Cylinder with Lock

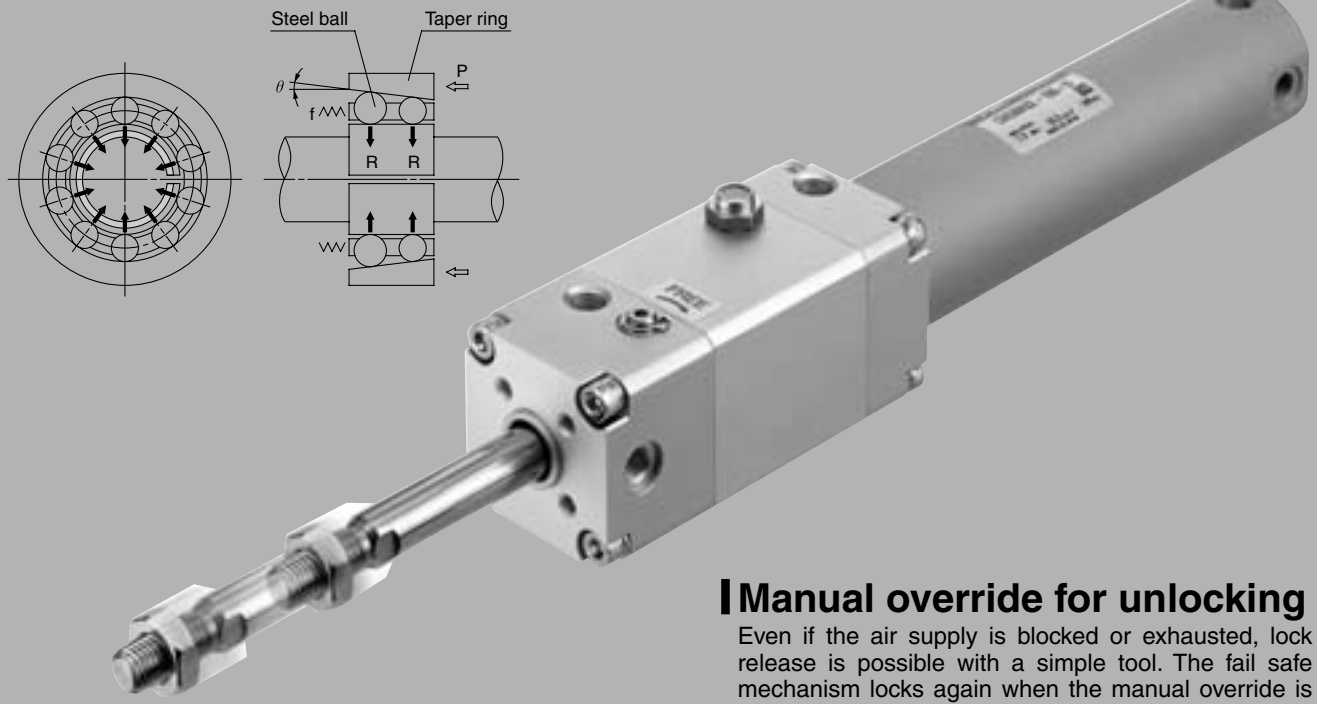
Series CNG

ø20, ø25, ø32, ø40

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

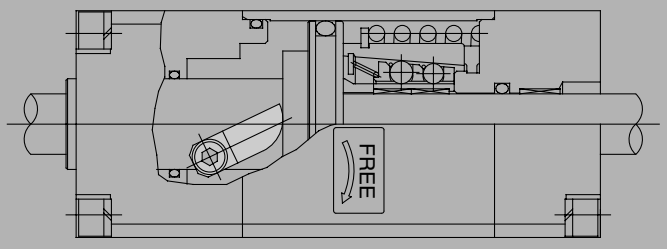
Simple construction

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



Manual override for unlocking

Even if the air supply is blocked or exhausted, lock release is possible with a simple tool. The fail safe mechanism locks again when the manual override is released.



High 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. (Unlocking pressure of 0.25 MPa ····· 0.05 MPa lower than conventional SMC products) In addition, both alignability and stable locking force with respect to piston rod eccentricity are obtained by allowing the taper ring to float.

High reliability and stable holding force

Outstanding durability and stable holding force are maintained by the use of a brake shoe having superior wear resistance, which has also been substantially lengthened (double the conventional SMC product).

Design minimizes the influences of unlocking air quality

A construction which is strong against moisture and drainage in the compressed air has been realized by separating the locking mechanism and the unlocking chamber.

Can be locked in both directions

Holding force is equal on either extend or retract.

Series Variations

Series	Action	Cushion type: Rubber bumper	Cushion type: Air cushion	With rod boot	Bore size (mm)	Lock holding force (N)	Stroke (mm)
Cylinder with lock Series CNG	Double acting, Single rod	●	●	●	**20**	215	Max. Up to 1500
					25	335	
					32	550	
					40	860	

Series CNG
Model Selection

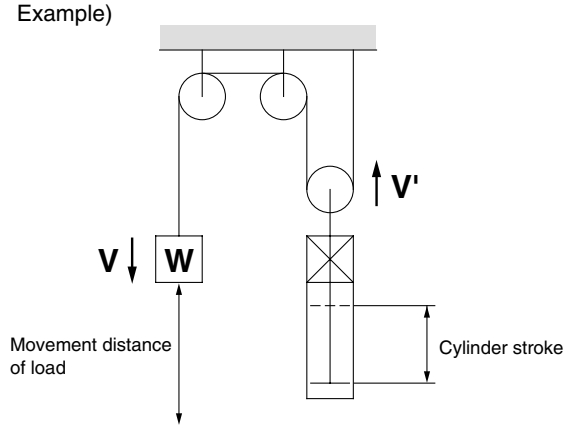
Precautions on Model Selection

⚠ 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)



3. The following selection example and procedures are based on use at the intermediate stop (including emergency stops during 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 graphs (5) to (7) depending on the operating pressure and select models.

Selection Example

- Load mass: **m** = 12 kg
- Movement distance: **st** = 200 mm
- Movement time: **t** = 0.8 s
- Load condition: Vertical downward = Load in direction of rod extension
- Operating pressure: **P** = 0.4 MPa

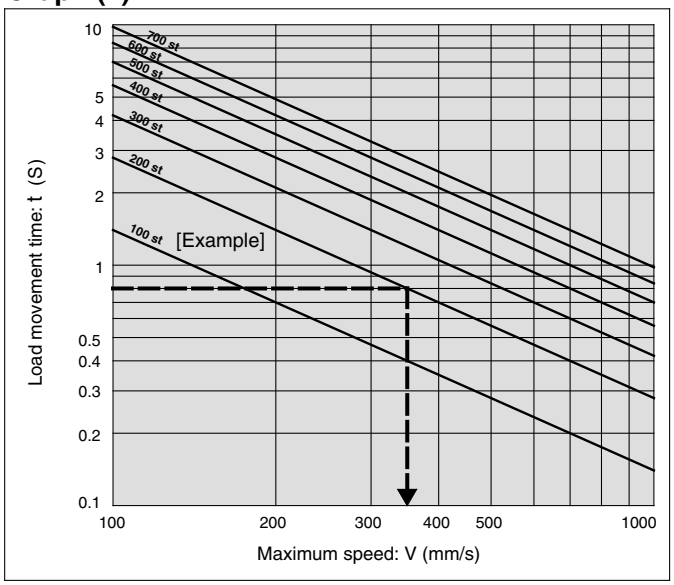
Step (1): From graph (1) find the maximum movement speed of the load.
∴Maximum speed V ≅ 350 mm/s

Step (2): Select graph (6) based upon the load condition and operating pressure, and then from the intersection of the maximum speed V = 350 mm/s found in Step (1), and the load mass m = 12 kg
∴ø32 → select a CNG32 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).

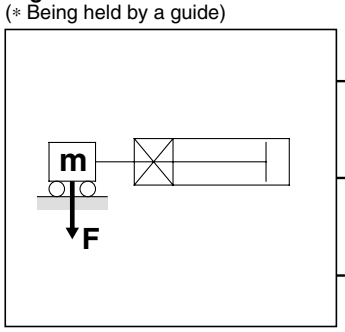
Graph (1)

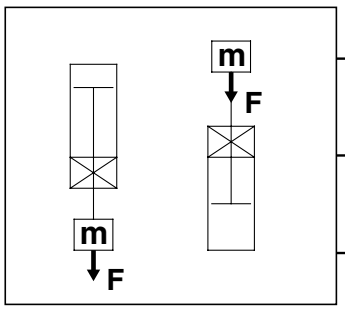


Step (2) Find the bore size.

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 mass. Select the bore size on the above the point of intersection.

Load Condition	Operating Pressure	
Load in the direction at the right angle to rod (∗ Being held by a guide)	**0.3 MPa ≤**	**Graph (2)**
	0.4 MPa ≤	**Graph (3)**
	0.5 MPa ≤	**Graph (4)**
Load in the direction of rod extension Load in the direction of rod retraction	**0.3 MPa ≤**	**Graph (5)**
	0.4 MPa ≤	**Graph (6)**
	0.5 MPa ≤	**Graph (7)**

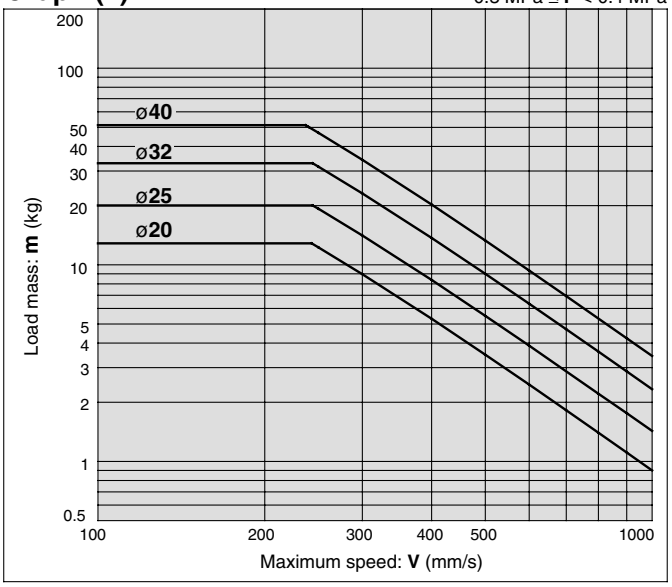




Selection Graph

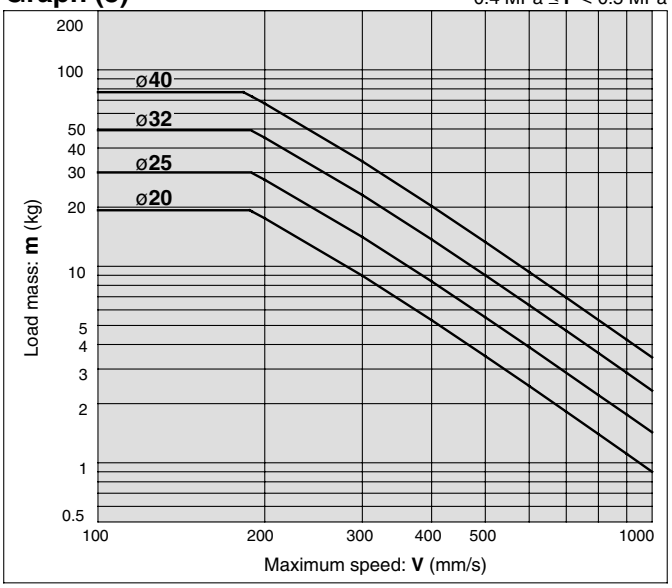
Graph (2)

0.3 MPa ≤ **P** < 0.4 MPa



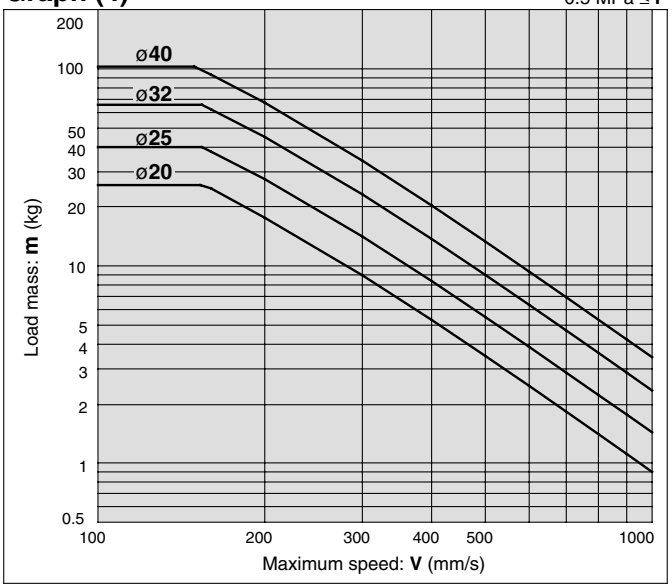
Graph (3)

0.4 MPa ≤ **P** < 0.5 MPa



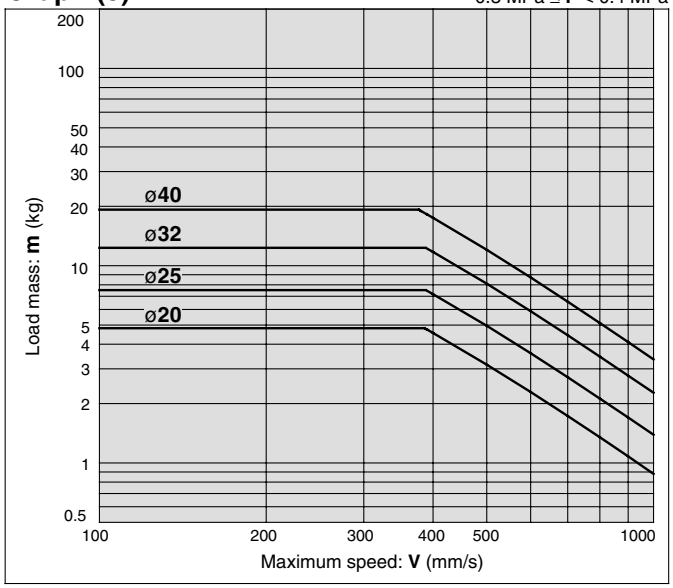
Graph (4)

0.5 MPa ≤ **P**



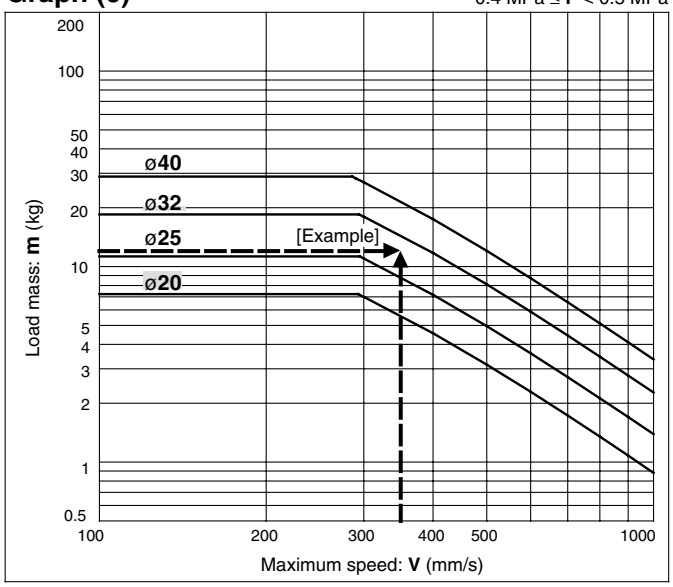
Graph (5)

