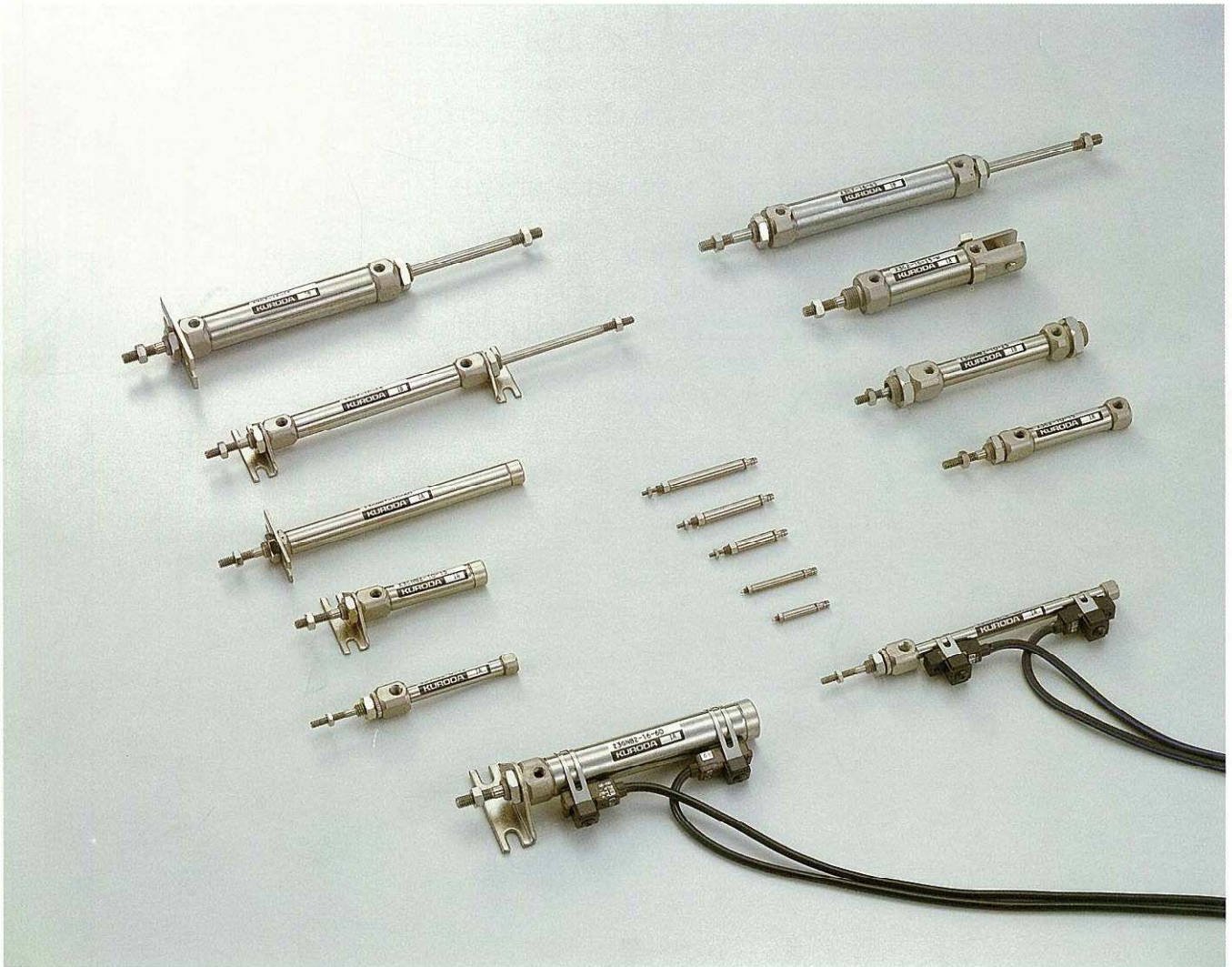


KURODA

MINIATURE AIR CYLINDER

Z3 SERIES





FOR SAFETY USE

Be sure to read the following instructions before use.

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

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

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

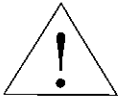
- | |
|--|
| <p>⚠ CAUTION : Indicates a potentially hazardous situation which may arise due to improper handling or operation and could result in personal injury or property-damage-only accidents.</p> <p>⚠ WARNING : Indicates a potentially hazardous situation which may arise due to improper handling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

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

(※2) ISO 4414 : Pneumatic fluid power-Recommendations for the application of equipment to transmission and control systems

⚠ WARNING

- **The applicability of pneumatic equipment to the intended system should be judged by the pneumatic system designer or the personnel who determined specifications for such system.**
As operating conditions for products contained in this catalogue are diversified, the applicability of pneumatic equipment to the intended system should be determined by the pneumatic system designer or the personnel who determined specifications for such system after conducting an analysis or testing as necessary.
The system designer shall be responsible for assuring the intended system performance and safety.
Before making a system, the system designer should thoroughly examine all specifications for such a system and also take into consideration the possibility of any trouble with the equipment.
- **The pneumatic equipment should be handled by persons who have sufficient knowledge and rich experience.**
Improper handling of compressed air will result in danger.
Assembling, operation and maintenance of machinery using pneumatic equipment should be performed by persons who have sufficient knowledge and rich experience.
- **Never operate machinery nor remove the equipment until safety is assured.**
 - Before checking or servicing machinery and equipment, be sure to check that steps for prevention of dropping or runaway of the driven component have been completely taken.
 - When removing the equipment, make sure that the above-mentioned safety measures have been done beforehand. Then turn off air supply and power to the system and purge compressed air in the system.
 - When restarting machinery and equipment, check that proper prevention of malfunction has been provided for and then restart carefully.
- **When using the pneumatic equipment in the following conditions or environments, take the proper safety measures and consult KURODA beforehand.**
 - Conditions and environments other than specified and outdoor use.
 - Applications to nuclear power equipment, railroads, aircraft, vehicles, medical equipment, equipment connected with food and drink, amusement facilities and safety devices such as emergency interruption devices, clutch/brake circuits for a press and the likes.
 - Applications which require extreme safety and will also greatly affect men and property.



AIR CYLINDERS/COMMON INSTRUCTIONS①

Be sure to read them before use.

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

DESIGN

⚠ WARNING

- When exerting force changes due to a twist or other accident in the sliding part of the machine, the air cylinder may produce a shockable action.
In this case, the air cylinder may catch the human body such as hands and feet or the machine may suffer a damage. Therefore, it is necessary to adjust the machine and make a design so that the air cylinder can smoothly operate without injuring the human body.
- Especially when there is the possibility that the human body is endangered, fit a protective cover.
When there is the possibility that applied load or the moving part of the air cylinder endangers the human body, design the system so that the human body cannot directly touch these parts.
- Firmly clamp the air cylinder to prevent the fixed part and connection of the air cylinder from loosening.
Especially when using the air cylinder in a place where it is frequently operated or in a vibratory place, use a firm clamping method.
- A decelerating circuit or shock absorber may be required according to circumstances.
When the load moves at high speed or the mass is large, it is difficult to absorb a shock only by the built-in cushion. Provide a circuit to decelerate the cylinder before the piston enters cushion stroke or a shock absorber on the load side.
In this case, fully take into consideration the rigidity of the machine.
- Take into consideration the possibility of pressure failure in the circuit due to outage etc.
For an air cylinder used in the clamping mechanism, if clamping pressure in the circuit lowers due to outage etc., clamping force will reduce, so that the load may sometimes come off. To avoid such danger, design the system to incorporate a safety device to protect the human body and machine. Also provide the hanger and lift with proper prevention against dropping.
- Take into consideration the possibility of power failure.
Take proper countermeasures against equipment controlled by air pressure, electricity, hydraulic pressure, etc. so as to protect the human body and machine even if these power sources are faulty.
- Design a circuit to prevent the load and piston rod from sudden protrusion.
When the air cylinder is driven with a 3-position ABR connection (exhaust center) type solenoid valve or when the air cylinder is started after air pressure is applied to one side of the piston after exhausting residual air from the cylinder, the load and piston rod may sometimes suddenly protrude. In this case, the air cylinder may catch the human body such as hands and feet or damage the machine.
Select a device to prevent the sudden protrusion of the piston rod and design a proper circuit.

DESIGN

⚠ WARNING

- Take into consideration the action of air cylinders in an emergency.
When the machine is stopped by a person in an emergency or stopped by the safety device due to the occurrence of outage, system trouble, etc., the air cylinder may catch the human body or damage the machine according to circumstances. To avoid such an accident, take into consideration the action of air cylinders in designing a system so as to prevent an injury to the human body and a damage to the machine.
- Take into consideration the action of an air cylinder when it restarts from stoppage in an emergency or abnormal state.
Make a design to prevent an injury to the human body and a damage to the machine when the air cylinder is restarted.
When it is necessary to reset the air cylinder to the starting position, make a design to incorporate a safety manual control unit.
- Stopping at intermediate position
When stopping the air cylinder piston at an intermediate position using a 3-position all port block (closed center) type solenoid valve, it is difficult to stop it accurately because of its compressibility, unlike a hydraulic cylinder can do. In addition, as the solenoid valve and air cylinder allow a certain degree of air leak, they cannot stop at the fixed position for a long period of time according to circumstances.
When it is required to stop them at the fixed position for a long period of time, contact KURODA.
- Remodeling air cylinders
Do not remodel air cylinders.

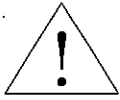
⚠ CAUTION

- When adjusting the driving speed of an air cylinder, install a speed controller.
Adjust the driving speed on the low speed side and then adjust it gradually until the prescribed speed is attained.
- When using an air cylinder, take into consideration the buckling of the piston rod.
Large buckling may result in a damage to the air cylinder or may reduce the life span of it. Especially when using an air cylinder exceeding its rated maximum stroke by putting it with the bottom up, contact KURODA.

SELECTION

⚠ WARNING

- Refer to specifications.
Air cylinders listed in this catalogue are designed for compressed air.
When using other fluid than compressed air, contact KURODA beforehand.
Do not use the air cylinder outside the specified pressure and temperature range; this may result in a breakdown or faulty operation.



AIR CYLINDERS/COMMON INSTRUCTIONS②

Be sure to read them before use.

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

INSTALLATION

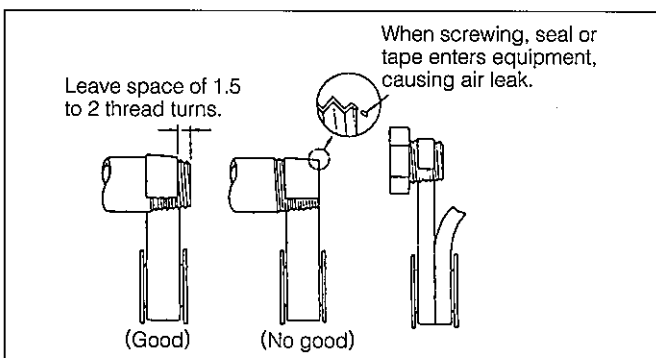
! CAUTION

- Avoid applying eccentric load and lateral load to the piston rod.
Applying eccentric load and lateral load to the piston rod causes a faulty operation and a damage to the packing.
- For a long stroke cylinder, provide a reinforcing ring.
For a long stroke cylinder, provide a reinforcing ring to prevent droop of rod, deflection of tube and damage to rod by vibration and external load.
- Do not flaw and dent the cylinder tube and piston rod sliding part.
Even a slight flaw or dent will cause a faulty operation and a damage to the packing.
- Prevent seizure of rotating parts.
Apply grease to the rotating parts (pin etc.) to prevent seizure.
- Do not start the system before making sure that equipment is properly operated.
After installing the air cylinder, connect compressed air and power supply. Perform functional test and leak test properly and check that the system is correctly operated with safety. Then start the system.

PIPING

! CAUTION

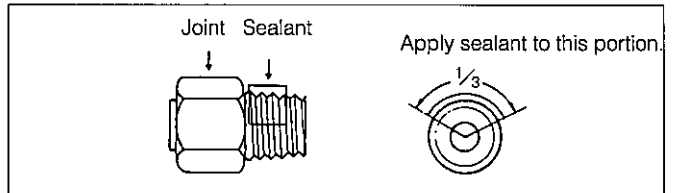
- Before piping
Thoroughly flush the inside of each pipe to remove chips, coolant, dust, etc. before piping.
- How to wind a seal tape
When winding a seal tape around the threaded portion, leave space of 1.5 to 2 thread turns.



PIPING

! CAUTION

- How to apply liquid sealant
When applying liquid sealant to the threaded portion, apply a proper amount to about 1/3 of the periphery of the threaded portion and then screw it.



- Screw of pipe and joint
When screwing the pipe and joint, use care to prevent chips and sealant from entering the pipe and joint. Tighten them within a proper range of clamping torque.

Thread size	Clamping torque(N·m)
M3	0.3~0.5
M5	1.5~2.0
R,Rc1/8	7.0~9.0
R,Rc1/4	12 ~14
R,Rc3/8	22 ~24
R,Rc1/2	28 ~30
R,Rc3/4	28 ~30
R,Rc1	36 ~38

CUSHION (FOR AIR CYLINDER WITH BUILT-IN CUSHION)

! CAUTION

- Adjust the cushion by rotating the cushion needle.
The cushion has been properly adjusted before it has leaves our factory. When using the air cylinder, readjust the cushion to meet the applied load and the driving speed of the cylinder.
Rotating the cushion needle clockwise makes small the throttle to increase cushioning performance.
- After adjusting the cushion, be sure to tighten the lock nut.
- Do not use the air cylinder with the cushion needle fully opened; otherwise causing a damage to the packing.



AIR CYLINDERS/COMMON INSTRUCTIONS③

Be sure to read them before use.

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

LUBRICATION



CAUTION

- **Oil supply to lubricated air cylinders**
Set an air lubricator in the pneumatic circuit and supply Class 1 turbine oil ISO VG32 (containing no additive). Do not use other oils (spindle oil, machine oil, etc.), otherwise causing a damage to the sealed part.
- **Oil supply to non-lubricated air cylinders**
The non-lubricated air cylinder can be used without lubrication, but can be used with lubrication. When using it with lubrication, do not discontinue supplying oil. Otherwise, the applied lubricant may run off, sometimes resulting in an operation failure. When using a lubricant, Class 1 turbine oil ISO VG32 (containing no additive) is recommended.

OPERATING ENVIRONMENT



DANGER

- Do not use air cylinders in a explosive environment.



WARNING

- Do not use air cylinders in a corrosive environment.
- **When using air cylinders in a place attended with much dust, water drops or oil drops, fit bellows or other proper means to the piston rod.**
For use in a dusty place, use an air cylinder with powerful scraper.

QUALITY OF AIR



WARNING

- **Use pure air.**
Compressed air containing corrosive gases, chemicals, salt, etc. causes a breakdown or operation failure. So do not use such air.

