



### MECHANICAL SPECIFICATIONS

- Mechanical rotation angle:  $310^\circ \pm 5^\circ$
- Electrical rotation angle:  $290^\circ \pm 20^\circ$
- Torque: 0.5 to 1.5 Ncm. (0.7 to 2.1 in-oz)
- Stop torque: > 80 Ncm. (> 112 in-oz)

\* Others upon request.

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

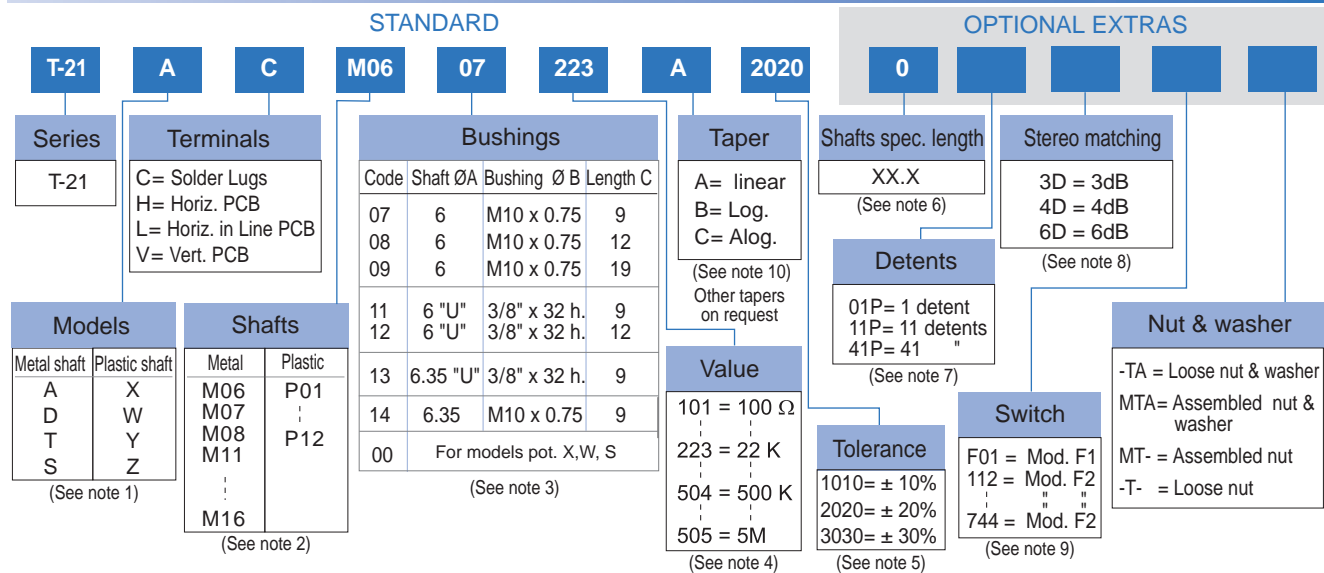
### FEATURES

- Carbon resistive element.
- High mechanical endurance.
- Upon request:
  - Detents.
  - Stereo matching.
  - Switch.
  - Nut & washer.
  - Custom assemblies with wires and connectors.

### ELECTRICAL SPECIFICATIONS

- Range of values\*  
 $100\Omega \leq R_n \leq 5\text{ M}$  (Decad. 1.0 - 2.0 - 2.2 - 2.5 - 4.7 - 5.0)
- Standard tolerance\*:  $100\Omega \leq R_n \leq 1\text{ M}$  .....  $\pm 20\%$   
 $1\text{ M}\Omega < R_n \leq 5\text{ M}$  .....  $\pm 30\%$
- Max. Voltage: 250 VDC (lin) 150 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  $R_n > 1\text{ K}$ ) Lin ; Log; Alog.
- Residual resistance\*:  $\leq 0.5\% R_n$  (5  $\Omega$  min)
- Equivalent Noise Resistance:  $\leq 3\% R_n$  (3  $\Omega$  min.)
- Operating temperature\*\*:  $-25^\circ\text{C} + 70^\circ\text{C}$  ( $-13^\circ\text{F} + 158^\circ\text{F}$ )