0.3 MPa ≤ **P** < 0.4 MPa



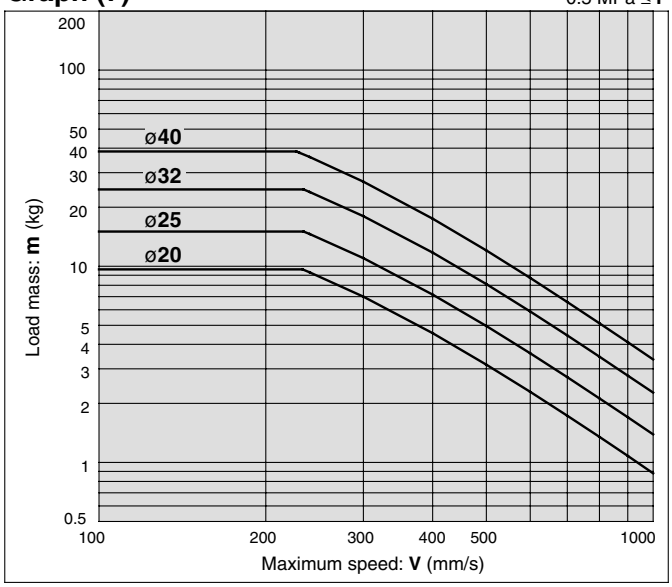
Graph (6)

0.4 MPa ≤ **P** < 0.5 MPa



Graph (7)

0.5 MPa ≤ **P**



Cylinder with Lock
Double Acting, Single Rod
Series CNG
ø20, ø25, ø32, ø40

How to Order

	CNG	L	N	32		–	100		–	D	–		
With auto switch	CDNG	L	N	32		–	100		–	D	–	M9BW		–	

With auto switch (Built-in magnet)

Mounting style

B	Basic style
L	Axial foot style
F	Rod side flange style
G	Head side flange style
U	Rod side trunnion style
T	Head side trunnion style
D	Clevis style

∗ Mounting brackets are shipped together, (but not assembled).

Cushion type

N	Rubber bumper
A	Air cushion

Bore size

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

Port thread type

Nil	Rc
TN	NPT

Auto switch

Nil	Without auto switch

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

Locking direction

D	Both directions

Cylinder suffix

Rod boot	Nil	None
	J	Nylon tarpaulin
	K	Heat resistant tarpaulin

∗ When equipped with rod boot, foot and rod side flange type brackets are attached before shipment.

Number of auto switches

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

Made to Order
Refer to page 673 for details.

Cylinder stroke (mm)
Refer to "Standard Stroke" on page 673.

Built-in Magnet Cylinder Model

If a built-in magnet cylinder without an auto switch is required, there is no need to enter the symbol for the auto switch.
(Example) CDNGLN40-100-D

Applicable Auto Switch/Refer to pages 1719 to 1827 for further information on auto switches.

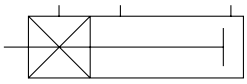
Type	Special function	Electrical entry	Indicator light	Wiring (Output)	Load voltage DC	Load voltage AC	Auto switch model	Lead wire length (m) 0.5 (Nil)	1 (M)	3 (L)	5 (Z)	None (N)	Pre-wired connector	Applicable load	
							Applicable bore size ø20 to ø40								
Solid state switch	—	Grommet	Yes	3-wire (NPN)	5 V, 12 V		M9N	●	●	●	○	—	○	IC circuit	Relay, PLC
				3-wire (PNP)			M9P	●	●	●	○	—	○		
				2-wire	12 V		M9B	●	●	●	○	—	○	—	
		Connector					H7C	●	—	●	●	●	—		
	Diagnostic indication (2-color indication)	Grommet		3-wire (NPN)	5 V, 12 V	—	M9NW	●	●	●	○	—	○	IC circuit	
				3-wire (PNP)			M9PW	●	●	●	○	—	○		
				2-wire	12 V		M9BW	●	●	●	○	—	○	—	
	Water resistant (2-color indication)						H7BA	—	—	●	○	—	○		
	With diagnostic output (2-color indication)			4-wire (NPN)	5 V, 12 V		H7NF	●	—	●	○	—	○	IC circuit	
Reed switch	—	Grommet	Yes	3-wire (NPN equivalent)	5 V	—	A96	●	—	●	—	—	—	IC circuit	Relay, PLC
			No	2-wire	24 V	100 V	A93	●	—	●	—	—	—	—	
						100 V or less	A90	●	—	●	—	—	—	IC circuit	
			Yes			100 V, 200 V	B54	●	—	●	●	—	—	—	
			No			200 V or less	B64	●	—	●	—	—	—		
		Connector	Yes			—	C 73C	●	—	●	●	●	—		
			No			24 V or less	C80C	●	—	●	●	●	—	IC circuit	
	Diagnostic indication (2-color indication)	Grommet	Yes		—	—	B59W	●	—	●	—	—	—	—	

∗ 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
None ····· N (Example) H7CN

∗ Solid state auto switches marked with "○" are produced upon receipt of order.
∗ D-A9□V□/M9□V□/M9□WV and D-M9□A(V)L types cannot be mounted.

∗ Since there are other applicable auto switches than listed, refer to page 687 for details.
∗ For details about auto switches with pre-wired connector, refer to pages 1784 and 1785.
∗ D-A9□/M9□/M9□W auto switches are shipped together (not assembled). (Only auto switch brackets are assembled at the time of shipment.)

JIS Symbol



Made to Order

Made to Order Specifications
(For details, refer to pages 1836, 1876 and 1926.)

Symbol	Specifications
—XA□	Change of rod end shape
—XC4 *	With heavy duty scraper
—XC35	With coil scraper

* -XC4 (with heavy duty scraper) is available only for ø32 and ø40.

Model

Series	Type	Lock operation
CNG	Non-lube	Spring locking

Cylinder Specifications

Bore size (mm)	**20**	**25**	**32**	**40**
Lubrication	Not required (Non-lube)			
Proof pressure	1.5 MPa			
Max. operating pressure	1.0 MPa			
Min. operating pressure	0.08 MPa			
Piston speed	50 to 1000mm/s *			
Ambient and fluid temperature	Without auto switch: –10 to 70°C (No freezing) With auto switch: –10 to 60°C (No freezing)			
Cushion	Rubber bumper, Air cushion			
Stroke length tolerance (mm)	Up to 800st: $^{+1.4}_{0}$			
Mounting	Basic style, Axial foot style, Rod side flange style, Head side flange style, Rod side trunnion style, Head side trunnion style, Clevis style (used for 90° change of port position)			

* When the piston is locked, the load mass is limited by the mounting orientation and the operating pressure.

Lock Specifications

Bore size (mm)	**20**	**25**	**32**	**40**
Locking action	Spring locking (Exhaust locking)			
Unlocking pressure	0.20 MPa or more	0.25 MPa or more		
Lock starting pressure	0.15 MPa or less	0.20 MPa or less		
Operating pressure range	0.2 to 1.0 MPa	0.25 to 1.0 MPa		
Locking direction	Both directions			
Holding force	215	335	550	860

* Be sure to select cylinders in accordance with the procedures on page 670.

Rod Boot Material

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

* Maximum ambient temperature for the rod boot itself.

Refer to pages 685 to 687 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.

Standard Stroke/

Refer to the minimum auto switch mounting stroke (page 686) for cylinders with an auto switch.

Bore size (mm)	Standard stroke (mm) (1)	Long stroke (mm)	Max. manufacturable stroke (mm)
20	25, 50, 75, 100, 125, 150, 200	201 to 350	1500
25	25, 50, 75, 100, 125, 150, 200, 250, 300	301 to 400	
32		301 to 450	
40		301 to 800	

Note 1) Intermediate strokes other than the above are produced upon receipt of order. Spacers are not used for intermediate strokes.
Note 2) Long strokes are applicable to the axial foot style and rod side flange style.
In the case of other mounting brackets or when long stroke limits are exceeded, the maximum useable stroke is determined by the stroke selection table (information edition).

Stopping Accuracy

(mm)

Lock type	Piston speed (mm/s)			
	100	300	500	1000
Spring locking	±0.3	±0.6	±1.0	±2.0

Condition: Lateral, Supply pressure P = 0.5 MPa
Load mass ····· Upper limit of allowed value
Solenoid valve for locking: Mounted directly to unlocking port
Maximum value of stopping position dispersion from 100 measurements

Mounting Bracket Part No.

Mounting bracket	Bore size (mm)			
	20	25	32	40
Axial foot *	CNG-L020	CNG-L025	CNG-L032	CNG-L040
Flange	CNG-F020	CNG-F025	CNG-F032	CNG-F040
Trunnion pin	CG-T020	CG-T025	CG-T032	CG-T040
Clevis **	CG-D020	CG-D025	CG-D032	CG-D040
Rod side pivot bracket	CNG-020-24	CNG-025-24	CNG-032-24	CNG-040-24
Head side pivot bracket	CG-020-24A	CG-025-24A	CG-032-24A	CG-040-24A

* When ordering foot bracket, order 2 pieces per cylinder.
** Clevis pin, retaining ring, and mounting bolt are shipped together with clevis style.
*** Mounting bolts are included with the foot and flange styles.

Accessory

Mounting		Basic style	Axial foot style	Rod side flange style	Head side flange style	Rod side trunnion style	Head side trunnion style	Clevis style
Standard equipment	Rod end nut	●	●	●	●	●	●	●
	Clevis pin	—	—	—	—	—	—	●
Option	Single knuckle joint	●	●	●	●	●	●	●
	Double knuckle joint (with pin) *	●	●	●	●	●	●	●
	Pivot bracket	—	—	—	—	●	●	●
	Rod boot	●	●	●	●	●	●	●

* Pin and retaining ring are shipped together with double knuckle joint.

Mass

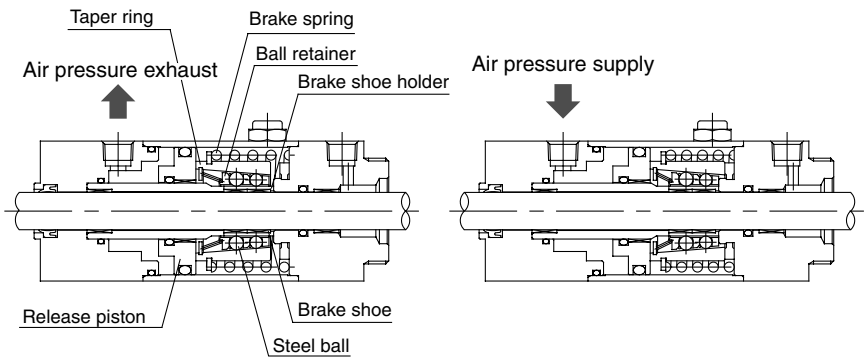
(kg)

Bore size (mm)		20	25	32	40
Basic mass	Basic style	0.52	0.83	0.91	1.24
	Axial foot style	0.63	0.96	1.07	1.46
	Flange style	0.64	1.01	1.08	1.47
	Trunnion style	0.53	0.85	0.94	1.29
	Clevis style	0.57	0.91	1.06	1.47
Rod side pivot bracket		0.11	0.13	0.20	0.27
Head side pivot bracket		0.08	0.09	0.17	0.25
Single knuckle joint		0.05	0.09	0.09	0.10
Double knuckle joint (with pin)		0.05	0.09	0.09	0.13
Additional mass per each 50 mm of stroke		0.05	0.07	0.09	0.15
Additional mass with air cushion		0.01	0.01	0.02	0.02
Additional mass for long stroke		0.01	0.01	0.02	0.03

Calculation: (Example) **CNGLA20-100-D** (Foot style, ø20, 100 st)

Basic mass····· 0.63 kg (Foot style, ø20)
Additional mass ····· 0.05 kg/50 st
Air cylinder stroke ····· 100 st
Air cushion additional mass ····· 0.01 kg
0.63 + 0.05 x 100/50 + 0.01 = 0.74 kg

Construction Principle

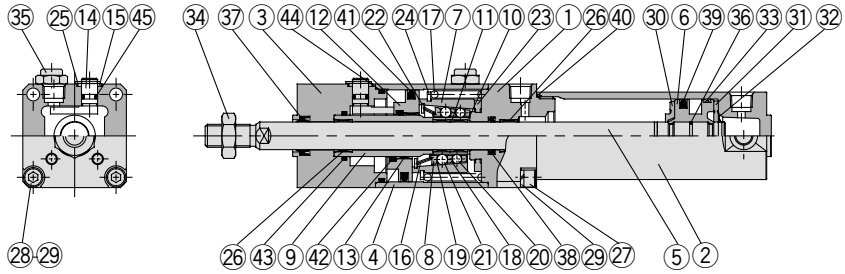


Locked state **Unlocked state**

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. The braking force is released as the steel balls are removed from the taper ring by the ball retainer.

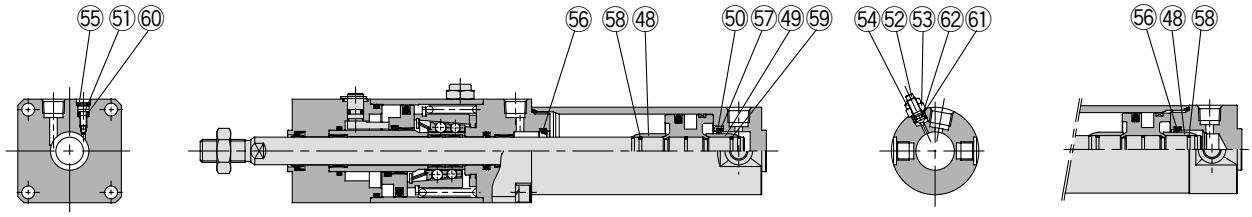
Construction

With rubber bumper: CNGBN



Long stroke

With air cushion: CNGBA



Long stroke

Component Parts

No.	Description		Material	Note
1	**Rod cover**		Aluminum alloy	Clear hard anodized
2	**Tube cover**		Aluminum alloy	Clear hard anodized
3	**Cover**		Aluminum alloy	Clear hard anodized
4	**Intermediate cover**		Aluminum alloy	Clear hard anodized
5	**Piston rod**		Carbon steel*	Hard chrome plated
6	**Piston**		Aluminum alloy	Chromated
7	**Taper ring**		Carbon steel	Heat treated
8	**Ball retainer**		Special resin	
9	**Piston guide**		Carbon steel	Zinc chromated
10	**Brake shoe holder**		Special steel	Heat treated
11	**Brake shoe**		Special friction material	
12	**Release piston**		Carbon steel	Zinc chromated
13	**Release piston bushing**	ø20	Oil-impregnated sintered alloy	
		ø25,ø32,ø40	Steel + Special resin	
14	**Unlocking cam**		Chromium molybdenum steel	Electroless nickel plated
15	**Washer**		Rolled steel plate	Electroless nickel plated
16	**Retainer pre-load spring**		Steel wire	Zinc chromated
17	**Brake spring**		Steel wire	Zinc chromated
18	**Clip A**		Stainless steel	ø25, ø32 only
19	**Clip B**		Stainless steel	ø25, ø32 only
20	**Steel ball A**		Carbon steel	
21	**Steel ball B**		Carbon steel	
22	**Tooth ring**		Stainless steel	
23	**Bumper**		Urethane	
24	**Type C retaining ring for taper ring**		Carbon steel	
25	**Type C retaining ring for unlocking cam shaft**		Carbon steel	
26	**Bushing**		Oil-impregnated sintered alloy	ø40: Copper alloy
27	**Hexagon socket head cap screw**		Chromium molybdenum steel	Nickel plated
28	**Hexagon socket head cap screw**		Chromium molybdenum steel	Nickel plated
29	**Spring washer for hex. socket head cap screw**		Steel wire	Nickel plated
30	**Bumper A**		Urethane	
31	**Bumper B**		Urethane	ø40 is the same as bumper A
32	**Retaining ring**		Stainless steel	
33	**Wear ring**		Resin	
34	**Rod end nut**		Rolled steel	Nickel plated
35	**BC element**		Bronze	
36	**Piston gasket**		NBR	

Note) In the case of cylinders with auto switches, magnets are installed in the piston.

