




# Smooth Cylinder



**Minimum operating pressure 0.01 to 0.03 MPa**

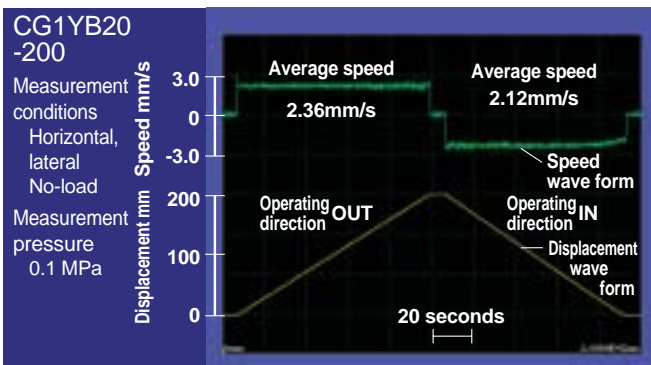
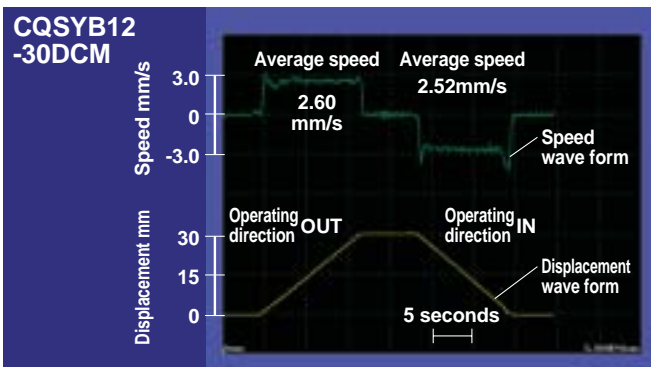
Bore size (mm)	Minimum operating pressure (MPa)
12	0.03
16	0.03
20	0.02
25	0.02
32	0.02
40	0.02
50	0.01
63	0.01
80	0.01
100	0.01

(Measurement based on JIS B8377)

**Series CQSY/CQ2Y/CM2Y/CG1Y/CA2Y**  
 ø12 to ø25    ø32 to ø100    ø20 to ø40    ø20 to ø100    ø40 to ø100

**Stable operation possible even at a low speed of 5 mm/s (measurement based on JIS B8377)**

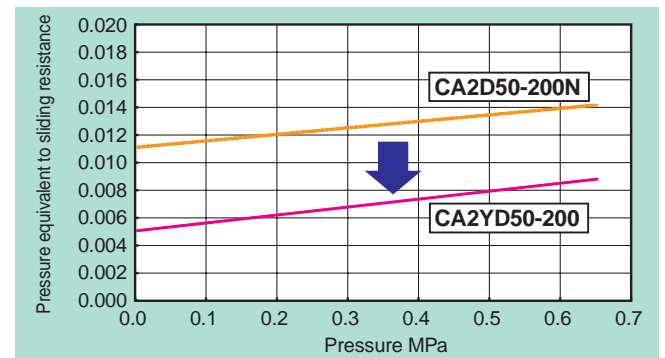
Smooth operation with less sticking and slipping



**Sliding resistance**

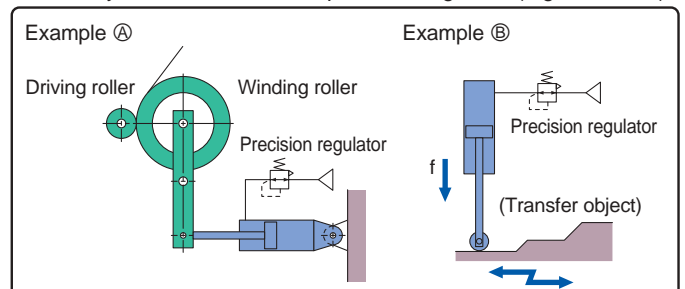
Bi-directional low-friction operation possible.

Pressure can be controlled regardless of its direction.



**Example**

Smooth cylinder combined with precision regulator (e.g. Series IR)



# Smooth Cylinder Series CQSY

ø12, ø16, ø20, ø25

Specifications and auto switch information not provided below are the same as those of the anti-lateral load type of Series CQS□S. Please refer to page 2.2-30 and the subsequent pages of Best Pneumatics Vol. 2.



## How to Order

**Standard**

**CQSY B 20-30 D C**

**With auto switch**

**CDQSY B 20-30 D C F9BW S**

**With auto switch**  
(Built-in magnet)

**Mounting**

<b>B</b>	Through-hole/Both ends tapped (Standard)
<b>L</b>	Foot
<b>F</b>	Front flange
<b>G</b>	Rear flange
<b>D</b>	Double clevis

\* Mounting brackets are not mounted and are supplied loose at the time of shipment.

**Bore size**

<b>12</b>	12 mm
<b>16</b>	16 mm
<b>20</b>	20 mm
<b>25</b>	25 mm

**Cylinder stroke (mm)**  
→ Refer to "Standard stroke table" on page 2.

**Number of auto switches**

<b>Nil</b>	2 pcs.
<b>S</b>	1 pc.
<b>n</b>	n pcs.

**Auto switch**

<b>Nil</b>	Without auto switch (Built-in magnet)
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\* Please select the applicable auto switch model from the table below.  
\* Auto switches are not mounted and are supplied loose at the time of shipment.  
Note) Please also confirm whether the selected auto switch can be mounted at the desired position. Auto switches of models A9□V and F9□V may not be mounted on the side with ports due to the cylinder stroke or the size of the fittings.

**Bumper/Rod end thread**

<b>C</b>	Rubber bumper & Rod end female thread
<b>CM</b>	Rubber bumper & Rod end male thread

**Action**

<b>D</b>	Double acting
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### Applicable Auto Switches / For detailed auto switch specifications, please refer to page 5.3-2 of Best Pneumatics Vol. 2. For the specifications of D-M9, please refer to SMC Information '02-E500.

Type	Special function	Electrical entry	Indicator	Wiring (Output)	Load voltage			Auto switch model		Lead wire (m)*			Pre-wired connector	Applicable load	
					DC	AC		Perpendicular	In-line	0.5 (Nil)	3 (L)	5 (Z)			
Reed switch	-	Grommet	Yes	3-wire (Equiv. NPN)	-	5 V	-	<b>A96V</b>	<b>A96</b>	●	●	-	-	IC	-
				2-wire	24 V	12 V	100 V	<b>A93V</b>	<b>A93</b>	●	●	-	-	-	Relay, PLC
Solid state switch	-	Grommet	Yes	3-wire (NPN)	24 V	5 V, 12 V	-	-	<b>M9N</b>	●	●	-	-	IC	Relay, PLC
				3-wire (PNP)				-	<b>M9P</b>	●	●	-	-		
				2-wire				-	<b>M9B</b>	●	●	-	-		
				3-wire (NPN)				<b>F9NV</b>	<b>F9N</b>	●	●	○	○		
				3-wire (PNP)	<b>F9PV</b>	<b>F9P</b>	●	●	○	○					
				2-wire	<b>F9BV</b>	<b>F9B</b>	●	●	○	○					
				3-wire (NPN)	<b>F9NVV</b>	<b>F9NV</b>	●	●	○	○					
				3-wire (PNP)	<b>F9PVV</b>	<b>F9PV</b>	●	●	○	○					
				2-wire	<b>F9BWW</b>	<b>F9BW</b>	●	●	○	○					
				2-wire	-	<b>F9BA</b>	-	●	○	○					

\* Lead wire length 0.5 m ..... Nil (Example) A93  
3 m ..... L (Example) A93L  
5 m ..... Z (Example) F9NWZ

\* ○: Manufactured upon receipt of order.

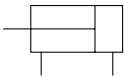
In addition to the models in the above table, there are some other auto switches that are applicable. For more information, refer to page 2.2-37 of Best Pneumatics Vol. 2.



## Specifications

Model	Pneumatic (Non-lube)
Action	Double acting, single rod
Fluid	Air
Proof pressure	1.05 MPa
Maximum operating pressure	0.7 MPa
Ambient and fluid temperature	Without auto switch -10 to 70°C (with no freezing) With auto switch -10 to 60°C (with no freezing)
Cushion	Rubber bumper
Rod end thread	Female thread
Rod end thread tolerance	JIS class 2
Stroke length tolerance	$\begin{matrix} +1.0 \\ 0 \end{matrix}$
Mounting	Through-hole/Both ends tapped
Operating piston speed	5 to 500 mm/s
Allowable leakage rate	0.5 /min (ANR) or less

### JIS symbol



## Minimum Operating Pressure

Unit: MPa				
Bore size (mm)	12	16	20	25
Minimum operating pressure	0.03		0.02	

## Standard Stroke Table

Bore size (mm)	Standard stroke (mm)
12, 16	5, 10, 15, 20, 25, 30
20, 25	5, 10, 15, 20, 25, 30, 35, 40, 45, 50

## Replacement Parts: Seal Kits

Bore size (mm)	Kit No.	Contents
12	CQSY12-PS	Piston seal 1 pc.
16	CQSY16-PS	Rod seal 1 pc.
20	CQSY20-PS	Tube gasket 1 pc.
25	CQSY25-PS	Grease pack (10 g) 1 pc.

When only grease for maintenance is necessary, please order by the following part numbers.

**Grease pack** GR-L-005 (5 g)  
GR-L-010 (10 g)  
GR-L-150 (150 g)

## Theoretical Output Table

Unit: N						
Bore size (mm)	Rod size (mm)	Operating direction	Piston area (mm <sup>2</sup> )	Operating pressure (MPa)		
				0.3	0.5	0.7
12	6	IN	84.8	25	42	59
		OUT	113	34	57	79
16	8	IN	151	45	75	106
		OUT	201	60	101	141
20	10	IN	236	71	118	165
		OUT	314	94	157	220
25	12	IN	378	113	189	264
		OUT	491	147	245	344

## Intermediate Strokes

Method	Installation of spacer on standard stroke body.	
Model no.	Refer to page 1 for standard model no.	
Standard stroke	Method	Intermediate strokes at 1 mm intervals are available by using spacers with standard stroke cylinders.
	Stroke range	Bore size (mm)
		Stroke range (mm)
Example	Model no.: CQSYB25-47DC CQSYB25-50DC with 3 mm width spacer inside. B dimension is 77.5 mm. Calculation: $\varnothing 25$ , B dimension 27.5 mm (without switch) $27.5 \text{ (B dimension)} + 50 \text{ (st)} = 77.5 \text{ (mm)}$	

# Series CQSY

Mounting bracket dimensions are the same as those of the anti-lateral load type of Series CQS□S.

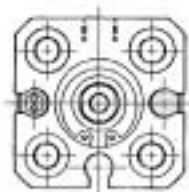


Please refer to page 2.2-30 and the subsequent pages of Best Pneumatics Vol. 2.

