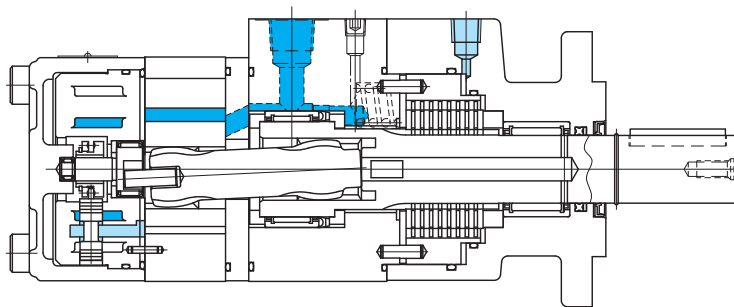
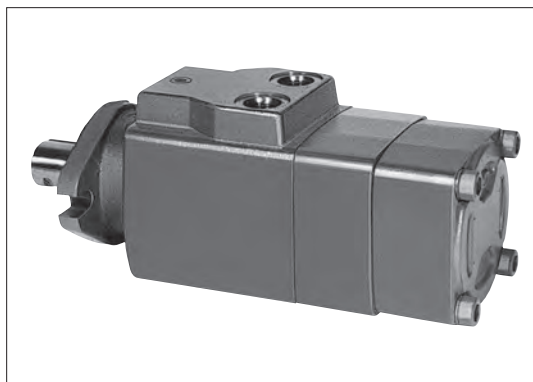
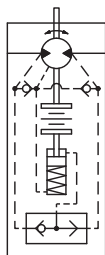


# Mechanical brake integrated high torque low speed internal gear motors

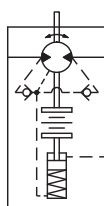
## GR-M series



### Functional Symbols

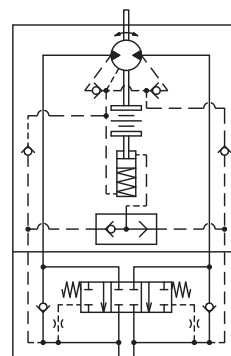


GR-M\*



GR-ME\*

CB-03-\*G mounting type  
GR-MC\*



### Model Code

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

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

- 1 Hydraulic fluid  
Omit: mineral oil  
F3: Phosphate ester
- 2 Mechanical brake integrated high torque low speed internal gear motor  
GR-M series
- 3 Mechanical brake control  
Omit: internal pilot  
E: External pilot  
C: Internal pilot (used when CB-03-\*G counterbalance module is mounted)  
Note: See page N6-4 for external pilot pressure (brake release pressure).
- 4 Braking torque  
1: 100 N·m  
2: 200 N·m
- 5 Motor displacement code
- 6 Mounting  
2: 2-bolt flange (not used for the G type of ports)  
3: Foot bracket (not used for the G type of ports)  
4: 4-bolt flange  
5: 4-bolt square flange (not used for the S type of ports)
- 7 Porting  
G: Flange piping in body  
P: Rc1/2 taper threaded port in body  
S: 7/8-14UNF threaded port (SAE O-ring seal) in body  
C: Counterbalance valve CB-03-\*G mounting type (used only for GR-MC\*)
- 8 Tachometer  
Omit: no tachometer mounting connection (standard)  
T: With tachometer mounting connection (S150 provided in 14)  
Note: Consult Tokyo Keiki for mounting tachometer.
- 9 Shaft end configuration  
0: Parallel shaft with square key (1")  
4: Parallel shaft with square key (1-1/4")  
8: Involute spline shaft (1-1/4")  
12:  $\phi$ 25 parallel, keyed  
13:  $\phi$ 32 parallel, keyed
- 10 Rotation direction (viewed from shaft end)  
Omit: 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  
Omit: standard spool distributor valve  
S: Low pulsation type spool distributor valve
- 13 Drain port  
Omit: no drain port (standard)  
D: Rc1/8 drain port located on same side as main ports (for GR-MC, 180 degrees opposite of main ports)
- 14 Special feature  
S2: Rc1/4 drain port located 180° opposite of main ports.  
S150: With tachometer mounting connection
- 15 Tapered pipe connection  
Designated when 7 is 'P' type or 13 is 'D' type

