SPECIFIC CYLINDERS

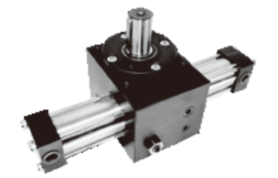
SERIES Products Content

Feature & order indication · P418

Torque output table, Oil volume & Applicable oil type · · · · · · · · · · · P419

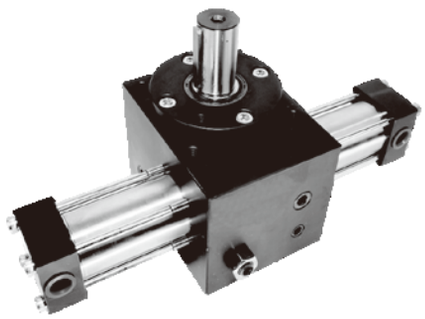
Inertia Calculation · P420

Seal order indication, structure & part names · · · · · · · · · · · · · · P421



JHR High Rotary Cylinder Ø32~Ø40 · · · · · P418

JHR ROTARY CYLINDERS



3.5Mpa(35Kgf/cm^2) rotary cylinder

external shaft type RPH 

- This series of rotary cylinders has beautiful appearance, excellent performance and high torque.
- All with magnetic induction and angle adjustment.

Tie-rod Hydraulic Cylinder
Mold Hydraulic Cylinders
Swivel & Clamp Hydraulic Cylinders
Booster Cylinders & Unclamping cylinders
ISO Specifications Cylinders
Round Hydraulic Cylinders
Specific Hydraulic Cylinders
Systems & Fittings

FEATURE

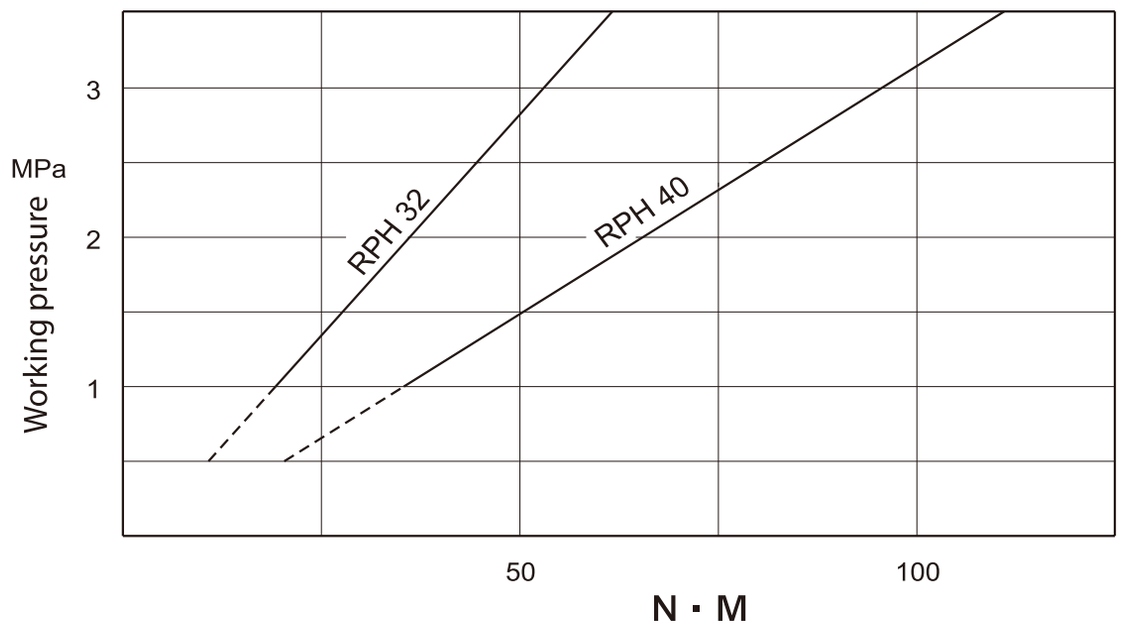
Series	JHR	
Bore (mm)	Ø32	Ø40
Rotation angle	90±5° ，180±5°	
Shaft diameter (mm)	Ø24	Ø28
Shaft point (mm)	Refer dimensions	
Working media	Compressed air that has been filtered for refueling mist	
Pressure area (MPa)	3.5 (35kgf/cm²)	
Temperature(°C)	-10~+60	
Load (kg)	12	20
Buffer angle	39°	32°

ORDER INDICATION

JHR	40	90	LN01P	2
Series	Bore	Rotation angle	Advanced switch	Sensor qty.
High Rotary Cylinder	32:32mm	90°		1 : 1
	40:40mm	180°		2 : 2

Notes:
1. NPN & PNP type can be selected. (3 wires, 24VDC)
2. The output contact can be selected as connector type.

TORQUE OUTPUT TABLE



OIL VOLUME

Units: CC (mℓ)

Bore \ Rotation angle	90°	180°
ϕ 32	29	54
ϕ 40	52	100

APPLICABLE OIL TYPE

Mineral oil	Water glycol	Phosphate ester oil	W/O operating oil	O/W operating oil
○	×	×	△	△

Notes: ○ allow to use × not allowed △ pls contact with us

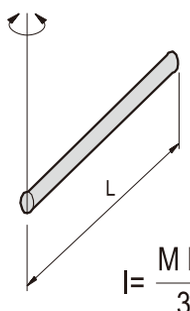
Use ISO-VG32 as operating oil.

INERTIA CALCULATION

Kinetic energy of rotational motion : $E = \frac{1}{2} I \omega^2$

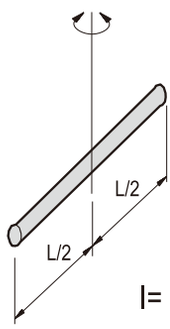
E = kinetic energy (J)
I = moment of inertia (Kg · m²)
ω = angular velocity (rad/s)

(1)



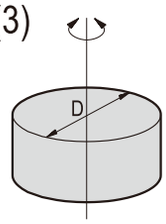
$I = \frac{M L^2}{3}$

(2)



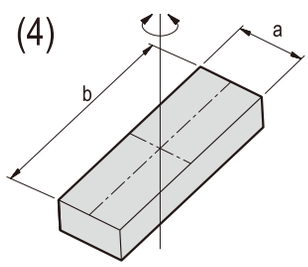
$I = \frac{M L^2}{12}$

(3)



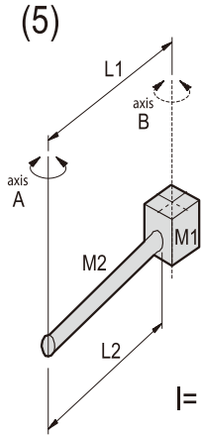
$I = \frac{M D^2}{8}$

(4)



$I = \frac{M}{12}(a^2+b^2)$

(5)



