TÜVRheinland® CERT ISO 9001

M+S HYDRAULIC

HYDRAULIC MOTORS

MLHM
MLHP
MLHR
MLHH

SAE version

SPOOL VALVE HYDRAULIC MOTORS

CONTENTS

SPOOL VALVE HYDRAULIC MOTORS

GENERAL INFORMATION:

Orbit motors convert hydraulic energy (pressure, oil flow) into mechanical energy (torque, speed). Hydraulic orbit motors operate on the principle of an internal gear (rotor) rotating within a fixed external gear (stator). The internal gear transmits the torque generated by the application of pressure from hydraulic oil fed into motor which is then delivered via the motor's output shaft. Orbit motors have high starting torque and constant output torque at wide speed range.

DISTRIBUTOR VALVE

MLHM, MLHP, MLHR, MLHH, MLHPL, MLHRL, HP, HR, MLHRW, HW series motors have spool valve: the distributor valve has been integrated with the output shaft. The cardan shaft rotates distributor valve and transfers mechanical energy from gerotor set to output shaft. The valve has hydrodynamic bearings and has infinite life when load ratings are not exceeded.

GEARWHEEL SET

There are two forms of gearwheel set:

- Gerotor set has plain teeth. These types motors are suitable for long operating periods at moderate pressures or short operating periods at high pressures. MLHM, MLHP, MLHPL and HP series motors have gerotor set.

- Roll-gerotor set has teeth fitted with rollers. The rollers reduce local stress and the tangential reaction forces on the rotor reducing friction to a minimum. This gives long operating life and better efficiency even at continuous high pressures. Roll-gerotor sets are recommended for operation with thin oil and for applications with continually reversing loads. MLHR, MLHRL, HR , MLHH, MLHRW and HW series motors have roll-gerotor set.

FEATURES:

Standard Motor The standard motor mounting flange is located as close to the output shaft as possible. This type of mounting supports the motor close to the shaft load. This mounting flange is also compatible with many standard gear boxes.

Wheel Motor W mounting flange makes the motors possible to fit a wheel hub or a winch drum so that the radial load acts closer to motor bearings. This gives the best utilization of the bearing capacity and is a very compact solution.

Needle Bearing MLHPN and MLHRN have an output shaft supported in needle bearing. These types motors are suitable for operating conditions such us frequent start and stops, vibration on the shaft, high static and dynamic radial loads in short operating terms.

Low Leakage LL Series hydraulic motors are designed to operate at the whole standard range of working conditions (pressure drop and frequency of rotation), but with considerable decreased volumetric losses in the drain ports. This motors are suitable for hydraulic systems with series-connected motors with demands for low leakage.

Low Speed Valve LSV feature optimizes the motor for low-speed performance. Motors with this valving provide very low speed while maintaining high torque. They are designed to run continuously at low speed (up to 200 RPM) at normal pressure drop and reduced flow. Optimal run is guaranteed at frequency of rotation from 20 to 50 RPM. Motors with this valving have an increased starting pressure and are not recommended for using at pressure drop less than 580 PSI [40 bar].

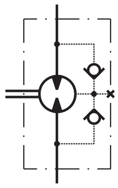
Free Running FR motors are with increased clearance at all friction parts, allowing the shaft to rotate more freely with less mechanical drag. The increased clearance also improves lubrication of the wear surfaces of gear set and friction parts. Additional advantages of "FR" version are prolonging of the life of the hydraulic motors at high speeds , as well as the possibility to use them in systems with wide variation of the loading. FR Series motors are designed to operate with high speed /over than 300 RPM/ and low pressure drop. Volumetric efficiency may be reduced slightly.

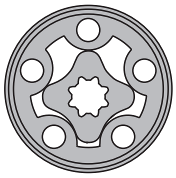
High Pressure Shaft Seal The high pressure shaft seals allow the motors to withstand high case pressures at high speeds without external drain line.

Motors with Speed Sensor Motors are available with integrated inductive speed sensor. The output signal is a standardized voltage signal that can be used to control the speed of a motor. The torque and the radial load of the motor are not affected by the installation of speed sensor.

HYDRAULIC MOTORS MLHM

CONTENTS

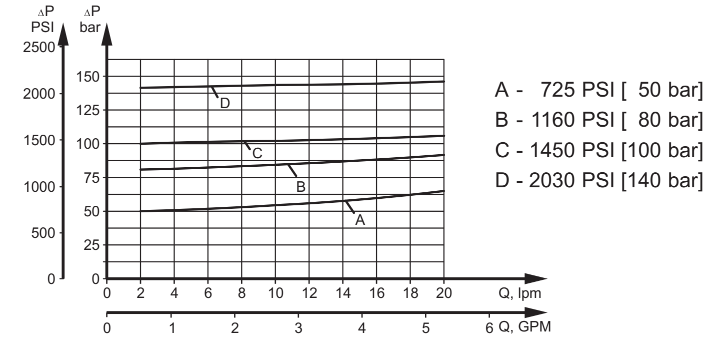




APPLICATION

- » Conveyors
- » Textile machines
- » Mining machinery
- » Machine tools
- » Ventilators
- » Construction plant equipment and access platforms etc.

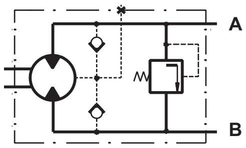
Pressure Settings at Flow
Q=.53 GPM [2 lpm], 150 SUS [32 mm^2/s], 122°F [50°C]



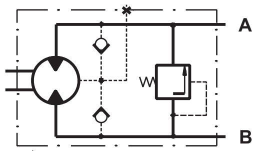
OPTIONS

- » Model - Spool valve, gerotor
- » With or without flange
- » Side and rear ports
- » Series with pressure valve(s)
- » Shafts - straight and splined
- » Metric and BSPP ports
- » Speed sensoring;
- » Other special features

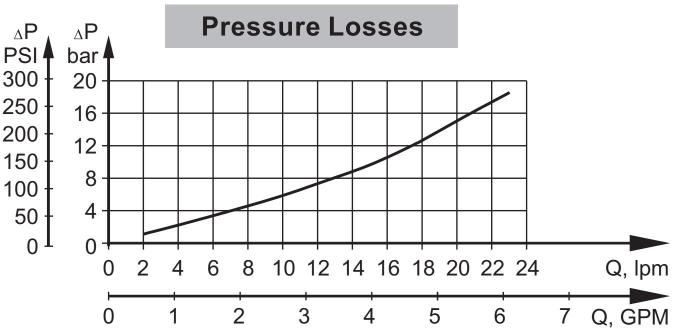
MLHMP Series with Integrated Internal Crossover Relief Valve
A⟶B,Δp=1450 or 725 PSI [100 or 50 bar]



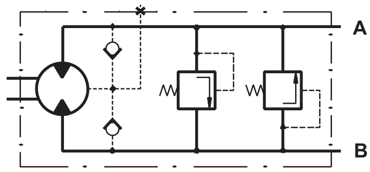
MLHMP Series with Integrated Internal Crossover Relief Valve
B⟶A,Δp=1450 or 725 PSI [100 or 50 bar]



Pressure Losses



MLHMD Series with Integrated Internal Crossover Relief Valves
A⟷B,Δp=100 or 50 bar [1450 or 725 PSI]



GENERAL

Max. Displacement,	in^3/rev [cm^3/rev]	3.05 [50]
Max. Speed,	[RPM]	2440
Max. Torque,	lb-in [daNm]	cont.: 398 [4,5] int.: 513 [5,8]
Max. Output,	HP [kW]	4,3 [3,2]
Max. Pressure Drop,	PSI [bar]	cont.: 1500 [105] int.: 2030 [140]
Max. Oil Flow,	GPM [lpm]	6.6 [25]
Min. Speed,	[RPM]	20
Pressure fluid		Mineral based - HLP(DIN 51524) or HM(ISO 6743/4)
Temperature range,	°F [°C]	-40 ÷ 284 [-40 ÷ 140]
Optimal Viscosity range,	SUS [mm^2/s]	98 ÷ 347 [20 ÷ 75]
Filtration		ISO code 20/16 (Min. recommended fluid filtration of 25 microns)

SPECIFICATION DATA

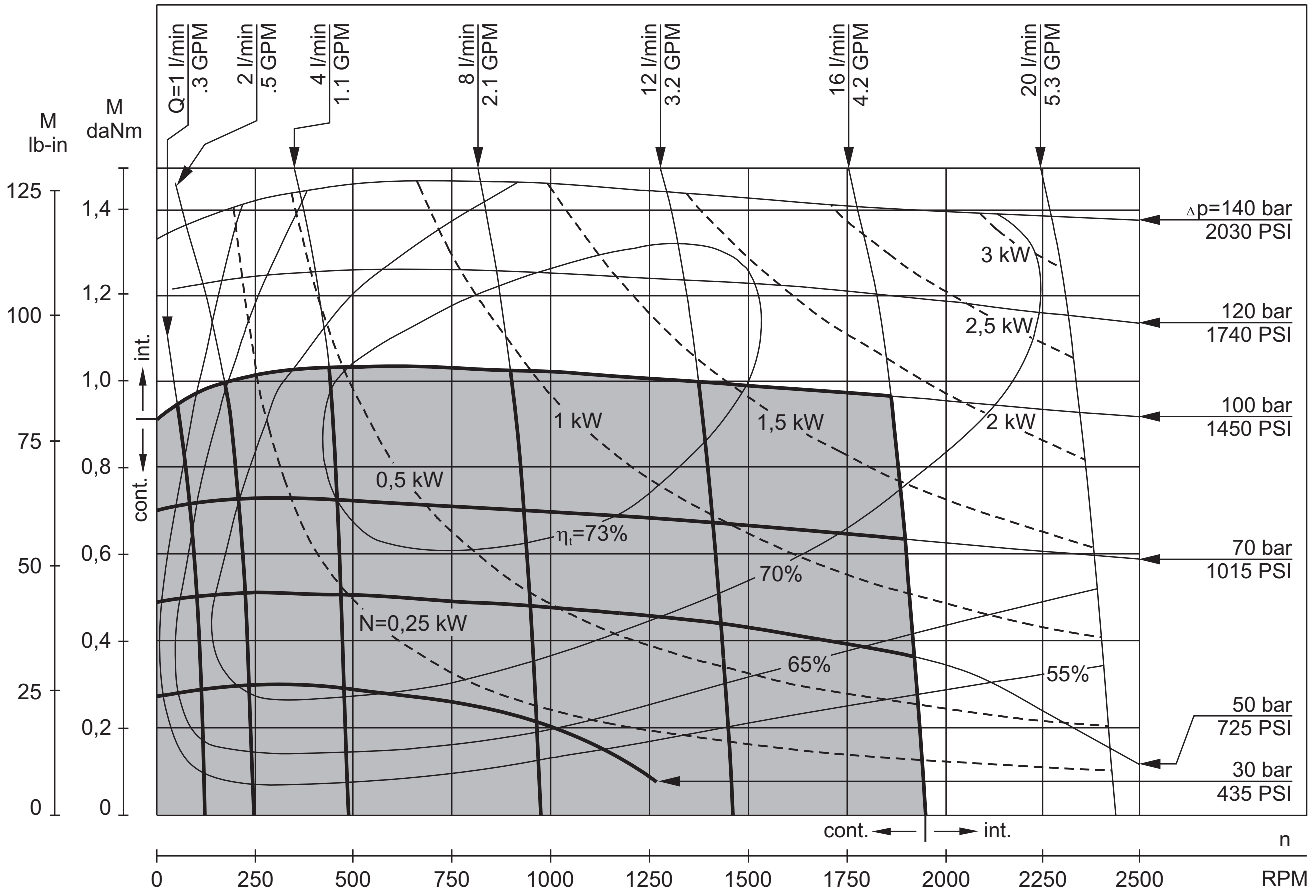
Type		MLHM 8	MLHM 12.5	MLHM 20	MLHM 32	MLHM 40	MLHM 50
Displacement, in³/rev [cm³/rev]		.50 [8,2]	.77 [12,5]	1.22 [19,9]	1.93 [31,6]	39,8 [39,8]	3.08 [50]
Max. Speed, [RPM]	Cont.	1950	1550	1000	630	500	400
	Int.*	2450	1940	1250	800	630	500
Max. Torque, lb-in [daNm]	Cont.	95 [1,1]	140 [1,6]	220 [2,5]	350 [4,0]	400 [4,5]	410 [4,6]
	Int.*	135 [1,5]	200 [2,3]	310 [3,5]	500 [5,7]	620 [7,0]	780 [8,8]
	Peak**	187 [2,1]	293 [3,3]	453 [5,1]	568 [6,4]	725 [8,2]	885 [10,0]
Max. Output, HP [kW]	Cont.	2.4 [1,8]	3.2 [2,4]	3.2 [2,4]	3.2 [2,4]	3.0 [2,2]	2.4 [1,8]
	Int.*	3.5 [2,6]	4.3 [3,2]	4.3 [3,2]	4.3 [3,2]	4.3 [3,2]	4.3 [3,2]
Max. Pressure Drop, PSI [bar]	Cont.	1450 [100]	1450 [100]	1450 [100]	1450 [100]	1310 [90]	1020 [70]
	Int.*	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]
	Peak**	2900 [200]	2900 [200]	2900 [200]	2320 [160]	2320 [160]	2320 [160]
Max. Oil Flow, GPM [lpm]	Cont.	4.2 [16]	5.3 [20]	5.3 [20]	5.3 [20]	5.3 [20]	5.3 [20]
	Int.*	5.3 [20]	6.6 [25]	6.6 [25]	6.6 [25]	6.6 [25]	6.6 [25]
Max. Inlet Pressure, PSI [bar]	Cont.	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]
	Int.*	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]
	Peak**	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]
Max. Return Pressure without Drain Line or Max. Pressure in Drain Line, PSI [bar]	Cont. 0-100 RPM	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]
	Cont. 100-400 RPM	1500 [105]	1500 [105]	1500 [105]	1500 [105]	1500 [105]	1500 [105]
	Cont. 400-800 RPM	725 [50]	725 [50]	725 [50]	725 [50]	725 [50]	725 [50]
	Cont. >800 RPM	290 [20]	290 [20]	290 [20]	-	-	-
	Int.* 0-max. RPM	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]
Max. Return Pressure with Drain Line, PSI [bar]	Cont.	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]
	Int.*	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]
	Peak**	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]
Max. Starting Pressure with Unloaded Shaft, PSI [bar]		60 [4]	60 [4]	60 [4]	60 [4]	60 [4]	60 [4]
Min. Starting Torque, lb-in [daNm]	At max. press. drop Cont.	60 [0,7]	105 [1,2]	2,1 [185]	300 [3,4]	335 [3,8]	365 [4,1]
	At max. press. drop Int.*	90 [1,0]	150 [1,7]	2,9 [255]	425 [4,8]	550 [6,2]	700 [7,9]
Min. Speed*, [RPM]**		50	40	30	30	25	20
Weight, kg [lb] For **F** flange: +.441 [0,200]	MLHM[M] rear ports	4.2 [1,9]	4.41 [2,0]	4.63 [2,1]	4.85 [2,2]	5.07 [2,3]	5.51 [2,5]
	MLHM[M]	4.41 [2,0]	4.63 [2,1]	4.85 [2,2]	5.07 [2,3]	5.29 [2,4]	5.73 [2,6]
	MLHM[M]...P	4.85 [2,2]	5.07 [2,3]	5.29 [2,4]	5.51 [2,5]	5.73 [2,6]	6.17 [2,8]
	MLHM[M]...D	5.73 [2,6]	5.95 [2,7]	6.17 [2,8]	6.39 [2,9]	6.61 [3,0]	7.05 [3,2]

* Intermittent operation: the permissible values may occur for max. 10% of every minute.
** Peak load: the permissible values may occur for max. 1% of every minute.
*** For speeds lower than given, consult factory or your regional manager.

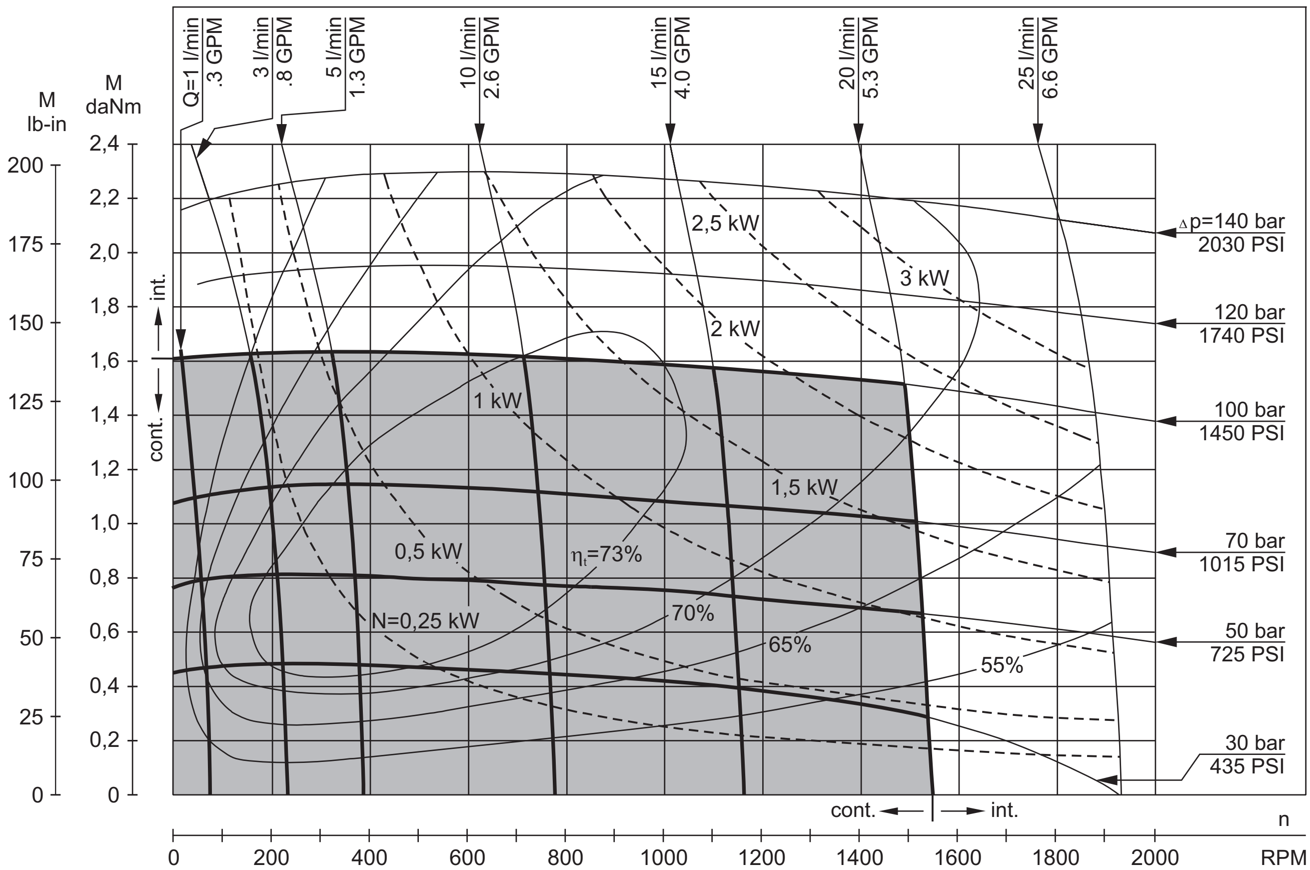
1. Intermittent speed and intermittent pressure must not occur simultaneously.
2. Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
3. Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP (DIN51524) or HM (ISO 6743/4). If using synthetic fluids consult the factory for alternative seal materials.
4. Recommended minimum oil viscosity 70 SUS [13 mm²/s] at 122°F [50°C].
5. Recommended maximum system operating temperature is 180°F [82°C].
6. To assure optimum motor life fill with fluid prior to loading and run at moderate load and speed for 10-15 minutes.

FUNCTION DIAGRAMS

MLHM 8



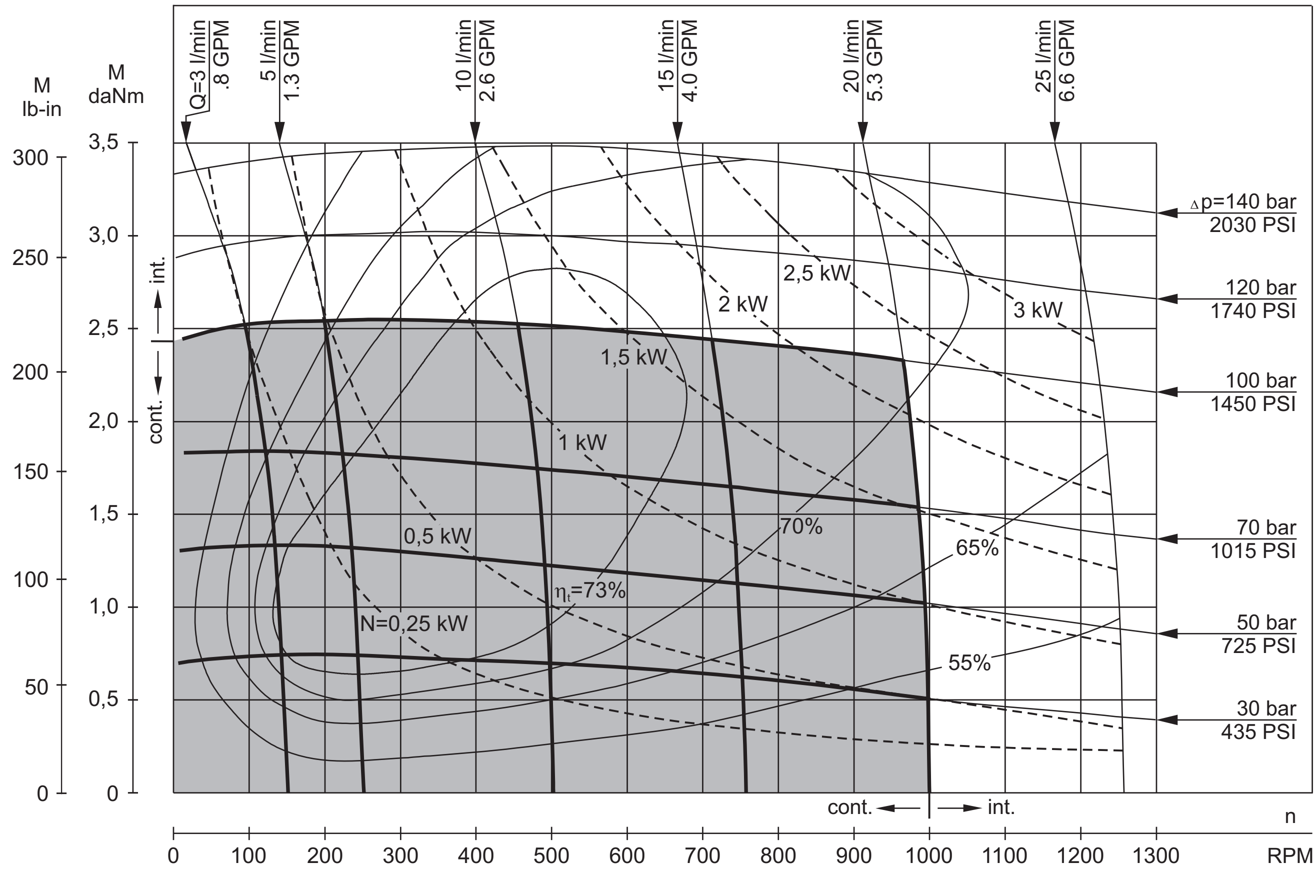
MLHM 12,5



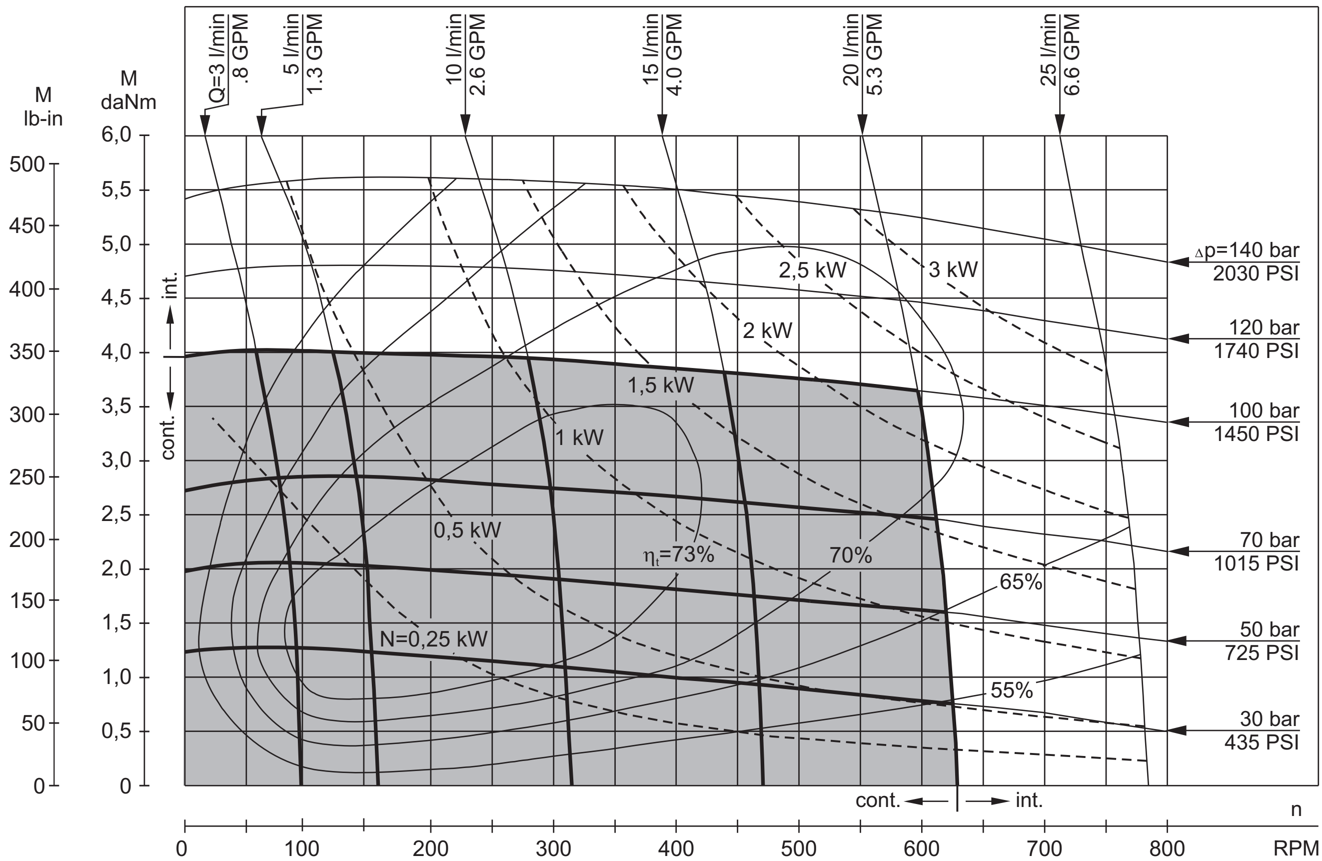
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5 PSI÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHM 20



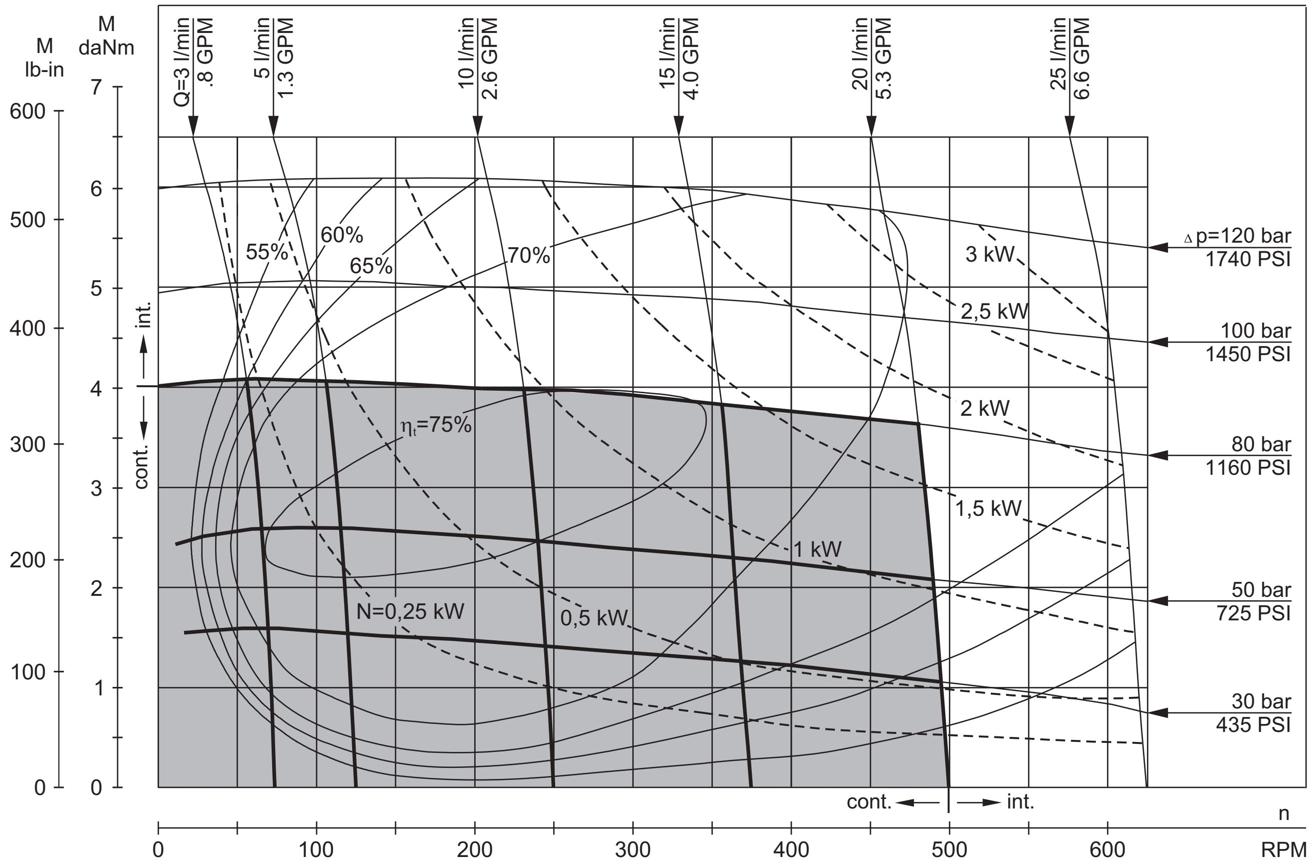
MLHM 32



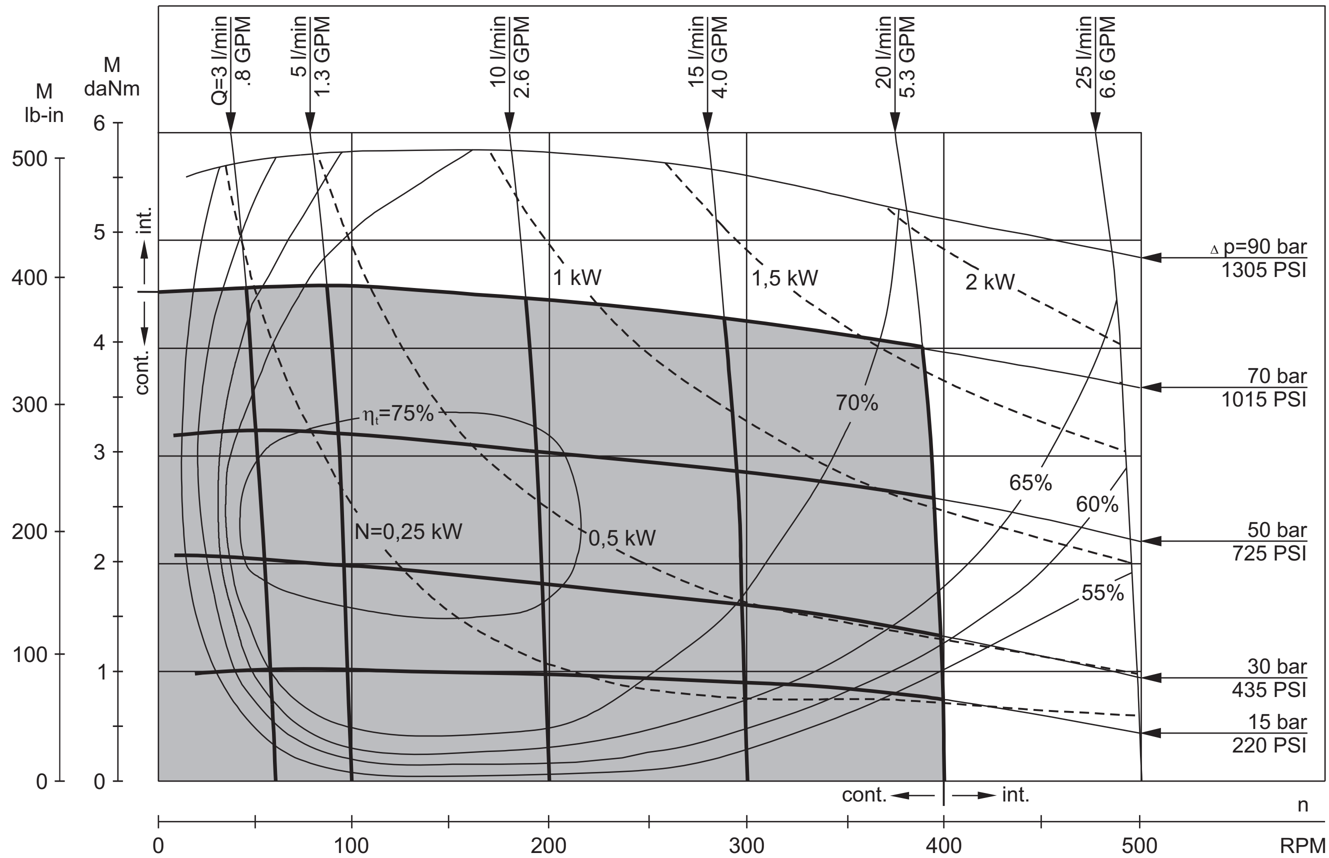
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5 PSI÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHM 40



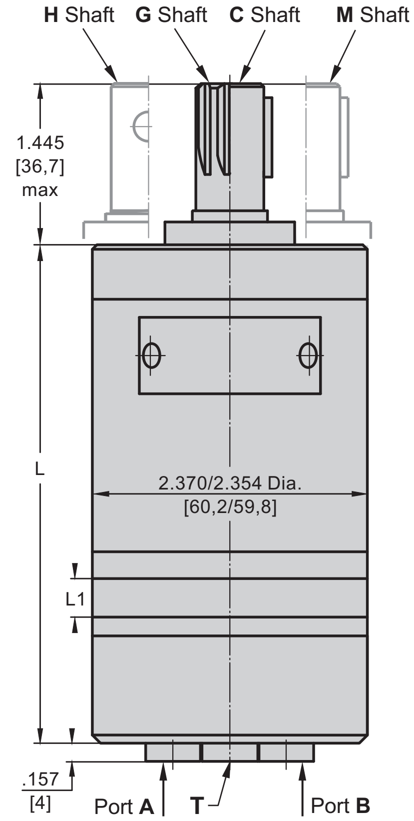
MLHM 50



The function diagrams data is for average performance of randomly selected motors at back pressure 72.5 PSI÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

DIMENSIONS and MOUNTING DATA MLHM, MLHMP, MLHMD

Three Bolts Mount



Shaft Dim.
See Page 11

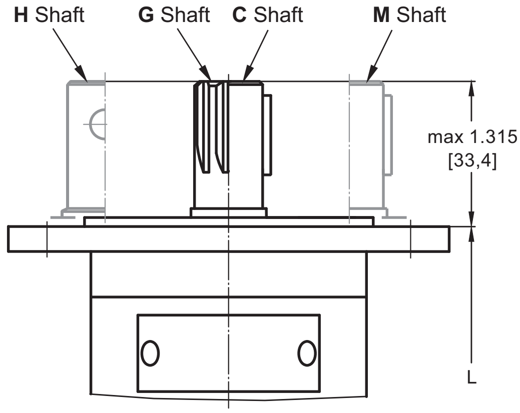
Flange Dim.
See Page 10

Port Dim.
See Page 10

Standard Rotation
Viewed from Shaft End
Port **A** Pressurized - **CW**
Port **B** Pressurized - **CCW**

Reverse Rotation
Viewed from Shaft End
Port **A** Pressurized - **CCW**
Port **B** Pressurized - **CW**

F Oval Mount (2 Holes)

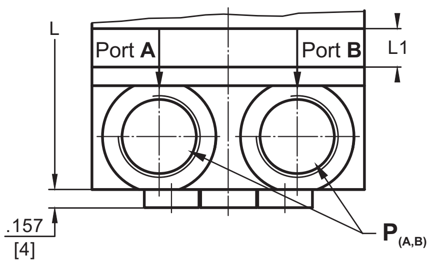


	Versions		
	2, 6	3, 9	4, 7
$P_{(A,B)}$	2xG3/8	2xM18x1,5	2x9/16-18 UNF
T	2xG1/8	M10x1	3/8 - 24 UNF

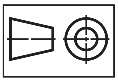
Rear Ports Version
6 7 9

Type	Side Ports L, in [mm]	Rear Ports L, in [mm]	L_1, in [mm]
MLHM(M) 8	4.189 [106,4]	4.134 [105,0]	.13 [3,5]
MLHM(M) 12,5	4.268 [108,4]	4.213 [107,0]	.21 [5,5]
MLHM(M) 20	4.386 [111,4]	4.331 [110,0]	.335 [8,5]
MLHM(M) 32	4.583 [116,4]	4.528 [115,0]	.531 [13,5]
MLHM(M) 40	4.720 [119,9]	4.665 [118,5]	.669 [17,0]
MLHM(M) 50	4.878 [123,9]	4.823 [122,5]	.828 [21,0]

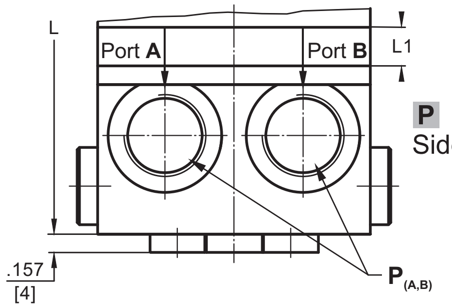
Side Ports Version
2 3 4



Type	Side Ports L, in [mm]	Rear Ports L, in [mm]	L_1, in [mm]
MLHMF 8	4.327 [109,9]	4.272 [108,5]	.13 [3,5]
MLHMF 12,5	4.406 [111,9]	4.350 [110,5]	.21 [5,5]
MLHMF 20	4.524 [114,9]	4.469 [113,5]	.335 [8,5]
MLHMF 32	4.720 [119,9]	4.665 [118,5]	.531 [13,5]
MLHMF 40	4.858 [123,4]	4.803 [122,0]	.669 [17,0]
MLHMF 50	5.016 [127,4]	4.961 [126,0]	.828 [21,0]

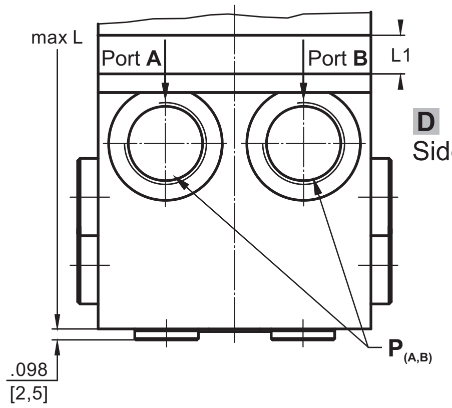


in [mm]



P
Side Ports

Type	L, in [mm]	Type	L, in [mm]	L_1, in [mm]
MLHM(M) 8 ...P	4.567 [116,0]	MLHMF 8 ...P	4.665 [118,5]	.138 [3,5]
MLHM(M) 12,5...P	4.646 [118,0]	MLHMF 12,5...P	4.783 [121,5]	.217 [5,5]
MLHM(M) 20 ...P	4.764 [121,0]	MLHMF 20 ...P	4.902 [124,5]	.335 [8,5]
MLHM(M) 32 ...P	4.961 [126,0]	MLHMF 32 ...P	5.059 [128,5]	.531 [13,5]
MLHM(M) 40 ...P	5.079 [129,0]	MLHMF 40 ...P	5.236 [133,0]	.669 [17,0]
MLHM(M) 50 ...P	5.256 [133,5]	MLHMF 50 ...P	5.394 [137,0]	.828 [21,0]

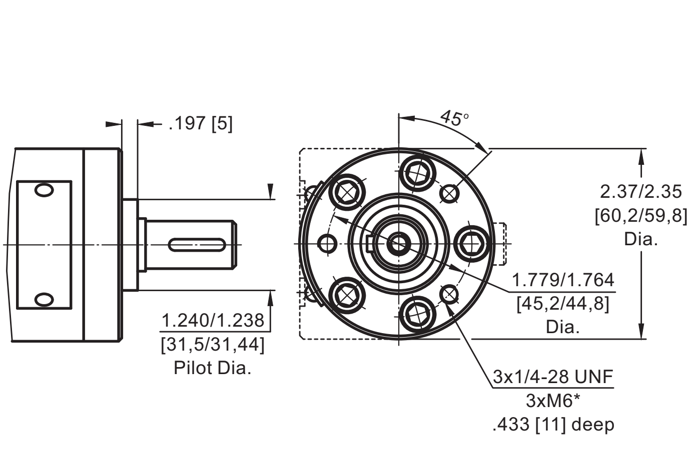


D
Side Ports

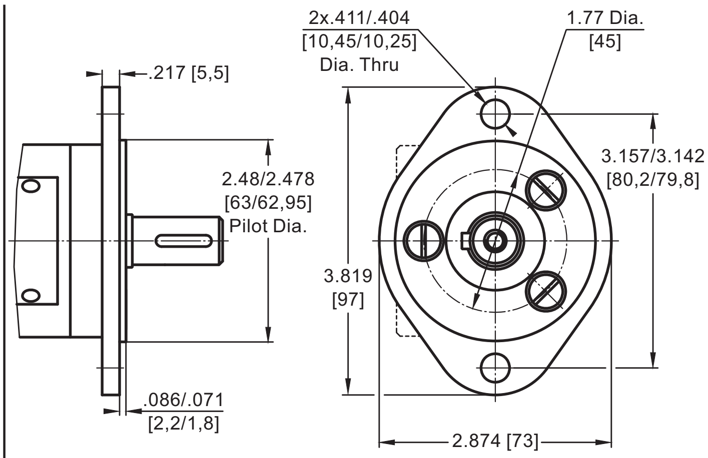
Type	L, in [mm]	Type	L, in [mm]	L_1, in [mm]
MLHM(M) 8 ...D	5.319 [135,1]	MLHMF 8 ...D	5.457 [138,6]	.138 [3,5]
MLHM(M) 12,5...D	5.398 [137,1]	MLHMF 12,5...D	5.535 [140,6]	.217 [5,5]
MLHM(M) 20 ...D	5.516 [140,1]	MLHMF 20 ...D	5.654 [143,6]	.335 [8,5]
MLHM(M) 32 ...D	5.713 [145,1]	MLHMF 32 ...D	5.850 [148,6]	.531 [13,5]
MLHM(M) 40 ...D	5.850 [148,6]	MLHMF 40 ...D	5.988 [152,1]	.669 [17,0]
MLHM(M) 50 ...D	6.008 [152,6]	MLHMF 50 ...D	6.146 [156,1]	.828 [21,0]

MOUNTING

Three Bolts Mount

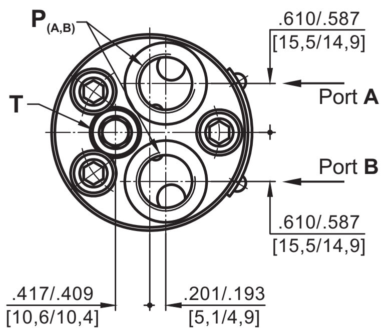


F Oval Mount (2 Holes)

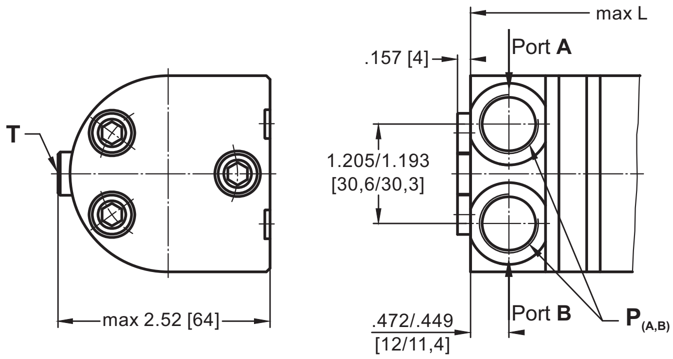


PORTS

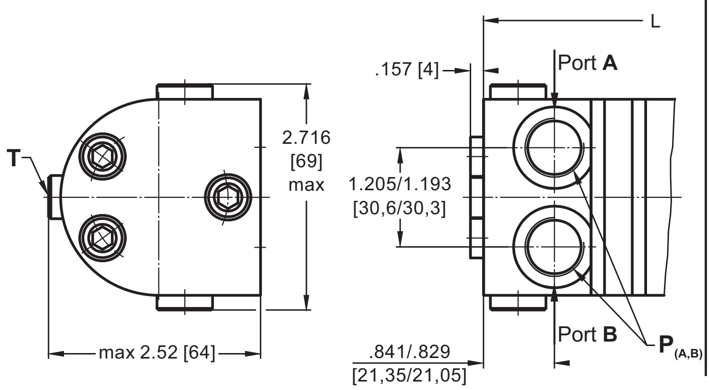
Rear Ports Version 6 7 9



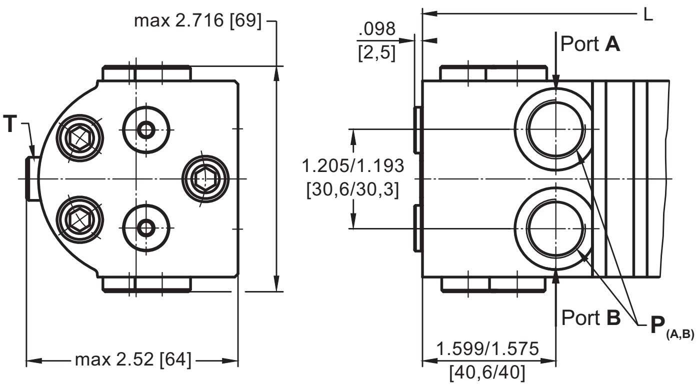
Side Ports, without valves Version 2 3 4

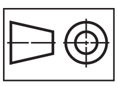


P Side Ports with Single Crossover Relief Valve



D Side Ports with Dual Crossover Relief Valve





in [mm]

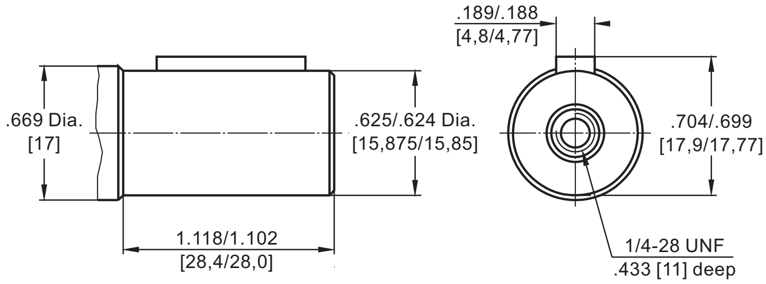
Standard Rotation
Viewed from Shaft End
Port **A** Pressurized - **CW**
Port **B** Pressurized - **CCW**

Reverse Rotation
Viewed from Shaft End
Port **A** Pressurized - **CCW**
Port **B** Pressurized - **CW**

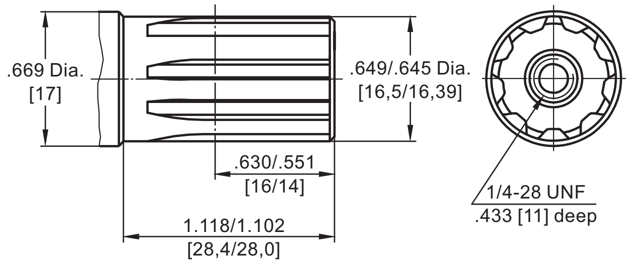
	Versions		
	2 , 6	3 , 9	4 , 7
$P_{(A,B)}$	2xG⅜	2xM18x1,5	2x 9/16 -18 UNF
T	2xG⅛	M10x1	⅜ - 24 UNF

SHAFT EXTENSIONS

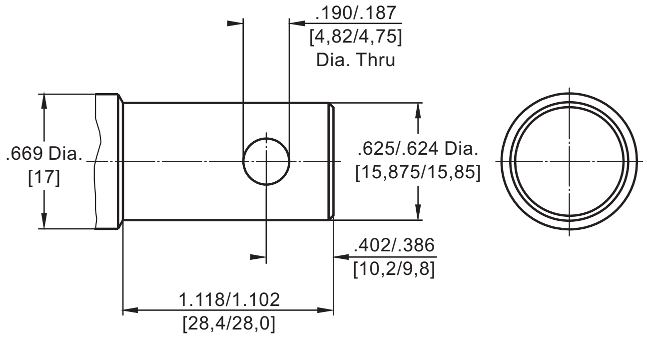
C - ⅝" [15,8] straight, Parallel key 3⁄16"x3⁄16"x¾" BS46
Max. Torque 345 lb-in [3,9 daNm]



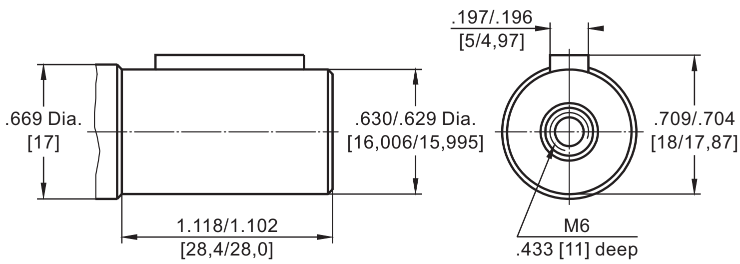
G - splined - metric B17x14 DIN 5482
Max. Torque 390 lb-in [4,4 daNm]



H - ⅝" [15,8] straight, w/ .19 [4,82] Crosshole
Max. Torque 345 lb-in [3,9 daNm]



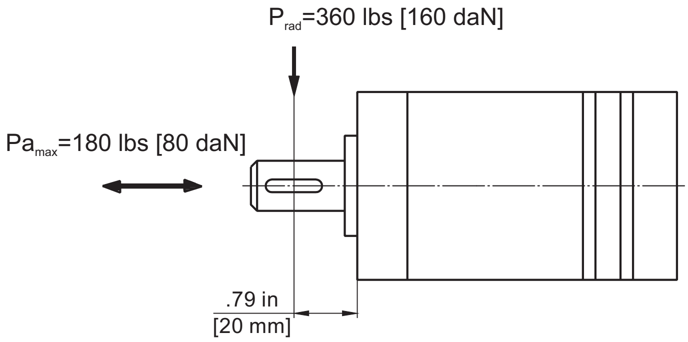
M - ø16 straight, Parallel key A5x5x16 DIN 6885
Max. Torque 345 lb-in [3,9 daNm]



Requirement max. Torque must be not exceeded.

in [mm]

PERMISSIBLE SHAFT LOAD



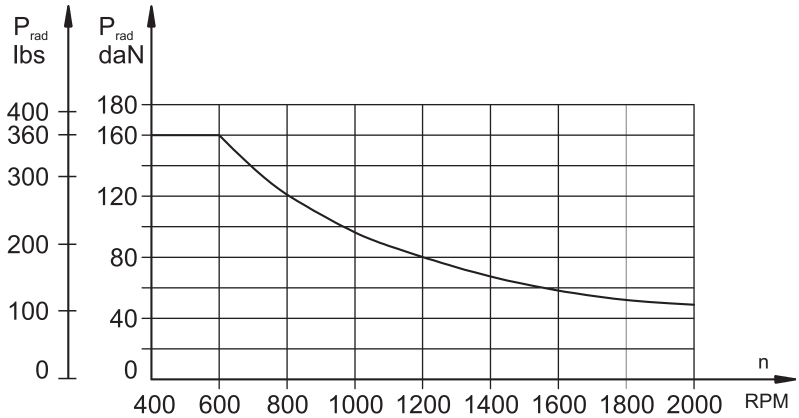
The permissible radial shaft load [Prad] is calculated from the distance [L] between the point of load application and the mounting surface:

$$P_{rad} = \frac{600}{n} X \frac{13040}{61,5+L}, \text{ [daN]}$$

[L in mm; L≤ 80 mm]

$$P_{rad} = \frac{600}{n} X \frac{1155}{2.42 + L}, \text{ [lbs]}$$

[L in inch; L≤ 3.15 in]



The drawing shows the permissible radial load when L=.79 in [20 mm].

If the calculated shaft load exceeds the permissible, a flexible coupling must be used.

ORDER CODE

	1	2	3	4	5	6	7	8	9
MLHM									

Pos.1 - Mounting Flange

omit	- round, three bolts 1/4-28 UNF
F	- flange, two holes
M	- round metric, three bolts M6

Pos.2 - Displacement code

8	- .50 in³/rev [8,2 cm³/rev]
12.5	- .79 in³/rev [12,9 cm³/rev]
20	- 1.22 in³/rev [20,0 cm³/rev]
32	- 1.93 in³/rev [31,8 cm³/rev]
40	- 2.44 in³/rev [40,0 cm³/rev]
50	- 3.05 in³/rev [50,0 cm³/rev]

Pos.3 - Shaft Extensions* [for dimensions data see page 11]

C	- 5/8" [15,8] straight, Parallel key
VC	- 5/8" [15,8] straight, Parallel key w/ corrosion resistant bushing
G	- Involute Splined- Metric B17x14 DIN5482
H	- 5/8" [15,8] straight, Parallel key w/ .19 [4,82] Crosshole
M	- 16 mm straight, Parallel key
VM	- 16 mm straight, Parallel key w/ corrosion resistant bushing

Pos.4 - Port Size/Type [standard manifold to each]

2	- side ports, 2xG3/8, G1/8, BSP thread, ISO 228
3	- side ports, 2xM18x1,5; M10x1; metric, ISO 262
4	- side ports, 2x9/16-18 UNF, O-ring, 3/8-24 UNF
6	- rear ports, 2xG3/8, G1/8, BSP thread, ISO 228
7	- rear ports, 2x9/16-18 UNF, O-ring, 3/8-24 UNF
9	- rear ports, 2xM18x1,5; M10x1; metric, ISO 262

Pos.5 - Option**

omit	- without valves
D	- side ports with dual crossover relief valve
P	- side ports with single crossover relief valve

Pos.6 - Directions for Control [for "P" option only]

/L	- B → A (left control)
/R	- A → B (right control)

Pos.7 - Valve Rated Pressure [for "P" and "D" option only]

/50	- Δp= 725 PSI [50 bar]
/80	- Δp=1160 PSI [80 bar]
/100	- Δp=1450 PSI [100 bar]
/140	- Δp=2030 PSI [140 bar]

Pos.8 - Special Features [see page 110]

Pos.9 - Design Series

omit	- Factory specified

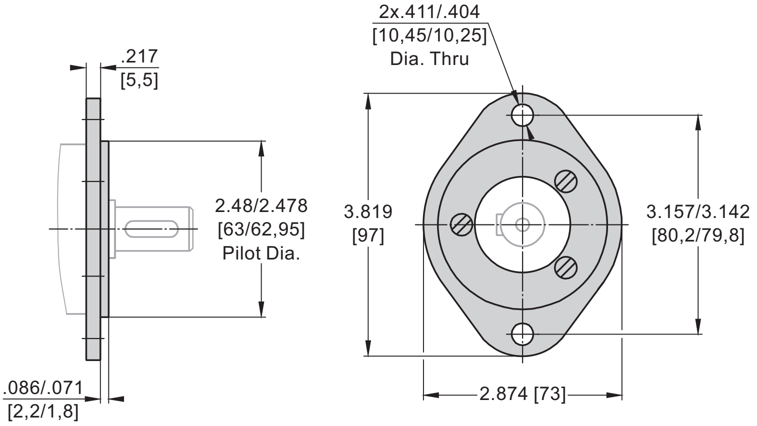
NOTES: * The permissible output torque for shafts must not be exceeded!
** Options **P**, **D** - for side ports (2, 3, 4) only.

The hydraulic motors are mangano-phosphatized as standard.

⚠ **MLHMP** and **MLHMD** are available with new crossover relief valves with improved characteristics. The new valves allow easier pressure setting in a wider range: from 725 PSI to 2030 PSI [50÷140 bar]. For more information about MLHMP and MLHMD - series 2 please contact with "M+S Hydraulic".

F - Flange (2 Holes)

Order No for Flange:48443 029 00

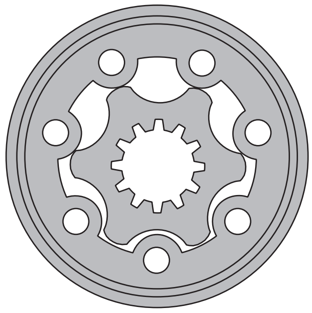


F Flange is mounted to the motor with 3 screws - 1/4-28 UNF.
Tightening Torque: 45÷53 lb-in [5÷6 Nm].

HYDRAULIC MOTORS MLHP

APPLICATION

- » Conveyors
- » Feeding mechanism of robots and manipulators
- » Metal working machines
- » Textile machines
- » Agricultural machines
- » Food industries
- » Grass cutting machinery etc.



CONTENTS

OPTIONS

- » Model - Spool valve, gerotor
- » Flange and wheel mount
- » Motor with needle bearing
- » Side and rear ports
- » Shafts - straight, splined and tapered
- » Shaft seal for high and low pressure
- » SAE, Metric and BSPP ports
- » Speed sensoring
- » Other special features

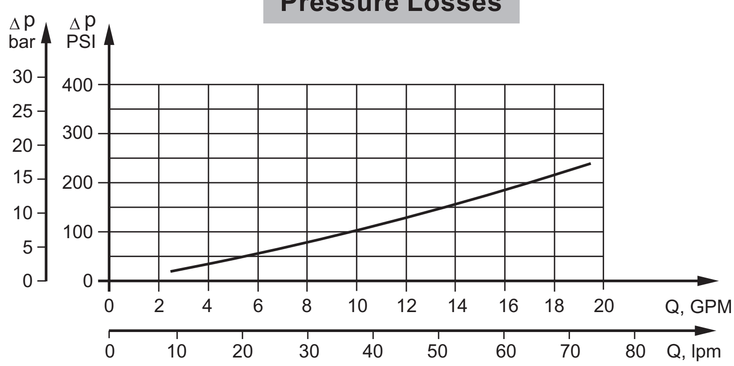
GENERAL

Max. Displacement,	in³/rev [cm³/rev]	38.05 [623,6]
Max. Speed,	[RPM]	1815
Max. Torque,	lb-in [daNm]	cont.: 4415 [50] int.: 5565 [64]
Max. Output,	HP [kW]	17.1 [12,8]
Max. Pressure Drop,	PSI [bar]	cont.: 2030 [140] int.: 2540 [175]
Max. Oil Flow,	GPM [lpm]	19.8 [75]
Min. Speed,	[RPM]	10
Pressure fluid		Mineral based - HLP(DIN 51524) or HM(ISO 6743/4)
Temperature range,	°F [°C]	-40 ÷ 284 [-40 ÷ 140]
Optimal Viscosity range,	SUS [mm²/s]	98 ÷ 347 [20 ÷ 75]
Filtration		ISO code 20/16 (Min. recommended fluid filtration of 25 microns)

Oil flow in drain line

Pressure drop PSI [bar]	Viscosity SUS [mm²/s]	Oil flow in drain line GPM [lpm]
1450 [100]	98 [20]	.660 [2,5]
	164 [35]	.476 [1,8]
2030 [140]	98 [20]	.925 [3,5]
	164 [35]	.740 [2,8]

Pressure Losses



SPECIFICATION DATA

Specification Data for MLHP... motors with **C, D, G, H, M, S** and **T** shafts.
(1.124 [28,56] sealing diameter)

Type		MLHP 25	MLHP 32	MLHP 40	MLHP 50	MLHP 63	MLHP 80	MLHP 100	MLHP 125
Displacement, in^3/rev [cm^3/rev]		1.73 [28,4]	2.1 [34,5]	2.47 [40,5]	3.02 [49,5]	3.8 [62,3]	4.83 [79,2]	6.04 [99]	7.55 [123,8]
Max. Speed, [RPM]	Cont.	1408	1450	1480	1210	1210	755	605	486
	Int.*	1584	1594	1555	1515	1515	945	755	605
Max. Torque, lb-in [daNm]	Cont.	290 [3,3]	380 [4,3]	550 [6,2]	835 [9,4]	835 [9,4]	1340 [15,1]	1710 [19,3]	23,7 [2100]
	Int.*	415 [4,7]	415 [4,7]	730 [8,2]	1050 [11,9]	1050 [11,9]	1725 [19,5]	2100 [23,7]	29,8 [2640]
	Peak**	595 [6,7]	760 [8,6]	950 [10,7]	1285 [14,3]	1285 [14,3]	1985 [22,4]	2435 [27,5]	36,5 [3235]
Max. Output, HP [kW]	Cont.	6.0 [4,5]	6.0 [4,5]	11.5 [8,4]	13.5 [10,1]	13.5 [10,1]	13.7 [10,2]	14.1 [10,5]	13.7 [10,2]
	Int.*	8.2 [6,1]	10.5 [7,8]	15.5 [11,6]	16.1 [12,2]	16.1 [12,2]	16.8 [12,5]	17.1 [12,8]	16.1 [12]
Max. Pressure Drop, PSI [bar]	Cont.	1450 [100]	1450 [100]	1750 [120]	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]
	Int.*	2030 [140]	2030 [140]	2250 [155]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]
	Peak**	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]
Max. Oil Flow, GPM [lpm]	Cont.	10.5 [40]	13.2 [50]	15.9 [60]	15.9 [60]	15.9 [60]	15.9 [60]	15.9 [60]	15.9 [60]
	Int.*	11.9 [45]	14.5 [55]	18.5 [70]	19.8 [75]	19.8 [75]	19.8 [75]	19.8 [75]	19.8 [75]
Max. Inlet Pressure, PSI [bar]	Cont.	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]
	Int.*	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]
	Peak**	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]
Max. Return Pressure with Drain Line, PSI [bar]	Cont.	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]
	Int.*	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]
	Peak**	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]
Max. Starting Pressure with Unloaded Shaft, PSI [bar]		145 [10]	145 [10]	145 [10]	145 [10]	145 [10]	145 [10]	145 [10]	131 [9]
Min. Starting Torque, lb-in [daNm]	At max.press. drop Cont.	265 [3,0]	355 [4,0]	480 [5,4]	690 [7,8]	690 [7,8]	1170 [13,2]	1470 [16,6]	1830 [20,7]
	At max.press. drop Int.*	4,2 [370]	5,6 [500]	6,8 [600]	10 [885]	10 [885]	16,8 [1490]	21 [1860]	26,6 [2360]
Min. Speed*, [RPM]**		20	15		10	10	10	10	10
Weight, lb [kg] For rear ports: +.992 [0,450]	MLHP[F][N]	12.3 [5,6]	12.3 [5,6]	12.6 [5,7]	12.8 [5,8]	12.8 [5,8]	13.2 [5,9]	13.5 [6,1]	13.7 [6,2]
	MLHPW[N]	11.7 [5,3]	11.7 [5,3]	11.9 [5,4]	12.1 [5,5]	12.1 [5,5]	12.4 [5,6]	12.8 [5,8]	13.2 [5,9]
	MLHPQ[N]	11.1 [5,0]	11.1 [5,0]	11.2 [5,1]	11.5 [5,2]	11.5 [5,2]	11.7 [5,3]	12.1 [5,5]	12.4 [5,6]

* Intermittent operation: the permissible values may occur for max. 10% of every minute.
** Peak load: the permissible values may occur for max. 1% of every minute.
*** For speeds lower than given, consult factory or your regional manager.

1. Intermittent speed and intermittent pressure must not occur simultaneously.
2. Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
3. Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP (DIN51524) or HM (ISO 6743/4). If using synthetic fluids consult the factory for alternative seal materials.
4. Recommended minimum oil viscosity 70 SUS [13 mm²/s] at 122°F [50°C].
5. Recommended maximum system operating temperature is 180°F [82°C].
6. To assure optimum motor life fill with fluid prior to loading and run at moderate load and speed for 10-15 minutes.

SPECIFICATION DATA (continued)

Specification Data for MLHP... motors with **C, D, G, H, M, S** and **T** shafts.
(1.124 [28,56] sealing diameter)

Type		MLHP 160	MLHP 200	MLHP 250	MLHP 315	MLHP 400	MLHP 500	MLHP 630
Displacement, in³/rev [cm³/rev]		9.66 [158,4]	12.1 [198]	15.1 [247,5]	19.3 [316,8]	24.16 [396]	30.2 [495]	38.05 [623,6]
Max. Speed, [RPM]	Cont.	378	303	242	190	150	120	95
	Int.*	472	378	303	236	189	150	120
Max. Torque, lb-in [daNm]	Cont.	2770 [31,3]	3240 [36,6]	3360 [38]	3360 [38]	3190 [36]	3452 [39]	3895 [44]
	Int.*	3345 [37,8]	4035 [45,6]	5160 [58,3]	4960 [56]	5240 [59]	5045 [57]	5665 [64]
	Peak**	3880 [43,8]	4870 [55]	6060 [68,5]	7505 [85]	7560 [85,4]	6903 [78]	7257 [82]
Max. Output, HP [kW]	Cont.	13.5 [10,1]	13.5 [10]	10 [7,5]	7.9 [5,8]	6.2 [4,6]	4.7 [3,5]	4.4 [3,3]
	Int.*	16.2 [12,1]	16.1 [12]	16.1 [12]	12.1 [9]	10.5 [7,8]	9,7 [7,2]	7.5 [5,6]
Max. Pressure Drop, PSI [bar]	Cont.	2030 [140]	2030 [140]	1600 [110]	1300 [90]	1015 [70]	870 [60]	800 [55]
	Int.*	2540 [175]	2540 [175]	2540 [175]	2030 [140]	1665 [115]	1305 [90]	1160 [80]
	Peak**	3260 [225]	3260 [225]	3260 [225]	3260 [225]	2610 [180]	1885 [130]	1740 [110]
Max. Oil Flow, GPM [lpm]	Cont.	15.9 [60]	15.9 [60]	15.9 [60]	15.9 [60]	15.9 [60]	15.9 [60]	15.9 [60]
	Int.*	19.8 [75]	19.8 [75]	19.8 [75]	19.8 [75]	19.8 [75]	19.8 [75]	19.8 [75]
Max. Inlet Pressure, PSI [bar]	Cont.	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2030 [140]	2030 [140]
	Int.*	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2540 [175]	2540 [175]
	Peak**	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]
Max. Return Pressure with Drain Line, PSI [bar]	Cont.	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2030 [140]	2030 [140]
	Int.*	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2540 [175]	2540 [175]
	Peak**	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3262 [225]	3260 [225]	3260 [225]
Max. Starting Pressure with Unloaded Shaft, PSI [bar]		116 [8]	100 [7]	87 [6]	73 [5]	73 [5]	73 [5]	73 [5]
Min. Starting Torque, lb-in [daNm]	At max.press. drop Cont.	2500 [28,2]	2950 [33,5]	2970 [33,6]	3045 [34,4]	3050 [34,5]	3180 [36]	3670 [41,5]
	At max.press. drop Int.*	3140 [35,5]	3770 [42,6]	4795 [54,2]	5480 [61,9]	5390 [60,8]	4780 [54]	5480 [62]
Min. Speed*, [RPM]**		10	10	10	10	10	10	10
Weight, lb [kg] For rear ports: +.992 [0,450]	MLHP[F][N]	14.1 [6,4]	14.6 [6,6]	15 [6,8]	15.6 [7,1]	16.8 [7,6]	20 [8,9]	21.4 [9,5]
	MLHPW[N]	13.5 [6,1]	13.9 [6,3]	14.3 [6,5]	15 [6,8]	15.9 [7,2]	19.0 [8,6]	20.3 [9,2]
	MLHPQ[M][N]	12.8 [5,8]	13.2 [6]	13.7 [6,2]	14.3 [6,5]	15 [6,8]	18.3 [8,3]	19.8 [9]

* Intermittent operation: the permissible values may occur for max. 10% of every minute.
** Peak load: the permissible values may occur for max. 1% of every minute.
*** For speeds lower than given, consult factory or your regional manager.

1. Intermittent speed and intermittent pressure must not occur simultaneously.
2. Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
3. Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP (DIN51524) or HM (ISO 6743/4). If using synthetic fluids consult the factory for alternative seal materials.
4. Recommended minimum oil viscosity 70 SUS [13 mm²/s] at 122°F [50°C].
5. Recommended maximum system operating temperature is 180°F [82°C].
6. To assure optimum motor life fill with fluid prior to loading and run at moderate load and speed for 10-15 minutes.

SPECIFICATION DATA (continued)

Specification Data for MLHP... motors with **B, K, R** and **L** shafts.
(1.378 [35] sealing diameter)

Type		MLHP 80	MLHP 100	MLHP 125	MLHP 160	MLHP 200
Displacement, in³/rev [cm³/rev]		4.83 [79,2]	6.04 [99]	7.55 [123,8]	9.66 [158,4]	12.1 [198]
Max. Speed, [RPM]	Cont.	755	605	486	378	303
	Int.*	945	755	605	472	378
Max. Torque, lb-in [daNm]	Cont.	1340 [15,15]	1710 [19,3]	2100 [23,7]	2770 [31,3]	3240 [36,6]
	Int.*	1725 [19,5]	2100 [23,7]	2640 [29,8]	3345 [37,8]	4035 [45,6]
	Peak**	1985 [22,4]	2435 [27,5]	3235 [36,5]	3875 [43,8]	4870 [55]
Max. Output, HP [kW]	Cont.	13.7 [10,2]	14.1 [10,5]	13.7 [10,2]	13.5 [10,1]	13.5 [10]
	Int.*	16.8 [12,5]	17.1 [12,8]	16.1 [12]	16.2 [12,1]	16.1 [12]
Max. Pressure Drop, PSI [bar]	Cont.	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]
	Int.*	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]
	Peak**	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]
Max. Oil Flow, GPM [lpm]	Cont.	15.9 [60]	15.9 [60]	15.9 [60]	15.9 [60]	15.9 [60]
	Int.*	19.8 [75]	19.8 [75]	19.8 [75]	19.8 [75]	19.8 [75]
Max. Inlet Pressure, PSI [bar]	Cont.	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]
	Int.*	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]
	Peak**	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]
Max. Return Pressure with Drain Line, PSI [bar]	Cont.	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]
	Int.*	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]
	Peak**	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]
Max. Starting Pressure with Unloaded Shaft, PSI [bar]		145 [10]	145 [10]	131 [9]	116 [8]	100 [7]
Min. Starting Torque, lb-in [daNm]	At max.press. drop Cont.	1170 [13,2]	1470 [16,6]	1830 [20,7]	2500 [28,2]	2950 [33,5]
	At max.press. drop Int.*	1490 [16,8]	1860 [21]	2360 [26,6]	3140 [35,5]	3770 [42,6]
Min. Speed*, [RPM]**		10	10	10	10	10
Weight, lb [kg] For rear ports: +.992 [0,450]	MLHP[F]	13.2 [6]	13.7 [6,2]	13.9 [6,3]	14.3 [6,5]	14.8 [6,7]

* Intermittent operation: the permissible values may occur for max. 10% of every minute.
** Peak load: the permissible values may occur for max. 1% of every minute.
*** For speeds lower than given, consult factory or your regional manager.

1. Intermittent speed and intermittent pressure must not occur simultaneously.
2. Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
3. Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP (DIN51524) or HM (ISO 6743/4). If using synthetic fluids consult the factory for alternative seal materials.
4. Recommended minimum oil viscosity 70 SUS [13 mm²/s] at 122°F [50°C].
5. Recommended maximum system operating temperature is 180°F [82°C].
6. To assure optimum motor life fill with fluid prior to loading and run at moderate load and speed for 10-15 minutes.

SPECIFICATION DATA (continued)

Specification Data for MLHP... motors with **B, K, R** and **L** shafts.
(1.378 [35] sealing diameter)

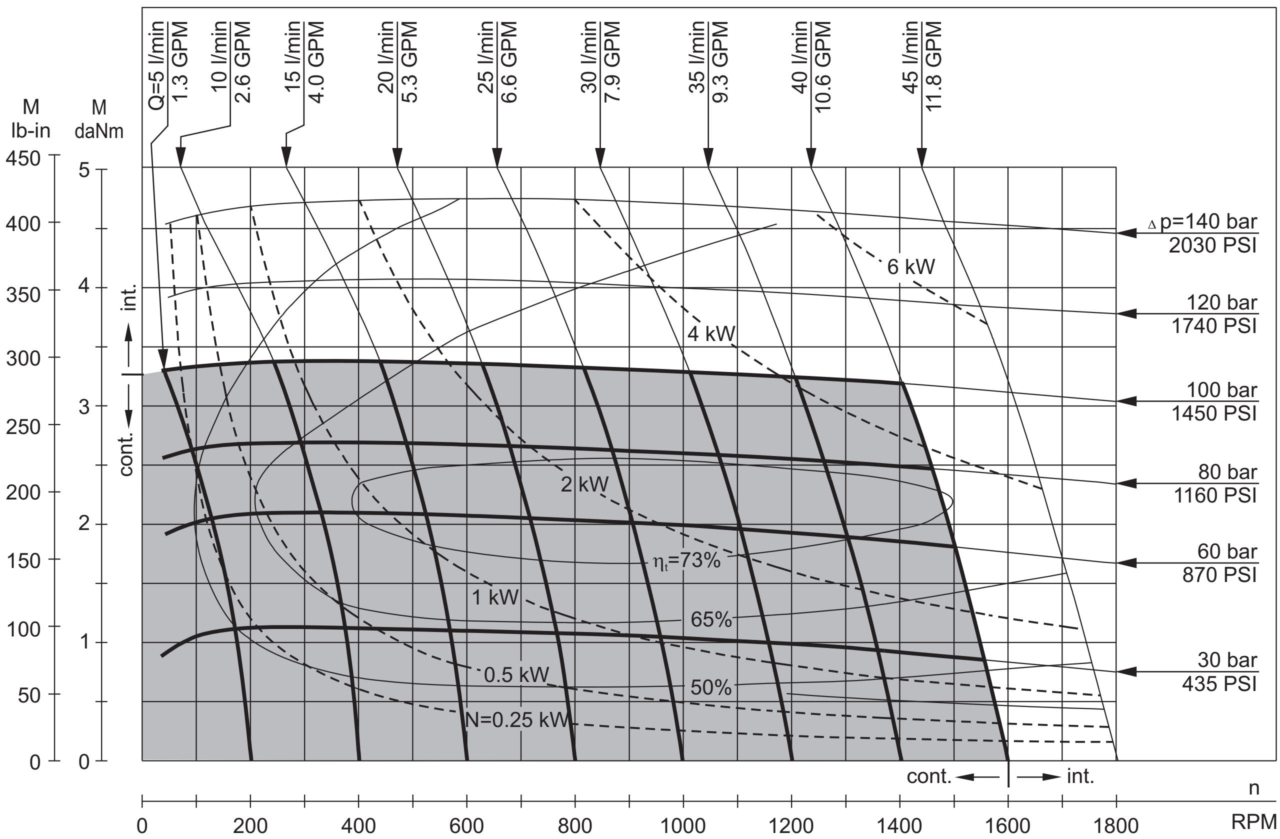
Type		MLHP 250	MLHP 315	MLHP 400	MLHP 500	MLHP 630
Displacement, in³/rev [cm³/rev]		15.1 [247,5]	19.3 [316,8]	24.16 [396]	30.2 [495]	38.05 [623,6]
Max. Speed, [RPM]	Cont.	242	190	150	120	95
	Int.*	303	236	189	150	120
Max. Torque, lb-in [daNm]	Cont.	4160 [47]	4360 [48]	4415 [50]	3452 [39]	3895 [44]
	Int.*	5160 [58,3]	4960 [56]	5240 [59]	5045 [57]	5665 [64]
	Peak**	6060 [68,5]	7505 [85]	7560 [85,4]	6903 [78]	7257 [82]
Max. Output, HP [kW]	Cont.	12.1 [9]	10.2 [7,6]	8.3 [6,2]	4.7 [3,5]	4.4 [3,3]
	Int.*	16.1 [12]	12.1 [9]	10.5 [7,8]	9,7 [7,2]	7.5 [5,6]
Max. Pressure Drop, PSI [bar]	Cont.	3030 [140]	1740 [120]	1400 [95]	870 [60]	800 [55]
	Int.*	2540 [175]	2030 [140]	1670 [115]	1305 [90]	1160 [80]
	Peak**	3260 [225]	3260 [225]	2610 [180]	1885 [130]	1740 [110]
Max. Oil Flow, GPM [lpm]	Cont.	15.9 [60]	15.9 [60]	15.9 [60]	15.9 [60]	15.9 [60]
	Int.*	19.8 [75]	19.8 [75]	19.8 [75]	19.8 [75]	19.8 [75]
Max. Inlet Pressure, PSI [bar]	Cont.	2540 [175]	2540 [175]	2540 [175]	2030 [140]	2030 [140]
	Int.*	2900 [200]	2900 [200]	2900 [200]	2540 [175]	2540 [175]
	Peak**	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]
Max. Return Pressure with Drain Line, PSI [bar]	Cont.	2540 [175]	2540 [175]	2540 [175]	2030 [140]	2030 [140]
	Int.*	2900 [200]	2900 [200]	2900 [200]	2540 [175]	2540 [175]
	Peak**	3260 [225]	3260 [225]	3262 [225]	3260 [225]	3260 [225]
Max. Starting Pressure with Unloaded Shaft, PSI [bar]		87 [6]	73 [5]	73 [5]	73 [5]	73 [5]
Min. Starting Torque, lb-in [daNm]	At max.press. drop Cont.	3790 [42,8]	4050 [45,8]	4140 [46,8]	3180 [36]	3670 [41,5]
	At max.press. drop Int.*	4795 [54,2]	5480 [61,9]	5390 [60,8]	4780 [54]	5480 [62]
Min. Speed*, [RPM]**		10	10	10	10	10
Weight, lb [kg] For rear ports: +.992 [0,450]	MLHP[F]	15.2 [6,9]	15.9 [7,2]	17 [7,7]	19.9 [9,0]	21.2 [9,6]

* Intermittent operation: the permissible values may occur for max. 10% of every minute.
** Peak load: the permissible values may occur for max. 1% of every minute.
*** For speeds lower than given, consult factory or your regional manager.

