October 1 2008

TOKIMEC » TOKYO KEIKI

The company name was changed to **TOKYO KEIKI INC.**

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Motors

Vane Motors

Model	Max.Operating Pressure MPa	Minimum Speed min^{-1}	Max. Speed min^{-1}	Rated Torque N·m (50 100 200 300 500 1000 2000 3000 5000 10000 20000)	Page
25M	15.7	100	2600	42 55 65	N3
35M			2600	80 95 115	
45M			2600	130 155 185	
MHT24/32	14	10	400	24 32	N7
MHT50			350		
MHT70/90			300	70 90	
MHT150			250		See page N16 for multi-torque motors
MHT190/250			200	190 250	
MHT380/500			200	380 500	N16
MHT750			100		
MHT1000			75		

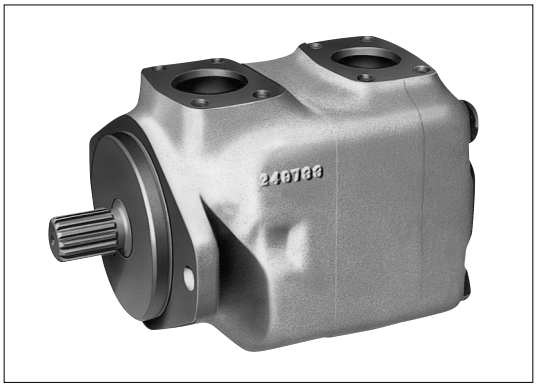
Vane Motor Operating Considerations

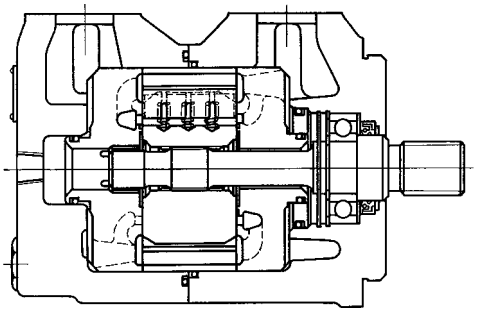
• Mounting
- – Base for motor should be sufficiently rigid.
- – Motor can be mounted at any attitude.
- – Flatness of mounting surface and squareness tolerance should be less than 0.025mm.
- – Mating of mounting pilot should be clearance fit.

• Drive method
- – MHT motor should be direct drive. Avoid external thrust loads.
  Consult Tokimec when using high speed **M motors for indirect drive.
- – MHT motors cannot function as brake. Consult Tokimec when considering braking function with high speed **M motors.

• Hydraulic oil and filtration
- – Use JIS K 2213-2 type(additive) ISO VG32~68 anti-wear oil or SAE application class
  SC, SD, SE, SF crankcase oil. Diesel engine oil cannot be used.
- – Water-glycol, phosphate ester, etc., fire resistant fluids cannot be used.
- – Viscosity of oil used should be 13~54mm²/S, with starting viscosity up to 110mm²/s (**M motor 860mm²) allowed.
- – Full volume filter 25μm or less or bypass filter 10μm or less should be incorporated in inlet and return lines.

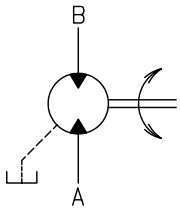
High speed vane motors **M Series





- These motors can be used over a wide speed range from low to high speed and is suitable for various applications including mobile machinery.
- Cartridge kit rotating section enables easy replacement.

Functional Symbol



Model Code

25M 65 A (2) -1 C 20 - JA - J

1 2 3 4 5 6 7

1 Vane motor
25M Series
35M Series
45M Series

2 Displacement
25M : 42,55,65
35M : 80,95,115
45M : 130,155,185

3 Porting
A:SAE4 bolt flange

4 Mounting
Omitted for flange mounting
2: Foot mounting

5 Shaft type
1:Parallel shaft with square key
11:Involute spline shaft

6 Position of cover B port
A: 180° from shaft side A port
B: 90° anticlockwise from shaft side A port
C: In line with shaft side A port
D: 90° clockwise from shaft side A port

7 Design no.

Specifications

Model		Displ. cm^3/rev	Rated Max.Press. MPa	Rated Torque N·m	Rated Max. Speed min^{-1}	Min. Speed min^{-1}	Weight kg	
							Flange Mount	Foot Mount
25M	42	44. 0	15. 7	103	2600	100	18	24
	55	57. 7		135				
	65	68. 7		162				
35M	80	83. 6		196			29	35
	95	100		236				
	115	122		287				
45M	130	138		317			38. 5	44. 5
	155	163		395				
	185	193		453				

Max. Speed & Max. Operating Pressure

Model	Max. Speed min^{-1}	Max. Oper. Pressure MPa
25M 35M 45M	3600	3. 5
	3300	7
	2800	14
	2600	15. 7

Operating Considerations

- Rotation direction
  Motor can rotate in either direction. Oil flow to A port will result in right (CW) rotation as viewed from shaft end and oil flow to B port will result in left (CCW) rotation.
- Shaft
  Use spline shaft (no. 11 involute spline) in applications subject to shock load.
- Drain piping
  Connect drain piping directly to tank. Drain line allowable back pressure is 0.07MPa. (Surge pressure allowed up to 0.18MPa)

- Consult Tokimec in the following cases.
  – When using at speeds below 100min^{-1}.
  – When using motor as brake (pump).
  – When using motor in indirect drive.

- See Vane Motor Operating Considerations (page N2).

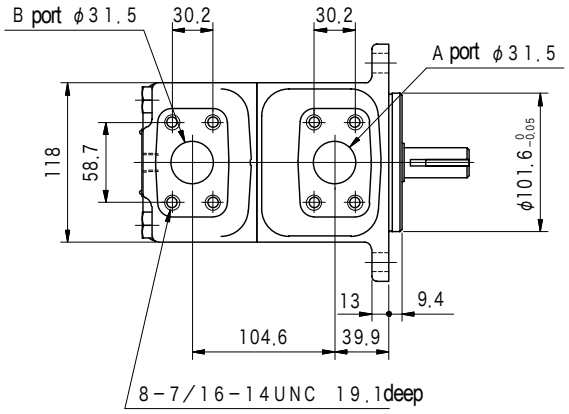
Piping Flange (Conforming to SAE J518c, Standard Pressure)

Model	Size	Flange Model	
25M	1-1/4	Threaded	FL1-10-10P-10-JA-S4-J
		Welded	FL1-10-10W-10-JA
35M	1-1/2	Threaded	FL1-12-12P-10-JA-S4-J
		Welded	FL1-12-12W-10-JA
45M	2	Threaded	FL1-16-16P-10-JA-S4-J
		Welded	FL1-16-16W-10-JA

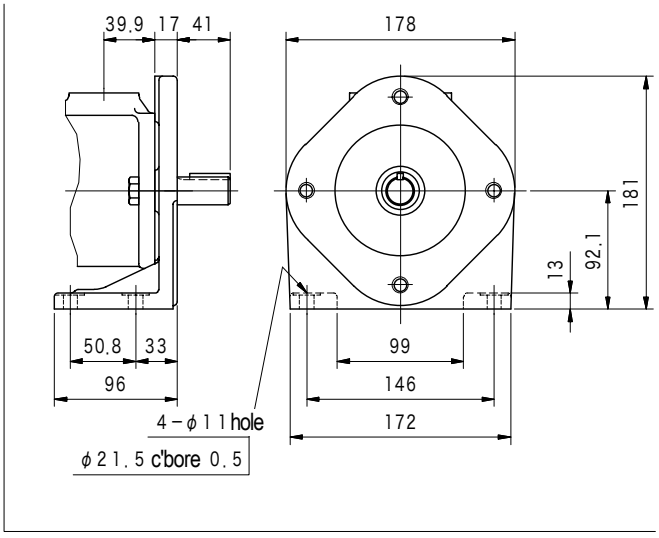
- Hex socket bolts, spring washers, O-rings are included.
- Flanges must be ordered separately.
- See page Q12 for dimensions.

Dimensions

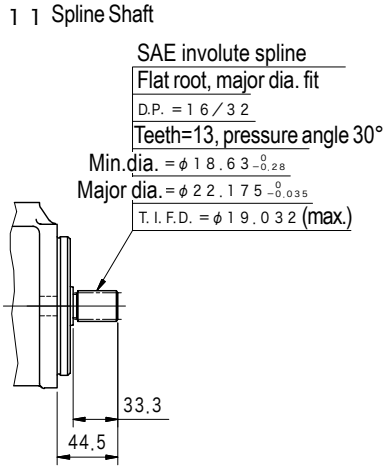
25M Flange Mounting

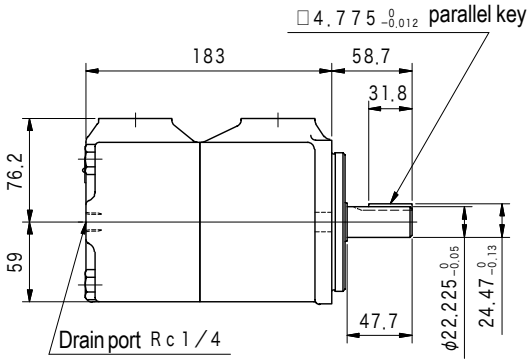


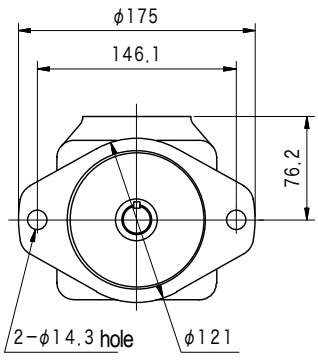
25M Foot Mounting



11 Spline Shaft

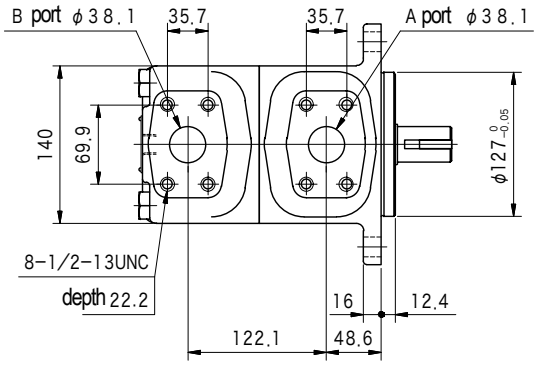




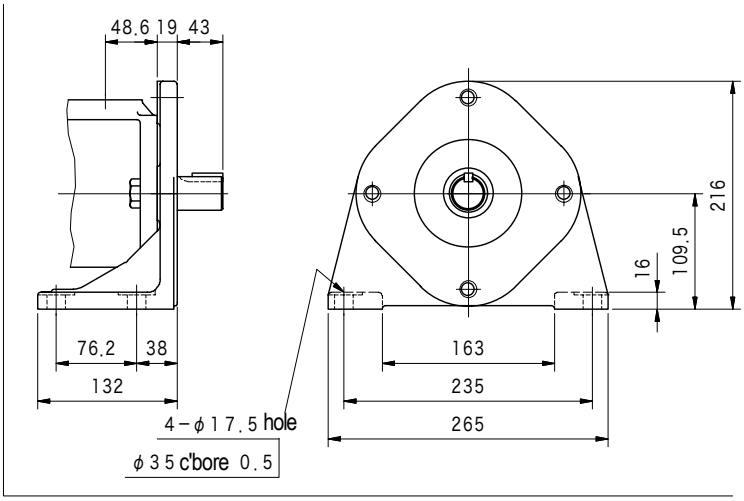


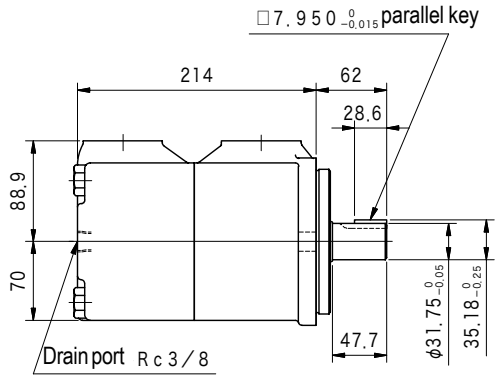
Dimensions

35M Flange Mounting

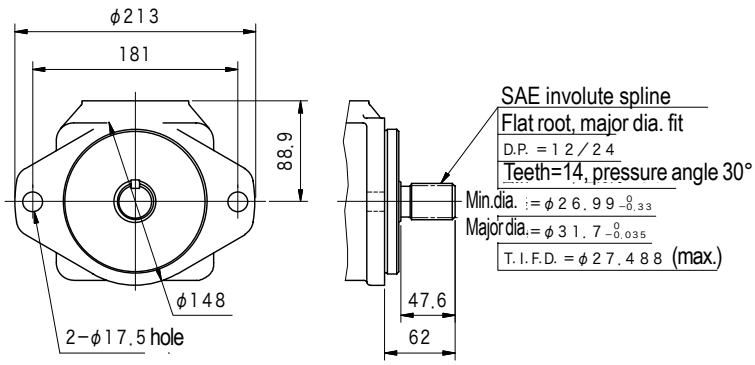


35M Foot Mounting

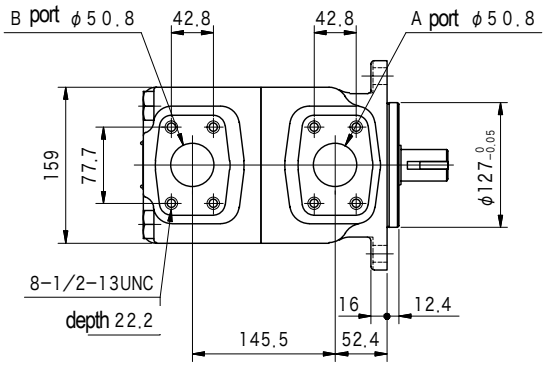




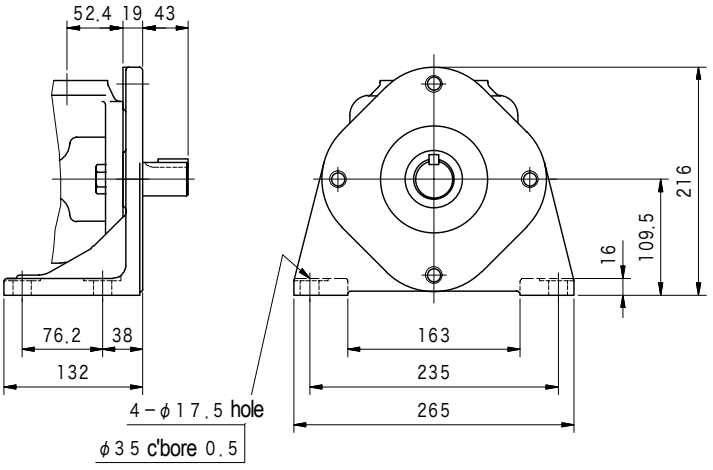
11 Spline Shaft

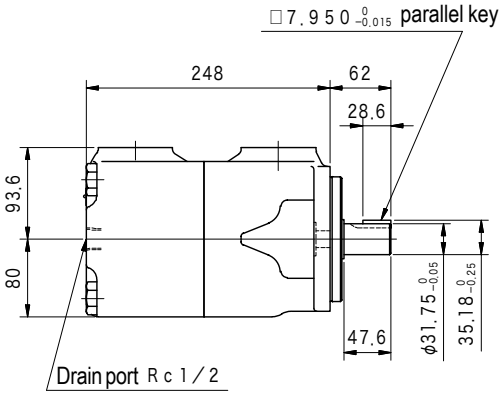


45M Flange Mounting

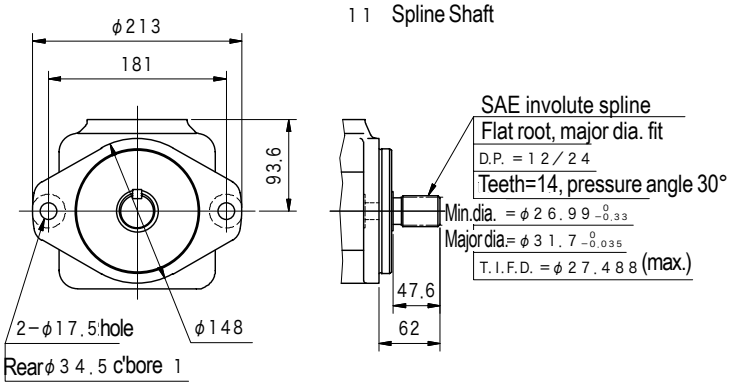


45M Foot Mounting

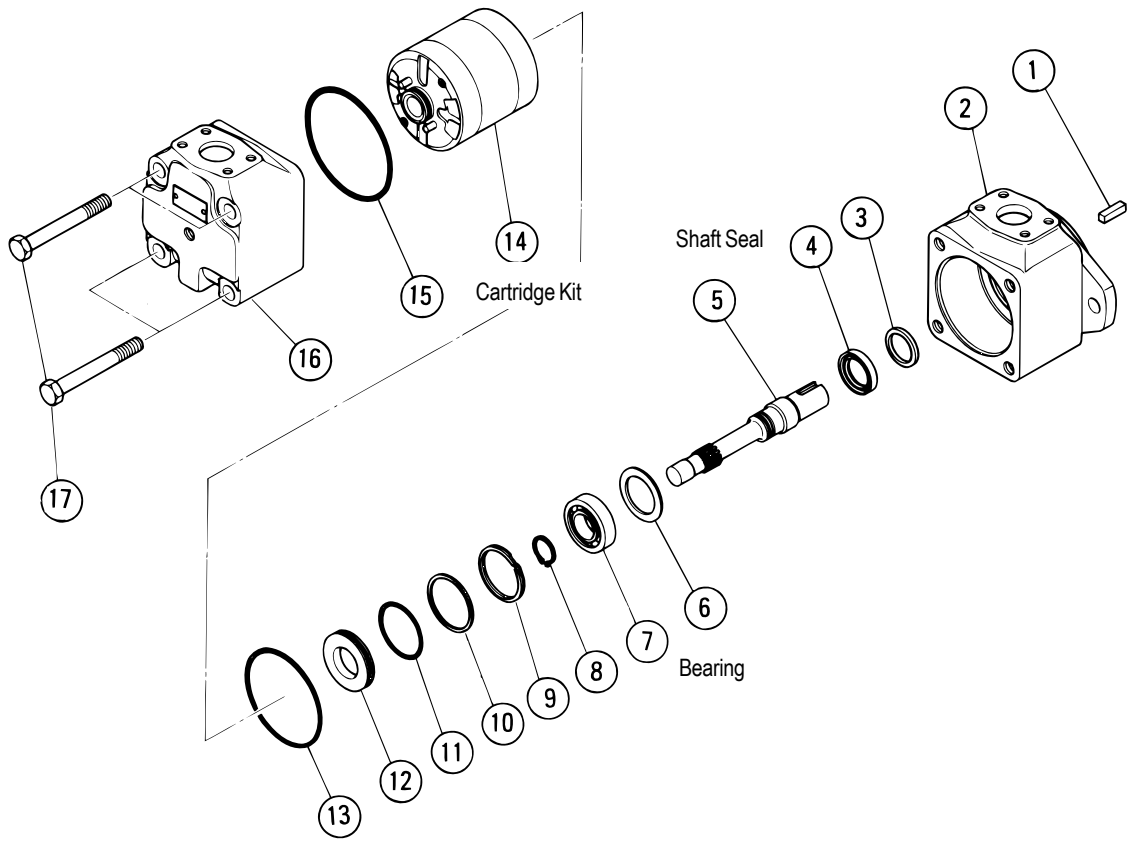




11 Spline Shaft



Construction

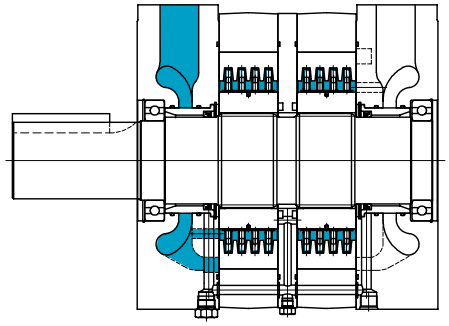


Seals, Bearings, Cartridge Kit

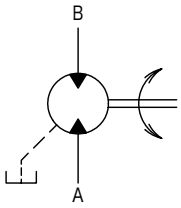
Model	25M		35M		45M	
Seal Kit Part No.		VP923157A		VP923163A		VP923106A
Shaft Seal Part No.		VP191668		VP193428		VP195287
Bearing Part No.		0070**6205**1		0070**6206**1		0070**6207**1
Cartridge Kit	42	VP923160A	80	VP923165A	130	VP923111A
	55	VP923161A	95	VP923166A	155	VP923110A
	65	VP923162A	115	VP923167A	185	VP923109A

Note: ● Shaft seal included in seal kit.
● Bearing numbers in bold correspond to JIS B 1521.

High torque low speed vane motors MHT



Functional Symbol



- Balanced type vane motor suitable for a wide range of speeds and torques.
- Compact with large torque output.
- Smooth, stable low speeds even at 10 rpm.
- Compact design eliminates need for gear boxes and reduction gears.

Model Code

MHT 24 - R1 - 12 - JA - (S12)

1	2	3	4	5

1 Low speed high torque vane motor
2 Torque displacements
See 'Specifications'
3 Shaft
R1: Parallel shaft with square key
N1: No shaft
4 Design no.
12:MHT24,32,70,90
30:MHT50(also for MHT50,150,190,250,380,500,750,1000 shaftless motors)
35:MHT150,190,250,380,500,750,1000
5 Special suffix
Omitted for bi-directional rotation motor (MHT24 to 90)
S12: Right hand rotation (MHT150 and larger)
Note: Consult Tokimec for left hand rotation motor.

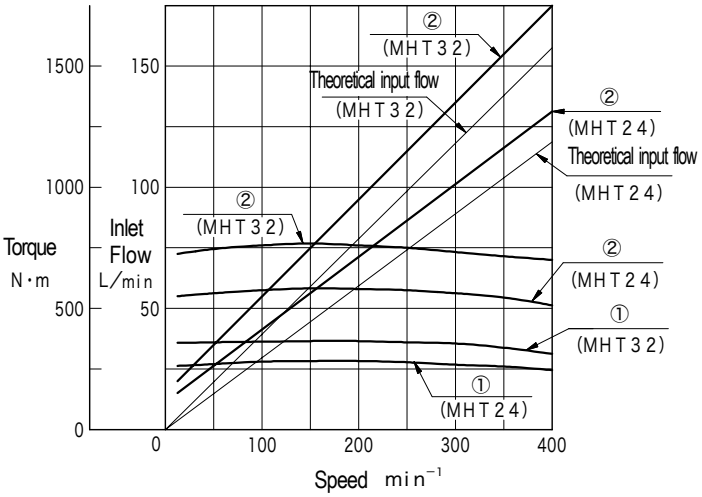
Specifications

Model	Displacement cm^3/rev	Max. Operating Pressure MPa	Theoretical Torque (Press. diff. 0.7MPa) N·m	Speed min^{-1}		Weight kg
				Minimum	Maximum	
MHT24	298	14	33	10	400	55
MHT32	398		44		400	55
MHT50	620		69		350	95
MHT70	868		97		300	110
MHT90	1116		124		300	110
MHT150	1860		207		250	165
MHT190	2360		263		200	240
MHT250	3100		346		200	240
MHT380	4720		526		200	335
MHT500	6200		691		200	335
MHT750	9300		1036		100	420
MHT1000	12400		1381		75	505

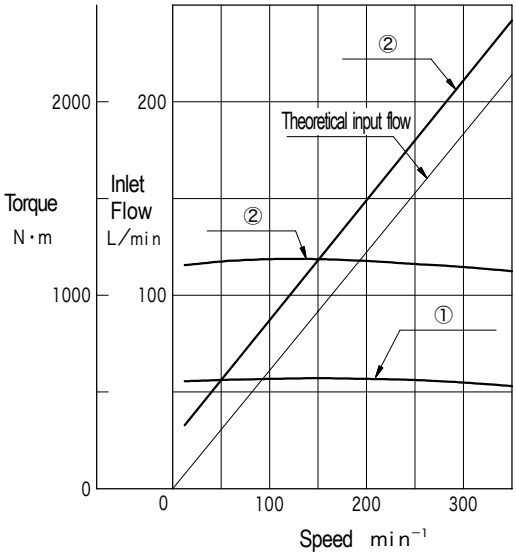
Performance Curves (at 25 mm²/s)

Performance Curves: ① :7 MPa ② :14 MPa

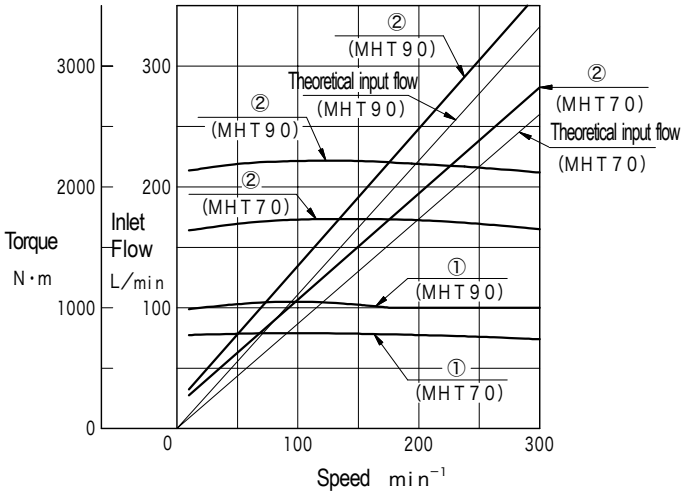
MHT24／MHT32



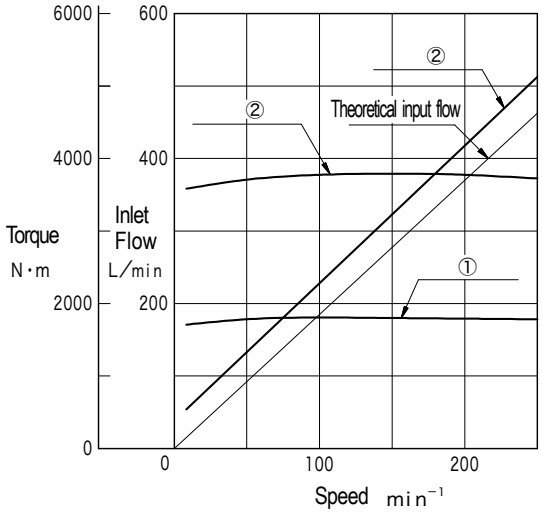
MHT50



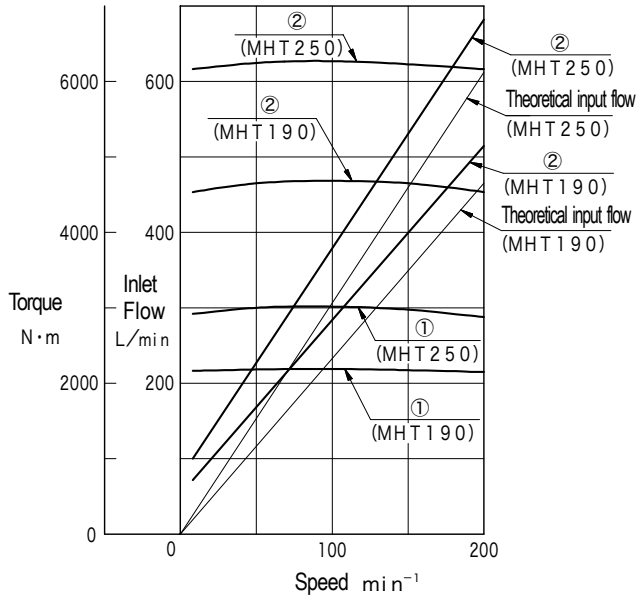
MHT70／MHT90



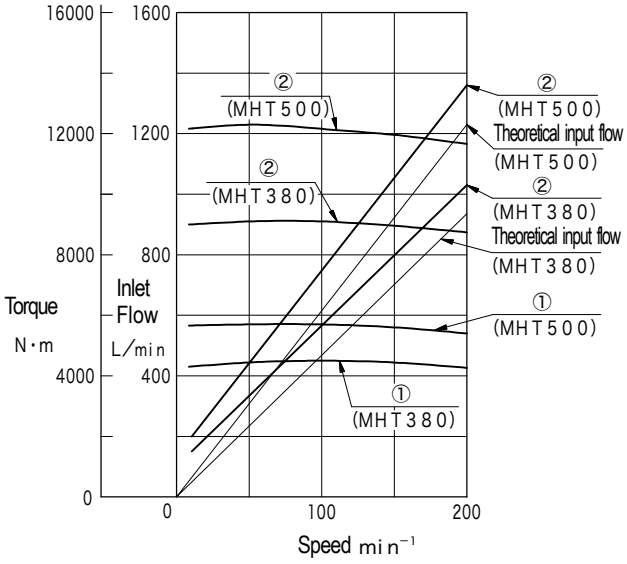
MHT150



MHT190／MHT250



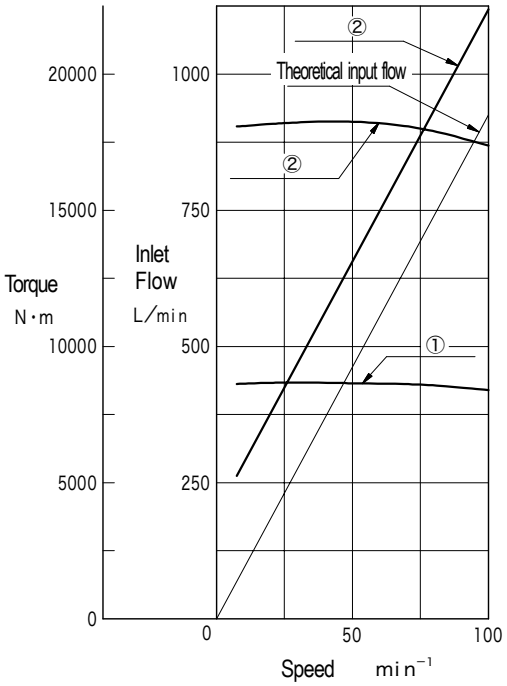
MHT380／MHT500



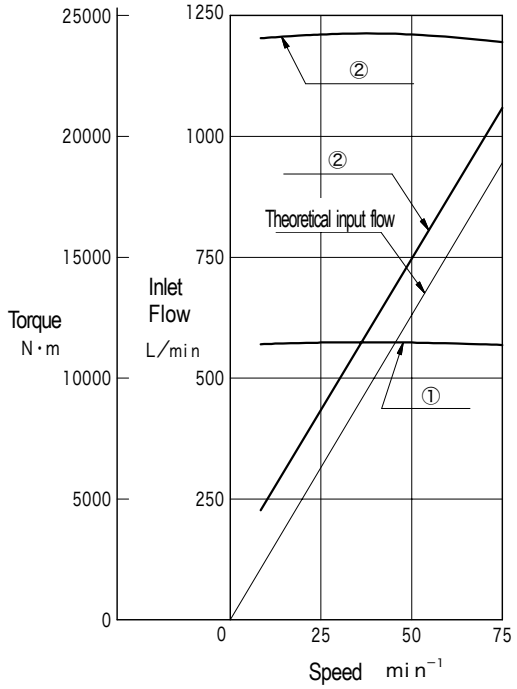
Performance Curves (at 25 mm²/s)

Performance Curves: ① :7 MPa ② :14 MPa

MHT750



MHT1000



Operating Considerations

- Mounting
  Motor is mounted using the six bolt holes on the body. See dimensions for information on bolt tightening torque.
- Rotation direction
  MHT24~90 can be operated in either direction. Motor models MHT150 and larger are uni-directional with right (CW) rotation (viewed from shaft end) standard.

Model	Ports: Left Hand Rotation		Ports: Right Hand Rotation	
	Input Flow	Output Flow	Input Flow	Output Flow
MHT24	B port	A port	A port	B port
MHT32				
MHT50	A port	B port	B port	A port
MHT70				
MHT90				
MHT150	A port	B port	—	—
MHT190				
MHT250				
MHT380				
MHT500				
MHT750				
MHT1000				

Consult Tokimec for left hand rotation. Rotation direction and port inlet/outlet relationship is as follows.

- Motor cannot be used as brake (pump).• Drain
  Drain should be piped directly to tank. Allowable drain line back pressure is 0.17MPa.
- When motor is used at pressure below 3.5MPa or less than 50 rpm, confirm that drain flow is above values given in the table below. If drain flow is low, raise back pressure on motor outlet and increase drain flow.
- Maintain the difference in temperatures between motor and oil at less than 28°C. In the case motor is cold and oil hot, run motor at no load at low speed (less than 50 rpm) until the differential temperature is less than 28°C before normal operation.
- For initial startup, fill oil from each port and operate after motor is completely filled with oil.
- See page N2 for Vane Motor Operating Considerations.

Model	Drain cm³/min	Model	Drain cm³/min
MHT24	200	MHT190	200
MHT32		MHT250	
MHT50		MHT380	380
MHT70		MHT500	
MHT90		MHT750	570
MHT150		MHT1000	760

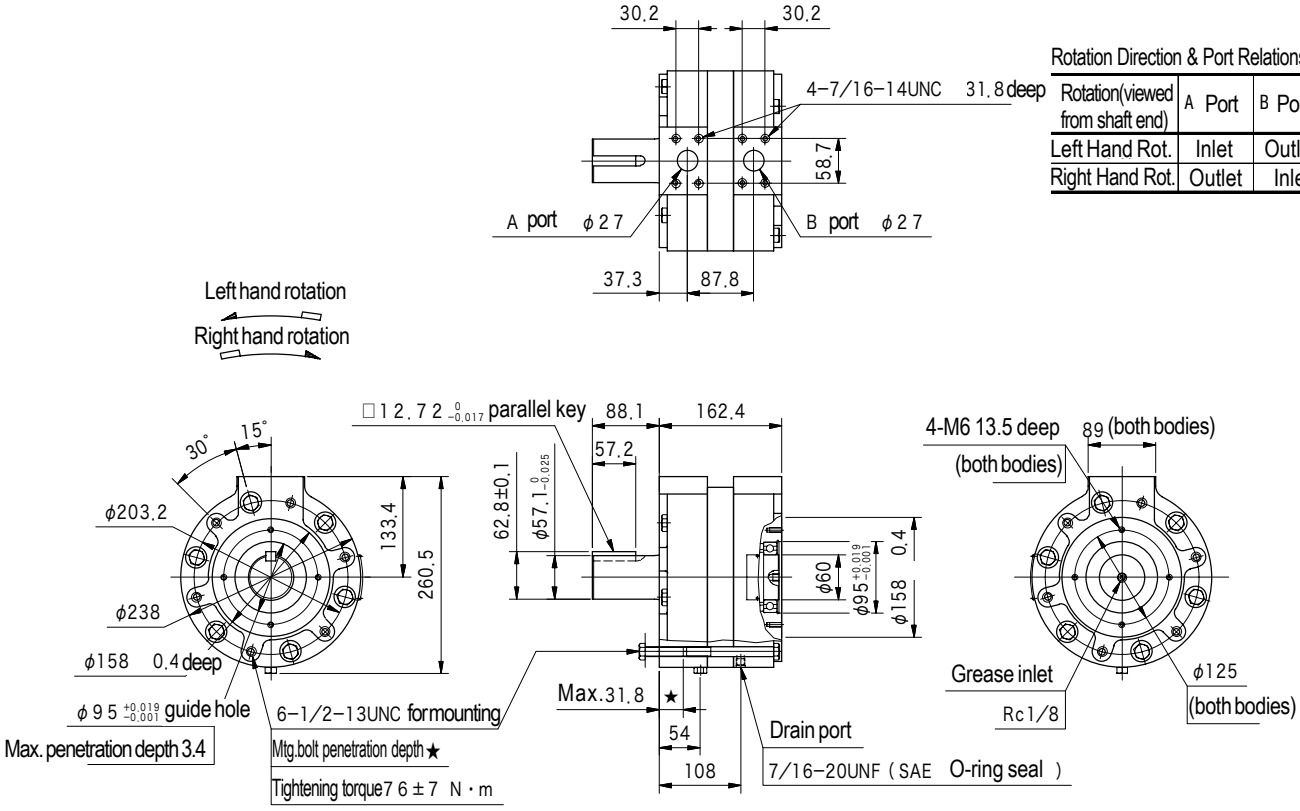
Piping Flange (Conforming to SAE J518c St'd Pressure)

Motor Model	Size	Flange Model	
		Threaded	Welded
MHT24	1-1/4	FL1-10-10P-10-JA-S4-J	FL1-10-10W-10-JA
MHT32			
MHT50			
MHT70	1-1/2	FL1-12-12P-10-JA-S4-J	FL1-12-12W-10-JA
MHT90			
MHT150	2	FL1-16-16P-10-JA-S4-J	FL1-16-16W-10-JA
MHT190	2-1/2	FL1-20-20P-10-JA-S4-J	FL1-20-20W-10-JA
MHT250			
MHT380			
MHT500			
MHT750			
MHT1000			

- Hex socket bolt, spring washers, O-rings included.
- Flange must be ordered separately.
- See page Q12 for dimensions.

