# Cylinder with Lock

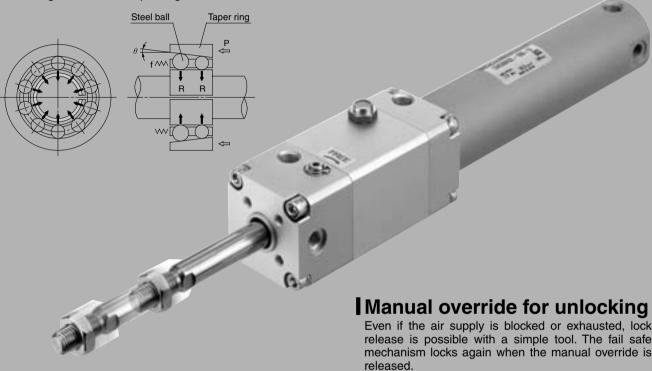
# Series CNG

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.



## 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.

# Design minimizes the influences of unlocking air quality

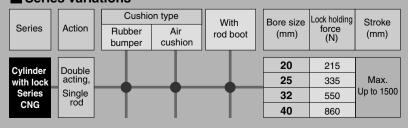
PARA

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.

## 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).

#### Series Variations



#### Can be locked in both directions

Holding force is equal on either extend or retract.



CLJ2

CLM2

CLG1

CL<sub>1</sub>

MLGC

CNG

**MNB** 

CNA

CNS

CLS

CLQ

RLQ

MLU

MLGP

ML1C

Individual



# **Model Selection**

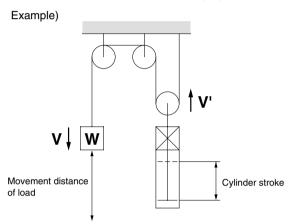
#### **Precautions on Model Selection**

## 

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.



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  $\stackrel{\sim}{=}$  350 mm/s

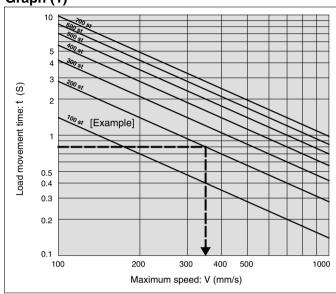
Step (2): Select graph (6) based upon the load condition and operating pressure, and then from the intersection of the maximum speed V = 350 mm/s found in Step (1), and the load mass m = 12 kg

∴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).

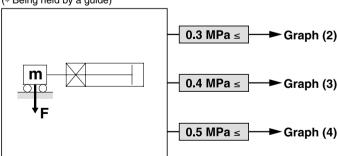
#### Graph (1)



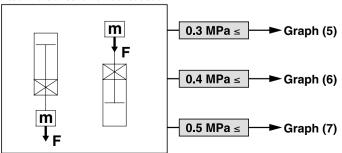
#### Step (2) Find the bore size.

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 Load in the direction at the right angle to rod (\* Being held by a guide)



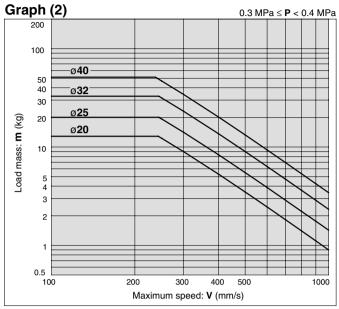
#### Load in the direction of rod extension Load in the direction of rod retraction

