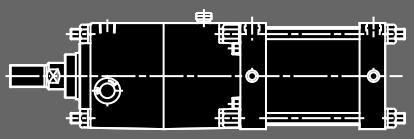
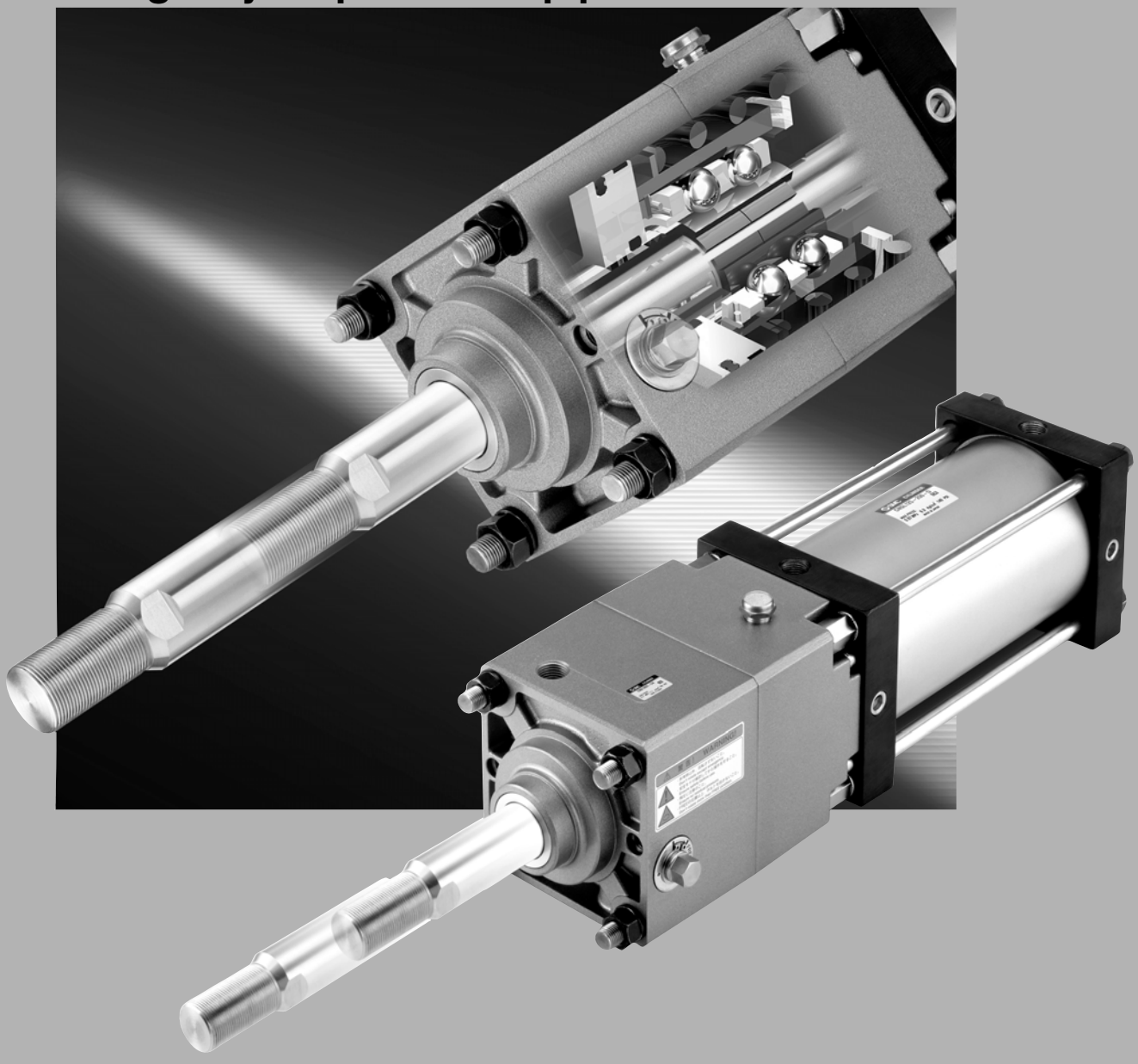


Cylinder with Lock

Series CNS/ ø125, ø140, ø160

A locking cylinder ideal for intermediate stops, emergency stops and drop prevention.



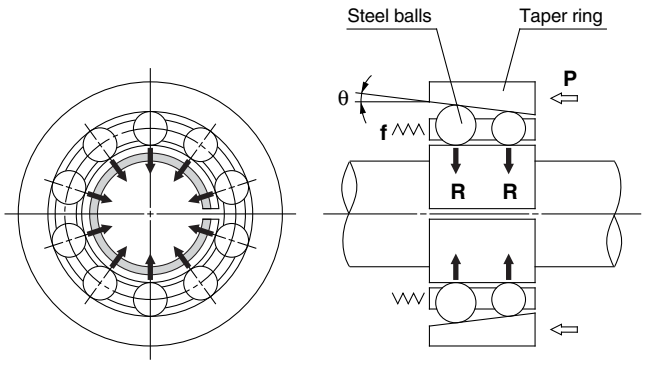
Series Variations

Series	Action	Model	Standard variations: Built-in auto switch magnets	Standard variations: With rod boot	Lock type: Spring locking	Bore size (mm)	Standard stroke (mm)
Cylinder with lock Series CNS	**Double acting**	**Single rod Series CNS**	●	●	●	**125** **140** **160**	Maximum 1600

A locking cylinder ideal
emergency stops an

Cylinder with Lock
Series CNS

Simple construction
A force magnifying mechanism is employed based on the wedge effect of a taper ring and steel balls.



Enhanced locking efficiency
Greater locking efficiency as well as stable locking and unlocking operation has been achieved by arranging a large number of steel ball bearings in circular rows. The floating taper ring provides alignment and stable locking force with respect to piston rod eccentricity. (Unlocking pressure of 0.25MPa ..... △0.05MPa lower than conventional SMC products)

Greater reliability and stable holding force
Outstanding durability and stable holding force are maintained through the use of a substantially lengthened brake shoe which provides superior wear resistance. (Double that of a conventional SMC product)

A metal rod scraper is standard
Resistance against welding process spatter and other external contaminants is achieved by providing a metal rod scraper as standard.

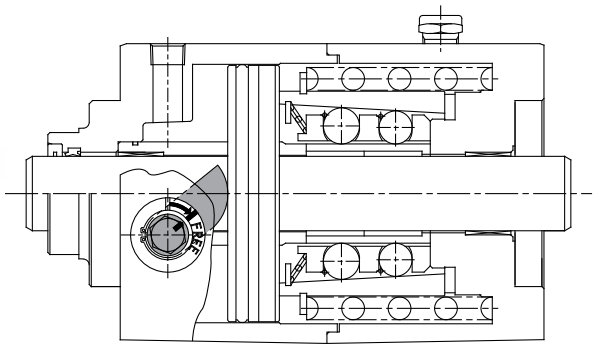
for intermediate stops, d drop prevention.

Maximum piston speed: 500mm/s

Within the allowable kinetic energy range, speeds between 50 to 500mm/s can be achieved.

Simple manual override

In the event that the air supply is cut off or unavailable, unlocking can be performed with a commercially available tool. The fail safe mechanism locks again when the manual override is released.



Enclosed construction minimizes influences of poor air quality

Separation of the lock mechanism and the unlocking piston chamber produces a structure which is resistant to moisture and drainage in compressed air.

Compact lock unit saves space

The lock unit is extremely compact, without a large overhang.

Can be locked in both directions

Holding force is equal on either extend or retract.

Series Variations

Series	Action	Model	Standard variations: Built-in auto switch magnets	Standard variations: With rod boot	Lock type: Spring locking	Bore size (mm)	Standard stroke (mm)
Cylinder with lock Series CNS	Double acting	Single rod Series CNS	●	●	●	125 140 160	Maximum 1600

Series CNS
ø125, ø140, ø160

How to Order

Standard Type CNS L □ 125 □ – 100 □ – D – □

With auto switch CDNS L □ 125 □ – 100 □ – D – M9BW □ – □

With auto switch

Mounting style

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

Tubing material

Symbol	Bore size	Without magnet	Built-in magnet
		Tubing material	Tubing material
–	ø125, ø140	Aluminium tube (1000 st or less)	Aluminium tube
		Steel tube (1001 st or more)	
	ø160	Aluminium tube (1200 st or less)	
		Steel tube (1201 st or more)	
F*1	ø125 to ø160	Steel tube	

* 1 Auto switches are not available with steel tube.

Thread type

–	Rc
TN	NPT
TF	G

Cylinder stroke (mm)
Refer to page 3.6-5 for maximum stroke.

Bore size

125	125 mm
140	140 mm
160	160 mm

Number of auto switches

–	2 pcs.
S	1 pc.
n	"n" pcs.

Auto switch

–	Without auto switch

* Select applicable auto switch part numbers from the table below.

Locking direction

D	Both directions

Made to Order
Refer to page 3.6-5 for details.

With rod boot/cushion

Rod boot	–	Without rod boot
	J	Nylon tarpaulin
	K	Heat resistant tarpaulin
Cushion	–	With double-side cushion
	N	Without cushion
	R	With rod cushion
	H	With head cushion

* When the symbols are two or more, indicate them alphabetically.

Internal magnet cylinder part numbers

In the case of internal magnets with no auto switches, the auto switch type symbol is "–".
(Example) CDNSL140-100-D

Mounting brackets/Part numbers

Refer to page 3.6-6 for the part numbers of mounting brackets for other than the basic air cylinder.

Applicable Auto Switches/Refer to Auto Switch Guide for further information on auto switches.

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

** Water resistant type auto switches can be mounted on the above models, but in such case SMC cannot guarantee water resistance.
** Consult with SMC regarding water resistant types with the above model numbers.
* Lead wire length symbols: 0.5 m ····· – (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.

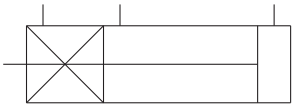
* There are other applicable auto switches than listed above. For details, refer to Auto Switch Guide.
* For details about auto switches with pre-wired connector, refer to Auto Switch Guide.
* D-A9□/M9□/M9□W/M9□A auto switches are shipped together (not assembled). (Only auto switch brackets are assembled at the time of shipment.)

Cylinder Specifications

Type	Non-lube type
Fluid	Air
Proof pressure	1.57 MPa
Maximum operating pressure	0.97 MPa
Minimum operating pressure	0.08 MPa
Piston speed	50 to 500 mm/s *
Ambient and fluid temperature	Without auto switch: 0°C to 70°C With auto switch : 0°C to 60°C (With no freezing)
Cushion	Air cushion
Stroke length tolerance	up to 250: $^{+1.0}_{0}$, 251 to 1000: $^{+1.4}_{0}$, 1001 to 1500: $^{+1.8}_{0}$, 1501 to 1600: $^{+2.2}_{0}$
Mounting brackets	Basic type, Axial foot type, Front flange type, Rear flange type, Single clevis type, Double clevis type, Centre trunnion type

* There are load limitations depending on the piston speed when locked, the mounting orientation and the operating pressure.

Symbol



Lock Specifications

Locking	Spring locking (exhaust locking)
Unlocking pressure	0.25 MPa or more
Locking pressure	0.20 MPa or less
Maximum operating pressure	0.25 to 0.7 MPa
Locking direction	Both directions

Holding force for Spring Locking (Maximum Static Load)

Bore size [mm]	**125**	**140**	**160**
Holding force [KN]	8.4	10.5	13.8

* Be sure to make cylinder selections in accordance with the method given on page 3.6-17

Made to Order

Made to Order Specifications

Symbol	Specifications
-XA□	Change of rod end shape
-XC14	Change of trunnion bracket mounting position

Refer to pages 3.6-19 to 3.6-21 for cylinders with auto switches.

- Minimum auto switch mounting stroke
- Proper auto switch mounting position (detection at stroke end) and mounting height
- Operating range
- Switch mounting bracket: Part no.

Cylinder Stroke

[mm]

Tube material	Aluminium alloy	Carbon steel pipe	
Bore size [mm]	Basic style, Head side flange style, Single clevis style, Double clevis style, Centre trunnion style	Basic style, Head side flange style, Single clevis style, Double clevis style, Centre trunnion style	Foot style, Rod side flange style
125, 140	Up to 1000	Up to 1000	Up to 1600
160	Up to 1200	Up to 1200	Up to 1600

Cylinder Stroke/Auto Switch Mounting on Cylinder Unit (Built-in Magnet)

Refer to the minimum auto switch mounting stroke (page 3.6-20) for those with an auto switch.

[mm]

Bore size [mm]	Basic style, Head side flange style, Single clevis style, Double clevis style, Center trunnion style	Foot style, Rod side flange style
125, 140	Up to 1000	Up to 1400
160	Up to 1200	Up to 1400

Stopping Accuracy

Unit: mm

Locking	Piston speed [mm/s]		
	100	300	500
Spring locking	0.5	1.0	2.0

Conditions/Horizontal, supply pressure P = 0.5MPa
Load weight …… Upper limit of allowed values
Solenoid valve for locking …… Mounted directly to unlocking port
Maximum value taken from the range of 100 measured stopping positions

Mounting Bracket Part No.

Bore size [mm]	125	140	160
Foot (1)	CS1-L12	CS1-L14	CS1-L16
Rod side flange style (2)	CS1-FL12	CS1-FL14	CS1-FL16
Head side flange style	CS1-F12	CS1-F14	CS1-F16
Single knuckle joint	CS1-C12	CS1-C14	CS1-C16
Double knuckle joint (3)	CS1-D12	CS1-D14	CS1-D16

Note 1) When ordering foot bracket, order 2 pieces per cylinder.
Note 2) ø125 to ø160 rod side flange styles use Series CS1 long stroke flanges.
Note 3) Clevis pin and cotter pin (2 pcs.) are shipped together with double clevis style.

Rod Boot Material

Symbol	Rod boot material	Max. ambient temperature
J	Nylon tarpaulin	70°C
K	Heat resistant tarpaulin	110°C *

* Maximum ambient temperature for the rod boot itself.

