ISO/VDMA Cylinder: With Lock Type
Double Acting, Single Rod
Series C95N
ø32, ø40, ø50, ø63, ø80, ø100

How to Order

Without auto switch **C95N** **B** **32** — **100** — **D**

With auto switch **C95ND** **B** **32** — **100** — **D** — **A53** **S**

Built-in magnet

Mounting style

B	Basic/without bracket style
L	Axial foot style
F	Rod side flange style
G	Head side flange style
C	Single clevis style
D	Double clevis style

Bore size

32	32 mm
40	40 mm
50	50 mm
63	63 mm
80	80 mm
100	100 mm

Stroke (mm)
Refer to "Standard Stroke" on page 6-12-20.

Lock direction

D	Both direction

Auto switch

Nil	Without auto switch

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

Number of auto switches

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

Applicable Auto Switch/Tie-rod Mounting

Type	Special function	Electrical entry	Indicator light	Wiring (Output)	Load voltage DC	Load voltage AC	Auto switch model: Tie-rod mounting	Auto switch model: Band mounting	Lead wire length (m): 0.5 (Nil)	3 (L)	5 (Z)	Applicable load	
Reed switch	—	Grommet	Yes	3-wire (Equiv. to NPN)	5 V	—	**A56**	—	●	●	—	IC	—
				2-wire	12 V	—	**A53**	—	●	●	●	—	Relay, PLC
						100 V, 200 V	**A54**	—	●	●	●		
			No		5 V, 12 V	—	**A67**	—	●	●	—	IC	
					12 V	200 V or less	**A64**	—	●	●	—	—	
	Diagnostic indication (2-color)		Yes	3-wire	5 V	—	**Z76**	—	◉	◉	—	IC	—
	—			2-wire	12 V	AC 100	**Z73**	—	●	●	●	—	Relay, PLC
			No		5 V, 12 V	100 V or less	**Z80**	—	●	●	—	IC	
		Terminal conduit	Yes		12 V	—	—	**A33**	—	—	—	—	PLC
						100 V, 200 V	—	**A34**	—	—	—	—	Relay, PLC
		DIN terminal					—	**A44**	—	—	—		
Solid state switch	—	Grommet	Yes	3-wire (NPN)	24 V	5 V, 12 V	—	**F59**	—	●	●	○	IC	Relay, PLC
				3-wire (PNP)				**F5P**	—	●	●	○	
				2-wire	—	—	100 V, 200 V	**J51**	—	●	●	○	—
					24 V	12 V	—	**J59**	—	●	●	○	
	Diagnostic indication (2-color)			3-wire (NPN)		5 V, 12 V		**F59W**	—	●	●	○	IC
				3-wire (PNP)				**F5PW**	—	●	●	○	
				2-wire		12 V		**J59W**	—	●	●	○	—
	Water resistant (2-color)							**F5BAL**	—	—	●	○	
	With timer			3-wire (NPN)		5 V, 12 V		**F5NTL**	—	—	●	○	IC
	Diagnostic output (2-color)			4-wire (NPN)				**F59F**	—	●	●	○	
	Strong magnetic field resistant (2 color)			2-wire		—		**P5DW**	—	—	●	●	—
	—			3-wire (NPN)		5 V, 12 V		**Y59A**	—	●	●	○	IC
				2-wire		—		**Y59B**	—	◉	◉	○	—
				3-wire (PNP)		5 V, 12 V		**Y7P**	—	●	●	○	IC
	Diagnostic indication (2-color)			3-wire (NPN)				**Y7NW**	—	●	●	○	
				3-wire (PNP)				**Y7PW**	—	●	●	○	
				2-wire		—		**Y7BW**	—	●	●	○	—
	Water resistant (2-color)							**Y7BAL**	—	—	●	○	
	—	Terminal conduit		3-wire (NPN)		5 V, 12 V		—	**G39**	—	—	—	IC
				2-wire		12 V		—	**K39**	—	—	—	—

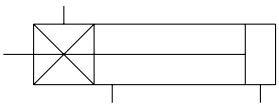
∗ Lead wire length symbols: 0.5 m ····· Nil (Example) A53
3 m ····· L (Example) A53L
5 m ····· Z (Example) A53Z

○: Manufactured upon receipt of order.
Refer to page 6-16-1 for details of applicable auto switches in addition to those listed above.

Auto Switch Mounting Bracket Part No.

Bore size (mm)	32	40	50	63	80	100
D-A3/A4/K3/G3	BMB2-032	BMB2-040	BMB1-050	BMB1-063	BMB1-080	BMB1-100
D-A5/A6/F5/J5	BT-03		BT-05		BT-06	
D-Z□/Y□	BMB4-032		BMB4-050		BMB4-063	
D-P5DWL	BMB3T-040		BMB3T-050		BMB3T-080	

JIS Symbol
Cylinder with lock



Specifications

Bore size (mm)	32, 40, 50, 63, 80, 100
Model	Non-lube
Fluid	Air
Proof pressure	1.5 MPa
Maximum operating pressure	1.0 MPa
Minimum operating pressure	0.08 MPa
Piston speed	50 to 1000 mm/s Note)
Ambient and fluid temperature	Without auto switch: –10°C to 70°C (No freezing) With auto switch: –10°C to 60°C (No freezing)
Cushion	Double side air cushion
Stroke length tolerance	Up to 250: $^{+1.0}_{0}$, 251 to 1000: $^{+1.4}_{0}$
Mounting	Basic style, Axial foot style, Rod side flange style, Head side flange style, Single clevis style, Double clevis style

Note) Load limits exist depending upon piston speed when locked, mounting direction and operating pressure.

Lock Specifications

Lock actuation	Spring lock (Exhaust lock)
Unlocking pressure	0.25 MPa or more
Locking pressure	0.20 MPa or less
Maximum operating pressure	1.0 MPa
Locking direction	Two-way

Standard Stroke

For cases with auto switches, refer to the table of minimum strokes for mounting of auto switches on page 6-12-25.

Bore size (mm)	Standard stroke (mm)
32	25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500
40	25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500
50	25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500, 600
63	25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500, 600
80	25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800
100	25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800

Stopping Accuracy

(mm)

Locking system	Piston speed (mm/s)			
	100	300	500	1000
Spring lock	±0.3	±0.6	±1.0	±2.0

Conditions / Horizontal supply pressure P = 0.5 MPa
Load weight·····Upper limit of allowable value
Solenoid valve for locking mounted on the unlocking port
Maximum value of stopping position dispersion from 100 measurements

Spring Lock Holding Power (Maximum static load)

Bore size (mm)	**32**	**40**	**50**	**63**	**80**	**100**
Holding power N	552	882	1370	2160	3430	5390

Weight/Aluminum Tube

(kg)

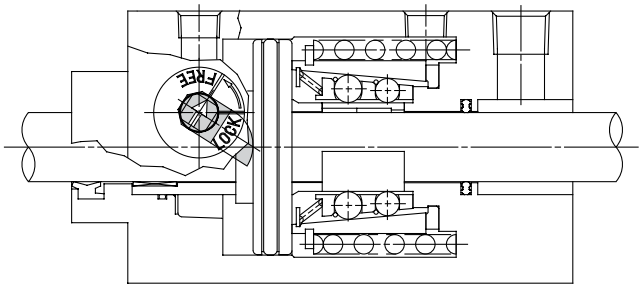
Bore size (mm)		32	40	50	63	80	100
Basic weight	Basic style	1.26	1.87	2.97	4.50	7.34	10.80
	Foot style	0.16	0.20	0.38	0.46	0.89	1.09
	Flange style	0.20	0.23	0.47	0.58	1.30	1.81
	Single clevis style	0.16	0.23	0.37	0.60	1.07	1.73
	Double clevis style	0.20	0.32	0.45	0.71	1.28	2.11
Additional weight per each 50 mm of stroke	All mounting brackets	0.11	0.16	0.26	0.27	0.42	0.56
Accessory	Single rod clevis	0.07	0.11	0.22	0.22	0.40	0.40
	Double clevis (With pin)	0.09	0.15	0.34	0.34	0.69	0.69

