω	4M7Ω	5MΩ
100	200	220	250	470	500	1K	2K	500K	1M	2M	2M2	4M7	5M

6 - Resistance law / taper

Lin - Linear	А
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

SNP
TPXX, ex: TP20
SH

11 - Housing

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

12 - Rotor

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

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

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

13 - Wiper

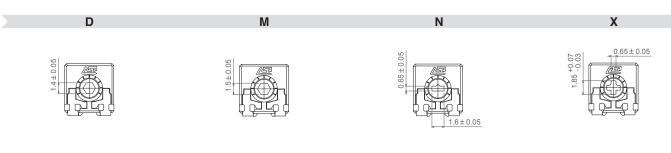
Wiper position (Standard: $50\% \pm 15^{\circ}$)	(leave blank)
Initial or CCW	PI
Final or CW	PF
Others: following clock positions; at 3 hours: P3H	PXH, ex: P3H
Wiper torque (Standard: <2Ncm)	(leave blank)
Low torque, < 1.5Ncm	PGB

14 - Potentiometers with assembled accessories

Assembled from terminal side		WT		
Assembled from collector side	e WTI			
Accessory Reference		-XXXXX		
See list of shafts and thumbwheels available	E	Example: 6	030	
Color of shaft or thumbwheel	-YY E	ixample, w	hite: BA	
Non self-extinguishable. Self-extinguishable according to standard UL 94 (-V0 in box 17 modifies only the accessory, please, note.)		(leave blar -V0	nk)	
For ordering spare accessories: Accessory reference - color- flammability. Ex. 6030-AZ-V0 is a blue self-extinguishable 6030 thumbwh	eel	XXXX-	YY-V0	
Color chart for rotor, housing and accessories				
Black ⁽¹⁾ White Neutral Transp. Red Green Yellow	Blue	Grey	Brown	
NE BA IN TA RO VE AM	AZ	GS	MR	

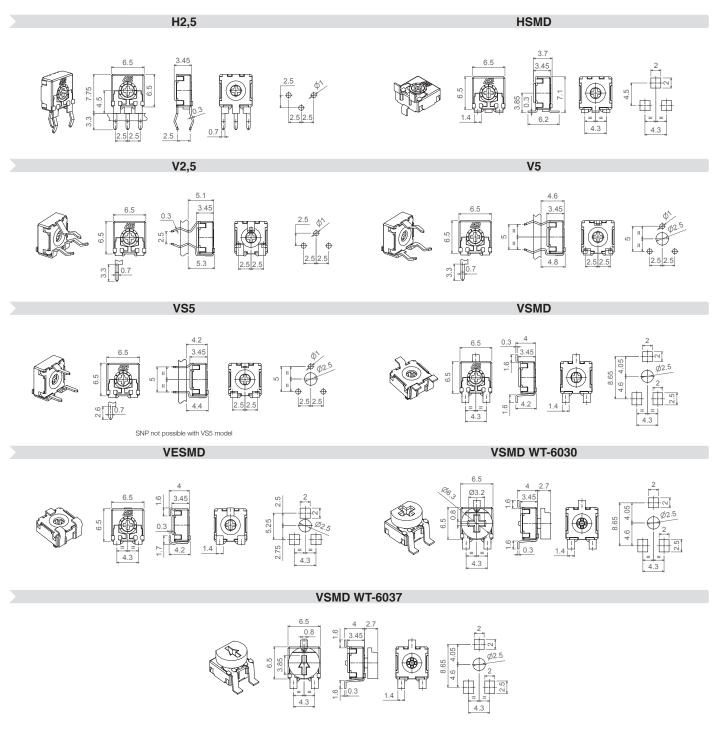
(1) black is not an option for housings.

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

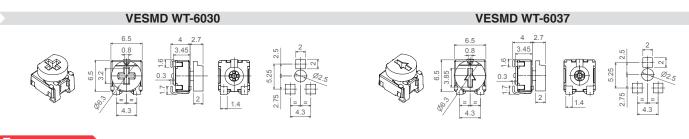


Models

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

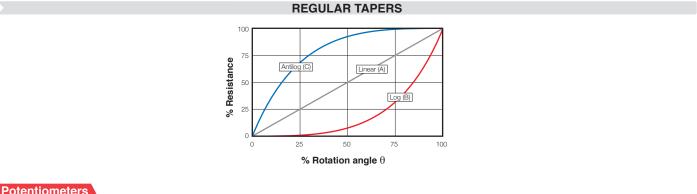


CA6



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.



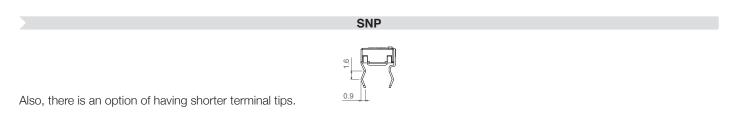
Potentiometers with cut track

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



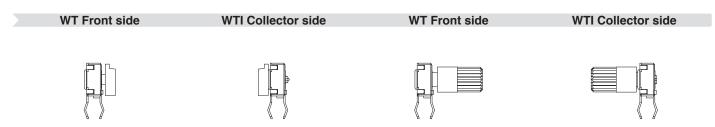
Terminals

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



Possibilities for insertion of accessories

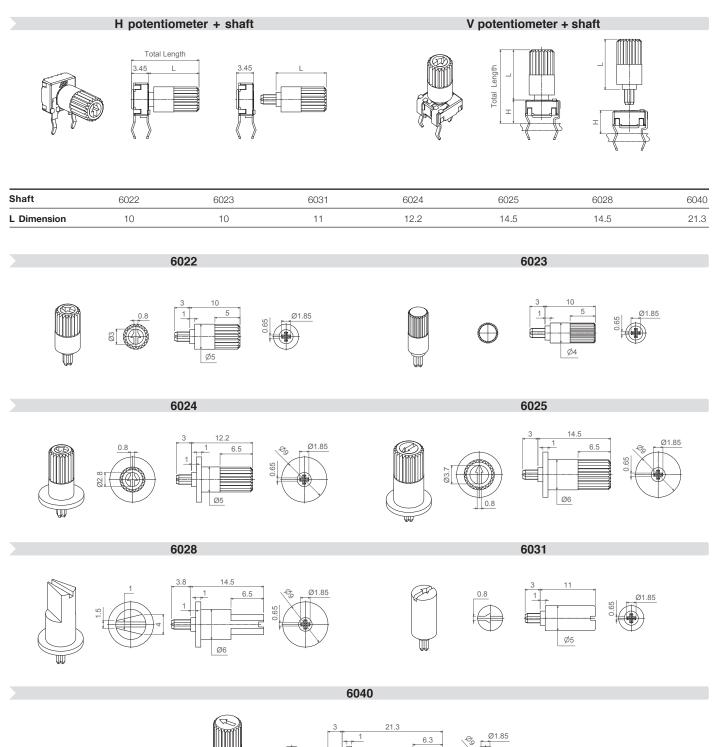
Accessories can be mounted on potentiometers through either the front side (WT) or the collector side (WTI). For the specific angular position of shafts with planes, a drawing with the exact position is requested.



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:

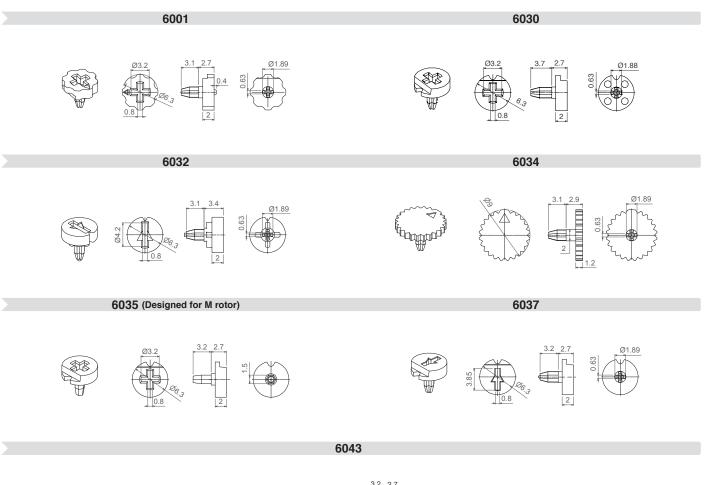


Ø6

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

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

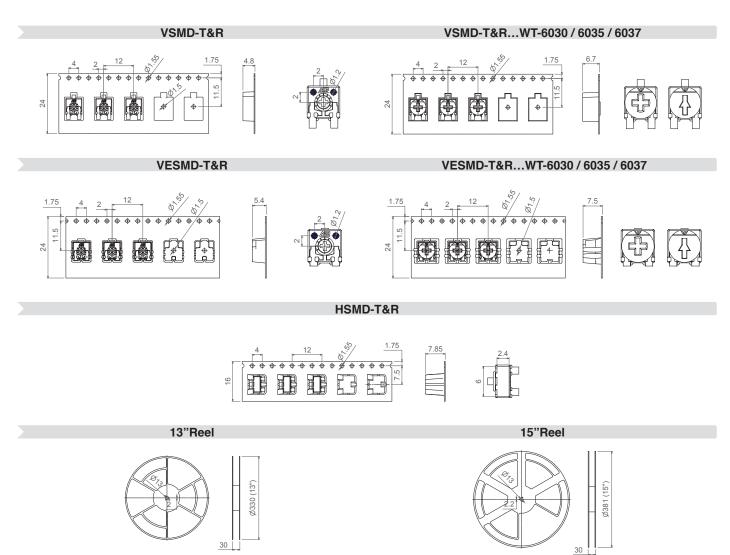


Bulk packaging:

Potentiometer model	With shaft or thumbwheel inserted?	Pieces per small box (150 x 100 x 70)	Pieces per bigger box (250 x 150 x 70, CG on description)
	None, only potentiometers.	1.000	4.000
H2,5 - V2,5 - V5	6001, 6030, 6032, 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.
VSIVID	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.
VLOND	6030, 6035, 6037	700 pcs per reel, 12mm step between cavities.	1.000 pcs per reel, 12mm step between cavities.
LIGNE	None, only potentiometers.	750 pcs per reel, 12mm step between cavities.	1.000 pcs per reel, 12mm step between cavities.
HSMD	With specific thumbwheel.	Under request.	Under request.

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



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	$100\Omega \le Rn \le 1M\Omega$ 1 K $\Omega \le Rn \le 1 M\Omega$				
$\begin{tabular}{lllllllllllllllllllllllllllllllllll$	+50%, -30% (out of range)	- ±25% ±25% ±50% -				
Variation laws	Lin (A), Log (B), Antilog (C). Oth	her tapers available on request				
Residual resistance	Lin (A), Log (B), Antilog (C) ≤ 5	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 Angl Other tapers,					
Maximum power dissipation** Lin (A) Log (B), Antilog (C)	at 5 0.1 0.0	OW				
Maximum voltage Lin (A) Log (B), Antilog (C)	100VDC 60VDC					
Operating temperature	-25°C +70°C (-	+85°C on request)				
Temperature coefficient $100\Omega \le \text{Rn} \le 10\text{K}\Omega$ $10\text{K}\Omega < \text{Rn} \le 5\text{M}\Omega$	+200/ -500 ppm +200/ -1000 ppm					

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

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

Mechanical Specifications						
	CA6 Through-hole	CA6 SMD				
Resistive element	Carbon technology	Carbon technology				
Angle of rotation (mechanical)	235°	2 ± 10°				
Angle of rotation (electrical)	215° ± 20°					
Wiper standard delivery position	50%	± 15°				
Max. stop torque	4 1	Nom				
Max. push/pull on rotor	9.	8 N				
Wiper torque*	<2	Ncm				
Mechanical life	1.000 cycles (others	s available on request)				

* Stronger or softer torque feeling is available on request.

Test results

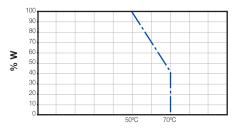
The following typical test results are given at 23°C $\pm 2^{\circ}$ C and 50% $\pm 25\%$ RH.

CA6 Through-hole and SMD

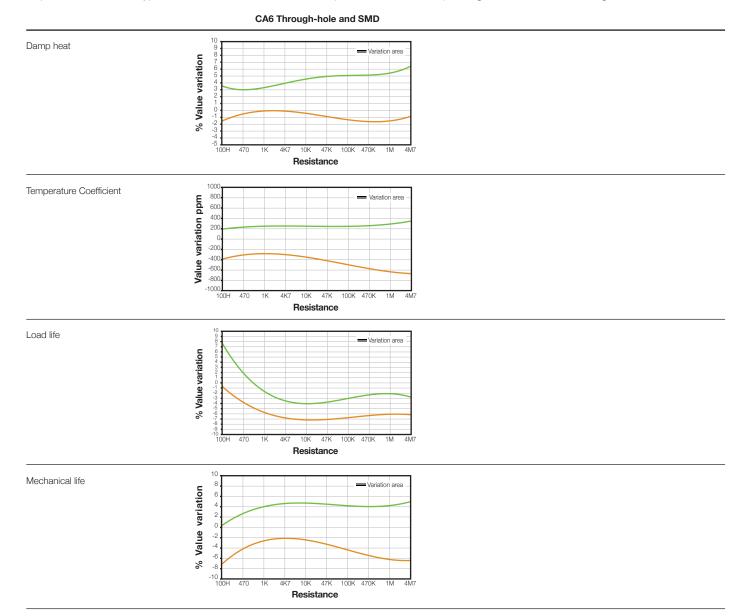
	Test conditions	Typical variation of nominal resistance
Damp heat	500 h. at 40°C and 95% RH	+5%, -2%
Thermal cycles	16 h at 85℃, plus 2 h at –25℃	±2.5%
Load life	1.000 h. at 50°C	+0%; -6%
Mechanical life	1.000 cycles at 10 c.p.m. and at 23°C ± 2°C	±4%
Storage (3 years)	3 years at 23°C ± 2°C	±3%

CA6 Through-hole and SMD

Power derating curve:



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









CARBON – CA9

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

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

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

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

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

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

Applications

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

- Industrial: Timers and relays, dimmers, adjustment of output.

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

CERMET – CE9 🖗

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

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

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

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

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

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

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

Applications

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

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

CA9 A CE9 HOW TO ORDER

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

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

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

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

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

1 - Serie	es											
CA9	CE9											
2 - Roto	ors											
) E	Ξ	J	K	KA	М	MA		MT	Ρ	R	Y
<u>3 - Mod</u>	el and	l pitch										
H2,5	H3,8	HS	\$3,8	H5	ŀ	HSMD	V7,5	١	/10	VK1	0 \	/R10
MAV10	MT	/10	VSME) VS	SMD V	NT-9002	VSN	/DC	Y V	SMD(CY WT-	9002
4 - Pacl	kaging	J			Troug	gh-hole	•		SM	D moo	dels	
Bulk					(bla	ank) ⁽¹⁾			(b	lank) ⁽	1)	
T&R (Tap	be and	13" ree	el)			T&R				T&R		
T&R (Tap	be and	15" ree	el)		T	&R15				T&R15		
(1) If blank, b	ulk packa	iging is imp	plied.									
5 - Resi	stanc	e value	•									
100Ω 200)Ω 220	Ω 250Ω	470Ω	500Ω	1KΩ	2KΩ	500KΩ	1MΩ	2MΩ	2M2Ω	4M7Ω	5MΩ
100 20	0 220	250	470	500	1K	2K	500K	1M	2M	2M2	4M7	5M
6 - Resi	stance	e law /	tape	r								
Lin - Line	ear								А			
Log - Lo	garithr	nic							В			
Antilog -	Antilo	garithm	ic						С			
- Specia	l tapers	s have o	codes	assigr	ned:			CODE	E YXXX	XX		
7 - Tole	rance											
±20%		±30	0%		+50%	%,-30%		±10		±5%		
2020		30	30		5	030		10	10		050)5
8 - Ope	rating	Life (C	ycles	;)								
Standard	d (1.00	0 cycle	s)							(1	eave b	lank)
Long life:	LV + the	e numbe	er of cy	cles. e>	:: LV10) for 10.0)00 cycle	S. (othe	rs on requ	uest) LV	/XX: ex:	LV1C
9 - Cut	Track	– Oper	n circi	uit.								
Open cir	cuit at	beginn	ing of	track,	fully (CCW			PCI			
Open circuit at end of track, fully CW							PCF					
Pin in Paste option (Reflow Soldering)								PIP				
10 - Dei	tents (DT)										
One dete			inning						DTI			
One dete	ent at t	he end							DTF			
X numbe	er of de	etents						XD	T: 10D	Т		

	NΡ							SI	٧P	
SNAP II	۱J							SI	٩J	
Shorter	tip of ter	under request)	x: TP25						
Steel Te	rminals				iΗ					
12 - Ho	ousing									
Color: F	or colors	other tha	n standard	l: -See co	olor chart l	oelow-	CJ-colo	or, ex., red	d: CJ-RC	
13 - Ro	tor									
Color: F	or colors	other tha	n standard	l: -See co	olor chart l	oelow-	RT-colo	r; ex., blu	ie: RT-AZ	
By defau For carb and roto If only ro	Ilt, carbor on: self-e r are V0 if tor: RT-V(n is non se xtinguisha f only the l	elf-extingui	shable, c rty can be	ermet is s e added. V	and roto elf-extingui ′0 means h CJ-V0.	shable:		lank) V0), RT-V0	
14 - Wi		(Otopda	rd. 500/	. 1 50)				/leave bl	anla	
		(Stanua	rd: 50%	± 15°)				(leave bl	ank)	
Initial or							PI			
Final or					Doll		PF PXH, ex: P3H			
		· ·	ositions;			2 5)	(leave blank)			
			l: <2.5Nc	m, tor de	etents: <	3.5)		`	,	
	que, < 1	.5Ncm						PGE	5	
15 - Lii	-							//		
Not cor				0/ 5		00/ 1 100		(leave bl	,	
					r example	, 3%: LN3	% LN	lx%; ex:		
		,	led & belo					LAx%	0	
			ith asser	nbled a	ccessor	ies)A/T		
		termina						WT		
	ory Refe	on collecto	r side					WTI -XXXXX		
	,		mbwheel	s availab	ole		Exa	ample: 9		
Color of	f shaft or	thumbw	heel				-YY Exa	ample, w	hite: BA	
Non self-extinguishable. Self-extinguishable according to standard UL 94 (-V0 in box 17 modifies only the accessory, please, note.)							(1	leave bla -V0	ınk)	
Access	ory refere	ence - cc	essories Nor- flamr self-exti	nability.	ble 9010	thumbwh		XXX-YY	-V0	
Color o	hart fo	r rotor, h	ousing	and acc	essories	5				
(1)		.	-	Deal	0	X-II		C.*.01.1	Droute	
Black ⁽¹⁾	White	Neutral	Transp.	Red	Green	Yellow	Blue	Grey	Browr	

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

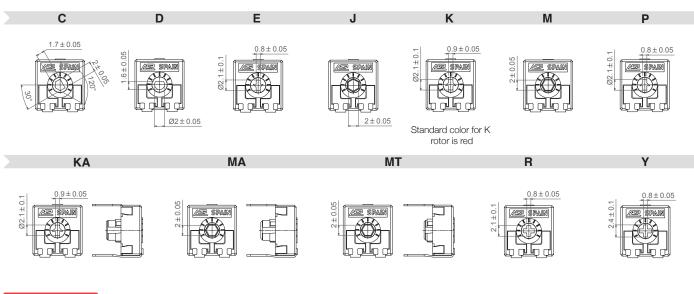
www.acptechnologies.com

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

(1) black is not an option for housings.

Rotors

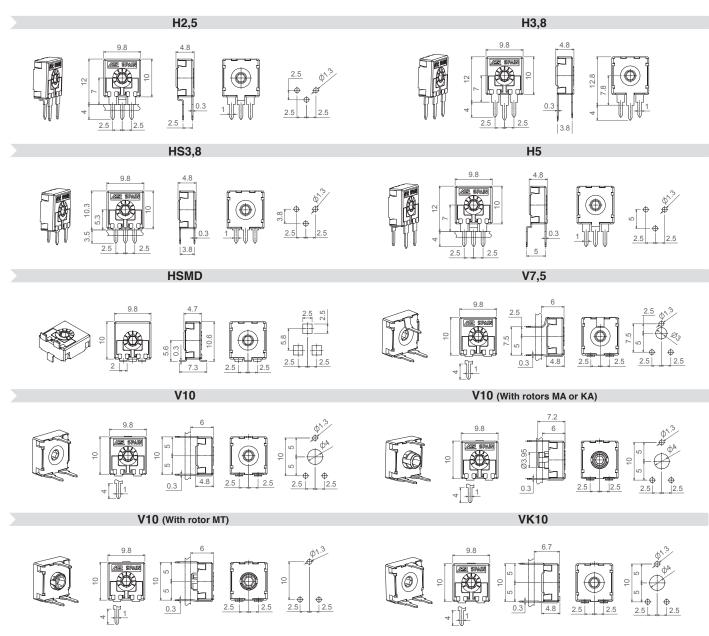
Rotors are drawn in their standard positioning, 50% of rotation. Alternative delivery positioning can be requested. Accessories in this catalogue are designed for the M rotor, unless otherwise stated.



Models

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

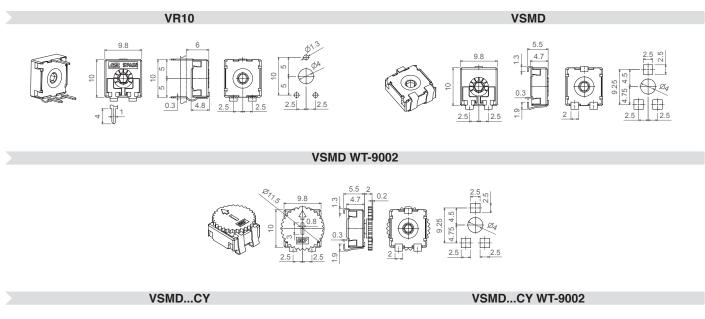
from the menu above.

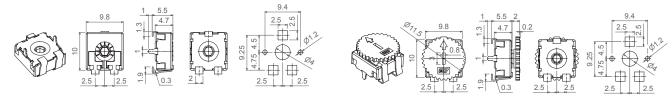


Specifications on this catalog are for reference only, as they are subject to change without notice.

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CA9 🐖 CE9

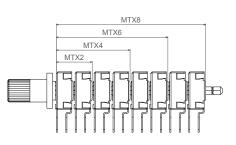




GANGED

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).

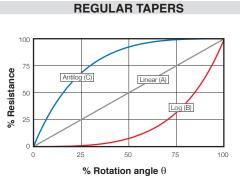
Model	MTX2	MTX4	MTX6	MTX8
Shaft	9048, 9074, 9076	9039, 9051	9018	9056



Tapers

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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.-



% Resistance or Vo



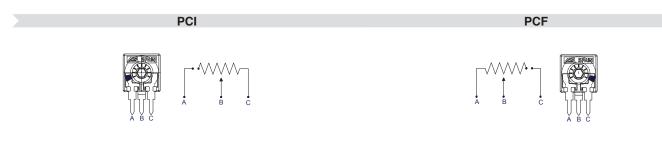
SPECIAL TAPERS

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.

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

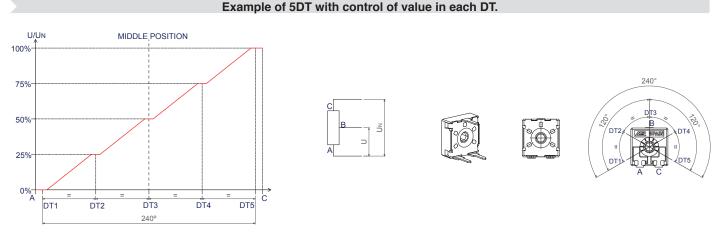
Other positions are available on request.



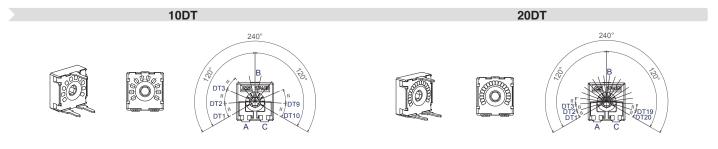
Potentiometers with detents

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

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



Other examples of potentiometers with detents:



Number of standard detents (evenly distributed) already available.	1 (initial 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.

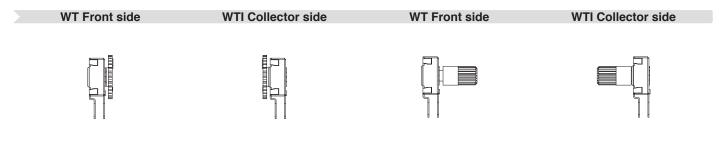
For potentiometers with detents, mechanical life is also 1.000 cycles if no additional cycles are mentioned. Please, indicate the number of cycles needed with LV (number of cycles), for example: LV07, for 7.000 cycles.

