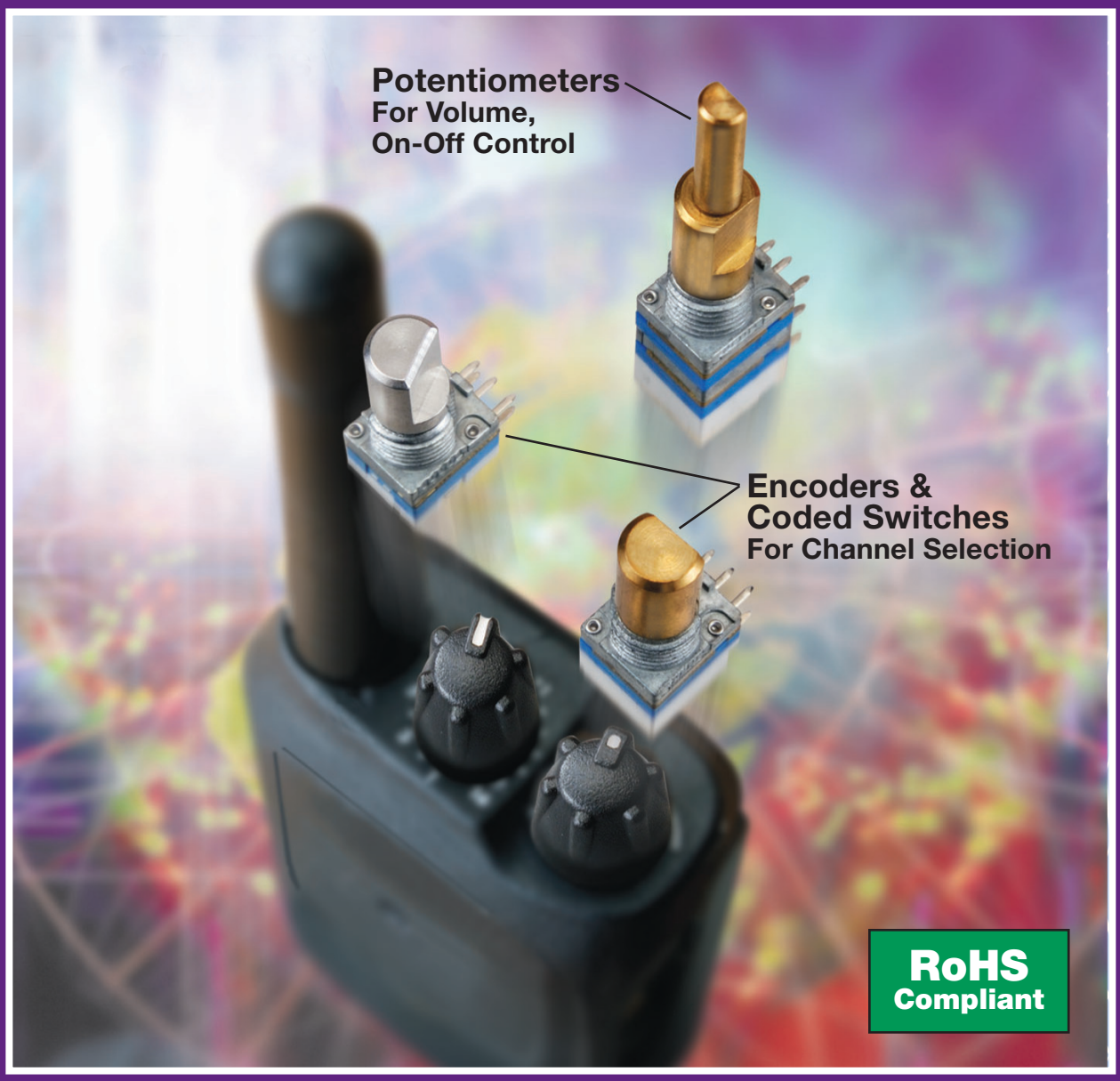
TOCOS

TP7 and TP9 Series

POTENTIOMETERS
ENCODERS & CODED SWITCHES



SELECTION GUIDE

www.tocos.com

TP7 and TP9 Series

World's Smallest Potentiometers!



