KOGANEI

Catalog No.BK-C0037

NEW Products

http://www.koganei.co.jp

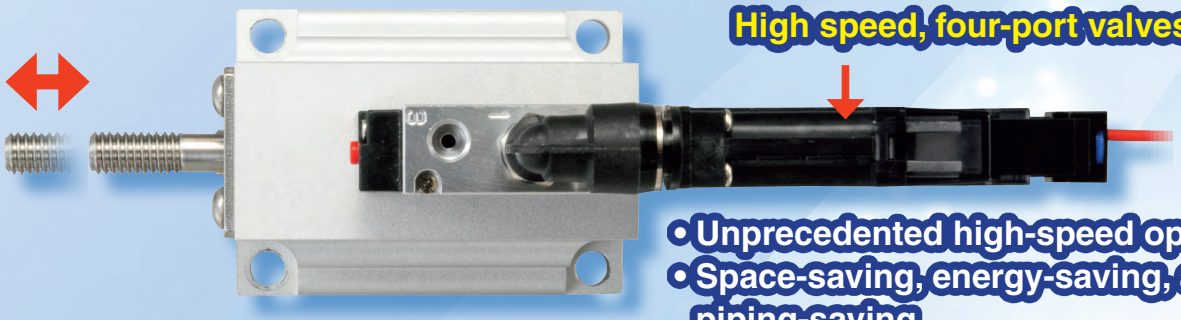
RoHS compliant product

High-speed Valpack Cylinders

Valve mounted cylinder KDV Series

High-speed Valpack Cylinders

KDV Series Integration of cylinders and valves! Time lost due to air coming and going in the tubes is reduced.



- Unprecedented high-speed operations!
- Space-saving, energy-saving, and piping-saving

Highest frequency the world has seen[Note]

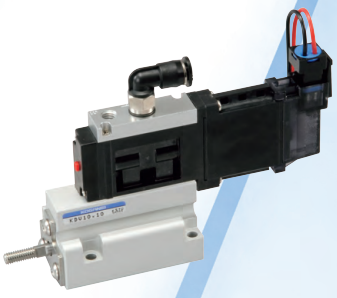
Note: Based on in-house testing (September 2015)

Maximum operating frequency of 100 cycle/second[Note]

Note: Differs depending on the pressure, stroke, and cylinder bore.

Response of 5 ms or less[Note]

Note: Differs depending on usage conditions.

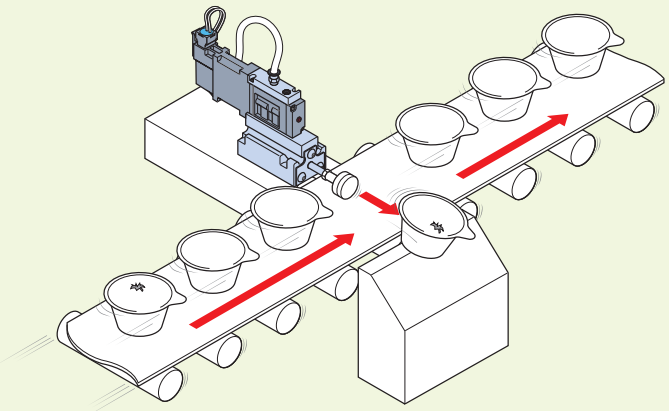


Also perfect for uses like high-speed inspection work and the removal of defective products that are too heavy to be blown away by an air blower!

Example of use

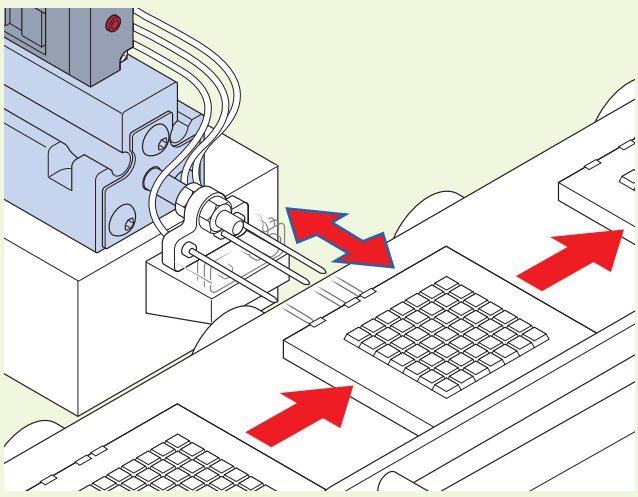
Removal of defective products

Quickly remove defective products from among products that are moving at high speed.



High-speed inspection work

Example of use for high-frequency inspection work.



Maximum operating frequency (Maximum value for loads with a possible reciprocation of 1 second)

Model	Stroke mm [in]				
	1 [0.039]	5 [0.197]	10 [0.394]	20 [0.787]	30 [1.181]
KDV6	100 cycle/second	50 cycle/second	25 cycle/second	20 cycle/second	—
KDV10	—				—
KDV16	—				15 cycle/second
KDVT16 (two valves)	—	60 cycle/second	35 cycle/second	25 cycle/second	20 cycle/second

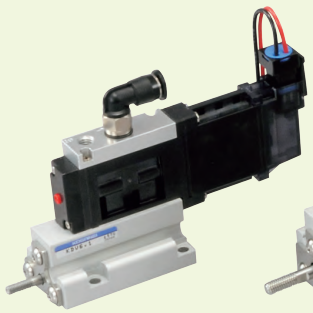
* These are reference values. Usage of -TL4 (elbow ϕ4 mm [0.157 in] fitting), at an air pressure value of 0.5 MPa [72.5 psi]. Remarks: 1 mm [0.039 in] and 5 mm [0.197 in] strokes use a collar stopper.

Operation time (the time required from when the solenoid valve turns on until the load completes a full stroke)

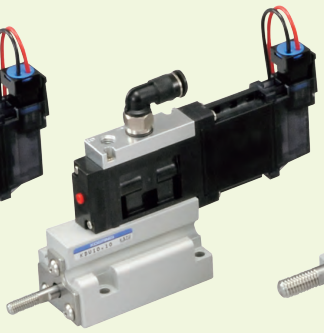
Model	Stroke mm [in]				
	1 [0.039]	5 [0.197]	10 [0.394]	20 [0.787]	30 [1.181]
KDV6	5 ms or less/one way	10 ms or less/ one way	20 ms or less/ one way	25 ms or less/ one way	—
KDV10	—				—
KDV16	—				33 ms or less/ one way
KDVT16 (two valves)	—	8 ms or less/ one way	14 ms or less/ one way	20 ms or less/ one way	25 ms or less/ one way

* These are reference values. Usage of -TL4 (elbow ϕ4 mm [0.157 in] fitting), at an air pressure value of 0.5 MPa [72.5 psi]. Remarks: 1 mm [0.039 in] and 5 mm [0.197 in] strokes use a collar stopper.

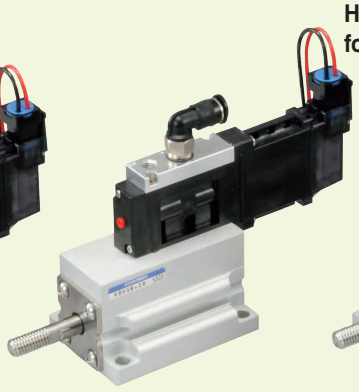
Variations



KDV6

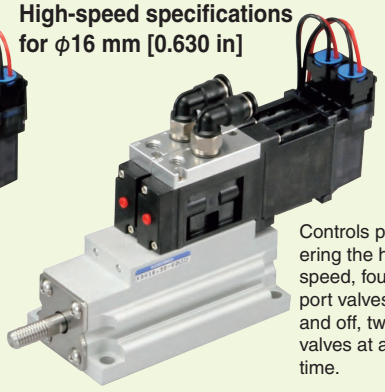


KDV10



KDV16

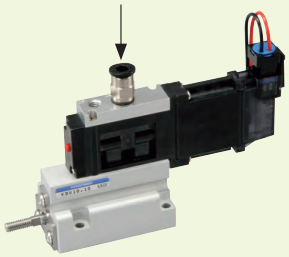
High-speed specifications for ϕ16 mm [0.630 in]



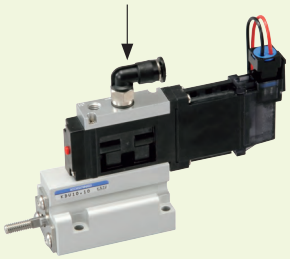
KDVT16 (with two valves)

Controls powering the high-speed, four-port valves on and off, two valves at a time.

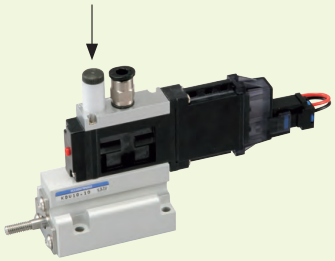
Straight fitting (ϕ4 mm [0.157 in], ϕ6 [0.236 in])



Elbow fitting (ϕ4 mm [0.157 in], ϕ6 [0.236 in])



With muffler



L-type plug connector

S-type plug connector

INDEX

Safety precautions (high-speed Valpack 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 described below are to help you use the product safely and correctly, and to prevent injury or damage to you, other people, and assets.
Always adhere to the following safety regulations: ISO4414 (Pneumatic fluid power - General rules and safety requirements for systems and their components) and JIS B 8370 (Pneumatic system regulations).

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

⚠ **DANGER**	Indicates situations that can be clearly predicted as dangerous. Death or serious injury may result if the situation is not avoided. It could also result in damage or destruction of assets.
⚠ **WARNING**	Indicates situations that, while not immediately dangerous, could become dangerous. Death or serious injury may result if the situation is not avoided. It could also result in damage or destruction of assets.
⚠ **CAUTION**	Indicates situations that, while not immediately dangerous, could become dangerous. Minor or semi-serious injury may result if the situation is not avoided. It could also result in damage or destruction of assets.
⚠ **ATTENTION**	While there is no chance of injury, these points should be observed for appropriate use of the product.

■This product was designed and manufactured for use in general industrial machinery.

■When selecting and handling equipment, the system designer or another person with sufficient knowledge and experience should always read the safety precautions, catalog and other literature before commencing operation. Improper handling is dangerous.
■After reading the catalog and other documentation, always store them in a location that allows easy availability for reference to users of this product.
■Whenever transferring or lending the product to another person, always attach the catalog and other information to the product where they are easily visible in order 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 contingencies. Read the catalog 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. Machines 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 high levels of safety. Using the product in any of the ways described above creates the risk of loss of 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. Doing so creates the risk of ignition and fire.
- When mounting the product and workpiece, always make sure they are firmly supported and secured in place. Falling, dropping, or abnormal operation of the product creates the risk of personal injury.
- Persons using a pacemaker or other similar medical devices should maintain a distance of at least one meter [3.28 ft] away from the product. Getting too close to the product creates the risk of malfunction of a pacemaker due to the strong magnet built into the product.
- Never attempt to modify the product in any way. Doing so creates the risk of injury, electric shock, fire, etc. due to abnormal operations.
- Never attempt inappropriate disassembly, assembly or repair of the product relating to basic construction, or to its performance or to functions. Doing so creates the risk of injury, electric shock, fire, etc.
- Do not splash water on the product. Spraying water on the product, washing the product, or using the product under water creates the risk of malfunction, leading to injury, electric shock, fire, etc.
- While the product is in operation, avoid touching it with your hands or otherwise approaching too close. Also, do not attempt to make any adjustments to internal or attached mechanisms (sensor switch mounting location, manual override, detachable connectors for wiring, pressure switch adjustments, disconnection of piping tubes or plugs, etc.) while the product is in operation.
  This may cause an unintended cylinder movement resulting in injury.
- Do not apply loads to the piston rod that exceed its bending or buckling strength. Doing so may cause abnormal wear or damage to the rod or tube and reduce the product's operating life.
- Always align the direction of motion of the load with the axis of the piston rod. If they are not the same, the undue force on the tube and piston rod may cause abnormal wear or damage.

