



HYDRAULIC MOTORS

MLHM
MLHP
MLHR
MLHH



SAE version

SPOOL VALVE HYDRAULIC MOTORS

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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 as 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

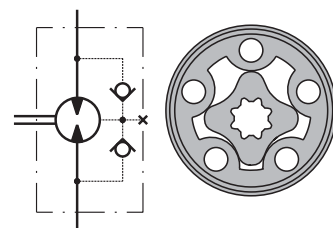


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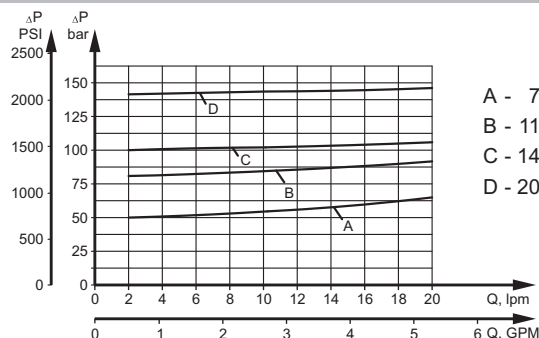
APPLICATION

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



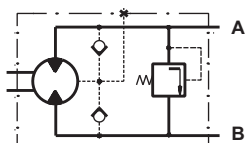
Pressure Settings at Flow

Q=.53 GPM [2 lpm], 150 SUS [32 mm²/s], 122°F [50°C]

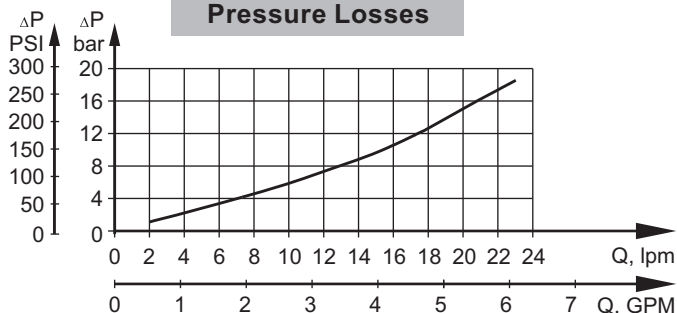


MLHMP Series with Integrated Internal Crossover Relief Valve

A → B, Δp=1450 or 725 PSI [100 or 50 bar]

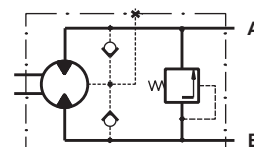


Pressure Losses



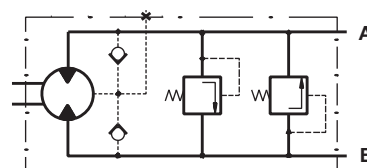
MLHMP Series with Integrated Internal Crossover Relief Valve

B → A, Δp=1450 or 725 PSI [100 or 50 bar]



MLHMD Series with Integrated Internal Crossover Relief Valves

A ↔ B, Δp=100 or 50 bar [1450 or 725 PSI]



GENERAL

Max. Displacement,	in³/rev [cm³/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 [mm²/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, in ³ /rev [cm ³ /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]	4,6 [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.*	20 [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, lb [kg] 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.

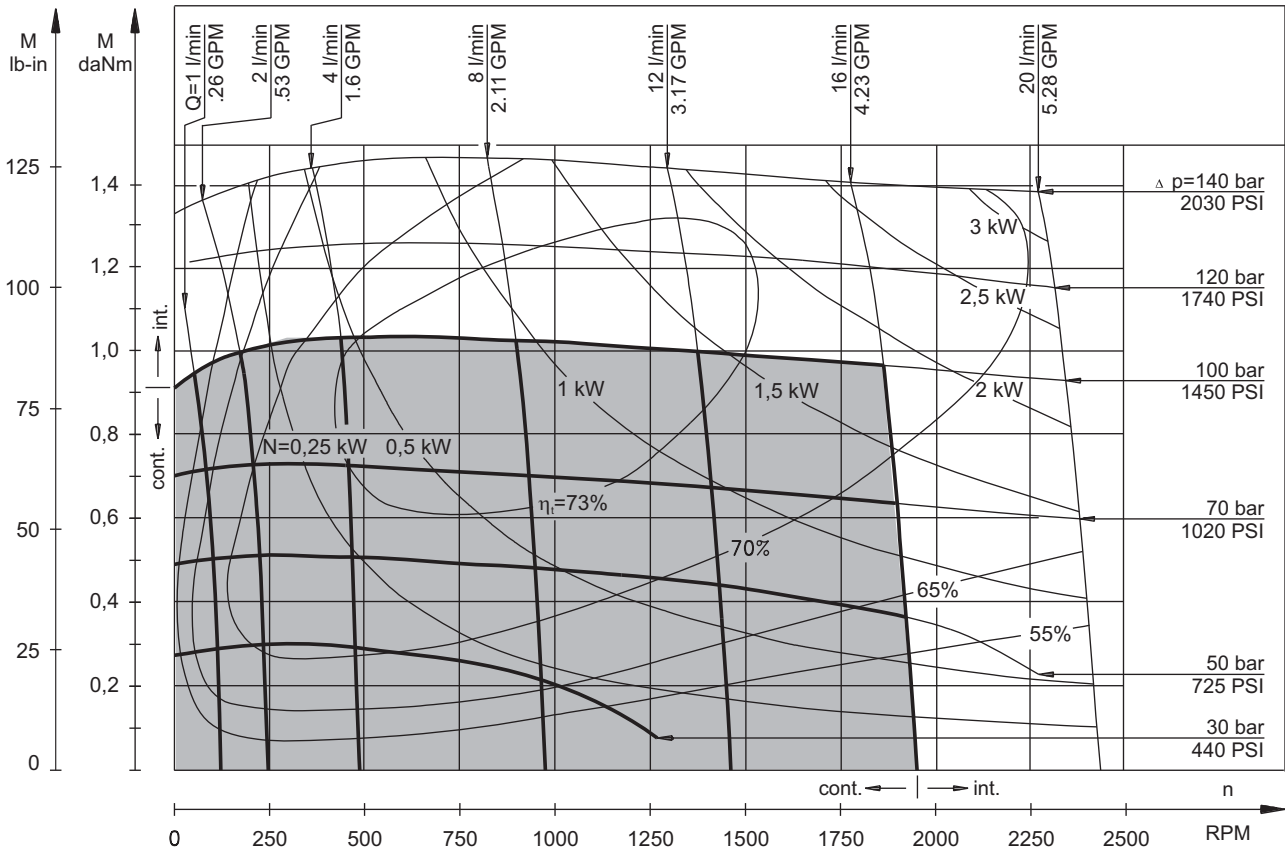
** Peak load: the permissible values may occur for max. 1% of every minute.

*** For speeds lower than given, consult factory or your regional manager.

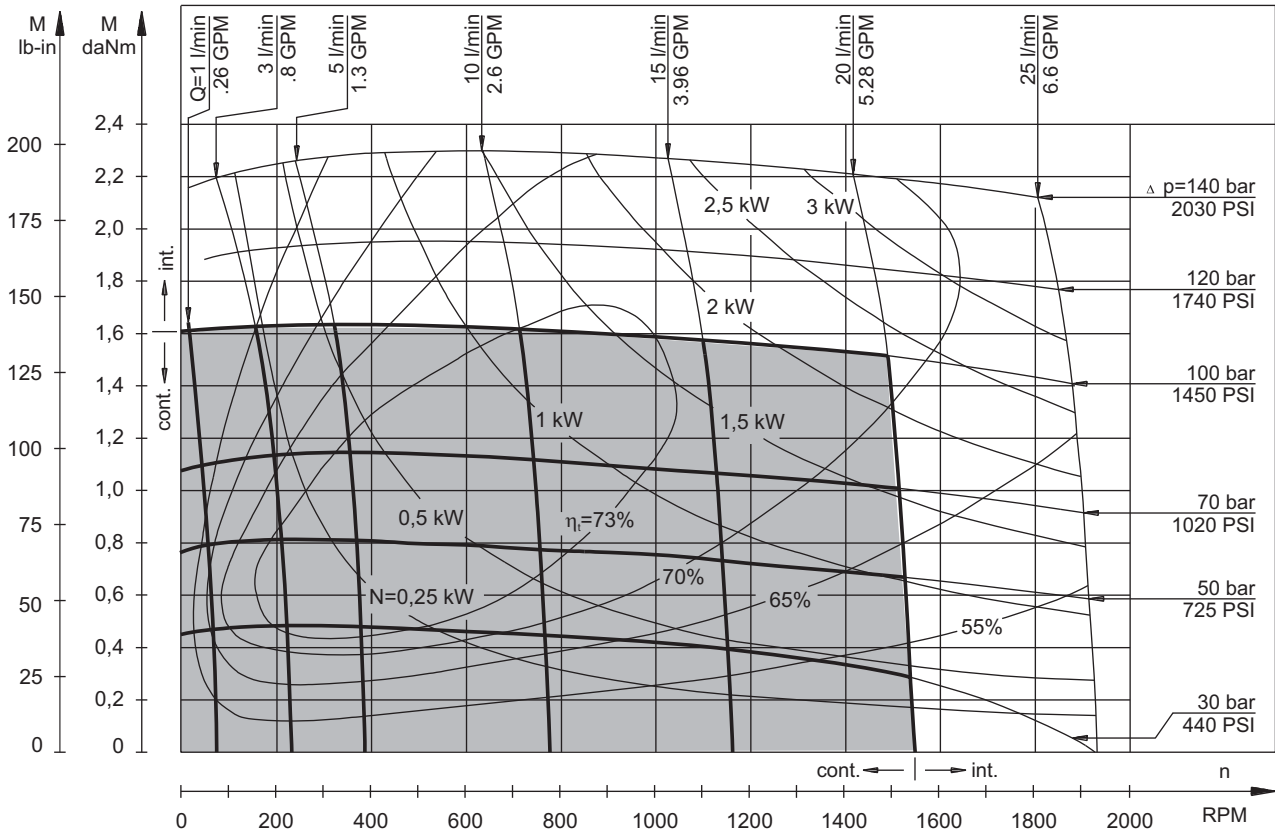
- Intermittent speed and intermittent pressure drop must not occur simultaneously.
- Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
- Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP(DIN51524) or HM (ISO 6743/4). If using synthetic fluids consult the factory for alternative seal materials.
- Recommended minimum oil viscosity 70 SUS [13 mm²/s] at 122°F [50°C].
- Recommended maximum system operating temperature is 180°F [82°C].
- To assure optimum motor life fill with fluid prior to loading and run at moderate load and speed for 15-30 minutes.

FUNCTION DIAGRAMS

MLHM 8



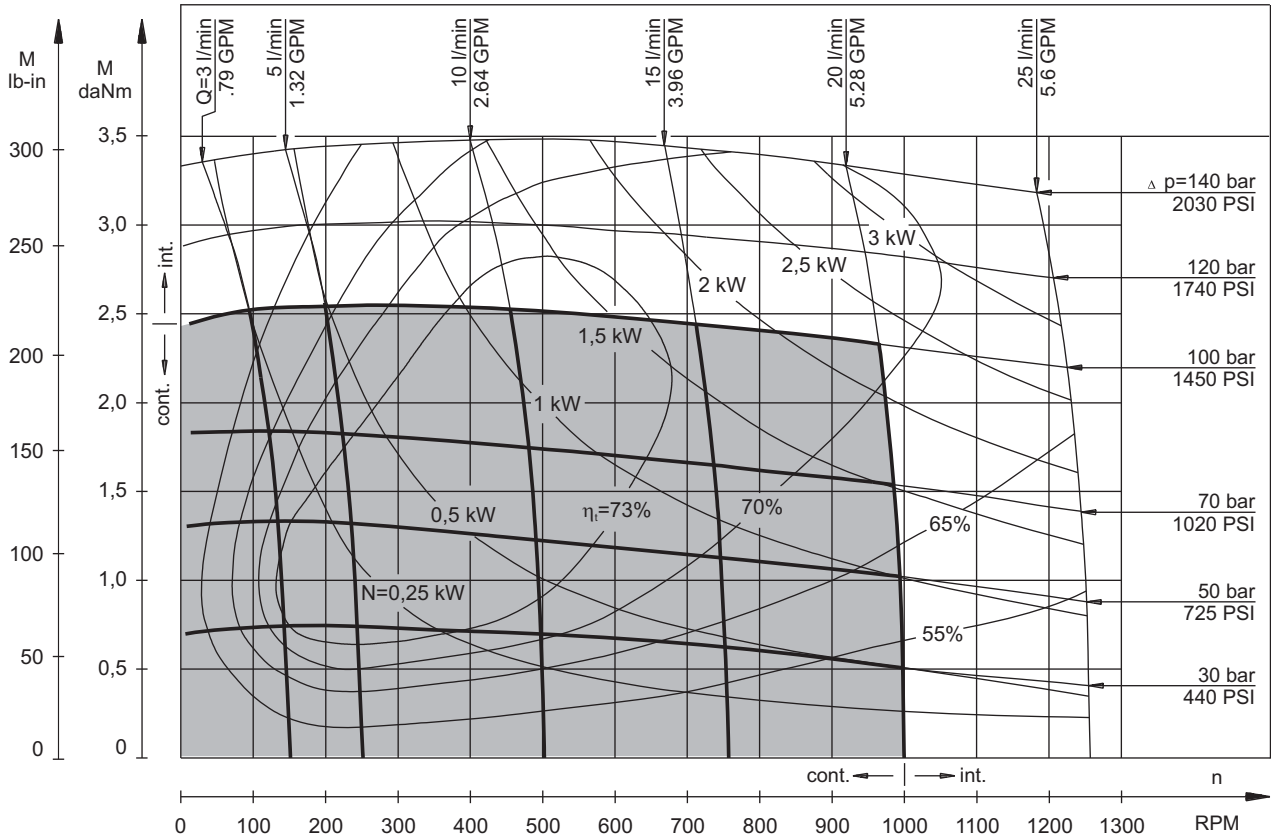
MLHM 12,5



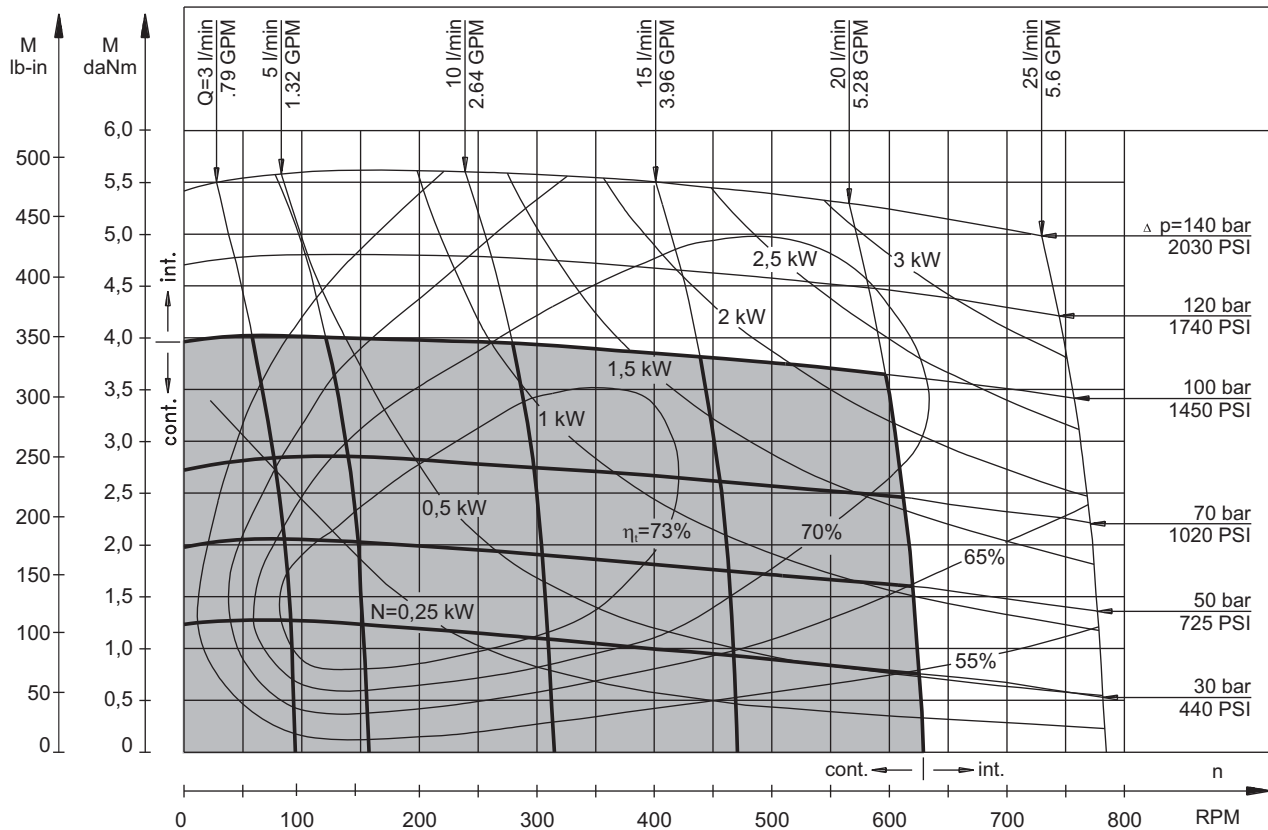
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHM 20



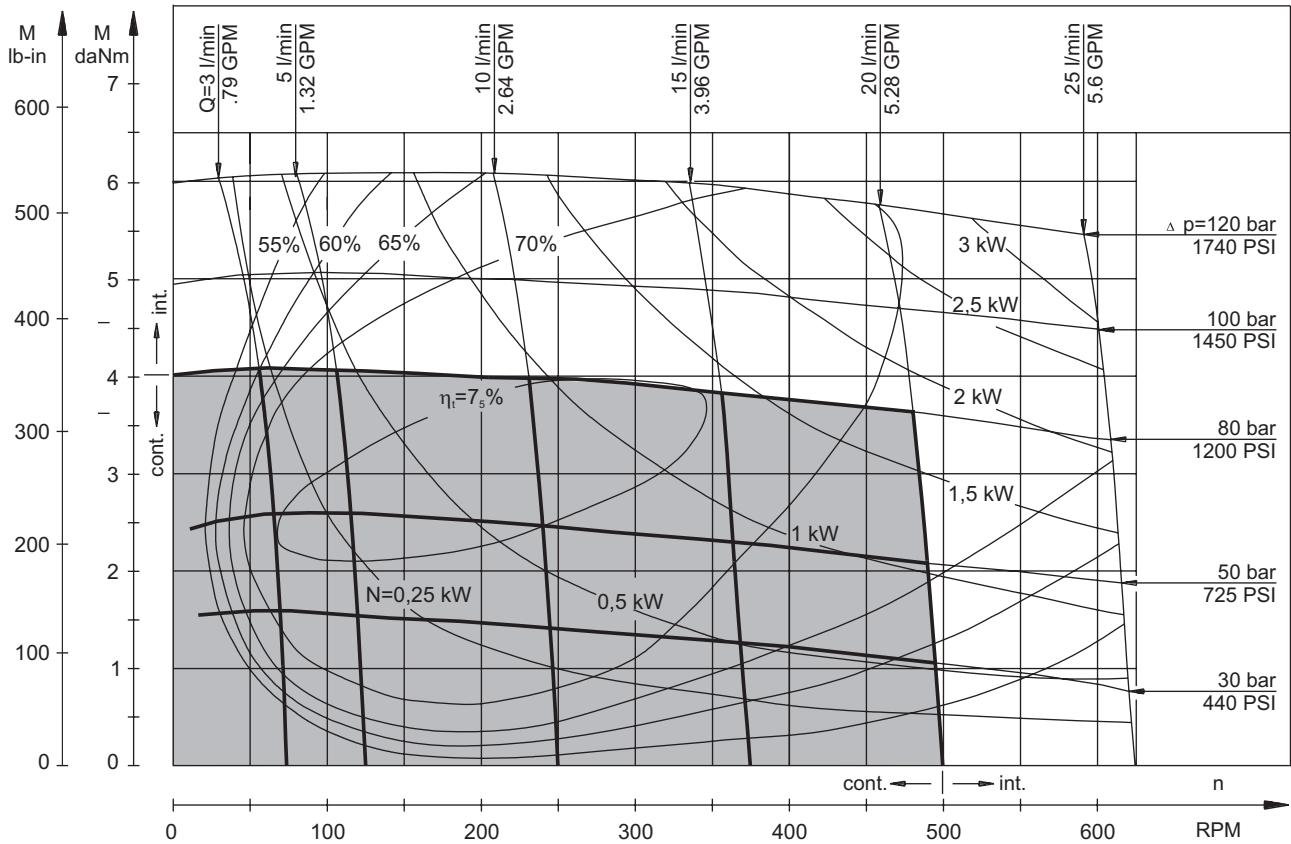
MLHM 32



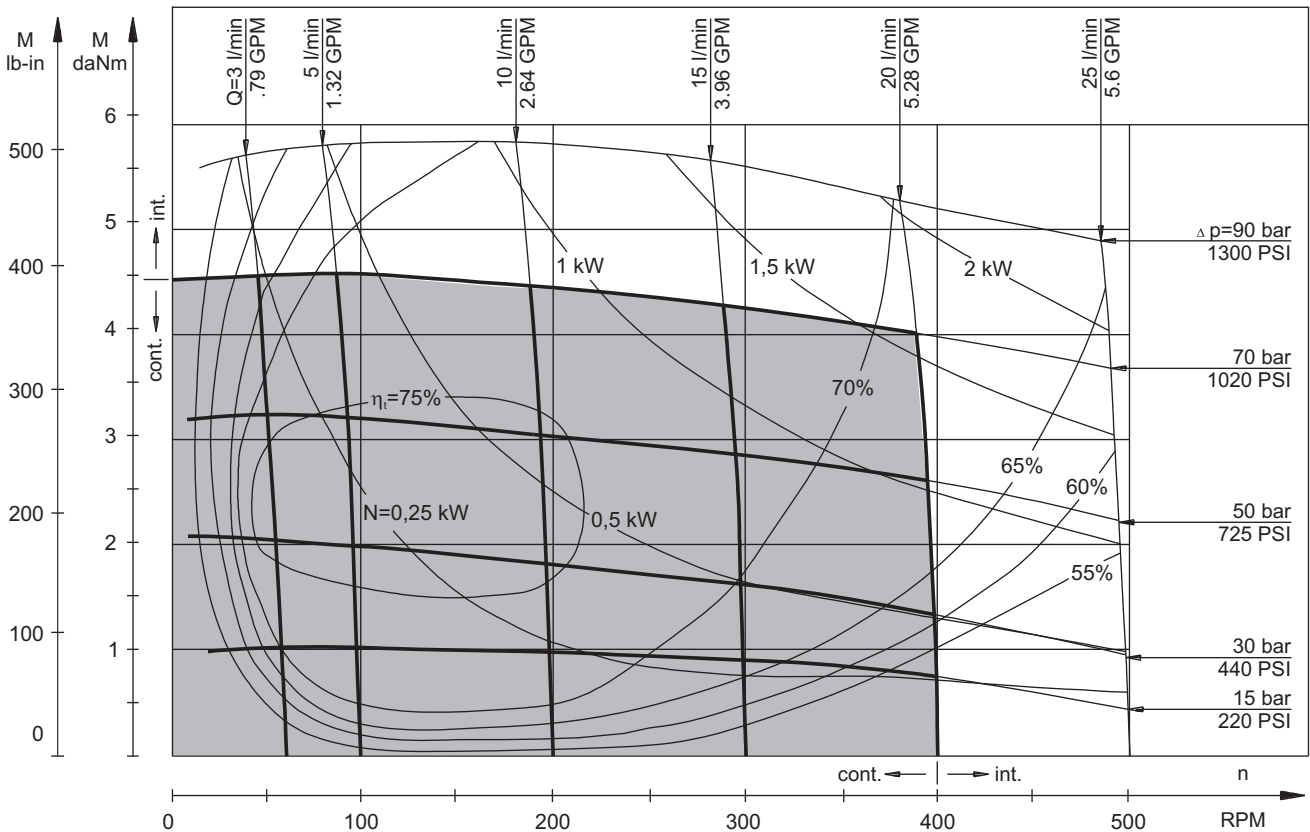
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHM 40

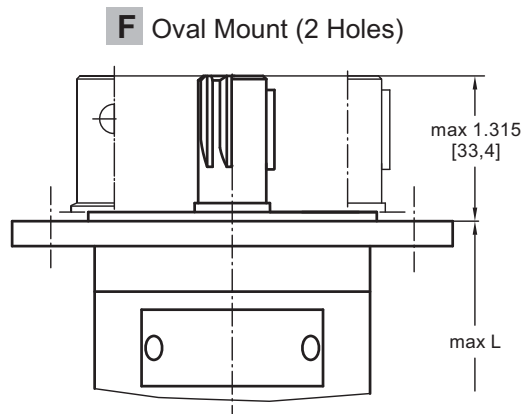
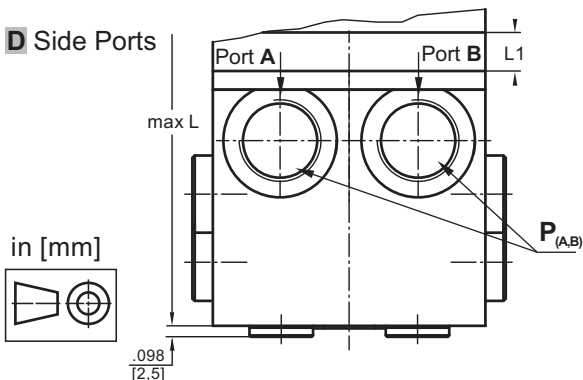
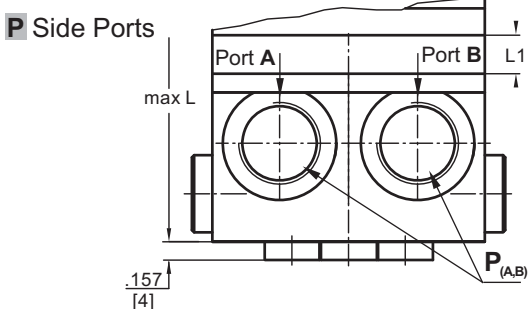
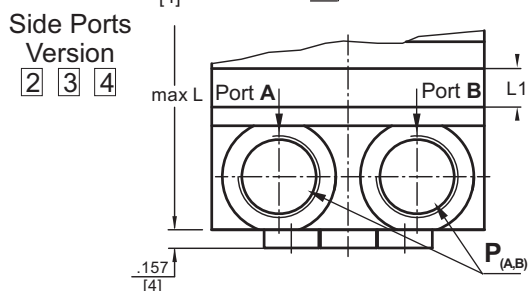
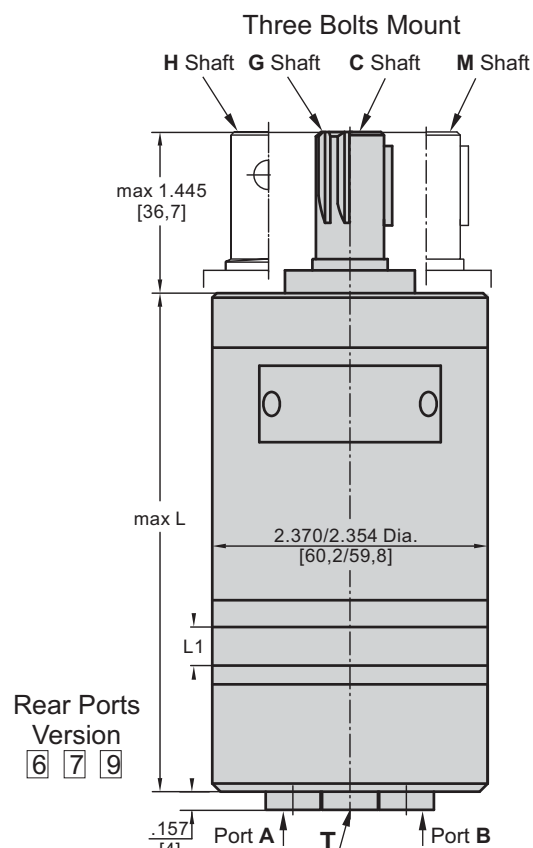


MLHM 50



The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷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



Versions			
	2, 6	3, 9	4, 7
P _(A,B)	2xG $\frac{3}{8}$	2xM18x1,5	2x $\frac{9}{16}$ -18UNF
T	G $\frac{1}{8}$	M10x1	$\frac{3}{8}$ -24UNF

Type	Side Ports L _{max} , in [mm]	Rear Ports L _{max} , in [mm]	L ₁ in [mm]
MLHM(M) 8	4.134 [105,0]	4.094 [104,0]	.138 [3,5]
MLHM(M)12.5	4.213 [107,0]	4.173 [106,0]	.217 [5,5]
MLHM(M) 20	4.331 [110,0]	4.291 [109,0]	.335 [8,5]
MLHM(M) 32	4.528 [115,0]	4.488 [114,0]	.531 [13,5]
MLHM(M) 40	4.665 [118,5]	4.626 [117,5]	.669 [17,0]
MLHM(M) 50	4.823 [122,5]	4.783 [121,5]	.827 [21,0]

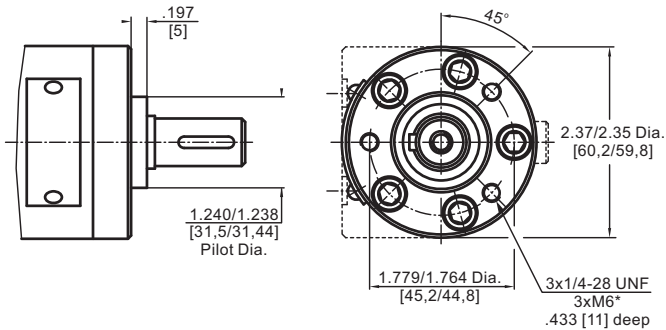
Type	Side Ports L _{max} , in [mm]	Rear Ports L _{max} , in [mm]	L ₁ in [mm]
MLHMF 8	4.272 [108,5]	4.232 [107,5]	.138 [3,5]
MLHMF 12.5	4.350 [110,5]	4.311 [109,5]	.217 [5,5]
MLHMF 20	4.469 [113,5]	4.429 [112,5]	.335 [8,5]
MLHMF 32	4.665 [118,5]	4.626 [117,5]	.531 [13,5]
MLHMF 40	4.803 [122,0]	4.764 [121,0]	.669 [17,0]
MLHMF 50	4.961 [126,0]	4.921 [125,0]	.827 [21,0]

Type	L _{max} , in [mm]	Type	L _{max} , in [mm]
MLHM(M) 8...P	4.528 [115,0]	MLHMF 8...P	4.665 [118,5]
MLHM(M)12,5...P	4.606 [117,0]	MLHMF12,5...P	4.744 [120,5]
MLHM(M) 20...P	4.724 [120,0]	MLHMF 20...P	4.862 [123,5]
MLHM(M) 32...P	4.921 [125,0]	MLHMF 32...P	5.059 [128,5]
MLHM(M) 40...P	5.039 [128,0]	MLHMF 40...P	5.197 [132,0]
MLHM(M) 50...P	5.217 [132,5]	MLHMF 50...P	5.354 [136,0]

Type	L _{max} , in [mm]	Type	L _{max} , in [mm]	L ₁ , in [mm]
MLHM(M) 8...D	5.276 [134,0]	MLHMF 8...D	5.433 [138]	.13 [3,5]
MLHM(M)12,5...D	5.354 [136,0]	MLHMF12,5...D	5.512 [140]	.21 [5,5]
MLHM(M) 20...D	5.472 [139,0]	MLHMF 20...D	5.748 [146]	.335 [8,5]
MLHM(M) 32...D	5.669 [144,0]	MLHMF 32...D	5.827 [148]	.531 [13,5]
MLHM(M) 40...D	5.807 [147,5]	MLHMF 40...D	5.945 [151]	.669 [17,0]
MLHM(M) 50...D	5.965 [151,5]	MLHMF 50...D	6.102 [155]	.828 [21,0]

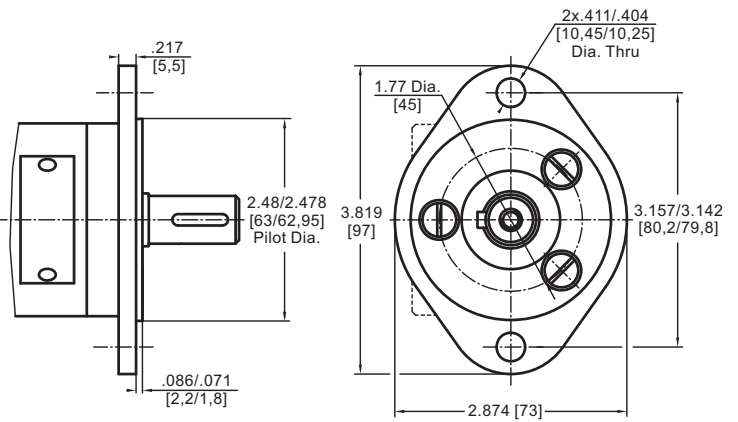
MOUNTING

Three Bolts Mount



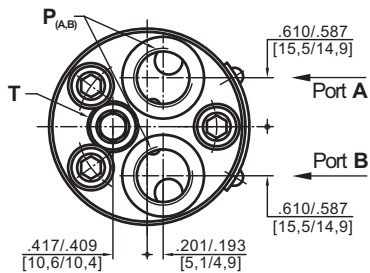
* For M Flange

F Oval Mount (2 Holes)

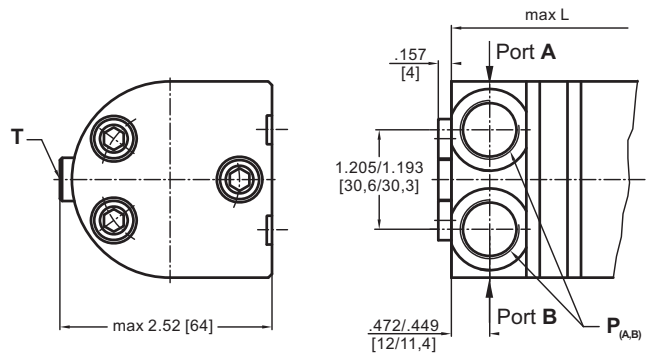


PORTS

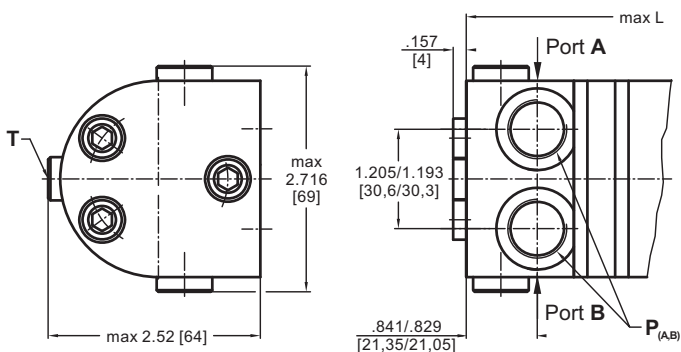
Rear Ports
Version **6** **7** **9**



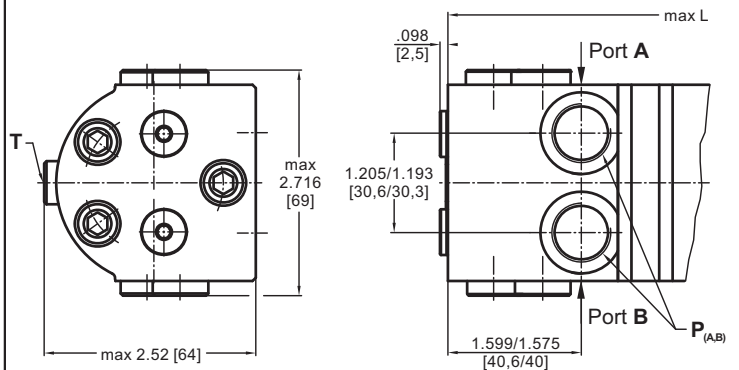
Side Ports, without valves
Version **2** **3** **4**



P Side Ports with Single Crossover Relief Valve

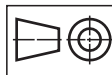


D Side Ports with Dual Crossover Relief Valve



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



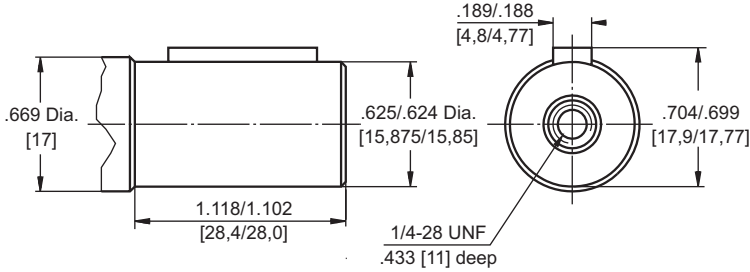
in [mm]

Versions			
	2 , 6	3 , 9	4 , 7
P _(A,B)	2xG $\frac{3}{8}$	2xM18x1,5	2x $\frac{9}{16}$ -18UNF
T	G $\frac{1}{8}$	M10x1	$\frac{3}{8}$ -24UNF

SHAFT EXTENSIONS

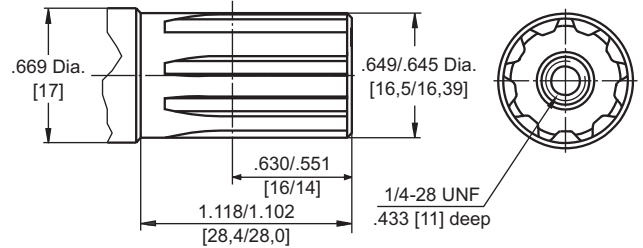
C

5/8" [15,8] straight, Parallel key 3/16"x3/16"x3/4" BS 46
Max. Torque 345 lb-in [3,9 daNm]



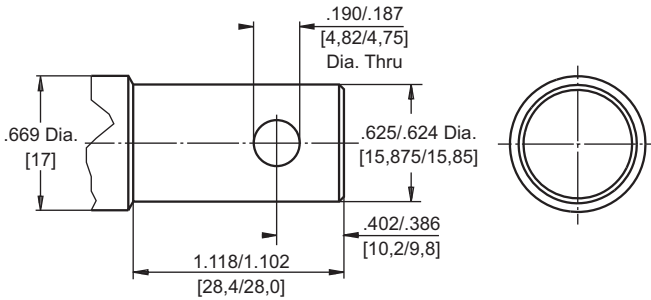
G

Splined - Metric B 17x14 DIN 5482
Max. Torque 390 lb-in [4,4 daNm]



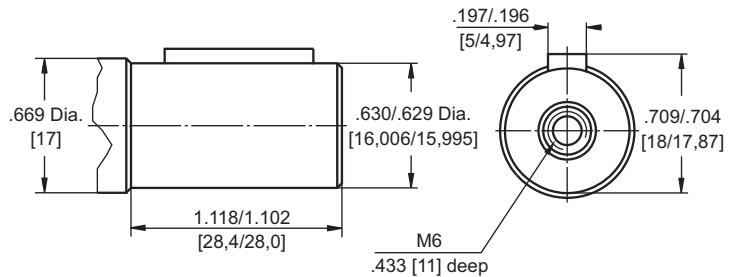
H

5/8" [15,8] straight, w/ .19 [4,82] Crosshole
Max. Torque 345 lb-in [3,9 daNm]



M

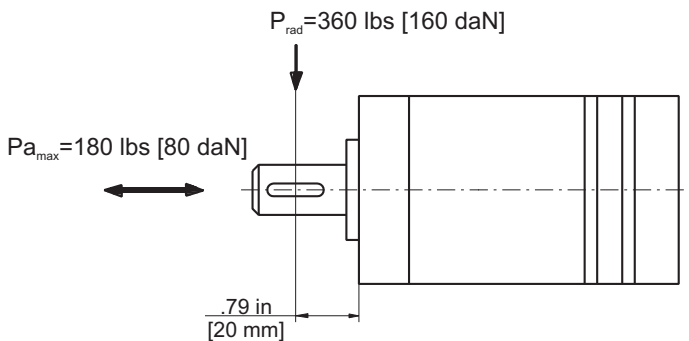
ø16 straight, Parallel key A5x5x16 DIN 6885
Max. Torque 345 lb-in [3,9 daNm]



Requirement max. Torque must be not exceeded.



PERMISSIBLE SHAFT LOAD



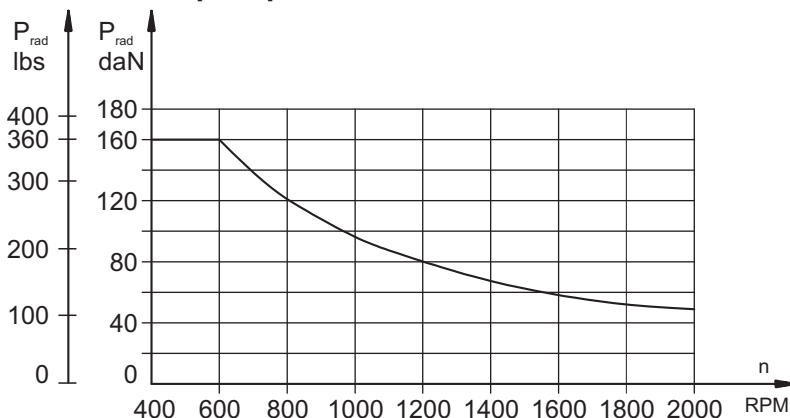
The permissible radial shaft load [P_{rad}] is calculated from the distance [L] between the point of load application and the mounting surface:

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

[L in mm; $L \leq 80 \text{ mm}$]

$$P_{rad} = \frac{600}{n} \times \frac{1155}{2,42 + L}, [\text{lbs}]$$

[L in inch; $L \leq 3.15 \text{ in}$]



The drawing shows the permissible radial load when $L = .79 \text{ in [20 mm]}$.

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

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

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** - .5 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 103]

Pos.9 - Design Series

- omit - Factory specified

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

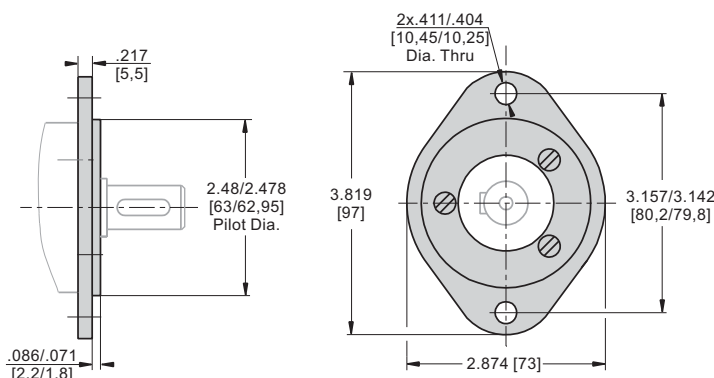
** Options **P**, **D** - for side ports (2, 3, 4) only.

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.

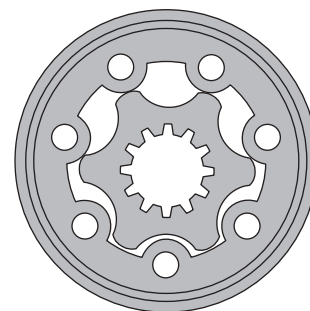
Tightening Torque: 45÷53 lb-in [5÷6 Nm].

HYDRAULIC MOTORS MLHP



APPLICATION

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



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Wheel motor	27
Shaft extensions	28÷29
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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 sensing
- » Other special features

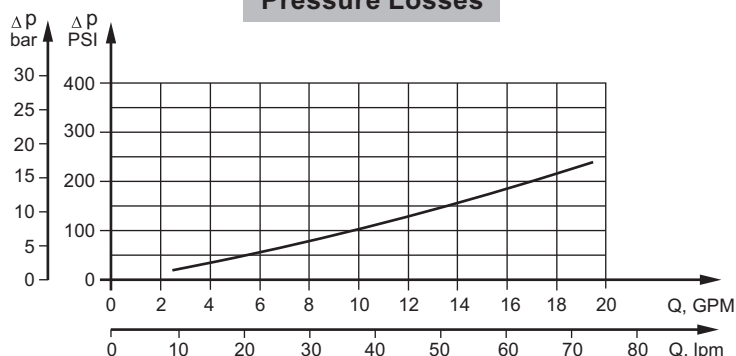
GENERAL

Max. Displacement, in ³ /rev [cm ³ /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 [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 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 80	MLHP 100	MLHP 125
Displacement, in³/rev [cm³/rev]		1.73 [28,4]	2.1 [34,5]	2.47 [40,5]	3.02 [49,5]	4.83 [79,2]	6.04 [99]	7.55 [123,8]
Max. Speed, [RPM]	Cont.	1408	1450	1480	1210	755	605	486
	Int.*	1584	1594	1555	1515	945	755	605
Max. Torque lb-in [daNm]	Cont.	290 [3,3]	380 [4,3]	550 [6,2]	835 [9,4]	1340 [15,1]	1710 [19,3]	2100 [23,7]
	Int.*	415 [4,7]	540 [6,1]	730 [8,2]	1050 [11,9]	1725 [19,5]	2100 [23,7]	2640 [29,8]
	Peak**	595 [6,7]	760 [8,6]	950 [10,7]	1285 [14,3]	1985 [22,4]	2435 [27,5]	3235 [36,5]
Max. Output HP [kW]	Cont.	6.0 [4,5]	7.8 [5,8]	11.5 [8,4]	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]	16.8 [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]
	Int.*	2030 [140]	2030 [140]	2250 [155]	2540 [175]	2540 [175]	2540 [175]	2540 [175]
	Peak**	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]
	Int.*	11.9 [45]	14.5 [55]	18.5 [70]	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]
	Int.*	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]
Max. Return Pres- sure with Drain Line PSI [bar]	Cont.	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]
	Peak**	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]	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]	1170 [13,2]	1470 [16,6]	1830 [20,7]
	At max.press. drop Int.*	370 [4,2]	500 [5,6]	600 [6,8]	885 [10]	1490 [16,8]	1860 [21]	2360 [26,6]
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]	12.4 [5,6]	12.6 [5,7]	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]	12.4 [5,6]	12.8 [5,8]	13 [5,9]
	MLHPQ(M)(N)	11.1 [5,0]	11.1 [5,0]	11.2 [5,1]	11.5 [5,2]	11.7 [5,3]	12.1 [5,5]	12.3 [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.

- Intermittent speed and intermittent pressure drop must not occur simultaneously.
- Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
- 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.
- Recommended minimum oil viscosity 70 SUS [13 mm²/s] at 122°F [50°C].
- Recommended maximum system operating temperature is 180°F [82°C].
- 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 Pres- sure 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.

- Intermittent speed and intermittent pressure drop must not occur simultaneously.
- Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
- 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.
- Recommended minimum oil viscosity 70 SUS [13 mm²/s] at 122°F [50°C].
- Recommended maximum system operating temperature is 180°F [82°C].
- 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 Pres- sure 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]		13.2 [6]	13.7 [6,2]	13.9 [6,3]	14.3 [6,5]	14.8 [6,7]
For rear ports: +.992 [0,450]						

* 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.

- Intermittent speed and intermittent pressure drop must not occur simultaneously.
- Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
- 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.
- Recommended minimum oil viscosity 70 SUS [13 mm²/s] at 122°F [50°C].
- Recommended maximum system operating temperature is 180°F [82°C].
- 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 Pres- sure 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] MLHP(F)		15.2 [6,9]	15.9 [7,2]	17 [7,7]	19.9 [9,0]	21.2 [9,6]
For rear ports: +.992 [0,450]						

* Intermittent operation: the permissible values may occur for max. 10% of every minute.

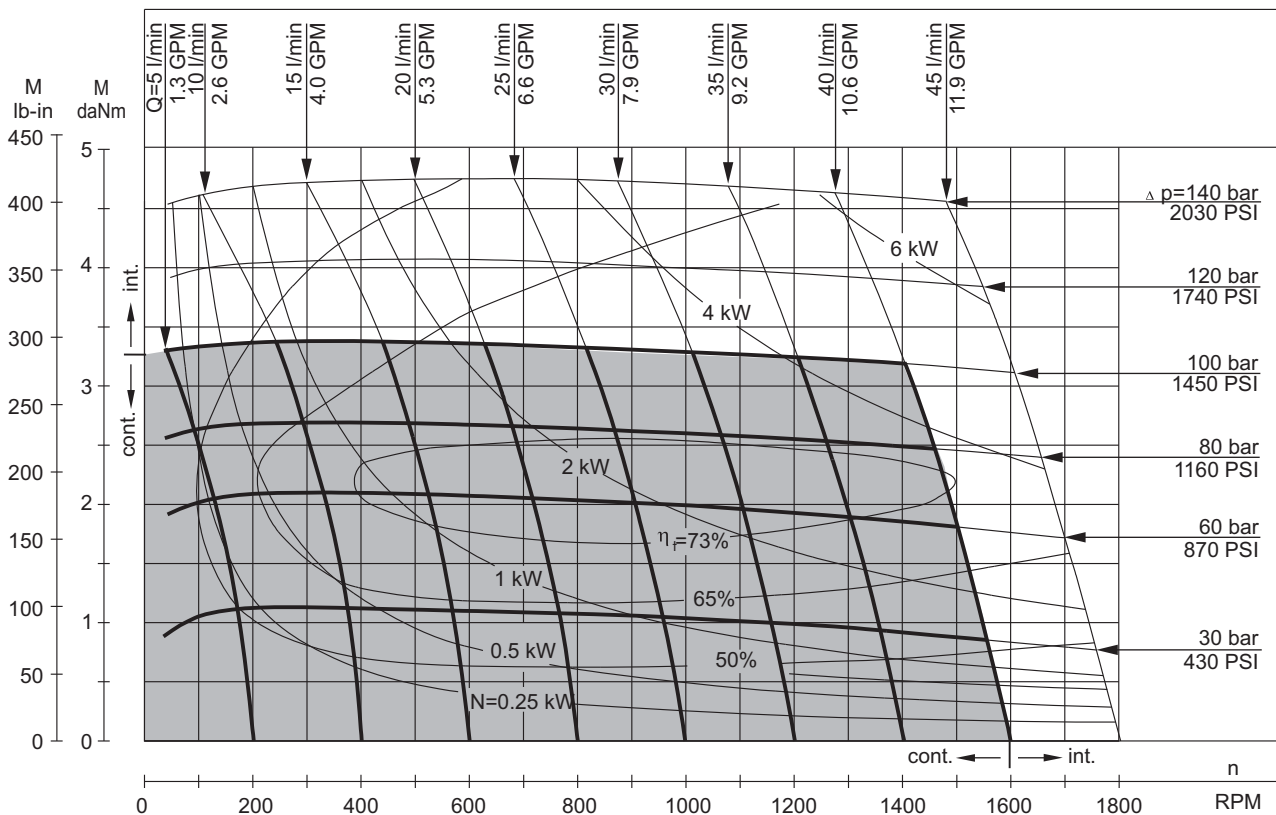
** Peak load: the permissible values may occur for max. 1% of every minute.

