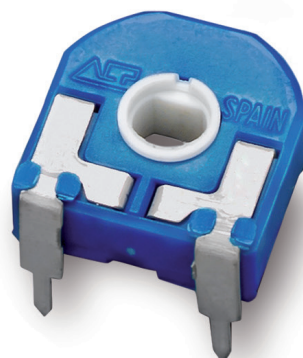
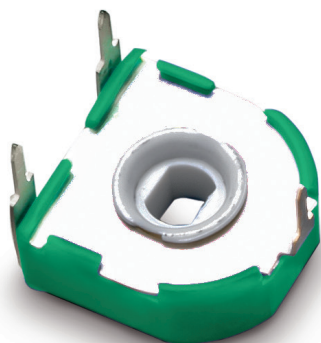


## CAR14

Carbon Potentiometers CAR

## CER14

Cermet Potentiometers CER



## CARBON – CAR 14

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

CAR14, carbon potentiometers with plastic housing and Ingress Protection rating type IP 54 (high level of protection against dust and also against water splashing), according to IEC 60529. Plastic materials can be self-extinguishable according to UL 94 V-0 under request.

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

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

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

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

### Applications

CAR14 is mainly used in control applications in different markets:

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

## CERMET – CER14

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

CER14, cermet potentiometers with plastic housing and Ingress Protection rating type IP 54 (high level of protection against dust and also against water splashing), according to IEC 60529. Plastic materials (housing and rotor) are self-extinguishable according to UL 94 V-0. ACP's cermet potentiometers have better thermal stability, allow for higher thermal dissipation and withstand higher temperatures than carbon potentiometers.

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

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

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

- Resistance value.
- Tolerance.
- Tapers / variation laws.
- Pitch.
- Positioning of the wiper (standard is at 50% rotation).
- Housing and rotor color.
- Mechanical life.

### Applications

CER14 is used in applications where either the operating temperature is high, or where the applications requires product with excellent ohmic value stability:

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

# CAR14 CER14 HOW TO ORDER

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

EXAMPLE: **CER14NV12,5-10KA2020 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			
CAR14/CER14	N	H2,5		- 10K	A	2020		10DT	SNP				PI		WT	14117	-BA	-V0

Standard configuration:	CAR14 Through-hole	CER14 Through-hole
Dimensions:	14mm	
Protection:	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: CAR14PH2,5-10K CODE C00111.

## 1 - Series

■ CAR14 ■ CER14

## 2 - Rotors

B D E F G K M N P T X Z

## 3 - Model and pitch

V15 VR15

## 4 - Packaging

### Trough-hole

Bulk (blank)...<sup>(1)</sup>

(1) If blank, bulk packaging is implied.

## 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

Other resistive values available on request.

## 6 - Resistance law / taper

Lin - Linear A

Log - Logarithmic B

Antilog - Antilogarithmic C

- Special tapers have codes assigned: CODE YXXXXX

## 7 - Tolerance

±20% ±30% +50%,-30% ±10% ±5%

2020 3030 5030 1010 0505

## 8 - Operating Life (Cycles)

Standard (1.000 cycles) (leave blank)

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

## 9 - Cut Track – Open circuit.

Open circuit at beginning of track, fully CCW PCI

Open circuit at end of track, fully CW PCF

## 10 - Detents (DT)

One detent at the beginning DTI

One detent at the end DTF

X number of detents XDT: 10DT

For this product: Only available under request

## 11 - Terminals

SNAP IN P SNP

Shorter tip of terminal, TPXX, where XX is tip length (under request) TPXX, ex: TP30

Steel Terminals SH

## 12 - Housing

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

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

## 14 - Wiper

**Wiper position** (Standard: 50% ± 15%) (leave blank)

Initial or CCW PI

Final or CW PF

Others: following clock positions; at 3 hours: P3H PXH, ex: P3H

**Wiper torque** (Standard: <2.5Ncm, for detents: <3.5) (leave blank)

Low torque, < 1.5Ncm PGB

## 15 - Linearity

Not controlled (leave blank)

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

Absolute linearity controlled & below x% LAx%

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 -XXXXX

See list of shafts and thumbwheels available Example: 14117

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

Non self-extinguishable, Self-extinguishable according to standard (leave blank)

