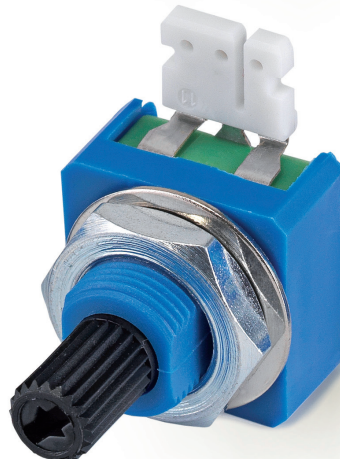
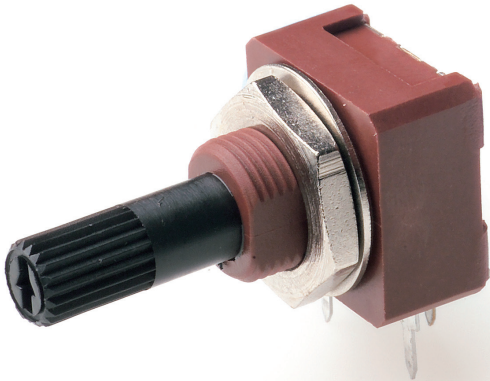


# MCS14

Control Carbon  
Potentiometers MCS



## CARBON – MCS14

MCS14mm carbon potentiometer with plastic enclosure and shaft. Thanks to the CS14 placed inside its plastic enclosure, we can achieve 360° of mechanical rotation (electrical angle up to 330°).

The plastic enclosure is fitted with a bushing for fixation to a panel through a nut and a washer.

Through-hole and pluggable 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 50 detents available).

### Applications

MCS14 potentiometers are used in control applications:

- Electronic appliances, heating, HVAC systems, thermostats, washing machines, dishwashers, tumble-dryers, etc...

# MCS14 HOW TO ORDER

EXAMPLE: **MCS14NH2,5-10KA2020 SNP PI WT-14187-BA**

Standard features									Extra features								Assembled accessory			
Series	Rotor	Model	Connector	Packg.	Ohm value	Taper	Tol.	Life	Track	Detents	Snap in	Housing	Rotor	Wiper	Lin.	Oper.T <sup>a</sup>	Assembly	Ref #	Color	Flam.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18			
MCS14	N	H2,5			- 10K	A	2020				SNP			PI			WT	-14187	-BA	

Standard configuration:	MCS14 Through-hole
Dimensions:	14mm
Protection:	IP 54 (dust-proof) On request: Self-extinguishable, to meet UL 94 V-0
Substrate:	Carbon technology
Color:	Blue 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: MCS14NH2,5-10K CODE C00111. Other features could be available on request, please, ask.

## 1 - Series

■ MCS14

## 2 - Rotors

N Z

## 3 - Model and pitch

H0 HC0\* H2,5 H5 HP V12,5 V15

\* Under request.

## 4 - Connector

SHORT latching shape and groove at INITIAL terminal side	SI
SHORT latching shape and groove at FINAL terminal side	SF
LONG latching shape and groove at INITIAL terminal side	LI
LONG latching shape and groove at FINAL terminal side	LF

## 5 - Packaging

### Trough-hole

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

## 6 - Resistance value

1KΩ	2KΩ	2K2Ω	4K7Ω	5KΩ	10KΩ	4M7Ω	5MΩ
1K	2K	2K2	4K7	5K	10K	4M7	5M

## 7 - Resistance law / taper

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

## 8 - Tolerance

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

## 9 - Operating Life (Cycles)

Standard (15.000 cycles) (Others on request)	LV15
Long life: LV + the number of cycles. ex: LV50 for 50.000 cycles. (others on request)	LVXX: ex: LV50

## 10 - Cut Track – Open circuit.

MCS14 already has an open circuit area at the base of the potentiometer (between 330° and 0°). Additional cut tracks can be studied on request.