*** For speeds lower than given, consult factory or your regional manager.

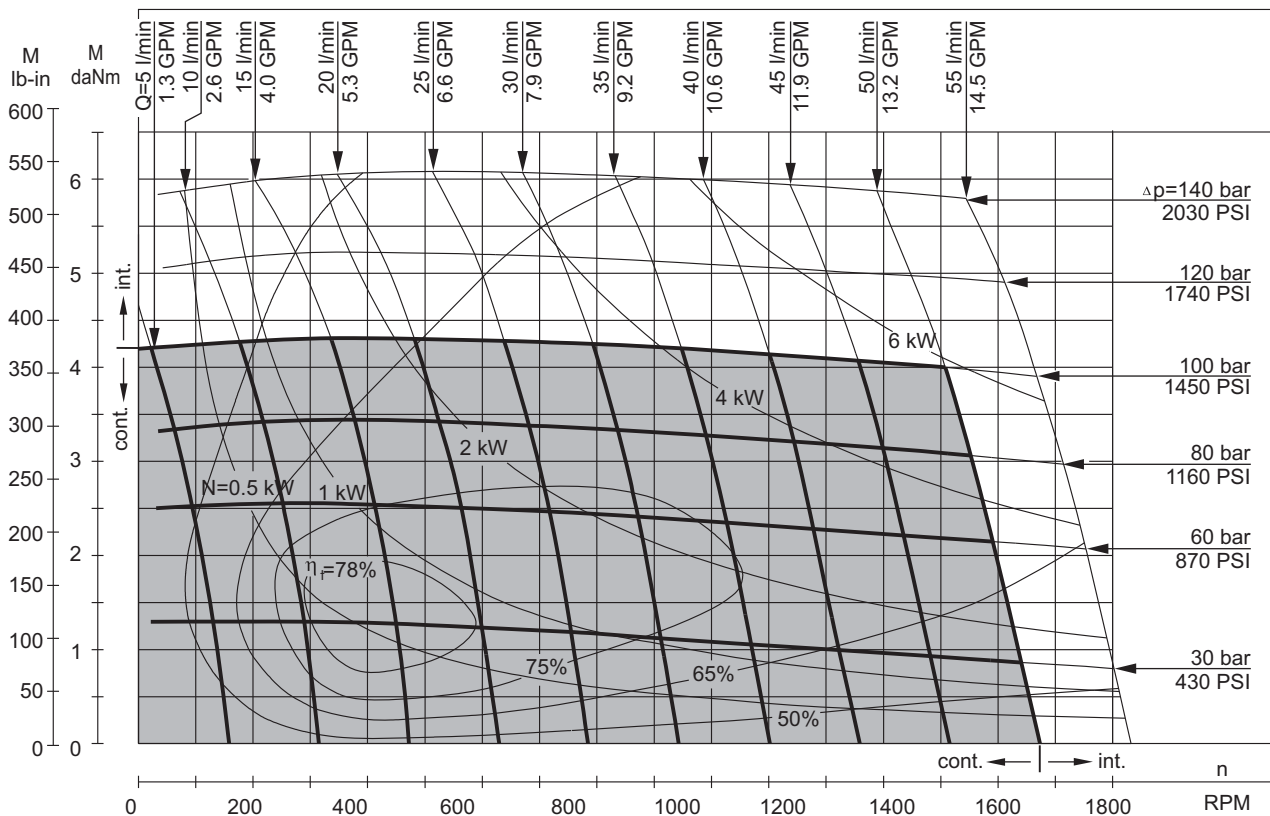
- Intermittent speed and intermittent pressure drop must not occur simultaneously.
- Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
- Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP(DIN51524) or HM (ISO 6743/4).
If using synthetic fluids consult the factory for alternative seal materials.
- Recommended minimum oil viscosity 70 SUS [13 mm²/s] at 122°F [50°C].
- Recommended maximum system operating temperature is 180°F [82°C].
- 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



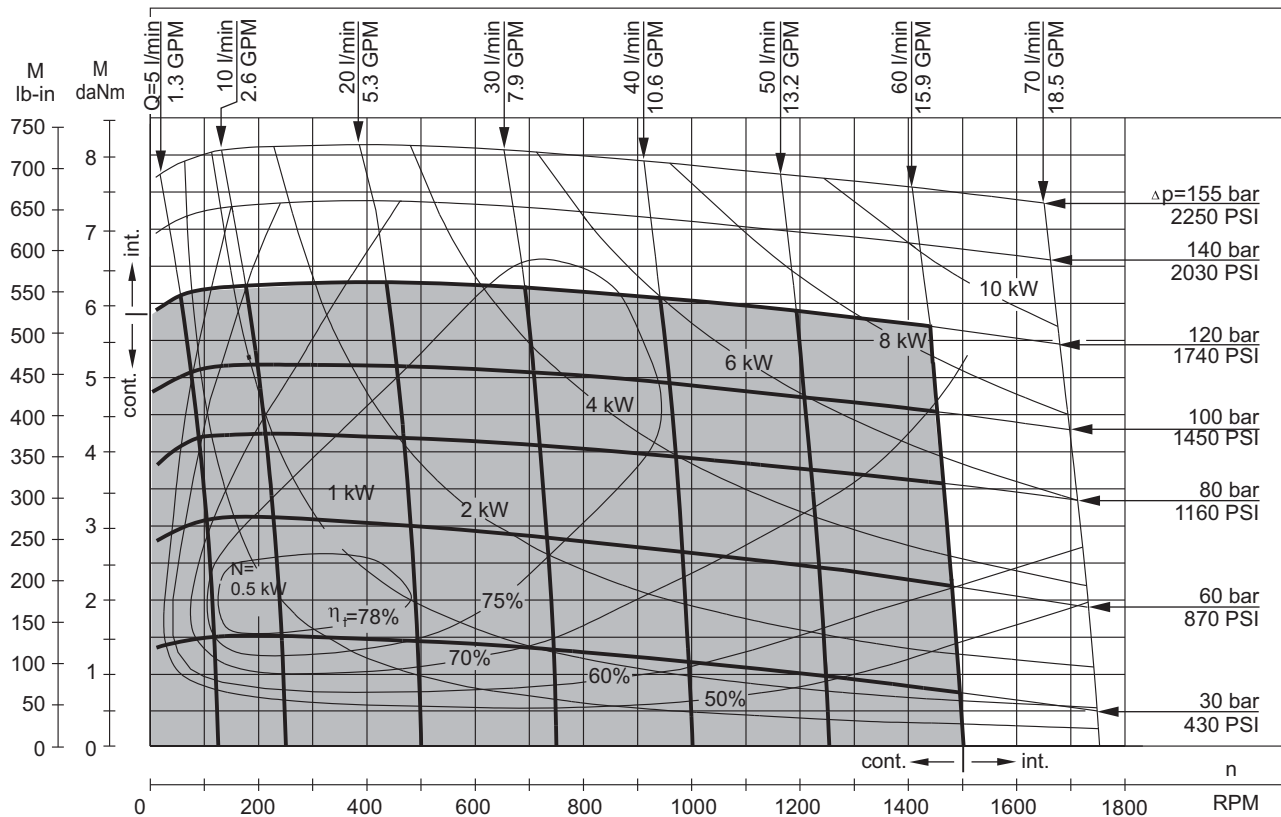
MLHP 32



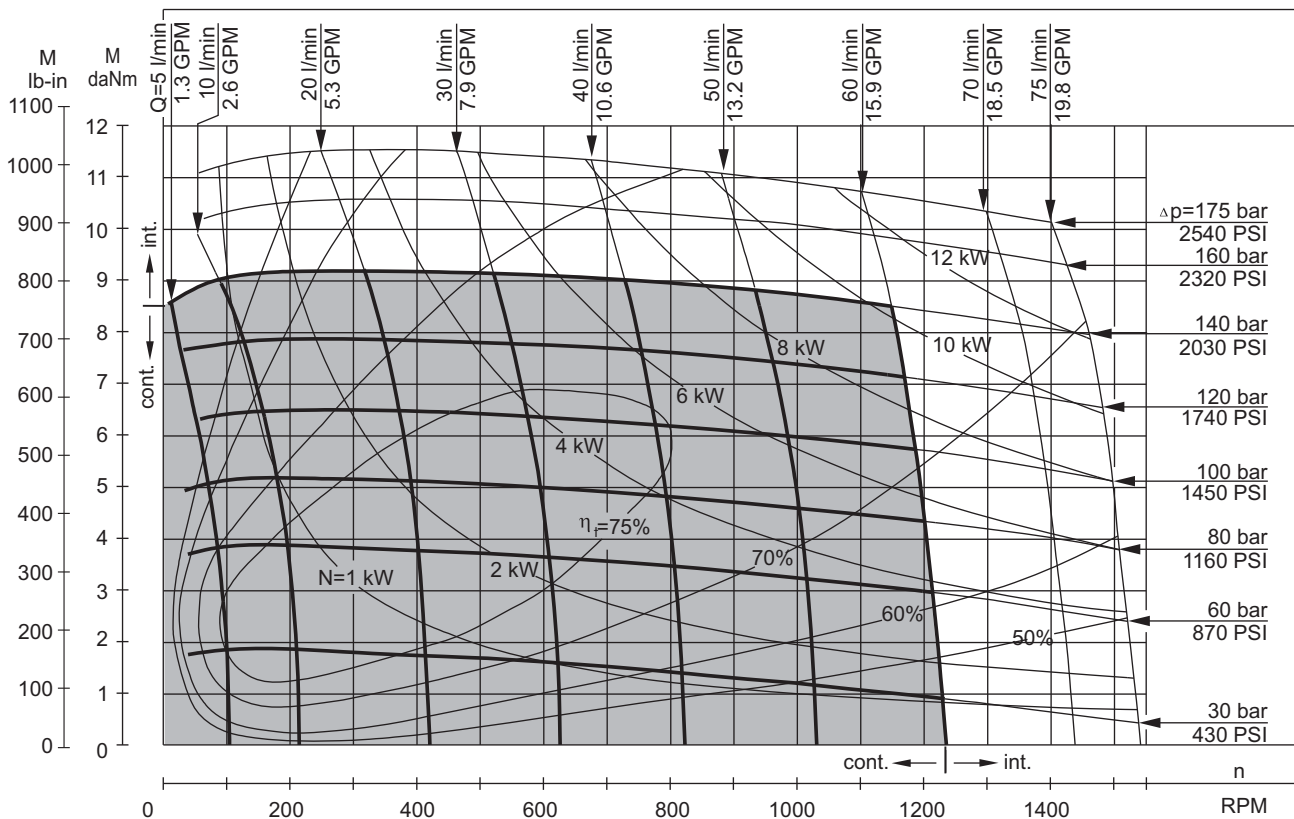
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHP 40



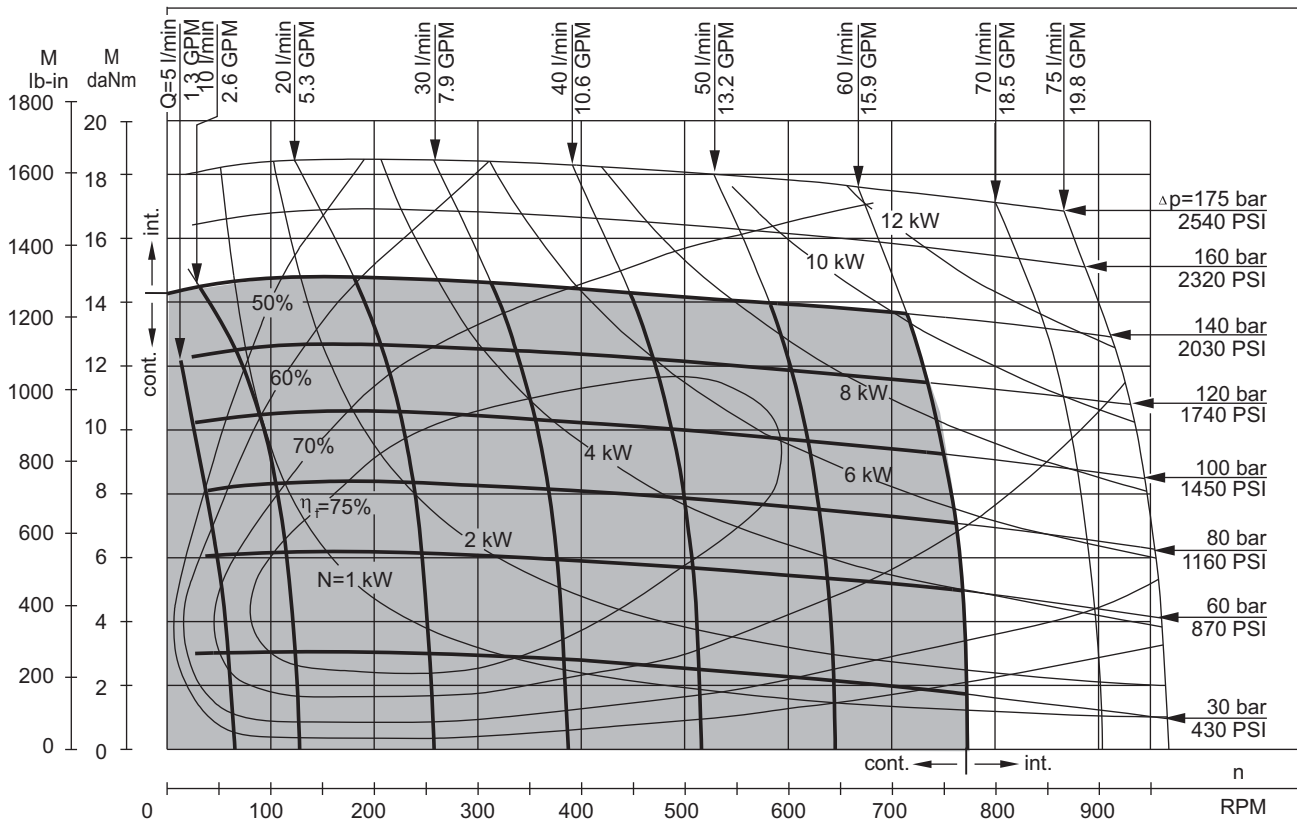
MLHP 50



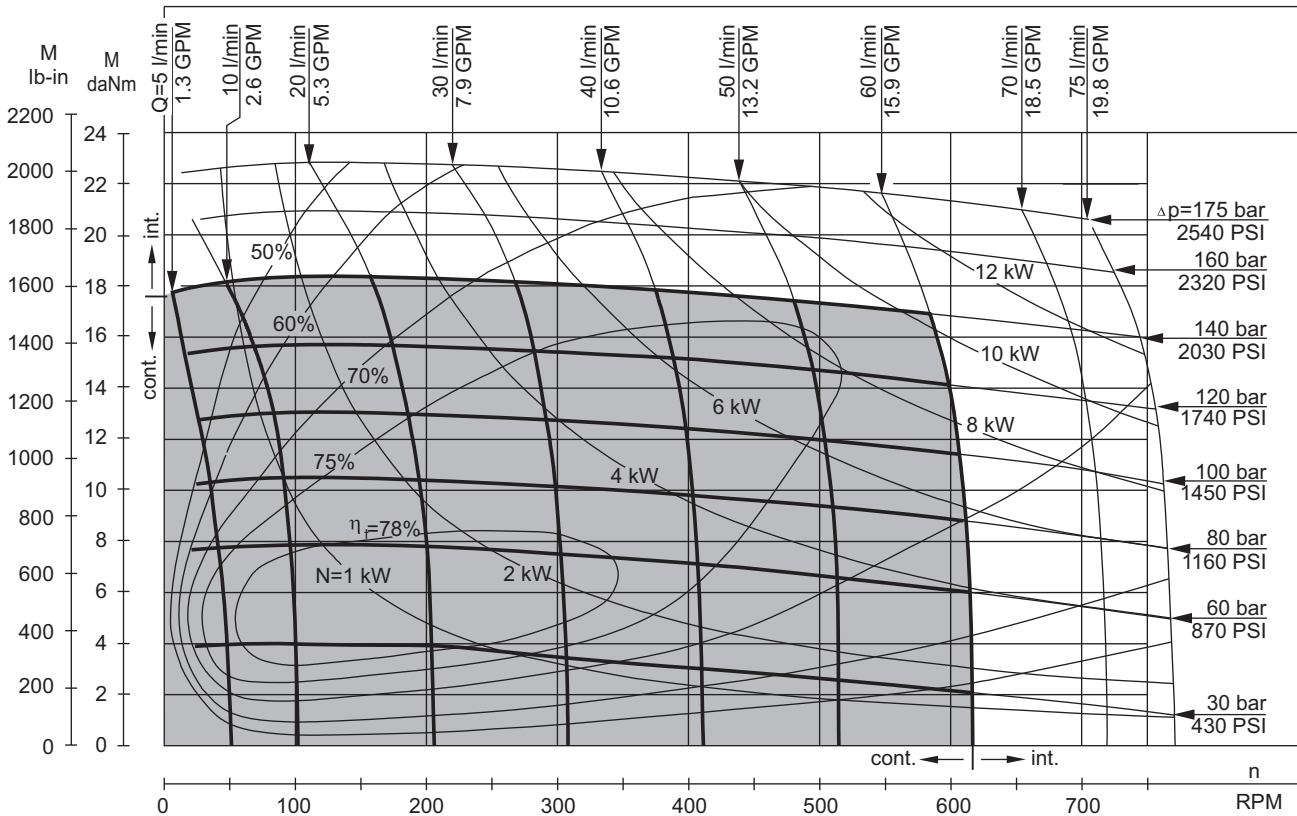
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5-145 PSI [5-10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHP 80



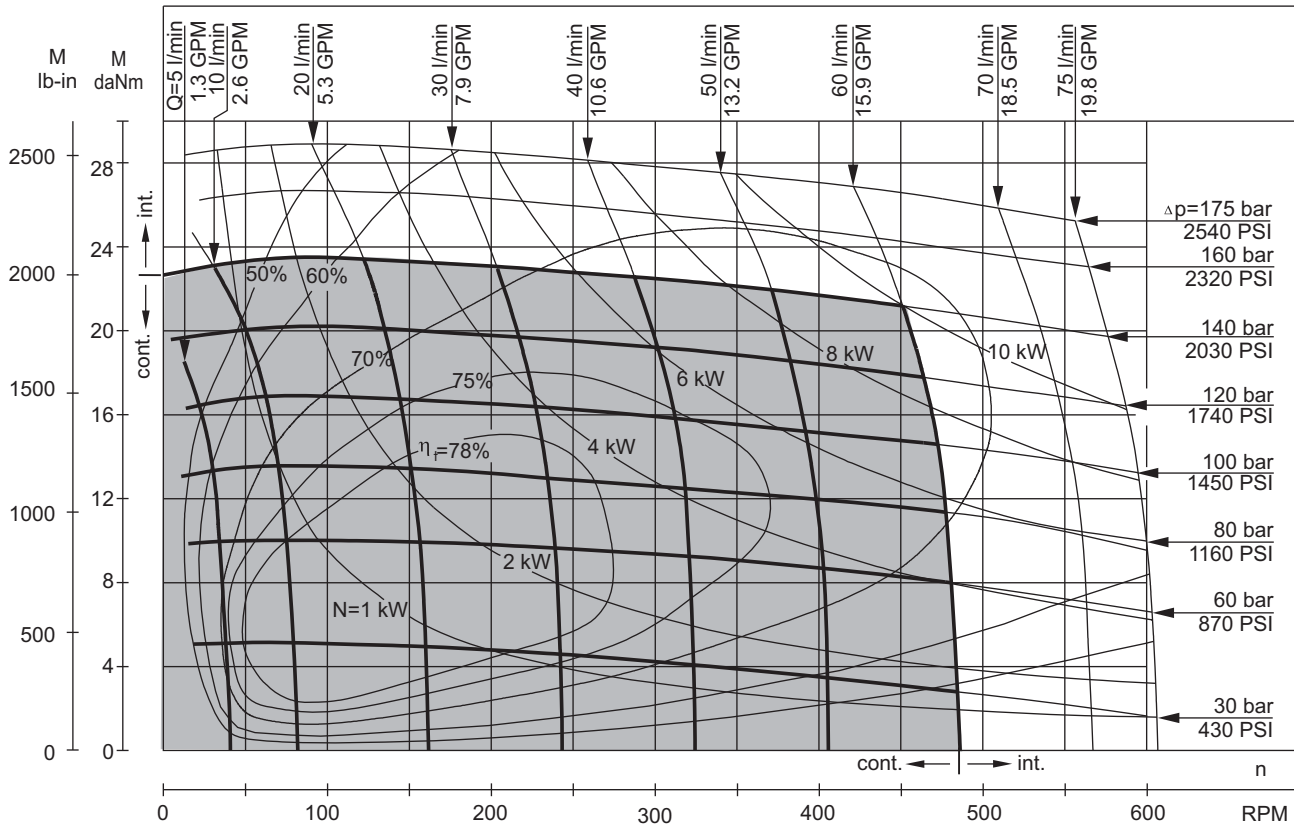
MLHP 100



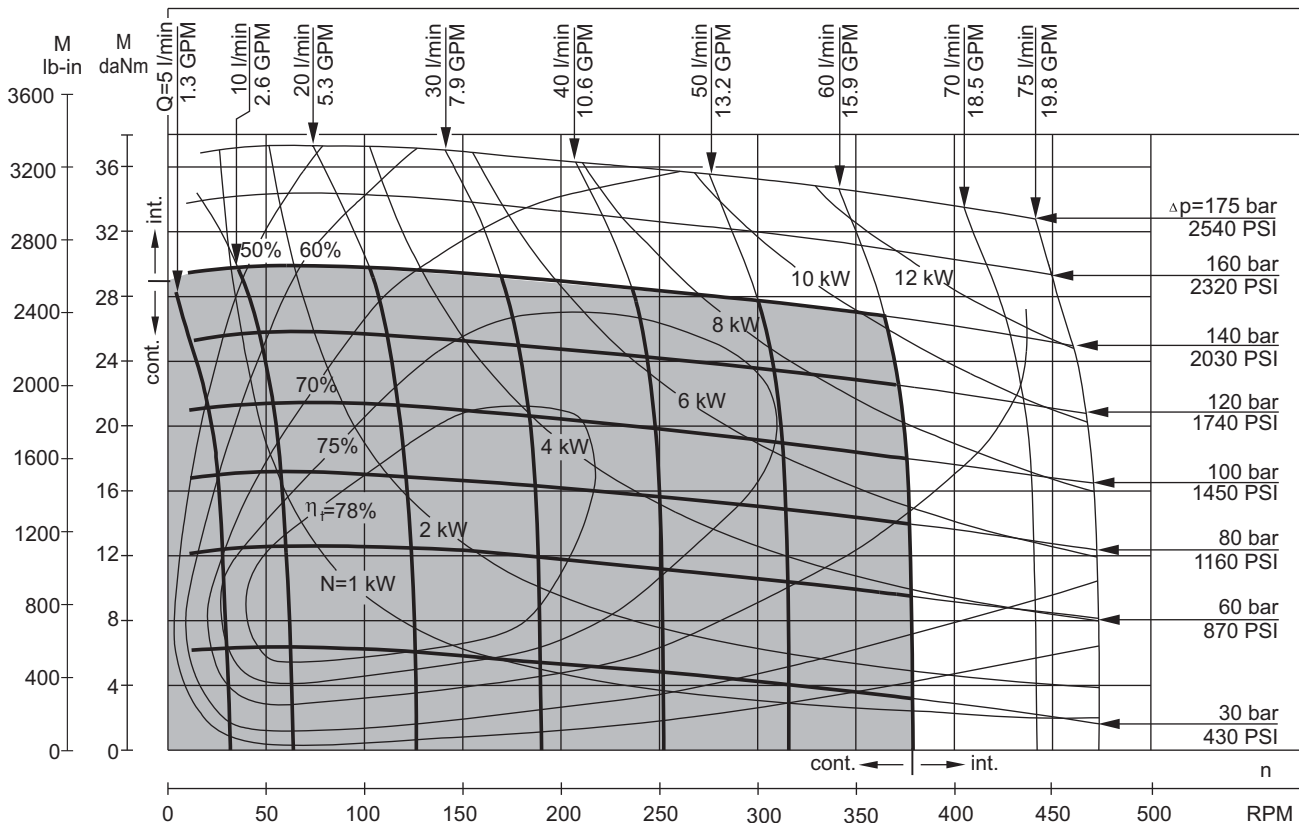
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHP 125



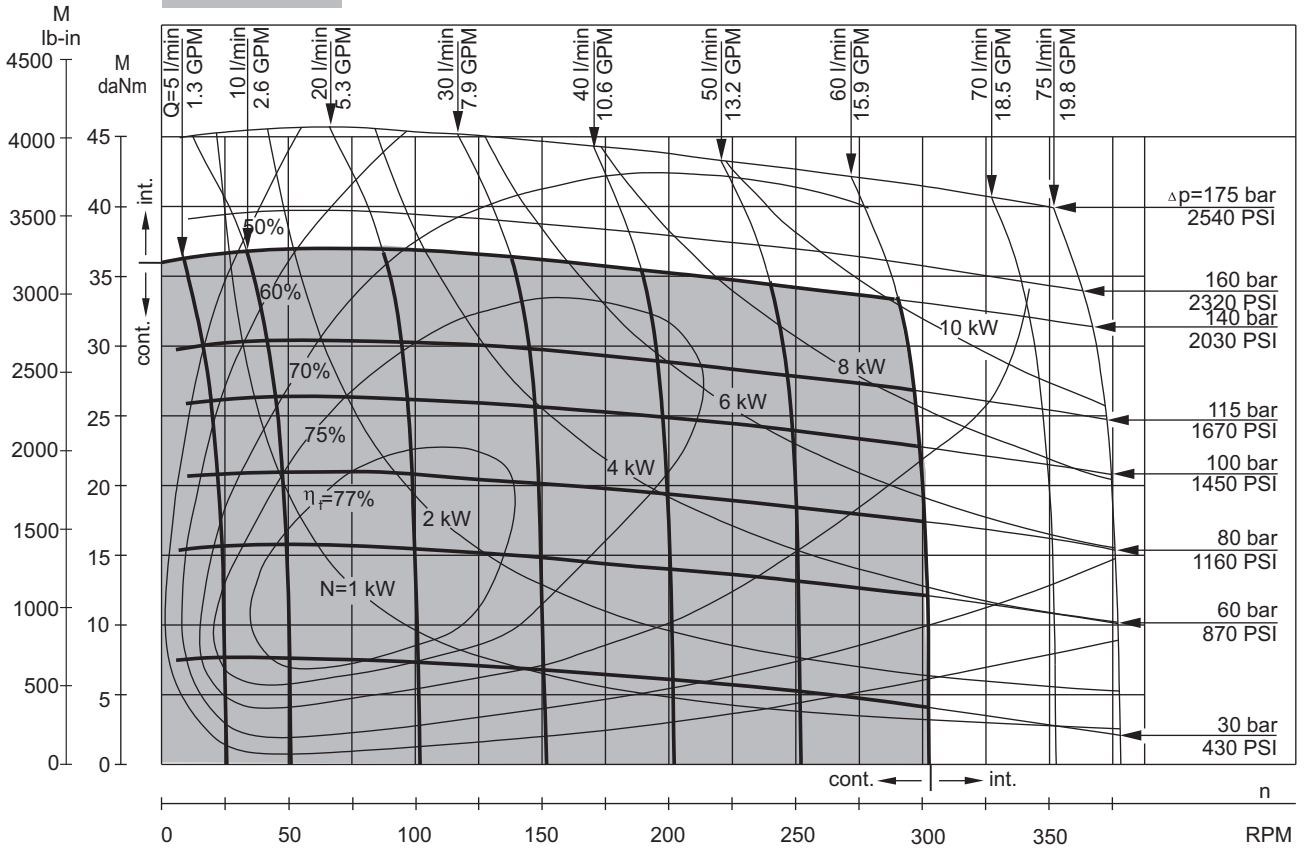
MLHP 160



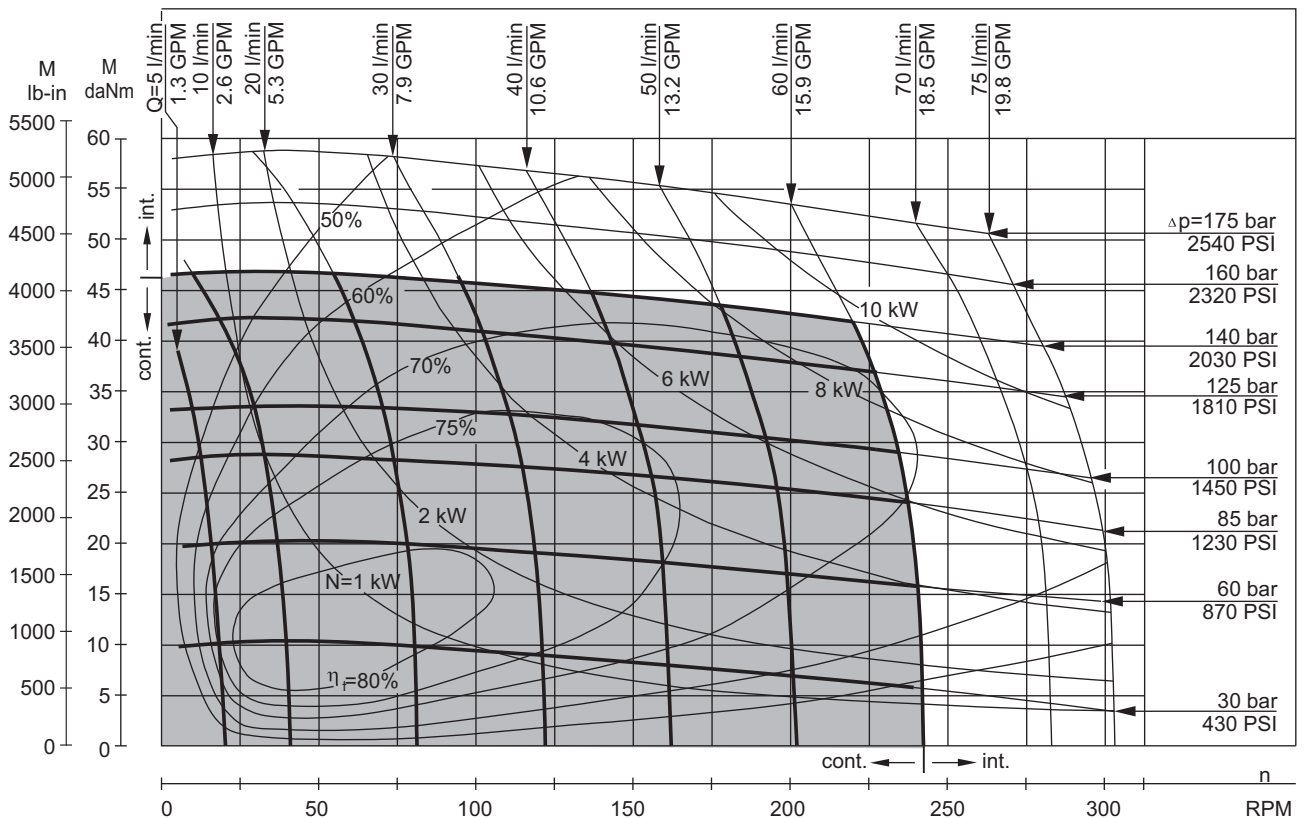
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHP 200



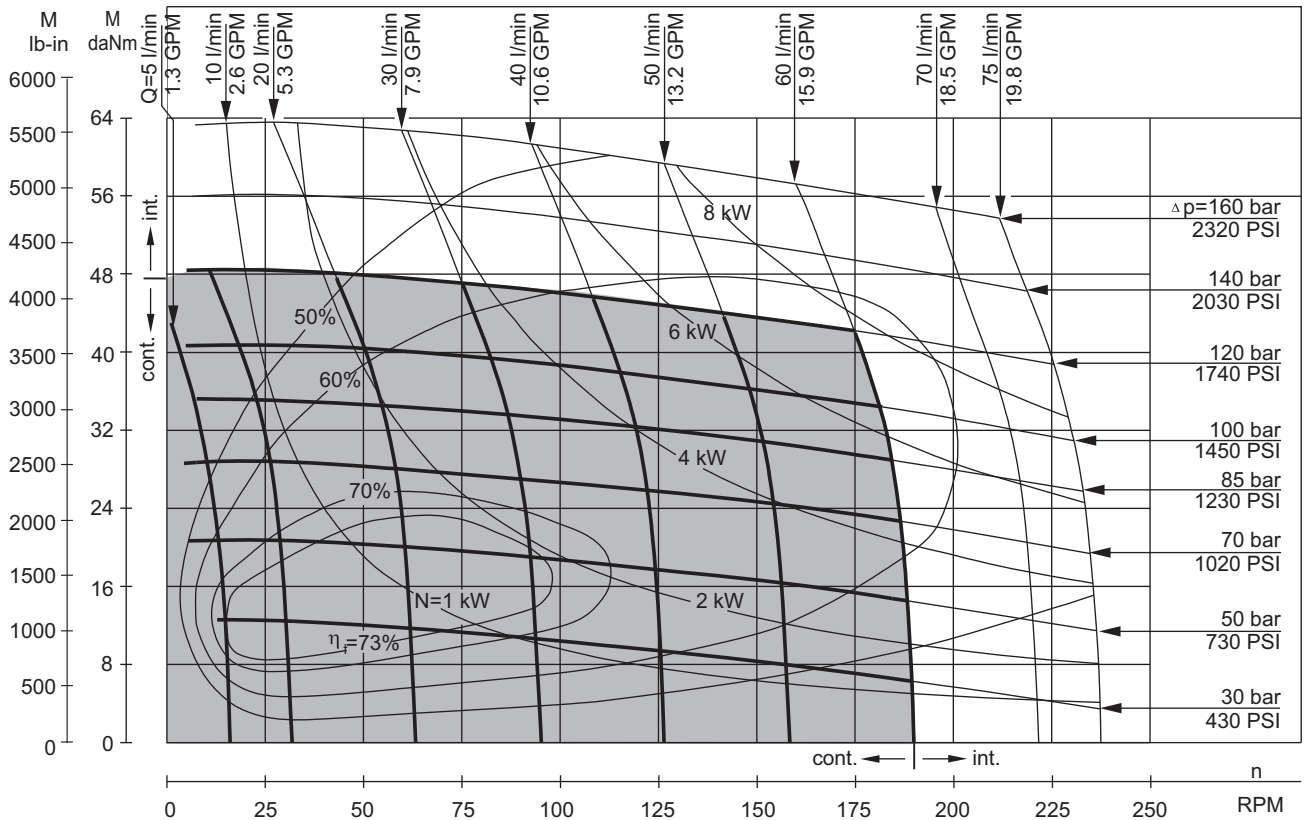
MLHP 250



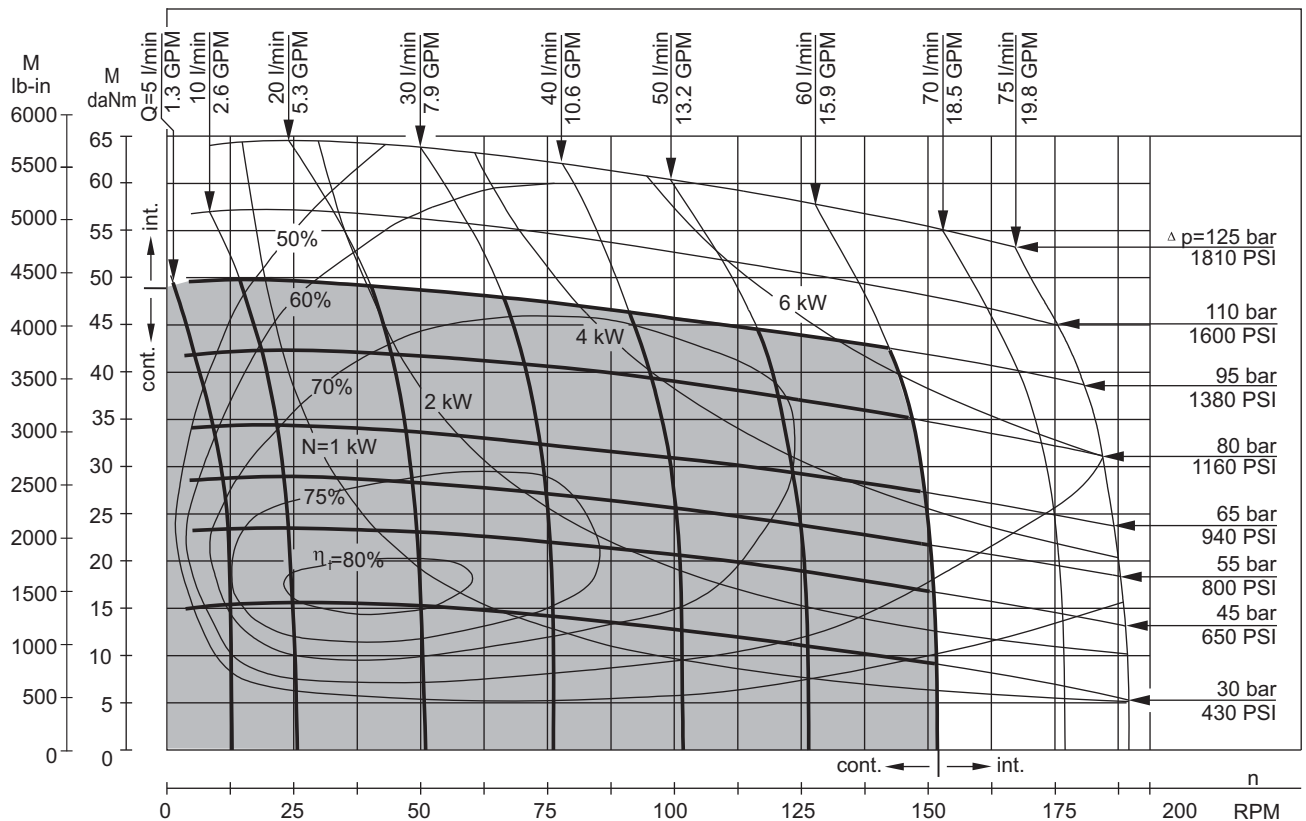
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHP 315



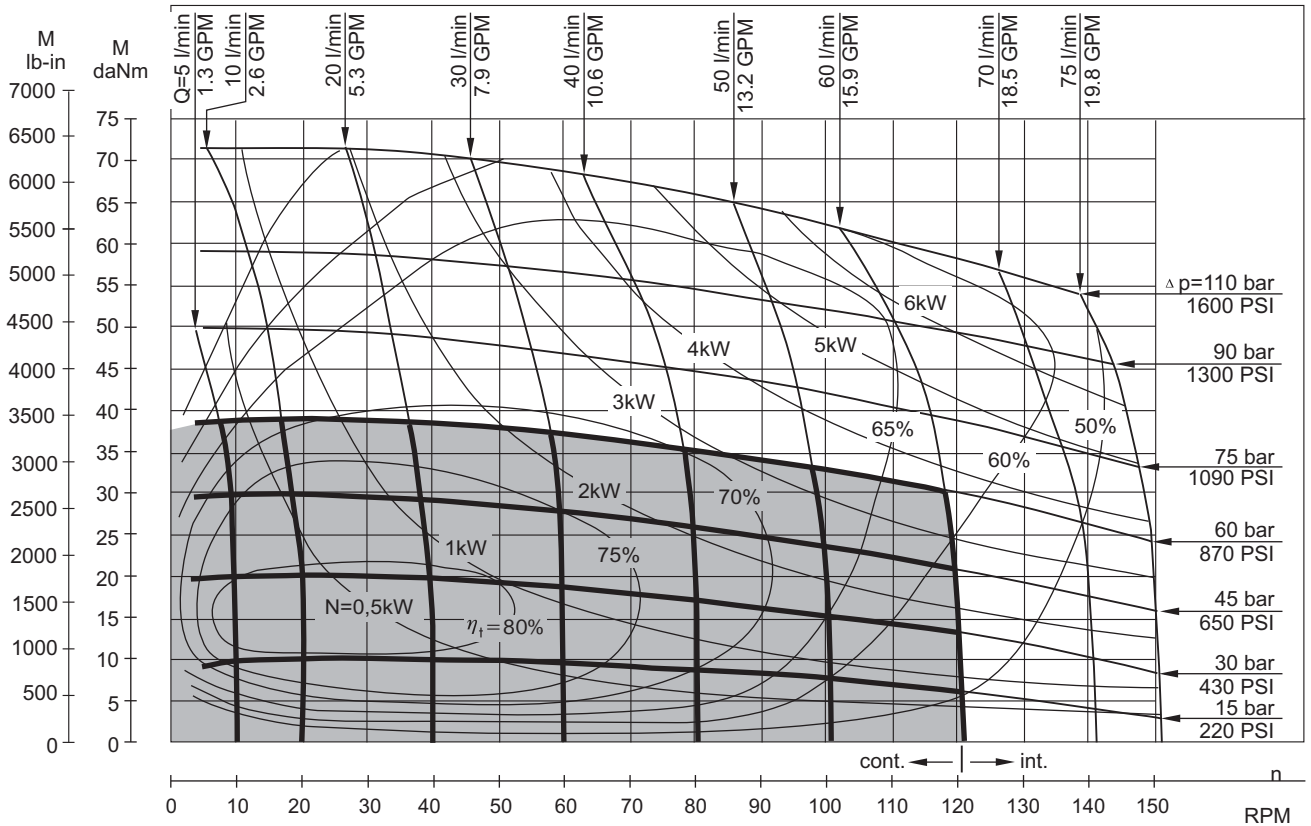
MLHP 400



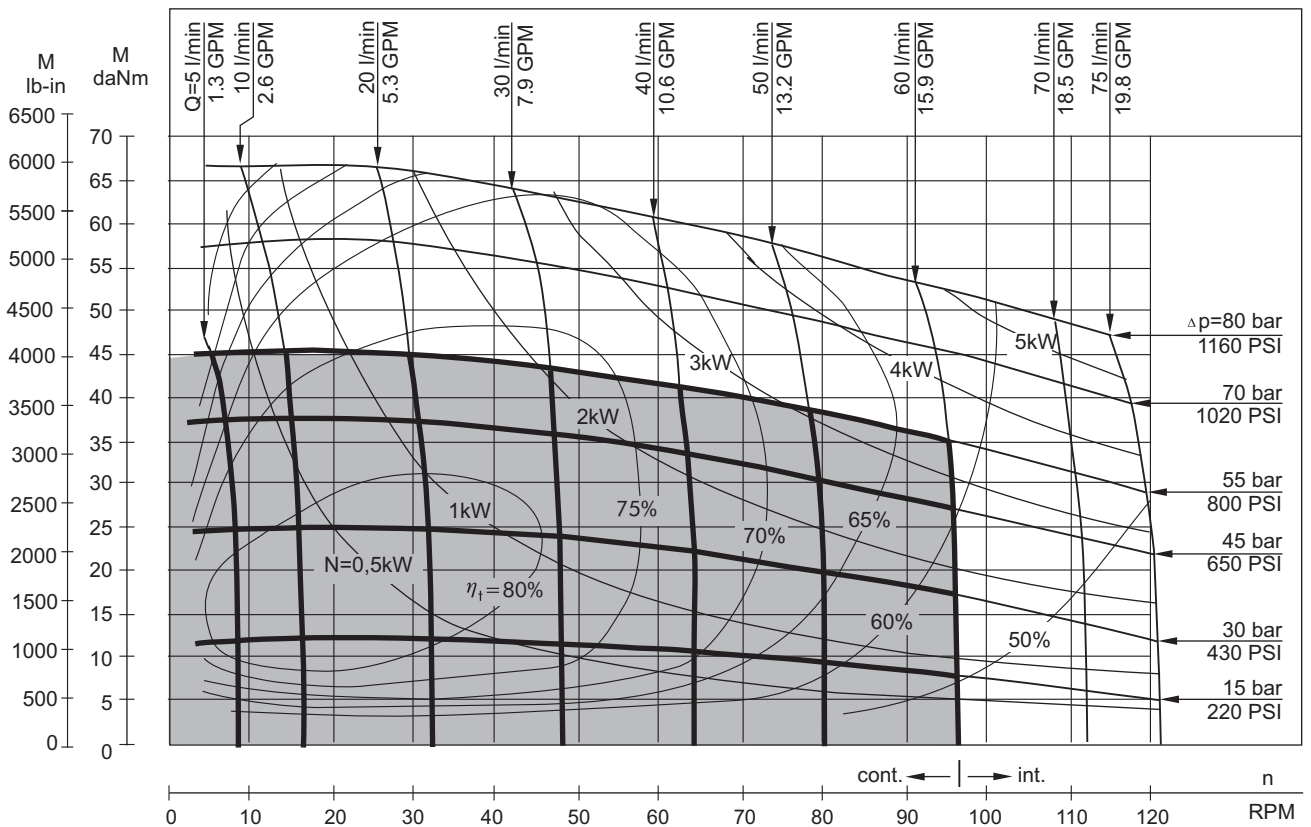
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

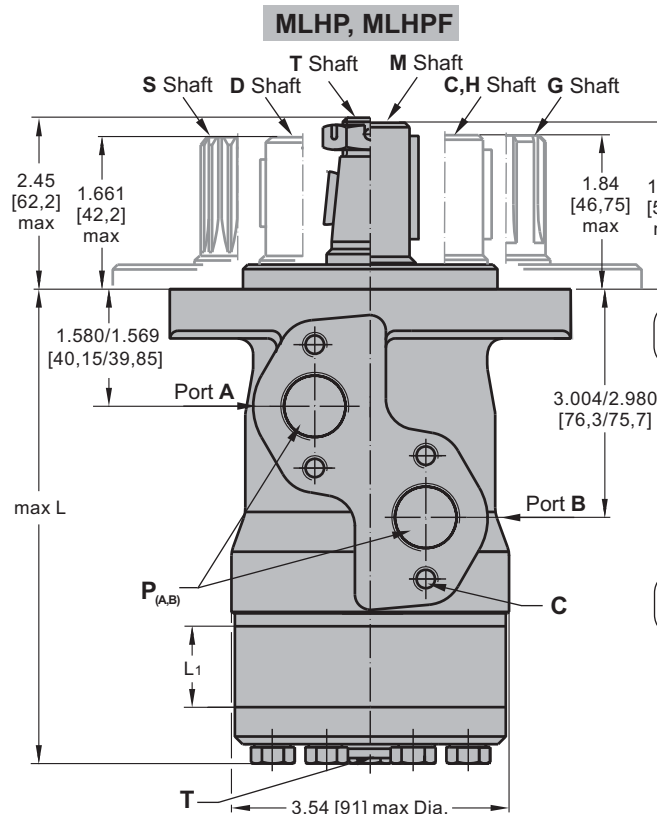
MLHP 500



MLHP 630



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

DIMENSIONS AND MOUNTING DATA


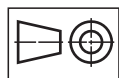
Shaft Dim.
See Page 28

Flange Dim.
See Page 26

Port Dim.
See Page 26

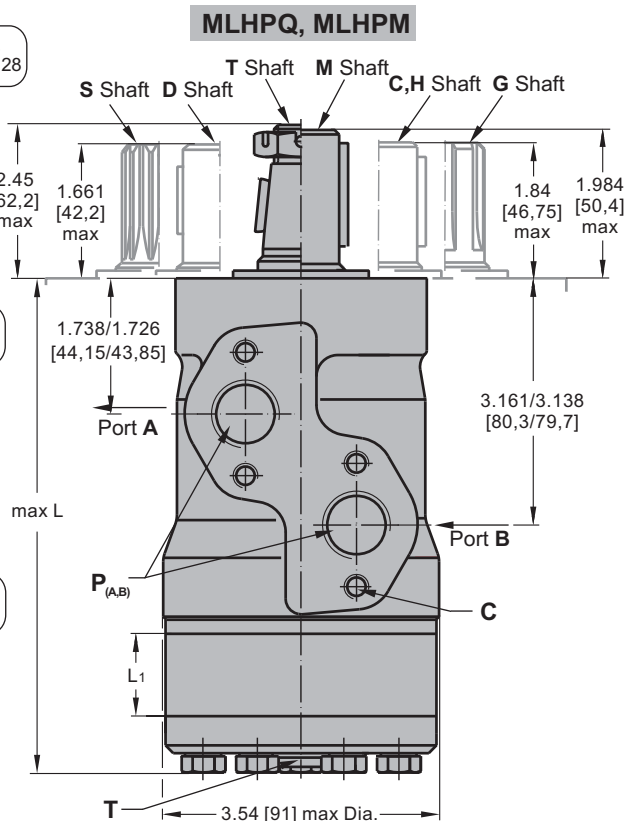
Version **6 7 8 9**
Rear ports

in [mm]



max L

	Versions			
	2, 6	3, 9	4, 7	5, 8
C	4xM8	4xM8	4x $\frac{5}{16}$ -18 UNC	4x $\frac{5}{16}$ -18 UNC
P_(A,B)	2xG $\frac{1}{2}$	2xM22x1,5	2x $\frac{7}{8}$ -14 UNF	2x $\frac{1}{2}$ -14 NPTF
T	G $\frac{1}{4}$	M14x1,5	$\frac{7}{16}$ -20 UNF	$\frac{7}{16}$ -20 UNF



Standard Rotation

Viewed from Shaft End

Port A Pressurized - **CW**

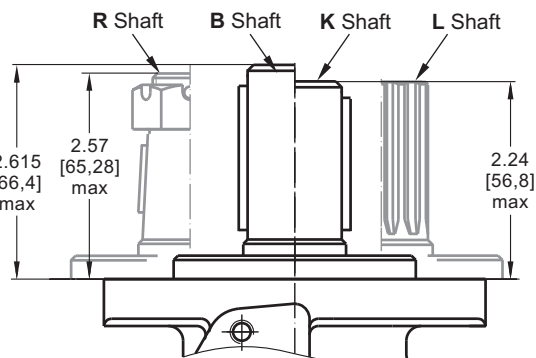
Port B Pressurized - **CCW**

Reverse Rotation

Viewed from Shaft End

Port A Pressurized - **CCW**

Port B Pressurized - **CW**

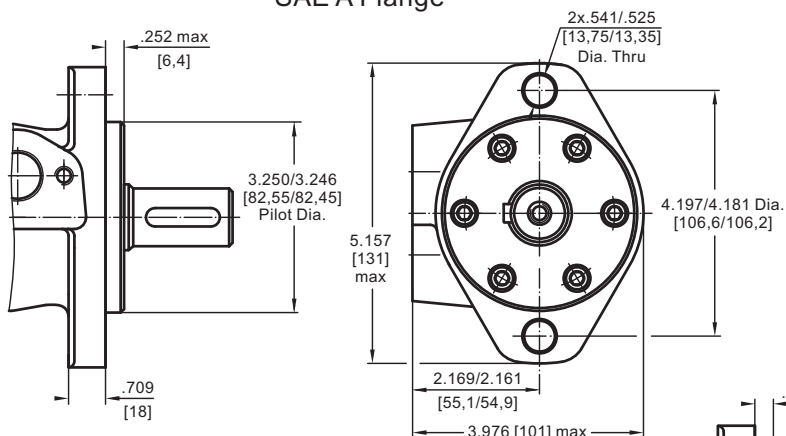


Type	L max, in [mm]		Type	L max, in [mm]		L ₁ in [mm]
	Versions 2,3,4,5	Versions 6,7,8,9		Versions 2,3,4,5	Versions 6,7,8,9	
MLHP(F) 25	5.35 [136,0]	5.98 [152,0]	MLHPQ(M) 25	5.53 [140,5]	6.16 [156,5]	.21 [5,20]
MLHP(F) 32	5.39 [137,0]	6.02 [153,0]	MLHPQ(M) 32	5.57 [141,5]	6.20 [157,5]	.25 [6,30]
MLHP(F) 40	5.45 [138,5]	6.06 [154,0]	MLHPQ(M) 40	5.61 [142,5]	6.24 [158,5]	.29 [7,40]
MLHP(F) 50	5.41 [137,5]	6.04 [153,5]	MLHPQ(M) 50	5.59 [142,0]	6.22 [158,0]	.26 [6,67]
MLHP(F) 80	5.57 [141,5]	6.20 [157,5]	MLHPQ(M) 80	5.75 [146,0]	6.34 [162,0]	.42 [10,67]
MLHP(F) 100	5.67 [144,0]	6.32 [160,5]	MLHPQ(M) 100	5.85 [148,5]	6.48 [164,5]	.52 [13,33]
MLHP(F) 125	5.81 [147,5]	6.44 [163,5]	MLHPQ(M) 125	5.98 [152,0]	6.61 [168,0]	.66 [16,67]
MLHP(F) 160	5.98 [152,0]	6.63 [168,5]	MLHPQ(M) 160	6.16 [156,5]	6.79 [172,5]	.84 [21,33]
MLHP(F) 200	6.20 [157,5]	6.83 [173,5]	MLHPQ(M) 200	6.38 [162,0]	7.01 [178,0]	1.05 [26,67]
MLHP(F) 250	6.46 [164,0]	7.11 [180,5]	MLHPQ(M) 250	6.63 [168,5]	7.26 [184,5]	1.31 [33,33]
MLHP(F) 315	6.83 [173,5]	7.46 [189,5]	MLHPQ(M) 315	7.01 [178,0]	7.64 [194,0]	1.68 [42,67]
MLHP(F) 400	7.24 [184,0]	7.89 [200,5]	MLHPQ(M) 400	7.42 [188,5]	8.05 [204,5]	2.10 [53,33]
MLHP(F) 500	7.78 [197,5]	8.41 [213,5]	MLHPQ(M) 500	7.95 [202,0]	8.58 [218,0]	2.62 [66,63]
MLHP(F) 630	8.47 [215,0]	9.09 [231,0]	MLHPQ(M) 630	8.62 [219,0]	9.25 [235,0]	3.31 [84,00]

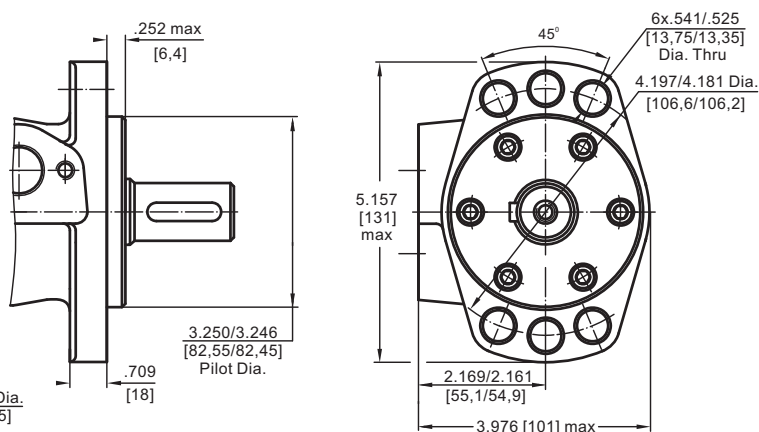
* -For Rear Ported Motors.