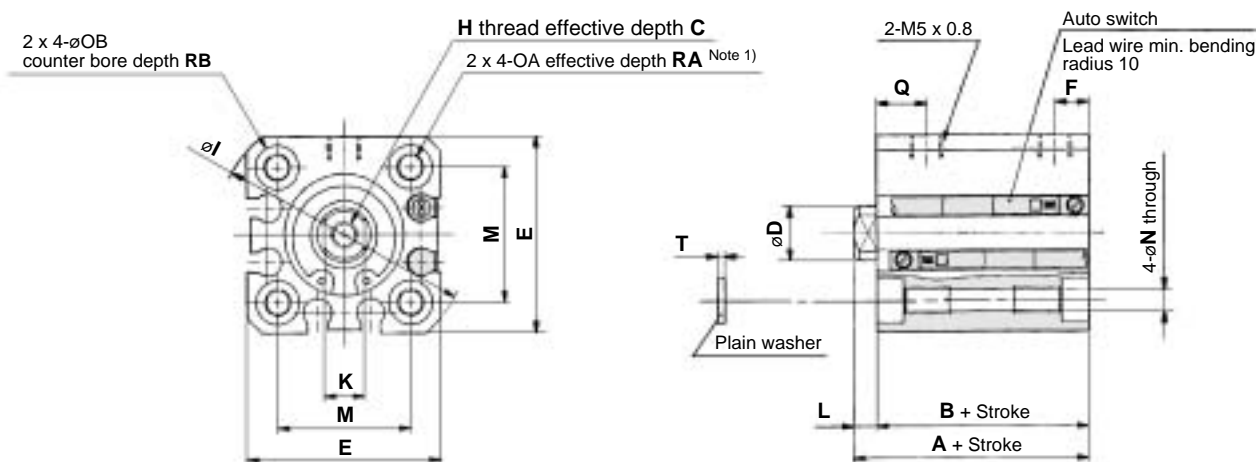
## Dimensions/ø12 to ø25

### Standard (Through-hole/Both ends tapped)/CQSYB, CDQSYB

ø12

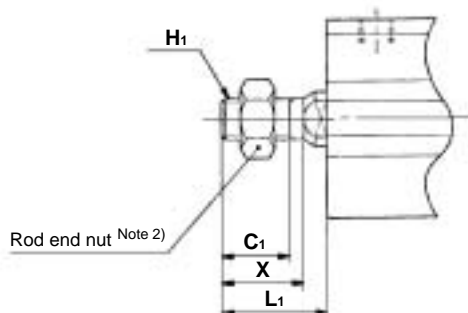


ø16



ø20, ø25

### Rod end male thread



### Rod end male thread (mm)

Bore size (mm)	C <sub>1</sub>	H <sub>1</sub>	L <sub>1</sub>	X
12	9	M5 x 0.8	14	10.5
16	10	M6 x 1.0	15.5	12
20	12	M8 x 1.25	18.5	14
25	15	M10 x 1.25	22.5	17.5

### Standard

Bore size (mm)	Stroke range (mm)	Without auto switch		With auto switch		C	D	E	F	H	I	K	L	M	N	OA	OB	Q	RA	RB	T
		A	B	A	B																
12	5 to 30	25.5	22	30.5	27	6	6	25	5	M3 x 0.5	32	5	3.5	15.5	3.5	M4 x 0.7	6.5	7.5	7	4	0.5
16	5 to 30	25.5	22	30.5	27	8	8	29	5	M4 x 0.7	38	6	3.5	20	3.5	M4 x 0.7	6.5	7.5	7	4	0.5
20	5 to 50	29	24.5	39	34.5	7	10	36	5.5	M5 x 0.8	47	8	4.5	25.5	5.4	M6 x 1.0	9	9	10	7	1
25	5 to 50	32.5	27.5	42.5	37.5	12	12	40	5.5	M6 x 1.0	52	10	5	28	5.4	M6 x 1.0	9	11	10	7	1

Note 1) Threaded through hole is used for the standard of ø20 with 5 to 10 mm strokes and ø25 with a 5 mm stroke.

Note 2) For more information about the rod end nut and accessories, please refer to page 2.3-18 of Best Pneumatics Vol. 2.

# Smooth Cylinder Series CQ2Y

ø32, ø40, ø50, ø63, ø80, ø100

Specifications and auto switch information not provided below are the same as those of the anti-lateral load type of Series CQ2□S. Please refer to page 2.3-118 and the subsequent pages of Best Pneumatics Vol. 2.



## How to Order

**Standard**

**CQ2Y** B 32   30 D C

**With auto switch**

**CDQ2Y** B 32   30 D C   F9BW S

**Mounting**

<b>B</b>	Through-hole (Standard)
<b>A</b>	Both ends tapped
<b>L</b>	Foot
<b>F</b>	Front flange
<b>G</b>	Rear flange
<b>D</b>	Double clevis

\* Mounting brackets are not mounted and are supplied loose at the time of shipment.

**Bore size**

<b>32</b>	32 mm
<b>40</b>	40 mm
<b>50</b>	50 mm
<b>63</b>	63 mm
<b>80</b>	80 mm
<b>100</b>	100 mm

**Port thread type**

<b>Nil</b>	Rc
<b>TN</b>	NPT
<b>TF</b>	G

**Cylinder stroke (mm)**

→ Refer to Standard stroke table on page 5.

**Action**

<b>D</b>	Double acting
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**Cushion**

<b>C</b>	Rubber bumper
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**Body option**

<b>Nil</b>	Standard (Rod end female thread)
<b>M</b>	Rod end male thread

**Number of auto switches**

<b>Nil</b>	2 pcs.
<b>S</b>	1 pc.
<b>n</b>	n pcs.

**Auto switch**

<b>Nil</b>	Without auto switch (Built-in magnet)
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\* Please select the applicable auto switch model from the table below.  
\* Auto switches are not mounted and are supplied loose at the time of shipment (except for D-P5DWL).

## Applicable Auto Switches / For detailed auto switch specifications, please refer to page 5.3-2 of Best Pneumatics Vol. 2. For the specifications of D-M9, please refer to SMC Information '02-E500.

Type	Special function	Electrical entry	Indicator	Wiring (Output)	Load voltage		Rail mounting		Direct mounting		Lead wire (m)*				Pre-wired connector	Applicable load				
					DC	AC	ø12 to ø100		ø32 to ø100		0.5 (Nil)	3 (L)	5 (Z)	None (N)		IC	Relay, PLC			
							Perp.	In-line	Perp.	In-line										
Reed switch	-	Grommet	Yes	3-wire (Equiv. NPN)	-	5 V	-	A76H	A96V	A96	●	●	-	-	-	IC	-			
				2-wire	-	-	200 V	A72	A72H	-	-	●	●	-	-	-	-	-	Relay, PLC	
					24 V	12 V	100 V	A73	A73H	-	-	●	●	●	-	-	-			
					12 V	-	-	A73C	-	-	-	●	●	●	●	-	-			
Diagnostic indication (2-color)	Grommet	Yes	-	-	-	A79W	-	-	-	●	●	-	-	-	-	-				
Solid state switch	-	Grommet	Yes	3-wire (NPN)	24 V	5 V, 12 V	-	F7NV	F79	F9NV	F9N	●	●	○	-	○	IC			
				3-wire (PNP)				F7PV	F7P	F9PV	F9P	●	●	○	-	○				
		Connector		2-wire				-	-	-	-	●	●	●	●	-	-	-	-	-
				2-wire				-	-	-	-	●	●	●	●	-	-	-	-	-
	Grommet	3-wire (NPN)	-	-	-	M9N	●	●	-	-	-	-	○	-	IC					
		3-wire (PNP)	-	-	-	M9P	●	●	-	-	-	-	○	-	IC					
	Diagnostic indication (2-color)	Grommet	Yes	3-wire (NPN)	24 V	5 V, 12 V	-	F7N WV	F79 W	F9N WV	F9N W	●	●	○	-	○	IC			
				3-wire (PNP)				-	F7P W	F9P WV	F9P W	●	●	○	-	○				
				2-wire				-	-	-	-	●	●	○	-	○	-	-		
				2-wire				-	-	-	-	●	●	○	-	○	-	-		
	Water resistant (2-color)	Grommet	Yes	2-wire	12 V	-	-	F7B WV	J79 W	F9B WV	F9B W	●	●	○	-	○	-			
	With diagnostic output (2-color)	Grommet	Yes	4-wire (NPN)	5 V, 12 V	-	-	-	-	-	-	●	●	○	-	○	IC			
Latch with diagnostic output (2-color)	Grommet	Yes	2-wire	-	-	-	-	-	-	●	●	○	-	○	-	-				
Magnetic field resistant (2-color)	Grommet	Yes	2-wire	-	-	-	-	-	-	-	●	●	-	○	-	-				
								-	-	-	-	●	●	-	○	-				

\* Lead wire length 0.5 m ..... Nil (Example) A73C  
 3 m ..... L (Example) A73CL  
 5 m ..... Z (Example) A73CZ  
 None ..... N (Example) A73CN

\* ○: Manufactured upon receipt of order.

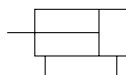
D-P5DWL is available for ø40 to ø100.

In addition to the models in the above table, there are some other auto switches that are applicable. For more information, please consult SMC.

# Series CQ2Y



JIS symbol



## Specifications

Model	Pneumatic (Non-lube)
Fluid	Air
Proof pressure	1.05 MPa
Maximum operating pressure	0.7 MPa
Ambient and fluid temperature	Without auto switch -10 to 70°C (with no freezing) With auto switch -10 to 60°C (with no freezing)
Cushion	Rubber bumper (Standard)
Rod end thread	Female thread
Rod end thread tolerance	JIS class 2
Stroke length tolerance	$\begin{matrix} +1.0 \\ 0 \end{matrix}$
Mounting	Through-hole
Operating piston speed range	5 to 500 mm/s
Allowable leakage rate	0.5 $\mu$ l/min (ANR) or less

## Minimum Operating Pressure

Unit: MPa						
Bore size (mm)	32	40	50	63	80	100
Minimum operating pressure	0.02			0.01		

## Standard Stroke Table

Bore size (mm)	Standard stroke (mm)
32, 40	5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 75, 100
50, 63, 80, 100	10, 15, 20, 25, 30, 35, 40, 45, 50, 75, 100

## Replacement Parts: Seal Kits

Bore size (mm)	Kit No.	Contents
32	CQ2Y32-PS	
40	CQ2Y40-PS	Piston seal 1 pc.
50	CQ2Y50-PS	Rod seal 1 pc.
63	CQ2Y63-PS	Gasket 1 pc.
80	CQ2Y80-PS	Grease pack (10 g) 1 pc.
100	CQ2Y100-PS	

When only grease for maintenance is necessary, please order by the following part numbers.

**Grease pack** GR-L-005 (5 g)  
GR-L-010 (10 g)  
GR-L-150 (150 g)

## Theoretical Output Table

				Unit: N	
Bore size (mm)	Operating direction	Operating pressure (MPa)			
		0.3	0.5	0.7	
32	IN	181	302	422	
	OUT	241	402	563	
40	IN	317	528	739	
	OUT	377	628	880	
50	IN	495	825	1155	
	OUT	589	982	1374	
63	IN	841	1402	1962	
	OUT	935	1559	2182	
80	IN	1361	2268	3175	
	OUT	1508	2513	3519	
100	IN	2144	3574	5003	
	OUT	2356	3927	5498	

## Intermediate Strokes

Method	Installation of spacer on standard stroke body.				
Model no.	Refer to page 4 for standard model no.				
Standard stroke	Method	Intermediate strokes at 1 mm intervals are available by using spacers with standard stroke cylinders.			
	Stroke range	<table border="1" style="width: 100%;"> <tr> <th>Bore size (mm)</th> <th>Stroke range (mm)</th> </tr> <tr> <td>32 to 100</td> <td>1 to 99</td> </tr> </table>	Bore size (mm)	Stroke range (mm)	32 to 100
Bore size (mm)	Stroke range (mm)				
32 to 100	1 to 99				
Example	Model no.: CQ2YB50-57DC CQ2YB50-75DC with 18 mm width spacer inside. B dimension is 125.5 mm. Calculation: $\varnothing 50$ , B dimension 50.5 mm (without switch) $50.5$ (B dimension) + 75 (st) = 125.5 (mm)				

# Smooth Cylinder **Series CQ2Y**



Mounting bracket dimensions are the same as those of the **anti-lateral load type of Series CQ2□S**. Please refer to page 2.3-118 and the subsequent pages of Best Pneumatics Vol. 2.

**Dimensions/ø32 to ø50** (Types with auto switch and without auto switch only differ in the A and B dimensions. Please refer to the table below.)