- **Compact and lightweight design optimize customers' space saving requirements**
- **Industry-proven durability and performance**
- **Shaft and bushing flexibility for custom design requirements**

Features

- **Compact 7mm Design**

- **Durability**
Stainless shafts are available as an option. Stainless shafts are 1.5 times stronger than conventional brass and aluminum shafts. Stainless shafts are ideal for hand-held, 2-way radios which have a high drop risk.

- **Variations of switches available**
Rotary and momentary push types are available as options. On-Off switch function and Band Selector function can be combined into one multi-function unit.

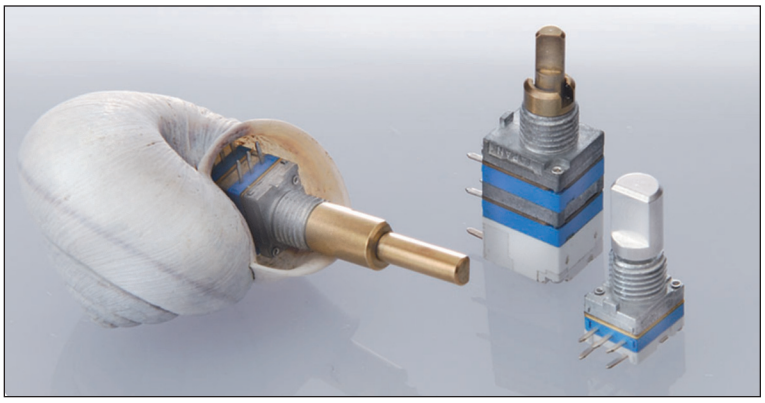
- **Waterproof option meets IP67**
Rubber O-ring installed between the shaft and bushing to prevent water intrusion is available as an option.

- **High torque models**

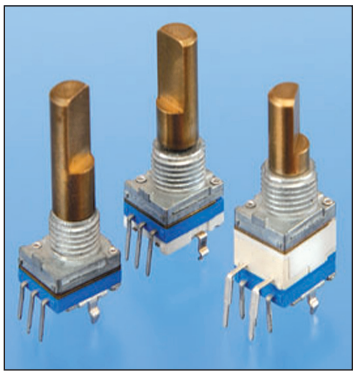
- **Vertical and horizontal mounts**

- **Wide temperature range**
Standard: -20 to +70°C
Optional: -30 to +70°C

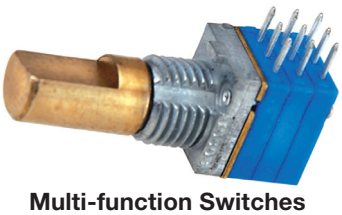
RoHS Compliant



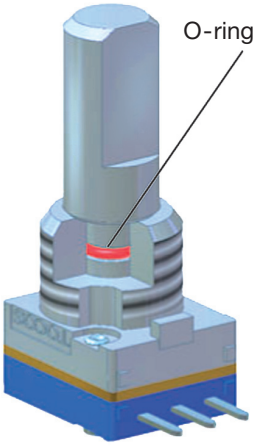
Compact 7mm and 9mm Models



Vertical Mount Models



Multi-function Switches



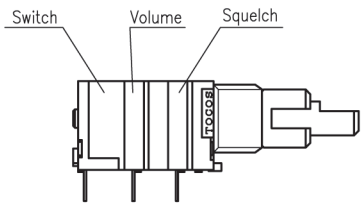
Waterproof Option

Major Applications For Volume, Encoders and Switches

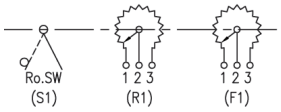
POTENTIOMETERS

1. For Volume + Power On-Off Switches:
   TP76N00N, TP96N00N
2. For Volume + Squelch + Power On-Off Switches:
   TP76D00N, TP96D00N

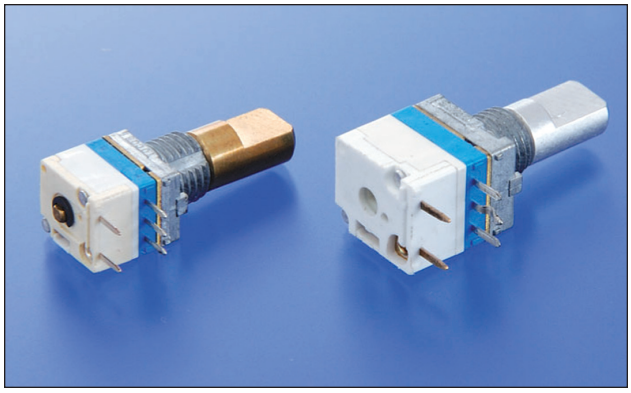
Rotary Switch



TP76D00N



Circuit Diagram

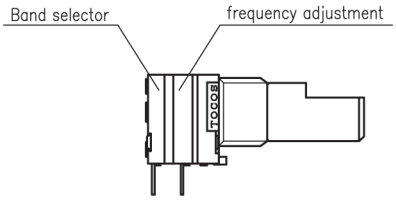


See page 4 for drawing.

