



6mm carbon potentiometers with plastic housing and protection type IP 5 (dust-proof).

CA6 potentiometers are available both in through-hole and in SMD terminal configuration. The substrate in our SMD potentiometers is high temperature resistant, for reflow soldering.

Tapers available include linear, log and antilog, even for SMD potentiometers. ACP can also study special requests.

Terminals are manufactured in tinned brass to guarantee better soldering and higher resistance to corrosion. They can be provided straight or crimped (with "snap in"), which is recommended to hold the potentiometer to the board prior to the soldering operation.

Thumbwheels and shafts can be provided either separately or already inserted in the potentiometer. CA6VSMD potentiometers, with or without thumbwheel, can be requested in Bulk or Tape & Reel (T&R) packaging.

ACP's potentiometers can be adjusted from either side, both in the horizontal and the vertical adjustment types. There is a guide on the housing to simplify the manual adjusting operations.

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

- Resistance value.
- Tolerance.
- Tapers / variation laws of the resistive element (linear, log, antilog).
- Others on request.
- Pitch.
- Positioning of the wiper (the standard is at 50%).
- Housing and rotor color.
- Mechanical life.
- Self-extinguishable plastic parts according to UL 94 V-0.

Applications

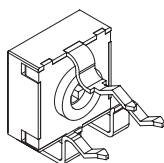
- Small electronic appliances.
- Measurement and test equipment.
- Automotive: alarms, switches
- Telecommunication equipment (antenna amplifiers and receivers, videocomm., intercomm.)
- Alarm systems.

Models

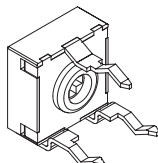
All models shown here have the standard rotor for the 6mm series, the cross (X). Models can be manufactured with any of the rotors listed on the rotor menu. The color of the housing or rotor can also be modified.



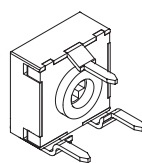
CA6 H2,5



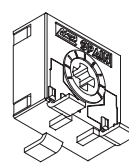
CA6 V 2,5



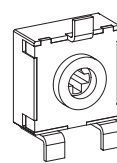
CA6 V5



CA6 VS5



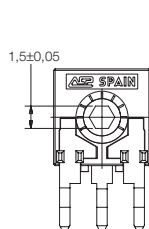
CA6 HSMD



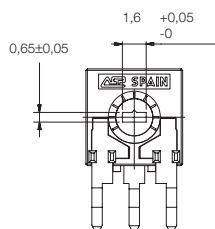
CA6 VSMD

Rotors

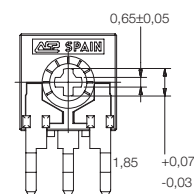
The rotor by default is the cross (X). Accessories are designed for the X rotor.



M



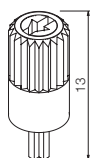
N



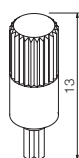
X

Shafts

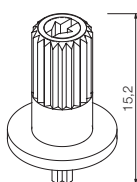
Shafts are offered in different colors. On request, they can also be provided in accordance with UL 94 V-0. Potentiometers can be supplied with shafts already inserted in. ACP can also study special shafts.



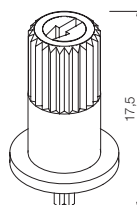
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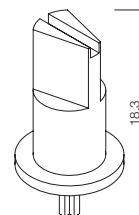
6023



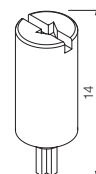
6024



6025



6028



6031

Thumbwheels

Thumbwheels are offered in different colors. On request, they can also be provided in accordance with UL 94 V-0. Potentiometers can be supplied with thumbwheels already inserted in. ACP can also study special thumbwheels.



