

# Low Speed Cylinder

## *CJ2X/CUX/CQSX/CQ2X/CM2X*

ø10 to ø16    ø10 to ø32    ø12 to ø25    ø32 to ø100    ø20 to ø40

### Air Cylinder Series *CJ2X*



Bore size (mm)	Minimum operating pressure (MPa)	Minimum operating piston speed (mm/s)
10, 16	0.06	1

Page

RE<sub>B</sub><sup>A</sup>

10-3-6

REC

C□X

C□Y

### Free Mount Cylinder Series *CUX*



Bore size (mm)	Minimum operating pressure (MPa)	Minimum operating piston speed (mm/s)
10, 16	0.06	1
20, 25, 32	0.05	0.5

10-3-8

MQ<sub>M</sub><sup>Q</sup>

RHC

MK(2)

RS<sub>G</sub><sup>Q</sup>

### Compact Cylinder Series *CQSX*



Bore size (mm)	Minimum operating pressure (MPa)	Minimum operating piston speed (mm/s)
12, 16	0.03	1
20, 25	0.025	0.5

10-3-10

RS<sub>A</sub><sup>H</sup>

RZQ

MI<sub>S</sub><sup>W</sup>

CEP1

CE1

### Compact Cylinder Series *CQ2X*



Bore size (mm)	Minimum operating pressure (MPa)	Minimum operating piston speed (mm/s)
32, 40	0.025	0.5
50, 63, 80, 100	0.01	0.5

10-3-12

CE2

ML2B

C<sub>5</sub>-S

CV

### Compact Cylinder Series *CM2X*



Bore size (mm)	Minimum operating pressure (MPa)	Minimum operating piston speed (mm/s)
20, 25, 32, 40	0.025	0.5

10-3-14

MVGQ

CC

RB

J

D-

-X

20-

Data

### Clean Series

#### Compact Cylinder Series *10-/11-CQSX*



#### Air Cylinder Series *10-/11-CQ2X*



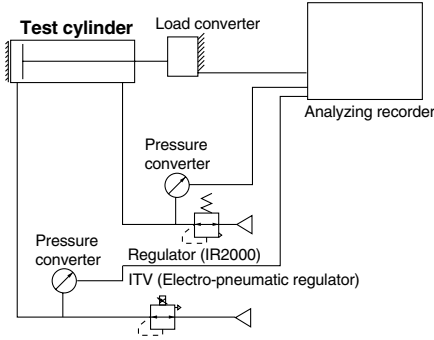
#### Air Cylinder Series *10-/11-CM2X*



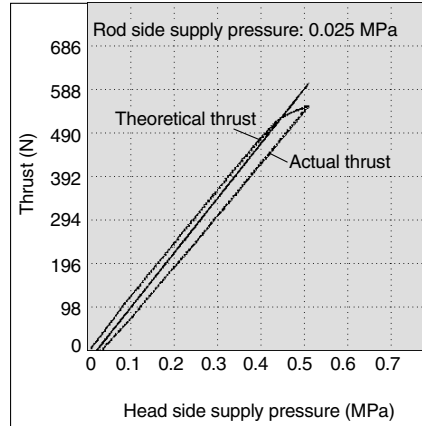
# Low Speed Cylinder

**Improved low friction characteristics (CM2X, CQSX, CQ2X)**  
 Minimum operating pressure is reduced in half (compared to previous version).  
 Stabilization of thrust has been realized.

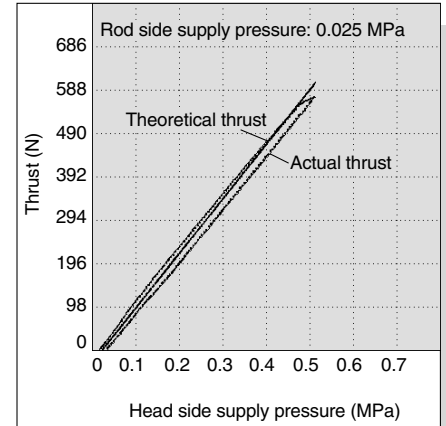
Measurement circuit of cylinder output relative to supply pressure



CQ2B40-75D (Standard)

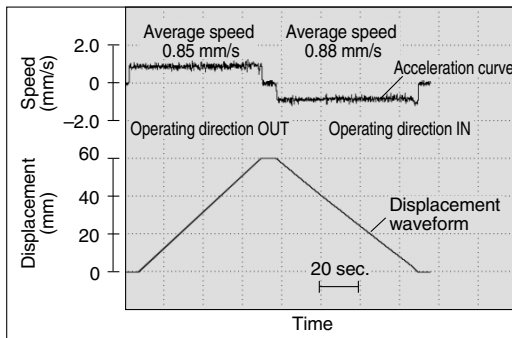


CQ2XB40-75D (Low speed cylinder)

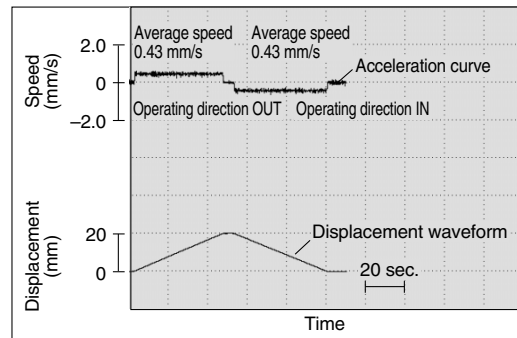


**Stable low speed operation even at 0.5 mm/s (1 mm/s for  $\phi 16$  or smaller) is achieved.**  
 Operates smoothly with minimal stick-slip.

CJ2XB10-60



CQSXB20-20D



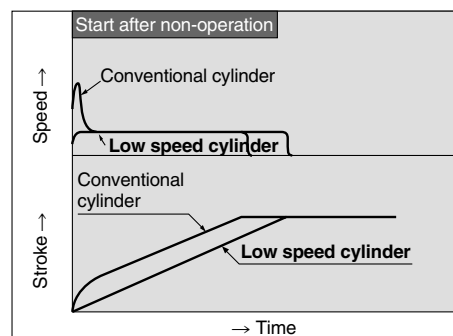
Note 1) Average speed is what the stroke is divided by piston rod's transit time.  
 Note 2) The OUT operating direction is considered to be positive with regard to speed.

Data conditions • Working fluid..... Air  
 • Mounting orientation..... Horizontal no-load  
 • Operating pressure..... 0.35 MPa  
 • Operating circuit..... Meter-in

**Possible to transfer a workpiece which hates shocks at lower speeds.**

Smooth start with a little ejection even after being rendered for hours.

**The dimensions of all models are the same as those of standard cylinders.**



# Clean room specification has been added. (10-/11-CQSX, CQ2X, CM2X)

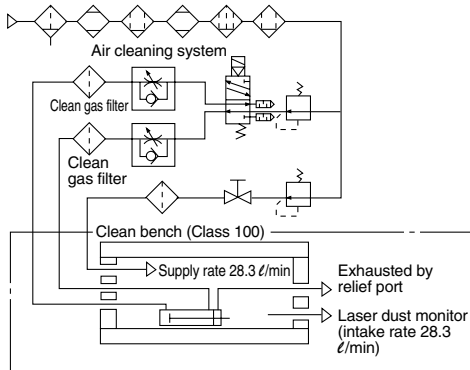
Particulate generation data for microspeed cylinder with clean room specifications are measured using the following test method.

## [Example of test method]

The test sample is in place in an acrylic chamber. The chamber is set up on a Class 100 clean bench. The solenoid valve is operated while supplying a volume of clean air equal to the intake volume of a laser dust monitor (28.3 ℓ/min). The amount of particle generation is measured for a specific number of operating cycles.

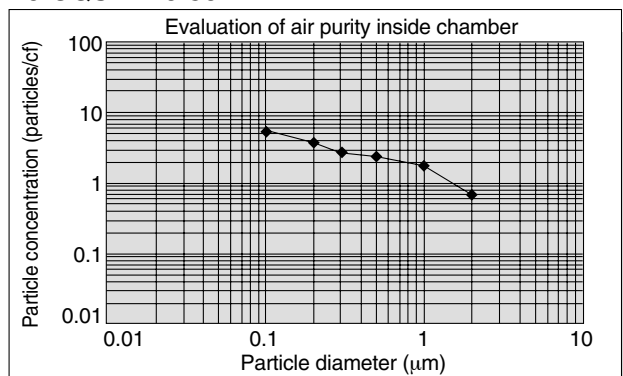
### Measuring Conditions

Chamber volume	15 ℓ
Purity of air supplied to chamber	Same quality as supply air
Laser dust monitor	Hitachi Electronics Engineering Corporation TS-6200 Min. measurable particle dia.: 0.1 μm Intake rate: 28.3 ℓ/min
Laser dust monitor setting conditions	Sampling time: 5 min Interval time: 55 min
Cylinder operating conditions	Operating frequency: 30 cpm Average piston speed: 100 mm/s Mounting: Horizontal no-load Supply pressure: 0.5 MPa

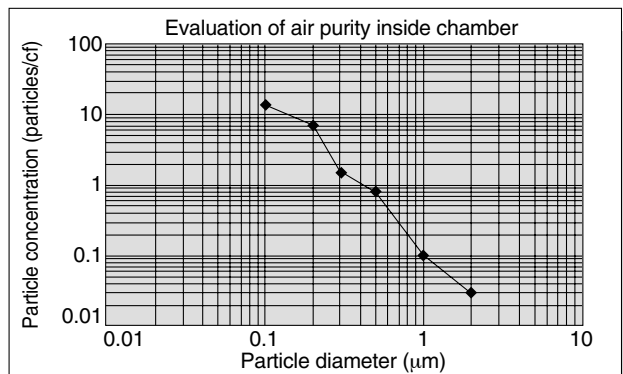


Particle generation measuring circuit

### 10-CQSXB20-50D



### 10-CM2XB20-50



RE<sub>B</sub><sup>A</sup>

REC

C□X

C□Y

MQ<sub>M</sub><sup>Q</sup>

RHC

MK(2)

RS<sub>G</sub><sup>Q</sup>

RS<sub>A</sub><sup>H</sup>

RZQ

MI<sub>S</sub><sup>W</sup>

CEP1

CE1

CE2

ML2B

C<sub>5</sub>-S

CV

MVGQ

CC

RB

J

D-

-X

20-

Data



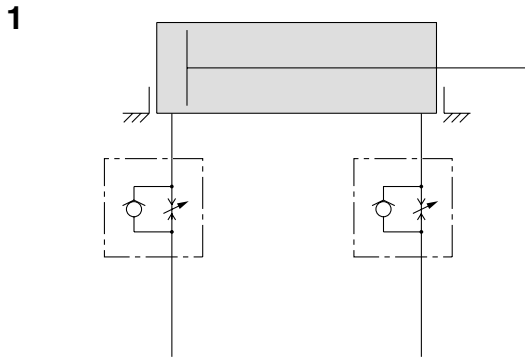
# Low Speed Cylinder Specific Product Precautions

Be sure to read before handling.

## Recommended Pneumatic Circuit

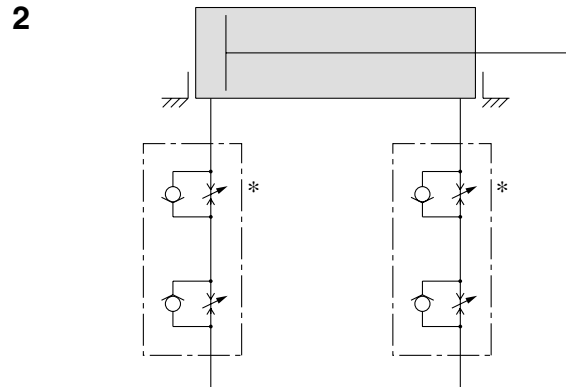
### Warning

#### Horizontal Operation



#### Meter-in speed controllers

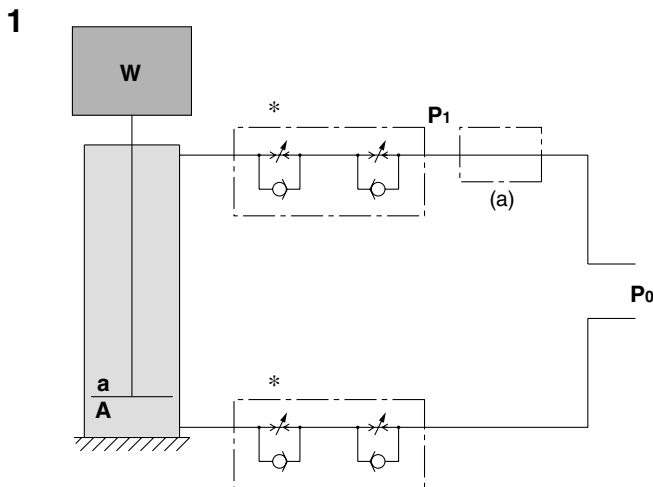
Meter-in speed controllers can reduce lurching while controlling the speed. The two knobs facilitate adjustment.



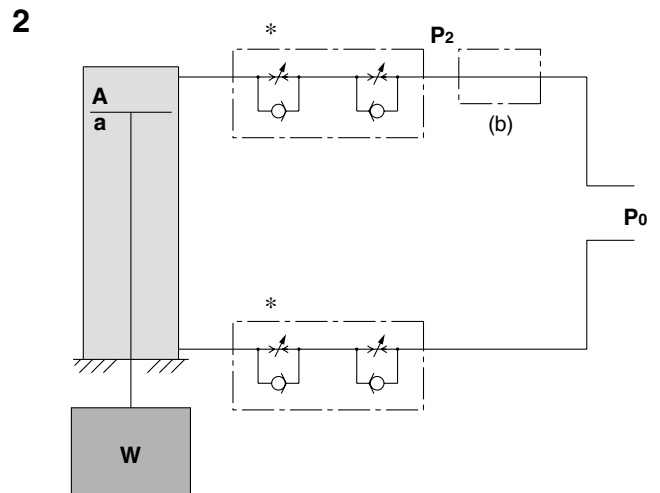
#### Dual speed controllers

Velocity is controlled by meter-out circuit. Using concurrently the meter-in circuit can alleviate the stick-slip. More stable low speed operation can be achieved than meter-in circuit alone.

#### Vertical Operation



- (1) The speed is controlled with meter-out control. When the meter-in controller is used in conjunction with the meter-out controller, lurching is reduced. (\*)
- (2) Depending on the size of the load, installing a regulator with check valve at position (a) can decrease lurching during descent, and operation delay during ascent.  
As a guide, when  
 $W + P_0a > P_0A$ ,  
adjust  $P_1$ , so that it could be  $W + P_1a = P_0A$ .