QUALITY OF AIR



CAUTION

- **Fit an air filter with filtration of 5µm or fine.**
- **Install an air dryer.**
Compressed air containing much drainage causes the operation failure of pneumatic equipment. Install an air dryer, lower the temperature and reduce drainage.
- **Take proper countermeasures against sludge.**
If sludge produced in compressor oil enters pneumatic equipment, it will cause the operation failure of pneumatic equipment. It is recommendable to use compressor oil (NISSEKI FAIR-CALL A68, IDEMITSU DAPHUNY SUPER CS68) featuring minimized sludge production or use a sludge filter or mist cleaner to prevent sludge from entering the pneumatic equipment.
- **Use at low temperature**
When using pneumatic equipment at temperature of 5°C or below, install an air dryer or take other countermeasures to prevent drainage and moisture in compressed air from freezing or solidifying.

MAINTENANCE AND INSPECTION



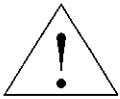
WARNING

- **Inspection before maintenance**
Check that proper prevention against the dropping and runaway of load has been provided. Then turn off air and power supply to the system and discharge residual air in the system before doing maintenance. For 3-position all port block (closed center) type, compressed air is contained between solenoid valve and air cylinder. Discharge the residual air.
- **Inspection after maintenance**
When restarting the system, check that protrusion prevention has been provided. Then connect compressed air supply and power supply to the pneumatic system, and perform functional and leak tests to make sure that the air cylinder is properly installed and works safely without fail.
- **Disassembling the air cylinder**
As the cover and tube are fixed with adhesives, they cannot be disassembled. When disassembling is required, contact KURODA beforehand.



CAUTION

- **Draining**
To maintain constant air quality, drain the air filter periodically.



MAGNETIC PROXIMITY SWITCHES FOR CYLINDERS/COMMON INSTRUCTIONS ①

Be sure to read them before use.

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

DESIGN AND SELECTION

! WARNING

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

Applying load current, voltage, temperature and shock exceeding the range of specifications will cause a damage to the switch and a faulty operation. Thoroughly read the specifications and use the switch within the range of the specifications. Especially, be sure to use the switch within the maximum contact capacity and operating current range.

- Be careful of distance between adjacent cylinders.

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

In designing a system, provide a distance of more than 40 mm between the cylinder tubes.

(When a permissible distance is specified for each cylinder, follow the specified distance.)

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

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

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

In this case, piston speed is expressed as follows :

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

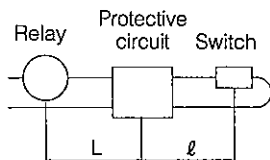
- Reduce the length of wiring as much as practicable.

(Reed switch)

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

① When using a switch with built-in contact protective circuit and the length of wiring is more than 5 m, be sure to connect a protective circuit (see Page 36) near to the switch in series.

In case of capacitive load :



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

② Even when using a switch with built-in contact protective circuit and length of wiring is more than 30 m, the protective circuit may not fully absorb inrush current according to circumstances ;

this sometimes shortens the switch service life.

For how to connect a protective circuit contact KURODA.

(Proximity switch)

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

DESIGN AND SELECTION

! WARNING

- Be careful of leak current.

For a 2-wire proximity switch, current (leak current) flows in it to operate the internal circuit even if the switch is turned off. When 2 or more switches are connected in parallel, leak current increases corresponding to the number of connected switches. When leak current is larger than operating current for turning off load, the load is not turned off.

- Be careful of internal voltage drop of switch.

(Reed switch)

When 2 or more switches with LED are connected in series, voltage drop occurs by the number of connected switches due to the resistance of light emitting diode. (Refer to "Internal Voltage Drop" described in "Specifications for Switch".) Note that load may not be sometimes moved even if the switch operates normally.

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

(Proximity switch)

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

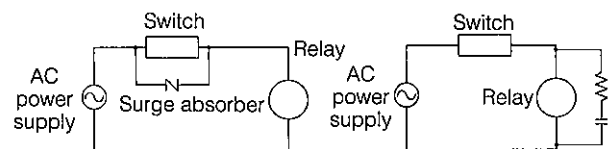
- Do not use load that produces surge voltage.

(Reed switch)

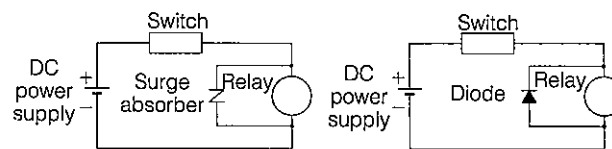
When driving a relay or other load that produces surge voltage, use a switch with built-in contact protective circuit or connect a protective circuit to the switch.

In case of inductive load

Load at 100 V AC



Load at DC



(Proximity switch)

A zener diode for surge protection is connected to the output side of a proximity switch. However, it may be broken if surge is repeatedly applied to it. When directly driving a relay, solenoid valve or other load that produces surge, use a switch with built-in surge absorbing element.



MAGNETIC PROXIMITY SWITCHES FOR CYLINDERS/COMMON INSTRUCTIONS ②

Be sure to read them before use.

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

DESIGN AND SELECTION

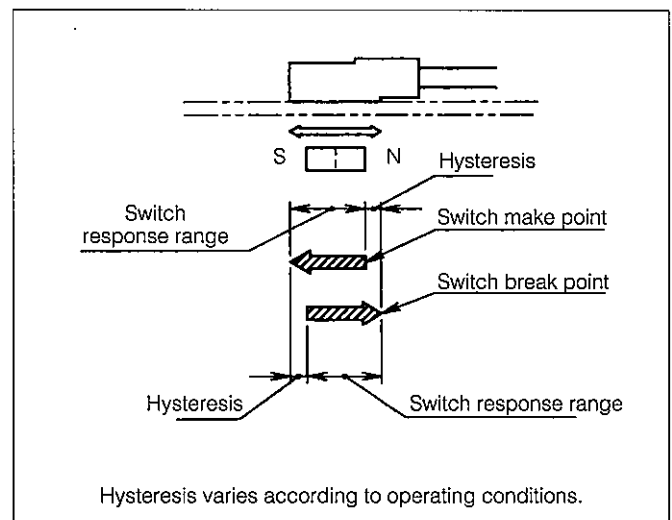
⚠ WARNING

- When using the switch in an interlock circuit, pay attention to the following points;
When a switch for cylinder is used for interlock signals requiring high degree of reliability, provide the switch with a mechanical protective function against trouble and malfunction or use a double-interlock system by using the switch together with other switch (sensor etc.). In addition, check the switch periodically to make sure that it works normally.
- Provide space for maintenance.
In designing a system, take into account space for maintenance and inspection.

INSTALLATION AND ADJUSTMENT

⚠ WARNING

- Do not drop or hit the switch.
When handling the switch, do not drop or hit it or do not apply an excessive shock to it (refer to specification for each switch). Otherwise, the internal mechanism of the switch may be broken.
- Do not swing around the switch while holding the lead wire.
If excessive tensile force is applied to the lead wire, the inside wire may be broken or the internal mechanism of the switch may suffer a damage.
- Fix the switch with prescribed clamping torque.
When the switch is fixed with clamping torque exceeding the prescribed value, the set screw, metal fixture, switch, etc. may be broken.
- Set the switch at the center of its response range.
The magnet (piston) moves to a point at which it turns on the switch and then it moves in opposite direction to other point at which it turns off the switch. The distance between these points is called hysteresis.
When the switch is installed within this distance, its operation may be sometimes unstable.
Set the switch so that the magnet is located at the center of its response range (within which the switch is turned on). (Set positions described in this catalogue are the most suitable positions at the stroke end.)





MAGNETIC PROXIMITY SWITCHES FOR CYLINDERS/COMMON INSTRUCTIONS ③

Be sure to read them before use.

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

WIRING

! WARNING

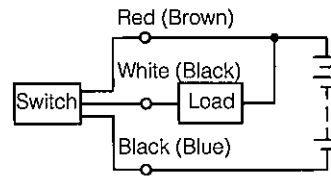
- Properly wire in accordance with each lead wire color or terminal No.
In this case, be sure to turn off power to the electric circuit on the connection side.
- Do not make wrong wiring.
As DC current has polarity, do not confuse (+) with (-).
<Reed switch>
When the connection of wiring is reversed, the switch is operated but the lamp is not on. If current exceeding the prescribed operating range flows to the switch, the lamp will be broken and the switch fails.
<Proximity switch>
Even if the connection of wiring of a 2-lead wire switch is reversed, the protective circuit prevents the breakdown of the switch. In this case, however, the switch is left turned on.
Note that, if the connection of wiring of a 2-lead wire switch is reversed with load short-circuited, the switch will be broken.
If the power line of a 3-lead wire switch is reversely wired ("+" replaces with "-"), the protective circuit will protect the switch. However, note that, if the power line is replaced with the output line by mistake, the switch will be broken.
- Do not wire the switch together with the power line and high voltage line.
Wire the switch by keeping away from the power line and high voltage line. Otherwise, the control circuit including the switch may malfunction due to noise.
- Avoid applying repetitive bending stress and tensile force to the lead wire.
When setting the switch in a moving part, sag the wiring so that repetitive stress and tensile force will not be applied to the lead wire.
Wiring that produces repetitive bending stress and tensile force cause the breaking of wire.
- Check for poor insulation.
Check lead wire connection, extension cable and terminal base for poor insulation. If poor insulation occurs, excess current will flow to the switch, sometimes resulting in a damage to the switch.
- Be sure to connect load before turning on power supply.
When a 2-lead wire switch is turned on without connecting load such as relay, PLC, etc., excess current will momentarily flow to the switch, resulting in a damage to the switch.
- Do not turn on the switch with load short-circuited.
If the switch is turned on with load short-circuited, excess current will flow to the switch, sometimes resulting in a damage to the switch.

WIRING

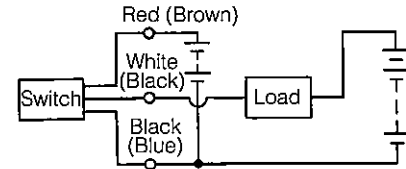
! WARNING

- It is possible to provide power supply to load and power supply to switches individually and also to use them in common.
When power supplies are individually provided, they should have the same voltage.

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

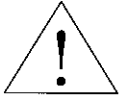


Where power supply to load and power supply to switch are not commonly used :



E1 and E2 should be the same voltage.

Bracketed () color is new color.



MAGNETIC PROXIMITY SWITCHES FOR CYLINDERS/COMMON INSTRUCTIONS ④

Be sure to read them before use.

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

OPERATING ENVIRONMENT

DANGER

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

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

WARNING

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

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

- Do not use the switch in a place where water is always poured on it.

Excepting some type of switch, these switches meet structural specifications IP67 or IP65 prescribed by IEC Standard (refer to specifications for each switch). However, do not use the switch in a place where water is always poured on it; otherwise causing insulation failure and malfunction.

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

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

When it is necessary to use the switch in such an environment, contact KURODA.

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

Using the switch in a place attended with an unusual temperature change will adversely affect the inside of the switch.

When it is necessary to use the switch in such an environment, contact KURODA.

- Do not use the switch in a place where an excessive shock occurs.
(Reed switch)

For a reed switch, if an excessive shock (over 30G) is applied to it during operation, the contact may malfunction according to circumstances.

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

- Do not use the switch in a place where surge is produced.
(Proximity switch)

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

OPERATING ENVIRONMENT

WARNING

- Be careful of adjacent magnetic material. Keep the switch away from magnetic material by more than 10 mm.

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

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

MAINTENANCE AND INSPECTION

WARNING

Perform the following maintenance and inspection periodically.

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

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

- Check the lead wire for damage.

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

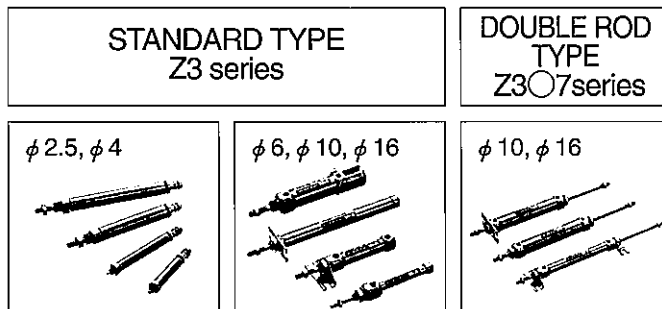
When a damage is found, change the switch and repair the lead wire immediately.

Specification	Model No.	Acting / Bore								
		Double acting			Single acting (Spring return/Spring extend)					
		φ 6	φ 10	φ 16	φ 2.5	φ 4	φ 6	φ 10	φ 16	
Standard type (Single rod)	Z3○	●	●	●	◎	◎	●	●	●	
Double rod type	Z3○7		●	●						
Custom made cylinder	Non-rotating piston rod type	Z3○U		●	●				●	●
	Adjustable stroke cylinder	Stroke adjustable on end with rod extended	Z3○A7		●	●				
		Stroke adjustable on end with rod retracted	Z3○A2		●	●				
	Dual stroke cylinder	Single rod type	Z3○D2		●	●				
		Double rod type	Z3○D7		●	●				
	Air-hydro cylinder	Z3○O2	●	●	●					
	High-temperature cylinder	Z3○X2	●	●	●					
	Built-in air cushion type	Z3○2-*B		●	●					
	Built-in speed controller type	Z3○P2		●	●					
	Built-in linear bearing type	Z3○B2		●	●					
For use in clean room type	CFZ3○	●	●	●			◎	◎	◎	

●: Available ◎: Available (Only single-acting spring return) Blank : Unavailable
 ○: C or G C : Without magnet G : With magnet (with switch available)
 *: Bore

AIR CYLINDER/Z3 series

Bore/ ϕ 2.5, ϕ 4, ϕ 6, ϕ 10, ϕ 16



ACTING

Double acting		<input type="radio"/>	<input type="radio"/>
Single acting (spring return)	<input type="radio"/>	<input type="radio"/>	
Single acting (spring extend)		<input type="radio"/>	

CUSHION

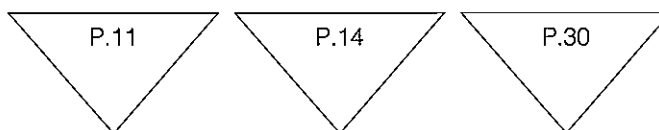
Damper cushion		<input type="radio"/> (Except ϕ 6)	<input type="radio"/>
No cushion	<input type="radio"/>		

MOUNTING

One side nose mounting	<input type="radio"/>	<input type="radio"/>	
Both side nose mounting		<input type="radio"/>	<input type="radio"/>
One side foot mounting		<input type="radio"/>	
Both side foot mounting		<input type="radio"/>	<input type="radio"/>
Flange mounting		<input type="radio"/>	<input type="radio"/>
Female clevis		<input type="radio"/> (Except ϕ 6)	

WITH SWITCH

M type reed switch		<input type="radio"/>	<input type="radio"/>
M type proximity switch		<input type="radio"/>	<input type="radio"/>



ACCESSORIES

Standard ●Nose nut ●Rod end nut ●Pin
 Option ●Rod end female clevis ●Rod end male clevis ●Rear hinge

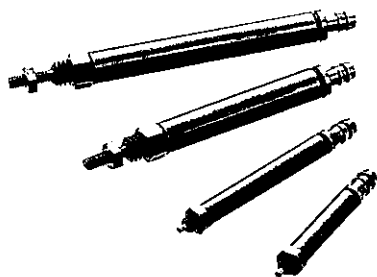
CUSTOM MADE CYLINDER

Non-rotating piston rod type (P.35) Dual stroke cylinder (P.36) Adjustable stroke cylinder (P.37)
 Air-hydro cylinder (P.38) High-temperature cylinder (P.38) With air cushion type (P.39)
 Built-in speed controller type (P.39) Built-in linear bearing type (P.40) For use in clean room type (P.40)

AIR CYLINDER/STANDARD TYPE (Single acting)

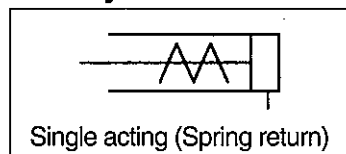
Z3 series

φ 2.5, φ 4



- **Compact and lightweight**
Rod cover and body are united to minimize overall length.
- **High corrosion resistance**
Improved corrosion resistance by non-electrolytic nickel plating.
- **Durability**
Stainless spring washer is provided to increase surface strength and enhance durability.

