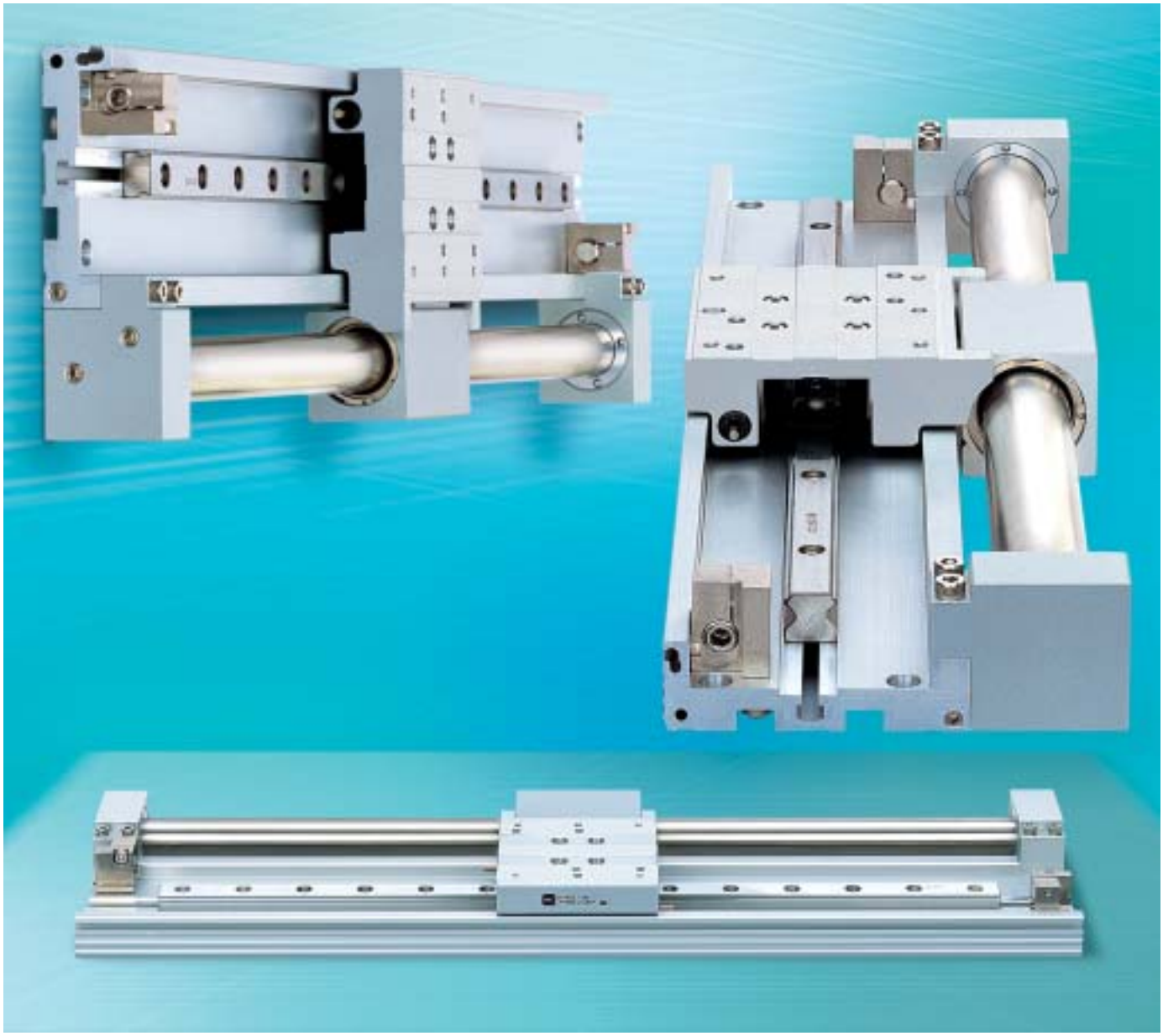
Magnetically Coupled Rodless Cylinder
Low Profile Guide Type

Series CY1F

Size: ø10, ø15, ø25

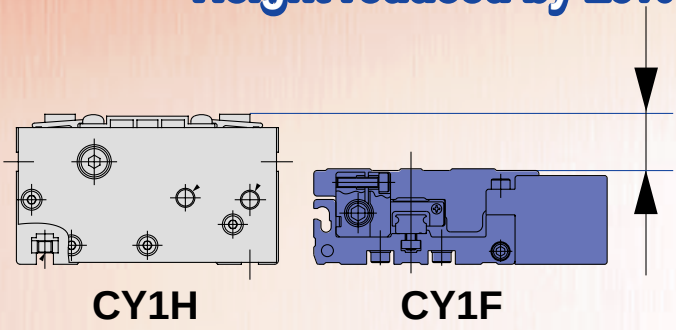


New Series of magnetically coupled rodless cylinder featuring compact and low profile design.

New Series of magnetically coupled rodless

With reduced mounting height and overall length,

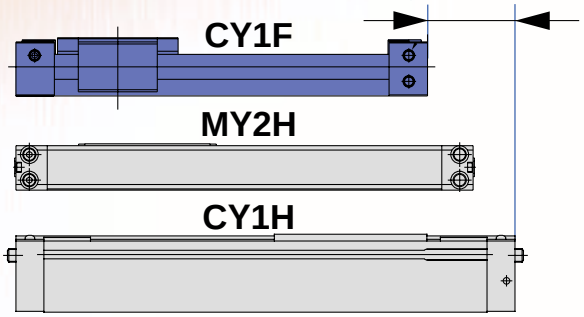
Low profile **Height reduced by 29%**



Height mm

Series	ø10	ø15	ø25
CY1F	28	34	46
CY1H	39.5	46	63

Compact body **Overall length reduced by 31%**



Overall length mm

Series	ø10	ø15	ø25
CY1F	198	205	240
CY1H	225	294	350
MY2H	—	260	310

∗For 100mm stroke cylinder

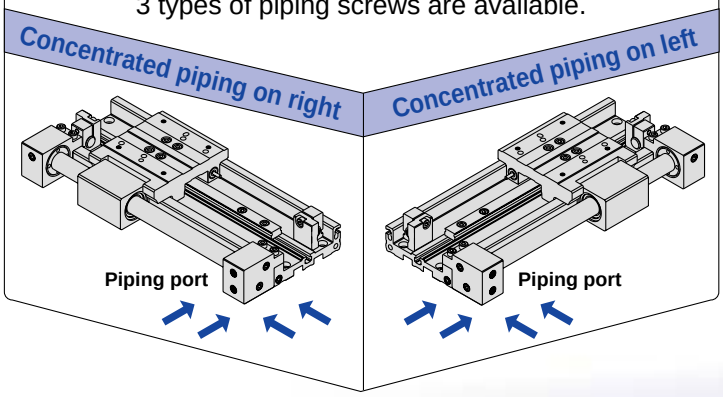
Overall length reduced by 22% compared to Series MY2H

Magnetically coupled rodless cylinder: Low profile guide

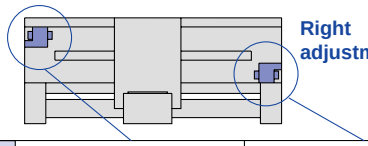
Series CY1F: ø10, ø15, ø25

Various concentrated piping ports are available.

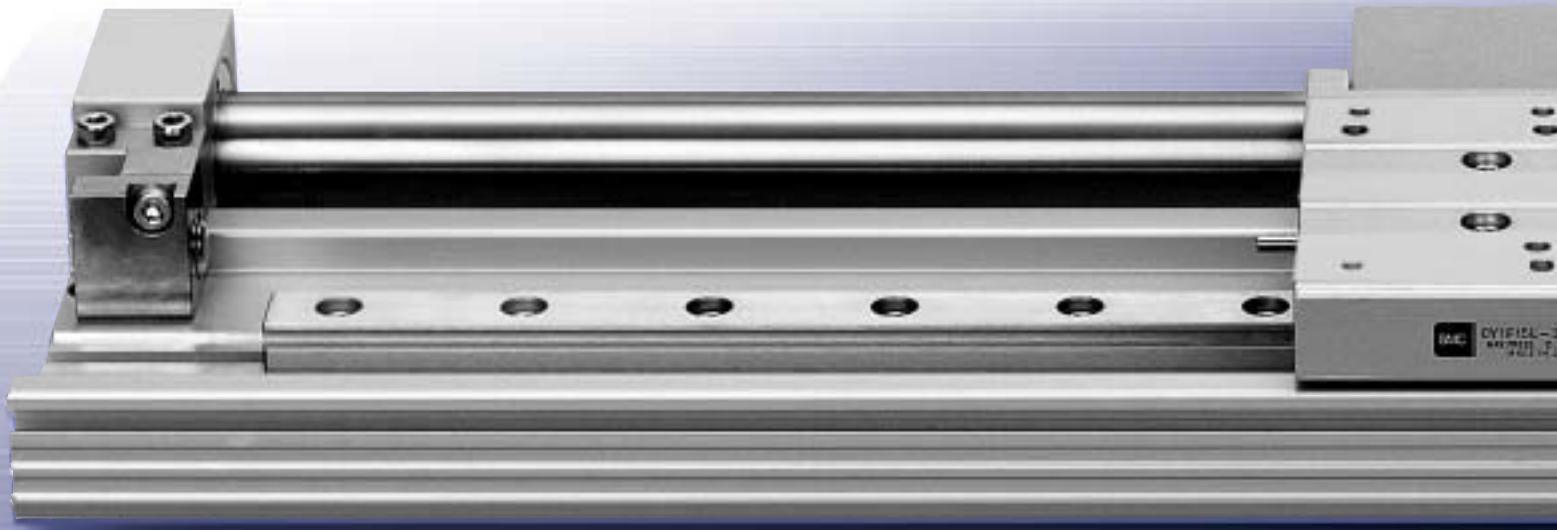
Piping port position can be specified using a part number.
3 types of piping screws are available.



4 types of stroke adjustment are available.



Both sides standard type	-1mm to 0mm	-1mm to 0mm
AL type	-25mm to 0mm	-1mm to 0mm
AR type	-1mm to 0mm	-25mm to 0mm
A type	-25mm to 0mm	-25mm to 0mm



cylinder featuring compact and low profile design.
small work pieces can be transferred with high precision.

