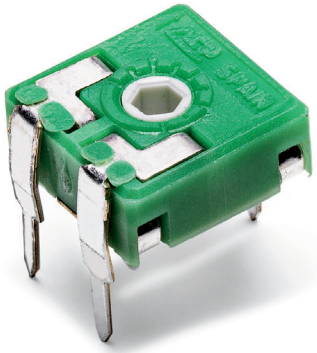
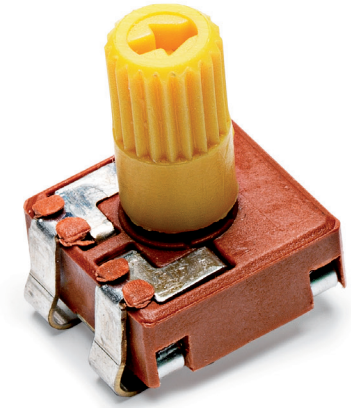
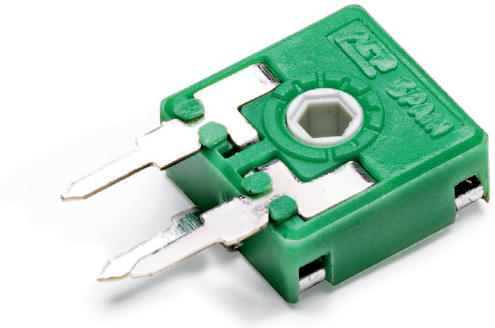
# RS9

Rotary Sensor





# RS9

9mm Rotary Sensor appropriated for position sensing and control applications capable of withstanding high configurations of mechanical life.

- Standard: from 25.000 to 50.000 cycles
- Long life: up to 200.000 cycles. More cylcles available under request.

RS9 has plastic housing and Ingress Protection rating type IP 54 (high level of protection against dust and also against water splashing), according to IEC 60529. Plastic materials can be self-extinguishable according to UL 94 V-0 under request.

Through-hole and SMD configurations are available. Terminals and collector are manufactured in tinned brass, although versions with steel terminals are also available under request. Terminals for through-hole models can be provided straight or crimped, which helps hold the component to the PCB during soldering.

Standard taper is linear, with independent linearity of ±3%. ACP can study other special tapers (even cut tracks, step curves with areas of constant value, etc), as well as more strict linearity.

Thumbwheels and shafts can be provided either separately or already inserted in the sensor. Our RS9 can be manufactured in a wide range of possibilities regarding: resistance value, tolerance, tapers, pitch, positioning of the wiper, housing and rotor color.

**Applications**

- Household appliances: temperature control, position sensor.
- Automotive: position adjustment and sensing. Industrial controls.

# RS9 HOW TO ORDER

EXAMPLE: **RS9MH2,5-10KA2020 SNP PI WT-9005-BA**

| Standard features | | | | | | | | Extra features | | | | | | | Assembled accessory | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Series | Rotor | Model | Packg. | Ohm value | Taper | Tol. | Life | Track | Detents | Snap in | Housing | Rotor | Wiper | Lin. | Assembly | Ref # | Color | Flam. |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | | 16 | | |
| RS9 | M | H2,5 | | - 10K | A | 2020 | | | | SNP | | | PI | | WT | -9005 | -BA | -V0 |

| **Standard configuration:** | **RS9 Through-hole** | **RS9 SMD** |
|---|---|---|
| Dimensions: | 9mm | |
| Protection: | IP 54 (dust-proof)<br>On request: Self-extinguishable, to meet UL 94 V-0 | |
| Substrate: | Carbon technology | Carbon technology, special for high temperature |
| Color: | Green housing + white rotor | Brown housing + grey rotor |
| Packaging: | Bulk | |
| Wiper position: | at 50% ±15º | |
| Terminals: | Straight, without crimping. | |
| Marking: | Resistive value marked on housing. Others on request. | |

**Customized products:** A drawing is requested when ordering a customized product. Series, rotor, model and total resistive value are indicated before the code that includes all special specifications. Example: CA9PH2,5-10K CODE C00111.

### 1 - Series

- RS9

### 2 - Rotors

C D E J K M P R Y

### 3 - Model and pitch

H2,5 H3,8 HS3,8 H5 HSMD V7,5 V10 VK10 VR10 VSMD VSMD WT-9002

| 4 - Packaging | Trough-hole | SMD models |
|---|---|---|
| Bulk | (blank)...(1) | (blank)...(1) |
| T&R (Tape and 13" reel) | (N.A.)(2) | T&R |
| T&R (Tape and 15" reel) | (N.A.)(2) | T&R15 |

(1) If blank, bulk packaging is implied. (2) N.A., Not Applicable: Tape and Reel packaging is only available for SMD terminals.

