Hydraulic Motor (General)

	Piston Motor		Gear motor, vane motor, etc
	Motor unit	Motor with reduction gear	
Products included in this catalog	Piston motor in swash plate design for general purpose and fan application.	For excavator and mini-excavator (For travel and swing systems)	
KYB products not included in this catalog. (Contact KYB)	Piston motor in bent axis design Radial piston motor (Low speed high torque)	For mixer truck	Internal gear motor (Manufactured by Sauer-Danfoss)
Not included in KYB product lineup			External gear motor (Production discontinued) Vane motor

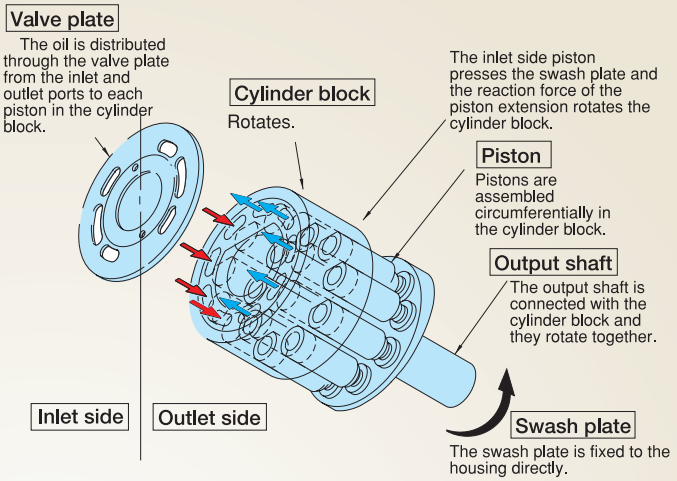
Motor: Piston Motor (Swash plate type)

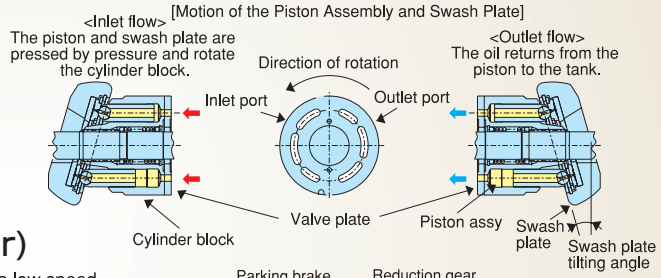
Basic Construction

Motor unit

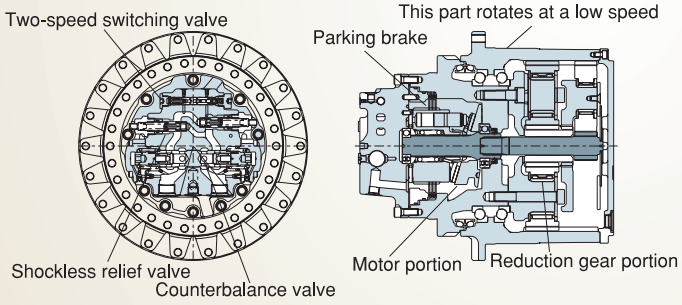
[Construction and Mechanism]

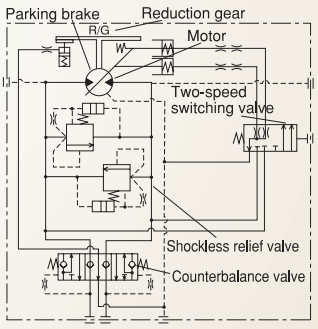
1. When high-pressure oil supplied from the pump flows into the cylinder block through the valve plate, the swash plate is pushed by the force of the piston assembly.
2. The piston assembly receives reaction force against it and produces reaction force in the rotating direction.
   The total force of high-pressure side piston assembly produces a rotating force in the cylinder block, and the torque is transmitted to the shaft through the spline, resulting in the rotation of the shaft.
3. The oil delivered from the outlet port returns to the reservoir through the valve plate.
4. The inlet and outlet sides can be switched by an external valve operation to rotate the motor in the reverse direction.





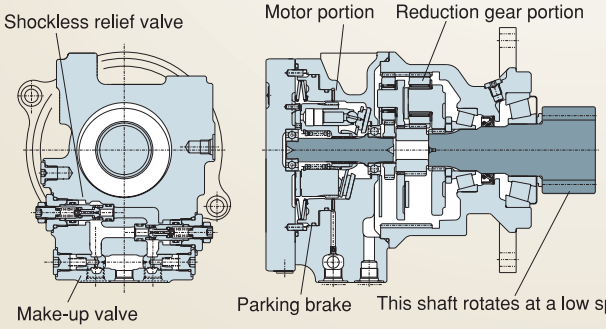
Traveling motor (with reduction gear)

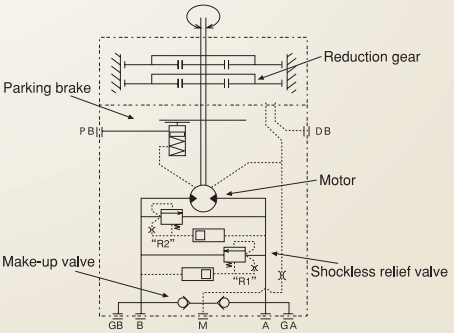




Hydraulic circuit

Swing motor (with reduction gear)





Hydraulic circuit

【Main Components of the Travel Motor (MAG)】

◇ Reduction gear
- ● A case rotation type simple planetary reduction gear is adopted.