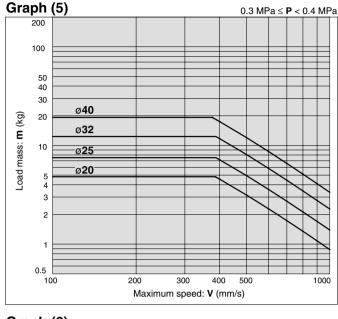




# Cylinder with Lock Series CNG

#### **Selection Graph**





CLJ2

CLM2

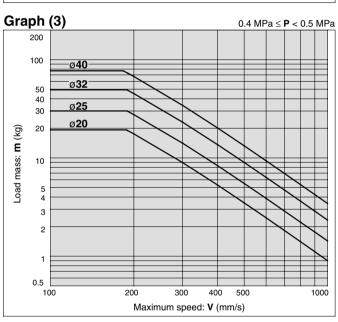
CLG1

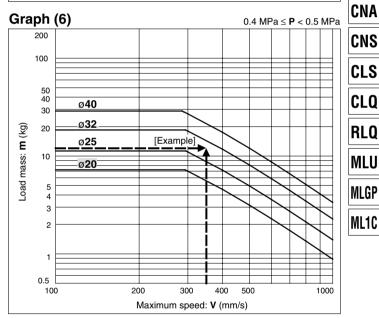
CL<sub>1</sub>

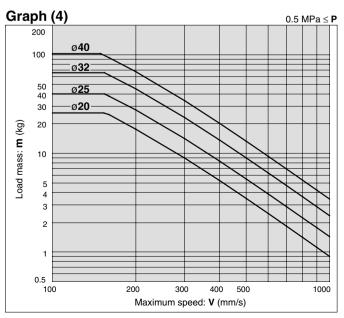
MLGC

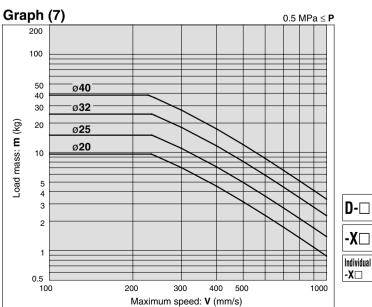
**CNG** 

MNB







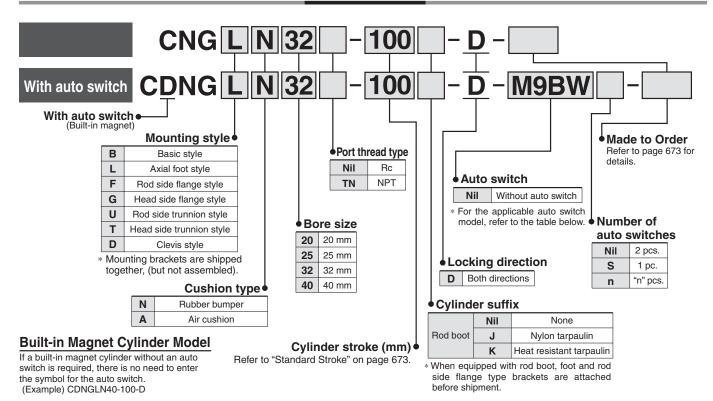


# Cylinder with Lock **Double Acting, Single Rod**

# Series CNG

ø20, ø25, ø32, ø40

#### **How to Order**



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

7 1/4	plicable Auto Swi		Ī	ages 17 15 to		Load vol			Loo	ما بدراه	e ler	ath	/m)				
<b></b>	0	Electrical	ndicator light	Wiring	Load voit		lage	Auto switch model		u wii	Г	Ŭ	ì	Pre-wired			
Туре	Special function	entry	Sign	(Output)	[	C	AC	Applicable bore size	0.5	1	3	5	None	connector	nector Applicable		
			_					ø20 to ø40	(Nil)	(IVI)	(L)	(Z)	(N)				
				3-wire (NPN)		5 V, 12 V		M9N	•	•		0	_	0	IC circuit		
_		Grommet		3-wire (PNP)		5 V, 12 V		M9P	•			0	_		IC Circuit		
호				O vedeno		40.14		M9B	•	•	•	0	-	0			
switch		Connector 2-wire 3-wire (NPN) 24		12 V		H7C	•	_	•	•	•	_	1 -				
state			24 V	= \( \( \) \( \)	_	M9NW	•	•	•	0	-	0		Relay, PLC			
st	Diagnostic indication			3-wire (PNP)	re (PNP)	5 V, 12 V	5 V, 12 V	M9PW	•	•	•	0	_	0	IC circuit	1 20	
Solid	(2-color indication)	(2-color indication) Grommet	Oino		12 V		M9BW	•	•	•	0	_	0				
Ś	Water resistant (2-color indication)			2-wire			H7BA**	_	_	•	0	-	0	1 -			
	With diagnostic output (2-color indication)			4-wire (NPN)	NPN)	5 V, 12	5 V, 12 V		H7NF	•	_	•	0	-	0	IC circuit	
			Yes	3-wire (NPN equivalent)	_	5 V	_	A96	•	_	•	_	_	_	IC circuit		
ے		Grommet					100 V	A93	•	_	•	_	-	_	_		
switch		Grommet	2				100 V or less	A90	•	_	•	_	-	_	IC circuit		
S S			Yes			40.17	100 V, 200 V	B54	•	_	•	•	_	_		Relay, PLC	
Reed			2	2-wire	24 V	12 V	200 V or less	B64	•	_	•	_	-	_	_	0	
~		Cammantan	Yes				C 73C	•	_	•	•	•	_	1			
		Connector	2				24 V or less	C80C	•	_	•	•	•	_	IC circuit		
	Diagnostic indication (2-color indication)	Grommet	Yes			_	_	B59W	•	_	•	_	-	_	_		

- \*\* 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 ······Nil (Example) M9NW
  - 1 m .....M
  - (Example) M9NWM (Example) M9NWL 3 m ..... L
  - 5 m ...... Z (Example) M9NWZ
  - None ······ N (Example) H7CN
- \* Solid state auto switches marked with "O" are produced upon receipt of order.
- \* D-A9 \( \textstyle \

- \* 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.)

Since there are other applicable auto switches than listed, refer to page 687 for details.

#### Model

Series	Туре	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)	n) Up to 800st: +1.4					
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)					

<sup>\*</sup> When the piston is locked, the load mass is limited by the mounting orientation and the operating pressure.

	Series	Туре	Lock operation
CNG		Non-lube	Spring locking

### JIS Symbol





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

<sup>\* -</sup>XC4 (with heavy duty scraper) is available only for Ø32 and

#### 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		

<sup>\*</sup> 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 *		

<sup>\*</sup> 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		
25	05 50 75 400 405 450 000	301 to 400	1500	
32	25, 50, 75, 100, 125, 150, 200,	301 to 450	1500	
40	250, 300	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**

				(mn					
Look tuno		Piston speed (mm/s)							
Lock type	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



D-□

CLJ2

CLM2

CLG1

CL1

MLGC

**CNG** 

MNB

CNA

CNS

CLS

CLQ

RLQ

MLU

MLGP

ML1C

#### Mounting Bracket Part No.

May making by a sket	Bore size (mm)						
Mounting bracket	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	Rod end nut	•	•	•	•	•	•	•
equipment	Clevis pin	_	_	_	_	_	_	•
	Single knuckle joint	•	•	•	•	•	•	•
0 "	Double knuckle joint (with pin) *	•	•	•	•	•	•	•
Option	Pivot bracket	_	_	_	_	•	•	•
	Rod boot	•	•	•	•	•	•	•

<sup>\*</sup> Pin and retaining ring are shipped together with double knuckle joint.

#### Mass

					(kg)
	Bore size (mm)	20	25	32	40
	Basic style	0.52	0.83	0.91	1.24
	Axial foot style	0.63	0.96	1.07	1.46
Basic mass	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 pivo	ot bracket	0.11	0.13	0.20	0.27
Head side piv	ot bracket	0.08	0.09	0.17	0.25
Single knuckl	e joint	0.05	0.09	0.09	0.10
Double knuck	de 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 ma	Additional mass with air cushion		0.01	0.02	0.02
Additional ma	Additional mass for long stroke		0.01	0.02	0.03

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

Basic mass----- 0.63 kg (Foot style, ø20)

retainer.

