KOGANEI

Catalog No.BK-C0023

NEW Products

http://www.koganei.co.jp

ISO9001
ISO14001

TÜV CERT ISO 9001 / ISO 14001

Magnet Type

Clean System Flat Rodless Cylinders

Magnet Type
Clean System Flat Rodless Cylinders

Environmentally Friendly RoHS Compliant Product !

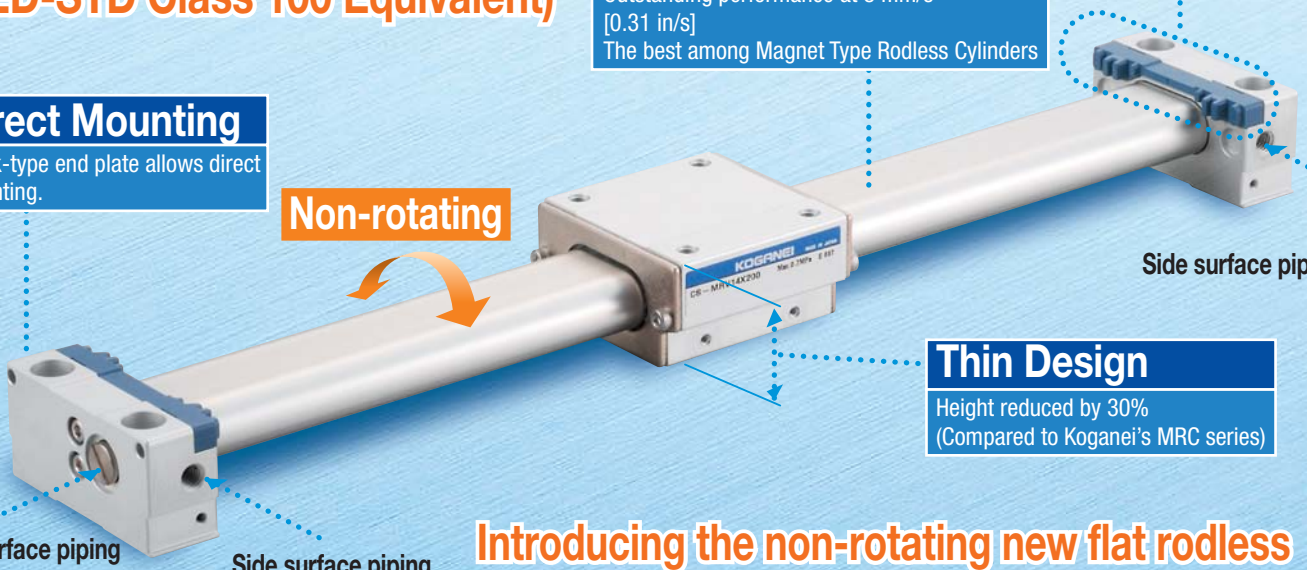
JIS and ISO Class 5 Equivalent (FED-STD Class 100 Equivalent)

Low-speed Performance
Outstanding performance at 8 mm/s [0.31 in/s]
The best among Magnet Type Rodless Cylinders

Direct Mounting
Block-type end plate allows direct mounting.

Non-rotating

Plate Bumper (urethane rubber)



Side surface piping

Thin Design
Height reduced by 30%
(Compared to Koganei's MRC series)

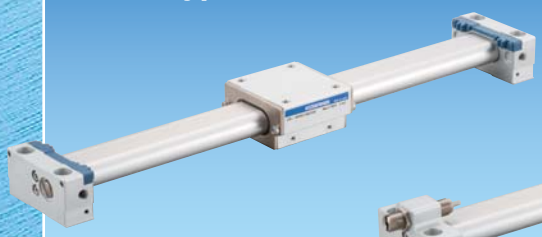
End surface piping

Side surface piping

Introducing the non-rotating new flat rodless cylinder with low-speed performance and a low center of gravity for clean specifications.

Variations

Basic Type

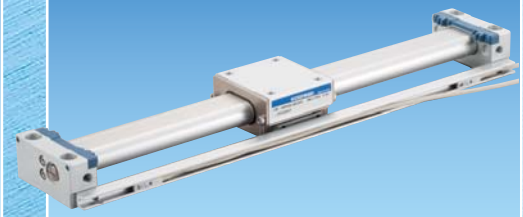


With Shock Absorber Specification

Equipped with silicon-free shock absorbers.

Option

Sensor Switch



Stroke position detection is possible over a span of strokes with installation a sensor rail and sensor magnet. Installation of a 3-lead PNP output type is also possible.

Contents

⚠ CAUTION!

Grease is applied on the outer surface of the Clean System Flat Rodless Cylinder's tube. Wash hands thoroughly after touching this grease. There is a danger that smoking may cause the grease on your hands to catch fire and release toxic gases (Although the grease used in this product is very chemically stable at room temperature, it will release toxic gases at temperatures in excess of 260°C [500°F]).
Read the safety precautions on page ❷ before using this product.

Safety Precautions (Clean System Flat Rodless Cylinders) **Always read these precautions carefully before use.**

Before selecting and using the products, please read all the Safety Precautions carefully to ensure proper product use.
The Safety Precautions shown below are to help you use the product safely and correctly, and to prevent injury or damage to you, other people, and assets beforehand.
Follow the Safety Precautions for: ISO4414 (Pneumatic fluid power—Recommendations for the application of equipment to transmission and control systems), JIS B 8370 (Pneumatic system regulations)

The directions are ranked according to degree of potential danger or damage:
"DANGER!", "WARNING!", "CAUTION!", and "ATTENTION!"

⚠ **DANGER**	Expresses situations that can be clearly predicted as dangerous. If the noted danger is not avoided, it could result in death or serious injury. It could also result in damage or destruction of assets.
⚠ **WARNING**	Expresses situations that, while not immediately dangerous, could become dangerous. If the noted danger is not avoided, it could result in death or serious injury. It could also result in damage or destruction of assets.
⚠ **CAUTION**	Expresses situations that, while not immediately dangerous, could become dangerous. If the noted danger is not avoided, it could result in light or semi-serious injury. It could also result in damage or destruction of assets.
⚠ **ATTENTION**	While there is little chance of injury, this content refers to points that should be observed for appropriate use of the product.

■This product was designed and manufactured as parts for use in General Industrial Machinery.

- In the selection and handling of the equipment, the system designer or other person with fully adequate knowledge and experience should always read the Safety Precautions, Catalog, User's Manual and other literature before commencing operation. Making mistakes in handling is dangerous.
- After reading the Instruction Manual, Catalog, etc., always place them where they can be easily available for reference to users of this product.
- If transferring or lending the product to another person, always attach the Instruction Manual, Catalog, etc., to the product where they are easily visible, to ensure that the new user can use the product safely and properly.
- The danger, warning, and caution items listed under these "Safety Precautions" do not cover all possible cases. Read the Catalog and User's Manual carefully, and always keep safety first.

⚠ DANGER

- Do not use the product for the purposes listed below:
  1. Medical equipment related to maintenance or management of human lives or bodies.
  2. Mechanical devices or equipment designed for the purpose of moving or transporting people.
  3. Critical safety components in mechanical devices.

  This product has not been planned or designed for purposes that require advanced stages of safety. It could cause injury to human life.
- Do not use the product in locations with or near dangerous substances such as flammable or ignitable substances. This product is not explosion-proof. It could ignite or burst into flames.
- When mounting the product and workpiece, always firmly support and secure them in place. When mounting the Flat Rodless cylinder, always mount it with an end plate tightened with mounting bolts at four counterbore locations (left and right).
  Failure to firmly secure the end plate could result in separation of the connection between the cylinder barrel and the end plate, leading to possible injury.
- Persons who use a pacemaker, etc., should keep a distance of at least one meter [3.28ft.] away from the product. There is a possibility that the pacemaker will malfunction due to the strong magnet built into the product.
- Never attempt to remodel the product. It could result in abnormal operation leading to injury, electric shocks, fire, etc.
- Never attempt inappropriate disassembly, assembly or repair of the product relating to basic construction, or to its performance or to functions. It could result in injury, electric shocks, fire, etc.
- Do not splash water on the product. Spraying it with water, washing it, or using it underwater could result in malfunction of the product leading to injury, electric shocks, fire, etc.
- While the product is in operation, avoid touching it with your hands or otherwise approaching too close. In addition, do not make any adjustments to the interior or to the attached mechanisms (sensor switch mounting location, disconnection of piping tubes or plugs, etc.).
  The actuator can move suddenly, possibly resulting in injury.
- When operating the product, always install speed controllers, and gradually loosen the needle valve from a choked state to adjust the speed increasing. Failure to make this adjustment could result in sudden movements, putting human lives at risk.

⚠ WARNING

- Do not use the product in excess of its specification range. Such use could result in product breakdowns, function stop or damage or drastically reduce the operating life.
- Before supplying air or electricity to the device and before starting operation, always conduct a safety check of the area of machine operation. Unintentional supply of air or electricity could possibly result in electric shocks, or in injury caused by contact with moving parts.
- Do not touch the terminals and the miscellaneous switches, etc., while the device is powered on. There is a possibility of electric shocks and abnormal operation.
- Do not allow the product to be thrown into fire. The product could explode and/or release toxic gases.
- Do not sit on the product, place your foot on it, or place other objects on it. Accidents such as falling and tripping over could result in injury. Dropping the product may result in injury, or also damage or break the product resulting in abnormal or erratic operation, or runaway, etc.
- When conducting any kind of operation for the product, such as maintenance, inspection, repair, or replacement, always turn off the air supply completely and confirm that residual pressure inside the product or in piping connected to the product is zero before proceeding. In particular, be aware that residual air will still be in the air compressor or air storage tank. The actuator could abruptly move if residual air pressure remains inside the piping, causing injury.
- Do not use the actuator for equipment whose purpose is absorbing the shocks and vibrations of mechanical devices. It could break and possibly result in injury or in damage to mechanical devices.

- Avoid scratching the cords for the sensor switch lead wires, etc. Letting the cords be subject to scratching, excessive bending, pulling, rolling up, or being placed under heavy objects or squeezed between two objects, may result in current leaks or defective continuity that lead to fires, electric shocks, or abnormal operation.
- Do not subject sensor switches to an external magnetic field during actuator operation. Unintended movements could result in damage to the equipment or in personal injury.
- Use within the recommended load and operating frequency specifications. Attempting to use beyond the recommended load and operating frequency specifications could damage the table, etc., which could result in damage to the equipment or personal injury. It could also drastically reduce the product's operating life.
- Use safety circuits or create system designs that prevent damage to machinery or injury to personnel when the machine is shut down due to an emergency stop or electrical power failure.
- Install relief valves, etc., to ensure that the actuator does not exceed its rated pressure when such pressure is rising due to external forces on the actuator. Excessive pressure could lead to a breakdown and damage.
- In initial operations after the equipment has been idle for 48 hours or more, or has been in storage, there is a possibility that contacting parts may have become stuck, resulting in equipment operation delays or in sudden movements. Before these initial operations, always run a test to check that operating performance is normal.

⚠ CAUTION

- The surface of the Clean System Flat Rodless Cylinder's tube is covered with grease. Wash hands thoroughly after touching this grease. There is a danger that smoking may cause the grease on your hands to catch fire and release toxic gases.
- Do not use in locations that are subject to direct sunlight (ultraviolet rays), dust, salt, iron powder, humidity, or in the media and/or the ambient atmospheres that include organic solvents, phosphate ester type hydraulic oil, sulphur dioxide, chlorine gas, acids, etc. It could lead to early shutdown of function or a sudden degradation of performance, and result in a reduced operating life. For the materials, see the Major Parts and Materials.
- When mounting the product, leave room for adequate working space around it. Failure to ensure adequate working space will make it more difficult to conduct daily inspections or maintenance, which could eventually lead to system shutdown or damage to the product.
- Do not bring floppy disks or magnetic media, etc., within one meter [3.28ft.] of the product. There is the possibility that the data on the floppy disks will be destroyed due to the magnetism of the magnet.
- Do not use the sensor switch in locations subject to large electrical currents or strong magnetic fields. It could result in erratic operation. In addition, do not use magnetized materials in the mounting bracket. The magnetism could leak, possibly resulting in erratic operation.
- Do not bring the product too close to a magnetic body. Positioning it near a magnetic body or strong magnetic field will cause erratic operation of sensor switches due to magnetization of the main body and table, or cause failure by adherence of iron powder, etc.
- Never use other companies' sensor switches with these products. It could possibly cause error or accidental operation.
- Do not scratch, dent, or deform the actuator by climbing on the product, using it as scaffold, or placing objects on top of it. It could lead to damaged or broken products that result in operation shutdown or degraded performance.
- Always post an "operations in progress" sign for installations, adjustments, or other operations, to avoid unintentional supplying of air or electrical power, etc. Such accidental supplies may cause electrical shocks, or sudden activation of the actuator that could result in physical injury.
- Do not pull on the cords of the lead wires, etc., of the sensor switches mounted on the actuators, grab them to lift, or place heavy objects or excessive loads on them. Such action could result in current leaks or defective continuity that lead to fire, electric shocks, or abnormal operation.