Accessories

Mounting brackets		Basic type	Foot type	Front flange type	Rear flange type	Single clevis type	Double clevis type	Centre trunnion type
Standard equipment	Clevis pin	–	–	–	–	–	●	–
Options	Rod end nut	●	●	●	●	●	●	●
	Single knuckle joint	●	●	●	●	●	●	●
	Double knuckle joint (with pin)	●	●	●	●	●	●	●
	With rod boot	●	●	●	●	●	●	●

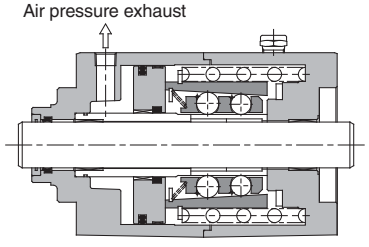
Weight Table/Numbers inside ( ) are for steel tubing

[kg]

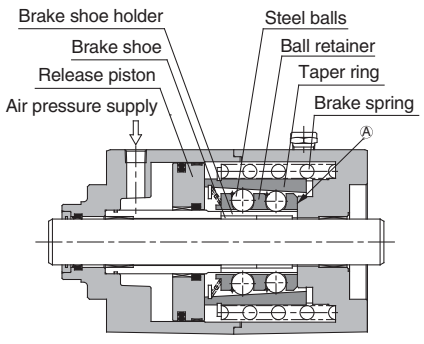
Bore size [mm]		125	140	160
Lock unit weight		14.40	20.20	30.60
Basic weight	Basic type	28.79 (30.26)	37.67 (39.48)	55.31 (57.52)
	Foot type	30.42 (31.89)	40.19 (42.00)	58.11 (60.32)
	Flange type	31.47 (32.94)	42.67 (44.48)	61.70 (63.91)
	Single clevis type	31.86 (33.33)	41.96 (43.77)	60.80 (63.01)
	Double clevis type (includes clevis pin & cotter pin)	32.32 (33.79)	42.71 (44.52)	61.65 (63.86)
	Trunnion type	32.92 (34.39)	43.40 (45.21)	62.71 (64.92)
Additional weight per 100mm of stroke		1.77 (2.66)	1.96 (3.01)	2.39 (3.58)
Accessories	Single knuckle	0.91	1.16	1.56
	Double knuckle (with pin)	1.37	1.81	2.48
	Rod end nut	0.16	0.16	0.23

Calculation (Ex.) CNSL140-100-D
Basic weight ..... 40.19 (foot type, ø140)
Additional weight ..... 1.96/100 stroke
Cylinder stroke ..... 100mm stroke
40.19 + 1.96 x 100/100 = 42.15kg

Construction Principle



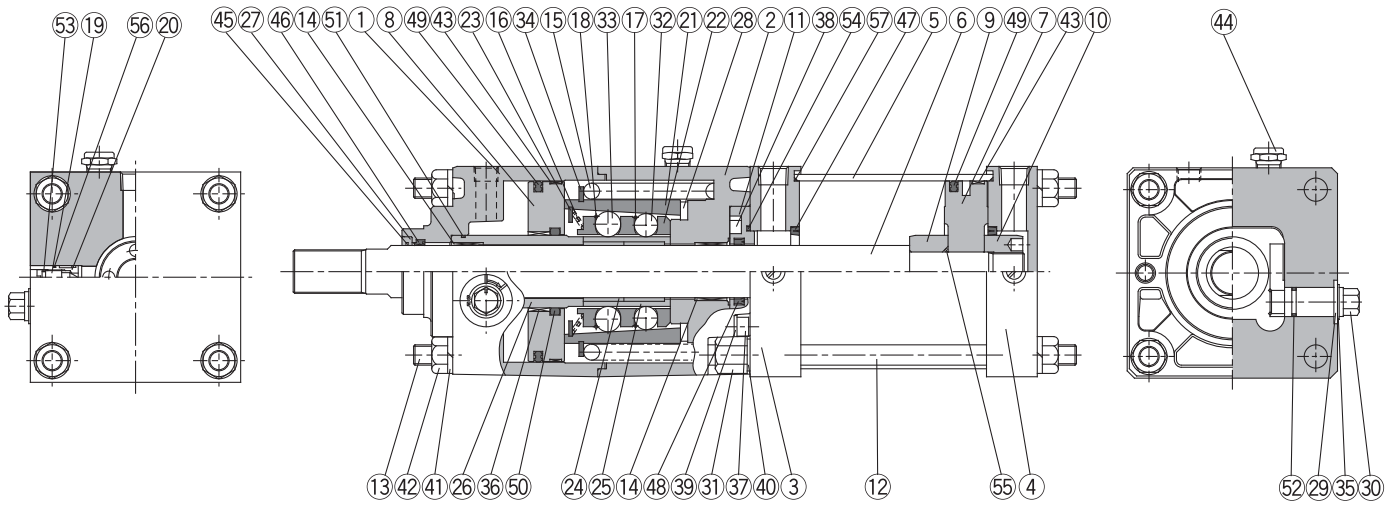
Locked condition



Unlocked condition

Spring Locking (Exhaust Locking)
The spring force which acts upon the taper ring is magnified by a wedge effect, and is conveyed to all of the numerous steel balls which are arranged in two circles. These act on the brake shoe holder and brake, which locks the piston rod by tightening against it with a large force.
Unlocking is accomplished when air pressure is supplied to the unlocking port. The release piston and taper ring oppose the spring force, moving to the right side, and the ball retainer strikes the cover section A. The braking force is released as the steel balls are removed from the taper ring by the ball retainer.

Construction



Parts list

No.	Description	Material	Note
1	**Cover A**	Aluminium alloy	Hard anodised & coated
2	**Cover B**	Aluminium alloy	Hard anodised & coated
3	**Rod cover**	Rolled steel plate	Black coated
4	**Head cover**	Rolled steel plate	Black coated
5	**Cylinder tube**	Aluminium alloy	Hard anodised
6	**Piston rod**	Carbon steel	Hard chrome plated
7	**Piston**	Aluminium alloy casting	Chromated
8	**Release piston**	Aluminium alloy	Chromated
9	**Cushion ring A**	Rolled steel	Zinc chromated
10	**Cushion ring B**	Rolled steel	Zinc chromated
11	**Retaining plate B**	Bronze casting	
12	**Tie-rod A**	Carbon steel	Chromated
13	**Unit holding tie-rod**	Carbon steel	Chromated
14	**Bushing**	Lead bronze casting	
15	**Brake spring**	Steel wire	Black coated
16	**Pre-load spring**	Steel wire	Zinc chromated
17	**Clip A**	Stainless steel wire	
18	**Clip B**	Stainless steel wire	
19	**Cushion valve**	Rolled steel	Electroless nickel plated
20	**Valve guide**	Brass	
21	**Taper ring**	Carbon steel	Heat treated
22	**Ball retainer**	Aluminium alloy	
23	**Tooth ring**	Stainless steel	
24	**Brake shoe**	Special friction material	
25	**Brake shoe holder**	Special steel	Heat treated
26	**Piston guide**	Carbon steel	Zinc chromated
27	**Coil scraper mounting plate**	Aluminium alloy	Anodised
28	**Bumper**	Polyurethane rubber	
29	**Washer**	Carbon steel	Colorless zinc chromated

Parts list

No.	Description	Material	Note
30	**Unlocking cam**	Carbon steel	Zinc chromated
31	**Wing nut**	Carbon steel Carbon steel	ø125,140 nickel plated ø160 black zinc chromated
32	**Steel ball A**	Carbon steel	
33	**Steel ball B**	Carbon steel	
34	**C type snap ring for shaft (for taper ring)**	Carbon steel	Black oxide finish
35	**C type snap ring for shaft (for unlocking cam)**	Lead bronze casting	Nickel plated
36	**Bushing (for release piston)**	Chromium molybdenum steel	
37	**Hexagon socket head cap screw**	Chromium molybdenum steel	Nickel plated
38	**Hexagon socket head cap screw**	Spring steel	Nickel plated
39	**Conical spring washer**	Spring steel	Nickel plated
40	**Conical spring washer**	Steel wire	Nickel plated
41	**Spring washer**	Rolled steel	Black zinc chromated
42	**Hexagon nut**	Resin	Black zinc chromated
43	**Wear ring**		
44	**BC element**	Phosphor bronze	
45	**Coil scraper**	NBR	
46	**Wiper ring**	NBR	
47	**Cushion seal**	NBR	
48	**Rod seal**	NBR	
49	**Piston seal**	NBR	
50	**0-ring (for release piston)**	NBR	
51	**0-ring (for piston guide)**	NBR	
52	**0-ring (for unlocking cam)**	NBR	
53	**Valve seal**	NBR	
54	**Retaining plate gasket**	NBR	
55	**Piston gasket**	NBR	
56	**Guide gasket**	NBR	
57	**Tube gasket**		

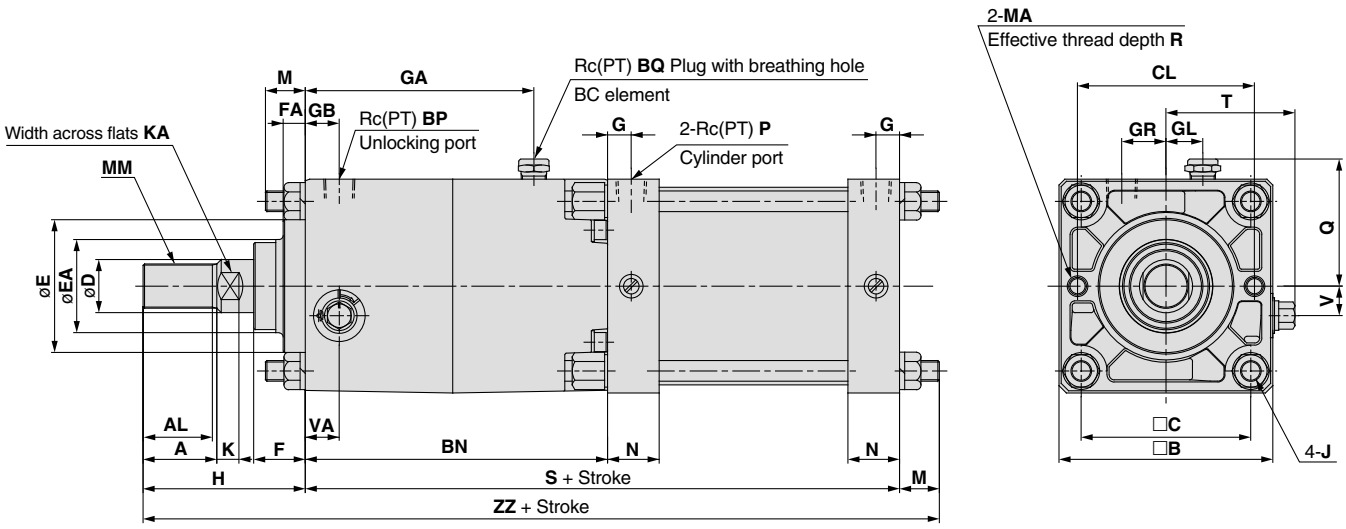
Replacement parts/Seal kits

Bore size [mm]	Seal kit	Contents
125	CS1N125A-PS	A set of above Nos. 46, 48, 49, 53, 54, 57
140	CS1N140A-PS	
160	CS1N160A-PS	

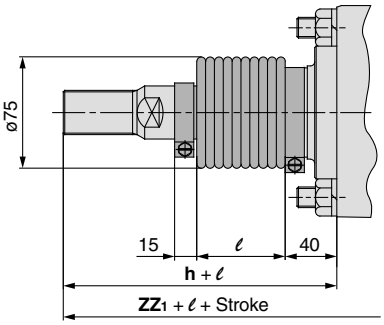
* Since the lock section for Series CNS is normally replaced as a unit, replacement seal kits are for the cylinder section only. Order using the seal kit for each bore size.
* Seal kits are sets consisting of items 46, 48, 49, 53, 54 and 57, which can be ordered using the seal kit for each cylinder bore size.
* Seal kit includes a grease pack (40 g).
  Order with the following part number when only the grease pack is needed.
  Grease pack part no.: GR-S-010 (10 g), **GR-S-020** (20 g)

Dimensions

Basic type/CNSB



With rod boot



(mm)

Bore size (mm)	Stroke range (mm)	A	AL	B	BN	BP	BQ	C	CL	D	E	EA	F	FA	G	GA	GB	GL	GR	J
125	to 1000	50	47	145	205	1/2	3/8	115	120	36	90	63	35	14	16	155	23	25	30	M14 x 1.5
140	to 1000	50	47	161	245	1/2	3/8	128	136	36	90	63	35	14	16	180	28	30	30	M14 x 1.5
160	to 1200	56	53	182	290	1/2	3/8	144	144	40	90	63	43	14	18.5	215	35	35	35	M16 x 1.5

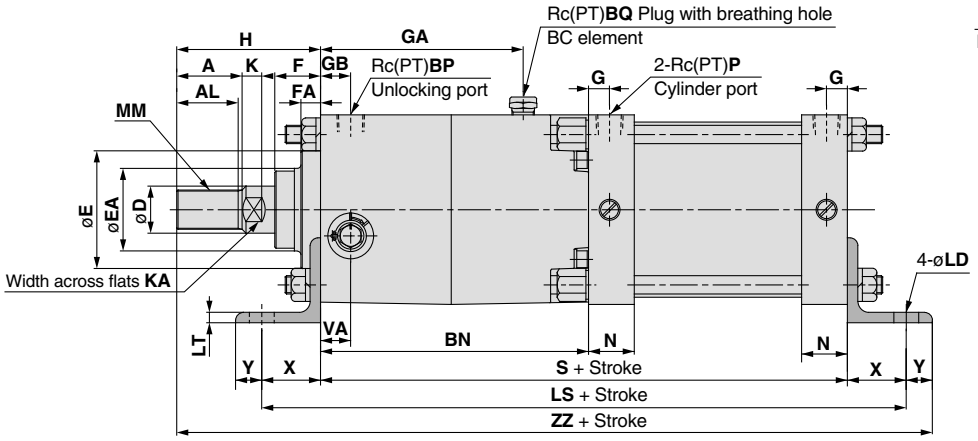
(mm)