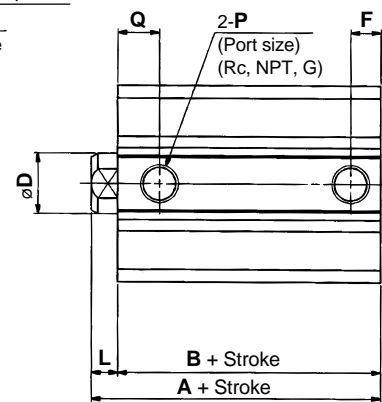
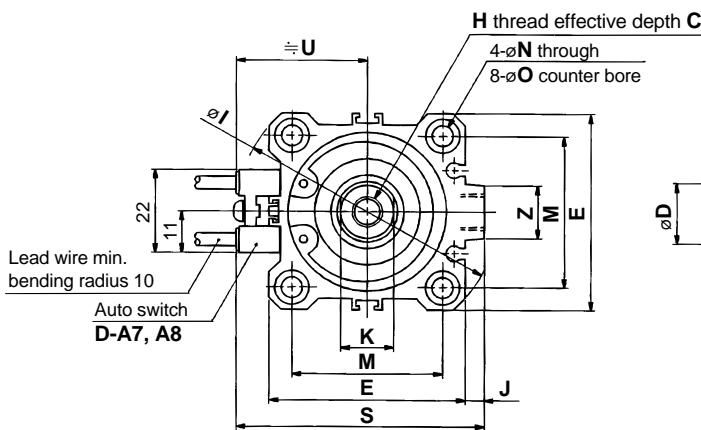
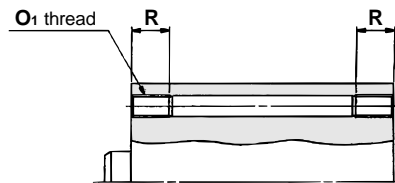
## Through-hole/CQ2YB, CDQ2YB

## Both ends tapped/CQ2YA, CDQ2YA

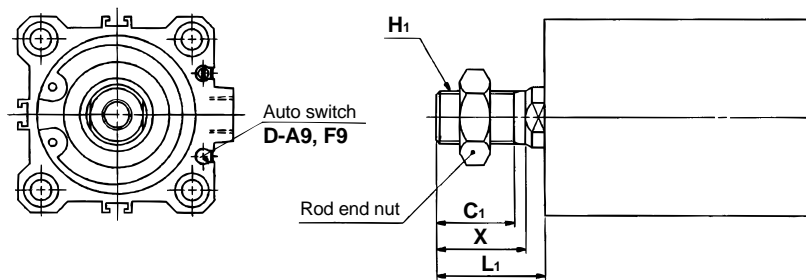
### CDQ2YA

Both ends tapped (mm)

Bore size (mm)	O <sub>1</sub>	R
32	M6 x 1.0	10
40	M6 x 1.0	10
50	M8 x 1.25	14



### Rod end male thread



Rod end male thread (mm)

Bore size (mm)	C <sub>1</sub>	X	H <sub>1</sub>	L <sub>1</sub>
32	20.5	23.5	M14 x 1.5	28.5
40	20.5	23.5	M14 x 1.5	28.5
50	26	28.5	M18 x 1.5	33.5

Bore size (mm)	Stroke range (mm)	Without auto switch		With auto switch		C	D	E	F	H	I	J	K	L	M	N	O	P	Q	S	U	Z
		A	B	A	B																	
32	5 to 50	40	33	50	43	13	16	45	7.5	M8 x 1.25	60	4.5	14	7	34	5.5	9 depth 7	1/8	10.5	58.5	31.5	14
	75, 100	50	43																			
40	5 to 50	46.5	39.5	56.5	49.5	13	16	52	8	M8 x 1.25	69	5	14	7	40	5.5	9 depth 7	1/8	11	66	35	14
	75, 100	56.5	49.5																			
50	10 to 50	48.5	40.5	58.5	50.5	15	20	64	10.5	M10 x 1.5	86	7	17	8	50	6.6	11 depth 8	1/4	10.5	80	41	19
	75, 100	58.5	50.5																			

# Series CQ2Y



Mounting bracket dimensions are the same as those of the **anti-lateral load type of Series CQ2□S**. Please refer to page 2.3-118 and the subsequent pages of Best Pneumatics Vol. 2.

## Dimensions/ø63 to ø100

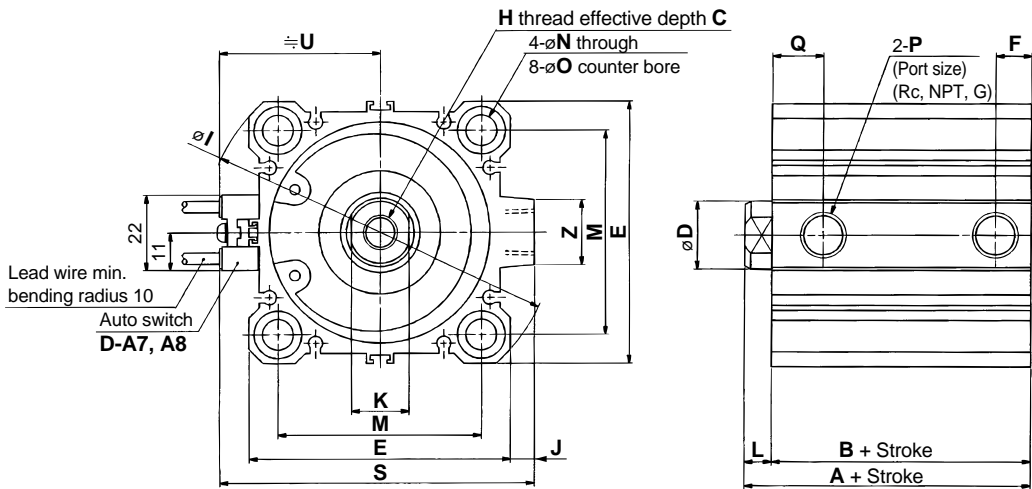
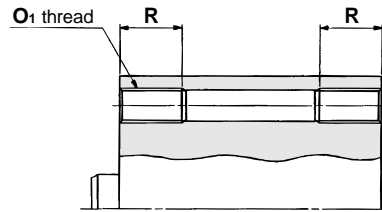
(Types with auto switch and without auto switch only differ in the A and B dimensions. Please refer to the table below.)

### Through-hole/CQ2YB, CDQ2YB

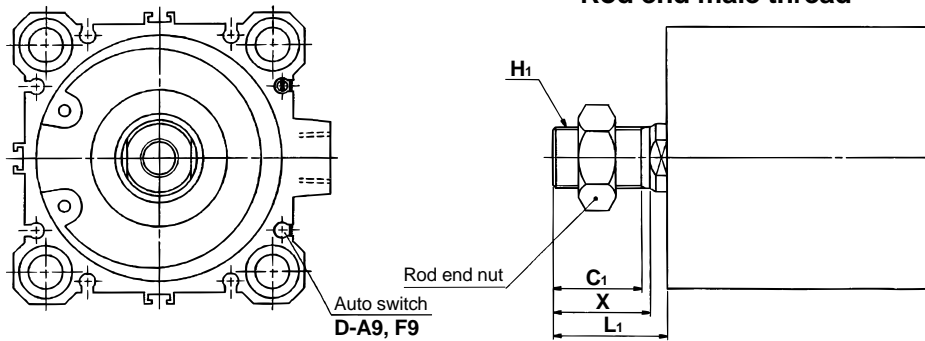
### Both ends tapped/CQ2YA, CDQ2YA

#### Both ends tapped (mm)

Bore size (mm)	O <sub>1</sub>	R
63	M10 x 1.5	18
80	M12 x 1.75	22
100	M12 x 1.75	22



#### Rod end male thread



#### Rod end male thread (mm)

Bore size (mm)	C <sub>1</sub>	X	H <sub>1</sub>	L <sub>1</sub>
63	26	28.5	M18 x 1.5	33.5
80	32.5	35.5	M22 x 1.5	43.5
100	32.5	35.5	M26 x 1.5	43.5

Bore size (mm)	Stroke range (mm)	Without auto switch		With auto switch		C	D	E	F	H	I	J	K	L	M	N	O	P	Q	S	U	Z
		A	B	A	B																	
63	10 to 50	54	46	64	56	15	20	77	10.5	M10 x 1.5	103	7	17	8	60	9	14 depth 10.5	1/4	15	93	47.5	19
	75, 100	64	56																			
80	10 to 50	63.5	53.5	73.5	63.5	21	25	98	12.5	M16 x 2.0	132	6	22	10	77	11	17.5 depth 13.5	3/8	16	112.5	57.5	26
	75, 100	73.5	63.5																			
100	10 to 50	75	63	85	73	27	30	117	13	M20 x 2.5	156	6.5	27	12	94	11	17.5 depth 13.5	3/8	23	132.5	67.5	26
	75, 100	85	73																			



# Smooth Cylinder Series CM2Y

ø20, ø25, ø32, ø40

Specifications and auto switch information not provided below are the same as those of the **standard, double acting, single rod type of Series CM2**. Please refer to page 1.4-3 and the subsequent pages of Best Pneumatics Vol. 2.



## How to Order

Standard

CM2Y L 40   150

With auto switch

CDM2Y L 40   150 H7BW S

**With auto switch** (Built-in magnet)

**Mounting**

<b>B</b>	Basic
<b>L</b>	Axial foot
<b>F</b>	Front flange
<b>G</b>	Rear flange
<b>C</b>	Single clevis
<b>D</b>	Double clevis
<b>U</b>	Front trunnion
<b>T</b>	Rear trunnion
<b>E</b>	Integral clevis
<b>BZ</b>	Boss-cut basic
<b>FZ</b>	Boss-cut front flange
<b>UZ</b>	Boss-cut front trunnion

**Bore size**

<b>20</b>	20 mm
<b>25</b>	25 mm
<b>32</b>	32 mm
<b>40</b>	40 mm

**Port thread type**

<b>Nil</b>	Rc
<b>TN</b>	NPT
<b>TF</b>	G

**Auto switch**

<b>Nil</b>	Without auto switch (Built-in magnet)
------------	---------------------------------------

\* Please select the applicable auto switch model from the table below.

**Number of auto switches**

<b>Nil</b>	2 pcs.
<b>S</b>	1 pc.
<b>n</b>	n pcs.

**Cylinder stroke (mm)**  
→ Refer to Standard stroke table on page 9.

### Applicable auto switches / For detailed auto switch specifications, please refer to page 5.3-2 of Best Pneumatics Vol. 2.

Type	Special function	Electrical entry	Indicator	Wiring (Output)	Load voltage		Auto switch model	Lead wire (m)*				Pre-wired connector	Applicable load										
					DC	AC		0.5 (Nil)	3 (L)	5 (Z)	None (N)		IC	Relay, PLC									
Reed switch	—	Grommet	Yes	3-wire (Equiv. NPN)	—	5 V	C76	●	●	—	—	—			—	IC	—						
								Connector	2-wire	24 V	12 V	100 V	C73	●	●	●	—	—	—	Relay, PLC			
													100 V, 200 V	B54	●	●	●	—			—		
													—	C73C	●	●	●	●			—		
													—	A33A	—	—	—	●			—		
	Diagnostic indication (2-color)	Grommet	Yes	3-wire (NPN)	—	—	100 V, 200 V	A34A	—	—	—	●	—	—	Relay, PLC								
A44A								—	—	—	●	—											
Solid state switch	—	Grommet	Yes	3-wire (NPN)	—	5 V, 12 V	H7A1	●	●	○	—	○	IC	—									
								3-wire (PNP)	H7A2	●	●	○			—	○							
								2-wire	H7B	●	●	○			—	○							
									H7C	●	●	●			●	—							
								Terminal conduit	3-wire (NPN)	G39A	—	—			—	●	—	IC					
									2-wire	K39A	—	—			—	●	—	—					
	Diagnostic indication (2-color)	Grommet	Yes	3-wire (NPN)	—	24 V	5 V, 12 V	H7NW	●	●	○	—	○	IC	Relay, PLC								
								3-wire (PNP)	H7PW	●	●	○	—			○							
								2-wire	H7BW	●	●	○	—			○							
									H7BA	—	●	○	—			○							
								Water resistant (2-color)	Grommet	Yes	3-wire (NPN)	—	5 V, 12 V			H7NF	●	●	○	—	○	IC	—
																	4-wire (NPN)	H7LF	●	●	○		

\* Lead wire length 0.5 m ..... Nil (Example) C73C  
 3 m ..... L (Example) C73CL  
 5 m ..... Z (Example) C73CZ  
 None ..... N (Example) C73CN

\* ○: Manufactured upon receipt of order.  
 \* Do not add the suffix (N) indicating "no lead wire" to the part numbers of models D-A3□A, A44A, G39A and K39A.

