

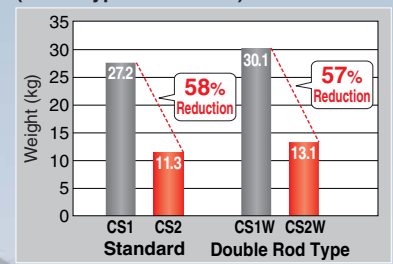
# Air Cylinder New

Large Bore Sizes  $\varnothing 125, \varnothing 140, \varnothing 160$



- Lighter installation achieved by reducing weight.
- Die cast rod cover and head cover used to achieve greater weight reduction.
- Rod bore size changed to suit uses, achieving greater weight reduction.

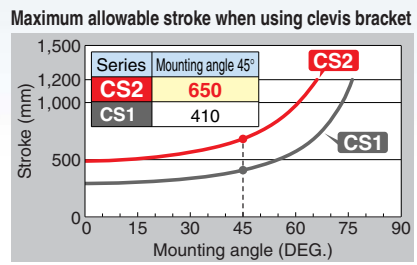
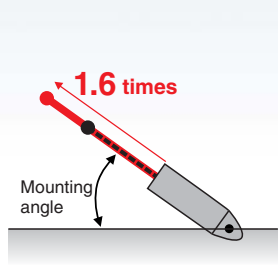
CS1  $\leftrightarrow$  CS2 Weight Comparison (Basic Type  $\varnothing 160$ -100st)



## Maximum stroke when using rotating bracket

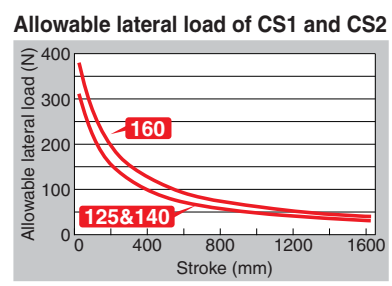
Expanded by **1.6 times** (compared to series CS1)

Lighter cylinder reduces self-weight deflection. Stroke range extended to widen use.



## Allowable lateral load equal to Series CS1

Even if rod diameter is changed to suit various needs, function remains equal to Series CS1.



*Series Expanded* **NEW**

## Double Rod Type, Smooth Cylinder added to Series CS2!

**9 Made to Order types added!**

**Double Rod Type**

**Smooth Cylinder**

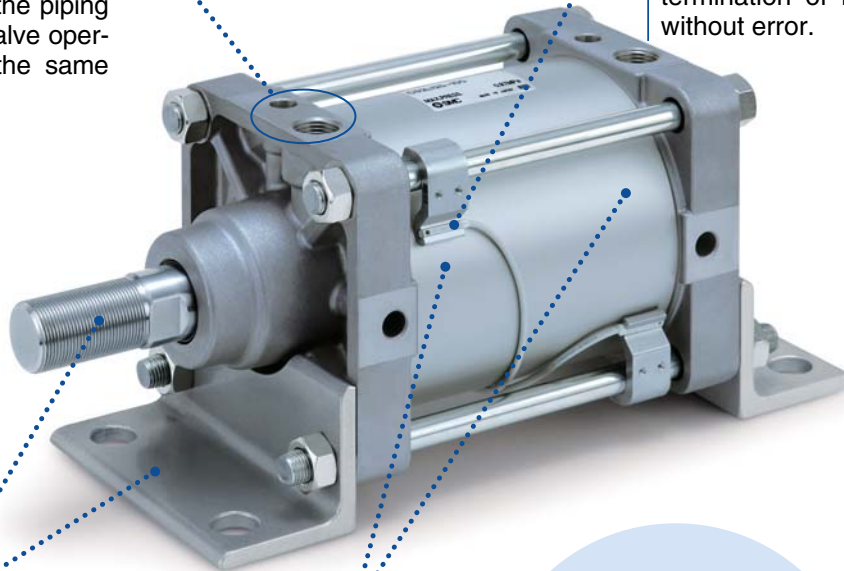
# Series CS2

### Improved operability after installation

Operability has been improved by placing the piping port and cushion valve operation position on the same side.

### Compact auto switches can be mounted

2-color display auto switches can be mounted, enabling precise determination of mounting position, without error.



### Interchangeability with Series CS1

Cylinder mounting dimensions and rod end thread sizes are interchangeable with Series CS1.

### Cushion seals are now replaceable

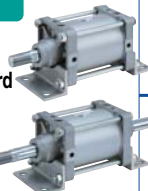

Maintenance improved by making cushion seals replaceable.

### Smooth Cylinder



- Minimum operating pressure **0.8 psi**
- Realize stable, low speed operation at even **5 mm/s**

## Series Variations

Series	Action	Type	Standard variations		Bore size (mm)	Made to Order
			With rod boot	Copper-free		
<b>P.2</b> Standard CS2 	Double acting	Single rod	●	●	125 140 160	<ul style="list-style-type: none"> <li>• Change of rod end shape <b>NEW</b></li> <li>• Special port positions</li> <li>• Change of trunnion bracket mounting position</li> <li>• Change of tie-rod length</li> <li>• Double clevis pin and double knuckle pin with split pin and flat washer</li> <li>• Double clevis pin and double knuckle pin made of stainless steel</li> <li>• Rod side trunnion mounted on the front of the rod cover</li> <li>• Made of stainless steel (Piston rod is hard chrome plated)</li> <li>• With rod end bracket</li> </ul>
		<b>NEW</b> Double rod	●	●		
<b>P.17</b> Smooth Cylinder CS2Y <b>NEW</b> 	Double acting	Single rod	●			

# Combination of Standard Products and Made to Order Specifications

## Series CS2

- : Standard
- ◎ : Made to Order specifications
- : Special product (Contact SMC for details)
- : Not available

Symbol	Specification	Applicable bore size	CS2 (Standard)		CS2Y (Smooth Cylinder)	
			Double acting			Double acting
			Single rod	Double rod		Single rod
			Non-lube		Non-lube	
			ø125 to ø160		ø125 to ø160	
Standard	Standard	ø125 to ø160	●	●	●	
CDS2	Built-in magnet		●	●	●	
CS2□-□ <sub>J</sub> <sub>K</sub>	With rod boot		●	●	●	
20-	Copper and Fluorine-free		◎	◎	—	
-XA□	Change of rod end shape	ø125 to ø160	◎	◎	◎	
-XB5	Oversized rod cylinder		○	○	○	
-XB6	Heat-resistant cylinder (32 to 302°F)		○	○	—	
-XB7	Cold-resistant cylinder		○	○	—	
-XB9	Low speed cylinder (5 to 50 mm/s)		○	○	○	
-XC3	Special port position		◎	○	◎	
-XC4	With heavy duty scraper		○	○	—	
-XC5	Heat resistant cylinder (32 to 230°F)		○	○	—	
-XC6	Made of stainless steel		—	—	—	
-XC7	Tie-rod, cushion valve, tie-rod nut, etc. made of stainless steel		○	○	○	
-XC8	Adjustable stroke cylinder/Adjustable extension type		○	—	—	
-XC9	Adjustable stroke cylinder/Adjustable retraction type		○	—	○	
-XC10	Dual stroke cylinder/Double rod type		○	—	○	
-XC11	Dual stroke cylinder/Single rod type		○	—	○	
-XC12	Tandem cylinder		○	—	—	
-XC14	Change of trunnion bracket mounting position		◎	◎	◎	
-XC15	Change of tie-rod length		◎	◎	◎	
-XC22	Fluororubber seal		○	○	—	
-XC26	Double clevis pin/Double knuckle pin with split pin and flat washer		◎	—	◎	
-XC27	Double clevis pin and double knuckle pin made of stainless steel		◎	—	◎	
-XC30	Rod side trunnion mounted on the front of the rod cover		◎	◎	◎	
-XC35	With coil scraper		○	○	—	
-XC39	Special trunnion bearing		○	○	○	
-XC40	Clevis hole with bushing		○	—	○	
-XC50	Knuckle fixed with nut		○	○	○	
-XC68	Made of stainless steel (With hard chrome plated piston rod)		◎	◎	◎	
-XC86	With rod end bracket		◎	○	◎	

Basic

Double Rod Type

Smooth Cylinder

Auto Switch

Made to Order

# Air Cylinder

# Series CS2

ø125, ø140, ø160

## How to Order

**CS2 L 125 - 300 -**

**With auto switch** **CDS2 L 125 - 300 - M9BW -**

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

**Mounting**

B	Basic
L	Foot
F	Rod flange
G	Head flange
C	Single clevis
D	Double clevis
T	Center trunnion

**Bore size**

125	125 mm
140	140 mm
160	160 mm

**Port thread type**

Nil	Rc
TN	NPT
TF	G

**Made to Order**  
For details, refer to the next page.

**Number of auto switches**

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

**Auto switch**

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

\* Refer to the table below for the applicable auto switch model.

**Suffix for cylinder**

Rod boot	Nil	None
	J	Nylon tarpaulin
	K	Heat resistant tarpaulin

\* With air cushions on both sides only.

**Cylinder stroke (mm)**  
Refer to the next page for the "Maximum Stroke" table.

**Built-in Magnet Cylinder Model**

If a built-in magnet cylinder without auto switch is required, there is no need to enter the symbol for auto switch.  
(Example) CDS2B125-200

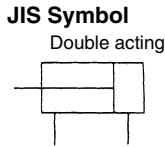
### Applicable Auto Switches / For detailed auto switch specifications, refer to Best Pneumatics No. 2.

Type	Special function	Electrical entry	Indicator/light	Wiring (Output)	Load voltage		Auto switch model		Lead wire length (m)				Pre-wired connector	Applicable load		
					DC	AC	Tie-rod mounting	Band mounting	0.5 (Nil)	1 (M)	3 (L)	5 (Z)		IC circuit	Relay, PLC	
Solid state switch	—	Grommet	No	3-wire (NPN)	24 V	5 V, 12 V	—	M9N	●	●	●	○	—			—
				3-wire (PNP)				M9P	●	●	●	○				
		2-wire		—	—	100 V, 200 V	M9B	●	●	●	○	—	—			
		—					J51	●	●	○	○					
	Terminal conduit	—	—	—	—	—	—	G39	—	—	—	—	—	—	—	
								—	K39	—	—	—				—
	Diagnostic indication (2-color indication)	Grommet	Yes	3-wire (NPN)	24 V	5 V, 12 V	—	M9NW	●	●	●	○	—	—	—	—
				3-wire (PNP)				M9PW	●	●	●	○				
				2-wire	—	—	—	M9BW	●	●	●	○	—	—		
				—				M9NA	—	○	○	●			○	
Water resistant (2-color indication)	Grommet	No	3-wire (NPN)	24 V	5 V, 12 V	—	M9PA	—	○	○	●	○	—	—	—	
			3-wire (PNP)				M9PA	—	○	○	●	○				
Diagnostic indication (2-color indication)	Grommet	No	2-wire	—	12 V	—	M9BA	—	○	○	●	○	—	—	—	
			—				M9BA	—	○	○	●	○				
Reed switch	—	Grommet	Yes	3-wire (NPN equivalent)	24 V	12 V	—	A96	●	—	●	—	—	—	—	
				—				100 V	A93	●	—	●				—
				—					100 V or less	A90	●	—				●
				—				200 V or less		A54	●	—				●
		Terminal conduit	—	—	—	—	—		—	A33	—	—	—	—	—	—
								—		A34	—	—	—			
		DIN terminal	Yes	—	—	—	—	—	—	A44	—	—	—	—	—	—
										—	A44	—	—			
Diagnostic indication (2-color indication)	Grommet	No	—	—	—	—	—	A59W	●	—	●	—	—	—	—	
			—					A59W	●	—	●	—				

\* Lead wire length symbols: 0.5 m ..... Nil (Example) M9NW  
 1 m ..... M (Example) M9NWM  
 3 m ..... L (Example) M9NWL  
 5 m ..... Z (Example) M9NWZ

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

\* Since there are applicable auto switches other than listed, refer to page 23 for details.  
 \* For details about auto switches with pre-wired connector, refer to Best Pneumatics No. 2.  
 \* D-A9□, M9□, M9□W, M9□AL are shipped together (but not assembled). (Only auto switch mounting bracket is assembled at the time of shipment.)



**Made to Order Specifications**  
(For details, refer to pages 25 to 29.)

Symbol	Specifications
-XA□	Change of rod end shape
-XC3	Special port position
-XC14	Change of trunnion bracket mounting position
-XC15	Change of tie-rod length
-XC26	Double clevis pin/Double knuckle pin with split pin and flat washer
-XC27	Double clevis pin and double knuckle pin made of stainless steel
-XC30	Rod side trunnion mounted on the front of the rod cover
-XC68	Made of stainless steel (With hard chrome plated piston rod)
-XC86	With rod end bracket

**Rod Boot Material**

Symbol	Material	Max. ambient temperature
J	Nylon tarpaulin	158°F
K	Heat resistant tarpaulin	230°F*

\* Maximum ambient temperature for the rod boot itself.

For the specifications of cylinders with auto-switch, please refer to pages 21 to 24.

- Minimum stroke for auto switch mounting
- Auto switch proper mounting position (detection at stroke end) and its mounting height
- Operating range
- Auto switch mounting bracket part no.

**Specifications**

Bore size (mm)	125	140	160
<b>Action</b>	Double acting, Single rod		
<b>Fluid</b>	Air		
<b>Proof pressure</b>	227 psi		
<b>Maximum operating pressure</b>	140 psi		
<b>Minimum operating pressure</b>	7.3 psi		
<b>Piston speed</b>	50 to 500 mm/s		
<b>Cushion</b>	Air cushion		
<b>Ambient and fluid temperature</b>	Without auto switch	32 to 158°F (No freezing)	
	With auto switch	32 to 140°F (No freezing)	
<b>Lubrication</b>	Not required (Non-lube)		
<b>Stroke length tolerance (mm)</b>	Stroke		Tolerance
	250 or less		+1.0 0
	251 to 1000		+1.4 0
	1001 to 1500		+1.8 0
1501 to 1600		+2.2 0	
<b>Mounting</b>	Basic, Foot, Rod flange, Head flange, Single clevis, Double clevis, Center trunnion		

**Maximum Stroke**

Mounting bracket	Maximum stroke (mm)	
	Basic, Head flange, Single clevis, Double clevis, Center trunnion	Foot, Rod flange
Bore size		
125	1000 or less	1600 or less
140		
160	1200 or less	

**Accessory**

Mounting		Basic	Foot	Rod flange	Head flange	Single clevis	Double clevis	Center trunnion
Standard equipment	Clevis pin	—	—	—	—	—	●	—
Option	Rod end nut	●	●	●	●	●	●	●
	Single knuckle joint	●	●	●	●	●	●	●
	Double knuckle joint (Knuckle pin, Split pin)	●	●	●	●	●	●	●
	Rod boot	●	●	●	●	●	●	●

\* If using the rod end nut with a single knuckle joint or a double knuckle joint, use the type with rod end bracket (-XC86) or refer to page 11.

**Mounting Bracket Part No.**

Bore size (mm)	125	140	160
Foot*	CS2-L12	CS2-L14	CS2-L16
Flange	CS2-F12	CS2-F14	CS2-F16
Single clevis	CS2-C12	CS2-C14	CS2-C16
Double clevis**	CS2-D12	CS2-D14	CS2-D16

\* Order two foot brackets per cylinder.

\*\* When ordering the double clevis style, the clevis pin and 2 split pins are included as accessories.

