# PIHER

# **Encoders and switches**

# **Encoders and switches**

v02

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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 switches and incremental encoders for these applications.

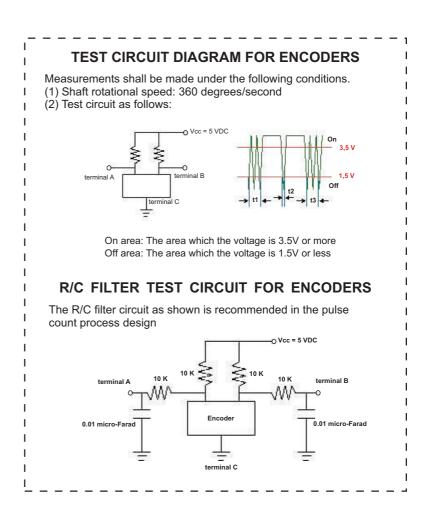
The pursuit of the most cost-effective total solution for your needs is firmly embedded in our business philosophy, so whatever your requirements may be, be sure that Piher will deliver.

Two more catalogues are available depending on the technology used:

- Sensors
- Control potentiometers

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

	Series	Size	SMD	Page
	CI-11	11	-	2
Encoders	CI11LM	11	YES	5
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	E-15	15	YES	9
Switches	S-15	15	YES	12
	TS-1146	6	YES	16
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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











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

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# CI-11 11mm incremental encoder



### **Main features**

Operating temperature range	-30°C to +85°C	
Contact resistance	100 mΩ Initial (MAX)	
Pulses/detents	15/30; 20/20	
Switch travel	0.5 mm	
Switch type	SPST	
Metal shaft	yes	

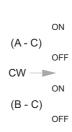
# **Electrical specifications**

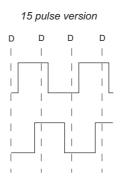
Rating	5 VDC 10 mA (1 mA min.)
Dielectric strength	300 VAC for 1 min (Leak current 1 mA)
Insulation resistance	100 MΩ (min.) @ 50 VDC 1 mA
Sliding noise	t1, t3 < 2 ms, t2 < 2 mS (under 360°/S test condition)
Switch dielectric strength	300 VAC 1 mA for 1 minute
Switch contact resistance	100 mΩ (max.) @ initial
Phrase difference	0.08T min.

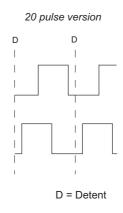
# **Mechanical specifications**

-	
Rotational torque	0.3 to 2 Ncm(detented); 0.5 Ncm Max. (no detents)
Push-Pull strength of shaft	20 N(2.0 4kgf)
Operating life	min. 20K cycles (endless rotation)
Shaft play in axial direction	0.7x L/30 mm p-p MAX
Switch operating force	4.5 ± 1.5 N (450±153 gf)

# **Graph code**







### Standard models

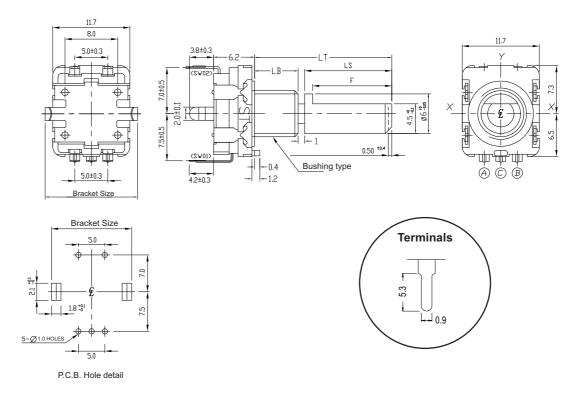
CI-11CT-V1Y22-LFACF (threaded bushing and 0.5mm switch)

CI-11C0-V1Y22-HF4CF (threaded bushing without switch)

CI-11CT-V1N42-LFACF (bushing without thread and 0.5mm switch)

CI-11C0-V1N42-HF4CF (bushing without thread without switch)