JIS symbol



ORDERING INSTRUCTIONS

Z3C	1	-	2.5	-	10
	①		②		③

① Acting

1	Single acting spring return
---	-----------------------------

② Bore (mm)

2.5	φ 2.5
4	φ 4

③ Stroke (mm)

Bore	Stroke
φ 2.5	5,10
φ 4	5,10,15,20

SPECIFICATIONS

Acting	Unit	Single acting spring return
Fluid		Non-lubricated/lubricated air
Pressure range	MPa	0.35~07
Temperature range	°C	0~60
Piston speed range	mm/s	50~300
Cushion		Not provided
Piston stroke allowance	mm	+1.0 -0.2
Mounting		Nose mounting (Standard)

(Note) When the pneumatic equipment is used at low temperature of less than

STANDARD STROKE (Unit : mm)

Bore	Standard stroke	Max. stroke
φ 2.5	5,10	10
φ 4	5,10,15,20	20

THEORETICAL OUTPUT (Out stroke) (Unit : N)

Bore (mm)	Operating pressure			
	0.4	0.5	0.6	0.7
φ 2.5	1.9	2.4	2.9	3.4
φ 4	5.0	6.2	7.5	8.7

(Note) Effective output = Theoretical output × 0.85
To calculate output of a single acting cylinder, appeared on above table, subtract the spring tensile strength.

SPRING TENSION (Unit : N)

Bore(mm)	At stroke 0	At max. stroke
φ 2.5	0.65	1.2
φ 4	1.5	2.9

ACCESSORIES

	Name	Nose mounting (Standard)
Standard	Nose nut	○
	Rod end nut	○ (Not provided for φ 2.5)

APPLICABLE TUBE

Type of tube	Material	Size(mm)		Tube model No.
		O.D.	I.D.	
Millimeter size	Nylon	4	2.5	TN-4

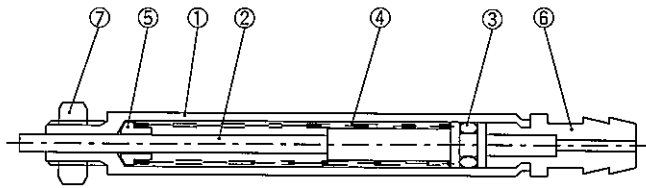
CYLINDER MASS (Unit : g)

Bore (mm)	Stroke(mm)			
	5	10	15	20
φ 2.5	1.5	1.9	—	—
φ 4	3.4	4.4	5.2	6.1

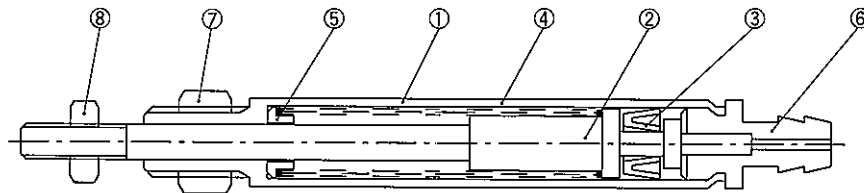
AIR CYLINDER/STANDARD TYPE Z3 series

CONSTRUCTIONS

Z3C1-2.5-○



Z3C1-4-○



PARTS LIST (MAIN PARTS)

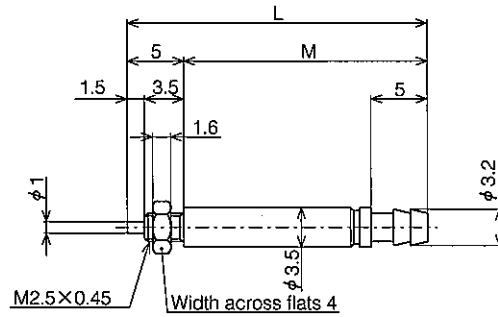
No.	Description	Material
①	Cylinder tube	Copper alloy
②	Piston rod	Stainless steel
③	Piston packing	NBR
④	Return spring	Hard steel
⑤	Spring retainer	Stainless steel
⑥	Head cover	Copper alloy
⑦	Nose nut	Copper alloy
⑧	Rod end nut	Copper alloy

AIR CYLINDER/STANDARD TYPE Z3 series

DIMENSIONS

Z3C1-2.5-○

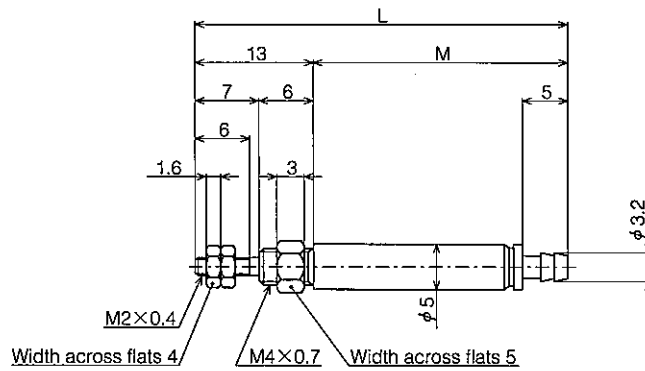
(Unit : mm)



	5st	10st
L	26.5	35.5
M	21.5	30.5

Z3C1-4-○

(Unit : mm)



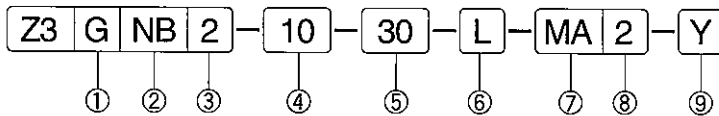
	5st	10st	15st	20st
L	37	46	55	64
M	24	33	42	51

AIR CYLINDER/STANDARD TYPE

Z3 series

φ6, φ10, φ16

ORDERING INSTRUCTIONS



①Magnet

G	Built-in magnet	With switch available
C	No magnet	With switch unavailable

	Bore	Built-in magnet/G	No magnet/C
Double acting	φ 6	○	◎
	φ 10	○	◎
	φ 16	○	◎
Single acting	φ 6	○	◎
	φ 10	○	◎
	φ 16	○	◎

○: Standard ◎: Available on request

②Port position

No mark	At right angles to piston axis (Standard)
NB	In direction of piston axis

(Note) NB : One side nose mounting, one side foot mounting and flange mounting

③Acting

2	Double acting single rod
1	Single acting single rod (Spring return)
0	Single acting single rod (Spring extend)

④Bore (mm)

6	φ 6
10	φ 10
16	φ 16

⑤Stroke (mm)

Bore	Stroke
φ 6	15,30,45,60,
φ 10	
φ 16	

*Strokes other than standard are available upon order. In this case, please specify a stroke at a multiple of 5mm. (Minimum stroke : 5 mm)

*A specific stroke that cannot be divided by 5 is also available upon order. In this case, a cylinder whose stroke is longer than your specified stroke but is a multiple of 5 mm is used.

A spacer is put into such a cylinder to meet your specified stroke.

MODEL No. OF MOUNTING

Bore(mm)	φ 6	φ 10	φ 16
Foot mounting	Z36-L	Z310-L	Z316-L
Flange mounting	Z36-A	Z310-A	Z316-A
Rear hinge	—	Z310-BY	Z316-BY

⑥Mounting

N	One side nose mounting
NW	Both side nose mounting (Except φ 6)
L	One side foot mounting
LW	Both side foot mounting (Except φ 6)
A	Flange mounting
W	Female clevis (Except φ 6)

(Note) When using foot mounting type cylinders φ 10 and φ 16 at a stroke of more than 60 mm, use both-side foot mounting type cylinders.

⑦Type of switch

No mark	No switch		
MA	MA-1	(AC100V,DC24V)	M type reed switch
MB	MD-1	(DC24V)	
MC	MD-3	(DC5,6V)	
MD	MR	(AC, DC5~100V)	
ME	MA-2L	(AC100V/110V)	
MF	MA-2H	(AC200V/220V)	M type proximity switch
MG	MT-3	(DC5~30V)	
MH	MT-3U	(DC5~30V)	
MJ	MT-2	(DC24V)	
MK	MT-2U	(DC24V)	

⑧Number of switch

No mark	No switch
2	With 2 units
1	With 1 unit

⑨Rod end hardware

No mark	With rod end nut
Y	With rod end female clevis
I	With rod end male clevis

MODEL No. OF SWITCH MOUNTING BRACKET

Bore (mm)	M type switch mounting bracket
φ 6	Z36-MJ
φ 10	Z310-MJ
φ 16	Z316-MJ

AIR CYLINDER/STANDARD TYPE Z3 series

SPECIFICATIONS

Acting		Unit	Double acting	Single acting spring return	Single acting spring extend
Fluid			Non-lubricated/lubricated air		
Pressure range	φ 6	MPa	0.12~0.7	0.3~0.7	0.35~0.7
	φ 10	MPa	0.08~0.7	0.15~0.7	
	φ 16	MPa	0.06~0.7	0.15~0.7	
Temperature range		°C	0~70		
Piston speed range		mm/s	50~750		
Cushion			Built-in damper (φ 6 is no damper)		
Mounting			One side nose mounting, Both side nose mounting, One side foot mounting, Both side foot mounting, Flange mounting, Female clevis (Except φ 6)		

(Note) When the pneumatic equipment is used at low temperature of less than 5°C, it may be frozen. Use it in dry air passed through an air dryer.

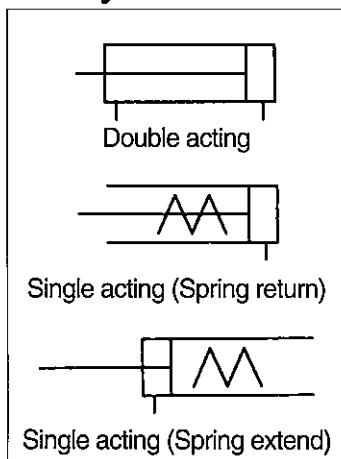
STANDARD STROKE

(Unit : mm)

Acting	Bore	Unit	Max. stroke	Stroke length allowance
Double acting	φ 6	15,30,45,60	100	± 1.2 -0.2
	φ 10		150	± 1.8 -0.2
	φ 16		200	± 1.5 -0.2
Single acting spring return	φ 6	15,30,45,60	75	± 1.2 -0.2
	φ 10		105	± 1.5 -0.2
	φ 16		120	± 1.2 -0.2
Single acting spring extend	φ 6	15,30	30	± 1.5 -0.2
	φ 10			
	φ 16			

- Lighter body weight
- Improved abrasion resistance
- Reduced clearance of rod bearing and clevis bearing
- High speed driving (φ 10, φ 16)
- Reduced overall length of cylinder with switch

JIS symbol



ACCESSORIES

Name		Nose mounting	Foot mounting	Flange mounting	Female clevis
Standard	Nose nut	○	○	○	—
	Rod end nut	○	○	○	○
	Clevis pin	—	—	—	○
Option	Rod end female clevis (With pin)	○	○	○	○
	Rod end male clevis	○	○	○	○
	Rear hinge	—	—	—	○

THEORETICAL OUTPUT (OUT STROKE)

(Unit : N)

Name	Operating pressure					
	0.2	0.3	0.4	0.5	0.6	0.7
φ 6	5.7	8.4	11.2	14.0	16.8	19.6
φ 10	15.7	23.6	31.4	39.3	47.1	55.0
φ 16	40.2	60.3	80.4	100.5	120.6	140.7

(Note) Effective output = Theoretical output × 0.85

The output of single acting cylinder is calculated by subtracting the spring tensile strength.

SPRING TENSION

(Unit : N)

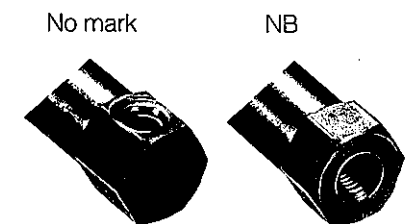
Bore (mm)	At stroke 0				At max. stroke
	15mm stroke	30mm stroke	45mm stroke	60mm stroke	
φ 6	2	2	2.4	2	3.5
φ 10	3.7	3.7	4.2	3.7	5.9
φ 16	6.1	6.1	7.0	6.1	9.8

HEAD COVER PORT POSITION

In case of nose mounting, the head cover port position differs depending on the type.

No mark — At right angles to piston axis (Standard)

NB — In direction of piston axis



AIR CYLINDER/STANDARD TYPE Z3 series

CYLINDER MASS/Double acting (Unit : g)

Bore (mm)	Mounting	Stroke(mm)			
		15	30	45	60
φ 6	Nose mounting	15	16	18	20
	Female clevis	23	26	30	33
φ 10	Nose mounting	23	26	30	33
	Female clevis	27	31	34	38
φ 16	Nose mounting	42	48	53	58
	Female clevis	54	59	64	70

CYLINDER MASS/Single acting (Unit : g)

Bore (mm)	Mounting	Stroke(mm)							
		15		30		45		60	
		Spring return	Spring extend	Spring return	Spring extend	Spring return	Spring extend	Spring return	Spring extend
φ 6	Nose mounting	11	13	15	17	18	—	20	—
	Female clevis	21	24	26	29	34	—	37	—
φ 10	Nose mounting	21	24	26	29	34	—	37	—
	Female clevis	23	29	31	33	36	—	39	—
φ 16	Nose mounting	43	45	51	54	65	—	70	—
	Female clevis	49	52	58	61	71	—	76	—

MODEL WITH SWITCH/For detailed specifications of switches, refer to page 41 to 44.