- (1) The speed is controlled with meter-out control. When the meter-in controller is used in conjunction with the meter-out controller, lurching is reduced. (\*)
- (2) Installing a regulator with check valve at position (b) can decrease lurching during descent, and actuation delay during ascent.  
As a guide,  
adjust  $P_2$ , so that it could be  $W + P_2A = P_0a$ .

**W:** Load (N) **P<sub>0</sub>:** Operating pressure (MPa) **a:** Piston area in the rod side (mm<sup>2</sup>) **A:** Piston area in the head side (mm<sup>2</sup>)

### Warning

Since **C□J2X**, **C□UX10** are subject to internal leakage due to their construction, the speed may not be fully controlled with the meter-out controller (\*) during low speed operation.

RE <sup>A</sup> <sub>B</sub>
REC
<b>C□X</b>
C□Y
MQ <sup>Q</sup> <sub>M</sub>
RHC
MK(2)
RS <sup>Q</sup> <sub>G</sub>
RS <sup>H</sup> <sub>A</sub>
RZQ
MI <sup>W</sup> <sub>S</sub>
CEP1
CE1
CE2
ML2B
C <sup>1</sup> / <sub>6</sub> 5-S
CV
MVGQ
CC
RB
J
D-
-X
20-
Data

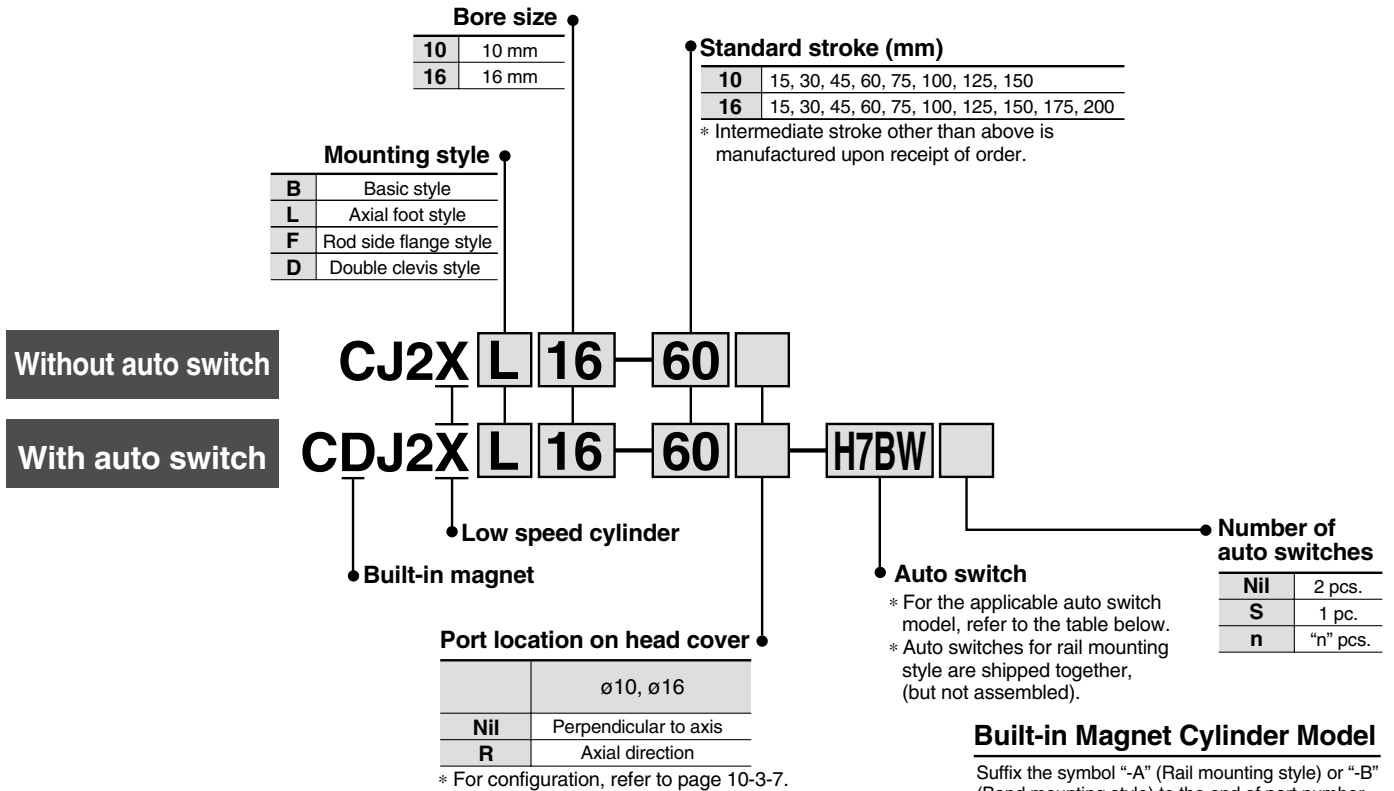


The external dimensions and the related things about auto switches are the same as standard type, double acting, single rod. For Series CJ2, refer to Best Pneumatics Vol. 6.

# Low Speed Cylinder Double Acting, Single Rod Series CJ2X

ø10, ø16

## How to Order



### Built-in Magnet Cylinder Model

Suffix the symbol "-A" (Rail mounting style) or "-B" (Band mounting style) to the end of part number for cylinder with auto switch.

Example	Rail mounting style	CDJ2XB10-45-A
	Band mounting style	CDJ2XB16-60-B

### Applicable Auto Switch/Refer to page 10-20-1 for further information on auto switches.

Type	Special function	Electrical entry	Indicator/light	Wiring (Output)	Load voltage		Auto switch model			Lead wire length (m)*				Pre-wire connector	Applicable load			
					DC	AC	Band mounting	Rail mounting		0.5 (Nil)	3 (L)	5 (Z)	None (N)		IC circuit	Relay, PLC		
Reed switch	—	Grommet	Yes	3-wire (NPN equivalent)	—	5 V	—	C76	—	A76H	●	●	—	—	—	IC circuit	—	
						—	200 V	—	A72	A72H	●	●	—	—	—			
		Connector		2-wire	24 V	12 V	100 V	C73	A73	A73H	●	●	●	—	—	—	—	Relay, PLC
						12 V	—	C73C	A73C	—	●	●	●	●	—	—		
Solid state switch	—	Grommet	Yes	3-wire (NPN)	24 V	5 V, 12 V	—	H7A1	F7NV	F79	●	●	○	—	○	IC circuit	—	
				3-wire (PNP)				H7A2	F7PV	F7P	●	●	○	—	○			
				2-wire				H7B	F7BV	J79	●	●	○	—	○			
				—				H7C	J79C	—	●	●	●	●	○			○
		Connector		2-wire	24 V	5 V, 12 V	—	H7NW	F7NWW	F79W	●	●	○	—	○	IC circuit	Relay, PLC	
								H7PW	—	F7PW	●	●	○	—	○			
								H7BW	F7BWV	J79W	●	●	○	—	○			
								H7NF	—	F79F	●	●	○	—	○			
Grommet	3-wire (NPN)	5 V, 12 V	—	—	—	—	—	—	—	—	—	—	—	—	—			
																3-wire (PNP)	5 V, 12 V	—
Grommet	2-wire	12 V	—	—	—	—	—	—	—	—	—	—	—					
														With diagnostic output (2-color indication)	4-wire (NPN)	5 V, 12 V	—	—

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

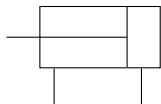
\* Solid state switches marked with "○" are produced upon receipt of order.

• Since there are other applicable auto switches than listed, refer to Best Pneumatics Vol. 6 for details.  
 • For details about auto switches with pre-wire connector, refer to page 10-20-66.

# Low Speed Cylinder Double Acting, Single Rod Series CJ2X



**JIS Symbol**  
Double acting,  
Single rod



## ⚠ Precautions

Be sure to read before handling. For Safety Instructions and Actuator Precautions, refer to pages 10-24-3 to 10-24-6.

## Mounting

### ⚠ Caution

- During installation, secure the rod cover and tighten by applying an appropriate tightening force to the retaining nut or to the rod cover body. If the head cover is secured or the head cover is tightened, the cover could rotate, leading to the deviation.
- Proper tightening torque for mounting thread should be within the range specified. Apply a Loctite® (no. 242 Blue) for mounting thread.

Bore size (mm)	Proper tightening torque for mounting thread (N·m) (tightening torque for mounting nut)
10	3.0 to 3.2
16	5.4 to 5.9

- To remove and install the snap ring for the knuckle pin or the clevis pin, use an appropriate pair of pliers (tool for installing a type C snap ring). Especially with  $\phi 10$ , use ultra thin pliers, such as Super Tool Corp., CSM-07A.
- For the auto switch mounting rail, do not remove the pre-equipped rail. Since the mounting thread is drilled through inside a the cylinder, it will result in air leakage.

## Operating Precautions

### ⚠ Warning

- It might not be able to control by meter-out at a low speed operation.

### ⚠ Caution

- For Series CJ2X, 0.1 Nℓ/min is the values at maximum in terms of its construction and there is internal leakage (ANR).

## Specifications

Action	Double acting, Single rod	
Fluid	Air	
Proof pressure	1.05 MPa	
Maximum operating pressure	0.7 MPa	
Minimum operating pressure	0.06 MPa	
Ambient and fluid temperature	Without auto switch: -10 to 70°C (No freezing) With auto switch: -10 to 60°C (No freezing)	
Cushion	Rubber bumper (Standard equipment)	
Lubrication	Not required (Non-lube)	
Thread tolerance	JIS Class 2	
Stroke length tolerance	+1.0 0	
Piston speed	1 to 300 mm/s	
Allowable kinetic energy	$\phi 10$	0.035 J
	$\phi 16$	0.090 J

## Standard Stroke

Bore size (mm)	Standard stroke (mm)
10	15, 30, 45, 60, 75, 100, 125, 150
16	15, 30, 45, 60, 75, 100, 125, 150, 175, 200

## Mounting Style and Accessory

Mounting		Basic style	Axial foot style	Rod side flange style	Double* clevis style
Standard equipment	Mounting nut	●	●	●	—
	Rod end nut	●	●	●	●
	Clevis pin	—	—	—	●
Option	Single knuckle joint	●	●	●	●
	Double knuckle joint*	●	●	●	●
	T-bracket	—	—	—	●

\* Pin and snap ring are shipped together with double clevis and double knuckle joint.

## Port Location on Head Cover

For basic style, the port position in a head cover is available either perpendicular to the axis or in-line with the cylinder axis.



Axial direction

Perpendicular

## Mounting Bracket Part No.

Mounting bracket	Bore size (mm)	
	10	16
Foot bracket	CJ-L010B	CJ-L016B
Flange bracket	CJ-F010B	CJ-F016B
T-bracket*	CJ-T010B	CJ-T016B

\* T-bracket is used with double clevis (D).

## Auto Switch Mounting Bracket Part No. (Band mounting style)

Bore size (mm)	Auto switch mounting bracket part no.	Note
10	BJ2-010	Common for the types of D-C7/C8 and D-H7
16	BJ2-016	

RE<sub>B</sub><sup>A</sup>

REC

C□X

C□Y

MQ<sub>M</sub><sup>Q</sup>

RHC

MK(2)

RS<sub>G</sub><sup>Q</sup>

RS<sub>A</sub><sup>H</sup>

RZQ

MI<sub>S</sub><sup>W</sup>

CEP1

CE1

CE2

ML2B

C<sub>5</sub>-S

CV

MVGQ

CC

RB

J

D-

-X

20-

Data

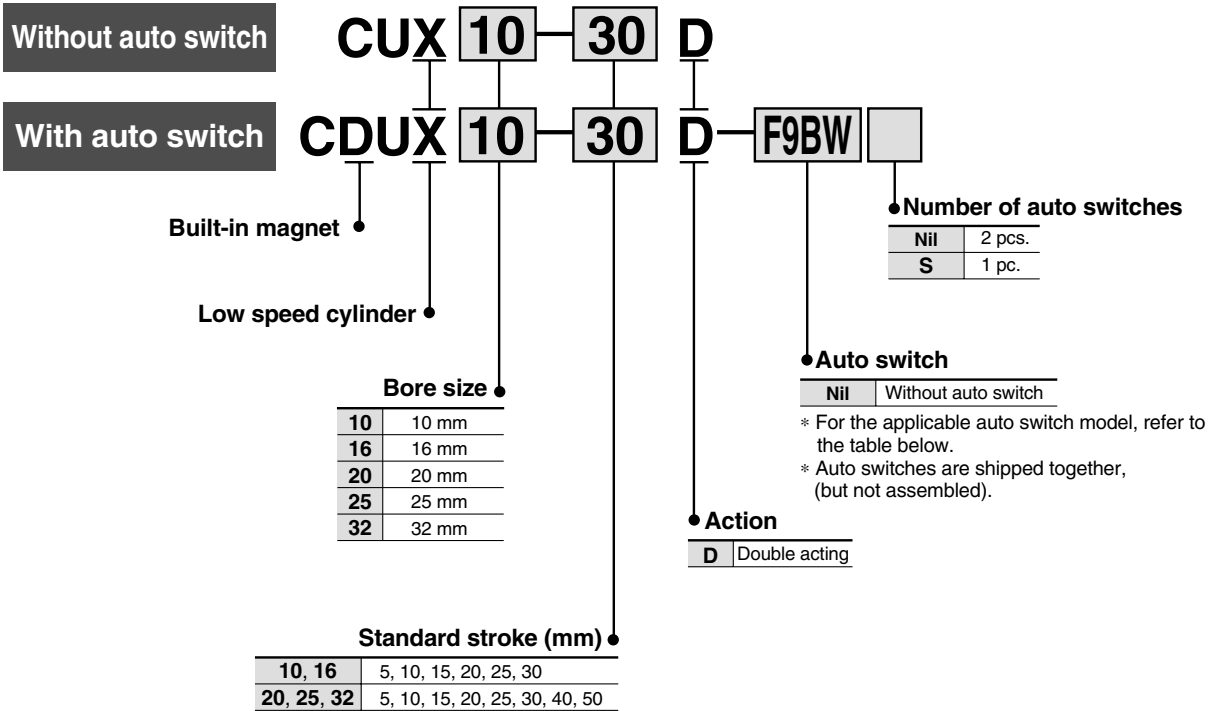


The external dimensions and the related things about auto switches are the same as standard type, double acting, single rod. For Series CU, CDU, refer to Best Pneumatics Vol. 7.

