



PIHER

## Sensors

## Sensors

v01

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smart engineering for  
extreme environments

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Piher is recognised as a world leader in custom controls and sensor solutions by the top Land Vehicle/Automotive and Appliance players.

In this catalogue you will find a selection of the most prolific of our rotary and linear sensors for these applications.

The pursuit of the most cost-effective total solution for your needs is firmly embedded in our business philosophy, so whatever your requirements may be, be sure that Piher will deliver.

Two more catalogues are available depending on the technology used:

- Contact incremental encoders & rotary switches
- Control potentiometers

Should you be interested in any of these catalogues or require further information please do not hesitate to contact your nearest Piher supplier.

Rotary  
sensors

Linear  
sensors

Series	MRA	ERA	Life	Lin	SMD	Op.Temp	Page
PT-10V	235 ±5	220 ±20	10K	-	SOON	-25 to +70*	4
PT-10H	235 ±5	220 ±20	10K	-	-	-25 to +70*	4
PTC-10V	235 ±5	220 ±20	10K	-	SOON	-40 to +90	4
PTC-10H	235 ±5	220 ±20	10K	-	-	-40 to +90	4
PT-15V	265 ±5	240 ±20	up to 200k	±3	PS-15	-25 to +70*	6
PT-15H	265 ±5	240 ±20	up to 200k	±3	-	-25 to +70*	6
PTC-15V	265 ±5	240 ±20	10K	±2.5	-	-40 to +90	6
PTC-15H	265 ±5	240 ±20	10K	±2.5	-	-40 to +90	6
PS-15	265 ±5	240 ±20	10K	±3	YES	-40 to +85	8
PC-16	300 ±5	280 ±20	25K	±3	-	-25 to +70*	10
PC-16 SC	300 ±5	280 ±20	25K	±3	-	-25 to +70*	10
HVAC v2.1	360	120-340	100K	±2	-	-40 to +85	12
HVAC v3	360	120-340	100K	±2	-	-40 to +85	12
N-15	360	340 ±10	200K	±3	YES	-40 to +120	14
A-15	360	360	200K	±6°	YES	-40 to +120	14
Z-15	360	110° ±10°	2M	±3	YES	-40 to +120	16
PCR	up to 360	up to 360	1M	±2	-	-40 to +120	18
NPL	7.25-12mm	6-12mm	50K	±2	-	-40 to +105	20
PL-40	40 ±1	37 ±1	25K	-	-	-25 to +70	22

MRA: Mechanical rotation angle (degrees)  
ERA: Electrical rotation angle (degrees)  
Lin: Absolute linearity (percentage)

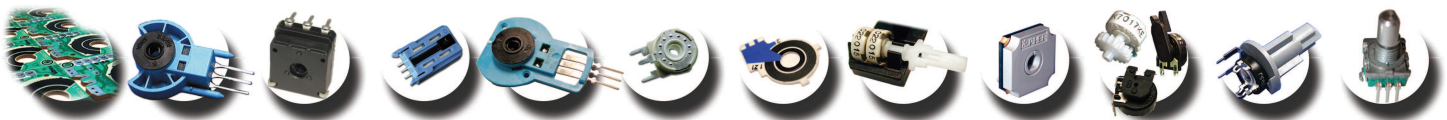
\*up to +85°C depending on the application

All models of this catalogue can be adapted to meet customer's requirements. Request full datasheets from your nearest Piher supplier or visit [www.piher.net](http://www.piher.net)



NOTE: The information contained in this catalogue should be used for reference purposes only. Due to continuous product improvements, we reserve the right to make specification and/or product changes without prior notification. Please refer to [www.piher.net](http://www.piher.net) for updated information.

# Applications for Automotive



The Automotive market is one of the key drivers of Piher's success. Demanding new and cost effective ideas year on year has shaped the company in to what it is today: proactive and customer driven. Since the seventies Piher served the key European Automotive OEM's and component suppliers and has developed an expertise in providing custom Control and Sensor solutions unrivalled in today's Automotive sector.

Along with the acquisition of a prestigious array of quality awards representative of this sector: ISO 9001, QS9000, ISO 14001 and ISO TS 16949, Piher's products are listed in the IMDS database providing detailed information on product recyclability.

# PT-10 & PTC-10

## 10mm rotary sensor



Main features	PT-10	PTC-10
Plastic material according to UL94V-0	upon request	yes
Resistive element	carbon	cermet
Dust proof enclosure	yes	yes
Supplied in magazines for automatic insertion	yes	yes
Wiper positioned at 50% or fully clockwise	yes	yes
Low & extra low torque versions	yes	yes
Mechanical detents	yes	yes
Special tapers	yes	yes
Special switch option	upon request	SPDT switch
Cut track option	yes	upon request
Laser trimming for tighter tolerances	-	yes
Crimped terminals available	yes	yes

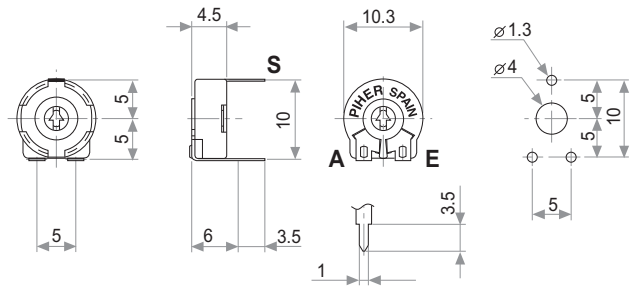
Electrical specifications	PT-10	PTC-10
Range of values*	100Ω ≤ Rn ≤ 5 M (Decad. 1.0 - 2.0 - 2.2 - 2.5 - 4.7 - 5.0)	
Tolerance*	100Ω ≤ Rn ≤ 1M Ω ..... ± 20% 1MΩ < Rn ≤ 5M Ω ..... ± 30%	
Max. Voltage	200 VDC (lin) 100 VDC (no lin)	
Nominal Power	50°C (122°F) 0.15 W (lin) 0.07 W (no lin)	70°C (158°F) 0.33 W (lin) 0.17 W (no lin)
Taper*	Lin, Log, Alog (Log & Alog only Rn≥1k)	
Residual resistance	≤ 5.10 <sup>-3</sup> Rn (2 Ω min.)	
Equivalent noise resistance	≤ 3% Rn (3 Ω min.)	
Operating temperature	-25°C + 70°C** (-13°F + 158°F)	-40°C + 90°C -40°C + 90°C (-40°F + 194°F)

(\*) Others upon request      (\*\*) Up to 85°C depending on application

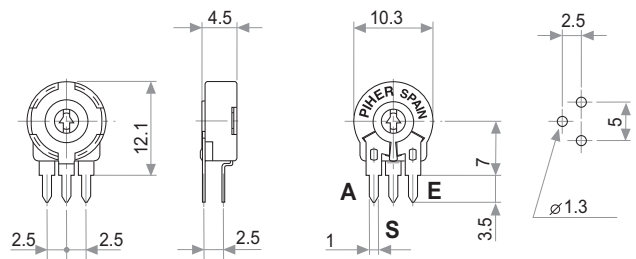
### Mechanical specifications

Mechanical rotation angle	235° ± 5°
Electrical rotation angle	220° ± 20°
Torque	0.4 to 2 Ncm. (0.6 to 2.7 in-oz)
Stop torque	> 5 Ncm. (>7 in-oz)
Life	10K cycles