M TYPE REED SWITCH

Lead wire type



Model No.	Rated voltage (V)	Rated current range(mA)	Pilot lamp (Lights up at ON)	Application
MA-1	AC100	5~45	○	Relay PLC
	DC24	5~45		
MD-1	DC24	25~65	○	Relay
MD-3	DC5,6	Max. 50 (Inductive load) Max. 300 (Resistive load)	○	IC circuit
MR	AC DC 5~100	Max. 50 (Inductive load) Max. 300 (Resistive load)	Not provided	Relay PLC
MA-2L	AC100/110	5~150	○	Relay
MA-2H	AC200/220	5~150	○	Relay

(Note) The MA-2L is the same as the MA-1 except that it is provided with the surge suppressor SS-2L.

The MA-2H is the same as the MA-1 except that it is provided with the surge suppressor SS-2H.

M TYPE PROXIMITY SWITCH

Lead wire type



Model No.	Rated voltage (V)	Rated current range(mA)	Pilot lamp (Lights up at ON)	Application
MT-2 MT-2U	DC24 (DC10~30)	5~100	○	Relay PLC
MT-3 MT-3U	DC5~30	5~200	○	Relay PLC IC circuit

MINIMUM STROKE WITH M TYPE SWITCH (Unit : mm)

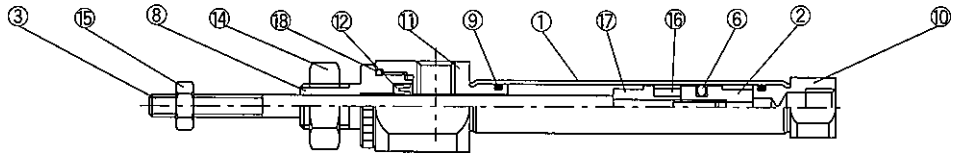
Bore	Number of switch		
	With 2 units (On the same surface)	With 2 units (On different surface)	With 1 unit
φ 6	45	15	15
φ 10			
φ 16	40		

AIR CYLINDER/STANDARD TYPE Z3 series

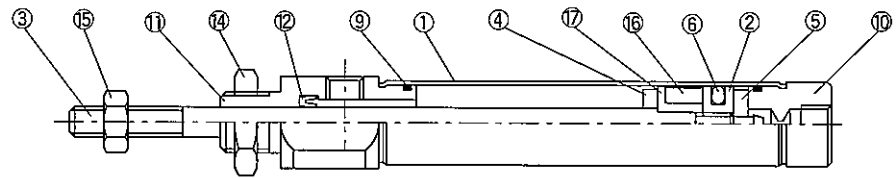
CONSTRUCTIONS AND MAIN PARTS

Double acting

φ6

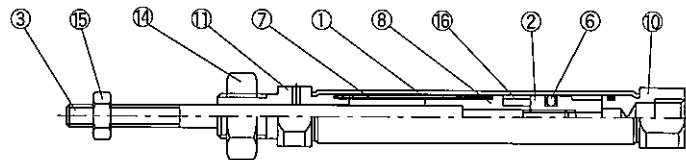


φ10, φ16

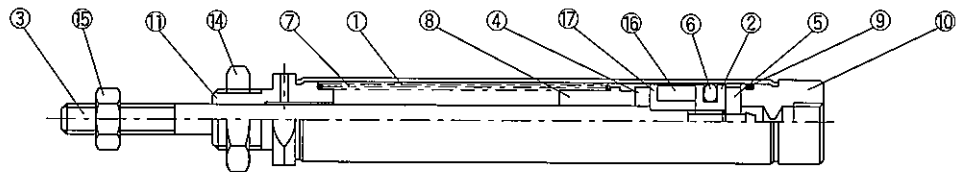


Single acting (Spring return)

φ6

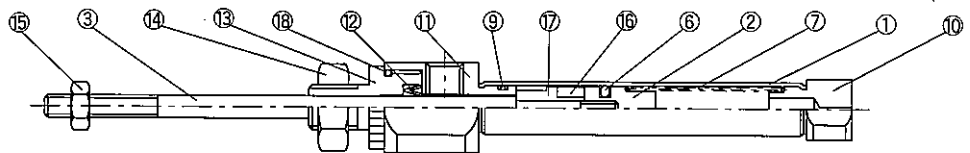


φ10, φ16

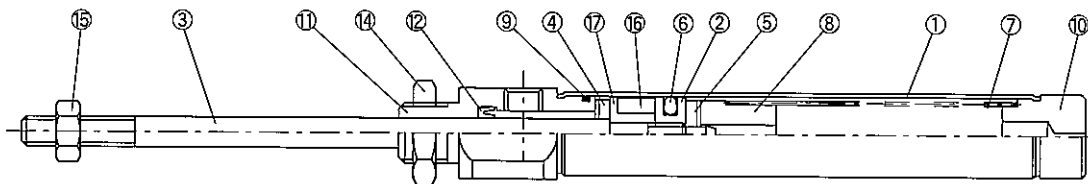


Single acting (Spring extend)

φ6



φ10, φ16



(Note) Cannot be disassembled.

No.	Description	Material	No.	Description	Material
①	Cylinder tube	Stainless steel	⑩	Head cover	Aluminum alloy
②	Piston	Aluminum alloy	⑪	Rod cover	Aluminum alloy
③	Piston rod	Stainless steel	⑫	Rod packing	NBR
④	Damper A	Urethane rubber	⑬	Bushing	Aluminum alloy
⑤	Damper B	Urethane rubber	⑭	Nose nut	Soft steel
⑥	Piston packing	NBR	⑮	Rod end nut	Soft steel
⑦	Return spring	Hard steel	⑯	Magnet	Resin
⑧	Collar A	Aluminum alloy	⑰	Magnet holder	Aluminum alloy
⑨	O-ring	NBR	⑱	O-ring	NBR

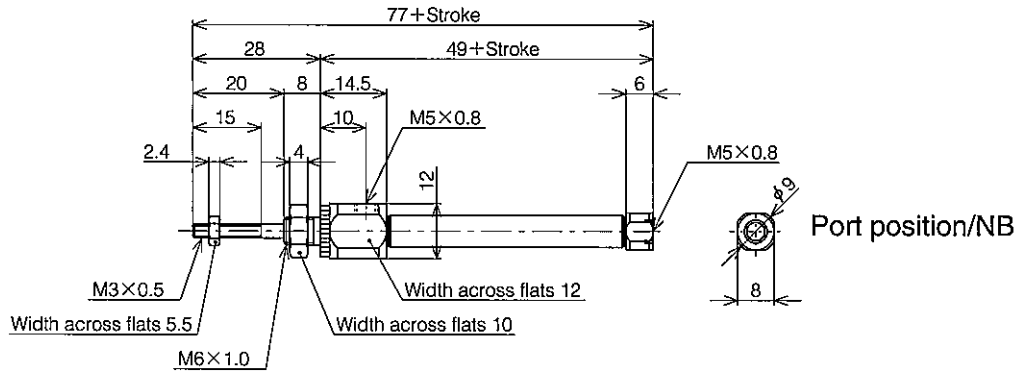
AIR CYLINDER/STANDARD TYPE Z3 series

DIMENSIONS

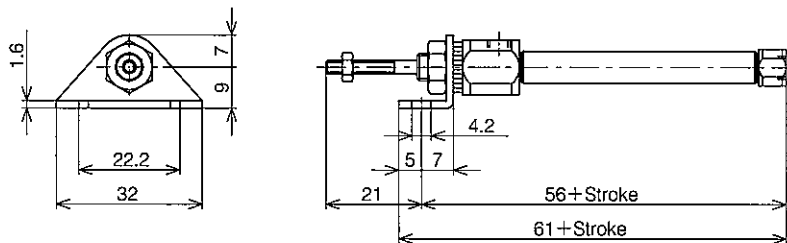
Double acting $\phi 6/Z3\text{O}2-6$

(Unit : mm)

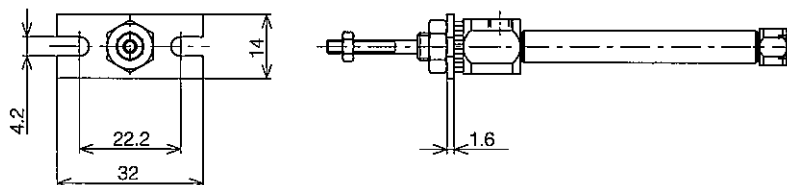
One side nose mounting/N



One side foot mounting/L



Flange mounting/A



* Strokes other than standard are available upon order. In this case, please specify a stroke at a multiple of 5 mm. (Minimum stroke : 5 mm)
 * A specific stroke that cannot be divided by 5 is also available upon order. In this case, a cylinder whose stroke is longer than your specified stroke but is a multiple of 5 mm is used. A spacer is put into such a cylinder to meet your specified stroke. The cylinder so manufactured has the same size and configuration as those of the original cylinder whose stroke is a multiple of 5 mm.

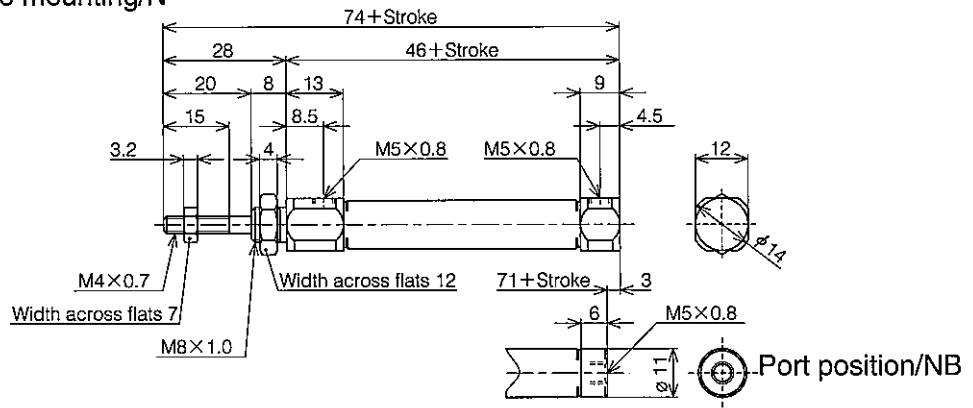
AIR CYLINDER/STANDARD TYPE Z3 series

DIMENSIONS

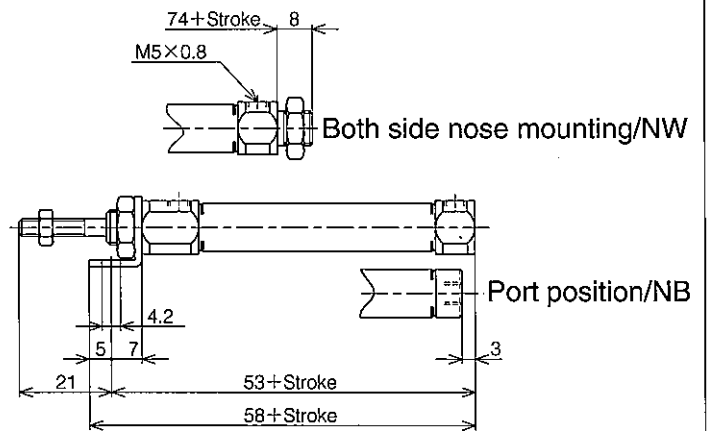
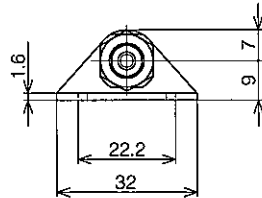
Double acting $\phi 10/Z3\bigcirc 2-10$

(Unit : mm)

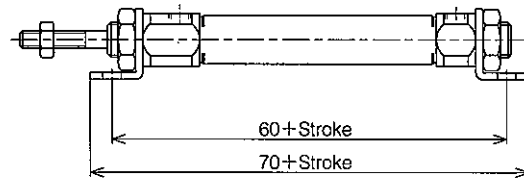
One side nose mounting/N



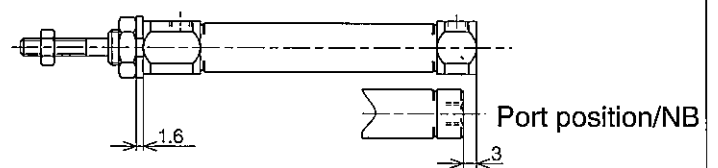
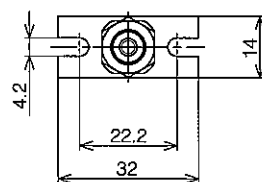
One side foot mounting/L



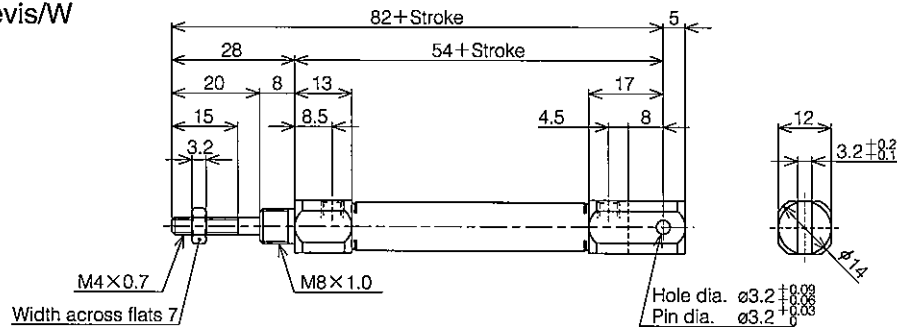
Both side foot mounting/LW



Flange mounting/A



Female clevis/W



* Strokes other than standard are available upon order. In this case, please specify a stroke at a multiple of 5 mm. (Minimum stroke : 5 mm)
 * A specific stroke that cannot be divided by 5 is also available upon order. In this case, a cylinder whose stroke is longer than your specified stroke but is a multiple of 5 mm is used. A spacer is put into such a cylinder to meet your specified stroke. The cylinder so manufactured has the same size and configuration as those of the original cylinder whose stroke is a multiple of 5 mm.