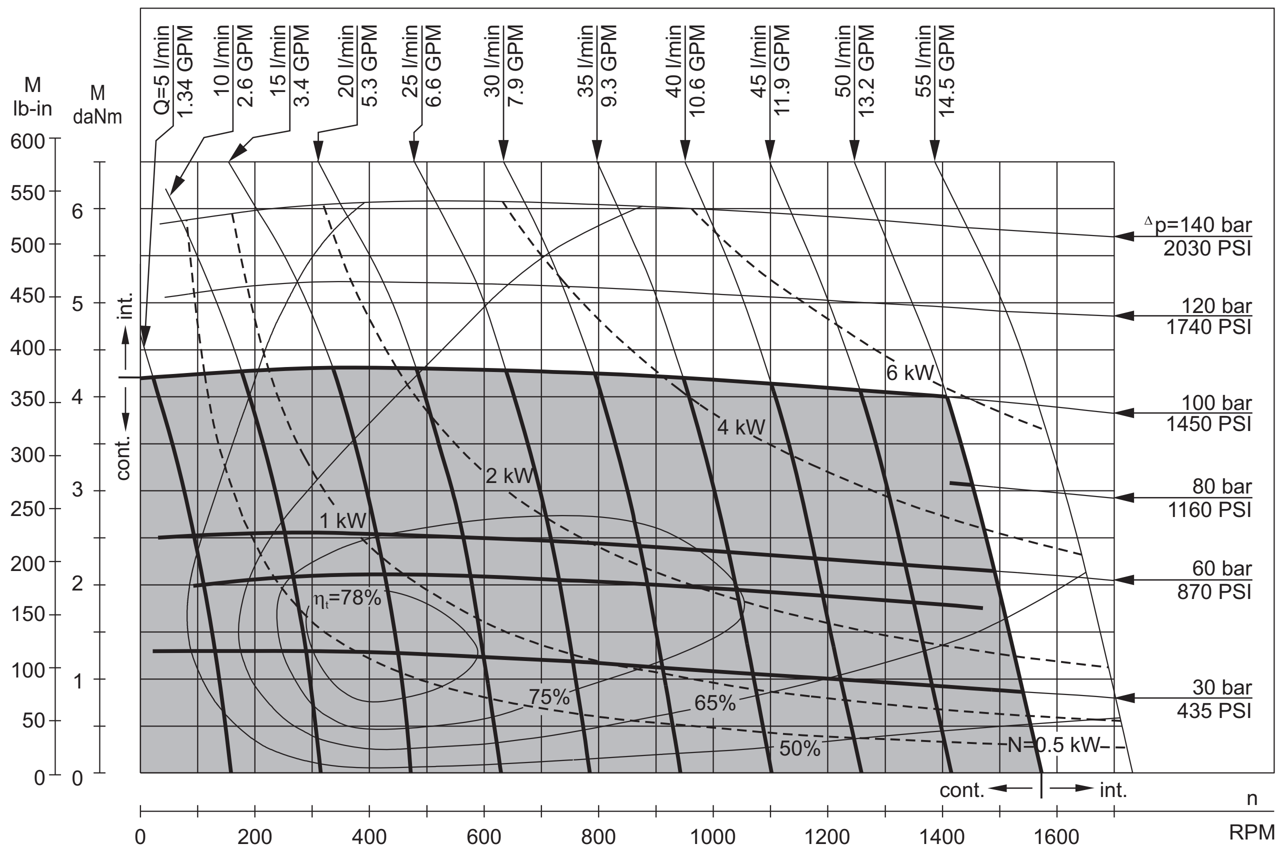
1. Intermittent speed and intermittent pressure must not occur simultaneously.
2. Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
3. Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP (DIN51524) or HM (ISO 6743/4). If using synthetic fluids consult the factory for alternative seal materials.
4. Recommended minimum oil viscosity 70 SUS [13 mm²/s] at 122°F [50°C].
5. Recommended maximum system operating temperature is 180°F [82°C].
6. To assure optimum motor life fill with fluid prior to loading and run at moderate load and speed for 10-15 minutes.

FUNCTION DIAGRAMS

MLHP 25



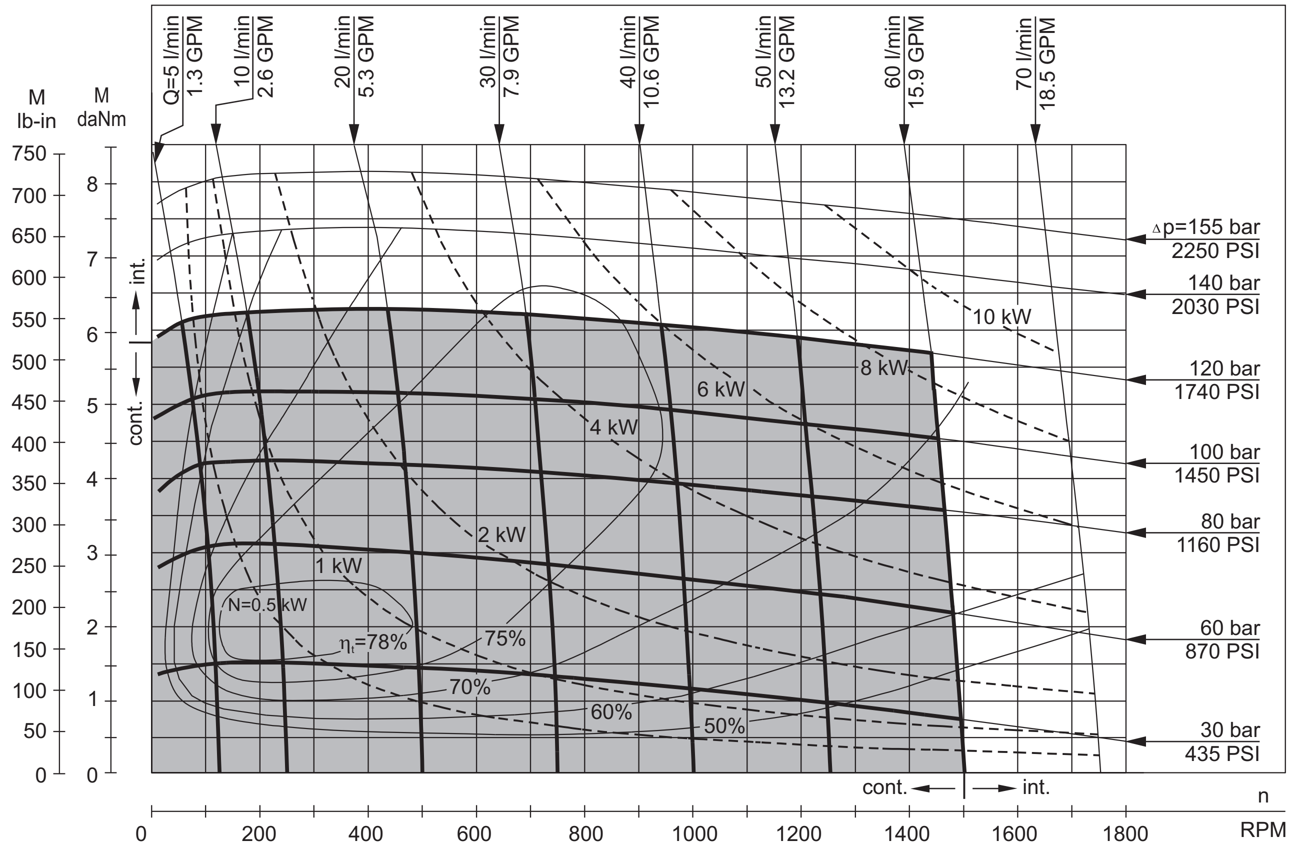
MLHP 32



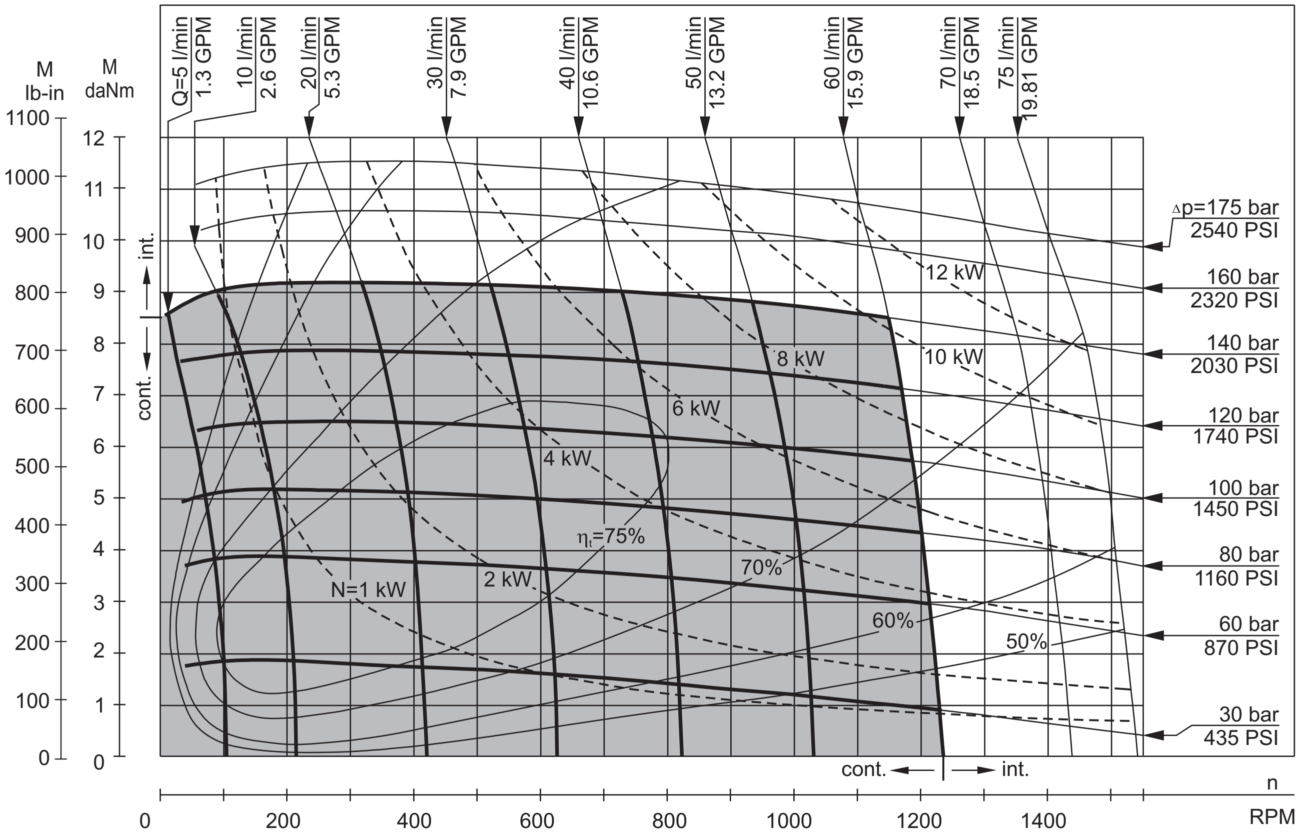
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5 PSI÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHP 40



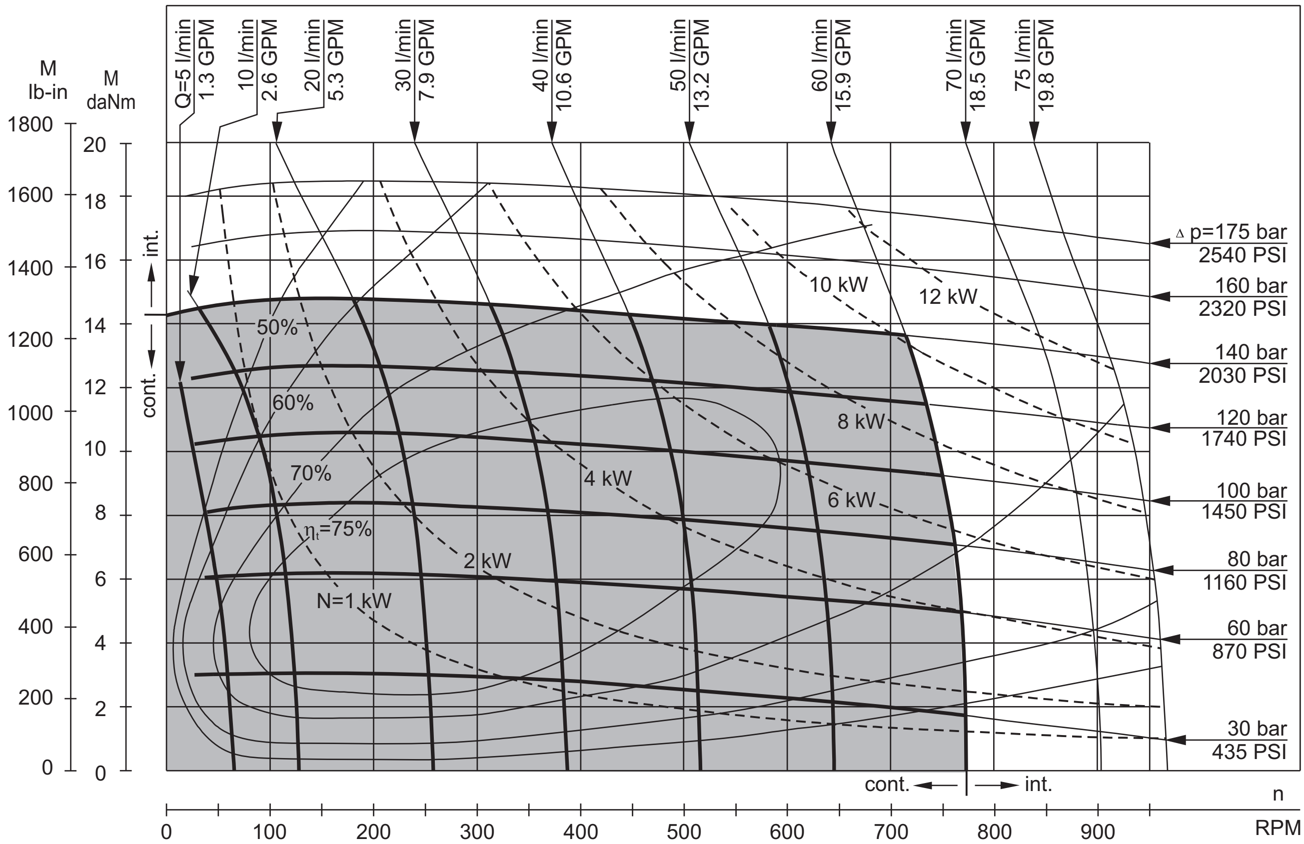
MLHP 50



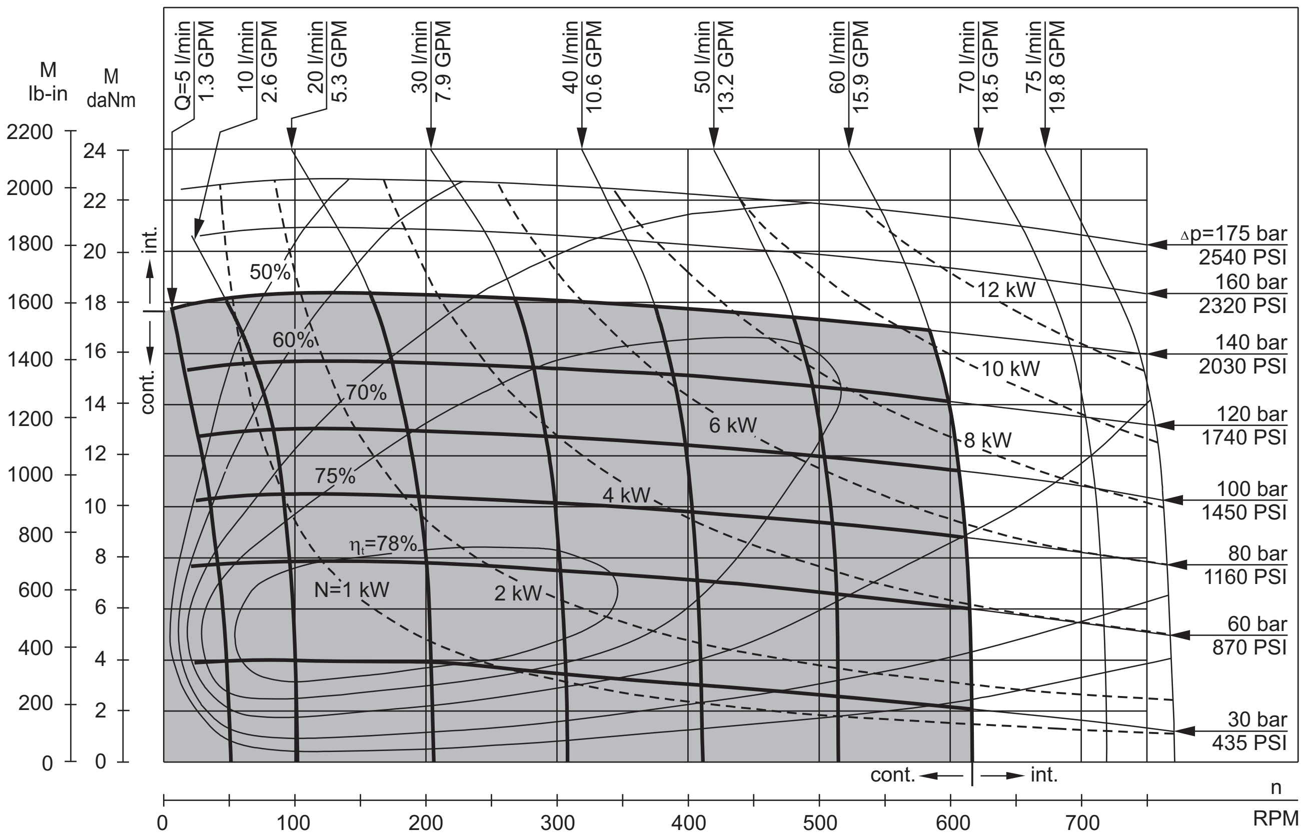
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5 PSI÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHP 80



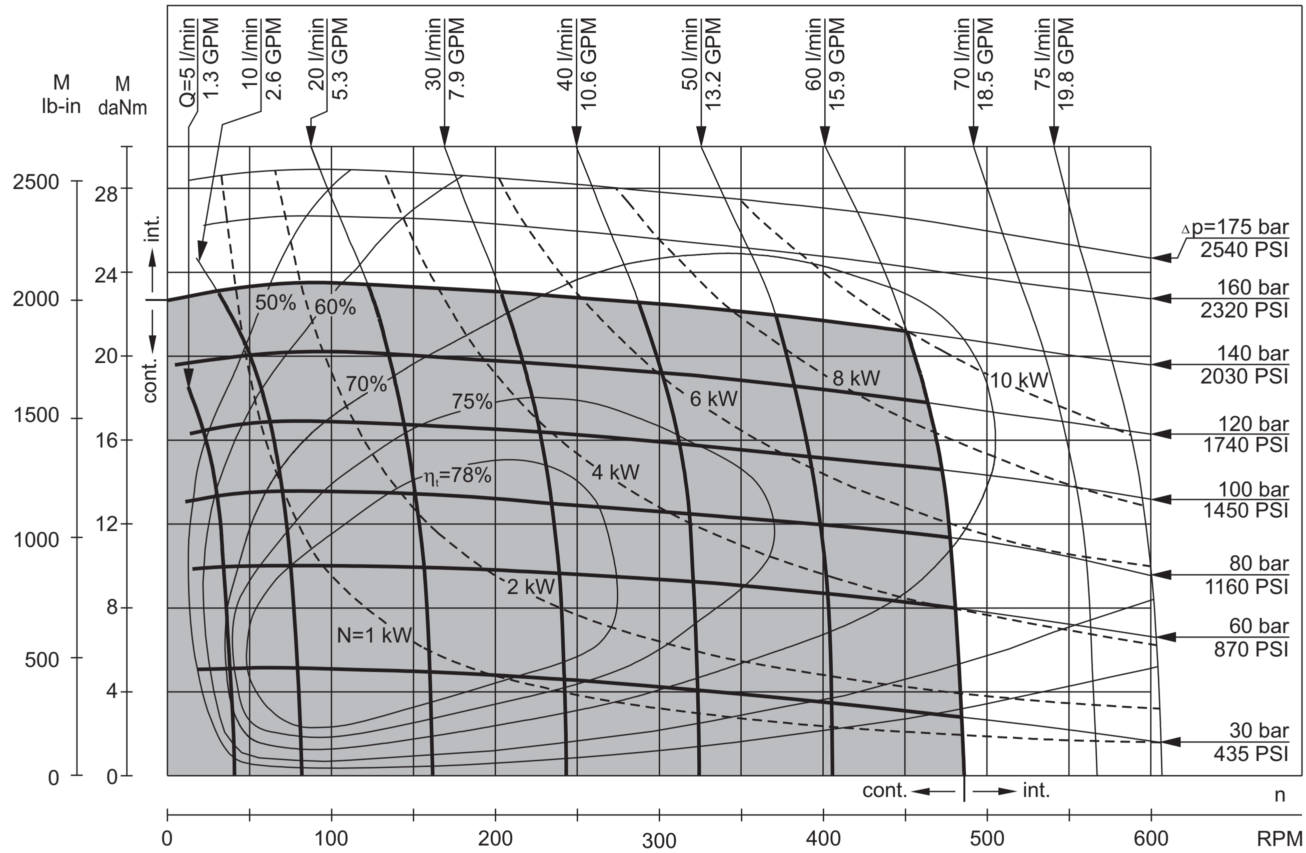
MLHP 100



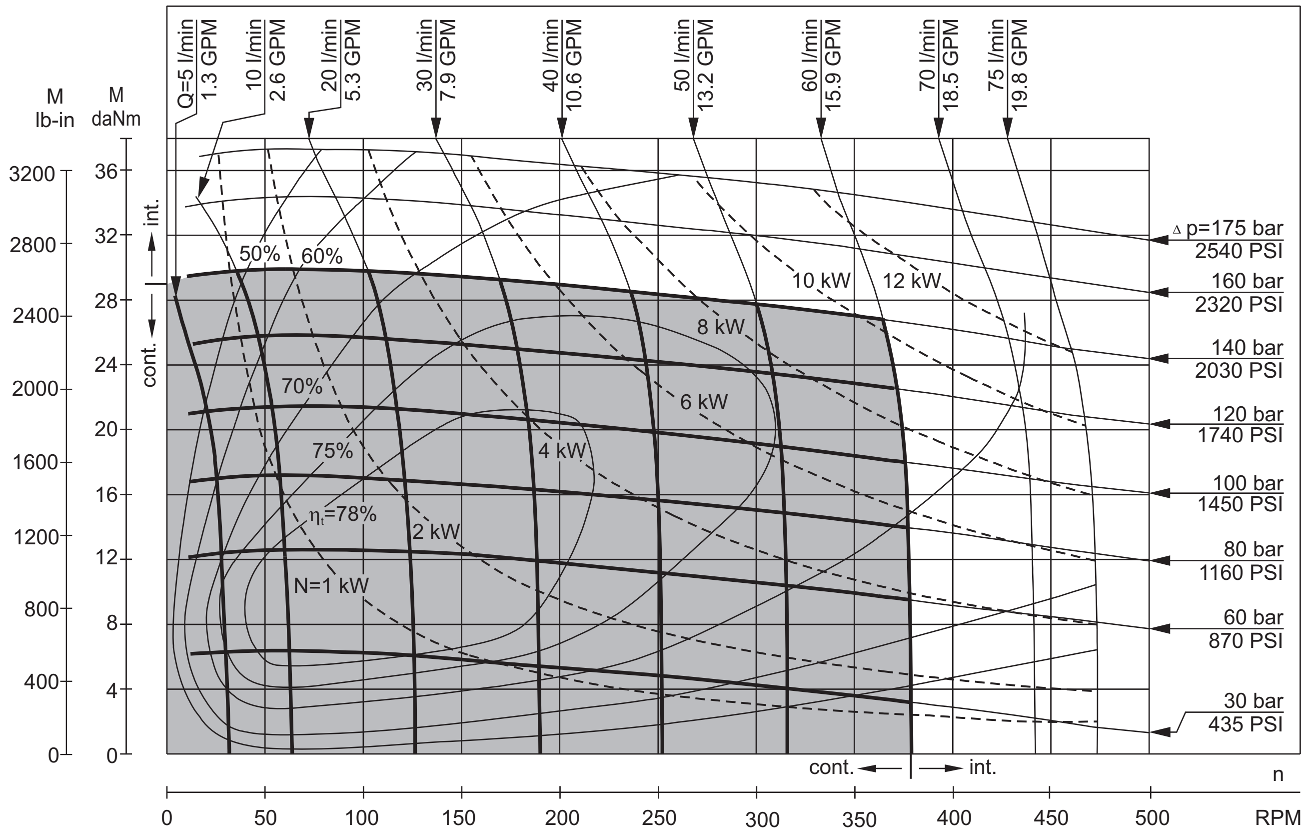
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5 PSI÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHP 125



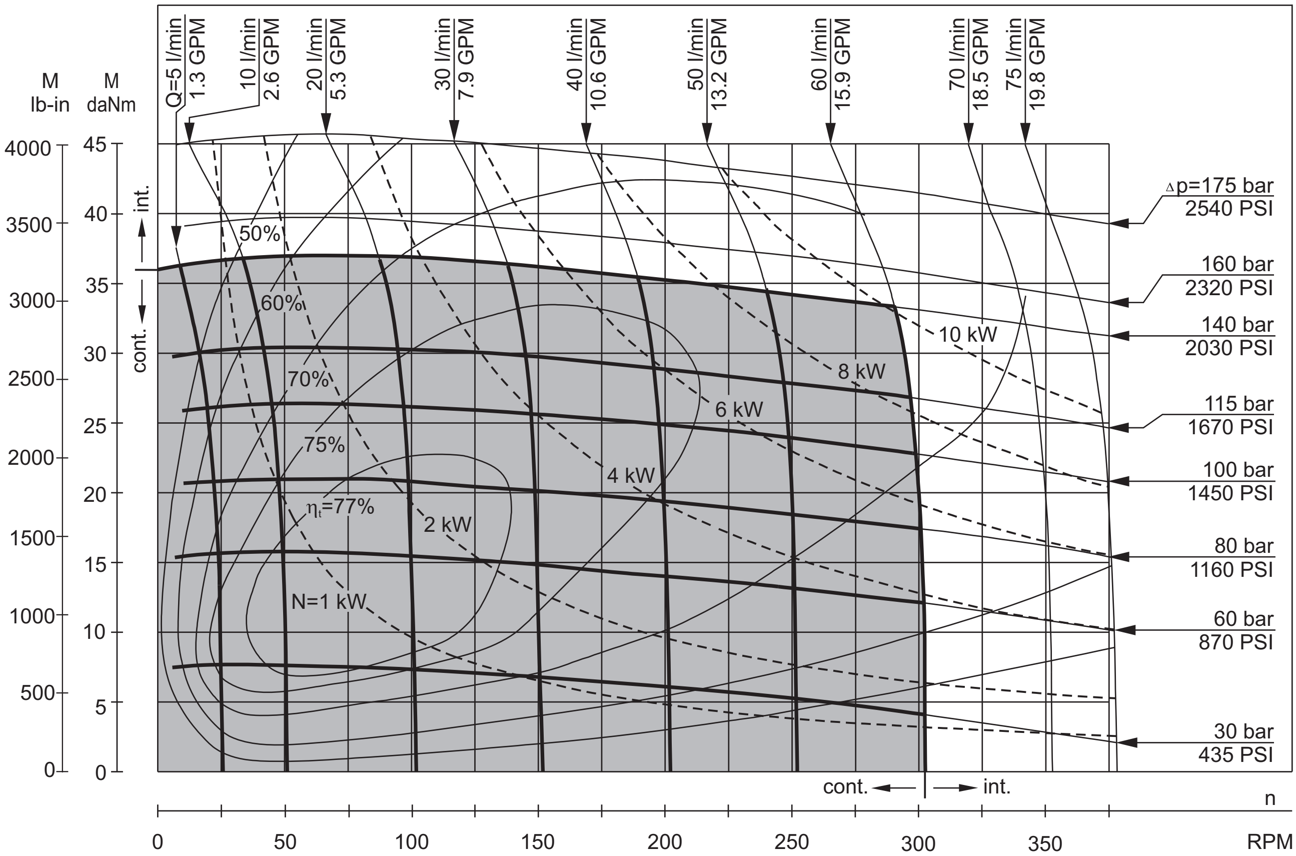
MLHP 160



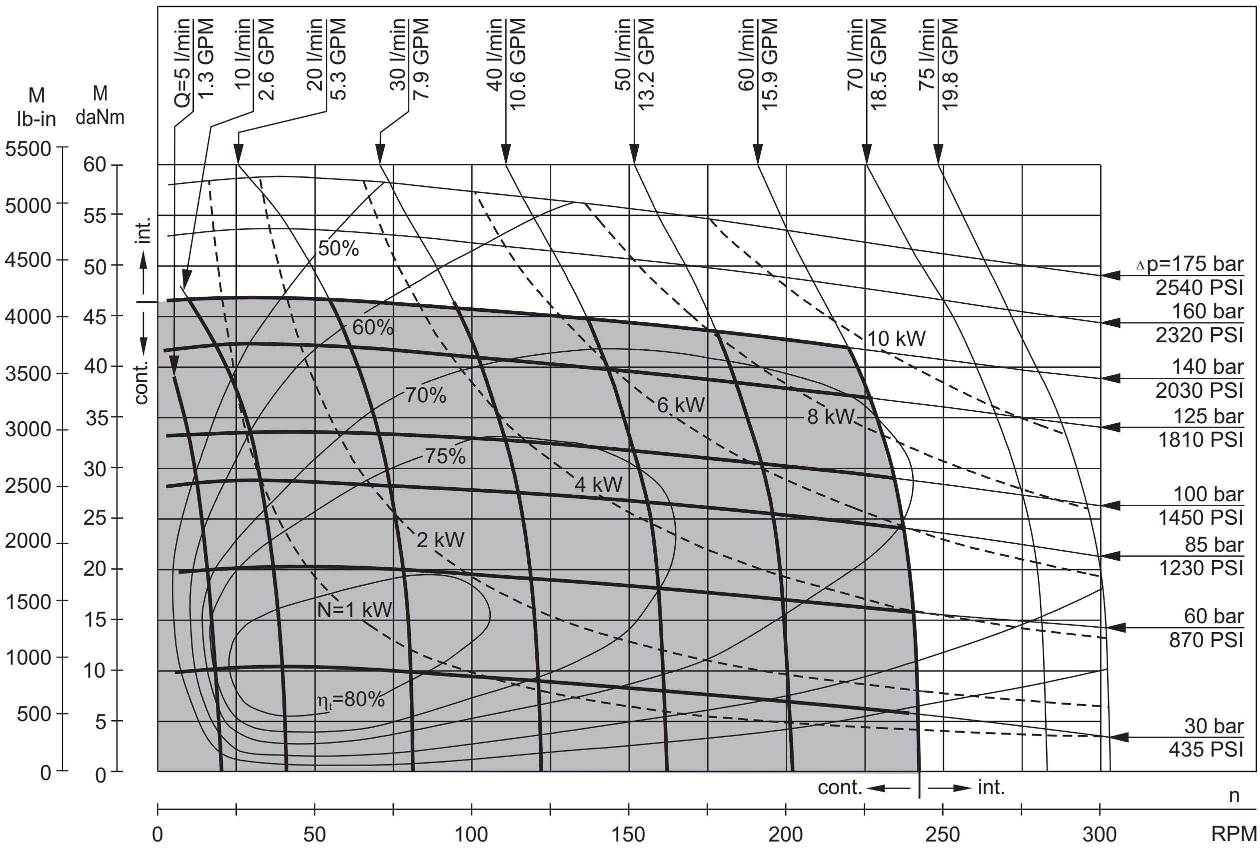
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5 PSI÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHP 200



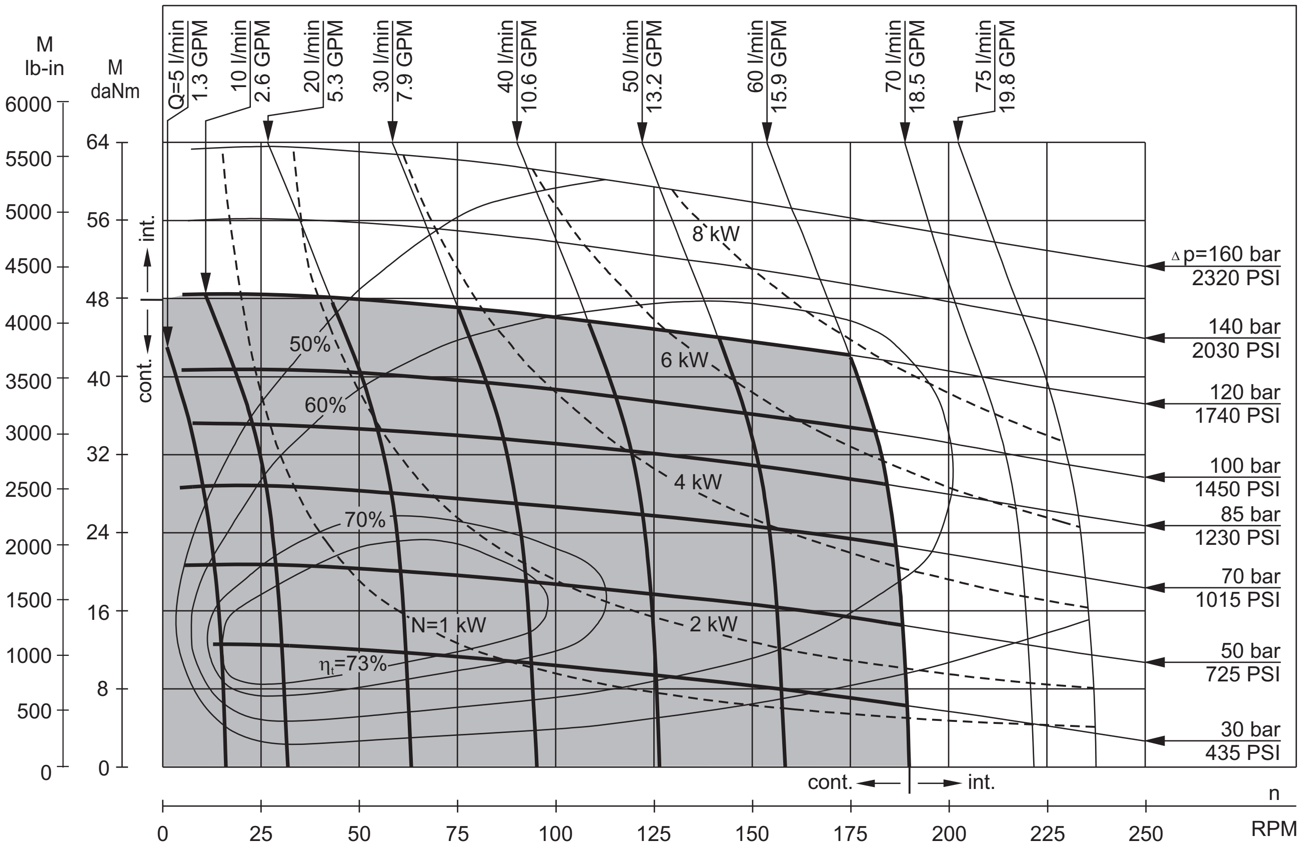
MLHP 250



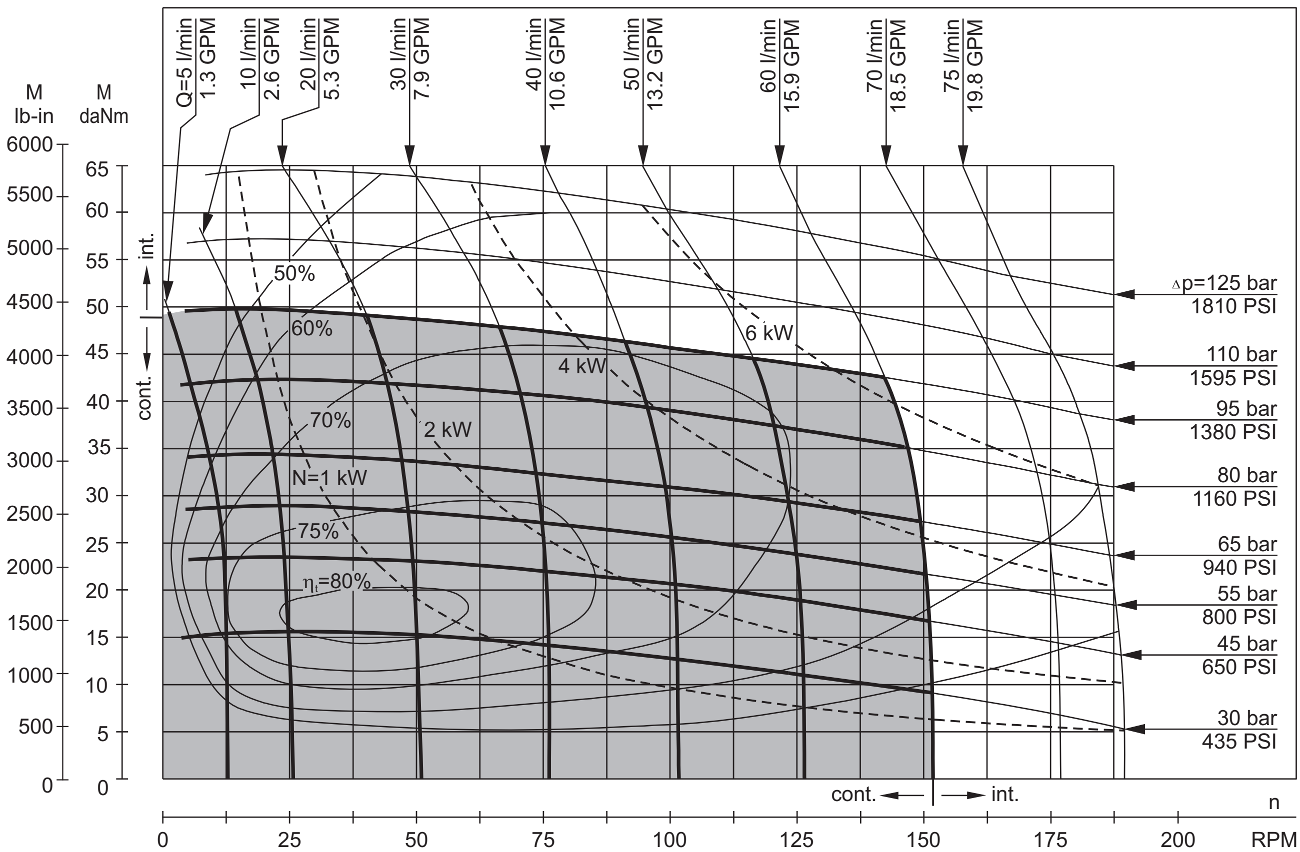
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5 PSI÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHP 315



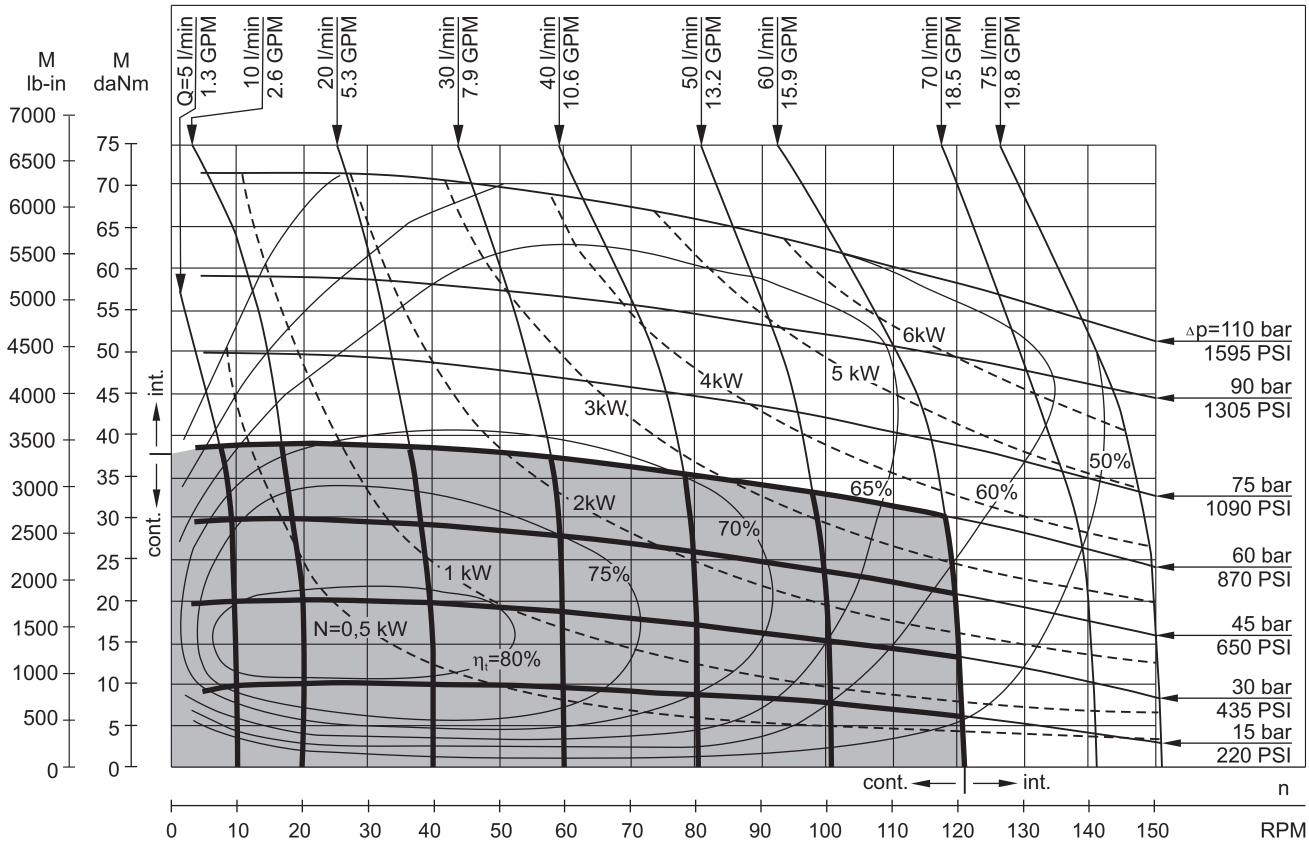
MLHP 400



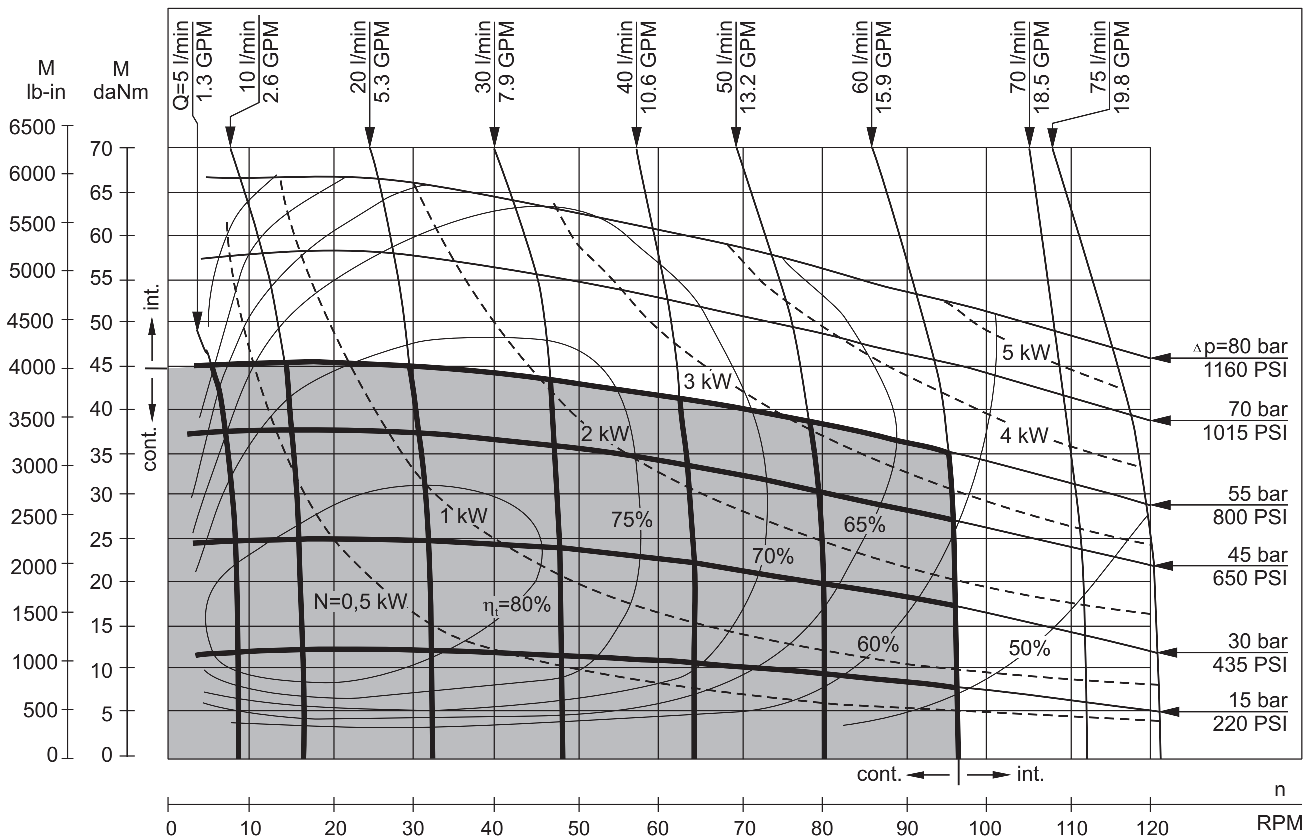
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5 PSI÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHP 500



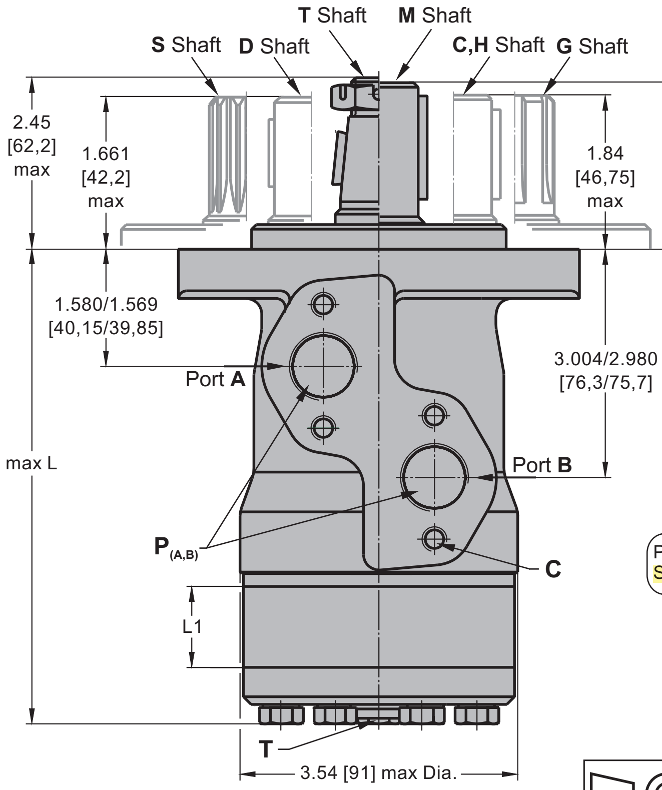
MLHP 630



The function diagrams data is for average performance of randomly selected motors at back pressure 72.5 PSI÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

DIMENSIONS and MOUNTING DATA

MLHP, MLHPF

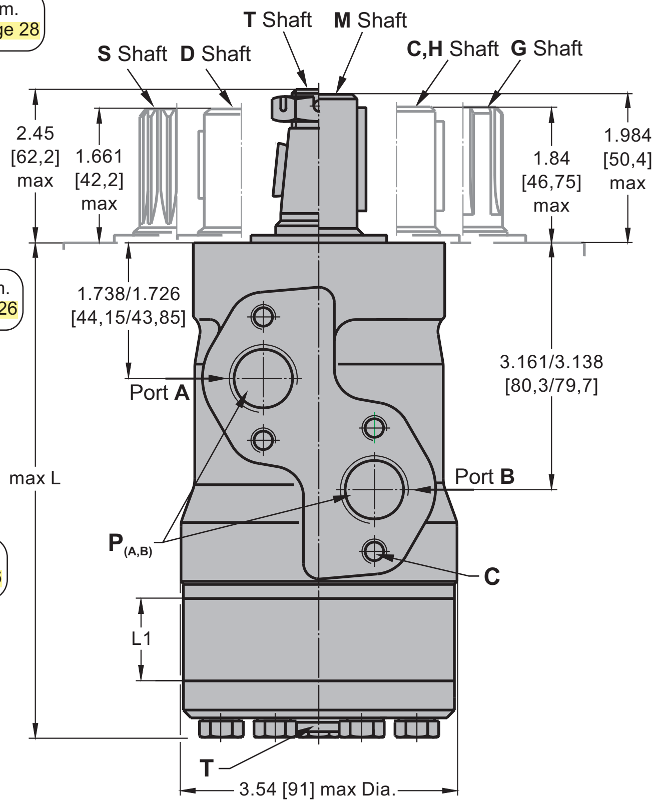


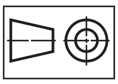
Shaft Dim.
See Page 28

Flange Dim.
See Page 26

Port Dim.
See Page 26

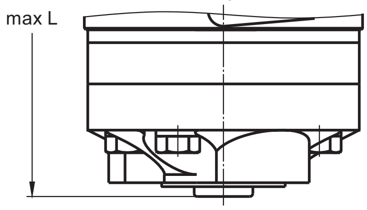
MLHPQ, MLHPM

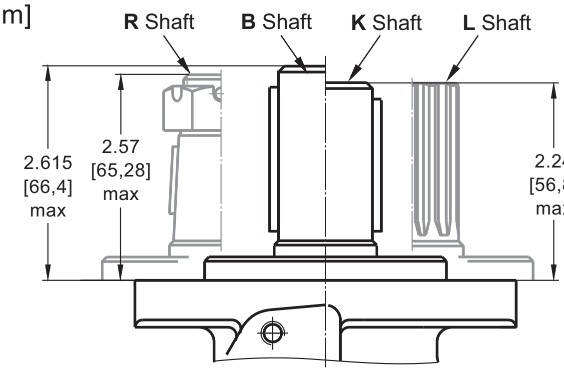




in [mm]

Version 6 7 8 9
Rear ports





	Versions			
	2, 6	3, 9	4, 7	5, 8
C	4xM8	4xM8	4x 5/16 - 18 UNF	4x 5/16 - 18 UNF
$P_{(A,B)}$	2xG½	2xM22x1,5	2x 7/8 - 14 UNF	2x½ - 14 NPTF
T	G¼	M14x1,5	7/16 - 20 UNF	7/16 - 20 UNF

Standard Rotation
Viewed from Shaft End
Port **A** Pressurized - **CW**
Port **B** Pressurized - **CCW**

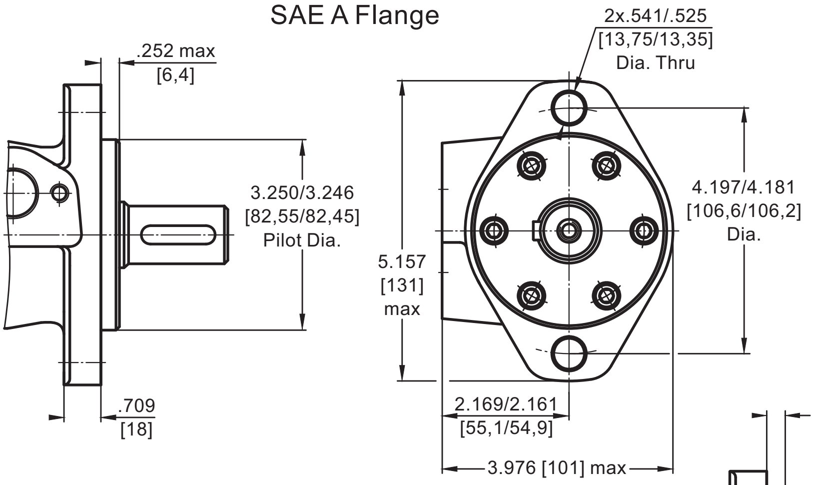
Reverse Rotation
Viewed from Shaft End
Port **A** Pressurized - **CCW**
Port **B** Pressurized - **CW**

Type	L max, in [mm]		Type	L max, in [mm]		L_1, in [mm]
	Versions 2,3,4,5	*Versions 6,7,8,9		Versions 2,3,4,5	*Versions 6,7,8,9	
MLHP(F) 25	5.35 [136,0]	5.91 [150,0]	MLHPQ(M) 25	5.53 [140,5]	6.08 [154,5]	.21 [5,20]
MLHP(F) 32	5.39 [137,0]	5.96 [151,5]	MLHPQ(M) 32	5.57 [141,5]	6.12 [155,5]	.25 [6,30]
MLHP(F) 40	5.45 [138,5]	6.00 [152,5]	MLHPQ(M) 40	5.61 [142,5]	6.16 [156,5]	.29 [7,40]
MLHP(F) 50	5.41 [137,5]	5.96 [151,5]	MLHPQ(M) 50	5.59 [142,0]	6.14 [156,0]	.26 [6,67]
MLHP(F) 63	5,39 [137,0]	5.85 [148,5]	MLHPQ(M) 80	5.65 [143,5]	6.08 [154,5]	.33 [8,40]
MLHP(F) 80	5.57 [141,5]	6.12 [155,5]	MLHPQ(M) 80	5.75 [146,0]	6.29 [160,0]	.42 [10,67]
MLHP(F) 100	5.67 [144,0]	6.24 [158,5]	MLHPQ(M) 100	5.85 [148,5]	6.39 [162,5]	.52 [13,33]
MLHP(F) 125	5.81 [147,5]	6.36 [161,5]	MLHPQ(M) 125	5.98 [152,0]	6.54 [166,0]	.66 [16,67]
MLHP(F) 160	5.98 [152,0]	6.56 [166,5]	MLHPQ(M) 160	6.16 [156,5]	6.71 [170,5]	.84 [21,33]
MLHP(F) 200	6.20 [157,5]	6.75 [171,5]	MLHPQ(M) 200	6.38 [162,0]	6.93 [176,0]	1.05 [26,67]
MLHP(F) 250	6.46 [164,0]	7.03 [178,5]	MLHPQ(M) 250	6.63 [168,5]	7.19 [182,5]	1.31 [33,33]
MLHP(F) 315	6.83 [173,5]	7.38 [187,5]	MLHPQ(M) 315	7.01 [178,0]	7.56 [192,0]	1.68 [42,67]
MLHP(F) 400	7.24 [184,0]	7.81 [198,5]	MLHPQ(M) 400	7.42 [188,5]	7.97 [202,5]	2.10 [53,33]
MLHP(F) 500	7.78 [197,5]	8.33 [211,5]	MLHPQ(M) 500	7.95 [202,0]	8.50 [216,0]	2.62 [66,63]
MLHP(F) 630	8.47 [215,0]	9.02 [229,0]	MLHPQ(M) 630	8.62 [219,0]	9.17 [233,0]	3.31 [84,00]

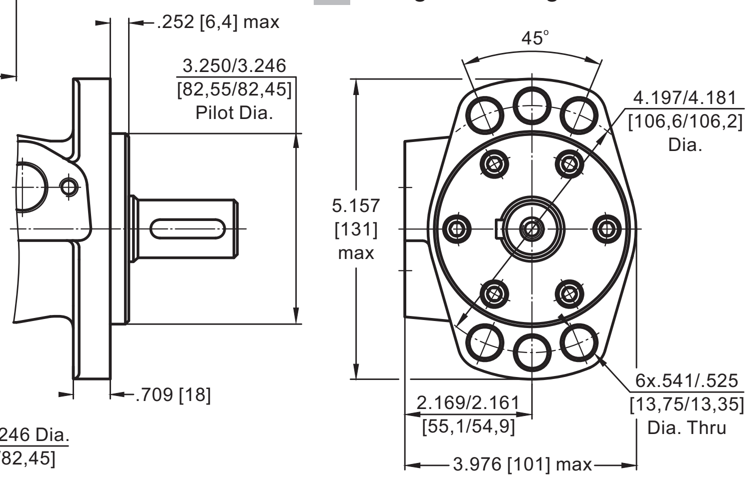
* - For Rear Ported Motors

MOUNTING

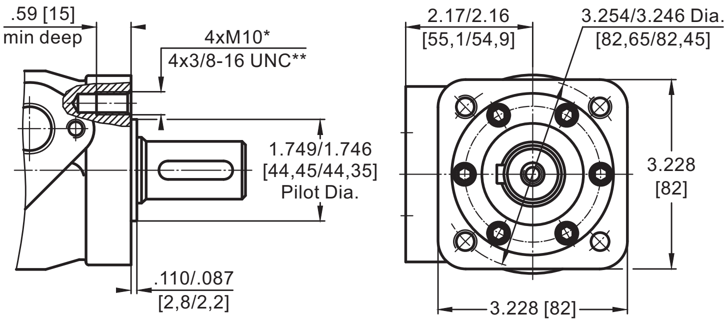
SAE A Flange



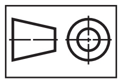
F - Magneto Flange



M and **Q** - Square Flange



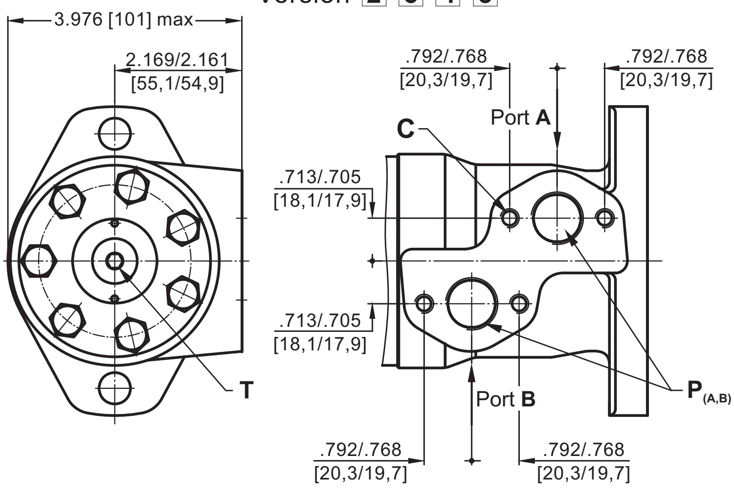
* For **M** Flange
** For **Q** Flange



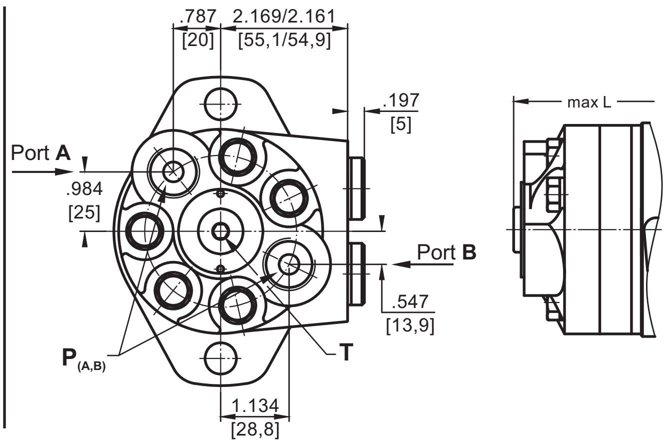
in [mm]

PORTS

Side Ports
Version 2 3 4 5



Rear Ports
Version 6 7 8 9

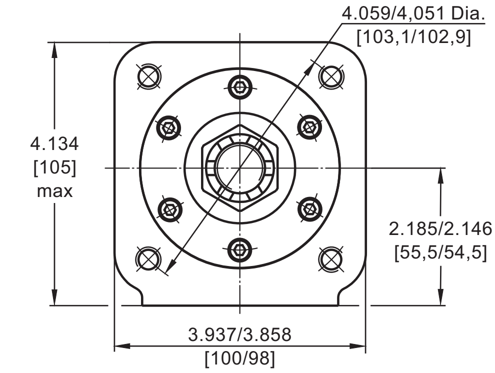


	Versions			
	2 , 6	3 , 9	4 , 7	5 , 8
C	4xM8	4xM8	4x 5/16 - 18 UNF	4x5/16 - 18 UNF
$P_{(A,B)}$	2xG½	2xM22x1,5	2x7/8 - 14 UNF	2x½ - 14 NPTF
T	G¼	M14x1,5	7/16 - 20 UNF	7/16 - 20 UNF

Standard Rotation
Viewed from Shaft End
Port **A** Pressurized - **CW**
Port **B** Pressurized - **CCW**

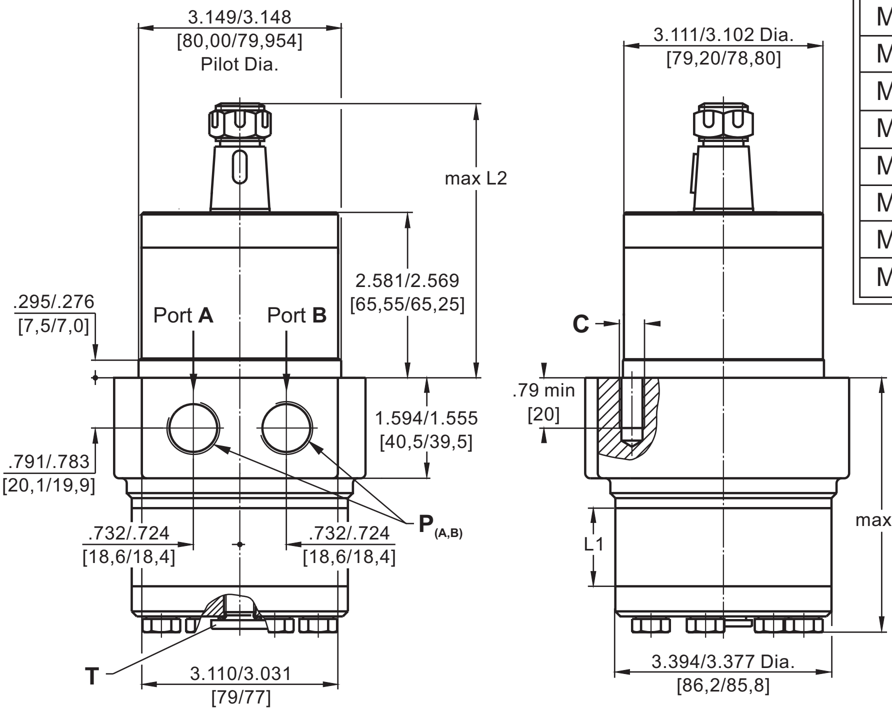
Reverse Rotation
Viewed from Shaft End
Port **A** Pressurized - **CCW**
Port **B** Pressurized - **CW**

DIMENSIONS and MOUNTING DATA - MLHPW (WHEEL MOTOR)



	Versions			
	2	3	4	5
C	4xM10	4xM10	⅜ - 16 UNF	⅜ - 16 UNF
$P_{(A,B)}$	2xG½	2xM22x1,5	2x⅞ - 14 UNF	2x½ - 14 NPTF
T	G¼	M14x1,5	7⁄16 - 20 UNF	7⁄16 - 20 UNF

Type	L, in [mm]	L_1, in [mm]
MLHPW(N) 25	3.01 [76,5]	.21 [5,20]
MLHPW(N) 32	3.07 [78,0]	.25 [6,30]
MLHPW(N) 40	3.13 [79,5]	.29 [7,40]
MLHPW(N) 50	3.07 [78,0]	.26 [6,67]
MLHPW(N) 80	3.23 [82,0]	.42 [10,67]
MLHPW(N) 100	3.35 [85,0]	.52 [13,33]
MLHPW(N) 125	3.47 [88,0]	.66 [16,67]
MLHPW(N) 160	3.66 [93,0]	.84 [21,33]
MLHPW(N) 200	3.86 [98,0]	1.05 [26,67]
MLHPW(N) 250	4.13 [105,0]	1.31 [33,33]
MLHPW(N) 315	4.51 [114,5]	1.68 [42,67]
MLHPW(N) 400	4.92 [125,0]	2.10 [53,33]



Shaft version	L_2, in [mm]
C, G, H	4.17 [106]
S, D	3.99 [101,4]
M	4.32 [109,6]
T	4.78 [121,5]

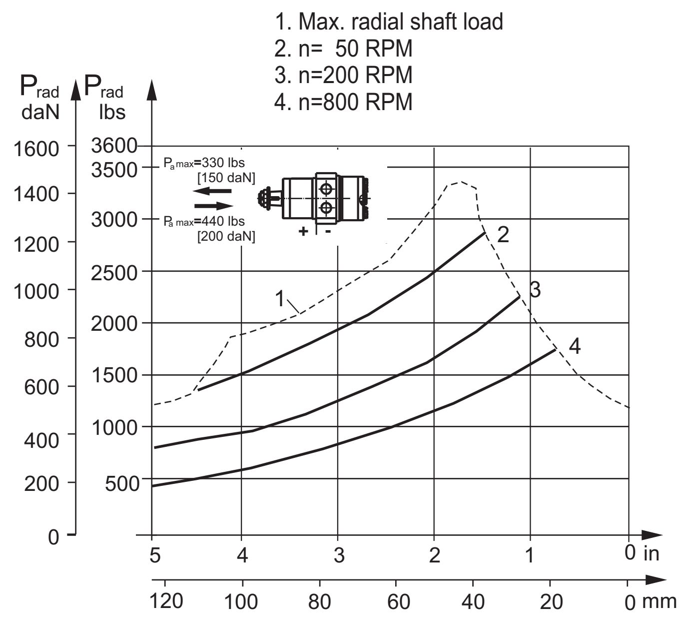
Standard Rotation
Viewed from Shaft End
Port **A** Pressurized - **CW**
Port **B** Pressurized - **CCW**

Reverse Rotation
Viewed from Shaft End
Port **A** Pressurized - **CCW**
Port **B** Pressurized - **CW**

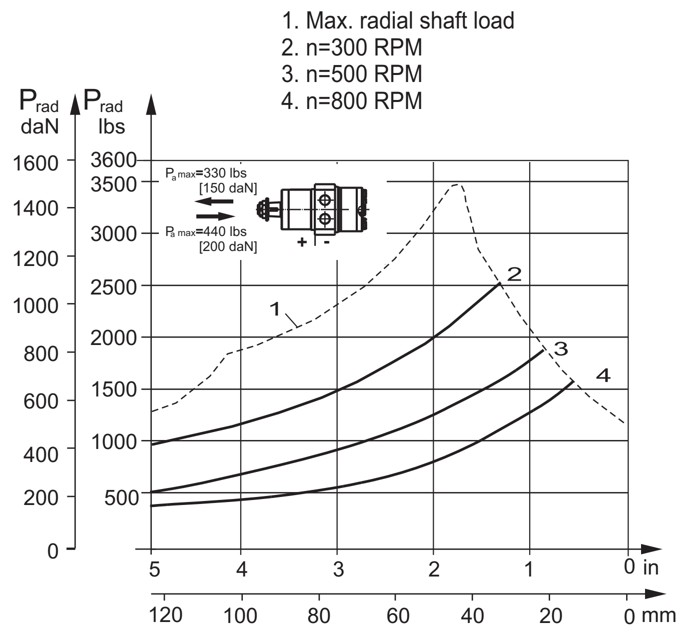
PERMISSIBLE SHAFT LOADS

MLHPWN

The curves apply to a B10 bearing life of 2000 hours.



MLHPW

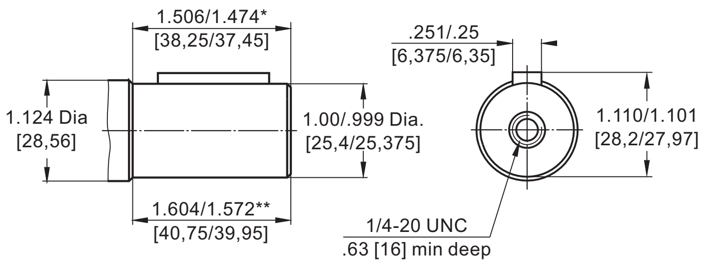


SHAFT EXTENSIONS for MLHP and MLHR MOTORS

1.124 [28,56] sealing diameter

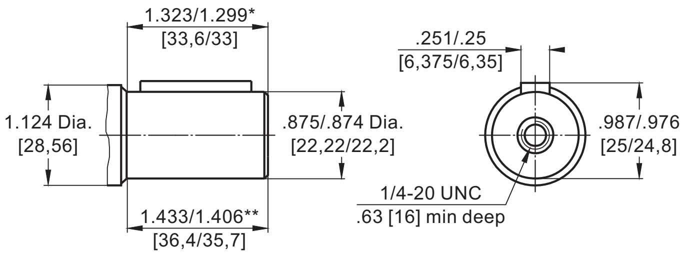
C

1" [25,4] straight, Parallel key ¼"x¼"x1¼" BS 46
Max. Torque 3009 lb-in [34 daNm]



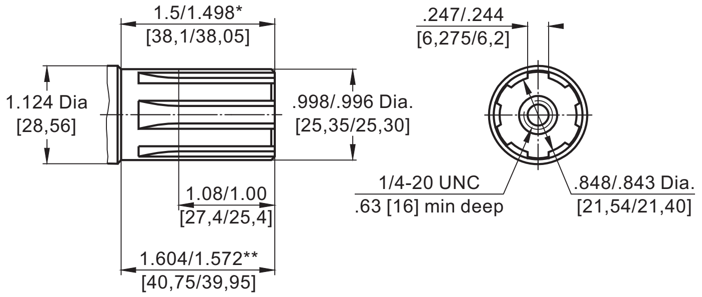
D

⅞" [22,2] straight, Parallel key ¼"x¼"x1" BS 46
Max. Torque 3200 lb-in [36 daNm]



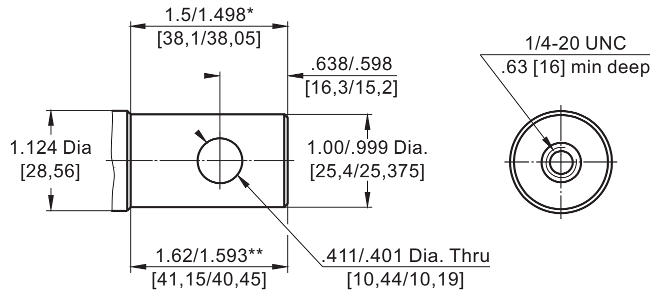
G

1" [25,4], SAE 6B Splined
Max. Torque 3540 lb-in [40 daNm]



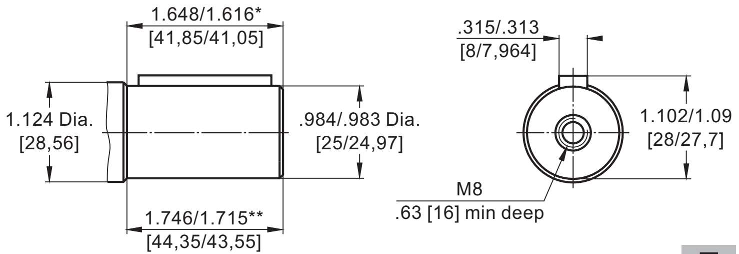
H

1" [25,4] straight, w/ .406 [10,3] Crosshole
Max. Torque 3009 lb-in [34 daNm]



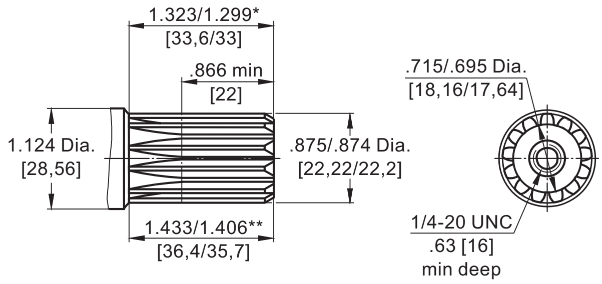
M

ø25 straight, Parallel key A8x7x32 DIN 6885
Max. Torque 3009 lb-in [34 daNm]



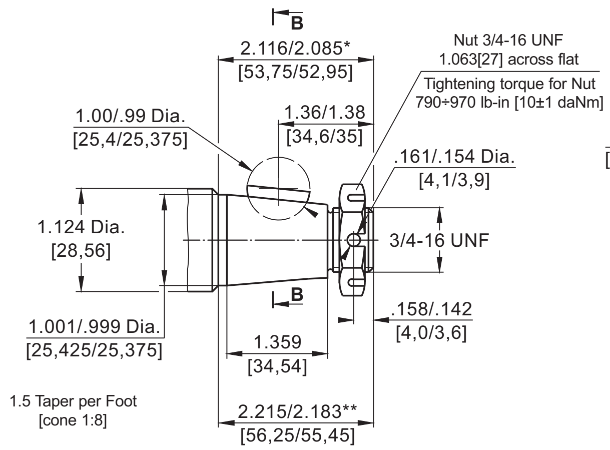
S

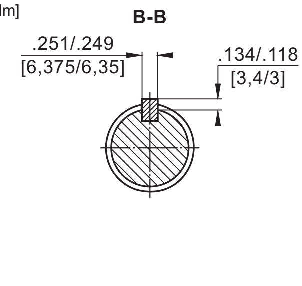
13 T Splined, ⅞" [22,2], ANS B 92.1-1976
Max. Torque 3200 lb-in [36 daNm]

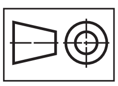


T

1" [25,4], SAE J501 Tapered
Woodruff key ¼"x1" SAE J502
Max. Torque 3540 lb-in [40 daNm]







in [mm]

* For SAE A and **F** Flange
** For **M** and **Q** Flange

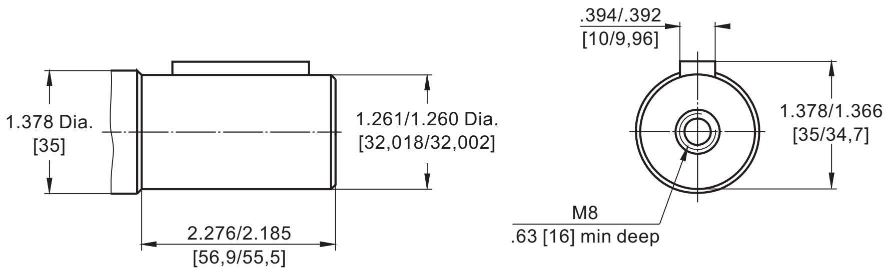
Requirement max. Torque must not be exceeded.