◇ Motor (standard component)
- ● Counterbalance valve (standard component for all models): Prevents the motor from overrunning on a down slope. The valve is effective to prevent cavitation.
- ● Two speed mechanism (standard component for all models): Two step speed change can be done under the same flow, which allows a wider range of speed control. (See Page 24)
- ● Shockless relief valve (standard component for MAG-50 through 230): Reduces shocks at the stop and prevents cavitation.
- ● Anti-cavitation valve (with no relief mechanism) (standard component for MAG-18 through 33): This valve has stopping performance similar to the shockless version and can prevent cavitation.
- ● Parking brake (standard component for MAG-50 through 230 and optional for MAG-12 through 33): A multiple-plate wet disk brake system is adopted.

(Optional Component)
- ● Automatic two-speed system (except for MAG-12): Speed is automatically switched from Low to High or vice versa according to travel load pressure.

【Main Components of the Swing Motor (MSG)】

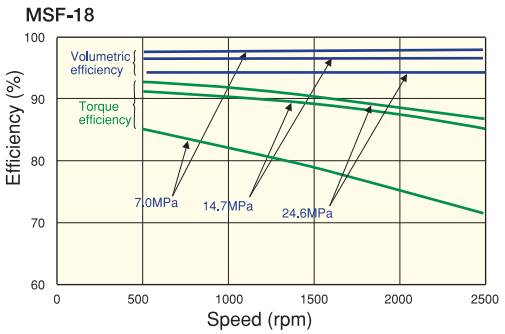
◇ Reduction gear
- ● Shaft rotation type planetary reduction gear is adopted.
- ● Motor lubricant circulation system: Hydraulic fluid is also used as a reduction gear lubricant. No maintenance is required.

◇ Motor (standard component for all models)
- ● Shockless relief valve: Reduces shocks at the stop and prevents cavitation.
- ● Parking brake: Multiple-plate disk brake is adopted. (Output torque ratio over 100%)
- ● Make-up valve: Prevents cavitation.

(Optional Components for All Models)
- ● Parking brake delaying valve: Delays the response time of the parking brake
- ● Anti-reaction valve: Reduces the reaction at the time the motor stops.

Basic Characteristics

The motor's general characteristics (performance) are as follows.



Output torque calculation formula:

$$T = \frac{P \times D}{2 \times \pi} \times \eta_m$$

D: Motor displacement [cm³/rev]
T: Output torque [N-m]
P: Effective pressure [MPa]
ηv: Mechanical (torque) efficiency

- ○ Output torque can be obtained from motor displacement, pressure, and mechanical efficiency.
- ○ The torque efficiency is affected by mechanical friction and other factors, and drops at a higher speed and lower pressure.

Output speed calculation formula:

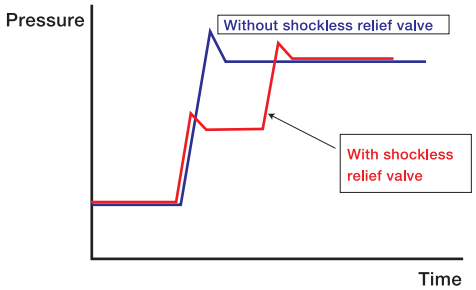
$$N = \frac{Q \times 10^3}{D} \times \eta_v$$

N: Speed [rpm]
Q: Flow rate [L/min.]
ηv: Volumetric efficiency

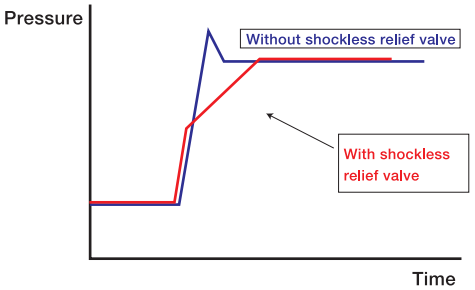
- ○ The speed can be decided by motor capacity, flow rate, and volumetric efficiency.
- ○ Volumetric efficiency is affected by leakage inside the motor (from the high pressure side to the low pressure side), and decreases at a slower speed and higher pressure.

【Characteristics of the Shockless Relief Valve】

<Travel motor>



<Swing motor>



Motor: Piston Motor Unit

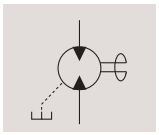
【Swash Plate Piston Motor】

The MSF series is a compact, light, swashplate type piston motor, which has been used for construction and agricultural machines.
All rotary parts are manufactured by one of KYB-affiliated companies, Takako Industries, Inc., which is the world's leading company in this technology.

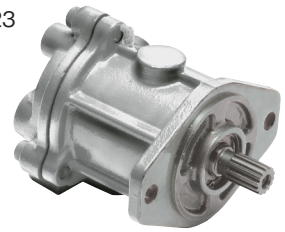
【Model code】 MSF – 23
Example 1 2

1	Fixed displacement swashplate type piston motor	
2	Max. displacement	Nominal value (cm³/rev)

■ MSF Series (motor unit)


Symbol

MSF-23



<General purpose>

Model	Displacement (cm³/rev)	Max. working pressure(MPa)	Max. speed(rpm)	Max. flow rate (L/min.)
MSF–18	16.4～18.4	24.5	3000	50
MSF–23	23.4	24.5	3000	70

Models for fan and mixer drum driving applications are also available.
Please contact us for details.