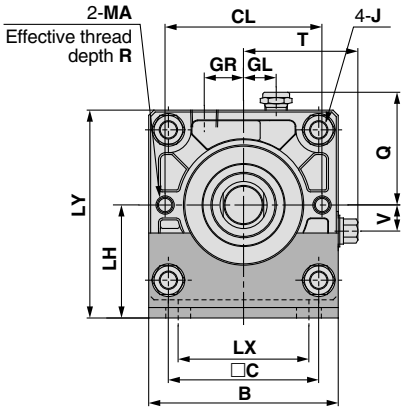
Bore size (mm)	K	KA	M	MA	MM	N	P	Q	R	S	T	V	VA	H	ZZ
125	15	31	27	M12 x 1.75	M30 x 1.5	35	1/2	85.5	25	303	87.5	20	23	110	440
140	15	31	27	M12 x 1.75	M30 x 1.5	35	1/2	93.5	25	343	95	20	28	110	480
160	17	36	30.5	M12 x 1.75	M36 x 1.5	39	3/4	104	25	396	109	25	35	120	546.5

With rod boot (mm)

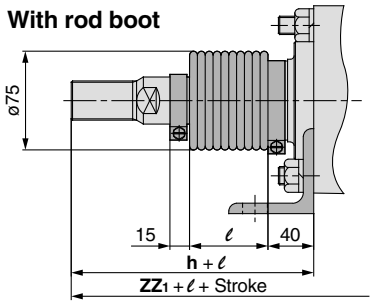
Bore size (mm)	Stroke range (mm)	ZZ_1	ℓ	h
125	to 1000	463	0.2 stroke	133
140	to 1000	503	0.2 stroke	133
160	to 1200	567.5	0.2 stroke	141

Foot type/CNSL

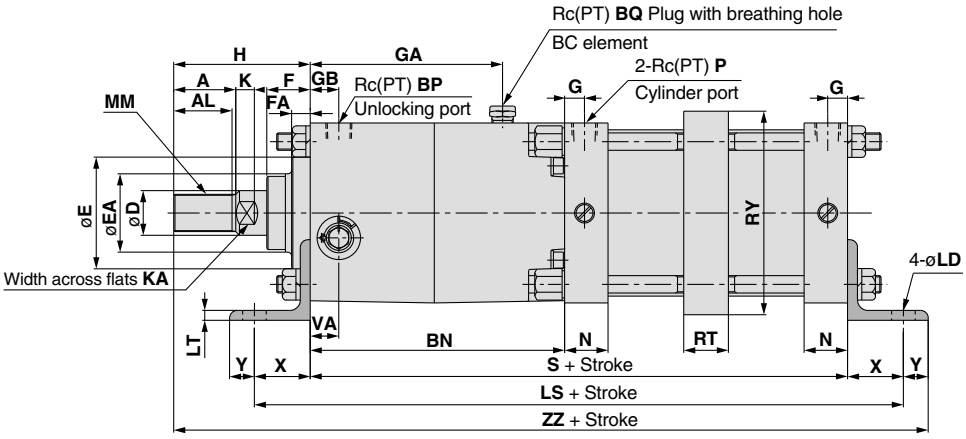


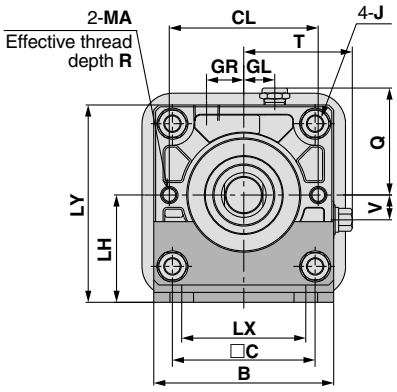


With rod boot



Long strokes





(mm)

Bore size (mm)	Stroke range (mm)	A	AL	B	BN	BP	BQ	C	CL	D	E	EA	F	FA	G	GA	GB	GL	GR	J
125	to 1400	50	47	145	205	1/2	3/8	115	120	36	90	63	35	14	16	155	23	25	30	M14 x 1.5
140	to 1400	50	47	161	245	1/2	3/8	128	136	36	90	63	35	14	16	180	28	30	30	M14 x 1.5
160	to 1400	56	53	182	290	1/2	3/8	144	144	40	90	63	43	14	18.5	215	35	35	35	M16 x 1.5

(mm)

Bore size (mm)	K	KA	LD	LH	LS	LT	LX	LY	MM	N	P	Q	R	S	T	V	VA	X	Y	H	ZZ
125	15	31	19	85	393	8	100	157.5	M30 x 1.5	35	1/2	85.5	25	303	87.5	20	23	45	20	110	478
140	15	31	19	100	433	9	112	180.5	M30 x 1.5	35	1/2	93.5	25	343	95	20	28	45	30	110	528
160	17	36	19	106	496	9	118	197	M36 x 1.5	39	3/4	104	25	396	109	25	35	50	25	120	591

With rod boot (mm)

Bore size (mm)	Stroke range (mm)	ZZ_1	ℓ	h
125	to 1400	501	0.2 stroke	133
140	to 1400	551	0.2 stroke	133
160	to 1400	612	0.2 stroke	141

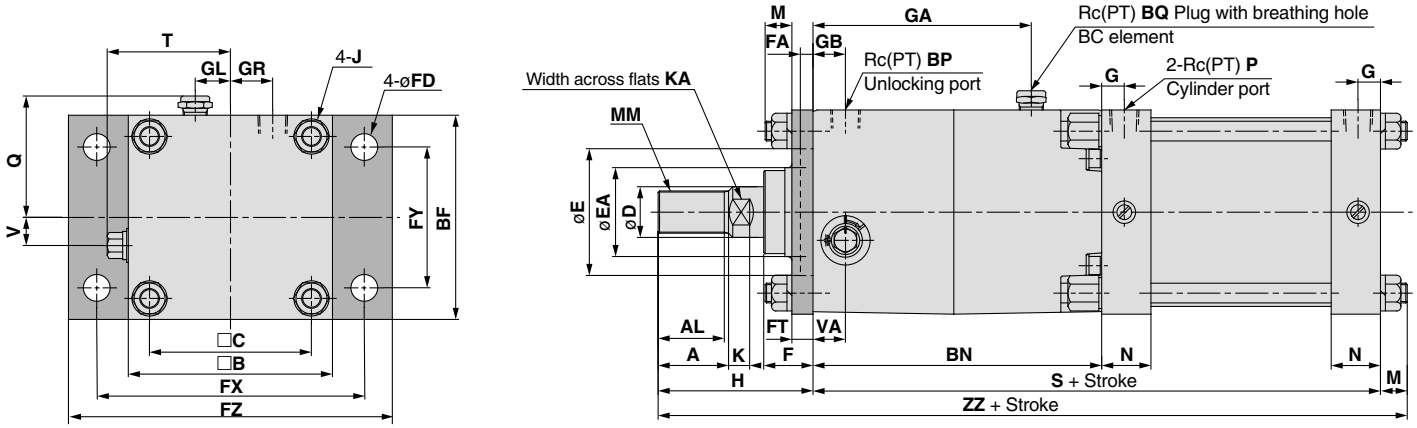
For long strokes (mm)

Bore size (mm)	Stroke range (mm)	RT	RY
125	1401 to 1600	36	164
140	1401 to 1600	36	184
160	1401 to 1600	45	204

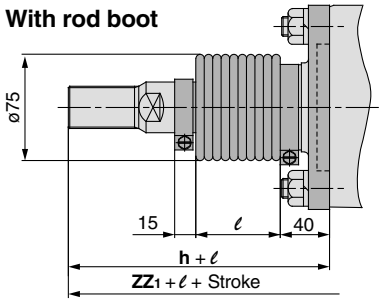
∗ Not available with auto switches.

Dimensions

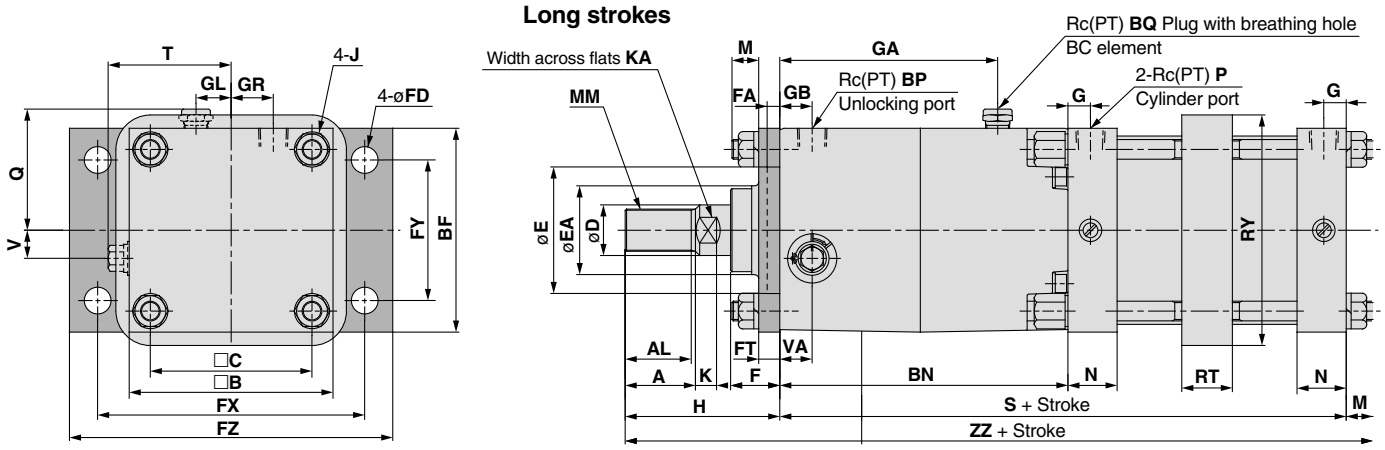
Front flange type/CNSF



With rod boot



Long strokes



(mm)

Bore size (mm)	Stroke range (mm)	A	AL	B	BF	BN	BP	BQ	C	D	E	EA	F	FA	FD	FT	FX	FY	FZ	G	GA
125	to 1400	50	47	145	145	205	1/2	3/8	115	36	90	63	35	14	19	14	190	100	230	16	155
140	to 1400	50	47	161	160	245	1/2	3/8	128	36	90	63	35	14	19	20	212	112	255	16	180
160	to 1400	56	53	182	180	290	1/2	3/8	144	40	90	63	43	14	19	20	236	118	275	18.5	215

(mm)

Bore size (mm)	GB	GL	GR	J	K	KA	M	MM	N	P	Q	S	T	V	VA	H	ZZ
125	23	25	30	M14 x 1.5	15	31	19	M30 x 1.5	35	1/2	85.5	303	87.5	20	23	110	432
140	28	30	30	M14 x 1.5	15	31	19	M30 x 1.5	35	1/2	93.5	343	95	20	28	110	472
160	35	35	35	M16 x 1.5	17	36	22	M36 x 1.5	39	3/4	104	396	109	25	35	120	538

With rod boot (mm)

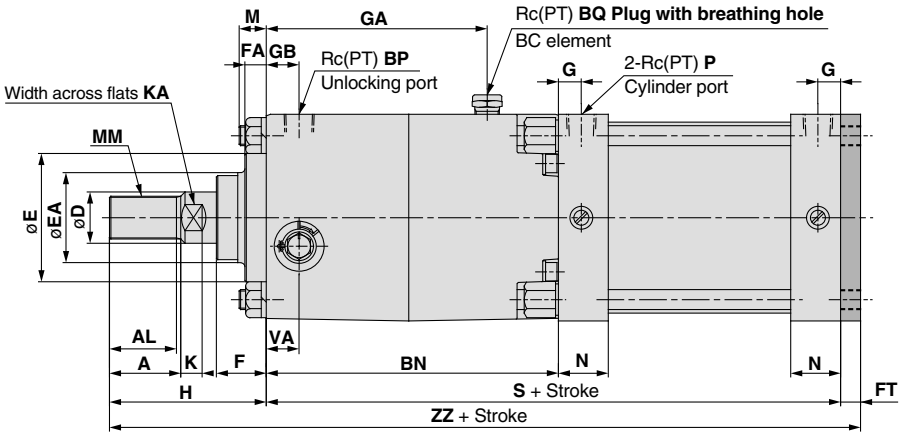
Bore size (mm)	Stroke range (mm)	ZZ_1	ℓ	h
125	to 1400	455	0.2 stroke	133
140	to 1400	495	0.2 stroke	133
160	to 1400	559	0.2 stroke	141

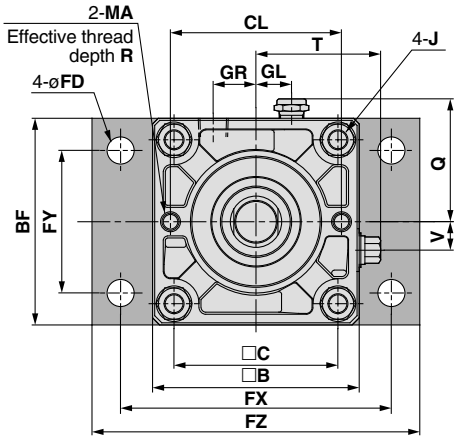
For long strokes (mm)

Bore size (mm)	Stroke range (mm)	RT	RY
125	1401 to 1600	36	164
140	1401 to 1600	36	184
160	1401 to 1600	45	204

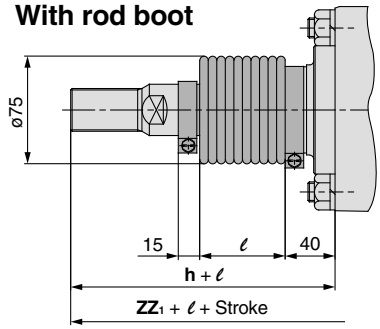
∗ Not available with auto switches.