**V(10)**

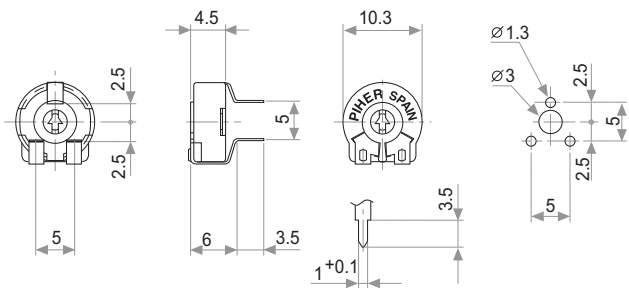


## H(2.5)

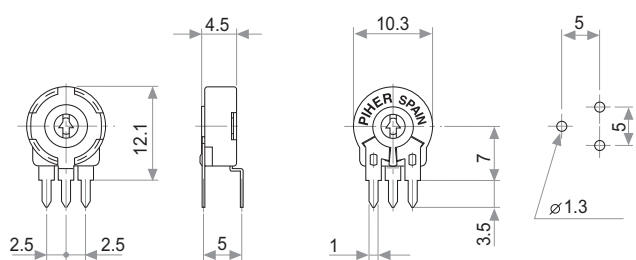


**A** = Initial      **S** = Wiper      **E** = Final

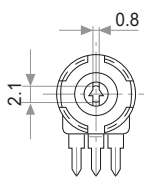
**V(5)**



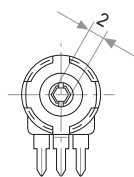
**H(5)**



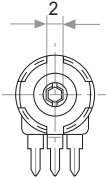
### Rotors (wipers positioned at 50%)



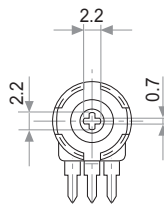
**L** = Screwdriver  
thru hole



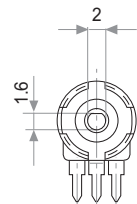
**M** = Hexagonal  
thru hole



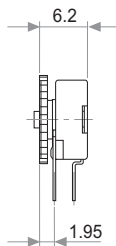
**G** = Hexagonal thru hole



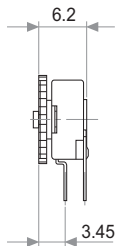
**K** = Cross slot  
thru hole



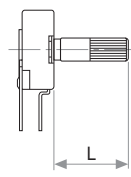
## R



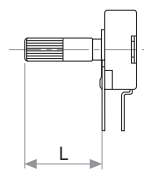
**Y** = Adjustable from terminal side



**Z** = Adjustable from collector side



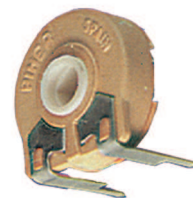
**X=**  
Adjustable from collector side



**W =**  
Adjustable from terminal side

# PT-15 & PTC-15

## 15mm rotary sensor



Main features	PT-15	PTC-15
Plastic material according to UL94V-0	upon request	yes
Resistive element	carbon	cermet
Dust proof enclosure	yes	yes
Long life model	yes	yes
Supplied in magazines for automatic insertion	yes	yes
Wiper positioned at 50% or fully clockwise	yes	yes
Low torque versions	yes	yes
Mechanical detents	yes	yes
Special tapers	yes	yes
Special switch option	upon request	SPDT switch
Cut track option	yes	upon request
Laser trimming for tighter tolerances	-	yes
Crimped terminals available	yes	yes
Special linearity	upon request	upon request

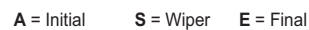
Electrical specifications	PT-15	PTC-15
Range of values*	$100\Omega \leq R_n \leq 5\text{ M}$ (Decad. 1.0 - 2.0 - 2.2 - 2.5 - 4.7 - 5.0)	
Tolerance*	$100\Omega \leq R_n \leq 1\text{M}\Omega$ ..... $\pm 20\%$ $1\text{M}\Omega < R_n \leq 5\text{M}\Omega$ ..... $\pm 30\%$	
Max. Voltage	250 VDC (lin) 125 VDC (no lin)	
Nominal Power	$50^\circ\text{C}$ (122°F) 0.25 W (lin) 0.12 W (no lin)	$70^\circ\text{C}$ (158°F) 0.50 W (lin) 0.25 W (no lin)
Taper*	Lin, Log, Alog (Log & Alog only $R_n \geq 1\text{k}$ )	
Residual resistance	$\leq 5 \cdot 10^{-3} R_n$ (2 $\Omega$ min.)	
Equivalent noise resistance	$\leq 3\% R_n$ (3 $\Omega$ min.)	
Operating temperature	$-25^\circ\text{C} + 70^\circ\text{C}^{**}$ (-13°F + 158°F)	$-40^\circ\text{C} + 90^\circ\text{C}$ $-40^\circ\text{C} + 90^\circ\text{C}$ (-40°F + 194°F)

(\*) Others upon request    (\*\*) Up to 85°C depending on application

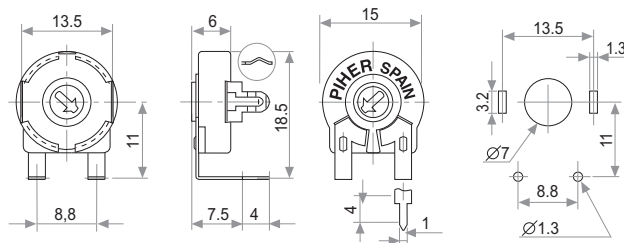
Mechanical specifications	PT-15	PTC-15
Mechanical rotation angle	$265^\circ \pm 5^\circ$	
Electrical rotation angle	$240^\circ \pm 20^\circ$	
Torque	0.5 to 2.5 Ncm. (0.7 to 3.4 in-oz)	
Stop torque	> 10 Ncm. (>14 in-oz)	
Life	10K, 100K, 200K cycles	10K cycles

(\*) Others upon request

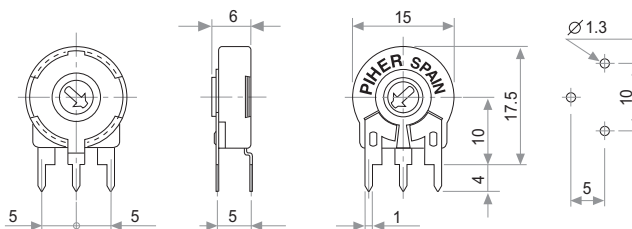
**V(12.5)**



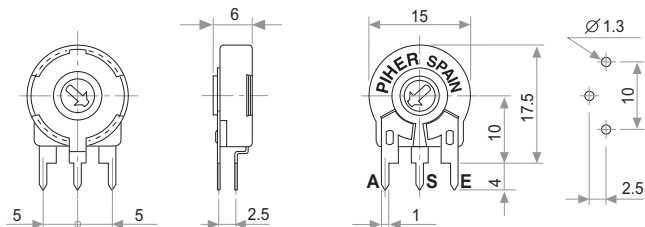
## VD



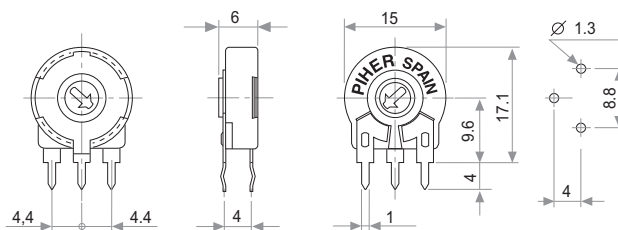
**H(5)**



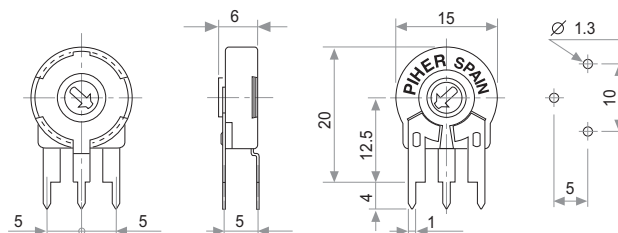
## H(2.5)



