Automotive / Appliance control - sensor

10 mm carbon potentiometer
PT10

Main features

- Carbon resistive element.
- Dust proof enclosure.
- Polyester substrate.
- Wiper positioned at initial, 50% or fully clockwise.

Also upon request:

- Available in magazines for automatic insertion.
- Long life model for low-cost control potentiometer applications.
- Self-extinguishable plastic UL 94V-0.
- Cut track option (open circuit).
- Special tapers.
- Mechanical detents.
- Low torque version.
- Special switch option.
- 3% Linearity and 100K cycles mechanical life.

Description

The PT10 potentiometer offers control where frequent adjustment is required. The shaftless design allows for employment of different engagement mechanisms, such as a customized shaft, a motor control or a human interface adjustment.

This potentiometer can also control variable outputs including frequency, change in motor speed or volume.

Typical applications include test and measurement equipment, consumer electronics, appliances, small engines, robotics, motion controllers, and medical equipment control panels.

This datasheet shows you the basics of the PT10 potentiometer that is quite versatile and easy to taylor. Do not hesitate to contact Piher for advice.

Mechanical specifications

Mechanical rotation angle [1]		235° ± 5°
Electrical rotation angle [2]		220° ± 20°
Torque	rotational	0.4 to 2 Ncm. (0.6 to 2.7 in-oz)
	stop	› 5 Ncm. (‹7 in-oz)
Life [3]		up to 100K cycles

[1] 360° version available: ST10 [2] 333° version available: ST10 [3] Others: check availability.

Electrical specifications

Range of values [1]		100Ω ≤ Rn ≤ 5MΩ (Decad. 1.0 - 2.0 - 2.2 - 2.5 - 4.7 - 5.0)
Tolerance [1]	100Ω ≤ Rn ≤ 1MΩ	± 20%
	1MΩ ≤ Rn ≤ 5MΩ	± 30%
Max. voltage		200 VDC (lin) 100 VDC (no lin)
Nominal power 50°C (122°F) [3]		0.15 W (lin) 0.07 W (no lin)
Taper		Linear ; Log; Alog. (Log. & Alog. only Rn ≥1K)
Residual resistance		≤ 0.5% Rn (5Ω min.)
Equivalent noise resistance		≤ 3% Rn (3Ω min.)
Operating temperature [2,3]		-25°C to +70°C (-13°F to + 158°F)

[1] Others: check availability. [2] Up to 85°C depending on application.

[3] For higher specifications please visit our PTC10 series.

For reflow soldering capable models please see our PS10 datasheet.

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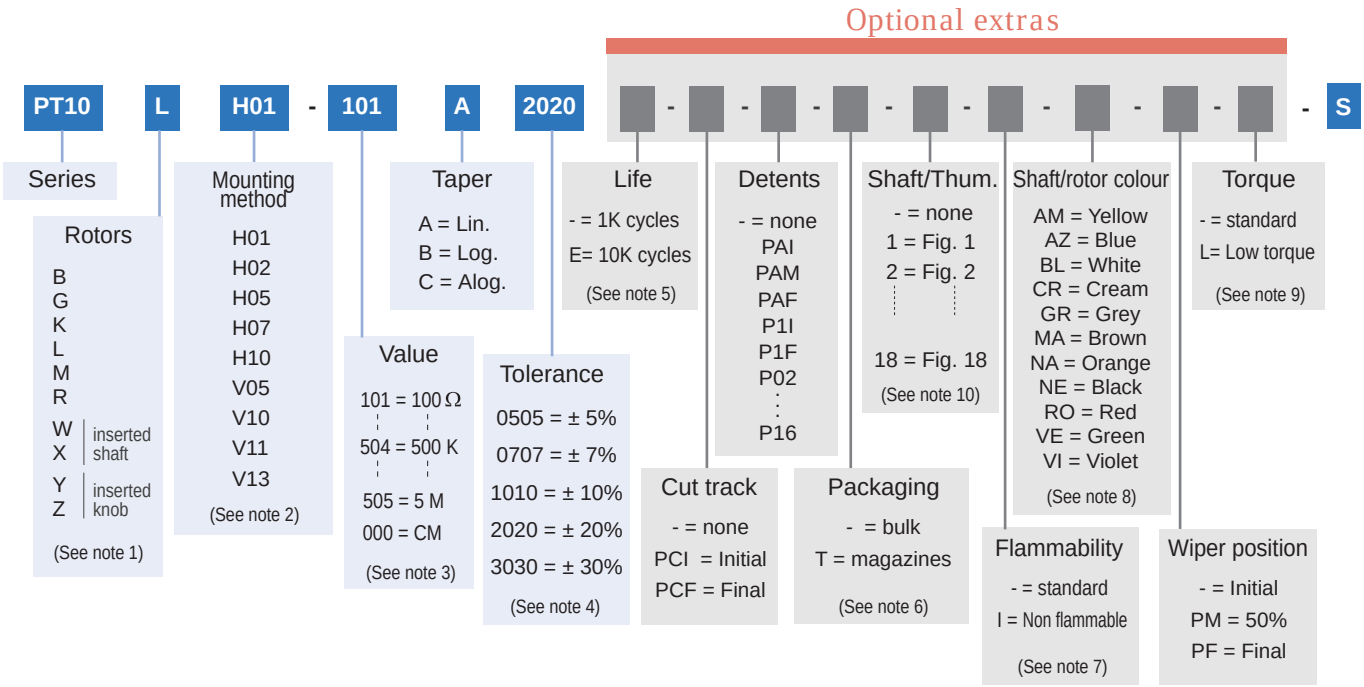
How to order