* The material for ø20 and ø25 cylinders equipped with auto switches is stainless steel.

Component Parts

No.	Description	Material	Note
37	**Rod seal A**	NBR	
38	**Rod seal B**	NBR	
39	**Piston seal**	NBR	
40	**Cylinder tube gasket**	NBR	
41	**Release piston seal**	NBR	
42	**Rod seal C**	NBR	
43	**Piston guide gasket**	NBR	
44	**Intermediate cover gasket**	NBR	
45	**Unlocking cam gasket**	NBR	
46	**Head cover**	Aluminum alloy	Clear hard anodized
47	**Cylinder tube**	Aluminum alloy	Hard anodized
48	**Cushion ring A**	Brass	
49	**Cushion ring B**	Brass	Same as cushion ring A except ø20, 25 standard stroke
50	**Seal retainer**	Rolled steel	Zinc chromated long strokes not available
51	**Cushion valve A**	Chromium molybdenum steel	Electroless nickel plated
52	**Cushion valve B**	Rolled steel	Electroless nickel plated
53	**Valve retainer**	Rolled steel	Electroless nickel plated
54	**Lock nut**	Rolled steel	Nickel plated
55	**Retaining ring**	Stainless steel	
56	**Cushion seal A**	Urethane	
57	**Cushion seal B**	Urethane	Same as cushion seal A except ø20, 25 standard stroke
58	**Cushion ring gasket A**	NBR	
59	**Cushion ring gasket B**	NBR	Same as cushion ring gasket A except ø20, 25 standard stroke
60	**Valve seal A**	NBR	
61	**Valve seal B**	NBR	
62	**Valve retainer gasket**	NBR	

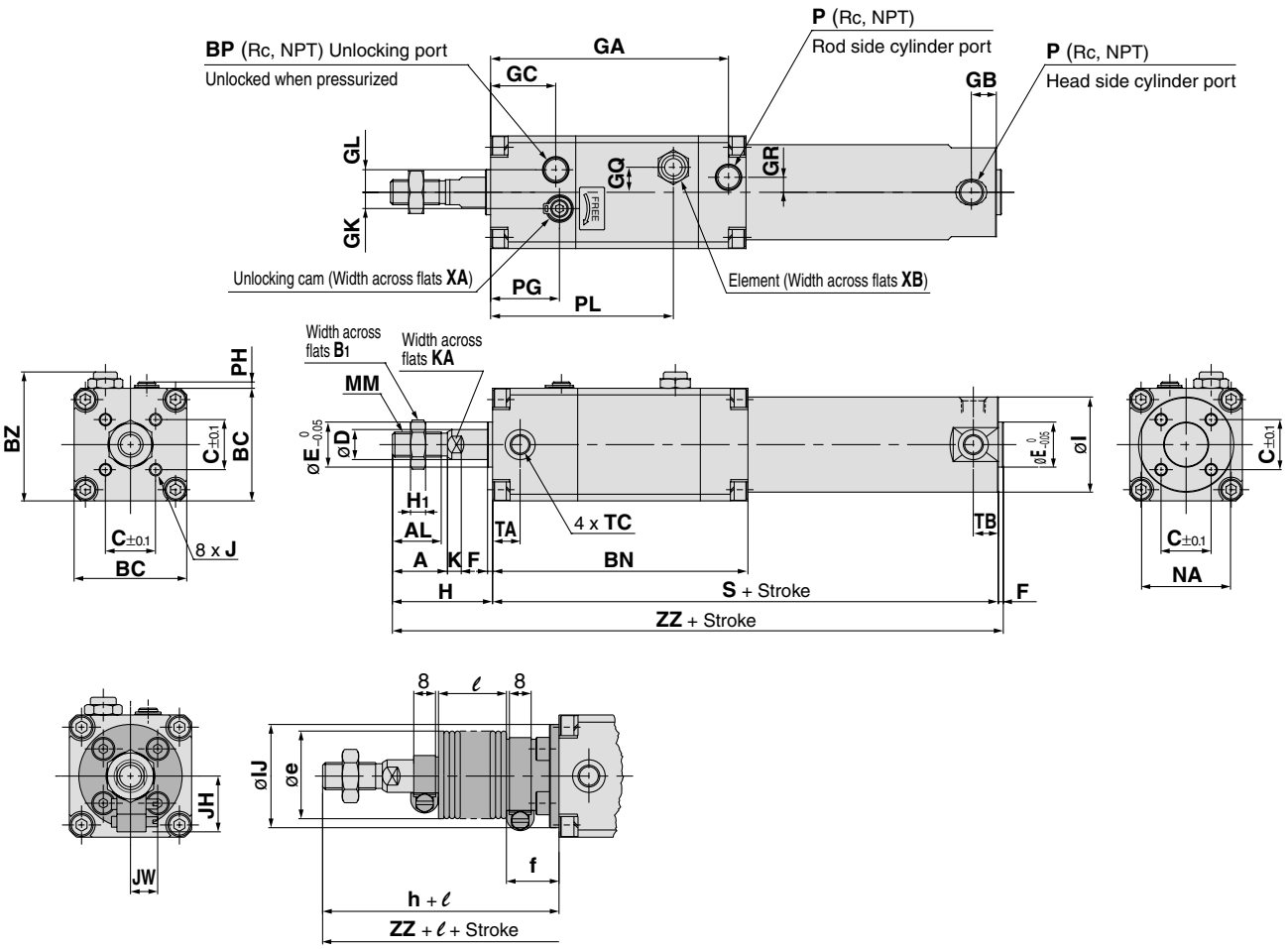
Replacement Parts: Seal Kit

Bore size (mm)	Kit no.	Contents
20	CG1N20-PS	Set of above nos. ㊲, ㊴, ㊵
25	CG1N25-PS	
32	CG1N32-PS	
40	CG1N40-PS	

* Since the lock section for Series CNG is normally replaced as a unit, kits are for the cylinder section only. These can be ordered using the order number for each bore size.
* Seal kit includes a grease pack (10 g). Order with the following part number when only the grease pack is needed. **Grease pack part number: GR-S-010** (10 g)

Dimensions

Basic style (B): With rubber bumper CNGBN



With rod boot

(mm)

Bore size (mm)	Stroke range without rod boot		Stroke range with rod boot		A	AL	B_1	BC	BN	BP	BZ	C	D	E	F	GA	GB	GC	GK	GL	GR	GQ	H_1	I
	Standard	Long stroke	Standard	Long stroke																				
20	Up to 200	201 to 350	20 to 200	201 to 350	18	15.5	13	38	93	1/8	44.5	14	8	12	2	85	10 (12)	18	5.5	6	4	8	5	26
25	Up to 300	301 to 400	20 to 300	301 to 400	22	19.5	17	45	103	1/8	51.5	16.5	10	14	2	96	10 (12)	25	6.5	9	7	10	6	31
32	Up to 300	301 to 450	20 to 300	301 to 450	22	19.5	17	45	104	1/8	51.5	20	12	18	2	97	10 (12)	25	6.5	9	7	10	6	38
40	Up to 300	301 to 800	20 to 300	301 to 800	30	27	19	52	112	1/8	58.5	26	16	25	2	104	10 (13)	26	7	11	7	12	8	47

(mm)

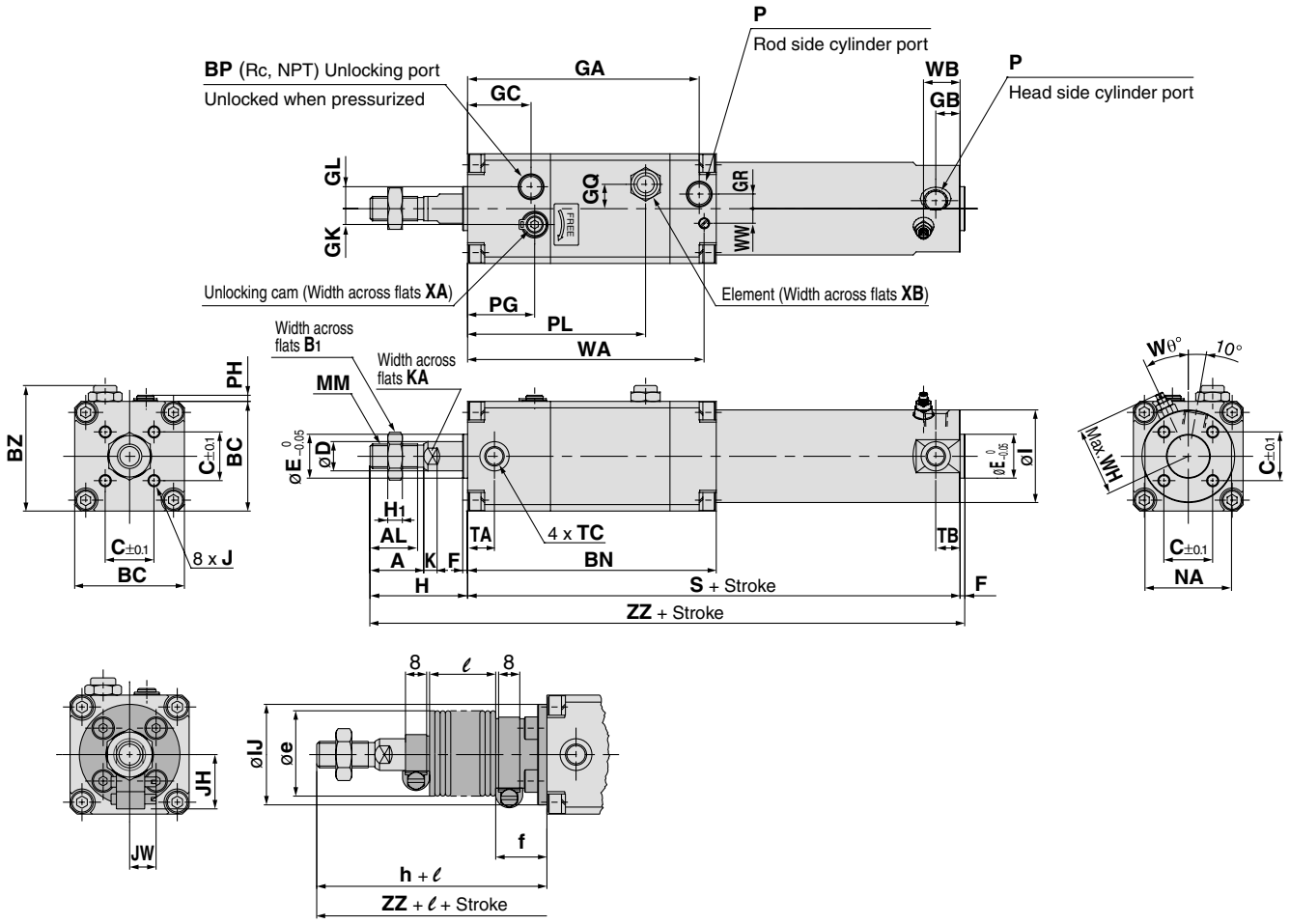
Bore size (mm)	J	K	KA	MM	NA	P	PG	PH	PL	S	TA	TB	TC	XA	XB	Without rod boot	
																H	ZZ
20	M4 x 0.7 depth 7	5	6	M8 x 1.25	24	1/8	21.5	2	65	141 (149)	11	11	M5 x 0.8	3	12	35	178 (186)
25	M5 x 0.8 depth 7.5	5.5	8	M10 x 1.25	29	1/8	26.5	2.5	73	151 (159)	11	11	M6 x 0.75	3	12	40	193 (201)
32	M5 x 0.8 depth 8	5.5	10	M10 x 1.25	35.5	1/8	26.5	2.5	73	154 (162)	11	10 (11)	M8 x 1.0	3	12	40	196 (204)
40	M6 x 1 depth 12	6	14	M14 x 1.5	44	1/8	28	2.5	81	169 (178)	12	10 (12)	M10 x 1.25	4	12	50	221 (230)

(mm)

Bore size (mm)	With rod boot							
	IJ	JH (Reference)	JW (Reference)	e	f	h	ℓ	ZZ
20	27	15.5	10.5	30	18	55	0.25 x Stroke	198 (206)
25	32	16.5	10.5	30	19	62		215 (223)
32	38	18.5	10.5	35	19	62		218 (226)
40	48	21.5	10.5	35	19	70		241 (250)

Note) ( ): Denotes the dimensions for long stroke.