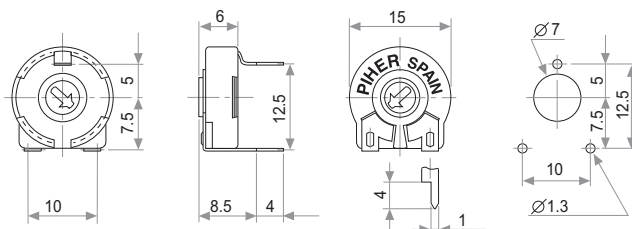
## HB



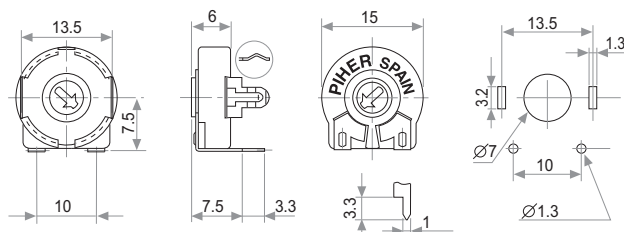
### Hc5 (only PT15)



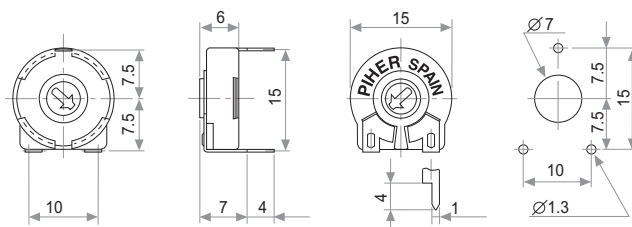
## va(12.5)



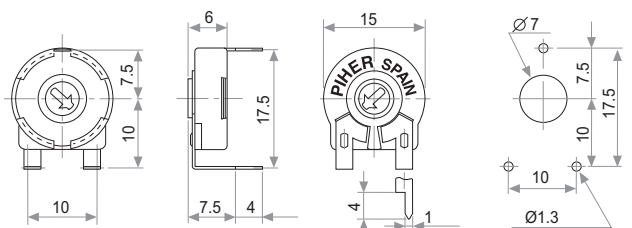
## VD(15) (only PT15)



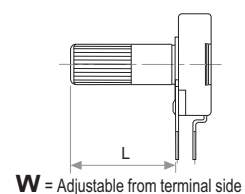
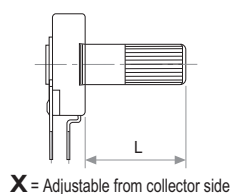
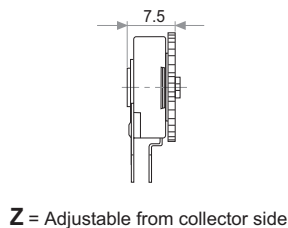
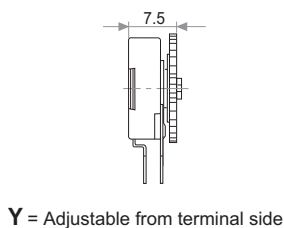
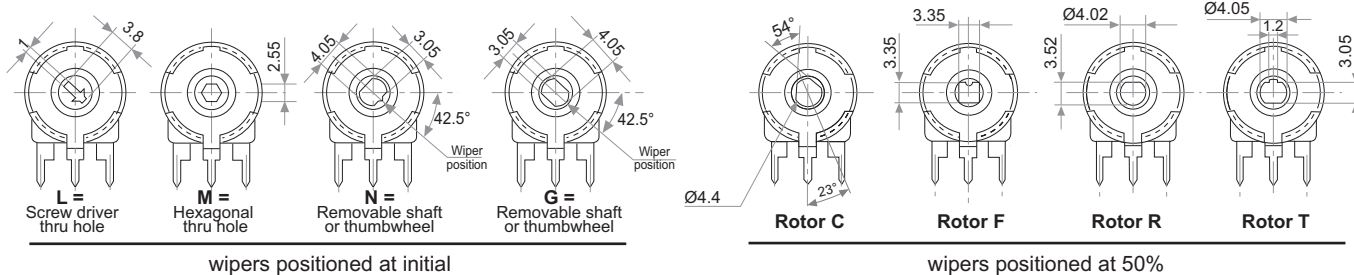
## V(15)



## V(17.5)



## Rotors





# PS-15

## 15mm SMD rotary sensor



### Main features

Leadfree reflow soldering compatible	yes
Plastic material according to UL94V-0	yes
Resistive element	carbon
Dust proof enclosure	yes
Wiper positioned at 50% or fully clockwise	yes
Mechanical detents	yes
Special tapers	yes
Absolute linearity	3% (upon request)

### Electrical specifications

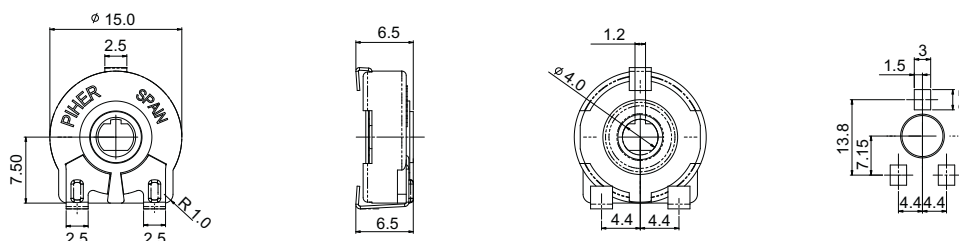
Range of values*	1K to 1M
Tolerance*	$\pm 30\%$
Nominal Power	0.25W @ 50°C (122°F)
Taper*	Linear
Residual resistance	$\leq 5 \cdot 10^{-3} R_n$
Equivalent noise resistance	$\leq 3\% R_n$
Operating temperature	-40°C + 85°C

(\*) Others upon request

### Mechanical specifications

Mechanical rotation angle	$265^\circ \pm 5^\circ$
Electrical rotation angle	$240^\circ \pm 20^\circ$
Torque	0.5 to 2.5 Ncm. (0.7 to 3.4 in-oz)
Stop torque	> 10 Ncm. (>14 in-oz)
Mechanical life	10K cycles

### DIMENSIONS





# PC16 & PC16 SC

## 16mm rotary sensor



### Main features

Plastic material according to UL94V-0	yes
Resistive element	carbon
Dust proof enclosure	yes
Modular gang type (up to 4)	yes
Stereo matching	upon request
Nut & washer	upon request
Special tapers	yes
Switch option	yes
Shafts available	yes (plastic, metallic)
Bushings available	yes
10A/250v switch rating available	yes (PC17 series)