# Low Speed Cylinder Double Acting, Single Rod Series CUX

ø10, ø16, ø20, ø25, ø32

## How to Order



### Applicable Auto Switch/Refer to page 10-20-1 for further information on auto switches.

Type	Special function	Electrical entry	Indicator/light	Wiring (Output)	Load voltage			Auto switch model		Lead wire length (m)*			Pre-wire connector	Applicable load	
					DC	AC	Perpendicular	In-line	0.5 (Nil)	3 (L)	5 (Z)	IC circuit		—	
															—
Reed switch	—	Grommet	Yes	3-wire (NPN equivalent)	—	5 V	—	A96V	A96	●	●	—	—	IC circuit	—
				2-wire	24 V	12 V	100 V	A93V	A93	●	●	—	—	—	Relay, PLC
Solid state switch	Diagnostic indication (2-color indication)	Grommet	Yes	3-wire (NPN)	5 V, 12 V	—	M9NV	M9N	●	●	○	○	IC circuit	Relay, PLC	
				3-wire (PNP)					24 V	12 V	M9PV	M9P			●
				2-wire	5 V, 12 V		F9NVV	F9NW			●	●	○		○
				3-wire (NPN)					12 V	F9PWV	F9PW	●	●		○
				3-wire (PNP)	5 V, 12 V		F9BWW	F9BW				●	●		○
				2-wire					12 V	—	—	—	—		—

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

\* Solid state switches marked with "○" are produced upon receipt of order.

- Since there are other applicable auto switches than listed, refer to Best Pneumatics Vol. 7 for details.
- For details about auto switches with pre-wire connector, refer to page 10-20-66.



# Low Speed Cylinder Double Acting, Single Rod Series CUX

## Specifications



Fluid	Air
Proof pressure	1.05 MPa
Maximum operating pressure	0.7 MPa
Ambient and fluid temperature	Without auto switch: -10 to 70°C (No freezing) With auto switch: -10 to 60°C (No freezing)
Lubrication	Not required (Non-lube)
Piston speed	ø10, ø16: 1 to 300 mm/s ø20 to ø32: 0.5 to 300 mm/s
Cushion	Rubber bumper on both ends
Rod end thread	Male thread
Thread tolerance	JIS Class 2
Stroke length tolerance	+1.0 (Note) 0
Mounting	Basic style

Note) Tolerance  $^{+1.0}_0$

## Minimum Operating Pressure

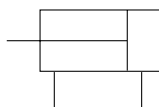
Bore size (mm)	10	16	20	25	32
Min. operating pressure (MPa)	0.06	0.06	0.05	0.05	0.05

## Standard Stroke

Bore size (mm)	Standard stroke (mm)
10, 16	5, 10, 15, 20, 25, 30
20, 25, 32	5, 10, 15, 20, 25, 30, 40, 50

### JIS Symbol

Double acting,  
Single rod



## ⚠ Precautions

Be sure to read before handling. For Safety Instructions and Actuator Precautions, refer to pages 10-24-3 to 10-24-6.

### Mounting

#### ⚠ Caution

- Tightening the cylinder beyond the range of the indicated torque (shown in the table below) may affect operation. Apply Loctite® (no. 242, Blue) to the mounting threads.

Bore size (mm)	Hexagon socket head (mm)	Proper tightening torque (N·m) (Cylinder body)
10	M3	0.54 ±10%
16	M4	1.23 ±10%
20, 25	M5	2.55 ±10%
32	M6	4.02 ±10%

### Operating Precautions

#### ⚠ Warning

- It might not be able to control CUX10 by meter-out at a low speed operation.

#### ⚠ Caution

- For Series CUX10, up to 0.1 Nl/min (ANR) of internal leakage is anticipated due to cylinder structure.

### Maintenance

#### ⚠ Caution

##### 1. Replacement parts/Seal kit

Order it in accordance with the bore size.

Bore size (mm)	Kit no.	Contents
16	CUX16-PS	Piston seal: 1 pc.
20	CUX20-PS	Rod seal: 1 pc.
25	CUX25-PS	Gasket: 1 pc.
32	CUX32-PS	Grease pack (10 g): 1 pc.

\* It is impossible to replace seals in bore size 10 mm.

##### 2. Grease pack

When maintenance requires only grease, use the following part numbers to order.

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

RE<sup>A</sup><sub>B</sub>

REC

C□X

C□Y

MQ<sup>Q</sup><sub>M</sub>

RHC

MK(2)

RS<sup>Q</sup><sub>G</sub>

RS<sup>H</sup><sub>A</sub>

RZQ

MI<sup>W</sup><sub>S</sub>

CEP1

CE1

CE2

ML2B

C<sub>5</sub>-S

CV

MVGQ

CC

RB

J

D-

-X

20-

Data



# Low Speed Cylinder Double Acting, Single Rod Series CQSX

ø12, ø16, ø20, ø25

## How to Order

**Without auto switch** CQSX **B** **20** **30** **D**  

**With auto switch** CDQSX **B** **20** **30** **D**   **F9BW**  

**Built-in magnet** (points to CDQSX)

**Low speed cylinder** (points to CQSX)

**Mounting style** (points to B)

<b>B</b>	Through-hole/ Both ends tapped common (Standard)
<b>L</b>	Foot style
<b>F</b>	Rod side flange style
<b>G</b>	Head side flange style
<b>D</b>	Double clevis style

**Bore size** (points to 20)

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

**Standard stroke** (points to 30)

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

• Manufacturing of intermediate stroke cylinders by the 1 mm interval are available by using spacers with standard stroke cylinders. The overall length of cylinder will be the same as the standard stroke with a longer one.  
Example) 3 mm width spacer is installed in the standard cylinder CQSXB25-50D to make CQSXB25-47D.

**Number of auto switches**

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

**Auto switch** (points to F9BW)

**Nil** Without auto switch (Built-in magnet)

\* For the applicable auto switch model, refer to the table below.  
\* Auto switches are shipped together, (but not assembled).

**Cushion/Rod end thread**

<b>Nil</b>	Standard (Rod end female thread)
<b>C</b>	With rubber bumper
<b>M</b>	Rod end male thread

\* Combination above is possible.

**Action**

<b>D</b>	Double acting
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### Applicable Auto Switch/Refer to page 10-20-1 for further information on auto switches.

Type	Special function	Electrical entry	Indicator light	Wiring (Output)	Load voltage			Auto switch model		Lead wire length (m)*			Pre-wire connector	Applicable load	
					DC	AC		Perpendicular	In-line	0.5 (Nil)	3 (L)	5 (Z)			
Reed switch	—	Grommet	Yes	3-wire (NPN equivalent)	—	5 V	—	<b>A96V</b>	<b>A96</b>	●	●	—	—	IC circuit	—
				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>M9NV</b>	<b>M9N</b>	●	●	○	○	IC circuit	Relay, PLC
				3-wire (PNP)				<b>M9PV</b>	<b>M9P</b>	●	●	○	○		
				2-wire				<b>M9BV</b>	<b>M9B</b>	●	●	○	○		
				3-wire (NPN)				<b>F9NWV</b>	<b>F9NW</b>	●	●	○	○		
				3-wire (PNP)				<b>F9PWV</b>	<b>F9PW</b>	●	●	○	○		
				2-wire				<b>F9BWV</b>	<b>F9BW</b>	●	●	○	○		

\* Lead wire length symbols: 0.5 m ..... Nil (Example) A93  
 3 m ..... L (Example) Y93BL  
 5 m ..... Z (Example) F9NWZ

\* Solid state switches marked with "○" are produced upon receipt of order.

- Since there are other applicable auto switches than listed, refer to Best Pneumatics Vol. 7 for details.
- For details about auto switches with pre-wire connector, refer to page 10-20-66.

# Low Speed Cylinder Double Acting, Single Rod Series CQSX

## Specifications



Type	Pneumatic (Non-lube)
Action	Double acting, Single rod
Fluid	Air
Proof pressure	1.5 MPa
Maximum operating pressure	1.0 MPa
Ambient and fluid temperature	Without auto switch: -10 to 70°C (No freezing) With auto switch: -10 to 60°C (No freezing)
Rubber bumper	None
Rod end thread	Female thread
Rod end thread tolerance	JIS Class 2
Stroke length tolerance	Standard stroke $^{+1.0}_0$
Mounting	Through-hole/Both ends tapped common
Piston speed	$\phi 12, \phi 16$ : 1 to 300 mm/s $\phi 20, \phi 25$ : 0.5 to 300 mm/s

## Minimum Stroke for Auto Switch Mounting

No. of auto switches mounted	D-A9□, D-F9□WV	D-A9□V	D-M9□, D-F9□W	D-M9□V
2 pcs.	10	10	15 <sup>Note)</sup>	5
1 pc.	10 <sup>Note)</sup>	5	15 <sup>Note)</sup>	5

(mm)

Note) Please consult with SMC for shorter stroke length than indicated in the table.

## Minimum Operating Pressure

Bore size (mm)	12	16	20	25
Min. operating pressure (MPa)	0.03	0.03	0.025	0.025

## Body Option

Description	Application
Rod end male thread	Available for all standard models
Rubber bumper	of double acting, single rod.

## ⚠ Precautions

**Be sure to read before handling. For Safety Instructions and Actuator Precautions, refer to pages 10-24-3 to 10-24-6.**

### Snap Ring Installation/Removal

#### ⚠ Caution

- For installation and removal, use an appropriate pair of pliers (tool for installing a type C snap ring).
- Even if a proper plier (tool for installing type C snap ring) is used, it is likely to inflict damage to a human body or peripheral equipment, as a snap ring may be flown out of the tip of a plier (tool for installing a type C snap ring). Be much careful with the popping of a snap ring. Besides, be certain that a snap ring is placed firmly into the groove of rod cover before supplying air at the time of installment.

### Maintenance

#### ⚠ Caution

##### 1. Replacement parts/Seal kit

Order it in accordance with the bore size.

Bore size (mm)	Kit no.	Contents
12	CQSX12-PS	Piston seal: 1 pc.
16	CQSX16-PS	Rod seal: 1 pc.
20	CQSX20-PS	Tube gasket: 1 pc.
25	CQSX25-PS	Grease pack (10 g): 1 pc.

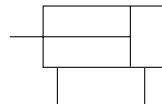
##### 2. Grease pack

When maintenance requires only grease, use the following part numbers to order.

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

### JIS Symbol

Double acting,  
Single rod



## Mounting Bracket Part No.

Bore size (mm)	Foot <sup>(1)</sup>	Flange	Double clevis
12	CQS-L012	CQS-F012	CQS-D012
16	CQS-L016	CQS-F016	CQS-D016
20	CQS-L020	CQS-F020	CQS-D020
25	CQS-L025	CQS-F025	CQS-D025

Note 1) When ordering foot bracket, order 2 pieces per cylinder.

Note 2) Parts belonging to each bracket are as follows.  
Foot or Flange: Body mounting bolts  
Double clevis: Clevis pin, Type C snap ring for shaft, Body mounting bolts

RE<sub>A</sub>  
B

REC

C□X

C□Y

MQ<sub>M</sub><sup>Q</sup>

RHC

MK(2)

RS<sub>G</sub><sup>Q</sup>

RS<sub>A</sub><sup>H</sup>

RZQ

MI<sub>S</sub><sup>W</sup>

CEP1

CE1

CE2

ML2B

C<sub>G</sub><sup>1</sup>5-S

CV

MVGQ

CC

RB

J

D-

-X

20-

Data



# Low Speed Cylinder

## Double Acting, Single Rod

# Series CQ2X

ø32, ø40, ø50, ø63, ø80, ø100

### How to Order

**Without auto switch**

**CQ2X B 40 30 D**

**With auto switch**

**CDQ2X B 40 30 D F9BW**

**Built-in magnet** →

**Low speed cylinder** →

**Mounting style** →

**Bore size** →

**Action** →

**Standard stroke** →

**Auto switch** →

**Cushion/Rod end thread** →

**Number of auto switches** →

<b>B</b>	Through-hole (Standard)
<b>A</b>	Both ends tapped style
<b>L</b>	Foot style
<b>F</b>	Rod side flange style
<b>G</b>	Head side flange style
<b>D</b>	Double clevis style

Bore size	
32	32 mm
40	40 mm
50	50 mm
63	63 mm
80	80 mm
100	100 mm

Action	
<b>D</b>	Double acting

Auto switch	
Nil	Without auto switch (Built-in magnet)
<b>S</b>	Without auto switch (Built-in magnet)
<b>n</b>	"n" pcs.

Cushion/Rod end thread	
<b>Nil</b>	Standard (Rod end female thread)
<b>C</b>	With rubber bumper
<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.

\* For the applicable auto switch model, refer to the table below.  
\* Auto switches are shipped together, (but not assembled).  
\* Combination above is possible.

Refer to "Standard Stroke" on page 10-3-13.

### Applicable Auto Switch

Refer to page 10-20-1 for further information on auto switches.

Type	Special function	Electrical entry	Indicator/light	Wiring (Output)	Load voltage		Rail mounting style		Direct mounting style		Lead wire length (m)*				Pre-wire connector	Applicable load		
					DC	AC	ø32 to ø100		ø32 to ø100		0.5 (Nil)	3 (L)	5 (Z)	None (N)				
							Perpendicular	In-line	Perpendicular	In-line								
Reed switch	—	Grommet	Yes	3-wire (NPN equivalent)	—	5 V	—	A76H	A96V	A96	●	●	—	—	—	IC circuit	—	
				2-wire	—	—	200 V	A72	A72H	—	—	●	●	—	—	—	—	Relay, PLC
		Connector		24 V	12 V	100 V	—	—	A93V	A93	●	●	—	—	—			
							—	—	A73C	—	—	●	●	●	●	—		
Diagnostic indication (2-color indication)	Grommet	—	—	A79W	—	—	—	●	●	—	—	—	—					
Solid state switch	—	Grommet	Yes	3-wire (NPN)	24 V	5 V, 12 V	—	F7NV	F79	M9NV	M9N	●	●	○	—	○	IC circuit	
				3-wire (PNP)				F7PV	F7P	M9PV	M9P	●	●	○	—	○		
		Connector		2-wire				12 V	F7BV	J79	M9BV	M9B	●	●	○	—	○	—
				J79C					—	—	—	●	●	●	●	—		
		Grommet		3-wire (NPN)	5 V, 12 V	—	F7NWV	F79W	F9NWV	F9NW	●	●	○	—	○	IC circuit		
				3-wire (PNP)			—	F7PW	F9PWV	F9PW	●	●	○	—	○			
				2-wire			12 V	F7BWV	J79W	F9BWV	F9BW	●	●	○	—	○	—	
				4-wire (NPN)				5 V, 12 V	—	F79F	—	—	●	●	○	—		○

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

\* Solid state switches marked with "○" are produced upon receipt of order.

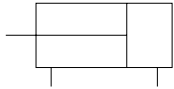
• Since there are other applicable auto switches than listed, refer to Best Pneumatics Vol. 7 for details.  
 • For details about auto switches with pre-wire connector, refer to page 10-20-66.



