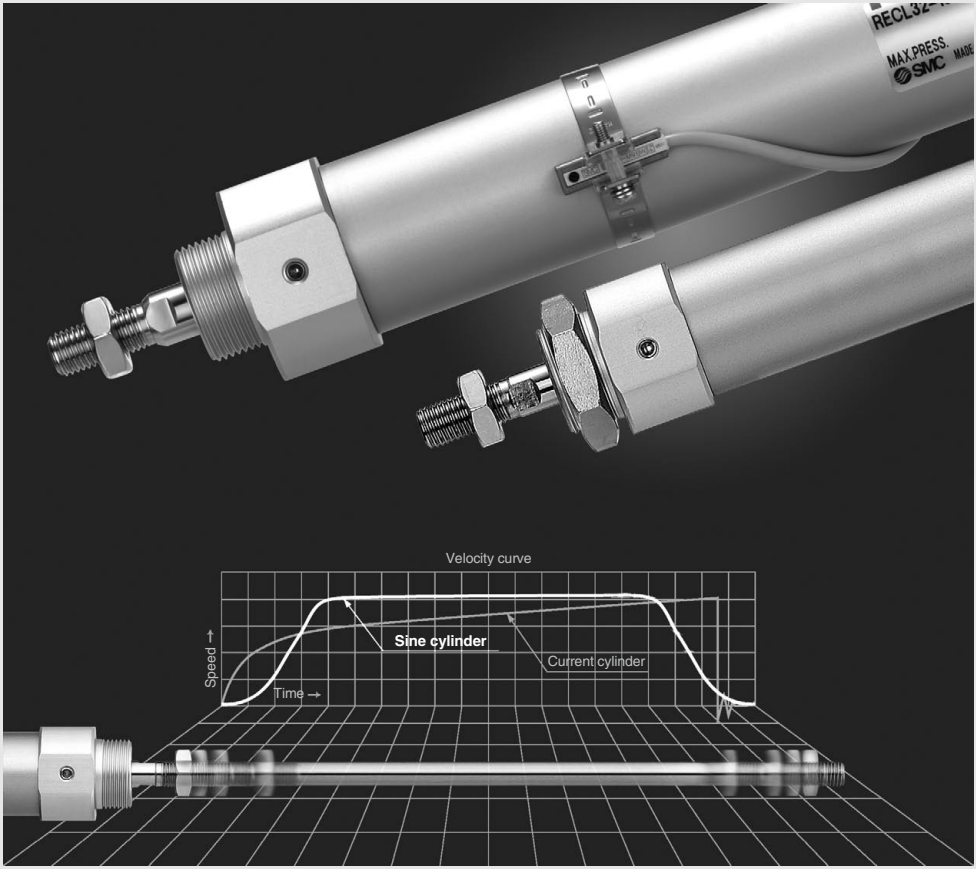
Sine Cylinder

REC Series

ø20, ø25, ø32, ø40

Allows high speed transfer of work with dramatically reduced shock/impact.



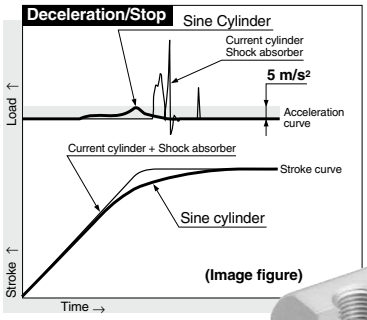
Sine Cylinder

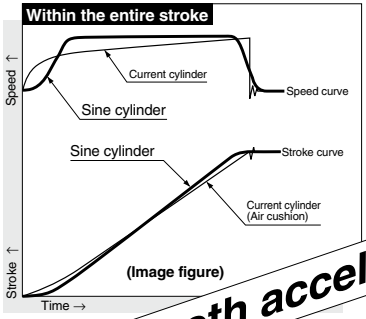
REC Series

ø20,ø25,ø32,ø40

Allows rapid transfer of work

Motion comparison with the one with shock absorber





Smooth acceleration

Space-saving has been realized by simple circuit

Comparison to Shockless Transfer Systems

Current System

Control method	Speed control by a flow control valve which can variable throttle flow according to indicated current.	Shock absorber	Multistage speed control by combining speed controllers and a directional control valve.
System construction	Symbol Current system 1		
Acceleration	Smooth operation	Same start up as standard cylinder due to lack of slow controlled start function.	Smooth speed control cannot be achieved by digital control changes are associated with it.
Deceleration	Smooth operation	Initial impact is large. (Initial force against shock absorber)	Smooth speed control cannot be achieved by digital control, and sudden speed changes are associated with it.
Construction	Complex	Simple	Complex

Sine Cylinder

Cushioning keep up with depth of orifice as sine function which change depend on stroke.
Smooth operation without sudden speed changes
Smooth operation without sudden speed changes
Simple

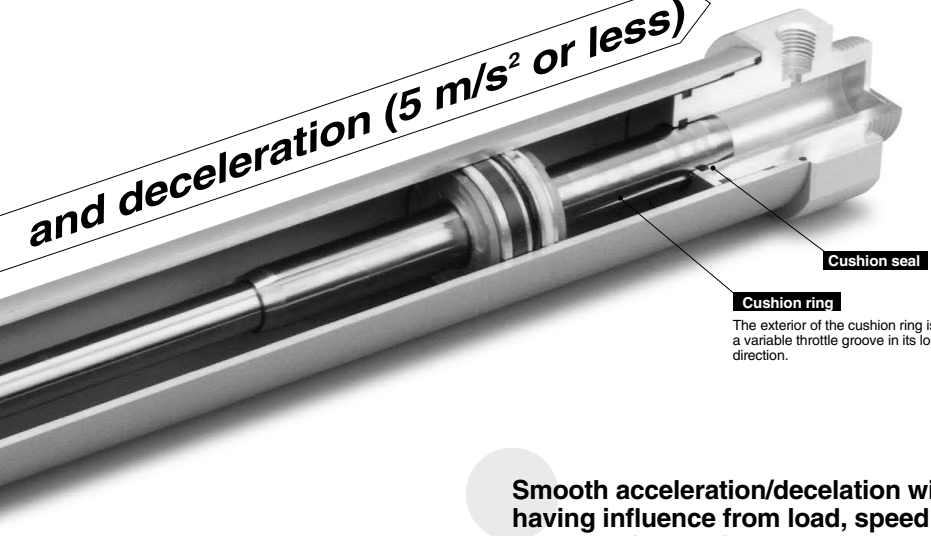
Compatible with Clean Room ISO Class 4 (ISO14644-1). (Refer to page 123.)

This model conforming to the clean room specification removes dust generated inside with an exhaust from the relief port or vacuum sweeping.

SMC

with dramatically reduced shock/impact.

and deceleration (5 m/s² or less)



The exterior of the cushion ring is provided with a variable throttle groove in its longitudinal direction.

Smooth acceleration/decelation without having influence from load, speed or pressure fluctuation

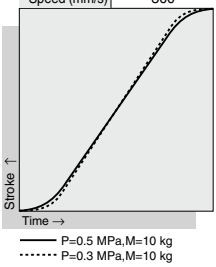
Reducing actuation cycle time

Max. 500 mm/s of high speed transfer is possible. Cycle time can be drastically reduced compared with current low speed cylinder (10 to 30 mm/s).