SHAFT EXTENSIONS for MLHP and MLHR MOTORS (continued)

1.378 [35] sealing diameter

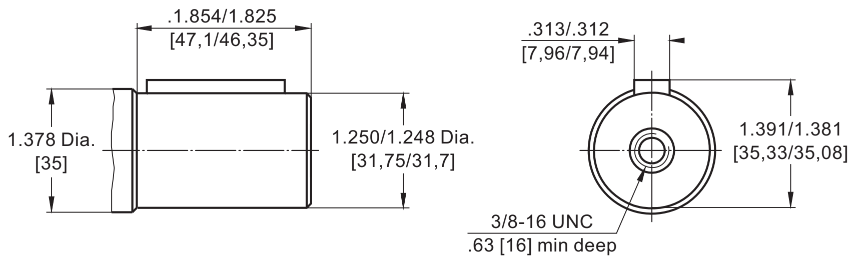
B

ø32 straight, Parallel key A10x8x45 DIN 6885
Max. Torque 6815 lb-in [77 daNm]



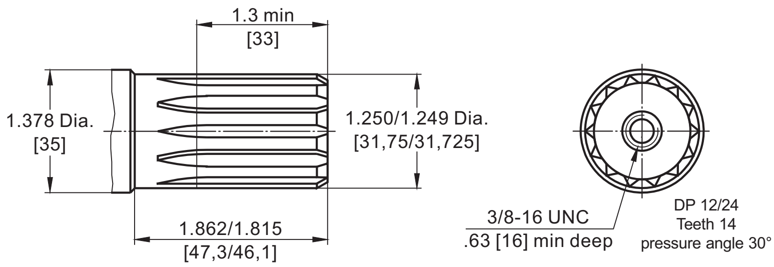
K

1¼" [31,75] straight, Parallel key ⁵⁄₁₆"x⁵⁄₁₆"x1¼" BS 46
Max. Torque 6815 lb-in [77 daNm]



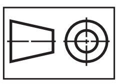
L

14T Splined,1¼" [31,75], ANS B 92.1-1976
Max. Torque 6815 lb-in [77 daNm]

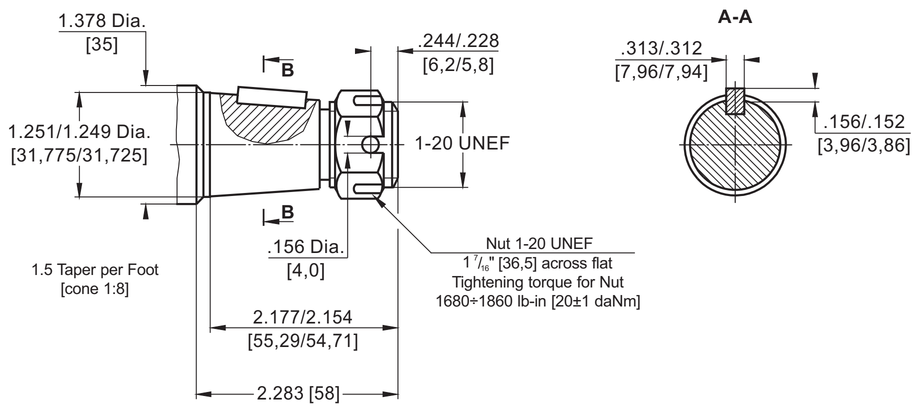


R

1¼" [31,75],SAE J501 Tapered, Parallel key ⁵⁄₁₆"x⁵⁄₁₆"x1"
Max. Torque 6815 lb-in [77 daNm]



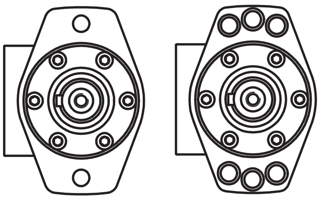
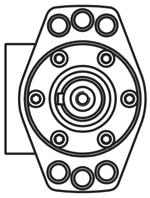
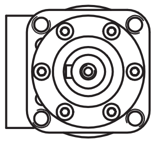
in [mm]



Requirement max. Torque must not be exceeded.

PERMISSIBLE SHAFT LOADS for MLHP and MLHR MOTORS

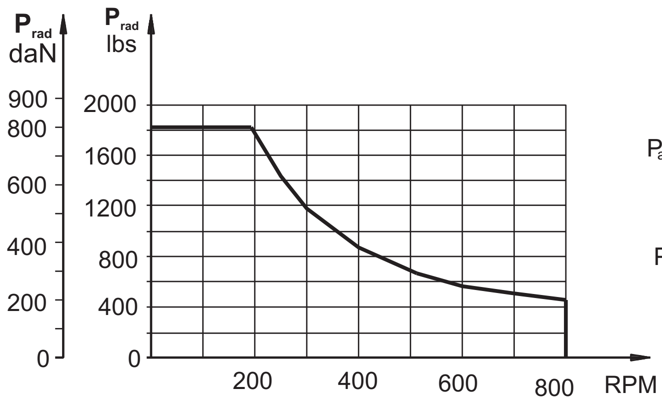
The permissible radial shaft load **P**$\mathbf{P_{rad}}$ depends on the speed **n**, RPM, mounting flange, distance **L** from the point of load to the mounting flange and shaft version.

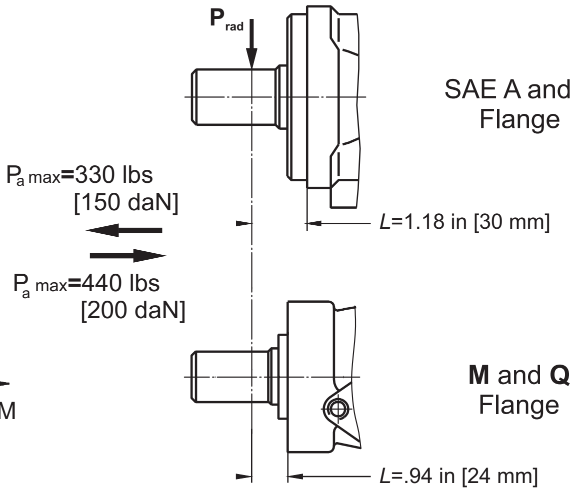
Mounting Flange			
Shaft Version	Keyed **C** Splined **G**	Keyed **B** Splined **L**	Keyed **C** Splined **G**
Radial Shaft Load P_{rad}, in mm	$\frac{800}{n} \times \frac{25000}{95+L}$, daN*	$\frac{800}{n} \times \frac{18750}{95+L}$, daN*	$\frac{800}{n} \times \frac{25000}{101+L}$, daN*
Radial Shaft Load P_{rad}, in inch	$\frac{800}{RPM} \times \frac{2215}{3.74+L}$, lbs*	$\frac{800}{RPM} \times \frac{1660}{3.74+L}$, lbs*	$\frac{800}{RPM} \times \frac{2215}{3.98+L}$, lbs*

* n < 200 RPM; max Prad=1800 lbs [800 daN]
n ≥ 200 RPM; L < 2.2 in [55 mm]

MLHP and MLHR

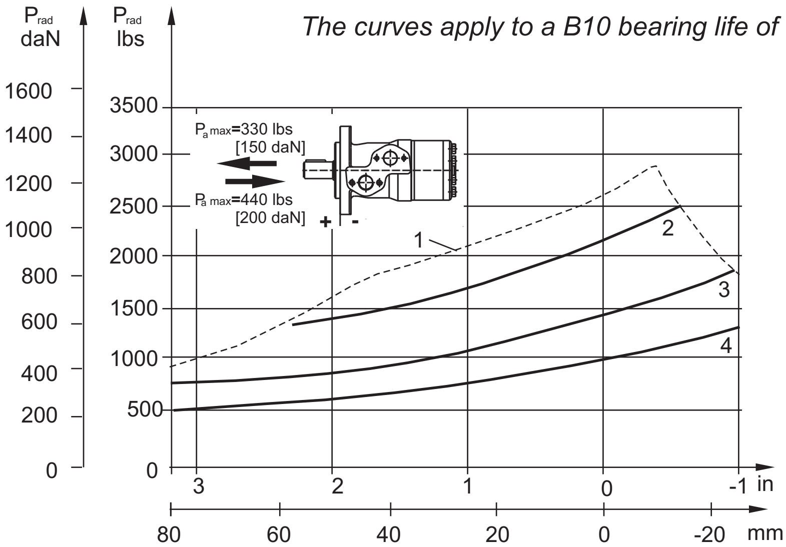
Radial Shaft Load P_{rad} for C, G Shaft Extensions by L=1.18 in [30 mm] (.94 in [24 mm])



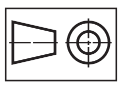


MLHPN and MLHRN

The curves apply to a B10 bearing life of 2000 hours.



1. Max. radial shaft load
2. n= 50 RPM
3. n=200 RPM
4. n=800 RPM

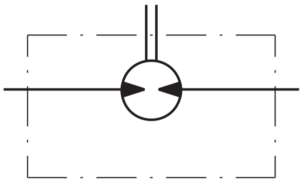

in [mm]

MAX. PERMISSIBLE SHAFT SEAL PRESSURE for MLHP and MLHR MOTORS

MLHP/MLHR...U1 motors with high pressure seal and without drain connection:

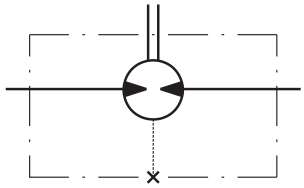
The shaft seal pressure equals the average of input pressure and return pressure.

$$P_{seal}=\frac{P_{input}+P_{return}}{2}$$



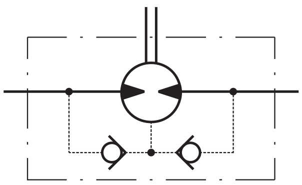
MLHP/MLHR...U motors with high pressure seal and drain connection:

The shaft seal pressure equals the pressure in the drain line.



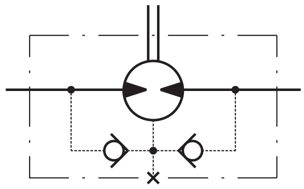
MLHP/MLHR...1 motors with standard shaft seal and without drain connection:

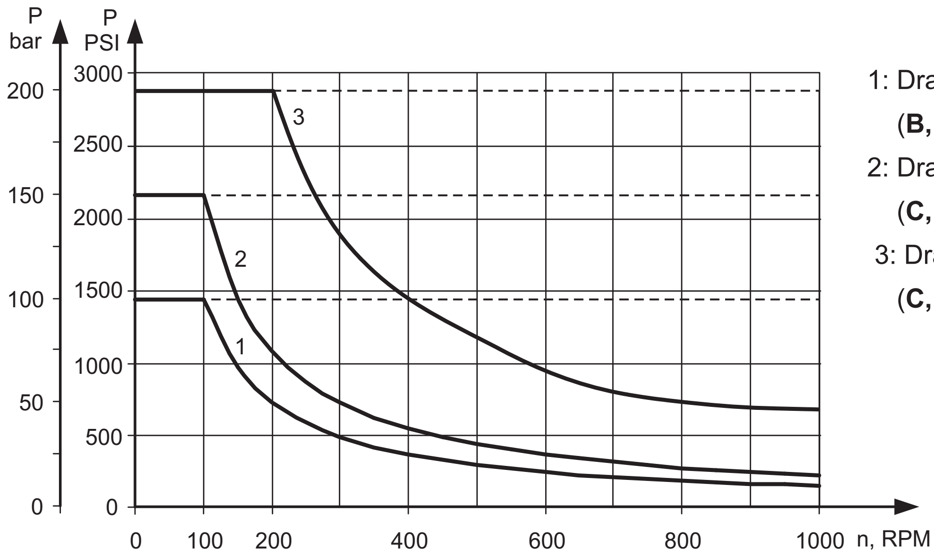
The shaft seal pressure never exceeds the pressure in the return line.



MLHP/MLHR... motors with standard shaft seal and with drain connection:

The shaft seal pressure equals the pressure in the drain line.





1: Drawing for Standard Shaft Seal (**B, K, L, R** shafts)

2: Drawing for Standard Shaft Seal (**C, G, D, H, M, S, T** shafts)

3: Drawing for High Pressure Seal ("**U**" Seal) (**C, G, D, H, M, S, T** shafts)

- continuous operations

- intermittent operations

ORDER CODE

	1	2	3	4	5	6	7	8	9
M L H P									

Pos.1 - Mounting Flange

omit	- SAE A, two holes
F	- Magneto, six holes
M	- Square metric, four bolts M10
Q	- Square, four bolts
W	- Wheel motor

Pos.2 - Displacement code

25*	- 1.73 in^3/rev [28,4 cm^3/rev]
32*	- 2.11 in^3/rev [34,5 cm^3/rev]
40*	- 2.47 in^3/rev [40,5 cm^3/rev]
50	- 3.02 in^3/rev [49,5 cm^3/rev]
63**	- 3.80 in^3/rev [62,3 cm^3/rev]
80	- 4.83 in^3/rev [79,2 cm^3/rev]
100	- 6.04 in^3/rev [99,0 cm^3/rev]
125	- 7.55 in^3/rev [123,8 cm^3/rev]
160	- 9.66 in^3/rev [158,4 cm^3/rev]
200	- 12.10 in^3/rev [198,0 cm^3/rev]
250	- 15.10 in^3/rev [247,5 cm^3/rev]
315	- 19.30 in^3/rev [316,8 cm^3/rev]
400	- 24.16 in^3/rev [396,0 cm^3/rev]
500	- 30.20 in^3/rev [495,0 cm^3/rev]
630	- 38.05 in^3/rev [623,6 cm^3/rev]

Pos.3 - Shaft Extensions* [see pages 28 and 29]**

C	- 1" [25,4] straight, Parallel key
VC	- 1" [25,4] straight, Parallel key w/ corrosion resistant bushing
D	- $^7/_8$" [22,2] straight, Parallel key
G	- 1" [25,4] SAE 6B Splined
H	- 1" [25,4] straight w/ .406 [10,3] Crosshole
M	- 25 mm straight, Parallel key
VM	- 25 mm straight, Parallel key w/ corrosion resistant bushing
S	- $^7/_8$" [22,2] 13T Splined
T	- 1" [25,4] SAE J501 Tapered
B	- 32 mm straight, Parallel key
K	- 1¼" [31,75] straight, Parallel key
L	- 1¼" [31,75] 14T Splined
R	- 1¼" [31,75] SAE J501 Tapered

Pos.4 - Option [needle bearings]

omit	- none
N	- with needle bearings

Pos.5 - Port Size/Type [standard manifold to each]

2	- side ports, 2xG1/2, G1/4, BSP thread, ISO 228
3	- side ports, 2xM22x1,5, M14x1,5, metric thread, ISO 262
4	- side ports, 2x7/8-14 UNF, O-ring, 7/16-20 UNF
5	- side ports, 2x1/2-14 NPTF, 7/16-20 UNF
6	- rear ports, 2xG1/2, G1/4, BSP thread, ISO 228
7	- rear ports, 2x7/8-14 UNF, O-ring, 7/16-20 UNF
8	- rear ports, 2x1/2-14 NPTF, 7/16-20 UNF
9	- rear ports, 2xM22x1,5, M14x1,5, metric thread, ISO 262

Pos.6 - Shaft Seal Version [see page 31]

omit	- Standard shaft seal
U	- High pressure shaft seal (without check valves)

Pos.7 - Drain Port

omit	- with drain port
1	- without drain port

Pos.8 - Special Features [see page 110]

Pos.9 - Design Series

omit	- Factory specified

The hydraulic motors are mangano-phosphatized as standard.

NOTES:
* Not with Low Pressure Seal.
** 63 displacement code is not for MLHPW!
*** The permissible output torque for shafts must not be exceeded.

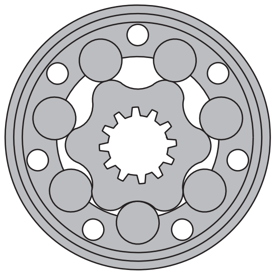
The following combinations are not allowed:
- **Q, M, W** flange with **B**, **K**, **L**, **R** shafts;
- **N** option with **B**, **K**, **L**, **R** shafts, **U** option or **RS** option;
- **W** flange with rear ports;
- **B**, **K**, **L**, **R** shafts with **U** option.

Displacement codes 25, 32, 40, 50 and 63 are not allowed with **B**, **K**, **L**, **R** shafts!

HYDRAULIC MOTORS MLHR

APPLICATION

- » Conveyors
- » Feeding mechanism of robots and manipulators
- » Metal working machines
- » Textile machines
- » Agricultural machines
- » Food industries
- » Grass cutting machinery etc.



CONTENTS

OPTIONS

- » Model - Spool valve, roll-gerotor
- » Flange mount
- » Motor with needle bearing
- » Side and rear ports
- » Shafts - straight, splined and tapered
- » SAE, Metric and BSPP ports
- » Speed sensoring
- » Other special features

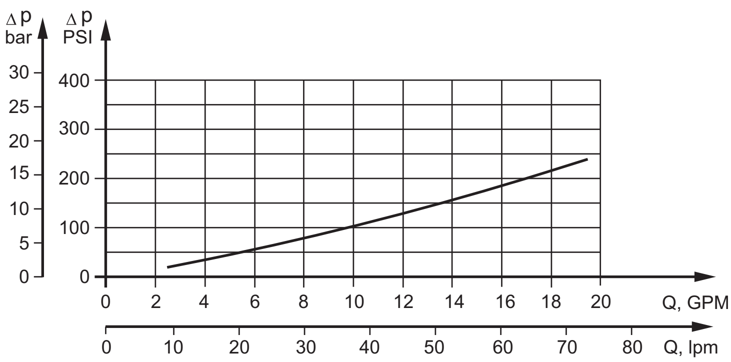
GENERAL

Max. Displacement,	in^3/rev [cm^3/rev]	24.4 [397]
Max. Speed,	[RPM]	970
Max. Torque,	lb-in [daNm]	cont.: 5400 [61] int.: 6100 [69]
Max. Output,	HP [kW]	20.1 [15]
Max. Pressure Drop,	PSI [bar]	cont.: 2540 [175] int.: 2900 [200]
Max. Oil Flow,	GPM [lpm]	19.8 [75]
Min. Speed,	[RPM]	10
Pressure fluid		Mineral based - HLP(DIN 51524) or HM(ISO 6743/4)
Temperature range,	°F [°C]	-40 ÷ 284 [-40 ÷ 140]
Optimal Viscosity range,	SUS [mm^2/s]	98 ÷ 347 [20 ÷ 75]
Filtration		ISO code 20/16 (Min. recommended fluid filtration of 25 microns)

Oil flow in drain line

Pressure drop PSI [bar]	Viscosity SUS [mm^2/s]	Oil flow in drain line GPM [lpm]
1450 [100]	98 [20]	.660 [2,5]
	164 [35]	.476 [1,8]
2030 [140]	98 [20]	.925 [3,5]
	164 [35]	.740 [2,8]

Pressure Losses



SPECIFICATION DATA

Specification Data for MLHR... motors with **C, D, G, H, M, S** and **T** shafts.

(1.124 [28,56] sealing diameter)

Type		MLHR 50	MLHR 80	MLHR 100	MLHR 125	MLHR 160	MLHR 200	MLHR 250	MLHR 315	MLHR 400
Displacement, in³/rev [cm³/rev]		3.14 [51,5]	4.90 [80,3]	6.09 [99,8]	7.67 [125,7]	9.74 [159,6]	12.19 [199,8]	15.26 [250,1]	19.26 [315,7]	24.4 [397]
Max. Speed, [RPM]	Cont.	775	750	600	475	375	300	240	190	150
	Int.*	970	940	750	600	470	375	300	240	190
Max. Torque, lb-in [daNm]	Cont.	900 [10,1]	1725 [19,5]	2125 [24]	2655 [30]	3450 [39]	3410 [38,5]	3450 [39]	3450 [39]	3360 [38]
	Int.*	1150 [13]	1947 [22]	2480 [28]	3010 [34]	3805 [43]	4070 [46]	5150 [58]	5045 [57]	5310 [60]
	Peak**	1505 [17]	2390 [27]	2832 [32]	3275 [37]	4070 [46]	4960 [56]	6280 [71]	7400 [83]	7700 [87]
Max. Output, HP [kW]	Cont.	9.5 [7]	17 [12,5]	17.4 [13]	16.8 [12,5]	15.4 [11,5]	12 [9]	8.7 [6,5]	8 [6]	6.4 [4,8]
	Int.*	11.9 [8,5]	20.1 [15]	20.1 [15]	19.5 [14,5]	18.8 [14]	15.4 [11,5]	14.1 [10,5]	12.9 [9,6]	11.8 [8,8]
Max. Pressure Drop, PSI [bar]	Cont.	2030 [140]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2030 [140]	1600 [110]	1300 [90]	1020 [70]
	Int.*	2540 [175]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2540 [175]	2540 [175]	2030 [140]	1670 [115]
	Peak**	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3045 [210]	2540 [175]
Max. Oil Flow, GPM [lpm]	Cont.	10.5 [40]	15.8 [60]	15.8 [60]	15.8 [60]	15.8 [60]	15.8 [60]	15.8 [60]	15.8 [60]	15.8 [60]
	Int.*	13.2 [50]	19.8 [75]	19.8 [75]	19.8 [75]	19.8 [75]	19.8 [75]	19.8 [75]	19.8 [75]	19.8 [75]
Max. Inlet Pressure, PSI [bar]	Cont.	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]
	Int.*	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]
	Peak**	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]
Max. Return Pressure with Drain Line, PSI [bar]	Cont.	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]
	Int.*	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]
	Peak**	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]
Max. Starting Pressure with Unloaded Shaft, PSI [bar]		145 [10]	145 [10]	145 [10]	130 [9]	102 [7]	73 [5]	58 [4]	44 [3]	44 [3]
Min. Starting Torque, lb-in [daNm]	At max.press. drop Cont.	710 [8]	1330 [15]	1770 [20]	2215 [25]	2832 [32]	2920 [33]	2740 [31]	2920 [33]	2650 [30]
	At max.press. drop Int.*	885 [10]	1505 [17]	2035 [23]	2480 [28]	3275 [37]	3540 [40]	4250 [48]	5220 [58]	4425 [50]
Min. Speed*, [RPM]**		10	10	10	10	10	10	10	10	10
Weight, lb [kg]	MLHR(F)(N)	15 [6,8]	15,2 [6,9]	15.9 [7,2]	16.1 [7,3]	15.2 [7,5]	17.6 [8]	18.5 [8,4]	20 [9,1]	21.6 [9,8]
For rear ports +1.433 [0,650]	MLHRQ(M)(N)	13.7 [6,2]	13.9 [6,3]	14.6 [6,6]	15 [6,8]	15 [6,8]	14.7 [7,2]	17.2 [7,8]	19 [8,6]	20.5 [9,3]

* Intermittent operation: the permissible values may occur for max. 10% of every minute.
** Peak load: the permissible values may occur for max. 1% of every minute.
*** For speeds lower than given, consult factory or your regional manager.

1. Intermittent speed and intermittent pressure must not occur simultaneously.
2. Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
3. Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP (DIN51524) or HM (ISO 6743/4). If using synthetic fluids consult the factory for alternative seal materials.
4. Recommended minimum oil viscosity 70 SUS [13 mm²/s] at 122°F [50°C].
5. Recommended maximum system operating temperature is 180°F [82°C].
6. To assure optimum motor life fill with fluid prior to loading and run at moderate load and speed for 10-15 minutes.

SPECIFICATION DATA (continued)

Specification Data for MLHR... motors with **B, K, R** and **L** shafts.
(1.378 [35] sealing diameter)

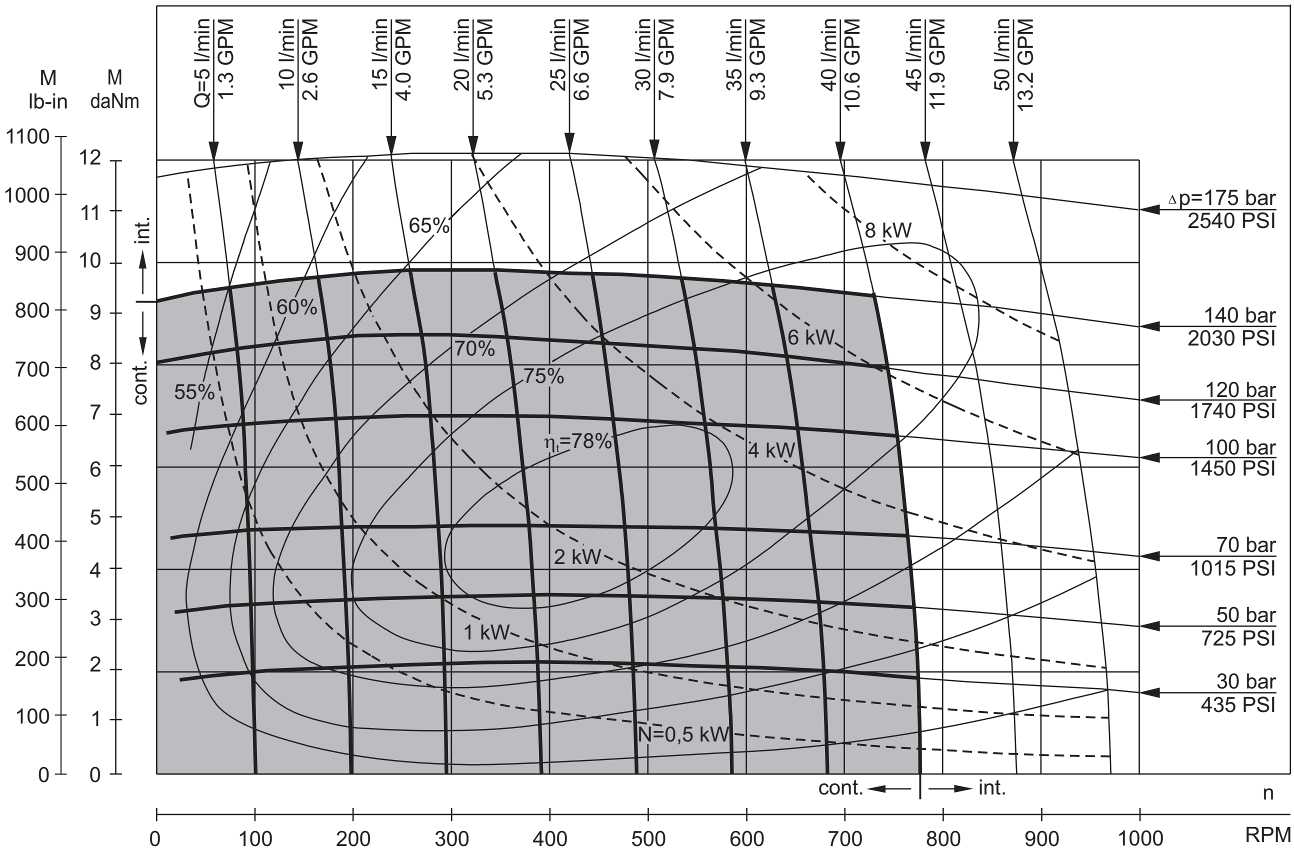
Type		MLHR 50	MLHR 80	MLHR 100	MLHR 125	MLHR 160	MLHR 200	MLHR 250	MLHR 315	MLHR 400
Displacement, in³/rev [cm³/rev]		3.14 [51,5]	4.90 [80,3]	6.09 [99,8]	7.67 [125,7]	9.74 [159,6]	12.19 [199,8]	15.26 [250,1]	19.26 [315,7]	24.4 [397]
Max. Speed, [RPM]	Cont.	775	750	600	475	375	300	240	190	150
	Int.*	970	940	750	600	470	375	300	240	190
Max. Torque, lb-in [daNm]	Cont.	900 [10,1]	1725 [19,5]	2125 [24]	2655 [30]	3450 [39]	4000 [45]	4780 [54]	4870 [55]	5400 [61]
	Int.*	1150 [13]	1947 [22]	2480 [28]	3010 [34]	3805 [43]	4425 [50]	5400 [61]	5580 [63]	6100 [69]
	Peak**	1505 [17]	2390 [27]	2832 [32]	3275 [37]	4070 [46]	4960 [56]	6280 [71]	7350 [83]	7700 [87]
Max. Output, HP [kW]	Cont.	9.5 [7]	17 [12,5]	17.4 [13]	16.8 [12,5]	15.4 [11,5]	14.8 [11]	13.4 [10]	12 [9]	10.5 [7,8]
	Int.*	11.9 [8,5]	20.1 [15]	20.1 [15]	19.5 [14,5]	18.8 [14]	17.4 [13]	16.1 [12]	14.8 [11]	14.2 [10,6]
Max. Pressure Drop, PSI [bar]	Cont.	2030 [140]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	1960 [135]	1670 [115]
	Int.*	2540 [175]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2320 [160]	2030 [140]
	Peak**	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3045 [210]	2540 [175]
Max. Oil Flow, GPM [lpm]	Cont.	10.5 [40]	15.8 [60]	15.8 [60]	15.8 [60]	15.8 [60]	15.8 [60]	15.8 [60]	15.8 [60]	15.8 [60]
	Int.*	13.2 [50]	19.8 [75]	19.8 [75]	19.8 [75]	19.8 [75]	19.8 [75]	19.8 [75]	19.8 [75]	19.8 [75]
Max. Inlet Pressure, PSI [bar]	Cont.	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]
	Int.*	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]
	Peak**	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]
Max. Return Pressure with Drain Line, PSI [bar]	Cont.	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]
	Int.*	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]
	Peak**	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]
Max. Starting Pressure with Unloaded Shaft, PSI [bar]		145 [10]	145 [10]	145 [10]	130 [9]	102 [7]	73 [5]	58 [4]	44 [3]	44 [3]
Min. Starting Torque, lb-in [daNm]	At max.press. drop Cont.	710 [8]	1330 [15]	1770 [20]	2215 [25]	2832 [32]	3630 [41]	4000 [45]	4000 [45]	4340 [49]
	At max.press. drop Int.*	885 [10]	1505 [17]	2035 [23]	2480 [28]	3275 [37]	4070 [46]	4870 [55]	5840 [66]	5400 [61]
Min. Speed*, [RPM]**		10	10	10	10	10	10	10	10	10
Weight, lb [kg] **For rear ports +1.433 [0,650]**		15.2 [6,9]	15.4 [7]	16.1 [7,3]	16.3 [7,4]	15.4 [7,6]	18.9 [8,1]	18.7 [8,5]	20.3 [9,2]	21.8 [9,9]

* Intermittent operation: the permissible values may occur for max. 10% of every minute.
** Peak load: the permissible values may occur for max. 1% of every minute.
*** For speeds lower than given, consult factory or your regional manager.

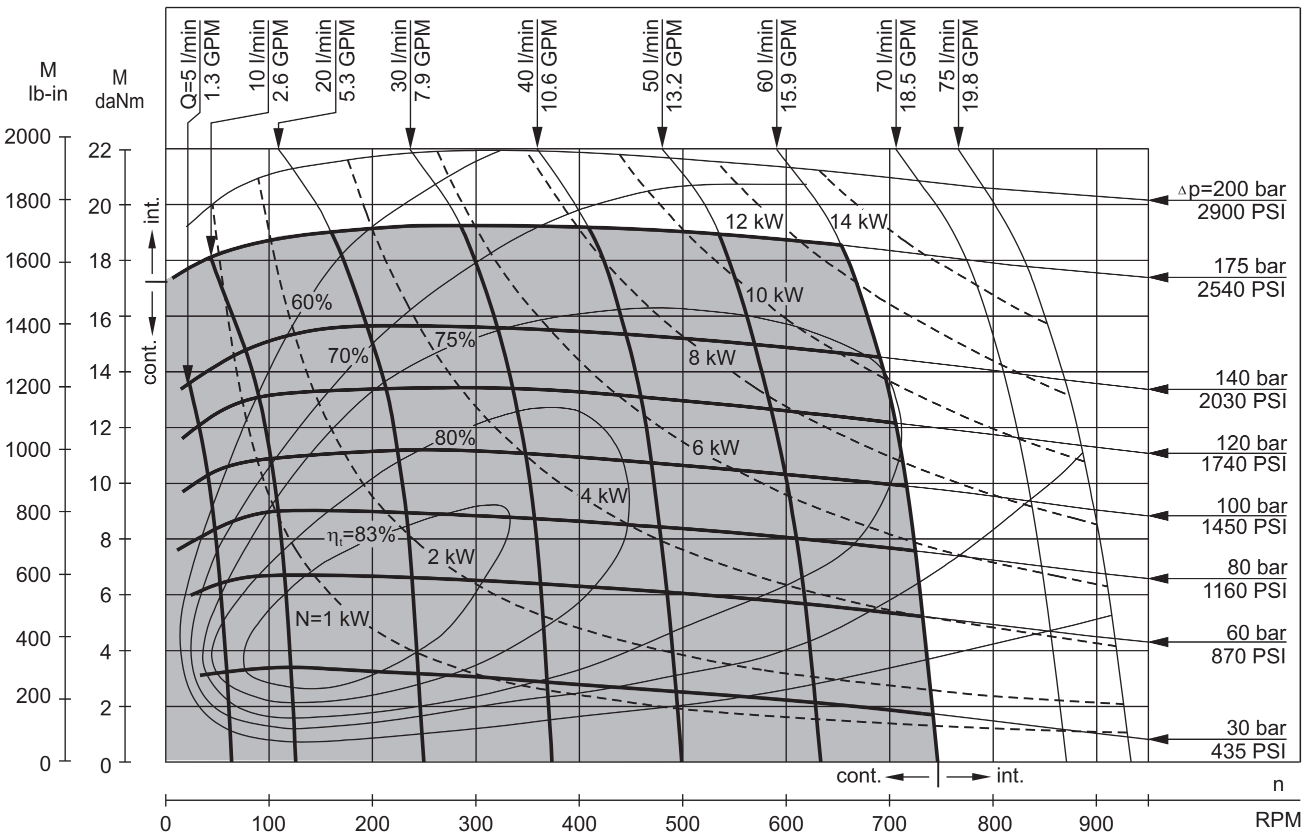
1. Intermittent speed and intermittent pressure must not occur simultaneously.
2. Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
3. Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP (DIN51524) or HM (ISO 6743/4). If using synthetic fluids consult the factory for alternative seal materials.
4. Recommended minimum oil viscosity 70 SUS [13 mm²/s] at 122°F [50°C].
5. Recommended maximum system operating temperature is 180°F [82°C].
6. To assure optimum motor life fill with fluid prior to loading and run at moderate load and speed for 10-15 minutes.

FUNCTION DIAGRAMS

MLHR 50



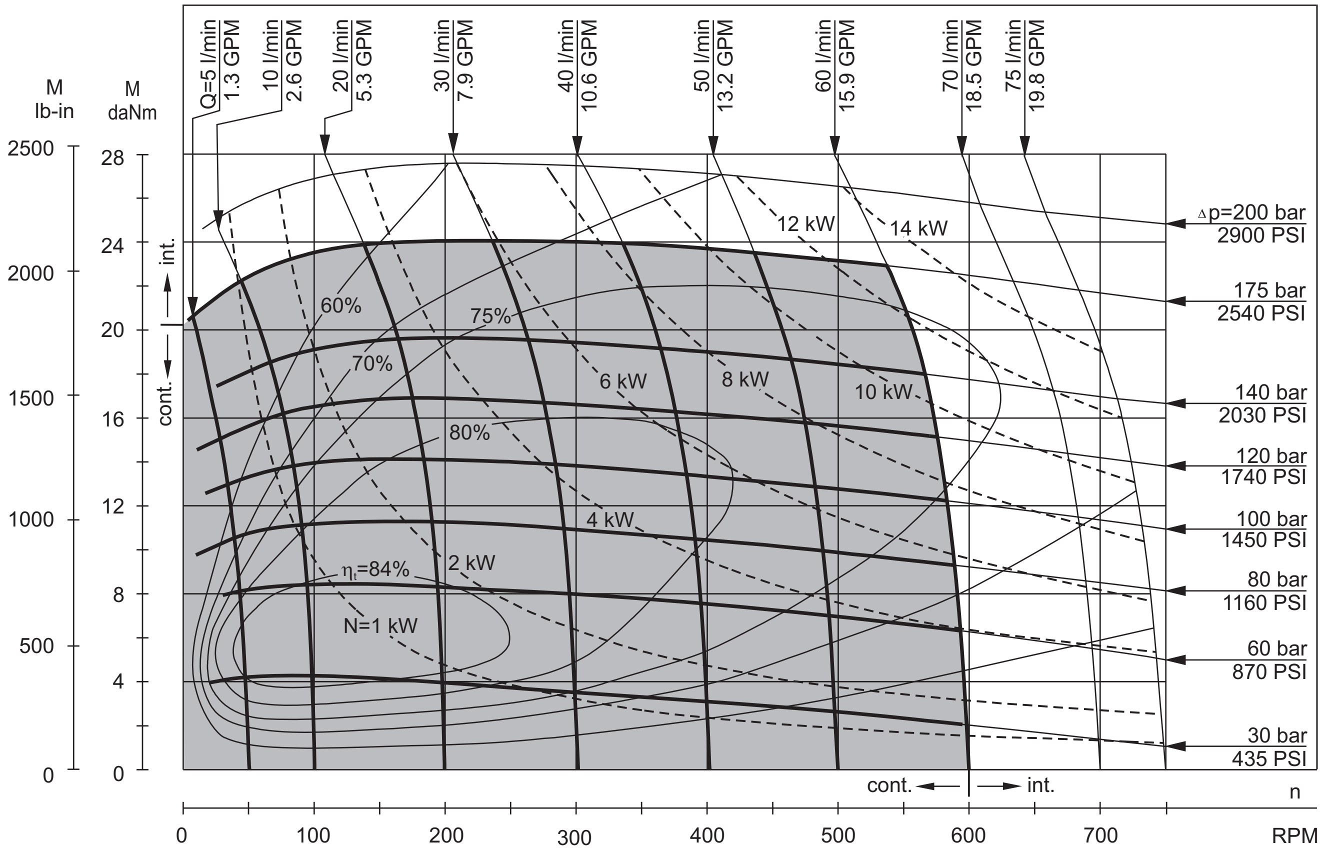
MLHR 80



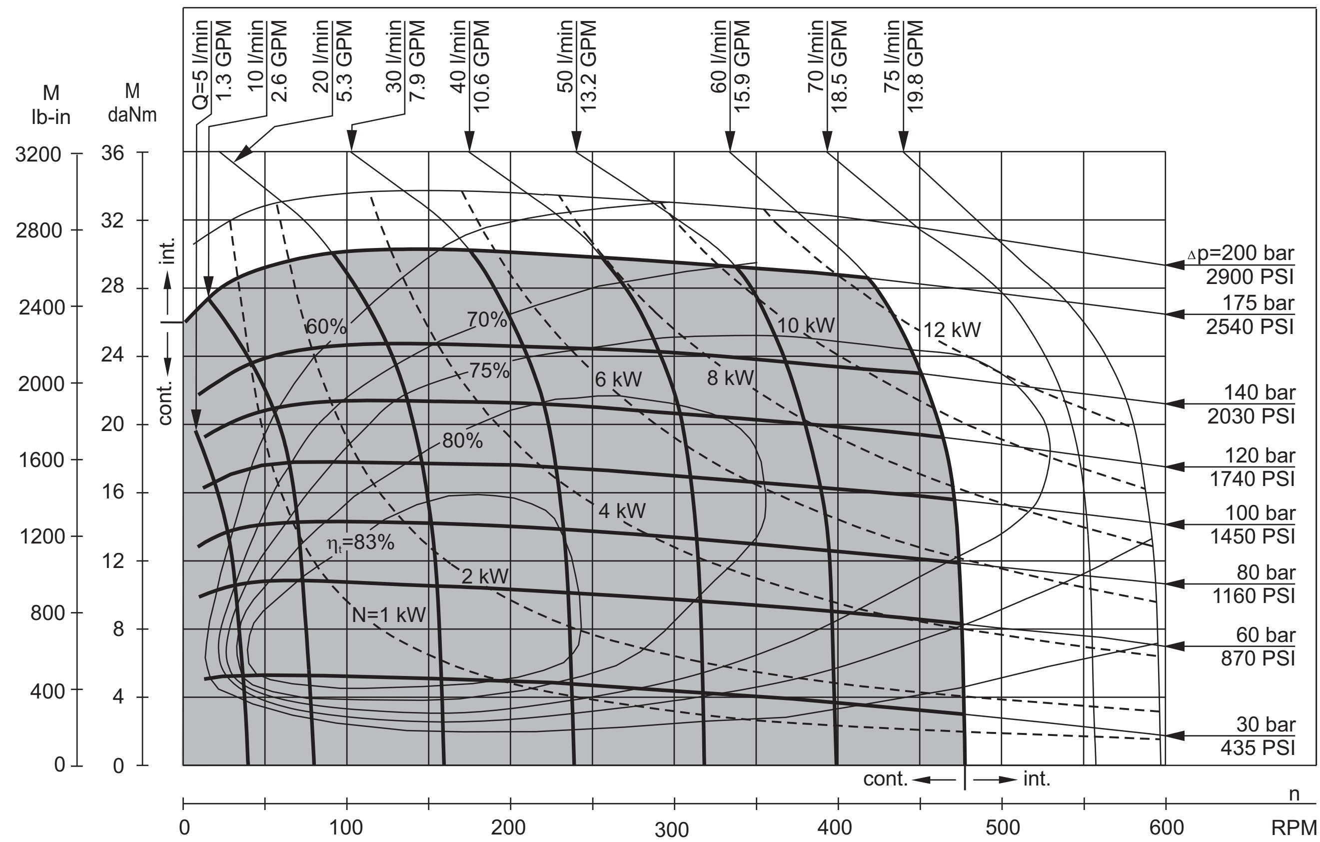
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5 PSI÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHR 100



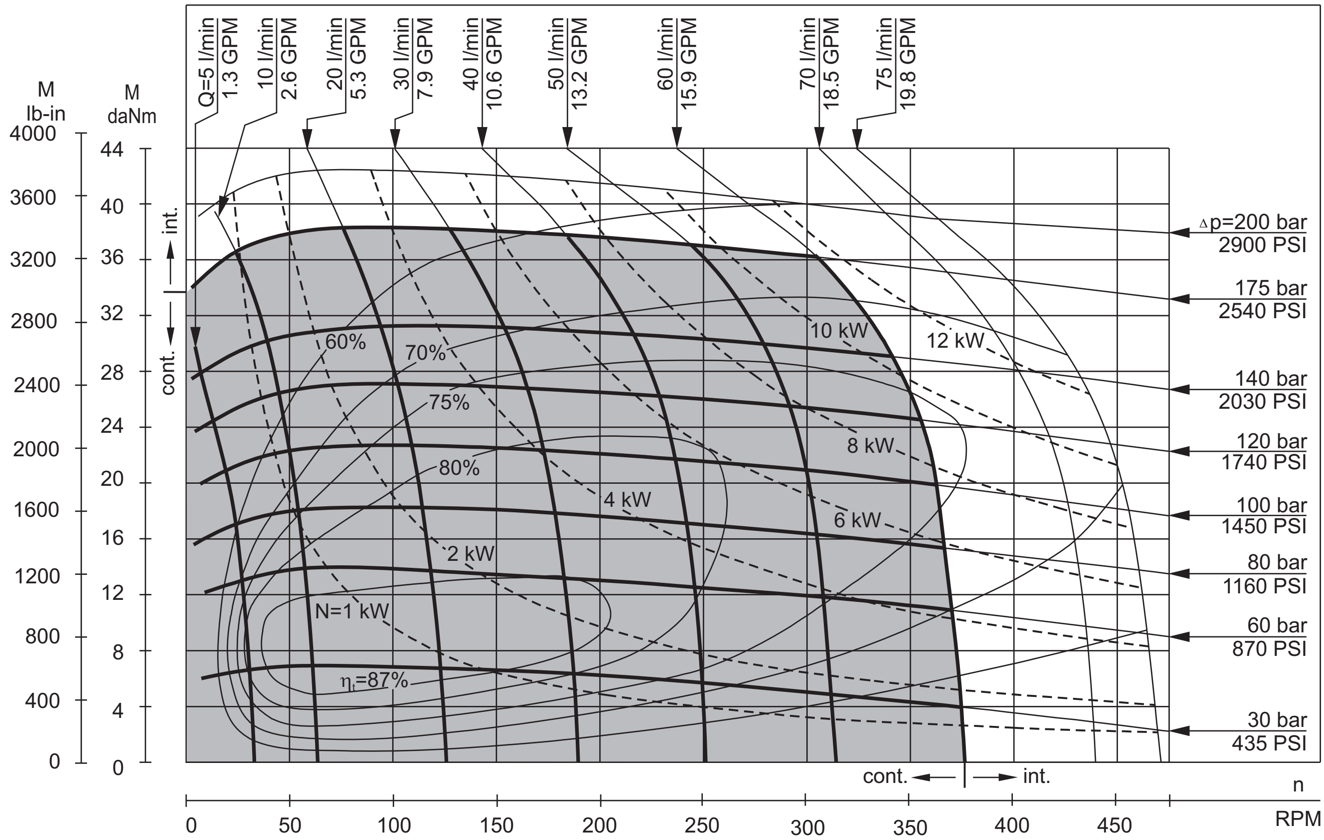
MLHR 125



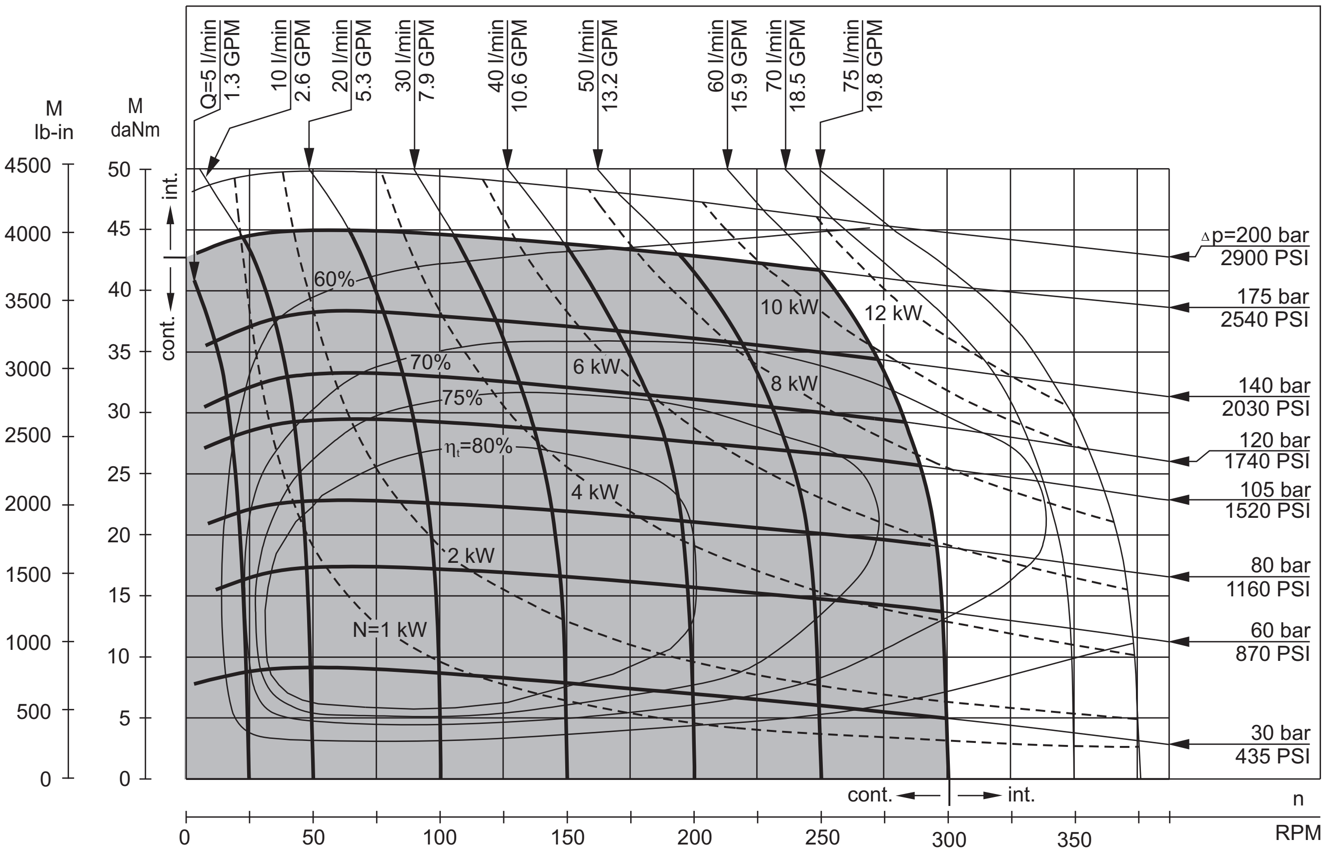
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5 PSI÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHR 160



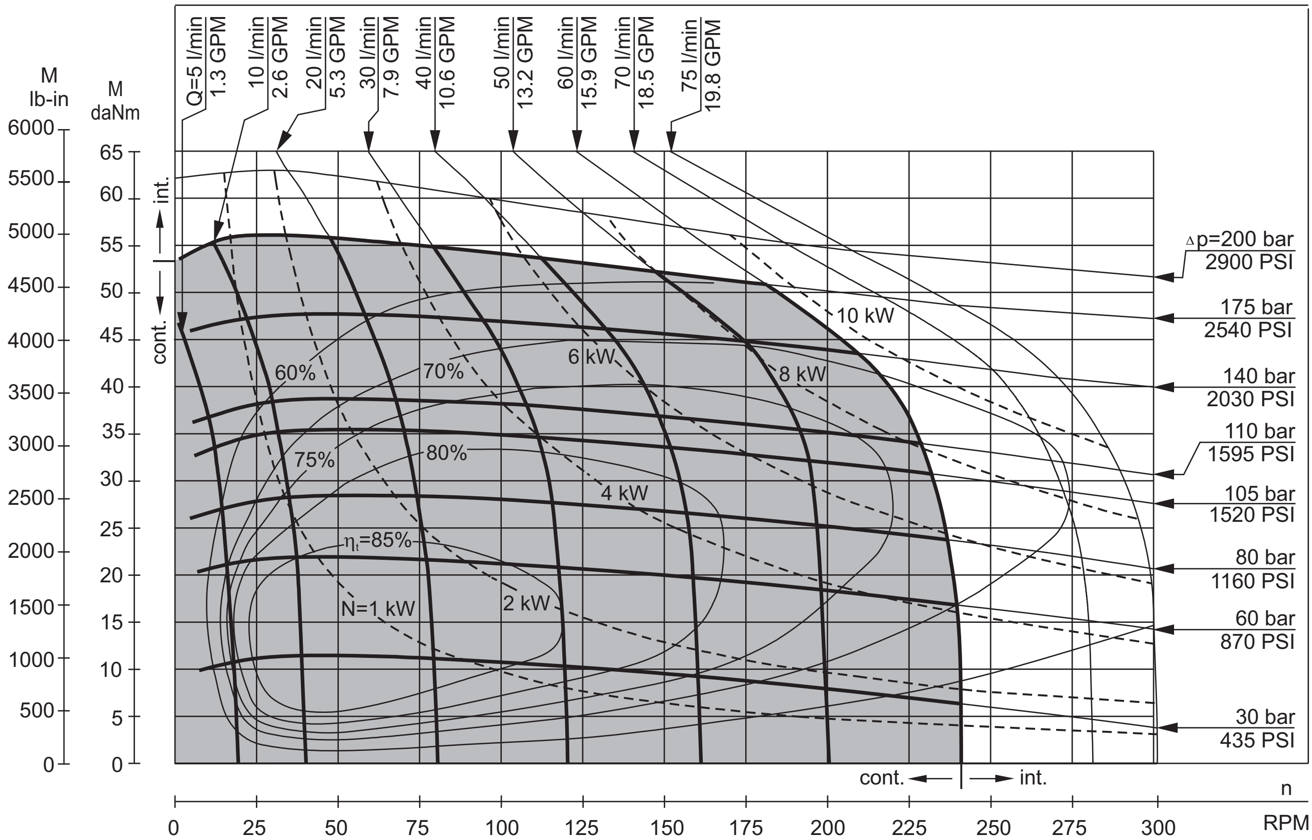
MLHR 200



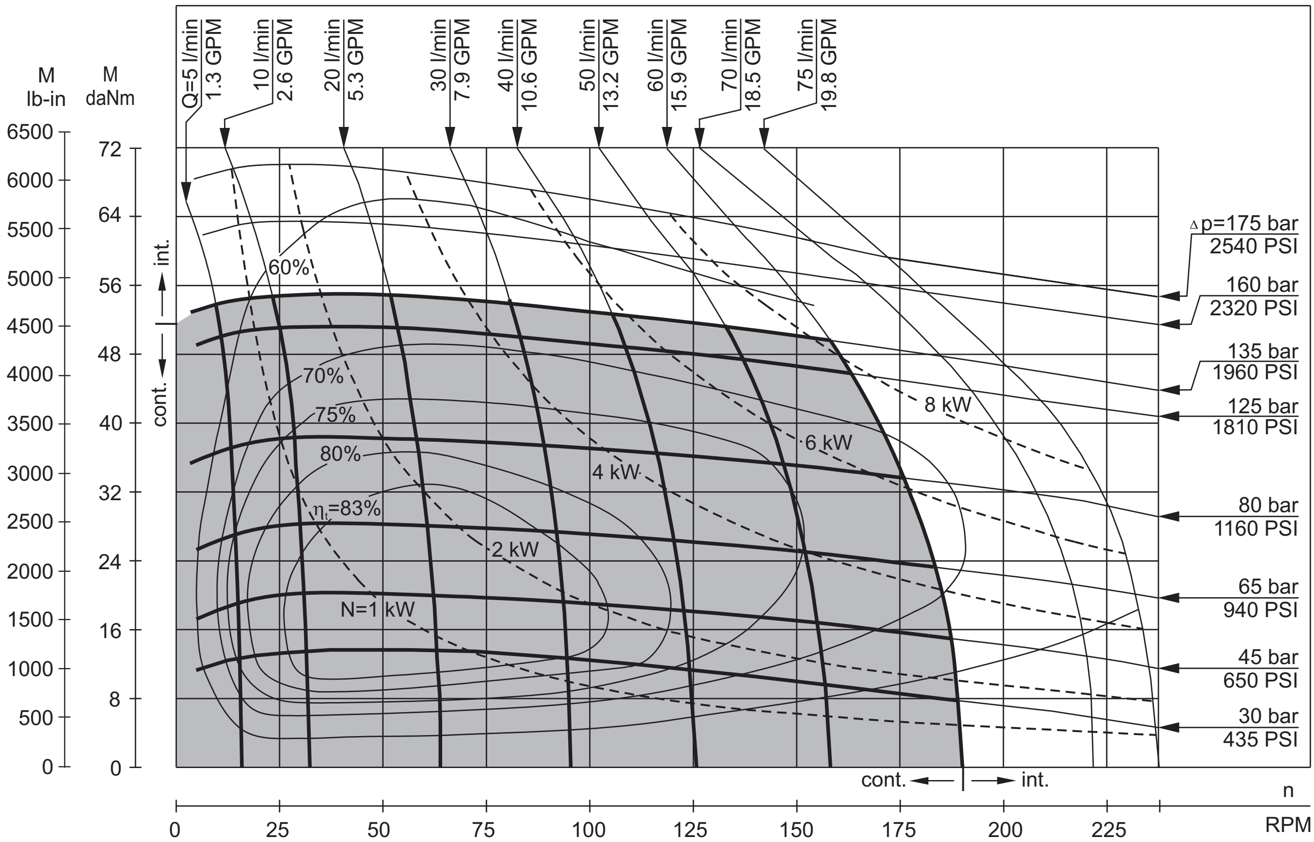
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5 PSI÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHR 250



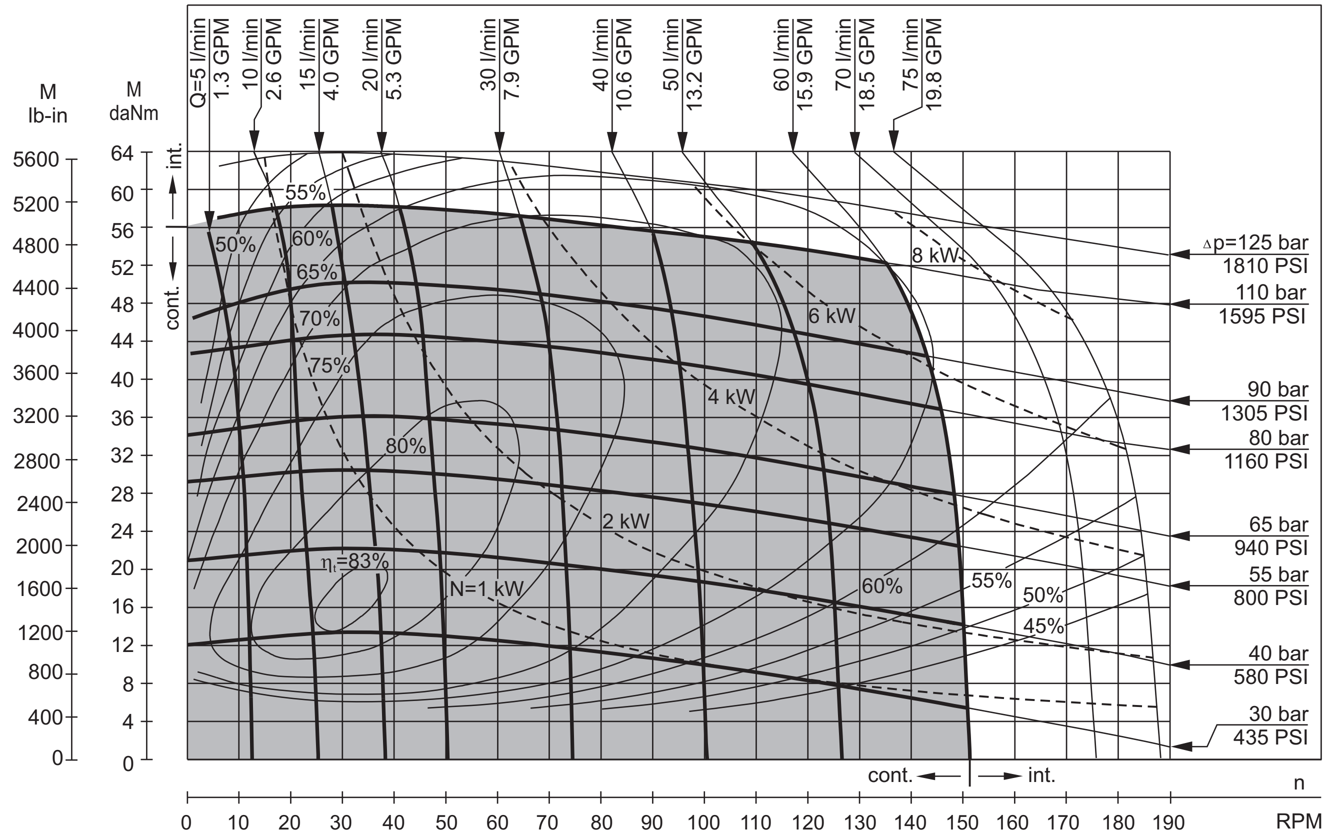
MLHR 315



The function diagrams data is for average performance of randomly selected motors at back pressure 72.5 PSI÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

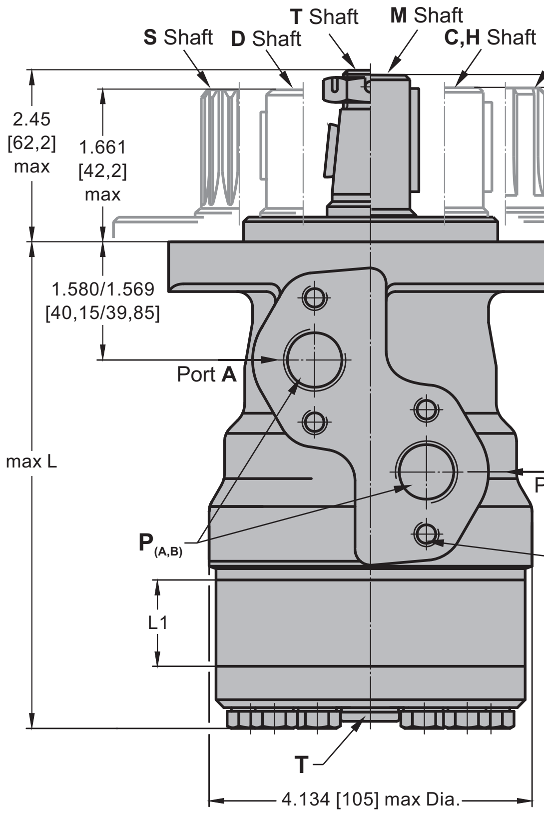
MLHR 400



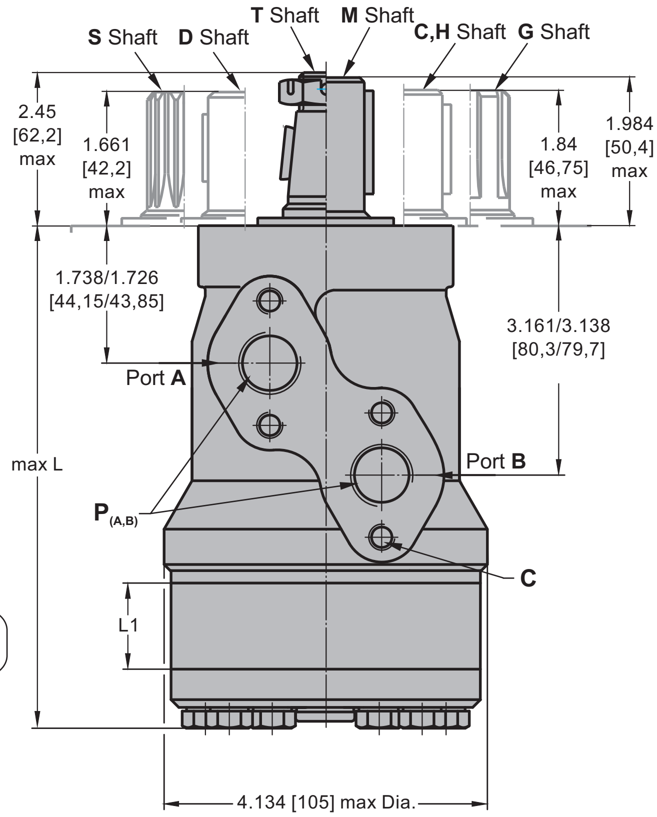
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5 PSI÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

DIMENSIONS and MOUNTING DATA

MLHR, MLHRF



MLHRQ, MLHRM

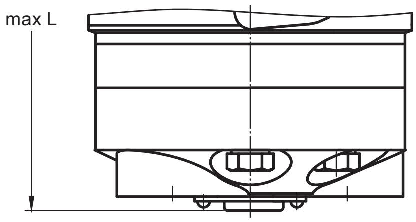


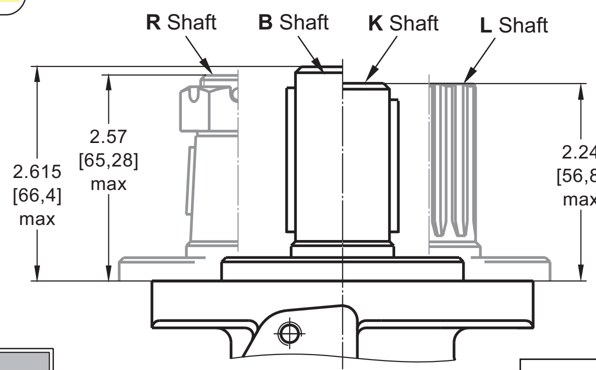
Shaft Dim.
See Pages 28÷29

Flange Dim.
See Page 42

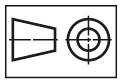
Port Dim.
See Page 42

Version 6 7 8 9
Rear ports





	Versions			
	2 , 6	3 , 9	4 , 7	5 , 8
C	4xM8	4xM8	4x 5⁄16 - 18 UNF	4x5⁄16 - 18 UNF
$P_{(A,B)}$	2xG½	2xM22x1,5	2x7⁄8 - 14 UNF	2x½ - 14 NPTF
T	G¼	M14x1,5	7⁄16 - 20 UNF	7⁄16 - 20 UNF



in [mm]

Standard Rotation
Viewed from Shaft End
Port **A** Pressurized - **CW**
Port **B** Pressurized - **CCW**

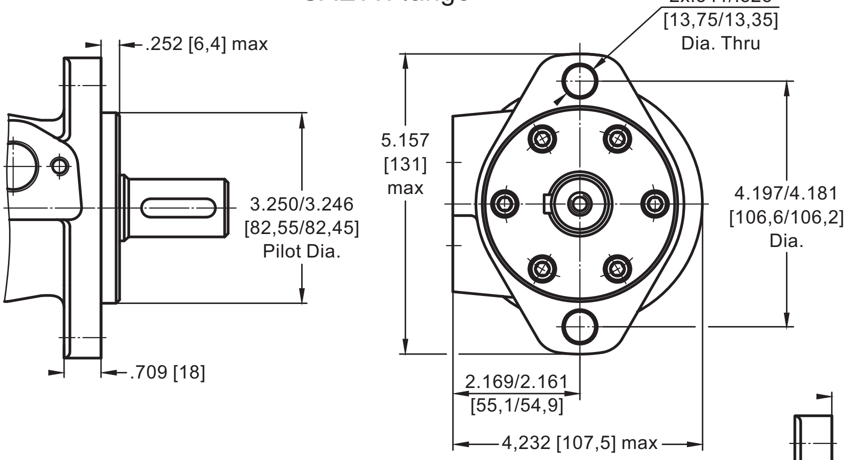
Reverse Rotation
Viewed from Shaft End
Port **A** Pressurized - **CCW**
Port **B** Pressurized - **CW**

Type	Lmax, in [mm]		Type	Lmax, in [mm]		L1, in [mm]
	Versions 2,3,4,5	*Versions 6,7,8,9		Versions 2,3,4,5	*Versions 6,7,8,9	
MLHR(F) 50	5.51 [140,0]	6.14 [156,0]	MLHRQ(M) 50	5.67 [144,0]	6.30 [160,0]	.35 [9,0]
MLHR(F) 80	5.71 [145,0]	6.34 [161,0]	MLHRQ(M) 80	5.87 [149,0]	6.50 [165,0]	.55 [14,0]
MLHR(F) 100	5.85 [148,5]	6.48 [164,5]	MLHRQ(M) 100	6.00 [152,5]	6.63 [168,5]	.69 [17,4]
MLHR(F) 125	6.00 [152,5]	6.63 [168,5]	MLHRQ(M) 125	6.18 [157,0]	6.81 [173,0]	.86 [21,8]
MLHR(F) 160	6.24 [158,5]	6.87 [174,5]	MLHRQ(M) 160	6.42 [163,0]	7.05 [179,0]	1.09 [27,8]
MLHR(F) 200	6.52 [165,5]	7.15 [181,5]	MLHRQ(M) 200	6.69 [170,0]	7.32 [186,0]	1.37 [34,8]
MLHR(F) 250	6.87 [174,5]	7.50 [190,5]	MLHRQ(M) 250	7.03 [178,5]	7.60 [194,5]	1.71 [43,5]
MLHR(F) 315	7.30 [185,5]	7.93 [201,5]	MLHRQ(M) 315	7.48 [190,0]	8.11 [206,0]	2.16 [54,8]
MLHR(F) 400	7.89 [200,5]	8.52 [216,5]	MLHRQ(M) 400	8.05 [204,5]	8.68 [220,5]	2.73 [69,4]

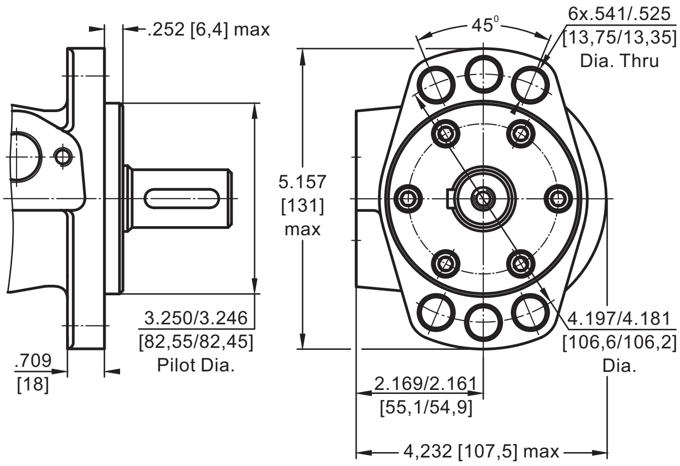
* - For Rear Ported Motors

MOUNTING

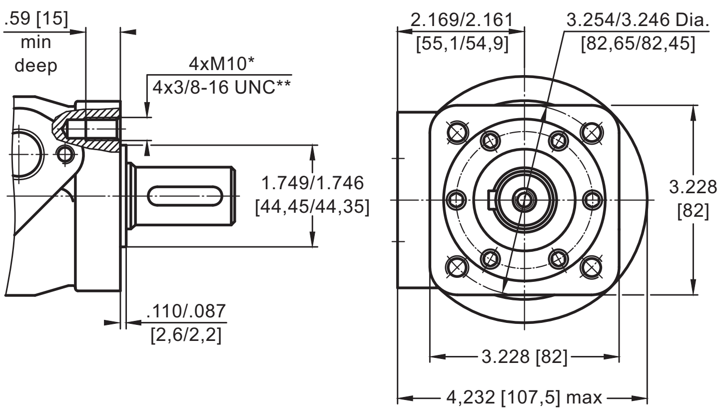
SAE A Flange



F - Magneto Flange



M and **Q** - Square Flange



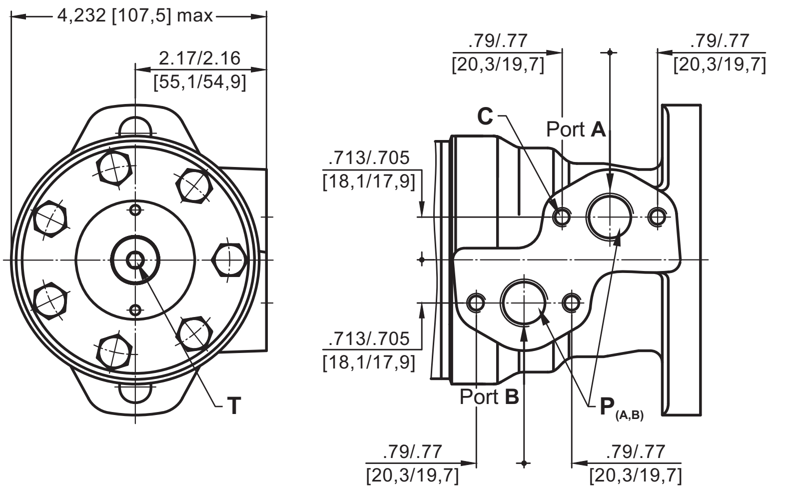
* For **M** Flange
** For **Q** Flange

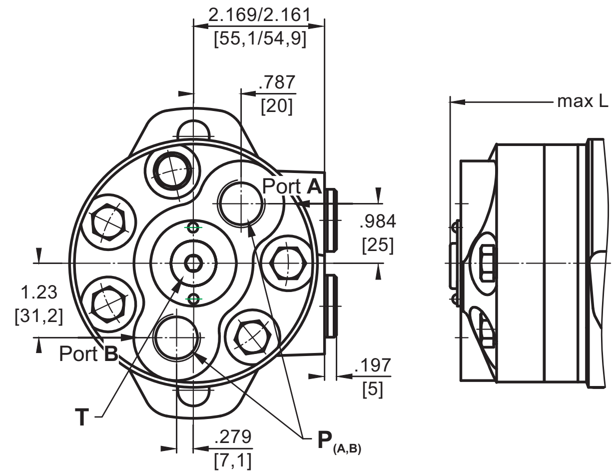
in [mm]

PORTS

Side Ports
Version 2 3 4 5

Rear Ports
Version 6 7 8 9





	Versions			
	2, 6	3, 9	4, 7	5, 8
C	4xM8	4xM8	4x 5/16 - 18 UNF	4x 5/16 - 18 UNF
$P_{(A,B)}$	2xG½	2xM22x1,5	2x 7/8 - 14 UNF	2x½ - 14 NPTF
T	G¼	M14x1,5	7/16 - 20 UNF	7/16 - 20 UNF

Standard Rotation
Viewed from Shaft End
Port **A** Pressurized - **CW**
Port **B** Pressurized - **CCW**

Reverse Rotation
Viewed from Shaft End
Port **A** Pressurized - **CCW**
Port **B** Pressurized - **CW**

ORDER CODE

	1	2	3	4	5	6	7	8	9
MLHR									

Pos.1 - Mounting Flange

omit	- SAE A, two holes
F	- Magneto, six holes
M	- Square metric, four bolts M10
Q	- Square, four bolts

Pos.2 - Displacement code

50	- 3.14 in^3/rev [51,5 cm^3/rev]
80	- 4.90 in^3/rev [80,3 cm^3/rev]
100	- 6.09 in^3/rev [99,8 cm^3/rev]
125	- 7.67 in^3/rev [125,7 cm^3/rev]
160	- 9.74 in^3/rev [159,6 cm^3/rev]
200	- 12.19 in^3/rev [199,8 cm^3/rev]
250	- 15.26 in^3/rev [250,1 cm^3/rev]
315	- 19.26 in^3/rev [315,7 cm^3/rev]
400	- 24.40 in^3/rev [397,0 cm^3/rev]

Pos.3 - Shaft Extensions* [see pages 28 and 29]

C	- 1" [25,4] straight, Parallel key
VC	- 1" [25,4] straight, Parallel key w/ corrosion resistant bushing
D	- 7/8" [22,2] straight, Parallel key
G	- 1" [25,4] SAE 6B Splined
H	- 1" [25,4] straight w/ .406 [10,3] Crosshole
M	- 25 mm straight, Parallel key
VM	- 25 mm straight, Parallel key w/ corrosion resistant bushing
S	- 7/8" [22,2] 13T Splined
T	- 1" [25,4] SAE J501 Tapered
B	- 32 mm straight, Parallel key
K	- 1¼" [31,75] straight, Parallel key
L	- 1¼" [31,75] 14T Splined
R	- 1¼" [31,75] SAE J501 Tapered

Pos.4 - Option [needle bearings]

omit	- none
N	- with needle bearings

Pos.5 - Port Size/Type [standard manifold to each]

2	- side ports, 2xG1/2, G1/4, BSP thread, ISO 228
3	- side ports, 2xM22x1,5, M14x1,5, metric thread, ISO 262
4	- side ports, 2x7/8-14 UNF, O-ring, 7/16-20 UNF
5	- side ports, 2x1/2-14 NPTF, 7/16-20 UNF
6	- rear ports, 2xG1/2, G1/4, BSP thread, ISO 228
7	- rear ports, 2x7/8-14 UNF, O-ring, 7/16-20 UNF
8	- rear ports, 2x1/2-14 NPTF, 7/16-20 UNF
9	- rear ports, 2xM22x1,5, M14x1,5, metric thread, ISO 262

Pos.6 - Shaft Seal Version [see page 31]

omit	- Standard shaft seal
U	- High pressure shaft seal (without check valves)

Pos.7 - Drain Port

omit	- with drain port
1	- without drain port

Pos.8 - Special Features [see page 110]

Pos.9 - Design Series

omit	- Factory specified

NOTES: * The permissible output torque for shafts must not be exceeded!

The following combinations are not allowed:
- **Q** and **M** flange with **B**, **K**, **L**, **R** shafts;
- **N** option with **B**, **K**, **L**, **R** shafts, **U** option or **RS** option;
- **B**, **K**, **L**, **R** shafts with **U** option.

The hydraulic motors are mangano-phosphatized as standard.

HYDRAULIC MOTORS MLHRFL

APPLICATION

» Actuator motor as driving-motor for steering mechanism of the three-wheel vehicles;

» For conveyors (series connection);

» Dosing motor etc.

OPTIONS

» Good start-up characteristics;

» Precise control of the Torque at low small flow.

» Smooth operation at high pressure and small oil flow;

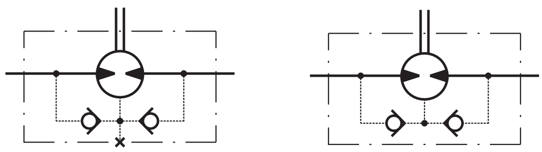
» High volumetric efficiency.

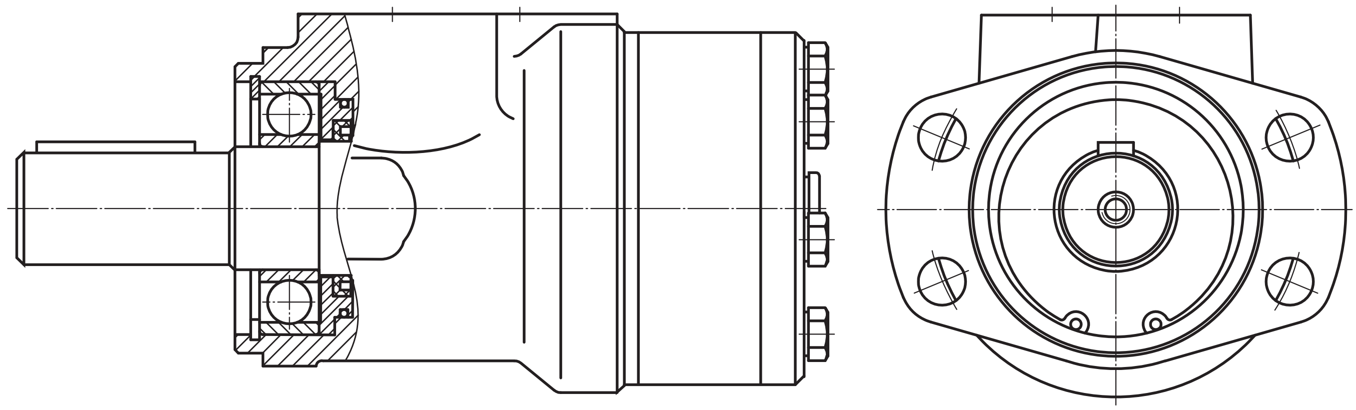
The hydraulic motors type MLHRFL... are designed to be used in operating modes with peak radial loads of the output shaft (especially at starting and stopping) at direct drive of wheels or mechanisms (without clutch or gearbox).