# Series CS2

## Weight

Bore size (mm)		125	140	160
Basic weight	Basic	5.46	6.50	9.07
	Foot	7.49	9.50	12.45
	Rod flange	8.51	12.03	15.80
	Head flange	8.51	12.03	15.80
	Single clevis	8.53	10.79	14.56
	Double clevis	8.99	11.54	15.41
	Trunnion	9.59	12.23	15.47
Additional weight with magnet (With built-in magnet and auto switch)		0.07	0.07	0.08
Additional mass per each 100 mm of stroke		1.55	1.67	2.23
Accessory bracket	Single knuckle	0.91	1.16	1.56
	Double knuckle (With Knuckle pin, Split pin)	1.37	1.81	2.48
	Rod end nut	0.16	0.16	0.23

Calculation: (Example) **CS2L160-500**

- Basic weight ..... 12.45 (kg)
  - Additional weight ..... 2.23 (kg/100 mm)
  - Cylinder stroke ..... 500 (mm)
- $12.45 + 2.23 \times 500/100 = 23.60$  (kg)

### ⚠ Warning

- Do not use the cylinder as a shock absorber.**  
Using the cylinder as a shock absorber may cause damage.
- Do not open the cushion valve beyond the stopper.**  
As a retaining mechanism for the cushion valve, retaining ring is installed, and the cushion valve should not be opened beyond that point.  
If not operated in accordance with the above precautions, the cushion valve may be ejected from the cover when air pressure is supplied.
- Use the air cushion at the end of cylinder stroke.**

### ⚠ Caution

- Regarding the installation of a knuckle joint**  
Please contact SMC if a knuckle joint must be installed on the piston rod by using the rod end nut.
- Regarding the screw-in of fittings when piping**  
When ports and fittings are screwed in, tighten them with the proper tightening torque below.

Bore size (mm)	Connecting thread nominal size	Proper tightening torque N·m
125, 140	1/2	28 to 30
160	3/4	

- Do not deform cushion rings when removing and assembling.**  
Cushion rings are press molded products. If a cushion ring bumps with something when removing and assembling, the air cushion may not function properly due to cushion ring deformation.

## Theoretical Output / Double Acting




Unit: N

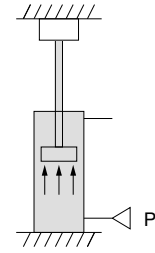
Bore size (mm)	Rod size (mm)	Operating direction	Piston area (mm <sup>2</sup> )	Operating pressure (psi)								
				29	44	58	73	87	102	116	131	145
125	32	OUT	12300	2460	3690	4920	6150	7380	8610	9840	11100	12300
		IN	11500	2300	3450	4600	5750	6900	8050	9200	10400	11500
140	32	OUT	15400	3080	4620	6160	7700	9240	10800	12300	13900	15400
		IN	14600	2920	4380	5840	7300	8760	10200	11700	13100	14600
160	38	OUT	20100	4020	6030	8040	10100	12100	14100	16100	18100	20100
		IN	19000	3800	5700	7600	9500	11400	13300	15200	17100	19000

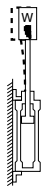
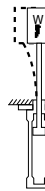

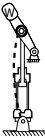

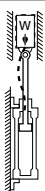
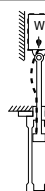




## Relation between Cylinder Size and Maximum Stroke

The below table shows the applicable maximum stroke (in cm units), found by calculation assuming the case where the force generated by the cylinder itself acts as buckling force on the piston rod, or piston rod and cylinder tube.

Therefore, it is possible to find the applicable maximum stroke for each cylinder size using the relationship between the size of the operating pressure and the cylinder support type, regardless of the load ratio.

 [Reference] If it is stopped with the external stopper on the cylinder extension side, even with a light load, the maximum generated force of the cylinder will act on the cylinder itself.



Mounting			Operating pressure (psi)	Applicable max. stroke according to buckling strength (cm)		
Support bracket nominal symbol and schematic diagram				125	140	160
Foot: <b>L</b>	Rod flange: <b>F</b>	Head flange: <b>G</b>	<b>L, F</b> 44 73 102 <b>G</b> 44 73 102	103	92	113
				79	70	86
				66	58	72
				45	38	47
				33	27	34
				26	22	27
Clevis: <b>C, D</b>		Center trunnion: <b>T</b>	<b>C, D</b> 44 73 102 <b>T</b> 44 73 102	96	83	106
				71	61	76
				59	50	62
				135	119	147
				101	89	111
				84	74	91
Foot: <b>L</b>	Rod flange: <b>F</b>	Head flange: <b>G</b>	<b>L, F</b> 44 73 102 <b>G</b> 44 73 102	301	267	330
				231	207	253
				193	172	212
				144	126	156
				109	94	118
				90	78	97
Foot: <b>L</b>	Rod flange: <b>F</b>	Head flange: <b>G</b>	<b>L, F</b> 44 73 102 <b>G</b> 44 73 102	433	386	476
				334	297	367
				281	250	309
				210	185	229
				160	141	175
				134	117	129

Basic

Double Rod Type

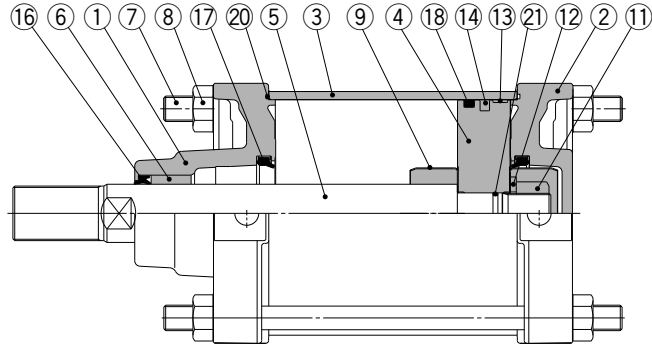
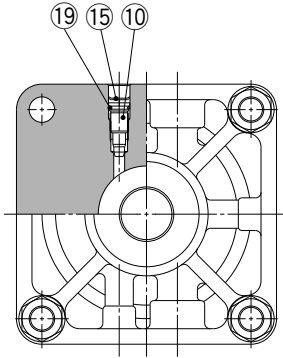
Smooth Cylinder

Auto Switch

Made to Order

# Series CS2

## Construction



### Component Parts

No.□	Description	Material□	Note□
1	Rod cover	Aluminum die-cast□	Chromated□
2	Head cover	Aluminum die-cast□	Chromated□
3	Cylinder tube	Aluminum alloy□	Hard anodized□
4	Piston	Aluminum alloy□	Chromated□
5	Piston rod	Carbon steel□	Hard chrome plated□
6	Bushing	Oil-impregnated sintered alloy□	□
7	Tie-rod	Carbon steel□	Zinc chromated□
8	Tie-rod nut	Rolled steel□	Nickel plated□
9	Cushion ring	Stainless steel□	□
10	Cushion valve	Rolled steel□	Nickel plated□
11	Piston nut	Carbon steel□	Nickel plated□
12	Flat washer	Carbon steel□	Nickel plated□
13	Wear ring	Resin□	□
14	Magnet*	—□	□
15	Retaining ring	Spring steel	Phosphate coated

\* Built-in magnet type with auto switch

### Component Parts

No.□	Description	Material□	Note□
16	Rod seal	NBR□	□
17	Cushion seal	Urethane□	
18	Piston seal	NBR□	
19	Valve seal	NBR□	
20	Tube gasket	NBR□	
21	Piston gasket	NBR	

### Replacement Parts: Seal Kit

Bore size (mm)	Kit no.	Content
125	CS2-125A-PS□	Set of nos. □ above 16, 17, 18, 20.
140	CS2-140A-PS□	
160	CS2-160A-PS	

\* Seal kit includes a grease pack (40 g).□

Order with the following part number when only the grease pack is needed.□

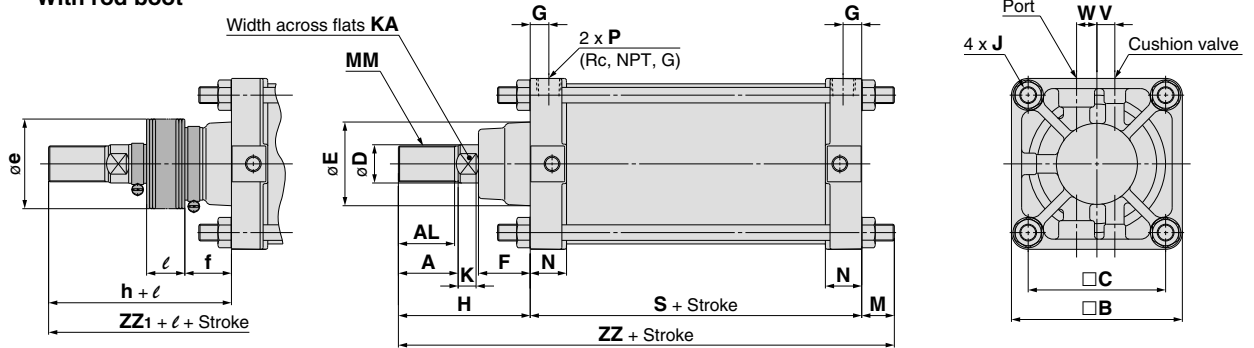
Grease pack part number: GR-S-010 (10 g), GR-S-020 (20 g)



**Dimensions**

**Basic: CS2B**

With rod boot



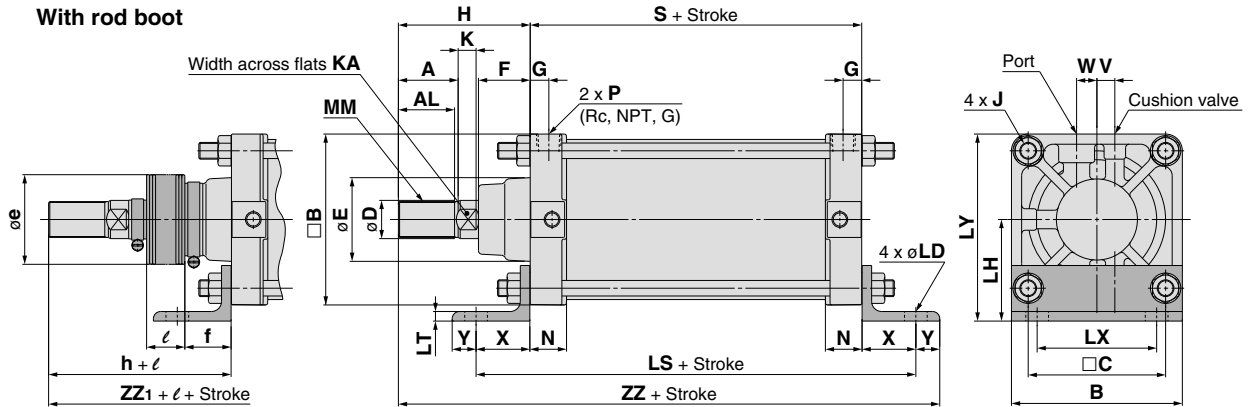
Bore size (mm)	Stroke range (mm)	A	AL	□B	□C	D	E	F	G	J	V	W	K	KA	M	MM
125	Up to 1000	50	47	143	115	32	71	43	15	M14 x 1.5	15	17	15	27	27	M30 x 1.5
140	Up to 1000	50	47	157	128	32	71	43	15	M14 x 1.5	15	17	15	27	27	M30 x 1.5
160	Up to 1200	56	53	177	144	38	78.5	42	18	M16 x 1.5	15	20	17	34	30.5	M36 x 1.5

Bore size (mm)	N	P	S	Without rod boot		With rod boot				
				H	ZZ	e	f	h	ℓ	ZZ1
125	30.5	1/2	98	110	235	75	40	133	1/5 stroke	258
140	30.5	1/2	98	110	235	75	40	133	1/5 stroke	258
160	34.5	3/4	106	120	256.5	75	40	141	1/5 stroke	277.5

\* The minimum stroke with rod boot is 30 mm or more.  
 \*\* For auto switch mounting position and its mounting height, refer to page 21.  
 \*\*\* Refer to "Minimum Stroke for Auto Switch Mounting" on page 22.

**Foot: CS2L**

With rod boot



Bore size (mm)	Stroke range (mm)	A	AL	□B	B	□C	D	E	F	G	J	V	W	K	KA	LD	LH	LS
125	Up to 1600	50	47	143	143	115	32	71	43	15	M14 x 1.5	15	17	15	27	19	85	188
140	Up to 1600	50	47	157	157	128	32	71	43	15	M14 x 1.5	15	17	15	27	19	100	188
160	Up to 1600	56	53	177	177	144	38	78.5	42	18	M16 x 1.5	15	20	17	34	19	106	206

Bore size (mm)	LT	LX	LY	MM	N	P	S	X	Y	Without rod boot		With rod boot				
										H	ZZ	e	f	h	ℓ	ZZ1
125	8	100	156.5	M30 x 1.5	30.5	1/2	98	45	20	110	273	75	40	133	1/5 stroke	296
140	9	112	178.5	M30 x 1.5	30.5	1/2	98	45	30	110	283	75	40	133	1/5 stroke	306
160	9	118	194.5	M36 x 1.5	34.5	3/4	106	50	25	120	301	75	40	141	1/5 stroke	322

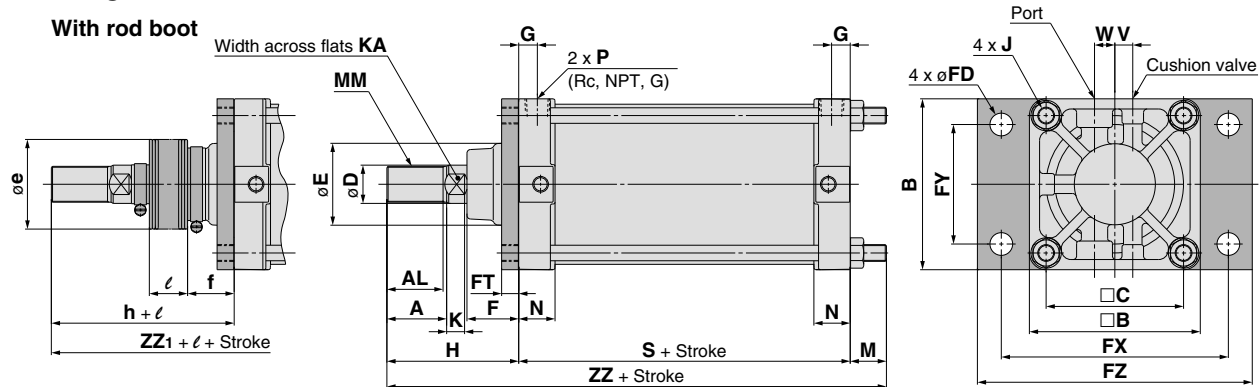
\* The minimum stroke with rod boot is 30 mm or more.  
 \*\* For auto switch mounting position and its mounting height, refer to page 21.  
 \*\*\* Refer to "Minimum Stroke for Auto Switch Mounting" on page 22.

Basic  
 Double Rod Type  
 Smooth Cylinder  
 Auto Switch  
 Made to Order

# Series CS2

## Dimensions

### Rod flange: CS2F



(mm)

Bore size (mm)	Stroke range (mm)	A	AL	□B	B	□C	D	E	F	FD	FT	FX	FY	FZ	G	J	V
125	Up to 1600	50	47	143	145	115	32	71	43	19	14	190	100	230	15	M14 x 1.5	15
140	Up to 1600	50	47	157	160	128	32	71	43	19	20	212	112	255	15	M14 x 1.5	15
160	Up to 1600	56	53	177	180	144	38	78.5	42	19	20	236	118	275	18	M16 x 1.5	15

(mm)

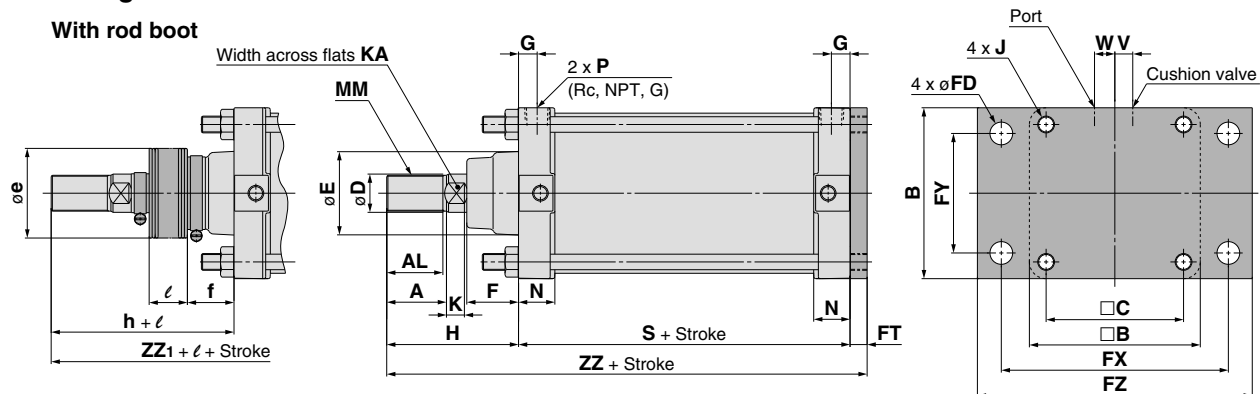
Bore size (mm)	W	K	KA	M	MM	N	P	S	Without rod boot		With rod boot				
									H	ZZ	e	f	h	ℓ	ZZ1
125	17	15	27	13	M30 x 1.5	30.5	1/2	98	110	221	75	40	133	1/5 stroke	244
140	17	15	27	13	M30 x 1.5	30.5	1/2	98	110	221	75	40	133	1/5 stroke	244
160	20	17	34	15	M36 x 1.5	34.5	3/4	106	120	241	75	40	141	1/5 stroke	262

\* The minimum stroke with rod boot is 30 mm or more.