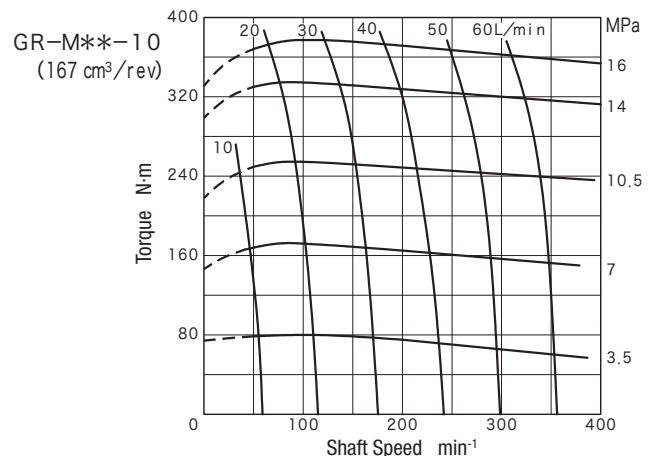
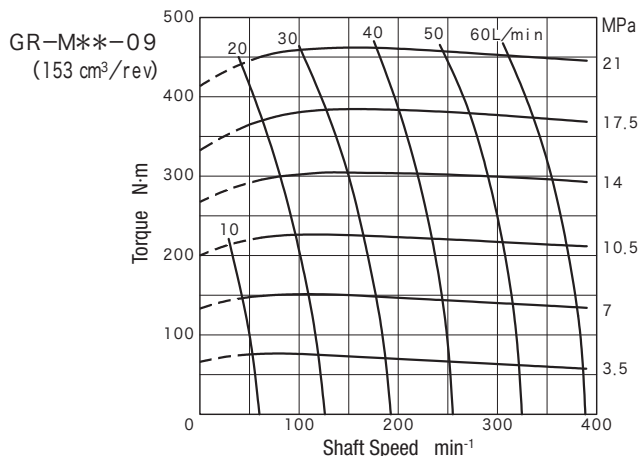
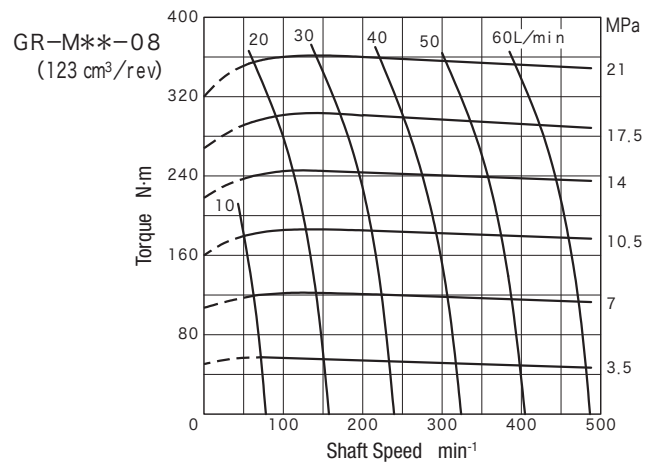
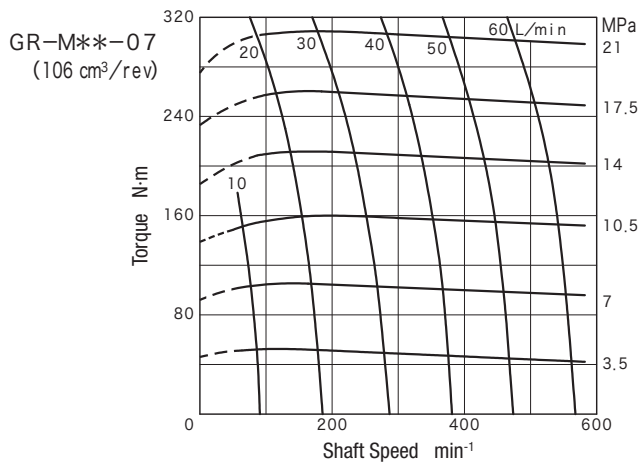
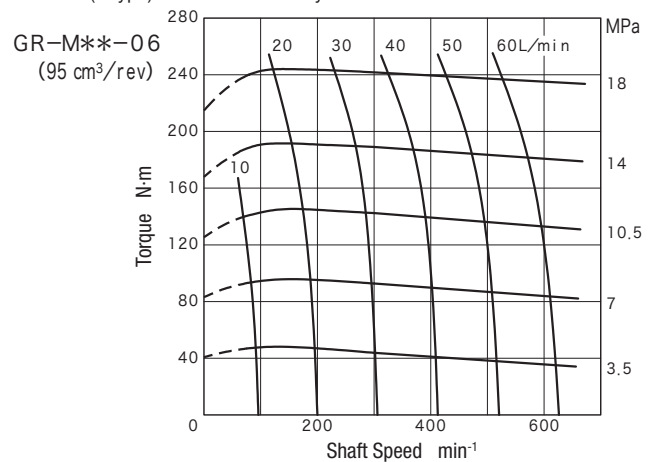
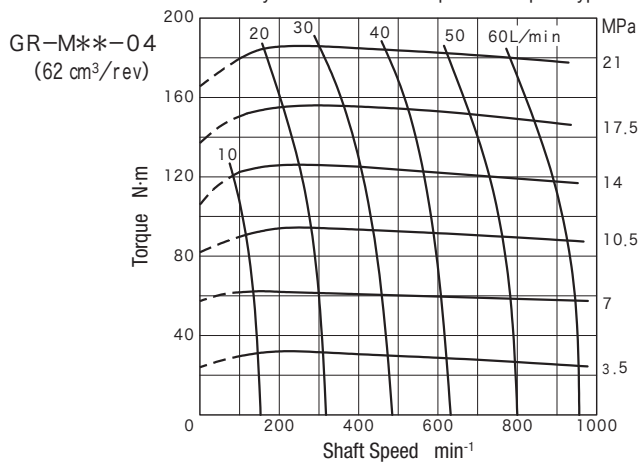
# Specifications

Model Code	Displacement cm <sup>3</sup> /rev	Working Pressure MPa		Flow L/min		* 2 Torque N·m		Speed (Rated) min <sup>-1</sup>	Max. Back Pressure MPa	*1 Weight kg
		Rating	*3 Max.	Rating	*3 Max.	Rating	*3 Max.			
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 for flange type mounting. Add 2kg for foot mounting and 1kg for tachometer attachment models.  
 \*2 There may be torque limitations due to shaft end configuration. See page N6-4 for shaft configuration and allowable torque.  
 \*3 'Max.' refers to instantaneous max. Not recommended for continuous operation.