## 11 - Detents (DT)

X number of detents: ex. 16 detents XDT, ex:16DT

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

## 12 - 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

## 13 - Housing

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

## 14 - 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:

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

## 15 - Wiper

<b>Wiper position</b> (Standard: 50% ± 15°)	(leave blank)
Initial or CCW	PI
Final or CW	PF
Others: following clock positions; at 3 hours: P3H	PXH, ex: P3H

<b>Wiper torque</b> (Standard: <2.5Ncm, for detents: <3.5)	(leave blank)
Low torque, < 1.5Ncm	PGB

## 16 - Linearity

Standard, according to IEC 190	(leave blank)
Independent linearity controlled & below x%, for example, 3%: LN3%	LNx%; ex: LN3%
Absolute linearity controlled & below x%	LAX%

## 17 - Operating Temperature

-25°C... +70°C	(leave blank)
-25°C... +85°C	T <sup>a</sup> D
-25°C... +105°C	T <sup>a</sup> B

## 18 - Potentiometers with assembled accessories

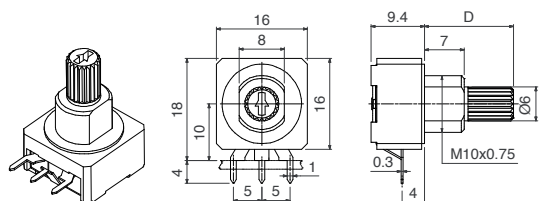
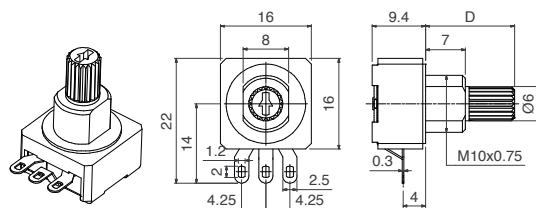
Assembled from terminal side	WT
Accessory Reference	-XXXXX
See list of shafts and thumbwheels available	Example: 14187
Color of shaft or thumbwheel	-YY Example, white: BA
Non self-extinguishable. Self-extinguishable according to standard UL 94 (-V0 in box 17 modifies only the accessory, please, note.)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

### Color chart for rotor, housing and accessories

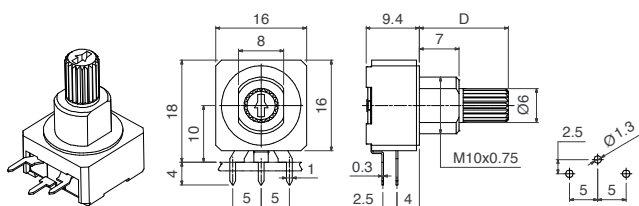
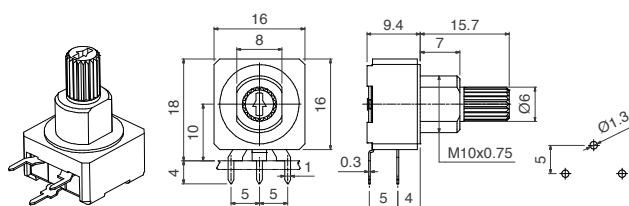
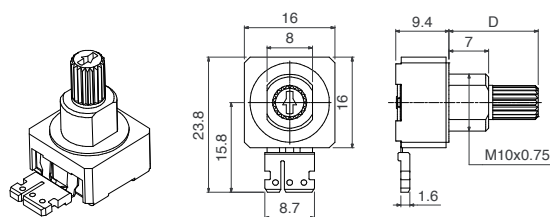
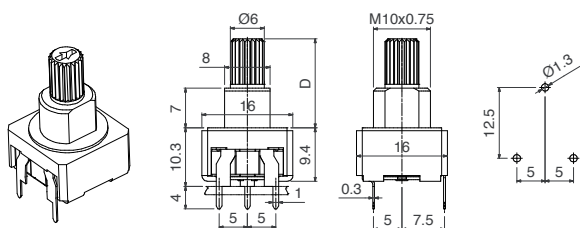
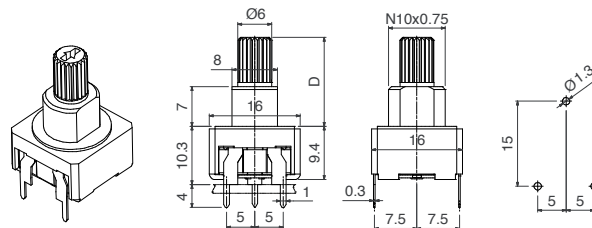
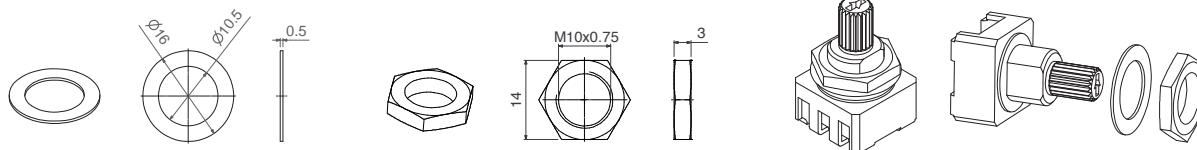
Black <sup>(1)</sup>	White	Neutral	Transp.	Red	Green	Yellow	Blue	Grey	Brown
NE	BA	IN	TA	RO	VE	AM	AZ	GS	MR

(1) black is not an option for housings.