Dimensions

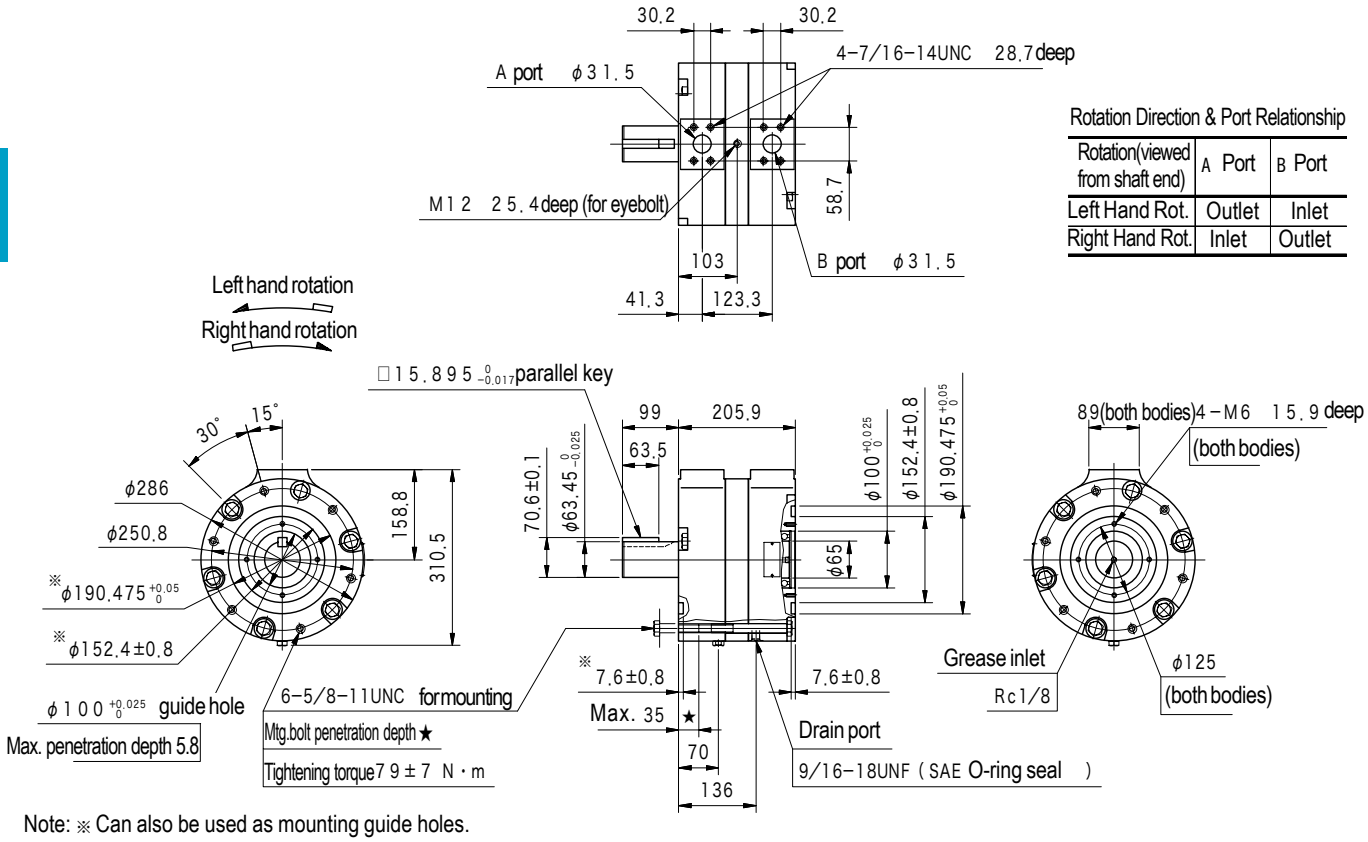
MHT24−R1−12−JA
MHT32−R1−12−JA



Rotation Direction & Port Relationship

Rotation(viewed from shaft end)	A Port	B Port
Left Hand Rot.	Inlet	Outlet
Right Hand Rot.	Outlet	Inlet

MHT50−R1−30−JA



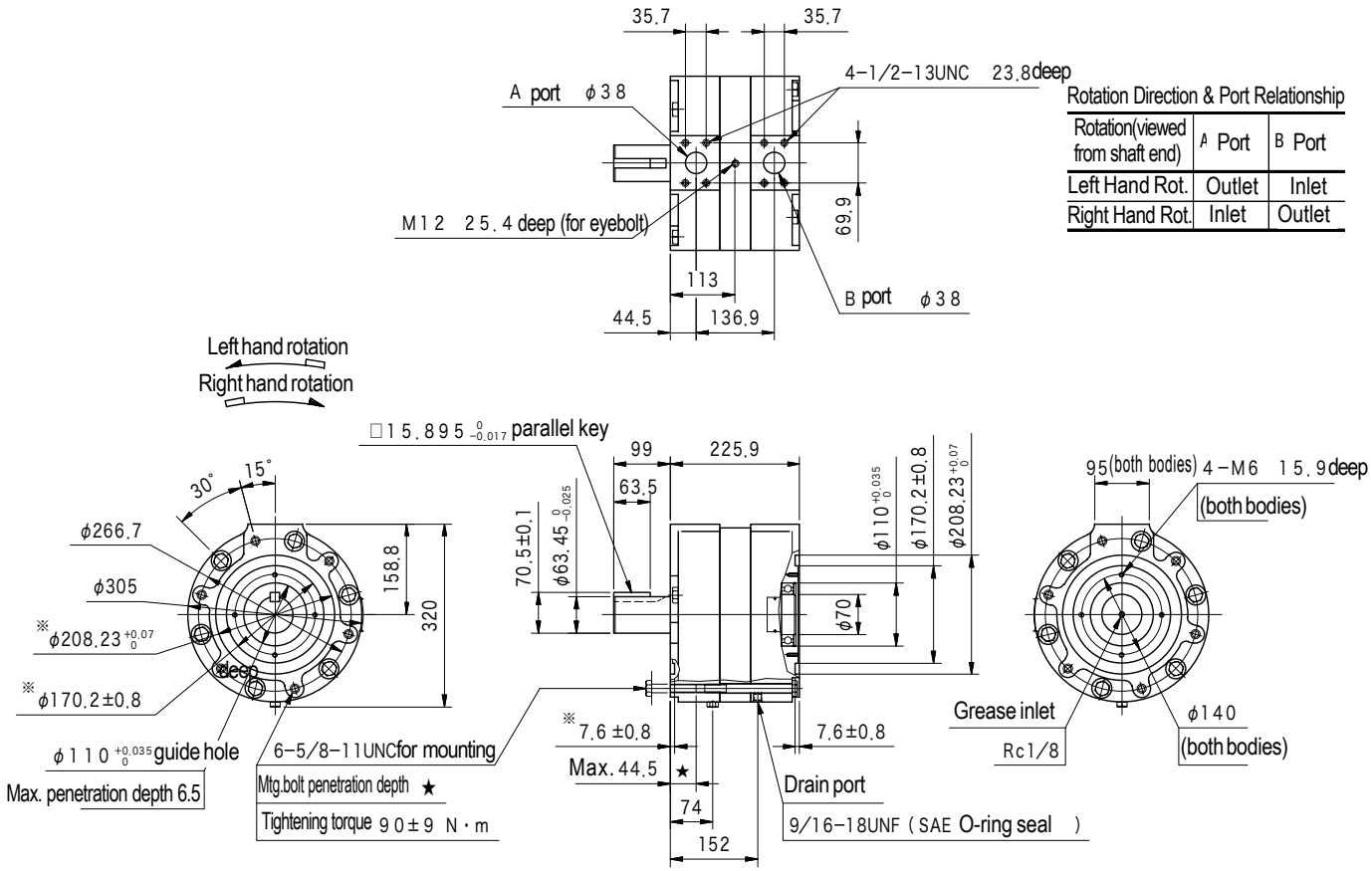
Rotation Direction & Port Relationship

Rotation(viewed from shaft end)	A Port	B Port
Left Hand Rot.	Outlet	Inlet
Right Hand Rot.	Inlet	Outlet

Note: ※ Can also be used as mounting guide holes.

Dimensions

MHT70−R1−12−JA
MHT90−R1−12−JA

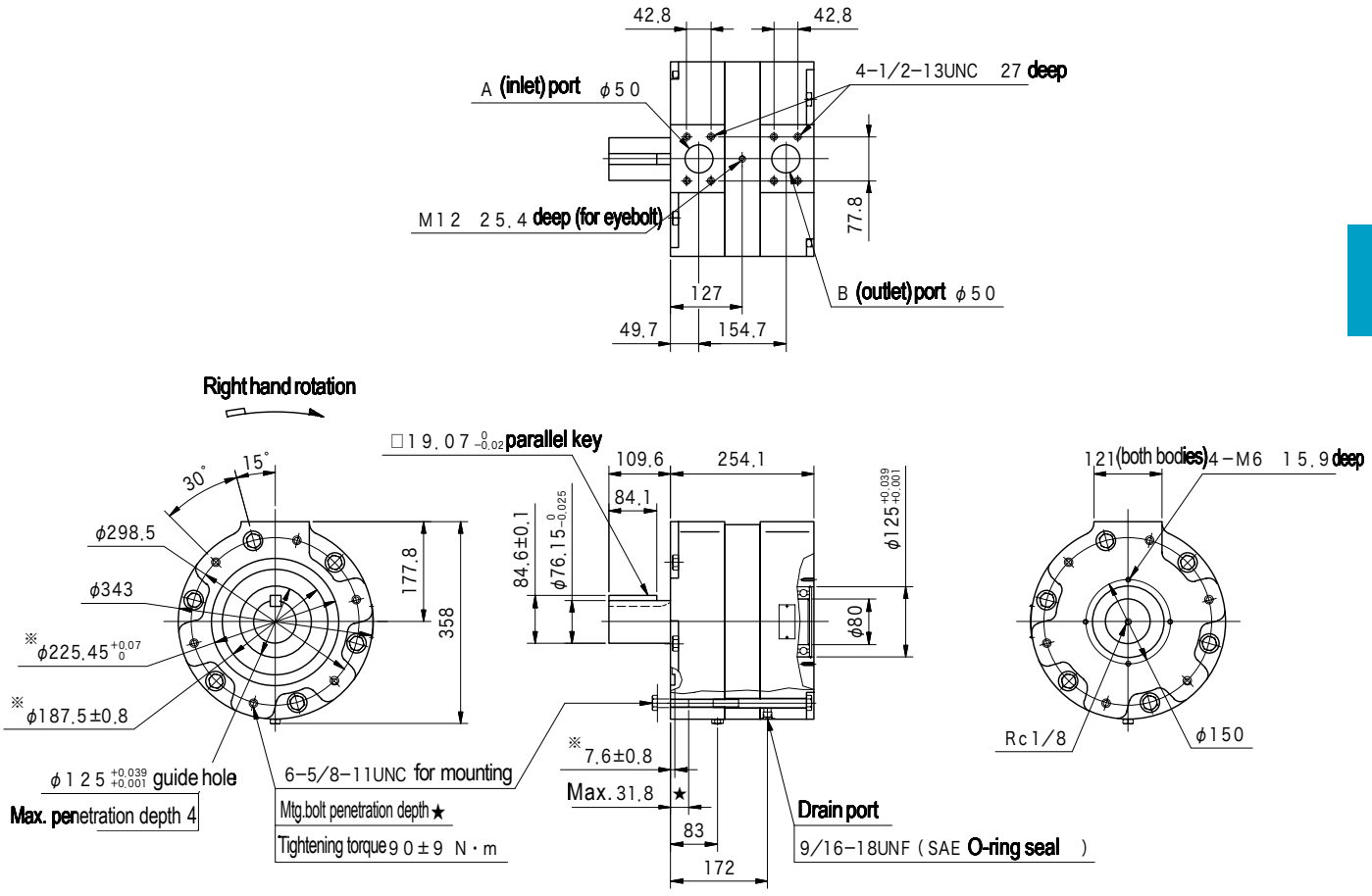


Rotation Direction & Port Relationship

Rotation(viewed from shaft end)	A Port	B Port
Left Hand Rot.	Outlet	Inlet
Right Hand Rot.	Inlet	Outlet

Note: ※ Can also be used as mounting guide holes.

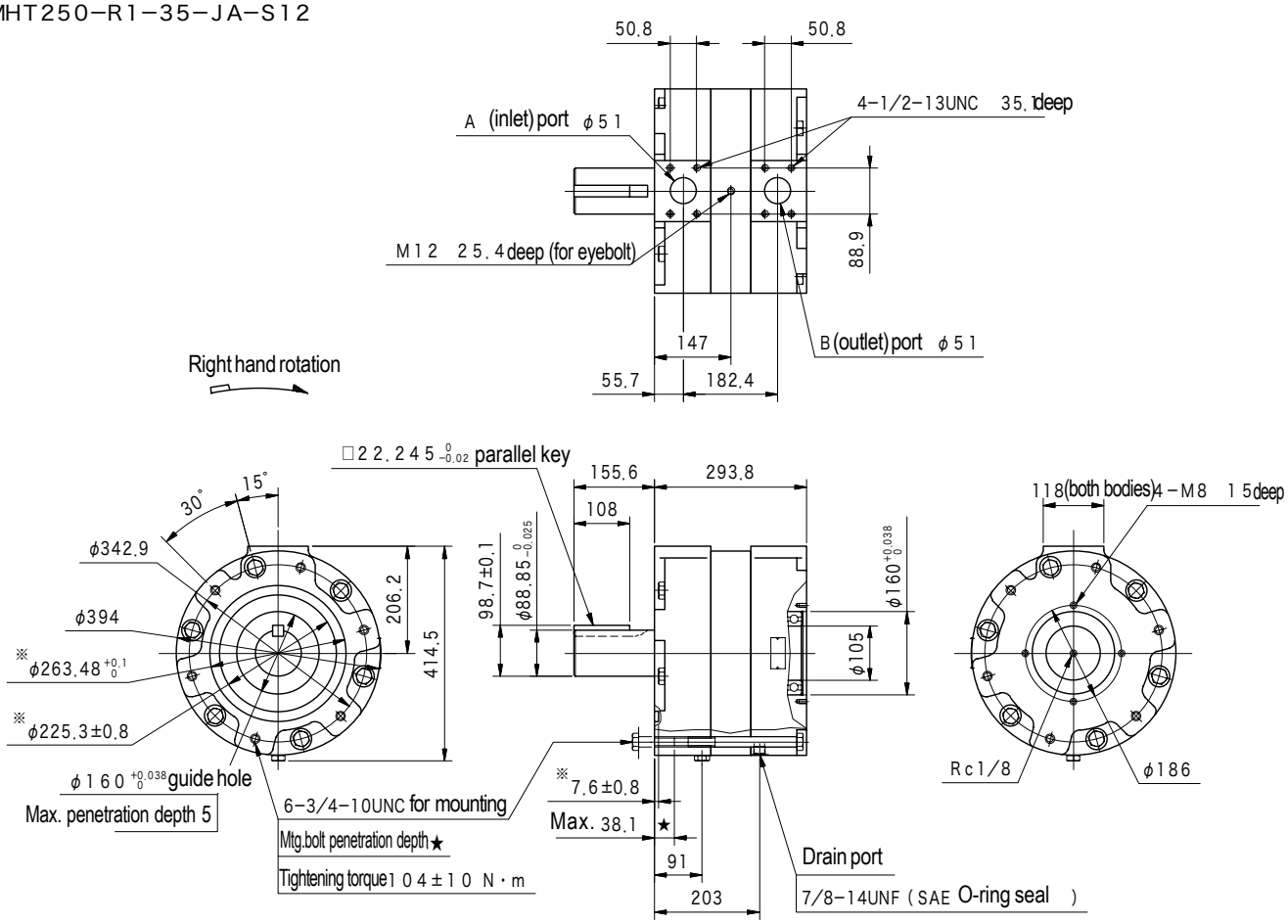
MHT150−R1−35−JA−S12



Note: ※ Can also be used as mounting guide holes.

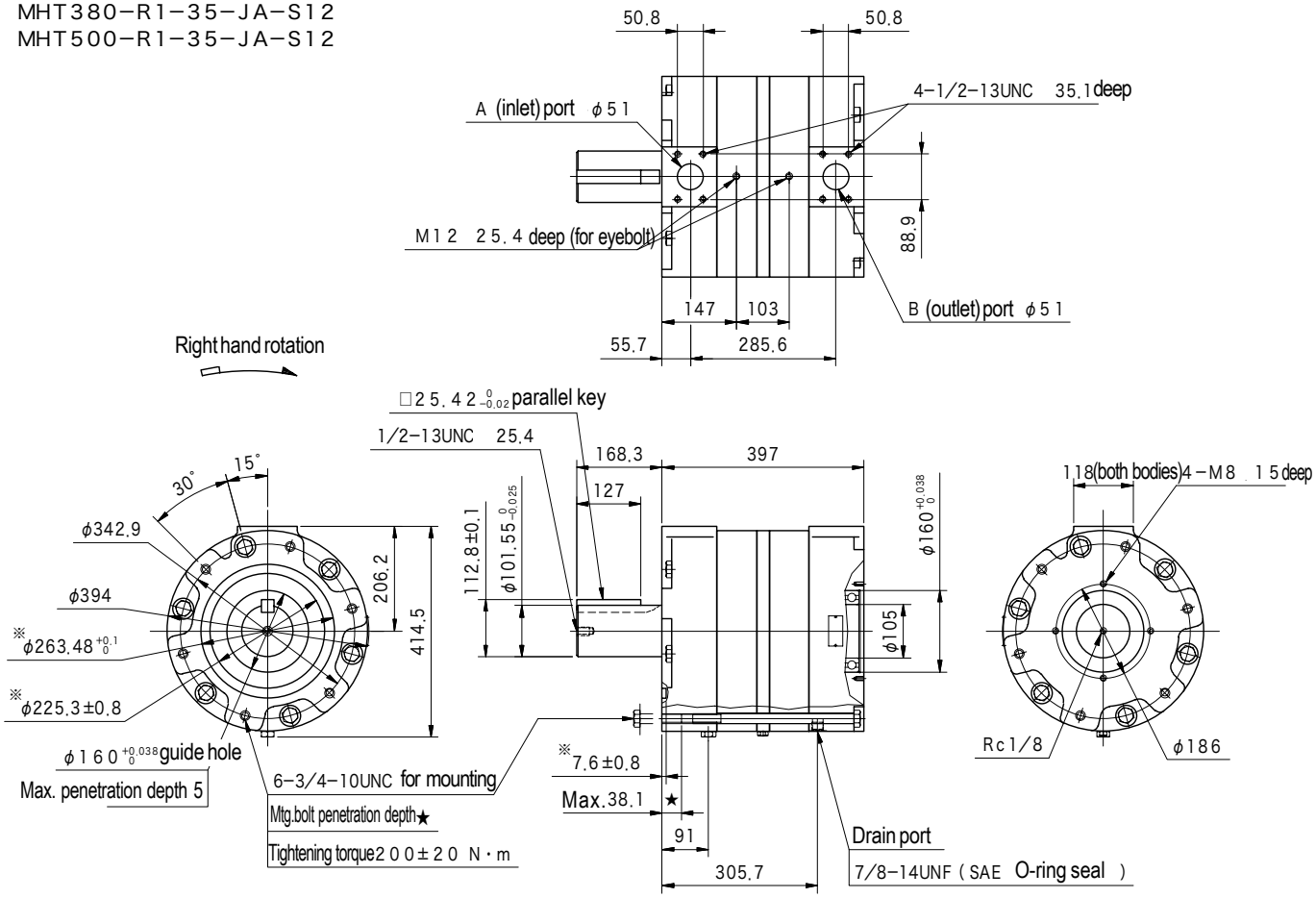
Dimensions

MHT190−R1−35−JA−S12
MHT250−R1−35−JA−S12



Note: ※ Can also be used as mounting guide holes.

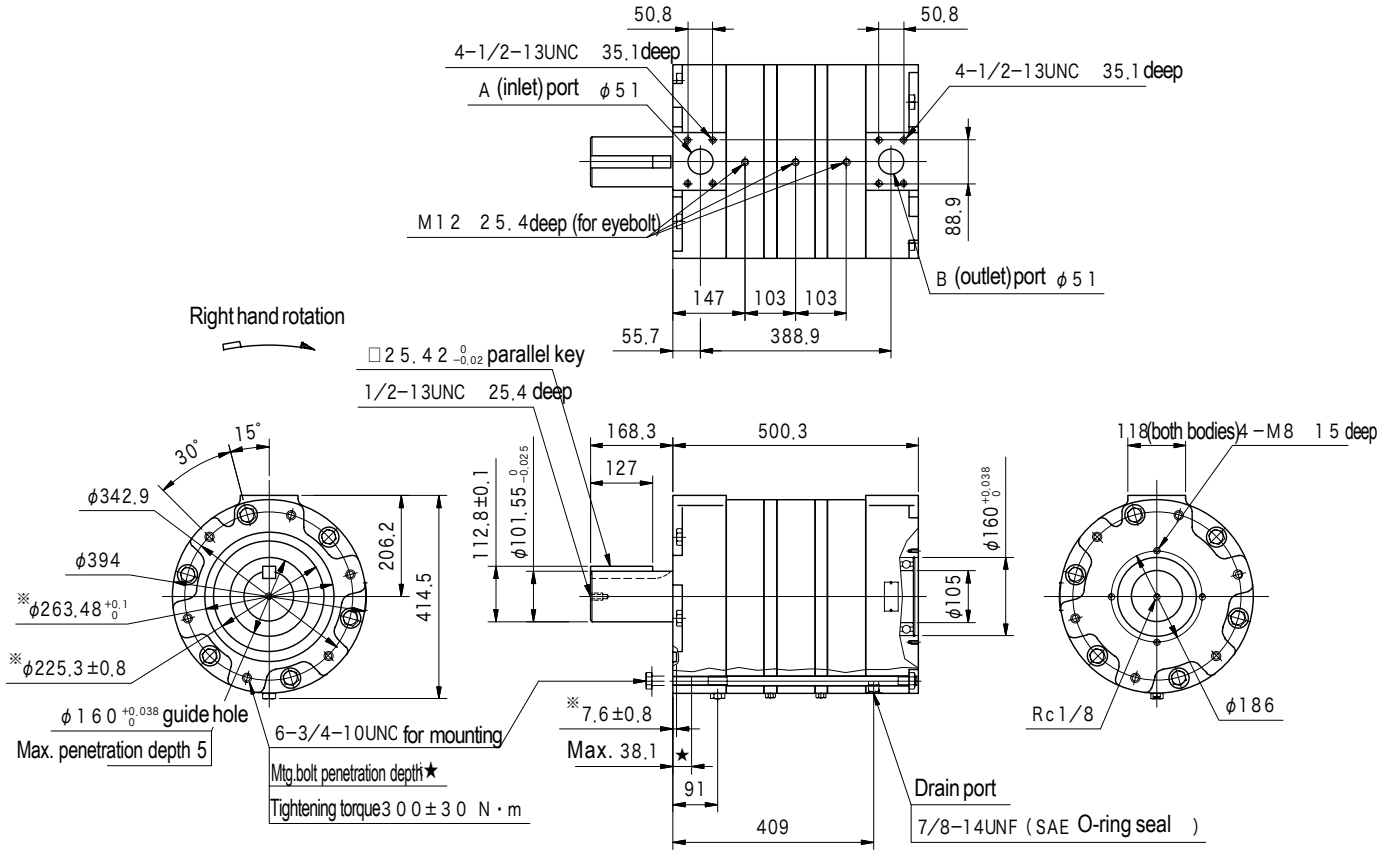
MHT380−R1−35−JA−S12
MHT500−R1−35−JA−S12



Note: ※ Can also be used as mounting guide holes.

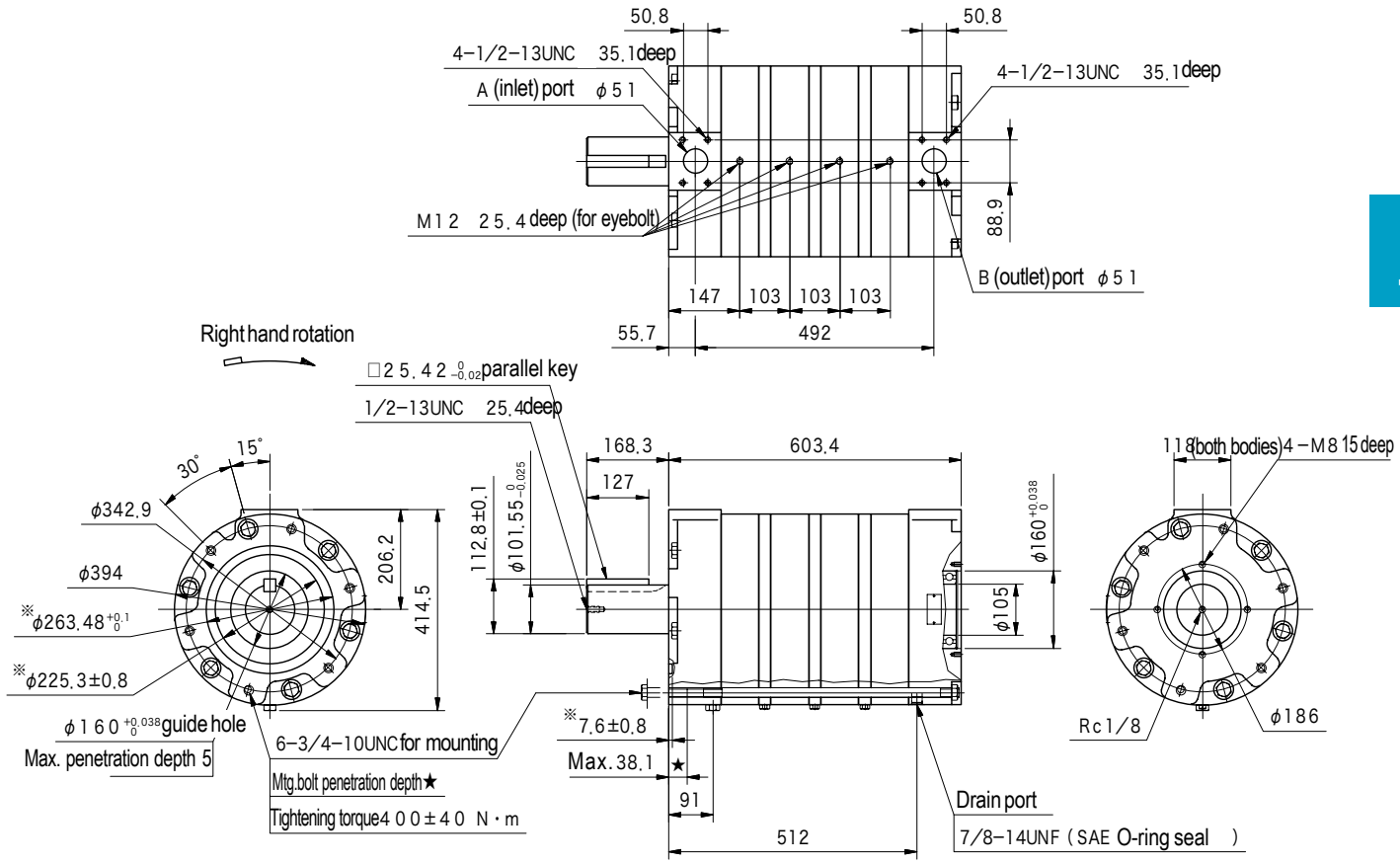
Dimensions

MHT750−R1−35−JA−S12



Note: ※ Can also be used as mounting guide holes.

MHT1000−R1−35−JA−S12

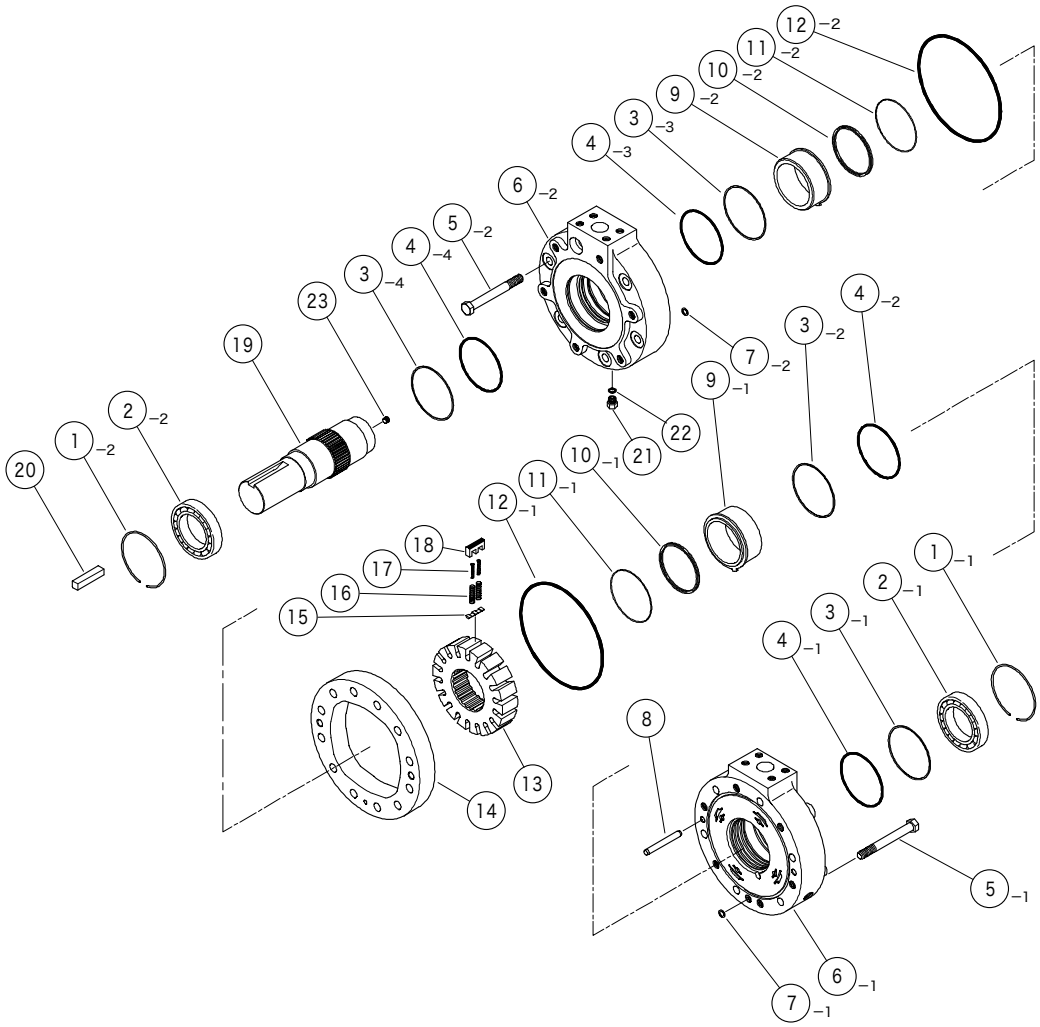


Note: ※ Can also be used as mounting guide holes.

MHT24～MHT90

MHT24
MHT32

No.	Description	Part No.	Standard	Qty
2	Bearing	40012193	JIS B 1521 6012ZZ	2
3	Backup Ring	VA15590	————	4
4	O-Ring	007915319	AS568-153 (NBR, Hs90)	4
7	O-Ring	007901219	AS568-012 (NBR, Hs90)	2
10	X-Ring	VP429290	————	2
12	O-Ring	007926219	AS568-262 (NBR, Hs90)	2
22	O-Ring	007990419	AS568-904 (NBR, Hs90)	1



Note : Schematic is of model MHT24-R1-12-JA

MHT50

No.	Description	Part No.	Standard	Qty
2	Bearing	40012194	JIS B 1521 6013ZZ	2
3	Backup Ring	VA15596	————	4
4	O-Ring	007923919	AS568-239 (NBR, Hs90)	4
7	O-Ring	007911219	AS568-112 (NBR, Hs90)	2
10	X-Ring	VP427689	————	2
12	O-Ring	007926819	AS568-268 (NBR, Hs90)	2
22	O-Ring	007990619	AS568-906 (NBR, Hs90)	1

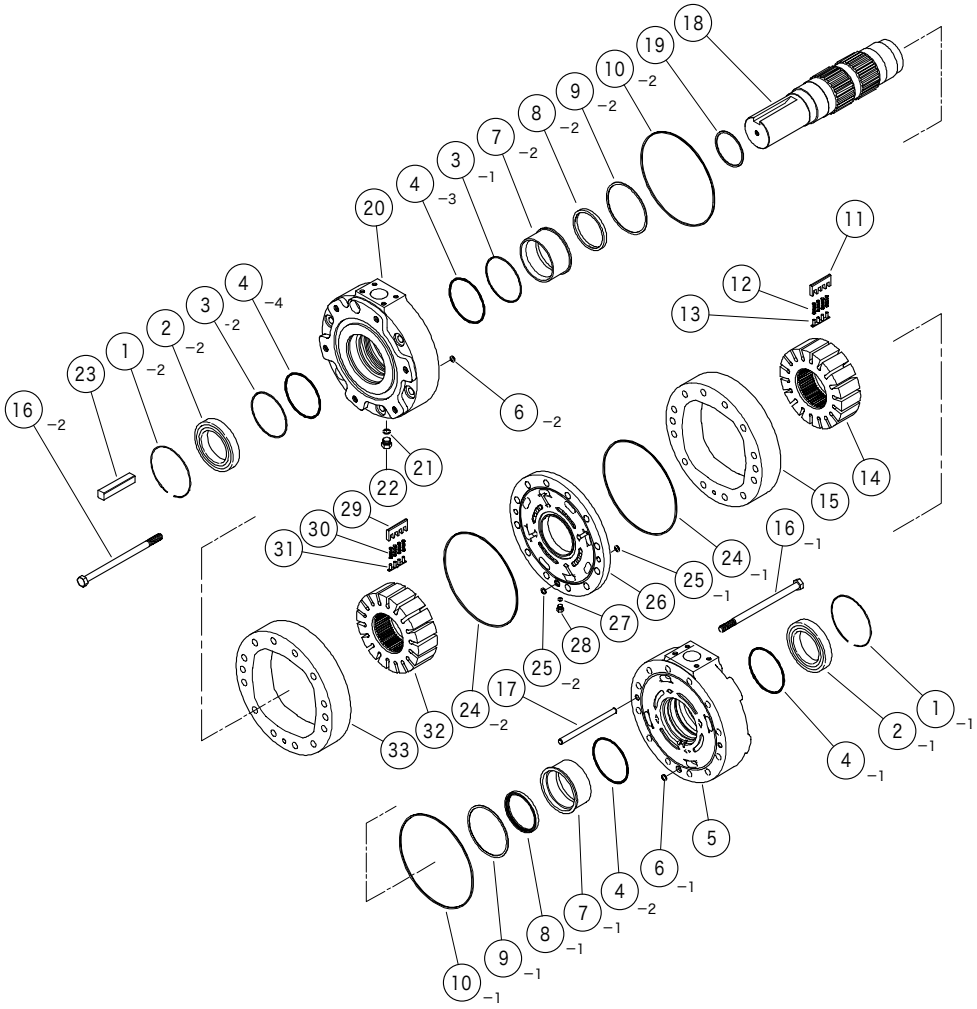
MHT70
MHT90

No.	Description	Part No.	Standard	Qty
2	Bearing	40012195	JIS B 1521 6014ZZ	2
3	Backup Ring	VA15591	————	4
4	O-Ring	007924119	AS568-241 (NBR, Hs90)	4
7	O-Ring	007911219	AS568-112 (NBR, Hs90)	2
10	X-Ring	VP429291	————	2
12	O-Ring	007927119	AS568-271 (NBR, Hs90)	2
22	O-Ring	007990619	AS568-906 (NBR, Hs90)	1

MHT150～MHT1000－S12

MHT150

No.	Description	Part No.	Standard	Qty
2	Bearing	40012196	JIS B 1521 6016ZZ	2
3	Backup Ring	VA15593	————	2
4	O-Ring	007924619	AS568-246 (NBR, Hs90)	4
6	O-Ring	007911219	AS568-112 (NBR, Hs90)	2
8	Shaft Seal	VA31071	————	2
10	Seal Ring	40012879	————	2
21	O-Ring	007990619	AS568-906 (NBR, Hs90)	1

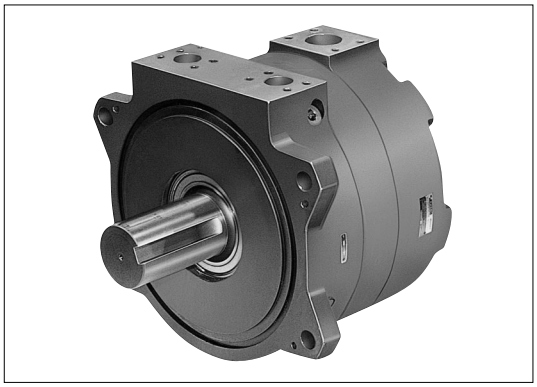


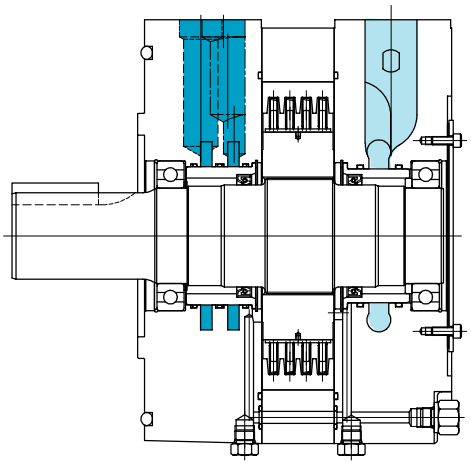
Note : Schematic is of model MHT380/500-R1-35-JA-S12
Parts (24)~(33) not used in MHT150 - MHT250.
Two sets of parts (24)~(33) used in MHT750.
Three sets of parts (24)~(33) used in MHT1000.

