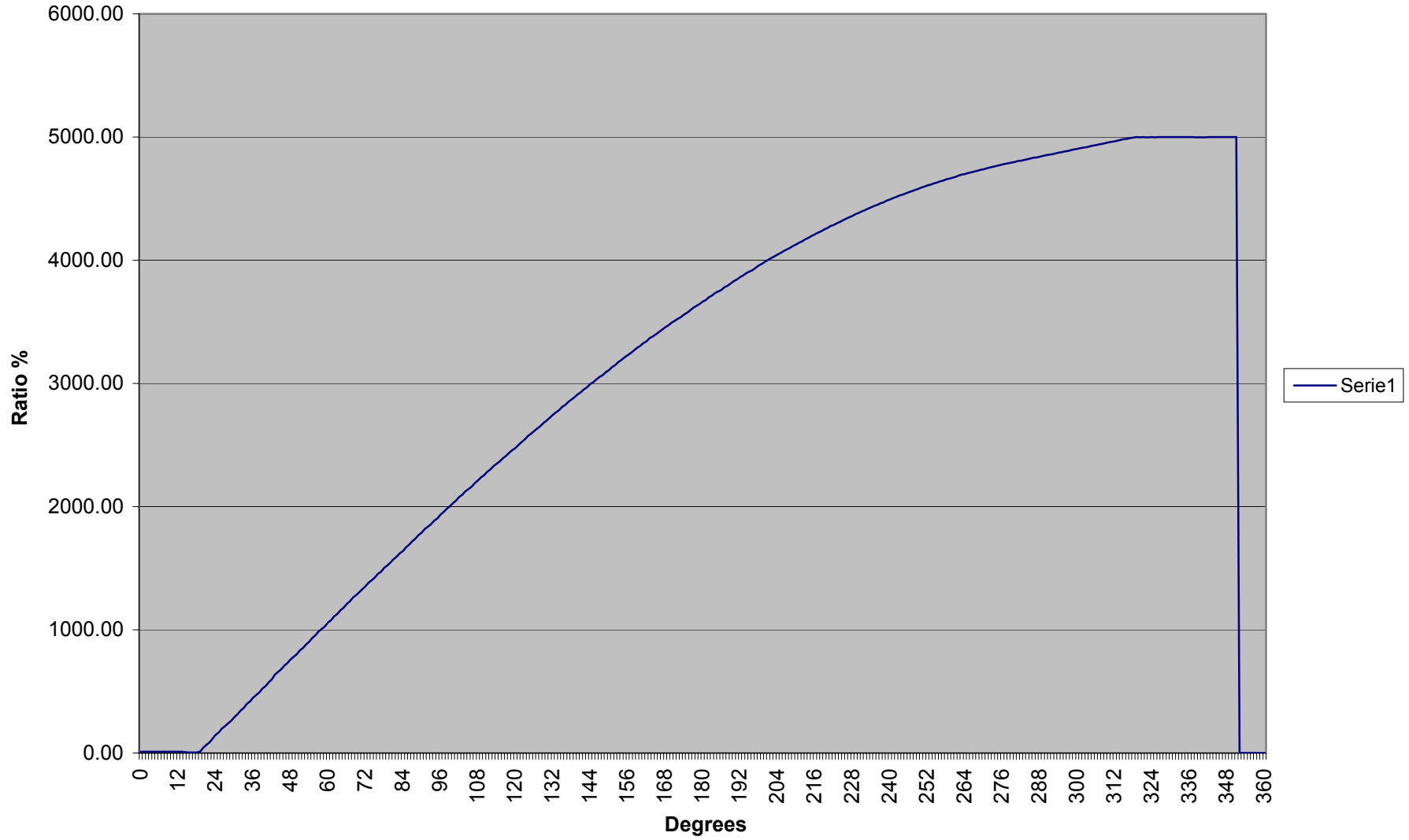




### fp50 sin90 5k





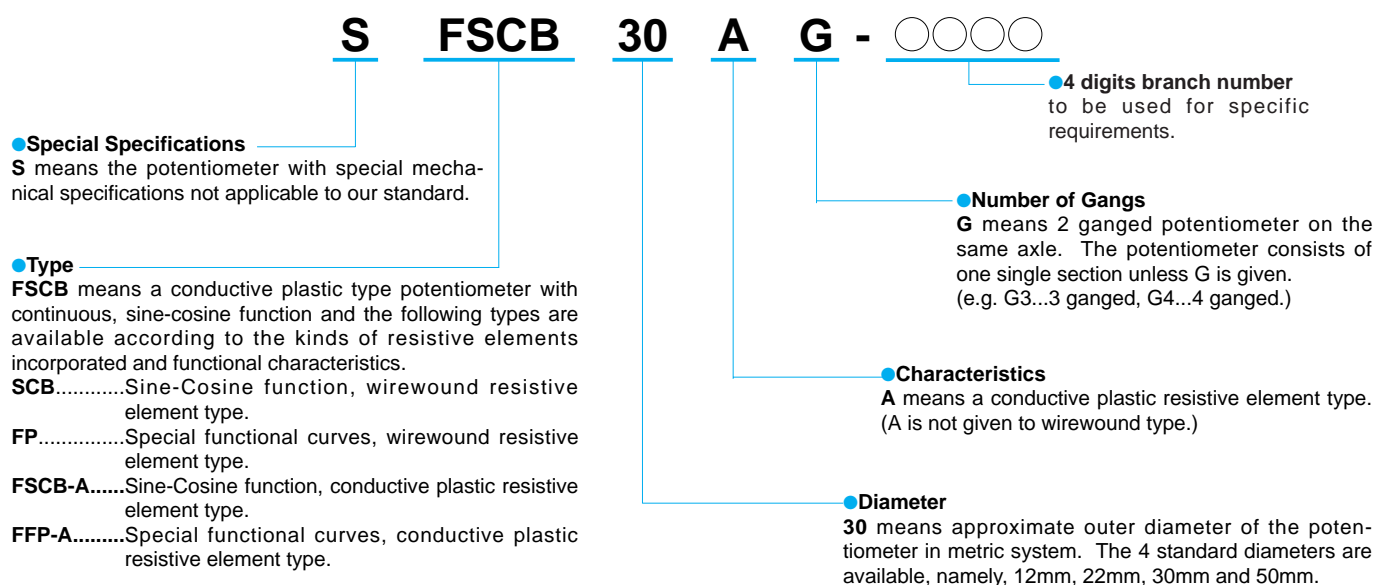
# NON-LINEAR POTENTIOMETER

(Precision 1-turn, Wirewound & Conductive Plastic Element)

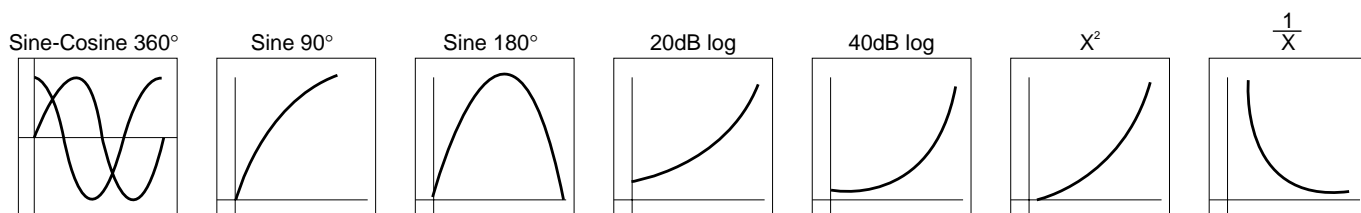
A precise detection of Sine-Cosine and other Non-Linear function voltage can be obtained through the shaft revolution of **SAKAE Non-Linear Potentiometer Series**. There are 2 kinds of resistive element in this series:

traditional wirewound with high stability and newest conductive plastic featuring long life expectancy and high speed tracking ability.

## THE NOMENCLATURE OF SAKAE NON-LINEAR POT. SERIES



### Examples of Non-Linear Function Curves



## SELECTION GUIDE

| Function Characteristics  | Kind of Element    | Model No.                        | Features   |
|---------------------------|--------------------|----------------------------------|--|
| Sine-Cosine               | Wirewound          | <b>SCB50</b>                     | Most popular precision pot. with sine-cosine output.   |
|                           | Conductive Plastic | <b>FSCB22A, FSCB30A, FSCB50A</b> | Conductive plastic resistive element pot. with essentially infinite resolution and long life expectancy, using a patented multifinger contact. |
| Special Functional Curves | Wirewound          | <b>FP50</b>                      | Various kinds of special functions are available in this series.   |
|                           | Conductive Plastic | <b>FFP12A, FFP22A</b>            | Various kinds of special functions are available in this series with smaller diameter.   |

## ● General Performances

| Kind of Element    | Model No. | Function Characteristics                        | Standard Total Resistance Range ( $\Omega$ ) | Special Resistance Values ( $\Omega$ ) | Conformity Tolerance (Peak-Peak) (%) | Special Specifications |                                |            |                     |             |              |
|--------------------|-----------|---|--|--|--------------------------------------|------------------------|--------------------------------|------------|---------------------|-------------|--------------|
|                    |           |   |  |  |                                      | With Stopper           | Front and Rear Shaft Extension | Extra Taps | Simple Sealing Type | With-Switch | Multi-ganged |