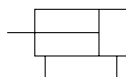
In addition to the models in the above table, there are some other auto switches that are applicable. For more information, please consult SMC.

# Series CM2Y



Integral clevis

JIS symbol



## Grease Pack for Maintenance

When only grease for maintenance is necessary, please order by the following part numbers.

**Grease pack** GR-L-005 (5 g)  
GR-L-010 (10 g)  
GR-L-150 (150 g)

## Specifications

Bore size (mm)	20	25	32	40
Action	Double acting, single rod			
Piston speed	5 to 500 mm/s			
Fluid	Air			
Proof pressure	1.05 MPa			
Maximum operating pressure	0.7 MPa			
Ambient and fluid temperature	Without auto switch -10 to 70°C (with no freezing)			
	With auto switch -10 to 60°C (with no freezing)			
Lubrication	Non-lube			
Thread tolerance	JIS class 2			
Stroke length tolerance	+1.4 0 mm			
Cushion	Rubber bumper			
Allowable leakage rate	0.5 /min (ANR) or less			

## Minimum Operating Pressure

Unit: MPa

Bore size (mm)	20	25	32	40
Minimum operating pressure	0.02			

## Mounting Bracket and Accessory

Accessory	Standard			Option		
	Mounting nut	Rod end nut	Clevis pin	Single knuckle joint	Note 3) Double knuckle joint	Note 4) Clevis bracket
Basic	● (1 pc.)	●	—	●	●	—
Axial foot	● (2)	●	—	●	●	—
Front flange	● (1)	●	—	●	●	—
Rear flange	● (1)	●	—	●	●	—
Integral clevis	— Note1)	●	—	●	●	●
Single clevis	— Note1)	●	—	●	●	—
Double clevis Note 3)	— Note1)	●	●	●	●	—
Front trunnion	● (1) Note2)	●	—	●	●	—
Rear trunnion	● (1) Note2)	●	—	●	●	—
Boss-cut basic	● (1)	●	—	●	●	—
Boss-cut flange	● (1)	●	—	●	●	—
Boss-cut trunnion	● (1)	●	—	●	●	—



Note 1) Mounting nuts are not attached to the integral clevis, single clevis and double clevis types.

Note 2) Trunnion nuts are mounted on the front trunnion type and rear trunnion type.

Note 3) Pins and snap rings (cotter pins in case of ø40) are packed with the double clevis and double knuckle joint types.

Note 4) Pins and snap rings are packed with clevis brackets.

## Standard Stroke Table

Bore size (mm)	Standard stroke (mm)
20, 25, 32, 40	25, 50, 75, 100, 125, 150, 200, 250, 300



Note 1) Intermediate strokes not listed above are also available.

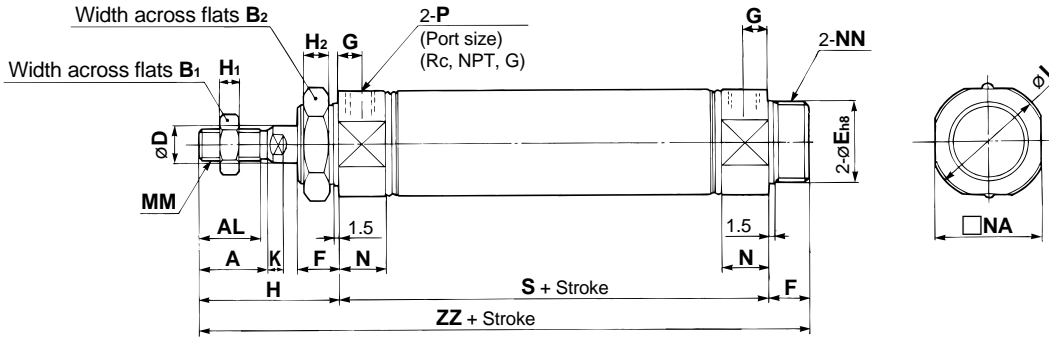
Note 2) As the stroke increases, more sliding resistance may result due to the deflection of the piston rod and other factors. Take measures such as the installation of a guide.

## Dimensions/ø20 to ø40

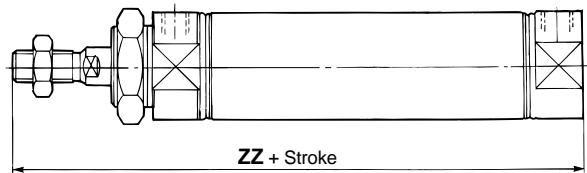


Mounting bracket dimensions are the same as those of the standard, double acting, single rod type of Series CM2. Please refer to page 1.4-3 and the subsequent pages of Best Pneumatics Vol. 2.

### Basic/CM2YB



### Boss-cut



Bore size (mm)	A	AL	B <sub>1</sub>	B <sub>2</sub>	D	E	F	G	H	H <sub>1</sub>	H <sub>2</sub>	I	K	MM	N	NA	NN	P	S	ZZ
20	18	15.5	13	26	8	20 <sup>0</sup> <sub>-0.033</sub>	13	8	41	5	8	28	5	M8 x 1.25	15	24	M20 x 1.5	1/8	62	116
25	22	19.5	17	32	10	26 <sup>0</sup> <sub>-0.033</sub>	13	8	45	6	8	33.5	5.5	M10 x 1.25	15	30	M26 x 1.5	1/8	62	120
32	22	19.5	17	32	12	26 <sup>0</sup> <sub>-0.033</sub>	13	8	45	6	8	37.5	5.5	M10 x 1.25	15	34.5	M26 x 1.5	1/8	64	122
40	24	21	22	41	14	32 <sup>0</sup> <sub>-0.039</sub>	16	11	50	8	10	46.5	7	M14 x 1.5	21.5	42.5	M32 x 2	1/4	88	154

### Boss-cut (mm)

Bore size (mm)	ZZ
20	103
25	107
32	109
40	138

# Smooth Cylinder Series CG1Y

ø20, ø25, ø32, ø40, ø50, ø63, ø80, ø100

Specifications and auto switch information not provided below are the same as those of the low friction, double acting, single rod type of Series CG1□Q. Please refer to page 1.6-43 and the subsequent pages of Best Pneumatics Vol. 2.



## How to Order

**Standard**

**CG1Y L 25 □ 100**

**With auto switch**

**CDG1Y L 25 □ 100 H7BW S**

**With auto switch**  
(Built-in magnet)

**Mounting**

<b>B</b>	Basic
<b>L</b>	Axial foot
<b>F</b>	Front flange
<b>G</b>	Rear flange
<b>U*</b>	Front trunnion
<b>T*</b>	Rear trunnion
<b>D</b>	Clevis

\* Not available at ø80 and ø100.  
Note) Mounting brackets are not mounted and are supplied loose at the time of shipment.

**Bore size**

<b>20</b>	20 mm
<b>25</b>	25 mm
<b>32</b>	32 mm
<b>40</b>	40 mm
<b>50</b>	50 mm
<b>63</b>	63 mm
<b>80</b>	80 mm
<b>100</b>	100 mm

**Auto switch**

<b>Nil</b>	Without auto switch (Built-in magnet)
------------	---------------------------------------

\* Please select the applicable auto switch model from the table below.

**Number of auto switches**

<b>Nil</b>	2 pcs.
<b>S</b>	1 pc.
<b>n</b>	n pcs.

**Cylinder stroke (mm)**  
→ Refer to Standard stroke table on page 12.

**Port thread type**

<b>Nil</b>	Rc
<b>TN</b>	NPT
<b>TF</b>	G

## Applicable auto switches / For detailed auto switch specifications, please refer to page 5.3-2 of Best Pneumatics Vol. 2.

Type	Special function	Electrical entry	Indicator	Wiring (Output)	Load voltage		Auto switch model		Lead wire (m)*				Pre-wired connector	Applicable load			
					DC	AC	Applicable bore size		0.5 (Nil)	3 (L)	5 (Z)	None (N)					
							ø20 to ø63	ø20 to ø100									
Reed switch	-	Grommet	Yes	3-wire (Equiv. NPN)	-	5 V	-	<b>C76</b>	-	●	●	-	-	-	IC	-	
				2-wire	24 V	12 V	100 V, 200 V	<b>B54</b>		●	●	●	-	-	-	-	-
		12 V				100 V	<b>C73</b>	-	●	●	●	-	-	-	-	-	
		-				-	<b>C73C</b>	-	●	●	●	●	-	-	-	-	-
Diagnostic indication (2-color)	Grommet	-	<b>B59W</b>		●	●	-	-	-	-	-	-	-	-			
Solid state switch	-	Grommet	Yes	3-wire (NPN)	24 V	5 V, 12 V	-	<b>H7A1</b>	<b>G59</b>	●	●	○	-	○	IC	Relay, PLC	
				3-wire (PNP)				<b>H7A2</b>	<b>G5P</b>	●	●	○	-	○			
		2-wire		<b>H7B</b>	<b>K59</b>	●	●	○	-	○	-	-					
				<b>H7C</b>	-	●	●	●	●	-	-	-					
		Diagnostic indication (2-color)		Grommet	3-wire (NPN)	24 V	5 V, 12 V	-	<b>H7NW</b>	<b>G59W</b>	●	●	○	-	○		IC
					3-wire (PNP)				<b>H7PW</b>	<b>G5PW</b>	●	●	○	-	○		
					2-wire				<b>H7BW</b>	<b>K59W</b>	●	●	○	-	○		
					2-wire				<b>H7BA</b>	<b>G5BA</b>	-	●	○	-	○		
		Water resistant (2-color)		Grommet	24 V	5 V, 12 V	-	<b>H7NF</b>	<b>G59F</b>	●	●	○	-	○	IC		
		With diagnostic output (2-color)						<b>H7LF</b>	-	●	●	○	-	○			
Latch with diagnostic output (2-color)	Grommet	-	-	-	-	-	-	-	-	-	-	-					

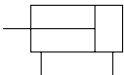
\* Lead wire length 0.5 m ..... Nil (Example) C73C  
 3 m ..... L (Example) C73CL  
 5 m ..... Z (Example) C73CZ  
 None ..... N (Example) C73CN

\* ○: Manufactured upon receipt of order.

In addition to the models in the above table, there are some other auto switches that are applicable. For more information, refer to page 1.6-45 of Best Pneumatics Vol. 2.



JIS symbol



## Specifications

Bore size (mm)	20	25	32	40	50	63	80	100
Action	Double acting, single rod							
Model	Non-lube							
Fluid	Air							
Proof pressure	1.05 MPa							
Maximum operating pressure	0.7 MPa							
Ambient and fluid temperature	Without auto switch -10 to 70°C (with no freezing)							
	With auto switch -10 to 60°C (with no freezing)							
Operating piston speed	5 to 500 mm/s							
Stroke length tolerance	Up to 300 <sup>st</sup> + <sup>1.4</sup> mm							
Cushion	Rubber bumper							
Mounting	Basic, Axial foot, Front flange, Rear flange, Front trunnion, Rear trunnion, Clevis (in case of 90° change in port location)							
Allowable leakage rate	0.5 /min (ANR) or less							



\* Front trunnion type and rear trunnion type are not available at ø80 and ø100.