$I = I_1 + M_1 L_1^2 + \frac{M_2 L_2^2}{3}$

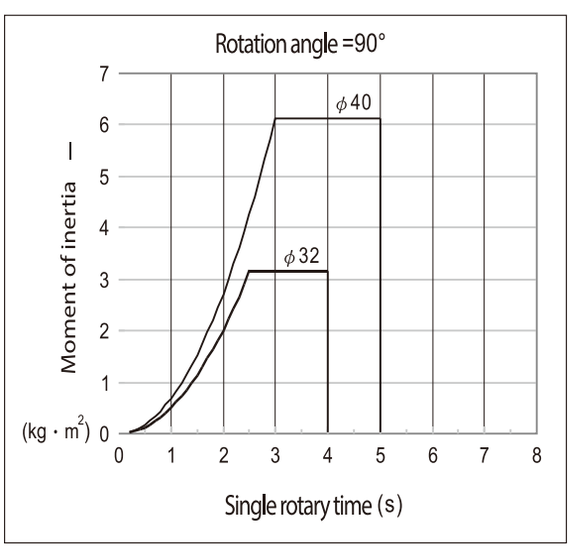
I_1 = the moment of inertia of M_1 to the B-axis when the center of mass passes through B-axis

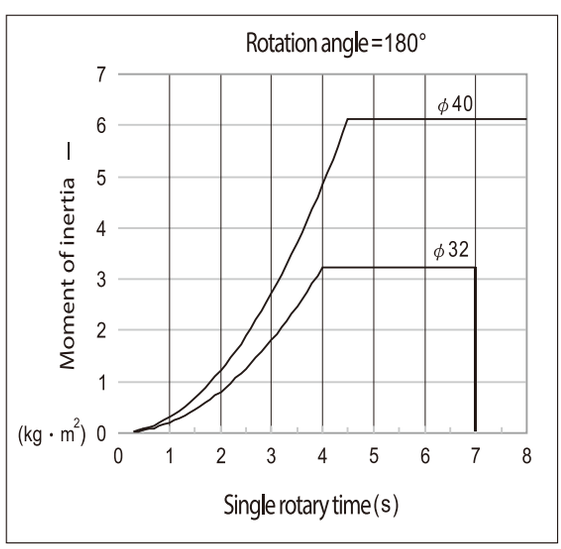
$I(I_1)$ = moment of inertia (Kg · m²)

$M(M_1, M_2)$ = mass (Kg)

L, a, b = length (m)

D = diameter (m)

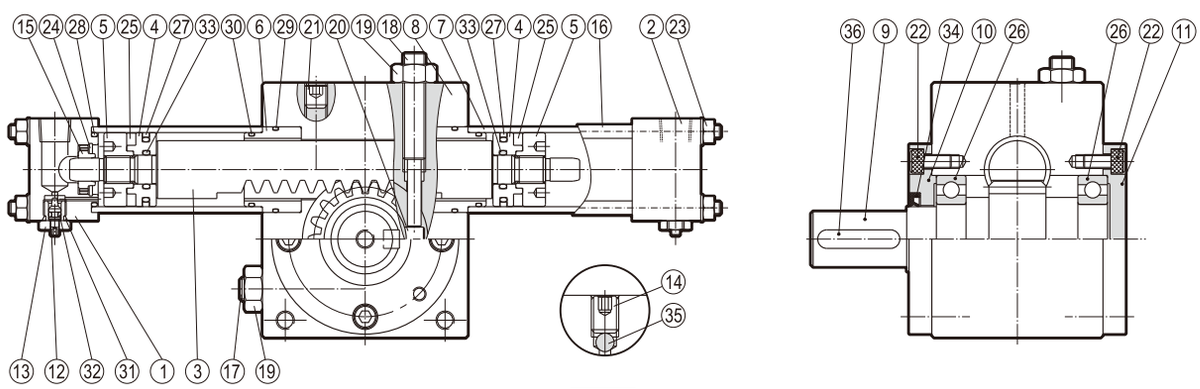




ORDER INDICATION

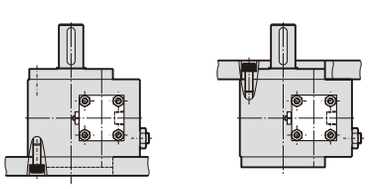
JHR	40	90	30	2
Series	Bore	Rotation angle	Seal no.	Qty.
High rotary cylinder	32:32mm 40:40mm	90° 180°		

INTERNAL STRUCTURE AND PART NAMES



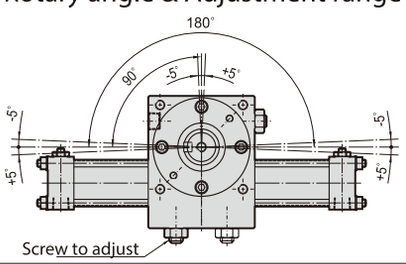
Item	Part name	Qty	Item	Part name	Qty	Item	Part name	Qty
①	Rod cover	1	⑬	Buffer needle seat	2	㉕	Magnetic ring	2
②	Rod cover	1	⑭	Set screw	2	㉖	Bearing	2
③	Teeth row	1	⑮	Rear buffer ring	2	㉗	Piston tight	2
④	Piston	2	⑯	Tie rod	8	㉘	Back cover O-ring	2
⑤	Magnet holder	2	⑰	Adjusting screw	1	㉙	Cover O-ring	2
⑥	Rod seal	2	⑱	Adjusting screw	1	㉚	Cover O-ring	2
⑦	Cylinder body	2	⑲	Nut	2	㉛	Buffer O-ring	2
⑧	Body	1	⑳	Stop pin	1	㉜	Buffer O-ring	2
⑨	Rod gear	1	㉑	Set screw	1	㉝	Piston O-ring	2
⑩	Rod cover	1	㉒	Screw	8	㉞	Rod seal	1
⑪	Rod cover	1	㉓	Nut & washer	8	㉟	Steel ball	2
⑫	Buffer needle	2	㉔	C-shaped buckle	2	㊱	Parallel key	1