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

### For ordering spare accessories:

Accessory reference - color- flammability. XXXX-YY-V0

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

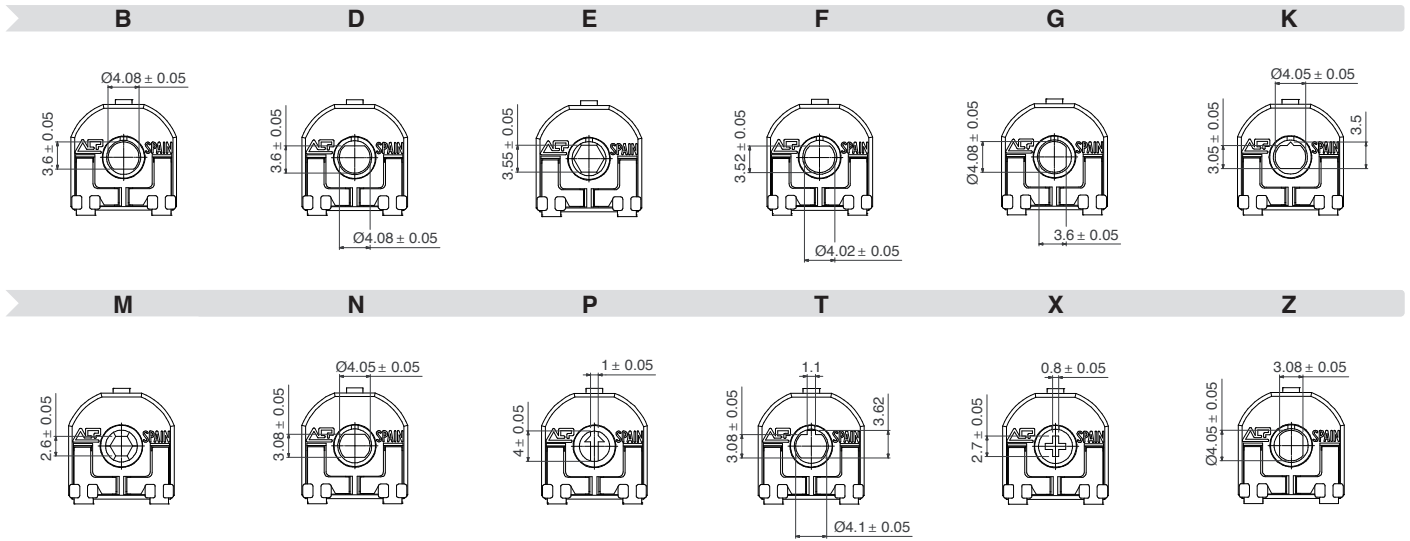
### Color chart for rotor, housing and accessories

Black <sup>(1)</sup>	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.

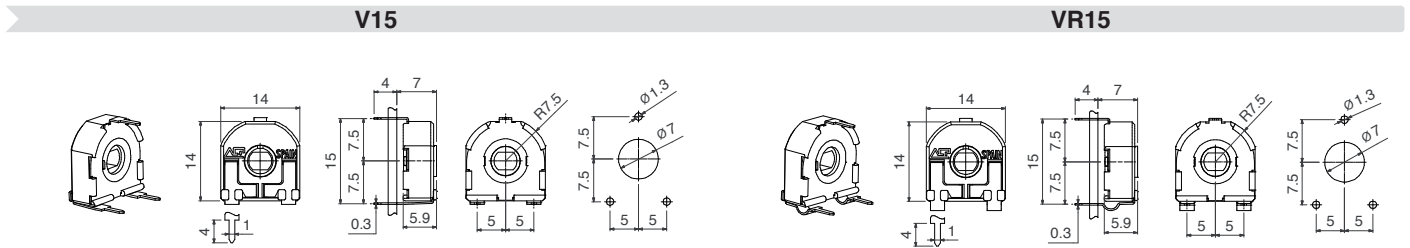
## Rotors

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

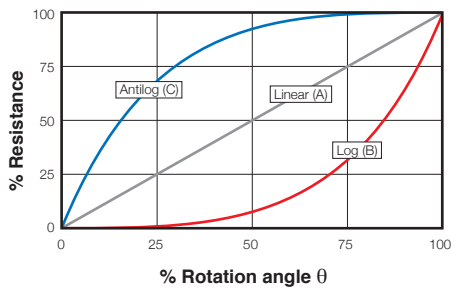
All models shown here have the most common rotor for 14mm potentiometers: the N rotor. Different rotors are available from the menu above.