\*\* For auto switch mounting position and its mounting height, refer to page 21.

\*\*\* Refer to "Minimum Stroke for Auto Switch Mounting" on page 22.

### Head flange: CS2G



(mm)

Bore size (mm)	Stroke range (mm)	A	AL	□B	B	□C	D	E	F	FD	FT	FX	FY	FZ	G	J	V
125	Up to 1000	50	47	143	145	115	32	71	43	19	14	190	100	230	15	M14 x 1.5	15
140	Up to 1000	50	47	157	160	128	32	71	43	19	20	212	112	255	15	M14 x 1.5	15
160	Up to 1200	56	53	177	180	144	38	78.5	42	19	20	236	118	275	18	M16 x 1.5	15

(mm)

Bore size (mm)	W	K	KA	MM	N	P	S	Without rod boot		With rod boot				
								H	ZZ	e	f	h	ℓ	ZZ1
125	17	15	27	M30 x 1.5	30.5	1/2	98	110	222	75	40	133	1/5 stroke	245
140	17	15	27	M30 x 1.5	30.5	1/2	98	110	228	75	40	133	1/5 stroke	251
160	20	17	34	M36 x 1.5	34.5	3/4	106	120	246	75	40	141	1/5 stroke	267

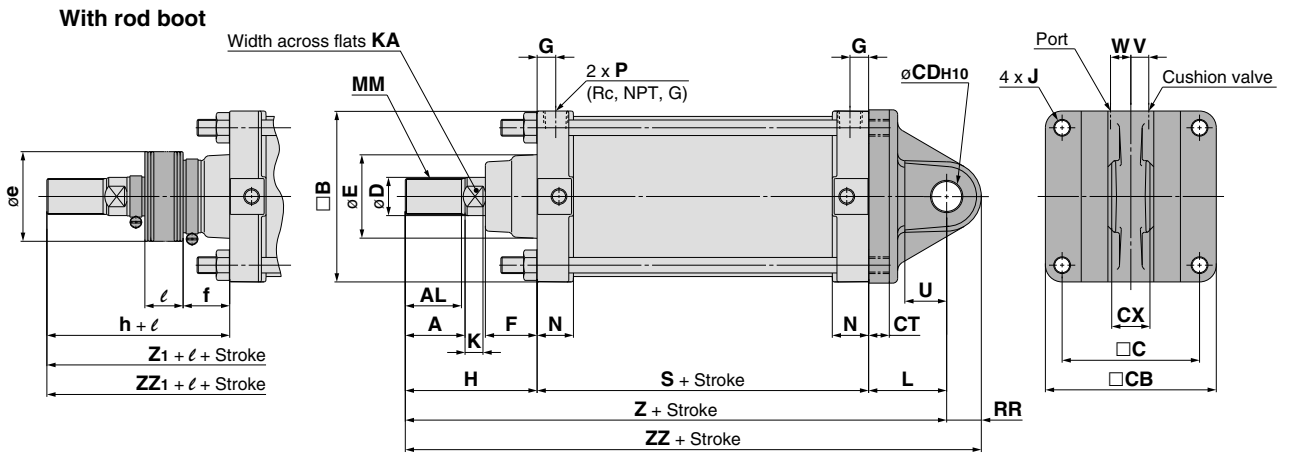
\* The minimum stroke with rod boot is 30 mm or more.

\*\* For auto switch mounting position and its mounting height, refer to page 21.

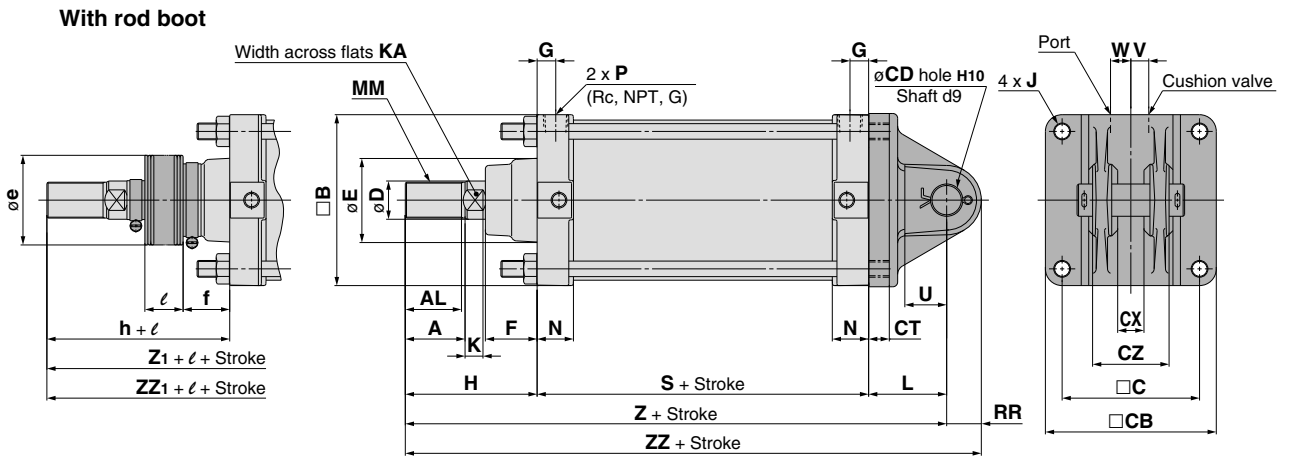
\*\*\* Refer to "Minimum Stroke for Auto Switch Mounting" on page 22.

**Dimensions**

**Single clevis: CS2C**



**Double clevis: CS2D**



(mm)

Bore size (mm)	Stroke range (mm)	A	AL	□B	□C	□CB	CDH10	CT	Single clevis			D	E	F	G	J	V	W
									CX	CX	CZ							
125	Up to 1000	50	47	143	115	145	25 <sup>+0.084</sup> <sub>0</sub>	17	32 <sup>-0.1</sup> <sub>-0.3</sub>	32 <sup>+0.3</sup> <sub>+0.1</sub>	64 <sup>0</sup> <sub>-0.2</sub>	32	71	43	15	M14 x 1.5	15	17
140	Up to 1000	50	47	157	128	160	28 <sup>+0.084</sup> <sub>0</sub>	17	36 <sup>-0.1</sup> <sub>-0.3</sub>	36 <sup>+0.3</sup> <sub>+0.1</sub>	72 <sup>0</sup> <sub>-0.2</sub>	32	71	43	15	M14 x 1.5	15	17
160	Up to 1200	56	53	177	144	180	32 <sup>+0.100</sup> <sub>0</sub>	20	40 <sup>-0.1</sup> <sub>-0.3</sub>	40 <sup>+0.3</sup> <sub>+0.1</sub>	80 <sup>0</sup> <sub>-0.2</sub>	38	78.5	42	18	M16 x 1.5	15	20

(mm)

Bore size (mm)	K	KA	L	MM	N	P	S	U	RR	Without rod boot			With rod boot					
										H	Z	ZZ	e	f	h	l	Z1	ZZ1
125	15	27	65	M30 x 1.5	30.5	1/2	98	35	29	110	273	302	75	40	133	1/2 stroke	296	325
140	15	27	75	M30 x 1.5	30.5	1/2	98	40	32	110	283	315	75	40	133	1/2 stroke	306	338
160	17	34	80	M36 x 1.5	34.5	3/4	106	45	36	120	306	342	75	40	141	1/2 stroke	327	363

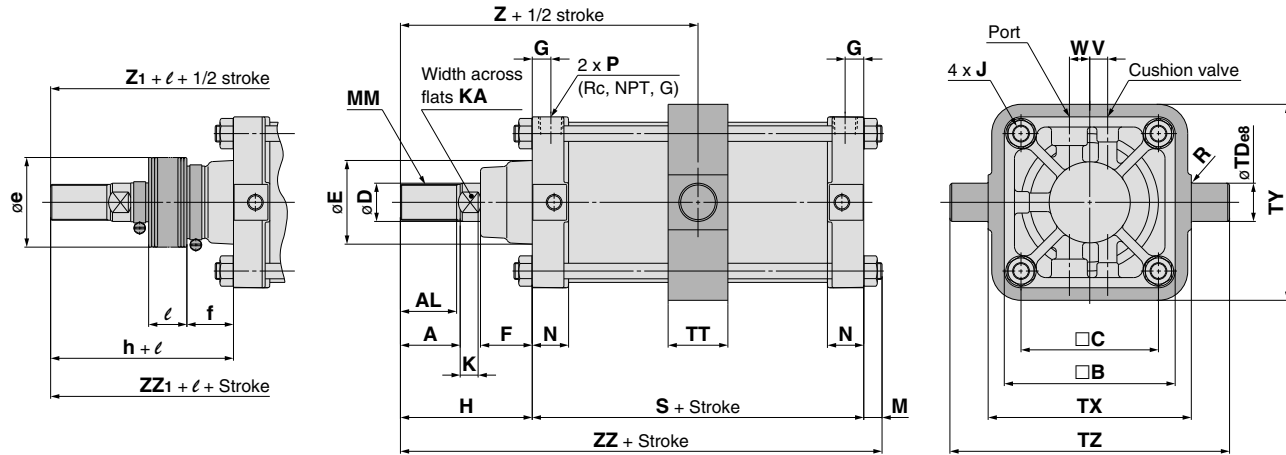
\* The minimum stroke with rod boot is 30 mm or more.  
 \*\* For auto switch mounting position and its mounting height, refer to page 21.  
 \*\*\* Refer to "Minimum Stroke for Auto Switch Mounting" on page 22.

# Series CS2

## Dimensions

### Center trunnion: CS2T

#### With rod boot



(mm)

Bore size (mm)	Stroke range (mm)	A	AL	□B	□C	D	E	F	G	J	V	W	K	KA	M	MM	N
125	25 to 1000	50	47	143	115	32	71	43	15	M14 x 1.5	15	17	15	27	13	M30 x 1.5	30.5
140	30 to 1000	50	47	157	128	32	71	43	15	M14 x 1.5	15	17	15	27	13	M30 x 1.5	30.5
160	35 to 1200	56	53	177	144	38	78.5	42	18	M16 x 1.5	15	20	17	34	15	M36 x 1.5	34.5

(mm)

Bore size (mm)	P	R	S	TD <sub>e8</sub>	TT	TX	TY	TZ	Without rod boot			With rod boot					
									H	Z	ZZ	e	f	h	l	Z <sub>1</sub>	ZZ <sub>1</sub>
125	1/2	1	98	32 <sup>-0.050</sup> <sub>-0.089</sub>	50	170	164	234	110	159	221	75	40	133	1/2 stroke	182	244
140	1/2	1.5	98	36 <sup>-0.050</sup> <sub>-0.089</sub>	55	190	184	262	110	159	221	75	40	133	1/2 stroke	182	244
160	3/4	1.5	106	40 <sup>-0.050</sup> <sub>-0.089</sub>	60	212	204	292	120	173	241	75	40	141	1/2 stroke	194	262

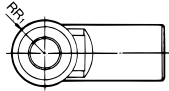
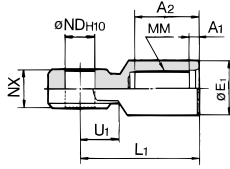
\* The minimum stroke with rod boot is 30 mm or more for ø125, ø140 and 35 mm or more for ø160.

\*\* For auto switch mounting position and its mounting height, refer to page 21.

\*\*\* Refer to "Minimum Stroke for Auto Switch Mounting" on page 22.

# Air Cylinder / Series CS2 Accessory Bracket

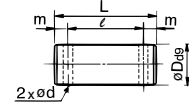
## I Type Single Knuckle Joint\*



Material: Cast iron

Part no.	Applicable bore size (mm)	A <sub>1</sub>	A <sub>2</sub>	E <sub>1</sub>	L <sub>1</sub>	MM	ND <sub>H10</sub>	NX	RR <sub>1</sub>	U <sub>1</sub>
I-12A	125	8	54	46	100	M30 x 1.5	25 <sup>+0.084</sup> <sub>0</sub>	32 <sup>-0.1</sup> <sub>-0.3</sub>	27	33
I-14A	140	8	54	48	105	M30 x 1.5	28 <sup>+0.084</sup> <sub>0</sub>	36 <sup>-0.1</sup> <sub>-0.3</sub>	30	39
I-16A	160	8	60	55	110	M36 x 1.5	32 <sup>+0.1</sup> <sub>0</sub>	40 <sup>-0.1</sup> <sub>-0.3</sub>	34	39

## Knuckle Pin / Clevis Pin

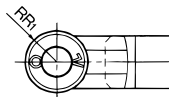
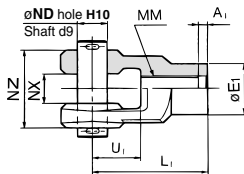


Material: Carbon steel

Part no.	Applicable bore size (mm)	D <sub>d9</sub>	L	ℓ	m	d (Drill through)	Applicable split pin
IY-12	125	25 <sup>-0.065</sup> <sub>-0.117</sub>	79.5	69.5	5	4	ø4 x 40
IY-14	140	28 <sup>-0.065</sup> <sub>-0.117</sub>	86.5	76.5	5	4	ø4 x 40
IY-16	160	32 <sup>-0.080</sup> <sub>-0.142</sub>	94.5	84.5	5	4	ø4 x 40

\* Split pin is included.

## Y Type Double Knuckle Joint\*



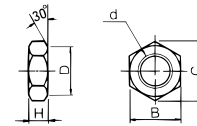
Material: Cast iron

Part no.	Applicable bore size (mm)	A <sub>1</sub>	E <sub>1</sub>	L <sub>1</sub>	MM	ND <sub>H10</sub>	NX	NZ	RR <sub>1</sub>	U <sub>1</sub>
Y-12A	125	8	46	100	M30 x 1.5	25 <sup>+0.084</sup> <sub>0</sub>	32 <sup>+0.3</sup> <sub>+0.1</sub>	64 <sup>-0.1</sup> <sub>-0.3</sub>	27	42
Y-14A	140	8	48	105	M30 x 1.5	28 <sup>+0.084</sup> <sub>0</sub>	36 <sup>+0.3</sup> <sub>+0.1</sub>	72 <sup>-0.1</sup> <sub>-0.3</sub>	30	47
Y-16A	160	8	55	110	M36 x 1.5	32 <sup>+0.1</sup> <sub>0</sub>	40 <sup>+0.3</sup> <sub>+0.1</sub>	80 <sup>-0.1</sup> <sub>-0.3</sub>	34	46

- \* Use a single knuckle joint or a double knuckle joint individually. (Screw it entirely over the rod end threads and tighten it.)
- \* Extend the dimensions of A, H, when using a single/double knuckle joint together with a rod end nut. (To extend dimensions A, H, refer to the below table, and specify the product as made-to-order -XA0.)
- \* A pin and split pin are included with the double knuckled joint.