⚠ ATTENTION

- When considering the possibility of using this product in situations or environments not specifically noted in the Catalog or User's Manual, or in applications where safety is an important requirement such as in an airplane facility, combustion equipment, leisure equipment, safety equipment and other places where human life or assets may be greatly affected, take adequate safety precautions such as the application with enough margins for ratings and performance or fail-safe measure. Be sure to consult us with such applications.
- Always check the Catalog and other reference materials for product wiring and piping.
- Use a protective cover, etc., to ensure that the operating parts of mechanical devices, etc., are isolated and do not come into direct contact with human bodies.
- Do not control in a way that would cause workpieces to fall during a power failure. Take control measures so that they prevent the table or workpieces, etc., from falling during a power failure or emergency stop of the mechanical devices.
- When handling the product, wear protective gloves, safety glasses, safety boots, etc., to keep safety.
- When the product can no longer be used, or is no longer necessary, dispose of it appropriately as industrial waste.
- Pneumatic equipment can exhibit degraded performance and function over its operating life. Always conduct daily inspections of the pneumatic equipment, and confirm that all requisite system functions are satisfied, to prevent accidents from happening.
- For inquiries about the product, consult your nearest Koganei sales office or Koganei overseas department. The address and telephone number is shown on the back cover of this catalog.

⚠ OTHERS

- Always observe the following items.
  1. When using this product in pneumatic systems, always use genuine KOGANEI parts or compatible parts (recommended parts).
     When conducting maintenance and repairs, always use genuine KOGANEI parts or compatible parts (recommended parts). Always observe the required methods and procedure.
  2. Never attempt inappropriate disassembly or assembly of the product relating to basic configurations, or its performance or functions.

Koganei cannot be responsible if these items are not properly observed.

Design and selection

⚠ Warning

1. Check the specifications.
Read the specifications carefully to ensure correct use within the product's specified voltage, current, temperature and maximum impact, otherwise it could result in a breakdown or defective operation.

2. Avoid mounting actuators in close proximity to each other.
Mounting two or more actuators with sensor switches in close proximity may result in erratic operation of the sensor switches due to magnetic field interference.

3. Be careful of how long the sensor switch is ON while detecting the position in mid-stroke.
Set the sensor switch at an intermediate position of the actuator stroke. Be aware that it is possible that if the actuator's speed is too fast during detection of piston travel, the sensor switch's operation time will decrease and the load (programmable controller, etc.) may not activate.
The maximum speed at which the piston can be detected is calculated using the equation below.

$$V\text{〔mm/s〕} = \frac{\text{Sensor switch's actuation range〔mm〕}}{\text{Time required for activating the load〔ms〕}} \times 1000$$

4. Keep wiring as short as possible.
Solid state sensor switch lead wires should be within 30 m [98 ft] as stipulated by EN standards. For the reed sensor switch, if the lead wire is too long (10 m [33 ft] or more), capacitive surges will shorten the operating life of the sensor switch. If long wiring is needed, install the protection circuit mentioned in the catalog. If the load is inductive or capacitive, also install the protection circuit mentioned in the catalog.

5. Avoid repeated or excessive bending or pulling of lead wires.
Applying repeated bending stress or tension force on the lead wire could break the wires.

6. Check for current leakage.
2-lead wire solid state sensor switches produce current leakage to activate their internal circuits and the current passes through a load even when turned-off. Ensure they satisfy the following inequality:

Input off current of programmable controller > Leakage current

If the above inequality cannot be satisfied, select a 3-lead wire solid state sensor switch instead. Also note that parallel installation of a total of n sensor switches will multiply the amount of current leakage by n times.

⚠ Caution

1. Check for sensor switch internal voltage drop.
Series connection of reed sensor switches with indicator lamps or 2-lead wire solid state sensor switches causes increasing internal voltage drop and the load may fail to activate. A total number of n sensor switches will lead to n times the internal voltage drop. Ensure that the system satisfies the following inequality:

Supply voltage – Internal voltage drop × n > Minimum operating voltage for load

In relays with a rated voltage of less than DC 24 V, check to see whether the above inequality is satisfied, even in the case of n = 1.
If the above inequality cannot be satisfied, select a reed sensor switch without an indicator lamp.

2. Do not use KOGANEI sensor switches with actuators from another company.
The sensor switches are designed for use with KOGANEI actuators only. Use with actuators from another company may lead to malfunction.

Installation and adjustment

⚠ Warning

1. During actuator operation, do not subject sensor switches to an external magnetic field.
Unintended movement may cause personal injury or damage to the equipment.

⚠ Caution

1. Ensure a safe installation environment for the actuators with sensor switches.
Do not use the sensor switch in locations subject to large electrical currents or strong magnetic fields. This may cause the device to malfunction. In addition, do not use magnetized materials for the mounting bracket. This may also cause erratic operations of the device.

2. Install sensor switches in the center of their operating range.
Adjust the mounting position of a sensor switch so that the piston stops in the center of its operating range (the range while the sensor is ON). Operations will be unstable if mounted at the end of the operating range (at the boundary near ON and OFF). Also be aware that the operating range will vary with changes in temperature.

3. Follow the tightening torque for mounting sensor switches.
Over-tightening beyond the allowed tightening torque may damage the mounting threads, mounting brackets, sensor switches and other components. However, insufficient tightening torque may cause the sensor switch position to change, resulting in unstable operation. Follow the instructions on page ⓴ concerning the tightening torque.

4. Do not carry the actuator by the sensor switch lead wires.
After mounting a sensor switch to an actuator, do not grab the lead wires to carry the actuator. It may not only break the lead wires, but it will apply stress to the interior of the sensor switch causing the internal components to break.

5. Do not drop or bump sensor switches.
While handling sensor switches, do not subject them to excessive shock (294.2 m/s^2 [965 ft/sec^2]) by hitting, dropping or bumping them.
For reed sensor switches, the contact reed may be activated unintentionally, causing it to send or break signals suddenly. This may cause contact interval changes that will affect sensor switch sensitivity and result in erratic operation. Even if the sensor switch case is undamaged, the inner components of the sensor switch may be damaged resulting in erratic operations.

Safety Precautions (Sensor Switch)

Wiring

⚠ Danger

1. **Prevent nearby moving objects from coming into contact with the sensor switches.**
   When actuators equipped with sensor switches are moving or when moving objects are nearby, do not let them come into contact. In particular, lead wires may become worn or damaged causing unstable operation of the sensor switch. In the worst case, this may result in current leaks or electrical shock.
2. **Always turn off the power supply before performing wiring work.**
   Performing wiring work while the power is on may result in electric shock. Incorrect wiring can immediately cause damage to the sensor switch. Turn on the power only after the wiring work is complete.

⚠ Warning

1. **Check the catalog and other materials to ensure that the sensor switch is wired correctly.**
   Incorrect wiring may result in abnormal operation.
2. **Do not share wiring with power or high voltage lines.**
   Avoid sharing or wiring parallel to power or high voltage lines. Noise from these lines may cause the sensor switch to cause erratic operation.
3. **Avoid repeated or excessive bending or pulling of lead wires.**
   Applying repeated bending stress or tension force on the lead wire may result in wire breakage.
4. **Check the wiring polarity.**
   Be sure that the wiring connections are correct for sensor switches that specify polarity (+, –, output). Incorrect polarity could result in damage to sensor switches.

⚠ Caution

Avoid short-circuiting loads.
Turning a sensor switch ON while the load is short-circuited causes an overcurrent that will instantly damage the sensor switch. An example of a short-circuited load: The sensor switch's output lead wire is directly connected to the power supply.

Handling Instructions and Precautions

General Precautions

Media

1. Use air as the media. For the use of any other media, consult KOGANEI.
2. Air used for the Clean System Flat Rodless Cylinder should be clean air that contains no degraded compressor oil, etc. Install an air filter (filtration of 40 μm or less) near the Clean System Flat Rodless Cylinder or valve to remove dust or accumulated liquid.
   Also drain the air filter periodically. If liquid or dust enters into the Clean System Flat Rodless Cylinder, this may cause a defective operation.

Piping

1. Before installing piping for the Clean System Flat Rodless Cylinder, always flush the tube completely by blowing compressed air through it. Machining chips, sealing tape, rust and other debris remaining from the piping work may result in air leaks and malfunctions.
2. When screwing pipes or fittings into the Clean System Flat Rodless Cylinder, use the appropriate tightening torque shown below:

Connecting thread	Tightening torque N·m [ft·lbf]
M5×0.8	1.6 [1.2]
Rc1/8	6.9 ~ 8.8 [5.1 ~ 6.5]

Atmosphere

1. Cover the unit when using it in locations where it might be subject to excessive dust, dripping water, dripping oil, etc.
2. This unit cannot be used when media or ambient atmosphere contain any of the following substances the following: Organic solvents, phosphoric acid ester type hydraulic oil, sulfur dioxide, chlorine gas, or acids.

Lubrication

The Clean System Flat Rodless Cylinder does not require lubrication to operate. If lubrication is required, consult us. Do not use turbine oil.

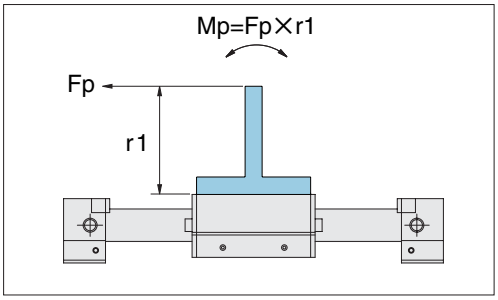
Others

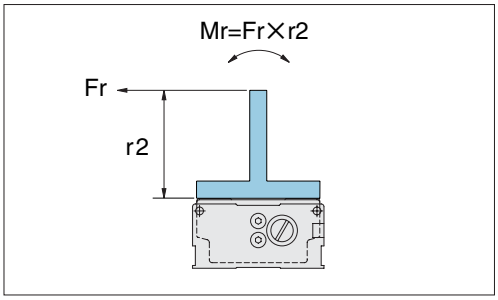
1. The Clean System Flat Rodless Cylinder may not move smoothly when operated by hand. This is normal since it was designed to operate with air pressure. Always ensure that air is supplied when operating the device.
2. The Clean System Rodless Cylinder is equipped with a strong magnet. Do not place magnetic media such as data storage devices and magnetic detection devices within 1 m [3.28 ft] of this product. Doing so may cause data corruption and malfunction.

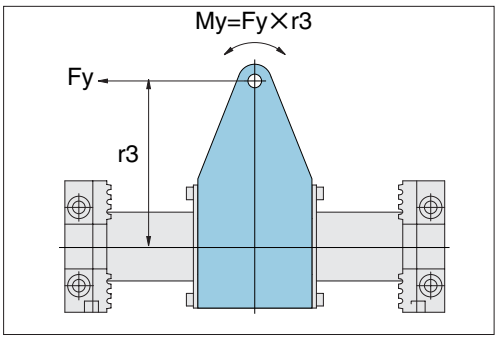
Selection

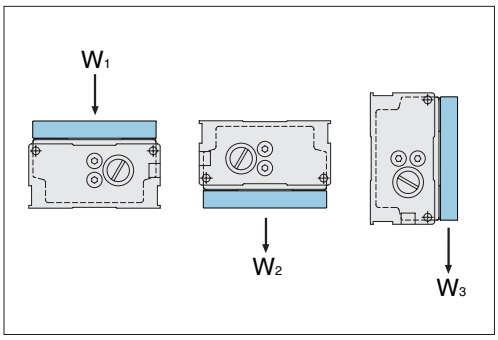
Allowable load and moment

It is possible to apply a load directly on the Clean System Flat Rodless Cylinder and use it. However, the load and the moment should not exceed the values listed below. Use this product after checking the sections on page ❼ regarding Rubber Bumper Capacity and Shock Absorber Capacity since payload may change depending on speed.