The radial loads are borne by a radial ball bearing which is mounted on the shaft of the hydraulic motor.

The main technical features correspond to the standard motors series MLHRFL 1.378 Dia. [35 mm] sealing diameter. There are no changes in the overall and mounting dimensions. For detailed technical and mounting data please refer to MLHR catalogue.

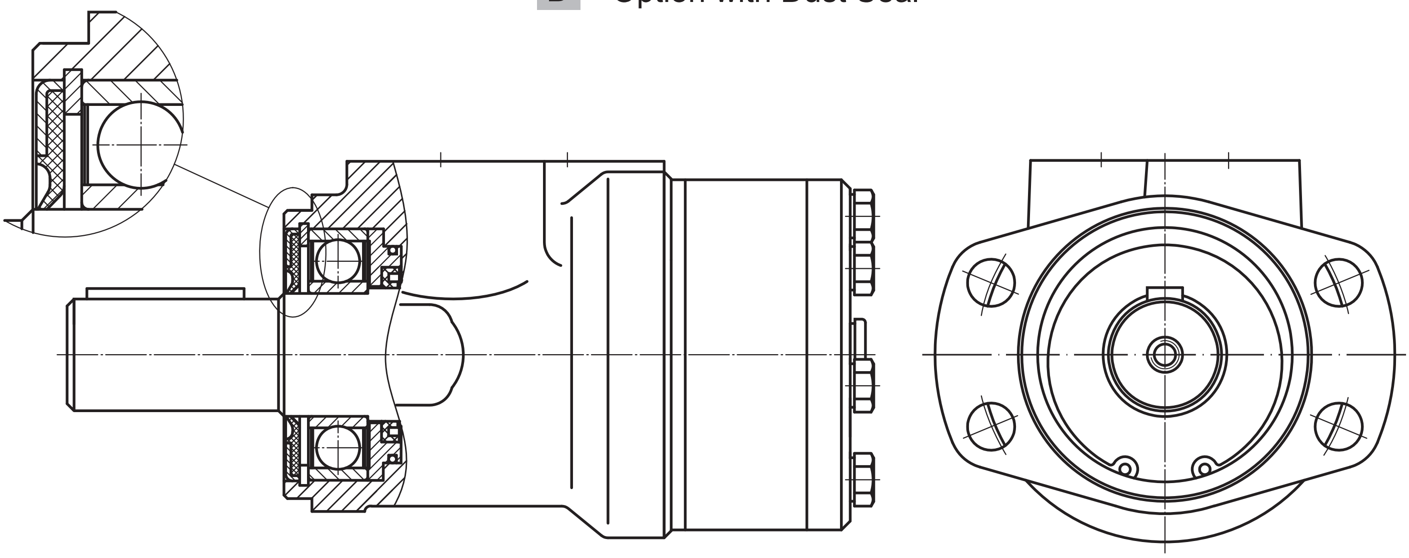
MAX. PERMISSIBLE SHAFT SEAL PRESSURE



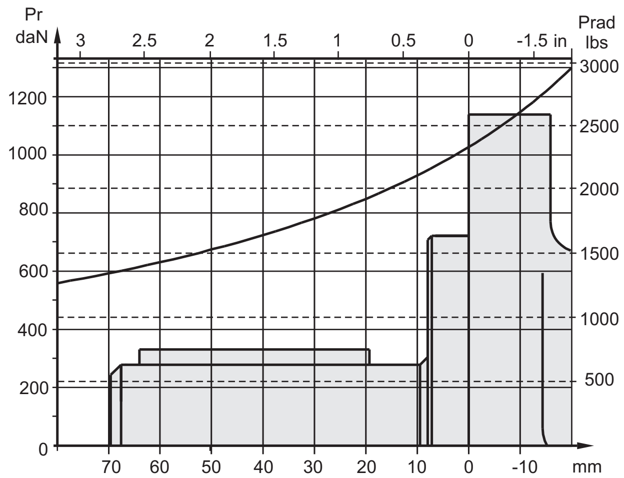


D - Option with Dust Seal

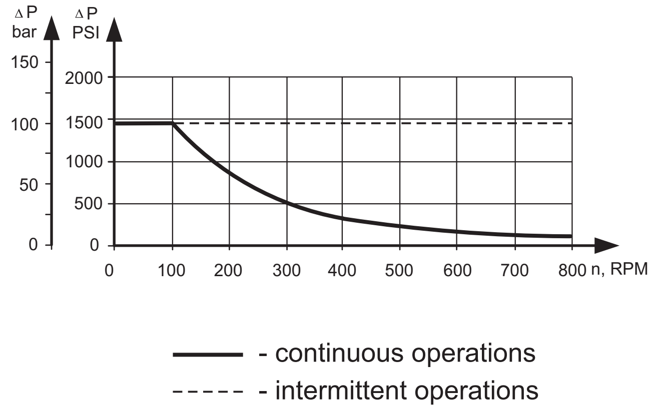
M2:1



PERMISSIBLE SHAFT LOADS



MAX. PERMISSIBLE SHAFT SEAL PRESSURE



ORDER CODE

	1	2	3	4	5	6	7	8	9	10
M R										

Pos.1 - Mounting Flange

F	- Oval mount, four holes

Pos.2 - Option [bearings]

L	- with radial ball bearing

Pos.3 - Port type

omit	- Side ports
E	- Rear ports

Pos.4 - Displacement code

50	- 51,5 cm^3/rev [3.14 in^3/rev]
80	- 80,3 cm^3/rev [4.90 in^3/rev]
100	- 99,8 cm^3/rev [6.09 in^3/rev]
125	- 125,7 cm^3/rev [7.67 in^3/rev]
160	- 159,6 cm^3/rev [9.74 in^3/rev]
200	- 199,8 cm^3/rev [12.19 in^3/rev]
250	- 250,1 cm^3/rev [15.26 in^3/rev]
315	- 315,7 cm^3/rev [19.26 in^3/rev]
400	- 397,0 cm^3/rev [24.40 in^3/rev]

Pos. 5 - Shaft Extensions

CB	- ø32 straight, Parallel key A10x8x45 DIN6885
KB	- ø35 tapered 1:10, Parallel key B6x6x20 DIN6885
SB	- splined A 25x22 DIN 5482
OB	- ø1¼" tapered1:8, Parallel key $^5/_{16}$"x$^5/_{16}$"x1¼" BS46
HB	- ø1¼" splined 14T ANSI B92.1 - 1976

Pos. 6 - Option [Dust Seal]

omit	- without dust seal
D	- with dust seal

Pos. 7 - Drain Port

omit	- with drain port
1	- without drain port

Pos. 8 - Ports

omit	- BSPP (ISO 228)
M	- Metric (ISO 262)

Pos. 9 - Special Features [see page 110]

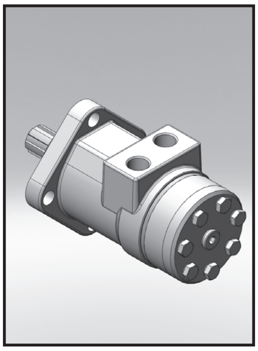
Pos.10 - Design Series

omit	- Factory specified

NOTES: * The permissible output torque for shafts must not be exceeded!

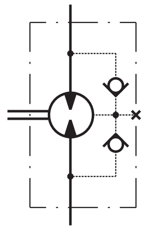
The hydraulic motors are mangano-phosphatized as standard.

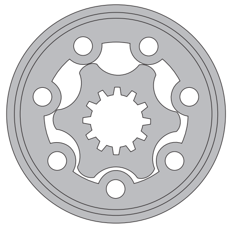
HYDRAULIC MOTORS MLHPL



APPLICATION

» Conveyors
» Feeding mechanism of robots and manipulators
» Metal working machines
» Textile machines
» Agricultural machines
» Food industries
» Mining machinery etc.





CONTENTS

OPTIONS

» Model - Spool valve, gerotor
» Antifriction needle bearing
» Flange mount
» Shafts - straight, splined and tapered
» Metric and BSPP ports
» Other special features

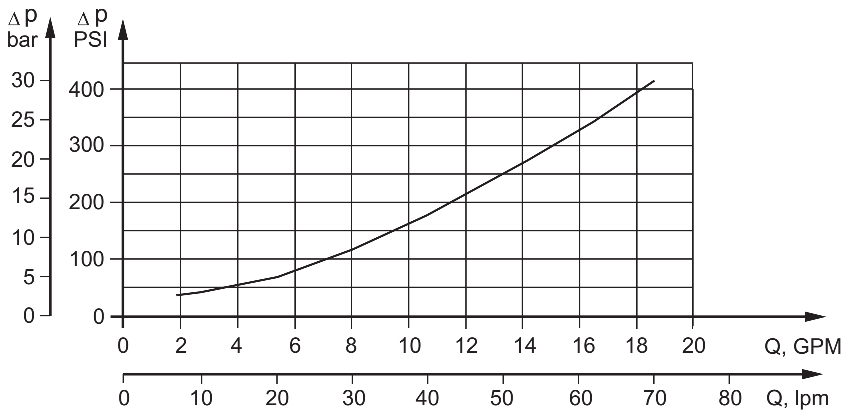
GENERAL

Max. Displacement, in^3/rev [cm^3/rev]	24.16 [396]
Max. Speed, [RPM]	1515
Max. Torque, lb-in [daNm]	cont.: 4415 [50] int.: 5222 [59]
Max. Output, HP [kW]	23.5 [17,5]
Max. Pressure Drop, PSI [bar]	cont.: 2030 [140] int.: 2540 [175]
Max. Oil Flow, GPM [lpm]	20 [75]
Min. Speed, [RPM]	10
Pressure fluid	Mineral based - HLP(DIN 51524) or HM(ISO 6743/4)
Temperature range, °F [°C]	-40 ÷ 284 [-40 ÷ 140]
Optimal Viscosity range, SUS [mm^2/s]	98 ÷ 347 [20 ÷ 75]
Filtration	ISO code 20/16 (Min. recommended fluid filtration of 25 microns)

Oil flow in drain line

Pressure drop PSI [bar]	Viscosity SUS [mm^2/s]	Oil flow in drain line GPM [lpm]
1450 [100]	98 [20]	.660 [2,5]
	164 [35]	.476 [1,8]
2030 [140]	98 [20]	.925 [3,5]
	164 [35]	.740 [2,8]

Pressure Losses



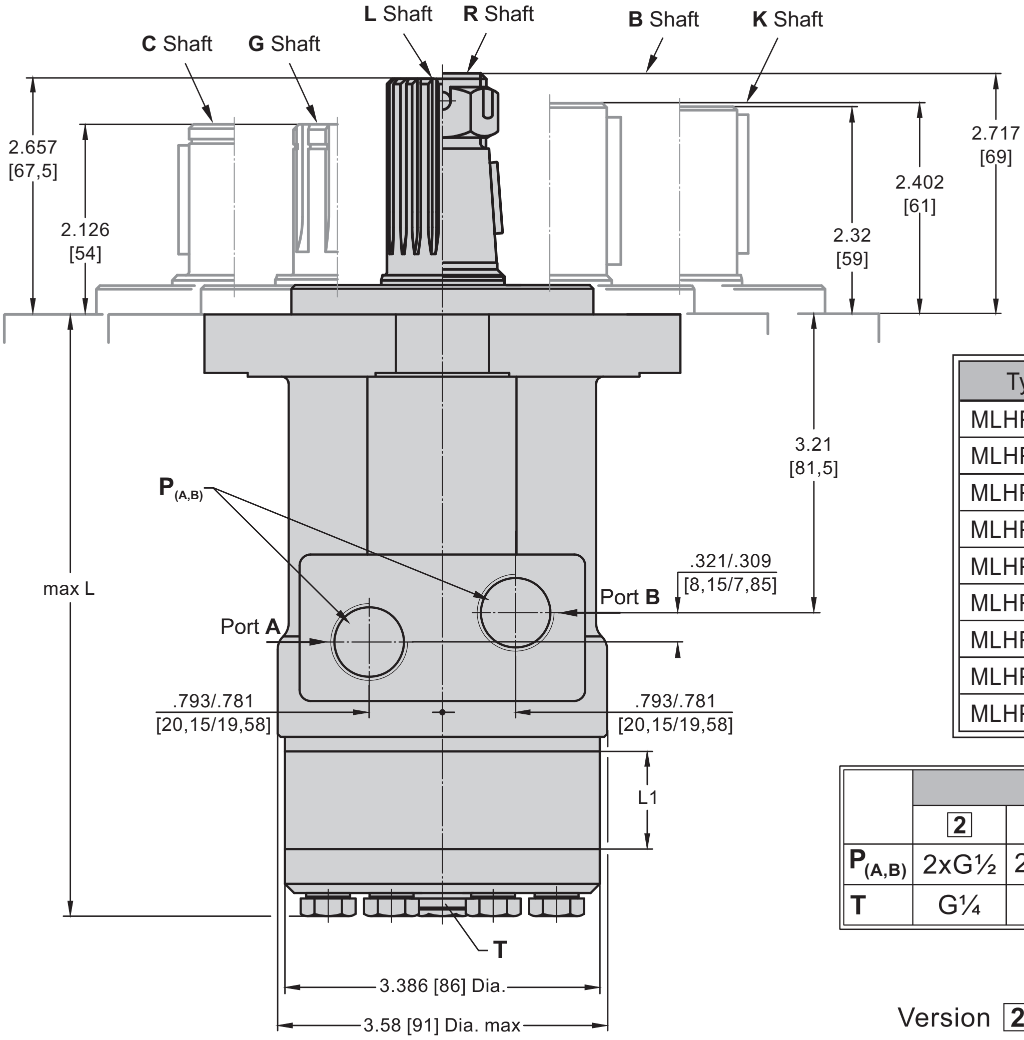
SPECIFICATION DATA

Type		MLHPL 50	MLHPL 80	MLHPL 100	MLHPL 125	MLHPL 160	MLHPL 200	MLHPL 250	MLHPL 315	MLHPL 400
Displacement, in³/rev [cm³/rev]		3.02 [49,5]	4.83 [79,2]	6.04 [99]	7.55 [123,8]	9.66 [158,4]	12.1 [198]	15.1 [247,5]	19.3 [316,8]	24.16 [396]
Max. Speed, [RPM]	Cont.	1210	755	605	485	378	303	242	190	150
	Int.*	1515	945	755	605	472	378	303	236	189
Max. Torque, lb-in [daNm]	Cont.	832 [9,4]	1336 [15,1]	1708 [19,3]	2100 [23,7]	2770 [31,3]	3240 [36,6]	4160 [47]	4300 [48,6]	4425 [50]
	Int.*	1054 [11,9]	1725 [19,5]	2097 [23,7]	2637 [29,8]	3345 [37,8]	4035 [45,6]	5160 [58,3]	4956 [56]	5222 [59]
	Peak**	1240 [14,0]	1947 [22,0]	2390 [27,0]	3230 [36,5]	3717 [42]	4700 [53]	5930 [67]	7523 [85]	7560 [85,4]
Max. Output, HP [kW]	Cont.	13.3 [9,9]	13.3 [9,9]	13.3 [9,9]	13.3 [9,9]	15.7 [11,7]	13.8 [10,3]	13.1 [9,8]	10.2 [7,6]	8.9 [6,6]
	Int.*	16.8 [12,5]	16.8 [12,5]	16.8 [12,5]	16.8 [12,5]	16.8 [12,5]	20.8 [15,5]	23.5 [17,5]	11 [8,2]	12.3 [9,2]
Max. Pressure Drop, PSI [bar]	Cont.	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]	1300 [120]	1015 [95]
	Int.*	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2030 [140]	1665 [115]
	Peak**	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	2610 [180]
Max. Oil Flow, GPM [lpm]	Cont.	16 [60]	16 [60]	16 [60]	16 [60]	16 [60]	16 [60]	16 [60]	16 [60]	16 [60]
	Int.*	20 [75]	20 [75]	20 [75]	20 [75]	20 [75]	20 [75]	20 [75]	20 [75]	20 [75]
Max. Inlet Pressure, PSI [bar]	Cont.	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]
	Int.*	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]
	Peak**	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]
Max. Return Pressure without Drain Line or Max. Pressure in Drain Line, PSI [bar]	Cont. 0-100 RPM	1450 [100]	1450 [100]	1450 [100]	1450 [100]	1450 [100]	1450 [100]	1450 [100]	1450 [100]	1450 [100]
	Cont. 100-300 RPM	725 [50]	725 [50]	725 [50]	725 [50]	725 [50]	725 [50]	725 [50]	725 [50]	725 [50]
	Cont. 300-600 RPM	365 [25]	365 [25]	365 [25]	365 [25]	365 [25]	365 [25]	365 [25]	365 [25]	365 [25]
	Cont. >600 RPM	220 [15]	220 [15]	220 [15]	220 [15]	220 [15]	220 [15]	220 [15]	220 [15]	220 [15]
	Int.* 0-max. RPM	1450 [100]	1450 [100]	1450 [100]	1450 [100]	1450 [100]	1450 [100]	1450 [100]	1450 [100]	1450 [100]
Max. Return Pressure with Drain Line, PSI [bar]	Cont.	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]
	Int.*	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]
	Peak**	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]
Max. Starting Pressure with Unloaded Shaft, PSI [bar]		145 [10]	145 [10]	145 [10]	130 [9]	116 [8]	100 [7]	87 [6]	73 [5]	73 [5]
Min. Starting Torque, lb-in [daNm]		681 [7,7]	1150 [13]	1487 [16,8]	1860 [21]	2478 [28]	2850 [32,2]	3665 [41,4]	3805 [43]	3900 [44]
Min. Speed*, [RPM]**		10	10	10	10	10	10	10	10	10
Weight, lb [kg]		15 [6,8]	15.4 [7]	15.7 [7,1]	15.9 [7,2]	16.3 [7,4]	16.8 [7,6]	17.2 [7,8]	18 [8,2]	18.9 [8,6]

* Intermittent operation: the permissible values may occur for max. 10% of every minute.
** Peak load: the permissible values may occur for max. 1% of every minute.
*** For speeds lower than given, consult factory or your regional manager.

1. Intermittent speed and intermittent pressure must not occur simultaneously.
2. Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
3. Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP (DIN51524) or HM (ISO 6743/4). If using synthetic fluids consult the factory for alternative seal materials.
4. Recommended minimum oil viscosity 70 SUS [13 mm²/s] at 122°F [50°C].
5. Recommended maximum system operating temperature is 180°F [82°C].
6. To assure optimum motor life fill with fluid prior to loading and run at moderate load and speed for 10-15 minutes.

DIMENSIONS and MOUNTING DATA

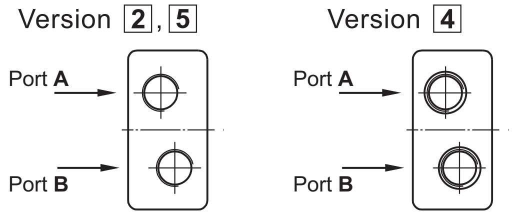


Shaft Dim.
See Page 49

Type	L_{max}, in [mm]	L_1, in [mm]
MLHPL 50	5.71 [145,0]	.26 [6,67]
MLHPL 80	5.87 [149,0]	.42 [10,67]
MLHPL 100	5.96 [151,5]	.52 [13,33]
MLHPL 125	6.10 [155,0]	.66 [16,67]
MLHPL 160	6.28 [159,5]	.84 [21,33]
MLHPL 200	6.49 [165,0]	1.05 [26,67]
MLHPL 250	6.75 [171,5]	1.31 [33,33]
MLHPL 315	7.13 [181,0]	1.68 [42,67]
MLHPL 400	7.54 [191,5]	2.10 [53,33]

	Versions		
	2	4	5
$P_{(A,B)}$	2xG½	2x⅞ - 14 UNF	2x½ - 14 NPTF
T	G¼	7/16 - 20 UNF	7/16 - 20 UNF

Side Ports

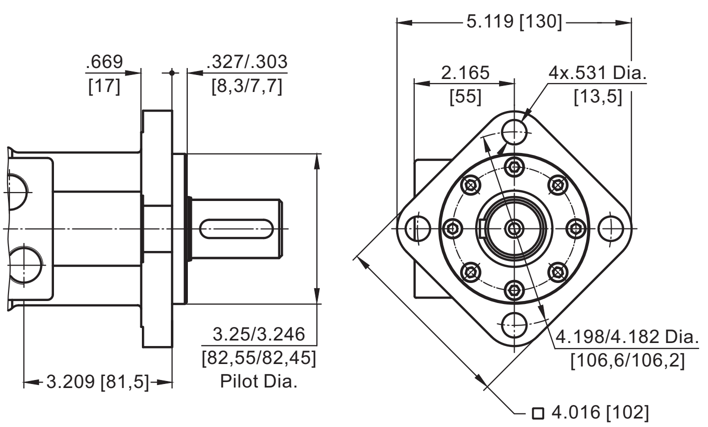


Standard Rotation
Viewed from Shaft End
Port **A** Pressurized - **CW**
Port **B** Pressurized - **CCW**

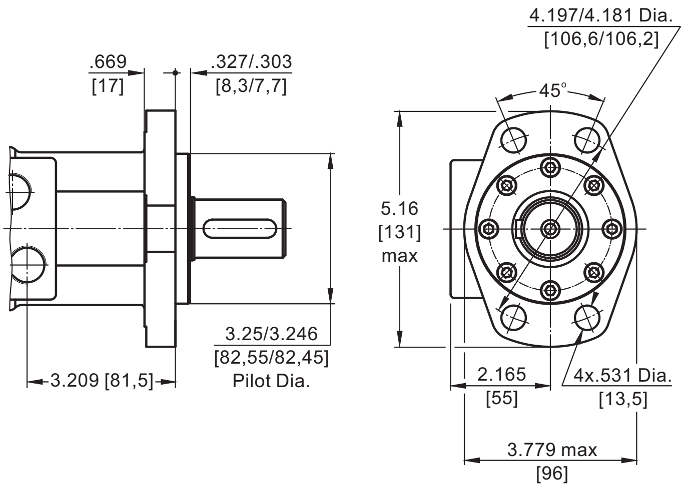
Reverse Rotation
Viewed from Shaft End
Port **A** Pressurized - **CCW**
Port **B** Pressurized - **CW**

MOUNTING

Square Mount (4 Holes)



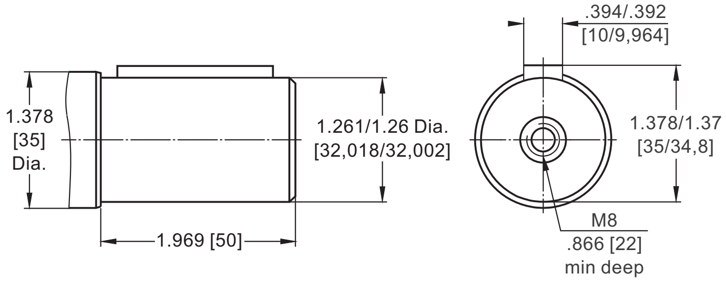
F - Oval Mount (four Holes)



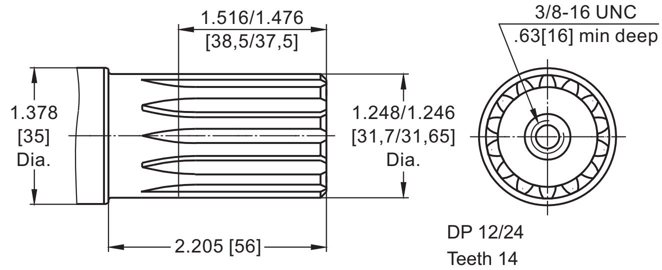
in [mm]

SHAFT EXTENSIONS for MLHPL and MLHRL

B - ø32, Parallel key A10x8x40 DIN 6885
Max. Torque 6815 lb-in [77 daNm]

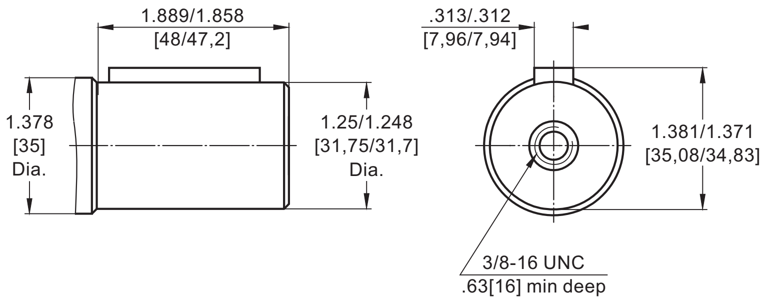


L - 14T splined, 1¼" [31,75], ANS B92.1-1976
Max. Torque 6815 lb-in [77 daNm]

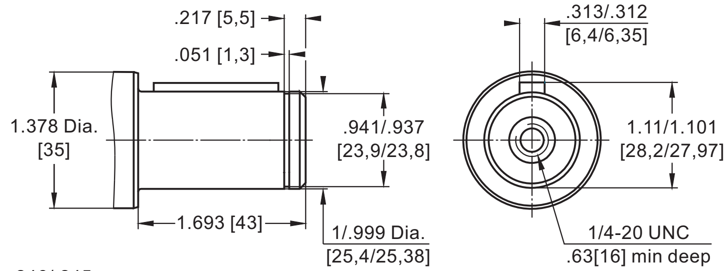


DP 12/24
Teeth 14
Pressure angle 30°

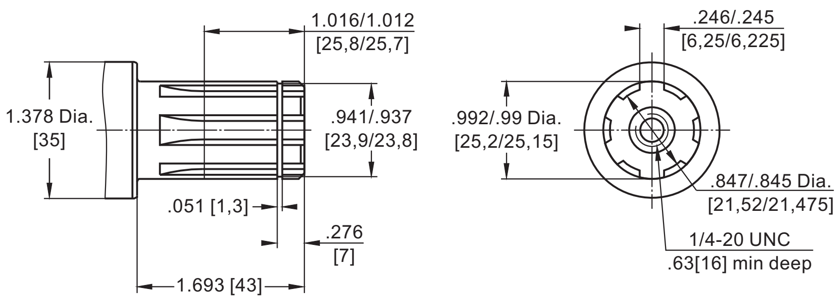
K - 1¼" [31,75] straight, Parallel key ⁵⁄₁₆"x⁵⁄₁₆"x1¼" BS46
Max. Torque 6815 lb-in [77 daNm]



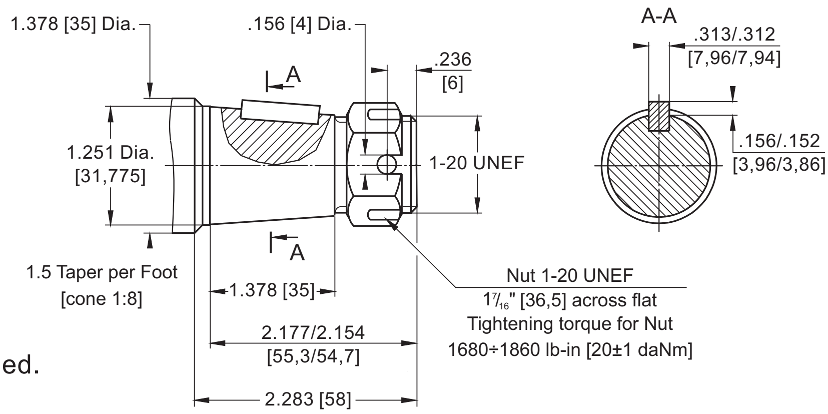
C - 1" [25,4] straight, Parallel key ¼"x¼"x1¼" BS46
Max. Torque 3010 lb-in [34 daNm]



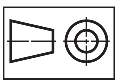
G - 1" [25,4] splined Bs2059 (SAE 6B)
Max. Torque 3010 lb-in [34 daNm]



R - 1¼" [31,75] tapered, SAE J501,
Parallel key ⁵⁄₁₆"x⁵⁄₁₆"x1" BS46
Max. Torque 34 daNm [3010 lb-in]



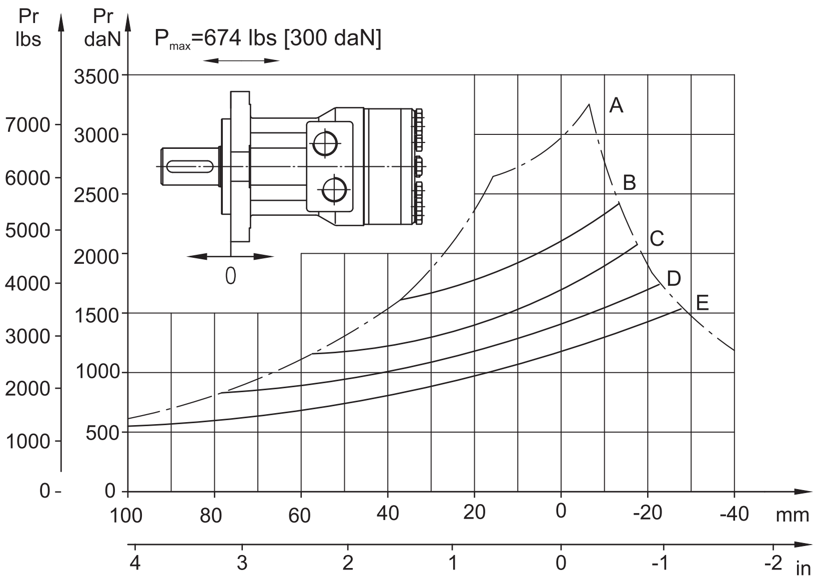
▽ - Motor Mounting Surfase

 in [mm]

Requirement max. Torque must be not exceeded.

PERMISSIBLE SHAFT LOADS for MLHPL and MLHRL

The curves apply to a B10 bearings life of 2000 hrs



A - Max. radial shaft load.
B - n=50 min^{-1}
C - n=100 min^{-1}
D - n=200 min^{-1}
E - n=400 min^{-1}

ORDER CODE

	1	2	3	4	5	6
MLHPL						

Pos.1 - Mounting Flange

omit - Square mount, four holes
F - Oval mount, four holes

Pos.2 - Displacement code*

50	- 3.02 in^3/rev [49,5 cm^3/rev]
80	- 4.83 in^3/rev [79,2 cm^3/rev]
100	- 6.04 in^3/rev [99,0 cm^3/rev]
125	- 7.55 in^3/rev [123,8 cm^3/rev]
160	- 9.66 in^3/rev [158,4 cm^3/rev]
200	- 12.10 in^3/rev [198,0 cm^3/rev]
250	- 15.10 in^3/rev [247,5 cm^3/rev]
315	- 19.30 in^3/rev [316,8 cm^3/rev]
400	- 24.16 in^3/rev [396,0 cm^3/rev]

Pos.3 - Shaft Extensions**

B	- ø32 straight, Parallel key
K	- 1¼" [31,75] straight, Parallel key
L	- 1¼" [31,75] splined 14T ANS B 92.1-1976
R	- 1¼" [31,75] tapered SAE J 501
C	- ø25,4 straight, Parallel key
G	- ø25,4 splined BS 2059 (SAE 6B)

Pos.4 - Port Size/Type [standard manifold to each]

2	- side ports, 2xG1/2, G1/4, BSP thread, ISO 228
4	- side ports, 2x7/8-14 UNF, O-ring, 7/16-20 UNF
5	- side ports, 2x1/2-14 NPTF, 7/16-20 UNF

Pos.5 - Special Features [see page 110]

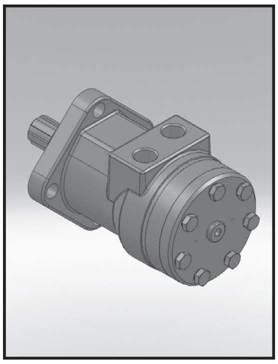
Pos.6 - Design Series

omit - Factory specified

NOTES:
* For the Function Diagrams please look at "M+S Hydraulic" Catalogue for MLHP motors, pages 19÷23.
** The permissible output torque for shafts must not be exceeded!

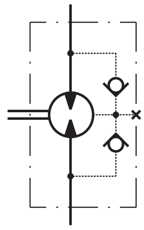
The hydraulic motors are mangano-phosphatized as standard.

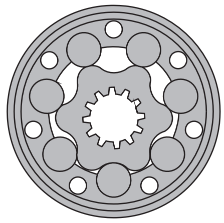
HYDRAULIC MOTORS MLHRL



APPLICATION

- Conveyors
- Feeding mechanism of robots and manipulators
- Metal working machines
- Textile machines
- Agricultural machines
- Food industries
- Mining machinery etc.





CONTENTS

OPTIONS

- Model - Spool valve, roll-gerotor
- Antifriction needle bearing
- Flange mount
- Shafts - straight, splined and tapered
- Metric and BSPP ports
- Other special features

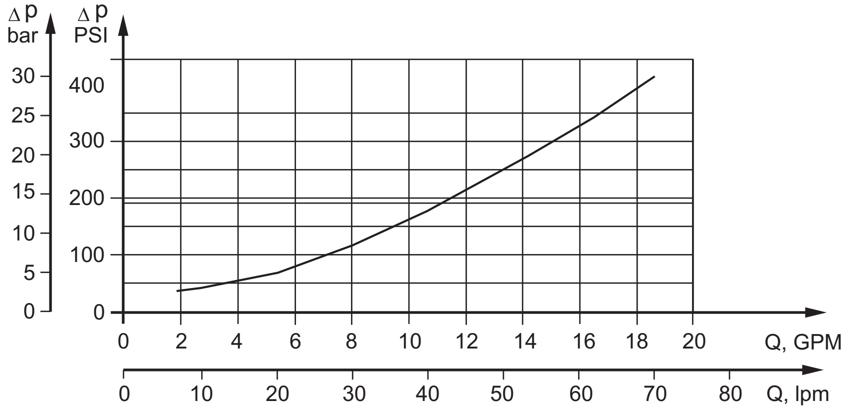
GENERAL

Max. Displacement,	in³/rev [cm³/rev]	24.4 [397]
Max. Speed,	[RPM]	970
Max. Torque,	lb-in [daNm]	cont.: 5400 [61] int.: 6100 [69]
Max. Output,	HP [kW]	21.5 [16]
Max. Pressure Drop,	PSI [bar]	cont.: 2540 [175] int.: 2900 [200]
Max. Oil Flow,	GPM [lpm]	20 [75]
Min. Speed,	[RPM]	10
Pressure fluid		Mineral based - HLP(DIN 51524) or HM(ISO 6743/4)
Temperature range,	°F [°C]	-40 ÷ 284 [-40 ÷ 140]
Optimal Viscosity range,	SUS [mm²/s]	98 ÷ 347 [20 ÷ 75]
Filtration		ISO code 20/16 (Min. recommended fluid filtration of 25 microns)

Oil flow in drain line

Pressure drop PSI [bar]	Viscosity SUS [mm²/s]	Oil flow in drain line GPM [lpm]
1450 [100]	98 [20]	.660 [2,5]
	164 [35]	.476 [1,8]
2030 [140]	98 [20]	.925 [3,5]
	164 [35]	.740 [2,8]

Pressure Losses



M+S HYDRAULIC

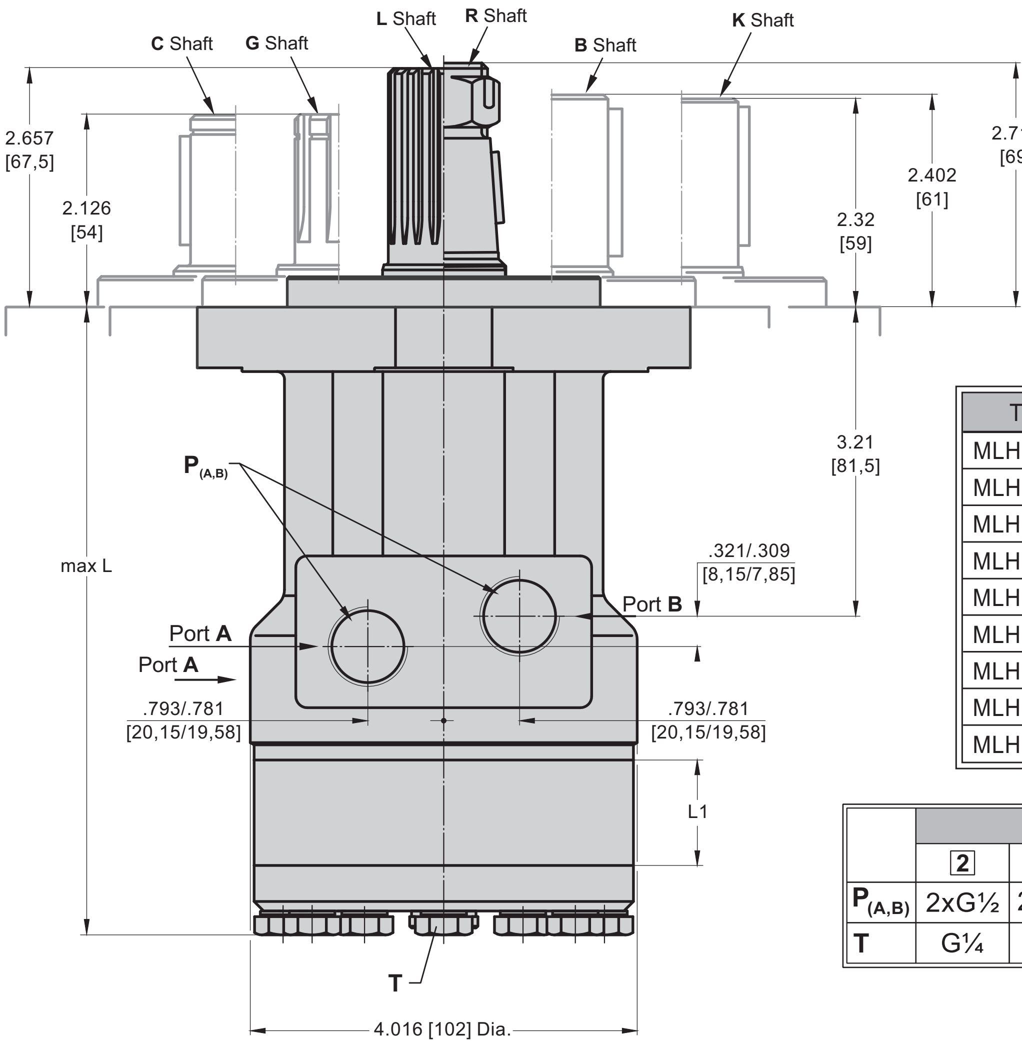
SPECIFICATION DATA

Type		MLHRL 50	MLHRL 80	MLHRL 100	MLHRL 125	MLHRL 160	MLHRL 200	MLHRL 250	MLHRL 315	MLHRL 400
Displacement, in³/rev [cm³/rev]		3.14 [51,5]	4.90 [80,3]	6.09 [99,8]	7.67 [125,7]	9.74 [159,6]	12.19 [199,8]	15.26 [250,1]	19.26 [315,7]	24.4 [397]
Max. Speed, [RPM]	Cont.	775	750	600	475	375	300	240	190	150
	Int.*	970	940	750	600	470	375	300	240	190
Max. Torque, lb-in [daNm]	Cont.	900 [10,1]	1770 [20]	2125 [24]	2655 [30]	3450 [39]	4000 [45]	4780 [54]	4870 [55]	5400 [61]
	Int.*	1150 [13]	1947 [22,0]	2480 [28]	3010 [34]	3805 [43]	4425 [50]	5400 [61]	5580 [63]	6100 [69]
	Peak**	1505 [17]	2390 [27,0]	2832 [32]	3275 [37]	4070 [46]	4960 [56]	6280 [71]	7350 [83]	7700 [87]
Max. Output, HP [kW]	Cont.	9.5 [7]	17 [12,5]	17.4 [13]	16.8 [12,5]	15.4 [11,5]	14.8 [11]	13.4 [10]	12 [9]	10.5 [7,8]
	Int.*	11.9 [8,5]	20.1 [15]	20.1 [15]	21.5 [16]	18.8 [14]	17.4 [13]	16.1 [12]	14.8 [11]	14.2 [10,6]
Max. Pressure Drop, PSI [bar]	Cont.	2030 [140]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	1960 [135]	1670 [115]
	Int.*	2540 [175]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2320 [160]	2030 [140]
	Peak**	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3045 [210]	2540 [175]
Max. Oil Flow, GPM [lpm]	Cont.	11 [40]	16 [60]	16 [60]	16 [60]	16 [60]	16 [60]	16 [60]	16 [60]	16 [60]
	Int.*	13 [50]	20 [75]	20 [75]	20 [75]	20 [75]	20 [75]	20 [75]	20 [75]	20 [75]
Max. Inlet Pressure, PSI [bar]	Cont.	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]
	Int.*	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]
	Peak**	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]
Max. Return Pressure without Drain Line or Max. Pressure in Drain Line, PSI [bar]	Cont. 0-100 RPM	1450 [100]	1450 [100]	1450 [100]	1450 [100]	1450 [100]	1450 [100]	1450 [100]	1450 [100]	1450 [100]
	Cont. 100-300 RPM	725 [50]	725 [50]	725 [50]	725 [50]	725 [50]	725 [50]	725 [50]	725 [50]	725 [50]
	Cont. 300-600 RPM	365 [25]	365 [25]	365 [25]	365 [25]	365 [25]	365 [25]	365 [25]	365 [25]	365 [25]
	Cont. >600 RPM	220 [15]	220 [15]	220 [15]	220 [15]	220 [15]	220 [15]	220 [15]	220 [15]	220 [15]
	Int.* 0-max. RPM	1450 [100]	1450 [100]	1450 [100]	1450 [100]	1450 [100]	1450 [100]	1450 [100]	1450 [100]	1450 [100]
Max. Return Pressure with Drain Line, PSI [bar]	Cont.	2030 [140]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]
	Int.*	2540 [175]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]
	Peak**	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]
Max. Starting Pressure with Unloaded Shaft, PSI [bar]		145 [10]	145 [10]	145 [10]	130 [9]	100 [7]	73 [5]	58 [4]	44 [3]	44 [3]
Min. Starting Torque, lb-in [daNm]		710 [8]	1330 [15]	1770 [20]	2215 [25]	2835 [32]	3275 [37]	4000 [45]	4000 [45]	4340 [49]
Min. Speed***, [RPM]		10	10	10	10	10	10	10	10	10
Weight, lb [kg]		18.7 [8,5]	19 [8,6]	19.6 [8,9]	19.8 [9,0]	20.3 [9,2]	21.2 [9,6]	22.3 [10,1]	23.8 [10,8]	25.4 [11,5]

* Intermittent operation: the permissible values may occur for max. 10% of every minute.
** Peak load: the permissible values may occur for max. 1% of every minute.
*** For speeds lower than given, consult factory or your regional manager.

1. Intermittent speed and intermittent pressure must not occur simultaneously.
2. Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
3. Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP (DIN51524) or HM (ISO 6743/4). If using synthetic fluids consult the factory for alternative seal materials.
4. Recommended minimum oil viscosity 70 SUS [13 mm²/s] at 122°F [50°C].
5. Recommended maximum system operating temperature is 180°F [82°C].
6. To assure optimum motor life fill with fluid prior to loading and run at moderate load and speed for 10-15 minutes.

DIMENSIONS and MOUNTING DATA

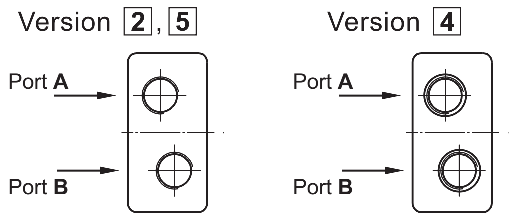


Shaft Dim.
See Page 49

Type	L_{max},in [mm]	L_1, in [mm]
MLHRL 50	8.80 [147,5]	.35 [9,0]
MLHRL 80	6.00 [152,5]	.55 [14,0]
MLHRL 100	6.12 [155,5]	.69 [17,4]
MLHRL 125	6.30 [160,0]	.86 [21,8]
MLHRL 160	6.54 [166,0]	1.09 [27,8]
MLHRL 200	6.81 [173,0]	1.37 [34,8]
MLHRL 250	7.15 [181,5]	1.71 [43,5]
MLHRL 315	7.60 [193,0]	2.16 [54,8]
MLHRL 400	8.17 [207,5]	2.73 [69,4]

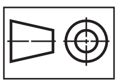
	Versions		
	2	4	5
$P_{(A,B)}$	2xG½	2x⅞ - 14 UNF	2x½ - 14 NPTF
T	G¼	7/16 - 20 UNF	7/16 - 20 UNF

Side Ports



Standard Rotation
Viewed from Shaft End
Port **A** Pressurized - **CW**
Port **B** Pressurized - **CCW**

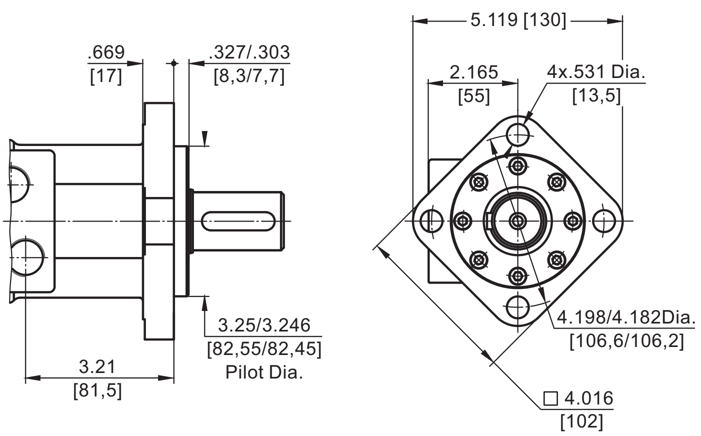
Reverse Rotation
Viewed from Shaft End
Port **A** Pressurized - **CCW**
Port **B** Pressurized - **CW**



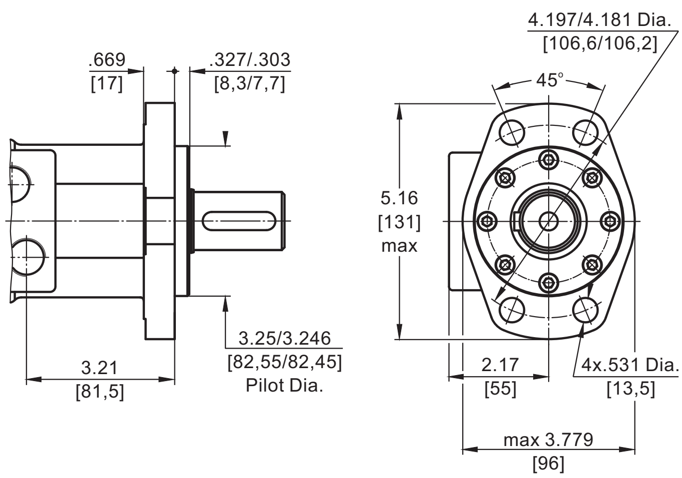
in [mm]

MOUNTING

Square Mount (4 Holes)



F - Oval Mount (four Holes)



ORDER CODE

	1	2	3	4	5	6
MLHRL						

Pos.1 - Mounting Flange

omit	- Square mount, four holes
F	- Oval mount, four holes

Pos.2 - Displacement code*

50	- 3.14 in³/rev [51,5 cm³/rev]
80	- 4.90 in³/rev [80,3 cm³/rev]
100	- 6.09 in³/rev [99,8 cm³/rev]
125	- 7.67 in³/rev [125,7 cm³/rev]
160	- 9.74 in³/rev [159,6 cm³/rev]
200	- 12.19 in³/rev [199,8 cm³/rev]
250	- 15.26 in³/rev [250,1 cm³/rev]
315	- 19.26 in³/rev [315,7 cm³/rev]
400	- 24.40 in³/rev [397,0 cm³/rev]

Pos.3 - Shaft Extensions** [see page 49]

B	- ø32 straight, Parallel key
K	- 1¼" [31,75] straight, Parallel key
L	- 1¼" [31,75] splined 14T ANS B 92.1-1976
R	- 1¼" [31,75] tapered SAE J 501
C	- ø25,4 straight, Parallel key
G	- ø25,4 splined BS 2059 (SAE 6B)

Pos.4 - Port Size/Type [standard manifold to each]

2	- side ports, 2xG1/2, G1/4, BSP thread, ISO 228
4	- side ports, 2x7/8-14 UNF, O-ring, 7/16-20 UNF
5	- side ports, 2x1/2-14 NPTF, 7/16-20 UNF

Pos.5 - Special Features [see page 110]

Pos.6 - Design Series

omit - Factory specified

NOTES:

* For the Function Diagrams please look at "M+S Hydraulic" Catalogue for MLHR motors, pages 36÷40.

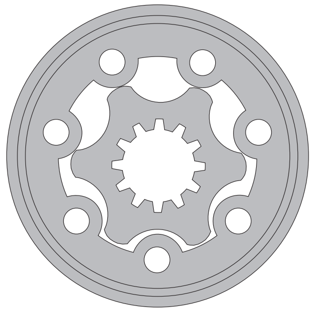
** The permissible output torque for shafts must not be exceeded!

The hydraulic motors are mangano-phosphatized as standard.

HYDRAULIC MOTORS HP

APPLICATION

» Conveyors
» Feeding mechanism of robots and manipulators
» Metal working machines
» Textile machines
» Agricultural machines
» Food industries
» Grass cutting machinery etc.



CONTENTS

OPTIONS

» Model - Spool valve, gerotor
» Flange mount
» Side ports
» Shafts - straight, splined and tapered
» SAE and manifold ports
» Speed sensoring
» Other special features

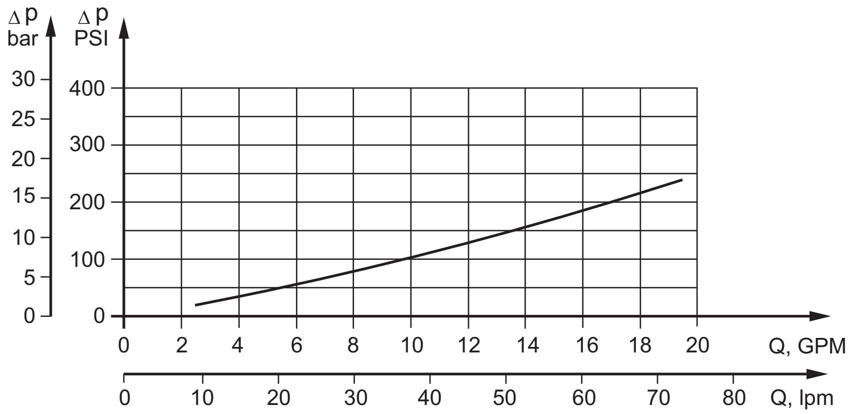
GENERAL

Max. Displacement,	in^3/rev [cm^3/rev]	24.16 [396]
Max. Speed,	[RPM]	1408
Max. Torque,	lb-in [daNm]	cont.: 3665 [41,4] int.: 4520 [51,1]
Max. Output,	HP [kW]	16.1 [12]
Max. Pressure Drop,	PSI [bar]	cont.: 1815 [125] int.: 2540 [175]
Max. Oil Flow,	GPM [lpm]	20 [75]
Min. Speed,	[RPM]	10
Pressure fluid		Mineral based - HLP(DIN 51524) or HM(ISO 6743/4)
Temperature range,	°F [°C]	-40 ÷ 284 [-40 ÷ 140]
Optimal Viscosity range,	SUS [mm^2/s]	98 ÷ 347 [20 ÷ 75]
Filtration		ISO code 20/16 (Min. recommended fluid filtration of 25 microns)

Oil flow in drain line

Pressure drop PSI [bar]	Viscosity SUS [mm^2/s]	Oil flow in drain line GPM [lpm]
1450 [100]	98 [20]	.660 [2,5]
	164 [35]	.476 [1,8]
2030 [140]	98 [20]	.925 [3,5]
	164 [35]	.740 [2,8]

Pressure Losses



SPECIFICATION DATA

Type		HP 25	HP 32	HP 40	HP 50	HP 80	HP 100
Displacement, in^3/rev [cm^3/rev]		1.73 [28,4]	2.11 [34,5]	2.47 [40,5]	3.02 [49,5]	4.83 [79,2]	6.04 [99,0]
Max. Speed, [RPM]	Cont.	1055	1160	900	909	758	606
	Int.*	1600	1300	1110	1111	947	758
Max. Torque, lb-in [daNm]	Cont.	290 [3,3]	460 [5,2]	575 [6,5]	717 [8,1]	1141 [12,9]	1434 [16,2]
	Int.*	400 [4,5]	620 [7,0]	795 [9,0]	990 [11,2]	1585 [17,9]	1974 [22,3]
	Peak**	610 [6,9]	780 [8,8]	975 [11]	1210 [13,7]	1930 [21,8]	2420 [27,3]
Max. Output, HP [kW]	Cont.	4.60 [3,4]	7.5 [5,6]	7.5 [5,6]	11.3 [8,4]	11.3 [8,4]	11.3 [8,4]
	Int.*	8.2 [6,1]	11.3 [8,4]	11.5 [8,6]	14.1 [10,5]	16 [12]	16 [12]
Max. Pressure Drop, PSI [bar]	Cont.	1450 [100]	1815 [125]	1815 [125]	1815 [125]	1815 [125]	1815 [125]
	Int.*	2030 [140]	2465 [170]	2540 [175]	2540 [175]	2540 [175]	2540 [175]
	Peak**	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]
Max. Oil Flow, GPM [lpm]	Cont.	8 [30]	10.5 [40]	10.5 [40]	11.9 [45]	15.9 [60]	15.9 [60]
	Int.*	10.5 [40]	11.9 [45]	11.9 [45]	14.5 [55]	19.8 [75]	19.8 [75]
Max. Inlet Pressure, PSI [bar]	Cont.	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]
	Int.*	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]
	Peak**	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]
Max. Return Pressure with Drain Line, PSI [bar]	Cont.	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]
	Int.*	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]
	Peak**	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]
Max. Starting Pressure with Unloaded Shaft, PSI [bar]		145 [10]	145 [10]	145 [10]	145 [10]	145 [10]	145 [10]
Min. Starting Torque, lb-in [daNm]	At max.press. drop Cont.	265 [3,0]	425 [4,8]	566 [6,4]	655 [7,4]	1045 [11,8]	1300 [14,7]
	At max.press. drop Int.*	362 [4,1]	565 [6,4]	725 [8,2]	900 [10,2]	1440 [16,3]	1800 [20,3]
Min. Speed***, [RPM]		20	15	10	10	10	10
Weight, lb [kg]	HP	11.5 [5,2]	11.5 [5,2]	11.5 [5,2]	11.7 [5,3]	11.9 [5,4]	12.3 [5,6]
	HPQ	10.6 [4,8]	10.6 [4,8]	10.6 [4,8]	10.8 [4,9]	11.25 [5,1]	11.69 [5,3]

* Intermittent operation: the permissible values may occur for max. 10% of every minute.
** Peak load: the permissible values may occur for max. 1% of every minute.
*** For speeds lower than given, consult factory or your regional manager.

1. Intermittent speed and intermittent pressure must not occur simultaneously.
2. Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
3. Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP (DIN51524) or HM (ISO 6743/4). If using synthetic fluids consult the factory for alternative seal materials.
4. Recommended minimum oil viscosity 70 SUS [13 mm²/s] at 122°F [50°C].
5. Recommended maximum system operating temperature is 180°F [82°C].
6. To assure optimum motor life fill with fluid prior to loading and run at moderate load and speed for 10-15 minutes.

SPECIFICATION DATA (continued)

Type		HP 125	HP 160	HP 200	HP 250	HP 315	HP 400
Displacement, in^3/rev [cm^3/rev]		7.55 [123,8]	9.66 [158,4]	12.1 [198]	15.1 [247,5]	19.3 [316,8]	24.16 [396]
Max. Speed, [RPM]	Cont.	485	379	303	242	189	152
	Int.*	606	473	379	303	237	189
Max. Torque, lb-in [daNm]	Cont.	1790 [20,2]	2105 [23,8]	2400 [27,1]	2860 [32,3]	3290 [37,2]	3665 [41,4]
	Int.*	2470 [27,9]	2805 [31,7]	3390 [38,3]	3675 [41,5]	4340 [49,0]	4520 [51,1]
	Peak**	3025 [34,2]	3870 [43,7]	4830 [54,6]	4830 [54,6]	5500 [62,1]	5585 [63,1]
Max. Output HP [kW]	Cont.	11.3 [8,4]	10.3 [7,7]	9.5 [7,1]	9 [6,7]	8.2 [6,1]	7.2 [5,4]
	Int.*	16 [12]	16 [12]	16 [12]	14.3 [10,7]	13.1 [9,8]	11 [8,2]
Max. Pressure Drop, PSI [bar]	Cont.	1815 [125]	1670 [115]	1520 [105]	1450 [100]	1305 [90]	1160 [80]
	Int.*	2540 [175]	2250 [155]	2175 [150]	1885 [130]	1740 [120]	1450 [100]
	Peak**	3260 [225]	3260 [225]	3260 [225]	2610 [180]	2320 [160]	1885 [130]
Max. Oil Flow, GPM [lpm]	Cont.	15.9 [60]	15.9 [60]	15.9 [60]	15.9 [60]	15.9 [60]	15.9 [60]
	Int.*	19.8 [75]	19.8 [75]	19.8 [75]	19.8 [75]	19.8 [75]	19.8 [75]
Max. Inlet Pressure, PSI [bar]	Cont.	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]
	Int.*	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]
	Peak**	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]
Max. Return Pressure with Drain Line, PSI [bar]	Cont.	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]
	Int.*	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]
	Peak**	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]
Max. Starting Pressure with Unloaded Shaft, PSI [bar]		145 [10]	145 [10]	100 [7]	100 [7]	100 [7]	100 [7]
Min. Starting Torque, lb-in [daNm]	At max.press. drop Cont.	1630 [18,4]	1910 [21,6]	2190 [24,7]	2600 [29,4]	3000 [33,9]	3330 [37,6]
	At max.press. drop Int.*	2250 [25,1]	2550 [28,8]	3090 [34,9]	3345 [37,8]	3950 [44,6]	4115 [46,5]
Min. Speed***, [RPM]		10	10	10	10	10	10
Weight, lb [kg]	HP	12.6 [5,7]	13.0 [5,9]	13.4 [6,1]	13.9 [6,3]	14.6 [6,6]	15.7 [7,1]
	HPQ	11.91 [5,4]	12.35 [5,6]	12.79 [5,8]	13.23 [6,0]	13.89 [6,3]	14.8 [6,7]

* Intermittent operation: the permissible values may occur for max. 10% of every minute.
** Peak load: the permissible values may occur for max. 1% of every minute.
*** For speeds lower than given, consult factory or your regional manager.

1. Intermittent speed and intermittent pressure must not occur simultaneously.
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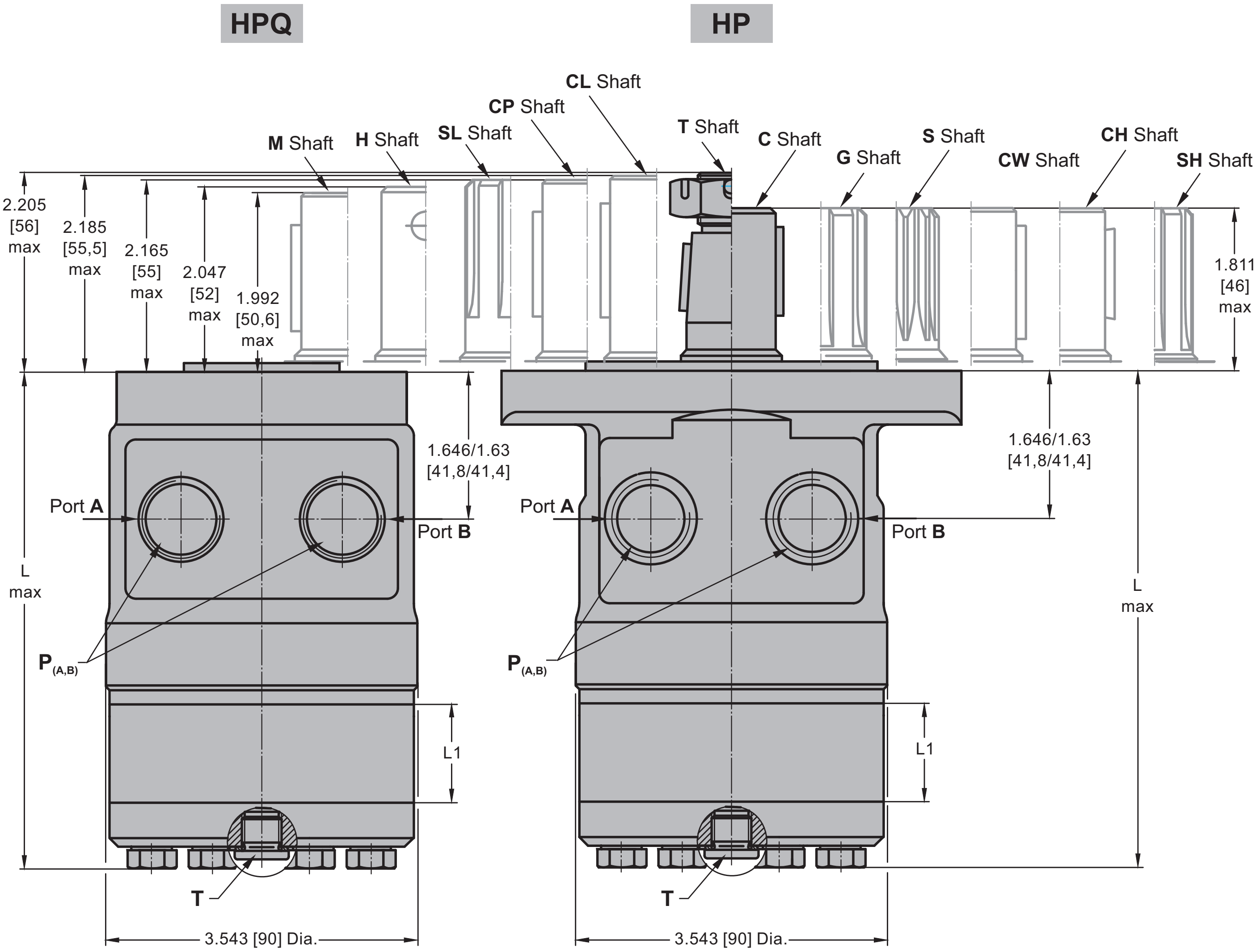
3. Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP (DIN51524) or HM (ISO 6743/4). If using synthetic fluids consult the factory for alternative seal materials.
4. Recommended minimum oil viscosity 70 SUS [13 mm²/s] at 122°F [50°C].
5. Recommended maximum system operating temperature is 180°F [82°C].
6. To assure optimum motor life fill with fluid prior to loading and run at moderate load and speed for 10-15 minutes.

DIMENSIONS and MOUNTING DATA



Type	L_{max}, in [mm]	L_1, in [mm]
HP(Q) 25	4.69 [119,0]	.21 [5,20]
HP(Q) 32	4.72 [120,0]	.25 [6,30]
HP(Q) 40	4.76 [121,0]	.29 [7,40]
HP(Q) 50	4.74 [120,5]	.26 [6,67]
HP(Q) 80	4.90 [124,5]	.42 [10,67]
HP(Q) 100	5.00 [127,0]	.52 [13,33]
HP(Q) 125	5.14 [130,5]	.66 [16,67]
HP(Q) 160	5.32 [135,0]	.84 [21,33]
HP(Q) 200	5.53 [140,5]	1.05 [26,67]
HP(Q) 250	5.79 [147,0]	1.31 [33,33]
HP(Q) 315	6.16 [156,5]	1.68 [42,67]
HP(Q) 400	6.57 [167,0]	2.10 [53,33]

Shaft Dim.
See Page 60 and 61

Flange Dim.
See Page 59

Port Dim.
See Page 59

Standard Rotation
Viewed from Shaft End
Port **A** Pressurized - **CW**
Port **B** Pressurized - **CCW**

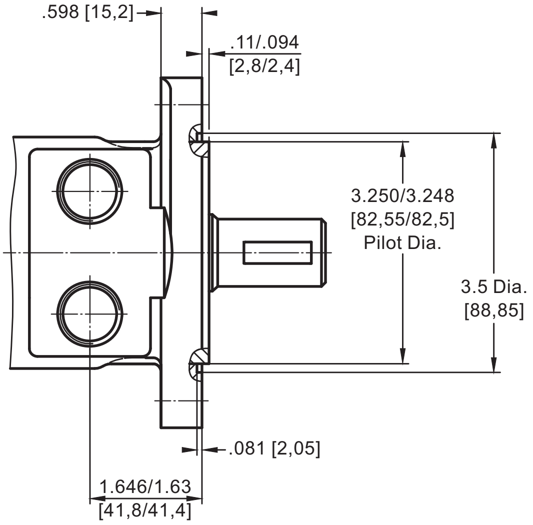
Reverse Rotation
Viewed from Shaft End
Port **A** Pressurized - **CCW**
Port **B** Pressurized - **CW**

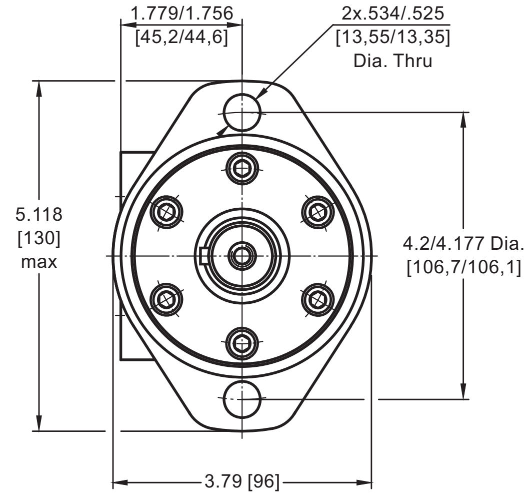
	Versions				
	1	2	3	4	5
C	4x5⁄16 - 18 UNF	-	4xM8	-	-
$P_{(A,B)}$	2x.39 Dia. [2x10]	2xG½	2x.39 Dia. [2x10]	2x7⁄8 - 14 UNF	2x½ - 14 NPTF
T	7⁄16 - 20 UNF	G¼	7⁄16 - 20 UNF	7⁄16 - 20 UNF	7⁄16 - 20 UNF

in [mm]

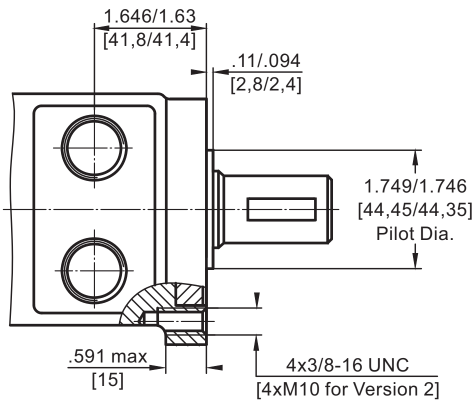
MOUNTING

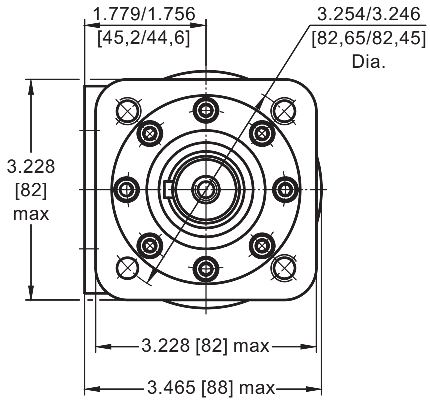
SAE A Flange





Q - Square Flange



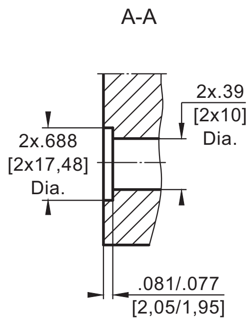


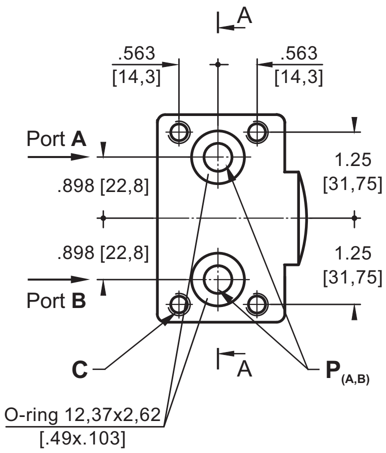
in [mm]

PORTS

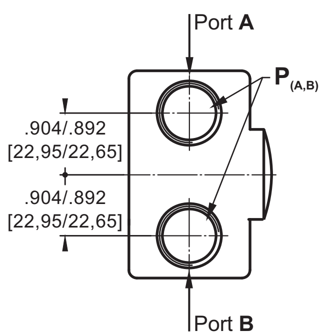
Side Ports

Version 1, 3

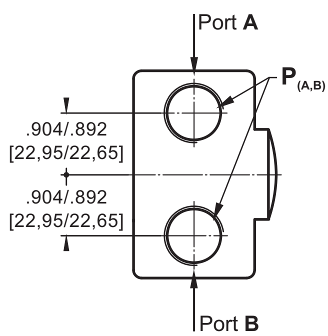




Version 4



Version 2, 5



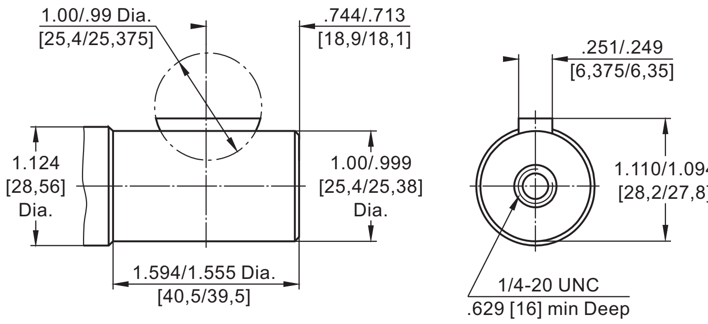
Standard Rotation
Viewed from Shaft End
Port **A** Pressurized - **CW**
Port **B** Pressurized - **CCW**

Reverse Rotation
Viewed from Shaft End
Port **A** Pressurized - **CCW**
Port **B** Pressurized - **CW**

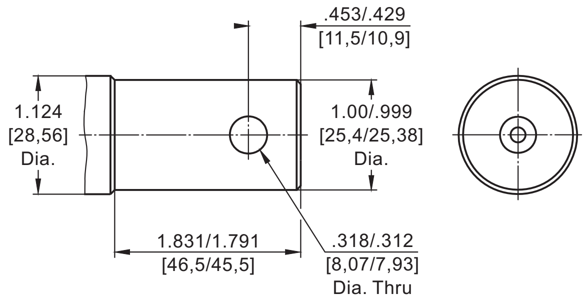
	Versions				
	1	2	3	4	5
C	4x5⁄16 - 18 UNF	-	4xM8	-	-
$P_{(A,B)}$	2x.39 Dia. [2x10]	2xG½	2x.39 Dia. [2x10]	2x7⁄8 - 14 UNF	2x½ - 14 NPTF
T	7⁄16 - 20 UNF	G¼	7⁄16 - 20 UNF	7⁄16 - 20 UNF	7⁄16 - 20 UNF

SHAFT EXTENSIONS for HP and HR MOTORS

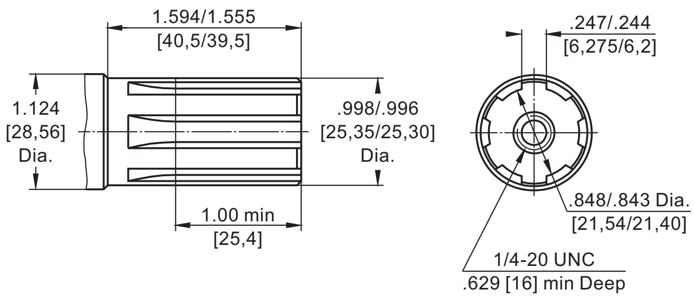
C - 1" [25,4] straight, Woodruff key ¼"x1" SAE J502
Max. Torque 3009 lb-in [34 daNm]



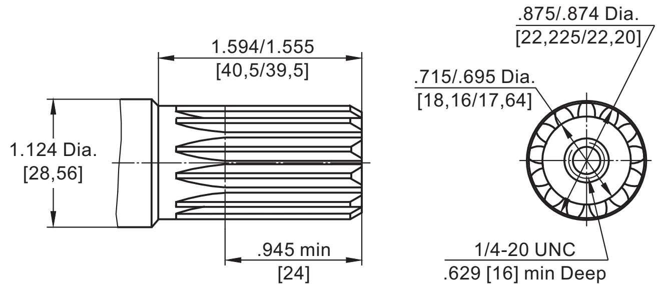
H - 1" [25,4] straight, w/ .315 [8] Crosshole
Max. Torque 3009 lb-in [34 daNm]



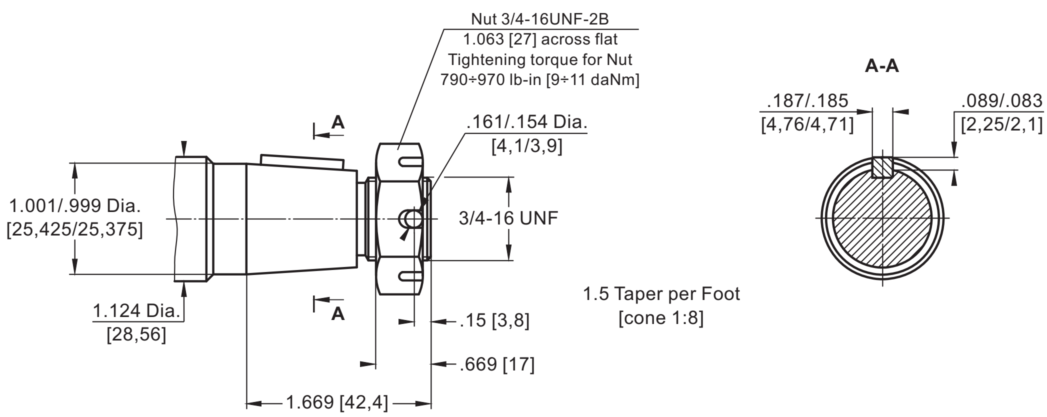
G - 1" [25,4] splined, SAE 6B
Max. Torque 3540 lb-in [40 daNm]



S - ⅞" [22,2] splined 13T, ANS B 92.1-1976
Max. Torque 3200 lb-in [36 daNm]



T - 1" [25,4] tapered SAE J501, Parallel key 3/16"x 3/16"x¾"
Max. Torque 3540 lb-in [40 daNm]

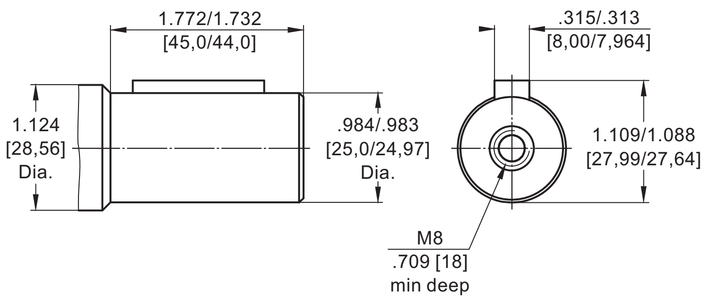


Requirement max. Torque must not be exceeded.