Spring locking (Exhaust locking)

The spring force which acts upon the taper ring is

magnified by a wedge effect, and is conveyed to all

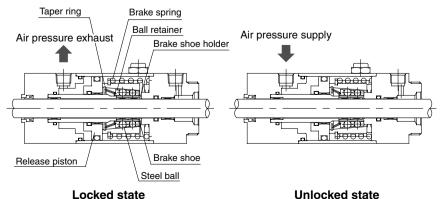
of the numerous steel balls which are arranged in two circles. These act on the brake shoe holder and brake, which locks the piston rod by tightening against it with a large force. Unlocking is accomplished when air pressure is supplied to the unlocking port. The release piston and taper ring oppose 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

Additional mass ..... 0.05 kg/50 st Air cylinder stroke ......100 st

Air cushion additional mass ..... 0.01 kg  $0.63 + 0.05 \times 100/50 + 0.01 = 0.74$  kg

#### **Construction Principle**

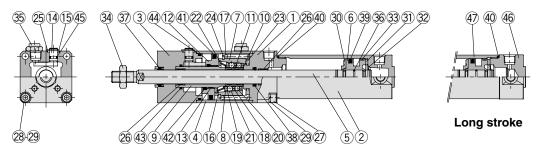


**Unlocked state** 

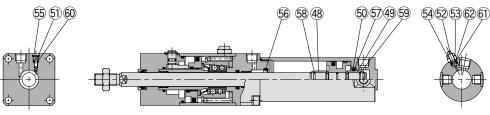


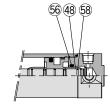
#### Construction

#### With rubber bumper: CNGBN



#### With air cushion: CNGBA





Long stroke

Com	ponent Par	ts		
No.	Descriptio	n	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 co	ver	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 hol	der	Special steel	Heat treated
11	Brake shoe		Special friction material	
12	Release piston		Carbon steel	Zinc chromated
13	Release piston	ø <b>20</b>	Oil-impregnated sintered alloy	
	bushing	ø <b>25</b> ,ø <b>32</b> ,ø <b>40</b>	Steel + Special resin	
14	Unlocking cam		Chromium molybdenum steel	Electroless nickel plated
15	Washer		Rolled steel plate	Electroless nickel plated
16	Retainer pre-loa	ad 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 un	locking cam shaft	Carbon steel	
26	Bushing		Oil-impregnated sintered alloy	ø40: Copper alloy
27	Hexagon socket he	ad cap screw	Chromium molybdenum steel	Nickel plated
28	Hexagon socket he	ad cap screw	Chromium molybdenum steel	Nickel plated
29	Spring washer for hex. sock	et 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.

#### omponent Parts

Com	ponent 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	Aluminum alloy	Anodized
49	Cushion ring B	Aluminum alloy	Same anodized 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	
25	CG1N25-PS	Cat of above rea 27 29 49
32	CG1N32-PS	Set of above nos. 37, 39, 40
40	CG1N40-PS	

<sup>\*</sup> 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  $\lfloor -\mathbf{X} \rfloor$ bore size.

CLG1

CL<sub>1</sub>

MLGC

**CNG** 

MNB

**CNA** 

CNS

CLS CLQ

RLQ

MLU

MLGP

ML1C

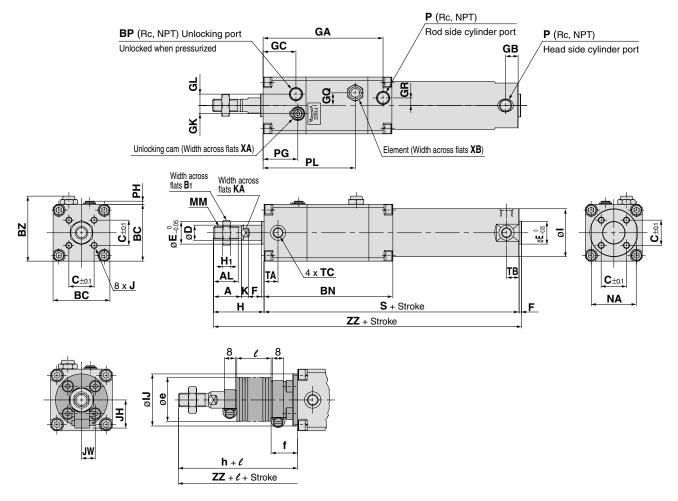
**D-**□

-X□

<sup>\*</sup> 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



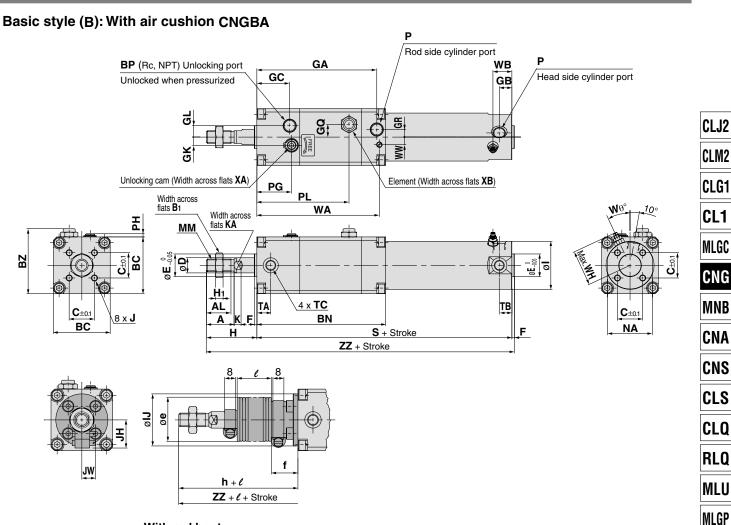
#### With rod boot

Stroke range without rod boot Stroke range with rod boot Bore size В1 BC BN BP ΒZ С D F GA GB GC GK GL GR GQ H1 AL Е (mm) 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 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) Without rod boot Bore size PG PH PL K KA MM NA Ρ s TΑ TB TC XA XB (mm) Н ZZ M8 x 1.25 M4 x 0.7 depth 7 24 1/8 21.5 141 (149) 11 11 M5 x 0.8 20 6 2 65 3 12 35 178 (186) 25 5.5 8 29 1/8 26.5 2.5 151 (159) 11 11 M6 x 0.75 3 12 40 193 (201) M5 x 0.8 depth 7.5 M10 x 1.25 73 32 2.5 154 (162) 11 10 (11) M8 x 1.0 M5 x 0.8 depth 8 5.5 10 M10 x 1.25 35.5 1/8 26.5 73 3 12 40 196 (204) 40 2.5 81 12 10 (12) M10 x 1.25 12 221 (230) M6 x 1 depth 12 14 M14 x 1.5 1/8 28 169 (178) 50

								(mm)
			٧	Vith r	od b	oot		
Bore size (mm)	IJ	JH (Reference)	JW (Reference)	е	f	h	e	ZZ
20	27	15.5	10.5	30	18	55	ø.	198 (206)
25	32	16.5	10.5	30	19	62	stroke	215 (223)
32	38	18.5	10.5	35	19	62	1/4 SI	218 (226)
40	48	21.5	10.5	35	19	70		241 (250)