### 5 - Resistance value

10K

The RS9 has 10K, linear taper and ±30% by default. Other resistive values, tolerances and tapers (log, antilog, cut tracks, constant value areas, etc.) can be studied on request. Please, enclose a drawing when ordering special tapers.

### 6 - Resistance law / taper

| | |
|---|---|
| Lin - Linear | A |
| - Special tapers have codes assigned: | CODE YXXXXX |

### 7 - Tolerance

±30%

3030

### 8 - Operating Life (Cycles)

| | |
|---|---|
| Standard: between 25.000-50.000 cycles | ex:LV25; LV50 |
| Long life: LV+the number of cycles. ex: LV200 for 200.000 cycles. (others on request) | LVXXX:ex: LV200 |

### 9 - Cut Track – Open circuit.

| | |
|---|---|
| Open circuit at beginning of track, fully CCW | PCI |
| Open circuit at end of track, fully CW | PCF |

### 10 - Detents (DT)

Not applicable for RS9

### 11 - Terminals

| | |
|---|---|
| SNAP IN P | SNP |
| SNAP IN J | SNJ |
| Shorter tip of terminal, TPXX, where XX is tip length (under request) | TPXX, ex: TP25 |
| Steel Terminals | SH |

### 12 - Housing

| | |
|---|---|
| **Color:** For colors other than standard: -See color chart below- | CJ-color, ex., red: CJ-RO |

### 13 - Rotor

| | |
|---|---|
| **Color:** For colors other than standard: -See color chart below- | RT-color; ex., blue: RT-AZ |

| *** Self-extinguishable property, V0, for housing and rotor:** | |
|---|---|
| By default, carbon is non self-extinguishable. Self-extinguishable property can be added. V0 means housing and rotor are V0. | (blank)<br>V0 |
| If only the housing needs to be V0, then CJ-V0. | CJ-V0, RT-V0 |
| If only rotor: RT-V0 | |

### 14 - Wiper

| | |
|---|---|
| **Wiper position** (Standard: 50% ± 15º) | (leave blank) |
| Initial or CCW | PI |
| Final or CW | PF |
| Others: following clock positions; at 3 hours: P3H | PXH, ex: P3H |
| **Wiper torque** (Standard: <2Ncm) | (leave blank) |

Stronger or softer torque feeling is available on request.

### 15 - Linearity

| | |
|---|---|
| Standard Independent Linearity | LN3% |
| Other Independent linearity below x%, for example, 4%: LN4% LNx%; ex: | LN4% |
| Absolute linearity controlled & below x% LAx% | LAx% |

### 16 - Potentiometers with assembled accessories

| | |
|---|---|
| Assembled from terminal side | WT |
| Assembled from collector side | WTI |
| Accessory Reference<br>See list of shafts and thumbwheels available | -XXXXX<br>Example: 9010 |
| Color of shaft or thumbwheel | -YY Example, white: BA |
| Non self-extinguishable. Self-extinguishable according to standard UL 94<br>(-V0 in box 17 modifies only the accessory, please, note.) | (leave blank)<br>-V0 |

**For ordering spare accessories:** Accessory reference - color- flammability.
Ex. 9010-AZ-V0 is a blue self-extinguishable 9010 thumbwheel — XXXX-YY-V0

### Color chart for rotor, housing and accessories

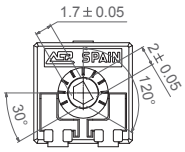
| Black(1) | White | Neutral | Transp. | Red | Green | Yellow | Blue | Grey | Brown |
|---|---|---|---|---|---|---|---|---|---|
| NE | BA | IN | TA | RO | VE | AM | AZ | GS | MR |

(1) black is not an option for housings.

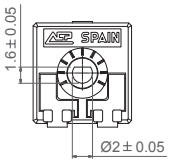
## Rotors

Rotors are drawn in their standard positioning, 50% of rotation. Alternative delivery positioning can be requested. Accessories in this catalogue are designed for the M rotor, unless otherwise stated.

