



FOR SAFETY USE

Be sure to read the following instructions before use.

For common and individual instructions, refer to the text of this catalogue.

The following safety precautions are provided to prevent damage and danger to personnel and to provide instructions on the correct usage of this product. These precautions are classified into 3 categories; “CAUTION”, “WARNING” and “DANGER” according to the degree of possible injury or damage and the degree of impendence of such injury or damage.

Be sure to comply with all precautions along with JIS B8370^(※1) and ISO 4414^(※2), as they include important content regarding safety.

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|------------------|--|
| ⚠ CAUTION | • Indicates a potentially hazardous situation which may arise due to improper handling or operation and could result in personal injury or property-damage-only accidents. |
| ⚠ WARNING | • Indicates a potentially hazardous situation which may arise due to improper handling or operation and could result in serious personal injury or death. |
| ⚠ DANGER | • Indicates an impending hazardous situation which may arise due to improper handling or operation and could result in serious personal injury or death. |

(※1) JIS B8370 : General Rules for Pneumatic Systems

(※2) ISO 4414 : Pneumatic fluid power-General rules relating to systems

⚠ WARNING

● **The applicability of pneumatic equipment to the intended system should be judged by the pneumatic system designer or the personnel who determined specifications for such system.**

As operating conditions for products contained in this catalogue are diversified, the applicability of pneumatic equipment to the intended system should be determined by the pneumatic system designer or the personnel who determined specifications for such system after conducting an analysis or testing as necessary.

The system designer shall be responsible for assuring the intended system performance and safety.

Before making a system, the system designer should thoroughly examine all specifications for such a system and also take into consideration the possibility of any trouble with the equipment.

● **The pneumatic equipment should be handled by persons who have sufficient knowledge and rich experience.**

Improper handling of compressed air will result in danger.

Assembling, operation and maintenance of machinery using pneumatic equipment should be performed by persons who have sufficient knowledge and rich experience.

● **Never operate machinery nor remove the equipment until safety is assured.**

• Before checking or servicing machinery and equipment, be sure to check that steps for prevention of dropping or runaway of the driven component have been completely taken.

• When removing the equipment, make sure that the above-mentioned safety measures have been done beforehand.

Then turn off air supply and power to the system and purge compressed air in the system.

• When restarting machinery and equipment, check that proper prevention of malfunction has been provided for and then restart carefully.

● **When using the pneumatic equipment in the following conditions or environments, take the proper safety measures and consult KURODA beforehand.**

• Conditions and environments other than specified and outdoor use.

• Applications to nuclear power equipment, railroads, aircraft, vehicles, medical equipment, equipment connected with food and drink, amusement facilities and safety devices such as emergency interruption devices, clutch/brake circuits for a press and the likes.

• Applications which require extreme safety and will also greatly affect men and property.



HI-ROTOR/COMMON INSTRUCTIONS ①

Be sure to read them before use.

Also refer to Par. "For Safety Use" and instructions mentioned for each series.

DESIGN

WARNING

- **When HI-ROTOR is subject to load fluctuation, up/down movement and fluctuating frictional resistance, make a safty design in due consideration of such factors.**

Operating speed of HI-ROTOR will increase, causing a damage to machine and an injury to human body.

- **Especially when there is the possibility that the human body is endangered, fit a protective cover.**

When there is the possibility that applied load or the moving part of the HI-ROTOR endangers the human body, design the system so that the human body cannot directly touch these parts.

- **Speed-reducing circuit or shock absorber will be required according to circumstances.**

Set inertial energy to less than allowable value. When load speed is high or mass is large, inertial energy of load exceeds allowable value, making it difficult for HI-ROTOR to absorb shocks.

In this case, provide a speed-reducing circuit or a shock absorber on the load side and also thoroughly examine the rigidity of machine.

- **Take into consideration the possibility of pressure failure in the circuit due to outage etc.**

For an HI-ROTOR used in the clamping mechanism, if clamping pressure in the circuit lowers due to outage etc., clamping force will reduce, so that the load may sometimes come off. To avoid such danger, design the system to incorporate a safety device to protect the human body and machine. Also provide the hanger and lift with proper prevention against dropping.

- **Take into consideration the possibility of power failure.**

Take proper countermeasures against equipment controlled by air pressure, electricity, hydraulic pressure, etc. so as to protect the human body and machine even if these power sources are faulty.

- **Use prevention against runaway of load in designing a circuit.**

If compressed air is supplied to one side of vane without residual air in HI-ROTOR, (for example, HI-ROTOR is operated by 3-position exhaust center type solenoid valve or restarted after residual air in circuit is exhausted), HI-ROTOR will suddenly actuate, causing a damage to machine and an injury to human body.

- **Take into consideration the action of HI-ROTOR in an emergency.**

When the machine is stopped by a person in an emergency or stopped by the safety device due to the occurrence of outage, system trouble, etc., the HI-ROTOR may catch the human body or damage the machine according to circumstances. To avoid such an accident, take into consideration the action of HI-ROTORs in designing a system so as to prevent an injury to the human body and a damage to the machine.

DESIGN

WARNING

- **Take into consideration the action of an HI-ROTOR when it restarts from stoppage in an emergency or abnormal state.**

Make a design to prevent an injury to the human body and a damage to the machine when the HI-ROTOR is restarted.

When it is necessary to reset the HI-ROTOR to the starting position, make a design to incorporate a safety manual control unit.

- **Do not use HI-ROTOR as a shock absorber.**

When abnormal pressure is applied or air leak occurs, speed-reducing effect is considerably lost, sometimes resulting in a damage to machine and an injury to human body.

- **Do not stop HI-ROTOR halfway only by means of directional control valve or do not leave HI-ROTOR stopped there.**

HI-ROTOR and directional control valve are designed to tolerate a certain degree of air leak. Even if HI-ROTOR is stopped halfway by shutting in air using directional control valve without an external stopper provided for HI-ROTOR, the stop position cannot be held due to air leak; this may result in a damage to machine and an injury to human body.

- **Firmly tighten fixed part and joint.**

When using HI-ROTOR for heavy-duty purposes such as continuous operation or using in vibratory place, apply a secure tightening method.

- **Remodeling HI-ROTOR**

Do not remodel HI-ROTOR.

CAUTION

- **Use HI-ROTOR within specified oscillation time.**

If used in lower speed range than specified, HI-ROTOR will not smoothly operate due to a stick and slip phenomenon.

- **Do not apply torque exceeding rated output to HI-ROTOR from the outside.**

If HI-ROTOR receives external force over rated output, it may be broken according to circumstances.

- **When repeatability accuracy for oscillating angle is required, provide a stopper on the outside to stop load directly.**

- **When adjusting the driving speed of an HI-ROTOR, install a speed controller.**

Adjust the driving speed on the low speed side and then adjust it gradually until the prescribed speed is attained.



HI-ROTOR/COMMON INSTRUCTIONS ②

Be sure to read them before use.

Also refer to Par. "For Safety Use" and instructions mentioned for each series.

SELECTION

! WARNING

- **Refer to specifications.**

HI-ROTOR listed in this catalogue are designed for compressed air.

When using other fluid than compressed air, contact KURODA beforehand.

Do not use the HI-ROTOR outside the specified pressure and temperature range; this may result in a breakdown or faulty operation.

INSTALLATION

! WARNING

- **Do not start the system before making sure that equipment is properly operated.**

After installing the HI-ROTOR, connect compressed air and power supply.

Perform functional test and leak test properly and check that the system is correctly operated with safety. Then start the system.

- **Coating with paint**

When coating the resin portion with paint, it may be adversely affected by paint and solvent. For the propriety of painting, contact KURODA beforehand.

Do not peel off the nameplate affixed on the HI-ROTOR and do not erase or smear out the letter on it.

- **When adjusting the oscillation angle of HI-ROTOR by applying pressure, take proper means to prevent HI-ROTOR from rotating beyond required level.**

If HI-ROTOR is rotated beyond required level, it will sometimes cause a hazardous situation.

- **Do not loosen the angle adjust screw of HI-ROTOR over adjustable range.**

If it is loosened over adjustable range, the angle adjust screw will come off, causing a damage to machine and an injury to human body.

- **When using a shaft coupling, select one with degree of freedom.**

If a shaft coupling without degree of freedom is used, a kink will occur due to eccentricity, causing a malfunction or damage to products; this sometimes result in a damage to machine and injury to human body.