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



With rod boot

																							(1	mm)
Bore size	Stroke rang	e without rod boot	Stroke range	e with rod boot	_	AL	ъ.	DC.	BN	DD	BZ	С	D	Е	_	GA	GB	cc	GK	G	СD	GQ	ш.	
(mm)	Standard	Long stroke	Standard	Long stroke	_ A	AL	Di	ьс	DIA	DF	DZ		ט	_	Г	GA	GB	GC	GK	GL	un	GQ	п	
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	ММ	NA	Р	PG	РН	PL	s	TA	тв	тс	WA	WB	wн	ww	Wθ	XA	ХВ
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)
		With	out rod boot			٧	Vith r	od b	oot		
	Bore size (mm)	н	ZZ	IJ	JH (Reference)	JW (Reference)	е	f	h	l	ZZ
	20	35	178 (186)	27	15.5	10.5	30	18	55	o)	198 (206)
Ī	25	40	193 (201)	32	16.5	10.5	30	19	62	stroke	215 (223)
	32	40	196 (204)	38	18.5	10.5	35	19	62	1/4 SI	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.

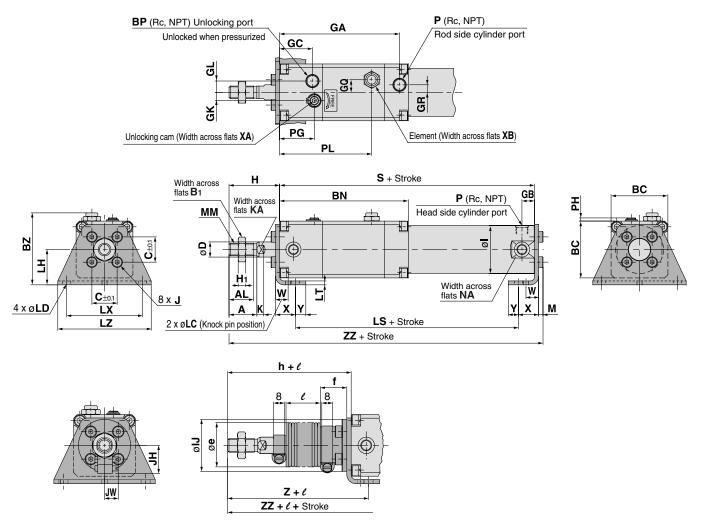
D-□

ML1C

-X□ Individual -X□

#### **Dimensions**

#### Axial foot style (L): With rubber bumper CNGLN



With rod boot

																							(mm)
Bore size	Stroke rang	e without rod boot	Stroke range	with rod boot		AL	В.	ВС	BN	DD.	BZ	С	D	GA	GB	~~	CK	CI	CD	GQ	ш.		
(mm)	Standard	Long stroke	Standard	Long stroke	A	AL	<b>D</b> 1	ьс	DIN	DP	DΖ	C	ט	GA	GB	GC	GK	GL	GH	GQ	П1		J
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

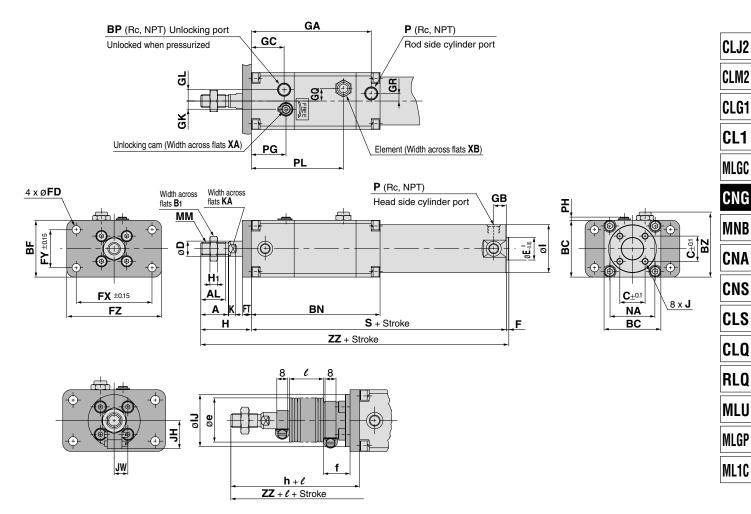
																						(111111)
Bore size (mm)	K	KA	М	ММ	NA	Р	PG	РН	PL	s	LC	LD	LH	LS	LT	LX	LZ	х	Υ	w	ХА	хв
20	5	6	3	M8 x 1.25	24	1/8	21.5	2	65	141 (149)	4	6	25	117 (125)	3	50	62	15	7	10	3	12
25	5.5	8	3.5	M10 x 1.25	29	1/8	26.5	2.5	73	151 (159)	4	6	28	127 (135)	3	57	70	15	7	10	3	12
32	5.5	10	3.5	M10 x 1.25	35.5	1/8	26.5	2.5	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)
	W	ithout rod boot					Wit	h ro	d boot		
re size (mm)	н	ZZ	IJ	JH (Reference)	JW (Reference)	е	f	h	e	z	ZZ
20	35	182 (190)	27	15.5	10.5	30	18	55	ø.	67	202 (210)
25	40	197.5 (205.5)	32	16.5	10.5	30	19	62	stroke	74	219.5 (227.5)
32	40	200.5 (208.5)	38	18.5	10.5	35	19	62	1/4 st	75	222.5 (230.5)
40	50	226 (235)	48	21.5	10.5	35	19	70	1	83.5	246 (255)

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



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



		V	illi iou L	,001																			(1	mm)
Bore size	Stroke rang	e without rod boot	Stroke rang	e with rod boot	_	AL	ъ.	BC.	DE	BN	DD	BZ	С	D	Е	_	GA	GB	GC.	GK	2	CB	GQ	ш.
(mm)	Standard	Long stroke	Standard	Long stroke	A	AL	Di	ВС	DF	DIN	DF	DZ		ט	4	Г	GA	GB	GC	GK	5	un	GQ	ш
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			v	KA	ММ	NA	Р	PG	ВΠ	DI	s	FD	СТ	EV	EV	<b>E</b> 7	<b>ν</b> Λ	VD	With	out rod boot
(mm)	-	J	_	NΑ	IVIIVI	IVA	Г	PG	РΠ	FL	3	FD	ГІ	F.A.	ГТ	<b>F</b> Z	ΛА	ΛD	Н	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)
			Wit	h roc	d boc	ot		
Bore size (mm)	IJ	JH (Reference)	JW (Reference)	е	f	h	e	ZZ
20	27	15.5	10.5	30	18	55	o)	198 (206)
25	32	16.5	10.5	30	19	62	stroke	215 (223)
32	38	18.5	10.5	35	19	62	1/4 st	218 (226)
40	48	21.5	10.5	35	19	70	-,	241 (250)