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

 Image: spectrum of the spect

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



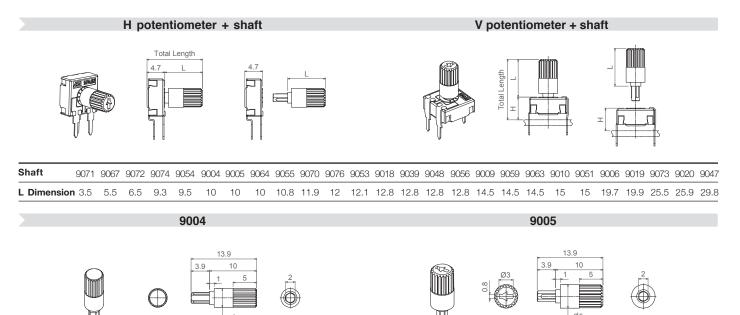
Shafts

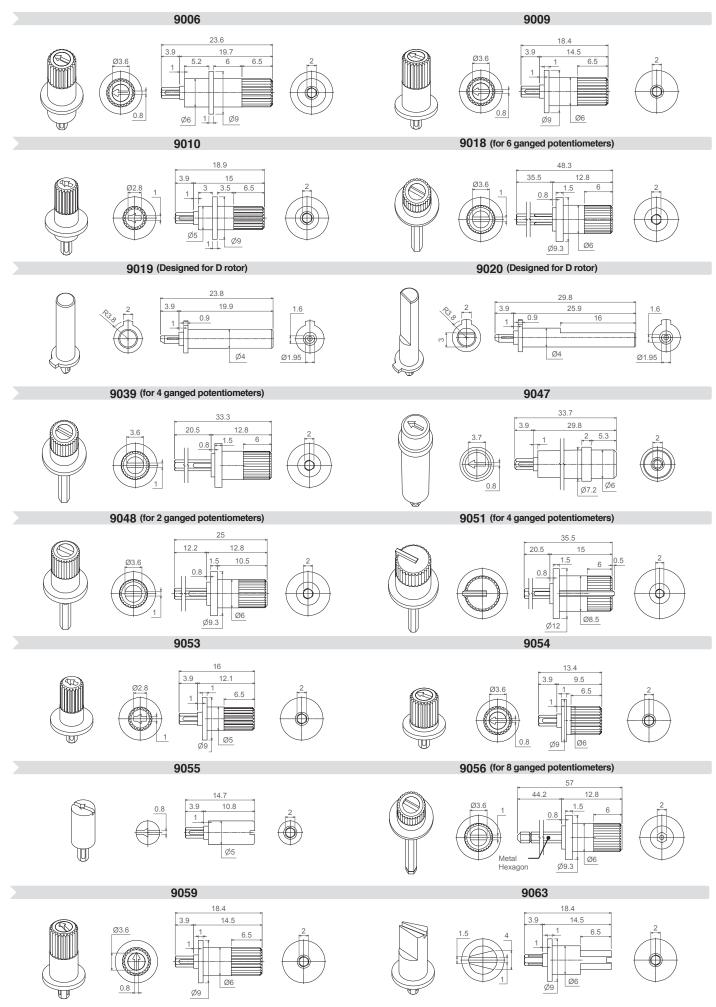
Shafts are available in different colors (color chart in "how to order" section) and with self-extinguishable property, according to UL 94 V-0, under request. ACP can study special shaft designs.

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

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:



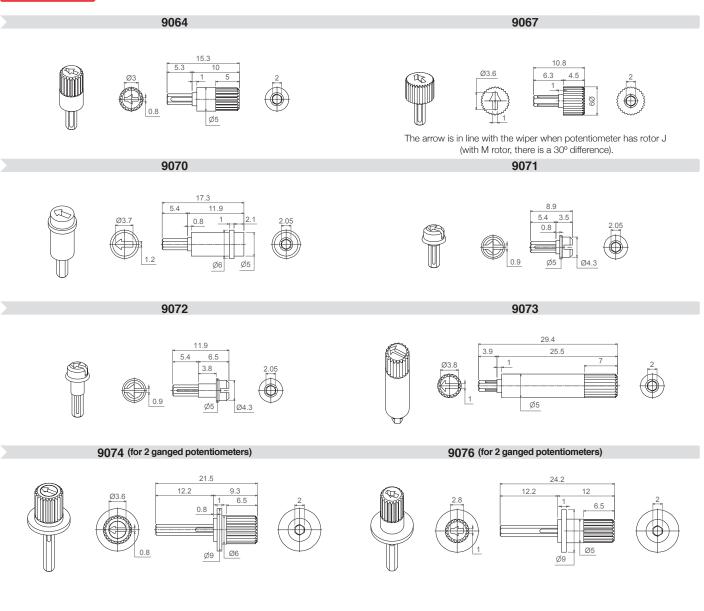


The arrow is in line with the wiper when potentiometer has rotor J (with M rotor, there is a 30° difference).

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

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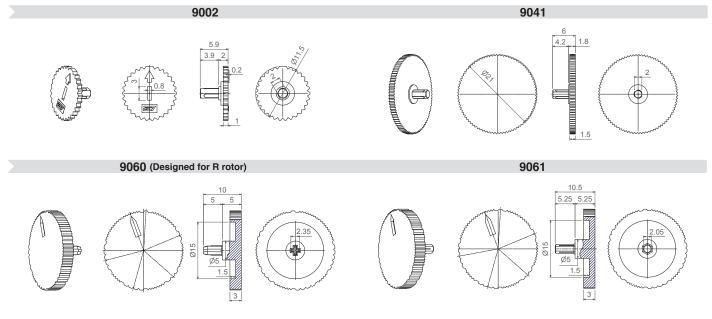
CA9 🖷 CE9



Thumbwheel

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

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



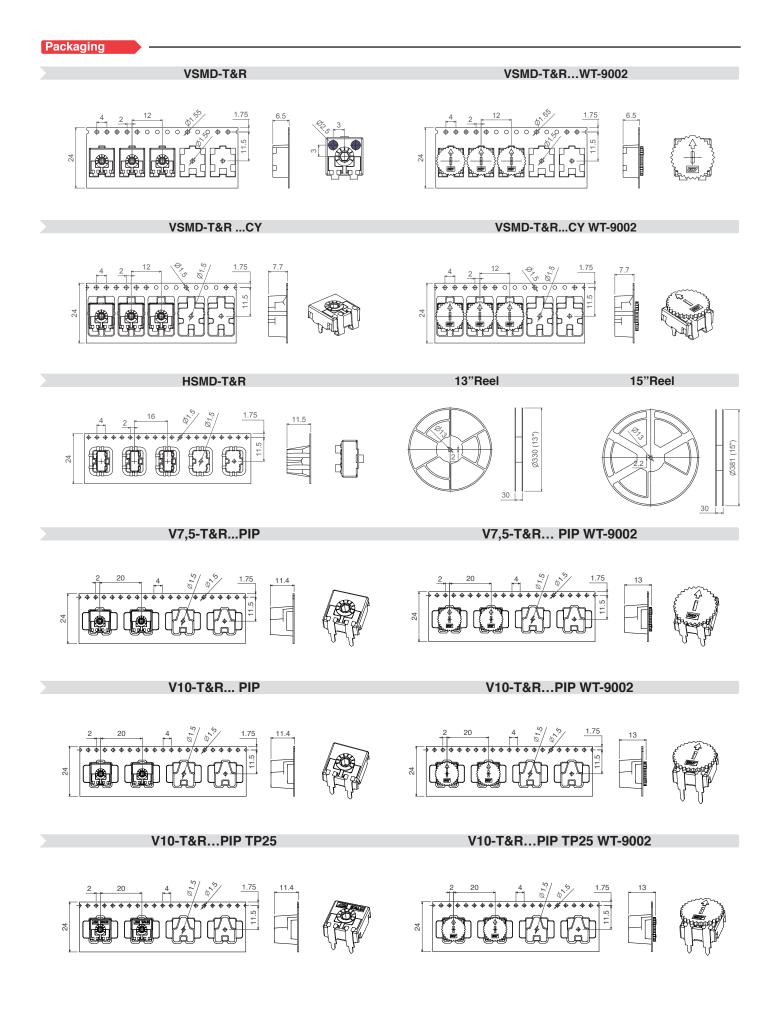
Packaging

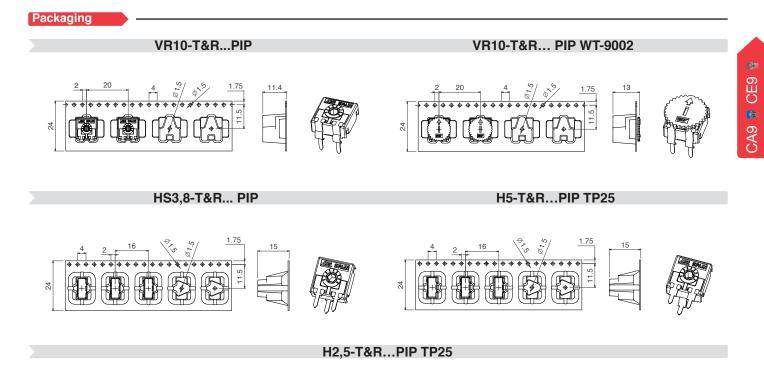
Bulk packaging:

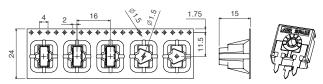
Potentiometer model	With shaft or thumbwheel inserted?	Pieces per small box (150 x 100 x 70)	Pieces per bigger box (250 x 150 x 70, CG on description)
	None, only potentiometers.	500	1.500
H2,5 - H3,8 - HS3,8 - H5 HSMD - V7,5 - V10 VK10 - VR10 - VSMD	9002	250	1.000
	9004, 9005, 9006, 9009, 9010, 9018, 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.

Tape & Reel packaging:	With thumbwheel inserted?	13" Reel (Standard), with 24mm width tape	15" Reel, with 24mm width tape
VSMD	None, only potentiometers.	900 pcs per reel, 12mm step between cavities.	1.250 pcs per reel, 12mm step between cavities.
	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
	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
H2,5PIP TP25 - H5PIP TP25 - HS3,8 PIP	None, only potentiometers or 9002	250	350
V7,5PIP - V10PIP - V10PIP TP25 - VR10PIP		250	400

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







Electric Specifications

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

		8	•	
	CA9 Through-hole	CA9 SMD	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* Rn < 100Ω: 100Ω ≤ Rn ≤ 100KΩ 100K< Rn ≤ 1MΩ: 1MΩ < Rn ≤5MΩ: Rn > 5MΩ:	+50%, -30% (out of range) ±20% ±20% ±30% +50%, -30% (out of range)	- ±30% ±40% ±50% -	- ±20% ±20% ±30% -	
Variation laws	Lin (A), I	Log (B), Antilog (C). Other tapers available or	n request	
Residual resistance	Lin (A), Log (B), Antilog (C) \leq 5	≤2Ω		
CRV - Contact Resistance Variation (dynamic)				
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 5 0.1 0.1	at 70° C. 0.5W 0.20W		
Maximum voltage Lin (A) Log (B), Antilog (C)	200\ 150\	200VDC		
Operating temperature	-25°C +70°C (+	-40°C +90°C (+125°C on request		
Temperature coefficient 100Ω ≤ Rn ≤ 10KΩ 10KΩ < Rn ≤ 5MΩ	+200/ -300 ppm +200/ -500 ppm	+200/ -500 ppm +200/ -1000 ppm	±100 ppm ±100 ppm	

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

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

	CA9 Through-hole	CA9 SMD	CE9 Through-hole and SMD				
Resistive element	Carbon technology	Carbon technology	Cermet				
Angle of rotation (mechanical)	240° ± 5°						
Angle of rotation (electrical)	220° ± 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	cles (many more available on request, pl	ease, inquire)				

* Stronger or softer torque feeling is available on request.

Test results

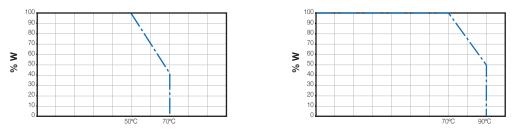
The following typical test results are given at 23°C \pm 2°C and 50% \pm 25% RH.

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

CA9 Through-hole and SMD

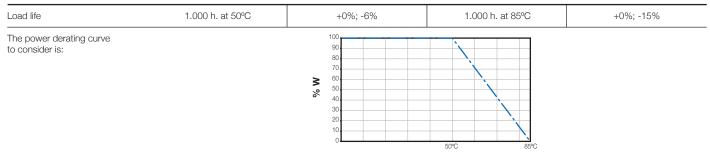
CE9 Through-hole and SMD

Power derating curve:

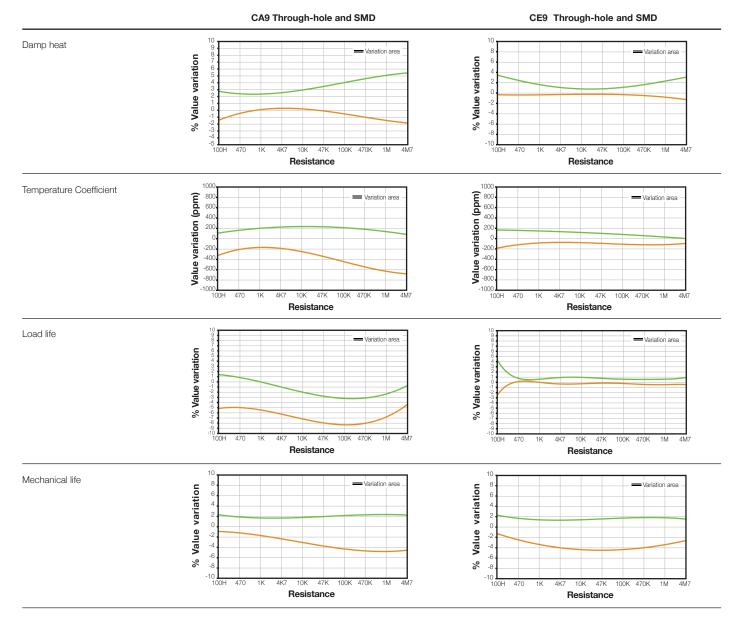


For temperatures out of range

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:



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CARBON – CA14

CERMET – CE14 🕅

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

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

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

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

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

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

Applications

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

- Electronic household appliances, heating, ventilation and air conditioning (HVAC) equipment, thermostats.
- Automotive: HVAC controls, lighting regulation (position adjustment and sensing), dimmers, seat heating controls.
- Industrial electronics: multimeters, oscilloscopes, time relays, measurement and test equipment.

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

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

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

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

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

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

Applications

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

- Electronic appliances: boilers, water heaters.
- Automotive: climate controls, position sensors.
- Industrial electronics: multimeters, oscilloscopes, time relays, measurement and test equipment.

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

Standard features						Extra features						Assembled accessory						
Series	Rotor	Model	Packg.	Ohm value	Taper	Tol.	Life	Track	Detents	Snap in	Housing	Rotor	Wiper	Lin.	Assembly	Ref #	Color	Flam.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		16		
CA14/CE14	Ν	H2,5		- 10K	А	2020			10DT	SNP			PI		WT	14117	-BA	-V0

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

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

CA1	4 🔳 CI	E14												
2 - Ro	otors													
В	D	E		F	G	K		Μ	Ν		Ρ	Т	Х	Z
3 - Mo	odel a	nd	pitch											
HO	HC0	ł	H2,5	H4	H5	F	HA5	I	HL5	V12,	5	VA12,	5 VI	L12,5
VR12,	5 V1	5	VJ15	(V15)) CFF	= V	17,5	V	D7,5	VD1	1 V	SMD	VSMD	C\
			HS	GMD (U	Inder r	eque	st, no	ot re	eadily a	ivailab	ole)			
4 - Pa	ckagi	ng			т	roug	h-hc	ole			SN	1D mo	dels	
Bulk						(blar	nk) ⁽¹)			(blank)	.(1)	
T&R (1	ape ar	nd 1	3" ree	el)		(N.)	A.) ⁽²⁾					T&R		
T&R (T	ape ar	nd 1	5" ree	el)		(N./	A.) ⁽²⁾					T&R15	5	
(1) If blan	k, bulk pa	ickag	jing is im	plied. (2)	N.A., Not	Applic	able: Ta	ape a	nd Reel pa	ackaging	g is only	available	for SMD te	erminals
5 - Re	sistar	ce	value	•										
100Ω 2	200Ω 2	20Ω	250Ω	470Ω	500Ω	1KΩ	2KΩ		500KΩ	1MΩ	2MS	2 2M2Ω	2 4M7Ω	5MS
100	200 2	20	250	470	500	1K	2K		500K	1M	2M	2M2	4M7	5M
Other res	istive valı	les a	vailable	on reque	st.									
6 - Re	sistar	ce	law /	taper										
Lin - L	inear										A			
Log - l	_ogarit	hmi	ic								В			
Antilog	ı - Anti	loga	arithm	ic							С			
- Spec	ial tap	ers	have o	codes	assign	ed:			(CODE	YXX	XXX		
<u>7 - To</u>	leranc	e												
±20%			±30)%		+50%	6,-30	%		±10	1%		±5	%
2020			303	30		50	030			101	0		050)5
8 - Op	eratin	g L	.ife (C	ycles										
Standa	ard (1.0	000	cycle	s)								(leave b	lank)
otaria														

9 - Cut hack - Open circuit.		
Open circuit at beginning of track, fully CCW	PCI	
Open circuit at end of track, fully CW	PCF	
10 - Detents (DT)		
One detent at the beginning	DTI	
One detent at the end	DTF	
X number of detents	XDT: 10DT	

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

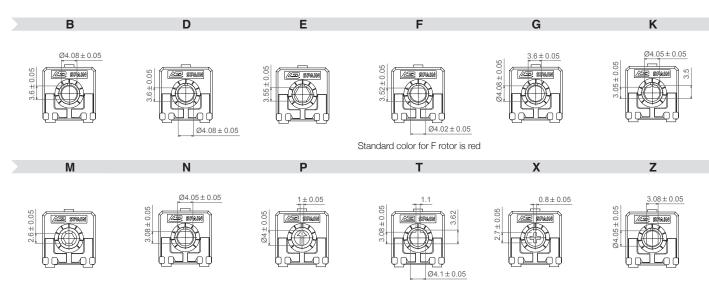
SNAP IN P		S	NP
SNAP IN R			NR
<u> </u>			
Shorter tip of terminal, TPXX, where XX is tip length (under re	quest)		ex: TP30
Steel Terminals			SH
12 - Housing			
Color: For colors other than standard: -See color chart below-	CJ-co	olor, ex., re	d: CJ-RO
13 - Rotor			
Color: For colors other than standard: -See color chart below-	RT-co	lor; ex., blu	ue: RT-AZ
 * Self-extinguishable property, V0, for housing and r By default, carbon is non self-extinguishable, cermet is Self-exti For carbon: self-extinguishable property can be added. V0 mea and rotor are V0. If only the housing needs to be V0, then CJ-V If only rotor: RT-V0 14 - Wiper 	inguishable ans housing	l ,	lank) V0), RT-V0
Wiper position (Standard: 50% ± 15°)		(leave bl	ank)
Initial or CCW		PI	
Final or CW		PF	
Others: following clock positions; at 3 hours: P3H		PXH, ex:	РЗН
Wiper torque (Standard: <2.5Ncm, for detents: <3.5)		(leave bl	ank)
Low torque, < 1.5Ncm		PGE	3
15 - Linearity			
Not controlled		(leave bl	ank)
Independent linearity controlled & below x%, for example, 3%: I	LN3% L	Nx%; ex:	LN3%
Absolute linearity controlled & below x%		LAx9	6
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	Ev	-XXXXX 44 xample: 14	
Color of shaft or thumbwheel		xample, w	
Non self-extinguishable. Self-extinguishable according to stand UL 94 (-V0 in box 17 modifies only the accessory, please, note.	ard	(leave blai -V0	
For ordering spare accessories: Accessory reference - color- flammability. Ex. 14117-AZ-V0 is a blue self-extinguishable 14117 thui	mbwheel	XXXX	K-YY-V0
Color chart for rotor, housing and accessories			
Black ⁽¹⁾ White Neutral Transp. Red Green Yello	w Blue	Grey	Brown

(1) black is not an option for housings.

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

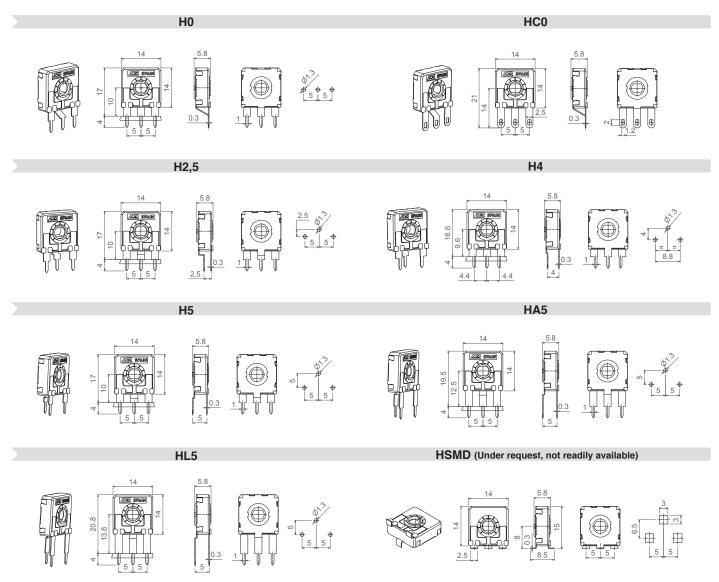
Rotors

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



Models

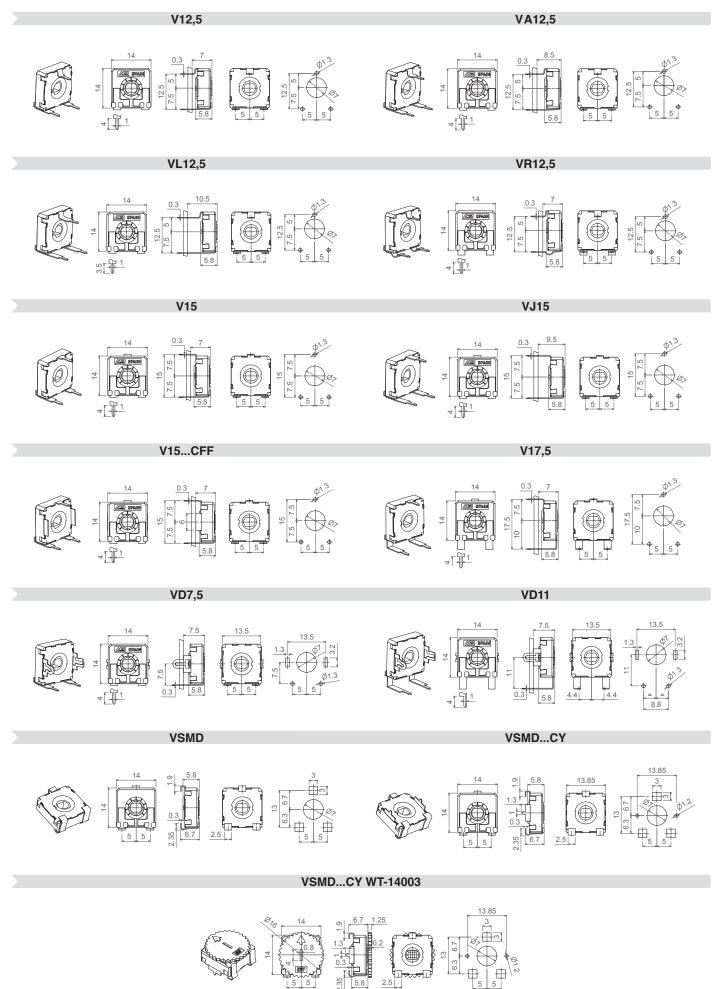
All models shown here have the most common rotor for 14mm potentiometers: the N rotor. Different rotors are available from the menu above.



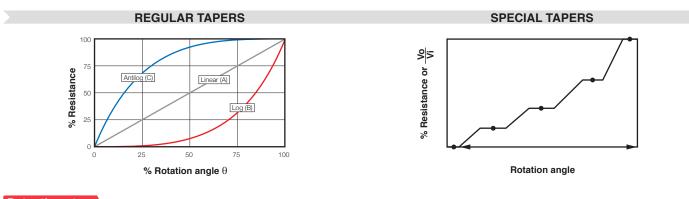
Specifications on this catalog are for reference only, as they are subject to change without notice.

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CA14 🐕 CE14 🖗



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



Potentiometers with cut track

The cut track is an area with very high resistive value, resulting in an open circuit. It is widely used in lighting applications. Mechanical life with cut track needs to be confirmed.

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

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

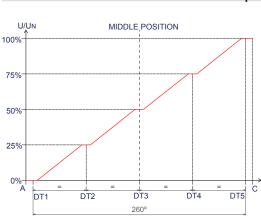
Other positions are available on request.