Motor: Piston motor (with reduction gear)

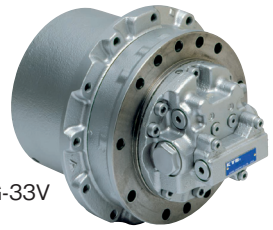
The MAG series offers high-torque motors for medium- or high-speed traveling crawler vehicles. It consists of a case rotation planetary reduction gear and a swash plate piston motor, and is equipped with a two-speed change unit and a parking brake unit. .
The two-speed change mechanism supports the automatic speed change according to the load. The MSG series motors incorporating a shaft-rotation type simple planetary reduction gear and the swash plate motor are ideal solutions for the swing system of excavators and mini-excavators. The motor is equipped with a parking brake in our standard version.

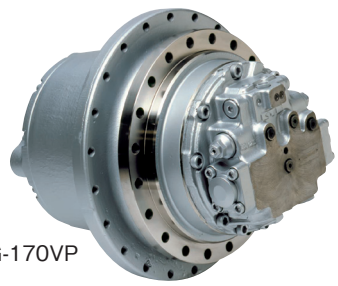
【Model code】 MAG – 170 V P – 3800 F
Example 1 2 3 4 5 6

1	MAG: Case-rotation type motor with reduction gear (for travel systems)	
	MSG: Shaft-rotation type motor with reduction gear (for swing systems)	
2	Max. displacement	Nominal (cm³/rev)
3	Two-speed change mechanism	V: Equipped Void: Not equipped
4	Parking brake system	P: Equipped Void: Not equipped
5	MAG: Output torque (kgf-m)	MSG: Reduction gear ratio
6	Development serial number	

■ MAG Series (with reduction gear)

(For excavator and mini-excavator travel)


MAG-33V

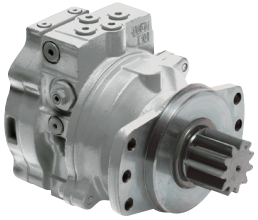

MAG-170VP

Model	Max. output torque(kN-m)	Max. working pressure(MPa)	Max. speed(rpm)	Max. flow rate(L/min.)	Typical applications
MAG–12V–120E	1.18	20.6	80	20	Mini excavator
MAG–18V–230F	2.26	24.5	70	30	
MAG–18V–350F	3.43	27.5	60	40	
MAG–26V–400F	3.92	27.5	60	50	
MAG–33V–650F	6.37	27.5	60	60	
MAG–50VP–800	7.84	29.4	55	80	Midi excavator
MAG–85VP–1800E	17.7	34.3	55	150	Excavator
MAG–85VP–2400E	23.5	34.3	50	150	
MAG–170VP–3800G	37.3	34.3	50	270	
MAG–230VP–6000	58.8	34.3	50	320	

Models for winches and skid-steer loaders are also available.
Please contact us for details.

■ MSG Series (with reduction gear)

(For excavator and mini-excavator swing)

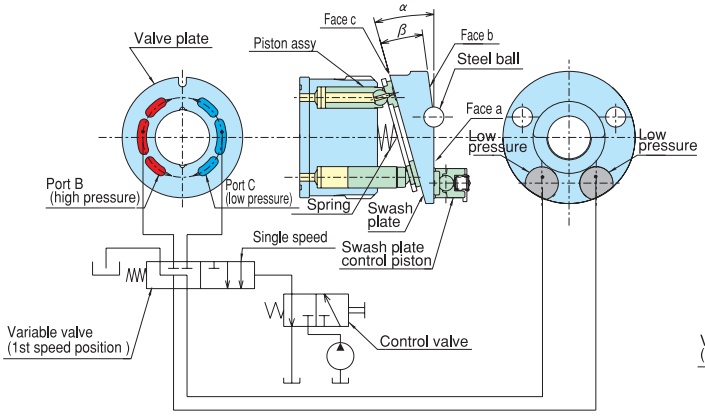

MSG-27P

Model	Max. output torque(kN-m)	Max. working pressure(MPa)	Max. speed(rpm)	Max. flow rate(L/min.)	Typical applications
MSG–27P–10E	0.83	20.6	90	25	Mini excavator
MSG–27P–16E	1.27	20.6	85	35	
MSG–27P–23E	2.04	20.6	70	44	
MSG–50P–21	3.48	24	85	77	

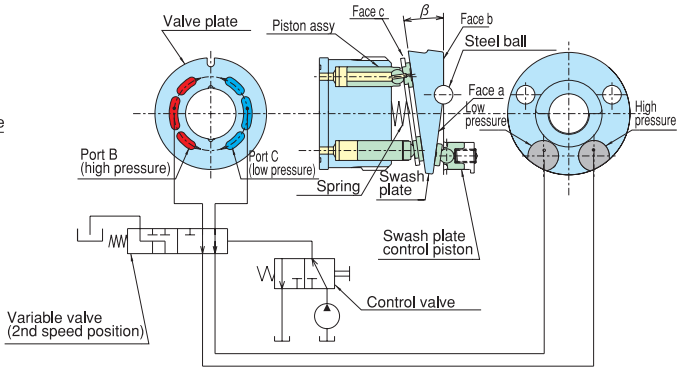
【Two-speed Change Mechanism】(MAG series for travel systems)

The swashplate has three surface sections, a, b, and c, and can be tilted by external pilot pressure with two steel balls at the rear of the swashplate working as fulcrums.