6001



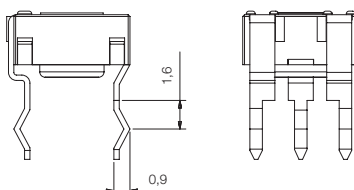
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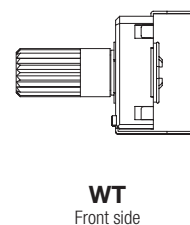
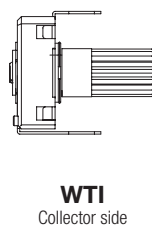
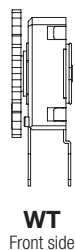
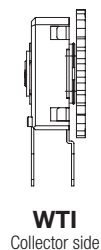
Terminals

In the CA6 family, ACP will always recommend terminals with “snap in” in order to better hold the component to the board prior to soldering. (Not available for CA6VS5 model).



SNP

ACP's potentiometers can be adjusted through either the front side (WT) or the collector side (WTI):

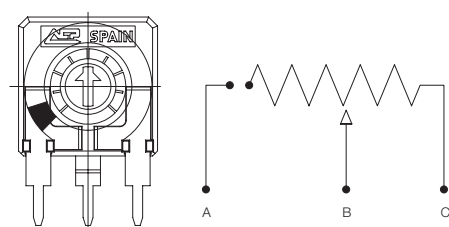


Potentiometers with cut track

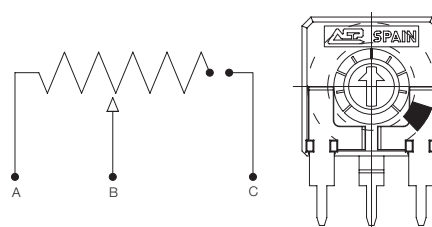
The resistive element in this potentiometer has an area with very high resistive values, resulting in an open circuit. Recommended for lighting regulation.

With cut at the beginning of the track CCW: Off-On.

With cut at the end of track- CW: On-Off. Others positions available on request.



CCW: Off-On



CW: On-Off

Packaging

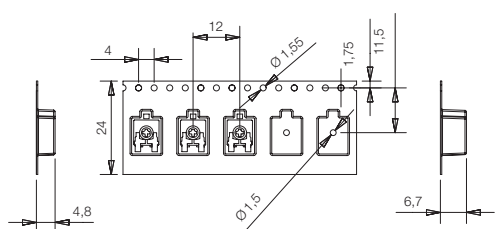
Bulk packaging: Potentiometers are first bagged and then introduced in boxes:

Potentiometer model	+ Shaft or thumbwheel inserted	Pieces per box (130 x 60 x 90)
H2,5 - V2,5 - V5 - VS5 - HSMD - VSMD	- (only potentiometers)	1000
	6001, 6030, 6032	1000
	6022, 6023, 6024, 6031	500
	6025, 6028	300

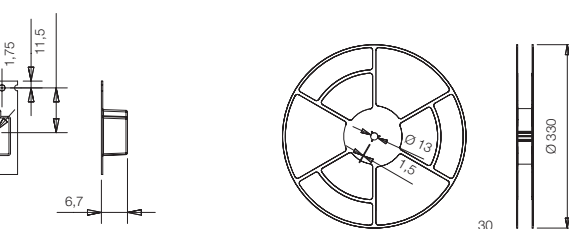
Tape and reel (T&R) packaging:

Potentiometer model	+ Shaft or thumbwheel reference	Pieces per reel
VSMD	- (only potentiometers)	1200
	6030	750

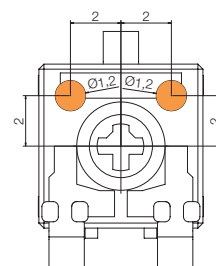
Dimensions: Reel Ø: 330mm, Tape width: 24mm



Without thumbwheel



With thumbwheel



Electric Specifications

These are standard features; other specifications can always be studied on request.