MHT190
MHT250
MHT380
MHT500
MHT750
MHT1000

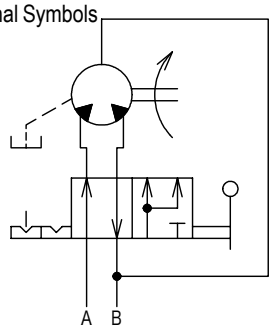
No.	Description	Part No.	Standard	Quantity			
				MHT190 MHT250	MHT380 MHT500	MHT750	MHT1000
2	Bearing	40012197	JIS B 1521 6021ZZ	2	2	2	2
3	Backup Ring	VA15595	————	2	2	2	2
4	O-Ring	007925419	AS568-254 (NBR, Hs90)	4	4	4	4
6	O-Ring	007911419	AS568-114 (NBR, Hs90)	2	2	2	2
8	Shaft Seal	VA30972	————	2	2	2	2
10	Seal Ring	40012880	————	2	2	2	2
21	O-Ring	007991019	AS568-910 (NBR, Hs90)	1	1	1	1
24	Seal Ring	40012880	————	—	2	4	6
25	O-Ring	007911419	AS568-114 (NBR, Hs90)	—	2	4	6
27	O-Ring	007990619	AS568-906 (NBR, Hs90)	—	1	2	3

High torque low speed vane motors
(multi-torque type) MHT

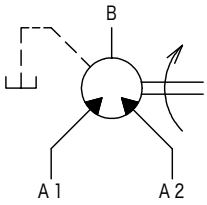




Functional Symbols



With special switching valve



- Special switching valves enables easy switching from low speed high torque to high speed low torque.
- Balanced type vane motor provides wide range of speeds and torques.
- Compact with large torque output.
- Smooth, stable low speeds even at 10 rpm.
- Compact design which eliminates need for gear boxes and reduction gears.

Model Code

MHT 500 / 250 / 250 - R1 - 35 - JA - S 12 (9)

1 | 2 | 3 | 4 | 5 | 6 | 7

1 Low speed high torque vane motor
2 Full torque displacements
24,32,50,70,90,150,190,250,380,500,750,1000,1250*
3 Partial torque displacements
See 'Specifications'
4 Shaft
R1: Parallel shaft with square key (standard)
N1: No shaft
5 Design no.
JA-12:MHT 24,32
15-JA:MHT 70,90
JA-30:MHT 50
35-JA:MHT150,190,250,380,500,750(2-speed),1000(2-speed)
JA-35:MHT 750(4-speed), 1000 (3-speed)
6 Special feature
Omitted for bi-directional rotation models (appl. to MHT50/25/25)
S12:Right hand rotation (standard)
S123:Right hand rotation with flange type body mounting (for MHT70 and above)
Note: Consult Tokimec for left hand rotation models
7 Special switching valve
Omitted for no switching valve
8:Switching valve (applicable for MHT70/45/25 only)
9:Switching valve (applicable to all models except above model.
Note: Use switching valve for MHT750/625/500/375 and MHT1000/750/500.

* Note: Consult Tokimec for details regarding 1250 size motor

● Switching Valve [Model Code]

DMHT 500 - 2 - 10 - JA

1 | 2 | 3 | 4

1 Switching valve for MHT motors
2 MHT model

Motor	32	50	90	150	250	500	750	1000
Appl. Motor (multi-torque)	MHT24 MHT32	MHT50	MHT70 MHT90	MHT150	MHT190 MHT250	MHT380 MHT500	MHT750	MHT1000

3 Motor speeds
2 : 2 speed
3 : 3 (or 4) speed
4 Design no.
Design no. is '-10-JA-S1' for MHT250, 500, 750 (2-speed) and MHT1000 (2-speed).
Design no. is 'JA-10-S3' for MHT750 (3-speed) and MHT1000 (3-speed).

Specifications

Model	Design No.	Displacement cm³/rev		Theoretical Torque (Press. differential 0.7 MPa) N·m		Max. Oper. Press. MPa	Speed min⁻¹		Weight kg	
		Full Tqe.	Partial Torque	Full Tqe.	Partial Torque		Min.	Max.	Motor	Sw. Valve
2 Speed Models										
MHT24/12/12	JA-12	298	149	33	16.5	14	10	400	55	13
MHT32/16/16	JA-12	398	199	44	22			400	55	13
MHT50/25/25	JA-30	620	310	69	34.5			350	95	24
MHT70/35/35	15-JA	868	434	97	48.5			300	110	26.5
MHT90/45/45	15-JA	1116	558	124	62			300	110	26.5
MHT150/75/75	35-JA	1860	930	207	104			250	165	30
MHT190/95/95	35-JA	2360	1180	263	131			200	240	38
MHT250/125/125	35-JA	3100	1550	346	173			200	240	38
MHT380/190/190	35-JA	4720	2360	526	263			200	335	39
MHT500/250/250	35-JA	6200	3100	690	345			200	335	39
MHT750/375/375	35-JA	9300	4650	1040	520			100	420	40
MHT1000/500/500	35-JA	12400	6200	1380	690			75	505	41
3 Speed Models										
MHT70/45/25	15-JA	868	558 310	97	62 34.5	14	10	300	110	26.5
MHT1000/750/500	JA-35	12400	9300 6200	1380	1040 690			150	560	81
4 Speed Models										
MHT750/625/500/375	JA-35	9300	7750 6200 4650	1040	860 690 520	14	10	150	470	79

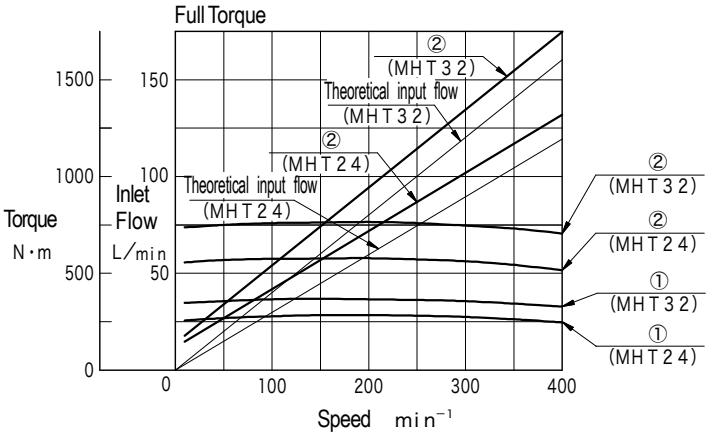
● 3, 4-speed combinations other those above are available. Consult Tokimec.

Performance Curves (at 25mm²/s)

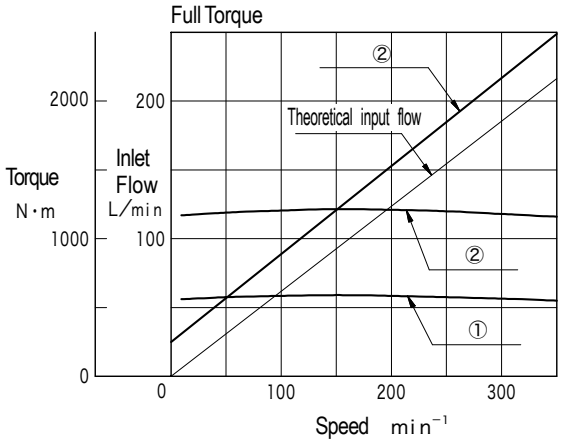
Performance Curves: ① :7 MPa ② :14 MPa

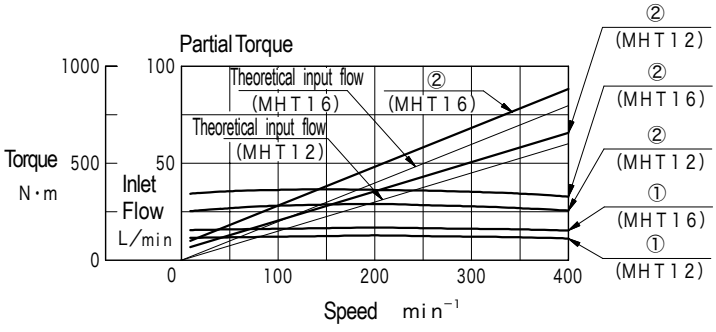
2 Speed Models

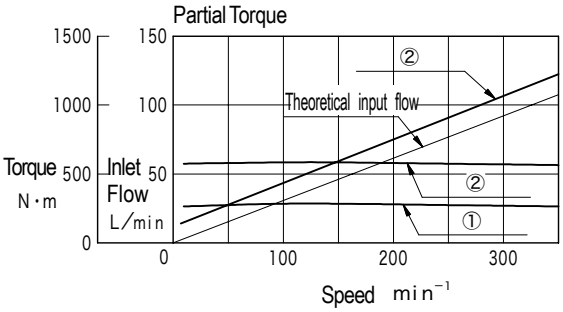
MHT24/12/12
MHT32/16/16



MHT50/25/25



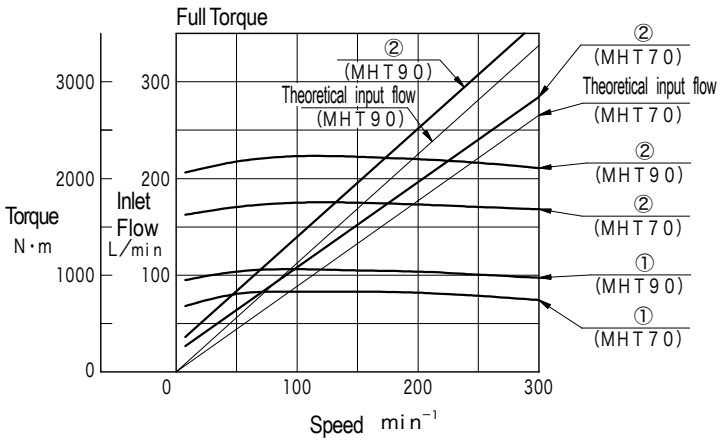


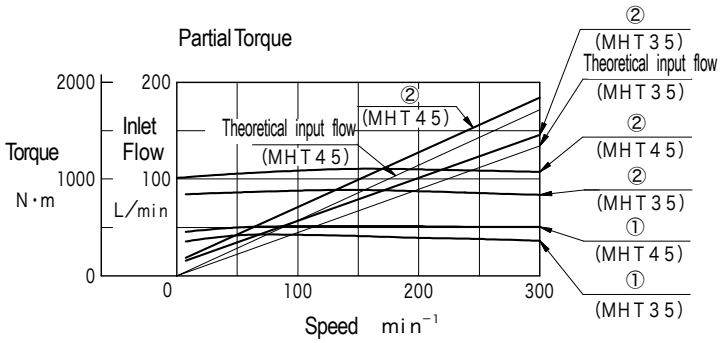


Performance Curves (at 25 mm²/s)

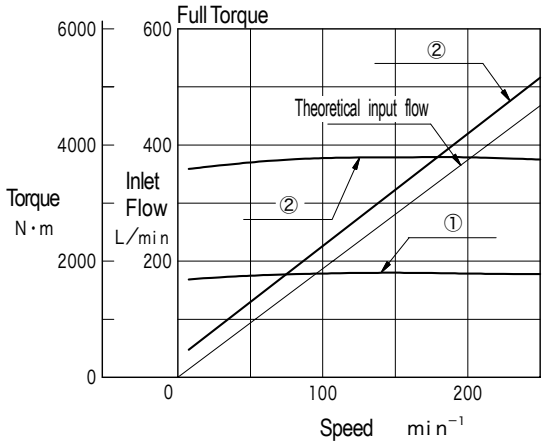
Performance Curves: ① :7 MPa ② :14 MPa

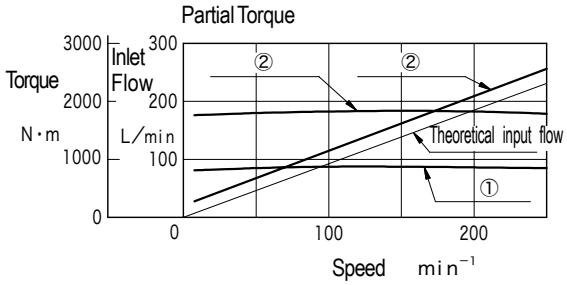
MHT70/35/35
MHT90/45/45



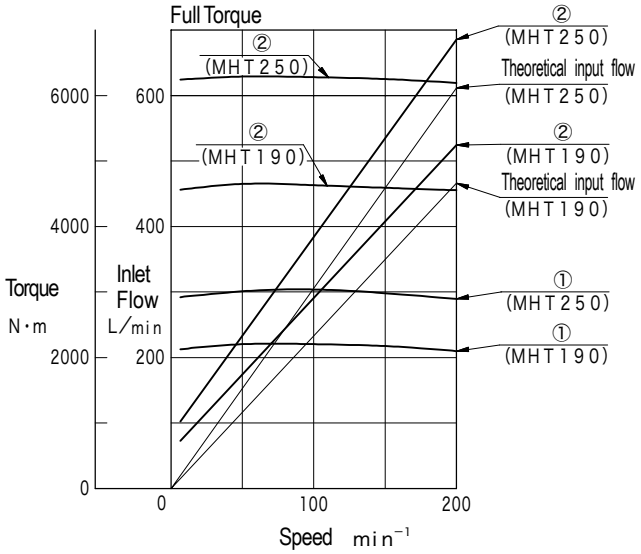


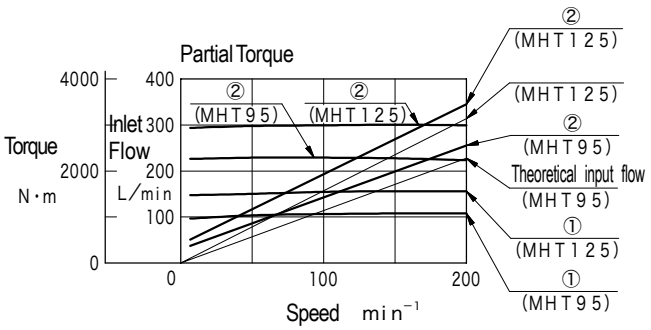
MHT150/75/75



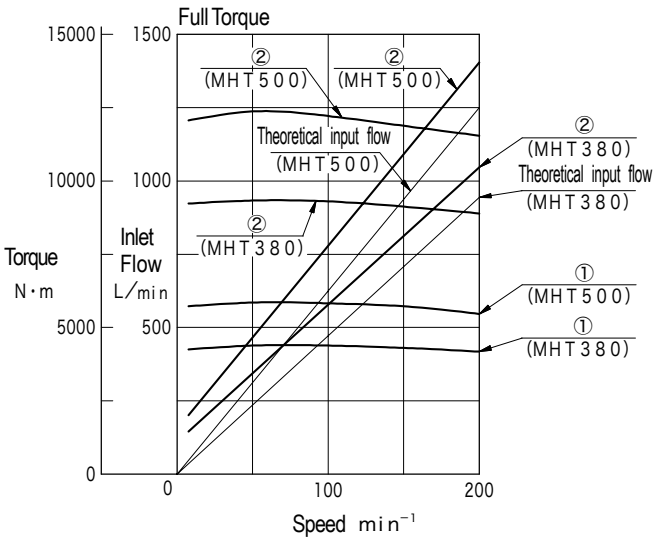


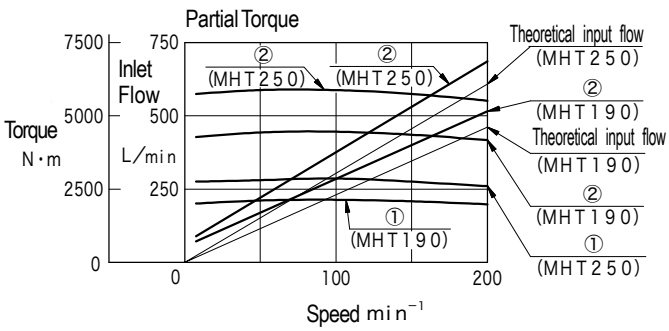
MHT190/95/95
MHT250/125/125





MHT380/190/190
MHT500/250/250

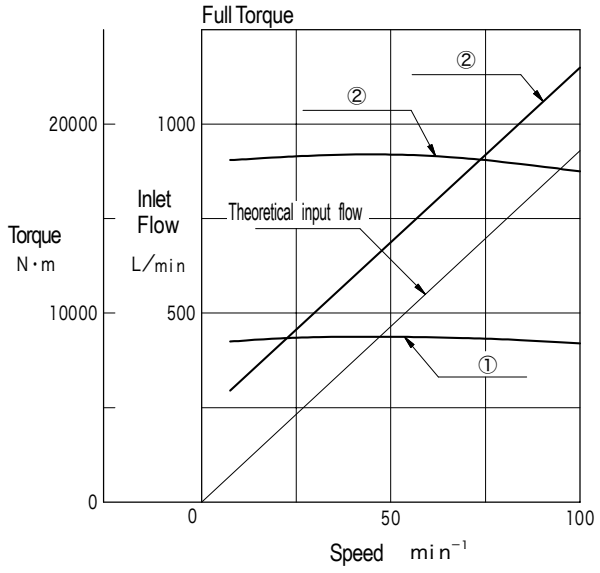


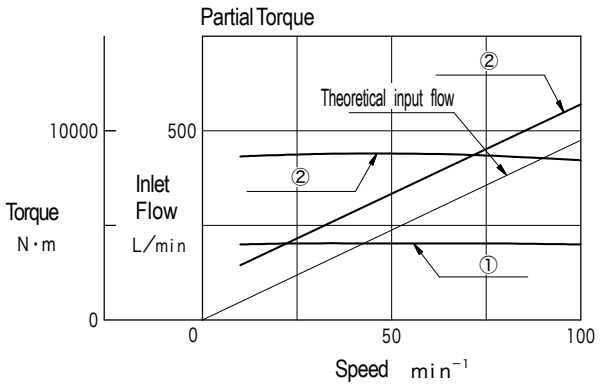


Performance Curves (at 25 mm²/s)

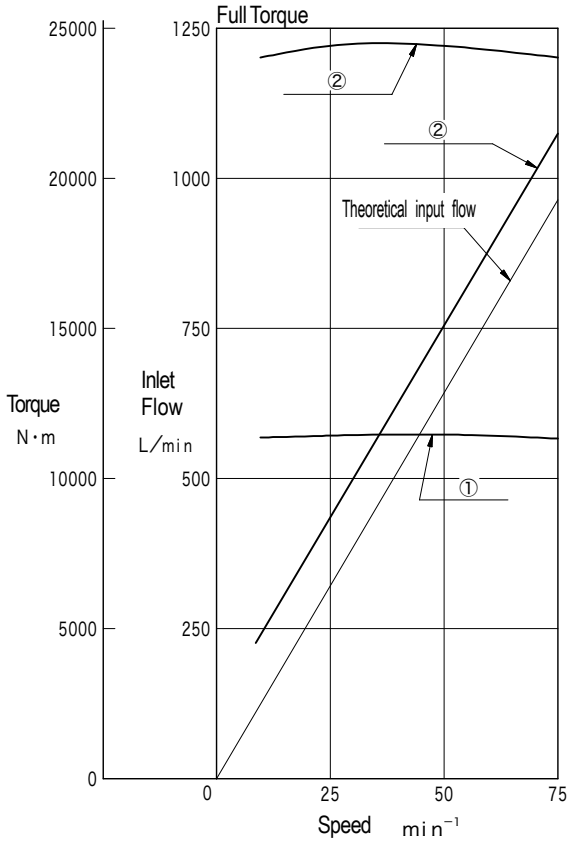
Performance Curves: ① :7 MPa ② :14 MPa

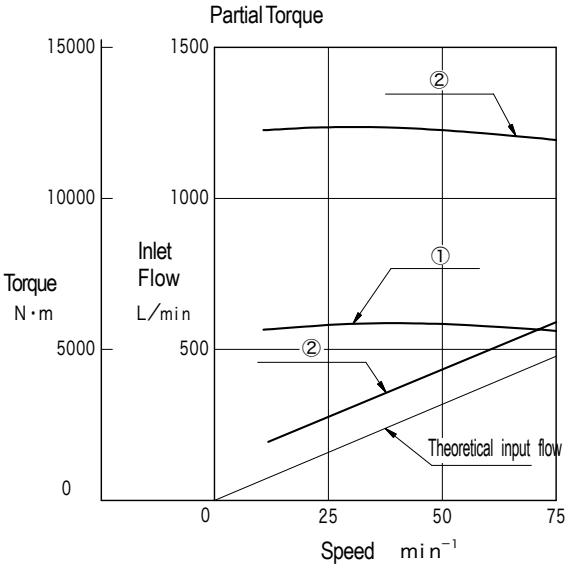
MHT750/375/375





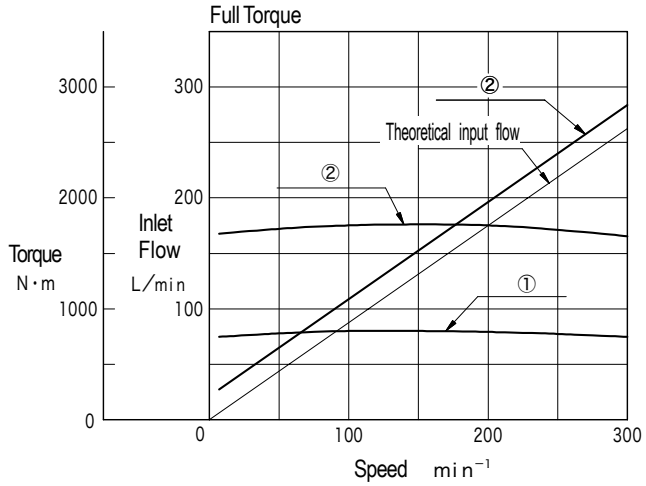
MHT1000/500/500

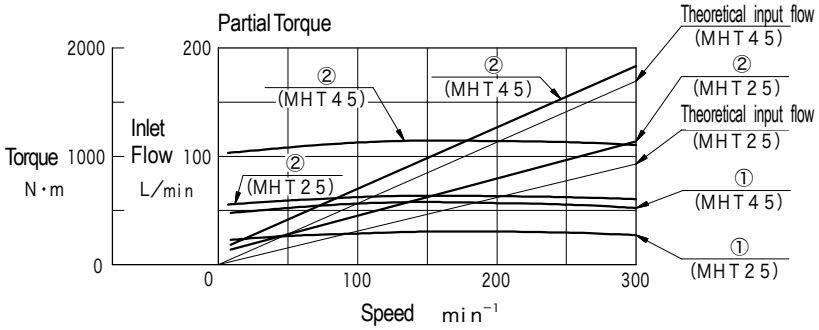




3 Speed Models

MHT70/45/25



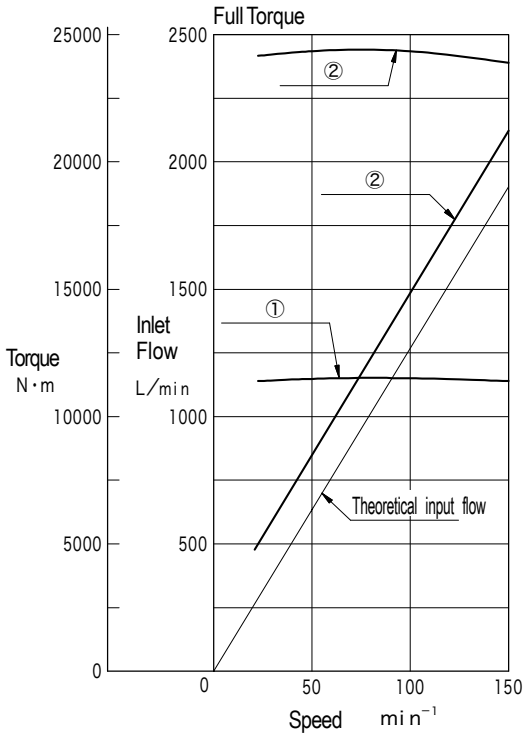


Performance Curves (at 25 mm²/s)

Performance Curves: ① :7 MPa ② :14 MPa

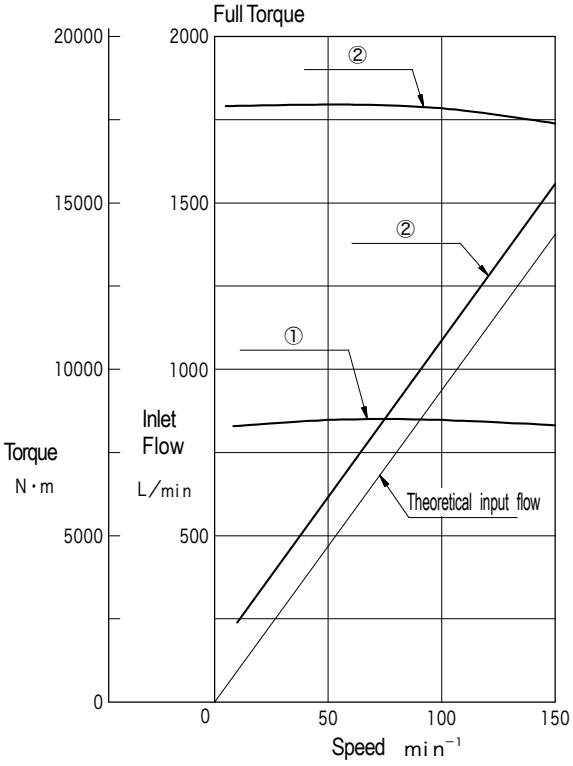
3 Speed Models

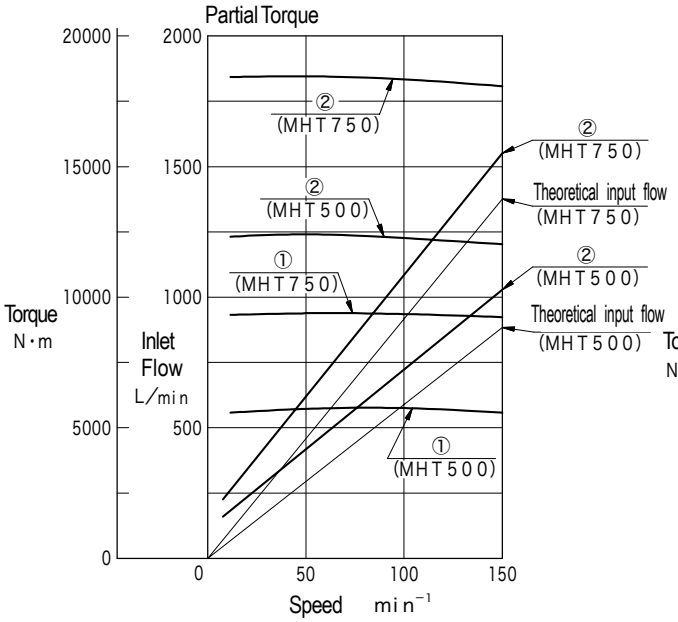
MHT1000/750/500

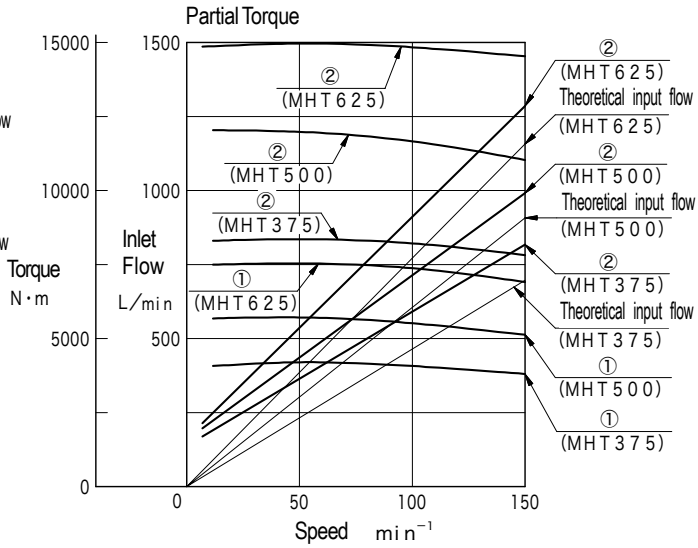


4 Speed Models

MHT750/625/500/375



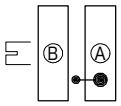
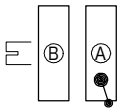
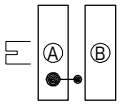
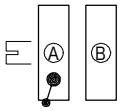
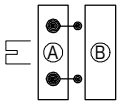
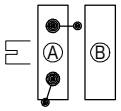
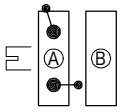
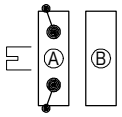
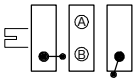
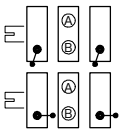
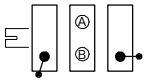
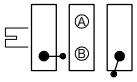
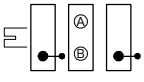
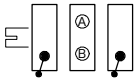
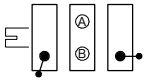




Port Connection and Torque Switching

When using special switching valve

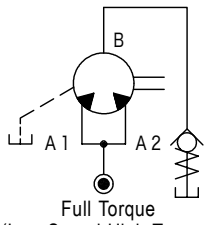
- Input port A, outlet port B. (For left hand rotation of MHT50/25/25, inlet and outlet ports should be reversed.)
- Switch lever after motor is stopped. Lever should be switched fully until it contacts stopper pin. Tighten fixing bolt.
- Lever position and torque relationship is shown in the below table.

Motor Model		Torque Switching Condition				
		Max. Torque	High Torque	Medium Torque	Low Torque	Stop
2 Speed	MHT24/12/12 MHT32/16/16					
	All 2 speeds models except for above model.					
3 Speed	MHT70/45/25					
	MHT1000/750/500					
4Speed	MHT750/625/500/375					

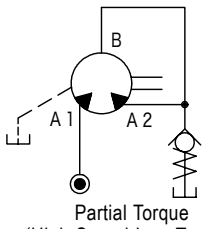
When switching valve is not used

- Select desired torque and determine port connections from below table.

Torque Condition		A1 Port	A2 Port	B Port
Full Torque	Lo-speed, high-torq	Inlet	Inlet	Outlet
Partial Torque	High speed, low torq	Inlet	Outlet	
		Outlet	Inlet	



Full Torque
(Low Speed High Torque)



Partial Torque
(High Speed Low Torque)

- For 3-speed models (MHT70/45/25), ports should be connected as the following table.

Torque Condition		A1 Port	A2 Port	B Port
Full Torque	Lo-speed, high-torq	Inlet	Inlet	Outlet
Partial Torque	Med-speed, med-torq.	Outlet	Inlet	
	High speed, low torq	Inlet	Outlet	

- Always use special switching valve for MHT750/625/500/375 and MHT1000/750/500.
- When using MHT50/25/25 with left hand rotation, the port connections shown in the above left table should be reversed.

Operating Considerations

- Mounting
  Mount motor using 4 bolt holes on the mounting flange (for MHT24, 32, 50, use 6 mounting holes on body). See dimensions for information on bolt tightening torque.
- Drain
  Drain should be piped directly to tank. Allowable drain line back pressure is 0.17MPa.
- When motor is used at pressures below 3.5MPa or less than 50 rpm, confirm that drain flow is above values given in the table below. If drain flow is low, raise back pressure on motor outlet and increase drain flow.