1st Speed : Low speed (high torque)



2nd Speed : High speed (low torque)



Low speed = Large displacement

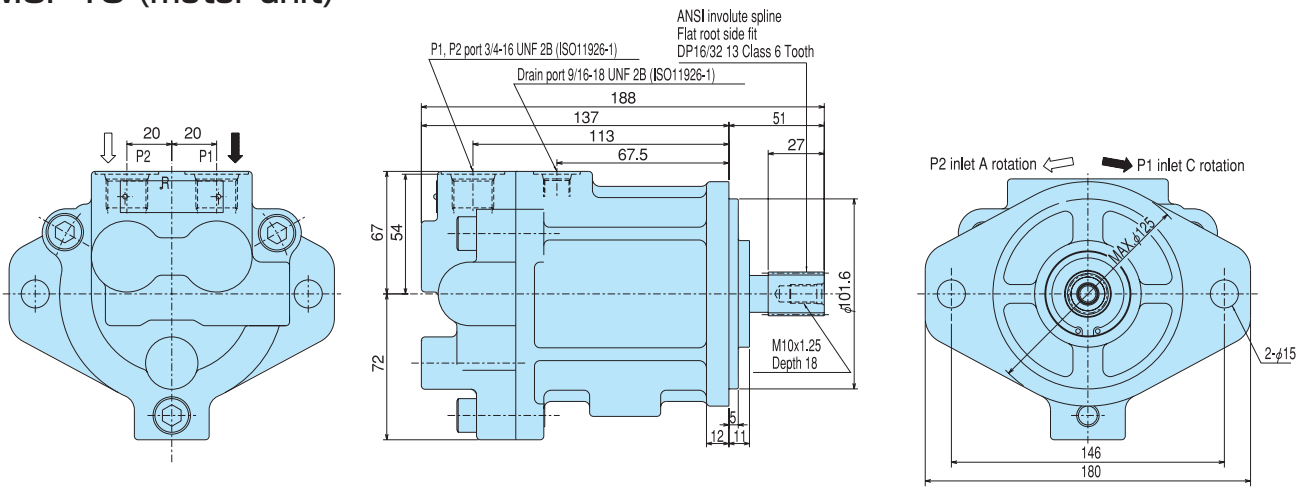
When the control valve position is switched to 1st speed, the variable valve connects the swash plate control piston chamber behind the swash plate with the reservoir and the section “a” of the swash plate is pressed against the fixed face by the driving force of the motor on the piston and the spring on the cylinder block side. As a result, the swash plate tilts at a maximum angle α to output a larger displacement (1st speed).

High speed = Small displacement

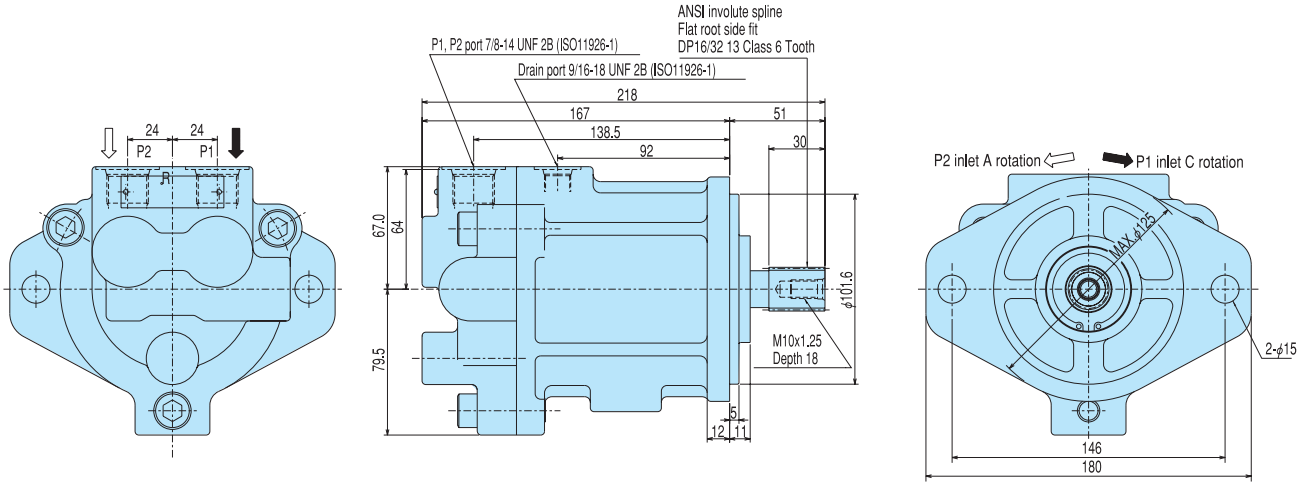
Switching the variable valve position to 2nd speed with the control valve leads the motor driving pressure to the swash plate control piston. As the force of the piston overcomes the driving force of the motor and the force of the spring, the face “b” of swash plate is pressed to the fixed face, making the swash plate tilt at a minimum angle β to generate a smaller displacement. (2nd speed).

