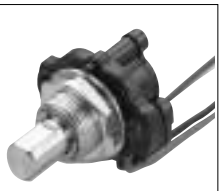
MODEL HSM12 · HSM18E (Bushingmount)

Model HSM12

Model HSM18E
Lug terminal type



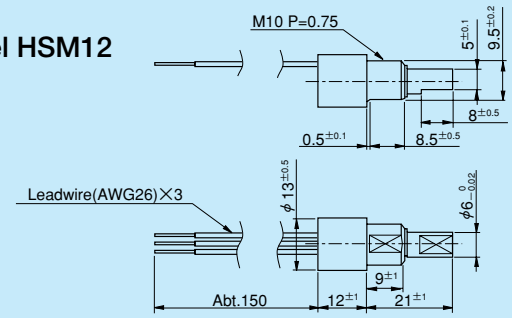
Model HSM18EL
Leadwire type

●Standard Model Nos.

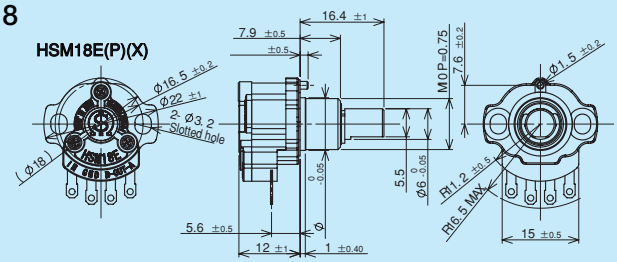
HSM12(Bushingmount type)
HSM18E･EL(A combined type with bushingmount and flange-mount)

●Standard Dimensions

■Model HSM12



■Model HSM18



Note: 1) The drawings show the position of shaft flatted at the ratio value of 50%.
2) 1pc.each of inner teeth washer and hex nut are attached.(2pcs.each attached in case of HSM12)
3) Please duly note that inner construction may burn out when applying the voltage to the wrong terminals except input terminal.

●General Specifications

Model number	HSM12	HSM18E · EL
Current Consumption	Approx. 6mA	Single output : Approx.7mA Dual output : Approx.14mA
Independent Linearity Tolerance	±1.5%FS(FS=90°)	
Mechanical Rotating Angle	360° (Endless)	
Effective Electrical Angle	±45° (Endless)	
Applied Voltage	5V±10%D.C.	
Load resistance	Over 10KΩmin.	
Effective Output	Approx. 10%～Approx. 90%Vin・FS(FS=100°)	
Output Temperature Characteristics	Within ±2.5%Vout/FS	
Drift at center position	Within ±0.5%Vout/FS	
Operating Temperature Range	−40℃～+105℃	
Storage Temperature Range	−50℃～+105℃	
Mass	Approx. 15g	
Rotating Torque	Within 2mN･m (Within 20gf･cm)	

●Environmental Specifications

Model number	HSM12	HSM18E · EL
Thermal Shock	5 cycles −50℃～+105℃	
Exposure at Low Temperature	24 hours at −50℃	
Exposure at High Temperature	1,000 hours at +105℃	
Vibration	10 to 2,000Hz 196m/s²	
Shock	980m/s² 6ms	
Rotational Life Expectancy	Approx. 50,000,000 shaft revolutions	
EMS Durability	50V/m(80MHz～1GHz1KHz 80% Amplitude Modulation)	100V/m(same as on the left)
ESD Durability	±4kV contact discharge ±4kV aerial discharge	±8kV contact discharge ±15kV aerial discharge

(note) Rotational Life Expectancy may differ from the specifications depending on status of use.

●Special Specifications Available.
Special effective electrical angle(Possible to meet with from ±10° to ±45° by 5° step, as requested), Special machining on the shaft, Special output(HSM18E & EL are only available - Cross, Parallel)

1-turn Contactless potentiometer

（Hall effect IC type）

SAKAE Contactless potentiometers using hall effect IC are low-cost types with high performance which was researched and developed based on our experience of contactless inductance type potentiometers. Hall effect IC itself has ever been used in many kinds of our joystick controllers. We have established great trust with many users and achieved satisfactory performance.
To meet with a request for potentiometer type, we studied unique circuit configuration and inner construction. As a result of our study, we have finally completed producing a high-performance product with EMS durability. The Contactless potentiometer has very long life expectancy and excellent resistance to vibration due to its contactless element, which can meet many types of applications in different industrial field.