Reference Example) Motion on RECL32-300

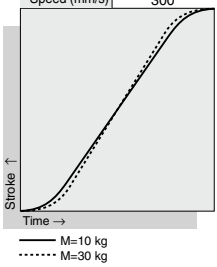
Pressure Fluctuation

Pressure (MPa)	0.3	0.5
Load (kg)	10	
Speed (mm/s)	300	

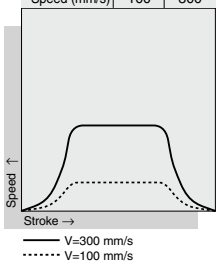


Load Fluctuation

Pressure (MPa)	0.5	
Load (kg)	10	30
Speed (mm/s)	300	



Pressure (MPa)	0.5	
Load (kg)	10	
Speed (mm/s)	100	300



⚠Caution

Recommended Speed Controllers

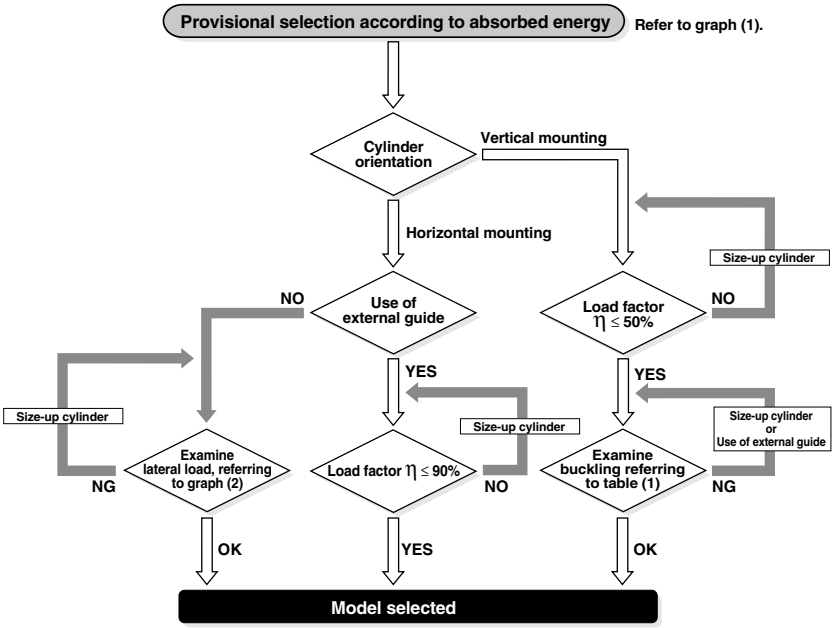
Model	Model		
	Elbow type	Straight type	In-line type
REC20	AS2201F-01-06-X214	AS2301F-01-06-X214	AS2001F-06-X214
REC25	AS2201F-01-06-X214	AS2301F-01-06-X214	AS2001F-06-X214
REC32	AS2201F-01-06-X214	AS2301F-01-06-X214	AS3001F-08-X214
REC40	AS3201F-02-08-X214	AS3301F-02-08-X214	AS3001F-08-X214

⚠Caution

Use the recommended speed controllers. (Refer to page 133.)

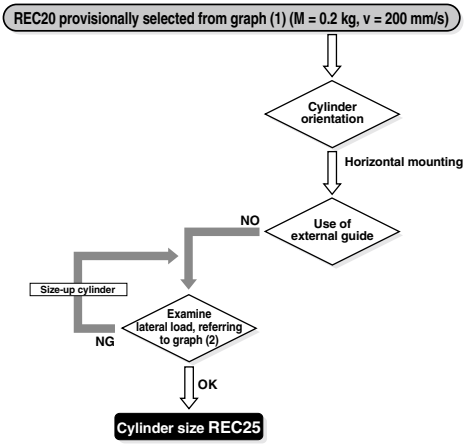
Model Selection

Selection Step



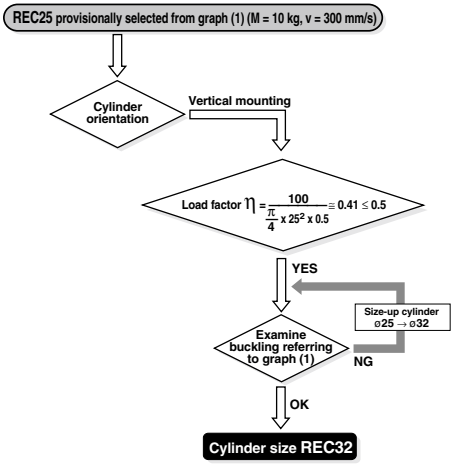
Selection Example 1

Actuating orientation:
Horizontal transfer of work (without external guide)
Maximum speed: v = 200 mm/s
Supply pressure: P = 0.5 MPa
Load mass: M = 0.2 kg (2N)
Cylinder stroke: 300 mm

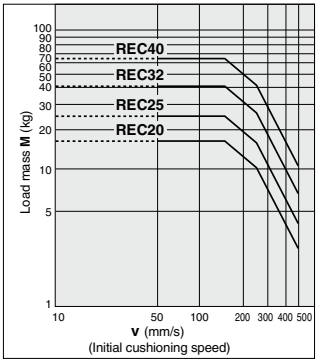


Selection Example 2

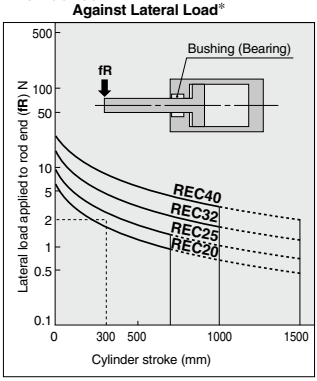
Actuating orientation:
Vertical transfer of work (Rod side flange)
Maximum speed: v = 300 mm/s
Supply pressure: P = 0.5 MPa
Load mass: M = 10 kg
Cylinder stroke: 400 mm



Graph (1) Absorbed Energy Curve



Graph (2) Applicable Max. Stroke Against Lateral Load∗



∗ The above curve in the graph refers to P = 0.5 MPa of supply pressure. If supply pressure is other than P = 0.5 MPa, please figure out a max. stroke, using proportional calculation.
Example) If P = 0.6 MPa, a max. stroke
= the respective stroke in the graph x $\frac{0.6}{0.5}$

Figure (1)

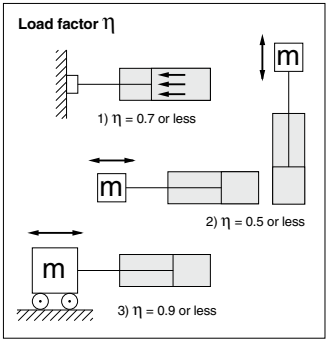


Table (1) Relation between Cylinder Size and Max. Stroke (cm)

Mounting type			Symbol	Operating pressure (MPa)	Applicable max. stroke according to buckling strength			
Mounting bracket symbol and figure					REC			
					ø20	ø25	ø32	ø40
Foot type: **L**	Rod side flange type: **F**	Head side flange type: **G**	**L**	0.3	39	50	56	61
			F	0.5	30	38	43	47
				0.7	24	31	36	39
			G	0.3	11	17	19	21
				0.5	7	11	13	13
				0.7	4	7	9	9
Clevis type: **C, D**	Rod side trunnion type: **U**	Head side trunnion type: **T**	**C**	0.3	32	42	48	52
			D	0.5	22	30	35	37
				0.7	17	24	27	29
			U	0.3	82	103	116	127
				0.5	62	79	89	97
				0.7	52	66	75	81
			T	0.3	33	43	49	53
				0.5	23	31	36	39
				0.7	18	25	29	31
Foot type: **L**	Rod side flange type: **F**	Head side flange type: **G**	**L**	0.3	118	148	167	182
			F	0.5	90	114	128	140
				0.7	76	95	108	117
			G	0.3	51	66	75	81
				0.5	37	49	55	60
				0.7	30	39	45	49
Foot type: **L**	Rod side flange type: **F**	Head side flange type: **G**	**L**	0.3	168	211	237	259
			F	0.5	129	162	183	199
				0.7	109	136	154	168
			G	0.3	76	97	110	119
				0.5	56	73	83	90
				0.7	46	60	68	74

1) In the case where cylinder is used for static action: Load factor η = 0.7 or less
2) In the case where cylinder is used for dynamic action: Load factor η = 0.5 or less
3) In the case where guide is used in horizontal orientation: Load factor η = 0.9 or less

Sine Cylinder
REC Series
ø20, ø25, ø32, ø40

How to Order

RE C B 25 ☐ – 150 – M9BW ☐ – C

Sine cylinder

Rod type

Mounting type

B	Basic type	**C**	Single clevis type
L	Axial foot type	**D**	Double clevis type
F	Rod side flange type	**U**	Rod side trunnion type
G	Head side flange type	**T**	Head side trunnion type

Bore size

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

Port type

Nil	Rc
TN	NPT
TF	G

Cylinder stroke (mm)
Refer to page 121 for standard strokes.

Auto switch

Nil	Without auto switch (Built-in magnet)

∗ Select an applicable auto switch part number from the table below.

Number of auto switches

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

Auto switch mounting bracket Note)

Note) This symbol is indicated when the D-A9□ or M9□ type auto switch is specified. This mounting bracket does not apply to other auto switches (D-C7□ and H7□, etc.) (Nil)

Applicable Auto Switches/Refer to pages 947 to 1067 for further information on auto switches.