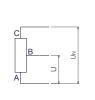
Potentiometers with detents

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

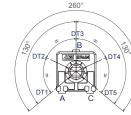
Detents can be light or strong, or even a combination of different feelings. They can be evenly distributed along the angle (standard) or tailored to match customers' request. They can also be combined with special tapers: constant value areas, open circuit zone, different slopes, etc. One common example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



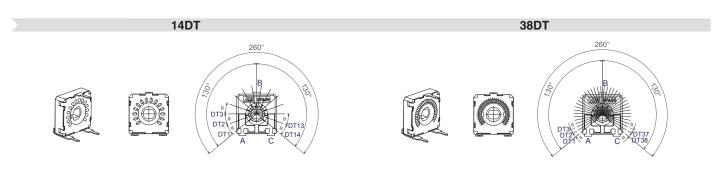
Example of 5DT with control of value in each DT.







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

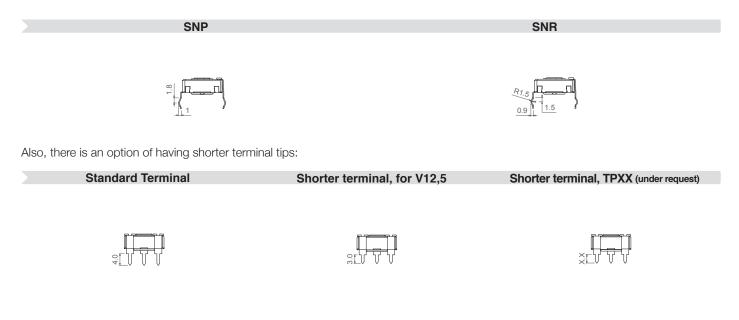
Our patented design with two wipers has improved the performance of these potentiometers, giving them more stable electrical parameters, improved reliability and Contact Resistance Variation (CRV) and narrower tolerances for detent positioning.

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

Potentiometers with detents

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



Possibilities for insertion of accessories

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

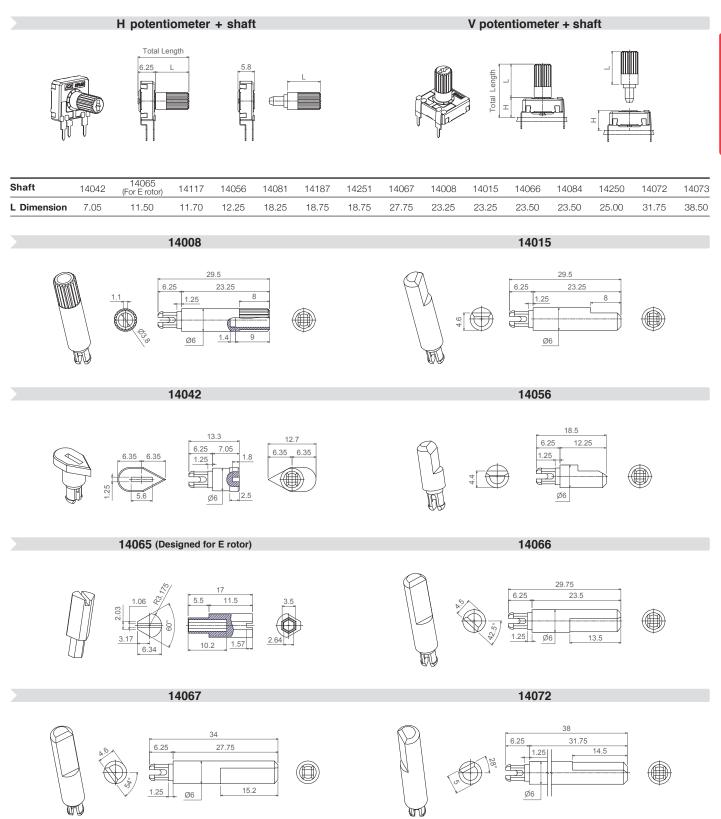
WT Front side	WTI Collector side	WT Front side	WTI Collector side

Shafts

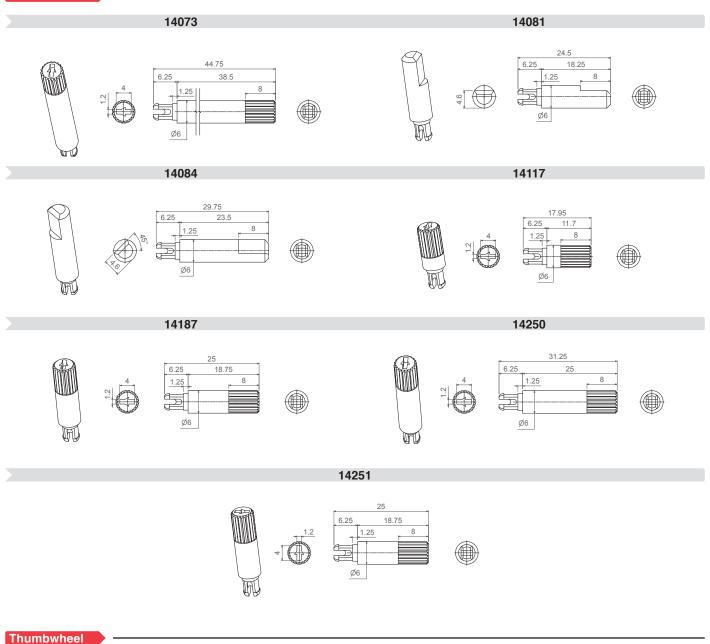
Shafts are available in different colors (color chart in "how to order" section) and with self-extinguishable property, according to UL 94 V-0, under request. ACP can study special shaft designs.

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:

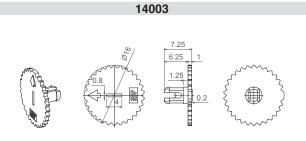


CA14 🙀 CE14 🖗



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

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



Packaging

Bulk packaging:

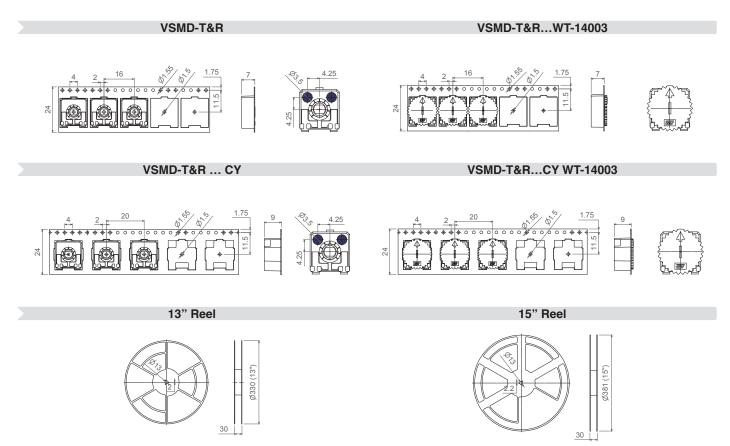
Potentiometer model	With shaft or thumbwheel inserted?	Pieces per small box (150 x 100 x 70)	Pieces per bigger box (250 x 150 x 70, CG on description)	
H2.5 - H4 - H5- HA5- HL5- H0	None, only potentiometers.	200 150 for models with*	700 600 for VJ15 - V17,5 - VD7,5 500 for VD11	
HC0 - V12,5 - V15 - VA12,5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



Electric Specifications

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* Rn < 100Ω: 100Ω ≤ Rn ≤ 100KΩ 100K< Rn ≤ 1MΩ: 1MΩ < Rn ≤5MΩ: Rn > 5MΩ:	+50%, -30% (out of range)	- ±30% ±40% ±50% -	- +20% +20% +30% -
Variation laws	Lin (A),	Log (B), Antilog (C). Other tapers available or	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 245°±20° ≤ 3%Rn. Other tapers, please inquire	L
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)		250VDC 200VDC	
Operating temperature	-25°C +70°C (-	+85°C on request)	-40°C +90°C (+125°C on request)
Temperature coefficient 100Ω ≤ Rn ≤ 10KΩ 10KΩ < Rn ≤ 5MΩ	+200/ -300 ppm +200/ -500 ppm	+200/ -500 ppm +200/ -1000 ppm	±100 ppm ±100 ppm

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

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

	CA14 Through-hole	CA14 SMD	CE14 Through-hole and SME
Resistive element	Carbon technology	Carbon technology	Cermet
Angle of rotation (mechanical)		$265^{\circ} \pm 5^{\circ}$	
Angle of rotation (electrical)		245° ± 20°	
Wiper standard delivery position		50% ± 15°	
Max. stop torque		10 Ncm	
Max. push/pull on rotor		50 N	
Wiper torque*		<2.5 Ncm Potentiometers with detents: <3.5 Nc	m
Mechanical life	1.000 cvc	es (many more available on request, pl	ease, inquire)

* Stronger or softer torque feeling is available on request.

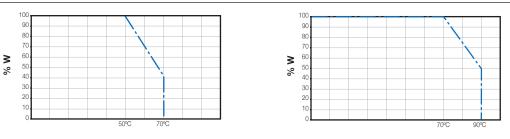
Test results

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

	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%		

Power derating curve:

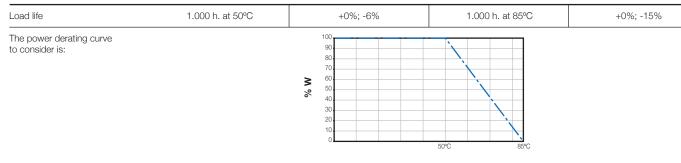
CA14 Through-hole and SMD



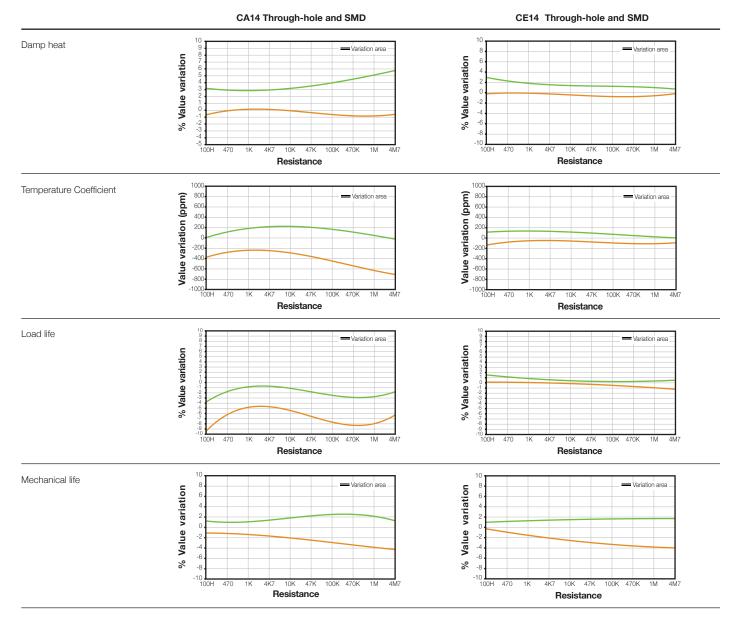
CE14 Through-hole and SMD

For temperatures out of range

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



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



CA14 🐕 CE14 🖗









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

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

EXAMPLE: CER14NV12,5-10KA2020 10DT SNP PI WT-14117-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		
CAR14/CER14	1 N	H2,5		- 10K	А	2020			10DT	SNP			PI		WT	14117	-BA	-V0
andard co	nfigura	ation:		CAR14	Throug	h-hole									CER14	Throug	h-hole	
mensions:										1	4mm							
otection:								On	request: S	(dust-proo iishable, to	/	. 94 V-0					
ubstrate:				Carbo	on techi	nology										Cermet		
olor:				Blue hou	sing + v	white roto	r								Brown ho	using + v	white rot	or
ackaging:										l	Bulk							
iper positior	n:									at 50)% ±15°							
rminals:									Str	aight, wi	thout crim	nping.						
arking:								Resistiv	e value m	arked or	housing.	. Others	on reques	st.				

	eries												
CA	R14	CE	R14										
2 - R	otors	S											
B	D	E		F	G	K	N	N		Ρ	Т	Х	Z
3 - N	lodel	and	pitch										
V15													
4 - P	acka	ging			-	Troug	jh-hole	•					
Bulk						(blar	nk) ⁽¹⁾						
(1) If bla	ank, bulk	< packaę	ging is im	plied.									
5 - R	esist	ance	value	•									
100Ω	200Ω	220Ω	250Ω	470Ω	500Ω	1KΩ	2KΩ	. 500KΩ	1MΩ	2MΩ	2M2Ω	4M7Ω	5MΩ
100	200	220	250	470	500	1K	2K	500K	1M	2M	2M2	4M7	5M
Other n	esistive	values a	vailable	on reque	est.								
6 - R	esist	ance	law /	taper									
	Linea			-						А			
Log -	Loga	arithm	ic							В			
Antilo	g - Ai	ntiloga	arithmi	С						С			
- Spe	ecial ta	apers	have o	codes	assigi	ned:			CODE	E YXXX	XX		
7 - T	olera	nce											
±20%		nce	±30)%		+50%	%,-30%		±1()%		±59	%
2020)		303	30		5	030		10	10		050)5
			Life (C)						(eave b	lank)
			-		cles. ex	<: LV10) for 10.(000 cycle	S. (othe	ers on requ	uest) L\	/XX: ex:	LV10
	-			,				,.			,		
			Oper										
Oper	ı circu	iit at b	eginni	ng of	track,	fully (CCW			PCI			
Oper	ı circu	iit at e	end of	track,	fully C	W				PCF			
10 -	Deter	nts (E	DT)										
-			e begi	nning						DTI			
One	deten	t at th	e end							DTF			
X nur	nber (of det	ents						XI	DT: 10	DT		

11 - Terminals							
SNAP IN P						SI	NP
Shorter tip of terminal, T	PXX, wher	e XX is ti	p length	(under request)	TPXX, e	ex: TP30
Steel Terminals						S	SH
12 - Housing							
Color: For colors other th	an standard	d: -See co	olor chart	below-	CJ-colo	or, ex., red	d: CJ-RO
13 - Rotor							
Color: For colors other th	an standard	d: -See co	olor chart	below-	RT-colo	r; ex., blu	ie: RT-AZ
* Self-extinguishable By default, carbon is non : For carbon: self-extinguish and rotor are V0. If only the If only rotor: RT-V0	self-extingu nable prope	ishable, c rty can be	ermet is S e added. \	Self-extingui /0 means h	shable:		lank) V0), RT-V0
14 - Wiper							
Wiper position (Stand	ard: 50%	± 15°)				(leave bl	ank)
Initial or CCW						PI	
Final or CW						PF	
Others: following clock	positions;	at 3 hou	urs: P3H		F	PXH, ex:	РЗН
Wiper torque (Standar	rd: <2.5Nc	m, for d	etents: <	3.5)		(leave bl	ank)
Low torque, < 1.5Ncm						PGE	3
15 - Linearity							
Not controlled						(leave bl	ank)
Independent linearity cont	rolled & bel	ow x%, fo	or example	e, 3%: LN39	% LN	lx%; ex:	LN3%
Absolute linearity contro	olled & belo	ow x%				LAx%	6
Other features could be available	e on request, p	lease, ask.					
16 - Potentiometers v		nbled a	ccesso	ries			
Assembled from termin	al side					WT	
Assembled from collect	or side					WTI	
Accessory Reference See list of shafts and th	umbwhee	s availat	ole		Exa	-XXXXX 14 mple:	
Color of shaft or thumb						ample, w	
Non self-extinguishable. S UL 94 (-V0 in box 17 mod					(le	eave blar -V0	nk)
For ordering spare ac Accessory reference - c Ex. 14117-AZ-V0 is a b	olor- flamr lue self-ex	nability. tinguisha			/heel	XXXX	<-YY-V0
Color chart for rotor,							
Black ⁽¹⁾ White Neutra	1-	Red	Green	Yellow	Blue	Grey	Brown
NE BA IN	TA	RO	VE	AM	AZ	GS	MR

(1) black is not an option for housings.

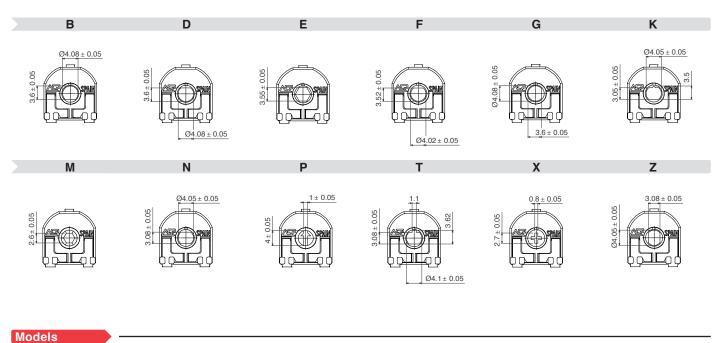
52 <u>www.acptechnologies.com</u>

For this product: Only available under request

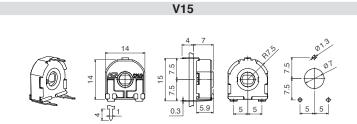
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Rotors

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

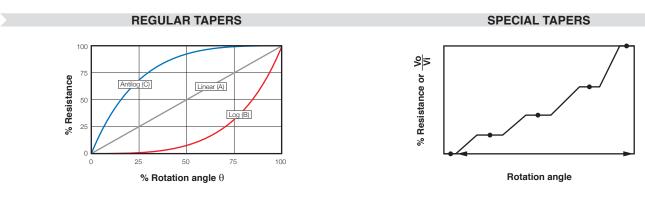


All models shown here have the most common rotor for 14mm potentiometers: the N rotor. Different rotors are available from the menu above.



Tapers

The standard taper is linear (A). Log (B) and Antilog (C) tapers are also available, as well as special tapers according to customer's specifications. 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.-



CAR14
CAR14
CER14

Potentiometers with cut track

The cut track is an area with very high resistive value, resulting in an open circuit. It is widely used in lighting applications. Mechanical life with cut track needs to be confirmed.

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

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

Other positions are available on request.

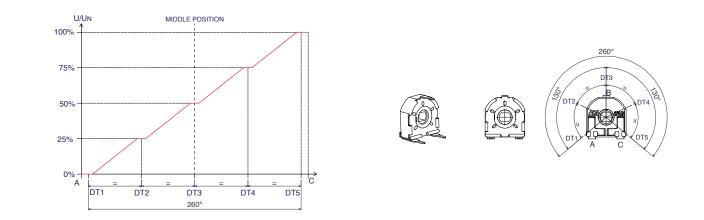


Potentiometers with detents

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

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

Example of 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

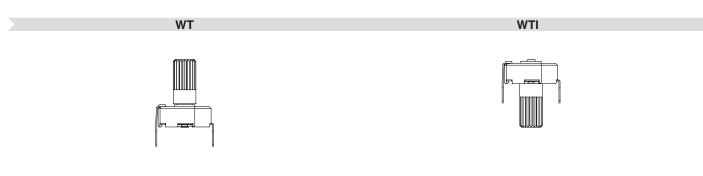
By default, terminals are always straight, as shown on the "models" section. ACP can provide crimped terminals (with snap in, "SNP" or "SNR") to better hold the component to the PCB during the soldering operation.

	SNP	
Charter terminal tipe are only available under request	-++	

Shorter terminal tips are only available under request.



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



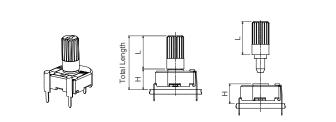
Shafts

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

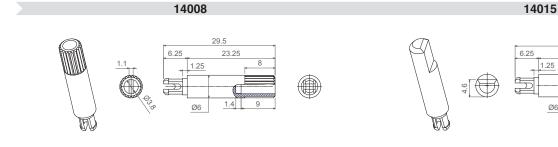
Shafts can be sold separately or delivered already mounted on the potentiometer at ACP.

When a shaft is mounted, 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:

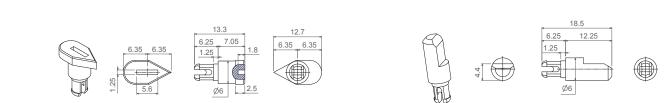
V potentiometer + shaft



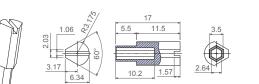
Shaft	14042	14065 (For E rotor)	14117	14056	14081	14187	14251	14067	14008	14015	14066	14084	14250	14072	14073
L Dimension	7.05	11.50	11.70	12.25	18.25	18.75	18.75	27.75	23.25	23.25	23.50	23.50	25.00	31.75	38.50

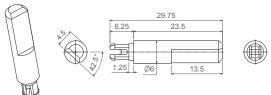


14042



14065 (Designed for E rotor)





14066

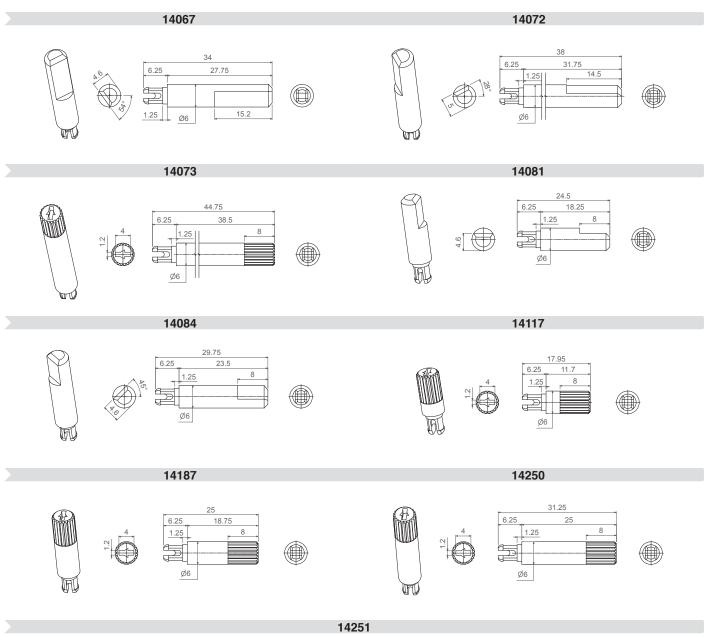
29.5

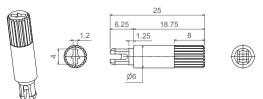
Ø6

14056

23.25

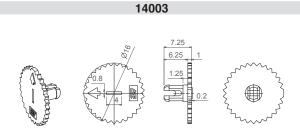
CAR14
CAR14
CER14





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

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



Packaging

Bulk packaging:

Potentiometer model	With shaft or thumbwheel inserted?	Pieces per small box (150 x 100 x 70)	Pieces per bigger box (250 x 150 x 70, CG on description)
	None, only potentiometers.	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) Log (B) Antilog (C)	$100\Omega \le Rn \le 5M\Omega$ 1 K $\Omega \le Rn \le 2M2\Omega$	100Ω ≤ Rn ≤ 5MΩ 1 KΩ ≤ Rn ≤ 2M2Ω				
Tolerance* Rn < 100Ω: 100Ω ≤ Rn ≤ 100KΩ 100K< Rn ≤ 1MΩ: 1MΩ < Rn ≤5MΩ: Rn > 5MΩ:	+50%, -30% (out of range) ±20% ±20% ±30% +50%, -30% (out of range)	- ±20% ±20% ±30% -				
Variation laws	Lin (A), Log (B), Antilog (C). Of	Lin (A), Log (B), Antilog (C). Other tapers available on request				
Residual resistance	Lin (A), Log (B), Antilog (C) \leq 5*10-3*Rn. Minimum value 2 Ω	≤2Ω				
CRV - Contact Resistance Variation (dynamic)	Lin (A) Electrical Angl Other tapers,					
CRV - Contact Resistance Variation (static)	Lin (A) Electrical Angl Other tapers,					
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)	250 ⁰ 200 ¹					
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.

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

	CAR14 Through-hole	CER14 Through-hole				
Resistive element	Carbon technology	Carbon technology Cermet				
Angle of rotation (mechanical)	265° ± 5°					
Angle of rotation (electrical)	245° ± 20°					
Viper standard delivery position	50% ± 15°					
lax. stop torque	101	Ncm				
fax. push/pull on rotor	50 N					
/iper torque*	<2.5 Ncm Potentiometers with detents: <3.5 Ncm					
lechanical life	1.000 cycles (many more availa	able on request, please, inquire)				

* Stronger or softer torque feeling is available on request.

Test results

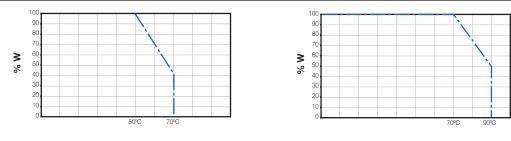
The following typical test results (with 95% confidence) are given at $23^{\circ}C \pm 2^{\circ}C$ and $50\% \pm 25\%$ RH.