Lightweight

Weight reduced by 50%

kg

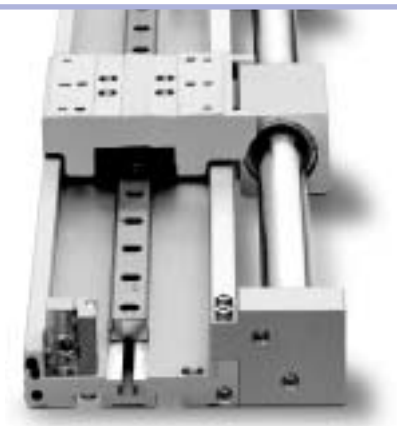
Series	ø10	ø15	ø25
CY1F	0.7	1.1	2.5
CY1H	1.0	2.2	4.6
MY2H	—	1.3	3.2

∗For 100mm stroke cylinder

Available bore sizes ø10, 15, 25

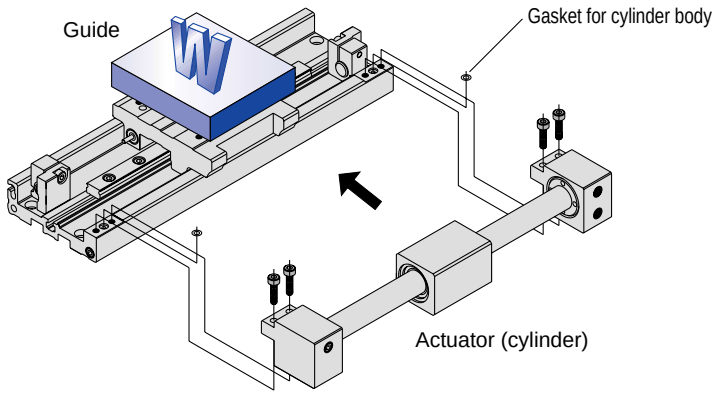
Model	Bore size (mm)	Standard stroke (mm)	Maximum stroke	Cushion	Piping directions
CY1F	10	50 100 150 200 250 300 350 400 450 500 550 600	500	Built-in shock absorber	Concentrated piping on right
	15		750		Concentrated piping on left
	25		1200		

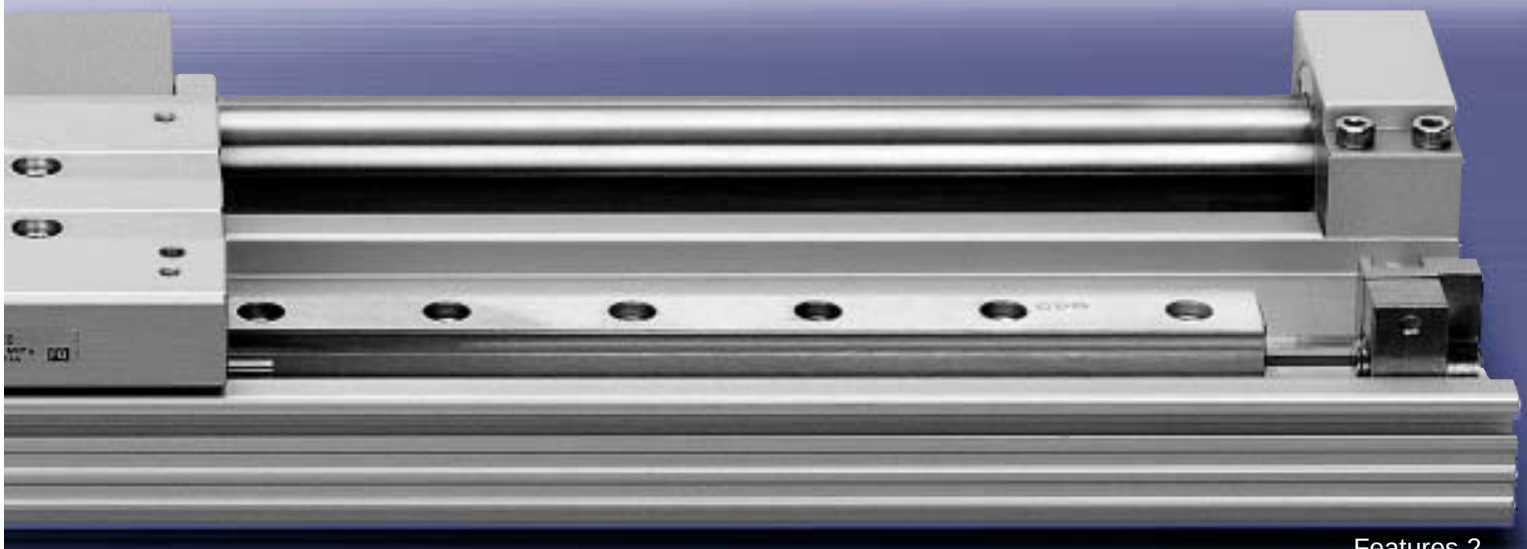
Accumulated dust on the guide can be removed easily without an end cover.



The cylinder and guide are integrated.

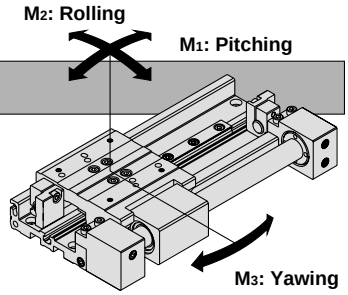
The cylinder portion can be replaced without interfering with the work piece.





Series CY1F
Model Selection 1

The following are the steps for selection of the series CY1F best suited to your applicaton.



Standards for Tentative Model Selection

Cylinder model	Guide model	Standard for guide selection	Graph for related allowable values
CY1F	High precision guide (Single axis)	Slide table accuracy approx. ±0.05mm or less	Refer to page 28

Selection Flow Chart

Es: Allowable kinetic energy for intermediate stop by pneumatic circuit (J)
Ps: Operating pressure limit for intermediate stop by external stopper, etc. Limit value(MPa)
Pv: Maximum operating pressure in vertical operation (MPa)
mv: Maximum allowable load mass in vertical operation (kg)
α **:** Load factor

$$\Sigma\alpha = \frac{\text{Load mass (m)}}{\text{Maximum allowable load } (m_{max})} + \frac{\text{Static moment (M)}}{\text{Allowable static moment } (M_{max})} + \frac{\text{Dynamic moment } (M_E)}{\text{Allowable dynamic moment } (M_{Emax})}$$

E: Load kinetic energy (J)

$$E = \frac{m}{2}\left(\frac{\upsilon a}{1000}\right)^2$$

Operating conditions

- **m: Load mass (kg)**
- **υa: Average speed**
- **P: Operating pressure (MPa)**
- **L: Center of gravity of the work piece (mm)**
- **Mode of operation (Horizontal, Inclination, Vertical)**

Mode of operation

Horizontal actuation

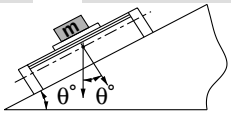
First tentative bore size selection

$$\varnothing D \geq 1.6 \times \sqrt{\frac{m}{P}}$$

Inclination actuation

First tentative bore size selection

$$\varnothing D \geq 5.0 \times \sqrt{\frac{0.1 \times m\cos\theta + m\sin\theta}{P}}$$



Inclined operation

Note 1)

Perpendicular actuation

Review of load mass and operating pressure

First tentative bore size determination

$$\varnothing D \geq 5.0 \times \sqrt{\frac{0.1 \times m + m}{P}}$$

Determination of allowable load mass & pressure (Refer to page 29)

$m \leq mv$, $P \leq Pv$

$m > mv$, $P > Pv$

Determination of load factor ($\Sigma\alpha$) (Refer to page 27)

$\Sigma\alpha > 1$ **Review of operating conditions**

$$\Sigma\alpha = \frac{\text{Load mass (m)}}{\text{Maximum allowable load } (m_{max})} + \frac{\text{Static moment (M)}}{\text{Allowable static moment } (M_{max})} + \frac{\text{Dynamic moment } (M_E)}{\text{Allowable dynamic moment } (M_{Emax})}$$

$\Sigma\alpha \leq 1$

Note 1)

Intermediate stop

Yes

Intermediate stop method

Stopped by external stopper

Stopped by pneumatic circuit

No

Determination of load's kinetic energy (E) (Refer to page 29)

$E > Es$ **Review of larger bore size**

$E \leq Es$

Determination of bore size

$$E = \frac{m}{2}\left(\frac{\upsilon a}{1000}\right)^2$$

Determination of pressure for intermediate stop (p) (Refer to page 29)

$P > Ps$ **Review of larger bore size and operating pressure**

$P \leq Ps$

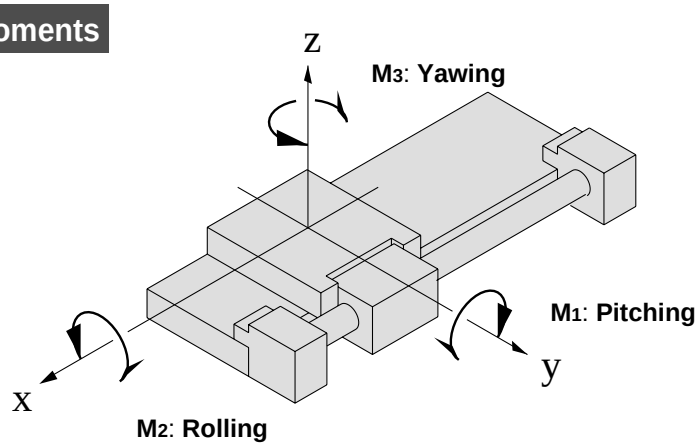
Model determination

Note 1) This cylinder cannot be stopped at an intermediate position by a pneumatic circuit. The only possible way in that case is the use of an external stopper.

Types of Moment Applied to Rodless Cylinders

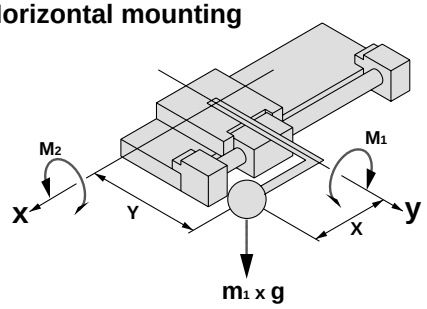
Multiple moments may be generated depending on the mounting orientation load and position of the center of gravity.

Coordinates and Moments

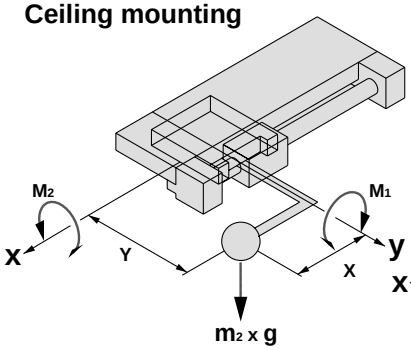


Static moment

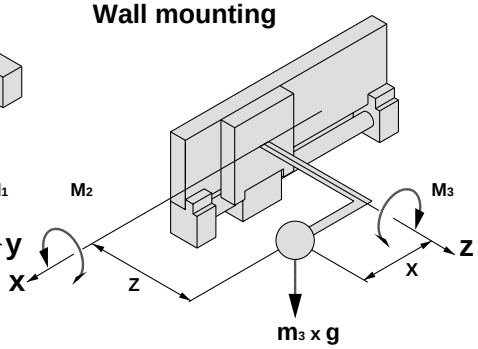
Horizontal mounting



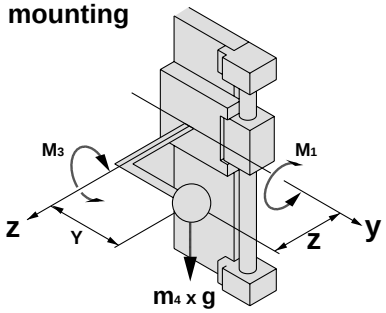
Ceiling mounting



Wall mounting



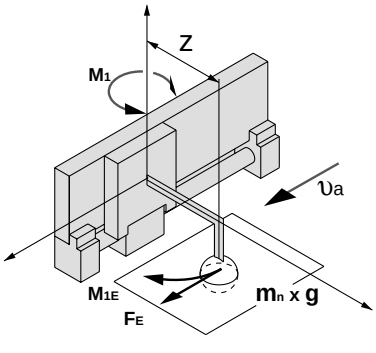
Vertical mounting

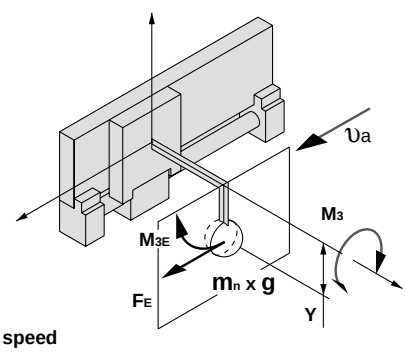


Mounting orientation		Horizontal	Ceiling	Wall	Vertical
Static load m		m_1	m_2	m_3	m_4
Static moment	M_1	$m_1 \times g \times X$	$m_2 \times g \times X$	—	$m_4 \times g \times Z$
	M_2	$m_1 \times g \times Y$	$m_2 \times g \times Y$	$m_3 \times g \times Z$	—
	M_3	—	—	$m_3 \times g \times X$	$m_4 \times g \times Y$

g: Gravitational acceleration

Dynamic moment





Mounting orientation		Horizontal	Ceiling	Wall	Vertical
Dynamic load F_E		$\frac{1.4}{100} \times \upsilon a \times m_n \times g$			
Dynamic moment	M_{1E}	$\frac{1}{3} \times F_E \times Z$			
	M_{2E}	**Dynamic moment M_{2E} is not generated.**			
	M_{3E}	$\frac{1}{3} \times F_E \times Y$			

Note) Regardless of the mounting orientation, dynamic moment is calculated with the formulas above.