Type	Special function	Electrical entry	Indicator light	Wiring (Output)	Load voltage DC	Load voltage DC	Load voltage AC	Auto switch model: Perpendicular	Auto switch model: In-line	Lead wire length (m): 0.5 (Nil)	1 (M)	3 (L)	5 (Z)	None (N)	Pre-wired connector	Applicable load	
Solid state auto switch	—	Grommet	Yes	3-wire (NPN)	24 V	5 V, 12 V	—	**M9NV**	**M9N**	●	●	●	○	—	○	IC circuit	Relay, PLC
								—	—	●	—	●	○	—	○		
				3-wire (PNP)				**M9PV**	**M9P**	●	●	●	○	—	○		
								—	—	●	—	●	○	—	○		
				2-wire		12 V		**M9BV**	**M9B**	●	●	●	○	—	○	IC circuit	
								—	—	●	—	●	○	—	○		
		Connector						—	**H7C**	●	—	●	●	●	—	—	
	Diagnostic indication (2-color indicator)	Grommet		3-wire (NPN)		5 V, 12 V		**M9NWV**	**M9NW**	●	●	●	○	—	○	IC circuit	
								—	—	●	—	●	○	—	○		
				3-wire (PNP)				**M9PWV**	**M9PW**	●	●	●	○	—	○		
								—	—	●	—	●	○	—	○		
				2-wire		12 V		**M9BWV**	**M9BW**	●	●	●	○	—	○	—	
								—	—	●	—	●	○	—	○		
	Water resistant (2-color indicator)			3-wire (NPN)		5 V, 12 V		**M9NAV**∗1	**M9NA**∗1	○	○	●	○	—	○	IC circuit	
				3-wire (PNP)				**M9PAV**∗1	**M9PA**∗1	○	○	●	○	—	○		
				2-wire		12 V		**M9BAV**∗1	**M9BA**∗1	○	○	●	○	—	○	—	
								—	—	●	—	●	○	—	○		
	With diagnostic output (2-color indicator)			4-wire (NPN)		5 V, 12 V		—	**H7NF**	●	—	●	○	—	○	IC circuit	
Reed auto switch	—	Grommet	Yes	3-wire (NPN equivalent)	—	5 V	—	**A96V**	**A96**	●	—	●	—	—	—	IC circuit	—
			No	2-wire	24 V	12 V	100 V	**A93V**∗2	**A93**	●	●	●	●	—	—	—	Relay, PLC
			Yes				100 V or less	**A90V**	**A90**	●	—	●	—	—	—	IC circuit	
			No				100 V, 200 V	—	**B54**	●	—	●	●	—	—	—	
			Yes				200 V or less	—	**B64**	●	—	●	—	—	—	—	
		Connector	No				—	—	**C73C**	●	—	●	●	●	—	—	
			Yes				24 V or less	—	**C80C**	●	—	●	●	●	—	IC circuit	
	Diagnostic indication (2-color indicator)	Grommet	Yes		—	—	—	—	**B59W**	●	—	●	—	—	—	—	

∗1 Water resistant type auto switches can be mounted on the above models, but in such case SMC cannot guarantee water resistance. A water-resistant type cylinder is recommended for use in an environment which requires water resistance. However, please contact SMC for water-resistant products of ø20 and ø25.

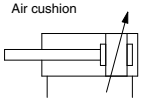
∗2 1 m type lead wire is only applicable to D-A93.

∗ Lead wire length symbols: 0.5 m ····· Nil (Example) M9NW
1 m ····· M (Example) M9NWM
3 m ····· L (Example) M9NWL
5 m ····· Z (Example) M9NWZ
None ····· N (Example) H7CN

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

∗ Since there are other applicable auto switches than listed, refer to page 132 for details.
∗ For details about auto switches with pre-wired connector, refer to pages 1014 and 1015.
∗ D-A9□(V)/M9□(V)/M9□W(V), M9□A(V) auto switches are shipped together (not assembled). (Only auto switch mounting brackets are assembled before shipped.)

Symbol
Air cushion



Standard Specifications

Bore size (mm)	20	25	32	40
Action	Double acting, Single rod			
Fluid	Air			
Proof pressure	1.5 MPa			
Maximum operating pressure	1.0 MPa			
Minimum operating pressure	0.2 MPa			
Ambient and fluid temperature	–10 to 60°C			
Piston speed	50 to 500 mm/s			
Cushion	Air cushion (End rubber bumper)			
Effective cushioning stroke (mm)	45	45	50	60
Lubrication	Not required (Non-lube)			
Stroke length tolerance	Up to 1000 st: $^{+1.4}_{0}$, 1001 to 1500 st: $^{+1.8}_{0}$			

Standard Stroke

Bore size (mm)	Minimum stroke (1) (Recommended)	Standard stroke (2) (mm)	Maximum manufacturable stroke (mm)
20	150	Up to 700	1500
25	150	Up to 700	
32	150	Up to 1000	
40	200	Up to 1000	

Note 1) The recommended minimum strokes or shorter lengths are available. However, since the effective cushion stroke is longer, the cushion performance may differ from the standard specifications.
Note 2) When exceeding the standard strokes, it will be out of warranty.

Weight

(kg)

Bore size (mm)		20	25	32	40
Basic Weight	Basic type	0.32	0.47	0.74	1.25
	Axial foot type	0.47	0.63	0.90	1.52
	Flange type	0.38	0.56	0.83	1.37
	Single clevis type	0.36	0.51	0.78	1.34
	Double clevis type	0.37	0.53	0.79	1.38
	Trunnion type	0.36	0.54	0.81	1.35
Additional weight per each 50 mm of stroke		0.05	0.07	0.09	0.13
Mounting bracket	Pivot bracket for clevis (With pin)	0.07	0.07	0.14	0.14
	Single knuckle joint	0.06	0.06	0.06	0.23
	Double knuckle joint (With pin)	0.07	0.07	0.07	0.20

∗ Calculation: (Example) ····· **RECL32-200**
Basic weight ····· 0.90 (Foot type ø32)
Additional weight ····· 0.09/50 st
Cylinder stroke ····· 200 (st)
0.90 + 0.09 x 200/50 = 1.26 kg

Accessory (Option)

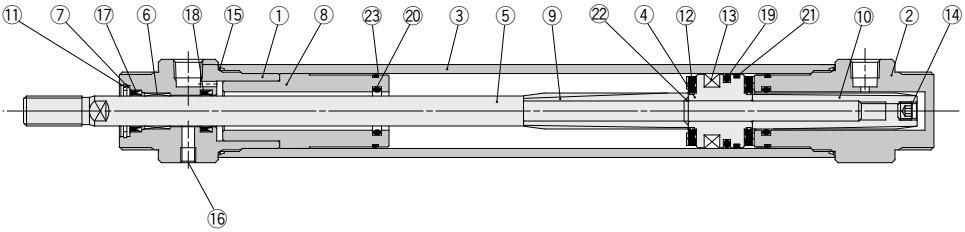
Refer to pages 127 and 128 for part numbers and dimensions of the single knuckle joint, double knuckle joint, clevis pin, and knuckle pin.

Mounting Bracket Part No.

Mounting bracket	Minimum order	Bore size (mm)				Description (when ordering a minimum number)
		20	25	32	40	
Axial foot ∗	2	CM-L020B	CM-L032B		CM-L040B	Foot 2 pcs., Mounting nut 1 pc.
Flange	1	CM-F020B	CM-F032B		CM-F040B	Flange 1 pc.
Single clevis∗∗	1	CM-C020B	CM-C032B		CM-C040B	Single clevis 1 pc., Liner 3 pcs.
Double clevis (With pin)∗∗∗	1	CM-D020B	CM-D032B		CM-D040B	Double clevis 1 pc., Liner 3 pcs., Clevis pin 1 pc., Retaining ring 2 pcs.
Trunnion (With nut)	1	CM-T020B	CM-T032B		CM-T040B	Trunnion 1 pc., Trunnion nut 1 pc.

∗ When ordering foot bracket, order 2 pieces per cylinder.
∗∗ 3 liners are included in the clevis bracket for adjusting an angle when mounting it.
∗∗∗ Clevis pin and retaining ring (cotter pin for ø40) are packaged together.

