



M+S HYDRAULIC

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

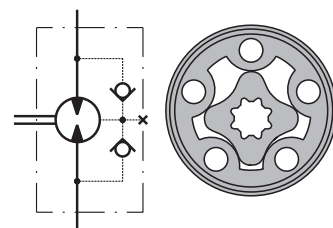


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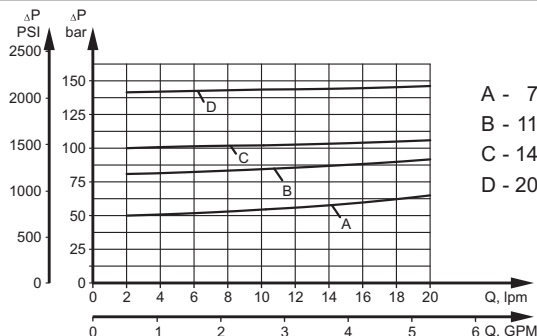
APPLICATION

- » 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]

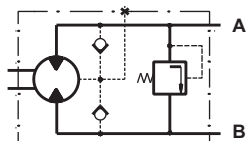


OPTIONS

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

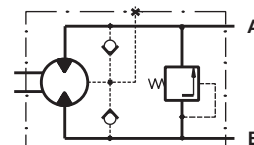
MLHMP Series with Integrated Internal Crossover Relief Valve

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

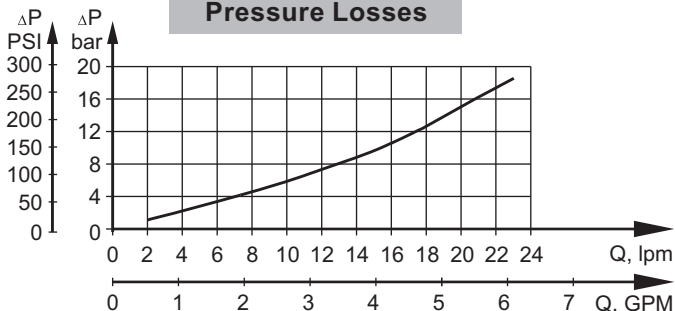


MLHMP Series with Integrated Internal Crossover Relief Valve

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

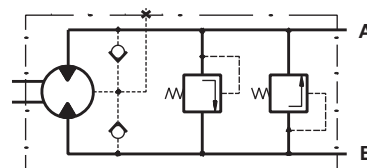


Pressure Losses



MLHMD Series with Integrated Internal Crossover Relief Valves

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



GENERAL

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

SPECIFICATION DATA

| Type | | MLHM 8 | MLHM 12.5 | MLHM 20 | MLHM 32 | MLHM 40 | MLHM 50 |
|--|---------------------------|------------|--------------|-------------|-------------|-------------|------------|
| Displacement, in³/rev [cm³/rev] | | .50 [8,2] | .77 [12,5] | 1.22 [19,9] | 1.93 [31,6] | 39,8 [39,8] | 3.08 [50] |
| Max. Speed, [RPM] | Cont. | 1950 | 1550 | 1000 | 630 | 500 | 400 |
| | Int.* | 2450 | 1940 | 1250 | 800 | 630 | 500 |
| Max. Torque lb-in [daNm] | Cont. | 95 [1,1] | 140 [1,6] | 220 [2,5] | 350 [4,0] | 400 [4,5] | 410 [4,6] |
| | Int.* | 135 [1,5] | 200 [2,3] | 310 [3,5] | 500 [5,7] | 620 [7,0] | 780 [8,8] |
| | Peak** | 187 [2,1] | 293 [3,3] | 453 [5,1] | 568 [6,4] | 725 [8,2] | 885 [10,0] |
| Max. Output HP [kW] | Cont. | 2.4 [1,8] | 3.2 [2,4] | 3.2 [2,4] | 3.2 [2,4] | 3.0 [2,2] | 2.4 [1,8] |
| | Int.* | 3.5 [2,6] | 4.3 [3,2] | 4.3 [3,2] | 4.3 [3,2] | 4.3 [3,2] | 4.3 [3,2] |
| Max. Pressure Drop PSI [bar] | Cont. | 1450 [100] | 1450 [100] | 1450 [100] | 1450 [100] | 1310 [90] | 1020 [70] |
| | Int.* | 2030 [140] | 2030 [140] | 2030 [140] | 2030 [140] | 2030 [140] | 2030 [140] |
| | Peak** | 2900 [200] | 2900 [200] | 2900 [200] | 2320 [160] | 2320 [160] | 2320 [160] |
| Max. Oil Flow GPM [lpm] | Cont. | 4.2 [16] | 5.3 [20] | 5.3 [20] | 5.3 [20] | 5.3 [20] | 5.3 [20] |
| | Int.* | 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.