⚠ WARNING

- Do not use the product in excess of its specification range. Doing so creates the risk of product breakdown, loss of function, or damage. It could also drastically reduce operating life.

⚠ WARNING

- Before supplying air or electricity to the device and before starting operation, always conduct a safety check of the area where the machine is operating. Unintentional supply of air or electricity creates the risk of electric shock or injury due to contact with moving parts.
- Do not touch terminals or switches while the power is turned on. Doing so creates the risk of electric shock and abnormal operation.
- Always check the catalog and other reference materials for correct product wiring and piping. Improper wiring and piping creates the risk of abnormal operation of the cylinder.
- Do not allow the product to be thrown into fire.
  Doing so creates the risk of explosion and the release of toxic gases.
- Do not sit on the product, place your foot on it, or place other objects on it.
  Doing so creates the risk of injury due to tripping or the product tipping over or falling, resulting in product damage and abnormal, erratic, or runaway operation.
- Before conducting maintenance, inspection, repair, replacement, or any other similar procedure, always completely cut off all air supply and confirm that residual pressure inside the product or in piping connected to the product is zero.
  In particular, be aware that residual air will still be in the air compressor or storage tank. The cylinder may move abruptly, if residual air pressure remains inside the piping, causing injury.
- Before performing any kind of wiring work, be sure to turn off the power. Failure to do so creates the risk of electric shock.
- Correctly apply the rated voltage to the solenoid. Applying the wrong voltage will make it impossible to obtain the rated function, and creates the risk of damage to and burnout of the product.
- Do not allow lead wires and other cords to become damaged.
  Allowing a cord to become damaged, bent excessively, pulled, rolled up, placed under heavy objects, or squeezed between two objects creates the risk of current leaks or defective continuity that can lead to fire, electric shock, or abnormal operation.
- Do not connect or disconnect connectors while the power is turned on. Also, never apply unnecessary force to connectors. Doing so creates the risk of personal injury, device damage, and electric shock due to abnormal machine operation.
- When the product has been idle for over 48 hours or has been in storage, it is possible that the moving parts or contacting parts may have become stuck, leading to operating lags or sudden movements. Before these initial operations, always run a test to check that operating performance is normal.
- When the device has not been used for long periods (over 30 days), it is possible that the moving parts may have become stuck, leading to operating lags or sudden movements. Check for proper operation a minimum of once every 30 days.
- Do not use solenoid valves or the wiring that controls them in locations subject to surges or near strong magnetic fields or power lines through which large electric currents flow. It could result in unintended operation.

- When a solenoid valve is turned off, it may generate a surge voltage or an electromagnetic wave that affects the operation of surrounding equipment. Use surge-protected solenoids and use countermeasures for electromagnetic waves and surges to electric circuits.
- Do not use any type of medium that is not specifically stipulated in the specifications. Using a non-specified medium could lead to short term loss of function, sudden degradation of performance, and a reduced operating life.
- Use countermeasures for heat dissipation so that the ambient temperature of the solenoid valves falls within the temperature range for normal specifications when the energizing time is long or when installing Valpack cylinders in the control panel. When continuously energizing for long periods of time, high heat produced by the coils may also have an adverse effect on adjacent devices and may reduce the operating life or the functions of the solenoid valve. For this reason, contact Koganei when continuously energizing for long periods of time, or when the time energizing per day becomes longer than that of the time de-energized.
- After completing wiring work, check to make sure that all connections are correct before turning on the power.
- Do not use the cylinder as a device to absorb the shock or vibration of machinery. Doing so may create the risk of injury or the breakdown of the machinery.
- Do not allow lead wires of sensor switches or other cords to become damaged.
  Allowing a cord to become damaged, bent excessively, pulled, rolled up, placed under heavy objects, or squeezed between two objects creates the risk of current leaks or defective continuity that can lead to fire, electric shock, or abnormal operation.
- Do not apply an external magnetic field to sensor switches while the Valpack cylinder is in motion. Untended operations could damage equipment or cause injury.
- Use the product within the recommended load and specified operating speed. Using the cylinder in excess of the recommended load and specified operating speed could damage the cylinder causing destruction of equipment or injury.
- Use safety circuits or design a system that prevents damage to machinery and personal injury when the machine is shut down due to an emergency stop or electrical power failure.
- Install relief valves or other devices to ensure that the cylinder does not exceed its rated pressure when the pressure is increased by external forces on the Valpack cylinder. Excessive pressure could lead to a breakdown and damage.
- Do not use the product near the ocean, in direct sunlight, near mercury vapor lamps, or near equipment that generates ozone. Deterioration of rubber parts caused by ozone may reduce performance and functions or stop functions.
- Because Koganei products may be used under a wide variety of conditions, decisions concerning conformance with a particular system should be made upon the careful evaluation by the person in charge of system design. Assurances concerning expected system performance and safety are the responsibility of the designer who decides system conformity. Be sure to use the latest catalogs and technical materials to study and evaluate specification details, to consider the possibility of machine breakdown, and to configure a system that ensures fail-safe safety and reliability.

⚠ CAUTION

- Do not use the product in locations subject to direct sunlight (ultraviolet radiation), in locations with dust, salt, or iron particles, or in locations with media and/or ambient atmosphere that include organic solvents, phosphate ester type hydraulic oil, sulfur dioxide gas, chlorine gas, acids, etc. Such uses could lead to loss of functions within a short period, sudden degradation in performance, or reduced operating life. For details on materials used in the product, refer to the description of materials used in major parts.
- When installing the product, be sure to allow adequate work space around it. Failure to do so will make it more difficult to conduct daily inspections or maintenance, which could eventually lead to system shutdown or damage to the product.
- When transporting or mounting a heavy product, firmly support the product using a lift or support, or use multiple people to ensure personal safety.
- Do not bring any magnetic media or memory within one meter [3.28 ft] of the product. Doing so creates the risk of damage to data on the magnetic media due to magnetism.
- Oil from the compressor (with the exception of oil-free compressors) may dramatically decrease the product's capabilities or cause the functions to stop. Be sure to remove oil from the air by installing a mist filter preceding the pneumatic equipment.
- Depending on the product, unintended operations may occur when a leakage current occurs in the control circuit. Use countermeasures for circuit leakages in the control circuit so as not to exceed the allowable leakage current values for the product's specifications.
- While the product is in operation, avoid touching it with your hands or otherwise approaching too close. Failure to do so creates the risk of burns due to the heat generated by the coils.
- Do not use the solenoid valve or sensor switch in locations subject to large electric currents or strong magnetic fields. It could result in erratic operation.
  Also avoid using magnetic material for any parts used for mounting. Doing so creates the risk of magnetism leakage that causes malfunctions.
- Do not bring the product too close to magnetic bodies. The sensor switch may malfunction if the product is located near a magnetized magnetic body or where a large magnetic field is generated.
- Never use another companies' sensor switches with these products. Doing so may cause malfunctions or runaway operation.
- Always be sure to post a "Work in Progress" sign during installation, adjustment, or other operations, to avoid unintended supply of pneumatic or electric power. Unintended power or air supply can cause electric shock and sudden cylinder movement, creating the risk of personal injury.
- Do not subject any cords, such as the sensor switch lead wires, to excessive loads by pulling on them, lifting the product by them, or placing heavy objects on them. Doing so may cause current leakage or defective continuity leading to fire, electric shock, or abnormal operation.
- Using extremely dry air with a dew point lower than -20°C [-4°C], may affect the quality of the lubricating oil used. This may cause loss of functions, shorter operating life, degraded performance or other problems.

⚠ ATTENTION

- Whenever considering use of this product in situations or environments not specifically noted in the catalog, or in applications where safety is an important requirement such as in aircraft facilities, combustion equipment, leisure equipment, safety equipment, and other places where human life or assets may be greatly affected, take adequate safety precautions such as allowing plenty of margin for ratings and performance, or fail-safe measures.
  Be sure to contact Koganei before use in such applications.
- Moving parts of machinery should be isolated with protective covers so as not to come into direct contact with human bodies.
- Do not configure controls that would allow workpieces to fall if power fails.
  Configure the control system to prevent workpieces or tables from falling if the machinery stops during an emergency stop or power outage.
- When handling the product, wear protective gloves, safety glasses, safety shoes, and other protective clothing whenever necessary.
- 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.
- Install a noise eliminator (such as mufflers) in the exhaust port. Doing so reduces noise during exhaust.
- For inquiries about the product, consult your nearest Koganei sales office or Koganei Overseas Department. The addresses and telephone numbers are shown on the back cover of this catalog.
- Air leakage from pneumatic equipment is not zero. Consider air leakage when mounting.

⚠ Other

- Always observe the following items.
  1. When using this product in pneumatic systems, always use genuine Koganei parts or compatible parts (recommended parts).
     Use only authentic Koganei parts or compatible parts (recommended parts) to do maintenance or repairs.
     Always observe the prescribed methods and procedures.
  2. Never inappropriately disassemble or modify the product in relation to its basic construction, performance, or functions.

Koganei cannot be held responsible for any problems that occur as a result of these safety precautions not being 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 shock ranges, failure to do so could result in a breakdown or defective operation.

2. Be careful of how long the sensor switch is on when detecting the position in mid-stroke.
Be aware that, when the sensor switch is mounted at an intermediate point of the cylinder stroke to detect the passing of the piston, if the piston is moving too fast, the length of time the sensor switch operates is too short to delete the piston passing (so loads such as programmable controllers are not operated).
The highest detectable cylinder speed is

$$V\ \text{mm/s [in/sec]} = \frac{\text{Sensor switch operating range mm [in]}}{\text{Time required for load operation [ms]}} \times 1000$$

3. Keep wiring as short as possible.
Lead wires for solid state sensor switches should be within 30 m [98 ft] as stipulated by EN standards.

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

5. Check for leakage current.
2-lead wire solid state sensor switches produce a current (leakage current) even when turned off, to activate their internal circuit. Ensure that your application satisfies 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. And, if n sensor switches are connected in parallel, the leakage current increases by n times.

⚠ CAUTION

1. Check for internal voltage drop of sensor switches.
When reed sensor switches with indicator lamps or 2-lead wire solid state sensor switches are connected in series, internal voltage drop increases and the load cycle may fail to activate. Connecting n switches will drop the internal voltage by n times as much.
Ensure that the circuit satisfies the following inequality:
Supply voltage – Internal voltage drop x n > Minimum operating voltage of the load
In relays with rated voltage of less than 24 VDC, check that the above inequality is satisfied even when n=1.

2. Do not use Koganei sensor switches with other companies' cylinders.
The sensor switches are designed for use with Koganei cylinders only. They may not function correctly if used with other companies' cylinders.

Installation and adjustment

⚠ WARNING

1. Do not apply an external magnetic field to the sensor switch while the cylinder is in operation.
This may cause unintended operation, thereby damaging the device or causing injury.

⚠ CAUTION

1. Be aware of the environment in which you install the sensors and cylinders.
Do not use the sensor switch in locations subject to large electric currents or strong magnetic fields. It could result in erratic operation.
Also avoid using magnetic material for any parts used for mounting. It could result in erratic operation.

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 guidelines 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 ㉑ concerning the tightening torque.

4. Do not carry the cylinder by its mounted sensor switch's lead wires.
After mounting a sensor switch on the cylinder, do not carry the cylinder by grabbing the lead wires. Never do this, as it may damage not only the lead wires but may also apply stress to the inside of the sensor switch that may damage internal elements.

5. Do not drop the sensor switches or bump them against other objects.
While handling sensor switches, do not subject them to excessive shock (294.2 m/s^2 [30 G] or larger) by hitting, dropping or bumping them.

Wiring

⚠ DANGER

1. Prevent nearby moving objects from coming into contact with sensor switches.
When cylinders equipped with sensor switches are moving or when moving objects are nearby, do not let them come into contact with each other. 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 electric shock.