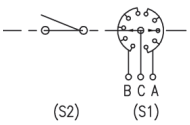
ENCODERS

1. For Random Frequency Adjustment:
   TP70N00E20, TP90N00E20
2. For Random Frequency Adjustment + Frequency Band Selector:
   TP70N00AE20, TP90N00AE20

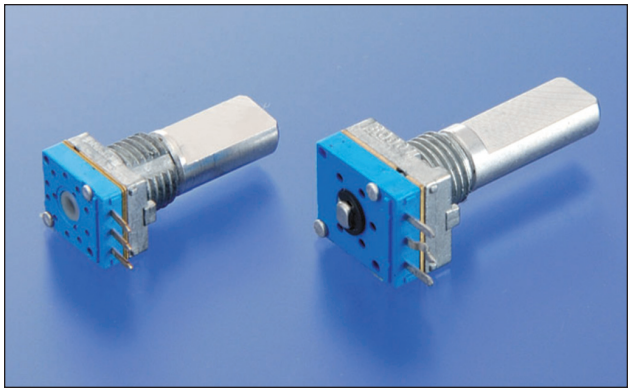
Momentary Push Switch



TP70N00AE20



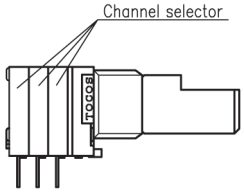
Circuit Diagram



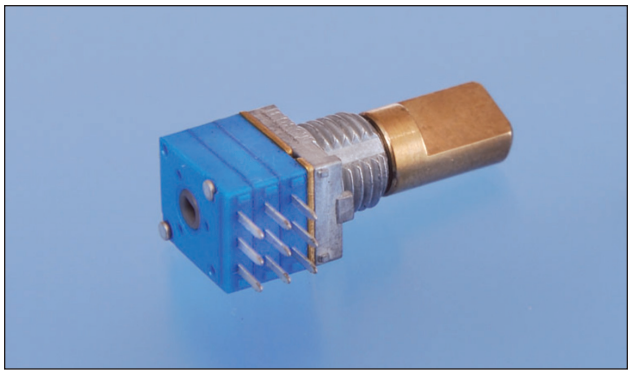
See page 5 for drawing.

CODED SWITCHES

1. For Pro-use. Channel selector is preset to assigned frequencies:
   TP70TF5161 (Triple unit, Single shaft, 16 channels)



TP70TF5161



See page 6 for drawing.

