

### MECHANICAL SPECIFICATIONS

- Mechanical rotation angle:  $265^\circ \pm 5^\circ$   
 $240^\circ \pm 5^\circ$  available upon request.
- 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\*: Up to 100K cycles

\* Others: check availability.

\*\* Up to 85°C depending on application.

### FEATURES

- Carbon resistive element.
- IP54 protection according to IEC 60529.
- Polyester substrate.
- Also upon request:
  - Long life model for low cost control pot. applications
  - Low torque option
  - Supplied in magazines for automatic insertion.
  - Wiper positioned at initial, 50% or fully clockwise.
  - Self extinguishable plastic UL 94V-0.
  - Cut track option.
  - Special Tapers.
  - Mechanical detents.

### ELECTRICAL SPECIFICATIONS

- Range of values\*:  $100\Omega \leq R_n \leq 5M\Omega$  (Decad. 1.0 - 2.0 - 2.2 - 2.5 -4.7 -5.0)
- Tolerance\*:  $100\Omega \leq R_n \leq 1M\Omega$  : .....  $\pm 20\%$   
 $1M\Omega \leq R_n \leq 5M\Omega$  : .....  $\pm 30\%$
- Max. Voltage: 250 VDC (lin) 125 VDC (no lin)
- Nominal Power 50°C (122°F) (see power rating curve)  
0.25 W (lin) 0.12 W (no lin)
- Taper\*: (Log. & Alog. only  $R_n \geq 1K$ ) Lin ; Log; Alog.
- Residual resistance\*:  $\leq 0.5\% R_n$  (5Ω min.)
- Equivalent Noise Resistance:  $\leq 3\% R_n$  (3Ω min.)
- Operating temperature\*\*:  $-25^\circ C + 70^\circ C$  ( $-13^\circ F + 158^\circ F$ )

### HOW TO ORDER

PT15	L	H01	-	223	A	2020	OPTIONAL EXTRAS					S	
Series	Code	Mounting Method		Taper	Life	Value	Tolerance	Detents	Flammability	Wiper position	Shaft/rotor colour	Magazine	Torque
C F G L M N R T X W Y Z  (See note 1)	H01 H2.5 H05 H5 H25 HC5 H06 B H02 H2.5P H10 H5P V02 V12.5 V12 VA V15 V15 V20 VL15 V17 V17.5 V18 D V24 VD15 V21 V12.5P V22 VAP V23 V15P V25 V17.5P  (See note 2)			A = Lin. B = Log. C = Alog.	E = Long life U = Extra Long life  (See note 5)	101 = 100 Ω 223 = 22 K 504 = 500 K 505 = 5 M  (See note 3)	0505 = $\pm 5\%$ 0707 = $\pm 7\%$ 1010 = $\pm 10\%$ 2020 = $\pm 20\%$ 3030 = $\pm 30\%$  (See note 4)	PAI PAM PAF P11 P1F P02 : P38	I = non flammable  (See note 6)	PM = 50% PF = Final	RO=Red NE=Black VE=Green AM=Yellow AZ=Blue MA=Brown GR=Grey NA=Orange CR=Cream  (See note 7)	T  (See note 9)	-- = Standard L = Low torque  (See note 8)
				Cut track	Shaft/Thum.								
				PCI = Initial PCF = Final	01 - Fig. 1 : 28 - Fig. 28  (See note 10)								

#### NOTES:

- "Z" adjustment only available on "H" versions. Standard colour for the "T" rotor: Orange.
- Terminal styles: "P" are crimped terminals. V24 terminals material: brass. V=Vertical adjust; H=Horizontal Adjust
- Value: Example: Code:  $\frac{10}{1} \rightarrow 100 \Omega$       Example:  $\frac{07}{05} \rightarrow \begin{matrix} +7\% \\ -5\% \end{matrix}$       Code:  $\frac{07}{05} \rightarrow \begin{matrix} \text{negative tolerance} \\ \text{positive tolerance} \end{matrix}$   
 Numb of zeros.      First two digits of the value.
- Non standard tolerance: check availability.
- Life
  - Standard: 1K cycles.
  - Long life: 10K cycles.
  - Extra long life: 100K cycles (Only for low torque versions. To be studied case by case.)
- Non flammable: housing, rotor and shaft. According to UL 94V-0
- Colour shaft/rotor:
  - Potentiometer without shaft: only rotor
  - Potentiometer with shaft: only shaft
  - Cream colour only available in standard plastic.
- Low torque:  $\leq 1.5Ncm$ . No detent option available for low torque models.
- Magazines (35 pcs/mag): available for VA (12.5), V (12.5), V (12.5P), V (15), V15 (P) and H models.  
For more information please contact your nearest Piher supplier.
- If you wish to use your own custom plastic shaft/knob/actuator please contact Piher for advice about compatible materials.