Rear flange type/CNSG





With rod boot



(mm)

Bore size (mm)	Stroke range (mm)	A	AL	□B	BF	BN	BP	BQ	□C	CL	D	E	EA	F	FA	FD	FT	FX	FY	FZ	G	GA
125	to 1000	50	47	145	145	205	1/2	3/8	115	120	36	90	63	35	14	19	14	190	100	230	16	155
140	to 1000	50	47	161	160	245	1/2	3/8	128	136	36	90	63	35	14	19	20	212	112	255	16	180
160	to 1200	56	53	182	180	290	1/2	3/8	144	144	40	90	63	43	14	19	20	236	118	275	18.5	215

(mm)

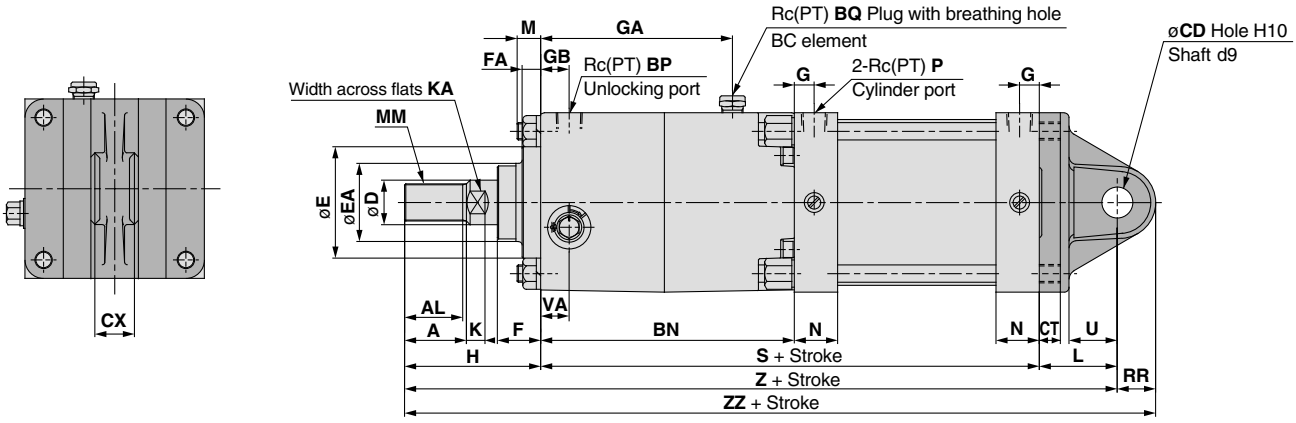
Bore size (mm)	GB	GL	GR	J	K	KA	M	MA	MM	N	P	Q	R	S	T	V	VA	H	ZZ
125	23	25	30	M14 x 1.5	15	31	19	M12 x 1.75	M30 x 1.5	35	1/2	85.5	25	303	87.5	20	23	110	427
140	28	30	30	M14 x 1.5	15	31	19	M12 x 1.75	M30 x 1.5	35	1/2	93.5	25	343	95	20	28	110	473
160	35	35	35	M16 x 1.5	17	36	22	M12 x 1.75	M36 x 1.5	39	3/4	104	25	396	109	25	35	120	536

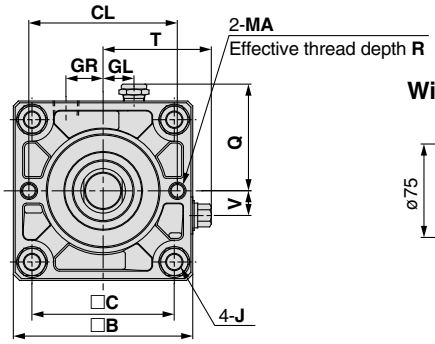
With rod boot (mm)

Bore size (mm)	Stroke range (mm)	ZZ_1	ℓ	h
125	to 1000	450	0.2 stroke	133
140	to 1000	496	0.2 stroke	133
160	to 1200	557	0.2 stroke	141

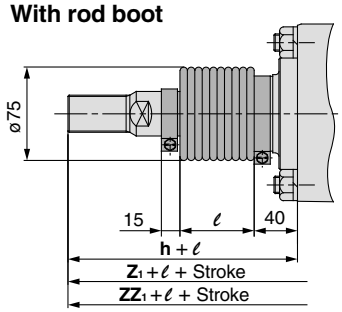
Dimensions

Single clevis type/CNSC





With rod boot



(mm)

Bore size (mm)	Stroke range (mm)	A	AL	B	BN	BP	BQ	C	CD_{H10}	CL	CT	CX	D	E	EA	F	FA	G	GA	GB	GL
125	to 1000	50	47	145	205	1/2	3/8	115	$25^{+0.084}_{0}$	120	17	$32^{-0.1}_{-0.3}$	36	90	63	35	14	16	155	23	25
140	to 1000	50	47	161	245	1/2	3/8	128	$28^{+0.084}_{0}$	136	17	$36^{-0.1}_{-0.3}$	36	90	63	35	14	16	180	28	30
160	to 1200	56	53	182	290	1/2	3/8	144	$32^{+0.100}_{0}$	144	20	$40^{-0.1}_{-0.3}$	40	90	63	43	14	18.5	215	35	35

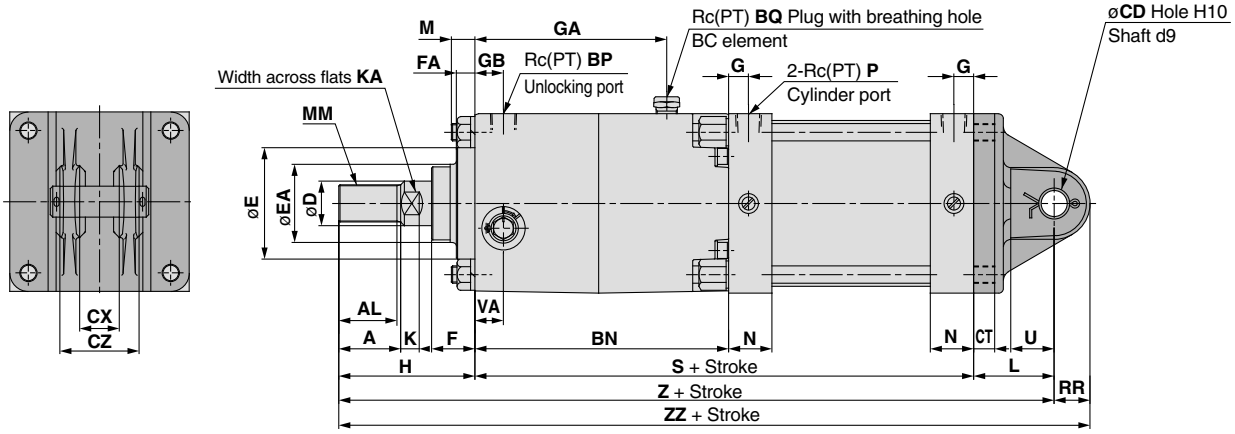
(mm)

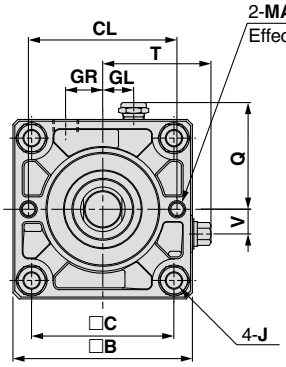
Bore size (mm)	GR	J	K	KA	L	M	MA	MM	N	P	Q	R	RR	S	T	U	V	VA	H	Z	ZZ
125	30	M14 x 1.5	15	31	65	19	M12 x 1.75	M30 x 1.5	35	1/2	85.5	25	29	303	87.5	35	20	23	110	478	507
140	30	M14 x 1.5	15	31	75	19	M12 x 1.75	M30 x 1.5	35	1/2	93.5	25	32	343	95	40	20	28	110	528	560
160	35	M16 x 1.5	17	36	80	22	M12 x 1.75	M36 x 1.5	39	3/4	104	25	36	396	109	45	25	35	120	596	632

With rod boot (mm)

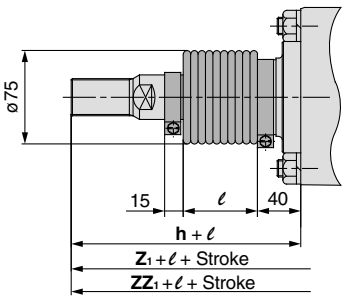
Bore size (mm)	Stroke range (mm)	Z_1	ZZ_1	ℓ	h
125	to 1000	501	530	0.2 stroke	133
140	to 1000	551	583	0.2 stroke	133
160	to 1200	617	653	0.2 stroke	141

Double clevis type/CNSD





With rod boot



(mm)

Bore size (mm)	Stroke range (mm)	A	AL	B	BN	BP	BQ	C	CD_{H10}	CL	CT	CX	CZ	D	E	EA	F	FA
125	to 1000	50	47	145	205	1/2	3/8	115	$25^{+0.084}_{0}$	120	17	$32^{+0.3}_{+0.1}$	$64^{0}_{-0.2}$	36	90	63	35	14
140	to 1000	50	47	161	245	1/2	3/8	128	$28^{+0.084}_{0}$	136	17	$36^{+0.3}_{+0.1}$	$72^{0}_{-0.2}$	36	90	63	35	14
160	to 1200	56	53	182	290	1/2	3/8	144	$32^{+0.100}_{0}$	144	20	$40^{+0.3}_{+0.1}$	$80^{0}_{-0.2}$	40	90	63	43	14

(mm)

Bore size (mm)	G	GA	GB	GL	GR	J	K	KA	L	M	MA	MM	N	P	Q	R	RR	S	T
125	16	155	23	25	30	M14 x 1.5	15	31	65	19	M12 x 1.75	M30 x 1.5	35	1/2	85.5	25	29	303	87.5
140	16	180	28	30	30	M14 x 1.5	15	31	75	19	M12 x 1.75	M30 x 1.5	35	1/2	93.5	25	32	343	95
160	18.5	215	35	35	35	M16 x 1.5	17	36	80	22	M12 x 1.75	M36 x 1.5	39	3/4	104	25	36	396	109

(mm)

Bore size (mm)	U	V	VA	H	Z	ZZ
125	35	20	23	110	478	507
140	40	20	28	110	528	560
160	45	25	35	120	596	632

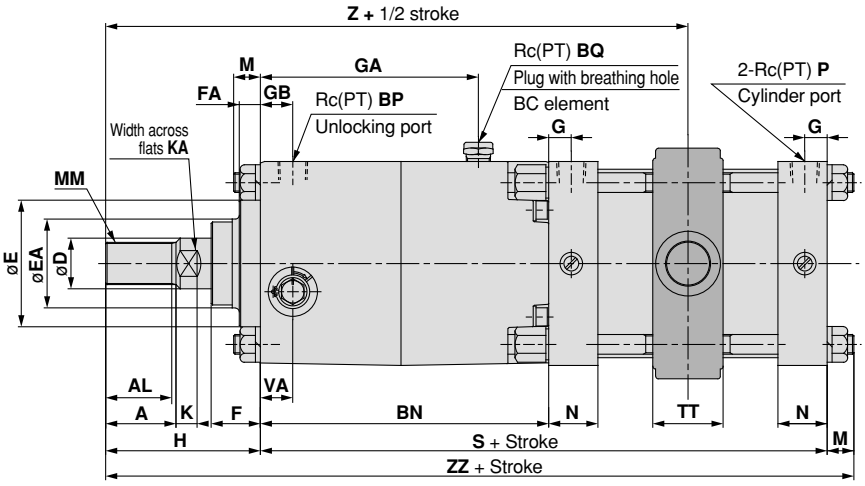
With rod boot (mm)

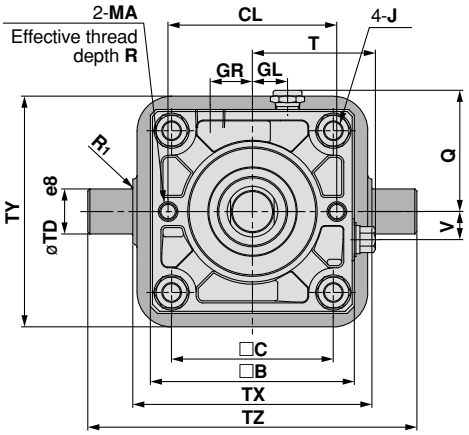
Bore size (mm)	Stroke range (mm)	Z_1	ZZ_1	ℓ	h
125	to 1000	501	530	0.2 stroke	133
140	to 1000	551	583	0.2 stroke	133
160	to 1200	617	653	0.2 stroke	141

∗ Packed with clevis pin, flat washer and cotter pin.