### HOW TO ORDER



### NOTES:

- MODELS : Models D y T are not available with "V" terminals.
- SHAFTS : The codes indicate diameter and length. M08: Code for the double potentiometer.
- BUSHINGS ; The codes types 11, 12 and 13 have an antirotation lug (at 90°CW). Plastic shaft and double model are only available with Ø6 bushing.
- VALUE:
  - Code:  $\frac{10}{1} = 100\Omega$  (Number of zeros 2 first digits of the value.)
  - In models "D" and "T" with different values, order under special drawing number.
- Tolerance (special), upon request. Example: +7% Code: 07, -5% Code: 05 (negative tolerance, positive tolerance)
- Shafts special length:
  - Only for special length and plain shafts (not knurled). Example: Shaft Ø6 L= 24.5
  - Flatted and slotted shafts, etc. will need drawing.
  - Shaft M08 (T-21D) with other length, order under special drawing number. Recommendation : Shaft L > 60 ..... bushing C = 19
- DETENTS : - Not available in models with plastic shaft X, W, Y, Z.  
- Detents and switch are not compatible.
- Stereo matching: Only available in tandem models and upon request.
- SWITCHES : Two types of switches are offered: F1 and F2.
  - F1 = The code is "F01"
  - Plastic shafts are only available if they are code P10, P11 or P12
  - F2 = (Only with metal shaft) Indicate the corresponding I-21 switch code.
- Switch option not available with antilog taper.

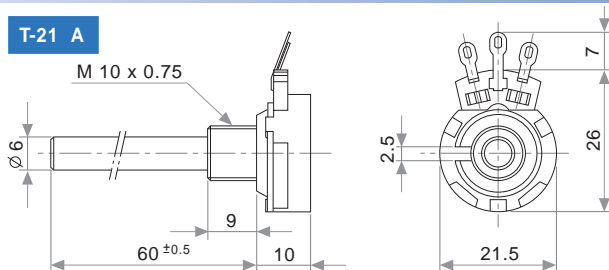
## STANDARD OPTIONS

Shaft length .....0 standard  
 Detents .....Without  
 Stereo matching .....Only for model "T" and upon request

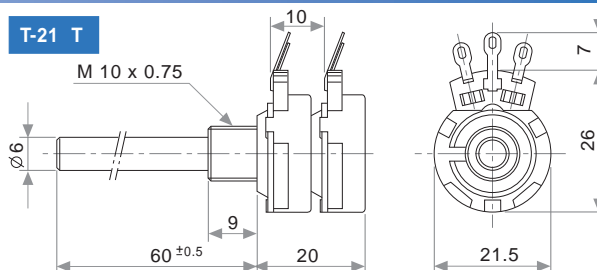
Switch .....No switch  
 Nut & washer .....Without nut and washer  
 Wiper position ..... Initial