## HOW TO ORDER CUSTOM DRAWING

PT-15 LH 01 + DRAWING NUMBER (Max. 16 digits)

This way of ordering should be used for options which are not included in the "How to order" standard and optional extras.

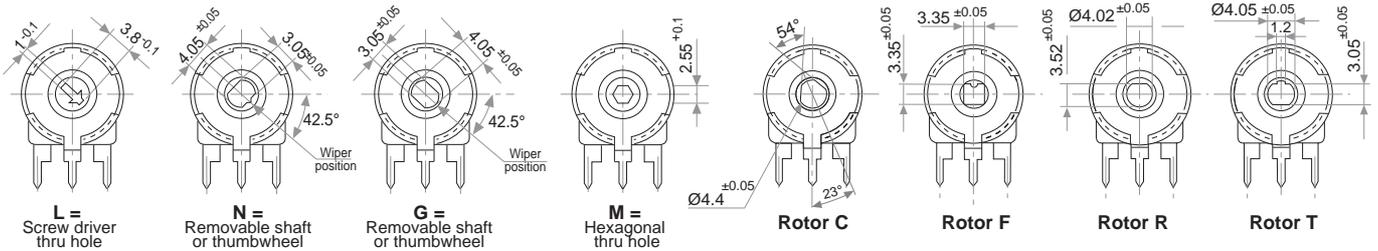
## STANDARD OPTIONS

Cut track .....	No
Detents .....	None
Non flammable .....	No
Rotor colour .....	White
Shaft colour .....	Natural
Wiper position .....	Initial
Torque .....	Standard
Terminals material .....	Steel
Life .....	1000 cycles

## ROTORS

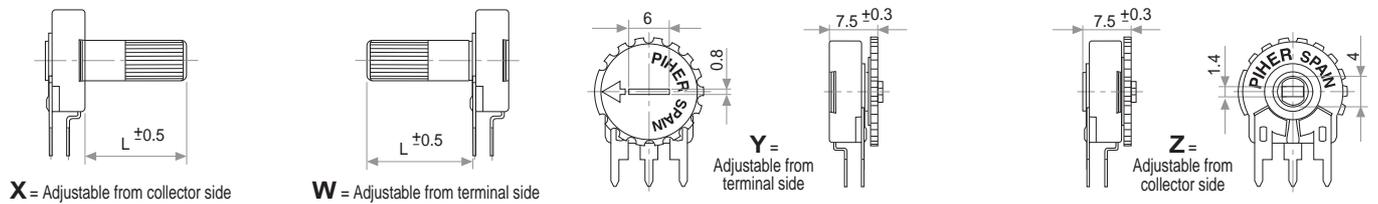
Wipers positioned at initial (without shaft)

Wipers positioned at 50% (without shaft)

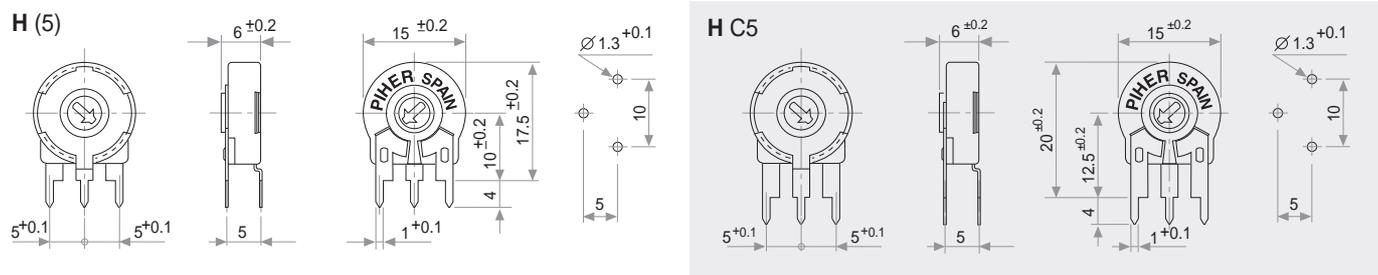
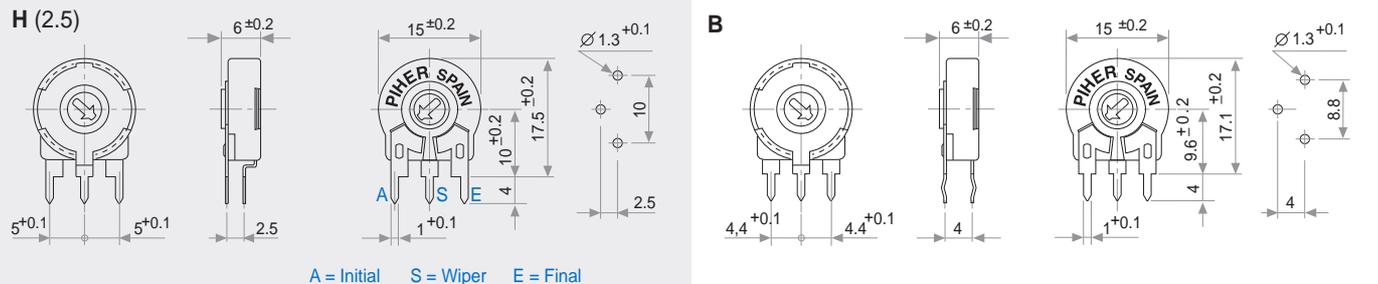