Basic style (B): With air cushion CNGBA



With rod boot

(mm)

Bore size (mm)	Stroke range without rod boot		Stroke range with rod boot		A	AL	B_1	BC	BN	BP	BZ	C	D	E	F	GA	GB	GC	GK	GL	GR	GQ	H_1	I
	Standard	Long stroke	Standard	Long stroke																				
20	Up to 200	201 to 350	20 to 200	201 to 350	18	15.5	13	38	93	1/8	44.5	14	8	12	2	87	10 (12)	18	5.5	6	4	8	5	26
25	Up to 300	301 to 400	20 to 300	301 to 400	22	19.5	17	45	103	1/8	51.5	16.5	10	14	2	97	10 (12)	25	6.5	9	7	10	6	31
32	Up to 300	301 to 450	20 to 300	301 to 450	22	19.5	17	45	104	1/8	51.5	20	12	18	2	97	10 (12)	25	6.5	9	7	10	6	38
40	Up to 300	301 to 800	20 to 300	301 to 800	30	27	19	52	112	1/8	58.5	26	16	25	2	104	10 (13)	26	7	11	7	12	8	47

(mm)

Bore size (mm)	J	K	KA	MM	NA	P	PG	PH	PL	S	TA	TB	TC	WA	WB	WH	WW	Wθ	XA	XB
20	M4 x 0.7 depth 7	5	6	M8 x 1.25	24	M5 x 0.8	21.5	2	65	141 (149)	11	11	M5 x 0.8	88	15 (16)	23	5.5	30°	3	12
25	M5 x 0.8 depth 7.5	5.5	8	M10 x 1.25	29	M5 x 0.8	26.5	2.5	73	151 (159)	11	11	M6 x 0.75	98	15 (16)	25	6	30°	3	12
32	M5 x 0.8 depth 8	5.5	10	M10 x 1.25	35.5	Rc 1/8	26.5	2.5	73	154 (162)	11	10 (11)	M8 x 1.0	99	15 (16)	28.5	6	25°	3	12
40	M6 x 1 depth 12	6	14	M14 x 1.5	44	Rc 1/8	28	2.5	81	169 (178)	12	10 (12)	M10 x 1.25	107	15 (16)	33	8	20°	4	12

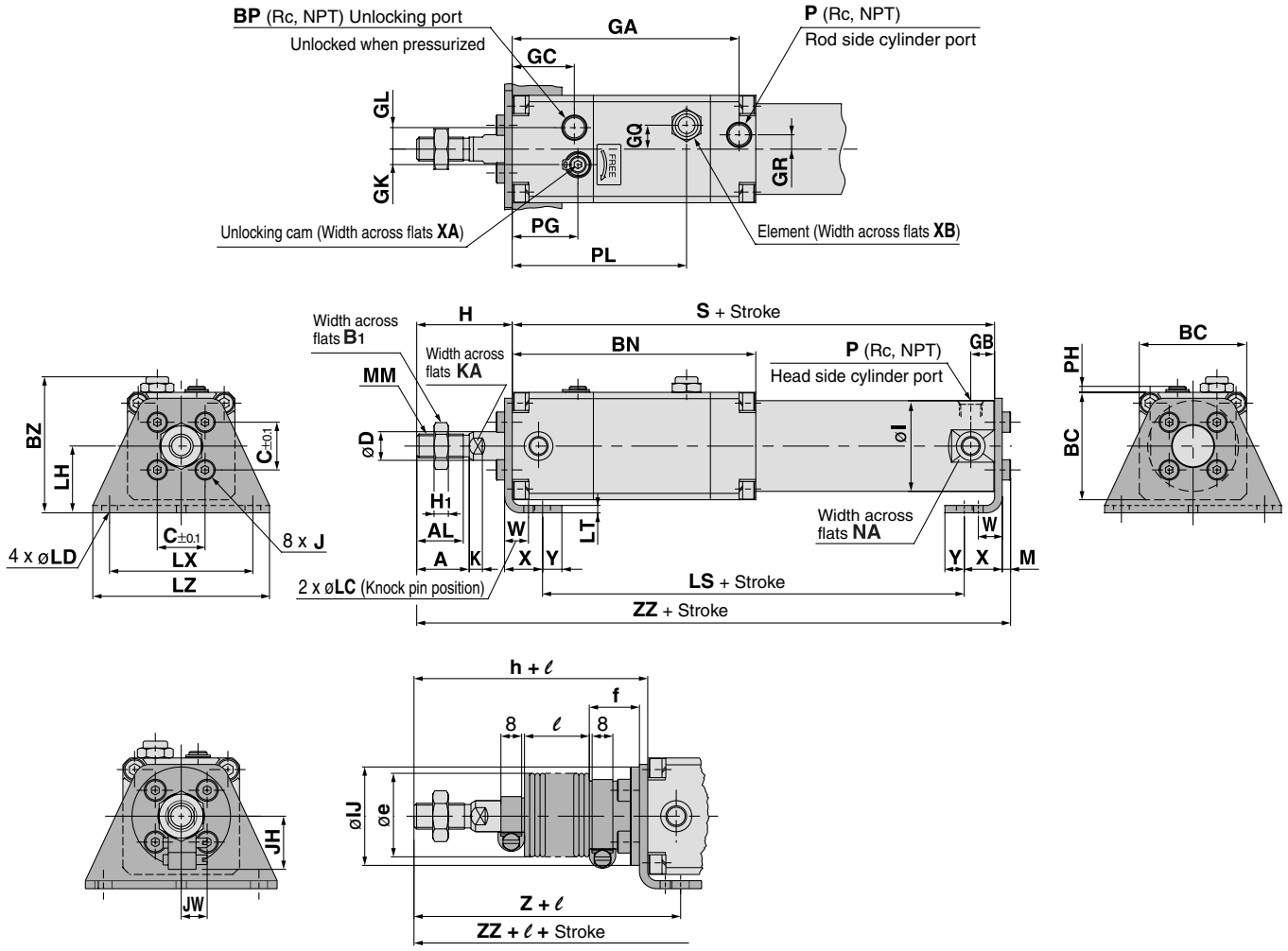
(mm)

Bore size (mm)	Without rod boot		With rod boot							
	H	ZZ	IJ	JH (Reference)	JW (Reference)	e	f	h	ℓ	ZZ
20	35	178 (186)	27	15.5	10.5	30	18	55	0.25 x Stroke	198 (206)
25	40	193 (201)	32	16.5	10.5	30	19	62		215 (223)
32	40	196 (204)	38	18.5	10.5	35	19	62		218 (226)
40	50	221 (230)	48	21.5	10.5	35	19	70		241 (250)

Note) ( ): Denotes the dimensions for long stroke.
Dimensions with mounting bracket are the same as dimensions with rubber bumper.

Dimensions

Axial foot style (L): With rubber bumper CNGLN



With rod boot

(mm)

Bore size (mm)	Stroke range without rod boot		Stroke range with rod boot		A	AL	B_1	BC	BN	BP	BZ	C	D	GA	GB	GC	GK	GL	GR	GQ	H_1	I	J
	Standard	Long stroke	Standard	Long stroke																			
20	Up to 200	201 to 350	20 to 200	201 to 350	18	15.5	13	38	93	1/8	50.5	14	8	85	10 (12)	18	5.5	6	4	8	5	26	M4 x 0.7
25	Up to 300	301 to 400	20 to 300	301 to 400	22	19.5	17	45	103	1/8	57	16.5	10	96	10 (12)	25	6.5	9	7	10	6	31	M5 x 0.8
32	Up to 300	301 to 450	20 to 300	301 to 450	22	19.5	17	45	104	1/8	57	20	12	97	10 (12)	25	6.5	9	7	10	6	38	M5 x 0.8
40	Up to 300	301 to 800	20 to 300	301 to 800	30	27	19	52	112	1/8	65.5	26	16	104	10 (13)	26	7	11	7	12	8	47	M6 x 1

(mm)

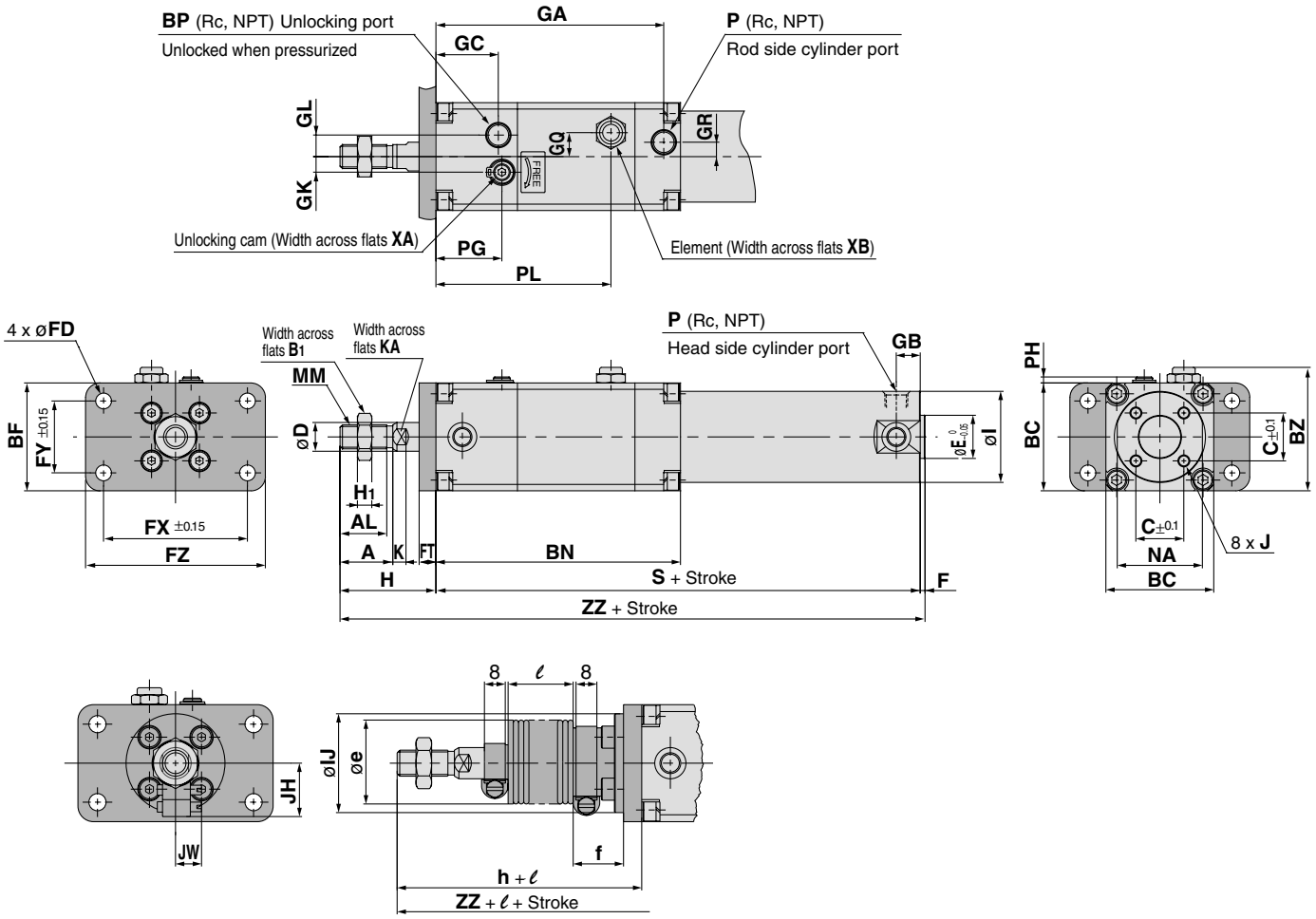
Bore size (mm)	K	KA	M	MM	NA	P	PG	PH	PL	S	LC	LD	LH	LS	LT	LX	LZ	X	Y	W	XA	XB
20	5	6	3	M8 x 1.25	24	1/8	21.5	2	65	141 (149)	4	6	25	117 (125)	3	50	62	15	7	10	3	12
25	5.5	8	3.5	M10 x 1.25	29	1/8	26.5	2.5	73	151 (159)	4	6	28	127 (135)	3	57	70	15	7	10	3	12
32	5.5	10	3.5	M10 x 1.25	35.5	1/8	26.5	2.5	73	154 (162)	4	6.6	28	128 (136)	3	60	74	16	8	10	3	12
40	6	14	4	M14 x 1.5	44	1/8	28	2.5	81	169 (178)	4	6.6	33	142 (151)	3	68	84	16.5	8.5	10	4	12

(mm)

Bore size (mm)	Without rod boot		With rod boot								
	H	ZZ	IJ	JH (Reference)	JW (Reference)	e	f	h	ℓ	Z	ZZ
20	35	182 (190)	27	15.5	10.5	30	18	55	0.25 x Stroke	67	202 (210)
25	40	197.5 (205.5)	32	16.5	10.5	30	19	62		74	219.5 (227.5)
32	40	200.5 (208.5)	38	18.5	10.5	35	19	62		75	222.5 (230.5)
40	50	226 (235)	48	21.5	10.5	35	19	70		83.5	246 (255)

Note) ( ): Denotes the dimensions for long stroke.

Rod side flange style (F): With rubber bumper CNGFN



With rod boot

(mm)

Bore size (mm)	Stroke range without rod boot		Stroke range with rod boot		A	AL	B_1	BC	BF	BN	BP	BZ	C	D	E	F	GA	GB	GC	GK	GL	GR	GQ	H_1
	Standard	Long stroke	Standard	Long stroke																				
20	Up to 200	201 to 350	20 to 200	201 to 350	18	15.5	13	38	38	93	1/8	44.5	14	8	12	2	85	10 (12)	18	5.5	6	4	8	5
25	Up to 300	301 to 400	20 to 300	301 to 400	22	19.5	17	45	45	103	1/8	51.5	16.5	10	14	2	96	10 (12)	25	6.5	9	7	10	6
32	Up to 300	301 to 450	20 to 300	301 to 450	22	19.5	17	45	45	104	1/8	51.5	20	12	18	2	97	10 (12)	25	6.5	9	7	10	6
40	Up to 300	301 to 800	20 to 300	301 to 800	30	27	19	52	52	112	1/8	58.5	26	16	25	2	104	10 (13)	26	7	11	7	12	8

(mm)

Bore size (mm)	I	J	K	KA	MM	NA	P	PG	PH	PL	S	FD	FT	FX	FY	FZ	XA	XB	Without rod boot	
																			H	ZZ
20	26	M4 x 0.7	5	6	M8 x 1.25	24	1/8	21.5	2	65	141 (149)	5.5	6	52	25	65	3	12	35	178 (186)
25	31	M5 x 0.8	5.5	8	M10 x 1.25	29	1/8	26.5	2.5	73	151 (159)	5.5	7	60	30	75	3	12	40	193 (201)
32	38	M5 x 0.8	5.5	10	M10 x 1.25	35.5	1/8	26.5	2.5	73	154 (162)	6.6	7	60	30	75	3	12	40	196 (204)
40	47	M6 x 1	6	14	M14 x 1.5	44	1/8	28	2.5	81	169 (178)	6.6	8	66	36	82	4	12	50	221 (230)