MOUNTING

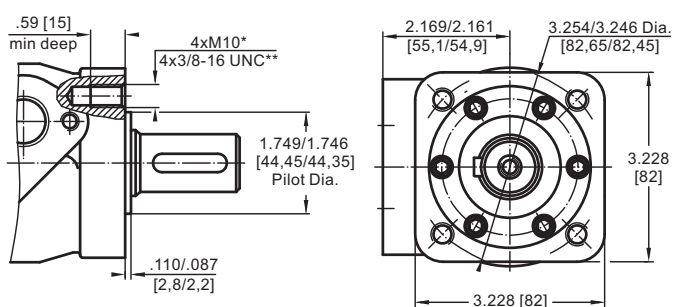
SAE A Flange



F - Magneto Flange



M and Q - Square Flange

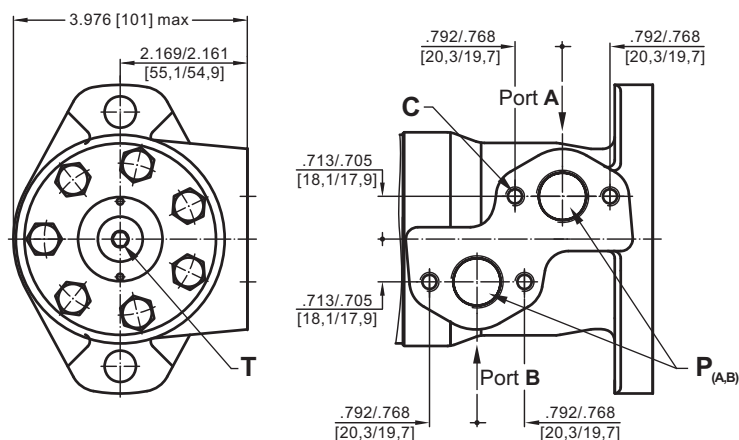


- * For **M** Flange
** For **Q** Flange

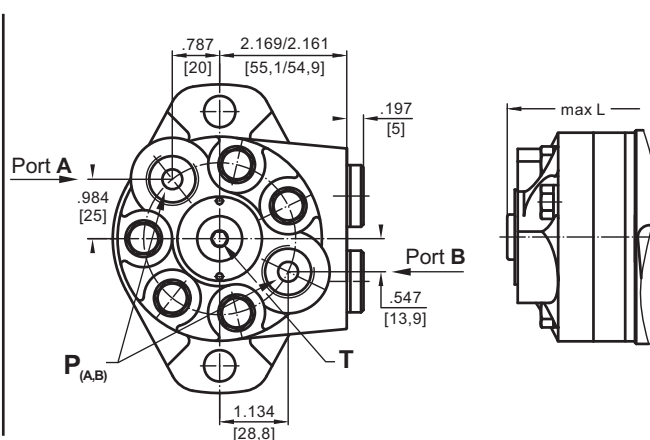


PORTS

Side Ports

Version **2** **3** **4** **5**

Rear Ports

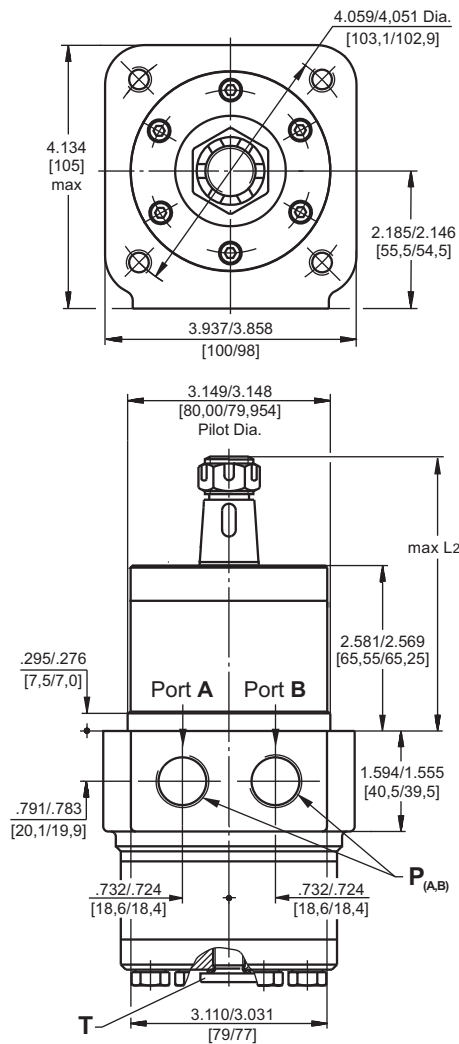
Version **6** **7** **8** **9**

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	5, 8
C	4xM8	4xM8	4x $\frac{5}{16}$ -18 UNC	4x $\frac{5}{16}$ -18 UNC
P_(A,B)	2xG $\frac{1}{2}$	2xM22x1,5	2x $\frac{7}{8}$ -14 UNF	2x $\frac{1}{2}$ -14 NPTF
T	G $\frac{1}{4}$	M14x1,5	$\frac{7}{16}$ -20 UNF	$\frac{7}{16}$ -20 UNF

DIMENSIONS AND MOUNTING DATA - MLHPW (WHEEL MOTOR)



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]

Versions			
	2	3	4
C	4xM10	4xM10	3/8-16 UNC
P _(A,B)	2xG1/2	2xM22x1,5	2x7/8-14 UNF
T	G1/4	M14x1,5	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]

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



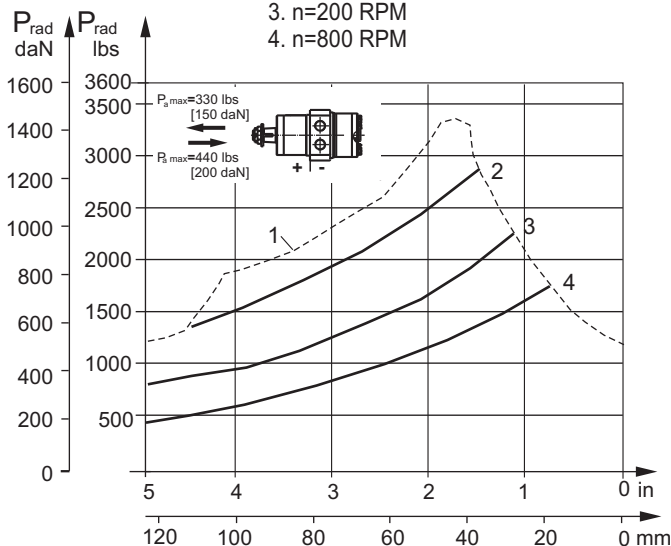
PERMISSIBLE SHAFT LOADS

MLHPWN

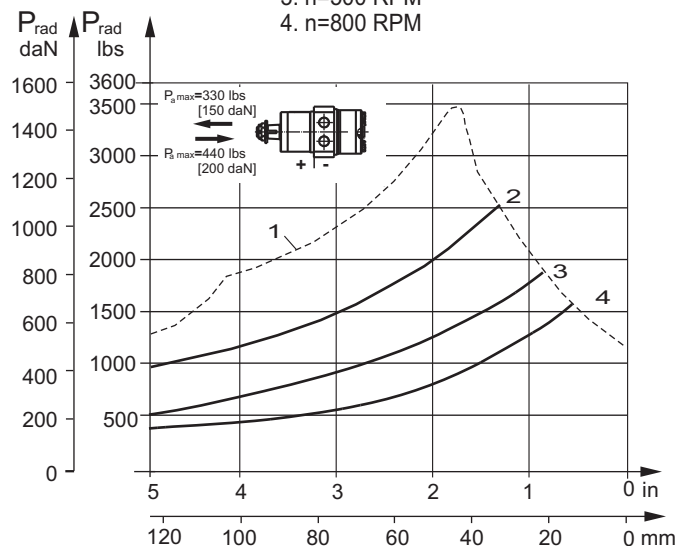
MLHPW

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



1. Max. radial shaft load
2. n=300 RPM
3. n=500 RPM
4. n=800 RPM

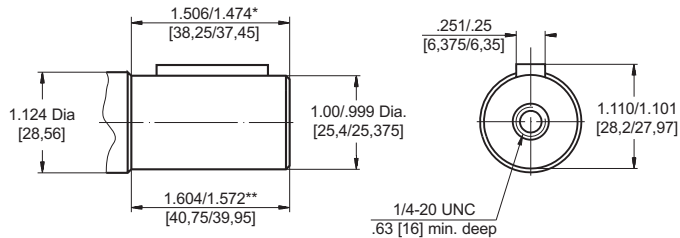


SHAFT EXTENSIONS FOR MLHP AND MLHR MOTORS

1.124 [28,56] sealing diameter

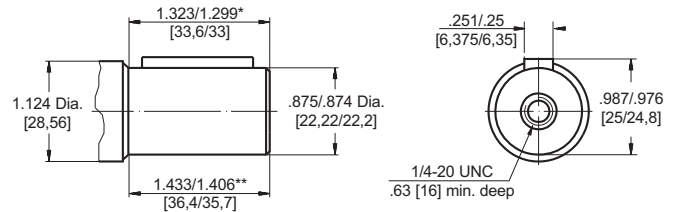
C

1" [25,4] straight, Parallel key $\frac{1}{4}$ "x $\frac{1}{4}$ "x1 $\frac{1}{4}$ " BS 46
Max. Torque 3009 lb-in [34 daNm]



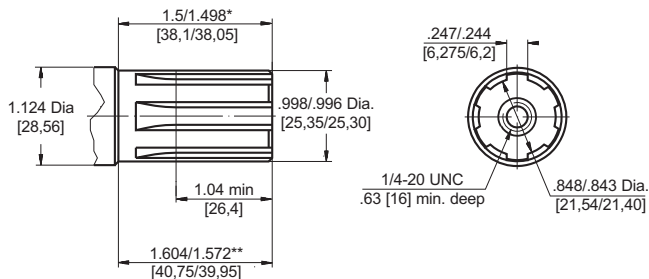
D

$\frac{7}{8}$ " [22,2] straight, Parallel key $\frac{1}{4}$ "x $\frac{1}{4}$ "x1" BS 46
Max. Torque 3200 lb-in [36 daNm]



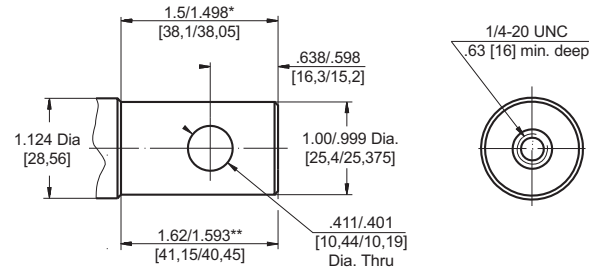
G

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



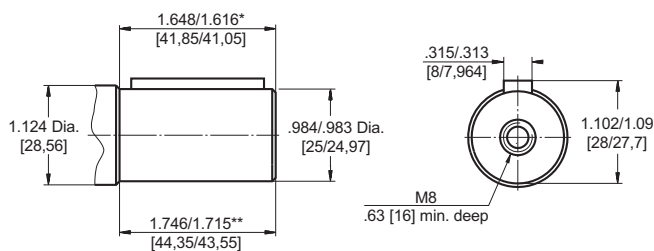
H

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



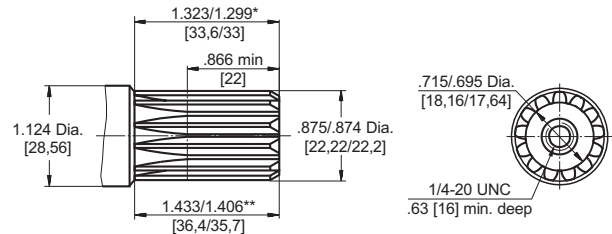
M

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



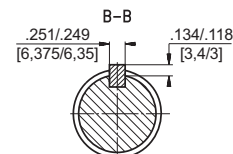
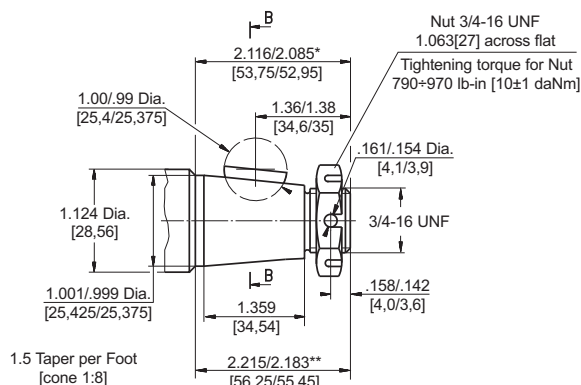
S

13T Splined, $\frac{7}{8}$ " [22,2], ANS B 92.1-1976
Max. Torque 3200 lb-in [36 daNm]



T

1" [25,4], SAE J501 Tapered
Woodruff key $\frac{1}{4}$ "x1" SAE J502
Max. Torque 3540 lb-in [40 daNm]



* For SAE A and F Flange

** For M and Q Flange

Requirement max. Torque must not be exceeded.

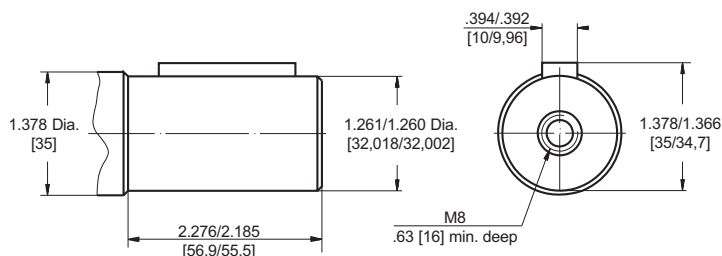
SHAFT EXTENSIONS FOR MLHP AND MLHR MOTORS (continued)

1.378 [35] sealing diameter

B

ø32 straight, Parallel key A10x8x45 DIN 6885

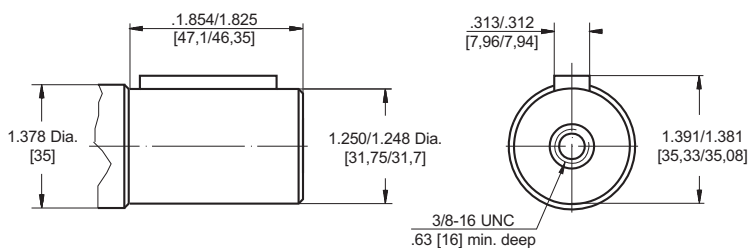
Max. Torque 6815 lb-in [77 daNm]



K

1¼" [31,75] straight, Parallel key 5/16"x5/16"x1¼" BS 46

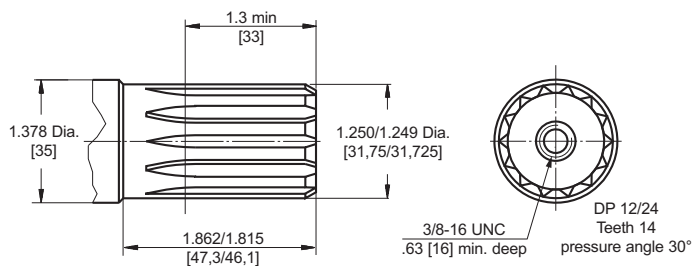
Max. Torque 6815 lb-in [77 daNm]



L

14T Splined, 1¼" [31,75], ANS B 92.1-1976

Max. Torque 6815 lb-in [77 daNm]

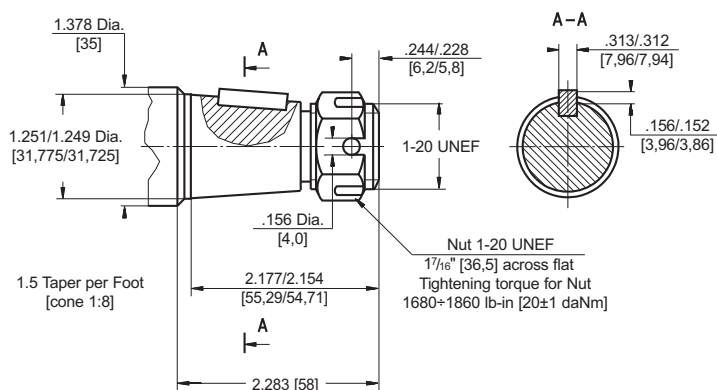


R

1¼" [31,75], SAE J501 Tapered

Parallel key 5/16"x5/16"x1"

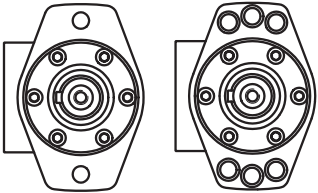
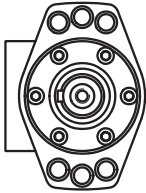
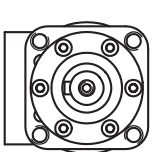
Max. Torque 6815 lb-in [77 daNm]



Requirement max. Torque must not be exceeded.

PERMISSIBLE SHAFT LOADS FOR MLHP AND MLHR MOTORS

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

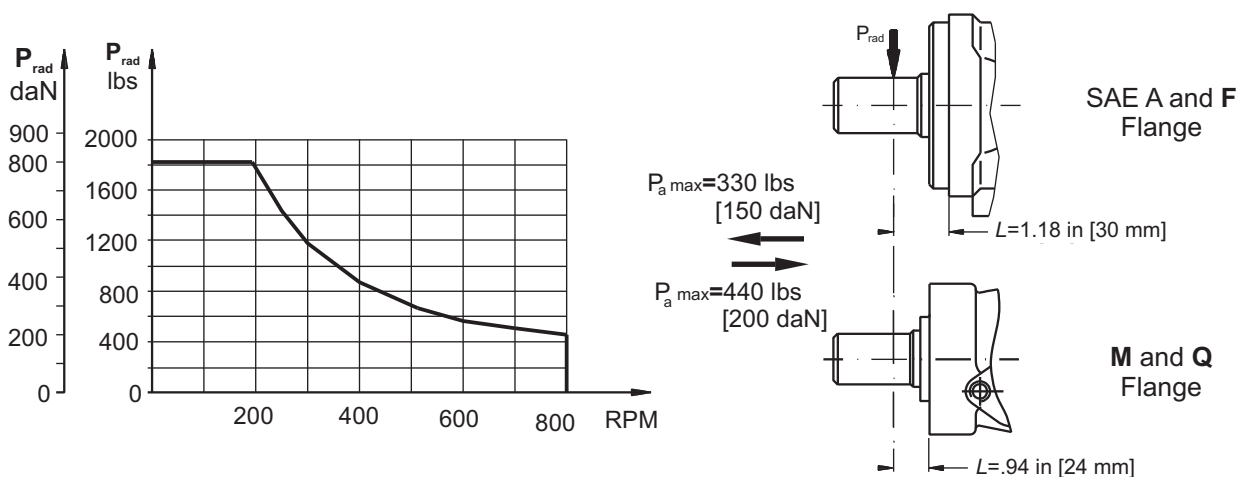
Mounting Flange			
Shaft Version	Keyed C Splined G	Keyed B Splined L	Keyed C Splined G
Radial Shaft Load P_{rad} , in mm	$\frac{800}{n} \times \frac{25000}{95+L}$, daN*	$\frac{800}{n} \times \frac{18750}{95+L}$, daN*	$\frac{800}{n} \times \frac{25000}{101+L}$, daN*
Radial Shaft Load P_{rad} , in inch	$\frac{800}{RPM} \times \frac{2215}{3.74+L}$, 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 P_{rad} =1800 lbs [800 daN]

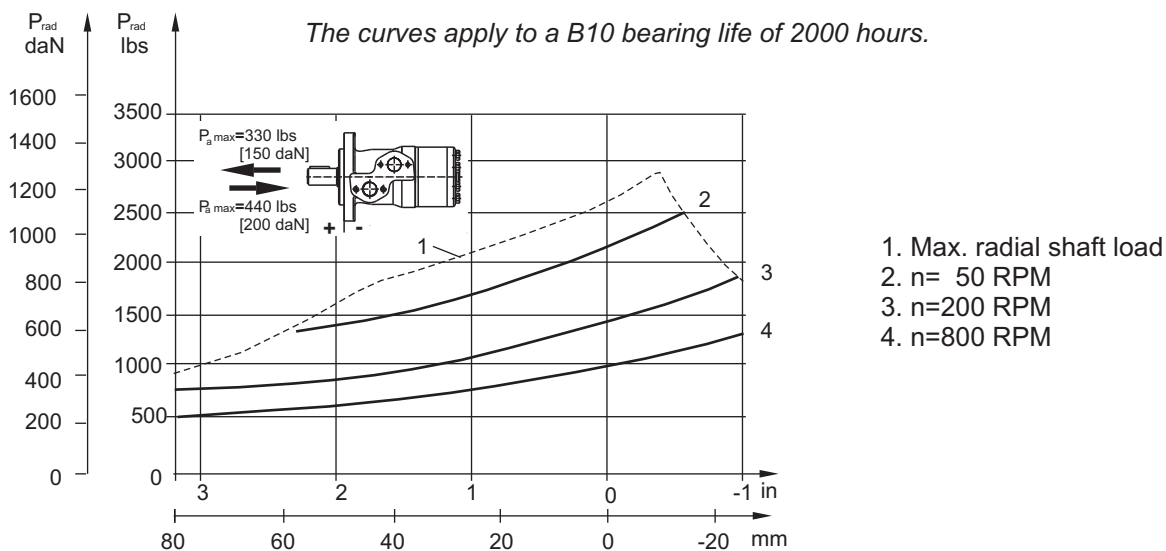
$n \geq 200$ RPM; $L < 2.2$ in [55 mm]

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



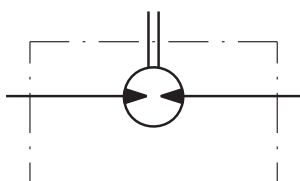
1. Max. radial shaft load
2. $n= 50$ RPM
3. $n=200$ RPM
4. $n=800$ RPM

MAX. PERMISSIBLE SHAFT SEAL PRESSURE FOR MLHP AND MLHR MOTORS

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

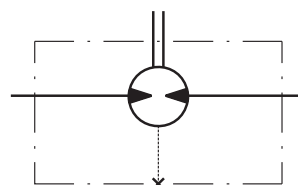
The shaft seal pressure equals the average of input pressure and return pressure.

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



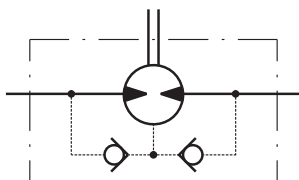
MLHP/MLHR...U motors with high pressure seal and drain connection:

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



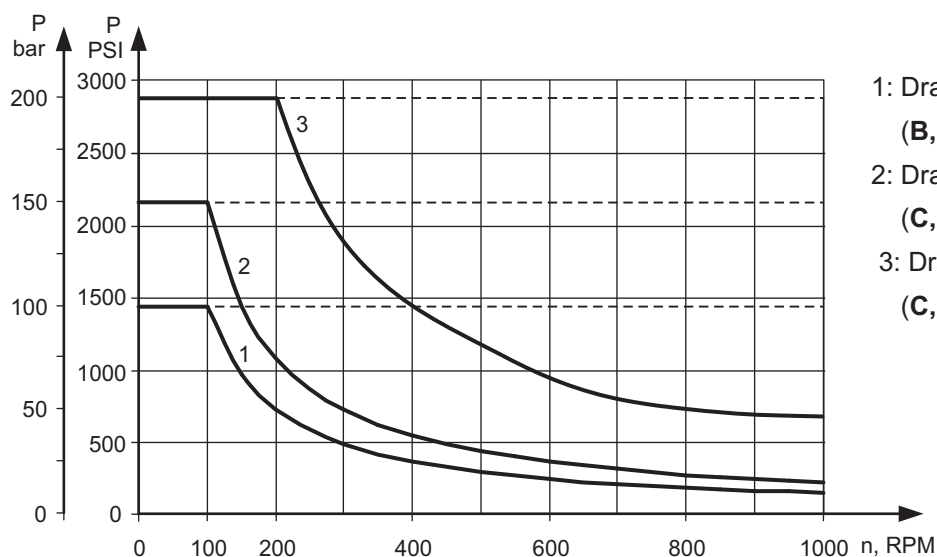
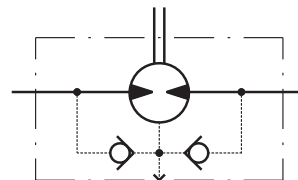
MLHP/MLHR...1 motors with standard shaft seal and without drain connection:

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

	1	2	3	4	5	6	7	8	9
MLHP									

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 in³/rev [28,4 cm³/rev]

32 - 2.11 in³/rev [34,5 cm³/rev]

40 - 2.47 in³/rev [40,5 cm³/rev]

50 - 3.02 in³/rev [49,5 cm³/rev]

80 - 4.83 in³/rev [79,2 cm³/rev]

100 - 6.04 in³/rev [99,0 cm³/rev]

125 - 7.55 in³/rev [123,8 cm³/rev]

160 - 9.66 in³/rev [158,4 cm³/rev]

200 - 12.10 in³/rev [198,0 cm³/rev]

250 - 15.10 in³/rev [247,5 cm³/rev]

315 - 19.30 in³/rev [316,8 cm³/rev]

400 - 24.16 in³/rev [396,0 cm³/rev]

500 - 30.20 in³/rev [495,0 cm³/rev]

630 - 38.05 in³/rev [623,6 cm³/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 - 1 1/4" [31,75] straight, Parallel key

L - 1 1/4" [31,75] 14T Splined

R - 1 1/4" [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 103]
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, 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 and 50 are not allowed with **B, K, L, R** shafts!

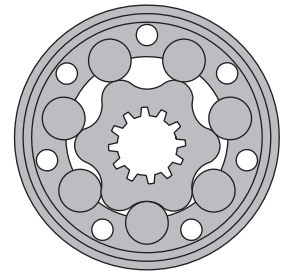
The hydraulic motors are mangano-phosphatized as standard.

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

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Dimensions and mounting	41÷42
Shaft extensions	28÷29
Permissible shaft loads	30
Permissible shaft Seal Pressure ...	31
Order code	43

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 sensing
- » Other special features

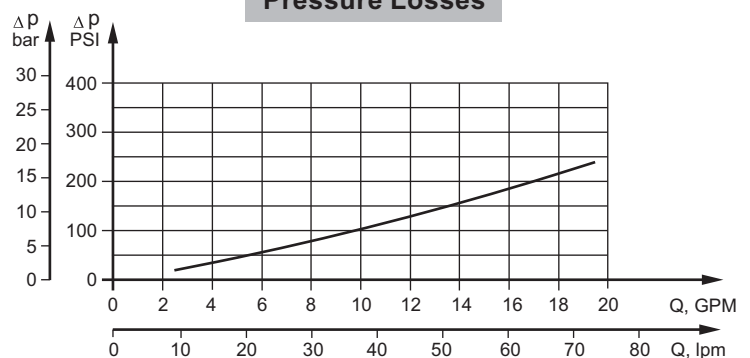
GENERAL

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 [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 [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, in ³ /rev [cm ³ /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 Pres- sure 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.*	85 [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]	15.4 [7,6]	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.

- Intermittent speed and intermittent pressure must not occur simultaneously.
- Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
- 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.
- Recommended minimum oil viscosity 70 SUS [13 mm²/s] at 122°F [50°C].
- Recommended maximum system operating temperature is 180°F [82°C].
- 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, in ³ /rev [cm ³ /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 Pres- sure 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.

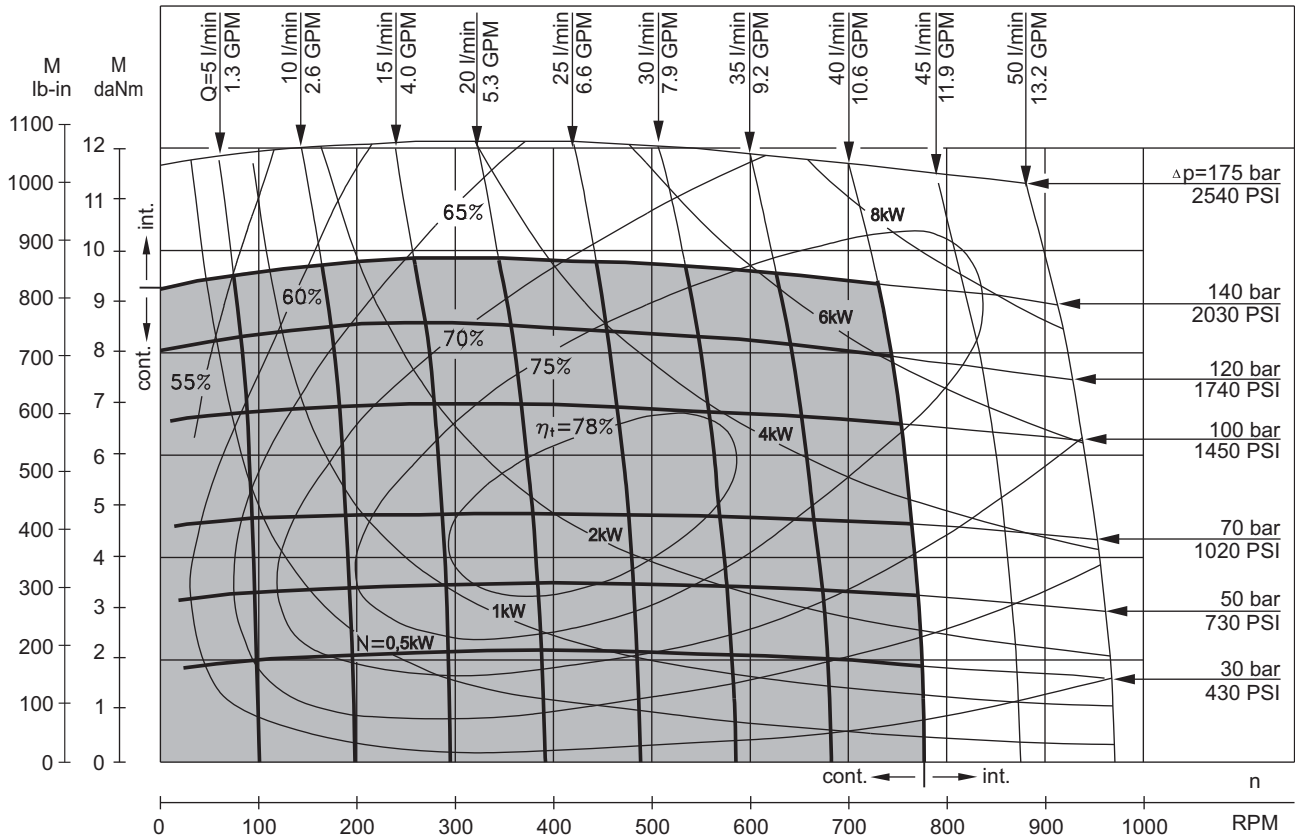
** Peak load: the permissible values may occur for max. 1% of every minute.

*** For speeds lower than given, consult factory or your regional manager.

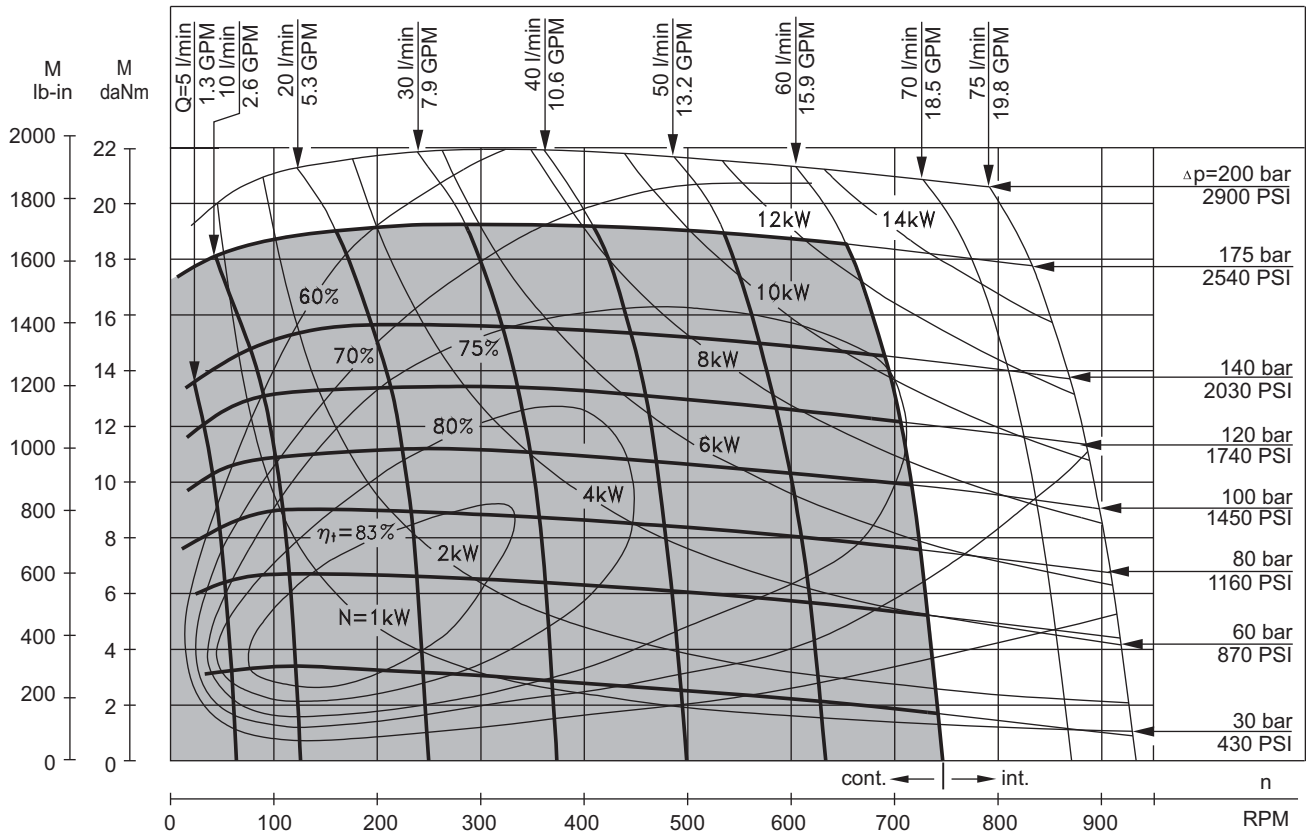
- Intermittent speed and intermittent pressure must not occur simultaneously.
- Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
- Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP(DIN51524) or HM (ISO 6743/4).
If using synthetic fluids consult the factory for alternative seal materials.
- Recommended minimum oil viscosity 70 SUS [13 mm²/s] at 122°F [50°C].
- Recommended maximum system operating temperature is 180°F [82°C].
- 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



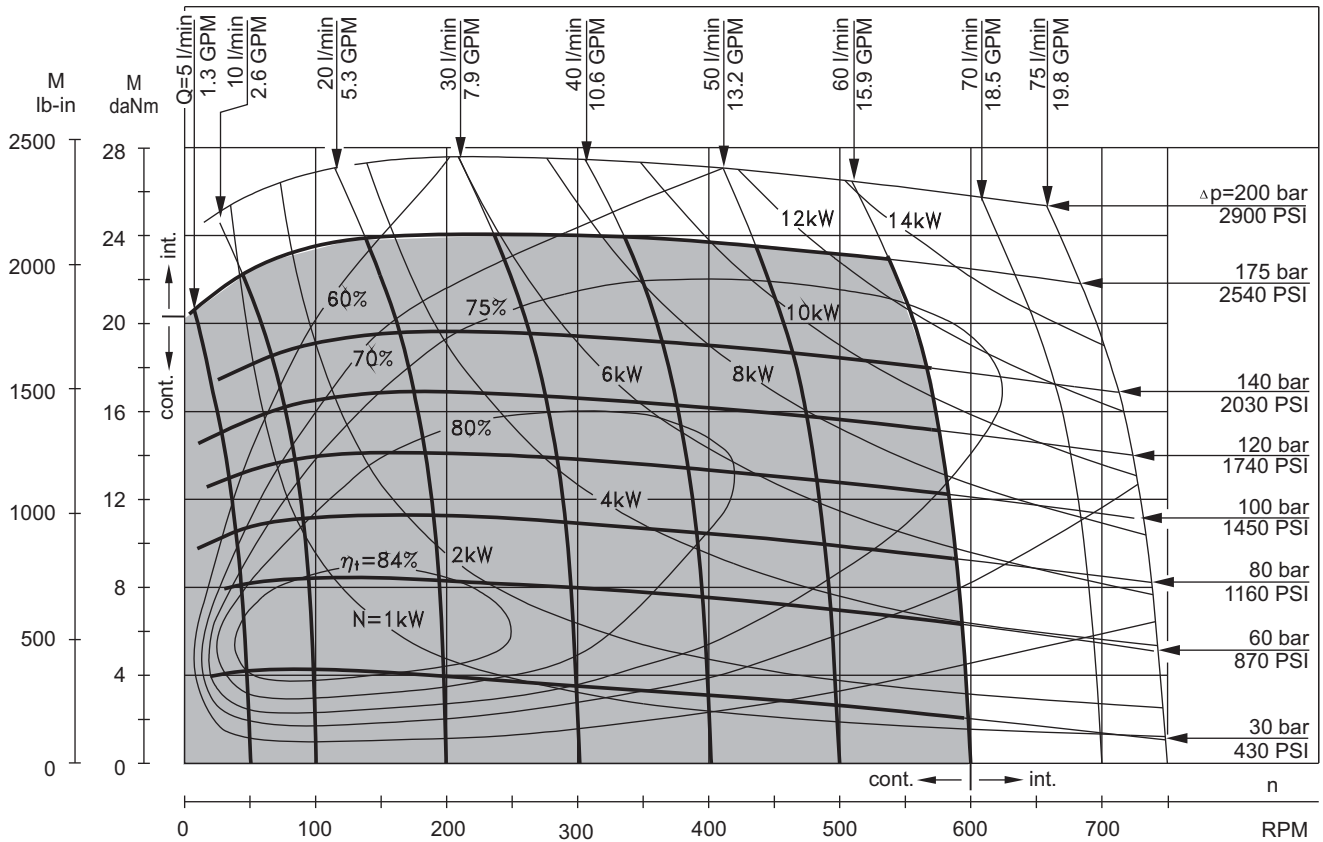
MLHR 80



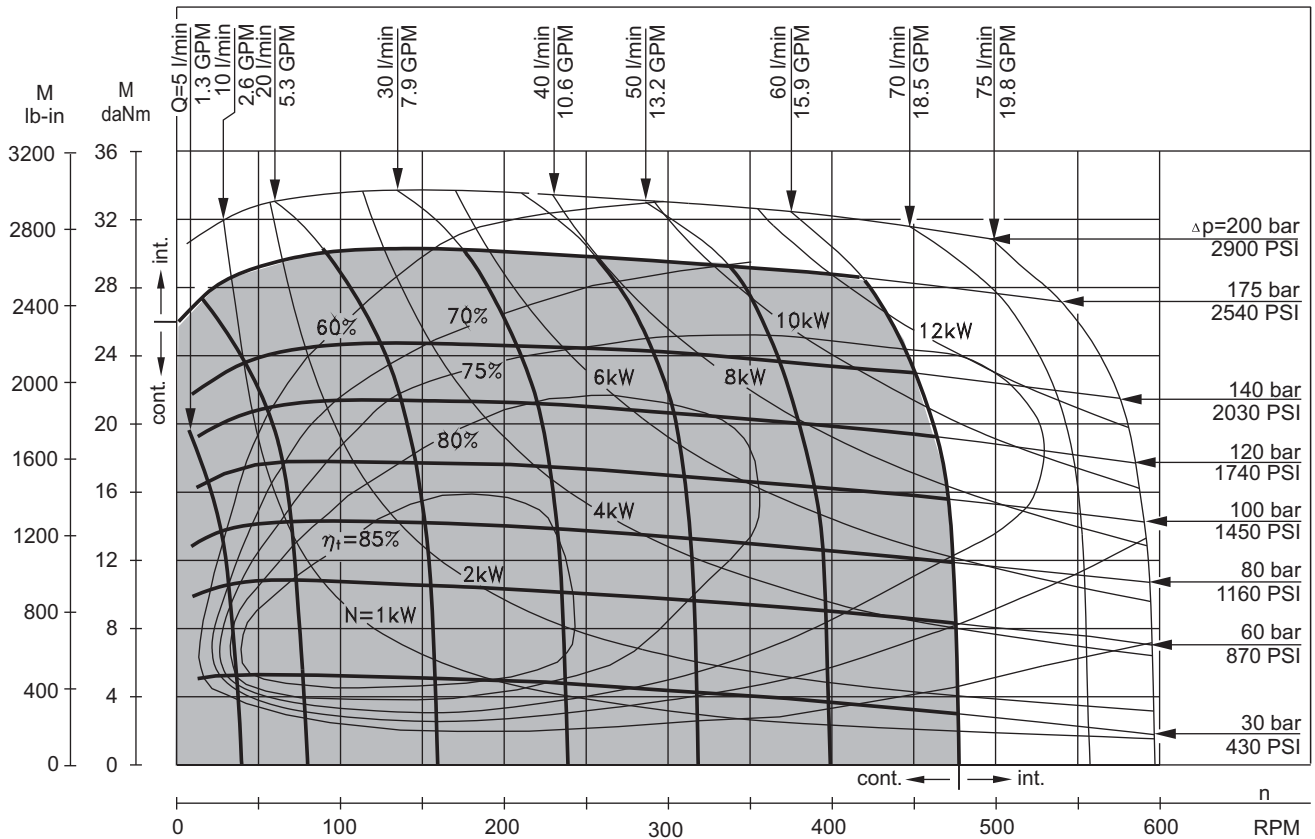
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5-145 PSI [5-10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHR 100



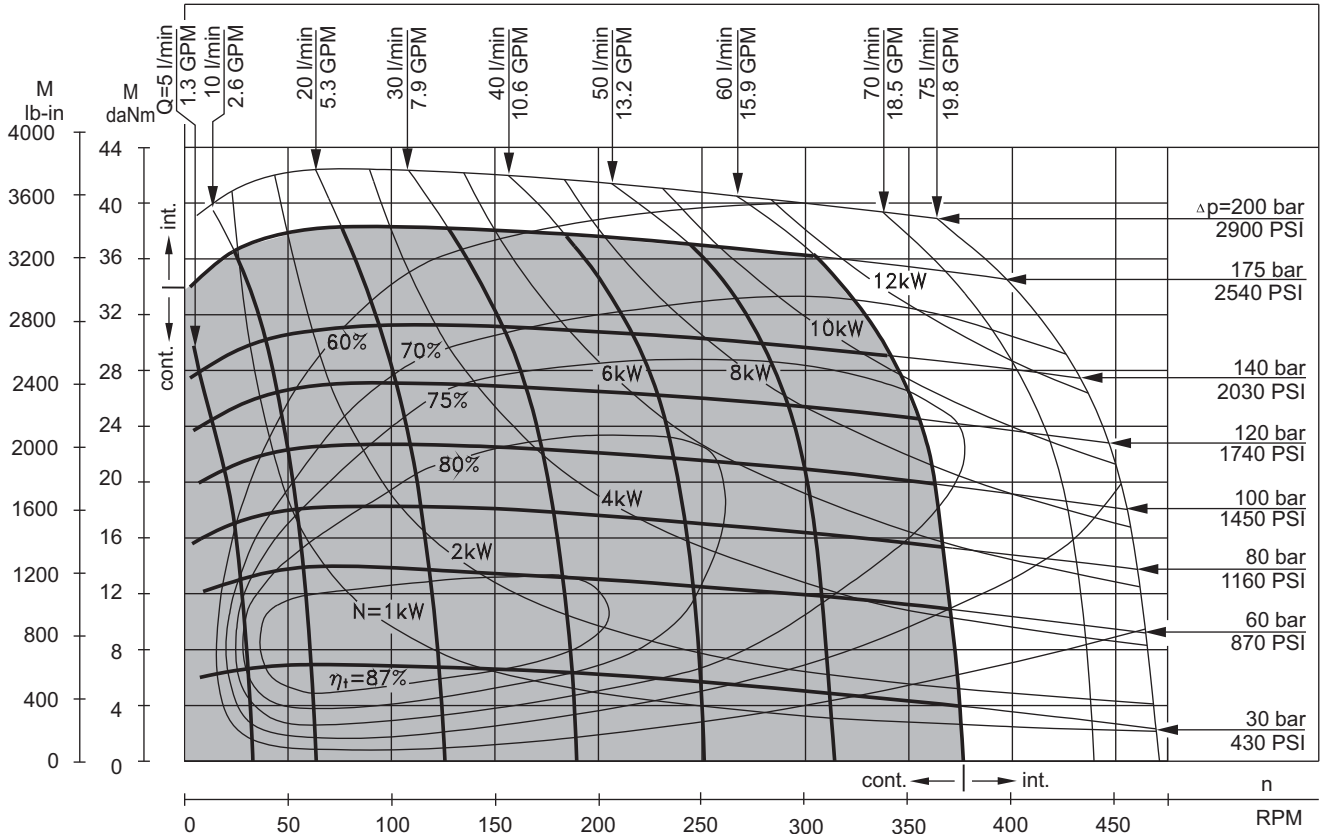
MLHR 125



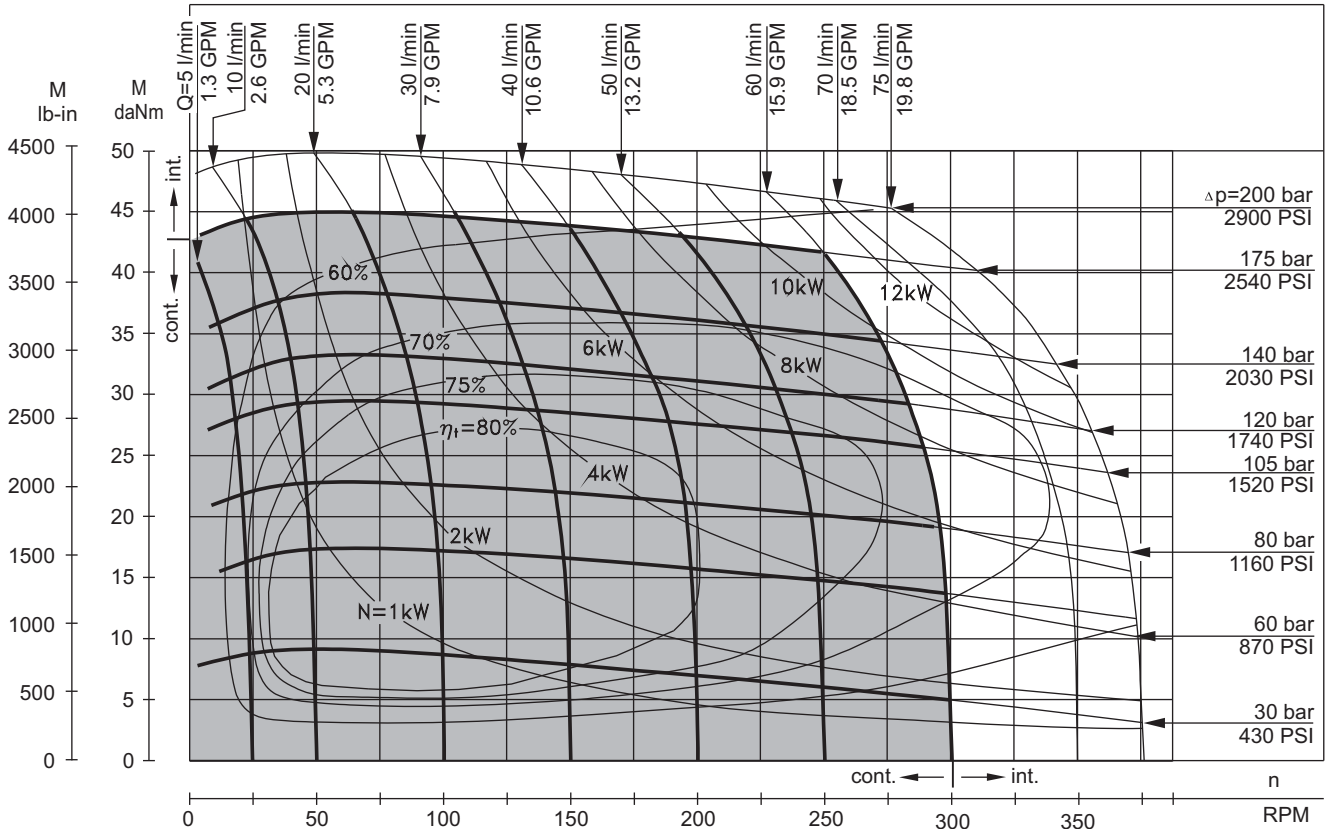
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHR 160



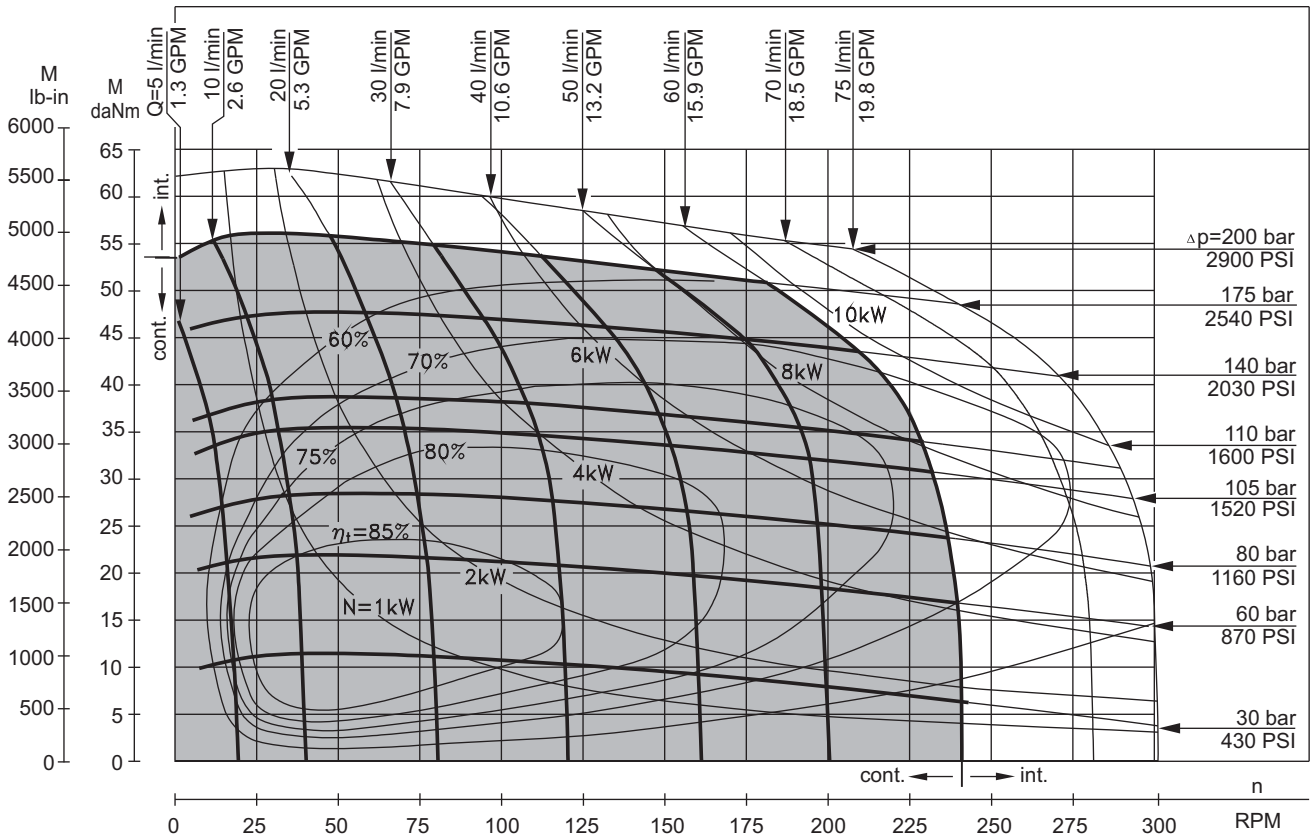
MLHR 200



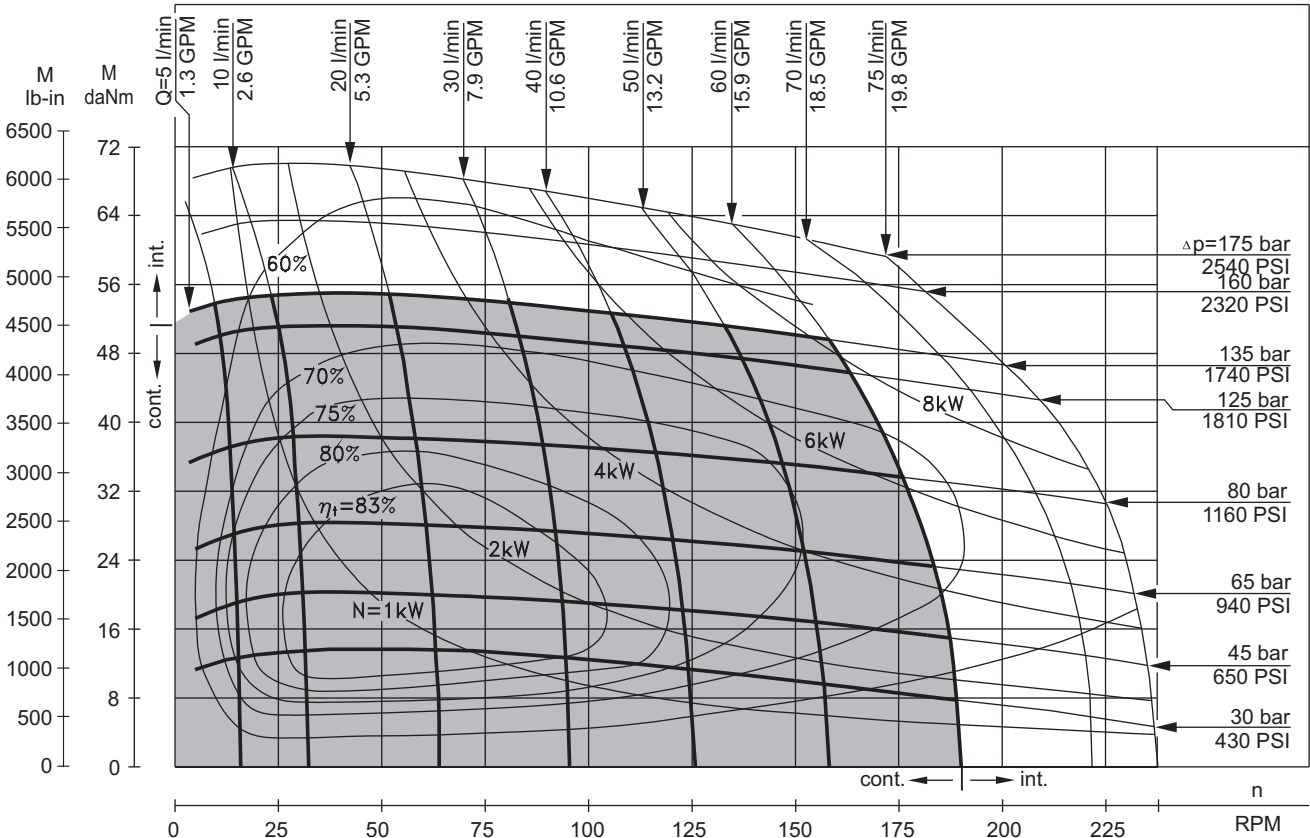
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHR 250