# Low Speed Cylinder Double Acting, Single Rod Series CQ2X



**JIS Symbol**  
Double acting,  
Single rod



## Specifications

Bore size (mm)		32	40	50	63	80	100
Model		Pneumatic (Non-lube)					
Fluid		Air					
Proof pressure		1.5 MPa					
Maximum operating pressure		1.0 MPa					
Ambient and fluid temperature		Without auto switch: -10 to 70°C (No freezing) With auto switch: -10 to 60°C (No freezing)					
Piping	Screw-in type	Note)					
		M5 x 0.8	Rc 1/8	Rc 1/4	Rc 1/4	Rc 3/8	Rc 3/8
		Rc 1/8					
Rubber bumper		None					
Rod end thread		Female thread					
Rod end thread tolerance		JIS Class 2					
Stroke length tolerance		+1.0 0					
Mounting		Through-hole					
Piston speed		0.5 to 300 mm/s					

Note) Only 5 stroke comes with M5 x 0.8 in the case of no auto switch.

## Minimum Operating Pressure

Bore size (mm)	32	40	50	63	80	100
Min. operating pressure (MPa)	0.025			0.01		

## Standard Stroke

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

• Manufacturing of Intermediate stroke  
Intermediate strokes by the 1 mm interval are available by using spacers with standard stroke cylinders. But, as for ø40 to ø100 with damper, please consult with SMC separately.  
Example) 18 mm width spacer is installed in the standard cylinder CQ2XB40-75D to make CQ2XB40-57D.

## ⚠ Precautions

Be sure to read before handling. For Safety Instructions and Actuator Precautions, refer to pages 10-24-3 to 10-24-6.

### Snap Ring Installation/Removal

#### ⚠ Caution

- For installation and removal, use an appropriate pair of pliers (tool for installing a type C snap ring).
- Even if a proper plier (tool for installing type C snap ring) is used, it is likely to inflict damage to a human body or peripheral equipment, as a snap ring may be flown out of the tip of a plier (tool for installing a type C snap ring). Be much careful with the popping of a snap ring. Besides, be certain that a snap ring is placed firmly into the groove of rod cover before supplying air at the time of installment.

### Maintenance

#### ⚠ Caution

##### 1. Replacement parts/Seal kit

Order it in accordance with the bore size.

Bore size (mm)	Kit no.	Contents
32	CQ2X32-PS	Piston seal: 1 pc.
40	CQ2X40-PS	Rod seal: 1 pc.
50	CQ2X50-PS	
63	CQ2X63-PS	Gasket: 1 pc.
80	CQ2X80-PS	
100	CQ2X100-PS	Grease pack (10 g): 1 pc.

##### 2. Grease pack

When maintenance requires only grease, use the following part numbers to order.

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

## Mounting Bracket Part No.

Bore size (mm)	Foot <sup>(1)</sup>	Flange	Double clevis <sup>(3)</sup>
32	CQ-L032	CQ-F032	CQ-D032
40	CQ-L040	CQ-F040	CQ-D040
50	CQ-L050	CQ-F050	CQ-D050
63	CQ-L063	CQ-F063	CQ-D063
80	CQ-L080	CQ-F080	CQ-D080
100	CQ-L100	CQ-F100	CQ-D100

Note 1) When ordering foot bracket, order 2 pieces per cylinder.

Note 2) Parts belonging to each bracket are as follows.

Foot or Flange: Body mounting bolts  
Double clevis: Clevis pin, Type C snap ring for shaft, Body mounting bolts

Note 3) For double clevis style, clevis pin and snap ring are shipped together.

RE<sub>B</sub><sup>A</sup>

REC

C□X

C□Y

MQ<sub>M</sub><sup>Q</sup>

RHC

MK(2)

RS<sub>G</sub><sup>Q</sup>

RS<sub>A</sub><sup>H</sup>

RZQ

MI<sub>S</sub><sup>W</sup>

CEP1

CE1

CE2

ML2B

C<sub>5</sub>-S

CV

MVGQ

CC

RB

J

D-

-X

20-

Data



The external dimensions and the related things about auto switches are the same as standard type, double acting, single rod. For Series CM2, refer to Best Pneumatics Vol. 6.

# Low Speed Cylinder Double Acting, Single Rod Series **CM2X** ø20, ø25, ø32, ø40

## How to Order

**Mounting style**

<b>B</b>	Basic style	<b>T</b>	Head side trunnion style
<b>L</b>	Axial foot style	<b>E</b>	Clevis integrated style
<b>F</b>	Rod side flange style	<b>BZ</b>	Boss-cut basic style
<b>G</b>	Head side flange style	<b>FZ</b>	Boss-cut rod side flange style
<b>C</b>	Single clevis style	<b>UZ</b>	Boss-cut rod side trunnion style
<b>D</b>	Double clevis style		
<b>U</b>	Rod side trunnion style		

**Standard stroke**  
Refer to "Standard Stroke" on page 10-3-15.

**Without auto switch** **CM2X** **L** **40** **150**

**With auto switch** **CDM2X** **L** **40** **150** **H7BW** **□**

**Built-in magnet**

**Low speed cylinder**

**Bore size**

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

**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)
------------	---------------------------------------

\* For the applicable auto switch model, refer to the table below.

### Applicable Auto Switch/Refer to page 10-20-1 for further information on auto switches.

Type	Special function	Electrical entry	Indicator light	Wiring (Output)	Load voltage		Auto switch model	Lead wire length (m)*				Pre-wire connector	Applicable load										
					DC	AC		0.5 (Nil)	3 (L)	5 (Z)	None (N)												
Reed switch	—	Grommet	Yes	3-wire (NPN equivalent)	—	5 V	—	<b>C76</b>	●	●	—	—	—	IC circuit	—								
				Connector	2-wire	24 V	12 V	100 V	<b>C73</b>	●	●	●	—	—	—	Relay, PLC							
		100 V, 200 V						<b>B54</b>	●	●	●	—	—										
		—						<b>C73C</b>	●	●	●	●	—										
		—						<b>A33A</b>	—	—	—	●	—										
		DIN terminal		2-wire	24 V	12 V	100 V, 200 V	<b>A34A</b>	—	—	—	●	—	—	Relay, PLC								
—	<b>A44A</b>		—				—	—	●	—													
Diagnostic indication (2-color indication)	Grommet	—	—	—	—	—	<b>B59W</b>	●	●	—	—	—	—	—									
Solid state switch	—	Grommet	Yes	3-wire (NPN)	24 V	5 V, 12 V	—	<b>H7A1</b>	●	●	○	—	○	IC circuit	Relay, PLC								
				3-wire (PNP)				<b>H7A2</b>	●	●	○	—	○										
		Connector		2-wire				24 V	12 V	<b>H7B</b>	●	●	○	—		○	—						
										<b>H7C</b>	●	●	●	●		—		—					
		Terminal conduit		3-wire (NPN)				24 V	12 V	<b>G39A</b>	—	—	—	●		—	IC circuit						
										2-wire	<b>K39A</b>	—	—	—		●		—	—				
		Diagnostic indication (2-color indication)		Grommet				24 V	12 V	3-wire (NPN)	5 V, 12 V	—	<b>H7NW</b>	●		●	○	—	○	IC circuit			
										3-wire (PNP)			<b>H7PW</b>	●		●	○	—	○				
										2-wire			<b>H7BW</b>	●		●	○	—	○	—			
													<b>H7BA</b>	—		●	○	—	○				
										Water resistant (2-color indication)			Grommet	24 V		12 V	<b>H7NF</b>	●	●	○	—	○	IC circuit
																	4-wire (NPN)	5 V, 12 V	—	—	—	○	

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

\* Solid state switches marked with "○" are produced upon receipt of order.  
 \* Do not indicate suffix "N" for no lead wire on D-A3□A/A44A/G39A/K39A models.

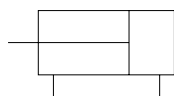
- Since there are other applicable auto switches than listed, refer to Best Pneumatics Vol. 6 for details.
- For details about auto switches with pre-wire connector, refer to page 10-20-66.



# Low Speed Cylinder Double Acting, Single Rod Series CM2X



**JIS Symbol**  
Double acting  
Single rod



## Standard Stroke

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

Note) Other intermediate strokes can be manufactured upon receipt of order.

## ⚠ Precautions

**Be sure to read before handling. For Safety Instructions and Actuator Precautions, refer to pages 10-24-3 to 10-24-6.**

## Operating Precautions

### ⚠ Warning

- Do not rotate the cover.
  - When installing a cylinder or screwing a pipe fitting into the port, the coupling portion of the cover could break if the cover rotated.

### ⚠ Caution

- Be careful of the snap ring to pop out.
  - When replacing the rod seal, take care that the snap ring does not spring out while you are removing it.

## Maintenance

### ⚠ Caution

- Replacement parts/Seal kit**  
Order it in accordance with the bore size.

Bore size (mm)	Kit no.	Contents
20	CM2X20-PS	Rod seal: 1 pc.
25	CM2X25-PS	
32	CM2X32-PS	Grease pack (10 g): 1 pc.
40	CM2X40-PS	

- Grease pack**

When maintenance requires only grease, use the following part numbers to order.

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	
Type	Pneumatic	
Action	Double acting, Single rod	
Fluid	Air	
Proof pressure	1.5 MPa	
Maximum operating pressure	1.0 MPa	
Minimum operating pressure	0.025 MPa	
Ambient and fluid temperature	Without auto switch: -10 to 70°C (No freezing) With auto switch: -10 to 60°C (No freezing)	
Cushion	Rubber bumper	
Piping	Screw-in type	ø20 to ø32: Rc 1/8, ø40: Rc 1/4
Lubrication	Not required (Non-lube)	
Thread tolerance	JIS Class 2	
Stroke length tolerance	+1.4 0	

## Piston Speed

Bore size (mm)	20	25	32	40
Piston speed (mm/s)	0.5 to 300			
Allowable kinetic energy (J)	0.27	0.4	0.65	1.2

## Mounting Bracket Part No.

Bore size (mm)	20	25	32	40
Axial foot*	CM-L020B	CM-L032B	CM-L040B	
Flange	CM-F020B	CM-F032B	CM-F040B	
Single clevis	CM-C020B	CM-C032B	CM-C040B	
Double clevis (with pin)**	CM-D020B	CM-D032B	CM-D040B	
Trunnion (with nut)	CM-T020B	CM-T032B	CM-T040B	

\* When ordering foot bracket, order 2 pieces per cylinder.

\*\* Clevis pin and snap ring (cotter pin for ø40) are shipped together.

## Auto Switch Mounting Bracket Part No.

Auto switch model	Bore size (mm)			
	20	25	32	40
D-C7/C8, D-H7	BM2-020	BM2-025	BM2-032	BM2-040
D-B5/B6, D-G5	BA2-020	BA2-025	BA2-032	BA2-040
D-A3□A/A44A, D-G39A/K39A	BM3-020	BM3-025	BM3-032	BM3-040

## Mounting Style and Accessory

Mounting	Accessory	Standard equipment			Option	
	Mounting nut	Rod end nut	Clevis pin	Single knuckle joint	Double <sup>(3)</sup> knuckle joint	Clevis bracket
Basic style	● (1 pc.)	●	—	●	●	—
Axial foot style	● (2)	●	—	●	●	—
Rod side flange style	● (1)	●	—	●	●	—
Head side flange style	● (1)	●	—	●	●	—
Clevis integrated style	— (1)	●	—	●	●	●
Single clevis style	— (1)	●	—	●	●	—
Double clevis style <sup>(3)</sup>	— (1)	●	●	●	●	—
Rod side trunnion style	● (1) <sup>(2)</sup>	●	—	●	●	—
Head side trunnion style	● (1) <sup>(2)</sup>	●	—	●	●	—
Boss-cut basic style	● (1)	●	—	●	●	—
Boss-cut flange style	● (1)	●	—	●	●	—
Boss-cut trunnion style	● (1)	●	—	●	●	—
Note					With pin	With pin

Note 1) Mounting nut is not equipped with clevis integrated style, single clevis style and double clevis style.

Note 2) Trunnion nuts are attached for rod side trunnion and head side trunnion styles.

Note 3) Pin and snap ring are shipped together with double clevis and double knuckle joint. (ø40 is cotter pin.)

RE<sub>B</sub><sup>A</sup>

REC

C□X

C□Y

MQ<sub>M</sub><sup>Q</sup>

RHC

MK(2)

RS<sub>G</sub><sup>Q</sup>

RS<sub>A</sub><sup>H</sup>

RZQ

MI<sub>S</sub><sup>W</sup>

CEP1

CE1

CE2

ML2B

C<sub>5</sub>-S

CV

MVGQ

CC

RB

J

D-

-X

20-

Data

# Series 10-, 11-CQSX, CQ2X

## Clean Series Low Speed Cylinder Series 10-, 11-


The type which is applicable for using inside the clean room graded Class 100 by making an actuator's rod section a double seal construction and discharging by relief port directly to the outside of clean room. Since the external dimensions and applicable auto switches are the same as standard type, refer to the separate catalog of "Pneumatic Clean Series".

### Series 10-, 11-CQSX

#### How to Order

**Clean Series**

10	Relief type
11	Vacuum type



**10-C(D)QSX B 20-30 D [ ] F9BW [ ]**

- Built-in magnet**
- Low speed cylinder**
- Mounting style**

B	Through-hole/Both ends tapped common (Standard)
---	---
- Bore size**

12	12 mm
16	16 mm
20	20 mm
25	25 mm
- Cylinder stroke (mm)**

Bore size (mm)	Standard stroke (mm)
12, 16	5, 10, 15, 20, 25, 30
20	5, 10, 15, 20, 25, 30, 35, 40, 45, 50
25	30, 35, 40, 45, 50
- Number of auto switches**

Nil	2 pcs.
S	1 pc.
n	"n" pcs.
- Auto switch**

Nil	Without auto switch (Built-in magnet)
-----	---------------------------------------

\* For the applicable auto switch model, refer to page 10-3-10.  
\* Auto switches are shipped together, (but not assembled).
- Rod end thread**

Nil	Standard (Rod end female thread)
M	Rod end male thread
- Action**

D	Double acting
---	---------------

**Manufacturing of Intermediate stroke**  
Intermediate strokes by the 1 mm interval are available by using spacers with standard stroke cylinders. The overall length of cylinder will be the same as the standard stroke with a longer one.  
Example) 3 mm width spacer is installed in the standard cylinder 10-CQSXB25-50D to make 10-CQSXB25-47D.