● "Made to order" with rod end bracket (-XC86) is available when ordering cylinders and accessories together. Please refer to page 29 for details.

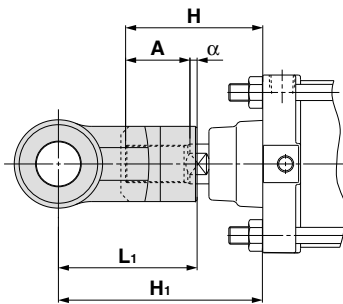
## Rod End Nut



Material: Rolled steel

Part no.	Applicable bore size (mm)	d	H	B	C	D
NT-12	125, 140	M30 x 1.5	18	46	53.1	44
NT-16	160	M36 x 1.5	21	55	63.5	53

## Single/Double Knuckle Joint



Bore size (mm)	Symbol	H	A	α	L <sub>1</sub>	H <sub>1</sub>	Applicable knuckle joint part number	
							I type single knuckle	Y type double knuckle
125		110	50	3.5	100	156.5	I-12A	Y-12A
140		110	50	3.5	105	161.5	I-14A	Y-14A
160		120	56	3.5	110	170.5	I-16A	Y-16A

## A, H Dimensions when Mounting a Single/Double Knuckle Joint together with a Rod End Nut

Bore size (mm)	A	H
125	65	125
140	65	125
160	76	140

# Air Cylinder, Double Rod

## Series CS2W

ø125, ø140, ø160

### How to Order

**CS2W L 125 - 100 -**

**With auto switch CDS2W L 125 - 100 - M9BW -**

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

**Double rod type**

**Mounting**

B	Basic
L	Foot
F	Rod flange
T	Center trunnion

**Bore size**

125	125 mm
140	140 mm
160	160 mm

**Port thread type**

Nil	Rc
TN	NPT
TF	G

**Cylinder stroke (mm)**

Refer to the next page for the "Maximum Stroke" table.

**Made to Order**  
For details, refer to the next page.

**Number of auto switches**

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

**Auto switch**

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

\* Refer to the table below for the applicable auto switch model.

**Suffix for cylinder**

Single side rod boot	J	Nylon tarpaulin
	K	Heat resistant tarpaulin
Both side rod boot	JJ	Nylon tarpaulin
	KK	Heat resistant tarpaulin

### Built-in Magnet Cylinder Model

If a built-in magnet cylinder without auto switch is required, there is no need to enter the symbol for auto switch.

(Example) CDS2WB125-100

### Applicable Auto Switches / For detailed auto switch specifications, refer to Best Pneumatics No. 2.

Type	Special function	Electrical entry	Indicator light	Wiring (Output)	Load voltage		Auto switch model		Lead wire length (m)				Pre-wired connector	Applicable load				
					DC	AC	Tie-rod mounting	Band mounting	0.5 (Nil)	1 (M)	3 (L)	5 (Z)						
Solid state switch		Grommet	No	3-wire (NPN)	24 V	5 V, 12 V	—	M9N	●	●	●	○	—	IC circuit	Relay, PLC			
				3-wire (PNP)				M9P	●	●	●	○						
		2-wire		M9B	●	●	●	○	—									
		—		J51	●	—	●	○										
	Terminal conduit	No	3-wire (NPN)	24 V	5 V, 12 V	—	G39	—	—	—	—	—	—	IC circuit				
			2-wire				K39	—	—	—	—	—	—	—		—		
	Diagnostic indication (2-color indication)	Grommet	Yes	3-wire (NPN)	24 V	5 V, 12 V	—	M9NW	●	●	●	○	○	—		IC circuit		
				3-wire (PNP)				M9PW	●	●	●	○	○	—				
				2-wire				M9BW	●	●	●	○	○	—				
				3-wire (NPN)				M9NA	○	○	●	○	○	—		IC circuit		
Water resistant (2-color indication)	Grommet	No	3-wire (PNP)	24 V	5 V, 12 V	—	M9PA	○	○	●	○	○	—	—				
			2-wire				M9BA	○	○	●	○	○	—	—				
Diagnostic indication (2-color indication)	Grommet	Yes	4-wire (NPN)	24 V	5 V, 12 V	—	F59F	●	—	●	○	○	—	IC circuit				
Reed switch		Grommet	Yes	3-wire (NPN equivalent)	24 V	—	5 V	A96	●	—	●	—	—	—	IC circuit			
								12 V	100 V	A93	—	—	●	—	—	—	—	
								5 V, 12 V	100 V or less	A90	—	—	●	—	●	—	—	IC circuit
								—	100 V, 200 V	A54	—	—	●	—	●	●	—	—
		Terminal conduit	No	2-wire	24 V	12 V	—	—	200 V or less	A64	—	—	●	—	—	—	—	
										—	A33	—	—	—	—	—	—	—
		DIN terminal	Yes	2-wire	24 V	12 V	—	—	100 V, 200 V	A34	—	—	—	—	—	—	—	
										—	A44	—	—	—	—	—	—	—
Diagnostic indication (2-color indication)	Grommet	No	—	—	—	—	—	A59W	—	●	—	●	—	—	—			

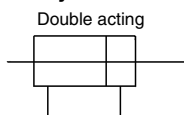
\* Lead wire length symbols: 0.5 m ..... Nil (Example) M9NW  
 1 m ..... M (Example) M9NWM  
 3 m ..... L (Example) M9NWL  
 5 m ..... Z (Example) M9NWZ

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

\* Since there are applicable auto switches other than listed, refer to page 23 for details.  
 \* For details about auto switches with pre-wired connector, refer to Best Pneumatics No. 2.  
 \* D-A9□, M9□, M9□W, M9□AL are shipped together (but not assembled). (Only auto switch mounting bracket is assembled at the time of shipment.)



**JIS Symbol**



**Rod Boot Material**

Symbol	Material	Max. ambient temperature
<b>J</b>	Nylon tarpaulin	158°F
<b>K</b>	Heat resistant tarpaulin	230°F*

\* Maximum ambient temperature for the rod boot itself.

**Minimum Stroke for Auto Switch Mounting**

For details on the minimum number of strokes required for mounting, please refer to the "Minimum Stroke for Auto Switch Mounting" table on page 22.

**Made to Order Specifications**  
(For details, refer to pages 25 to 29.)

Symbol	Specifications
<b>-XA</b> <input type="checkbox"/>	Change of rod end shape
<b>-XC14</b>	Change of trunnion bracket mounting positions
<b>-XC15</b>	Change of tie-rod length
<b>-XC30</b>	Rod side trunnion mounted on the front of the rod cover
<b>-XC68</b>	Made of stainless steel (With hard chrome plated piston rod)

For the specifications of cylinders with auto-switch, please refer to pages 21 to 24.

- Minimum stroke for auto switch mounting
- Auto switch proper mounting position (detection at stroke end) and its mounting height
- Operating range
- Auto switch mounting bracket part no.

**Specifications**

Bore size (mm)	125	140	160
<b>Action</b>	Double acting, Double rod		
<b>Fluid</b>	Air		
<b>Proof pressure</b>	227 psi		
<b>Maximum operating pressure</b>	140 psi		
<b>Minimum operating pressure</b>	7.3 psi		
<b>Piston speed</b>	50 to 500 mm/s		
<b>Cushion</b>	Air cushion		
<b>Ambient and fluid temperature</b>	Without auto switch	32 to 158°F (No freezing)	
	With auto switch	32 to 140°F (No freezing)	
<b>Lubrication</b>	Not required (Non-lube)		
<b>Stroke length tolerance</b>	250 or less <sup>st</sup> : +1.0 / 0, 251 to 1,000 <sup>st</sup> : +1.4 / 0, 1,001 to 1,200 <sup>st</sup> : +1.8 / 0		
<b>Mounting</b>	Basic, Foot, Rod flange, Head flange, Center trunnion		

**Maximum Stroke**

Bore size	Maximum stroke (mm)
<b>125</b>	1000 or less
<b>140</b>	1000 or less
<b>160</b>	1200 or less

**Accessory**

Mounting		Basic	Foot	Rod flange	Center trunnion
Option	Rod end nut	●	●	●	●
	Single knuckle joint	●	●	●	●
	Double knuckle joint (Knuckle pin, Split pin)	●	●	●	●
	Rod boot	●	●	●	●

\* If using the rod end nut together with a single knuckle joint and a double knuckle joint, please refer to page 11.

**Mounting Bracket Part No.**

Bore size (mm)	125	140	160
Foot*	CS2-L12	CS2-L14	CS2-L16
Flange	CS2-F12	CS2-F14	CS2-F16

\* Order two foot brackets per cylinder.

**Weight / Aluminum tube: lube type**

Bore size (mm)		125	140	160
Basic weight	Basic	6.36	7.54	9.93
	Foot	8.39	10.54	13.31
	Rod flange	9.41	13.07	16.66
	Trunnion	10.49	13.27	16.33
Additional weight with magnet (With built-in magnet and auto switch)		0.07	0.07	0.08
Additional weight per 100 mm of stroke		2.18	2.30	3.11
Accessory bracket	Single knuckle	0.91	1.16	1.56
	Double knuckle joint (Knuckle pin, Split pin)	1.37	1.81	2.48
	Rod end nut	0.16	0.16	0.23

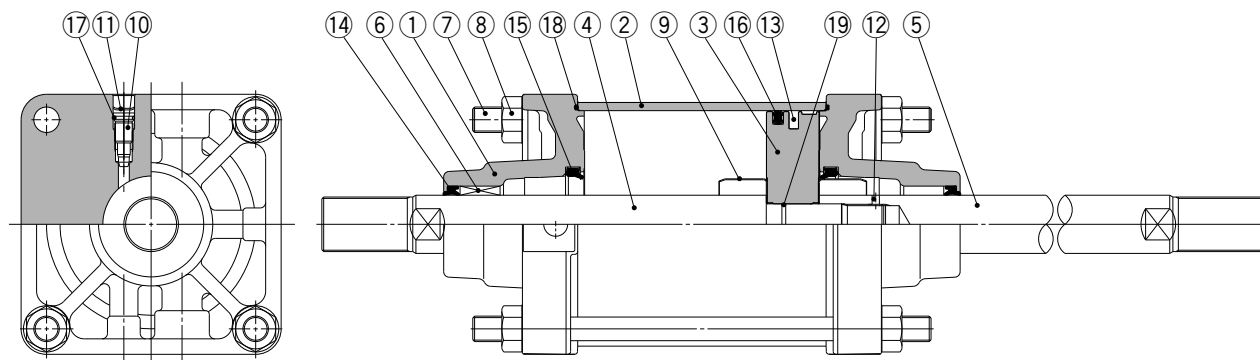
Calculation: (Example) **CS2WL160-500**

- Basic weight ..... 13.31 (kg)
  - Additional weight ..... 3.11 (kg/100 mm)
  - Cylinder stroke ..... 500 (mm)
- 13.31 + 3.11 x 500/100 = 28.86 (kg)

Basic  
Double Rod Type  
Smooth Cylinder  
Auto Switch  
Made to Order

# Series CS2W

## Construction



### Component Parts

No.	Description	Material	Note
1	Rod cover	Aluminum die-cast	Chromated
2	Cylinder tube	Aluminum alloy	Hard anodized
3	Piston	Aluminum alloy	Chromated
4	Piston rod A	Carbon steel	Hard chrome plated
5	Piston rod B	Carbon steel	Hard chrome plated
6	Bushing	Oil-impregnated sintered alloy	
7	Tie-rod	Carbon steel	Zinc chromated
8	Tie-rod nut	Rolled steel	Nickel plated
9	Cushion ring	Stainless steel	
10	Cushion valve	Rolled steel	Nickel plated
11	Retaining ring	Spring steel	Phosphate coated
12	Pin	Spring steel	Phosphate coated
13	Magnet*	—	

\* Built-in magnet type with auto switch

### Component Parts

No.	Description	Material	Note
14	Rod seal	NBR	
15	Cushion seal	Urethane	
16	Piston seal	NBR	
17	Valve seal	NBR	
18	Tube gasket	NBR	
19	Piston gasket	NBR	

### Replacement Parts: Seal Kit

Bore size (mm)	Kit no.	Content
125	CS2W125A-PS	Set of nos. above 14, 15, 16, 18.
140	CS2W140A-PS	
160	CS2W160A-PS	

\* Seal kit includes a grease pack (40 g).

Order with the following part number when only the grease pack is needed.

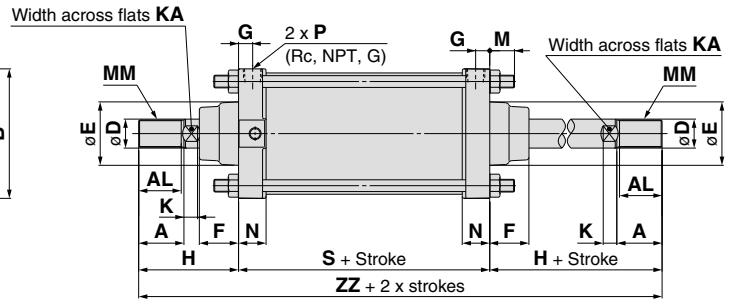
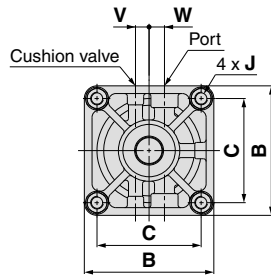
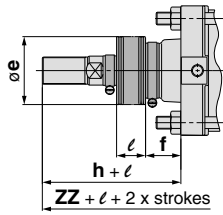
**Grease pack part number: GR-S-010 (10 g), GR-S-020 (20 g)**



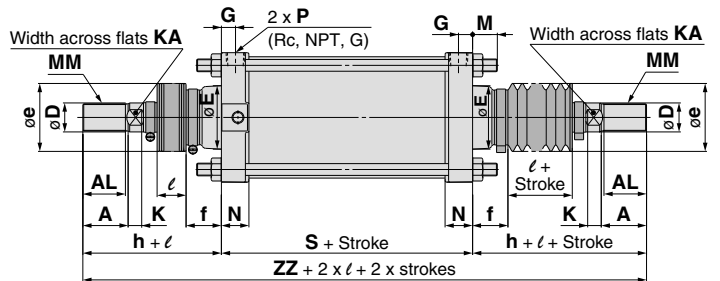
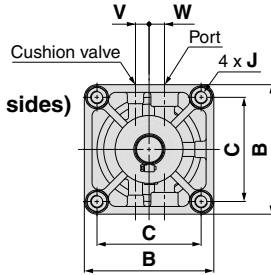
**Dimensions**

**Basic: CS2WB**

With rod boot (One side)



With rod boot (Both sides)



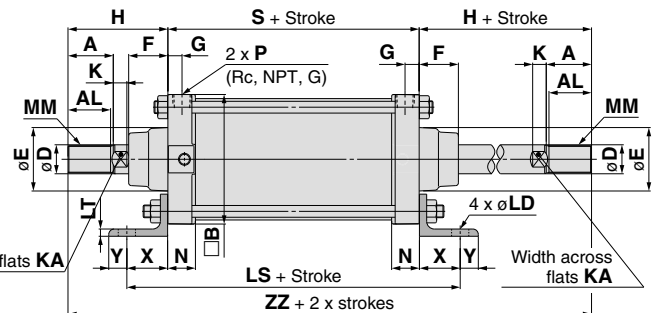
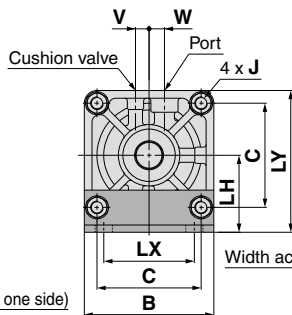
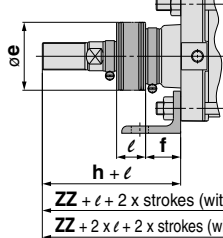
Bore size (mm)	Stroke range (mm)	A	AL	B	C	D	E	F	G	J	V	W	K	KA	M	MM	N	P	S
ø125	Up to 1000	50	47	143	115	32	71	43	15	M14 x 1.5	15	17	15	27	27	M30 x 1.5	30.5	1/2	98
ø140	Up to 1000	50	47	157	128	32	71	43	15	M14 x 1.5	15	17	15	27	27	M30 x 1.5	30.5	1/2	98
ø160	Up to 1200	56	53	177	144	38	78.5	42	18	M16 x 1.5	15	20	17	34	30.5	M36 x 1.5	34.5	3/4	106

Bore size (mm)	Without rod boot		With rod boot (single side)					With rod boot (Both sides)	
	H	ZZ	e	f	h	l	ZZ	ZZ	
ø125	110	318	75	40	133	1/2 stroke	341	364	
ø140	110	318	75	40	133	1/2 stroke	341	364	
ø160	120	346	75	40	141	1/2 stroke	367	388	

\* The minimum stroke with rod boot is 30 mm or more.  
 \*\* For auto switch mounting position and its mounting height, refer to page 21.  
 \*\*\* Refer to "Minimum Stroke for Auto Switch Mounting" on page 22.