# Standard dimensions (with switch)

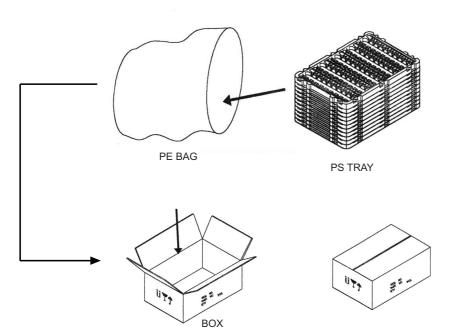


	LT	F	LS	LB
CI-11CT-V1Y22-LFACF	13.7	6.8	8.0	5
CI-11CT-V1N42-LFACF	13.7	6.8	7.7	5

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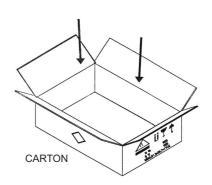
<sup>\*</sup>Other configurations upon request

### **Packaging**



100 pieces per PVC tray 11 trays per box (top tray is always left empty) 1000 pieces per box 2000 pieces per carton (2 boxes)

Box dimensions: 35.5 x 24.9 x 15.5 cm Carton dimensions: 51.2 x 36.7 x 17 cm



### **Specifications**

### **Electrical**

- Resolution:

- Rated Power: 5 VDC 10 mA (1 mA min.) - Contact Resistance: 100 m $\Omega$  (max.) @ initial

Insulation Resistance: 100 MΩ (min.) @ 250 VDC 1 mA
 Dielectric Strength: 300 VAC for 1 min (Leak current 1 mA)

360°

- Sliding Noise: t1, t3 < 3 ms, t2 < 2 mS (under 360°/S test condition)

- Phrase Difference: 0.08T min.- Electrical Life: 20,000 operations

Mechanical

- Number of Detents: 20 (20-pulse encoder), 30 (15-pulse encoder)

- Rotational Torque: 0.3 to 2 Ncm(with detents) 0.5 Ncm Max. (without detents)

- Shaft play in axial direction 0.7x I/30 mm p-p MAX

- Push-Pull Strength of Shaft: 20 N(2.0 4kgf)

**Switch** 

- Type: SPST - Switching Function: (On)-Off

- Contact Resistance:  $100 \text{ m}\Omega \text{ (max.)}$  @ initial

- Insulation Resistance: 100 MΩ (min.) @ 250 VDC 1 mA

- Dielectric Strength: 300 VAC 1 mA for 1 minute

- Operating Force:  $4.5 \pm 1.5 \text{ N } (450 \pm 153 \text{ gf})$ 

**Durability** 

- Operating Temperature: -40°C to +85°C - Storage Temperature: -40°C to +85°C

- Switch type: Circuit single pole and single throw (push on)

- Switch Travel: 0.5m

- Contact Resistance initial period  $100 \text{m}\Omega$ ,  $200 \text{m}\Omega$  after the end of useful life is reached

Mechanical life: min 20,000 cycles
 Cold: -20 ± 2°C for 96H
 Dry heat: 85 ± 2°C for 96H

- Damp heat: 40 ± 2°C 90 to 95% RH for 96H

# Cl11LM 11mm SMD incremental encoder with 1.5mm switch travel



### Main features

Operating temperature range	-40°C to +85°C	
Contact resistance	100 mΩ Initial (MAX)	
Pulses/Detents	15/30	
Switch travels	1.5mm	
Switch type	SPST	
Metal shaft	yes	