| Wirewound          | SCB50     | Sin-Cos   | 500~10k                                      | —                                      | $\pm 1.0 \sim \pm 0.5$               | —                      | ○                              | —          | ○                   | —           | ○            |
|                    | FP50      | $X^2, \frac{1}{X}$ , etc.                       | 500~10k                                      | —                                      | $\pm 5.0 \sim \pm 0.5$               | ○                      | ○                              | ○          | ○                   | ○           | ○            |
| Conductive Plastic | FSCB22A   | Sin-Cos   | 1k~10k                                       | 500, 20k, 50k                          | $\pm 2.0 \sim \pm 1.0$               | —                      | ○                              | —          | ○                   | —           | ○            |
|                    | FSCB30A   | Sin-Cos   | 1k~10k                                       | 500, 20k, 50k                          | $\pm 1.0 \sim \pm 0.7$               | —                      | ○                              | —          | ○                   | —           | ○            |
|                    | FSCB50A   | Sin-Cos   | 1k~10k                                       | 20k, 50k, 100k                         | $\pm 0.5 \sim \pm 0.2$               | —                      | ○                              | —          | ○                   | —           | ○            |
|                    | FFP12A    | Sin 360°<br>$\frac{1}{X^2}, \frac{1}{X}$ , etc. | 1k~10k                                       | —                                      | $\pm 5.0 \sim \pm 2.0$               | —                      | ○                              | ○          | ○                   | —           | —            |
|                    | FFP22A    | Sin 180°<br>$\frac{1}{X^2}, \frac{1}{X}$ , etc. | 1k~10k                                       | —                                      | $\pm 5.0 \sim \pm 1.0$               | ○                      | ○                              | ○          | ○                   | —           | ○            |