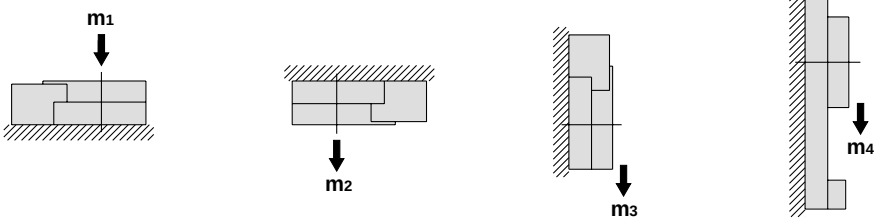
g: Gravitational acceleration, υa: Average speed

Maximum Allowable Moment/Maximum Allowable Load

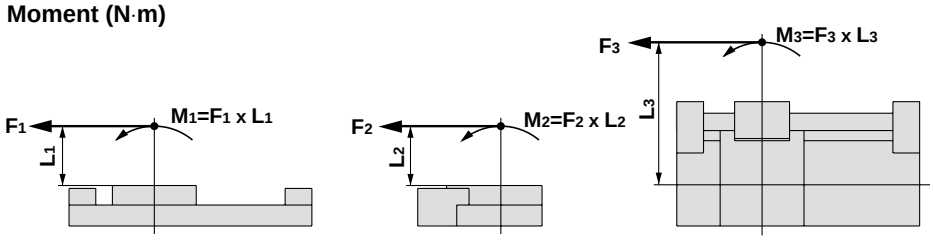
Model	Bore size (mm)	Maximum allowable moment (N·m)			Maximum allowable load (kg)			
		M_1	M_2	M_3	m_1	m_2	m_3	m_4
CY1F	10	1	2	1	2	2	2	1.4
	15	1.5	3	1.5	5	5	5	2
	25	14	20	14	12	12	12	12

The above values are the maximum allowable values for moment and load. Refer to each graph regarding the maximum allowable moment and maximum allowable load for a particular piston speed.

Load (kg)



Moment (N·m)



<Calculation guide load factor>

1. Maximum allowable load (1), static moment (2), and dynamic moment (3) (at the time of impact with stopper) must be examined for the selection calculations.

∗ To evaluate, use υa (average speed) for (1) and (2), and υ (impact speed $\upsilon = 1.4\upsilon a$) for (3).
Calculate m max for (1) from the maximum allowable load graph (m_1, m_2, m_3) and Mmax for (2) and (3) from the maximum allowable moment graph (M_1, M_2, M_3).

$$\text{Sum of guide load factors } \Sigma\alpha = \frac{\text{Load mass [m]}}{\text{Maximum allowable load [m max]}} + \frac{\text{Static moment [M] Note 1)}}{\text{Allowable static moment [Mmax]}} + \frac{\text{Dynamic moment [ME] Note 2)}}{\text{Allowable dynamic moment [MEmax]}} \leq 1$$

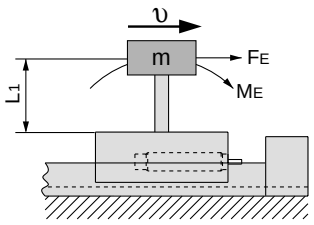
Note 1) Moment caused by the load, etc., with cylinder in resting condition.
Note 2) Moment caused by the impact load equivalent at the stroke end (at the time of impact with stopper).
Note 3) Depending on the shape of the work piece, multiple moments may occur. When this happens, the sum of the load factors ($\Sigma\alpha$) is the total of all such moments.

2. Reference formulas [Dynamic moment at impact]
Use the following formulas to calculate dynamic moment when taking stopper impact into consideration.

- m : Load mass (kg)
- F : Load (N)
- F_E : Load equivalent to impact (at impact with stopper) (N)
- υa: Average speed (mm/s)
- M : Static moment (N·m)
- υ : Impact speed (mm/s)
- L_1 : Distance to the load's center of gravity (m)
- M_E : Dynamic moment (N·m)
- g : Gravitational acceleration (9.8m/s^2)

$\upsilon = 1.4\upsilon a$ (mm/s) $\quad F_E = \frac{1.4}{100}\,\upsilon a \cdot g \cdot m$ Note 4)

$\therefore M_E = \frac{1}{3} \cdot F_E \cdot L_1 = 0.05\upsilon a\ m\ L_1$ (N·m) Note 5)



Note 4) $\frac{1.4}{100}\,\upsilon a$ is a dimensionless coefficient for calculating impact force.

Note 5) Average load coefficient (= $\frac{1}{3}$):
This coefficient is for averaging the maximum load moment at the time of stopper impact according to service life calculations.

3. Refer to page 30 and 31 for detailed selection procedures.

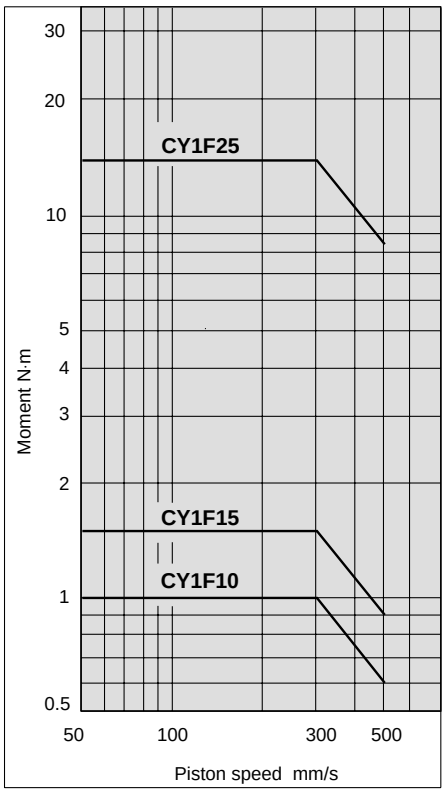
Maximum allowable moment

Select the moment from within the range of operating limits shown in the graphs. Note that the maximum allowable load value may sometimes be exceeded even within the operating limits shown in the graphs. Therefore, also check the allowable load for the selected conditions.

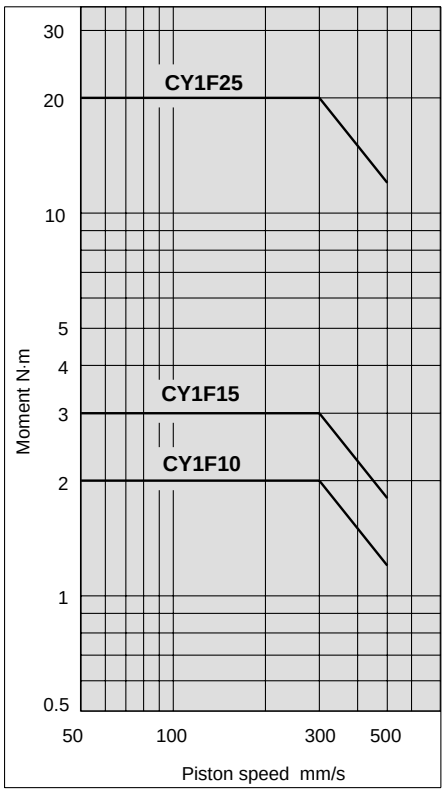
Maximum allowable load

Select the load from within the range of limits shown in the graphs. Note that the maximum allowable moment value may sometimes be exceeded even within the operating limits shown in the graphs. Therefore, also check the allowable moment for the selected conditions.

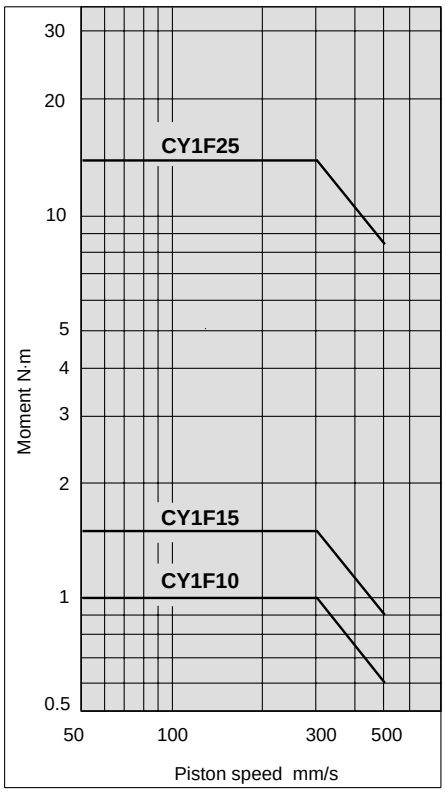
1 CY1F/M1



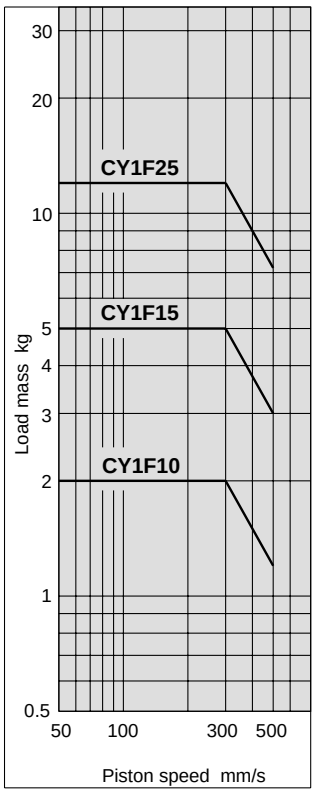
2 CY1F/M2



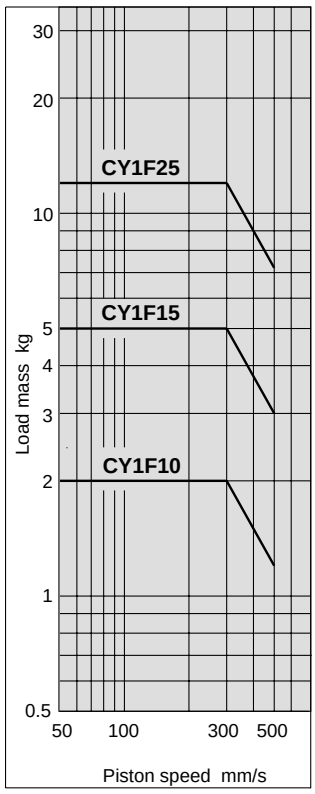
3 CY1F/M3



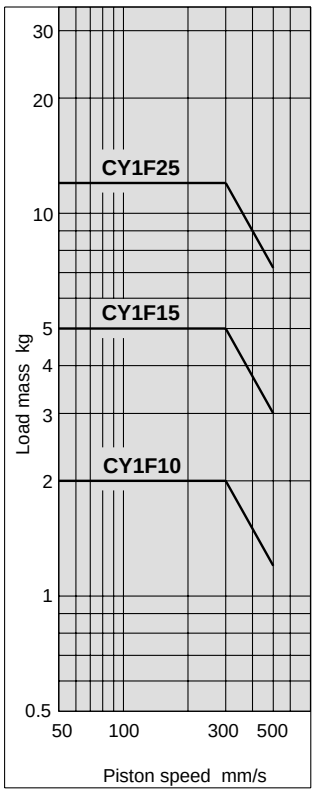
4 CY1F/m1



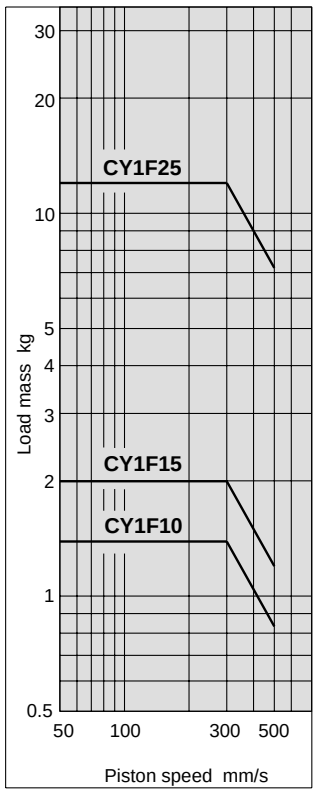
5 CY1F/m2



6 CY1F/m3



7 CY1F/m4



Vertical Actuation

①**Vertical operation**

In vertical operation, observe the maximum load mass and the maximum operating pressure shown in the table below to prevent a drop due to slipping off of magnet couplings.