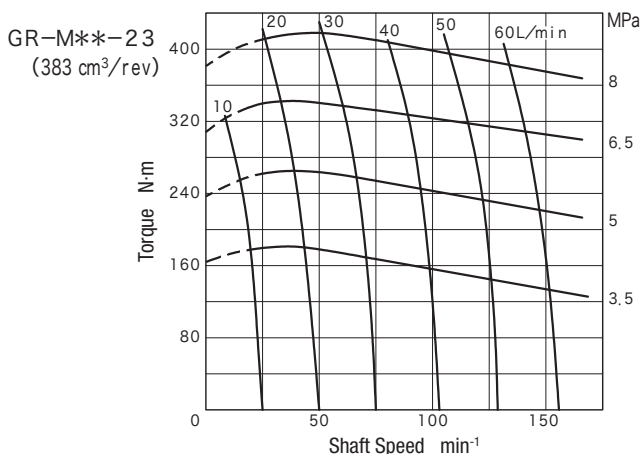
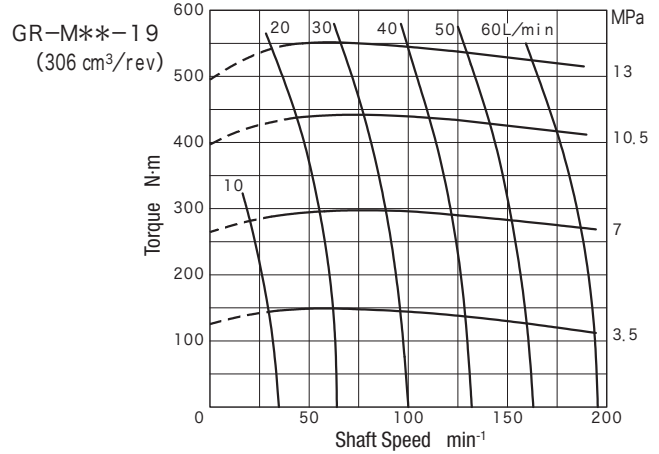
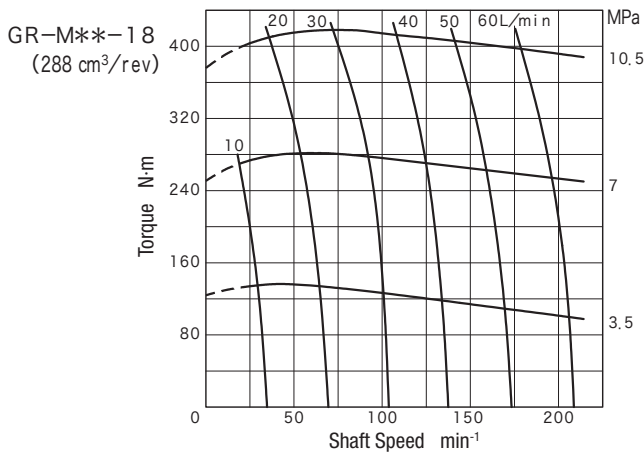
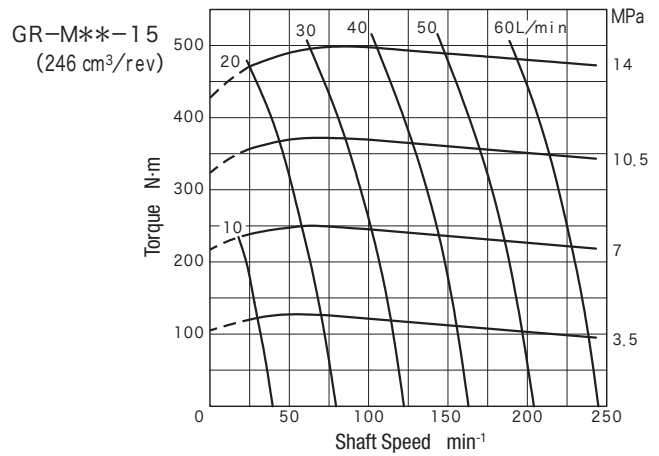
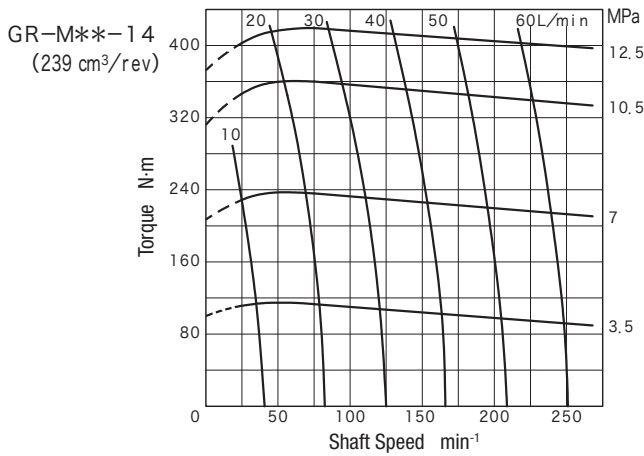
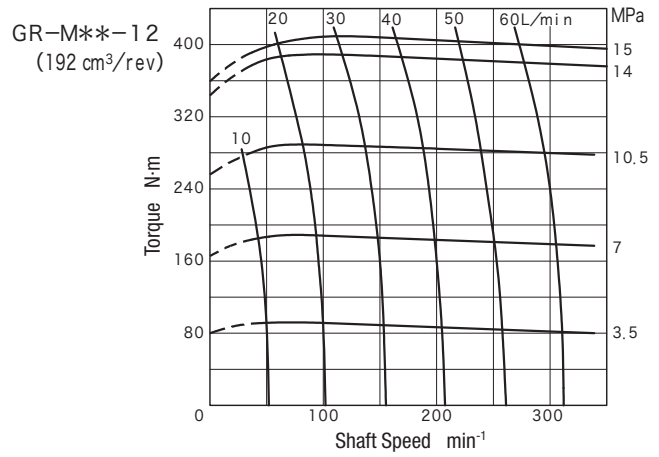
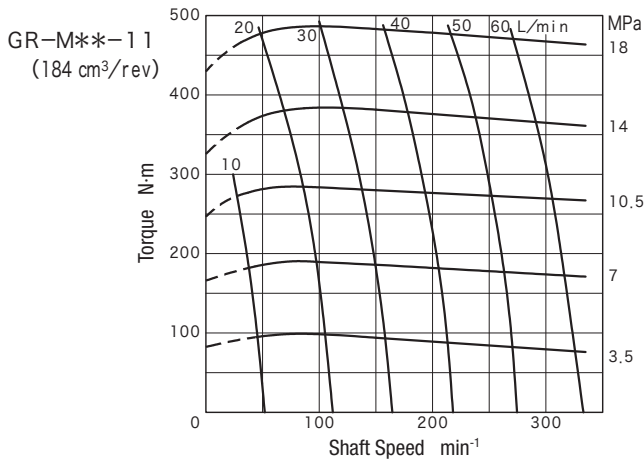
## Characteristics Curves (value with ISO VG32 equivalent fluid operating at 49°C (22 mm<sup>2</sup>/s) (typical examples))