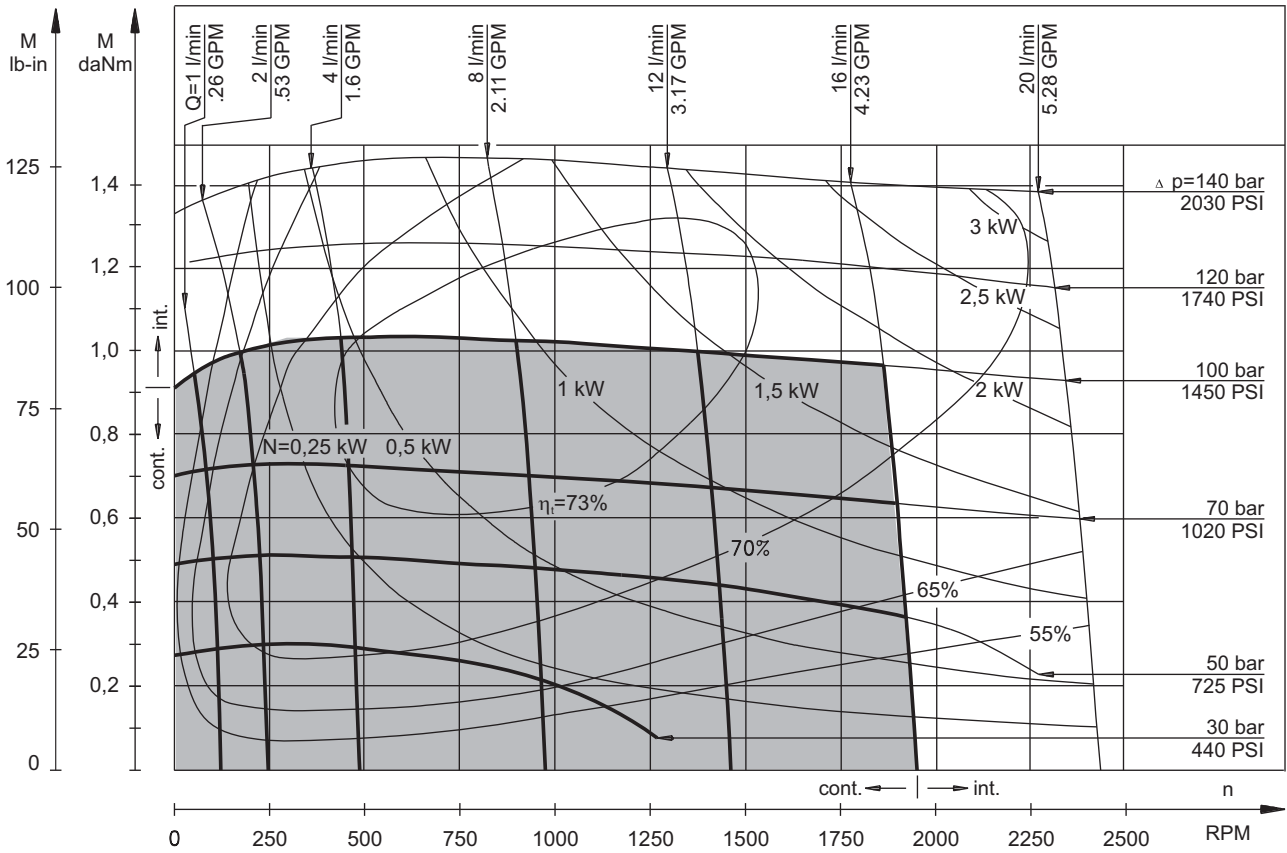
** Peak load: the permissible values may occur for max. 1% of every minute.