Note: 1. For detailed performances, please refer to specifications of each model in this catalog.

## ● Environmental Performances

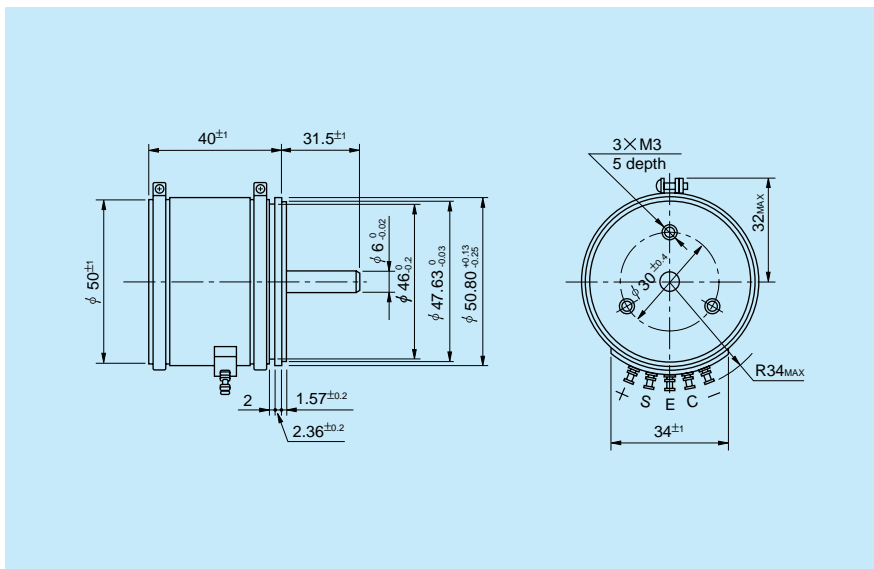
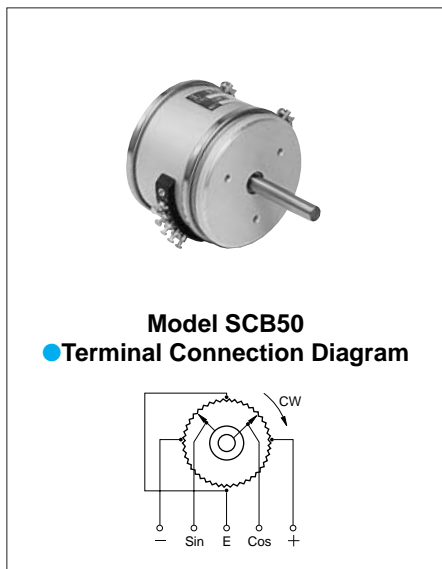
| Model Nos.                                  | SCB50, FP50   | FSCB22A, FSCB30A, FSCB50A, FFP12A, FFP22A   |
|---|---|---|
| <b>Operating Temperature Range</b>          | -55°C ~ +105°C  | -55°C ~ +105°C  |
| <b>Temperature Cycle</b>                    | 5 cycles under -55°C ~ +105°C<br>Total resistance value variation: below $\pm 5\%$<br>No mechanical damage  | 5 cycles under -55°C ~ +105°C<br>Total resistance value variation: below $\pm 10\%$<br>No mechanical damage   |
| <b>Exposure at Low Temperature</b>          | 24 hours at -55°C<br>Total resistance value variation: below $\pm 5\%$<br>No mechanical damage  | 24 hours at -55°C<br>Total resistance value variation: below $\pm 5\%$<br>No mechanical damage  |
| <b>Exposure at High Temperature</b>         | 1,000 hours at 105°C<br>Total resistance value variation: below $\pm 5\%$<br>No mechanical damage   | 1,000 hours at 105°C<br>Total resistance value variation: below $\pm 10\%$<br>No mechanical damage  |
| <b>Vibration</b>                            | 10Hz to 2,000Hz 147m/s <sup>2</sup> 12 hours<br>Total resistance value variation: below $\pm 5\%$<br>No mechanical and electrical damage  | 10Hz to 2,000Hz 147m/s <sup>2</sup> 12 hours<br>Total resistance value variation: below $\pm 2\%$<br>No mechanical and electrical damage  |
| <b>Shock</b>                                | 490m/s <sup>2</sup> 11ms 18 times<br>Total resistance value variation: below $\pm 1\%$<br>No mechanical and electrical damage   | 490m/s <sup>2</sup> 11ms 18 times<br>Total resistance value variation: below $\pm 1\%$<br>No mechanical and electrical damage   |
| <b>Moisture Resistance</b>                  | 40°C 95%RH 240 hours<br>Total resistance value variation: below $\pm 10\%$<br>Insulation resistance: over 10M $\Omega$  | 40°C 95%RH 120 hours<br>Total resistance value variation: below $\pm 10\%$<br>Insulation resistance: over 10M $\Omega$  |
| <b>Rotational Life Expectancy (at 25°C)</b> | No load at 40 r.p.m.<br>1,000,000 shaft revolutions<br>Total resistance value variation: below $\pm 5\%$ against initial value<br>Conformity tolerance: below 150% of specified value<br>Noise: below 500 $\Omega$ E.N.R. | No load at 400 r.p.m., inverting every 15 minutes<br>FSCB-A...50,000,000 shaft revolutions<br>FFP-A...10,000,000 shaft revolutions<br>Total resistance value variation: below $\pm 10\%$ against initial value<br>Conformity tolerance: below 150% of specified value<br>Output smoothness: below 150% of specified value |