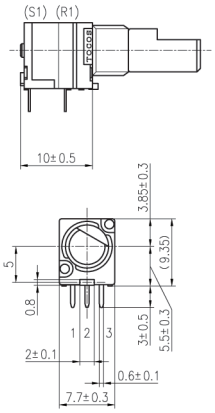
Potentiometers

TP7 Series - 7mm

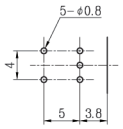
TP76N00N



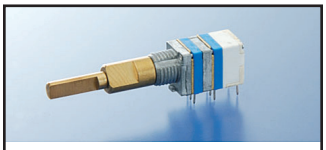
Outline Dimensions



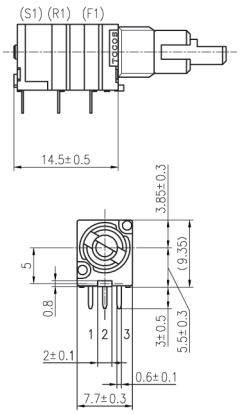
Mounting Hole Dimensions



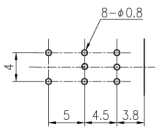
TP76D00N



Outline Dimensions

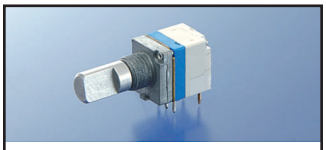


Mounting Hole Dimensions

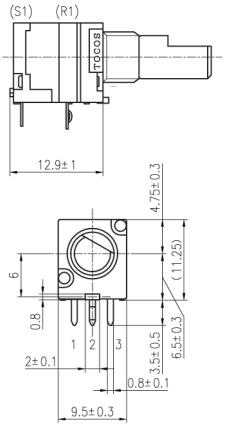


TP9 Series - 9mm

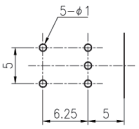
TP96N00N



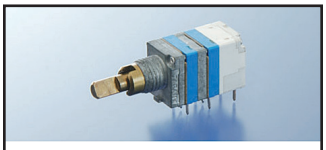
Outline Dimensions



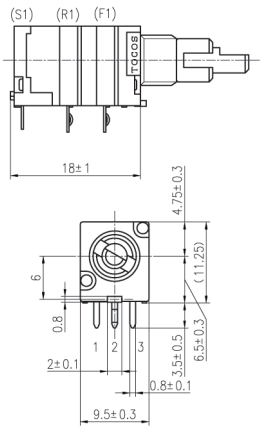
Mounting Hole Dimensions



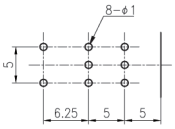
TP96D00N



Outline Dimensions



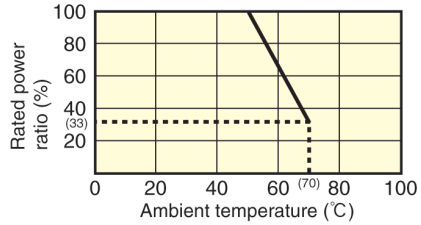
Mounting Hole Dimensions



Electrical

• Nominal total resistance	1, 2, 5, 10, 20, 50, 100, 200, 500(kΩ)
• Resistance tolerance	±20%
• Resistance taper	A • B • C
• End resistance	50Ω max.
• Power rating	0.05W
• Noise	100mV max.
• Insulation resistance	100MΩ min. at DC250V
• Dielectric strength	1 minute at AC300V
• Max. operating voltage	DC10V, AC50V

• Derating curve



Environment

• Soldering heat resistance	350±5°C at 3 sec.
• Operating temperature range	-20 to +70°C
• Rotational life	15,000 cycles without load
• Shaft Seal (Optional O-ring seal between the bushing and shaft)	After securing to a panel, there shall be no leak between shaft and bushing at up to 9.8kPa (0.1kgf/cm²) 1 meter water by hydraulic pressure for 30 minutes (IP67).

Mechanical

• Total rotational angle	300° (Mechanical)
• Rotational torque	2 to 24.5mN • m at +20°C (20 to 250gf • cm) 49.1mN • m at -20°C (500gf • cm max.)
• Shaft wobble and bend	
Radial direction	0.5 x Shaft length/30mm max.
Thrust direction	0.5mm max.
• Detent position	Center, 11, etc.
• Detent torque	2.9-29.4mN • m (30 to 300gf • cm)
• Shaft stopper strength	
TP7 inner shaft of dual shaft	0.3N • m (3kgf • cm) min.
TP7 others	0.4N • m (4kgf • cm) min.
TP9	0.5N • m (5kgf • cm) min.
• Shaft push-pull strength	98.1 N (10kgf) min.
• Nut tightening strength	0.98N • m (10kgf • cm) min.

Switch Specifications

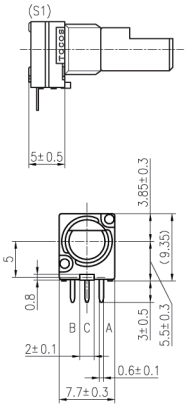
• Rotary switch, N	S.P.S.T.: DC16V-3A; 50° max.
• Momentary push, A	S.P.S.T.: DC12V-0.5A; 0.5mm Stroke
• Switch life	10,000 cycles without load
• Switch contact resistance	Initial 50mΩ max. After 10,000 cycles-200mΩ max.

