## 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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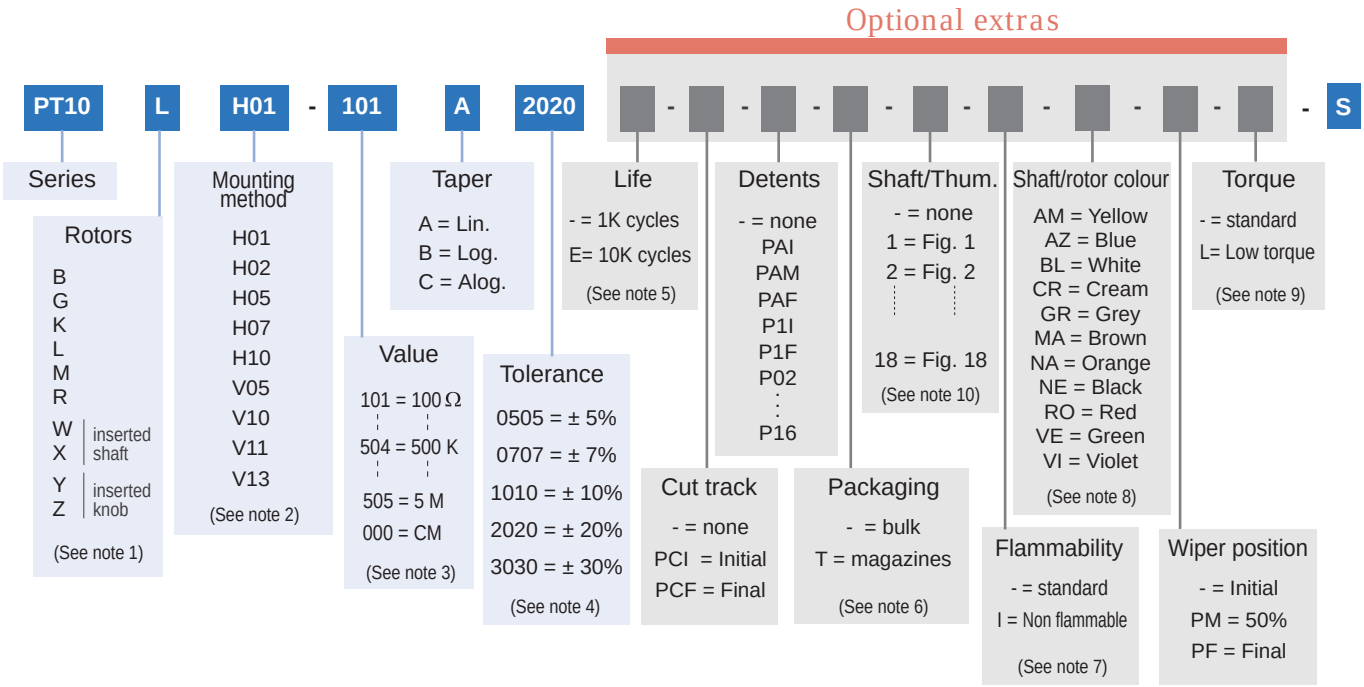
## How to order




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. |

## Automotive / Appliance control - sensor

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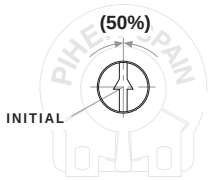
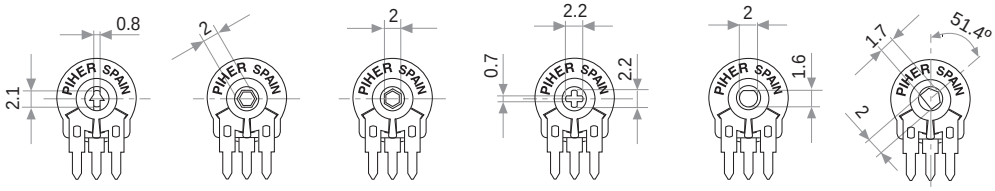



## Rotors (Default delivery is at initial position. Wipers are shown positioned at 50% for the picture)

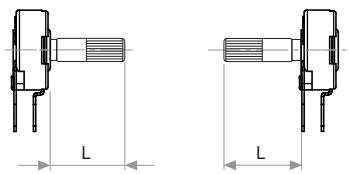
Without shaft or knob.