Note: 2. In case of the potentiometer with special resistance values and special specifications, the above performances may change and therefore, please consult us in advance, separately.

3. As for operating temperature range, we can not guarantee that all values of performances can satisfy within this operating temperature range. (Please see page 24 in this catalog for further details.)

4. The above values of performances based on each testings were measured after each testings completed, respectively, under standard conditions. As for the values during testings and other values not mentioning in the above table, please ask us separately.

● Standard Dimensions



● General Specifications

Standard Resistance

Range: 500Ω to 10kΩ  
 Max. Practical Resistance Value: 20kΩ  
 Total Resistance Tolerance: Standard Class  $\pm 5\%$  (J)  
 Precision Class  $\pm 3\%$  (H)

Conformity

Tolerance: Standard Class  $\pm 1.0\%$   
 (Peak-Peak) Precision Class  $\pm 0.5\%$   
 Power Rating: 2.0W  
 Noise: Below 100Ω E.N.R.

Electrical Travel: 360° (Endless)  
 Mechanical Travel: 360° (Endless)  
 Insulation Resistance: Over 1,000MΩ at 1,000V.D.C.  
 Dielectric Strength: 1 minute at 1,000V.A.C.  
 Starting Torque: Below 11mN•m (110gf•cm)  
 Max. Working Voltage: 250V  
 Resist. Temperature Coefficient of Wire:  $\pm 20$ p.p.m./°C  
 Mass: Approx. 160g

● Standard Resistance Values ■ No. of Wire Turns ■ Resistance Wire Used

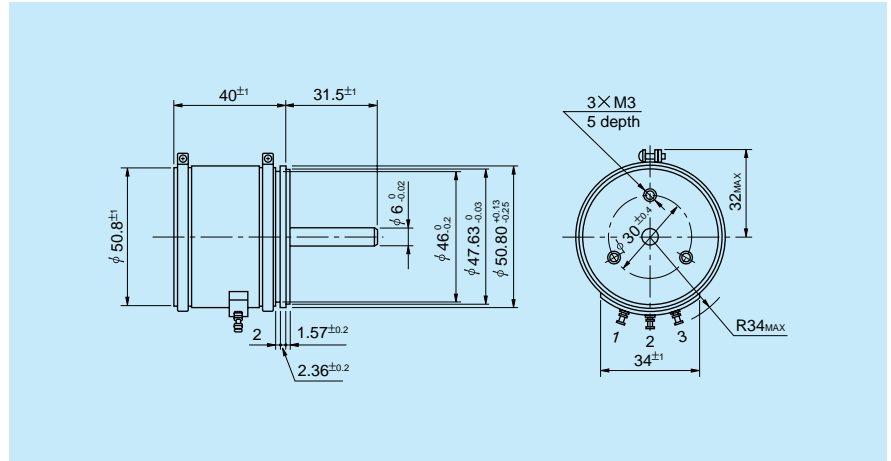
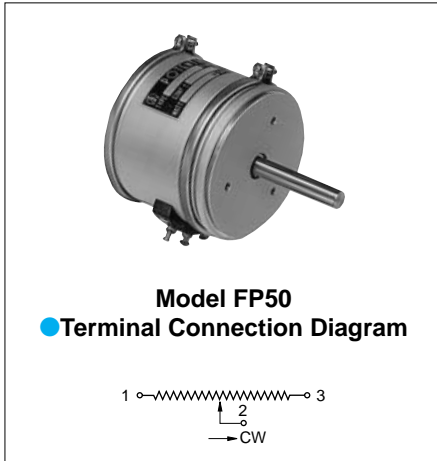
| Resist. Value (Ω) | 500          | 1k    | 2k    | 5k           | 10k   | ※ 20k |
|-------------------|--------------|-------|-------|--------------|-------|-------|
| No. of Wire Turns | 1,000        | 1,400 | 1,800 | 1,800        | 2,000 | 2,500 |
| Resist. Wire Used | Cu-Ni System |       |       | Ni-Cr System |       |       |

Note: Mark ※ shows value at special higher practical resistance.