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

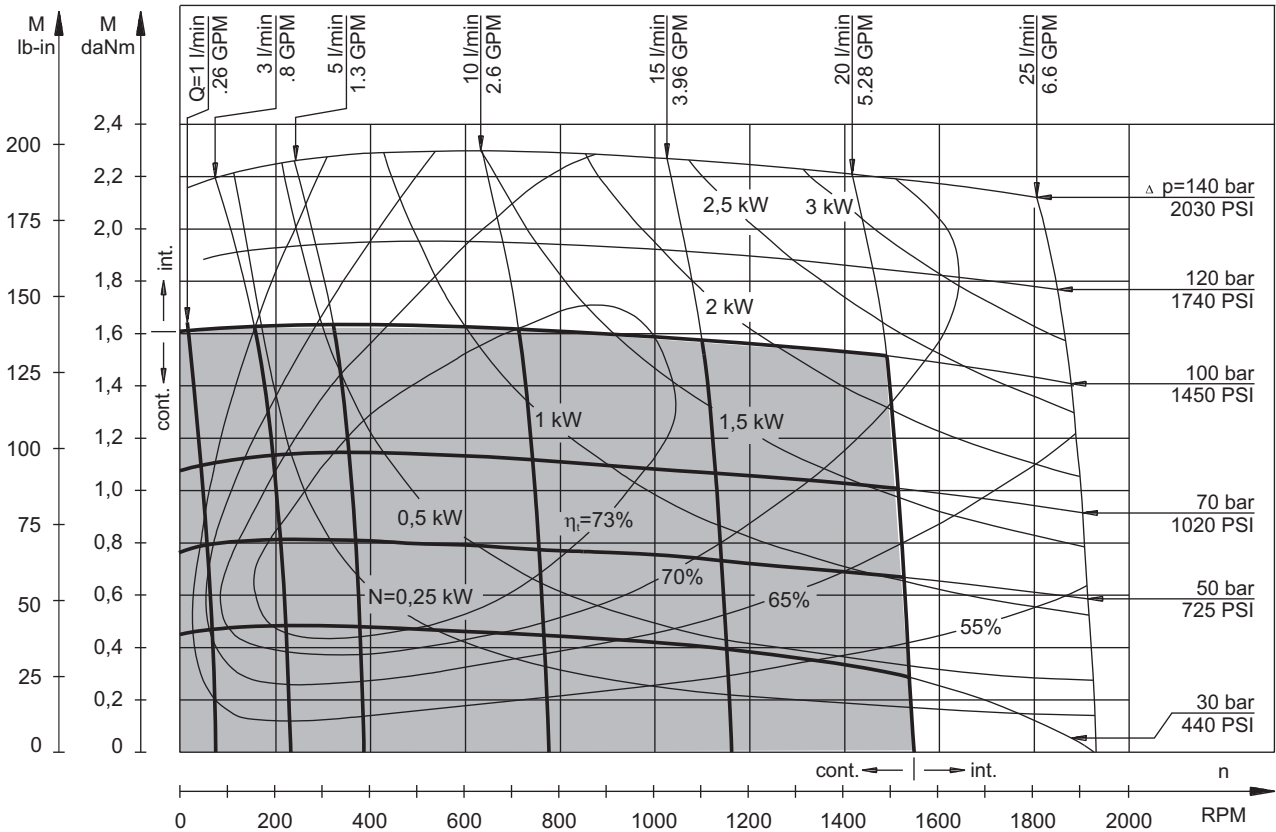
- Intermittent speed and intermittent pressure drop must not occur simultaneously.
- Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
- Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP(DIN51524) or HM (ISO 6743/4). 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