Dimensions (unit: mm)

MSF-18 (motor unit)

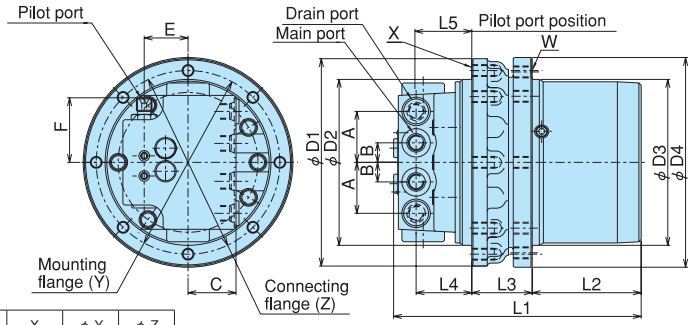


MSF-23 (motor unit)



Dimensions (unit: mm)

MAG-12V (for travel)

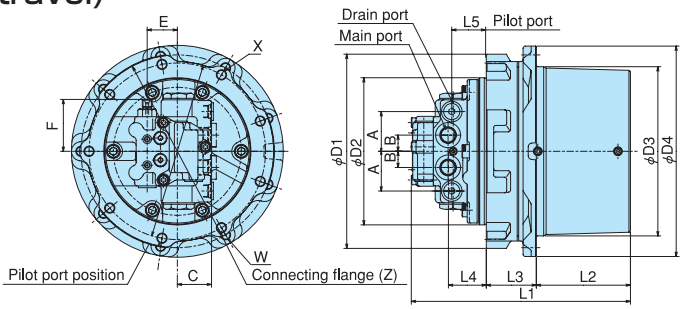


Model	φ D1	φ D2	φ D3	φ D4	L1	L2	L3	L4	L5
MAG-12V-120E	179	140	140	177	205	95	45	50	51

Model	A	B	C	E	F	Main port	Drain port	Pilot port	W	X	φ Y	φ Z
MAG-12V-120E	43	16.5	39	37	54.5	G1/4(PF1/4)	G1/4(PF1/4)	G1/4(PF1/4)	8-M10	8-M10	155	155

Mounting flange (Y): Vehicle mounting P.C.D. (Mounting screw X) Connecting flange (Z): Sprocket mounting P.C.D. (Mounting screw W)

MAG-18V, 26V, 33V, and 50VP (for travel)

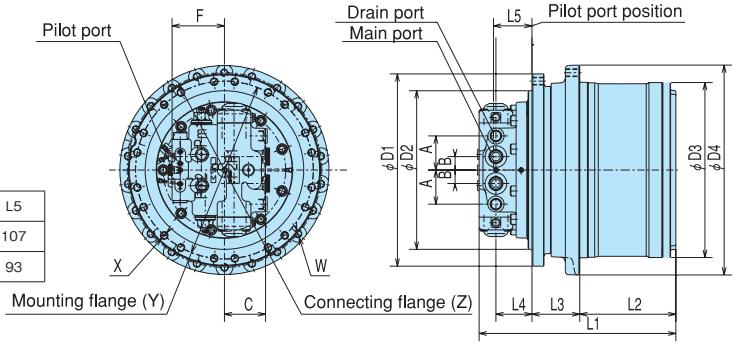


Model	φ D1	φ D2	φ D3	φ D4	L1	L2	L3	L4	L5
MAG-18V-230F (W/A.C.V)	190	150	160	200	250	104	40	59	61
MAG-18V-350F (W/A.C.V)	215	165	190	238	263	115	50	48	41.5
MAG-26V-400F (W/A.C.V)	215	165	204	255	288	120	70	46	41.5
MAG-33V-550F (W/A.C.V)	264	200	230	286	296	128	68	50	43.5
MAG-50VP-800 (W/R.V)	284	210	265	332	354	145	80	70	64

Model	A	B	C	E	F	Main port	Drain port	Pilot port	W	X	φ Y	φ Z
MAG-18V-230F (W/A.C.V)	46.5	19.5	40	37	58	G3/8(PF3/8)	G1/4(PF1/4)	G1/4(PF1/4)	13-M10	12-M10	170	180
MAG-18V-350F (W/A.C.V)	54	22	45	41	71	G1/2(PF1/2)	G1/4(PF1/4)	G1/4(PF1/4)	11-M12	11-M12	192	215
MAG-26V-400F (W/A.C.V)	54	22	45	41	71	G1/2(PF1/2)	G3/8(PF3/8)	G1/4(PF1/4)	9-M12	11-M12	192	232
MAG-33V-650F (W/A.C.V)	54	22	45	41	71	G1/2(PF1/2)	G3/8(PF3/8)	G1/4(PF1/4)	12-M14	12-M14	240	262
MAG-50VP-800 (W/R.V)	58	23	50	48	71	G1/2(PF1/2)	G3/8(PF3/8)	G1/4(PF1/4)	12-M16	12-M14	250	300

Mounting flange (Y): Vehicle mounting P.C.D. (Mounting screw X) Connecting flange (Z): Sprocket mounting P.C.D. (Mounting screw W)

MAG-85VP (for travel)

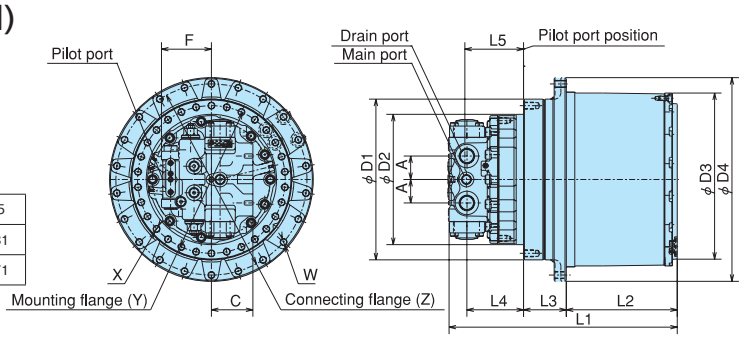


Model	φ D1	φ D2	φ D3	φ D4	L1	L2	L3	L4	L5
MAG-85VP-1800E	350	290	324	394	387	180	83	89	107
MAG-85VP-2400E	400	330	365	437	713	200	100	75	93