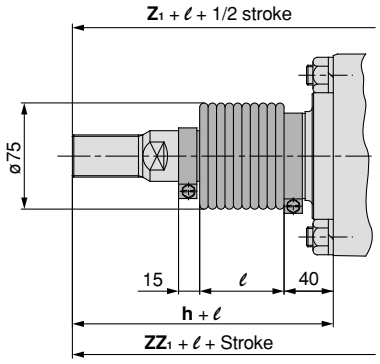
Dimensions

Centre trunnion type/CNST





With rod boot



(mm)

Bore size (mm)	Stroke range (mm)	A	AL	B	BN	BP	BQ	C	CL	D	E	EA	F	FA	G	GA	GB	GL	GR	J	K	KA
125	25 to 1000	50	47	145	205	1/2	3/8	115	120	36	90	63	35	14	16	155	23	25	30	M14 x 1.5	15	31
140	30 to 1000	50	47	161	245	1/2	3/8	128	136	36	90	63	35	14	16	180	28	30	30	M14 x 1.5	15	31
160	35 to 1200	56	53	182	290	1/2	3/8	144	144	40	90	63	43	14	18.5	215	35	35	35	M16 x 1.5	17	36

(mm)

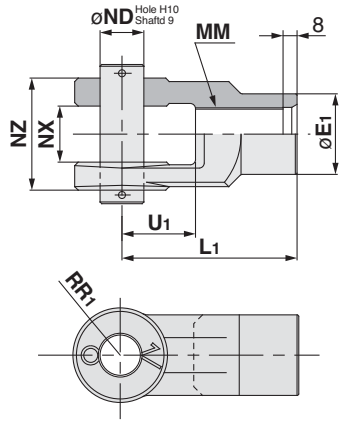
Bore size (mm)	M	MA	MM	N	P	Q	R	R_1	S	T	TD_{e8}	TT	TX	TY	TZ	V	VA	H	Z	ZZ
125	19	M12 x 1.75	M30 x 1.5	35	1/2	85.5	25	1	303	87.5	$32^{-0.050}_{-0.089}$	50	170	164	234	20	23	110	364	432
140	19	M12 x 1.75	M30 x 1.5	35	1/2	93.5	25	1.5	343	95	$36^{-0.050}_{-0.089}$	55	190	184	262	20	28	110	404	472
160	22	M12 x 1.75	M36 x 1.5	39	3/4	104	25	1.5	396	109	$40^{-0.050}_{-0.089}$	60	212	204	292	25	35	120	463	538

With rod boot (mm)

Bore size (mm)	Stroke range (mm)	Z_1	ZZ_1	ℓ	h
125	25 to 1000	387	455	0.2 stroke	133
140	30 to 1000	427	495	0.2 stroke	133
160	35 to 1200	484	559	0.2 stroke	141

Series CNS
Accessory Dimensions

Y Type Double Knuckle Joint

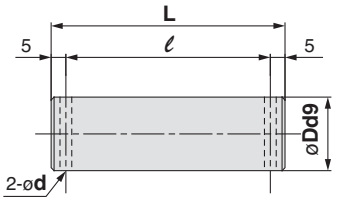


Material: Cast iron [mm]

Part No.	Applicable bore size (mm)	E1	L1	MM	NDH10	NX	NZ	RR1	U1
Y-12	**125**	46	100	M30 x 1.5	$25^{+0.084}_{0}$	$32^{+0.3}_{+0.1}$	$64^{-0.1}_{-0.3}$	27	42
Y-14	**140**	48	105	M30 x 1.5	$28^{+0.084}_{0}$	$36^{+0.3}_{+0.1}$	$72^{-0.1}_{-0.3}$	30	47
Y-16	**160**	55	110	M36 x 1.5	$32^{+0.1}_{0}$	$40^{+0.3}_{+0.1}$	$80^{-0.1}_{-0.3}$	34	46

∗ Knuckle pins and cotter pins are included.

Clevis Pin/Knuckle Pin

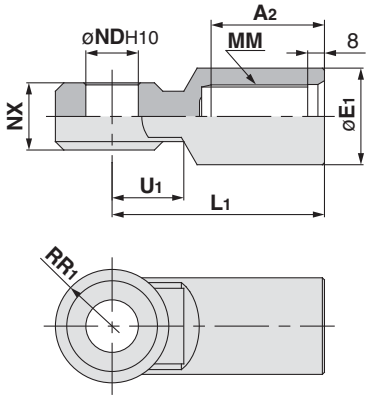


Material: Carbon steel [mm]

Part No.	Applicable bore size (mm)	Dd9	L	ℓ	Cotter pin
IY-12	**125**	$25^{-0.065}_{-0.117}$	79.5	69.5	ø4 x 40ℓ
IY-14	**140**	$28^{-0.065}_{-0.117}$	86.5	76.5	ø4 x 40ℓ
IY-16	**160**	$32^{-0.080}_{-0.142}$	94.5	84.5	ø4 x 40ℓ

∗ Cotter pins (2 pcs.) are included.

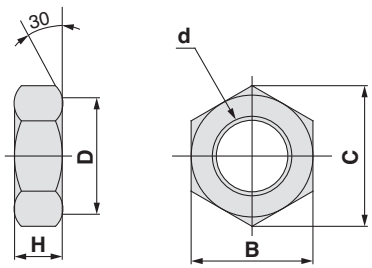
I Type Single Knuckle Joint



Material: Cast iron [mm]

Part No.	Applicable bore size (mm)	A2	E1	L1	MM	NDH10	NX	RR1	U1
I-12	**125**	54	46	100	M30 x 1.5	$25^{+0.084}_{0}$	$32^{-0.1}_{-0.3}$	27	33
I-14	**140**	54	48	105	M30 x 1.5	$28^{+0.084}_{0}$	$36^{-0.1}_{-0.3}$	30	39
I-16	**160**	60	55	110	M36 x 1.5	$32^{+0.1}_{0}$	$40^{-0.1}_{-0.3}$	34	39

Rod End Nut

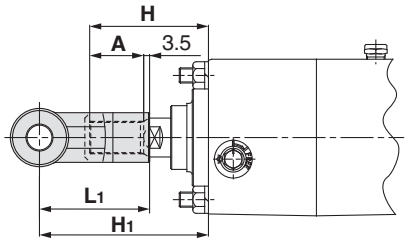


Material: Rolled steel [mm]

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

Series CNS
Accessory Dimensions

Single/Double Knuckle Joint Mounting



[mm]

Symbol / Bore size [mm]	H	A	L1	H1	Applicable knuckle joint part nos.	
					I type single knuckle	Y type double knuckle
125	110	50	100	156.5	**I-12**	**Y-12**
140	110	50	105	161.5	**I-14**	**Y-14**
160	120	56	110	170.5	**I-16**	**Y-16**

A, H dimensions when single/double knuckle joint and rod end nut are mounted together

Bore size [mm]	A	H
125	65	125
140	65	125
160	76	140

* Single knuckle joint and double knuckle joint should be used separately.
  (Fasten by screwing completely into the rod end threads.)
* When using a single/double knuckle joint together with a rod end nut, the **A** and **H** dimensions should be extended.
  (For extension of the **A** and **H** dimensions, refer to the table above and specify the order made product **-XAO**.)

Series CNS
Model Selection

Precautions on Model Selection

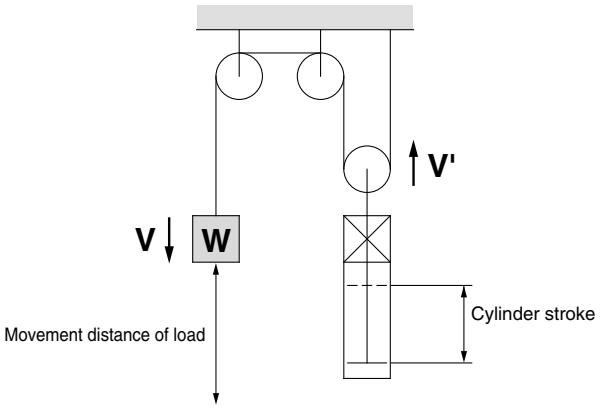
⚠ Caution

1. In order that the originally selected maximum speed is not exceeded, be certain to use a speed controller to adjust the total movement distance of the load so that movement takes place in no less than the applicable movement time.

   The movement time is the time that is necessary for the load to travel the total movement distance from the start without any intermediate stops.

2. In cases where the cylinder stroke and the movement distance of the load are different (double speed mechanism, etc.), use the movement distance of the load for selection purposes.

Example)



Selection Example

- **Load weight:** m = 320kg
- **Movement distance:** st = 400mm
- **Movement time:** t = 2s
- **Load condition:** Vertical downward = Load in direction of rod extension
- **Operating pressure:** P = 0.4MPa

Step 1: From graph 1 find the maximum movement speed of the load

∴ Maximum speed V: approx. 280mm/s

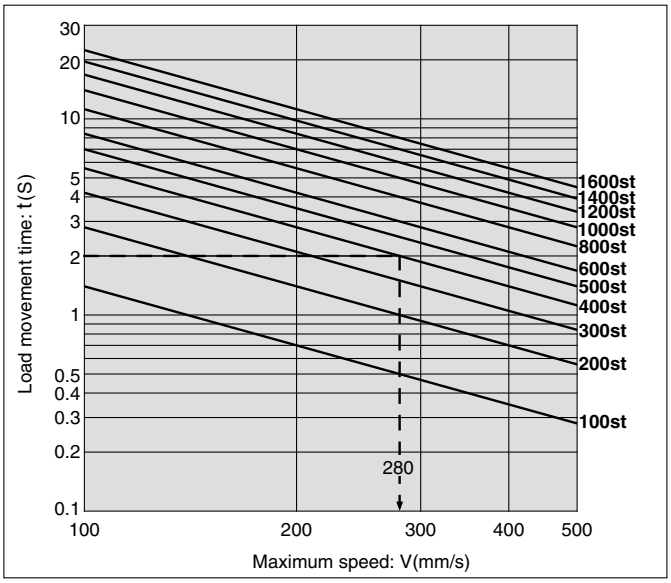
Step 2: Select Graph 6 based upon the load condition and operating pressure, and then from the intersection of the maximum speed V = 280mm/s found in Step 1, and the load weight m = 320kg

∴ ø140→ select a CNS140 or larger bore size.

Step 1 Find the maximum load speed: V

Find the maximum load speed: V(mm/s) from the load movement time: t(s) and the movement distance: st(mm).

Graph 1

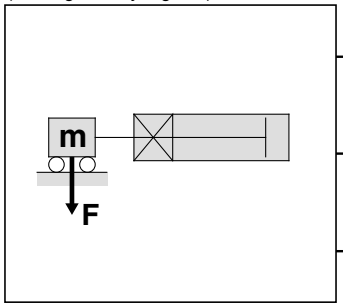


Step 2 Find the cylinder bore size.

Select a graph based upon the load condition and operating pressure, and then find the point of intersection for the maximum speed found in Step 1 and the load weight. Select the bore size on the line above the point of intersection.

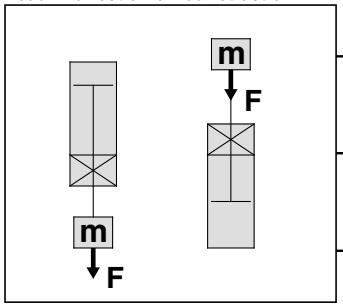
Load condition | Operating pressure

Direction of load at right angle to rod
(∗ Being held by a guide)