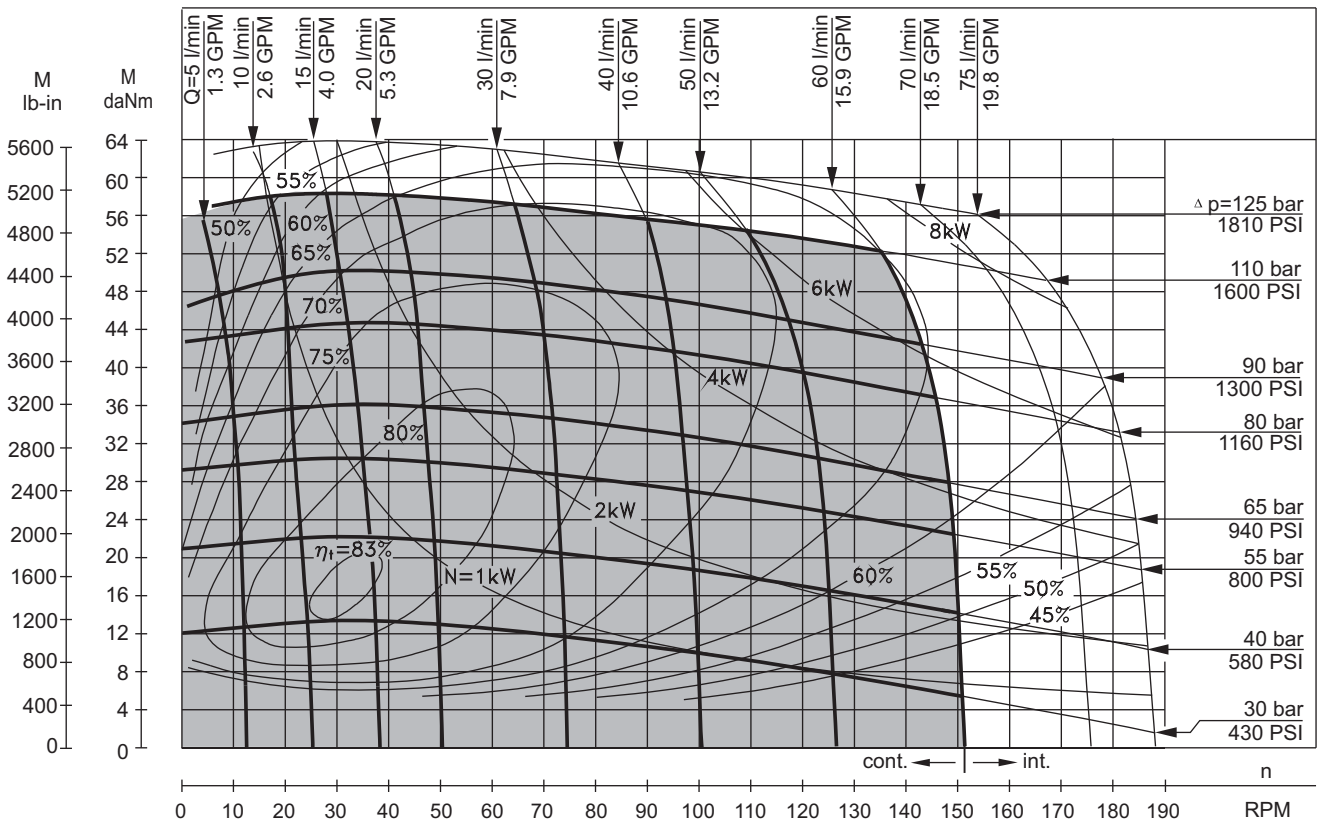
MLHR 315



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

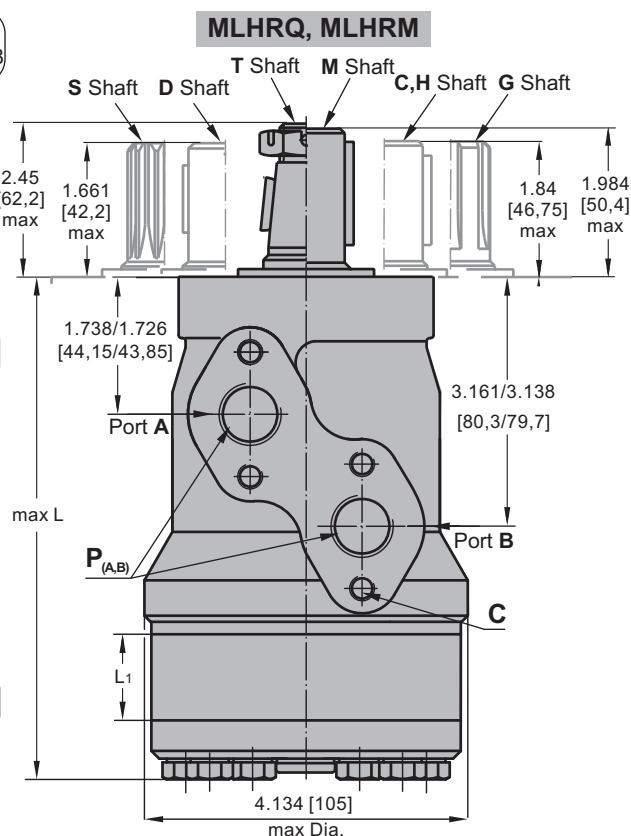
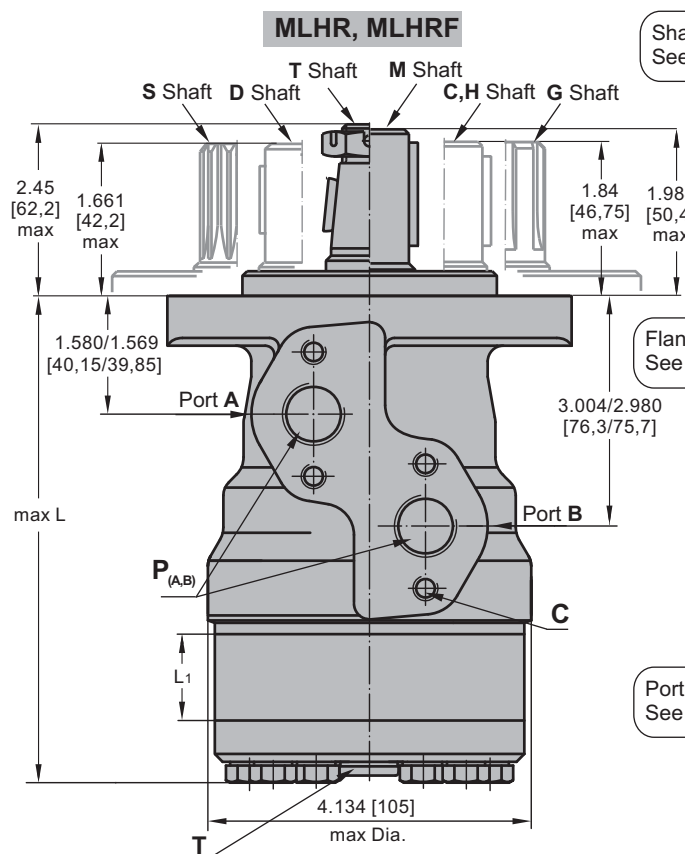
FUNCTION DIAGRAMS

MLHR 400

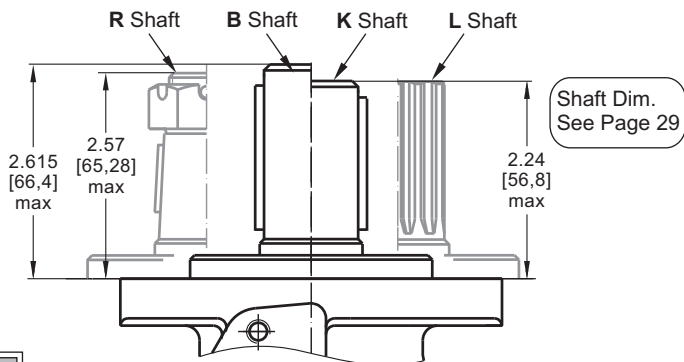
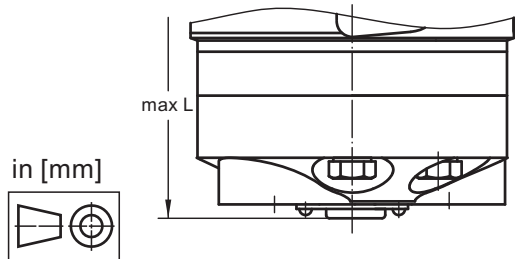


The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

DIMENSIONS AND MOUNTING DATA



Version **6 7 8 9**
Rear ports



	Versions			
	2, 6	3, 9	4, 7	5, 8
C	4xM8	4xM8	4x $\frac{5}{16}$ -18 UNC	4x $\frac{5}{16}$ -18 UNC
P(A,B)	2xG $\frac{1}{2}$	2xM22x1,5	2x $\frac{7}{8}$ -14 UNF	2x $\frac{1}{2}$ -14 NPTF
T	G $\frac{1}{4}$	M14x1,5	$\frac{7}{16}$ -20 UNF	$\frac{7}{16}$ -20 UNF

Standard Rotation

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

Reverse Rotation

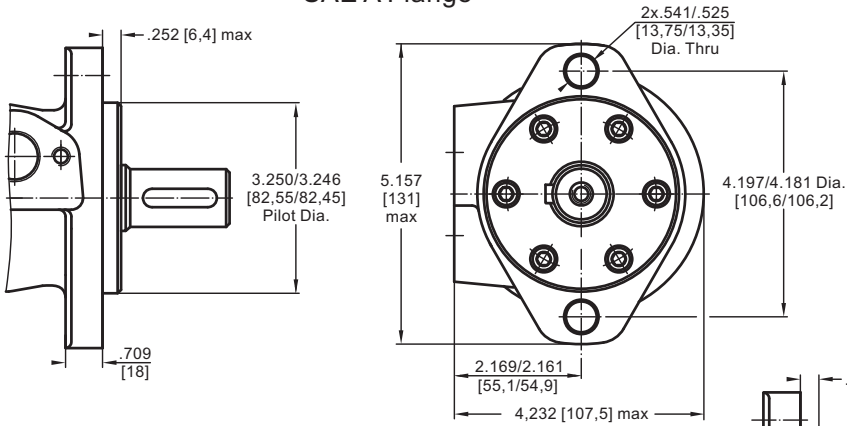
Viewed from Shaft End
Port A Pressurized - **CCW**
Port B Pressurized - **CW**

Type	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]	6.24 [158,5]	MLHRQ(M) 50	5.69 [144,5]	6.42 [163,0]	.35 [9,0]
MLHR(F) 80	5.71 [145,0]	6.44 [163,5]	MLHRQ(M) 80	5.88 [149,5]	6.61 [168,0]	.55 [14,0]
MLHR(F) 100	5.85 [148,5]	6.58 [167,0]	MLHRQ(M) 100	6.02 [153,0]	6.73 [171,0]	.69 [17,4]
MLHR(F) 125	6.02 [153,0]	6.75 [171,5]	MLHRQ(M) 125	6.18 [157,0]	6.91 [175,5]	.86 [21,8]
MLHR(F) 160	6.26 [159,0]	6.99 [177,5]	MLHRQ(M) 160	6.42 [163,0]	7.14 [181,5]	1.09 [27,8]
MLHR(F) 200	6.54 [166,0]	7.26 [184,5]	MLHRQ(M) 200	6.69 [170,0]	7.42 [188,5]	1.37 [34,8]
MLHR(F) 250	6.87 [174,5]	7.60 [193,0]	MLHRQ(M) 250	7.05 [179,0]	7.78 [187,5]	1.71 [43,5]
MLHR(F) 315	7.32 [186,0]	8.05 [204,5]	MLHRQ(M) 315	7.48 [190,0]	8.21 [208,5]	2.16 [54,8]
MLHR(F) 400	7.89 [200,5]	8.62 [219,0]	MLHRQ(M) 400	8.07 [205,0]	8.78 [223,0]	2.73 [69,4]

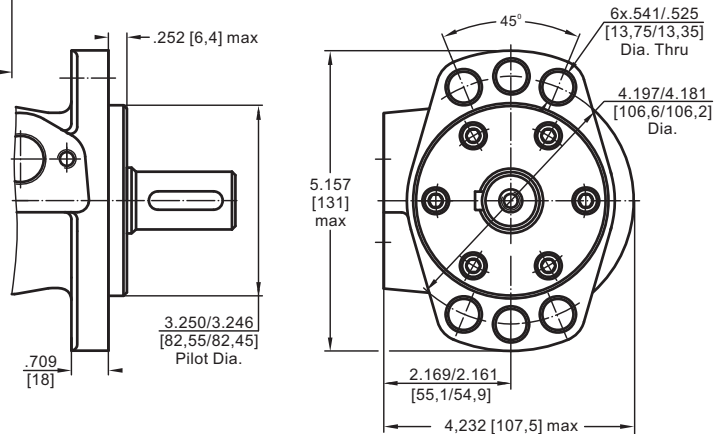
* -For Rear Ported Motors.

MOUNTING

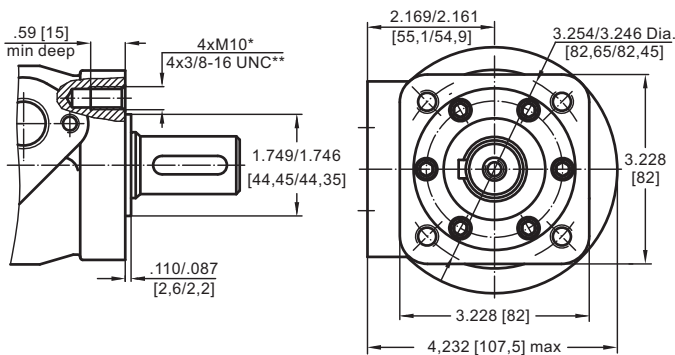
SAE A Flange



F - Magneto Flange



M and Q - Square Flange

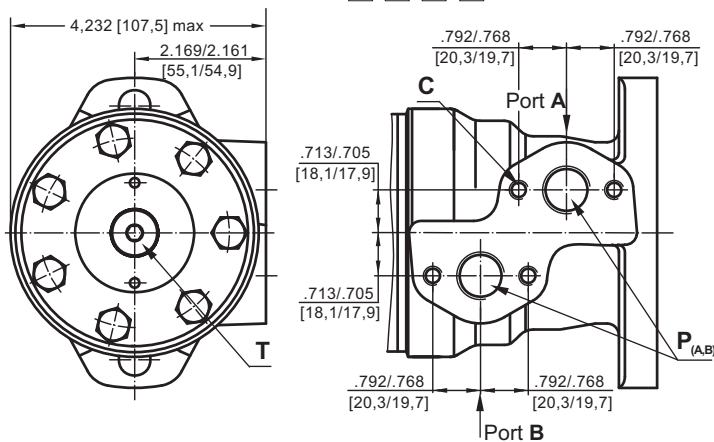


- * For M Flange
- ** For Q Flange
- *** Perform at customer's request

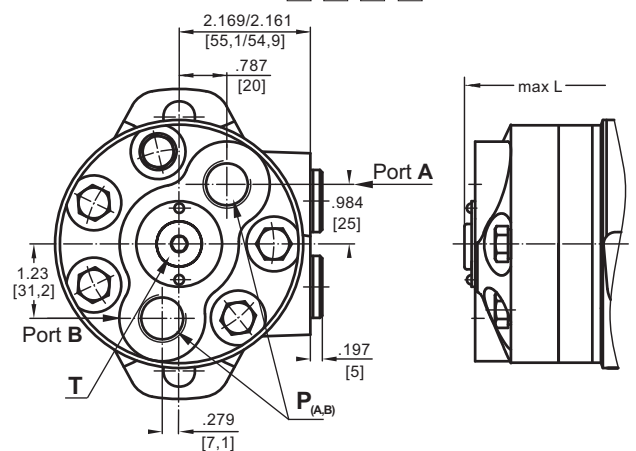


PORTS

Side Ports Version 2 3 4 5



Rear Ports Version 6 7 8 9



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	5, 8
C	4xM8	4xM8	4x $\frac{5}{16}$ -18 UNC	4x $\frac{5}{16}$ -18 UNC
P(A,B)	2xG $\frac{1}{2}$	2xM22x1,5	2x $\frac{7}{8}$ -14 UNF	2x $\frac{1}{2}$ -14 NPTF
T	G $\frac{1}{4}$	M14x1,5	$\frac{1}{16}$ -20 UNF	$\frac{1}{16}$ -20 UNF

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 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* [\[see pages 28 and 29\]](#)

C - 1" [25,4] straight, Parallel key

VC - 1" [25,4] straight, Parallel key w/ corrosion resistant bushing

D - $\frac{7}{8}$ " [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 - $\frac{7}{8}$ " [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 [\[see page 103\]](#)

Pos.9 - Design Series

omit - Factory specified

Notes:

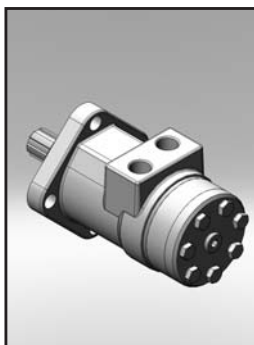
The following combinations are not allowed:

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

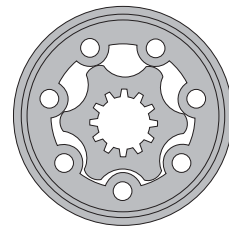
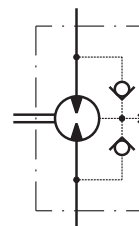
The hydraulic motors are mangano-phosphatized as standard.

HYDRAULIC MOTORS MLHPL



APPLICATION

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



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OPTIONS

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

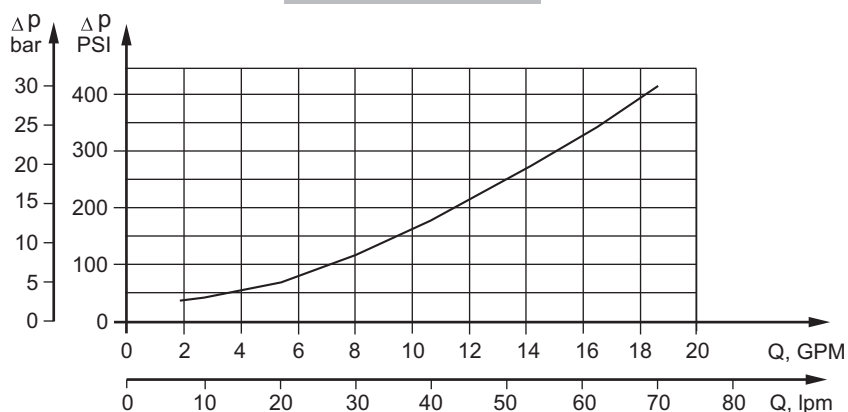
GENERAL

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 [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 [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]
Max. Return Pressure with Drain Line PSI [bar]	Int.* 0-max. RPM	1450 [100]	1450 [100]	1450 [100]	1450 [100]	1450 [100]	1450 [100]	1450 [100]	1450 [100]	1450 [100]
	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]
Max. Starting Pressure with Unloaded Shaft, PSI [bar]	Cont.	145 [10]	145 [10]	145 [10]	131 [9]	116 [8]	100 [7]	87 [6]	73 [5]	73 [5]
	Int.*	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]
Min. Starting Torque lb-in [daNm]		681 [7,7]	1150 [13]	1487 [16,8]	21,0 [1860]	28,0 [2478]	2850 [32,2]	3665 [41,4]	3805 [43,0]	3900 [44,0]
Min. Speed***, [RPM]		10	10	10	10	10	10	10	10	10
Weight, lb [kg]		18.5 [8,4]	18.7 [8,5]	19.4 [8,8]	19.6 [8,9]	20 [9,1]	20.9 [9,5]	22 [10,0]	23.6 [10,7]	25.1 [11,4]

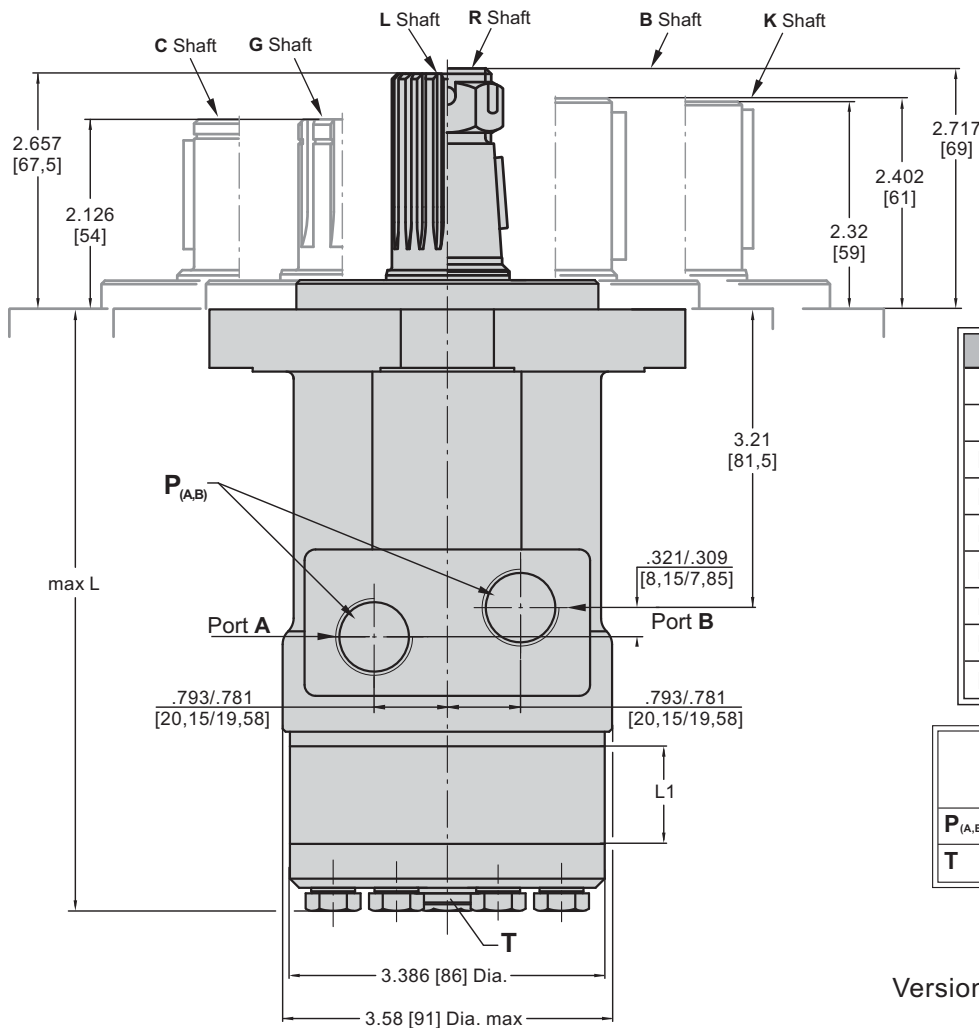
* Intermittent operation: the permissible values may occur for max. 10% of every minute.

** 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 drop 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 47

Type	L _{max} mm [in]	L _i 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]

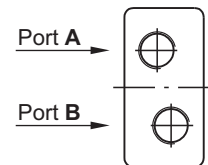
Versions			
	2	4	5
P _(A,B)	2xG $\frac{1}{2}$	2x $\frac{7}{8}$ -14 UNF	2x $\frac{1}{2}$ -14 NPTF
T	G $\frac{1}{4}$	$\frac{7}{16}$ -20 UNF	$\frac{7}{16}$ -20 UNF

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

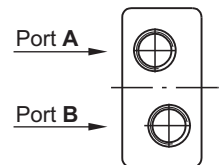
Reverse Rotation
Viewed from Shaft End
Port A Pressurized - **CCW**
Port B Pressurized - **CW**

Side Ports

Version **2** **5**

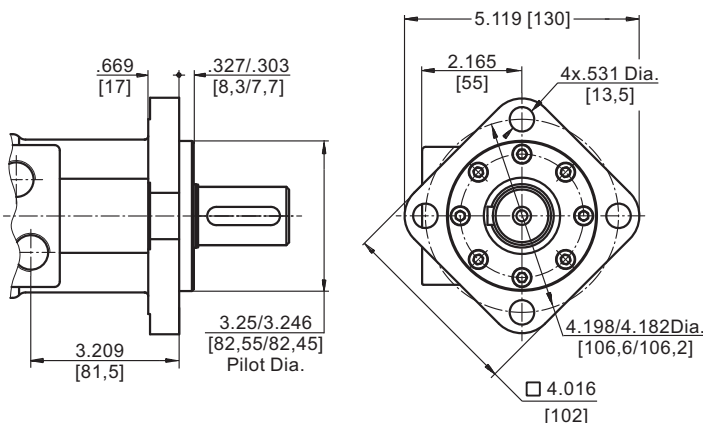


Version **4**

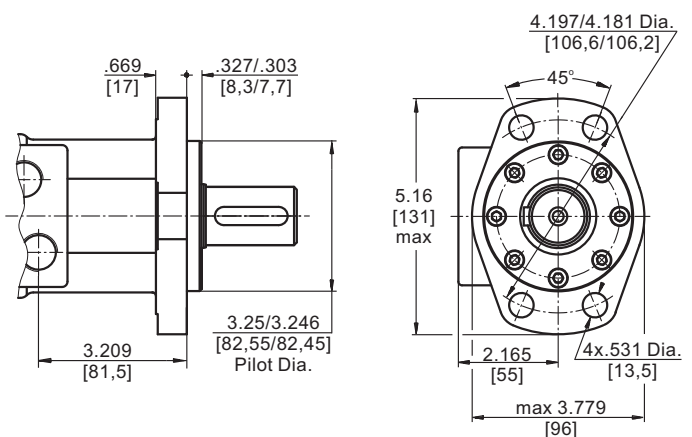


MOUNTING

Square Mount (4 Holes)



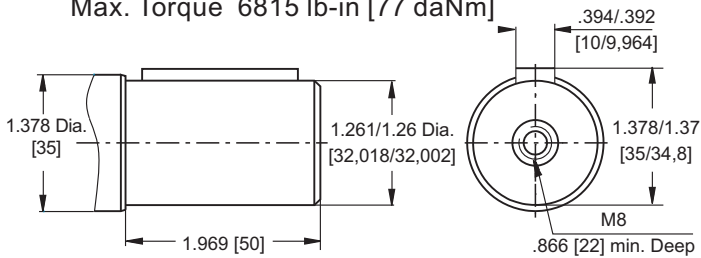
F Oval Mount (4 Holes)



SHAFT EXTENSIONS FOR MLHPL AND MLHRL

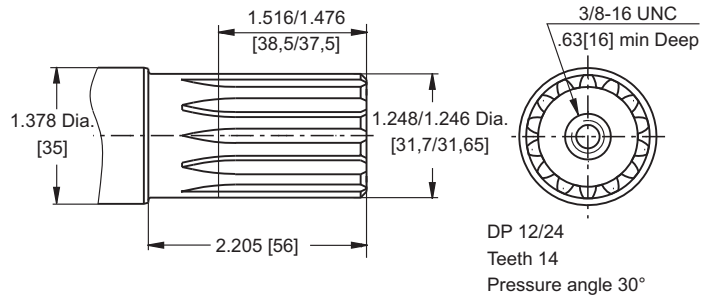
B

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



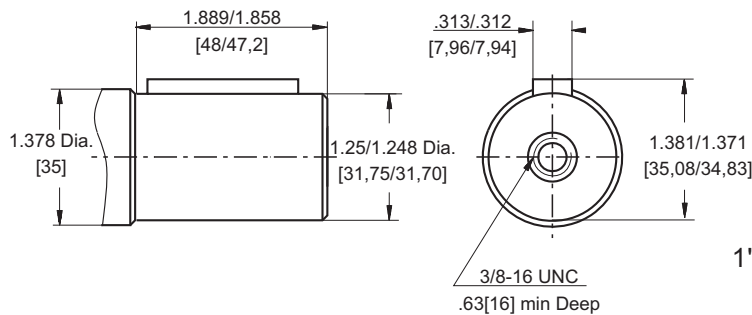
L

14T Splined, 1 1/4" [31,75], ANS B92.1-1976
Max. Torque 6815 lb-in [77 daNm]



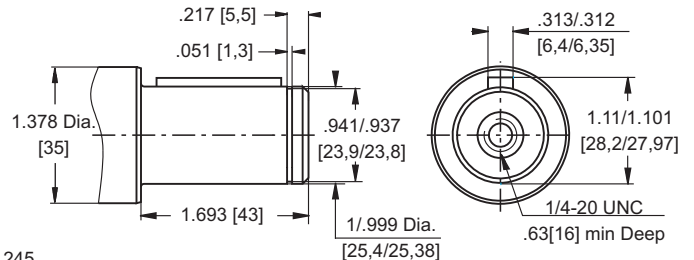
K

1 1/4" [31,75] straight, Parallel key 5/16"x5/16"x1 1/4" BS 46
Max. Torque 6815 lb-in [77 daNm]



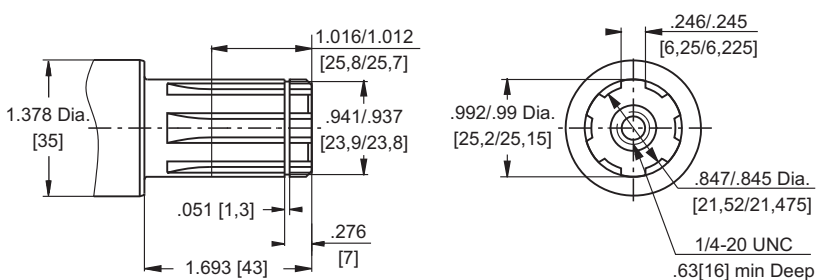
C

1" [25,4] straight, Parallel key 1/4"x 1/4"x 1 1/4" BS46
Max. Torque 3010 lb-in [34 daNm]



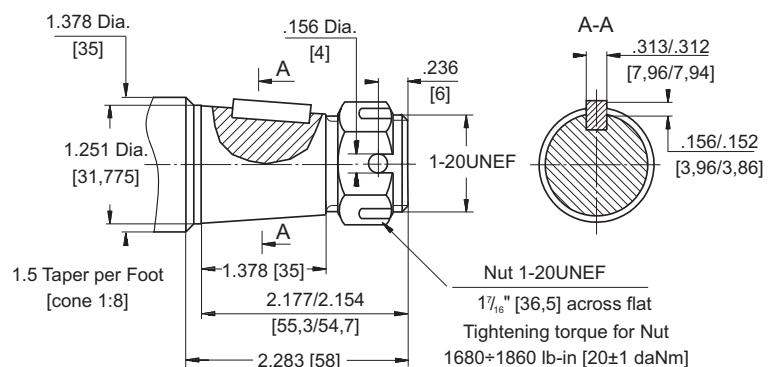
G

1" [25,4], Splined BS 2059 (SAE 6B)
Max. Torque 3010 lb-in [34 daNm]



R

1 1/4" [31,75], SAE J501 Tapered
Parallel key 5/16"x 5/16"x1"
Max. Torque 6815 lb-in [77 daNm]



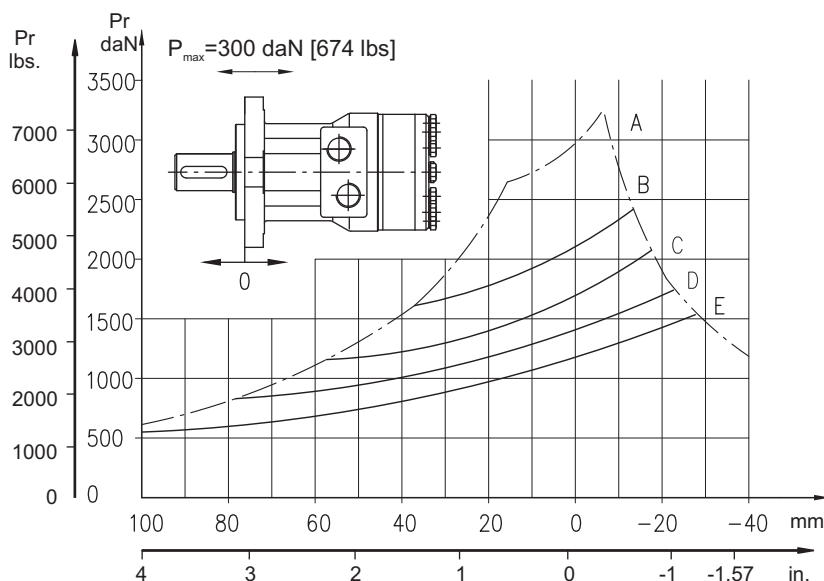
▽ - Motor Mounting Surface



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 - $n=50 \text{ min}^{-1}$

C - $n=100 \text{ min}^{-1}$

D - $n=200 \text{ min}^{-1}$

E - $n=400 \text{ min}^{-1}$

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 103]

Pos.6 - Design Series

omit - Factory specified

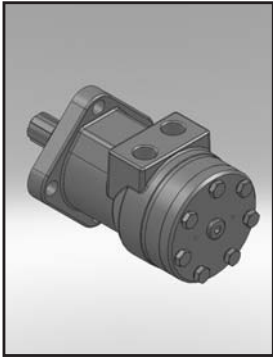
NOTES:

* 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!

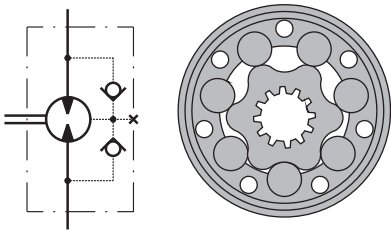
The hydraulic motors are mangano-phosphatized as standard.

HYDRAULIC MOTORS MLHRL



APPLICATION

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



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OPTIONS

- » Model - Spool valve, roll-gerotor
- » Antifriction conical bearings
- » Flange mount
- » Shafts - straight, splined and tapered
- » SAE and BSPP ports
- » Other special features

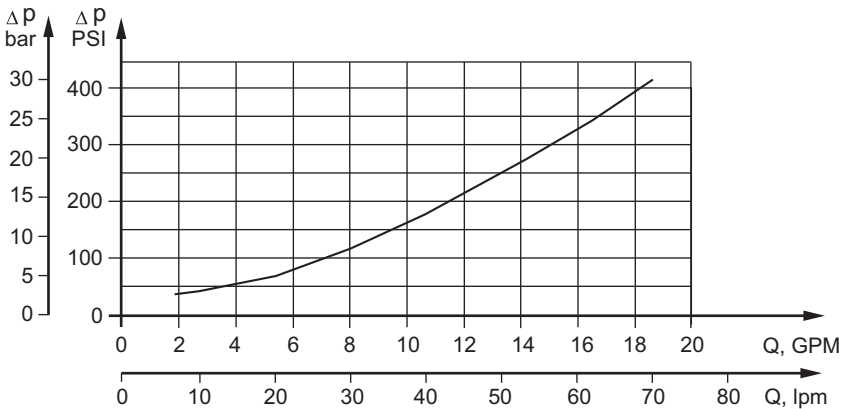
GENERAL

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]	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 [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		MLHRL 50	MLHRL 80	MLHRL 100	MLHRL 125	MLHRL 160	MLHRL 200	MLHRL 250	MLHRL 315	MLHRL 400
Displacement, in ³ /rev [cm ³ /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 Pres- sure without Drain Line or Max. Pres- sure 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 Pres- sure 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]	102 [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]

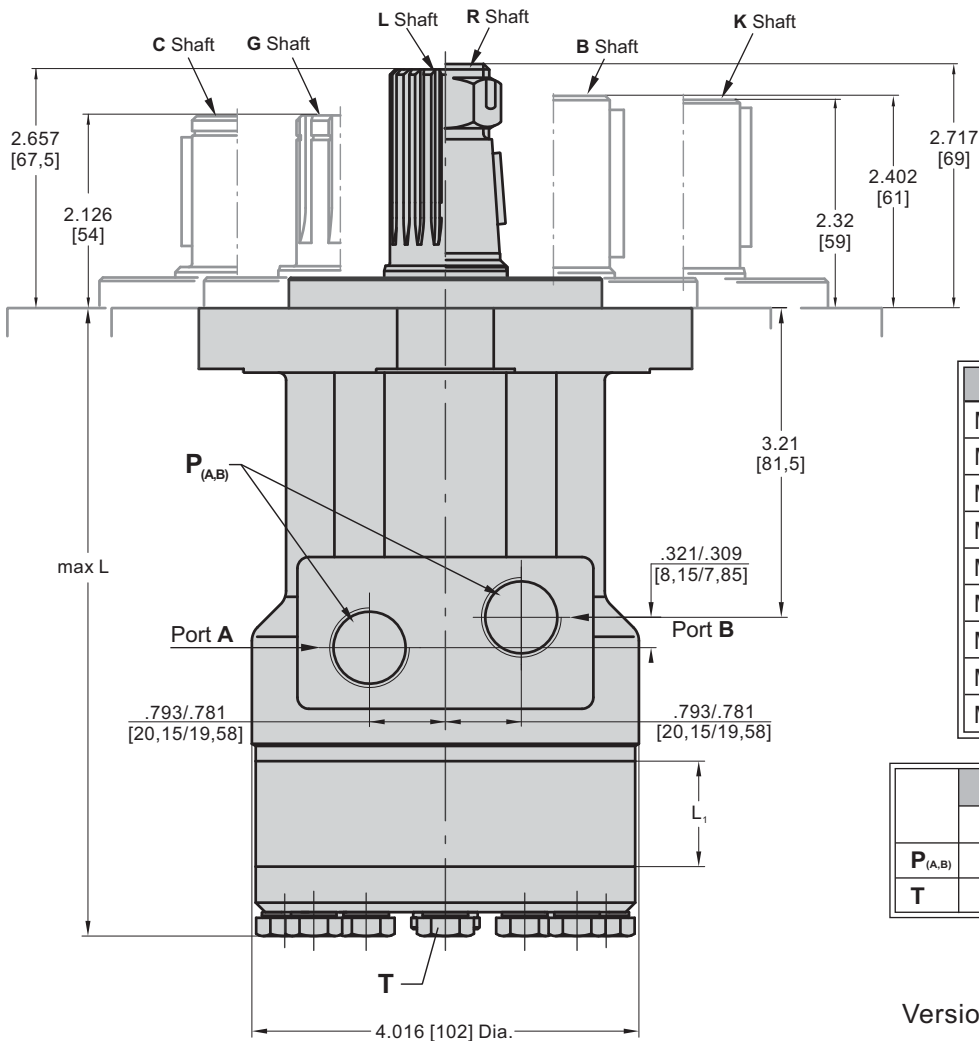
* Intermittent operation: the permissible values may occur for max. 10% of every minute.

** Peak load: the permissible values may occur for max. 1% of every minute.

*** For speeds lower than given, consult factory or your regional manager.

- Intermittent speed and intermittent pressure drop must not occur simultaneously.
- Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
- 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.
- Recommended minimum oil viscosity 70 SUS [13 mm²/s] at 122°F [50°C].
- Recommended maximum system operating temperature is 180°F [82°C].
- 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 47

Type	L, 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]

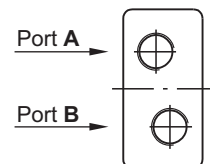
	Versions		
	2	4	5
P _(A,B)	2xG1/2	2x7/8-14 UNF	2x1/2-14 NPTF
T	G1/4	7/16 -20 UNF	7/16 -20 UNF

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

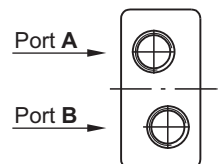
Reverse Rotation
Viewed from Shaft End
Port A Pressurized - **CCW**
Port B Pressurized - **CW**

Side Ports

Version **2** **5**

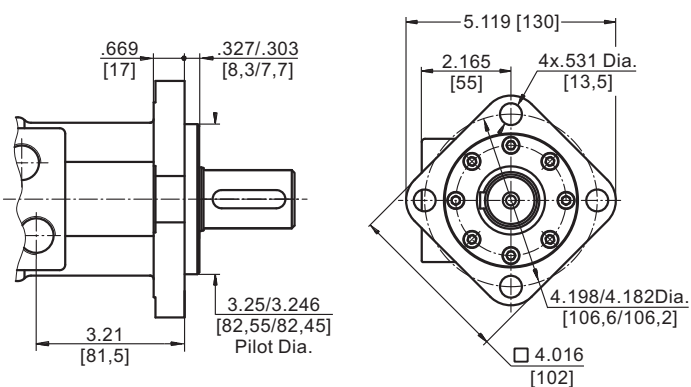


Version **4**

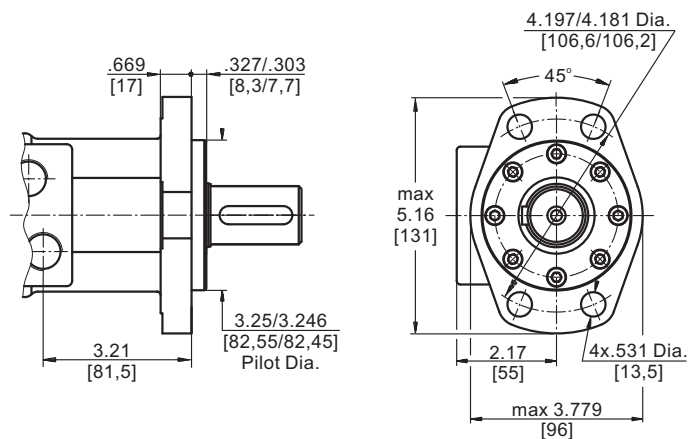


MOUNTING

Square Mount (4 Holes)

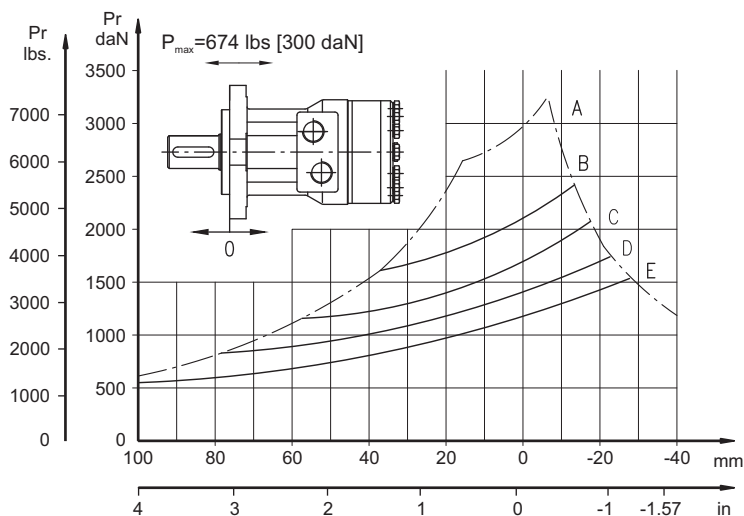


F Oval Mount (4 Holes)



Permissible Shaft Loads MLHPL and MLHRL

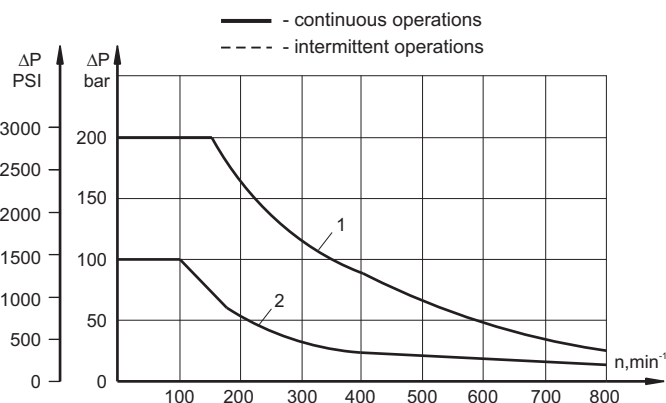
The curves apply to a B10 bearings life of 2000 hrs



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

MAX. PERMISSIBLE SHAFT SEAL PRESSURE

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



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 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 page 47]

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 103]

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.

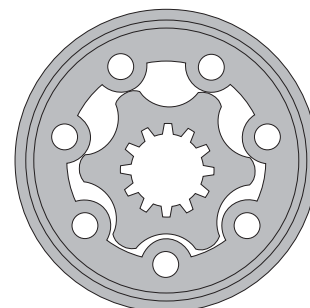
** The permissible output torque for shafts must not be exceeded!

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

Specification data	54÷55
Dimensions and mounting	56÷57
Shaft versions	58÷59
Permissible shaft loads.....	60
Permissible shaft seal pressure	60
Order code	61

OPTIONS

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

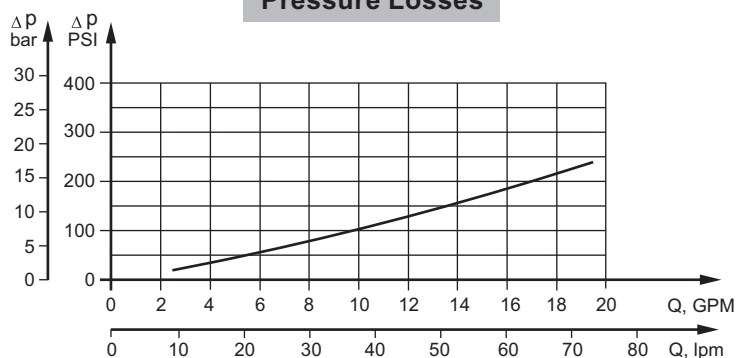
GENERAL

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]	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 [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 Pres- sure 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.

- Intermittent speed and intermittent pressure drop must not occur simultaneously.
- Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
- 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.
- Recommended minimum oil viscosity 70 SUS [13 mm²/s] at 122°F [50°C].
- Recommended maximum system operating temperature is 180°F [82°C].
- 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 Pres- sure 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.

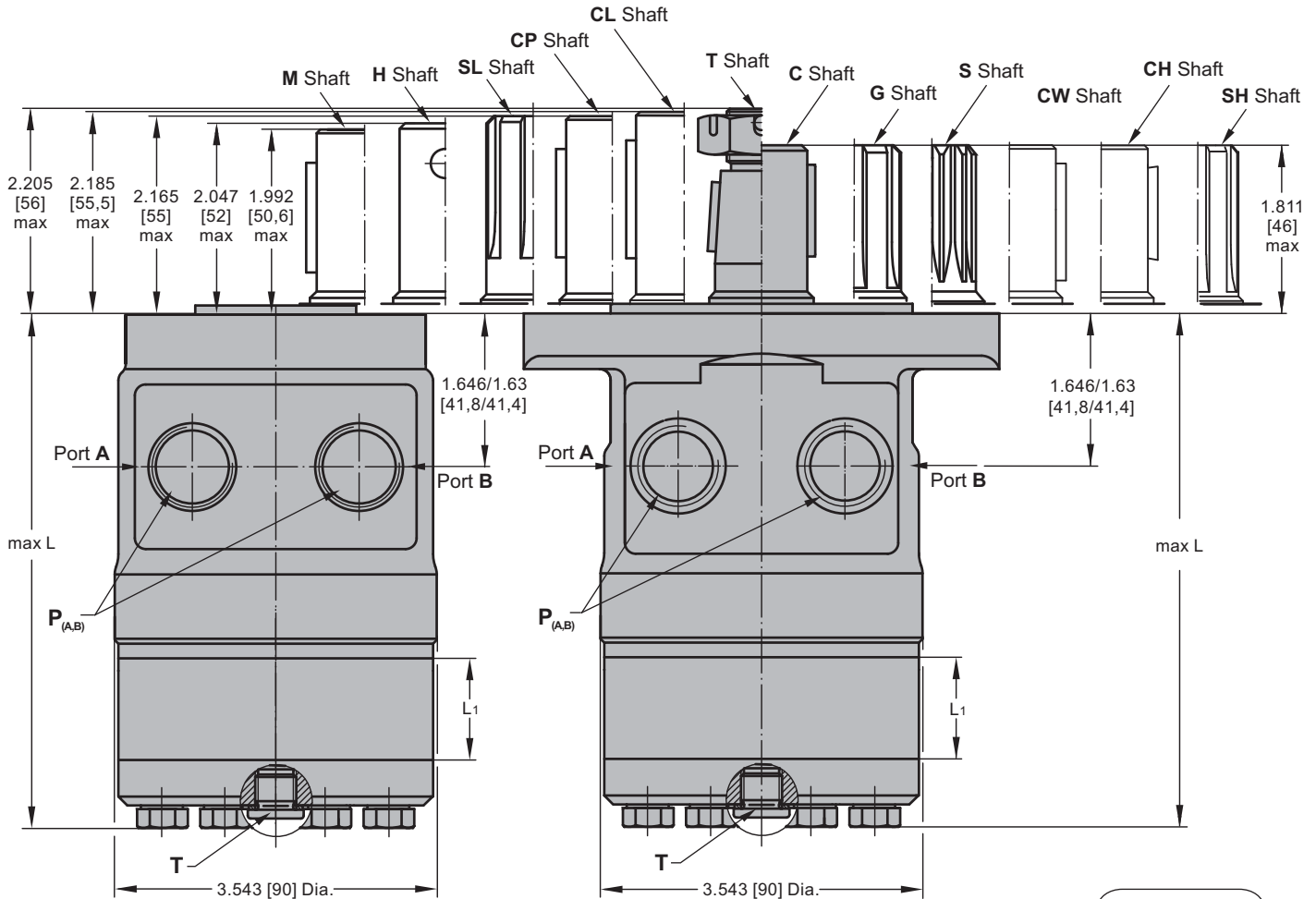
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- Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP(DIN51524) or HM (ISO 6743/4).
If using synthetic fluids consult the factory for alternative seal materials.
- Recommended minimum oil viscosity 70 SUS [13 mm²/s] at 122°F [50°C].
- Recommended maximum system operating temperature is 180°F [82°C].
- 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 HP

HPQ

HP



Shaft Dim.
See Page 58 and 59

Flange Dim.
See Page 57

Port Dim.
See Page 57

Type	Lmax, 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]

Standard Rotation

Viewed from Shaft End

Port A Pressurized - CW

Port B Pressurized - CCW

Reverse Rotation

Viewed from Shaft End

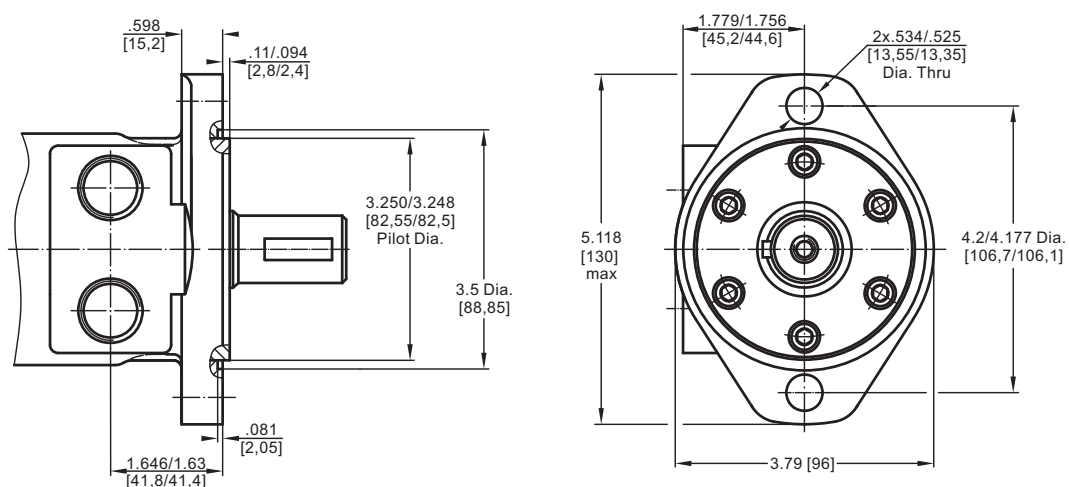
Port A Pressurized - CCW

Port B Pressurized - CW

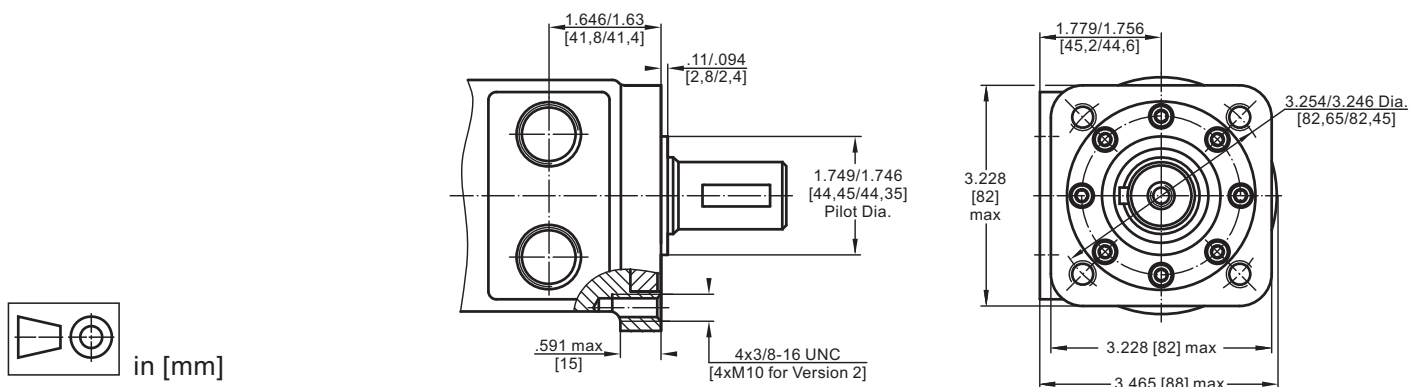


MOUNTING

SAE A Flange



Q - Square Flange

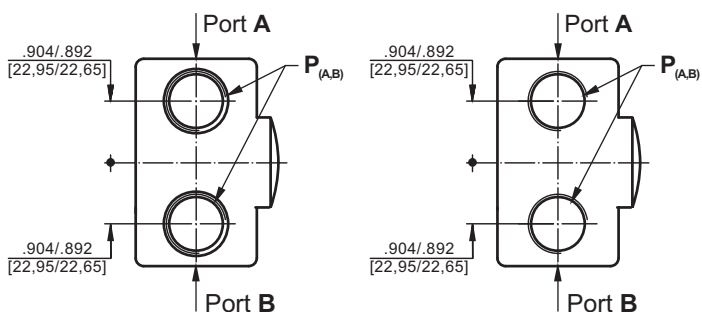
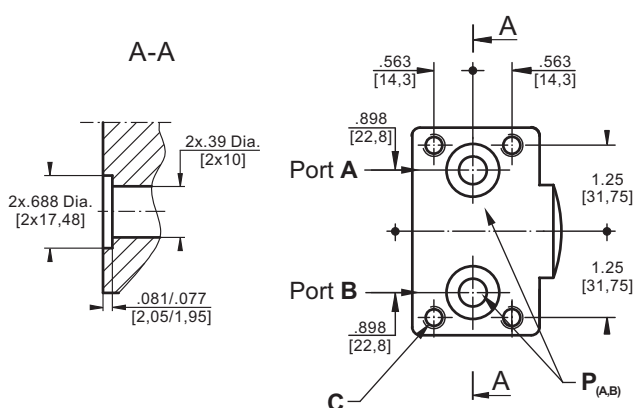


PORTS

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

Reverse Rotation Viewed from Shaft End

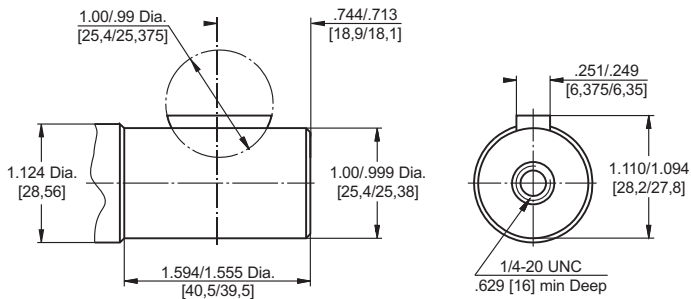
Port **A** Pressurized - **CCW**Port **B** Pressurized - **CW**

Versions					
	1	2	3	4	5
C	4x $\frac{5}{16}$ -18UNC	-	4x M8	-	-
P_(A,B)	2x.39 Dia. [2x10]	2xG1/2	2x.39 Dia. [2x10]	2x $\frac{7}{8}$ -14UNF	2x $\frac{1}{2}$ -14NPTF
T	$\frac{7}{16}$ -20UNF	G1/4	$\frac{7}{16}$ -20UNF	$\frac{7}{16}$ -20UNF	$\frac{7}{16}$ -20UNF

SHAFT EXTENSIONS FOR HP AND HR MOTORS

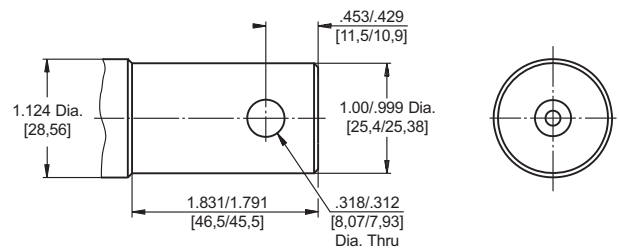
C

1" [25,4] straight, Woodruff key $\frac{1}{4}$ "x1" SAE J502
Max. Torque 3009 lb-in [34 daNm]



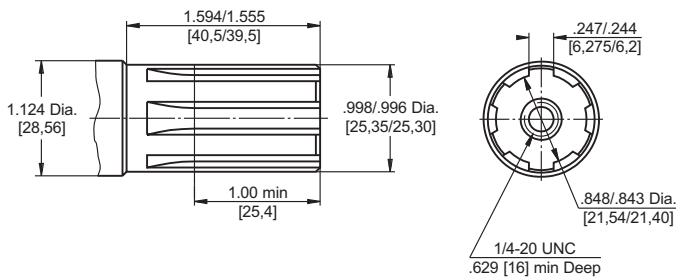
H

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



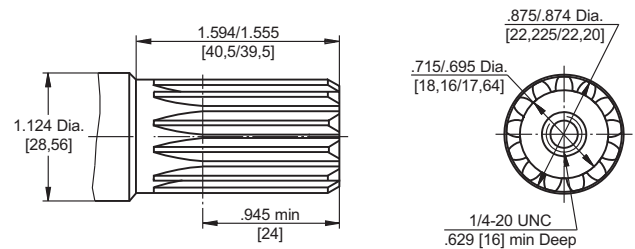
G

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



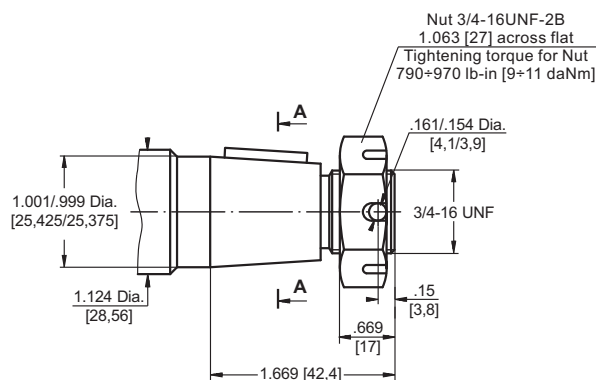
S

13T Splined, $\frac{7}{8}$ " [22,2], ANS B 92.1-1976
Max. Torque 3200 lb-in [36 daNm]

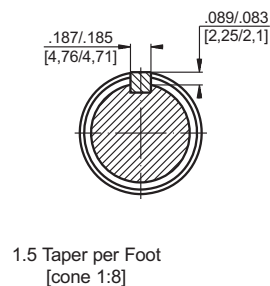


T

1" [25,4], SAE J501 Tapered
Parallel key $\frac{3}{16}$ "x $\frac{3}{16}$ "x $\frac{3}{4}$ "
Max. Torque 3540 lb-in [40 daNm]



A-A



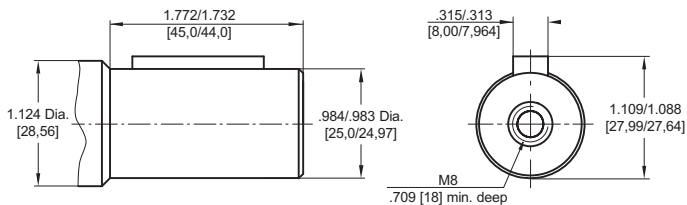
Requirement max. Torque must not be exceeded.