Calculation: (Example) C95ND40-100
- Basic weight ····· 1.87 (kg) (Basic, ø40)
- Additional weight ····· 0.16 (kg/50 st)
- Cylinder stroke ····· 100 (st)

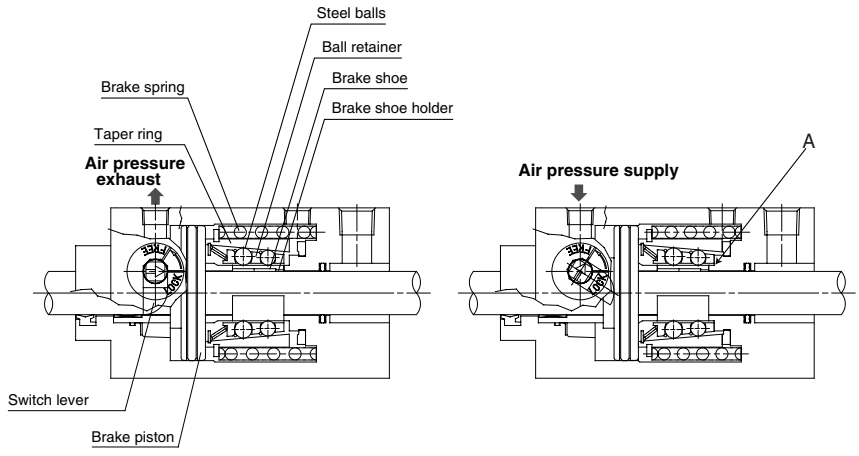
1.87 + 0.16 x 100/50 + 0.32 = 2.51 kg

Manual override for unlocking

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



Construction Principle



Locked condition **Unlocked condition**

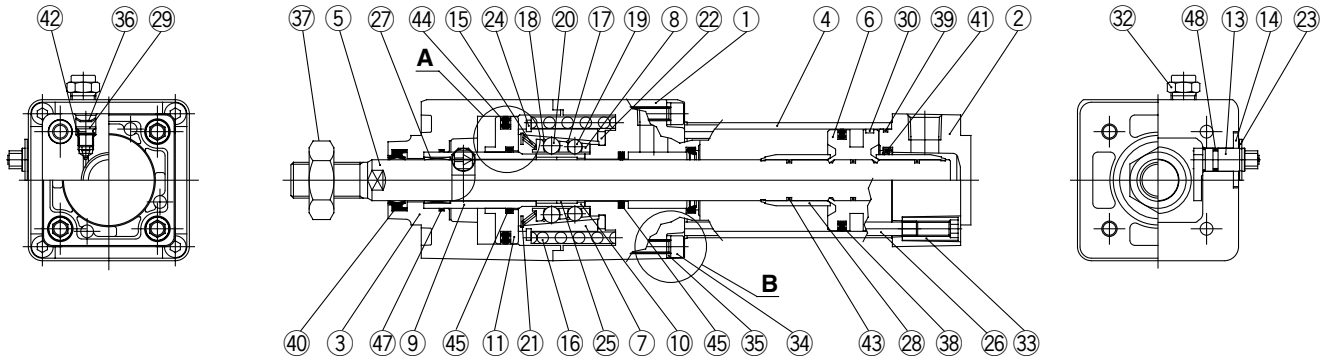
Spring lock (Exhaust lock)

The spring force which acts upon the taper ring is magnified by a wedge effect, and is conveyed to all of the numeous 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.

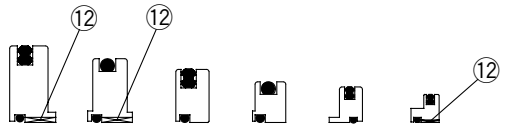
Unlocking is accomplished when air pressure is supplied to the unlocking port. The brake piston and taper ring oppose the spring force, moving to the right side, and the ball retainer strikes the cover section A. The braking force is released as the steel balls are removed from the taper ring by the ball retainer.

Construction

[First angle projection]

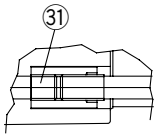


Section A
(Release piston bushing)



ø100 ø80 ø63 ø50 ø40 ø32

Section B
(Tie-rod for unit attachment)



ø80, ø100

Component Parts

No.	Description		Material		Qty.	Note
①	Rod cover		Aluminum alloy		1	
②	Head cover		Aluminum die-casted		1	
③	Cover		Aluminum alloy		1	
④	Cylinder tube		Aluminum alloy		1	
⑤	Piston rod		Carbon steel		1	
⑥	Piston		Aluminum alloy		1	
⑦	Taper ring		Carbon steel		1	
⑧	Ball retainer		Special resin		1	
⑨	Piston guide		Carbon steel		1	
⑩	Brake shoe holder		Special steel		1	
⑪	Brake release piston	32, 80, 100	Carbon steel		1	
		40, 50, 63	Aluminum alloy		1	
⑫	Breake release piston bushing		Steel + Special resin		1	32, 80,100 only
⑬	Cam for lock release		Chrome molybdenum steel		1	
⑭	Washer		Carbon steel		1	
⑮	Spring for retainer pre-load		Stainless wire		1	
⑯	Brake spring		Stainless wire		1	
⑰	Clip A		Stainless steel		1	
⑱	Clip B		Stainless steel		1	
⑲	Steel ball A		Carbon steel	32 to 50	10	
				63 to 100	9	

No.	Description	Material		Qty.	Note
⑳	Steel ball B	Carbon steel	32 to 50	10	
			63 to 100	9	
㉑	Tooth ring	Stainless steel		1	
㉒	Damper	Polyurethane rubber		1	
㉓	Snap ring for release cam ⓐ	Carbon steel		1	
㉔	Snap ring for taper ring	Carbon steel		1	
㉕	Brake shoe	Special friction material		2	
㉖	Tie-rod	Carbon steel		4	
㉗	Bushing	Lead bronze casting		1	
㉘	Cushion ring	Brass		2	
㉙	Cushion valve	Steel wire		2	
㉚	Wear ring	Resin		1	
㉛	Tie-rod for unit attachment	Carbon steel		2	
㉜	BC element	Bronze + Brass		1	
㉝	Tie-rod nut	Carbon steel	32 to 63	4	
			80, 100	8	
㉞	Cap screw	Chrome molybdenum steel		4	
㉟	Spring washer	Steel wire		4	
㊱	Snap ring	Steel for spring		2	40 to 100
㊲	Rod end nut	Steel		1	

No.	Description	Material	Qty.
㊳	Piston seal	NBR	1
㊴	Tube gasket	NBR	2
㊵	Rod seal A	NBR	1
㊶	Cushion seal	NBR	2
㊷	Cushion seal valve	NBR	2
㊸	Piston gasket	NBR	3
㊹	Release piston seal	NBR	1
㊺	Road seal B	NBR	1
㊻	Gasket for release piston	NBR	1
㊼	Gasket for release guide	NBR	1
㊾	Gasket for release cam	NBR	1

