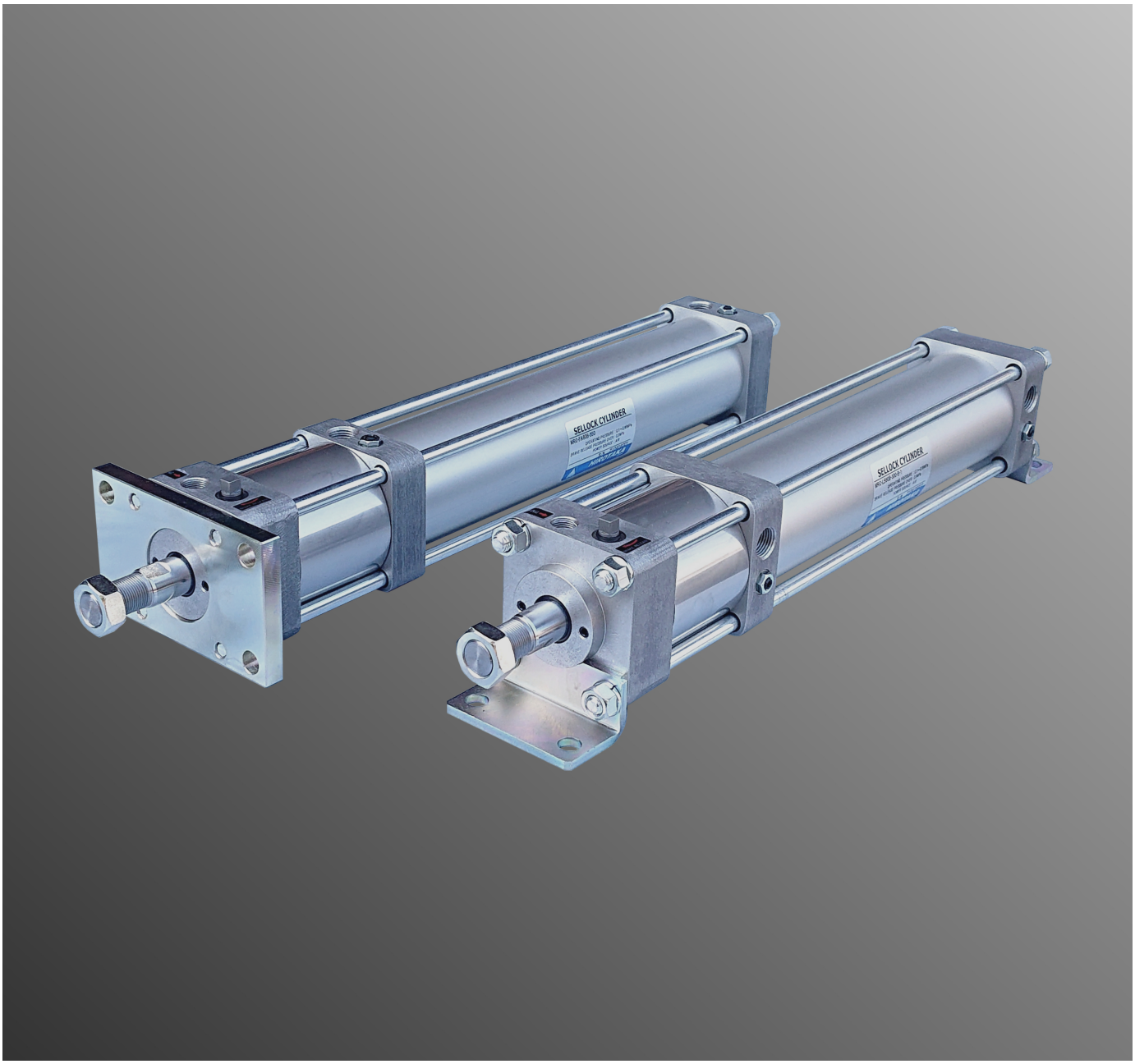
Air cylinder with brake system

SELLOCK CYLINDER

Air cylinder with braking functions such as intermediate stop and drop prevention.



HIROTAKA MFG. CO.,LTD.

Overview

It is possible to lock the piston rod in both directions of pushing and pulling.
Ideal for stopping in the middle of the stroke, emergency stop and fall prevention.
Demonstrates stable braking force with a long life.

Feature

❶ High boost efficiency

Since it is a mechanical method that presses the steel ball with taper ring, the optimum taper angle generates a large braking force and the brake is unlocked without difficulty even with low air pressure.

❷ Long-life brake metal

By optimally arranging a large number of steel balls, the gripping area of the brake metal is wide, and by adopting the centering action mechanism, the grip method is not eccentric and the life of the brake metal is very long.

❸ Braking force with little change

Since the braking force is generated by a strong spring, the safety design is such that the brakes are applied naturally even when the air runs our. In addition, since the using spring has a very low spring constant, it is a long-life product that does not change the braking force even after long-term use.