Fixed type



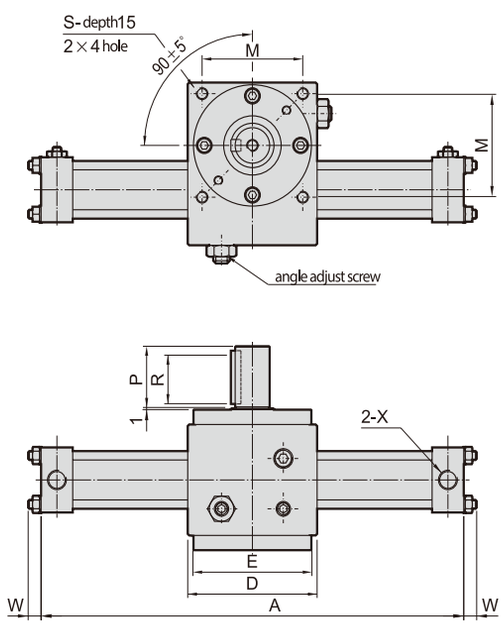
Bottom fixed　　Fixed above

Rotary angle & Adjustment range

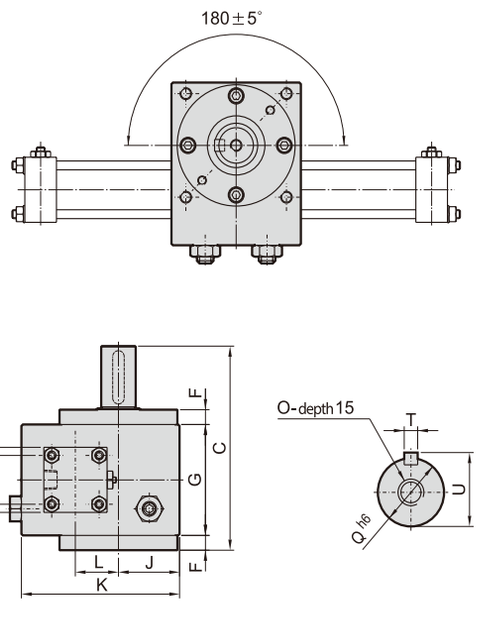


EXTERNAL DIMENSIONS

● Rotation angle 90°

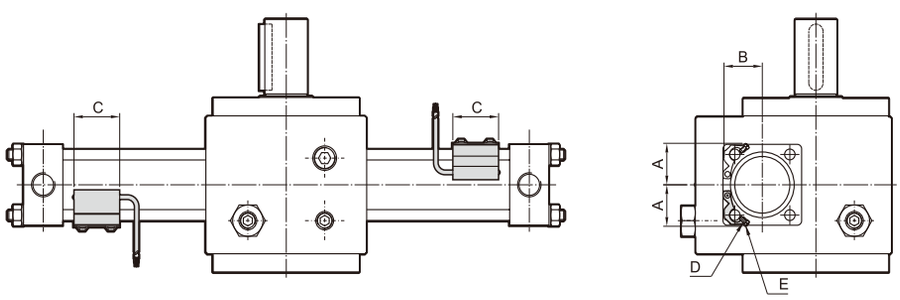


● Rotation angle 180°



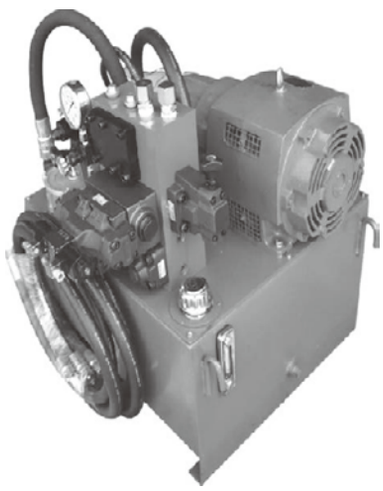
Type	A		C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R	S	T	U	W	X
	90°	180°																				
RPH32	286	357	138	90	82	10	75	44.4	42.5	110	30	70	33	M8	42	24	36	M8	8	27	9	PT 1/4
RPH40	315	400	170	105	96	12	95	50	51.5	135	36	82	37	M8	50	28	45	M10	8	31	9	PT 3/8

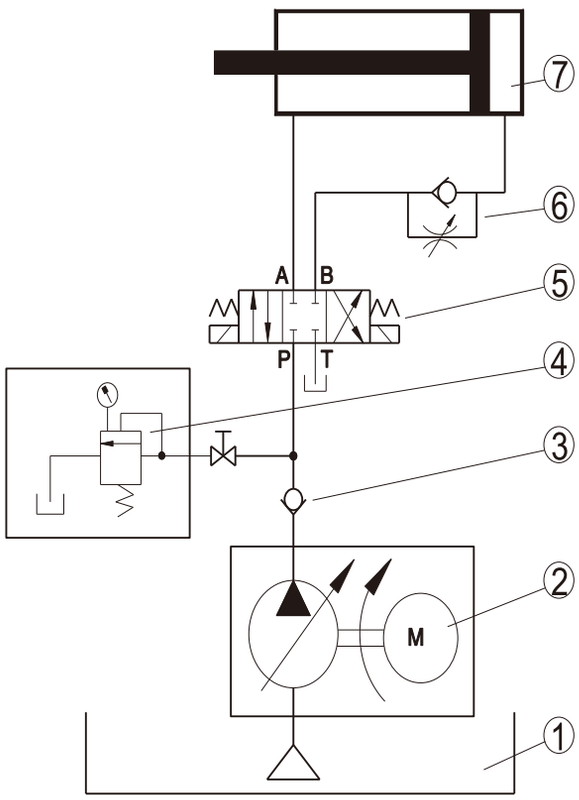
ADVANCED SWITCH DIMENSIONS



Bore	Type	A	B	C	D	E
32	LN01P	25	29	32	M4x16L	M4
40	LN01P	27	30	32	M4x16L	M4

BASIC CIRCUITS OF HYDRAULIC SYSTEM





①	Tank	Strainer, oil inlet, return filter, oil indicator, thermal indicators, cooler
②	Pump and motor	Motor fixed pump, variable pump, vertical motor, horizontal motor, coupling
③	Flow valves	One way check valves, pilot check valves
④	Pressure valves	Relief valves, unloading valves, sequence valve, reducing valves, balance valves, pressure switch
⑤	Direction valves	Solenoid valves, manual valves
⑥	Flow valves	Fix flow valves, variable flow valves, servo valves, proportion valves
⑦	Cylinders	Low, medium, high or ultra-high pressure
⑧	Accessories	Accumulator, pressure switch, pressure gauge, cocks

FEATURE OF HYDRAULIC CYLINDERS

1. Based on JIS-B8367spec., pressure used of hydraulic cylinders can be classified as:

Pressure used			
Metric (kgf/cm^2)	Imperial system (psi)	ISO system (Mpa)	Classified
35 kgf/cm^2	500	3.5	Low pressure
70 kgf/cm^2	1000	7	Low pressure
140 kgf/cm^2	2000	14	Medium pressure
210 kgf/cm^2	3000	21	High pressure

Notes:(1) Pressure used above 210 kgf/cm^2 and up to 700 kgf/cm^2 for a hydraulic cylinder is classified as "ultra-high-pressure cylinder"
(2) 1000 lbs/in^2 (1000 psi) =70 kgf/cm^2
(3) ISO 7Mpa=70 kgf/cm^2

2. Except basic selections of bore size, stroke, input pressure and mounting style, the followings should be also considered:
(a) With loading, a hydraulic cylinder should have the cushion feature added when the speed is 500mm/s above. If reaching more higher speed, a speed reducing valve needs to be used together. (Refer to pgXXX)
(b) Proper seals or packings should be choosen based on types of operating oil applied on the equipment to protect the life of cylinders.