Model	Drain cm^3/min	Model	Drain cm^3/min
MHT24/12/12	200	MHT190/95/95	200
MHT32/16/16		MHT250/125/125	
MHT50/25/25		MHT380/190/190	570
MHT70/35/35		MHT500/250/250	
MHT90/45/45		MHT750/375/375	760
MHT150/75/75		MHT1000/500/500	

- Rotation
  Uni-directional, either right (standard) or left rotation. Motor cannot be operated in both directions (except for MHT50/25/25). Consult Tokimec for left hand rotation models.
- Motor cannot be used as brake (pump).
- Maintain the difference in temperatures between motor and oil to less than 28°C. In the case motor is cold and oil hot, run motor at no load at load speed (less than 50 rpm) until the differential is less than 28°C before normal operation.
- For initial startup, fill oil from each port and operate after motor is completely filled with oil.
- See page N2 for Vane Motor Operating Considerations

Piping Flange (conforming to SAE J518c standard pressure)

When used with DMHT switching valve

Motor Model	Flange Model					
	A Port			B Port		
	Size	Threaded	Welded	Size	Threaded	Welded
MHT24/12/12	1-1/4	FL1-10-10P-10-JA-S4-J	FL1-10-10W-10-JA	1-1/4	FL1-10-10P-10-JA-S21-J	FL1-10-10W-10-JA-S21
MHT32/16/16						
MHT50/25/25					FL1-10-10P-10-JA-S19-J	FL1-10-10W-10-JA-S19
MHT70/35/35	1-1/2	FL1-12-12P-10-JA-S4-J	FL1-12-12W-10-JA	1-1/2	FL1-12-12P-10-JA-S19-J	FL1-12-12W-10-JA-S19
MHT70/45/25						
MHT90/45/45						
MHT150/75/75	2	FL1-16-16P-10-JA-S4-J	FL1-16-16W-10-JA	2	FL1-16-16P-10-JA-S19-J	FL1-16-16W-10-JA-S19
MHT190/95/95	2-1/2	FL1-20-20P-10-JA-S4-J	FL1-20-20W-10-JA	2-1/2	FL1-20-20P-10-JA-S19-J	FL1-20-20W-10-JA-S19
MHT250/125/125						
MHT380/190/190						
MHT500/250/250						
MHT750/375/375						
MHT1000/500/500						
MHT750/625/500/375		FL1-20-20P-10-JA-S19-J	FL1-20-20W-10-JA-S19		FL1-20-20P-10-JA-S20-J	FL1-20-20W-10-JA-S20
MHT1000/750/500						

When NOT used with DMHT switching valve

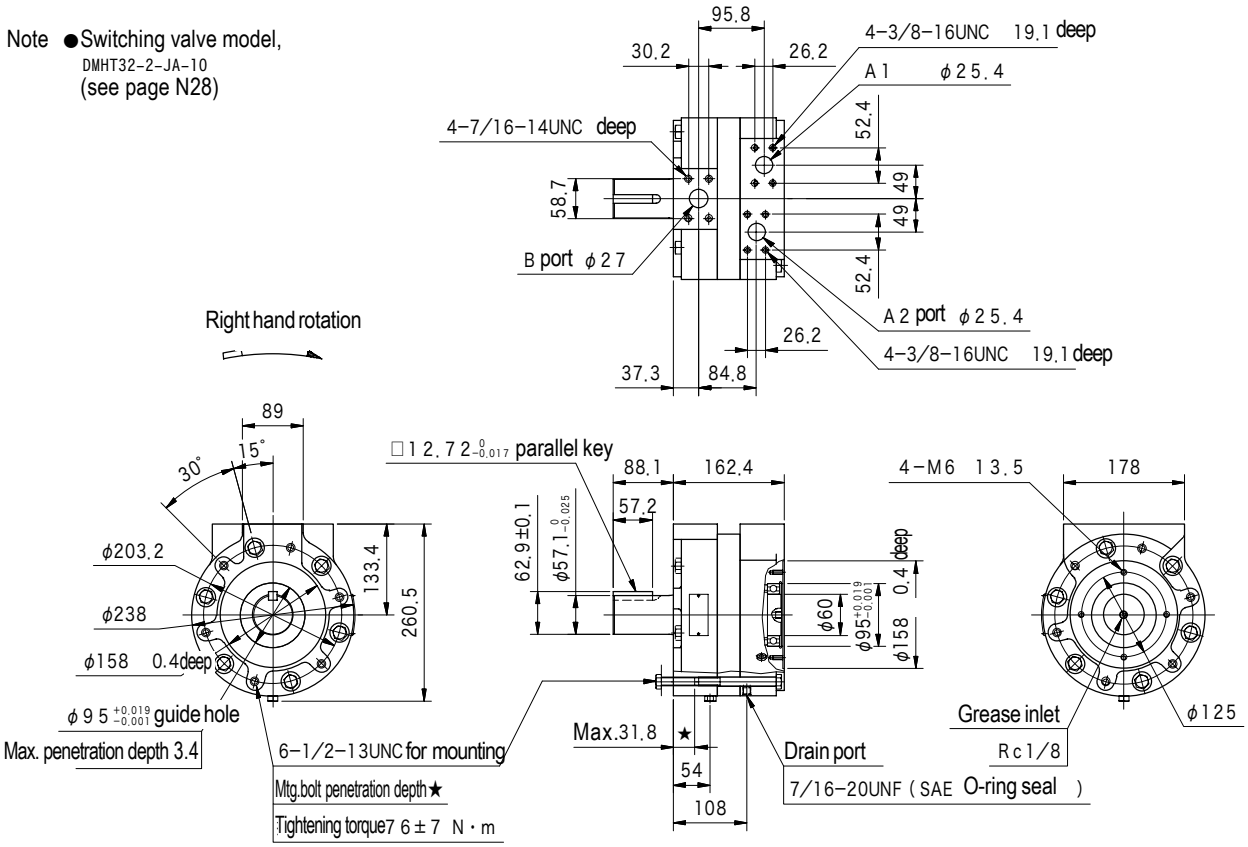
Motor Model	Flange Model					
	A1, A2 Port			B Port		
	Size	Threaded	Welded	Size	Threaded	Welded
MHT24/12/12	1	FL1-8-08P-10-JA-S4-J	FL1-8-08W-10-JA	1-1/4	FL1-10-10P-10-JA-S4-J	FL1-10-10W-10-JA
MHT32/16/16						
MHT50/25/25	1-1/4	FL1-10-10P-10-JA-S4-J	FL1-10-10W-10-JA			
MHT70/35/35				1-1/2	FL1-12-12P-10-JA-S4-J	FL1-12-12W-10-JA
MHT70/45/25						
MHT90/45/45						
MHT150/75/75	1-1/2	FL1-12-12P-10-JA-S4-J	FL1-12-12W-10-JA	2	FL1-16-16P-10-JA-S4-J	FL1-16-16W-10-JA
MHT190/95/95				2-1/2	FL1-20-20P-10-JA-S4-J	FL1-20-20W-10-JA
MHT250/125/125						
MHT380/190/190						
MHT500/250/250						
MHT750/375/375						
MHT1000/500/500						

- Hex socket bolts, spring washer, O-rings included.
- Flanges must be ordered separately.
- See page Q12 for dimensional detail.

Dimensions

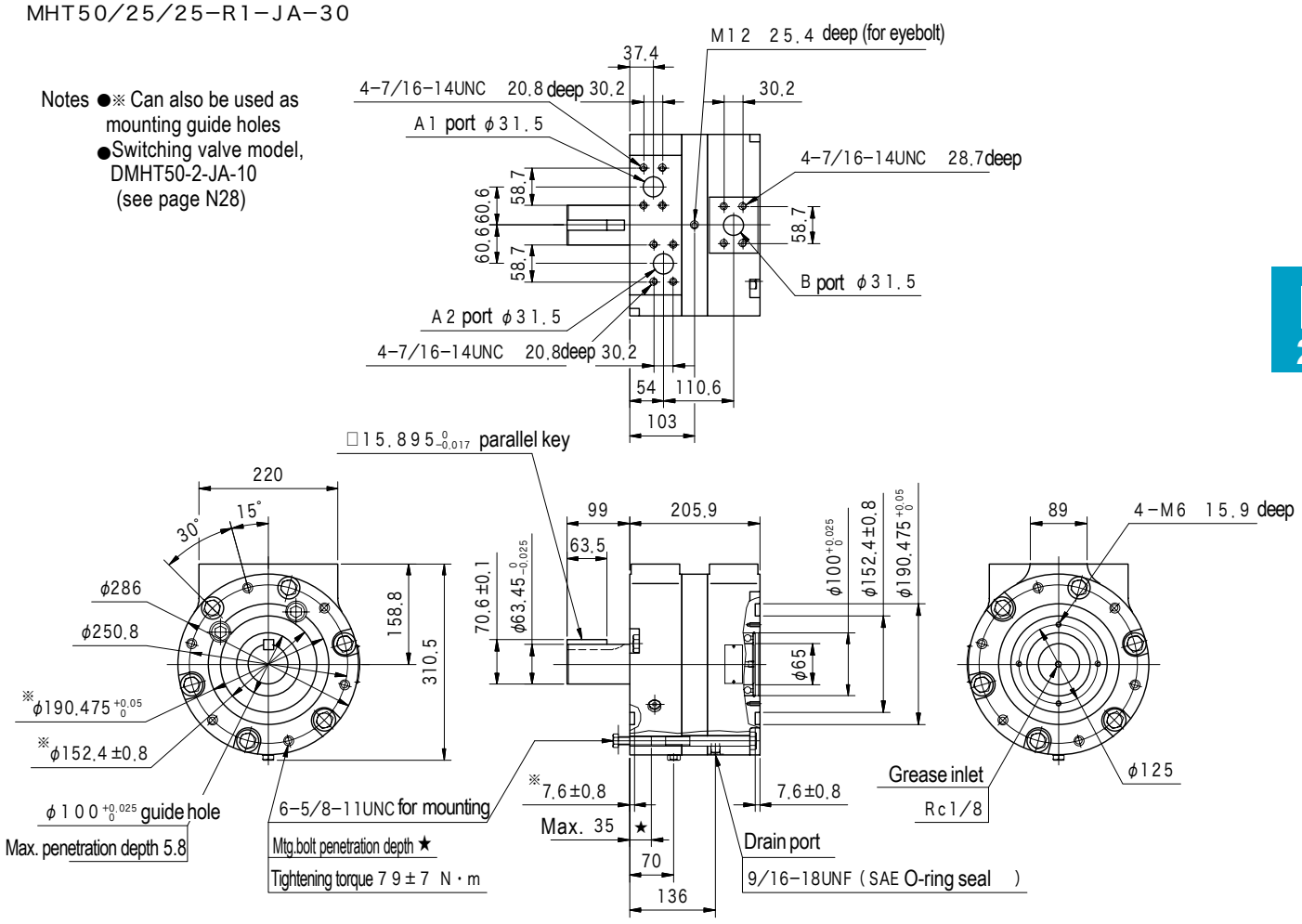
MHT24/12/12-R1-JA-12-S12
MHT32/16/16-R1-JA-12-S12

Note ●Switching valve model,
DMHT32-2-JA-10
(see page N28)



MHT50/25/25-R1-JA-30

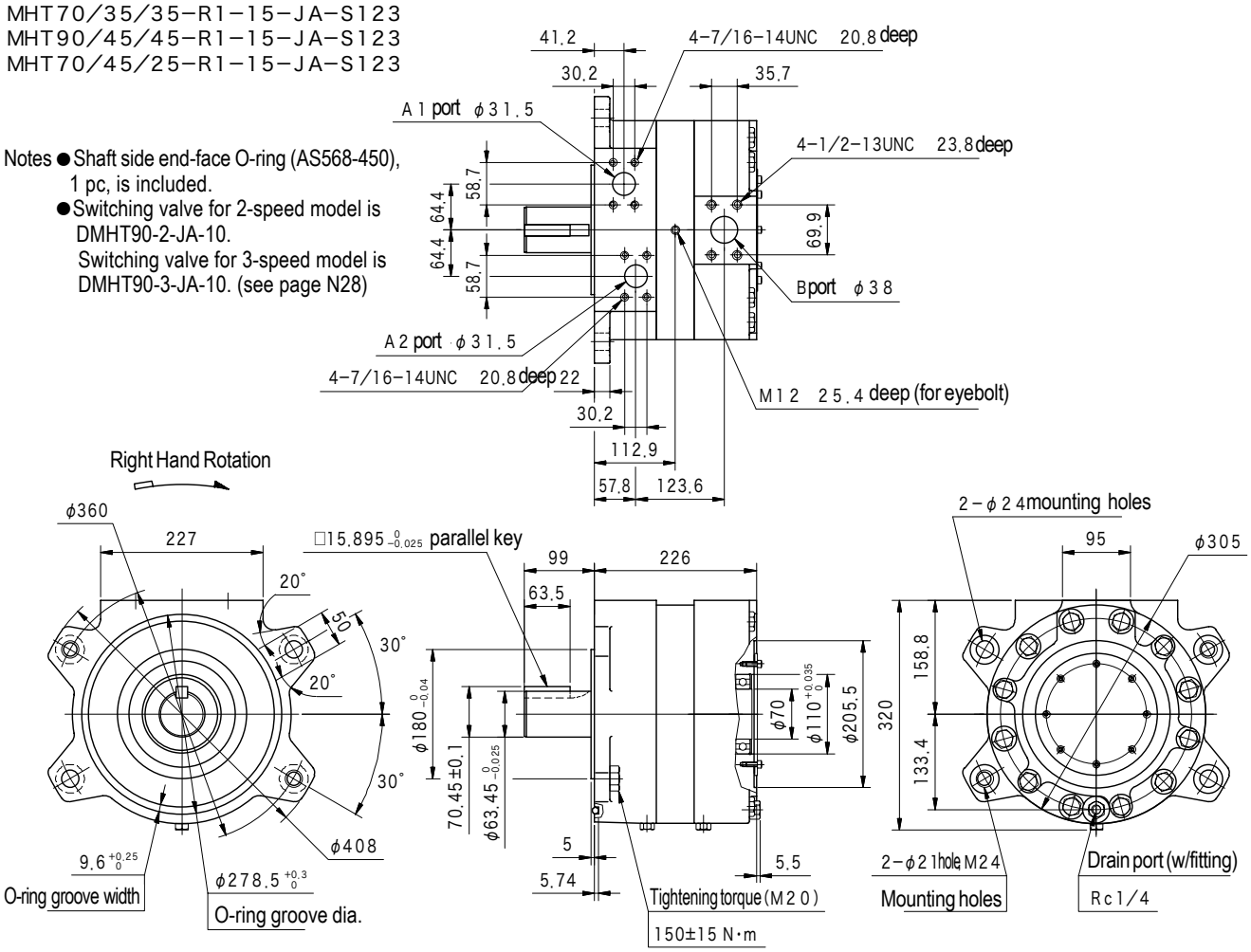
Notes ●※ Can also be used as mounting guide holes
●Switching valve model,
DMHT50-2-JA-10
(see page N28)



Dimensions

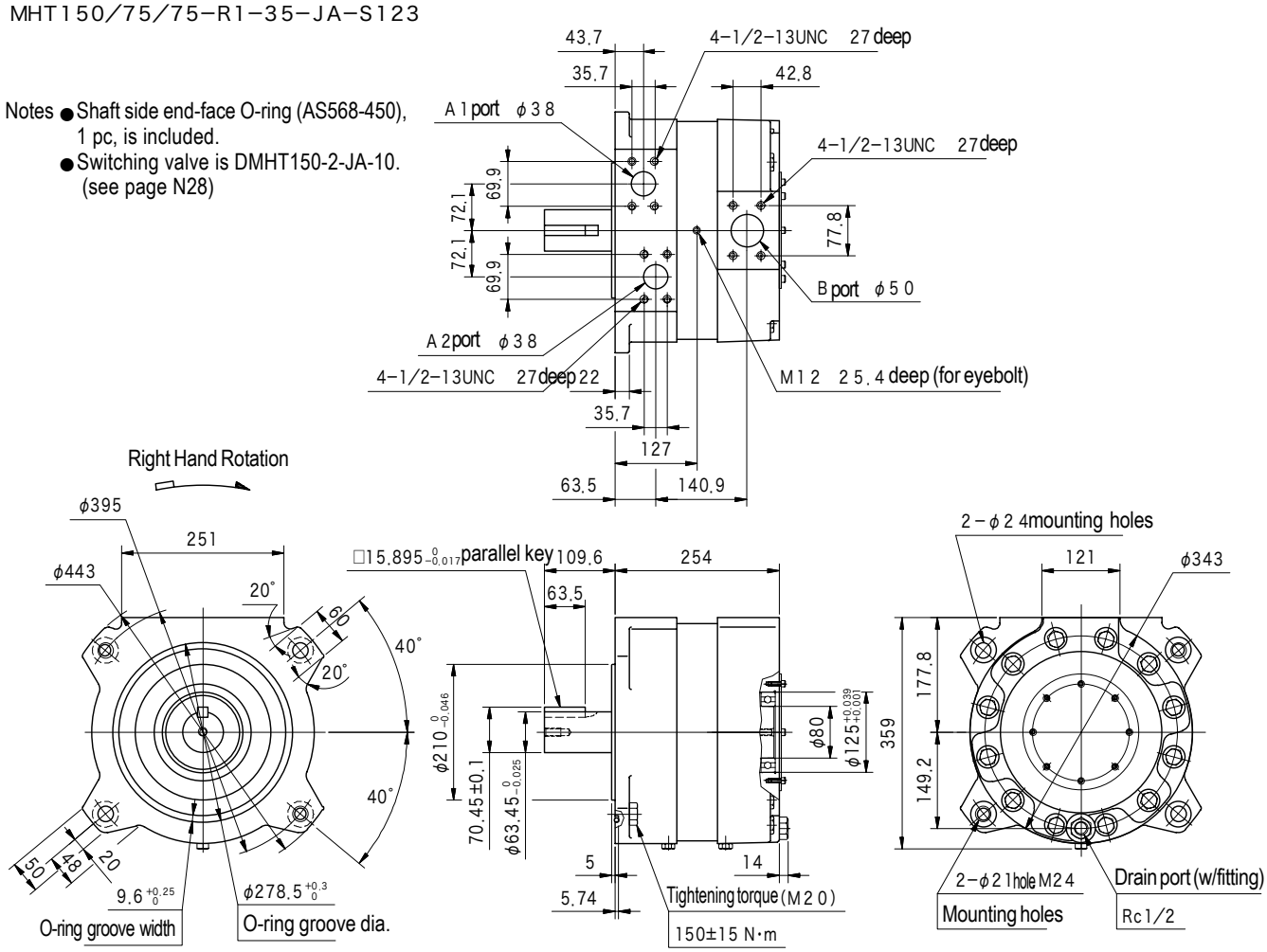
MHT70/35/35-R1-15-JA-S123
MHT90/45/45-R1-15-JA-S123
MHT70/45/25-R1-15-JA-S123

Notes ● Shaft side end-face O-ring (AS568-450), 1 pc, is included.
● Switching valve for 2-speed model is DMHT90-2-JA-10.
Switching valve for 3-speed model is DMHT90-3-JA-10. (see page N28)



MHT150/75/75-R1-35-JA-S123

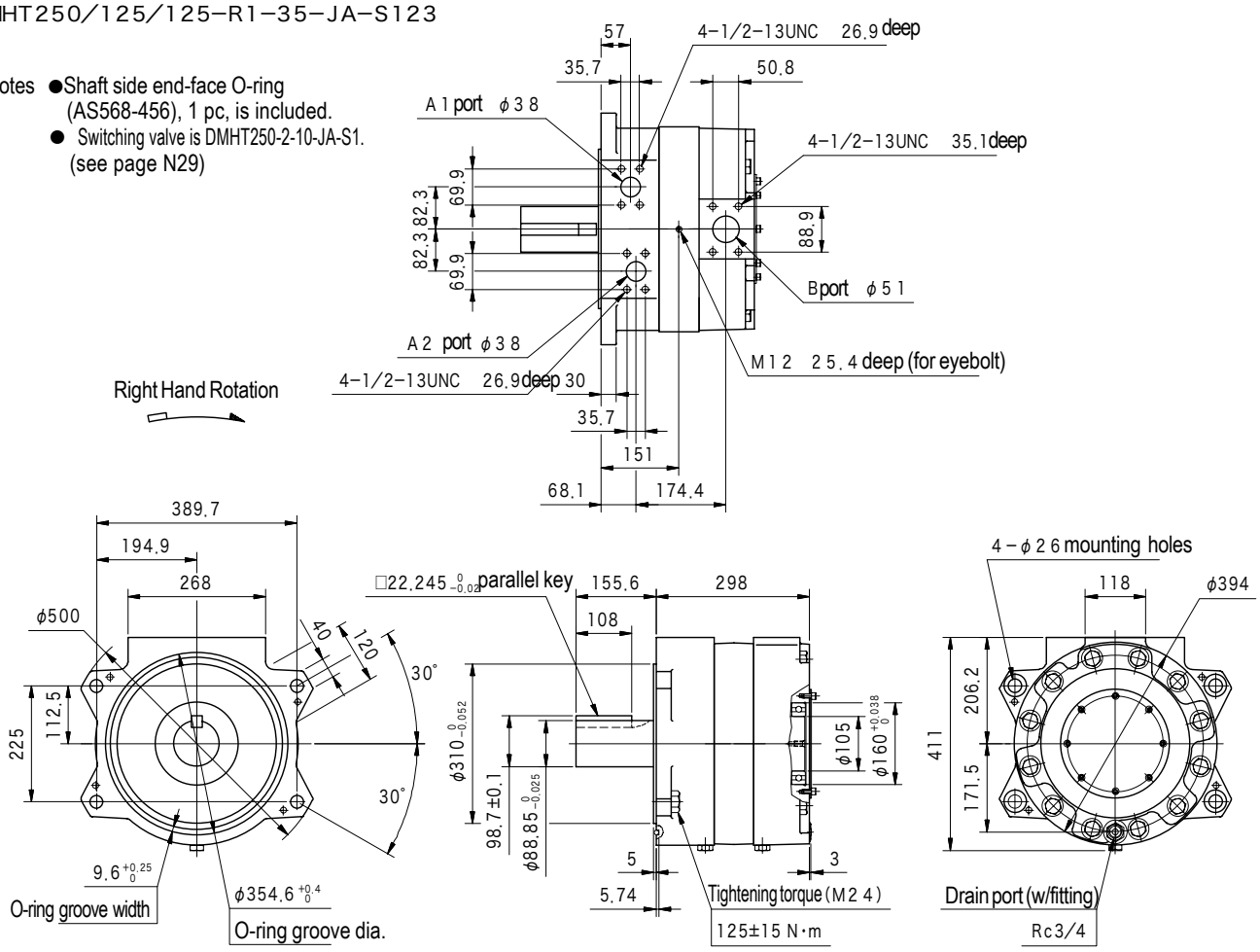
Notes ● Shaft side end-face O-ring (AS568-450), 1 pc, is included.
● Switching valve is DMHT150-2-JA-10. (see page N28)



Dimensions

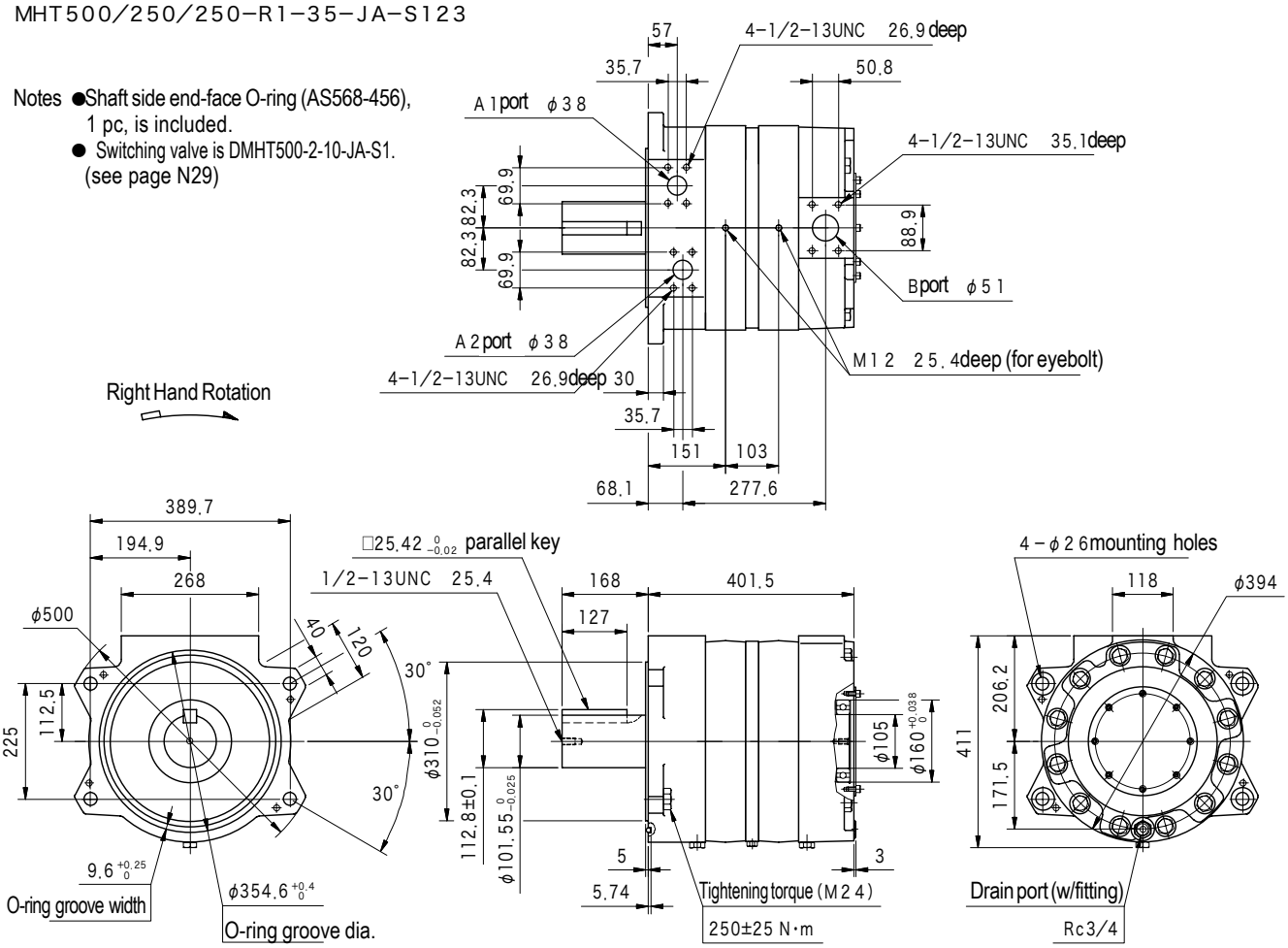
MHT190/95/95-R1-35-JA-S123
MHT250/125/125-R1-35-JA-S123

Notes ●Shaft side end-face O-ring (AS568-456), 1 pc, is included.
● Switching valve is DMHT250-2-10-JA-S1. (see page N29)



MHT380/190/190-R1-35-JA-S123
MHT500/250/250-R1-35-JA-S123

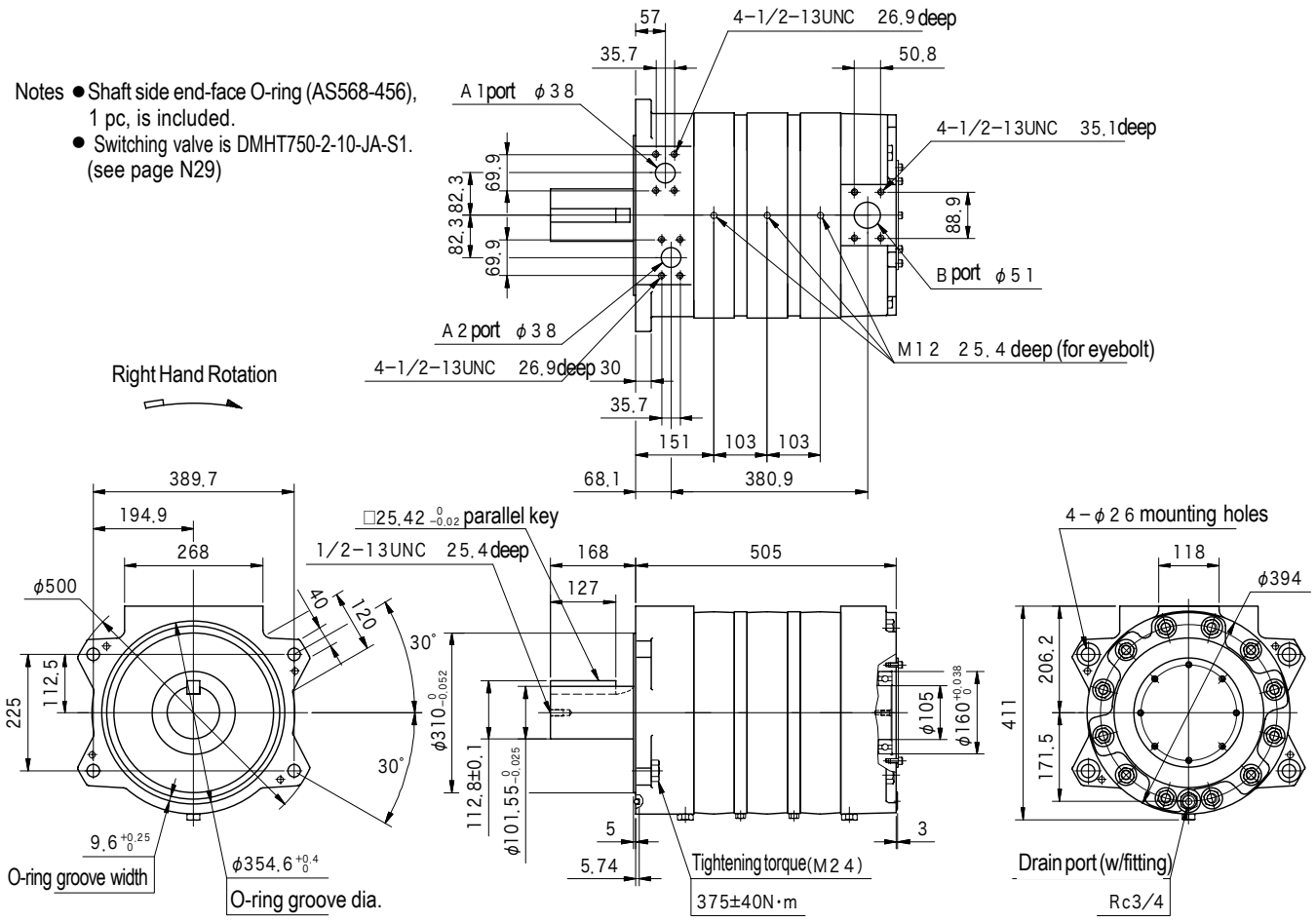
Notes ●Shaft side end-face O-ring (AS568-456), 1 pc, is included.
● Switching valve is DMHT500-2-10-JA-S1. (see page N29)



Dimensions

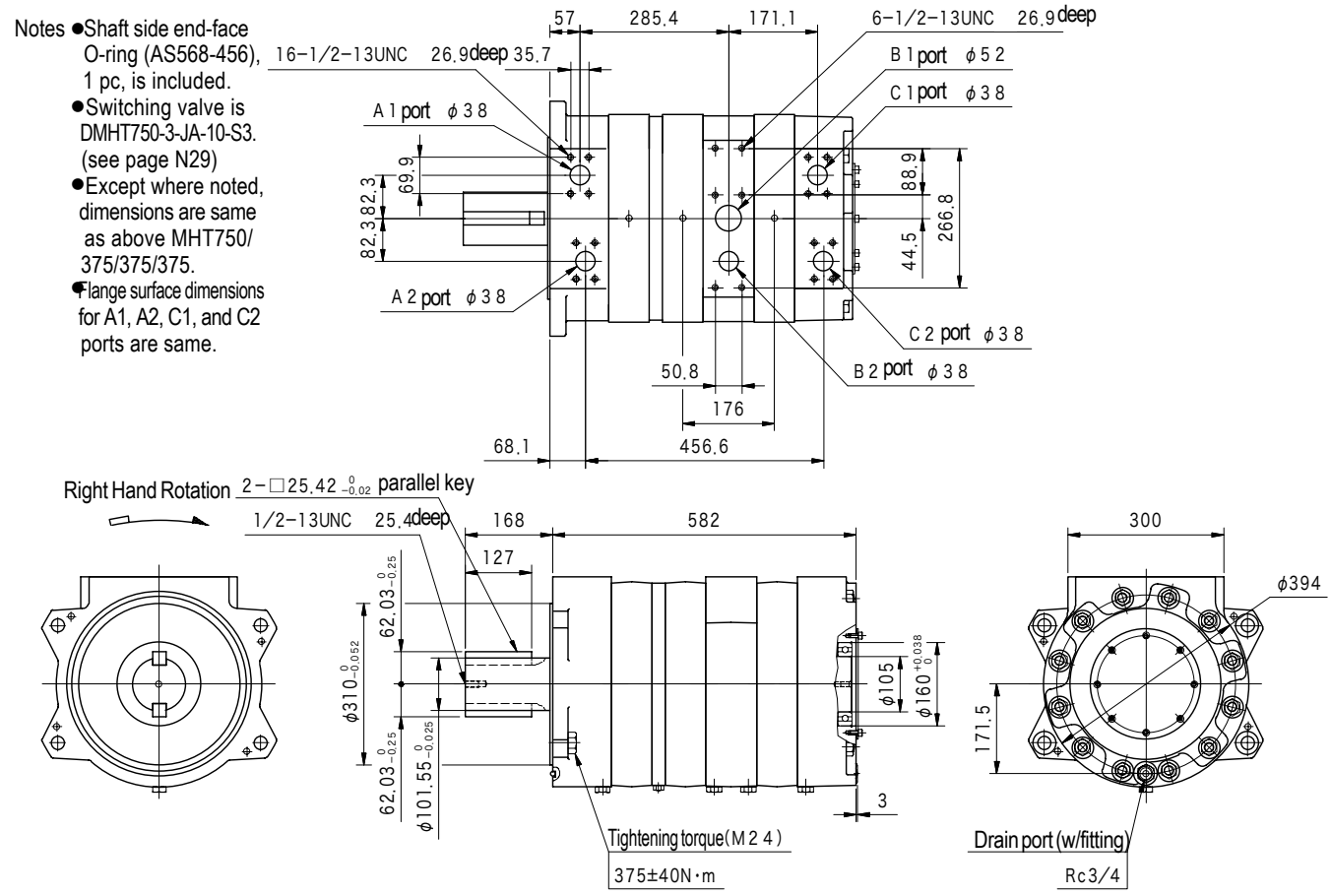
MHT750/375/375-R1-35-JA-S123

Notes
- Shaft side end-face O-ring (AS568-456), 1 pc, is included.
- Switching valve is DMHT750-2-10-JA-S1. (see page N29)



MHT750/625/500/375-R1-JA-35-S123

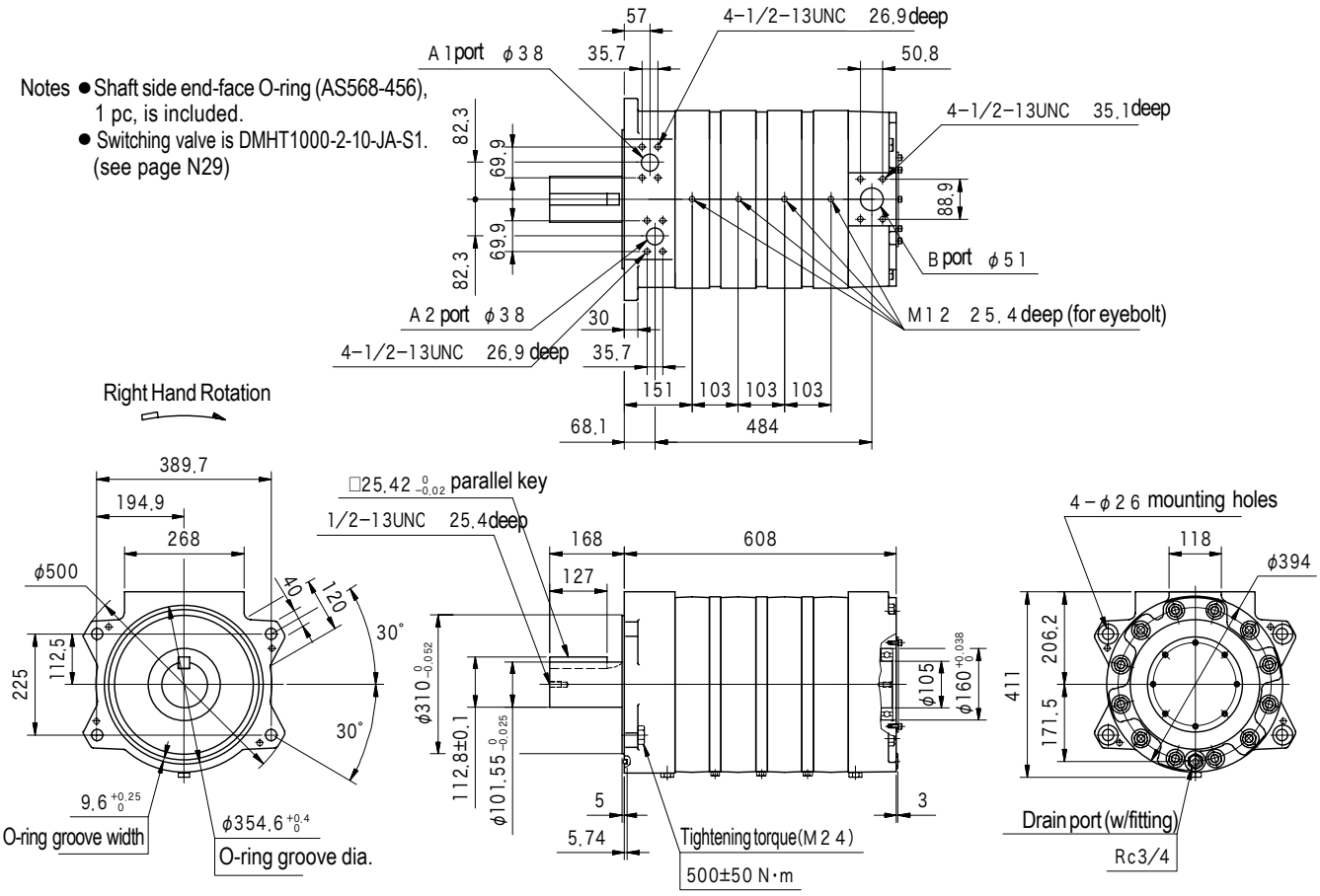
Notes
- Shaft side end-face O-ring (AS568-456), 1 pc, is included.
- Switching valve is DMHT750-3-JA-10-S3. (see page N29)
- Except where noted, dimensions are same as above MHT750/375/375/375.
- Flange surface dimensions for A1, A2, C1, and C2 ports are same.