❹ Simple design

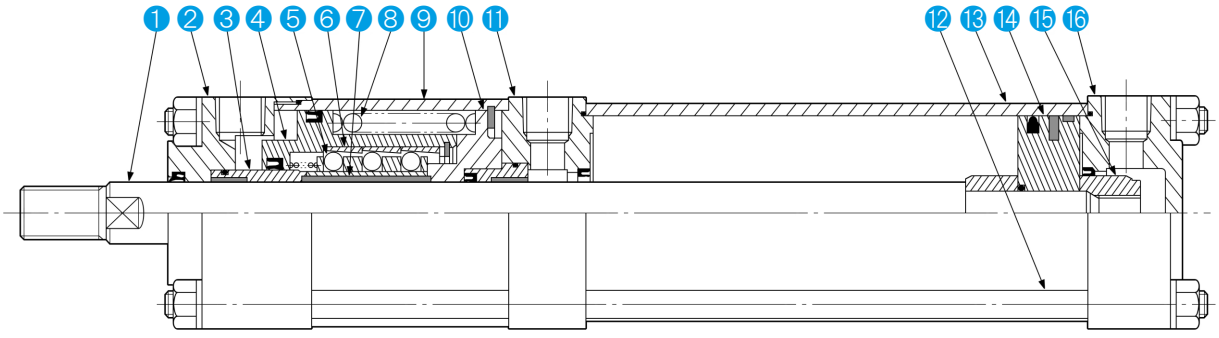
Easy to install with no obstructive protrusions.

❺ Compact style

By shortening the total length of the cylinder and consolidating the brake part, it is easy to incorporate it into the device.

❻ Easy to install cylinder

Since the piping port, cushion needle, unlocking port, manual unlocking lever, etc. are unified in the same direction, the degree the degree of freedom in device design is improved due to the compact appearance.



No.	Description	Material	No.	Description	Material	No.	Description	Material
1	Piston rod	Carbon steel	7	Brake metal	Copper alloy	13	Cylinder tube	Aluminum alloy
2	Braking system	Aluminum alloy	8	Spring	Piano wire	14	Cylinder piston	Aluminum alloy
3	Sleeve	Carbon steel	9	Brake tube	Carbon steel	15	Cushion collar	Carbon steel
4	Brake piston	Carbon steel	10	Brake cover	Carbon steel	16	Head cover	Aluminum alloy
5	Steel ball	Bearing steel	11	Rod cover	Aluminum alloy			
6	Taper ring	Bearing steel	12	Tie-rod	Rolled steel			

※ No.11 and 16 of ϕ125 are cast iron.

Specifications

Fluid	Air
Operating pressure	0.1 to 0.99 MPa
Proof pressure	1.5 MPa
Unlocking pressure	0.3 MPa
Ambient temperature	−5 to 80℃ (Non-freezing)
Operating speed	50 to 1000 mm/sec
Lubrication	No required 〈Note 1〉
Stopping accuracy	±1 mm (300 mm/sec) 〈Note 2〉
Locking force	Cylinder thrust at air pressure 0.75 MPa

〈Note 1〉 If lubricating, additive-free turbine oil ISO VG 32 or VG 46 is recommended.

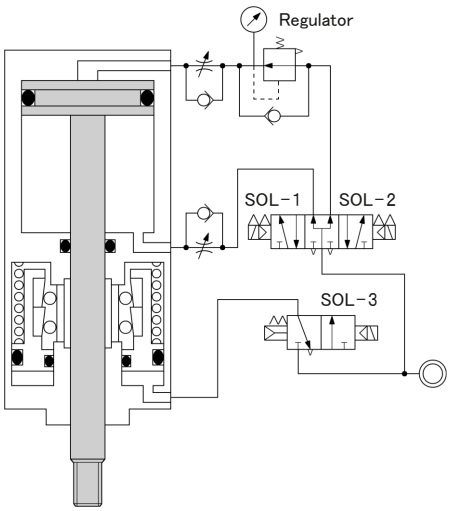
〈Note 2〉 The values will vary depending on the unlocking valve, scan time, cylinder speed, etc.

Bore size and stroke limit

Unit : mm

Bore size	40	50	63	80	100	125
Stroke limit	500	600	600	750	750	1000

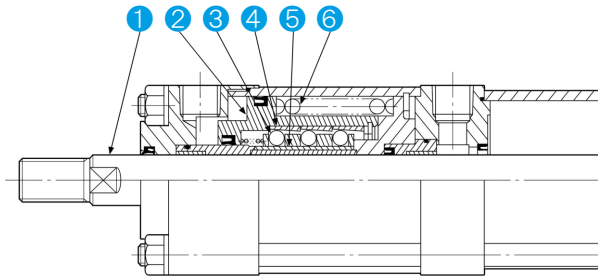
Basic pneumatic circuit



Action	SOL−1	SOL−2	SOL−3
Locked stop	OFF	OFF	OFF
Forward	OFF	ON	ON
Reverse	ON	OFF	ON

If the piston rod pops out when the brake is unlocked, be sure to install a regulator at the position shown in the figure to prevent it from popping out.

Operating principle



● Unlocking

When air is supplied to the brake release port, the brake piston ② moves to the right due to the force of compressed air. The inner diameter of the taper ring ④ is angled, and the inner diameter increases as it moves to the right, so the steel ball ③ loses the force to be pushed toward the center and the brake metal ⑤ is released.

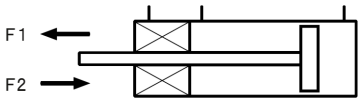
● Locking

When air is exhausted inside the brake release port, the brake piston ② moves to the left due to the force of the spring ⑥. Since the taper ring ④ has a small inner diameter on the left side, the steel ball ③ is pushed toward the center and the brake metal ⑤ grips the piston rod ① strongly.

There are many rows of steel balls in the axial direction, and the area for grasping the brake metal is wide. And it is designed so that the fluctuation of the tightening force of each steel ball due to the optimum angle of the taper ring and the variation of the inner diameter is minimized.

Since the movement of the steel ball rolls when the brake is released and when it is locked, the boosting efficiency is maximized.