## Minimum Operating Pressure

Bore size (mm)	20	25	32	40	50	63	80	100
Minimum operating pressure	0.02				0.01			

Unit: MPa

## Replacement Parts: Seal Kits

Bore size (mm)	Kit No.	Contents
20	CG1Y20-PS	
25	CG1Y25-PS	
32	CG1Y32-PS	Piston seal 1 pc.
40	CG1Y40-PS	Rod seal 1 pc.
50	CG1Y50-PS	Tube gasket 2 pcs.
63	CG1Y63-PS	Grease pack (10 g) 1 pc.
80	CG1Y80-PS	
100	CG1Y100-PS	

When only grease for maintenance is necessary, please order by the following part numbers.

**Grease pack** GR-L-005 (5 g)  
GR-L-010 (10 g)  
GR-L-150 (150 g)

## Standard Stroke Table

Bore size (mm)	Standard stroke (mm) <small>Note 1)</small>
20	25, 50, 75, 100, 125, 150, 200
25, 32, 40, 50, 63, 80, 100	25, 50, 75, 100, 125, 150, 200, 250, 300



Note 1) Intermediate strokes not listed above are also available.

Note 2) Consult SMC for strokes outside the above ranges.

Note 3) As the stroke increases, more sliding resistance may result due to the deflection of the piston rod and other factors. Take measures such as the installation of a guide.

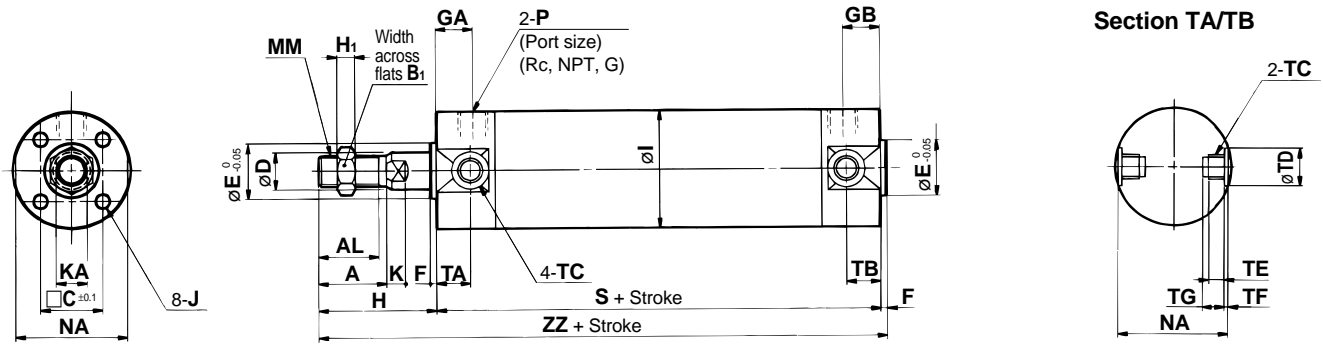
# Series CG1Y

## Dimensions/ø20 to ø100



Mounting bracket dimensions are the same as those of the **low friction, double acting, single rod type of Series CG1□Q**. Please refer to page 1.6-43 and the subsequent pages of Best Pneumatics Vol. 2.

### Basic/CG1YB



Section TA/TB (mm)

Bore size (mm)	TC*	TDH9	TE	TF	TG
20	M5 x 0.8	8 <sup>+0.08</sup> <sub>0</sub>	4	0.5	5.5
25	M6 x 0.75	10 <sup>+0.08</sup> <sub>0</sub>	5	1	6.5
32	M8 x 1.0	12 <sup>+0.08</sup> <sub>0</sub>	5.5	1	7.5
40	M10 x 1.25	14 <sup>+0.08</sup> <sub>0</sub>	6	1.25	8.5
50	M12 x 1.25	16 <sup>+0.08</sup> <sub>0</sub>	7.5	2	10
63	M14 x 1.5	18 <sup>+0.08</sup> <sub>0</sub>	11.5	3	14.5

\* Trunnion mounting taps for the width across flats NA are not attached to ø80 and ø100 types.

Bore size (mm)	Stroke range (mm)	A	AL	B <sub>1</sub>	C	D	E	F	GA	GB	H	H <sub>1</sub>	I	J	K	KA	MM
20	Up to 200	18	15.5	13	14	8	12	2	12	12	35	5	26	M4 x 0.7 depth 7	5	6	M8 x 1.25
25	Up to 300	22	19.5	17	16.5	10	14	2	12	12	40	6	31	M5 x 0.8 depth 7.5	5.5	8	M10 x 1.25
32	Up to 300	22	19.5	17	20	12	18	2	12	12	40	6	38	M5 x 0.8 depth 8	5.5	10	M10 x 1.25
40	Up to 300	30	27	19	26	16	25	2	13	13	50	8	47	M6 x 1 depth 12	6	14	M14 x 1.5
50	Up to 300	35	32	27	32	20	30	2	14	14	58	11	58	M8 x 1.25 depth 16	7	18	M18 x 1.5
63	Up to 300	35	32	27	38	20	32	2	14	14	58	11	72	M10 x 1.5 depth 16	7	18	M18 x 1.5
80	Up to 300	40	37	32	50	25	40	3	20	20	71	13	89	M10 x 1.5 depth 22	10	22	M22 x 1.5
100	Up to 300	40	37	41	60	30	50	3	20	20	71	16	110	M12 x 1.75 depth 22	10	26	M26 x 1.5

(mm)

Bore size (mm)	Stroke range (mm)	NA	P	S	TA	TB	ZZ
20	Up to 200	24	1/8	77	11	11	114
25	Up to 300	29	1/8	77	11	11	119
32	Up to 300	35.5	1/8	79	11	11	121
40	Up to 300	44	1/8	87	12	12	139
50	Up to 300	55	1/4	102	13	13	162
63	Up to 300	69	1/4	102	13	13	162
80	Up to 300	80	3/8	122	—	—	196
100	Up to 300	100	1/2	122	—	—	196

# Smooth Cylinder Series CA2Y

ø40, ø50, ø63, ø80, ø100

Specifications and auto switch information not provided below are the same as those of the **standard, double acting, single rod type** of Series CA2. Please refer to SMC catalog CAT.ES20-176.



## How to Order

**Standard**

CA2Y L 40 [ ] 150

**With auto switch**

CDA2Y L 40 [ ] 150 Y7BW S

**With auto switch**  
(Built-in magnet)

**Mounting**

B	Basic
L	Axial foot
F	Front flange
G	Rear flange
C	Single clevis
D	Double clevis
T	Center trunnion

**Bore size**

40	40 mm
50	50 mm
63	63 mm
80	80 mm
100	100 mm

**Auto switch**

Nil	Without auto switch
-----	---------------------

\* Please select the applicable auto switch model from the table below.  
\* Models D-Z7□, Z80, Y59□, Y69, and Y7□ are not mounted and are supplied loose at the time of shipment. (Only switch mounting brackets for above models are mounted.)

**Number of auto switches**

Nil	2 pcs.
S	1 pc.
3	3 pcs.
n	n pcs.

**Cylinder stroke (mm)**  
→ Refer to Standard stroke table on page 15.

**Port thread type**

Nil	Rc
TN	NPT
TF	G

### Cylinders with built-in magnets

If built-in magnet type is ordered without auto switch, leave the field for the auto switch type blank. (Example) CDA2YB40-100

### Applicable auto switches / For detailed auto switch specifications, please refer to page 5.3-2 of Best Pneumatics Vol. 2.

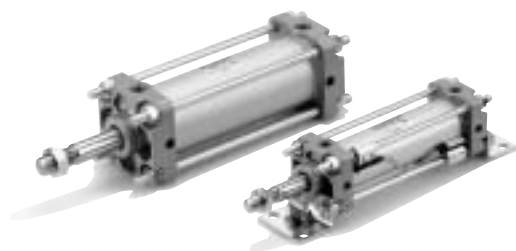
Type	Special function	Electrical entry	Indicator	Wiring (Output)	Load voltage		Auto switch model	Lead wire (m)*			Pre-wired connector	Applicable load		
					DC	AC		0.5 (Nil)	3 (L)	5 (Z)				
Reed switch	-	Grommet	Yes	3-wire (NPN)	-	5 V	-	Z76	●	●	-	-	IC	-
				2-wire	24 V	12 V	100 V	Z73	●	●	●	-	-	Relay, PLC
	Diagnostic indication (2-color)	Grommet	-	-	-	A54	●	●	●	-	-			
Solid state switch	-	Grommet	Yes	3-wire (NPN)	24 V	5 V, 12 V	-	Y59A	●	●	○	○	IC	Relay, PLC
				3-wire (PNP)	-	-	100 V, 200 V	Y7P	●	●	○	○		
	2-wire	-	12 V	-	J51	●	●	○	-	-				
	3-wire (NPN)	24 V	5 V, 12 V	-	Y59B	●	●	○	○	-				
	Y7NW				●	●	○	○	IC					
	Diagnostic indication (2-color)	Grommet	Yes	3-wire (PNP)	24 V	12 V	-	Y7PW	●	●	○	○	-	
	Water resistant (2-color)			Y7BW				●	●	○	○	-		
	With diagnostic output (2-color)	Grommet	Yes	2-wire	24 V	5 V, 12 V	-	Y7BA	-	●	○	○	IC	
	Latch with diagnostic output (2-color)			F59F				●	●	○	○	-		
	Magnetic field resistant (2-color)	Grommet	Yes	4-wire (NPN)	24 V	-	-	F5LF	●	●	○	○	-	
	2-wire			-				P5DW	-	●	●	○	○	-

\* Lead wire length 0.5 m ..... Nil (Example) A54  
3 m ..... L (Example) A54L  
5 m ..... Z (Example) A54Z

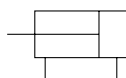
\* ○: Manufactured upon receipt of order.

In addition to the models in the above table, there are some other auto switches that are applicable. For more information, refer to SMC catalog CAT.ES20-176.

# Series CA2Y



JIS symbol



## Replacement Parts: Seal Kits

Bore size (mm)	Kit No.	Contents
40	CA2Y40-PS	Rod seal 1 pc.
50	CA2Y50-PS	Piston seal 1 pc.
63	CA2Y63-PS	Cylinder tube gasket 2 pcs.
80	CA2Y80-PS	Grease pack (10 g) 1 pc.
100	CA2Y100-PS	

When only grease for maintenance is necessary, please order by the following part numbers.

**Grease pack** GR-L-005 (5 g)  
GR-L-010 (10 g)  
GR-L-150 (150 g)

## Specifications

Action	Double acting
Operating piston speed	5 to 500 mm/s
Fluid	Air
Proof pressure	1.05 MPa
Maximum operating pressure	0.7 MPa
Ambient and fluid temperature	Without auto switch -10 to 70°C (with no freezing) With auto switch -10 to 60°C (with no freezing)
Cushion	None
Thread tolerance	JIS class 2
Lubrication	Not required (Non-lube)
Mounting	Basic, Axial foot, Front flange, Rear flange, Single clevis, Double clevis Center trunnion
Allowable leakage rate	0.5 $\mu$ /min (ANR)

## Minimum Operating Pressure

Bore size (mm)	40	50	63	80	100
Minimum operating pressure	0.02	0.01			

Unit: MPa

## Standard Stroke Table

Bore size (mm)	Standard stroke (mm)
40	25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500
50, 63	25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500, 600
80, 100	25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500, 600, 700



Note 1) Intermediate strokes not listed above are also available. Consult SMC for strokes outside the above ranges.

Note 2) As the stroke increases, more sliding resistance may result due to the deflection of the piston rod and other factors. Take measures such as the installation of a guide.