### Electrical specifications

Range of values*	$100\Omega \leq R_n \leq 5\text{ M}$ (Decad. 1.0 - 2.0 - 2.2 - 2.5 - 4.7 - 5.0)
Tolerance*	$100\Omega \leq R_n \leq 1\text{M}\Omega$ ..... $\pm 20\%$ $1\text{M}\Omega < R_n \leq 5\text{M}\Omega$ ..... $\pm 30\%$
Max. Voltage	250 VDC (lin) 125 VDC (no lin)
Nominal Power	50°C (122°F) 0.2 W (lin) 0.1 W (no lin)
Taper*	Lin, Log, Alog (Log & Alog only $R_n > 1\text{k}$ )
Residual resistance	$\leq 0.1\% R_n$ (2Ω min.)
Equivalent noise resistance	$\leq 3\% R_n$ (3 Ω min.)
Operating temperature	-25°C + 70°C** (-13°F + 158°F)

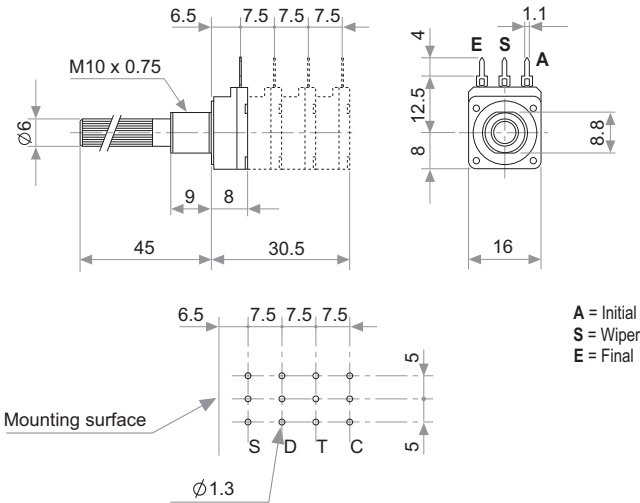
(\*) Others upon request

(\*\*) Up to 85°C depending on application

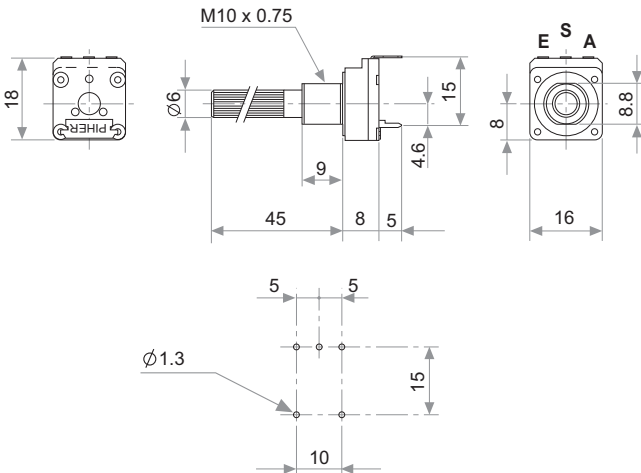
### Mechanical specifications

Mechanical rotation angle	$300^\circ \pm 5^\circ$
Electrical rotation angle	$280^\circ \pm 20^\circ$
Torque	0.5 to 1.5 Ncm. (0.7 to 2.1 in-oz)
Stop torque	> 40 Ncm. (>56 in-oz)
Max. torque nut (binding out)	< 80 Ncm. (112 in-oz)
Thrust and pull in the shaft	> 25 N
Life	25K cycles

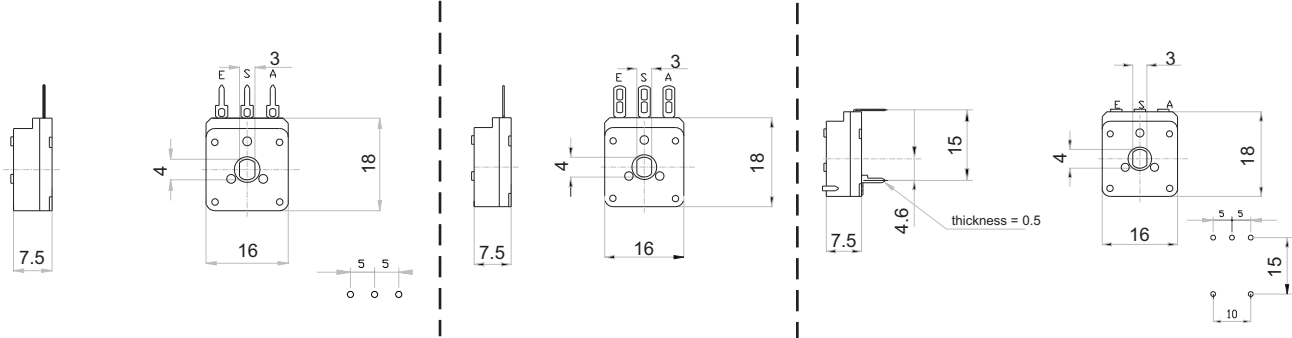
PC-16 S/D/T/C..H...



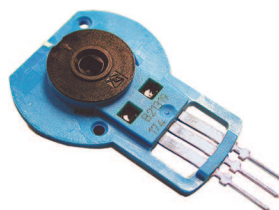
PC-16 SV .....



PC16 SC



# HVAC position sensor



## Main features

Resistive element	carbon
Dust proof enclosure	yes
Long life model	yes
Packaging	plastic trays
Wiper positioned at 50%	yes

## Electrical specifications

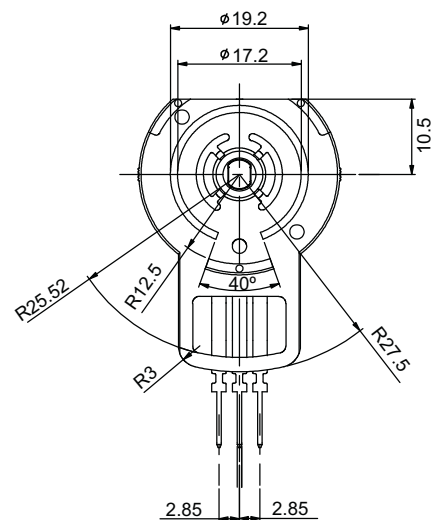
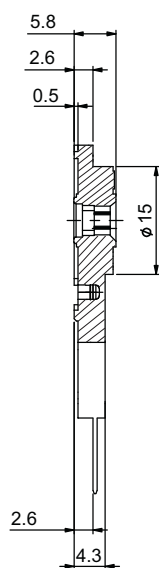
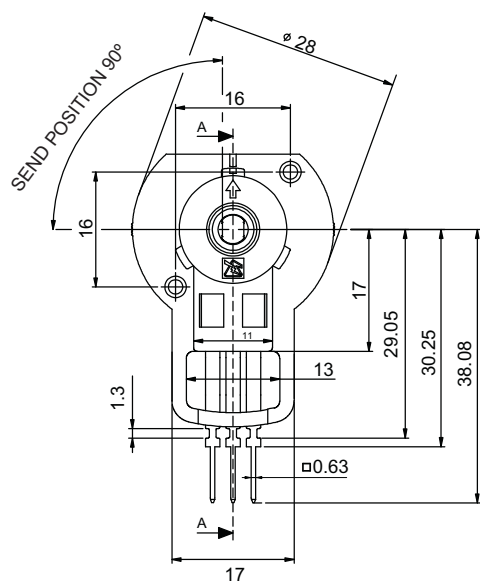
Resistive value*	4K7
Tolerance*	± 20%
Linearity	± 2%
Max. Voltage	34 VDC (lin)
Nominal Power	50°C (122°F) 0.25 W (lin)
Taper*	Linear
Residual resistance	≤ 6% Rn
Equivalent noise resistance	≤ 20% Rn
Operating temperature	-40°C + 85°C