2. Always turn off the power before doing wiring work.
Doing wiring work while the power is on may result in electric shock. Also, incorrect wiring could damage the sensor switch in an instant. 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 wiring in parallel to or in the same conduit with power lines and high-voltage lines. Noise from such wiring could cause the sensor switch and control circuit to suffer erratic operation.

Safety Precautions (Sensor Switches)

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

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

1. Avoid short circuiting loads.
Turning on the sensor switch while the load is short-circuited causes overcurrent, which will damage the sensor switch in an instant.
Example of short-circuit load: Sensor switch's output lead wire is directly connected to the power supply.

2. Position sensor switches in the center of their operating range.
Sensor switch operations may be unstable, depending on the operating environment, if positioned at the edge of the operating range.

3. Solid state sensor switches that are compliant with the EMC standards (EN61000-6-2 and EN60947-5-2) are not resistant to surges from lightning. Use countermeasures on the machine to protect them from lightning surges.

4. Use an internal element to absorb surges for direct activation of loads that generate surges.

Warranty and General Disclaimer

1. Warranty Period
The warranty period for Koganei products is 12 months from the date of delivery.

2. Scope of Warranty and General Disclaimer

(1) The Koganei product warranty covers individual products. When a product purchased from Koganei or from an authorized Koganei distributor or agent malfunctions during the warranty period in a way that is attributable to Koganei's responsibility, Koganei will repair or replace the product free of charge. Even if a product is still within the warranty period, its durability is determined by its operation cycles and other factors. Contact your nearest Koganei sales office or the Koganei overseas department for details.

(2) Koganei is not responsible for any losses or for any damages to other machinery caused by breakdown, loss of function, or loss of performance of Koganei products.

(3) Koganei is not responsible for any losses due to use or storage of the product in a way that is outside of the product specifications prescribed in Koganei catalogs and instruction manuals, and/or due to actions that violate the mounting, installation, adjustment, maintenance or other safety precautions.

(4) Koganei is not responsible for any losses caused by breakdown of the product due to factors outside the responsibility of Koganei, including but not limited to fire, natural disaster, the actions of third parties, and intentional actions or errors by the purchaser.

Handling instructions and precautions

General precautions

Piping

Before installing piping to the Valpack cylinder, thoroughly flush the inside of the pipes (with compressed air). Machining chips, sealing tape, rust and other debris remaining from the piping work may result in air leaks and malfunctions.

Air supply

1. Use air as the medium. For the use of any other medium, consult your nearest Koganei sales office.

2. Air used for the Valpack cylinder should be clean air that contains no degraded compressor oil or other matter. Install an air filter (filtration of 40 μm or less) near the Valpack cylinder to remove dust and collected liquid. Also drain the air filter periodically. If collected liquid or dust gets into the Valpack cylinder, it may cause defective operation.

Environment

1. Cover the unit when using it in locations where it might be subject to excessive dust, dripping water, dripping oil, etc.

2. Do not use the Valpack cylinder in environments which may be corrosive. Using it in these types of environments may result in damage or defective operation.

3. Do not use it in excessively dry conditions.

4. Do not use it if the ambient temperature is over 50°C [122°F]. Doing so may result in damage or defective operation. Also, consider anti-freezing measures if the temperature is less than 5°C [41°F], because moisture may freeze and result in damage or defective operation.

Handling

1. Do not place your hands in the way of the cylinder when it is operating.

2. Be careful that no part of your body is pinched between the rod end and the cylinder body when the cylinder is retracting.

3. Confirm that there is no pressurized air in the cylinder before starting maintenance work.

4. Use a separate cushioning device, such as a shock absorber, if noise or vibration is an issue. Otherwise, installing a muffler and exhaust throttle (recommended exhaust throttle valve with muffler: **TVM-M5**) in the exhaust port reduces noise.

5. Do not press against the rod with an external stopper to stop it. Doing so might cause damages.

6. Avoid usages that apply a lateral load to the piston rod.

7. Applying loads may cause operating frequency to fall.

Mounting

Mounting

1. The cylinder can be mounted in any orientation, but the mounting surface must be flat. If the cylinder twists or flexes when mounted, not only will it be inaccurate, but there may be air leaks and erratic operation.
2. Note that a mounting surface that is scratched or dented can adversely affect flatness.
3. In cases where loosening of screws due to impact and/or vibration may be a factor, consider looseness prevention measures.
4. Do not scratch or dent the sliding parts of the piston rod. Doing so could damage the packing and cause air leaks.
5. The piston rod is coated with grease. Do not wipe it off. Doing so may cause deffective operation.
6. If you are using a combination of a cylinder and guide, use cylinder joints for flexible connections.
7. First, screw in the cylinder's mounting screws prior to installing the sensor switch, as the screws may interfere with the sensor.
8. The recommended tightening torques for the mounting screws are listed in the following chart.

N•m [in•lbf]

Screw size	Tightening torque
M3×0.5	1.2 [10.6]
M4×0.7	2.7 [23.9]

About the installation of throttle valves and speed controllers

It is possible to install throttle valves (exhaust throttle valves) and speed controllers. When installing, install the throttle valve or meter-out type speed controller to the exhaust port of the air supply/exhaust block. However, the push/pull speed cannot be controlled individually because there is only one exhaust port in the four-port valve configuration. (Recommended muffler with exhaust throttle valve:TVM-M5)

Stopping the piston rod with external stoppers

Either install an external stopper made of resin or attach a resin cap or resin pusher on the rod. Allowing the rod and an external stopper made of metal to collide, may damage the rod.

Allowable load

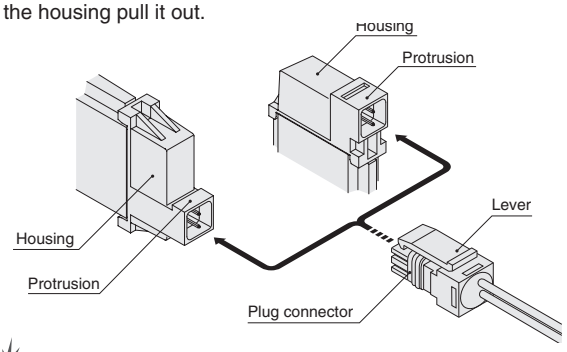
The cylinder should use less than the allowable loads noted on the following chart.

Cylinder bore mm [in]	Allowable load g [oz]
6 [0.236]	4 [0.14]
10 [0.394]	11 [0.39]
16 [0.630]	28 [0.99] (KDVT16 is 18 [0.63])

Procedure for connecting cables

Detachable plugin connectors

When connecting a connector, hold the connector in your fingers and insert the pin, and insert it until the hook on the lever catches on the protrusion on the housing.
To remove a connector, pinch the lever and the connector together, and when the hook on the lever disengages from the protrusion on the housing pull it out.



NOTE When removing a connector, check whether the hook on the lever is fully disengaged from the protrusion before pulling it out. If it is pulled out while hooked to the protrusion, it will damage the housing.

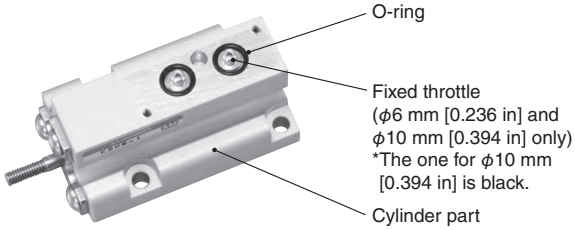
About cable types

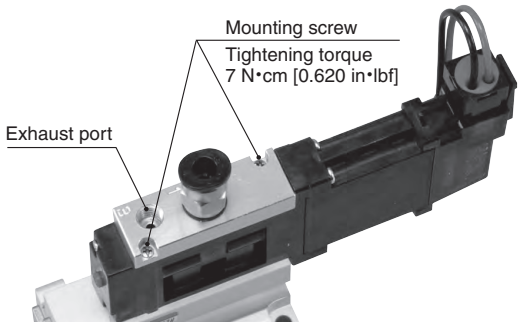
Cable types use two wires (red and black lead wires). White wires are not used.

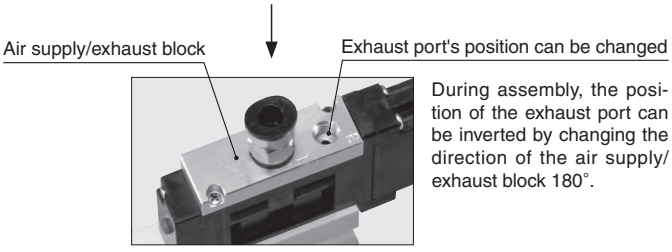
Installing the valve to the cylinder part

The recommended tightening torque for valve-mounting screws is 7 N•cm [0.620 in•lbf] when installing the valve to the cylinder part.
Be sure to check that the O-ring and the fixed throttle (fixed throttle for ϕ6 mm [0.236 in] or ϕ10 mm [0.394 in] only) are in place on the cylinder side.

NOTE **Operating the ϕ6 mm [0.236 in] and ϕ10 mm [0.394 in] cylinders without a fixed throttle will damage the cylinder. Be sure to check that there is a fixed throttle.**





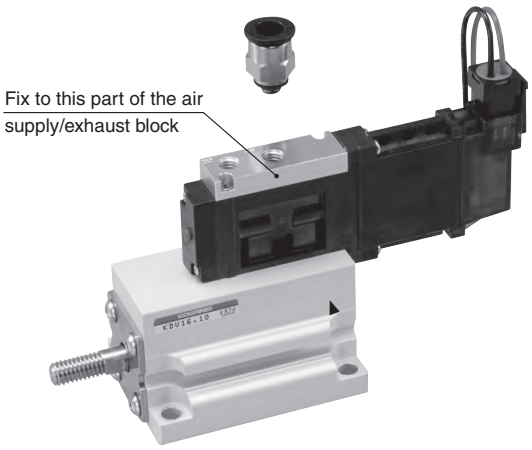


During assembly, the position of the exhaust port can be inverted by changing the direction of the air supply/exhaust block 180°.

Installing fittings to the air supply/exhaust block

● For one-valve installation

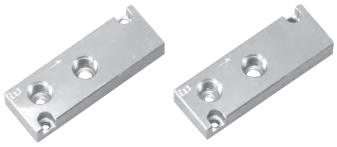
Clamp the air supply/exhaust block when installing fittings to it. The recommended tightening torque for fittings is 1 N•m [8.85 in•lbf].



● For two-valve installation (KDVT16)

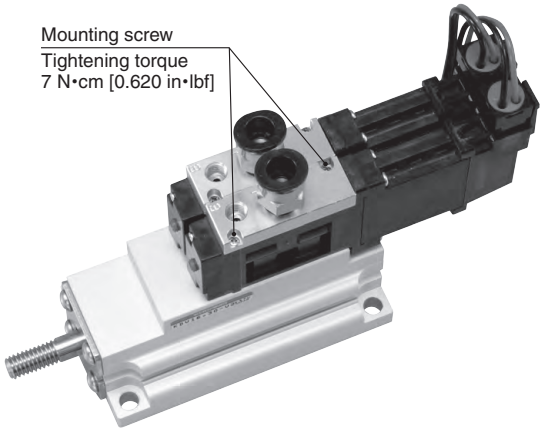
When two valves are installed, be sure to follow the procedures below when clamping the air supply/exhaust blocks two at a time because there is a risk of the mounting screws becoming loose or deforming if the valve-mounting screws are directly subjected to the pressure of the clamp.

1. Remove each air supply/exhaust block from the bodies of the valves.



2. Clamp each air supply/exhaust block and install the fittings. The recommended tightening torque for fittings is 1 N•m [8.85 in•lbf].

3. Position the air supply/exhaust blocks and the bodies of the valves on the cylinder part and screw in the valve-mounting screws. The recommended tightening torque for valve-mounting screws is 7 N•cm [0.620 in•lbf].



About operating two-valve installations (KDVT16)

Turn the valves on and off two at a time when operating a two-valve installation (KDVT16).
The KDVT16 makes the cylinder operate at high-speeds by turning the four-port solenoid valves on and off, two at a time, and causing a large increase in the flow rate.