Pitching Direction Moment : Mp = Fp × r1 (N·m)
Rolling Direction Moment : Mr = Fr × r2 (N·m)
Yawing Direction Moment : My = Fy × r3 (N·m)
Max. Load Capacity : W_1 · W_2 · W_3 (N)

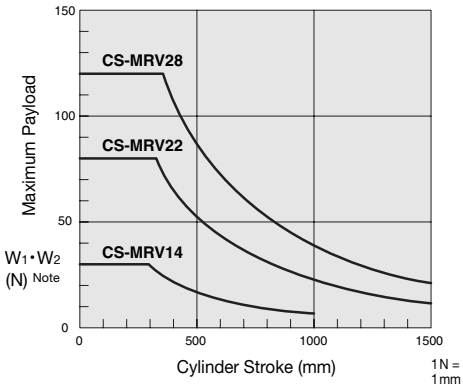
Caution : External forces Fp and Fy should be at 60% or less of the magnet retaining force.

Moment direction / Equivalent bore size mm	Mp N·m [ft·lbf]	Mr N·m [ft·lbf]	My N·m [ft·lbf]	W_1 Caution N [lbf]	W_2 Caution N [lbf]	W_3 Caution N [lbf]
14	1.2 [0.9]	0.3 [0.2]	1.2 [0.9]	30 [6.7]	30 [6.7]	10 [2.2]
22	4 [3.0]	1 [0.7]	4 [3.0]	80 [18.0]	80 [18.0]	30 [6.7]
28	8 [5.9]	2 [1.5]	8 [5.9]	120 [27.0]	120 [27.0]	45 [10.1]

Caution : Be sure that the above values do not exceed the moment that includes the inertial force generated when the load is moved or stopped.
Also be sure that the mass and speed are within the ranges of the rubber bumper and shock absorber capacity graphs.

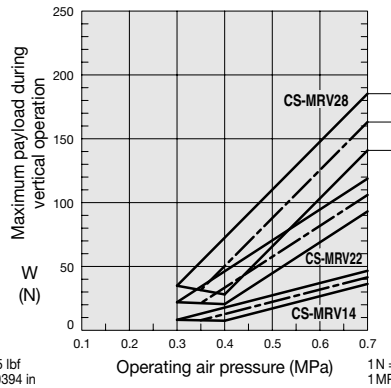
Caution : This is the maximum value for W. W will vary with the stroke, so use the product within the ranges of the "Maximum Payload and Stroke" graph below.

Maximum Payload and Stroke



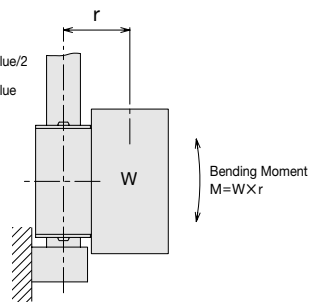
1 N = 0.225 lbf
1 mm = 0.0394 in

Relationship between the maximum payload and air pressure during vertical operation (reference)



Bending Moment
When M = 0
When M = the Maximum Value/2
When M = the Maximum Value

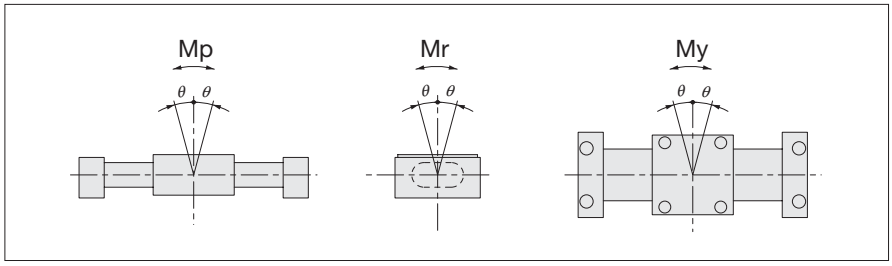
1 N = 0.225 lbf
1 MPa = 145 psi



Note: The value of W_3 is 1/3 that of W_1 and W_2.

Slider deflection

The table below lists reference values of slider deflection caused by the play. Since there is a little play in the slider on the Clean System Flat Rodless Cylinder, use it in combination with a linear guide for high precision applications.



Equivalent bore size mm	Slider deflection θ (± °)		
	Mp direction	Mr direction	My direction
14	0.8	1.8	0.8
22	0.6	1.2	0.6
28	0.7	1.3	0.7

Cushioning capacity

Rubber Bumper Capacity

All of the Clean System Flat Rodless Cylinders come with standard rubber bumpers. The maximum payload and impact speed ranges for absorbing kinetic energy are listed below in the “Rubber Bumper and Shock Absorber Capacity Graph” under “When using a rubber bumper.” Do not use the product in excess of the maximum impact speed of 500 mm/s [19.7 in/sec].

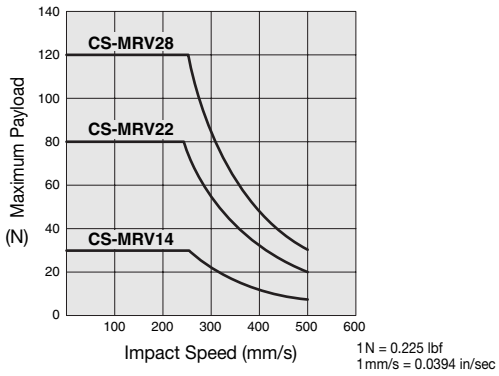
Shock Absorber Capacity

The Clean System Flat Rodless Cylinder can be equipped with optional shock absorbers. The maximum payload and impact speed ranges for absorbing kinetic energy are listed below in the “Rubber Bumper and Shock Absorber Capacity Graph” under “When using a shock absorber.” Do not use the product in excess of the maximum impact speed of 800 mm/s [31.5 in/sec].

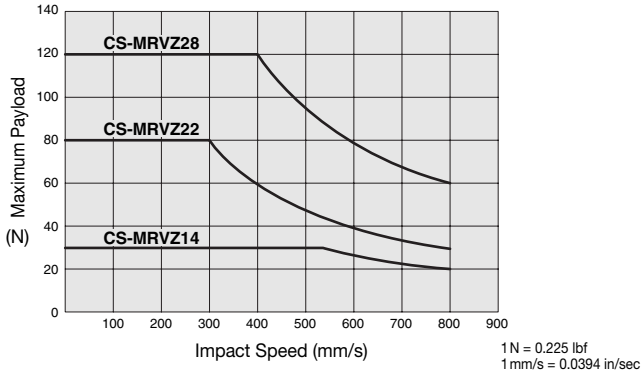
Rubber Bumper and Shock Absorber Capacity Graph

(Horizontal movement, at operating air pressure of 0.5 MPa [73 psi])

When using a rubber bumper



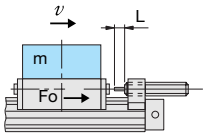
When using a shock absorber

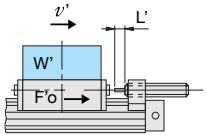


In the graphs, “impact speed” refers to the speed immediately before the slider impacts the rubber bumper or shock absorber. This is different from the “average speed (cylinder stroke/travel time).”

Calculation of Impact Energy

Horizontal Impact



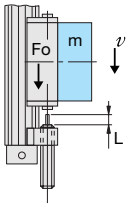


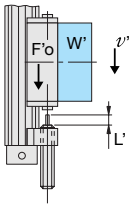
$E = E_1 + E_2 = \frac{m \cdot v^2}{2} + F_0 \cdot L$

$E' = E'_1 + E'_2 = \frac{W' \cdot v'^2}{2g'} + F'_0 \cdot L'$

Vertical Impact [Note1]

When descending [Note2]

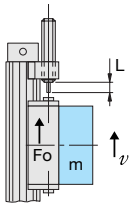


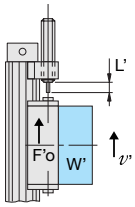


$E = E_1 + E_2 + E_3 = \frac{m \cdot v^2}{2} + F_0 \cdot L + m \cdot g \cdot L$

$E' = E'_1 + E'_2 + E'_3 = \frac{W' \cdot v'^2}{2g'} + F'_0 \cdot L' + W' \cdot L'$

When ascending

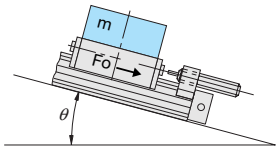




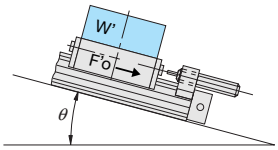
$E = E_1 + E_2 - E_3 = \frac{m \cdot v^2}{2} + F_0 \cdot L - m \cdot g \cdot L$

$E' = E'_1 + E'_2 - E'_3 = \frac{W' \cdot v'^2}{2g'} + F'_0 \cdot L - W' \cdot L'$

Note 1 : For impact on incline,
E_3 becomes $E_3' = m \cdot g \cdot L \cdot \sin\theta$.



Note 1 : For impact on incline,
E'_3 becomes $E_3'' = W' \cdot L' \cdot \sin\theta$.



Note 2 : When descending, heavier loads can be carried using lower operating air pressure (P) than when ascending.

E : Total impact energy ··· [J]
E_1 : Kinetic energy ··· $(m \cdot v^2)/2$ [J]
E_2 : Additional energy by cylinder thrust ··· $Fo \cdot L$ [J]
E_3 : Additional energy by load mass ··· $m \cdot g \cdot L$ [J]
m : Load mass [kg]
v : Impact speed [m/s]
g : Gravity acceleration 9.8 [m/s^2]
Fo : Cylinder thrust ··· $= \pi/4 \cdot D^2 \cdot P$ [N]
[D: Cylinder bore (mm), P: Operating air pressure (MPa)]
L : Absorbing stroke of shock absorber [m]

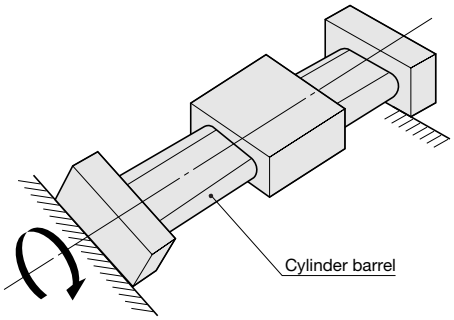
Note 2 : When descending, heavier loads can be carried using lower operating air pressure (P') than when ascending.

E' : Total impact energy ··· [ft·lbf]
E'_1 : Kinetic energy ··· $(W' \cdot v'^2)/2g'$ [ft·lbf]
E'_2 : Additional energy by cylinder thrust ··· $F'o \cdot L'$ [ft·lbf]
E'_3 : Additional energy by load weight ··· $W' \cdot L'$ [ft·lbf]
W' : Load weight [kg]
v' : Impact speed [ft./sec.]
g' : Gravity acceleration 32.2 [ft./sec.]
F'o : Cylinder thrust ··· $= \pi/4 \cdot D'^2 \cdot P'$ [lbf.]
[D': Cylinder bore [in.], P': Operating air pressure [psi.]]
L' : Absorbing stroke of shock absorber [ft.]

Mounting

Mounting

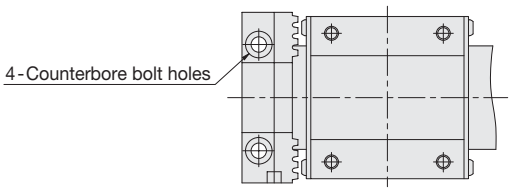
1. The Clean System Flat Rodless Cylinder houses a strong magnet so do not use this product in a place where machine oil with magnetic substances or machining chips are present.
2. Do not dent or scratch the cylinder barrel.
3. If an external force larger than the magnetic retaining force is applied and there is a misalignment or separation of the slider and the piston, return the piston to the end of the stroke and restore the slider to its correct position using external force.
4. Grease is applied to the outer surface of the cylinder barrel. Do not wipe the surface with alcohol or other agents. Removing the grease could result in a malfunction. For questions regarding the grease used on the cylinder, contact your nearest sales office.
5. Mount the cylinder barrel without twisting it. If the mounting surface is not flat, the cylinder may twist and result in a malfunction.