TP7 Series - 7mm

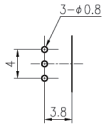
TP70N00E20



Outline Dimensions



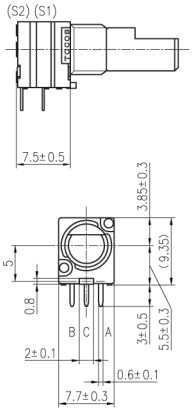
Mounting Hole Dimensions



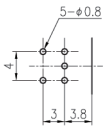
TP70N00AE20



Outline Dimensions

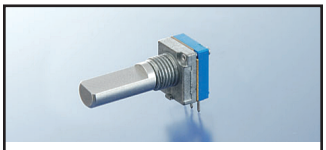


Mounting Hole Dimensions

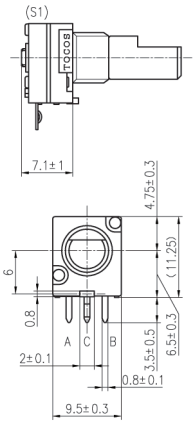


TP9 Series - 9mm

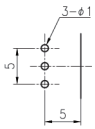
TP90N00E20



Outline Dimensions



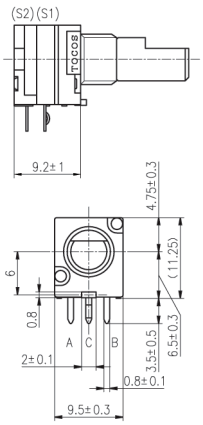
Mounting Hole Dimensions



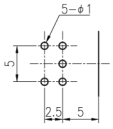
TP90N00AE20



Outline Dimensions



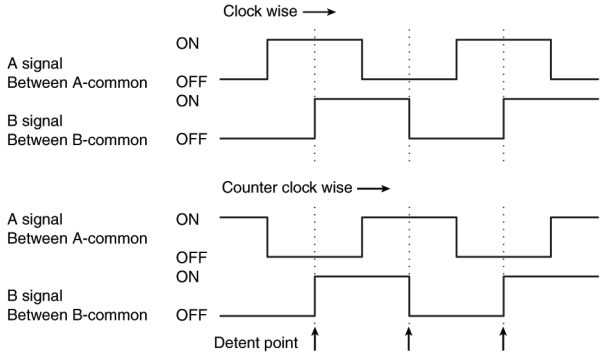
Mounting Hole Dimensions



Specifications

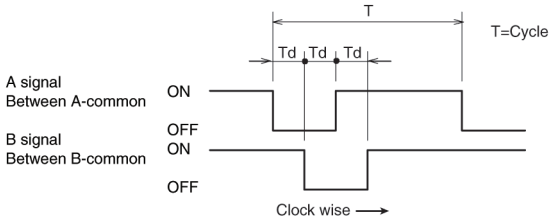
• Voltage rating	DC 5V
• Current rating	1mA
• Max. operating current	2.5mA
• Chattering	10ms max. (15 r.p.m)
• Contact resistance	TP7 10Ω max. TP9 200Ω max.

• Output signal



• Resolution	10 pulses
• Detent point	20 detents A-common: ON or OFF B-common: Non provisions

• Phase Difference Td=T/4±T/6



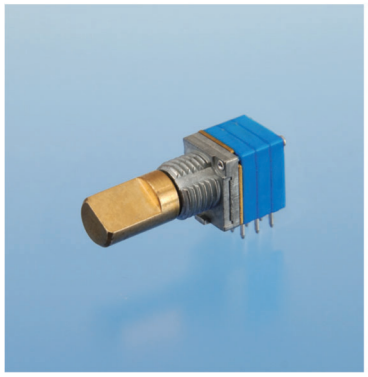
• Duty ratio	50%±5% (18°±5.4°)
• Step angle	18°±3°
• Rotational Life	50,000 cycles
• Rotational torque	2 to 24.5mN • m (0 to +70°C) (20 to 250gf • cm) 49.1mN max. (0 to -20°C) (500gf • cm max.)

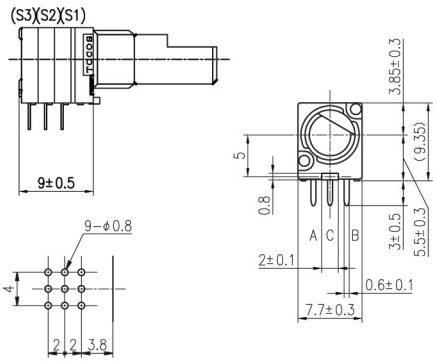
Please refer to Page 4 for other specifications.