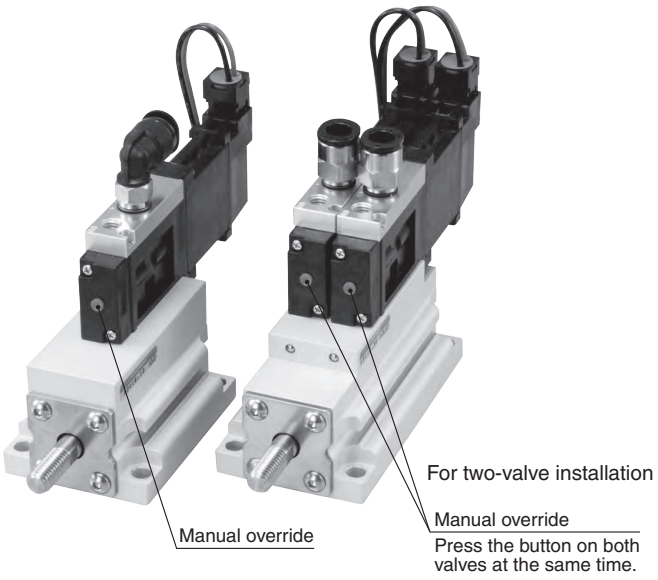
NOTE Be careful of the wiring connections because the controls turn the valves on and off two at a time.
Also, please make sure to select a device after confirming the value of the inrush current for the solenoid valve.

NOTE The air from the exhaust port will leak and the cylinder will not operate normally if only one side of the valve is operated.

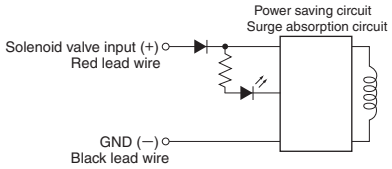
About manual override operations

To operate, press the manual override until it is in a fixed position. While pressing the manual override, the valve enters a state the same as when energizing. It returns to normal when manual override is released.

NOTE Check for danger before manually operating because when manual operations occur, the connected devices operate.
For the two-valve installation (KDVT16), press the manual overrides for each of the two valves at the same time.



Inner circuits

Circuit specifications	Inner circuits
Power saving type (**-L**) See notes 1 through 5.	

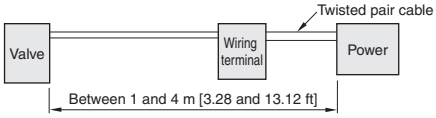
NOTE Do not perform megger tests between pins.

Note 1: Avoid using on switches that produce chattering because the power saving circuit may not operate correctly.

2: Noise may be produced near the coil part while the valve is being energized. However, this is caused by the inherent qualities of the power saving circuit and there is nothing wrong with the operations of the valve.

3: When using a lead wire as the power line, use less than 1 m [3.28 ft]. When using a cable, use between 1 and 4 m [3.28 and 13.12 ft].

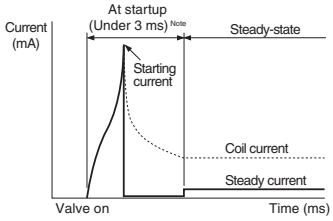
4: Be sure to use a twisted pair cable when connecting and wiring the wiring terminal if you are wiring the power line. Also, make sure that the total length from the power source is between 1 and 4 m [3.28 and 13.12 ft].



5: Consult us before putting a resistor or filter on the power line because doing so may damage the power saving circuit.

About the current waveform of the power saving circuit

This is the waveform of the power line.



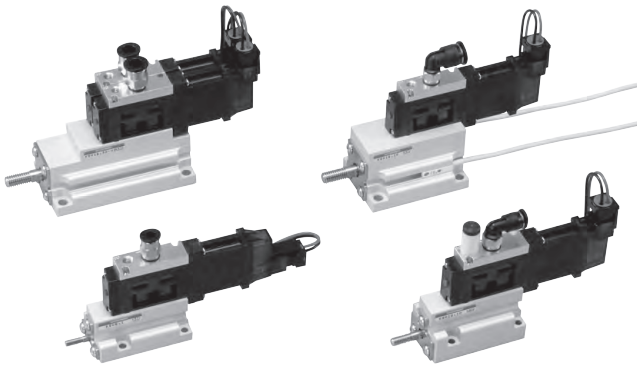
Note: The startup time differs depending on the model.

About mounting

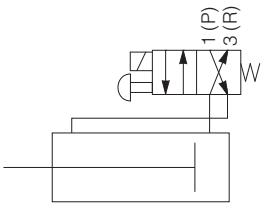
⚠ WARNING

Because directly contacting the solenoid valve (coil part) with ferromagnetic materials (such as iron) may cause malfunctions, leave a space of 1 mm [0.039 in] or more.

High-speed Valpack cylinders



Symbol



Specifications

● Specifications for high-speed Valpack cylinders

Item \ Cylinder bore	6 [0.236]	10 [0.394]	16 [0.630]
Operating type	Double acting type		
Mounting method	Direct mounting		
Medium	Air		
Operating pressure range MPa [psi]	0.2 to 0.7 [29 to 102]		
Proof pressure MPa [psi]	1.05 [152]		
Operating temperature range °C [°F]	0 to 50 [32 to 122] (non-condensation)		
Maximum usage speed (reference values)[Note] mm/s [in/sec]	2000 [80] (**KDVT16** is 2500 [100])		
Cushion	Rubber bumper		
Lubrication	No		
Port size	M5×0.8		

Note: These are reference values measured under Koganei measurement conditions.

● Specifications for solenoid valve

Item \ Model				VPK4-100SA-24-L
Medium				Air
Operation system				Direct drive type
Number of ports				4
Number of positions				2
Lubrication				No
Maximum operating frequency			Hz	100
Rated voltage				24 VDC
Type				DC solenoid
Applicable voltage range			V	21.6 to 26.4 (24.0±10%)
Power specifications	Current (when rated voltage applied)	Starting	mA	1000
		Holding	mA	92
	Power consumption	Starting	W	24
		Holding	W	2.2
Allowable circuit leakage current			mA	3
Insulation resistance			MΩ	100 or over
Color of LED indicator				Red
Surge protection				Surge absorption transistor

Cylinder bore and stroke

mm [in]

Cylinder bore	Standard Stroke
6 [0.236]	1[Note], 5, 10, 15, 20
10 [0.394]	5, 10, 15, 20
16 [0.630]	5, 10, 15, 20, 25, 30

Note: Sensor switches cannot be installed for 1 mm [0.039 in] strokes.

Mass

g [oz]

Model	Standard stroke						
	1	5	10	15	20	25	30
KDV6	94 [3.32]			98 [3.46]		—	—
KDV10	—	116 [4.09]		123 [4.34]		—	—
KDV16	—	194 [6.84]		209 [7.37]		225 [7.94]	
KDVT16	—	246 [8.68]	245 [8.64]	261 [9.21]	260 [9.17]	274 [9.67]	273 [9.63]

Values at -TS6 fittings, -KM muffler, and 1000 mm [39 in] of lead wire for the wiring.

● Additional mass of sensor switches

ZE□□□A and **ZE□□□G**: 15 g [0.53 oz]

ZE□□□B: 35 g [1.23 oz]

Thrust

N [lbf]

Cylinder bore mm [in]	Piston rod diameter mm [in]	Operation	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]
6 [0.236]	**3 [0.118]**	Push side	28.2 [0.044]	5.6 [1.26]	8.5 [1.91]	11.3 [2.54]	14.1 [3.17]	16.9 [3.80]	19.7 [4.43]
		Pull side	21.2 [0.033]	4.2 [0.94]	6.4 [1.44]	8.5 [1.91]	10.6 [2.38]	12.7 [2.86]	14.8 [3.33]
10 [0.394]	**4 [0.157]**	Push side	78.5 [0.122]	15.7 [3.53]	23.6 [5.31]	31.4 [7.06]	39.3 [8.83]	47.1 [10.59]	55.0 [12.36]
		Pull side	65.9 [0.102]	13.2 [2.97]	19.8 [4.45]	26.4 [5.93]	33.0 [7.42]	39.5 [8.88]	46.1 [10.36]
16 [0.630]	**6 [0.236]**	Push side	201.0 [0.312]	40.2 [9.04]	60.3 [13.56]	80.4 [18.07]	100.5 [22.59]	120.6 [27.11]	140.7 [31.63]
		Pull side	172.0 [0.267]	34.4 [7.73]	51.6 [11.60]	68.8 [15.47]	86.0 [19.33]	103.2 [23.20]	120.4 [27.07]

Order codes

● Order codes for high-speed Valpack cylinders

KDV [×] - [ ] - [ ] **-24-L** [ ] - [ ] [ ] [ ]

High-speed Valpack cylinders

Cylinder bore
×
Stroke
●See page ⓾ for cylinder bores and strokes.

Fitting
Blank: No fitting
TS4 : Straight ϕ4 mm [0.157 in] (with TS4-M5M)
TS6 : Straight ϕ6 mm [0.236 in] (with TS6-M5M)
TL4 : Elbow ϕ4 mm [0.157 in] (with TL4-M5M)
TL6 : Elbow ϕ6 mm [0.236 in] (with TL6-M5M)
* Attached prior to shipping

Muffler
Blank: No muffler
KM : With muffler (1)
* Attached prior to shipping

Wiring
S0: S-type plug connector, lead wire 300 mm [11.8 in]
S1: S-type plug connector, lead wire 1000 mm [39 in]
S3: S-type plug connector, lead wire 3000 mm [118 in]Note
SN: S-type plug connector, no connector
L0: L-type plug connector, lead wire 300 mm [11.8 in]
L1: L-type plug connector, lead wire 1000 mm [39 in]
L3: L-type plug connector, lead wire 3000 mm [118 in]Note
LN: L-type plug connector, no connector

Lead wire length
A: 1000 mm [39 in]
B: 3000 mm [118 in]
G: With 300 mm [11.8 in] M8 connector, only on the **ZE175, ZE177, ZE275, ZE277**

Sensor switch model (note: sensor switches cannot be installed on KDV6×1)
Blank: No sensor switch
ZE135: 2-lead wires, solid state type, horizontal lead wires
ZE155: 3-lead wires, solid state NPN output type, horizontal lead wires
ZE175: 3-lead wires, solid state PNP output type, horizontal lead wires
ZE235: 2-lead wires, solid state type, vertical lead wires
ZE255: 3-lead wires, solid state NPN output type, vertical lead wires
ZE275: 3-lead wires, solid state PNP output type, vertical lead wires
ZE137: 2-lead wires, 2-color LED solid state type, horizontal lead wires
ZE157: 3-lead wires, 2-color LED solid state NPN output type, horizontal lead wires
ZE177: 3-lead wires, 2-color LED solid state PNP output type, horizontal lead wires
ZE237: 2-lead wires, 2-color LED solid state type, vertical lead wires
ZE257: 3-lead wires, 2-color LED solid state NPN output type, vertical lead wires
ZE277: 3-lead wires, 2-color LED solid state PNP output type, vertical lead wires
●For details on sensor switches, see page ⓱.

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

Note: It is a three-wire cable type when the length is 3000 mm [118 in]. White wires are not used.

● Order codes for high-speed Valpack cylinders with two-valve installation KDVT16 (compatible only with ϕ16 mm [0.630 in])

KDVT [16 ×] - [ ] - [ ] **-24-L** [ ] - [ ] [ ] [ ] [ ]

High-speed Valpack cylinders
Two-valve installation

Cylinder bore 16 mm [0.630 in]
×
Stroke
●See page ⓾ for cylinder bores and strokes.