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



# Characteristics Curves (value with ISO VG32 equivalent fluid operating at 49°C (22 mm<sup>2</sup>/s) (typical examples))

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



## Notes on Operation

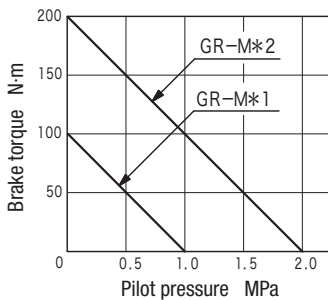
- Concerning radial loads and thrust loads  
As a basic rule, do not apply radial load or thrust load from an external source to the shaft end. When motors are to be operated by belt, chain, gear drive or some other form of indirect drive, consult Tokyo Keiki.
- Shaft end configuration and allowable torque  
When selecting GR-M series shaft, ensure that total torque of mechanical brake and hydraulic brake applied at the same time does not exceed values in the table below.

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 above, shaft end configuration 0 cannot be used for GR-M(\*2).

### 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 200 N·m, when pilot pressure is 1 MPa, brake torque is 100 N·m. When pilot pressure is 2 MPa, brake torque is 0 N·m. 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 Code	Max. Brake Torque*1	Brake Release Pressure*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.

\*2: Pilot pressure needed for 0 N·m 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 Tokyo Keiki when using motors in series circuit.

- Dynamic brake

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

[Chart]

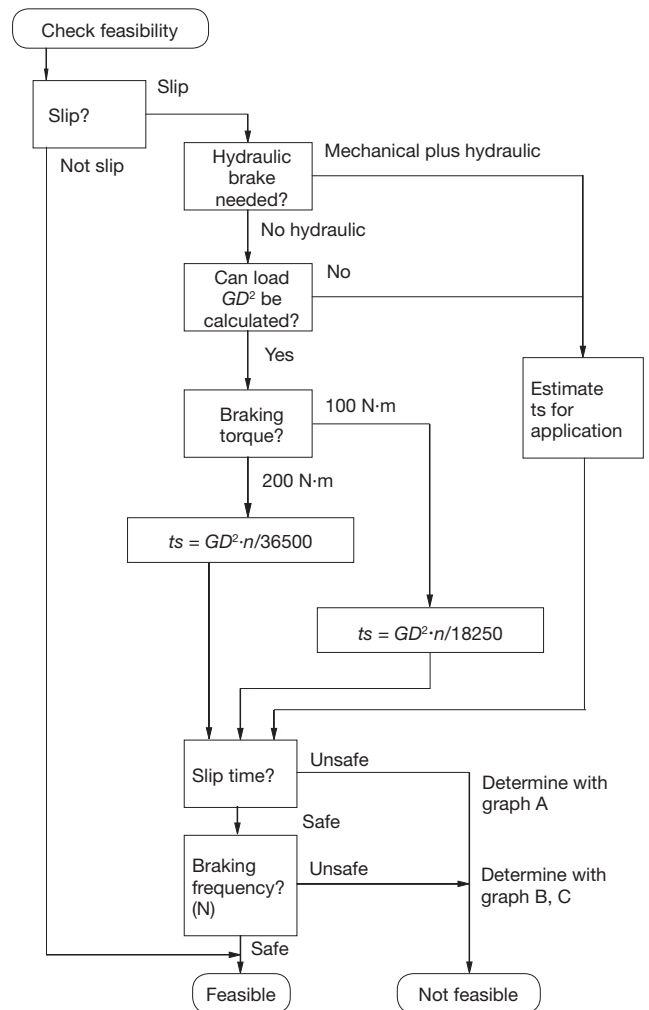
Mechanical brake working conditions are determined from slip time and braking frequency as follows:

$GD^2$  ( $\text{kg}\cdot\text{m}^3/\text{s}^2$ ): inertial moment (calculated from motor shaft)