	Through-Hole	SMD
Range of resistance values Lin (A) Log (B) Antilog (C)	100Ω ... 5MΩ 1 KΩ ... 2,2 MΩ	100Ω - 1MΩ 1KΩ - 1MΩ
Tolerance Special tolerances available on request	100Ω ... 1MΩ ±20% >1MΩ ... 5MΩ ±30% Out of range: Rn> 5MΩ: +50% -30%	< 1MΩ ± 25%
Variation laws	Lin (A), Log (B), Antilog (C) Other tapers available on request	
Residual resistance	Lin (A), Log (B), Antilog (C) $\leq 5 \cdot 10^{-3} \cdot R_n$ Minimum value 2Ω	
CRV - Contact Resistance Variation (dynamic)	$\leq 3\% R_n$	
CRV - Contact Resistance Variation (static)	$\leq 5\% R_n$	
Maximum power dissipation at 40° C. Lin (A) No Lin (B, C)	0,10W 0,06W	
Maximum voltage at 40°C Lin (A) No Lin (B, C)	100 VDC 60VDC	
Operating temperature	-25°C ... +70°C	
Temperature coefficient	100Ω - 10KΩ → +200/ -300 ppm. >10KΩ - 5MΩ → +200/ -500 ppm	100Ω - 100KΩ → +200/ -500 ppm. >100KΩ - 1MΩ → +200/ -1000 ppm.

Mechanical Specifications

	Through-Hole and SMD
Resistive element	Carbon technology
Angle of rotation (mechanical)	235° ± 10°
Wiper position	Middle position: 50% ± 15°
Angle of rotation (electrical)	215° ± 20°
Max. stop torque	4 Ncm
Max. push/pull on rotor	9,8 N
Wiper torque	< 2 Ncm
Mechanical life	1000 cycles (more available on request)

Test

Test // Conditions // Typical variation of Nominal Resistance

Damp heat // 500 h. at 40°C and 95% RH // +5%; -2%

Thermal cycles // 16h at 85°C, plus 2h at -25°C // ±2,5%

Load life // 1.000 h. at 40°C // +0%; -5%

Mechanical life // 1000 cycles at 10 c.p.m. and at 23°C ± 2°C // ±3%

Soldering effect // 2 seconds at 350°C // ±1%

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

For further information on tests, go to TESTS AND RELIABILITY, on pages 10-11

CA6 HOW TO ORDER

EXAMPLE: CA6XV2,5-10KA2020 SNP PI WT6030-BA-V0

Standard features								Extra features					Assembled accessory			
Series	Rotor	Model	Packg	Ohm value	Taper	Tol	Life	Track	Terminals	Housing	Rotor	Wiper position	Assembly	Ref #	Color	Flam.
1	2	3	4	5	6	7	8	9	10	11	12	13		14		15
CA6	X	V2,5		-10K	A	2020			SNP			PI	WT	6030	-BA	-V0

Standard configuration		Customized products	
Dimensions:	6mm	A drawing is requested to order a customized product. The code assigned will include all special specifications.	
Protection:	IP 5 (dust proof)		
Resistance:	Carbon technology		
Color:	Blue housing with white rotor		
Packaging:	Bulk		
Wiper position:	at 50% ± 15°		
Terminals:	Snap in P strongly recommended		
Marking:	Resistive value marked on housing; others on request.		
		Series, rotor, model and total resistive value are given before the special code: CA6XV5-10K CODE C00111	

1 - Series

CA6

2 - Rotors

X (Standard)

M

N

3 - Model and pitch

H2,5

V2,5

V5

VS5

HSMD

VSMD

4 - Packaging

Through-hole

SMD models

Bulk -standard-

(blank)...

(blank)...

T&R (Tape and reel)

(N.A.)⁽¹⁾

-T&R

(1) N.A. - Not Available: Tape and Reel packaging is only available for VSMD model.

5 - Resistance value

Through-hole

SMD

Taper:	Lin (A)	Log (B), Antilog (C)	Lin (A)	Log (B), Antilog (C)
Value Rn	100 Ω / 100	1KΩ / 1K	100Ω / 100	1KΩ / 1K
	... / / / / ...
	5 MΩ / 5M	2,2 MΩ / 2M2	1 MΩ / 1 MΩ	1 MΩ / 1M

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

Please, indicate terminal position when ordering a special taper.