- from 0.3MPa → Graph 2
- from 0.4MPa → Graph 3
- from 0.5MPa → Graph 4

Load in direction of rod extension
Load in direction of rod retraction

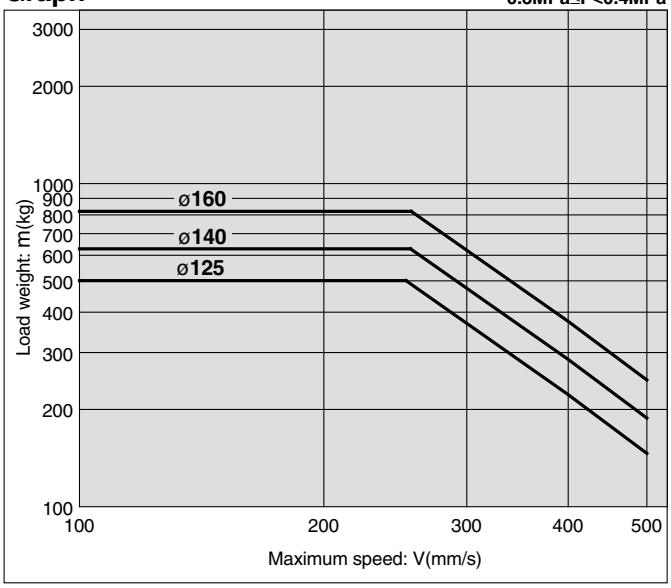


- from 0.3MPa → Graph 5
- from 0.4MPa → Graph 6
- from 0.5MPa → Graph 7

Selection Graphs

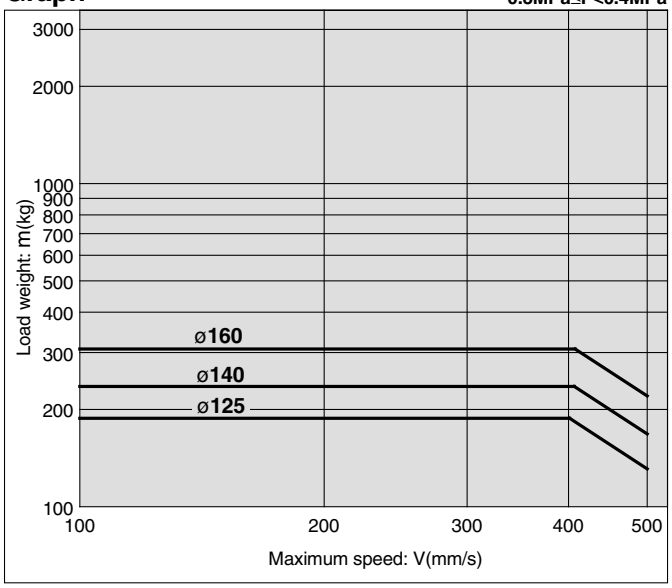
Graph 2

0.3MPa≤P<0.4MPa



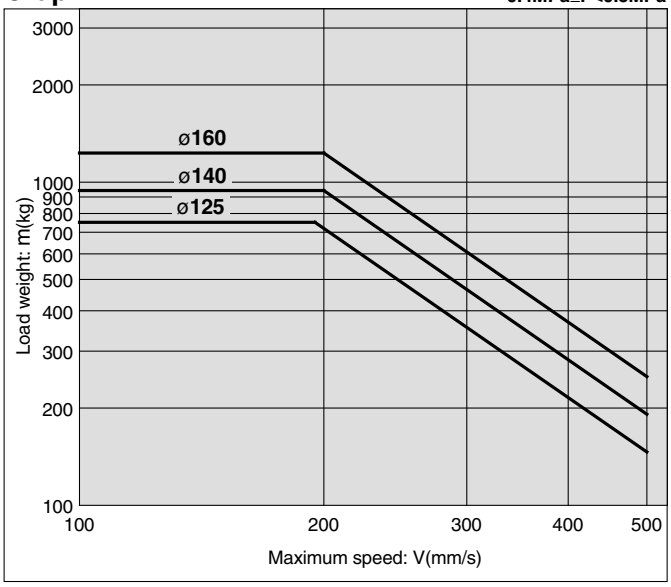
Graph 5

0.3MPa≤P<0.4MPa



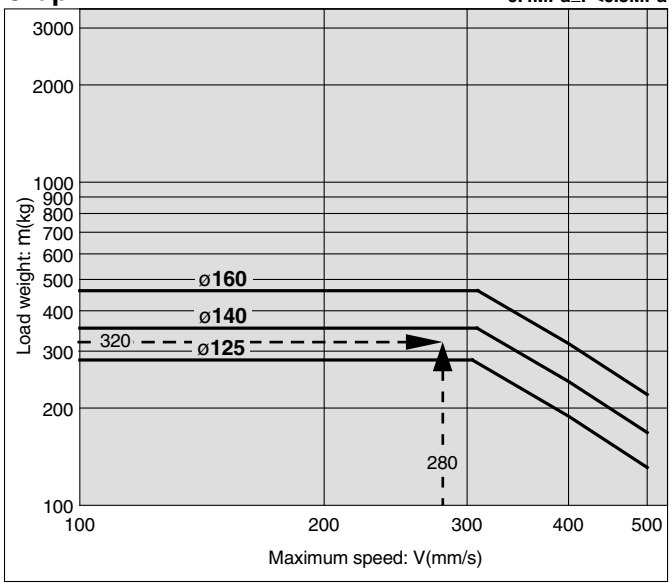
Graph 3

0.4MPa≤P<0.5MPa



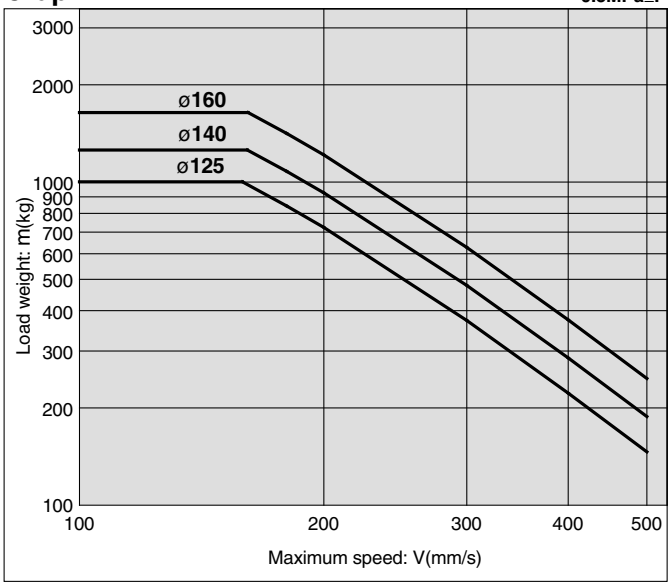
Graph 6

0.4MPa≤P<0.5MPa



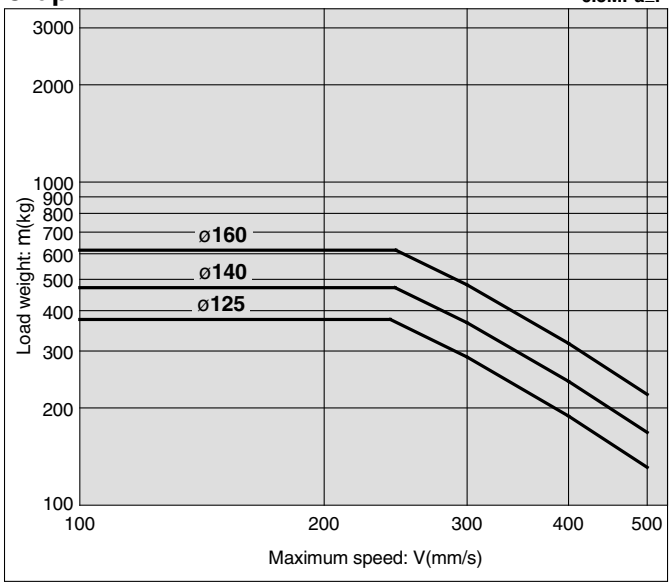
Graph 4

0.5MPa≤P



Graph 7

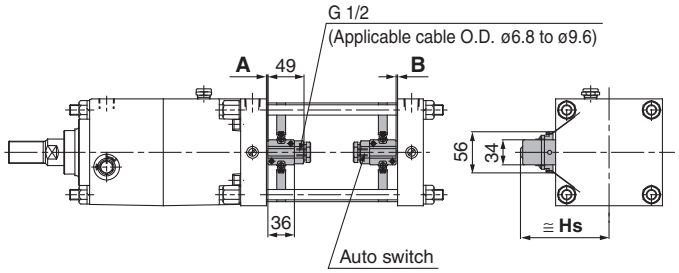
0.5MPa≤P



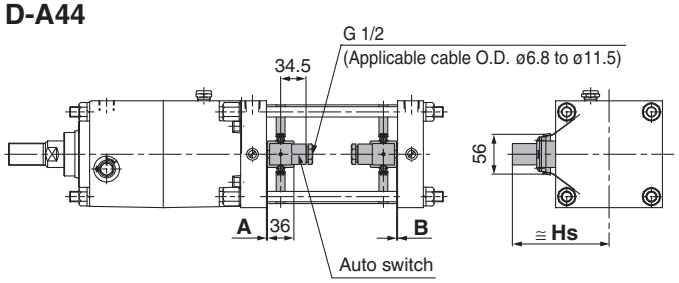
Auto Switch Mounting 1

Auto Switch Proper Mounting Position (Detection at Stroke End) and Its Mounting Height

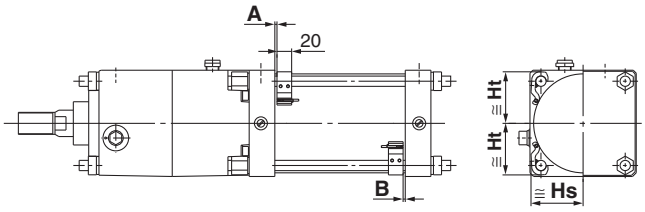
<Band mounting style>
D-A3□
D-G39/K39



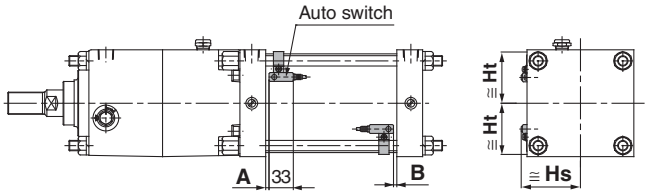
D-A44



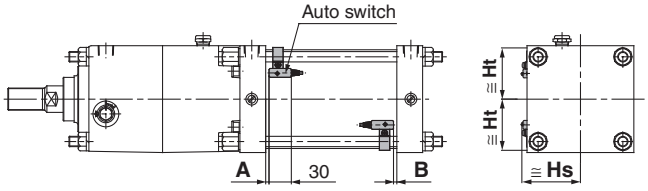
<Tie-rod mounting style>
D-A9□/A9□V **D-Z7□/Z80**
D-M9□/M9□V **D-Y59□/Y69□/Y7P/Y7PV**
D-M9□W/M9□WV **D-Y7□W/Y7□WV**
D-M9□A/M9□AV **D-Y7BA**



D-A5□/A6□



D-F5□/J5□/D-F5NTL
D-F5BA/F59F
D-F5□W/J59W



Auto Switch Proper Mounting Position

(mm)

Auto switch model / Bore size (mm)	D-A9□ D-A9□V		D-M9□ D-M9□V D-M9□W D-M9□WV D-M9□A D-M9□AV		D-Z7□/Z80 D-Y5□/Y6□ D-Y7P/Y7PV D-Y7□W D-Y7□WV D-Y7BA		D-A5□ D-A6□ D-A3□ D-A44 D-G39 D-K39		D-A59W		D-F5□W D-J59W D-F5BA D-F5□ D-J5□ D-F59F		D-F5NT	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B
125	4	4	8	8	1.5	1.5	0	0	2	2	4.5	4.5	9.5	9.5
140	4	4	8	8	1.5	1.5	0	0	2	2	4.5	4.5	9.5	9.5
160	4	4	8	8	1.5	1.5	0	0	2	2	4.5	4.5	9.5	9.5

∗ The above shown are the proper auto switch mounting positions for detection at stroke end.
Adjust the auto switch after confirming the operating conditions in the actual setting.

Auto Switch Mounting Height

(mm)

Auto switch model / Bore size (mm)	D-A9□ D-A9□V D-M9□ D-M9□W D-M9□A		D-M9□V D-M9□WV D-M9□AV		D-Z7□/Z80 D-Y5□/Y6□ D-Y7P D-Y7PV D-Y7□W D-Y7□WV D-Y7BA		D-A3□ D-G39 D-K39	D-A44	D-A5□ D-A6□ D-A59W		D-F5□ D-J5□ D-F5□W D-J59W D-F5BA D-F59F D-F5NT	
	Hs	Ht	Hs	Ht	Hs	Ht	Hs	Hs	Hs	Ht	Hs	Ht
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

Auto Switch Mounting 2

Minimum Stroke for Auto Switch Mounting

n: Number of auto switch [mm]

Auto switch model	No. of auto switches mounted		Mounting brackets other than centre trunnion	Centre trunnion ø125	Centre trunnion ø140	Centre trunnion ø160
D-A9□	2 (Different surfaces, Same surface)	1	15	100	105	110
	n		$15 + 40\frac{(n-2)}{2}$ (n = 2, 4, 6, 8 ···) Note 1)	$100 + 40\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$105 + 40\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$110 + 40\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)
D-A9□V	2 (Different surfaces, Same surface)	1	10	75	80	85
	n		$10 + 30\frac{(n-2)}{2}$ (n = 2, 4, 6, 8 ···) Note 1)	$75 + 30\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$80 + 30\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$85 + 30\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)
D-M9□ D-M9□W	2 (Different surfaces, Same surface)	1	15	105	110	115
	n		$15 + 40\frac{(n-2)}{2}$ (n = 2, 4, 6, 8 ···) Note 1)	$105 + 40\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$110 + 40\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$115 + 40\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)
D-M9□V D-M9□WV	2 (Different surfaces, Same surface)	1	10	80	85	90
	n		$10 + 30\frac{(n-2)}{2}$ (n = 2, 4, 6, 8 ···) Note 1)	$80 + 30\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$85 + 30\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$90 + 30\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)
D-M9□A	2 (Different surfaces, Same surface)	1	20	115	120	
	n		$20 + 40\frac{(n-2)}{2}$ (n = 2, 4, 6, 8 ···) Note 1)	$115 + 40\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$120 + 40\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	
D-M9□AV	2 (Different surfaces, Same surface)	1	15	90	95	
	n		$15 + 30\frac{(n-2)}{2}$ (n = 2, 4, 6, 8 ···) Note 1)	$90 + 30\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$95 + 30\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	
D-A5/A6 D-A59W D-F5□/J5□ D-F5□W D-J59W D-F5BA D-F59F	2 (Different surfaces, Same surface)	1	25	125	135	
	n (stesso lato)		$25 + 55\frac{(n-2)}{2}$ (n = 2, 4, 6, 8 ···) Note 1)	$125 + 55\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$135 + 55\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	
D-F5NT	2 (Different surfaces, Same surface)	1	35	145	155	
	n (Same surface)		$35 + 55\frac{(n-2)}{2}$ (n = 2, 4, 6, 8 ···) Note 1)	$145 + 55\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$155 + 55\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	
D-A3□ D-G39 D-K39	2	Different surfaces	35	110		
		Same surface	100			
	n	Different surfaces	35 + 30 (n – 2) (n = 2, 3, 4, 5 ···)	110 + 30 (n – 2) (n = 2, 4, 6, 8 ···) Note 1)		
		Same surface	100 + 100 (n – 2) (n = 2, 3, 4, 5 ···)	110 + 100 (n – 2) (n = 2, 4, 6, 8 ···) Note 1)		
	1		15	110		
D-A44	2	Different surfaces	35	110		
		Same surface	55			
	n	Different surfaces	35 + 30 (n – 2) (n = 2, 3, 4, 5 ···)	110 + 30 (n – 2) (n = 2, 4, 6, 8 ···) Note 1)		
		Same surface	55 + 55 (n – 2) (n = 2, 3, 4, 5 ···)	110 + 50 (n – 2) (n = 2, 4, 6, 8 ···) Note 1)		
	1		15	110		
D-Z7□ D-Z80 D-Y59□ D-Y7P D-Y7□W	2 (Different surfaces, Same surface)	1	15	105	110	115
	n		$15 + 40\frac{(n-2)}{2}$ (n = 2, 4, 6, 8 ···) Note 1)	$105 + 40\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$110 + 40\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$115 + 40\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)
D-Y69□ D-Y7PV D-Y7□WV	2 (Different surfaces, Same surface)	1	10	90	95	100
	n		$10 + 30\frac{(n-2)}{2}$ (n = 2, 4, 6, 8 ···) Note 1)	$90 + 30\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$95 + 30\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$100 + 30\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)
D-Y7BA	2 (Different surfaces, Same surface)	1	20	115	120	125
	n		$20 + 45\frac{(n-2)}{2}$ (n = 2, 4, 6, 8 ···) Note 1)	$115 + 45\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$120 + 45\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)	$125 + 45\frac{(n-4)}{2}$ (n = 4, 8, 12, 16 ···) Note 2)

Note 1) When "n" is an odd number, an even number that is one larger than this odd number is used for the calculation.

Note 2) When "n" is an odd number, a multiple of 4 that is larger than this odd number is used for the calculation.

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□A/M9□AV**	7	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-Y7BA**	12	13	7
D-F59F/F5□/J5□ **D-F5□W/J59W** **D-F5BA/F5NT**	5	5	5.5
D-G39/K39	11	11	10

∗ Since the operating range is provided as a guideline including hysteresis, it cannot be guaranteed (assuming approximately ±30% dispersion). It may 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□A/M9□AV**	BS5-125	BS5-125	BS5-160
D-A5/A6/A59W **D-F5□/J5□/F5NT** **D-F5□W/J59W** **D-F5BA/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-Y7BA**	BS4-125	BS4-125	BS4-160

[Mounting screw set made of stainless steel]

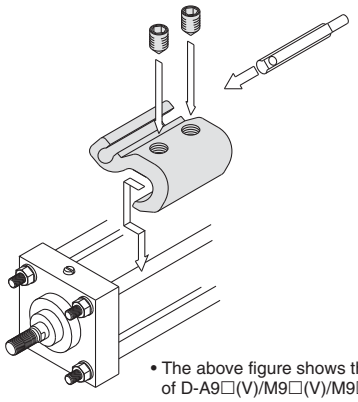
The following set of mounting screws made of stainless steel (including nuts) is available. Use it in accordance with the operating environment. (Please order the auto switch mounting bracket separately, since it is not included.)