	CAR14 Th	rough-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%		

CAR14 Through-hole

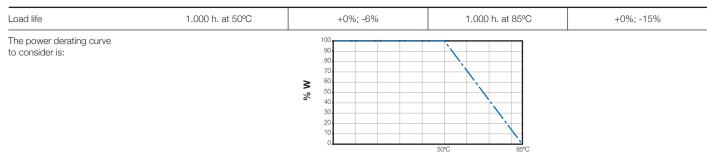
CER14 Through-hole

Power derating curve:

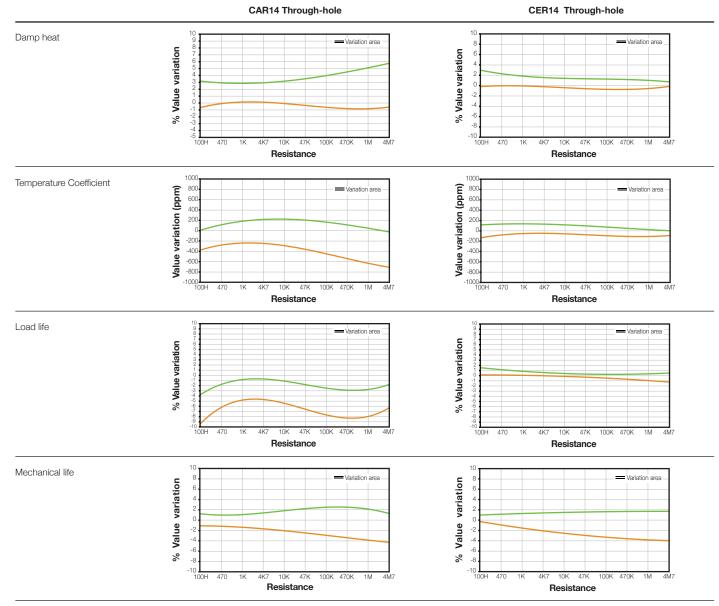


For temperatures out of range

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



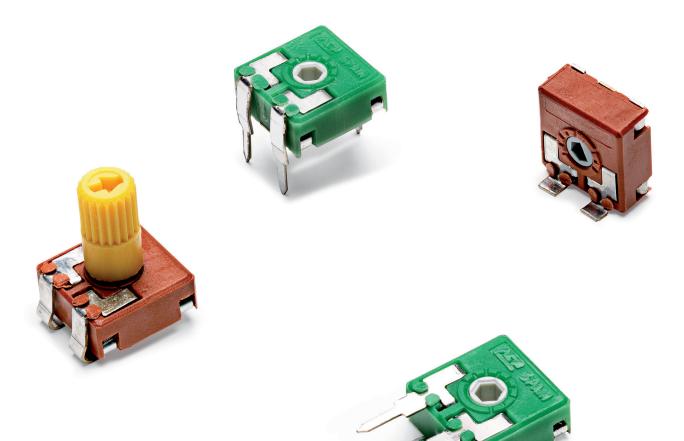
Representation of the typical variation of nominal resistance (with 95% confidence) throughout the ohm value range:



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

CAR14
CAR14
CER14





RS9

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 $\pm 3\%$. 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 🖗 HOW TO ORDER

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

Standard	d featu	res						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	Μ	H2,5		- 10K	А	2020				SNP			PI		WT	-9005	-BA	-V0
andard co	onfigura	ation:			F	RS9 Thro	ugh-hol	e						R	S9 SMD			
mensions:										ç	9mm							
otection:			IP 54 (dust-proof) On request: Self-extinguishable, to meet UL 94 V-0															
ubstrate:			Carbon technology Carbon technology, special for high temperature															
olor:			Green housing + white rotor Brown housing + grey rotor															
ackaging:		Bulk																
iper positio	n:	at 50% ±15°																
rminals:		Straight, without crimping.																
arking:			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 - Se	eries							
RS9)							
2 - R	otors							
С	D	Е	J	K	М	Ρ	R	Y

3 - Model and pitch

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

Trough-hole	SMD models
(blank) ⁽¹⁾	(blank) ⁽¹⁾
(N.A.) ⁽²⁾	T&R
(N.A.) ⁽²⁾	T&R15
	(blank) ⁽¹⁾ (N.A.) ⁽²⁾

(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 - C	ut Trac	k – Ope	en circuit.
-------	---------	---------	-------------

Open circuit at beginning of track, fully CCW	PCI
Open circuit at end of track, fully CW	PCF
Pin in Paste option (Reflow Soldering)	PIP

10 - Detents (DT)

Not applicable for RS9

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 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 ΡI 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% LAx% 16 - Potentiometers with assembled accessories Assembled from terminal side WT WTI Assembled from collector side Accessory Reference -XXXXX 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 (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

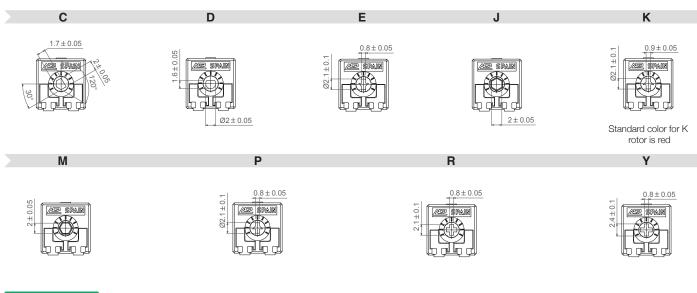
Black⁽¹⁾ White Neutral Transp. Red Yellow Blue Brown Green Grey ΑZ GS NE ΒA RO VE AM MR IN TA (1) black is not an option for housings.

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

Rotors

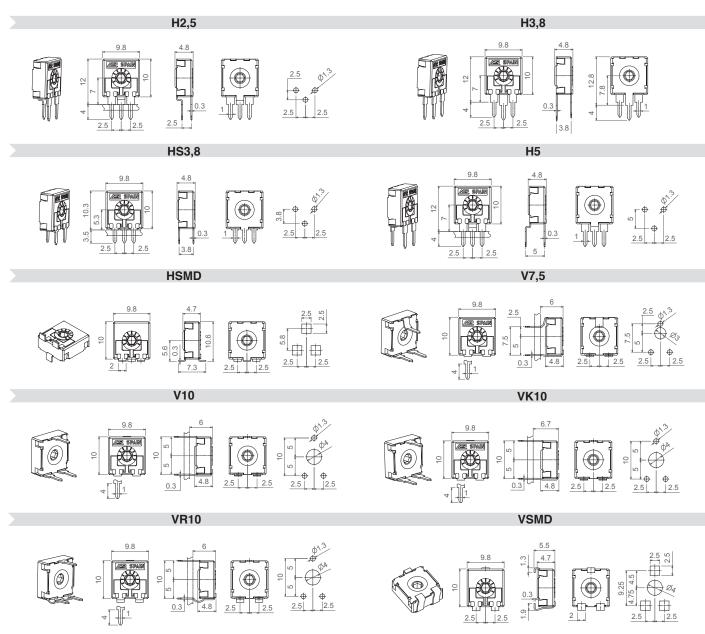
Rotors are drawn in their standard positioning, 50% of rotation. Alternative delivery positioning can be requested. Accessories in this catalogue are designed for the M rotor, unless otherwise stated.



Models

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

from the menu above.

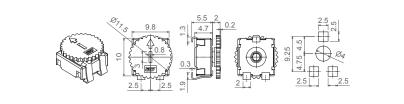


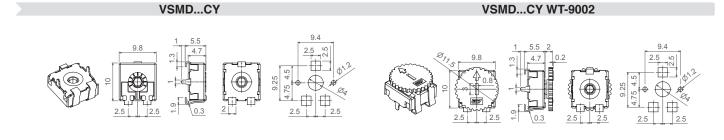
Specifications on this catalog are for reference only, as they are subject to change without notice.

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RS9

VSMD WT-9002

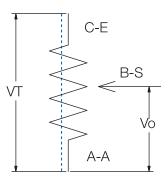




Tapers

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.





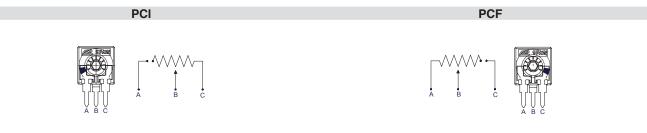
Potentiometers with cut track

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.



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

 SNP
 SNJ

 Image: Signal state of the sta

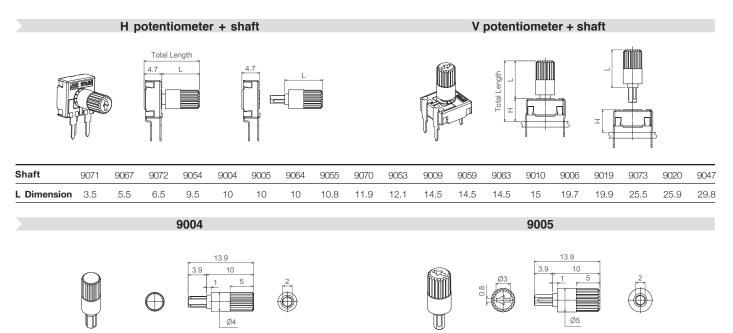
Shafts

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.

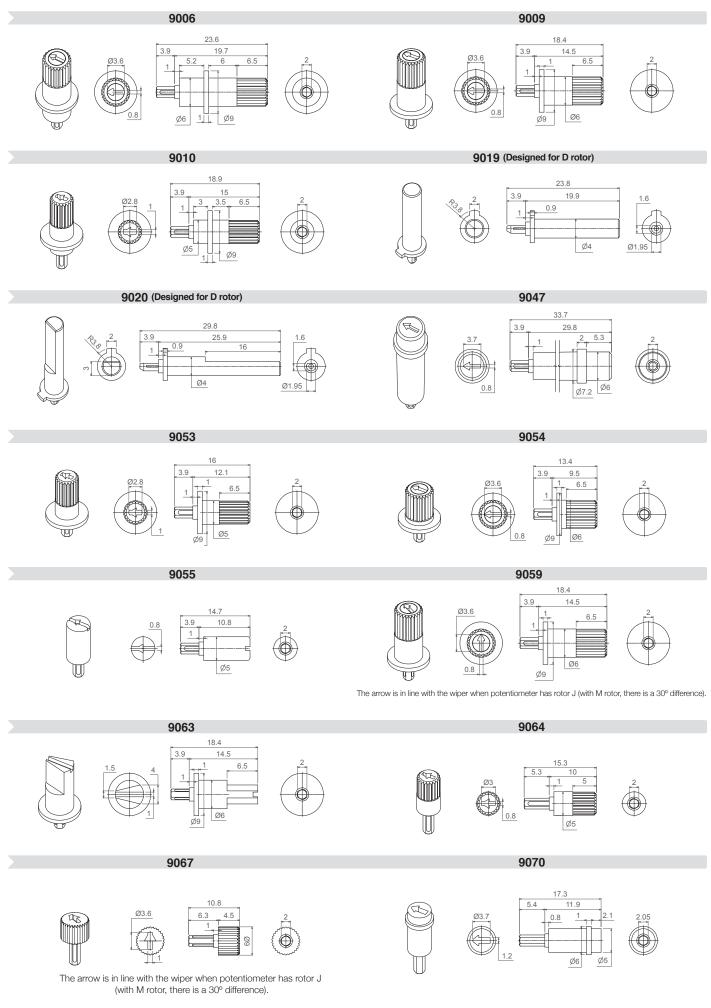
Unless otherwise stated, the arrow in the shafts is in line with the wiper and it points to 50% when assembled with M rotors.

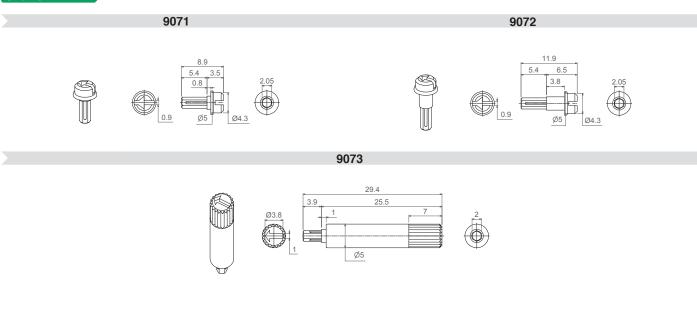
When a shaft is mounted on a potentiometer, the distance from the top of the potentiometer to the top of the shaft is marked with "L" in the table below, as shown in the drawings:



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

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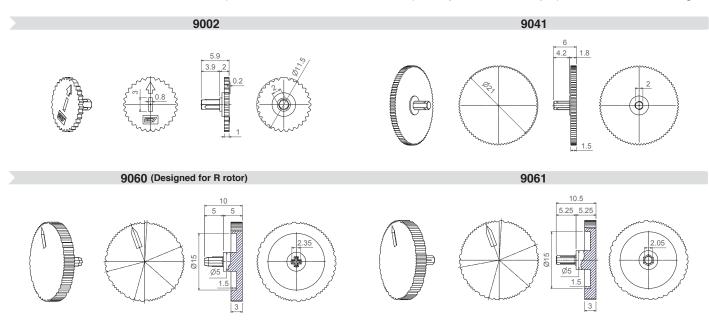




Thumbwheel

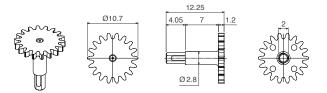
Thumbwheels are available in different colors (color chart in "how to order" section) and with self-extinguishable property according to UL 94 V-0, under request.

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



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



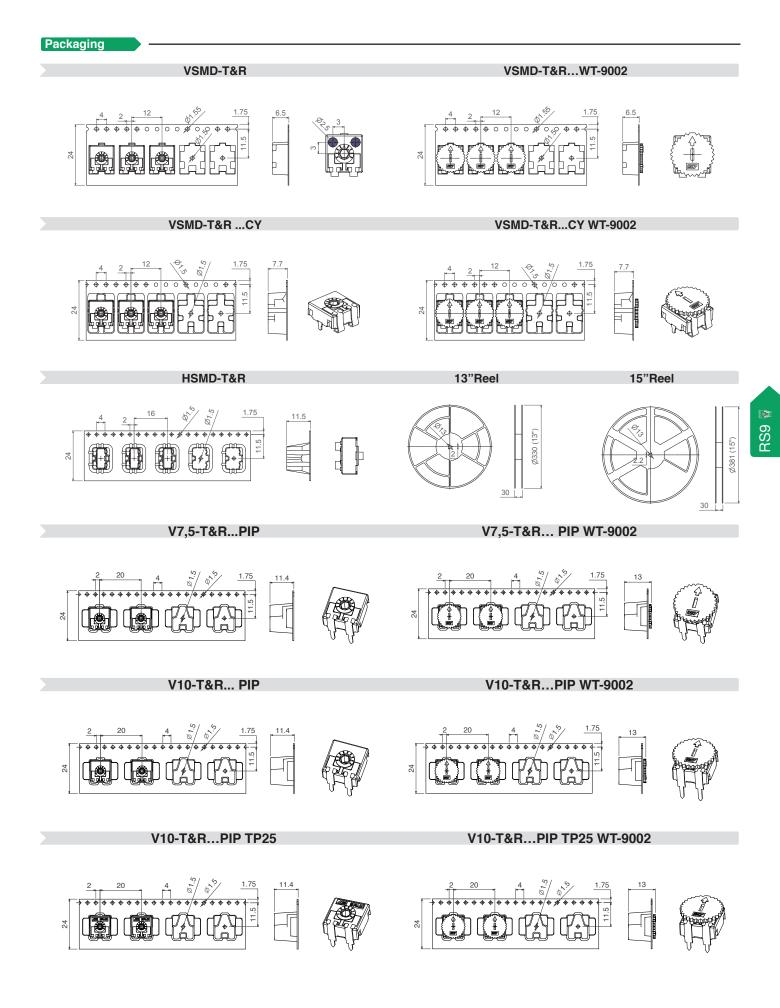
Packaging

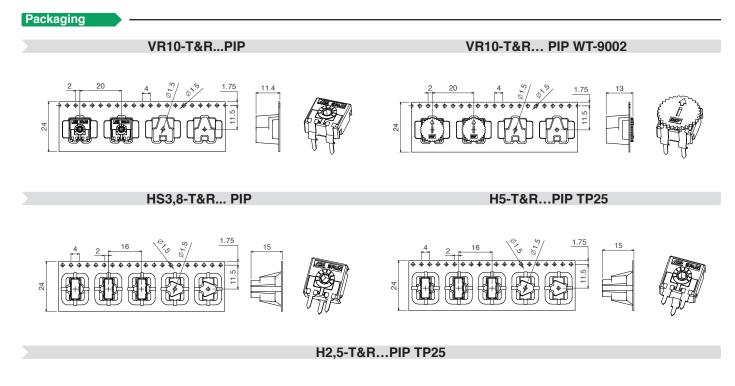
Bulk packaging:

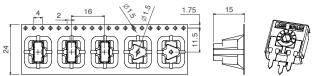
Potentiometer model	With shaft or thumbwheel inserted?	Pieces per small box (150 x 100 x 70)	Pieces per bigger box (250 x 150 x 70, CG on description)
	None, only potentiometers.	500	1.500
	9002	250	1.000
H2,5 - H3,8 - HS3,8 - H5 HSMD - V7,5 - V10 VK10 - VR10 - VSMD	9004, 9005, 9006, 9009, 9010, 9041,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

Tape & Reel packaging:	With thumbwheel inserted?	13" Reel (Standard), with 24mm width tape	15" Reel, with 24mm width tape
	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
VSIVIDCY	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
H2,5PIP TP25 - H5PIP TP25 - HS3,8 PIP	None, only potentiometers	250	350
V7,5PIP - V10PIP - V10PIP TP25 - VR10PIP	or 9002	250	400

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







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)	$100\Omega \le Rn \le 5M\Omega$ 1 K $\Omega \le Rn \le 2M2\Omega$	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 taper	rs available on request				
Residual resistance	Lin (A) ≤ 5*10-3*Rn. 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 $100\Omega \le Rn \le 10K\Omega$ $10K\Omega < Rn \le 5M\Omega$	+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.

** Dissipation of special tapers will vary, 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.

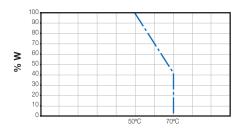
Test results

The following typical test results are given at 23°C $\pm 2^{\circ}\text{C}$ 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%

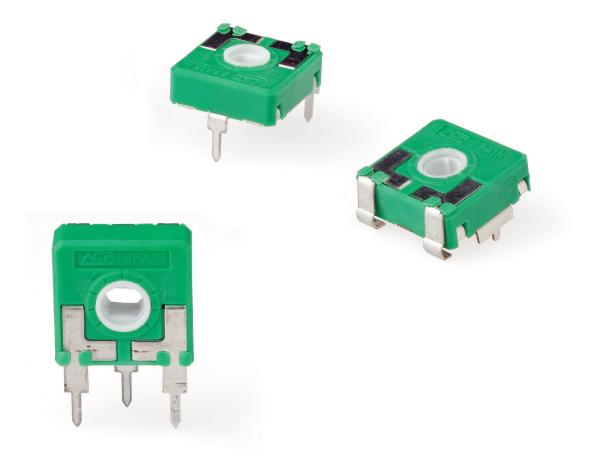
Power derating curve:

RS9 Through-hole and SMD



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RS14 🖪

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 \pm 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 A HOW TO ORDER

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

Standar	d featu	res						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	-V0
Standard configuration: RS14 Through-h																		
andard co	onfigur	ation:			R	S14 Thro	bugh-h	ole						RS	614 SMD			
andard connensions:	onfigur	ation:			R	S14 Thro	ough-h	ole		1.	4mm			RS	614 SMD		_	
	onfigur	ation:			R	S14 Thro	ough-h		quest: Sel	IP 54 (d	dust-proof		JL 94 V-0		614 SMD	_	_	_
nensions:	onfigur	ation:				S14 Three		On rea	quest: Sel	IP 54 (d	dust-proof	o meet l			S14 SMD	igh temp	erature	
nensions: otection:	onfigur	ation:			(chnolo	On red gy	quest: Sel	IP 54 (d	dust-proof	o meet l	bon techr	nology, s		• ·	erature	

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 - 5	Seri	es									
RS	614										
2 - F	Roto	ors									
F				Ν				Т			Z
3 - 1	Vlod	el ano	d pitch								
H0	Н	C0	H2,5	H4	H5	HA5	HL5	V12,5	VA12	,5	VL12,5
VR1	2,5	V15	VJ15	(V15).	CFF	V17,5	VD7,5	VD11	VSMD	VSI	MD CY

	HSMD (Under request, not readily available)					
4 - Packaging	Trough-hole	SMD models				
Bulk	(blank) ⁽¹⁾	(blank) ⁽¹⁾				

Duik	(bidi iry	(bitai irty
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

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	А	
- Special tapers have codes assigned:	CODE YXXXX	X
7 - Tolerance		
±30%		
3030		
8 - Operating Life (Cycles)		
Long life: LV + number of cycles. i.e: LV100 for 100.00	0 cycles, LV150, LV1M	LVXXX: ex: LV100

	ies, lv 150, lv 11vi	LVAAA. EX. LV 100
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 RS14

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-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 roto By default, carbon is non self-extinguishable. Self-extinguishable pro 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	
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	WT
Assembled from collector side	WTI
See list of shafts and thumbwheels available	-XXXXX Example: 1411
Color of shaft or thumbwheel Non self-extinguishable. Self-extinguishable according to standard UL 94 (-V0 in box 17 modifies only the accessory, please, note.)	-YY Example, white: BA (leave blank) -V0
For ordering spare accessories: Accessory reference - co Ex. 14117-AZ-V0 is a blue self-extinguishable 14117 thumby	
Color chart for rotor, housing and accessories	
Black ⁽¹⁾ White Neutral Transp. Red Green Yellow	Blue Grey Brow

ΒA (1) black is not an option for housings.

NE

TA

IN

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

RO

VE

AM

AZ

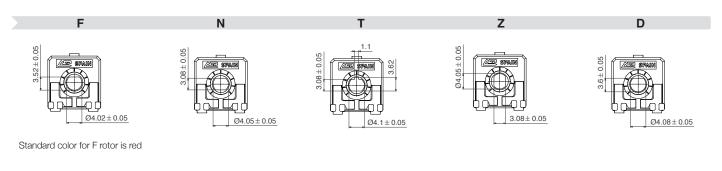
GS

MR

Rotors

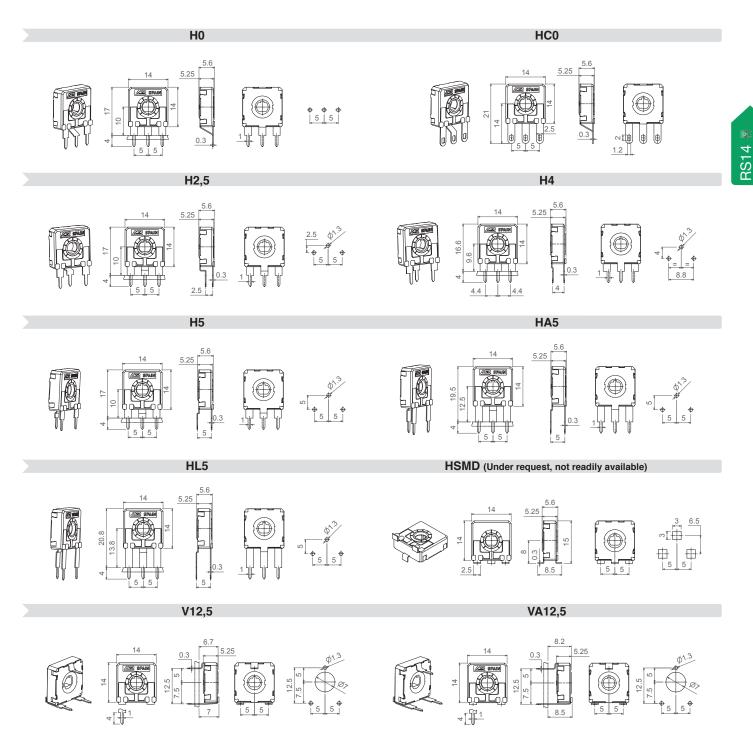
T is the standard rotor for RS14. Rotors are drawn in their standard positioning, 50% of rotation. Alternative delivery

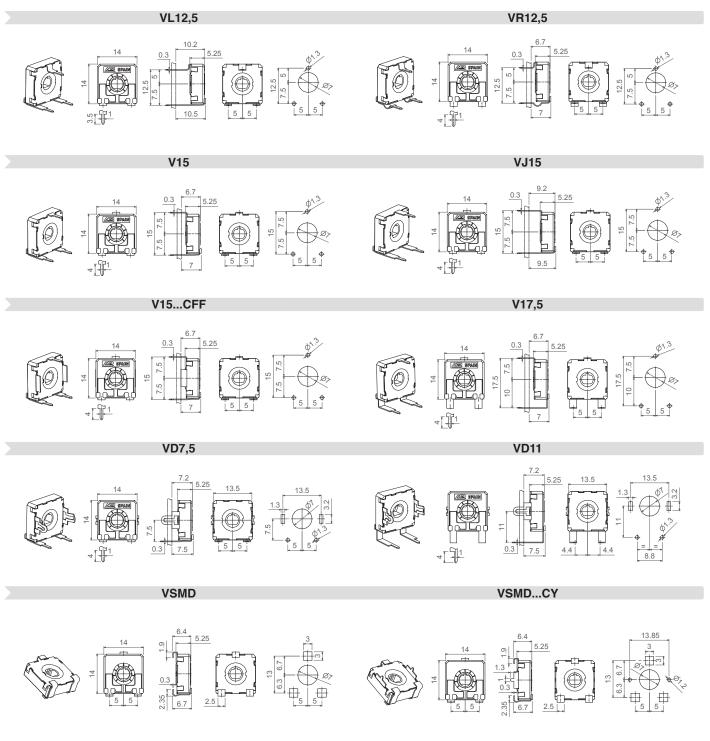
positioning can be requested. Accessories in this catalogue are designed for N, Z and T rotors, unless otherwise stated. Other rotor styles, on request.