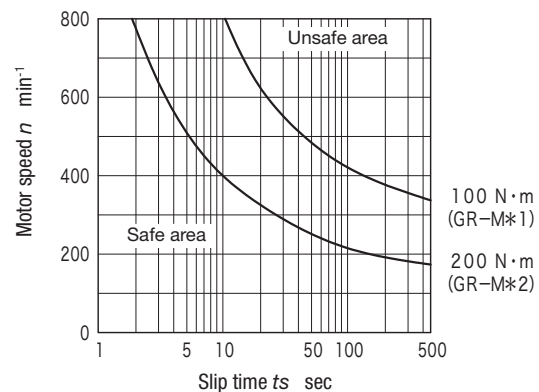
$t_s$  (s): slip time

$n$  ( $\text{min}^{-1}$ ): motor rpm

$N$  (freq/min): braking frequency

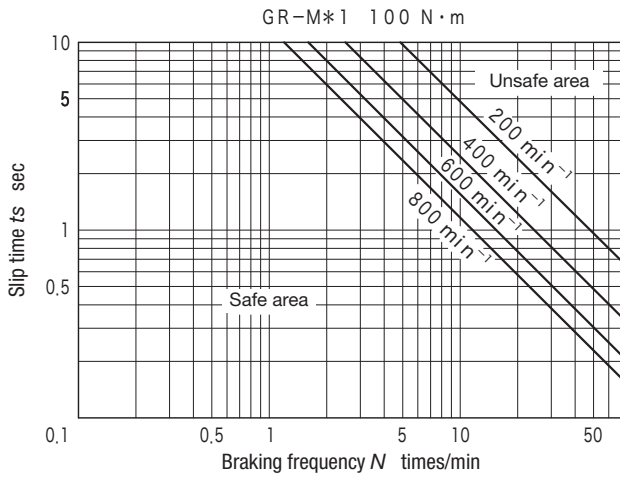


### Graph A

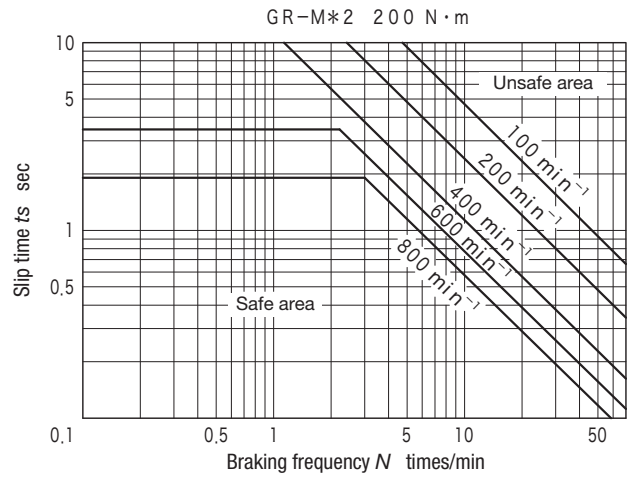


# Notes on Operation

## ● Graph B



## ● Graph C

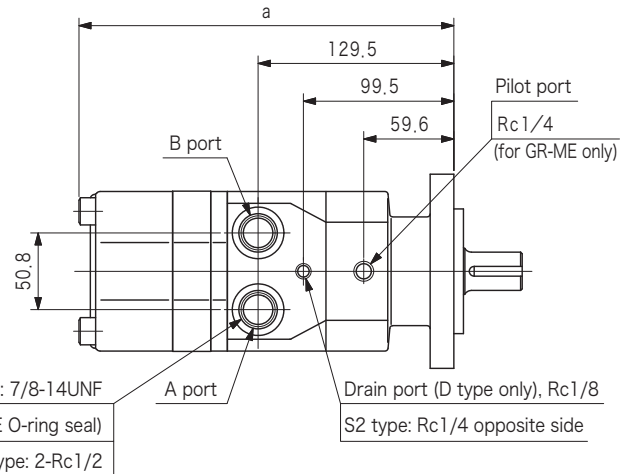
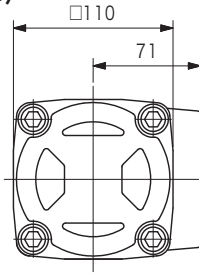