⚠Caution

If the maximum load mass or maximum operating pressure is exceeded, it will cause the magnet coupling to slip off.

Bore size (mm)	Maximum load weight mv (kg)	Maximum operating pressure Pv (MPa)
10	1.4	0.55
15	2.0	0.65
25	12	0.65

Intermediate Stop

①**Intermediate stop by external stopper or stroke adjustment with adjustment bolt.**

Observe the maximum pressure limit in the table below in case of intermediate stop by an external stopper or stroke adjsutment with the attached adjustment bolt.

⚠Caution

Be careful if the operating pressure limit is exceeded, it will cause the magnet coupling to slip off.

Bore size (mm)	Holding force (N)	Operating pressure limit for intermediate stop Ps (MPa)
10	53.9	0.55
15	137	0.65
25	363	0.65

②**The load is stopped by pneumatic circuit.**

Observe the maximum kinetic energy in the table below in case the load is stopped at an intermediate position by a pneumatic circuit.

Note that intermediate stop by a pneumatic circuit is not available in vertical operation.

⚠Caution

If the allowable kinetic energy is exceeded, it will cause the magnet coupling to slip off.

Bore size (mm)	Allowable kinetic energy for intermediate stop Es (J)
10	0.03
15	0.13
25	0.45

Series CY1F
Model Selection 2

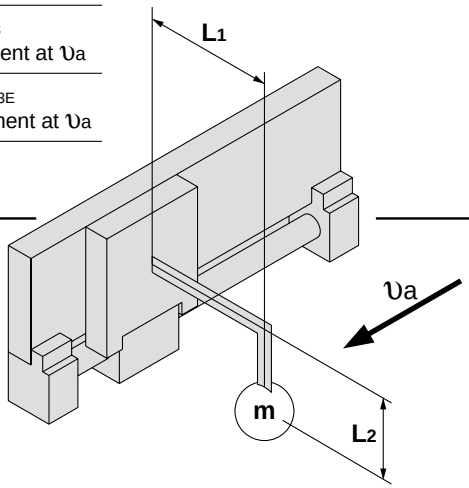
Selection Calculation

The selection calculation finds the load factors ($\Sigma\alpha n$) of the items below, where the total (αn) does not exceed 1.

$$\Sigma\alpha n = \alpha_1 + \alpha_2 + \alpha_3 \leq 1$$

Item	Load factor αn	Note
1 Maximum load mass	$\alpha_1 = m/m_{max}$	Review m m max is the maximum load mass at υa
2 Static moment	$\alpha_2 = M/M_{max}$	Review M_1, M_2, M_3 Mmax is the allowable moment at υa
3 Dynamic moment	$\alpha_3 = M_E/M_{Emax}$	Review M_{1E}, M_{2E}, M_{3E} $M_E$max is the allowable moment at υa

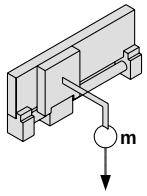
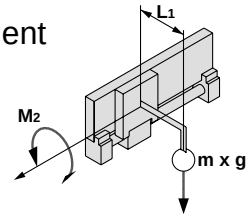
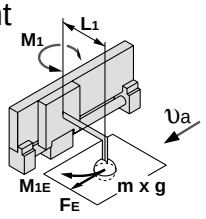
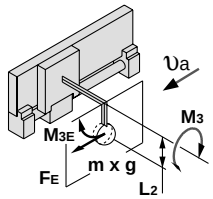
υ: Collision speed υa: Average speed



Calculation example 1

Operating conditions

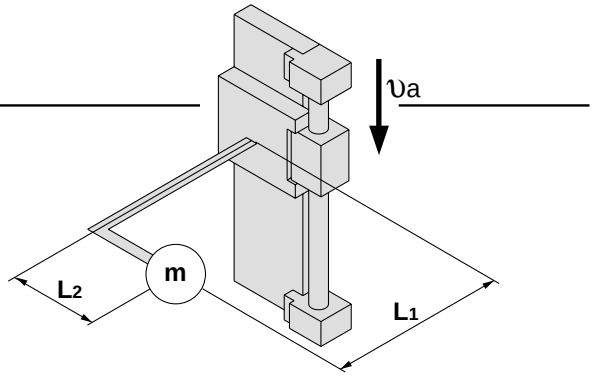
Cylinder: CY1F15
Terminal butter mechanism: Standard (shock absorber)
Mounting: Wall mounting
Speed (average) : υa = 300 [mm/s]
Load mass: m = 0.5 [kg] (excluding weight of arm section)
L1 = 50 [mm]
L2 = 40 [mm]

Item	Load factor αn	Note
1 Load mass 	$\alpha_1 = m/m_{max}$ = 0.5/5 **= 0.1**	Investigate m. Find the value of m max. at 300mm/s in Graph 6 for m3 on page 28.
2 Static moment 	M2 = m x g x L1 = 0.5 x 9.8 x 0.05 = 0.245 [N·m] $\alpha 2$ = M2/M2 max = 0.245/3 **= 0.082**	Investigate M_2. M_1 and M_3 are not required because they are not generated. Find the value of M_2 max. at 300mm/s in Graph 2.
3 Dynamic moment 	M_{1E} = 1/3 x F_E x L_1 (F_E = 1.4/100 x υa x g x m) = 0.05 x υa x m x L_1 = 0.05 x 300 x 0.5 x 0.05 = 0.375 [N·m] α_{3A} = M_{1E}/M_{1E} max = 0.375/1.07 **= 0.350**	Investigate M_{1E}. Find the collision speed υ. υ=1.4 x υa =1.4 x 300 =420 [mm/s] Find the value of M_{E1} max. at 420mm/s in Graph 1.
	M_{3E} = 1/3 x F_E x L_2 (F_E = 1.4/100 x υa x g x m) = 0.05 x υa x m x L_2 = 0.05 x 300 x 0.5 x 0.04 = 0.3 [N·m] α_{3B} = M_{3E}/M_{3E} max = 0.3/1.07 **= 0.28**	Investigate M_{3E}. From above, find the value of M_{3E} max at 420mm/s in Graph 3.

From above,
$\Sigma\alpha n = \alpha_1 + \alpha_2 + \alpha_{3A} + \alpha_{3B} = 0.1 + 0.082 + 0.35 + 0.28 = 0.812$.
From $\Sigma\alpha n = 0.812 \leq 1$, it is applicable.

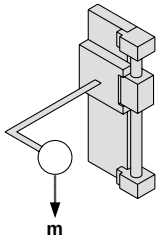
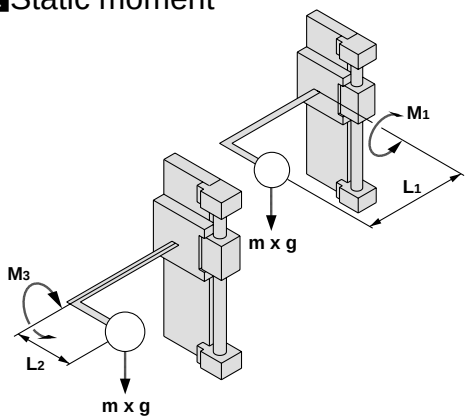
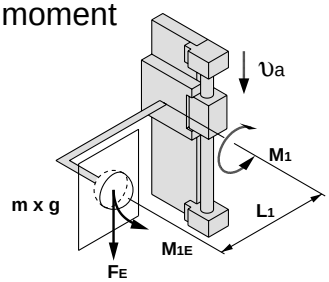
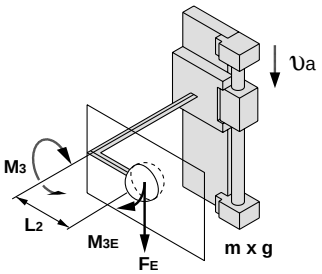
Series CY1F
Model Selection 3

Calculation example 2



Operating conditions

Cylinder: CY1F25
Terminal butter mechanism: Standard (shock absorber)
Mounting: Vertical mounting
Speed (average) : υa=300 [mm/s]
Load mass: m = 3 [kg] (excluding weight of arm section)
L1 = 50 [mm]
L2 = 40 [mm]

Item	Load factor αn	Note
1 Load mass 	α_1 = m/mmax = 3/12 **= 0.25**	Investigate m. Find the value of m max. at 300mm/s in Graph 7 for m3.
2 Static moment 	M_1 = m x g x L_1 = 3 x 9.8 x 0.05 = 1.47 [N·m] α_{2a} =M_1/M_1 max =1.47/14 **=0.105**	Investigate M_1. Find the value of M_2 max. at 300mm/s in Graph 1.
	M_3 = m x g x L_2 = 3 x 9.8 x 0.04 = 1.176 [N·m] α_{2b} = M_3/M_3 max = 1.176/14 **= 0.084**	Investigate M_3. Find the value of M_3 max. at 300mm/s in Graph 3.
3 Dynamic moment 	M_{1E} = 1/3 x F_E x L_1 (F_E =1.4/100 x υa x g x m) =0.05 x υa x m x L_1 =0.05 x 300 x 3 x 0.05 =2.25 [N·m] α_{3A} = M_{1E}/M_{1E} max = 2.25/10 **= 0.225**	Investigate M_{1E}. Find the collision speed U υ = 1.4 x υa = 1.4 x 300 = 420 [mm/s] Find the value of M_{1E} max. at 420mm/s in Graph 1.
	M_{3E} = 0.05 x υa x m x L_2 (F_E = 1.4/100 x υa x g x m) = 0.05 x 300 x 3 x 0.04 = 1.8 [N·m] α_{3B} = M_{3E}/M_{3E} max = 1.8/10 **= 0.18**	Investigate M_{3E}. From above, find the value of M_{3E} max. at 420mm/s in Graph 3.

From above,
$\Sigma\alpha n = \alpha_1 + \alpha_{2a} + \alpha_{2b} + \alpha_{3A} + \alpha_{3B} = 0.25 + 0.105 + 0.084 + 0.225 + 0.18 = 0.844$
From $\Sigma\alpha n = 0.844 \leq 1$, it is applicable.

Magnetically Coupled Rodless Cylinder

Series CY1F

Low Profile Guide Type/ø10, ø15, ø25

How to order

CY1F **10** □ **R** — **300** □ — **F9BW** □

Bore size (mm)

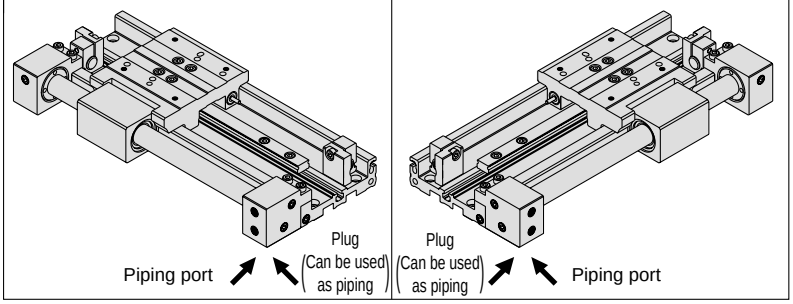
10	10
15	15
25	25

Piping thread type

Symbol	Type	Bore size (mm)
Nil	M	10, 15
	Rc	25
TN	NPT	
TF	G	

Piping direction

R: Concentrated piping on right	**L:** Concentrated piping on left



Adjustment bolt suffix

Nil	Both sides are standard
AL	Right: Standard For 25 mm adjustment on left
AR	For 25 mm adjustment on right Left: Standard
A	For 25 mm adjustment on both sides

Auto switch

Nil	Without auto switch

∗Refer to the table below for auto switch model numbers.