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

All rotors are thru-hole.

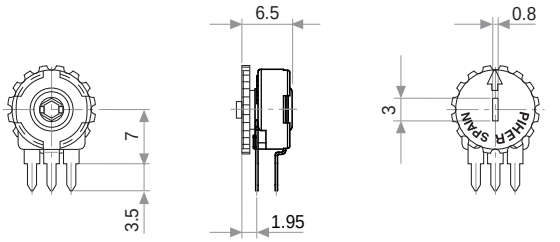
With inserted shaft.



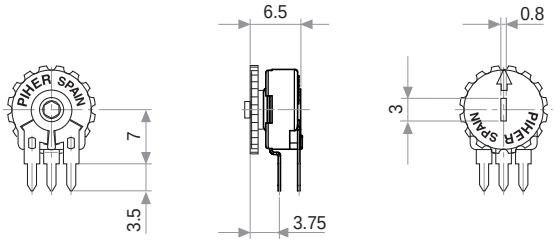

**X** = Adjustable from collector side

**W** = Adjustable from terminal side

### With knob/humbwheel inserted




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



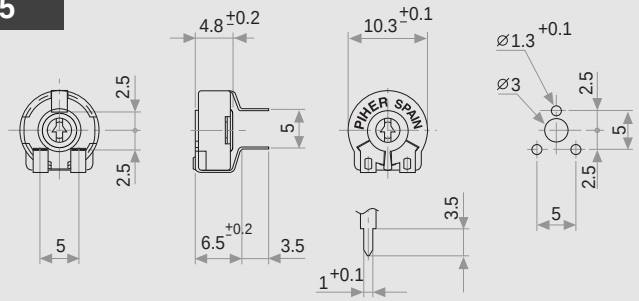

**Z** = Adjustable from collector side (default knob is 5034).

## Mounting methods. Dimensions

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

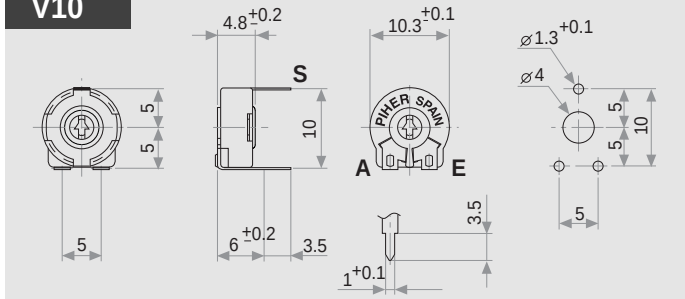
V = horizontal mounting – vertical adjustment