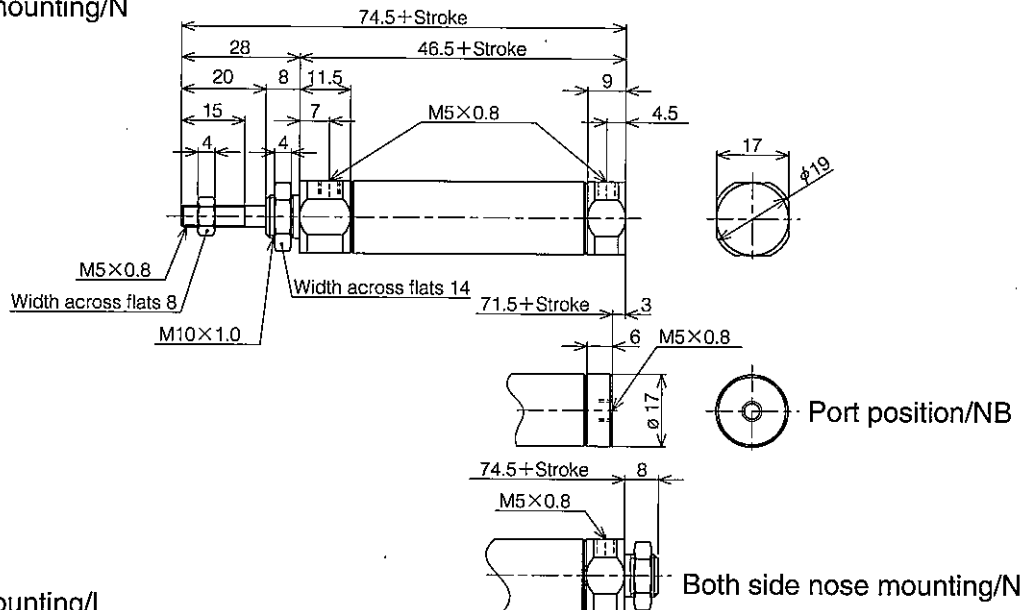
AIR CYLINDER/STANDARD TYPE Z3 series

DIMENSIONS

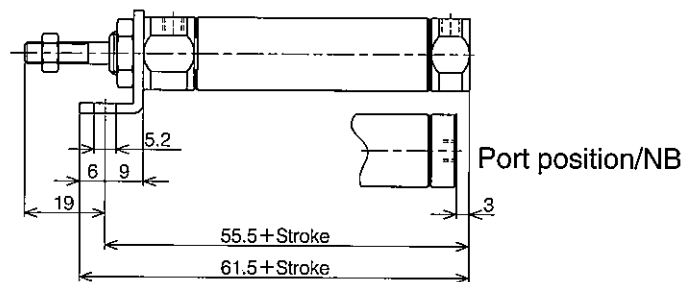
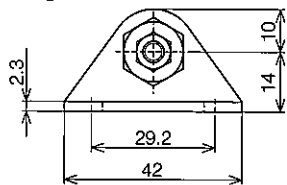
Double acting $\phi 16/Z3\bigcirc 2-16$

(Unit : mm)

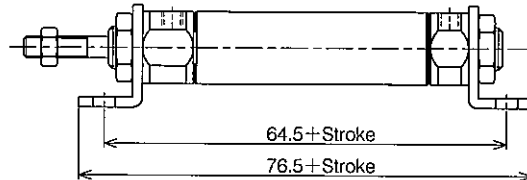
One side nose mounting/N



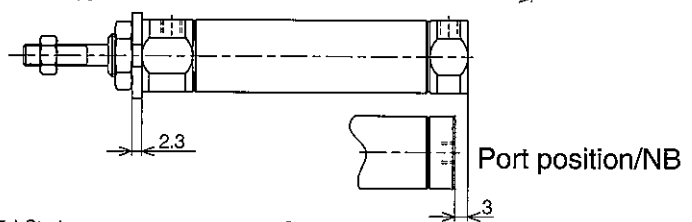
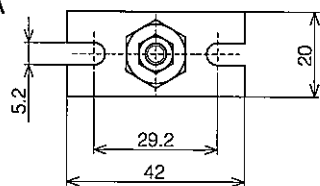
One side foot mounting/L



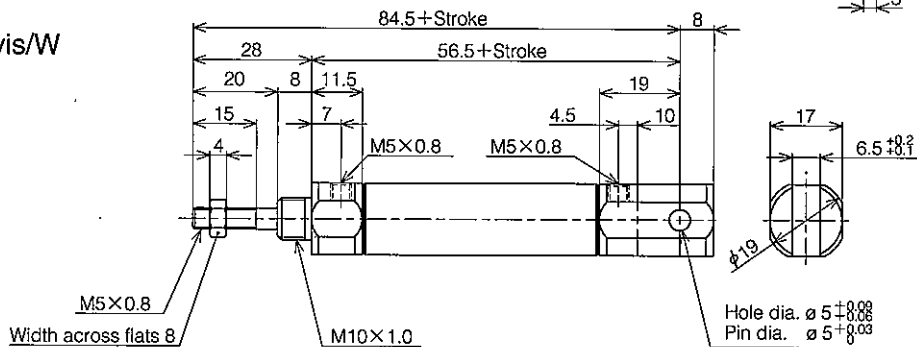
Both side foot mounting/LW



Flange mounting/A



Female clevis/W



* Strokes other than standard are available upon order. In this case, please specify a stroke at a multiple of 5 mm. (Minimum stroke : 5 mm)

* A specific stroke that cannot be divided by 5 is also available upon order. In this case, a cylinder whose stroke is longer than your specified stroke but is a multiple of 5 mm is used. A spacer is put into such a cylinder to meet your specified stroke. The cylinder so manufactured has the same size and configuration as those of the original cylinder whose stroke is a multiple of 5 mm.

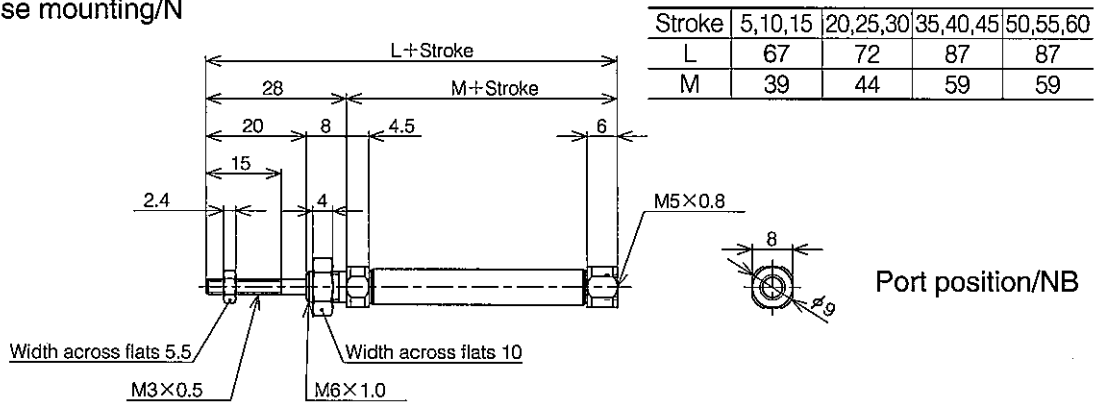
AIR CYLINDER/STANDARD TYPE Z3 series

DIMENSIONS

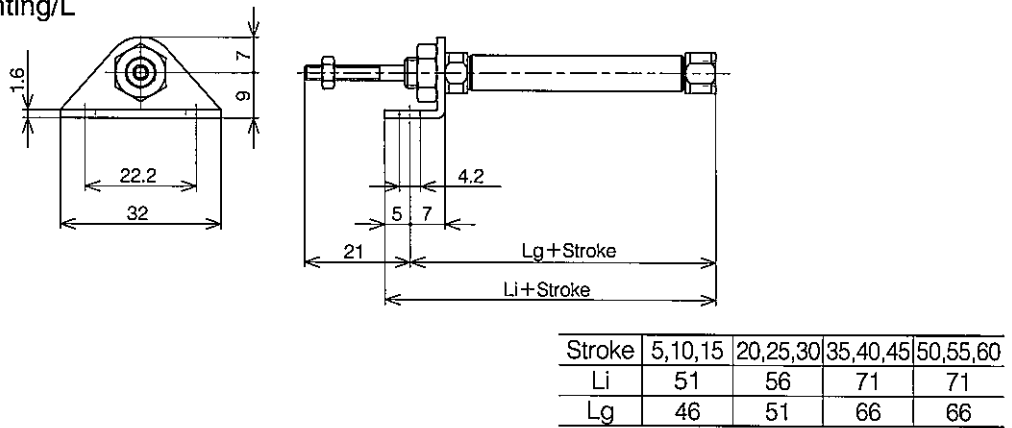
Single acting (Spring return) $\phi 6/Z3\bigcirc 1-6$

(Unit : mm)

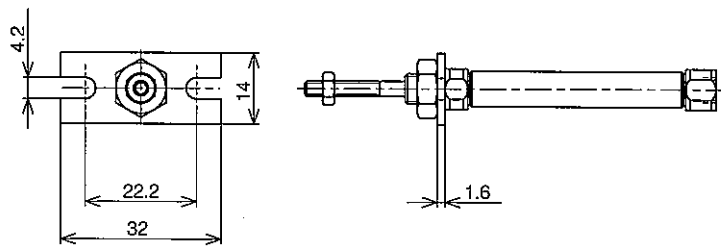
One side nose mounting/N



One side foot mounting/L



Flange mounting/A



- * Strokes other than standard are available upon order. In this case, please specify a stroke at a multiple of 5 mm. (Minimum stroke : 5 mm)
- * A specific stroke that cannot be divided by 5 is also available upon order. In this case, a cylinder whose stroke is longer than your specified stroke but is a multiple of 5 mm is used. A spacer is put into such a cylinder to meet your specified stroke. The cylinder so manufactured has the same size and configuration as those of the original cylinder whose stroke is a multiple of 5 mm.

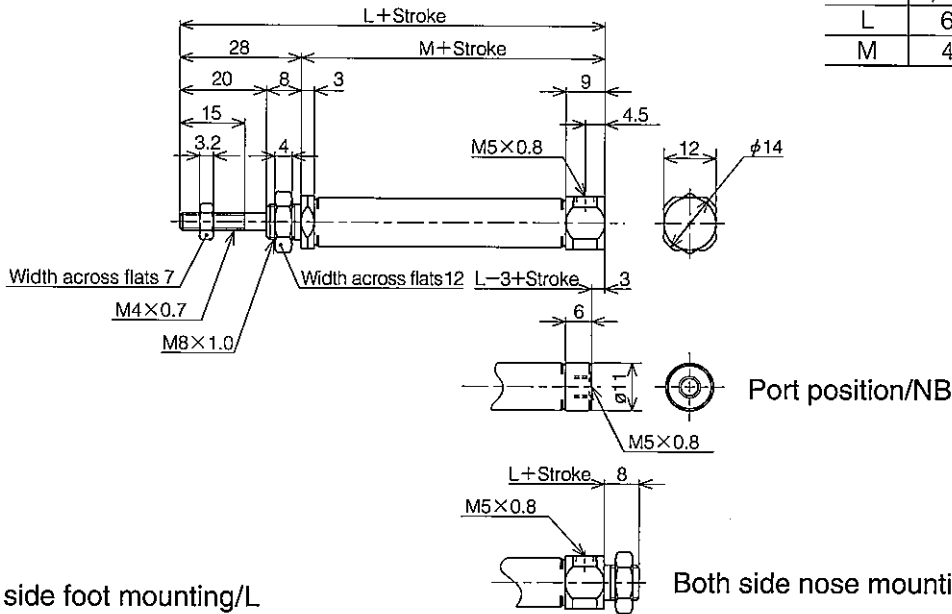
AIR CYLINDER/STANDARD TYPE Z3 series

DIMENSIONS

Single acting (Spring return) $\phi 10/Z3\bigcirc 1-10$

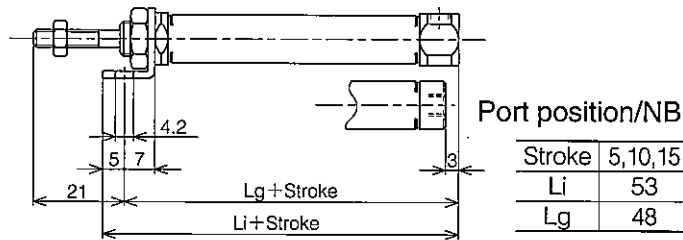
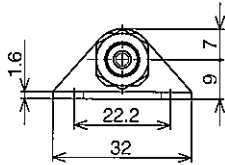
(Unit : mm)

One side nose mounting/N



Stroke	5,10,15	20,25,30	35,40,45	50,55,60
L	69	74	84	84
M	41	46	56	56

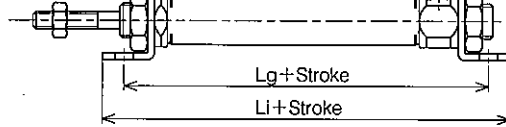
One side foot mounting/L



Port position/NB

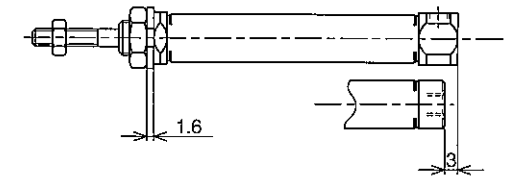
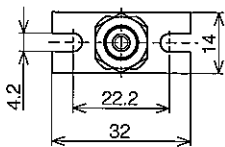
Stroke	5,10,15	20,25,30	35,40,45	50,55,60
Li	53	58	68	68
Lg	48	53	63	63

Both side foot mounting/LW



Stroke	5,10,15	20,25,30	35,40,45	50,55,60
Li	65	70	80	80
Lg	55	60	70	70

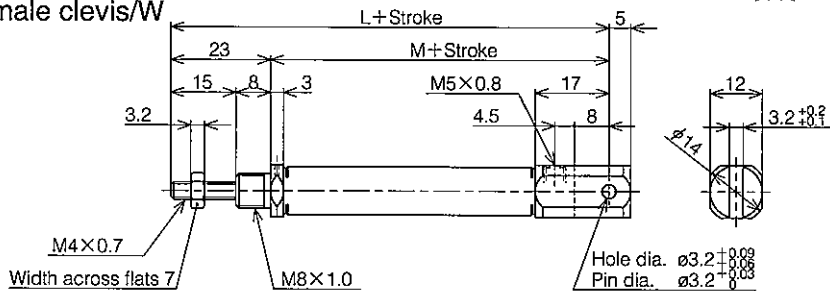
Flange mounting/A



Port position/NB

Stroke	5,10,15	20,25,30	35,40,45	50,55,60
L	72	77	87	87
M	49	54	64	64

Female clevis/W



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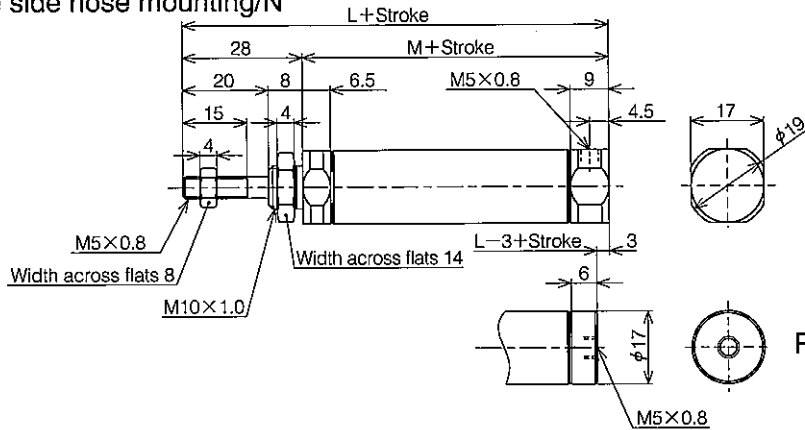
AIR CYLINDER/STANDARD TYPE Z3 series