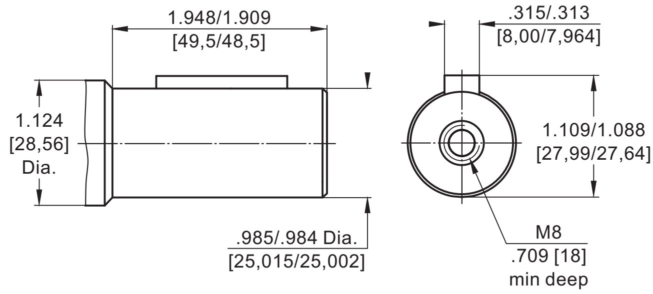
in [mm]

SHAFT EXTENSIONS for HP and HR MOTORS

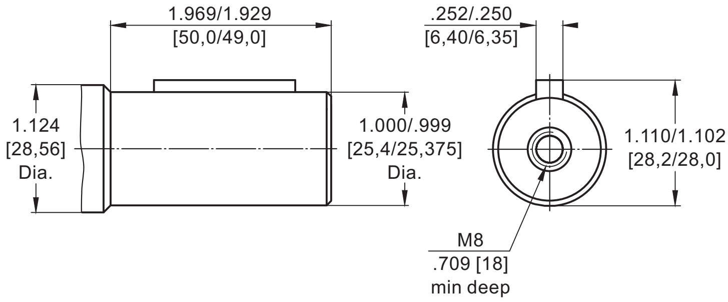
M - ø25 straight, Parallel key A8x7x32 DIN 6885
Max. Torque 3009 lb-in [34 daNm]



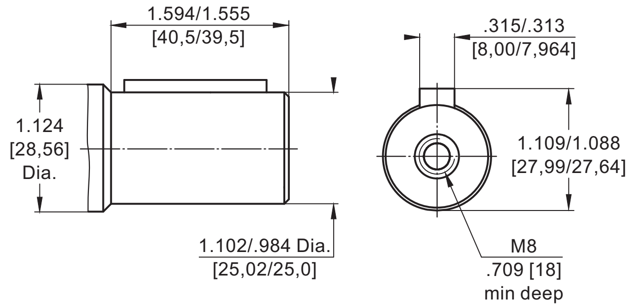
CP - ø25 straight, Parallel key A8x7x32 DIN 6885
Max. Torque 3009 lb-in [34 daNm]



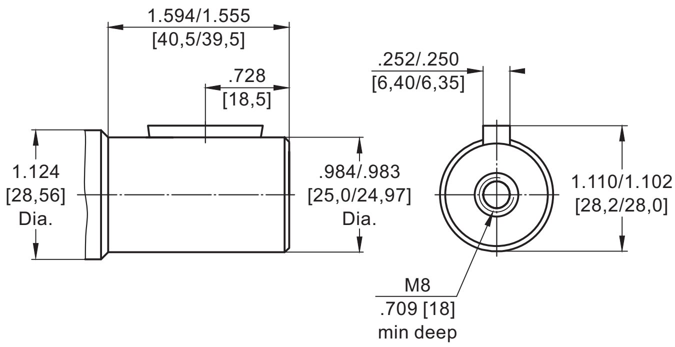
CL - 1" [25,4] straight, Parallel key ¼"x¼"x1¼" BS46
Max. Torque 3009 lb-in [34 daNm]



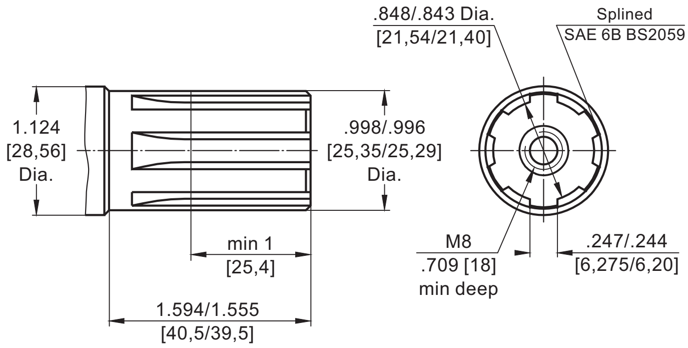
CW - ø25 straight, Parallel key A8x7x32 DIN 6885
Max. Torque 3009 lb-in [44 daNm]



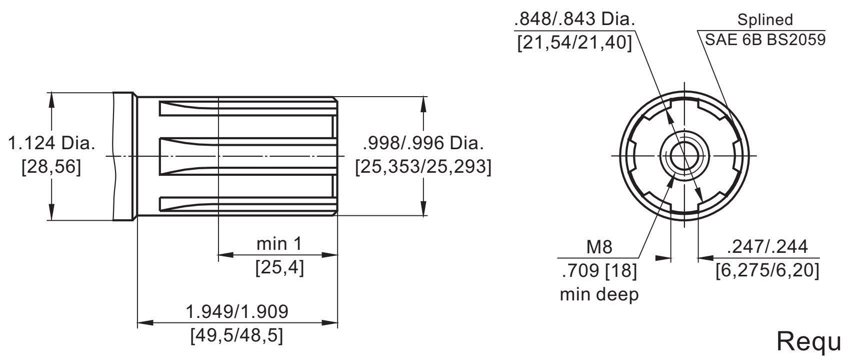
CH - ø25 straight, Woodruff key ¼"x1" SAE J502
Max. Torque 3009 lb-in [34 daNm]



SH - 1" [25,4] splined, SAE 6B
Max. Torque 3540 lb-in [40 daNm]



SL - 1" [25,4] splined, SAE 6B
Max. Torque 3540 lb-in [40 daNm]



in [mm]

Requirement max. Torque must not be exceeded.

PERMISSIBLE SHAFT LOADS for HP and HR MOTORS

The permissible radial shaft load **P**$_{rad}$ depends on the speed RPM and distance *L* from the point of load to the mounting flange.

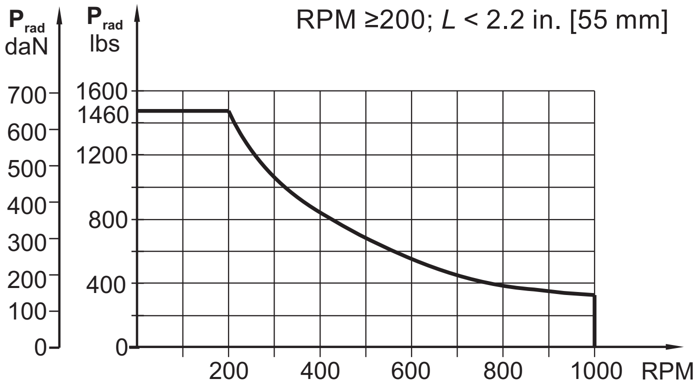
$$\text{Radial Shat Load } \mathbf{P}_{rad} = \frac{650}{RPM} \times \frac{23200}{89+L} \text{ ,daN*}$$

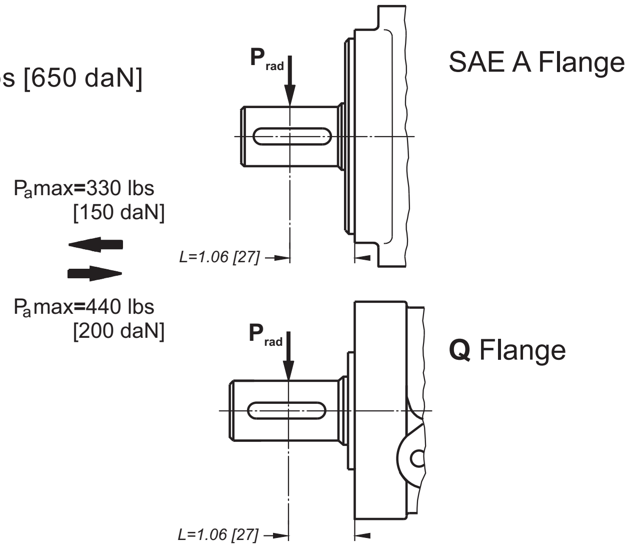
* *L* - in mm.

$$\text{Radial Shaft Load: } P_{rad} = \frac{1460}{RPM} \times \frac{913}{3.5+L} \text{ ,lbs*}$$

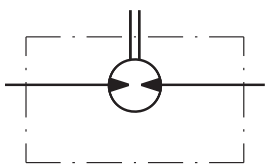
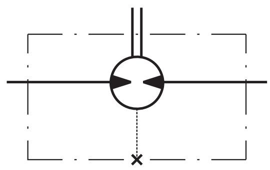
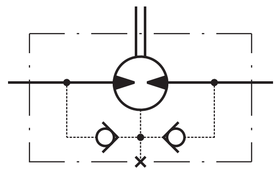
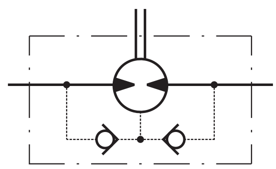
* *L* - in inch

RPM < 200=> max Prad=1460 lbs [650 daN]
RPM ≥200; *L* < 2.2 in. [55 mm]

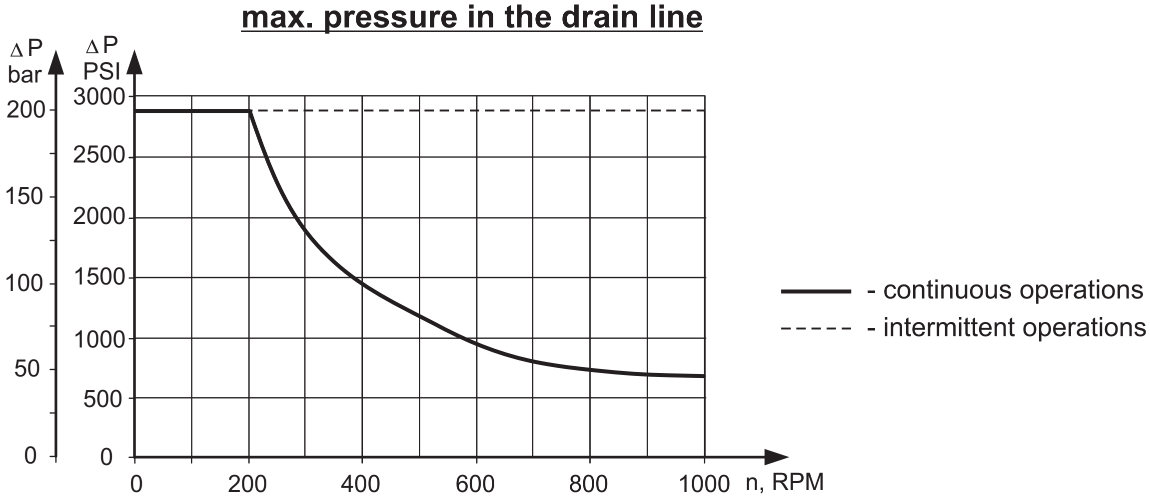




MAX. PERMISSIBLE SHAFT SEAL PRESSURE for HP and HR MOTORS

HP...1 and HR...1 motors without drain connection:	***HP... and HR... motors with drain connection:***	***HP...K and HR...K motors with check valves and drain connection:***	***HP...K1 and HR...K1 motors with check valves and without drain connection:***
The shaft seal pressure equals the average of input pressure and return pressure. $P_{seal}=\frac{P_{input}+P_{return}}{2}$	The shaft seal pressure equals the pressure in the drain line.	The shaft seal pressure equals the pressure in the drain line.	The shaft seal pressure never exceeds the pressure in the return line.
			

Max. return pressure without drain line or max. pressure in the drain line



ORDER CODE

	1	2	3	4	5	6	7	8	9
H P					U				

Pos.1 - Mounting Flange

omit - SAE A, two holes
Q - Square, four bolts

Pos.2 - Displacement code*

25 - 1.73 in^3/rev [28,4 cm^3/rev]
32 - 2.11 in^3/rev [34,5 cm^3/rev]
40 - 2.47 in^3/rev [40,5 cm^3/rev]
50 - 3.02 in^3/rev [49,5 cm^3/rev]
80 - 4.83 in^3/rev [79,2 cm^3/rev]
100 - 6.04 in^3/rev [99,0 cm^3/rev]
125 - 9.66 in^3/rev [123,8 cm^3/rev]
160 - 9.74 in^3/rev [158,4 cm^3/rev]
200 - 12.10 in^3/rev [198,0 cm^3/rev]
250 - 15.10 in^3/rev [247,5 cm^3/rev]
315 - 19.30 in^3/rev [316,8 cm^3/rev]
400 - 24.16 in^3/rev [396,0 cm^3/rev]

Pos.3 - Shaft Extensions**

C - 1" [25,4] straight, Woodruff key
G - 1" [25,4] SAE 6B Splined
H - 1" [25,4] straight, w/.315 [8] Cross-hole
S - $^7/_8$" [22,2] 13T Splined
T - 1" [25,4] SAE J501 Tapered
M - ø 25 straight, Parallel key A8x7x32 DIN 6885
CP - ø 25 straight, Parallel key A8x7x32 DIN 6885
CL - 1" [25,4] straight, Parallel key $^1/_4$"x$^1/_4$"x1$^1/_4$" BS46
CW - ø 25 straight, Parallel key A8x7x32 DIN 6885
CH - ø25 straight, Woodruff key $^1/_4$"x1" SAE J502
SH - 1" [25,4], SAE 6B Splined
SL - 1" [25,4], SAE 6B Splined

Pos.4 - Port Size/Type [standard manifold to each]

1 - side ports, Manifold [5/16-18 UNC Mounting Threads], 7/16-20 UNF
2 - side ports, 2xG1/2, G1/4
3 - side ports, Manifold [M8 Mounting Threads], 7/16-20 UNF
4 - side ports, 2x7/8-14 UNF, O-ring, 7/16-20 UNF
5 - side ports, 2x1/2-14 NPTF, 7/16-20 UNF

Pos.5 - Shaft Seal Version [see page 60]

U - high pressure shaft seal

Pos.6 - Check Valves

omit - without check valves
K - with check valves

Pos.7 - Drain Port

omit - with drain port
1 - without drain port

Pos.8 - Special Features [see page 110]

Pos.9 - Design Series

omit - Factory specified

NOTES:

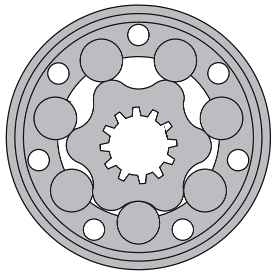
* For the Function Diagrams please look at "M+S Hydraulic" Catalogue for MLHP motors, pages 18÷24.
** The permissible output torque for shafts must not be exceeded!

The hydraulic motors are mangano-phosphatized as standard.

HYDRAULIC MOTORS HR

APPLICATION

» Conveyors
» Feeding mechanism of robots and manipulators
» Metal working machines
» Textile machines
» Agricultural machines
» Food industries
» Grass cutting machinery etc.



CONTENTS

OPTIONS

» Model - Spool valve, roll-gerotor
» Flange mount
» Side ports
» Shafts - straight, splined and tapered
» SAE and manifold ports
» Speed sensoring
» Other special features

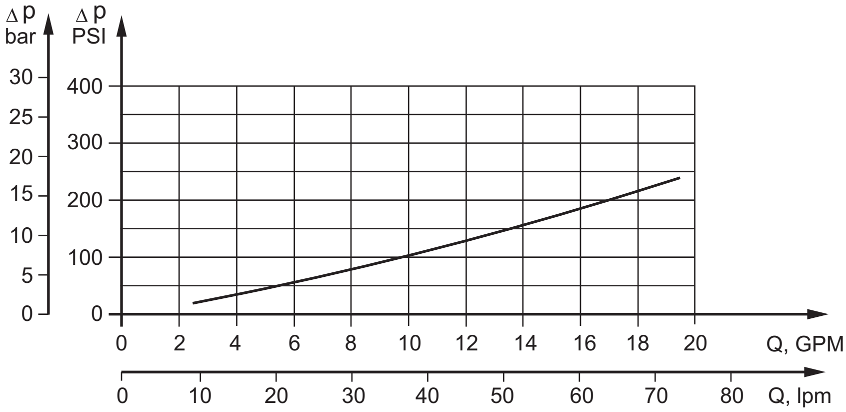
GENERAL

Max. Displacement,	in^3/rev [cm^3/rev]	23.56 [386]
Max. Speed,	[RPM]	971
Max. Torque,	lb-in [daNm]	cont.: 3980 [45,0] int.: 4560 [51,5]
Max. Output,	HP [kW]	16.2 [12,1]
Max. Pressure Drop,	PSI [bar]	cont.: 2030 [140] int.: 2540 [175]
Max. Oil Flow,	GPM [lpm]	20 [75]
Min. Speed,	[RPM]	10
Pressure fluid		Mineral based - HLP(DIN 51524) or HM(ISO 6743/4)
Temperature range,	^oF [^oC]	-40 ÷ 284 [-40 ÷ 140]
Optimal Viscosity range,	SUS [mm^2/s]	98 ÷ 347 [20 ÷ 75]
Filtration		ISO code 20/16 (Min. recommended fluid filtration of 25 microns)

Oil flow in drain line

Pressure drop PSI [bar]	Viscosity SUS [mm^2/s]	Oil flow in drain line GPM [lpm]
1450 [100]	98 [20]	.660 [2,5]
	164 [35]	.476 [1,8]
2030 [140]	98 [20]	.925 [3,5]
	164 [35]	.740 [2,8]

Pressure Losses



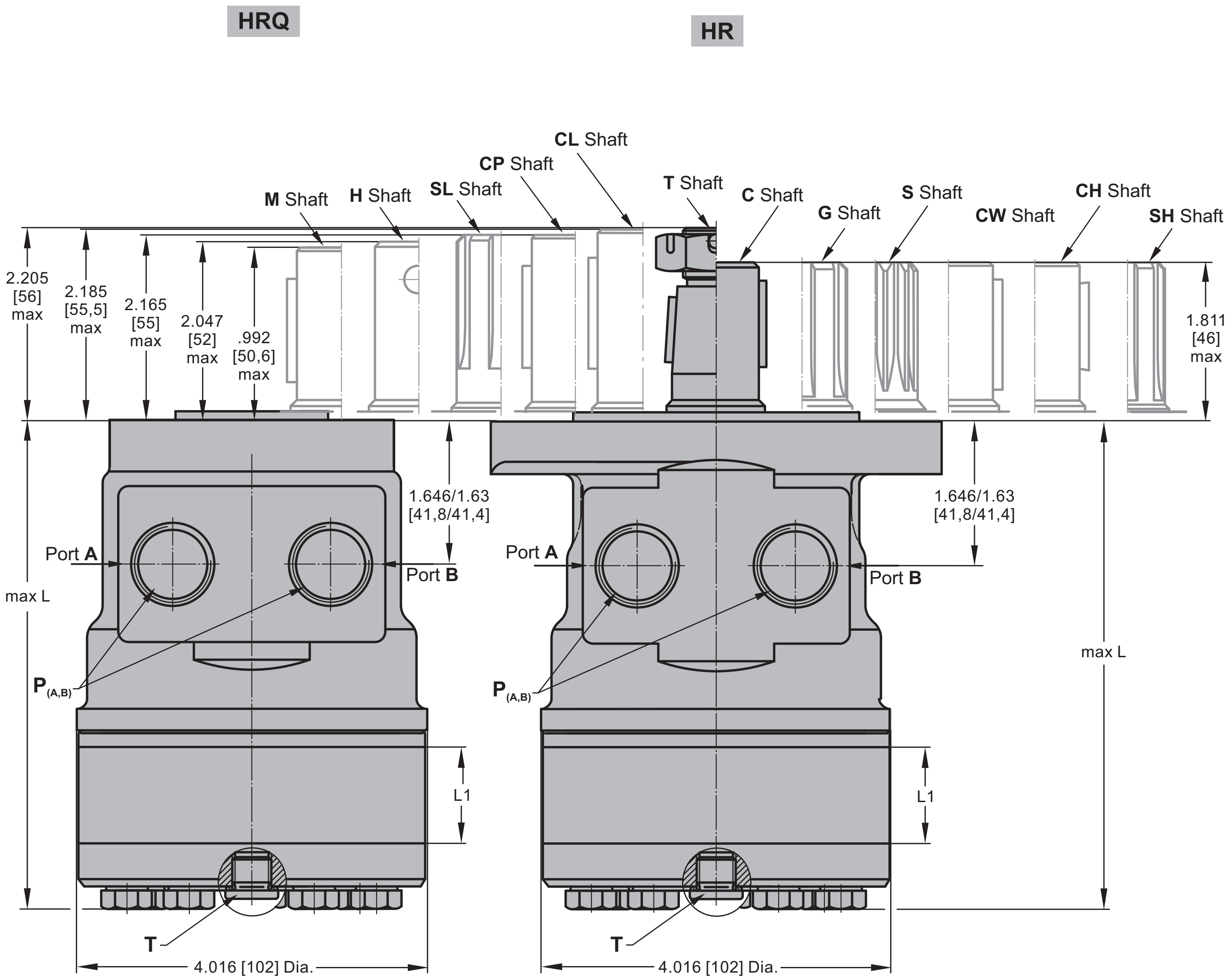
SPECIFICATION DATA

Type		HR 50	HR 80	HR 100	HR 125	HR 160	HR 200	HR 250	HR 315	HR 400
Displacement, in^3/rev [cm^3/rev]		3.14 [51,5]	4.90 [80,3]	6.09 [99,8]	7.48 [122,5]	9.37 [153,6]	11.95 [195,8]	14.95 [245]	18.67 [306]	23.56 [386]
Max. Speed, [RPM]	Cont.	777	747	601	490	391	306	245	196	155
	Int.*	971	934	752	612	488	383	306	245	194
Max. Torque, lb-in [daNm]	Cont.	870 [9,8]	1415 [16,0]	1725 [19,5]	2125 [24,0]	2655 [30,0]	3097 [35,0]	3275 [37,0]	3720 [42,0]	3980 [45,0]
	Int.*	1080 [12,2]	1680 [19,0]	2090 [23,6]	2570 [29,0]	3220 [36,4]	3640 [41,1]	3965 [44,8]	4380 [49,5]	4560 [51,5]
	Peak**	1260 [14,2]	1965 [22.2]	2435 [27,5]	2990 [33,8]	3750 [42,4]	4780 [54,0]	4790 [54,1]	5310 [60,0]	5445 [61,5]
Max. Output, HP [kW]	Cont.	8.7 [6,5]	13.1 [9,8]	13.1 [9,8]	13.1 [9,8]	13.1 [9,8]	11.7 [8,7]	9.8 [7,3]	9.4 [7,0]	7.9 [5,9]
	Int.*	10.9 [8,1]	16.2 [12,1]	16.2 [12,1]	16.2 [12,1]	16.2 [12,1]	14.3 [10,7]	12.5 [9,3]	10.6 [7,9]	8.9 [6,6]
Max. Pressure Drop, PSI [bar]	Cont.	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]	1885 [130]	1595 [110]	1450 [100]	1235 [85]
	Int.*	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2250 [155]	1960 [135]	1740 [120]	1450 [100]
	Peak**	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	2610 [180]	2320 [160]	1880 [130]
Max. Oil Flow, GPM [lpm]	Cont.	10.5 [40]	15.9 [60]	15.9 [60]	15.9 [60]	15.9 [60]	15.9 [60]	15.9 [60]	15.9 [60]	15.9 [60]
	Int.*	13.2 [50]	20 [75]	20 [75]	20 [75]	20 [75]	20 [75]	20 [75]	20 [75]	20 [75]
Max. Inlet Pressure, PSI [bar]	Cont.	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]
	Int.*	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]
	Peak**	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]
Max. Return Pressure with Drain Line, PSI [bar]	Cont.	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]
	Int.*	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]
	Peak**	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]
Max. Starting Pressure with Unloaded Shaft, PSI [bar]		145 [10]	145 [10]	145 [10]	145 [10]	145 [10]	145 [10]	102 [7]	102 [7]	102 [7]
Min. Starting Torque, lb-in [daNm]	At max.press. drop Cont.	710 [7,9]	1090 [12,3]	1355 [15,3]	1665 [18,8]	2090 [23,6]	2370 [26,8]	2495 [28,2]	2965 [33,5]	3190 [36,0]
	At max.press. drop Int.*	870 [9,8]	1345 [15,2]	1670 [18,9]	2055 [23,2]	2575 [29,1]	2910 [32,9]	3170 [35,8]	3375 [38,1]	3515 [39,7]
Min. Speed*, [RPM]**		10	10	10	10	10	10	10	10	10
Weight, lb [kg]	HR	13.45 [6,1]	14.11 [6,4]	14.55 [6,6]	14.55 [6,6]	15.21 [6,9]	15.87 [7,2]	16.53 [7,5]	17.64 [8,0]	18.96 [8,6]
	HRQ	12.57 [5,7]	13.23 [6,0]	13.67 [6,2]	13.67 [6,2]	14.33 [6,5]	14.77 [6,7]	15.65 [7,1]	16.76 [7,6]	18.08 [8,2]

* Intermittent operation: the permissible values may occur for max. 10% of every minute.
** Peak load: the permissible values may occur for max. 1% of every minute.
*** For speeds lower than given, consult factory or your regional manager.

1. Intermittent speed and intermittent pressure must not occur simultaneously.
2. Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
3. Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP (DIN51524) or HM (ISO 6743/4). If using synthetic fluids consult the factory for alternative seal materials.
4. Recommended minimum oil viscosity 70 SUS [13 mm²/s] at 122°F [50°C].
5. Recommended maximum system operating temperature is 180°F [82°C].
6. To assure optimum motor life fill with fluid prior to loading and run at moderate load and speed for 10-15 minutes.

DIMENSIONS and MOUNTING DATA for HR



Shaft Dim.
See Page 60 and 61

Standard Rotation
Viewed from Shaft End
Port **A** Pressurized - **CW**
Port **B** Pressurized - **CCW**

Reverse Rotation
Viewed from Shaft End
Port **A** Pressurized - **CCW**
Port **B** Pressurized - **CW**

Type	Lmax, in [mm]	L_1, in [mm]
HR(Q) 50	4.85 [123,3]	.35 [9,0]
HR(Q) 80	5.05 [128,3]	.55 [14,0]
HR(Q) 100	5.19 [131,7]	.69 [17,4]
HR(Q) 125	5.19 [131,7]	.69 [17,4]
HR(Q) 160	5.36 [136,1]	.86 [21,8]
HR(Q) 200	5.59 [142,1]	1.09 [27,8]
HR(Q) 250	5.87 [149,1]	1.37 [34,8]
HR(Q) 315	6.21 [157,8]	1.71 [43,5]
HR(Q) 400	6.66 [169,1]	2.16 [54,8]

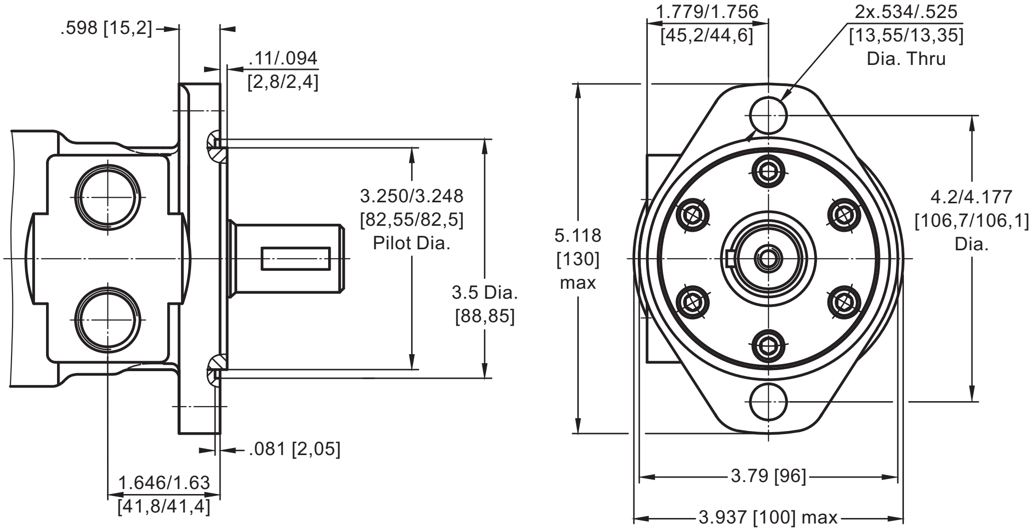
Flange Dim.
See Page 67

Port Dim.
See Page 67

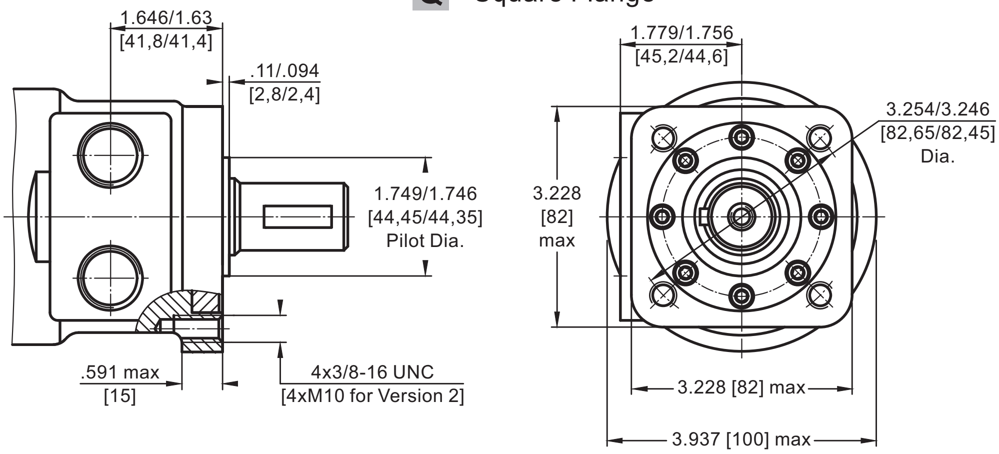
in [mm]

MOUNTING

SAE A Flange



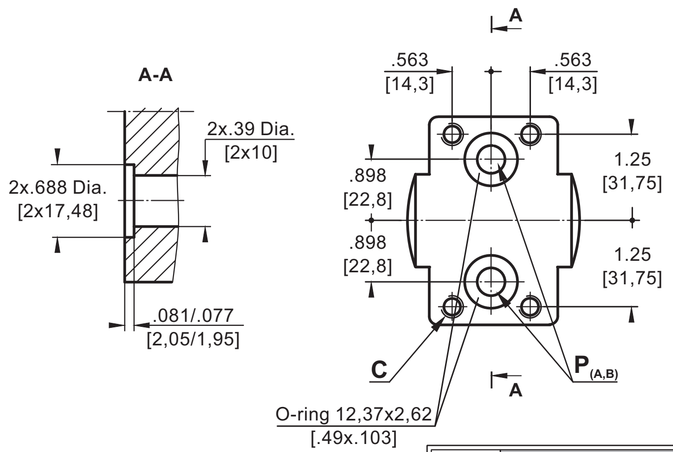
Q - Square Flange



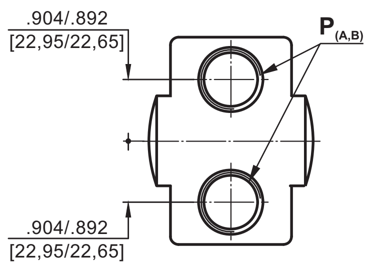
PORTS

Side Ports

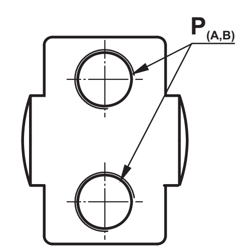
Version 1, 3



Version 4



Version 2, 5



	Versions				
	1	2	3	4	5
C	4x5⁄16 - 18 UNF	-	4xM8	-	-
$P_{(A,B)}$	2x.39 Dia. [2x10]	2xG½	2x.39 Dia. [2x10]	2x7⁄8 - 14 UNF	2x½ - 14 NPTF
T	7⁄16 - 20 UNF	G¼	7⁄16 - 20 UNF	7⁄16 - 20 UNF	7⁄16 - 20 UNF

in [mm]

ORDER CODE

	1	2	3	4	5	6	7	8	9
HR					U				

Pos.1 - Mounting Flange

omit - SAE A, two holes
Q - Square, four bolts

Pos.2 - Displacement code*

50 - 3.14 in^3/rev [51,5 cm^3/rev]
80 - 4.90 in^3/rev [80,3 cm^3/rev]
100 - 6.09 in^3/rev [99,8 cm^3/rev]
125 - 7.48 in^3/rev [122,5 cm^3/rev]
160 - 9.37 in^3/rev [153,6 cm^3/rev]
200 - 11.95 in^3/rev [195,8 cm^3/rev]
250 - 14.95 in^3/rev [245,0 cm^3/rev]
315 - 18.67 in^3/rev [306,0 cm^3/rev]
400 - 23.56 in^3/rev [386,0 cm^3/rev]

Pos.3 - Shaft Extensions** [see pages 60 and 61]

C - 1" [25,4] straight, Woodruff key
G - 1" [25,4] SAE 6B Splined
H - 1" [25,4] straight, w/.315 [8] Cross-hole
S - 7/8" [22,2] 13T Splined
T - 1" [25,4] SAE J501 Tapered
M - ø 25 straight, Parallel key A8x7x32 DIN 6885
CP - ø 25 straight, Parallel key A8x7x32 DIN 6885
CL - 1" [25,4] straight, Parallel key 1/4"x1/4"x11/4" BS46
CW - ø 25 straight, Parallel key A8x7x32 DIN 6885
CH - ø25 straight, Woodruff key 1/4"x1" SAE J502
SH - 1" [25,4], SAE 6B Splined
SL - 1" [25,4], SAE 6B Splined

Pos.4 - Port Size/Type [standard manifold to each]

1 - side ports, Manifold [5/16-18 UNC Mounting Threads], 7/16-20 UNF
2 - side ports, 2xG1/2, G1/4
3 - side ports, Manifold [M8 Mounting Threads], 7/16-20 UNF
4 - side ports, 2x7/8-14 UNF, O-ring, 7/16-20 UNF
5 - side ports, 2x1/2-14 NPTF, 7/16-20 UNF

Pos.5 - Shaft Seal Version [see page 62]

U - high pressure shaft seal

Pos.6 - Check Valves

omit - without check valves
K - with check valves

Pos.7 - Drain Port

omit - with drain port
1 - without drain port

Pos.8 - Special Features [see page 110]

Pos.9 - Design Series

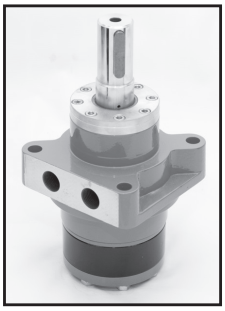
omit - Factory specified

NOTES:

* For the Function Diagrams please look at "M+S Hydraulic" Catalogue for MLHR motors, pages 36÷40.
** The permissible output torque for shafts must not be exceeded!

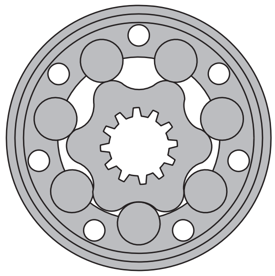
The hydraulic motors are mangano-phosphatized as standard.

HYDRAULIC MOTORS MLHRW



APPLICATION

- » Conveyors
- » Feeding mechanism of robots and manipulators
- » Metal working machines
- » Textile machines
- » Agricultural machines
- » Food industries
- » Grass cutting machinery etc.



CONTENTS

OPTIONS

- » Model - Spool valve, roll-gerotor
- » Wheel mount
- » Shafts - straight and tapered
- » Shaft seal for high and low pressure
- » SAE, Metric and BSPP ports
- » Other special features

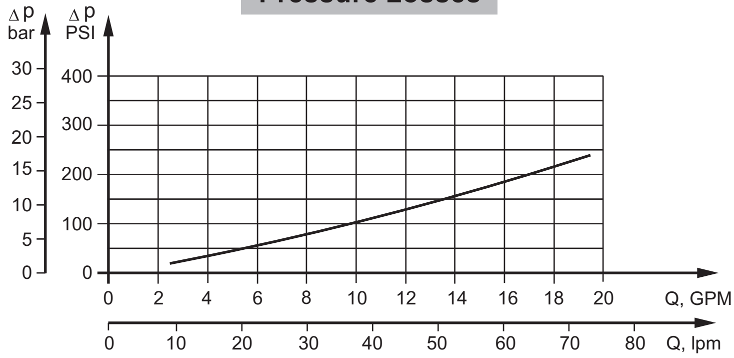
GENERAL

Max. Displacement,	in^3/rev [cm^3/rev]	24.4 [397]
Max. Speed,	[RPM]	1029
Max. Torque,	lb-in [daNm]	cont.: 5400 [61] int.: 6100 [69]
Max. Output,	HP [kW]	20.1 [15]
Max. Pressure Drop,	PSI [bar]	cont.: 2540 [175] int.: 2900 [200]
Max. Oil Flow,	GPM [lpm]	19.8 [90]
Min. Speed,	[RPM]	10
Pressure fluid		Mineral based - HLP (DIN 51524) or HM (ISO 6743/4)
Temperature range,	^oF [^oC]	-40 ÷ 284 [-40 ÷ 140]
Optimal Viscosity range,	SUS [mm^2/s]	98 ÷ 347 [20 ÷ 75]
Filtration		ISO code: 18/16/13 According to ISO 4406-1999

Oil flow in drain line

Pressure drop bar [PSI]	Viscosity mm^2/s [SUS]	Oil flow in drain line lpm [GPM]
100 [1450]	20 [98]	2,5 [.660]
	35 [164]	1,8 [.476]
140 [2030]	20 [98]	3,5 [.925]
	35 [164]	2,8 [.740]

Pressure Losses



SPECIFICATION DATA

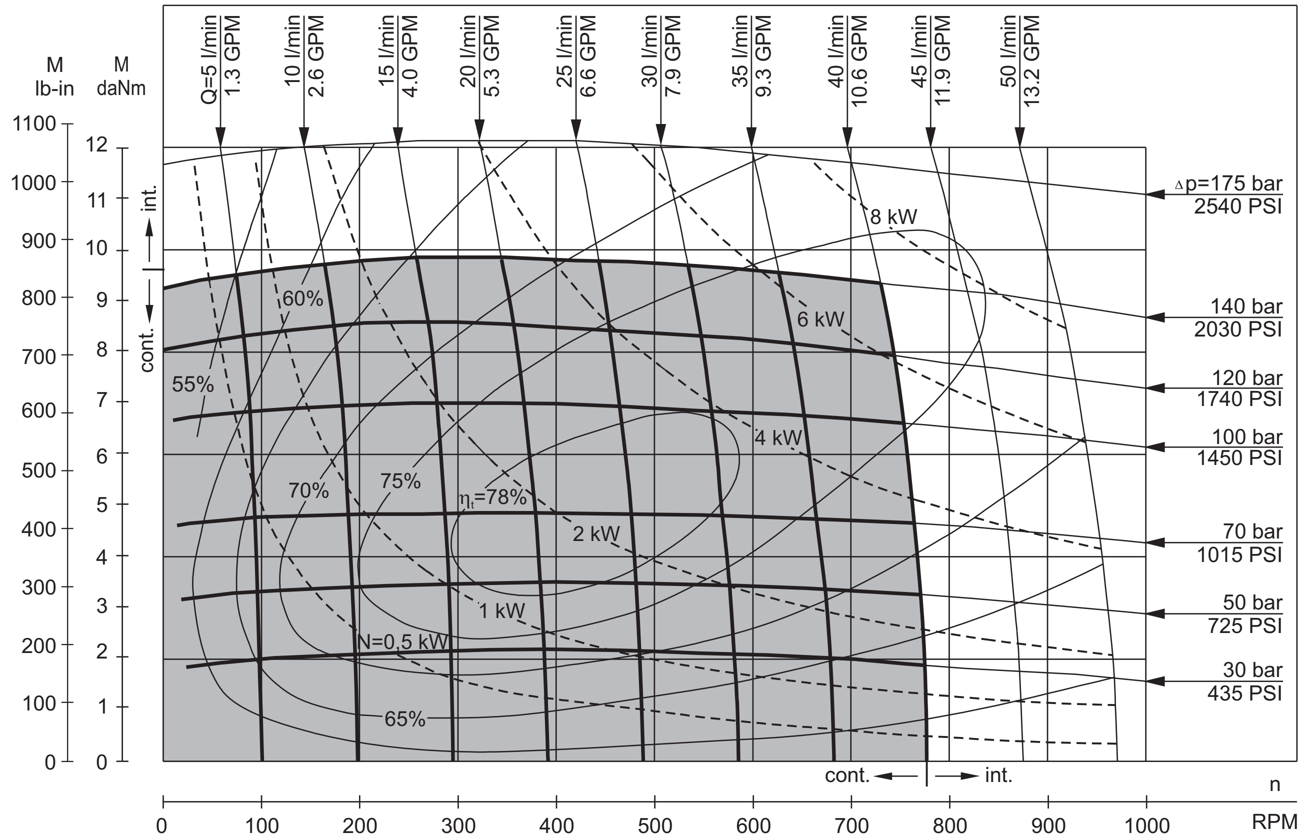
Type		MLHRW 50	MLHRW 80	MLHRW 100	MLHRW 125	MLHRW 160	MLHRW 200	MLHRW 250	MLHRW 315	MLHRW 400
Displacement, in³/rev [cm³/rev]		3.14 [51,5]	4.90 [80,3]	6.09 [99,8]	7.67 [125,7]	9.74 [159,6]	12.19 [199,8]	15.26 [250,1]	19.26 [315,7]	24.4 [397]
Max. Speed, [RPM]	Cont.	775	750	600	475	375	300	300	240	190
	Int.*	1029	940	750	600	470	375	360	285	226
Max. Torque, lb-in [daNm]	Cont.	900 [10]	1770 [20]	2125 [24]	2655 [30]	3450 [39]	4000 [45]	4780 [54]	4870 [55]	5400 [61]
	Int.*	1150 [13]	1947 [22]	2480 [28]	3010 [34]	3805 [43]	4425 [50]	5400 [61]	5580 [63]	6100 [69]
	Peak**	1505 [17]	2390 [27]	2832 [32]	3275 [37]	4070 [46]	4960 [56]	6280 [71]	7350 [83]	7700 [87]
Max. Output, HP [kW]	Cont.	9.5 [7]	17 [12,5]	17.4 [13]	16.8 [12,5]	15.4 [11,5]	14.8 [11]	13.4 [10]	12 [9]	10.5 [7,8]
	Int.*	11.9 [8,5]	20.1 [15]	20.1 [15]	19.5 [14,5]	18.8 [14]	17.4 [13]	16.1 [12]	14.8 [11]	14.2 [10,6]
Max. Pressure Drop, PSI [bar]	Cont.	2030 [140]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	1960 [135]	1600 [110]
	Int.*	2540 [175]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2320 [160]	2030 [140]
	Peak**	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3045 [210]	2540 [175]
Max. Oil Flow, GPM [lpm]	Cont.	11 [40]	15.9 [60]	15.9 [60]	15.9 [60]	15.9 [60]	15.9 [60]	19.8 [75]	19.8 [75]	19.8 [75]
	Int.*	13 [50]	19.8 [75]	19.8 [75]	19.8 [75]	19.8 [75]	19.8 [75]	23.8 [90]	23.8 [90]	23.8 [90]
Max. Inlet Pressure, PSI [bar]	Cont.	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]
	Int.*	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]
	Peak**	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]
Max. Return Pressure with Drain Line, PSI [bar]	Cont.	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]
	Int.*	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]
	Peak**	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]
Max. Starting Pressure with Unloaded Shaft, PSI [bar]		145 [10]	145 [10]	145 [10]	130 [9]	102 [7]	73 [5]	73 [5]	73 [5]	73 [5]
Min. Starting Torque, lb-in [daNm]	At max.press. drop Cont.	710 [8]	1330 [15]	1770 [20]	2215 [25]	2832 [32]	3630 [41]	4425 [50]	4425 [50]	4425 [50]
	At max.press. drop Int.*	885 [10]	1505 [17]	2035 [23]	2480 [28]	3275 [37]	4070 [46]	4870 [55]	5840 [66]	5400 [61]
Min. Speed*, [RPM]**		10	10	10	9	7	5	6	5	5
Weight, lb [kg]		21.2 [9,6]	21.4 [9,7]	21.7 [9,8]	22.1 [10,0]	22.7 [10,3]	23.8 [10,8]	24.9 [11,3]	26 [11,8]	27.63 [12,5]

* Intermittent operation: the permissible values may occur for max. 10% of every minute.
** Peak load: the permissible values may occur for max. 1% of every minute.
*** For speeds lower than given, consult factory or your regional manager.

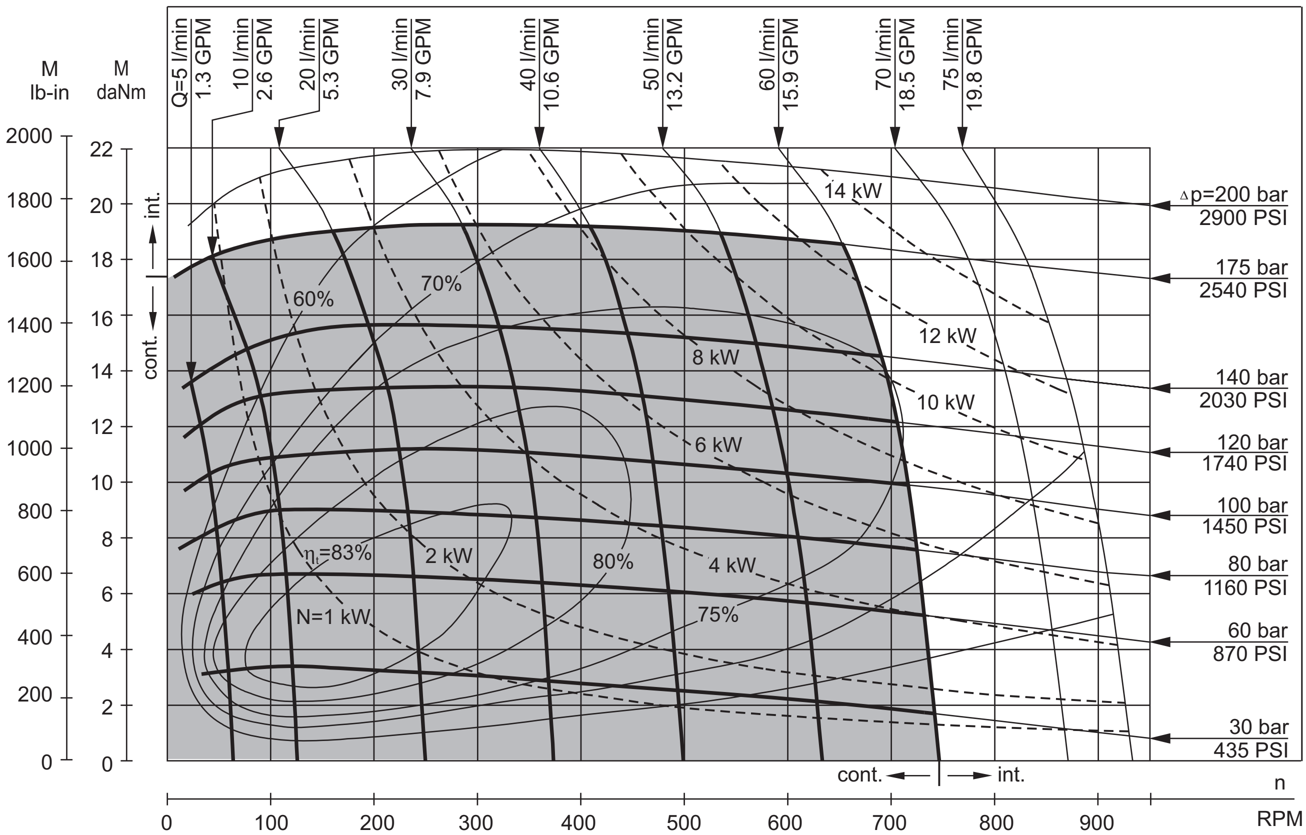
1. Intermittent speed and intermittent pressure must not occur simultaneously.
2. Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
3. Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP (DIN51524) or HM (ISO 6743/4). If using synthetic fluids consult the factory for alternative seal materials.
4. Recommended minimum oil viscosity 70 SUS [13 mm²/s] at 122°F [50°C].
5. Recommended maximum system operating temperature is 180°F [82°C].
6. To assure optimum motor life fill with fluid prior to loading and run at moderate load and speed for 10-15 minutes.

FUNCTION DIAGRAMS

MLHRW 50



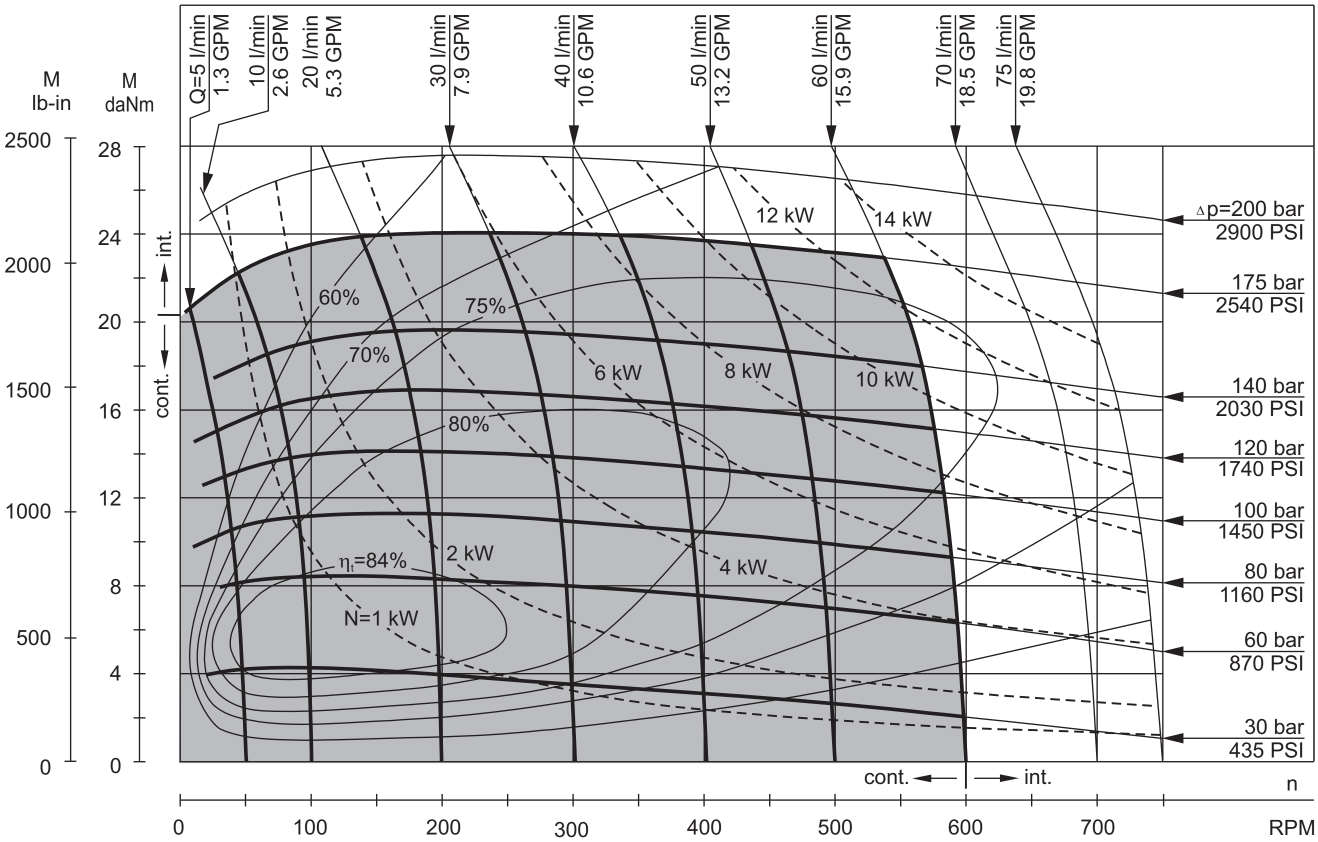
MLHRW 80



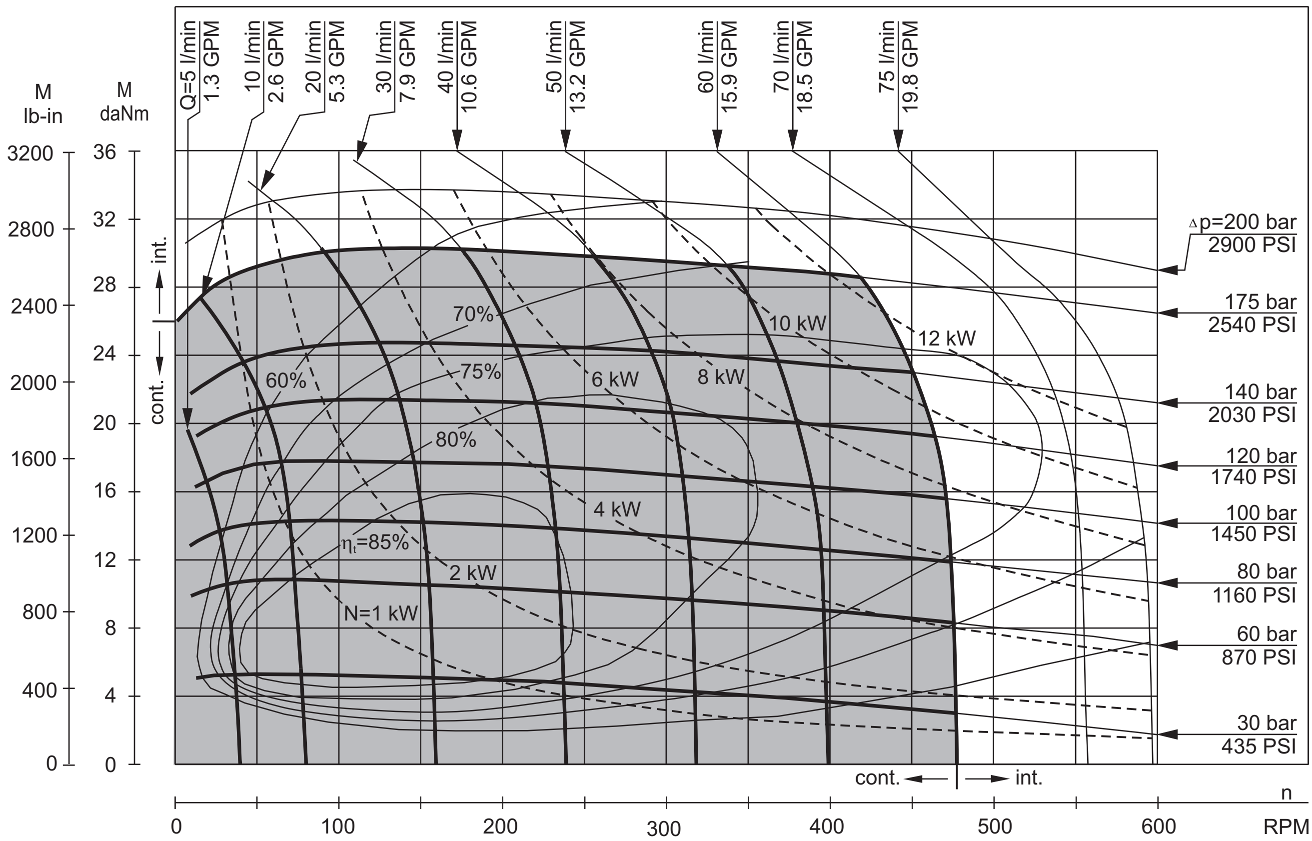
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5 PSI÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHRW 100



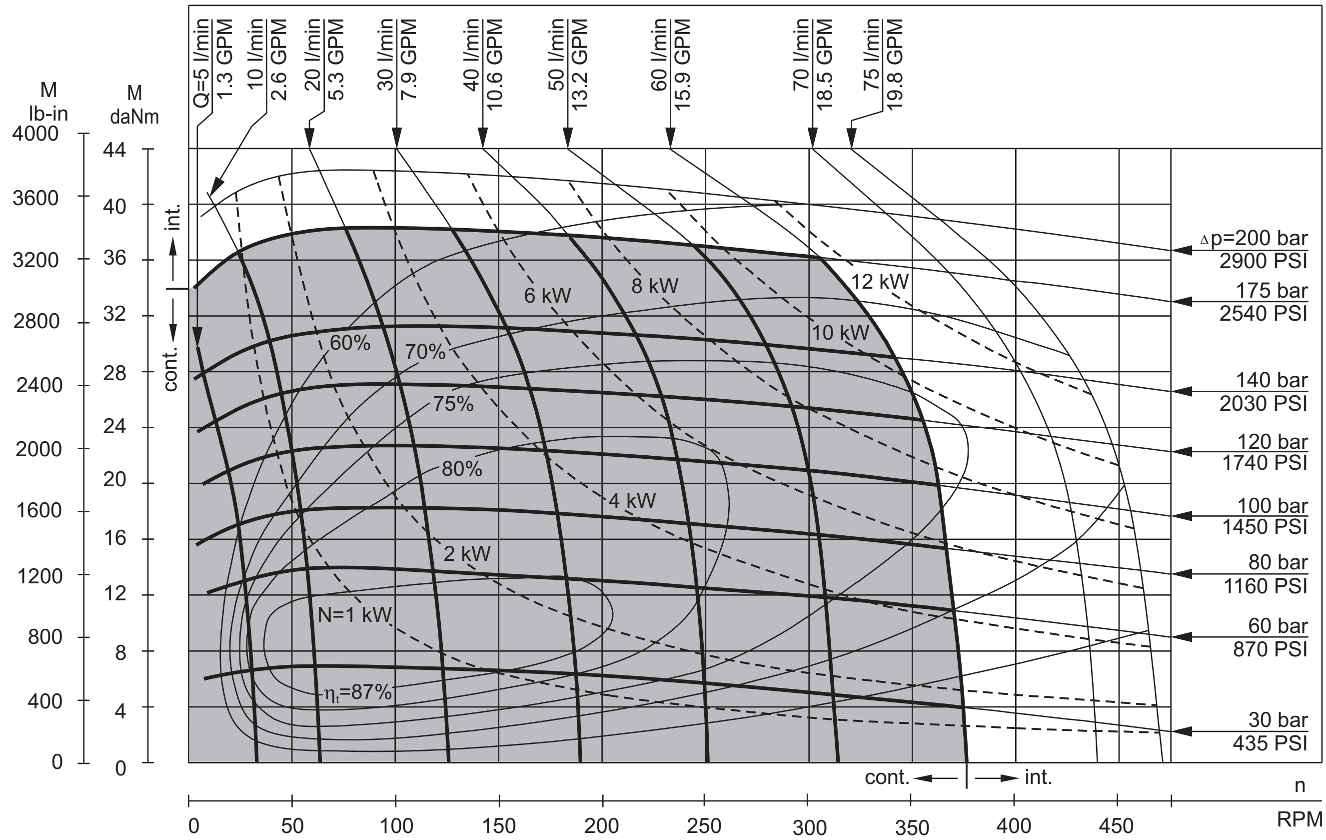
MLHRW 125



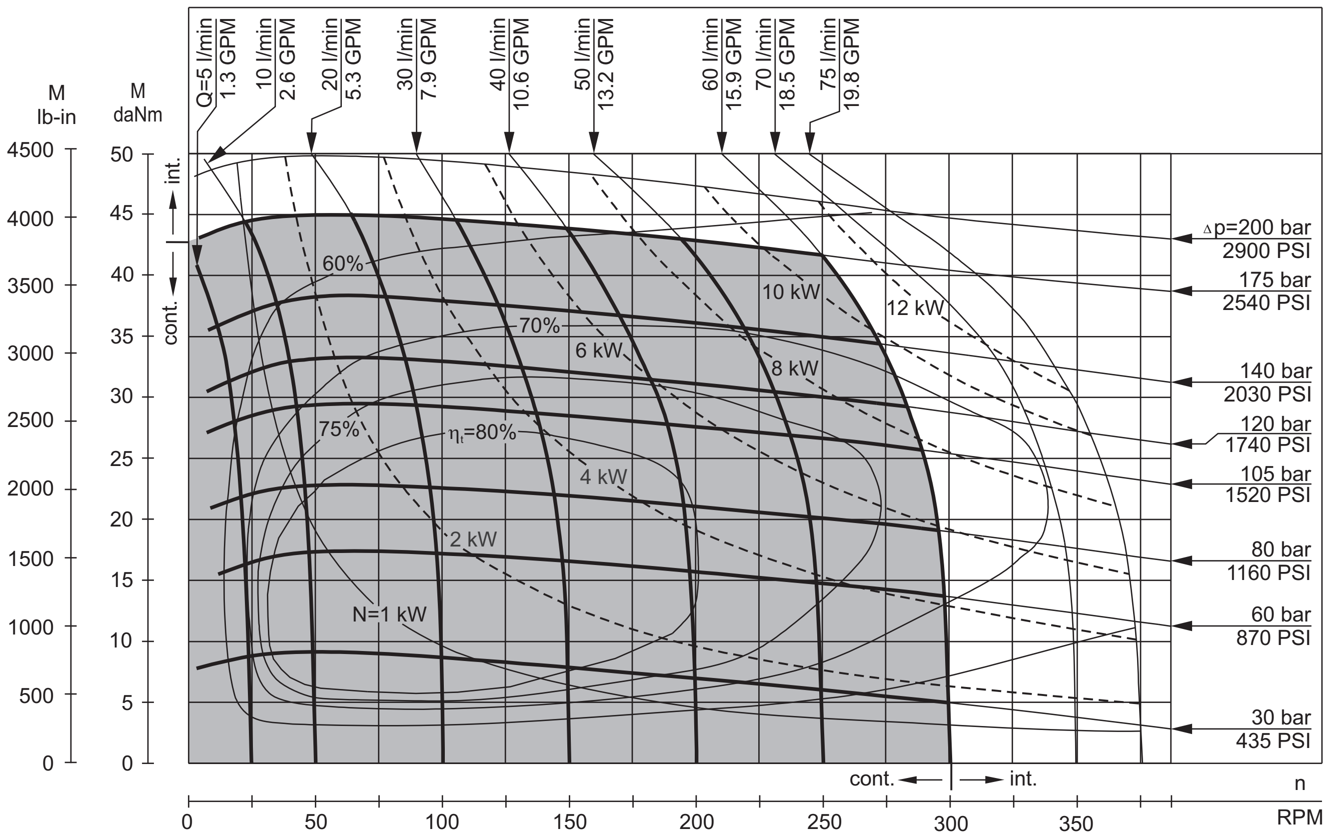
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5 PSI÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHRW 160



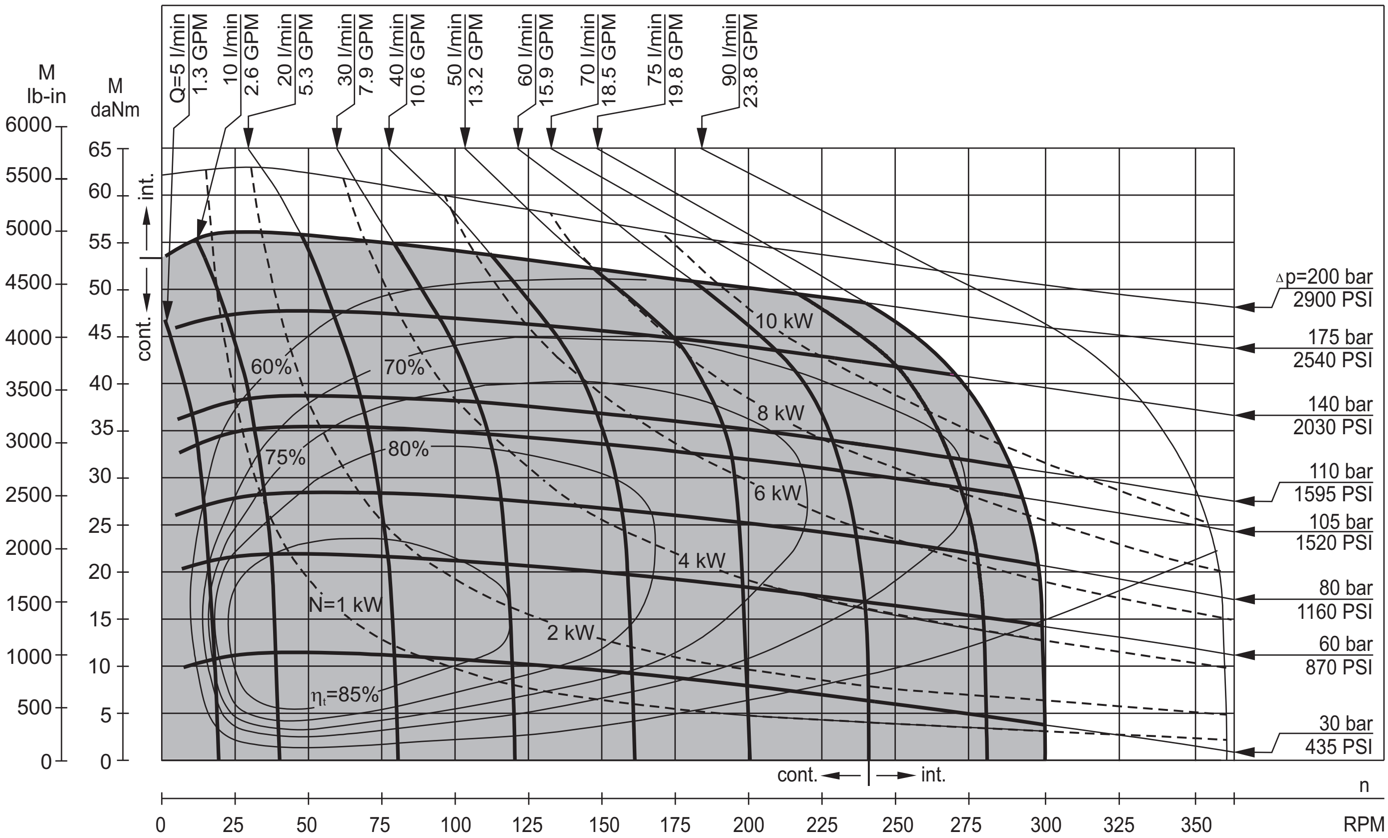
MLHRW 200



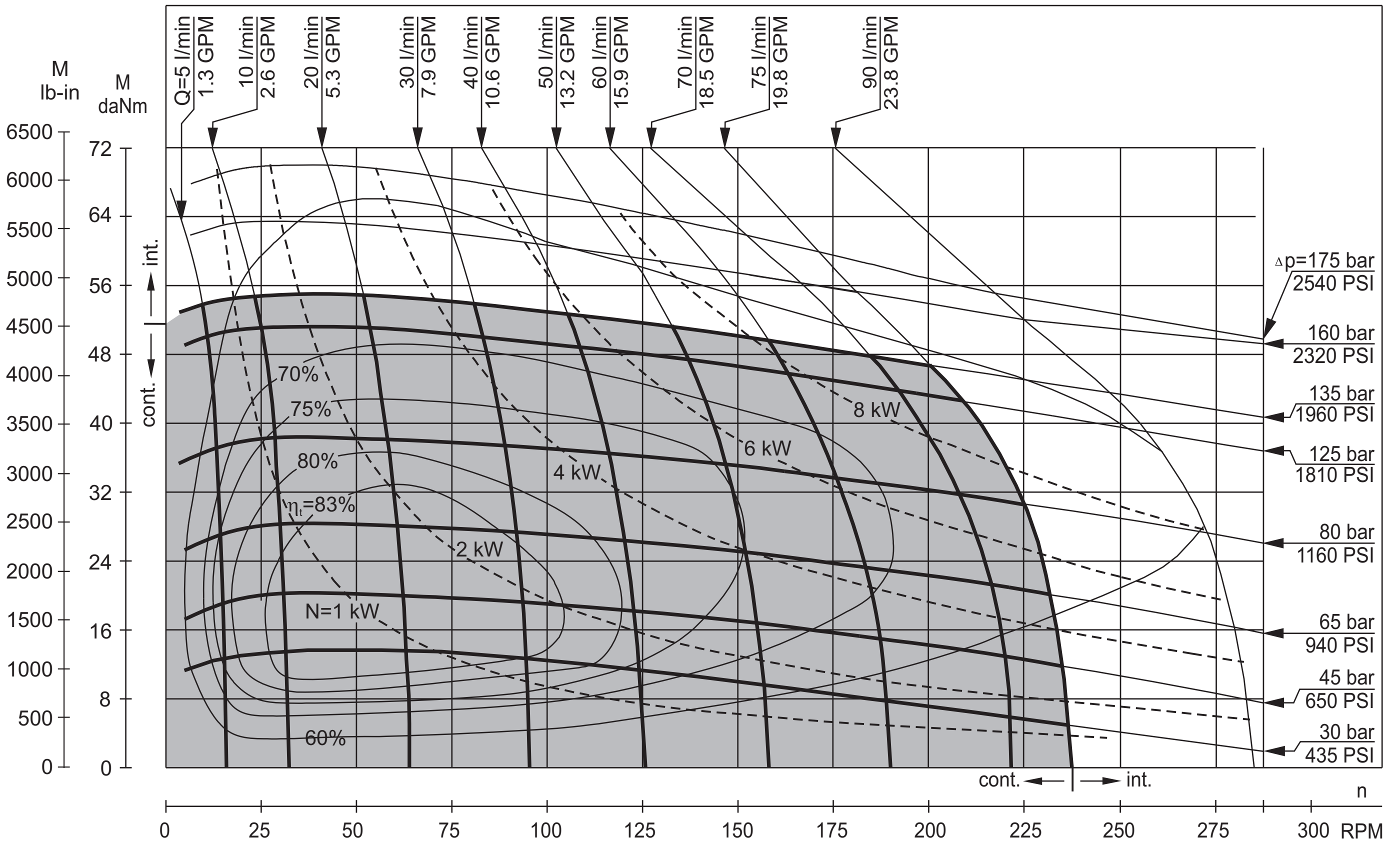
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5 PSI÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHRW 250



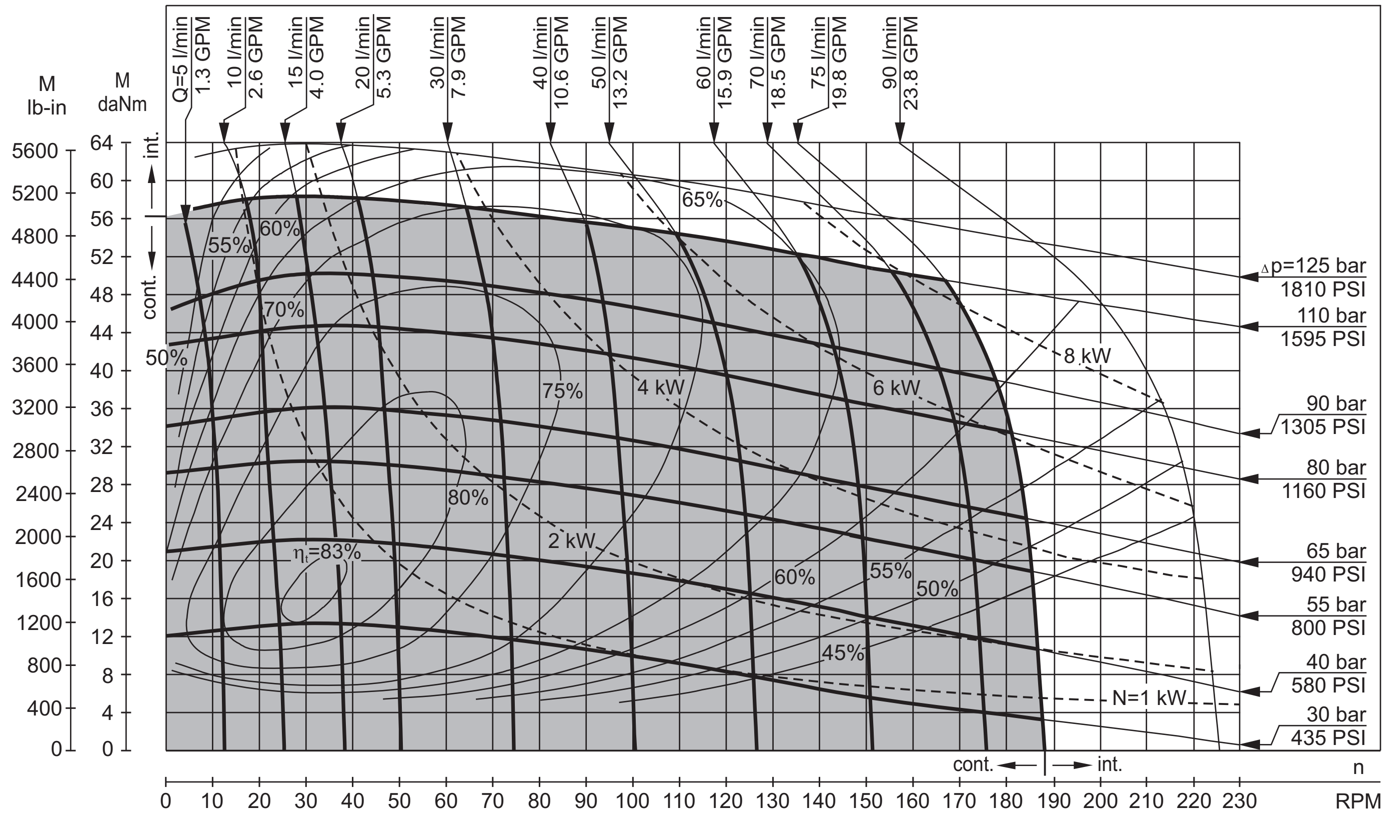
MLHRW 315



The function diagrams data is for average performance of randomly selected motors at back pressure 72.5 PSI÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHRW 400

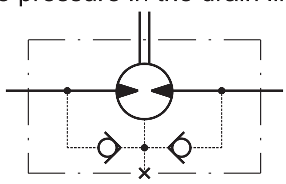


The function diagrams data is for average performance of randomly selected motors at back pressure 72.5 PSI÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

MAX. PERMISSIBLE SHAFT SEAL PRESSURE

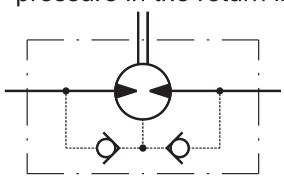
MLHRW...; MLHRW...UK motors with drain connection:

The shaft seal pressure equals the pressure in the drain line.



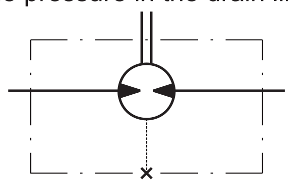
MLHRW...1 motors without drain connection:

The shaft seal pressure never exceeds the pressure in the return line.

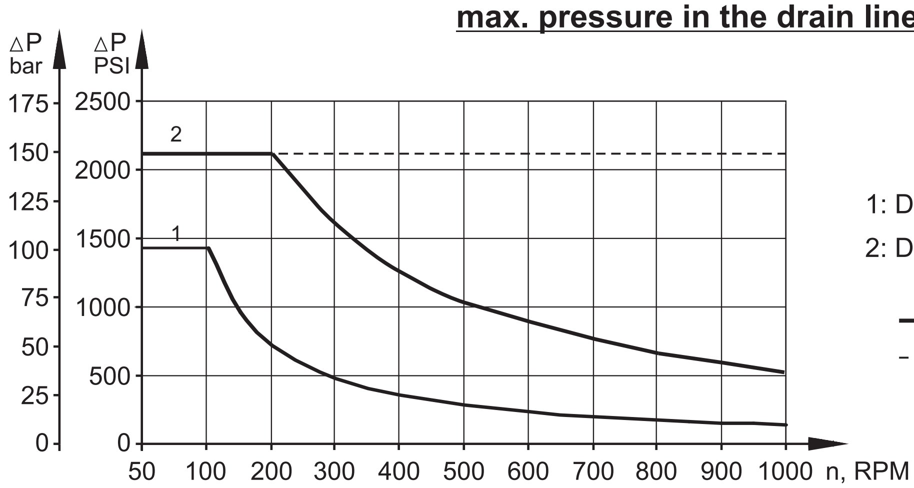


MLHRW...U motors with high pressure seal and drain connection:

The shaft seal pressure equals the pressure in the drain line.