## MODELS WITH METALIC SHAFTS

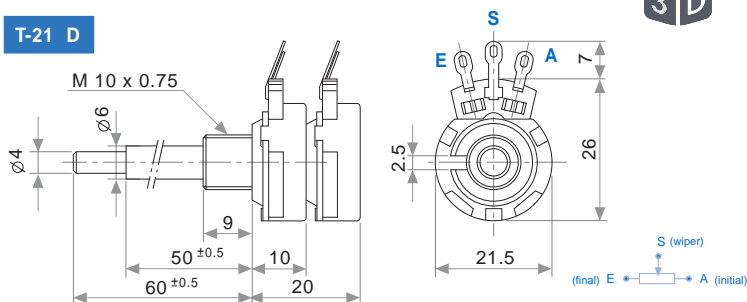
**T-21 A**



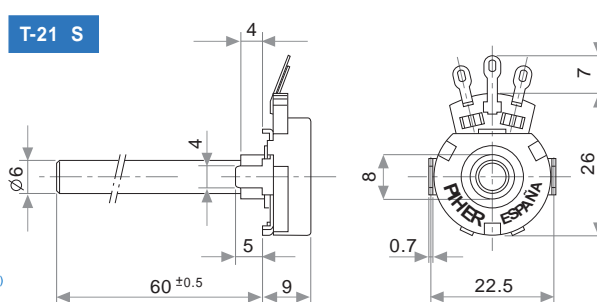
**T-21 T**



**T-21 D**

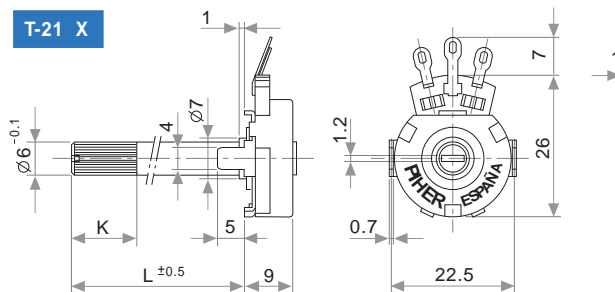


**T-21 S**

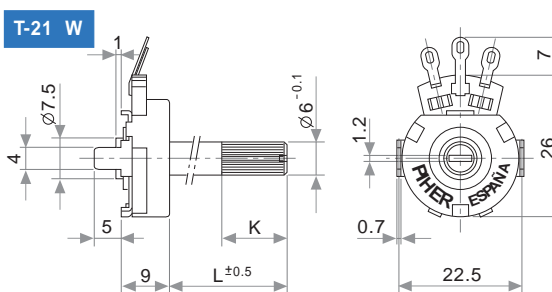


## MODELS WITH PLASTIC SHAFTS

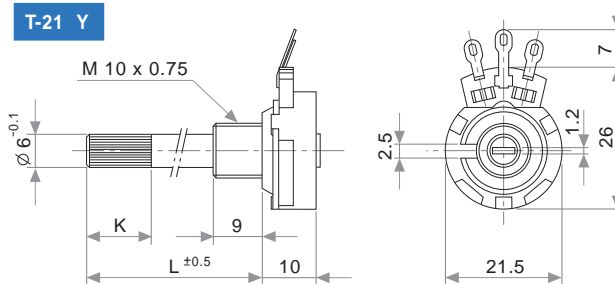
**T-21 X**



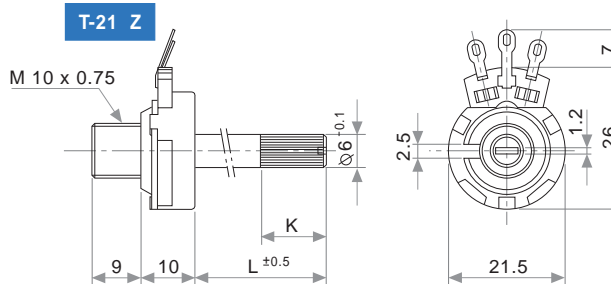
**T-21 W**



**T-21 Y**

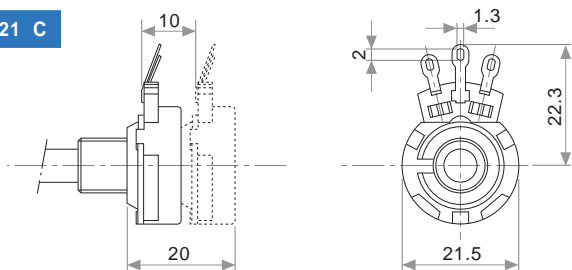


**T-21 Z**

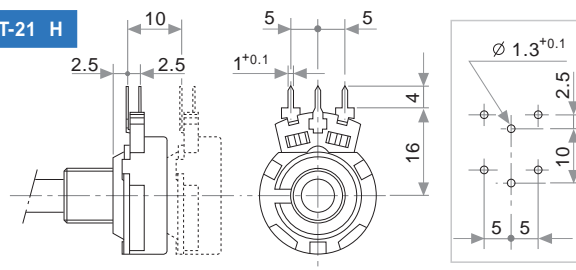


## TERMINALS

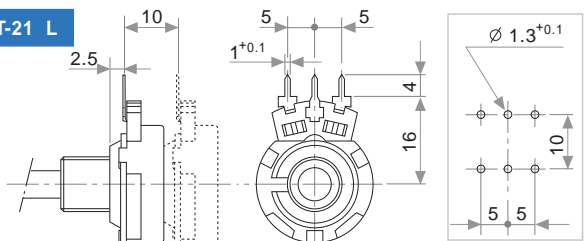
**T-21 C**



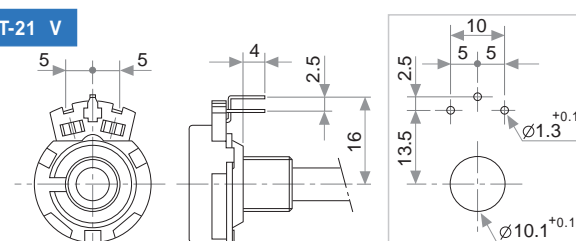
**T-21 H**



**T-21 L**



**T-21 V**



## PLASTIC SHAFTS

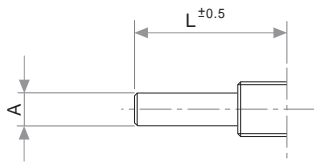
| T-21 X/Y without Switch |        |        |      |
|-------------------------|--------|--------|------|
| Knurling length         | T-21 X | T-21 Y | CODE |
| K = 0                   | L = 2  | /      | P01  |
| K = 6                   | L = 10 | /      | P02  |