- **Provide space for maintenance and inspection.**

INSTALLATION

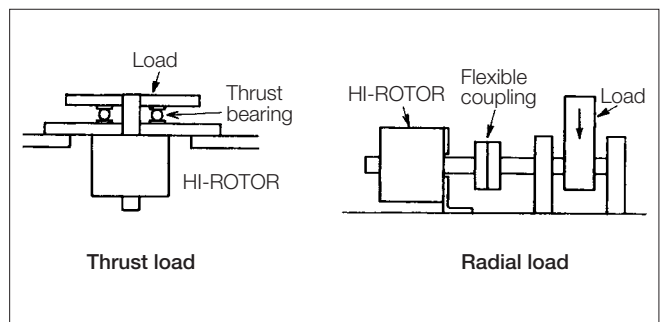
! WARNING

- **Do not apply excessive load to shaft.**

If excessive load over allowable value is applied to shaft, it will cause a malfunction or breakdown, sometimes resulting in a damage to machine and an injury to human body.

HI-ROTOR is capable of receiving up to allowable radial thrust load prescribed in specifications in a state where no inertial load occur. However, avoid using HI-ROTOR in such a manner that load is directly applied to the shaft.

In order to improve operating conditions, it is recommended that no load be directly applied to the shaft by using a method shown in Fig. below:



- **Install an external stopper in a separate place from the shaft.**

If a stopper is located near the shaft, reaction force exerted on the stopper due to torque of HI-ROTOR itself is applied to the shaft and thus damages the shaft and bearing. The reaction force will also break machine and injure human body.

! CAUTION

- **Do not wipe off the model name inscribed on a nameplate etc. with organic solvent.**

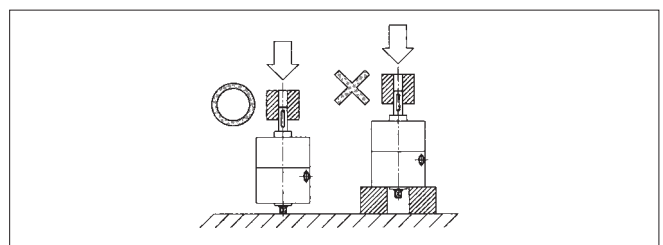
The inscribed indication may be erased.

- **Do not step your foot directly on the shaft and equipment fitted to the shaft.**

Stepping on the shaft directly will cause a damage to bearing etc.

- **Do not hit the shaft with the body fixed or do not hit the body with the shaft fixed; otherwise causing to bend the shaft and damage the bearing.**

When mounting a load on the shaft, set HI-ROTOR in such a manner that the body does not receive force as shown in Fig. below:





HI-ROTOR/COMMON INSTRUCTIONS ③

Be sure to read them before use.

Also refer to Par. "For Safety Use" and instructions mentioned for each series.

PIPING

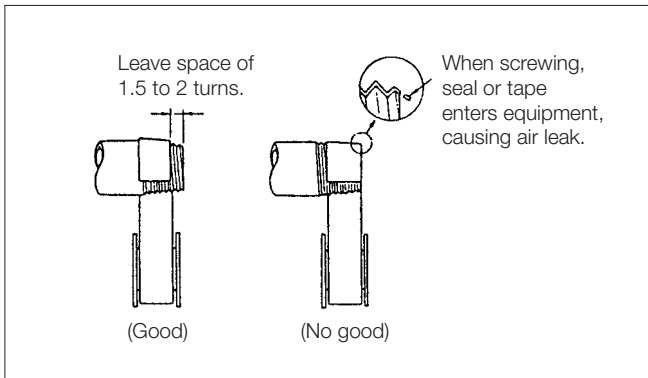
! CAUTION

• Before piping

Thoroughly flush the inside of each pipe to remove chips, coolant, dust, etc. before piping.

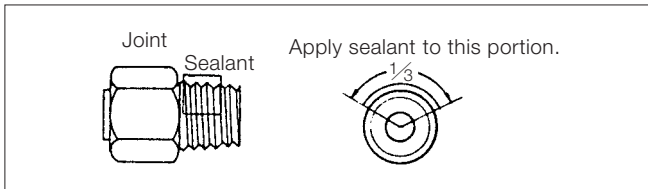
• How to wind a seal tape

When winding a seal tape around the threaded portion, leave space of 1.5 to 2 thread turns.



• How to apply liquid sealant

When applying liquid sealant to the threaded portion, apply a proper amount to about $\frac{1}{3}$ of the periphery of the threaded portion and then screw it.



PIPING

! CAUTION

• Screw of pipe and joint

When screwing the pipe and joint, use care to prevent chips and sealant from entering the pipe and joint.

Tighten them within a proper range of clamping torque.

Port size	Clamping torque (N·m)
M5	1.5~ 2.0
R, Rc $\frac{1}{8}$	7.0~ 9.0
R, Rc $\frac{1}{4}$	12.0~14.0
R, Rc $\frac{3}{8}$	22.0~24.0
R, Rc $\frac{1}{2}$	28.0~30.0

• Avoid wrong piping.

When connecting a pipe to a Rotary Actuator, be careful not to mistake the supply port by referring to the nameplate affixed to the product or the product catalogue.

LUBRICATION

! CAUTION

• HI-ROTOR listed in this catalogue are non-lubrication.

The non-lubricated HI-ROTOR can be used without lubrication, but can be used with lubrication.

When using it with lubrication, do not discontinue supplying oil. Otherwise, the applied lubricant may run off, sometimes resulting in an operation failure.

When using a lubricant, Class 1 turbine oil ISO VG 32 (containing additive) is recommended.

Do not use spindle oil and machine oil. Otherwise, the seal and packing may be damaged.



HI-ROTOR/COMMON INSTRUCTIONS ④

Be sure to read them before use.

Also refer to Par. "For Safety Use" and instructions mentioned for each series.

QUALITY OF AIR

! WARNING

- **Use pure air**

Compressed air containing corrosive gases, chemicals, salt, etc. causes a breakdown or operation ailure. So do not use such air.

! CAUTION

- **Fit an air filter with filtration of 5 μm or fine.**

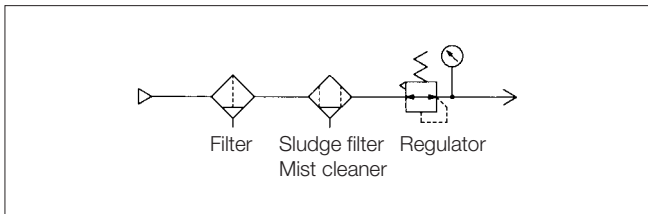
- **Install an air dryer.**

Compressed air containing much drainage causes the operation failure of pneumatic equipment. Install an air dryer, lower the temperature and reduce drainage.

- **Take proper countermeasures against sludge.**

If sludge produced in compressor oil enters pneumatic equipment, it will cause the operation failure of pneumatic equipment.

It is recommendable to use compressor oil (NISSEKI FAIRCALL A68, IDEMITSU DAPHUNY SUPER CS68) featuring minimized sludge production or use a sludge filter or mist cleaner to prevent sludge from entering the pneumatic equipment.



- **Use at low temperature**

When using pneumatic equipment at temperature of 5 °C or below, install an air dryer or take other countermeasures to prevent drainage and moisture in compressed air from freezing or solidifying.

OPERATING ENVIRONMENT

! DANGER

- Do not use HI-ROTOR in a explosive environment.

! WARNING

- Do not use HI-ROTOR in a corrosive environment.
- Do not use HI-ROTOR in a place attended with much dust, water drops or oil drops.

MAINTENANCE AND INSPECTION

! WARNING

- **Inspection before doing maintenance**

Check that proper prevention against drop of load and runaway have been taken, before turning off air and power supply to equipment and discharging air remaining in the system.

For 3-position all port block (closed center) type, compressed air is sealed in between solenoid valve and Rotary Actuator. So purge the residual air.

- **Inspection after finishing maintenance**

When connecting the system to compressed air supply and power supply, HI-ROTOR may sometimes suddenly actuate.

Therefore, when restarting the system, thoroughly check the safety of surrounding conditions before connecting the pneumatic system to compressed air supply and power supply.

Furthermore, perform a proper functional test and a leak test to check that the system normally operates.

- **Disassembling HI-ROTOR**

When disassembling HI-ROTOR, consult our company beforehand.

! CAUTION

- **Draining**

To maintain constant air quality, drain the air filter periodically.



MAGNETIC PROXIMITY SWITCH/Common INSTRUCTIONS ①

Be sure to read them before use.

Also refer to Par. "For Safety Use" and instructions mentioned for each series.

DESIGN AND SELECTION

! WARNING

- Use the switch within the range of specifications described in this catalogue.