Dimensions

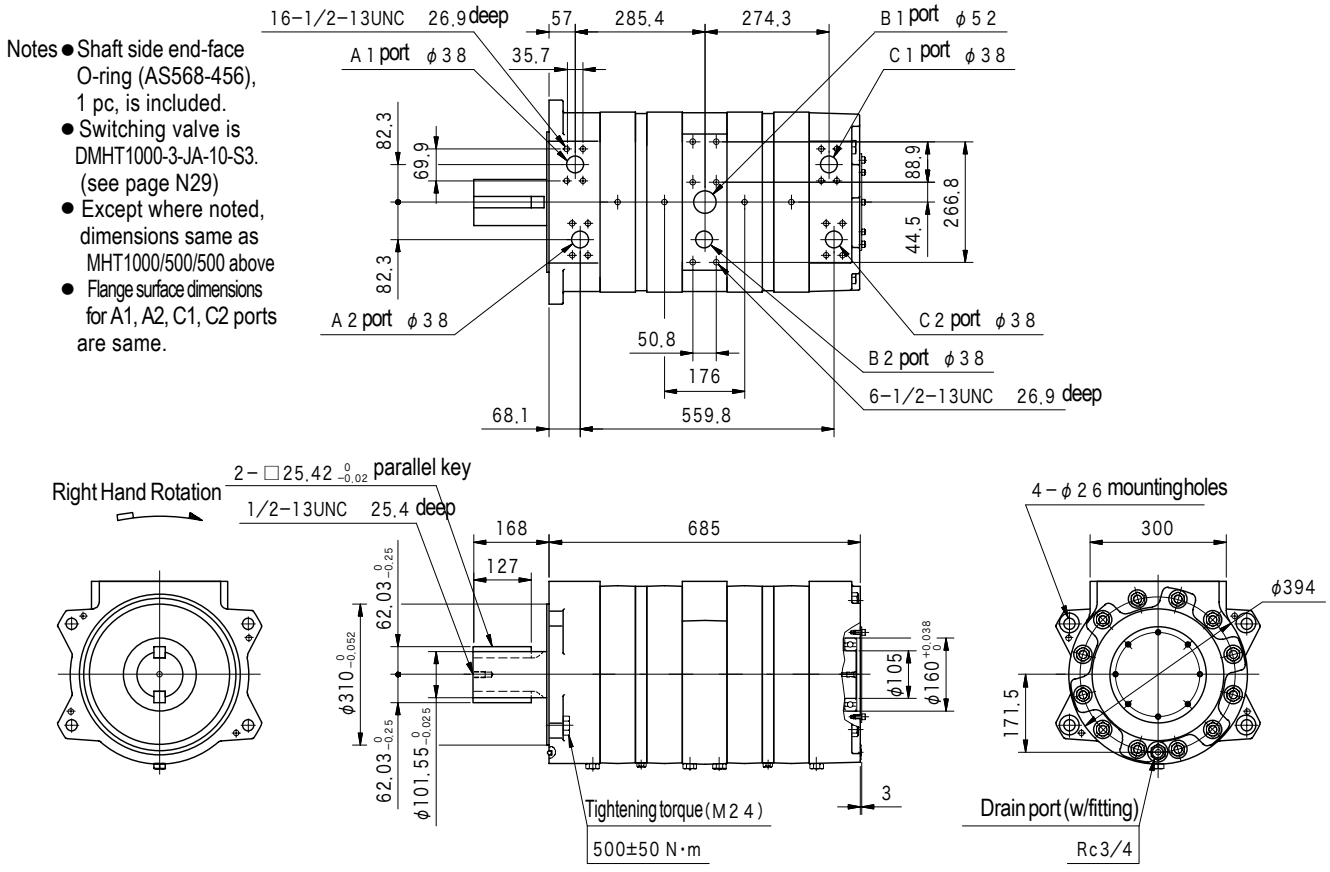
MHT1000/500/500-R1-35-JA-S123

Notes
- Shaft side end-face O-ring (AS568-456), 1 pc, is included.
- Switching valve is DMHT1000-2-10-JA-S1. (see page N29)



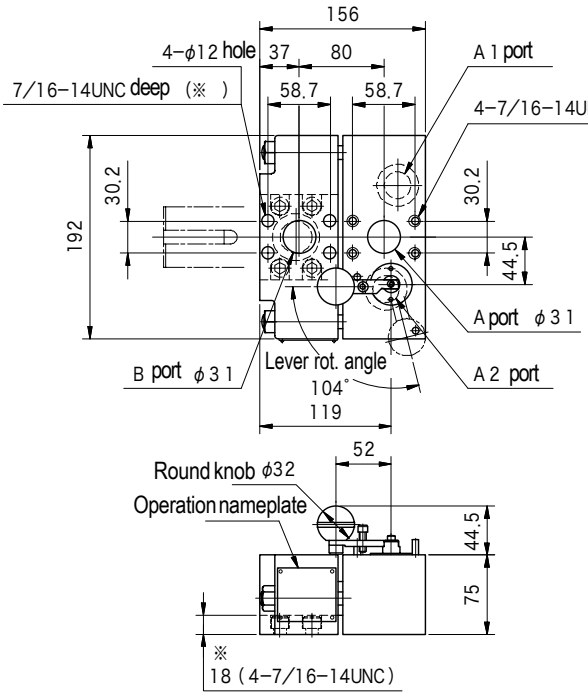
MHT1000/750/500-R1-JA-35-S123

Notes
- Shaft side end-face O-ring (AS568-456), 1 pc, is included.
- Switching valve is DMHT1000-3-JA-10-S3. (see page N29)
- Except where noted, dimensions same as MHT1000/500/500 above
- Flange surface dimensions for A1, A2, C1, C2 ports are same.

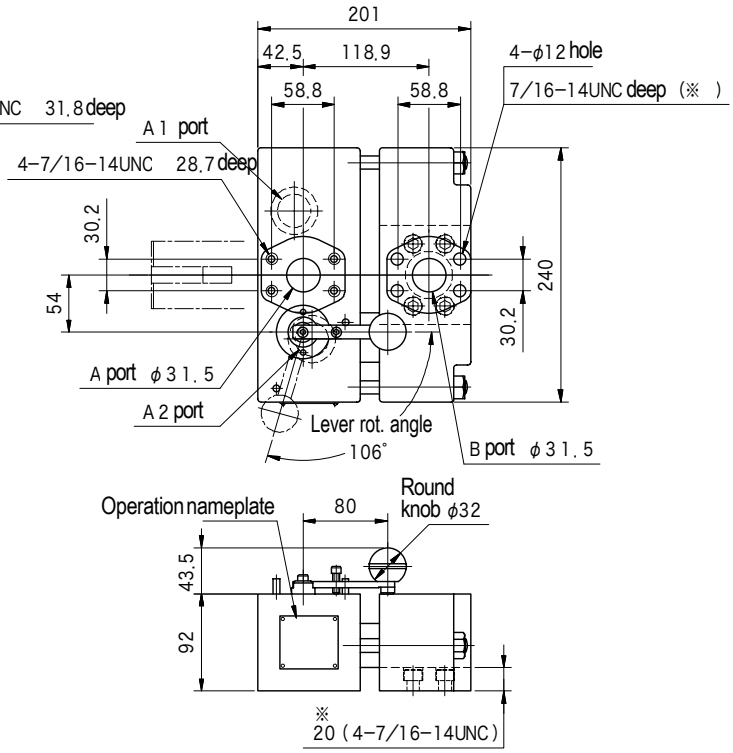


Dimensions

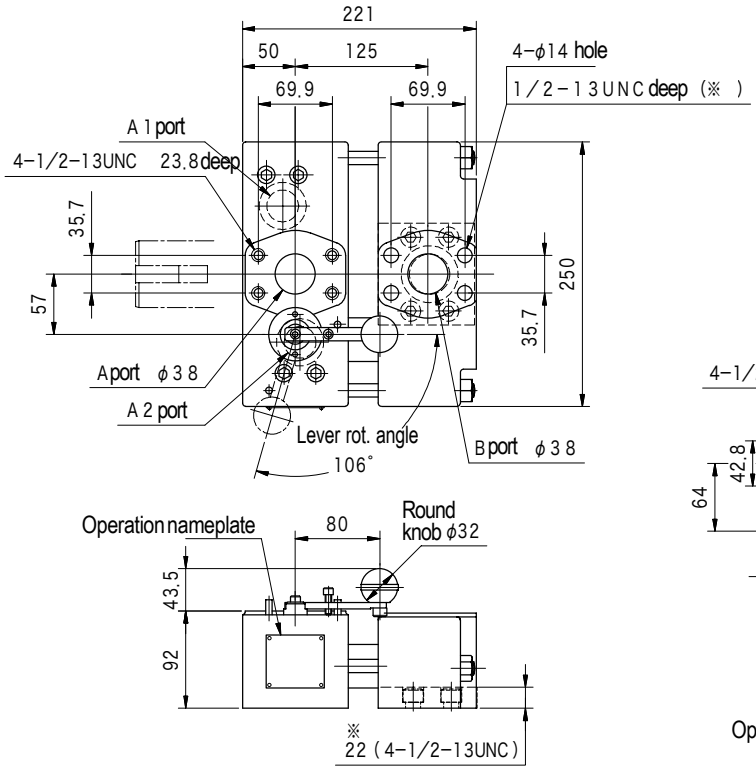
DMHT32−2−JA−10



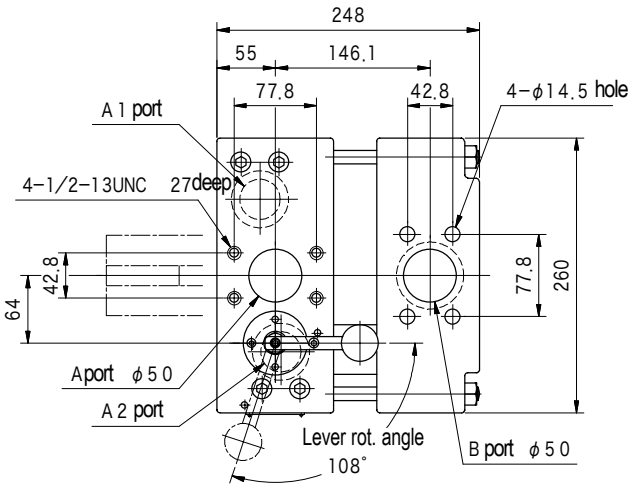
DMHT50−2−JA−10



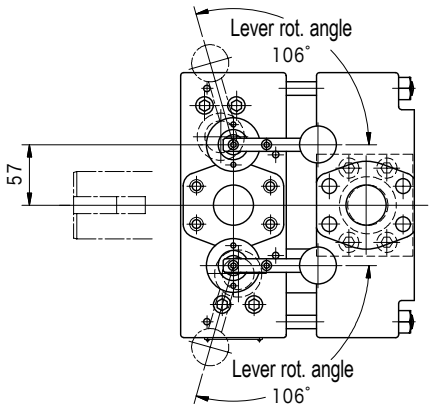
DMHT90−2−JA−10



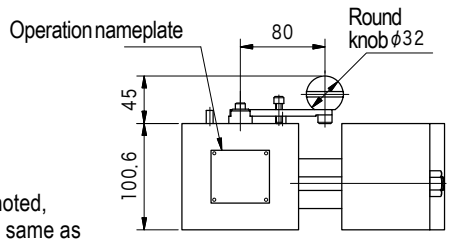
DMHT150−2−JA−10



DMHT90−3−JA−10

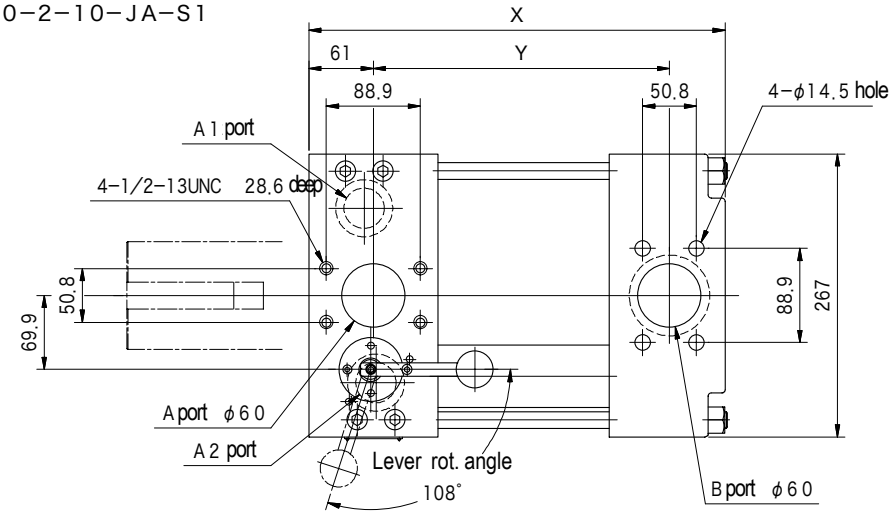


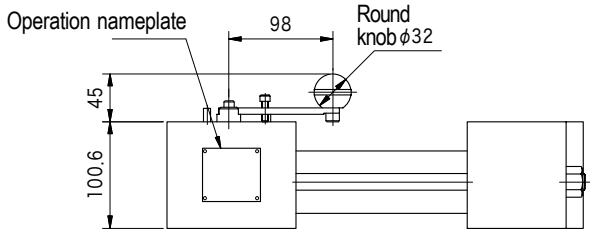
Note ●Except where noted, dimensions are same as DMHT90-2-JA-10 above.



Dimensions

DMHT250−2−10−JA−S1
DMHT500−2−10−JA−S1
DMHT750−2−10−JA−S1
DMHT1000−2−10−JA−S1

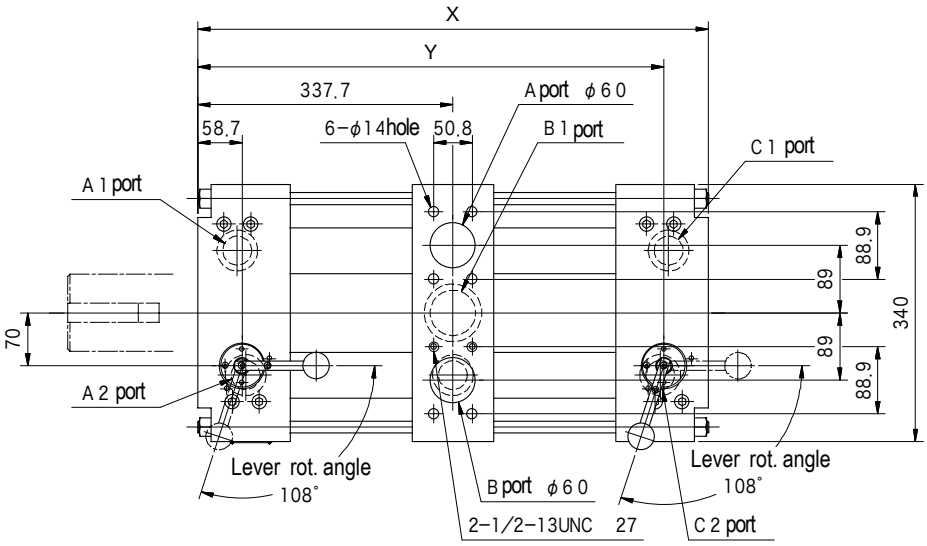


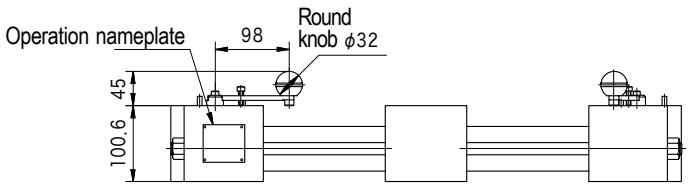


Dimensions

Model	X	Y
DMHT250	291	177
DMHT500	394	280
DMHT750	497	383
DMHT1000	600	486

DMHT750−3−JA−10−S3
DMHT1000−3−JA−10−S3



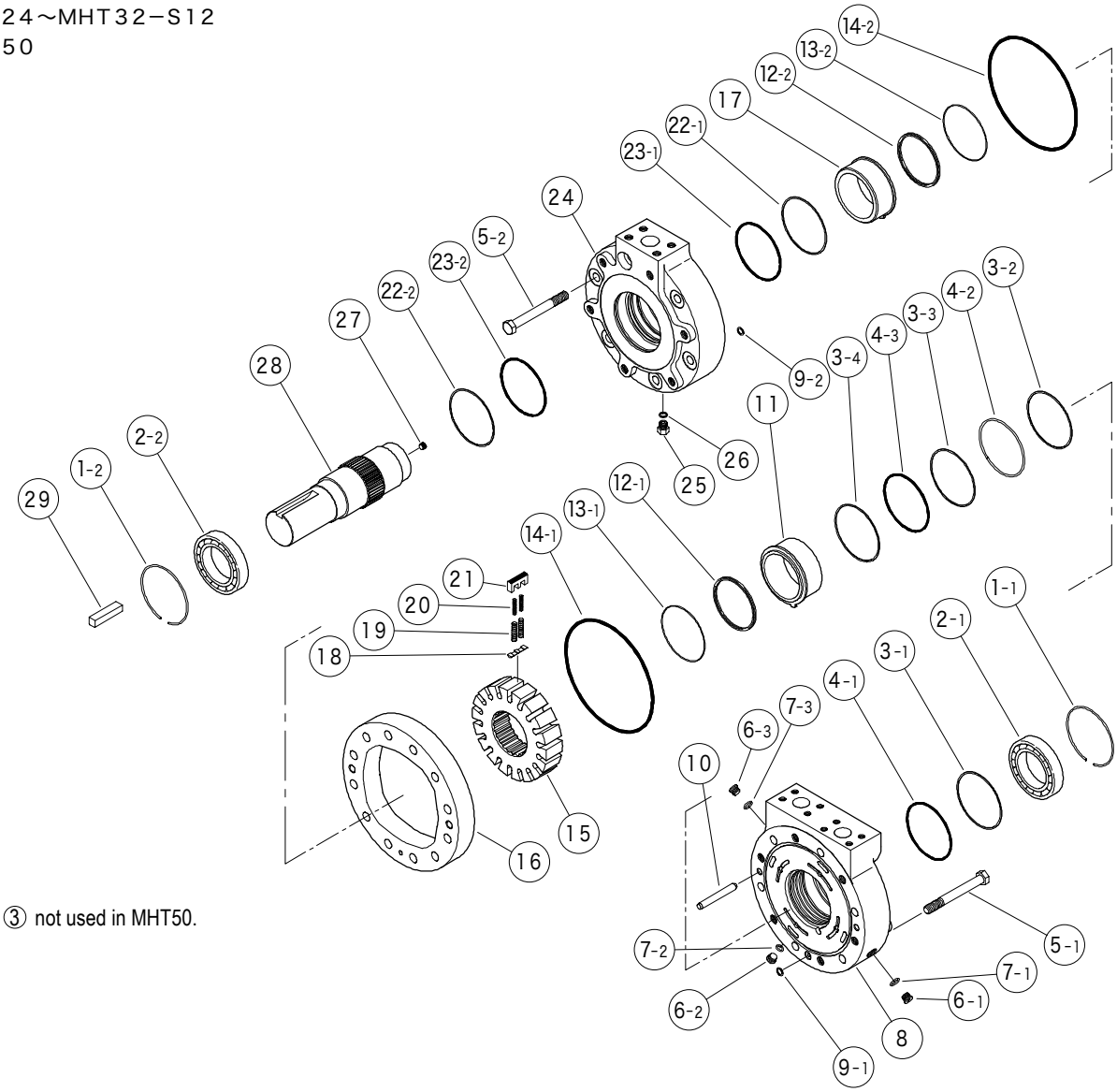


Dimensions

Model	X	Y
DMHT750	572. 3	513. 6
DMHT1000	675. 5	616. 8

Construction

MHT24～MHT32－S12
MHT50



Note● ③ not used in MHT50.

MHT24／12／12－S12
MHT32／16／16－S12

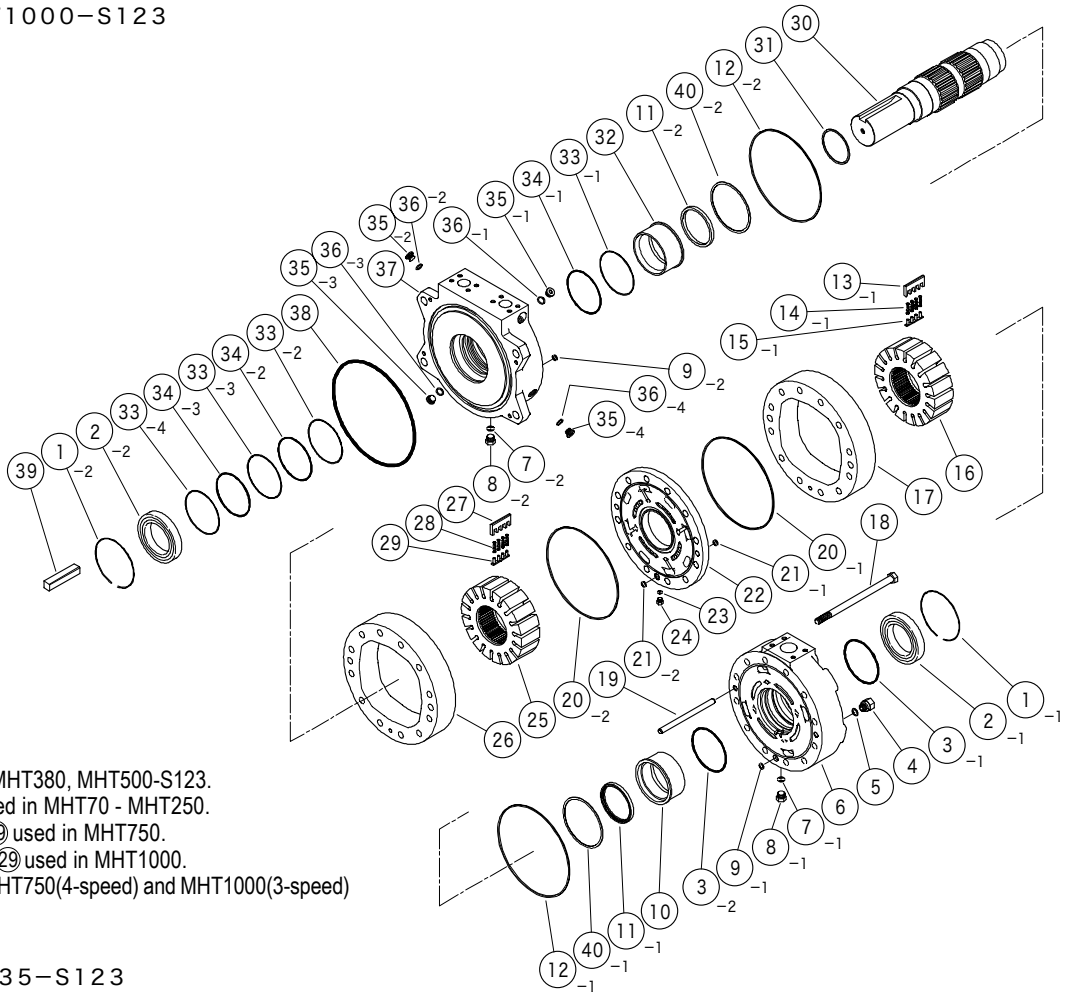
No.	Description	Part No.	Standard	Qty
2	Bearing	40012193	JIS B 1521 6012ZZ	2
3	Backup ring	VA21304	————	4
4	O-ring	007904319	AS568-043 (NBR, Hs90)	3
7	O-ring	007990619	AS568-906 (NBR, Hs90)	3
9	O-ring	007901219	AS568-012 (NBR, Hs90)	2
12	X-ring	VP429290	————	2
14	O-ring	007926219	AS568-262 (NBR, Hs90)	2
22	Backup ring	VA15590	————	2
23	O-ring	007915319	AS568-153 (NBR, Hs90)	2
26	O-ring	007990419	AS568-904 (NBR, Hs90)	1

MHT50／25／25

No.	Description	Part No.	Standard	Qty
2	Bearing	40012194	JIS B 1521 6013ZZ	2
4	O-ring	007904419	AS568-044 (NBR, Hs90)	3
7	O-ring	007990819	AS568-908 (NBR, Hs90)	3
9	O-ring	007911219	AS568-112 (NBR, Hs90)	2
12	X-ring	VP427689	————	2
14	O-ring	007926819	AS568-268 (NBR, Hs90)	2
22	Backup ring	VA15596	————	2
23	O-ring	007923919	AS568-239 (NBR, Hs90)	2
26	O-ring	007990619	AS568-906 (NBR, Hs90)	1

Construction

MHT70～MHT1000－S123



Notes

Schematic is of MHT380, MHT500-S123.
⑳～㉙ not used in MHT70 - MHT250.
Two sets ⑳～㉙ used in MHT750.
Three sets ⑳～㉙ used in MHT1000.
Construction of MHT750(4-speed) and MHT1000(3-speed) is different.

MHT70／35／35－S123
MHT70／45／25－S123
MHT90／45／45－S123

No.	Description	Part No.	Standard	Qty
2	Bearing	40012195	JIS B 1521 6014ZZ	2
3	O-ring	007924119	AS568-241 (NBR, Hs90)	2
5	O-ring	007990619	AS568-906 (NBR, Hs90)	1
7	O-ring	007990619	AS568-906 (NBR, Hs90)	2
9	O-ring	007911219	AS568-112 (NBR, Hs90)	2
11	Shaft seal	40011705	————	2
12	O-ring	007927119	AS568-271 (NBR, Hs90)	2
33	Backup ring	VA15592	————	4
34	O-ring	007915519	AS568-155 (NBR, Hs90)	3
36	O-ring	007991019	AS568-910 (NBR, Hs90)	3
38	O-ring	007945019	AS568-450 (NBR, Hs90)	1

MHT150／75／75－S123

No.	Description	Part No.	Standard	Qty
2	Bearing	40012196	JIS B 1521 6016ZZ	2
3	O-ring	007924619	AS568-246 (NBR, Hs90)	2
5	O-ring	007990619	AS568-906 (NBR, Hs90)	1
7	O-ring	007990619	AS568-906 (NBR, Hs90)	2
9	O-ring	007911219	AS568-112 (NBR, Hs90)	2
11	Shaft seal	VA31071	————	2
12	Seal	40012879	————	2
33	Backup ring	VA15594	————	4
34	O-ring	007915719	AS568-157 (NBR, Hs90)	3
36	O-ring	007991219	AS568-912 (NBR, Hs90)	3
38	O-ring	007945019	AS568-450 (NBR, Hs90)	1

MHT190／95／95－S123　MHT250／125／125－S123　MHT380／190／190－S123
MHT500／250／250－S123　MHT750／375／375－S123　MHT1000／500／500－S123

No.	Description	Part No.	Standard	Quantity			
				MHT190 MHT250	MHT380 MHT500	MHT750	MHT1000
2	Bearing	40012197	JIS B 1521 6021ZZ	2	2	2	2
3	O-ring	007925419	AS568-254 (NBR, Hs90)	2	2	2	2
5	O-ring	007991019	AS568-910 (NBR, Hs90)	1	1	1	1
7	O-ring	007991019	AS568-910 (NBR, Hs90)	2	2	2	2
9	O-ring	007911419	AS568-114 (NBR, Hs90)	2	2	2	2
11	Shaft seal	VA30972	————	2	2	2	2
12	Seal	40012880	————	2	2	2	2
20	Seal	40012880	————	—	2	4	6
21	O-ring	007911419	AS568-114 (NBR, Hs90)	—	2	4	6
23	O-ring	007990619	AS568-906 (NBR, Hs90)	—	1	2	3
33	Backup ring	VA21130	————	4	4	4	4
34	O-ring	007916119	AS568-161 (NBR, Hs90)	3	3	3	3
36	O-ring	007991219	AS568-912 (NBR, Hs90)	4	4	4	4
38	O-ring	007945619	AS568-456 (NBR, Hs90)	1	1	1	1

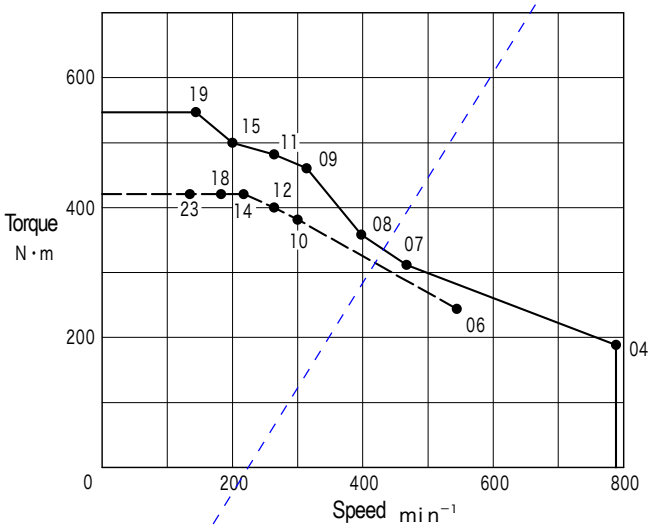
CR／GR－M Output Characteristics

●CR／GR－M

Model	Displ. Code	Displacement cm^3/rev	Operating Pressure MPa	
			Rated	※ Max.
CR GR－M	04	62	21	28
	06	95	18	24
	07	106	21	28
	08	123		
	09	153		
	10	167	16	21. 5
	11	184	18	24
	12	192	15	20
	14	239	12. 5	16. 5
	15	246	14	18. 5
	18	288	10. 5	14
	19	306	13	15. 5
	23	383	8	10. 5

Note ※'Max.' refers to instantaneous maximum pressure.
Not recommended for continuous operation.

Torque at Rated Pressure



Operating Considerations

Hydraulic Fluid

- Max. working pressure and speed, etc., may vary depending on the hydraulic fluid used.
  See Appendix 1 on Hydraulic Fluid for details on fluid selection.
- Mineral based oil
  Use anti-wear oil equivalent to JIS K 2213-2 (additive) ISO VG32-68 (old turbine oil #90~180) or crankcase oil of SAE application class SC, SD, SE, or SF.
- Fire resistant fluids
  – Water glycol fluids cannot be used.
  – Specifications of motor when used with phosphate ester fluids will differ from mineral oil specifications. See specifications of each motor for details. Seals are fluoro-rubber. Add “F3” prefix to model code.
  – Consult Tokimec regarding use of motors with other fire-resistant fluids.

Mounting

- Mounting base of motor should be of sufficient rigidity.
- Motor can be mounted in any attitude.
- Flatness of mounting surface and squareness toleranceshould be less than 0.025mm.
- Mating of mounting pilot should be clearance fit.

Filtration

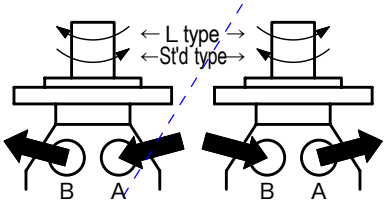
To ensure long motor life, filtration system should be incorporated and all oil in the system should pass through a filter every 8 hours. A 25μm line filter should be used when the motor is in operation.

Fluid Viscosity

Viscosity range of oil used should be 10~860mm²/s with 13~54mm²/s range recommended. Oil temperature should be maintained below 65°C.

Rotation

Motor is bi-directional. With the standard motor, flow to inlet port A will rotate shaft to the left (CCW) when viewed from shaft end and flow to inlet port B will result in right hand (CW) rotation. Rotation reverse of standard model is indicated by “L” in the model code.



CR、GR−M Series

Drain

Regardless of rotation direction, motor is internally drained so that pressure from high pressure side does not act on motor case. Allowable back pressure is 70MPa (2MPa for F3 model) but for longer shaft seal life, back pressures of less than 1.8MPa (1MPa for F3 model) are recommended. When motor is used in circuit with back pressures higher than 1.8MPa (1MPa for F3 model), utilize D type model with external drain port and connect drain directly to tank. For closed loop circuits such as transmissions, by connecting drain line to tank, cooled oil will replenish the circuit loop to restrain temperature rise.

Overload Protection

Incorporate pressure control valve on motor inlet side to prevent overload. For inertial loads, also incorporate pressure control valve on the motor outlet side.

Starting Pressure

Pressure required to start motor under no load differs according to the displacement is below 1.5MPa for CR and GR(2)H Series of motors. For GR-M motors, control valve pilot pressure must be maintained (to release the mechanical brake) and required starting pressure for GR-M*1 is above 1MPa and for GR-M*2 is above 2MPa.

Control Valves

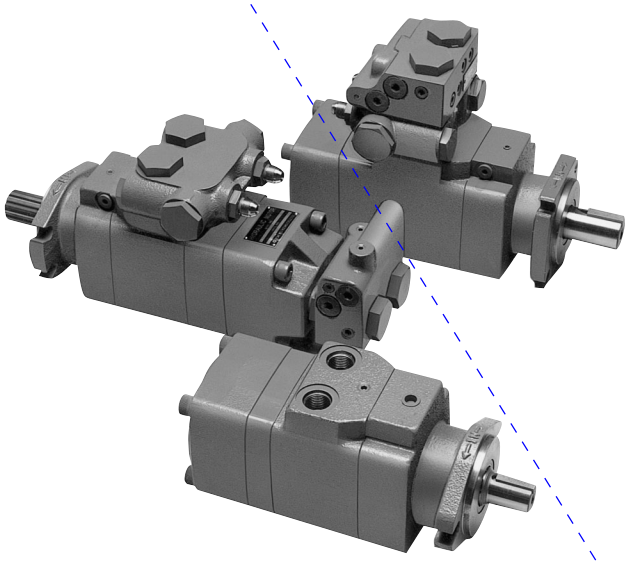
Counterbalance and brake valves should be specified if required.

Allowable Load for Indirect Drive

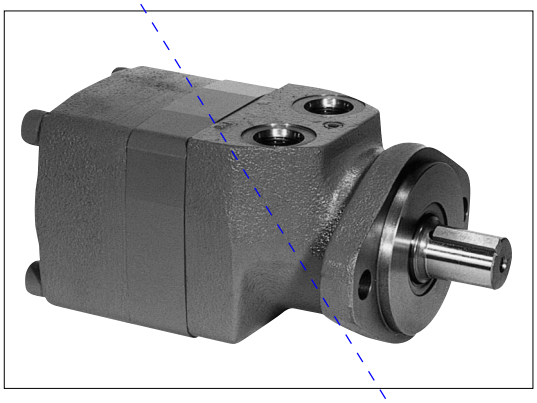
See 'Operating Considerations' each motor series for allowable side loads for indirect drive.

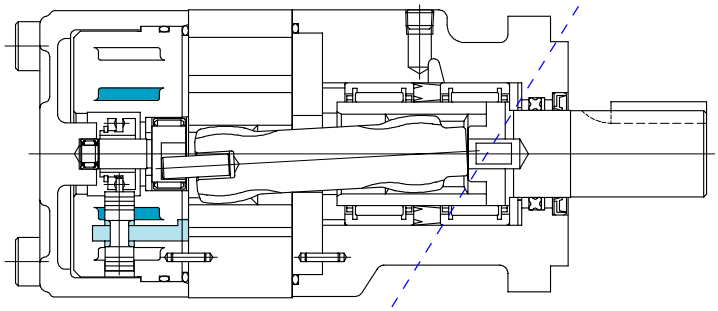
Tachometer Attachment

Consult Tokimec when selecting “T” type motor for tachometer attachment.

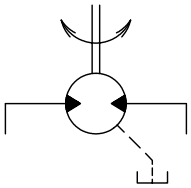


High torque low speed internal gear motors





Functional Symbol



Model Code

(F3) - CR - 04 - 2 S (T) 4 (L) - 30 - (S) (D) - J A - (S150) - (J)

1	2	3	4	5	6	7	8	9	10	11	12	13

1 Fluid
Omitted for minteral oil
F3: phosphate ester

2 Internal gear low speed high torque motor
CR Series

3 Motor displacement code

4 Mounting
2:2 -bolt flange
3:Foot bracket
4:4-bolt flange
5:4-bolt square flange

5 Ports
S:7/8-14UNF threaded port (SAE O-ring seal) in body
P:Rc1/2 taper threaded port in body
G:Flange piping

6 Tachometer mounting
Omitted for no tachometer mounting connection
T: With tach. mounting connection (see 12)

7 Shaft
0:Parallel shaft with square key (1")
4:Parallel shaft with square key (1 1/4")
8:Involute spline shaft (1 1/4")
12:25mm parallel, keyed
13:32mm parallel, keyed

8 Rotation (viewed from shaft end)
Omitted for left rotation with inlet port 'A'
(right rotation with inlet port 'B')
L: right rotation with inlet port 'A'
(left rotation with inlet port 'B')

9 Design no.

10 Distributor valve
Omitted for standard spool distributor valve
S:Low pulsation type spool distributor valve

11 Drain port
Omitted for no drain port (internal drain, standard)
D:Rc 1/8 drain port located on same side as main ports
(external drain)

12 Tachometer mounting
6 'T' designated
S150:X-ring seal used at mounting connection
(used both for internal and external drain)
S151:Shaft seal used at mounting connection
(only for external drain, with 'D' designated
under position)

13 Tapered pipe connection
'P' type for 5 and 'D' type for 11 designated.

Specifications

Model	Displacement cm³/rev	Operating Pressure MPa		Flow L/min		＊2 Torque (diff. press) N・m		Speed (Rated) min⁻¹	Max. Back Pressure MPa	＊1 Weight kg
		Rated	＊3 Max.	Rated	Max.	Rated	＊3 Max.			
CR-04	62	21	28	60	80	185	245	790	7	10.3
CR-06	95	18	24			245	325	545		10.3
CR-07	106	21	28			310	415	465		11.0
CR-08	123					360	480	395		11.3
CR-09	153					460	610	315		11.8
CR-10	167	16	21.5			380	505	300		11.0
CR-11	184	18	24			480	640	265		12.3
CR-12	192	15	20			400	535	265		11.3
CR-14	239	12.5	16.5			420	560	215		11.8
CR-15	246	14	18.5			500	665	195		13.3
CR-18	288	10.5	14			420	560	180		12.3
CR-19	306	13	15.5			550	655	170		13.3
CR-23	383	8	10.5			420	560	135		13.3

＊1 Weight for flange type mounting. Add 2kg for foot bracket and 1kg for tachometer types.
＊2 There may be torque limitations due to shaft configuration. (see page N37 for allowable torque depending on shaft type.)
＊3 'Max.' refers to instantaneous max. Continuous operation is not recommended.