(\*) Others upon request

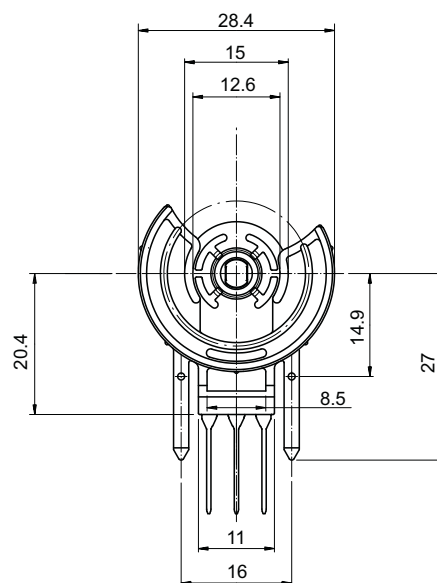
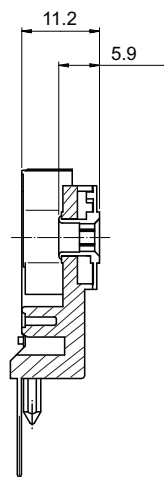
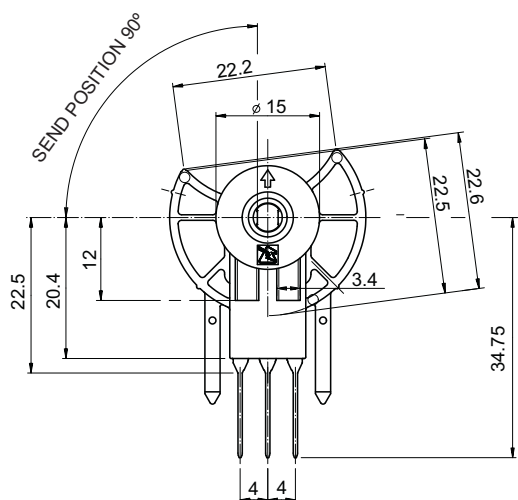
## Mechanical specifications

Mechanical rotation angle	360° (endless)
Electrical rotation angle	120°, 170°, 180°, 250°, 340°
Torque	0.2 to 1.2 Ncm.
Life	100K cycles

### V3



### V2.1



# N-15 / A-15

## 15 mm low profile rotary sensor



	N-15	A-15
<b>Main features</b>		
Mouting methods	SMD, through hole, horizontal	
Resistive element	carbon	
Dust proof enclosure	yes	
Packaging	embossed tape, bulk	
Low profile	yes (4.4 mm)	
Linearity/precision	±3% (absolute)	up to 6°
Shaft insertable from both sides	yes	
Rotor	"T" polarised	
Long life version	yes	
Endless rotation	yes	
Fully customisable	yes	
Leadfree reflow soldering compatable	yes	
Incremental encoder version available	yes (E15 series)	
Rotary switch version available	yes (S15 series)	
Hybrid pulse generator-potentiometer version	yes (contact PIHER for detailed information)	

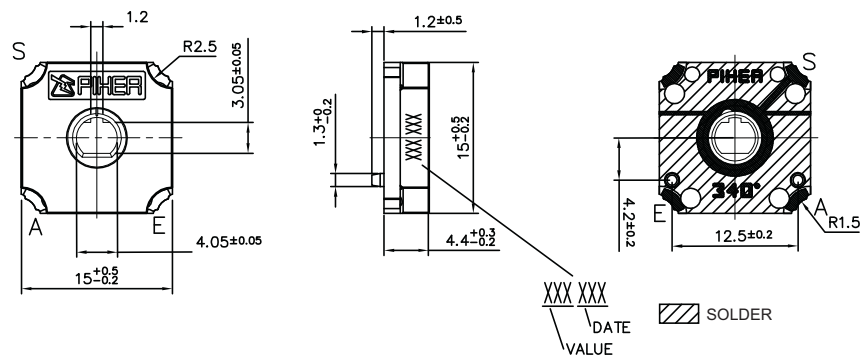
	N-15	A-15
<b>Electrical specifications</b>		
Range of values*	5k, 10k, 100k	5k, 10k
Tolerance*	± 30%	± 40%
Max. Voltage	250 VDC	
Nominal Power	0.15 W @ 50°C	
Taper	Linear	special
Operating temperature	-40°C + 120°C	

(\*) Others upon request

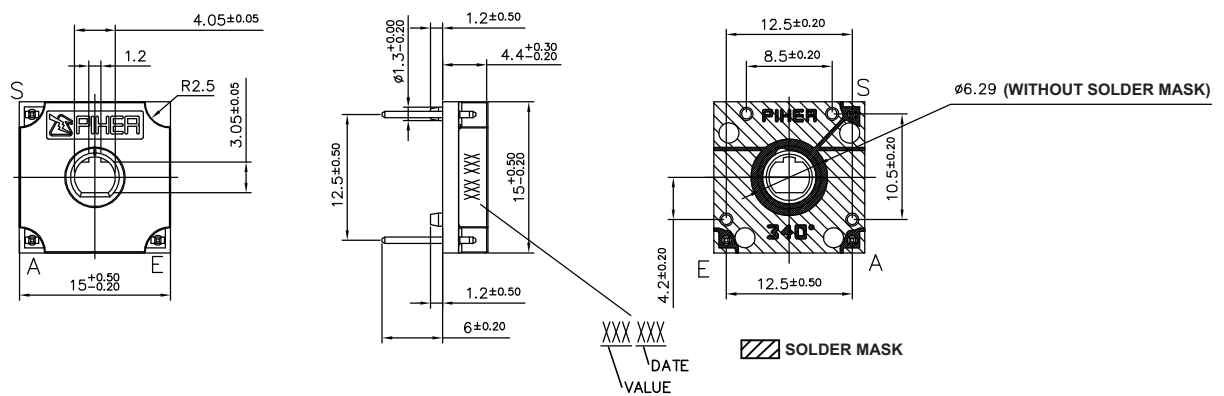
	N-15	A-15
<b>Mechanical specifications</b>		
Mechanical rotation angle	360°	
Electrical rotation angle	340° ± 10°	360° ± 7°
Torque	≤ 20 mN.m	
Mechanical life*	100K cycles	

(\*) 200K cycles upon request  
Z-15 series: up to 2M cycles

## SMD version

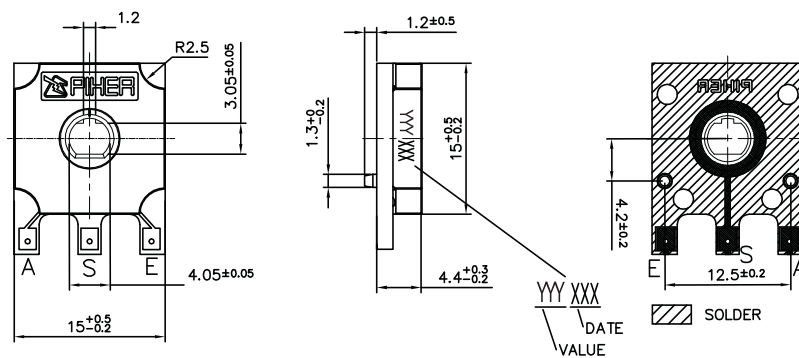


## Through hole version



## Horizontal adjust version

\* This drawing is just an example, horizontal adjust versions will be studied case by case