# Dimensions

## ● Porting

**S type:** 7/8-14UNF (SAE O-ring seal) in body  
(not applied to mounting type 5)

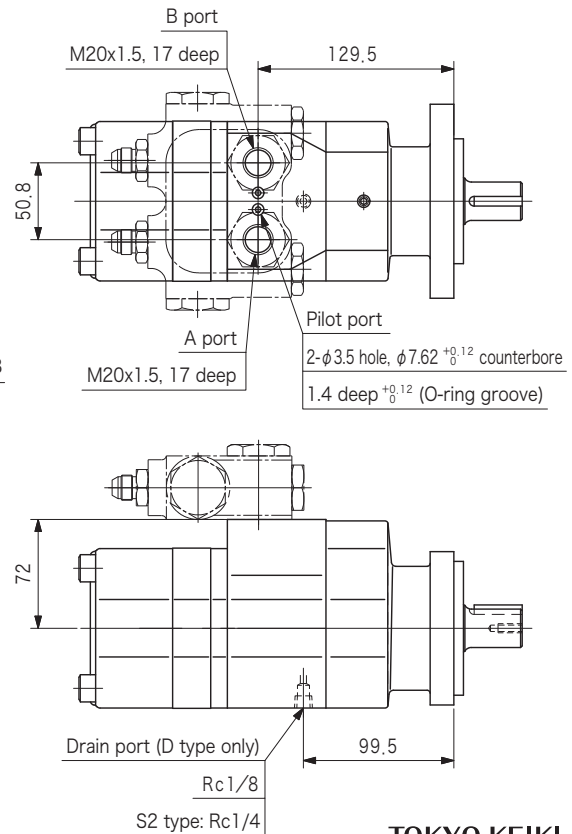
**P type:** Rc1/2 in body



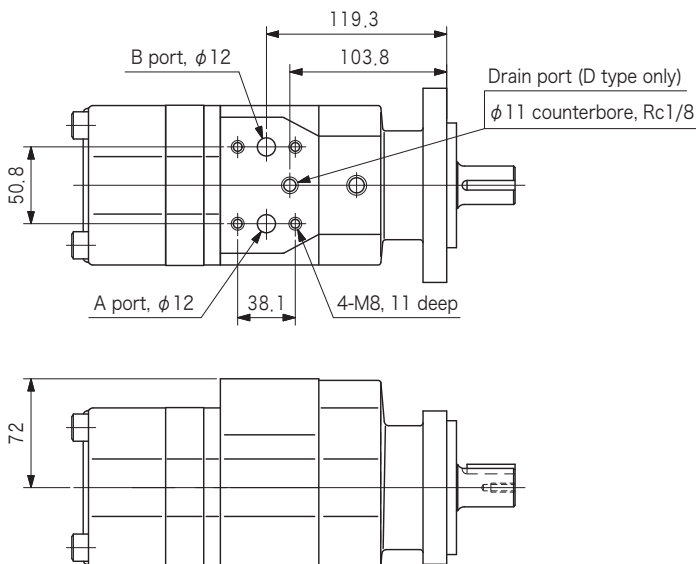
Dimensions table

Model Code	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



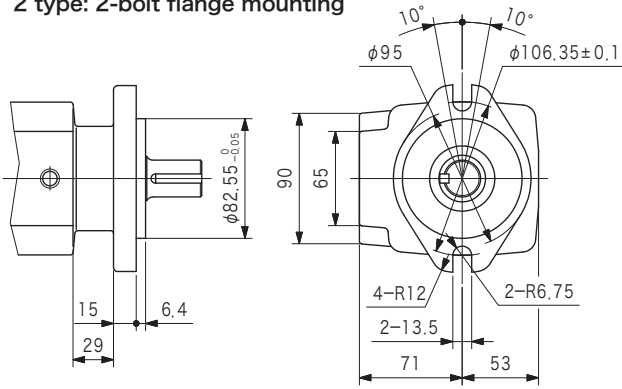
**G type:** flange connection in body  
(not applied to mounting types 2, 3)



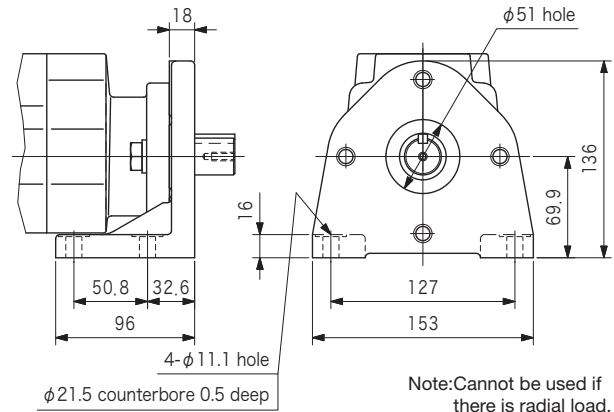
# Dimensions

## ● Mounting

2 type: 2-bolt flange mounting

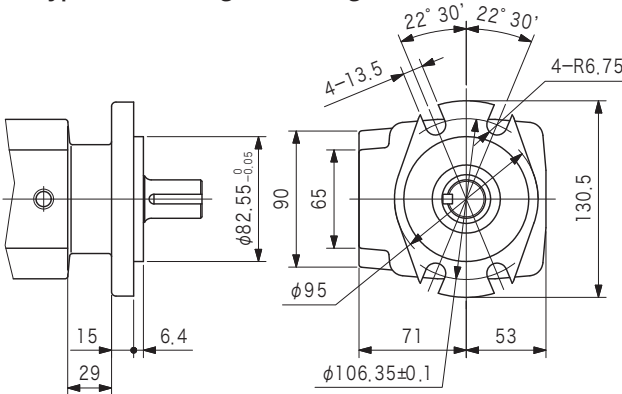


3 type: foot bracket mounting (type 2 foot bracket mounting)

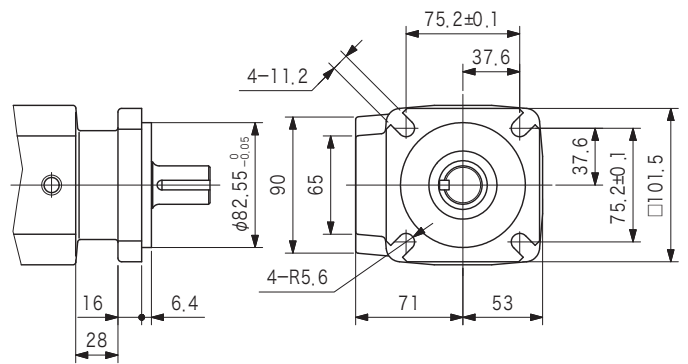


Note: Cannot be used if there is radial load.

4 type: 4-bolt flange mounting

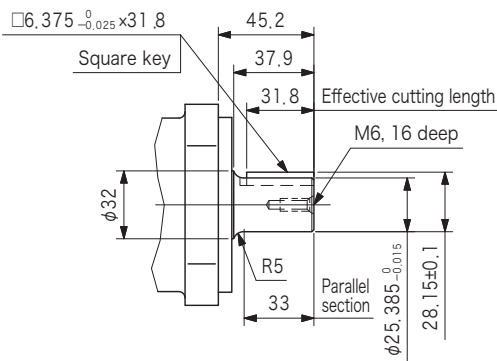


5 type: 4-bolt square flange mounting

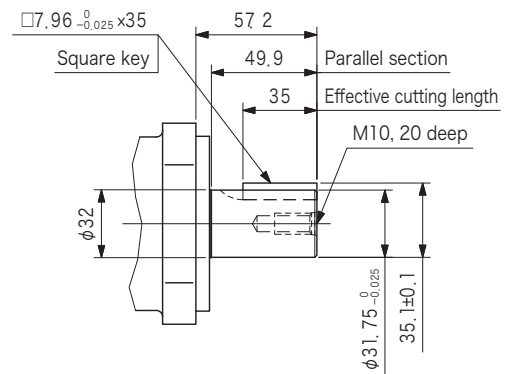


## ● Shaft end configuration

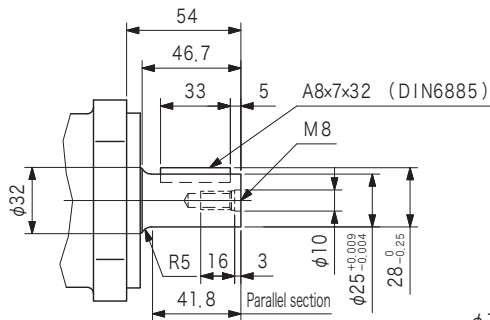
0 type: square key parallel shaft (1")