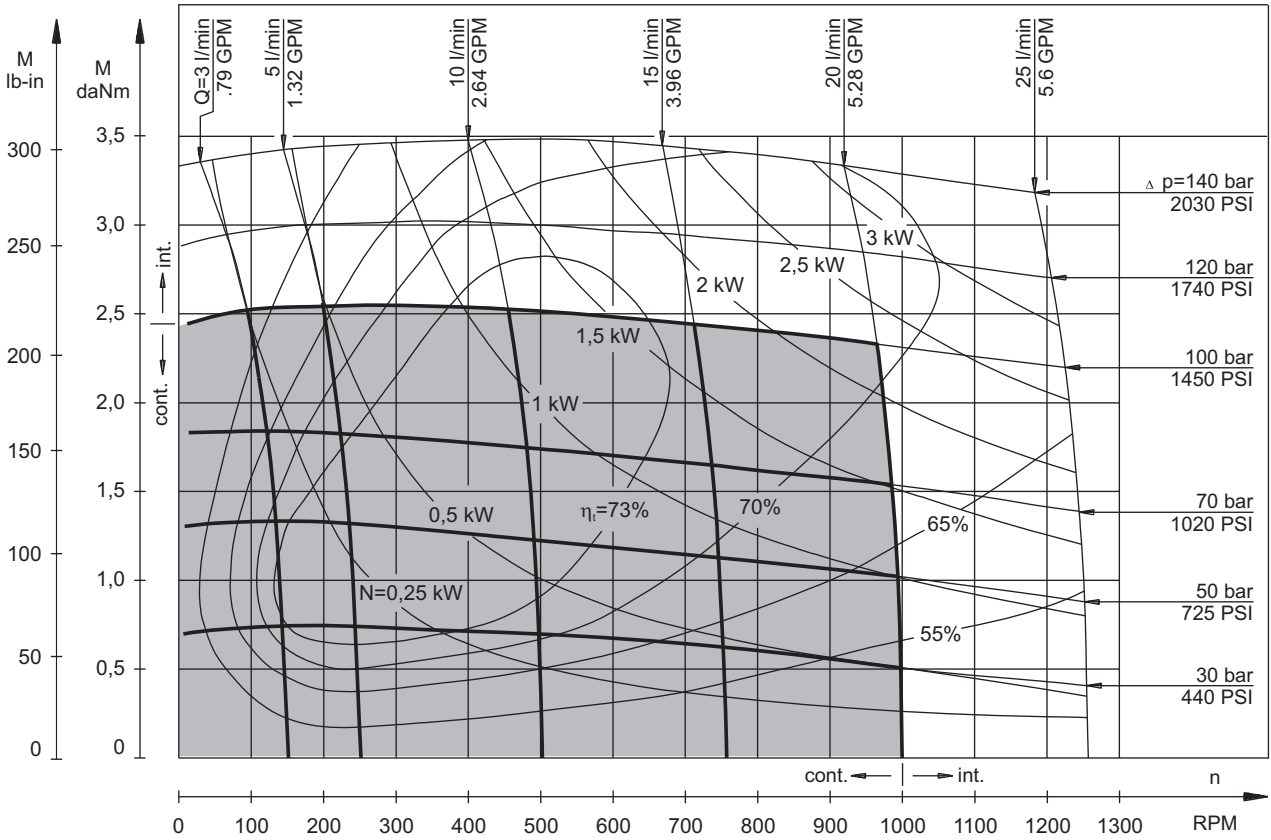
MLHM 12,5



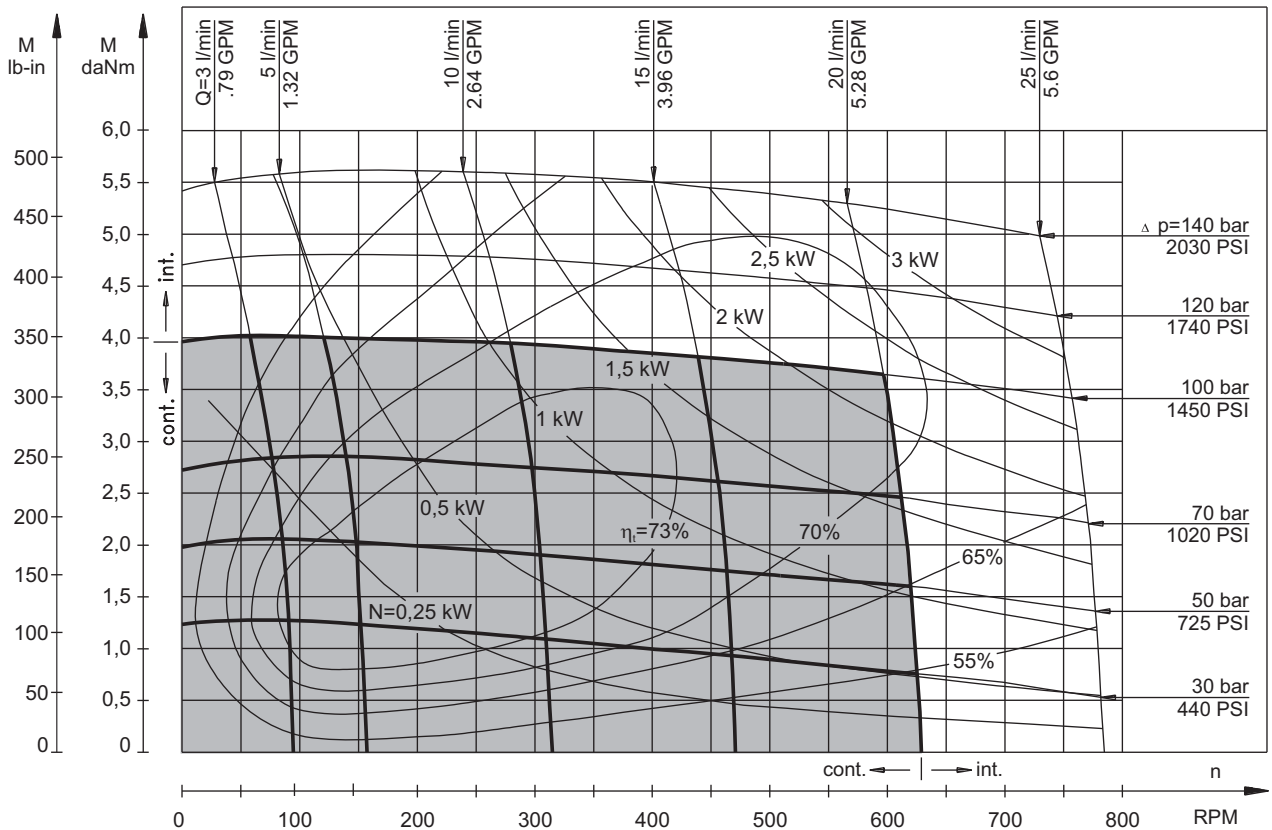
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHM 20