6. When mounting the unit, always use the four counterbore bolt holes on the left and right of the end plate.

Tightening Torque N·m [ft·lbf]

Equivalent bore size mm	14	22	28
Tightening Torque	2.8 [2.1] (M4)	6 [4.4] (M5)	10 [7.4] (M6)



Mounting the shock absorber

Tightening torque for the hex nuts used on the shock absorber N·m [ft·lbf]

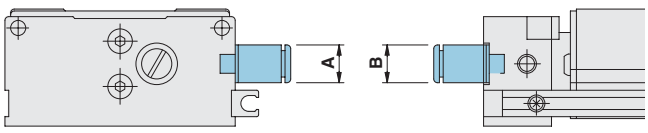
Model	KSHJM8×5-14 for the **CS-MRVZ14**	KSHJM8×5-22 for the **CS-MRVZ22**	KSHJM10×10-28 for the **CS-MRVZ28**
Tightening Torque	2.5 [1.8]		6.5 [4.8]

1. Use the shock absorber within its capacity range (see the capacity graph).
2. The maximum impact speed of the shock absorber is 800 mm/s [31.5 in/sec]. This differs from the average speed, so do not exceed a speed of 800 mm/s [31.5 in/sec] at the time of impact.
3. Do not use the shock absorber in locations where there is dripping water, dripping oil or dust. In these locations, use a cover to prevent water, etc., from directly affecting the unit. Otherwise, it may lead to a defective operation and reduce energy absorption.
4. Do not loosen the lock screw on the end of the shock absorber. Oil may leak out from the unit and lead to decreased functionality of the shock absorber.
5. Do not install other shock absorbers on this product. Since each shock absorber's characteristics are different, use of other shock absorbers may damage the cylinder.

Size of piping materials

For the side surface port with sensor rail, the distance to the sensor rail determines the outer diameter of the attached pipe fitting. For an end surface port, the diameter of the counterbore determines the outer diameter of the fitting. Use the values listed below for the outer diameter of the pipe fitting.

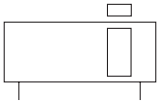
Equivalent bore size mm	Side surface (with sensor rail)	End surface
	A	**B**
14	ϕ 10 [0.394 in]	ϕ 10 [0.394 in]
22	ϕ 13 [0.512 in]	ϕ 10 [0.394 in]
28	ϕ 16 [0.630 in]	—



Clean System Flat Rodless Cylinders

Specification List

Symbol



Specifications

Item \ Model		CS-MRV14	CS-MRV22	CS-MRV28
Equivalent bore size mm [in]		14 [0.551]	22 [0.866]	28 [1.102]
Medium		Air Note 1		
Operating type		Double acting type		
Operating pressure range MPa [psi]		0.2 ～ 0.7 [29 ～ 102]		
Proof pressure MPa [psi]		1.05 [152]		
Operating temperature range °C [°F]		0 ～ 60 [32 ～ 140]		
Operating speed range mm/s [in/sec]	Standard type	8 ～ 500 [0.31 ～ 19.7] Note 2		
	With shock absorber specification	8 ～ 800 [0.31 ～ 31.5] Note 2		
Cushion	Standard type	Rubber bumper		
	With shock absorber specification	Shock absorber		
Lubrication		Not required Note 3		
Stroke adjustment range (with shock absorber specification only) (per one side in the specification stroke) mm [in]		0 ～ −10 [0 ～ −0.394]	0 ～ −6 [0 ～ −0.236]	0 ～ −15 [0 ～ −0.591]
Maximum stroke mm		1000	1500 Note 4	
Stroke tolerance mm [in]		+2 [+0.079] 0 [0]		
Port size mm		M5×0.8		Rc 1/8

Notes 1 : Use clean air that contains no moisture, dust, oxidized oil and other contaminants.
2 : For the relationship between the maximum payload and the impact speed, see the rubber bumper and the shock absorber capacity graphs on page ❼.
3 : This unit can be used without lubrication. However, if lubrication is required, always consult us. Do not use turbine oil.
4 : The maximum stroke with the sensor rail is 1000 mm.

Magnetic Retaining Force

N [lbf]

Item \ Model	CS-MRV14	CS-MRV22	CS-MRV28
Retaining force	115 [25.9]	310 [69.7]	500 [112]

Shock Absorber Specifications

Item \ Model	CS-MRVZ14	CS-MRVZ22	CS-MRVZ28
Applicable shock absorber	**KSHJM 8×5-14**	**KSHJM 8×5-22**	**KSHJM 10×10-28**
Max. absorption J [ft･lbf]	1 [0.7]	1.5 [1.1]	3 [2.2]
Absorption stroke mm [in]	5 [0.197]		10 [0.394]
Max. impact speed mm/s [in/sec]	800 [31.5]		
Max. operating frequency cycle/min	60		
Spring return force (at compressed) N [lbf]	6 [1.3]		8 [1.8]
Angle variation	Less than 1°		
Operating temperature range °C [°F]	0 ～ 60 [32 ～ 140]		

Caution : Shock absorber durability differs depending on how the rodless cylinder is used.

Equivalent bore size and Stroke

mm

Model \ Item	Standard stroke	Available stroke	Available stroke with sensor rail
CS-MRV(Z)14	100, 150, 200, 250, 300, 350, 400, 450, 500	1 ～ 1000	1 ～ 1000
CS-MRV(Z)22	200, 250, 300, 350, 400, 450, 500, 600, 700, 800	1 ～ 1500	
CS-MRV(Z)28	200, 250, 300, 350, 400, 450, 500, 600, 700, 800	1 ～ 1500	

Note : Non-standard strokes are available at 1 mm intervals.

Mass

kg [oz.]

Model		Zero stroke mass	Additional mass per 1 mm [0.0394 in] stroke	Shock absorber		Sensor magnet	Sensor rail zero stroke mass	Additional mass per 1 mm [0.0394 in] sensor rail	Sensor Switch	
				One side	Both sides				1 m lead wire or **ZE175G**	3 m lead wirea
CS-MRV(Z)14	Standard type	0.22 [7.76]	0.000267 [0.00942]	–	–	0.004 [0.14]	0.007 [0.25]	0.0001 [0.0035]	0.015 [0.53]	0.035 [1.23]
	With shock Absorber	0.27 [9.52]		0.01 [0.35]	0.02 [0.71]					
CS-MRV(Z)22	Standard type	0.50 [17.64]	0.000491 [0.01732]	–	–		0.008 [0.28]			
	With shock Absorber	0.59 [20.81]		0.01 [0.35]	0.02 [0.71]					
CS-MRV(Z)28	Standard type	0.86 [30.34]	0.000656 [0.02314]	–	–		0.010 [0.35]			
	With shock Absorber	1.00 [35.27]		0.022 [0.78]	0.044 [1.55]					

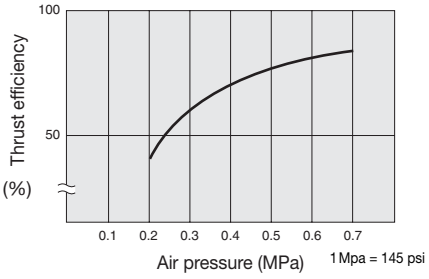
Theoretical Thrust

N [lbf]

Equivalent bore size mm	Pressure area mm² [in²]	Air pressure MPa [psi]					
		0.2 [29]	0.3 [44]	0.4 [58]	0.5 [73]	0.6 [87]	0.7 [102]
14	157 [0.243]	31 [7.0]	47 [10.6]	63 [14.2]	79 [17.8]	94 [21.1]	110 [24.7]
22	402 [0.623]	80 [18.0]	121 [127.2]	161 [36.2]	201 [45.2]	241 [54.2]	281 [63.2]
28	628 [0.973]	126 [28.3]	188 [42.3]	251 [56.3]	314 [70.6]	377 [84.7]	440 [98.9]

Values in the table are only theoretical. There may be some differences from these in actual applications.
See the thrust efficiency graph to the right for selecting models.
Be aware that low pressure can cause the thrust efficiency to drop.

Thrust efficiency



Air Flow Rate and Air Consumption

Air consumption of the Clean System Flat Rodless Cylinder is calculated using the equation below. However, the simplified chart can make the calculations easier.

Air flow rate : $Q_1 = \frac{\pi D^2}{4} \times L \times \frac{60}{t} \times \frac{P+0.101}{0.101} \times 10^{-6}$

Air consumption : $Q_2 = \frac{\pi D^2}{4} \times L \times 2 \times n \times \frac{P+0.101}{0.101} \times 10^{-6}$

Q_1	: Air flow rate required for the cylinder	ℓ/min(ANR)
Q_2	: Cylinder air consumption	ℓ/min(ANR)
D	: Equivalent bore size	mm
L	: Cylinder stroke	mm
t	: Time needed for the cylinder to travel 1 stroke	s
n	: Number of cylinder reciprocations per minute	times/min
P	: Operating pressure	MPa

Air consumption for every 1 mm [0.0394 in] of the stroke

cm³ [ft³]/reciprocations (ANR)

Cylinder diameter mm [in]	Air pressure MPa [psi]					
	0.2 [29]	0.3 [44]	0.4 [58]	0.5 [73]	0.6 [87]	0.7 [102]
14 [0.551]	0.936 [3.31×10⁻⁵]	1.246 [4.40×10⁻⁵]	1.558 [5.50×10⁻⁵]	1.868 [6.60×10⁻⁵]	2.180 [7.70×10⁻⁵]	2.490 [8.79×10⁻⁵]
22 [0.866]	2.396 [8.46×10⁻⁵]	3.192 [1.127×10⁻⁴]	3.988 [1.408×10⁻⁴]	4.784 [1.689×10⁻⁴]	5.580 [1.971×10⁻⁴]	6.378 [2.252×10⁻⁴]
28 [1.102]	3.744 [1.322×10⁻⁴]	4.988 [1.761×10⁻⁴]	6.232 [2.201×10⁻⁴]	7.476 [2.640×10⁻⁴]	8.720 [3.079×10⁻⁴]	9.966 [3.519×10⁻⁴]

The values in the table are calculated based upon the air flow rate and air consumption at a 1 mm [0.0394 in] stroke cylinder during 1 reciprocation of the rodless cylinder.
Actually required air flow rate and air consumption are calculated with the equations below.

● When calculating air flow (When selecting F.R.L., valves, etc.)

Example : For a Clean System Flat Rodless Cylinder with equivalent bore size of 22 mm [0.866 in] traveling a speed of 300 mm/s [11.8 in/sec], operating with air pressure of 0.5 MPa [73 psi].

$4.784 \times \frac{1}{2} \times 300 \times 10^{-3} = 0.71$ ℓ/s (ANR)

(The flow rate every minute is calculated using the equation $4.784 \times \frac{1}{2} \times 300 \times 60 \times 10^{-3} = 43.05$ ℓ/min (ANR).)

● When calculating air consumption

Example 1 : For a Clean System Flat Rodless Cylinder with equivalent bore size of 22 mm [0.866 in], a stroke of 100 mm [3.94 in], and air pressure of 0.5 MPa [73 psi] making 1 reciprocation.

$4.784 \times 100 \times 10^{-3} = 0.478$ ℓ/trip (ANR)

Example 2 : For a Clean System Flat Rodless Cylinder with equivalent bore size of 22 mm [0.866 in], a stroke of 100 mm [3.94 in], and air pressure of 0.5 MPa [73 psi] making 10 reciprocations per minute.

$4.784 \times 100 \times 10 \times 10^{-3} = 4.78$ ℓ/min (ANR)

Caution : To calculate the actually required air consumption when using the Clean System Flat Rodless Cylinder, add the air consumption of the piping to the air consumption from the above equations.

Order Codes

● Basic type

CS-MRV [ ] **14×200** - [ ] [ ] [ ]

Clean System Flat Rodless Cylinder with Rubber Bumper

Equivalent bore size × Stroke

Sensor rail
Blank : No sensor rail
S : With sensor rail (includes sensor magnet)

Number of sensor switches
1 : With 1 sensor switch
2 : With 2 sensor switch
3 : With 3 sensor switch
⋮

Lead wire length
A : 1000 mm [39 in]
B : 3000 mm [118 in]
G : 300 mm [11.811 in] with M8 connector, only on the ZE175

Sensor switch model
Blank : No sensor switch
ZE135 : 2-lead wire solid state switch with indicator lamp DC 10 ~ 28 V
ZE155 : 3-lead wire solid state switch with NPN output and indicator lamp DC 4.5 ~ 28 V
ZE101 : 2-lead wire reed switch without indicator lamp DC 5 ~ 28 V, AC 85 ~ 115 V
ZE102 : 2-lead wire reed switch with indicator lamp DC 10 ~ 28 V, AC 85 ~ 115 V
ZE175 : 3-lead wire solid state switch with PNP output and indicator lamp DC 4.5 ~ 28 V

Note : The packaging is the same as for standard products which use a single package.