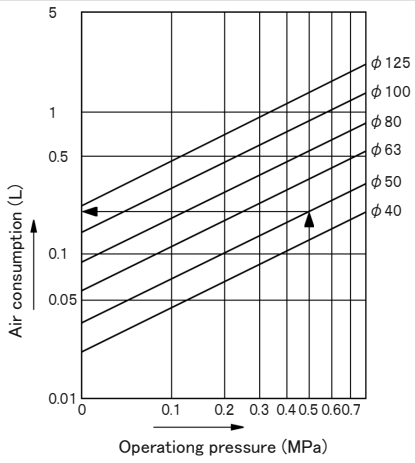
Theoretical thrust and Locking force



Unit : N

Bore size (mm)		Operating pressure : MPa						
		0.2	0.3	0.4	0.5	0.6	0.7	Locking force
40	F1	252	377	503	629	754	880	942
	F2	220	331	440	551	662	772	
50	F1	392	588	784	980	1176	1372	1472
	F2	329	494	658	823	987	1152	
63	F1	622	933	1244	1555	1866	2177	2337
	F2	559	839	1118	1398	1677	1957	
80	F1	1004	1506	2008	2510	3012	3514	3770
	F2	906	1359	1812	2265	2718	3171	
100	F1	1570	2355	3140	3925	4710	5495	5890
	F2	1430	2145	2860	3575	4290	5005	
125	F1	2454	3681	4908	6135	7362	8589	9203
	F2	2262	3393	4524	5655	6786	7917	

Air consumption



The table shows the air consumption required for one cycle of 10 mm stroke.

Example : MRC-LB-50B-100

Operating pressure : 0.5 MPa, 10 cycles per minute

0.22(L) × 100/10(stroke) × 10(cycles) = 22 L/min (ANR)

How to order

MRC - F A - 50B - 150 - BZ - 2 - JIH2ME - AC100V - KO

Symbol	Mounting type
SD	Basic
LB	Axial foot
FA	Rod flange
FB	Head flange
CA	Single clevis
CB	Double clevis
TC	Center trunnion

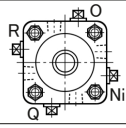
Symbol	Bore size
40	40 mm
50	50 mm
63	63 mm
80	80 mm
100	100 mm
125	125 mm

Symbol	Stroke
50	50 mm
75	75 mm
100	100 mm
150	150 mm
200	200 mm
300	300 mm
400	400 mm
500	500 mm

Symbol	Number of auto switches
1	1 pc.
2	2 pcs.
N	N pcs.

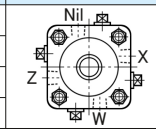
Symbol	Brake release valve voltage
AC100V	100 VAC
AC200V	200 VAC
DC24V	24 VDC

* Only brake release valve mounted type can be selected

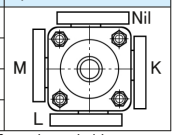
Symbol	Manual brake release lever position
Nil	
Q	
R	
O	

* View from the rod side
* Cannot be installed in the position as the brake release valve

Symbol	Type
MRC	Standard
MRCV	Brake release valve mounted type

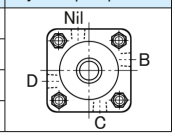
Symbol	Unlocking port location
Nil	
X	
W	
Z	

* View from the rod side
* No selection for brake release valve mounted type

Symbol	Brake release valve position
Nil	
K	
L	
M	

* View from the rod side
* When the mounting type is the rod flange, it cannot be attached to the K and M positions.
* When the mounting type is the axial foot, it cannot be attached to the K and L positions.

Symbol	Cushion
B	With both sides
H	With head cover side
R	With rod cover side
N	Without cushion

Symbol	Cylinder port position
Nil	
B	
C	
D	

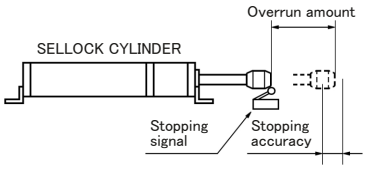
* View from the rod side
* Cushion needle is in the same position

Symbol	Accessory
J	With rod boot
I	Single knuckle joint
Y	Double knuckle joint

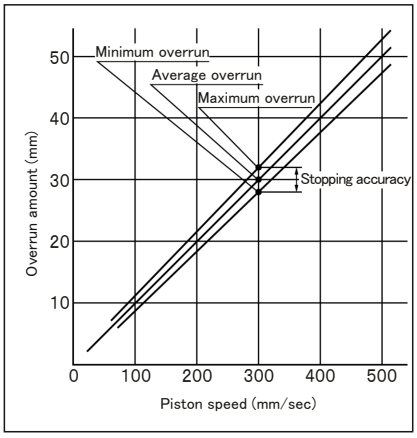
Symbol	Auto switch
RS6	Read auto switch
H2ME	Solid state auto switch

Stopping accuracy and Overrun amount

Standard type

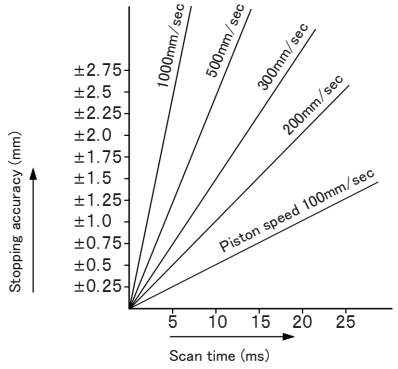


Due to the time delay caused by the brake release valve, scan time, air supply / exhaust, etc., from the output of the stop signal during the operation of the cell lock cylinder until the brake actually works and the piston rod stops, the piston rod sure to overrun to some extent.
The variation in the stop position after overrun is the stop accuracy.