# **Electrical specifications**

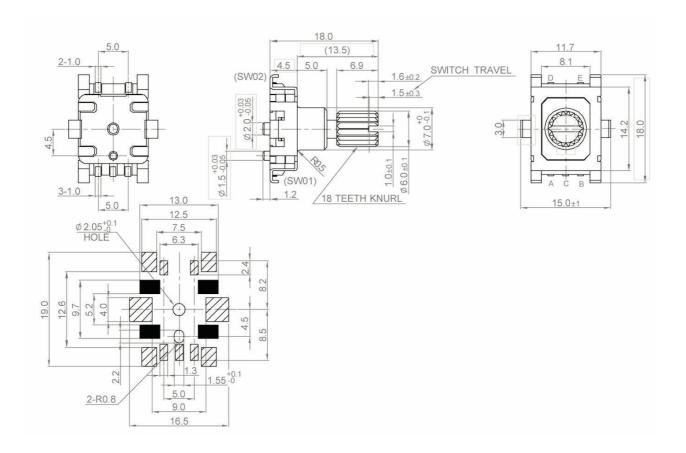
-	
Rating	5 VDC 10 mA (1 mA min.)
Dielectric strength	300 VAC for 1 min (Leak current 1 mA)
Insulation resistance	100 MΩ (min.) @ 250 VDC 1 mA
Sliding noise	t1, t2, t3, t4 ≥ 4 mS (under 360°/S test condition)
Switch dielectric strength	300 VAC 1 mA for 1 minute
Switch contact resistance	100 mΩ (max.) @ initial

### **Mechanical specifications**

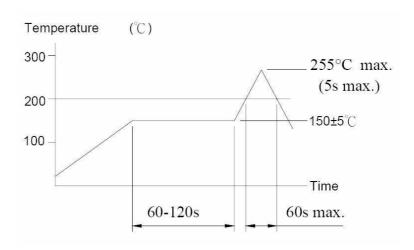
-	
Detent torque	50 gf.cm MAX
Operating life	15K cycles (endless rotation)
Switch operating force	200 +200/-100gf

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### Standard dimensions



# Recommended reflow profile



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# Cl-12 12mm incremental encoder



### **Main features**

Operating temperature range	-10°C to +70°C
Contact resistance	100 mΩ Initial (MAX)
Pulses/detents	12/00, 12/12, 24/00, 24/2
Switch travel	0.5 mm
Switch type	SPST
Shaft material	Plastic

# **Electrical specifications**

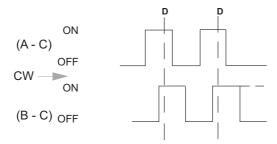
Rating	5 VDC 10 mA (1 mA min.)
Dielectric strength	50 VAC for 1 min (Leak current 1 mA)
Insulation resistance	10 MΩ (min.) @ 50 VDC 1 mA
Sliding noise	t1, t3 < 3 ms, t2 < 2 mS (under 360°/S test condition)
Switch dielectric strength	50 VAC 1 mA for 1 minute
Switch contact resistance	100 mΩ (max.) @ initial
Phrase difference	0.08T min.

# **Mechanical specifications**

-	
Rotational torque	0.3 to 2 Ncm(detented); 0.5 Ncm Max. (no detents)
Push-Pull strength of shaft	40 N(4kgf)/10 sec
Operating life	min. 20K cycles (endless rotation)
Shaft play in axial direction	0.7x L/30 mm p-p MAX
Switch operating force	4.5 ± 1.5 N (450±153 gf)

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### Graph code

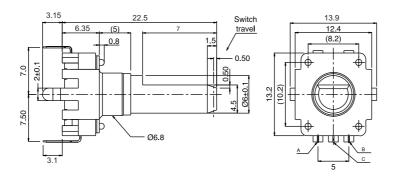


D = Detent

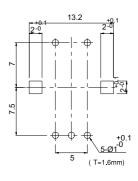
### **Standard dimensions**

### With switch

### CI12CT-V24C-N

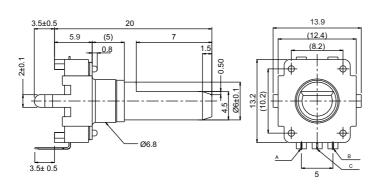


P.C.B. Hole Detail

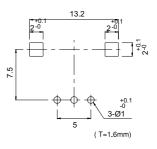


### Without switch

### CI12C0-V12B-N



P.C.B. Hole Detail



# **Packaging**

100 pieces per PVC tray 10 trays per box 1000 pieces per box 2000 pieces per carton (2 boxes)