NOTES:

(1) "Z" adjustment only available on "H" versions. Rotor "G" only available in purple color (shaft/rotor color code "VI").

(2) V05 & H07 terminals material: brass. SMD versions available (PS10 series). Endles rotation version available (ST10).

(3) Value Example: Code: 10 1 → 100 Ω (10 = First two digits of the value; 1 = Numb of zeros) 000 = CM = Switch version (contact us)

(4) Other tolerances: check availability. Example: +7% -5% Code: 07 05 (07 = positive tolerance; 05 = negative tolerance)
High and low ohmic values may not allow all tolerances: check availability.

(5) Standard: 1000 cycles. Long life "E": 10.000 cycles. Others: check availability..

(6) Magazines: not available with the H10, V05 and V13 models, nor with adjustment types X, W, Y, Z.

(7) Non flammable: housing, rotor and shaft. According to UL 94V-0

(8) Colour shaft/rotor: • Potentiometer without shaft: only rotor • Potentiometer with shaft: only shaft

(9) Low Torque: ≤ 1 Ncm
No detent option available for low torque models.

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

How to order examples

PT10LH01-103A2020-S
10mm potentiometer with rotor "L" (arrow shape), H01 mounting method (horizontal adjustment), 10K value and 20% resistive tolerance.

PT10WV05-104A1010-9-NE-S
10mm potentiometer with rotor W (factory pre-inserted shaft), V05 mounting method (vertical adjustment), 100K value,10% resistive tolerance and black shaft.

Standard default options

Life	1000 cycles
Cut track	No
Detents	None
Packing	Bulk
Non flammable	No
Rotor colour	White
Shaft colour	Natural (not coloured)
Wiper send position	Initial
Torque	0.4 to 2 Ncm.

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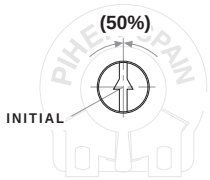
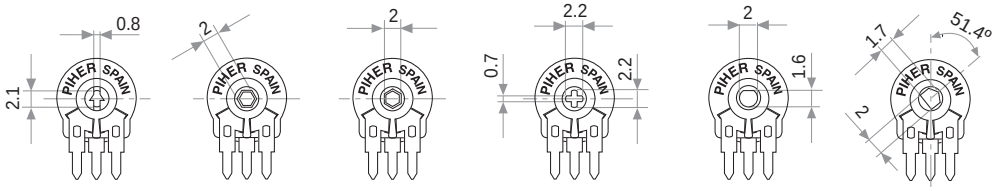


Rotors (Default delivery is at initial position. Wipers are shown positioned at 50% for the picture)

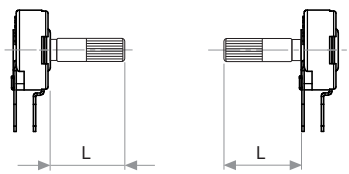
Without shaft or knob.



L = Screwdriver **M** = Hexagonal **G** = Hexagonal **K** = Cross slot **R** **B**

All rotors are thru-hole.