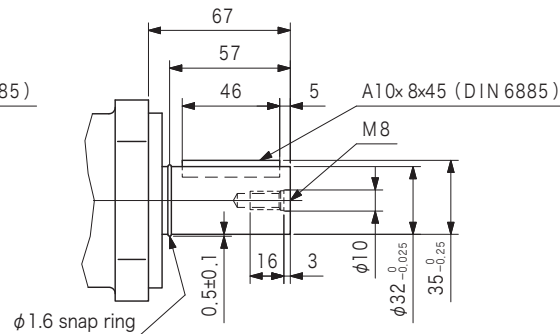
4 type: square key parallel shaft (1-1/4")



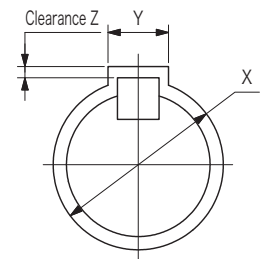
12 type: parallel shaft with key (φ25)



13 type: parallel shaft with key (φ32)



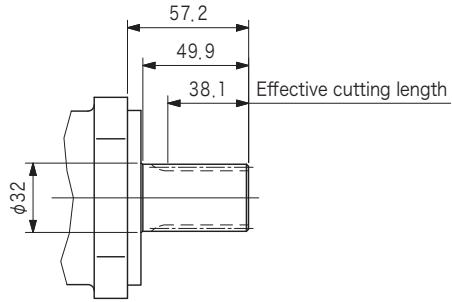
● Shaft with key coupling dimensions



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

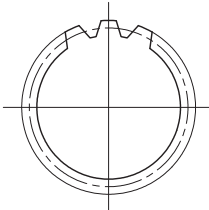
## Dimensions

### 8 type: involute spline shaft



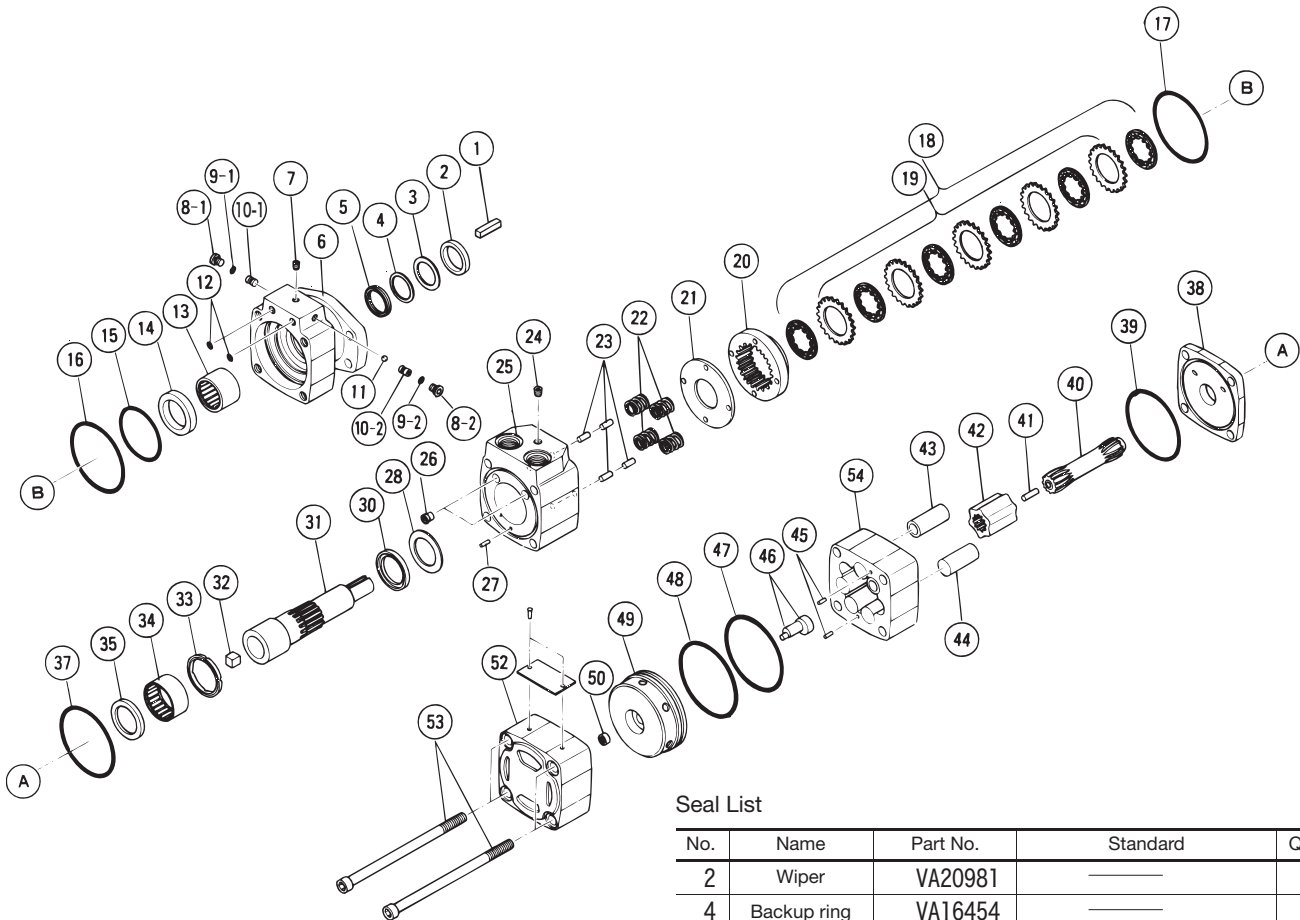
Involute Spline Specifications (shaft)		
Pitch diameter = $\phi 29.634$		
Flat root side fit		
Teeth = 14	D.P. = 12/24	Pressure angle = 30°
Minor diameter	T.I.F.D.	Major diameter
$\phi 26.99_{-0.33}^0$	$\phi 27.488 \text{ max.}$	$\phi 31.22_{-0.12}^0$
Over pin diameter = $35.798_{-0.045}^0$ (when using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