● With shock absorber specification

CS-MRVZ [ ] **14×200** - [ ] - [ ] [ ] [ ]

Clean System Flat Rodless Cylinder with Shock Absorber

Eauivalent bore size × Stroke

Sensor rail
Blank : No sensor rail
S : With sensor rail (includes sensor magnet)

Number of sock absorbers
K1 : 1
K2 : 2

Number of sensor switches
1 : With 1 sensor switch
2 : With 2 sensor switch
3 : With 3 sensor switch
⋮

Lead wire length
A : 1000 mm [39 in]
B : 3000 mm [118 in]
G : 300 mm [11.811 in] with M8 connector, only on the ZE175

Sensor switch model
Empty : No sensor switch
ZE135 : 2-lead wire solid state switch with indicator lamp DC 10 ~ 28 V
ZE155 : 3-lead wire solid state switch with NPN output and indicator lamp DC 4.5 ~ 28 V
ZE101 : 2-lead wire reed switch without indicator lamp DC 5 ~ 28 V, AC 85 ~ 115 V
ZE102 : 2-lead wire reed switch with indicator lamp DC 10 ~ 28 V, AC 85 ~ 115 V
ZE175 : 3-lead wire solid state switch with PNP output and indicator lamp DC 4.5 ~ 28 V

Note : The packaging is the same as for standard products which use a single package.

Additional Parts

● Sensor rail

S-MRV **14×100**

Equivalent bore size × Stroke
(1 sensor rail, 2 bolts)

● Magnet set

MG-MRV [ ]

Equivalent bore size
14 : For **CS-MRV14**
22 : For **CS-MRV22**
28 : For **CS-MRV28**
(1 sensor switch, 1 magnet holder, 2 bolts)

● Shock absorber

KSHJM [ ]

Size
8 × 5-14 : For **CS-MRVZ14**
8 × 5-22 : For **CS-MRVZ22**
10 × 10-28 : For **CS-MRVZ28**

Note : Additional parts use standard specifications.

About Evaluations of Clean Level

No standard, including JIS, has officially stipulated a method for evaluating the clean level of the equipment for the cleanroom specifications. KOGANEI has established its own measurement method for evaluating the clean level. The particle generation level of the Clean System Flat Rodless Cylinder is measured according to the method below.

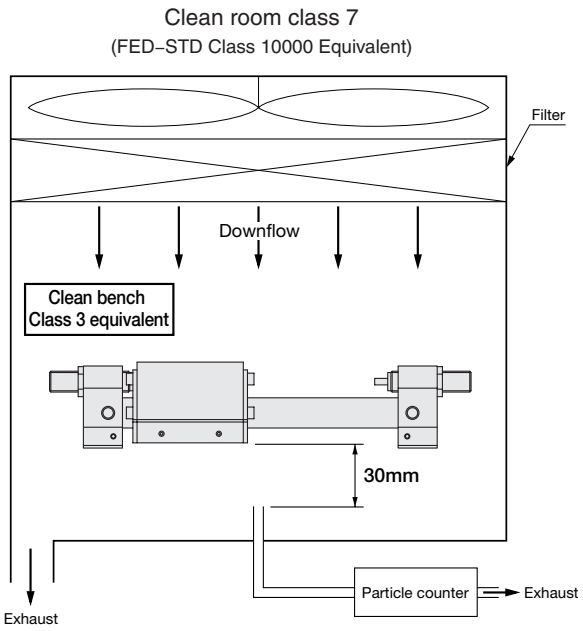
1. Measuring Sample Products

①CS-MRVZ14 × 500 (no load)
②CS-MRVZ22 × 500 (1 kg load) [2.2 lbs.]
③CS-MRVZ28 × 500 (1.5 kg load) [3.3 lbs.]

2. Measuring Conditions

2-1 Testing procedure
Measuring area : Center of the cylinder, lower section
Measuring position : 30 mm [1.18 in] from the slider
2-2 Operating condition of the sample product
Operating frequency : 10 times/minute*
Operating Speed : CS-MRVZ14 500 mm/s [19.7 in/sec]
CS-MRVZ22, CS-MRVZ28 } 250 mm/s [7.87 in/sec]
Applied pressure : 0.5 MPa [73 psi]
Mounting direction : Horizontal

Caution : The particle generation level is an average of 10 repetitions of the test taken 10 times/minute.
The particle generation level is also the actual measured value based on the above conditions.
In your applications, we would like to ask for your evaluations based upon your operating conditions.



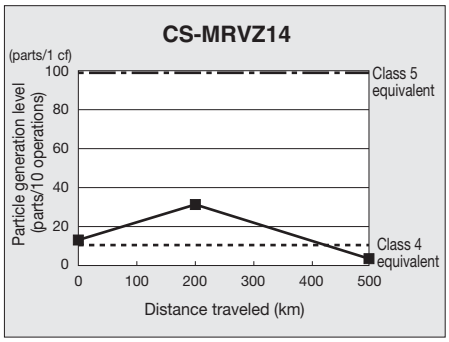
3. Particle counter

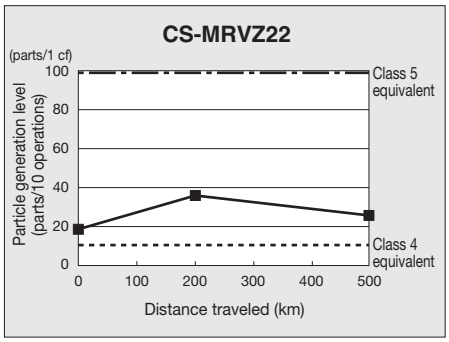
Maker/Model ····· Rion Co., Ltd. /KM-20
Suction flow rate ····· 28.3 ℓ/min [7.47 gal/min]
Possible particle diameter ····· 0.1 μm, 0.2 μm, 0.3 μm, 0.5 μm, 0.7 μm, 1.0 μm

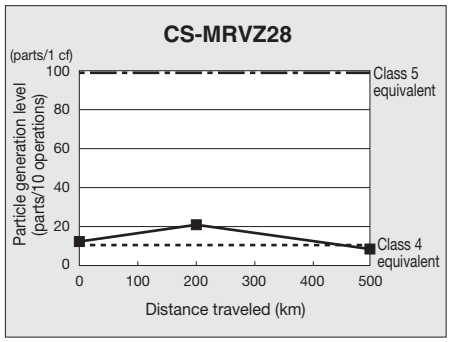
4. Measuring methodology

4-1 Verification of the particle generation level in the measurement system
Before measuring, measure the background for 9 minutes and verify that the particle generation of the measurement system is at zero.
4-2 Measurement
4-3 Re-verification
Repeat the measurement in step 4-1 and verify that the particle generation of the measurement system is at zero.

5. Measurement Results (average particle generation level of over 0.1 μm particles)



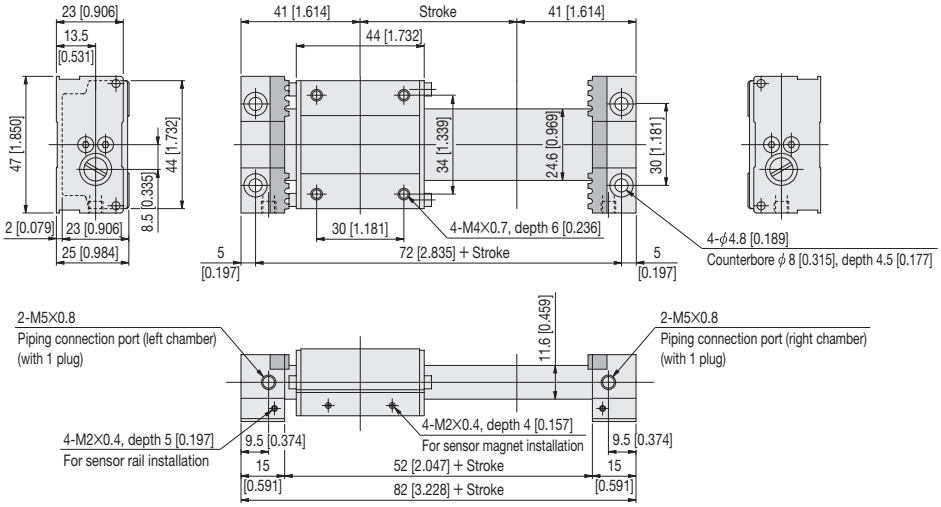




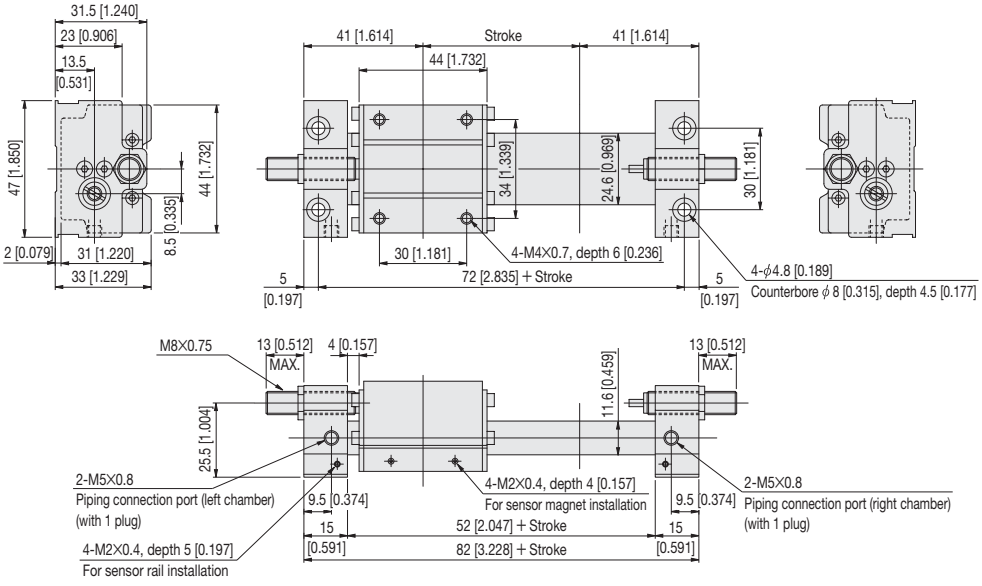
Caution : The particle generation level in the graphs above are based on measured values under conditions established at KOGANEI and are not guaranteed values.