# Z-15 2 million cycle 15 mm low profile rotary sensor



## Main features

Mouting methods	SMD, through hole
Resistive element	carbon
Dust proof enclosure	yes
Packaging	embossed tape, bulk
Low profile	yes (4.4 mm)
Linearity/precision	±3% (absolute)
Shaft insertable from both sides	yes
Rotor	“T” polarised
Endless rotation	yes
Fully customisable	yes
Leadfree reflow soldering compatable	yes

## Electrical specifications

Value*	5K
Tolerance*	± 30%
Max. Voltage**	27 VDC (5K version)
Nominal Power	0.15 W @ 50°C
Taper	Linear
Operating temperature	-40°C + 120°C

(\*) Others upon request

(\*\*) Max. voltage is dependent on nominal power and resistance value.  
Max. voltage can not exceed 250VDC

## Mechanical specifications

Mechanical rotation angle	360°
Electrical rotation angle	110° ± 10°
Torque	≤ 20 mN.m
Mechanical life	up to 2M cycles



# Printed Circuit Resistors linear / rotary sensors



## Main features

Low profile	yes
Low cost	yes
No insertion costs	yes
No insertion errors	yes
No soldering problems	yes
Fixed & variable resistor combinations	unlimited
High frequency performance	excellent
Calibrated voltage dividers	yes
Special ohmic values	yes
Functional (in-circuit) trimming	yes
Laser trimming	yes

## Electrical specifications

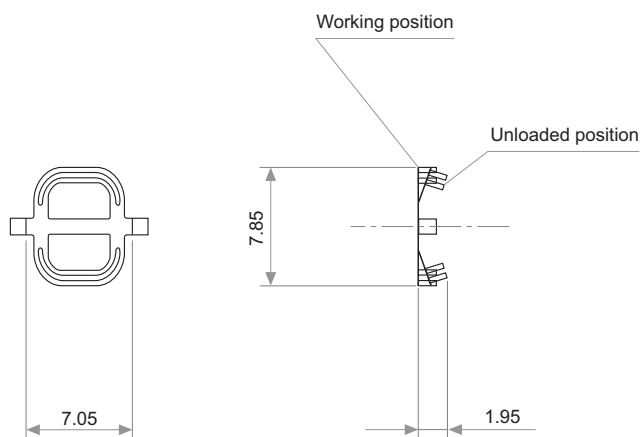
Resistance range	$10\ \Omega \leq R_n \leq 1\ \text{M}$
Tolerance	Non-trimmed resistors: $\pm 30\%$ , $\pm 20\%$ , $\pm 10\%$ Trimmed resistors: $\pm 10\%$ , $\pm 5\%$
Matching capability	$\pm 2\%$ , $\pm 1\%$
Voltage ratio	Non-trimmed resistors: $\pm 10\%$ Trimmed resistors: $\pm 2\%$
TRC	better than 300 ppm/°C

## Mechanical specifications

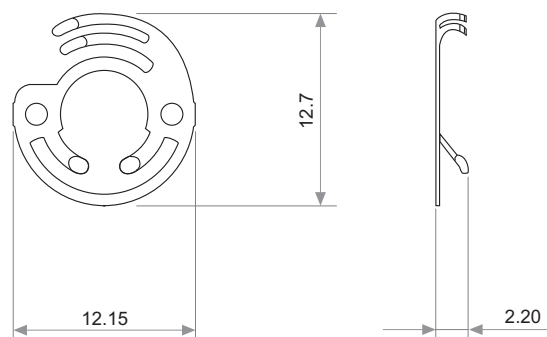
Rotational life (potential dividers)	from 10K to 100K cycles
--------------------------------------	-------------------------

## Wiper examples

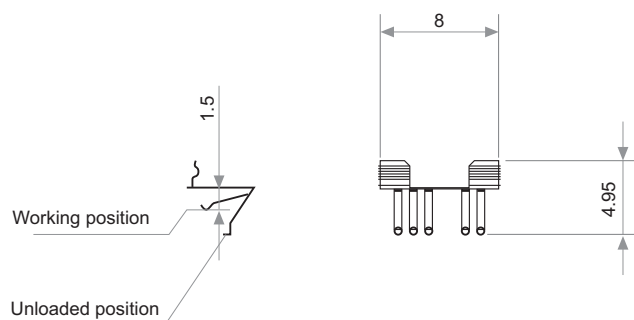
**Ref. 5303**



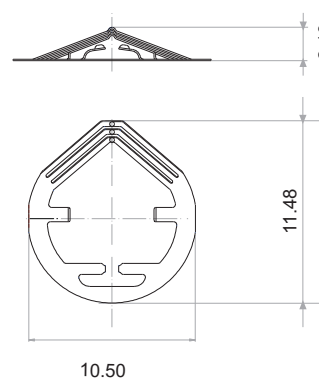
**Ref. 5382**



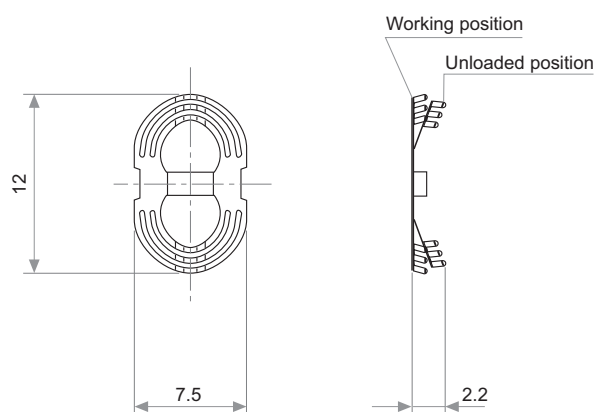
**Ref. 5076**



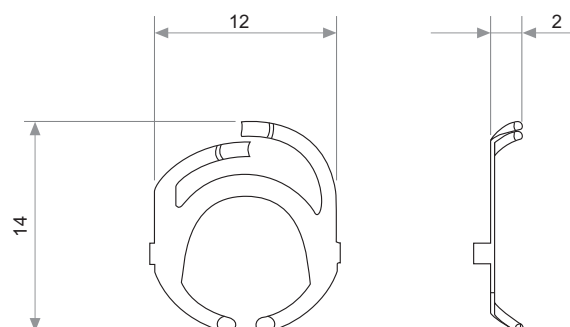
**Ref. 5738**



**Ref. 5093**



**Ref. 5184**



# NPL

## linear position sensor



### Main features

Fixation methods / clip style	inward outward without clip straight crimped
Resistive element	carbon
Overmoulding technology	yes
Versions	metal, & plastic

### Electrical specifications

Range of values*	1K to 100K ohms
Tolerance	± 30%
Max. Voltage**	50 VDC to 100 VDC
Nominal Power	0.20 W @ 50°C
Taper*	Linear
Operating temperature	-40°C + 105°C
Relative linearity*	± 2%