Fitting
Blank: No fitting
TS4 : Straight ϕ4 mm [0.157 in] (with TS4-M5M)
TS6 : Straight ϕ6 mm [0.236 in] (with TS6-M5M)
TL4 : Elbow ϕ4 mm [0.157 in] (with TL4-M5M)
TL6 : Elbow ϕ6 mm [0.236 in] (with TL6-M5M)
* Attached prior to shipping

Muffler
Blank: No muffler
KM : With muffler (1)
* Attached prior to shipping

Wiring
S0: S-type plug connector, lead wire 300 mm [11.8 in]
S1: S-type plug connector, lead wire 1000 mm [39 in]
S3: S-type plug connector, lead wire 3000 mm [118 in]Note
SN: S-type plug connector, no connector
L0: L-type plug connector, lead wire 300 mm [11.8 in]
L1: L-type plug connector, lead wire 1000 mm [39 in]
L3: L-type plug connector, lead wire 3000 mm [118 in]Note
LN: L-type plug connector, no connector

Lead wire length
A: 1000 mm [39 in]
B: 3000 mm [118 in]
G: With 300 mm [11.8 in] M8 connector, only on the **ZE175,ZE177,ZE275,ZE277**

Sensor switch model (note: sensor switches cannot be installed on KDV6×1)
Blank: No sensor switch
ZE135: 2-lead wires, solid state type, horizontal lead wires
ZE155: 3-lead wires, solid state NPN output type, horizontal lead wires
ZE175: 3-lead wires, solid state PNP output type, horizontal lead wires
ZE235: 2-lead wires, solid state type, vertical lead wires
ZE255: 3-lead wires, solid state NPN output type, vertical lead wires
ZE275: 3-lead wires, solid state PNP output type, vertical lead wires
ZE137: 2-lead wires, 2-color LED solid state type, horizontal lead wires
ZE157: 3-lead wires, 2-color LED solid state NPN output type, horizontal lead wires
ZE177: 3-lead wires, 2-color LED solid state PNP output type, horizontal lead wires
ZE237: 2-lead wires, 2-color LED solid state type, vertical lead wires
ZE257: 3-lead wires, 2-color LED solid state NPN output type, vertical lead wires
ZE277: 3-lead wires, 2-color LED solid state PNP output type, vertical lead wires
●For details on sensor switches, see page ⓱.

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

Note: It is a three-wire cable type when the length is 3000 mm [118 in]. White wires are not used.

Order codes

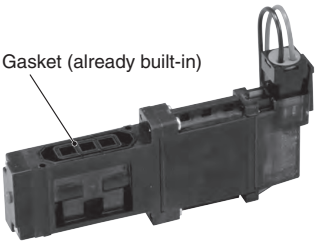
● Order codes for K4 valves for high-speed Valpack cylinders only

Note: Be aware that valve-mounting screws and air supply/exhaust blocks for air supply are not included.

VPK4-100SA-24-L ☐ **24 VDC**

K4 valves for high-speed Valpack cylinders

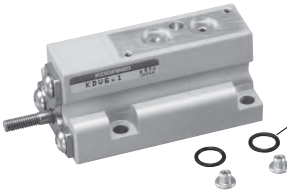
Wiring
S0 : S-type plug connector, lead wire 300 mm [11.8 in]
S1 : S-type plug connector, lead wire 1000 mm [39 in]
S3 : S-type plug connector, lead wire 3000 mm [118 in][Note]
SN : S-type plug connector, without connector
L0 : L-type plug connector, lead wire 300 mm [11.8 in]
L1 : L-type plug connector, lead wire 1000 mm [39 in]
L3 : L-type plug connector, lead wire 3000 mm [118 in][Note]
LN : L-type plug connector, without connector
Note: It is a three-wire cable type when the length is 3000 mm [118 in]. White wires are not used.



● Order codes for cylinder parts only

CY-KDV ☐ ×

Cylinder bore [mm]
×
Stroke [mm]
●See page ⓾ for cylinder bores and strokes.

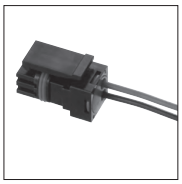


Number of valves that can be equipped
Blank: 1 valve
T : 2 valves (only compatible with ϕ16 mm [0.630 in] for **KDVT16**)

Cylinders for high-speed Valpack cylinders

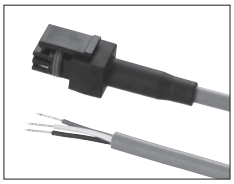
Order codes for additional parts

Connector, lead-wire type



K210-P20: IP67 plug connector, 300 mm [11.8 in] long lead wire (two wires)
K210-P21: IP67 plug connector, 1000 mm [39 in] long lead wire (two wires)
Note: Use a cable type for the 3000 mm [118 in] length.

Connector, cable type



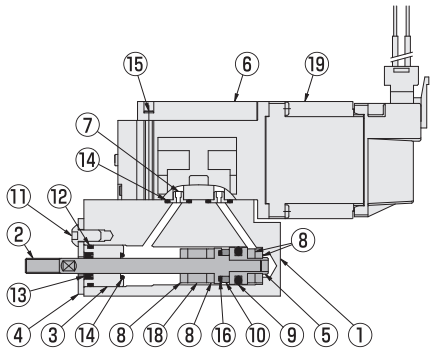
K210-C33: IP67 plug connector, 3000 mm [118 in] long cable (three wires)
Note: Use with two wires. White wires are not used.

Muffler

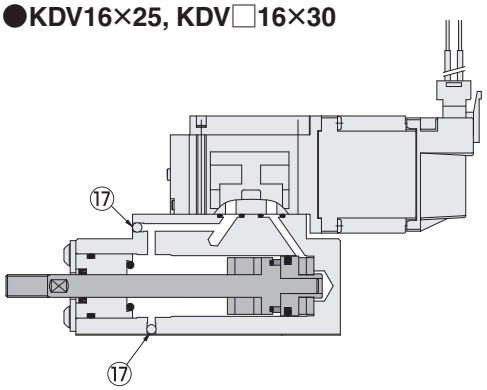
KM-05: muffler 1 pack (10 pcs.)
* Thread size: M5 × 0.8

Inner construction

● KDV6, KDV10, KDV□16 (stroke 20 mm [0.787 in] or shorter)



●KDV16×25, KDV□16×30



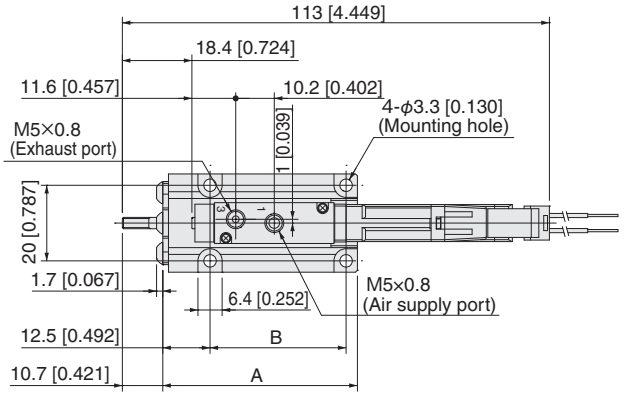
Major parts and materials

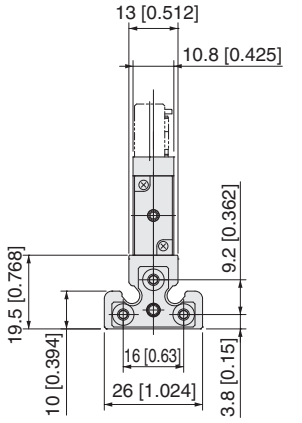
No.	Name	Materials
①	Cylinder body	Aluminum alloy (anodized)
②	Piston rod	Stainless steel
③	Rod bushing	Brass
④	Rod cover	Stainless steel
⑤	Piston	Stainless steel
⑥	Air supply/exhaust block	Aluminum alloy (anodized)
⑦	Fixed throttle (ϕ6 mm [0.236 in] and ϕ10 mm [0.394 in] only)	Aluminum alloy (anodized)
⑧	Bumper	Urethane rubber
⑨	Piston seal	Synthetic rubber (HNBR)
⑩	Magnet	Neodymium magnet
⑪	Fixing bolt for rod cover	Stainless steel
⑫	O-ring	Synthetic rubber (NBR)
⑬	Rod seal	Synthetic rubber (NBR)
⑭	O-ring	Synthetic rubber (NBR)
⑮	Mounting screw for valve	Carbon steel
⑯	O-ring	Synthetic rubber (NBR)
⑰	Steal ball (stroke 25 or longer only)	Steel
⑱	Collar (stroke 1, 5, 15, and 25 only)	Plastic (POM)
⑲	Parts for valve assembly (high-speed, four-port valves made for KDV)	—

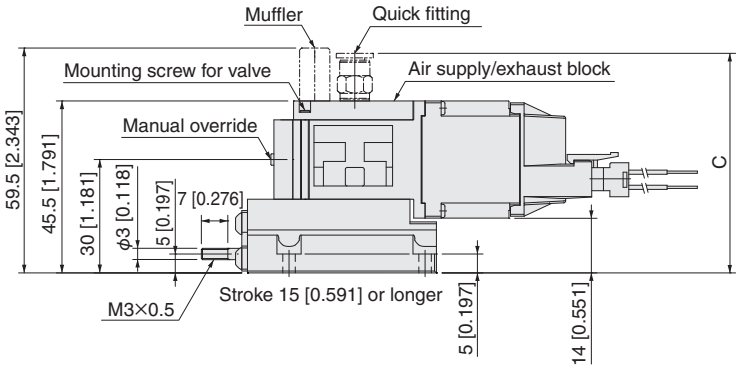
Dimensions mm [in]

● KDV6

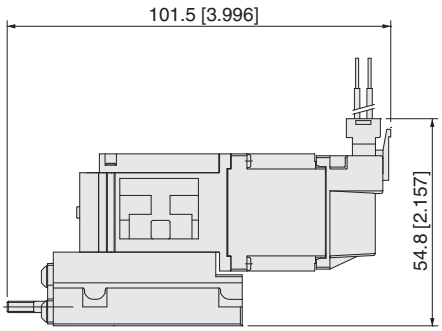
Stroke	A	B
1 [0.039]	44.5 [1.752]	29 [1.142]
5 [0.197]	44.5 [1.752]	29 [1.142]
10 [0.394]	44.5 [1.752]	29 [1.142]
15 [0.591]	51.5 [2.028]	36 [1.417]
20 [0.787]	51.5 [2.028]	36 [1.417]



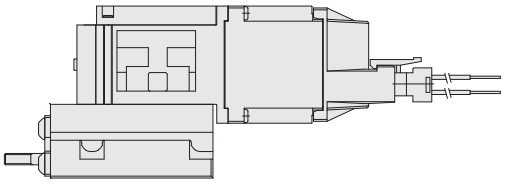




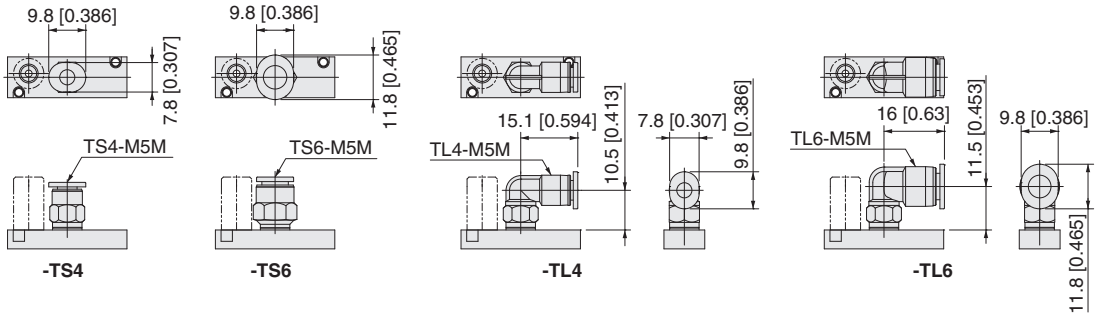
Fitting	C
TS4	58.1 [2.287]
TS6	59.5 [2.343]
TL4	60.9 [2.398]
TL6	62.9 [2.476]