7 - Tolerance

Through-hole models

SMD models

100 Ω ≤ Rn ≤ 1MΩ: ±20%

2020

1 MΩ ≤ Rn ≤ 5MΩ: ±30%

3030

For Rn > 5MΩ, tol : +50% - 30%

5030

Special tolerances available: <5% ... 10%, etc.

2525

8 - Operating life (cycles)

Standard (1000cycles)

(leave blank)

Long life: LV + the number of cycles. ex: LV06 for 6000 cycles⁽¹⁾

LVXX: ex: LV06

(1) Others on request.

9 - Cut track

At beginning of track, CCW: Off - On

PCI

At end of track, CW: On - Off

PCF

10 - Terminals (Crimped terminals or snap in:)

Without SNAP IN-

(leave blank)

With SNAP IN P

SNP

11 - Housing color

Standard is blue

(leave blank)

With other colors -See color chart below-, for example, red CJ-color; ex: CJ-RO

12 - Rotor color

Standard is white

(leave blank)

With other colors -See color chart below-, for example, red RT-color; ex: RT-RO

13 - Wiper position

(Standard: at 50% ± 15°)	(leave blank)
Initial or CCW	PI
Final or CW	PF

15 - Flammability (according to UL 94 V-0)

Not self-extinguishable	(leave blank)
Self-extinguishable (including all plastic parts of the potentiometers: rotor, housing and accessory. If only one part needs to be V0, please, inform)	-V0

For ordering spare accessories

Accessory reference - color- flammability. Ex. 6030-BA-V0 is a white self-extinguishable 6030 thumbwheel	XXXX-YY-__
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Color chart for rotor, housing and accessories

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

(1) Black is not available for housings.

14 - Potentiometers with assembled accessories

Assembled from front side	WT
Assembled from collector side	WTI
Accessory Reference See list of shafts and thumbwheels available	XXXX Example: 6030
Color of shaft or thumbwheel	-YY Example, white: -BA

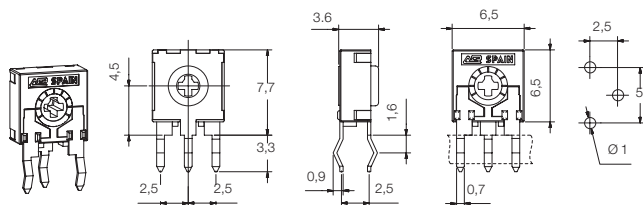
DRAWINGS CA6

Tolerances 6 mm (in mm.):