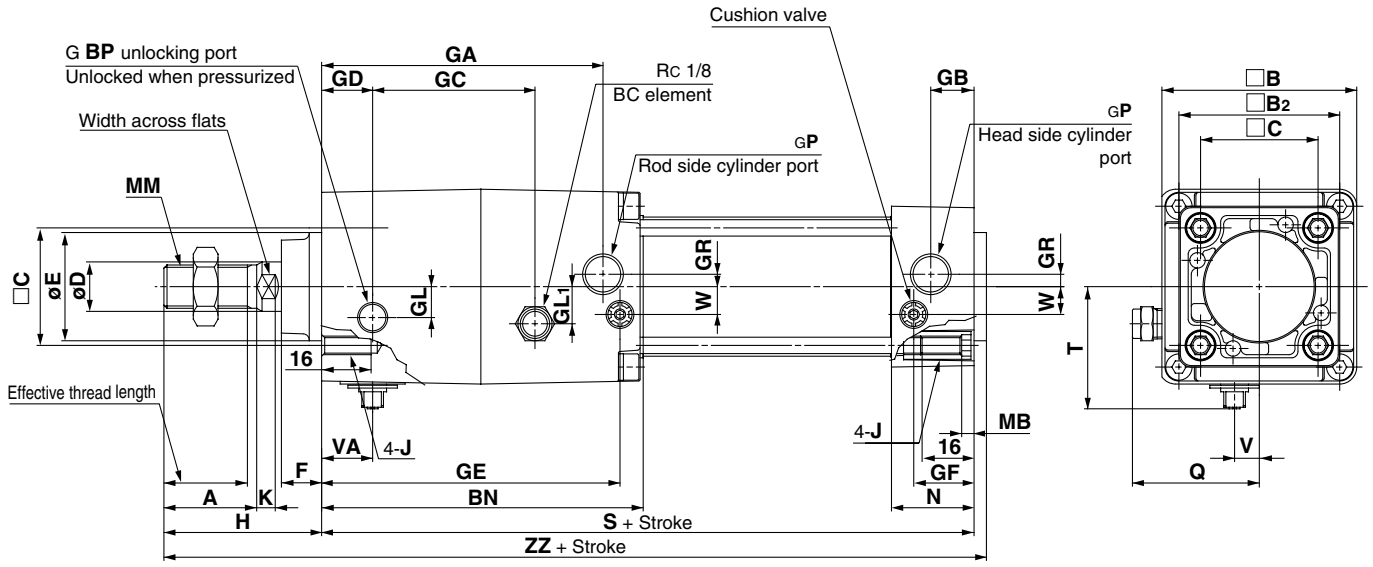
Replacement Parts: Seal Kit

Bore size (mm)	Kit no.	Contents
32	CS95-32	Kits include items ㉚ and ㊳ to ㊶.
40	CS95-40	
50	CS95-50	
63	CS95-63	
80	CS95-80	
100	CS95-100	

∗ Seal kits consist of items ㉚ and ㊳ to ㊶ contained in one kit, and can be ordered using the order number for each respective tube bore size.

Dimensions

Basic style (B): C95NB



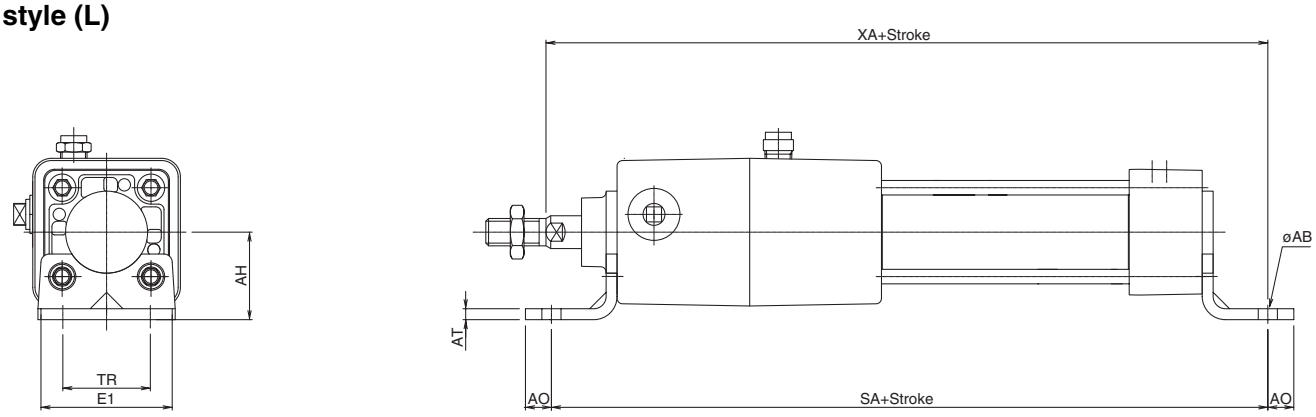
Bore size (mm)	Effective thread length (mm)	Width across flats	A	B	B_2	BN	BP	C	D	Ee_{11}	F	GA	GB	GC	GD	GL	GL_1
32	19.5	10	22	54	46	97	G 1/8	32.5	12	30	13	83	13	45.5	13	7.5	12
40	21	13	24	63	52	104	G 1/8	38	16	35	13	91	14	52.5	16.5	10	12
50	29	16	32	75	65	120.5	G 1/4	46.5	20	40	14	104.5	15.5	58.5	19	11.5	15
63	29	16	32	90	75	134.5	G 1/4	56.5	20	45	14	119.5	16.5	68	23	17.5	12
80	37	21	40	102	95	169	G 1/4	72	25	45	20	150	19	81	33	22	18
100	37	21	40	116	114	189	G 1/4	89	30	55	20	170	19	96	37.5	25	20

Bore size (mm)	GR	GE	GF	J	MB	K	MM	N	P	Q	H	S	T	V	VA	W	ZZ
32	4	88.5	18.3	M6 x 1	4	6	M10 x 1.25	27	G 1/8	37	48	164	34	6.5	13	6.5	216
40	4	96.5	19.5	M6 x 1	4	6.5	M12 x 1.25	27	G 1/4	41.5	54	182	39.5	8	16.5	9	240
50	5	111.2	22.4	M8 x 1.25	5	8	M16 x 1.5	31.5	G 1/4	47.5	69	195	47	9	20	10.5	268
63	9	123.5	20.7	M8 x 1.25	5	8	M16 x 1.5	31.5	G 3/8	55	69	224	55.5	8.5	23	12	297
80	11.5	157	26	M10 x 1.5	5	10	M20 x 1.5	38	G 3/8	61	86	259	61.5	10.5	33	14	349
100	17	177	26	M10 x 1.5	5	10	M20 x 1.5	38	G 1/2	68	91	289	69.5	10.5	37.5	15	384

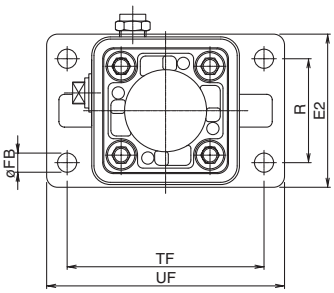
Dimensions: Cylinder Mounting Accessory

[First angle projection]