Models

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

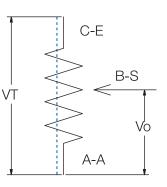




Tapers

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



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

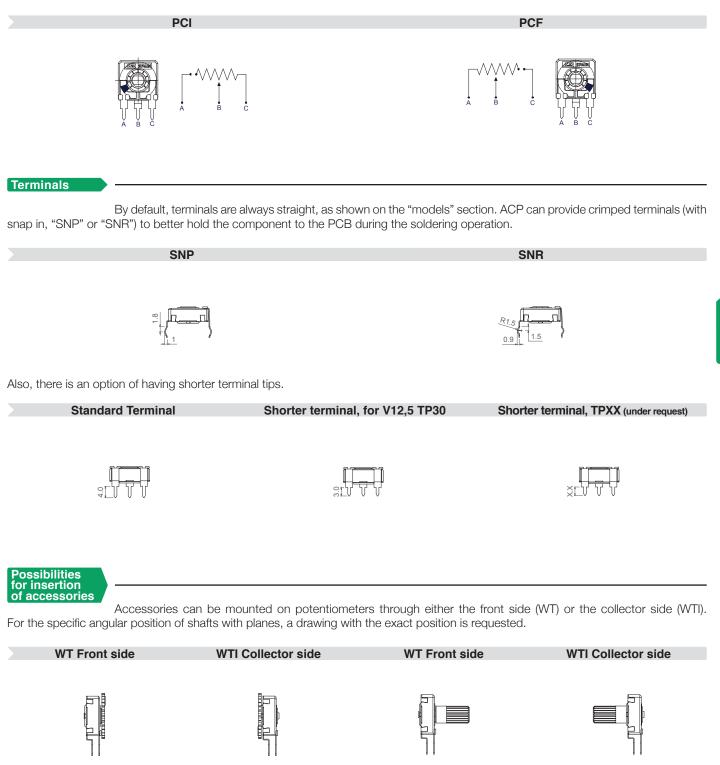
Potentiometers with cut track

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.

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

Other positions are available on request.



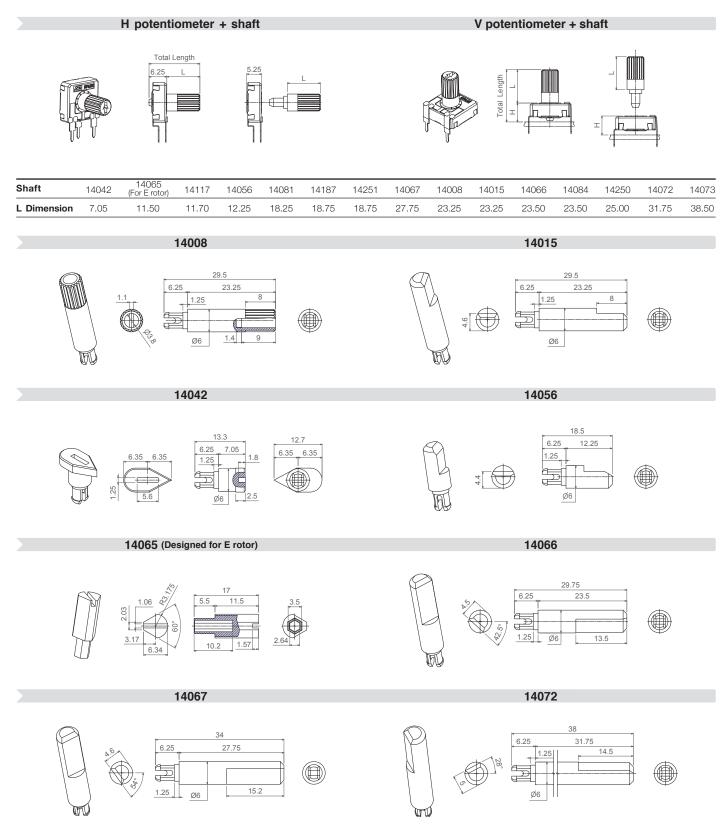
3S14 🖗

Shafts

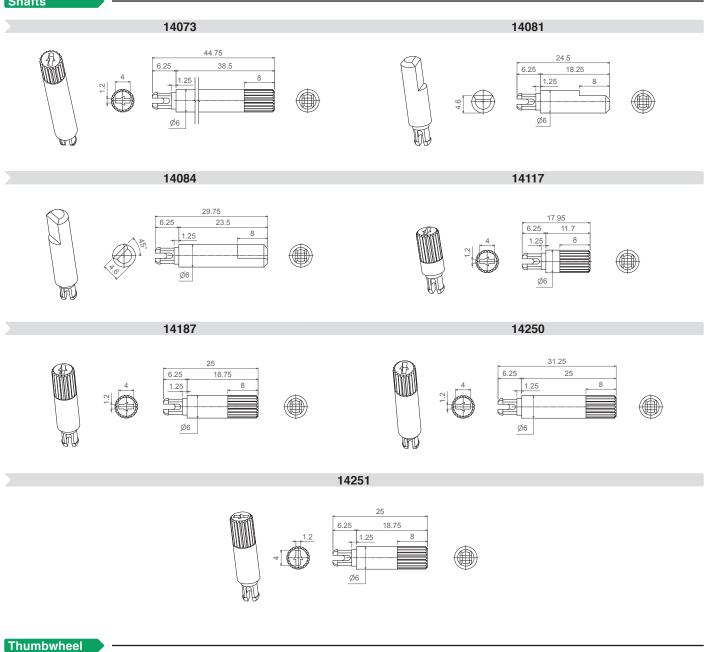
Shafts are available in different colors (color chart in "how to order" section) and with self-extinguishable property, according to UL 94 V-0, under request. ACP can study special shaft designs.

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:

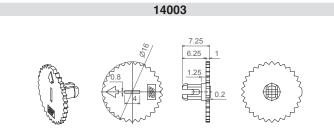






Thumbwheels are available in different colors (color chart in "how to order" section) and with self-extinguishable property according to UL 94 V-0, under request.

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



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

RS14 🙀

Packaging

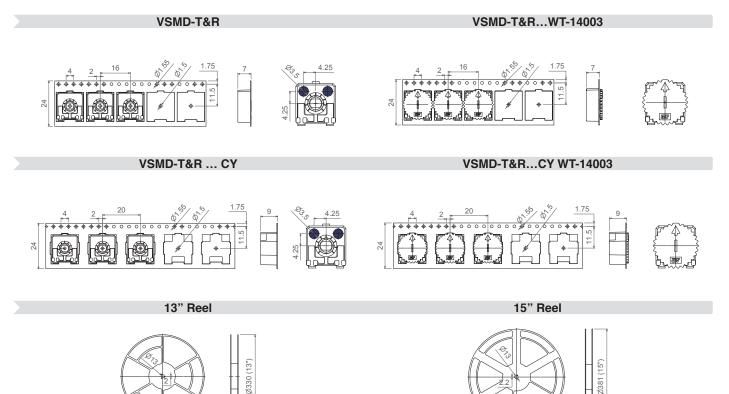
Bulk packaging:

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.	
VOIVD	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.	
	14003	To be determined.	To be determined.	

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



30

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 vo	Itage 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° ≤ 5%Rn. Other tapers, please inquire				
Maximum power dissipation** Lin (A)	at 50°C	c, 0.15W			
Maximum voltage Lin (A)	250	VDC			
Operating temperature	-25°C	-25°C +85°C			
Linearity	3%				
Temperature coefficient $100\Omega \le Rn \le 10K\Omega$ $10K\Omega < Rn \le 5M\Omega$	+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.

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

Mechanical Specifications **RS14** Through-hole and SMD Resistive element Carbon technology $265^{\circ} \pm 5^{\circ}$ Angle of rotation (mechanical) 245° ± 20° Angle of rotation (electrical) $50\% \pm 15^{\circ}$ Wiper standard delivery position 10 Ncm Max. stop torque 50 N Max. push/pull on rotor <1.5 Ncm Wiper torque* 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:









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 $\pm 3\%$. 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	res						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		
RSR14	Т	V15		- 10K	А	3030									WT	-14008	-NE	-V0
andard co	nfigura	ation:						RSR	14 Throu	gh-hole								
mensions:									14mm									
otection:						0	n reque	IP est: Self-ex	54 (dust-j tinguishat		eet UL 94	- V-0						
ubstrate:								Car	bon techr	nology								

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.

RSR14				
2 - Rotors	6			
F	Ν	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 ±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

3030	±30%			
	3030			

8 - Operating Life (Cycles)

	100.000	cycles: LV100
Standard:	150.000	cycles: LV150
	250.000	cycles: LV250
Long life: LV + number of cycles. i.e: LV100 for 300.000 cycles, LV300, L	_V1M L\	/XXX: 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

SNAP IN P		SNP
Shorter tip of terminal, TPXX, where XX is tip length (under reque	est)	TPXX, ex: TP25
Steel Terminals		SH
12 - Housing		
Color: For colors other than standard: -See color chart below-	CJ-colo	r, 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 rot By default, carbon is non self-extinguishable. Self-extinguishable p 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 14 - Wiper 		(blank) V0 CJ-V0, RT-V0
Wiper position (Standard: 50% ± 15°)	(leave blank)
Initial or CCW		PI
Final or CW		PF
Others: following clock positions; at 3 hours: P3H	P	XH, 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%	LN:	x%; 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 E	Example: 14117
Color of shaft or thumbwheel Non self-extinguishable. Self-extinguishable according to standard	4	mple, white: BA

(leave blank) -V0 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 XXXX-YY-V0

Color chart for rotor, housing and accessories

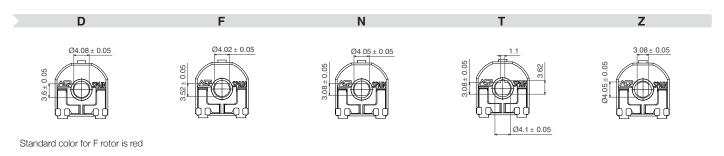
Black ⁽¹⁾	White	Neutral	Transp.	Red	Green	Yellow	Blue	Grey	Brown
NE	BA	IN	TA	RO	VE	AM	AZ	GS	MR

(1) black is not an option for housings.

Rotors

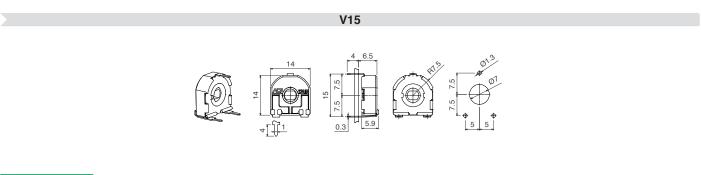
T is the standard rotor for RSR14. Rotors are drawn in their standard positioning, 50% of rotation. Alternative delivery positioning can be requested.

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



Models

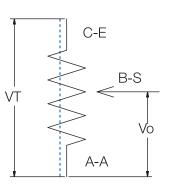
All models shown here have the most common rotor for RSR14, the T rotor.



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.

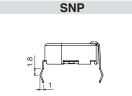
PCF = Cut at final position, when the potentiometer is turned fully clockwise.

Other positions are available on request.



RSR14 @

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.



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.

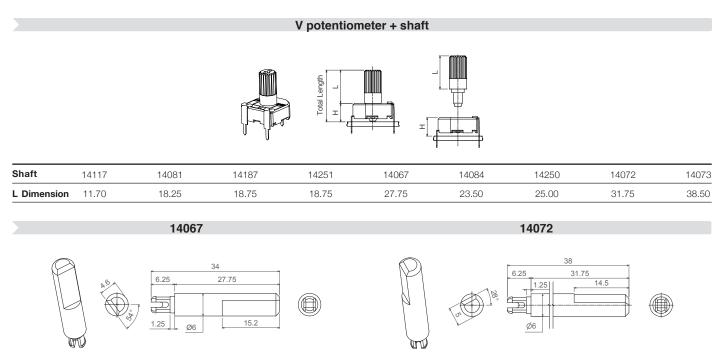


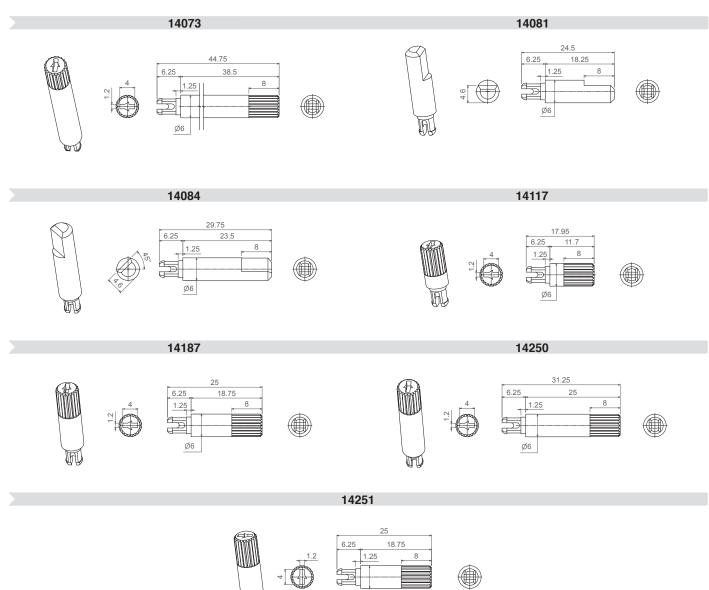
Shafts

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:





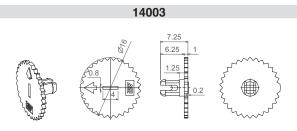
Ø6

G

RSR14 @

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

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



Packaging

Bulk packaging:

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.

ectric pecifications

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 $100\Omega \le Rn \le 10K\Omega$ $10K\Omega < Rn \le 5M\Omega$	+200/ -300 ppm +200/ -500 ppm

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

** Dissipation of special tapers will vary, 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.	

Standard: 100.000. 150.000 and 250.000 cycles. Up to 1.000.000 cycles (please, inquiry).

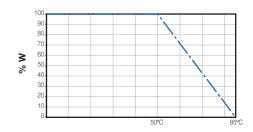
* Stronger or softer torque feeling is available on request.

Test results

The following typical test results (with 95% confidence) are given at 23°C ±2°C and 50% ±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	Deerature 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 \pm 2°C	±20%		
Storage (3 years)	3 years at 23°C ± 2°C	±3%		

Power derating curve:











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

Series	d featur	es						Extra fe	atures						Assemb	oled acc	essory	
Series	Rotor	Model	Packg. (Ohm value	Taper	Tol.	Life	Track	Detents	s 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	Ν	V15		- 10K	А	3030	LV15					RSN		LN3%	WT	-14015	-NE	-V0
andard co	onfigura	tion:			CS	4 Thro	ough-ho	le						с	S14 SMD			
mensions:							_			14	4mm							
otection:											dust-proof							
ibstrate:					Ca	rhon te	chnolog		quest: Se	elf-extingu	iishable, to				special for	high tem	noratu	
olor:							+ white							0,7	using + gre			
ickaging:						Bu									T&R			
iper positio	n:									at 50)% ±15°							
rminals:					Straig	nt, with	out crim	ping.							J-Lead			
arking:								Resistive	e value r	marked or	housing.	Others	on reque	st.				
stomized	produc	ts: A dra	awing is r	requeste	d when o	dering	a custoi	mized pro	duct. Se	eries, rotor	, model a	nd total	resistive	value are	indicated l	before th	e code	that incluc
special spe	ecificatio	ns. Exan	nple: CS	14NV15-	10K COE	E C00	111.											
Series										12 - Hou								
CS14										Color: For	colors oth	er than s	tandard: -	See color	chart below	/- CJ	-color, e	ex., red: CJ-
Rotors										13 - Roto	or							
D*	E			< M	N*	Ρ	T*	Х	Z*	Rotors N	l, T, Z						F	RSN
otors available f			0 turns.							All other	s rotors:						(leav	e blank)
H2,5	H5	V12	2.5 \	/15	/15CFF	V	SMD	VSMD	CY	Color: For	colors oth	er than s	tandard: -	See color	chart below	/- RT-	-color; e:	x., blue: RT
- Packagi i Ilk .R (Tape ar .R (Tape ar	nd 13" re	,	(bla A)	ugh-hole ank) ⁽¹⁾ N.A.) ⁽²⁾ N.A.) ⁽²⁾)	S	MD mc (blank). T&R T&R1	(1)		* Self ext Not V0 (b) Housing a Only hous Only rotor	y default) and rotor \ sing V0		perty V0	for hou	sing and ı	rotor		(leave bla V0 CJ-V0 RT-V0
g Box: See		CIJ					TOITI	0		14 - Wip								
If blank, bulk pa		nplied. (2) N	I.A., Not App	licable: Tape	and Reel pac	kaging is c	nly available	for SMD term	ninals.	<u> </u>	osition (S	andard:	50% ±	15°)			(lea	ave blank)
Resistan						0 0				Initial or C								PI
			,						5MO	Final or C	W							
)Ω 200Ω 22	20Ω 250Ω	2 47002 5	i00Ω 1KG	2 2ΚΩ	. 500KΩ 1	MΩ 21	MΩ 2M29	2 4M7Ω 5	JIVILL									PF
					. 500KΩ 1 500K		MΩ 2M29 M 2M2		5M	Others: fo	ollowing cl	ock pos	itions. Ex	at 3 hou	ırs: P3H		PXH	PF I, ex: P3H
)Ω 200Ω 22	20 250	470	500 1K	K 2K	500K					Others: fo		ock pos	itions. Ex	at 3 hou	ırs: P3H		PXF	
DΩ 200Ω 22	20 250	470	500 1K	K 2K	500K					Wiper to	orque				ırs: P3H ts <3.5 Ncr	n		
0Ω 200Ω 22 00 200 2 Presistan	20 250 ce law /	470	500 1K	K 2K	500K	M 2			5M	Wiper to	for 15.00) turns:	<2.5 Nci	m, deten	ts <3.5 Ncr	n	(lea	l, ex: P3H
0Ω 200Ω 22 00 200 2 • Resistan n - Linear	20 250 ce law / hmic) 470 {	500 1K	K 2K	500K	M 2 A			5M	Wiper to Standard	for 15.00	0 turns: for 15.00	<2.5 Nci 00 turns	m, deten <1.5 Ncr	ts <3.5 Ncr	n	(lea	H, ex: P3H ave blank)
0Ω 200Ω 22 10 200 2 10 Resistan 1 - Linear 19 - Logarit	20 250 ce law / hmic ogarithn) 470 { t aper (s	500 1K see also	C 2K page 10	500K	M 2 A B	M 2M2		5M	Wiper to Standard Special lo Standard	for 15.00 w torque for >15.00	0 turns: for 15.00	<2.5 Ncr 00 turns <1.5 Nc	m, deten <1.5 Ncr m	ts <3.5 Ncr		(lea	H, ex: P3H ave blank) PGB
0Ω 200Ω 22 10 200 2 Resistan 1 - Linear g - Logariti tilog - Antil Special tape	20 250 ce law / hmic ogarithn ers have) 470 { taper (s nic codes a	500 1K see also ssigned:	C 2K page 10	500K	M 2 A B C	M 2M2		5M	Wiper to Standard Special lo Standard	for 15.00 w torque to for >15.00 or softer fe	0 turns: for 15.00	<2.5 Ncr 00 turns <1.5 Nc	m, deten <1.5 Ncr m	ts <3.5 Nor n		(lea	H, ex: P3H ave blank) PGB
0Ω 200Ω 22 10 200 2 Resistan 1 - Linear g - Logariti tilog - Antil	20 250 ce law / hmic ogarithn ers have e (see a) 470 { taper (s nic codes a	500 1K see also ssigned: e 10)	C 2K page 10	500K	M 2 A B C	M 2M2		5M	Wiper to Standard Special lo Standard Stronger o	for 15.00 w torque for >15.00 or softer fe	0 turns: for 15.00 00 turns eeling the	<2.5 Nor 00 turns <1.5 No an above	m, deten <1.5 Ncr m	ts <3.5 Nor n		(lea (lea	H, ex: P3H ave blank) PGB
0Ω 200Ω 22 0 200 2 Resistan 1 - Linear g - Logariti tilog - Antil Special tape Tolerance	20 250 ce law / hmic ogarithn ers have e (see a +50%	a 470 { taper (s nic codes a lso page	500 1K see also ssigned: e 10)	K 2K page 10	500K	M 2 A B C DDE Y	M 2M2	2 4M7 :	5	Wiper to Standard Special lo Standard Stronger o 15 - Line	for 15.00 w torque for >15.00 or softer fe earity , according	0 turns: or 15.00 00 turns seeling the g to IEC	<2.5 Nor 20 turns <1.5 No an above 190	m, deten <1.5 Ncr m 2, availab	ts <3.5 Ncr n le on reque		(lea (lea	H, ex: P3H ave blank) PGB ave blank) ve blank)
0Ω 200Ω 22 Resistan a - Linear g - Logariti tilog - Antil Special tape Tolerance 0% 030	20 250 ce law / hmic ogarithn ers have e (see a +50% 50) 470 { i taper (s nic codes a lso page o,-30%	500 1K see also ssigned: e 10)	< 2K page 10 ±20%	500K	M 2 A B C DDE Y2 ±10%	M 2M2	2 4M7 : ±5%	5M 	Wiper to Standard Special lo Standard Stronger of 15 - Line Standard,	for 15.00 w torque for >15.00 or softer for arity according ent linearit	D turns: for 15.00 D0 turns beling the g to IEC y contro	<2.5 Nor 20 turns <1.5 No an above 190 Iled and	m, deten <1.5 Nor m a, availab below x?	ts <3.5 Nor n le on reque %. Ex: 3%		(lea (lea (lea	H, ex: P3H ave blank) PGB ave blank) ve blank) b, ex: LN39
0Ω 200Ω 22 0 200 2 Resistan 1 - Linear g - Logariti tilog - Antil Special tape 0%	20 250 ce law / hmic ogarithn ers have e (see a +50% 50 g Life () 470 3 i taper (s nic codes a iso page 5,-30%)30 Turns)	500 1K see also ssigned: ⇒ 10)	< 2K page 10 ±20%	500K	M 2 A B C DDE Y2 ±10%	M 2M2	2 4M7 : ±5%	5	Wiper to Standard Special lo Standard Stronger of 15 - Line Standard, Independ Absolute	for 15.00 w torque for >15.00 or softer for arity according ent linearity co	D turns: for 15.00 D0 turns beling the g to IEC y contro pontrolled	<2.5 Nor 20 turns <1.5 No an above 190 illed and and belo	m, deten <1.5 Ncr m e, availab below x9 below x9. E	is <3.5 Ncr n le on reque %. Ex: 3% x: 2,5%		(lea (lea (lea	H, ex: P3H ave blank) PGB ave blank)
0Ω 200Ω 22 0 200 2 Resistan 1 - Linear g - Logariti tilog - Antil Special tape 0% 030 • Operatin	20 250 ce law / hmic ogarithn ers have e (see a +50% 50 g Life (') 470 4 taper (s itaper (s codes a lso page p,-30%)30 Turns) ns) (others of	500 1K see also ssigned: a 10) =	< 2K page 10 ±20% 2020	500K	M 2 A B C DDE Y? ±10%	M 2M2	2 4M7 ===================================	5	Wiper to Standard Special lo Standard Stronger of 15 - Line Standard, Independ	for 15.00 w torque for >15.00 for >15.00 or softer fe arity according ent linearity linearity co ntiomete	D turns: for 15.00 D0 turns deling the g to IEC y contro pontrolled rs with	<2.5 Nor 20 turns <1.5 No an above 190 Illed and and belo assemb	m, deten <1.5 Ncr m e, availab below x9 below x9. E	is <3.5 Ncr n le on reque %. Ex: 3% x: 2,5%		(lea (lea (lea LNx%	H, ex: P3H ave blank) PGB ave blank) ve blank) b, ex: LN39
0Ω 200Ω 22 10 200 2 Resistan - Linear g - Linear g - Logariti tilog - Antil Special tape 0% 030 Operatin andard (15 ng life: LV + r	20 250 ce law / hmic ogarithm ers have e (see a +50% 50 g Life (.000 turn humber of	1 470 s taper (s itaper (s itaper (s codes a lso page b,-30%)30 Turns) ns) (others o turns, ex:	500 1K see also ssigned: ⇒ 10) un request). LV100 for	< 2K page 10 ±20% 2020	500K	M 2 A B C DDE Y? ±10%	M 2M2	2 4M7 == ±5% 0505	5	Wiper to Standard Special lo Standard Stronger of 15 - Line Standard, Independd Absolute 16 - Pote Assemble	for 15.00 w torque i for >15.00 or softer fe earity according ent linearity co ntiomete ad from ter	D turns: for 15.00 D0 turns eeling the g to IEC y contro pontrolled rs with minal sig	<2.5 Nor 20 turns <1.5 No an above 190 illed and and belo assemb de	m, deten <1.5 Ncr m e, availab below x9 below x9. E	is <3.5 Ncr n le on reque %. Ex: 3% x: 2,5%		(lea (lea (lea LNx% LAx%,	I, ex: P3H ave blank) PGB ave blank) ve blank) o, ex: LN39 ex: LA2,5
200Ω 200Ω 22 Resistan a - Linear g - Logariti tilog - Antil Special tape Tolerance 0% 330 Operatin andard (15	20 250 ce law / hmic ogarithn ers have e (see a +50% 50 g Life (.000 turn humber of k - Ope (has an -	 470 s taper (s taper (s codes a lso page a,-30%)30 Turns) ns) (others a turns. ex: n circui open circo 	500 1K see also ssigned: ⇒ 10) = un request). LV100 for t t cuit area a	< 2K page 10 ±20% 2020 r 100.000 f	500K) C turns, LV15 see of the p	M 2 A B C C DDDE Y7 1010	M 2M2	2 4M7 == ±5% 0505 LV15 XX: ex: LV	5M 	Wiper to Standard Special lo Standard Stronger of 15 - Line Standard, Independ Absolute 16 - Pote	for 15.00 w torque for >15.00 or softer fe arity according ent linearity co ntiomete ad from ter ad from co y Reference	D turns: for 15.00 D0 turns celing the g to IEC y contro ontrolled rs with minal sid llector size	<2.5 Nor 20 turns <1.5 No an above 190 illed and and belo assemb de ide	m, deteni <1.5 Nor m below x9 bw x%. E led acce	is <3.5 Ncr n le on reque %. Ex: 3% x: 2,5%	est.	(lea (lea LNx% LAx%, V	I, ex: P3H ave blank) PGB ave blank) ve blank) b, ex: LN3' ex: LA2,5
DΩ 200Ω 22 Resistan - Linear g - Linear g - Logariti tilog - Antil Special tape O% 030 Operatin andard (15 ng life: LV + r - Cut Trac G14 already	20 250 ce law / hmic ogarithm ers have e (see a +50% 50 g Life (.000 turn humber of k - Ope / has an itional cut	470 4 taper (s taper (s taper (s codes a so page o,-30% 300 Turns) others o turns. ex: tracks o	500 1K see also ssigned: ≥ 10) an request). LV100 for t tuit area a san be stu	< 2K page 10 ±20% 2020 r 100.000 t at the bas udied on	500K) C turns, LV15 se of the p request.	M 2 A B C DDE Y7 ±10% 1010	M 2M2	2 4M7 ± ±5% 0505 LV15 XX: ex: LV etween 33	5M 	Wiper to Standard Special lo Standard Stronger of 15 - Line Standard, Independ Absolute 16 - Pote Assemble Accessor	for 15.00 w torque i for >15.00 or softer fe earity according ent linearity co ntiomete ad from ter ad from ter d from co y Reference shafts an	D turns: for 15.00 D0 turns celing the celing the g to IEC y controlled minal sid llector size d thumb	<2.5 Nor 20 turns <1.5 No an above 190 illed and and belo assemb de ide	m, deteni <1.5 Nor m below x9 bw x%. E led acce	is <3.5 Ncr n le on reque %. Ex: 3% x: 2,5%	est.	(lea (lea LNx% LAx%, V	I, ex: P3H ave blank) PGB ave blank) ve blank) ve blank) o, ex: LN3' ex: LA2,5 NT
DΩ 200Ω 22 DQ 200 2 Resistan 1 a - Linear g g - Logariti 1 tilog - Antil 2 Decial tape 2 Tolerance 0% DOM 200 O% 30 Operatin andard (15 ng life: LV + r Cut Trac S14 already 0%. Addit	20 250 ce law / hmic ogarithn ers have e (see a +50% 50 g Life (.000 turn humber of k - Ope has an ional cur (DT) (A	 470 s taper (s taper (s taper (s taper (s codes a lso page p, -30% 030 Turns) ns) (others of turns. ex: n circui open circuitacks of vailable 	ssigned: ssigned: an request). LV100 for t cuit area a an be stu for up t	< 2K page 10 ±20% 2020 r 100.000 t at the bas udied on	500K) C turns, LV15 se of the p request.	M 2 A B C DDE Y7 ±10% 1010	M 2M2	2 4M7 ± ±5% 0505 LV15 XX: ex: LV etween 33	5M 	Wiper to Standard Special lo Standard Stronger of 15 - Line Standard, Independ Absolute 16 - Pote Assemble Accessor See list of Color of s Non self-ey	for 15.00 w torque for >15.00 or softer fe arity according ent linearity co ntiomete ad from ter ad from ter ad from co y Reference shafts an haft or thu ktinguishab	D turns: for 15.00 D0 turns celing the celing the g to IEC y controlled minal sid llector si ce d thumb llector si ce d thumb	<2.5 Nor 20 turns <1.5 No an above 190 Illed and and belo assemb de ide ide wheels a el xtinguisha	m, deten <1.5 Ncr m below x9 bw x%. E led acce available	is <3.5 Ncr n le on reque %. Ex: 3% x: 2,5%	est. 	(lea (lea LNx% LAx%, V V V V	I, ex: P3H ave blank) PGB ave blank) ve blank) o, ex: LN3 ex: LA2,5 N/T VTI ex: 14117