Max. return pressure without drain line or max. pressure in the drain line



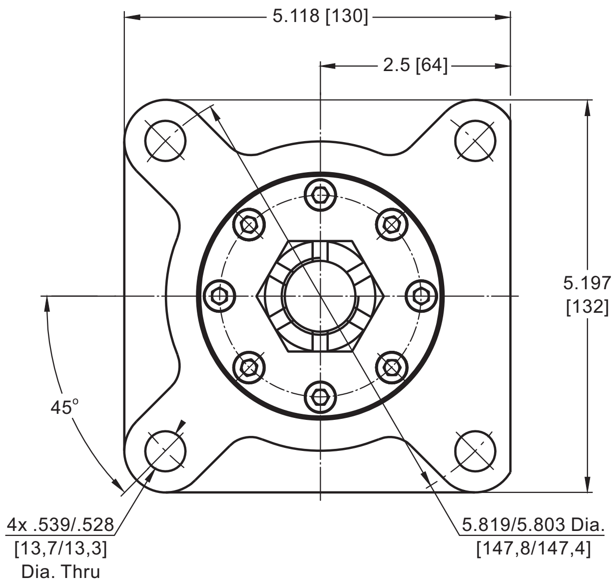
1: Drawing for Standard Shaft Seal

2: Drawing for High Pressure Seal (**"U"** Seal)

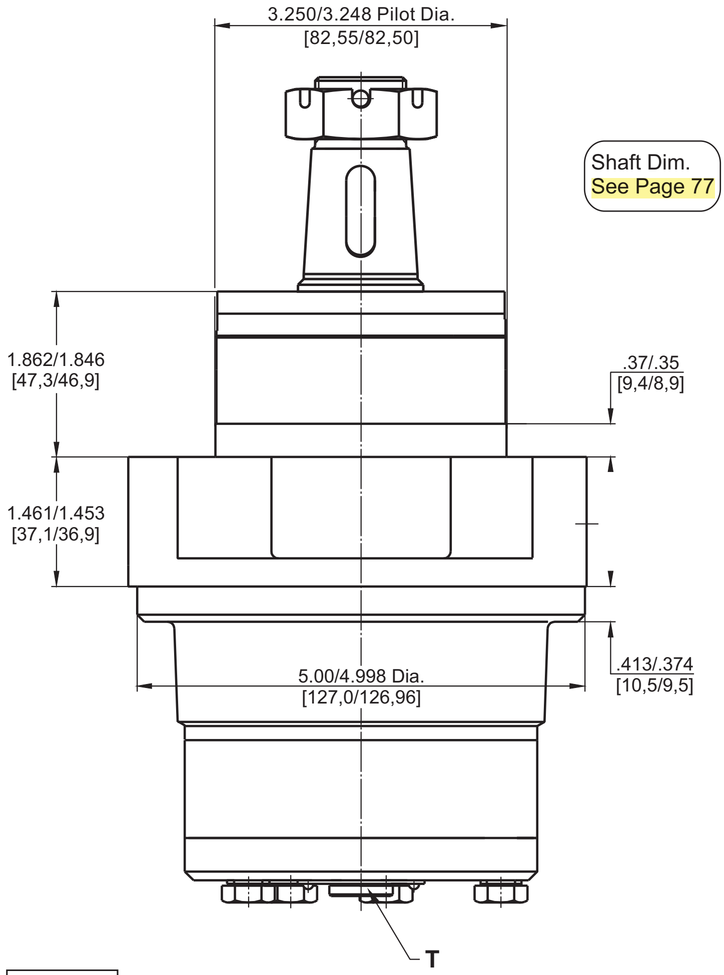
- continuous operations

- intermittent operations

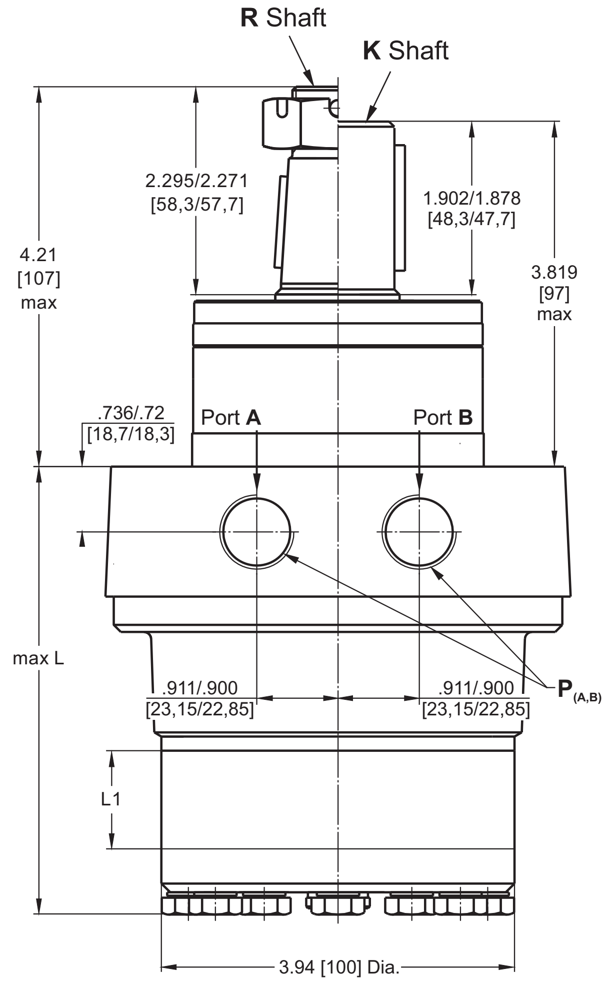
DIMENSIONS and MOUNTING DATA - MLHRW (WHEEL MOTOR)

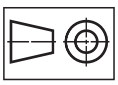


Type	Lmax, in [mm]	L1, in [mm]
MLHRW 50	4.25 [108,0]	.35 [9,0]
MLHRW 80	4.45 [113,0]	.55 [14,0]
MLHRW 100	4.59 [116,5]	.69 [17,4]
MLHRW 125	4.74 [120,5]	.86 [21,8]
MLHRW 160	4.98 [126,5]	1.09 [27,8]
MLHRW 200	5.26 [133,5]	1.37 [34,8]
MLHRW 250	5.61 [142,5]	1.71 [43,5]
MLHRW 315	6.04 [153,5]	2.16 [54,8]
MLHRW 400	6.63 [168,5]	2.16 [54,8]



Shaft Dim.
See Page 77





in [mm]

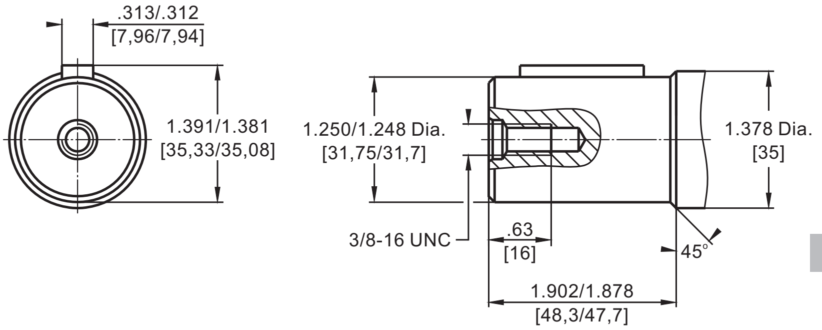
Standard Rotation
Viewed from Shaft End
Port A Pressurized - **CW**
Port B Pressurized - **CCW**

Reverse Rotation
Viewed from Shaft End
Port A Pressurized - **CCW**
Port B Pressurized - **CW**

	Versions	
	2	4
$P_{(A,B)}$	2xG½	2x⅞ - 14 UNF
T	G¼	7/16 - 20 UNF

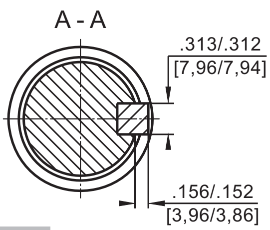
SHAFT EXTENSIONS

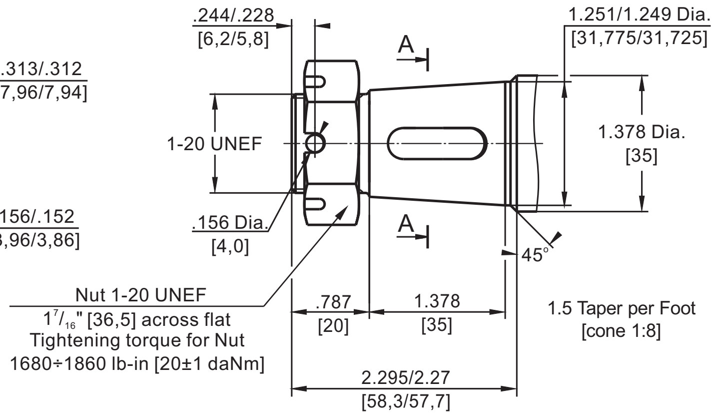
K - 1¼" [31,75] straight, Parallel key 5⁄16"x 5⁄16"x1¼" BS 46
Max. Torque 6815 lb-in [77 daNm]



Requirement max. Torque must be not exceeded.

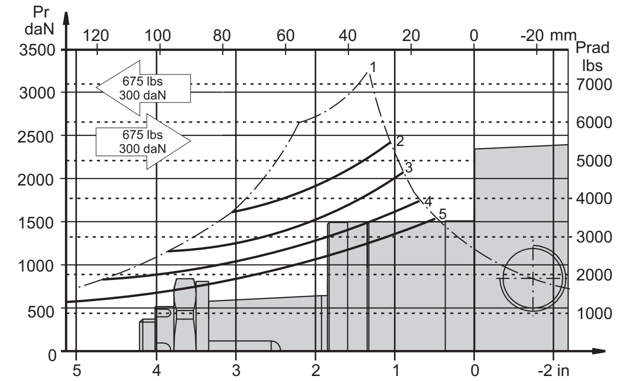
R - 1¼" [31,75] straight, SAE J501 Tapered, Parallel key 5⁄16"x 5⁄16"x1¼" BS 46
Max. Torque 6815 lb-in [77 daNm]



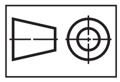


PERMISSIBLE SHAFT LOADS

The curve applies to a B10 bearing life of 2000 hours.



1. Permissible radial shaft load
2. Drawing by n= 50 rpm
3. Drawing by n=100 rpm
4. Drawing by n=200 rpm
5. Drawing by n=400 rpm



in [mm]

ORDER CODE

	1	2	3	4	5	6	7
MLHRW							

Pos.1 - Displacement code

50	- 3.14 in³/rev [51,5 cm³/rev]
80	- 4.90 in³/rev [80,3 cm³/rev]
100	- 6.09 in³/rev [99,8 cm³/rev]
125	- 7.67 in³/rev [125,7 cm³/rev]
160	- 9.74 in³/rev [159,6 cm³/rev]
200	- 12.19 in³/rev [199,8 cm³/rev]
250	- 15.26 in³/rev [250,1 cm³/rev]
315	- 19.26 in³/rev [315,7 cm³/rev]
400	- 24.40 in³/rev [397,0 cm³/rev]

Pos.2 - Shaft Extensions*

K	- 1¼" [31,75] straight, Parallel key
R	- 1¼" [31,75] SAE J501 Tapered

Pos.3 - Port Size/Type [standard manifold to each]

2	- side ports, 2xG1/2, G1/4, BSP thread, ISO 228
4	- side ports, 2x7/8-14 UNF, O-ring, 7/16-20 UNF

Pos.4 - Shaft Seal Version

omit	- Standard shaft seal
U	- High pressure shaft seal without check valves
UK	- High pressure shaft seal with check valves

Pos.5 - Drain Port

omit	- with drain port
1	- without drain port

Pos.6 - Special Features [see page 110]

Pos.7 - Design Series

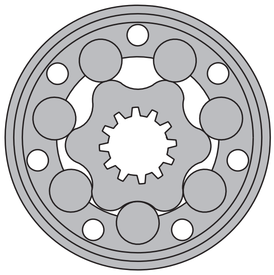
omit - Factory specified

NOTES: * The permissible output torque for shafts must not be exceeded!
The hydraulic motors are mangano-phosphatized as standard.

HYDRAULIC MOTORS MLHH

APPLICATION

» Conveyors
» Feeding mechanism of robots and manipulators
» Metal working machines
» Textile machines
» Agricultural machines
» Food industries
» Mining machinery etc.



CONTENTS

OPTIONS

» Model - Spool valve, roll-gerotor
» Flange mount
» Shafts - straight, splined and tapered
» SAE, Metric and BSPP ports
» Speed sensoring
» Other special features

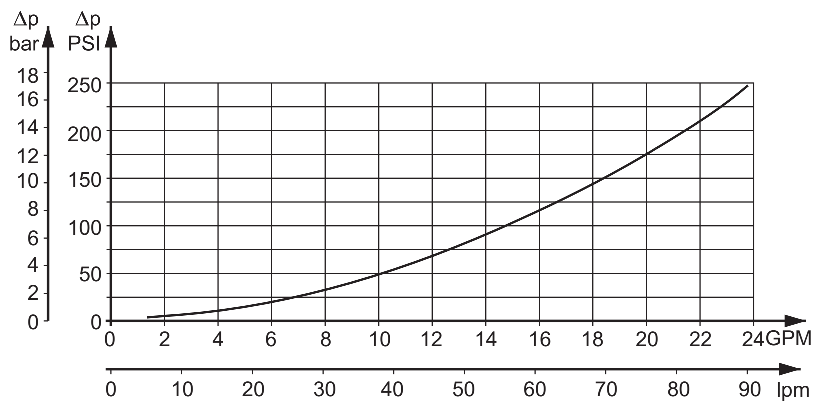
GENERAL

Max. Displacement, in^3/rev [cm^3/rev]	30.7 [502,4]
Max. Speed, [RPM]	445
Max. Torque, lb-in [daNm]	cont.: 7434 [84] int.: 9204 [104]
Max. Output, HP [kW]	24.8 [18,5]
Max. Pressure Drop, PSI [bar]	cont.: 2540 [175] int.: 2900 [200]
Max. Oil Flow, GPM [lpm]	23.9 [90]
Min. Speed, [RPM]	5
Pressure fluid	Mineral based - HLP(DIN 51524) or HM(ISO 6743/4)
Temperature range, °F [°C]	-40 ÷ 284 [-40 ÷ 140]
Optimal Viscosity range, SUS [mm^2/s]	98 ÷ 347 [20 ÷ 75]
Filtration	ISO code 20/16 (Min. recommended fluid filtration of 25 microns)

Oil flow in drain line

Pressure drop PSI [bar]	Viscosity SUS [mm^2/s]	Oil flow in drain line GPM [lpm]
1450 [100]	98 [20]	.660 [2,5]
	164 [35]	.476 [1,8]
2030 [140]	98 [20]	.925 [3,5]
	164 [35]	.740 [2,8]

Pressure Losses



SPECIFICATION DATA

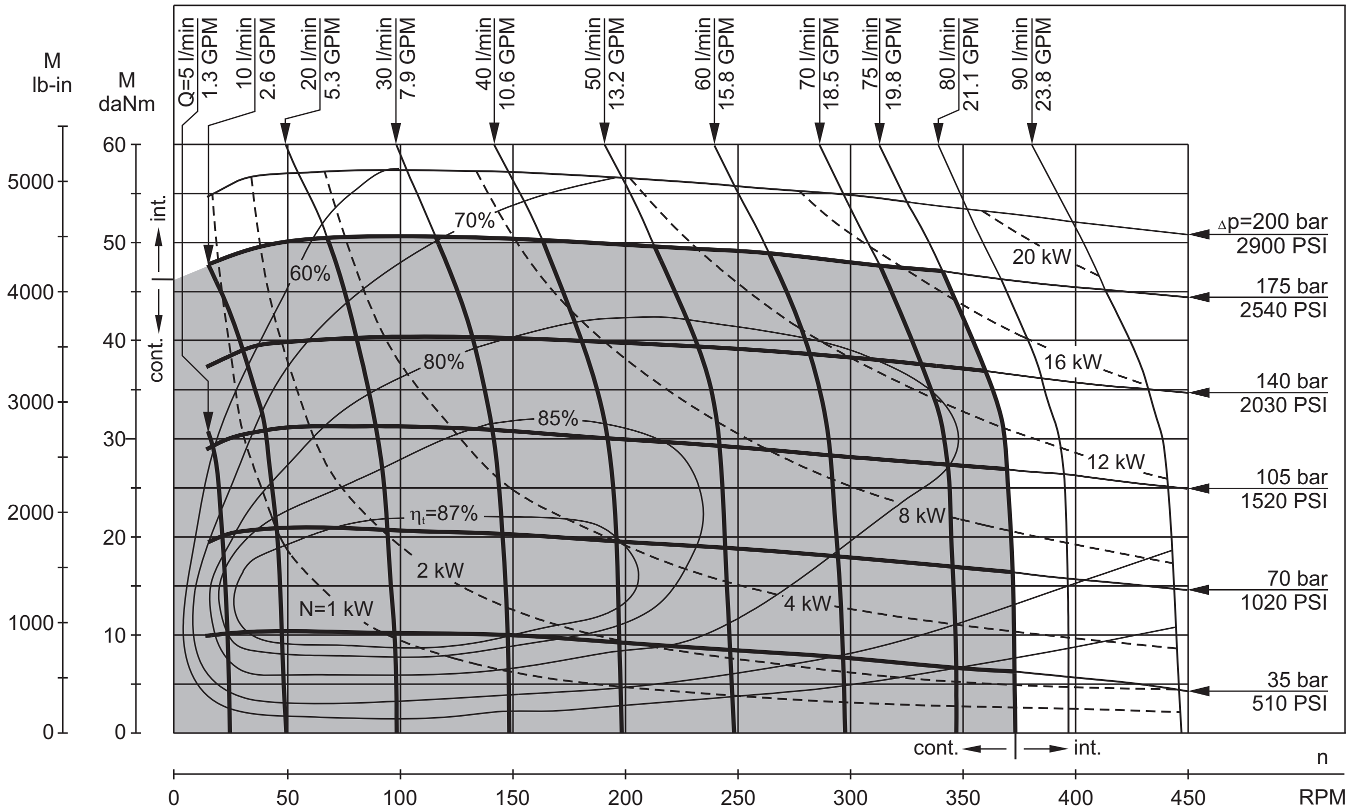
Type		MLHH 200	MLHH 250	MLHH 315	MLHH 400	MLHH 500
Displacement, in3/rev [cm3/rev]		12.3 [201,3]	15.4 [252]	19.2 [314,9]	24.2 [396,8]	30.7 [502,4]
Max. Speed, [RPM]	Cont.	370	295	235	185	150
	Int.*	445	350	285	225	180
Max. Torque, lb-in [daNm]	Cont.	4510 [51]	5398 [61]	6548 [74]	7434 [84]	7257 [82]
	Int.*	5130 [58]	6195 [70]	7257 [82]	8673 [98]	9204 [104]
	Peak**	5064 [64]	6992 [79]	8673 [98]	9647 [109]	10350 [117]
Max. Output, HP [kW]	Cont.	21 [16]	21 [16]	18.7 [14]	16.7 [12,5]	14.7 [11]
	Int.*	24.8 [18,5]	24.8 [18,5]	20.7 [15,5]	20.1 [15]	18.7 [14]
Max. Pressure Drop, PSI [bar]	Cont.	2540 [175]	2540 [175]	2540 [175]	2240 [155]	1740 [120]
	Int.*	2900 [200]	2900 [200]	2900 [200]	2750 [190]	2100 [145]
	Peak**	3260 [225]	3260 [225]	3260 [225]	3045 [210]	2390 [165]
Max. Oil Flow, GPM [lpm]	Cont.	19.8 [75]	19.8 [75]	19.8 [75]	19.8 [75]	19.8 [75]
	Int.*	23.9 [90]	23.9 [90]	23.9 [90]	23.9 [90]	23.9 [90]
Max. Inlet Pressure, PSI [bar]	Cont.	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]
	Int.*	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]
	Peak**	3626 [250]	3626 [250]	3626 [250]	3626 [250]	3626 [250]
Max. Starting Pressure with Unloaded Shaft, PSI [bar]		72 [5]	72 [5]	72 [5]	72 [5]	72 [5]
Min. Starting Torque, lb-in [daNm]	At max.press. drop Cont.	3450 [39]	4600 [52]	5840 [66]	6370 [72]	6370 [72]
	At max.press. drop Int.*	3980 [45]	5221 [59]	6460 [73]	7788 [88]	7788 [88]
Min. Speed***, [RPM]		10	10	8	5	5
Weight, lb [kg]		23.2 [10,5]	24.3 [11]	25.4 [11,5]	27.1 [12,3]	28.7 [13]

* Intermittent operation: the permissible values may occur for max. 10% of every minute.
** Peak load: the permissible values may occur for max. 1% of every minute.
*** For speeds lower than given, consult factory or your regional manager.

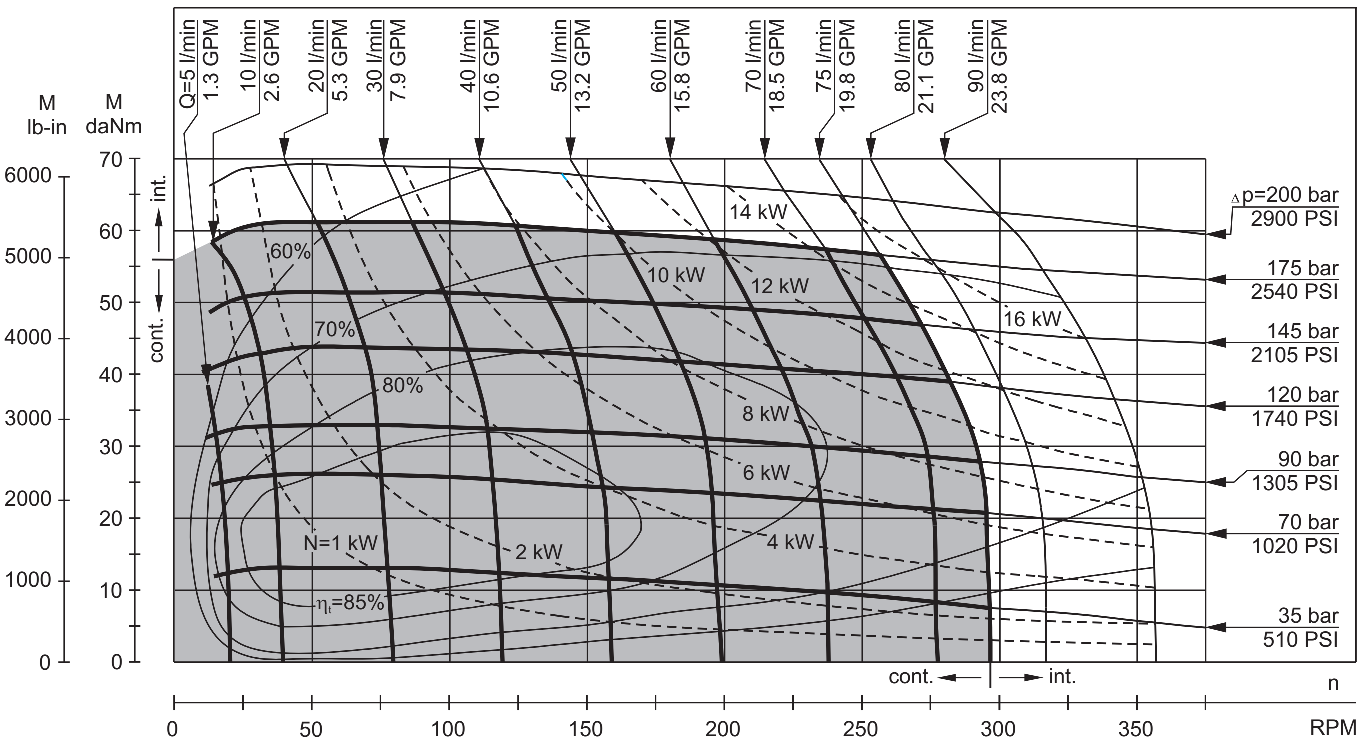
1) Intermittent speed and intermittent pressure must not occur simultaneously.
2) Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
3) Recommend using a premium quality, anti-wear type mineral based hydraulic oil, HLP(DIN51524) or HM(ISO6743/4). If using synthetic fluids consult the factory for alternative seal materials.
4) Recommended minimum oil viscosity 70 SUS [13 mm²/s] at 122ºF [50ºC].
5) Recommended maximum system operating temperature is 180ºF [82ºC].
6) To assure optimum motor life fill with fluid prior to loading and run at moderate load and speed for 10-15 minutes.

FUNCTION DIAGRAMS

MLHH 200



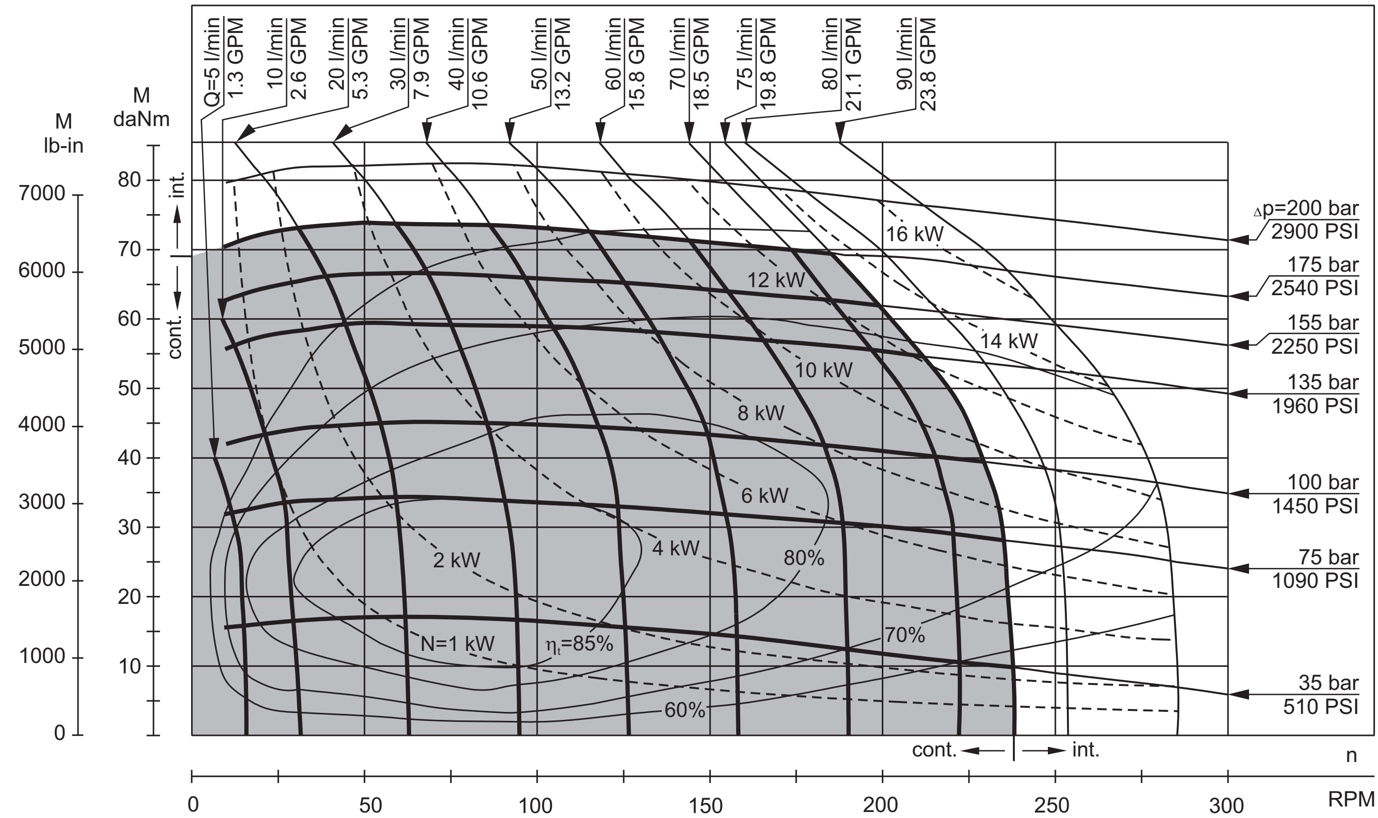
MLHH 250



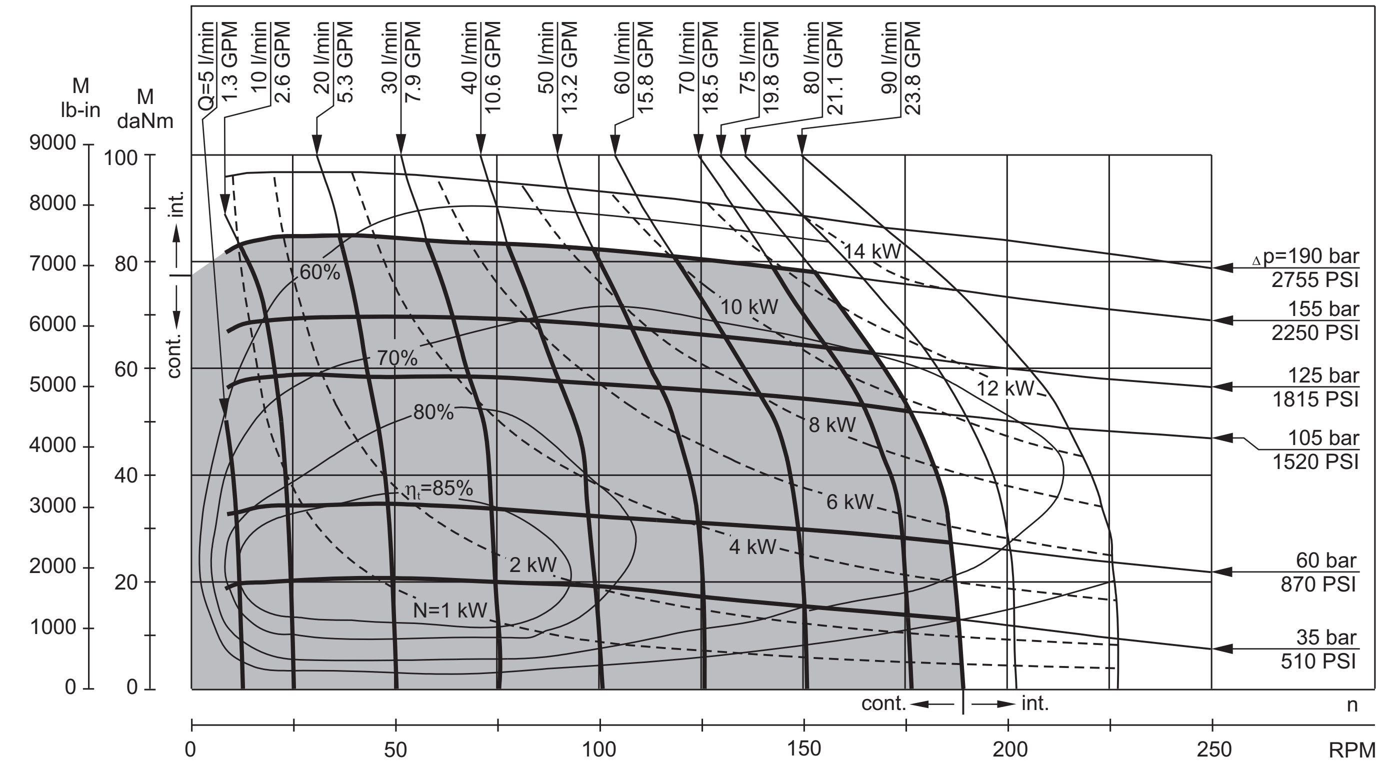
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5 PSI÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHH 315



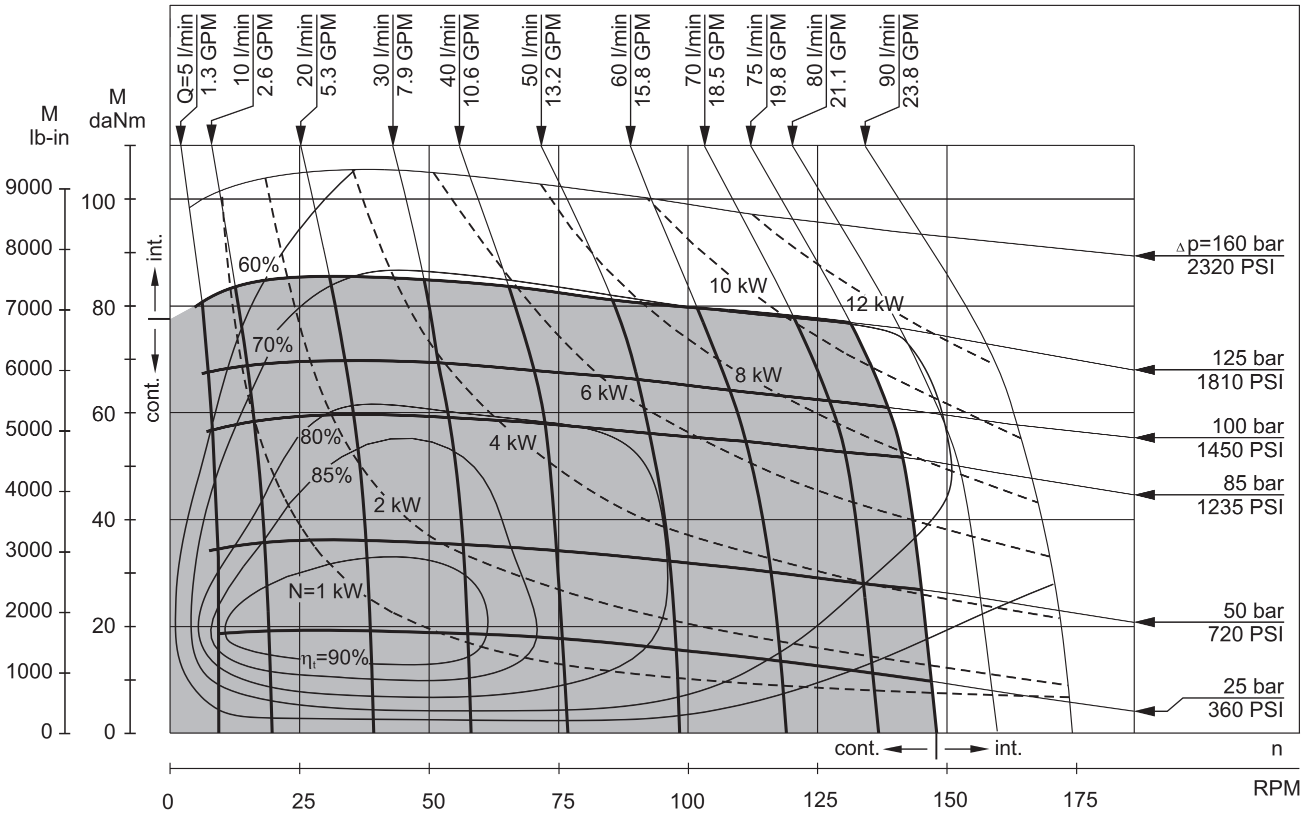
MLHH 400



The function diagrams data is for average performance of randomly selected motors at back pressure 72.5 PSI÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHH 500



The function diagrams data is for average performance of randomly selected motors at back pressure 72.5 PSI÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

PERMISSIBLE SHAFT LOADS

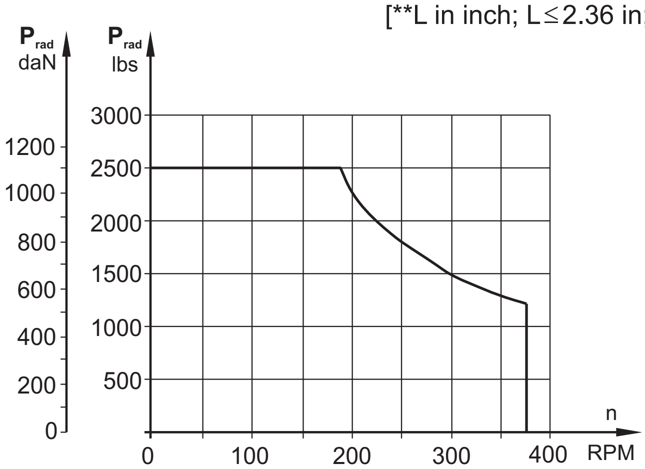
The permissible radial shaft load P_{rad} depends on the speed (RPM) and distance (L) from the point of load to the mounting flange.

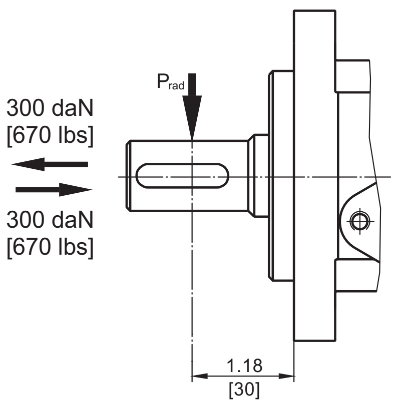
$$\text{Radial Shaft Load } P_{rad} = \frac{1100}{n} \times \frac{25000}{103{,}5+L}, \text{ daN*}$$

[*L in mm; L≤60 mm; n≥200 RPM]

$$\text{Radial Shaft Load } P_{rad} = \frac{1100}{RPM} \times \frac{2215}{4.075+L}, \text{ lbs**}$$

[**L in inch; L≤2.36 in; n≥200 RPM]





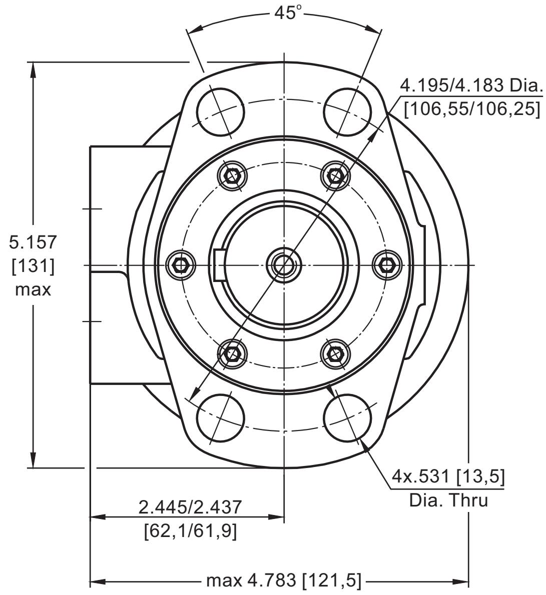
DIMENSIONS and MOUNTING DATA

Magneto mount (4 holes)

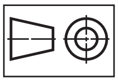
Type	L, in [mm]	L_1, in [mm]
MLHH 200	6.65 [169]	1.09 [27,8]
MLHH 250	6.93 [176]	1.37 [34,8]
MLHH 315	7.24 [184]	1.71 [43,5]
MLHH 400	7.72 [196]	2.16 [54,8]
MLHH 500	8.31 [211]	2.73 [69,4]

Standard Rotation
Viewed from Shaft End
Port **A** Pressurized - **CW**
Port **B** Pressurized - **CCW**

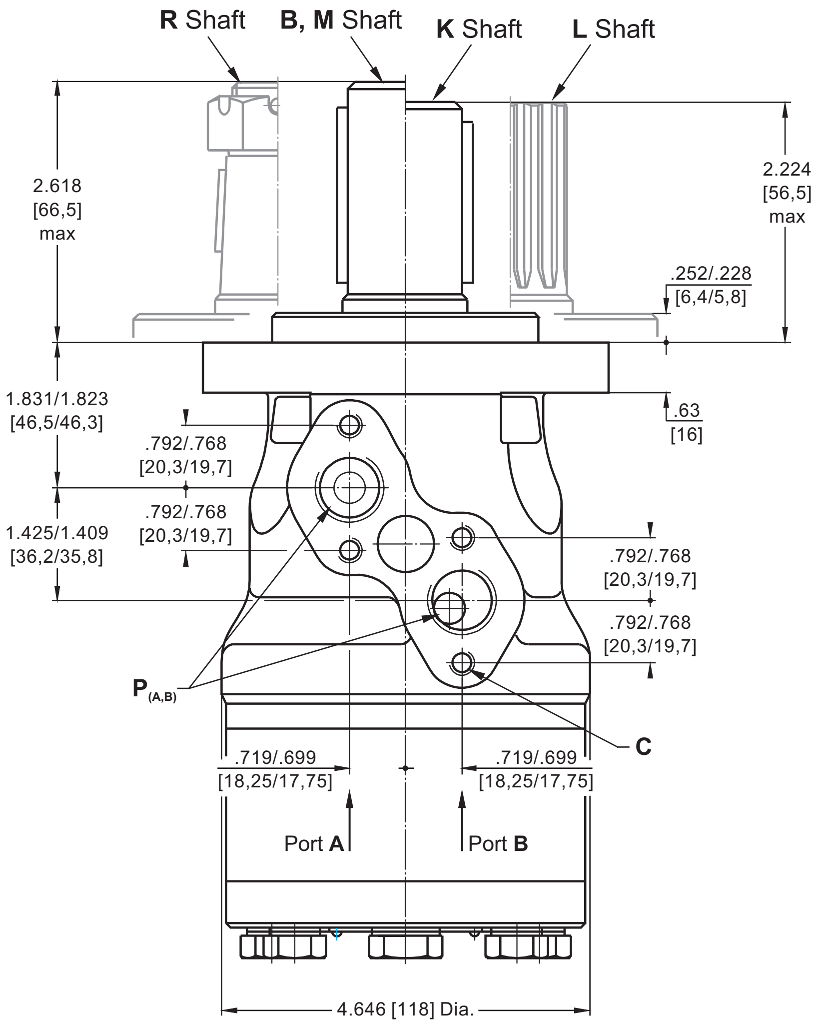
Reverse Rotation
Viewed from Shaft End
Port **A** Pressurized - **CCW**
Port **B** Pressurized - **CW**

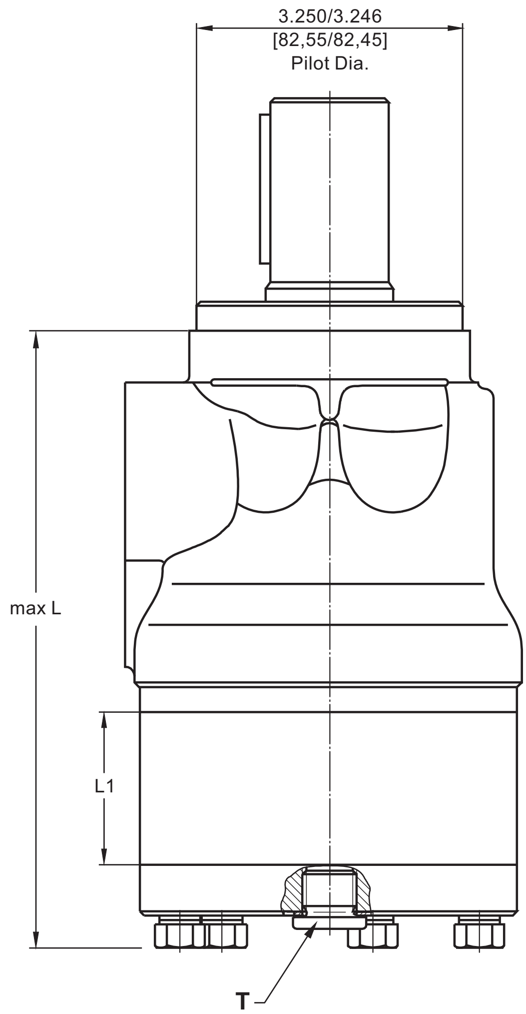


	Versions			
	2	3	4	5
C	4xM8	4xM8	4x$\frac{5}{16}$-18 UNC	4x$\frac{5}{16}$-18 UNC
P$_{(A,B)}$	2xG½	2xM22x1,5	2x$\frac{5}{8}$-14 UNF	2x½-14 NPTF
T	G¼	M14x1,5	$\frac{7}{16}$-20 UNF	$\frac{7}{16}$-20 UNF

 in [mm]

Shaft Dim.
See Page 85



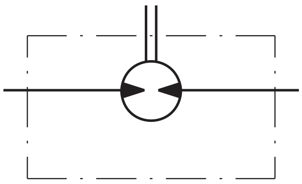


MAX. PERMISSIBLE SHAFT SEAL PRESSURE

MLHH...U1 motors with high pressure seal and without drain connection:

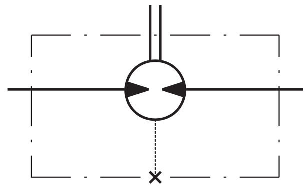
The shaft seal pressure equals the average of input pressure and return pressure.

$$P_{seal} = \frac{P_{input} + P_{return}}{2}$$



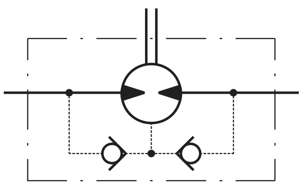
MLHH...U motors with high pressure seal and drain connection:

The shaft seal pressure equals the pressure in the drain line.



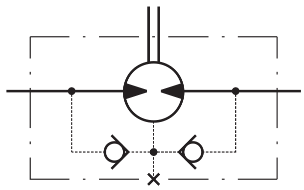
MLHH...1 motors with standard shaft seal and without drain connection:

The shaft seal pressure never exceeds the pressure in the return line.

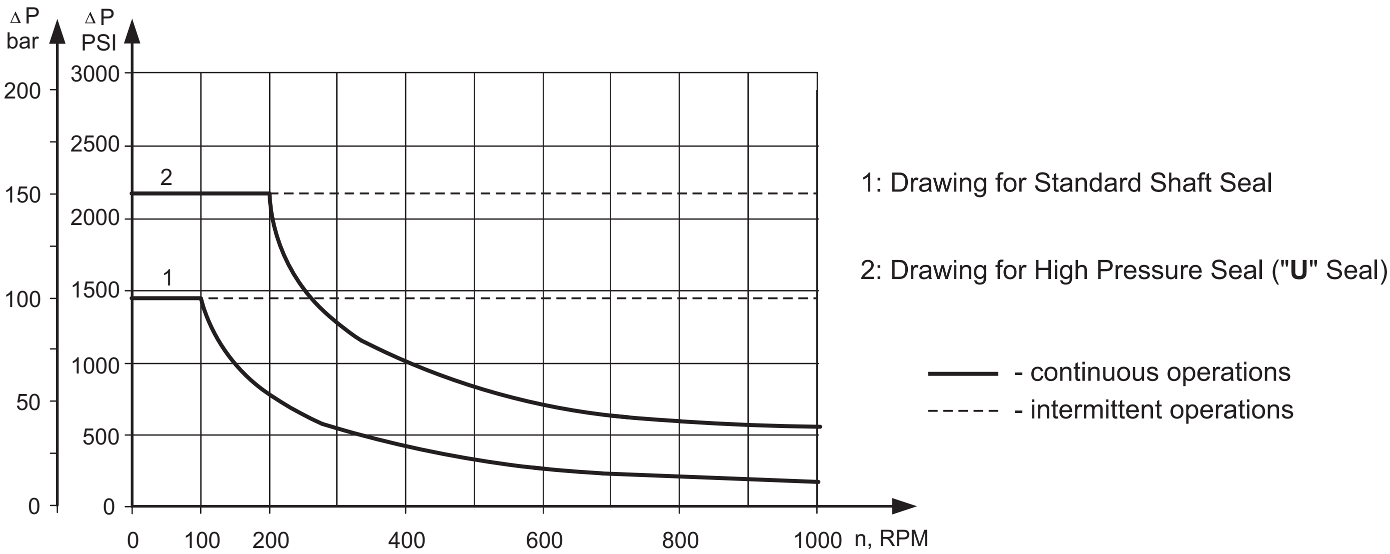


MLHH... motors with standard shaft seal and with drain connection:

The shaft seal pressure equals the pressure in the drain line.



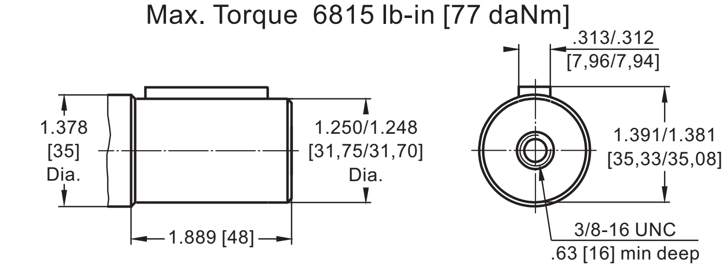
Max. return pressure without drain line or max. pressure in the drain line



SHAFT EXTENSIONS

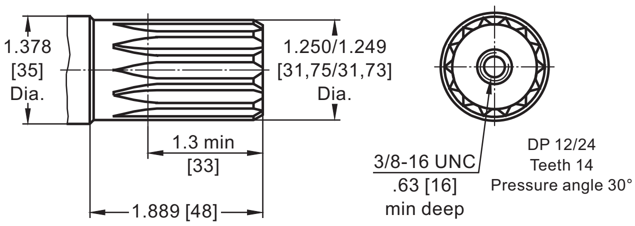
K

1¼" [31,75]straight, Parallel key 5⁄16"x 5⁄16"x1¼" BS 46
Max. Torque 6815 lb-in [77 daNm]



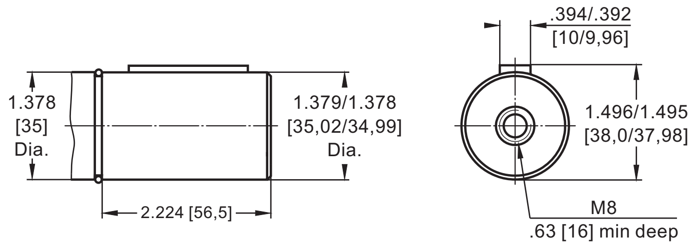
L

14T Splined,1¼" [31,75], ANS B 92.1-1976
Max. Torque 8400 lb-in [95 daNm]



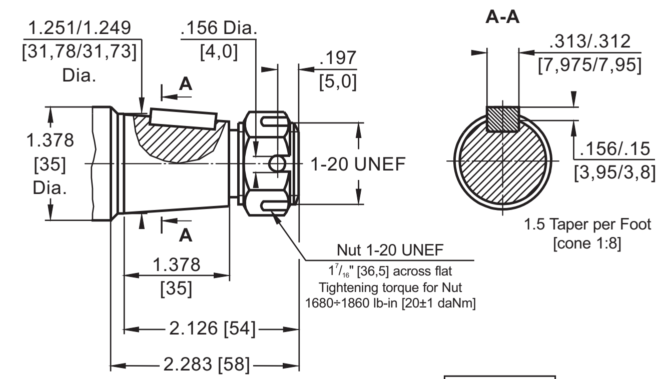
B

ø35 straight, Parallel key A10x8x45 DIN 6885
Max. Torque 8400 lb-in [95 daNm]



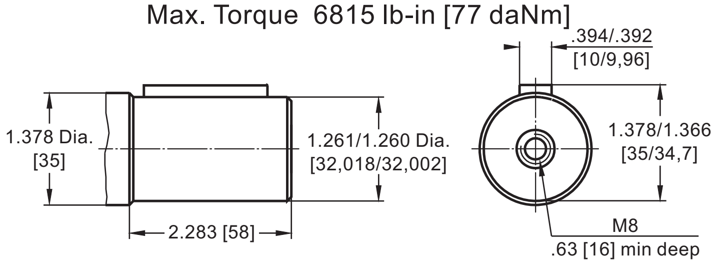
R

1¼" [31,75],SAE J501 Tapered, Parallel key 5⁄16"x 5⁄16"x1"
Max. Torque 8400 lb-in [95 daNm]



M

ø32 straight, Parallel key A10x8x45 DIN 6885
Max. Torque 6815 lb-in [77 daNm]



in [mm]

Requirement max. Torque must be not exceeded.

ORDER CODE

	1	2	3	4	5	6	7
MLHH							

Pos.1 - Displacement code

200	- 12.3 in³/rev [201,3 cm³/rev]
250	- 15.4 in³/rev [252,0 cm³/rev]
315	- 16.4 in³/rev [314,9 cm³/rev]
400	- 24.2 in³/rev [396,8 cm³/rev]
500	- 30.7 in³/rev [502,4 cm³/rev]

Pos.2 - Shaft Extensions*

K	- 1¼" [31,75] straight, Parallel key
L	- 1¼" [31,75] Splined 14T ANS B92.1-1970
B**	- ø35 straight, Parallel key
R	- 1¼" [31,75] SAE J501 Tapered
M	- ø32 straight, Parallel key

Pos.3 - Port Size/Type [standard manifold to each]

2	- side ports, 2xG1/2, G1/4, BSP thread, ISO 228
3	- side ports, 2xM22x1,5, M14x1,5, metric thread,ISO 262
4	- side ports, 2x7/8-14 UNF, O-ring, 7/16-20 UNF
5	- side ports, 2x1/2-14 NPTF, 7/16-20 UNF

Pos.4 - Shaft Seal Version

omit	- Standard shaft seal
U	- High pressure shaft seal (without check valves)

Pos.5 - Drain Port

omit	- with drain port
1	- without drain port

Pos.6 - Special Features [see page 110]

Pos.7 - Design Series

omit	- Factory specified

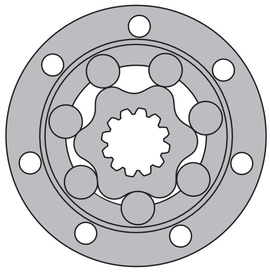
NOTES:

* The permissible output torque for shafts must not be exceeded!
** The following combination is not allowed: **B** shaft with **U** shaft seal.

The hydraulic motors are mangano-phosphatized as standard.

APPLICATION

- Conveyors
- Feeding mechanism of robots and manipulators
- Metal working machines
- Textile machines
- Agricultural machines
- Food industries
- Grass cutting machinery etc.



CONTENTS

OPTIONS

- Model - Spool valve, roll-gerotor
- Wheel and flange mount
- Shafts - straight, splined and tapered
- BSPP and SAE ports
- Other special features

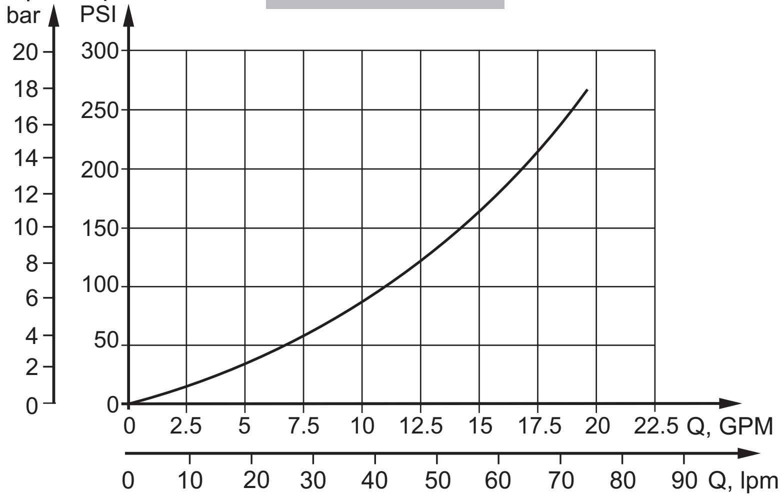
GENERAL

Max. Displacement,	in^3/rev [cm^3/rev]	45.99 [753,8]
Max. Speed,	[RPM]	750
Max. Torque,	lb-in [daNm]	cont.: 96 [8500] int.: 106 [9382]
Max. Output,	HP [kW]	23,1 [31]
Max. Pressure Drop,	PSI [bar]	cont.: 205 [3000] int.: 225 [3260]
Max. Oil Flow,	GPM [lpm]	115 [30.4]
Min. Speed,	[RPM]	10
Pressure fluid		Mineral based- HLP(DIN 51524) or HM(ISO 6743/4)
Temperature range,	^oF [^oC]	-40÷284 [-40÷140]
Optimal Viscosity range,	SUS [mm^2/s]	98÷347 [20÷75]
Filtration		ISO code 20/16 (Min. recommended fluid filtration of 25 microns)

Oil flow in drain line

Pressure drop PSI [bar]	Viscosity SUS [mm^2/s]	Oil flow in drain line GPM [lpm]
1450 [100]	98 [20]	.660 [2,5]
	164 [35]	.476 [1,8]
2030 [140]	98 [20]	.925 [3,5]
	164 [35]	.740 [2,8]

Pressure Losses



SPECIFICATION DATA

Type		HW 80	HW 100	HW 125	HW 160	HW 200	HW 235
Displacement, in^3/rev [cm^3/rev]		4.86 [79,7]	6.19 [101,4]	7.69 [126]	9.63 [157,8]	12.28 [201,3]	14.36 [235,3]
Max. Speed, [RPM]	Cont.	565	445	357	380	373	319
	Int.*	750	590	476	475	497	425
Max. Torque, lb-in [daNm]	Cont.	1664 [18,8]	2124 [24]	3098 [35]	3894 [44]	4868 [55]	5710 [64,5]
	Int.*	1956 [22,1]	2496 [28,2]	3408 [38,5]	4248 [48]	5310 [60]	6196 [70]
Max. Output, HP [kW]	Cont.	20.7 [15,4]	21.2 [15,8]	21.7 [16,2]	23.6 [17,6]	24.9 [18,6]	24.4 [18,2]
	Int.*	23.3 [17,4]	24.3 [18,1]	26.6 [19,8]	29 [21,6]	31 [23,1]	30.3 [22,6]
Max. Pressure Drop, PSI [bar]	Cont.	2540 [175]	2540 [175]	2970 [205]	2970 [205]	2970 [205]	2970 [205]
	Int.*	2970 [205]	2970 [205]	3260 [225]	3260 [225]	3260 [225]	3260 [225]
Max. Oil Flow, GPM [lpm]	Cont.	12 [45]	12 [45]	12 [45]	16 [60]	20 [75]	20 [75]
	Int.*	16 [60]	16 [60]	16 [60]	20 [75]	26.4 [100]	26.4 [100]
Max. Inlet Pressure, PSI [bar]	Cont.	2900 [200]	2900 [200]	3050 [210]	3050 [210]	3050 [210]	3050 [210]
	Int.*	3260 [225]	3260 [225]	3625 [250]	3625 [250]	3625 [250]	3625 [250]
Max. Starting Pressure with Unloaded Shaft, PSI [bar]		174 [12]	174 [12]	145 [10]	145 [10]	145 [10]	145 [10]
Min. Starting Torque, lb-in [daNm]	At max. press. drop Cont.	1328 [15]	1699 [19,2]	2540 [28,7]	3186 [36]	3991 [45,1]	4673 [52,8]
	At max. press. drop Int.*	1558 [17,6]	1991 [22,5]	2788 [31,5]	3478 [39,3]	4355 [49,2]	5080 [57,4]
Min. Speed***, [RPM]		12	12	10	10	10	10
Weight, lb [kg]	HW	31.1 [14,1]	31.3 [14,2]	31.5 [14,3]	32.2 [14,6]	33.3 [33.3]	34.2 [15,5]
	HWF	27.8 [12,6]	28.0 [12,7]	28.2 [12,8]	28.9 [13,1]	30.0 [13,6]	30.9 [14,0]
	HWFR	32.2 [14,6]	32.4 [14,7]	32.6 [14,8]	33.3 [15,1]	34.4 [15,6]	35.3 [16,0]
	HWFV	27.8 [12,6]	28.0 [12,7]	28.2 [12,8]	28.9 [13,1]	30.0 [13,6]	30.9 [14,0]
	HWS	30.4 [13,8]	30.6 [13,9]	30.9 [14,0]	31.5 [14,3]	32.6 [14,8]	33.5 [15,2]
	HWSW	29.8 [13,5]	30.0 [13,6]	30.2 [13,7]	30.9 [14,0]	31.9 [14,5]	32.8 [14,9]
	HWSR	34.8 [15,8]	35.1 [15,9]	35.3 [16,0]	35.9 [16,3]	37.0 [16,8]	37.9 [17,2]
	HWD	31.5 [14,3]	31.8 [14,4]	31.9 [14,5]	32.6 [14,8]	33.7 [15,3]	34.6 [15,7]
	HWV	30.4 [13,8]	30.6 [13,9]	30.9 [14,0]	31.5 [14,3]	32.6 [14,8]	33.5 [15,2]
	HWE	31.9 [14,5]	32.2 [14,6]	32.4 [14,7]	33.1 [15,0]	34.2 [15,5]	35.1 [15,9]
	HWSE	31.3 [14,2]	31.5 [14,3]	31.8 [14,4]	32.4 [14,7]	33.5 [15,2]	34.4 [15,6]
	HWFE	28.7 [13,0]	28.9 [13,1]	29.1 [13,2]	29.8 [13,5]	30.9 [14,0]	31.8 [14,4]
	HW(7,8,9,10)	35.3 [16,0]	35.5 [16,1]	35.7 [16,2]	36.4 [16,5]	37.5 [17,0]	38.4 [17,4]
	HWF(7,8,9,10)	31.9 [14,5]	32.2 [14,6]	32.4 [14,7]	33.1 [15,0]	34.2 [15,5]	35.1 [15,9]
	HWS(7,8,9,10)	34.6 [15,7]	34.8 [15,8]	35.1 [15,9]	35.7 [16,2]	36.8 [16,7]	37.7 [17,1]

* Intermittent operation: the permissible values may occur for max. 10% of every minute.
** For speeds lower than given, consult factory or your regional manager.
*** **For “E”-option and versions 7,8,9,10 it is not recommendable a flow bigger than 75% of the nominal flow rate.**

1. Intermittent speed and intermittent pressure must not occur simultaneously.
2. Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
3. Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP(DIN51524) or HM (ISO 6743/4). If using synthetic fluids consult the factory for alternative seal materials.
4. Recommended minimum oil viscosity 70 SUS [13 mm²/s] at 122°F [50°C].
5. Recommended maximum system operating temperature is 180°F [82°C].
6. To assure optimum motor life fill with fluid prior to loading and run at moderate load and speed for 10-15 minutes.

SPECIFICATION DATA

Type		HW 250	HW 300	HW 315	HW 350	HW 370	HW 400
Displacement, in^3/rev [cm^3/rev]		15.38 [252]	300 [18.31]	314,9 [19.22]	21.22 [347,8]	22.53 [369,2]	24.21 [396,8]
Max. Speed, [RPM]	Cont.	298	250	238	216	203	189
	Int.*	397	333	318	288	271	252
Max. Torque, lb-in [daNm]	Cont.	6107 [69]	7170 [81]	7523 [85]	8320 [94]	8497 [96]	8497 [96]
	Int.*	6638 [75]	7877 [89]	8230 [93]	9028 [102]	9293 [105]	8674 [98]
Max. Output, HP [kW]	Cont.	22.5 [16,8]	22 [16,5]	21.9 [16,4]	22 [16,5]	17.7 [13,2]	16.8 [12,5]
	Int.*	27.9 [20,8]	27.9 [20,8]	27.9 [20,8]	27.9 [20,8]	25.7 [19,2]	24.8 [18,5]
Max. Pressure Drop, PSI [bar]	Cont.	2970 [205]	2970 [205]	2970 [205]	2970 [205]	200 [2900]	2680 [185]
	Int.*	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3200 [220]	2760 [190]
Max. Oil Flow, GPM [lpm]	Cont.	20 [75]	20 [75]	20 [75]	20 [75]	20 [75]	20 [75]
	Int.*	26.4 [100]	26.4 [100]	26.4 [100]	26.4 [100]	26.4 [100]	26.4 [100]
Max. Inlet Pressure, PSI [bar]	Cont.	3050 [210]	3050 [210]	3050 [210]	3050 [210]	3050 [210]	3050 [210]
	Int.*	3625 [250]	3625 [250]	3625 [250]	3625 [250]	3625 [250]	3625 [250]
Max. Starting Pressure with Unloaded Shaft, PSI [bar]		145 [10]	145 [10]	145 [10]	145 [10]	145 [10]	145 [10]
Min. Starting Torque, lb-in [daNm]	At max. press. drop Cont.	5000 [56,5]	5877 [66,4]	6169 [69,7]	6815 [77]	7036 [79,5]	6966 [78,7]
	At max. press. drop Int.*	5443 [61,5]	6452 [72,9]	6744 [76,2]	7400 [83,6]	7612 [86]	7107 [80,3]
Min. Speed***, [RPM]		10	10	10	8	8	8
Weight, lb [kg]	HW	34.6 [15,7]	16,1 [35.5]	35.9 [16,3]	36.8 [16,7]	37.3 [16,9]	38.1 [17,3]
	HWF	31.3 [14,2]	14,6 [32.2]	32.6 [14,8]	33.5 [15,2]	34.0 [15,4]	34.8 [15,8]
	HWFR	35.7 [16,2]	16,6 [36.6]	37.0 [16,8]	37.9 [17,2]	38.4 [17,4]	39.2 [17,8]
	HWFV	31.3 [14,2]	14,6 [32.2]	32.6 [14,8]	33.5 [15,2]	34.0 [15,4]	34.8 [15,8]
	HWS	34.0 [15,4]	15,8 [34.8]	35.3 [16,0]	36.2 [16,4]	36.6 [16,6]	37.5 [17,0]
	HWSW	33.3 [15,1]	15,5 [34.2]	34.6 [15,7]	35.5 [16,1]	35.9 [16,3]	36.8 [16,7]
	HWSR	38.4 [17,4]	17,8 [39.2]	39.7 [18,0]	40.6 [18,4]	41.0 [18,6]	41.9 [19,0]
	HWD	35.1 [15,9]	35.9 [35.9]	36.4 [16,5]	37.0 [16,8]	37.7 [17,1]	38.6 [17,5]
	HWV	34.0 [15,4]	15,8 [34.8]	35.3 [16,0]	36.2 [16,4]	36.6 [16,6]	37.5 [17,0]
	HWE	35.5 [16,1]	16,5 [36.4]	36.8 [16,7]	37.7 [17,1]	38.1 [17,3]	39.0 [17,7]
	HWSE	34.8 [15,8]	16,2 [35.7]	36.2 [16,4]	37.0 [16,8]	37.5 [17,0]	38.4 [17,4]
	HWFE	32.2 [14,6]	15,0 [33.1]	33.5 [15,2]	34.4 [15,6]	34.8 [15,8]	35.7 [16,2]
	HW(7,8,9,10)	38.8 [17,6]	18,0 [39.7]	40.1 [18,2]	41.0 [18,6]	41.4 [18,8]	42.3 [19,2]
	HWF(7,8,9,10)	35.5 [16,1]	16,5 [36.4]	36.8 [16,7]	37.7 [17,1]	38.1 [17,3]	39.0 [17,7]
	HWS(7,8,9,10)	38.1 [17,3]	17,7 [39.0]	39.5 [17,9]	40.3 [18,3]	40.8 [18,5]	41.7 [18,9]

* Intermittent operation: the permissible values may occur for max. 10% of every minute.
** For speeds lower than given, consult factory or your regional manager.
***** For "E"-option and versions 7,8,9,10 it is not recommendable a flow bigger than 75% of the nominal flow rate.**

1. Intermittent speed and intermittent pressure must not occur simultaneously.
2. Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
3. Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP(DIN51524) or HM (ISO 6743/4). If using synthetic fluids consult the factory for alternative seal materials.
4. Recommended minimum oil viscosity 70 SUS [13 mm²/s] at 122°F [50°C].
5. Recommended maximum system operating temperature is 180°F [82°C].
6. To assure optimum motor life fill with fluid prior to loading and run at moderate load and speed for 10-15 minutes.

SPECIFICATION DATA

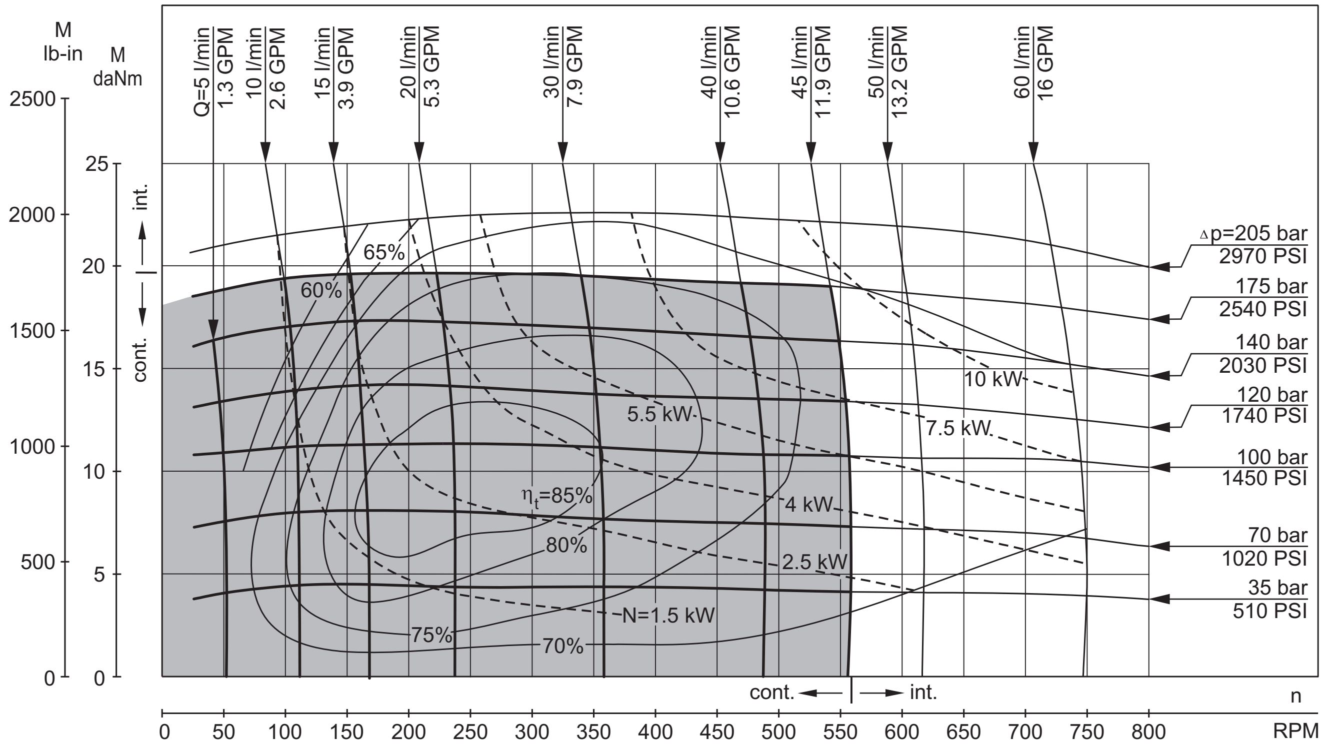
Type		HW 470	HW 500	HW 535	HW 550	HW 600	HW 750
Displacement, in^3/rev [cm^3/rev]		28.72 [470,6]	30.66 [502,4]	32.65 [535]	33.56 [550]	36.55 [598,9]	45.99 [753,8]
Max. Speed, [RPM]	Cont.	159	149	140	136	125	99
	Int.*	244	229	215	209	192	152
Max. Torque, lb-in [daNm]	Cont.	8143 [92]	8054 [91]	7966 [90]	7877 [89]	8054 [91]	8143 [92]
	Int.*	8939 [101]	8939 [101]	9205 [104]	9293 [105]	9382 [106]	9382 [106]
Max. Output, HP [kW]	Cont.	14.2 [10,6]	14.5 [10,8]	9,4 [12.6]	12 [9]	11.7 [8,7]	9.8 [7,3]
	Int.*	23.3 [17,4]	23.9 [17,8]	16,4 [22]	21.2 [15,8]	20.2 [20.2]	16.8 [12,5]
Max. Pressure Drop, PSI [bar]	Cont.	2180 [150]	2030 [140]	130 [1885]	1815 [125]	1670 [115]	1380 [95]
	Int.*	2390 [165]	2250 [155]	150 [2180]	2105 [145]	1960 [135]	1520 [105]
Max. Oil Flow, GPM [lpm]	Cont.	20 [75]	20 [75]	20 [75]	20 [75]	20 [75]	20 [75]
	Int.*	30.4 [115]	30.4 [115]	30.4 [115]	30.4 [115]	30.4 [115]	30.4 [115]
Max. Inlet Pressure, PSI [bar]	Cont.	3050 [210]	3050 [210]	3050 [210]	3050 [210]	3050 [210]	3050 [210]
	Int.*	250 [250]	250 [250]	250 [250]	250 [250]	250 [250]	250 [250]
Max. Starting Pressure with Unloaded Shaft, PSI [bar]		145 [10]	145 [10]	145 [10]	145 [10]	145 [10]	145 [10]
Min. Starting Torque, lb-in [daNm]	At max. press. drop Cont.	6674 [75,4]	6603 [74,6]	6532 [73,8]	6452 [72,9]	6373 [72,0]	6515 [73,6]
	At max. press. drop Int.*	7328 [82,8]	7328 [82,8]	7540 [85,2]	7470 [84,4]	7417 [83,8]	7505 [84,8]
Min. Speed***, [RPM]		8	8	5	5	5	4
Weight, lb [kg]	HW	39.9 [18,1]	40.6 [18,4]	41.5 [18,8]	41.7 [18,9]	44.9 [20,4]	48.3 [21,9]
	HWF	36.6 [16,6]	37.3 [16,9]	38.1 [17,3]	38.4 [17,4]	41.4 [18,8]	44.6 [20,3]
	HWFR	37.0 [16,8]	41.7 [18,9]	42.5 [19,3]	42.8 [19,4]	46.3 [21,0]	49.6 [22,5]
	HWFV	36.6 [16,6]	37.3 [16,9]	38.1 [17,3]	38.4 [17,4]	41.4 [18,8]	44.6 [20,3]
	HWS	39.2 [17,8]	39.9 [18,1]	40.8 [18,5]	41.0 [18,6]	44.3 [20,1]	47.6 [21,6]
	HWSW	38.6 [17,5]	39.2 [17,8]	40.1 [18,2]	40.3 [18,3]	43.7 [19,8]	46.9 [21,3]
	HWSR	43.7 [19,8]	44.3 [20,1]	45.2 [20,5]	45.4 [20,6]	48.9 [22,2]	52.2 [23,7]
	HWD	40.3 [18,3]	41.0 [18,6]	41.9 [19,0]	42.1 [19,1]	45.4 [20,6]	48.7 [22,1]
	HWV	39.2 [17,8]	39.9 [18,1]	40.8 [18,5]	41.0 [18,6]	44.3 [20,1]	47.6 [21,6]
	HWE	40.8 [18,5]	41.7 [18,9]	42.3 [19,2]	42.5 [19,3]	45.9 [20,8]	49.2 [22,3]
	HWSE	40.1 [18,2]	40.8 [18,5]	41.7 [18,9]	41.9 [19,0]	45.2 [20,5]	48.5 [22,0]
	HWFE	37.5 [17,0]	38.1 [17,3]	39.0 [17,7]	39.2 [17,8]	42.3 [19,2]	45.6 [20,7]
	HW(7,8,9,10)	44.1 [20,0]	44.6 [20,3]	45.6 [20,7]	45.9 [20,8]	49.2 [22,3]	52.5 [23,8]
	HWF(7,8,9,10)	40.8 [18,5]	41.4 [18,8]	42.3 [19,2]	42.5 [19,3]	45.6 [20,7]	48.9 [22,2]
	HWS(7,8,9,10)	43.4 [19,7]	44.1 [20,0]	44.9 [20,4]	45.2 [20,5]	48.5 [22,0]	51.8 [23,5]

* Intermittent operation: the permissible values may occur for max. 10% of every minute.
** For speeds lower than given, consult factory or your regional manager.
*** **For "E"-option and versions 7,8,9,10 it is not recommendable a flow bigger than 75% of the nominal flow rate.**

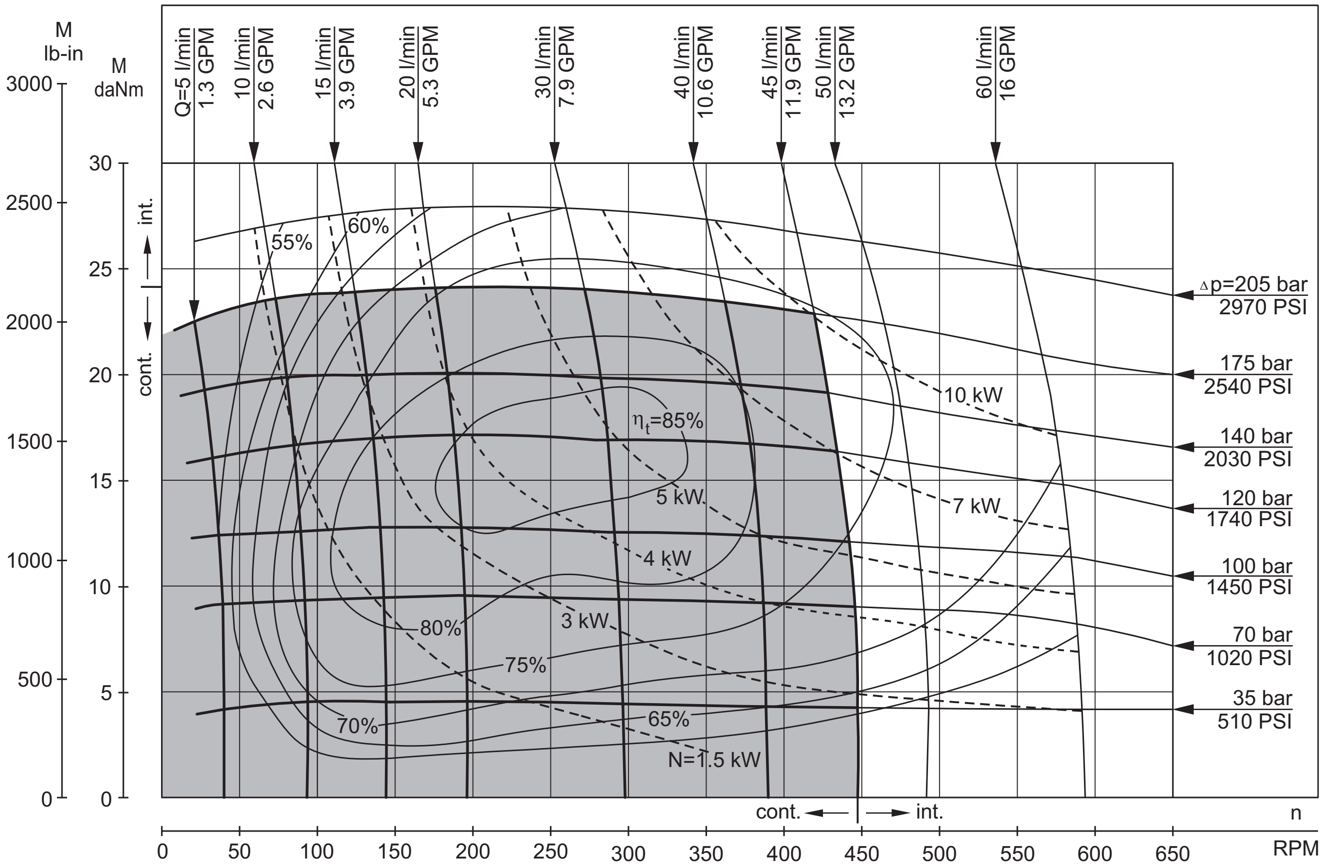
1. Intermittent speed and intermittent pressure must not occur simultaneously.
2. Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
3. Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP(DIN51524) or HM (ISO 6743/4). If using synthetic fluids consult the factory for alternative seal materials.
4. Recommended minimum oil viscosity 70 SUS [13 mm²/s] at 122°F [50°C].
5. Recommended maximum system operating temperature is 180°F [82°C].
6. To assure optimum motor life fill with fluid prior to loading and run at moderate load and speed for 10-15 minutes.