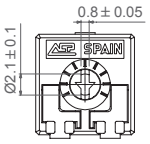
### C



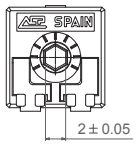

### D




### E



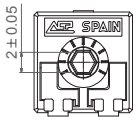

### J




### K


Standard color for K rotor is red

### M




### P

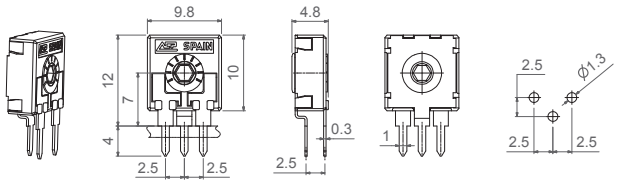

### R


### Y

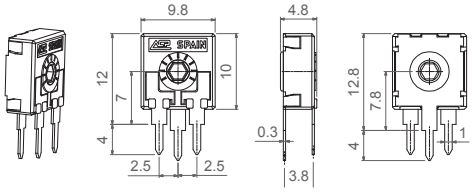

## Models

All models shown here have the most common rotor for 9mm potentiometers: the M rotor. Different rotors are available from the menu above.

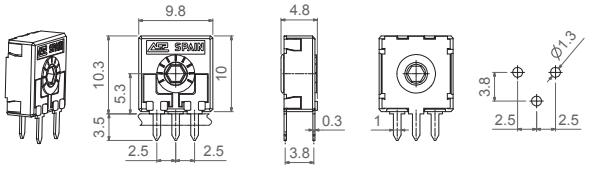
### H2,5



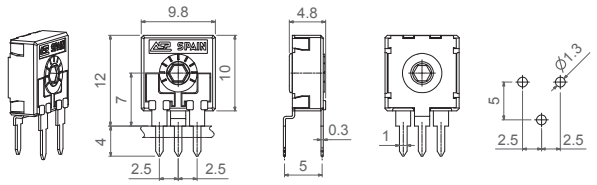

### H3,8



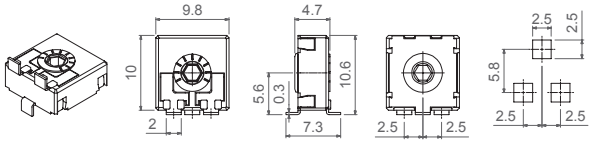

### HS3,8



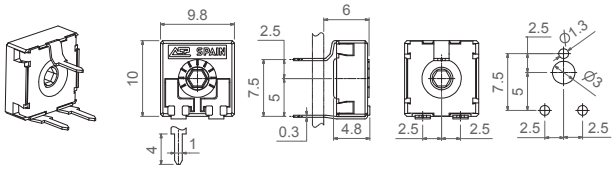

### H5



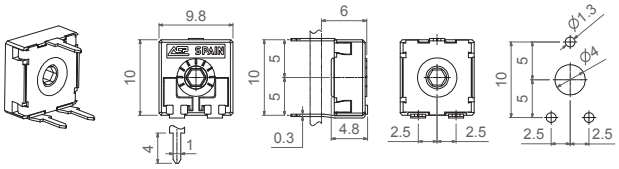

### HSMD



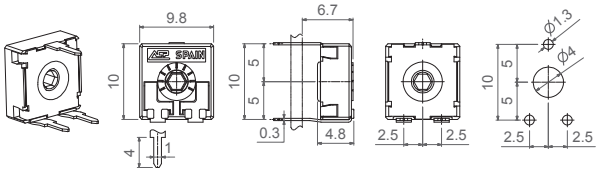

### V7,5



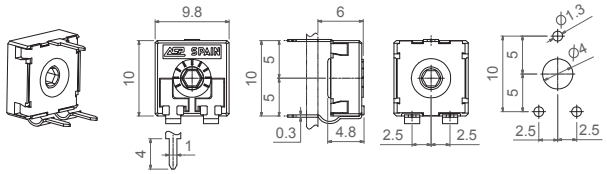

### V10



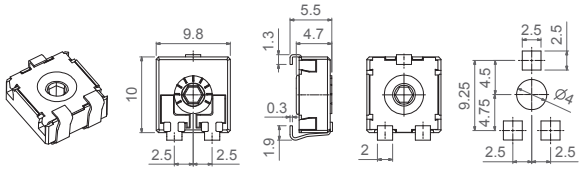

### VK10




### VR10



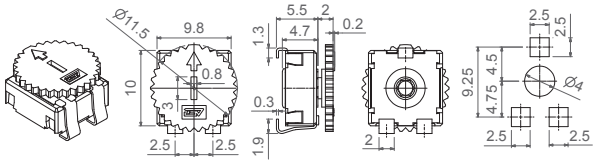

### VSMD



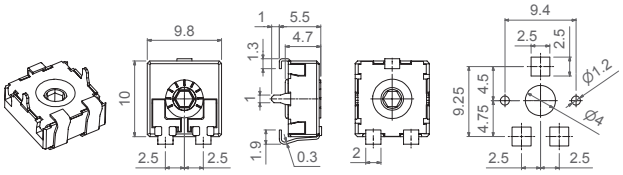

RS9

## Models

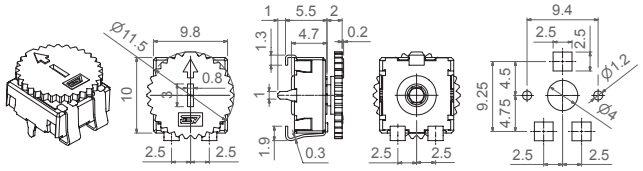
### VSMD WT-9002




### VSMD...CY



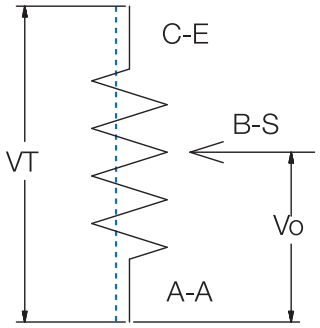

### VSMD...CY WT-9002




## Tapers

The standard taper is linear (A) and the standard ohm value is 10K, since a RS9 will normally be used as a voltage divider. For other tapers, please, inquire.

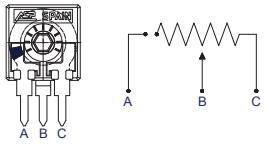
### Voltage Divider



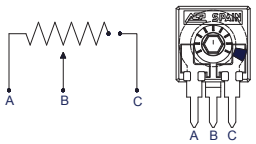

## Potentiometers with cut track

The cut track is an area with very high resistive value, resulting in an open circuit. It is widely used in lighting applications.
Mechanical life with cut track needs to be confirmed.
PCI = Cut at initial position, when the potentiometer is turned fully counter clockwise.
PCF = Cut at final position, when the potentiometer is turned fully clockwise.
Other positions are available on request.