THE NOMENCLATURE OF SAKAE 1-TURN CONTACTLESS POT. SERIES

S HSM 18 E P 12 - ○○○○

●Special Specification
S means the potentiometer with special mechanical specifications not applicable to our standard.

●Type
HSM means Hall effect IC type of 1-turn contactless potentiometer.

●Dimensions
18 means the approximate outer diameter of the potentiometer in metric system. The 3 standard diameters are available, namely, 12mm, 18mm and 30mm.

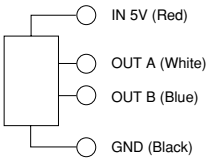
●4 digits branch number
to be used for specific requirements.

●Applied Voltage
None: 5V (Standard)
12:12V (HSM30 is only available in option.)
24:24V (HSM30 is only available in option.)

●Dual output (HSM18 and 30 only available)
P means parallel output. X means cross output. None means single output (standard) (Dual Independent output is only available in WP/WX-HSM30.)

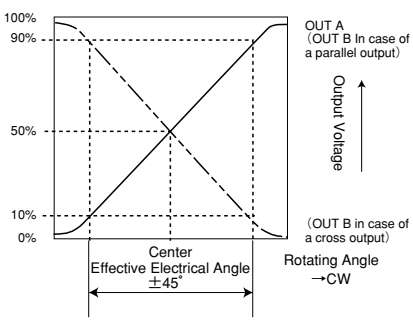
●Type
E means lug terminal type for HSM18
EL means leadwire type for HSM18
F means flange type for HSM30
(Except for the above types, no character shows.)

● Leadwire (terminal) Connection Diagram



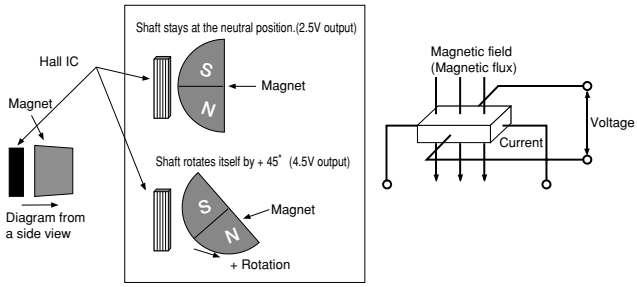
Note: Above colors means the colors of the leadwires

● Output Characteristics



● Construction and Output Voltage

Construction
Semicylinder permanent magnet is joined to shaft. The magnet rotates and passes near Hall effect IC installed in circuit board as per the below diagram.



Output Voltage
In case shaft stays at the neutral position, the distance between S pole and Hall effect IC is the same as that between N pole and Hall effect IC. Therefore, magnetic fields of S pole and N pole get balanced out and Hall IC does not have an effect on magnetic fields, namely, 0(Zero) magnetic field. In this condition, the output voltage of Hall effect IC is set to 2.5V.
In case shaft rotates in the direction of plus, Hall effect IC gradually has more effect on magnetic field from S pole depending on the rotation angle. Due to this, the output voltage increases and turns around 4.5V at + 45°(in case of HSM18E). While, rotating in the direction of minus, Hall effect IC has more effect on magnetic field from N pole, then the output voltage decreases and turns around 0.5V at -45°. Therefore, Hall effect IC output gets around 0.5 V to 4.5V between ±45°in proportion to the rotation angle.

1-TURN CONTACTLESS POTENTIOMETER

(Inductance Type)

This is a 1-turn Contactless Potentiometer using inductance coil technology, which has been developed based on our own technical know how (Japan pat.No.3009764).
This Contactless Potentiometer has various excellent features such as semipermanent life expectancy, being completely free from sliding noise, high speed tracking ability, essentially infinite resolution, etc. and can be used as an angle detecting sensor or mechanical linear displacement sensor for various kinds of mechanical and electrical devices as well as robot devices, medical equipments, measure control instruments, etc.

THE NOMENCLATURE OF SAKAE 1-TURN CONTACTLESS POT. SERIES

S KSM 22 F S - 5 - ○○○○

●Special Specifications
S means the potentiometer with special mechanical specifications not applicable to our standards.

●Kind
KSM means inductance type of 1-turn contactless potentiometer.

●Diameter
22 means approximate outer diameter of 22mm of the potentiometer in metric system.