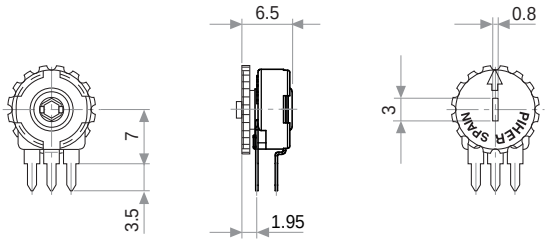
With inserted shaft.



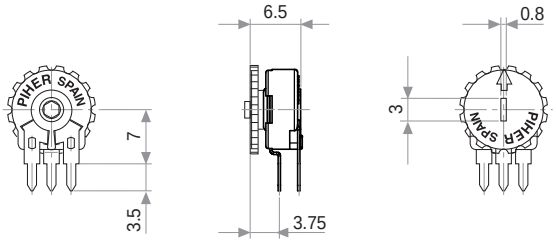
X = Adjustable from collector side

W = Adjustable from terminal side

With knob/humbwheel inserted



Y = Adjustable from terminal side (default knob is 5034).



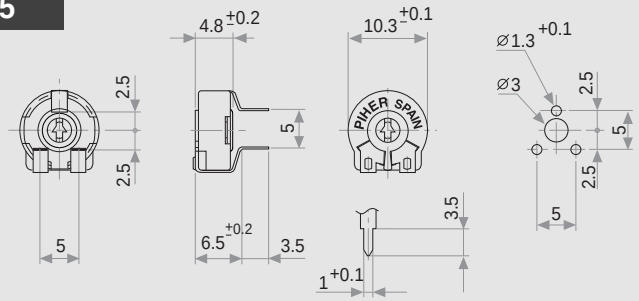
Z = Adjustable from collector side (default knob is 5034).

Mounting methods. Dimensions

Download 3D - STEP files here: https://piher.net/piher/?p=905

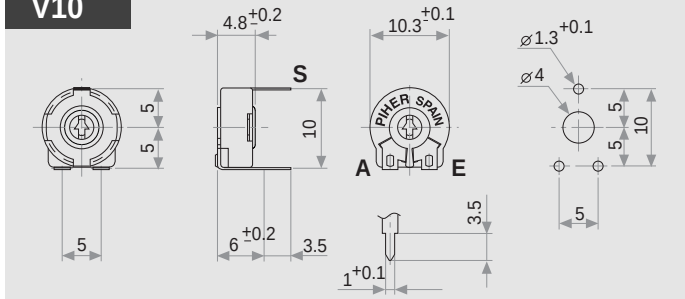
V = horizontal mounting – vertical adjustment

V05



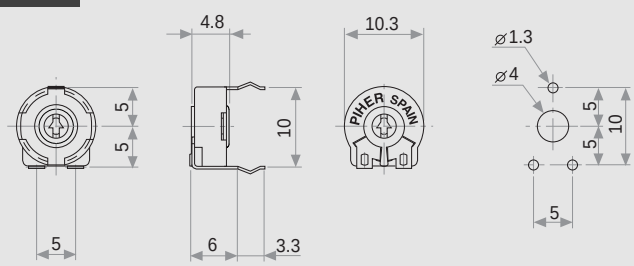
H = vertical mounting – horizontal adjustment

V10

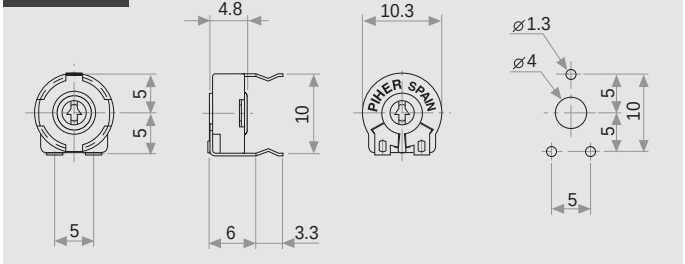


A = Initial **S** = Wiper **E** = Final

V11



V13



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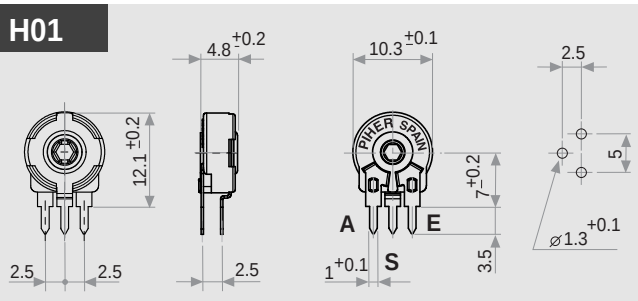
Mounting methods. Dimensions