### ● Involute spline coupling dimensions



Involute Spline Specifications (hole)		
Pitch diameter = $\phi 29.634$		
Flat root side fit		
Teeth = 14	D.P. = 12/24	Pressure angle = 30°
Minor diameter	T.I.F.D.	Major diameter
$\phi 27.59_{0}^{+0.125}$	$\phi 31.326 \text{ min.}$	$\phi 31.75_{0}^{+0.035}$
Over pin diameter = $24.355_{0}^{+0.05}$ (when using $\phi 3.6576$ pin)		

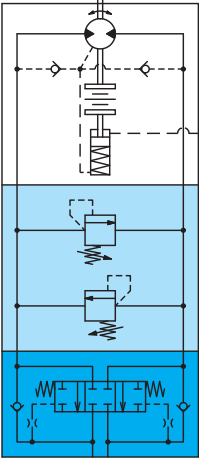
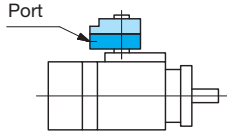
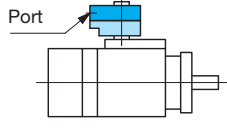
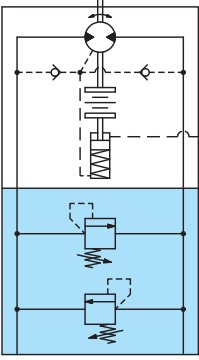
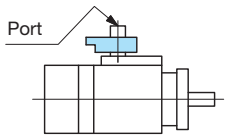
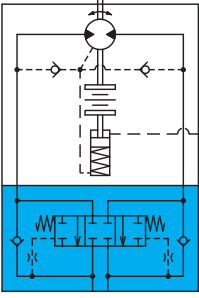
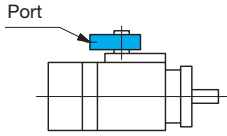
## Construction



### Seal List

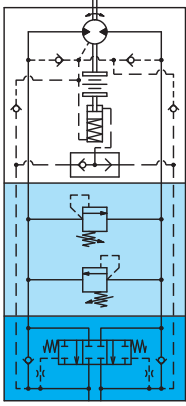
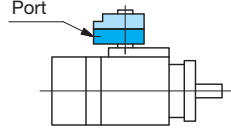
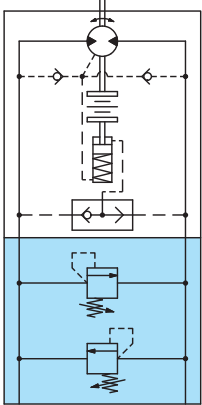
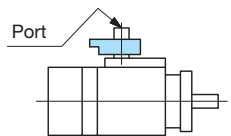
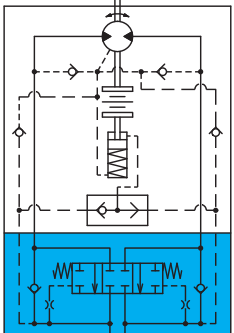
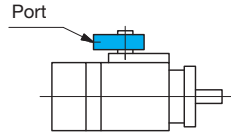
No.	Name	Part No.	Standard	Qty
2	Wiper	VA20981	—	1
4	Backup ring	VA16454	—	1
5	X ring	VA16453	—	1
9	O-ring	007990419	AS568-904 (NBR, Hs90)	2
12	O-ring	007900919	AS568-009 (NBR, Hs90)	2
15	O-ring	007914819	AS568-148 (NBR, Hs90)	1
16	O-ring	008051419	JIS B 2401 1B-G90	1
17	O-ring	007915319	AS568-153 (NBR, 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	Motor and Control Valve Models
<p><b>A</b></p>  <p>External pilot GR-ME*</p> <p>Brake valve BR-03-***</p> <p>Counterbalance valve CB-03-*</p>	<p>1</p>  <p>2</p> 	<p>Motor control valves</p> <p>GR-ME*-***-*S*</p> <p>CB-03-*-S1</p> <p>BR-03-***-S1</p> <p>Motor control valves</p> <p>GR-ME*-***-*S*</p> <p>CB-03-*-S1</p> <p>BR-03-***-S1</p>
<p><b>B</b></p>  <p>External pilot GR-ME*</p> <p>Brake valve BR-03-***</p>	<p>1</p> 	<p>Motor control valves</p> <p>GR-ME*-***-*S*</p> <p>BR-03-***</p>
<p><b>C</b></p>  <p>External pilot GR-ME*</p> <p>Counterbalance valve CB-03-*</p>	<p>1</p> 	<p>Motor control valves</p> <p>GR-ME*-***-*S*</p> <p>CB-03-*</p>



# Motor/Valve Combinations

Functional Symbols	Outline	Motor and Control Valve Models
<p><b>D</b></p>  <p>Internal pilot GR-MC*</p> <p>Brake valve BR-03-***</p> <p>Counterbalance valve CB-03-*G</p>	<p>1</p> 	<p>Motor control valves</p> <p>GR-MC*-***-C*</p> <p>CB-03-*G-S1</p> <p>BR-03-***-S1</p>
<p><b>E</b></p>  <p>Internal pilot GR-M*</p> <p>Brake valve BR-03-***</p>	<p>1</p> 	<p>Motor control valves</p> <p>GR-M*-***-S*</p> <p>BR-03-***</p>
<p><b>F</b></p>  <p>Internal pilot GR-MC*</p> <p>Counterbalance valve CB-03-*G</p>	<p>1</p> 	<p>Motor control valves</p> <p>GR-MC*-***-C*</p> <p>CB-03-*G</p>