| K = 12                  | L = 16 | L = 15 | P03  |
| K = 12                  | L = 26 | L = 25 | P04  |
| K = 12                  | L = 36 | L = 35 | P05  |
| K = 35                  | L = 46 | L = 45 | P06  |

| T-21Y w/Sw F01  |        |      |
|-----------------|--------|------|
| Knurling length | T-21 Y | CODE |
| K = 5           | L = 16 | P10  |
| K = 14.6        | L = 25 | P11  |
| K = 35          | L = 46 | P12  |

| T-21 W/Z without Switch |        |        |      |
|-------------------------|--------|--------|------|
| Knurling length         | T-21 W | T-21 Z | CODE |
| K = 12                  | L = 26 | L = 26 | P07  |
| K = 12                  | L = 36 | L = 36 | P08  |
| K = 12                  | L = 46 | L = 46 | P09  |

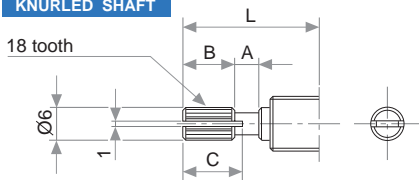
## METALIC SHAFTS

### PLAIN SHAFT



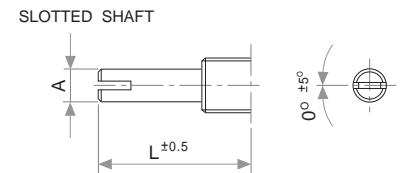
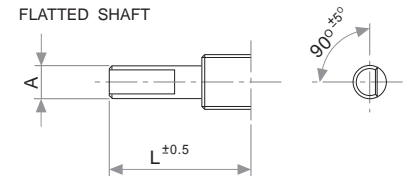
| A    | L     | CODE |
|------|-------|------|
| 6    | 60    | M06  |
| 6.35 | 60    | M07  |
| 4/6  | 50/60 | M08  |