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

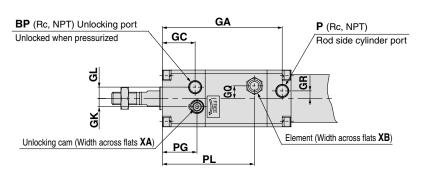


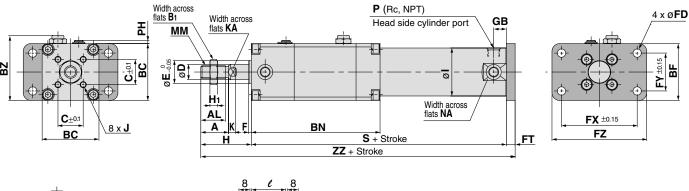
-**X**□

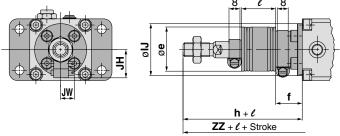


#### **Dimensions**

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







With rod boot

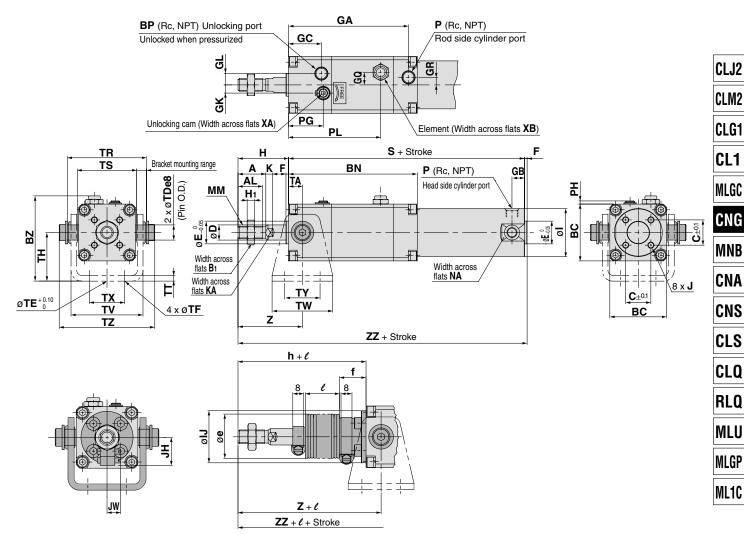
(mm) Stroke range without rod boot Stroke range with rod boot Bore size B<sub>1</sub> BC BF BN BP ΒZ С F GA GB GC GK GL GR GQ H1 AL D Ε ı Standard Long stroke (mm) Standard Long stroke Up to 200 20 20 to 200 12 85 10 18 5.5 26 18 15.5 38 38 93 1/8 44 5 14 2 6 4 8 5 13 8 Up to 300 96 10 25 20 to 300 22 17 45 45 103 1/8 51.5 16.5 10 14 2 25 6.5 9 7 10 31 19.5 6 25 6.5 32 Up to 300 20 to 300 22 45 45 1/8 51.5 12 18 2 97 10 7 10 38 19.5 17 104 20 9 6 40 104 10 (13) 26 7 12 Up to 300 20 to 300 30 27 52 52 1/8 58.5 26 16 25 11 8 301 to 500 301 to 500 19 112

																			(mm)
Bore size		к	KA	мм	NA	Р	PG	ВΠ	DI	s	ED	СТ	EV	EV	E7	VA	VD	With	nout rod boot
(mm)	J	<b></b>	NΑ	IVIIVI	NA	F	PG	РΠ	PL	3	FU	ГІ	F^	ГТ	FZ	ΛA	^Ь	Н	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			Wi	th ro	d bo	ot		
(mm)	IJ	JH (Reference)	JW (Reference)	е	f	h	e	ZZ
20	27	15.5	10.5	30	18	55	m	198 (206)
25	32	16.5	10.5	30	19	62	stroke	215 (223)
32	38	18.5	10.5	35	19	62	1/4 St	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

																							(1	mm)
Bore size	Stroke rang	e without rod boot	Stroke range	with rod boot	_	AL	ъ.	BC.	BN	DD.	BZ	С	D	Е	F	GA	GB	~	7	<u></u>	CD.	GQ	ш.	
(mm)	Standard	Long stroke	Standard	Long stroke	A	AL	<b>D</b> 1	ьс	DIA	DP	DΖ	C	ט	_		GA	GB	GC	GK	GL	Għ	GQ	<b>П</b> 1	'
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

																								1)	mm)
Bore size (mm)	J	к	KA	ММ	NA	Р	PG	РН	PL	s	TA	TDe8	TE	TF	тн	TR	TS	TT	TV	TW	тх	TY	TZ	ХА	хв
20	M4 x 0.7	5	6	M8 x 1.25	24	1/8	21.5	2	65	141	11	8 <sup>-0.025</sup> -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	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	10	6.6	42.5	72.5	54	4.5	65.4	56	36	30	85.7	4	12

												(mm)
	W	ithou	it rod boot				With	n rod	boo	t		
Bore size (mm)	н	z	ZZ	IJ	JH (Reference)	JW (Reference)	е	f	h	e	z	ZZ
20	35	46	178	27	15.5	10.5	30	18	55	m	66	198
25	40	51	193	32	16.5	10.5	30	19	62	stroke	73	215
32	40	51	196	38	18.5	10.5	35	19	62	1/4 St	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.