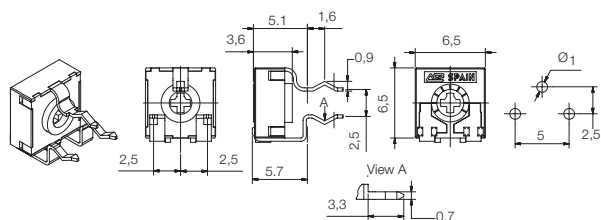
<1	±0,1
1...<5	±0,3
5...	±0,5

Model types. CA6

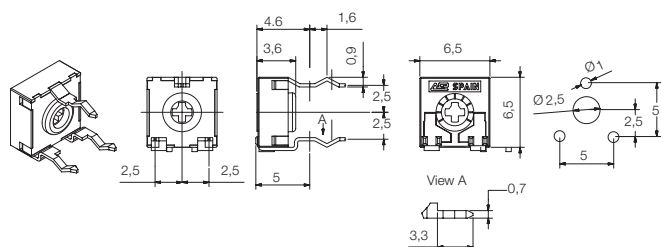
CA6 H2,5



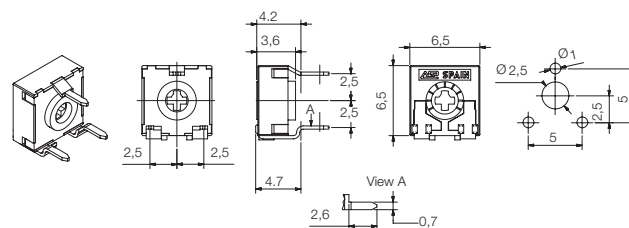
CA6 V2,5



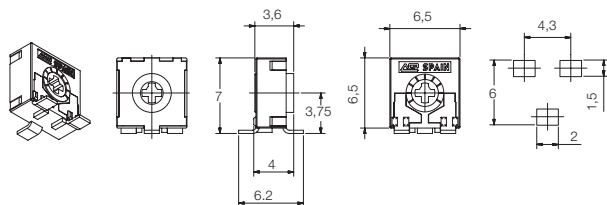
CA6 V5



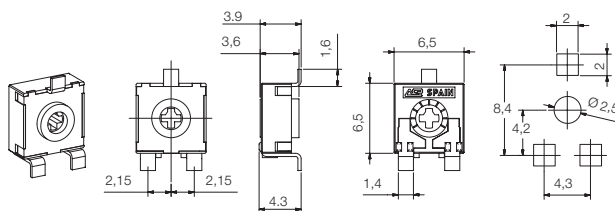
CA6 VS5



CA6 HSMD

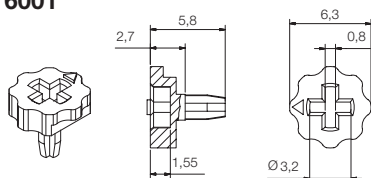


CA6 VSMD

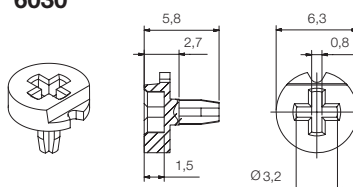


Thumbwheels CA6

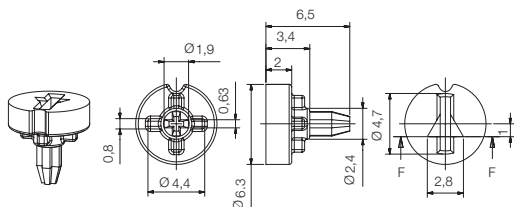
6001



6030



6032



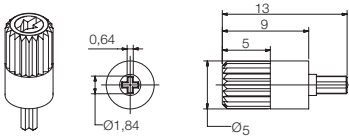
DRAWINGS CA6

Tolerances 6 mm (in mm.):

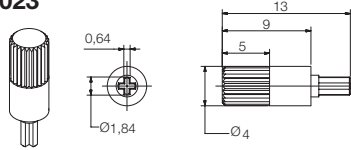
<1	±0,1
1...<5	±0,3
5...	±0,5

Shafts. CA6

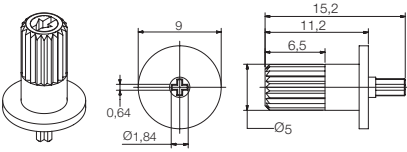
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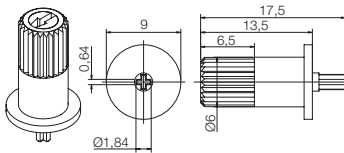
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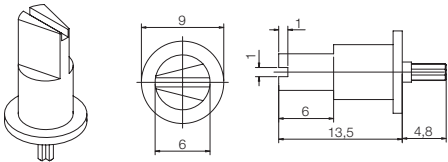
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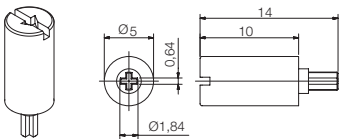
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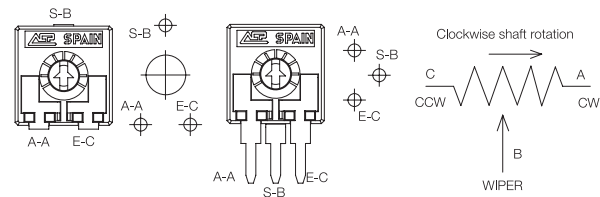


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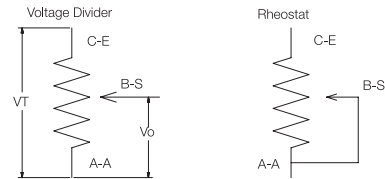


General concepts

Potentiometer configuration:



Electric use:



Resistance

Total Resistance: RT

The DC resistance between the input terminal and the wiper when the latter is positioned so as to give a maximum resistance value.