## Accessory

Mounting		Basic	Foot	Front flange	Rear flange	Single clevis	Double clevis	Center trunnion
Standard	Jam nut	●	●	●	●	●	●	●
	Clevis pin	-	-	-	-	-	●	-
Option	Single knuckle joint	●	●	●	●	●	●	●
	Double knuckle joint (with pin)	●	●	●	●	●	●	●

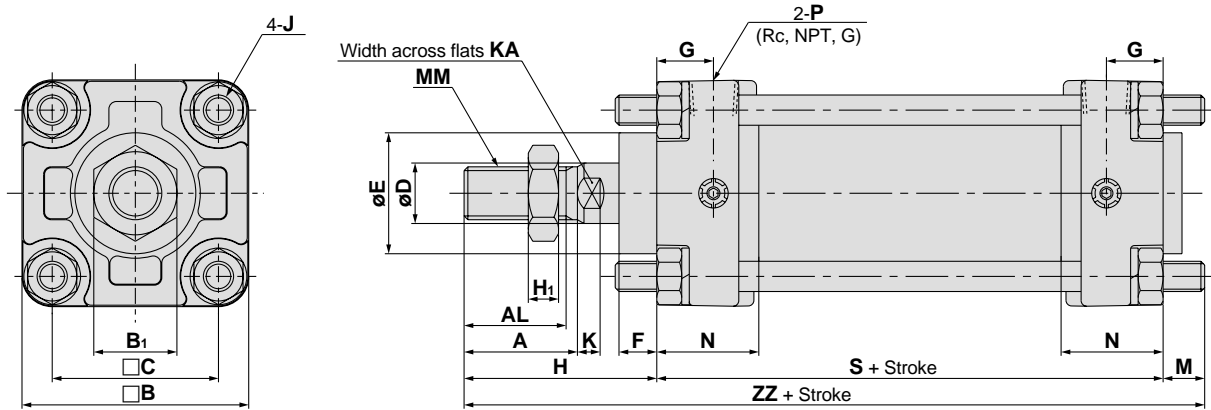


## Dimensions/ø40 to ø100



Mounting bracket dimensions are the same as those of the standard, double acting, single rod type of Series CA2. Please refer to SMC catalog CAT.ES20-176.

### Basic/CA2YB



Bore size (mm)	Stroke range	A	AL	□B	B <sub>1</sub>	□C	D	E	F	G	H	H <sub>1</sub>	J	K	KA	M	MM	N	P	S	ZZ
40	Up to 500	30	27	60	22	44	16	32	10	15	51	8	M8 x 1.25	6	14	11	M14 x 1.5	27	1/4	84	146
50	Up to 600	35	32	70	27	52	20	40	10	17	58	11	M8 x 1.25	7	18	11	M18 x 1.5	30	3/8	90	159
63	Up to 600	35	32	85	27	64	20	40	10	17	58	11	M10 x 1.25	7	18	14	M18 x 1.5	31	3/8	98	170
80	Up to 700	40	37	102	32	78	25	52	14	21	71	13	M12 x 1.75	10	22	17	M22 x 1.5	37	1/2	116	204
100	Up to 700	40	37	116	41	92	30	52	14	21	72	16	M12 x 1.75	10	26	17	M26 x 1.5	40	1/2	126	215





# Smooth Cylinder Safety Instructions

These safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by a label of "**Caution**", "**Warning**" or "**Danger**". To ensure safety, be sure to observe ISO 4414 Note 1), JIS B 8370 Note 2) and other safety practices.

**⚠ Caution** : Operator error could result in injury or equipment damage.

**⚠ Warning** : Operator error could result in serious injury or loss of life.

**⚠ Danger** : In extreme conditions, there is a possible result of serious injury or loss of life.

Note 1) ISO 4414: Pneumatic fluid power – General rules relating to systems

Note 2) JIS B 8370: Pneumatic system axiom

## **⚠ Warning**

### **1. The compatibility of pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications.**

Since the products specified here are used in various operating conditions, their compatibility with the specific pneumatic system must be based on specifications or after analysis and/or tests to meet your specific requirements. The expected performance and safety assurance will be the responsibility of the person who has determined the compatibility of the system. This person should continuously review the suitability of all items specified, referring to the latest catalog information with a view to giving due consideration to any possibility of equipment failure when configuring a system.

### **2. Only trained personnel should operate pneumatically operated machinery and equipment.**

Compressed air can be dangerous if handled incorrectly. Assembly, handling or maintenance of pneumatic systems should be performed by trained and experienced operators.

### **3. Do not service machinery/equipment or attempt to remove components until safety is confirmed.**

1. Inspection and maintenance of machinery/equipment should only be performed after confirmation of safe locked-out control positions.
2. When equipment is to be removed, confirm the safety process as mentioned above. Cut the supply pressure for this equipment and exhaust all residual compressed air in the system.
3. Before machinery/equipment is restarted, take measures to prevent shooting-out of cylinder piston rod, etc. (Bleed air into the system gradually to create back pressure.)

### **4. Contact SMC if the product is to be used in any of the following conditions:**

1. Conditions and environments beyond the given specifications, or if product is used outdoors.
2. Installation on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverages, recreation equipment, emergency stop circuits, press applications, or safety equipment.
3. An application which has the possibility of having negative effects on people, property, and therefore requires special safety analysis.



# Smooth Cylinder Actuator Precautions 1

Be sure to read before handling.

## Design

### Warning

1. **There is a possibility of dangerous sudden action by air cylinders if sliding parts of machinery are twisted due to external forces, etc.**

In such cases, human injury may occur; e.g., by catching hands or feet in the machinery, or damage to the machinery itself may occur. Therefore, the machine should be designed to avoid such dangers.

2. **A protective cover is recommended to minimize the risk of personal injury.**

If a stationary object and moving parts of a cylinder are in close proximity, personal injury may occur. Design the structure to avoid contact with the human body.

3. **Securely tighten all stationary parts and connected parts so that they will not become loose.**

Please refer to specific product precautions.

4. **A deceleration circuit or shock absorber, etc., may be required.**

When a driven object is operated at high speeds or the load is heavy, a cylinder's cushion will not be sufficient to absorb the shock. Install a deceleration circuit to reduce the speed before cushioning, or install an external shock absorber to relieve the shock. In this case, the rigidity of the machinery should also be examined.

5. **Consider a possible drop in operating pressure due to a power outage, etc.**

When a cylinder is used in a clamping mechanism, there is a danger of work dropping if there is a drop in circuit pressure caused by a power outage, etc.

Therefore, safety equipment should be installed to prevent damage to machinery and human injury. Suspension mechanisms and lifting devices also require consideration for drop prevention.

6. **Consider a possible loss of power source.**

Measures should be taken to protect against human injury and equipment damage in the event that there is a loss of power to equipment controlled by air pressure, electricity or hydraulics, etc.

7. **Design circuitry to prevent sudden lurching of driven objects.**

When a cylinder is driven by an exhaust center directional control valve or when starting up after residual pressure is exhausted from the circuit, etc., the piston and its driven object will lurch at high speeds if pressure is applied to one side of the cylinder because of the absence of air pressure inside the cylinder.

Therefore, equipment should be selected and circuits designed to prevent sudden lurching, because there is a danger of human injury and/or damage to equipment when this occurs.

8. **Consider emergency stops.**

Design so that human injury and/or damage to machinery and equipment will not be caused when machinery is stopped by a safety device under abnormal conditions, a power outage or a manual emergency stop.

9. **Consider the action when operation is restarted after an emergency stop or abnormal stop.**

Design the machinery so that human injury or equipment damage will not occur upon restart of operation. When the cylinder has to be reset at the starting position, install manual safety equipment.

10. **When the cylinder transfers work pieces that can fall or break due to vibration, take measures such as the installation of a guide.**

### Caution

1. **Avoid application of excessive lateral load to the cylinder.**

Application of excessive lateral load can cause the cylinder to malfunction or fall below the specifications.

2. **Design a structure that will prevent vibration of the cylinder.**

Influence of vibration may cause malfunction.

3. **Avoid use of a guide that can cause changes in the sliding resistance.**

Use of a guide that can cause changes in the sliding resistance or change of the external load can lead to unstable operation.

4. **Avoid structures that can cause changes in the mounting orientation.**

Changes in the mounting orientation may lead to unstable in operation.

5. **Avoid operation where there are large changes in temperature.**

**When the cylinder is operated at a low temperature, make sure that no frost is formed inside the cylinder or on the piston rod.**

Large changes in temperature and formation of frost may lead to unstable operation.

6. **Avoid high-frequency operation.**

As a guideline, operate the cylinder at 30 c.p.m or below.

7. **Speed adjustment should be conducted in the environment where the cylinder is used.**

In a different environment, the speed adjustment may be incorrect.

## Selection

### Warning

1. **Check the specifications.**

The products advertised in this catalog are designed according to use in industrial compressed air systems. If the products are used in conditions where pressure, temperature, etc., are out of specification, damage and/or malfunction may be caused. Do not use under these conditions.

Consult SMC if you use a fluid other than compressed air.

2. **Intermediate stops.**

When intermediate stopping of a cylinder piston is performed with a 3 position closed center directional control valve, it is difficult to achieve stopping positions as accurate and minute as with hydraulic pressure, due to the compressibility of air.

Furthermore, since valves and cylinders, etc. are not guaranteed for zero air leakage, it may not be possible to hold a stopped position for an extended period of time. Contact SMC in case it is necessary to hold a stopped position for an extended period.



# Smooth Cylinder Actuator Precautions 2

Be sure to read before handling.

## Selection

### ⚠ Caution

#### 1. Operate within the limits of the maximum usable stroke.

Refer to the selection procedures for the air cylinder to be used for the maximum usable stroke.

The piston rod will be damaged if operated beyond the maximum stroke.

#### 2. Operate the piston within a range such that collision damage will not occur at the end of the stroke.

Operate within a range such that damage will not occur when the piston having inertial force stops by striking the cover at the stroke end. Refer to the cylinder selection procedures for the range within which damage will not occur.

#### 3. Use a speed controller to adjust the cylinder drive speed, gradually increasing from a low speed to the desired speed setting.

#### 4. Provide an intermediate support for a cylinder with a long stroke.

If the cylinder has a long stroke, provide an intermediate support to prevent the rod from sagging and the tube from flexing, as well as to prevent damage to the rod due to vibrations or external loads.

#### 5. When the cylinder has a long stroke, take measures to prevent increase of the sliding resistance caused by the deflection of the piston rod and other factors.

## Pneumatic Circuit

### ⚠ Caution

#### 1. Keep the piping length between the speed controller and cylinder port as short as possible.

A large distance between the speed controller and cylinder may lead to unstable speed control.

#### 2. To control the speed, use speed controllers that allow easy control in low-speed operation or dual speed controllers (Series ADS) that prevent sudden movement.

(The maximum speed may be limited when speed controllers for low-speed operation are used.)

Please refer to the recommended circuits on page 21.

#### 3. Allow sufficient margin when setting the pressure supplied to the cylinder.

If the operating pressure is low, low-speed and low-pressure operation may lack stability depending on the load conditions. Also, the maximum speed may be limited depending on the pneumatic circuit and operating pressure.

#### 4. Consider the piping resistance of the pneumatic circuit when the sliding resistance is to be decreased.

With some pneumatic circuits, the piping resistance may increase, resulting in larger sliding resistance.

## Mounting

### ⚠ Caution

#### 1. Make sure to connect the rod and the load so that their axial center and movement directions match.

If they do not match, stress could be applied to the rod and the tube, causing the inner surface of the tube, the bushing, the rod surface, and the seals to wear and to become damaged.

#### 2. When an external guide is used, connect the external slider and the load in such a way that there is no interference at any point within the stroke.

#### 3. Do not scratch or gouge the sliding portion of the cylinder tube or the piston rod by striking it with an object, or squeezing it.