### Specifications

Bore size (mm)	10- (Relief type)			
	12	16	20	25
Fluid	Air			
Proof pressure	1.5 MPa			
Maximum operating pressure	1.0 MPa			
Minimum operating pressure	0.04 MPa		0.035 MPa	
Ambient and fluid temperature	Without auto switch: -10 to 70°C (No freezing) With auto switch: -10 to 60°C (No freezing)			
Piston speed	1 to 200 mm/s			
Piston rod size	6	8	10	12
Rod end thread	Female thread: M3 x 0.5 Male thread: M5 x 0.8	M4 x 0.7 M6 x 1.0	M5 x 0.8 M8 x 1.25	M6 x 1.0 M10 x 1.25
Rod end thread tolerance	JIS Class 2			
Stroke tolerance	+1.0 0 mm			
Port size	M5 x 0.8			
Vacuum port, Relief port	M5 x 0.8			


Bore size (mm)	11- (Vacuum type)			
	12	16	20	25
Fluid	Air			
Proof pressure	1.5 MPa			
Maximum operating pressure	1.0 MPa			
Minimum operating pressure	0.03 MPa		0.025 MPa	
Ambient and fluid temperature	Without auto switch: -10 to 70°C (No freezing) With auto switch: -10 to 60°C (No freezing)			
Piston speed	1 to 200 mm/s		0.5 to 200 mm/s	
Piston rod size	6	8	10	12
Rod end thread	Female thread: M3 x 0.5 Male thread: M5 x 0.8	M4 x 0.7 M6 x 1.0	M5 x 0.8 M8 x 1.25	M6 x 1.0 M10 x 1.25
Rod end thread tolerance	JIS Class 2			
Stroke tolerance	+1.0 0 mm			
Port size	M5 x 0.8			
Vacuum port, Relief port	M5 x 0.8			

### Series 10-, 11-CQ2X

#### How to Order

**Clean Series**

10	Relief type
11	Vacuum type



**10-C(D)Q2XB 40-30 D [ ] J79W [ ]**

- Built-in magnet**
- Low speed cylinder**
- Bore size**

32	32 mm
40	40 mm
50	50 mm
63	63 mm
- Cylinder stroke (mm)**

Bore size (mm)	Standard stroke (mm)
32, 40	5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 75, 100
50, 63	10, 15, 20, 25, 30, 35, 40, 45, 50, 75, 100
- Number of auto switches**

Nil	2 pcs.
S	1 pc.
n	"n" pcs.
- Auto switch**

Nil	Without auto switch (Built-in magnet)
-----	---------------------------------------

\* For the applicable auto switch model, refer to page 10-3-12.  
\* Auto switches are shipped together, (but not assembled).
- Rod end thread**

Nil	Standard (Rod end female thread)
M	Rod end male thread
- Action**

D	Double acting
---	---------------

**Manufacturing of Intermediate stroke**  
Intermediate strokes by the 1 mm interval are available by using spacers with standard stroke cylinders. But, as for ø40 with damper, please consult SMC separately.  
Example) 18 mm width spacer is installed in the standard cylinder 10-CQ2XB40-75D to make 10-CQ2XB40-57D.

### Specifications

Bore size (mm)	10- (Relief type)				11- (Vacuum type)			
	32	40	50	63	32	40	50	63
Fluid	Air							
Proof pressure	1.5 MPa							
Maximum operating pressure	1.0 MPa							
Minimum operating pressure	0.035 MPa		0.03 MPa		0.025 MPa		0.02 MPa	
Ambient and fluid temperature	Without auto switch: -10 to 70°C (No freezing) With auto switch: -10 to 60°C (No freezing)							
Piston speed	1 to 200 mm/s				0.5 to 200 mm/s			
Piston rod size	16		20		16		20	
Rod end thread	Female thread: M8 x 1.25 Male thread: M14 x 1.5	M10 x 1.5 M18 x 1.5	M8 x 1.25 M14 x 1.5	M10 x 1.5 M18 x 1.5	M8 x 1.25 M14 x 1.5	M10 x 1.5 M18 x 1.5	M8 x 1.25 M14 x 1.5	M10 x 1.5 M18 x 1.5
Rod end thread tolerance	JIS Class 2							
Stroke tolerance	+1.0 0 mm							
Port size	M5 x 0.8, Rc 1/8 (Note)		Rc 1/4		M5 x 0.8, Rc 1/8 (Note)		Rc 1/4	
Vacuum port, Relief port	M5 x 0.8							

Note) Only 5 stroke comes with M5 x 0.8 in the case of no auto switch on ø32.



# Microspeed Cylinder for Clean Room Series 10-, 11-CM2X

## Series 10-, 11-CM2X

### How to Order

Clean Series	
10	Relief type
11	Vacuum type

**10-C(D)M2X L 40-150-F9BW**

Built-in magnet

Low speed cylinder

Bore size

20	20 mm
25	25 mm
32	32 mm
40	40 mm

Cylinder stroke (mm)

Refer to "Standard Stroke" below.

Mounting style

B	Basic style
L	Axial foot style
F	Rod side flange style
G	Head side flange style
BZ	Boss-cut basic style
FZ	Boss-cut rod style Flange style



Number of auto switches

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

Auto switch

Nil	Without auto switch (Built-in magnet)
-----	--

\* For the applicable auto switch model, refer to page 10-3-14.

### Stroke

Clean series	Bore size (mm)	Standard stroke (mm)
10- (Relief type)	20	25, 50, 75, 100, 125, 150, 175, 200, 250, 300
	25	
	32	
	40	
11- (Vacuum type)	20	
	25	
	32	
	40	

### Specifications

Bore size (mm)	10- (Relief type)				11- (Vacuum type)			
	20	25	32	40	20	25	32	40
Fluid	Air							
Proof pressure	1.5 MPa							
Maximum operating pressure	1.0 MPa							
Minimum operating pressure	0.035 MPa				0.025 MPa			
Ambient and fluid temperature	Without auto switch: -10 to 70°C (No freezing) With auto switch: -10 to 60°C (No freezing)							
Cushion	Rubber bumper							
Piston speed	1 to 200 mm/s				0.5 to 200 mm/s			
Piston rod size	ø8	ø10	ø12	ø14	ø8	ø10	ø12	ø14
Rod end thread	M8 x 1.25	M10 x 1.25	M14 x 1.5	M8 x 1.25	M10 x 1.25	M14 x 1.5	M14 x 1.5	M14 x 1.5
Rod end thread tolerance	JIS Class 2							
Stroke tolerance	+1.4 0 mm							
Port size	Rc 1/8			Rc 1/4	Rc 1/8			Rc 1/4
Vacuum port, Relief port	M5 x 0.8							

## ⚠ Precautions

Be sure to read before handling. For Safety Instructions and Actuator Precautions, refer to pages 10-24-3 to 10-24-6.

### Operating Precautions

#### ⚠ Warning

##### 1. Do not rotate the cover.

- When installing a cylinder or screwing a pipe fitting into the port, the coupling portion of the cover could break if the cover rotated.

#### ⚠ Caution

##### 1. Be careful of the snap ring to pop out.

- When replacing the rod seal, take care that the snap ring does not spring out while you are removing it.

### Maintenance

#### ⚠ Caution

##### 1. Grease pack

- When maintenance requires only grease, use the following part numbers to order.  
GR-X-005 (5 g)

RE<sup>A</sup><sub>B</sub>

REC

C□X

C□Y

MQ<sup>Q</sup><sub>M</sub>

RHC

MK(2)

RS<sup>Q</sup><sub>G</sub>

RS<sup>H</sup><sub>A</sub>

RZQ

MI<sup>W</sup><sub>S</sub>

CEP1

CE1

CE2

ML2B

C<sup>1</sup>/<sub>5</sub>-S

CV

MVGQ

CC

RB

J

D-

-X

20-

Data

# Made to Order Specifications:

## -XB13: Low Speed Cylinder

5 to 50 mm/s (CY1: 7 to 50 mm/s)



Symbol

Low Speed Cylinder										-XB13			
CJ2	Standard model no.				—XB13		CY1	Standard model no.				—XB13	
CM2	Mounting style	Bore size	Stroke		—XB13		MGP <sup>M</sup> <sub>L</sub>	Standard model no.				—XB13	
CG1	Standard model no.				—XB13		MGGM	Standard model no.				—XB13	
MB	Standard model no.				—XB13		MGCM	Standard model no.				—XB13	
CU	Standard model no.				—XB13		CX2	Standard model no.				—XB13	
CQ2	Standard model no.				—XB13		CXW <sup>M</sup> <sub>L</sub>	Standard model no.				—XB13	
CQS	Standard model no.				—XB13		CXS <sup>M</sup> <sub>L</sub>	Standard model no.				—XB13	
					Low speed cylinder ●		MXU	Standard model no.				—XB13	
							CXT <sup>M</sup> <sub>L</sub>	Standard model no.				—XB13	
												Low speed cylinder ●	

Note) Operate without lubrication from a pneumatic system lubricator.

### Specifications

Applicable cylinder	Air cylinder/Standard					Free mount cylinder	Compact cylinder	Compact cylinder	Magnetically coupled rodless cylinder	Compact guide cylinder	Guide cylinder		Slide unit	Dual rod cylinder	Compact slide	Platform cylinder
	Series	CJ2	CM2	CG1	MB						CU	CQ2				
Action	Double acting, Single rod						Double acting									
Bore size (mm)	6, 10 16	20, 25 32, 45	20, 25 32, 40 50, 63	32, 40 50, 63 80, 100	6, 10 16, 20 25, 32	12, 16, 20 25, 32, 40 50, 63, 80 100	12, 16 20, 25	CY1B: 6 10, 15, 20 25, 32 40, 50, 63 CY1S: CY1L: 6 to 40	12, 16, 20 25, 32, 40 50, 63, 80 100		20, 25, 32 40, 50	10, 15 25	10, 16, 20 25, 32	6, 10 15, 20 25, 32	6, 10 16	12, 16 20, 25 32, 40
Piston speed	5 to 50 mm/s						7 to 50 mm/s	5 to 50 mm/s	5 to 50 mm/s							
Cushion	Rubber bumper		Air cushion on both ends	Rubber bumper on both ends	No rubber bumper	No rubber bumper	Rubber bumper on both ends	Rubber bumper (Basic cylinder)	Shock absorber (CX2: Option)		Rubber bumper					
Auto switch	Mountable															
Mounting	Basic Foot Flange Double clevis	Basic Foot Flange Trunnion Clevis	Basic Foot Flange Clevis Trunnion	Basic	Basic Foot Flange Double clevis	Basic Foot Flange Double clevis	Basic Slider	Basic	Basic Front mounting Flange	Basic						
Dimensions	Dimensions and specifications are the same as standard products of double acting. Refer to Best Pneumatics Vol. 6, 7 and 8.															
Additional specifications																

\* No shock absorber is available for the Series MGGM.

# Related Products: Speed Controller for Low Speed Operation

The effective area of controlled flow is approximately 1/10 of the standard type.  
These controllers are suitable for controlling the speed of microspeed cylinders.  
The dual type speed controller is especially suitable for cylinders with a small bore size.

## Elbow/Universal Type



### Air Flow/Effective Area

Model		AS12□1FM-M5 AS13□1FM-M5	AS22□1FM-□01 AS23□1FM-□01	AS22□1FM-□02 AS23□1FM-□02			
Tubing O.D.	Metric size	ø3.2, ø4, ø6	ø3.2, ø4	ø6, ø8	ø4	ø6	ø8, ø10
	Inch size	ø1/8", ø5/32", ø3/16" ø1/4"	ø1/8", ø5/32"	ø3/16", ø1/4" ø5/16"	ø5/32"	ø3/16"	ø1/4", ø5/16" ø3/8"
Controlled flow	Air flow (ℓ/min (ANR))	7	12		38		
	Effective area (mm <sup>2</sup> )	0.1	0.2		0.6		
Free flow	Flow rate (ℓ/min (ANR))	100	180	230	260	390	460
	Effective area (mm <sup>2</sup> )	1.5	2.7	3.5	4	6	7

Note) Supply pressure: 0.5 MPa, Temperature: 20°C

## In-line Type



### Air Flow/Effective Area

Model		AS1001FM	AS2001FM		AS2051FM	
Tubing O.D.	Metric size	ø3.2, ø4, ø6	ø4	ø6	ø6	ø8
	Inch size	ø1/8", ø5/32", ø3/16" ø1/4"	ø5/32"	ø3/16", ø1/4"	ø3/16"	ø1/4", ø5/16"
Controlled flow	Air flow (ℓ/min (ANR))	7	12		38	
	Effective area (mm <sup>2</sup> )	0.1	0.2		0.6	
Free flow	Flow rate (ℓ/min (ANR))	100	130	230	290	460
	Effective area (mm <sup>2</sup> )	1.5	2	3.5	4.5	7

Note) Supply pressure: 0.5 MPa, Temperature: 20°C

## Elbow Type (Metal body)



### Air Flow/Effective Area

Model			AS12□0M		AS22□0M-□01		AS22□0M-□02	
Port size	Cylinder side Tube side	M5 x 0.8	10-32 UNF		R 1/8	NPT 1/8		R 1/4
					Rc 1/8			Rc 1/4
Controlled flow	Air flow (ℓ/min (ANR))	7		12		38		
	Effective area (mm <sup>2</sup> )	0.1		0.2		0.6		
Free flow	Flow rate (ℓ/min (ANR))	105		280		420		
	Effective area (mm <sup>2</sup> )	1.6		4.3		6.5		

Note) Supply pressure: 0.5 MPa, Temperature: 20°C

## Dual Type



### Air Flow/Effective Area

Model		ASD230FM-M5	ASD330FM-□01	ASD430FM-□02	
Tubing O.D.	Metric size	ø4, ø6	ø6, ø8	ø6	ø8, ø10
	Inch size	ø1/8", ø5/32" ø3/16", ø1/4"	ø3/16", ø1/4"	—	ø1/4", ø5/16" ø3/8"
Controlled flow	Air flow (ℓ/min (ANR))	7	12	38	
	Effective area (mm <sup>2</sup> )	0.1	0.2	0.6	
Free flow	Air flow (ℓ/min (ANR))	75	175	295	350
	Effective area (mm <sup>2</sup> )	1.1	2.7	4.5	5.3

Note) Supply pressure: 0.5 MPa, Temperature: 20°C

RE<sub>B</sub><sup>A</sup>

REC

C□X

C□Y

MQ<sub>M</sub><sup>Q</sup>

RHC

MK(2)