●Type
F···Popular version with metal housing and oilless bearings.
E···Low-cost version with plastic housing and oilless bearings.

●4 digits branch number
to be used for specific requirments.

●Applied Voltage
5 means applied voltage of 5V.D.C. (Available 3 to 10V.D.C. on F type to your special request.)

●Mounting Method
−: Bushingmount
I : Sealed and Bushingmount
S: Servomount with ball bearings

SELECTION GUIDE

1-turn Contactless Potentiometer (Inductance type)

- **Bushingmount**
  - **KSM22F** ····· Popular type with metal housing and oilless bearings.
  - **KSM22E** ····· Low-cost version with plastic housing and oilless bearing.
  - **KSM22FI** ····· Sealed type with KSM22F
  - **KSM22EI** ····· Simple sealed type with KSM-22E
- **Servomount**
  - **KSM22FS** ····· Metal housing, low-torque and longer life version.

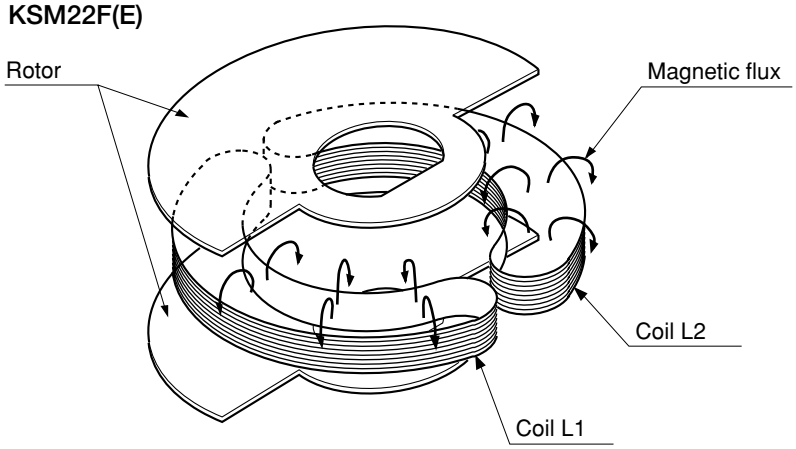
Technical Explanation on Inductance Type Contactless Potentiometer

●Principle・Construction・Function

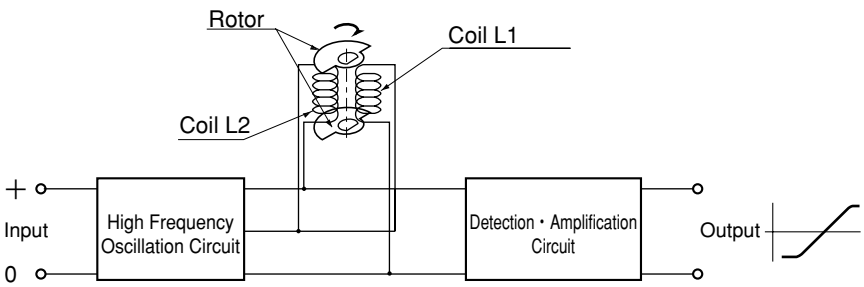
This contactless potentiometer has a pair of semicircle rotor connected to the operating shaft, a pair of detective coil putted between the semicircle rotor, high frequency oscillator to apply the coil, and a detection circuit which takes an inductance change of the coil from an eddy current on the semicircle rotor caused by high frequency oscillator, in the housing case. When rotating the shaft, the area volume opposed between the semicircle rotor and the coil varies, which brings on output change in response to the rating angle.

●Relationship between the semicircle rotor and the detection coil

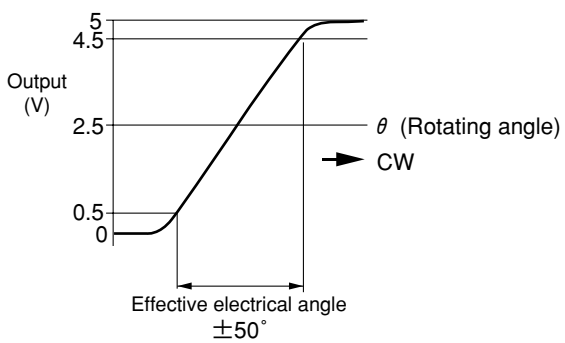
Construction of model KSM22F(E)



●Oscillator and Detection Circuit



●Output Characteristic



●Leadwire (Terminal) Connection Diagram