Clean System Dimensions (mm) [in]

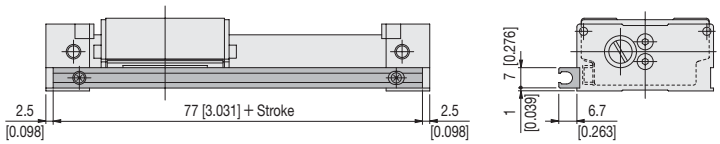
Basic type **CS-MRV14** × Stroke



With Shock Absorber Specification **CS-MRVZ14** × Stroke



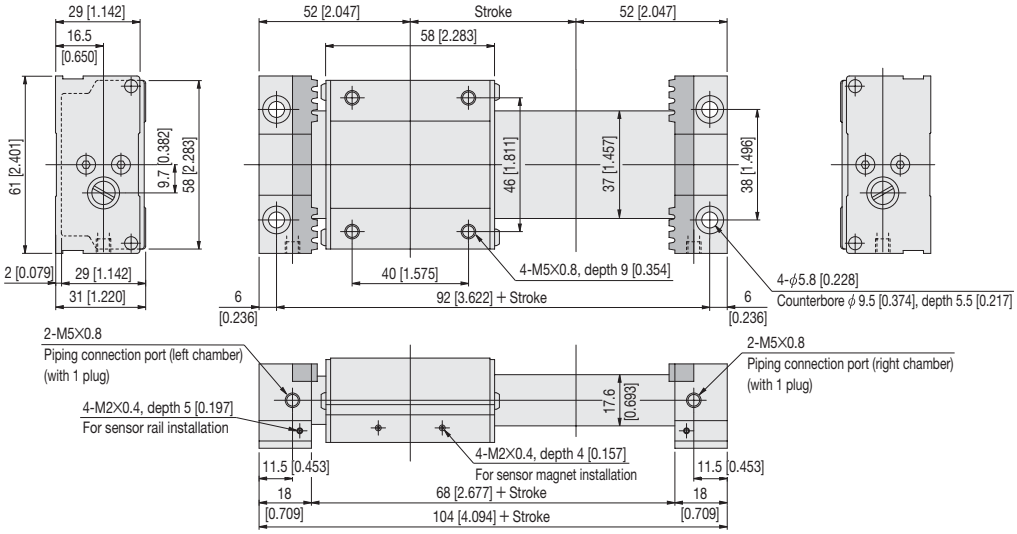
With Sensor Rail **CS-MRV□S14** × Stroke



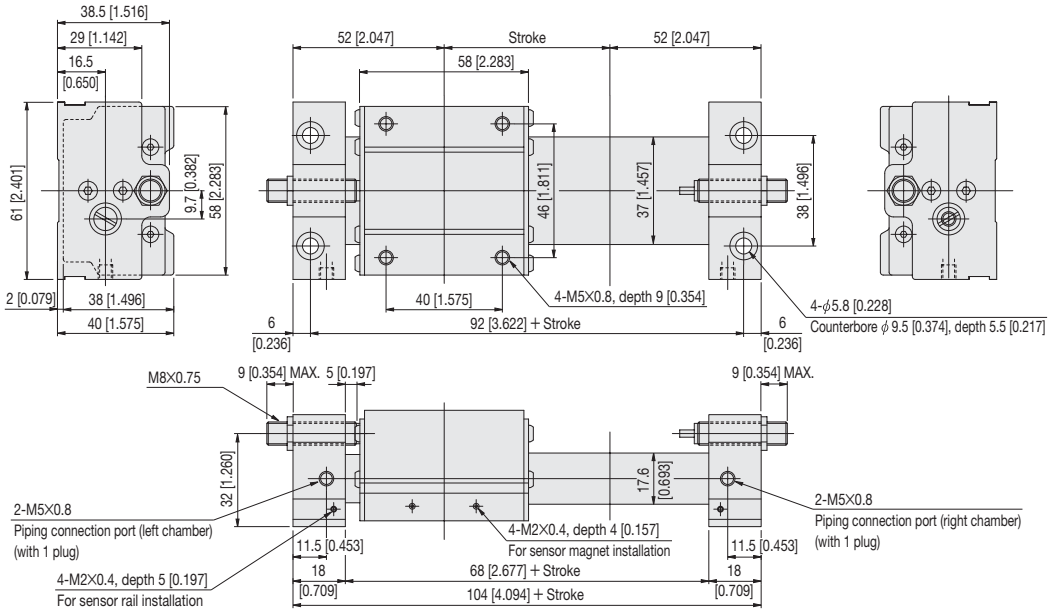
The product, equipped with a sensor rail, is shipped with the sensor magnet and sensor rail attached to the piping port side.

Clean System Dimensions (mm) [in]

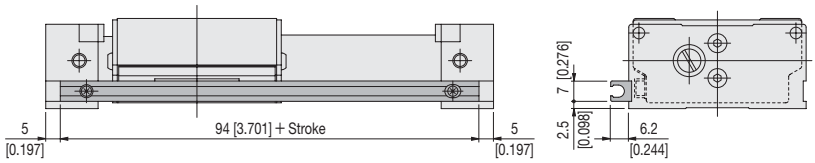
Basic type **CS-MRV22** × Stroke



With Shock Absorber Specification **CS-MRVZ22** × Stroke

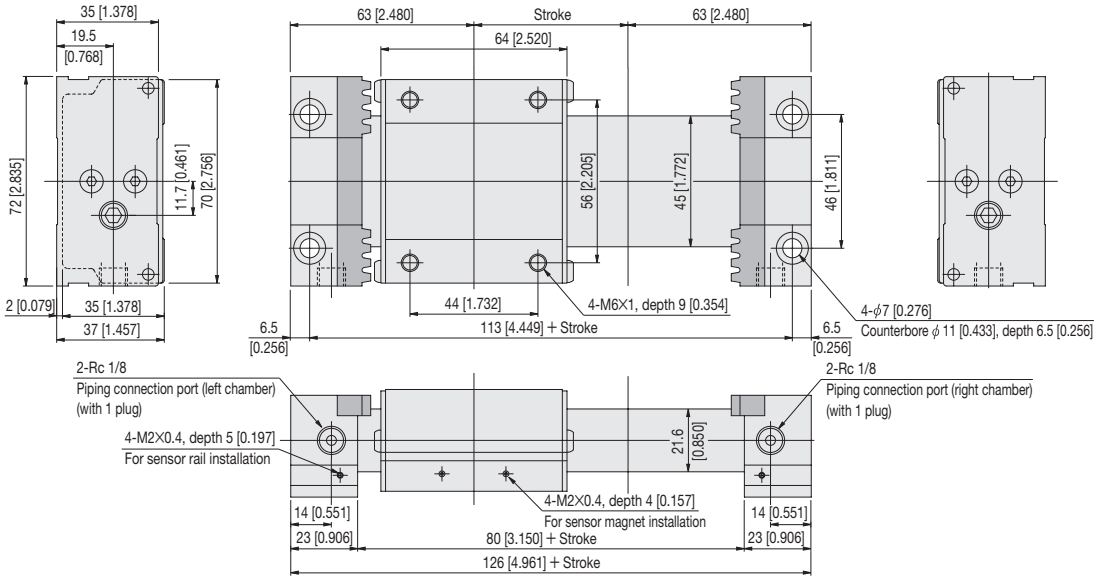


With Sensor Rail **CS-MRV□S22** × Stroke

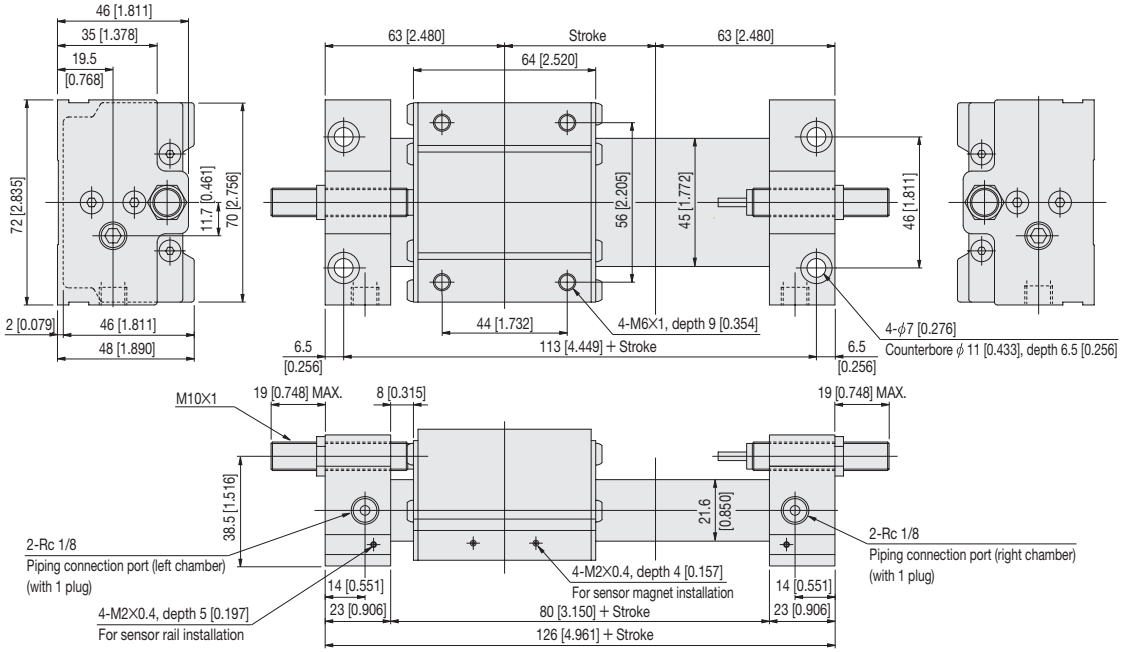


The product, equipped with a sensor rail, is shipped with the sensor magnet and sensor rail attached to the piping port side.

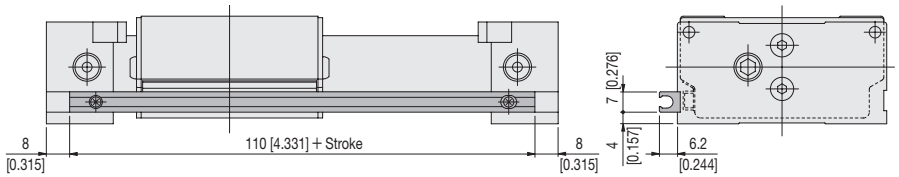
Basic type **CS-MRV28** × Stroke



With Shock Absorber Specification **CS-MRVZ28** × Stroke

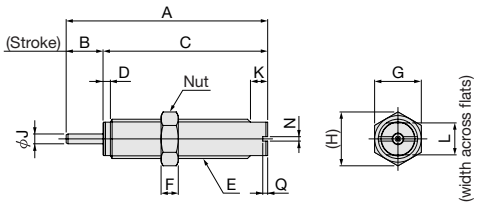


With Sensor Rail **CS-MRV□S28** × Stroke



The product, equipped with a sensor rail, is shipped with the sensor magnet and sensor rail attached to the piping port side.

Dimensions of Shock Absorber (mm) [in]



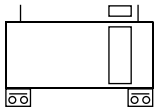
mm [in]

Model	A	B	C	D	E	F	G	H	J	K	L	N	Q
KSHJM8×5-14 (for **CS-MRVZ14)**	37 [1.457]	5 [0.197]	32 [1.260]	1.2 [0.047]	M8×0.75	2 [0.079]	10 [0.394]	11.5 [0.453]	2.5 [0.098]	3 [0.118]	7 [0.276]	1.3 [0.051]	1.5 [0.059]
KSHJM8×5-22 (for **CS-MRVZ22)**													
KSHJM10×10-28 (for **CS-MRVZ28)**	60 [2.362]	10 [0.394]	50 [1.969]	2 [0.079]	M10×1	3 [0.118]	12 [0.472]	13.9 [0.547]	3 [0.118]	5 [0.197]	8.5 [0.335]	1.3 [0.051]	1.5 [0.059]

Sensor Switch

Solid State Type, Reed Switch Type

Symbol



Specifications

Solid State Type

Item \ Model	ZE135□	ZE155□	ZE175□
Wiring type	2-lead wire	3-lead wire with NPN output	3-lead wire with PNP output
Lead wire direction	Horizontal		
Voltage	—	DC 4.5 ～ 28 V	
Load voltage	DC 10 ～ 28 V	DC 4.5 ～ 28 V	
Load current	4 ～ 20 mA at 25°C [77°F] and 60°C [140°F] at 10 mA	50 mA MAX.	
Consumption current	—	8 mA MAX. (DC 24 V)	10 mA MAX. (DC 24 V)
Internal voltage drop Note 1	4.5 V MAX.	0.5 V MAX. (a voltage of 10 V or less at 20 mA)	
Leakage current	1 mA MAX. (DC 24 V, 25°C [77°F])	50 μA MAX. (DC 24 V)	
Response time	1 ms MAX.		
Insulation resistance	100MΩ MIN. (DC 500 V Megger, between case and lead wire terminal)		
Dielectric strength	AC 500 V (50/60 Hz) in 1 minute (between case and lead wire terminal)		
Shock resistance Note 2	294.2m/s² [30 G] (non-repeated)		
Vibration resistance Note 2	88.3m/s² [9.0 G] (total amplitude of 1.5 mm [0.06 in], 10 ～ 55 Hz)		
Enviromental protection	IEC IP67, JIS C0920 (water-proof type)		
Operating indicator	When ON, a red LED indicator lights up		
Lead wire Note 3	PCCV 0.2 SQ × 2-lead (brown and blue) × ℓ	PCCV 0.15 SQ × 3-lead (brown, blue, and black) × ℓ	
Ambient temperature	0 ～ 60°C [32° ～ 140°F]		
Storage temperature range	−10 ～ 70°C [14° ～ 158°]		
Mass	15 g [0.53 oz] (for lead wire length A : 1000 mm [39 in]), 35 g [1.23 oz] (for lead wire length B : 3000 mm [118 in]), 15 g [0.53 oz] (for lead wire length 300 mm [11.811 in] with M8 connector)		