Applying load current, voltage, temperature and shock exceeding the range of specifications will cause a damage to the switch and a faulty operation.

Thoroughly read the specifications and use the switch within the range of the specifications.

Especially, be sure to use the switch within the maximum contact capacity and operating current range.

- Be careful of distance between adjacent HI-ROTOR.

When 2 or more HI-ROTORs, each of switch is equipped with a switch are close installed or a magnetic material moves very close to the HI-ROTOR, there is the possibility that the switch malfunctions due to magnetic interference between the switch and magnetic material.

- Pay attention to switch-on time at the center of stroke.

Example : The vane is set at the center of stroke and load is driven when the vane passes the switch. In this case, if oscillating speed is extremely high, operating time is short even when the switch is turned on.

As a result, load cannot be fully moved according to circumstances.

In this case, oscillating speed is expressed as follows :

$$V = \frac{\text{Operating range of switch (mm)}}{\text{Operating time of load (ms)}} \times 1000 \quad (\text{mm/s})$$

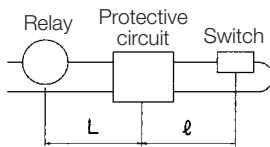
- Reduce the length of wiring as much as practicable.

<Reed switch>

When capacitive load is driven or the wiring from switch to load is long, inrush current increases due to line floating capacity at the time of switch-on ; this results in a damage to the switch or shortens the switch service life.

- In designing a system, provide a distance of more than 40 mm between the HI-ROTOR. (When a permissible distance is specified for each HI-ROTOR, follow the specified distance.)

In case of capacitive load.



When "L" is longer than 10 m, set "l" at 100 to 200 mm.

- Even when using a switch with built-in contact protective circuit and length of wiring is more than 30 m, the protective circuit may not fully absorb inrush current according to circumstances ; this sometimes shortens the switch service life.

For how to connect a protective circuit contact KURODA.

<Proximity switch>

When inrush current caused by line floating capacity occurs, take a proper countermeasure to absorb the rush current.

DESIGN AND SELECTION

! WARNING

- Be careful of leak current.

For a 2-wire proximity switch, current (leak current) flows in it to operate the internal circuit even if the switch is turned off.

When 2 or more switches are connected in parallel, leak current increases corresponding to the number of connected switches.

When leak current is larger than operating current for turning off load, the load is not turned off.

- Be careful of internal voltage drop of switch.

<Reed switch>

When 2 or more switches with LED are connected in series, voltage drop occurs by the number of connected switches due to the resistance of light emitting diode. (Refer to "Internal Voltage Drop" described in "Specifications for Switch".)

Note that load may not be sometimes moved even if the switch operates normally.

When the voltage drop of light emitting diode becomes a problem, use a switch without LED.

<Proximity switch>

When connecting 2-wire proximity switches in series, pay attention to the same points as those for connecting reed switches. However, note that the internal voltage drop is generally larger than that of reed switches.

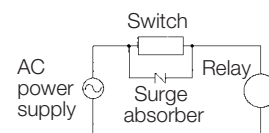
- Do not use load that produces surge voltage.

<Reed switch>

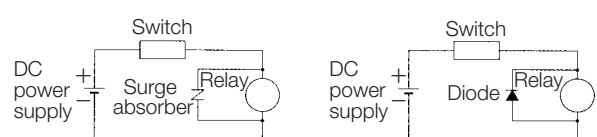
When driving a relay or other load that produces surge voltage, use a switch with built-in contact protective circuit or connect a protective circuit to the switch.

In case of inductive load

Load at 100 V AC



Load at DC



<Proximity switch>

A zener diode for surge protection is connected to the output side of a proximity switch. However, it may be broken if surge is repeatedly applied to it.

When directly driving a relay, solenoid valve or other load that produces surge, use a switch with built-in surge absorbing element.



MAGNETIC PROXIMITY SWITCH / COMMON INSTRUCTIONS ②

Be sure to read them before use.

Also refer to Par. "For Safety Use" and instructions mentioned for each series.

DESIGN AND SELECTION

! WARNING

- **When using the switch in an interlock circuit, pay attention to the following points;**

When a switch for HI-ROTOR is used for interlock signals requiring high degree of reliability, provide the switch with a mechanical protective function against trouble and malfunction or use a double-interlock system by using the switch together with other switch (sensor etc.).

In addition, check the switch periodically to make sure that it works normally.

- **Provide space for maintenance.**

In designing a system, take into account space for maintenance and inspection.

INSTALLATION AND ADJUSTMENT

! WARNING

- **Do not drop or hit the switch.**

When handling the switch, do not drop or hit it or do not apply an excessive shock to it (refer to specification for each switch).

- **Do not swing around the switch while holding the lead wire.**

If excessive tensile force is applied to the lead wire, the inside wire may be broken or the internal mechanism of the switch may suffer a damage.

- **Fix the switch with prescribed clamping torque.**

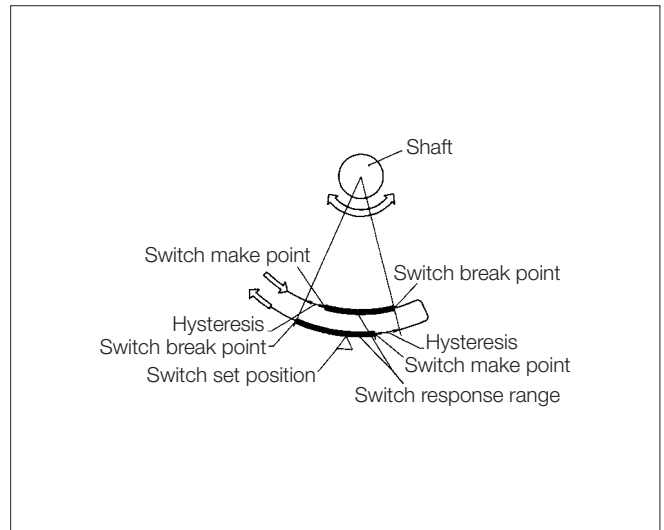
When the switch is fixed with clamping torque exceeding the prescribed value, the set screw, metal fixture, switch, etc. may be broken.

- **Set switch to center of working range.**

When magnet on the shaft rotates in one direction to a point at which the switch is turned on and then rotates in opposite direction to a point at which the switch is turned off, the angle of shaft rotation between these two points is called hysteresis.

When the switch is installed within this range, operation may be unstable according to circumstances.

Install the switch so that magnet is located at the center of working range (within which the switch is turned on.).



! CAUTION

- **Do not wipe off the model name inscribed on a nameplate etc. with organic solvent.**

The inscribed indication may be erased.



MAGNETIC PROXIMITY SWITCH/Common INSTRUCTIONS ③

Be sure to read them before use.

Also refer to Par. "For Safety Use" and instructions mentioned for each series.

WIRING

! WARNING

- **Properly wire in accordance with each lead wire color or terminal No.**

In this case, be sure to turn off power to the electric circuit on the connection side.

- **Do not make wrong wiring.**

As DC current has polarity, do not confuse (+) with (-).

<Reed switch>

When the connection of wiring is reversed, the switch is operated but the lamp is not on.

If current exceeding the prescribed operating range flows to the switch, the lamp will be broken and the switch fails.

<Proximity switch>

Even if the connection of wiring of a 2-lead wire switch is reversed, the protective circuit prevents the breakdown of the switch. In this case, however, the switch is left turned on. Note that, if the connection of wiring of a 2-lead wire switch is reversed with load short-circuited, the switch will be broken.

If the power line of a 3-lead wire switch is reversely wired (" + " replaces with " - "), the protective circuit will protect the switch. However, note that, if the power line is replaced with the output line by mistake, the switch will be broken.

- **Do not wire the switch together with the power line and high voltage line.**

Wire the switch by keeping away from the power line and high voltage line.

Otherwise, the control circuit including the switch may malfunction due to noise.

- **Avoid applying repetitive bending stress and tensile force to the lead wire.**

When setting the switch in a moving part, sag the wiring so that repetitive stress and tensile force will not be applied to the lead wire.

Wiring that produces repetitive bending stress and tensile force cause the breaking of wire.

- **Check for poor insulation.**

Check lead wire connection, extension cable and terminal base for poor insulation. If poor insulation occurs, excess current will flow to the switch, sometimes resulting in a damage to the switch.

- **Be sure to connect load before turning on power supply.**

When a 2-lead wire switch is turned on without connecting load such as relay, PLC, etc., excess current will momentarily flow to the switch, resulting in a damage to the switch.