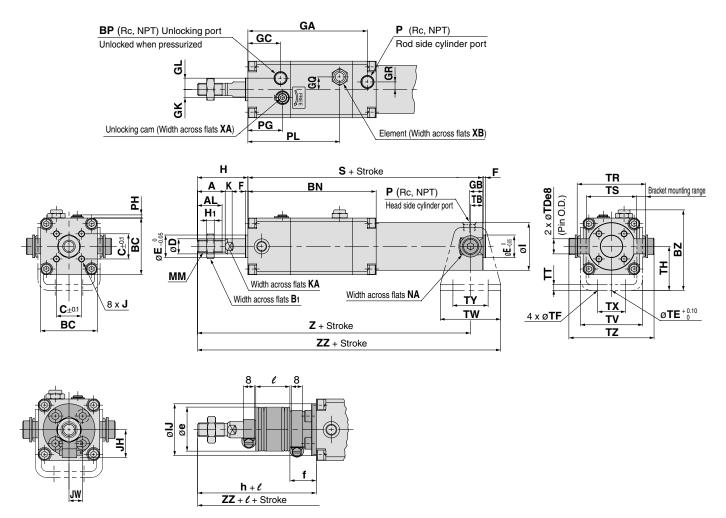


**D-**□

Individual -X□

#### **Dimensions**

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



With rod boot

																							(	(mm)
Bore size	Stroke rang	ge without rod boot	Stroke range	e with rod boot	_	AL	В.	ВС	BN	DD.	BZ	С	D	Е	_	GA	GB	~~	GK	2	CD.	~	ш.	
(mm)	Standard	Long stroke	Standard	Long stroke	A	AL	<b>D</b> 1	ВС	DIA	DP	DZ		ט			GA	GD	GC	GK	GL	Gr	GQ	<b>П</b> 1	•
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

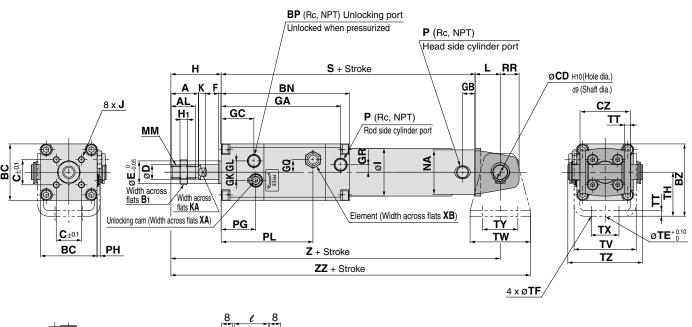
																								1)	mm)
Bore size (mm)	J	к	KA	ММ	NA	Р	PG	РН	PL	s	тв	TDe8	TE	TF	тн	TR	тѕ	TT	TV	TW	тх	ΤY	TZ	ХА	ХВ
20	M4 x 0.7	5	6	M8 x 1.25	24	1/8	21.5	2	65	141	11	8 <sup>-0.025</sup> -0.047	10	5.5	25	39	28	3.2	35.8	42	16	28	47.6	3	12
25	M5 x 0.8	5.5	8	M10 x 1.25	29	1/8	26.5	2.5	73	151	11	10 -0.025	10	5.5	30	43	33	3.2	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	10	6.6	40	65.5	49	4.5	58.4	56	30	30	78.7	4	12

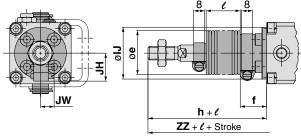
												(mm)
		Without ro	d boot				١	Nith	rod b	oot		
Bore size (mm)	н	Z	ZZ	IJ	JH (Reference)	JW (Reference)	е	f	h	e	Z	ZZ
20	35	165	186	27	15.5	10.5	30	18	55	a)	185	206
25	40	180	201	32	16.5	10.5	30	19	62	stroke	202	223
32	40	184	208	38	18.5	10.5	35	19	62	1/4 st	206	230
40	50	209 (216)	237 (244)	48	21.5	10.5	35	19	70	1,	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	Stroke rang	ge without rod boot	Stroke range	with rod boot	Α	AL	ъ.	BC.	BN	DВ	BZ	С	D	Е	F	GA	GB	CC	GK	G	CP	GQ	ш.	
(mm)	Standard	Long stroke	Standard	Long stroke	A	AL	Dı	ВС	DIA	DP	DZ		ט		Г	GA	GB	GC	GK	GL	un	GQ	п	•
20	Up to 200	-	20 to 200	1	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	1	20 to 300	1	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

																								(1	mm)
Bore size (mm)	J	K	KA	ММ	NA	Р	PG	РН	PL	s	CD	CZ	L	RR	TE	TF	тн	TT	TV	TW	тх	TY	TZ	XA	ХВ
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)		
			Without ro	d boot		With rod boot									
	Bore size (mm)	н	Z	ZZ	IJ	JH (Reference)	JW (Reference)	е	f	h	l	z	ZZ		
	20	35	190	211	27	15.5	10.5	30	18	55	a)	210	231		
	25	40	207	228	32	16.5	10.5	30	19	62	roke	229	250		
	32	40	214	238	38	18.5	10.5	35	19	62	1/4 st	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.



CLJ2

CLM2

CLG1

CL1

MLGC

**CNG** 

MNB

**CNA** 

CNS

CLS

CLQ

RLQ

MLU

MLGP

ML1C

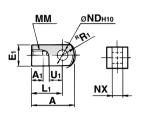


# **Accessory Bracket Dimensions**

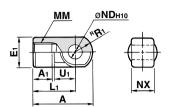
#### Single Knuckle Joint

#### I-G02/G03

Material: Rolled steel



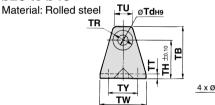
#### I-G04 Material: Cast iron

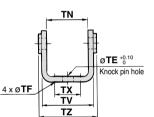


										(mm)
Part no.	Applicable bore size (mm)	A	<b>A</b> 1	E <sub>1</sub>	Lı	ММ	RR1	U <sub>1</sub>	ND <sub>H10</sub>	NX
I-G02	20	34	8.5	□16	25	M8 x 1.25	10.3	11.5	8 <sup>+ 0.058</sup>	8 - 0.2
I-G03	25, 32	41	10.5	□20	30	M10 x 1.25	12.8	14	10+0.058	10 - 0.2
I-G04	40	42	14	ø22	30	M14 x 1.5	12	14	10+0.058	18 - 0.3

#### **Rod Side Pivot Bracket**

#### ø20 to ø40





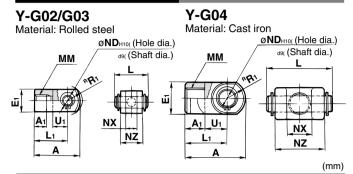
(mm)

							(,
Part no.	Applicable bore size (mm)	тв	Тфн9	TE	TF	тн	TN
CNG-020-24	20	42	8 + 0.036	10	5.5	31	(41.4)
CNG-025-24	25	48	10 + 0.036	10	5.5	37	(48.4)
CNG-032-24	32	53	12 + 0.043	10	6.6	38.5	(48.4)
CNG-040-24	40	60	14 + 0.043	10	6.6	42.5	(56.4)

Part no.	Applicable bore size (mm)	TR	тт	TU	TV	TW	тх	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

#### **Double Knuckle Joint**

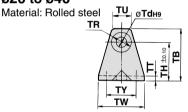
 Knuckle pin and retaining ring are attached.