SHAFT EXTENSIONS FOR HP AND HR MOTORS

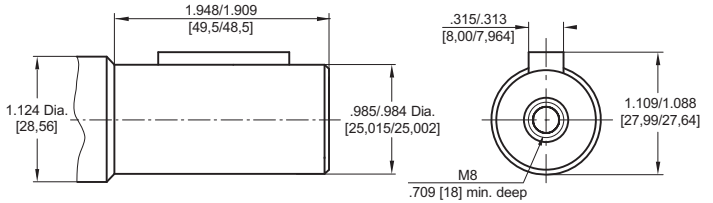
M

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



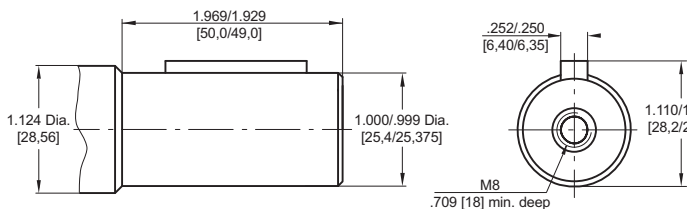
CP

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



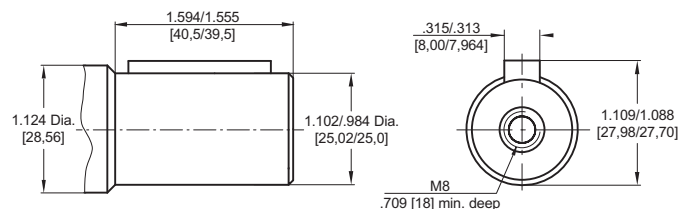
CL

1" [25,4] straight, Parallel key 1/4"x1/4"x1 1/4" BS46
Max. Torque 3009 lb-in [34 daNm]



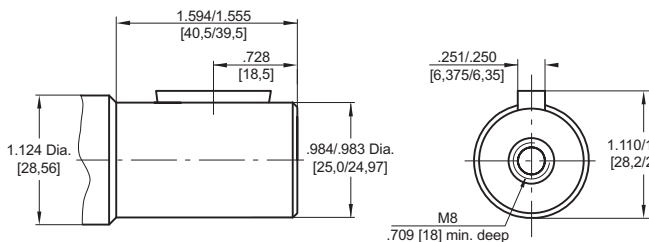
CW

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



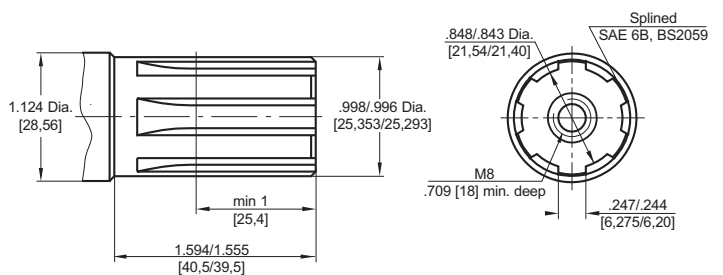
CH

ø25 straight, Woodruff key 1/4"x1" SAE J502
Max. Torque 3009 lb-in [34 daNm]



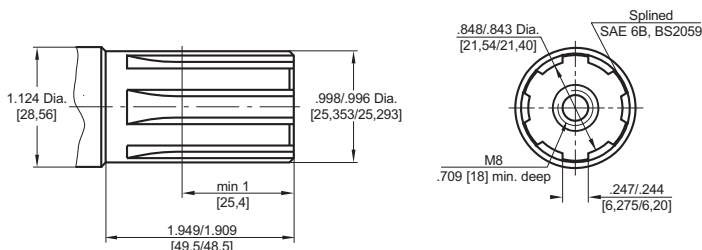
SH

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



SL

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



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.

$$\text{Radial Shaft Load } P_{rad} = \frac{650}{\text{RPM}} \times \frac{23200}{89+L}, \text{ daN}^*$$

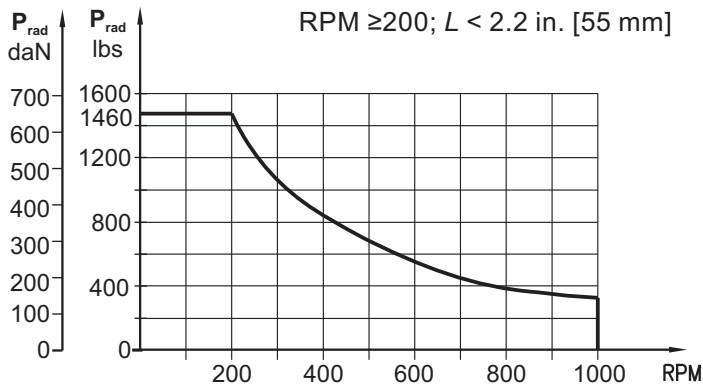
* L - in mm.

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

* L - in inch

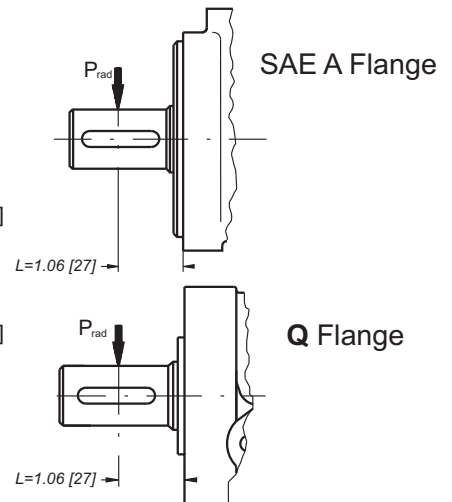
RPM < 200 => max P_{rad} = 1460 lbs [650 daN]

RPM ≥ 200; $L < 2.2$ in. [55 mm]



$P_a \text{ max} = 330 \text{ lbs}$
[150 daN]

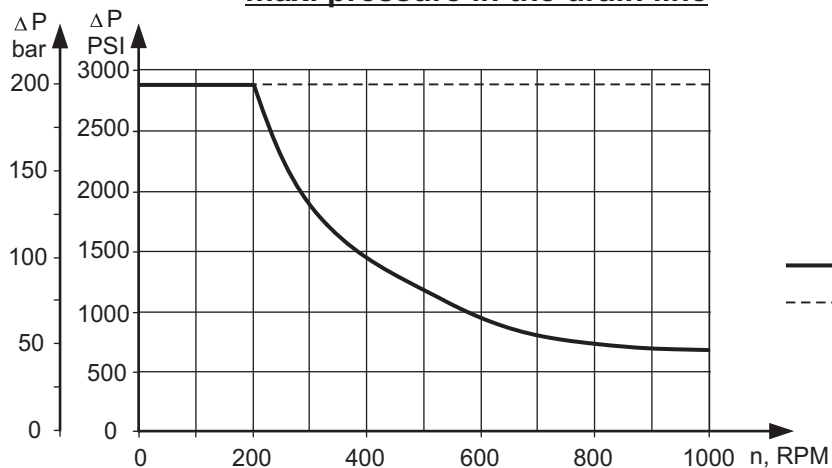
$P_a \text{ max} = 440 \text{ lbs}$
[200 daN]



MAX. PERMISSIBLE SHAFT SEAL PRESSURE FOR HP AND HR MOTORS

<i>HP...1 and HR...1 motors without drain connection:</i>	<i>HP... and HR... motors with drain connection:</i>	<i>HP...K and HR...K motors with check valves and drain connection:</i>	<i>HP...K1 and HR...K1 motors with check valves and without drain connection:</i>
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



— - continuous operations
- - - - - intermittent operations

ORDER CODE

	1	2	3	4	5	6	7	8	9
HP					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	- ø25 straight, Parallel key A8x7x32 DIN 6885
CP	- ø25 straight, Parallel key A8x7x32 DIN 6885
CL	- 1" [25,4] straight, Parallel key 1/4"x1/4"x1 1/4" BS46
CW	- ø25 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 103]

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.

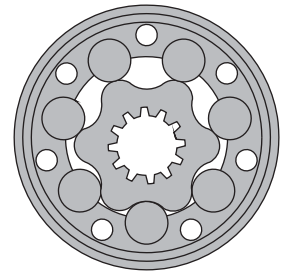
** The permissible output torque for shafts must not be exceeded!

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

Specification data	63
Dimensions and mounting	64÷65
Shaft versions	58÷59
Permissible shaft seal pressure.....	60
Permissible shaft loads.....	60
Order code	66

OPTIONS

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

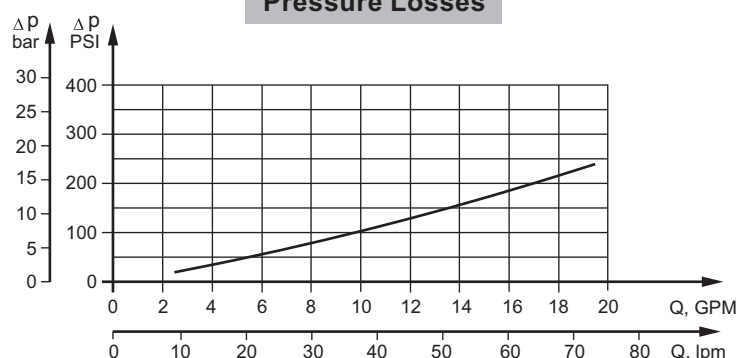
GENERAL

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]	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 [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]	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.	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 Pres- sure 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]

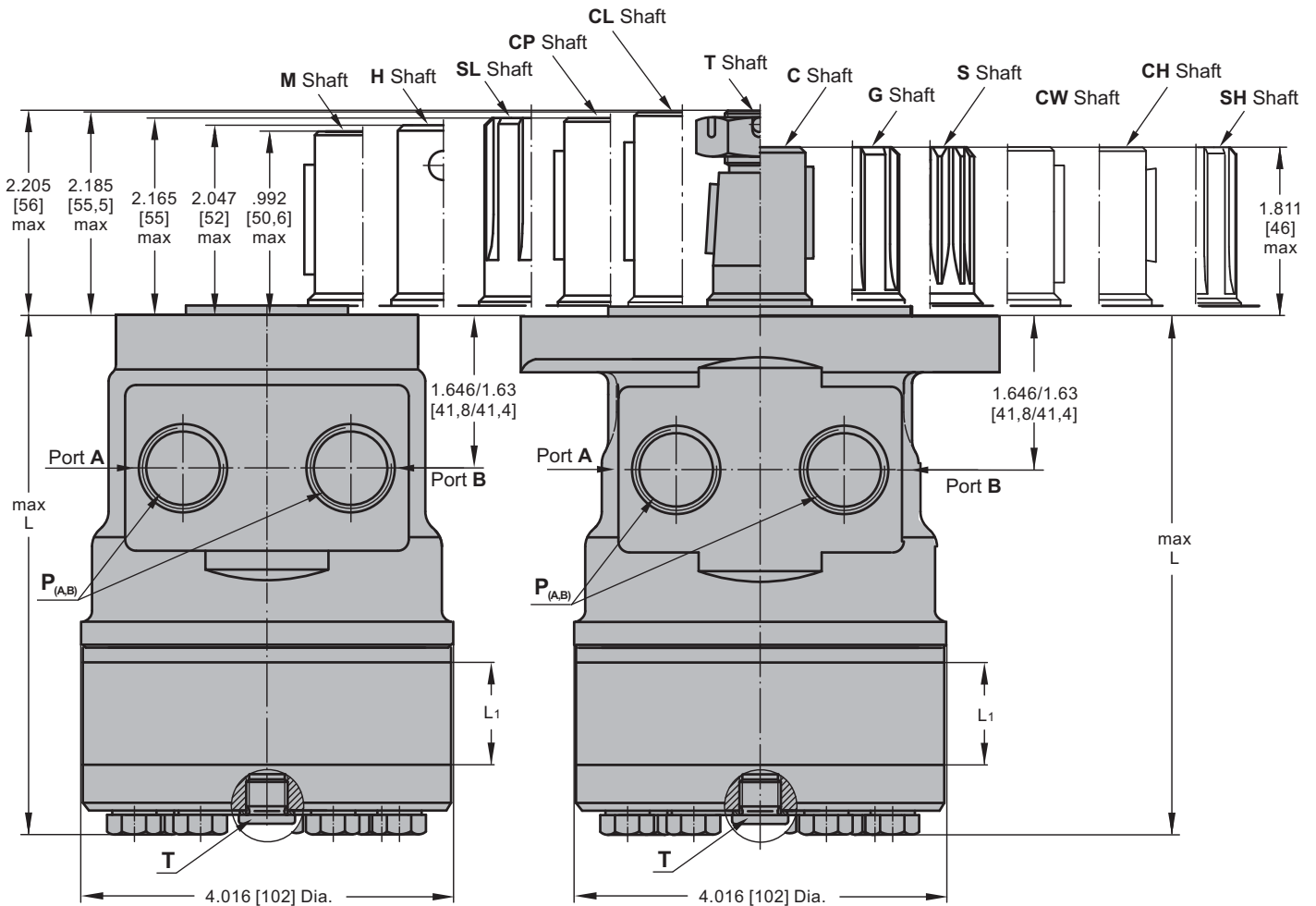
* Intermittent operation: the permissible values may occur for max. 10% of every minute.

** Peak load: the permissible values may occur for max. 1% of every minute.

*** For speeds lower than given, consult factory or your regional manager.

- Intermittent speed and intermittent pressure drop must not occur simultaneously.
- Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
- 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.
- Recommended minimum oil viscosity 70 SUS [13 mm²/s] at 122°F [50°C].
- Recommended maximum system operating temperature is 180°F [82°C].
- 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

HRQ
HR


Shaft Dim.
See Page 58 and 59

Standard Rotation

Viewed from Shaft End

Port A Pressurized - **CW**
 Port B Pressurized - **CCW**

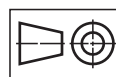
Reverse Rotation

Viewed from Shaft End

Port A Pressurized - **CCW**
 Port B Pressurized - **CW**

Type	L _{max} , 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]

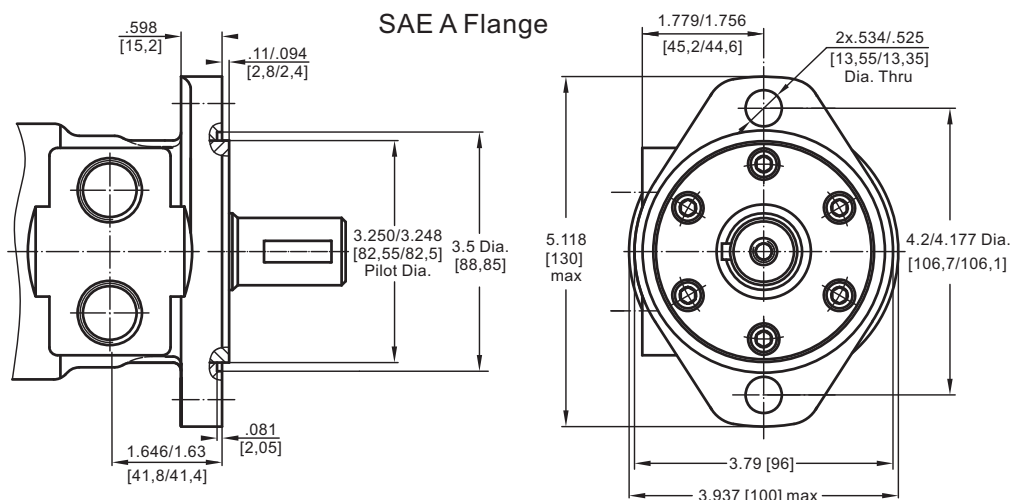
Flange Dim.
See Page 65



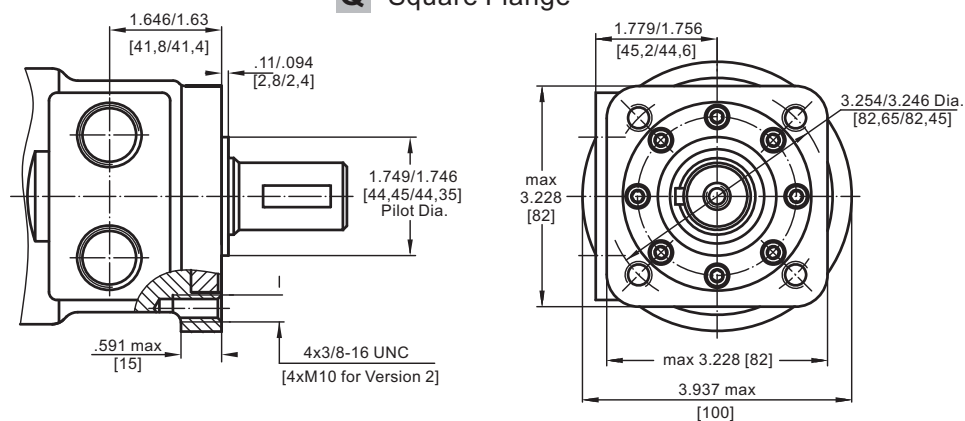
in [mm]

Port Dim.
See Page 65

MOUNTING

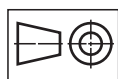
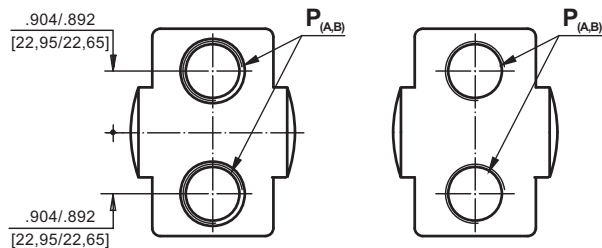
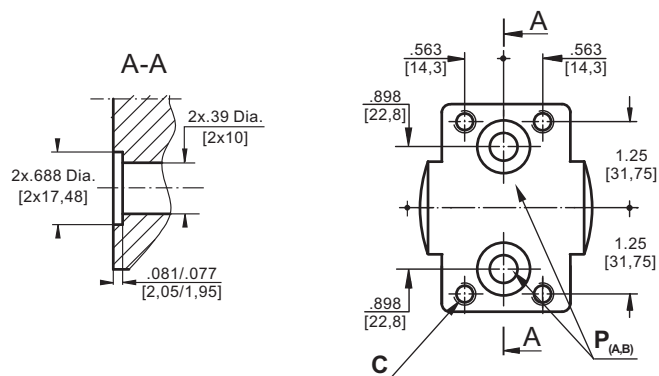


Q - Square Flange



PORTS

Side Ports

Version **1** , **3**Version **4**Version **2** , **5**

in [mm]

Versions					
	1	2	3	4	5
C	4x $\frac{5}{16}$ -18UNC	-	4x M8	-	-
P_(A,B)	2x.39 Dia. [2x10]	2xG1/2	2x.39 Dia. [2x10]	2x $\frac{7}{8}$ -14UNF	2x $\frac{1}{2}$ -14NPTF
T	$\frac{1}{16}$ -20UNF	G1/4	$\frac{1}{16}$ -20UNF	$\frac{1}{16}$ -20UNF	$\frac{1}{16}$ -20UNF

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 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 - 7.48 in³/rev [122,5 cm³/rev]

160 - 9.37 in³/rev [153,6 cm³/rev]

200 - 11.95 in³/rev [195,8 cm³/rev]

250 - 14.95 in³/rev [245,0 cm³/rev]

315 - 18.67 in³/rev [306,0 cm³/rev]

400 - 23.56 in³/rev [386,0 cm³/rev]

Pos.3 - Shaft Extensions [see pages 58 and 59]**
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 - ø25 straight, Parallel key A8x7x32 DIN 6885

CP - ø25 straight, Parallel key A8x7x32 DIN 6885

CL - 1" [25,4] straight, Parallel key 1/4"x1/4"x1 1/4" BS46

CW - ø25 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 103]
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!

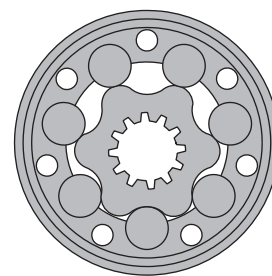
The hydraulic motors are mangano-phosphatized as standard.

HYDRAULIC MOTORS MLHRW



APPLICATION

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



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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

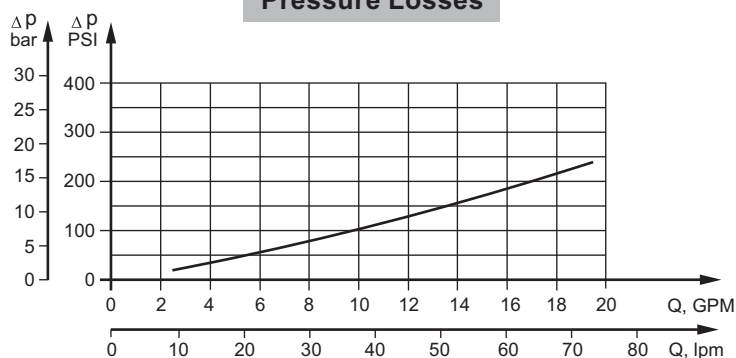
GENERAL

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]	23.8 [90]
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 [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		MLHRW 50	MLHRW 80	MLHRW 100	MLHRW 125	MLHRW 160	MLHRW 200	MLHRW 250	MLHRW 315	MLHRW 400
Displacement, in ³ /rev [cm ³ /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 Pres- sure 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.

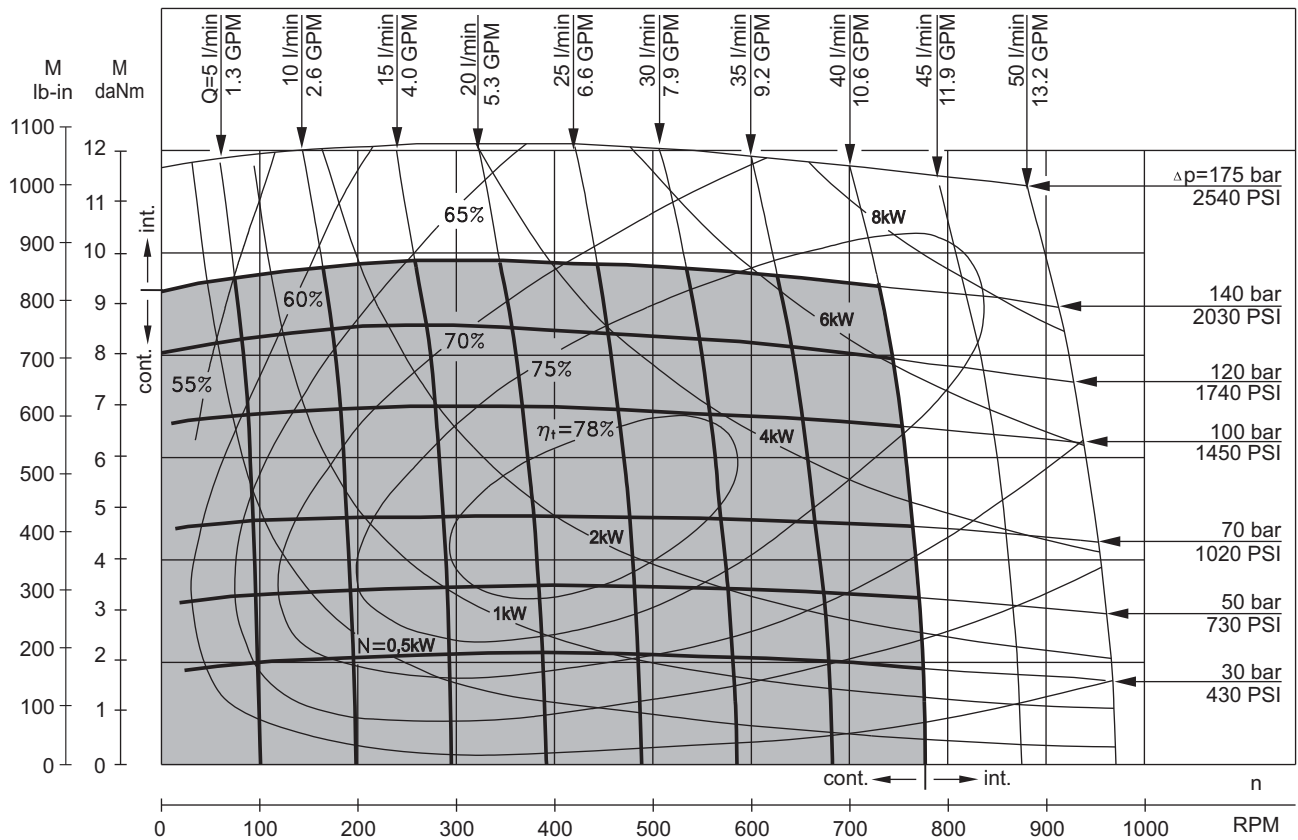
** Peak load: the permissible values may occur for max. 1% of every minute.

*** For speeds lower than given, consult factory or your regional manager.

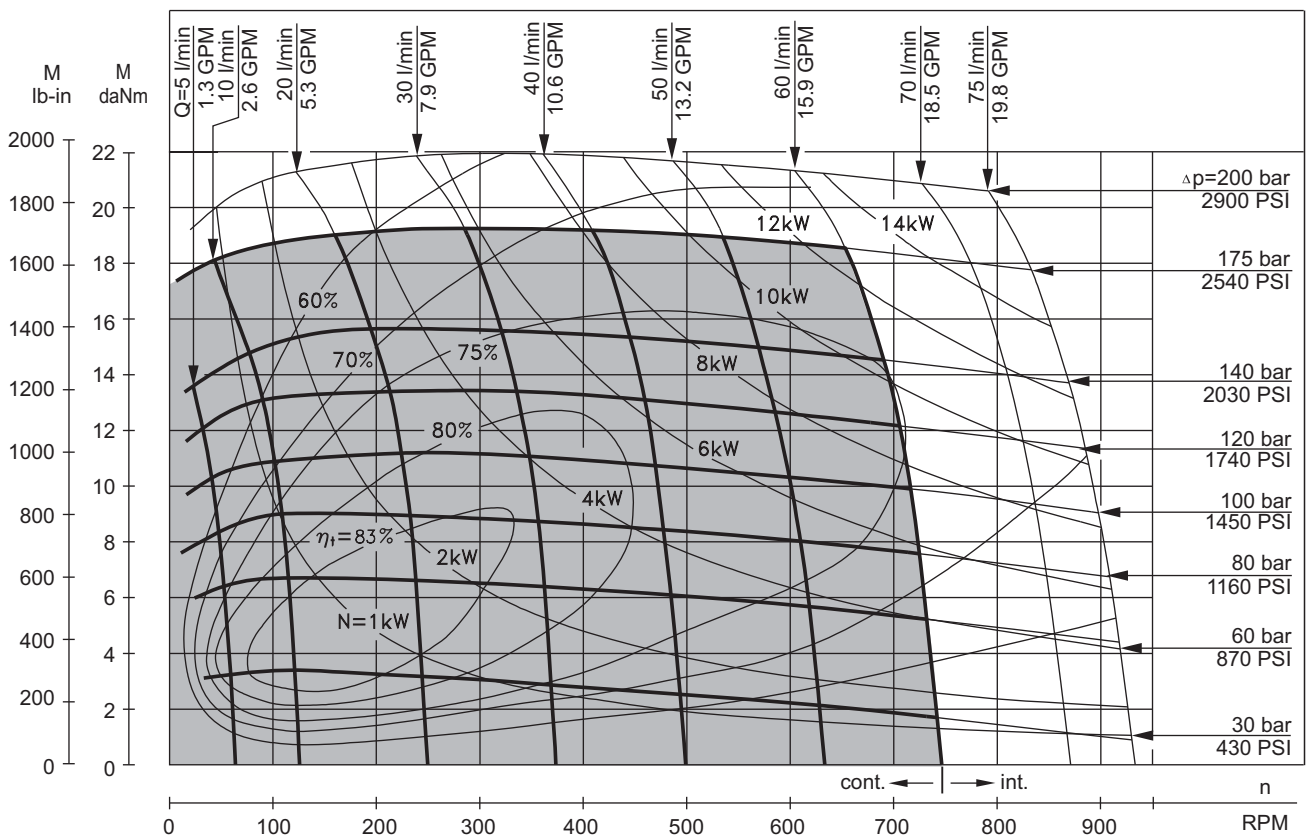
- Intermittent speed and intermittent pressure drop must not occur simultaneously.
- Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
- Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP(DIN51524) or HM (ISO 6743/4).
If using synthetic fluids consult the factory for alternative seal materials.
- Recommended minimum oil viscosity 70 SUS [13 mm²/s] at 122°F [50°C].
- Recommended maximum system operating temperature is 180°F [82°C].
- 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



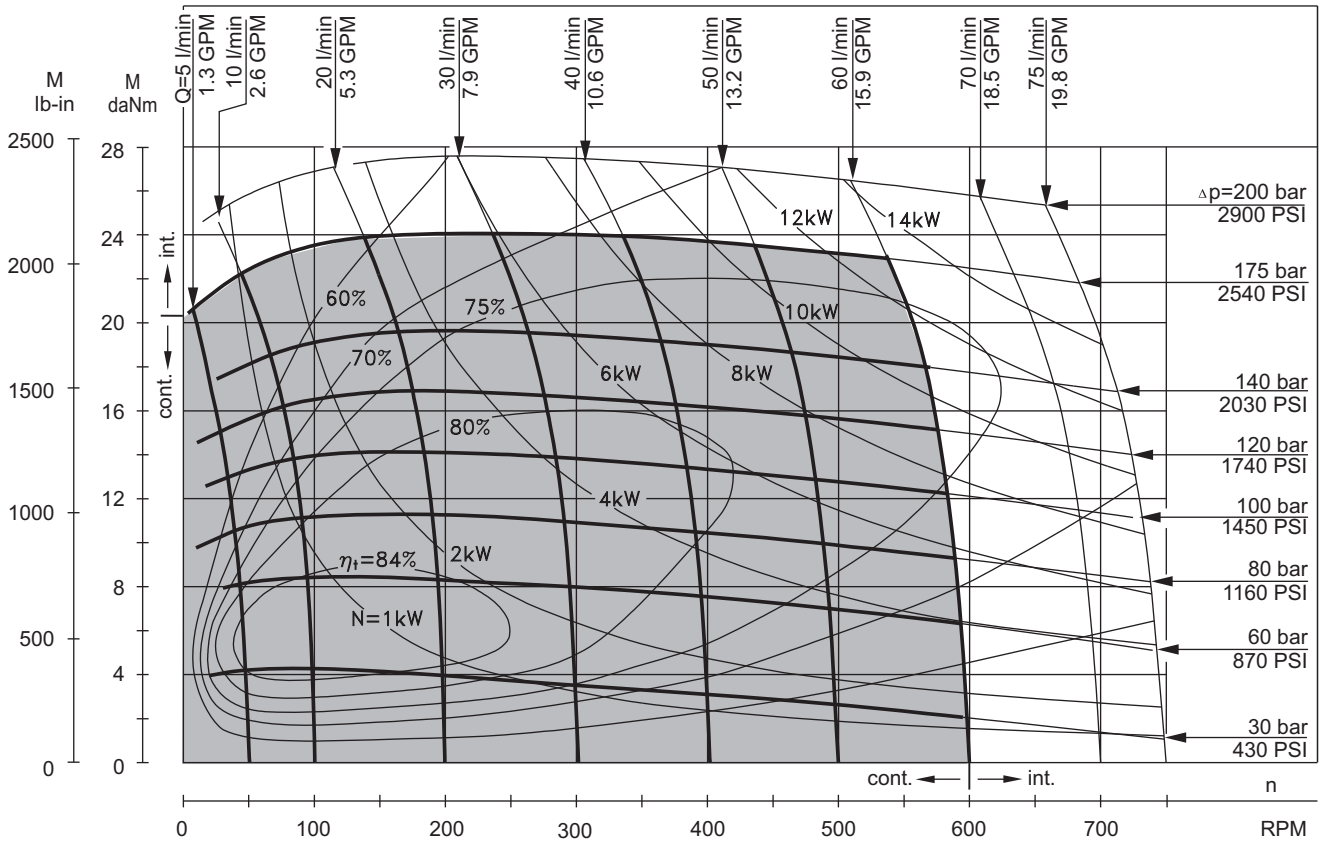
MLHRW 80



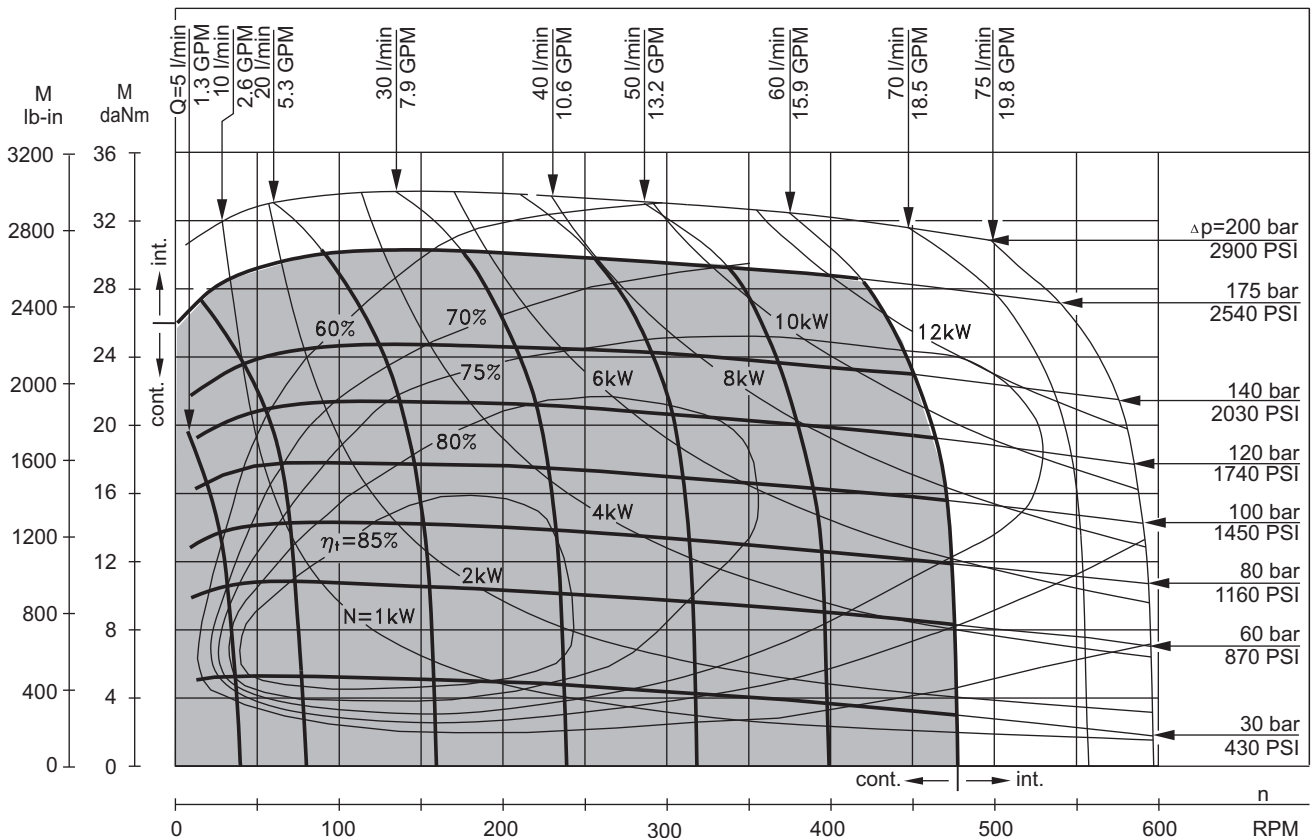
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHRW 100



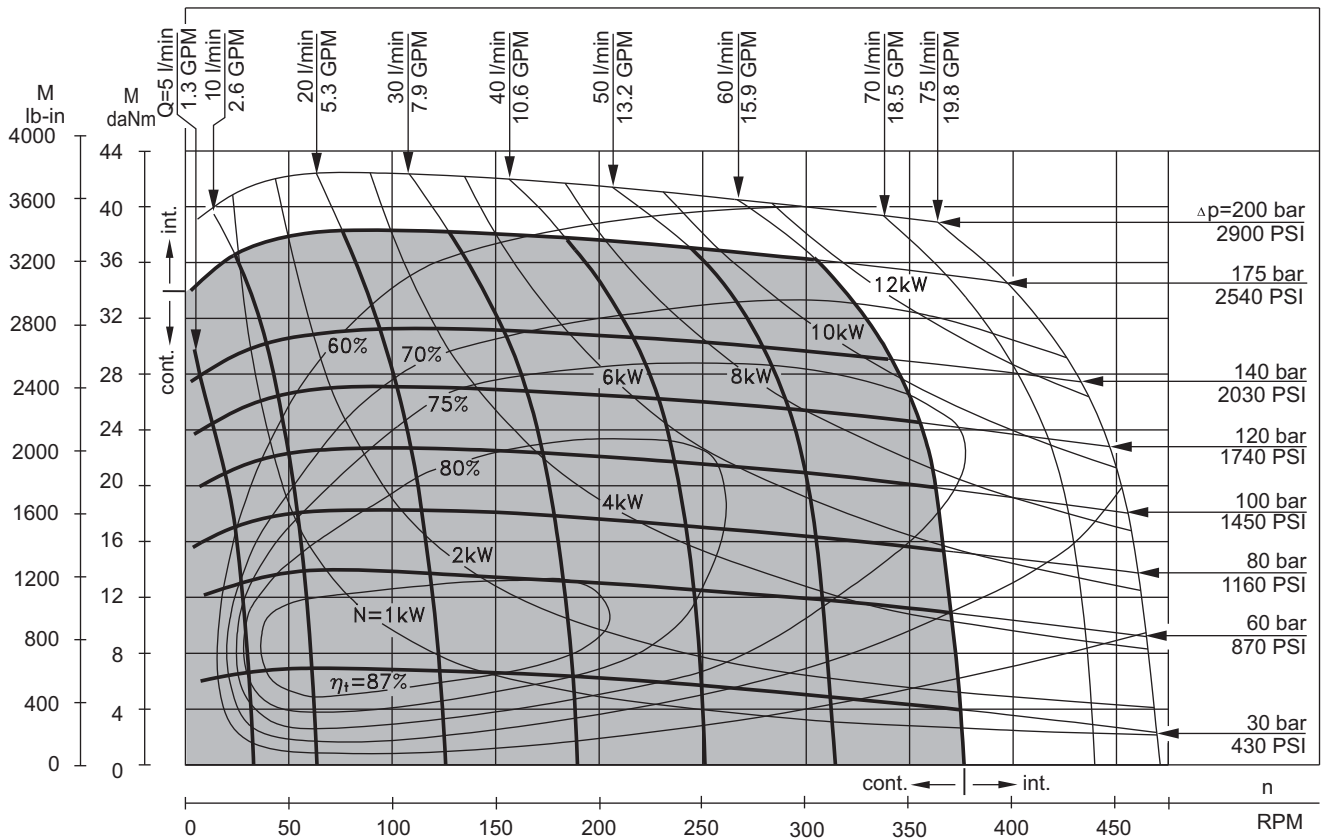
MLHRW 125



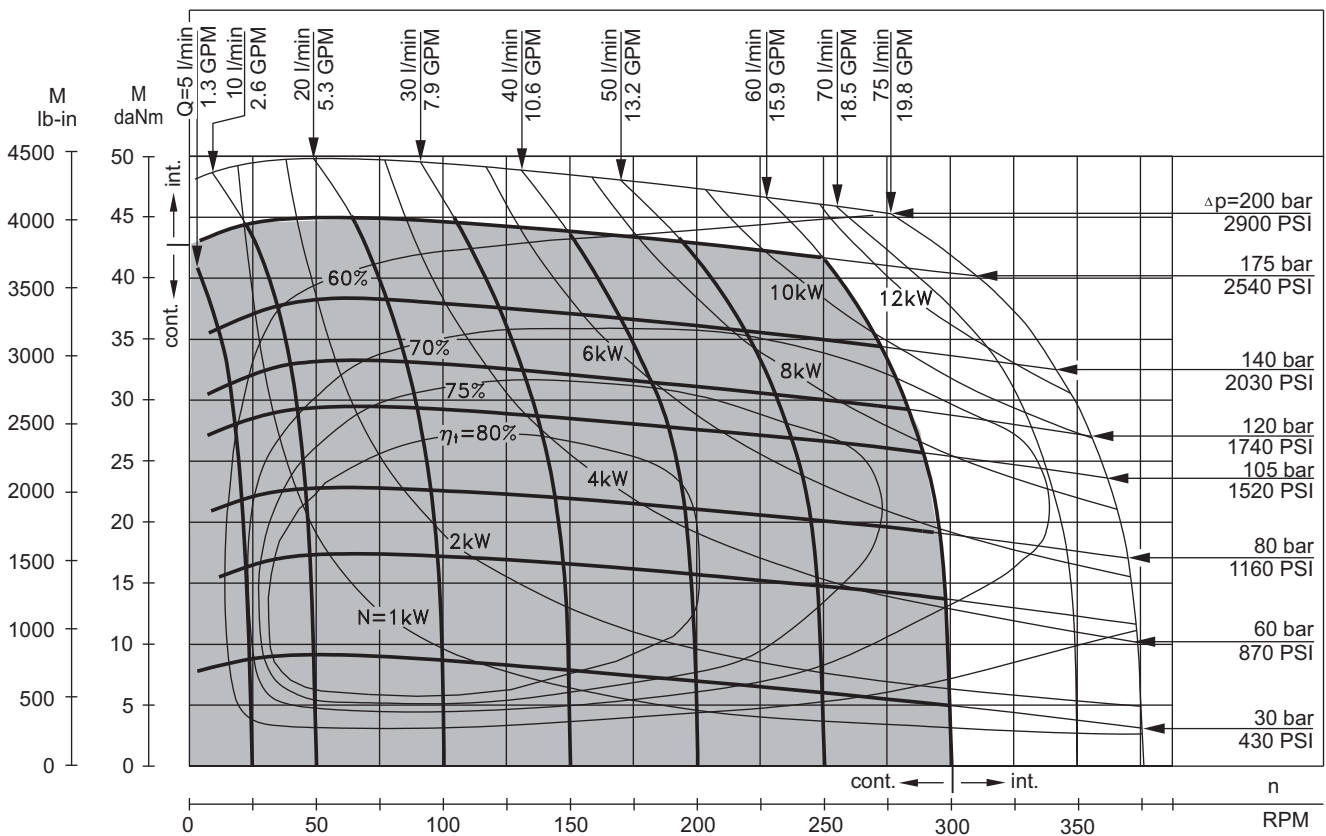
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHRW 160



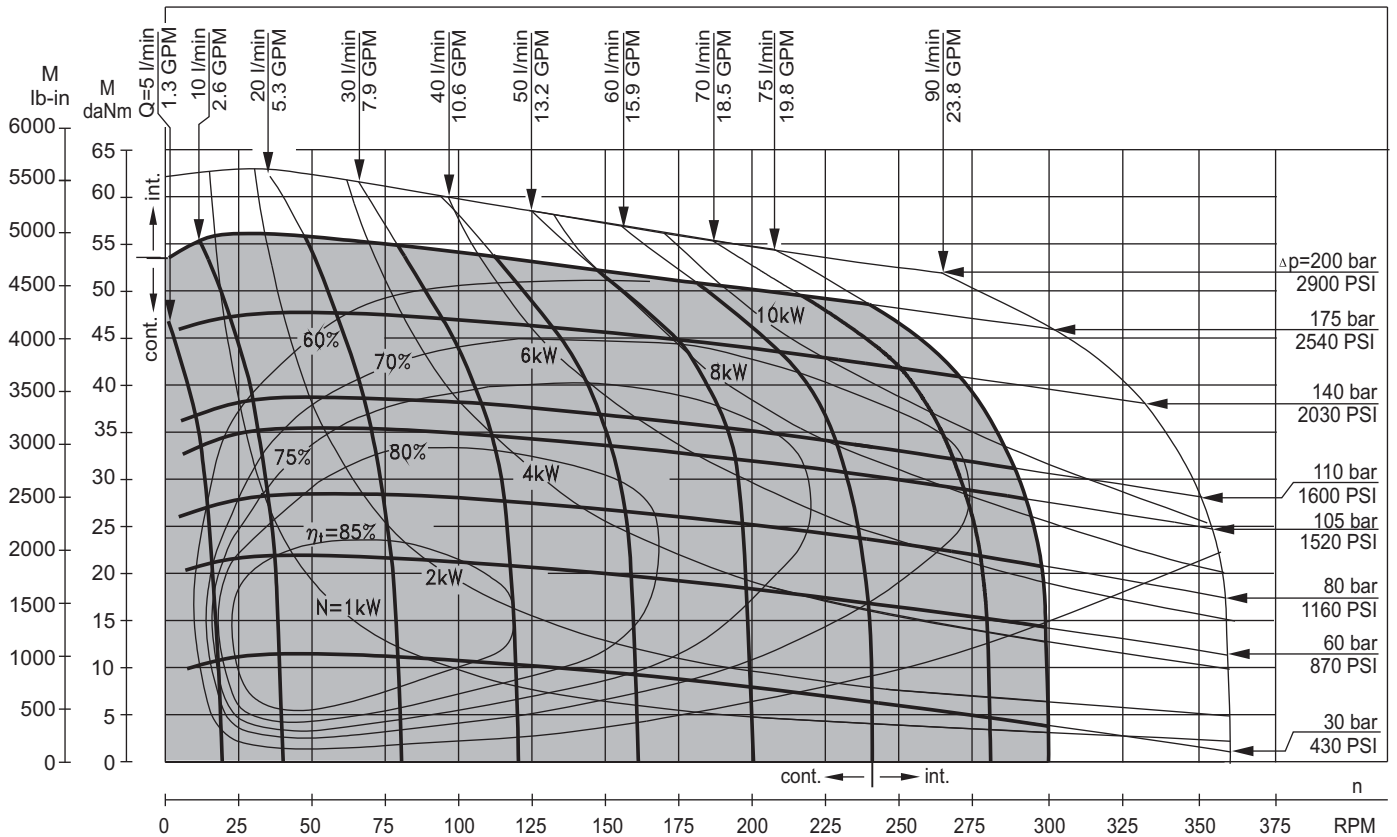
MLHRW 200



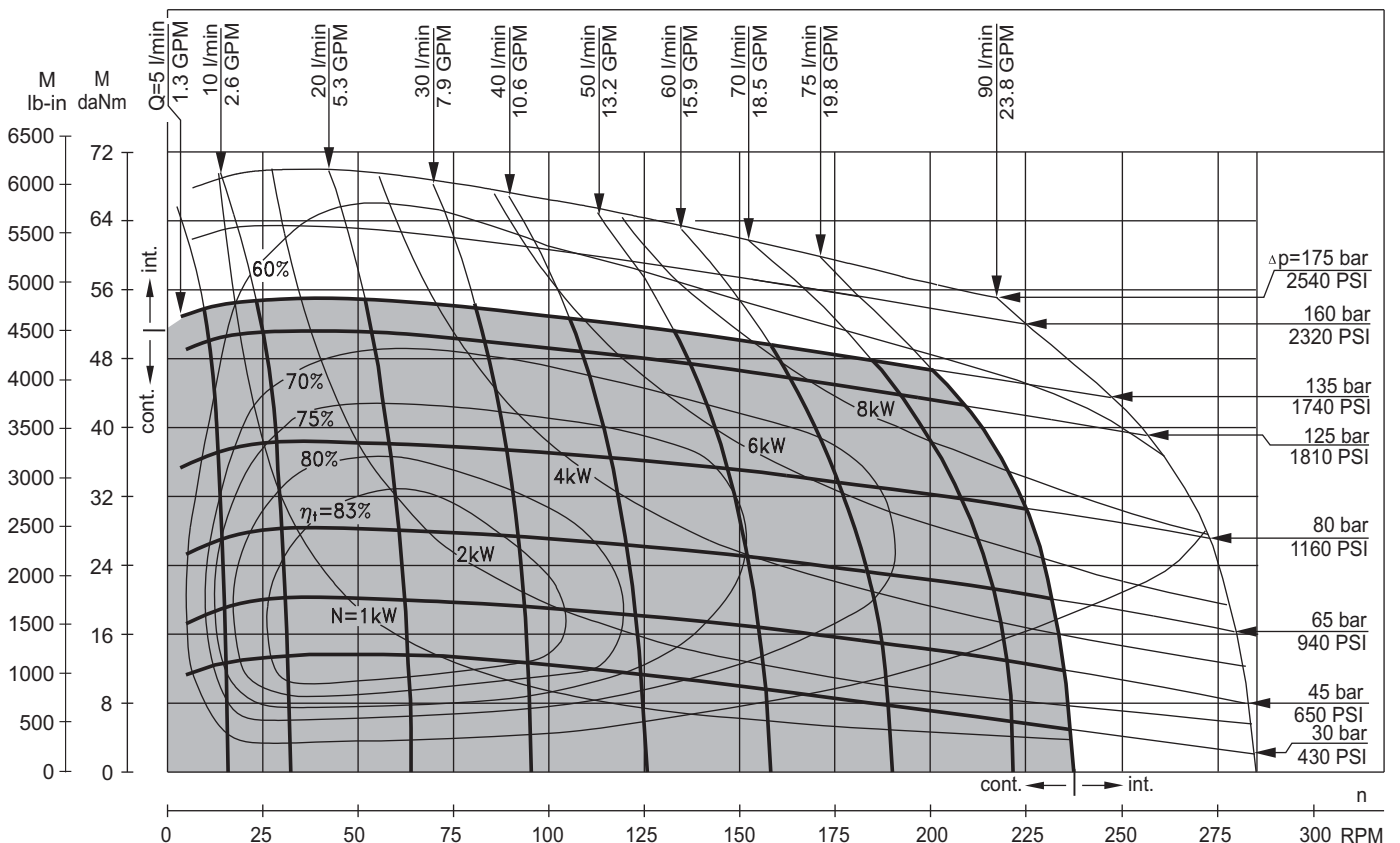
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHRW 250