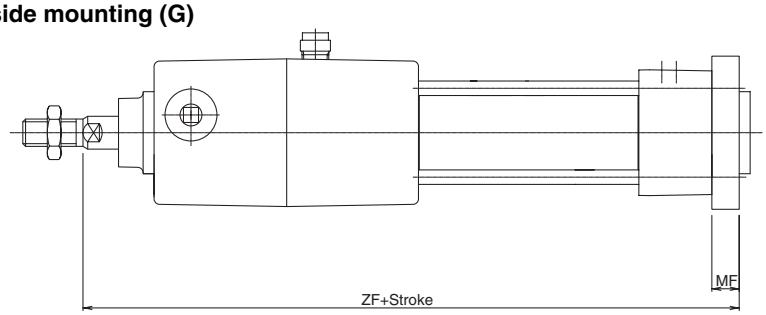
Foot style (L)



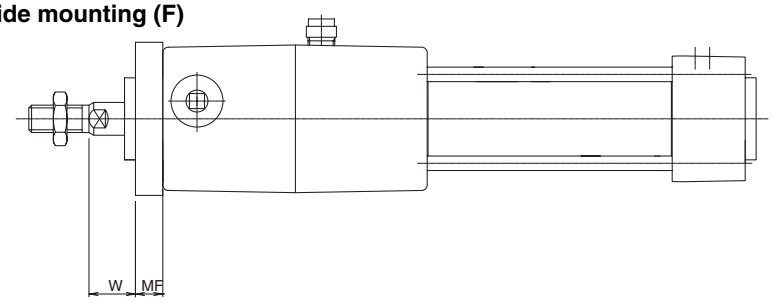
Flange style (F, G)



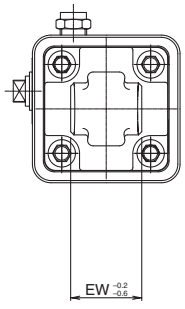
Head side mounting (G)



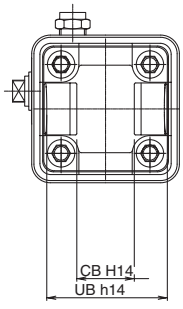
Rod side mounting (F)

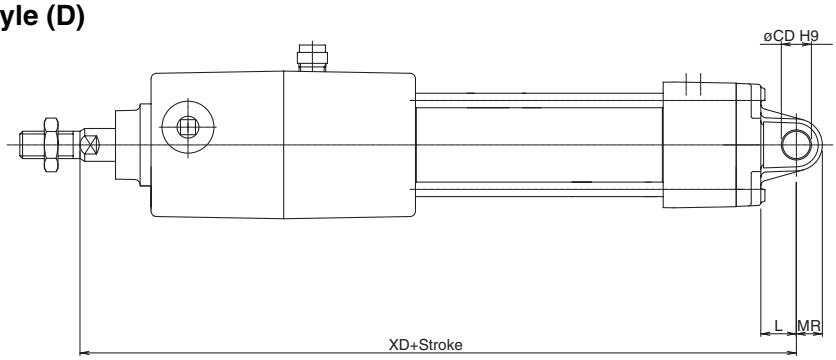


Head side single clevis style (C)



Head side double clevis style (D)





Bore (mm)	E1	R	W	MF	ZF	øFB	øCD H9	EB	L	XD	UB h14	CB H14	EW -0.2 -0.6	MR	TR	AO	AT	XA	SA	AH	øAB	TF	UF	E2
32	48	38	16	10	200	7	10	65	12	212	45	26	26	9.5	32	10	4.5	214	212	32	7	64	79	50
40	55	46	20	10	222	9	12	75	15	237	52	28	28	12	36	11	4.5	240	238	36	10	72	90	55
50	67	52	25	12	244	9	12	80	15	259	60	32	32	12	45	12	5.5	264	259	45	10	90	110	70
63	80	62	25	12	273	9	16	90	20	293	70	40	40	16	50	12	5.5	293	288	50	10	100	120	80
80	100	63	30	16	321	12	16	110	20	341	90	50	50	16	63	14	6.5	346	341	63	12	126	153	100
100	120	75	35	16	356	14	20	140	25	381	110	60	60	20	75	16	6.5	381	371	71	14.5	150	178	120

Refer to page 6-16-1 for details on auto switches.

Series C95N
Auto Switch Specifications

Applicable Auto Switch

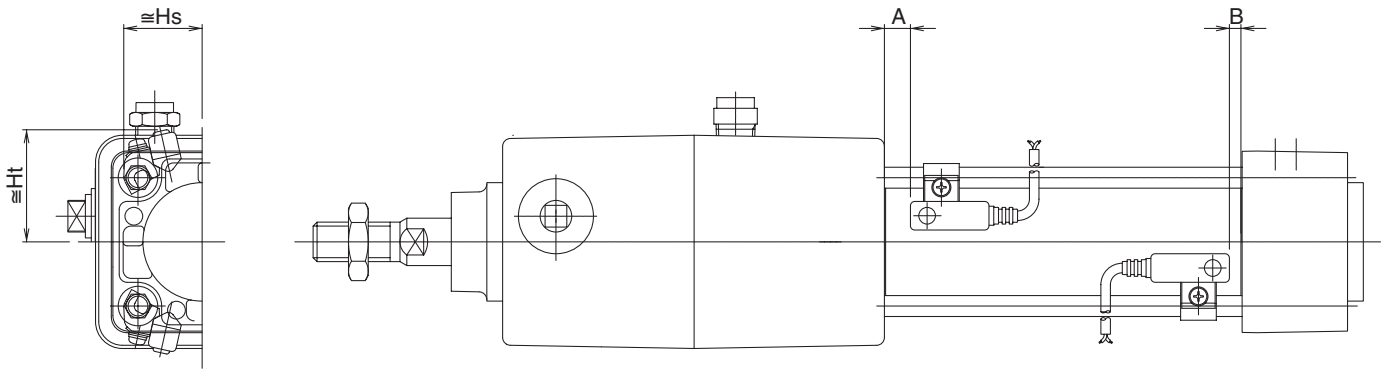
Type	Auto switch model	Electrical entry (Function)
Reed switch	**D-A5□/A6□**	Grommet
	D-A59W	Grommet (2-color indication)
	D-Z7□/Z80	Grommet
	D-A3□	Terminal conduit
	D-A44	DIN terminal
Solid state switch	**D-F5□/J5□**	Grommet
	D-F5□W/J59W	Grommet (2-color indication)
	D-F5BAL	Grommet (2-color indication, Water resistant)
	D-F59F	Grommet (2-color indication, Diagnostic output)
	D-F5NTL	Grommet (With timer)
	D-Y59□	Grommet (In-line)
	D-Y69□	Grommet (Perpendicular)
	D-Y7P	Grommet (In-line)
	D-Y7PV	Grommet (Perpendicular)
	D-Y7□W	Grommet (2-color indication, In-line)
	D-Y7□WV	Grommet (2-color indication, Perpendicular)
	D-Y7BAL	Grommet (Water resistant, In-line)
	D-G39/K39	Terminal conduit