Model	A	B	C	E	Main port	Drain port	Pilot port	W	X	φ Y	φ Z
MAG-85VP-1800E	71	28	84	108	G3/4(PF3/4)	G1/2(PF1/2)	G1/4(PF1/4)	16-M16	15-M15	320	364
MAG-85VP-2400E	71	28	84	108	G3/4(PF3/4)	G1/2(PF1/2)	G1/4(PF1/4)	16-M16	22-M16	370	405

Mounting flange (Y): Vehicle mounting P.C.D. (Mounting screw X) Connecting flange (Z): Sprocket mounting P.C.D. (Mounting screw W)

MAG-170VP and 230VP (for travel)



Model	φ D1	φ D2	φ D3	φ D4	L1	L2	L3	L4	L5
MAG-170VP-3800G	370	300	402	469	526	254	99	128	131
MAG-230VP-6000	462	380	450	530	613	313	112	157	171

Model	A	B	C	E	Main port	Drain port	Pilot port	W	X	φ Y	φ Z
MAG-170VP-3800G	–	54	95	110	G1(PF1)	G1/2(PF1/2)	G1/4(PF1/4)	30-M16	22-M16	340	440
MAG-230VP-6000	87	37	89	113	G1(PF1)	G1/2(PF1/2)	G1/4(PF1/4)	20-M24	24-M20	425	495

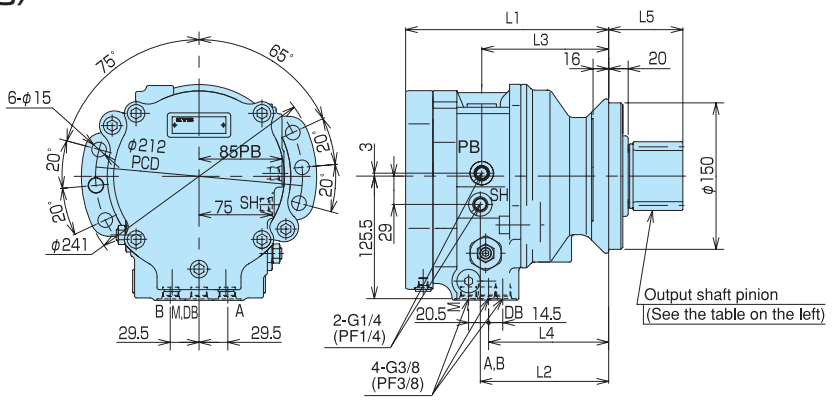
Mounting flange (Y): Vehicle mounting P.C.D. (Mounting screw X) Connecting flange (Z): Sprocket mounting P.C.D. (Mounting screw W)

MSG-27P-10E and 16E (for swing)

Model	L1	L2	L3	L4	L5
MSG-27P-10E	208	131.5	130	123	76
MSG-27P-16E	240	163.5	162	155	83

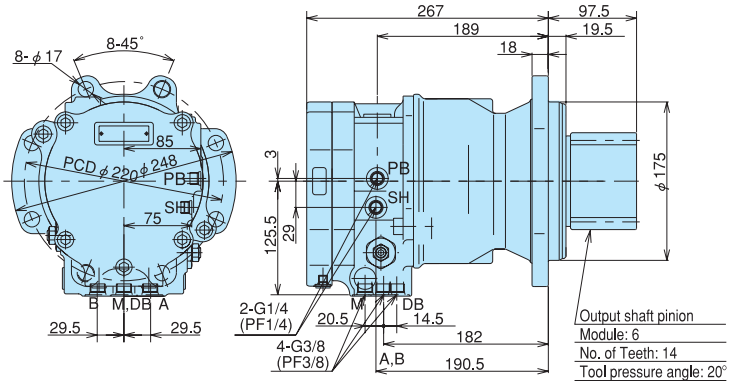
Output shaft pinion

Model	Module	No. of Teeth	Tool pressure angle
MSG-27P-10E	5	11	20°
MSG-27P-16E	6	11	20°

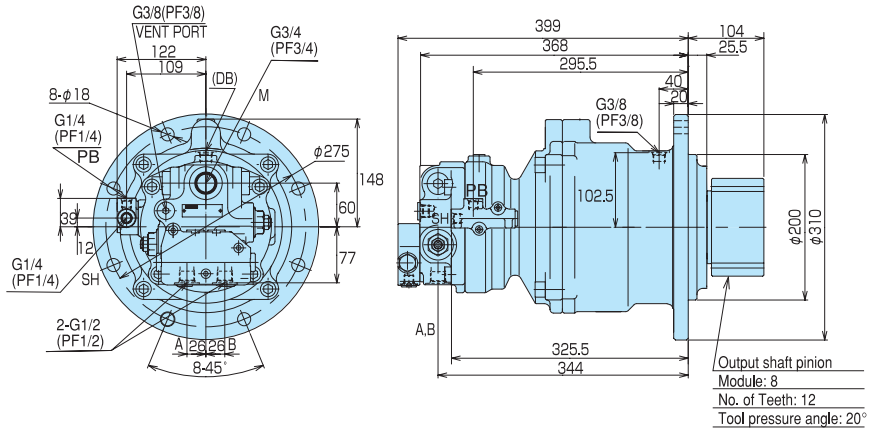


※ SH port: Signal pressure port for a model with an optional parking brake delaying valve mechanism.