BBA1: For D-A5/A6/F5/J5 types

D-F5BA auto switch is set on the cylinder with the stainless steel screws above when shipped. When an auto switch is shipped independently, BBA1 is attached.

Note 1) Refer to page 1997 for the details of BBA1.

Note 2) When using D-M9□A(V)/Y7BA, do not use the steel set screws which is included with the auto switch mounting brackets above (BS5-□□□, BS4-□□□). Order a stainless steel screw set (BBA1) separately, and select and use the M4 x 8L stainless steel set screws included in the BBA1.



• The above figure shows the mounting example of D-A9□(V)/M9□(V)/M9□W(V)/ M9□A(V).

Other than the applicable auto switches listed in “How to Order”, the following auto switches can be mounted.

Auto switch type	Model	Electrical entry (Fetching direction)	Features
Reed	D-A90V	Grommet (Perpendicular)	Without indicator light
	D-A93V, A96V	Grommet (In-line)	—
	D-Z73, Z76		
	D-A53, A56		
	D-A64, A67		Without indicator light
	D-Z80		
Solid state	D-M9NV, M9PV, M9BV	Grommet (Perpendicular)	—
	D-Y69A, Y69B, Y7PV		
	D-M9NWV, M9PWV, M9BWV		2-color indication
	D-Y7NWV, Y7PWV, Y7BWV		
	D-M9NAV, M9PAV, M9BAV		Water resistant (2-color indication)
	D-F59, F5P, J59	Grommet (In-line)	—
	D-Y59A, Y59B, Y7P		
	D-F59W, F5PW, J59W		2-color indication
	D-Y7NW, Y7PW, Y7BW		
	D-F5BA, Y7BA		Water resistant (2-color indication)
	D-F5NT		With timer

∗ With pre-wired connector is available for solid state auto switches.

∗ Normally closed (NC = b contact), solid state auto switch (D-F9G/F9H/Y7G/Y7H types) are also available.

Simple Specials:
-XA0 to XA30: Change of Rod End Shape

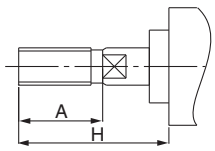
These changes are dealt with Simple Specials System.

Series		Action	Symbol for change of rod end shape
CN	Cylinder with lock	Double acting, Single rod	XA0 to 30

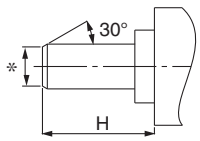
⚠ Precautions

1. SMC will make appropriate arrangements if no dimension, tolerance, or finish instructions are given in the diagram.
2. Standard dimensions marked with "∗" will be as follows to the rod diameter (D). Enter any special dimension you desire.
D ≤ 6→D – 1 mm, 6 < D ≤ 25 → D – 2 mm, D > 25 → D – 4 mm
3. In the case of double rod type and single acting retraction type, enter the dimensions when the rod is retracted.

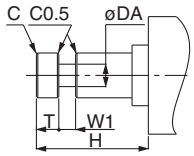
Symbol: **A0**



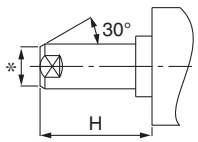
Symbol: **A1**



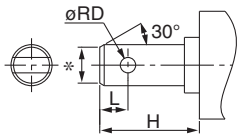
Symbol: **A2**



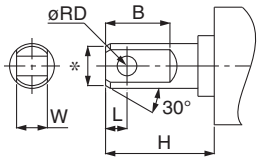
Symbol: **A3**



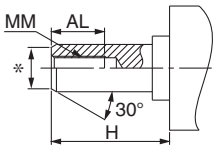
Symbol: **A4**



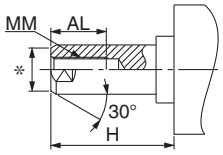
Symbol: **A5**



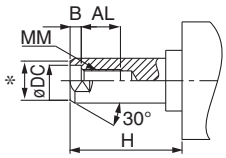
Symbol: **A6**



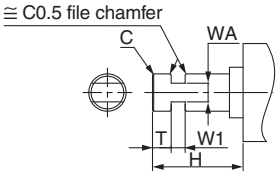
Symbol: **A7**



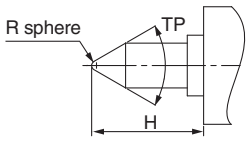
Symbol: **A8**



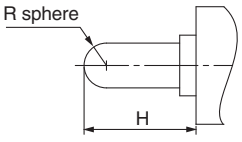
Symbol: **A9**



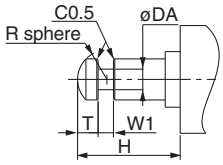
Symbol: **A10**



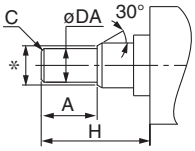
Symbol: **A11**



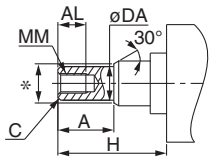
Symbol: **A12**



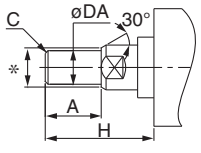
Symbol: **A13**



Symbol: **A14**



Symbol: **A15**



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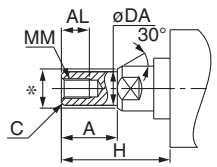

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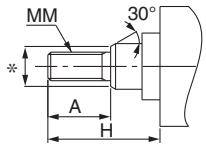

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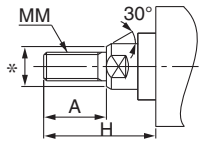

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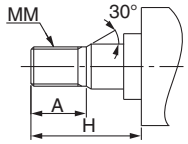

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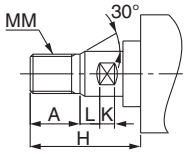

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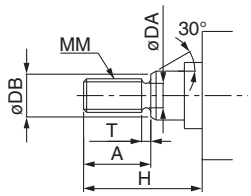

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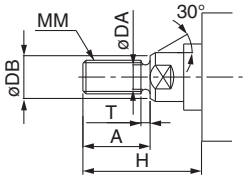

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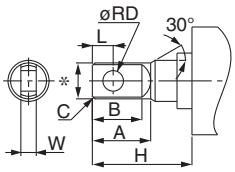

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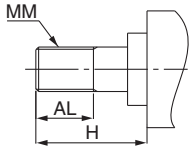

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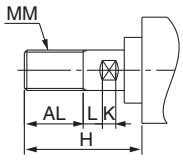

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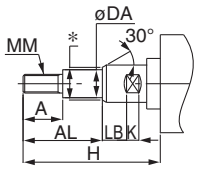

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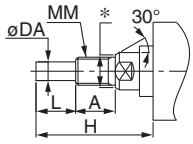

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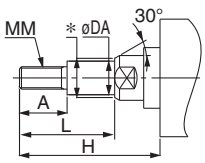

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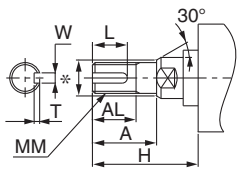

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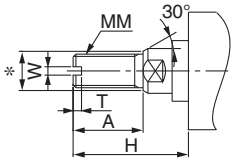


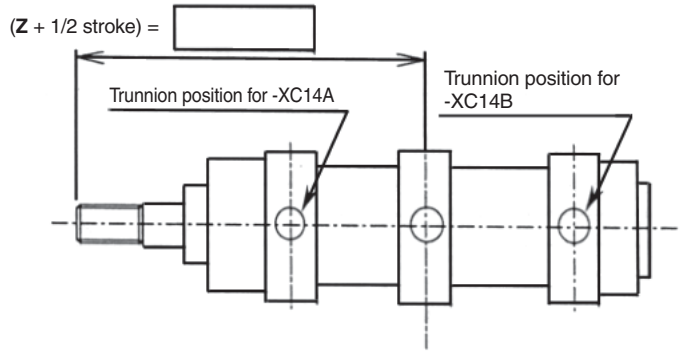
Simple Specials:
-XC14: Change of Trunnion Bracket Mounting Position

These changes are dealt with Simple Specials System.

7 Change of Trunnion Bracket Mounting Position

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

Series	Description	Model	Action
CNS	Cylinder with lock	**CNS**	Double acting, Single rod



⚠ Precautions

1. Specify "Z + 1/2 stroke" in the case the trunnion bracket position is not -XC14A, B or trunnion is not a centre trunnion.
2. SMC will make appropriate arrangements if no dimension, tolerance, or finish instructions are given in the diagram.
3. The possible range of trunnion bracket mounting position is indicated in the table below.
4. Some trunnion mounting positions do not allow auto switch mounting. Please consult with SMC for more information.

Symbol
-XC14

Series CNS

(mm)

Symbol / Bore size [mm]	**Z** + 1/2 stroke Without rod boot					
	For -XC14A	**For -XC14B**	**For -XC14** Minimum	**For -XC14** Maximum	Reference Standard (Centre trunnion)	Minimum stroke
125	375	353 + stroke	375.5	352.5 + stroke	364 + 0.5 stroke	25
140	417.5	390.5 + stroke	418	390 + stroke	404 + 0.5 stroke	30
160	479	447 + stroke	479.5	446.5 + stroke	463 + 0.5 stroke	35
Symbol / Bore size [mm]	**Z** + ℓ + 1/2 stroke With rod boot					
	For -XC14A	**For -XC14B**	**For -XC14** Minimum	**For -XC14** Maximum	Reference Standard (Centre trunnion)	Minimum stroke
125	398 + ℓ	376 + ℓ + stroke	398.5 + ℓ	375.5+ℓ + stroke	387 + ℓ + 1/2 stroke	30
140	440.5 + ℓ	413.5 + ℓ + stroke	441 + ℓ	413+ℓ + stroke	427 + ℓ + 1/2 stroke	30
160	500 + ℓ	468 + ℓ + stroke	500.5 + ℓ	467.5+ℓ + stroke	484 + ℓ + 1/2 stroke	35

Series CNS
Specific Product Precautions 1

Be sure to read before handling.

Design of Equipment & Machinery

⚠Warning

1. Construct so that the human body will not come into direct contact with driven objects or the moving parts of locking cylinders.

Devise a safe structure by attaching protective covers that prevent direct contact with the human body, or in cases where there is a danger of contact, provide sensors or other devices to perform an emergency stop, etc. before contact occurs.

2. Use a balance circuit, taking cylinder lurching into consideration.

In cases such as an intermediate stop, where a lock is operated at a desired position within the stroke and air pressure is applied from only one side of the cylinder, the piston will lurch at high speed when the lock is released. In such situations, there is a danger of causing human injury by having hands or feet, etc. caught, and also a danger of causing damage to the equipment. In order to prevent this lurching, a balance circuit such as the recommended air pressure circuits (p. 3.6-26) should be used.

Selection

⚠Warning

1. When in a locked condition, do not apply a load accompanied by an impact shock, strong vibration or turning force, etc.

Use caution, because an external action such as an impacting load, strong vibration or turning force, may damage the locking mechanism or reduce its life.

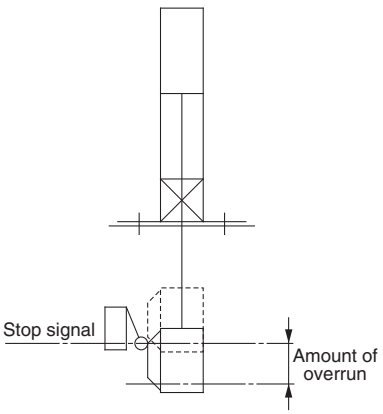
2. Consider stopping accuracy and the amount of overrun when an intermediate stop is performed.

Due to the nature of a mechanical lock, there is a momentary lag with respect to the stop signal, and a time delay occurs before stopping. The cylinder stroke resulting from this delay is the overrun amount. The difference between the maximum and minimum overrun amounts is the stopping accuracy.

- Place a limit switch before the desired stopping position, at a distance equal to the overrun amount.
- The limit switch must have a detection length (dog length) of the overrun amount + α.
- SMC's auto switches have operating ranges from 8 to 14mm (depending on the switch model).

  When the overrun amount exceeds this range, self-holding of the contact should be performed at the switch load side.

∗ Refer to page 3.6-5 regarding stopping accuracy.



Selection

⚠Warning

3. In order to further improve stopping accuracy, the time from the stop signal to the operation of the lock should be shortened as much as possible.

To accomplish this, use a device such as a highly responsive electric control circuit or solenoid valve driven by direct current, and place the solenoid valve as close as possible to the cylinder.

4. Note that stopping accuracy will be influenced by changes in piston speed.

When piston speed changes during the course of the cylinder stroke due to variations in the load or disturbances, etc., the dispersion of stopping positions will increase. Therefore, consideration should be given to establishing a standard speed for the piston just before it reaches the stopping position.

Moreover, the dispersion of stopping positions will increase during the cushioned portion of the stroke and during the accelerating portion of the stroke after the start of operation, due to the large changes in piston speed.

5. The holding force (max. static load) indicates the maximum capability to hold a static load without loads, vibration and impact. This does not indicate a load that can be held in ordinary conditions.

Select the most suitable bore sizes for the operating conditions in accordance with the selection procedures. The Model Selection (pages 3.6-17 and 3.6-18) is based on use at the intermediate stop (including emergency stops during the operation). However, when the cylinder is in a locked state, kinetic energy does not act upon it. Under these conditions, use the load mass at the maximum speed (V) of 100 mm/s shown in the graphs 5 to 7 on page 3.6-18 depending on the operating pressure and select models.

Mounting

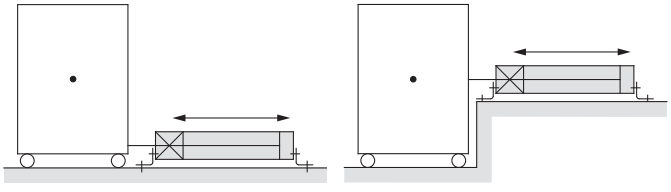
⚠Warning

1. Be certain to connect the rod end to the load with the lock released.

- If connected when in the locked condition, a load greater than the turning force or holding force may operate on the piston rod and cause damage to the lock mechanism. The CNS series is equipped with an emergency unlocking mechanism, however, when connecting the rod end to the load this should be done with the lock released by simply connecting an air line to the unlocking port and supplying air pressure of 0.25MPa or more.