Minimum Strokes for Auto Switch Mounting

Auto switch model	Number of auto switch mounted	**ø32 to ø63**	**ø80, ø100**
A5□ **A6□**	1, 2	15	20
	n	15 + 55 (n – 2)/2 n = 2, 4, 6, 8····	20 + 55 (n – 2)/2 n = 2, 4, 6, 8····
A59W	2	15	20
	n	20 + 55 (n – 2)/2 n = 2, 4, 6, 8····	25 + 55 (n – 2)/2 n = 2, 4, 6, 8····
	1	15	25
F5□(W)/J5□J **59W** **F5BAL/F59F**	1, 2	15	25
	n	15 + 55 (n – 2)/2 n = 2, 4, 6, 8····	25 + 55 (n – 2)/2 n = 2, 4, 6, 8····
F5NTL	1, 2	15	25
	n	15 + 55 (n – 2)/2 n = 2, 4, 6, 8····	25 + 55 (n – 2)/2 n = 2, 4, 6, 8····
A3□ **K3□** **G3□**	1	10	10
	2 (Same side)	100	100
	2 (Different sides)	35	35
	n (Same side)	100 + 100 (n – 2) n = 2, 4, 6, 8····	100 + 100 (n – 2) n = 2, 4, 6, 8····
	n (Different sides)	35 + 30 (n – 2) n = 2, 4, 6, 8····	35 + 30 (n – 2) n = 2, 4, 6, 8····
A44	1	10	10
	2 (Same side)	55	55
	2 (Different sides)	35	35
	n (Same side)	55 + 50 (n – 2) n = 2, 4, 6, 8····	55 + 50 (n – 2) n = 2, 4, 6, 8····
	n (Different sides)	35 + 30 (n – 2) n = 2, 4, 6, 8····	35 + 30 (n – 2) n = 2, 4, 6, 8····
Z7□ **Z80**	1, 2	15	15
	n	15 + 40 (n – 2)/2 n = 2, 4, 6, 8····	15 + 40 (n – 2)/2 n = 2, 4, 6, 8····
Y59□ **Y7P** **Y7□W**	1, 2	15	15
	n	15 + 40 (n – 2)/2 n = 2, 4, 6, 8····	15 + 40 (n – 2)/2 n = 2, 4, 6, 8····
Y69□ **Y7PV** **Y7□WV**	1, 2	10	10
	n	10 + 30 (n – 2)/2 n = 2, 4, 6, 8····	10 + 30 (n – 2)/2 n = 2, 4, 6, 8····
Y7BAL	1, 2	20	20
	n	20 + 45 (n – 2)/2 n = 2, 4, 6, 8····	20 + 45 (n – 2)/2 n = 2, 4, 6, 8····
P5DWL	1, 2	15	20
	n	15 + 65 (n – 2)/2 n = 2, 4, 6, 8····	20 + 65 (n – 2)/2 n = 2, 4, 6, 8····

Auto Switch Mounting Position and Mounting Height

[First angle projection]



Auto Switch Mounting Position

Bore size (mm)	D-A5□ D-A6□		D-A59W		D-F5□, D-F5□W D-J5□, D-J59W D-F59F, D-F5BAL		D-F5NTL		D-Z7□, D-Y59□, D-Y7BAL D-Z80, D-Y69□, D-Y7□W(V) D-Y7P(V)		D-A3□, D-G39 D-A44, D-K39		D-P5DWL	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B
32	10.5	0	14.5	2	17	4.5	22	9.5	14	1.5	10.5	0	13.5	1
40	21.5	0	25.5	2	28	4.5	33	9.5	25	1.5	21.5	0	24.5	1
50	23	0	27	2.5	29.5	5	34.5	10	26.5	2	23	0	26	1.5
63	28	0	32	2.5	34.5	5	39.5	10	31.5	2	28	0	31	1.5
80	28	2.5	22	6.5	24.5	9	29.5	14	21.5	6	28	2.5	31	5.5
100	28	2.2	32	6.5	34.5	9	39.5	14	31.5	6	28	2.5	31	5.5

Auto Switch Mounting Height

Bore size (mm)	D-A5□ D-A6□ D-A59W		D-F5□, D-J5□ D-F5□W, D-J59W D-F5BAL, D-F5NTL D-F59F		D-A3□, D-K39 D-G39		D-A44		D-Z7□, D-Z80 D-Y59□, Y7P D-Y7□W		D-Y69□, D-Y7PV D-Y7□WV		D-Y7BAL		D-P5DWL	
	Hs	Ht	Hs	Ht	Hs	Ht	Hs	Ht	Hs	Ht	Hs	Ht	Hs	Ht	Hs	Ht
32	35	24.5	32.5	25	67	27.5	77	27.5	25.5	23	26.5	23	30	23	38	31
40	38.5	27.5	36.5	27.5	71.5	27.5	81.5	27.5	29.5	26	30	26	34	26	42	33
50	43.5	34.5	41	34	77	—	87	—	33.5	31	34.5	31	38	31	46.5	39
63	48.5	39.5	46	39	83.5	—	93.5	—	39	36	40	36	43	36	51.5	44
80	55	46.5	52.5	46.5	92.5	—	103	—	47.5	45	48.5	45	52	45	58	51.5
100	62	55	59.5	55	103	—	113.5	—	55.5	53.5	56.5	53.5	60	53.5	65.5	60.5

Other than the applicable auto switches listed in “How to Order”, the following auto switches can be mounted. For detailed specifications, refer to page 6-16-1.

Type	Model	Electrical entry (Fetching direction)	Features
Reed switch	D-A53/A56	Grommet (In-line)	—
Solid state switch	D-F59/F5P/J59	Grommet (In-line)	—
	D-F59W/F5PW/J59W		2-color indication type
	D-F5BAL		2-color indication type, Water resistant
	D-F5NTL		With timer
	D-G5NTL		
	D-Y69A/Y69B/Y7PV	Grommet (Perpendicular)	—
	D-Y7NWV/Y7PWV/Y7BWV		2-color indication type

∗ With pre-wire connector is available for solid state auto switches. For details, refer to page 6-16-60.
∗ Normally closed (NC = b contact), solid state switch (D-Y7G/Y7H type) are also available. For details, refer to page 6-16-39.

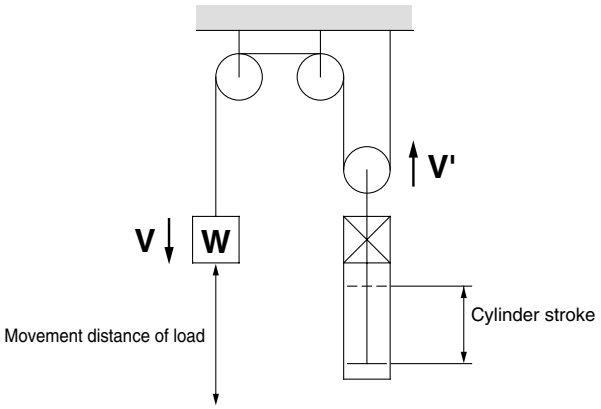
Series C95N
Model Selection

Precautions on Model Selection

⚠ Caution

1. **In order that the originally selected maximum speed is not exceeded, be certain to use a speed controller to adjust the total movement distance of the load so that movement takes place in no less than the applicable movement time.**
   The movement time is the time that is necessary for the load to travel the total movement distance from the start without any intermediate stops.
2. **In cases where the cylinder stroke and the movement distance of the load are different (double speed mechanism, etc.), use the movement distance of the load for selection purposes.**

Example)



Selection Example

- **Load weight:** m = 50 kg
- **Movement distance:** st = 500 mm
- **Movement time:** t = 2s
- **Load condition:** Vertical downward = Load in direction of rod extension
- **Operating pressure:** P = 0.4 MPa