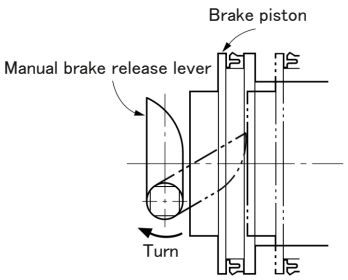
* Repeated stop accuracy varies depending on the type of brake release valve, sequencer scan time, cylinder speed change, etc.

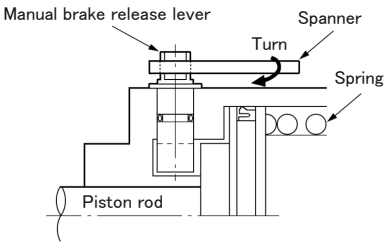
Variation width of stop position caused by scan time of sequencer and cylinder speed



When using a sequencer with a cylinder speed of 300 mm/sec and a scan time of 5 ms, set the variation width of the stop position to 1.5 mm and the stop accuracy to ±0.75 mm.
Furthermore, the stop accuracy is added to the above value depending on the variation of valve response, cylinder speed, sensor, etc.

How to manually release the brake





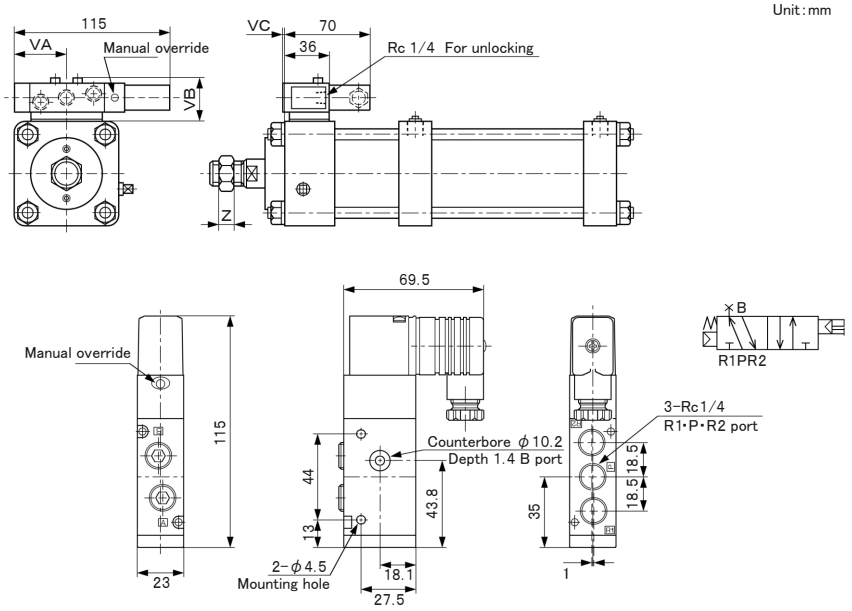
Hang the spanner on the brake release lever and turn it clockwise to push back the brake piston and unlock it.
When the brake release lever returns to its original position, the brake will lock, so keep the brake release lever in the unlock position while releasing the lock.
When you release your hand, the brake release lever returns to its original position and the brake locks.

Unlocking valve mounted type　Dimensions・Specifications

- Unlocking valve is mounted on the position side of the unlocking port.
- If the mounting type is the rod flange, the unlocking valve cannot be installed at the positions of the unlocking port X and Z.

Bore size 40 mm to 100 mm

Unit : mm



Brake release valve specifications	
Fluid	Air
Operating pressure range	0.15 to 0.7 MPa
Ambient temperature	5 to 50℃
Action	Pilot operated
Piping connection	Direct piping
Effective sectional area	12 mm²
Lubrication	No required
Manual override	Non-locking push type

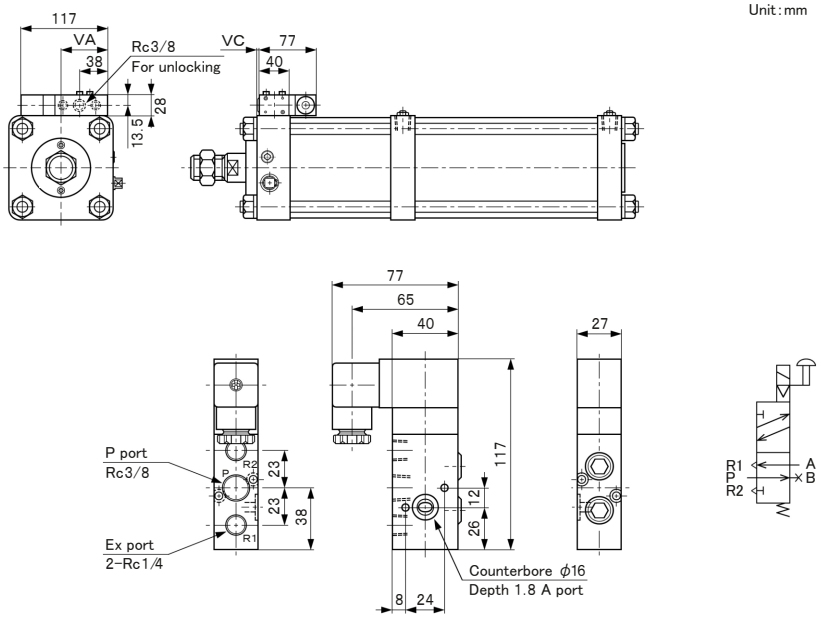
Solenoid specifications		
Rated voltage	100 VAC, 50/60 Hz 200 VAC, 50/60 Hz 24 VDC	
Operating voltage range	AC100V AC200V DC24V	100~110V(100±10%) 200~220V(200±10%) 24V(24±10%)
Starting current	AC100V AC200V DC24V	50Hz:0.046A,60Hz:0.042A 50Hz:0.023A,60Hz:0.021A 0.075A
Power consumption	AC100V AC200V DC24V	50Hz:1.8W,60Hz:1.5W 50Hz:1.8W,60Hz:1.5W 20W
Wiring method	DIN connector	