V = horizontal mounting – vertical adjustment

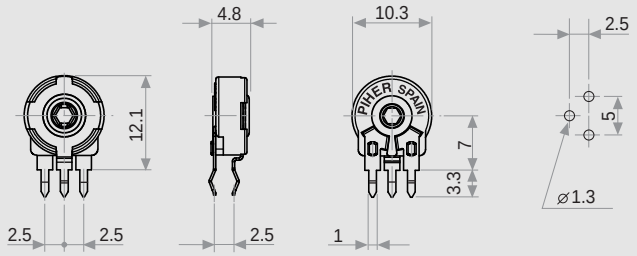
H = vertical mounting – horizontal adjustment

H01

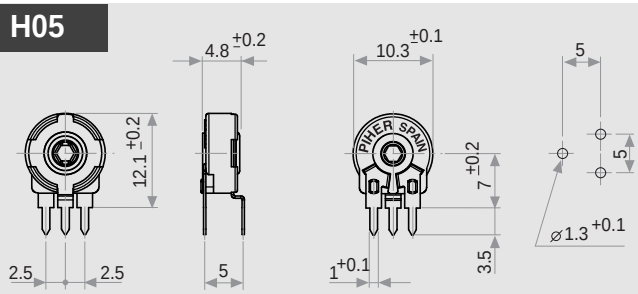


A = Initial **S** = Wiper **E** = Final

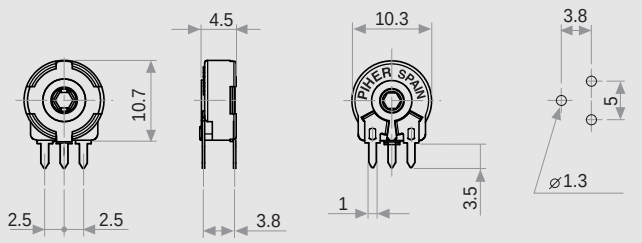
H02



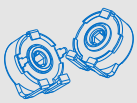
H05

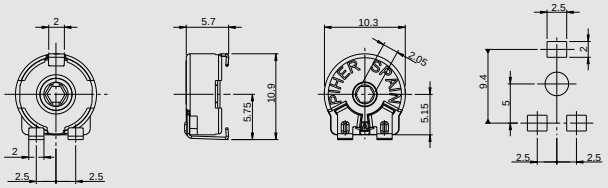


H07

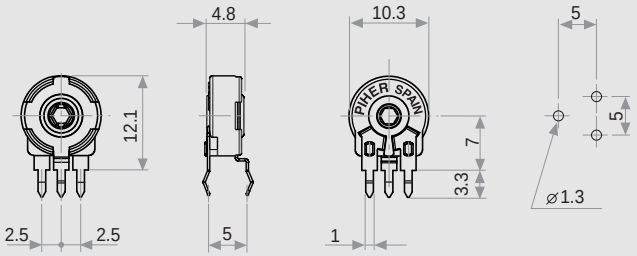


SMD versions (see PS10 datasheet)



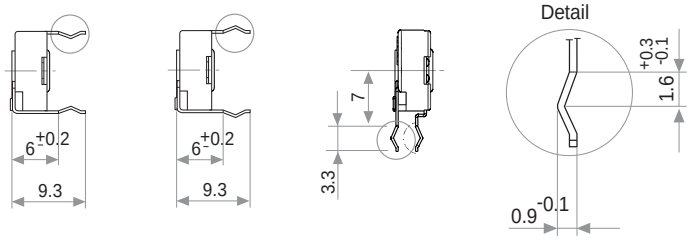


H10

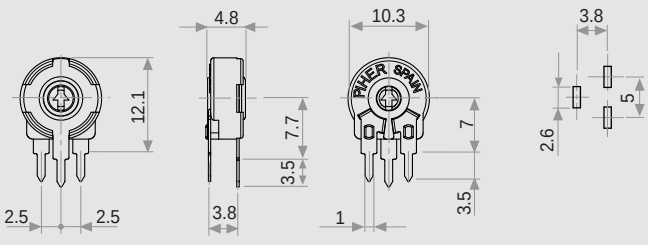


Crimped terminals - detail

V11, V13, H02, H10 models feature “crimped” terminals that provide greater stability during the soldering process.