FUNCTION DIAGRAMS

HW 80



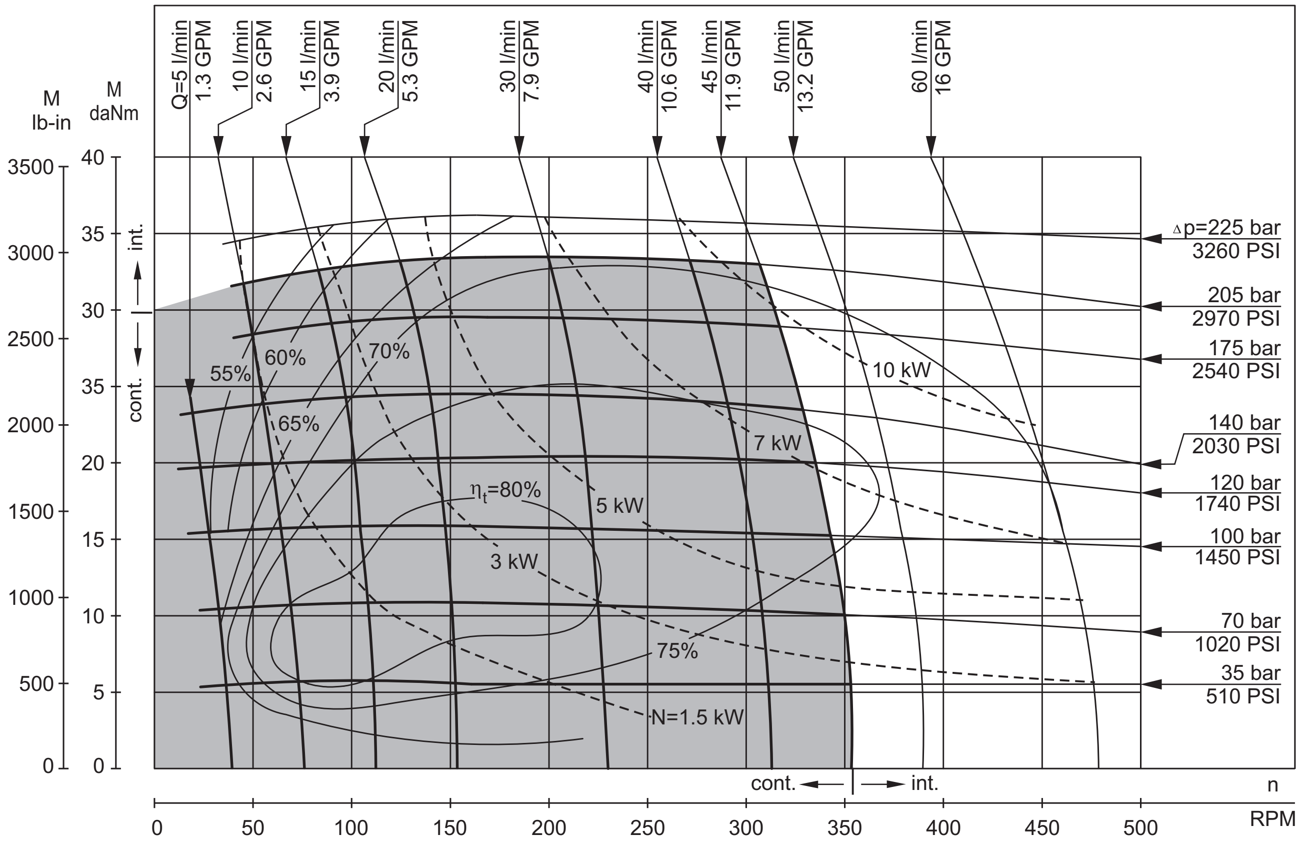
HW 100



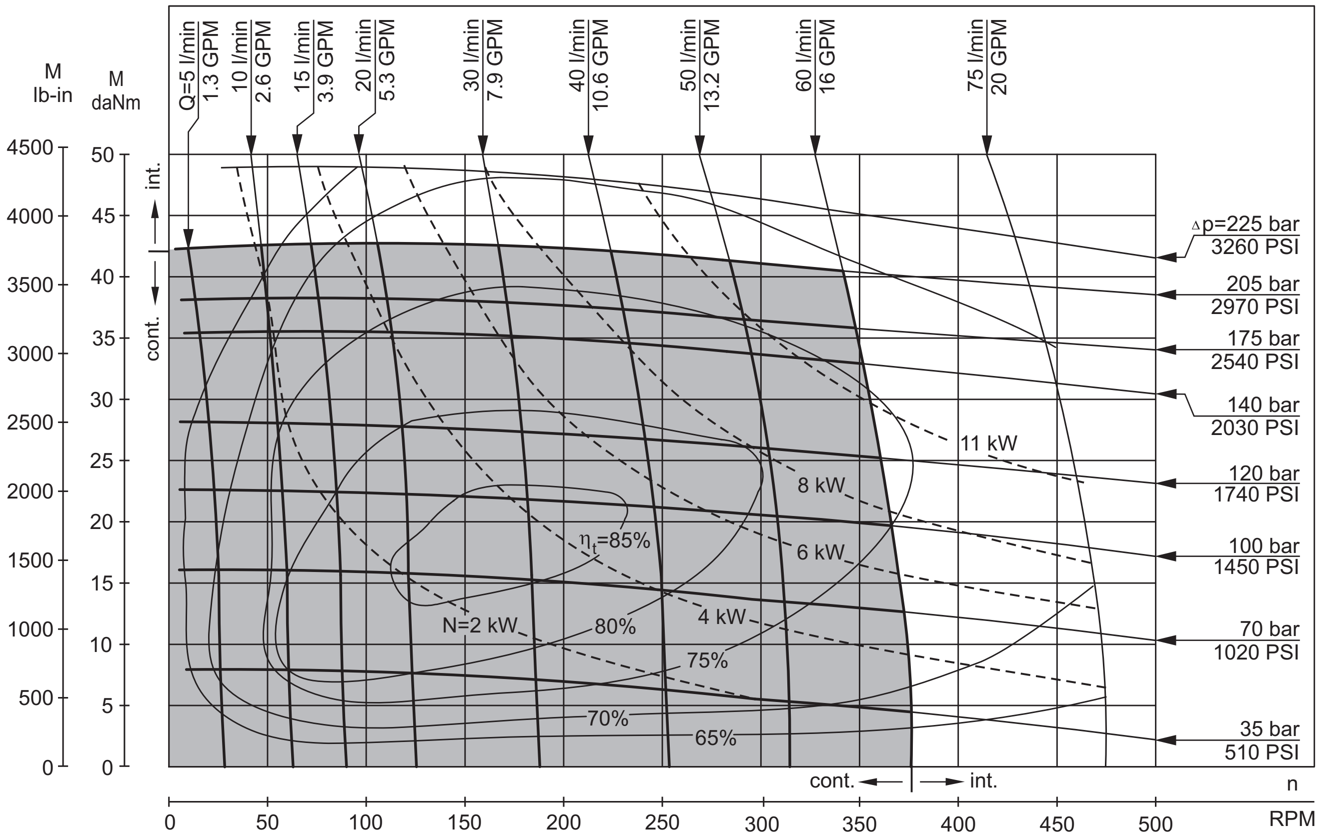
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5 PSI÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

HW 125



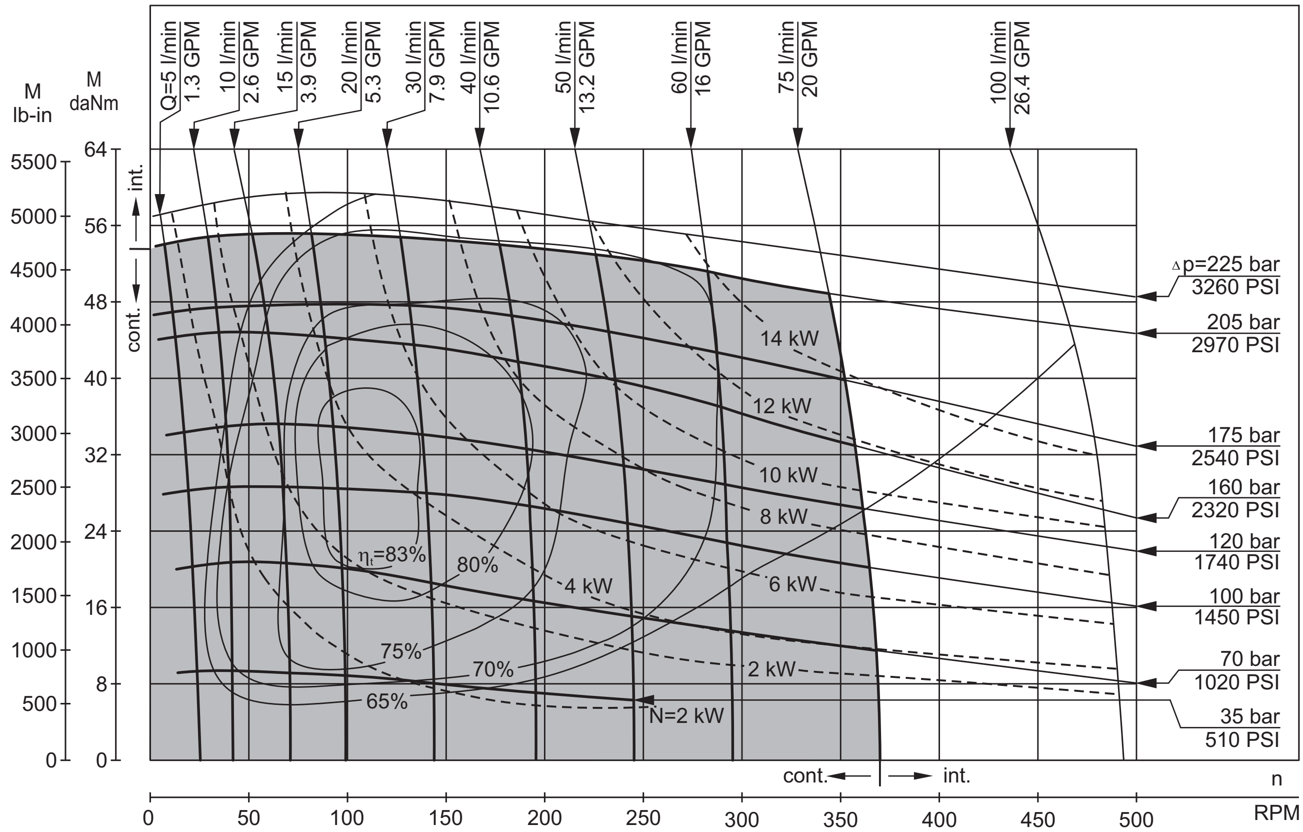
HW 160



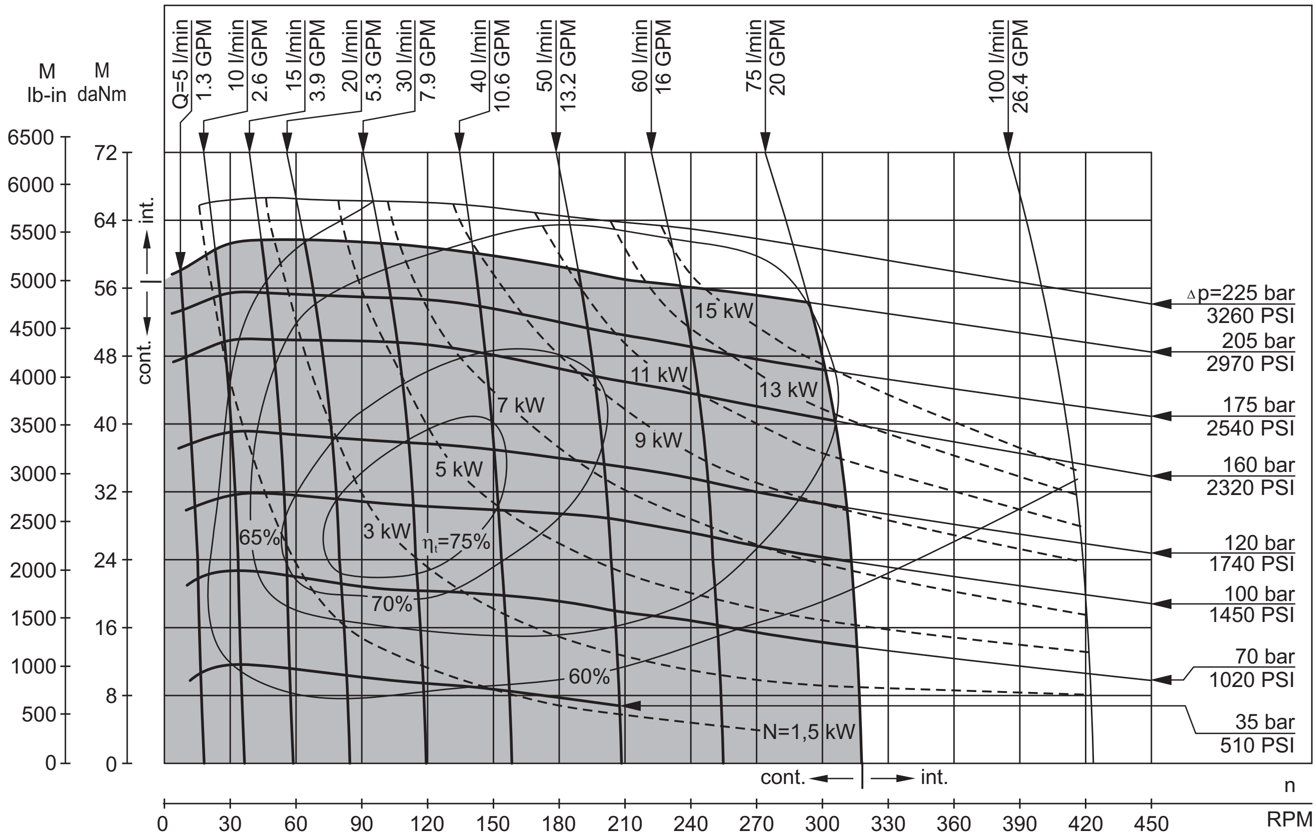
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5 PSI÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

HW 200



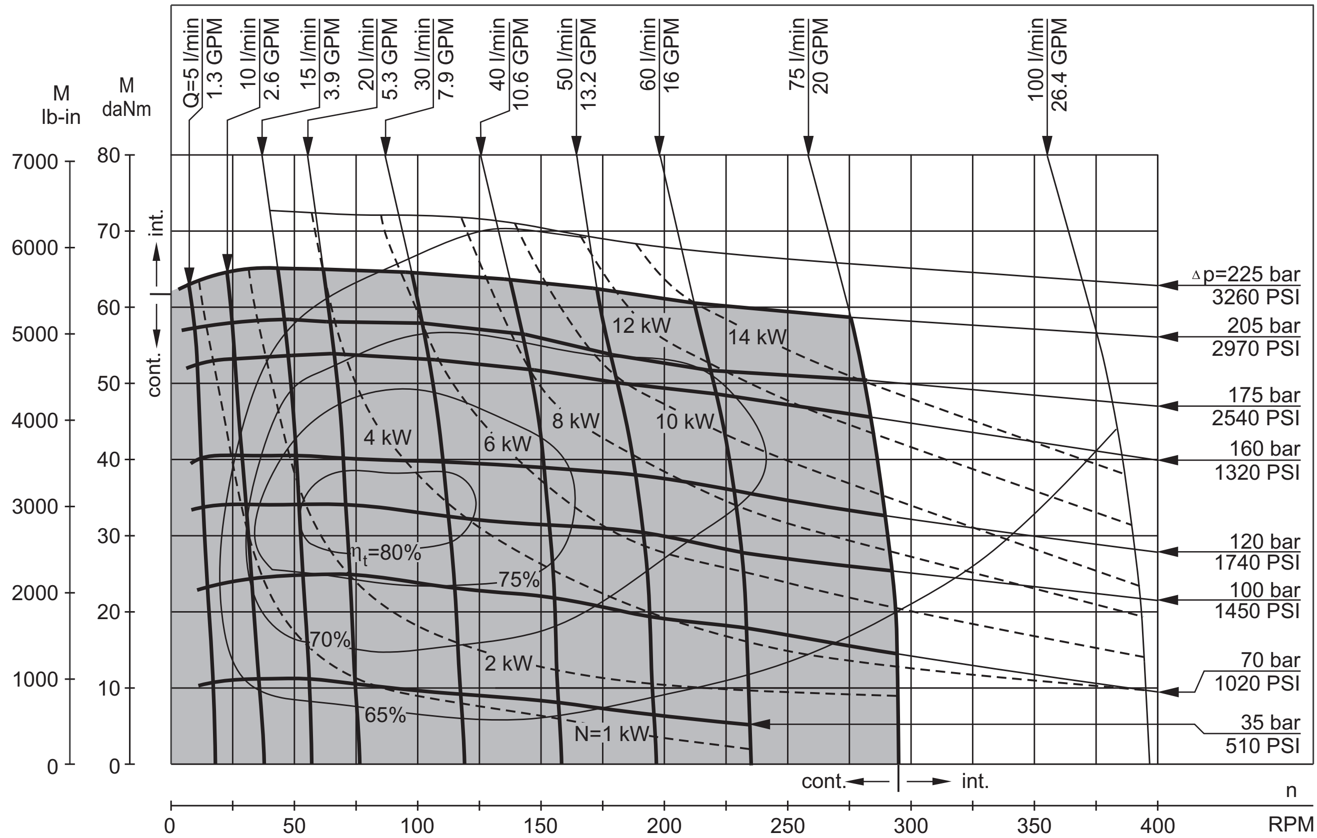
HW 235



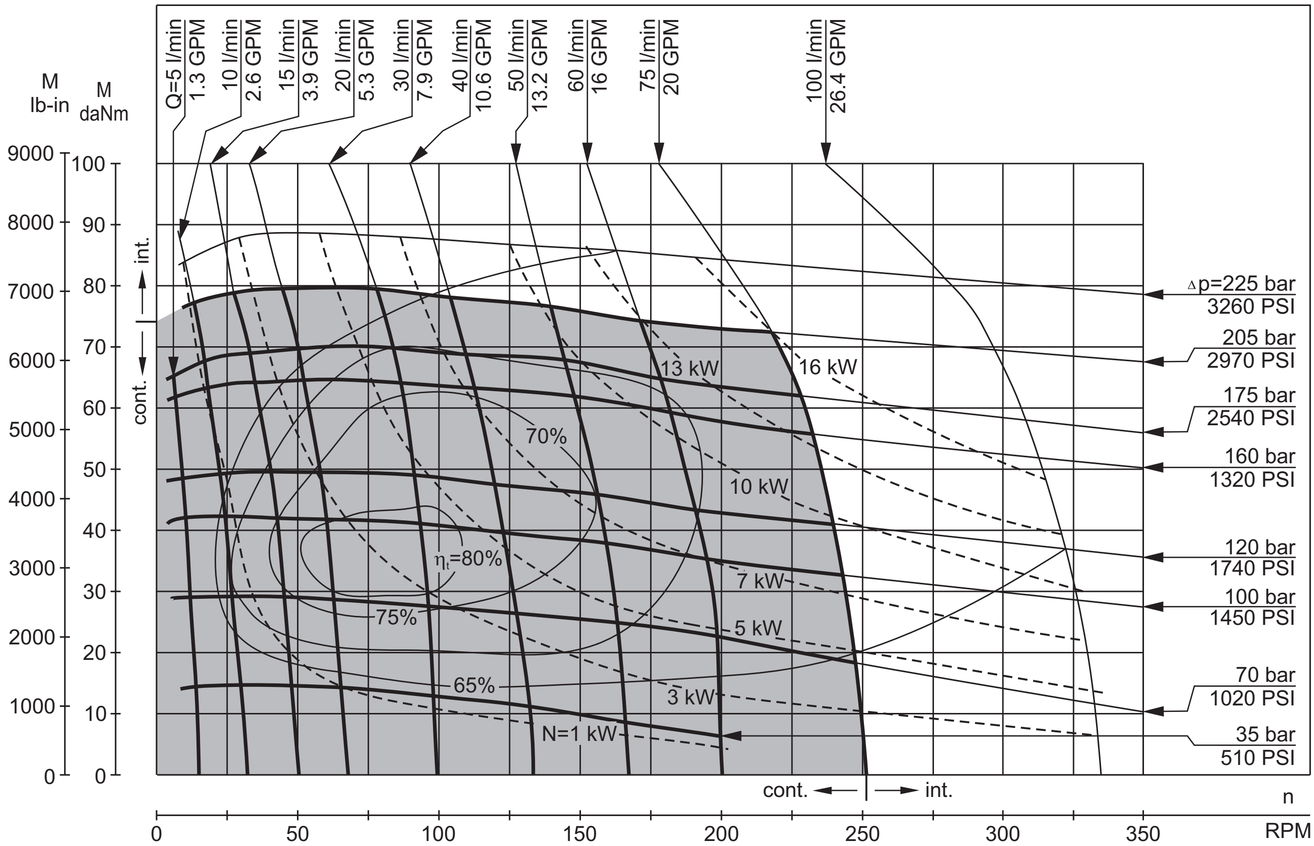
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5 PSI÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

HW 250



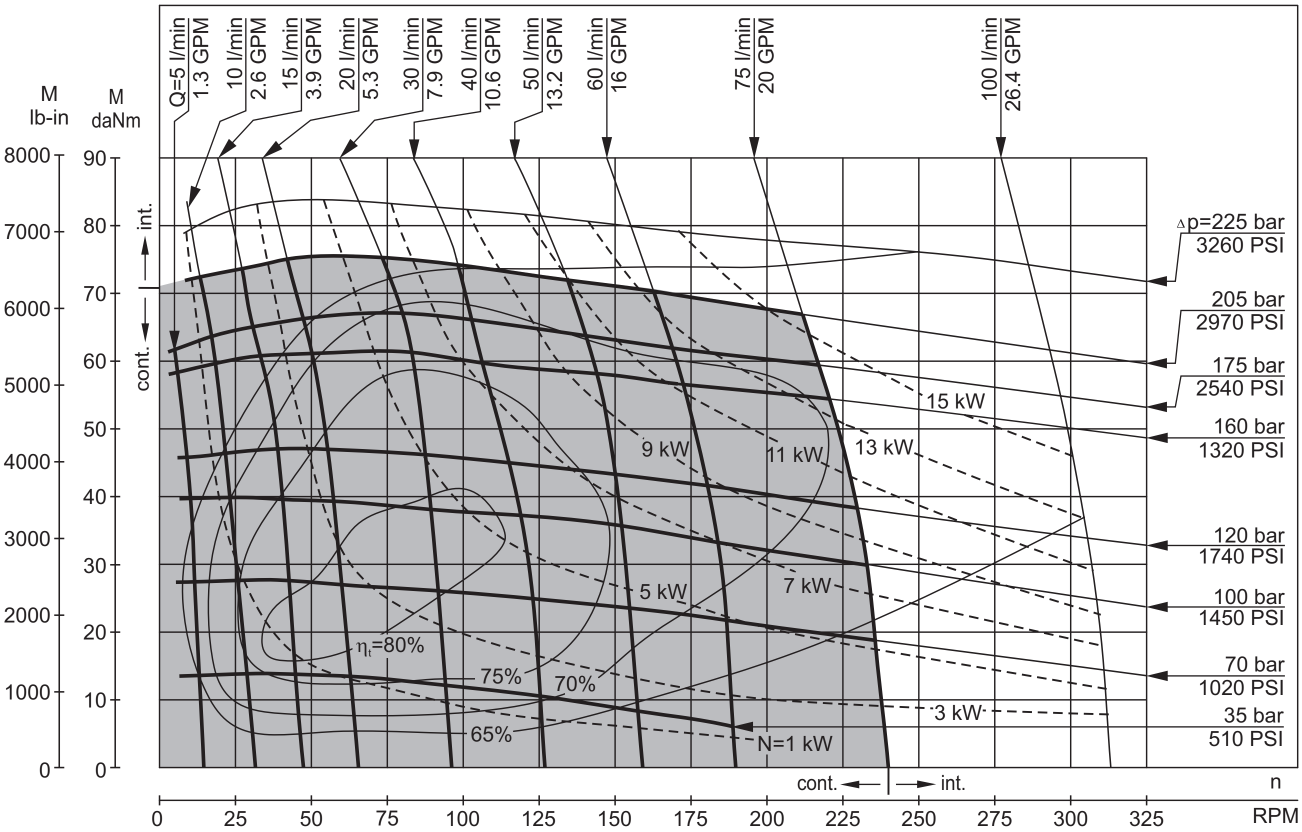
HW 300



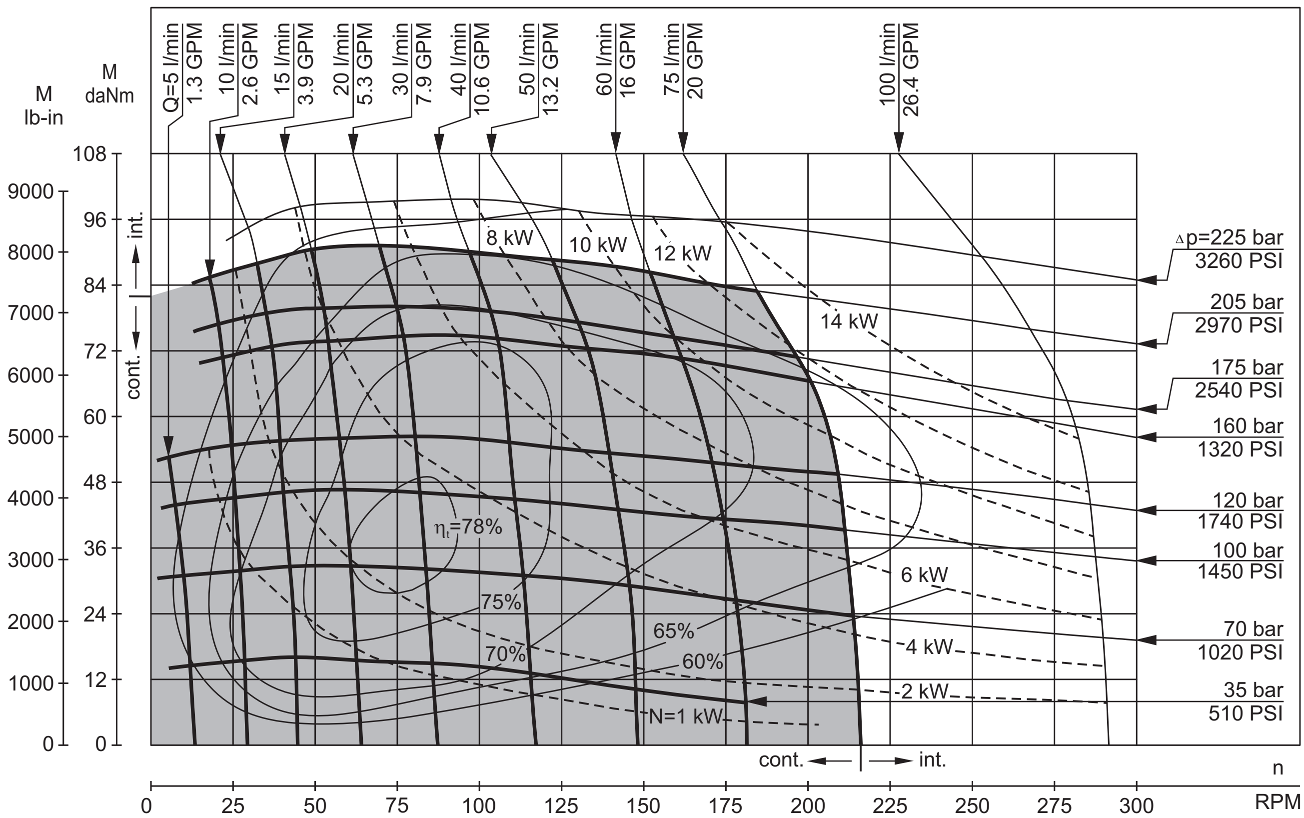
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5 PSI÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

HW 315



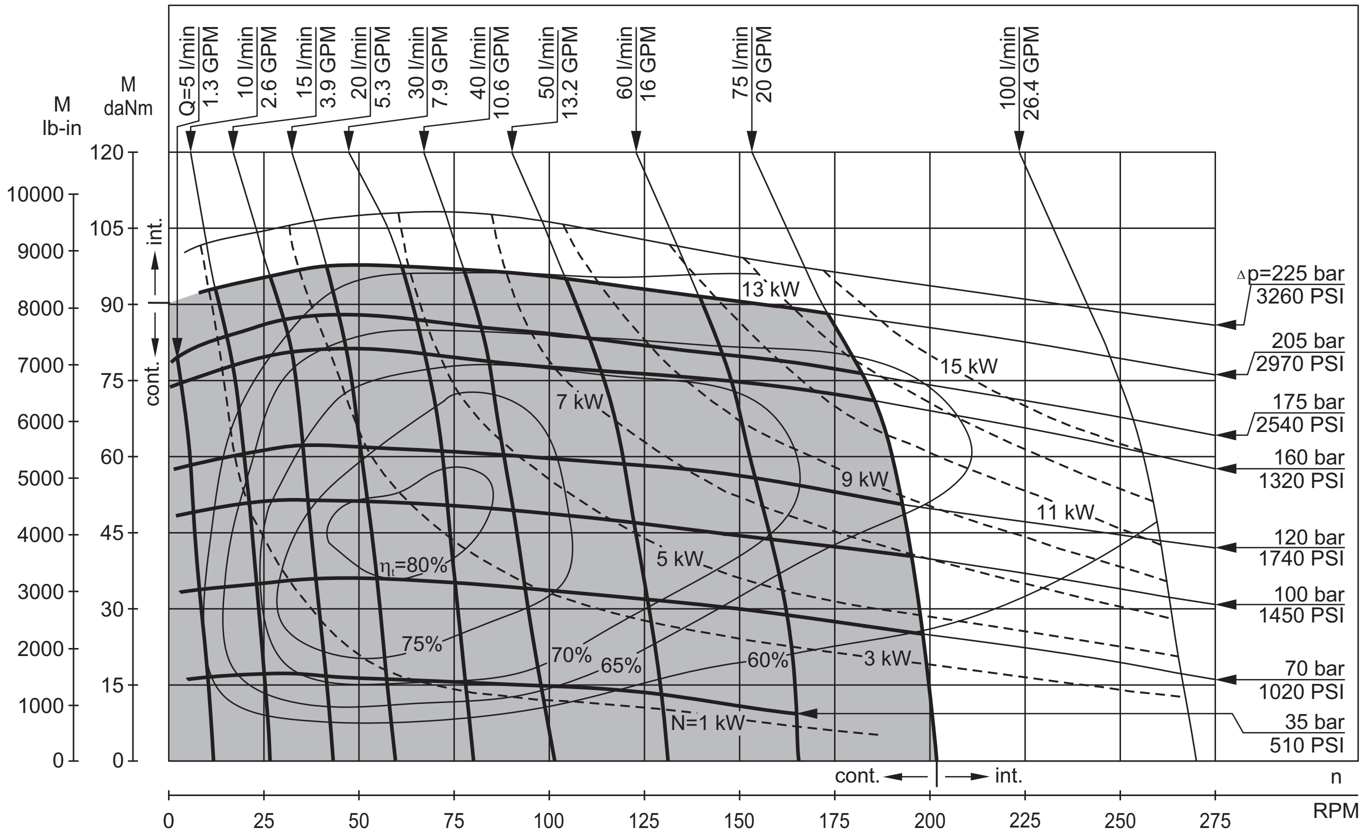
HW 350



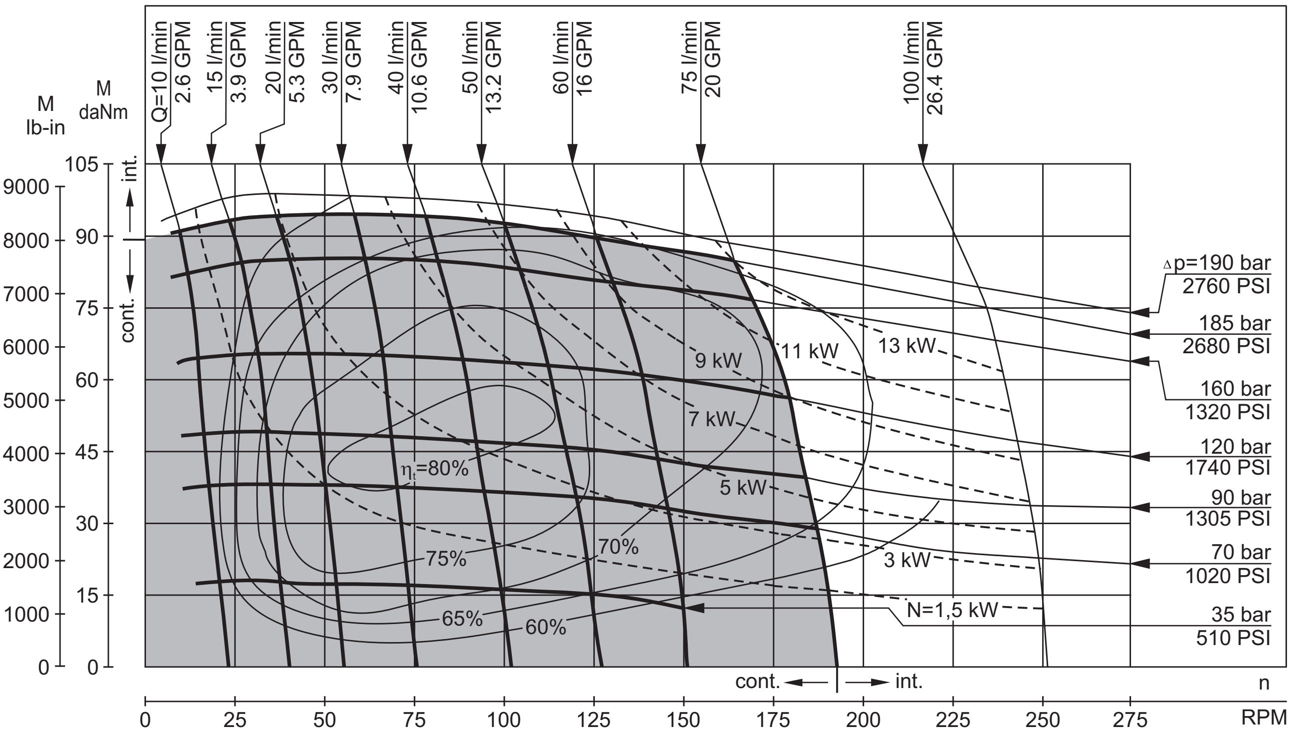
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5 PSI÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

HW 370



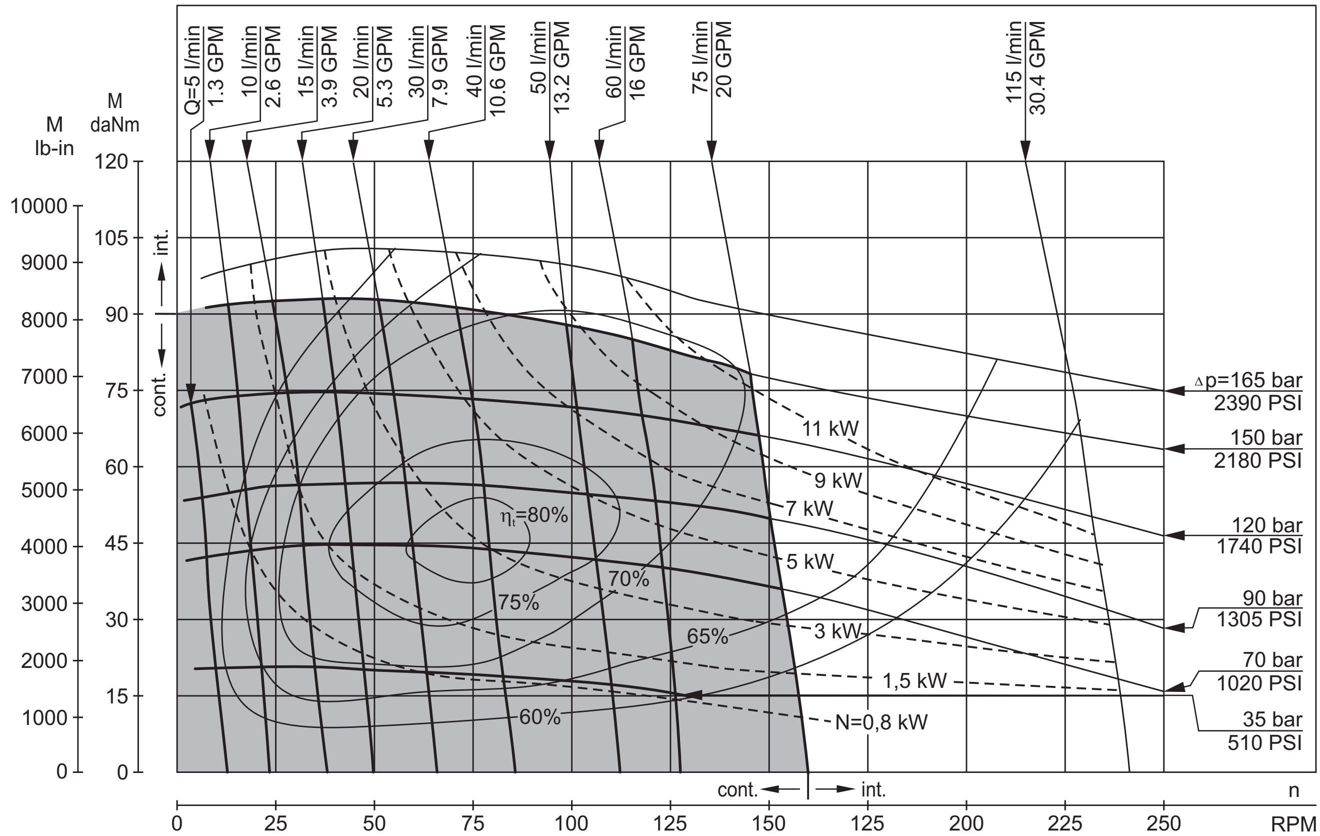
HW 400



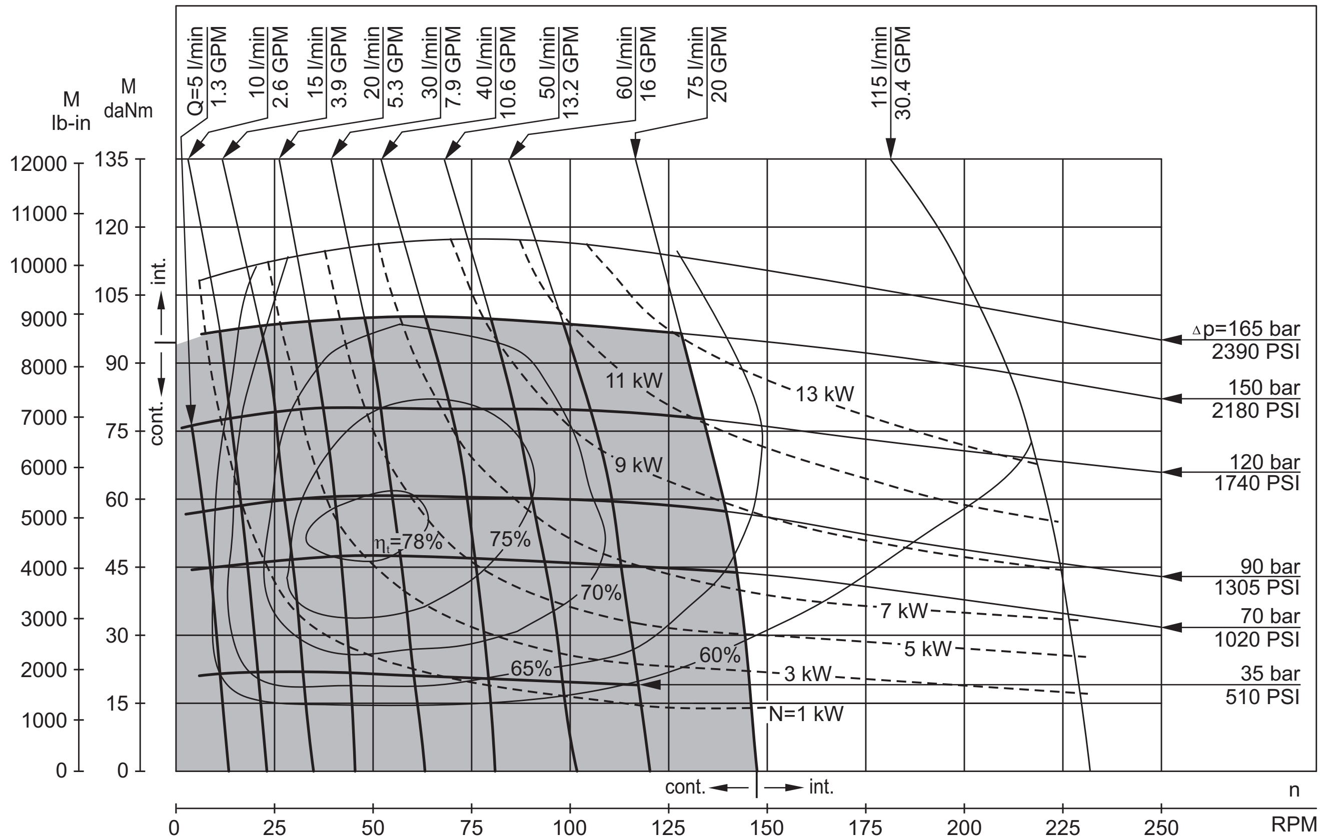
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5 PSI÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

HW 470



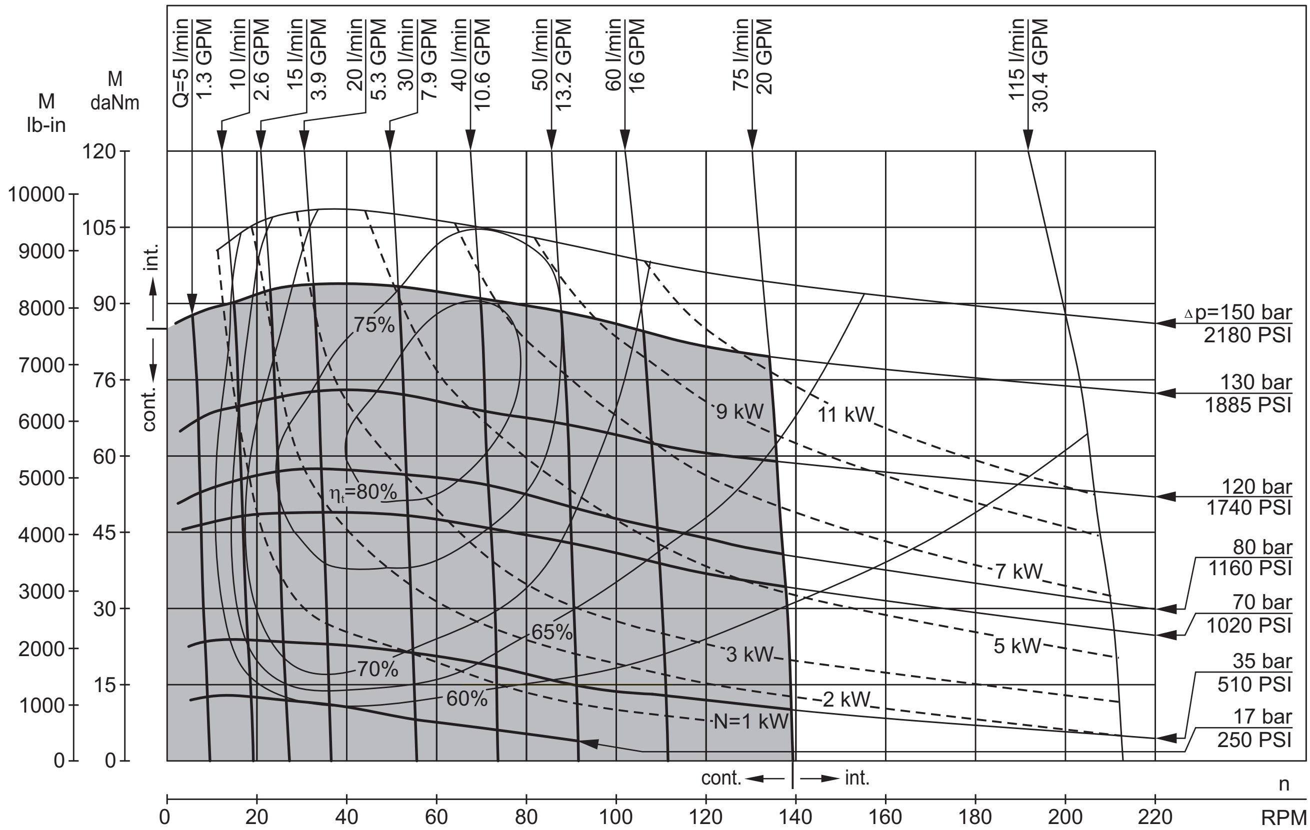
HW 500



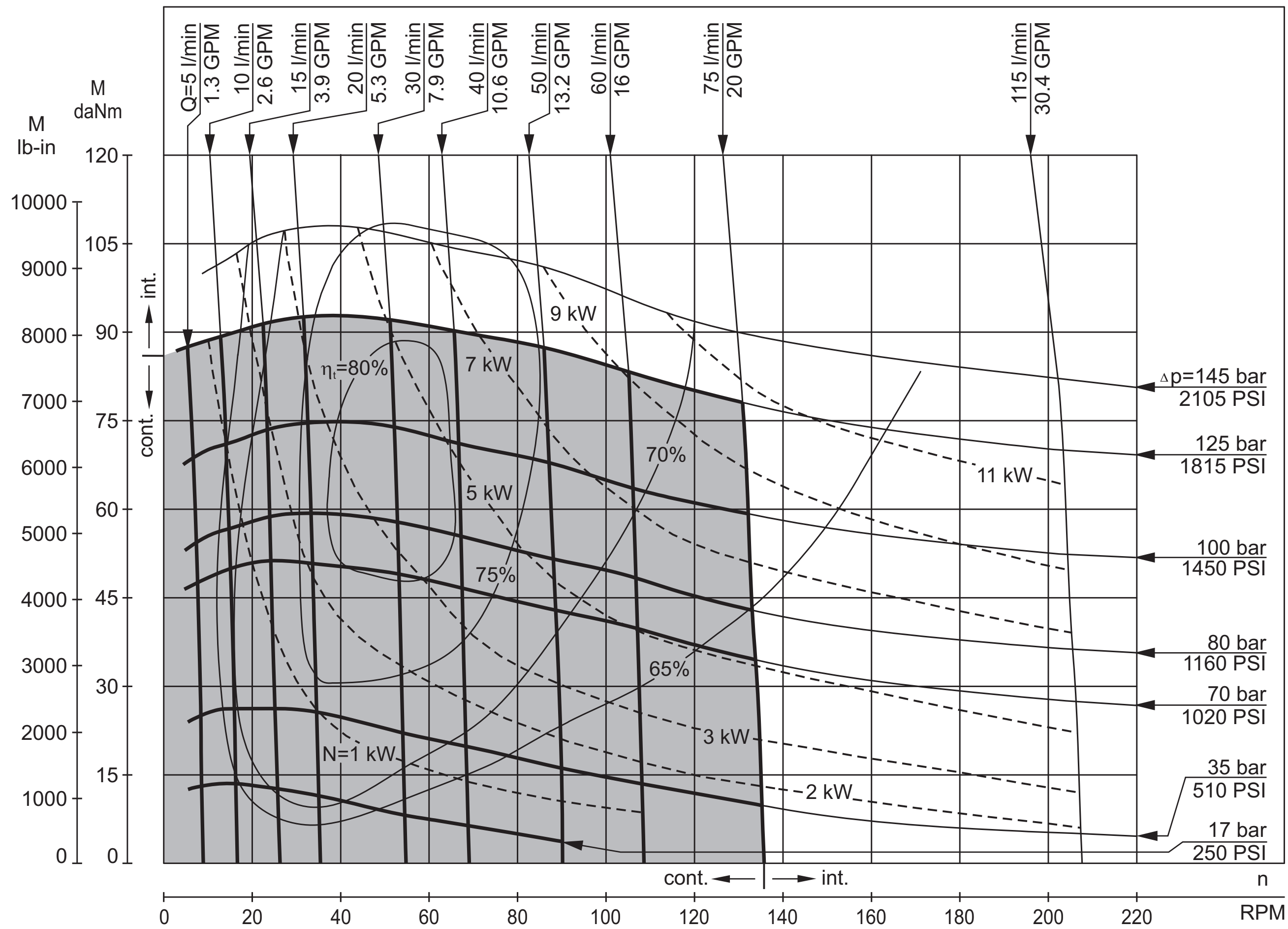
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5 PSI÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

HW 535



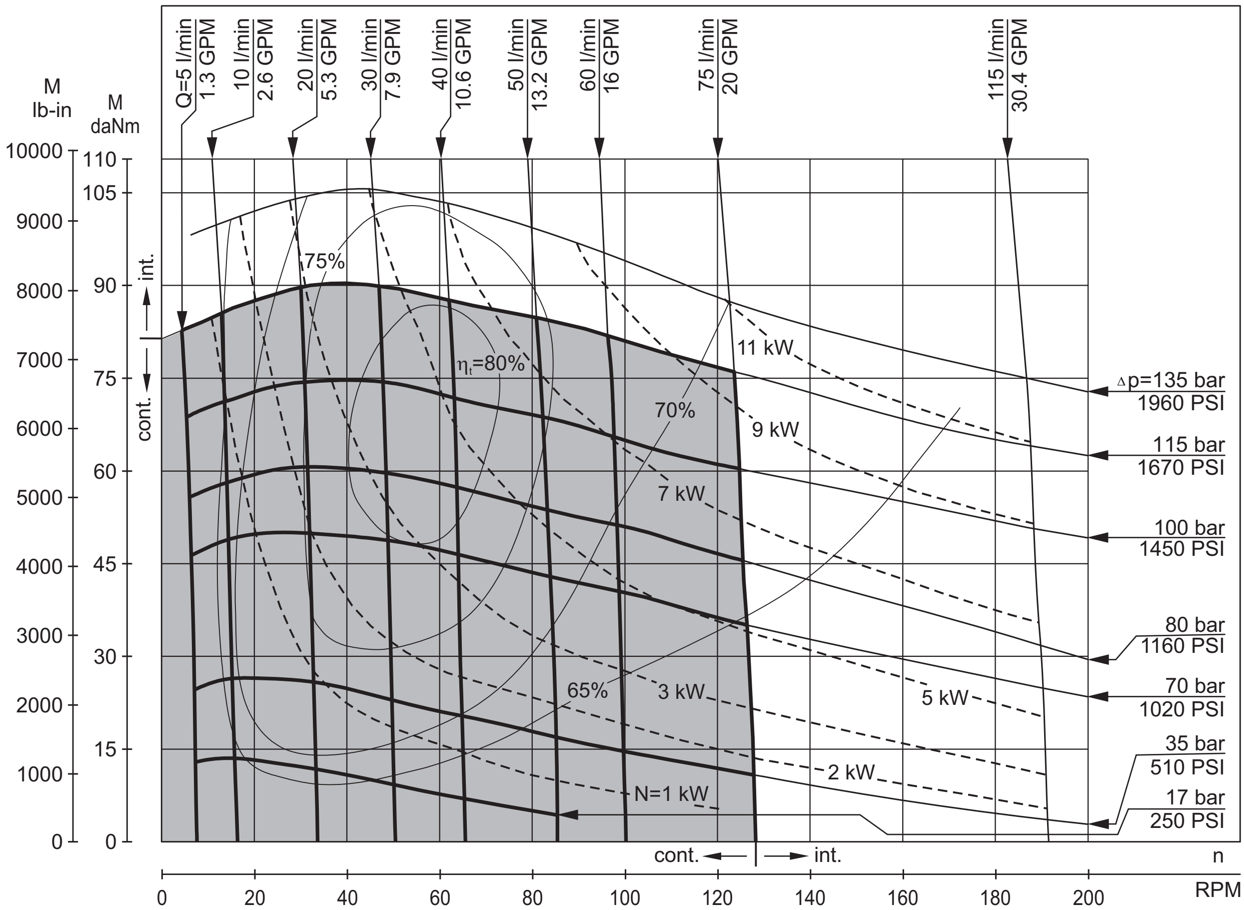
HW 550



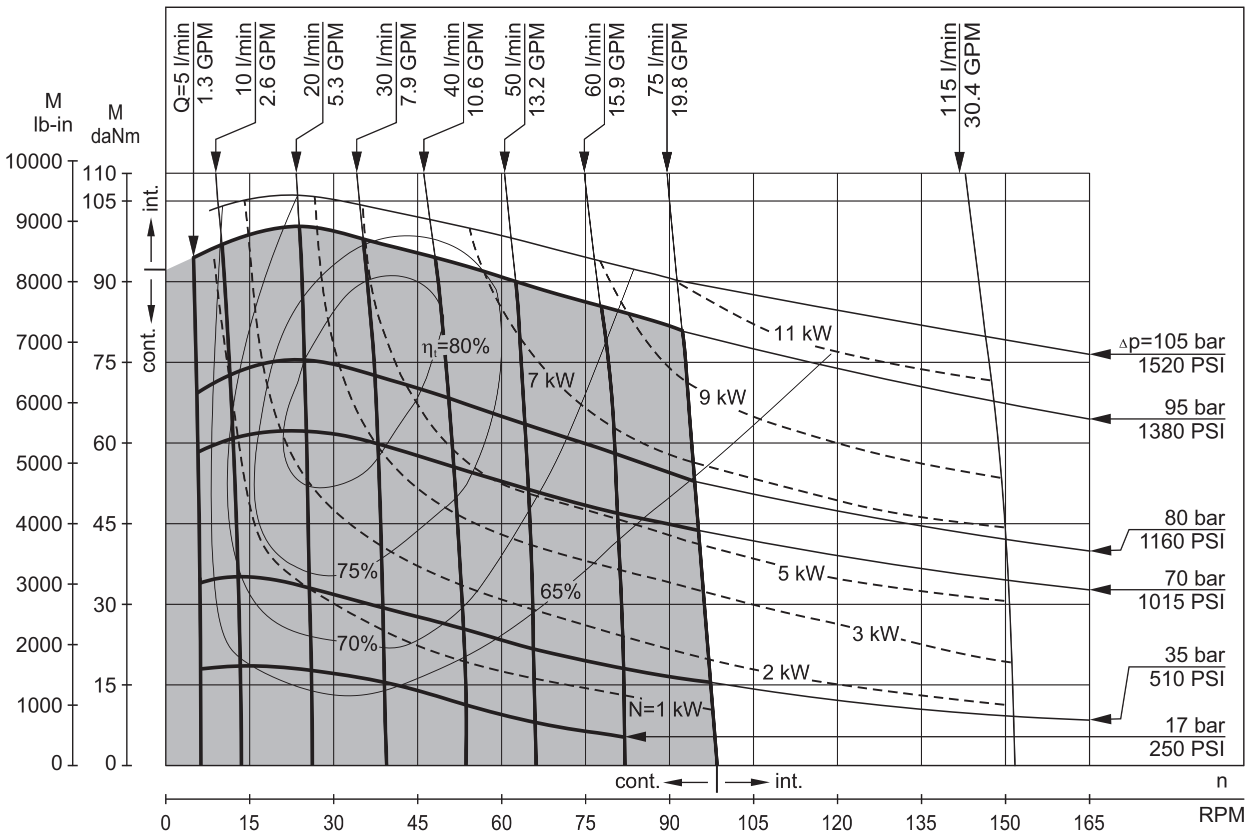
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5 PSI÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

HW 600



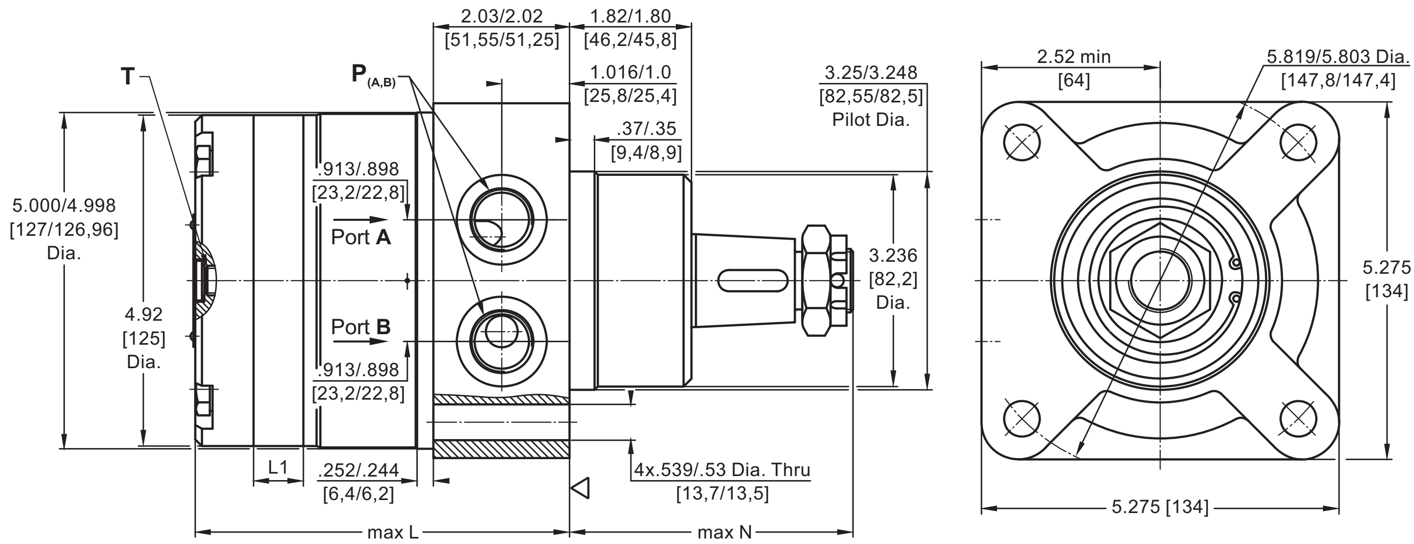
HW 750



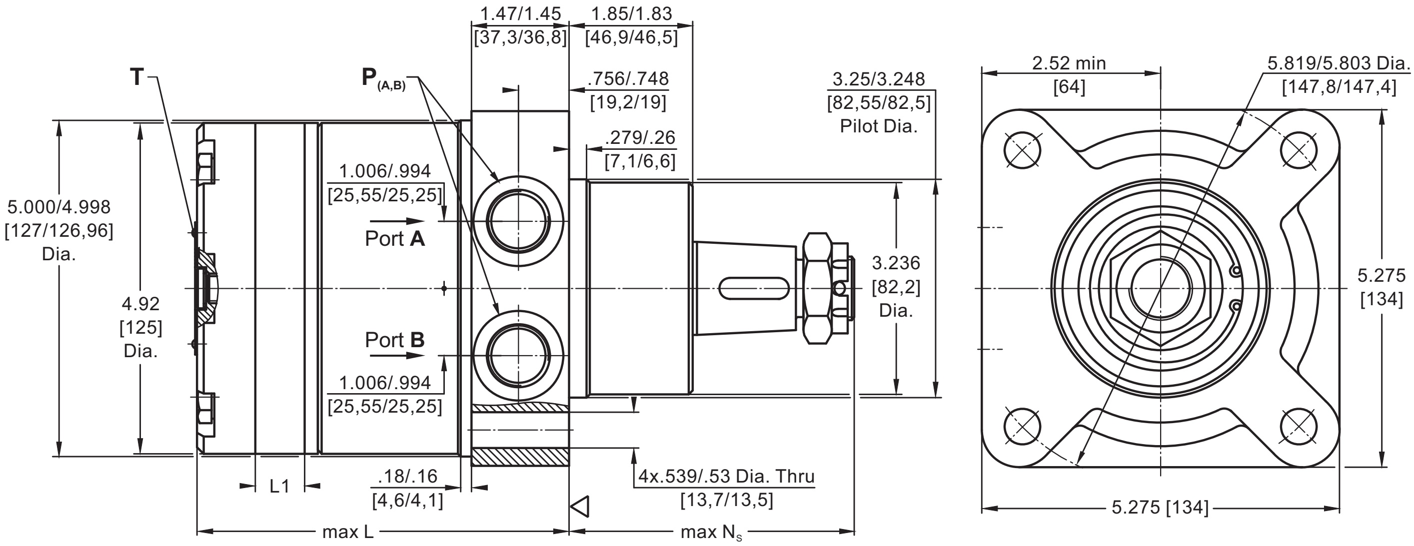
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5 PSI÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

DIMENSIONS and MOUNTING DATA

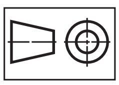
HW Wheel mount



HWS Wheel mount



Type	*L, in [mm]	L1, in [mm]
HW(S) 80	5.28 [134,0]	.43 [11,0]
HW(S) 100	5.39 [137,0]	.55 [14,0]
HW(S) 125	5.51 [140,5]	.68 [17,4]
HW(S) 160	5.71 [145,0]	.86 [21,8]
HW(S) 200	5.95 [151,0]	1.09 [27,8]
HW(S) 235	6.12 [155,5]	1.28 [32,5]
HW(S) 250	6.22 [158,0]	1.37 [34,8]
HW(S) 300	6.48 [164,5]	1.63 [41,4]
HW(S) 315	6.56 [166,5]	1.71 [43,5]
HW(S) 350	6.73 [171,0]	1.89 [48,0]
HW(S) 370	6.85 [174,0]	2.01 [51,0]
HW(S) 400	7.01 [178,0]	2.16 [54,8]
HW(S) 470	7.40 [188,0]	2.56 [65,0]
HW(S) 500	7.58 [192,5]	2.73 [69,4]
HW(S) 535	7.76 [197,0]	2.92 [74,1]
HW(S) 550	7.84 [199,0]	2.99 [76,0]
HW(S) 600	8.11 [206,0]	3.25 [82,6]
HW(S) 750	8.96 [227,5]	4.09 [104,0]


in [mm]

▽ - Motor Mounting Surface

Note: For N see pages 107÷108.

	Versions	
	2	4
$P_{(A,B)}$	2xG½	2x⅞-14UNF, O-ring
T	G¼	7/16-20UNF, O-ring

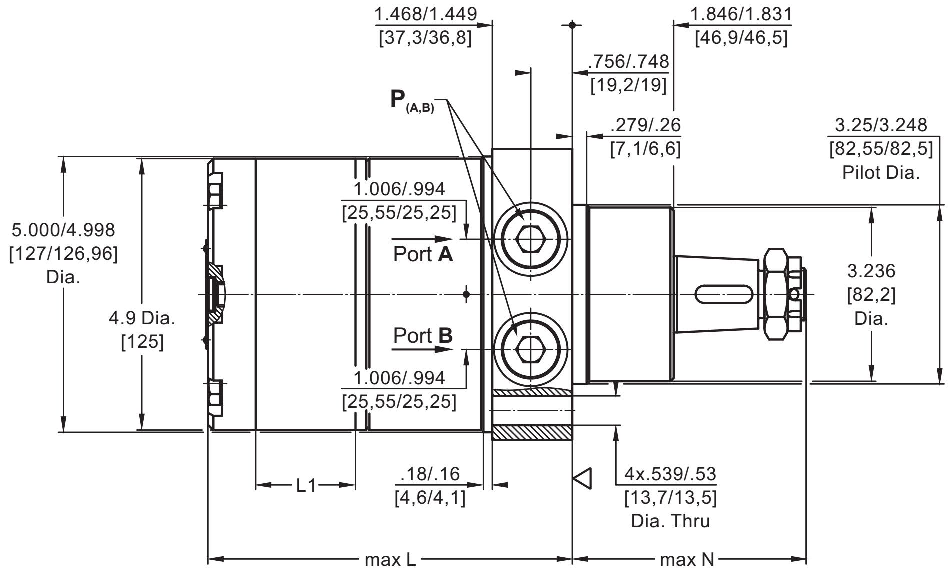
Standard Rotation
Viewed from Shaft End
Port **A** Pressurized - **CW**
Port **B** Pressurized - **CCW**

Reverse Rotation
Viewed from Shaft End
Port **A** Pressurized - **CCW**
Port **B** Pressurized - **CW**

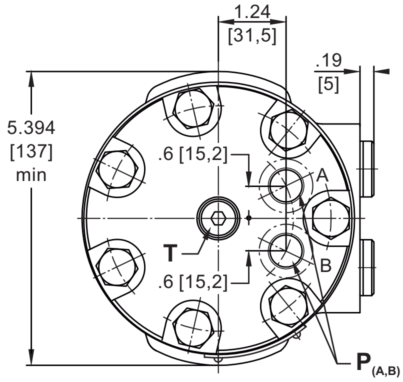
* For **LSV** option the dimension **L** is .118 in [3 mm] greater.

DIMENSIONS and MOUNTING DATA

HWSE Wheel mount, rear ports

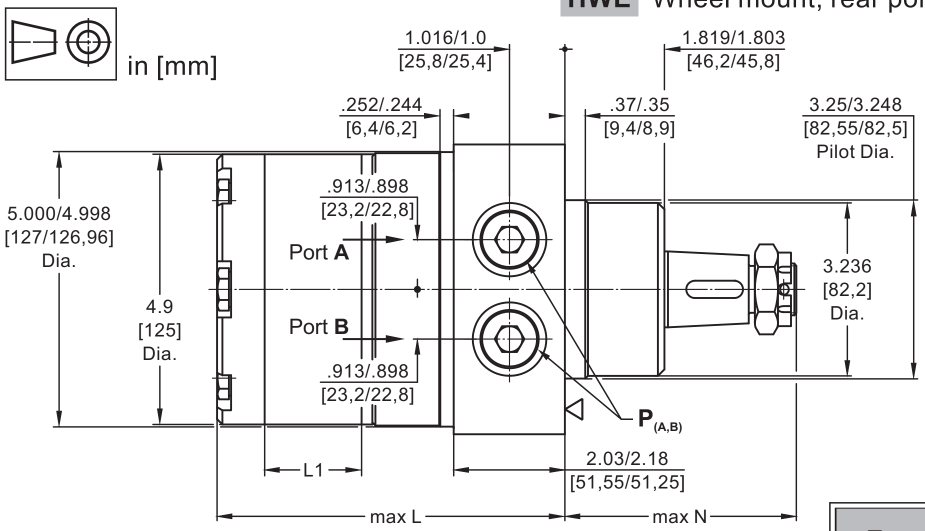


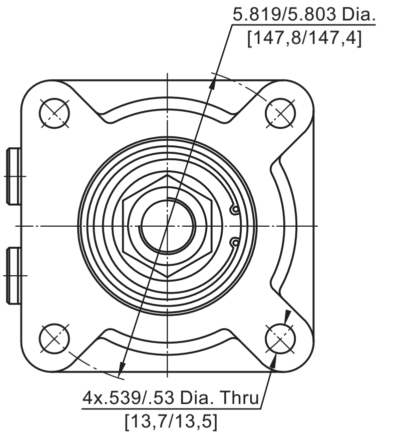
HWFE Magneto mount



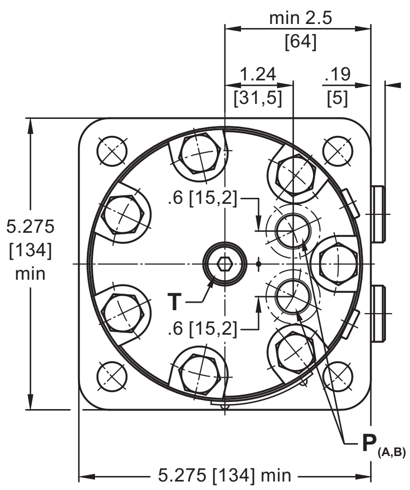
in [mm]

HWE Wheel mount, rear ports





HW(S)E



▽ - Motor Mounting Surface

Note: For N see pages 107÷108.

	Versions	
	5	6
$P_{(A,B)}$	2xG⅜	2x9⁄16-18UNF, O-ring
T	G¼	7⁄16-20UNF, O-ring

* For **LSV** option the dimension **L** is .118 in [3 mm] greater.

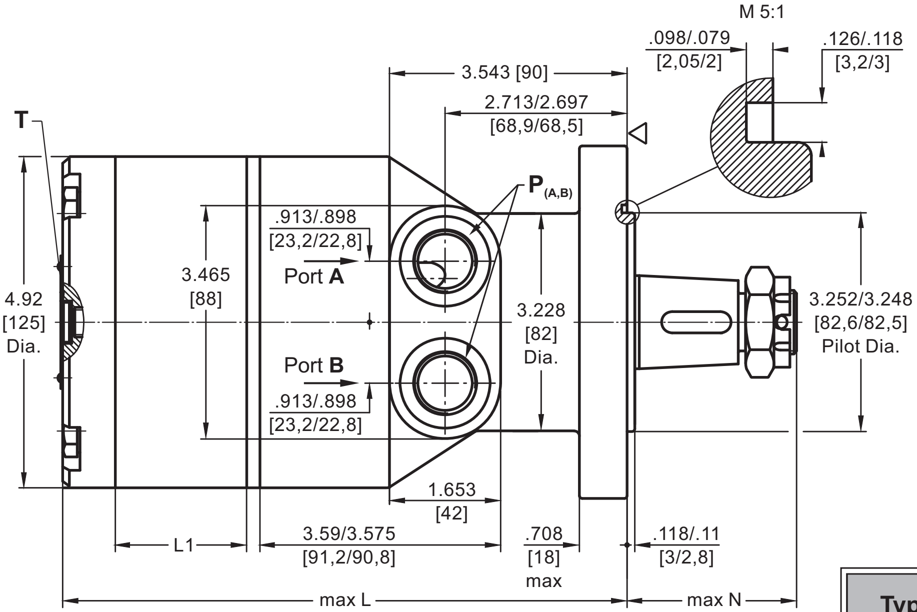
Type	*L, in [mm]		L_1, in [mm]
	HWE, HWSE	HWFE	
HW... 80	5.47 [139,0]	7.19 [182,5]	.43 [11,0]
HW... 100	5.59 [142,0]	7.30 [185,5]	.55 [14,0]
HW... 125	5.73 [145,5]	7.44 [189,0]	.68 [17,4]
HW... 160	5.91 [150,0]	7.62 [193,5]	.86 [21,8]
HW... 200	6.14 [156,0]	7.85 [199,5]	1.09 [27,8]
HW... 235	6.32 [160,5]	8.03 [204,0]	1.28 [32,5]
HW... 250	6.42 [163,0]	8.13 [206,5]	1.37 [34,8]
HW... 300	6.67 [169,5]	8.39 [213,0]	1.63 [41,4]
HW... 315	6.75 [171,5]	8.46 [215,0]	1.71 [43,5]
HW... 350	6.93 [176,0]	8.64 [219,5]	1.89 [48,0]
HW... 370	7.05 [179,0]	8.76 [222,5]	2.01 [51,0]
HW... 400	7.20 [183,0]	8.92 [226,5]	2.16 [54,8]
HW... 470	7.60 [193,0]	9.31 [236,5]	2.56 [65,0]
HW... 500	7.78 [197,5]	9.49 [241,0]	2.73 [69,4]
HW... 535	7.95 [202,0]	9.67 [245,5]	2.92 [74,1]
HW... 550	8.03 [204,0]	9.74 [247,5]	2.99 [76,0]
HW... 600	8.29 [210,6]	10.00 [254,1]	3.25 [82,6]
HW... 750	9.15 [232,5]	10.85 [275,5]	4.09 [104,0]

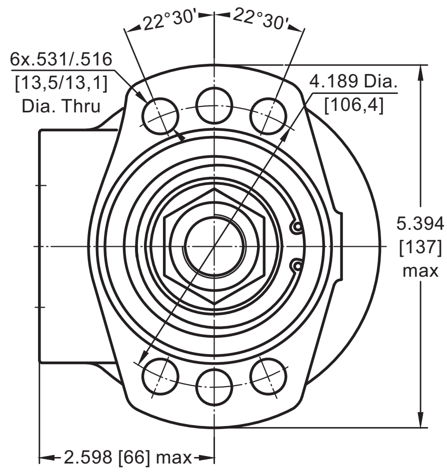
Standard Rotation
Viewed from Shaft End
Port **A** Pressurized - **CW**
Port **B** Pressurized - **CCW**

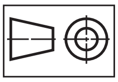
Reverse Rotation
Viewed from Shaft End
Port **A** Pressurized - **CCW**
Port **B** Pressurized - **CW**

DIMENSIONS and MOUNTING DATA

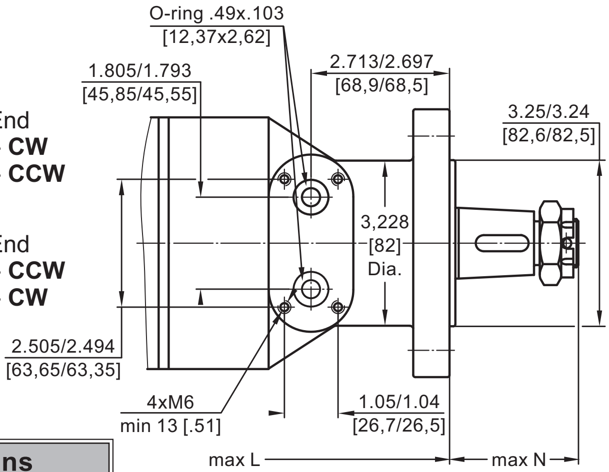
F Magneto mount, six holes






in [mm]

HWFV Magneto mount, six holes, relief valves



Standard Rotation
Viewed from Shaft End
Port **A** Pressurized - **CW**
Port **B** Pressurized - **CCW**

Reverse Rotation
Viewed from Shaft End
Port **A** Pressurized - **CCW**
Port **B** Pressurized - **CW**

	Versions	
	2	4
P(A,B)	2xG½	2x⅞-14UNF, O-ring
T	G¼	7/16-20UNF, O-ring

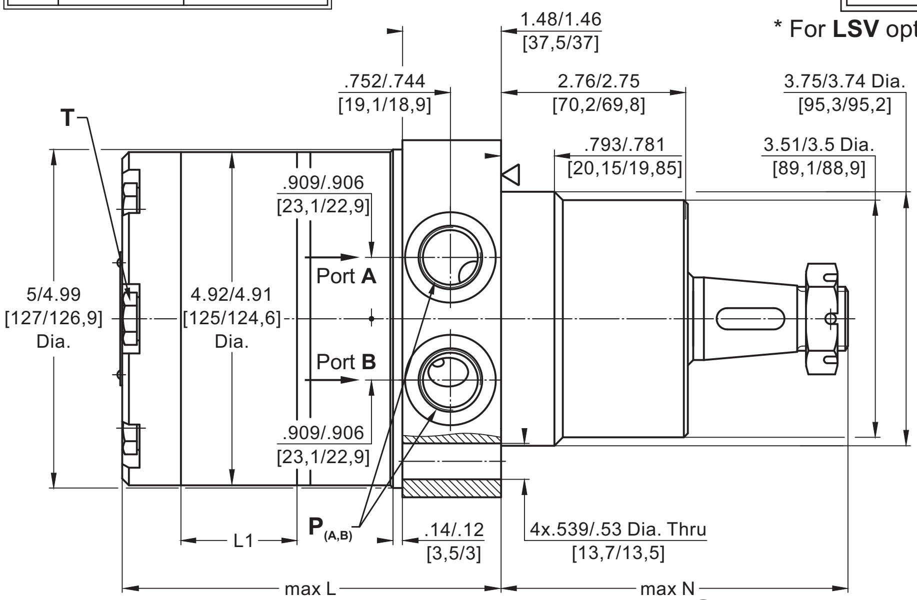
▽ - Motor Mounting Surface

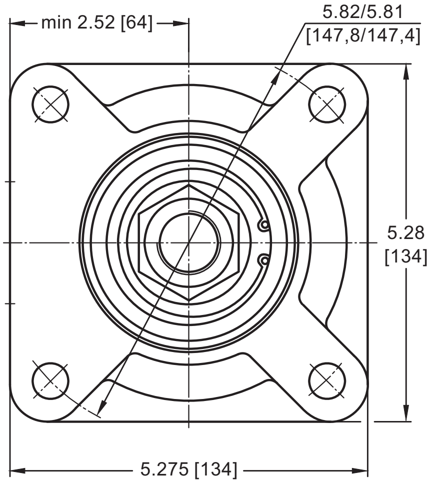
Note: For N see pages 107÷108.

Type	*L, in [mm]		L_1, in [mm]
	HWSW	HWF(V)	
HW... 80	4.35 [110.5]	7.01 [178,0]	.43 [11,0]
HW... 100	4.47 [113,5]	7.11 [180,5]	.55 [14,0]
HW... 125	4.61 [117,0]	7.24 [184,0]	.68 [17,4]
HW... 160	4.78 [121,5]	7.42 [188,5]	.86 [21,8]
HW... 200	5.00 [127,0]	7.66 [194,5]	1.09 [27,8]
HW... 235	5.20 [132,0]	7.84 [199,0]	1.28 [32,5]
HW... 250	5.30 [134,5]	7.93 [201,5]	1.37 [34,8]
HW... 300	5.55 [141,0]	8.20 [208,0]	1.63 [41,4]
HW... 315	5.63 [143,0]	8.27 [210,0]	1.71 [43,5]
HW... 350	5.81 [147,5]	8.45 [214,5]	1.89 [48,0]
HW... 370	5.94 [151,0]	8.56 [217,5]	2.01 [51,0]
HW... 400	6.08 [154,5]	8.72 [221,5]	2.16 [54,8]
HW... 470	6.48 [164,5]	9.11 [231,5]	2.56 [65,0]
HW... 500	6.65 [169,0]	9.29 [236,0]	2.73 [69,4]
HW... 535	6.85 [174,0]	9.47 [240,5]	2.92 [74,1]
HW... 550	6.91 [175,5]	9.55 [242,5]	2.99 [76,0]
HW... 600	7.16 [182,1]	9.81 [249,1]	3.25 [82,6]
HW... 750	8.01 [203,5]	10.65 [270,5]	4.09 [104,0]

* For **LSV** option the dimension **L** is .118 in [3 mm] greater.