Unit : mm

Bore size \ Symbol	VA	VB	VC
40	38.5	35	4
50	38.5	35	3
63	37.0	28	0
80	42.0	28	1
100	50.0	28	1

Bore size 125 mm

Unit : mm



Unlocking valve specifications	
Fluid	Air
Operating pressure range	0.15 to 0.9 MPa
Ambient temperature	5 to 50℃
Action	Pilot operated
Piping connection	Direct piping
Effective sectional area	25 mm²
Lubrication	No required
Manual override	Non-locking push type

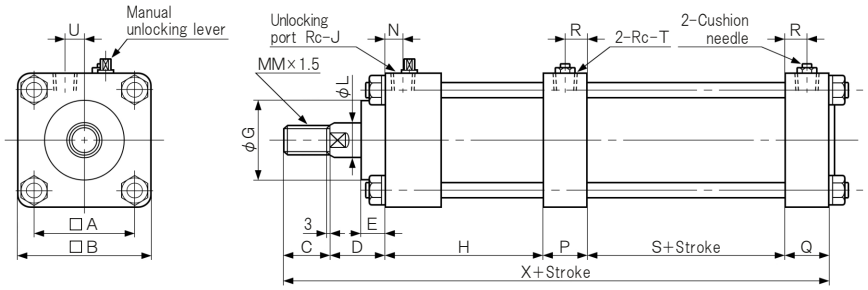
Solenoid specifications			
Rated voltage	100 VAC, 50/60 Hz 200 VAC, 50/60 Hz 24 VDC		
Operating voltage range	AC100V AC200V DC24V	90 to 130V(100 $^{+30}_{-30}$%) 180 to 250V(200 $^{+30}_{-30}$%) 21.6 to 26.4V(24±10%)	
Power consumption	Starting	AC100V AC200V DC24V	50Hz:10.6VA,60Hz:9.4VA 50Hz:10.2VA,60Hz:9.2VA ——
	Excitation	AC100V AC200V DC24V	50Hz:5.5VA,60Hz:4.4VA 50Hz:5.4VA,60Hz:4.4VA 5.8W
Insulation resistance	10 MΩ or more		
Wiring method	DIN connector		

Unit : mm

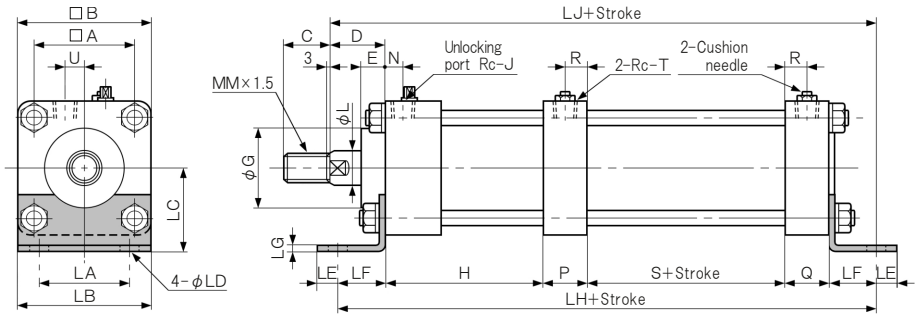
Bore size \ Symbol	VA	VC
125	63	3

Dimentions

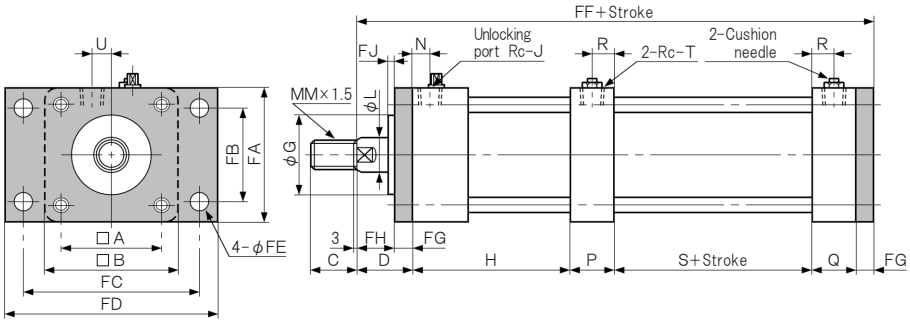
● Basic
Symbol : SD



● Axial foot
Symbol : LB



● Flange
Symbol : FA・FB



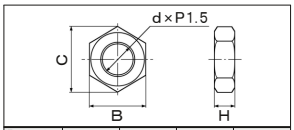
Unit : mm

Bore size (mm)	A	B	C	D	E	G	H	J	L	MM	N	P	Q	R	S	T	U	V	X	LA	LB
40	48	65	22	25	10	47	74	1/4	16	14	10	20	21	10	27	1/4	10	9	189	40	65
50	55	70	28	32	12	55	90	1/4	20	18	12	20	21	10	28	1/4	10	9	219	45	70
63	63	80	28	32	12	55	104	1/4	20	18	13	26	26	13	28	3/8	12	12	244	60	80
80	76	96	36	40	12	60	121	3/8	25	22	14	32	32	16	32	1/2	15	12	293	71	96
100	92	116	45	40	13	65	144	3/8	30	26	14	32	32	16	35	1/2	15	12	328	85	116
125	114	140	50	44	15	80	180	3/8	35	30	14	33	33	17	46	1/2	15	12	386	100	140