check availability



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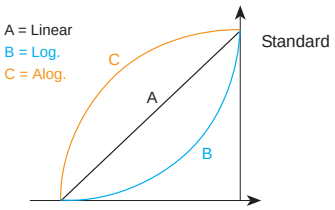
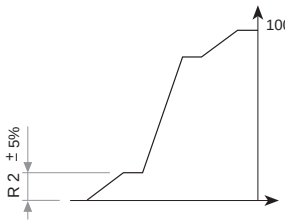
Standard values - tolerances

Resistance Ω	100	200	220	250	470	500	1K	2K	2.2K	2.5K	4.7K	5K	10K	20K	22K	25K	47K	50K	100K	200K	220K	250K	470K	500K	1M	2M	2.5M	4.7M	5M
How to order code	101	201	221	251	471	501	102	202	222	252	472	502	103	203	223	253	473	503	104	204	224	254	474	504	105	205	255	475	505
Standard tolerance	20%																									30%			

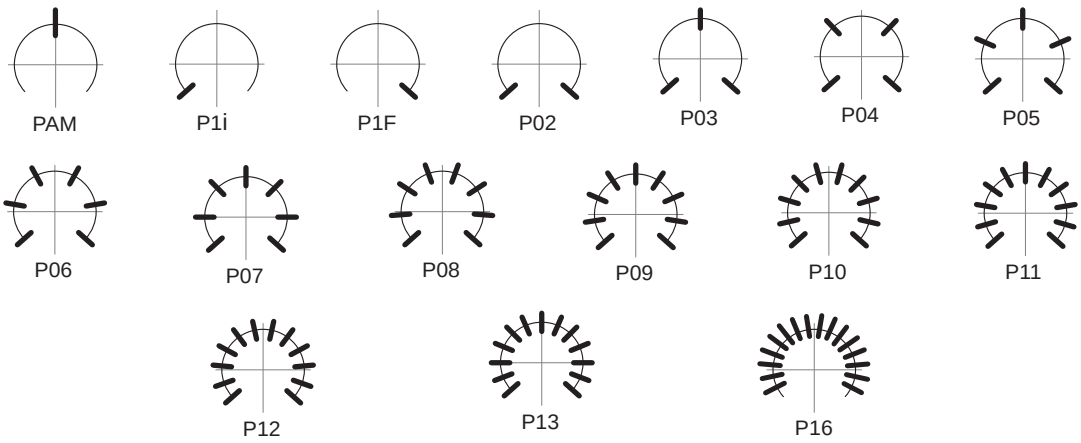
Tapers

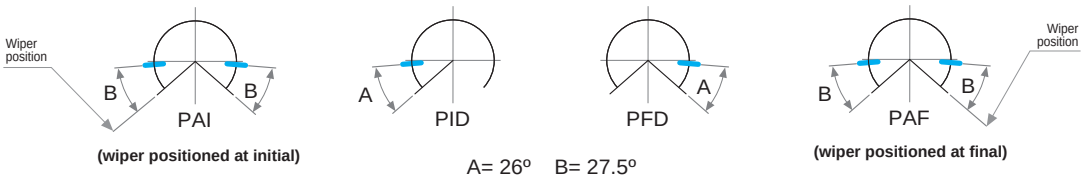




Special custom taper example.
(contact at sales@piher.net)

Detents



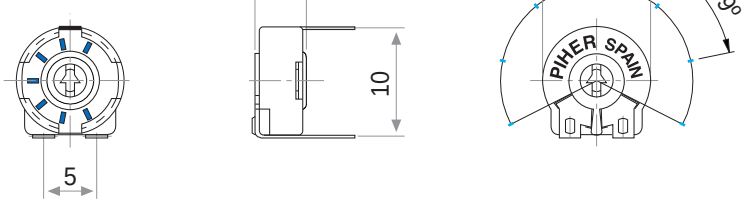


(wiper positioned at initial)

A= 26º B= 27.5º

(wiper positioned at final)

Detents detail. (7 detents example)



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

Standard mechanical life is 500 cycles.

Long life versions are available under request and have the following characteristics at Tª:

- Potentiometers with 1 to 3 detents: up to 10K cycles
- Potentiometers with 4 and more detents: up to 5K cycles

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 (see next page).

Detent torque can vary from 1.2 to 2.5 times the standard potentiometer torque.

For V05 mounting: check availability.

For more than 16 detents versions please contact your nearest PIHER authorised distributor.