Coded Switches

TP7 Series - 7mm

TP70TF5161(S) (S)=Sealed with O-ring between shaft and bushing





●—ON
○—OFF

Detent position		S1 A–C	S1 B–C	S2 A–C	S2 B–C	S3 A–C
FULL CCW	1	○	○	●	○	●
	2	○	●	●	○	●
	3	○	●	●	●	●
	4	○	○	●	●	●
	5	○	○	○	●	●
	6	○	●	○	●	●
	7	○	●	○	○	●
CW	8	○	○	○	○	●
	9	○	○	○	○	○
	10	○	○	●	○	○
	11	○	●	●	○	○
	12	○	●	●	●	○
	13	○	○	●	●	○
	14	○	○	○	●	○
	15	○	●	○	●	○
	16	○	●	○	○	○

Electrical Characteristics

	Specification	Conditions
• Contact resistance	ON: 250Ω max. OFF: 1MΩ min.	Detent position
• Dielectric strength	No dielectric strength	AC300V at 1 minute Between terminal - Case Between terminal - Shaft
• Insulation resistance	100MΩ min.	DC250V at 1 minute Between terminal - Case Between terminal - Shaft

Mechanical Characteristics

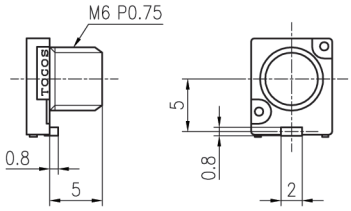
	Specification	Conditions
• Operating force	9.8-29.4mN • m(0 to +70°C) (100-300gf • cm) 98.1mN • m max.(0 to -20°C) (1000gf • cm) With detent pressure	
• Step angle	20±3° Rotational angle: 300±5°	
• Terminal strength	No damage to case and terminal fall-off. Bent terminals shall be acceptable No abnormality in electrical characteristics after testing to be seen	Static load of 4.9N (0.5kgf) shall be applied to the tip of the terminals for 15 secs. in vertical direction (1 time/terminal)
• Strength	Shaft pull: 98.1N min. (10kgf min.) Shaft push: 98.1N min. (10kgf min.) Nut tightening: 0.98N • m min. (10kgf • cm min.)	Static load
• Soldering, heat-resistance	There shall be no mechanical abnormality such as excessive play	Soldering iron: Max. 3 sec at 350±5°
• Shaft stopper strength	0.39N • m min. (4kgf • cm min.)	
• Shaft wobble and bend	Radial: 0.5x shaft length/30mm max. Single shaft thrust: 0.5mm max. 2.5N (250gf) applied to tip of the shaft	

Durability Characteristics

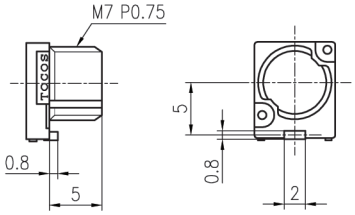
	Specification	Conditions
• Life (without load)	5,000 cycles (150,000 steps)	Contact resistance (ON): 1k Ω max. Contact resistance (OFF): 1MΩ min.
• Operating temperature range	-20°C to +70°C	
• Shaft Seal (Optional O-ring seal between the bushing and shaft)	After securing to a panel, there shall be no leak between shaft and bushing at up to 9.8kPa (0.1kgf/cm²) 1 meter water by hydraulic pressure for 30 minutes (IP67).	

BUSHING OPTIONS

TP7-M6

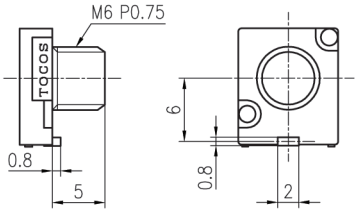


TP7-M7

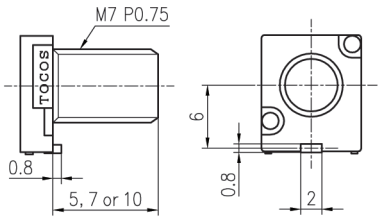


TP9-M6

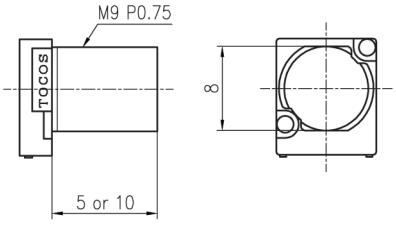
(For single shaft only)