Bore size (mm)	LC	LD	LE	LF	LG	LH	LJ	FA	FB	FC	FD	FE	FF	FG	FH	FJ
40	40	10	15	31.5	4.5	205	198.5	65	35	90	110	10	177	10	15	0
50	45	10	15	31.5	4.5	222	222.5	70	45	90	115	10	201	10	22	2
63	53	12	16	31.5	4.5	247	247.5	80	60	112	135	12	226	10	22	2
80	63	15	16	35.5	6	288	292.5	96	71	132	160	15	271	14	26	0
100	75	15	16	40	6	323	323	116	85	150	180	15	297	14	26	0
125	85	19	20	45	6	382	381	140	100	190	230	19	350	14	30	1

Note) A rod end nut is attached with all types.

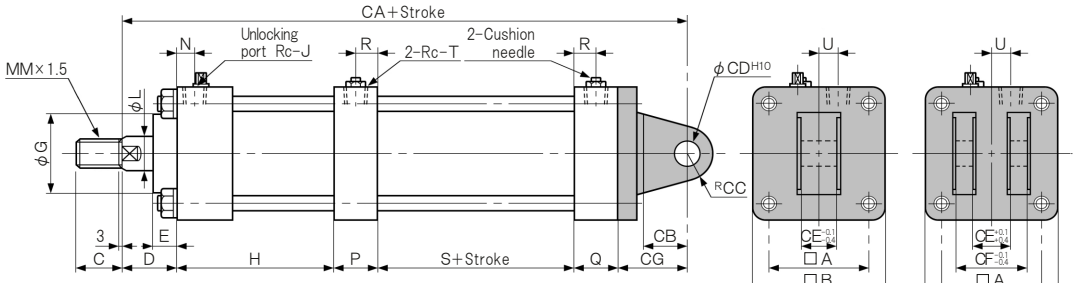
Rod end nut



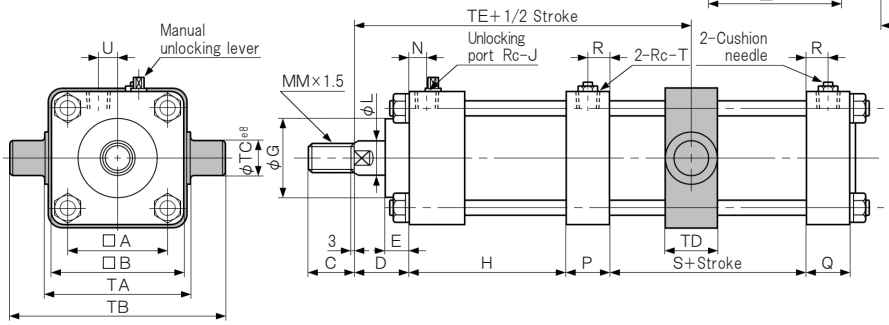
Bore size (mm)	d	H	B	C
40	M14	8	22	25.4
50	M18	11	27	31.2
63	M18	11	27	31.2
80	M22	13	32	37.0
100	M26	16	41	47.3
125	M30	18	46	53.1

Dimentions

● Clevis
Symbol : CA · CB



● Trunnion
Symbol : TC



Unit : mm

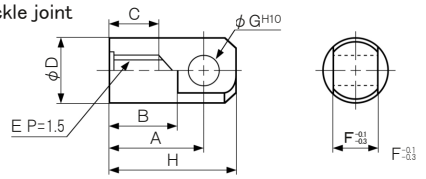
Bore size (mm)	A	B	C	D	E	G	H	J	L	MM	N	P	Q	R	S	T	U	V	CA	CB	CC
40	48	65	22	25	10	47	74	1/4	16	14	10	20	21	10	27	1/4	10	9	201	20	12
50	55	70	28	32	12	55	90	1/4	20	18	12	20	21	10	28	1/4	10	9	225	20	12
63	63	80	28	32	12	55	104	1/4	20	18	13	26	26	13	28	3/8	12	12	258	27	16
80	76	96	36	40	12	60	121	3/8	25	22	14	32	32	16	32	1/2	15	12	314	39	20
100	92	116	45	40	13	65	144	3/8	30	26	14	32	32	16	35	1/2	15	12	343	40	25
125	114	140	50	44	15	80	180	3/8	35	30	14	33	33	17	46	1/2	15	12	399	40	25

Bore size (mm)	CD	CE	CF	CG	TA	TB	TC	TD	TE
40	12	18	36	34	80	112	16	28	117
50	12	18	36	34	80	112	16	28	136
63	16	22	44	42	100	140	20	40	159
80	20	28	56	57	112	162	25	40	196
100	25	32	64	60	140	204	32	45	224
125	25	32	64	63	170	234	32	45	276

Note) A rod end nut is attached with all types.