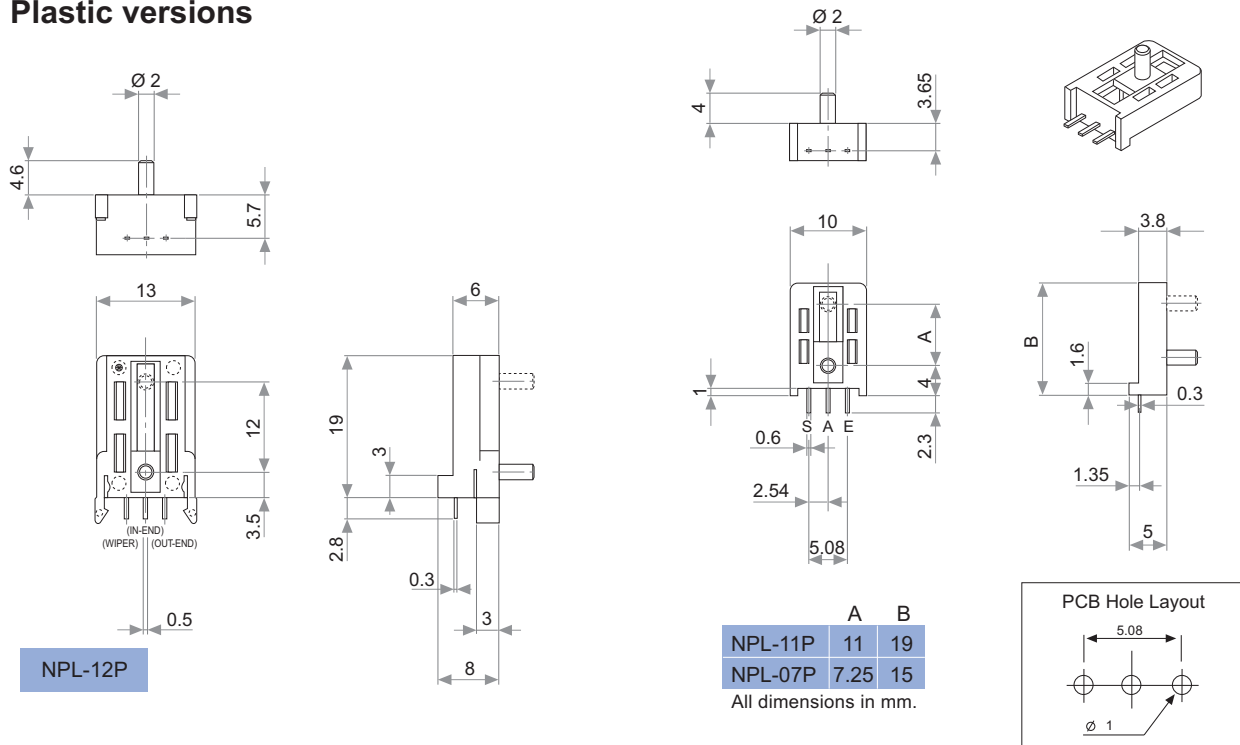
(\*) Others upon request

(\*\*) Depending on model

### Mechanical specifications

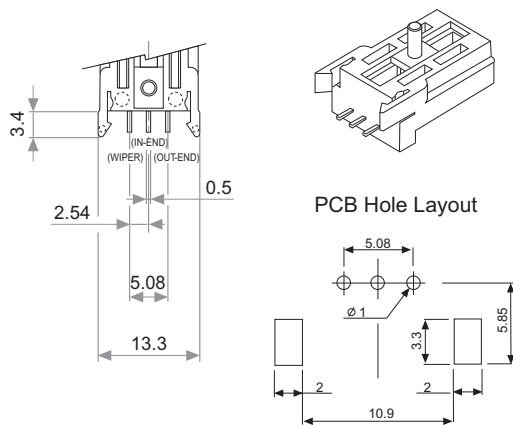
Mechanical travel	7.25, 8, 12 mm
electrical travel	6 to 12 mm
Sliding force	≤ 2N @ 10 mm/sec
Mechanical life*	50K cycles
Stop strenght	30N for 5 secs

## Plastic versions

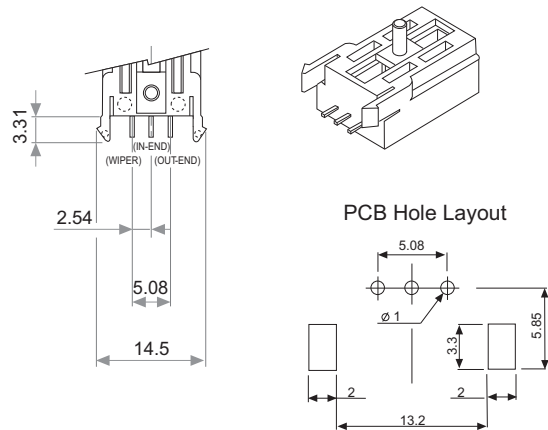


## Clip style (NPL12P)

### INWARD FACING CLIPS

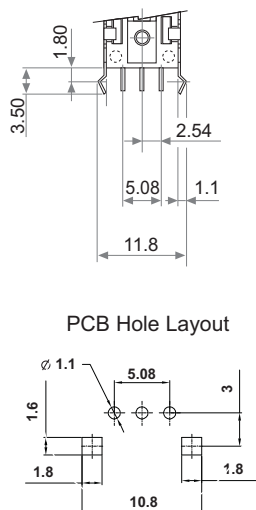


### OUTWARD FACING CLIPS

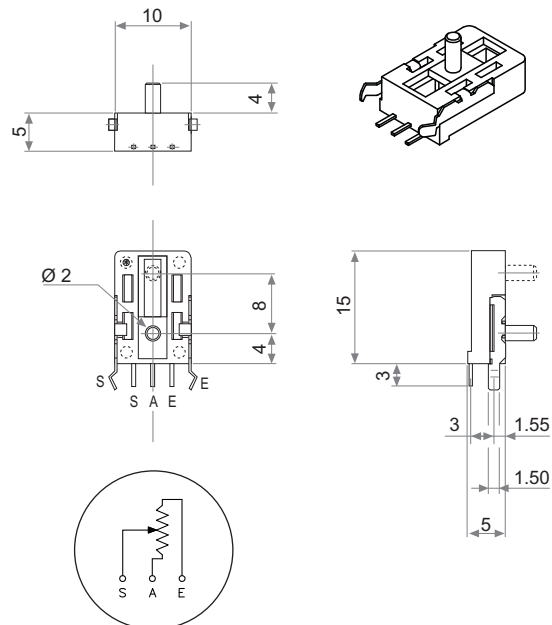
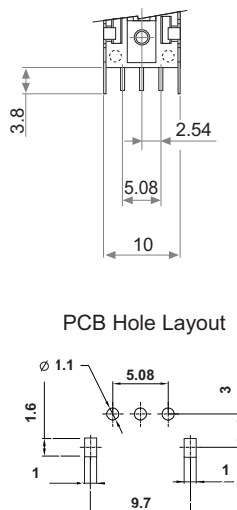


## Metal version (NPL08M)

### CRIMPED

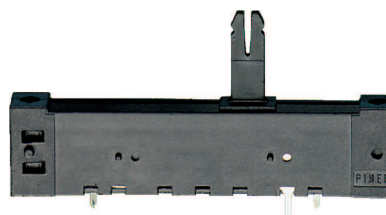


### STRAIGHT



# PL-40

## linear position sensor



### Main features

Dust proof enclosure	yes
Cut track	upon request (at initial of final position)
Resistive element	carbon
Shielded versions	yes
Stackable	yes