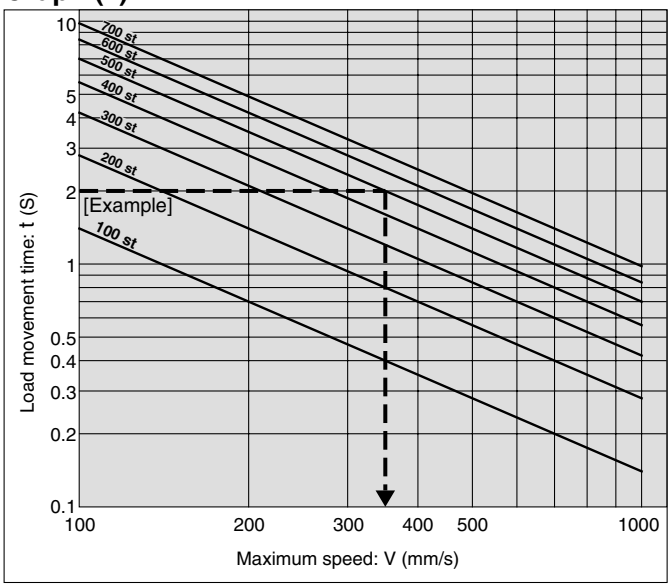
Step 1: From graph 1 find the maximum movement speed of the load
∴ Maximum speed V: approx. 350 mm/s

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 weight m = 50 kg
∴ ø63 → Select a MNB63 or larger bore size.

Step 1 Find the Maximum Load Speed: V

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

Graph (1)



Step 2 Find the Cylinder Bore Size.

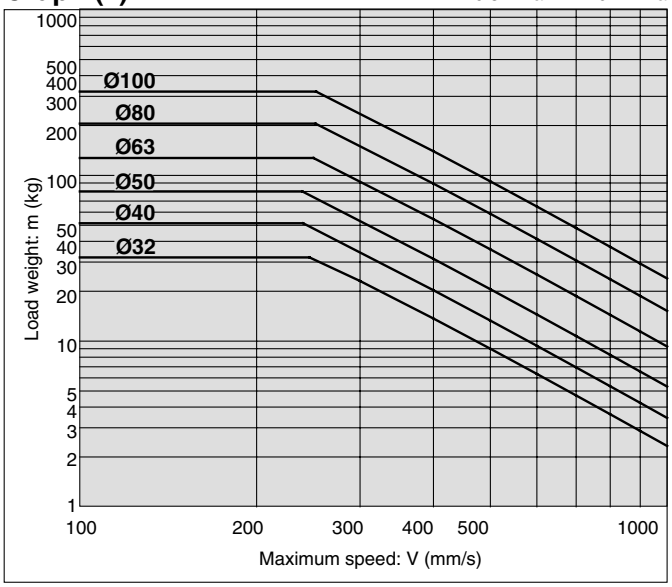
Select a graph based upon the load condition and operating pressure, and then find the point of intersection for the maximum speed found in Step 1 and the load weight. Select the bore size on the line above the point of intersection.

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

Selection Graph

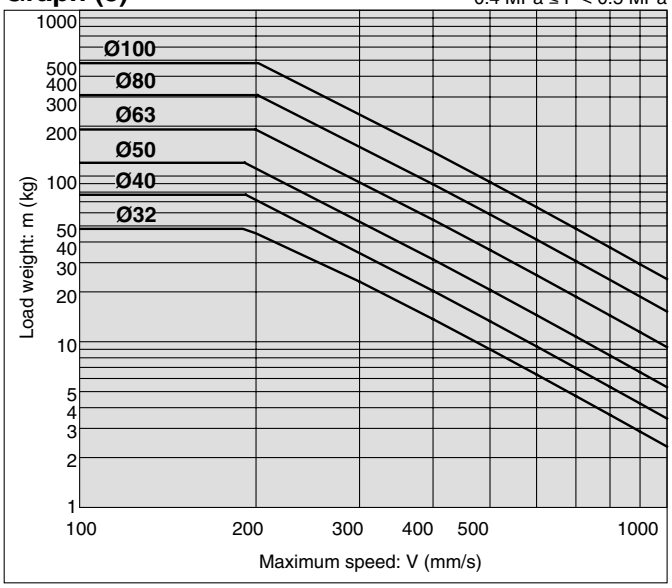
Graph (2)

0.3 MPa ≤ P < 0.4 MPa



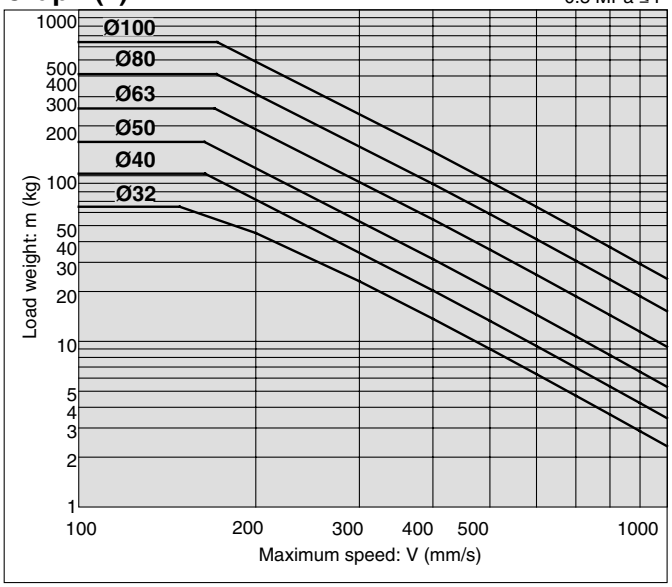
Graph (3)

0.4 MPa ≤ P < 0.5 MPa



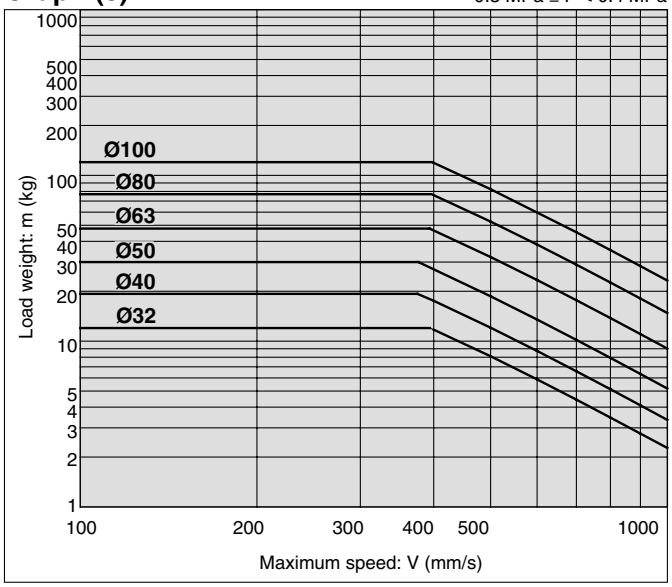
Graph (4)

0.5 MPa ≤ P



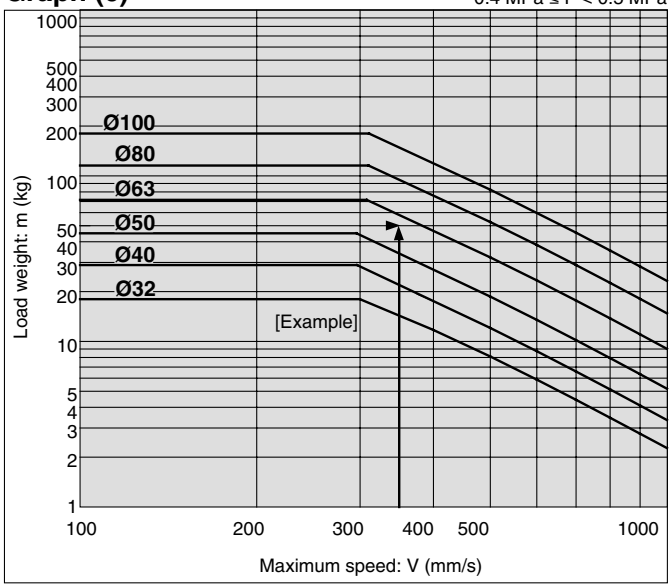
Graph (5)