3. Selections of part materials and precisions of machining have been carefully managed and based to the standard of Japan JIS-B8367. For example, the tolerance of parts processing is strictly controlled based on technology and experience which make cylinders have low friction and long life.

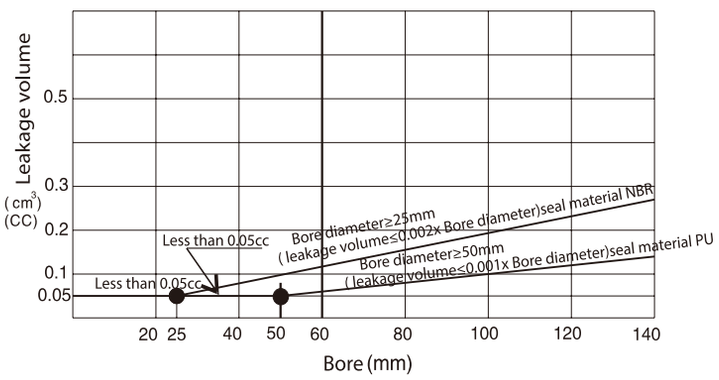
4. Tubes of cylinders are made with STKM13C steel materials which have surface friction between 0.8-3.2. Tolerances of inner bores are between H7-H9, and tensile strength up to 52 kgf/cm^2 above.
Formula to calculate the duration pressure of a cylinder tube is $t = \frac{P \times D}{200 \times S}$
t = tube thickness(mm)
P = max. working pressure(kgf/cm^2)
D= tube inner bore(mm)
S= α/5 safety coefficient
α= min. value of tensile strength (kgf/mm^2)
e.g: STKM13C seamless tube, t= $\frac{P \times D}{200 \times 52/5} = \frac{P \times D}{2080}$

5. Piston rod is made with S45C Carbon Steel. Outer dimension of a rod is ground, Cr hard plating, and polished to reach the f7-f8 tolerance. The surface roughness can be less than R max=3.2s and hardness is above HV700. The yielding point at this moment can be above 35 kgf/mm^2. Should a normalization treatment be done:
(a) With material S45C, the yield point can reach 50 kgf/mm^2 and tensile strength can be 58 kgf/mm^2.
(b) With material SCM440, the yield point can reach 85 kgf/mm^2 and tensile strength can be 100 kgf/mm^2.

6. Packing and seals are mostly imported which achieve oil resistant, rust resistant, long-lasting and pressure. All accessories compliant with JIS or ISO standard which make it have a long life and ease to maintain.