MSG-27P-23E (for swing)



MSG-50P-21 (for swing)



Precautions for handling MAG/MSG series

◇These series are designed for excavators and mini-excavators with open circuit. MAG models are also available for closed circuit travel motors and winch applications. Please contact us for details.

◇ We may recommend motor capacities and speed ratios suitable for the customer's requirements. Please let us know what your application requirements are.

◇ MAG motor is to be installed with its output shaft horizontally positioned and the main port facing sideways or upward. When the main port is set facing sideways, use the upper one out of two drain ports. Do not install MSG motor with the output shaft facing downward. Also use the specific drain port. It should not be substituted with the vent port.

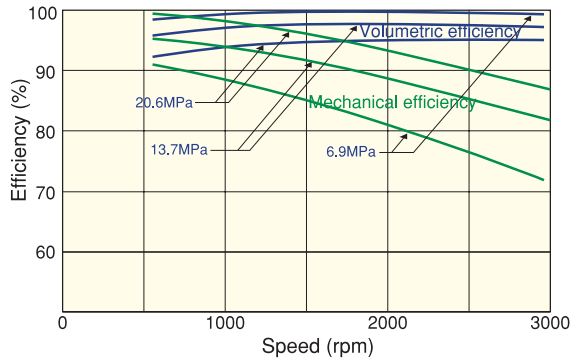
◇ Do not use the parking brake of MSG motor for dynamic braking. Configure the circuit so that the parking brake applies after the motor stops.

◇ Please read the "Precautionary on the Use of Hydraulic Equipment" on Page 4. Please contact us with any questions.

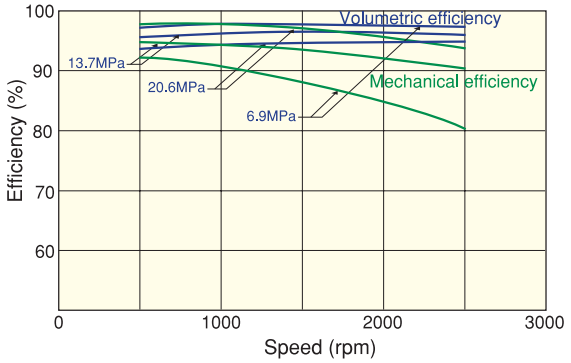
Performance Curve Operating oil:ISOVG46 Oil temperature: 50℃