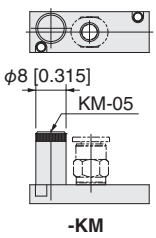


L-type plug connector



Stroke 10 [0.394] or shorter

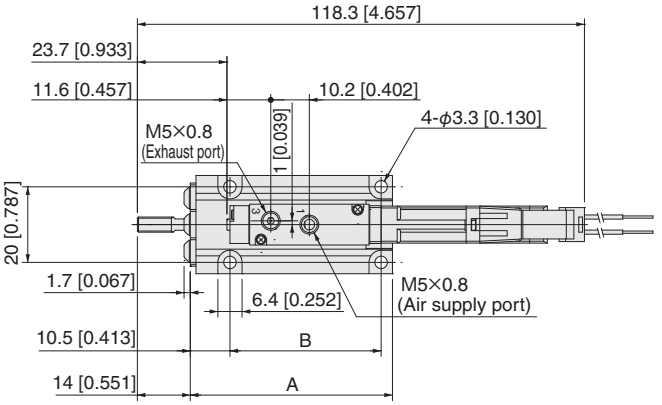


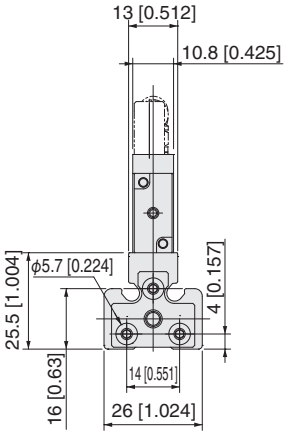


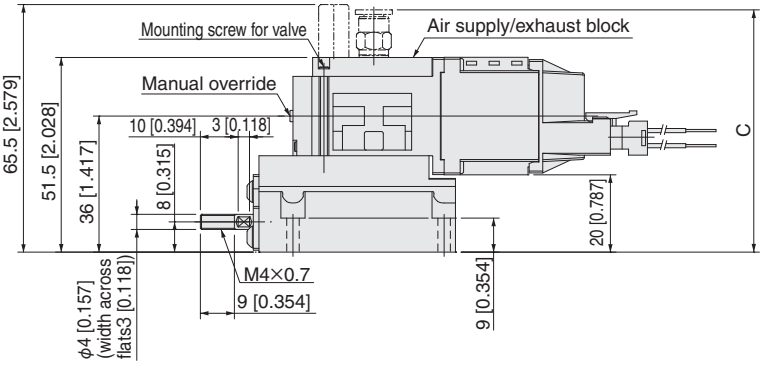
Dimensions mm [in]

● KDV10

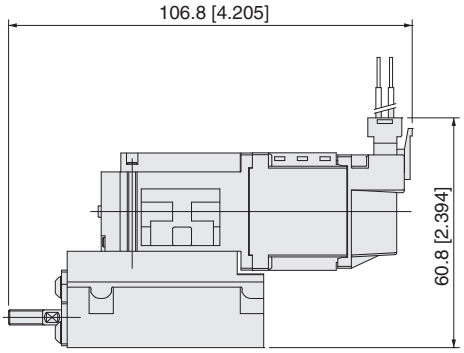
Stroke	A	B
5 [0.197]	46.5 [1.831]	33 [1.299]
10 [0.394]	46.5 [1.831]	33 [1.299]
15 [0.591]	53.5 [2.106]	40 [1.575]
20 [0.787]	53.5 [2.106]	40 [1.575]



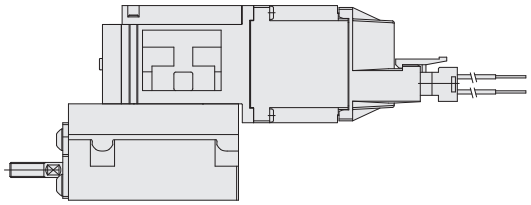




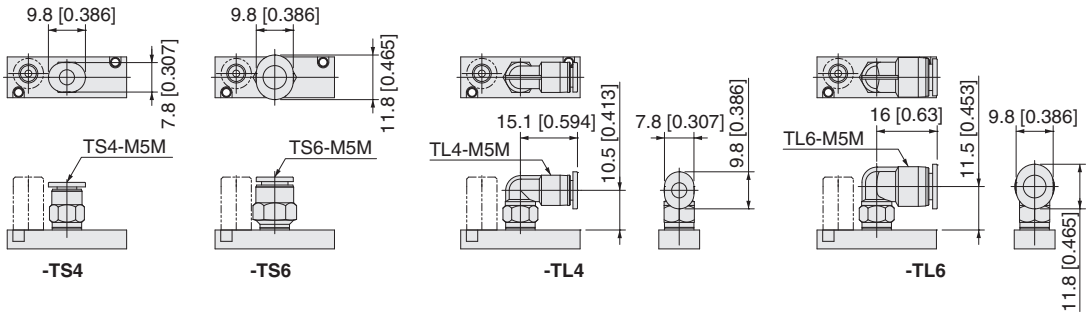
Fitting	C
TS4	64.1 [2.524]
TS6	65.5 [2.579]
TL4	66.9 [2.634]
TL6	68.9 [2.713]

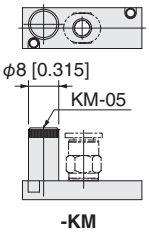


L-type plug connector



Stroke 10 [0.394] or shorter



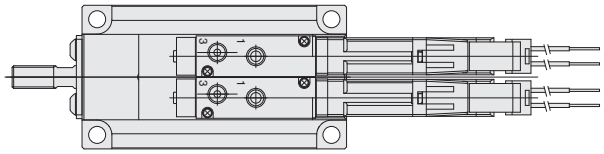


-KM

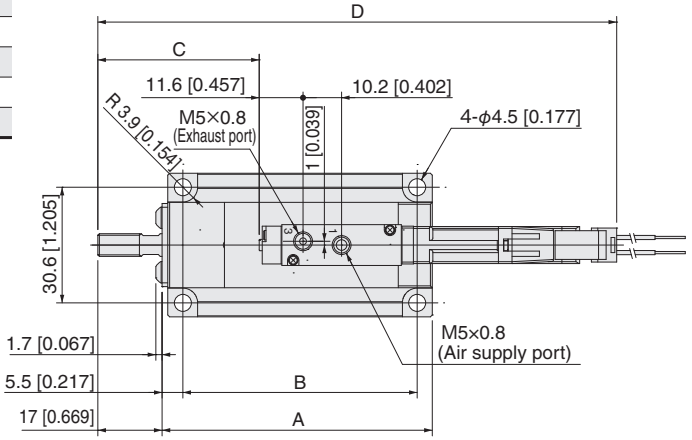
Dimensions mm [in]

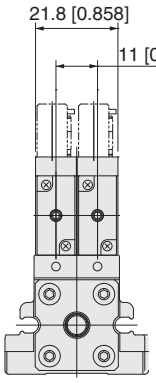
● KDV16 and KDVT16

Stroke	A	B	C	D
5 [0.197]	52.5 [2.067]	43 [1.693]	32.7 [1.287]	127.3 [5.012]
10 [0.394]	52.5 [2.067]	43 [1.693]	32.7 [1.287]	127.3 [5.012]
15 [0.591]	61.5 [2.421]	52 [2.047]	32.7 [1.287]	127.3 [5.012]
20 [0.787]	61.5 [2.421]	52 [2.047]	32.7 [1.287]	127.3 [5.012]
25 [0.984]	71.5 [2.815]	62 [2.441]	42.7 [1.681]	137.3 [5.406]
30 [1.181]	71.5 [2.815]	62 [2.441]	42.7 [1.681]	137.3 [5.406]

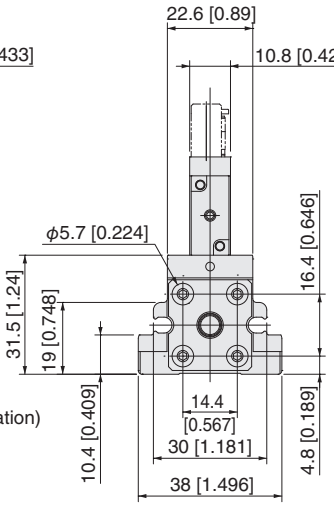


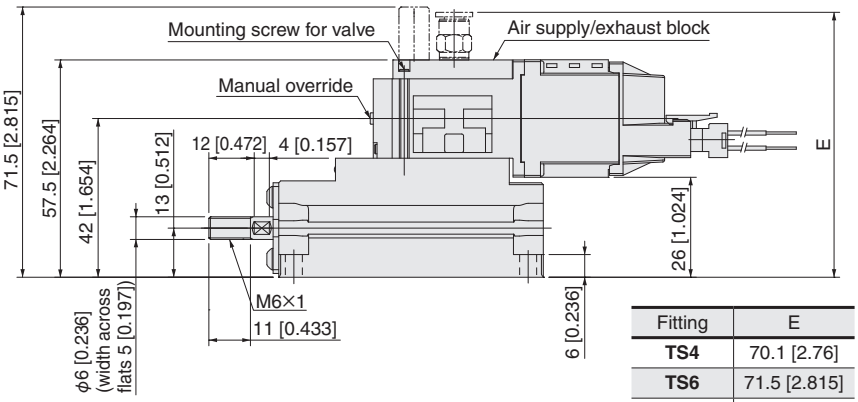
KDVT16
(For two-valve installation)



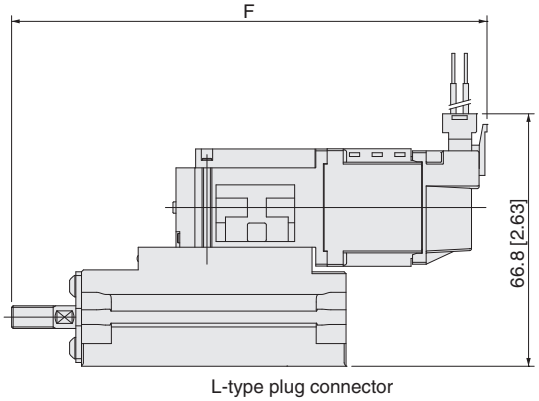


KDVT16
(For two-valve installation)

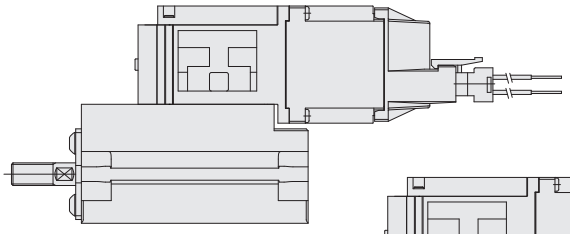




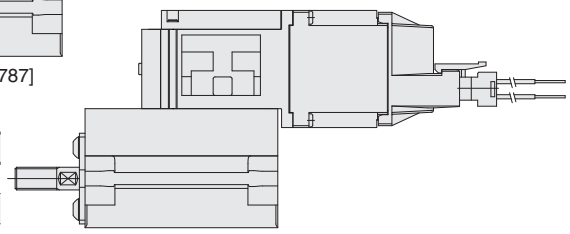
Fitting	E
TS4	70.1 [2.76]
TS6	71.5 [2.815]
TL4	72.9 [2.87]
TL6	74.9 [2.949]



L-type plug connector

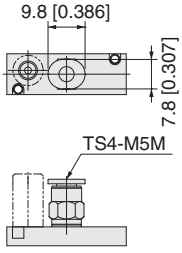


Stroke 15 [0.591], 20 [0.787]

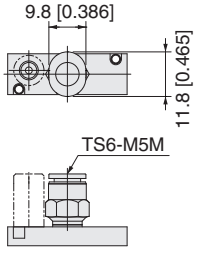


Stroke 5 [0.197], 10 [0.394]

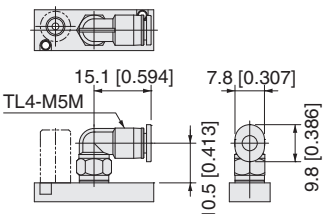
Stroke	F
5 [0.197]	115.8 [4.559]
10 [0.394]	115.8 [4.559]
15 [0.591]	115.8 [4.559]
20 [0.787]	115.8 [4.559]
25 [0.984]	125.8 [4.953]
30 [1.181]	125.8 [4.953]



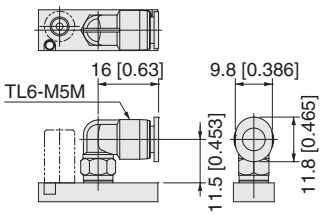
-TS4



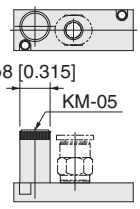
-TS6



-TL4



-TL6



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Sensor switch

Solid state type, two-color LED solid state type

●Robot cable is standard equipment

Flexibility is excellent because the conductor used is the same as for robot cables.