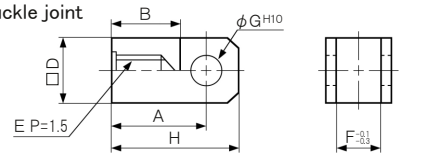
Knuckle joint

Single knuckle joint



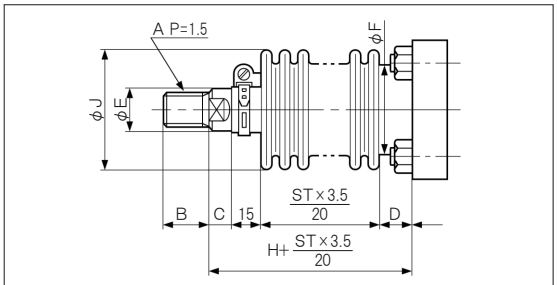
Symbol	Bore size (mm)	A	B	C	φD	E	F	G	H
I-04	40	40	25	20	22	14	12	10	51
I-05	50	45	30	24	24	18	16	12	57
I-06	63	45	30	24	24	18	16	12	57
I-08	80	53	35	29	32	22	20	16	69
I-10	100	63	45	35	32	26	20	16	79
I-12	125	90	60	46	50	30	30	25	115

Double knuckle joint



Symbol	Bore size (mm)	A	B	□D	E	F	G	H
Y-04	40	40	25	25	14	12	10	51
Y-05	50	45	30	32	18	16	12	57
Y-06	63	45	30	32	18	16	12	57
Y-08	80	53	35	38	22	20	16	69
Y-10	100	63	45	38	26	20	16	79
Y-12	125	90	60	60	30	30	25	115

Bellows



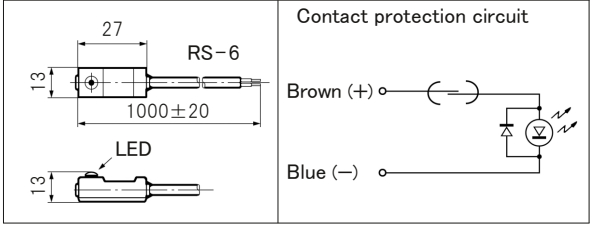
Bore size (mm)	A	B	C	D	φE	φF	φJ	H
40	M14	22	5	20	16	47	75	40
50	M18	28	12	20	20	55	80	47
63	M18	28	12	20	20	55	80	47
80	M22	36	16	24	25	60	85	55
100	M26	45	16	24	30	65	90	55
125	M30	50	20	24	35	80	95	59

Auto Switch

Read auto switch		
Auto switch model	RS−6	
Voltage	24 VDC	100 V/200 VAC
Max. switching current	20 mA	20 mA
Max. switching capacity	5 W	5 VA
Average operating time	1 m SEC	
Insulation resistance	100 MΩ or more (at 500 VDC)	
Impact resistance	30 G	
Ambient temperature	−10 to 60℃ (Non−freezing)	
Lead wire	2 cores cable, 1 m	
Indicator light	Red LED illuminates when turned ON	

Read auto switch

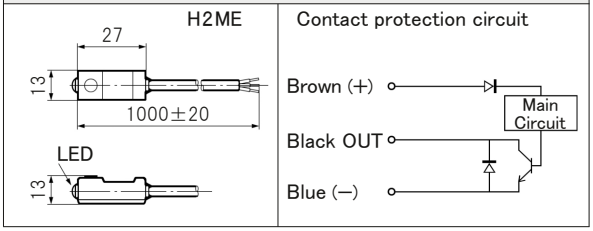
Dimentions and internal circuit



Solid state auto switch	
Auto switch model	H2ME
Output type	NPN
Voltage	5, 12, 24 VDC
Max. load current	5 mA (5 VDC),10 mA (12 VDC),20 mA (24 VDC)
Max. switching current	100 mA (5 VDC), 200 mA (24 VDC)
Internal voltage drop	0.6 V or less (24 VDC)
Max. leakage current	0.1 mA or less (24 VDC)
Impact resistance	30 G
Ambient temperature	−10 to 60℃ (Non−freezing)
Lead wire	3 cores cable, 1 m
Indicator light	Red LED illuminates when turned ON

Solod state auto switch

Dimentions and internal circuit



Mounting bracket compatibility : The same mounting bracket is used for both Read auto switch (RS−6) and Solid state auto switch (H2ME).

Mass

Unit : kg

Bore size (mm)	Basic weight at 0 mm of stroke					Additional weight per each 100 mm of stroke
	Basic type	Foot type	Flange type	Clevis type	Trunnion type	
40	2.23	2.41	2.66	2.58	2.61	0.42
50	3.30	3.47	3.80	3.74	3.82	0.50
63	4.00	4.37	5.06	4.55	4.85	0.55
80	7.30	8.07	9.18	8.84	8.66	1.00
100	11.45	12.37	14.14	13.60	13.97	1.23
125	29.70	29.40	31.20	30.90	31.30	1.86

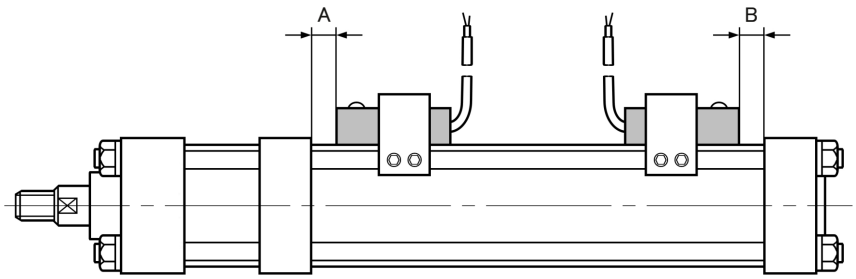
Example) MRC−LB−50B−300

Basic weight at 0 mm of stroke : 3.47 kg

Additional weight at 300 mm of stroke : $0.5 \times \frac{300}{100} = 1.5$ kg

3.47＋1.5＝4.97 kg

Auto switch setting position



Operating range : ℓ

- The distance until the piston moves, the auto switch turns on, and the piston moves in the same direction and turns off.