For custom voltage outputs in any detent position see page 6.

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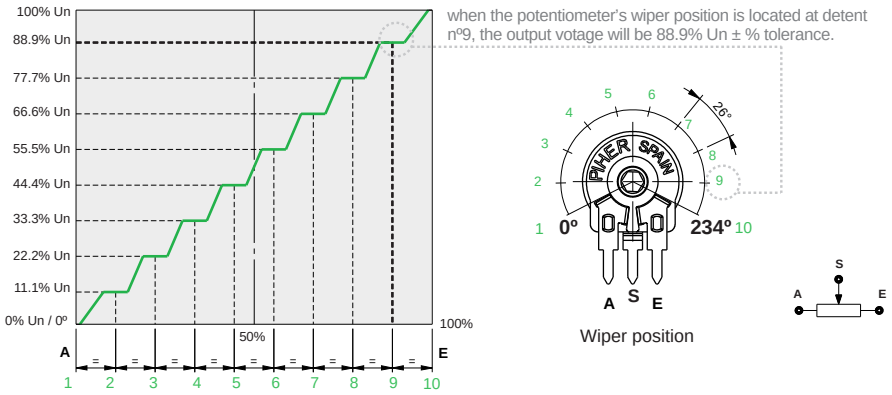
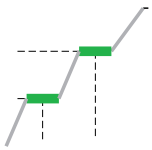
10 mm carbon potentiometer PT10

Stepped outputs

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

Stepped outputs version example (10 steps version):





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.

Stepped outputs

PIHER's potentiometers can feature special stepped outputs or 'constant voltage zones' for the 10mm 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 position. 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 precise control capabilities, our 10mm and 15mm potentiometers series are well suited for many consumer applications such as lighting (dimmers), power hand tools, relays, timers and HVAC systems.

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)
- ✓ It prevents changes in the output value 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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10 mm carbon potentiometer
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Shafts

For G and M rotor types, top view.

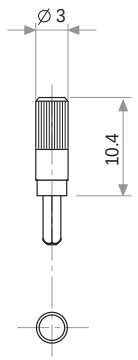

Fig. 1 / Ref. 5016

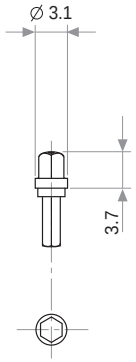

Fig. 2 / Ref. 5053

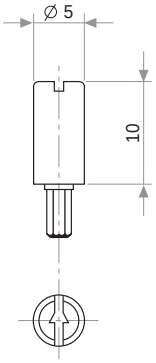

Fig. 3 / Ref. 5012

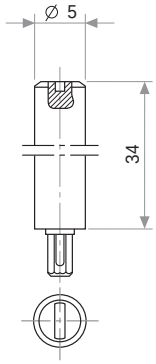

Fig. 4 / Ref. 6053

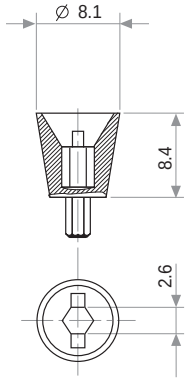

Fig. 6 / Ref. 5035

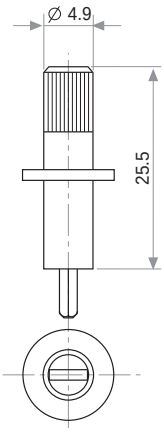

Fig. 7 / Ref. 5115

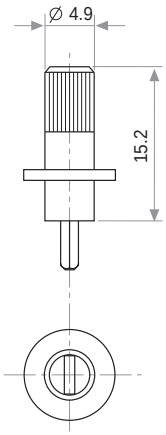

Fig. 8 / Ref. 5116

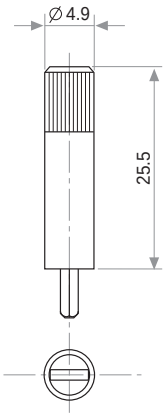

Fig. 9 / Ref. 5119

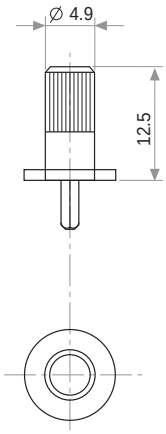

Fig. 10 / Ref. 5120

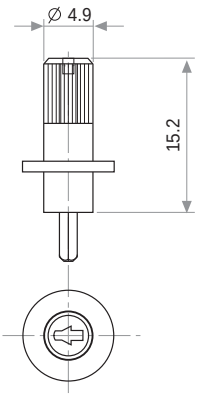

Fig. 12 / Ref. 6052

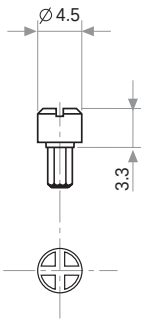

Fig. 14 / Ref. 5055

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Knobs/thumbwheels

For G and M rotor types, top view.