Construction



Component Parts

No.	Description	Material	Qty.	Note
1	**Rod cover**	Aluminum alloy	1	Clear anodized
2	**Head cover**	Aluminum alloy	1	Clear anodized
3	**Cylinder tube**	Aluminum alloy	1	Hard anodized
4	**Piston**	Aluminum alloy	1	Chromated
5	**Piston rod**	Stainless steel	1	Hard chrome plated
6	**Bushing**	Bearing alloy	1	
7	**Seal retainer**	Stainless steel	1	
8	**Cushion seal holder**	Aluminum alloy	1	Chromated
9	**Cushion ring A**	Brass	1	Electroless nickel plated
10	**Cushion ring B**	Brass	1	Electroless nickel plated
11	**Retaining ring**	Carbon steel	1	Phosphate coated
12	**Bumper**	Urethane	2	
13	**Magnet**	—	1	
14	**Hexagon socket head set screw**	Carbon steel	1	Zinc chromated
15	**Cylinder tube gasket**	NBR	2	
16	**Hexagon socket head set screw**	Carbon steel	1	Zinc chromated

Component Parts

No.	Description	Material	Qty.	Note
17	**Rod seal A**	NBR	1	
18	**Rod seal B**	NBR	1	
19	**Piston seal**	NBR	1	
20	**Cushion seal**	NBR	2	
21	**Wear ring**	Resin	1	
22	**Piston gasket**	NBR	1	
23	**Holder gasket**	NBR	2	

Replacement Parts/Seal Kit

Bore size (mm)	Kit no.	Contents
20	REC20-PS	Set of nos. above ⑮, ⑰, ⑲, ⑳, ㉑, ㉓
25	REC25-PS	
32	REC32-PS	
40	REC40-PS	

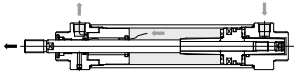
∗ Seal kit includes a grease pack (10 g).
Order with the following part number when only the grease pack is needed.
Grease pack part no.: GR-S-010 (10 g)

⚠Caution

When disassembling cylinders with bore sizes of ø20 to ø40, grip the double flat part of either the tube cover or the rod cover with a vise and loosen the other side with a wrench or an adjustable angle wrench, and then remove the cover. When re-tightening, tighten approximately 2 degrees more than the original position.

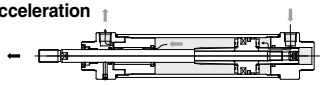
Working Principle

1. Start-up



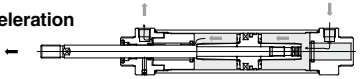
Actuating air passes from cylinder port on head side and enters the right hand side of chamber of the cylinder from space between cushion seal and U-shaped groove on the outer surface of cushion spear. Air in the left hand side of chamber of the cylinder passes through space between cushion seal and piston rod, and is released to the cylinder port on rod side.

2. In-rush/acceleration



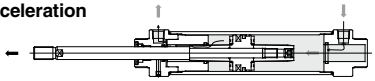
Differential pressure (theoretical force) generated on the left and right sides of piston becomes larger than starting resistance, and piston starts to actuate. With the actuation, U-shaped groove on the cushion spear outer surface gradually becomes deeper, air flow necessary for piston enters the right hand side of chamber of the cylinder, and piston accelerates. This acceleration process can be achieved smoothly (as a sine function) by using a cushion spear on which a U-shaped groove is machined.

3. Acceleration



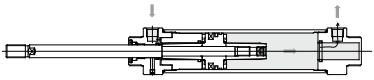
When piston starts to actuate, air can go in and out freely because cushion spear on head side is released from cushion seal. With this actuation, piston speed accelerates (or maintains the same speed).

4. Deceleration



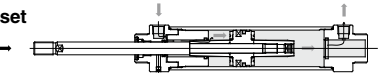
When cushion spear on rod side meets cushion seal, air in cushion chamber on rod side flows through space between cushion spear groove and cushion seal.
Since the space is reduced as a sine function, the cylinder rod decelerates smoothly.

5. Stop



The piston stops at the stroke end on rod side with smooth cushioning.
Air flow which is switched by solenoid valve is reversed from the one indicated in the above “1. Start-up”.

6. Reset



Actuating air passes from cylinder port on rod side and enters the left chamber of the cylinder from space between cushion seal and U-shaped groove on the outer surface of cushion spear.
Also, air in right hand side of chamber of piston is exhausted from cylinder port.
As U-shaped groove on the cushion spear outer surface gradually becomes deeper, the cylinder accelerates.

Clean Series

10 – **REC** [Mounting type] [Bore size] – [Stroke]

Clean Series

10	Relief type
11	Vacuum type

The type which is applicable for using inside the clean room graded ISO Class 4 by making an actuator's rod section a double seal construction and discharging by relief port directly to the outside of clean room.
The plug (M5 x 0.8) in the standard dimensions becomes a relief port.

For detailed specifications about the clean series, refer to the "Pneumatic Clean Series" (CAT.E02-23).

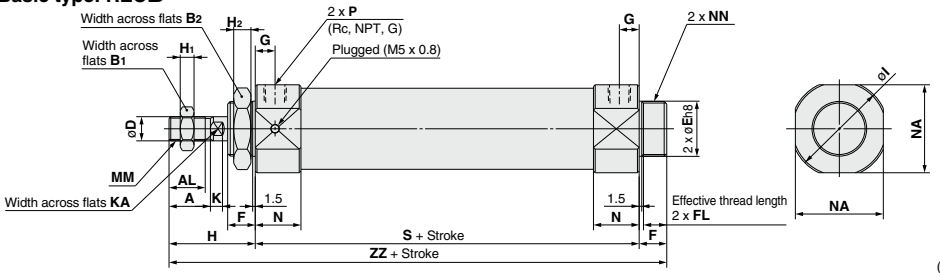
Specifications

Action	Double acting, Single rod
Bore size	ø20, ø25, ø32, ø40
Maximum operating pressure	1.0 MPa
Minimum operating pressure	0.2 MPa
Cushion	Air cushion
Relief port size	M5 x 0.8
Piston speed	50 to 400 mm/s
Mounting	Basic type, Axial foot type, Rod side flange type Head side flange type

∗ Auto switch can be mounted.

Dimensions

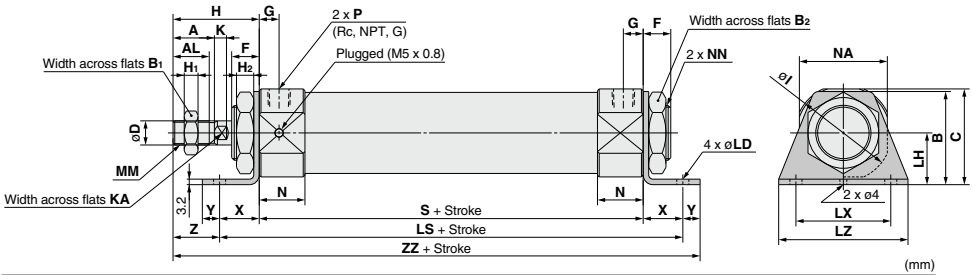
Basic type: RECB



(mm)

Bore (mm)	A	AL	B1	B2	D	E	F	FL	G	H	H1	H2	I	K	KA	MM	N	NA	NN	P	S	ZZ
20	18	15.5	13	26	8	20 $^{0}_{-0.033}$	13	10.5	10	41	5	8	33.5	5	6	M8 x 1.25	20	30	M20 x 1.5	1/8	146	200
25	22	19.5	17	32	10	26 $^{0}_{-0.033}$	13	10.5	10	45	6	8	37.5	5.5	8	M10 x 1.25	20	34.5	M26 x 1.5	1/8	146	204
32	22	19.5	17	32	12	26 $^{0}_{-0.033}$	13	10.5	11	45	6	8	46.5	5.5	10	M10 x 1.25	22	42.5	M26 x 1.5	1/8	159	217
40	24	21	22	41	14	32 $^{0}_{-0.039}$	16	13.5	12.5	50	8	10	56	7	12	M14 x 1.5	26.5	51	M32 x 2	1/4	181	247

Axial foot type: RECL



(mm)

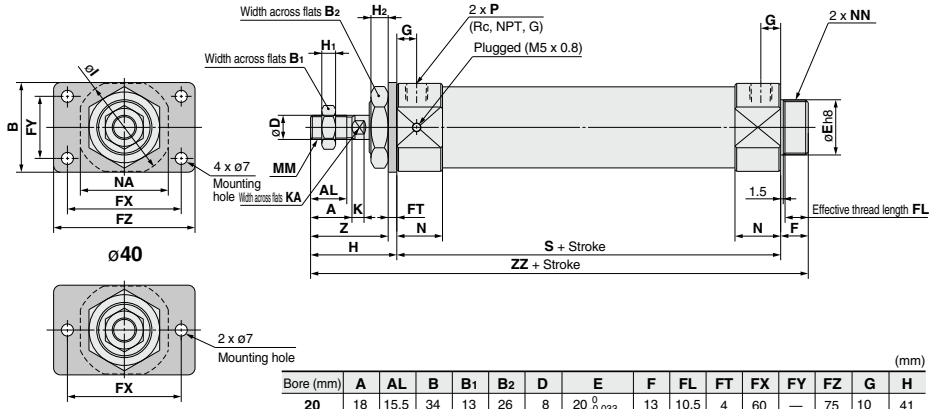
Bore (mm)	A	AL	B	B1	B2	C	D	F	G	H	H1	H2	I	K	KA	LD	LH	LS	LX	LZ	MM	N	NA
20	18	15.5	40	13	26	40	8	13	10	41	5	8	33.5	5	6	6.8	25	186	40	55	M8 x 1.25	20	30
25	22	19.5	47	17	32	45.5	10	13	10	45	6	8	37.5	5.5	8	6.8	28	186	40	55	M10 x 1.25	20	34.5
32	22	19.5	47	17	32	49.5	12	13	11	45	6	8	46.5	5.5	10	6.8	28	199	40	55	M10 x 1.25	22	42.5
40	24	21	54	22	41	55.5	14	16	12.5	50	8	10	56.2	7	12	7	30	227	55	75	M14 x 1.5	26.5	51

Bore (mm)	NN	P	S	X	Y	Z	ZZ
20	M20 x 1.5	1/8	146	20	8	21	215
25	M26 x 1.5	1/8	146	20	8	25	219
32	M26 x 1.5	1/8	159	20	8	25	232
40	M32 x 2	1/4	181	23	10	27	264

∗ Bracket is shipped together with the product.