### PCI



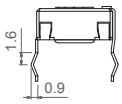

### PCF



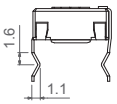
## Terminals

By default, terminals are always straight, as shown on the “models” section. ACP can provide crimped terminals (with snap in, “SNP” or “SNJ”) to better hold the component to the PCB during the soldering operation.

**SNP**

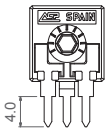



**SNJ**

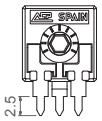



Also, there is an option of having shorter terminal tips:

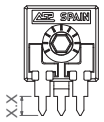
**Standard Terminal**




**Shorter terminal, for H5 TP25**



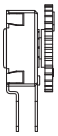

**Shorter terminal, TPXX (under request)**



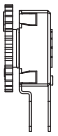

## Possibilities for insertion of accessories

Accessories can be mounted on potentiometers through either the front side (WT) or the collector side (WTI). For the specific angular position of shafts with planes, a drawing with the exact position is requested.

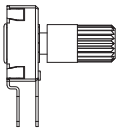
**WT Front side**



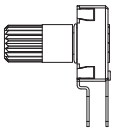
**WTI Collector side**



**WT Front side**



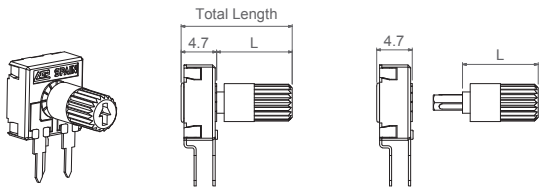
**WTI Collector side**



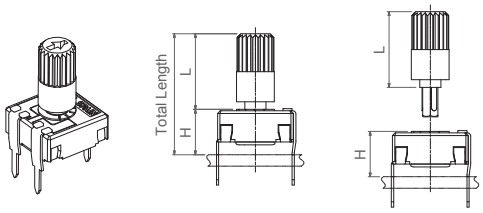
## Shafts

Shafts are available in different colors (color chart in “how to order” section) and with self-extinguishable property, according to UL 94 V-0, under request. ACP can study special shaft designs.
Shafts can be sold separately or delivered already mounted on the potentiometer at ACP.
Unless otherwise stated, the arrow in the shafts is in line with the wiper and it points to 50% when assembled with M rotors.
When a shaft is mounted on a potentiometer, the distance from the top of the potentiometer to the top of the shaft is marked with “L” in the table below, as shown in the drawings:

**H potentiometer + shaft**

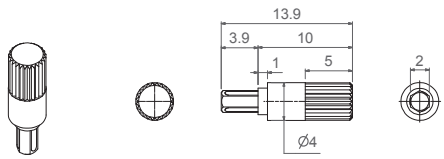



**V potentiometer + shaft**

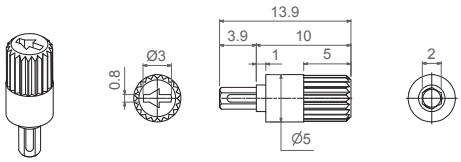



| Shaft | 9071 | 9067 | 9072 | 9054 | 9004 | 9005 | 9064 | 9055 | 9070 | 9053 | 9009 | 9059 | 9063 | 9010 | 9006 | 9019 | 9073 | 9020 | 9047 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **L Dimension** | 3.5 | 5.5 | 6.5 | 9.5 | 10 | 10 | 10 | 10.8 | 11.9 | 12.1 | 14.5 | 14.5 | 14.5 | 15 | 19.7 | 19.9 | 25.5 | 25.9 | 29.8 |

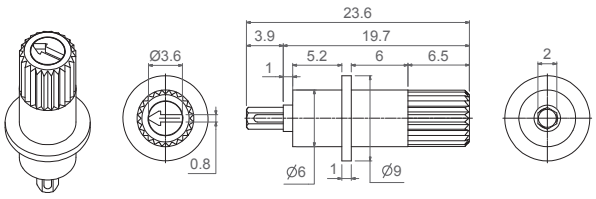
**9004**



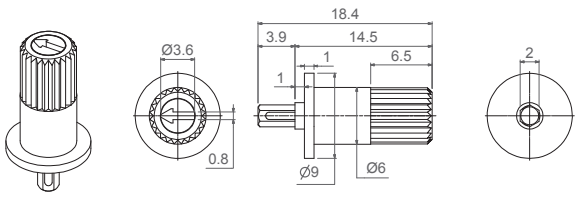

**9005**



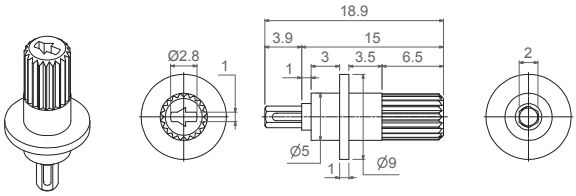
## 9006



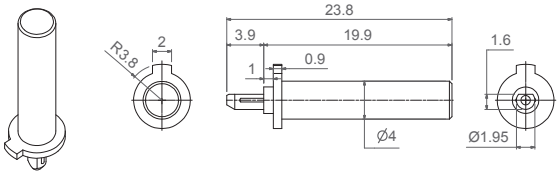

## 9009



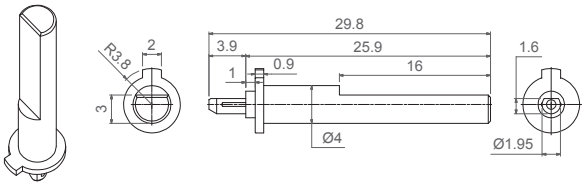

## 9010



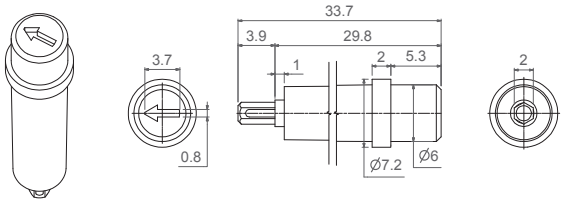

## 9019 (Designed for D rotor)



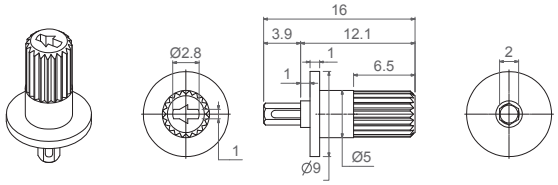

## 9020 (Designed for D rotor)



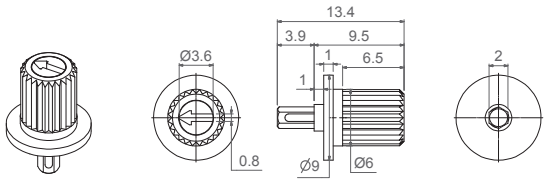

## 9047



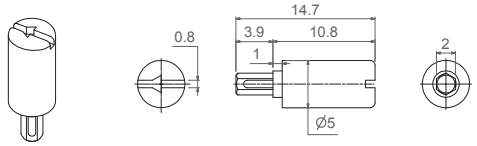

## 9053



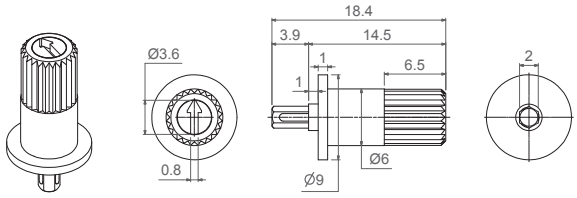