● Special Specifications Available

Multi-ganged (Available up to 3 gangs. Housing length is extended by 30mm per 1 gang), Shaft with front and rear extension (Rear shaft with 6mm dia. and 15mm length), Bushingmount type, Shaft dia. (Ø6.35mm) with inch dimensions, Special machining on the shaft, Oil-filled type.

● Standard Dimensions

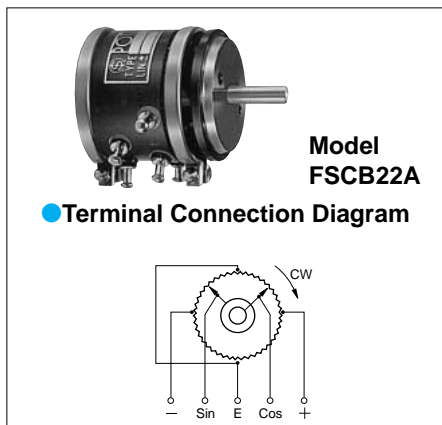


● General Specifications

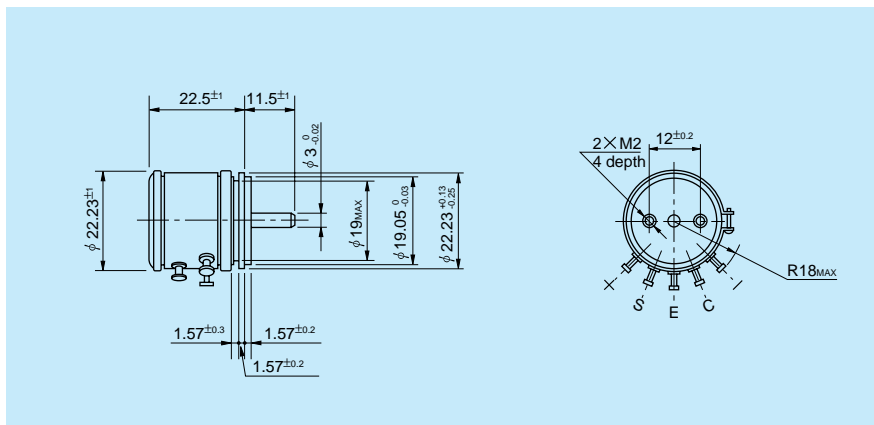
|   |   |   |                             |
|---|---|---|-----------------------------|
| <b>Standard Resistance Range:</b>           | 500Ω to 10kΩ  | <b>Noise:</b>                                   | Below 100Ω E.N.R.           |
| <b>Total Resistance Tolerance:</b>          | Standard Class ±10% (K)<br>Precision Class ±5% (J)  | <b>Electrical Travel:</b>                       | 300° ±3°                    |
| <b>Function Characteristics (Examples):</b> | 20dB log, Sine 90°, Sine 180°,<br>Tan 45°<br>X <sup>2</sup> (0 ≤ X ≤ 1)<br>1/X (1 ≤ X ≤ 10) | <b>Mechanical Travel:</b>                       | 360° (Endless)              |
| <b>Power Rating:</b>                        | 1.5W  | <b>Insulation Resistance:</b>                   | Over 1,000MΩ at 1,000V.D.C. |
| <b>Conformity Tolerance (Peak-Peak):</b>    | Standard Class ±5%<br>Precision Class ±3%<br>Super-precision Class ±1%                      | <b>Dielectric Strength:</b>                     | 1 minute at 1,000V.A.C.     |
|   |   | <b>Starting Torque:</b>                         | Below 8mN•m (80gf•cm)       |
|   |   | <b>Max. Working Voltage:</b>                    | 250V                        |
|   |   | <b>Resist. Temperature Coefficient of Wire:</b> | ±20p.p.m./°C                |
|   |   | <b>Mass:</b>                                    | Approx. 160g                |

● Special Specifications Available

Extra taps (Available up to 5 taps), Multi-ganged (Available up to 3 gangs. Housing length is extended by 30mm per 1 gang), Shaft with front and rear extension (Rear shaft with 6mm dia. and 15mm length), Bushingmount type, With stopper (Rotating angle becomes 330° and stopper strength is 0.9N•m [9kgf•cm]), Special electrical travel, Shaft dia. (Ø6.35mm) with inch dimensions, Special machining on the shaft, Oil-filled type.