### KNURLED SHAFT



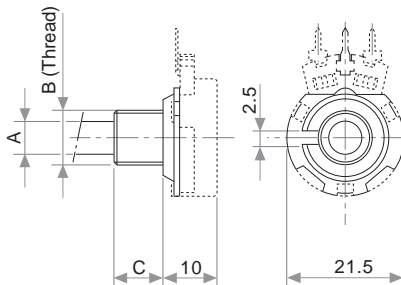
| L  | A | B  | C  | CODE |
|----|---|----|----|------|
| 15 | 2 | 6  | 7  | M11  |
| 20 | 2 | 10 | 11 | M12  |
| 25 | 4 | 12 | 14 | M13  |
| 30 | 4 | 12 | 14 | M14  |
| 35 | 4 | 12 | 14 | M15  |
| 40 | 4 | 12 | 14 | M16  |

### UNDER DRAWING



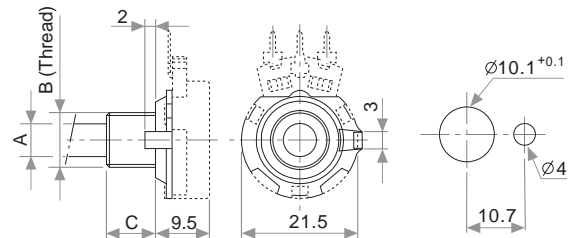
## BUSHINGS

### STANDARD



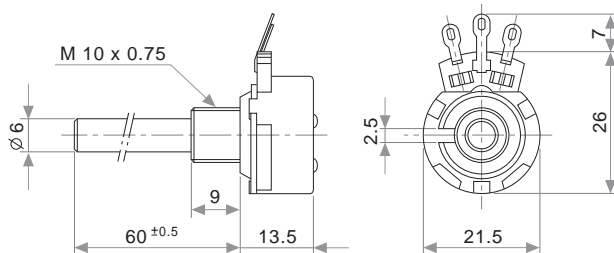
| CODE | A    | B          | C  |
|------|------|------------|----|
| 07   | 6    | M10 x 0.75 | 9  |
| 08   | 6    | M10 x 0.75 | 12 |
| 09   | 6    | M10 x 0.75 | 19 |
| 14   | 6.35 | M10 x 0.75 | 9  |

### NON ROTARY PAWL

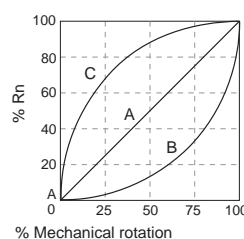


| CODE | A    | B            | C  |
|------|------|--------------|----|
| 11   | 6    | 3/8" x 32 h. | 9  |
| 12   | 6    | 3/8" x 32 h. | 12 |
| 13   | 6.35 | 3/8" x 32 h. | 9  |

## DETENTS

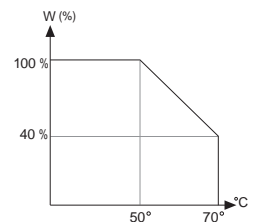


## TAPERS



A: Lin.  
B: Log.  
C: Alog.

## POWER RATING CURVE



## TESTS

## TYPICAL VARIATIONS

|                                  |                           |                       |
|----------------------------------|---------------------------|-----------------------|
| ELECTRICAL LIFE                  | 1.000 h. 50°C; 0.25 W     | ±5 %                  |
| MECHANICAL LIFE* :               | 25.000 (10-15 CPM)        | ±3 % (Rn < 1 M)       |
| 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 %                  |

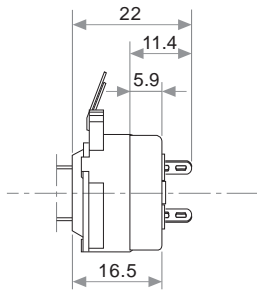
NOTE: Out of range values may not comply these results.

(\*) only applicable to values ≥1K. For lower values please consult.

## PACKAGING

Boxes of 150 / 200 pieces (160 x 110 x 85 mm.)