**Foot: CS2WL**

With rod boot



Bore size (mm)	Stroke range (mm)	A	AL	B	B	C	D	E	F	G	J	V	W	K	KA	LD	LH	LS	LT	LX	LY
ø125	Up to 1000	50	47	143	143	115	32	71	43	15	M14 x 1.5	15	17	15	27	19	85	188	8	100	156.5
ø140	Up to 1000	50	47	157	157	128	32	71	43	15	M14 x 1.5	15	17	15	27	19	100	188	9	112	178.5
ø160	Up to 1200	56	53	177	177	144	38	78.5	42	18	M16 x 1.5	15	20	17	34	19	106	206	9	118	194.5

Bore size (mm)	MM	N	P	S	X	Y	Without rod boot		With rod boot (Single side)					With rod boot (Both sides)	
							H	ZZ	e	f	h	l	ZZ	ZZ	
ø125	M30 x 1.5	30.5	1/2	98	45	20	110	318	75	40	133	1/2 stroke	341	364	
ø140	M30 x 1.5	30.5	1/2	98	45	30	110	318	75	40	133	1/2 stroke	341	364	
ø160	M36 x 1.5	34.5	3/4	106	50	25	120	346	75	40	141	1/2 stroke	367	388	

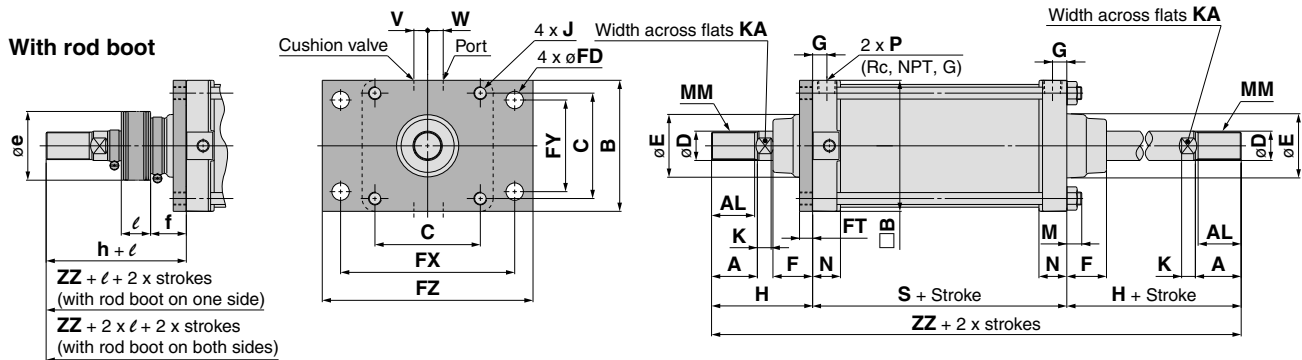
\* The minimum stroke with rod boot is 30 mm or more.  
 \*\* For auto switch mounting position and its mounting height, refer to page 21.  
 \*\*\* Refer to "Minimum Stroke for Auto Switch Mounting" on page 22.

Basic  
 Double Rod Type  
 Smooth Cylinder  
 Auto Switch  
 Made to Order

# Series CS2W

## Dimensions

### Rod flange: CS2WF

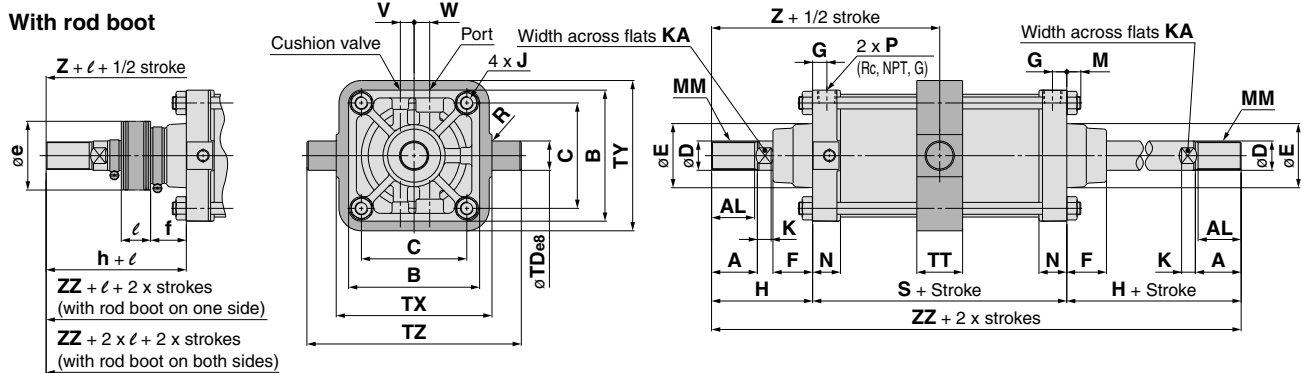


Bore size (mm)	Stroke range (mm)	A	AL	B	C	D	E	F	FD	FT	FX	FY	FZ	G	J	V	W	K	KA	M	
ø125	Up to 1000	50	47	143	145	115	32	71	43	19	14	190	100	230	15	M14 x 1.5	15	17	15	27	13
ø140	Up to 1000	50	47	157	160	128	32	71	43	19	20	212	112	255	15	M14 x 1.5	15	17	15	27	13
ø160	Up to 1200	56	53	177	180	144	38	78.5	42	19	20	236	118	275	18	M16 x 1.5	15	20	17	34	15

Bore size (mm)	MM	N	P	S	Without rod boot		With rod boot (Single side)					Both sides	
					H	ZZ	e	f	h	l	ZZ	ZZ	
ø125	M30 x 1.5	30.5	1/2	98	110	318	75	40	133	1/5 stroke	341	364	
ø140	M30 x 1.5	30.5	1/2	98	110	318	75	40	133	1/5 stroke	341	364	
ø160	M36 x 1.5	34.5	3/4	106	120	346	75	40	141	1/5 stroke	367	388	

\* The minimum stroke with rod boot is 30 mm or more.  
 \*\* For auto switch mounting position and its mounting height, refer to page 21.  
 \*\*\* Refer to "Minimum Stroke for Auto Switch Mounting" on page 22.

### Center trunnion: CS2WT



Bore size (mm)	Stroke range (mm)	A	AL	B	C	D	E	F	G	J	V	W	K	KA	M	MM	N	P	R	S
ø125	25 to 1000	50	47	143	115	32	71	43	15	M14 x 1.5	15	17	15	27	13	M30 x 1.5	30.5	1/2	1	98
ø140	30 to 1000	50	47	157	128	32	71	43	15	M14 x 1.5	15	17	15	27	13	M30 x 1.5	30.5	1/2	1.5	98
ø160	35 to 1200	56	53	177	144	38	78.5	42	18	M16 x 1.5	15	20	17	34	15	M36 x 1.5	34.5	3/4	1.5	106

Bore size (mm)	TDø8	TT	TX	TY	TZ	Without rod boot		With rod boot (Single side)					Both sides		
						H	Z	ZZ	e	f	h	l	Z	ZZ	ZZ
ø125	32 <sup>-0.050</sup> <sub>-0.089</sub>	50	170	164	234	110	159	318	75	40	133	1/5 stroke	182	341	364
ø140	36 <sup>-0.050</sup> <sub>-0.089</sub>	55	190	184	262	110	159	318	75	40	133	1/5 stroke	182	341	364
ø160	40 <sup>-0.050</sup> <sub>-0.089</sub>	60	212	204	292	120	173	346	75	40	141	1/5 stroke	194	367	388

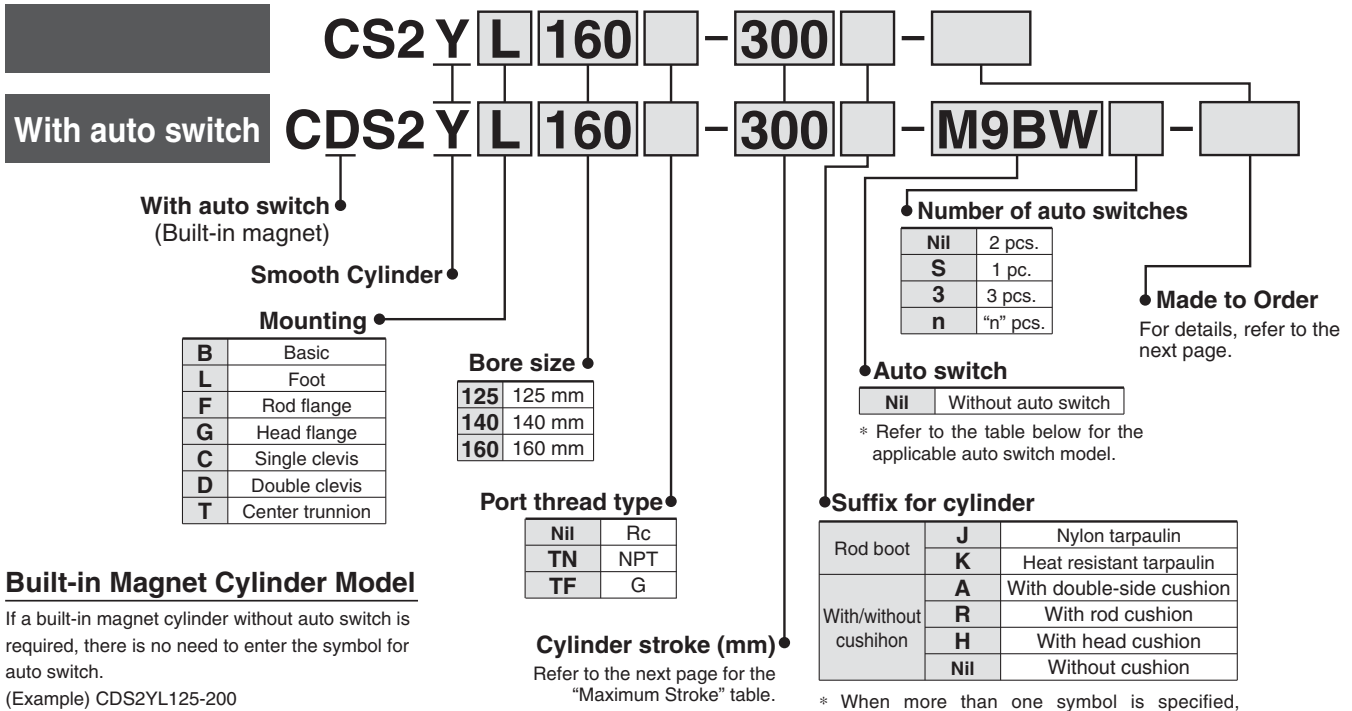
\* The minimum stroke with rod boot is 30 mm or more for ø125, ø140, and 35 mm or more for ø160.  
 \*\* For auto switch mounting position and its mounting height, refer to page 21.  
 \*\*\* Refer to "Minimum Stroke for Auto Switch Mounting" on page 22.

# Smooth Cylinder

## Series CS2Y

ø125, ø140, ø160

### How to Order



### Built-in Magnet Cylinder Model

If a built-in magnet cylinder without auto switch is required, there is no need to enter the symbol for auto switch.

(Example) CDS2YL125-200

### Applicable Auto Switches / For detailed auto switch specifications, refer to Best Pneumatics No. 2.

Type	Special function	Electrical entry	Indicator light	Wiring (Output)	Load voltage		Auto switch model		Lead wire length (m)				Pre-wired connector	Applicable load			
					DC	AC	Tie-rod mounting	Band mounting	0.5 (Nil)	1 (M)	3 (L)	5 (Z)					
Solid state switch	—	Grommet	—	3-wire (NPN)	24 V	5 V, 12 V	—	M9N	●	●	●	○	○	IC circuit			
				3-wire (PNP)				M9P	●	●	●	○	○				
				2-wire				M9B	●	●	●	○	○				
		Terminal conduit		3-wire (NPN)	24 V	5 V, 12 V	—	100 V, 200 V	—	G39	—	—	—		—	—	IC circuit
				2-wire					—	K39	—	—	—		—	—	
				3-wire (NPN)					M9NW	●	●	●	○		○	IC circuit	
	Diagnostic indication (2-color indication)	Grommet	3-wire (PNP)	24 V	5 V, 12 V	—	M9PW	●	●	●	○	○	IC circuit				
			2-wire				M9BW	●	●	●	○	○					
		Water resistant (2-color indication)	Grommet	3-wire (NPN)	24 V	5 V, 12 V	—	M9NA	○	○	●	○	○	IC circuit			
				3-wire (PNP)				M9PA	○	○	●	○	○				
Diagnostic indication (2-color indication)	Grommet	2-wire	24 V	12 V	—	M9BA	○	○	●	○	○	—					
		4-wire (NPN)				F59F	●	—	●	○	○		IC circuit				
Reed switch	—	Grommet	Yes (3-wire (NPN) equivalent)	2-wire	24 V	5 V, 12 V	100 V	A96	●	—	●	—	—	IC circuit	Relay, PLC		
								A93	●	—	●	—	—				
								A90	●	—	●	—	—				
								A54	●	—	●	●	—				
								A64	●	—	●	—	—				
								A33	—	—	—	—	—				
		Terminal conduit		Yes	2-wire	24 V	12 V	—	100 V, 200 V	—	A33	—	—	—	—	—	PLC
										—	A34	—	—	—	—	—	
										—	A44	—	—	—	—	—	
										—	A59W	●	—	●	—	—	Relay, PLC
Diagnostic indication (2-color indication)	Grommet	Yes	2-wire	24 V	—	—	—	A59W	●	—	●	—	—	Relay, PLC			

\* Lead wire length symbols: 0.5 m ..... Nil (Example) M9NW  
 1 m ..... M (Example) M9NWM  
 3 m ..... L (Example) M9NWL  
 5 m ..... Z (Example) M9NWX

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

\* Since there are applicable auto switches other than listed, refer to page 23 for details.

\* For details about auto switches with pre-wired connector, refer to Best Pneumatics No. 2.

\* D-A9□, M9□, M9□W, M9□AL are shipped together (but not assembled). (Only auto switch mounting bracket is assembled at the time of shipment.)

# Series CS2Y

Designed with a low sliding resistance of the piston, this air cylinder is ideal for applications such as contact pressure control, which requires smooth movements at low pressure.

## Low sliding resistance

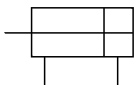
Min. operating pressure — 0.8 psi

## Auto switch mounting is possible



### JIS Symbol

Double acting



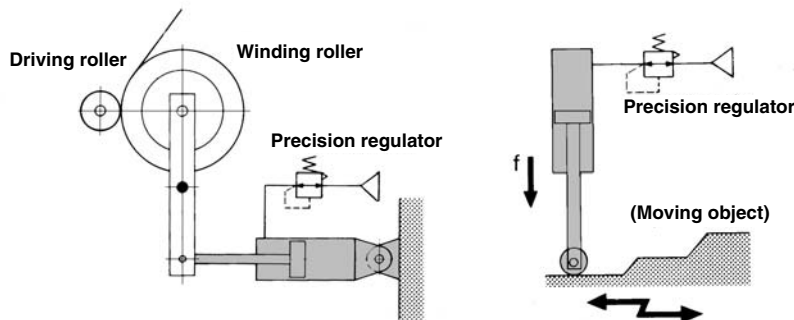
**Made to Order specifications**  
(For details, refer to pages 25 to 29.)