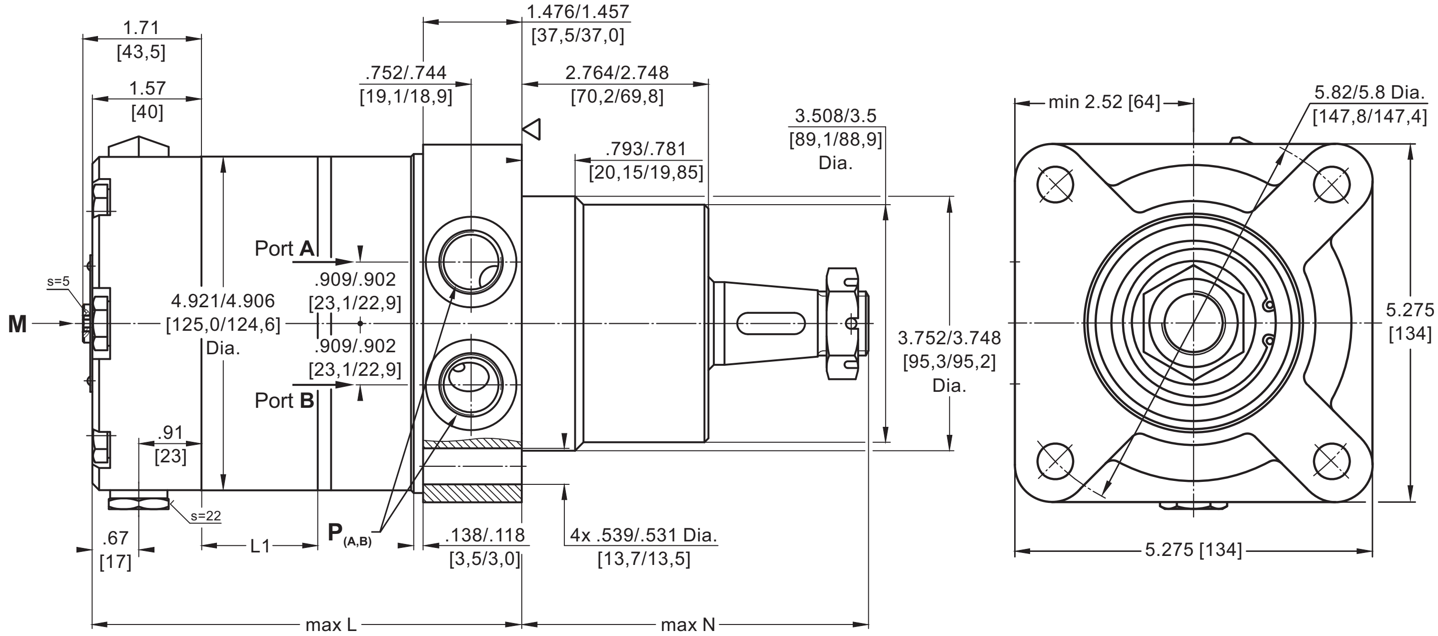
HWSW Wheel mount



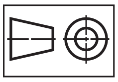


DIMENSIONS and MOUNTING DATA

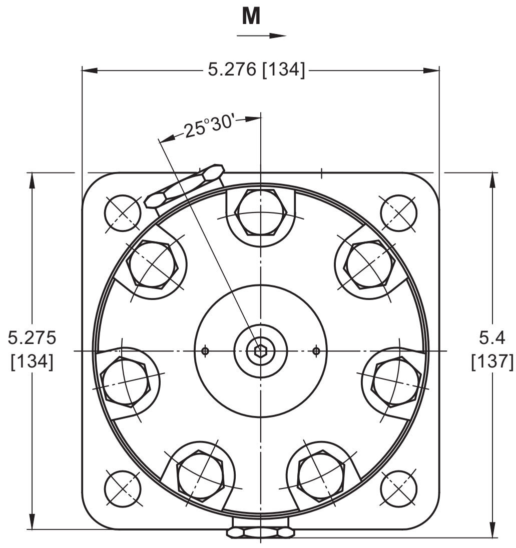
HWSWR Wheel mount, relief valves



Note: For N see pages 107÷108.



in [mm]



Type	*L, in [mm]	L1, in [mm]
HWSWR 80	5.28 [128,5]	.43 [11,0]
HWSWR 100	5.39 [131,5]	.55 [14,0]
HWSWR 125	5.51 [135,0]	.68 [17,4]
HWSWR 160	5.71 [139,5]	.86 [21,8]
HWSWR 200	5.95 [145,0]	1.09 [27,8]
HWSWR 235	6.12 [150,0]	1.28 [32,5]
HWSWR 250	6.22 [152,5]	1.37 [34,8]
HWSWR 300	6.48 [159,0]	1.63 [41,4]
HWSWR 315	6.56 [161,0]	1.71 [43,5]
HWSWR 350	6.73 [165,5]	1.89 [48,0]
HWSWR 370	6.85 [169,0]	2.01 [51,0]
HWSWR 400	7.01 [172,5]	2.16 [54,8]
HWSWR 470	7.40 [182,5]	2.56 [65,0]
HWSWR 500	7.58 [187,0]	2.73 [69,4]
HWSWR 535	7.76 [192,0]	2.92 [74,1]
HWSWR 550	7.84 [193,5]	2.99 [76,0]
HWSWR 600	8.09 [200,0]	3.25 [82,6]
HWSWR 750	8.70 [221,0]	4.09 [104,0]

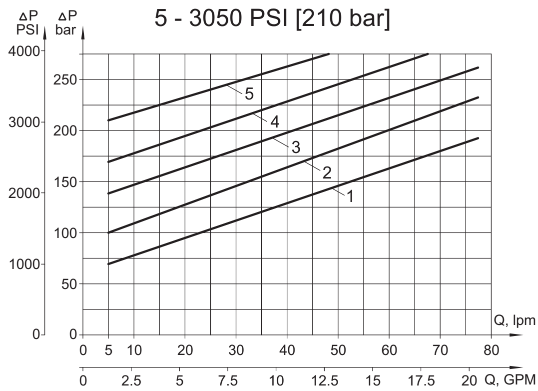
* For **LSV** option the dimension **L** is .118 in [3 mm] greater.

▽ - Motor mounting surface

	Versions	
	2	4
$P_{(A,B)}$	2xG½	2x⅞-14UNF, O-ring

Pressure Settings at Flow Q=1.32 GPM [5 lpm] 150 SUS [32 mm²/s]; 122°F [50°C]

1 - 1015 PSI [70 bar]
2 - 1450 PSI [100 bar]
3 - 2030 PSI [140 bar]
4 - 2470 PSI [170 bar]
5 - 3050 PSI [210 bar]

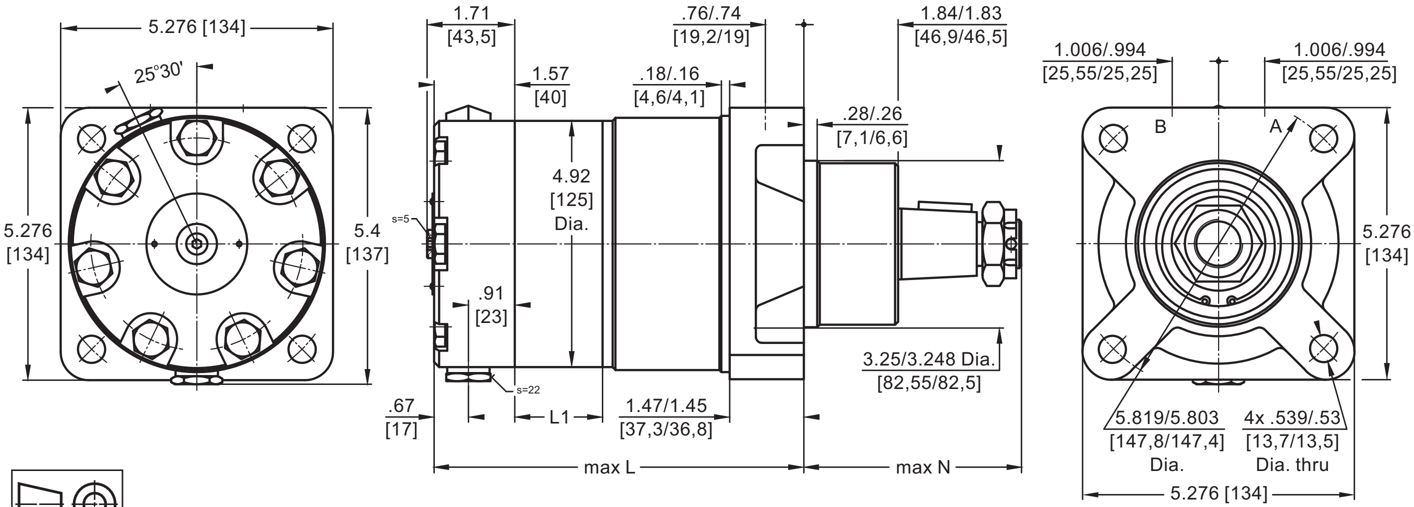


Standard Rotation
Viewed from Shaft End
Port **A** Pressurized - **CW**
Port **B** Pressurized - **CCW**

Reverse Rotation
Viewed from Shaft End
Port **A** Pressurized - **CCW**
Port **B** Pressurized - **CW**

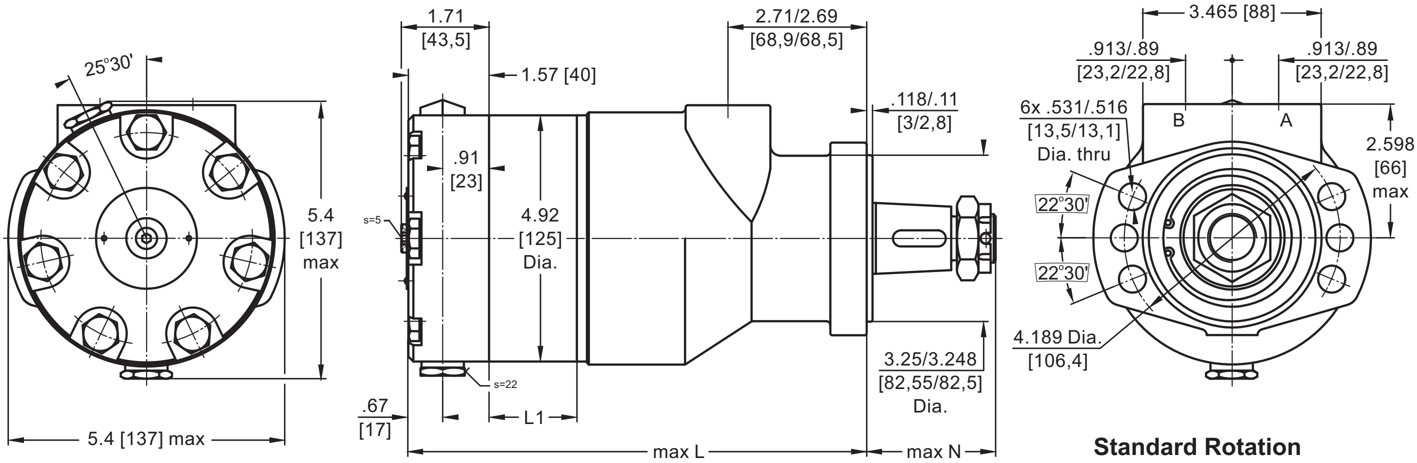
DIMENSIONS and MOUNTING DATA

HWSR Wheel mount, relief valves



in [mm]

HWFR Magneto mount, six holes, relief valves



Type	*L, in [mm]		L_1, in [mm]
	HWSR	HWFR	
HW... 80	5.98 [152,0]	7.69 [195,5]	.43 [11,0]
HW... 100	6.10 [155,0]	7.81 [198,5]	.55 [14,0]
HW... 125	6.24 [158,5]	7.95 [202,0]	.68 [17,4]
HW... 160	6.42 [163,0]	8.13 [206,5]	.86 [21,8]
HW... 200	6.65 [169,0]	8.37 [212,5]	1.09 [27,8]
HW... 235	6.83 [173,5]	8.54 [217,0]	1.28 [32,5]
HW... 250	6.93 [176,0]	8.64 [219,5]	1.37 [34,8]
HW... 300	7.19 [182,5]	8.89 [226,0]	1.63 [41,4]
HW... 315	7.26 [184,5]	8.98 [228,0]	1.71 [43,5]
HW... 350	7.44 [189,0]	9.15 [232,5]	1.89 [48,0]
HW... 370	7.56 [192,0]	9.27 [235,5]	2.01 [51,0]
HW... 400	7.72 [196,0]	9.43 [239,5]	2.16 [54,8]
HW... 470	8.11 [206,0]	9.82 [249,5]	2.56 [65,0]
HW... 500	8.29 [210,5]	10.00 [254,0]	2.73 [69,4]
HW... 535	8.46 [215,0]	10.19 [258,8]	2.92 [74,1]
HW... 550	8.54 [217,0]	10.26 [260,5]	2.99 [76,0]
HW... 600	8.92 [226,6]	10.52 [267,1]	3.25 [82,6]
HW... 750	9.63 [244,5]	11.34 [288,0]	4.09 [104,0]

* For **LSV** option the dimension **L** is 3 mm [.118 in] greater.

	Versions	
	2	4
$P_{(A,B)}$	2xG½	2x⅞-14UNF, O-ring

Standard Rotation
Viewed from Shaft End
Port **A** Pressurized - **CW**
Port **B** Pressurized - **CCW**

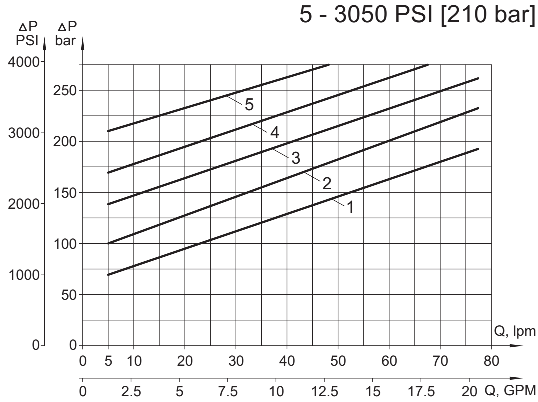
Reverse Rotation
Viewed from Shaft End
Port **A** Pressurized - **CCW**
Port **B** Pressurized - **CW**

▽ - Motor Mounting Surface

Note: For N see pages 107÷108.

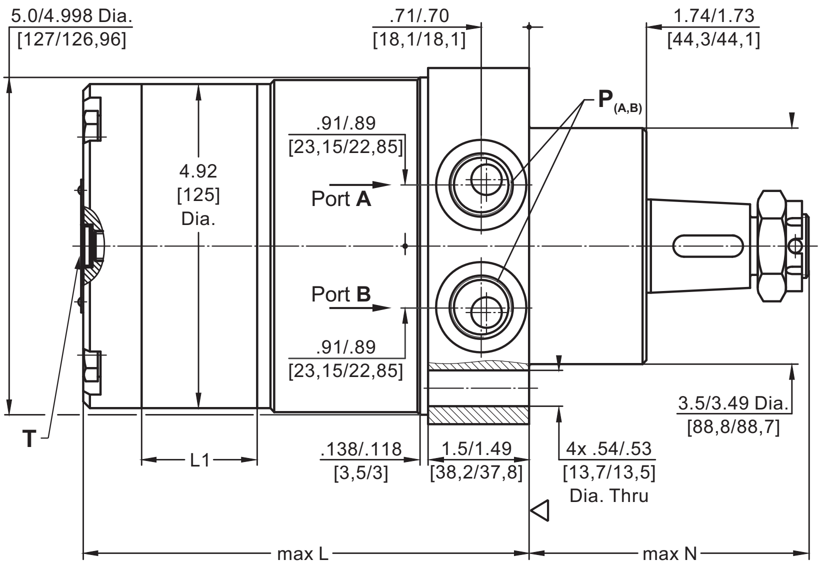
Pressure Settings at Flow Q=1.32 GPM [5 lpm] 150 SUS [32 mm²/s]; 122°F [50°C]

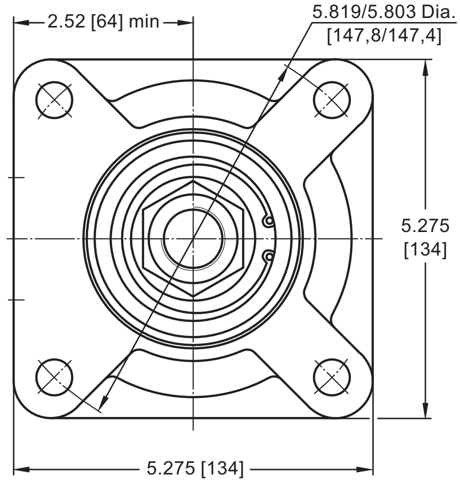
1 - 1015 PSI [70 bar]
2 - 1450 PSI [100 bar]
3 - 2030 PSI [140 bar]
4 - 2470 PSI [170 bar]
5 - 3050 PSI [210 bar]



DIMENSIONS and MOUNTING DATA

D Wheel mount

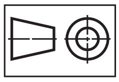




	Versions	
	2	4
P(A,B)	2xG½	2x⅞-14UNF, O-ring
T	G¼	7⁄16-20UNF, O-ring

▽ - Motor Mounting Surface

Note: For N see pages 107÷108.



in [mm]

Type	*L, in [mm]		L₁, in [mm]
	HWD	HWV	
HW... 80	5.35 [136,0]	5.28 [134,0]	.43 [11,0]
HW... 100	5.47 [139,0]	5.39 [137,0]	.55 [14,0]
HW... 125	5.61 [142,5]	5.53 [140,5]	.68 [17,4]
HW... 160	5.79 [147,0]	5.71 [145,0]	.86 [21,8]
HW... 200	6.02 [153,0]	5.94 [151,0]	1.09 [27,8]
HW... 235	6.22 [158,0]	6.12 [155,5]	1.28 [32,5]
HW... 250	6.30 [160,0]	6.22 [158,0]	1.37 [34,8]
HW... 300	6.56 [166,5]	6.46 [164,5]	1.63 [41,4]
HW... 315	6.65 [169,0]	6.56 [166,5]	1.71 [43,5]
HW... 350	6.83 [173,5]	6.73 [171,0]	1.89 [48,0]
HW... 370	6.95 [176,5]	6.85 [174,0]	2.01 [51,0]
HW... 400	7.09 [180,0]	7.01 [178,0]	2.16 [54,8]
HW... 470	7.50 [190,5]	7.40 [188,0]	2.56 [65,0]
HW... 500	7.66 [194,5]	7.58 [192,5]	2.73 [69,4]
HW... 535	7.85 [199,5]	7.76 [197,0]	2.92 [74,1]
HW... 550	7.93 [201,5]	7.83 [199,0]	2.99 [76,0]
HW... 600	8.15 [207,1]	8.11 [206,0]	3.25 [82,6]
HW... 750	9.02 [229,0]	8.96 [227,5]	4.09 [104,0]

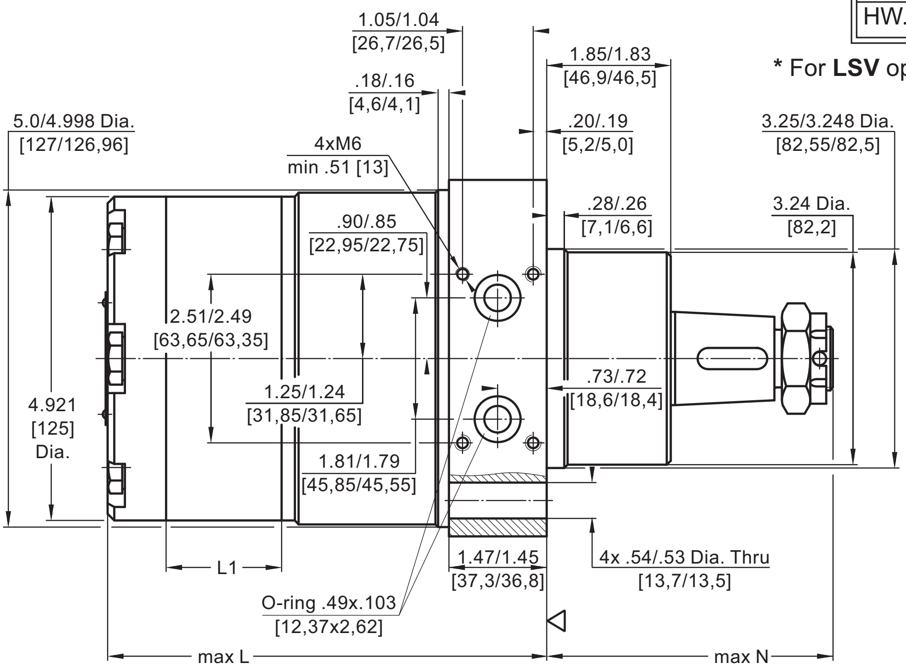
* For **LSV** option the dimension **L** is .118 in [3 mm] greater.

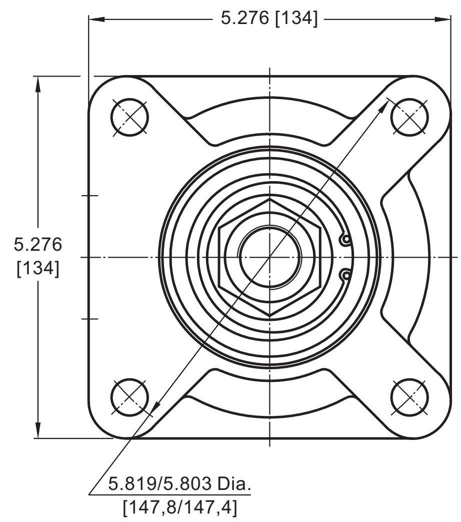
Standard Rotation
Viewed from Shaft End
Port **A** Pressurized - **CW**
Port **B** Pressurized - **CCW**

Reverse Rotation
Viewed from Shaft End
Port **A** Pressurized - **CCW**
Port **B** Pressurized - **CW**

	Versions	
	2	4
T	G¼	7⁄16-20UNF, O-ring

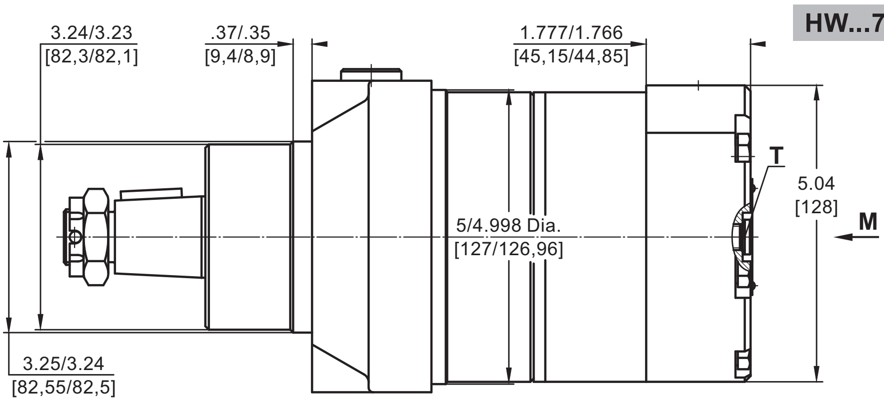
V Wheel mount, four holes, manifold 4xM6

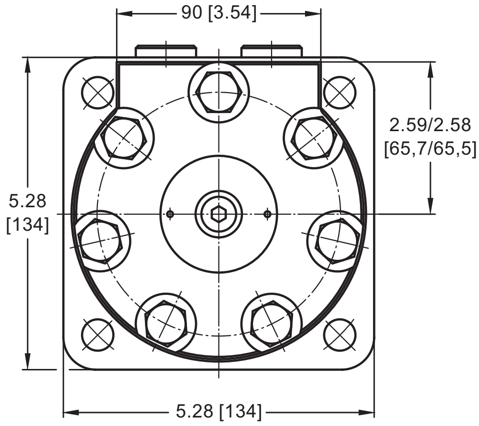


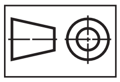


DIMENSIONS and MOUNTING DATA

HW...7

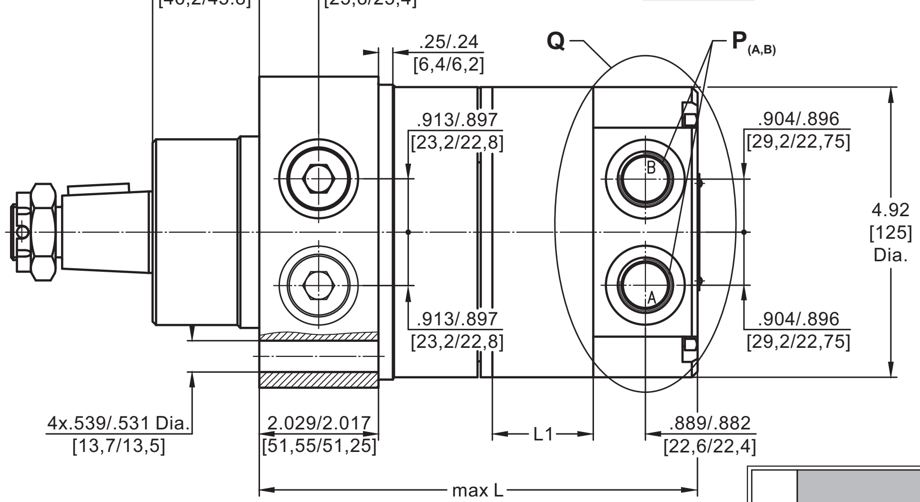


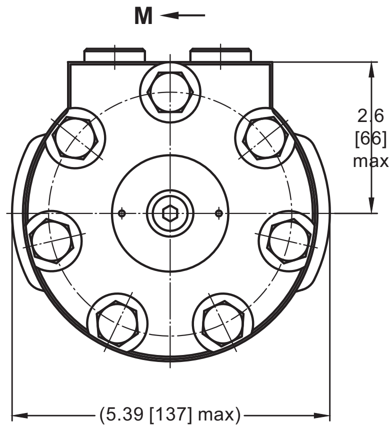




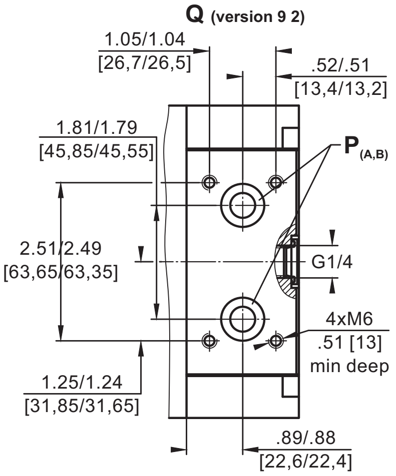
in [mm]

HWF...7,8,9,10

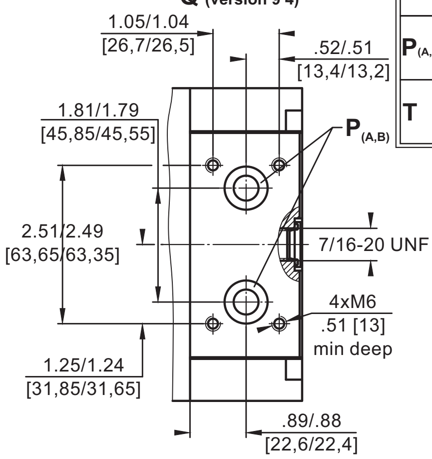




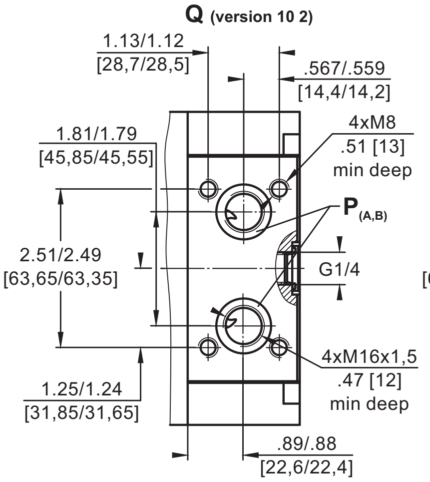
Q (version 9 2)



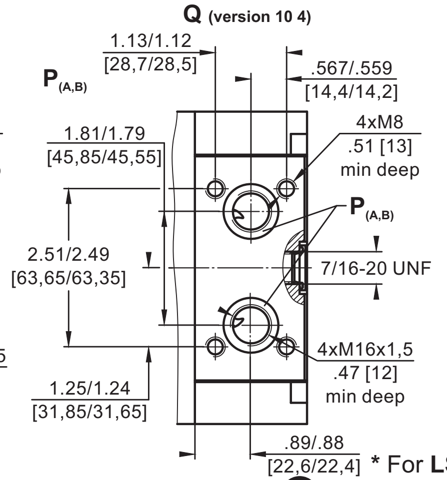
Q (version 9 4)



Q (version 10 2)



Q (version 10 4)



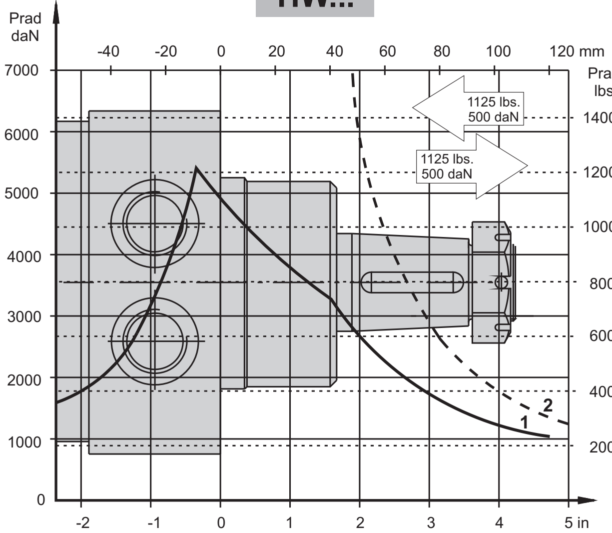
	Versions					
	7	8	9 2	9 4	10 2	10 4
$P_{(A,B)}$	2xG½	2x⅞-14UNF, O-ring	2xø9 O-ring 12,37x2,62 [.49x.103]		2xM16x1,5 O-ring 18x2 [.709x.787]	
T	G¼	7/16-20UNF, O-ring	G¼	7/16-20UNF, O-ring	G¼	7/16-20UNF, O-ring

Type	*L, in [mm]		L_1, in [mm]
	HW(S)...7,8,9,10	HWF...7,8,9,10	
HW... 80	6.20 [157,5]	7.89 [200,5]	.43 [11,0]
HW...100	6.32 [160,5]	8.01 [203,5]	.55 [14,0]
HW...125	6.46 [164,0]	8.15 [207,0]	.68 [17,4]
HW...160	6.61 [168,0]	8.31 [211,0]	.86 [21,8]
HW...200	6.85 [174,0]	8.54 [217,0]	1.09 [27,8]
HW...235	7.05 [179,0]	8.74 [222,0]	1.28 [32,5]
HW...250	7.13 [181,0]	8.82 [224,0]	1.37 [34,8]
HW...300	7.38 [187,5]	9.07 [230,5]	1.63 [41,4]
HW...315	7.48 [190,0]	9.17 [233,0]	1.71 [43,5]
HW...350	7.66 [194,5]	9.35 [237,5]	1.89 [48,0]
HW...370	7.78 [197,5]	9.47 [240,5]	2.01 [51,0]
HW...400	7.91 [201,0]	9.61 [244,0]	2.16 [54,8]
HW...470	8.33 [211,5]	10.02 [254,5]	2.56 [65,0]
HW...500	8.50 [216,0]	10.20 [259,0]	2.73 [69,4]
HW...535	8.68 [220,5]	10.37 [263,5]	2.92 [74,1]
HW...550	8.76 [222,5]	10.45 [265,5]	2.99 [76,0]
HW...600	9.02 [229,0]	10.71 [272,0]	3.25 [82,6]
HW...750	9.86 [250,5]	11.56 [293,5]	4.09 [104]

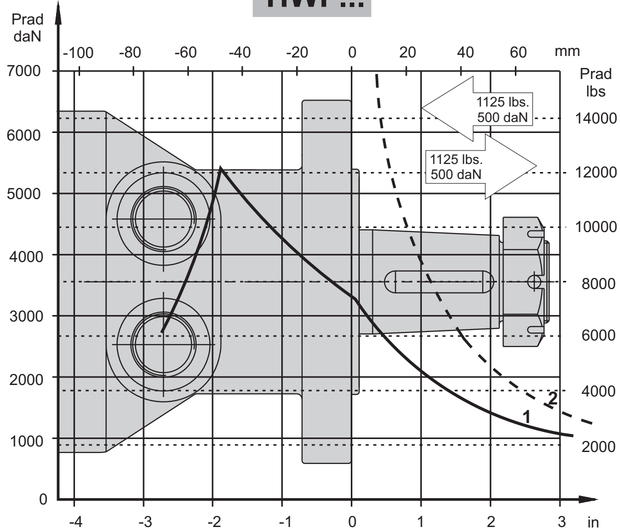
* For **LSV** option the dimension **L** is .118 in [3 mm] greater.

PERMISSIBLE SHAFT LOADS

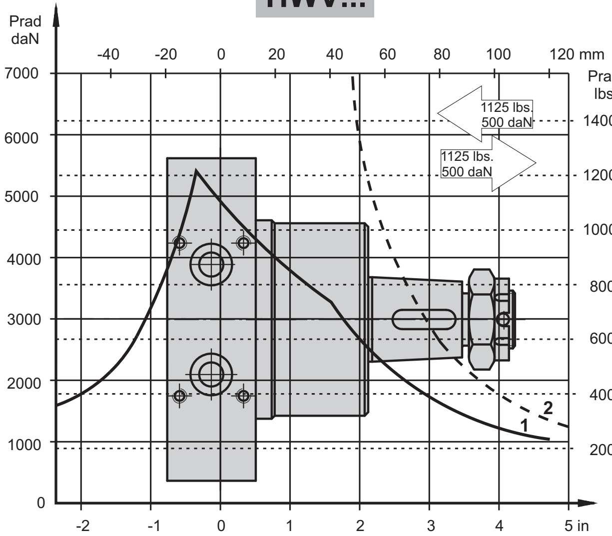
HW...



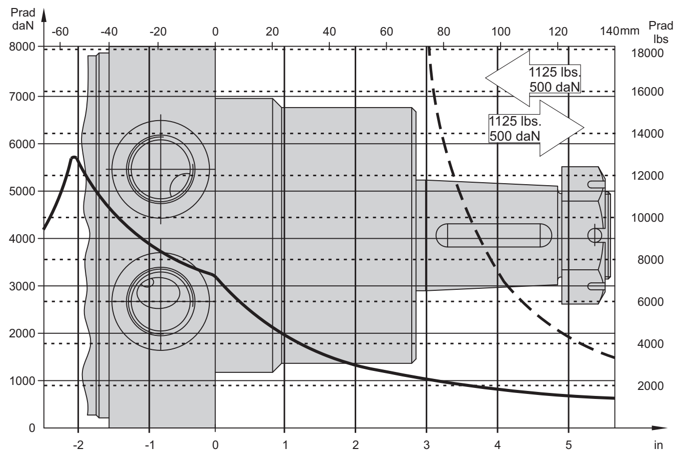
HWF...



HWV...



HWSW...

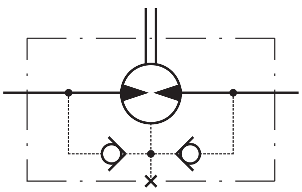


1 - Bearing curve: The curve applies to a B10 bearing life of 2000 hours at 100 RPM.

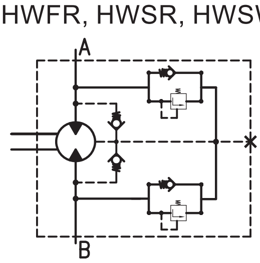
2 - Shaft curve: The curve represents Max. permissible radial shaft load with safety factor 3:1.

MAX. PERMISSIBLE SHAFT SEAL PRESSURE

HW, HWF, HWS, HWD, HWV, HWSW, HW(S)(F)...7,8,9,10



HWFR, HWSR, HWSWR

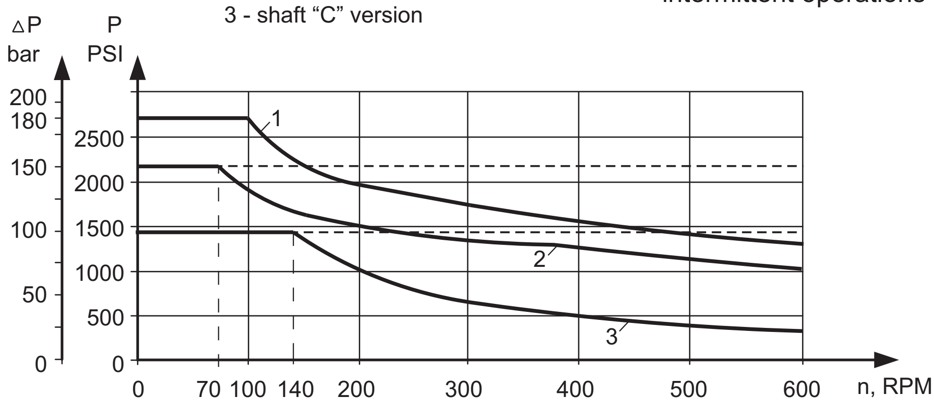


HW...U motors with drain connection:

The shaft seal pressure equals the pressure in the drain line.

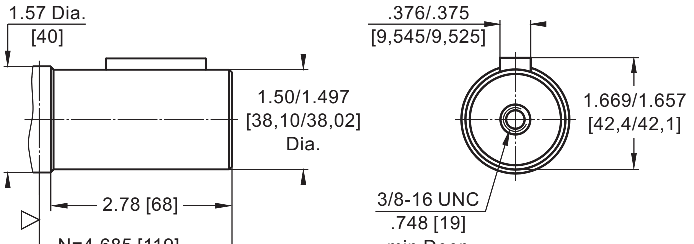
1 - high pressure "U" version
2 - standard version
3 - shaft "C" version

- continuous operations
- intermittent operations



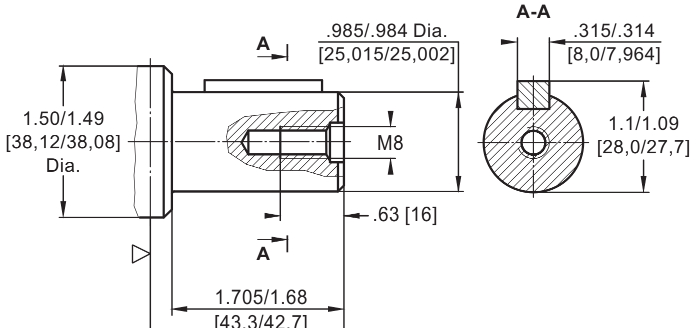
SHAFT EXTENSIONS

C - 1½" [38,1] straight, Parallel key ⅜"x ⅜"x1½" BS46
Max. Torque 10630 lb-in [120 daNm]



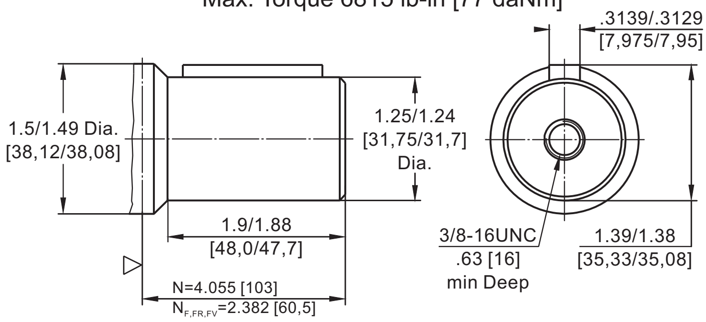
N=4.685 [119]
$N_{F,FR,FV}$=3.01 [76,5]
$N_{S,SR,V}$=4.724 [120]
N_D=4.63 [117,5]
$N_{SW,SWR}$=5.63 [143]

CO - ø25, straight, Parallel key A8x7x32 DIN 6885
Max. Torque 3540 lb-in [40 daNm]



N=3.66 [93]
$N_{F,FR,FV}$=1.95 [49,5]
$N_{S,SR,V}$=3.68 [93,5]
N_D=3.58 [91]
$N_{SW,SWR}$=4.61 [117]

K - 1¼" [31,75] straight, Parallel key 5⁄16"x5⁄16"x1½" BS46
Max. Torque 6815 lb-in [77 daNm]

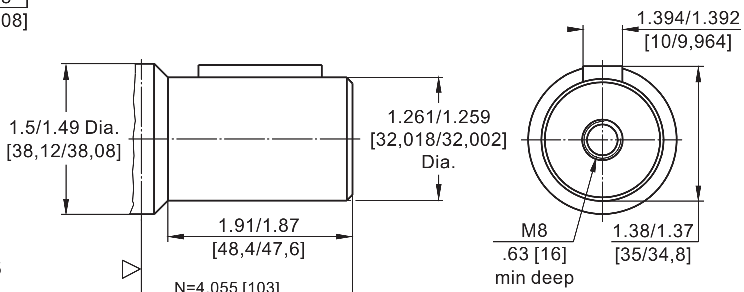


N=4.055 [103]
$N_{F,FR,FV}$=2.382 [60,5]
$N_{S,SR,V}$=4.09 [104]
N_D=3.99 [101,5]
$N_{SW,SWR}$=5.00 [127]

in [mm]

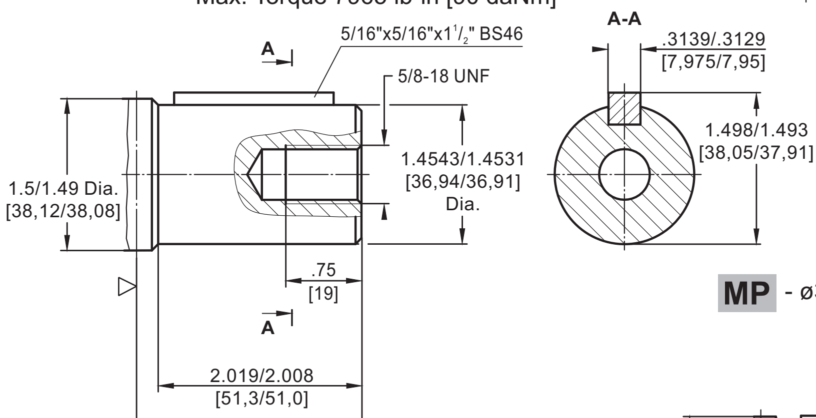
▽ - Motor Mounting Surface

M - ø32 straight, Parallel key A10x8x32 DIN 6885
Max. Torque 6815 lb-in [77 daNm]



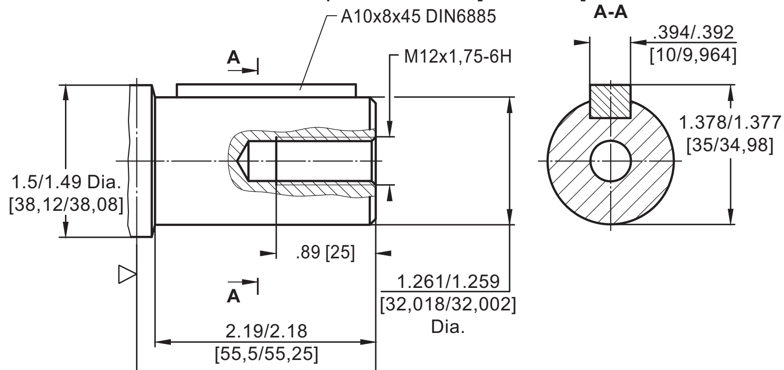
N=4.055 [103]
$N_{F,FR,FV}$=2.382 [60,5]
$N_{S,SR,V}$=4.09 [104]
N_D=3.99 [101,5]
$N_{SW,SWR}$=5.00 [127]

H - 1⅜" [35] straight, Parallel key 5⁄16"x5⁄16"x1½" BS46
Max. Torque 7965 lb-in [90 daNm]



N=4.31 [109,5]
$N_{F,FR,FV}$=2.62 [66,5]
$N_{S,SR,V}$=4.35 [110,5]
N_D=4.25 [108]
$N_{SW,SWR}$=5.26 [133,5]

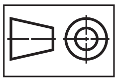
MP - ø32 straight, Parallel key A10x8x45 DIN 6885
Max. Torque 7520 lb-in [85 daNm]



N=4.11 [104,5]
$N_{F,FR,FV}$=2.40 [61]
$N_{S,SR,V}$=4.15 [105,5]
N_D=4.06 [103]
$N_{SW,SWR}$=5.06 [128,5]

N - for standard flange
N_F - for **F** flange
N_{FR} - for **FR** flange
N_{FV} - for **FV** flange
N_S - for **S** flange
N_{SR} - for **SR** flange
N_D - for **D** flange
N_V - for **V** flange
N_{SW} - for **SW** flange
N_{SWR} - for **SWR** flange

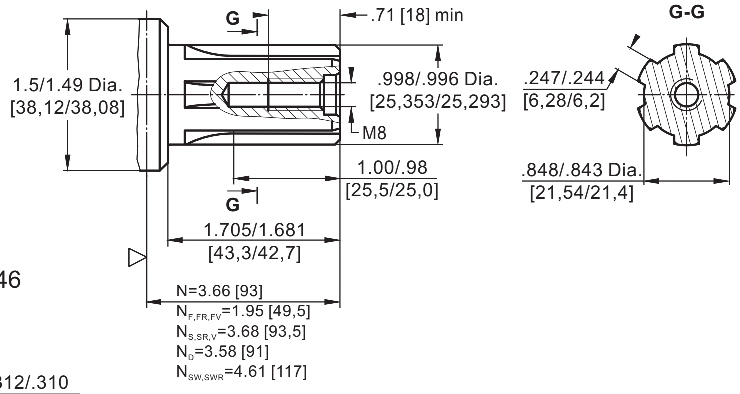
SHAFT EXTENSIONS [continued]



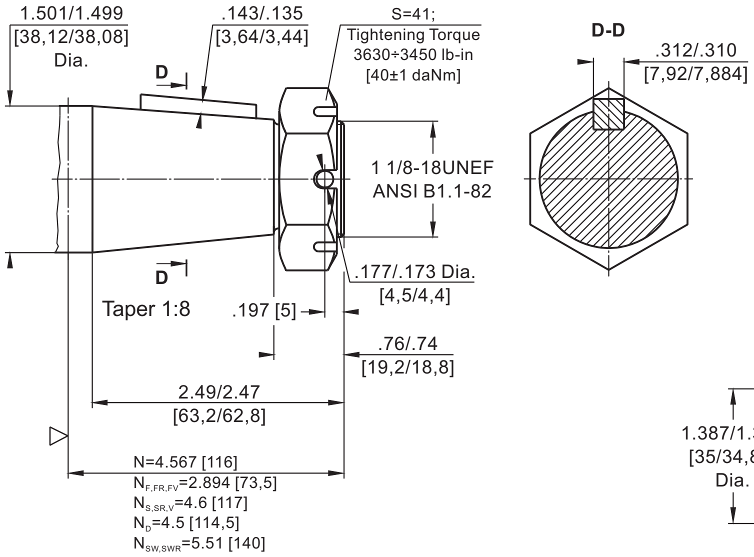
in [mm]

▽ - Motor Mounting Surface

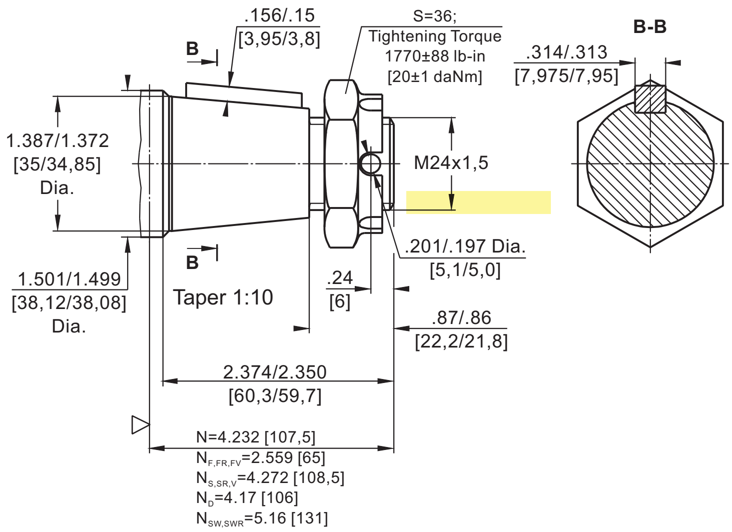
SH - ø1" splined BS 2059, SAE 6B
Max. Torque 3540 lb-in [40 daNm]



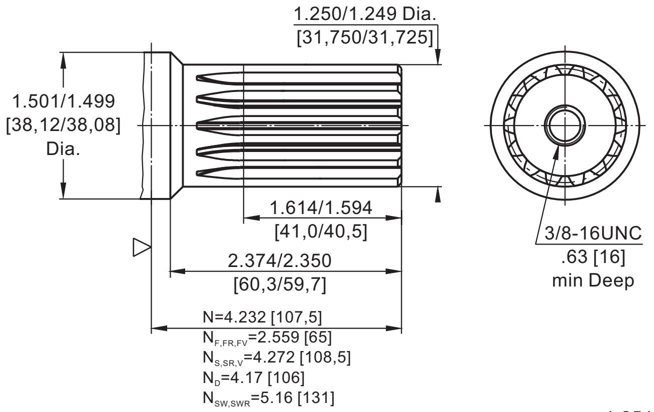
T - 1½" [38,1] tapered 1:8, Parallel key ⁵⁄₁₆"x⁵⁄₁₆"x1¼" BS46
Max. Torque 10620 lb-in [120 daNm]



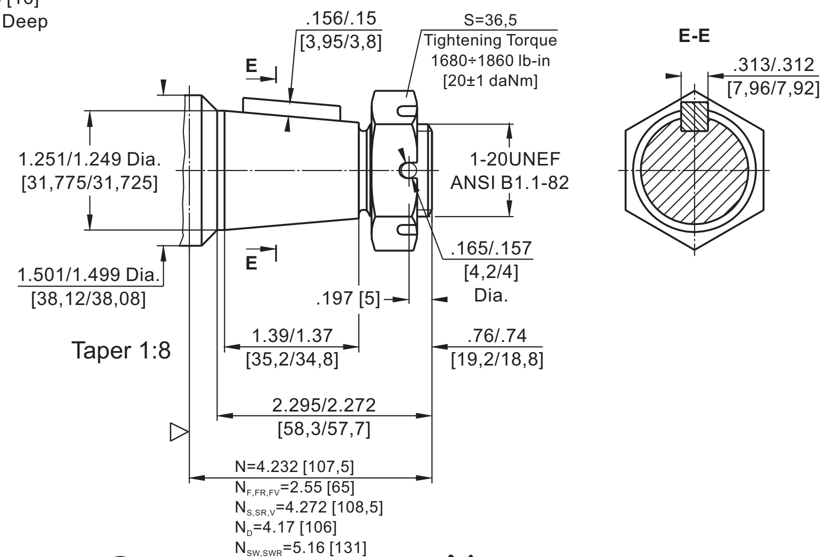
KB - ø35 tapered 1:10, Parallel key ⁵⁄₁₆"x⁵⁄₁₆"x1¼" BS46
Max. Torque 8410 lb-in [95 daNm]



L - ø1¼" [31,75] splined 14T, DP12/24 ANSI B92.1-1976
Max. Torque 8410 lb-in [95 daNm]



R - 1¼" [31,75] tapered 1:8, Parallel key ⁵⁄₁₆"x⁵⁄₁₆"x1" BS46
Max. Torque 8410 lb-in [95 daNm]



N - for standard flange
N_F - for **F** flange
N_{FR} - for **FR** flange
N_{FV} - for **FV** flange
N_S - for **S** flange
N_{SR} - for **SR** flange
N_D - for **D** flange
N_V - for **V** flange
N_{SW} - for **SW** flange
N_{SWR} - for **SWR** flange

ORDER CODE

	1	2	3	4	5	6	7	8	9
HW								/	

Pos.1 - Mounting Flange

omit	- Wheel mount, four holes
E	- Wheel mount, four holes, rear ports
F	- Magneto mount, six holes
FR	- Magneto mount, six holes, relief valves
FV[1)*]	- Magneto mount, six holes, manifold 4xM6
FE	- Magneto mount, six holes, rear ports
S	- Wheel mount, four holes
SR	- Wheel mount, four holes, relief valves
SW	- Wheel mount, four holes; mounting on ø95,3 [3.75]
SWR	- Wheel mount, four holes; mounting on ø95,3 [3.75], relief valves
SE	- Wheel mount, four holes, rear ports
D	- Wheel mount, four holes; mounting on ø88,8 [3.5]
V[1)*]	- Wheel mount, four holes, manifold 4xM6

Pos.2 - Displacement code

80	- 4.86 in^3/rev [79,7 cm^3/rev]
100	- 6.19 in^3/rev [101,4 cm^3/rev]
125	- 7.69 in^3/rev [126,0 cm^3/rev]
160	- 9.63 in^3/rev [157,8 cm^3/rev]
200	- 12.28 in^3/rev [201,3 cm^3/rev]
235	- 14.36 in^3/rev [235,3 cm^3/rev]
250	- 15.38 in^3/rev [252,0 cm^3/rev]
300	- 18.31 in^3/rev [300,0 cm^3/rev]
315	- 19.22 in^3/rev [314,9 cm^3/rev]
350	- 21.22 in^3/rev [347,8 cm^3/rev]
370	- 22.52 in^3/rev [369,0 cm^3/rev]
400	- 24.21 in^3/rev [396,8 cm^3/rev]
470	- 28.72 in^3/rev [470,6 cm^3/rev]
500	- 30.66 in^3/rev [502,4 cm^3/rev]
535	- 32.65 in^3/rev [535,0 cm^3/rev]
550	- 33.56 in^3/rev [550,0 cm^3/rev]
600	- 36.55 in^3/rev [598,9 cm^3/rev]
750	- 45.99 in^3/rev [753,8 cm^3/rev]

Pos.3 - Shaft Extensions[2)*]

K	- 1¼" [ø31,75] straight, Parallel key $^{5}/_{16}$"x$^{5}/_{16}$"x1$^{1}/_{2}$" BS46
KB	- ø35 tapered 1:10, Parallel key $^{5}/_{16}$"x$^{5}/_{16}$"x1$^{1}/_{4}$" BS46
L	- 1$^{1}/_{4}$" [ø31,75] splined 14T, DP12/24 ANSI B92.1-1976
M	- ø32 straight, Parallel key A10x8x32 DIN 6885
MP	- ø32 straight, Parallel key A10x8x45 DIN 6885
R	- 1$^{1}/_{4}$" [ø31,75] tapered 1:8, Parallel key $^{5}/_{16}$"x$^{5}/_{16}$"x1" BS46
T	- 1$^{1}/_{2}$" [ø38,1] tapered 1:8, Parallel key $^{5}/_{16}$"x$^{5}/_{16}$"x1$^{1}/_{4}$" BS46
C	- 1$^{1}/_{2}$" [ø38,1] straight, Parallel key $^{3}/_{8}$"x$^{3}/_{8}$"x1$^{1}/_{2}$" BS46
CO	- ø25, straight, Parallel key A8x7x32 DIN 6885
H	- 1$^{3}/_{8}$" [ø35] straight, Parallel key $^{5}/_{16}$"x$^{5}/_{16}$"x1$^{1}/_{2}$" BS46
SH	- 1" [ø25,32] splined BS 2059, SAE 6B

Pos.4 - Ports

2	- side ports, 2xG1/2, G1/4, BSP thread, ISO 228
4	- side ports, 2x7/8-14 UNF, O-ring, 7/16-20 UNF
5[3)*]	- rear ports, 2xG3/8, G1/4, BSP thread, ISO 228
6[3)*]	- rear ports, 2x9/16-18 UNF, O-ring, 7/16-20 UNF
7[8)*]	- side ports, 2xG1/2 thread in the cover
8[8)*]	- side ports, 2x7/8-14 UNF, O-ring thread in the cover
9[8)*]	- side ports, for valve mounting in the cover
10[8)*]	- side ports, for valve mounting and 2xM16 in the cover

Pos.5 - Drain line

omit	- For versions 2,4,5,6,7 and 8
2	- G1/4, BSP thread, ISO 228
4	- 7/16-20 UNF

Pos.6 - Shaft Seal Version

omit	- Standard shaft seal up to 150 bar [2175 PSI]
U	- High pressure shaft seal up to 180 bar [2610 PSI]

Pos.7 - Special Features[4)*, 5)*, 6)*] [see page 110]

Pos.8 - Valves Pressure Range, bar[7)*]

/	- 70, 100, 140, 170, 210

Pos.9 - Design Series

omit	- Factory specified

NOTES:

[1)*] Flanges **V** and **FV** is for versions 2 and 4 - drainage only!
[2)*] The permissible output torque for shafts must not be exceeded!
[3)*] For **5** and **6**-versions only /rear ports/!
[4)*] If the code on pos.7 is not specified in the order, it will be considered as LL-option.
[5)*] Colour at customer's request.
[6)*] Non painted feeding surfaces, colour at customer's request.
[7)*] For **SR** and **FR** only!
[8)*] Port versions 7,8,9 and 10 are available with HW(S)(F) flanges only!

Rear port-versions [**5** and **6**] are not available with **SR** and **FR!!!**

The hydraulic motors are mangano-phosphatized as standard.

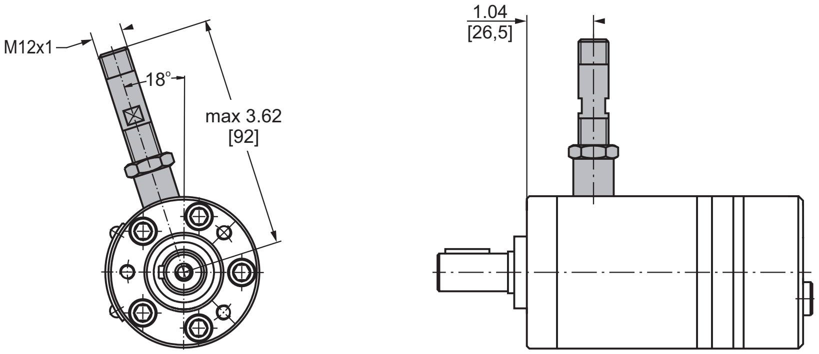
MOTOR SPECIAL FEATURES

Special Feature Description	Order Code	Motor type											
		MLHM	MLHP	MLHPW, MLHP(W)N	HP	MLHR	MLHRN	HR	MLHPL	MLHRL	MLHRW	MLHH	HW
Speed Sensor*	RS	O	O	-	O	O	-	O	-	-	-	O	O*****
Low Leakage	LL	O	-	-	-	O	O	O	-	O	O	O	O
Low Speed Valving	LSV	-	-	-	-	O	-	-	-	-	-	O	O
Free Running	FR	O	O	O	O	O	O	O	O	O	O	O	O
Reverse Rotation	R	O	O	O	O	O	O	O	O	O	O	O	O
Paint**	P	O	O	O	O	O	O	O	O	O	O	O	O
Corrosion Protected Paint**	PC	O	O	O	O	O	O	O	O	O	O	O	O
Special Paint***	PS PCS	O	O	O	O	O	O	O	O	O	O	O	O
Check Valves		S	S****	S	O	S****	S	O	S	S	S****	S****	S

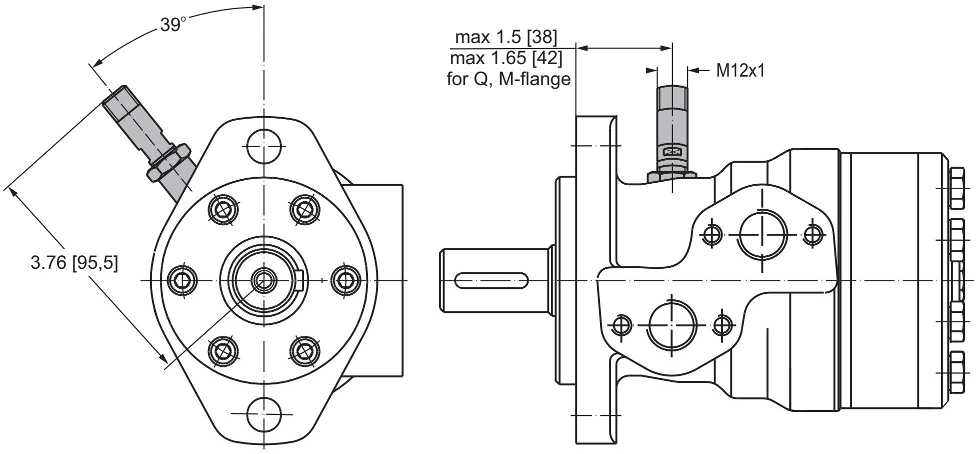
O	Optional
-	Not applicable
S	Standard

* For sensor ordering see pages 111÷112.
** Colour at customer's request.
*** Non painted feeding surfaces, colour at customer's request.
**** Without check valves for "**U**" shaft seal versions.
***** RS option is not available at HW...R (with relief valves).

MLHM...RS

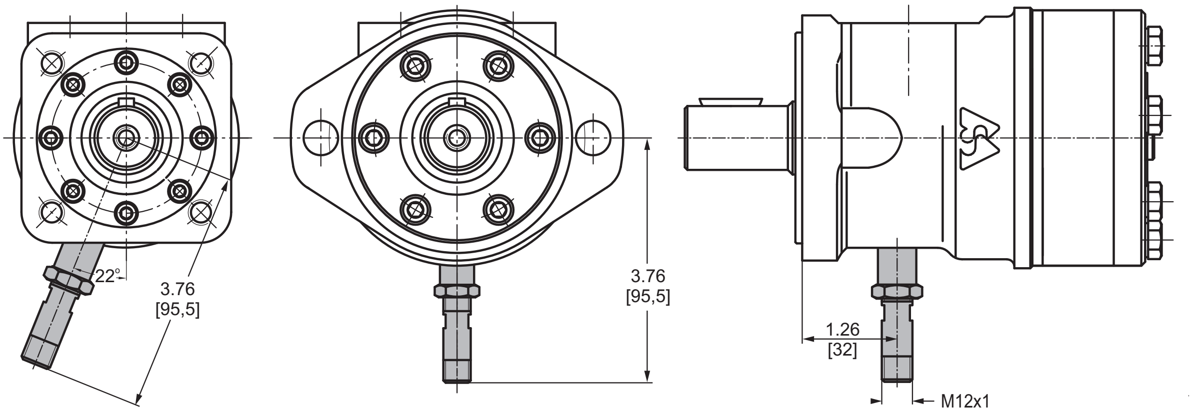


MLHP...RS
MLHR...RS

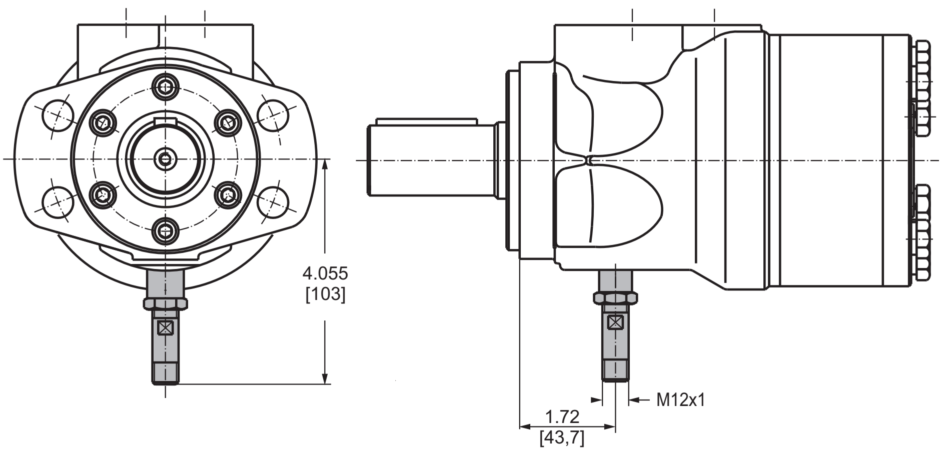


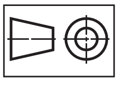
HP...RS
HR...RS

For Q-flange



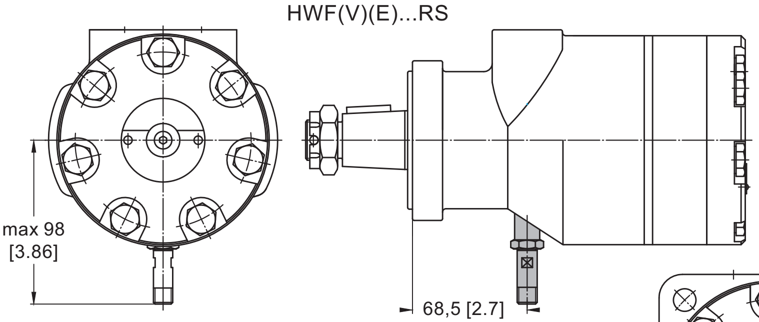
MLHH...RS




in [mm]

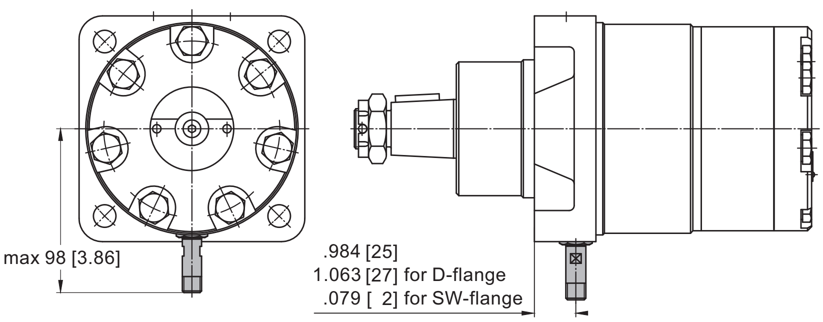
HW...RS

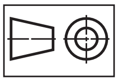
HWF(V)(E)...RS



RS option is not available at HW...R (with relief valves).

HW(S)(D)(SW)(V)(E)...RS





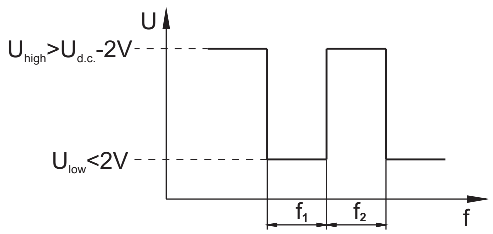
in [mm]

TECHNICAL DATA of the SPEED SENSOR

Technical data

Frequency range	0...15 000 Hz
Output	Universal PUSH PULL
Power supply	10-30 VDC
Current input	<20 mA (@24 VDC)
Maximum output current	500 mA
Ambient Temperature	-40...+125°C [-40...+257°F]
Protection	IP 67
Plug connector	M12-Series
Mounting principle	ISO 6149

Output signal

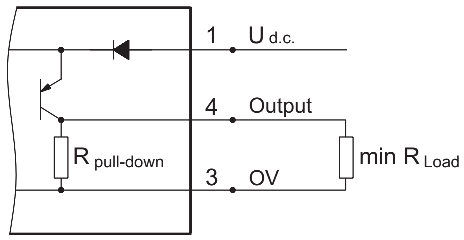


Load max.: $I_{high}=I_{low}<50mA$

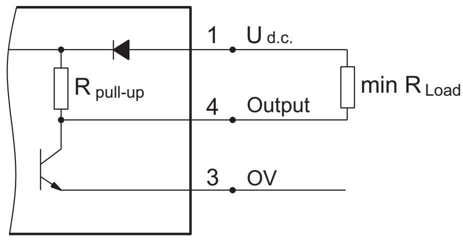
Motor type	MLHM	MLHP	MLHR	HP, HR	MLHH	HW
Pulses per revolution	30	36	36	36	42	12

Wiring diagrams

PNP

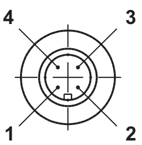


NPN



$R_{Load}[k\Omega]=U_{d.c.}[V]/I_{max}[mA]$

Stick type



Terminal No.	Connection	Cable Output
1	$U_{d.c.}$	Brown
2	No connection	White
3	0V	Blue
4	Output signal	Black

Order Code for Speed Sensor

Sensor Code	Electric connection
RS	Connector BINDER 713 series
RSL2,5	Cable output 3x0,25; 98 in [2,5 m] long
RSL3,5	Cable output 3x0,25; 138 in [3,5 m] long
RSL5	Cable output 3x0,25; 196 in [5 m] long
RSL10	Cable output 3x0,25; 394 in [10 m] long

NOTE: * - The speed sensor is not fitted at the factory, but is supplied in a plastic bag with the motor. For installation see enclosed instructions.

APPLICATION CALCULATION

VEHICLE DRIVE CALCULATIONS

1.Motor speed: n, RPM

$$n=\frac{168 \times v_{ml} \times i}{R_{in}} \qquad n=\frac{2{,}65 \times v_{km} \times i}{R_m}$$

v_{km}- vehicle speed, km/h;
v_{ml}- vehicle speed, mile/h;
R_m- wheel rolling radius, m;
R_{in}- wheel rolling radius, in;
i- gear ratio between motor and wheels.
If no gearbox, use i=1.

2.Rolling resistance: RR, lbs [daN]
The resistance force resulted in wheels contact with different surfaces:

$$RR=G \times \rho$$

G- total weight loaded on vehicle, lbs [daN];
ρ- rolling resistance coefficient (Table 1).

Table 1

Rolling resistance coefficient In case of rubber tire rolling on different surfaces	
Surface	ρ
Concrete- faultless	0.010
Concrete- good	0.015
Concrete- bad	0.020
Asphalt- faultless	0.012
Asphalt- good	0.017
Asphalt- bad	0.022
Macadam- faultless	0.015
Macadam- good	0.022
Macadam- bad	0.037
Snow- 5 cm	0.025
Snow- 10 cm	0.037
Polluted covering- smooth	0.025
Polluted covering- sandy	0.040
Mud	0.037÷0.150
Sand- Gravel	0.060÷0.150
Sand- loose	0.160÷0.300

3.Grade resistance: GR, lbs [daN]

$$GR=G \times (\sin\alpha + \rho \times \cos\alpha)$$

α- gradient negotiation angle (Table 2)

Table 2

Grade %	α Degrees	Grade %	α Degrees
1%	0° 35'	12%	6° 5'
2%	1° 9'	15%	8° 31'
5%	2° 51'	20%	11° 19'
6%	3° 26'	25%	14° 3'
8%	4° 35'	32%	18°
10%	5° 43'	60%	31°

4. Acceleration force: FA, lbs [daN]
Force **FA** necessary for acceleration from 0 to maximum speed **v** and time **t** can be calculated with a formula:

$$FA=\frac{v_{ml} \times G}{22 \times t}, \text{ [lbs]}; \qquad FA=\frac{v_{km} \times G}{36 \times t}, \text{ [daN]}$$

FA- acceleration force, lbs [daN];
t- time, [s].

5.Tractive effort: DP, lbs [daN]
Tractive effort DP is the additional force of trailer. This value will be established as follows:
-acc.to constructor's assessment;
-as calculating forces in items 2, 3 and 4 of trailer; the calculated sum corresponds to the tractive effort requested.

6.Total tractive effort: TE, lbs [daN]
Total tractive effort **TE** is total effort necessary for vehicle motion; that the sum of forces calculated in items from 2 to 5 and increased with 10 % because of air resistance.

$$TE=1{,}1 \times (RR + GR + FA + DP)$$

RR - force acquired to overcome the rolling resistance;
GR - force acquired to slope upwards;
FA - force acquired to accelerate (acceleration force);
DP - additional tractive effort (trailer).

7.Motor Torque moment: M, lb-in [daNm]
Necessary torque moment for every hydraulic motor:

$$M=\frac{TE \times R_{in}[R_m]}{N \times i \times \eta_M}$$

N- motor numbers;
η_M- mechanical gear efficiency (if it is available).

8.Cohesion between tire and road covering: M_w, lb-in [daNm]

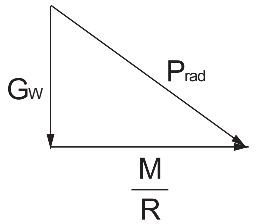
$$M_W=\frac{G_W \times f \times R_{in}[R_m]}{i \times \eta_M}$$

To avoid wheel slipping, the following condition should be observed $M_w > M$
f - frictional factor;
G_w- total weight over the wheels, lbs [daN].

Table 3

Surface	Frictional factor f
Steel on steel	0.15 ÷ 0.20
Rubber tire on polluted surface	0.5 ÷ 0.7
Rubber tire on asphalt	0.8 ÷ 1.0
Rubber tire on concrete	0.8 ÷ 1.0
Rubber tire on grass	0.4

9.Radial motor loading: P_{rad}, lbs [daN]
When motor is used for vehicle motion with wheels mounted directly on motor shaft, the total radial loading of motor shaft **P_{rad}** is a sum of motion force and weight force acting on one wheel.



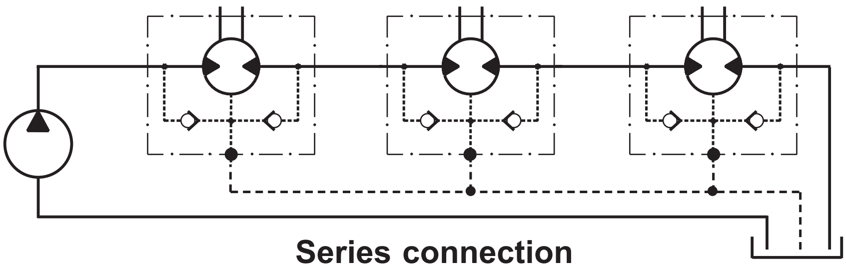
G_W - Weight held by wheel;
P_{rad} - Total radial loading of motor shaft;
M/R- Motion force.

$$P_{rad}=\sqrt{G_W^2+\left(\frac{M}{R}\right)^2}$$

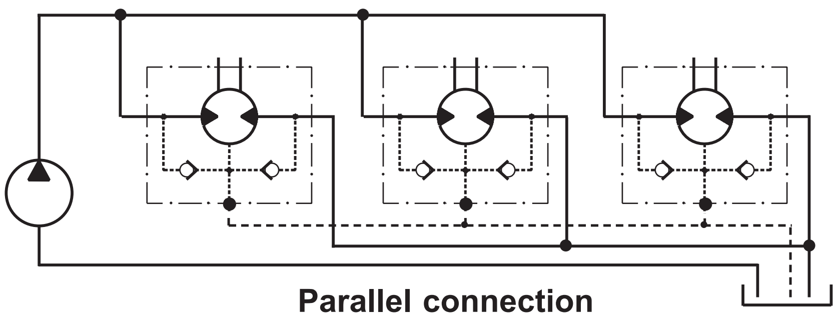
In accordance with calculated loadings the suitable motor from the catalogue is selected.

DRAINAGE SPACE AND DRAINAGE PRESSURE

Advantages in oil drainage from drain space: Cleaning; Cooling and Seal lifetime prolonging.



Series connection



Parallel connection

WARRANTY

M+S Hydraulic warrants, that its products, supplied directly to original equipment manufacturer, authorized distributor or other customer, will be free of defects in material or workmanship at the time of shipment from M+S Hydraulic and will conform to the products technical documentation (drawings and specifications) under sale agreement with Buyer.

This warranty will apply only to defects appearing within applicable Warranty period, mentioned below. If Buyer notifies M+S Hydraulic within the Warranty period about any such defects, M+S, at its sole option will replace or repair the defective products or their parts found by M+S Hydraulic to be defective in material or workmanship.

THE FOREGOING LIMITED WARRANTY IS AVAILABLE ONLY IF “M+S HYDRAULIC” IS PROMPTLY NOTIFIED IN WRITTEN OF THE ALLEGED DEFECT AND DOES NOT COVER FAILURE TO FUNCTION CAUSED BY DAMAGE TO THE PRODUCT, IMPROPER INSTALLATION, UNREASONABLE USE OR ABUSE OF THE PRODUCT, FAILURE TO PROVIDE OR USE OF IMPROPER MAINTENANCE OR USUAL, DEGRADATION OF THE PRODUCT DUE TO PHYSICAL ENVIRONMENTS OF AN USUAL NATURE. THE FOREGOING REMEDIES ARE THE SOLE AND EXCLUSIVE REMEDIES AVAILABLE TO CUSTOMER. To facilitate the inspection, M+S Hydraulic may require return of the product/part, which Buyer claims to be defective.

M+S Hydraulic shall not be liable for labor costs or any other expenses incurred during the disassembling or reinstalling of the product/part.

In case the claimed products are returned to M+S Hydraulic in bad condition: dirty, disassembled, with damaged or missing parts during transportation, the warranty will be considered as not applicable and the products will not be liable to repair.

Warranty periods

New products: The Warranty period is limited to 24 consecutive months (2 years) from the date of production of the product.

Repaired products: If the product is repaired in M+S Hydraulic during its warranty period, the warranty period of the repaired item shall continue for the balance of original Warranty period or for a period equal to 50% of the original new product Warranty period, whichever is later.

Spare parts: The Warranty period for Spare parts is 12 consecutive months (1 year) from the dispatch date of such parts from M+S Hydraulic.

LIMITATION OF LIABILITY M+S Hydraulic's liability for claim of any kind, for loss or damage arising out of, connected with or resulting from an order, or from the performance or branch thereof, or from the design, manufacture, sale delivery, operation or use of any of its products shall be limited to, at M+S 's sole option, replacement, repair of any defective product or the issuance of a credit to Customer against any future purchases. Cash refunds will not be made under any circumstances and Customer will not be entitled to recover any damages of any kind against M+S Hydraulic, including but not limited to incidental or consequential damages, whether direct or indirect, known or unknown, foreseen or unforeseen.

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