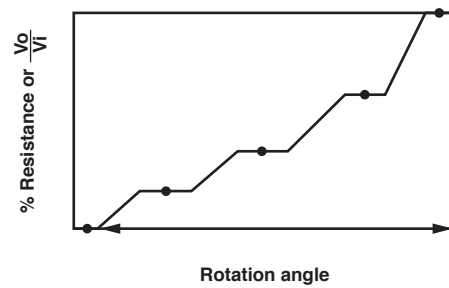
## Tapers

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

### REGULAR TAPERS



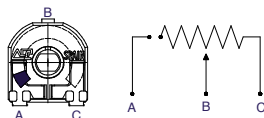
### SPECIAL TAPERS



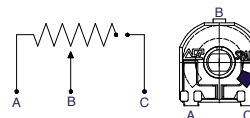
## Potentiometers with cut track

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

### PCI



### PCF

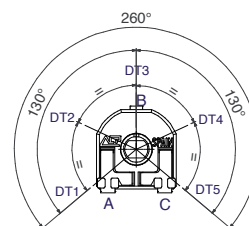
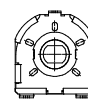
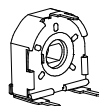
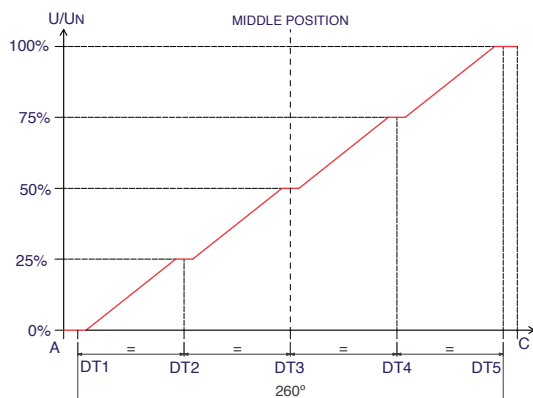


## Potentiometers with detents

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

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

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



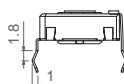
Our patented design with two wipers has improved the performance of these potentiometers, giving them more stable electrical parameters, improved reliability and Contact Resistance Variation (CRV) and narrower tolerances for detent positioning.

For this product, detents are only available under request.

## Terminals

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

### SNP

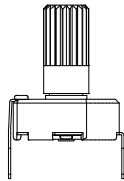


Shorter terminal tips are only available under request.

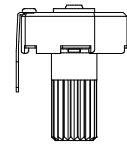
**Possibilities for insertion of accessories**

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

**WT**



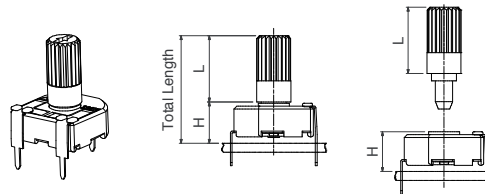
**WTI**



**Shafts**

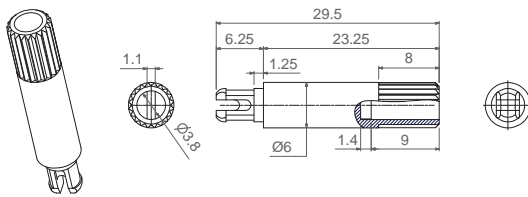
Shafts are available in different colors (color chart in "how to order" section) and with self-extinguishable property, according to UL 94 V-0, under request. ACP can study special shaft designs. Shafts can be sold separately or delivered already mounted on the potentiometer at ACP. When a shaft is mounted, the distance from the top of the potentiometer to the top of the shaft is marked with "L" in the table below, as shown in the drawings:

**V potentiometer + shaft**

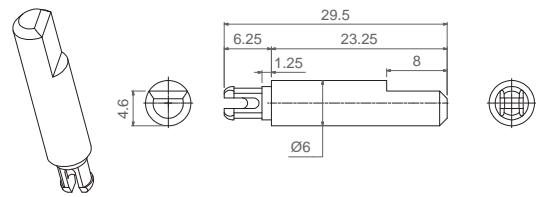


<b>Shaft</b>	14042	14065 (For E rotor)	14117	14056	14081	14187	14251	14067	14008	14015	14066	14084	14250	14072	14073
<b>L Dimension</b>	7.05	11.50	11.70	12.25	18.25	18.75	18.75	27.75	23.25	23.25	23.50	23.50	25.00	31.75	38.50

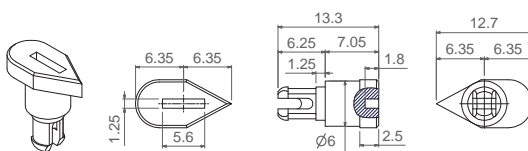
**14008**



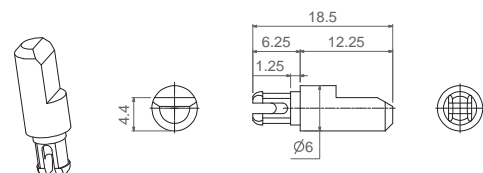
**14015**



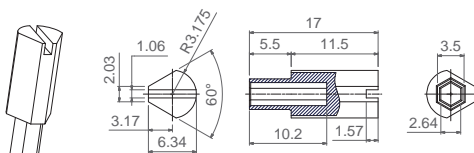
**14042**



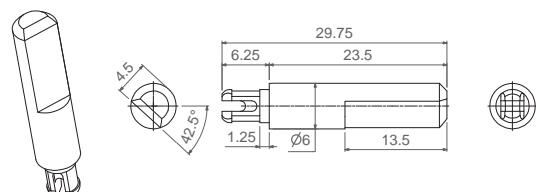
**14056**



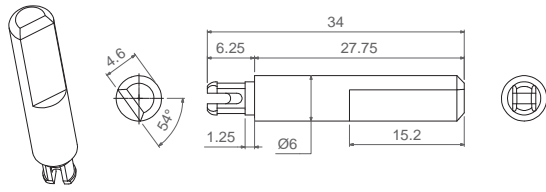
**14065 (Designed for E rotor)**



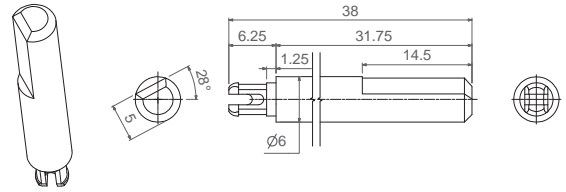
**14066**



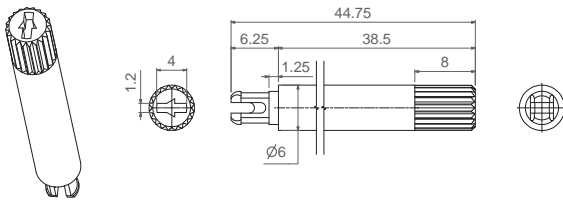
14067



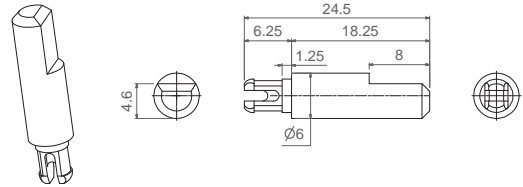
14072



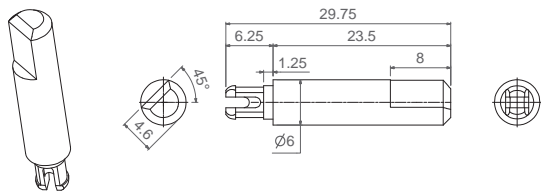
14073



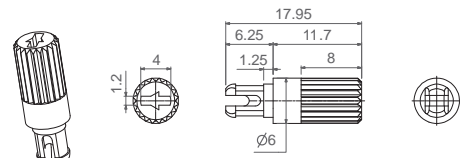
14081



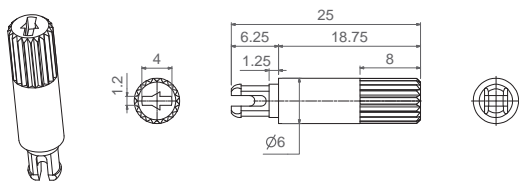
14084



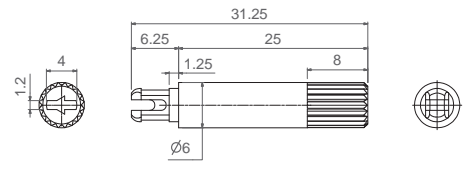
14117



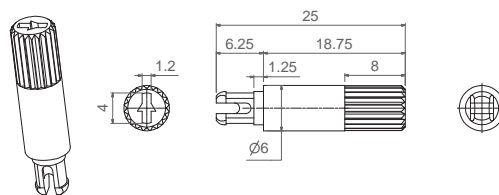
14187



14250



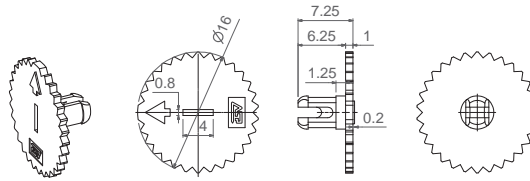
14251



## Thumbwheel

Thumbwheels are available in different colors (color chart in “how to order” section) and with self-extinguishable property according to UL 94 V-0, under request. Thumbwheels can be mounted on the potentiometers at ACP or sold separately. ACP can study special thumbwheel designs.

### 14003



## 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)
V15 - VR15	None, only potentiometers.	200 150 for models with*	700
	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.