Number of auto switches

Nil	2 pcs.
S	1 pc.
n	"n" pcs.

Applicable auto switches/ Refer to pages 14 through 19 for detailed auto switch specifications.

Type	Special function	Electrical entry	Indicator light	Wiring (output)	Load voltage			Auto switch models		Lead wire length (m)∗			Applicable load	
					DC		AC	Electrical entry direction		0.5 (Nil)	3 (L)	5 (Z)		
								Perpendicular	In-line					
Reed switch	—	Grommet	No	2-wire	24V	5V 12V	100V or less	**A90V**	**A90**	●	●	—	IC circuit	Relay PLC
			Yes			12V	100V	**A93V**	**A93**	●	●	—	—	
				3-wire (NPN equiv.)	—	5V	—	**A96V**	**A96**	●	●	—	IC circuit	—
Solid state switch	—	Grommet	Yes	3-wire (NPN)	24V	5V 12V	—	**F9NV**	**F9N**	●	●	○	IC circuit	Relay PLC
				3-wire (PNP)				**F9PV**	**F9P**	●	●	○		
				2-wire		12V		**F9BV**	**F9B**	●	●	○	—	
	Diagnostic indication (2-color display)			3-wire (NPN)		5V 12V		**F9NWV**	**F9NW**	●	●	○	IC circuit	
				3-wire (PNP)				**F9PWV**	**F9PW**	●	●	○		
				2-wire		12V		**F9BWV**	**F9BW**	●	●	○	—	

∗Lead wire length symbols 0.5m ····· Nil (Example) F9NW
3m ····· L F9NWL
5m ····· Z F9NWZ

∗Solid state switches marked with a "○" symbol are produced upon receipt of order.

Specifications

Bore size (mm)	10	15	25
Fluid	Air		
Lubrication	Non-lube		
Actuation	Double acting		
Maximum operating pressure (MPa)	0.7		
Minimum operating pressure (MPa)	0.2		
Proof pressure (MPa)	1.05		
Ambient and fluid temperature (°C)	−10 to 60		
Piston speed (mm/s)	50 to 500		
Cushion	Built-in shock absorber		
Stroke length tolerance (mm)	0 to 250st: $^{+1.0}_{0}$	251 to 1000st: $^{+1.4}_{0}$	1001st to: $^{+1.8}_{0}$
Stroke adjustment movable range (mm) Note 1)	−1.2 to 0.8		−1.4 to 0.6
Piping type	Centralized piping		
Port size Note 2)	M5 x 0.8		1/8

Note 1) The stroke adjustment movable range in the above table is that for the standard adjustment bolt.
For more information, please refer to page 31.
Note 2) With ¿25, piping screws can be selected by the customer. (Refer to How to Order.)

Shock Absorber Specifications

Applicable bore size (mm)		10, 15	25
Shock absorber model		RB0805- X552	RB1006- X552
Max. energy absorption (J)		0.98	3.92
Stroke absorption (mm)		5	6
Max. impact speed (m/s) Note)		0.05 to 5	
Max. operating frequency (cycle/min)		80	70
Spring force (N)	When expanded	1.96	4.22
	When compressed	3.83	6.18
Weight (g)		15	25

Note) Represents the maximum absorption energy per cycle. Thus, the operation frequency can be increased with the absorption energy.

Standard Stroke

Bore size (mm)	Standard stroke (mm)	Maximum stroke available (mm)
10	50, 100, 150, 200, 250, 300	500
15	50, 100, 150, 200, 250, 300, 350, 400, 450, 500	750
25	100, 150, 200, 250, 300, 350, 400, 450, 500, 550, 600	1200

∗The stroke is available in 1 mm increments with the maximum stroke as the upper limit. For a stroke in the standard stroke range, suffix the part number with-XB10. If the stroke does not fall within the standard stroke range, suffix the part No. with-XB11.
Refer to the Made to Order Specifications on page 20.

Magnetic Holding Force

Unit: N

Bore size (mm)	10	15	25
Holding force	53.9	137	363

Made to order Specifications

(Refer to page 20 regarding Made to Order Specifications for series CY1F)

Theoretical Output

Unit: N

Bore size (mm)	Piston area (mm^2)	Operating pressure [MPa]					
		0.2	0.3	0.4	0.5	0.6	0.7
10	78	15	23	31	39	46	54
15	176	35	52	70	88	105	123
25	490	98	147	196	245	294	343

Note) Theoretical output (N) = Pressure (MPa) x Piston area (mm^2)

Weights

Unit: kg

Model	Basic weight	Additional weight per 50 mm stroke	Standard adjustment bolt weight	Weight of adjustment bolt for 25 mm adjustment
CY1F10	0.520	0.095	0.004	0.012
CY1F15	0.815	0.133	0.004	0.012
CY1F25	1.970	0.262	0.007	0.021

Calculation method example: CY1F15-150AL

Basic weight ····· 0.815kg
Additional weight ····· 0.133kg/50st
Standard adjustment bolt weight ····· 0.004kg
Weight of adjustment bolt for 25 mm adjustment ···· 0.012kg
0.815 + 0.133 x 150 ÷ 50 + 0.004 + 0.012 = 1.23 (kg)

Cylinder stroke ····· 150st
Left ····· 25 mm adjustment bolt
Right ····· Standard adjustment bolt

Option

Adjustment bolt

Bore size (mm)	Standard adjustment bolt	25 mm adjustment bolt
10, 15	CYF-S10	CYF-L10
25	CYF-S25	CYF-L25

Replacement Parts

Part number of replacement shock absorber

Bore size (mm)	Shock absorber model no.
10, 15	RB0805- X552
25	RB1006- X552

Note) Order 2 units for each unit of cylinder.

Replacement Actuator (Cylinder)

CY1F B 10 R Stroke

Cylinder identification symbol

Piping direction suffix

R	Centralized piping on right
L	Centralized piping on left

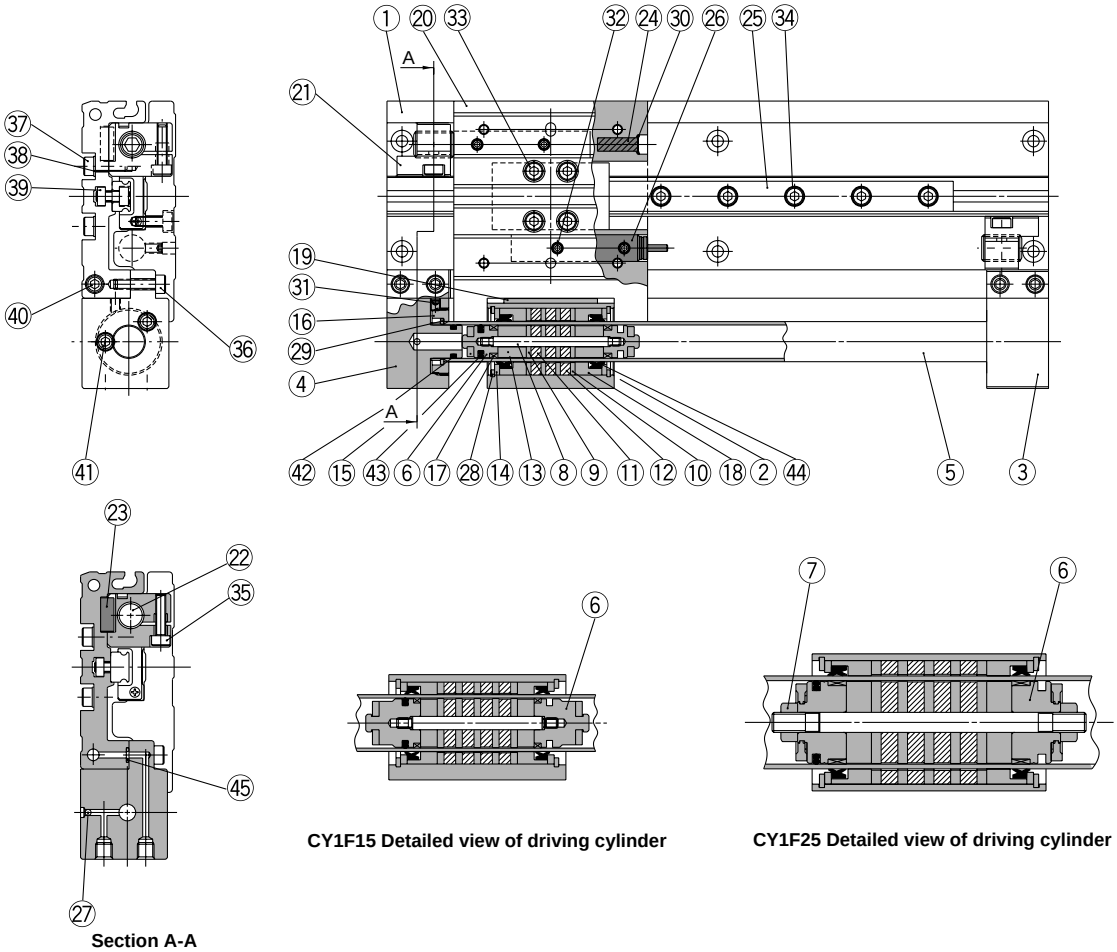
Bore size (mm)