## 9054




## 9055

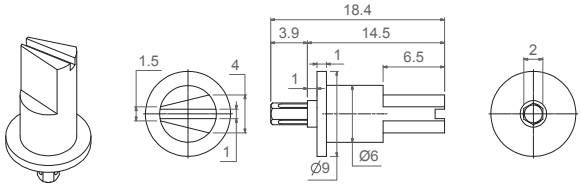



## 9059

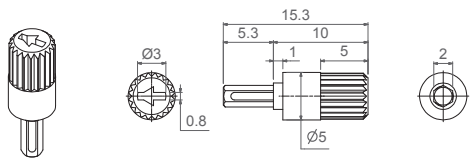



The arrow is in line with the wiper when potentiometer has rotor J (with M rotor, there is a 30° difference).

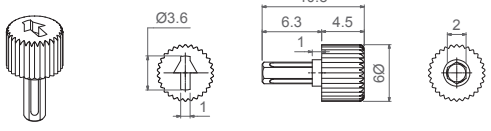
## 9063




## 9064

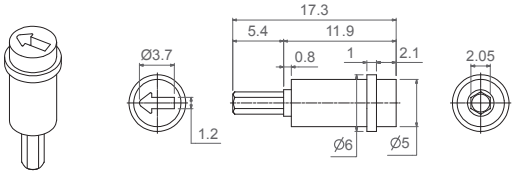



## 9067



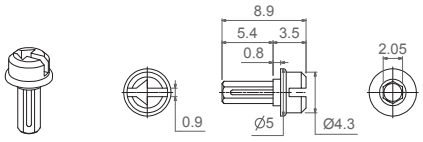

The arrow is in line with the wiper when potentiometer has rotor J (with M rotor, there is a 30° difference).

## 9070

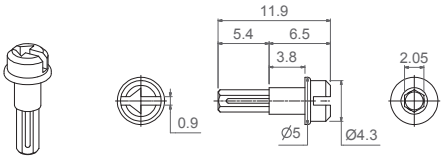


## Shafts

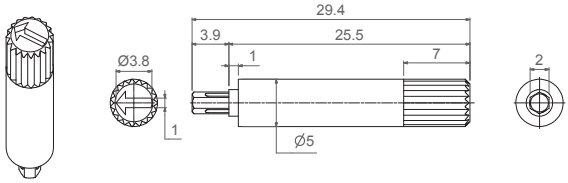
### 9071




### 9072



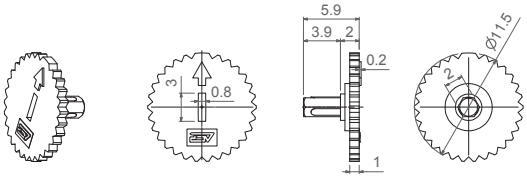

### 9073



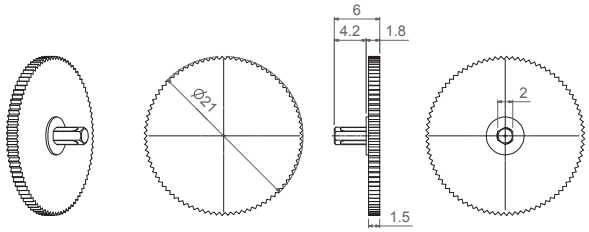

## Thumbwheel

Thumbwheels are available in different colors (color chart in “how to order” section) and with self-extinguishable property according to UL 94 V-0, under request.
Thumbwheels can be mounted on the potentiometers at ACP or sold separately. ACP can study special thumbwheel designs.