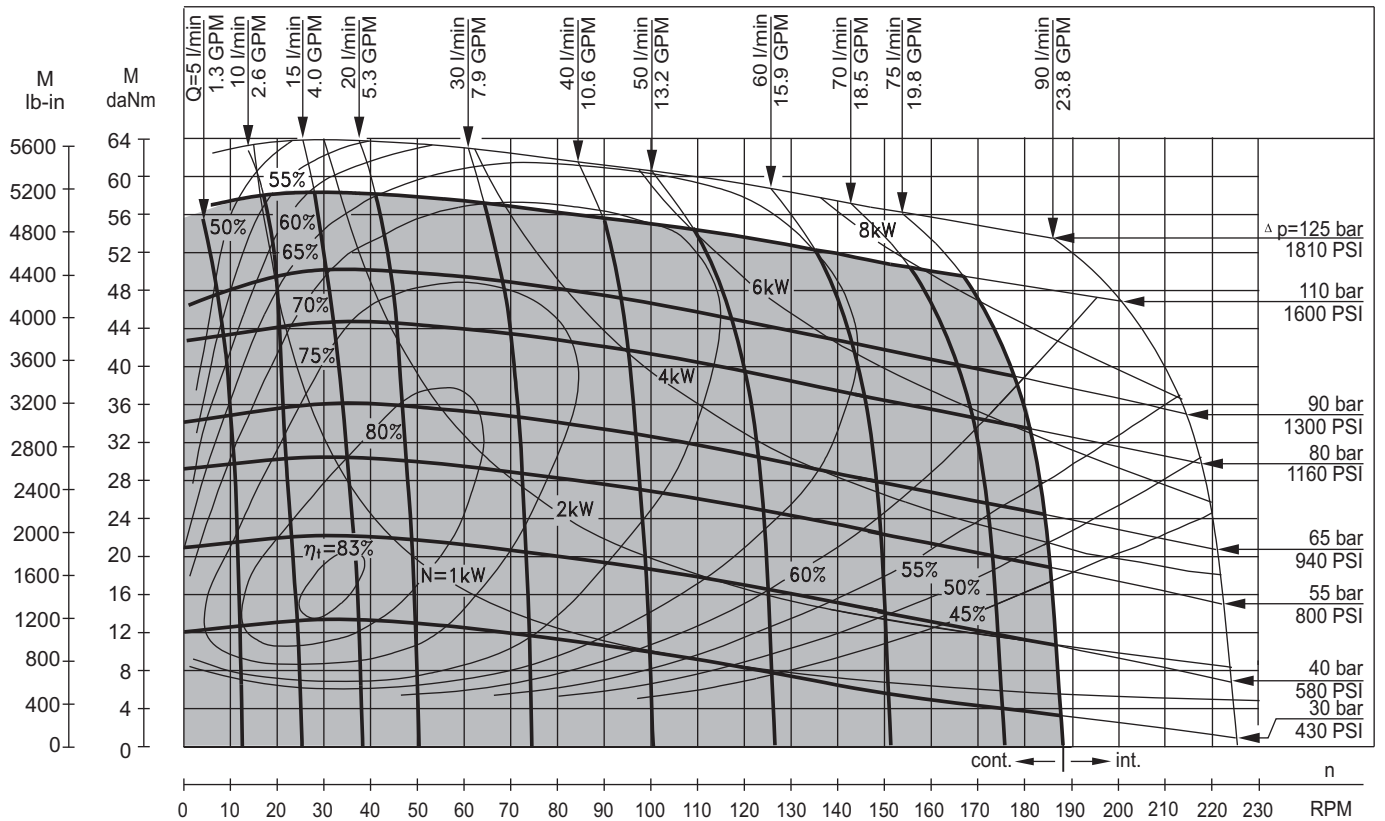
MLHRW 315



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

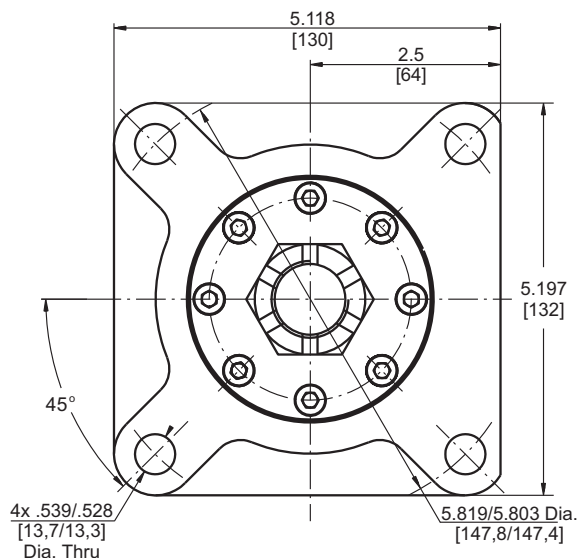
FUNCTION DIAGRAMS

MLHRW 400

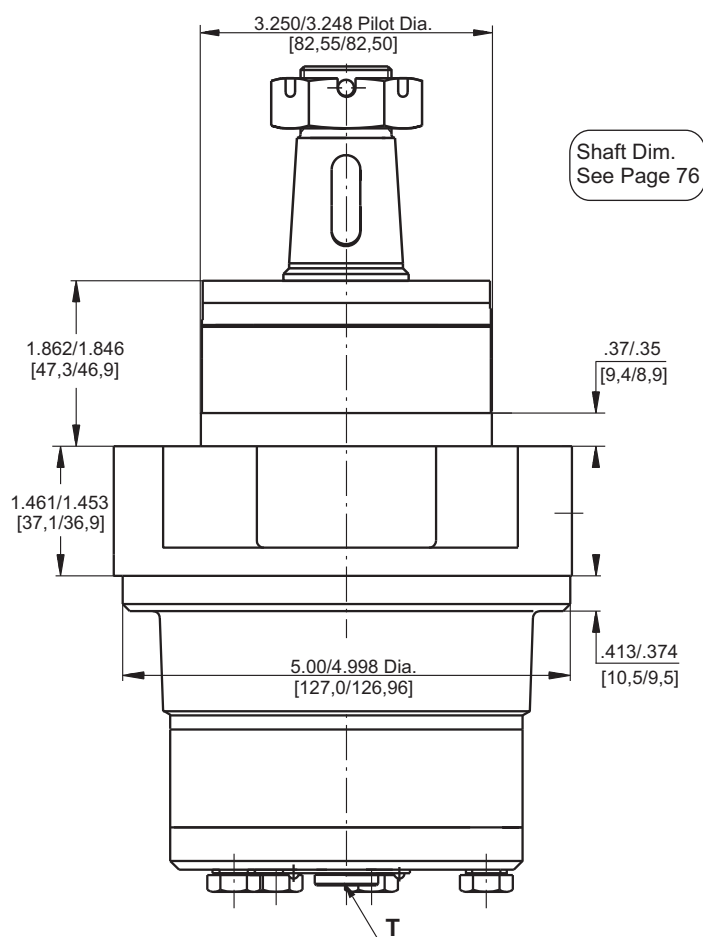


The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

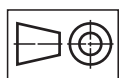
DIMENSIONS AND MOUNTING DATA - MLHRW (WHEEL MOTOR)



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]	2.73 [69,4]

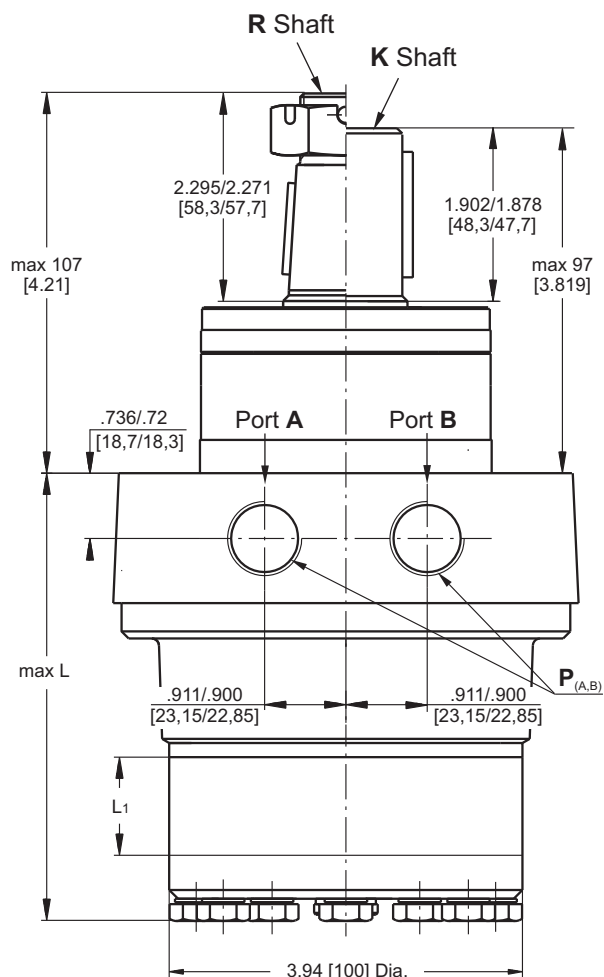


Shaft Dim.
See Page 76



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

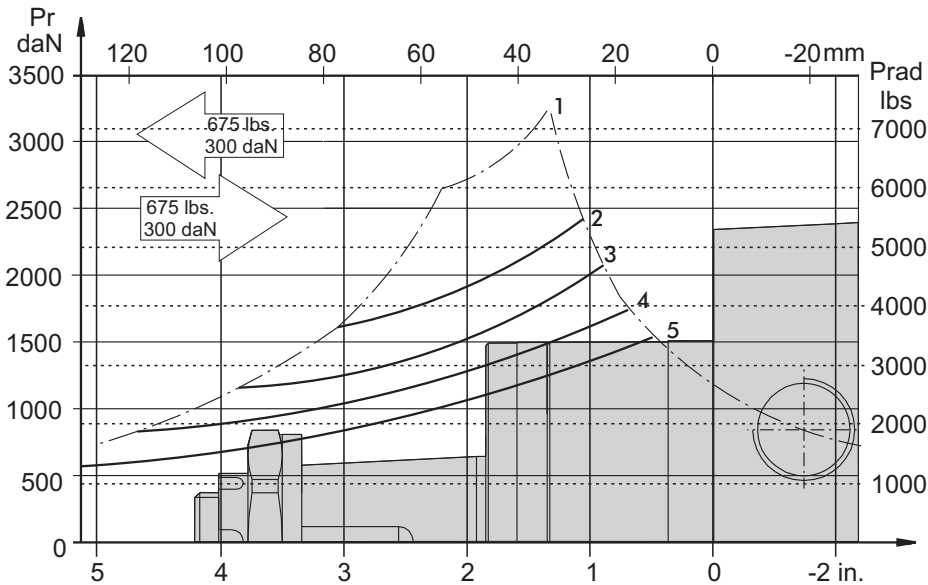
Reverse Rotation
Viewed from Shaft End
Port A Pressurized - **CCW**
Port B Pressurized - **CW**



Versions		
	2	4
P _(A,B)	2xG $\frac{1}{2}$	2x $\frac{7}{8}$ -14UNF
T	G $\frac{1}{4}$	$\frac{7}{16}$ -20UNF

PERMISSIBLE SHAFT LOADS MLHRW

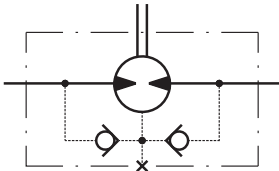
The curve applies to a B10 bearing life of 2000 hours.



MAX. PERMISSIBLE SHAFT SEAL PRESSURE

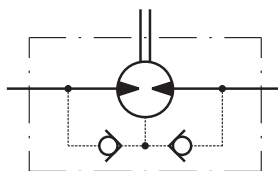
MLHRW...; MLHRW...UK motors with drain connection:

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



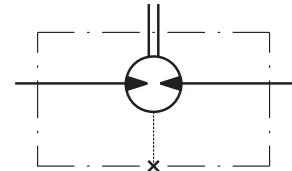
MLHRW...1 motors without drain connection:

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

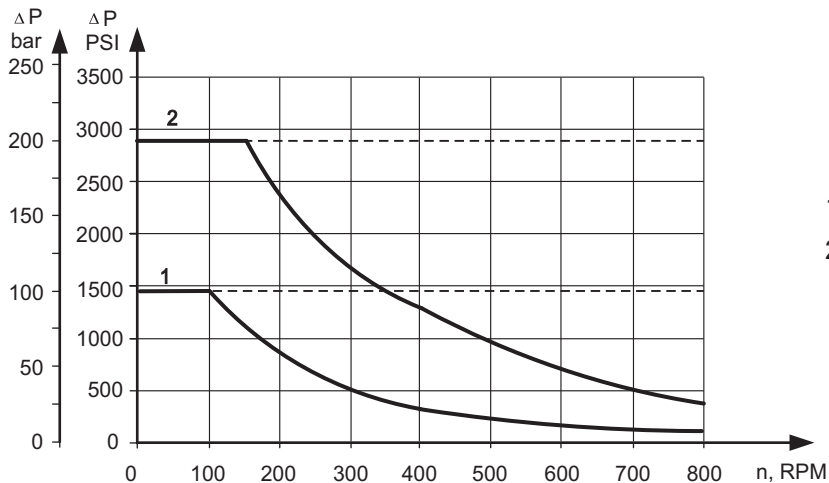


MLHRW...U motors with high pressure seal and drain connection:

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



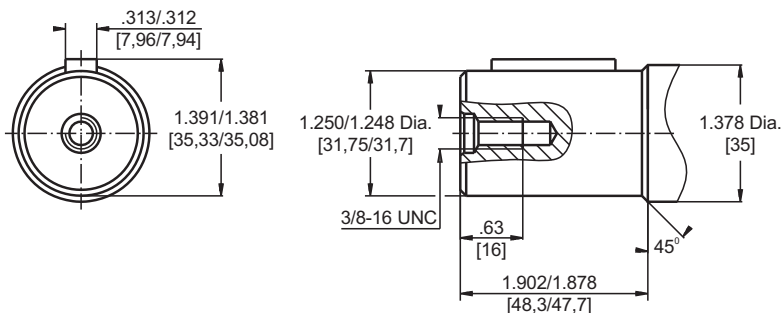
Max. return pressure without drain line or max. pressure in the drain line



SHAFT EXTENSIONS

K

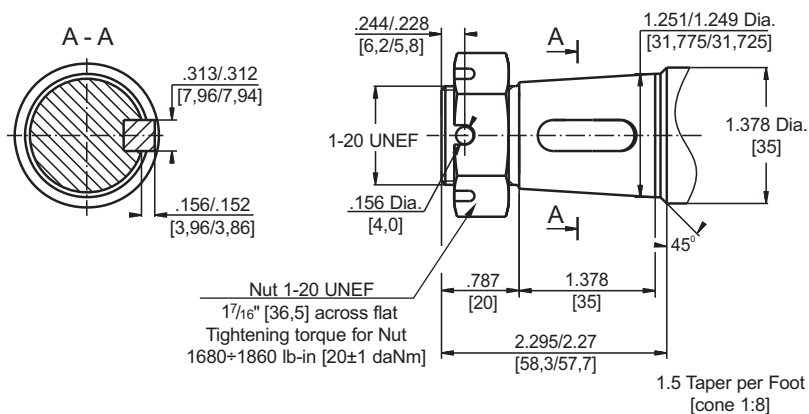
1¼" [31,75] straight, Parallel key 5/16"x5/16"x1¼" BS 46
 Max. Torque 6815 lb-in [77 daNm]



Requirement max. Torque must be not exceeded.


R

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



ORDER CODE

	1	2	3	4	5	6
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 103]

Pos.7 - Design Series

omit	- Factory specified
------	---------------------

Notes:

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

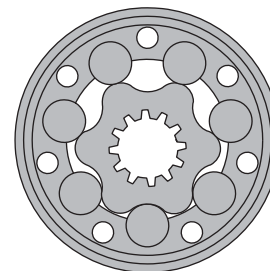
The hydraulic motors are mangano-phosphatized as standard.

HYDRAULIC MOTORS MLHH



APPLICATION

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



CONTENTS

Specification data	78
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Dimensions and mounting.....	82
Permissible shaft seal pressure....	83
Shaft extensions	84
Order code	84

OPTIONS

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

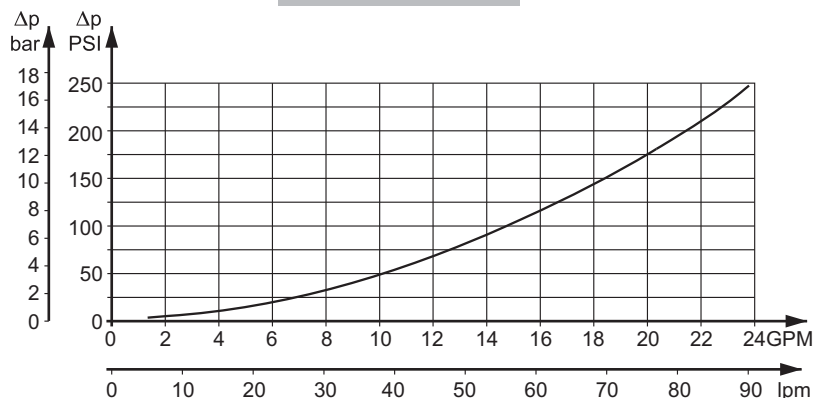
GENERAL

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 [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 [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, in-lb [daNm]	At max.press.dropCont	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.

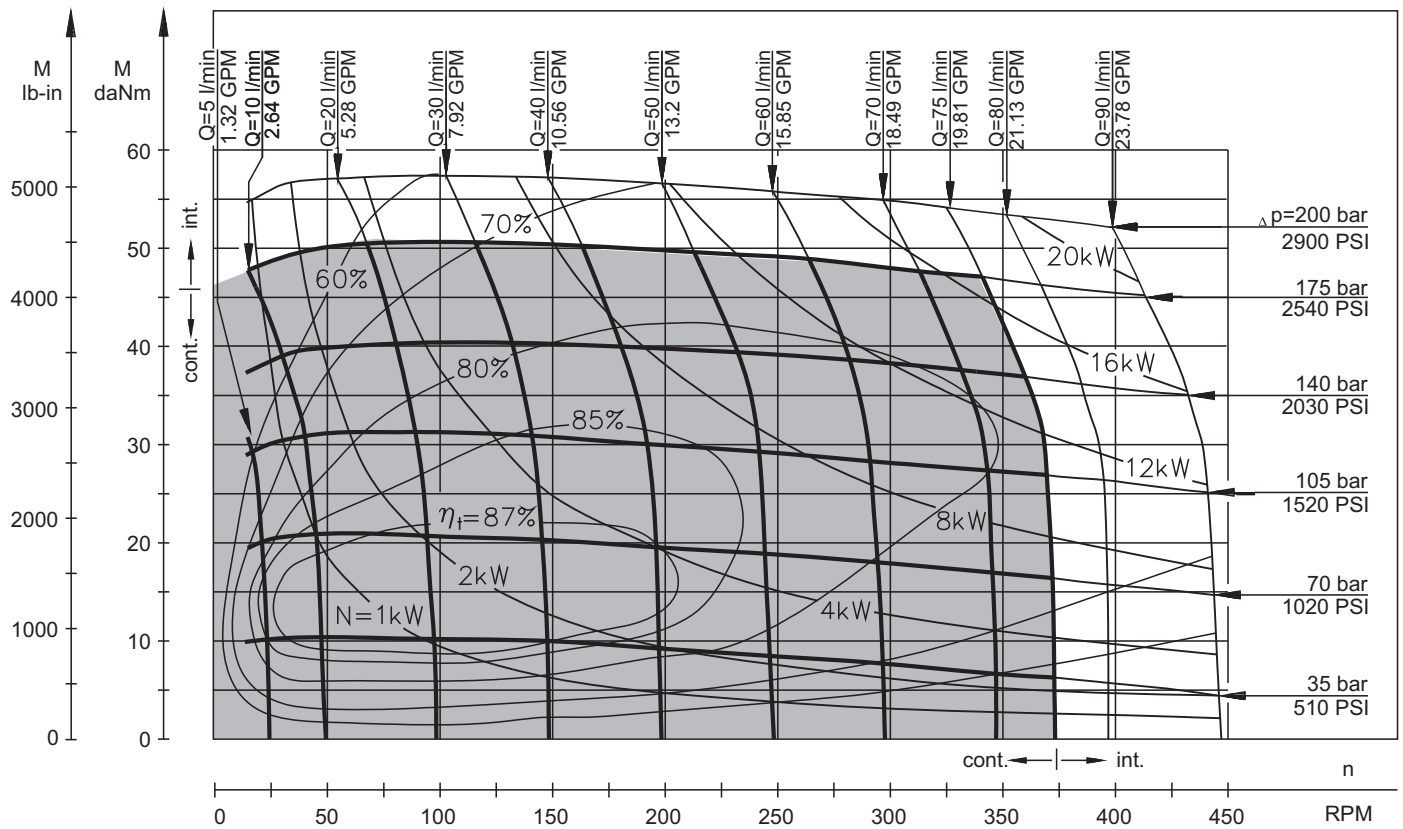
** Peak load: the permissible values may occur for max. 1% of every minute.

*** For speeds lower than given, consult factory or your regional manager.

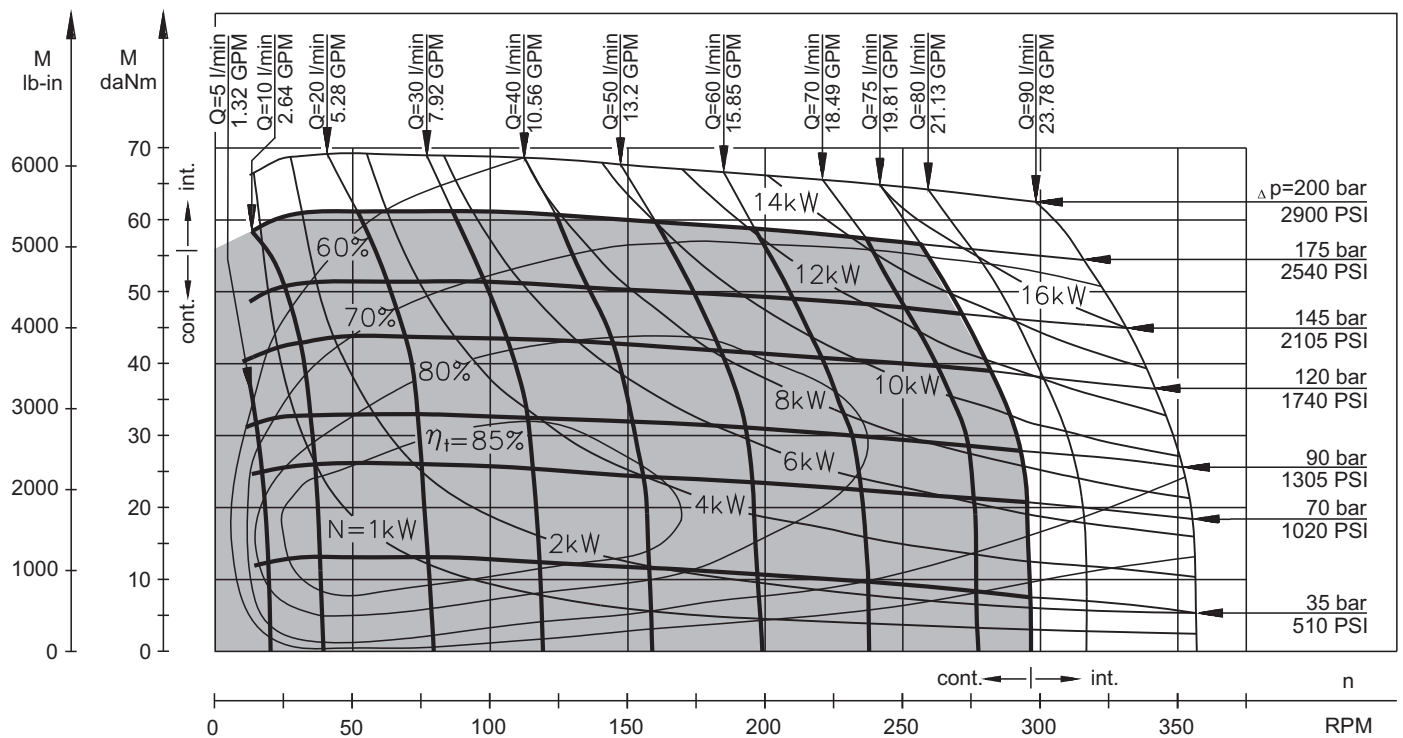
- 1) Intermittent speed and intermittent pressure must not occur simultaneously.
- 2) Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
- 3) Recommend using a premium quality, anti-wear type mineral based hydraulic oil, HLP(DIN51524) or HM(ISO6743/4).
If using synthetic fluids consult the factory for alternative seal materials.
- 4) Recommended minimum oil viscosity 70 SUS [13 mm²/s] at 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

MLHH 200



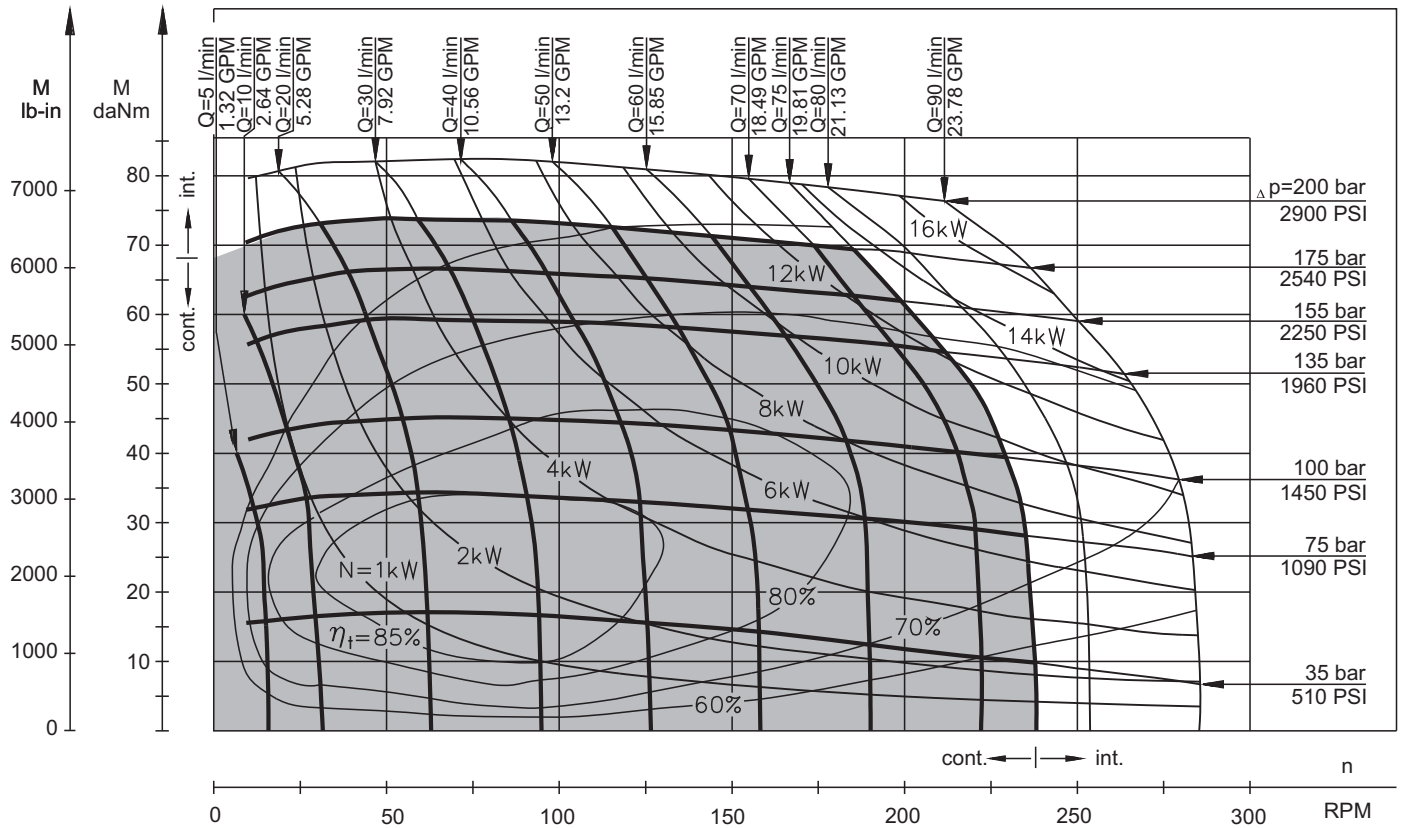
MLHH 250



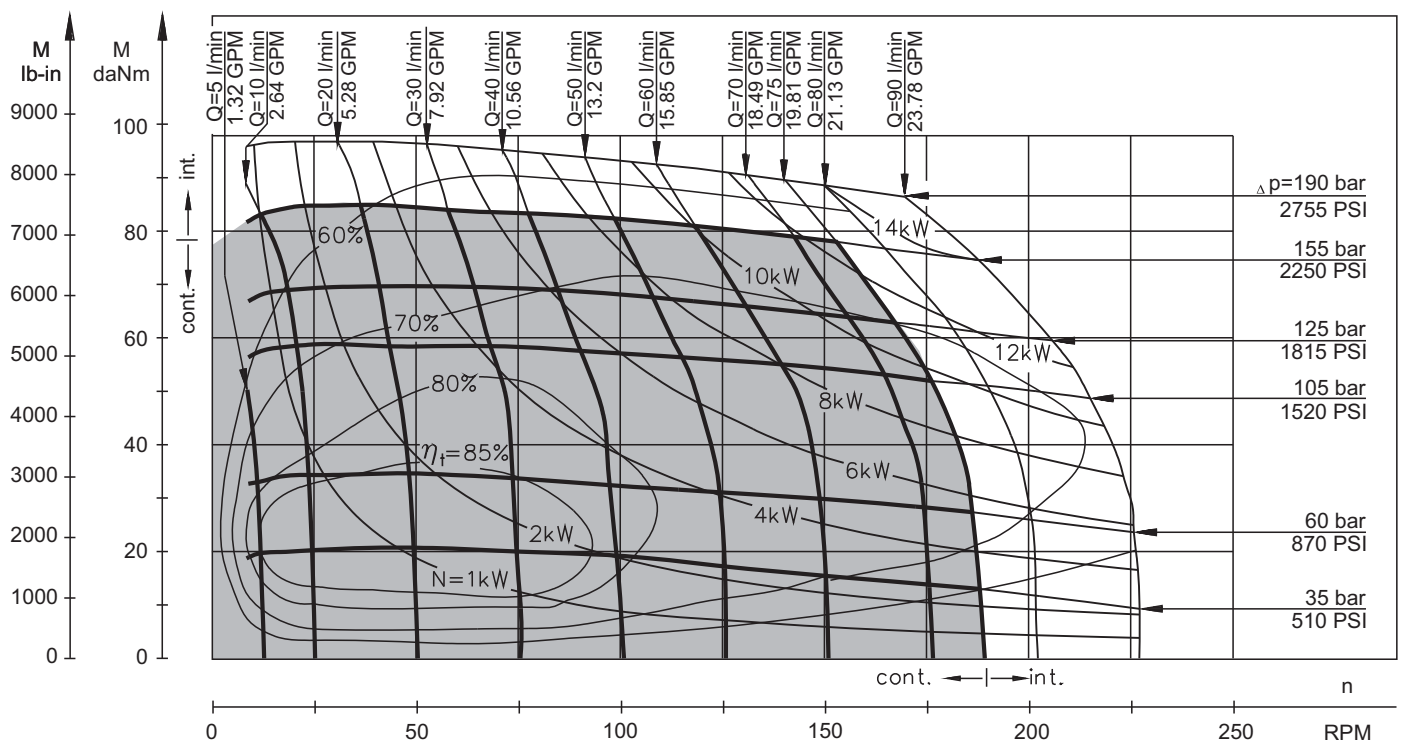
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHH 315



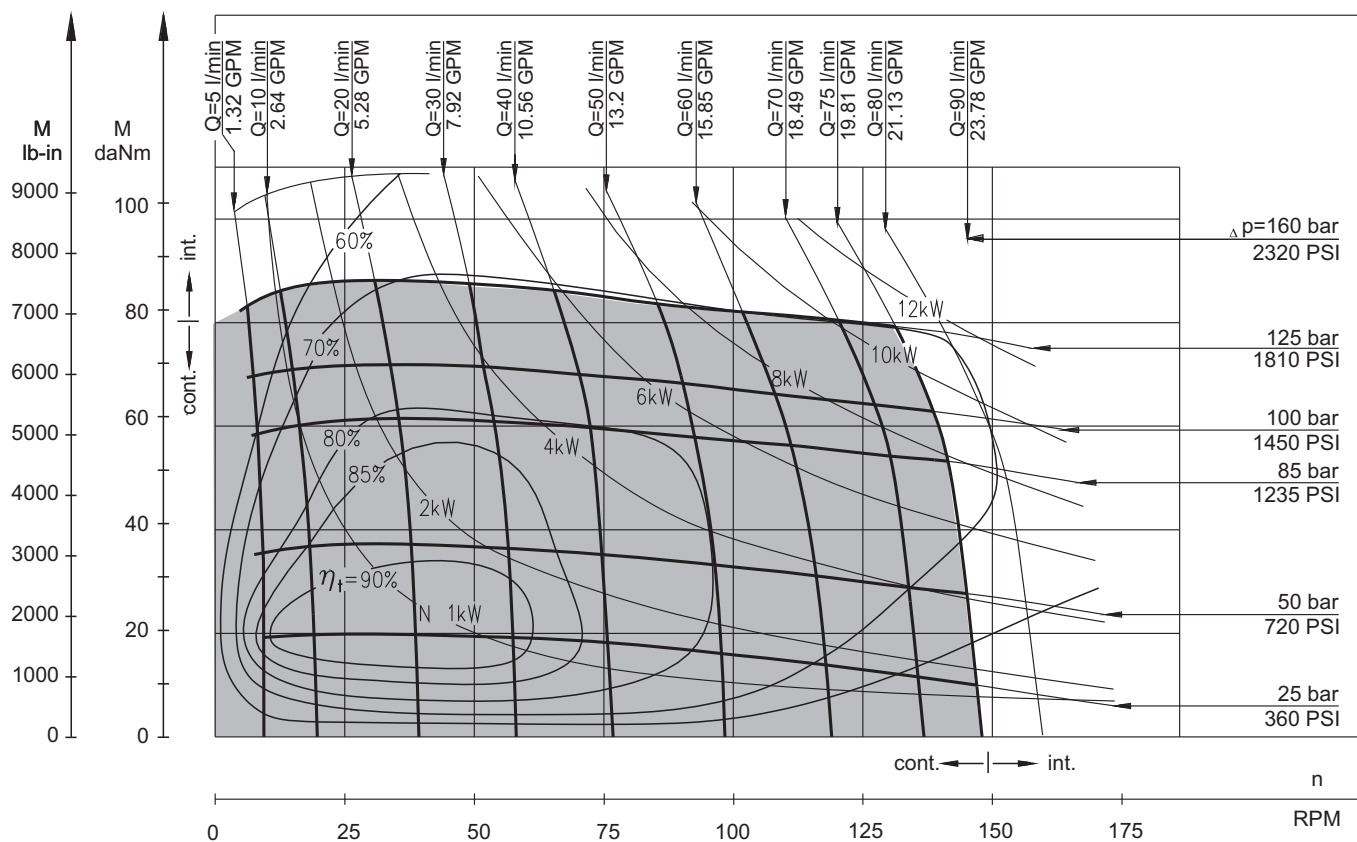
MLHH 400



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

PERMISSIBLE SHAFT LOADS FOR MLHH MOTORS

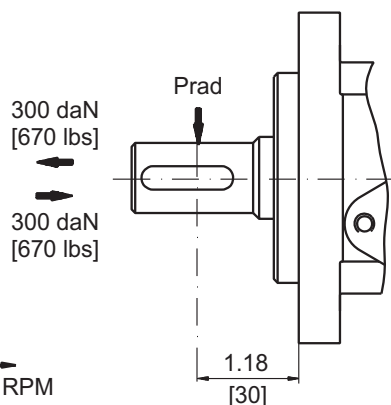
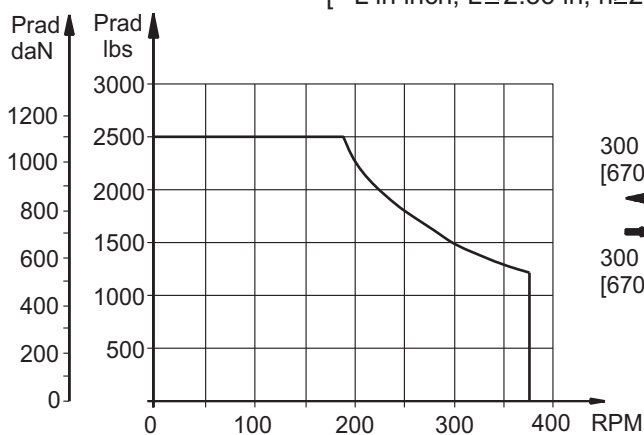
The permissible radial shaft load P_{rad} depends on the speed (RPM) and distance (L) from the point of load to the mounting flange.

$$\text{Radial Shaft Load } P_{rad} = \frac{1100}{n} \times \frac{25000}{103.5+L}, \text{ daN}^*$$

[*L in mm; L ≤ 60 mm; n ≥ 200 RPM]

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

[**L in inch; L ≤ 2.36 in; n ≥ 200 RPM]



DIMENSIONS AND MOUNTING DATA

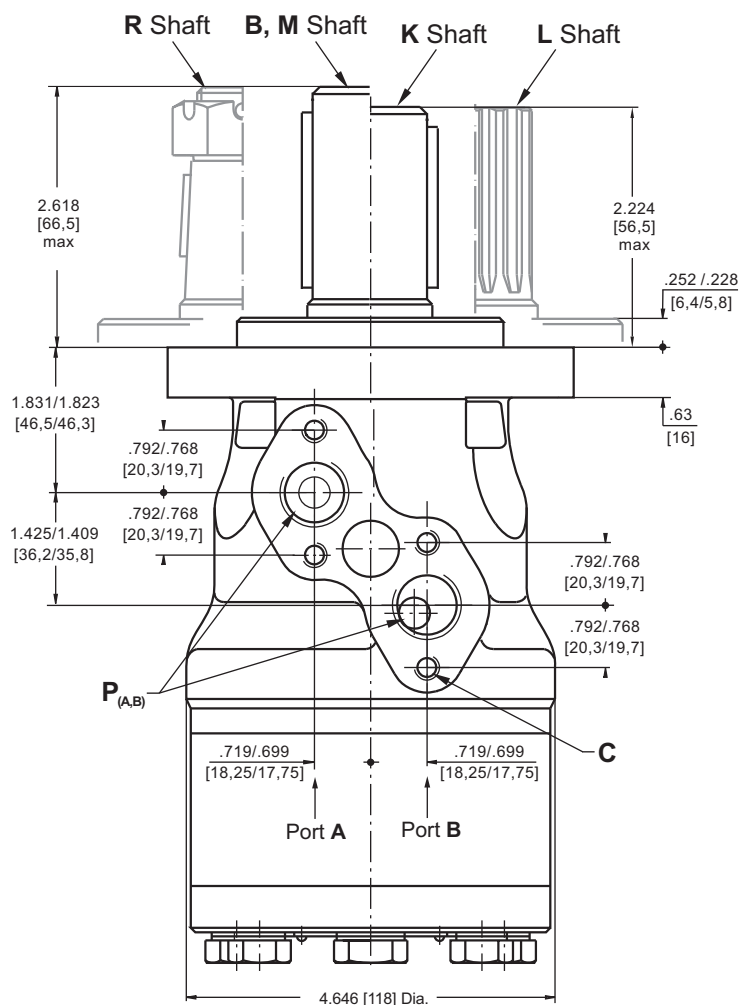
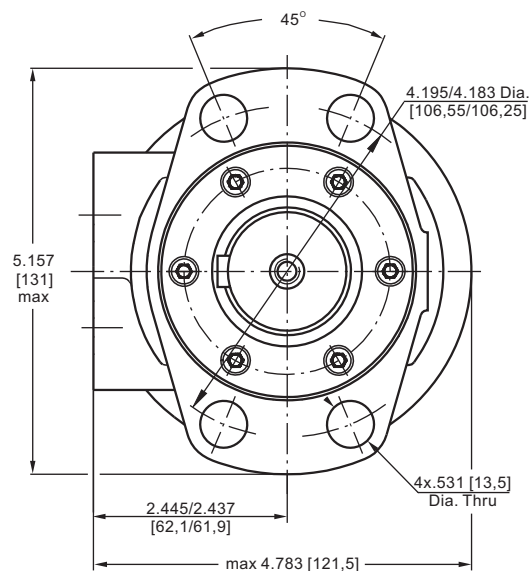
Magneto Mounting Flange with 4 hole

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]

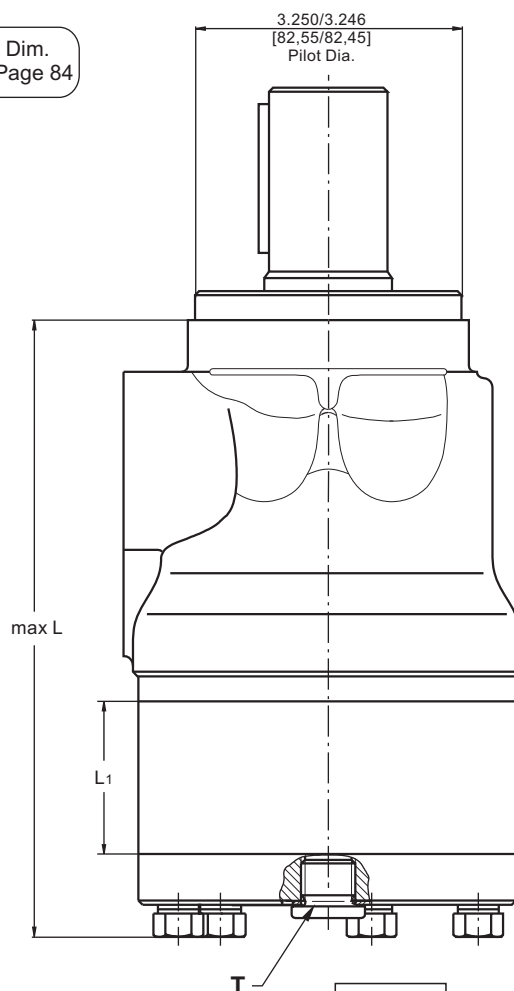
Standard Rotation
Viewed from Shaft End
Port **A** Pressurized - **CW**
Port **B** Pressurized - **CCW**

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

	Versions			
	2	3	4	5
C	4xM8	4xM8	4x $\frac{5}{16}$ -18UNC	4x $\frac{5}{16}$ -18UNC
P_(A,B)	2xG $\frac{1}{2}$	2xM22x1,5	2x $\frac{7}{8}$ -14UNF	2x $\frac{1}{2}$ -14NPTF
T	G $\frac{1}{4}$	M14x1,5	$\frac{7}{16}$ -20UNF	$\frac{7}{16}$ -20UNF



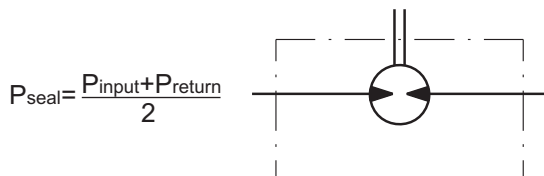
Shaft Dim.
See Page 84



MAX. PERMISSIBLE SHAFT SEAL PRESSURE FOR MLHH MOTORS

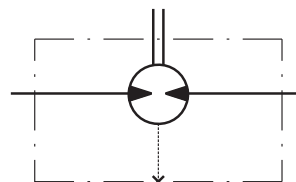
MLHH...U1 motors with high pressure seal and without drain connection:

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



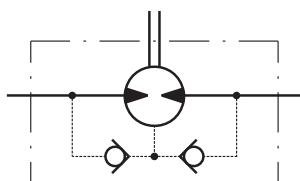
MLHH...U motors with high pressure seal and drain connection:

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



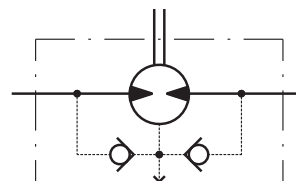
MLHH...1 motors with standard shaft seal and without drain connection:

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

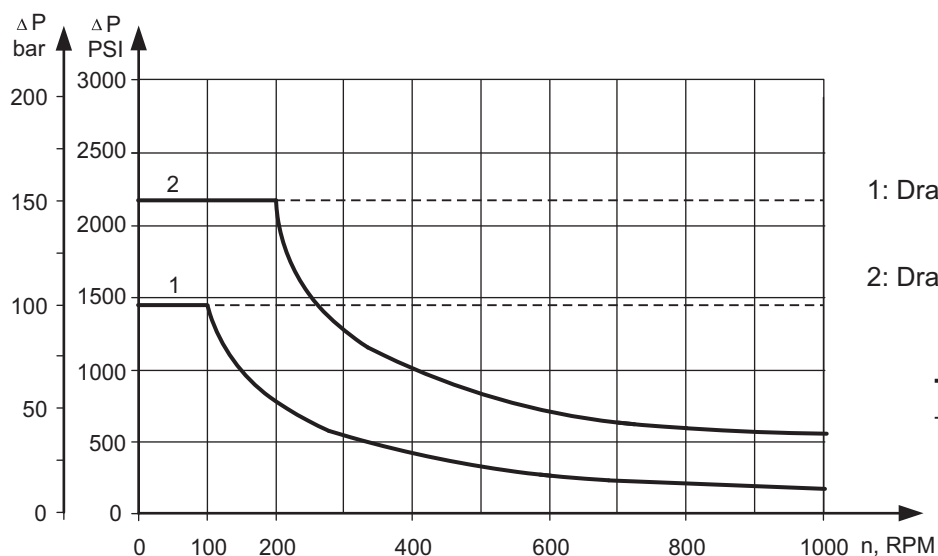


MLHH... motors with standard shaft seal and with drain connection:

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



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



1: Drawing for Standard Shaft Seal

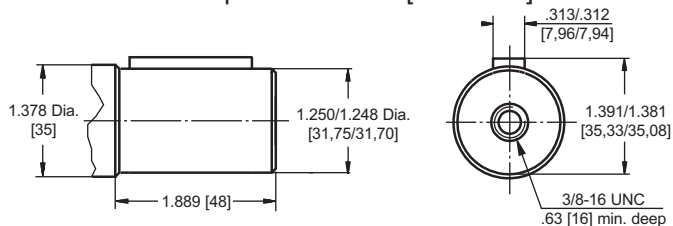
2: Drawing for High Pressure Seal ("U" Seal)

— - continuous operations
- - - - intermittent operations

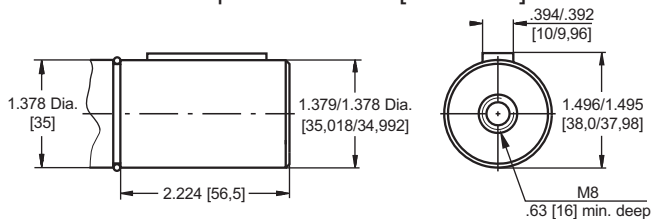
SHAFT EXTENSIONS

K

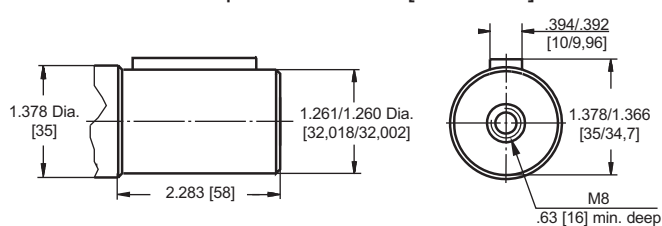
1¼" [31,75] straight, Parallel key 5/16"x 5/16"x1¼" BS 46
 Max. Torque 6815 lb-in [77 daNm]


B

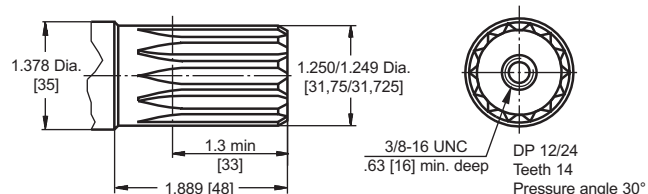
ø35 straight, Parallel key A10x8x45 DIN 6885
 Max. Torque 8400 lb-in [95 daNm]


M

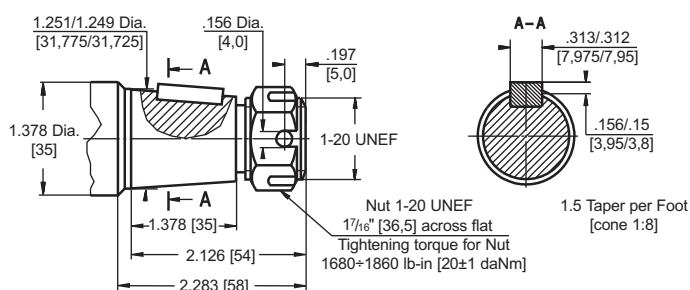
ø32 straight, Parallel key A10x8x45 DIN 6885
 Max. Torque 6815 lb-in [77 daNm]


L

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


R

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



Requirement max. Torque must be not exceeded.



ORDER CODE

1	2	3	4	5	6	7
MLHH						

Pos.1 - Displacement code

200	- 12.3 in ³ /rev [201,3 cm ³ /rev]
250	- 15.4 in ³ /rev [252,0 cm ³ /rev]
315	- 16.4 in ³ /rev [314,9 cm ³ /rev]
400	- 24.2 in ³ /rev [396,8 cm ³ /rev]
500	- 30.7 in ³ /rev [502,4 cm ³ /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 103]

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.

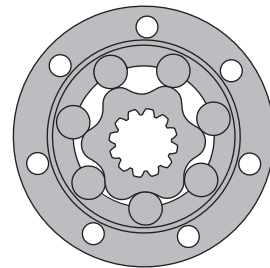
The hydraulic motors are mangano-phosphatized as standard.

HYDRAULIC MOTORS HW



APPLICATION

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



CONTENTS

Specification data	86÷87
Function diagrams	88÷94
Dimensions and mounting	95÷99
Permissible shaft Seal Pressure ...	99
Shaft extensions	100÷101
Permissible shaft loads	100
Order code	102

OPTIONS

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

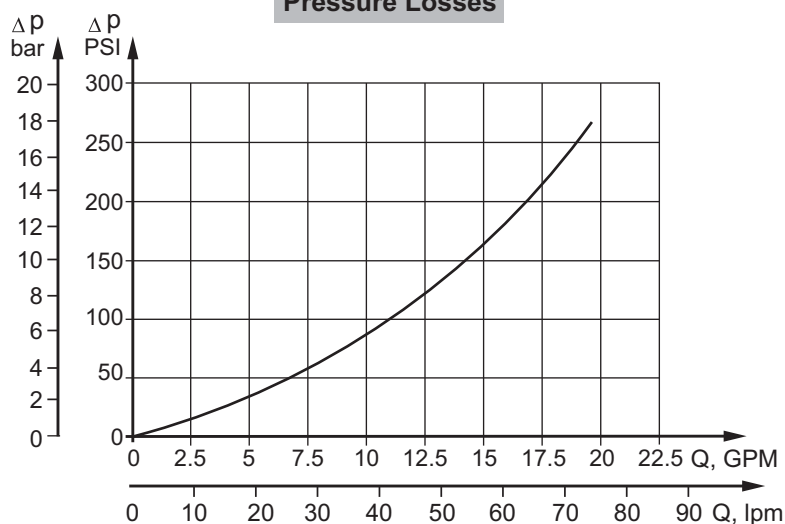
GENERAL

Max. Displacement, in ³ /rev [cm ³ /rev]	33.55 [550]
Max. Speed, [RPM]	497
Max. Torque, lb-in [daNm]	cont.: 8500 [96] int.: 9293 [105]
Max. Output, HP [kW]	31 [23,1]
Max. Pressure Drop, PSI [bar]	cont.: 3000 [205] int.: 3260 [225]
Max. Oil Flow, GPM [lpm]	30.4 [115]
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 [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 125	HW 160	HW 200	HW 235	HW 250	HW 300	HW 315
Displacement, in³/rev [cm³/rev]		7.69 [126]	9.64 [157,8]	12.28 [201,3]	14.33 [235,3]	15.37 [252]	18.3 [300]	19.21 [314,9]
Max. Speed, [RPM]	cont.	357	380	373	319	298	250	238
	int.*	476	475	497	425	397	333	318
Max. Torque lb-in [daNm]	cont.	3098 [35]	3894 [44]	4868 [55]	5710 [64,5]	6107 [69]	7170 [81]	7523 [85]
	int.*	3408 [38,5]	4248 [48]	5310 [60]	6196 [70]	6638 [75]	7877 [89]	8230 [93]
Max. Output, HP [kW]	cont.	21.7 [16,2]	23.6 [17,6]	24.9 [18,6]	24.4 [18,2]	16,8 [22,5]	22 [16,5]	21.9 [16,4]
	int.*	26.6 [19,8]	29 [21,6]	31 [23,1]	30.3 [22,6]	27.9 [20,8]	27.9 [20,8]	27.9 [20,8]
Max. Pressure Drop, PSI [bar]	cont.	2970 [205]	2970 [205]	2970 [205]	2970 [205]	2970 [205]	2970 [205]	2970 [205]
	int.*	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]
Max. Oil Flow GPM [lpm]	cont.	12 [45]	16 [60]	20 [75]	20 [75]	20 [75]	20 [75]	20 [75]
	int.*	16 [60]	20 [75]	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]	3050 [210]
	int.*	3625 [250]	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]	145 [10]
Min. Starting Torque lb-in [daNm]	at max. press. drop cont.	2540 [28,7]	3186 [36]	3991 [45,1]	4673 [52,8]	5000 [56,5]	5877 [66,4]	6169 [69,7]
	at max. press. drop int.*	2788 [31,5]	3478 [39,3]	4355 [49,2]	5080 [57,4]	5443 [61,5]	6452 [72,9]	6744 [76,2]
Min. Speed**, [RPM]		10	10	10	10	10	10	10
Weight, avg. lb [kg]	HW	31.5 [14,3]	32.2 [14,6]	33.3 [15,1]	34.2 [15,5]	34.6 [15,7]	35.5 [16,1]	35.9 [16,3]
	HWF	28.2 [12,8]	28.9 [13,1]	30.0 [13,6]	30.9 [14,0]	31.3 [14,2]	32.2 [14,6]	32.6 [14,8]
	HWFR	32.6 [14,8]	33.3 [15,1]	34.4 [15,6]	35.3 [16,0]	35.7 [16,2]	36.6 [16,6]	37.0 [16,8]
	HWS	30.9 [14,0]	31.5 [14,3]	32.6 [14,8]	33.5 [15,2]	34.0 [15,4]	34.8 [15,8]	35.3 [16,0]
	HWSR	35.3 [16,0]	35.9 [16,3]	37.0 [16,8]	37.9 [17,2]	38.4 [17,4]	39.2 [17,8]	39.7 [18,0]
	HWD	31.9 [14,5]	32.6 [14,8]	33.7 [15,3]	34.6 [15,7]	35.1 [15,9]	35.9 [16,3]	36.4 [16,5]
	HWV	30.9 [14,0]	31.5 [14,3]	32.6 [14,8]	33.5 [15,2]	34.0 [15,4]	34.8 [15,8]	35.3 [16,0]
	HWE	14,7 [32,4]	33.1 [15,0]	34.2 [15,5]	35.1 [15,9]	35.5 [16,1]	36.4 [16,5]	36.8 [16,7]
	HWSE	31.8 [14,4]	32.4 [14,7]	33.5 [15,2]	34.4 [15,6]	34.8 [15,8]	35.7 [16,2]	36.2 [16,4]
	HWFE	29.1 [13,2]	29.8 [13,5]	30.86 [14,0]	31.8 [14,4]	32.2 [14,6]	33.1 [15,0]	33.5 [15,2]

* 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 it is not recommendable a flow bigger than 75% of the nominal flow rate.