SNR

TPXX, ex: TP30 SH

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

www.acptechnologies.com 92

Shorter tip of terminal, TPXX, where XX is tip length (under request)

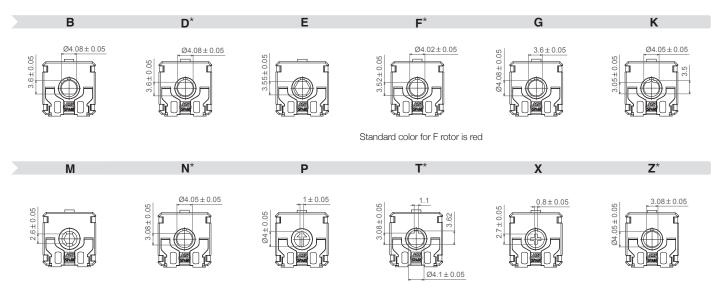
SNAP IN R

Steel Terminals

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

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.

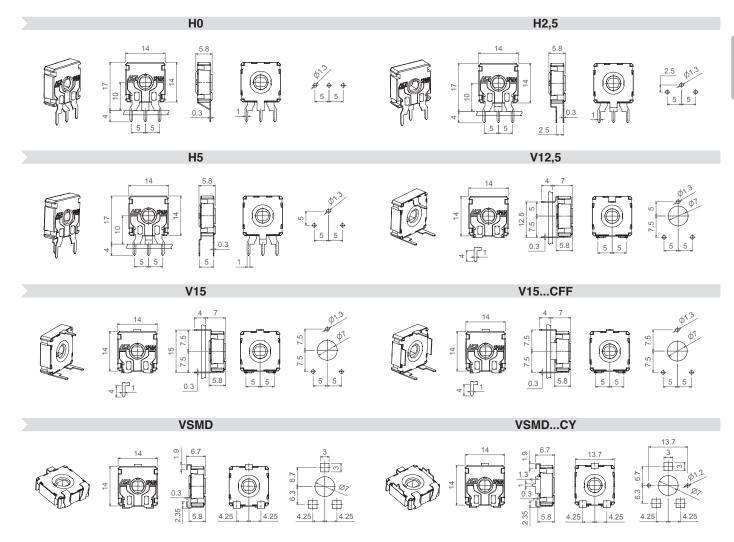
Accessories in this catalogue are designed for N, Z and T rotors, unless otherwise stated. Other rotor styles, on request.



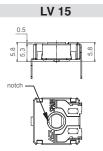
*Please, note that for more than 15.000 turns (up to 1.000.000 turns) the following rotors are available: D, F, N, T, Z.

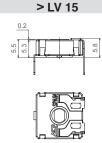
Models

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



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

Tapers

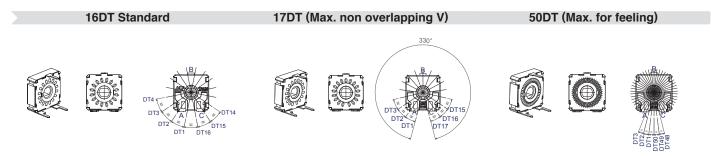
The Standard taper is linear (A). Log (B) and Antilog (C) tapers are also available, as well as special tapers according to customer specifications. See an example on the application described on page 11.

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



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

Standard Terminal



Shorter terminal, TPXX (under request)

SNR





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.

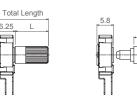
Shafts can be sold separately or already mounted on the potentiometer.

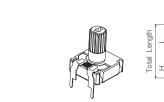
When a shaft is mounted on a potentiometer, the distance from the top of the potentiometer to the top of the shaft is marked with "L" in the table below, as shown in the drawing:

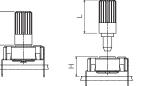
H potentiometer + shaft

6.25





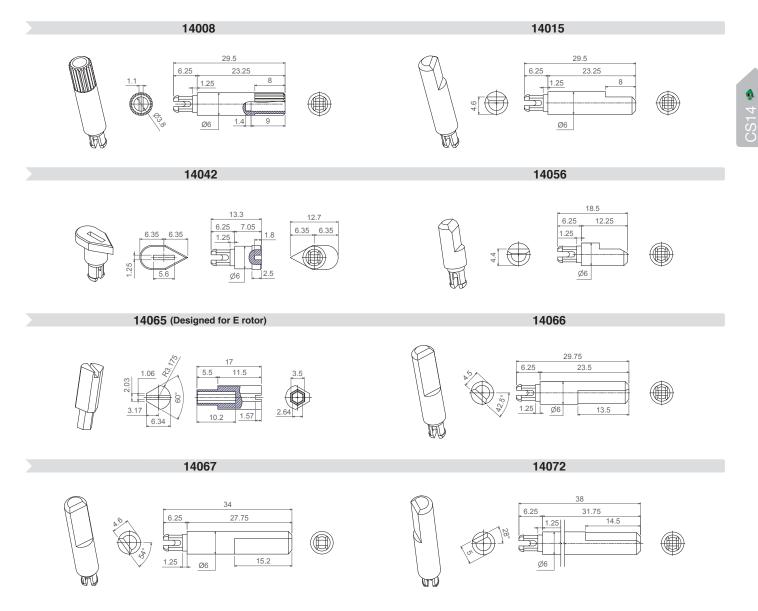


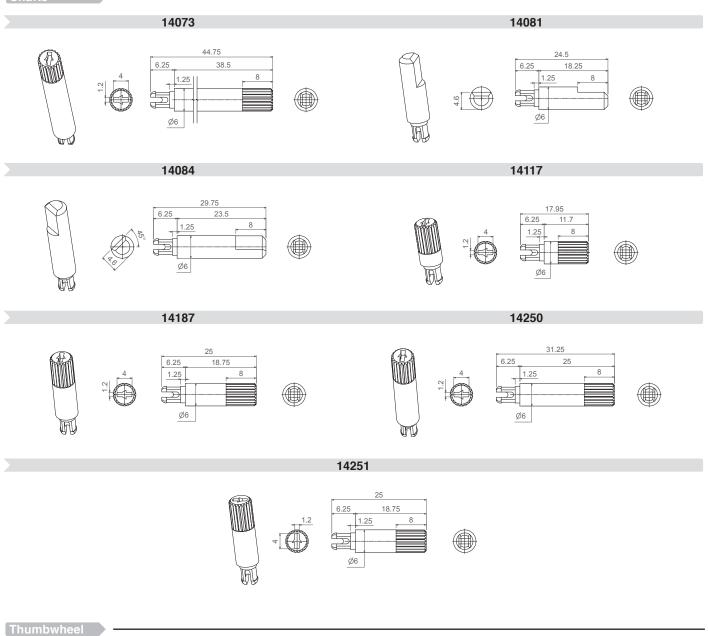


(H is set by the potentiometer model. See page 5)

V potentiometer + shaft

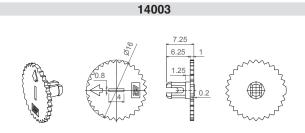
Shaft	14042	14065 (For E rotor)	14117	14056	14081	14187	14251	14067	14008	14015	14066	14084	14250	14072	14073
L Dimension	7.05	11.50	11.70	12.25	18.25	18.75	18.75	27.75	23.25	23.25	23.50	23.50	25.00	31.75	38.50





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

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



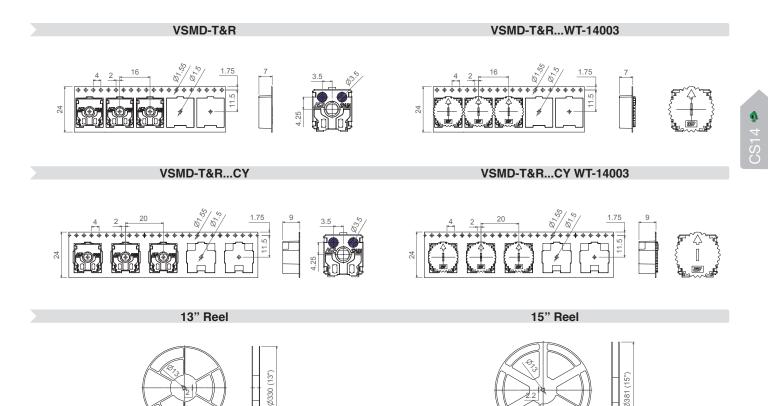
Packaging

Bulk packaging:

CS14 model	With shaft or thumbwheel inserted?	Pieces per small box (150 x 100 x 70)	Pieces per bigger box (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.



30

30

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

	CS14 Through-hole	CS14 SMD (upon availability)		
Range of resistance values* Lin (A) Log (B) Antilog (C)	100Ω ≤ Rn ≤ 5MΩ 1 KΩ ≤ Rn ≤ 2M2Ω	$100\Omega \le Rn \le 1M\Omega$ 1 K $\Omega \le Rn \le 1 M\Omega$		
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 taper	rs 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)		gle 330°±20° ≤ 5%Rn. s, please inquire		
Maximum power dissipation** Lin (A)	at 50°	C, 0.15W		
Maximum voltage Lin (A)	25	OVDC		
Operating temperature	-25°C +70°C (+85°C on request) Special Version 120° C			
Angle of rotation (electrical)	330	° ± 20°		
Temperature coefficient $100\Omega \le \text{Rn} \le 10\text{K}\Omega$ $10\text{K}\Omega < \text{Rn} \le 5\text{M}\Omega$	+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.

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

Mechanical Specifications		
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.

results

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

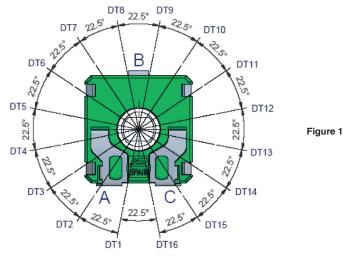
CS14 Through-hole and SMD

	Test conditions	Typical variation of Rn		
Damp heat	500 h. at 40°C and 95% RH	±20%		
Temperature Coefficient	erature 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%		

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

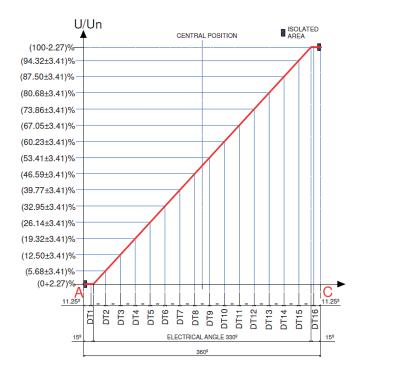
Using the CS14 as a voltage divider, we can obtain 16 non-overlapping voltage values at each one of the 16 detents located evenly spread along the full circumference with a separation of 22.5° between each contiguous detent. See figure 1.



TOLERANCE IN DETENT POSITIONS ±3°

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.

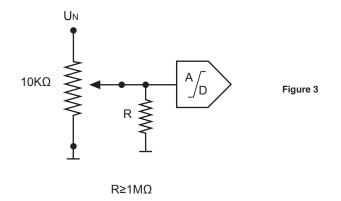




Applications

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













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.

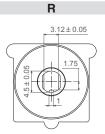
Q16 SHOW TO ORDER

EXAMPLE: Q16RV15 10KA3030 LV10 16DT 3N PDT1

S	Series	Roto	r	Model	Packagi	na C	hm value	Taper	Tolerand	ce l	Life	Nº Detents	Det.torque.	Terminals	Flammability	Position
_	1	2		3	4	<u> </u>	5	6	7		8	9	10	11	12	13
	Q16	R		V15			10K	А	3030	Ľ	V10	16DT	ЗN			PDT1
nda	ard con	figuratio	n:								Q16					
nens	sions:									16>	x15mm					
tect	tion:							On	n request: Se		P 54. uishable	e, to meet UL	94 V0			
re p	otention	neter:									CS14	,				
ckag	ging:										Bulk					
oer j	position:									Deten	nt 1 (PD	T1)				
min	als:									St	traight					
rkin	ıg:							Resis	stive value m	narked or	n housii	ng. Others on	request.			
6.0	ries									8 - Oper	atina I	Life (Turns)				
3e	nes											0 turns) (others	on request).			LV10
10												nber of turns. (pl		ilahility)		LVXXX: ex: LV
Ro	otors													naointy).		
Stan	dard. (O	thers und	ler stud	y).						-		fdetents				10DT
										Standard		tions under st	udu			16DT
_	del and	-									niigura		uuy			
5 S	tandard.	VSMD u	nder sti	udy.						10 - Dete		-				
Pa	ckaging									Standard						ЗN
k	chaging	,		(blan	k) ⁽¹⁾					Others av	vailable	4Ncm, 5Ncm	n, 6Ncm			4N, 5N, 6N
	cts supplied	bulk packed i	n bags, un							11 - Tern	ninals					
_										By defau	ılt, term	inals are alwa	ys straight			(leave blank
	sistive v		0500	1700	5000	41/0	10//0			SNAP IN	ΙP					SNP
Ω	200Ω	220Ω	250Ω	470Ω	500Ω	1KΩ	10KΩ sta			Steel Ter	minals					SH
0	200	220	250	470	500	1K	10)K	5M	12 - Flar	mmabi	lity				
Тар	ber											self extinguish d rotors self ex		according to	o UL 94 VO.	(leave blank V0
- Lii	near							A		Only Q16	6 housii	ng and rotor s	elf extinguish	able V0		Q-V0
ners	under s	tudy. Cod	le will b	e assigne	ed case by	case.				13 - Deli	ivery p	osition				
Tol	erance											on at detent 1				PDT1
	\leq Rn \leq	100KΩ:		100 KΩ ·	< Rn ≤ 1N	1Ω:	1 N	IΩ < Rn ≤	5MΩ:	Position a	at deter	nt. XX= (positi	on number)			PDTXX
	±30%									Special	markin	a				
±30% ±30% +50%,-30%					3030			5030		Special marking Special marking						GRE

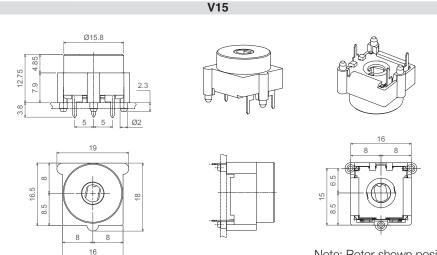
Rotor

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.

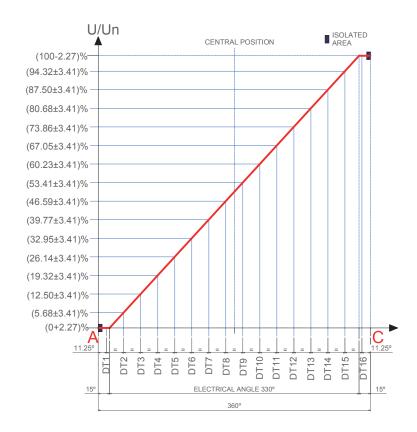
V15 is the standard model.



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.



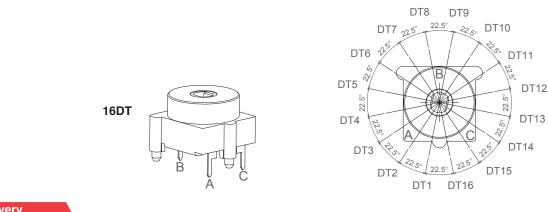
VALUE
(0+2.27)% Un
(5.68±3.41)% Un
(12.50±3.41)% Un
(19.32±3.41)% Un
(26.14±3.41)% Un
(32.95±3.41)% Un
(39.77±3.41)% Un
(46.59±3.41)% Un
(53.41±3.41)% Un
(60.23±3.41)% Un
(67.05±3.41)% Un
(73.86±3.41)% Un
(80.68±3.41)% Un
(87.50±3.41)% Un
(94.32±3.41)% Un
(100-2.27)% Un

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 Position

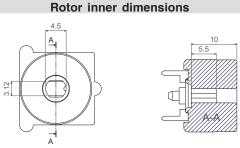
Unless otherwise specified, the Q16 is delivered with the wiper on position 1 (PDT1).

Shafts

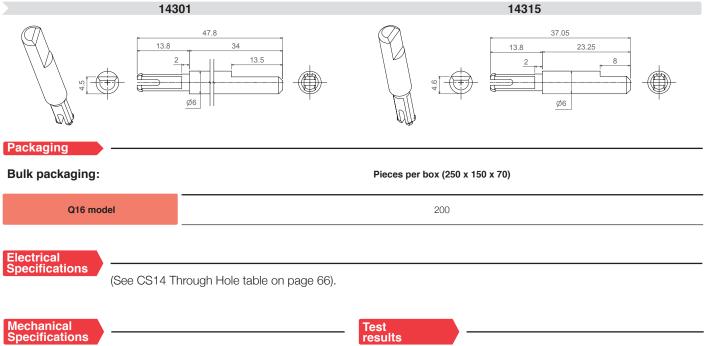
Shafts are sold separately. They can be inserted from either top or below side.

Please consult ACP for studying special designs.

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



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.



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.

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

Q16

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QJ16 🗵

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 $\pm 45^{\circ}$.

Application:

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 JHOW TO ORDER

EXAMPLE: QJ16RV15 10KA3030 LV10

Standard features											
Series	Rotor	Model	Packaging	Ohm value	Taper	Tolerance	Life	Mechanical Angle	Terminals	Flammability	Position
1	2	3	4	5	6	7	8	9	10	11	12
QJ16	R	V15		10K	А	3030	LV10	±45°			

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.	

QJ1	6							
2 - Ro	otors							
R Star	ndard. (Of	thers und	der study).				
3 - Mo	del and	pitch						
V15 S	standard.	VSMD u	nder stu	dy.				
4 - Pa Bulk	ickaging	I		(blanł	a (1)			
	cts supplied	bulk packed	in bags, unle					
(1) FIOUU								
. ,	sistive v	alue						
. ,	sistive v 200Ω	z alue 220Ω	250Ω	470Ω	500Ω	1KΩ	10KΩ standard	5MΩ
5 - Re			250Ω 250	470Ω 470	500Ω 500	1KΩ 1K	10KΩ standard 10K	5MΩ 5M
5 - Re 100Ω 100	200Ω 200	220Ω						
5 - Re 100Ω	200Ω 200 per	220Ω						

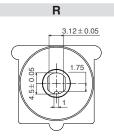
Standard (10.000 cycles)	LV10
Long life: LV + number of cycles. (please inquire availability).	LVXXX: ex: LV20
9 - Mechanical Angle	
Standard ±45°	(leave blank)
Other configurations under study	
10 - Terminals	
By default, terminals are always straight	(leave blank)
SNAP IN P	SNP
Steel Terminals	SH
11 - Flammability	
Standard: Non self extinguishable. All housings and rotors self extinguishable according to UL 94 V0.	(leave blank) V0
Only QJ16 housing and rotor self extinguishable V0	Q-V0
12 - Delivery position	
Standard, middle position	(leave blank)
Special marking	
Special marking	GRE

100Ω ≤Rn≤ 100KΩ:	100KΩ ≤Rn≤ 1MΩ:	1MΩ ≤Rn≤ 5MΩ:					
±30%	±30%	+50%,-30%					
3030	3030	5030					
Special tolerances under request. Please check availability.							

Rotor

7 - Tolerance

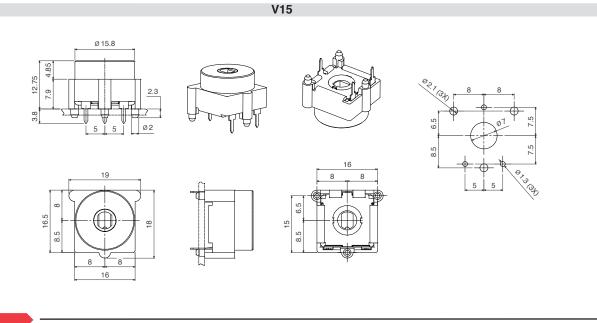
R is the standard rotor for QJ16. Other options can be made under study.