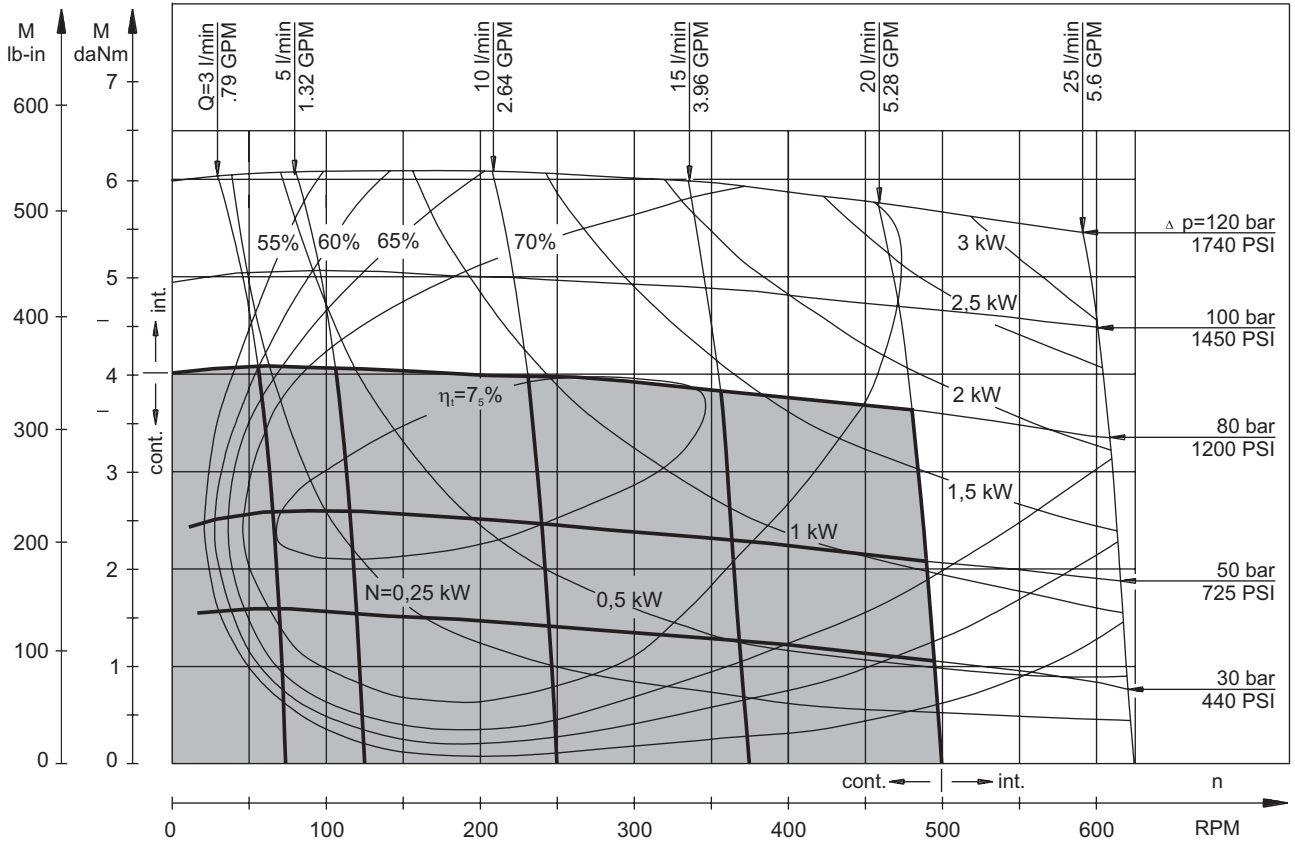
MLHM 32



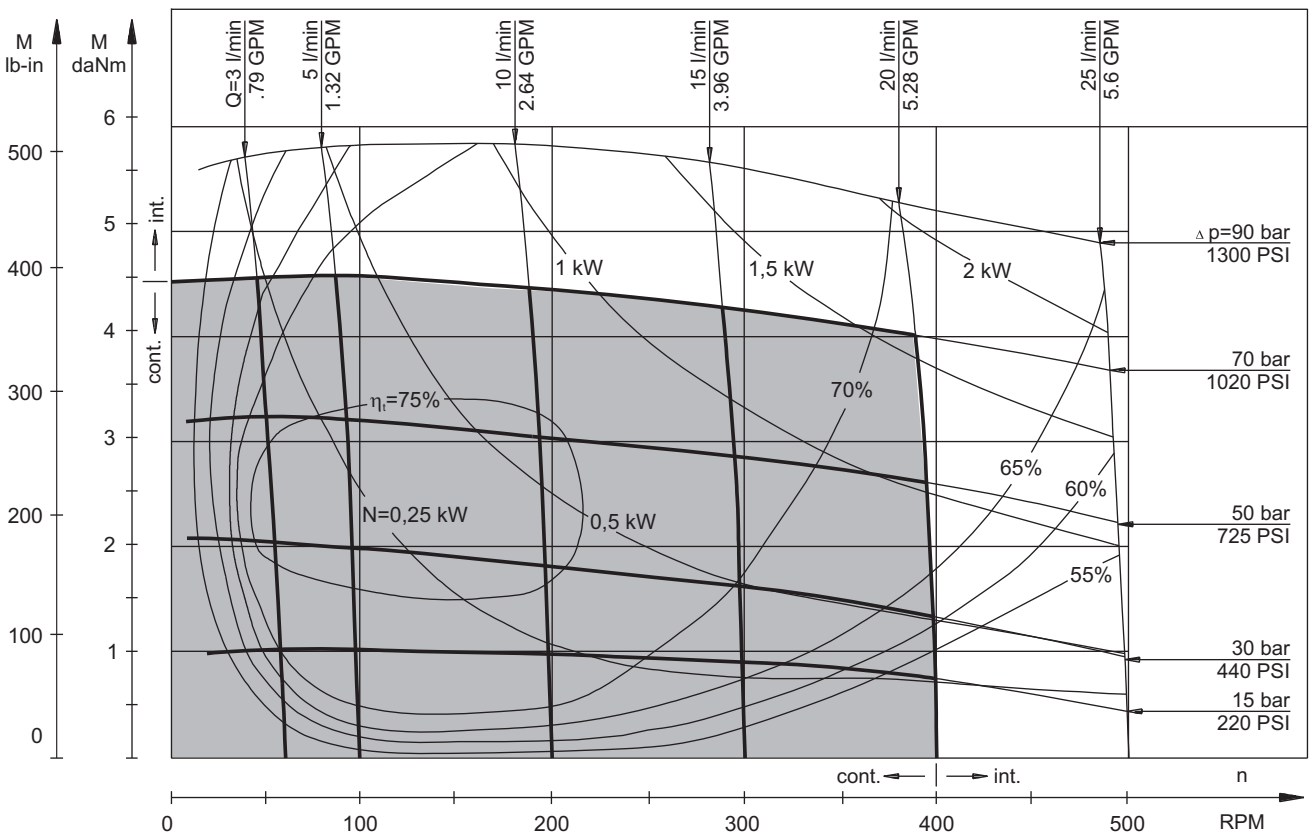
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHM 40