- Intermittent speed and intermittent pressure drop must not occur simultaneously.
- Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
- 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.
- Recommended minimum oil viscosity 13 mm²/s [70 SUS] at 50°C [122°F].
- Recommended maximum system operating temperature is 82°C [180°F].
- 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 350	HW 370	HW 400	HW 470	HW 500	HW 535	HW 550
Displacement, cm³/rev [in³/rev]		21.21 [347,8]	22.51 [369,2]	24.2 [396,8]	28.71 [470,6]	30.65 [502,4]	32.7 [535]	33.55 [550]
Max. Speed, [RPM]	cont.	216	203	189	159	149	140	136
	int.*	288	271	252	244	229	215	209
Max. Torque daNm [in-lb]	cont.	8320 [94]	8497 [96]	8497 [96]	8143 [92]	8054 [91]	7966 [90]	7877 [89]
	int.*	9028 [102]	9293 [105]	8674 [98]	8939 [101]	8939 [101]	9205 [104]	9293 [105]
Max. Output, kW [HP]	cont.	22 [16,5]	17.7 [13,2]	16.8 [12,5]	14.2 [10,6]	14.5 [10,8]	12.6 [9,4]	12 [9]
	int.*	27.9 [20,8]	25.7 [19,2]	24.8 [18,5]	23.3 [17,4]	23.9 [17,8]	22 [16,4]	21.2 [15,8]
Max. Pressure Drop, bar [PSI]	cont.	2970 [205]	2900 [200]	2680 [185]	2180 [150]	2030 [140]	1885 [130]	1815 [125]
	int.*	3260 [225]	3200 [220]	2760 [190]	2390 [165]	2250 [155]	2180 [150]	2105 [145]
Max. Oil Flow lpm [GPM]	cont.	20 [75]	20 [75]	20 [75]	20 [75]	20 [75]	20 [75]	20 [75]
	int.*	26.4 [100]	26.4 [100]	26.4 [100]	30.4 [115]	30.4 [115]	30.4 [115]	30.4 [115]
Max. Inlet Pressure, bar [PSI]	cont.	3050 [210]	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]	3625 [250]
Max. Starting Pressure with Unloaded Shaft, bar [PSI]		145 [10]	145 [10]	145 [10]	145 [10]	145 [10]	145 [10]	145 [10]
Min. Starting Torque daNm [in-lb]	at max. press. drop cont.	6815 [77]	7036 [79,5]	6966 [78,7]	6674 [75,4]	6603 [74,6]	6532 [73,8]	6452 [72,9]
	at max. press. drop int.*	7400 [83,6]	7612 [86]	7107 [80,3]	7328 [82,8]	7328 [82,8]	7540 [85,2]	7470 [84,4]
Min. Speed**, [RPM]		8	8	8	8	8	5	5
Weight, avg. kg [lb]	HW	36.8 [16,7]	37.3 [16,9]	38.1 [17,3]	39.9 [18,1]	40.6 [18,4]	41.58 [18,8]	41.7 [18,9]
	HWF	33.5 [15,2]	34.0 [15,4]	34.8 [15,8]	36.6 [16,6]	37.3 [16,9]	38.1 [17,3]	38.4 [17,4]
	HWFR	37.9 [17,2]	38.4 [17,4]	39.2 [17,8]	41.0 [18,6]	41.7 [18,9]	42.5 [19,3]	42.8 [19,4]
	HWS	36.2 [16,4]	36.6 [16,6]	37.5 [17,0]	39.2 [17,8]	39.9 [18,1]	40.8 [18,5]	41.0 [18,6]
	HWSR	40.6 [18,4]	41.0 [18,6]	41.9 [19,0]	43.7 [19,8]	44.3 [20,1]	45.2 [20,5]	45.4 [20,6]
	HWD	37.0 [16,8]	37.7 [17,1]	38.6 [17,5]	40.3 [18,3]	41.0 [18,6]	41.9 [19,0]	42.1 [19,1]
	HWV	36.2 [16,4]	36.6 [16,6]	37.5 [17,0]	39.2 [17,8]	39.9 [18,1]	40.8 [18,5]	41.0 [18,6]
	HWE	37.7 [17,1]	38.1 [17,3]	39.0 [17,7]	40.8 [18,5]	41.7 [18,9]	42.3 [19,2]	42.5 [19,3]
	HWSE	37.0 [16,8]	37.5 [17,0]	38.4 [17,4]	40.1 [18,2]	40.8 [18,5]	41.7 [18,9]	41.9 [19,0]
	HWFE	34.4 [15,6]	34.8 [15,8]	35.7 [16,2]	37.5 [17,0]	38.1 [17,3]	39.0 [17,7]	39.2 [17,8]

* Intermittent operation: the permissible values may occur for max. 10% of every minute.

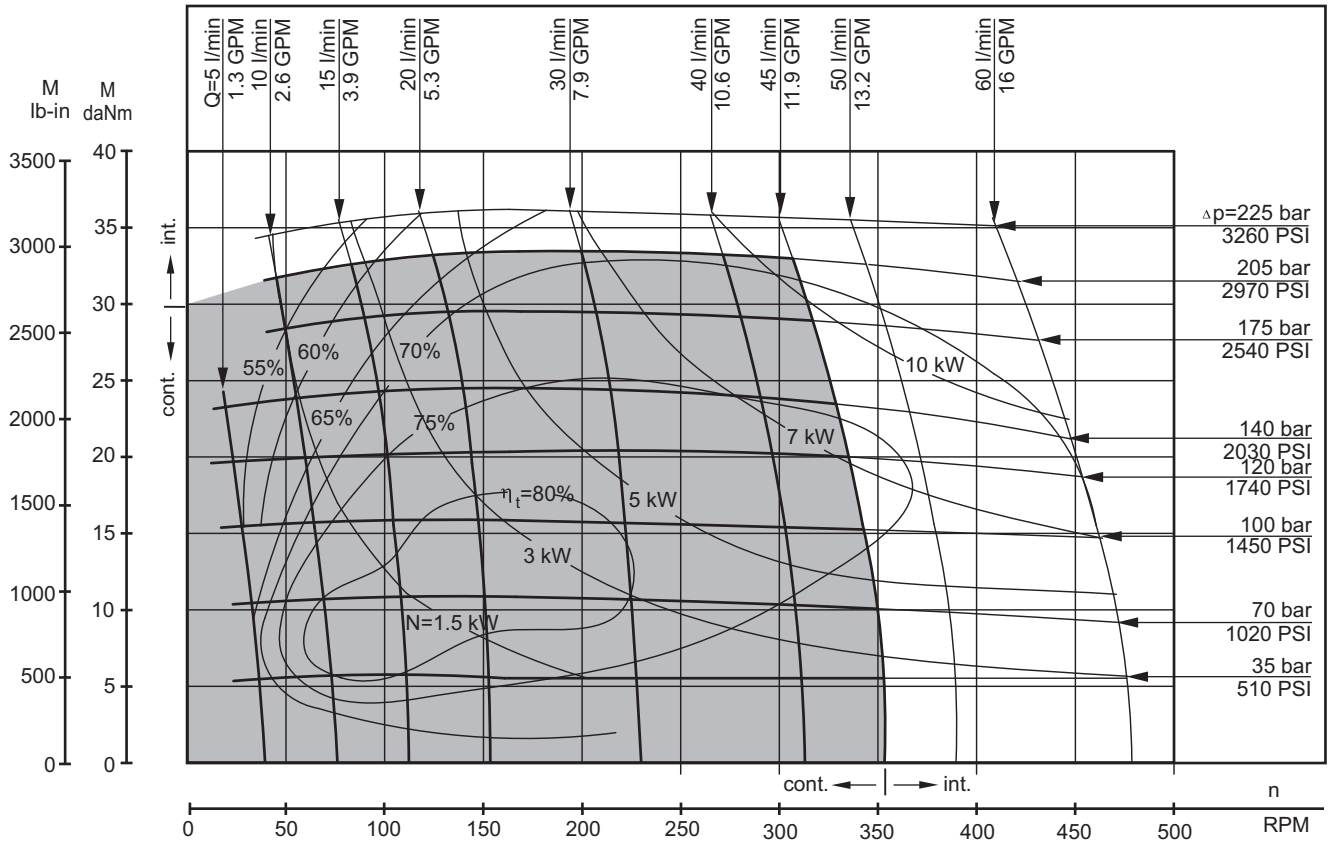
** For speeds lower than given, consult factory or your regional manager.

*** For "E"-option it is not recommendable a flow bigger than 75% of the nominal flow rate.

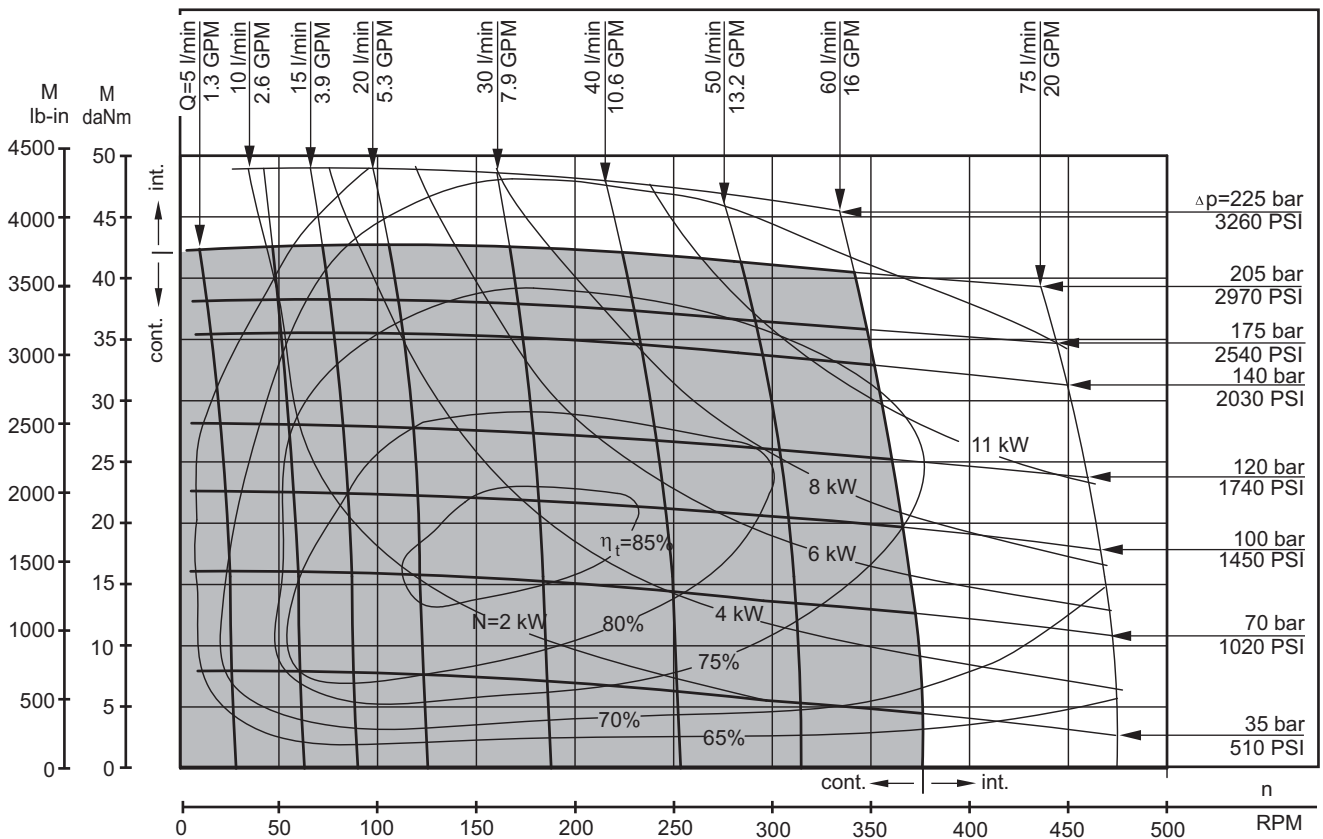
- Intermittent speed and intermittent pressure drop must not occur simultaneously.
- Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
- Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP(DIN51524) or HM (ISO 6743/4).
If using synthetic fluids consult the factory for alternative seal materials.
- Recommended minimum oil viscosity 13 mm²/s [70 SUS] at 50°C [122°F].
- Recommended maximum system operating temperature is 82°C [180°F].
- 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 125



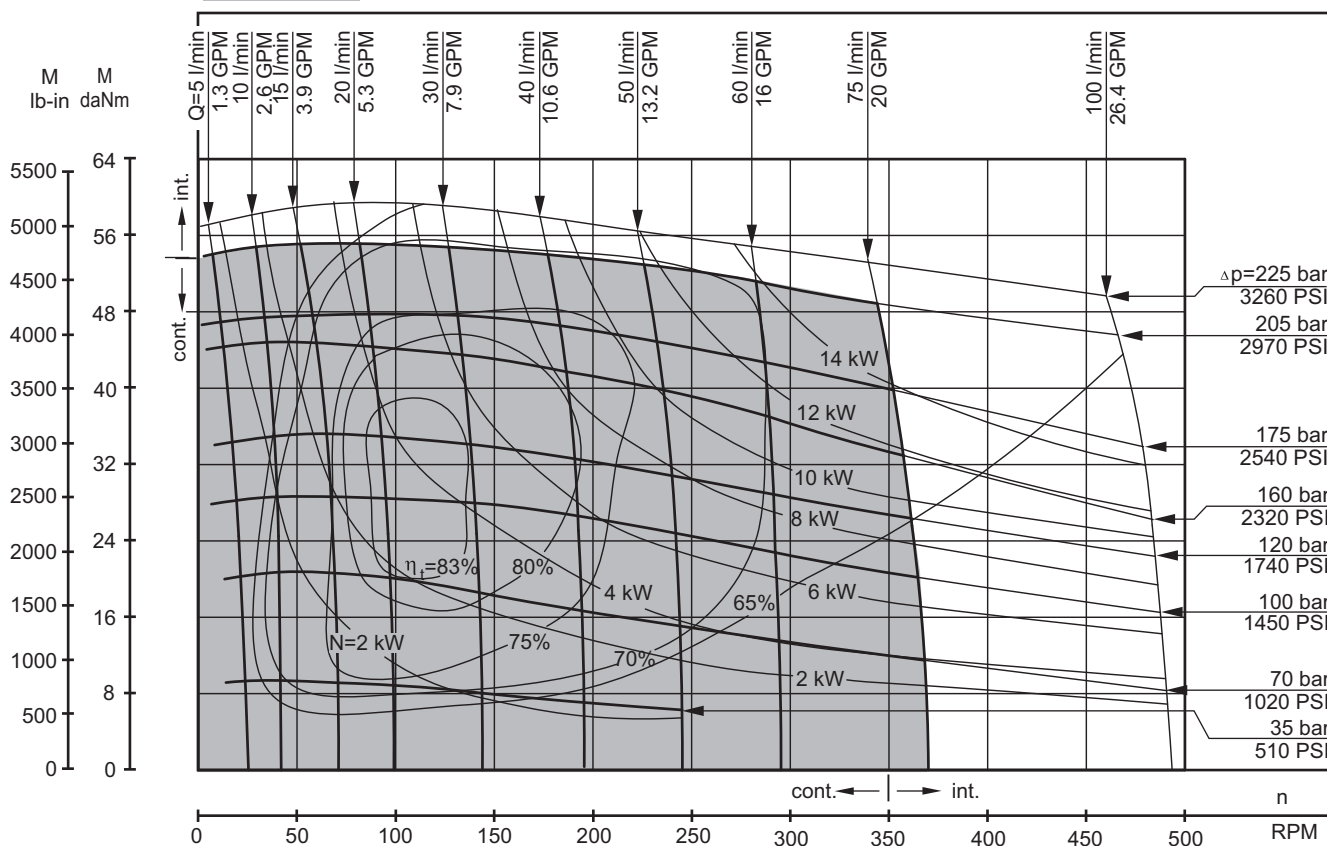
HW 160



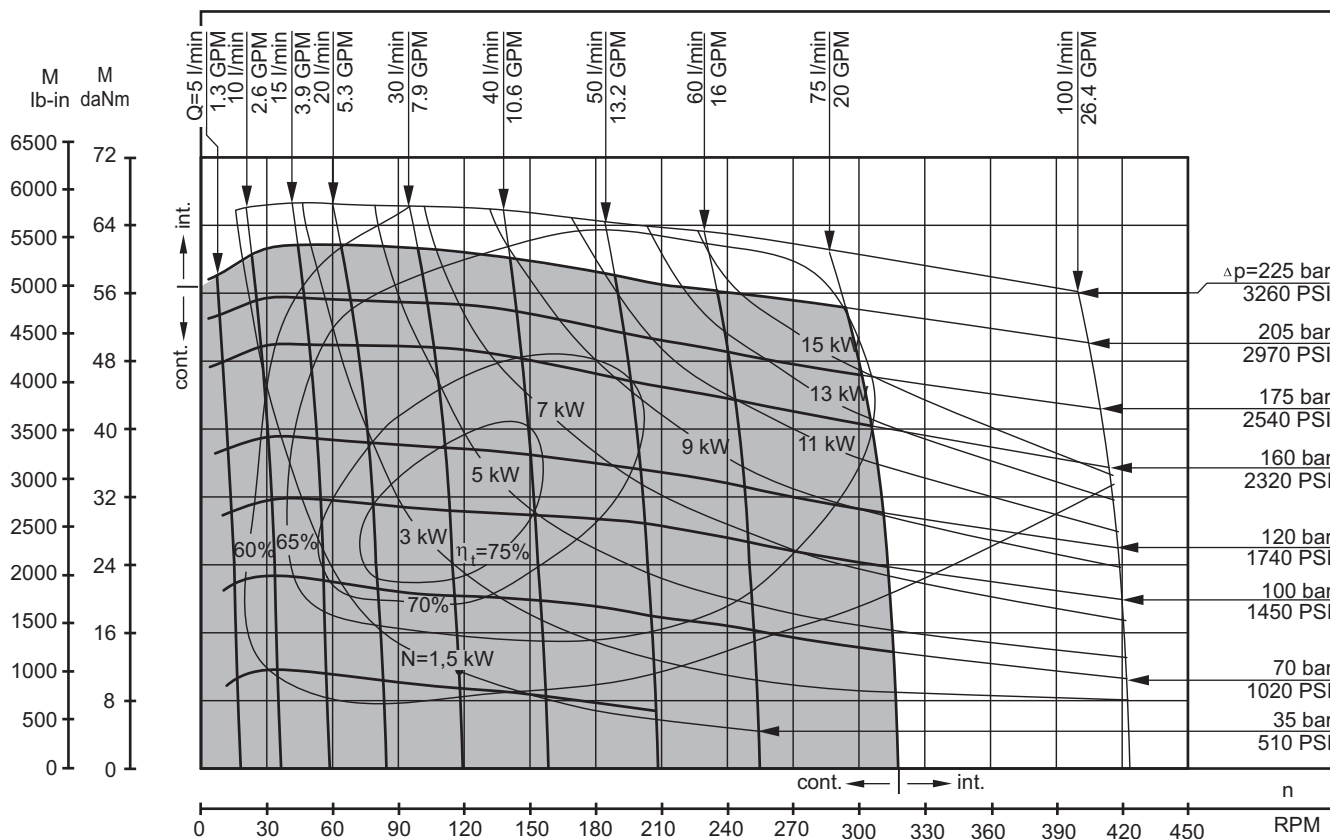
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

HW 200



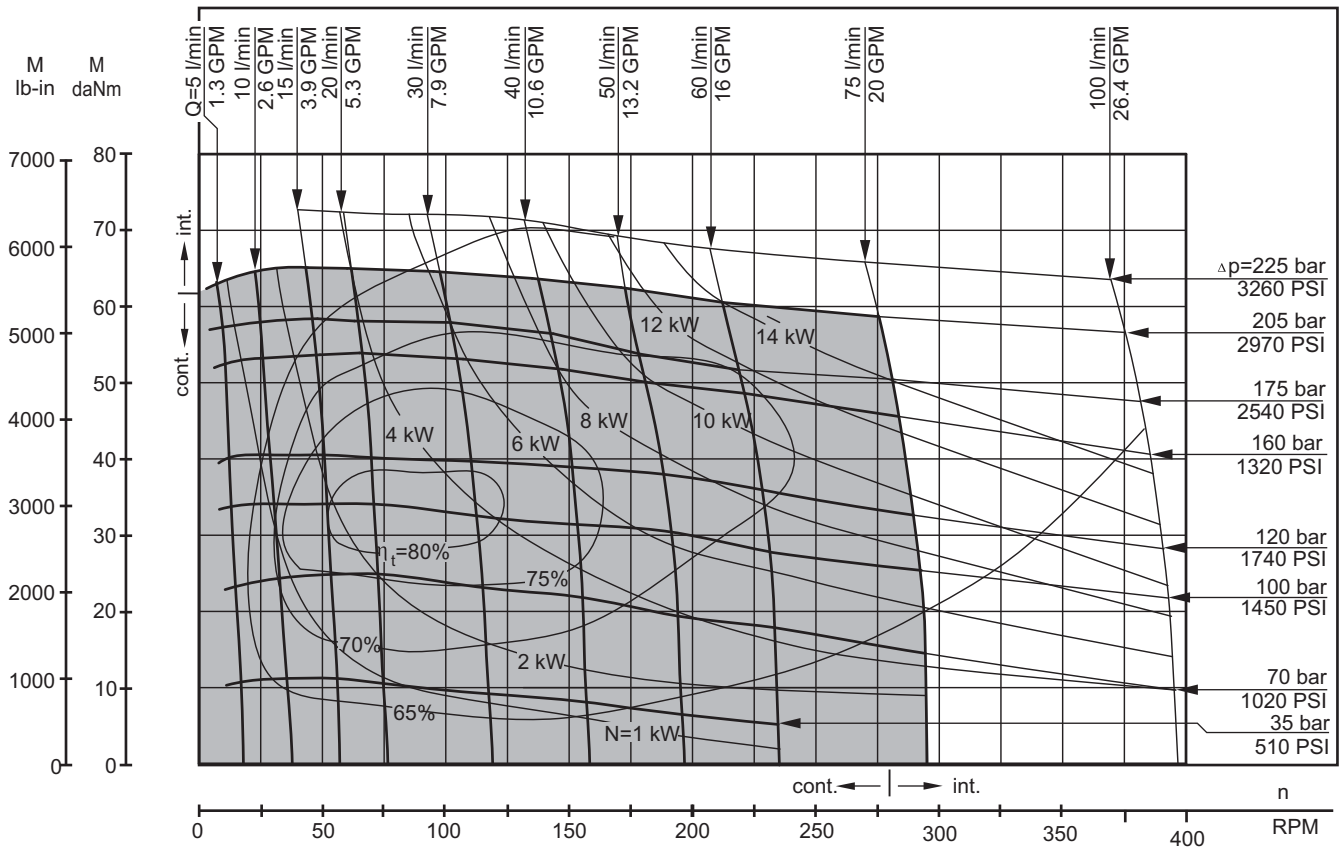
HW 235



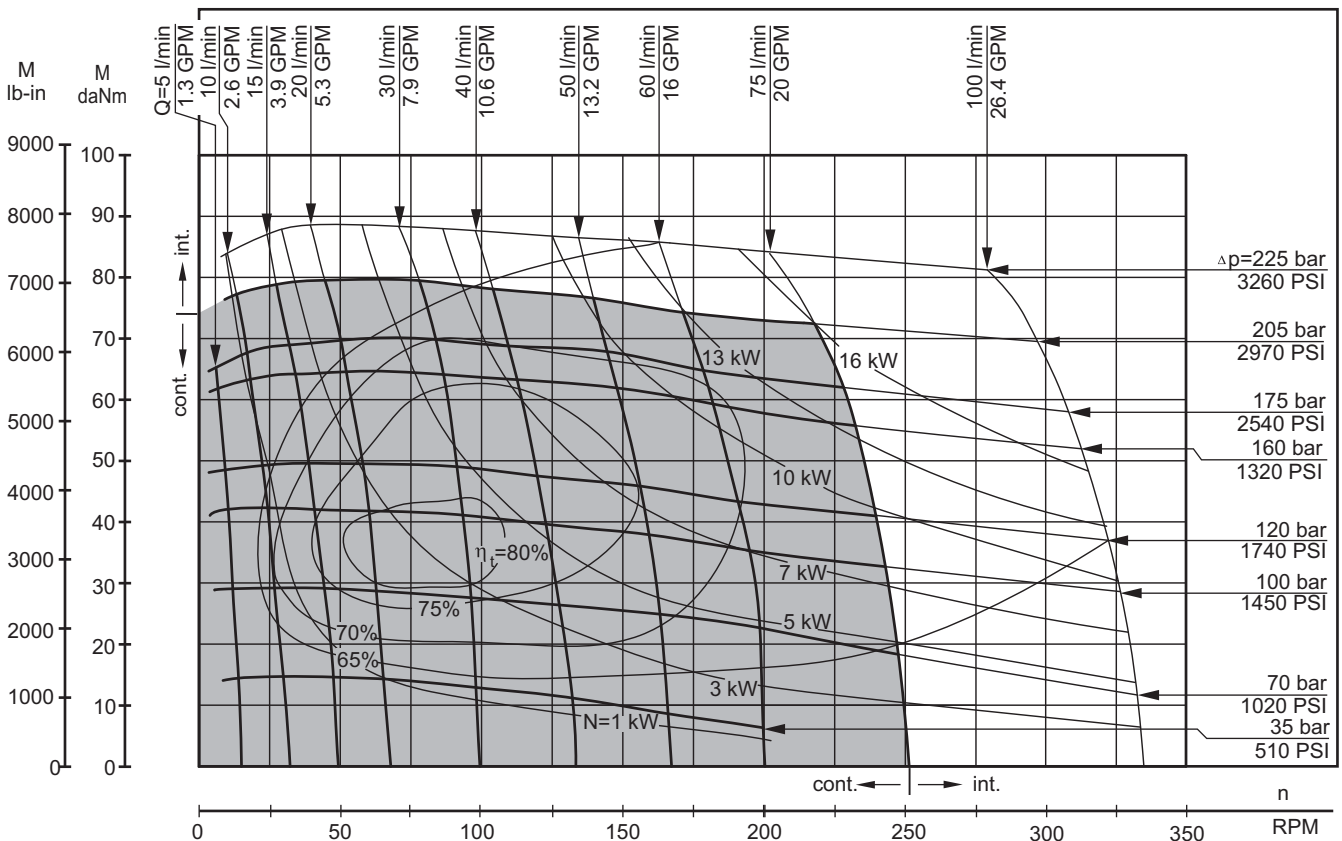
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

HW 250



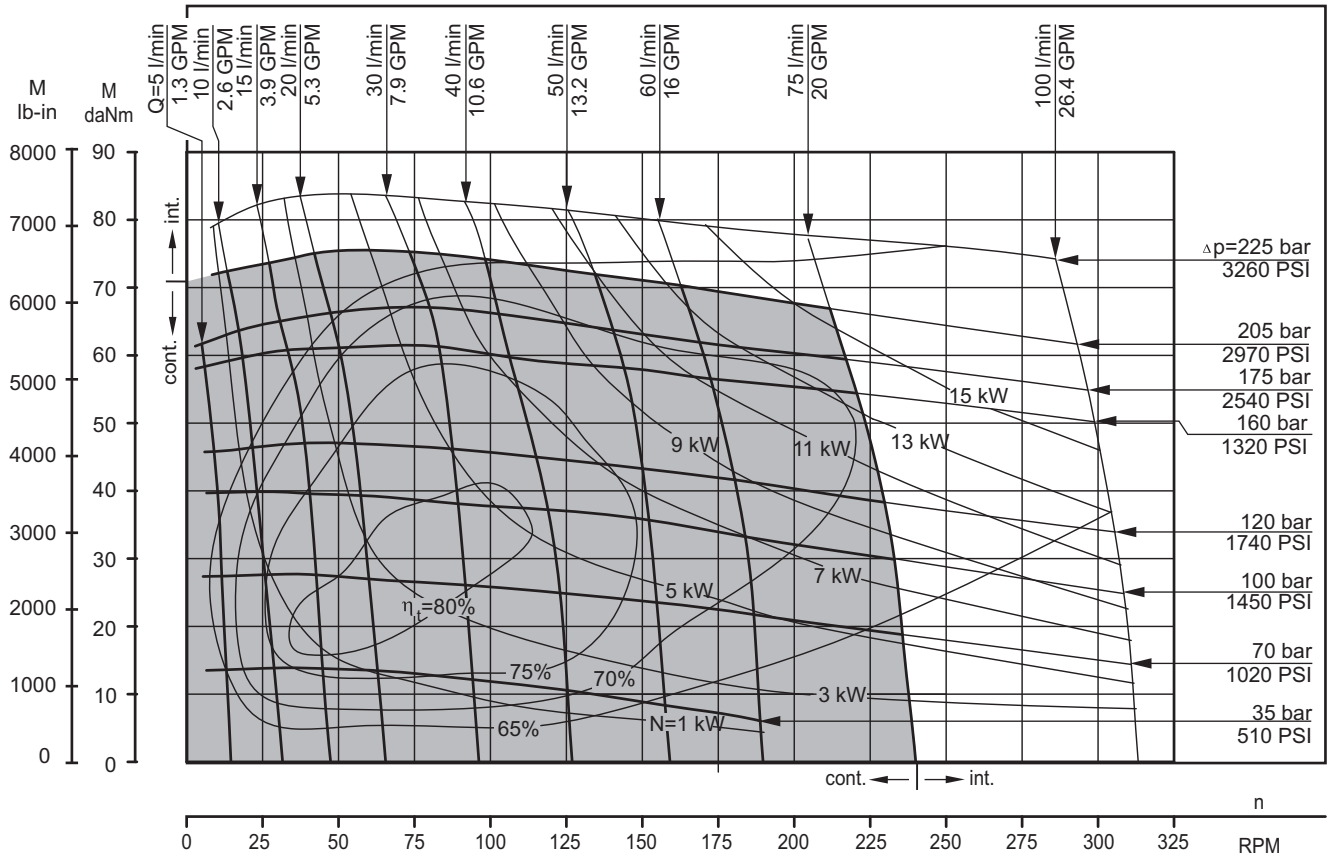
HW 300



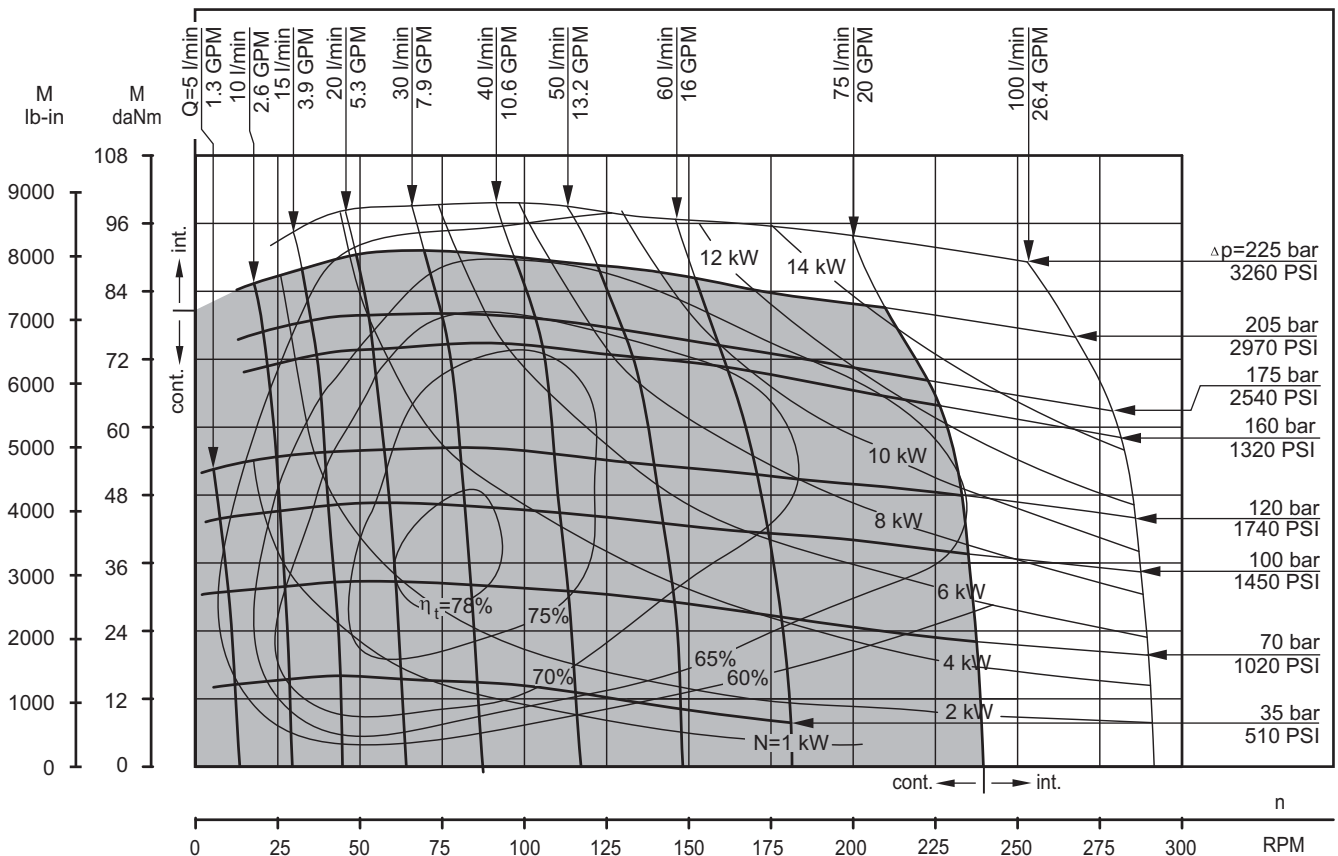
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

HW 315



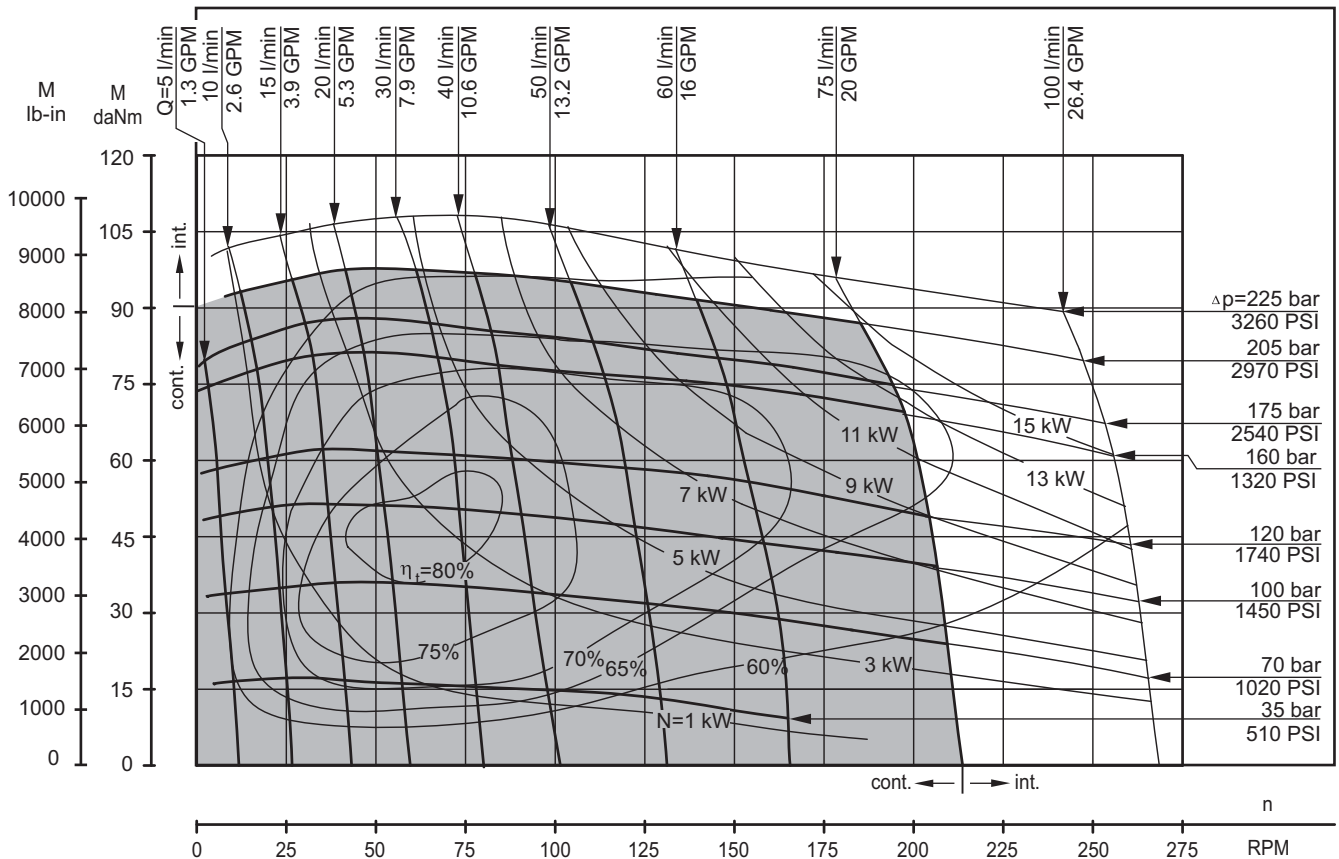
HW 350



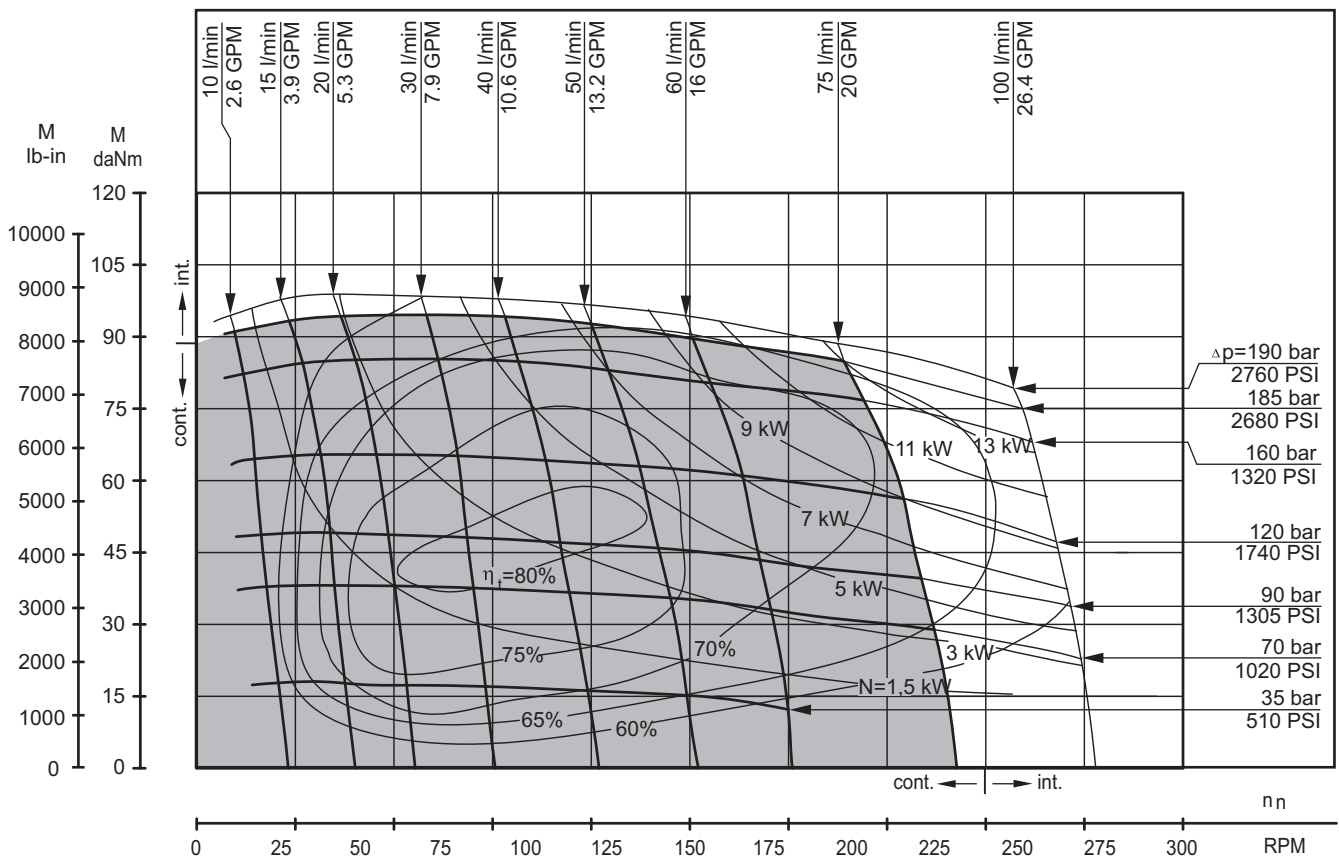
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

HW 370



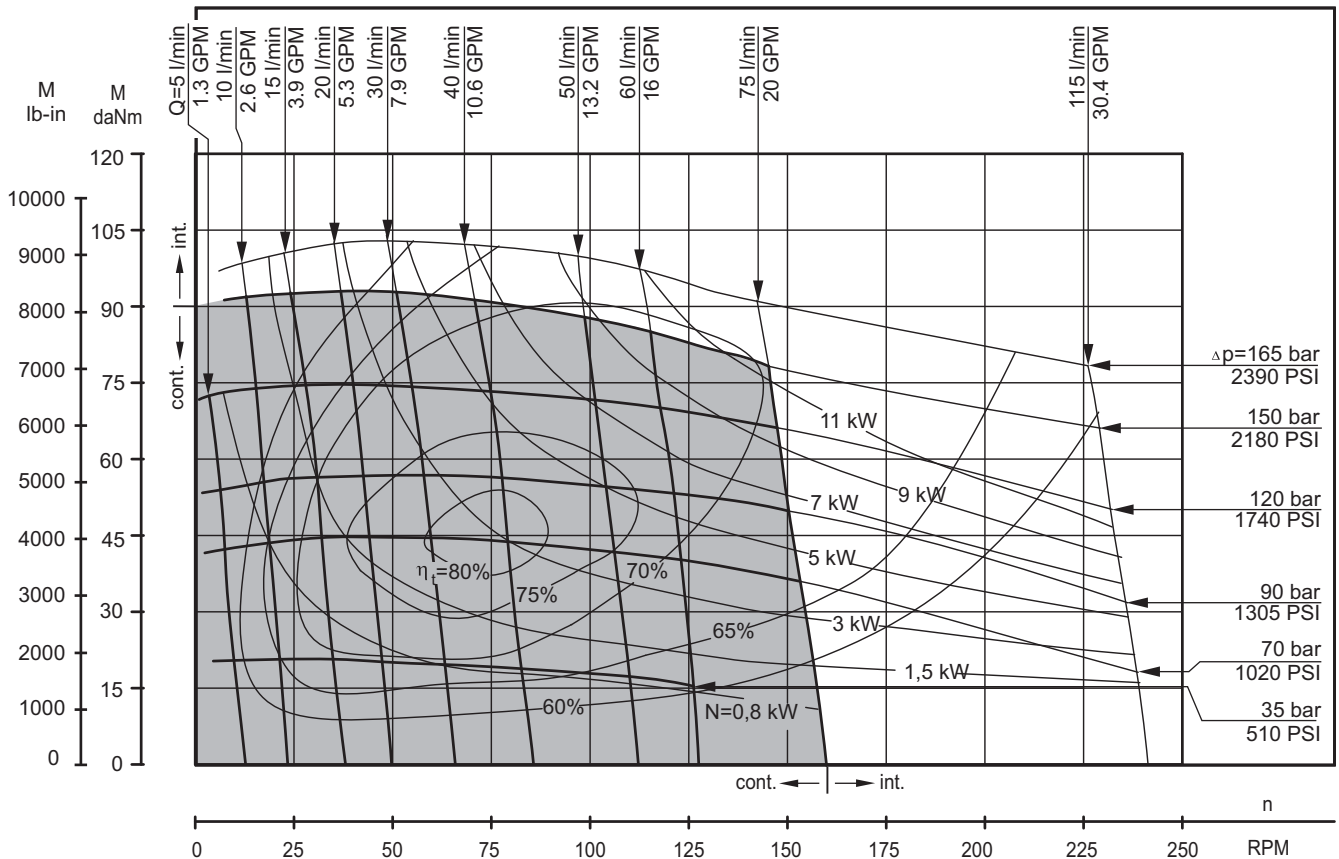
HW 400



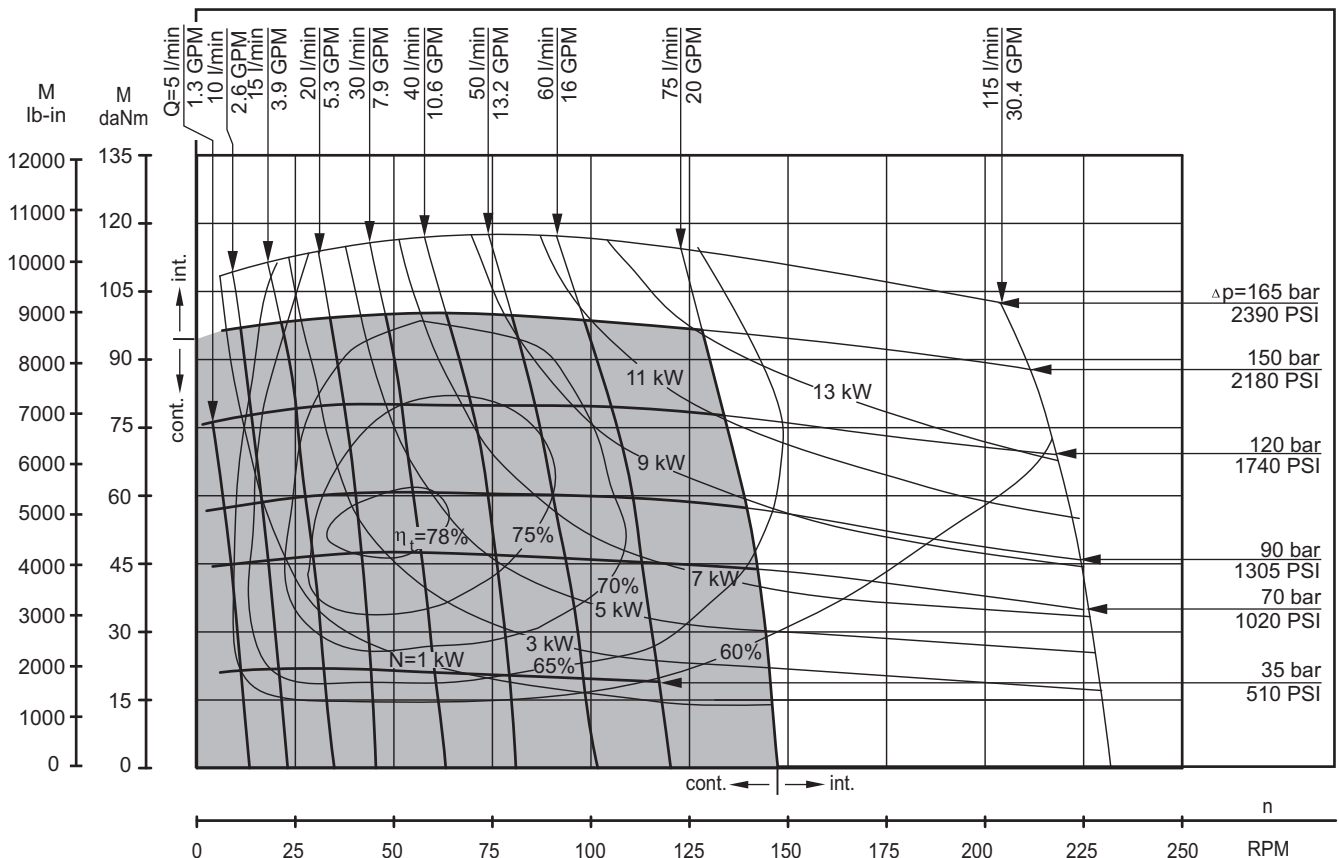
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

HW 470



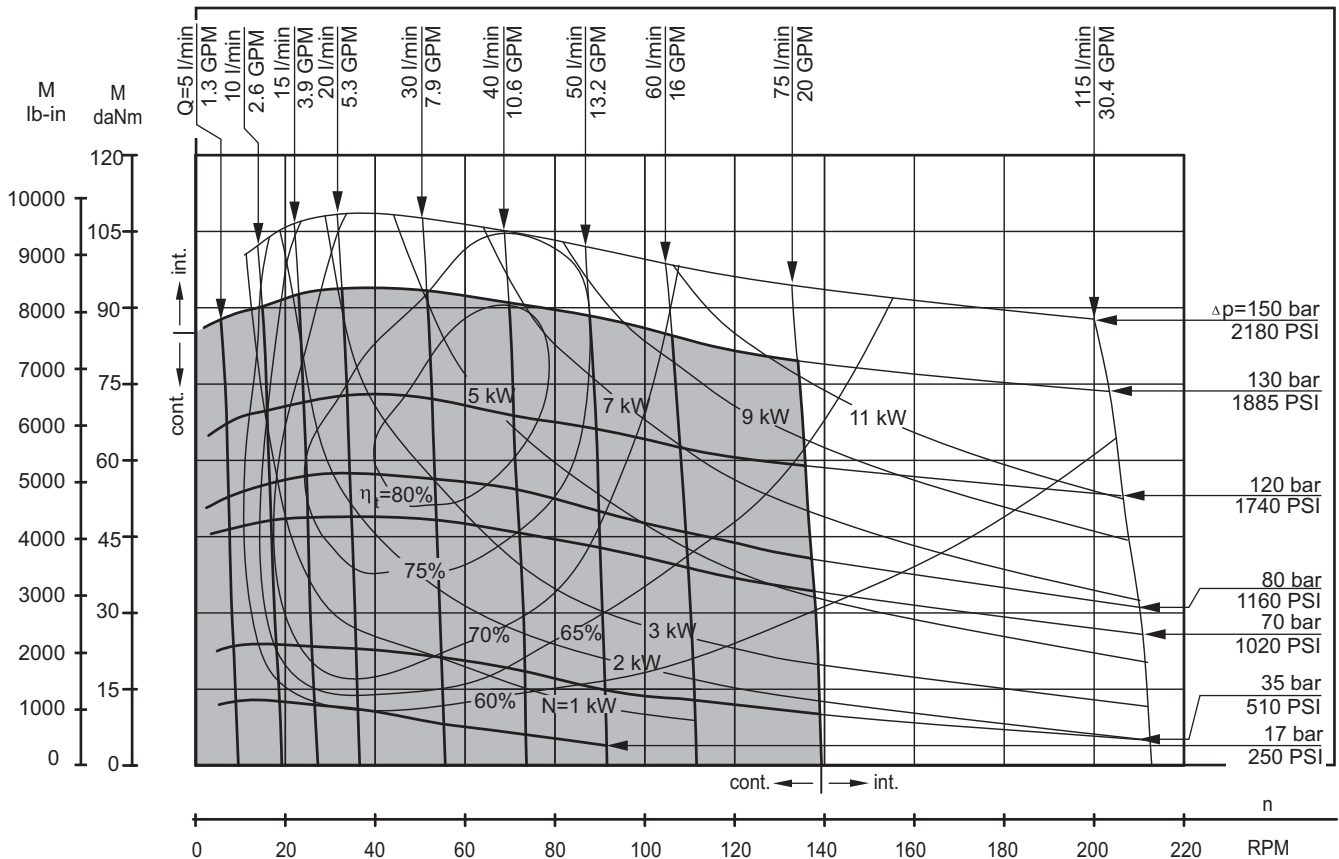
HW 500



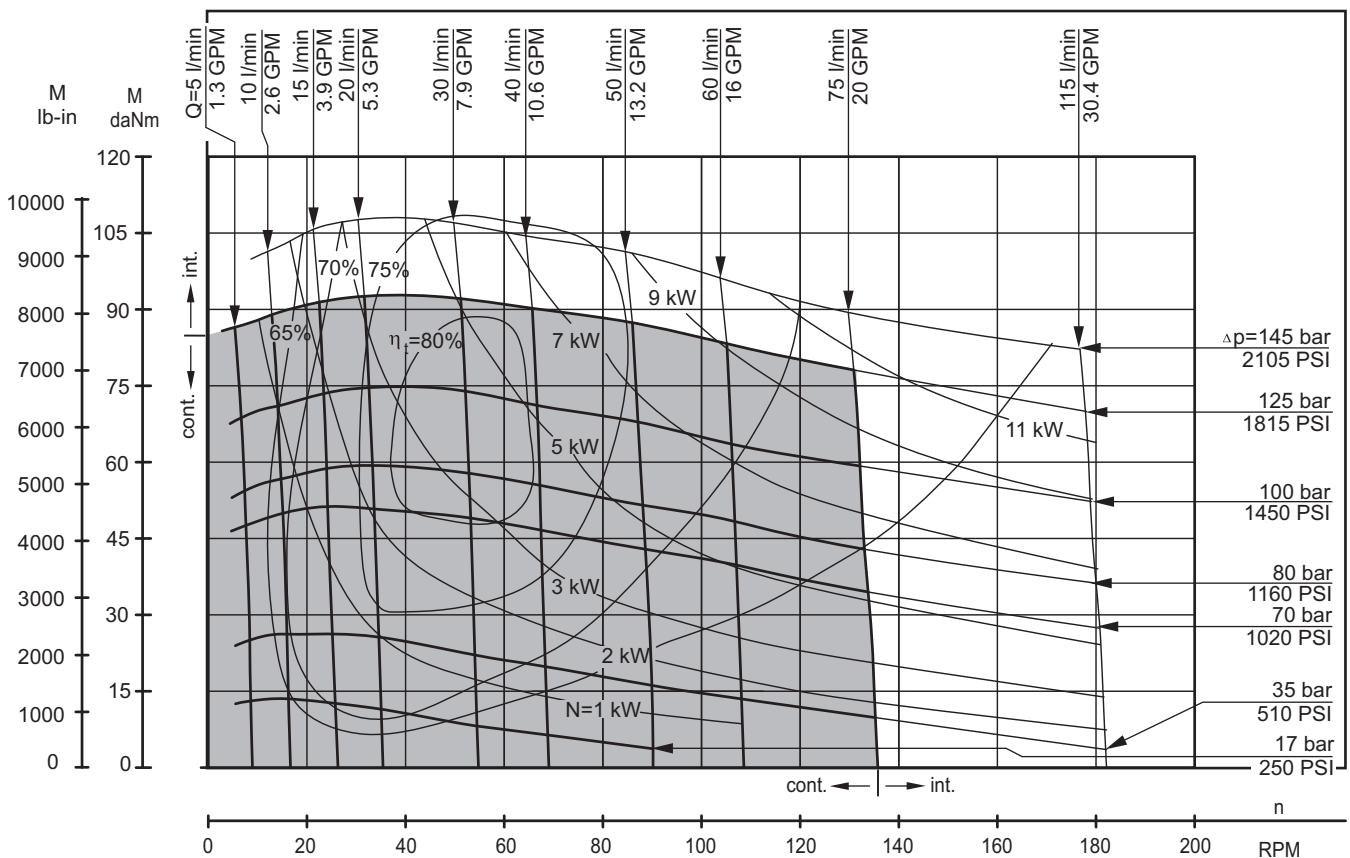
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

HW 535



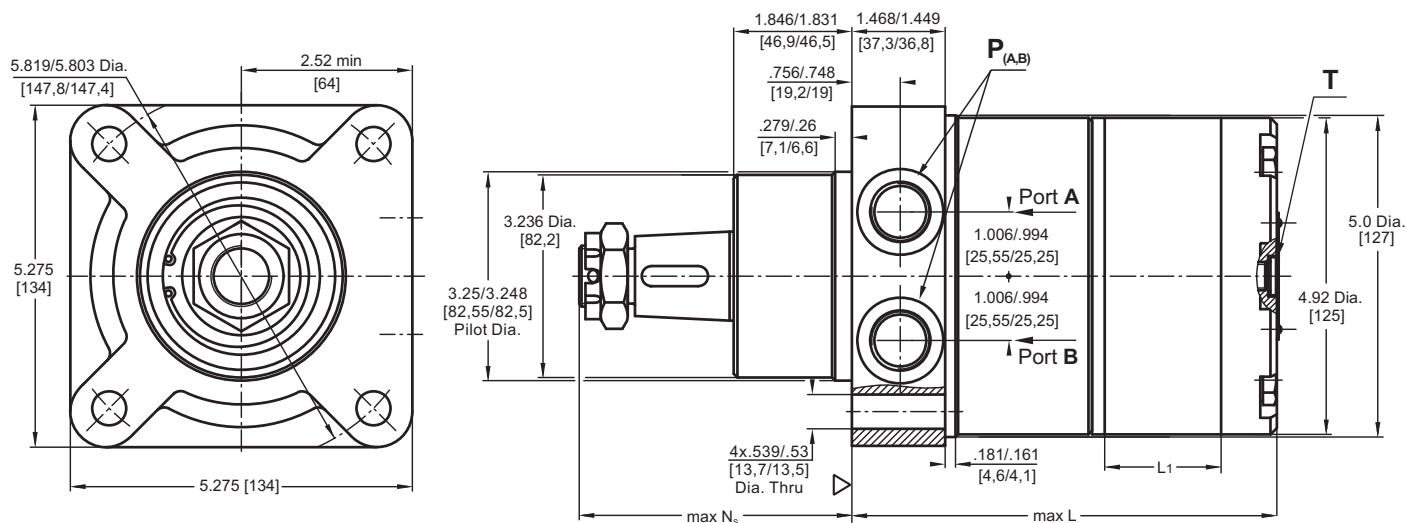
HW 550



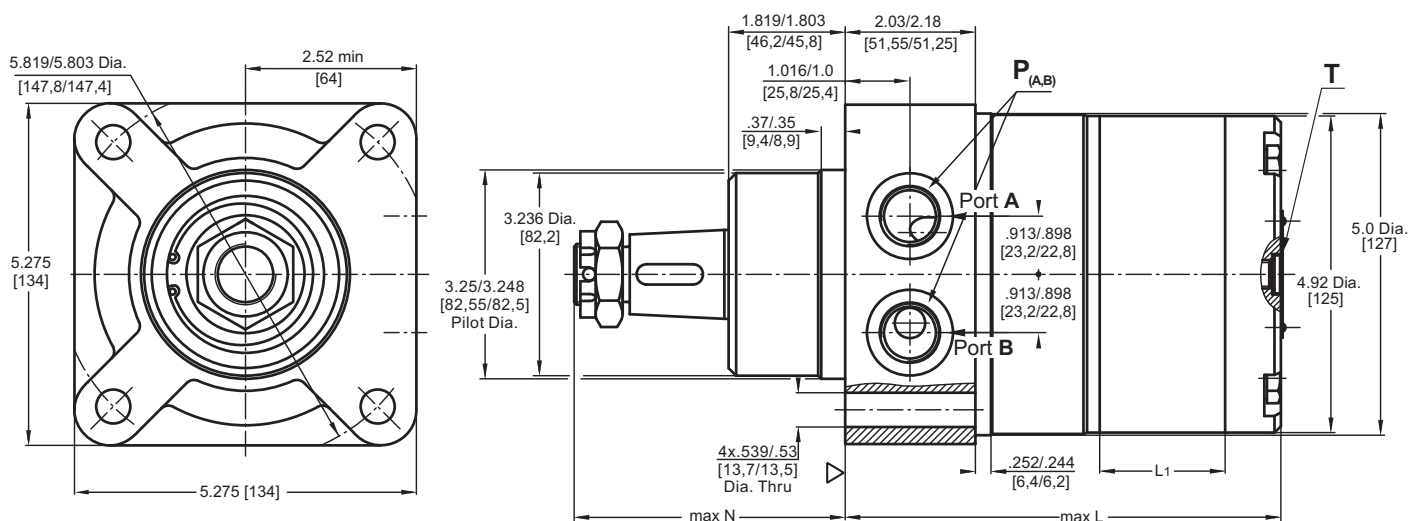
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

DIMENSIONS AND MOUNTING DATA

HWS - Wheel Mount



HW - Wheel Mount



Note: For N and N_s see pages 100+101.