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.

**H0****HC0\***

\*Under request.

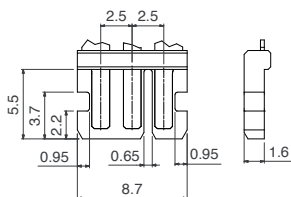
**H2,5****H5****HP****V12,5****V15****Nut****Washer****Nut and washer assembly indication**

ACP offers the possibility to turn one CS14 standard into a pluggable version. Thanks to an external RAST 2,5 card edge connector in which terminals are embedded, customer can transmit the output signal from the potentiometer to the electronic module. The three pins of the potentiometer (the collector and the two terminals) are fitted into a 1,55 mm thick plastic part with a pitch of 2,5mm. Extended temperature versions covering a range from -40°C to +120°C are available for applications where the working temperature interval exceeds the standard limits of -25°C to +70°C. The self-extinguishable version of the plastic parts, V0, can be supplied under request.

A typical application would be as feedback position sensor of the cooking style selector for kitchen ovens. ACP is able to supply different kind of connectors:

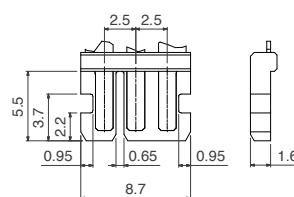
## SI

SHORT latching shape and groove at INITIAL terminal side.



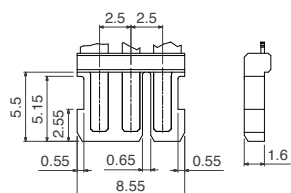
## SF

SHORT latching shape and groove at FINAL terminal side.



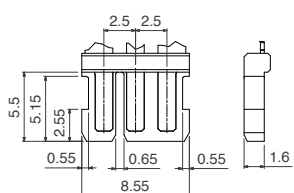
## LI

LONG latching shape and groove at INITIAL terminal side.



## LF

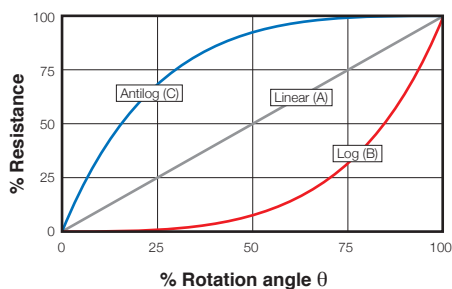
LONG latching shape and groove at FINAL terminal side.



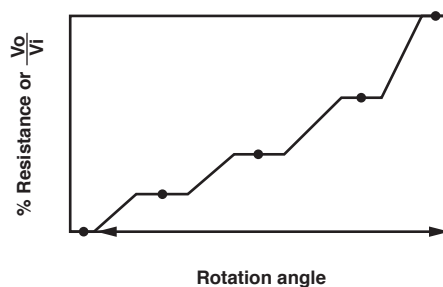
# Tapers

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

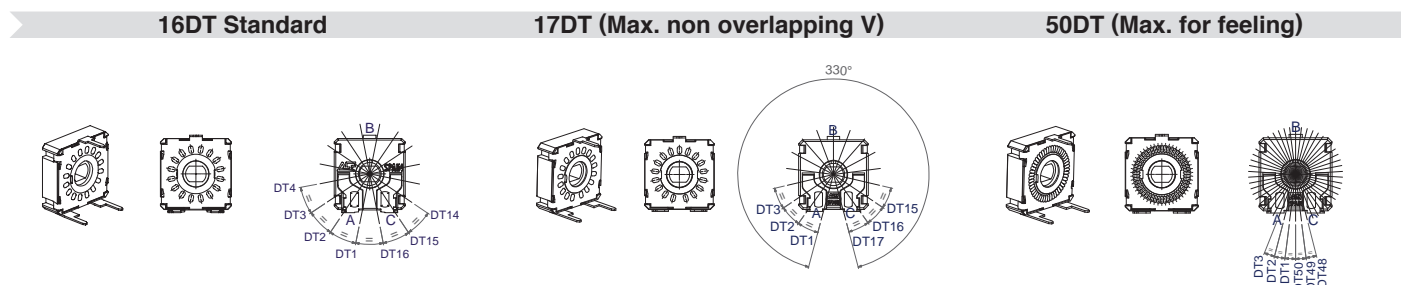


## Potentiometers with detents

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:

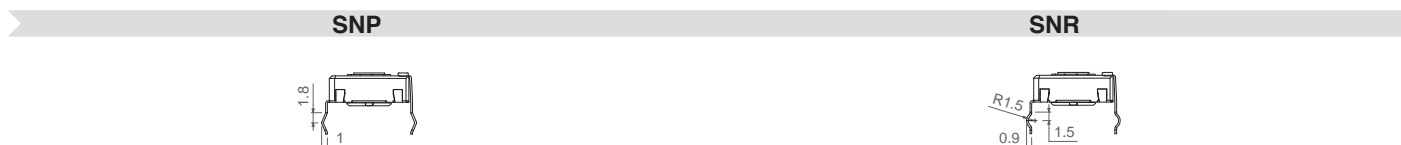


Our patented design with two wipers gives more stable electrical parameters, improved reliability and Contact Resistance Variation (CRV), as well as narrower tolerances for detent positioning.

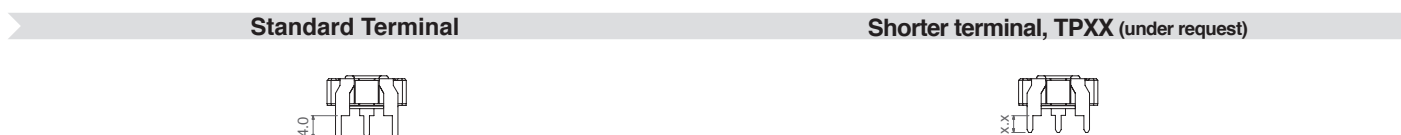
For potentiometers with detents, mechanical life is also 15.000 turns if no additional turns are mentioned. Please, indicate the number of turns needed. When needing a special number of detents or matching taper, a drawing is kindly requested.

## 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.



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



## Adjustment and orientation

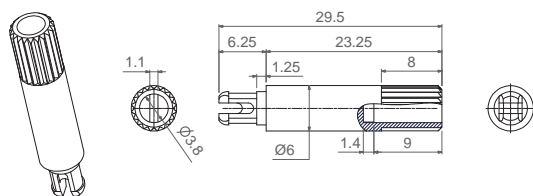
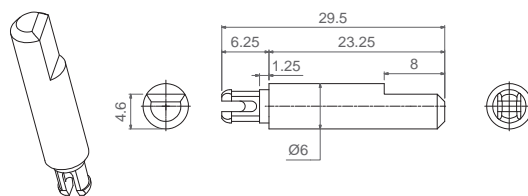
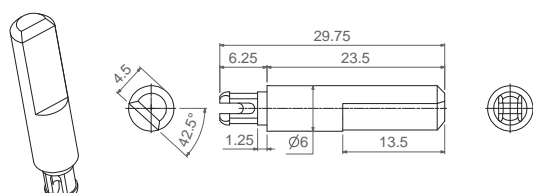
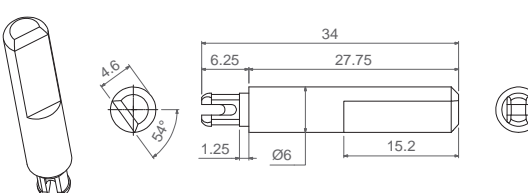
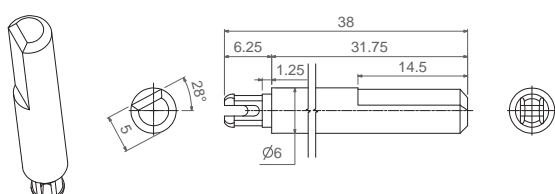
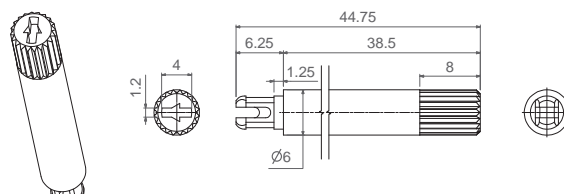
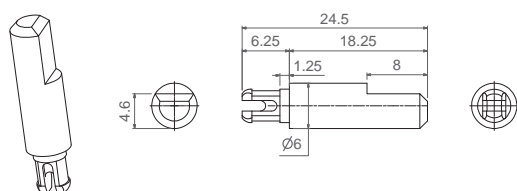
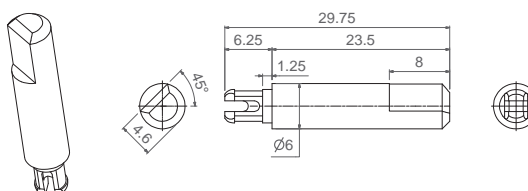
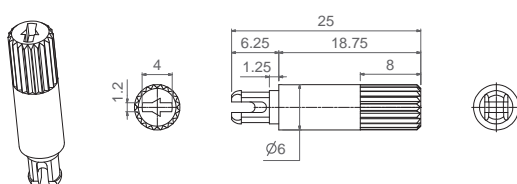
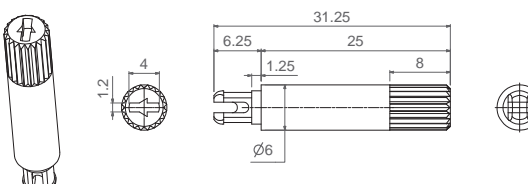
Should the shaft need to be positioned differently than shown on the "models" section on this catalogue, a drawing with the exact position is kindly requested.