- **Do not turn on the switch with load short-circuited.**

If the switch is turned on with load short-circuited, excess current will flow to the switch, sometimes resulting in a damage to the switch.

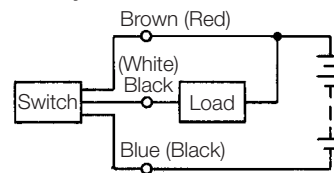
WIRING

! WARNING

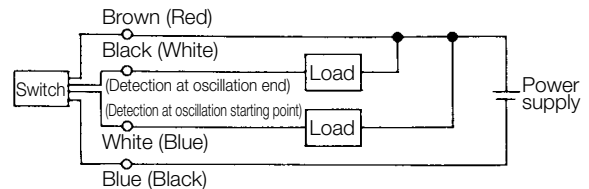
- **It is possible to provide power supply to load and power supply to switches individually and also to use them in common.**

When power supplies are individually provided, they should have the same voltage.

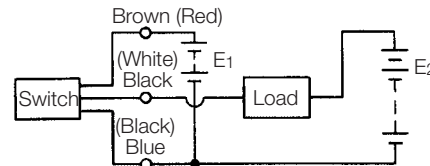
Where power supply to load and power supply to switch are commonly used :



(SR type switch unit)



Where power supply to load and power supply to switch are not commonly used :



E₁ and E₂ should be the same voltage.

Bracketed () color is former color.



MAGNETIC PROXIMITY SWITCH/COMMON INSTRUCTIONS ④

Be sure to read them before use.

Also refer to Par. "For Safety Use" and instructions mentioned for each series.

OPERATING ENVIRONMENT

DANGER

- **Never use the switch in an explosive or ignitable atmosphere.**

As the switch is not proof against explosion, never use it in an explosive gas atmosphere or ignitable atmosphere ; otherwise causing an explosion or fire.

WARNING

- **Do not use the switch in a place where there is a strong magnetic field or a large current.**

If the switch is used in a place where there is a strong magnetic field or a large current (large magnet, spot welding machine, etc.), the switch will malfunction or the magnet will be demagnetized.

- **Do not use the switch in a place where it is always splashed with water.**

Excepting some type of switch, these switches meet structural specifications IP65 prescribed by IEC Standard (refer to specifications for each switch). However, do not use the switch in a place where water is always poured on it; otherwise causing insulation failure and malfunction.

- **Do not use the switch in an environment containing oil and chemicals.**

When the switch is used in an environment containing coolant, washings, oils and chemicals, the inside of the switch is adversely affected even if it is used for a short period of time. When it is necessary to use the switch in such an environment, contact KURODA.

- **Do not use the switch in a place where an extreme temperature change occurs.**

Using the switch in a place attended with an unusual temperature change will adversely affect the inside of the switch. When it is necessary to use the switch in such an environment, contact KURODA.

- **Do not use the switch in a place where an excessive shock occurs.**

〈Reed switch〉

For a reed switch, if an excessive shock (over 980m/s²) is applied to it during operation, the contact may malfunction according to circumstances.

When a proximity switch is used in place of a reed switch, the deficiency can be reduced. In this case, check shock resistance given in specifications.

- **Do not use the switch in a place where surge is produced.**

〈Proximity switch〉

When there is a large surge source around the proximity switch, the circuit element in the switch may be adversely affected.

OPERATING ENVIRONMENT

WARNING

- **Be careful of adjacent magnetic material. Keep the switch away from magnetic material by more than 3.5 mm.**

When there is magnetic material such as iron close to the HI-ROTOR with a built-in magnet is absorbed and thus the switch may not operate according to circumstances.

Note that, when chips and iron powder such as weld spatters accumulate during operation, the same situation as above-mentioned will also occur.

MAINTENANCE AND INSPECTION

DANGER

Perform the following maintenance and inspection periodically.

- **Check the switch set screw and metal fixture for looseness and retighten as necessary.**

If the switch set screw and metal fixture are loosened, the switch set position will shift, resulting in an unstable operation or malfunction.

Readjust the set position and tighten the set screw and fixture.

- **Check the lead wire for damage.**

A damage to the coating of the lead wire may lead to insulation failure and breaking of wire.

When a damage is found, change the switch and repair the lead wire immediately.

STEP HI-ROTOR

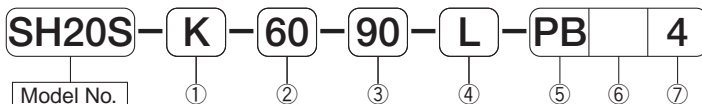
SH Series

5S、20S (Single vane) 5D、20D (Double vane)



ORDERING INSTRUCTIONS

STEP HI-ROTOR



SH5S
SH20S
SH5D
SH20D

② External HI-ROTOR setting angle
③ Internal HI-ROTOR setting angle

- Do not fill in, when ordering a standard type or angle setting is not required.
- Write the desired angle within oscillating angle range given in specifications on Page 16.
- (Note) • When the angle setting of two HI-ROTORs differ each other set the larger angle to the internal HI-ROTOR.
- For angle setting outside the specifications, contact KURODA.

Standard type STETOR is provided with the reference point stopper to have been set.

Set the attached angle setting stopper before use.

STEP HI-ROTOR with an angle setting stopper fixed at the desired stop angle can be manufactured upon order.

As the angle is roughly set, be sure to readjust it with the fine adjust screw before using the STEP HI-ROTOR. (Refer to Page. 11)

① Shaft configuration

	Shaft configuration	SH5S、SH5D	SH20S、SH20D
O	Round shaft	○	—
D	D-cut	○	—
K	Key-way	—	○
A	Right angle 2 flats	—	○

(Note) For specific shaft configuration, contact KURODA.

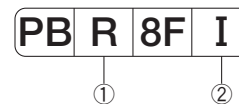
④ Mounting

No mark	Without foot mounting
L	With foot mounting

⑤ Switch

No mark	Without switch
PB	With switch

Switch: Switch, set screw, metal fixture



① Cable specifications

No mark	Standard
R	Flexible cable

(Note) Flexible cable is supplied to custom-made product.

② Switch type

No mark	Standard type (Black)
I	Different frequency type (Grey)

⑥ Cable specifications

No mark	Standard or without switch
R	Flexible cable

(Note) Flexible cable is supplied to custom-made product.

⑦ Number of switches

No mark	Without switch
4	4 pcs.
3	3 pcs.
n	n pc(s).

(Note) In order to prevent mutual interference and malfunction of the switches, each product is supplied with a combination of PB8F (standard type) and PB8FI (different frequency type). Both types can be used in the same manner.



Be sure to fit a reference point stopper and an angle setting stopper before using the STEP HI-ROTOR. Otherwise, the vane and seal may be broken, causing a faulty operation.

STEP HI-ROTOR

SPECIFICATIONS

Model No.	Unit	SH5S	SH20S	SH5D	SH20D
Vane type		Single vane		Double vane	
Fluid		Non-lubricated air (Lubricated air)			
Oscillating angle	Degree	Internal HI-ROTOR : 30~180 External HI-ROTOR : 30~180		Internal HI-ROTOR : 30~90 External HI-ROTOR : 30~180	
Oscillating reference point	Degree	90			
Port size		M5	Rc $\frac{1}{8}$	M5	Rc $\frac{1}{8}$
Operating puressure range	MPa	0.3~0.7	0.3~1	0.3~0.7	0.3~1
Proof withstanding pressure	MPa	1.05	1.5	1.05	1.5
Temperature range	°C	-5~60			
Internal volume	cm ²	35 (for internal:7, for external:28)	95 (for internal:23, for external:72)	33 (for internal:5, for external:28)	91 (for internal:19, for external:72)
Allowable radial load	N	59	255	59	255
Allowable thrust load	N	29	126	29	126
Allowable energy	mJ	1.96	8.82	1.96	8.82
Mass	kg	0.50	1.13	0.51	1.1

(Note) • When operating STEP HI-ROTOR at low temperature below 5°C, use dry air passing through an air dryer so as to prevent dewing and freezing.
• Be sure to use STEP HI-ROTOR within the allowable energy. For calculation of allowable energy, refer to Step 3 “How to check allowable energy”.