Electric Noise (Contact Resistance)

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 and it is measured in Ohms.

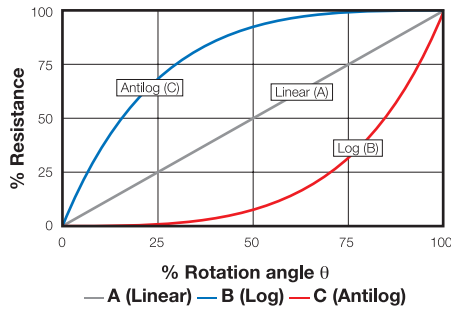
This noise can also be measured as "Contact Resistance Variation" (CRV); it does not depend on the position of the wiper on the resistive element and it is expressed in percentage of change between the initial resistance and the value of the resistance after the test. It is measured statically and dynamically.

ACP's potentiometers have less than 5% CRV.

ACP's standard resistance values:

100 Ω	100
200 Ω	200
220 Ω	220
250 Ω	250
470 Ω	470
500 Ω	500
1KΩ	1K
2 KΩ	2K
2,2KΩ	2K2
2,5 KΩ	2K5
4,7KΩ	4K7
5KΩ	5K
10 KΩ	10K
20 KΩ	20 K
22 KΩ	22 K
25 KΩ	25 K
47 KΩ	47 K
50 KΩ	50 K
100 KΩ	100 K
200 KΩ	200 K
...	...
1 MΩ	1M
2MΩ	2M
2,5MΩ	2M5
4,7MΩ	4M7
5MΩ	5M

Variation Laws -Tapers-

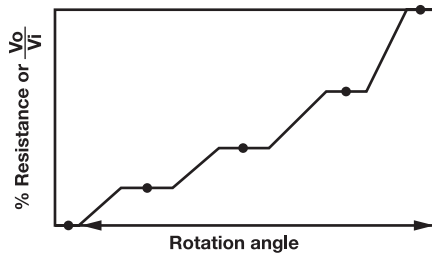


A potentiometer follows a linear variation law (A) when a certain movement of the wiper results in a certain change of the value of the resistance, no matter the position of the wiper relative to the resistive element. The resistance of the element is evenly distributed along the mechanical travel.

In case the movement of the wiper over the resistive element produces a change in the resistive value as B on the figure, we say the potentiometer follows a logarithmic law -Log-; the resistive value changes along the travel so that in the last section the value approaches the total resistance faster.

If the curve is like C on the figure, then we say it is an Antilogarithmic -antilog- law.

Special Tapers



We can provide with tapers with different slopes, areas with constant value or jumps, etc. Tolerances can be very low thanks to our laser trimming capability.

Special tapers can be combined with physical detents to match the areas where the customer wants to guarantee a constant value (the flat areas in the example). This is particularly suitable in applications which can benefit from a feeling of control over the position: automotive or household electronics. These detents can also be customized to match a customer's design.

Recommended soldering process:

Manual soldering

Soldering tools of 20W max.

Maximum temperature of soldering tools: 280°C

Time: 3 s. max.

Reflow soldering SMD (lead-free)

Solder temperature: 240°C for 5 ± 1 s.

Over 220°C: <40 s.

Preheating temperature: Max 150°C; 60- 90 s

Temperature Ramp-up: 2-3°C / s.

Flow

Solder temperature: max. 245 °C; 4 s

Preheating temperature: Max 100 °C; 30-60s

Linearity

It is the specified maximum deviation of the actual variation law compared to a straight reference line.