The tube bore is manufactured under precise tolerances. Thus, even a slight deformation could lead to a malfunction. Furthermore, any scratches or gouges on the sliding portion of the piston rod could damage the seals, which could lead to air leakage.

#### 4. Prevent the rotating parts from seizing.

Apply grease to the rotating parts (such as the pin) to prevent them from seizing.

#### 5. Do not use until you verify that the equipment can operate properly.

After mounting, repair or modification, etc., connect the air supply and electric power, and then confirm proper mounting by means of appropriate function and leak inspections.

#### 6. Instruction manual.

The product should be mounted and operated after thoroughly reading the manual and understanding its contents.

Keep the instruction manual where it can be referred to as needed.

## Piping

### ⚠ Caution

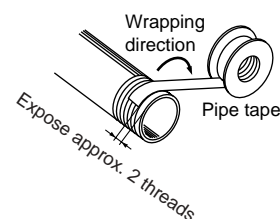
#### 1. Preparation before piping.

Before piping is connected, it should be thoroughly blown out with air (flushing) or washed to remove cutting chips, cutting oil and other debris from inside the pipe.

#### 2. Wrapping of sealant tape.

When connecting pipes and fittings, etc., be certain that cutting chips from the pipe threads and sealing material do not get inside the piping.

Also, when sealant tape is used, leave 1.5 to 2 thread ridges exposed at the end of the pipe/fitting.





# Smooth Cylinder Actuator Precautions 3

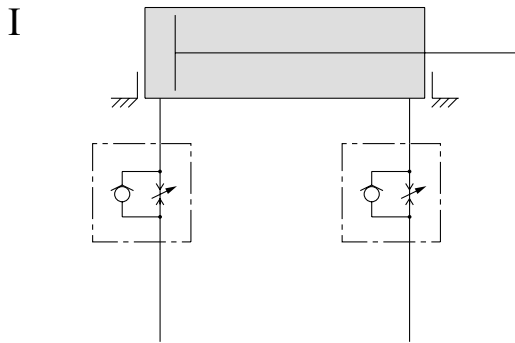
Be sure to read before handling.

## Recommended Pneumatic Circuit

Please refer to the following information when speed control is conducted with the smooth cylinder.

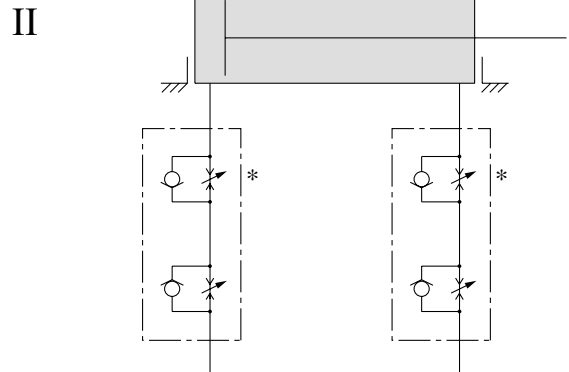
### Warning

#### Horizontal actuation (Speed control)



#### Meter-in speed controller

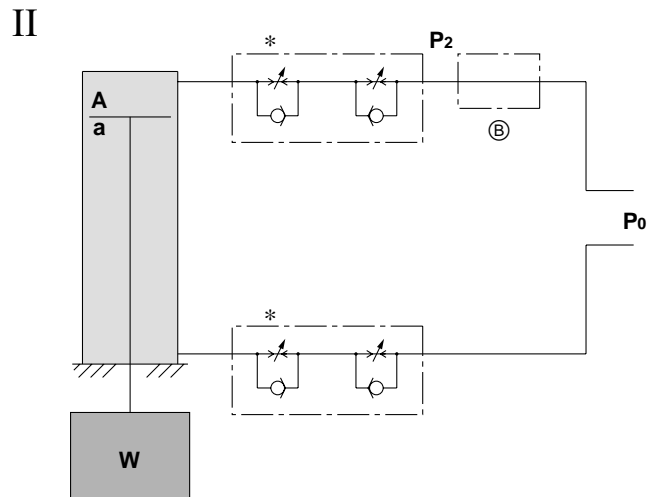
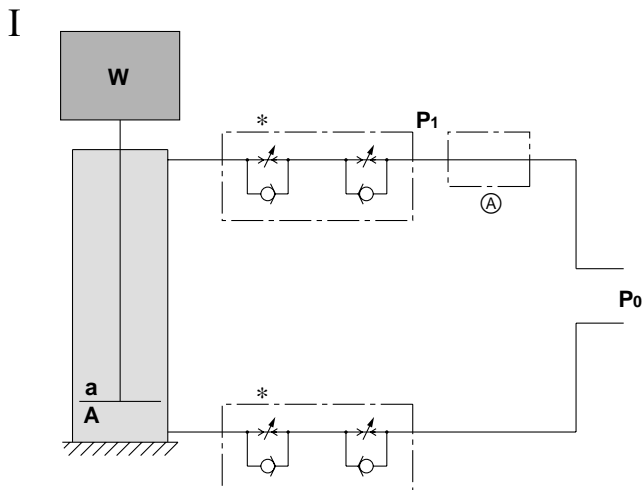
Meter-in speed controllers can not only control the speed but also reduce sudden movement. Easy adjustment is possible with two handles.



#### Dual speed controller

Meter-out speed control is conducted. Combine meter-in control to reduce sudden movement. Compared with circuits that only use meter-in control, this circuit achieves more stable low-speed operation.

#### Vertical actuation (Speed control)



- (1) Basically, meter-out control is used. Combine meter-in control to reduce sudden movement.\*
- (2) Depending on the size of the load, installation of a regulator with check valve at the (A) position is effective to reduce sudden movement in downward operation or delay in upward operation.

Guideline

When  $W + P_0a > P_0A$ :

Adjust  $P_1$  so that  $W + P_1a = P_0A$ .

- (1) Basically, meter-out control is used. Combine meter-in control to reduce sudden movement.\*
- (2) Installation of a regulator with check valve at the (B) position is effective to reduce sudden movement in downward operation or delay in upward operation.

Guideline

Adjust  $P_2$  so that  $W + P_2a = P_0a$ .

W: Load (N) P<sub>0</sub>: Operating pressure (MPa) a: Rod side piston area (mm<sup>2</sup>) A: Head side piston area (mm<sup>2</sup>)



# Smooth Cylinder Actuator Precautions 4

Be sure to read before handling.

## Lubrication

### Caution

#### 1. Do not lubricate the cylinder.

Lubrication may cause malfunction.

#### 2. Do not use greases other than those specified by SMC.

The low speed cylinder and low speed cylinder of clean room specification use different greases. Use of a grease outside the specification may lead to malfunction and particle generation.

- When only grease for maintenance is necessary, please order by the following part numbers.

Grease

GR-L-005 (5 g), GR-L-010 (10 g), GR-L-150 (150 g)

#### 3. Do not wipe off the grease adhering to the sliding part of the cylinder.

Wiping off the grease adhering to the sliding part of the air cylinder may lead to malfunction.

## Air Supply

### Warning

#### 1. Use clean air.

If compressed air includes chemicals, synthetic oils containing organic solvents, salt or corrosive gases, etc., it can cause damage or malfunction.

### Caution

#### 1. Install air filters.

Install air filters at the upstream side of valves. The filtration degree should be 5 μm or less.

#### 2. Install an after cooler, air dryer, drain catch, etc.

Air that includes excessive condensate may cause malfunction of valves and other pneumatic equipment. To prevent this, install an air dryer, after cooler, etc.

#### 3. Use the product within the specified range of fluid and ambient temperature.

Take measures to prevent freezing, since moisture in circuits will be frozen under 5°C, and this may cause damage to seals and lead to malfunction.

Refer to SMC's Best Pneumatics catalog vol. 4 for further details on compressed air quality.

#### 4. Take measures to prevent possible fluctuations in pressure.

Fluctuations in pressure may cause malfunction.

## Operating Environment

### Warning

#### 1. Do not use in environments where there is a danger of corrosion.

#### 2. Do not use in environments where a large amount of dust is present or where water or oil splashes on the cylinder.

## Maintenance

### Warning

#### 1. Maintenance should be done according to the procedures indicated in the operating manual.

If handled improperly, malfunction and damage of machinery or equipment may occur.

#### 2. Machine maintenance, and supply and exhaust of compressed air.

When machinery is serviced, first check measures to prevent dropping of driven objects and run-away of equipment, etc. Then cut off the supply pressure and electric power, and exhaust all compressed air from the system.

When machinery is restarted, check that proper measures are taken to prevent shooting out and that operation is normal with actuators in the proper positions.

### Caution

#### 1. Drain flushing.

Remove condensate from air filters regularly.



# Smooth Cylinder Auto Switch Precautions 1

Be sure to read before handling.

## Design & Selection

### Warning

#### 1. Confirm the specifications.

Read the specifications carefully and use this product appropriately. The product may be damaged or malfunction if it is used outside the range of specifications of current load, voltage, temperature or impact.

#### 2. Take precautions when multiple cylinders are used close together.

When multiple auto switch cylinders are used in close proximity, magnetic field interference may cause the switches to malfunction. Maintain a minimum cylinder separation of 40mm. (When the allowable separation is indicated for each cylinder series, use the specified value.)

#### 3. Pay attention to the length of time that a switch is ON at an intermediate stroke position.

When an auto switch is placed at an intermediate position of the stroke and a load is driven at the time the piston passes, the auto switch will operate, but if the speed is too great the operating time will be shortened and the load may not operate properly. The maximum detectable piston speed is:

$$V \text{ (mm/s)} = \frac{\text{Auto switch operating range (mm)}}{\text{Time load applied (ms)}} \times 1000$$

In cases of high piston speed, the use of an auto switch (D-F5NT, F7NT and G5NT) with a built-in OFF delay timer (approx. 200ms) makes it possible to extend the load operating time.

#### 4. Wiring should be kept as short as possible.

<Reed switch>

As the length of the wiring to a load gets longer, the inrush current at switching ON becomes greater, and this may shorten the product's life. (The switch will stay ON all the time.)

- 1) For an auto switch without a contact protection circuit, use a contact protection box when the wire length is 5m or longer.
- 2) Even if an auto switch has a built-in contact protection circuit, when the wiring is more than 30m long, it is not able to adequately absorb the inrush current and its life may be reduced. It is again necessary to connect a contact protection box in order to extend its life. Please contact SMC in this case.

<Solid state switch>

- 3) Although wire length should not affect switch function, use a wire 100m or shorter.

#### 5. Take precautions for the internal voltage drop of the switch.

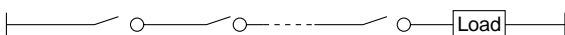
<Reed switch>

- 1) Switches with an indicator light except (D-A56, A76H, A96, A96V, C76 and Z76)

● If auto switches are connected in series as shown below, take note that there will be a large voltage drop because of internal resistance in the light emitting diode. (Refer to internal voltage drop in the auto switch specifications.)

[The voltage drop will be "n" times larger when "n" auto switches are connected.]

Even though an auto switch operates normally, the load may not operate.



- In the same way, when operating under a specified voltage, although an auto switch may operate normally, the load may not operate. Therefore, the formula below should be satisfied after confirming the minimum operating voltage of the load.

$$\text{Power supply voltage} - \text{Switch internal voltage drop} > \text{Minimum operating voltage of load}$$

- 2) If the internal resistance of a light emitting diode causes a problem, select a switch without an indicator light (Models D-A6□, A80, A80H, A90, A90V, C80 and Z80)

<Solid state switch>

- 3) Generally, the internal voltage drop will be greater with a 2-wire solid state auto switch than with a reed switch. Take the same precautions as in 1).

Also, note that a 12 VDC relay is not applicable.