10	10
15	15
25	25

Piping thread type

Symbol	Thread type	Bore size (mm)
Nil	M	10, 15
	Rc	25
TN	NPT	
TF	G	

Construction



Section A-A

CY1F15 Detailed view of driving cylinder

CY1F25 Detailed view of driving cylinder

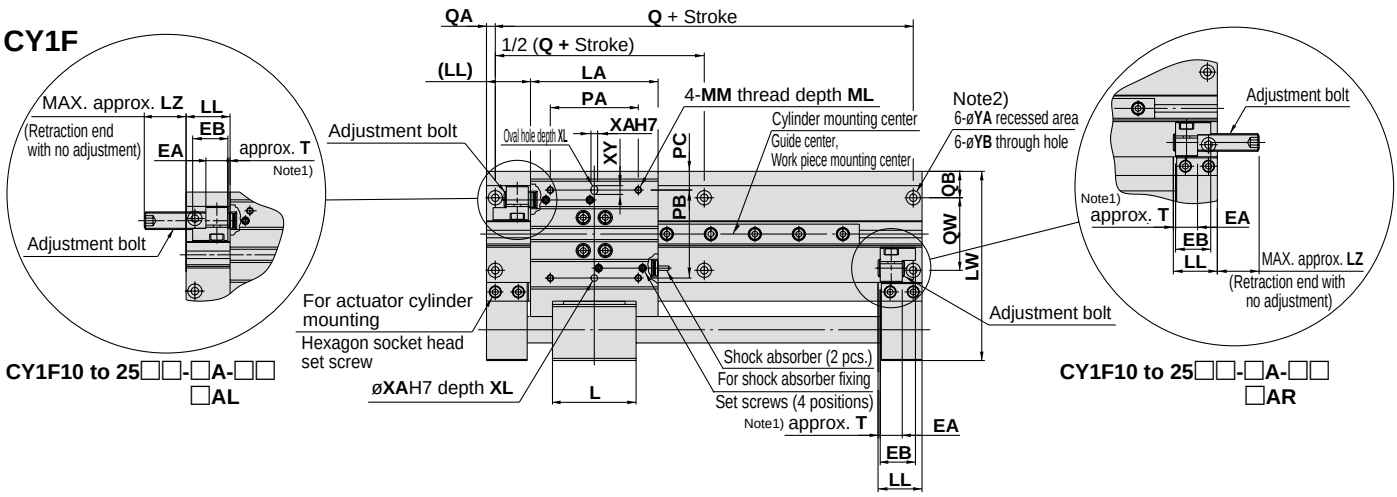
Parts list

No.	Description	Material	Note
1	**Body (rodless cylinder)**	Aluminium alloy	Anodized
2	**Body**	Aluminium alloy	Hard anodized
3	**End cover A**	Aluminium alloy	Hard anodized
4	**End cover B**	Aluminium alloy	Hard anodized
5	**Cylinder tube**	Stainless steel	
6	**Piston**	Aluminium alloy	Chromate (ø25)
		Brass	Electroless nickel plated (ø10, ø15)
7	**Piston nut**	Carbon steel	(Only for ø25)
8	**Shaft**	Stainless steel	
9	**Piston side yoke**	Rolled steel plate	Zinc chromated (ø15, ø25)
			Zinc chromated (ø10)
10	**External slider side yoke**	Rolled steel plate	Zinc chromated (ø15, ø25)
			Zinc chromated (ø10)
11	**Magnet A**	Rare earth magnet	(ø15, ø25)
			(ø10)
12	**Magnet B**	Rare earth magnet	(ø15, ø25)
			Chromate (ø10)
13	**Piston spacer**	Aluminium alloy	
14	**Spacer**	Rolled steel plate	Nickel plated
15	**Bumper**	Urethane rubber	
16	**Attachment ring**	Aluminium alloy	Hard anodized
17	**Wear ring A**	Special resin	
18	**Wear ring B**	Special resin	
19	**Wear ring C**	Special resin	
20	**Slide table**	Aluminium alloy	Hard anodized
21	**Adjuster holder**	Carbon steel	Electroless nickel plated

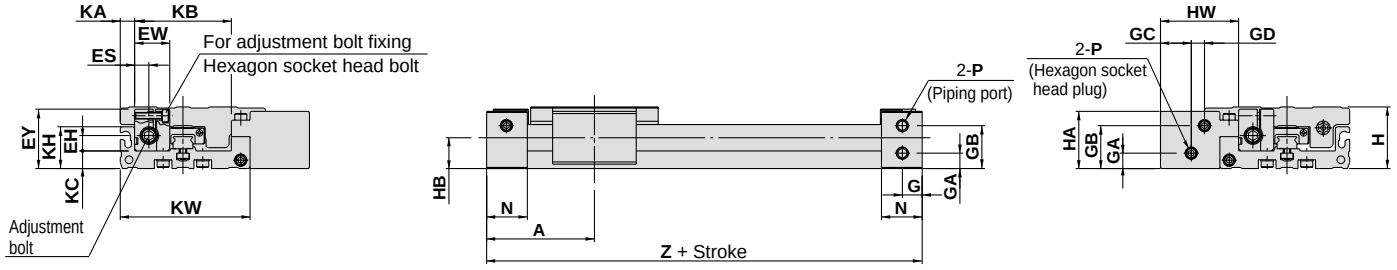
Parts list

No.	Description	Material	Note
22	**Adjustment bolt**	Chrome molybdenum steel	Nickel plated
23	**Adjuster holder positioning key**	Carbon steel	Zinc chromated
24	**Magnet**	Rare earth magnet	
25	**Guide**	———	
26	**Shock absorber**	———	
27	**Steel ball**	Bearing steel	
28	**C type snap ring for hole**	Carbon tool steel	Nickel plated
29	**C type snap ring for shaft**	Hard steel wire	(ø15)
		Stainless steel	(ø10, ø25)
30	**Snap ring**	Stainless steel	
31	**Hexagon socket head set screw**	Chrome molybdenum steel	Nickel plated
32	**Hexagon socket head set screw**	Chrome molybdenum steel	Nickel plated
33	**Hexagon socket head bolt**	Chrome molybdenum steel	Nickel plated
34	**Hexagon socket head bolt**	Chrome molybdenum steel	Nickel plated
35	**Hexagon socket head bolt**	Chrome molybdenum steel	Nickel plated
36	**Hexagon socket head bolt**	Chrome molybdenum steel	Nickel plated
37	**Hexagon socket head bolt**	Chrome molybdenum steel	Nickel plated
38	**Flat washer**	Rolled steel	Nickel plated
39	**Square nut**	Carbon steel	Nickel plated
40	**Hexagon socket head plug**	Chrome molybdenum steel	Nickel plated
41	**Hexagon socket head plug**	Chrome molybdenum steel	Nickel plated (Hexagon socket head taper plug for ø25)
42	**Cylinder tube gasket**	NBR	
43	**Piston seal**	NBR	
44	**Scraper**	NBR	
45	**Body (rodless cylinder) gasket**	NBR	

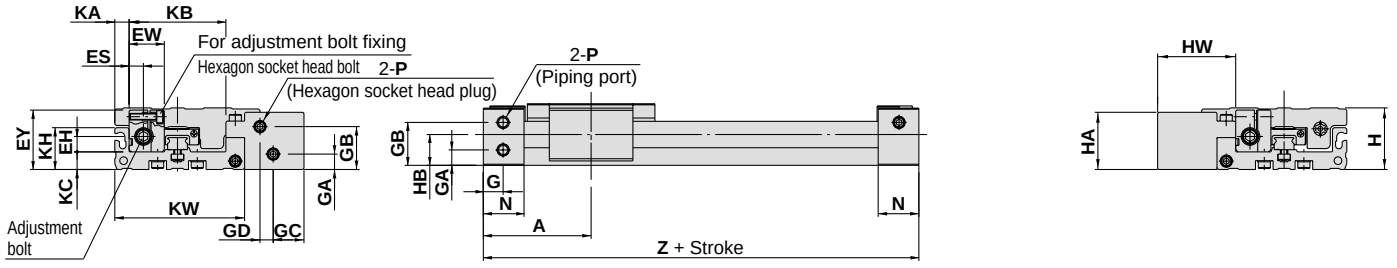
Dimensions



Concentrated piping on right (CY1F10 to 25□R-□□-□□)



Concentrated piping on left (CY1F10 to 25□L-□□-□□)



Model	Standard stroke	A	EA	EB	EH	ES	EW	EY	G	GA	GB	GC	GD	H	HA	HB	HW
CY1F10	50,100,150,200,250,300	49	10	16	7	6.5	16	27	9	7	19.5	14	6	28	26	14	35.5
CY1F15	50,100,150,200,250,300,350,400,450,500	52.5	10	16	7	6.5	16	29	9	8	23	17	9	34	32	17	41.5
CY1F25	50,100,150,200,250,300,350,400,450,500,550,600	70	13	17	10.5	8	22	40	10	12	33.5	22.5	12	46	44	23.5	55

Model	KA	KB	KC	KH	KW	L	LA	LL	LW	LZ	ML	MM	N	PA	PB	PC	Q	QA	QB	QW
CY1F10	6.5	44	8	19	59	38	58	20	86	19	5	M3 x 0.5	18.5	40	40	8.5	90	4	12	33
CY1F15	6.5	51	10	19	66	53	65	20	99	19	5	M3 x 0.5	18.5	50	50	7	97	4	12	40
CY1F25	7.5	66	13	27	84.5	70	89	25.5	128.5	17	9	M5 x 0.8	24	65	65	8	129	5.5	14.5	52

Model	T	XA	XL	XY	YA	YB	Z	Shock absorber
CY1F10	1	$3^{+0.012}_{0}$	4	4	6.5 depth 3.4	3.4	98	RB0805- X552
CY1F15	1	$3^{+0.012}_{0}$	4	4	6.5 depth 3.4	3.4	105	RB0805- X552
CY1F25	1	$5^{+0.012}_{0}$	5	7.5	9.5 depth 5.4	5.5	140	RB1006- X552

Model	P (Piping port)		
	Nil	**TN**	**TF**
CY1F10	M5 x 0.8	—	—
CY1F15	M5 x 0.8	—	—
CY1F25	Rc1/8	NPT1/8	G1/8

Note 1) When adjusting the stroke, keep the T dimension within a 0 to 2 mm range. However, with the 25 mm adjustment bolt, an adjustment range of 0 to 26 mm is available.
Note 2) There are four øYA and øYB dimensions with a 50 mm stroke.

Proper Mounting Position for Stroke End Detection

D-A9□, D-A9□V (mm)

Bore size (mm)	Mounting pattern①		Mounting pattern②		Mounting pattern③		* Operating range
	A1	B1	A2	B2	A3	B3	
10	38	60	18	80	38	80	9
15	39	66	19	86	39	86	10
25	44.5	95.5	24.5	115.5	44.5	115.5	11

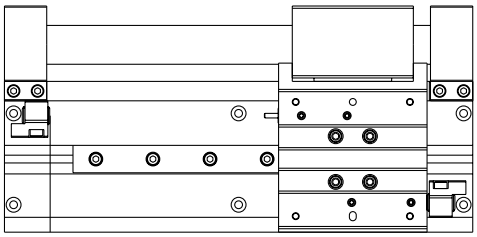
D-F9□, D-F9□V (mm)

Bore size (mm)	Mounting pattern①		Mounting pattern②		Mounting pattern③		* Operating range
	A1	B1	A2	B2	A3	B3	
10	34	64	22	76	34	76	5.5
15	35	70	23	82	35	82	5
25	40.5	99.5	28.5	111.5	40.5	111.5	5

D-F9□W, D-F9□WV (mm)

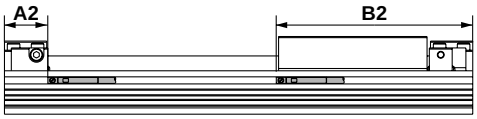
Bore size (mm)	Mounting pattern①		Mounting pattern②		Mounting pattern③		* Operating range
	A1	B1	A2	B2	A3	B3	
10	34	64	22	76	34	76	5.5
15	35	70	23	82	35	82	5
25	40.5	99.5	28.5	111.5	40.5	111.5	5

∗These values are given as a guideline including the hysteresis and are not guaranteed. They may vary significantly depending on the ambient environment (with ±30% variation).

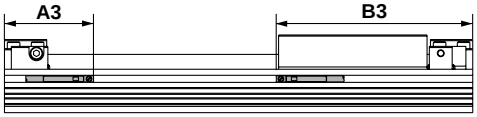


Mounting pattern①

Mounting pattern②



Mounting pattern③



⚠Caution

①**When adjusting the stroke, confirm the minimum stroke for auto switch mounting.**
See the table below for the minimum stroke for auto switch mounting.