Independent Linearity (LN)

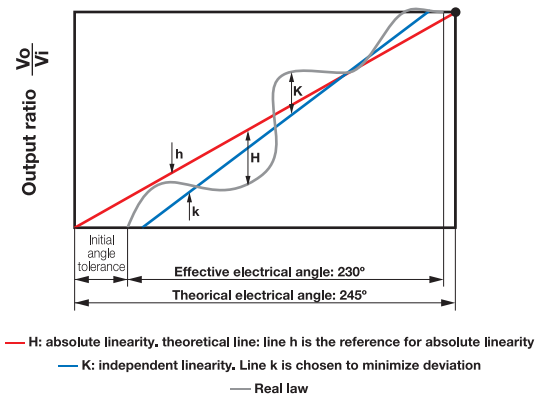
It is the maximum vertical deviation of the actual law from a straight reference line with the slope and position chosen to minimize deviation over the effective electrical travel or any specified portion thereof. It is expressed as a percentage of the total voltage applied. This is the definition used in ACP by default.

Absolute Linearity (LA)

It is the maximum vertical deviation of the actual law from the straight reference line, "Theoretical Law", that runs through the specified minimum and maximum output ratios along the theoretical angle of electrical travel. Unless otherwise specified, the minimum and maximum output ratios are respectively zero and 100% of the total applied voltage.

The main difference between the two definitions is the reference line chosen to measure the deviations:

- Independent linearity takes the line that best minimizes the deviation between the real law and this line.
- Absolute linearity uses a straight line that runs through the points of minimum and maximum output ratios considered over the theoretical electrical travel. As a result, the angular tolerance of the theoretical electrical travel has a direct influence in absolute linearity.

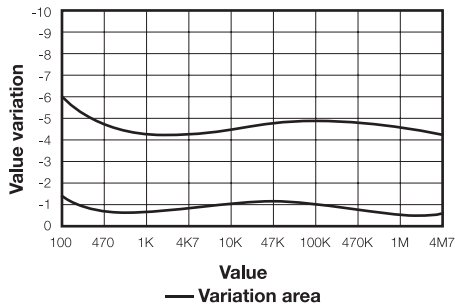


Tests and reliability. Carbon test

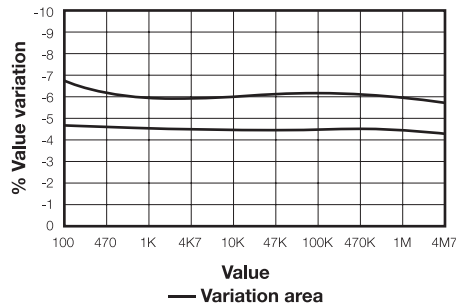
Carbon test

Test	Conditions	Typical variation of Nominal Resistance
Damp heat	500 h. at 40°C and 95% RH	+5%; -2%
Thermal cycles	16h at 85°C, plus 2h at -25°C	±2,5%
Temperature coefficient	-25°C / +70°C	100Ω - 10KΩ +200/ -300 ppm. >10KΩ - 5MΩ +200/ -500 ppm
Load life	1.000 h. at 40°C	+0%; -5%
Mechanical life	1000 cycles at 10 c.p.m.	±3%
Soldering effect	2 seconds at 350°C	±1%
Storage (3 years)	at 23°C ± 2°C	±3%