With shaft

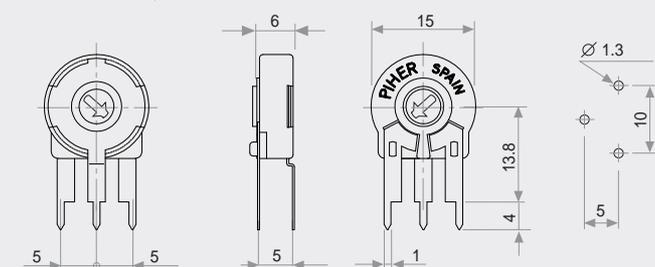
With thumbwheel



## VERTICAL MOUNT - HORIZONTAL ADJUST



Check availability.

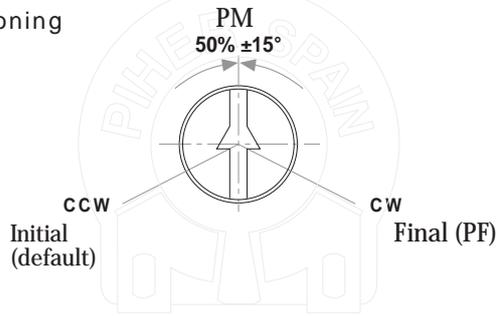


Download STEP files here:  
<https://piher.net/piher/?p=916>



## OPTIONS

### Positioning



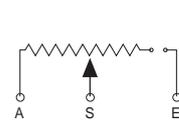
Cut Track  
(open circuit zone)

CCW on-off (A)



A = Initial  
S = Wiper  
E = Final

CW on-off (E)



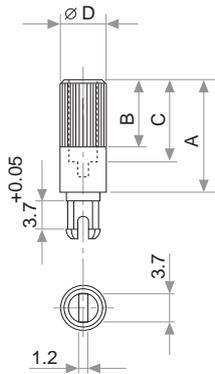
## TESTS

## VARIATIONS

ELECTRICAL LIFE	1.000 h. @ 50°C; 0.25 W	±5 %
MECHANICAL LIFE (CYCLES)	1000 @ 10 CPM ... 15 CPM	±3 % (Rn < 1 MΩ)
TEMPERATURE COEFFICIENT	-25°C; +70°C	±300 ppm (Rn < 100 K)
THERMAL CYCLING	16 h. @ 85°C; 2h. @ -25°C	±2.5 %
DAMP HEAT	500 h. @ 40°C @ 95% HR	±5 %
VIBRATION (for each plane X,Y,Z)	2 h. @ 10 Hz ... 55 Hz.	±2 %

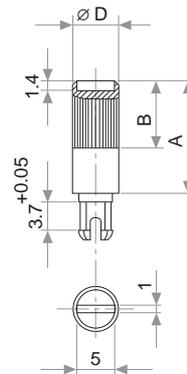
NOTE: Out of range values may not comply these results.