- Models: 13 displacements (6 gerotor widths, 3 eccentricities) (62~383cm³/rev)
- Mounting: flange and foot mounting (2 types, 4 versions)
- Shaft: spline shaft, parallel shaft (2 types, 5 versions)

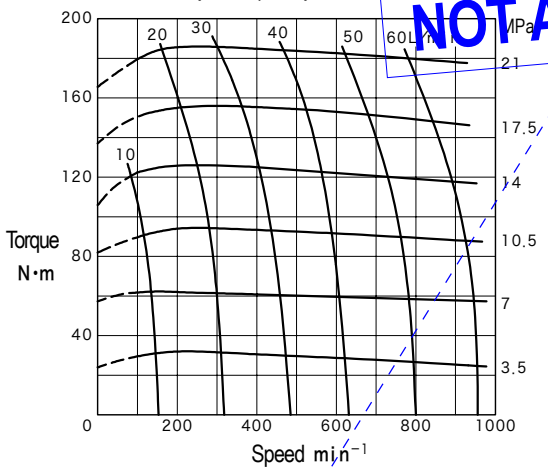
Motor Selection

Refer to the Characteristics Curves to select appropriate model based on the required pressure differential, speed, and torque. For example, select appropriate motor for pressure differential 10.5MPa, speed 300min^{-1}, and torque 240Nm would be CR-10. Required flow 53L/min can also be determined.

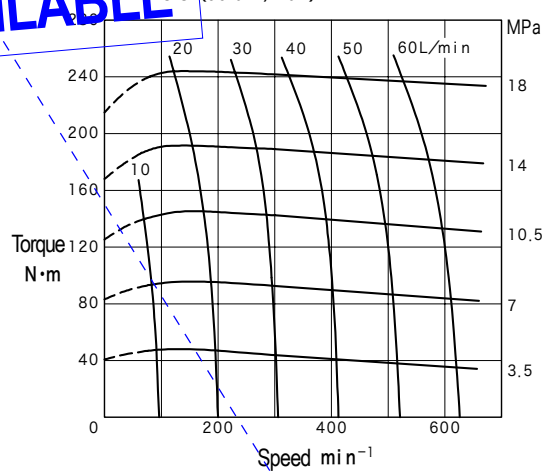
Performance Curves (value with ISO VG32 equivalent fluid operating at 49C°(22mm²/s)

Note: Some characteristics may be different for low pulsation spool type distributor valve (S type) motor. Consult Tokimec.

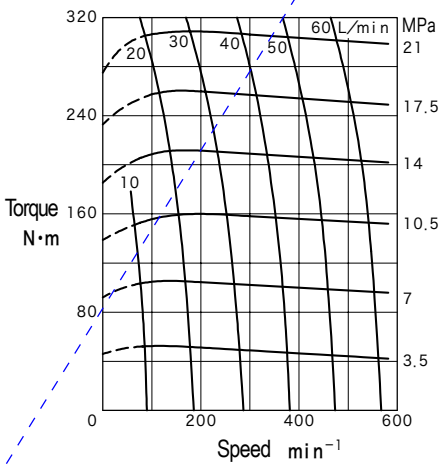
CR−04 (62 cm³/rev)



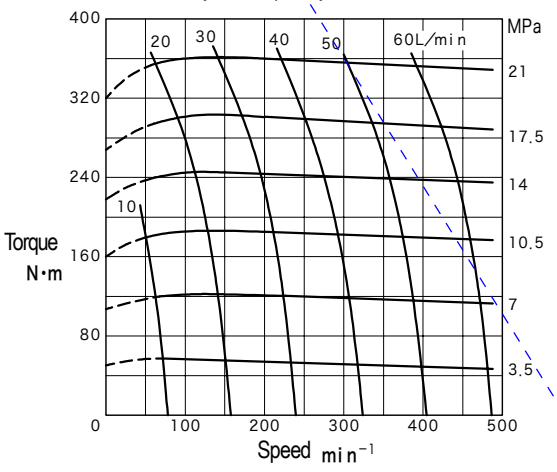
CR−06 (95 cm³/rev)



CR−07 (106 cm³/rev)



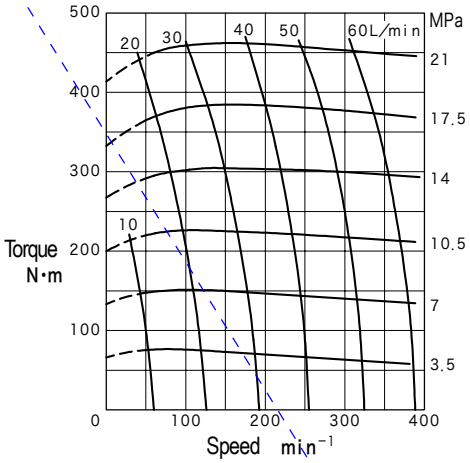
CR−08 (123 cm³/rev)



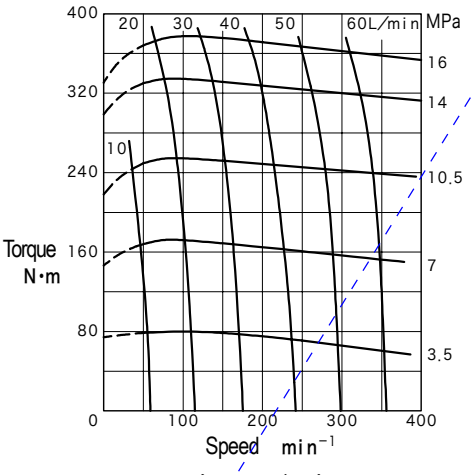
Performance Curves (value with ISO VG32 equivalent fluid operating at 49C°(22mm²/s)

Note: Some characteristics maybe different for low pulsation spool type distributor valve (S type) motor. Consult Tokimec.

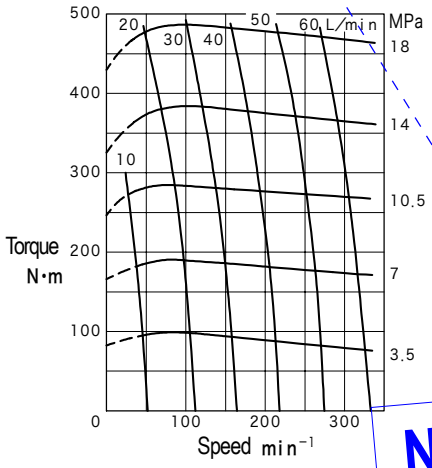
CR−09 (153 cm³/rev)



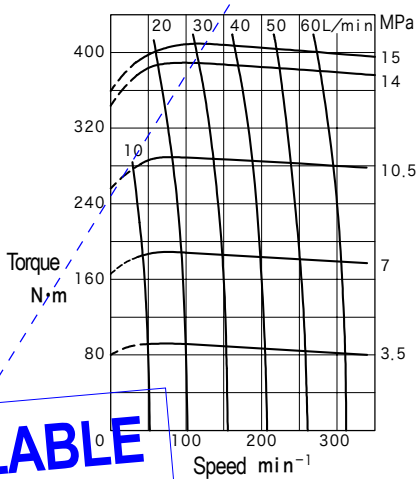
CR−10 (167 cm³/rev)



CR−11 (184 cm³/rev)

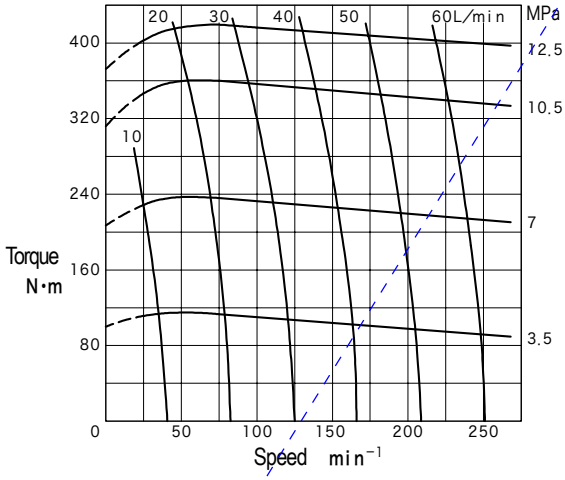


CR−12 (192 cm³/rev)

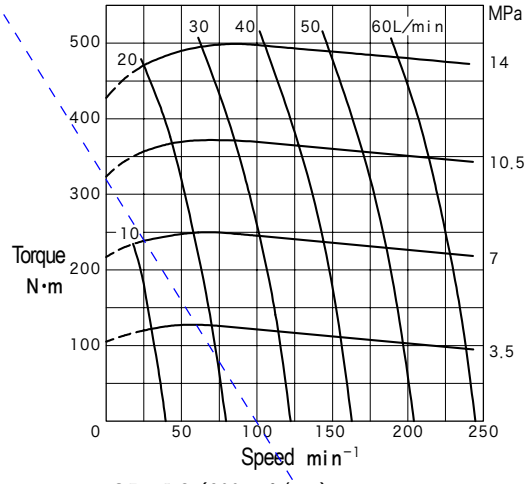


NOT AVAILABLE

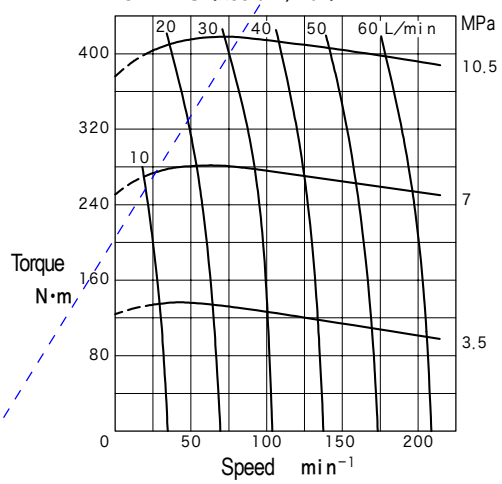
CR−14 (239 cm³/rev)



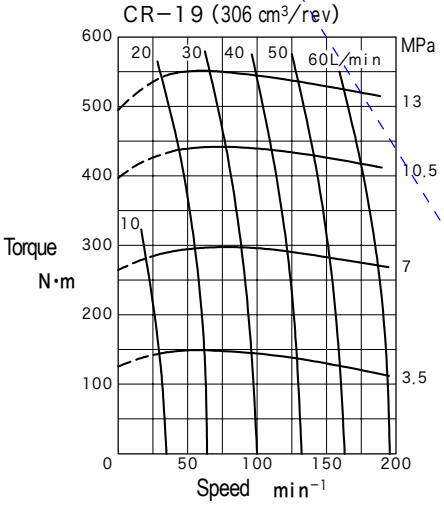
CR−15 (246 cm³/rev)



CR−18 (288 cm³/rev)

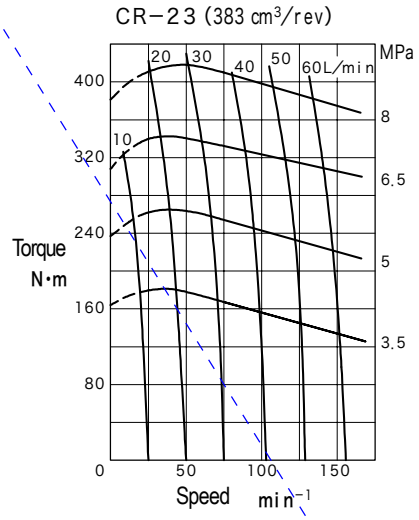


CR−19 (306 cm³/rev)



Performance Curves (value with ISO VG32 equivalent fluid operating at 49C°(22mm²/s)

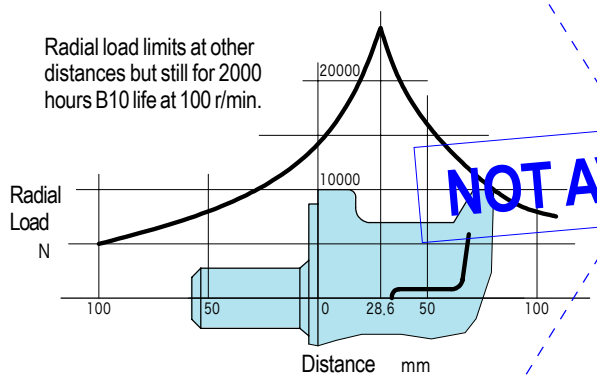
Note: Some characteristics may be different for low pulsation spool type distributor valve (S type) motor. Consult Tokimec.



Operating Considerations

• Indirect drive

In order to satisfy 2000 hour B10 life when operation at 100min^{-1}, with a concentrated radial load from a belt, chain, or gear drive at 20mm from the mounting surface, the permitted radial load would be 10500N. Consult Tokimec for applications involving a thrust load.



- For loads along each point of the curve in the above diagram, B10 life for speeds other than 100min^{-1}, would be as follows:
(2000X100/actual speed) hours

- If 2000 hour B10 life is necessary along all points in the above curve, the allowable speed other than 100min^{-1} is as follows:
(load acting at position) × (100/actual speed) $^{3/10}$ N

• Allowable torque per shaft type

Allowable torque will differ according to shaft type. Application

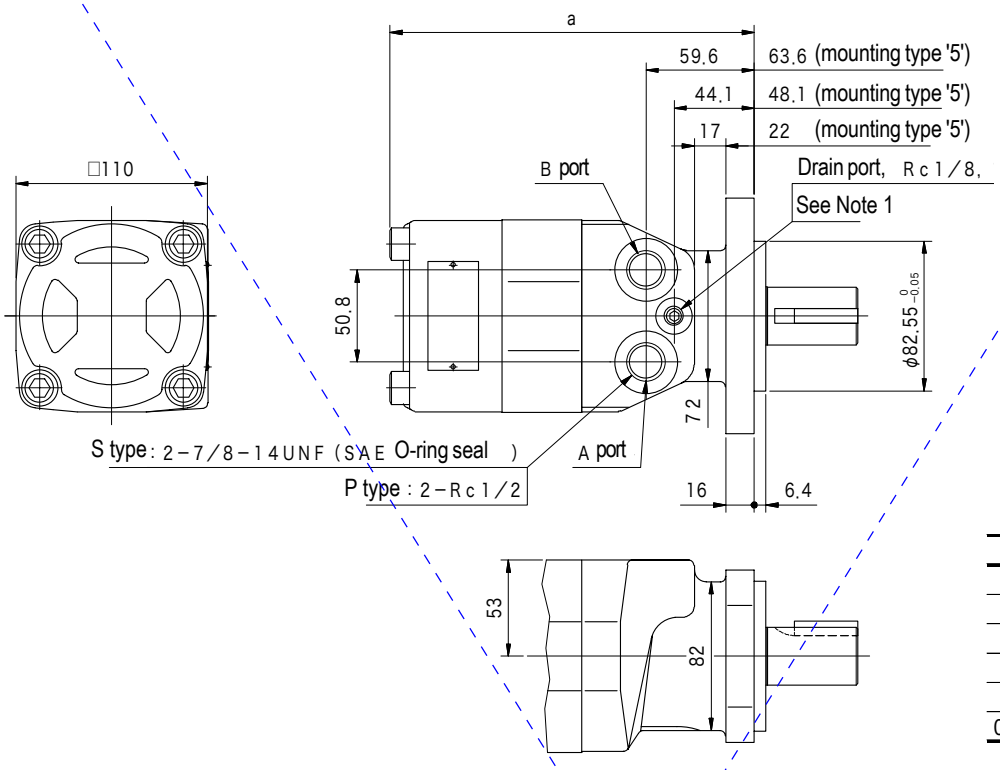
Shaft Type	Allowable Torque N·m
0	230
4	460
8	660
12	230
13	660

torque and braking torque should not exceed the values for each shaft type.

Dimensions

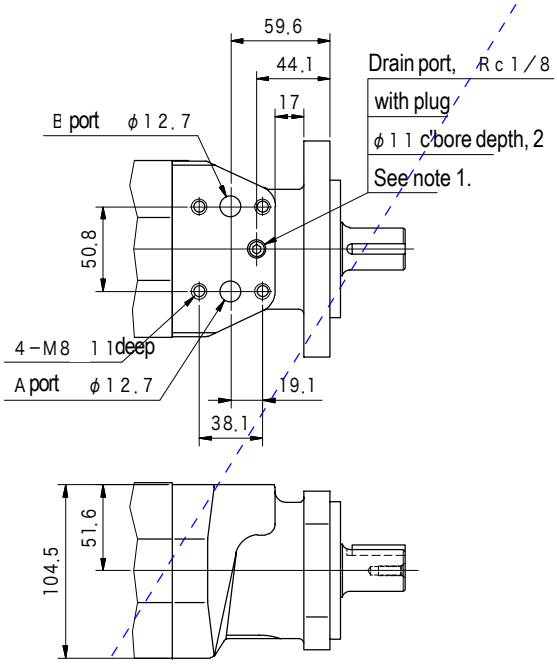
● Porting

S type: 7/8-14UNF (SAE O-ring seal) in body
P type: Rc 1/2 in body

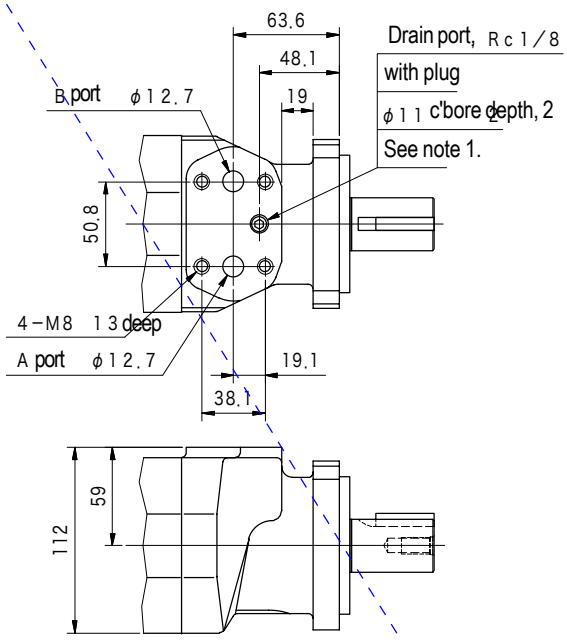


Model	a
CR-04、CR-06	169.5
CR-07、CR-10	179
CR-08、CR-12	182
CR-09、CR-14	188.5
CR-11、CR-18	195
CR-15、CR-19、CR-23	207.5

G type: gasket mounting pad on housing (for mounting types '2', '3', and '4').



G type: (for mounting type '5')



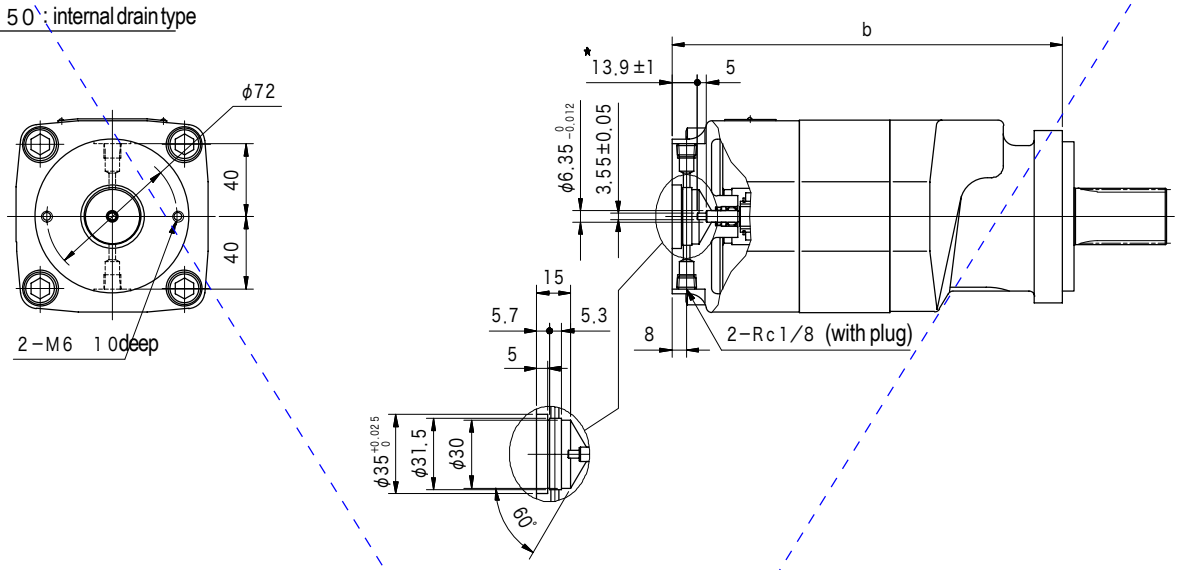
Note 1: Remove plug for external drain type motor.

Dimensions

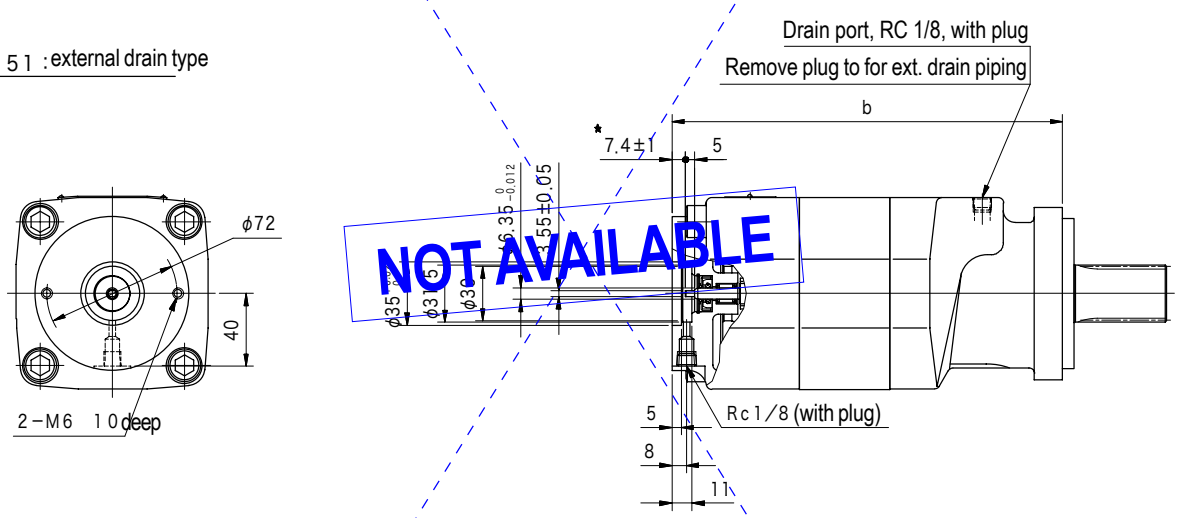
● Porting

T type: tachometer mounting type

S150 : internal drain type



S151 : external drain type



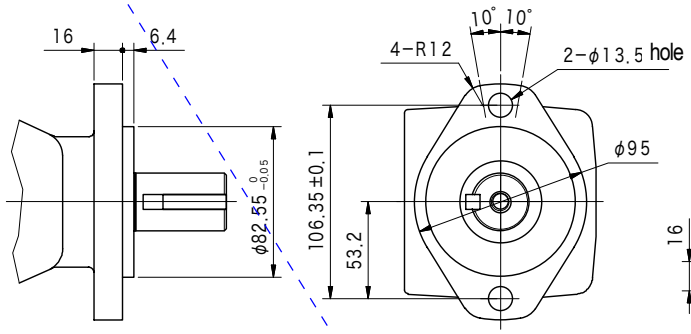
Note: Dimensions marked differ for S150 and S151.

Model	b
CR-04、CR-06	177. 5
CR-07、CR-10	187
CR-08、CR-12	190
CR-09、CR-14	196. 5
CR-11、CR-18	203
CR-15、CR-19、CR-23	215. 5

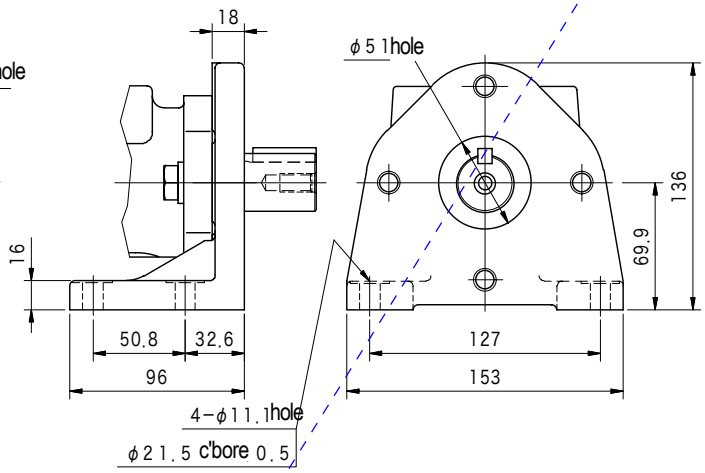
Dimensions

● Mounting

2 type: 2-bolt mounting interface

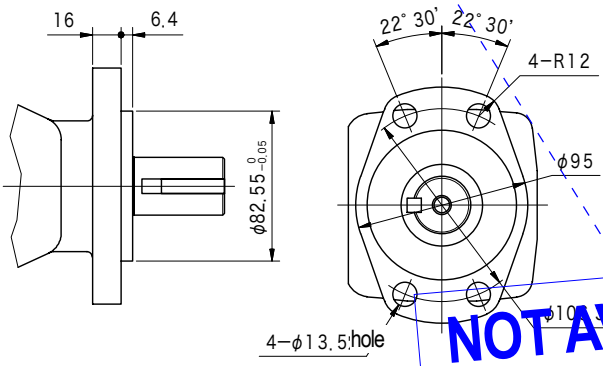


3 type: foot bracket mounting (2 type foot bracket mounting)



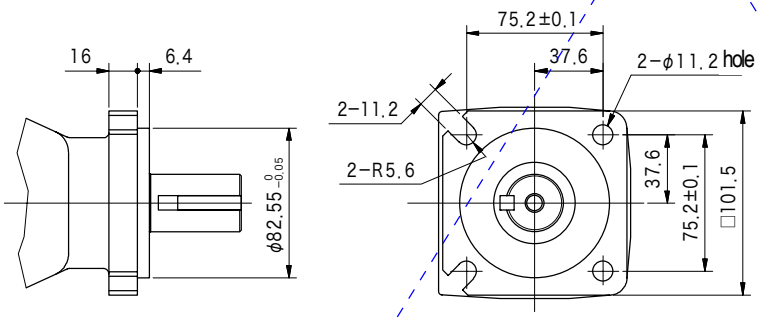
4 type: 4-bolt flange mounting

Note : Cannot be used if there is radial load.



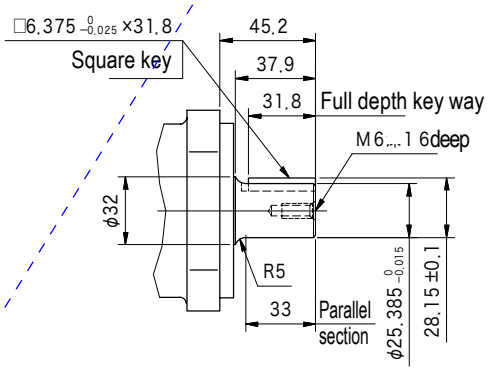
NOT AVAILABLE

5 type: 4-bolt square flange mounting

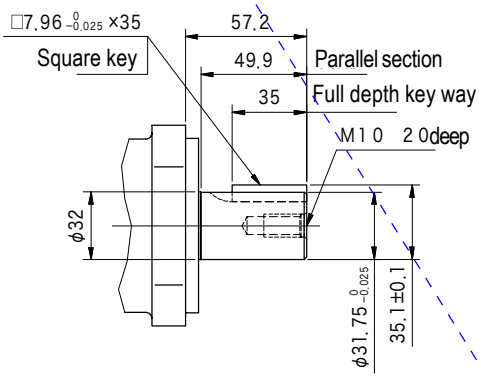


● Shaft

0 type: square key parallel shaft (1")



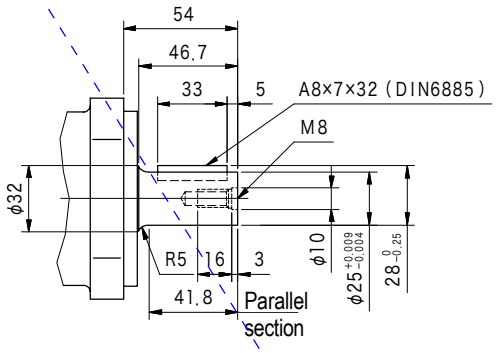
4 type: square key parallel shaft (1 1/4")



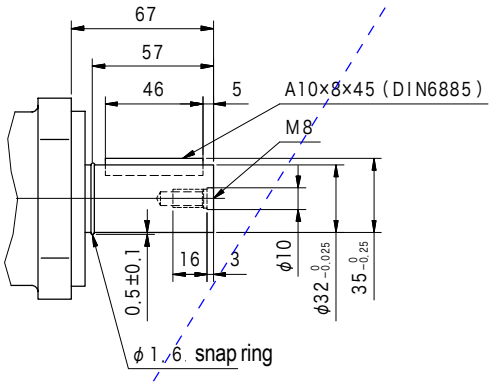
Dimensions

● Shaft

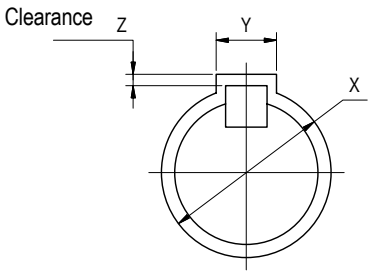
12 type: parallel shaft with key (φ25)



13 type: parallel shaft with key (φ32)

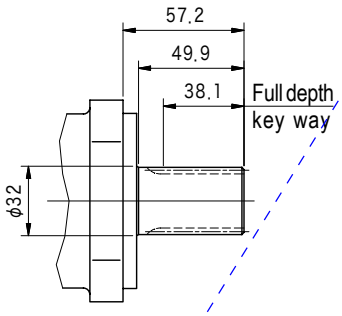


● Recommended coupling dimensions



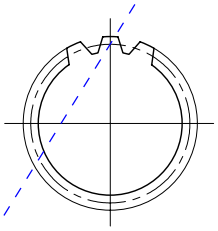
Shaft Type	X	Y	Z
0	φ25.385 +0.021 0	6.375 +0.03 0	0.1～0.5
4	φ31.75 +0.025 0	7.96 +0.036 0	0.1～0.5
12	φ25 +0.021 0	8 +0.036 0	0.1～0.5
13	φ32 +0.025 0	10 +0.036 0	0.1～0.5

8 type: involute spline



Involute Spline Specifications		
Pitch dia. = φ29.634		
Flat root side fit		
Teeth = 14	D.P. = 12/24	Pressure angle = 30°
Min. dia.	T.I.F.D.	Maj. dia.
φ26.99 0 −0.33	φ27.488	φ31.22 0 −0.12
Over pin dia. (when using φ4.064 pin)	= 35.798 0 −0.045	

● Involute spline coupling dimensions

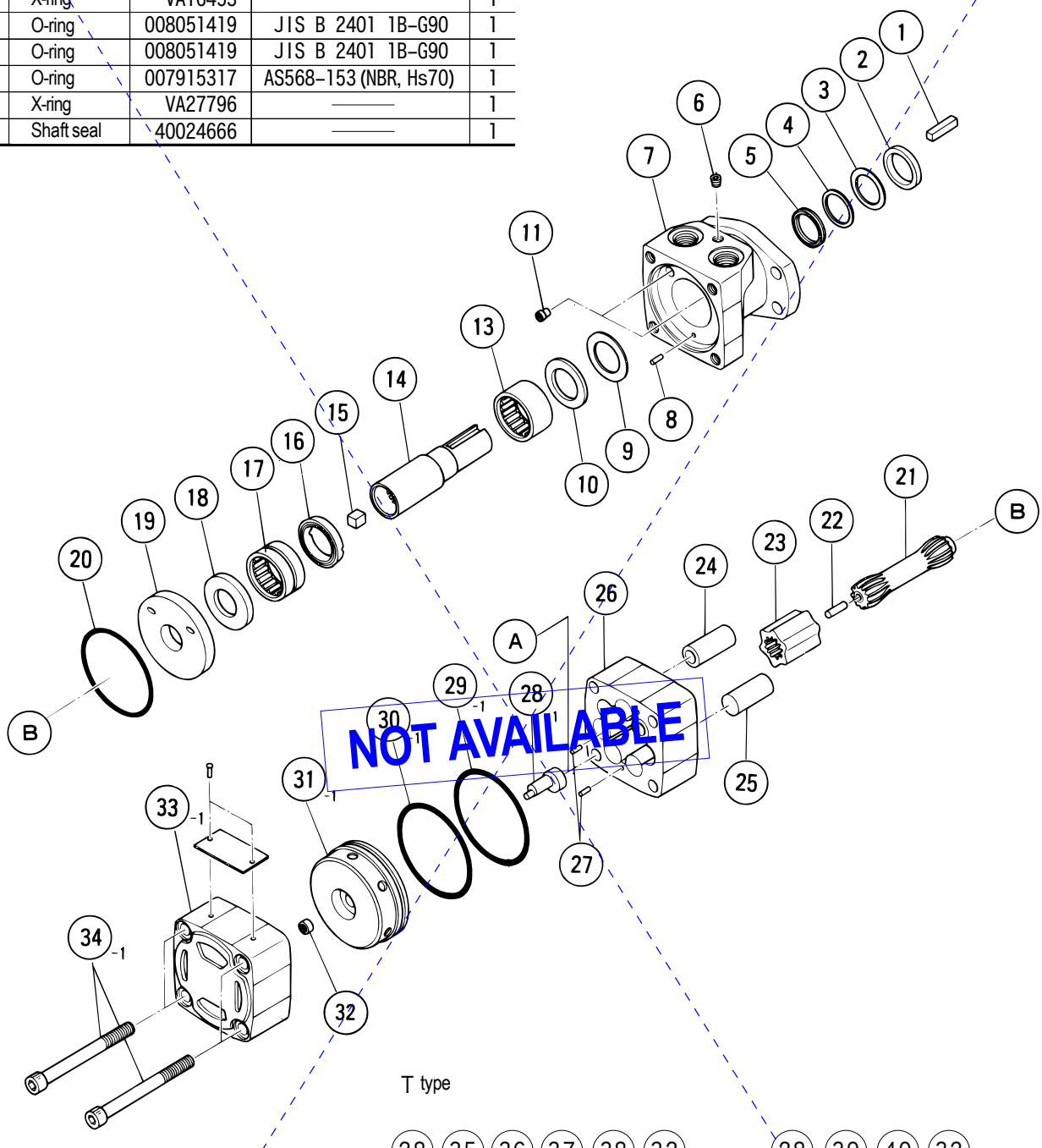


8 Type
Flat root fit
D.P. = 12/24 Teeth = 14
Pressure angle = 30°
Pitch dia. = φ29.634
Maj. dia. = φ31.75 +0.035 0
Min. dia. = φ27.59 +0.125 0
T.I.F.D. = φ31.326 min.
In case of φ3.6576 pin, over pin dia. is 24.355 +0.05 0

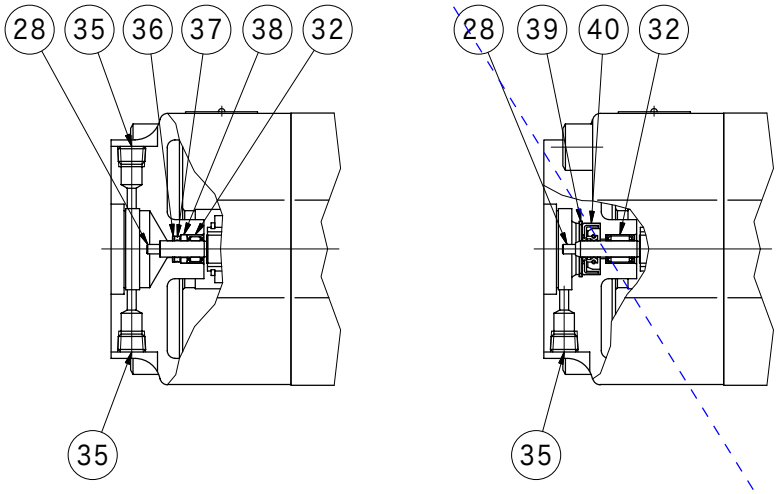
Construction

Seal List

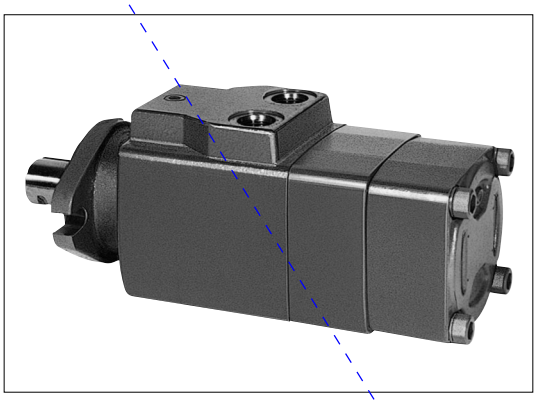
No.	Description	Part No.	Standard	Qty
2	Wiper	VA20981	———	1
4	Backp ring	VA16454	———	1
5	X-ring	VA16453	———	1
20	O-ring	008051419	JIS B 2401 1B-G90	1
29	O-ring	008051419	JIS B 2401 1B-G90	1
30	O-ring	007915317	AS568-153 (NBR, Hs70)	1
37	X-ring	VA27796	———	1
40	Shaft seal	40024666	———	1

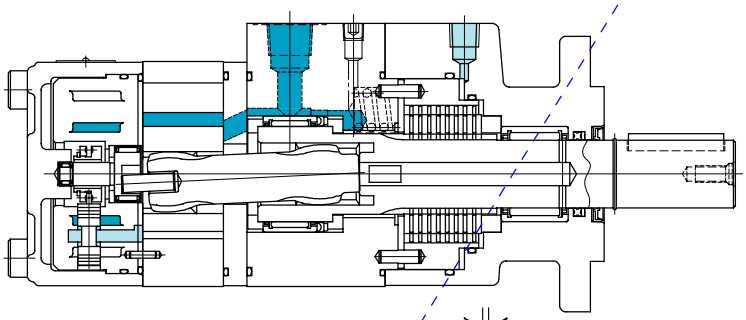


T type

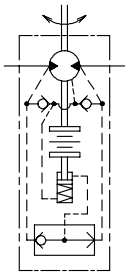


Mechanical brake integrated high torque low speed internal gear motors GR-M

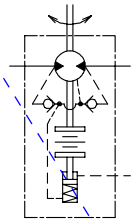




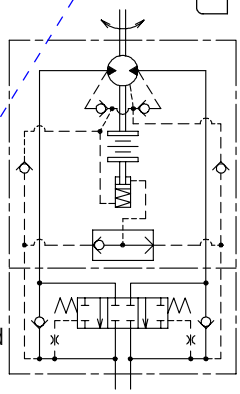
Functional Symbols



GR−M∗



GR−ME∗



CB−03−∗G mounted
GR−MC∗

Model Code

(F3) - GR- M (E) 1 - 09 - 4 S (T) 5 (L) - 30 - (S) (D) - J A - (S2) - (J)

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

1 Fluid
Omitted for mineral oil
F3: phosphate ester

2 Mechanical disc-brake integrated internal gear HTLS motor
GR-M Series

3 Pilot pressure brake release options
Omitted for internal pilot
E:External pilot
C:Internal pilot (used when CB-03-*G counterbalance module is mounted)

4 Braking torque

5 Motor displacement

6 Mounting
2:2-bolt flange 3: Foot bracket
4:4-bolt flange 5:4-bolt square flange

7 Porting
G:Flange piping in body
P:Rc 1/2 taper thread in body
S:7/8-14UNF thread piping (SAE 0-ring seal) in body
J:7/8-14UNF threaded piping (SAE O-ring seal) in end cover
C:Flanged pad port for use with CB-03 module

8 Tachometer mounting option
Omitted for no tachometer pickup (standard)
T: With tachometer pickup (tachometer cannot be mounted on types 'J', 'SJ'.