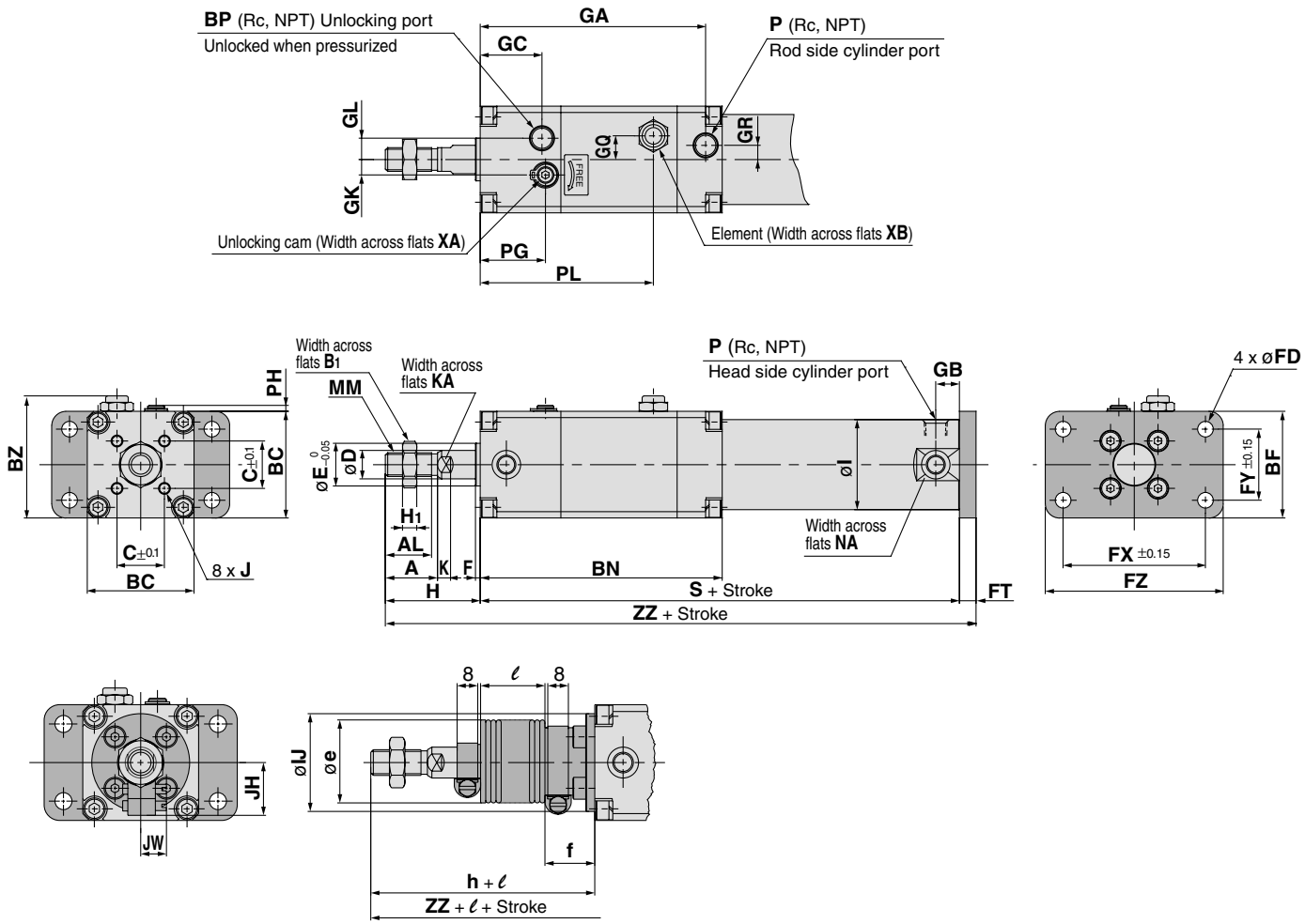
(mm)

Bore size (mm)	With rod boot							
	IJ	JH (Reference)	JW (Reference)	e	f	h	ℓ	ZZ
20	27	15.5	10.5	30	18	55	0.25 x Stroke	198 (206)
25	32	16.5	10.5	30	19	62		215 (223)
32	38	18.5	10.5	35	19	62		218 (226)
40	48	21.5	10.5	35	19	70		241 (250)

Note) ( ): Denotes the dimensions for long stroke.

Dimensions

Head side flange style (G): With rubber bumper CNGGN



With rod boot

(mm)

Bore size (mm)	Stroke range without rod boot		Stroke range with rod boot		A	AL	B_1	BC	BF	BN	BP	BZ	C	D	E	F	GA	GB	GC	GK	GL	GR	GQ	H_1	I
	Standard	Long stroke	Standard	Long stroke																					
20	Up to 200	—	20 to 200	—	18	15.5	13	38	38	93	1/8	44.5	14	8	12	2	85	10	18	5.5	6	4	8	5	26
25	Up to 300	—	20 to 300	—	22	19.5	17	45	45	103	1/8	51.5	16.5	10	14	2	96	10	25	6.5	9	7	10	6	31
32	Up to 300	—	20 to 300	—	22	19.5	17	45	45	104	1/8	51.5	20	12	18	2	97	10	25	6.5	9	7	10	6	38
40	Up to 300	301 to 500	20 to 300	301 to 500	30	27	19	52	52	112	1/8	58.5	26	16	25	2	104	10 (13)	26	7	11	7	12	8	47

(mm)

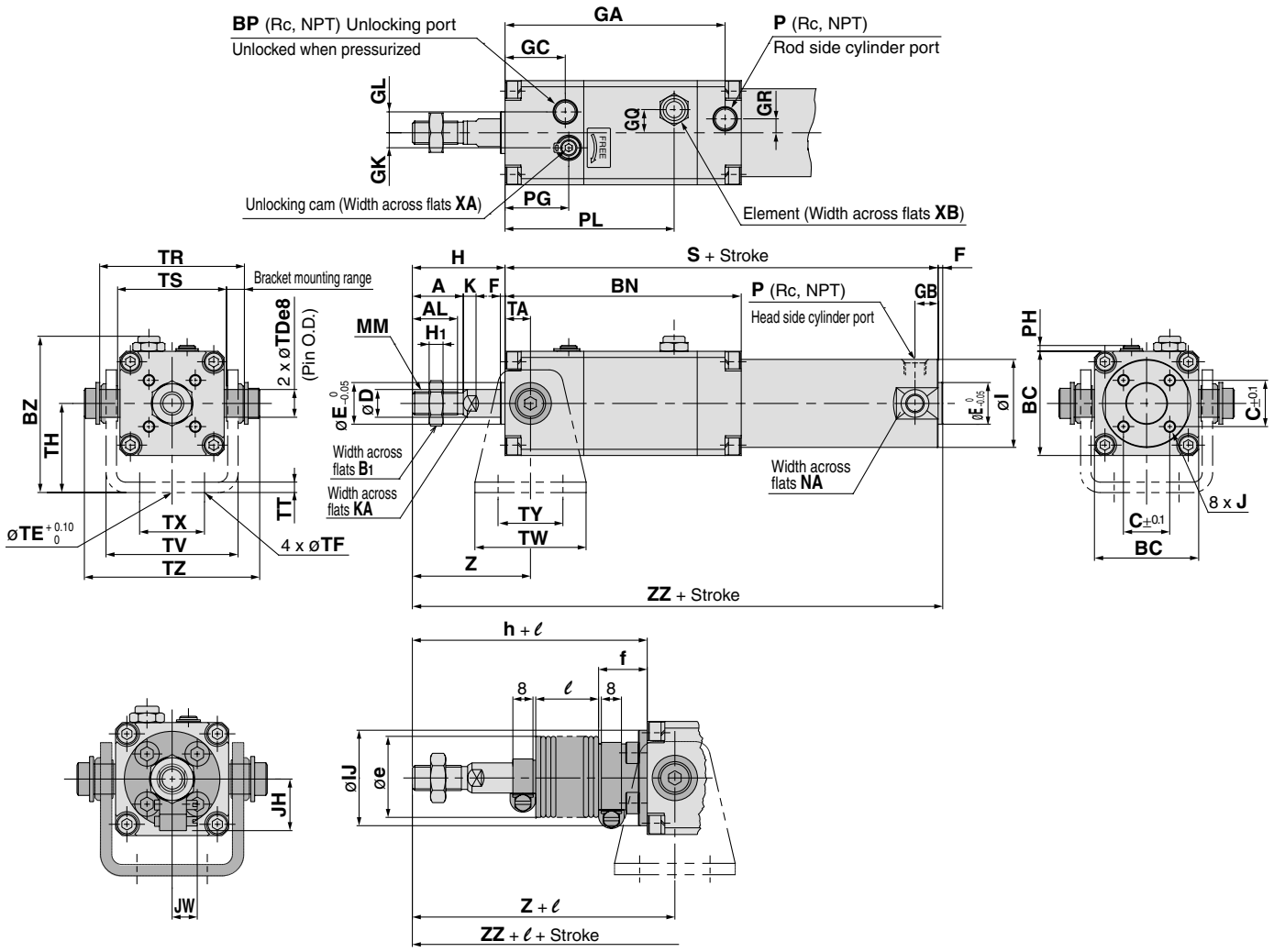
Bore size (mm)	J	K	KA	MM	NA	P	PG	PH	PL	S	FD	FT	FX	FY	FZ	XA	XB	Without rod boot	
																		H	ZZ
20	M4 x 0.7	5	6	M8 x 1.25	24	1/8	21.5	2	65	141	5.5	6	52	25	65	3	12	35	182
25	M5 x 0.8	5.5	8	M10 x 1.25	29	1/8	26.5	2.5	73	151	5.5	7	60	30	75	3	12	40	198
32	M5 x 0.8	5.5	10	M10 x 1.25	35.5	1/8	26.5	2.5	73	154	6.6	7	60	30	75	3	12	40	201
40	M6 x 1	6	14	M14 x 1.5	44	1/8	28	2.5	81	169 (178)	6.6	8	66	36	82	4	12	50	227 (236)

(mm)

Bore size (mm)	With rod boot							
	IJ	JH (Reference)	JW (Reference)	e	f	h	ℓ	ZZ
20	27	15.5	10.5	30	18	55	0.25 x Stroke	198 (206)
25	32	16.5	10.5	30	19	62		215 (223)
32	38	18.5	10.5	35	19	62		218 (226)
40	48	21.5	10.5	35	19	70		241 (250)

Note) ( ): Denotes the dimensions for long stroke.

Rod side trunnion style (U): With rubber bumper CNGUN



With rod boot

(mm)

Bore size (mm)	Stroke range without rod boot		Stroke range with rod boot		A	AL	B1	BC	BN	BP	BZ	C	D	E	F	GA	GB	GC	GK	GL	GR	GQ	H1	I
	Standard	Long stroke	Standard	Long stroke																				
20	Up to 200	—	20 to 200	—	18	15.5	13	38	93	1/8	56.5	14	8	12	2	85	10	18	5.5	6	4	8	5	26
25	Up to 300	—	20 to 300	—	22	19.5	17	45	103	1/8	66	16.5	10	14	2	96	10	25	6.5	9	7	10	6	31
32	Up to 300	—	20 to 300	—	22	19.5	17	45	104	1/8	67.5	20	12	18	2	97	10	25	6.5	9	7	10	6	38
40	Up to 300	301 to 500	20 to 300	301 to 500	30	27	19	52	112	1/8	75	26	16	25	2	104	10 (13)	26	7	11	7	12	8	47

(mm)

Bore size (mm)	J	K	KA	MM	NA	P	PG	PH	PL	S	TA	TDe8	TE	TF	TH	TR	TS	TT	TV	TW	TX	TY	TZ	XA	XB
20	M4 x 0.7	5	6	M8 x 1.25	24	1/8	21.5	2	65	141	11	$8^{-0.025}_{-0.047}$	10	5.5	31	51	40	3.2	47.8	42	26	28	59.6	3	12
25	M5 x 0.8	5.5	8	M10 x 1.25	29	1/8	26.5	2.5	73	151	11	$10^{-0.025}_{-0.047}$	10	5.5	37	58	47	3.2	54.8	42	28	28	68	3	12
32	M5 x 0.8	5.5	10	M10 x 1.25	35.5	1/8	26.5	2.5	73	154	11	$12^{-0.032}_{-0.059}$	10	6.6	38.5	62.5	47	4.5	57.4	48	28	28	75.7	3	12
40	M6 x 1	6	14	M14 x 1.5	44	1/8	28	2.5	81	169 (178)	12	$14^{-0.032}_{-0.059}$	10	6.6	42.5	72.5	54	4.5	65.4	56	36	30	85.7	4	12

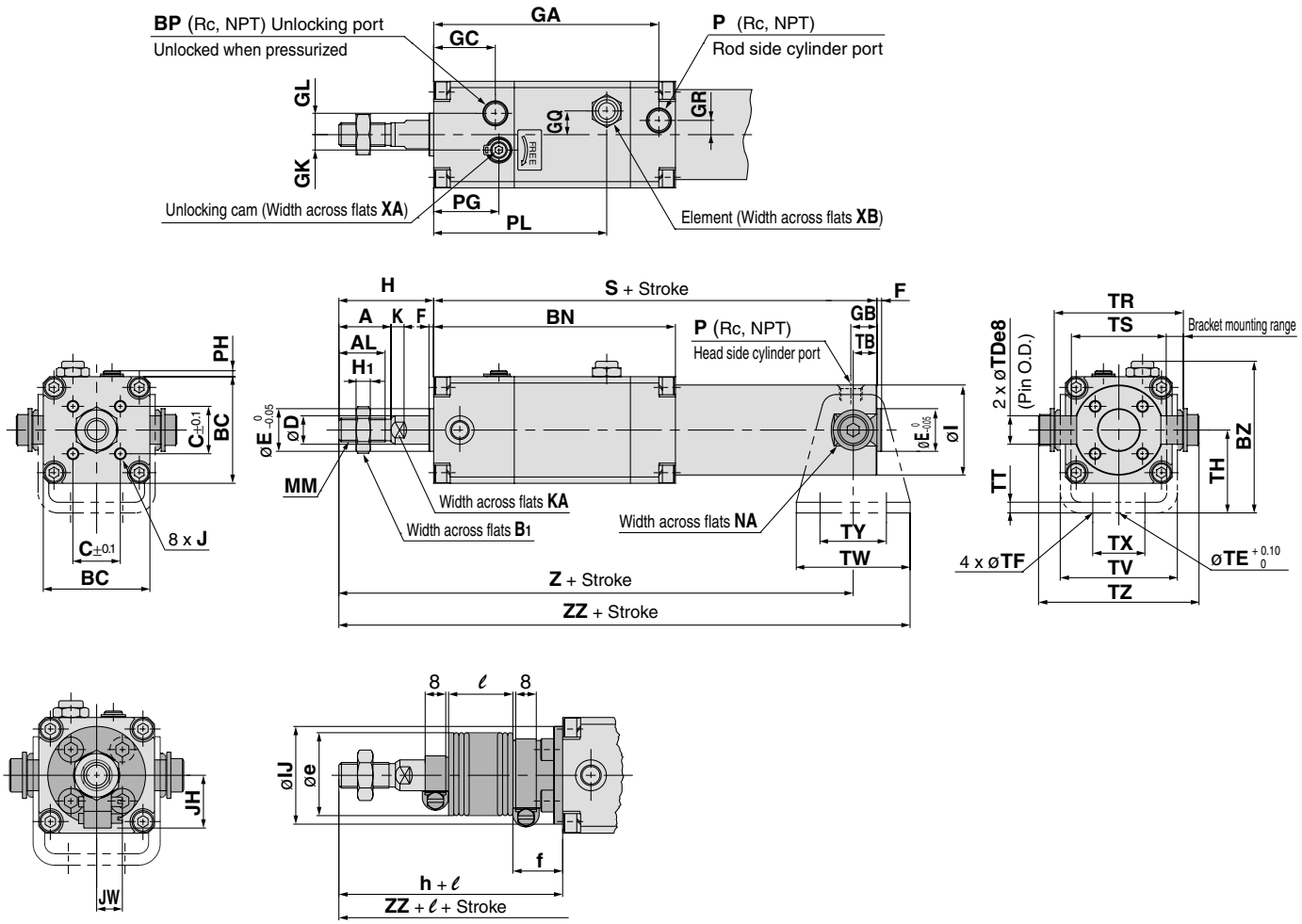
(mm)

Bore size (mm)	Without rod boot			With rod boot								
	H	Z	ZZ	IJ	JH (Reference)	JW (Reference)	e	f	h	ℓ	Z	ZZ
20	35	46	178	27	15.5	10.5	30	18	55	0.25 x Stroke	66	198
25	40	51	193	32	16.5	10.5	30	19	62		73	215
32	40	51	196	38	18.5	10.5	35	19	62		73	218
40	50	62	221 (230)	48	21.5	10.5	35	19	70		82	241 (250)

Note) ( ): Denotes the dimensions for long stroke.
For the pivot bracket, refer to page 684.