## SHAFTS (for N, G and T rotor types, top view)



Hollow model shafts					
FIG.	A	B	C	D	Ref.
1	12	9	8	6	5272
2	19	9	15	6	5214
5	9.5	6.5	5.5	6	5208
9	35	9	31	6	5216
10	37.8	9	33.8	6	5218
11	35	25	15	6	5209
13	7.8	4.8	3.8	6	5265

A = Length (FRS)  
B = Knurling length  
C = Hollow depth  
D = Shaft diameter  
FRS = From rotor surface

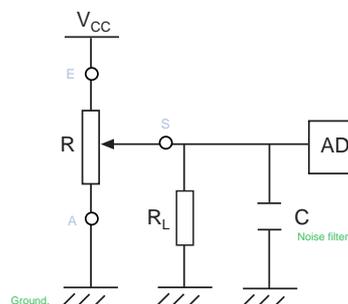


Solid model shafts				
FIG.	A	B	D	Ref.
6	15	9	6	5219
7	16.8	9	6	5220
8	25.3	9	6	5207
12	46	5	6	5227

Slot (1 x 1.4) perpendicular to wiper position. Fig. 12 slot is on line with wiper position.

## RECOMMENDED CONNECTIONS

Piher potentiometer's recommended connection circuit for a position sensor or control application. (voltage divider circuit electronic design).



$$R_L \geq 100 \times R$$

## SHAFTS (for N, G and T rotor types, top view)

By default shafts, knobs & thumbwheels are delivered unassembled.

Mounted shafts, knobs & thumbwheels are delivered at random position. Positioning available, check availability.

If you wish to use your own plastic shaft/knob/actuator please contact Piher for advice about compatible materials.

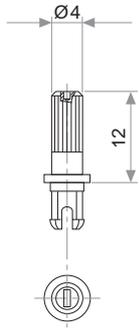


Fig. 3 / Ref. 5372

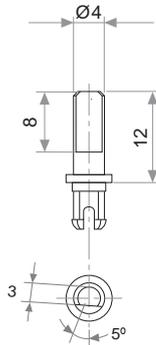


Fig. 15 / Ref. 5217

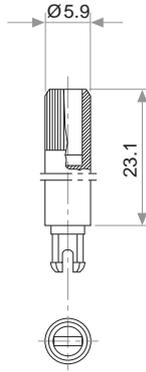


Fig. 17 / Ref. 5210

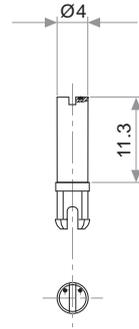


Fig. 18 / Ref. 5271

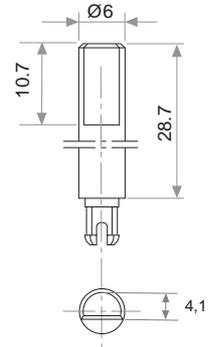


Fig. 19 / Ref. 6032\*

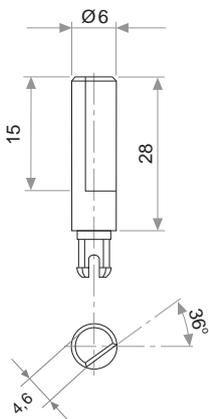


Fig. 20 / Ref. 5369\*

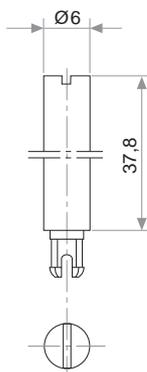


Fig. 21 / Ref. 6031\*

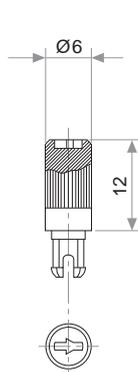


Fig. 22 / Ref. 6029

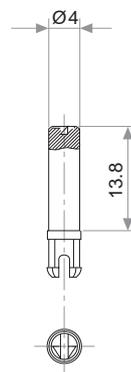


Fig. 23 / Ref. 6022

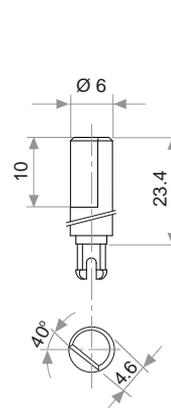


Fig. 29 / Ref. 6162

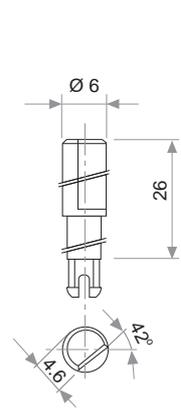


Fig. 25 / Ref. 6059

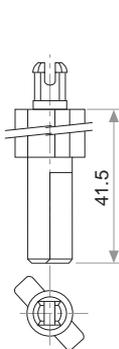


Fig. 27 / Ref. 5268\*

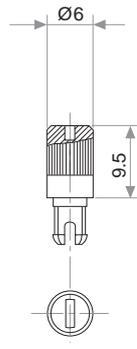


Fig. 28 / Ref. 6055

\* Not available in self extinguishable plastic

## THUMBWHEEL

By default shafts, knobs & thumbwheels are delivered unassembled. Mounted shafts, knobs & thumbwheels are delivered at random position. Custom positioning available. If you wish to use your own plastic shaft/knob/actuator please contact Piher for advice about compatible materials.