Note: Consult Tokimec for tachometer mounting.

9 Shaft
Parallel shaft with square key (1")
Parallel shaft with square key (1" 1/4)
Involute spline shaft (1-1/4")
Parallel shaft with key
Parallel shaft with key

10 Rotation direction (viewed from shaft end)
Omitted for left rotation with inlet port 'A'
(right rotation with inlet port 'B')
L: right rotation with inlet port 'A'
(left rotation with inlet port 'B')

11 Design no.

12 Distributor valve
Omitted for standard spool distributor valve
S: Low pulsation type spool distributor valve

13 Drain port
Omitted for no drain port (internal drain, standard)
D: Rc 1/8 drain port located on same side as main ports
(for GR-MC, 180 degrees opposite of main ports)

14 Special suffix
S2: Rc 1/4 drain port located 180 degrees opposite of main ports.

15 Tapered pipe thread connection, when position 7 is 'P' type and 13 is 'D' type

Specifications

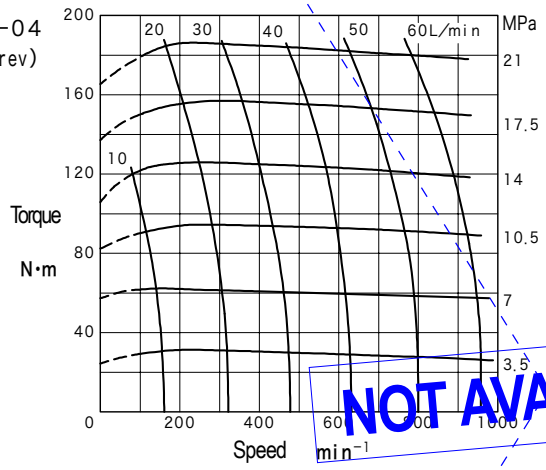
Model	Displacement	Operating Pressure MPa		Flow L/min		∗2 Torque N・m		Speed (Rated)	Max.Back Pressure MPa	∗1 Wt. kg
	cm^3/rev	Rated	∗3 Max.	Rated	∗3 Max.	Rated	∗3 Max.	min^{-1}		
GR-M∗∗-04	62	21	28	60	80	185	245	790	7	16. 8
GR-M∗∗-06	95	18	24			245	325	545		16. 8
GR-M∗∗-07	106	21	28			310	415	465		17. 5
GR-M∗∗-08	123					360	480	395		17. 8
GR-M∗∗-09	153					460	610	315		18. 4
GR-M∗∗-10	167	16	21. 5			380	505	300		17. 5
GR-M∗∗-11	184	18	24			480	640	265		18. 8
GR-M∗∗-12	192	15	20			400	535	265		17. 8
GR-M∗∗-14	239	12. 5	16. 5			420	560	215		18. 4
GR-M∗∗-15	246	14	18. 5			500	665	195		19. 8
GR-M∗∗-18	288	10. 5	14			420	560	180		18. 8
GR-M∗∗-19	306	13	15. 5			550	655	170		19. 8
GR-M∗∗-23	383	8	10. 5			420	560	135		19. 8

* 1 weight is for flange mounting with connections port on body.
Add 1kg for connection ports on cover, 2kg for foot mounting, 1kg for tachometer attachment models.
*2 torque limitation may exist depending on shaft type.
See page N47 for shaft type and allowable torques.
*3 max. refers to instantaneous and is not applicable for continuous operation.

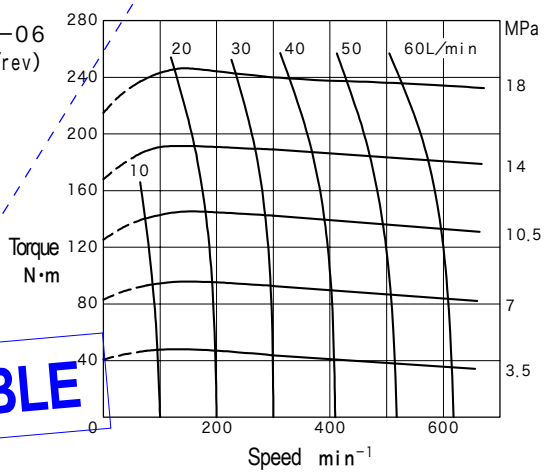
Performance Curves (value with ISO VG32 equivalent fluid operating at 49C°(22mm²/s)

Note: Some characteristics may be different for low pulsation spool type distributor valve (S type) motor. Consult Tokimec

GR−M∗∗−04 (62 cm^3/rev)

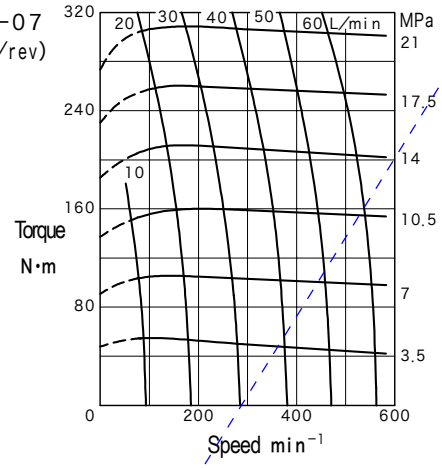


GR−M∗∗−06 (95 cm^3/rev)

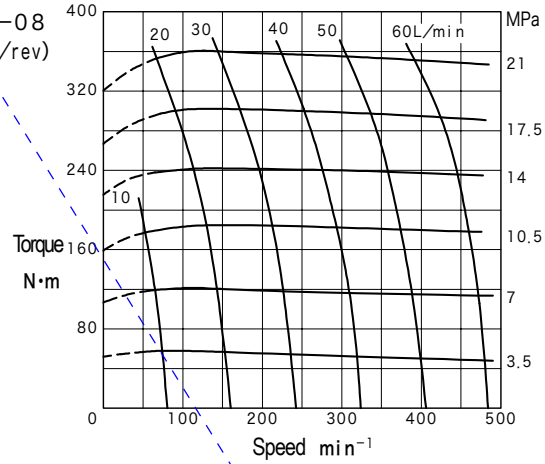


NOT AVAILABLE

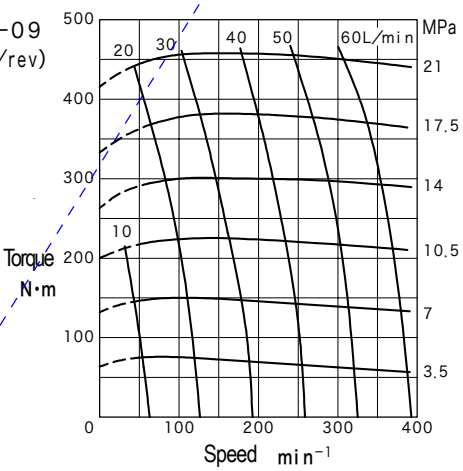
GR−M∗∗−07 (106 cm^3/rev)



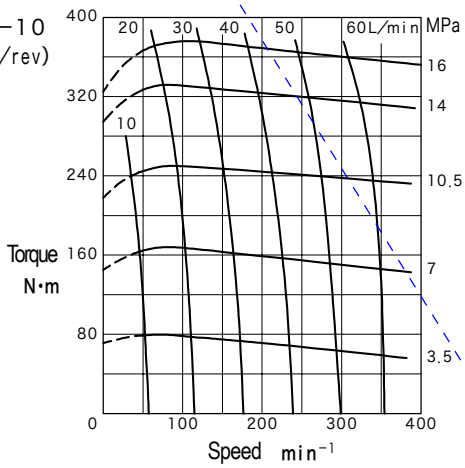
GR−M∗∗−08 (123 cm^3/rev)



GR−M∗∗−09 (153 cm^3/rev)



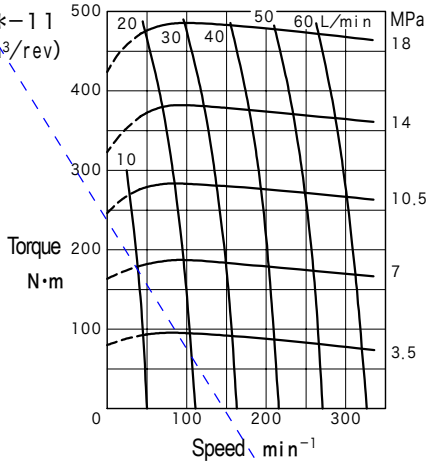
GR−M∗∗−10 (167 cm^3/rev)



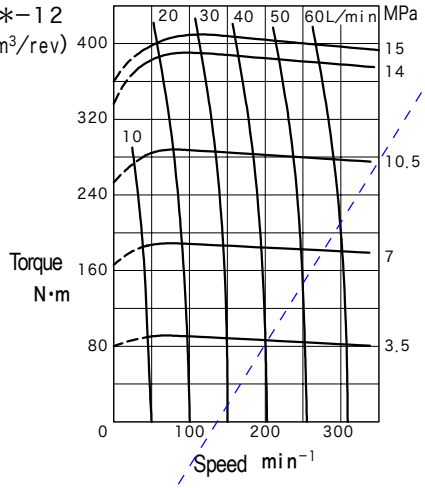
Performance Curves (value with ISO VG32 equivalent fluid operating at 49C°(22mm²/s)

Note: Some characteristics may be different for low pulsation spool type distributor valve (S type) motors. Consult Tokimec.

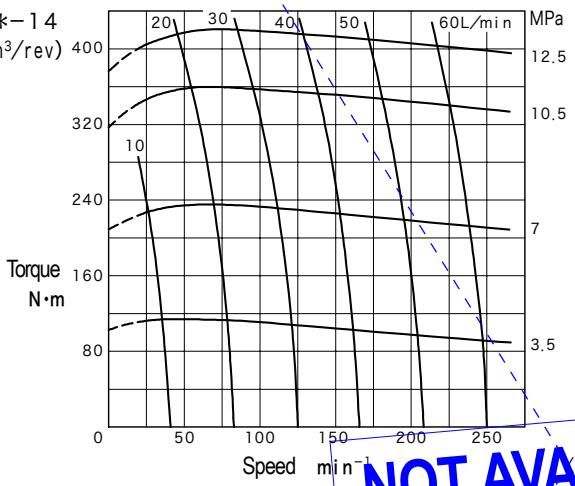
GR−M**−11
(184 cm³/rev)



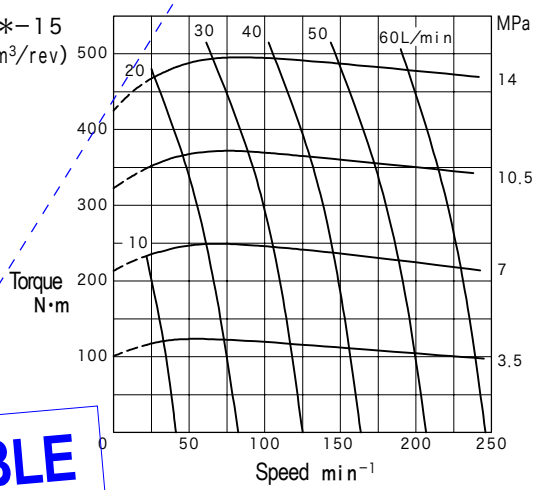
GR−M**−12
(192 cm³/rev)



GR−M**−14
(239 cm³/rev)

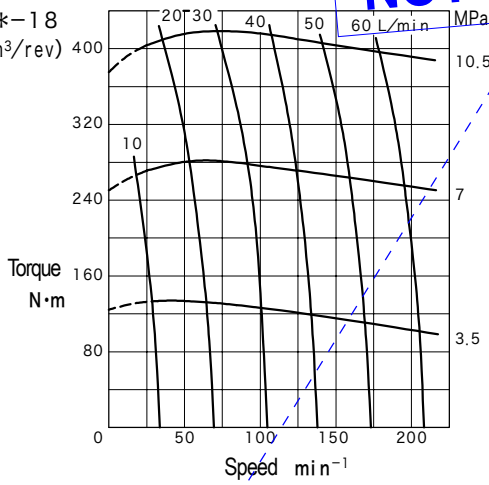


GR−M**−15
(246 cm³/rev)

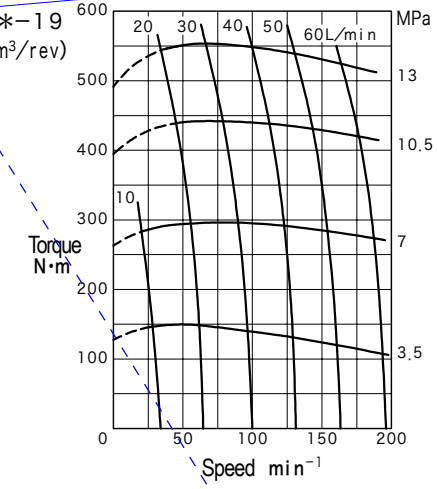


NOT AVAILABLE

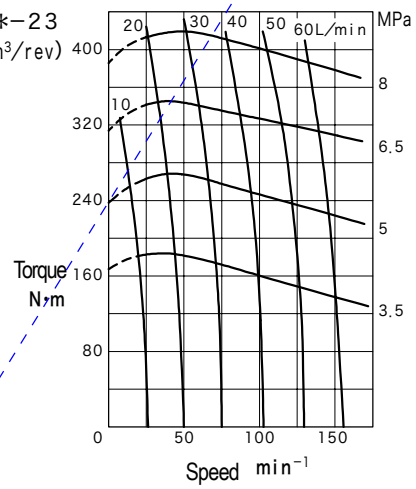
GR−M**−18
(288 cm³/rev)



GR−M**−19
(306 cm³/rev)



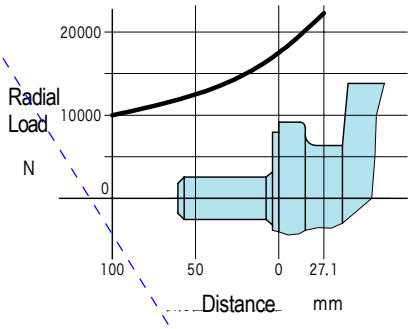
GR−M**−23
(383 cm³/rev)



• Indirect drive

In order to satisfy 2000 hour B10 life when operation at 100min^{-1}, with a concentrated radial load from a belt, chain, or gear drive at 20mm from the mounting surface, the permitted radial load would be 15000N. Consult Tokimec for applications involving a thrust load.

Radial load limits at other distances but still for 2000 hours B10 life at 100 r/min.



- For loads along each point of the curve in the above diagram, B10 life for speeds other than 100min^{-1}, would be as follows: (2000X100/actual speed) hours

- If 2000 hour B10 life is necessary along all points in the above curve, the allowable speed other than 100min^{-1} is as follows:
(load acting at position) × (100/actual speed) $^{3/10}$ N

• Allowable torque per shaft type

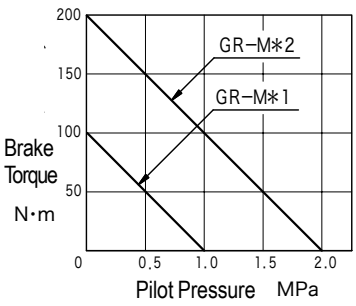
Allowable torque will differ according to shaft type. Application torque and braking torque should not exceed the values below for each shaft type.

Unit : N·m

Shaft Type	*T*t
0	230
4	460
8	660
12	230
13	660

*T*t = *TM* + *TD*
*T*t : Total torque
TM : Mechanical brake torque
TD : Hydraulic brake torque
Note: Per a[illegible] shaft type[illegible] not be used with GR-M

Pilot Pressure Brake Torque Relationship



• Brake Release Pressure

The mechanical brake mechanism of the GR-M is actuated by hydraulic pressure. In the case of GR-M*2, when pilot pressure is 0 MPa, brake torque is 200Nm, when pilot pressure is 1MPa, brake torque is 100Nm. When pilot pressure is 2MPa, brake torque is 0Nm. For internally drained motors, the difference between pilot port pressure and main port lower side pressure becomes the pilot pressure. For externally drained motors, pilot pressure is the difference between pilot port pressure and drain line pressure.

Model	Max. Brake Torque (Note 1)	Brake Release Press. (Note 2)
GR–M*1	100 N·m	1 MPa
GR–M*2	200 N·m	2 MPa

Note 1: Brake torque with pilot pressure 0 MPa.
Note 2: Pilot pressure needed for 0 Nm brake torque.

• Series circuits

When internal pilot motor or internal pilot motor with counterbalance valve is used in a series circuit, there may be cases where the mechanical brake remains released due to the design of the brake mechanism. Consult Tokimec when using motors in series circuit.

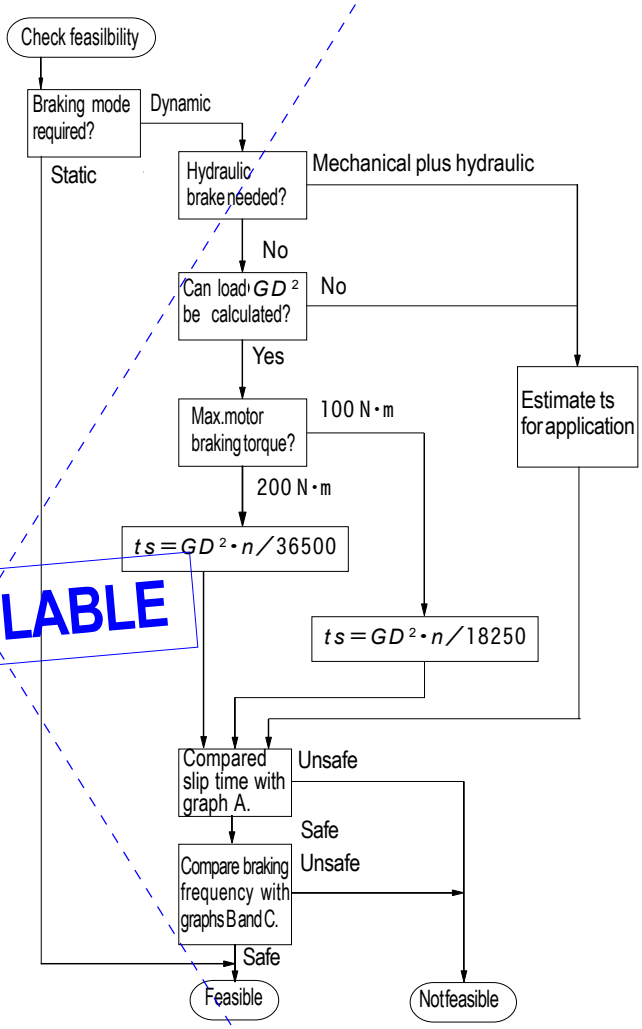
• Dynamic brake

When using braking torque in dynamic braking, determine slip time and braking frequency from the chart.

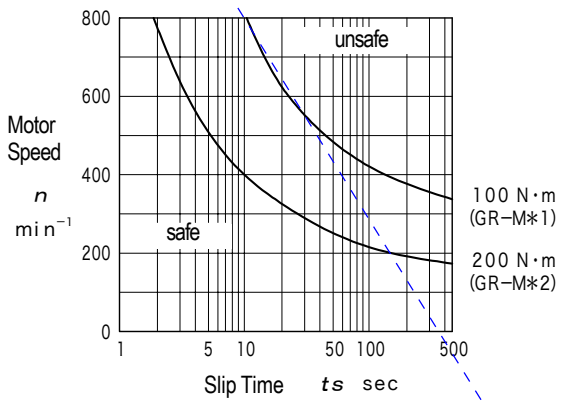
[Chart]

Mechanical brake working conditions are determined from slip time and braking frequency as follows:

*GD*²(kgm³/s²): inertial moment (calculated from motor shaft)
ts(s): slip time
n(min-1): motor rpm
N(freq/min): braking frequency

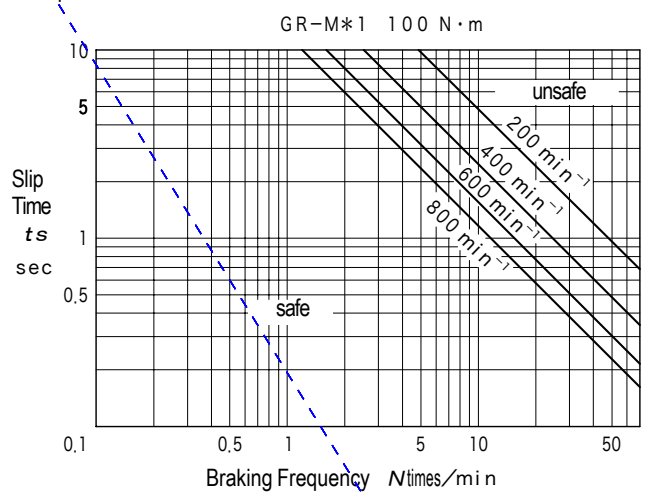


Graph A

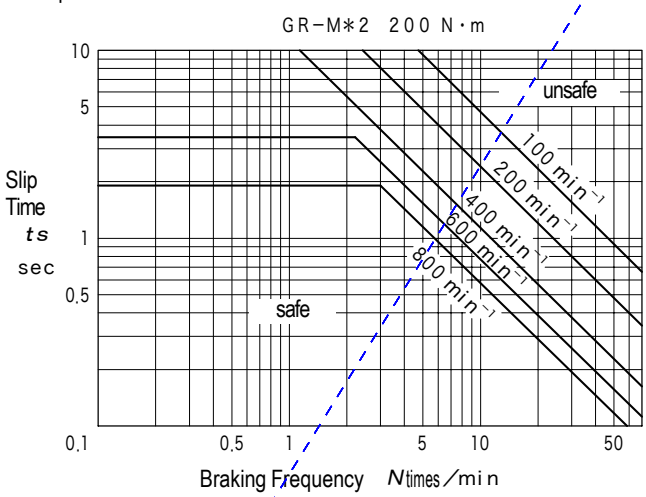


Operating Considerations

● Graph **B**



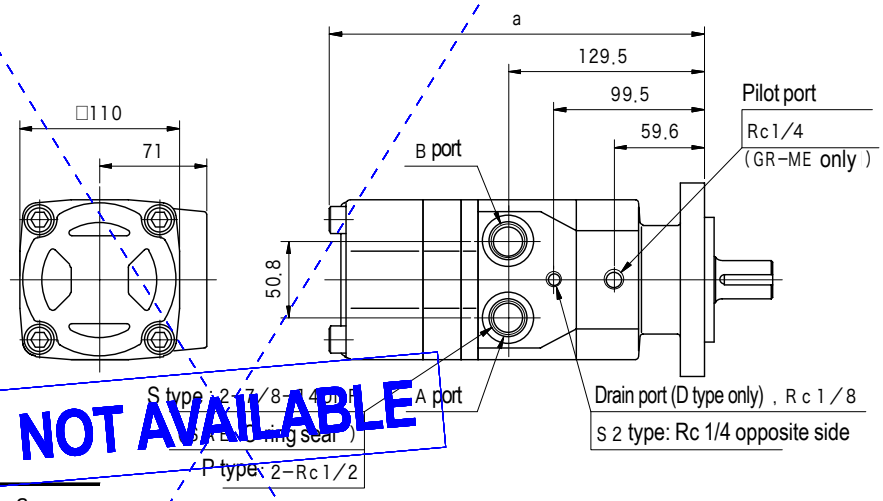
● Graph **C**



Dimensions

● Porting

S type: 7/8-14UNF in body
(SAE O-ring seal)
P type: Rc 1/2 in body

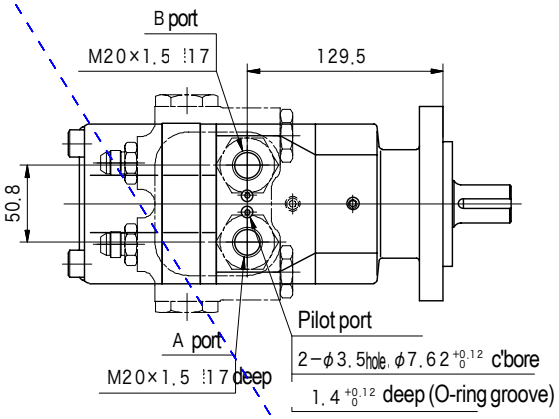


Dimensions

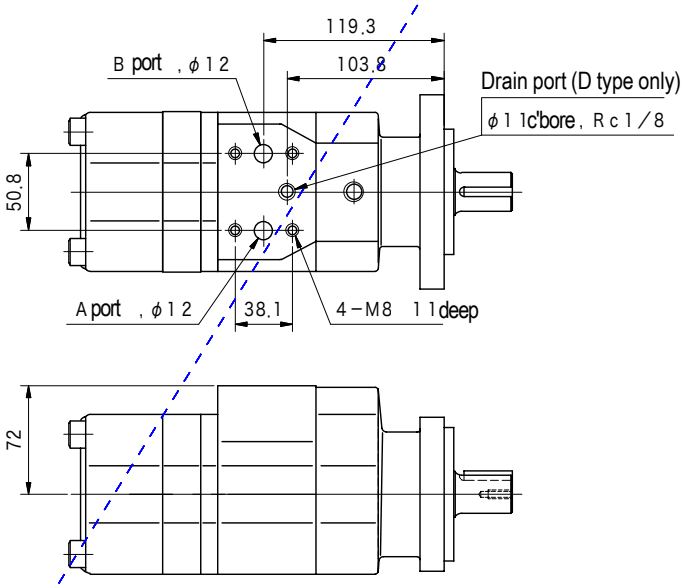
Model	a
GR−M∗∗−04、GR−M∗∗−06	235.5
GR−M∗∗−07、GR−M∗∗−10	245
GR−M∗∗−08、GR−M∗∗−12	248
GR−M∗∗−09、GR−M∗∗−14	254.5
GR−M∗∗−11、GR−M∗∗−18	261
GR−M∗∗−15、GR−M∗∗−19、GR−M∗∗−23	273.5

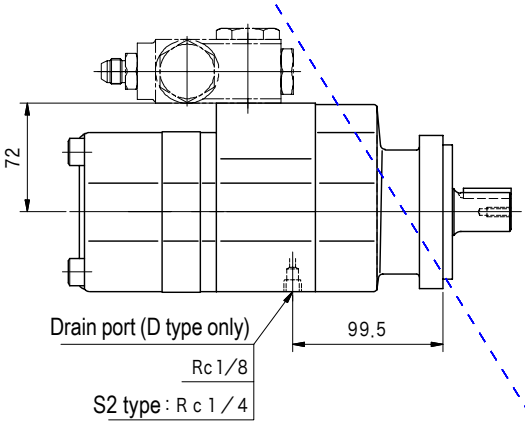
C type: counterbalance valve

CB-*G mounting type



G type: gasket mounting pad on housing

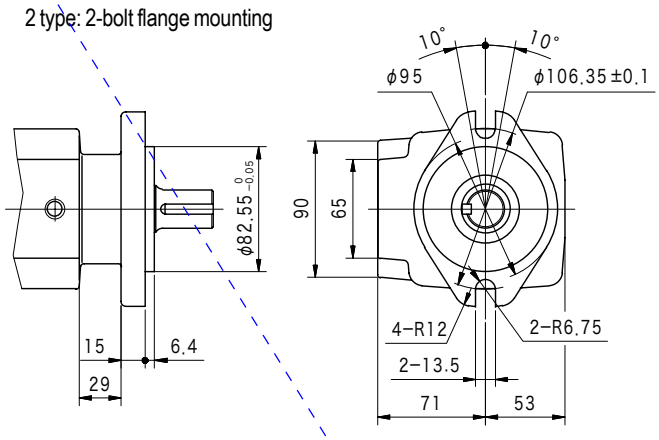




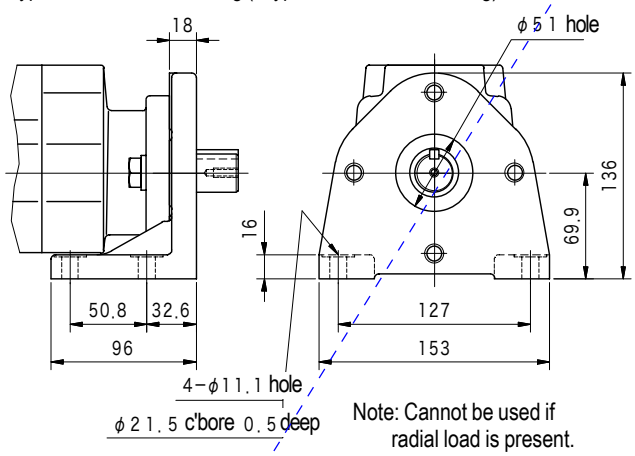
Dimensions

● Mounting

2 type: 2-bolt flange mounting

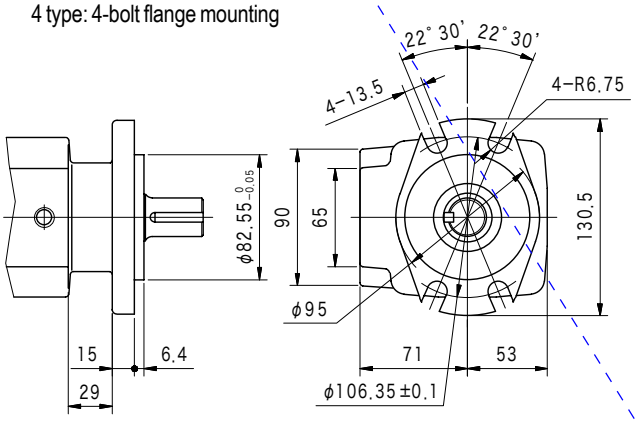


3 type: foot bracket mounting (2 type foot bracket mounting)

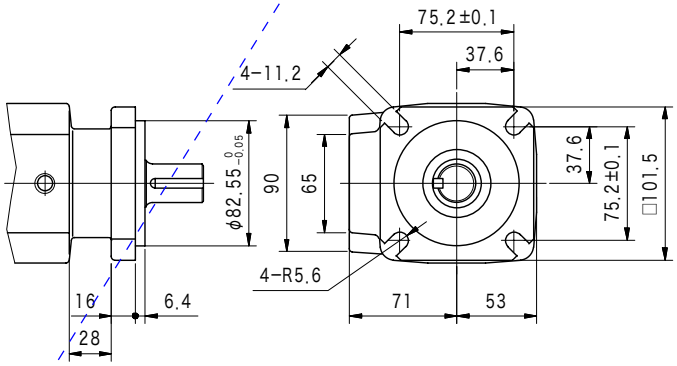


Note: Cannot be used if radial load is present.