## Electric Specifications

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)	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). Other tapers available on request	
Residual resistance	Rn ≤ 400Ω ≤ 2Ω; Rn > 400Ω 5*10 <sup>-3</sup> * Rn	≤2Ω
CRV - Contact Resistance Variation (dynamic)	Lin (A) Electrical Angle 245°±20° ≤ 3%Rn. Other tapers, please inquire	
CRV - Contact Resistance Variation (static)	Lin (A) Electrical Angle 245°±20° ≤ 5%Rn. Other tapers, please inquire	
Maximum power dissipation** Lin (A) Log (B), Antilog (C)	at 50°C 0.25W 0.13W	at 70° C. 0.7W 0.30W
Maximum voltage Lin (A) Log (B), Antilog (C)	250VDC 200VDC	
Operating temperature	-25°C ... +70°C (+85°C on request)	-40°C ... +90°C (+125°C on request)
Temperature coefficient 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.

## Mechanical Specifications

	CAR14 Through-hole	CER14 Through-hole
Resistive element	Carbon technology	Cermet
Angle of rotation (mechanical)	265° ± 5°	
Angle of rotation (electrical)	245° ± 20°	
Wiper standard delivery position	50% ± 15°	
Max. stop torque	10 Ncm	
Max. push/pull on rotor	50 N	
Wiper torque*	<2.5 Ncm Potentiometers with detents: <3.5 Ncm	
Mechanical life	1.000 cycles (many more available on request, please, inquire)	

\* Stronger or softer torque feeling is available on request.

## Test results

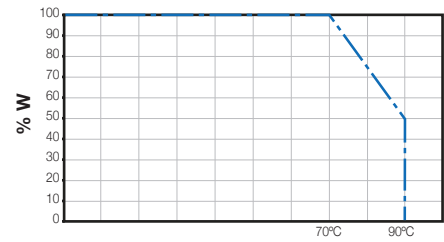
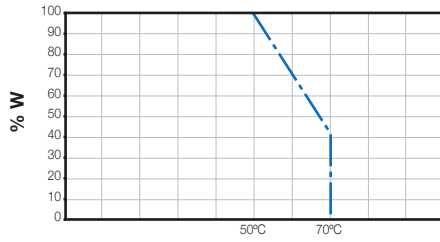
The following typical test results (with 95% confidence) are given at 23°C ±2°C and 50% ±25% RH.