# SWITCH F1



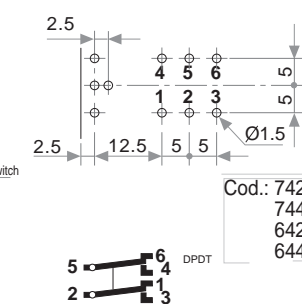
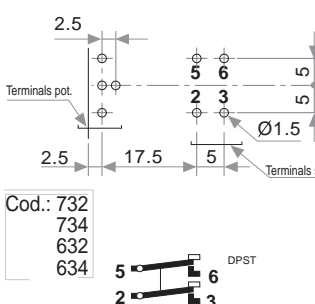
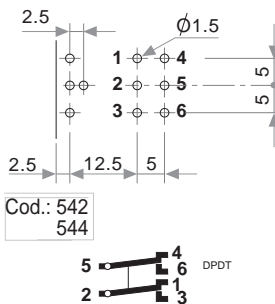
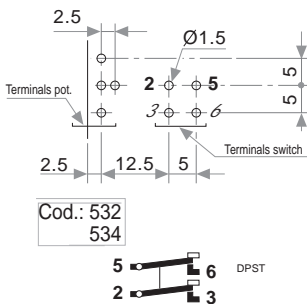
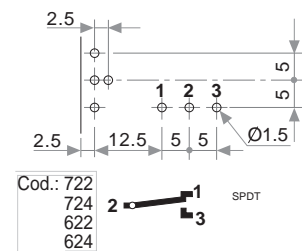
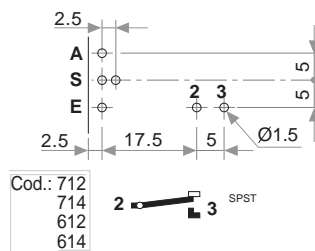
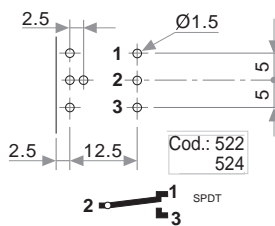
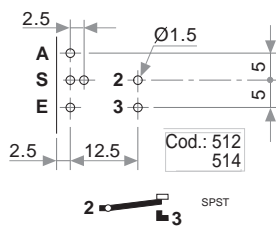
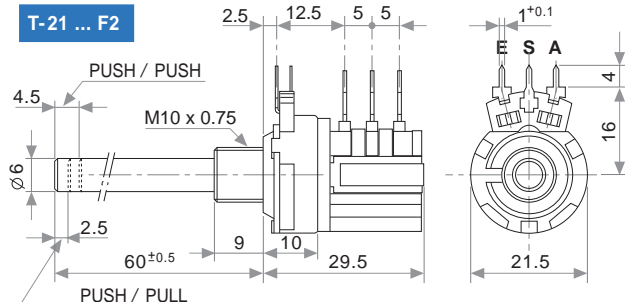
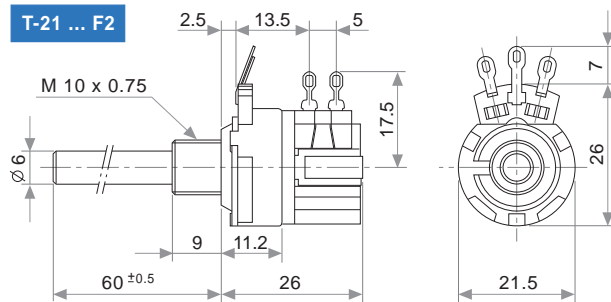
| MECHANICAL & ELECTRICAL SPECIFICATIONS | F 1                     |
|----------------------------------------|-------------------------|
| OPERATING ANGLE                        | 50° ±5°                 |
| OPERATING TORQUE                       | 3-7 Ncm (4.2-9.8 in-oz) |
| MAXIMUM AXIAL CHARGE                   | 80 N; 17 pounds         |
| NOMINAL CURRENT                        | 1A; 250 VAC             |
| CONTACT RESISTANCE                     | ≤ 25mΩ                  |
| TEST VOLTAGE (DIELECTRIC STRENGTH)     | 2000 V (50 Hz)          |