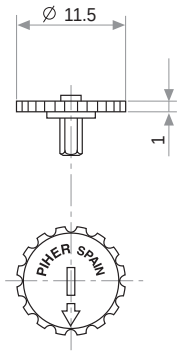


Fig. 5 / Ref. 5034

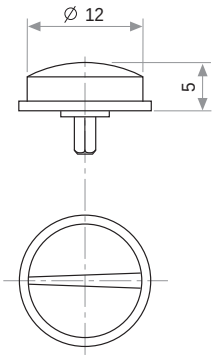


Fig. 15 / Ref. 6008

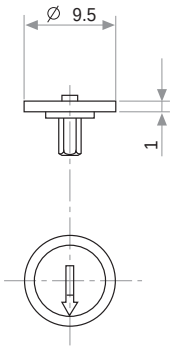


Fig. 16 / Ref. 5039

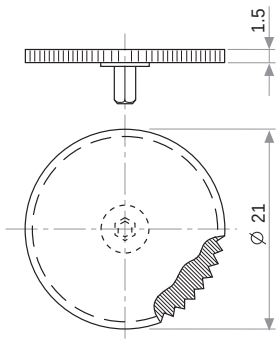


Fig. 17 / Ref. 5062

2- GANG Plastic Knob/ Plastic Shaft

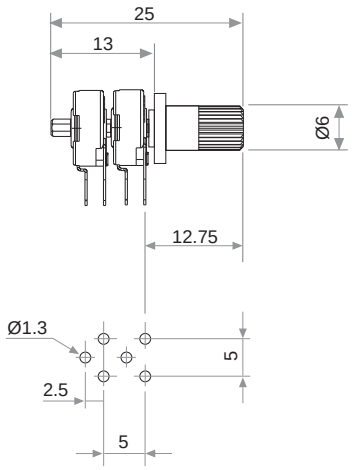
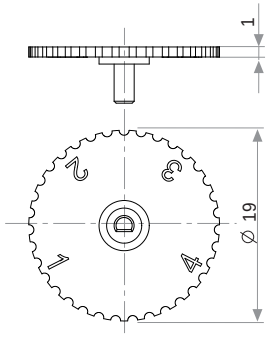


Fig. 18 / Ref. 6064

Numbered Thumbweel



Marking: configurable number of positions
Example of four positions marking pictured

For R rotor type only

Upon request.

By default, shafts, knobs & thumweels are delivered unassembled.

Mounted shafts, knobs & thumbweels are delivered at random position but can be delivered at specific positions too (a drawing must be provided by the customer).

If you need the shaft or knob to be delivered assembled from the factory, please select the appropriate rotor in the part number: X, W, Y or Z.

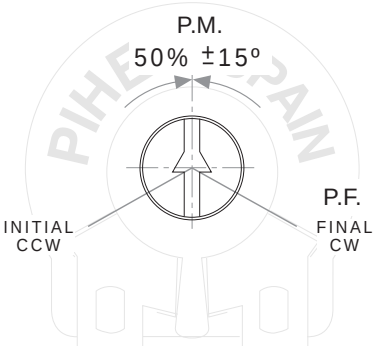
The plastic color can be stated in the part number. Non flammable plastic can be ordered too.

If the potentiometer is ordered with non flamable plastic materials (UL 94V0) then the shaft or knob will be delivered with non flamable plastic too.

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

Positioning

Std. Position = CCW. Other delivery positions upon request.