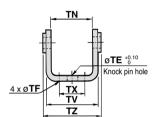


Part no.	Applicable bore size (mm)	Α	<b>A</b> 1	E <sub>1</sub>	Lı	ММ	RR1	U <sub>1</sub>	ND	NX	ΝZ	L	Applicable pin part no.
Y-G02	20	34	8.5	□16	25	M8 x 1.25	10.3	11.5	8	8 + 0.4	16	21	IY-G02
Y-G03	25, 32	41	10.5	□20	30	M10 x 1.25	12.8	14	10	10 + 0.4	20	25.6	IY-G03
Y-G04	40	42	16	ø22	30	M14 x 1.5	12	14	10	18 + 0.5	36	41.6	IY-G04

#### **Head Side Pivot Bracket**

#### ø20 to ø40





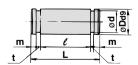
(mm)

Part no.	Applicable bore size (mm)	ТВ	Тфн9	TE	TF	тн	TN
CG-020-24A	20	36	8 + 0.036	10	5.5	25	(29.3)
CG-025-24A	25	43	10 + 0.036	10	5.5	30	(33.1)
CG-032-24A	32	50	12 + 0.043	10	6.6	35	(40.4)
CG-040-24A	40	58	14 + 0.043	10	6.6	40	(49.2)

Part no.	Applicable bore size (mm)	TR	тт	TU	TV	TW	тх	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

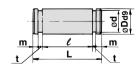


								(mm)
Part no.	Applicable bore size (mm)	Dd9	L	d	e	m	t	Applicable retaining ring
IY-G02	20	8 -0.040			16.2			Type C 8 for axis
IY-G03	25, 32	10 - 0.040						Type C 10 for axis
IY-G04	40	10 - 0.040	41.6	9.6	36.2	1.55	1.15	Type C 10 for axis

<sup>\*</sup> Retaining rings are included.

#### **Clevis Pin**

Material: Carbon steel

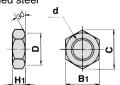


								(mm)
Part no.	Applicable bore size (mm)	Dd9	L	d	e	m	t	Applicable retaining ring
CD-G02	20	8 -0.040	43.4	7.6	38.6	1.5		Type C 8 for axis
CD-G25	25	10 - 0.040	48	9.6	42.6	1.55	1.15	Type C 10 for axis
CD-G03	32	12 - 0.050	59.4	11.5	54	1.55	1.10	Type C 12 for axis
CD-G04	40	14 - 0.050	71.4	13.4	65	2.05	1.15	Type C 14 for axis
			. —					

<sup>\*</sup> Retaining rings are included.

#### **Rod End Nut**

Material: Rolled steel

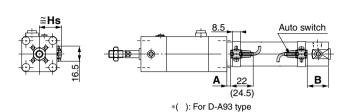


					(1	mm)
Part no.	Applicable bore size (mm)	B1	С	D	d	H1
NT-02	20	13	(15)	12.5	M8 x 1.25	5
NT-03	25, 32	17	(19.6)	16.5	M10 x 1.25	6
NT-G04	40	19	(21.9)	18	M14 x 1.5	8

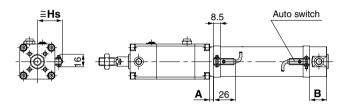


#### Auto Switch Proper Mounting Position (Detection at Stroke End) and Its Mounting Height

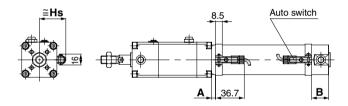
#### Reed auto switch D-A9□



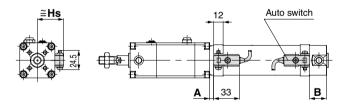
#### **D-C7, C8**



#### D-C73C, C80C



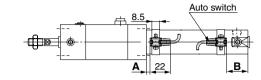
#### D-B5, B6, B59W



#### Solid state auto switch

**D-M9**□ D-M9□W





CLJ2

CLM2

CLG1

CL<sub>1</sub>

**CNG** 

CNS

CLS

CLQ

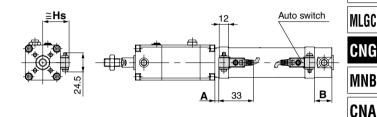
RLQ

MLU

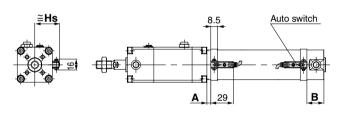
MLGP

ML1C

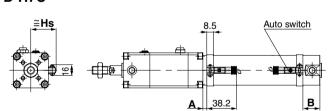
#### **D-G5NTL**



#### **D-H7**□, **H7**□**W** D-H7NF, H7BAL



#### D-H7C



#### **Auto Switch Proper Mounting Position**

Auto Oil	3 Switch Froper Mounting Fosition												(111111)	
Auto switch model	<b>D-A9</b> □		D-MS	9□ 9□W	_		D-E D-E	35□ 864	P D-R28M		D-H7□ D-H7C D-H7□W D-H7BAL D-H7NF		L	
size (mm)	Α	В	Α	В	Α	В	Α	В	Α	В	Α	В	Α	В
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)

mm)	Auto	Switch	Moun	ting I	Height

Auto switch model Bore	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
size (mm)	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

Note) Adjust the auto switch after confirming the operating conditions in the actual setting.