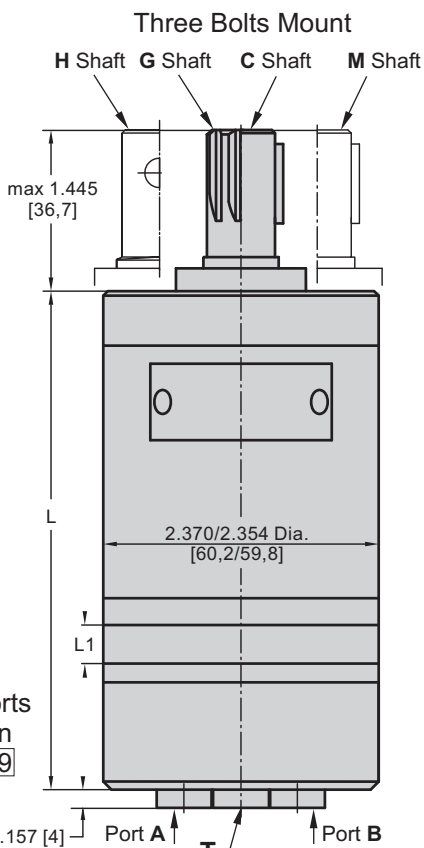


MLHM 50



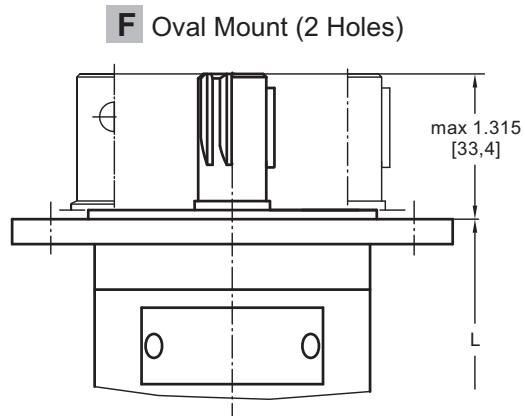
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

**DIMENSIONS AND MOUNTING DATA
MLHM, MLHMP, MLHMD**



Shaft Dim.
See Page 11

Flange Dim.
See Page 10



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

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

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

Rear Ports
Version
6 7 9

Side Ports
Version
2 3 4

P Side Ports

D Side Ports

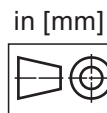
Port Dim.
See Page 10

| Type | Side Ports L, in [mm] | Rear Ports L, 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, in [mm] | Rear Ports L, 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] |

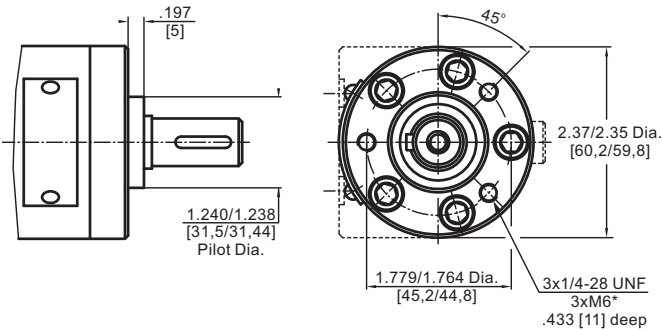
| Type | L, in [mm] | Type | L, in [mm] |
|-----------------|---------------|---------------|---------------|
| MLHM(M) 8...P | 4.528 [115,0] | MLHMF 8...P | 4.665 [118,5] |
| MLHM(M)12,5...P | 4.606 [117,0] | MLHMF12,5...P | 4.744 [120,5] |
| MLHM(M) 20...P | 4.724 [120,0] | MLHMF 20...P | 4.862 [123,5] |
| 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, in [mm] | Type | L, 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] |