RS<sub>G</sub><sup>Q</sup>

RS<sub>A</sub><sup>H</sup>

RZQ

MI<sub>S</sub><sup>W</sup>

CEP1

CE1

CE2

ML2B

C<sub>5</sub>-S

CV

MVGQ

CC

RB

J

D-

-X

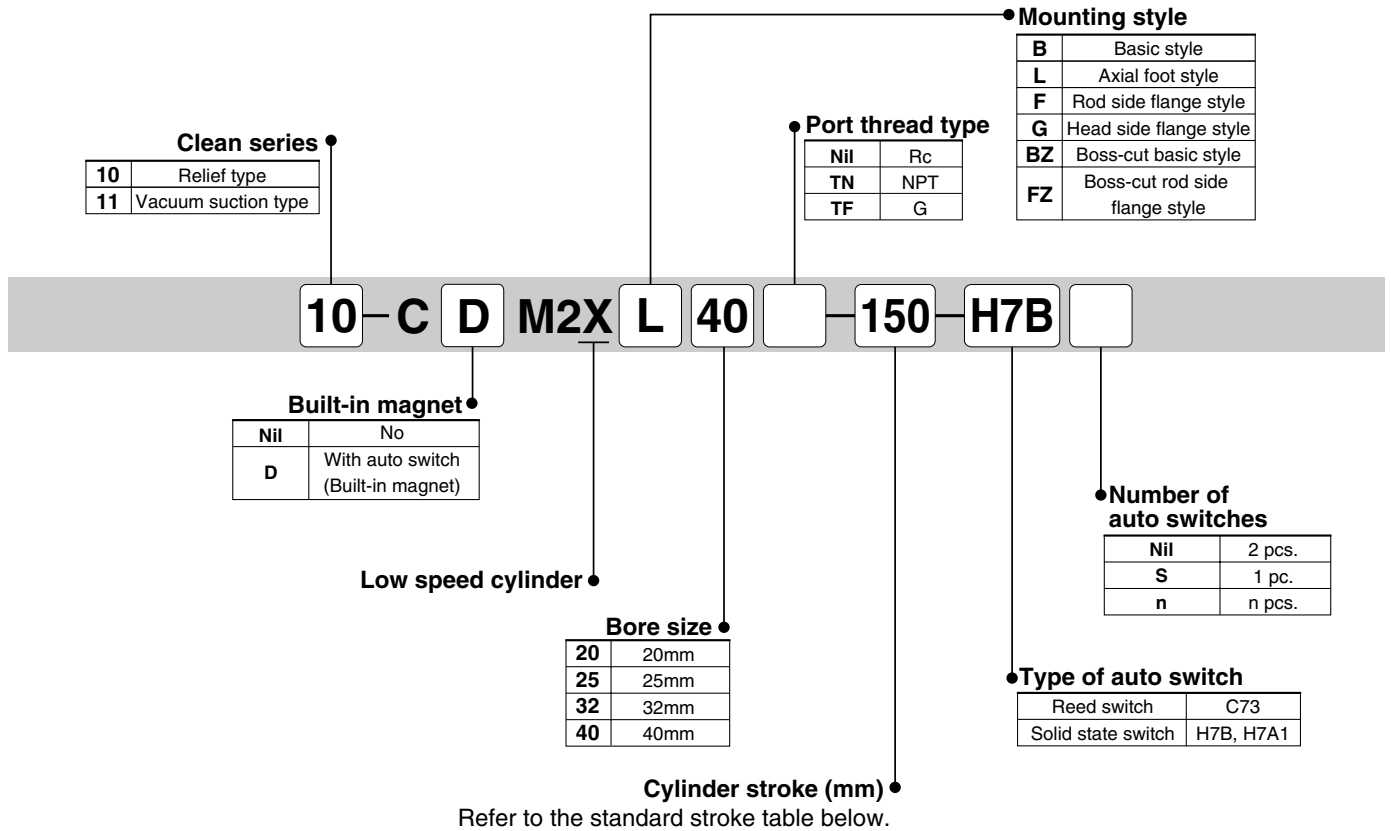
20-

Data

# Series 10-11-CM2X Low speed cylinder

Double acting single rod /  $\phi 20, \phi 25, \phi 32, \phi 40$

## How to Order




## Model

Relief type	Model	Bore size (mm)	Port size	Lubrication	Action	Standard stroke (mm)	Auto switch mounting	Cushion	
								Rubber	Air
Relief type	10-CM2X□20	20	1/8	Non-lube	Double acting single rod	25, 50, 75, 100, 125, 150, 200, 250, 300	○	○	—
	10-CM2X□25	25							
	10-CM2X□32	32							
	10-CM2X□40	40							
Vacuum suction type	11-CM2X□20	20	1/8	Non-lube	Double acting single rod	25, 50, 75, 100, 125, 150, 200, 250, 300	○	○	—
	11-CM2X□25	25							
	11-CM2X□32	32							
	11-CM2X□40	40							

## Specifications

Bore size (mm)	10- (Relief type)				11- (Vacuum suction type)			
	20	25	32	40	20	25	32	40
Fluid	Air							
Proof pressure	1.5 MPa							
Max. operating pressure	1.0 MPa							
Min. operating pressure	0.035 MPa				0.025 MPa			
Ambient and fluid temperature	Without auto switch : -10°C to 70°C (With no freezing) With auto switch : -10 to 60°C (With no freezing)							
Cushion	Rubber bumper							
Piston speed	1 to 200 mm/s				0.5 to 200 mm/s			
Piston rod diameter	ø8	ø10	ø12	ø14	ø8	ø10	ø12	ø14
Rod end thread	M8 x 1.25	M10 x 1.25		M14 x 1.5	M8 x 1.25	M10 x 1.25		M14 x 1.5
Rod end thread tolerance	JIS Class 2							
Stroke tolerance	+1.4 0 mm							
Port size	1/8			1/4	1/8			1/4
Vacuum suction port, Relief port	M5 x 0.8							
Grease	Fluorine grease							
Particle generation grade	Grade 2				Grade 1			
Suction flow rate (Reference values)	—				2 l/min (ANR)			

 External dimensions and applicable auto switches are the same as 10-/11-CM2. Please refer to pages 15 to 20.



## Specific Product Precautions

Be sure to read before handling.

### Precautions

#### Warning

**1. Do not rotate the cover.**

When installing a cylinder or screwing a pipe fitting into the port, the coupling portion of the cover could break if the cover is rotated.

#### Caution

**1. Be careful of the snap ring to pop out.**

When replacing the rod seal, take care that the snap ring does not spring out while you are removing it.

### Maintenance

#### Caution

**1. Grease pack**

Use the following part number to order grease for maintenance.

Grease pack  
GR-X-005 (5g)



# Actuator / Common Precautions 1

Be sure to read before handling. Refer to the main text for precautions for each series.

## Precaution on designing

### 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, personal injury by catching hands or feet in the machinery, or damage to the machinery itself may occur. Therefore, the machine should be adjusted to operate smoothly and designed to avoid such dangers.

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

If a driven 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.**

Particularly when a cylinder operates at a high frequency or is installed in a place where there is a lot of vibration, ensure that all parts remain secure.

- 4. A deceleration circuit may be required.**

When a driven object is operated at high speed or the load is heavy, a cylinder's cushion will not be sufficient to absorb the impact. Install a deceleration circuit to reduce the speed before cushioning to relieve the impact.

In this case, the rigidity of the machinery should also be examined.

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

When a cylinder is used in a clamping mechanism, there is a danger of workpiece dropping if there is a decrease in clamping force due to a drop in circuit pressure caused by a power outage, etc. Therefore, safety equipment should be installed to prevent damage to machinery and personal 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 avoid personal injury and equipment damage in the event that there is a loss of power to equipment controlled by pneumatics, electricity, or hydraulics.

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

When a cylinder is driven by an exhaust center type directional control valve or when it is started up after residual pressure is exhausted from the circuit, etc., the piston and its driven object will lurch when the cylinder is operated at high speed if pressure is applied to one side of the cylinder, due to the absence of air pressure inside the cylinder. Therefore, equipment should be selected and circuits should be designed to prevent this sudden lurching, because there is a danger of personal injury and/or damage to equipment when this occurs.

- 8. Consider emergency stops.**

Design the machinery so that personal injury and/or damage to machinery and equipment will not occur when the machinery is stopped by a safety device under abnormal conditions, such as 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 personal injury or equipment damage will not occur upon restart of operation.

When the cylinder has to be reset at the start position, install safety manual control equipment.

## Selection

### Warning

- 1. Confirm the specifications.**

The products featured in this catalog are designed for use in industrial compressed air systems. If the products are used in conditions where pressure and/or temperature are outside the range of specifications, damage and/or malfunctions may occur. Do not use in these conditions. (Refer to the specifications).

Please consult with SMC if you use a fluid other than compressed air.

- 2. Intermediate Stops**

With a 3-position closed center type valve, it is difficult to accurately and precisely stop a piston at the required position in the same way as can be done 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. Please contact with SMC when it is necessary to hold a stopped position for an extended period of time.

### Caution

- 1. Operate within the limits of the maximum feasible stroke.**

Operation that exceeds the maximum stroke may damage a piston rod. Refer to the air cylinder model selection procedures for the maximum feasible strokes.

- 2. Operate a cylinder within a range such that collision damage will not occur to a piston at the stroke end.**

Operate a cylinder within a range so that a piston having inertial force will not be damaged when it collides against the cover at the stroke end. Refer to the air cylinder model selection procedures for the maximum feasible strokes.

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

- 4. Provide intermediate supports for long stroke cylinders.**

An intermediate support should be provided in order to prevent damage to a long stroke cylinder, due to problems such as sagging of the rod, deflection of the cylinder tube, vibration and external load.



# Actuator / Common Precautions 2

Be sure to read before handling. Refer to the main text for precautions for each series.

## Mounting

### Caution

- 1. Be certain to match the rod shaft center with the load and direction of movement when connecting.**  
When not properly matched, problems may arise with the rod and tube, and damage may be caused due to friction on areas such as the inner tube surface, bushings, rod surface, and seals.
- 2. When using an external guide, connect the rod end 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. Moreover, scratches or gouges, etc. in the piston rod may lead to damaged seals and cause air leakage.
- 4. Do not use until you verify that the equipment can operate properly.**  
After mounting, repairs, or modification, etc., connect the air supply and electric power, and then confirm proper mounting by means of appropriate function and leak tests.
- 5. Instruction manual**  
Install the products and operate them only after reading the instruction manual carefully and understanding its contents. Also keep the manual where it can be referred to as necessary.

## Cushion

### Caution

- 1. Readjust with a cushion needle.**  
Cushions are adjusted at the time of shipment; however, the cushion needle on the cover should be readjusted, when the product is put into service based on factors such as the size of the load and the operating speed. When the cushion needle is turned clockwise, the restriction becomes smaller and the cushion's effectiveness is increased. Tighten the lock nut securely after adjustment is performed.
- 2. Do not operate the actuator with the cushion needle fully closed.**  
This could damage the seals.

## Air Supply

### Warning

- 1. Use clean air.**  
Do not use compressed air which contains chemicals, synthetic oil containing organic solvents, salts or corrosive gases, etc. as this may cause damage or malfunction.

### Caution

- 1. Install air filters.**  
Install air filters close to valves at their upstream side. A filtration degree of 5 $\mu$ m or less should be selected.
- 2. Install an aftercooler, air dryer, or water separator (Drain Catch).**  
Compressed air that includes excessive drainage may cause malfunction of valves and other pneumatic equipment. To prevent this, install an air dryer, aftercooler or water separator (drain catch), etc.
- 3. Use the product within the specified range of fluid and ambient temperature.**  
Take measures to prevent freezing at temperature below 5°C, since moisture in circuits may freeze and cause damage to seals and lead to malfunctions.



# Actuator / Common Precautions 3

Be sure to read before handling. Refer to the main text for precautions for each series.

## Operating Environment

### Warning

1. Do not use in atmospheres or locations where corrosion hazards exist.  
Refer to the construction drawings regarding cylinder materials.
2. In locations where ultrapure water or cleaning solvent, etc. splashes on the equipment, take suitable measures to protect the rod.

## Maintenance

### Warning

1. Perform maintenance procedures as shown in the instruction manual.  
Improper handling may result in malfunction and damage of machinery or equipment.
2. Removal of equipment, and supply / exhaust of compressed air  
Before any machinery or equipment is removed, first ensure that the appropriate measures are in place to prevent the fall or erratic movement of driven objects and equipment, then cut off the electric power and release the compressed air in the system.  
When machinery is restarted, proceed with caution after confirming that appropriate measures are in place to prevent cylinders from sudden movement.

### Caution

1. Drain flushing  
Remove drainage from air filters regularly.





# Auto switch / Common Precautions 1

Be sure to read before handling. Refer to the main text for precautions for each series.

## 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 specifications of current voltage, temperature or impact.

#### 2. Use caution when multiple cylinders are used in close proximity to each other.

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

#### 3. Use caution to the ON time of a switch at the intermediate position of stroke.

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 fast, the operating time will be shortened and the load may not operate properly. The maximum detectable piston speed is :

$$V \text{ (mm/s)} = \frac{\text{Auto switch operation range (mm)}}{\text{Load operating time (ms)}} \times 1000$$

In cases of high piston speed, the use of an auto switch (D-F5NT, F7NT, G5NT and M5□T) 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 rush 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 rush 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. Use caution to internal voltage drop of a switch.

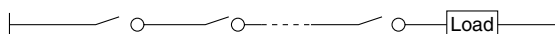
<Reed switch>

1. Switches with an indicator light (except D-A56/A76H/ A96/A96 V/C76/E76A/Z76)

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

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

The load may be ineffective even though the auto switch function is normal.



- Similarly, when operating below a specified voltage, it is possible that the load may be ineffective even though the auto switch function is normal. Therefore, the formula below should be satisfied after confirming the minimum operating voltage of the load.

Power voltage – Internal voltage drop of switch > 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 (D-A6□, A80, A80H, A90, A90V, C80, R80, 90, E80A, 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 please note that a 12VDC relay is not applicable.

#### 6. Use caution to the 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.

Current to operate load (OFF condition) > Leakage current  
If the condition given in the above formula is not met, it will not reset correctly (stays ON). Use a 3-wire switch if this specification cannot 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>

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

<Solid state switch>

Although a zener diode for surge protection is connected to 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 type of 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 inspections and confirm proper operation.

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

When designing an application, be sure to allow sufficient space for maintenance and inspection.



# Auto switch / Common Precautions 2

Be sure to read before handling. Refer to the main text for precautions for each series.

## 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 only cause broken 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 range of tightening torque, the mounting screws or switch may be damaged.

On the other hand, tightening below the range of tightening torque may allow the switch to slip out of position.

#### 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 positions shown in the catalog indicate the optimum position at the stroke end.) If mounted at the end of the operating range (around the borderline of ON and OFF), the operation will be unstable.

<D-M9□>

If this auto switch replaces the conventional model, it may not function depending on the application (shown below) because its operation range is shorter.

• **Applications where at the end, the stopping position shifting range is larger than the operation range**

e.g. Workpiece pushing, pressing into a hole, or clamping

• **Applications where an auto switch is used to detect intermediate stopping positions (Detecting time is shortened).**

**As indicated above, mount a switch at the center of the operating range.**

## Wiring

### Warning

#### 1. Avoid repeatedly bending or stretching lead wires.

Broken lead wires will result from repeatedly applying bending stress or stretching force to lead wires.

#### 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.

Be certain 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 switch.

#### 4. Do not wire 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

## Wiring

### Warning

#### 5. Do not allow short circuiting of loads.

<Reed switch>

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

<Solid state switch>

Models M-F9□(V), F9□W(V), J51, 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.