# SWITCH F2

| ELECTRICAL SPECIFICATIONS               | F 2                            |
|-----------------------------------------|--------------------------------|
| SWITCH RATING                           | 2 or 4A; 250 VAC               |
| CONTACT RESISTANCE                      | ≤ 25 mΩ                        |
| DIELECTRIC STRENGTH                     | 2000 V                         |
| INSULATION RESISTANCE                   | 100 MΩ                         |
| MECHANICAL SPECIFICATIONS               | F 2                            |
| OPERATING ANGLE (ROTARY)                | 35° ± 5°                       |
| PUSH / PUSH OPERATING TRAVEL            | 4 mm.                          |
| PUSH / PULL OPERATING TRAVEL            | 2.5 mm.                        |
| OPERATING TORQUE (ROTARY)               | 2 to 9 Ncm. (2.8 to 12.7oz/in) |
| OPERATING FORCE (Push/Push ; Push/Pull) | 4 to 7 N (14 to 27oz)          |
| MECHANICAL LIFE                         | 10.000 cycles                  |
| STOP TORQUE                             | > 100 Ncm. (142 oz/in)         |

## ROTARY

## PUSH



# I-21 HOW TO ORDER (only switch)

## STANDARD

## OPTIONAL

|               |                     |                  |                     |                 |                |                           |                              |
|---------------|---------------------|------------------|---------------------|-----------------|----------------|---------------------------|------------------------------|
| <b>I-21</b>   | <b>2</b>            | <b>3</b>         | <b>4</b>            | <b>M06</b>      | <b>0</b>       |                           |                              |
| <b>Series</b> |                     | <b>Code</b>      | <b>Switch model</b> | <b>Circuits</b> | <b>Shafts</b>  | <b>Shaft spec. length</b> | <b>Nut &amp; washer</b>      |
| I-21          |                     | 1                | 1                   | 1               | M04; L= 40     | XX.X                      | - TA = Loose nut & washer    |
| (See note 1)  |                     | 2                | 2                   | 1               | M06; L= 60     | (See note 3)              | MTA = Assembled nut & washer |
|               |                     | 3                | 1                   | 2               |                |                           | MT = Assembled nut           |
|               |                     | 4                | 2                   | 2               |                |                           | - T = Loose nut              |
|               |                     |                  |                     |                 |                |                           |                              |
| <b>Code</b>   | <b>Switch model</b> | <b>Terminals</b> |                     | <b>Code</b>     | <b>Current</b> | <b>Voltage</b>            |                              |
| 1             | rotary switch       | Solder lugs      |                     | 2               | 2 A            | 250 V                     |                              |
| 2             | push/ push switch   | Solder lugs      |                     | 4               | 4 A            | 250 V                     |                              |
| 3             | push/ pull switch   | Solder lugs      |                     |                 |                |                           |                              |
| 5             | rotary switch       | PCB              |                     |                 |                |                           |                              |
| 6             | push/ push switch   | PCB              |                     |                 |                |                           |                              |
| 7             | push/ pull switch   | PCB              |                     |                 |                |                           |                              |

### NOTES:

- When only the switch is ordered (without potentiometer), it will be called "I-21" followed by the respective code.
- The shaft and bushing for "I-21" is:

| COD. | A | B          | L  |
|------|---|------------|----|
| M06  | 6 | M10 x 0.75 | 60 |

- Only for special length and plain shaft (not knurled).  
Example: E: Ø6 L= 24.5 M06 24.5 → special length  
Flatted and slotted shafts, etc. will need drawing.