Dimensions

Rod side flange type: REC**F**



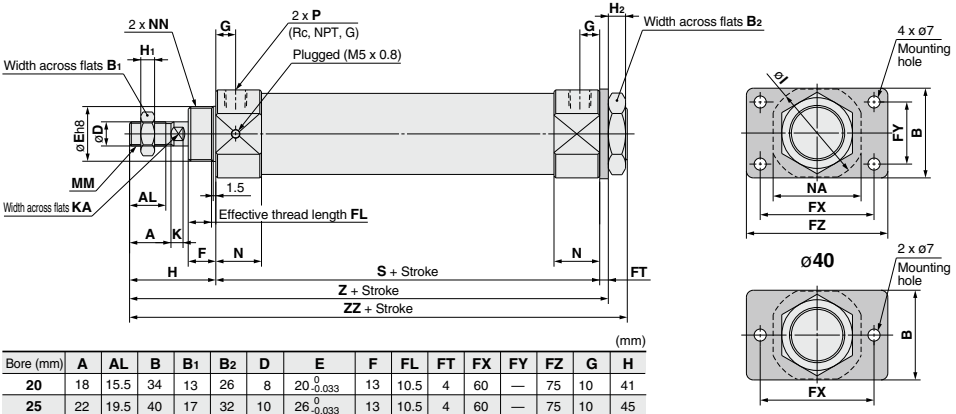
(mm)

Bore (mm)	A	AL	B	B_1	B_2	D	E	F	FL	FT	FX	FY	FZ	G	H
20	18	15.5	34	13	26	8	$20^{0}_{-0.033}$	13	10.5	4	60	—	75	10	41
25	22	19.5	40	17	32	10	$26^{0}_{-0.033}$	13	10.5	4	60	—	75	10	45
32	22	19.5	40	17	32	12	$26^{0}_{-0.033}$	13	10.5	4	60	—	75	11	45
40	24	21	52	22	41	14	$32^{0}_{-0.039}$	16	13.5	5	66	36	82	12.5	50

Bore (mm)	H_1	H_2	I	K	KA	MM	N	NA	NN	P	S	Z	ZZ
20	5	8	33.5	5	6	M8 x 1.25	20	30	M20 x 1.5	1/8	146	37	200
25	6	8	37.5	5.5	8	M10 x 1.25	20	34.5	M26 x 1.5	1/8	146	41	204
32	6	8	46.5	5.5	10	M10 x 1.25	22	42.5	M26 x 1.5	1/8	159	41	217
40	8	10	56.2	7	12	M14 x 1.5	26.5	51	M32 x 2	1/4	181	45	247

∗ Bracket is shipped together with the product.

Head side flange type: REC**G**



(mm)

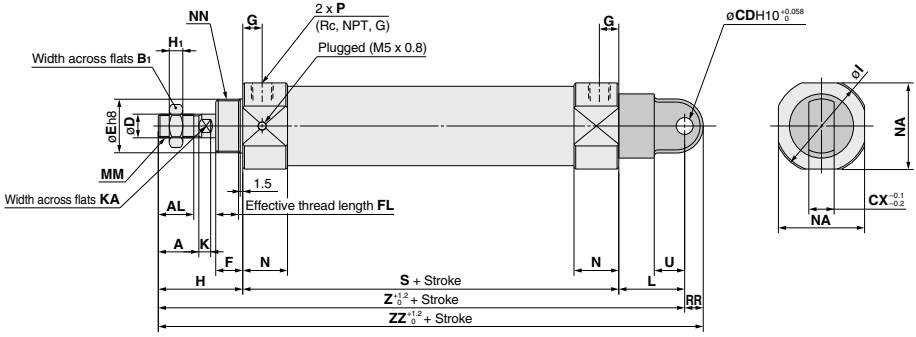
Bore (mm)	A	AL	B	B_1	B_2	D	E	F	FL	FT	FX	FY	FZ	G	H
20	18	15.5	34	13	26	8	$20^{0}_{-0.033}$	13	10.5	4	60	—	75	10	41
25	22	19.5	40	17	32	10	$26^{0}_{-0.033}$	13	10.5	4	60	—	75	10	45
32	22	19.5	40	17	32	12	$26^{0}_{-0.033}$	13	10.5	4	60	—	75	11	45
40	24	21	52	22	41	14	$32^{0}_{-0.039}$	16	13.5	5	66	36	82	12.5	50

Bore (mm)	H_1	H_2	I	K	KA	MM	N	NA	NN	P	S	Z	ZZ
20	5	8	33.5	5	6	M8 x 1.25	20	30	M20 x 1.5	1/8	146	191	200
25	6	8	37.5	5.5	8	M10 x 1.25	20	34.5	M26 x 1.5	1/8	146	195	204
32	6	8	46.5	5.5	10	M10 x 1.25	22	42.5	M26 x 1.5	1/8	159	208	217
40	8	10	56.2	7	12	M14 x 1.5	26.5	51	M32 x 2	1/4	181	236	247

∗ Bracket is shipped together with the product.

Dimensions

Single clevis type: RECC

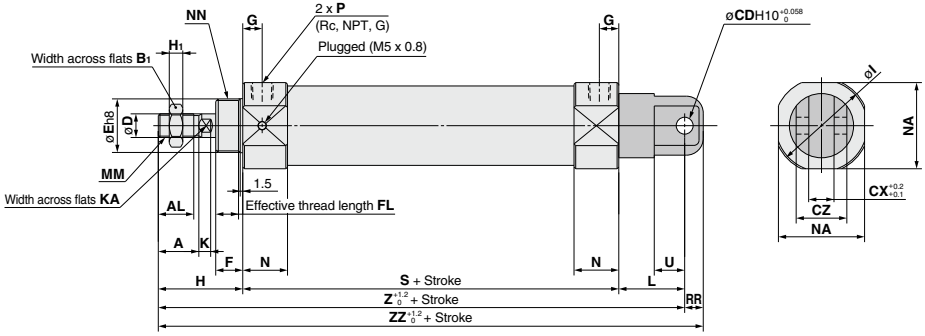


(mm)

Bore (mm)	A	AL	B1	CD	CX	D	E	F	FL	G	H	H1	I	K	KA	L	MM	N
20	18	15.5	13	9	10	8	$20^{0}_{-0.033}$	13	10.5	10	41	5	33.5	5	6	30	M8 x 1.25	20
25	22	19.5	17	9	10	10	$26^{0}_{-0.033}$	13	10.5	10	45	6	37.5	5.5	8	30	M10 x 1.25	20
32	22	19.5	17	9	10	12	$26^{0}_{-0.033}$	13	10.5	11	45	6	46.5	5.5	10	30	M10 x 1.25	22
40	24	21	22	10	15	14	$32^{0}_{-0.039}$	16	13.5	12.5	50	8	56.2	7	12	39	M14 x 1.5	26.5

Bore (mm)	NA	NN	P	RR	S	U	Z	ZZ
20	30	M20 x 1.5	1/8	9	146	14	217	226
25	34.5	M26 x 1.5	1/8	9	146	14	221	230
32	42.5	M26 x 1.5	1/8	9	159	14	234	243
40	51	M32 x 2	1/4	11	181	18	270	281

Double clevis type: RECD



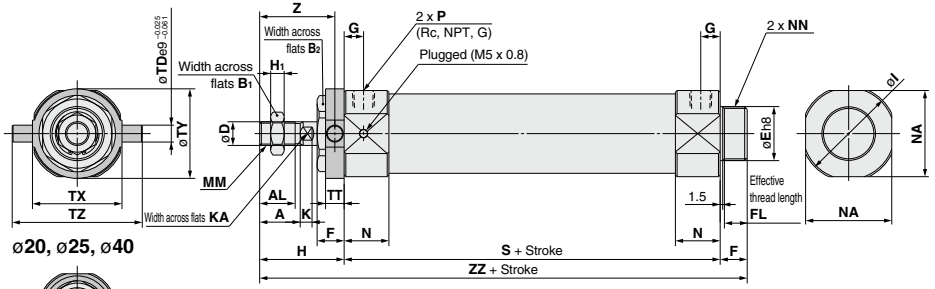
(mm)