Use caution to avoid reverse wiring with the brown power supply line and the black output line on 3-wire type switches.

#### 6. Avoid incorrect wiring.

<Reed switch>

A 24VDC 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 (-).

[In the case of model D-97, the side without indicator is (+) and the blue line side is (-).]

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

Also please note that a current greater than the maximum specified one will damage a light emitting diode and make it inoperable.

Applicable models

D-A73, A73H, A73C, C73, C73C, E73A, Z73, R73

D-97, 93A, A93, A93V

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

D-A53, A54, B53, B54

2) However, when using a 2 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 wire and the power supply line (-) is connected to the black wire, the switch will be damaged.

<D-M9□>

D-M9□ does not have built-in short-circuit prevention circuits. Reverse connection of power supply line (+) and (-) may damage the switch.



# Auto switch / Common Precautions 3

Be sure to read before handling. Refer to the main text for precautions for each series.

## Environment

### Warning

#### 1. Never use in the presence of explosive gases.

Our auto switches are not explosion proof. Never use them in the presence of explosive gas, as 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. (Please consult with SMC regarding the availability of a magnetic field resistant auto switch.)

#### 3. Do not use in environments where the auto switches will be constantly 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 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 environments with oil or chemicals.

Please consult with SMC if auto switches will be used in an environment with coolants, cleaning solvents, 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, a malfunction due to swelling of the potting resin, or hardening of the lead wires.

#### 5. Do not use in environments with temperature cycles.

Please consult with SMC if switches are to be used where there are temperature cycles other than normal temperature changes, as they may be adversely affected internally.

#### 6. Do not use in environments where there is excessive impact shock.

##### <Reed switch>

When excessive impact (300 m/s<sup>2</sup> or more) is applied to a reed switch during operation, the contact point may malfunction and generate or cut off a signal momentarily (1ms or less). Please consult with SMC regarding the need to use a solid state switch depending on the environment.

#### 7. Do not use in locations where surges are generated.

##### <Solid state switch>

When there are units (solenoid type lifters, high frequency induction furnaces, motors, etc.) which generate a large amount of surge in the area around cylinders with solid state auto switches, this may cause deterioration or damage to the switches. Avoid sources of surge generation and crossed lines.

#### 8. Avoid close contact with magnetic substances.

When a magnetic substance (substance attracted by a magnet) is brought into close proximity with an auto switch cylinder, it may cause the auto switches 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) Securely tighten switch mounting screws.

If screws become loose or the mounting position is dislocated, retighten screws securely 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 if damage is discovered.

##### 3) Confirm that the green light on the 2-color indicator type switch lights up.

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

## Other

### Warning

#### 1. Please consult with SMC concerning water resistance, elasticity of lead wires, etc.

##### \*Lead wire color changes

Lead wire colors of SMC auto switches have been changed in order to meet NECA (Nippon Electric Control Equipment Industries Association) Standard 0402 for production beginning September, 1996 and thereafter. Special care should be taken regarding wire polarity during the time that both old and new colors exist.

##### 2-wire system

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

##### 3-wire system

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

##### Solid state with diagnostic output

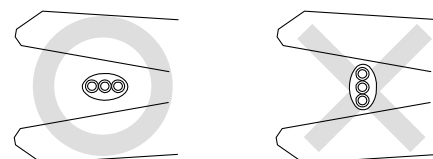
	Old	New
Power supply +	Red	Brown
Power supply GND	Black	Blue
Output	White	Black
Diagnostic output	Yellow	Orange

##### Solid state with latch type diagnostic output

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

### Caution

#### 1. When stripping the cable clad, take care with the orientation of the cable being stripped. The insulator may accidentally be torn or damaged depending on the orientation.(D-M9□ only)



Recommended tools are shown below.

Manufacturer	Model name	Model no.
VESSEL	Wire stripper	No 3000G
TOKYO IDEAL	Strip master	45-089

\* Stripper for round cable (ø2.0) can be used for a 2-wire type cable.

# Cylinder


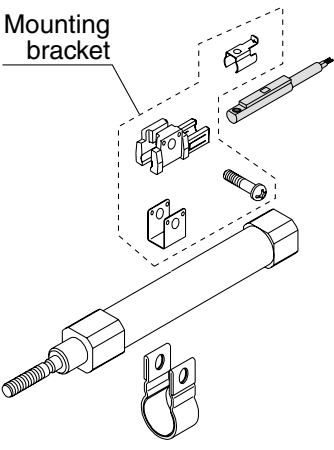

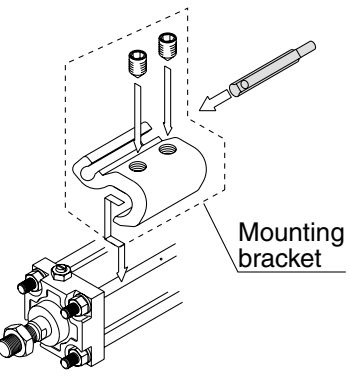

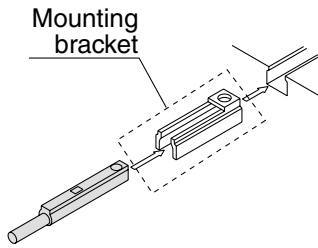
## Applicable auto switch list

Cylinder series		CDJ2	CDM2	CDBM2	CDG1	CDA2	CUJ	CDU	CDQS	CDQ2	REC	CXSJ	CXS	MGP	MGF	MXP	MXQ	MXS	CYP	CDQSX	CDQ2X	CDM2X				
Bore size		ø6	ø10/ø16	ø20 to ø40	ø20 to ø40	ø20 to ø63	ø80/ø100	ø40 to ø63	ø6 to ø10	ø6 to ø25	ø12 to ø25	ø32 to ø100	ø20 to ø40	ø6-ø10	ø6 to ø32	ø12 to ø63	ø40/ø63/ø100	ø6 to ø16	ø6 to ø25	ø6 to ø25	ø15/ø32	ø12 to ø25	ø32 to ø63	ø20 to ø40		
	Reed switch	D-C7/C8																								
D-C73C/C80C																										
D-B5/B6																										
D-B59W																										
D-A3/A4																										
D-A3□A/A44A																										
D-A3□C/A44C																										
D-A7/A8																										
D-A7□H/A80H																										
D-A73C/A80C																										
D-A79W																										
D-A5/A6																										
D-A59W																										
D-A9		*	*	*	*	*	*	*	*					*		*									*	
D-A9□V									*							*										
D-Z7/Z8																										
Solid state switch	D-H7																									
	D-H7C																									
	D-H7BAL																									
	D-H7□F																									
	D-H7□W																									
	D-G5/K5																									
	D-G5BAL																									
	D-G59F																									
	D-G5NTL																									
	D-G5□W/K59W																									
	D-G39/K39																									
	D-G39A/K39A																									
	D-F7/J7																									
	D-J79C																									
	D-F7□F																									
	D-F7BAL																									
	D-F7BAVL																									
	D-F7□V																									
	D-F7NTL																									
	D-F7□W (V)																									
	D-F5/J5																									
	D-F5BAL																									
	D-F5□W/J59W																									
	D-F5□F																									
	D-F5NTL																									
	D-G39C/K39C																									
	D-M9	*	*	*	*	*	*	*	*				*		*										*	
	D-M9□V								*							*										
	D-F9□W	*	*	*	*	*	*	*	*				*		*											*
	D-F9□WV								*						*											
	D-F9BAL								*						*											
	D-Y59A/Y7P/Y59B																									
	D-Y69A/Y7PV/Y69B																									
	D-Y7□W																									
D-Y7□WV																										
D-Y7BAL																										
D-P5□WL																										
D-F9G/H	*	*	*	*	*	*	*	*				*		*										*		
D-Y7G/H																										
D-G5NBL																										
D-F8□																										

Please refer to the next page for applicable auto switches and cylinders in the fields marked with asterisks (\*).

## Compact auto switch mounting bracket

Mounting brackets used for installing the compact auto switches D-A9/M9/F9 onto band mounting / tie-rod mounting / groove mounting style cylinders are available.


<p><b>Band mounting</b></p>  <p>Applicable cylinder  <b>10-/11-/21-/22-CDJ2 Series</b>  <b>10-/11-/21-/22-CDM2 Series</b>  <b>10-/11-/21-/22-CDG1 Series</b>  <b>10-/11-REC Series</b>  <b>10-/11-CDM2X Series</b></p>		<p><b>Applicable auto switch</b></p> <p>Solid state switch  <b>D-M9</b>  <b>D-F9□W</b> (2-color indication)          Reed switch  <b>D-A9</b></p> <p>Perpendicular entry is unavailable.</p>
<p><b>Tie-rod mounting</b></p>  <p>Applicable cylinder  <b>10-/11-/21-/22-CDA2 Series</b></p>		<p><b>Applicable auto switch</b></p> <p>Solid state switch  <b>D-M9/M9□V</b>  <b>D-F9□W/F9□WV</b> (2-color indication)  <b>D-F9BAL</b> (water resistant type)</p> <p>Reed switch  <b>D-A9/D-A9□V</b></p>
<p><b>Groove mounting</b></p>  <p>Applicable cylinder  <b>12-/13-/21-/22-MGP Series</b></p>		<p><b>Applicable auto switch</b></p> <p>Reed switch  <b>D-A9/D-A9□V</b></p>





# Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of “**Caution,**” “**Warning**” or “**Danger.**” They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC), Japan Industrial Standards (JIS)\*1) and other safety regulations\*2).

- \* 1) ISO 4414: Pneumatic fluid power – General rules relating to systems.  
ISO 4413: Hydraulic fluid power – General rules relating to systems.  
IEC 60204-1: Safety of machinery – Electrical equipment of machines. (Part 1: General requirements)  
ISO 10218-1992: Manipulating industrial robots -Safety.  
JIS B 8370: General rules for pneumatic equipment.  
JIS B 8361: General rules for hydraulic equipment.  
JIS B 9960-1: Safety of machinery – Electrical equipment of machines. (Part 1: General requirements)  
JIS B 8433-1993: Manipulating industrial robots - Safety.  
etc.
- \* 2) Labor Safety and Sanitation Law, etc.

 **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 possibility of serious injury or loss of life.

## Warning

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

Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results. The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalog information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

### **2. Only personnel with appropriate training should operate machinery and equipment.**

The product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

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

1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.

2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.

3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

### **4. Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.**

1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.

2. Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalog.

3. An application which could have negative effects on people, property, or animals requiring special safety analysis.

4. Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.



# Safety Instructions

## Caution

**The product is provided for use in manufacturing industries.**

The product herein described is basically provided for peaceful use in manufacturing industries.

If considering using the product in other industries, consult SMC beforehand and exchange specifications or a contract if necessary. If anything is unclear, contact your nearest sales branch.

## Limited Warranty and Disclaimer/Compliance Requirements

The product used is subject to the following “Limited Warranty and Disclaimer” and “Compliance Requirements”. Read and accept them before using the product.

### Limited Warranty and Disclaimer

**1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered.\*3)**

**Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.**

**2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.**

**This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.**

**3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalog for the particular products.**

**\* 3) Vacuum pads are excluded from this 1 year warranty.**

A vacuum pad is a consumable part, so it is warranted for a year after it is delivered.

Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.

### Compliance Requirements

**When the product is exported, strictly follow the laws required by the Ministry of Economy, Trade and Industry (Foreign Exchange and Foreign Trade Control Law).**



# Clean series: Common Precautions 1

Be sure to read before handling.

Refer to the main text for detailed precautions on every series.

## Air Supply

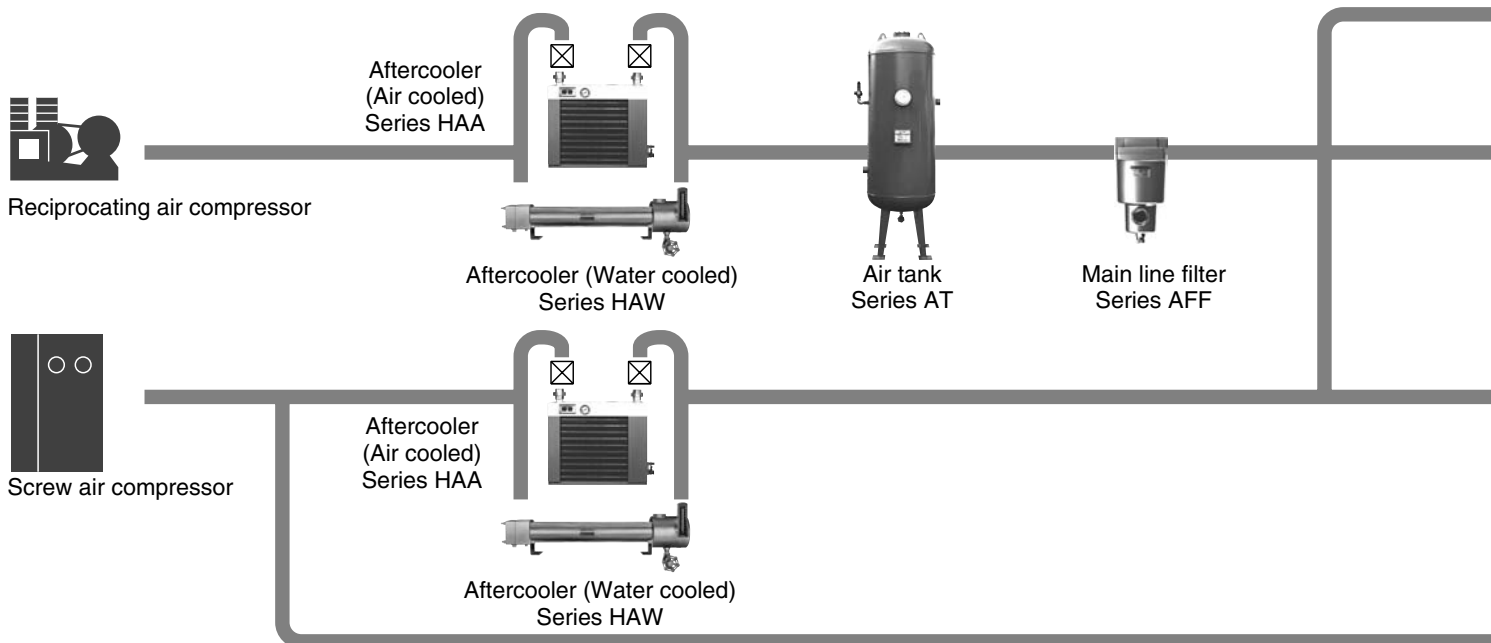
### Caution

#### System Configuration

Refer to the "Air Preparation System" below for the quality of compressed air before configuring the system.