## HOW TO ORDER CUSTOM DRAWING

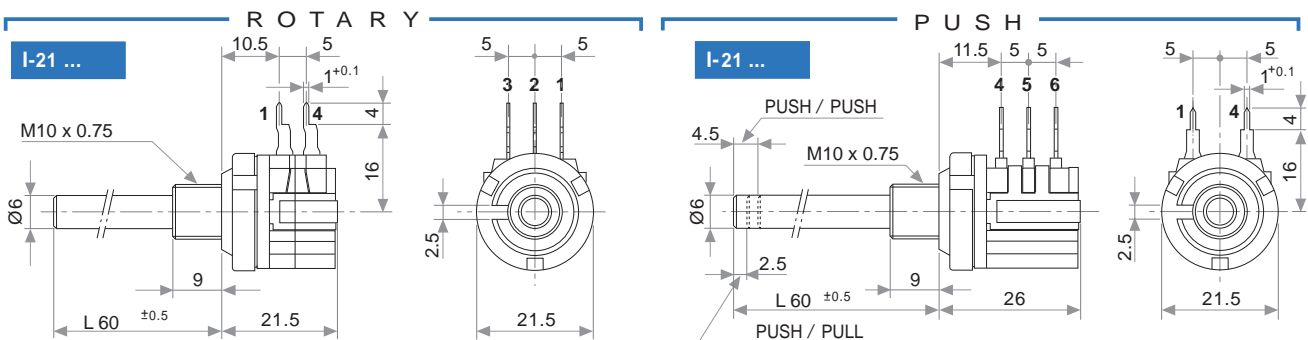
## STANDARD OPTIONS

I-21 + DRAWING NUMBER (Max. 16 digits)

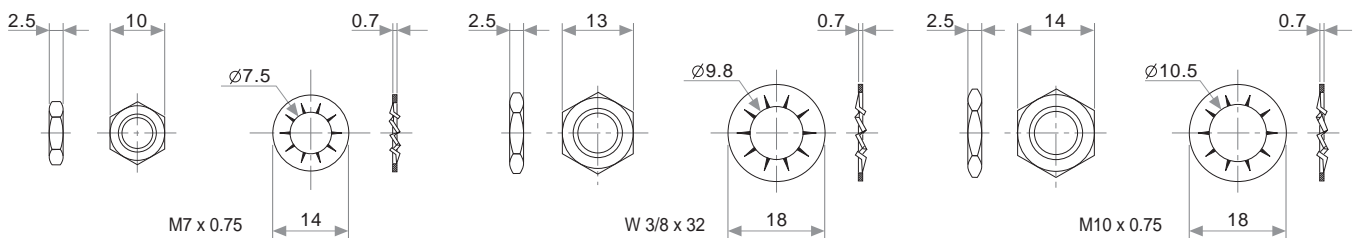
This way of ordering should be used for options which are not included in the "How to order" standard and optional extras.

Shaft length ..... See note 2

Nut & washer ..... Without nut and washer



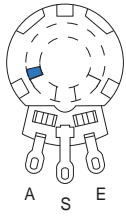
## NUT & WASHER



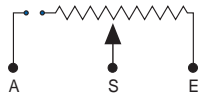
## PACKAGING

Boxes of 100 pieces ( 160 x 110 x 85 mm.).

## OPEN CIRCUIT FEATURE (CUT TRACK)

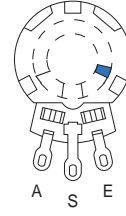
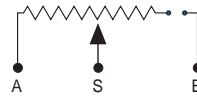


**PCI**  
Cut track at the beginning of the travel.



CCW on-off (A)

**PCF**  
Cut track at the end of the travel



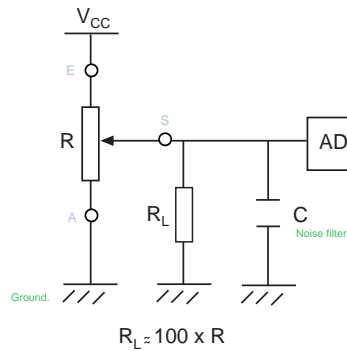
CW on-off (E)

A = Initial S = Wiper E = Final.

PCI, PCF and other configurations available upon request. Check the ordering code with Piher.

## RECOMMENDED CONNECTIONS

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



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