Dimensions

Head side trunnion style (T): With rubber bumper CNGTN



With rod boot

(mm)

Bore size (mm)	Stroke range without rod boot		Stroke range with rod boot		A	AL	B_1	BC	BN	BP	BZ	C	D	E	F	GA	GB	GC	GK	GL	GR	GQ	H_1	I
	Standard	Long stroke	Standard	Long stroke																				
20	Up to 200	—	20 to 200	—	18	15.5	13	38	93	1/8	50.5	14	8	12	2	85	10	18	5.5	6	4	8	5	26
25	Up to 300	—	20 to 300	—	22	19.5	17	45	103	1/8	59	16.5	10	14	2	96	10	25	6.5	9	7	10	6	31
32	Up to 300	—	20 to 300	—	22	19.5	17	45	104	1/8	64	20	12	18	2	97	10	25	6.5	9	7	10	6	38
40	Up to 300	301 to 500	20 to 300	301 to 500	30	27	19	52	112	1/8	72.5	26	16	25	2	104	10 (13)	26	7	11	7	12	8	47

(mm)

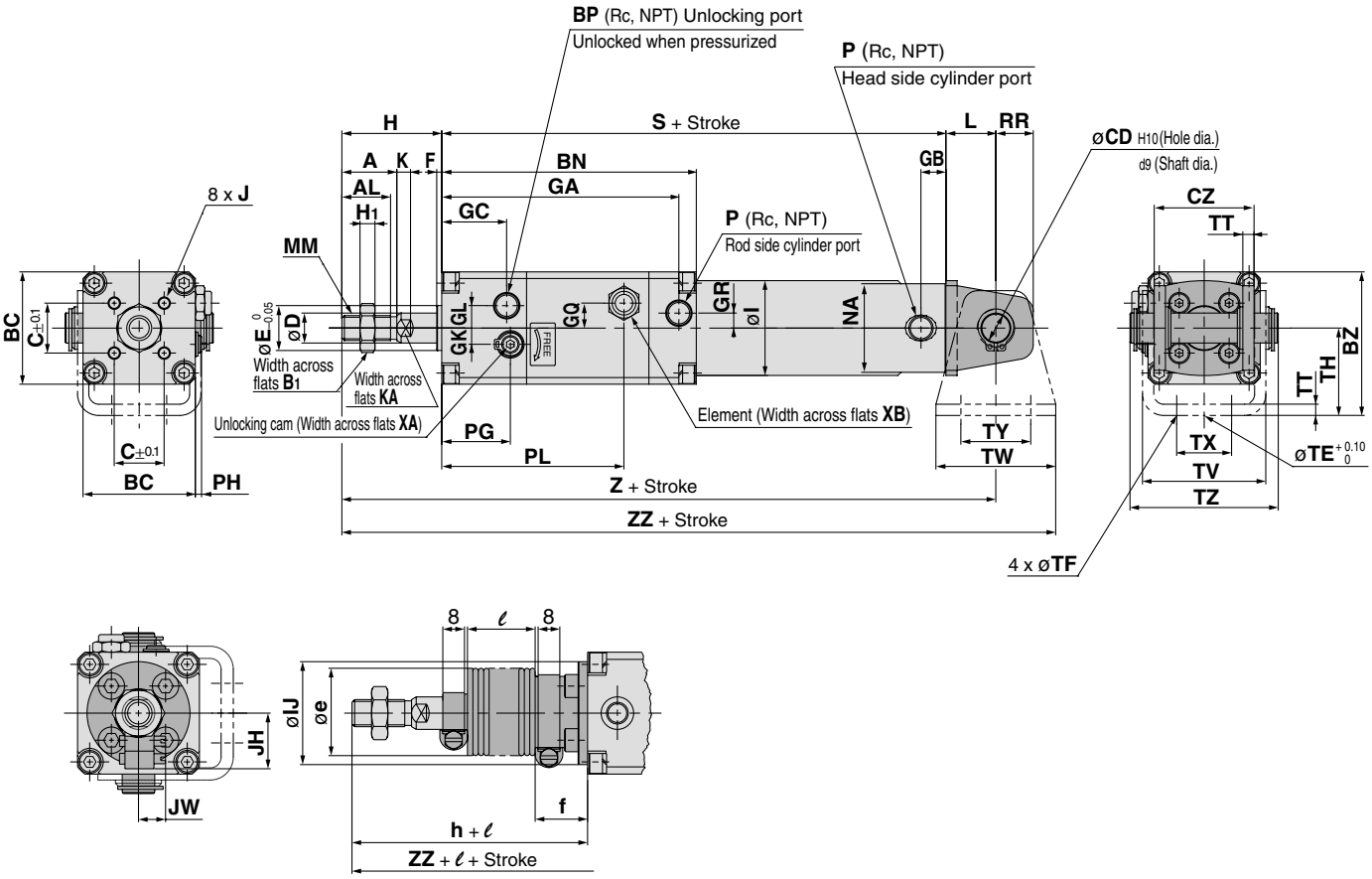
Bore size (mm)	J	K	KA	MM	NA	P	PG	PH	PL	S	TB	TDe8	TE	TF	TH	TR	TS	TT	TV	TW	TX	TY	TZ	XA	XB
20	M4 x 0.7	5	6	M8 x 1.25	24	1/8	21.5	2	65	141	11	$8^{-0.025}_{-0.047}$	10	5.5	25	39	28	3.2	35.8	42	16	28	47.6	3	12
25	M5 x 0.8	5.5	8	M10 x 1.25	29	1/8	26.5	2.5	73	151	11	$10^{-0.025}_{-0.047}$	10	5.5	30	43	33	3.2	39.8	42	20	28	53	3	12
32	M5 x 0.8	5.5	10	M10 x 1.25	35.5	1/8	26.5	2.5	73	154	10	$12^{-0.032}_{-0.059}$	10	6.6	35	54.5	40	4.5	49.4	48	22	28	67.7	3	12
40	M6 x 1	6	14	M14 x 1.5	44	1/8	28	2.5	81	169 (178)	10 (12)	$14^{-0.032}_{-0.059}$	10	6.6	40	65.5	49	4.5	58.4	56	30	30	78.7	4	12

(mm)

Bore size (mm)	Without rod boot			With rod boot								
	H	Z	ZZ	IJ	JH (Reference)	JW (Reference)	e	f	h	ℓ	Z	ZZ
20	35	165	186	27	15.5	10.5	30	18	55	0.25 x Stroke	185	206
25	40	180	201	32	16.5	10.5	30	19	62		202	223
32	40	184	208	38	18.5	10.5	35	19	62		206	230
40	50	209 (216)	237 (244)	48	21.5	10.5	35	19	70		229 (236)	257 (264)

Note) ( ): Denotes the dimensions for long stroke.
For the pivot bracket, refer to page 684.

Clevis style (D): With rubber bumper CNGDN



With rod boot

(mm)

Bore size (mm)	Stroke range without rod boot		Stroke range with rod boot		A	AL	B_1	BC	BN	BP	BZ	C	D	E	F	GA	GB	GC	GK	GL	GR	GQ	H_1	I
	Standard	Long stroke	Standard	Long stroke																				
20	Up to 200	—	20 to 200	—	18	15.5	13	38	93	1/8	44	14	8	12	2	85	10	18	5.5	6	4	8	5	26
25	Up to 300	—	20 to 300	—	22	19.5	17	45	103	1/8	52.5	16.5	10	14	2	96	10	25	6.5	9	7	10	6	31
32	Up to 300	—	20 to 300	—	22	19.5	17	45	104	1/8	57.5	20	12	18	2	97	10	25	6.5	9	7	10	6	38
40	Up to 300	301 to 500	20 to 300	301 to 500	30	27	19	52	112	1/8	66	26	16	25	2	104	10 (13)	26	7	11	7	12	8	47

(mm)

Bore size (mm)	J	K	KA	MM	NA	P	PG	PH	PL	S	CD	CZ	L	RR	TE	TF	TH	TT	TV	TW	TX	TY	TZ	XA	XB
20	M4 x 0.7	5	6	M8 x 1.25	24	1/8	21.5	2	65	141	8	29	14	11	10	5.5	25	3.2	35.8	42	16	28	43.4	3	12
25	M5 x 0.8	5.5	8	M10 x 1.25	29	1/8	26.5	2.5	73	151	10	33	16	13	10	5.5	30	3.2	39.8	42	20	28	48	3	12
32	M5 x 0.8	5.5	10	M10 x 1.25	35.5	1/8	26.5	2.5	73	154	12	40	20	15	10	6.6	35	4.5	49.4	48	22	28	59.4	3	12
40	M6 x 1	6	14	M14 x 1.5	44	1/8	28	2.5	81	169 (178)	14	49	22	18	10	6.6	40	4.5	58.4	56	30	30	71.4	4	12

(mm)

Bore size (mm)	Without rod boot			With rod boot								
	H	Z	ZZ	IJ	JH (Reference)	JW (Reference)	e	f	h	ℓ	Z	ZZ
20	35	190	211	27	15.5	10.5	30	18	55	0.25 x Stroke	210	231
25	40	207	228	32	16.5	10.5	30	19	62		229	250
32	40	214	238	38	18.5	10.5	35	19	62		236	260
40	50	241 (250)	269 (278)	48	21.5	10.5	35	19	70		261 (270)	289 (298)

Note) ( ): Denotes the dimensions for long stroke.
Clevis pin and retaining ring are attached.
For the pivot bracket, refer to page 684.

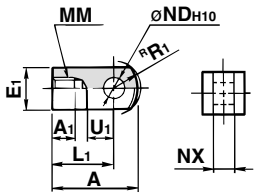
Series CNG

Accessory Bracket Dimensions

Single Knuckle Joint

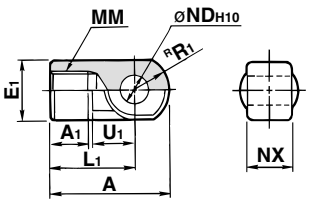
I-G02/G03

Material: Rolled steel



I-G04

Material: Cast iron



(mm)

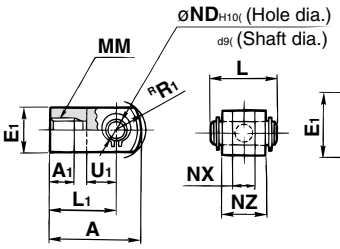
Part no.	Applicable bore size (mm)	A	A1	E1	L1	MM	RR1	U1	NDH10	NX
I-G02	20	34	8.5	□16	25	M8 x 1.25	10.3	11.5	$8^{+0.058}_{0}$	$8^{-0.2}_{-0.4}$
I-G03	25, 32	41	10.5	□20	30	M10 x 1.25	12.8	14	$10^{+0.058}_{0}$	$10^{-0.2}_{-0.4}$
I-G04	40	42	14	ø22	30	M14 x 1.5	12	14	$10^{+0.058}_{0}$	$18^{-0.3}_{-0.5}$

Double Knuckle Joint

∗ Knuckle pin and retaining ring are attached.

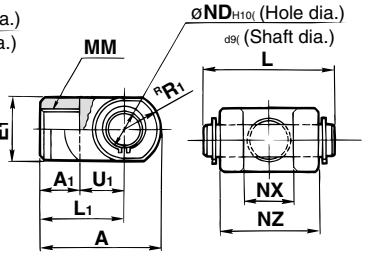
Y-G02/G03

Material: Rolled steel



Y-G04

Material: Cast iron



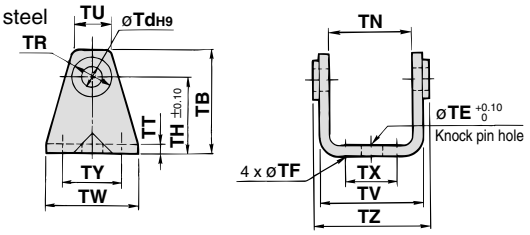
(mm)

Part no.	Applicable bore size (mm)	A	A1	E1	L1	MM	RR1	U1	ND	NX	NZ	L	Applicable pin part no.
Y-G02	20	34	8.5	□16	25	M8 x 1.25	10.3	11.5	8	$8^{+0.4}_{+0.2}$	16	21	IY-G02
Y-G03	25, 32	41	10.5	□20	30	M10 x 1.25	12.8	14	10	$10^{+0.4}_{+0.2}$	20	25.6	IY-G03
Y-G04	40	42	16	ø22	30	M14 x 1.5	12	14	10	$18^{+0.5}_{+0.3}$	36	41.6	IY-G04

Rod Side Pivot Bracket

ø20 to ø40

Material: Rolled steel



(mm)

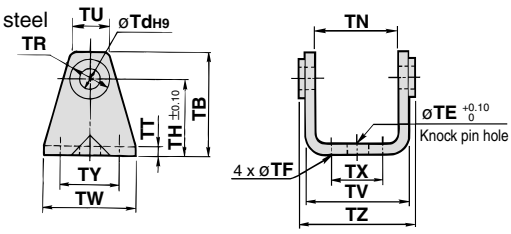
Part no.	Applicable bore size (mm)	TB	TdH9	TE	TF	TH	TN
CNG-020-24	20	42	$8^{+0.036}_{0}$	10	5.5	31	(41.4)
CNG-025-24	25	48	$10^{+0.036}_{0}$	10	5.5	37	(48.4)
CNG-032-24	32	53	$12^{+0.043}_{0}$	10	6.6	38.5	(48.4)
CNG-040-24	40	60	$14^{+0.043}_{0}$	10	6.6	42.5	(56.4)

Part no.	Applicable bore size (mm)	TR	TT	TU	TV	TW	TX	TY	TZ
CNG-020-24	20	13	3.2	21.2	47.8	42	26	28	50
CNG-025-24	25	15	3.2	21.3	54.8	42	28	28	57
CNG-032-24	32	17	4.5	25.6	57.4	48	28	28	61.4
CNG-040-24	40	21	4.5	26.3	65.4	56	36	30	71.4

Head Side Pivot Bracket

ø20 to ø40

Material: Rolled steel



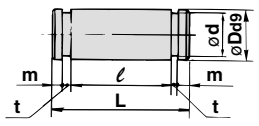
(mm)

Part no.	Applicable bore size (mm)	TB	TdH9	TE	TF	TH	TN
CG-020-24A	20	36	$8^{+0.036}_{0}$	10	5.5	25	(29.3)
CG-025-24A	25	43	$10^{+0.036}_{0}$	10	5.5	30	(33.1)
CG-032-24A	32	50	$12^{+0.043}_{0}$	10	6.6	35	(40.4)
CG-040-24A	40	58	$14^{+0.043}_{0}$	10	6.6	40	(49.2)

Part no.	Applicable bore size (mm)	TR	TT	TU	TV	TW	TX	TY	TZ
CG-020-24A	20	13	3.2	18.1	35.8	42	16	28	38.3
CG-025-24A	25	15	3.2	20.7	39.8	42	20	28	42.1
CG-032-24A	32	17	4.5	23.6	49.4	48	22	28	53.8
CG-040-24A	40	21	4.5	27.3	58.4	56	30	30	64.6

Knuckle Pin

Material: Carbon steel



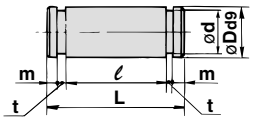
(mm)

Part no.	Applicable bore size (mm)	Dd9	L	d	ℓ	m	t	Applicable retaining ring
IY-G02	20	$8^{-0.040}_{-0.076}$	21	7.6	16.2	1.5	0.9	Type C 8 for axis
IY-G03	25, 32	$10^{-0.040}_{-0.076}$	25.6	9.6	20.2	1.55	1.15	Type C 10 for axis
IY-G04	40	$10^{-0.040}_{-0.076}$	41.6	9.6	36.2	1.55	1.15	Type C 10 for axis

∗ Retaining rings are included.