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

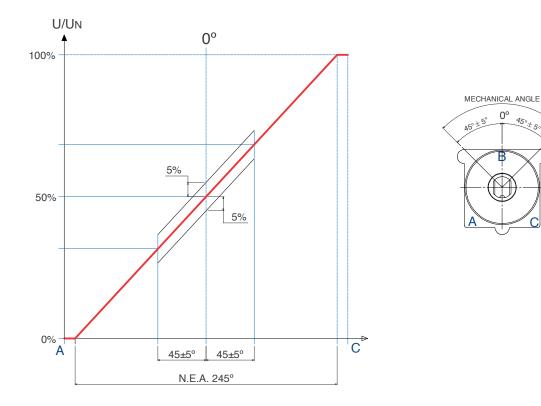
Models

V15 is the standard model.



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.

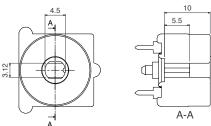
Shafts

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

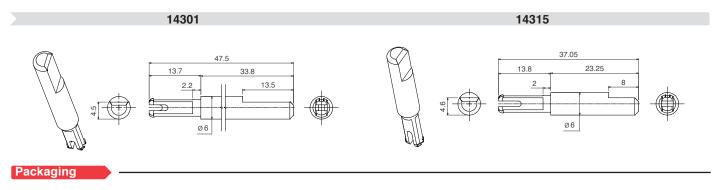
Please consult ACP for studying special designs.

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

Rotor inner dimensions



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



Bulk packaging:

QJ16 model

Pieces per box (250 x 150 x 70)

Electrical Specifications

	1					
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℃, plus 2 h at –25℃	16 h at 85°C, plus 2 h at –25°C ±20%			
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%		

QJ16





CARBON – MCA9

9mm carbon potentiometers with plastic enclosure and shaft.

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

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

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

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

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

Applications

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

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

CERMET – MCE9

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

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

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

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

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

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

Applications

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

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

MCA9 🛓 MCE9

MCA9 A MCE9 A HOW TO ORDER

Standard features Extra feature										Assembled accessory					
Series Rotor Model	Packg. Ohm val	le Taper	Tol.	Life	Track	Detents	s 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		
MCA9/MCE9 D H5	- 10k	A	2020				SNP			PI		WT	-9020	-NE	-V0
Standard configuration:		м	CA9 Thr	ough-h	ole						MCE9	Through-ł	hole		
Dimensions:							ç)mm							
Protection:					On	roquest:	IP 54 (o Self-extingu	dust-proo		04.1/ 0					
Substrate:		C	arbon te	chnoloc		request.	sen-extingt	uisi iadie, iu	Ineel OL	94 V-U		Cermet			
Color:			housing							Br		ising + whit	te rotor		
Packaging:							E	Bulk							
Viper position:							at 50	0% ±15°							
erminals:						St	raight, wi	thout crin	nping.						
/larking:					Resistiv	<i>r</i> e value r	narked or	n housing	. Others	on reque	st.				
								p or torrin	1100, 1170	, where a	vv is tip i	ength (under	request)	TP.	
	15 V7,5 T	V r ough-ho (blank)	10 le	VK10	VI		Steel Tern 12 - Hou Color: For 13 - Rote Color: For * Self-ex By default	minals using r colors ot or r colors ot tinguish , carbon is	her than s her than s able pro	standard: standard: perty, V extinguish	See colo See colo 0, for ho able, cerr	r chart belov r chart belov busing and met is Self-e:	v- C. v- RT I rotor: xtinguisha	J-color, e; -color; ex ble:	SH k., red: CJ-F k., blue: RT-/ (blank) V0
- Model and pitch 12,5 H3,8 H - Packaging	Τ 500Ω 1ΚΩ 2ΚΩ	r ough-ho (blank) 500KΩ	le 1MΩ 21	ΜΩ 2Μ2	Ω 4Μ7Ω	5ΜΩ	Steel Terr 12 - Hou Color: For 13 - Roto Color: For * Self-ex By default For carbor	minals using r colors ot r colors ot tinguish , carbon is n: self-extir are VO. If c	her than s her than s able pro s non self- nguishabl	standard: standard: •perty, V extinguish e property	See colo See colo 0, for hc able, cerr can be a	r chart belov r chart belov busing and	v- C. v- RT I rotor: xtinguisha eans hous	J-color, e; -color; ex ble:	SH k., red: CJ-F k., blue: RT-/ (blank)
- Model and pitch 12,5 H3,8 H - Packaging Ulk - Resistance value 000 2000 2200 2500 4700 00 200 220 250 470	500Ω 1KΩ 2KG 500 1K 2K	r ough-ho (blank) 500KΩ	le 1MΩ 21	ΜΩ 2Μ2	Ω 4Μ7Ω	5ΜΩ	Steel Terr 12 - HoL Color: For 13 - Rotu Color: For * Self-ex By default For carbor and rotor a	minals using r colors ot r c	her than s her than s able pro s non self- nguishabl	standard: standard: •perty, V extinguish e property	See colo See colo 0, for hc able, cerr can be a	r chart belov r chart belov busing and met is Self-e: dded. V0 me	v- C. v- RT I rotor: xtinguisha eans hous	J-color, e; -color; ex ble:	SH k., red: CJ-F k., blue: RT-/ (blank) V0
- Model and pitch 12,5 H3,8 H - Packaging Ulk - Resistance value 2000 2000 2200 2500 4700 00 200 220 250 4700 - Resistance law / taper	500Ω 1KΩ 2KG 500 1K 2K	r ough-ho (blank) 500KΩ	le 1MΩ 21 1M 2	ΜΩ 2Μ2	Ω 4Μ7Ω	5ΜΩ	Steel Terr 12 - Hou Color: Foi 13 - Rote Color: Foi * Self-ex By default For carbon and rotor a If only rote	minals using r colors ot r colors ot tinguish , carbon is n: self-extir are VO. If co r: RT-VO per	her than s her than s able prc r non self- nguishabl nly the ho	standard: standard: p perty, V extinguis e property susing nee	See colo See colo 0, for hc able, cerr can be a sids to be	r chart belov r chart belov busing and met is Self-e: dded. V0 me	v- C. v- RT I rotor: xtinguisha eans hous	J-color, e: -color; ex ble: ing C	SH k., red: CJ-F k., blue: RT-/ (blank) V0
- Model and pitch H2,5 H3,8 H - Packaging H ulk H - Resistance value V 00Ω 200Ω 250Ω 470Ω 00 200 220 250 470Ω 00 200 220 250 470 - Resistance law / taper in - Linear H H	500Ω 1KΩ 2KG 500 1K 2K	r ough-ho (blank) 500KΩ	le 1MΩ 21 1M 2 A	ΜΩ 2Μ2	Ω 4Μ7Ω	5ΜΩ	Steel Terr 12 - Hou Color: For 13 - Rota Color: For * Self-ex By default For carbor and rotor a If only roto 14 - Wip	minals using r colors ot r c	her than s her than s able prc r non self- nguishabl nly the ho	standard: standard: p perty, V extinguis e property susing nee	See colo See colo 0, for hc able, cerr can be a sids to be	r chart belov r chart belov busing and met is Self-e: dded. V0 me	v- C. v- RT I rotor: xtinguisha eans hous	J-color, ex -color; ex ble: ing C	SH k., red: CJ-F (blank) V0 CJ-V0, RT-V
- Model and pitch H2,5 H3,8 H - Packaging H - Resistance value H 000 2000 2200 2500 4700 2000 2200 2500 4700 00 200 220 250 470 H - Resistance law / taper H in - Linear H og - Logarithmic H	500Ω 1KΩ 2KG 500 1K 2K	r ough-ho (blank) 500KΩ	1MΩ 21 1M 2 A B	ΜΩ 2Μ2	Ω 4Μ7Ω	5ΜΩ	Steel Terr 12 - Hou Color: Fou 13 - Rotu Color: Fou * Self-ex By default For carbor and rotor a If only rotu 14 - Wip Wiper po	minals using r colors ot r colors ot colors ot r colors ot r colors ot r colors ot r colors ot r colors ot r colors ot colors ot r colors ot r colors ot r colors ot r colors ot colors ot r colors ot colors ot r colors ot	her than s her than s able prc r non self- nguishabl nly the ho	standard: standard: p perty, V extinguis e property susing nee	See colo See colo 0, for hc able, cerr can be a sids to be	r chart belov r chart belov busing and met is Self-e: dded. V0 me	v- C. v- RT I rotor: xtinguisha eans hous	l-color, ex -color; ex ble: ing C (leave	SH k., red: CJ-F k., blue: RT-/ (blank) V0 CJ-V0, RT-V
- Model and pitch 12,5 H3,8 H - Packaging H ulk H - Resistance value Value 000 2000 2200 2500 4700 2000 2200 2500 4700 00 200 220 2500 4700 H - Resistance law / taper In - Linear og - Logarithmic Intilog - Antilogarithmic	Τ 500Ω 1ΚΩ 2ΚΩ 500 1Κ 2Κ	rough-ho (blank) 500KΩ 500K	Ie 1MΩ 21 1M 2 A B C	MΩ 2M2 M 2M2	Ω 4Μ7Ω	5ΜΩ	Steel Terr 12 - Hou Color: Foi 13 - Rote Color: Foi * Self-ex By default For carbor and rotor a If only rotor 14 - Wip Wiper poi Initial or C	minals ising r colors of r c	her than s her than s able prc nguishabl nly the ho Standard	standard: •perty, V extinguish e property susing nee 50% ±	See colo See colo 0, for hc able, cerr can be a dds to be	r chart belov r chart belov Dusing and met is Self-e dded. V0 me V0, then CJ-	v- C. v- RT I rotor: xtinguisha eans hous	J-color, ex -color; ex ble: ing C (leave	SH k., red: CJ-F (blank) V0 CJ-V0, RT-V e blank) Pl
- Model and pitch H2,5 H3,8 H - Packaging H - Resistance value H 000 2000 2200 2500 4700 2000 2200 2500 4700 00 200 220 250 470 H - Resistance law / taper H in - Linear H og - Logarithmic H	Τ 500Ω 1ΚΩ 2ΚΩ 500 1Κ 2Κ	rough-ho (blank) 500KΩ 500K	1MΩ 21 1M 2 A B	MΩ 2M2 M 2M2	Ω 4Μ7Ω	5ΜΩ	Steel Terr 12 - Hou Color: Foi 13 - Rotu Color: Foi * Self-ex By default For carbor and rotor a If only rotc 14 - Wip Wiper po Wiper po Chinal or C Others: for	minals using r colors ot r colors ot r colors ot ttinguish , carbon is , carbon is , carbon is r: self-extii are VO. If c r: RT-VO er Set CCW SW bllowing c	her than s her than s able pro anon self- nguishabl nily the ho Standard	standard: standard: perty, V extinguish e property using nec : 50% ± itions; a	See colo See colo 0, for hc able, cerr can be a ds to be 15°)	r chart belov r chart belov Dusing and met is Self-e dded. V0 me V0, then CJ-	v- C. v- RT I rotor: xtinguisha eans hous	J-color, ex -color; ex ble: ing C (leave I F PXH, e	SH k., red: CJ-F (blank) V0 CJ-V0, RT-V blank) Pl Pl PF
- Model and pitch 42,5 H3,8 H - Packaging H - Vackaging H - Vackaging H - Resistance value N 000 2000 2200 2500 4700 2500 4700 00 200 220 250 470 - - Resistance law / taper In - Linear og - Logarithmic - ntilog - Antilogarithmic Special tapers have codes and tapers	Τ 500Ω 1ΚΩ 2ΚΩ 500 1Κ 2Κ	rough-ho (blank) 500ΚΩ 500Κ	Ie 1MΩ 21 1M 2 A B C	MΩ 2M2 M 2M2	Ω 4Μ7Ω	5MΩ 5M	Steel Terr 12 - Hou Color: Foi 13 - Rotu Color: Foi * Self-ex By default For carbor and rotor a If only rotc 14 - Wip Wiper po Wiper po Chinal or C Others: for	minals ising r colors ot r colors ot r colors ot tinguish , carbon is n: self-extir are V0. If co rr: RT-V0 er Dosition (S CCW SW blowing co rque (States)	her than s her than s able pro- raguishabl nly the ho Standard clock pos andard: <	standard: standard: perty, V extinguish e property using nec : 50% ± itions; a	See colo See colo 0, for hc able, cerr can be a ds to be 15°)	r chart belov r chart belov Jusing and met is Self-ez dded. V0 me V0, then CJ-	v- C. v- RT I rotor: xtinguisha eans hous	J-color, ex ble: ing C (leave PXH, e (leave	SH k., red: CJ-F (blank) V0 SJ-V0, RT-V blank) Pl PF ex: P3H
- Model and pitch I2,5 H3,8 H - Packaging Iulk - Resistance value 000 2000 2500 4700 00 2000 2200 2500 4700 00 2000 220 250 4700 - Resistance law / taper in - Linear og - Logarithmic ntilog - Antilogarithmic Special tapers have codes a - Tolerance - Tolerance - Tolerance	500Ω 1KΩ 2KG 500 1K 2K assigned:	rough-ho (blank) 500KΩ 500K	1MΩ 21 1M 2 A B C CODE Y2	MΩ 2M2 M 2M2	 Ω 4Μ7Ω 2 4M7 	5MΩ 5M	Steel Terr 12 - Hou Color: For 13 - Rota Color: For * Self-ex By default For carbor and rotor a If only rotor 14 - Wip Wiper po Initial or C Others: for Wiper to Low torq	minals sing r colors ot r colors ot tinguish , carbon is n: self-extir are VO. If co r: RT-VO per position (S CCW CW comparison comparis	her than s her than s able pro- raguishabl nly the ho Standard clock pos andard: <	standard: standard: perty, V extinguish e property using nec : 50% ± itions; a	See colo See colo 0, for hc able, cerr can be a ds to be 15°)	r chart belov r chart belov Jusing and met is Self-ez dded. V0 me V0, then CJ-	v- C. v- RT I rotor: xtinguisha eans hous	J-color, ex ble: ing C (leave PXH, e (leave	SH k., red: CJ-F (blank) VO CJ-VO, RT-V blank) PI PF ex: P3H blank)
- Model and pitch 12,5 H3,8 H - Packaging	T 500Ω 1KΩ 2KG 500 1K 2K assigned: +50%,-30	rough-ho (blank) 500KΩ 500K	Ie 1MΩ 21 1M 2 A B C CODE Y; ±10%	MΩ 2M2 M 2M2	Ω 4M7Ω 2 4M7 ±5%	5MΩ 5M	Steel Terr 12 - Hou Color: Fou 13 - Rotu Color: Fou * Self-ex By default For carbor and rotor a If only rotu 14 - Wip Wiper po Initial or C Final or C Others: fc Wiper to Low torqu 15 - Line	minals using r colors ot r colors r color	her than s her than s able pro- raguishabl nly the ho Standard clock pos andard: <	standard: standard: perty, V extinguish e property using nec : 50% ± itions; a	See colo See colo 0, for hc able, cerr can be a ds to be 15°)	r chart belov r chart belov Jusing and met is Self-ez dded. V0 me V0, then CJ-	v- C. v- RT I rotor: xtinguisha eans hous	J-color, ex -color; ex ble: ing C (leave R PXH, e (leave P	SH k., red: CJ-F (blank) V0 CJ-V0, RT-V blank) Pl pF ex: P3H blank) GB
- Model and pitch I2,5 H3,8 H - Packaging Iulk - Resistance value 000 2000 2500 4700 00 2000 2200 2500 4700 00 2000 220 250 4700 - Resistance law / taper in - Linear og - Logarithmic ntilog - Antilogarithmic Special tapers have codes a - Tolerance - Tolerance - Tolerance	500Ω 1KΩ 2KG 500 1K 2K assigned:	rough-ho (blank) 500KΩ 500K	1MΩ 21 1M 2 A B C CODE Y2	MΩ 2M2 M 2M2	 Ω 4Μ7Ω 2 4M7 	5MΩ 5M	Steel Terr 12 - Hou Color: Foo 13 - Rotu Color: Foo * Self-ex By default For carbor and rotor a If only rotor 14 - Wip Wiper po Initial or C Final or C Others: fo Wiper to Low torqu 15 - Line Not contr	minals using r colors ot r colors r colors ot r colors r colors	her than s her than s able pro s non self- nguishabl nly the ho Standard Standard clock pos andard: « Nom	standard: standard: perty, V extinguish a property uusing nec 50% ± 	See colo See colo 0, for hc able, cerr can be a dds to be 15°) t 3 hours , for dete	r chart belov r chart belov pusing and met is Self-e: dided. V0 me V0, then CJ- with the CJ- s: P3H ents: <3.5)	v- C v- RT I rotor: xtinguisha eans hous -VO.	J-color, ex ble: ing C (leave PXH, e (leave (leave	SH k., red: CJ-F (blank) V0 CJ-V0, RT-V e blank) PI PF ex: P3H e blank) GB
- Model and pitch 12,5 H3,8 H - Packaging	Τ 500Ω 1KΩ 2KG 500 1K 2K assigned:	rough-ho (blank) 500KΩ 500K	Ie 1MΩ 21 1M 2 A B C CODE Y; ±10%	MΩ 2M2 M 2M2	Ω 4M7Ω 2 4M7 ±5%	5MΩ 5M	Steel Terr 12 - Hou Color: Foo 13 - Rotu Color: Foo * Self-ex By default For carbor and rotor a If only rotor 14 - Wip Wiper po Initial or C Final or C Others: fo Wiper to Low torqu 15 - Line Not contr	minals ising r colors ot r colors ot tinguish , carbon is r: self-extir are VO. If co r: RT-VO per colors cCW cCW cCW cCW cCW cCW cCW cCW	her than s her than s able pro- ron self- nguishabl nly the ho Standard Standard Standard: < Norm	standard:	See colo See colo 0, for hc able, cern can be a dds to be 15°) t 3 hours , for dete	r chart belov r chart belov Jusing and met is Self-ez dded. V0 me V0, then CJ-	v- C v- RT I rotor: xtinguisha eans hous -VO.	J-color, ex -color; ex ble: ing C (leave PXH, e (leave PAXH, e (leave LNx%; e	SH k., red: CJ-f (blank) VO CJ-VO, RT-V e blank) Pl ex: P3H e blank) GB

9 -	Cut	Track	- 0	pen	circuit
•	out	maon	-	P0	onourc

Open circuit at beginning of track, fully CCW	PCI			
Open circuit at end of track, fully CW	PCF			
10 - Detents (DT)				
One detent at the beginning	DTI			
One detent at the end	DTF			
X number of detents, evenly distributed.	XDT: 10DT			

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

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

Red

RO

Green Yellow

AM

VE

WT-

-XXXXX, Example: 9019

-YY Example, black: NE

(leave blank)

-V0

Grey

GS

Brown

MR

Blue

AZ

Assembled from terminal side

Color of shaft

NE

Non self-extinguishable.

Accessory Reference (9019 or 9020)

Black⁽¹⁾ White Neutral Transp.

ΒA

(1) black is not an option for housings.

Self-extinguishable according to standard UL 94

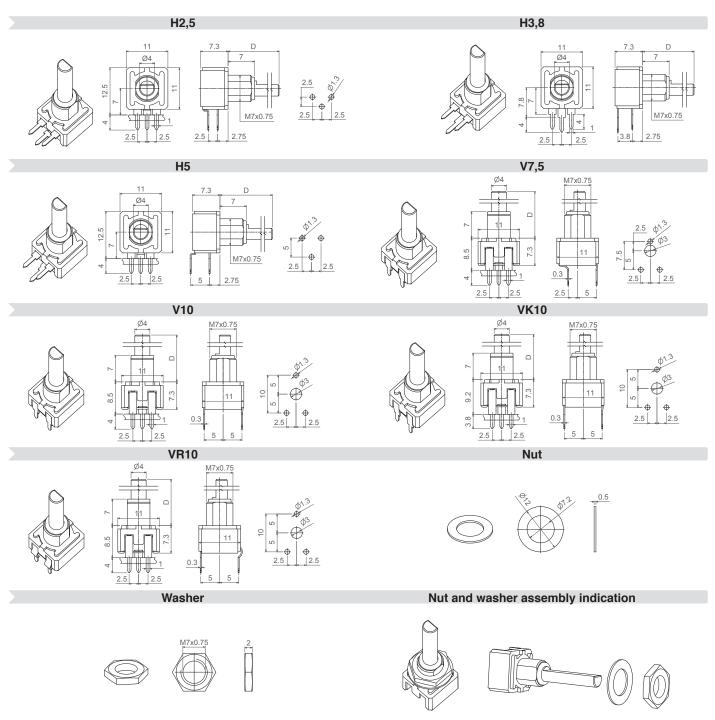
IN

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

Color chart for rotor, housing and accessories

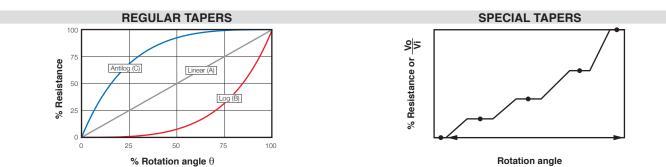
TA

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.-



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

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.

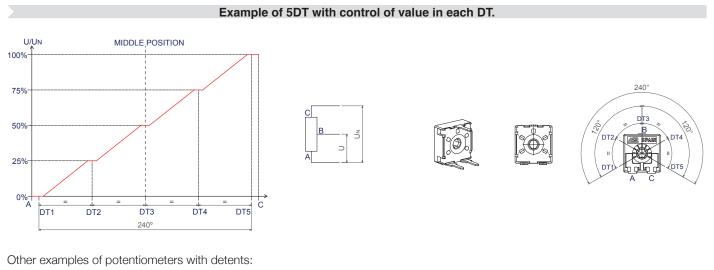
PCF = Cut at final position, when the potentiometer is turned fully clockwise.

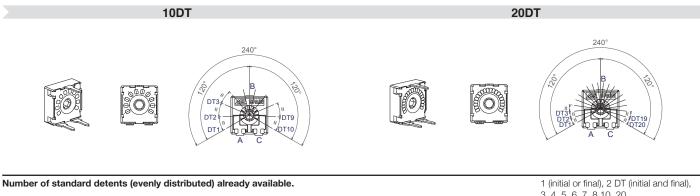
Other positions are available on request.



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:





	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.

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

 SNP
 SNJ

 Image: provide the standard Terminal
 Image: provide the standard Terminal

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

 Image: provide the standard Terminal
 Image: provide the standard Terminal
 Image: provide the standard Terminal

 Image: provide the standard Terminal
 Shorter terminal, for H5 TP25
 Shorter terminal, TPXX (under request)

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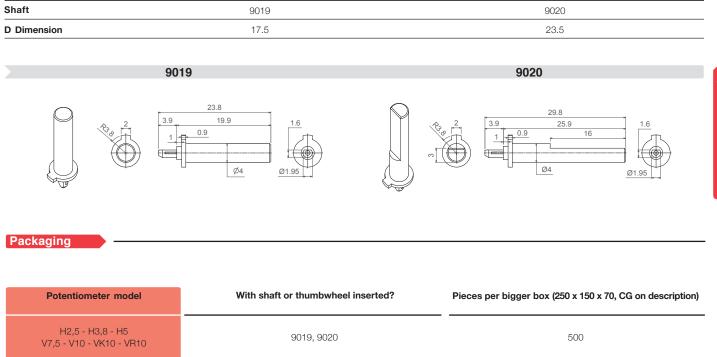
Should the shaft need to be positioned differently than shown on the "models" section on this catalogue, a drawing with the exact position is kindly requested.

Shafts

accessories

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

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





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

	MCA9 Through-hole	MCE9 Through-hole			
Range of resistance values* Lin (A) Log (B) Antilog (C)	$100\Omega \le Rn \le 5M\Omega$ 1 K $\Omega \le Rn \le 2M2\Omega$	100Ω ≤ Rn ≤ 5MΩ 1 KΩ ≤ Rn ≤ 2M2Ω			
Tolerance* Rn < 100Ω: 100Ω ≤ Rn ≤ 100KΩ 100K< Rn ≤ 1MΩ: 1MΩ < Rn ≤5MΩ: Rn > 5MΩ:	+50%, -30% (out of range) ±20% ±20% ±30% +50%, -30% (out of range)	±20% ±20% ±30%			
Variation laws	Lin (A), Log (B), Antilog (C). Of	ther tapers available on request			
Residual resistance	Lin (A), Log (B), Antilog (C) \leq 5*10-3*Rn. Minimum value 2 Ω	<u>≤</u> 2Ω			
CRV - Contact Resistance Variation (dynamic)	ce Lin (A) Electrical Angle 220°±20° ≤ 3%Rn. Other tapers, please inquire				
CRV - Contact Resistance Variation (static)		ıgle 220°±20° ≤ 5%Rn. s, please inquire			
Maximum power dissipation** Lin (A) Log (B), Antilog (C)	at 50°C 0.15W 0.10W	at 70° C. 0.5W 0.20W			
Maximum voltage Lin (A) Log (B), Antilog (C)	150VDC 200VDC	200VDC			
Operating temperature	-25°C +70°C (+85°C on request)	-40°C +90°C (+125°C on request)			
Temperature coefficient 100Ω ≤ Rn ≤ 10KΩ 10KΩ < Rn ≤ 5MΩ	+200/ -300 ppm +200/ -500 ppm	±100 ppm ±100 ppm			

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

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

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

* Stronger or softer torque feeling is available on request.