EXTERNAL STOPPER

Model No.		SH5S	SH20S	SH5D	SH20D
Min. setting angle	Internal HI-ROTOR	30°	30°	30°	30°
	External HI-ROTOR	30°	30°	30°	30°
Max. setting angle	Internal HI-ROTOR	180°	180°	90°	90°
	External HI-ROTOR	180°	180°	180°	180°
Angle setting pitch	Internal HI-ROTOR	15°	15°	15°	15°
	External HI-ROTOR	10°	10°	10°	10°
Angle fine adjustment range	Internal HI-ROTOR	-9°+6°			
	External HI-ROTOR	-6°+4°			
Fine adjustment range of oscillating reference point		±5°			

OUTPUT TORQUE

(Unit: N·cm)

Model No.		Supply pressure (MPa)							
		0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
SH5S	Internal HI-ROTOR	22.0	34.0	47.9	59.0	74.0	—	—	—
	External HI-ROTOR	121	171	227	273	337	—	—	—
SH5D	Internal HI-ROTOR	44.0	67.9	96.0	118	148	—	—	—
	External HI-ROTOR	118	171	231	273	337	—	—	—
SH20S	Internal HI-ROTOR	105	145	195	235	280	320	370	415
	External HI-ROTOR	279	440	575	720	850	1010	1140	1280
SH20D	Internal HI-ROTOR	210	290	390	470	560	640	740	829
	External HI-ROTOR	279	440	575	720	850	1010	1140	1280

(Note) As the output of the internal HI-ROTOR is smaller than that of the external, select a proper load on the basis of the output torque of the internal HI-ROTOR.

HOW TO SET OSCILLATING TIME (Unit: s)

Model No.	SH5S, SH5D	SH20S, SH20D
Oscillating angle	90°	90°
Internal HI-ROTOR	0.05~0.5	0.08~0.8
External HI-ROTOR	0.08~0.8	0.11~1.1

Set oscillating time within the range shown above. Slower setting exceeding this range may result in stick-and-slip. So you cannot get smooth operation. Search for oscillating time at angles other than 90 degree on the basis of these values.

ACCURACY

Model No.	SH5S, SH5D	SH20S, SH20D
Shaft runout	0.06mm (T.I.R.)	0.05mm (T.I.R.)
Stop angle accuracy	±3'	

(Note) • Shaft runout is the value at the shaft end.
• Stop angle accuracy is the value at the initial state after setting the angle.

STEP HI-ROTOR

MODEL WITH SWITCH/ For detailed specifications of switch, refer to Page 24 to 26.

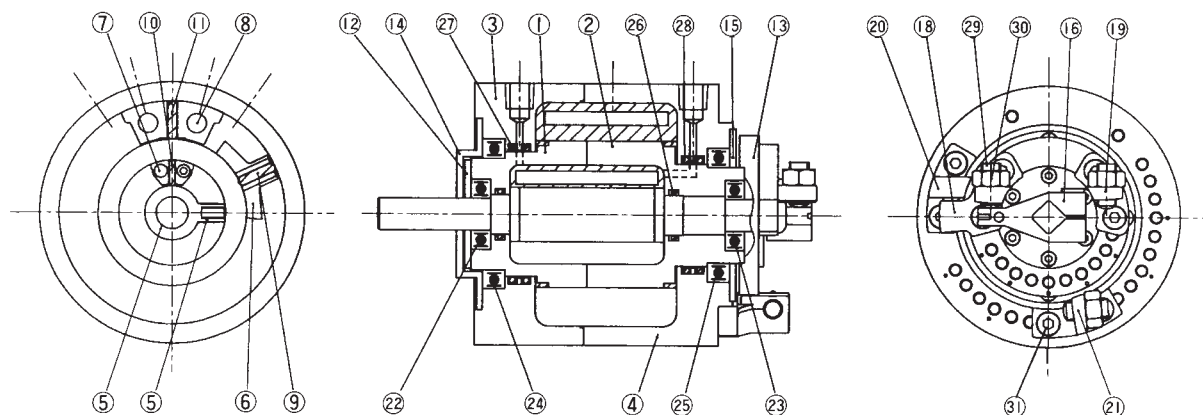
PB TYPE PROXIMITY SWITCH

Lead wire type

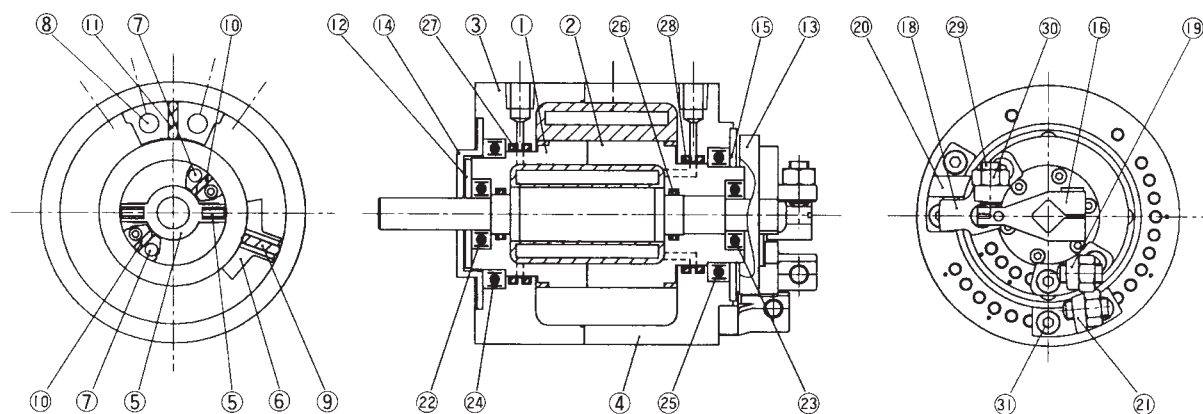
Model No.	Rated voltage (V)	Rated current range (mA)	Pilot lamp (Light up at ON)	Applications
PB8F PB8FI	DC12~24	100(max.)	○	Relay PLC IC circuit

STRUCTURE

Single vane



Double vane



STEP HI-ROTOR

MAIN COMPONENTS

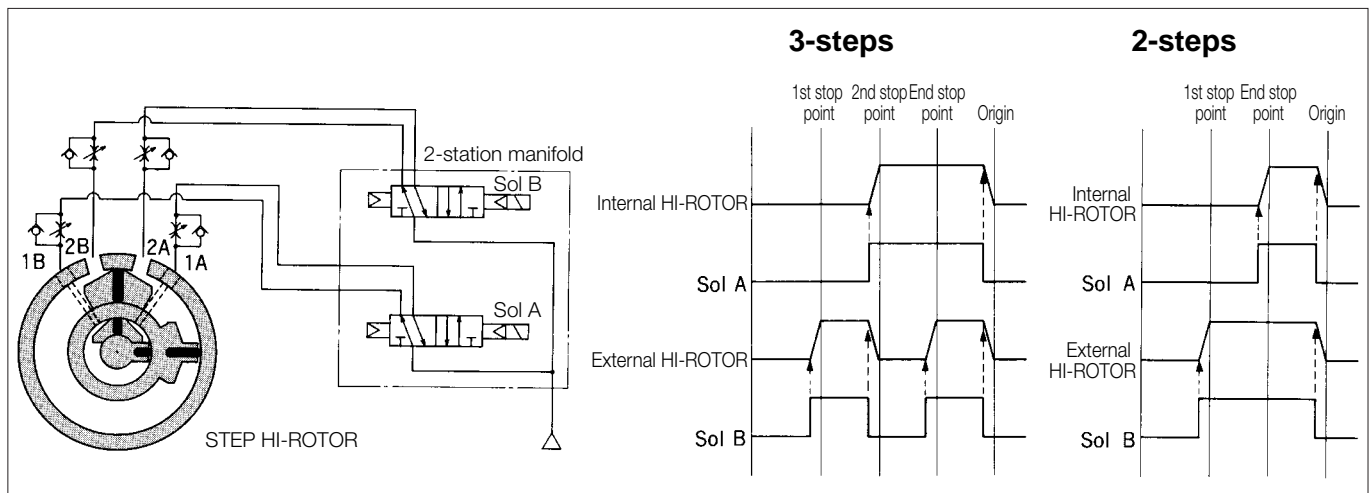
No.	Description	Material	Quantity	
			Single	Double
①	Body 1-A	Aluminium alloy		
②	Body 1-B	Aluminium alloy		
③	Body 2-A	Aluminium alloy		
④	Body 2-B	Aluminium alloy		
⑤	Vane shaft	Steel alloy for structure		
⑥	Vane	Synthetic resins		
⑦	Shoe 1	Synthetic resins		
⑧	Shoe 2	Synthetic resins		
⑫	Cover plate 1-A	Aluminium alloy		
⑬	Cover plate 1-B	Aluminium alloy		
⑭	Cover plate 2-A	Aluminium alloy		
⑮	Cover plate 2-B	Aluminium alloy		
⑯	Claw 1	Carbon steel for structure		
⑱	Stopper 1-L	Carbon steel for structure		
⑲	Stopper 1-R	Carbon steel for structure		
⑳	Stopper 2-L	Carbon steel for structure		
㉑	Stopper 2-R	Carbon steel for structure		
㉒	Bearing	Bearing steel		
㉓	Bearing	Bearing steel		
㉔	Bearing	Bearing steel		
㉕	Bearing	Bearing steel		
㉙	Fine adjusting screw	Steel alloy for structure		
㉚	Lock nut	Soft steel		
㉛	Bolt for stopper	Steel alloy for structure		

PACKING

No.	Description	Material	Quantity	
			Single	Double
⑤	Vane seal 1	NBR	1	1
⑨	Vane seal 2	NBR	1	1
⑩	Shoe seal 1	NBR	1	2
⑪	Shoe seal 2	NBR	1	1
㉒	O-ring	NBR	2	2
㉗	O-ring	NBR	2	2
㉘	O-ring	NBR	2	2

(Note) The vane seal and vane shaft are united in one piece.