2. Do not apply an offset load to the piston rod.

Particular care should be taken to match the load's centre of gravity with the centre of the cylinder shaft. When there is a large discrepancy, the piston rod may be subjected to uneven wear or damage due to the inertial moment during locking stops.



X Load centre of gravity and cylinder shaft centre are not matched.

○ Load centre of gravity and cylinder shaft centre are matched.

Note) Can be used if all of the generated moment is absorbed by an effective guide.

Series CNS
Specific Product Precautions 2

Be sure to read before handling.

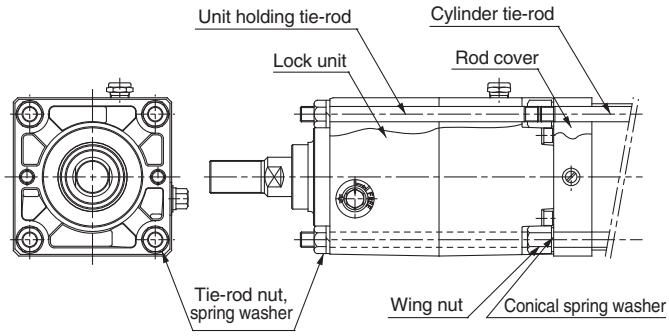
Mounting

⚠Caution

1. Precautions when using the base unit and when changing bracket positions, etc.

The lock unit and cylinder rod cover are assembled as shown in the drawing below. For this reason, it cannot be installed as in the case of common air cylinders, by using the basic type and screwing the cylinder tie-rods directly into machinery.

Furthermore, when brackets are replaced, the unit holding tie-rods may become loose and they should be retightened.



Bore size [mm]	Tie-rod nut	Width across flats	Socket
125 **140**	JIS B1181 Class 2 M14 x 1.5	22	JIS B4636 12 point socket 22
160	JIS B1181 Class 2 M16 x 1.5	24	JIS B4636 12 point socket 24

Adjustment

⚠Caution

1. Adjust the cylinder's air balance.

Balance the load by adjusting the air pressure in the front and rear sides of the cylinder with the load connected to the cylinder and the lock released. Lurching of the cylinder when unlocked can be prevented by carefully adjusting this air balance.

2. Adjust the mounting positions of the detectors on auto switches, etc.

When intermediate stops are to be performed, adjust the mounting positions of detectors on auto switches, etc., taking into consideration the overrun amount with respect to the desired stopping positions.

3. Do not open the cushion valve excessively.

If the cushion valve is rotated excessively in the opening direction (counterclockwise), it could be damaged. Be aware that the valve could slip out, or the threads becomes too short.

Air Pressure Circuits

⚠Warning

1. Be certain to use an air pressure circuit which will apply balancing pressure to both sides of the piston when in a locked stop.

In order to prevent cylinder lurching after a locked stop, when restarting or when manually unlocking, a circuit should be used which will apply balancing pressure to both sides of the piston, thereby canceling the force generated by the load in the direction of piston movement.

Air Pressure Circuits

⚠Warning

2. The effective area of the lock release solenoid valve should be at least 50% of the effective area of the cylinder driving solenoid valve, and it should be installed as close to the cylinder as possible so that it is closer than the cylinder driving solenoid valve.

If the effective area of the lock release solenoid valve is small or if it is installed at a distance from the cylinder, the time required for exhausting air for releasing the lock will be longer, which may cause a delay in the locking operation.

The delay in the locking operation may result in problems such as increase of overrunning when performing intermediate stop or emergency stop during operation, or if maintaining position from the operation stop state such as drop prevention, workpieces may be dropped depending on the timing of the load action to the operation delay of the lock.

3. Avoid backflow of the exhaust pressure when there is a possibility of interference of exhaust air, for example for a common exhaust type valve manifold.

The lock may not operate properly when the exhaust air pressure backflows due to interference of the exhaust air when exhausting air for lock release. It is recommended to use an individual exhaust type manifold or individual valves.

4. Allow at least 0.5 seconds from a locked stop (intermediate stop of the cylinder) until release of the lock.

When the locked stop time is too short, the piston rod (and load) may lurch at a speed greater than the control speed of the speed controller.

5. When restarting, control the switching signal for the unlocking solenoid valve so that it acts before or at the same time as the cylinder drive solenoid valve.

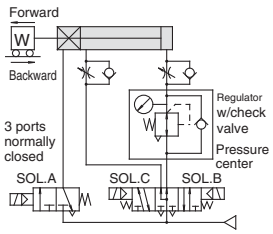
If the signal is delayed, the piston rod (and load) may lurch at a speed greater than the control speed of the speed controller.

6. Carefully check for dew condensation due to repeated air supply and exhaust of the locking solenoid valve.

The operating stroke of the lock part is very small. So, if the piping is long and the air supply and exhaust are repeated, the dew condensation caused by the adiabatic expansion accumulates in the lock part. This may corrode internal parts, causing air leak or lock release fault.

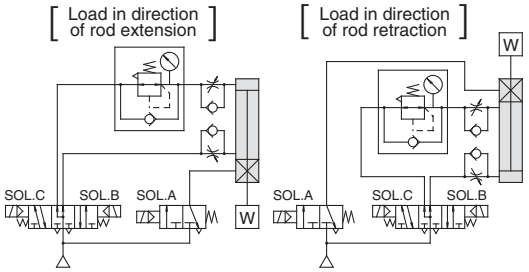
7. Basic circuits.

1. [Horizontal]



SOL.A	SOL.B	SOL.C	Action	
ON	ON	OFF	Forward	
OFF	OFF	OFF	Locked stop	0.5s or more
ON	OFF	OFF	Unlocked	0 to 0.5s
ON	ON	OFF	Forward	
ON	OFF	ON	Backward	
OFF	OFF	OFF	Locked stop	0.5s or more
ON	OFF	OFF	Unlocked	0 to 0.5s
ON	OFF	ON	Backward	

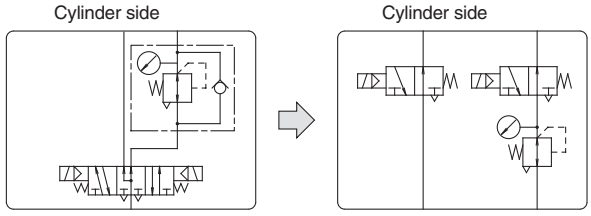
2. [Vertical]



Air Pressure Circuit

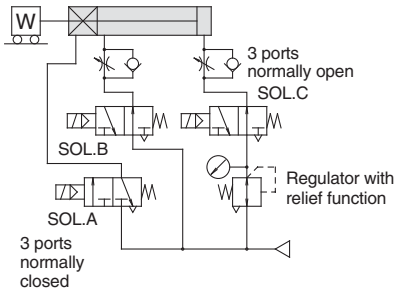
⚠Caution

1. A 3 position pressure center solenoid valve and regulator with check valve can be replaced with two 3 port normally open valves and a regulator with relief function.



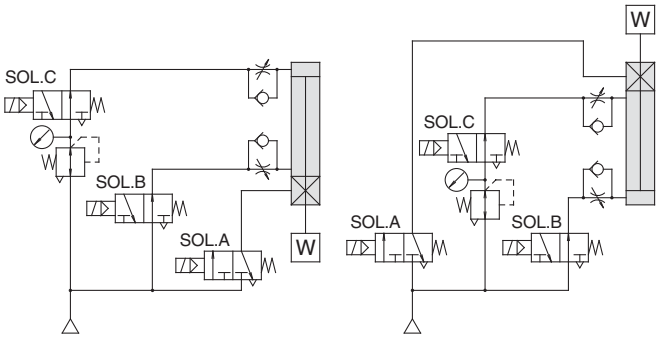
[Example]

1. [Horizontal]



2. [Vertical]

[Load in direction of rod extension] [Load in direction of rod retraction]



Manual Unlocking

⚠Warning

1. Never operate the unlocking cam until safety has been confirmed. (Do not turn to the FREE side.)

- When unlocking is performed with air pressure applied to only one side of the cylinder, the moving parts of the cylinder will lurch at high speed causing a serious hazard.
- When unlocking is performed, be sure to confirm that personnel are not within the load movement range and that no other problems will occur if the load moves.

2. Before operating the unlocking cam, exhaust any residual pressure which is in the system.

Manual Unlocking

⚠Warning

3. Take measures to prevent the load from dropping when unlocking is performed.

- Perform work with the load in its lowest position.
- Use supports, etc. to prevent the load from dropping.
- Confirm that balanced pressure is applied to both sides of the piston.

⚠Caution

1. The unlocking cam is an emergency unlocking mechanism only. During an emergency when the air supply is stopped or cut off, this is used to alleviate a problem by forcibly pushing back the release piston and brake spring to release the lock.

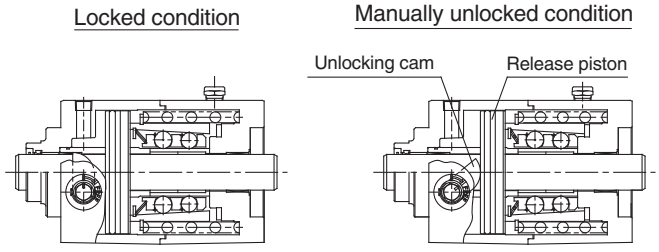
2. When installing the cylinder into equipment or performing adjustments, etc., be sure to apply air pressure of 0.25MPa or more to the unlocking port, and do not perform work using the unlocking cam.

3. When releasing the lock with the unlocking cam, it must be noted that the sliding resistance of the cylinder will be high, unlike normal unlocking with air pressure.

Bore size [mm]	Cylinder sliding resistance [N]	Cam unlocking torque (standard) N·m	Width across flats [mm]	Socket
125	961	68.6	16	JISB4636 12 point socket 16
140	1216	78.4	18	JISB4636 12 point socket 18
160	1579	156.8	21	JISB4636 12 point socket 21

4. Do not turn the unlocking cam (the arrow or mark on the unlocking cam head) past the position marked FREE. If it is turned too far, there is a danger of damaging the unlocking cam.

5. For safety reasons, the unlocking cam is constructed so that it cannot be fixed in the unlocked condition.



[Principle]
If the unlocking cam is turned clockwise with an adjustable angle wrench or socket wrench, etc., the release piston is pushed back and the lock is released.
Since the lever will return to its original position and become locked again when it is released, it should be held in this position for as long as unlocking is required.

Specific Product Precautions 4

Be sure to read before handling.

Maintenance

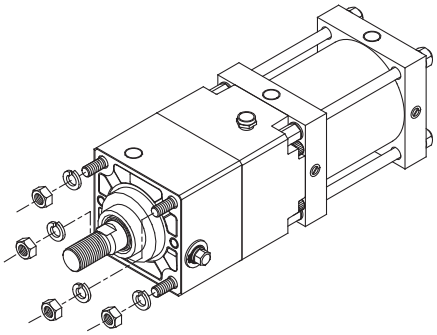
⚠Caution

1. The lock units for the CNS series are replaceable.
   To order replacement lock units for the CNS series, use the order numbers given in the table below.

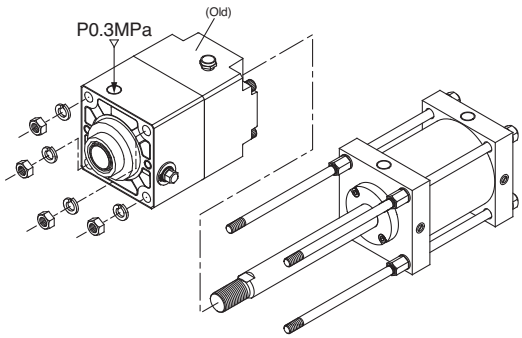
Bore size (mm)	Lock unit order number
125	CNS125D-UA
140	CNS140D-UA
160	CNS160D-UA

2. Replacement of lock units.
   1) Loosen the tie-rod nuts (4 pcs.) on the front side of the cylinder using a socket wrench. Refer to the table below for the applicable socket.

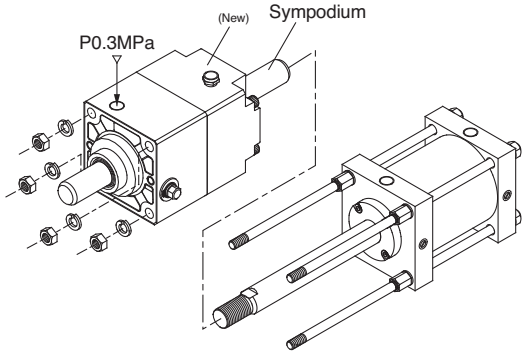
Bore size (mm)	Nut	Width across flats	Socket
125,140	JIS B1181 Class 2 M14 x 1.5	22	JIS B4636 12 point socket 22
160	JIS B1181 Class 2 M16 x 1.5	24	JIS B4636 12 point socket 24



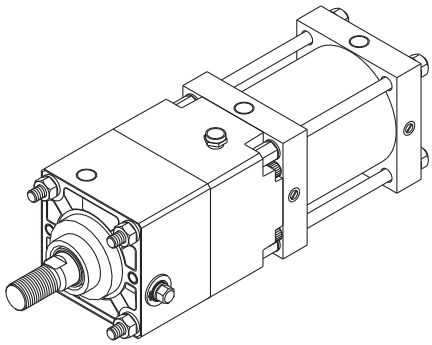
2) Apply compressed air of 0.3MPa or more to the unlocking port, and remove the lock unit.



3) Similarly, apply compressed air of 0.3MPa or more to the unlocking port of the new lock unit, and replace the sympodium with the cylinder piston rod.



4) Tighten the tie-rod nuts (4 pcs.) on the front side of the cylinder using a socket wrench.



⚠Warning

Never disassemble a CNS series lock unit.

1) Since a heavy duty spring is contained in the unit, there is a serious hazard, such as the possibility of parts being ejected, if disassembly is performed incorrectly. Therefore, do not loosen or remove the hexagon socket head cap screws which secure cover A and cover B.
2) Be sure to contact SMC regarding disassembly or repair, etc.