TP7 and TP9 Series
POTENTIOMETERS
ENCODERS & CODED SWITCHES

Potentiometers
For Volume, On-Off Control

Encoders & Coded Switches
For Channel Selection

RoHS Compliant

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
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

ENCODERS

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

CODED SWITCHES

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

TP7 Series - 7mm

TP76N00N  TP76D00N

TP9 Series - 9mm

TP96N00N  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.
**Encoders**

**TP7 Series - 7mm**

**TP9 Series - 9mm**

### 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**
  - Clock wise
  - A signal: ON
  - B signal: OFF
  - Clock wise
  - A signal: ON
  - B signal: OFF

  - Counter clock wise
  - A signal: OFF
  - B signal: ON
  - Counter clock wise
  - A signal: OFF
  - B signal: ON

- **Resolution**
  - 10 pulses

- **Detent point**
  - A-common: ON or OFF
  - B-common: Non provisions

- **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

### Electrical Characteristics

<table>
<thead>
<tr>
<th>Specification</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact resistance ON:</td>
<td>250Ω max. OFF: 1MΩ min.</td>
</tr>
<tr>
<td>Dielectric strength</td>
<td>No dielectric strength</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>100MΩ min.</td>
</tr>
</tbody>
</table>

### Mechanical Characteristics

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

### Durability Characteristics

<table>
<thead>
<tr>
<th>Specification</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life (without load)</td>
<td>5,000 cycles (150,000 steps)</td>
</tr>
<tr>
<td>Operating temperature range</td>
<td>-20°C to +70°C</td>
</tr>
<tr>
<td>Shaft Seal (Optional O-ring seal between the bushing and shaft)</td>
<td>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).</td>
</tr>
</tbody>
</table>
TOCOS®

BUSHING OPTIONS

TP7-M6
TP7-M7

TP9-M6
TP9-M7
TP9-M9

(For single shaft only)

SHAFT DIAMETERS AND STYLES

SINGLE SHAFT

Ø3.5mm - F
Ø6mm - F
Ø4.75mm - F
Ø4.75mm - S

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.

| Style | TP = Horizontal  
| 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.*

<table>
<thead>
<tr>
<th>POT #1</th>
<th>POT #2</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP 9 6 G 00 N 20 S B 103</td>
<td>A 104</td>
</tr>
</tbody>
</table>

- **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)