<Motor unit>

MSF-18

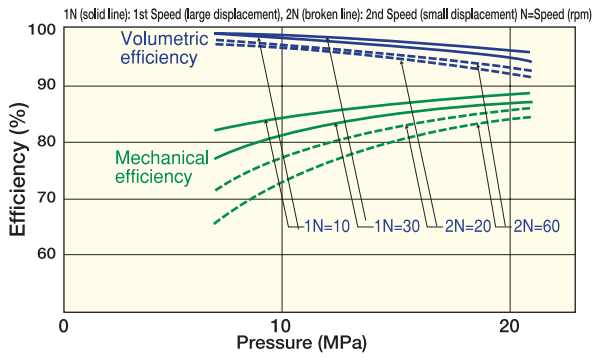


MSF-23

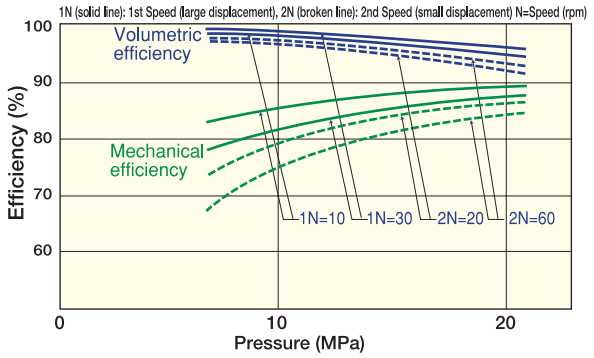


<Motor with reduction gear for travel>

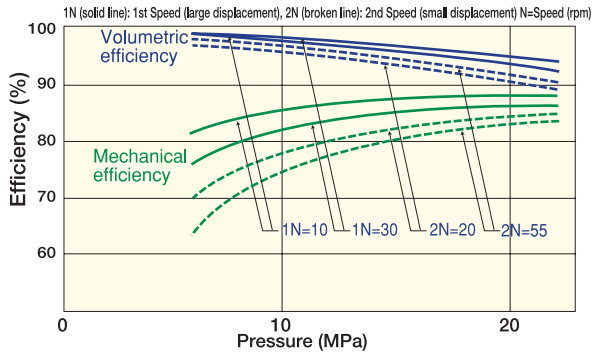
MAG-12V



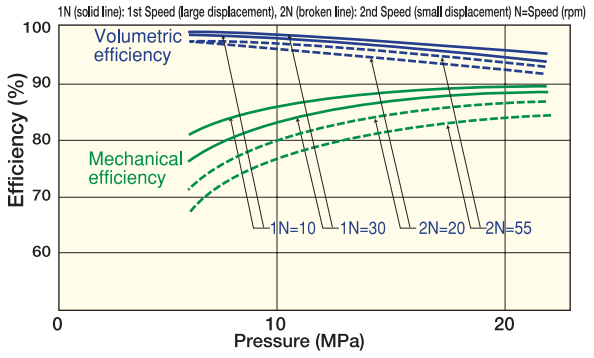
MAG-18V



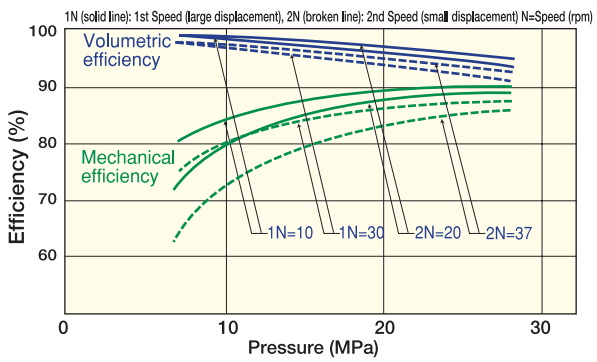
MAG-26V



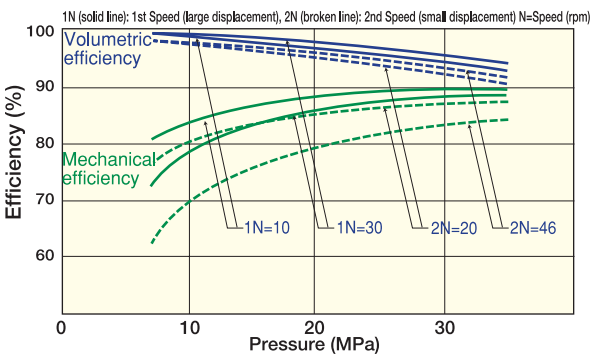
MAG-33V



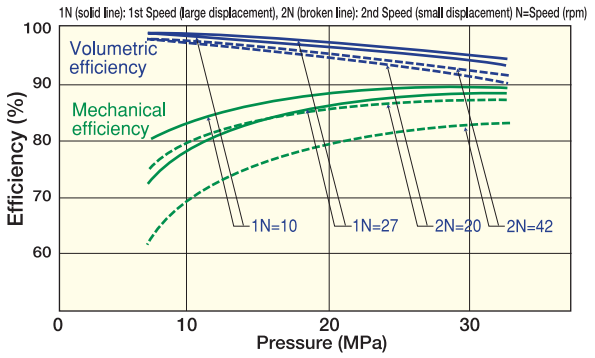
MAG-50V



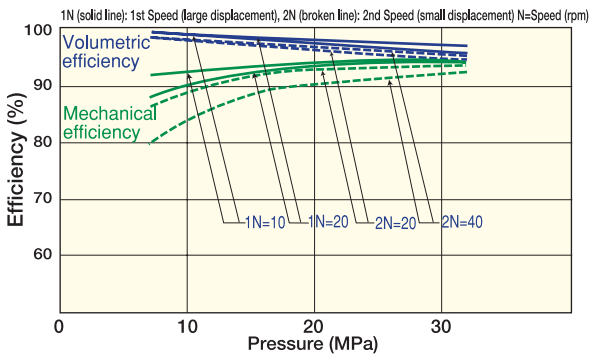
MAG-85V



MAG-170V

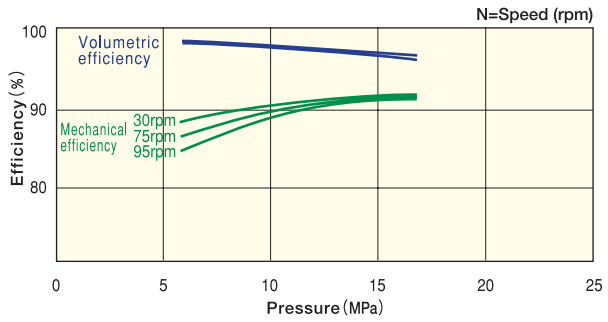


MAG-230V

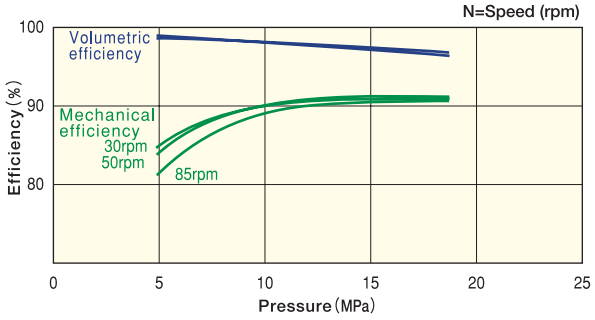


<Motor with reduction gear for swing system>

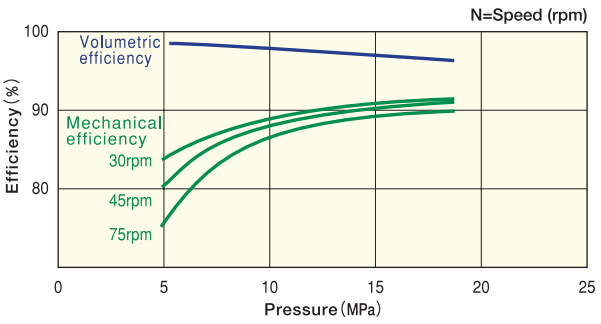
MSG-27P-10E



MSG-27P-16E



MSG-27P-23E



MSG-50P-21