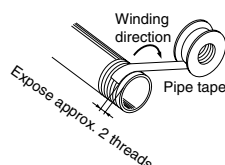
#### Main line

#### Sub-line



#### Piping

1. Provide an inclination of 1cm per meter in the direction of the air flow to the main piping.
2. If there is a line branching from the main piping, provide an outlet of compressed air on top using a tee so that drainage accumulated in the piping will not flow out.
3. Provide a drainage mechanism at every recessed point or dead end to prevent drain accumulation.
4. For future piping extensions, plug the end of the piping with a tee.
5. Before piping  
Before piping, the piping should be thoroughly blown out with air (flushed) or washed to remove chips, cutting oil and other debris from inside the pipe.
6. Wrapping of pipe tape  
When screwing piping or fittings into ports, ensure that chips from the pipe threads or sealing material do not get inside the valve. Also, when pipe tape is used, leave 1.5 to 2 thread ridges exposed at the end of the threads.



7. If air with a low dew point ( $-40^{\circ}\text{C}$  or less) is required, do not use nylon tube or resin fitting (except for fluorine resin) for the outlet side of the membrane air dryer or heatless air dryer. Nylon tubing could be affected by the ambient air and it thus might not be possible to achieve the prescribed low dew point at the end of the tube. Therefore, for low dew point air, use stainless steel or fluorine tube.

#### Maintenance

1. If the heatless air dryer Series ID is left unused for a long period, the absorbent may be moistened. Prior to use, close the valve on the outlet side of the dryer for regeneration and drying.

#### Caution on Design

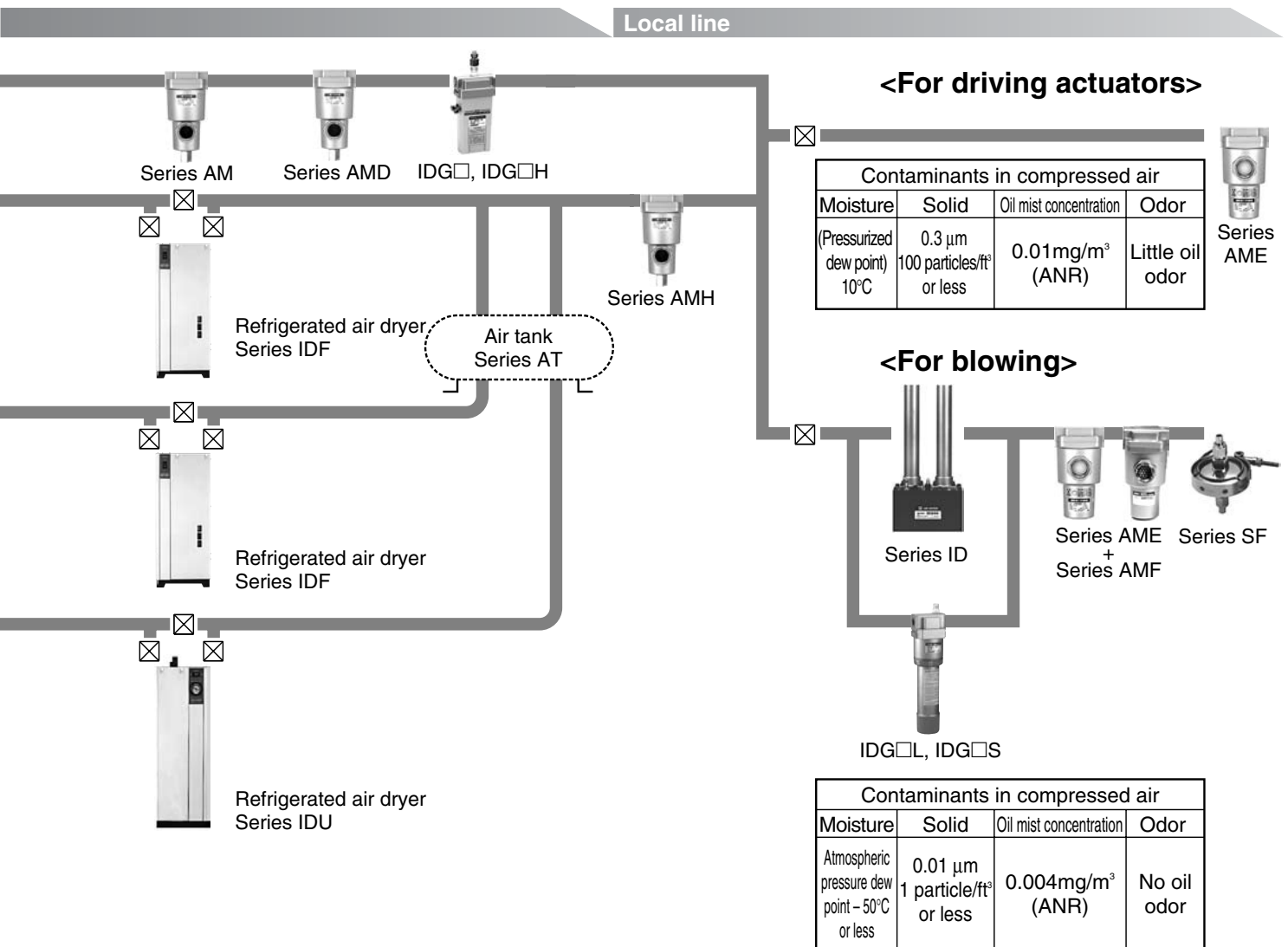
Employ a safe design, so that the following unexpected conditions will not occur.

### Warning

1. Provide a design that prevents high-temperature compressed air from flowing into the outlet side of the cooling equipment.  
If the flow of the coolant water in a water-cooled aftercooler is stopped or if the fan motor of an air cooled aftercooler is stopped, the high-temperature compressed air will flow to the outlet side of the cooling equipment, causing the equipment on the outlet side (such as the AFF, AM, AD, or IDF series) to be damaged or to malfunction.
2. Provide a design in which interruptions in the supply of compressed air are taken into consideration.



## Air Supply



There are cases in which compressed air cannot flow due to the freezing of the refrigerated air dryer or a malfunction (heatless dryer) in the switching valve.

### **⚠ Caution**

**3. Design a layout in which the leakage of the coolant water and the dripping of condensation are taken into consideration.**

A water-cooled aftercooler that uses coolant water could lead to water leakage due to freezing. Depending on the operating conditions, the refrigerated air dryer and its downstream pipes could create a dripping of water droplets due to condensation formed by supercooling.

**4. Provide a design that prevents back pressure and backflow.**

The generation of back pressure and backflow could lead to

equipment damage.

Take appropriate safety measures, including the proper installation methods.

**5. Depending on the model and operating conditions, the life span of air cylinders may be shortened when they are used in an environment of super dry air (atmospheric pressure dew point: -50°C) or high-purity nitrogen gas or when such super dry air or high-purity nitrogen gas is used as the fluid.**

Please contact with SMC for further details on applicable series, models, operating conditions and life spans.

**6. Blowing system**

Even a small amount of dust can be a problem for blowing systems.

Install Clean Gas Filter Series SF to the end of the blowing line.



# Clean series: Common Precautions 2

Be sure to read before handling.

Refer to the main text for detailed precautions on every series.

## Piping: Inside of Clean Room

### ⚠ Caution

1. Do not make the piping for the air cylinder relief port and regulator breathing vent piping common with solenoid valve exhaust piping.

This can cause malfunctions in the air cylinder or regulator pressure change.

2. Arrange the piping so that the exhaust air of the solenoid valves is exhausted outside of the clean room.

#### 3. Air filter drain piping

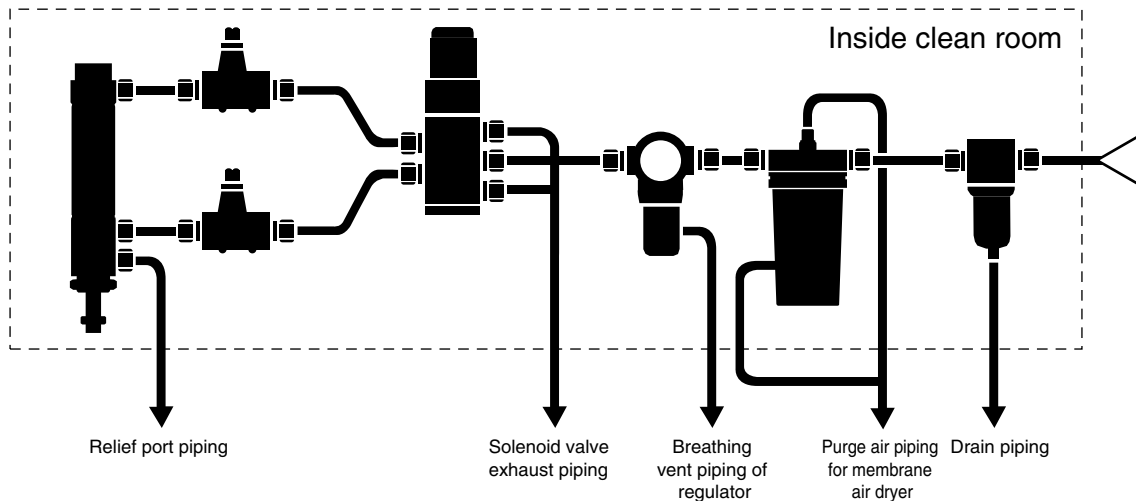
Exhaust drainage outside the clean room through piping from the drain guide of the air filter.

4. Arrange the membrane dryer air purge piping using a standard size tubing so that air is exhausted outside the clean room.

5. Take precautions so that the threaded portion of the piping connection or the tubing connection will not be loosened.

Take sufficient precautions against the piping shaking along with the vibration of the equipment.

6. Use polyurethane tubing containing no plasticizer.



## Handling

### ⚠ Caution

1. The inner bag of a double-packed clean series package should be opened in a clean room or clean environment.
2. When standard pneumatic equipment is brought into a clean room, spray high-purity air upon it and remove dust thoroughly by wiping the external surfaces of the cylinder tube, solenoid valves and air line equipment with alcohol.
3. To replace parts or disassemble the product in a clean room, first exhaust the compressed air inside the piping to the outside of the clean room before the work.
4. Do not use rotation type mounting brackets such as clevises, trunnions, etc.. They will generate a considerable amount of particulate matter due to the sliding friction between the metal parts.

## Lubrication / In the Case of Actuator

### ⚠ Warning

Be sure to wash your hands after handling fluoro-resin grease. The grease itself is not hazardous but it can produce a hazardous gas at temperatures exceeding 260°C.

### ⚠ Caution

1. Do not use any greases but those specified by SMC. Use of greases not specified will cause malfunctions or particle generation.
2. Do not lubricate the products since they are of a nonlubricant type. As the clean series actuators are lubricated at the factory with fluoro-resin grease, the product specifications may not be satisfied if turbine oil or other such lubricants are applied.

## Piston speed

### ⚠ Caution

The cylinder speed upper limit that retains the particle generation grade is 400 mm/s.



# Clean series: Common Precautions 3

Be sure to read before handling.

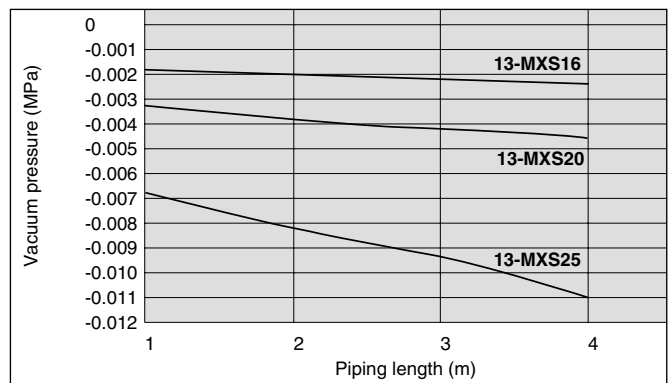
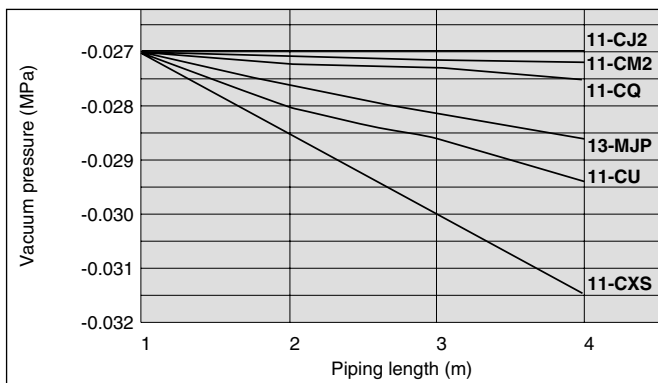
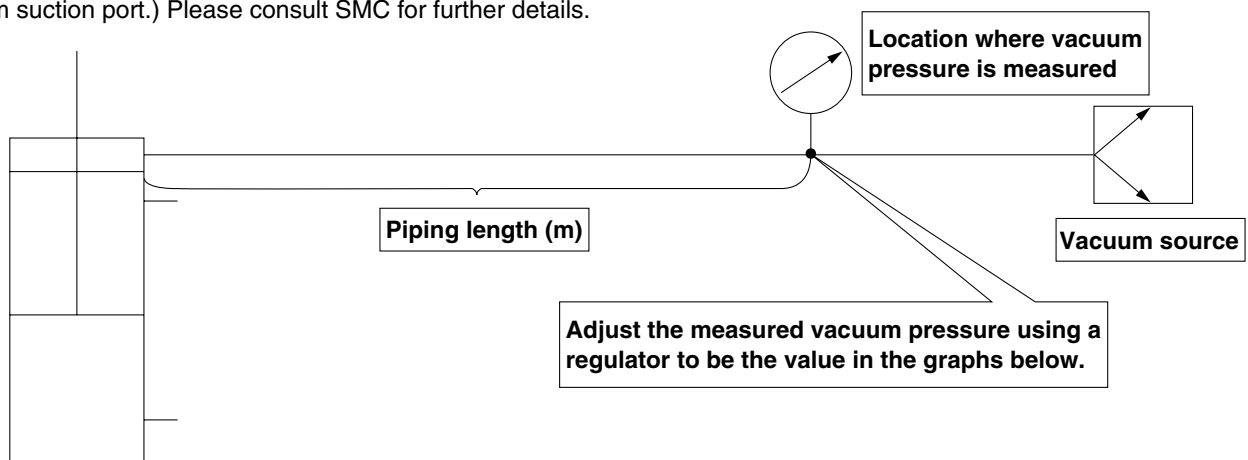
Refer to the main text for detailed precautions for every series.

## Suction flow rate of vacuum suction types

### ⚠ Caution

For the vacuum suction types (Series 11-/13-/22-), perform vacuum suction at the vacuum port to retain the particle generation grade.

The optimum suction flow rate varies depending on series and sizes. Refer to "Suction flow rate of vacuum suction type (Reference values)" for each series. (The vacuum pressure will be approximately -27 kPa at around 1 m from the vacuum suction port.) Please consult SMC for further details.





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