TP9-M7

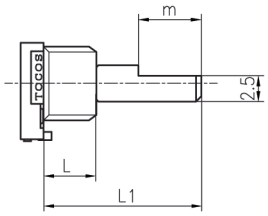


TP9-M9

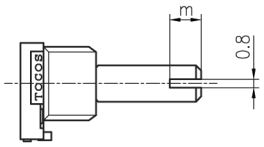


SHAFT DIAMETERS AND STYLES

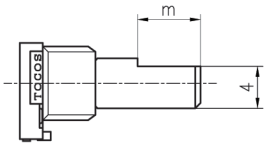
SINGLE SHAFT



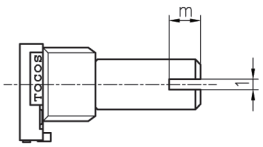
∅3.5mm - F



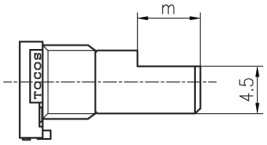
∅3.5mm - S



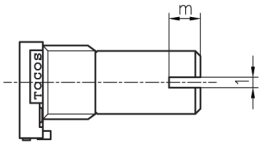
∅4.75mm - F



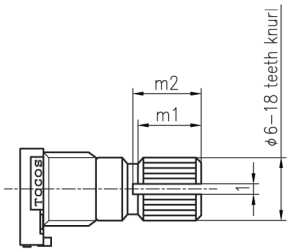
∅4.75mm - S



∅6mm - F



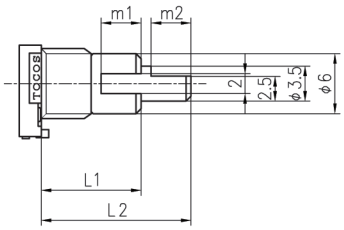
∅6mm - S



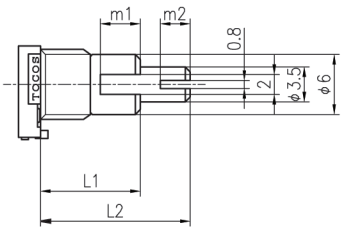
∅6mm - SK

DUAL SHAFT

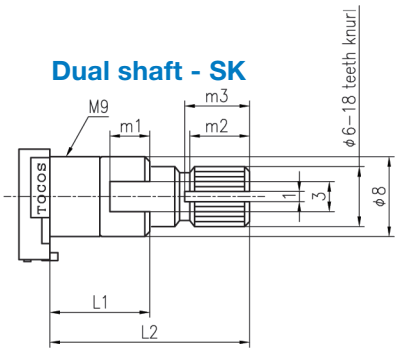
Dual shaft - F



Dual shaft - S



Dual shaft - SK



TP7 and TP9 Series Part Numbering System

Example: TP96G00N 20S B103 A104
M7-5mm Shaft-6mm dia.

								POT #1		POT #2	
TP	9	6	G	00	N	20	S	B	103	A	104

Style
TP = Horizontal
RH = Vertical

Size
7 = 7mm
9 = 9mm

Type
6 = 300° Rotation
0 = Non-Element, Encoder or Switch

Structure
N = Single Unit, Single Shaft
G = Dual Unit, Single Shaft
D = Dual Unit, Dual Shaft
F = Triple Unit, Dual Shaft
Q = Quad Unit, Single Shaft
T = Triple Unit, Single Shaft

Combinations*
00 = No Combination
01 = Center Detent
17 = High Torque
97 = Sealed with Shaft O-ring
975 = Stainless Steel Shaft

***Hundreds of combinations are available. Contact Tocos for combination options.**

Resistance Code
First and Second Digit = Value
Third Digit = Multiplier
Example: 103 = 10,000Ω

Resistance Taper
A = Audio (CW Log)
B = Linear
C = CCW Log

Shaft Ending
SK = Slotted and Knurled
S = Screw Driver Slot
F = Flatted

Shaft Length in mm
Including Bushing

Switch Type
Blank = No Switch
N = Rotary Switch
A = Momentary Push On
NA = Rotary + Momentary Push On
E20 = Rotary Encoder

1. Choose the potentiometers structure.
2. Select a combination, if none use 00.
3. Select switch type, if none leave blank.
4. Select shaft length, including the bushing. Standards are 15 and 20mm.
5. Select shaft ending.
6. Select taper and ohmic value.
7. Determine bushing and shaft sizes. (Other combinations are available)

ISO9000
ISO14000
Certified

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