D-□

(mm)

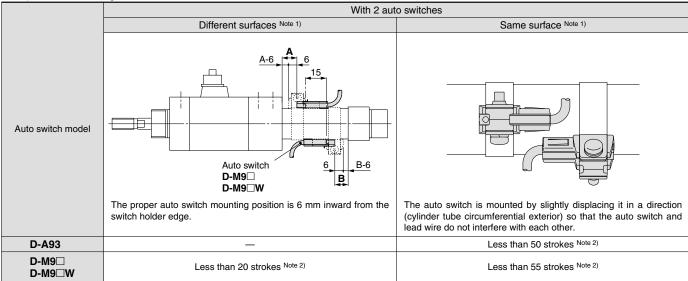
 $<sup>\</sup>ast$  ( ): For the long stroke type

### **Minimum Auto Switch Mounting Stroke**

n: No. of auto switches (mm)

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

Note 1) Auto switch mounting



Note 2) Minimum stroke for mounting auto switches in the other mounting styles mentioned in note 1.

#### **Operating Range**

				(mm)
Auto switch model	Bore size (mm)			
Auto Switch model	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

<sup>\*</sup> 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	Bore size (mm)				
model	ø <b>20</b>	ø <b>25</b>	ø <b>32</b>	ø <b>40</b>	
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.

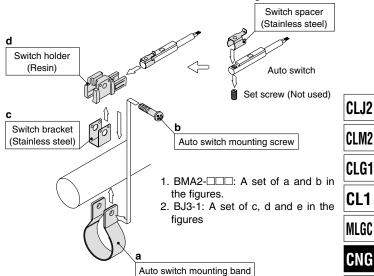
#### [Mounting screw set made of stainless steel]

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-B5/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.



CLG<sub>1</sub>

CL1

MLGC

**CNG** 

MNB

CNA

CNS

**CLS** 

CLQ

RLQ

MLU

MLGP

ML1C

#### Cylinder Brackets by Stroke/Mounting Surfaces

	st: Stroke (n			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		
neeu	D-C80		Without indicator light
	D-H7A1, H7A2, H7B	Grommet (In-line)	
Solid state	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.

D-□

-X□

Individual -X□





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

 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

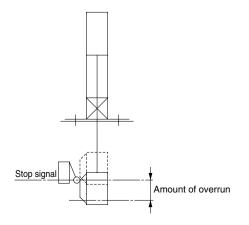
1. When in the locked state, do not apply a load accompanied by an impact shock, strong vibration or turning force, etc.

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 +  $ext{C}$ .
- 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

 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.





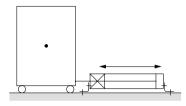
Be sure to read before handling. Refer to front matters 42 and 43 for Safety Instructions and pages 3 to 11 for Actuator and Auto Switch Precautions.

#### Mounting

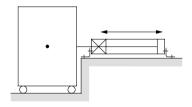
### 

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.



O 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 quide.

#### Adjustment

## **⚠** Caution

- 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 overrun distance to required stop position.

#### **Pneumatic Circuit**

## **⚠** Warning

 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.

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.

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

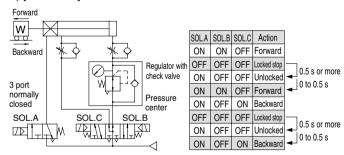
When the locked stop time is too short, the piston rod (and load) may lurch at a speed greater than the control speed of the speed controller.

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]



#### 2) [Vertical]

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

SOL.B SOL.C SOL.A SOL.C SOL.B

TEMPLE OF THE PROPERTY OF T

CLM2

CLJ2

CLG1

CL1

MLGC

CNG

MNB

CNA

D CLS

CLQ

RLQ

MLU

MLGP

ML1C

D-□

-X□

Individual -X□



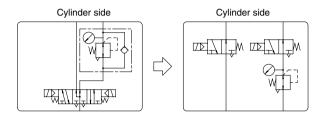
Be sure to read before handling.

Refer to front matters 42 and 43 for Safety Instructions and pages 3 to 11 for Actuator and Auto Switch Precautions.

#### **Pneumatic Circuit**

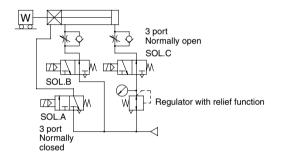
### 

 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]

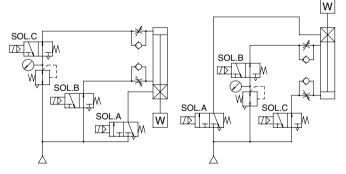
1. [Horizontal]



#### 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

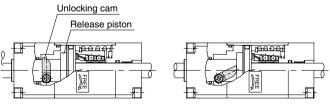
1. The unlocking cam is an emergency unlocking mechanism only.

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.

- 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.
- 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.





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.

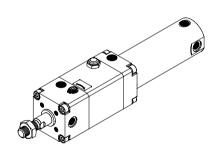
Dava siza (mm)	Lock unit part no.		
Bore size (mm)	Rubber bumper type	Air cushion type	
20	CNGN20D-UA	CNGA20D-UA	
25	CNGN25D-UA	CNGA25D-UA	
32	CNGN32D-UA	CNGA32D-UA	
40	CNGN40D-UA	CNGA40D-UA	

#### 2. Replacement of lock units.

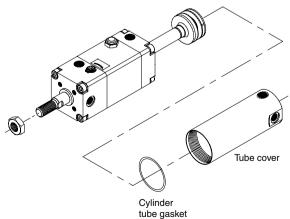
 Remove the lock unit by securing the square section of the rod cover or the wrench flats of the tube cover in an apparatus such as a vice, and then loosening the other end with a spanner or adjustable angle wrench, etc.

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

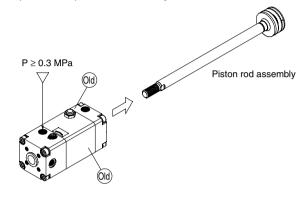
Bore size (mm)	Rod cover square section (mm)	Tube cover wrench flats (mm)
20	38	24
25	45	29
32	45	35.5
40	52	44



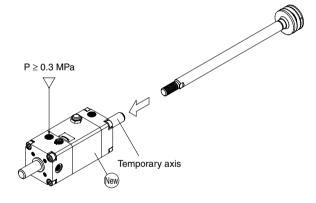
2) Remove the tube cover.

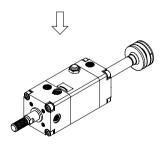


Apply 0.3 MPa or more of compressed air to the unlocking port, and pull out the piston rod assembly.



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.



CLJ2

CLM2

CLG1

CL<sub>1</sub>

MLGC

**CNG** 

MNB

**CNA** 

CNS

CLS

CLQ

RLQ

MLU

MLGP

ML1C

-X□ Individual -X□