DIMENSIONS

Single acting (Spring return) $\phi 16/Z3\bigcirc 1-16$

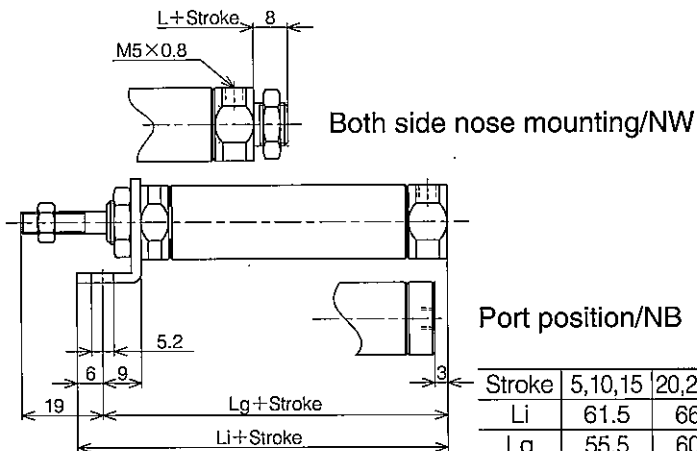
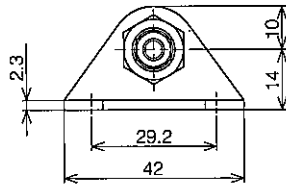
(Unit : mm)

One side nose mounting/N



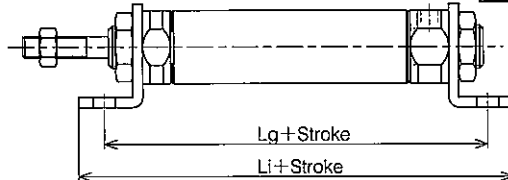
Stroke	5,10,15	20,25,30	35,40,45	50,55,60
L	74.5	79.5	89.5	89.5
M	46.5	51.5	61.5	61.5

One side foot mounting/L

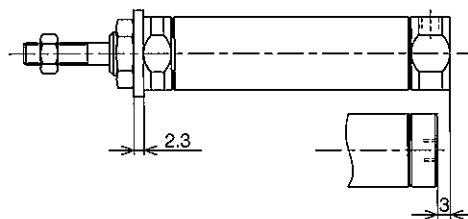
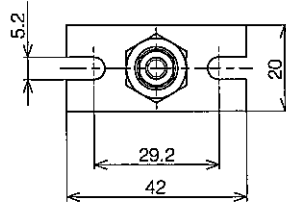


Stroke	5,10,15	20,25,30	35,40,45	50,55,60
Li	61.5	66.5	76.5	76.5
Lg	55.5	60.5	70.5	70.5

Both side foot mounting/LW

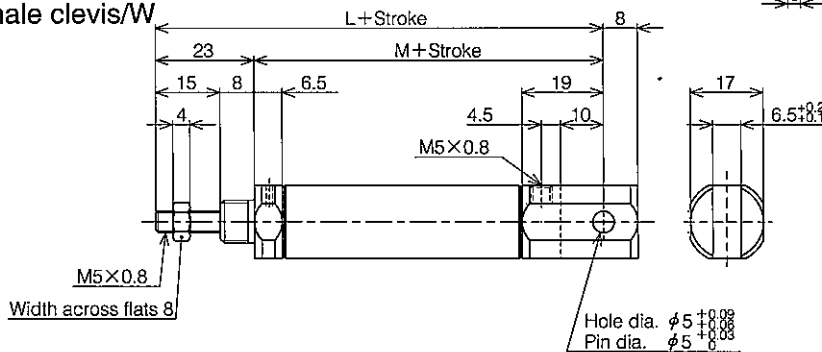


Flange mounting/A



Stroke	5,10,15	20,25,30	35,40,45	50,55,60
Li	76.5	81.5	91.5	91.5
Lg	64.5	69.5	79.5	79.5

Female clevis/W



Stroke	5,10,15	20,25,30	35,40,45	50,55,60
L	79.5	84.5	94.5	94.5
M	64.5	61.5	71.5	71.5

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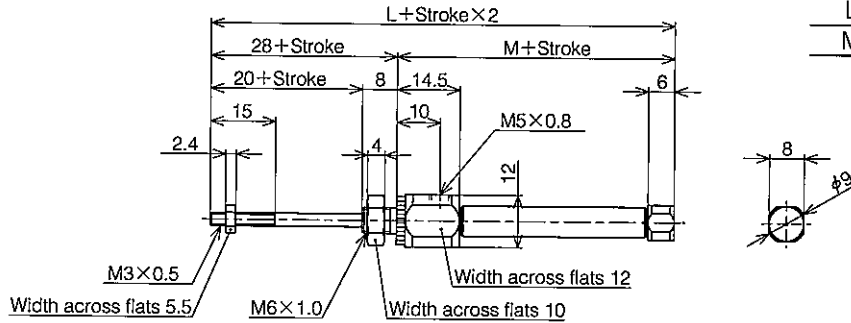
AIR CYLINDER/STANDARD TYPE Z3 series

DIMENSIONS

Single acting (Spring extend) $\phi 6/Z3\bigcirc\bigcirc-6$

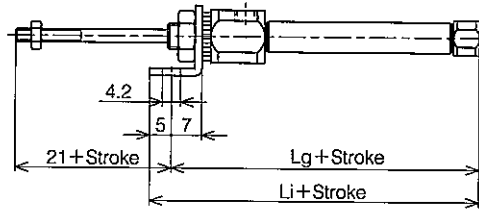
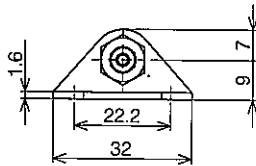
(Unit : mm)

One side nose mounting/N



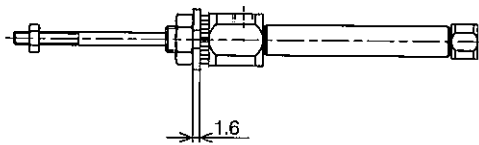
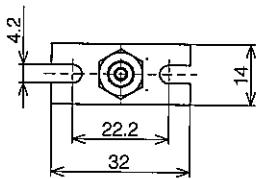
Stroke	5,10,15	20,25,30
L	77	82
M	49	54

One side foot mounting/L



Stroke	5,10,15	20,25,30
Li	61	66
Lg	56	61

Flange mounting/A



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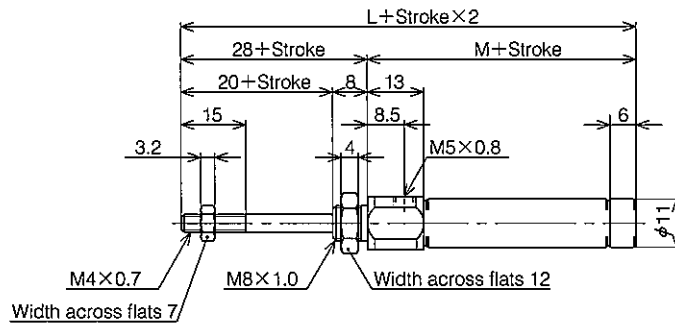
AIR CYLINDER/STANDARD TYPE Z3 series

DIMENSIONS

Single acting (Spring extend) $\phi 10/Z3\bigcirc 0-10$

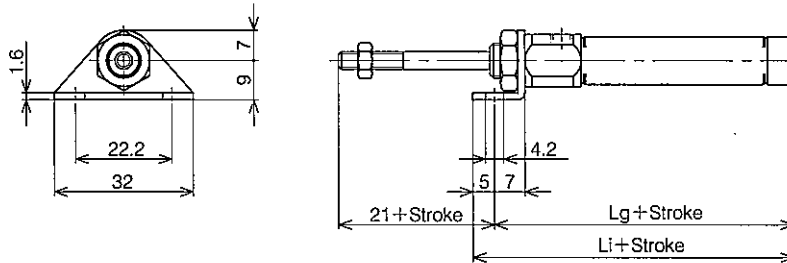
(Unit : mm)

One side nose mounting/N



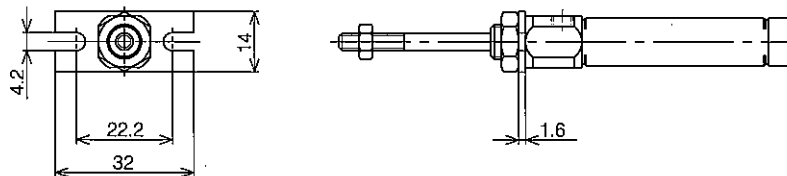
Stroke	5,10,15	20,25,30
L	76	81
M	48	53

One side foot mounting/L

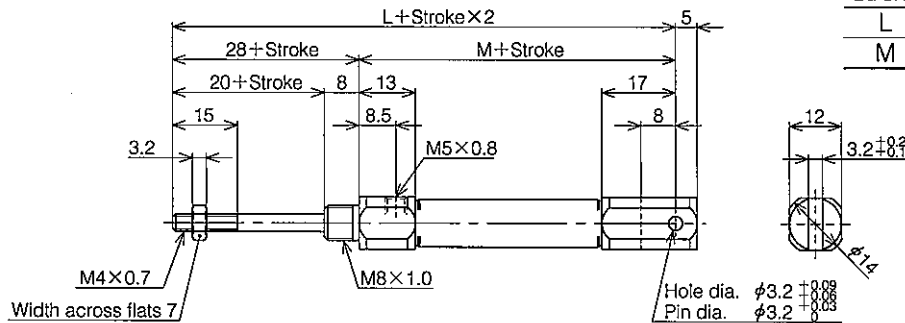


Stroke	5,10,15	20,25,30
Li	60	65
Lg	55	60

Flange mounting/A



Female clevis/W



Stroke	5,10,15	20,25,30
L	87	92
M	59	64

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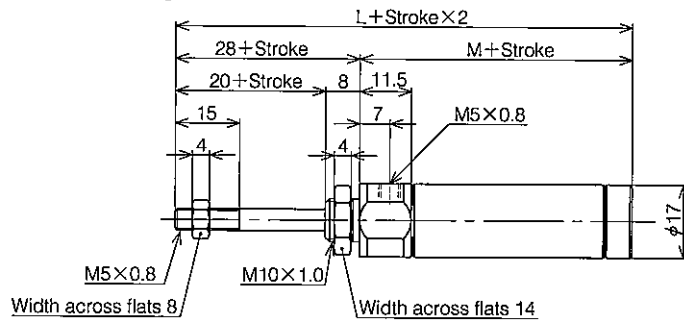
AIR CYLINDER/STANDARD TYPE Z3 series

DIMENSIONS

Single acting (Spring extend) $\phi 16/Z3\bigcirc 0-16$

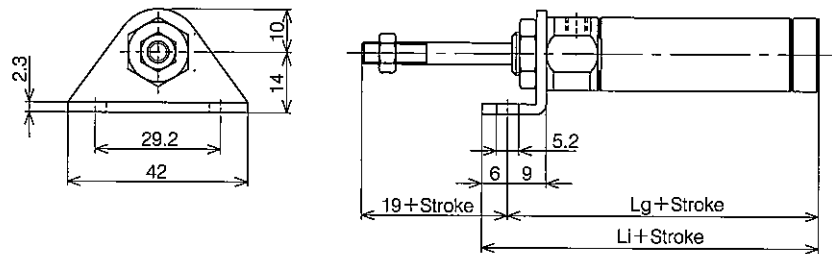
(Unit : mm)

One side nose mounting/N

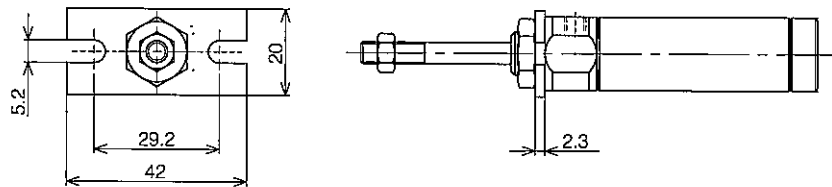


Stroke	5,10,15	20,25,30
L	76.5	81.5
M	48.5	53.5

One side foot mounting/L

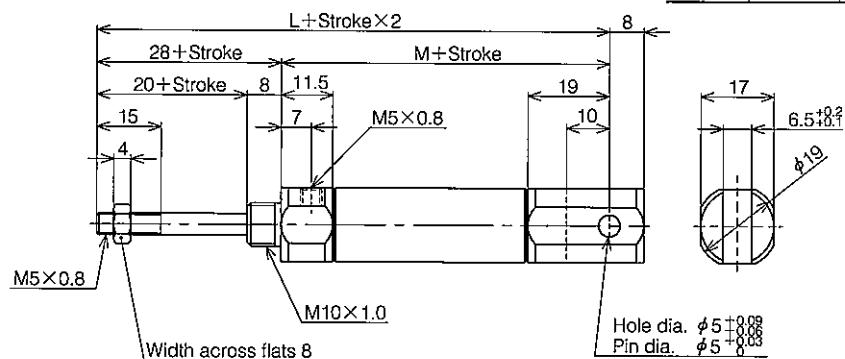


Flange mounting/A



Stroke	5,10,15	20,25,30
Li	63.5	68.5
Lg	57.5	62.5

Female clevis/W



Stroke	5,10,15	20,25,30
L	89.5	94.5
M	61.5	66.5

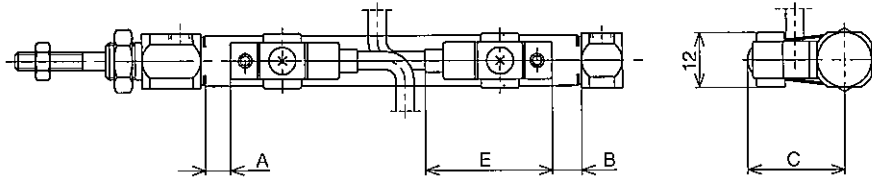
* Strokes other than standard are available upon order. In this case, please specify a stroke at a multiple of 5 mm. (Minimum stroke : 5 mm)

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AIR CYLINDER/STANDARD TYPE Z3 series

SWITCH SET POSITION

(Unit : mm)



Acting	Bore		With M type reed switch		With M type proximity switch		C
			A	B	A	B	
Double acting	ϕ 6		3	7	6	10	21
	ϕ 10		2	5	4	7	23
	ϕ 16		3	6	5	8	26
Single acting (Spring return)	ϕ 6	15st	8	7	11	10	21
		30st	13		16		
		45st	28		31		
		65st	28		31		
	ϕ 10	15st	7	5	9	7	23
		30st	12		14		
		45st	22		24		
		65st	22		24		
	ϕ 16	15st	8	6	10	8	26
		30st	13		15		
		45st	23		25		
		65st	23		25		
Single acting (Spring extend)	ϕ 6	15st	3	7	6	10	21
		30st		13		15	
	ϕ 10	15st	2	10	4	12	23
		30st		15		17	
	ϕ 16	15st	3	11	5	13	26
		30st		16		18	