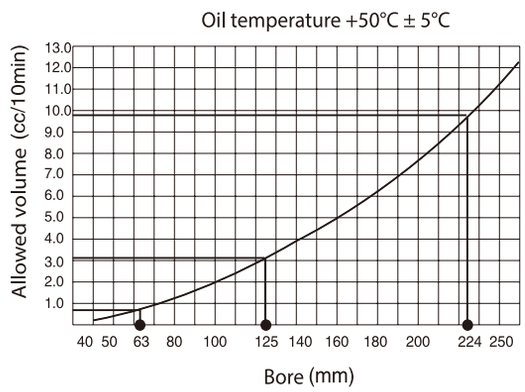
INSTALLATION OF HYDRAULIC CYLINDERS

■ Allowed volume of external leakage

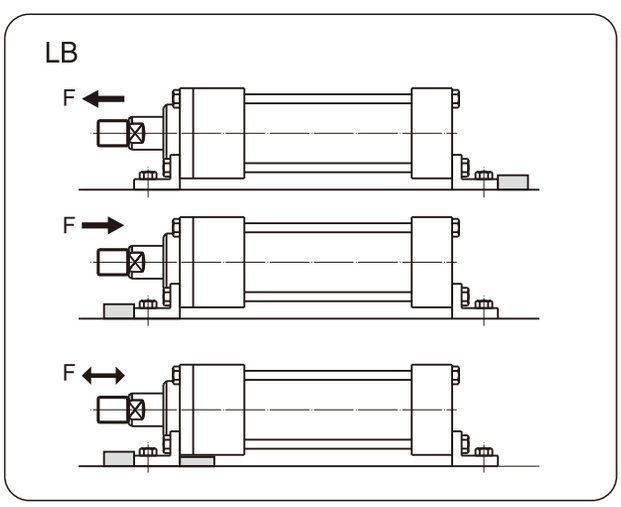


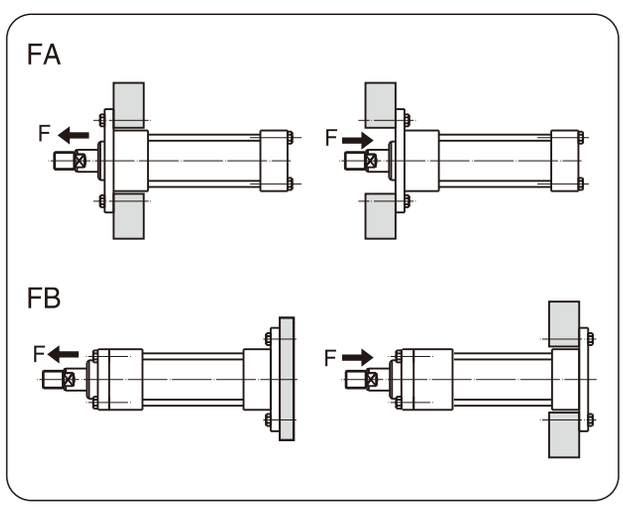
Note: piston moving distance 100m

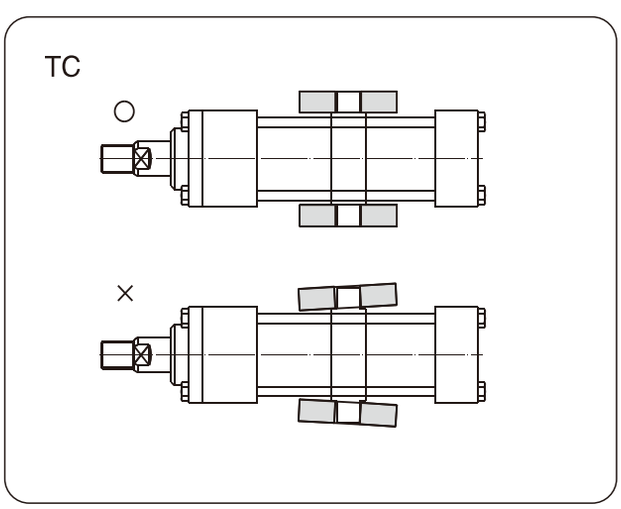
■ Allowed volume of internal leakage



Note: piston moving back and forth in 10 mins

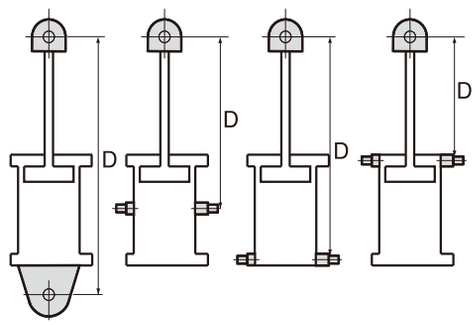
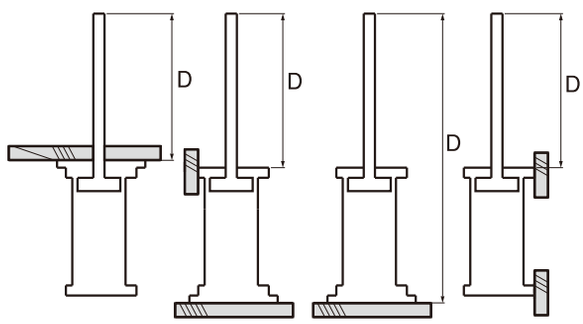
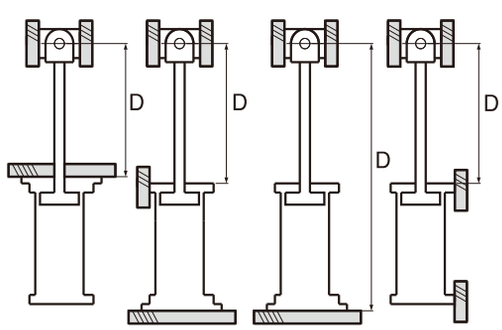
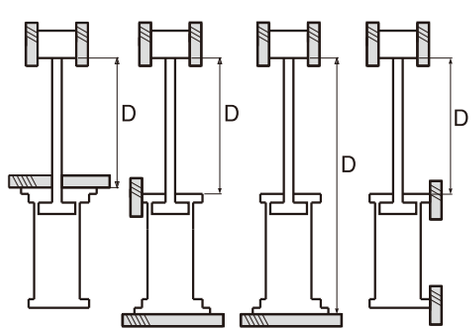






REFERENCE DATA FOR THE LENGTH OF A ROD STROKE

● Installation type

■ Fixed on both ends ■ Length between both end points is D=L (refer pg309 L values)	
■ Body fixed with rod end being free ■ Length between fixed body and rod end is D=1/2L (refer pg309 L values)	
■ Body fixed with guided rod end and pin connector ■ Length between fixed body and rod end is D=1.4L (refer pg309 L values)	
■ Body fixed with a guided rod end ■ Length between fixed body and rod end is D=2L (refer pg309 L values)	

L VALUE

Units: cm

Bore(mm) / Load(kg)	18	22.4	28	35.5	45	56	63	67	71	80	85	90	100	112	125	140
100	163	253	395													
150	133	207	323	519	834											
200	116	179	280	449	722	1118										
250	103	160	250	402	646	1000	1266	1432								
300	94	146	228	367	590	913	1156	1307	1468	1864	2104					
350	87	135	211	340	546	845	1070	1210	1359	1725	1948	2184				
400	82	127	198	318	511	791	1001	1132	1271	1614	1822	2043	2522	3163		
450	77	119	186	300	481	746	944	1067	1199	1522	1718	1926	2377	2982	3715	4660
500	73	113	177	284	457	707	895	1013	1137	1444	1630	1827	2255	2829	3524	4421
600	67	103	161	260	417	646	817	924	1038	1318	1488	1688	2059	2583	3217	4036
700	62	96	149	240	386	598	757	856	961	1220	1377	1544	1906	2391	2978	3736
800	58	90	140	225	361	559	708	801	899	1141	1288	1444	1783	2237	2786	3495
900	55	84	132	212	340	527	667	755	847	1076	1215	1362	1681	2109	2627	3295
1,000	52	80	125	201	323	500	633	716	804	1021	1152	1292	1595	2001	2492	3126
1,500	42	65	102	164	264	408	517	585	656	833	941	1055	1302	1633	2035	2552
2,000	37	57	88	142	228	354	448	506	569	722	815	913	1128	1415	1762	2210
2,500	33	51	79	127	204	316	400	453	509	646	729	817	1009	1265	1576	1977
3,000	30	46	72	116	187	289	366	413	464	589	665	746	921	1155	1439	1805
3,500	28	43	67	107	173	267	338	383	430	546	616	691	853	1069	1332	1671
4,000	26	40	63	101	162	250	317	358	402	510	576	646	797	1000	1246	1563
4,500	24	38	59	95	152	236	298	338	379	481	543	609	752	943	1175	1474
5,000	23	36	56	90	144	224	283	320	360	457	515	578	713	895	1114	1398
6,000	21	33	51	82	132	204	258	292	328	417	471	527	651	817	1017	1276
7,000	20	30	47	76	122	189	239	271	304	386	436	488	603	756	942	1182
8,000	18	28	44	71	114	177	224	253	284	361	407	457	564	707	881	1105
9,000	17	27	42	67	108	167	211	239	268	340	384	431	532	667	831	1042
10,000	16	25	40	64	102	158	200	226	254	323	364	409	504	633	788	989
15,000	13	21	32	52	83	129	163	185	208	264	298	334	412	517	643	807
20,000		18	28	45	72	112	142	160	180	228	258	259	357	447	557	699
25,000		16	25	40	65	100	127	143	161	204	231	258	319	400	498	625
30,000		15	23	37	59	91	116	131	147	186	210	236	291	365	455	571
35,000			21	34	55	85	107	121	136	173	195	218	270	338	421	528
40,000			20	32	51	79	100	113	127	161	182	204	252	316	394	494
45,000			19	30	48	75	94	107	120	152	172	193	238	298	372	466
50,000				28	46	71	90	101	114	144	163	183	226	283	352	442
60,000				26	42	65	82	93	104	132	149	167	206	258	322	404
70,000				24	39	60	76	86	96	122	138	154	191	239	298	374
80,000					36	56	71	80	90	114	129	144	178	224	279	350
90,000					34	53	67	76	85	108	122	136	168	211	263	330
100,000					32	50	63	72	80	102	115	129	160	200	249	313

HYDRAULIC CONVERSION TABLE

		International system	Metric system	Imperial system	Others
Pressure	Units	MPa	kgf/cm^2	bar	PSI
	Conversion rate	1	10.2	10	150
		0.098	1	0.98	14.22
		0.1	1.02	1	14.5
		0.0069	0.07	0.069	1
Load weight	Units	N	kgf	I b	—
	Conversion rate	1	0.102	0.224	—
		9.8	1	2.2	—
		4.46	0.455	1	—
Torque	Units	N · m	Kgf · m	—	—
	Conversion rate	1	0.102	—	—
		9.8	1	—	—
Motion	Units	$Kg \cdot m^2$	$Kgf \cdot m \cdot sec^2$	—	—
	Conversion rate	1	0.102	—	—
		9.8	1	—	—
Vacuum pressure	Units	–kpa	–mmHg	—	—
	Conversion rate	1	7.52	—	—
		0.133	1	—	—
Power	Units	kw	Kgf · m/sec	Ft–I b/sec	HP
	Conversion rate	1	102	736	1.34
		0.0098	1	7.23	0.013
		0.00135	0.138	1	0.0018
		0.745	76	550	1
Length		1m=10dm=100cm=1000mm 1in=0.0254m=0.254dm=2.54cm=25.4mm			
Area		$1m^2=100dm^2=10^4cm^2=10^6mm^2$ $1in^2=0.000645m^2=0.0645dm^2=6.45cm^2=645mm^2$			
Volume		$1m^3=1000dm^3=10^6cm^3$ $1k\ell(1m^3)=10^3\ \ell(1dm^3)=10^6CC(cm^3)$ ℓ= liter			