Test results

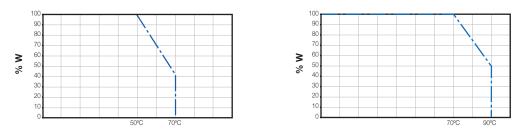
The following typical test results are given at 23°C \pm 2°C and 50% \pm 25% RH.

	MCA9 Thro	ough-hole	MCE9 Through-hole				
	Test conditions	Typical variation of nominal resistance	Test conditions	Typical variation of nominal resistance			
Damp heat	500 h. at 40°C and 95% RH	+5%, -2%	500 h. at 40°C and 95% RH	±2%			
Thermal cycles	16 h at 85℃, plus 2 h at –25℃	±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%			
Storage (3 years)	3 years at 23°C ± 2°C	±3%	3 years at 23°C ± 2°C	±1%			

Power derating curve:

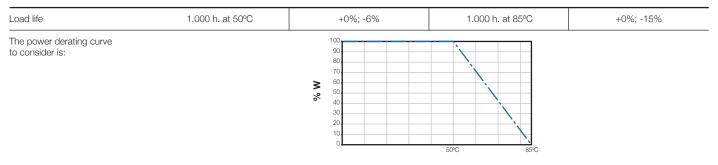
MCA9 Through-hole



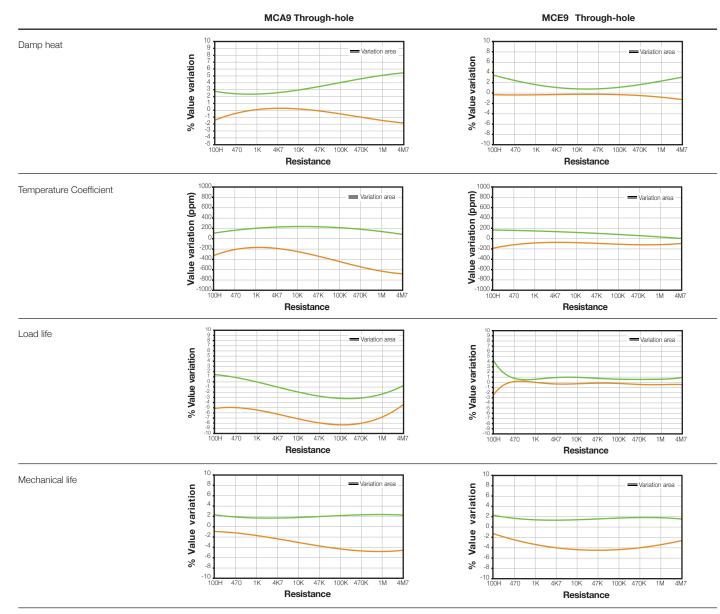


For temperatures out of range

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



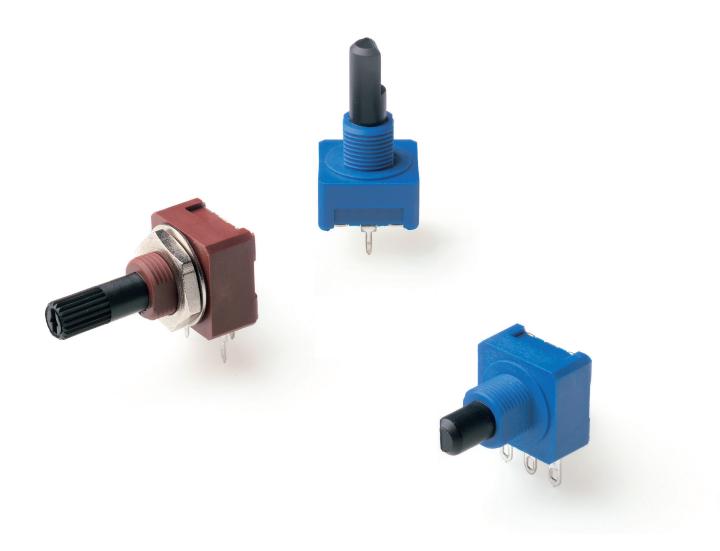
Representation of the typical variation of nominal resistance (with 95% confidence) throughout the ohm value range:



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Control Cermet Potentiometers MCE



CARBON – MCA14

14mm carbon potentiometers with plastic enclosure and shaft.

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

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

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

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

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

Applications

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

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

CERMET – MCE14

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

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

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

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

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

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

Applications

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

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

MCA14 L MCE14 HOW TO ORDER

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

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

Standard	d featur	res						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		
MCA14 MCE14	Ν	H2,5		- 10K	А	2020				SNP			PI		WT	-14187	-BA	
andard configuration: MCA14 Through-						hole MCE14						MCE14	Through-	hole				
nensions:			14mm															
tection:				IP 54 (dust-proof)														

	On request: Self-extinguishable, to meet UL 94 V-0					
Substrate:	Carbon technology	Cermet				
Color:	Blue housing + white rotor Brown housing + white rotor					
Packaging:	Bulk					
Wiper position:	at 50% ±15°					
Terminals:	Straight, without crimping.					
Marking:	Resistive value marked on housing. Others on request.					

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

1 - Ser	ies													
MCA1	4 ■ MC	E14												
2 - Rot	ors													
N	Z													
<u>3 - Mo</u>	del and	pitch												
HO	HC0	ł	H2,5		H4	H	15	HA5	5	HL5	V	V12,5		
VA12,5	VL12	,5	VR12,	5	V15	١	/J15	V17	,5	VD7,8	5 \	/D11		
4 - Pac	kaging					Tro	ough-ho	ole						
Bulk						(k	olank) ⁽¹⁾)						
	istance 0Ω 220Ω			500Ω	1KΩ	2ΚΩ.	500KΩ	1MΩ	2MΩ	2M2Ω	4M7Ω	5MΩ		
	0 220	250	470	500	1K	2K	500K	1M	2M	2M2	4M7	5M		
		200				2.13			2			0.11		
6 - Res	istance	law /	taper	r										
Lin - Lin	ear								А					
Log - Lo	ogarithmi	С							В					
Antilog	- Antiloga	arithmi	ic				C							
- Specia	al tapers	have o	codes	assig	ned:			CODE	E YXXX	XXX				
7 - Tole	ranco													
±20%	ance	±30)%		+509	6,-30%		±10)%		±5%			
2020		303	30		5	030		101		0505				
8 - Ope	erating L	.ife (C	ycles	;)										
Standar	d (1.000	cycles	s)							(1	eave b	lank)		
Long life:	LV + the	numbe	er of cyc	cles. e	x: LV45	5 for 45.	000 cycle	S. (othe	rs on requ	uest) L\	/XX: ex:	LV45		
9 - Cut	Track -	Oper	ı circı	uit.										
Open ci	rcuit at b	eginni	ing of	track,	CCW			PCI						
Open ci	rcuit at e	nd of	track,	fully C	W				PCF					
	tents (D		inning						DTI					
		-	ii ii ii iy											
	ent at th							Vr	DTF DT: 10					
	er of dete						n a voltage							

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

14 - Wiper

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

15 - Linearity

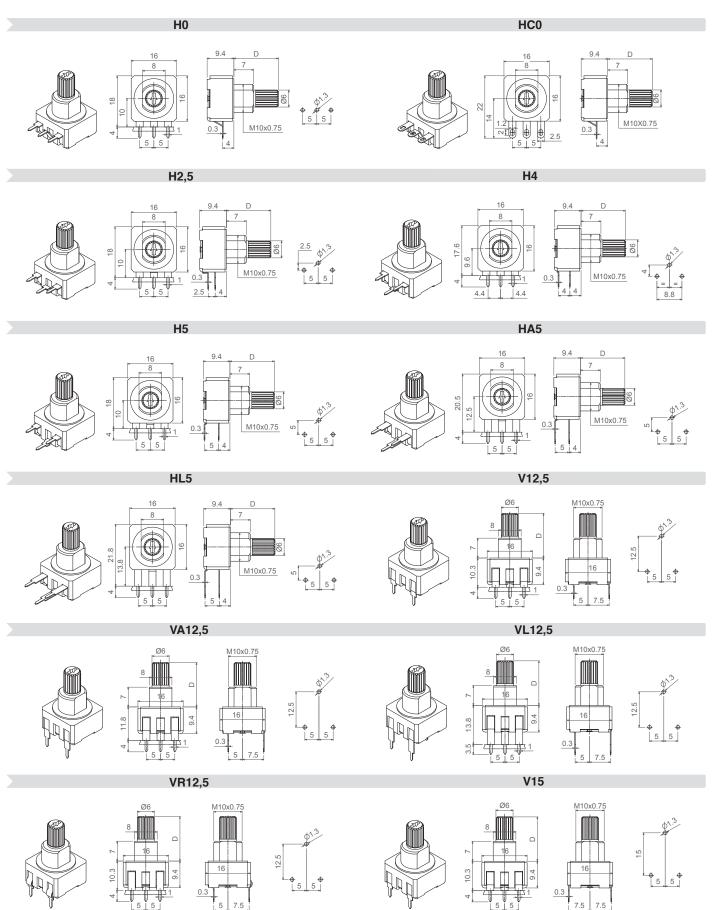
Not con	trolled							(leave bl	ank)			
Independ	lent linea	rity contro	lled & belo	ow x%, fo	or example	e, 3%: LN39	% L	LNx%; ex: LN3%				
Absolute	e linearit	y controll	ed & belo	ow x%				LAx9	6			
16 - Pot	tention	neters w	ith asser	nbled a	accessor	ies						
Assemb	led fron		WT									
Accesso See list o	-		-XXXXX Example: 14187									
Color of	shaft o	r thumbw	heel				-YY E>	kample, w	hite: BA			
	0		0		cording to ory, please			(leave bl -V0	lank)			
Color c	hart fo	r rotor, h	ousing a	and acc	essories	3						
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.

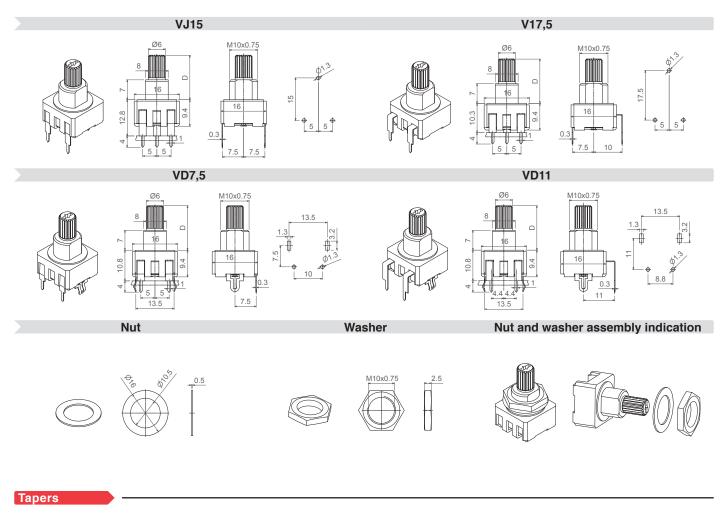
Specifications on this catalog are for reference only, as they are subject to change without notice.

Models

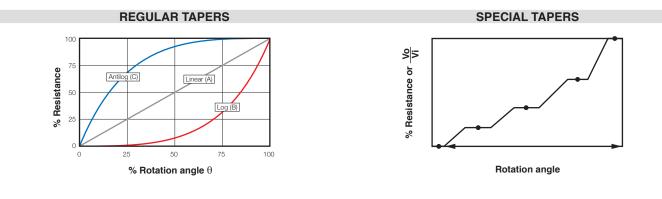
All models shown here have shaft 14187, but other shafts can be chosen from the list below. The D dimension indicated on the drawings refers to the possible length of the shaft, to be chosen at "shafts" section. Potentiometers are sold separately from the nuts and washers.



MCA14 🛓 MCE14 🛓



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



Potentiometers with cut track

The cut track is an area with very high resistive value, resulting in an open circuit. It is widely used in lighting applications. Mechanical life with cut track needs to be confirmed.

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

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

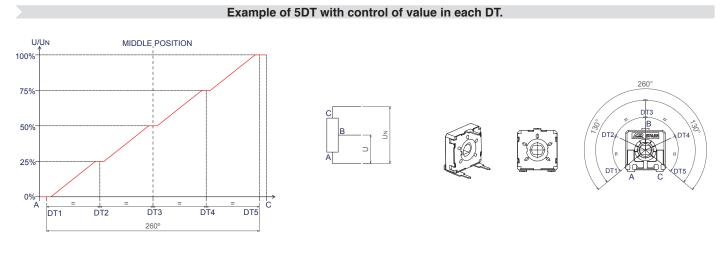
Other positions are available on request.



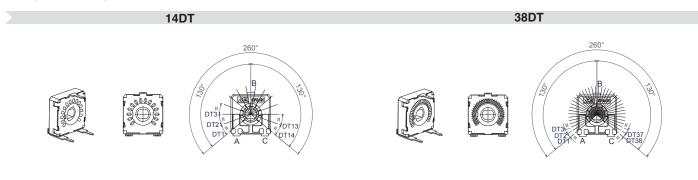
Potentiometers with detents

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

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



Examples of some potentiometers with detents:



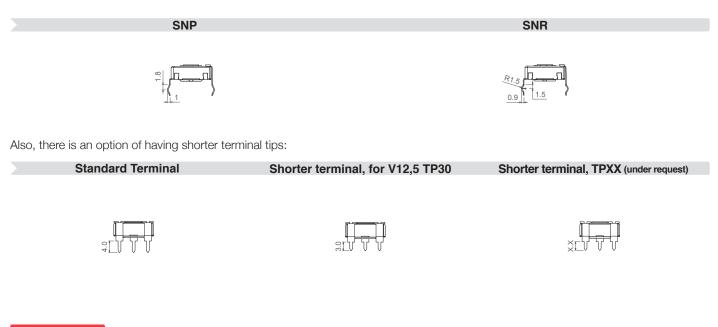
Number of standard detents (evenly distributed) already available.	1 (Initial, final or central), 3, 4, 5, 6, 7, 8, 9, 10, 13, 14, 17, 22, 27, 38.
Maximum number of detents for feeling only	38
Maximum number of detents when the voltage value in each detent is controlled and non-overlapping.	14

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

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

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

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



Adjustment and orientation

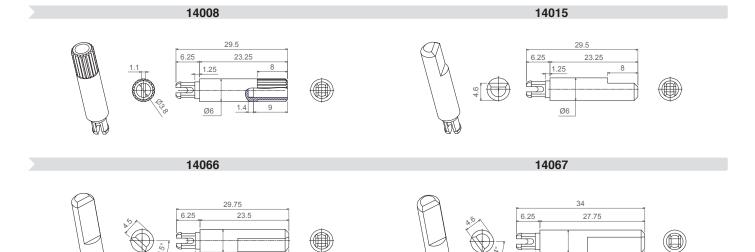
Should the shaft need to be positioned differently than shown on the "models" section on this catalogue, a drawing with the exact position is kindly requested.

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

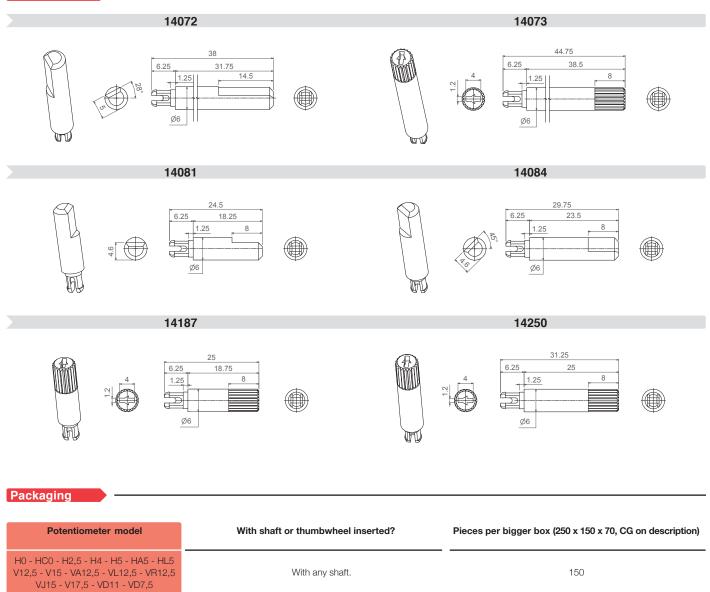


1.25

1.25

Ø6

15.2





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 < 100Ω: 100Ω ≤ Rn ≤ 100KΩ 100K< Rn ≤ 1MΩ: 1MΩ < Rn ≤5MΩ: Rn > 5MΩ:	+50%, -30% (out of range) ±20% ±20% ±30% +50%, -30% (out of range)	- ±20% ±20% ±30% -						
Variation laws	Lin (A), Log (B), Antilog (C). Of	ther tapers available on request						
Residual resistance	Lin (A), Log (B), Antilog (C) $\leq 5^{*}10-3^{*}$ Rn. Minimum value 2 Ω	≤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 Angl Other tapers,	le 245°±20° ≤ 5%Rn. please inquire						
Maximum power dissipation** Lin (A) Log (B), Antilog (C)	at 50°C 0.25W 0.13W	at 70℃. 0.7W 0.30W						
Maximum voltage Lin (A) Log (B), Antilog (C)		VDC VDC						
Operating temperature	-25°C +70°C (+85°C on request)	-40°C +90°C (+125°C on request)						
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.

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

	MCA14 Through-hole	MCE14 Through-hole
Resistive element	Carbon technology	Cermet
Angle of rotation (mechanical)	265	5° ± 5°
Angle of rotation (electrical)	245	° ± 20°
Wiper standard delivery position	50%	6 ± 15°
Max. stop torque	10	Ncm
Max. push/pull on rotor	E	50 N
Wiper torque*		5 Ncm th detents: <3.5 Ncm
Mechanical life	1.000 cycles (many more ava	ilable on request, please, inquire)

* Stronger or softer torque feeling is available on request.

Test results

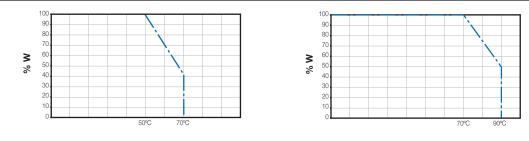
The following typical test results (with 95% confidence) are given at 23°C ±2°C and 50% ±25% RH.

	MCA14 Thr	ough-hole	MCE14 Th	rough-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%

Power derating curve:

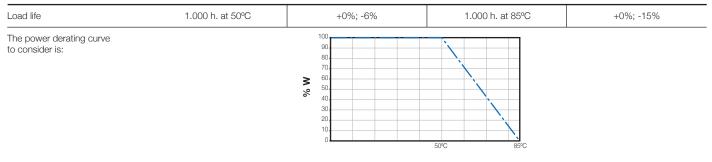
MCA14 Through-hole

MCE14 Through-hole

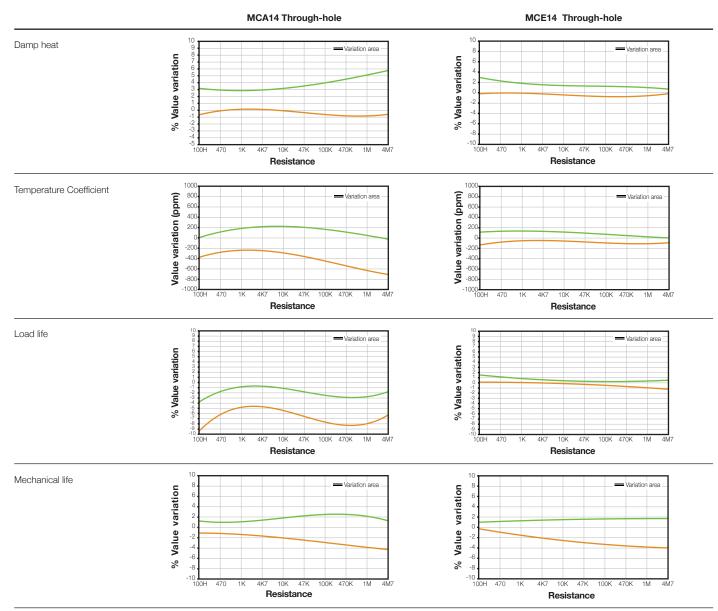


For temperatures out of range

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



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



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

MCA14 👗 MCE14 🛓







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.

Examples:

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).

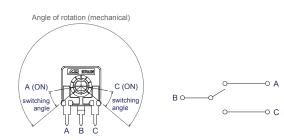
Standard features										Extra features								Assembled accessory			
S	Series	Rotor	Model	Packg.	Packg. Ohm value Taper			Life	Track	Collector	Terminals	Housing	Rotor	Wiper position	Lin	Assembly	Ref #	Color	Flam.		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		16		17		
COM	CA9	Μ	H2,5		-	-	-			2DT	SNP			PI		WT	-9005	-BA			

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

Standard features										Extra features							Assembled accessory			
	Series	Rotor	Model	Packg.	Ohm value	Taper	Tol.	Life	Track	Collector	Terminals	Housing	Rotor	Wiper position	Lin	Assembly Ref	t Color	Flam.		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		17		
CON	1 CA14	Ρ	V15		-	-	-		AC45°±	15°										

Electric Function

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

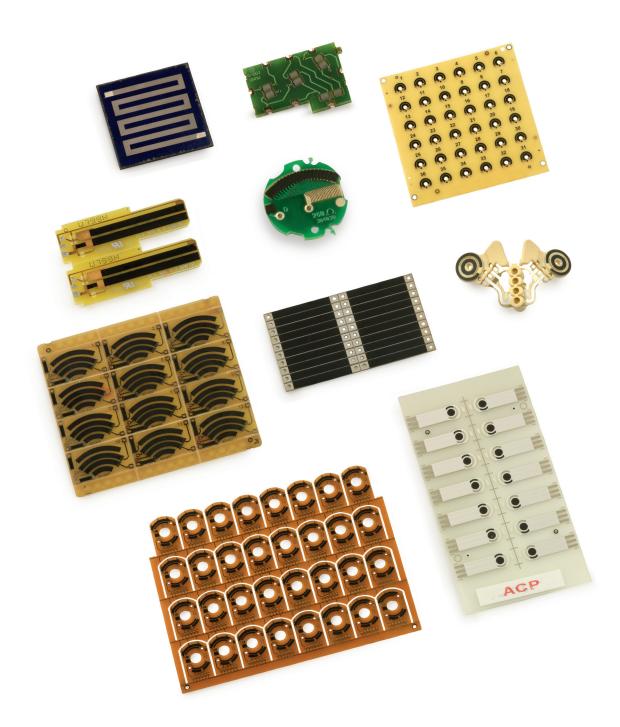
Specifications	COM CA6	COM CA9 / MCA9 COM CA14 / MCA14	COM CE9 / MCE9 COM CE14 / MCE14
Resistive element	Carbon	Carbon	Cermet
Power ratio	15V / 12mA	24V / 12mA	24V / 12mA
Resistance at ON position	≤5Ω	≤5Ω	≤5Ω
Dielectric Strength	600V	1500V	1500V
Insulation resistance	100ΜΩ	100GΩ	100GΩ
Switching angle at ON position	20° ± 15°	30° ± 15°	30° ± 15°
Operating temperature	-25°C +70°C (+85°C)		-40°C +90°C (+125°C)

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

Mechanical				
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	







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.

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 tracks.
- 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.

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.

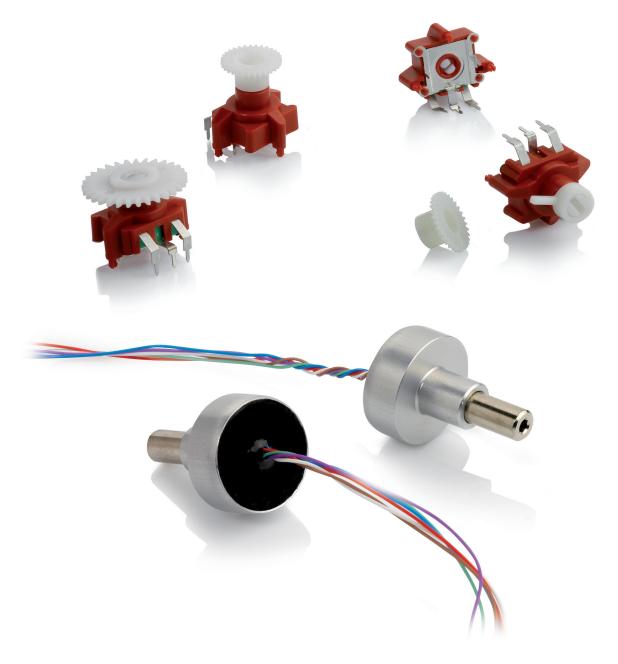
How to Order

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.







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.

Revision December 2020



Aragonesa de Componentes Pasivos

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