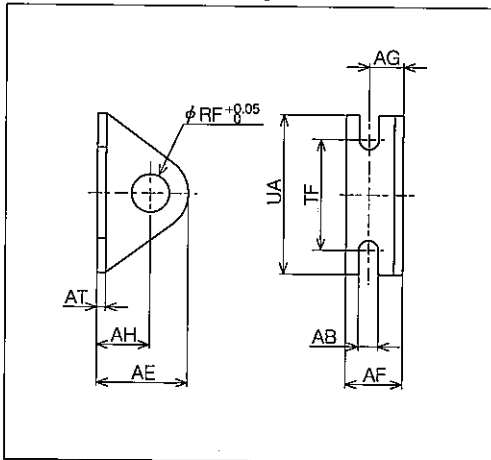
Switch	E
M type reed switch	28
M type proximity switch	26.5(24)

(Note) The parenthesized dimension is of the MT-※U type

AIR CYLINDER/STANDARD TYPE Z3 series

ACCESSORIES

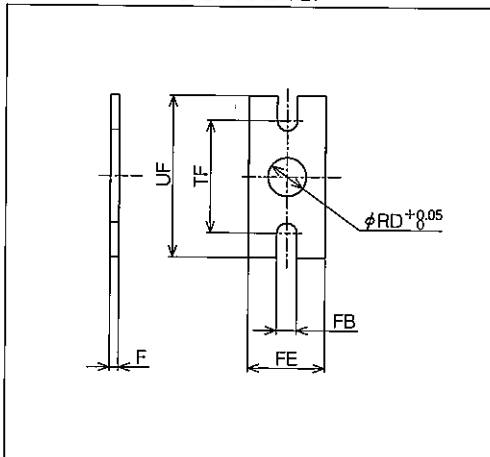
FOOT MOUNTING



(Unit : mm)

Model No.	Applicable bore	AB	AE	AF	AG	AH	AT	TF	RF	UA
Z36-L	φ 6	4.2	16	12	7	9	1.6	22.2	φ 6	32
Z310-L	φ 10	4.2	16	12	7	9	1.6	22.2	φ 8	32
Z316-L	φ 16	5.2	24	15	9	14	2.3	29.2	φ 10	42

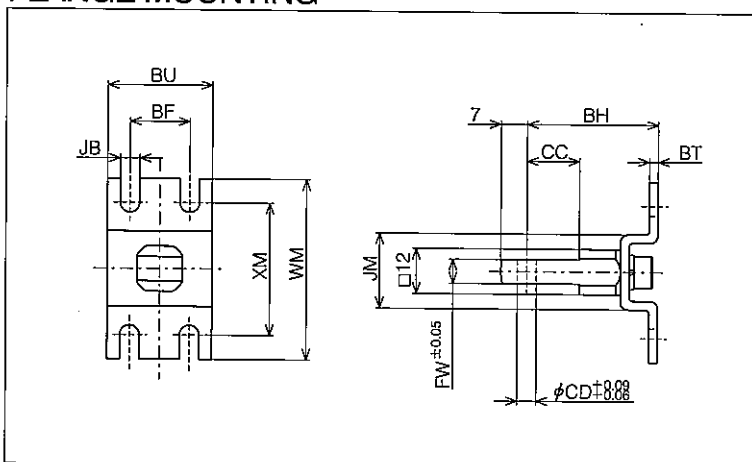
FLANGE MOUNTING



(Unit : mm)

Model No.	Applicable bore	FE	F	FB	RD	TF	UF
Z36-A	φ 6	14	1.6	4.2	φ 6	22.2	32
Z310-A	φ 10	14	1.6	4.2	φ 8	22.2	32
Z316-A	φ 16	20	2.3	5.2	φ 10	29.2	42

FLANGE MOUNTING

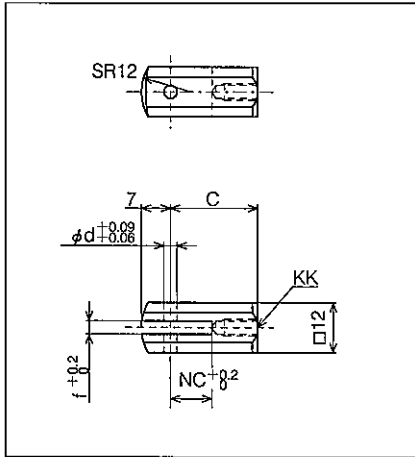


(Unit : mm)

Model No.	Applicable bore	BF	BH	BT	BU	CC	CD	FW	JB	JM	WM	XM
Z310-BY	φ 10	12	29	2	22	9	φ 3.3	3.1	4.2	18	40	30.2
Z316-BY	φ 16	16	35	2.3	28	14	φ 5.1	6.4	5.2	20	48	35.2

AIR CYLINDER/STANDARD TYPE Z3 series

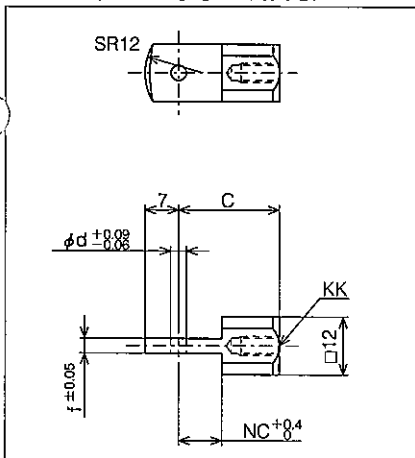
FOOT MOUNTING



(Unit : mm)

Model No.	Applicable bore	C	NC	d	f	KK
Z310-Y	φ 10	21	10	3.2	3.2	M4X0.7 depth8
Z316-Y	φ 16	21	10	5	6.5	M5X0.8 depth11

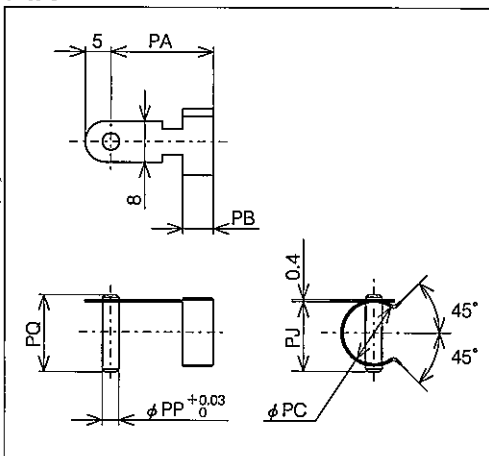
FLANGE MOUNTING



(Unit : mm)

Model No.	Applicable bore	C	NC	d	f	KK
Z310-I	φ 10	21	9	3.2	3.1	M4X0.7 depth8
Z316-I	φ 16	25	14	5	6.4	M5X0.8 depth11

PIN



(Unit : mm)

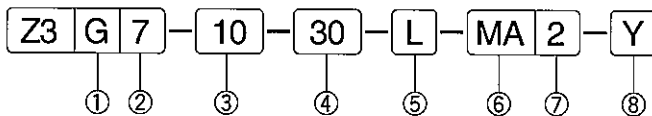
Model No.	Applicable bore	PA	PB	PC	PJ	PP	PQ	Applicable hardware
Z310-YP	φ 10	17	5	14	13.5	3.2	15.5	Rod end female clevis
								Female clevis
Z316-YP	φ 16	17	6	14	19	5	21	Rod end female clevis
Z316-CP		19		19				Female clevis

AIR CYLINDER/DOUBLE ROD TYPE

Z3○7 series

φ10, φ16

ORDERING INSTRUCTIONS



①Magnet

G	Built-in magnet	With switch available
C	No magnet	With switch unavailable

	Bore	Built-in magnet/G	No magnet/C
Double acting	φ10	○	◎
	φ16	○	◎

○: Standard ◎: Available on request

②Acting

7	Double acting double rod
---	--------------------------

③Bore (mm)

10	φ10
16	φ16

④Stroke (mm)

Bore	Stroke
φ10	15,30,45,60,
φ16	

⑤Mounting

NW	Both side nose mounting
LW	Both side foot mounting
A	Flange mounting

⑥Type of switch

No mark	No switch		
MA	MA-1	(AC100V,DC24V)	M type reed switch
MB	MD-1	(DC24V)	
MC	MD-3	(DC5,6V)	
MD	MR	(AC, DC5~100V)	
ME	MA-2L	(AC100V/110V)	M type proximity switch
MF	MA-2H	(AC200V/220V)	
MG	MT-3	(DC5~30V)	
MH	MT-3U	(DC5~30V)	
MJ	MT-2	(DC24V)	
MK	MT-2U	(DC24V)	

⑦Number of switch

No mark	No switch
2	With 2 units
1	With 1 unit

⑧Rod end hardware

No mark	With rod end nut
Y	With rod end female clevis
I	With rod end male clevis
YY	With two rod end female clevis
II	With two rod end male clevis

MODEL No. OF MOUNTING

Bore (mm)	φ10	φ16
Foot mounting	Z310-L	Z316-L
Flange mounting	Z310-A	Z316-A

MODEL No. OF SWITCH MOUNTING BRACKET

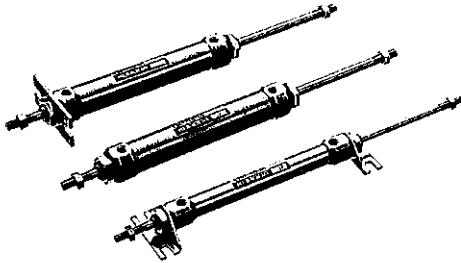
Bore (mm)	M type switch mounting bracket
φ10	Z310-MJ
φ16	Z316-MJ

AIR CYLINDER/DOUBLE ROD TYPE Z3○7 series

SPECIFICATIONS

Acting	Unit	Double acting
Fluid		Non-lubricated/lubricated air
Pressure range	MPa	0.1~0.7
Temperature range	°C	0~70
Piston speed range	mm/s	50~750
Cushion		Built-in damper
Stroke length allowance	mm	+1.0 0
Mounting		Both side nose mounting, Both side foot mounting, Flange mounting

(Note) When the pneumatic equipment is used at low temperature of less than 5°C, it may be frozen. Use it in dry air passed through an air dryer.

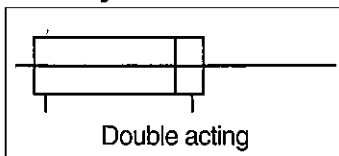


STANDARD STROKE

(Unit : mm)

Bore	Standard stroke	Max. stroke
φ 10	15,30,45,60	150
φ 16		

JIS symbol



ACCESSORIES

Name		Both side nose mounting	Both side foot mounting	Flange mounting
Standard	Nose nut	○	○	○
	Rod end nut	○	○	○
Option	Rod end female clevis (With pin)	○	○	○
	Rod end male clevis	○	○	○

MODEL WITH SWITCH/For detailed specifications of switches, refer to page 41 to 44.

M TYPE REED SWITCH

Lead wire type



Model No.	Rated voltage (V)	Rated current range(mA)	Pilot lamp (Lights up at ON)	Application
MA-1	AC100	5~45	○	Relay PLC
	DC24	5~45		
MD-1	DC24	25~65	○	Relay
MD-3	DC5,6	Max. 50 (Inductive load) Max. 300 (Resistive load)	○	IC circuit
MR	AC DC5~100	Max. 50 (Inductive load) Max. 300 (Resistive load)	Not provided	Relay PLC
MA-2L	AC100/110	5~150	○	Relay
MA-2H	AC200/220	5~150	○	Relay

(Note) The MA-2L is the same as the MA-1 except that it is provided with the surge suppressor SS-2L.

The MA-2H is the same as the MA-1 except that it is provided with the surge suppressor SS-2H.

M TYPE PROXIMITY SWITCH

Lead wire type



Model No.	Rated voltage (V)	Rated current range(mA)	Pilot lamp (Lights up at ON)	Application
MT-2 MT-2U	DC24 (DC10~30)	5~100	○	Relay PLC
MT-3 MT-3U	DC5~30	5~200	○	Relay PLC IC circuit

MINIMUM STROKE WITH M TYPE SWITCH

(Unit : mm)

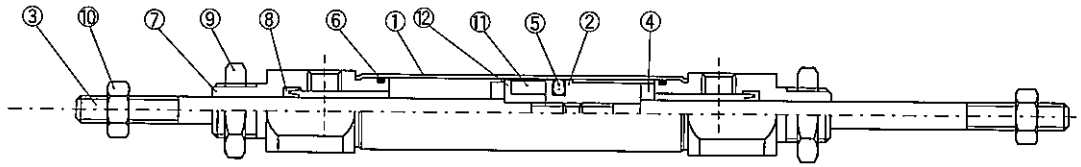
Bore	Number of switch		
	With 2 units (On the same surface)	With 2 units (On different surface)	With 1 unit
φ 10	40	15	15
φ 16	35		

SWITCH SET POSITION

Same as Standard type Z3 series.
See page 27.

AIR CYLINDER/DOUBLE ROD TYPE Z3○7 series

CONSTRUCTIONS AND MAIN PARTS



(Note) Cannot be disassembled.

No.	Description	Material	No.	Description	Material
①	Cylinder tube	Stainless steel	⑦	Rod cover	Aluminum alloy
②	Piston	Aluminum alloy	⑧	Rod packing	NBR
③	Piston rod	Stainless steel	⑨	Nose nut	Soft steel
④	Damper	Urethane rubber	⑩	Rod end nut	Soft steel
⑤	Piston packing	NBR	⑪	Magnet	Resin
⑥	O-ring	NBR	⑫	Magnet holder	Aluminum alloy

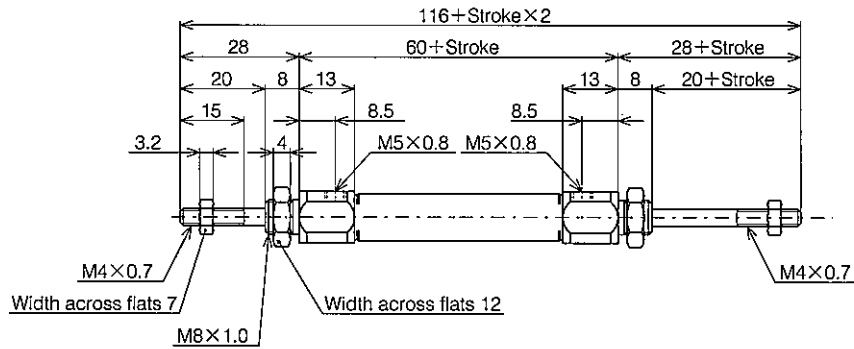
AIR CYLINDER/DOUBLE ROD TYPE Z3○7 series

DIMENSIONS

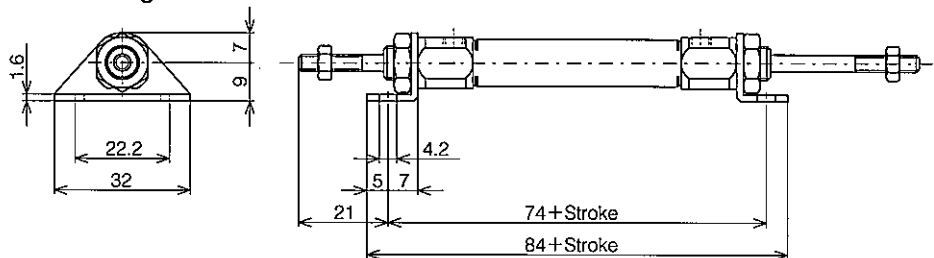
Double acting $\phi 10$ /Z3G7-10

(Unit : mm)