### Electrical specifications

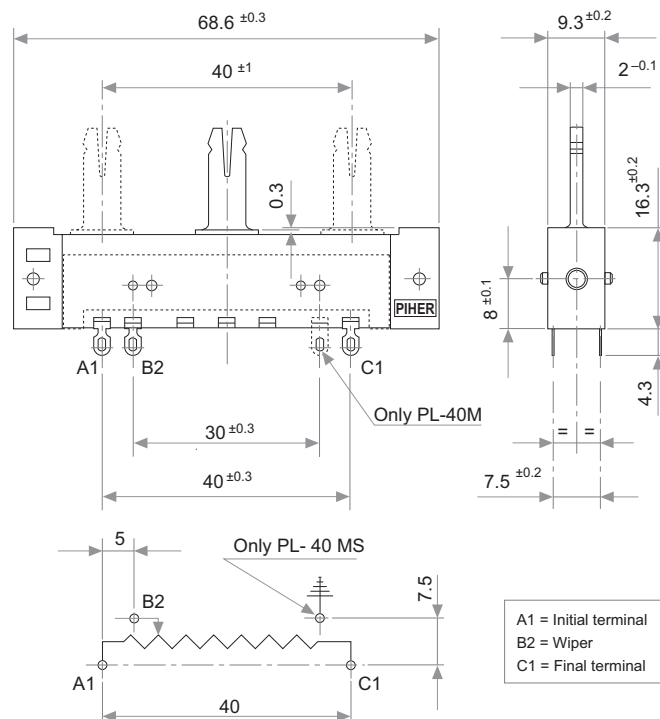
Range of values*	$100\Omega \leq R_n \leq 5\text{ M}$ (Decad. 1.0 - 2.0 - 2.2 - 2.5 - 4.7 - 5.0)
Tolerance*	$100\Omega \leq R_n \leq 1\text{M}\Omega$ ..... $\pm 20\%$ $1\text{M}\Omega < R_n \leq 5\text{M}\Omega$ ..... $\pm 30\%$
Max. Voltage	500 VDC (lin) 350 VDC (no lin)
Nominal Power	50°C (122°F) - 0.25 W (lin) 0.12 W (no lin)
Taper*	Lin, Log, Alog (Log & Alog only $R_n \geq 1\text{k}$ )
Residual resistance	$\leq 0.5\% R_n$ (2 $\Omega$ min.)
Equivalent noise resistance	$\leq 3\% R_n$ (3 $\Omega$ min.)
Operating temperature**	-25°C + 70°C (-13°F + 158°F)

(\*) Others upon request

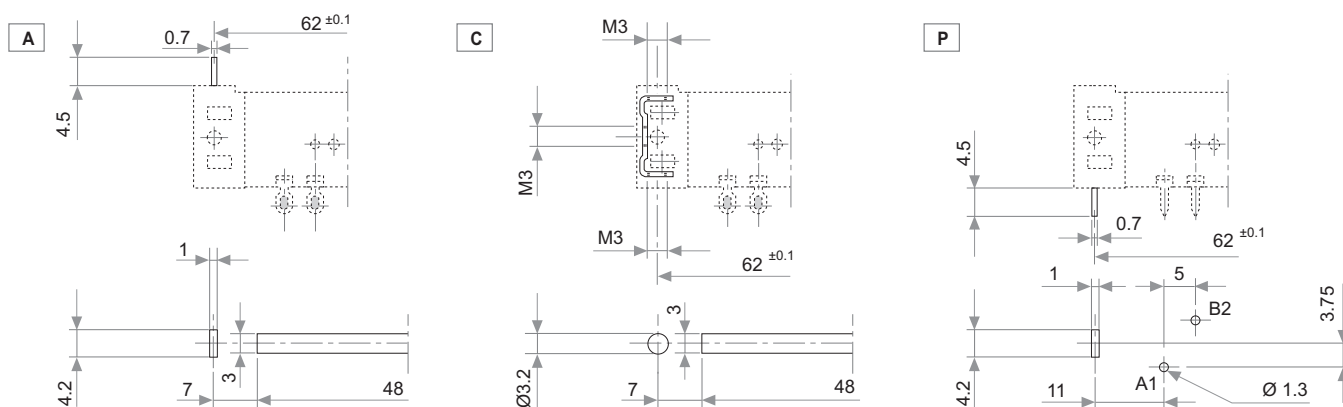
(\*\*) Up to 85°C depending on application

### Mechanical specifications

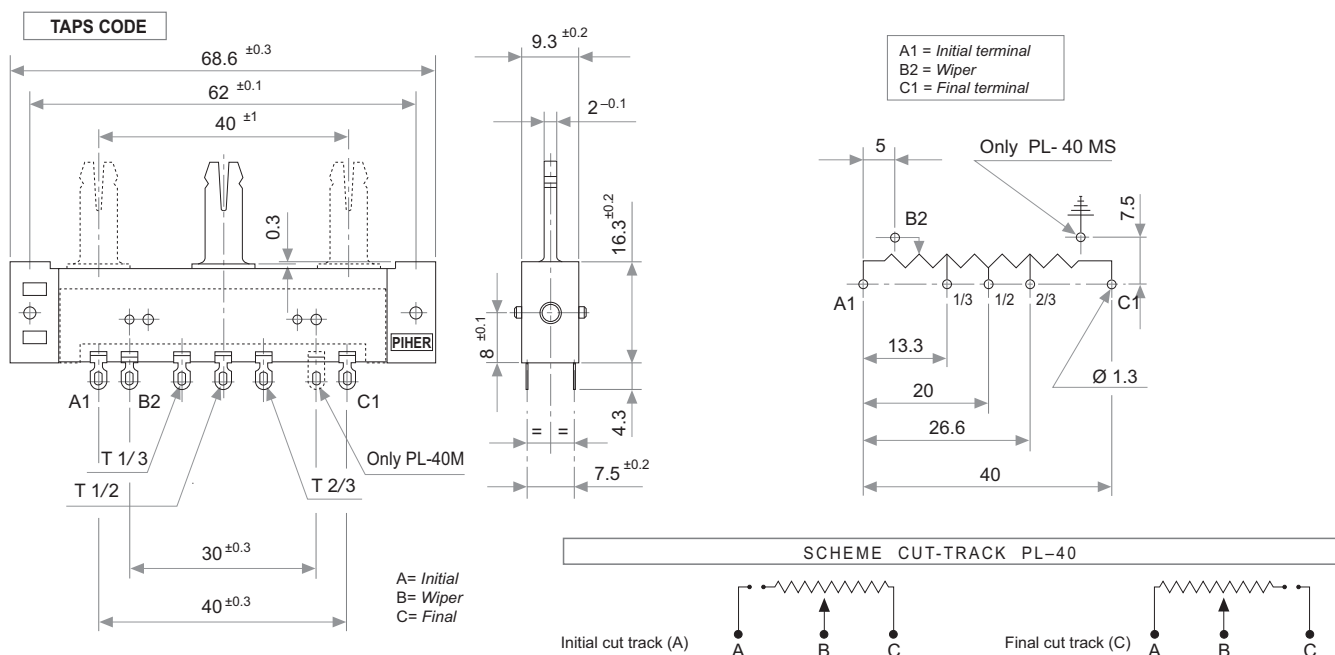
Mechanical travel	40mm $\pm$ 1mm
electrical travel	37mm $\pm$ 1mm
Sliding force	1 to 3 N (3.6 to 10 oz)
Mechanical life	25K cycles
Stop torque force	>50 N (>179 oz)



## Fixation means

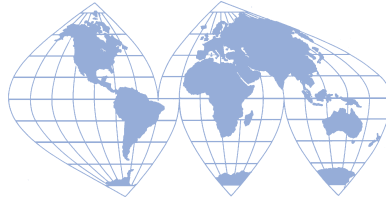


## OPTIONS





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