Symbol	Specifications
-XA□	Change of rod end shape
-XC3	Special port position
-XC14	Change of trunnion bracket mounting position
-XC15	Change of tie-rod length
-XC26	Double clevis pin/Double knuckle pin with split pin and flat washer
-XC27	Double clevis pin and double knuckle pin made of stainless steel
-XC30	Rod side trunnion mounted on the front of the rod cover
-XC68	Made of stainless steel (With hard chrome plated piston rod)
-XC86	With rod end bracket

For the specifications of cylinders with auto-switch, please refer to pages 21 to 24.	
•	Minimum stroke for auto switch mounting
•	Auto switch proper mounting position (detection at stroke end) and its mounting height
•	Operating range
•	Auto switch mounting bracket part no.

## Application Example

Low friction cylinder is used in combination with precision regulator (Series IR).



## Specifications

Bore size (mm)	125	140	160
<b>Action</b>	Double acting, Single rod		
<b>Direction of low friction</b>	Both directions		
<b>Fluid</b>	Air		
<b>Proof pressure</b>	152 psi		
<b>Maximum operating pressure</b>	102 psi		
<b>Minimum operating pressure</b>	0.8 psi*		
<b>Ambient and fluid temperature</b>	Without auto switch	32 to 158°F (No freezing)	
	With auto switch	32 to 140°F (No freezing)	
<b>Allowable leakage</b>	Less than 0.5 ℓ/min (ANR)		
<b>Cushion</b>	Without cushion** (manufacturable with cushion)		
<b>Lubrication</b>	Not required (Non-lube)		
<b>Mounting</b>	Basic, Foot, Rod flange, Head flange, Single clevis, Double clevis, Center trunnion		

\* If a cushion is used, this value will not include the operating pressure within the cushion stroke.  
\* If an air cushion is not used, set the energy at the stroke end to 0.36J or less.

## Maximum Stroke

Tube material	Aluminum alloy	Carbon steel tube (mm)	
		Basic, Head flange, Single clevis, Double clevis, Center trunnion, Rod flange	Foot, Rod flange
<b>125</b>	1000 or less	1000 or less	1600 or less
<b>140</b>	1000 or less	1000 or less	1600 or less
<b>160</b>	1200 or less	1200 or less	1600 or less

## Accessory

Mounting		Basic	Foot	Rod flange	Head flange	Single clevis	Double clevis	Center trunnion
Standard equipment	Clevis pin	—	—	—	—	—	●	—
	Rod end nut	●	●	●	●	●	●	●
Option	Single knuckle joint	●	●	●	●	●	●	●
	Double knuckle joint (Knuckle pin, Split pin)	●	●	●	●	●	●	●
	Rod boot	●	●	●	●	●	●	●

### Mounting Bracket Part No.

Bore size (mm)	125	140	160
Foot*	CS2-L12	CS2-L14	CS2-L16
Flange	CS2-F12	CS2-F14	CS2-F16
Single clevis	CS2-C12	CS2-C14	CS2-C16
Double clevis**	CS2-D12	CS2-D14	CS2-D16

\* Order two foot brackets per cylinder.  
 \*\* When ordering the double clevis style, the clevis pin and 2 split pins are included as accessories.

### Rod Boot Material

Symbol	Material	Max. ambient temperature
J	Nylon tarpaulin	158°F
K	Heat resistant tarpaulin	230°F*

\* Maximum ambient temperature for the rod boot itself.

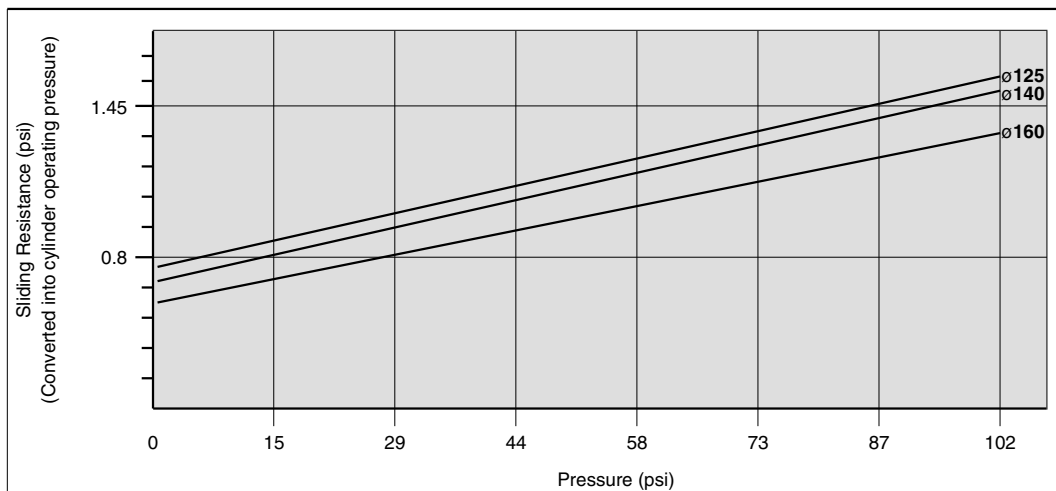
### Weight

Bore size (mm)		125	140	160
Basic weight	Basic	5.46	6.50	9.07
	Foot	7.49	9.50	12.45
	Rod flange	8.51	12.03	15.80
	Head flange	8.51	12.03	15.80
	Single clevis	8.53	10.79	14.56
	Double clevis	8.99	11.54	15.41
	Trunnion	9.59	12.23	15.47
Additional weight with magnet (With built-in magnet and auto switch)		0.07	0.07	0.08
Additional weight per each 100 mm of stroke		1.55	1.67	2.23
Accessory bracket	Single knuckle	0.91	1.16	1.56
	Double knuckle (With Knuckle pin, Split pin)	1.37	1.81	2.48
	Rod end nut	0.16	0.16	0.23

Calculation: (Example) **CS2Y160-500**

- Basic weight ..... 12.45 (kg)
- Additional weight ..... 2.23 (kg/100 mm)
- Cylinder stroke ..... 500 (mm)
- $12.45 + 2.23 \times 500/100 = 23.60$  (kg)

### Sliding Resistance



Basic

Double Rod Type

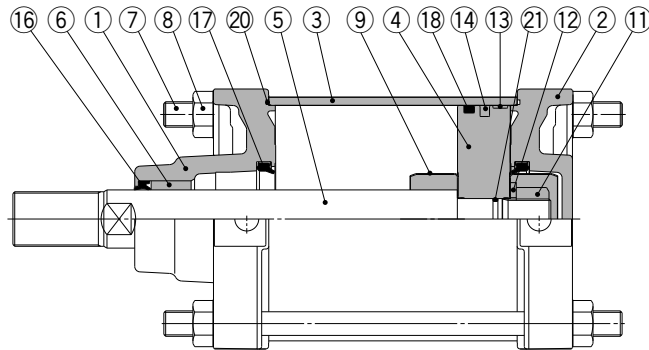
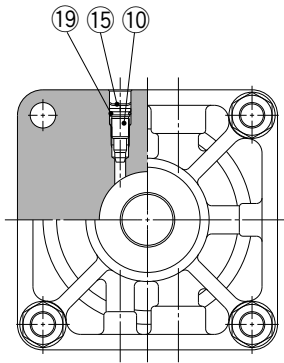
Smooth Cylinder

Auto Switch

Made to Order

# Series CS2Y

## Construction



### Component Parts

No.	Description	Material	Note
1	Rod cover	Aluminum die-cast	Chromated
2	Head cover	Aluminum die-cast	Chromated
3	Cylinder tube	Aluminum alloy	Hard anodized
4	Piston	Aluminum alloy	Chromated
5	Piston rod	Carbon steel	Hard chrome plated
6	Bushing	Oil-impregnated sintered alloy	
7	Tie-rod	Carbon steel	Zinc chromated
8	Tie-rod nut	Rolled steel	Nickel plated
9	Cushion ring	Stainless steel	
10	Cushion valve	Rolled steel	Nickel plated
11	Piston nut	Carbon steel	Nickel plated
12	Flat washer	Carbon steel	Nickel plated
13	Wear ring	Resin	
14	Magnet*	—	
15	Retaining ring	Spring steel	Phosphate coded.
16	Rod seal	NBR	
17	Cushion seal**	Urethane	
18	Piston seal	NBR	
19	Valve seal	NBR	
20	Tube gasket	NBR	
21	Piston gasket	NBR	

\* For types with built-in magnet or with auto switch.  
 \*\* Used with cushion only.

### Replacement Parts: Seal kit.

Bore size (mm)	Kit no.	Content
125	CS2Y125A-PS	Without cushion
140	CS2Y140A-PS	Consists of Component Part
160	CS2Y160A-PS	Numbers 16, 18, and 20
125	CS2Y125AA-PS	With single-side cushion
140	CS2Y140AA-PS	Consists of Component Part
160	CS2Y160AA-PS	Numbers 16, 17 (two), 18, and 20
125	CS2Y125AR-PS	With single-side cushion
140	CS2Y140AR-PS	Consists of Component Part
160	CS2Y160AR-PS	Numbers 16, 17 (one), 18 and 20.

\* Seal kit does not include a grease pack.  
 Order with the following part number when only the grease pack is needed.  
**Grease pack part number: GR-L-005 (5 g), GR-S-010 (10 g), GR-L-150 (150g)**

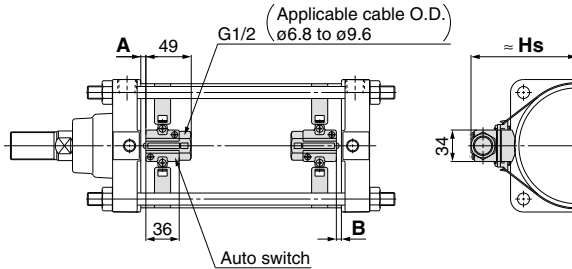
### Dimensions

External dimensions are the same as the CS2 standard type. Refer to pages 7 to 10.

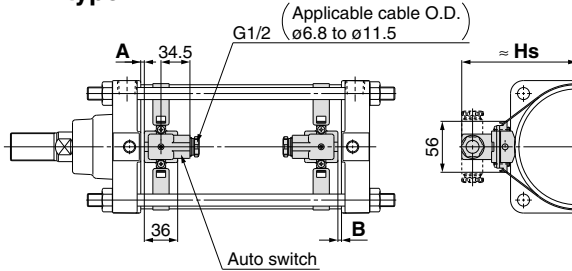
**Auto Switch Proper Mounting Position (Detection at stroke end) and Its Mounting Height**

<Band mounting>

D-A3□ type  
D-G3/K3 type



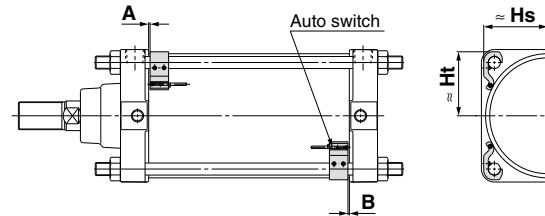
D-A44 type



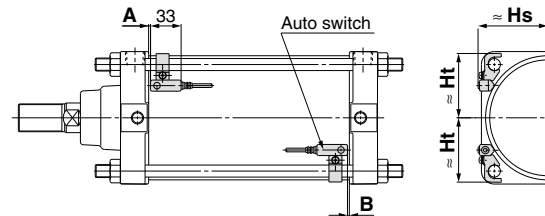
\* The indicator light faces the inside.

<Tie-rod mounting>

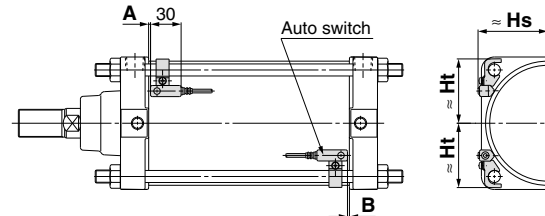
D-A9□/A9□V type      D-Z7□/Z80 type  
D-M9□/M9□V type      D-Y59□/Y69□/Y7P/Y7PV type  
D-M9□W/M9□WV type      D-Y7□W/Y7□WV type  
D-M9□AL/M9□AVL type      D-Y7BAL type



D-A5□/A6□ type



D-F5□/J5□/D-F5NTL type  
D-F5BAL/F59F type  
D-F5□W/J59W type



**Auto Switch Proper Mounting Position**

(mm)

Auto switch model	D-A9□ D-A9□V		D-M9□ D-M9□V D-M9□W D-M9□WV D-M9□AL D-M9□AVL		D-Z7□/Z80 D-Y5□/Y6□ D-Y7P/Y7PV D-Y7□W D-Y7□WV D-Y7BAL		D-A5□ D-A6□ D-A3□ D-A44 D-G39 D-K39		D-A59W		D-F5□W D-J59W D-F5BAL D-F5□ D-J5□ D-F59F		D-F5NTL	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Bore size 125	9	8	13	12	6.5	5.5	3	2	7	6	9.5	8.5	14.5	13.5
140	9	8	13	12	6.5	5.5	3	2	7	6	9.5	8.5	14.5	13.5
160	9	8	13	12	6.5	5.5	3	2	7	6	9.5	8.5	14.5	13.5

\* Provided as guidelines for auto switch proper mounting position (detection at stroke end). When setting an auto switch, confirm the operation and adjust its mounting position.

**Auto Switch Mounting Height**

(mm)

Auto switch model	D-A9□ D-A9□V D-M9□ D-M9□W D-M9□AL		D-M9□V D-M9□WV D-M9□AVL		D-Z7□/Z80 D-Y5□/Y6□ D-Y7P D-Y7PV D-Y7□W D-Y7□WV D-Y7BAL		D-A3□ D-G39 D-K39	D-A44	D-A5□ D-A6□ D-A59W		D-F5□ D-J5□ D-F5□W D-J59W D-F5BAL D-F59F D-F5NTL	
	Hs	Ht	Hs	Ht	Hs	Ht	Hs	Hs	Hs	Ht	Hs	Ht
Bore size 125	69	69.5	71.5	69.5	69	69.5	116	126	75.5	69.5	74.5	70
140	76	76	77.5	76	76	76	124	134	81	76.5	80	76.5
160	85	85	86	85	85	85	134.5	144.5	89	87.5	88	87.5

## Minimum Stroke for Auto Switch Mounting

n: Number of auto switches (mm)