Clevis Pin

Material: Carbon steel



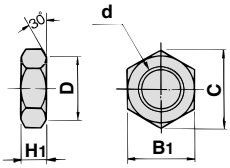
(mm)

Part no.	Applicable bore size (mm)	Dd9	L	d	ℓ	m	t	Applicable retaining ring
CD-G02	20	$8^{-0.040}_{-0.076}$	43.4	7.6	38.6	1.5	0.9	Type C 8 for axis
CD-G25	25	$10^{-0.040}_{-0.076}$	48	9.6	42.6	1.55	1.15	Type C 10 for axis
CD-G03	32	$12^{-0.050}_{-0.093}$	59.4	11.5	54	1.55	1.15	Type C 12 for axis
CD-G04	40	$14^{-0.050}_{-0.093}$	71.4	13.4	65	2.05	1.15	Type C 14 for axis

∗ Retaining rings are included.

Rod End Nut

Material: Rolled steel

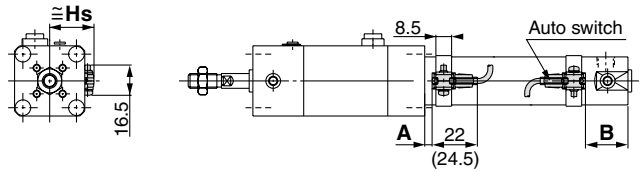


(mm)

Part no.	Applicable bore size (mm)	B1	C	D	d	H1
NT-02	20	13	(15)	12.5	M8 x 1.25	5
NT-03	25, 32	17	(19.6)	16.5	M10 x 1.25	6
NT-G04	40	19	(21.9)	18	M14 x 1.5	8

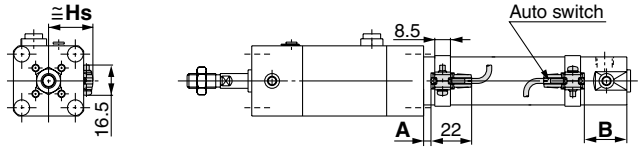
Auto Switch Proper Mounting Position (Detection at Stroke End) and Its Mounting Height

Reed auto switch
D-A9□

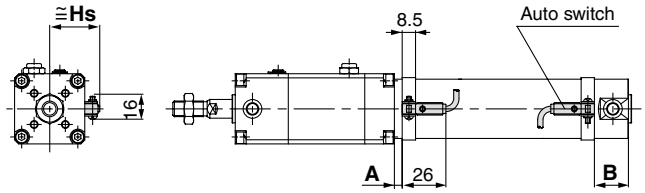


∗( ): For D-A93 type

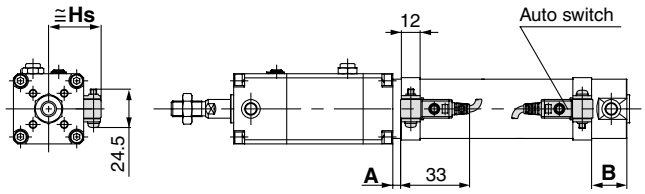
Solid state auto switch
D-M9□
D-M9□W



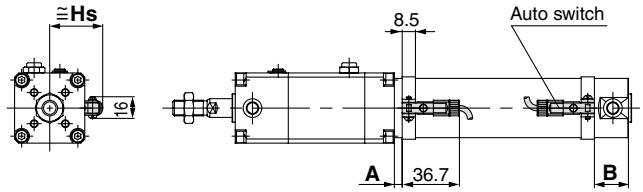
D-C7, C8



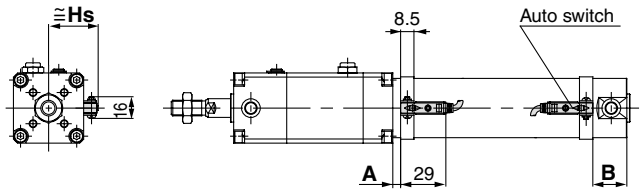
D-G5NTL



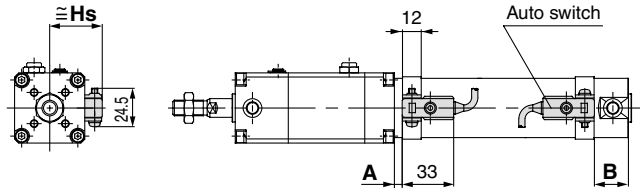
D-C73C, C80C



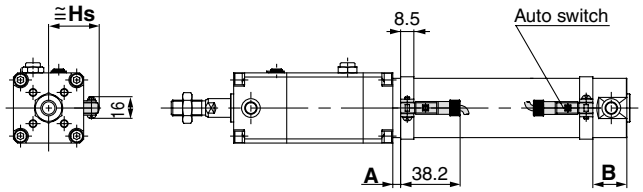
D-H7□, H7□W
D-H7NF, H7BAL



D-B5, B6, B59W



D-H7C



Auto Switch Proper Mounting Position (mm)

Bore size (mm) \ Auto switch model	D-A9□		D-M9□ D-M9□W		D-C7□ D-C80 D-C73C D-C80C		D-B5□ D-B64		D-B59W		D-H7□ D-H7C D-H7□W D-H7BAL D-H7NF		D-G5NTL	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B
20	8	20 (28)	12	24 (32)	8.5	20.5 (28.5)	2.5	14.5 (22.5)	5.5	17.5 (25.5)	7.5	19.5 (27.5)	4	16 (24)
25	8	20 (28)	12	24 (32)	8.5	20.5 (28.5)	2.5	14.5 (22.5)	5.5	17.5 (25.5)	7.5	19.5 (27.5)	4	16 (24)
32	9	21 (29)	13	25 (33)	9.5	21.5 (29.5)	3.5	15.5 (23.5)	6.5	18.5 (26.5)	8.5	20.5 (28.5)	5	17 (25)
40	14	23 (32)	18	27 (36)	14.5	23.5 (32.5)	8.5	17.5 (26.5)	11	20.5 (29.5)	13.5	22.5 (31.5)	10	19 (28)

Auto Switch Mounting Height (mm)

Bore size (mm) \ Auto switch model	D-A9□ D-M9□ D-M9□W	D-C7□ D-C80 D-H7□ D-H7□W D-H7NF D-H7BAL	D-C73C D-C80C	D-B5□ D-B64 D-B59W D-H7C D-G5NTL
	Hs	Hs	Hs	Hs
20	24	24.5	27	27.5
25	26.5	27	29.5	30
32	30	30.5	33	33.5
40	34.5	35	37.5	38

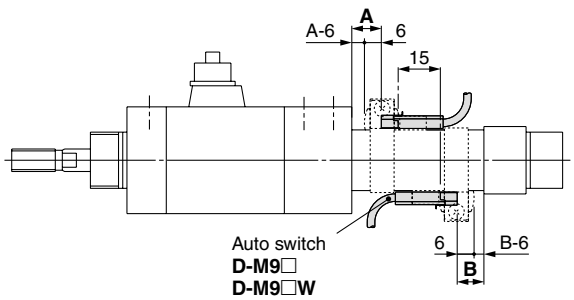
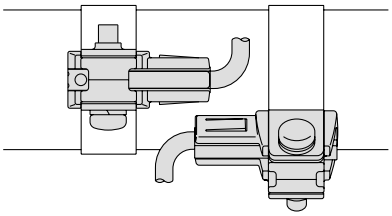
∗ ( ): For the long stroke type
Note) Adjust the auto switch after confirming the operating conditions in the actual setting.

Minimum Auto Switch Mounting Stroke

n: No. of auto switches (mm)

Auto switch model	No. of auto switches mounted				
	1	2		n	
		Different surfaces	Same surface	Different surfaces	Same surface
D-A9□ D-M9□ D-M9□W	10	15 note)	45 note)	$15 + 45\frac{(n-2)}{2}$ (n = 2, 4, 6···)	45 + 45 (n - 2)
D-C7□ D-C80	10	15	50	$15 + 45\frac{(n-2)}{2}$ (n = 2, 4, 6···)	50 + 45 (n - 2)
D-H7□ D-H7□W D-H7BAL D-H7NF	10	15	60	$15 + 45\frac{(n-2)}{2}$ (n = 2, 4, 6···)	60 + 45 (n - 2)
D-C73C D-C80C	10	15	65	$15 + 50\frac{(n-2)}{2}$ (n = 2, 4, 6···)	65 + 50 (n - 2)
D-B5□ D-B64 D-G5□NTL	10	15	75	$15 + 50\frac{(n-2)}{2}$ (n = 2, 4, 6···)	75 + 55 (n - 2)
D-B59W	10	20	75	$20 + 50\frac{(n-2)}{2}$ (n = 2, 4, 6···)	75 + 55 (n - 2)

Note) For cylinders with two D-A93/M9□/M9□W auto switches.

Auto switch model	With 2 auto switches	
	Different surfaces	Same surface
	 The proper auto switch mounting position is 6 mm inward from the switch holder edge.	 The auto switch is mounted by slightly displacing it in a direction (cylinder tube circumferential exterior) so that the auto switch and lead wire do not interfere with each other.
D-A93	—	Less than 50 strokes
D-M9□ D-M9□W	Less than 20 strokes	Less than 55 strokes

Operating Range

(mm)

Auto switch model	Bore size (mm)			
	20	**25**	**32**	**40**
D-A9□	7	6	8	8
D-M9□ D-M9□W	4.5	5	4.5	5.5
D-C7□/C-80 D-C73C/C-80C	8	10	9	10
D-B5□/B64	8	10	9	10
D-B59W	13	13	14	14
D-H7□/H7□W D-H7BAL/H7NF	4	4	4.5	5
D-H7C	7	8.5	9	10
D-G5NTL	4	4	4.5	5
D-G5NBL	35	40	40	45

∗ Since the operating is 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)			
	ø20	ø25	ø32	ø40
D-A9□ D-M9□ D-M9□W	note1) 1 BMA2-020 2 BJ3-1	note1) 1 BMA2-025 2 BJ3-1	note1) 1 BMA2-032 2 BJ3-1	note1) 1 BMA2-040 2 BJ3-1
D-C7□/C80 D-C73C/C80C D-H7□ D-H7□W D-H7BAL D-H7NF	BMA2-020	BMA2-025	BMA2-032	BMA2-040
D-B5□/B64 D-B59W D-G5NTL D-G5NBL	BA-01	BA-02	BA-32	BA-04

Note 1) Two kinds of auto switch mounting brackets are used as a set.

[Mounting screw set made of stainless steel]

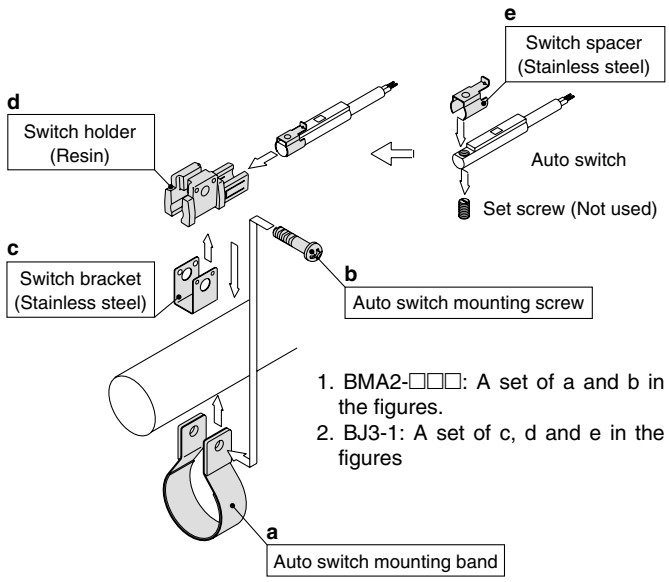
The following set of mounting screws made of stainless steel is available. Use it in accordance with the operating environment. (Please order the auto switch mounting bracket separately, since it is not included.)

BBA3: For D-B6/B6/G5/K5 types

BBA4: For D-C7/C8/H7 types

D-H7BAL/G5BAL auto switches are set on the cylinder with the stainless steel screws above when shipped. When an auto switch is shipped independently, BBA3 or BBA4 is attached.

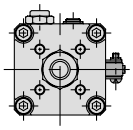
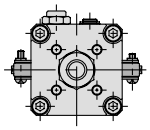
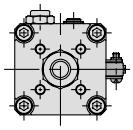
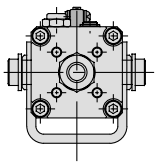
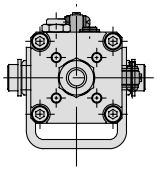
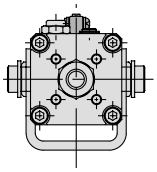
Note 2) Refer to pages 1813 and 1814 for the details about BBA3 and BBA4.



1. BMA2-□□□: A set of a and b in the figures.
2. BJ3-1: A set of c, d and e in the figures

Cylinder Brackets by Stroke/Mounting Surfaces

st: Stroke (mm)

Mounting bracket	Basic style, Foot style, Flange style, Clevis style			Trunnion style		
No. of auto switches mounted	1 (Rod cover side)	2 (Different surfaces)	2 (Mounted on the same surface)	1 (Rod cover side)	2 (Different surfaces)	2 (Mounted on the same surface)
Switch mounting surface / Switch model	Port surface 	Port surface 	Port surface 			
D-A9□ D-M9□ D-M9□W	10 st or more	15 to 44 st	45 st or more	10 st or more	15 to 44 st	45 st or more
D-C7□/C80	10 st or more	15 to 49 st	50 st or more	10 st or more	15 to 49 st	50 st or more
D-H7□/H7□W D-H7BAL/H7NF	10 st or more	15 to 59 st	60 st or more	10 st or more	15 to 59 st	60 st or more
D-C73C/C80C/H7C	10 st or more	15 to 64 st	65 st or more	10 st or more	15 to 64 st	65 st or more
D-B5□/B64/G5NTL	10 st or more	15 to 74 st	75 st or more	10 st or more	15 to 74 st	75 st or more
D-B59W	15 st or more	20 to 74 st	75 st or more	15 st or more	20 to 74 st	75 st or more

Other than the applicable auto switches listed in "How to Order", the following auto switches can be mounted.
For detailed specifications, refer to pages 1719 to 1827.