Box dimensions: 35.5  $\,$  x 24.9  $\,$  x 15.5 cm Carton dimensions: 51.2  $\,$  x 36.7  $\,$  x 17 cm

# E-15 15mm incremental encoder



# Main features

Operating temperature range	-40°C to +120°C
Contact current	10μA – 100mA
Pulse/Detents	3 or 6 pulse / no detents version / others upon reques
Low profile	yes (4.4 mm)
Hybrid variable resistor and pulse generator	under request
Customisation possibilities	infinite
Mounting	SMD, through hole, horizonal adjust
Reflow Soldering capability	yes
Shaft insertable from both sides	yes
All PT/ PTC 15 shafts compatible	yes

# **Electrical specifications**

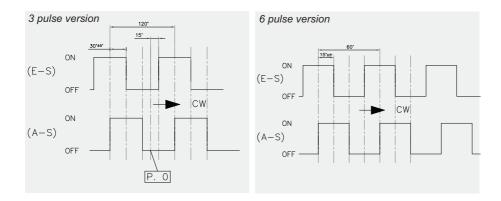
Closed contact resistance	<5Ω	
Open contact resistance	>10MΩ	

# **Mechanical specifications**

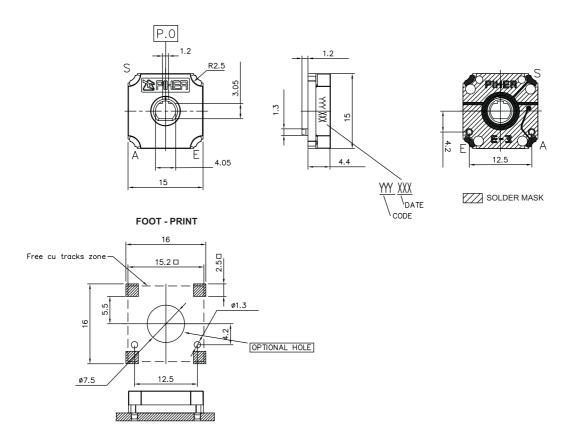
Rotational life 3 pulse version: 36	
	C cycles;
6 pulse version: 10	< cycles
Resistance to soldering heat see drawings	

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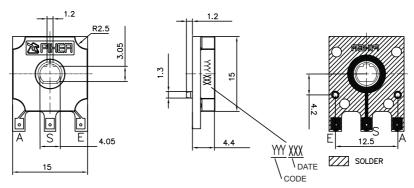
# Graph code



# Standard dimensions (SMD)

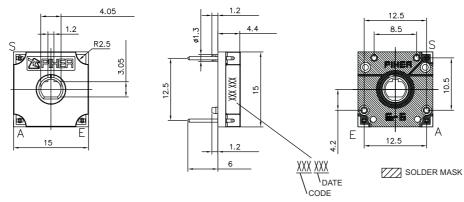


Standard dimensions (horizontal adjust)
\* This drawing is just an example, horizontal adjust versions will be studied case by case

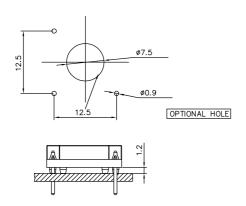


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# Standard dimensions (through hole)



### PCB HOLE LAYOUT



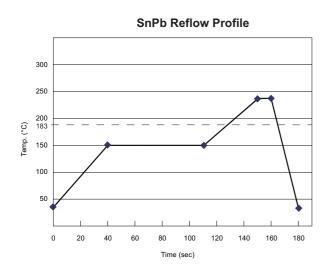
# **Packaging**

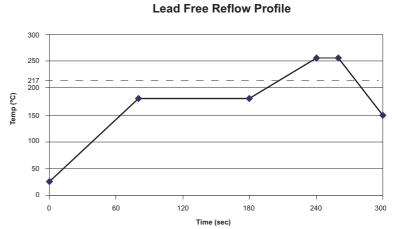
### **BULK**

150 Units per box. Through hole version only.

# **TAPE ON REEL** 500 Units per reel. SMD type only.

# Recommended reflow profile (SMD)





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# S-15 15mm rotary switch



### Main features

Number of positions (standard)	2, 6, others upon request	
Operating temperature range -40°C to +85°C		
Customisation possibilities	infinite	
Low profile	yes (4.4 mm)	
Mounting	SMD, through hole, horizonal adjust	
Reflow Soldering capability	yes	
Shaft insertable from both sides	yes	
All PT/ PTC 15 shafts compatible	yes	