▽ - Motor Mounting Surface

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**

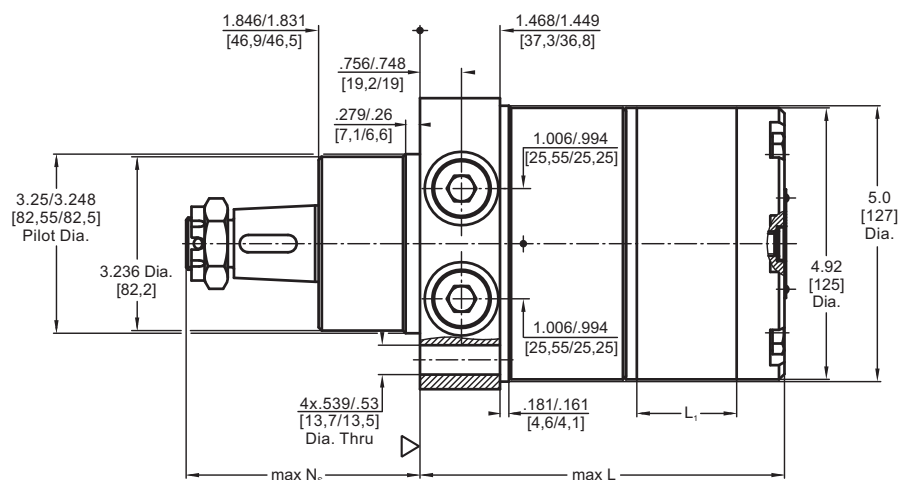
Versions		
	2	4
P _(A,B)	2xG ¹ / ₂	2x ⁷ / ₈ -14UNF, O-ring
T	G ¹ / ₄	⁷ / ₁₆ -20UNF, O-ring



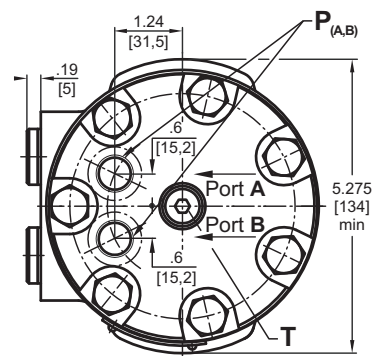
Type	*L, in [mm]	L ₁ , in [mm]
HW(S) 125	5.51 [140,5]	.68 [17,4]
HW(S) 160	5.71 [145,0]	.86 [21,8]
HW(S) 200	5.95 [151,0]	1.09 [27,8]
HW(S) 235	6.12 [155,5]	1.28 [32,5]
HW(S) 250	6.22 [158,0]	1.37 [34,8]
HW(S) 300	6.48 [164,5]	1.63 [41,4]
HW(S) 315	6.56 [166,5]	1.71 [43,5]
HW(S) 350	6.73 [171,0]	1.89 [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]

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

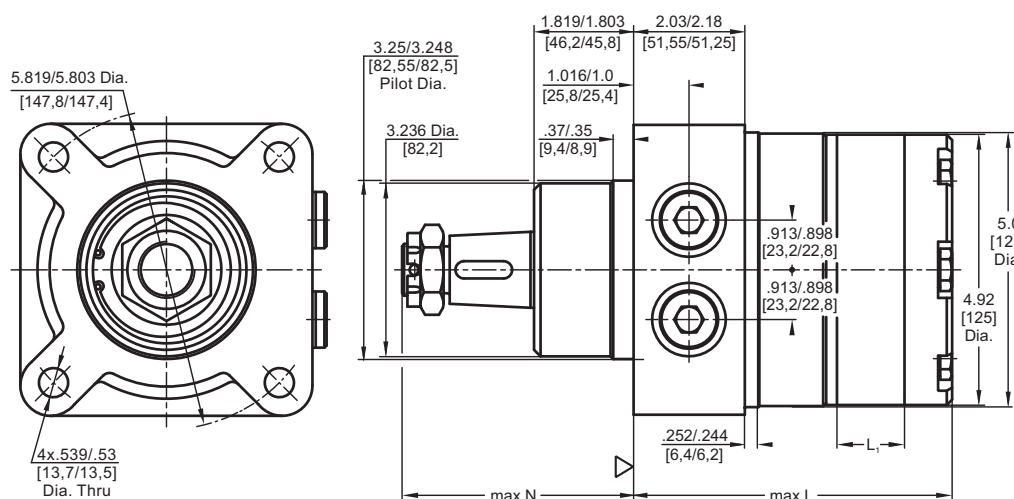
HWSE - Wheel Mount, rear ports



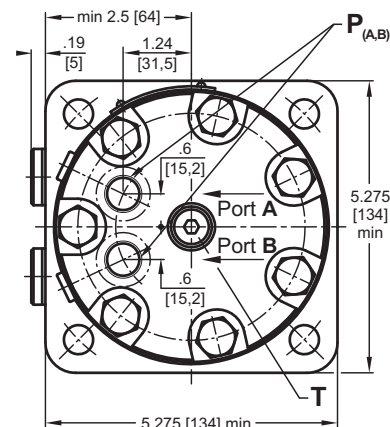
HWFE - Magneto Mount



HWE - Wheel Mount, rear ports



HW(S)E



Type	*L, mm [in]		L _i , mm [in]
	HWE, HWSE	HWFE	
HW... 125	145,5 [5.73]	189,0 [7.44]	17,4 [.68]
HW... 160	150,0 [5.91]	193,5 [7.62]	21,8 [.86]
HW... 200	156,0 [6.14]	199,5 [7.85]	27,8 [1.09]
HW... 235	160,5 [6.32]	204,0 [8.03]	32,5 [1.28]
HW... 250	163,0 [6.42]	206,5 [8.13]	34,8 [1.37]
HW... 300	169,5 [6.67]	213,0 [8.39]	41,4 [1.63]
HW... 315	171,5 [6.75]	215,0 [8.46]	43,5 [1.71]
HW... 350	176,0 [6.93]	219,5 [8.64]	48,0 [1.89]
HW... 370	179,0 [7.05]	222,5 [8.76]	51,0 [2.01]
HW... 400	183,0 [7.20]	226,5 [8.92]	54,8 [2.16]
HW... 470	193,0 [7.60]	236,5 [9.31]	65,0 [2.56]
HW... 500	197,5 [7.78]	241,0 [9.49]	69,4 [2.73]
HW... 535	202,0 [7.95]	245,5 [9.67]	74,1 [2.92]
HW... 550	204,0 [8.03]	247,5 [9.74]	76,0 [2.99]

	Versions	
	5	6
P _(A,B)	2xG 3/8	2x ⁹ / ₁₆ -18 UNF O-ring
T	G 1/4	⁷ / ₁₆ -20 UNF, O-ring

Note: For N and N_s see pages 100÷101.

▽ - Motor Mounting Surface

Standard Rotation

Viewed from Shaft End

Port A Pressurized - CW

Port **B** Pressurized - **CCW**

Reverse Rotation

Viewed from Shaft End

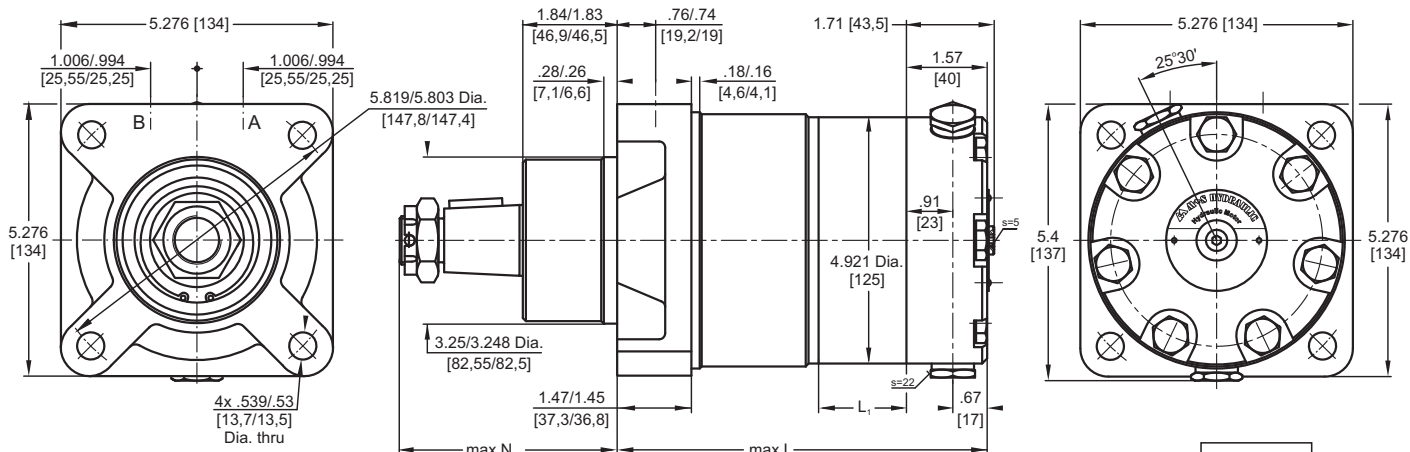
Port A Pressurized - CCW

Port **B** Pressurized - **CW**

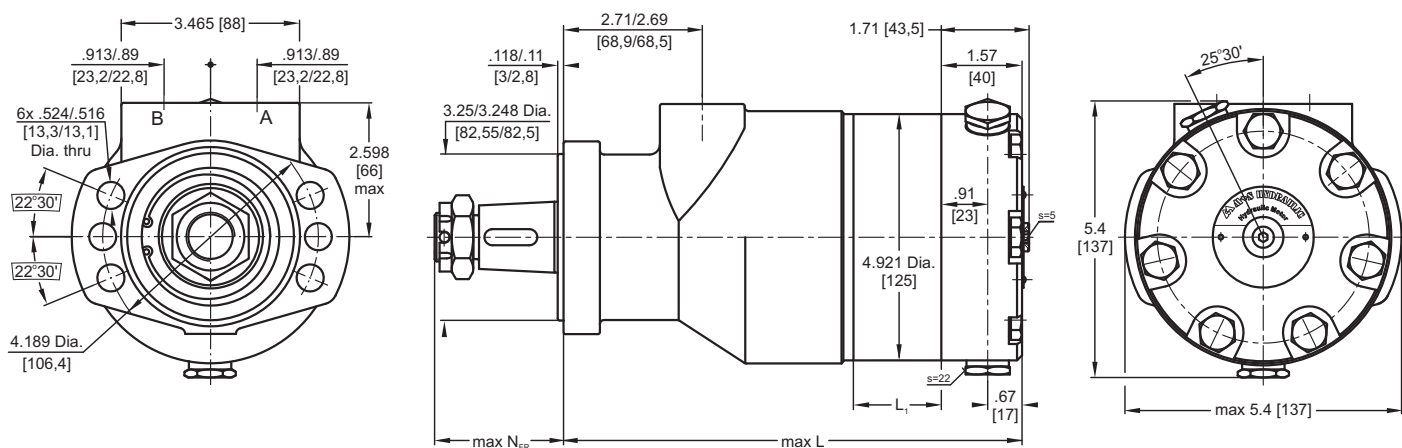
* For **LSV** option the dimension **L** is 3 mm [.118 in] greater.

DIMENSIONS AND MOUNTING DATA

HWSR - Wheel mount, relief valves



HWFR - Wheel mount, six holes, relief valves



Note: For N_{FR} and N_{SR} see pages 100+101.

▽ - Motor Mounting Surface

Standard Rotation

Viewed from Shaft End

Port A Pressurized - CW

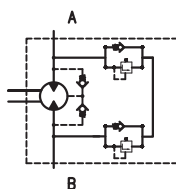
Port B Pressurized - CCW

Reverse Rotation

Viewed from Shaft End

Port A Pressurized - CCW

Port B Pressurized - CW

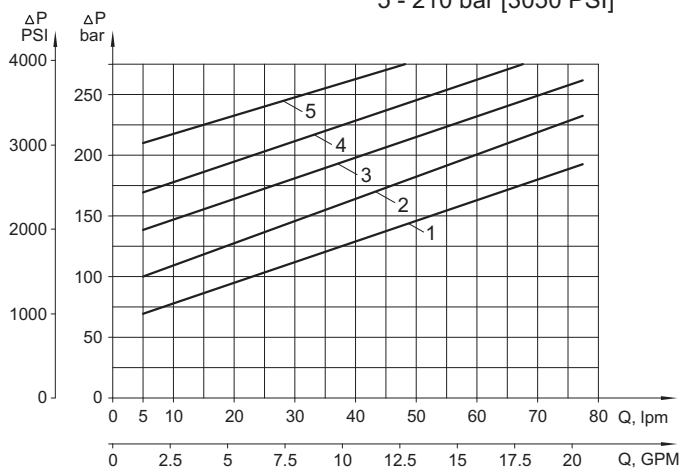


Versions		
	2	4
$P_{(A,B)}$	2xG $\frac{1}{2}$	2x $\frac{7}{8}$ -14UNF, O-ring

Type	L*max,in [mm]		L _i ,in [mm]
	HWSR	HWFR	
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]

Rated Pressure

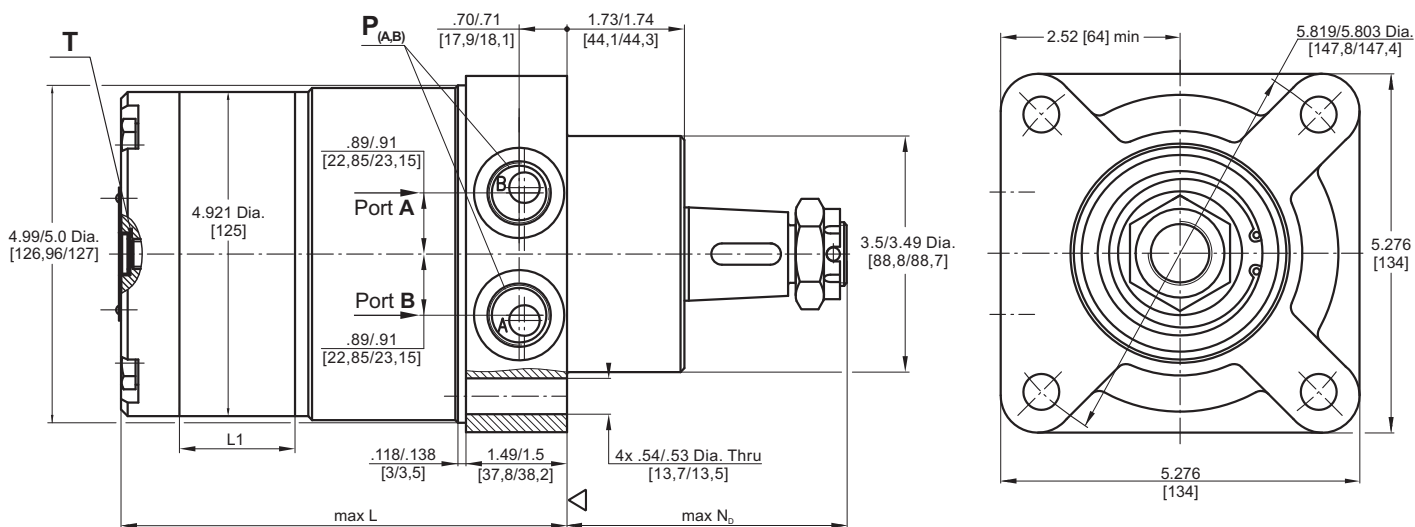
- 1 - 70 bar [1015 PSI]
- 2 - 100 bar [1450 PSI]
- 3 - 140 bar [2030 PSI]
- 4 - 170 bar [2470 PSI]
- 5 - 210 bar [3050 PSI]



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

DIMENSIONS AND MOUNTING DATA

HWD Wheel Mount



Versions		
	2	4
P _(A,B)	2xG $\frac{1}{2}$	2x $\frac{7}{8}$ -14UNF, O-ring
T	G $\frac{1}{4}$	$\frac{7}{16}$ -20UNF, O-ring

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

Type	*L, in [mm]		L _i , in [mm]
	HWD	HWV	
HW... 125	5.59 [142,0]	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]

Note: For N_D and N_V see pages 100÷101.

▽ - Motor Mounting Surface

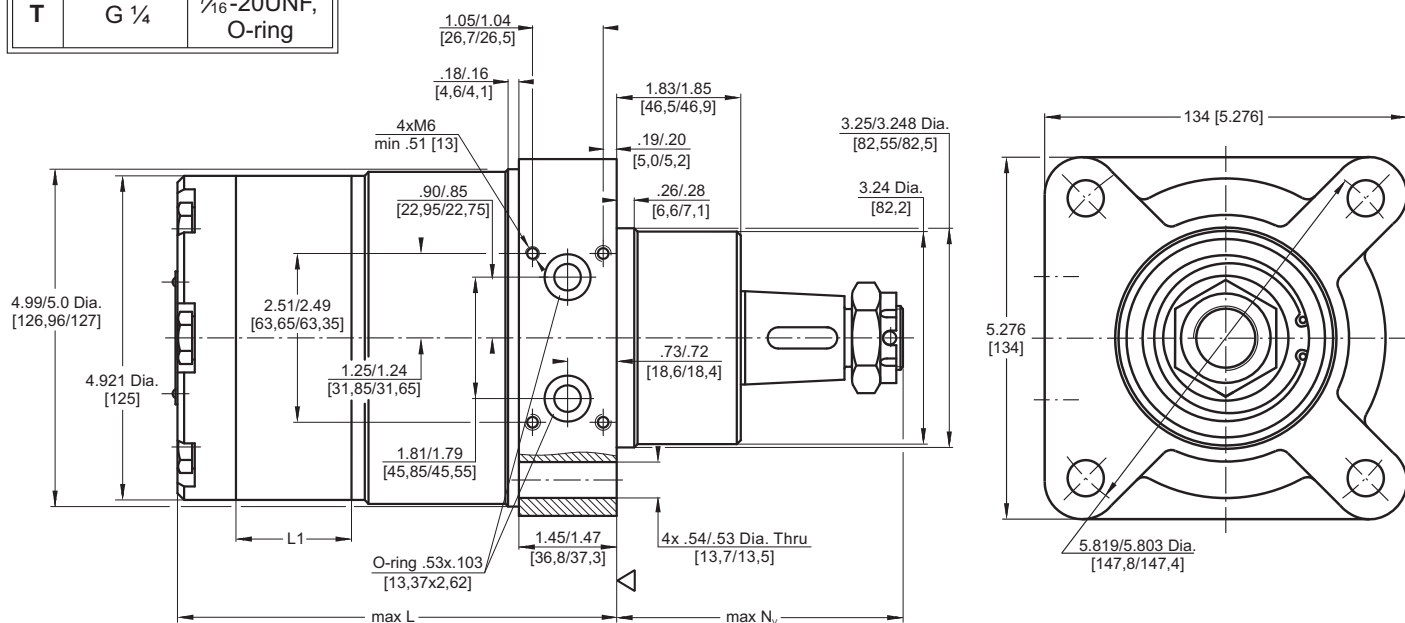


Standard Rotation
Viewed from Shaft End
Port A Pressurized - CW
Port B Pressurized - CCW

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

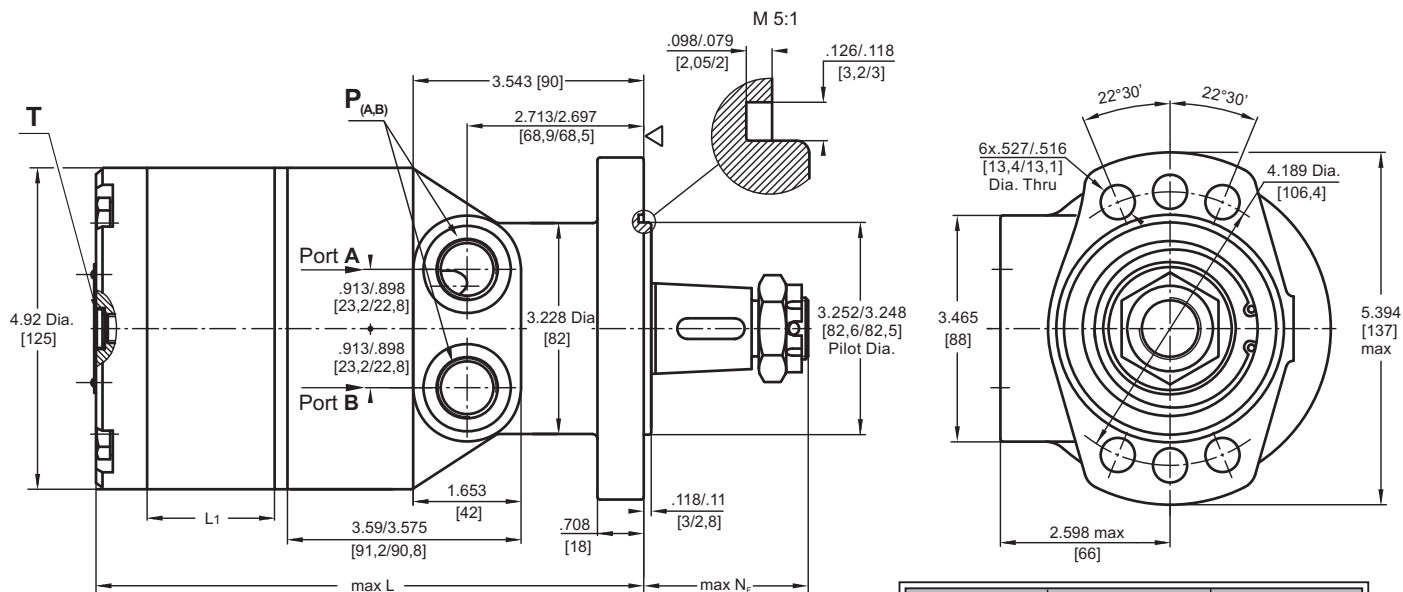
Versions		
	2	4
T	G $\frac{1}{4}$	$\frac{7}{16}$ -20UNF, O-ring

HWV Wheel Mount



DIMENSIONS AND MOUNTING DATA

HWF - Magneto Mount



Note: For N_F see pages 100÷101.

▽ - Motor Mounting Surface

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
$P_{(A,B)}$	2xG $\frac{1}{2}$	2x $\frac{7}{8}$ -14UNF, O-ring
T	G $\frac{1}{4}$	$\frac{7}{16}$ -20UNF, O-ring



Type	*L, in [mm]	L1, in [mm]
HWF 125	7.24 [184,0]	.68 [17,4]
HWF 160	7.42 [188,5]	.86 [21,8]
HWF 200	7.66 [194,5]	1.09 [27,8]
HWF 235	7.84 [199,0]	1.28 [32,5]
HWF 250	7.93 [201,5]	1.37 [34,8]
HWF 300	8.20 [208,0]	1.63 [41,4]
HWF 315	8.27 [210,0]	1.71 [43,5]
HWF 350	8.45 [214,5]	1.89 [48,0]
HWF 370	8.56 [217,5]	2.01 [51,0]
HWF 400	8.72 [221,5]	2.16 [54,8]
HWF 470	9.11 [231,5]	2.56 [65,0]
HWF 500	9.29 [236,0]	2.73 [69,4]
HWF 535	9.47 [240,5]	2.92 [74,1]
HWF 550	9.55 [242,5]	2.99 [76,0]

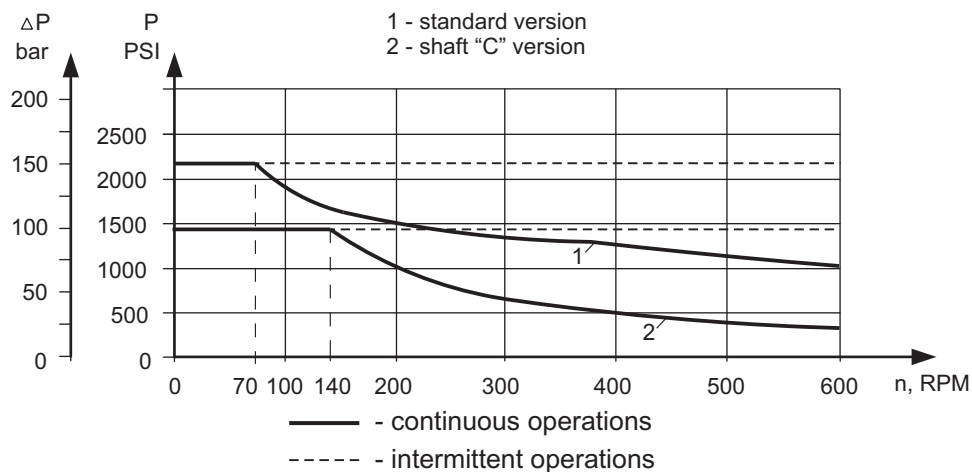
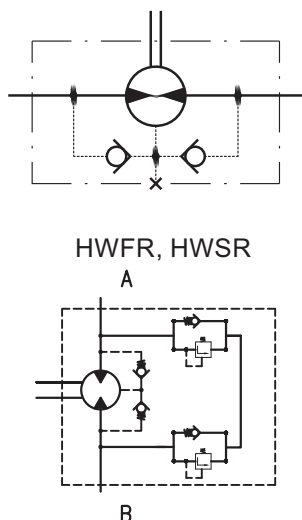
* For **LSV** option the dimension **L** is
.118 in [3 mm] greater.

MAX. PERMISSIBLE SHAFT SEAL PRESSURE

HW, HWF, HWS, HWD, HWV

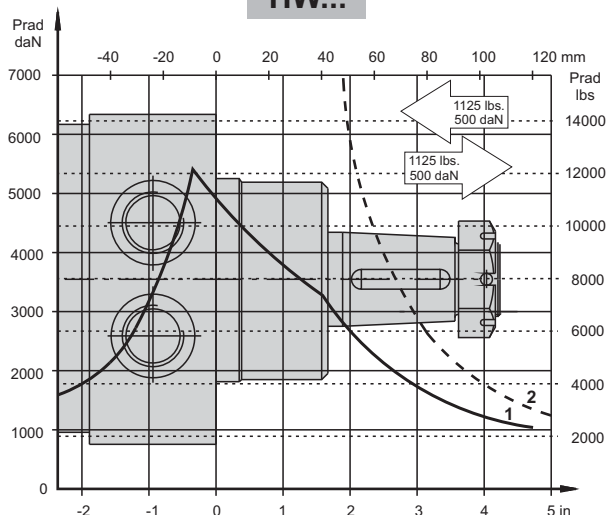
HW... motors with drain connection:

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

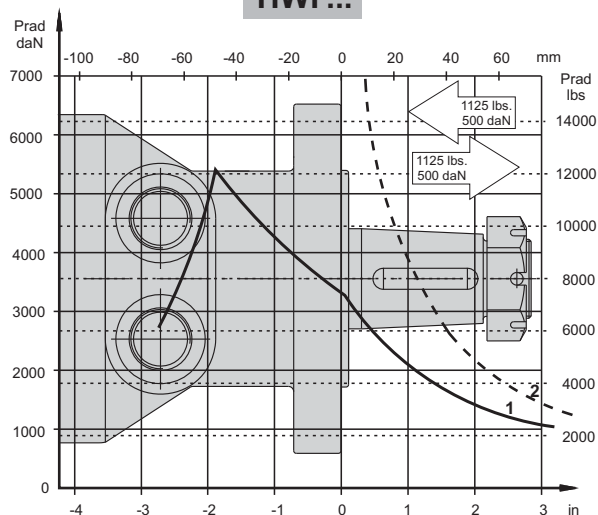


PERMISSIBLE SHAFT LOADS

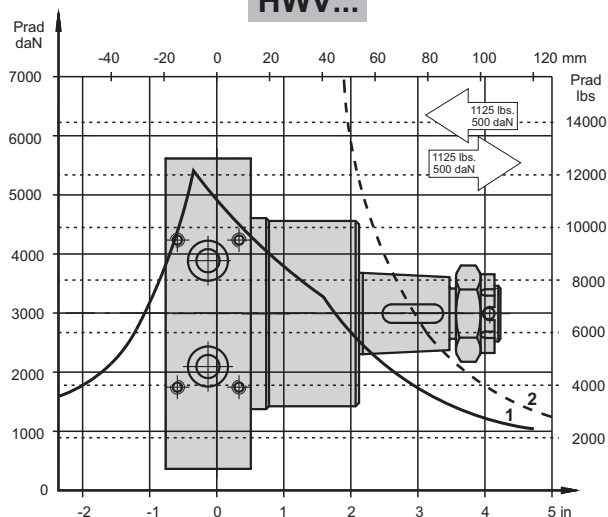
HW...



HWF...



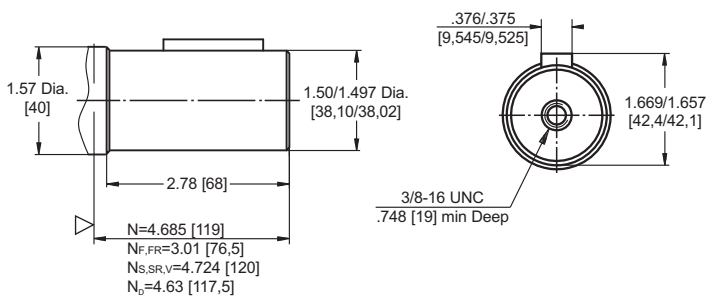
HWV...



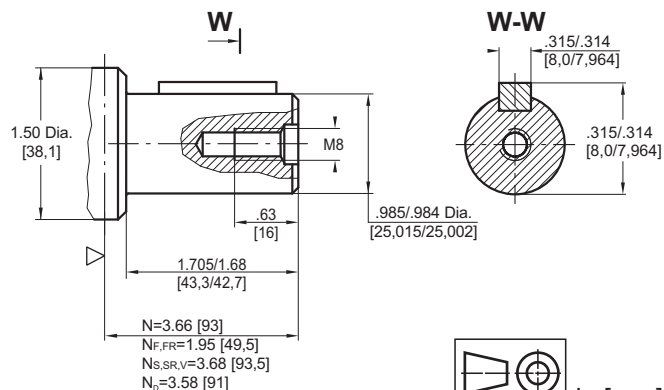
- 1 - Bearing curve: The curve applies to a B10 bearing life of 2000 hours at 100 RPM.
2 - Shaft curve: The curve represents Max. permissible radial shaft load with safety factor 3:1.

SHAFT EXTENSIONS

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



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



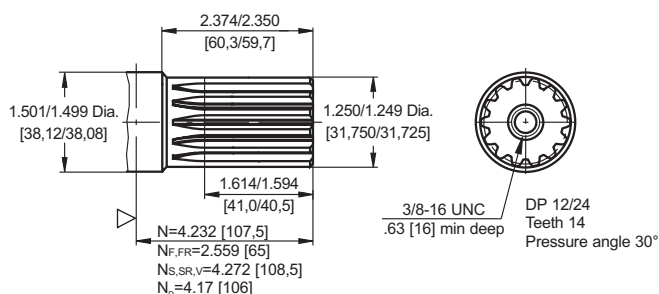
N - for standard flange
NF - for F flange
NFR - for FR flange
NS - for S flange
NSR - for SR flange
ND - for D flange
NV - for V flange



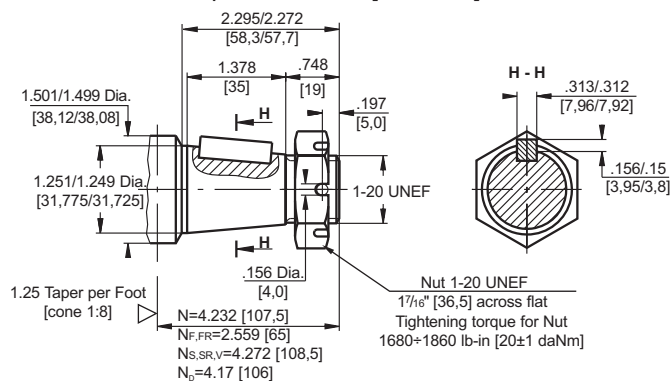
▽ - Motor Mounting Surface

SHAFT EXTENSIONS [continued]

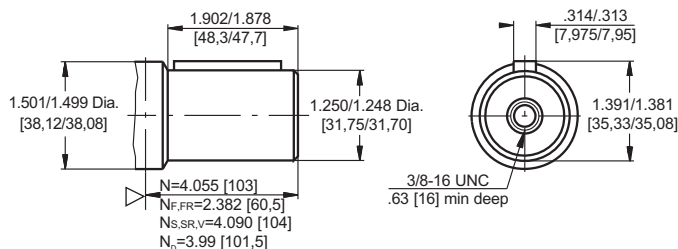
L - 1¼" [31,75] splined 14T, ANSI B92.1-1976
Max. Torque 8410 lb-in [95 daNm]



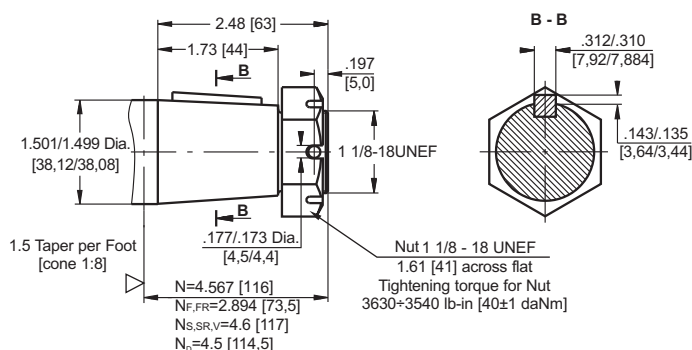
R - 1¼" [31,75] SAE J501 Tapered, Parallel key 5/16"x5/16"x1" BS46
Max. Torque 6815 lb-in [77 daNm]



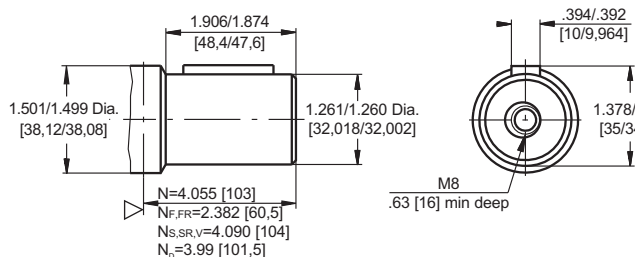
K - 1¼" [31,75] straight, Parallel key 5/16"x5/16"x1½" BS46
Max. Torque 6815 lb-in [77 daNm]



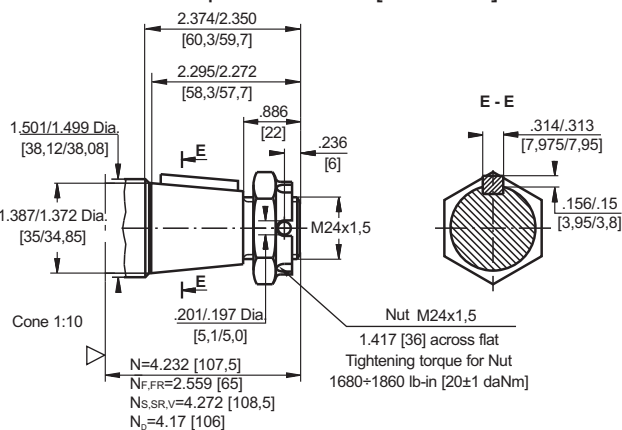
T - 1½" [38,1] Tapered, Parallel key 5/16"x5/16"x1¼" BS46
Max. Torque 10630 lb-in [120 daNm]



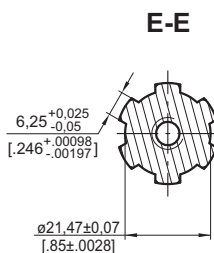
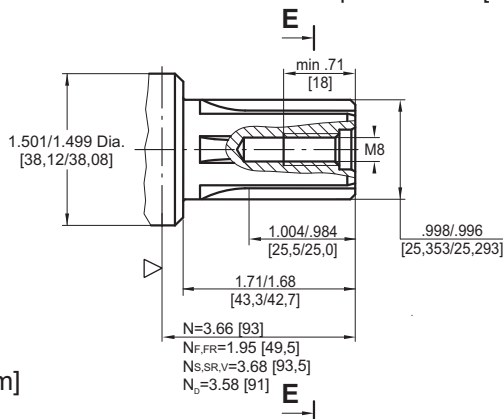
M - ø32 straight, Parallel key A10x8x32 DIN 6885
Max. Torque 6815 lb-in [77 daNm]



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



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



▽ - Motor Mounting Surface

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

ORDER CODE

	1	2	3	4	5	6	7
HW						/	

Pos.1 - Mounting Flange

omit	- Wheel mount, four holes
E	- Wheel mount, four holes, rear ports
F	- Oval mount, six holes
FR	- Oval mount, six holes, relief valves
FE	- Oval mount, six holes, rear ports
S	- Wheel mount, four holes
SR	- Wheel mount, four holes, relief valves
SE	- Wheel mount, four holes, rear ports
D	- Wheel mount, four holes; mounting on ø88,8 [3.5]
V*	- Wheel mount, four holes, valves

Pos.2 - Displacement code

125	- 126,0 cm ³ /rev [7.69 in ³ /rev]
160	- 158,0 cm ³ /rev [9.64 in ³ /rev]
200	- 201,3 cm ³ /rev [12.28 in ³ /rev]
235	- 235,0 cm ³ /rev [14.33 in ³ /rev]
250	- 252,0 cm ³ /rev [15.37 in ³ /rev]
300	- 300,0 cm ³ /rev [18.30 in ³ /rev]
315	- 314,9 cm ³ /rev [19.21 in ³ /rev]
350	- 347,8 cm ³ /rev [21.21 in ³ /rev]
370	- 369,0 cm ³ /rev [22.51 in ³ /rev]
400	- 396,8 cm ³ /rev [24.20 in ³ /rev]
470	- 470,6 cm ³ /rev [28.71 in ³ /rev]
500	- 502,4 cm ³ /rev [30.65 in ³ /rev]
535	- 536,0 cm ³ /rev [32.70 in ³ /rev]
550	- 550,0 cm ³ /rev [33.55 in ³ /rev]

Pos.3 - Shaft Extensions**

K	- 1¼" [31,75] straight, Parallel key ⁵ / ₁₆ "x ⁵ / ₁₆ "x1½" BS46
KB	- ø35 tapered 1:10, Parallel key ⁵ / ₁₆ "x ⁵ / ₁₆ "x1¼" BS46
L	- 1¼" [31,75] splined 14T, ANSI B92.1-1976
M	- ø32 straight, Parallel key A10x8x32 DIN 6885
R	- 1¼" [31,75] Tapered 1:8, Parallel key ⁵ / ₁₆ "x ⁵ / ₁₆ "x1¼" BS46
T	- 1½" [38,1] Tapered 1:8, Parallel key ⁵ / ₁₆ "x ⁵ / ₁₆ "x1¼" BS46
C	- 1½" [38,1] straight, Parallel key ³ / ₈ "x ³ / ₈ "x1½" BS46
CO	- ø25, straight, Parallel key A8x7x32 DIN 6885
SH	- ø1" 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***	- rear ports, 2xG3/8, G1/4, BSP thread, ISO 228
6***	- rear ports, 2x9/16-18 UNF, O-ring, 7/16-20 UNF

Pos.5 - Special Features****, ***** [see page 103]

Pos.6 - Valves Pressure Range, bar*****

/	- 70, 100, 140, 170, 210
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Pos.7 - Design Series

omit	- Factory specified
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NOTES:

- * Flange **V** is for versions 2 and 4 - drainage only!
- ** The permissible output torque for shafts must not be exceeded!
- *** For **E**-version only!
- **** If the code on pos.5 is not specified in the order, it will be considered as LL-option.
- ***** Colour at customer's request.
- ***** For **SR** and **FR** only!

E-version is 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	-
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	-
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	O	O	O	O	O	O	O	O	O	O	O	O
	PCS												
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 104÷105.

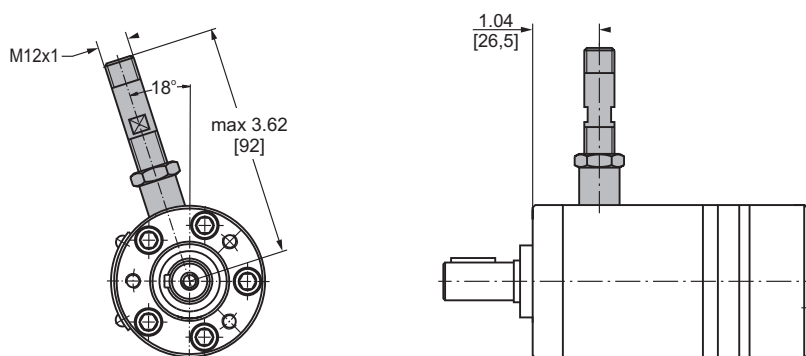
** Colour at customer's request.

*** Non painted feeding surfaces, colour at customer's request.

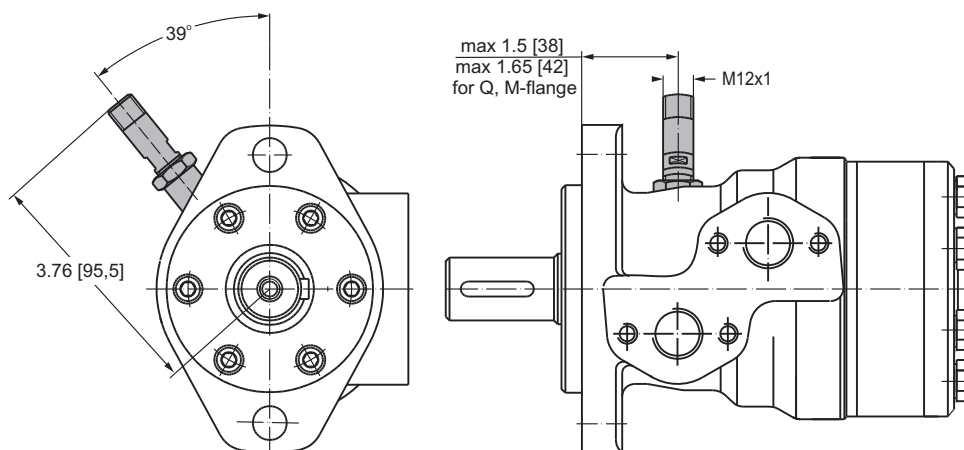
**** Without check valves for "U" shaft seal versions.

MOTORS WITH SPEED SENSOR

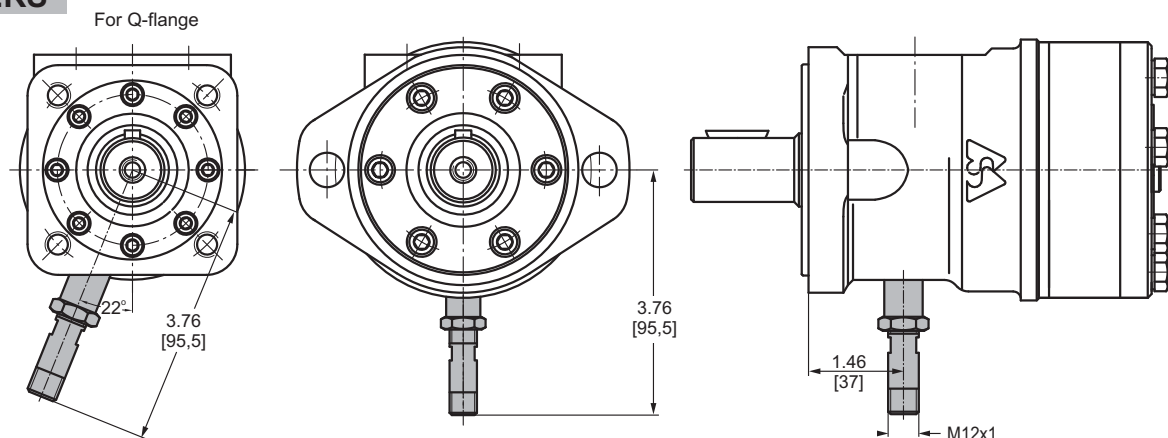
MLHM...RS



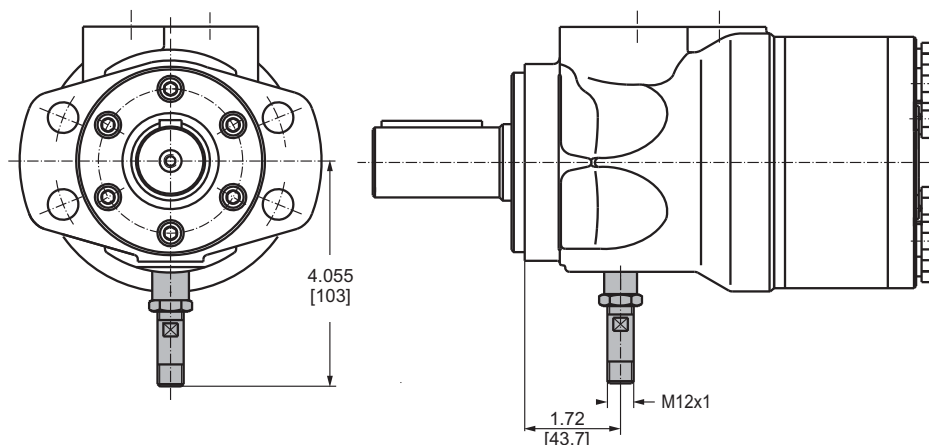
MLHP...RS MLHR...RS



HP...RS HR...RS

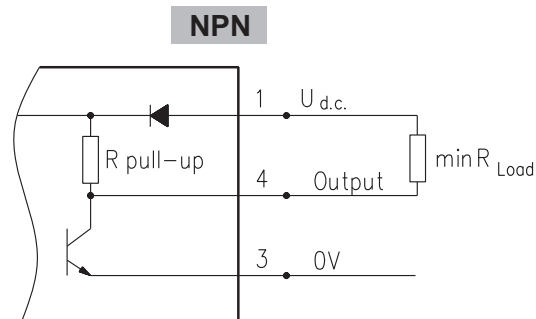
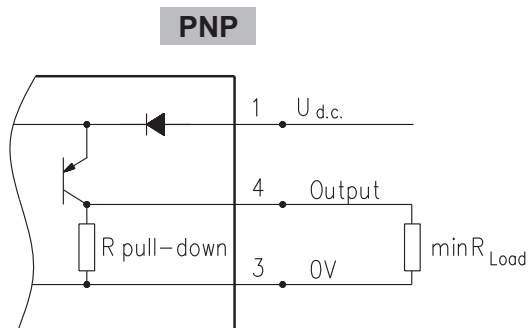


MLHH...RS



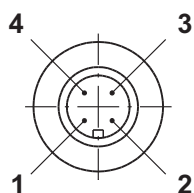
TECHNICAL DATA OF THE SPEED SENSOR

Wiring diagrams



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

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

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

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:

$$FA = \frac{v_{ml} \times G}{22 \times t}, [\text{lbs}]; \quad FA = \frac{v_{km} \times G}{3,6 \times t}, [\text{daN}]$$

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

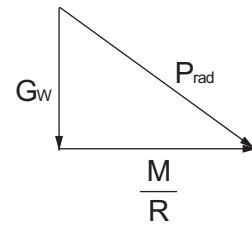
9.Radial motor loading: P_{rad} , lbs [daN]

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.

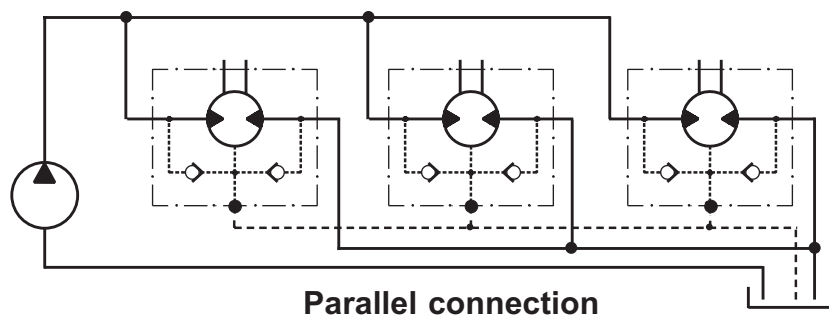
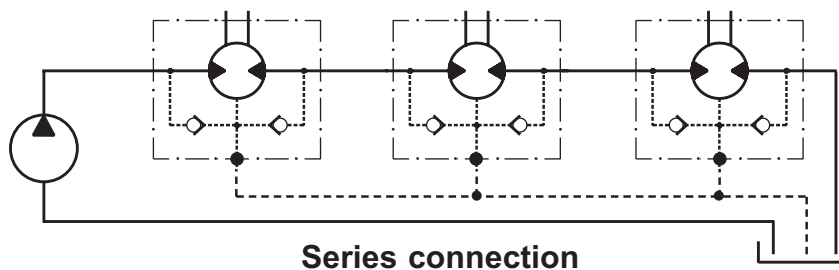


$$P_{rad} = \sqrt{G_w^2 + \left(\frac{M}{R}\right)^2}$$

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.



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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