**V05**



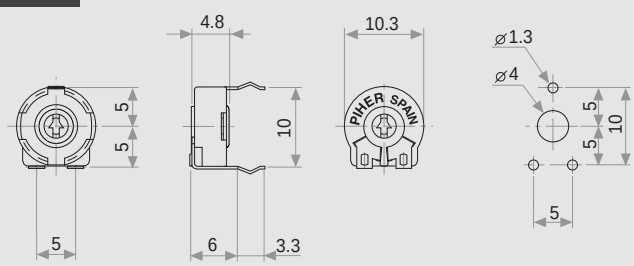

H = vertical mounting – horizontal adjustment

**V10**

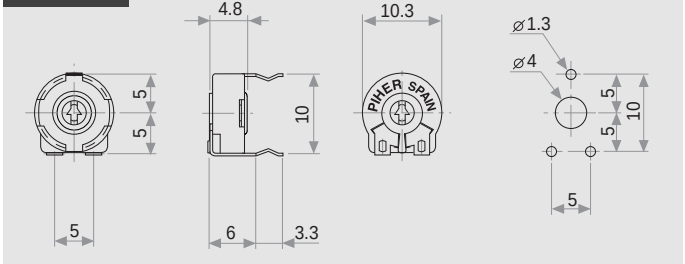



**A** = Initial **S** = Wiper **E** = Final

**V11**




**V13**



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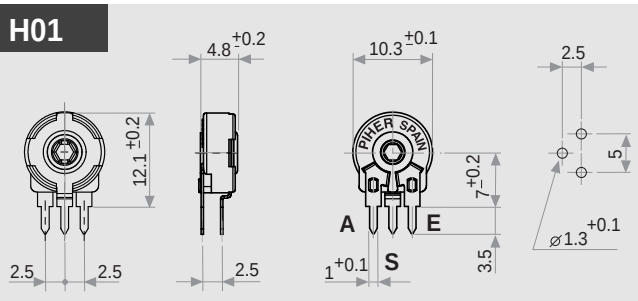
## Mounting methods. Dimensions

V = horizontal mounting – vertical adjustment

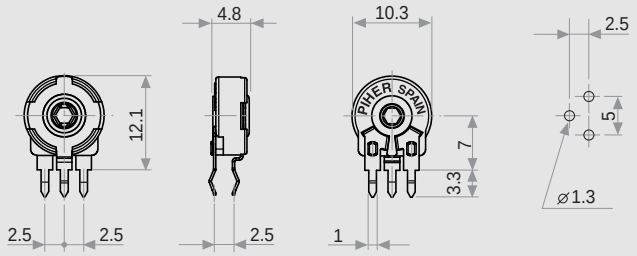
H = vertical mounting – horizontal adjustment