Hysteresis : C

- The distance from the position where the piston moves and the auto switch turns on until the piston moves in the opposite direction and turns off.

Most sensitive position and Mounting position

- Most sensitive position of the auto switch is in the center of the auto switch.
- When using the auto switch to detect the position of the stroke end, install it at the positions shown in Tables A and B in order to operate it at the most sensitive position.

Distance between auto switches

- When installing two or more auto switches, keep the distance between the auto switches at least 15 mm.

Unit : mm

Bore size (mm)	Proper mounting position		Operating range	hysteresis
	A	B	ℓ	C
40	0	0	11	2.5 or less
50	0	2	11	
63	0	3	12	
80	0	3	12	
100	2	3	12	
125	2	3	12	

Precautions for safe handling of read auto switch

Connecting of lead wire

- Be sure to connect the auto switch in series with a load such as a relay or sequencer without connecting it directly to the power supply.

Switching capacity

- Do not use a load that exceeds the maximum switching capacity of the auto switch.

Contact protection

- When using with an inductive load such as a relay, install a contact protection circuit. And if the lead wire length exceeds 10m, please contact us.

Polarity

- In case of DC24V, be careful about the polarity. Be sure to connect the brown lead wire to ⊕ and the blue lead wire to ⊖.

Voltage

- Be sure to use below the working voltage. If the working voltage and current of the auto switch are too small, the indicator light may not turn on.

Magnetic shield

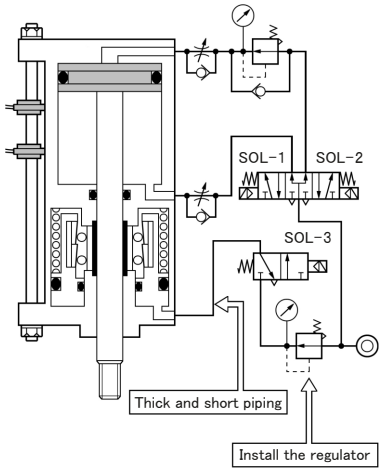
- If strong magnetism is generated around the auto switch, install a magnetic shield.

Cylinder speed

- When installing the auto switch in the middle of the stroke, please note that the relay may not respond if the piston speed is too fast.

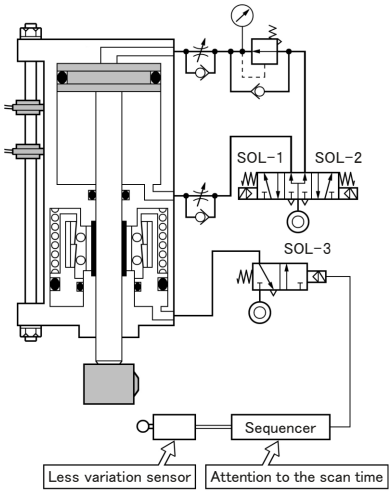
“Tips” for improving stop accuracy

Exhaust in the brake port as soon as possible.



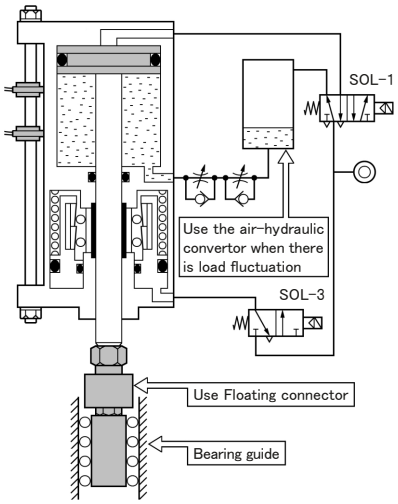
- Bring the brake release valve (SOL–3) closer to the brake release port.
- If the brake release valve is installed far from the brake release port, or if a valve with a small flow rate is used, install a quick exhaust valve on the brake release port.
- Install a regulator to keep the supply air pressure of the brake release valve constant (about 0.3 MPa) in order to stabilize the stop accuracy.

Prevent the electric control signal of the brake release valve from fluctuating.



- When sending a stop signal through the sequencer, attention to the scan time and do not pass it through the sequencer circuit if there is a lot of variation.
- Use the interior type as much as possible for the stop sensor, and when using the exterior type, use the type with less variation.
  (Proximity switch, auto switch, etc. are desirable)

Keep the cylinder speed constant.



- The guide part should be a bearing guide, avoiding the use of sliding guide as much as possible.
- For axial foot type and flange type, use the floating connector to prevent misalignment with the guide.
- When the stop pitch is 50 mm or less or the speed is high, release the brake first and then operate the operating valve. (At this time, make sure to balance the pressure of the cylinder accurately so that it does not pop out when the brake is released.)
- If the stopping near the stroke end (50 mm or less), use a type without cushion.
- If the speed changes (when the load fluctuates or a sliding guide is used), use an air–hydraulic convertor to stabilize the speed.

  ※ Please contact us as it cannot be used with standard products.

—MEMO—

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