TOLERANCE TABLE FOR INNER BORE DESIGN

Tolerance table for inner bore design

Unit=0.001mm

Range (mm)	B	C		D			E			F			G		H					
	B10	C9	C10	D8	D9	D10	E7	E8	E9	F6	F7	F8	G6	G7	H5	H6	H7	H8	H9	H10
<3	+180 +140	+80 +60	+100	+34 +20	+45	+60	+24 +14	+28	+39	+12 +6	+16	+20	+8 +2	+12	+4	+6	+10 0	+15	+25	+40
3-6	+188 +140	+100 +70	+118	+48 +30	+60	+78	+32 +20	+38	+50	+18 +10	+22	+28	+12 +4	+16	+5	+8	+12 0	+18	+30	+48
6-10	+208 +150	+116 +80	+138	+62 +40	+76	+98	+40 +25	+47	+61	+22 +13	+28	+35	+14 +5	+20	+6	+9	+15 0	+22	+36	+58
10-14	+220 +150	+138 +95	+165	+77 +50	+93	+120	+50 +32	+59	+75	+27 +16	+34	+43	+17 +6	+24	+8	+11	+18 0	+27	+43	+70
14-18																				
18-24	+244 +160	+162 +110	+194	+98 +65	+117	+149	+61 +40	+73	+92	+33 +20	+41	+53	+20 +7	+28	+9	+13	+21 0	+33	+52	+84
24-30																				
30-40	+270 +170	+182 +120	+220	+119 +80	+142	+180	+75 +50	+89	+112	+41 +25	+50	+64	+25 +9	+34	+11	+16	+25 0	+39	+62	+100
40-50	+280 +180	+192 +130	+230																	
50-65	+310 +190	+214 +140	+260	+146 +100	+174	+220	+90 +60	+106	+134	+49 +30	+60	+76	+29 +10	+40	+13	+19	+30 0	+46	+74	+120
65-80	+320 +200	+224 +150	+270																	
80-100	+360 +220	+257 +170	+310	+174 +120	+207	+260	+107 +72	+126	+156	+58 +36	+71	+90	+34 +12	+47	+15	+22	+35 0	+54	+87	+140
100-120	+380 +240	+267 +180	+320																	
120-140	+420 +260	+300 +200	+360	+208 +145	+245	+305	+125 +85	+148	+185	+68 +43	+83	+106	+39 +14	+54	+18	+25	+40 +0	+63	+100	+160
140-160	+440 +280	+310 +210	+370																	
160-180	+470 +310	+330 +230	+390																	
180-200	+525 +340	+335 +240	+425	+242 +170	+285	+355	+146 +100	+172	+215	+79 +50	+96	+122	+44 +15	+61	+20	+29	+46 +0	+72	+115	+185
200-225	+565 +380	+375 +260	+445																	
225-250	+605 +420	+395 +280	+465																	
250-280	+690 +480	+430 +300	+510	+271 +190	+320	+400	+162 +110	+191	+240	+88 +56	+108	+137	+49 +17	+69	+23	+32	+52 +0	+81	+130	+210
280-315	+750 +540	+460 +330	+540																	
315-355	+830 +600	+500 +360	+590	+299 +210	+350	+440	+182 +125	+214	+265	+98 +62	+119	+151	+54 +18	+75	+25	+36	+57 +0	+89	+140	+230
355-400	+910 +680	+540 +400	+630																	
400-450	+1010 +760	+595 +440	+690	+327 +230	+385	+480	+198 +135	+232	+290	+106 +68	+131	+165	+60 +20	+83	+27	+40	+63 +0	+97	+155	+250
450-500	+1090 +840	+630 +480	+730																	

Note: Tolerance of an inner bore dimension for a tube is H_7 - H_9

TOLERANCE TABLE FOR INNER BORE DESIGN

Tolerance table for inner bore design

Unit=0.001mm

Range (mm)	Js			K			M			N		P		R	S	T	U	X
	Js5	Js6	Js7	K5	K6	K7	M5	M6	M7	N6	N7	P6	P7	R7	S7	T7	U7	X7
<3	±2	±3	±5	0 −4	0 −6	0 −8	−2 −6	−2 −8	−2 −12	−4 −10	−4 −14	−6 −12	−6 −16	−10 −20	−14 −24	—	−18 −28	−20 −30
3-6	±2.5	±4	±6	0 −5	+2 −6	+3 −9	−3 −8	−1 −9	0 −12	−5 −13	−4 −16	−9 −17	−8 −20	−11 −23	−15 −27	—	−19 −31	−24 −36
6-10	±3	±4.5	±7.5	+1 −5	+2 −7	+5 −10	−4 −10	−3 −12	0 −15	−7 −16	−4 −19	−12 −21	−9 −24	−13 −28	−17 −32	—	−22 −37	−28 −43
10-14	±4	±5.5	±9	+2 −6	+2 −9	+6 −12	−4 −12	−4 −15	0 −18	−9 −20	−5 −23	−15 −26	−11 −29	−16 −34	−21 −39	—	−26 −44	−33 −51
14-18																		−38 −56
18-24	±4.5	±6.5	±10.5	+1 −8	+2 −11	+6 −15	−5 −14	−4 −17	0 −21	−11 −24	−7 −28	−18 −31	−14 −35	−20 −41	−27 −48	—	−33 −54	−46 −67
24-30																−33 −54	−40 −61	−56 −77
30-40	±5.5	±8	±12.5	+2 −9	+3 −13	+7 −18	−5 −16	−4 −20	0 −25	−12 −28	−8 −33	−21 −37	−17 −42	−25 −50	−34 −59	−39 −64	−51 −76	—
40-50																−45 −70	−61 −86	
50-65	±6.5	±9.5	±15	+3 −10	+4 −15	+9 −21	−6 −19	−5 −24	0 −30	−14 −33	−9 −39	−26 −45	−21 −51	−30 −60	−42 −72	−55 −85	−76 −106	—
65-80														−32 −62	−48 −78	−64 −94	−91 −121	
80-100	±7.5	±11	±17.5	+2 −13	+4 −18	+10 −25	−8 −23	−6 −28	0 −35	−16 −38	−10 −45	−30 −52	−24 −59	−38 −73	−58 −93	−78 −113	−111 −146	—
100-120														−41 −76	−66 −101	−91 −126	−131 −166	
120-140	±9	±12.5	±20	+3 −15	+4 −21	+12 −28	−9 −27	−8 −33	0 −40	−20 −45	−12 −52	−36 −61	−28 −68	−48 −88	−77 −117	−107 −147	—	—
140-160														−50 −90	−85 −125	−119 −159		
160-180														−53 −93	−93 −133	−131 −171		
180-200	±10	±14.5	±23	+2 −18	+5 −24	+13 −33	−11 −31	−8 −37	0 −46	−22 −51	−14 −60	−41 −70	−33 −79	−60 −106	−105 −151	—	—	—
200-225														−63 −109	−113 −159			
225-250														−67 −113	−123 −169			
250-280	±11.5	±16	±26	+3 −20	+5 −27	+16 −36	−13 −36	−9 −41	0 −52	−25 −57	−14 −66	−47 −79	−36 −88	−74 −126	—	—	—	—
280-315														−78 −130				
315-355	±12.5	±18	±28.5	+3 −22	+7 −29	+17 −40	−14 −39	−10 −46	0 −57	−26 −62	−16 −73	−51 −81	−41 −98	−87 −144	—	—	—	—
355-400														−93 −150				
400-450	±13.5	±20	±31.5	+2 −25	+8 −32	+18 −45	−16 −43	−10 −50	0 −63	−27 −67	−17 −80	−55 −95	−45 −108	−103 −166	—	—	—	—
450-500														−109 −172				