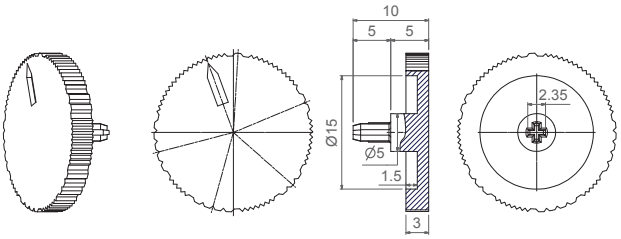
### 9002



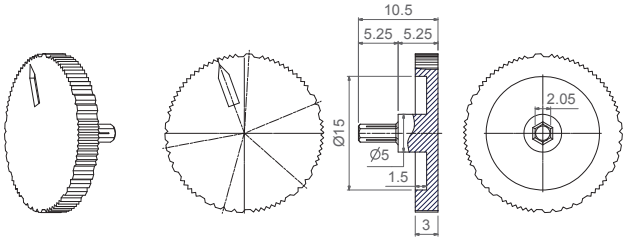

### 9041




### 9060 (Designed for R rotor)

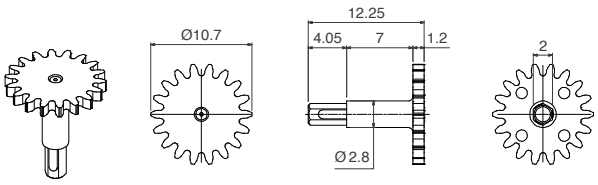



### 9061




## Gear Wheels

In addition to the range of shafts and thumbwheels we can provide gear wheels under study according to customer´s requirements.The below model is already available for prototyping purposes. It can be supplied loose or already mounted on the RS9 series



## Packaging

### Bulk packaging:

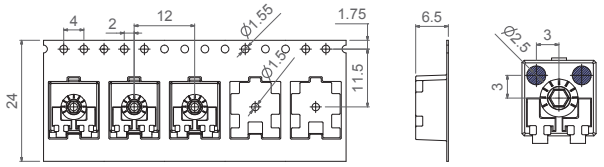
| Potentiometer model | With shaft or thumbwheel inserted? | Pieces per small box (150 x 100 x 70) | Pieces per bigger box (250 x 150 x 70, CG on description) |
|---|---|---|---|
| H2,5 - H3,8 - HS3,8 - H5<br>HSMD - V7,5 - V10<br>VK10 - VR10 - VSMD | None, only potentiometers. | 500 | 1.500 |
| | 9002 | 250 | 1.000 |
| | 9004, 9005, 9006, 9009, 9010, 9041, 9047, 9053, 9054, 9055, 9059, 9060, 9061, 9063, 9064, 9067, 9070. | 200 | 1.000 in general |
| | 9071, 9072 | 400 | 1.250 |

### Tape & Reel packaging:

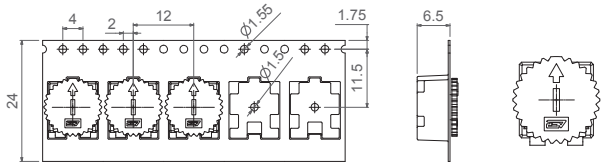
| | With thumbwheel inserted? | 13” Reel (Standard), with 24mm width tape | 15” Reel, with 24mm width tape |
|---|---|---|---|
| VSMD | None, only potentiometers. | 900 pcs per reel, 12mm step between cavities. | 1.250 pcs per reel, 12mm step between cavities. |
| | 9002 | 700 pcs per reel, 12mm step between cavities. | To be determined. |
| VSMD…CY | None, only potentiometers. | 750 pcs per reel, 12 mm step between cavities | 1000 pcs per reel, 12 mm step between cavities |
| | 9002 | To be determined | To be determined |
| HSMD | | 350 pcs per reel, 16 mm step between cavities | 475 pcs per reel, 16 mm step between cavities |

The 13” reel is the standard. For the 15” reel, T&R15 is added to the description.