EXAMPLE OF APPLICATIONS TO CONTROL



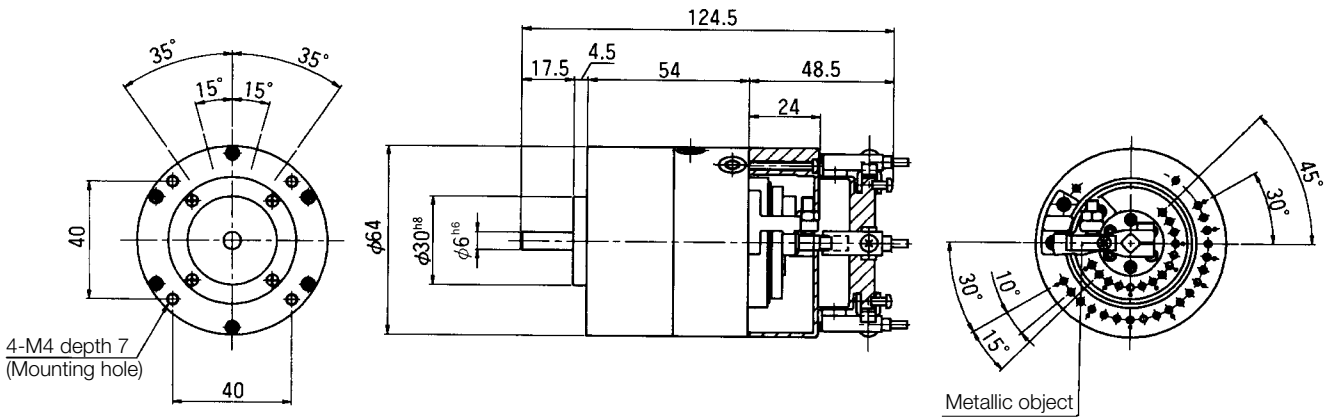
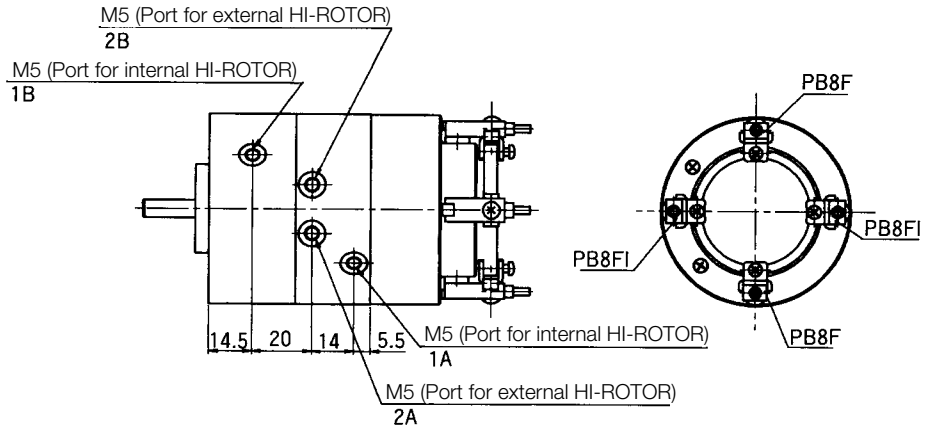
STEP HI-ROTOR

DIMENSIONS

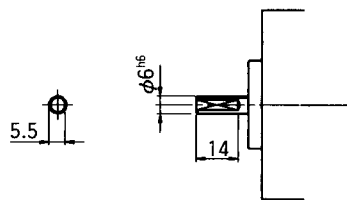
SH5S

(Unit : mm)