● Standard Dimensions

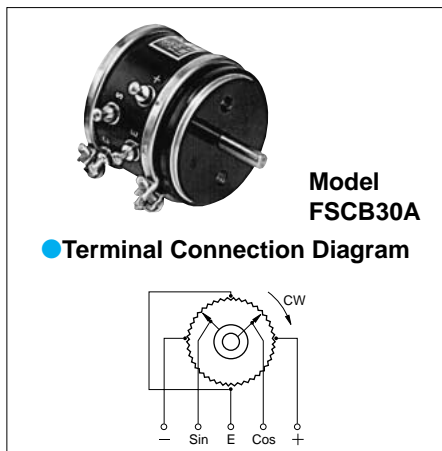


● General Specifications

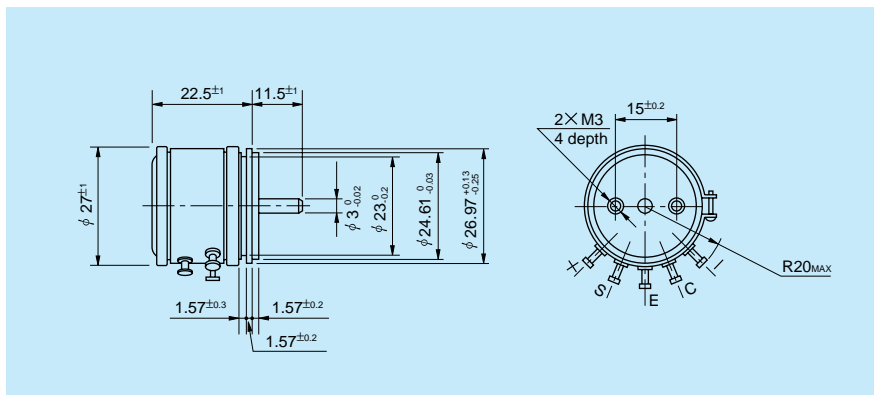
|   |   |   |                                   |
|---|---|---|-----------------------------------|
| <b>Standard Resistance Values:</b>          | 1k, 2k, 5k, 10k ( $\Omega$ )                                    | <b>Power Rating:</b>                    | 0.5W                              |
| <b>Special Practical Resistance Values:</b> | 500, 20k, 50k ( $\Omega$ )                                      | <b>Electrical Travel:</b>               | 360° (Endless)                    |
| <b>Total Resistance Tolerance:</b>          | Standard Class $\pm 15\%$ (L)<br>Precision Class $\pm 10\%$ (K) | <b>Mechanical Travel:</b>               | 360° (Endless)                    |
| <b>Conformity Tolerance:</b>                | Standard Class $\pm 2.0\%$<br>Precision Class $\pm 1.0\%$       | <b>Insulation Resistance:</b>           | Over 1,000M $\Omega$ at 500V.D.C. |
| <b>Resolution:</b>                          | Essentially infinite  | <b>Dielectric Strength:</b>             | 1 minute at 500V.A.C.             |
| <b>Output Smoothness:</b>                   | Below 0.1% against input voltage                                | <b>Starting Torque:</b>                 | Below 3mN·m (30gf·cm)             |
| <b>Contact Resistance Variation:</b>        | Below 8% C.R.V.   | <b>Max. Working Voltage:</b>            | 250V                              |
|   |   | <b>Resist. Temperature Coefficient:</b> | $\pm 400$ p.p.m./ $^{\circ}$ C    |
|   |   | <b>Mass:</b>                            | Approx. 20g                       |

● Special Specifications Available

Multi-ganged (Available up to 3 gangs. Housing length is extended by 16mm per 1 gang), Shaft with front and rear extension (Rear shaft with 3mm dia. and 10mm length), Shaft dia. ( $\varnothing 3.175$ mm) with inch dimensions, Special machining on the shaft, Oil-filled type.