Specifications

● Solid State Type

Item \ Model	ZE135□	ZE155□	ZE175□	ZE235□	ZE255□	ZE275□
Wiring method	2-lead wire	3-lead wire with NPN output	3-lead wire with PNP output	2-lead wire	3-lead wire with NPN output	3-lead wire with PNP output
Lead wire direction	Horizontal			Vertical		
Power supply voltage	—	4.5 to 28 VDC		—	4.5 to 28 VDC	
Load voltage	10 to 28 VDC	4.5 to 28 VDC		10 to 28 VDC	4.5 to 28 VDC	
Load current	2.5 to 20 mA (at 25°C [77°F], and 10 mA at 60°C [140°F])	40 mA max.		2.5 to 20 mA (at 25°C [77°F], and 10 mA at 60°C [140°F])	40 mA max.	
Consumption current	—	8 mA max. (24 VDC)	10 mA max. (24 VDC)	—	8 mA max. (24 VDC)	10 mA max. (24 VDC)
Internal voltage drop Note 1	4 V max.	2 V max. (0.8 V max when load is less than 10 mA)		4 V max.	2 V max. (0.8 V max when load is less than 10 mA)	
Leakage current	0.7 mA max. (24 VDC, 25°C [77°F])	50 μA max. (24 VDC)		0.7 mA max. (24 VDC, 25°C [77°F])	50 μA max. (24 VDC)	
Response time	1 ms max.					
Insulation resistance	100 MΩ MIN. (at 500 VDC megger, between case and lead wire terminal)					
Dielectric strength	500 VAC (50/60 Hz) 1 minute (between case and lead wire terminal)					
Shock resistance Note 2	294.2 m/s² [30 G] (non-repeated)					
Vibration resistance Note 2	88.3 m/s² [9 G] (total amplitude of 1.5 mm [0.059 in], 10 to 55 Hz)					
Protective structure	IP67 (IEC standard), JIS C0920 (waterproof type)					
Operation indicators	When ON, a red LED indicator lights up					
Lead wires	PCCV 0.2 SQ x 2-wire (brown and blue) x ℓ Note 3	PCCV 0.15 SQ x 3-wire (brown and blue) x ℓ Note 3		PCCV 0.2 SQ x 2-wire (brown and blue) x ℓ Note 3	PCCV 0.15 SQ x 3-wire (brown and blue) x ℓ Note 3	
Ambient temperature	0 to 60°C [32 to 140°F]					
Storage temperature range	- 10 to 70°C [14 to 158°F]					
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 [11.8 in] with M8 connector)					

Note 1: Internal voltage drop changes with the load current.
2: According to Koganei test standards.
3: Lead wire length ℓ: A; 1000 mm [39 in], B; 3000 mm [118 in], G; 300 mm [11.8 in] with M8 connector only on the ZE175□ and ZE275□

● Two-color LED solid state type

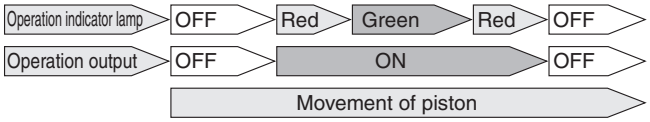
Item \ Model	ZE137□	ZE157□	ZE177□	ZE237□	ZE257□	ZE277□
Wiring method	2-lead wire	3-lead wire with NPN output	3-lead wire with PNP output	2-lead wire	3-lead wire with NPN output	3-lead wire with PNP output
Lead wire direction	Horizontal			Vertical		
Power supply voltage	—	4.5 to 28 VDC		—	4.5 to 28 VDC	
Load voltage	10 to 28 VDC	4.5 to 28 VDC		10 to 28 VDC	4.5 to 28 VDC	
Load current	2.5 to 20 mA (at 25°C [77°F], and 10 mA at 60°C [140°F])	40 mA max.		2.5 to 20 mA (at 25°C [77°F], and 10 mA at 60°C [140°F])	40 mA max.	
Consumption current	—	8 mA max. (24 VDC)	10 mA max. (24 VDC)	—	8 mA max. (24 VDC)	10 mA max. (24 VDC)
Internal voltage drop Note 1	4 V max.	2 V max. (0.8 V max if load is less than 10 mA)		4 V max.	2 V max. (0.8 V max when load is less than 10 mA)	
Leakage current	0.7 mA max. (24 VDC, 25°C [77°F])	50 μA max. (24 VDC)		0.7 mA max. (24 VDC, 25°C [77°F])	50 μA max. (24 VDC)	
Response time	1 ms max.					
Insulation resistance	100 MΩ MIN. (at 500 VDC megger, between case and lead wire terminal)					
Dielectric strength	500 VAC (50/60 Hz) 1 minute (between case and lead wire terminal)					
Shock resistance Note 2	294.2 m/s² [30 G] (non-repeated)					
Vibration resistance Note 2	88.3 m/s² [9 G] (total amplitude of 1.5 mm [0.059 in], 10 to 55 Hz)					
Protective structure	IP67 (IEC standard), JIS C0920 (waterproof type)					
Operation indicators	Appropriate operation range: Green LED indicator lit when on, operation range: Red LED indicator lit when on					
Lead wires	PCCV 0.2 SQ x 2-wire (brown and blue) x ℓ Note 3	PCCV 0.15 SQ x 3-wire (brown and blue) x ℓ Note 3		PCCV 0.2 SQ x 2-wire (brown and blue) x ℓ Note 3	PCCV 0.15 SQ x 3-wire (brown, blue, and black) x ℓ Note 3	
Ambient temperature	0 to 60°C [32 to 140°F]					
Storage temperature range	- 10 to 70°C [14 to 158°F]					
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 [11.8 in] with M8 connector)					

Note 1: Internal voltage drop changes with the load current.
2: According to Koganei test standards.
3: Lead wire length ℓ: A; 1000 mm [39 in], B; 3000 mm [118 in], G; 300 mm [11.8 in] with M8 connector only on the ZE177□ and ZE277□

Operation

●Explanation of operation of two-color LED solid state type

ZE137□, ZE157□, ZE177□, ZE237□, ZE257□, ZE277□

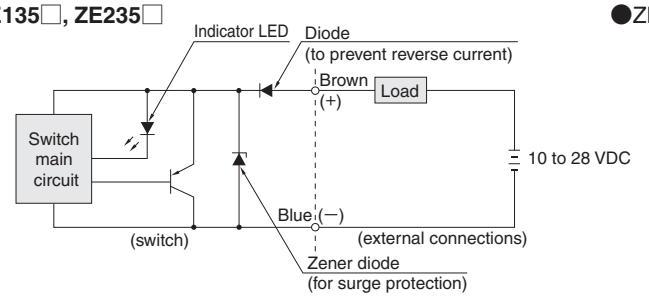


Note: The operating output may become unstable due to the effects of the operating and installation environments, even if the appropriate operating range (green LED indicator lit) is fixed.

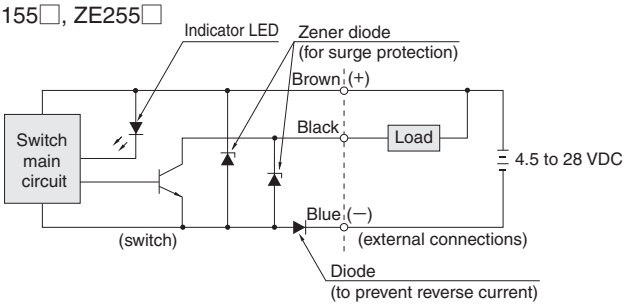
Diagram of inner circuits

● Solid State Type

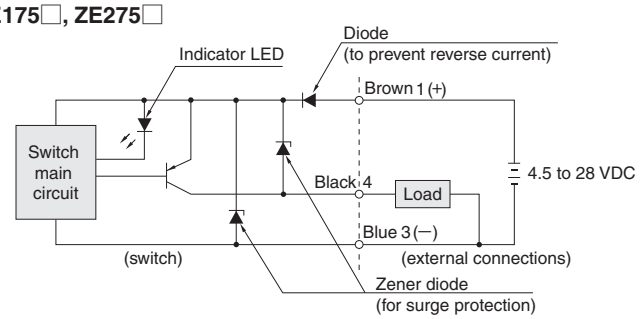
●ZE135□, ZE235□



●ZE155□, ZE255□

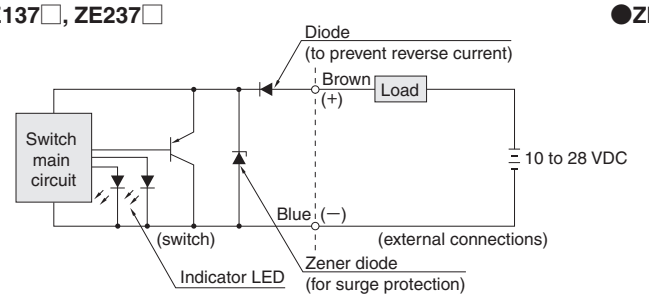


●ZE175□, ZE275□

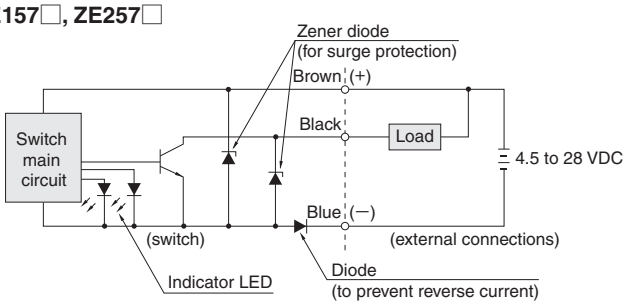


●Two-color LED solid state type

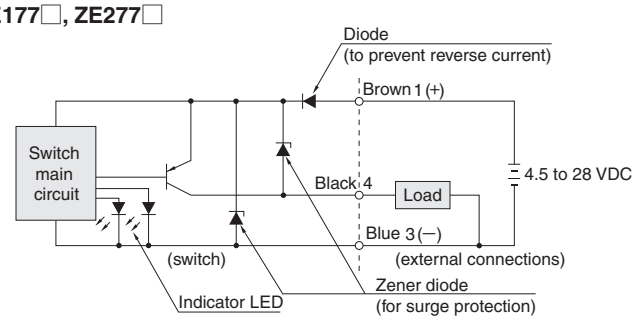
●ZE137□, ZE237□



●ZE157□, ZE257□



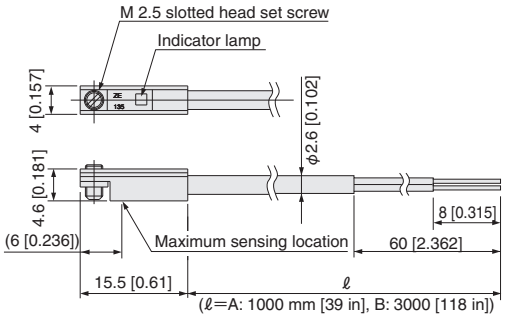
●ZE177□, ZE277□



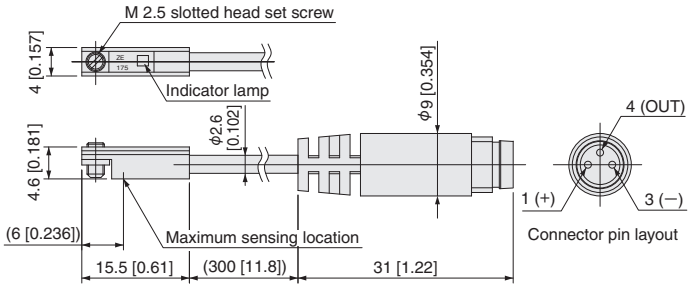
Sensor Switch Dimensions mm [in]