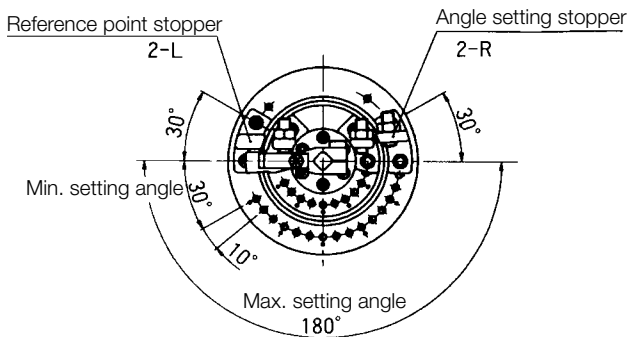
With switch



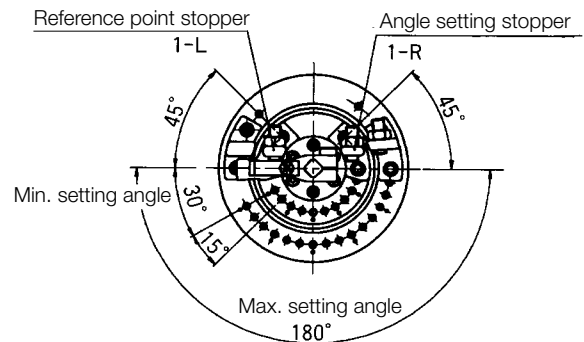
Without switch



D-cut shaft



External HI-ROTOR



Internal HI-ROTOR

Setting ranges of stopper

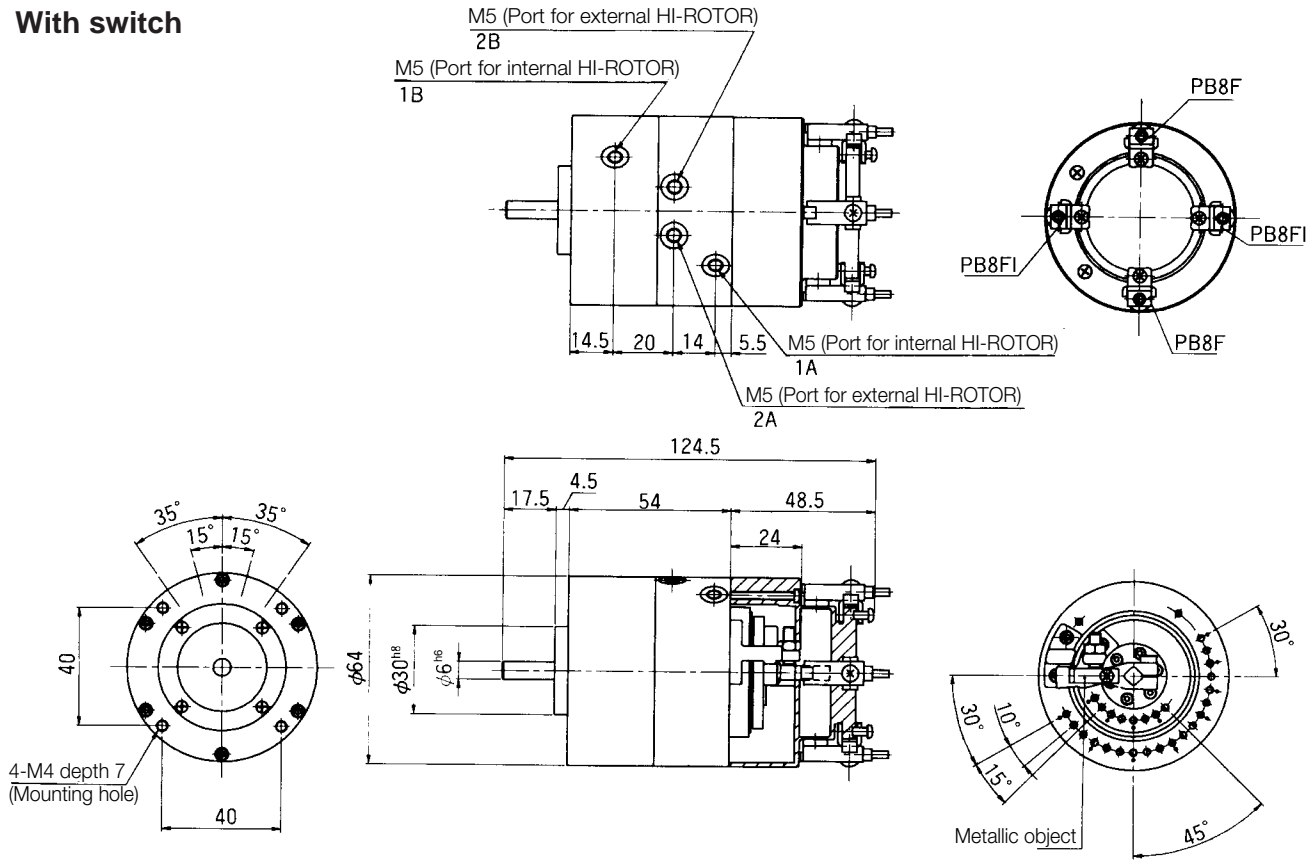
STEP HI-ROTOR

DIMENSIONS

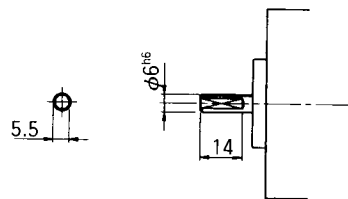
SH5D

(Unit : mm)

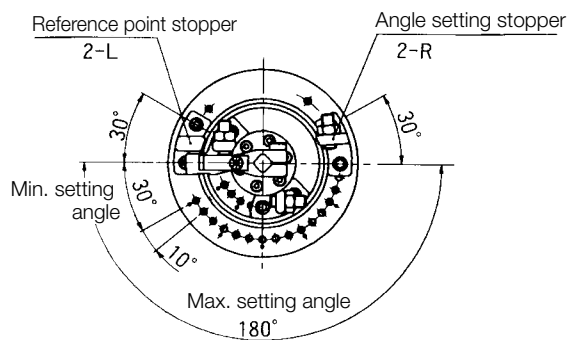
With switch



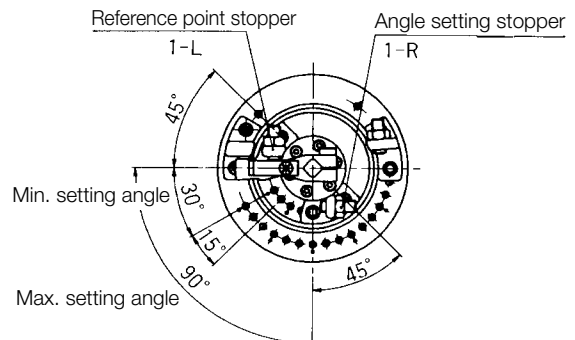
Without switch



D-cut shaft



External HI-ROTOR



Internal HI-ROTOR

Setting ranges of stopper

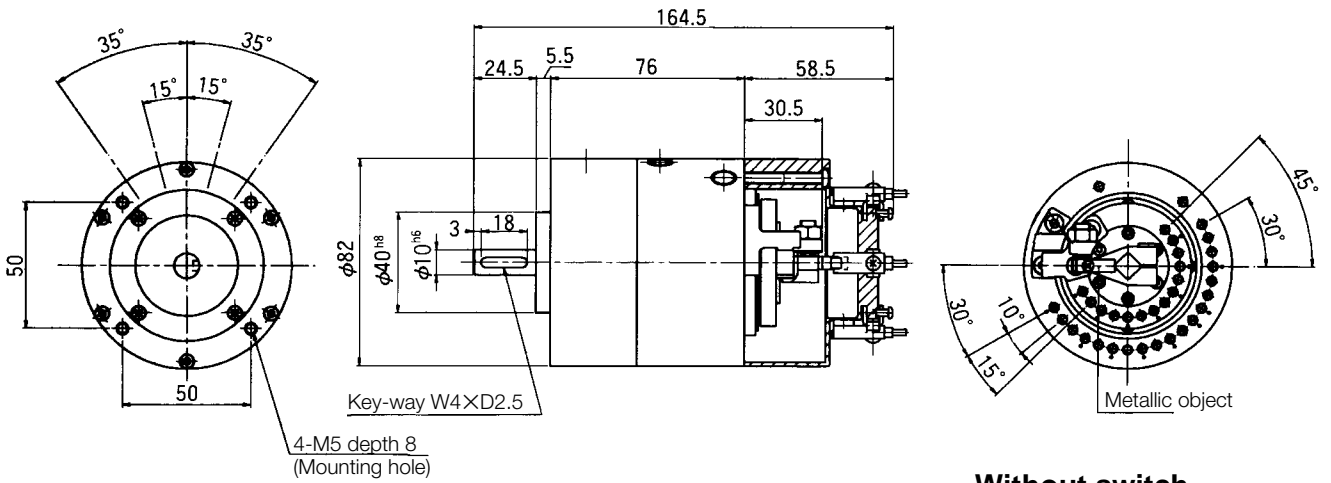
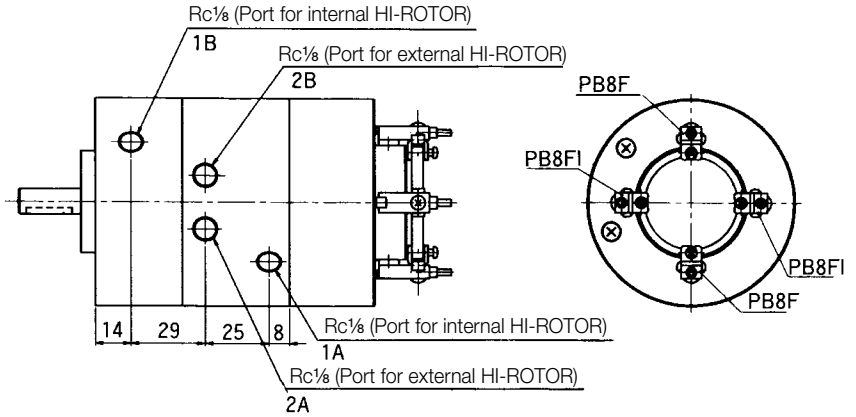
STEP HI-ROTOR

DIMENSIONS

SH20S

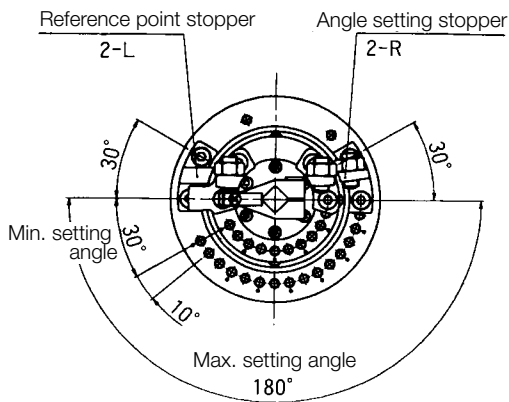
(Unit : mm)