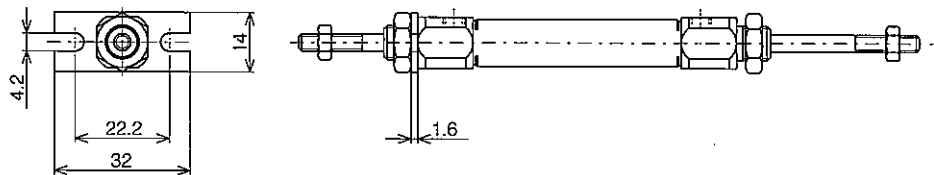
Both side nose mounting/NW



Both side foot mounting/LW



Flange mounting/A



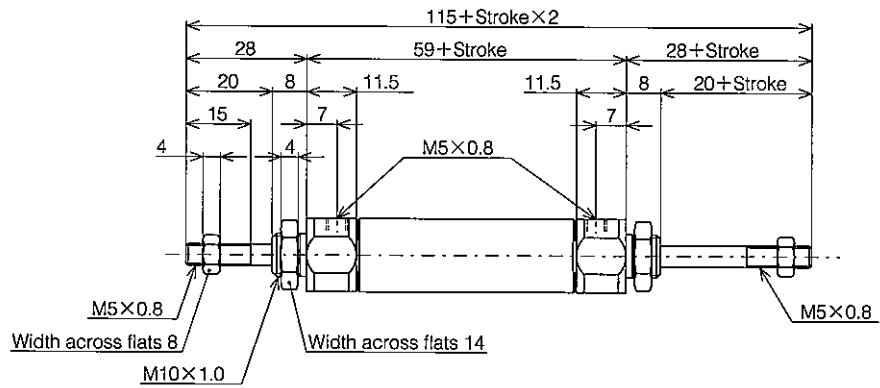
AIR CYLINDER/DOUBLE ROD TYPE Z3○7 series

DIMENSIONS

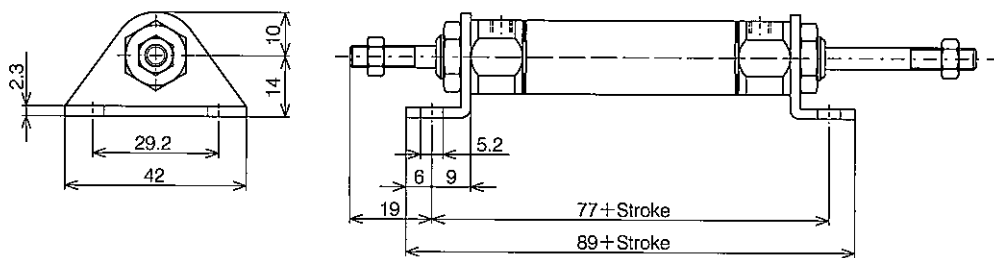
Double acting $\phi 16/Z3G7-16$

(Unit : mm)

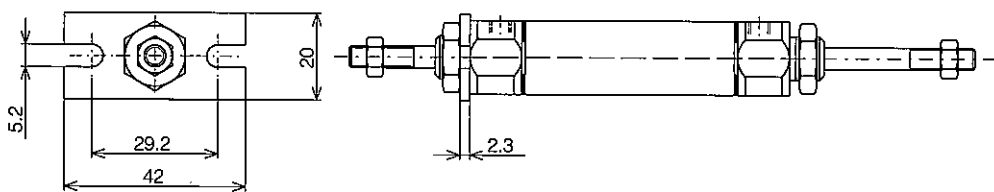
Both side nose mounting/NW



Both side foot mounting/LW

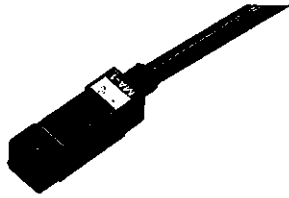


Flange mounting/A

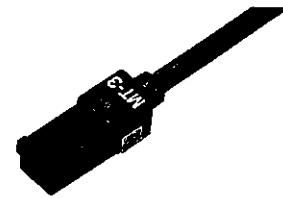


M TYPE SWITCH

M TYPE REED SWITCH



M TYPE PROXIMITY SWITCH



SPECIFICATIONS OF REED SWITCH

Model No.	Unit	MA-1	MD-1	MD-3	MR	MA-2L	MA-2H
Applications		Relay, PLC	Relay	IC circuit	Relay	Relay	Relay
Rated voltage	V	AC100 DC24	DC24	DC5~6	AC,DC5~100	AC100/110	AC200/220
Max. contact capacity	Inductive load	4.5VA	1W	1.5W	0.3W	1.5VA 1.5W	4.5VA
	Resistive load				1.8W	10VA 10W	4.5VA
Rated current range	Inductive load	5~45		25~65	Max. 50	Max. 50	5~150
	Resistive load				Max. 300	Max. 300	5~150
Internal voltage drop	V	Max. 2			0	—	
Surge suppressor		Not provided				Provided	
Mean response time	ms	1.0					
Shock resistance	G	30					
Temperature range	°C	5~60					
Pilot lamp		Red LED (Lights up at ON)			Not provided	Red LED (Lights up at ON)	
Lead wire	Color	Black 2-core cord (Blue line)	Black 2-core cord	Black 3-core cord	Black 2-core cord	Black 2-core cord (Blue line)	Black 2-core cord (Blue line)
	Length	m 1 (Standard), 2, 3, 4, 5					

- (Note) • The MA-1 cannot be used at 200V AC.
 • The MA-2L and MA-2H are same as the MA-1 except that they are provided with surge suppressor SS-2L and SS-2H, respectively.
 • When using the MR, the specified maximum contact capacity and current range should be both satisfied.

SPECIFICATIONS OF PROXIMITY SWITCH

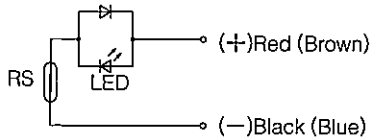
Model No.	Unit	MT-3	MT-3U	MT-2	MT-2U
Applications		Relay, PLC, IC circuit		Relay, PLC	
Rated voltage	V	DC5~30		DC24(DC10~30)	
Rated current range	mA	5~200		5~100	
Max. current consumption of switch controller	mA	max.20 (at 24V) max.10 (at 12V) max. 4 (at 5V)		—	
Max. leak current		10μA		1mA	
Internal voltage drop	V	Max. 1.5		Max. 3	
Mean response time	ms	1		1	
Shock resistance	G	50		50	
Temperature range	°C	5~60		5~60	
Protective construction		IP67		IP67	
Pilot lamp		Red LED (Lights up at ON)		Red LED (Lights up at ON)	
Lead wire	Color	Oil proof black 3-core cord		Oil proof black 2-core cord	
	Length	m 1 (Standard), 2, 3, 4, 5		1 (Standard), 2, 3, 4, 5	

M TYPE SWITCH

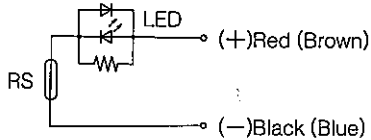
INTERNAL CIRCUIT DIAGRAM OF SWITCH

● Reed switch

MA-1

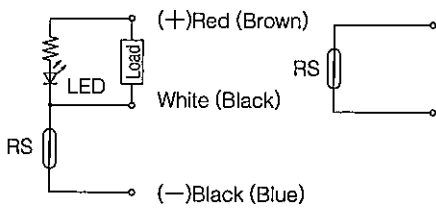


MD-1

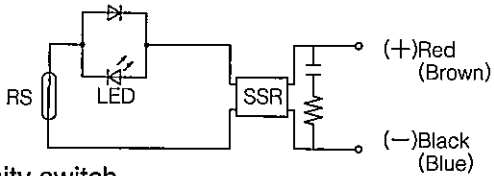


MD-3

MR

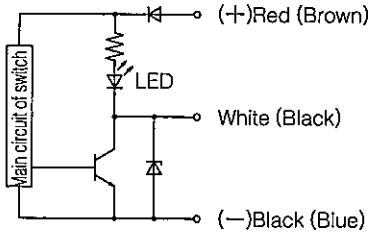


MA-2L, MA-2H

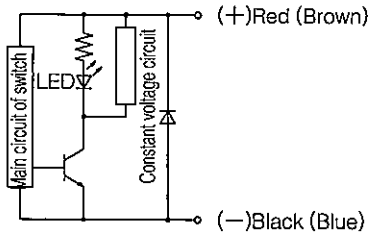


● Proximity switch

MT-3, MT-3U



MT-2, MT-2U



(Note) JIS for color of lead wire has been changed. Our shipment will change as per new color cord after stock has gone.

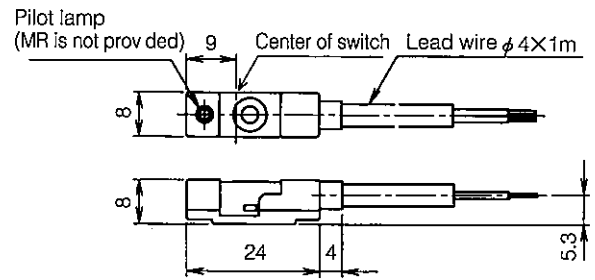
Current color : Red White Black
New color : Brown Black Blue

DIMENSIONS OF SWITCH

(Unit : mm)

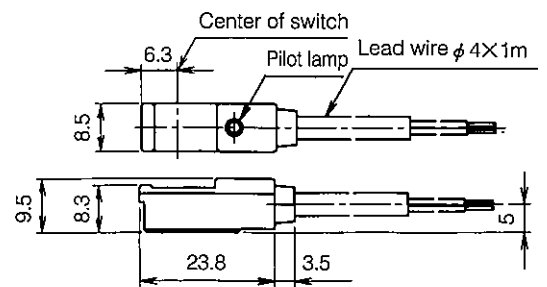
● Reed switch

MA-1, MD-1, MD-3, MR

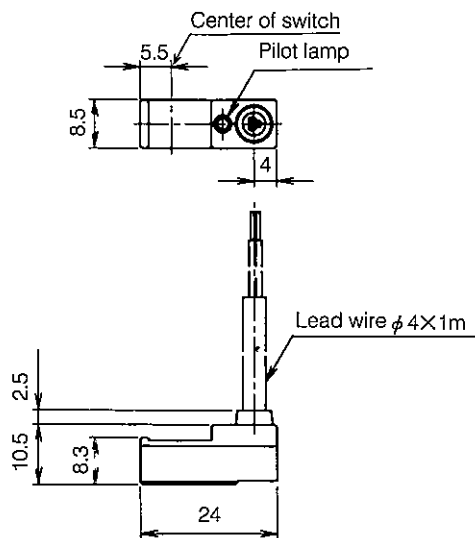


● Proximity switch

MT-3, MT-2



MT-3U, MT-2U



SWITCH LEAD WIRE LENGTH

The standard lead wire length of M type switches is 1 m. However, lead wire length of 2m, 3m, 4m and 5m are optionally available.

Ordering Instructions **MT-2-L30**

Lead wire length
No mark : 1 m (Standard)
L20 : 2m
L30 : 3m
L40 : 4m
L50 : 5m

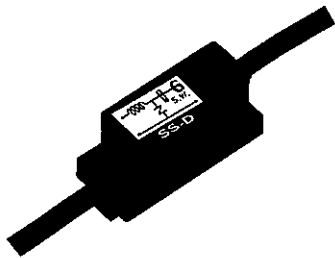
Type of switch

M TYPE SWITCH

HYSTERESIS AND RESPONSE RANGE OF SWITCHES

Reed switch (Unit : mm)			Proximity switch (Unit : mm)		
Bore	Switch response range	Hysteresis	Bore	Switch response range	Hysteresis
φ 6	5 ~ 8	0.5	φ 6	3~7	0.5
φ 10	5 ~ 9	0.7	φ 10	3~9	
φ 16	7~12	0.7	φ 16	6~9	

SURGE SUPPRESSOR

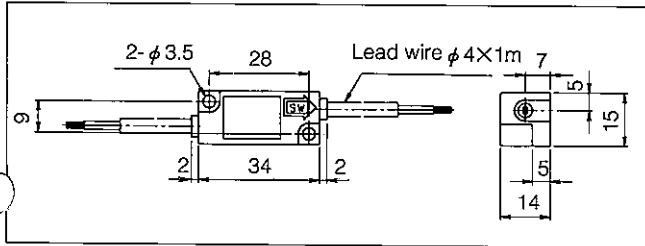


SPECIFICATIONS

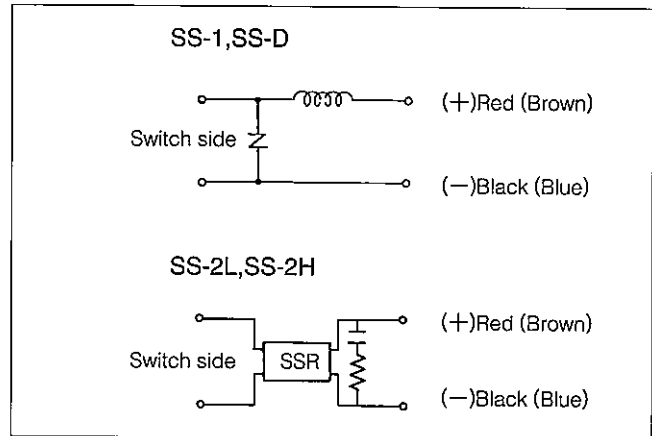
Model No.	Rated voltage (V)	Rated current range (mA)
SS-1	AC100	—
SS-D	DC24	—
SS-2L	AC100/110	5~150
SS-2H	AC200/220	5~150

DIMENSIONS

(Unit : mm)



INTERNAL CIRCUIT DIAGRAM



(Note) JIS for color of lead wire has been changed. Our shipment will change as per new color cord after stock has gone.

Current color : Red White Black
 New color : Brown Black Blue

M TYPE SWITCH

LEAD WIRE COLOR OF SWITCH

⚠ CAUTION

- JIS for color of lead wire has been changed. Our shipment will change as per new color code after stock has gone.

Type of switch		Current color	New color
M type switch	2-lead wire type	Red (+)	Brown (+)
		Black (-)	Blue (-)
	3-lead wire type	Red (+)	Brown (+)
		White (Output)	Black (Output)
		Black (-)	Blue (-)

MOUNTING METHOD THE SWITCH

⚠ CAUTION

- ① Wind the band around the cylinder tube and connect one end of the band to the hook of switch mounting bracket B.
- ② Insert it in a such a manner that the recess of the M type switch may be under mounting bracket B.
- ③ Connect the other end of the band to the hook of mounting bracket A.
- ④ Connect mounting bracket A to B and lightly tighten the switch set screw.
- ⑤ Check the detecting position and tighten the set screw. (Recommended the detecting torque : 0.3~0.4 N·m)
- ⑥ When changing the detecting position, do so as stated in step④.