Auto switch model	Number of auto switches mounted	Mounting brackets other than center trunnion	Center trunnion		
			ø125	ø140	ø160
<b>D-A9□</b>	With 2 pcs. (Different surfaces, Same surface), With 1 pc.	15	100	105	110
	With n pcs.	$15 + 40 \frac{(n-2)}{2}$ (n = 2, 4, 6, 8...)	$100 + 40 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$105 + 40 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$110 + 40 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)
<b>D-A9□V</b>	With 2 pcs. (Different surfaces, Same surface), With 1 pc.	10	75	80	85
	With n pcs.	$10 + 30 \frac{(n-2)}{2}$ (n = 2, 4, 6, 8...)	$75 + 30 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$80 + 30 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$85 + 30 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)
<b>D-M9□</b> <b>D-M9□W</b>	With 2 pcs. (Different surfaces, Same surface), With 1 pc.	15	105	110	115
	With n pcs.	$15 + 40 \frac{(n-2)}{2}$ (n = 2, 4, 6, 8...)	$105 + 40 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$110 + 40 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$115 + 40 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)
<b>D-M9□V</b> <b>D-M9□WV</b>	With 2 pcs. (Different surfaces, Same surface), With 1 pc.	10	80	85	90
	With n pcs.	$10 + 30 \frac{(n-2)}{2}$ (n = 2, 4, 6, 8...)	$80 + 30 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$85 + 30 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$90 + 30 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)
<b>D-M9□AL</b>	With 2 pcs. (Different surfaces, Same surface), With 1 pc.	20	115	120	
	With n pcs.	$20 + 40 \frac{(n-2)}{2}$ (n = 2, 4, 6, 8...)	$115 + 40 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$120 + 40 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	
<b>D-M9□AVL</b>	With 2 pcs. (Different surfaces, Same surface), With 1 pc.	15	90	95	
	With n pcs.	$15 + 30 \frac{(n-2)}{2}$ (n = 2, 4, 6, 8...)	$90 + 30 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$95 + 30 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	
<b>D-A5□/A6□</b> <b>D-A59W</b> <b>D-F5□/J5□</b> <b>D-F5□W</b> <b>D-J59W</b> <b>D-F5BAL</b> <b>D-F59F</b>	With 2 pcs. (Different surfaces, Same surface), With 1 pc.	25	125	135	
	With n pcs. (Same surface)	$25 + 55 \frac{(n-2)}{2}$ (n = 2, 4, 6, 8...)	$125 + 55 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$135 + 55 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	
<b>D-F5NTL</b>	With 2 pcs. (Different surfaces, Same surface), With 1 pc.	35	145	155	
	With n pcs. (Same surface)	$35 + 55 \frac{(n-2)}{2}$ (n = 2, 4, 6, 8...)	$145 + 55 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$155 + 55 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	
<b>D-A3□</b> <b>D-G39</b> <b>D-K39</b>	With 2 pcs.	Different surfaces	35	110	
		Same surface	100	110	
	With n pcs.	Different surfaces	$35 + 30(n-2)$	$110 + 30(n-2)$ (n = 2, 4, 6, 8...)	
		Same surface	$100 + 100(n-2)$	$110 + 100(n-2)$ (n = 2, 4, 6, 8...)	
With 1 pc.	15	110			
<b>D-A44</b>	With 2 pcs.	Different surfaces	35	110	
		Same surface	55	110	
	With n pcs.	Different surfaces	$35 + 30(n-2)$	$110 + 30(n-2)$ (n = 2, 4, 6, 8...)	
		Same surface	$55 + 55(n-2)$	$110 + 50(n-2)$ (n = 2, 4, 6, 8...)	
With 1 pc.	15	110			
<b>D-Z7□</b> <b>D-Z80</b> <b>D-Y59□</b> <b>D-Y7P</b> <b>D-Y7□W</b>	With 2 pcs. (Different surfaces, Same surface), With 1 pc.	15	105	110	115
	With n pcs.	$15 + 40 \frac{(n-2)}{2}$ (n = 2, 4, 6, 8...)	$105 + 40 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$110 + 40 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$115 + 40 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)
<b>D-Y69□</b> <b>D-Y7PV</b> <b>D-Y7□WV</b>	With 2 pcs. (Different surfaces, Same surface), With 1 pc.	10	90	95	100
	With n pcs.	$10 + 30 \frac{(n-2)}{2}$ (n = 2, 4, 6, 8...)	$90 + 30 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$95 + 30 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$100 + 30 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)
<b>D-Y7BAL</b>	With 2 pcs. (Different surfaces, Same surface), With 1 pc.	20	115	120	125
	With n pcs.	$20 + 45 \frac{(n-2)}{2}$ (n = 2, 4, 6, 8...)	$115 + 45 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$120 + 45 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)	$125 + 45 \frac{(n-4)}{2}$ (n = 4, 8, 12, 16...)



### Operating Range

(mm)

Auto switch model	Bore size		
	125	140	160
D-A9□/A9□V	12	12.5	11.5
D-M9□/M9□V D-M9□W/M9□WV D-M9□AL/M9□AVL	6	6.5	6.5
D-Z7□/Z80	14	14.5	13
D-A3□/A44 D-A5□/A6□	10	10	10
D-A59W	17	17	17
D-Y59□/Y69□ D-Y7P/Y7PV D-Y7□W/Y7□WV D-Y7BAL	12	13	7
D-F5□/J5□/F5□W D-J59W/F5BAL D-F5NTL/F59F	5	5	5.5
D-G39/K39	11	11	10

\* Since this is a guideline including hysteresis, not meant to be guaranteed.  
(Assuming approximately ±30% dispersion.)  
There may be the case it will vary substantially depending on an ambient environment.

### Auto Switch Mounting Bracket Part No.

Auto switch model	Bore size (mm)		
	ø125	ø140	ø160
D-A9□/A9□V D-M9□/M9□V D-M9□W/M9□WV D-M9□AL/M9□AVL	BS5-125	BS5-125	BS5-160
D-A5□/A6□ D-A59W D-F5□/J5□ D-F5NTL D-F5□W/J59W D-F5BAL/F59F	BT-12	BT-12	BT-16
D-A3□/A44 D-G39/K39	BS1-125	BS1-140	BS1-160
D-Z7□/Z80 D-Y59□/Y69□ D-Y7P/Y7PV D-Y7□W/Y7□WV D-Y7BAL	BS4-125	BS4-125	BS4-160

#### [Mounting screws set made of stainless steel]

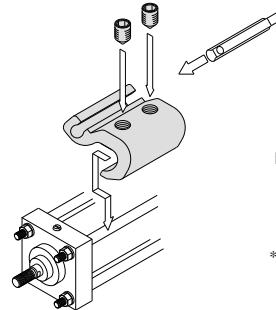
The following set of mounting screws made of stainless steel (including set screws) is also available. Use it in accordance with the operating environment. (Please order the auto switch mounting bracket separately, since it is not included.)

BBA1: For D-A5, A6, F5, J5 type

"D-F5BAL" auto switch is set on the cylinder with the stainless steel screws above when shipped.

When only an auto switch is shipped independently, "BBA1" screws are attached.

Note) When using the D-M9□AL/M9□AVL or Y7BAL model, do not use the steel set screw which is included with the auto switch mounting bracket in the above table (BS5-□□□, BS4-□□□). Please separately prepare the stainless steel screw set (BBA1), and select and use the M4 x 8L stainless steel set screw included in BBA1.



Note 1) Refer to Best Pneumatics No. 2 for the details of BBA1 screws.

\* Shows an example of mounting the D-A9□(V), M9□(V), M9□W(V), M9□A(V)L model.

Other than the applicable auto switches listed in "How to Order", the following auto switches can be mounted. For detailed specifications, refer to Best Pneumatics No. 2.

Type	Model	Electrical entry (Direction)	Features
Reed auto switch	D-A90V	Grommet (Perpendicular)	Without indicator light
	D-A93V, A96V		—
	D-Z73, Z76	Grommet (in-line)	Without indicator light
	D-A53, A56		—
	D-A67		Without indicator light
	D-Z80		—
Solid state auto switch	D-F59, F5P, J59	Grommet (in-line)	—
	D-Y59A, Y59B, Y7P		2-color indication
	D-F59W, F5PW, J59W		Water resistant (2-color indication)
	D-Y7NW, Y7PW, Y7BW		With timer
	D-F5BAL, Y7BAL		—
	D-F5NTL	Grommet (Perpendicular)	—
	D-M9NV, M9PV, M9BV		2-color indication
	D-Y69A, Y69B, Y7PV		Water resistant (2-color indication)
	D-M9NWV, M9PWV, M9BWV		—
	D-Y7NWV, Y7PWV, Y7BWV		Water resistant (2-color indication)
D-M9NAVL, M9PAVL, M9BAVL	—		

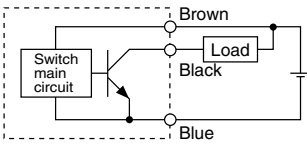
\* With pre-wired connector is available for solid state auto switches. For details, refer to Best Pneumatics No. 2.

\* Normally closed (NC = b contact), solid state switches (D-F9G, F9H, Y7G, Y7H type) are also available. For details, refer to Best Pneumatics No. 2.

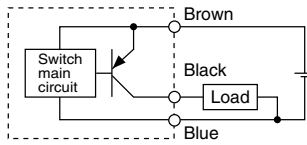
# Auto Switch Connections and Examples

## Basic Wiring

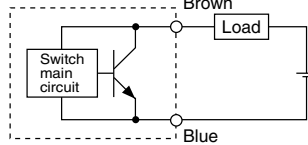
### Solid state 3-wire, NPN



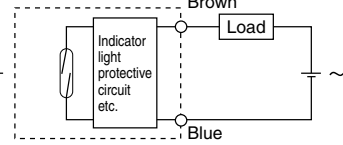
### Solid state 3-wire, PNP



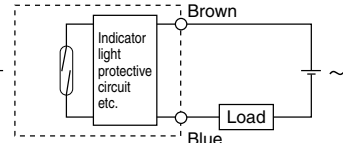
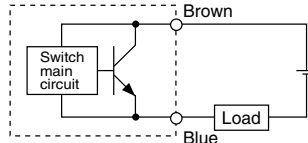
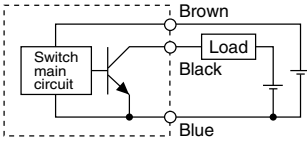
### 2-wire (Solid state)



### 2-wire (Reed)

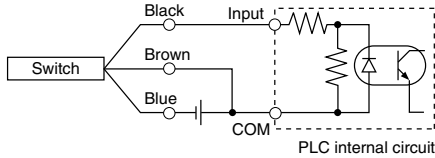


(Power supplies for switch and load are separate.)

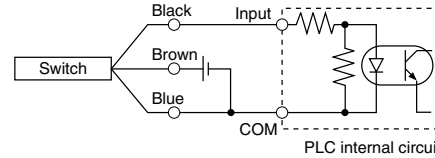


## Example of Connection to PLC (Programmable Logic Controller)

### • Sink input specification 3-wire, NPN

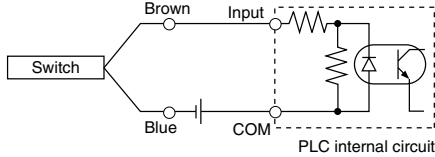


### • Source input specification 3-wire, PNP

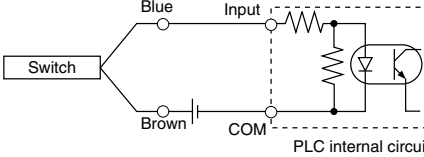


Connect according to the applicable PLC input specifications, since the connection method will vary depending on the PLC input specifications.

### 2-wire



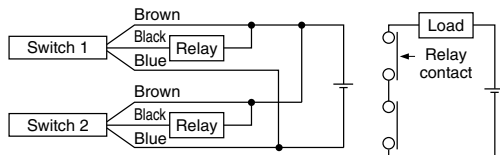
### 2-wire



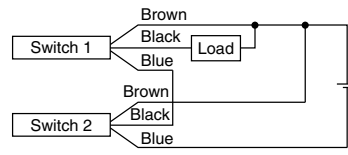
## Example of AND (Serial) and OR (Parallel) Connection

### • 3-wire

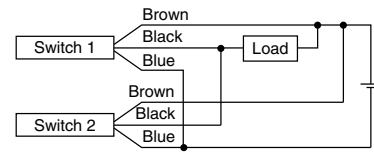
#### AND connection for NPN output (using relays)



#### AND connection for NPN output (performed with switches only)

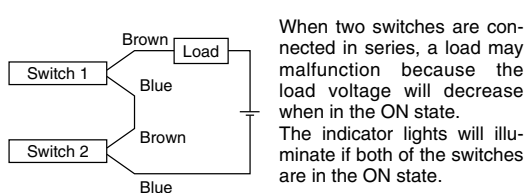


#### OR connection for NPN output



The indicator lights will illuminate when both switches are turned ON.

#### 2-wire with 2-switch AND connection

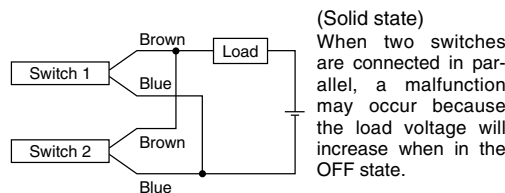


When two switches are connected in series, a load may malfunction because the load voltage will decrease when in the ON state. The indicator lights will illuminate if both of the switches are in the ON state.

$$\begin{aligned} \text{Load voltage at ON} &= \text{Power supply voltage} - \text{Residual voltage} \times 2 \text{ pcs.} \\ &= 24 \text{ V} - 4 \text{ V} \times 2 \text{ pcs.} \\ &= 16 \text{ V} \end{aligned}$$

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

#### 2-wire with 2-switch OR connection



(Solid state)

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

$$\begin{aligned} \text{Load voltage at OFF} &= \text{Leakage current} \times 2 \text{ pcs.} \times \text{Load impedance} \\ &= 1 \text{ mA} \times 2 \text{ pcs.} \times 3 \text{ k}\Omega \\ &= 6 \text{ V} \end{aligned}$$

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

(Reed)

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

# Air Cylinder / Series CS2

## Simple Specials

Please order through the Simple Specials system.

### 1 Change of Rod End Shape

Symbol  
-XA0 to XA30

#### Applicable Series

Series	Description	Model	Action	Symbol for applicable patterns
CS2	Standard type	CS2	Double acting single rod	XA0 to 30
		CS2W	Double acting double rod	XA0 to 30
	Smooth cylinder	CS2Y	Double acting single rod	XA0 to 30

#### Precautions

- 1) Dimensions, tolerance and finish that are not displayed here are the same as standard types, or set at the discretion of SMC.
- 2) The standard dimensions with \* will be as follows to the following rod diameter (D).  
Please specify if changing the dimensions.  
 $D \leq 6 \rightarrow D-1 \text{ mm}$     $6 < D \leq 25 \rightarrow D-2 \text{ mm}$     $D > 25 \rightarrow D-4 \text{ mm}$
- 3) In the case of double rod type and single acting retraction type, enter the dimensions for when the rod is retracted.
- 4) Only the single side of a double rod is able to manufacture.

<b>Symbol: A0</b> 	<b>Symbol: A1</b> 	<b>Symbol: A2</b> 	<b>Symbol: A3</b> 	<b>Symbol: A4</b> 
<b>Symbol: A5</b> 	<b>Symbol: A6</b> 	<b>Symbol: A7</b> 	<b>Symbol: A8</b> 	<b>Symbol: A9</b> 
<b>Symbol: A10</b> 	<b>Symbol: A11</b> 	<b>Symbol: A12</b> 	<b>Symbol: A13</b> 	<b>Symbol: A14</b> 
<b>Symbol: A15</b> 	<b>Symbol: A16</b> 	<b>Symbol: A17</b> 	<b>Symbol: A18</b> 	<b>Symbol: A19</b> 
<b>Symbol: A20</b> 	<b>Symbol: A21</b> 	<b>Symbol: A22</b> 	<b>Symbol: A23</b> 	<b>Symbol: A24</b> 
<b>Symbol: A25</b> 	<b>Symbol: A26</b> 	<b>Symbol: A27</b> 	<b>Symbol: A28</b> 	<b>Symbol: A29</b> 
<b>Symbol: A30</b> 				

Basic

Double Rod Type

Smooth Cylinder

Auto Switch

Made to Order

# Air Cylinder / Series CS2

## Made to Order Specifications 1

Contact SMC for detailed dimensions, specifications, and lead times.



### 2 Special Port Positions

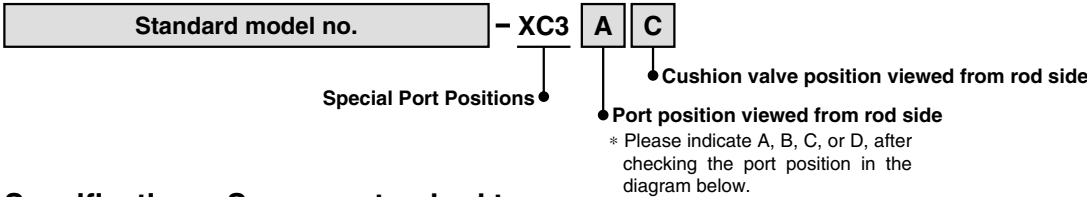
Symbol  
**-XC3**

The positions of ports and cushion valves on the rod cover and head cover are changed from those of the standard type.