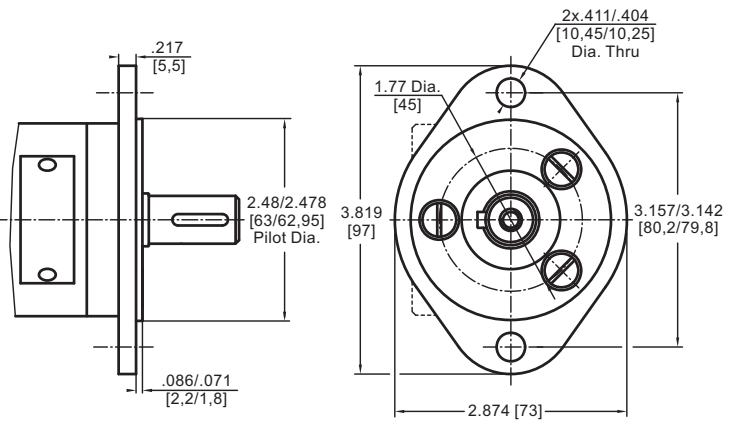
MOUNTING

Three Bolts Mount



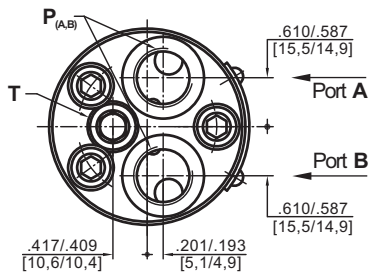
* For M Flange

F Oval Mount (2 Holes)

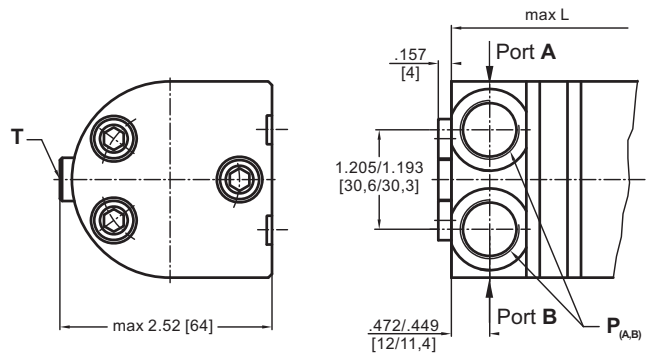


PORTS

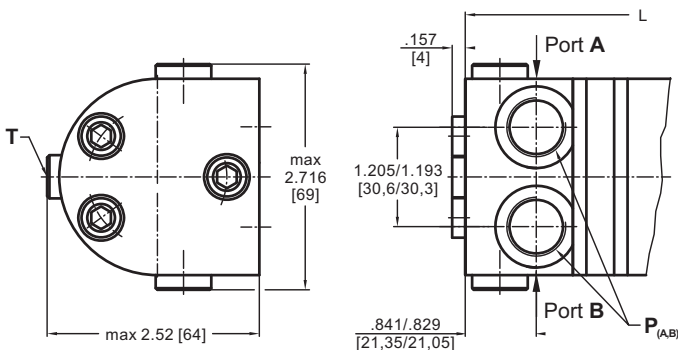
Rear Ports
Version **6** **7** **9**



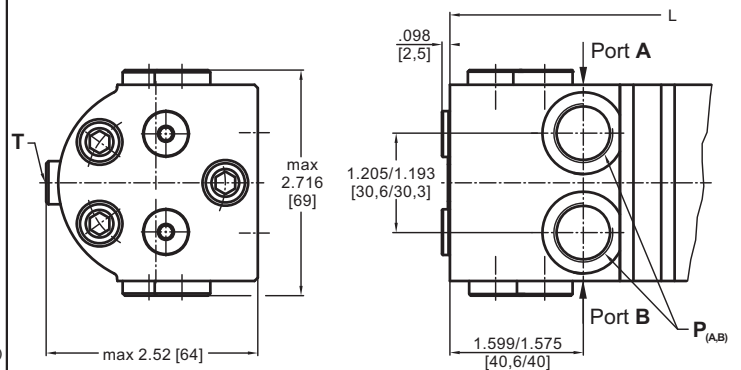
Side Ports, without valves
Version **2** **3** **4**