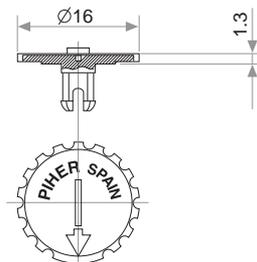


Fig. 4 / Ref. 5371

## DETENT CONFIGURATIONS EXAMPLES

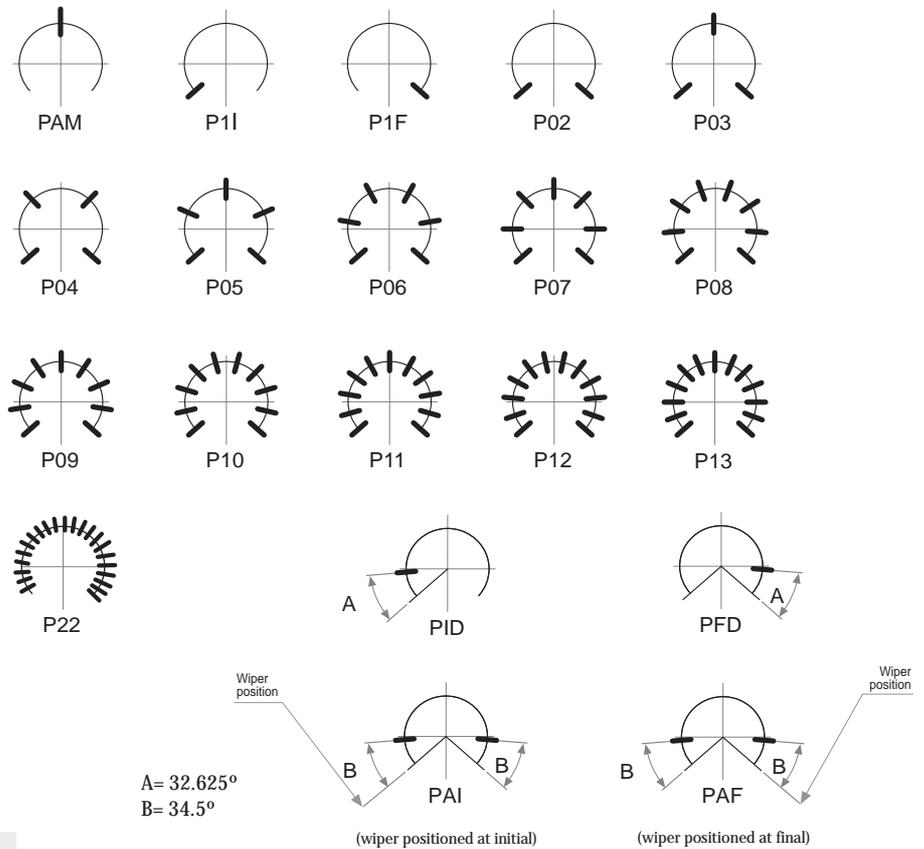
This innovative PT's with detents family has been specifically developed to allow the integration of otherwise large and expensive external mechanisms into the body of the potentiometer thus allowing a high range of configurations: special tapers, torque, tolerances, linearity, cut track, etc.

This detent (stop position) design not only adds a "click" sensation of position, but also offers enormous savings in both cost and space for any given application.

Strong and weak detents can be mixed as per customer's request.

Detent number and positions can be made or fitted to the customer needs or preferences.