## Shafts

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

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

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

**14008**

**14015**

**14066**

**14067**

**14072**

**14073**

**14081**

**14084**

**14187**

**14250**

**Packaging**

Potentiometer model	With shaft or thumbwheel inserted?	Pieces per bigger box (250 x 150 x 70, CG on description)
H0 - HC0 - H2,5 - H5 - HP - V12,5 - V15	With any shaft.	150

## Electric Specifications

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

### MCS14 Through-hole

Range of resistance values* Lin (A) Log (B) Antilog (C)	$1K\Omega \leq R_n \leq 5M\Omega$ $10K\Omega \leq R_n \leq 2M2\Omega$
Tolerance* (Please, inquire for >100K turns) $100\Omega \leq R_n \leq 100K\Omega$ $100K < R_n \leq 1M\Omega$ : $1M\Omega < R_n \leq 5M\Omega$ : $R_n > 5M\Omega$ :	$\pm 30\%$ $\pm 30\%$ $\pm 30\%$ $+50\%, -30\%$ (out of range)
Variation laws	Lin (A), Log (B), Antilog (C). Other tapers available on request
CRV - Contact Resistance Variation (dynamic)	Lin (A) Electrical Angle $330^\circ \pm 20^\circ \leq 3\%R_n$ . Other tapers, please inquire
CRV - Contact Resistance Variation (static)	Lin (A) Electrical Angle $330^\circ \pm 20^\circ \leq 5\%R_n$ . Other tapers, please inquire
Maximum power dissipation** Lin (A) Log (B), Antilog (C)	at $50^\circ\text{C}$ , 0.15W
Maximum voltage Lin (A) Log (B), Antilog (C)	250VDC
Operating temperature	$-25^\circ\text{C} \dots +70^\circ\text{C}$ (standard) $-25^\circ\text{C} \dots +85^\circ\text{C}$ $-25^\circ\text{C} \dots +105^\circ\text{C}$
Temperature coefficient $100\Omega \leq R_n \leq 10K\Omega$ $10K\Omega < R_n \leq 5M\Omega$	$+200/-300$ 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

### MCS14 Through-hole

Resistive element	Carbon technology
Angle of rotation (mechanical)	$360^\circ$
Angle of rotation (electrical)	$330^\circ \pm 20^\circ$
Wiper standard delivery position	$50\% \pm 15^\circ$
Max. push/pull on rotor	35N / 50 N
Wiper torque*	For 15.000 turns <2.5 Ncm, detents: <3.5 Ncm For > 15.000 turns <1.5 Ncm
Mechanical life	Standard is 15.000 turns. Up to 1.000.000 turns available depending on configuration

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

## Test results

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

### MCS14 Through-hole

	Test conditions	Typical variation of $R_n$
Damp heat	500 h. at $40^\circ\text{C}$ and 95% RH	$\pm 20\%$
Thermal cycles	16 h at $85^\circ\text{C}$ , plus 2 h at $-25^\circ\text{C}$	$\pm 20\%$
Load life	1.000 h. at $50^\circ\text{C}$	$\pm 20\%$
Mechanical life	15.000 cycles at 10 c.p.m. and at $23^\circ\text{C} \pm 2^\circ\text{C}$	$\pm 20\%$
Storage (3 years)	3 years at $23^\circ\text{C} \pm 2^\circ\text{C}$	$\pm 3\%$