### H01

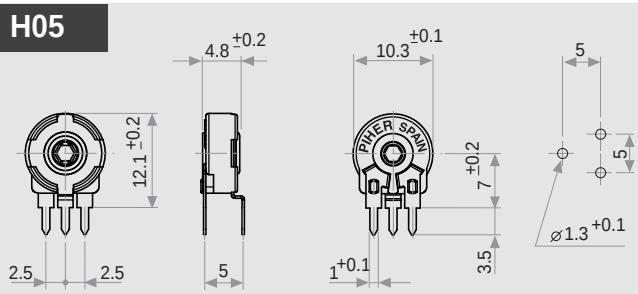



**A** = Initial **S** = Wiper **E** = Final

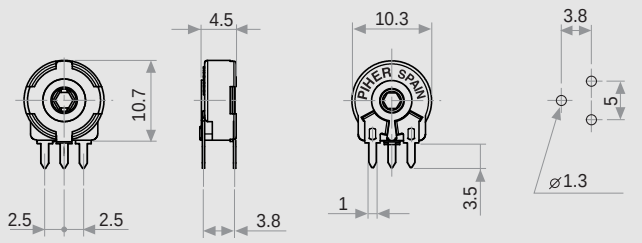
### H02



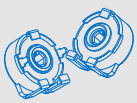

### H05

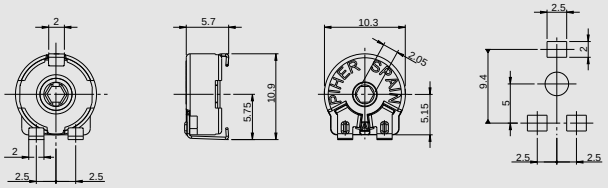



### H07

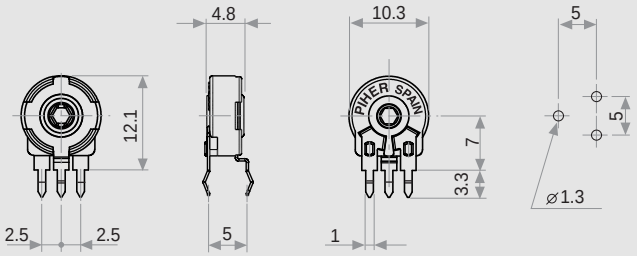



### SMD versions (see PS10 datasheet)



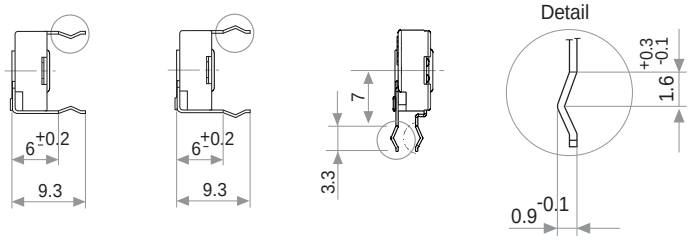


### H10

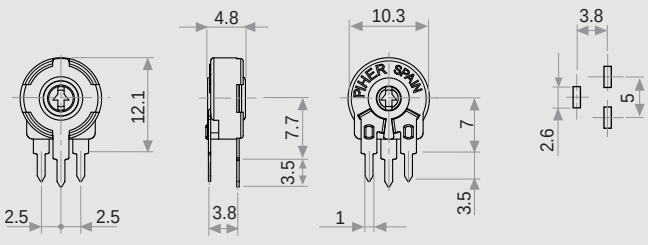



### Crimped terminals - detail

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




### check availability



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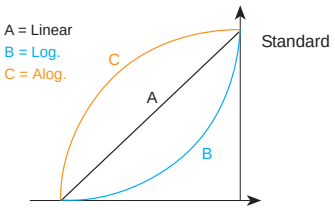
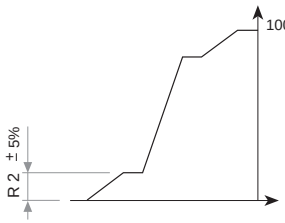
## Standard values - tolerances

| 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% | | | |

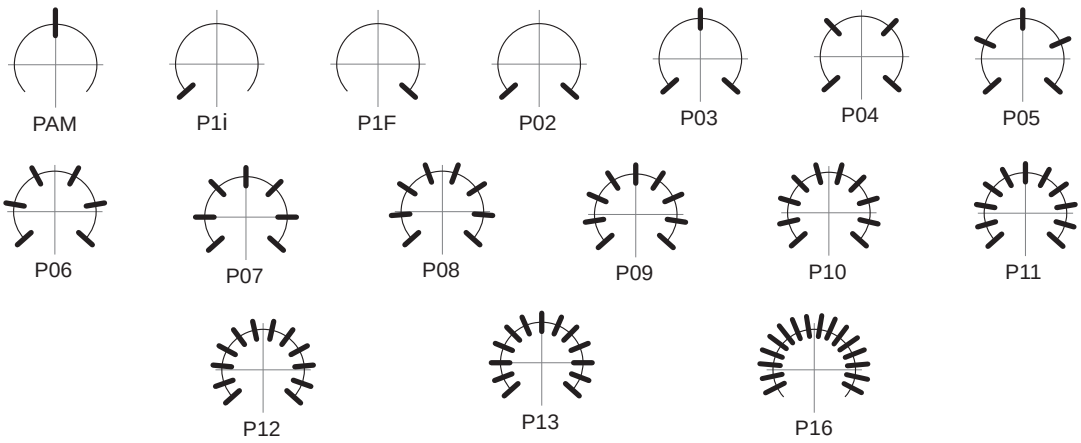
## Tapers

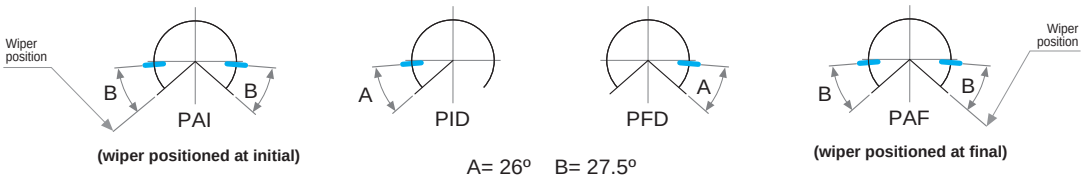



Special custom taper example.
(contact at sales@piher.net)