Notes 1 : Internal voltage drop changes with the load current.
2 : Measured by KOGANEI test standards
3 : Lead wire length ℓ : A ; 1000 mm [39 in], B ; 3000 mm [118 in], G ; 300 mm [11.811 in] with M8 connector only available in the ZE175□

Reed Switch Type

Item \ Model	ZE101□		ZE102□	
Wiring type	2-lead wire			
Lead wire direction	Horizontal			
Load voltage	DC 5 ～ 28 V	AC 85 ～ 115 V (r.m.s.)	DC 10 ～ 28 V	AC 85 ～ 115 V (r.m.s.)
Load current	40 mA MAX.	20 mA MAX.	5 ～ 40 mA	5 ～ 20 mA
Internal voltage drop Note 1	0.1 V MAX. (for load voltage of DC 40 mA)		3.0 V MAX.	
Leakage current	0 mA			
Response time	1 ms MAX.			
Insulation resistance	100MΩ MIN. (DC 500 V Megger, between case and lead wire terminal)			
Dielectric strength	AC 1500 V (50/60 Hz) in 1 minute (between case and lead wire terminal)			
Shock resistance Note 2	294.2m/s² [30.0 G] (non-repeated)			
Vibration resistance Note 2	88.3m/s² (total amplitude of 1.5 mm [0.06 in], 10 ～ 55 Hz), resonance frequency 2750 ± 250 Hz			
Enviromental protection	IEC IP67, JIS C0920 (water-proof type)			
Operating indicator	None		When ON, a red LED indicator lights up	
Lead wire Note 3	PCCV 0.2 SQ × 2-wire (brown and blue) × ℓ			
Ambient temperature	0 ～ 60°C [32° ～ 140°F]			
Storage temperature range	−10 ～ 70°C [14° ～ 158°]			
Contact protection measure	Required (see page ㉑ contact protection measures)			
Mass	15 g [0.53 oz] (for lead wire length A : 1000 mm [39 in]), 35 g [1.23 oz] (for lead wire length B : 3000 mm [118 in])			

Notes 1 : Internal voltage drop changes with the load current.
2 : Measured by KOGANEI test standards
3 : Lead wire length ℓ : A ; 1000 mm [39 in], B ; 3000 mm [118 in]

Order Codes

□ - MRV

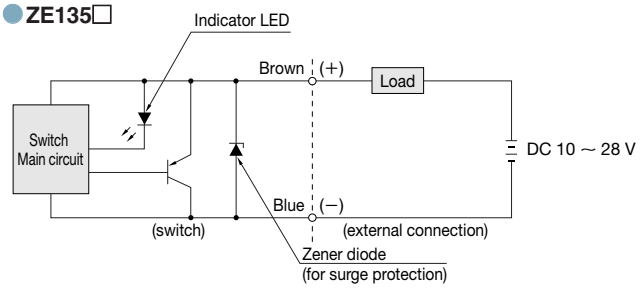
Lead wire length
A : 1000 mm [39 in]
B : 3000 mm [118 in]
G : 300 mm [11.811 in] with M8 connector, available only in the **ZE175**

Sensor switch model
ZE135 : Solid state type with indicator lamp DC 10 ~ 28 V Horizontal lead wire
ZE155 : Solid state type 3-lead wire with NPN output with indicator lamp DC 4.5 ~ 28 V Horizontal lead wire
ZE175 : Solid state type 3-lead wire with PNP output with indicator lamp DC 4.5 ~ 28 V Horizontal lead wire
ZE101 : Reed switch type Without indicator lamp DC 5 ~ 28 V Horizontal lead wire
AC 85 ~ 115 V
ZE102 : Reed switch type With indicator lamp DC 10 ~ 28 V Horizontal lead wire
AC 85 ~ 115 V

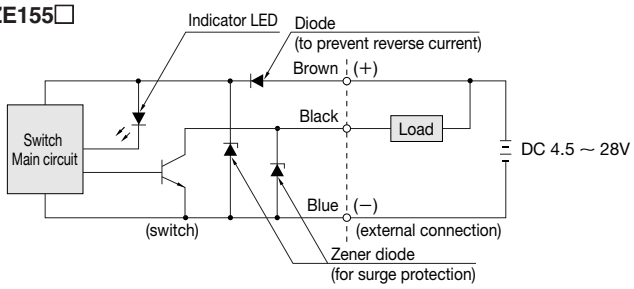
Internal Circuit Diagrams

Solid State Type

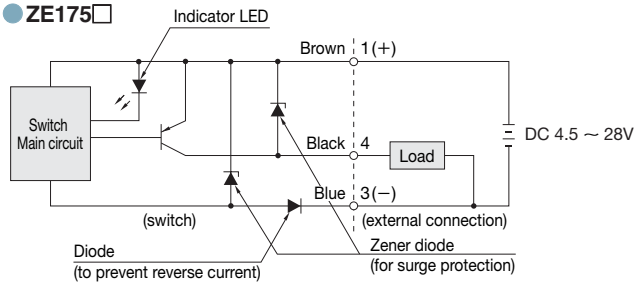
ZE135□



ZE155□



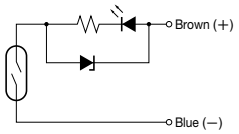
ZE175□



Reed Switch Type

ZE101□

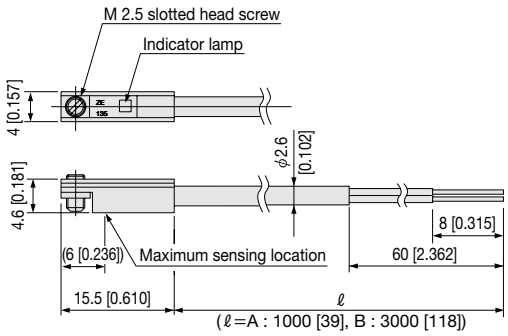
ZE102□



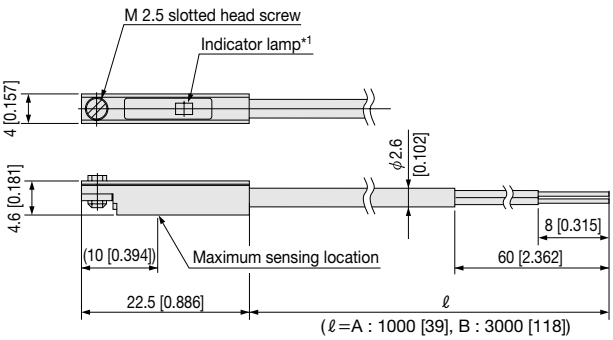
Sensor Switch Dimension Diagram (mm) [in]

Horizontal lead wire

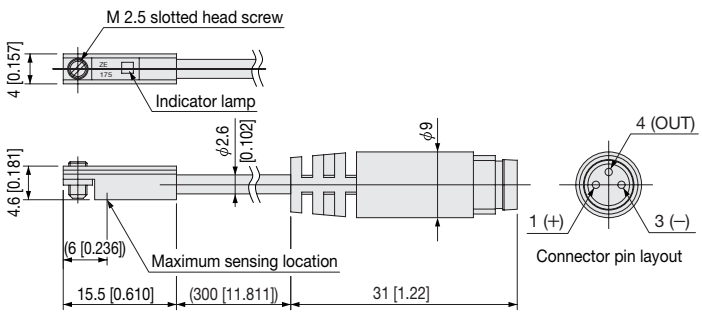
Solid state type (ZE135□, ZE155□, ZE175□)



Reed switch type (ZE101□, ZE102□)



Solid state type (ZE175G)

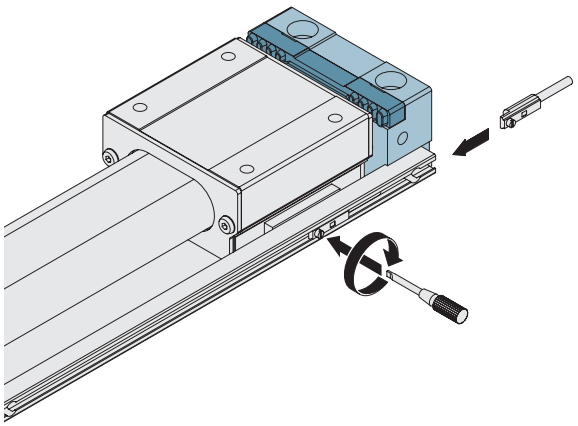


*1 : Not available with the ZE101□

Moving Sensor Switch

Loosening the screw allows the sensor switch to be moved along the switch mounting groove of the sensor rail.

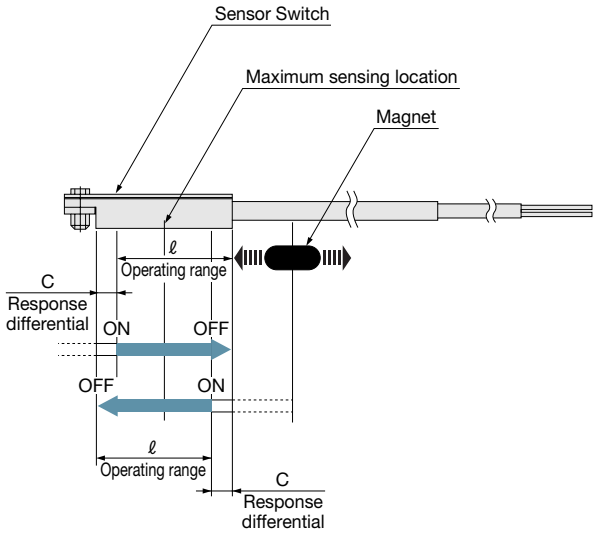
● Screw tightening torque
0.1 N·m ～ 0.2 N·m [0.9 in·lbf ～ 1.8 in·lbf]



Sensor Switch Operating Range, Response Differential, and Maximum Sensing Location

● Operating range : ℓ
The distance the piston travels in one direction, while the sensor switch is ON.

● Response differential : C
The distance between the point where the piston turns the switch ON and the point where the switch is turned OFF as the piston travels in the opposite direction.



Reed Switch Type

mm [in]

Equivalent bore size	14	22	28
Operating range : ℓ	7 ～ 8.6 [0.276 ～ 0.339]	7.5 ～ 8.6 [0.295 ～ 0.339]	6.8 ～ 8.5 [0.268 ～ 0.335]
Response differential : C	1.2 [0.047] or less	1.2 [0.047] or less	1 [0.039] or less
Maximum sensing location*	10 [0.394]		

Note : The values in the table above are reference values.
*The distance from the opposite end of the lead wire.

Solid State Type

mm [in]

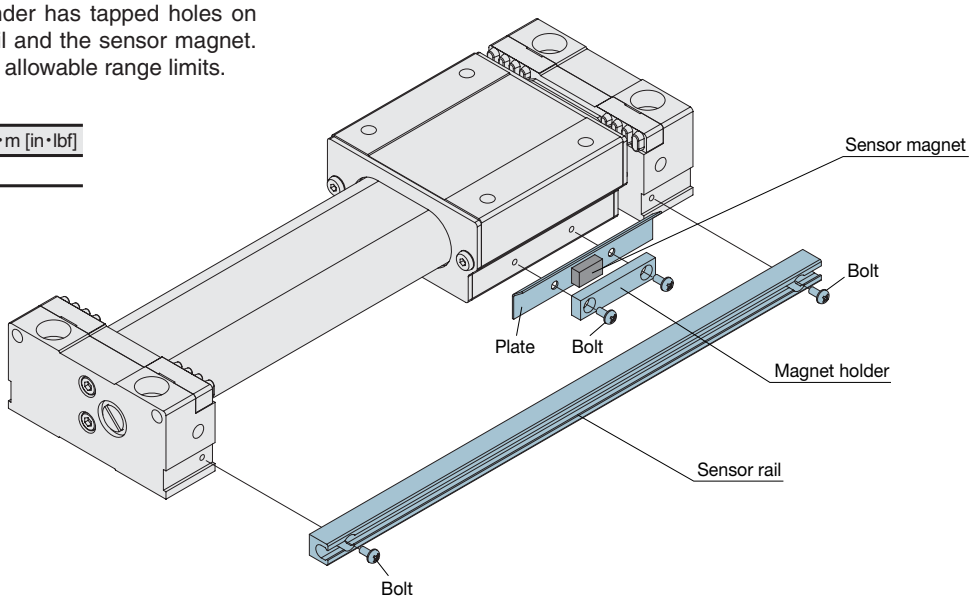
Equivalent bore size	14	22	28
Operating range : ℓ	2.6 ～ 3.5 [0.102 ～ 0.138]	2.8 ～ 3.7 [0.110 ～ 0.146]	2.6 ～ 4.0 [0.102 ～ 0.157]
Response differential : C	0.9 [0.035] or less	1.1 [0.043] or less	1.2 [0.047] or less
Maximum sensing location*	6 [0.236]		

Note : The values in the table above are reference values.
*The distance from the opposite end of the lead wire.