0.3 MPa ≤ P < 0.4 MPa



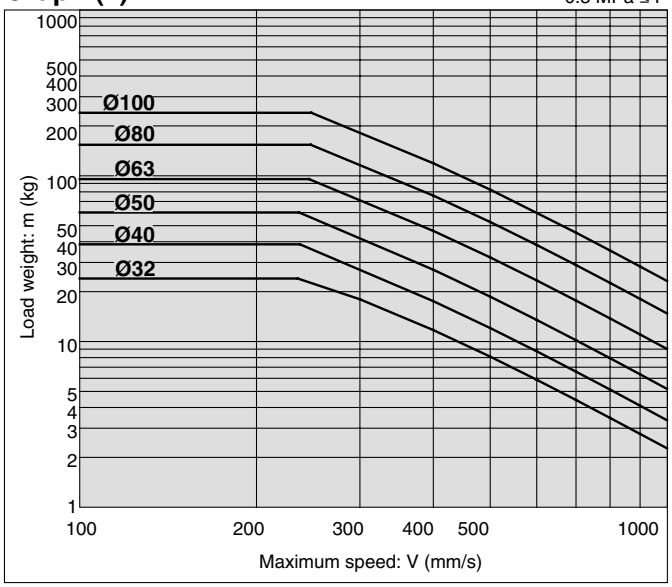
Graph (6)

0.4 MPa ≤ P < 0.5 MPa



Graph (7)

0.5 MPa ≤ P



Specific Product Precautions 1

Be sure to read before handing.

Design of Equipment & Machinery

⚠ Warning

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

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

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

In cases such as an intermediate stop, where a lock is operated at a desired position within the stroke and air pressure is applied from only one side of the cylinder, the piston will lurch at high speed when the lock is released. In such situations, there is a danger of causing human injury by having hands or feet, etc. caught, and also a danger of causing damage to the equipment. In order to prevent this lurching, a balance circuit such as the recommended pneumatic circuits (6-12-30 to 31) should be used.

Selection

⚠ Warning

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

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

Selection

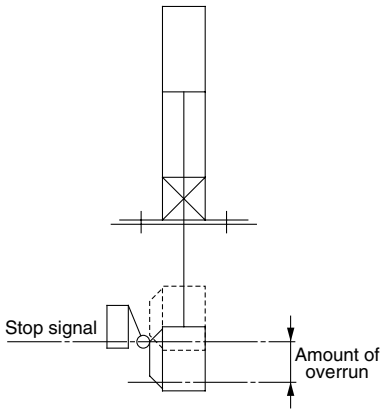
⚠ Warning

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 + a.
- SMC's auto switches have operating ranges from 8 to 14 mm (depending on the switch model).
  When the overrun amount exceeds this range, self-holding of the contact should be performed at the switch load side.

∗ Refer to page 6-12-20 regarding stopping accuracy.



Selection

⚠ Warning

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

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

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

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

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

Mounting

⚠ Warning

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

- If connected when in the locked condition, a load greater than the turning force or holding force, etc. may operate on the piston rod and cause damage to the lock mechanism. The C95N series is equipped with an emergency unlocking mechanism, however, when connecting the rod end to the load this should be done with the lock released. This can be accomplished by simply connecting an air line to the unlocking port and supplying air pressure of 0.25 MPa or more.

Specific Product Precautions 2

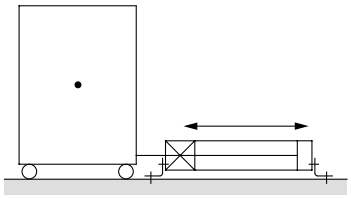
Be sure to read before handing.

Mounting

⚠ Warning

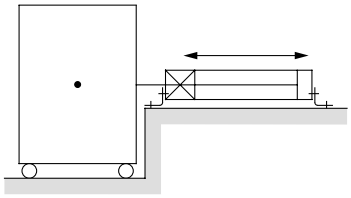
2. Do not apply an offset load to the piston rod.

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.

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



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

⚠ Caution

1. Use the hexagon wrenches shown below when replacing brackets.

Bore size (mm)		Bolt	Width across flats	Torque (N·m)
32, 40		MB-32-48-C1247	4	6.9
50, 63		MB-50-48-C1249	5	11
80, 100	Foot	MB-80-48-AC1251	6	25
	Other	MB-80-48-BC1251		

Adjustment

⚠ Warning

1. Do not open the cushion valve beyond the stopper.

As a retaining mechanism for the cushion valve, a crimped section (ø32 head cover) or retaining ring is installed (ø40 to ø100), and the cushion valve should not be opened beyond that point.

If not operated in accordance with the above precautions, the cushion valve may be ejected from the cover when air pressure is supplied.

2. Be certain to use an air cushion at the end of the cylinder stroke.

If this is not done, the tie-rod or piston assembly will be damaged.

⚠ Caution

1. Adjust the cylinder's air balance.

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

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

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

Pneumatic Circuit

⚠ Warning

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

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

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

The larger the effective sectional 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 less distance there is 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 second 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.

Specific Product Precautions 3

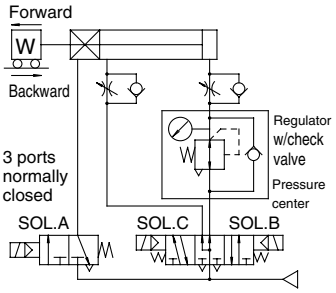
Be sure to read before handing.

Pneumatic Circuit

⚠ Warning

6. Basic circuit

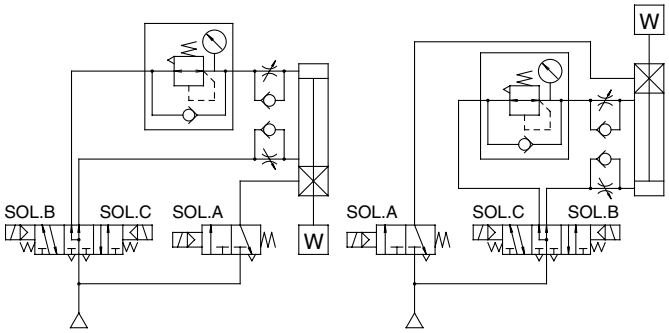
1. [Horizontal]



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

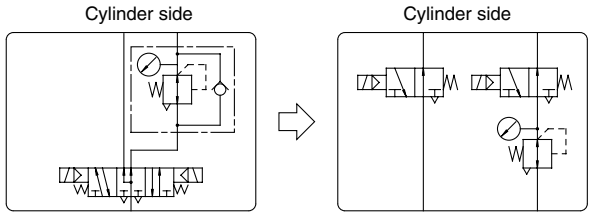
2. [Vertical]