## Detents



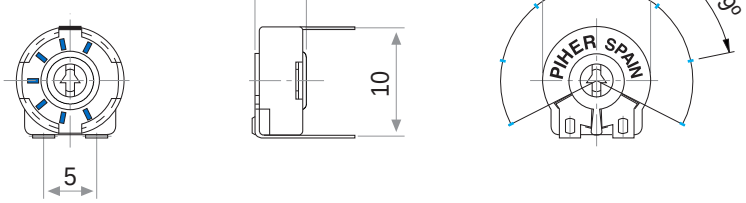




(wiper positioned at initial)

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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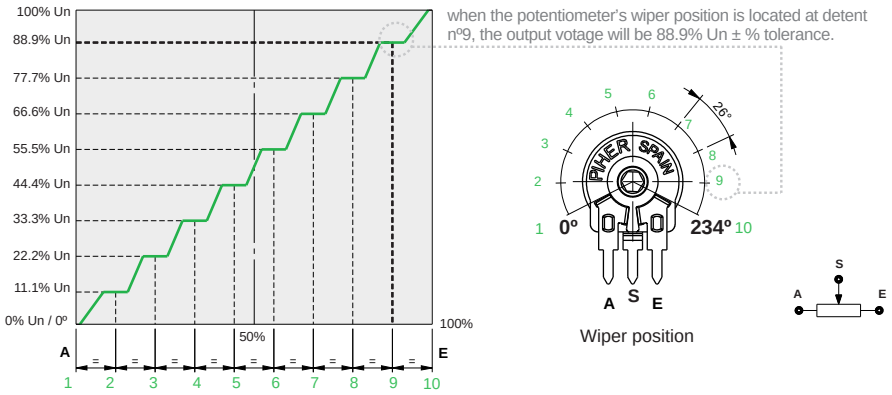
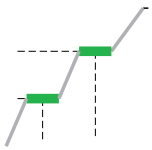
## Stepped outputs

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

## Automotive / Appliance control - sensor

# 10 mm carbon potentiometer
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## Shafts

For G and M rotor types, top view.