● Horizontal lead wire

● Solid state (ZE135□, ZE155□, ZE175□, ZE137□, ZE157□, ZE177)

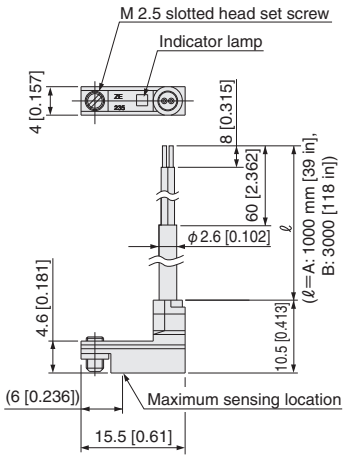


● Solid state (ZE175G, ZE177G)

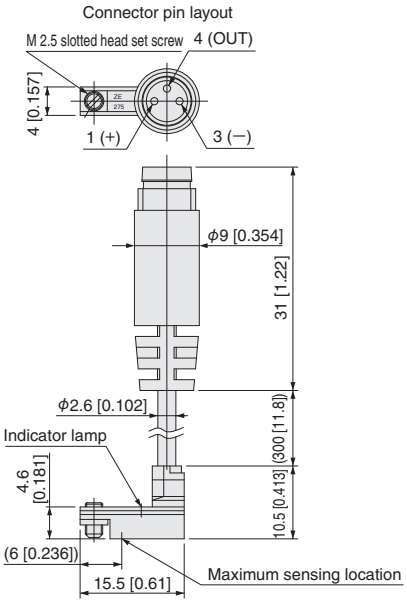


● Vertical lead wire

● Solid state (ZE235□, ZE255□, ZE275□, ZE237□, ZE257□, ZE277□)



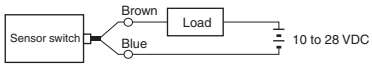
● Solid state (ZE275G, ZE277G)



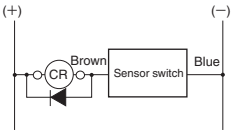
Wiring instructions for the solid state sensor switches

●2-lead wire

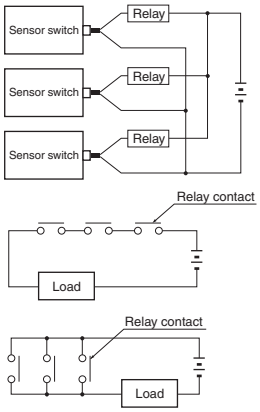
● Basic connection



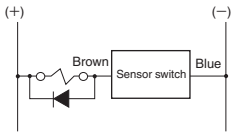
● Connection to relays



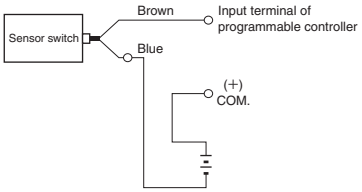
AND (series) connection and OR (parallel) connection



● Connection to solenoid valve

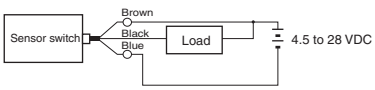


● Connection to programmable controller

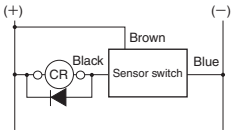


●3-lead wire with NPN output

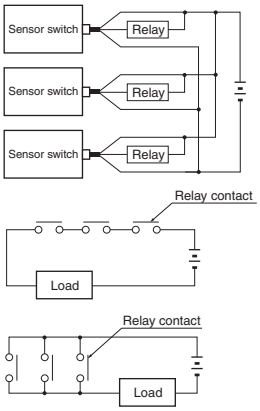
● Basic connection



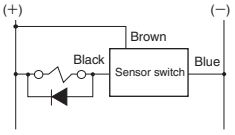
● Connection to relays



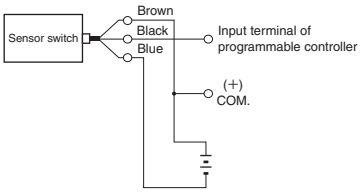
AND (series) connection and OR (parallel) connection



● Connection to solenoid valve

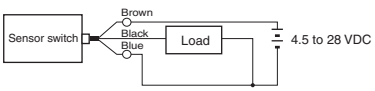


● Connection to programmable controller

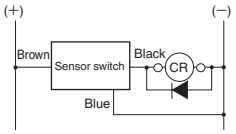


●3-lead wire with PNP output

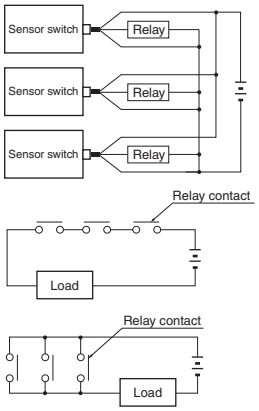
● Basic connection



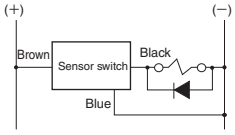
● Connection to relays



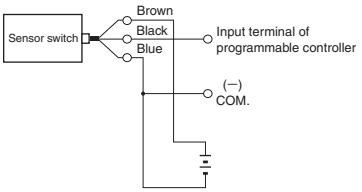
AND (series) connection and OR (parallel) connection



● Connection to solenoid valve



● Connection to programmable controller



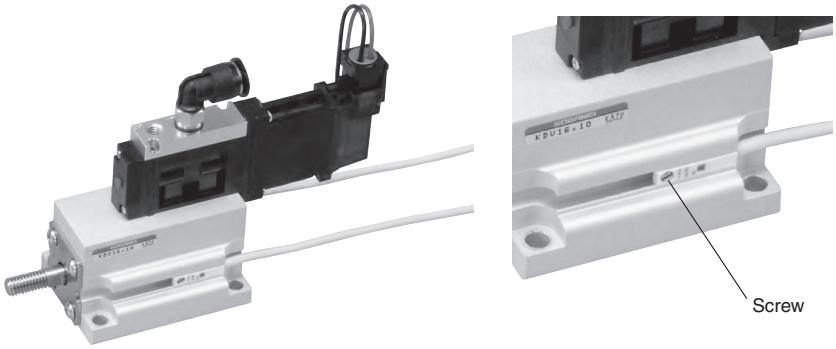
NOTE

1. Connect the lead wires according to their color. Incorrect wiring will cause damage to the sensor switch.
2. The use of a surge protection diode is recommended with the inductive load such as an electromagnetic relay.
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. Also avoid using magnetic material for any parts used for mounting. It could result in 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 the nearest Koganei sales office for use in environments subject to water or oil.

Moving Sensor Switch

- Loosening the screw allows the sensor switch to be moved along the switch mounting groove of the cylinder tube.
- The tightening torque for the screws is 0.1 N•m [0.86 in•lbf] to 0.2 N•m [1.77 in•lbf].

NOTE First, screw in the cylinder's mounting screws prior to installing the sensor switch, as the screws may interfere with the sensor.



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

● Operating range: ℓ

The range from where the piston turns the switch on and the point where the switch is turned off as the piston travels in the same direction.

● 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.

● Solid State Type

mm [in]

Item \ Diameter	6 [0.236]	10 [0.394]	16 [0.630]
Operating range: ℓ	1.5 to 5 [0.059 to 0.197]		
Response differential: C	0.3 [0.012] or less		
Maximum sensing location[Note]	6 [0.236]		

Remark: The values in the table above are reference values.

Note: The value from the opposite end of the lead wire. (shown by arrow)

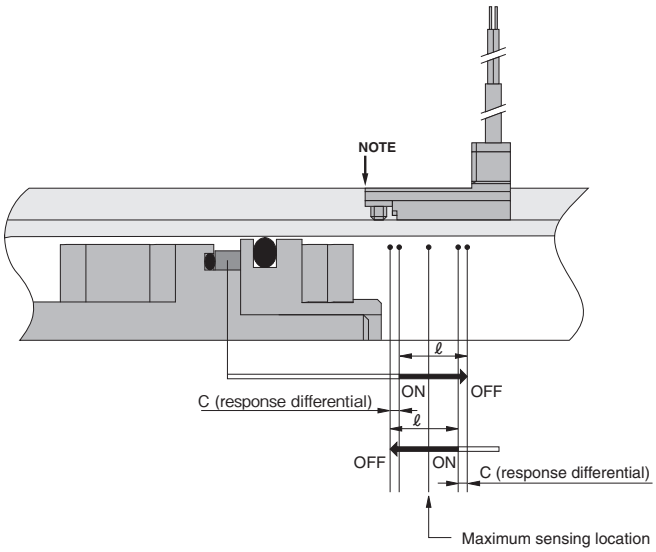
●Two-color LED solid state type

mm [in]

Item \ Diameter	6 [0.236]	10 [0.394]	16 [0.630]
Operating range: ℓ	2 to 6 [0.079 to 0.236]		
Response differential: C	0.5 [0.020] or less		
Maximum sensing location[Note]	6 [0.236]		

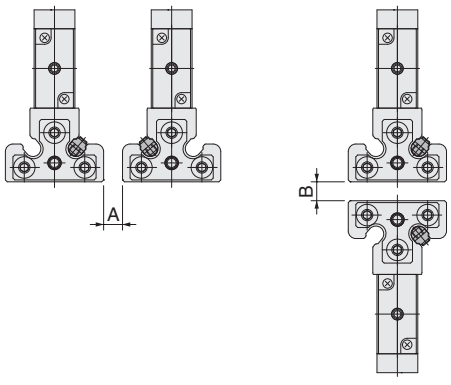
Remark: The values in the table above are reference values.

Note: The value from the opposite end of the lead wire. (shown by arrow)



When Mounting the Cylinders with Sensor Switches in Close Proximity

When using cylinders next to each other, use under conditions using values greater than in the table below. (It is possible to install them side-by-side.)



● Solid State Type

mm [in]

Cylinder bore	A	B
6 [0.236]	0	0
10 [0.394]		
16 [0.630]		

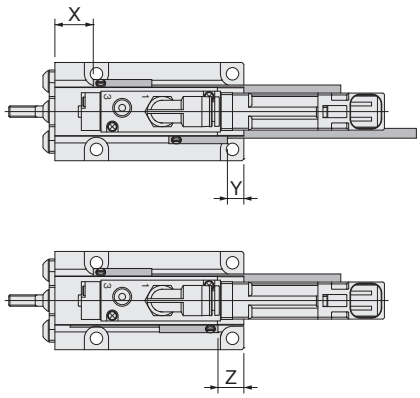
●Two-color LED solid state type

mm [in]

Cylinder bore	A	B
6 [0.236]	0	0
10 [0.394]		
16 [0.630]		

Mounting Position of the End of Stroke Detection Sensor Switch

Mounting the sensor switch in the locations shown (values in diagram are reference values), the sensor magnet comes to the maximum sensing location of the sensor switch at the end of the stroke.



Solid state type (2-color LED included)

mm [in]

Model \ Symbol	X	Y	Z
KDV6×5	20 [0.787]	7.5 [0.295]	11 [0.433]
KDV6×10			
KDV6×15	30 [1.181]	4.5 [0.177]	8 [0.315]
KDV6×20			
KDV10×5	21.5 [0.846]	8 [0.315]	12 [0.472]
KDV10×10			
KDV10×15	31.5 [1.240]	5 [0.197]	9 [0.354]
KDV10×20			
KDV□16×5	27 [1.063]	8.5 [0.335]	12 [0.472]
KDV□16×10			
KDV□16×15	37 [1.457]	7.5 [0.295]	11 [0.433]
KDV□16×20			
KDV□16×25	47 [1.850]	7.5 [0.295]	11 [0.433]
KDV□16×30			

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.

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