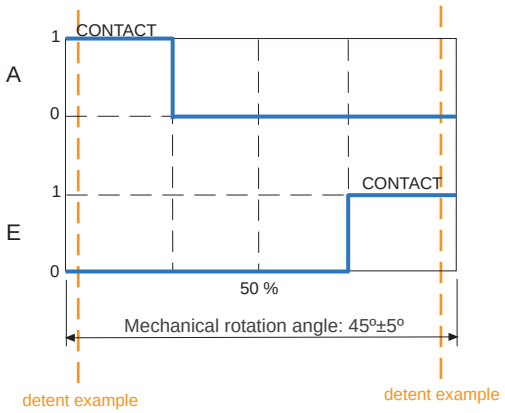
Automotive / Appliance control - sensor

10 mm carbon potentiometer
PT10

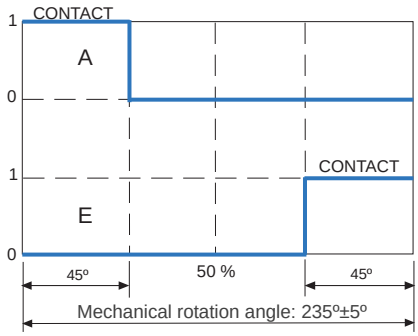
Switch versions

They can be delivered with or withouth detents/stops.

D48 Switch code example

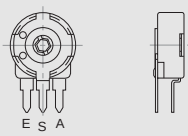


A80 Switch code

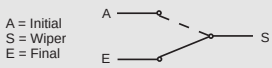


Switch standard specs.

Power Rating:
24V / 15mA
ON position resistance:
≤ 5 Ω
Insulation Resistance:
≥ 30 MΩ

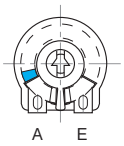


(D48, rotor shown at final position)

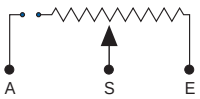


Cut track (open circuit feature)

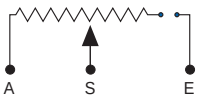
CCW on-off (A)



PCI
Cut track at the beginning of the travel.



PCF
Cut track at the end of the travel



CW on-off (E)

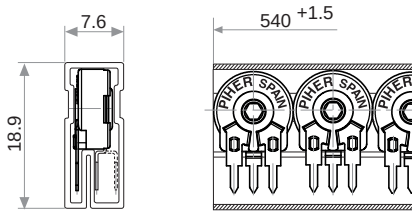
A = Initial S = Wiper E = Final. Other configurations available upon request.

Packaging

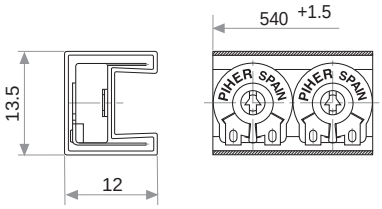
Default packaging is bulk (boxes).

Model	Units per box
Without shaft	1000 (80 x 85 x 185 mm.)
With thumbwheel	800 (80 x 85 x 185 mm.)
With shaft	400 (80 x 85 x 185 mm.)

Magazines for automatic insertion are available with 50pcs per magazine.



Magazines for PT10 H01 and H05
Also crimped term. H02



Magazines for PT10 V
Also crimped term. V11

Automotive / Appliance control - sensor

10 mm carbon potentiometer
PT10

Tests

	Typical variations	
Electrical life	1000 h. @ 50ºC; 0.15 W	±5 %
Mechanical life (cycles)	1000 @ 10 CPM ...15 CPM	±3 % (Rn < 1 MΩ)
Temperature coefficient	–25ºC; +70ºC	±300 ppm (Rn <100 KΩ)
Thermal cycling	16 h. @ 85ºC; 2h. @ -25ºC	±2.5 %
Damp heat	500 h. @ 40ºC @ 95% HR	±5 %
Vibration (for each plane x,y,z)	2 h. @ 10 Hz. ... 55 Hz.	±2 %

Out of range values may not comply with these results.
For other tests or the full range of tests, please, contact us.

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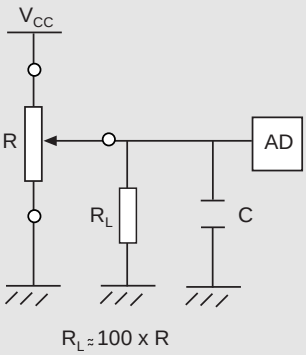
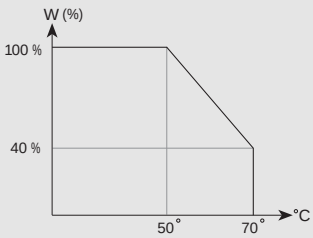
rev260619

Recommended connections

Recommended connection scheme for Piher´s position sensors
(voltage divider)



Power rating curve



For higher nominal power please visit our PTC-10 cermet potentiometer.

Contact

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