# **Electrical specifications**

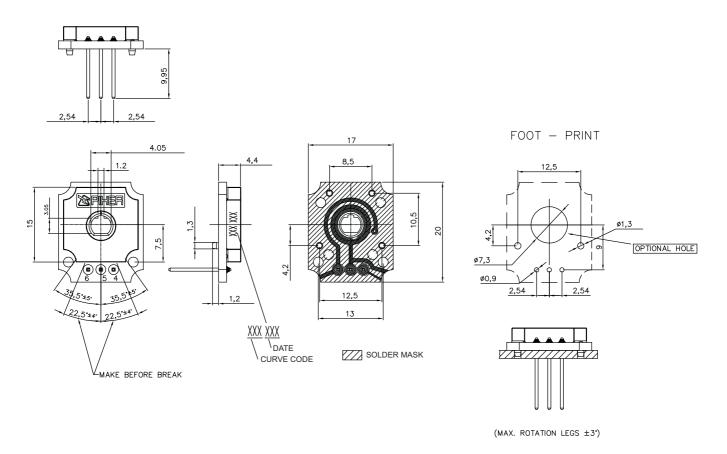
Closed contact resistance	<5Ω
Open contact resistance	>10MΩ
Contact current	10μA – 100mA
Operating voltage	16 VDC (6 positions); 13.5±0.2 VDC (2 positions)

# **Mechanical specifications**

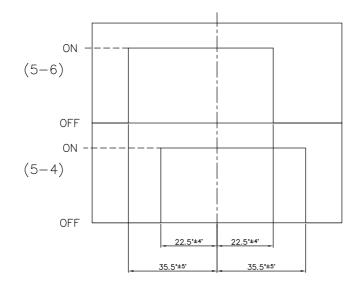
Rotational torque	<2Ncm
Rotational life	6 positions: 35K cycles; 2 positions: 15K cycles
Mechanical rotation angle	360° (endless)

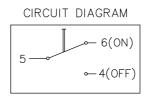
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# Standard dimensions (2 positions)



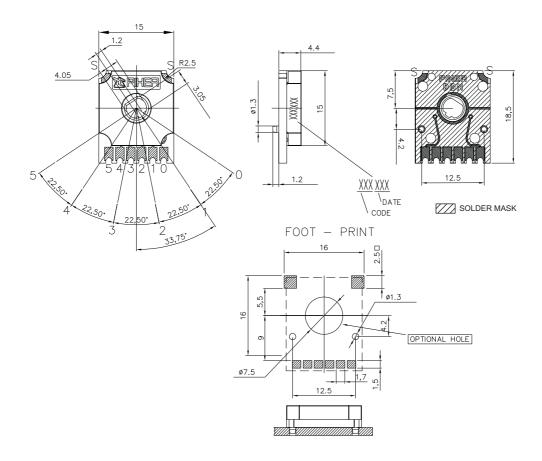
# Switch sequence (2 positions version)



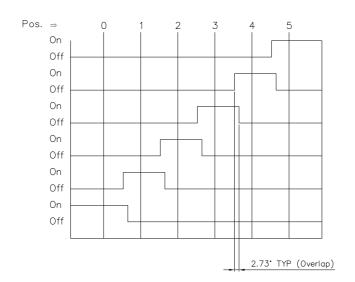


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# Standard dimensions (6 positions)