Minimum stroke for auto switch mounting (1pc.) (mm)

Bore size (mm)	D-A9□, D-A9□V D-F9□, D-F9□V	D-F9□W D-F9□WV
10	5	10
15		
25		

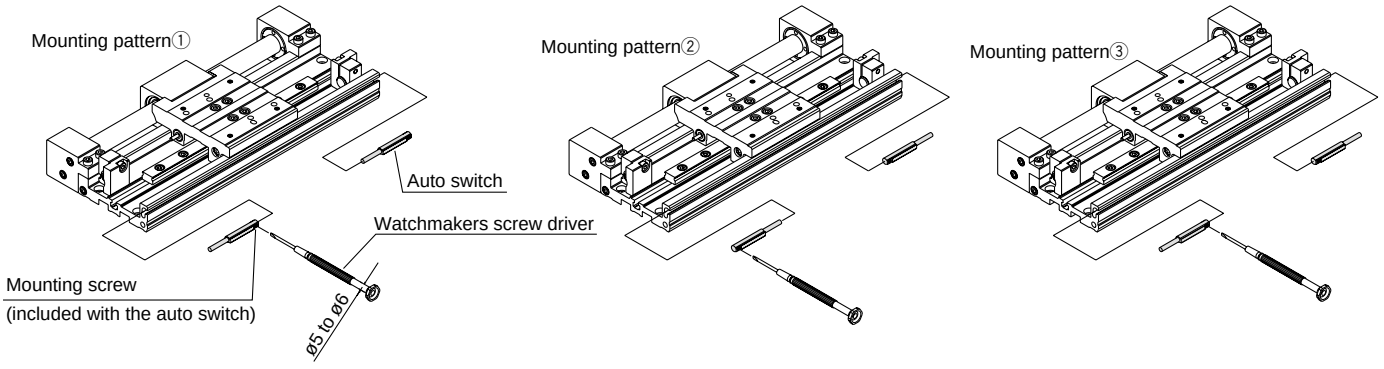
Minimum stroke for auto switch mounting (2pcs.) (mm)

Bore size (mm)	D-A90 D-A96	D-A93	D-A90V D-A96V D-A93V	D-F9□ D-F9□W	D-F9□V D-F9□WV
Mounting pattern①, ②	32	35	22	32	20
Mounting pattern③	20			12	

Auto Switch Mounting

As shown below, there are 3 ways to mount the auto switch according to 3 types of electrical entries. Insert the auto switch into the switch groove. Then use a flat head watchmaker's screw driver to tighten the included fixing screws.

Note) When tightening the holding screw (included with the auto switch), use a watchmakers screw driver with a handle 5 to 6mm in diameter. The tightening torque should be 0.1 to 0.2N·m.



Series CY1F
Auto Switch Specifications

Auto Switch Common Specifications

Type	Reed switch	Solid state switch
Leakage current	None	3wire: 100μA or less, 2-wire: 0.8mA or less
Operating time	1.2ms	1ms or less
Impact resistance	300m/s^2	1000m/s^2
Insulation resistance	50MΩ or more at 500VDC (between lead wire and case)	
Withstand voltage	1500VAC for 1min. (between lead wire and case)	1000VAC for 1min. (between lead wire and case)
Ambient temperature	−10 to 60°C	
Enclosure	IEC529 standard IP67, JISC0920 watertight construction	

Lead Wire Length

Lead wire length indication

(Example) **D-F9P L**

Lead wire length

Nil	0.5m
L	3m
Z	5m

Note 1) Lead wire length Z: 5m applicable auto switches
Solid state: All types are produced upon receipt of order (standard availability)
Note 2) For solid state switches with flexible lead wire specification, add "-61" at the end of the lead wire length.

(Example) D-F9PL- 61

Flexible specification

Contact Protection Boxes/CD-P11, CD-P12

<Applicable switches>

D-A9/A9□V

The above auto switches do not have internal contact protection circuits.

①**The operating load is an induction load.**

②**The length of wiring to load is 5m or more.**

③**The load voltage is 100 or 200 VAC.**

Use a contact protection box in any of the above situations.

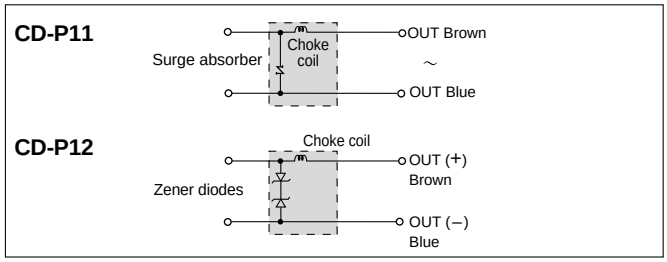
The life of the contacts may otherwise be reduced. (The may stay ON all the time.)

Specifications

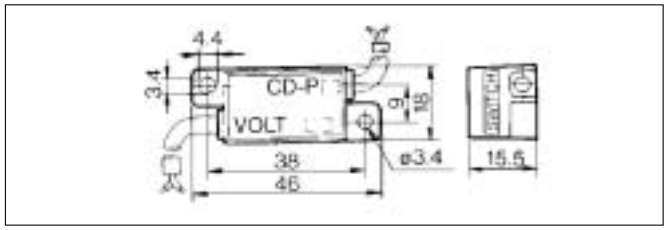
Part no	CD-P11		CD-P12
Load voltage	100VAC	200VAC	24VDC
Maximum load current	25mA	12.5mA	50mA

∗Lead wire length — Switch connection side 0.5m
Load connection side 0.5m

Internal circuits



Dimensions



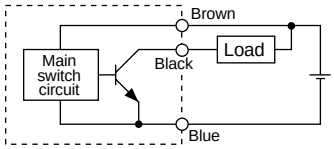
Connection

To connect a switch to a contact protection box, connect the lead wire from the side of the contact protection box marked SWITCH to the lead wire coming out of the switch. Furthermore, the switch unit should be kept as close as possible to the contact protection box, with a lead wire length of no more than 1 meter between them.

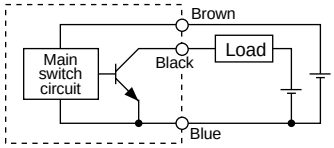
Series CY1F
Auto Switch Connections and Examples

Basic Wiring

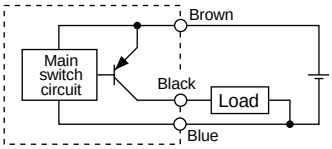
Solid state 3-wire, NPN



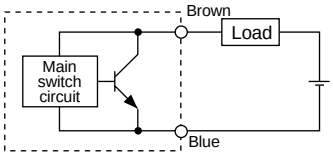
(Power supplies for switch and load are separate.)

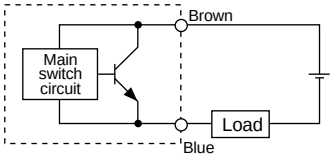


Solid state 3-wire, PNP

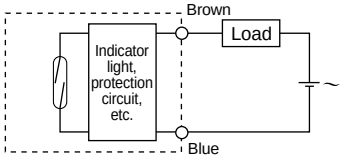


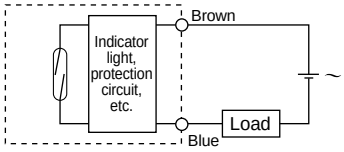
2-wire <Solid state>





2-wire <Reed switch>

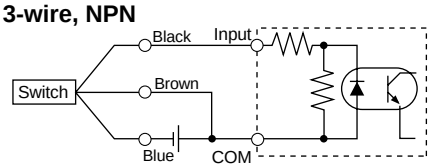




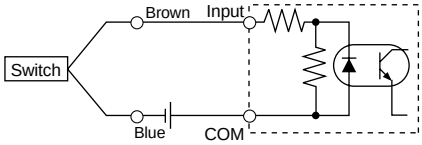
Examples of Connection to PLC

Sink input specifications

3-wire, NPN

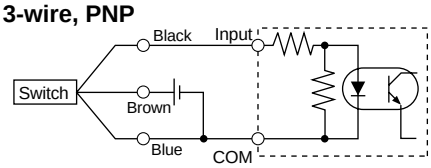


2-wire

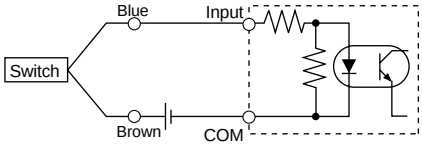


Source input specifications

3-wire, PNP



2-wire

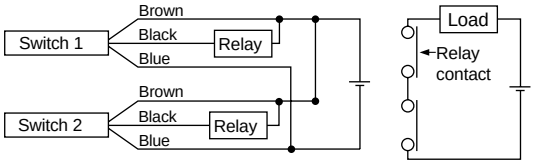


Connect according to the applicable PLC input specifications, as the connection method will vary depending on the PLC input specifications.

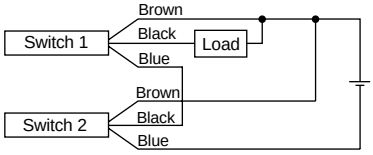
Connection Examples for AND (Series) and OR (Parallel)

3-wire

AND connection for NPN output (Using relays)

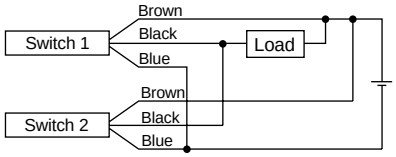


AND connection for NPN output (Performed with switches only)

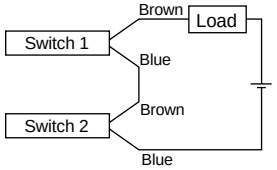


The indicator lights will light up when both switches are turned ON.

OR connection for NPN output



2-wire with 2 switch AND connection



When two switches are connected in series, a load may malfunction because the load voltage will decline when in the ON state.
The indicator lights will light up if both of the switches are in the ON state.

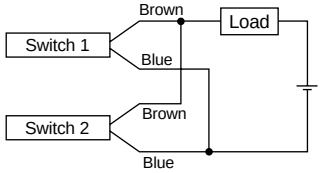
Load voltage at ON = $\frac{\text{Power supply voltage}}{} - \frac{\text{Internal voltage drop}}{}$ x 2 pcs.

= 24V − 4V x 2 pcs.

= 16V

Example: Power supply is 24VDC
Internal voltage drop in switch is 4V

2-wire with 2 switch OR connection



<Solid state>
When two switches are connected in parallel, malfunction may occur because the load voltage will increase when in the OFF state.

<Reed switch>
Because there is no current leakage, the load voltage will not increase when turned OFF. However, depending on the number of switches in the ON state, the indicator lights may sometimes dim or not light up, because of dispersion and reduction of the current flowing to the switches.

Load voltage at OFF = $\frac{\text{Leakage current}}{}$ x 2 pcs. x $\frac{\text{Load impedance}}{}$

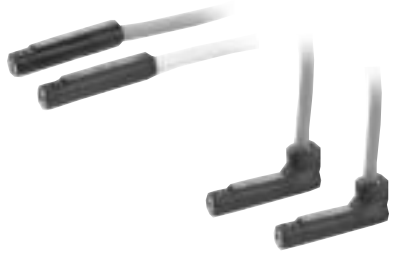
= 1mA x 2 pcs. x 3kΩ

= 6V

Example: Load impedance is 3kΩ
Leakage current from switch is 1mA

Reed Switches/Direct Mount Type
D-A90(V), D-A93(V), D-A96(V)

Grommet
Electrical entry direction: Side



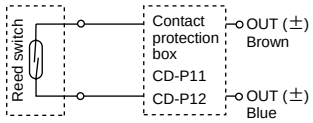
⚠Caution

Precautions

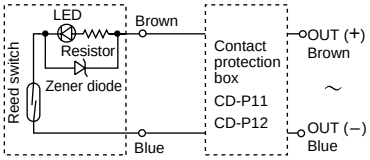
①Be sure to use fixing screws attached to the auto switch to secure the switch. Use of screws out of the specifications can damage the switch.

Auto Switch Internal Circuits

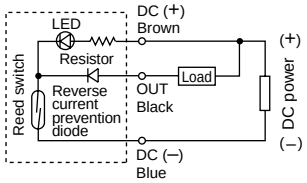
D-A90V



D-A93V



D-A96V



Note) ①The operating load is inductive load.
②The wiring to the load is 5 m or longer.
③The load voltage is 100VAC.
If any of the above conditions is applicable, the life time of the contact may be shortened. Use a contact protection box. (Refer to page 15 about the contact protection box.)