● Standard Dimensions



● General Specifications

**Standard Resistance**

**Values:** 1k, 2k, 5k, 10k ( $\Omega$ )

**Special Practical**

**Resistance Values:** 500, 20k, 50k ( $\Omega$ )

**Total Resistance**

**Tolerance:** Standard Class  $\pm 15\%$  (L)  
Precision Class  $\pm 10\%$  (K)

**Conformity**

**Tolerance:** Standard Class  $\pm 1.0\%$

**(Peak-Peak)** Precision Class  $\pm 0.7\%$

**Resolution:** Essentially infinite

**Output Smoothness:** Below 0.1% against input voltage

**Contact Resistance**

**Variation:** Below 8% C.R.V.

**Power Rating:** 0.75W

**Electrical Travel:** 360° (Endless)

**Mechanical Travel:** 360° (Endless)

**Insulation Resistance:** Over 1,000M $\Omega$  at 500V.D.C.

**Dielectric Strength:** 1 minute at 500V.A.C.

**Starting Torque:** Below 3mN·m (30gf·cm)

**Max. Working Voltage:** 250V

**Resist. Temperature**

**Coefficient:**  $\pm 400$ p.p.m./°C

**Mass:** Approx. 30g

● Special Specifications Available

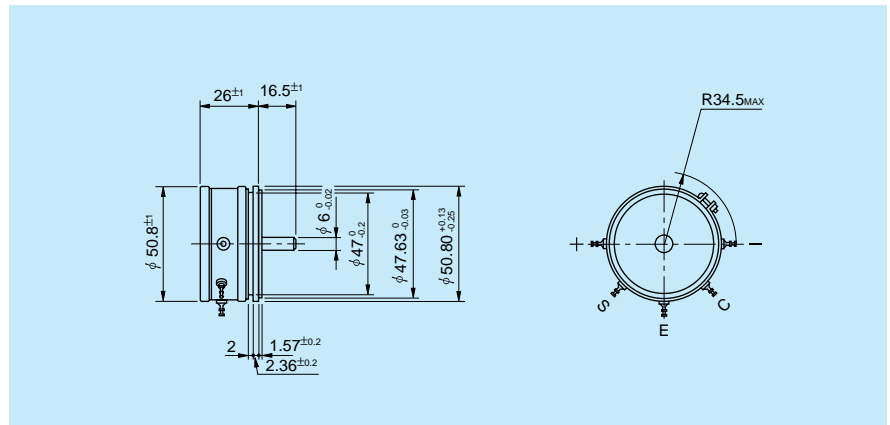
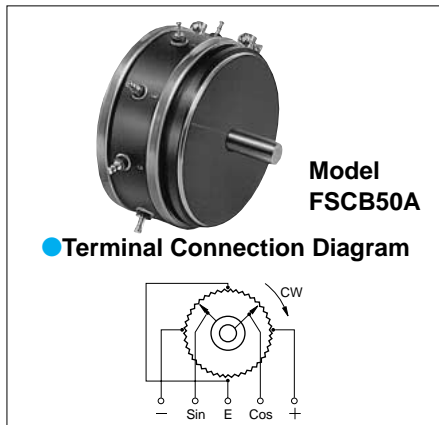
Multi-ganged (Available up to 3 gangs. Housing length is extended by 16mm per 1 gang), Shaft with front and rear extension (Rear shaft with 3mm dia. and 10mm length), Shaft dia. ( $\varnothing 3.175$ mm) with inch dimensions, Special machining on the shaft.

Conductive Plastic

MODEL FSCB50A

(Servomount)

● Standard Dimensions



● General Specifications

**Standard Resistance**

**Values:** 1k, 2k, 5k, 10k ( $\Omega$ )

**Special Higher**

**Practical Resistance**  
**Values:** 20k, 50k, 100k ( $\Omega$ )

**Total Resistance**

**Tolerance:** Standard Class  $\pm 15\%$  (L)  
Precision Class  $\pm 10\%$  (K)

**Conformity Tolerance:**

**(Peak-Peak)** Standard Class  $\pm 0.5\%$

Precision Class  $\pm 0.3\%$

Super Precision Class  $\pm 0.2\%$

**Resolution:** Essentially infinite

**Output Smoothness:** Below 0.1% against input voltage

**Contact Resistance**

**Variation:** Below 8% C.R.V.

**Power Rating:** 1.25W

**Electrical Travel:** 360° (Endless)

**Mechanical Travel:** 360° (Endless)

**Insulation Resistance:** Over 1,000M $\Omega$  at 1,000V.D.C.

**Dielectric Strength:** 1 minute at 1,000V.A.C.

**Starting Torque:** Below 5mN·m (50gf·cm)

**Max. Working Voltage:** 250V

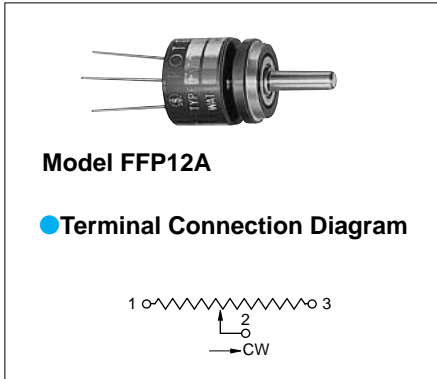
**Resist. Temperature**

**Coefficient:**  $\pm 400$ p.p.m./°C

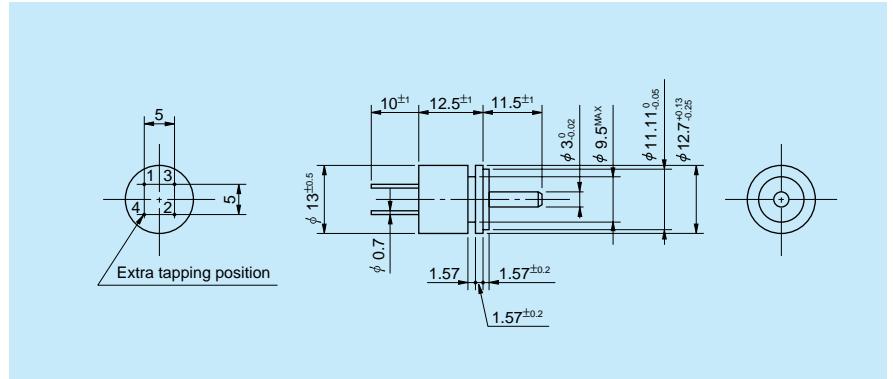
**Mass:** Approx. 120g

● Special Specifications Available

Multi-ganged (Available up to 3 gangs. Housing length is extended by 17mm per 1 gang), Shaft with front and rear extension (Rear shaft with 6mm dia. and 15mm length), Bushingmount type, Shaft dia. ( $\varnothing 6.35$ mm) with inch dimensions, Special machining on the shaft, Oil-filled type.



● **Standard Dimensions**



● **General Specifications**

**Standard Resistance**

**Values:** 1k, 2k, 5k, 10k ( $\Omega$ )

**Total Resistance**

**Tolerance:** Standard Class  $\pm 15\%$  (L)  
 Precision Class  $\pm 10\%$  (K)

**Function**

**Characteristics:** Sine  $360^\circ$ , 20dB log,  
 $X^2$  ( $0 \leq X \leq 1$ )  
 $1/X$  ( $1 \leq X \leq 10$ )

**Conformity**

**Tolerance:** Standard Class  $\pm 10\%$   
 Precision Class  $\pm 5\%$

**(Peak-Peak)**

**Resolution:** Essentially infinite

**Output Smoothness:** Below 0.1% against input voltage

**Power Rating:** 0.2W

**Electrical Travel:**

$300^\circ \pm 5^\circ$   
 ( $360^\circ$  in case of Sine  $360^\circ$ )

**Mechanical Travel:**

$360^\circ$  (Endless)

**Insulation Resistance:**

Over 1,000M $\Omega$  at 500V.D.C.