Auto switch type	Model	Electrical entry (Fetching direction)	Features
Reed	D-B53, C73, C76	Grommet (In-line)	—
	D-C80		Without indicator light
Solid state	D-H7A1, H7A2, H7B		—
	D-H7NW, H7PW, H7BW		Diagnostic indication (2-color)
	D-G5NTL		With timer

∗ For solid state auto switches, auto switches with a pre-wired connector are also available. Refer to pages 1784 and 1785 for details.
∗ Normally closed (NC = b contact) solid state auto switches (D-F9G/F9H types) are also available. Refer to page 1746 for details.
∗ Wide range detection type, solid state auto switch (D-G5NBL type) is also available. For details, refer to page 1776.

Series CNG
Specific Product Precautions 1

Be sure to read before handling.
Refer to front matters 42 and 43 for Safety Instructions and pages 3 to 11 for Actuator and Auto Switch Precautions.

Design of Equipment and 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 for causing damage to the equipment. In order to prevent this lurching, a balance circuit such as the recommended pneumatic circuits (pages 689 and 690) should be used.

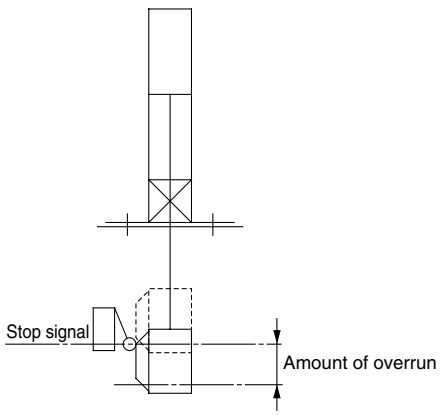
Selection

⚠ Warning

1. When in the locked state, 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.
- For SMC's auto switches, the operating range is between 8 and 14 mm. (It varies depending on a switch model.) When the overrun amount exceeds this range, selfholding of the contact should be performed at the switch load side.

∗ For stopping accuracy, refer to page 673.



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 the 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 670 and 671) is based on use at the intermediate stop (including emergency stops during 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 graphs (5) to (7) on page 671 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 in the locked state, a load greater than the turning force or holding force may operate on the piston rod and cause damage to the lock mechanism. Series CNG 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 airpressure of 0.25 MPa or more.

Series CNG
Specific Product Precautions 2

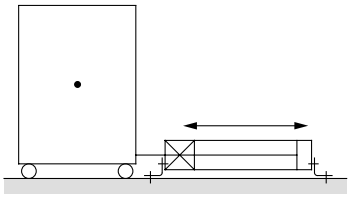
Be sure to read before handling.
Refer to front matters 42 and 43 for Safety Instructions and pages 3 to 11 for Actuator and Auto Switch Precautions.

Mounting

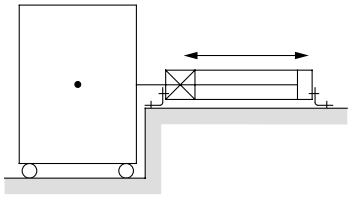
⚠ Caution

1. Do not apply offset loads to the piston rod.

Particular care should be taken to match the load's center of gravity with the center 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 center of gravity and cylinder shaft center are not matched.



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

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

Adjustment

⚠ Caution

1. Adjust the cylinder's air balance. Balance the load by adjusting the air pressure in the rod and head 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 mounting position for detection area of auto switch etc. When intermediate stop is done, adjust the mounting position for detection stop is done, adjust the mounting position for detection area of auto switch etc., with consideration of over-run distance to required stop position.

Pneumatic Circuit

⚠ Warning

1. Be certain to use an pneumatic 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 lock stop, when restarting or when manually unlocking, a circuit should be used to 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.

2. Use a solenoid valve for unlocking which has a large effective area, as a rule 50% or more of the effective area of the cylinder drive solenoid valve.

The larger the effective area is, the shorter the locking time will be (the overrun amount will be shorter), and stopping accuracy will be improved.

3. Place the solenoid valve for unlocking close to the cylinder, and no farther than the cylinder drive solenoid valve.

The shorter the distance from the cylinder (the shorter the piping), the shorter the overrun amount will be, and stopping accuracy will be improved.

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

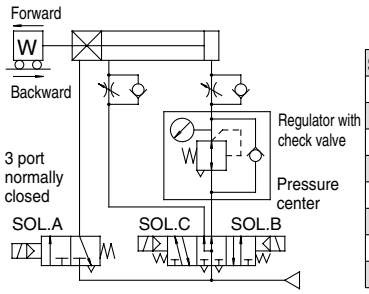
When the locked stop time is too short, the piston rod (and load) may lurch at a speed greater than the control speed of the speed controller.

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. Basic circuit

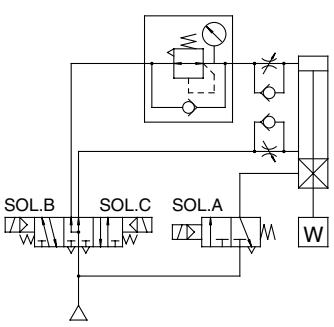
1) [Horizontal]



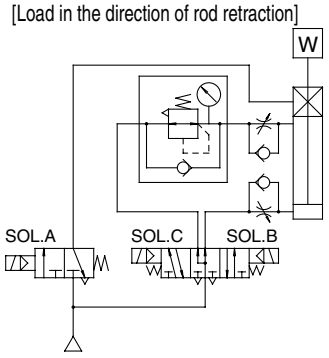
SOL.A	SOL.B	SOL.C	Action	
ON	ON	OFF	Forward	
OFF	OFF	OFF	Locked stop	0.5 s or more
ON	OFF	OFF	Unlocked	0 to 0.5 s
ON	ON	OFF	Forward	
ON	OFF	ON	Backward	
OFF	OFF	OFF	Locked stop	0.5 s or more
ON	OFF	OFF	Unlocked	0 to 0.5 s
ON	OFF	ON	Backward	

2) [Vertical]

[Load in the direction of rod extension]



[Load in the direction of rod retraction]



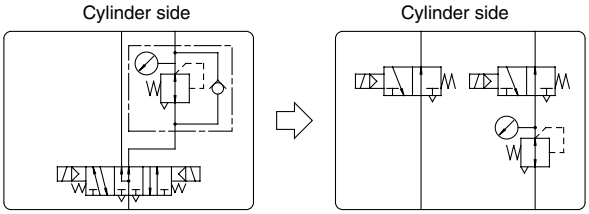
Series CNG
Specific Product Precautions 3

Be sure to read before handling.
Refer to front matters 42 and 43 for Safety Instructions and pages 3 to 11 for Actuator and Auto Switch Precautions.

Pneumatic Circuit

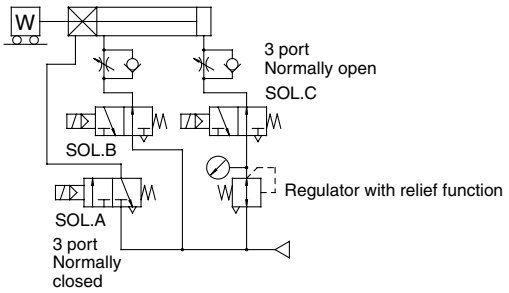
⚠ Caution

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.



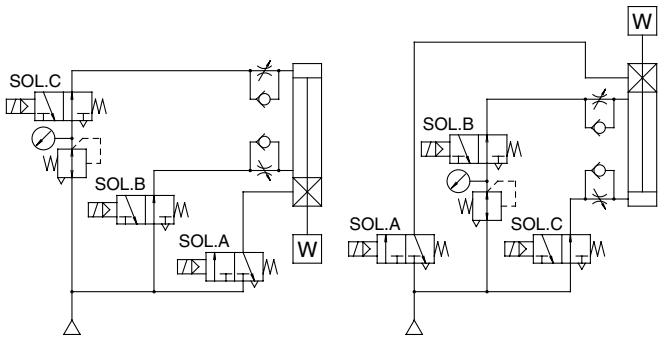
[Example]

1. [Horizontal]



2. [Vertical]

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



Manually Unlocking

⚠ Warning

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

3. Take measures to prevent the load from dropping when unlocking is performed.
a) Perform work with the load in its lowest position.
b) Take measures for drop prevention by strut, etc.

⚠ 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.

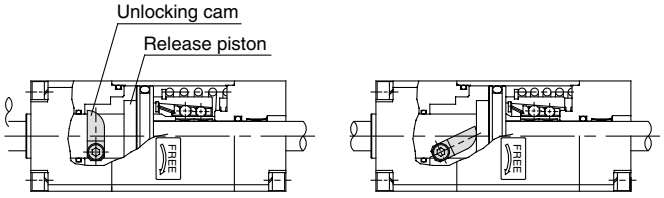
2. When installing the cylinder into equipment or performing adjustments, etc., be sure to apply air pressure of 0.25 MPa or more to the unlocking port, and do not perform work using the unlocking cam.

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

Bore size (mm)	Cylinder internal resistance (N)	Cam operating torque (standard) (N·m)	Max. cam operating torque (N·m)	Applicable hex. wrench size
20	24.6	1.0	2.3	Size 3
25	38.2	2.5	4.7	Size 3
32	62.7	3.0	4.7	Size 3
40	98	4.0	8.2	Size 4

4. Be sure to operate the unlocking cam on the FREE side (clockwise direction), and do not turn with a torque greater than the maximum cam operating torque. There is a danger of damaging the unlocking cam if it is turned excessively.

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



Locked state **Unlocked state**

[Principle]
If the unlocking cam is turned in a clockwise direction with a hexagon wrench, the release piston is pushed back and the lock is released. Further, if the unlocking cam is not held it will return to its original position and the unit will lock again. Therefore, the unlocking cam must be held in position for as long as unlocking is required.

Series CNG
Specific Product Precautions 4

Be sure to read before handling.
Refer to front matters 42 and 43 for Safety Instructions and pages 3 to 11 for Actuator and Auto Switch Precautions.

Maintenance

⚠ Caution

1. Series CNG lock units are replaceable.

(However, please note that lock units cannot be replaced in the case of long stroke specifications.)

To order replacement lock units for Series CNG, use the order numbers given in the table below.

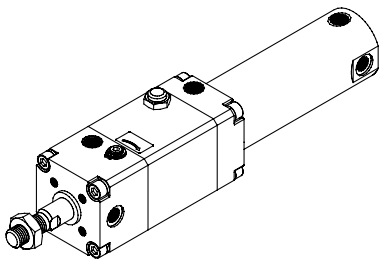
Bore size (mm)	Lock unit part no.	
	Rubber bumper type	Air cushion type
20	CNGN20D-UA	CNGA20D-UA
25	CNGN25D-UA	CNGA25D-UA
32	CNGN32D-UA	CNGA32D-UA
40	CNGN40D-UA	CNGA40D-UA

2. Replacement of lock units.

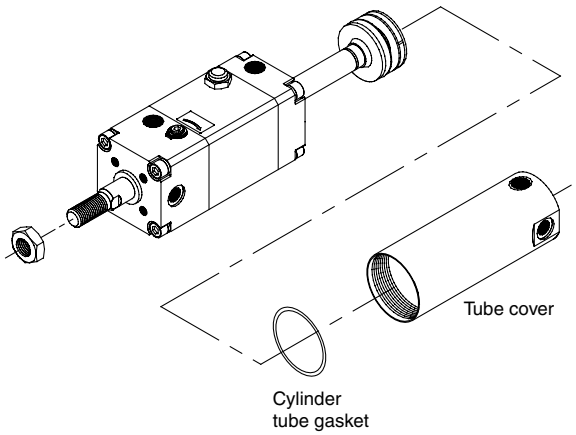
1) Remove the lock unit by securing the square section of the rod cover or the wrench flats of the tube cover in an apparatus such as a vice, and then loosening the other end with a spanner or adjustable angle wrench, etc.

For the dimensions of the square section and the wrench flats, refer to the table below.

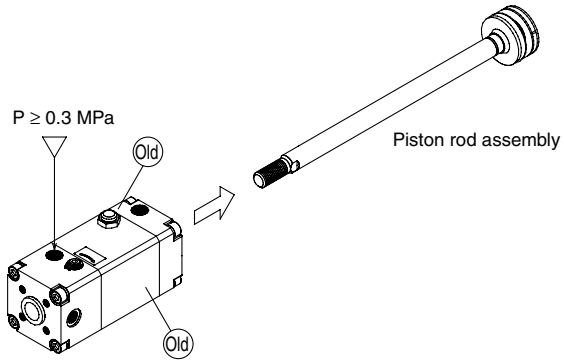
Bore size (mm)	Rod cover square section (mm)	Tube cover wrench flats (mm)
20	38	24
25	45	29
32	45	35.5
40	52	44



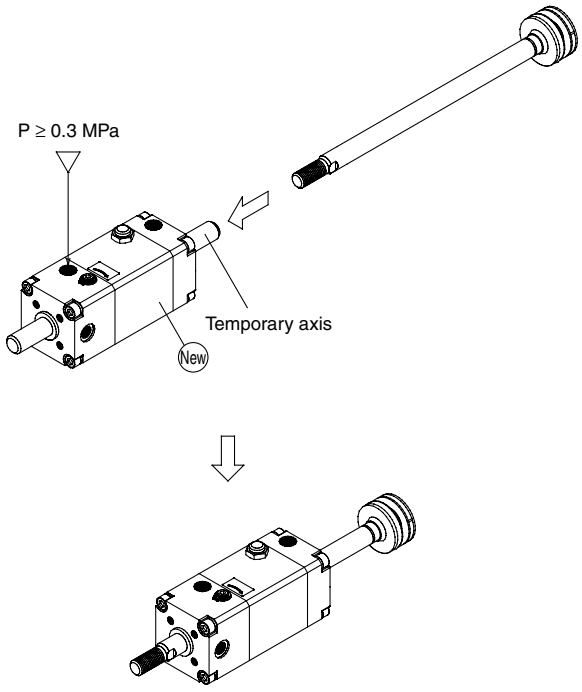
2) Remove the tube cover.



3) Apply 0.3 MPa or more of compressed air to the unlocking port, and pull out the piston rod assembly.



4) Similarly, apply 0.3 MPa or more of compressed air to the unlocking port of the new lock unit, and replace the new lock unit's temporary axis with the previous piston rod assembly.



5) Reassemble in reverse order from steps 2) and 1).

When retightening the sections, turn approximately 2° past their position prior to disassembly.