Mounting the Sensor Rail and Sensor Magnet

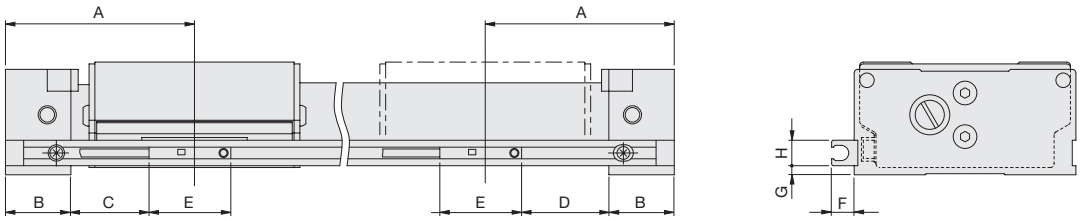
The Clean System Flat Rodless Cylinder has tapped holes on both sides for mounting the sensor rail and the sensor magnet. Tighten the bolts to a torque within the allowable range limits.

Bolt	Max. tightening torque N·m [in·lbf]
M2×0.4	0.2 [1.8]



Mounting Position of the End of Stroke Detection Sensor Switch

Mounting the sensor switch in the positions shown below the sensor magnet comes to the maximum sensing location of the sensor switch at the end of the stroke.



● Reed switch type (**ZE101□, ZE102□**)

mm [in]

Equivalent bore size	A	B	C	D	E	F	G	H
14	41 [1.614]	15 [0.591]	13.5 [0.531]	16 [0.630]	22.5 [0.886]	7.2 [0.283]	1 [0.039]	7 [0.276]
22	52 [2.047]	18 [0.709]	21.5 [0.846]	24 [0.945]		6.2 [0.244]	2.5 [0.098]	
28	63 [2.480]	23 [0.906]	27.5 [1.083]	30 [1.181]			4 [0.157]	

● Solid state type (**ZE135□, ZE155□, ZE175□**)

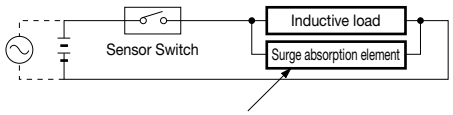
mm [in]

Equivalent bore size	A	B	C	D	E	F	G	H
14	41 [1.614]	15 [0.591]	16.5 [0.650]	20 [0.787]	15.5 [0.610]	7.2 [0.283]	1 [0.039]	7 [0.276]
22	52 [2.047]	18 [0.709]	24.5 [0.965]	28 [1.102]		6.2 [0.244]	2.5 [0.098]	
28	63 [2.480]	23 [0.906]	30.5 [1.201]	34 [1.339]			4 [0.157]	

Contact Protection for Reed Switch Type Sensor Switches

In order to use the reed switch type sensor switch safely, take contact protection measures listed below.

● For connecting an inductive load (electromagnetic relay)

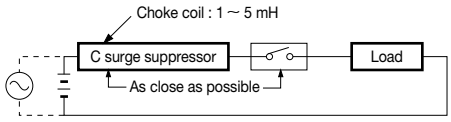


For DC ····· Diode, or CR, etc.
For AC ····· CR, etc.
Diode : Forward current should be more than the circuit current and the reverse current should be 10 times greater or more than the circuit voltage.

C : 0.01 ~ 0.1 μF
R : 1 ~ 4kΩ

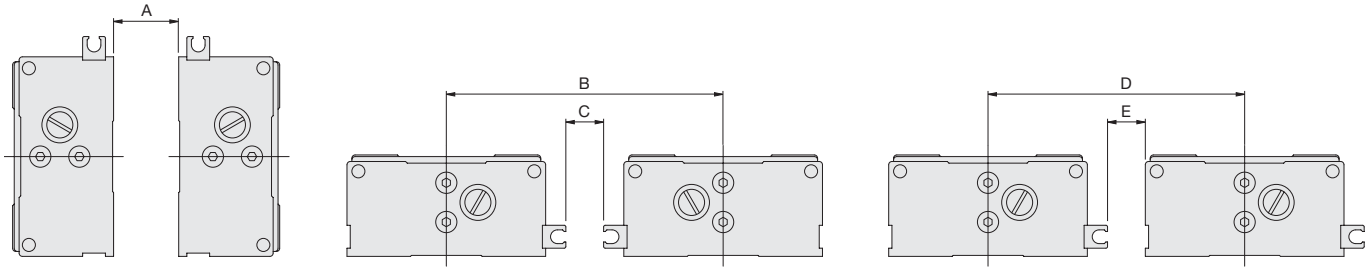
● For capacitative surges

(When the lead wire length exceeds 10 m [32.80 ft])



When Mounting the Cylinders with Sensor Switches in Close Proximity

When mounting Clean System Flat Rodless Cylinders in close proximity, use them at values shown in the table below, or larger than those in the table below.



● Reed switch type

mm [in]

Equivalent bore size	A	B	C	D	E
14	0	59.4 [2.339]	0	53.2 [2.094]	0
22	0	73.4 [2.890]	0	67.2 [2.646]	0
28	0	84.4 [3.323]	0	78.2 [3.079]	0

● Solid state type

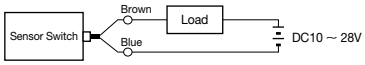
mm [in]

Equivalent bore size	A	B	C	D	E
14	3 [0.118]	61.4 [2.417]	2 [0.079]	55.2 [2.173]	2 [0.079]
22	0	76.4 [3.008]	3 [0.118]	69.2 [2.724]	2 [0.079]
28	0	87.4 [3.441]	3 [0.118]	84.2 [3.315]	6 [0.236]

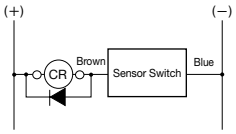
Wiring instructions for solid state sensor switches

2-lead wire type

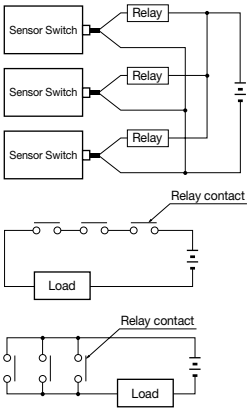
Basic connection



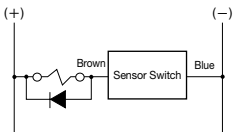
Connecting with relays



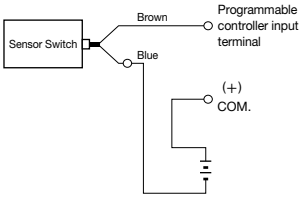
AND (series) connection and OR (parallel) connection



Connecting with a solenoid valve

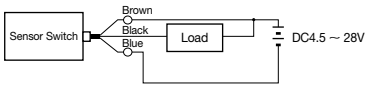


Connecting with a programmable controller

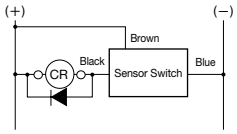


3-lead wire with NPN output

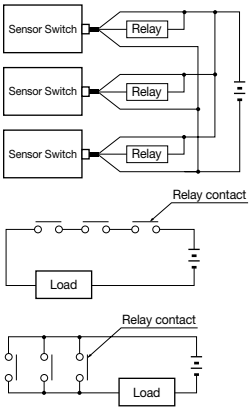
Basic connection



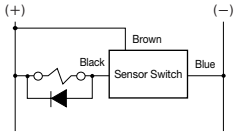
Connecting with relays



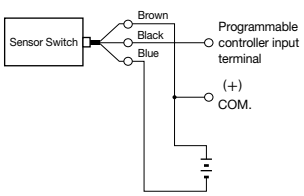
AND (series) connection and OR (parallel) connection



Connecting with a solenoid valve

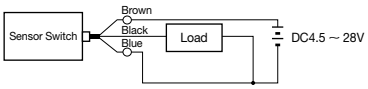


Connecting with a programmable controller

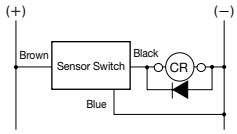


3-lead wire with PNP output

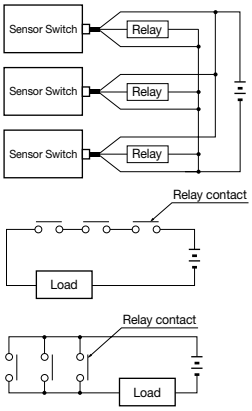
Basic connection



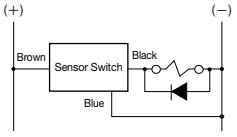
Connecting with relays



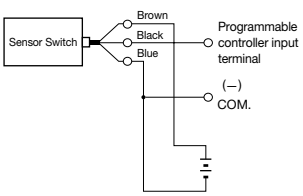
AND (series) connection and OR (parallel) connection



Connecting with a solenoid valve



Connecting with a programmable controller



Caution : **1.** Connect the lead wires according to their color. Incorrect wiring will cause damage to the sensor switch since there is no overcurrent protection.

2. With the inductive load of an electromagnetic relay, the use of a surge protection diode is recommended.

3. Avoid the use of AND (series) connections because the circuit voltage will drop in proportion to the number of sensor switches.

4. When using an OR (parallel) connection, it is possible to connect sensor switch outputs directly (ex: using corresponding black lead wires). Be aware of load return errors since current leakage increases with the number of switches.

5. Because the sensor switches are magnetically sensitive, avoid using them in locations subject to strong external magnetic fields or bringing them in close proximity to power lines and areas where large electric currents are present. In addition, do not use magnetized materials for the mounting bracket, since this may cause erratic operation.

6. Do not excessively pull on or bend the lead wires.

7. Avoid using the switches in environments where chemicals or gas are present.

8. Consult us for use in environments subject to water or oil.

Limited Warranty

KOGANEI CORP. warrants its products to be free from defects in material and workmanship subject to the following provisions.

Warranty Period The warranty period is 180 days from the date of delivery.

Koganei Responsibility If a defect in material or workmanship is found during the warranty period, KOGANEI CORP. will replace any part proved defective under normal use free of charge and will provide the service necessary to replace such a part.

Limitations

- This warranty is in lieu of all other warranties, expressed or implied, and is limited to the original cost of the product and shall not include any transportation fee, the cost of installation or any liability for direct, indirect or consequential damage or delay resulting from the defects.
- KOGANEI CORP. shall in no way be liable or responsible for injuries or damage to persons or property arising out of the use or operation of the manufacturer's product.
- This warranty shall be void if the engineered safety devices are removed, made inoperative or not periodically checked for proper functioning.
- Any operation beyond the rated capacity, any improper use or application, or any improper installation of the product, or any substitution upon it with parts not furnished or approved by KOGANEI CORP., shall void this warranty.
- This warranty covers only such items supplied by KOGANEI CORP. The products of other manufacturers are covered only by such warranties made by those original manufacturers, even though such items may have been included as the components.

The specifications are subject to change without notice.

URL http://www.koganei.co.jp

E-mail: overseas@koganei.co.jp

KOGANEI CORPORATION

OVERSEAS DEPARTMENT
3-11-28, Midori-cho, Koganei City, Tokyo 184-8533, Japan
Tel: 042-383-7271 Fax: 042-383-7276

MICHIGAN REPRESENTATIVE OFFICE
5070 East N Ave., Kalamazoo, Michigan, 49048, U.S.A.
Tel: 269-388-8769 Fax: 269-388-8771

SHANGHAI KOGANEI INTERNATIONAL TRADING CORPORATION
Room 2606-2607, Tongda Venture Building No.1, Lane 600, Tianshan Road, Shanghai, 200051, China
Tel: 021-6145-7313 Fax: 021-6145-7323

KOGANEI-PORNCHAI CO., LTD.
89/174 Moo 3, Vibhavadee Rangsit Road, Talad Bangkhen, Laksi, Bangkok, 10210, Thailand
Tel: 02-551-4025 Fax: 02-551-4015

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