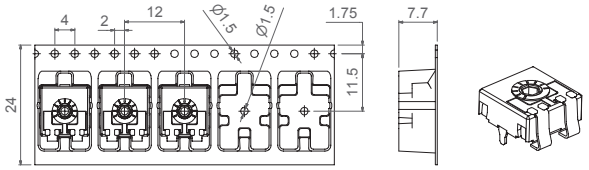
**VSMD-T&R**



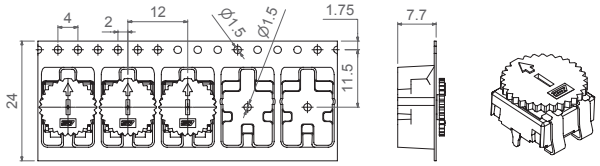

**VSMD-T&R…WT-9002**



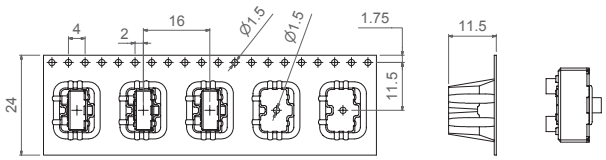

**VSMD-T&R ...CY**



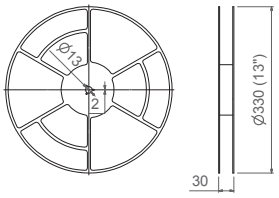

**VSMD-T&R...CY WT-9002**



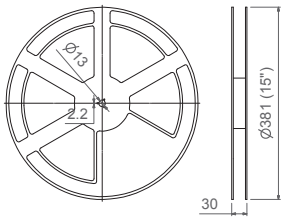

**HSMD-T&R**




**13”Reel**




**15”Reel**



## Electric Specifications

These are standard features; other specifications and out of range values can be studied on request.

| | RS9 Through-hole and SMD | |
|---|---|---|
| Range of resistance values*<br>Lin (A)<br>Log (B) Antilog (C) | <br>100Ω ≤ Rn ≤ 5MΩ<br>1 KΩ ≤ Rn ≤ 2M2Ω | <br>100Ω ≤ Rn ≤ 1MΩ<br>1 KΩ ≤ Rn ≤ 1 MΩ |
| Tolerance*<br>Rn < 100Ω:<br>100Ω ≤ Rn ≤ 100KΩ<br>100K< Rn ≤ 1MΩ:<br>1MΩ < Rn ≤5MΩ:<br>Rn > 5MΩ: | <br>+50%, -30% (out of range)<br>±20%<br>±20%<br>±30%<br>+50%, -30% (out of range) | <br>-<br>±30%<br>±40%<br>±50%<br>- |
| Variation laws | Lin (A). Other tapers available on request | |
| Residual resistance | Lin (A) ≤ 5*10-3*Rn. Minimum value 2Ω | |
| CRV - Contact Resistance Variation (dynamic) | Lin (A) Electrical Angle 220º±20º ≤ 3%Rn.<br>Other tapers, please inquire | |
| CRV - Contact Resistance Variation (static) | Lin (A) Electrical Angle 220º±20º ≤ 5%Rn.<br>Other tapers, please inquire | |
| Maximum power dissipation**<br>Lin (A)<br>Log (B), Antilog (C) | <br>at 50ºC<br>0.15W<br>0.10W | |
| Maximum voltage<br>Lin (A)<br>Log (B), Antilog (C) | <br>200VDC<br>150VDC | |
| Operating temperature | -25ºC … +70ºC (+85ºC on request) | |
| Temperature coefficient<br>100Ω ≤ Rn ≤ 10KΩ<br>10KΩ < Rn ≤ 5MΩ | <br>+200/ -300 ppm<br>+200/ -500 ppm | <br>+200/ -500 ppm<br>+200/ -1000 ppm |

* Out of range ohm values and tolerances are available on request, please, inquire.
** Dissipation of special tapers will vary, please, inquire.

## Mechanical Specifications

| | RS9 Through-hole and SMD |
|---|---|
| Resistive element | Carbon technology |
| Angle of rotation (mechanical) | 240º ± 5º |
| Angle of rotation (electrical) | 220º ± 20º |
| Wiper standard delivery position | 50% ± 15º |
| Max. stop torque | 5 Ncm |
| Max. push/pull on rotor | 40 N |
| Wiper torque* | <2 Ncm |
| Mechanical life | Standard: between 25.000 and 50.000cycles.<br>Long life: up to 200.000cycles (more available on request, please, inquire) |

* Stronger or softer torque feeling is available on request.

## Test results

The following typical test results are given at 23ºC ±2ºC and 50% ±25% RH.

RS9 Through-hole and SMD

| | Test conditions | Typical variation of nominal resistance |
|---|---|---|
| Damp heat | 500 h. at 40°C and 95% RH | ±20% |
| Thermal cycles | 16 h at 85ºC, plus 2 h at –25ºC | ±20% |
| Load life | 1.000 h. at 50°C | ±20% |
| Mechanical life | 1.000 cycles at 10 c.p.m. and at 23°C ± 2°C | ±20% |
| Storage (3 years) | 3 years at 23°C ± 2°C | ±20% |

Power derating curve:

RS9 Through-hole and SMD