Bore (mm)	A	AL	B1	CD	CX	CZ	D	E	F	FL	G	H	H1	I	K	KA	L	MM
20	18	15.5	13	9	10	19	8	$20^{0}_{-0.033}$	13	10.5	10	41	5	33.5	5	6	30	M8 x 1.25
25	22	19.5	17	9	10	19	10	$26^{0}_{-0.033}$	13	10.5	10	45	6	37.5	5.5	8	30	M10 x 1.25
32	22	19.5	17	9	10	19	12	$26^{0}_{-0.033}$	13	10.5	11	45	6	46.5	5.5	10	30	M10 x 1.25
40	24	21	22	10	15	30	14	$32^{0}_{-0.039}$	16	13.5	12.5	50	8	56.2	7	12	39	M14 x 1.5

Bore (mm)	N	NA	NN	P	RR	S	U	Z	ZZ
20	20	30	M20 x 1.5	1/8	9	146	14	217	226
25	20	34.5	M26 x 1.5	1/8	9	146	14	221	230
32	22	42.5	M26 x 1.5	1/8	9	159	14	234	243
40	26.5	51	M32 x 2	1/4	11	181	18	270	281

Dimensions

Rod side trunnion type: RECU



(mm)

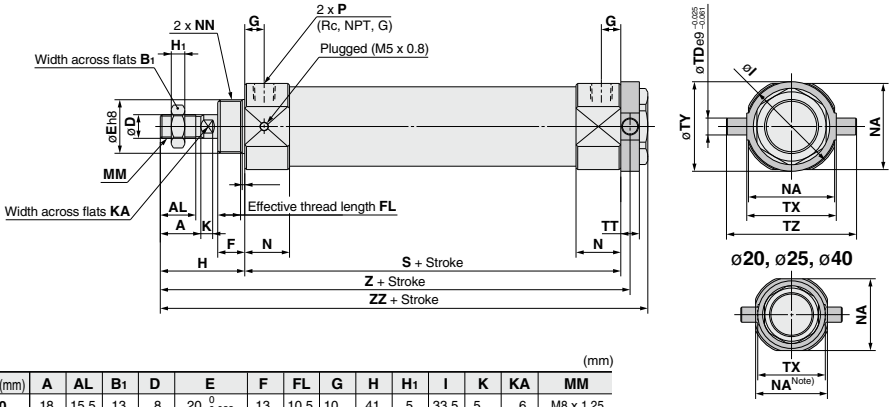
Bore (mm)	A	AL	B1	B2	D	E	F	FL	G	H	H1	I	K	KA
20	18	15.5	13	26	8	$20^{0}_{-0.033}$	13	10.5	10	41	5	33.5	5	6
25	22	19.5	17	32	10	$26^{0}_{-0.033}$	13	10.5	10	45	6	37.5	5.5	8
32	22	19.5	17	32	12	$26^{0}_{-0.033}$	13	10.5	11	45	6	46.5	5.5	10
40	24	21	22	41	14	$32^{0}_{-0.039}$	16	13.5	12.5	50	8	56.2	7	12

Bore (mm)	MM	N	NA	NN	P	S	TD	TT	TX	TY	TZ	Z	ZZ
20	M8 x 1.25	20	30	M20 x 1.5	1/8	146	8	10	32	32	52	36	200
25	M10 x 1.25	20	34.5	M26 x 1.5	1/8	146	9	10	40	40	60	40	204
32	M10 x 1.25	22	42.5	M26 x 1.5	1/8	159	9	10	40	40	60	40	217
40	M14 x 1.5	26.5	51	M32 x 2	1/4	181	10	11	53	53	77	44.5	247

∗ Bracket is shipped together with the product.

Note) For ø32, a trunnion pivot bracket NA (42.5) is used as standard.

Head side trunnion type: RECT



(mm)

Bore (mm)	A	AL	B1	D	E	F	FL	G	H	H1	I	K	KA	MM
20	18	15.5	13	8	$20^{0}_{-0.033}$	13	10.5	10	41	5	33.5	5	6	M8 x 1.25
25	22	19.5	17	10	$26^{0}_{-0.033}$	13	10.5	10	45	6	37.5	5.5	8	M10 x 1.25
32	22	19.5	17	12	$26^{0}_{-0.033}$	13	10.5	11	45	6	46.5	5.5	10	M10 x 1.25
40	24	21	22	14	$32^{0}_{-0.039}$	16	13.5	12.5	50	8	56.2	7	12	M14 x 1.5

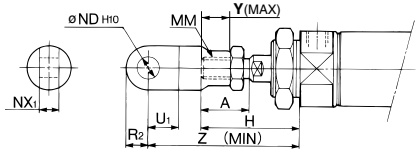
Bore (mm)	N	NA	NN	P	S	TD	TT	TX	TY	TZ	Z	ZZ
20	20	30	M20 x 1.5	1/8	146	8	10	32	32	52	192	202
25	20	34.5	M26 x 1.5	1/8	146	9	10	40	40	60	196	206
32	22	42.5	M26 x 1.5	1/8	159	9	10	40	40	60	209	219
40	26.5	51	M32 x 2	1/4	181	10	11	53	53	77	236.5	247

∗ Bracket is shipped together with the product.

Note) For ø32, a trunnion pivot bracket NA (42.5) is used as standard.

Accessory Dimensions 1

Single Knuckle Joint Mounting

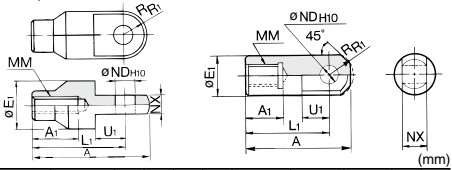


(mm)

Bore (mm)	A	H	MM	ND H10	NX1	U1	R2	Y	Z
20	18	41	M8 x 1.25	9 $^{+0.058}_{0}$	9 $^{-0.1}_{-0.2}$	14	10	11	66
25, 32	22	45	M10 x 1.25	9 $^{+0.058}_{0}$	9 $^{-0.1}_{-0.2}$	14	10	14	69
40	24	50	M14 x 1.5	12 $^{+0.070}_{0}$	16 $^{-0.1}_{-0.3}$	20	14	13	92

Single Knuckle Joint

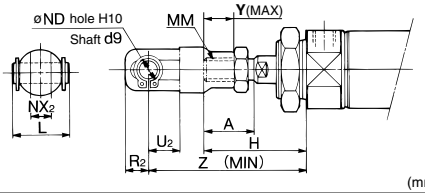
I-020B, 032B Material: Rolled steel **I-040B** Material: Free cutting sulfur steel



(mm)

Part no.	Applicable bore size (mm)	A	A1	E1	L1	MM	ND H10	NX	R1	U1
I-020B	**20**	46	16	20	36	M8 x 1.25	9 $^{+0.058}_{0}$	9 $^{-0.1}_{-0.2}$	10	14
I-032B	**25, 32**	48	18	20	38	M10 x 1.25	9 $^{+0.058}_{0}$	9 $^{-0.1}_{-0.2}$	10	14
I-040B	**40**	69	22	24	55	M14 x 1.5	12 $^{+0.070}_{0}$	16 $^{-0.1}_{-0.3}$	15.5	20

Double Knuckle Joint Mounting

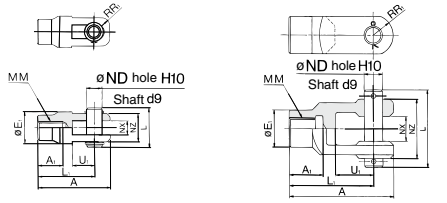


(mm)

Bore (mm)	A	H	L	MM	ND	NX2	R2	U2	Y	Z
20	18	41	25	M8 x 1.25	9	9 $^{+0.2}_{+0.1}$	10	14	11	66
25, 32	22	45	25	M10 x 1.25	9	9 $^{+0.2}_{+0.1}$	10	14	14	69
40	24	50	49.7	M14 x 1.5	12	16 $^{+0.3}_{+0.1}$	13	25	13	92

Double Knuckle Joint

Y-020B, Y-032B Material: Rolled steel **Y-040B** Material: Cast iron



(mm)

Part no.	Applicable bore size (mm)	A	A1	E1	L	L1	MM	ND	NX	NZ	R1	U1	Applicable pin part no.	Retaining ring Cotter pin Size
Y-020B	**20**	46	16	20	25	36	M8 x 1.25	9	9 $^{+0.2}_{+0.1}$	18	5	14	CDP-1	Type C9 for shaft
Y-032B	**25, 32**	48	18	20	25	38	M10 x 1.25	9	9 $^{+0.2}_{+0.1}$	18	5	14	CDP-1	Type C9 for shaft
Y-040B	**40**	68	22	24	49.7	55	M14 x 1.5	12	16 $^{+0.3}_{+0.1}$	38	13	25	CDP-3	ø3 x 18 L

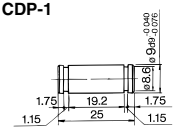
∗ Knuckle pins and retaining rings (cotter pins for ø40) are included.