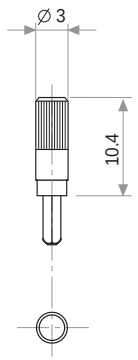


Fig. 1 / Ref. 5016

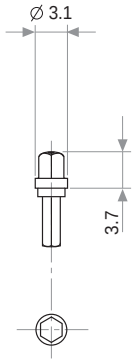


Fig. 2 / Ref. 5053

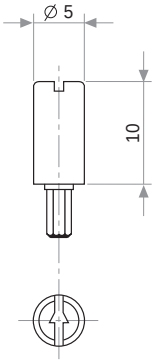


Fig. 3 / Ref. 5012

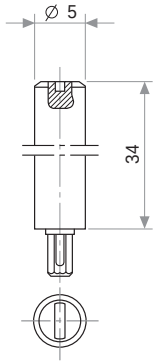


Fig. 4 / Ref. 6053

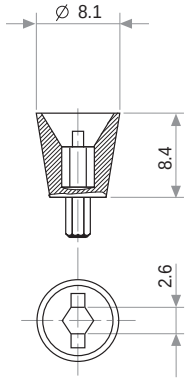


Fig. 6 / Ref. 5035

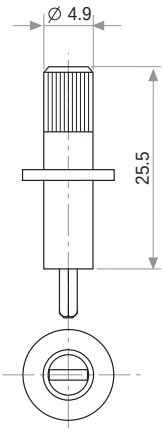


Fig. 7 / Ref. 5115

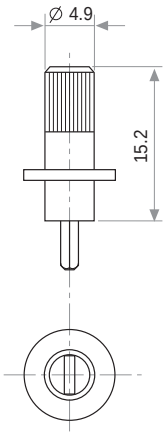


Fig. 8 / Ref. 5116

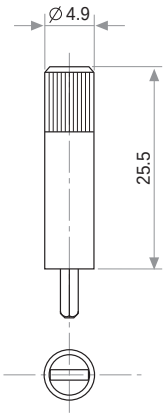


Fig. 9 / Ref. 5119

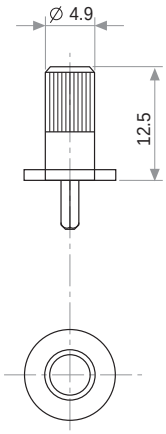


Fig. 10 / Ref. 5120

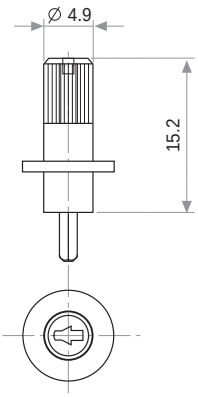


Fig. 12 / Ref. 6052

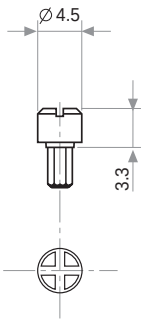


Fig. 14 / Ref. 5055

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## Knobs/thumbwheels

For G and M rotor types, top view.

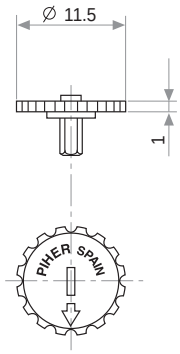



Fig. 5 / Ref. 5034

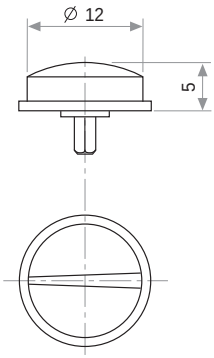



Fig. 15 / Ref. 6008

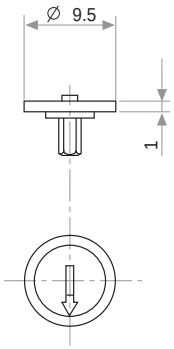



Fig. 16 / Ref. 5039

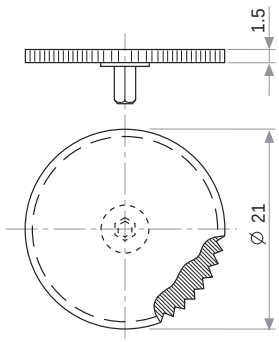



Fig. 17 / Ref. 5062

2- GANG Plastic Knob/ Plastic Shaft

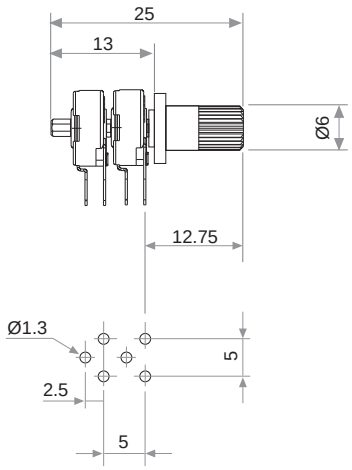
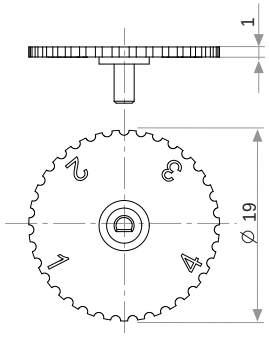



Fig. 18 / Ref. 6064

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.

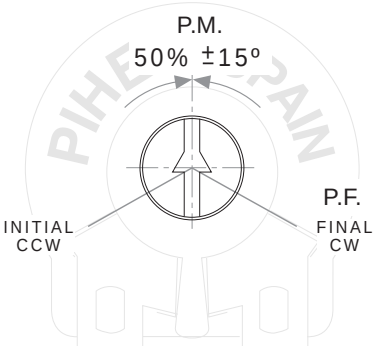
The plastic color can be stated in the part number. Non flammable plastic can be ordered too.

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.