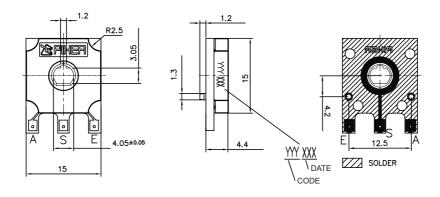
# Switch sequence (6 positions version)



ALL ANGLES REFERRED TO SHIPPING POSITION			
POSITIVE ANGLE INDICATES CW			
POS.	INITIAL ANGLE	END ANGLE	TOLERANCE
0	-42.5	-12	±5°
1	-14.72	10.5	±5°
2	7.78	33	±5°
3	30.28	55.5	±5°
4	52.78	78	±5°
5	75.28	110	±5°

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# Standard dimensions\* (horizontal adjust)



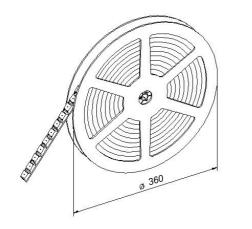
\* This drawing is just an example, horizontal adjust versions will be studied case by case

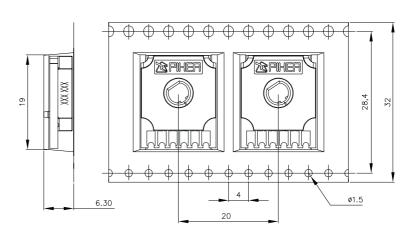
### **Packaging**

2 posititions version is only available in BULK packaging

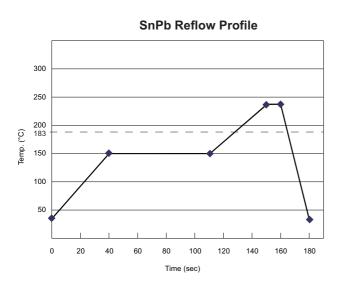
Tape on reel (6 positions version)

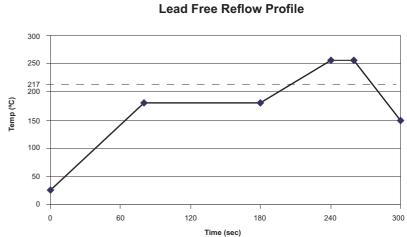
Units per reel: 650





# Recommended reflow profile (SMD)





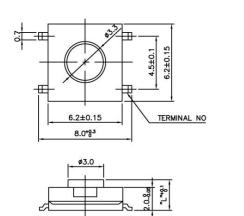
# TS SERIES tact switches

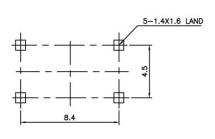


Operating temperature	-20°C to +70°C	
Operating life	100K cycles	
Rating	12V D.C. 50mA	
Contact resistance	100 mΩ max.	
Insulation resistance	100 MΩ min.	
Dielectric strength	250 VAC for 1 minute	
Switch travel	0.25 ± 0.1 mm	
Bounce	less than 100 msec.	
Mounting	SMD, with terminals	
Crimping option	yes	

### Standard dimensions

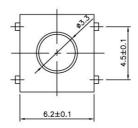


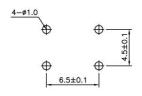




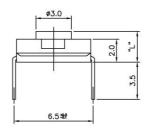
P.C.B. Hole Detail

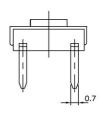
# TS-1126S





P.C.B. Hole Detail



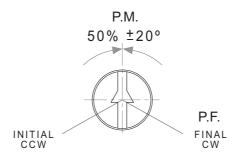


# Rotary switches 10/15mm rotary switches



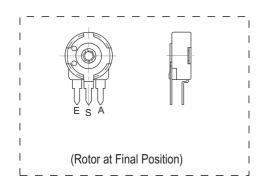
Power rating	24V / 15mA
ON position resistance	≤ 5 Ω
Insulation Resistance	$\geq$ 30 M $\Omega$
Resistive element	carbon or cermet
Dust proof enclosure	yes
Mechanical detents available	yes
Supplied in magazines for automatic insertion	upon request
Customisation according to customer's needs	yes
Pb-Free according to ELV 2000/53/EC / RoHS 2002/95/EC	yes
Plastic material according to UL94V-0	upon request
Long life model PT-10 (10K cycles)	upon request
Wiper positioned at 50% or fully clockwise	upon request