Double Clevis Pin/Material: Carbon steel

(mm)

Bore size/ø20, ø25, ø32

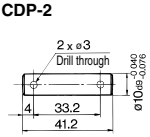
CDP-1



Retaining ring: Type C9 for shaft

Bore size/ø40

CDP-2



Cotter pin: ø3 x 18 L

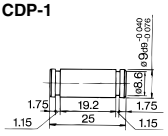
∗ Retaining rings (cotter pins for ø40) are included.

Double Knuckle Pin/Material: Carbon steel

(mm)

Bore size/ø20, ø25, ø32

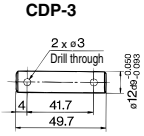
CDP-1



Retaining ring: Type C9 for shaft

Bore size/ø40

CDP-3



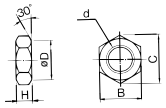
Cotter pin: ø3 x 18 L

∗ Retaining rings (cotter pins for ø40) are included.

Accessory Dimensions 2

Rod End Nut

Material: Carbon steel

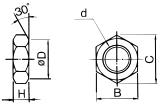


(mm)

Part no.	Applicable bore size (mm)	B	C	D	d	H
NT-02	**20**	13	15.0	12.5	M8 x 1.25	5
NT-03	**25, 32**	17	19.6	16.5	M10 x 1.25	6
NT-04	**40**	22	25.4	21.0	M14 x 1.5	8

Mounting Nut

Material: Carbon steel

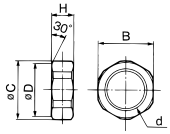


(mm)

Part no.	Applicable bore size (mm)	B	C	D	d	H
SN-020B	**20**	26	30	25.5	M20 x 1.5	8
SN-032B	**25, 32**	32	37	31.5	M26 x 1.5	8
SN-040B	**40**	41	47.3	40.5	M32 x 2.0	10

Trunnion Nut

Material: Carbon steel



(mm)

Part no.	Applicable bore size (mm)	B	C	D	d	H
TN-020B	**20**	26	28	25.5	M20 x 1.5	10
TN-032B	**25, 32**	32	34	31.5	M26 x 1.5	10
TN-040B	**40**	41	45	40.5	M32 x 2	10

Refer to page 1108 (CM2-XB12: External stainless steel cylinder) for stainless steel mounting brackets and accessories (some are not applicable.).

∗ Same mounting brackets and accessories are used as CM2 series (Best Pneumatics No. 2-1).

Auto Switch Mounting 1

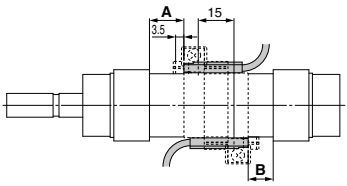
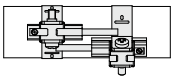
Minimum Stroke for Auto Switch Mounting

n: No. of auto switches (mm)

Auto switch model	No. of auto switches mounted				
	1	2		n	
		Different surfaces	Same surface	Different surfaces	Same surface
D-M9□	5	15 Note 1)	40 Note 1)	$20 + 35\frac{(n-2)}{2}$ (n = 2, 4, 6···) Note 3)	55 + 35 (n – 2) (n = 2, 3, 4, 5···)
D-M9□W	10	15 Note 1)	40 Note 1)	$20 + 35\frac{(n-2)}{2}$ (n = 2, 4, 6···) Note 3)	55 + 35 (n – 2) (n = 2, 3, 4, 5···)
D-M9□A	10	25	40 Note 1)	$25 + 35\frac{(n-2)}{2}$ (n = 2, 4, 6···) Note 3)	60 + 35 (n – 2) (n = 2, 3, 4, 5···)
D-A9□	5	15	30 Note 1)	$15 + 35\frac{(n-2)}{2}$ (n = 2, 4, 6···) Note 3)	50 + 35 (n – 2) (n = 2, 3, 4, 5···)
D-M9□V	5	20	35	$20 + 35\frac{(n-2)}{2}$ (n = 2, 4, 6···) Note 3)	35 + 35 (n – 2) (n = 2, 3, 4, 5···)
D-A9□V	5	15	25	$15 + 35\frac{(n-2)}{2}$ (n = 2, 4, 6···) Note 3)	25 + 35 (n – 2) (n = 2, 3, 4, 5···)
D-M9□WV **D-M9□AV**	10	20	35	$20 + 35\frac{(n-2)}{2}$ (n = 2, 4, 6···) Note 3)	35 + 35 (n – 2) (n = 2, 3, 4, 5···)
D-C7□ **D-C80**	5	20	60	$20 + 45\frac{(n-2)}{2}$ (n = 2, 4, 6···) Note 3)	60 + 45 (n – 2) (n = 2, 3, 4, 5···)
D-H7□ **D-H7□W** **D-H7BA** **D-H7NF**	10	25	70	$25 + 45\frac{(n-2)}{2}$ (n = 2, 4, 6···) Note 3)	70 + 45 (n – 2) (n = 2, 3, 4, 5···)
D-C73C **D-C80C** **D-H7C**	5	30	80	$30 + 50\frac{(n-2)}{2}$ (n = 2, 4, 6···) Note 3)	80 + 50 (n – 2) (n = 2, 3, 4, 5···)
D-B5□ **D-B64** **D-G5□** **D-K59□**	5	25	70	$25 + 50\frac{(n-2)}{2}$ (n = 2, 4, 6···) Note 3)	70 + 50 (n – 2) (n = 2, 3, 4, 5···)
D-B59W	10	30	75	$30 + 50\frac{(n-2)}{2}$ (n = 2, 4, 6···) Note 3)	75 + 50 (n – 2) (n = 2, 3, 4, 5···)

Note 3) When "n" is an odd number, an even number that is one larger than this odd number is used for the calculation.

Note 1) Auto switch mounting

Auto switch model	With 2 auto switches	
	Different surfaces	Same surface
	 Correct auto switch mounting position is 3.5 mm from the back face of the switch holder.	 The auto switch is mounted by slightly displacing it in a direction (cylinder tube circumferential exterior) so that the auto switch and lead wire do not interfere with each other.
D-M9□ **D-M9□W**	Less than 20 stroke Note 2)	Less than 55 stroke Note 2)
D-M9□A	Less than 25 stroke Note 2)	Less than 60 stroke Note 2)
D-A9□	—	Less than 50 stroke Note 2)

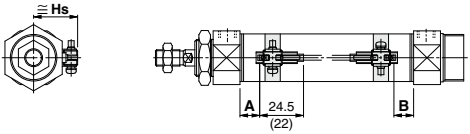
Note 2) Minimum stroke for auto switch mounting in types other than those mentioned in Note 1.

Auto Switch Mounting 2

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

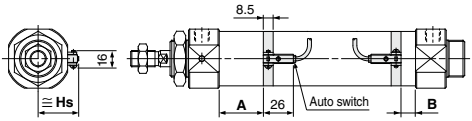
Reed auto switch

D-A9□

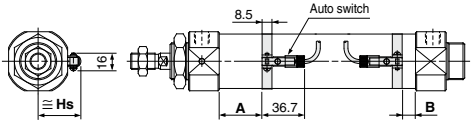


( ): For D-A96 type

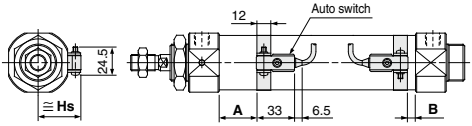
D-C7□, C80



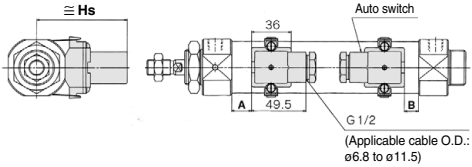
D-C73C, C80C



D-B5□, B64, B59W

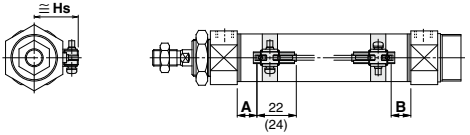


D-A44



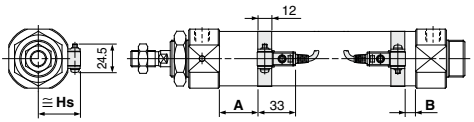
Solid state auto switch

D-M9□
D-M9□A
D-M9□W

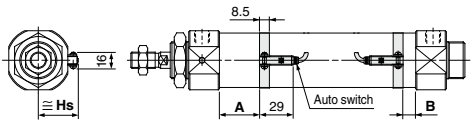


( ): For D-M9□A type

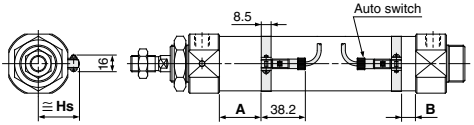
D-G5NT



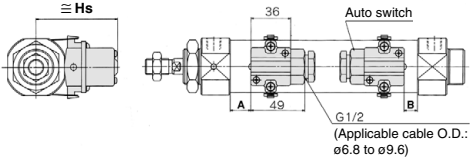
D-H7□, H7□W, H7NF, H7BA



D-H7C



D-A3□, G39, K39



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

Auto Switch Proper Mounting Position

(mm)