- Relative detent positions along the total mechanical travel. Unless otherwise specified the detents are evenly spaced (using the end points as reference)



### NOTES FOR DETENTED VERSIONS:

- For the following mounting methods, the detents configurations will be studied individually case by case:
  - V02 & V21
  - V12 & V22
  - V18
  - V24
- For more than 13 detents versions please contact your nearest PIHER authorised distributor.
- Standard mechanical life is 500 cycles.
- Long life versions are available under request and have the following characteristics at T<sup>a</sup>:
  - Potentiometers with 1 to 3 detents: up to 10K cycles
  - Potentiometers with 4 and more detents: up to 5K cycles
- Detent torque can vary from 1.2 to 2.5 times the standard potentiometer torque.
- For all detents versions of more than 13 detents the detent torque will be 0.5 to 3.5 Ncm.
- Please consult your nearest Piher supplier if unique non-overlapping values at each detent position or LOG/ALOG tapers are required.
- Different output voltage values can be matched at each detent position (under request).

## DETENTS WITH CONSTANT VALUE ZONES

application note

PIHER's potentiometers may feature special stepped outputs or 'constant voltage zones' for the 6, 10 and 15mm product families.

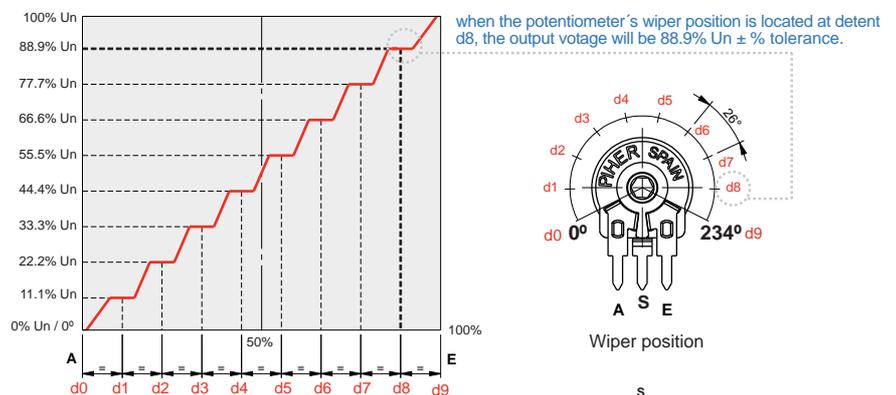
These constant voltage zones can be combined with PIHER's mechanical detents to provide exact alignment between the electrical output (flat areas) and the mechanical detent's positions. The result is a higher level of precision in controlling lighting, temperature, motor or other electronic control systems.

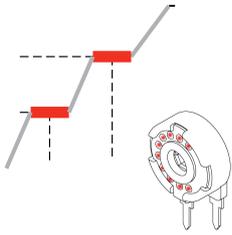
In addition to established catalogue detent configurations, we will design and manufacture any other configuration on our tried-and-tested carbon/cermet & THM/SMD potentiometer technology and processes.

With its exacting control capabilities, our potentiometers series are well suited for many consumer, industrial and automotive applications such as ovens, ranges, dishwashers, lighting (dimmers), power hand tools, washing machines and HVAC systems.

Constant value zones can be combined with strategically located stops matching the flat areas of the output. If you require this feature, please, send us your requirements to sales@piher.net

### 10 stepped outputs version example:





**Improved repeatability**

By combining the constant value zones with the detents, engineers can align the same voltage values with each of the detent stops when rotating the control both forward and backward.

This provides clear mechanical positions that are not only repeatable, but perfectly aligned electrical outputs at each of the (detent) angles.

Piher's detents also prevent output values from changing due to vibration or accidental rotor movements, furthering reliable control consistency.

**Design tip. Cost-effectiveness**

Absolute encoders can easily be replaced connecting the potentiometer to the microprocessor's analogue input.



**Main advantages**

- ✓ Unique, non-overlapping values at each stop (detent position)
- ✓ Prevents output value change due to light vibration or accidental rotor micro-movements
- ✓ Fully customisable according to customer's needs
- ✓ Cost effective replacement for absolute encoders

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The product information in this catalogue is for reference purposes. Please consult for the most up to date and accurate design information.

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**Our Advantage Value added proposition**



Engineering design-in support



Global footprint



Output customization



Manufacturing capabilities for high and low volume programs



Cable harness and connector assembly



One-stop solution provider for different position sensing technologies

Hall-effect	Potentiometric	Inductive
Capacitive	Reed switch	Printed PCB



Diverse portfolio of standard and customised sensors: Temperature, Gas & Moisture, Pressure, etc.

Note: All Piher products can be adapted to meet customer's requirements. Due to continuous process improvement, specifications are subject to change without notice. Please always use the latest updated datasheets and 3D models published at our website [www.piher.net](http://www.piher.net).

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