With switch

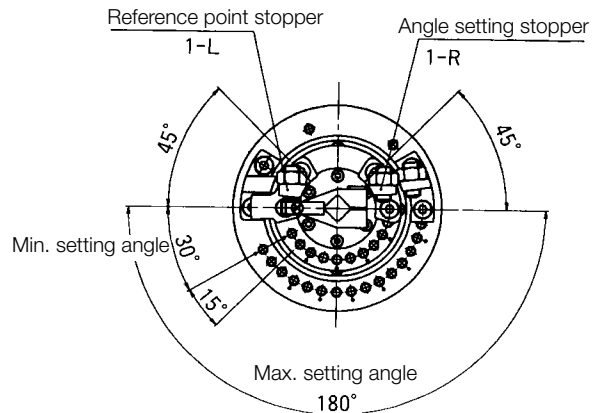


Without switch

Right angle 2 flats shaft



External HI-ROTOR



Internal HI-ROTOR

Setting ranges of stopper

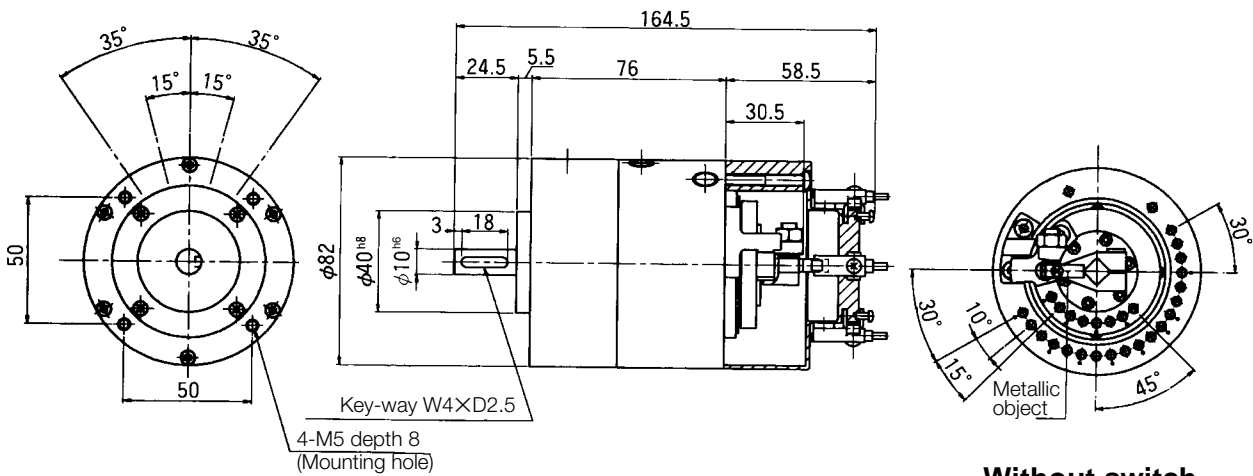
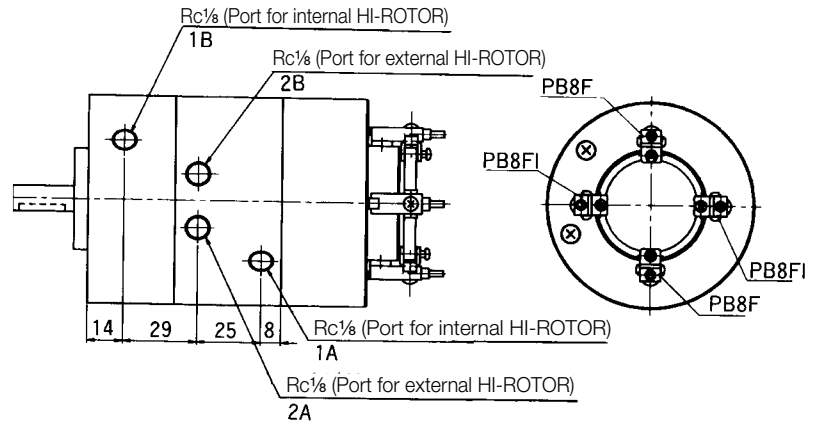
STEP HI-ROTOR

DIMENSIONS

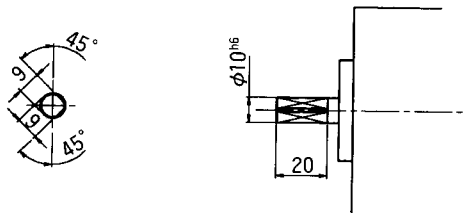
SH20D

(Unit : mm)

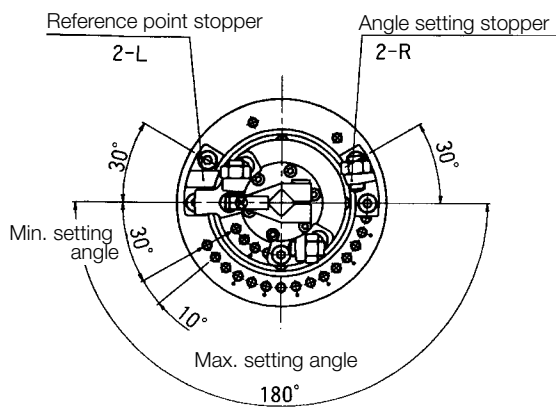
With switch



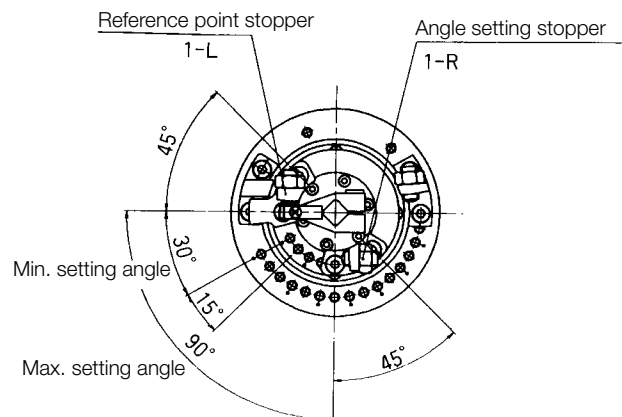
Without switch



Right angle 2 flats shaft



External HI-ROTOR



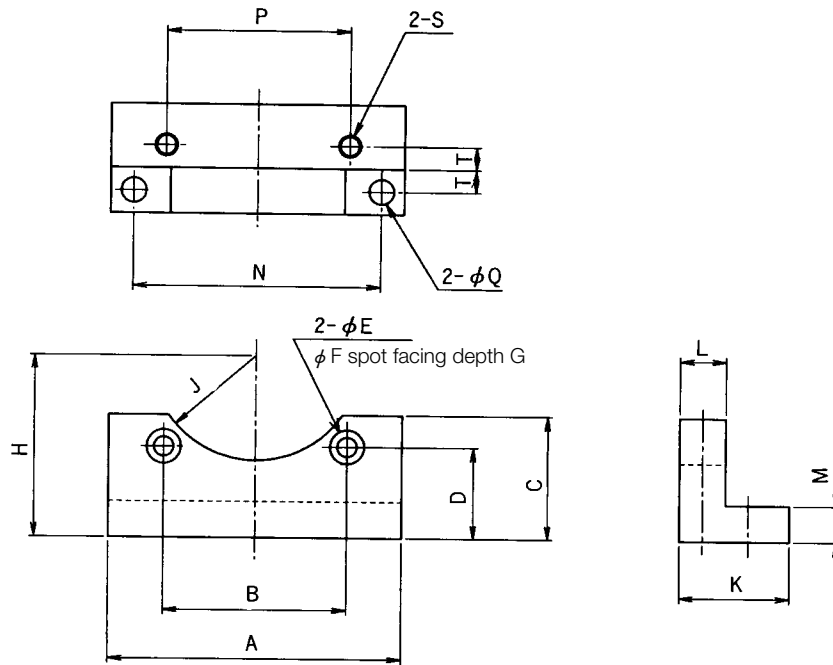
Internal HI-ROTOR

Setting ranges of stopper

STEP HI-ROTOR

ACCESSORIES

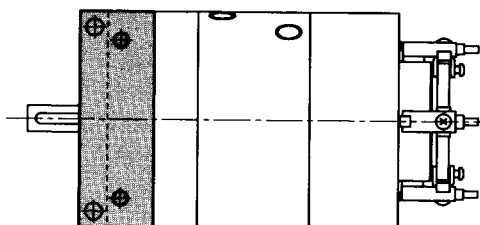
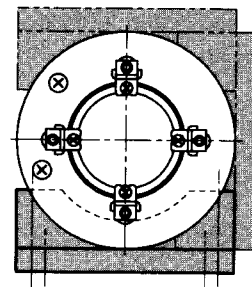
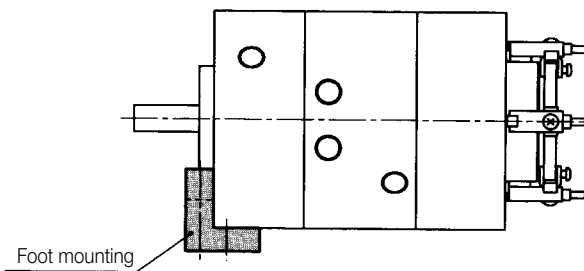
FOOT MOUNTING



(Unit : mm)

Model No.	Applicable STEP HI-ROTOR	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	S	T
G5-L	SH5S, SH5D	64	40	27	20	4.3	7.5	4.5	40	23	24	10	7.9	54	40	5.5	M5	5
G20-L	SH20S, SH20D	82	50	31	25	5.3	9	5.5	50	30.5	28	10.5	8.9	70	60	6.5	M6	5

Foot mounting can be fitted onto 3 sides by rotating 90 degree in each direction as shown below :



Model No.	Mass (g)
G5-L	60
G20-L	90