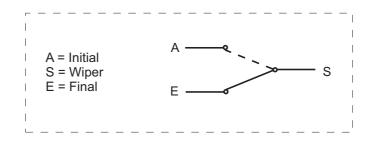
### Positioning



(Std. Position = CCW)

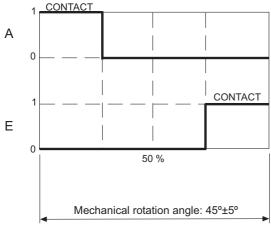
### Standar configurations



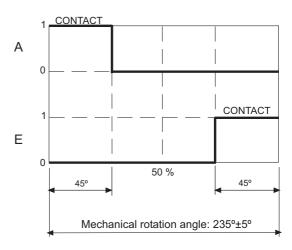


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### Standard configuration for PT10 model

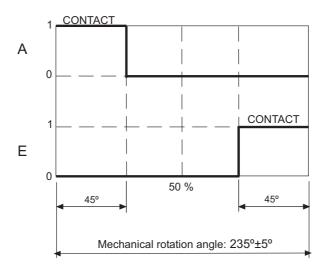




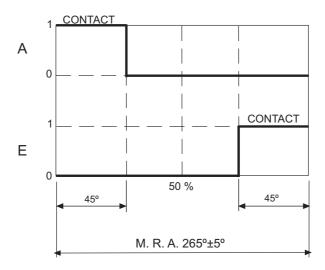


A80 Switch code PT-10LH01-CONMUTADOR-000A80

### Standard configuration for PTC10 model (PTC-10LH01-000)

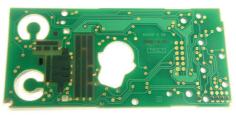


### Standard configuration for PTC15 model (PTC-15LH01-000)



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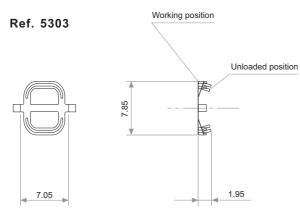
# PCR Printed circuit resistors

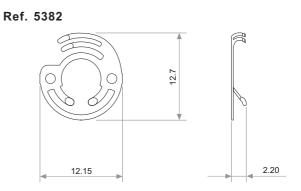


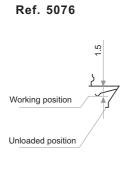


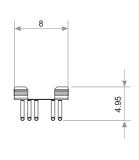
Description	PCB based / screen printed encoders, switches and potentiometers	
Resistance range	10 $\Omega$ to 1M $\Omega$	
TCR	Better than 300 ppm/°C	
Ohmic value tolerances	-Non-trimmed resistors: ± 30%, ±20%	
(others upon request)	(depending on values, shapes and substrates)	
	-Trimmed resistors: ±5%	
	-Matching capability: ±2%	
Voltage ratio tolerances	- Non-trimmed resistors: ±10%	
	- Trimmed resistors: ±2%, ±3%,	
Mechanical life (voltage dividers only)	From 10 thousand to 100 thousand cycles	
(others upon request)	(depending on each individual case)	

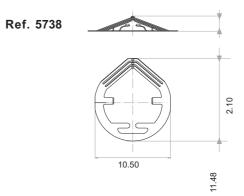
### Wiper examples (technical specifications upon request)

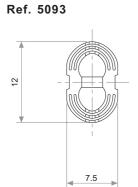


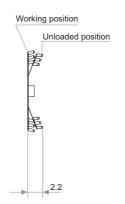


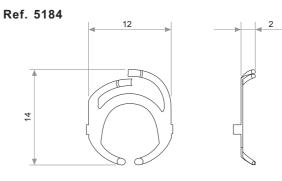












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### Sales Network



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