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



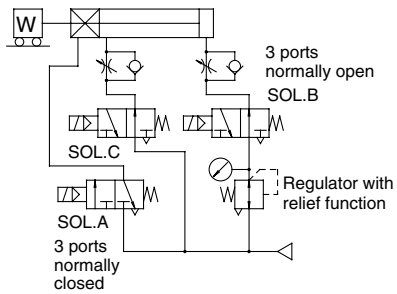
⚠ Caution

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]

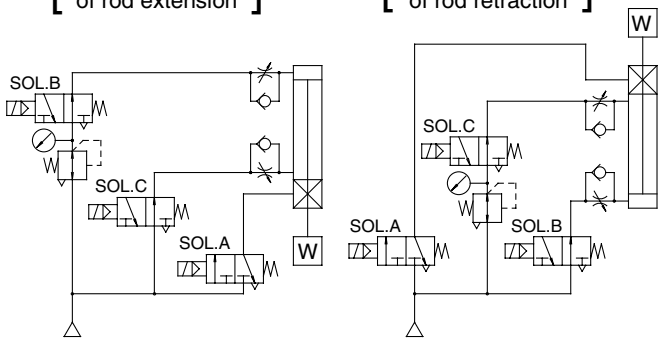
1. [Horizontal]



Pneumatic Circuit

2. [Vertical]

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



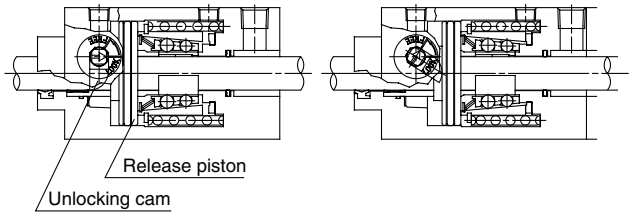
Manual Unlocking

⚠ Caution

1. The unlocking cam provided on the C95N series is an emergency unlocking mechanism only.
During an emergency when the air supply is cut off, it is used to alleviate a problem by forcibly pushing the release piston back to release the lock. However, take note that the sliding resistance of the piston rod will be high compared to unlocking with air pressure.

2. When installing into equipment or machinery, etc., in cases where it will be necessary to hold an unlocked condition for an extended time, air pressure of 0.25 MPa or more should be applied to the unlocking port.

3. Do not turn the unlocking cam (the arrow ¨← on the unlocking cam head) past the FREE position. If it is turned too far there is a danger of damaging the unlocking cam.



Locked condition Manually unlocked condition

[Principle]

If the unlocking cam is turned counter clockwise with a tool such as an adjustable angle wrench, the release piston is pushed back and the lock is released. Since the lever will return to its original position when released and become locked again, it should be held in this position for as long as unlocking is needed.

Specific Product Precautions 4

Be sure to read before handing.

Maintenance

⚠ Caution

1. The lock units for the C95N series are replaceable.

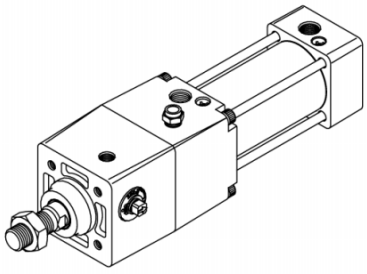
To order replacement lock units for the C95N series use the order numbers given in the table below.

Bore size (mm)	Lock unit part no.
32	C95N32D-UA
40	C95N40D-UA
50	C95N50D-UA
63	C95N63D-UA
80	C95N80D-UA
100	C95N100D-UA

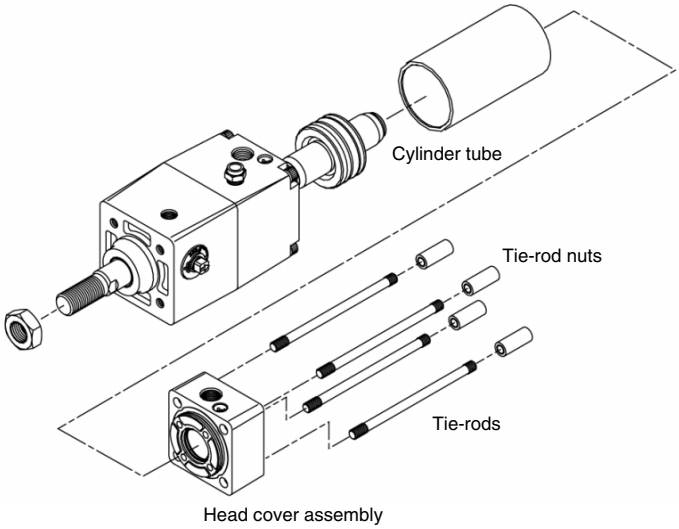
2. Replacement of lock units.

1) Loosen the tie-rod nuts (4 pcs.) on the cylinder head cover using a hexagon wrench. Refer to the table below for the applicable hexagon wrench.

Bore size (mm)	Tie-rod nut socket width across flats (mm)
32, 40	6
50, 63	8
80, 100	10

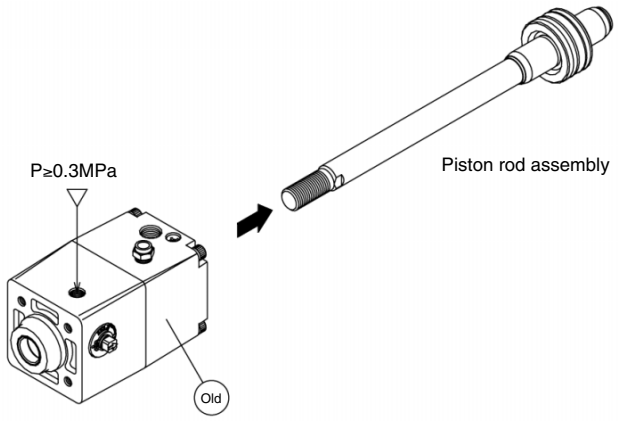


2) Remove the tie-rods, head cover and cylinder tube.

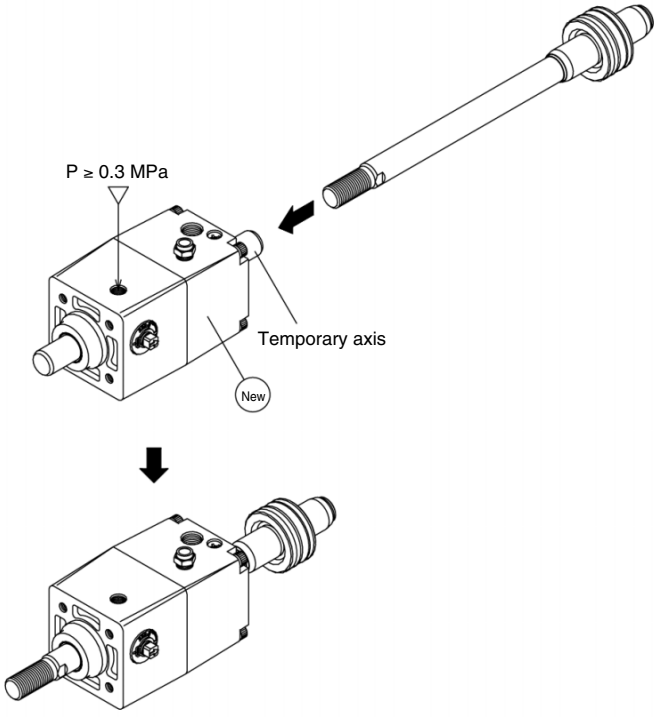


⚠ Caution

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 symposium with the previously mentioned piston rod assembly.



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