TOLERANCE TABLE FOR OUTER BORE DESIGN

Tolerance table for outer bore design

Unit=0.001mm

Range (mm)	b	c	d		e			f			g			h					
	b9	c9	d8	d9	e7	e8	e9	f6	f7	f8	g4	g5	g6	b4	b5	b6	b7	b8	b9
<3	−140 −165	−60 −85	−20 −34	−45	−14 −24	−28	−29	−6 −12	−16	−20	−2 −5	−6	−8	0 −3	−4	−6	−10	−14	−25
3-6	−140 −170	−70 −100	−30 −48	−60	−20 −32	−38	−50	−10 −18	−22	−28	−4 −8	−9	−12	0 −4	−5	−8	−12	−18	−30
6-10	−150 −186	−80 −116	−40 −62	−76	−25 −40	−47	−61	−13 −22	−28	−35	−5 −9	−11	−14	0 −4	−6	−9	−15	−22	−36
10-14	−150 −193	−95 −138	−50 −77	−93	−32 −50	−59	−75	−16 −27	−34	−43	−6 −11	−14	−17	0 −5	−8	−11	−18	−27	−43
14-18																			
18-24	−160 −212	−110 −162	−65 −98	−117	−40 −61	−73	−93	−20 −33	−41	−53	−7 −13	−16	−20	0 −6	−9	−13	−21	−33	−52
24-30																			
30-40	−170 −232	−120 −182	−80 −119	−142	−50 −75	−89	−112	−25 −41	−50	−64	−9 −16	−20	−25	0 −7	−11	−16	−25	−39	−62
40-50	−180 −242	−130 −192																	
50-65	−190 −264	−140 −214	−100 −146	−174	−60 −90	−106	−134	−30 −49	−60	−76	−10 −18	−23	−29	0 −8	−13	−19	−30	−46	−74
65-80	−200 −274	−150 −224																	
80-100	−220 −307	−170 −257	−120 −174	−207	−72 −107	−126	−159	−36 −58	−71	−90	−12 −22	−27	−34	0 −10	−15	−22	−35	−54	−87
100-120	−240 −327	−180 −267																	
120-140	−260 −360	−200 −300	−145 −208	−245	−85 −125	−148	−185	−43 −68	−83	−106	−14 −26	−32	−39	0 −12	−18	−25	−40	−63	−100
140-160	−280 −380	−210 −310																	
160-180	−310 −410	−230 −330																	
180-200	−340 −455	−240 −355	−170 −242	−285	−100 −146	−172	−215	−50 −79	−96	−122	−15 −29	−35	−44	0 −14	−20	−29	−46	−72	−115
200-225	−380 −495	−260 −375																	
225-250	−440 −535	−280 −395																	
250-280	−480 −610	−300 −430	−190 −271	−320	−110 −162	−191	−240	−56 −88	−106	−137	−17 −33	−40	−49	0 −16	−23	−32	−52	−81	−130
280-315	−540 −670	−330 −460																	
315-355	−600 −740	−360 −500	−210 −299	−350	−125 −182	−214	−265	−62 −98	−119	−151	−18 −36	−43	−54	0 −18	−25	−36	−57	−89	−140
355-400	−680 −820	−400 −540																	
400-450	−760 −915	−440 −595	−230 −327	−385	−135 −198	−232	−290	−68 −108	−131	−165	−20 −40	−47	−60	0 −20	−27	−40	−63	−97	−155
450-500	−840 −995	−480 −635																	

Note: Tolerance of an outer bore dimension for a rod is F_7 - F_8

TOLERANCE TABLE FOR OUTER BORE DESIGN

Tolerance table for outer bore design

Unit=0.001mm

Range (mm)	js				k			m			n	p	r	s	t	u	x
	js 4	js 5	js 6	js 7	k4	k5	k6	m4	m5	m6	n6	p6	r6	s6	t6	u6	x6
<3	±1.5	±2	±3	±5	+3	+4 0	+6	+5	+6 +2	+8	+10 +4	+12 +6	+60 +10	+20 +14	—	+24 +18	+26 +20
3-6	±2	±2.5	±4	±6	+5	+6 +1	+9	+8	+9 +4	+12	+16 +8	+20 +12	+23 +15	+27 +19	—	+31 +23	+36 +28
6-10	±2	±3	±4.5	±7.5	+6	+7 +1	+10	+10	+12 +6	+15	+19 +10	+24 +15	+28 +19	+32 +23	—	+37 +28	+43 +34
10-14	±2.5	±4	±5.5	±9	+6	+9 +1	+12	+12	+15 +7	+18	+23 +12	+29 +18	+34 +23	+39 +28	—	+44 +33	+51 +40
14-18																	+56 +45
18-24	±3	±4.5	±6.5	±10.5	+8	+11 +2	+15	+14	+17 +8	+21	+28 +15	+35 +22	+41 +28	+48 +35	—	+54 +41	+67 +54
24-30															+54 +41	+61 +48	+77 +64
30-40	±3.5	±5.5	±8	±12.5	+9	+13 +2	+18	+16	+20 +9	+25	+33 +17	+42 +26	+50 +34	+59 +43	+64 +48	+76 +60	—
40-50															+70 +54	+86 +70	
50-65	±4	±6.5	±9.5	±15	+10	+15 +2	+21	+19	+24 +11	+30	+39 +20	+51 +32	+60 +41	+72 +53	+85 +66	+106 +87	—
65-80													+62 +43	+78 +59	+94 +75	+121 +102	
80-100	±5	±7.5	±11	±17.5	+13	+18 +3	+25	+23	+28 +13	+35	+45 +23	+59 +37	+73 +51	+93 +71	+113 +91	+146 +124	—
100-120													+76 +54	+101 +79	+126 +104	+166 +144	
120-140	±6	±9	±12.5	±20	+15	+21 +3	+28	+27	+33 +15	+40	+52 +27	+68 +43	+88 +63	+117 +92	+147 +122	—	—
140-160													+90 +65	+125 +100	+159 +134		
160-180													+93 +68	+133 +108	+171 +146		
180-200	±7	±10	±14.5	±23	+18	+24 +4	+33	+31	+37 +17	+46	+60 +31	+79 +50	+106 +77	+151 +122	—	—	—
200-225													+109 +80	+159 +130			
225-250													+113 +84	+169 +140			
250-280	±8	±11.5	±16	±26	+20	+27 +4	+36	+36	+43 +20	+52	+66 +34	+88 +56	+126 +94	—	—	—	—
280-315													+130 +98				
315-355	±9	±12.5	±18	±28.5	+22	+29 +4	+40	+39	+46 +4	+57	+73 +37	+98 +62	+144 +108	—	—	—	—
355-400													+150 +114				
400-450	±10	±13.5	±20	±31.5	+25	+32 +5	+45	+43	+50 +23	+63	+80 +40	+108 +68	+166 +126	—	—	—	—
450-500													+172 +132				