4 type: 4-bolt flange mounting

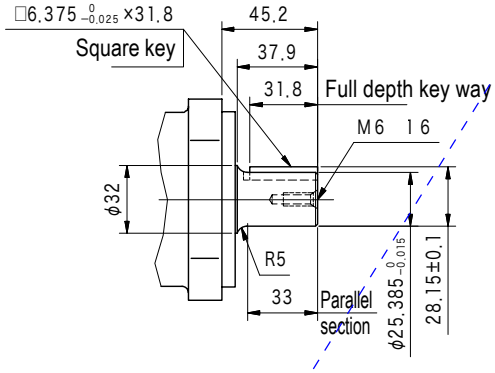


5 type: 4-bolt square flange mounting

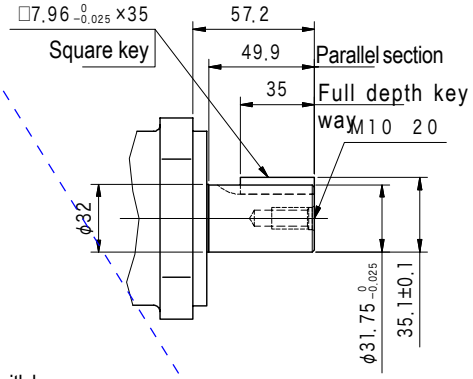


● Shaft

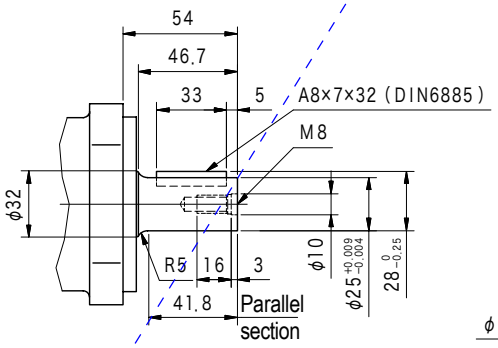
0 type: square key parallel shaft (1 inch)



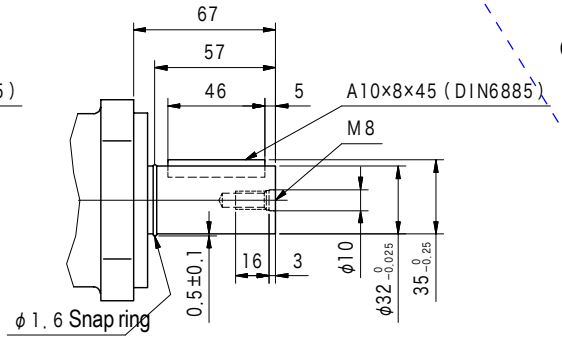
1 type: square key parallel shaft (1-1/4 inch)



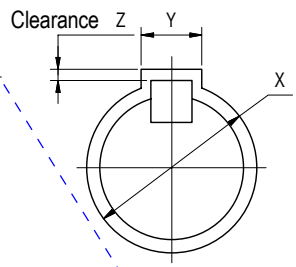
12 type: parallel shaft with key (φ25)



13 type: parallel shaft with key (φ32)



● Shaft with key coupling dimensions

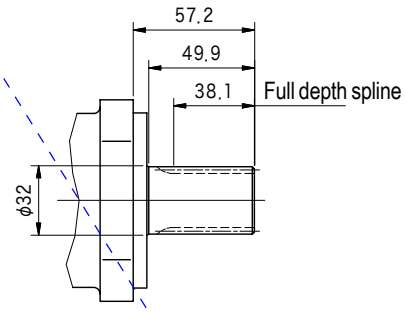


Shaft Type	X	Y	Z
0	$\phi 25.385^{+0.021}_{0}$	$6.375^{+0.03}_{0}$	0.1～0.5
4	$\phi 31.75^{+0.025}_{0}$	$7.96^{+0.036}_{0}$	0.1～0.5
12	$\phi 25^{+0.021}_{0}$	$8^{+0.036}_{0}$	0.1～0.5
13	$\phi 32^{+0.025}_{0}$	$10^{+0.036}_{0}$	0.1～0.5

NOT AVAILABLE

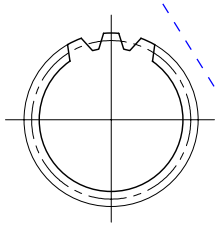
Dimensions

8 type: involute spline shaft



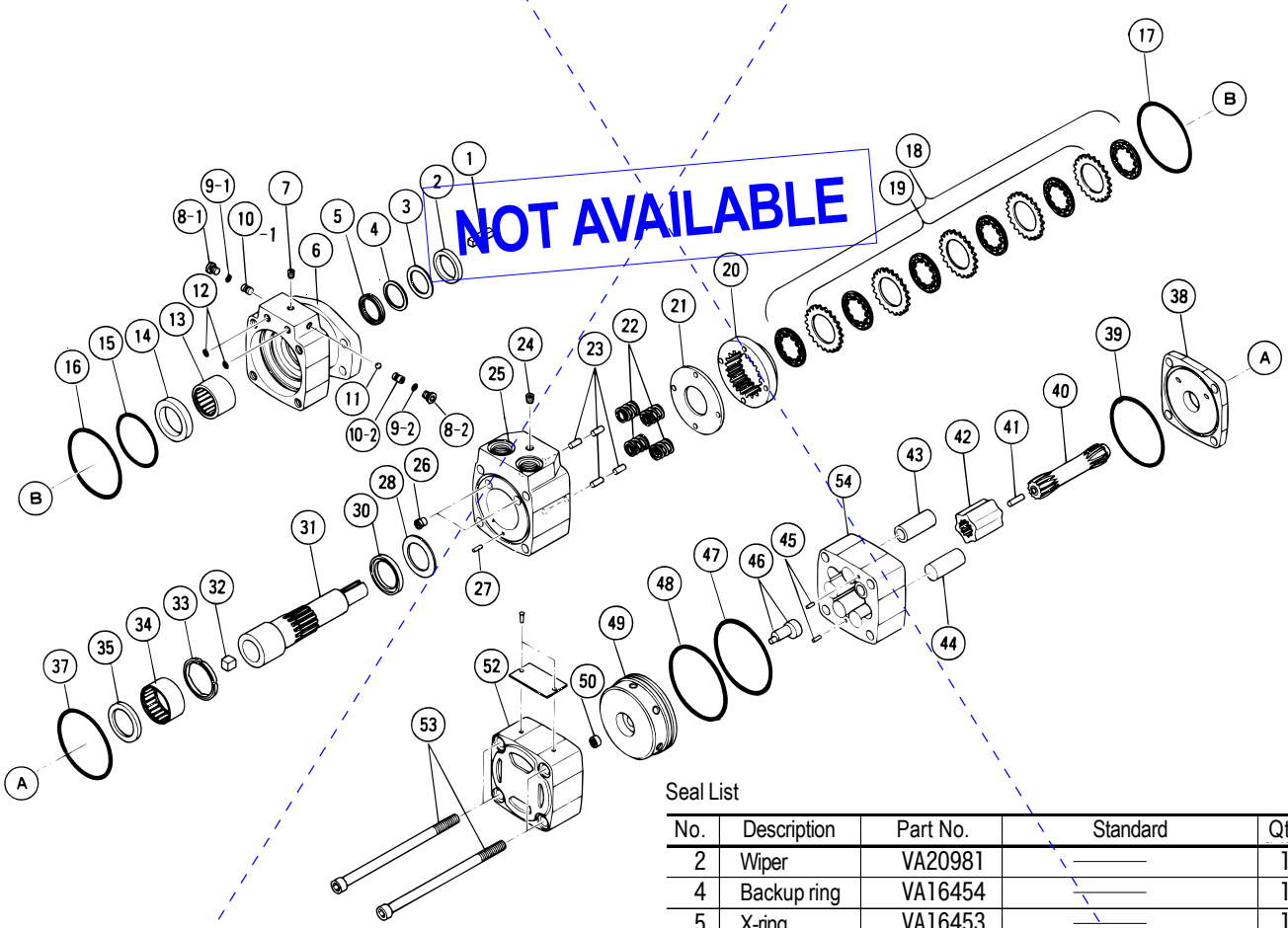
Involute Spline Specifications		
Pitch dia. $= \phi 29.634$		
Flat root side fit		
Teeth $=14$	D. P. $=12/24$	Pressure angle $=30°$
Min. dia.	T. I. F. D.	Max. dia.
$\phi 26.99\ ^{0}_{-0.33}$	$\phi 27.488$ max.	$\phi 31.22\ ^{0}_{-0.12}$
Over pin dia. $=35.798\ ^{0}_{-0.045}$ (when using $\phi 4.064$ pin)		

● Spline shaft coupling specifications



Involute Spline Specifications		
Pitch dia. $= \phi 29.634$		
Teeth $=14$	D. P. $=12/24$	Pressure angle $=30°$
Min. dia.	T. I. F. D.	Max. dia.
$=\phi 27.59\ ^{+0.125}_{0}$	$\phi 31.326$ min.	$=\phi 31.75\ ^{+0.035}_{0}$
Over pin dia. $=24.355\ ^{+0.05}_{0}$ (when using $\phi 3.657$ pin)		

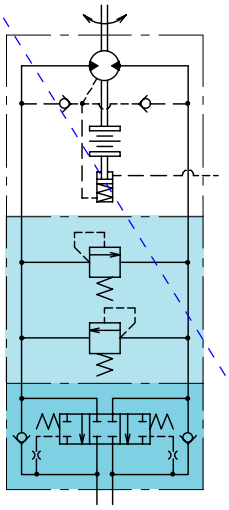
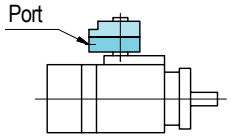
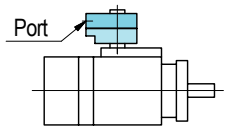
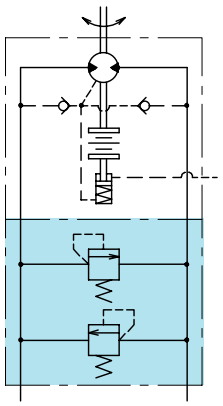
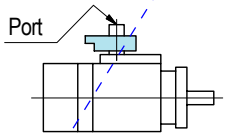
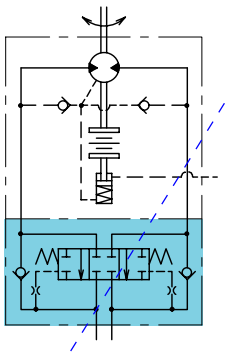
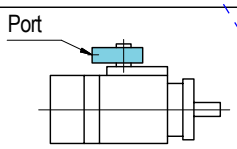
Construction



Seal List

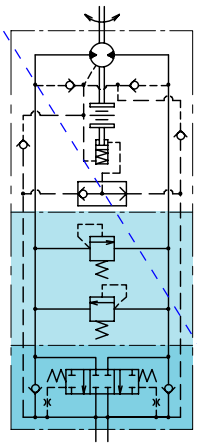
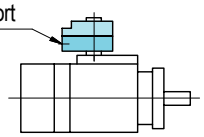
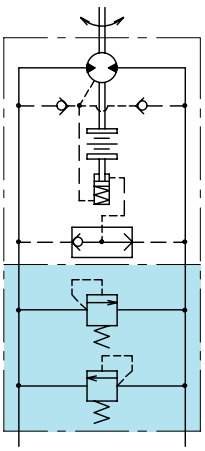
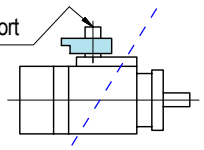
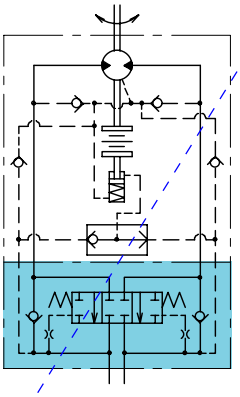
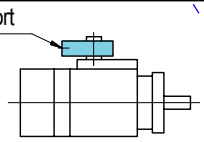
No.	Description	Part No.	Standard	Qty
2	Wiper	VA20981	———	1
4	Backup ring	VA16454	———	1
5	X-ring	VA16453	———	1
9	O-ring	007990419	AS568-904 (NBR, Hs90)	2
12	O-ring	007900919	AS568-009 (NBR, Hs90)	2
15	O-ring	007914819	AS568-148 (NBR, Hs90)	1
16	O-ring	008051419	JIS B 2401 1B-G90	1
17	O-ring	007915319	AS568-153 (NBR, Hs90)	1
37	O-ring	008051419	JIS B 2401 1B-G90	1
39	O-ring	008051419	JIS B 2401 1B-G90	1
47	O-ring	008051419	JIS B 2401 1B-G90	1
48	O-ring	007915317	AS568-153 (NBR, Hs70)	1

Motor/Valve Combinations

Functional Symbols		Outline	Models
A  External pilot motor GR-ME* Brake valve BR-03-*** Counterbalance valve CB-03-*	1		Motor GR-ME*-**-*S* Valves CB-03-*-S1 BR-03-***-S1
	2		Motor GR-ME*-**-*S* Valves CB-03-*-S1 BR-03-***-S1
B  External pilot motor GR-ME* Brake valve BR-03-***	1		Motor GR-ME*-**-*S* Valves BR-03-***
C  External pilot motor GR-ME* Counterbalance valve CB-03-*	1		Motor GR-ME*-**-*S* Valves CB-03-*

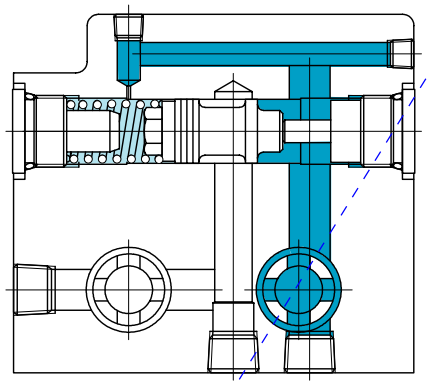
NOT AVAILABLE

Motor/Valve Combinations

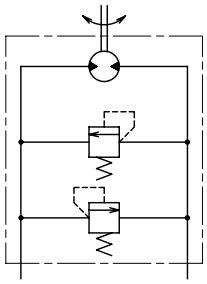
Functional Symbols	Outline	Models
D  External pilot motor GR−MC∗ Brake valve BR−03−∗∗∗ Counterbalance valve CB−03−∗G	1 Port 	Motor Valves GR−MC∗−∗∗−∗C∗ CB−03−∗G−S1 BR−03−∗∗∗−S1
E  External pilot motor GR−M∗ Brake valve BR−03−∗∗∗	1 Port 	Motor Valves GR−M∗−∗∗−∗S∗ BR−03−∗∗∗
F  External pilot motor GR−MC∗ Counterbalance valve CB−03−∗G	1 Port 	Motor Valves GR−MC∗−∗∗−∗C∗ CB−03−∗G

NOT AVAILABLE

Brake valves BR-03



Functional Symbol



Model Code

(F3) - BR - 03 - 150 - 10 - (S1)

1 2 3 4 5 6

1 Fluid
Omitted for mineral oil
F3: phosphate ester
2 Brake valve
3 Size
4 Cracking pressure code (see 'Specifications')
5 Design no.
6 Special suffix
S1: No mounting bolt, mounting nut or O-ring.
(used with when stacking counterbalance valve module CB-03)

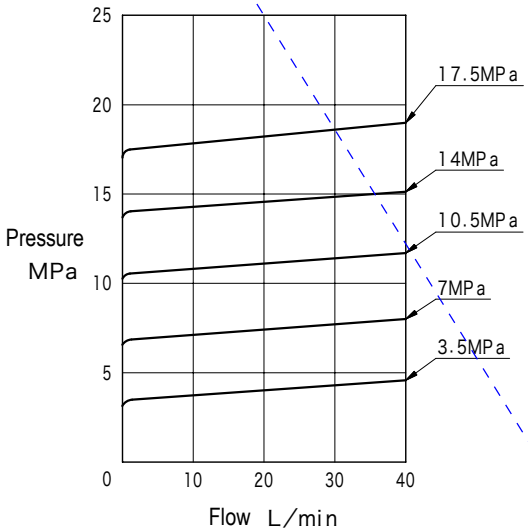
Specifications

Size	Max.Oper. Pressure MPa	Rated Flow L/min	Cracking Pressure MPa	Guaranteed Press. Proof MPa	Wt. kg
03	21	40	See Table	28	3. 3

Code	050	075	100	125	150	175	200	225	250
Cracking Pressure MPa	3. 5	5. 25	7	8. 75	10. 5	12. 25	14	15. 75	17. 5

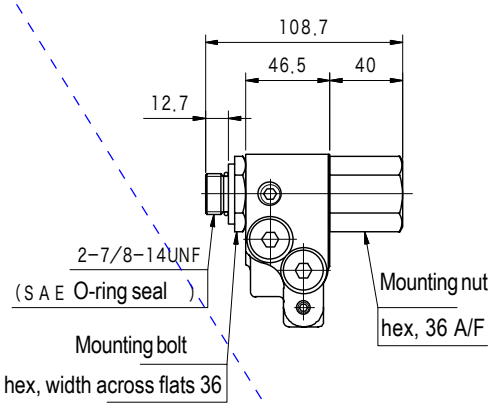
Performance Curves (at 20 mm²/s)

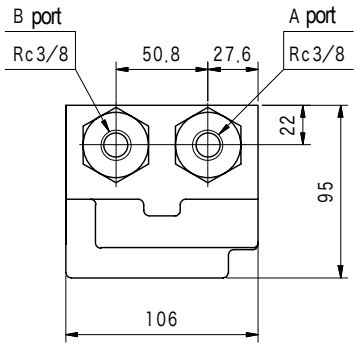
Flow-Pressure Characteristics



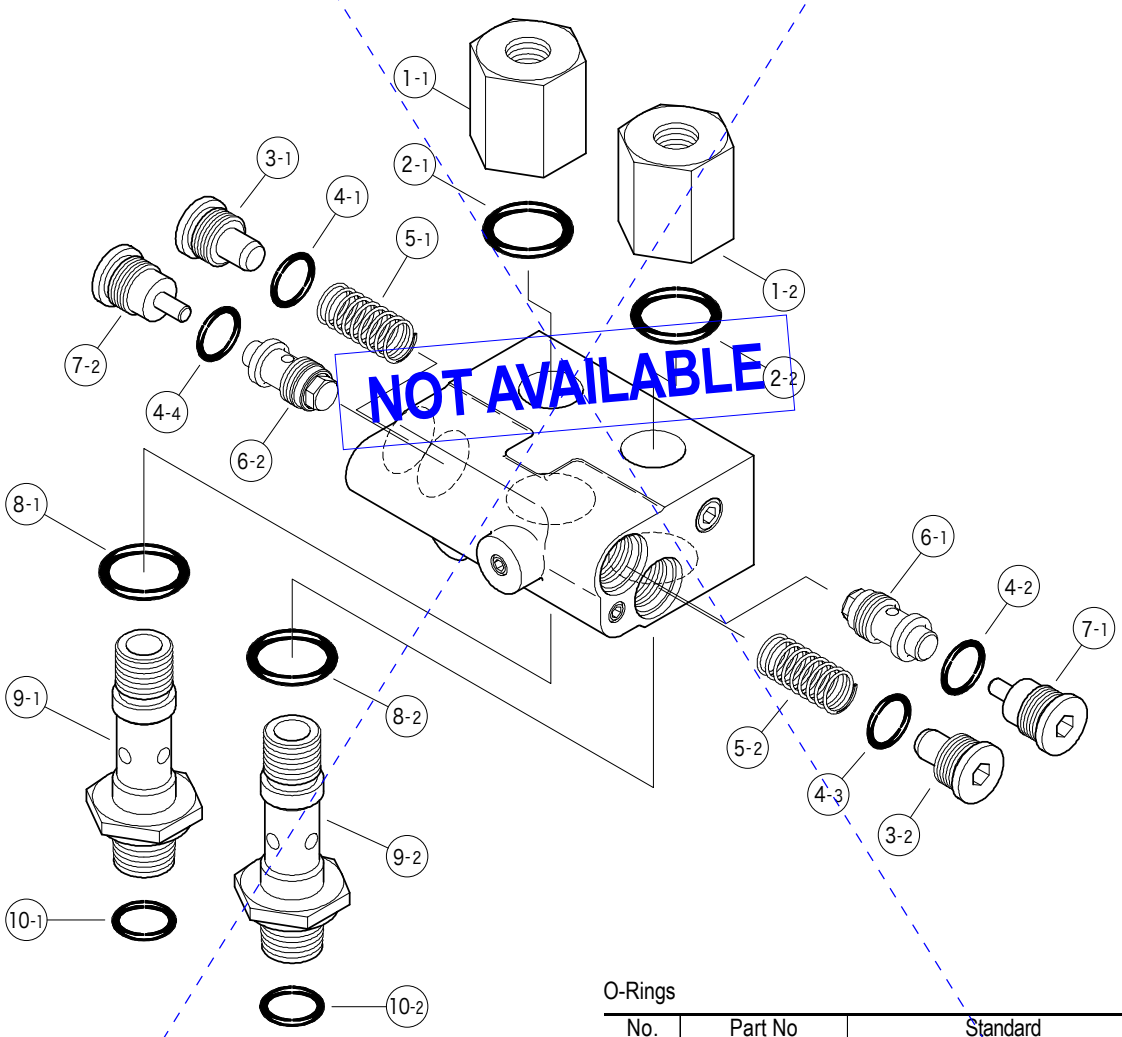
Dimensions

BR–03–***–10





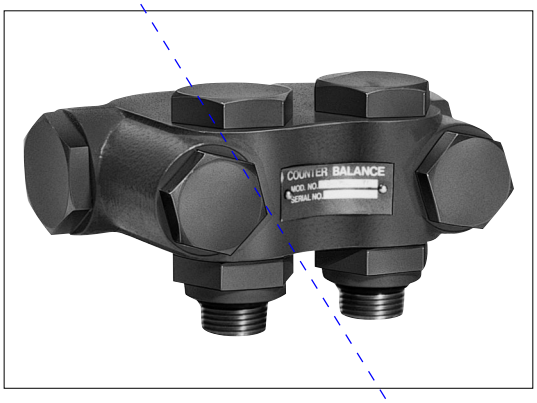
Construction

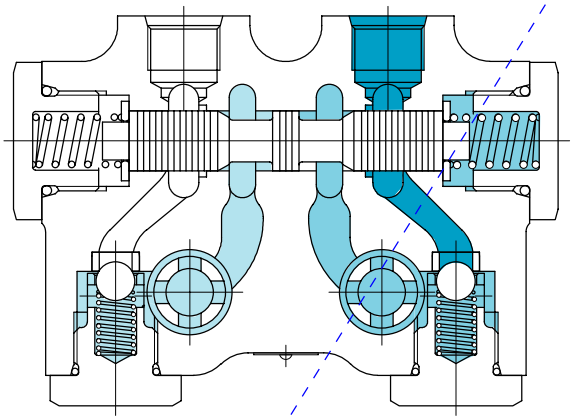


O-Rings

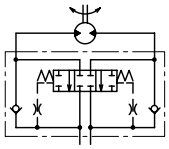
No.	Part No	Standard	Qty .
2	008002419	JIS B 2401 1B–P25	2
4	007990819	AS568–908 (NBR, Hs90)	4
8	008002419	JIS B 2401 1B–P25	2
10	007991019	AS568–910 (NBR, Hs90)	2

Counter balance valves CB-03

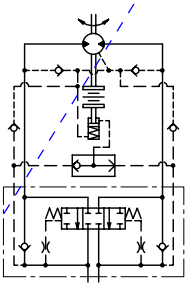




Functional Symbols



CB-03-*-10



CB-03-*G-10

Model Code

(F3) - CB - 03 - (B) (G) - 10 - (S1)

1	2	3	4	5	6	7

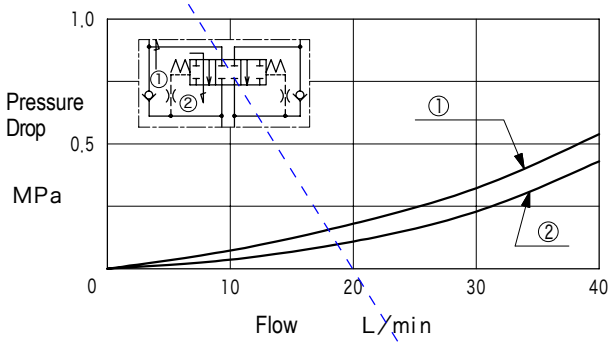
1 Fluid
Omitted for mineral oil
F3: phosphate ester
2 Counterbalance valve for CR, GRM motors
3 Size
4 Porting
Omitted for 3/4-16UNF threaded prot (SAE O-ring seal)
B: (3/4-16UNF) x with G3/8 hose nipple
E: (3/4-16UNF) x with Rc3/8 bushing
H: (3/4-16UNF) x with G3/8 elbow nipple
5 Applicable motor
Omitted for CR Series, GR-M(E) Series
G: for GR-MC Series
6 Design no.
7 Special suffix
S1: No mounting bolt, nut, O-ring
(used when mounted in combination with BR-03 brake module)

Specifications

Size	Max. Oper. Pressure MPa	Rated Flow L/min	Min.Switch'g Pressure MPa	Proof Pressure MPa	Wt. kg
03	21	40	0. 5	28	3. 5

Performance Curves (at 46 mm²/s)

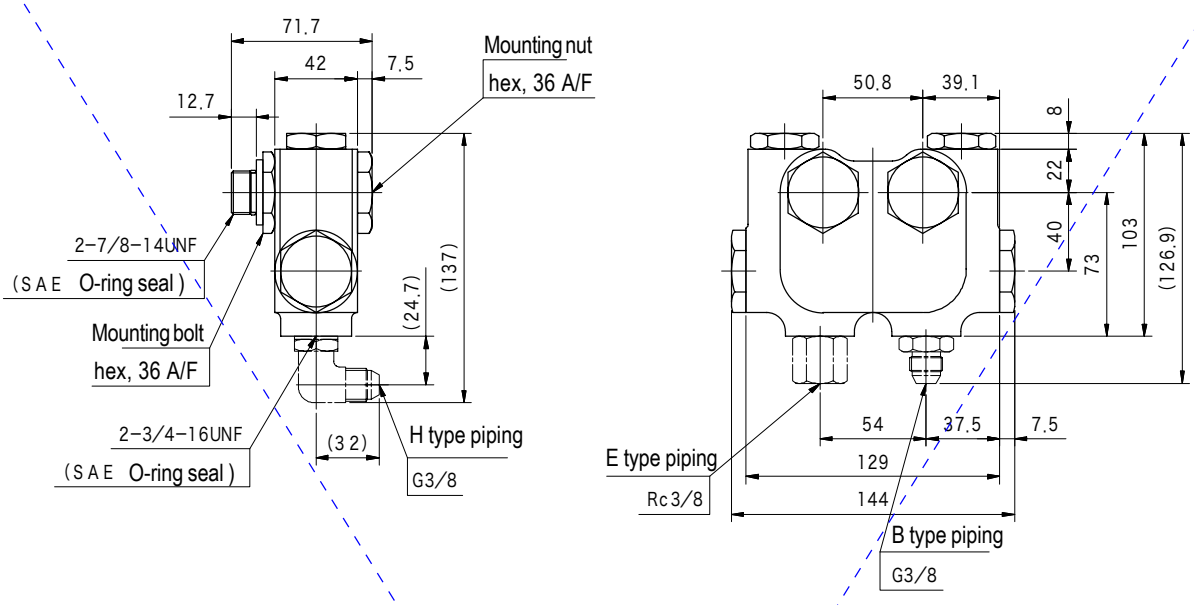
Pressure Drop Characteristics



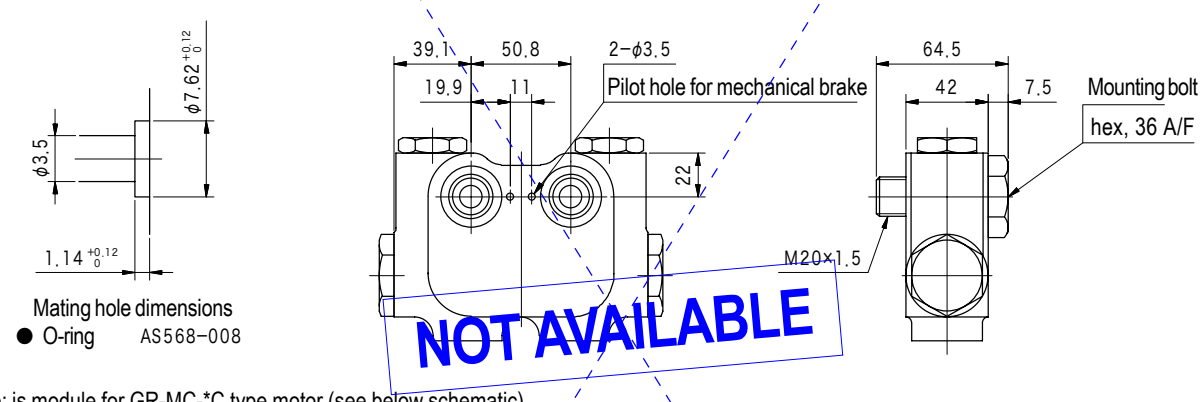
① : Check valve free flow direction
② : Control flow direction

Dimensions

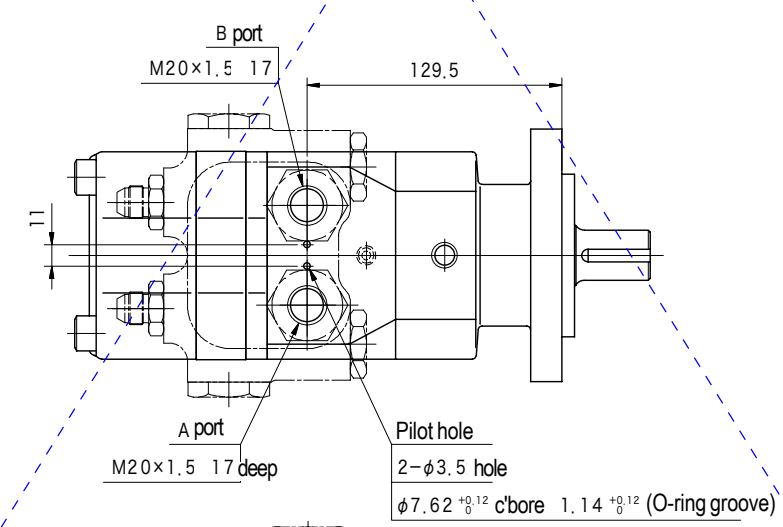
CB−03−∗

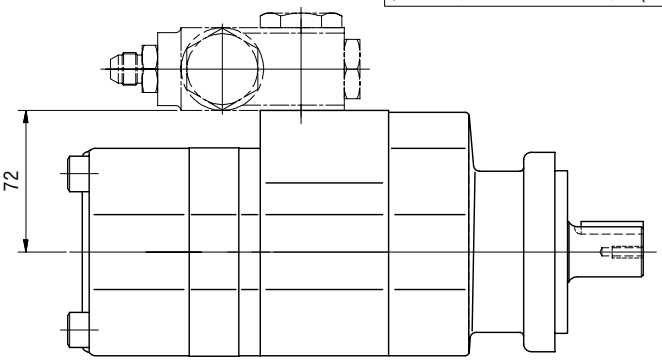


CB−03−∗G

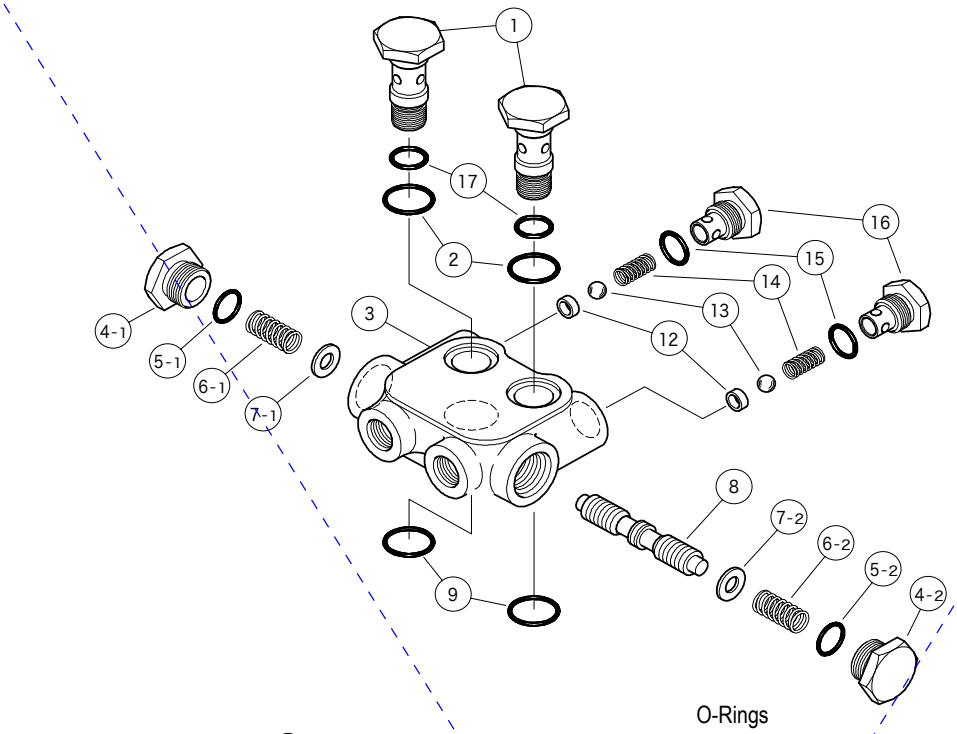


Note: is module for GR-MC-*C type motor (see below schematic)





Construction

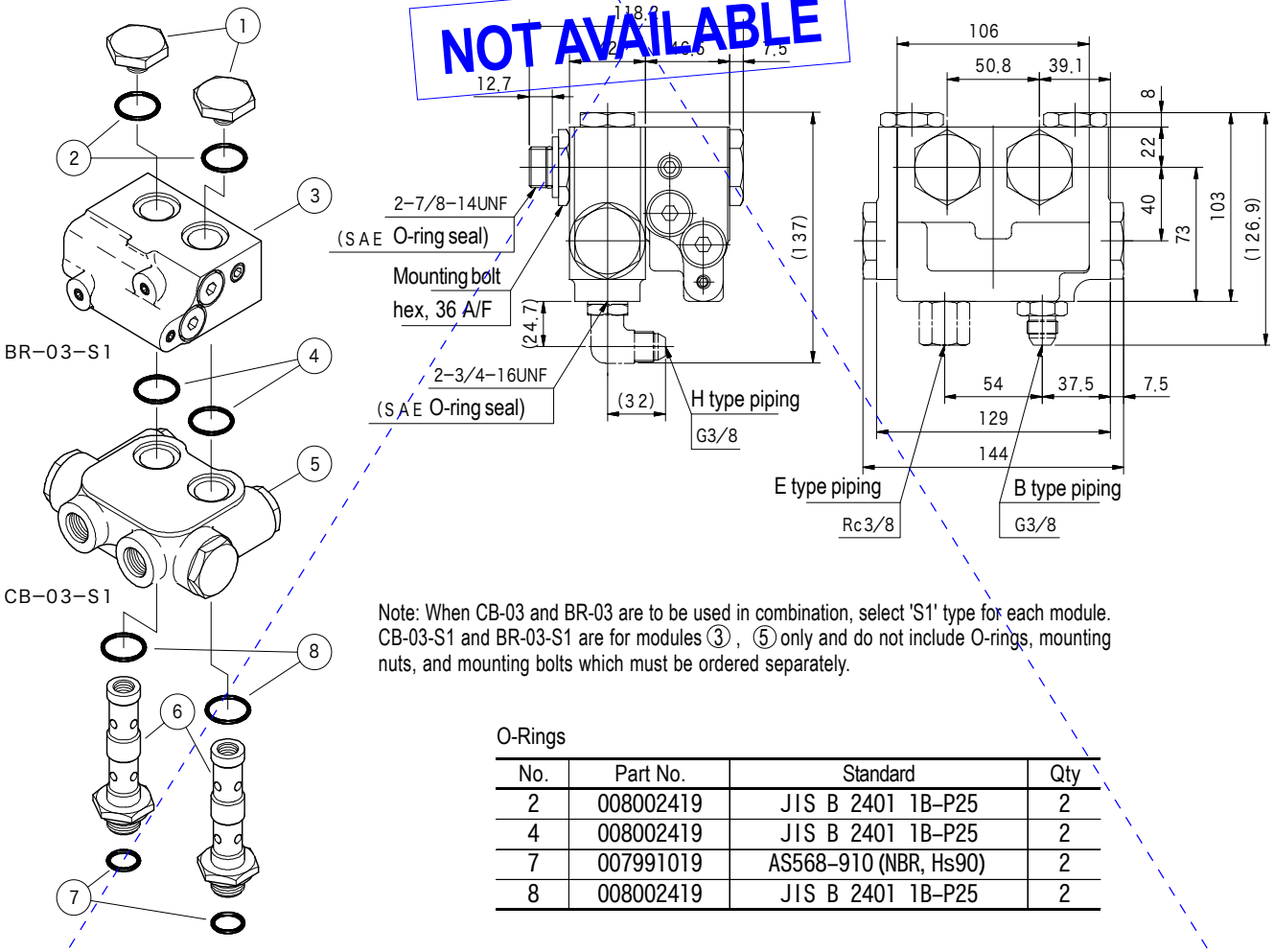


Note: For CB-03-*G-10, O-ring ⑰ is not used.

O-Rings

No.	Part No.	Standard	Qty
2	008002419	JIS B 2401 1B-P25	2
5	008002319	JIS B 2401 1B-P24	2
9	008002419	JIS B 2401 1B-P25	2
15	007991019	AS568-910 (NBR, Hs90)	2
17	007991019	AS568-910 (NBR, Hs90)	2

CB-03 Counterbalance Module & BR-03 Brake Module Combination Unit



Note: When CB-03 and BR-03 are to be used in combination, select 'S1' type for each module. CB-03-S1 and BR-03-S1 are for modules ③, ⑤ only and do not include O-rings, mounting nuts, and mounting bolts which must be ordered separately.

O-Rings

No.	Part No.	Standard	Qty
2	008002419	JIS B 2401 1B-P25	2
4	008002419	JIS B 2401 1B-P25	2
7	007991019	AS568-910 (NBR, Hs90)	2
8	008002419	JIS B 2401 1B-P25	2