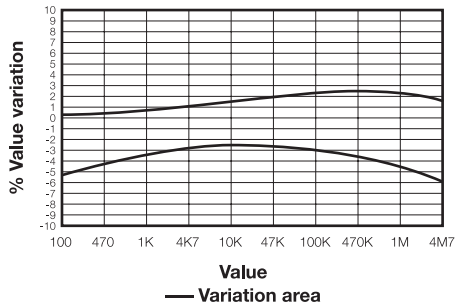
Load life



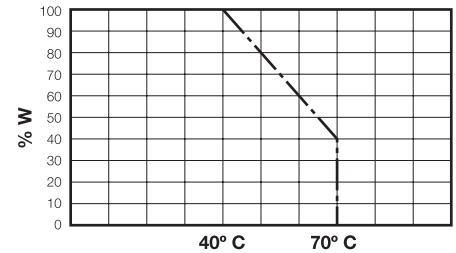
Mechanical life



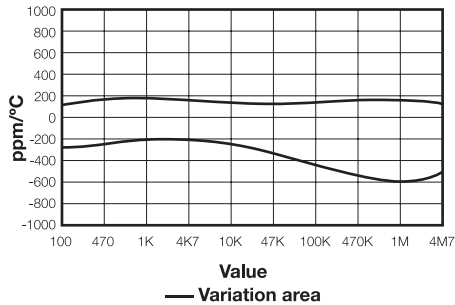
Damp heat



Power derating curve



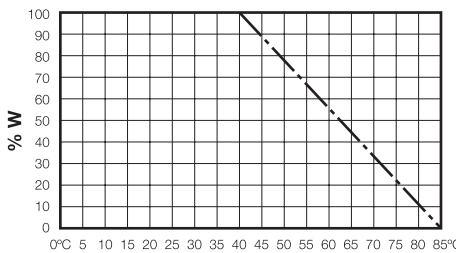
Temperature coefficient



Temperatures out of range:

The normal operation temperature range for an ACP carbon potentiometer is -25° ... +70°. When used at up to 85°C (at higher temperatures) the following variations should be observed:

Load Life	1,000 h, at 40°C	+0%; -5%
	1,000 h, at 85°C	+0%; -15%



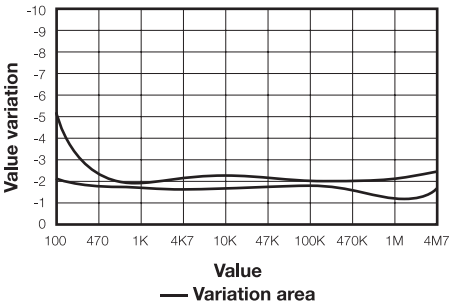
Power derating curve

Tests and reliability. Cermet test

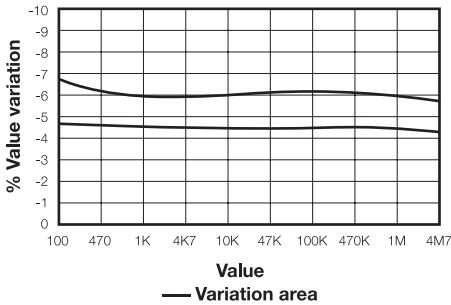
Cermet test

Test	Conditions	Typical variation of Nominal Resistance
Damp heat	500 h. at 40°C and 95% RH	±2%
Thermal cycles	16h at 90°C, plus 2h at -40°C	±2%
Temperature coefficient	-40°C/+90°C	±100ppm
Load life	1.000 h. at 70°C	±2%
Mechanical life	1000 cycles at 10 c.p.m.	±2%
Soldering effect	2 seconds at 350°C	±1%
Storage (3 years)	at 23°C ± 2°C	±3%

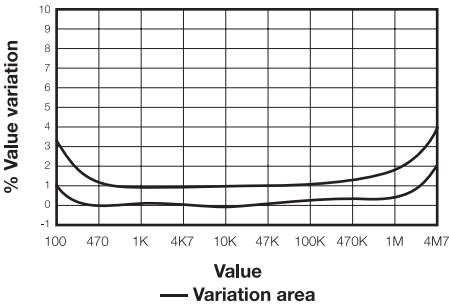
Load life



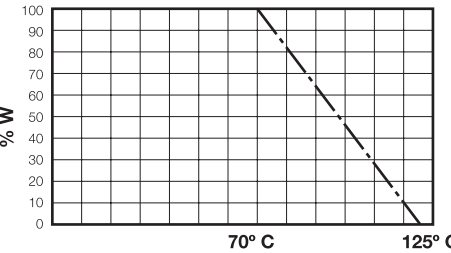
Mechanical life



Damp heat



Power derating curve



Temperature coefficient