	CAR14 Through-hole		CER14 Through-hole	
	Test conditions	Typical variation of Rn	Test conditions	Typical variation of Rn
Damp heat	500 h. at 40°C and 95% RH	+5%, -2%	500 h. at 40°C and 95% RH	±2%
Thermal cycles	16 h at 85°C, plus 2 h at -25°C	±2.5%	16 h at 90°C, plus 2 h at -40°C	±2%
Load life	1.000 h. at 50°C	+0%; -5%	1.000 h. at 70°C	±2%
Mechanical life	1.000 cycles at 10 c.p.m. and at 23°C ± 2°C	±3%	1.000 cycles at 10 c.p.m. and at 23°C ± 2°C	±2%
Storage (3 years)	3 years at 23°C ± 2°C	±3%	3 years at 23°C ± 2°C	±1%

**CAR14 Through-hole**

**CER14 Through-hole**

Power derating curve:

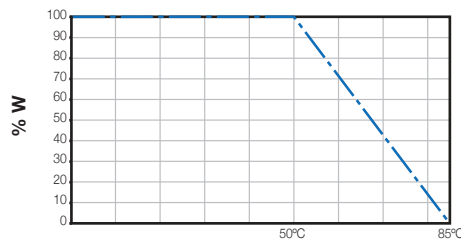


**For temperatures out of range**

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:

Load life	1.000 h. at 50°C	+0%; -6%	1.000 h. at 85°C	+0%; -15%
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The power derating curve to consider is:

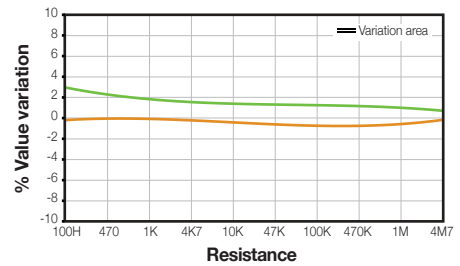
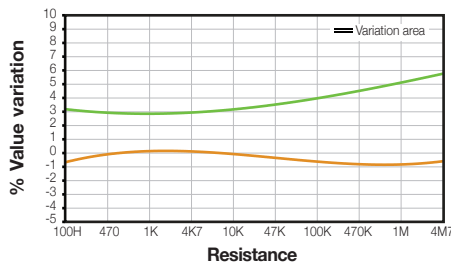


Representation of the typical variation of nominal resistance (with 95% confidence) throughout the ohm value range:

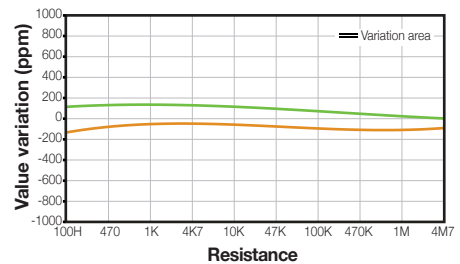
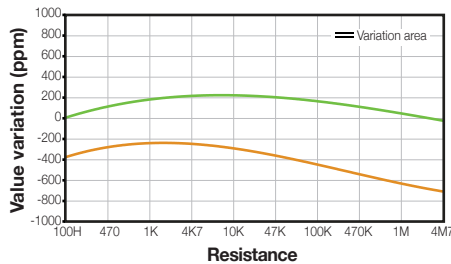
**CAR14 Through-hole**

**CER14 Through-hole**

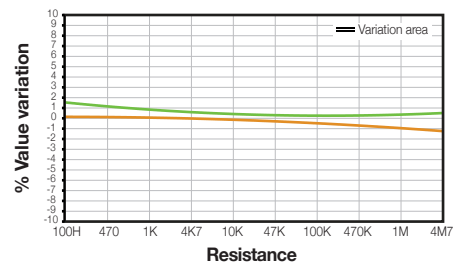
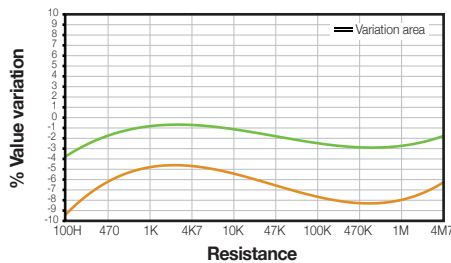
Damp heat



Temperature Coefficient



Load life



Mechanical life