**Dielectric Strength:**

1 minute at 500V.A.C.

**Starting Torque:**

Below 1mN·m (10gf·cm)

**Resistance**

**Temperature**

**Coefficient:**

$\pm 400$ p.p.m./ $^\circ C$

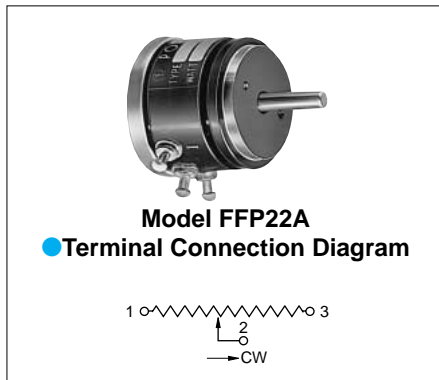
**Mass:**

Approx. 5g

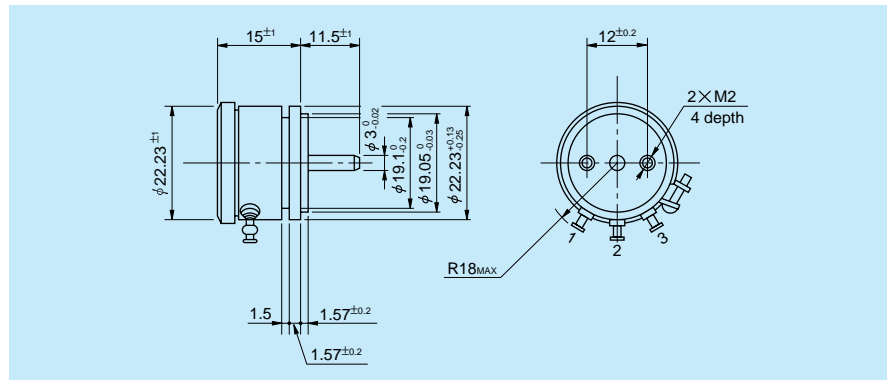
● **Special Specifications Available**

Extra taps (Available up to 1 tap), Shaft with front and rear extension (Rear shaft with 1mm dia. and 10mm length), With stopper (Rotating angle becomes  $310^\circ$  and stopper strength is 0.3N·m [3kgf·cm]), Special electrical travel, Shaft dia. ( $\phi 3.175$ mm) with inch dimensions, Special machining on the shaft, Special functions, Bushingmount type (Same dimensions as FCP12AC).





● Standard Dimensions



● General Specifications

**Standard Resistance**

**Values:** 1k, 2k, 5k, 10k (Ω)

**Total Resistance**

**Tolerance:** Standard Class ±15% (L)  
Precision Class ±10% (K)

**Function**

**Characteristics:** Sine 90°, Sine 180°, 20dB log,  
X<sup>2</sup> (0 ≤ X ≤ 1)  
1/X (1 ≤ X ≤ 10)

**Conformity**

**Tolerance:** Standard Class ±5%  
**(Peak-Peak)** Precision Class ±2%

**Resolution:**

Essentially infinite

**Output Smoothness:** Below 0.1% against input voltage

**Power Rating:** 0.5W

**Electrical Travel:** 300° ±5°

**Mechanical Travel:** 360° (Endless)

**Insulation Resistance:** Over 1,000MΩ at 500V.D.C.

**Dielectric Strength:** 1 minute at 500V.A.C.

**Starting Torque:** Below 3mN·m (30gf·cm)

**Resistance**

**Temperature**

**Coefficient:** ±400p.p.m./°C

**Mass:** Approx. 20g

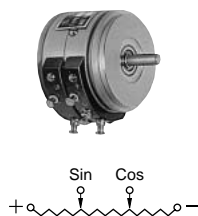
● Special Specifications Available

Extra taps (Available up to 1 tap), Shaft with front and rear extension (Rear shaft with 3mm dia. and 10mm length), With stopper (Rotating angle becomes 300° and stopper strength is 0.3N·m [3kgf·cm]), Special electrical travel, Shaft dia. (Ø3.175mm) with inch dimensions, Special machining on the shaft, Special functions.

SPECIALLY ORDERED ITEM

The following item discontinues to manufacture as our standard items and however, we can manufacture them as specially ordered items.

**Model SCA30 (Wirewound)**  
(1-turn Sine-Cosine Pot.)



- Standard Resistance Range : 50Ω ~ 20kΩ
- Total Resistance Tolerance : ±10% (K)
- Conformity tolerance (Peak-Peak) : ±3.0%
- Power Rating : 1W
- Noise : Below 100Ω E.N.R.
- Electrical travel : 360° (Endless)
- Mechanical travel : 360° (Endless)
- Mass : Approx. 25g