#### Applicable Series

Series	Description	Model	Action
CS2	Standard type	CS2	Double acting single rod
	Smooth cylinder	CS2Y	Double acting single rod

#### How to Order



#### Specifications: Same as standard type

#### Relation between Port Positions and Cushion Valve Positions (Rod chamfer)

Series	Symbols according to mounting bracket (relation of positions)
CS2	 Basic
	 Foot
	 Rod flange
	 Head flange
	 Single clevis
	 Double clevis
	 Center trunnion
<p>(1) The symbol A indicating the port or cushion valve position is assigned to the top position viewed from the rod side, with B, C, and D to the other positions in order when rotating clockwise.</p> <p>(2) The optional combination of the port and cushion valve is available only when the same positional change is applied to the rod cover and head cover.</p> <p>(3) The symbol -XC3AA indicates the standard specification so an optional specification with this part number does not exist.</p>	

### 3 Change of Trunnion Bracket Mounting Position

Symbol  
**-XC14**

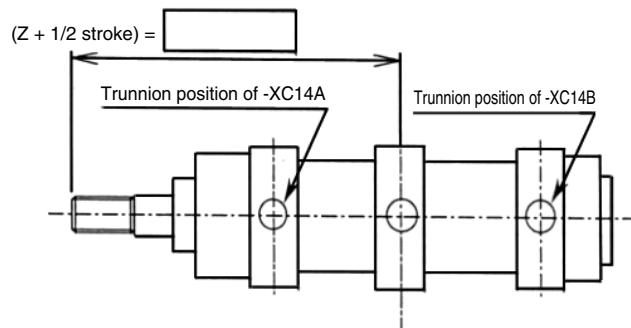
The position for mounting the trunnion bracket on the cylinder can be moved from the standard mounting position to any desired position.

#### Applicable Series

Series	Description	Model	Action
CS2	Standard type	CS2	Double acting single rod
		CS2W	Double acting double rod
	Smooth cylinder	CS2Y	Double acting single rod

#### Precautions

- Specify "Z + 1/2 stroke" in case the trunnion bracket position is not -XC14A, -XC14B or trunnion is not a center trunnion.
- SMC will make appropriate arrangements if no dimensions, tolerance, or finish instructions are given in the diagram.
- The possible range of trunnion bracket mounting positions is indicated in the table below.
- Some trunnion mounting positions do not allow auto switch mounting. Consult SMC for more information.
- Series CS2 has a greater range of trunnion bracket mounting positions than Series CS1, so the value of "Z + 1/2 stroke" at -XC14A and -XC14B is different.



#### Series CS2

Bore Size	Symbol		Z + 1/2 stroke		Reference for standard (center trunnion)	Minimum Stroke
	For -XC14A	For -XC14B	For -XC14			
			Minimum	Maximum		
125	165.5	152.5 + Stroke	166	152 + Stroke	159 + 1/2 stroke	25
140	168	150 + Stroke	168.5	149.5 + Stroke	159 + 1/2 stroke	30
160	186	160 + Stroke	186.5	159.5 + Stroke	173 + 1/2 stroke	35

**4** Change of Tie Rod Length Symbol **-XC15**

Standard M dimension, the tie rod length of the air cylinder, is changed.

**Applicable Series**

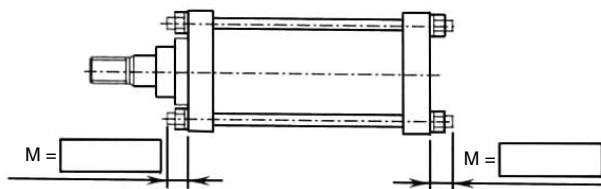
Series	Description	Model	Action
CS2	Standard type	CS2	Double acting single rod
		CS2W	Double acting double rod
	Smooth cylinder	CS2Y	Double acting single rod

**Precautions**

- 1) When ordering, specify the required M dimension with the part number.
- 2) SMC will make appropriate arrangements if no dimensions, tolerance, or finish instructions are given in the diagram.
- 3) The possible range of tie-rod length is listed in the table below.
- 4) The M dimension of the bracket mounting side of Flange (F, G), Clevis (C, D) types cannot be specified.

**Changeable Range of Tie Rod Length** (mm)

Model	CS2					
	125		140		160	
Bore size						
Mounting bracket	L	B, F, G, C, D, T	L	B, F, G, C, D, T	L	B, F, G, C, D, T
M minimum	20	12	21	12	23	14
M maximum	270					



**5** Double Clevis Pin/Double Knuckle Pin with Split Pin and Flat Washer Symbol **-XC26**

Flat washer was added to the double clevis type (a mounting type) or the double knuckle joint (an accessory).

**Applicable Series**

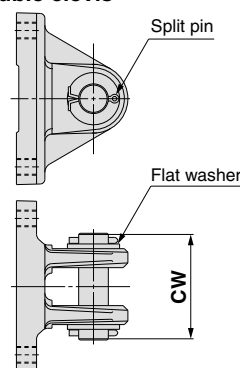
Series	Description	Model	Action
CS2	Standard type	CS2	Double acting single rod
	Smooth cylinder	CS2Y	Double acting single rod

**Specification**

<b>Mounting bracket</b>	Double clevis type (D), double knuckle joint only
<b>Changed parts</b>	Clevis pin, knuckle pin, flat washer
<b>Other specifications</b>	Same as standard type

**Dimensions** (Dimensions not listed below are the same as those of the standard type.)

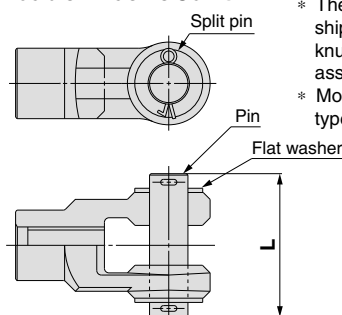
**Double clevis**



- \* The mounting bracket itself will be shipped together with the split pin, clevis pin and flat washer (but not assembled).
- \* Mounting is the same as standard types.

Bore size (mm)	CW
ø125	90
ø140	104
ø160	113

**Double Knuckle Joint**

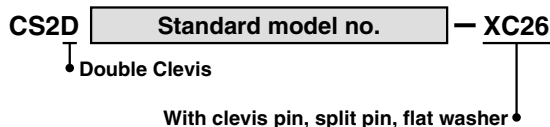


- \* The mounting bracket itself will be shipped together with the split pin, knuckle pin and flat washer (but not assembled).
- \* Mounting is the same as standard types.

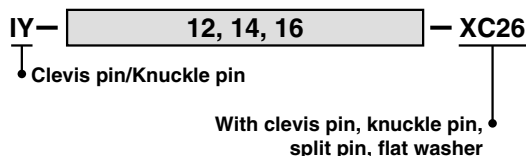
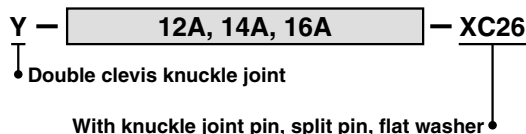
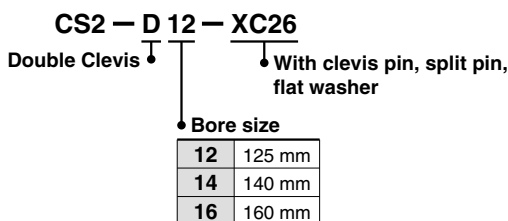
Bore size (mm)	L
ø125	90
ø140	104
ø160	113

**How to Order**

• **Product**



• **Parts Ass'y**



# Air Cylinder / Series CS2

## Made to Order Specifications 2

Contact SMC for detailed dimensions, specifications, and lead times.



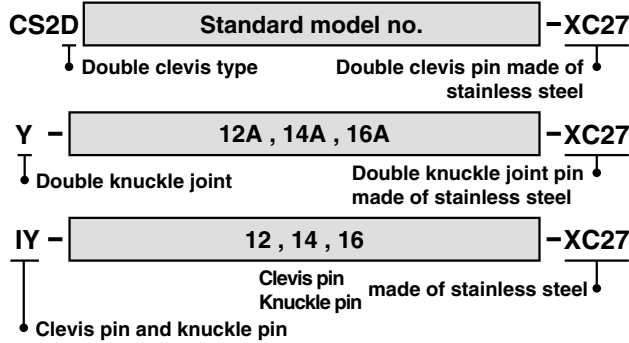
### 6 Double Clevis Pin and Double Knuckle Pin Made of Stainless Steel Symbol **-XC27**

To prevent the rotating part of a double clevis, which is a bracket, or double knuckle joint, which is an accessory, from rusting the materials of the pin and the retaining ring (split pin) have been changed to stainless steel.

#### Applicable Series

Series	Description	Model	Action
CS2	Standard type	CS2	Double acting single rod
	Smooth cylinder	CS2Y	Double acting single rod

#### How to Order

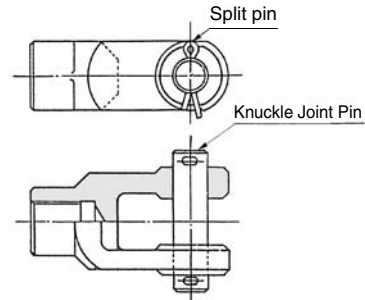


#### Specification

<b>Mounting bracket</b>	Double clevis type (D), double knuckle joint only
<b>Changed parts</b>	Clevis pin, knuckle pin, split pin
<b>Other specifications</b>	Same as standard type

#### Dimensions: Same as standard type

\* The mounting bracket itself will be shipped together with the split pin, clevis pin, and knuckle joint pin.



\* Mounting as the same as standard size.

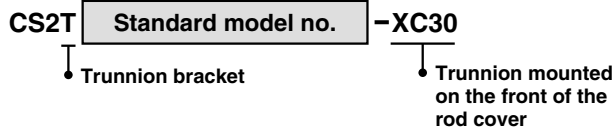
### 7 Rod Side Trunnion Mounted on the Front of the Rod Cover. Symbol **-XC30**

A cylinder with a reduced distance between the fulcrum and the rod end, which has been realized by mounting the trunnion bracket on the front of the cylinder's rod cover.

#### Applicable Series

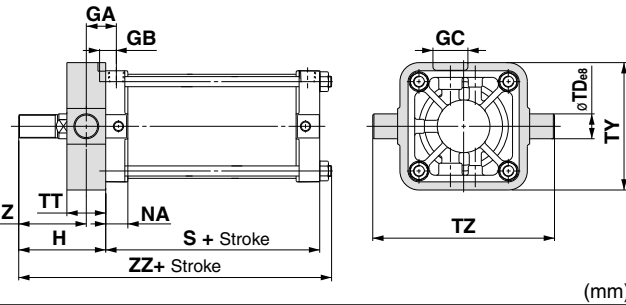
Series	Description	Model	Action
CS2	Standard type	CS2	Double acting single rod
		CS2W	Double acting double rod
	Smooth cylinder	CS2Y	Double acting single rod

#### How to Order



#### Specifications: Same as standard type

(Dimensions other than below are the same as standard type)



Bore size (mm)	GA	GB	GC	NA	S	TDe8	TT	TY	TZ	H	Z	ZZ
ø125	38	23	45	28.5	96	32 <sup>-0.050</sup> <sub>-0.089</sub>	50	164	234	112	87	221
ø140	40.5	23	45	28.5	96	36 <sup>-0.050</sup> <sub>-0.089</sub>	55	184	262	112	84.5	221
ø160	46	26	50	32.5	104	40 <sup>-0.050</sup> <sub>-0.089</sub>	60	204	292	122	92	241

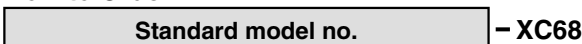
### 8 Made of Stainless Steel (With hard chrome plated piston rod) Symbol **-XC68**

Applicable for uses where rust and corrosion are expected, such as by immersing in water.

#### Applicable Series

Series	Description	Model	Action
CS2	Standard type	CS2	Double acting single rod
		CS2W	Double acting double rod
	Smooth cylinder	CS2Y	Double acting single rod

#### How to Order



Made of stainless steel (with hard chrome plated piston rod)

#### Specifications

<b>Parts changed to stainless steel</b>	Piston rod
<b>Other specifications and dimensions</b>	Same as standard type

#### Maximum Stroke (mm)

Series	Double functioning single rod	Double functioning single rod with rod boot
CS2	1600	1400

**9 With Rod End Bracket**

Symbol  
**-XC86**

The rod end bracket has been included to simplify the ordering procedure.

**Applicable Series**

Series	Description	Model	Action
CS2	Standard type	CS2	Double acting single rod
	Smooth cylinder	CS2Y	Double acting single rod

**How to Order**

Standard no. for each series — **XC86 A**

With rod end bracket

Suffix

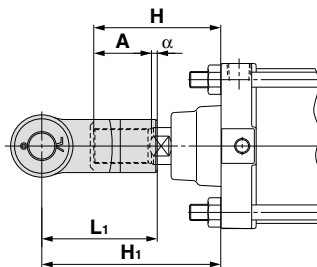
<b>A</b>	With rod end bracket
<b>B</b>	With double knuckle joint
<b>C</b>	With double knuckle joint
<b>D</b>	With double knuckle joint and rod end bracket
<b>E</b>	With double knuckle joint and rod end bracket

Note 1) The rod end bracket will be shipped together.

Note 2) 1 pin and 2 split pins will be shipped as accessories to the double knuckle joint.

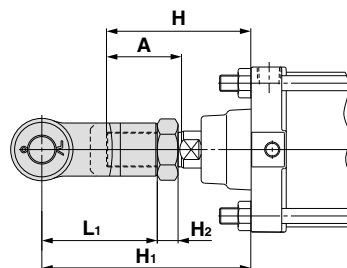
**Dimensions** (Dimensions other than below are the same as standard type.)

**Series CS2  
XC86B, XC86C**



Symbol Bore size (mm)	H	A	$\alpha$	L <sub>1</sub>	H <sub>1</sub>	Applicable knuckle joint part number	
						I type single knuckle	Y type double knuckle
<b>125</b>	110	50	3.5	100	156.5	<b>I-12A</b>	<b>Y-12A</b>
<b>140</b>	110	50	3.5	105	161.5	<b>I-14A</b>	<b>Y-14A</b>
<b>160</b>	120	56	3.5	110	170.5	<b>I-16A</b>	<b>Y-16A</b>


**Series CS2  
XC86D, XC86E**





Symbol Bore size (mm)	H	A	L <sub>1</sub>	H <sub>1</sub>	H <sub>2</sub>	Applicable knuckle joint part number		Applicable rod end nut
						I type single knuckle	Y type double knuckle	
<b>125</b>	125	65	100	181	18	<b>I-12A</b>	<b>Y-12A</b>	<b>NT-12</b>
<b>140</b>	125	65	105	186	18	<b>I-14A</b>	<b>Y-14A</b>	<b>NT-12</b>
<b>160</b>	140	76	110	198	21	<b>I-16A</b>	<b>Y-16A</b>	<b>NT-16</b>

## 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), American National Standards Institute (ANSI)\*1) and other safety regulations.

 **Caution:** **Caution** indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.

 **Warning:** **Warning** indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.

 **Danger:** **Danger** indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

\*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 10218-1: Manipulating industrial robots - Safety.  
 ANSI / (NFPA) T2.25.1 R2: Pneumatic fluid power - Systems standard for industrial machinery.  
 NFPA (Fluid) T2.24.1 R1: Hydraulic fluid power - Systems standard for stationary industrial machinery.  
 NFPA 79: Electrical Standard for Industrial Machinery.  
 ANSI / RIA / ISO 10218 -1: Robots for Industrial Environment - Safety Requirements - Part 1 - Robot. etc.

### 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.

### Caution

#### 1. 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.\*2)

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.

\*2) 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

#### 1. The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.

#### 2. The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulations of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.

### Record of changes

**Edition B** \* Addition of double rod type and Smooth cylinder to Series CS2

\* 9 Made to Order specifications added

NZ

## Safety Instructions

Be sure to read “Handling Precautions for SMC Products” (M-E03-3) before using.



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**For International Inquiries: [www.smcworld.com](http://www.smcworld.com)**

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