#### 6. Pay attention to leakage current.

<Solid state switch>

With a 2-wire solid state auto switch, current (leakage current) flows to the load to operate the internal circuit even when in the OFF state.

$$\text{Operating current of load (Input OFF signal of controller)} > \text{Leakage current}$$

If the criteria given in the above formula are not met, it will not reset correctly (stays ON). Use a 3-wire switch if this specification will not be satisfied.

Moreover, leakage current flow to the load will be "n" times larger when "n" auto switches are connected in parallel.

#### 7. Do not use a load that generates surge voltage.

<Reed switch>

If driving a load such as a relay that generates a surge voltage, use a switch with a built-in contact protection circuit or use a contact protection box.

<Solid state switch>

Although a zener diode for surge protection is connected at the output side of a solid state auto switch, damage may still occur if the surge is applied repeatedly. When a load, such as a relay or solenoid, which generates surge is directly driven, use a switch with a built-in surge absorbing element.

#### 8. Cautions for use in an interlock circuit.

When an auto switch is used for an interlock signal requiring high reliability, devise a double interlock system to avoid trouble by providing a mechanical protection function, or by also using another switch (sensor) together with the auto switch. Also perform periodic maintenance and confirm proper operation.

#### 9. Ensure sufficient clearance for maintenance activities.

When designing an application, be sure to allow sufficient clearance for maintenance and inspections.





# Smooth Cylinder Auto Switch Precautions 2

Be sure to read before handling.

## Mounting & Adjustment

### Warning

#### 1. Do not drop or bump.

Do not drop, bump or apply excessive impacts (300m/s<sup>2</sup> or more for reed switches and 1000m/s<sup>2</sup> or more for solid state switches) while handling.

Although the body of the switch may not be damaged, the inside of the switch could be damaged and cause a malfunction.

#### 2. Do not carry a cylinder by the auto switch lead wires.

Never carry a cylinder by its lead wires. This may not break the lead wires, but it may cause internal elements of the switch to be damaged by the stress.

#### 3. Mount switches using the proper tightening torque.

When a switch is tightened beyond the specified tightening torque, the mounting screws, mounting bracket, or switch may be damaged. On the other hand, tightening below the range of fastening torque may allow the switch to slip out of position. (Refer to switch mounting for each series regarding switch mounting, moving, and fastening torque, etc..)

#### 4. Mount a switch at the center of the operating range.

Adjust the mounting position of an auto switch so that the piston stops at the center of the operating range (the range in which a switch is ON). (The mounting position shown in a catalog indicates the optimum, position at stroke end.) If mounted at the end of the operating range (around the borderline of ON and OFF), operation will be unstable.

## Wiring

### Warning

#### 1. Avoid repeatedly bending or stretching the lead wire.

Repeatedly applying bending stress or stretching force to the lead wire will cause it to break.

#### 2. Be sure to connect the load before power is applied.

<2-wire type>

If the power is turned ON when an auto switch is not connected to a load, the switch will be instantly damaged because of excess current.

#### 3. Confirm proper insulation of wiring.

Make sure that there is no faulty wiring insulation (contact with other circuits, ground fault, improper insulation between terminals, etc.). Damage may occur due to excess current flow into a auto switch.

#### 4. Do not wire in conjunction with power lines or high voltage lines.

Wire separately from power lines or high voltage lines, avoiding parallel wiring or wiring in the same conduit with these lines. Control circuits, including auto switches, may malfunction due to noise from these other lines.

#### 5. Do not allow loads to short circuit.

<Reed switch>

If the power is turned ON with a load in a short circuit condition, the switch will be instantly damaged because of excess current flow into the switch.

<Solid state switch>

Models D-M9□, J51, F9BA, G5NB and all models of PNP output switches do not have built-in short circuit prevention circuits. If loads are short circuited, the switches will be instantly damaged.

Take special care to avoid reverse wiring between the brown power supply line and the black output line on 3-wire type switches.

#### 6. Avoid incorrect wiring.

<Reed switch>

A 24 VDC switch with indicator light has polarity. The brown lead wire or terminal No.1 is (+), and the blue lead wire or terminal No.2 is (-).

1) If connections are reversed, a switch will operate, however, the light emitting diode will not light up.

Also note that a current greater than that specified will damage a light emitting diode and it will no longer operate.

Applicable models:

D-A73, A73H, A73C, C73, C73C, Z73

D-A93, A93V

D-A33, A34, A33A, A34A, A44, A44A

D-A53, A54, B53, B54

2) However, when using a two color indication auto switch (D-A79W, A59W, B59W), be aware that the switch will constantly remain ON if the connections are reversed.

<Solid state switch>

1) If connections are reversed on a 2-wire type switch, the switch will not be damaged if protected by a protection circuit, but the switch will always stay in an ON state. However, it is still necessary to avoid reversed connections, since the switch could be damaged by a load short circuit in this condition.

2) If connections are reversed (power supply line + and power supply line -) on a 3-wire type switch, the switch will be protected by a protection circuit. However, if the power supply line (+) is connected to the blue (black) wire and the power supply line (-) is connected to the black (white) wire, the switch will be damaged.

#### \* Lead wire color changes

Lead wire colors of SMC switches and related products have been changed in order to meet NECA (Nippon Electric Control Equipment Industries Association) Standard 0402 for production beginning September, 1996 and thereafter. Please refer to the tables provided. Special care should be taken regarding wire polarity during the time that the old colors still coexist with the new colors.

#### 2-wire

	Old	New
Output (+)	Red	Brown
Output (-)	Black	Blue

#### Solid state with diagnostic output

	Old	New
Power supply	Red	Brown
GND	Black	Blue
Output	White	Black
Diagnostic output	Yellow	Orange

#### 3-wire

	Old	New
Power supply	Red	Brown
GND	Black	Blue
Output	White	Black

#### Solid state with latch diagnostic output

	Old	New
Power supply	Red	Brown
GND	Black	Blue
Output	White	Black
Latch diagnostic output	Yellow	Orange



# Smooth Cylinder Auto Switch Precautions 3

Be sure to read before handling.

## Operating Environment

### Warning

- 1. Never use in an atmosphere with explosive gases.**

The structure of auto switches is not designed to prevent explosion. Never use in an atmosphere with an explosive gas since this may cause a serious explosion.
- 2. Do not use in an area where a magnetic field is generated.**

Auto switches will malfunction or magnets inside cylinders will become demagnetized. (Consult SMC regarding the availability of a magnetic field resistant auto switch.)
- 3. Do not use in an environment where the auto switch will be continually exposed to water.**

Although switches except D-A3□/A44□/G39□/K39□ satisfy the IEC standard IP67 structure (JIS C 0920: anti-immersion structure), do not use switches in applications where they are continually exposed to water splash or spray. Poor insulation or swelling of the potting resin inside switches may cause malfunction.
- 4. Do not use in an environment with oil or chemicals.**

Consult SMC if auto switches will be used in an environment with coolant, cleaning solvent, various oils or chemicals. If auto switches are used under these conditions for even a short time, they may be adversely affected by improper insulation, malfunction due to swelling of the potting resin, or hardening of the lead wires.
- 5. Do not use in an environment with temperature cycles.**

Consult SMC if switches are used where there are temperature cycles other than normal temperature changes, as they may be adversely affected.
- 6. Do not use in an environment where there is excessive impact shock.**

<Reed switch>  
When excessive impact (300m/s<sup>2</sup> or more) is applied to a reed switch during operation, the contact point will malfunction and generate or cut off a signal momentarily (1ms or less). Consult SMC regarding the need to use a solid state switch depending upon the environment.
- 7. Do not use in an area where surges are generated.**

<Solid state switch>  
When there are units (solenoid lifter, high frequency induction furnace, motor, etc.) which generate a large amount of surge in the area around cylinders with solid state auto switches, this may deteriorate or damage the switch. Avoid sources of surge generation and disorganized lines.
- 8. Avoid accumulation of iron powder or close contact with magnetic substances.**

When a large amount of ferrous powder such as machining chips or spatter is accumulated, or a magnetic substance is brought into close proximity with an auto switch cylinder, it may cause the auto switch to malfunction due to a loss of the magnetic force inside the cylinder.

## Maintenance

### Warning

- 1. Perform the following maintenance periodically in order to prevent possible danger due to unexpected auto switch malfunction.**
  - 1) Secure and tighten switch mounting screws.

If screws become loose or the mounting position is dislocated, retighten them after readjusting the mounting position.
  - 2) Confirm that there is no damage to lead wires.

To prevent faulty insulation, replace switches or repair lead wires, etc., if damage is discovered.
  - 3) Confirm the lighting of the green light on the 2-color indicator switch.

Confirm that the green LED is on when stopped at the established position. If the red LED is on, the mounting position is not appropriate. Readjust the mounting position until the green LED lights up.

## Other

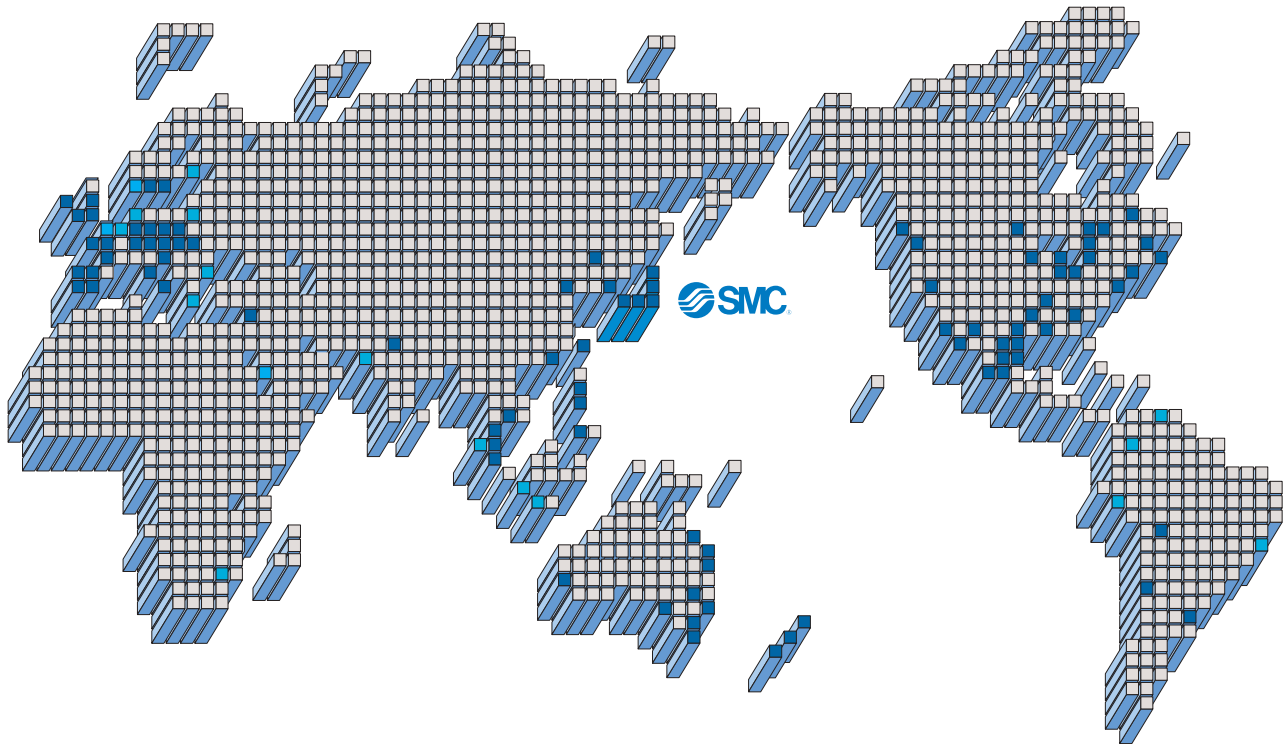
### Warning

- 1. Consult SMC concerning water resistance, elasticity of lead wires, and usage at welding sites, etc.**





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