SYMBOLS OF GEOMETRIC TOLERANCES

Symbol	Name	Tolerance type	Symbol	Name	Tolerance type
—	Straightness	Shape	⊥	Verticality	Path
○	Circularity		//	Parallelism	
⌭	Cylindricity		↗	Deflection	Deflection
◎	Co-centrality	Position	⌰	Total deflection	

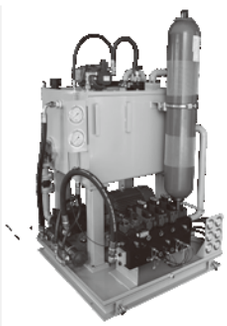
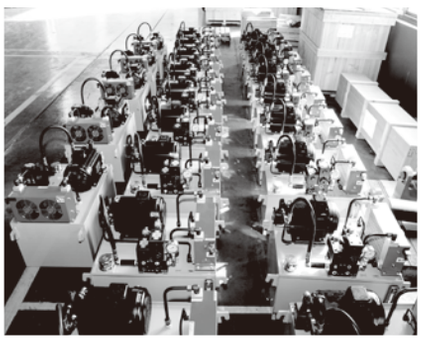
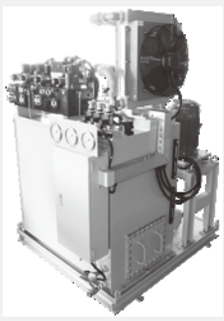
SYMBOLS OF SURFACE ROUGHNESS

Symbol	Name	Roughness			Condition	Example	New symbol
		Ra	Rmax	Rz			
~	Raw material surface	No machining required			Smooth surface	-Molding -Forging	20
▽	Rough surface	8~25a	32~100S	32~100Z	Cutting surface is clear	-Milling -Lathing	25 8.0
▽▽	Fine surface	2~6.3a	8~25S	8~25Z	Cutting surface recognizable	-Milling -Lathing	6.3 2.0
▽▽▽	Refined surface	0.25~1.6a	0.8~6.3S	0.8~6.3Z	Cutting surface is blurred	-Milling -Lathing	1.6 0.25
▽▽▽▽	Mirror surface	0.01~0.2a	0.2~0.8S	0.2~0.8Z	Cutting surface gloss as mirror	-Grinding -Honing -Polishing	0.2 0.01

SPECIFICATION OF HOLE THREADS

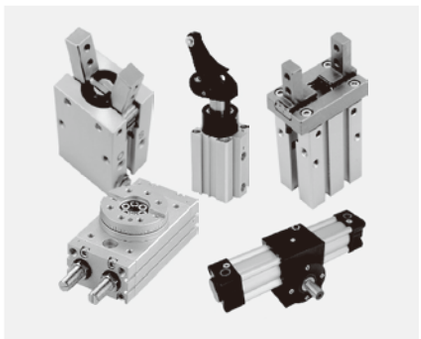
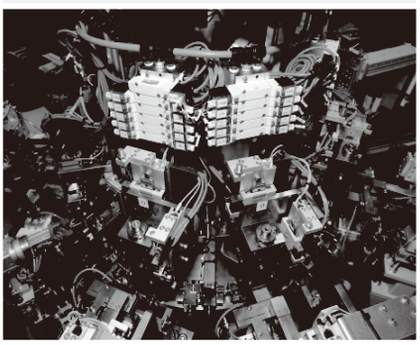
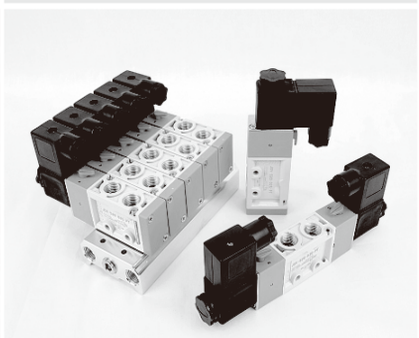
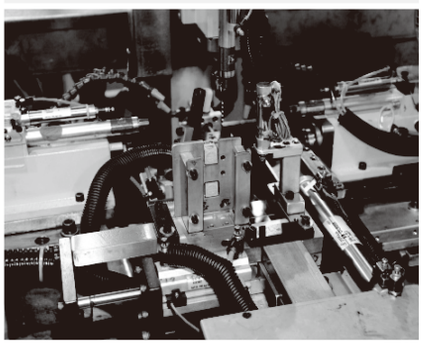
Symbol / Name	Taper thread Rc (also named PT)				Parallel thread g (also named PF)			
	Outer bore (mm)	Up (mm)	Depth (mm)	Bottom (mm)	Outer bore (mm)	Up (mm)	Depth (mm)	Bottom (mm)
1/8 –28T	9.73	8.2	10	6	9.73	8.7	13	6
1/4 –19T	13.16	10.9	13	8	13.16	11.7	15	8
3/8 –19T	16.66	14.4	17	10	16.66	15.2	15	10
1/2 –14T	20.96	18	20	14	20.96	19	19	14
3/4 –14T	26.44	23	25	18	26.44	24.5	20	18
1 –11T	33.25	29	31	23	33.25	30.7	24	23
1 1/4 –11T	41.95	38	40	30	41.91	39.3	25	30
1 1/2 –11T	47.8	44	46	36	47.8	45.2	25	36
2 –11T	59.61	55	57	46	59.61	57	30	46

■ Integration of hydraulic products
(mechanism, advanced electronic control, hydraulic power, cylinders etc.)

■ Pneumatic products

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