Auto Switch Specifications

D-A90, D-A90V (without indicator light)			
Auto switch part no.	D-A90, D-A90V		
Applicable load	IC circuit, Relay, PLC		
Load voltage	24V AC/DC or less	48V AC/DC or less	100V AC/DC or less
Maximum load current	50mA	40mA	20mA
Contact protection circuit	None		
Internal resistance	1Ω or less (including 3m lead wire length)		

D-A93, D-A93V, D-A96, D-A96V (with indicator light)			
Auto switch part no.	D-A93, D-A93V		D-A96, D-A96V
Applicable load	Relay, PLC		IC circuit
Load voltage	24VDC	100VAC	4 to 8VDC
Load current range and maximum load current	5 to 40mA	5 to 20mA	20mA
Contact protection circuit	None		
Internal voltage drop	D-A93 – 2.4V or less (to 20mA)/ 3V or less (to 40mA) D-A93V – 2.7V or less		0.8V or less
Indicator light	Red LED lights when ON		

- Lead wire
  D-A90(V), D-A93(V) — Oil resistant vynil heavy duty cable ø2.7, 0.18mm² x 2-wire (brown, blue), 0.5m
  D-A96(V) ———— Oil resistant vynil heavy duty cable ø2.7, 0.15mm² x 3-wire (brown, black, blue), 0.5m

Note 1) Refer to page 15 for reed state switch common specifications.
Note 2) Refer to page 15 for lead wire length.

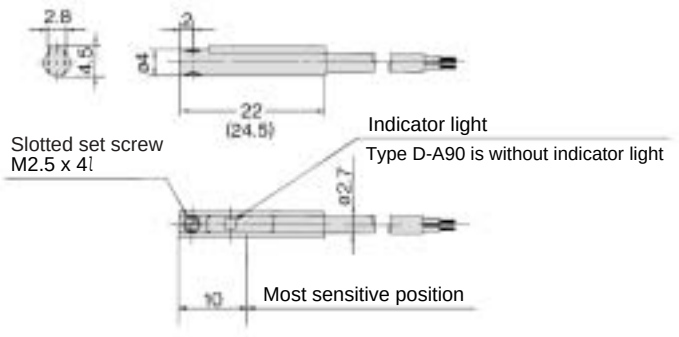
Auto Switch Weights

(g)

Model	D-A90	D-A90V	D-A93	D-A93V	D-A96	D-A96V
Lead wire length 0.5m	6	6	6	6	8	8
Lead wire length 3m	30	30	30	30	41	41

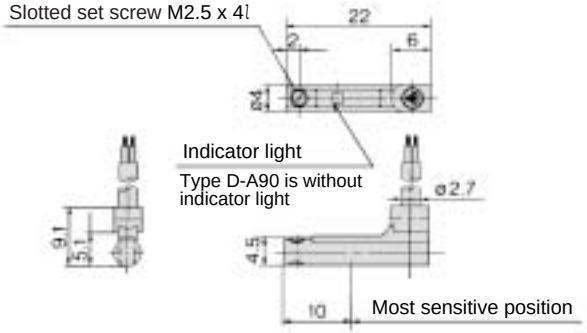
Auto Switch Dimensions

D-A90, D-A93, D-A96



Type D-A93 dimensions are shown inside ( ).

D-A90V, D-A93V, D-A96V



Solid State Switches/Direct Mount Type
D-F9N(V), D-F9P(V), D-F9B(V)

Grommet

⚠Caution

Precautions

Be sure to use fixing screws attached to the auto switch to secure the switch. Use of screws out of the specifications can damage the switch.

Auto Switch Specifications

D-F9□, D-F9□V (with indicator light)						
Auto switch part no.	D-F9N	D-F9NV	D-F9P	D-F9PV	D-F9B	D-F9BV
Electrical entry direction	In-line	Perpendicular	In-line	Perpendicular	In-line	Perpendicular
Wiring type	3-wire				2-wire	
Output type	NPN		PNP		—	
Applicable load	IC circuit, Relay, PLC				24VDC relay, PLC	
Power supply voltage	5, 12, 24VDC (4.5 to 28V)				—	
Current consumption	10mA or less				—	
Load voltage	28VDC or less		—		24VDC (10 to 8V)	
Load current	40mA or less		80mA or less		5 to 40mA	
Internal voltage drop	1.5V or less (0.8V or less at 10mA load current)		0.8V or less		4V or less	
Leakage current	100μA or less at 24VDC				0.8mA or less	
Indicator light	Red LED lights when ON					

- Lead wire — Oil proof heavy duty vinyl cord, ø2.7, 3 cores (brown, black, blue), 0.15mm², 2 cores (brown, blue), 0.18 mm², 0.5m

Note 1) Refer to page 15 for solid state switch common specifications.
Note 2) Refer to page 15 for lead wire length.

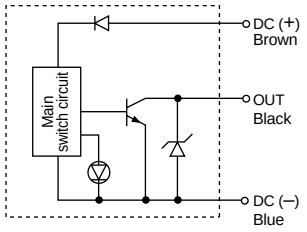
Auto Switch Weights

Unit: g

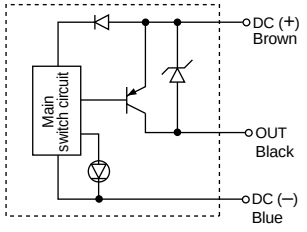
Model		D-F9N(V)	D-F9P(V)	D-F9B(V)
Lead wire length m	0.5	7	7	6
	3	37	37	31
	5	61	61	51

Auto Switch Internal Circuits

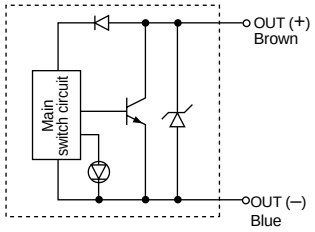
D-F9N, F9NV



D-F9P, F9PV

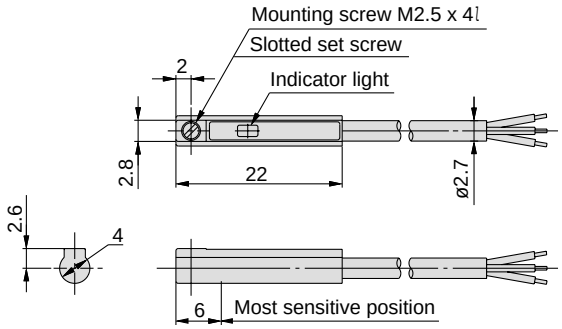


D-F9B, F9BV

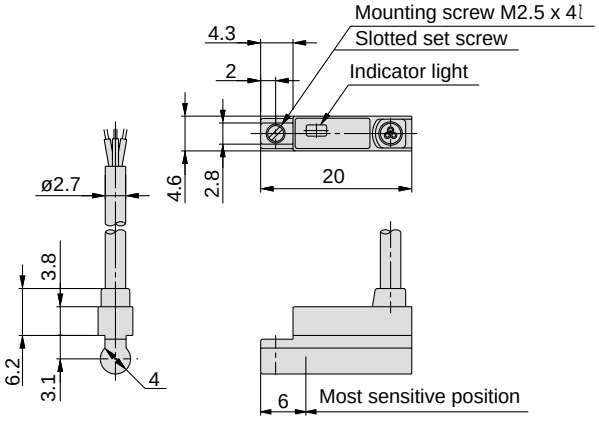


Auto Switch Dimensions

D-F9□



D-F9□V

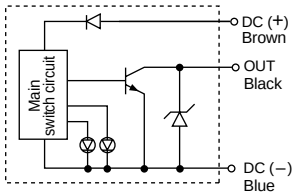


2-Color Display
Solid State Switches/Direct Mount Type
D-F9NW(V), D-F9PW(V), D-F9BW(V)

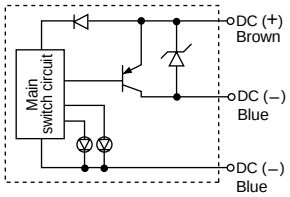
Grommet

Auto Switch Internal Circuits

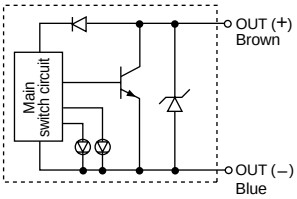
D-F9NW, F9NWV



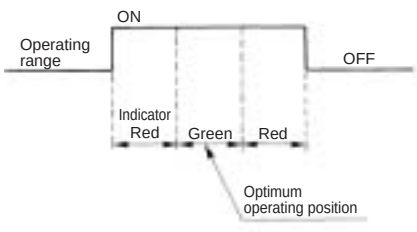
D-F9PW, F9PWV



D-F9BW, F9BWV



Indicator light/Display method



Auto Switch Specifications

D-F9□W, D-F9□WV (with Indicator light)						
Auto switch part no.	D-F9NW	D-F9NWV	D-F9PW	D-F9PWV	D-F9BW	D-F9BWV
Electrical entry direction	In-line	Perpendicular	In-line	Perpendicular	In-line	Perpendicular
Wiring type	3-wire				2-wire	
Output type	NPN		PNP		—	
Applicable load	IC circuit, Relay IC, PLC				24VDC relay, PLC	
Power supply voltage	5, 12, 24VDC (4.5 to 28V)				—	
Current consumption	10mA or less				—	
Load voltage	28VDC or less		—		24VDC (10 to 28V)	
Load current	40mA or less		80mA or less		5 to 40mA	
Internal voltage drop	1.5V or less (0.8V or less at 10mA load current)		0.8V or less		4V or less	
Leakage current	100μA or less at 24VDC				0.8mA or less	
Indicator light	Actuated position ····· Red LED lights up Optimum operating position ··· Green LED lights up					

• Lead wire — Oil proof heavy duty vinyl cord, ø2.7, 3 cores (brown, black, blue), 0.15mm², 2 cores (brown, blue), 0.18mm², 0.5m

Note 1) Refer to page 15 for solid state switch common specifications.

Note 2) Refer to page 15 for lead wire length.

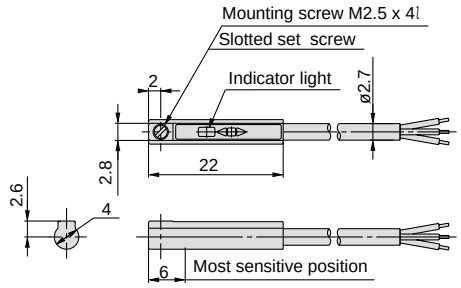
Auto Switch Weights

Unit: g

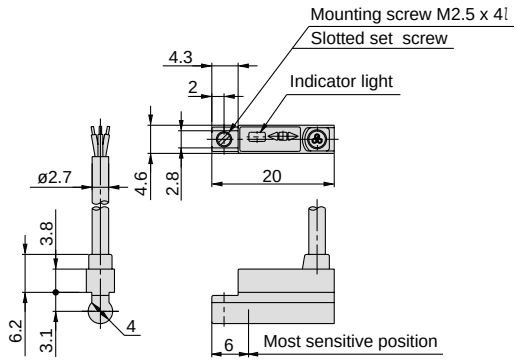
Model		D-F9NW(V)	D-F9PW(V)	D-F9BW(V)
Lead wire length m	0.5	7	7	7
	3	34	34	32
	5	56	56	52

Auto Switch Dimensions

D-F9□W



D-F9□WV



Series CY1F
Made to Order Specifications

Contact P/A for detailed specifications, lead times and prices.

1 Intermediate stroke

Symbol **-XB10**

Intermediate strokes are available within the standard stroke range.
The stroke can be set in 1mm increments.

Stroke range

Bore size (mm)	Stroke range (mm)
10	51 to 299
15	51 to 499
25	101 to 599

CY1F [Bore size] [Piping thread type] [Piping direction]–[Stroke] [Adjustment bolt symbol]–[Auto switch] [Symbol]–**XB10**

Example CY1F10R–237AL–A93–**XB10**

2 Long stroke

Symbol **-XB11**

Available with long strokes exceeding the standard strokes.
The stroke can be set in 1mm increments.

Stroke range

Bore size (mm)	Stroke range (mm)
10	301 to 500
15	501 to 750
25	601 to 1200

CY1F [Bore size] [Piping thread type] [Piping direction]–[Stroke] [Adjustment bolt symbol]–[Auto switch] [Symbol]–**XB11**

Example CY1F25L–777A–A93–**XB11**