Auto Switch model / Bore size (mm)	D-M9□(V) D-M9□W(V) D-M9□A(V)		D-A9□(V)		D-C7/C8 D-C73C D-C80C		D-B5 D-B6		D-B59W		D-A3□ D-G39 D-K39 D-A44		D-H7□ D-H7C D-H7□W D-H7BA D-H7NF		D-G5NT	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
20	59.5	34	55.5	30.5	56	31	50	25	53	28	49.5	24.5	55	30	51.5	26.5
25	59.5	34	55.5	30.5	56	31	50	25	53	28	49.5	24.5	55	30	51.5	26.5
32	63	40	59	36	59.5	36.5	53.5	30.5	56.5	33.5	53	30	58.5	35.5	55	32
40	73.5	42.5	69.5	38.5	70	39	64	33	67	36	63.5	32.5	69	38	65.5	34.5

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

Auto Switch Mounting Height

(mm)

Auto Switch model / Bore size (mm)	D-M9□(V) D-M9□W(V) D-M9□A(V) D-A9□(V)	D-C7/C8 D-H7□ D-H7□W D-H7NF D-H7BA	D-B5□ D-B64 D-B59W D-G5NT D-H7C	D-C73C D-C80C	D-A3□ D-G39 D-K39	D-A44
	Hs	Hs	Hs	Hs	Hs	Hs
20	25	24.5	27.5	27	62	72
25	27.5	27	30	29.5	64.5	74.5
32	31	30.5	33.5	33	68	78
40	35.5	35	38	37.5	72.5	82.5

Auto Switch Mounting 3

Operating Range

(mm)

Auto switch model	Bore size			
	20	25	32	40
D-A9□	7	6	8	8
D-M9□ D-M9□W	4	4	5	4
D-C7□/C80 D-C73C/C80C	8	10	9	10
D-B5□/B64	8	10	9	10
D-B59W	13	13	14	14
D-H7□/H7□W D-H7NF/H7BA	4	4	4.5	5
D-H7C	7	8.5	9	10
D-A3□/D-A44	9	10	9	10
D-G39/D-K39	8	9	9	9
D-G5NT	4	4	4.5	5
D-G5NB	35	40	40	45

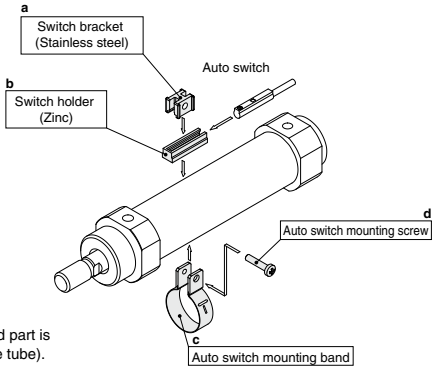
∗ Since this is a guideline including hysteresis, not meant to be guaranteed. (assuming approximately ±30% dispersion.)
There may be the case it will vary substantially depending on an ambient environment.

Auto Switch Mounting Bracket Part No.

Auto switch model	Bore size (mm)			
	ø20	ø25	ø32	ø40
D-A9□(V) D-M9□(V) D-M9□W(V) D-M9□A(V)	BMA3-020	BMA3-025	BMA3-032	BMA3-040
D-C7□/C80 D-C73C D-C80C D-H7□ D-H7□W D-H7BA D-H7NF	BMA2-020A	BMA2-025A	BMA2-032A	BMA2-040A
D-B5□/B64 D-B59W D-G5□/K59 D-G5□W/K59W D-G5BA/G59F D-G5NT D-G5NB	BA-01	BA-02	BA-32	BA-04

Note 1) Set part number which includes the auto switch mounting band (BM2-□□□A) and the holder kit (BJ5-1/Switch bracket: Transparent).
Since the switch bracket (made from nylon) are affected in an environment where alcohol, chloroform, methylamines, hydrochloric acid or sulfuric acid is splashed over, so it cannot be used. Please consult SMC regarding other chemicals.
Note 2) Set part number which includes the auto switch mounting band (BM2-□□□AS/Stainless steel screw) and the holder kit (BJ4-1/Switch bracket: White).
Note 3) For the D-M9□A(V) type auto switch, do not install the switch bracket on the indicator light.

[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.)
BBA4: For D-C7/C8/H7
Note 4) Refer to page 1048 for details of the BBA4.
The above stainless steel screws are used when a cylinder is shipped with the D-H7BA auto switch.
When only an auto switch is shipped independently, the BBA4 is attached.



(1) BJ□-1 is a set of "a" and "b".
(2) BM2-□□□A(S) is a set of "c" and "d".
Band (c) is mounted so that the projected part is on the internal side (contact side with the tube).
BJ4-1 (Switch bracket: White)
BJ5-1 (Switch bracket: Transparent)

Other than the applicable auto switches listed in "How to Order", the following auto switches can be mounted.
For detailed specifications, refer to pages 941 to 1067.

Auto switch type	Model	Electrical entry (Fetching direction)	Features	Applicable bore size
Reed	D-C73, C76	Grommet (In-line)	—	ø20 to ø40
	D-C80		Without indicator light	
	D-B53		—	ø20 to ø40
Solid state	D-H7A1, H7A2, H7B		—	ø20 to ø40
	D-H7NW, H7PW, H7BW		Diagnostic indication (2-color indicator)	
	D-G5NT		With timer	ø20 to ø40

∗ For solid state auto switches, auto switches with a pre-wired connector are also available. Refer to pages 1014 and 1015 for details.
∗ Normally closed (NC = b contact) solid state auto switches (D-F9G/F9H types) are also available. Refer to page 959 for details.
∗ Wide range detection type, solid state auto switches (D-G5NB type) are also available. Refer to page 1004 for details.

REC Series
Specific Product Precautions

Be sure to read this before handling the products.
Refer to back page 50 for Safety Instructions and pages 3 to 12 for Actuator and Auto Switch Precautions.

⚠Caution

1. Speed Adjustment

Throttle speed controller, such as AS series, is recommended for speed adjustment.

Recommended Speed Controller with One-touch Fitting

Model	Model		
	Elbow type	Universal type	In-line type
REC20	AS2201F-01-06A-X214	AS2301F-01-06A-X214	AS2002F-06A-X214
REC25	AS2201F-01-06A-X214	AS2301F-01-06A-X214	AS2002F-06A-X214
REC32	AS2201F-01-06A-X214	AS2301F-01-06A-X214	AS3002F-08A-X214
REC40	AS3201F-02-08A-X214	AS3301F-02-08A-X214	AS3002F-08A-X214

Symbol: Throttle valve

- Speed control is possible with meter-in and meter-out types of speed controllers. However, smooth acceleration and deceleration may not be obtained by these speed controllers.
- For installation other than horizontal mounting, it is recommended to use a system with reduced pressure supply circuit on the downward side. (This system is also effective for avoiding a start delay at rise and air consumption.)

2. Cushion Adjustment

Cushion adjustment mechanism is not designed.

Cushion adjustment is not necessary because the model can perform smooth acceleration and deceleration in a wide range of strokes without an adjusting cushion.

3. Plug (Relief Port)

For general conditions, a plug (M5 x 0.8) on the rod cover side is plugged with a hexagon socket head set screw ⑯. Do not remove it since dust may enter inside.

Hexagon socket set screw is not prepared for clean room specifications, and use it as relief port accordingly.

4. Cycle Time

Due to the nature of its construction, this cylinder starts and stops gradually. Therefore, the length of time for the stroke could be longer than that of standard cylinders.