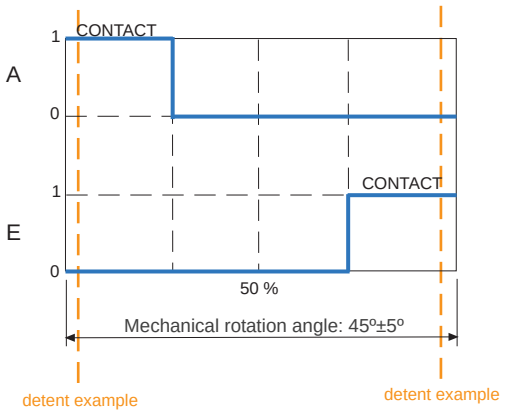
## Automotive / Appliance control - sensor

# 10 mm carbon potentiometer
# PT10

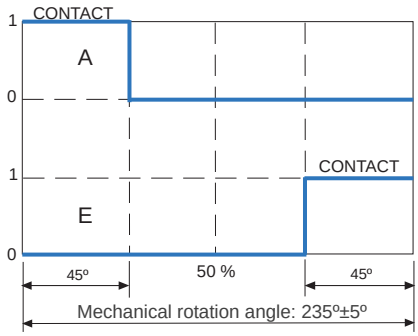
## Switch versions

They can be delivered with or withouth detents/stops.

D48 Switch code example

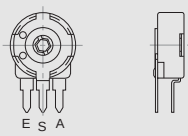



A80 Switch code

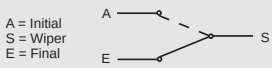



### Switch standard specs.

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

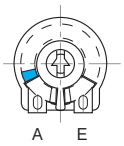



(D48, rotor shown at final position)

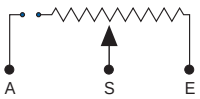



## Cut track (open circuit feature)

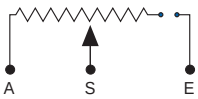
CCW on-off (A)




PCI
Cut track at the beginning of the travel.




PCF
Cut track at the end of the travel




CW on-off (E)

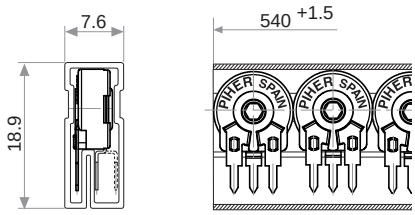
A = Initial S = Wiper E = Final. Other configurations available upon request.

## Packaging

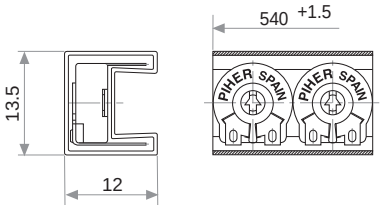
Default packaging is bulk (boxes).

| 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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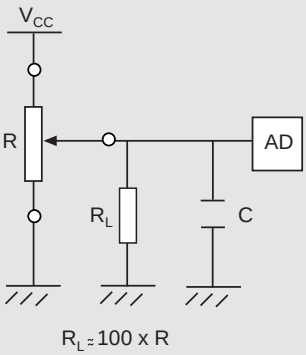
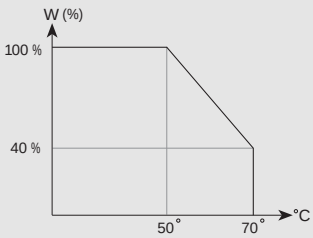
rev260619

## 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

Piher Sensors & Controls SA
Polígono Industrial Municipal
Vial T2, 22,
31500 Tudela - Spain.
t. +34-948-820450
f. +34-948-824050

sales@piher.net

www.piher.net

Общество с ограниченной ответственностью «МосЧип» ИНН 7719860671 / КПП 771901001
Адрес: 105318, г.Москва, ул.Щербаковская д.3, офис 1107

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**Офис по работе с юридическими лицами:**

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:
moschip.ru
moschip.ru_4
moschip.ru_6
moschip.ru_9