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

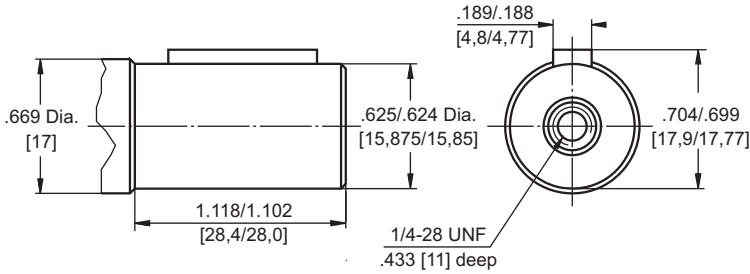


| Versions | | | |
|---------------------------|---------------------|---------------------|--------------------------|
| | 2 , 6 | 3 , 9 | 4 , 7 |
| P _(A,B) | 2xG $\frac{3}{8}$ | 2xM18x1,5 | 2x $\frac{9}{16}$ -18UNF |
| T | G $\frac{1}{8}$ | M10x1 | $\frac{3}{8}$ -24UNF |

SHAFT EXTENSIONS

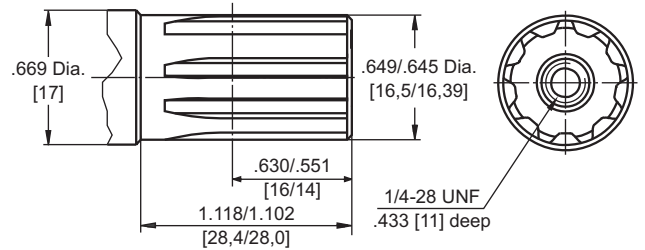
C

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



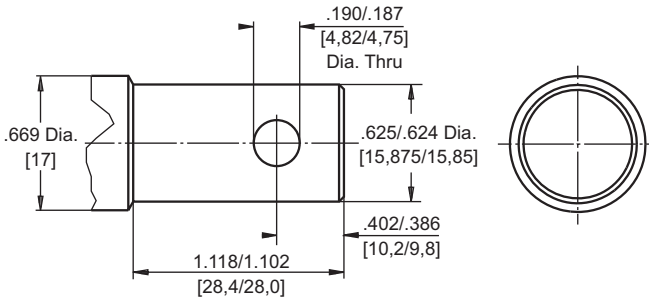
G

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



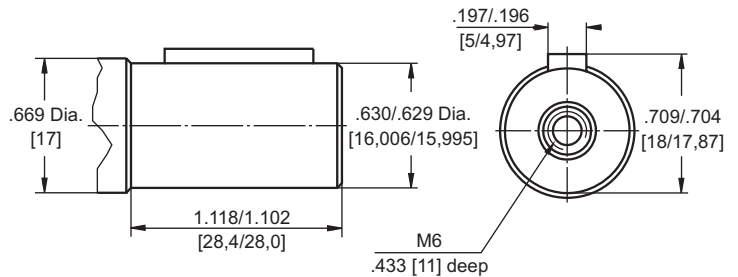
H

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



M

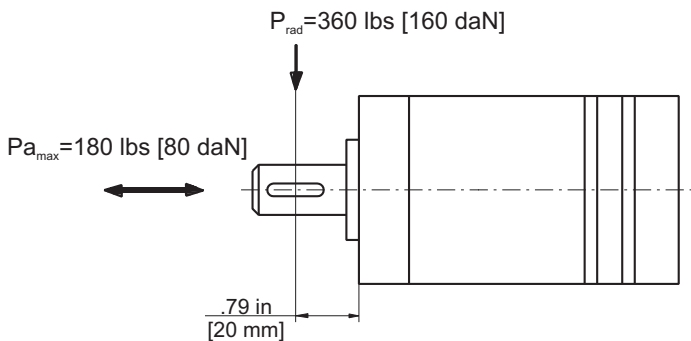
ø16 straight, Parallel key A5x5x16 DIN 6885
Max. Torque 345 lb-in [3,9 daNm]



Requirement max. Torque must be not exceeded.



PERMISSIBLE SHAFT LOAD



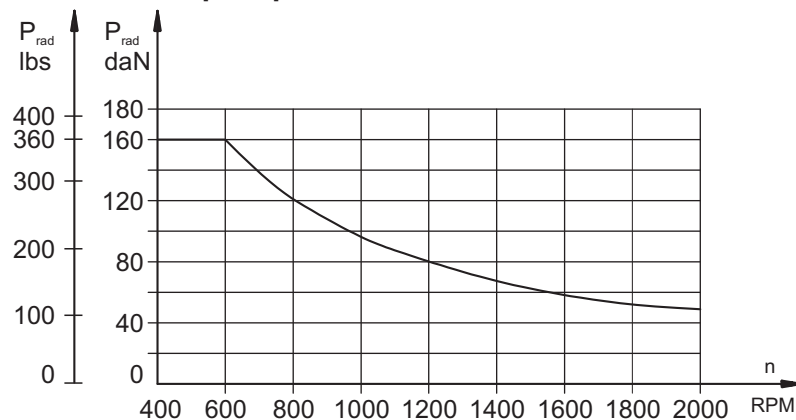
The permissible radial shaft load [P_{rad}] is calculated from the distance [L] between the point of load application and the mounting surface:

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

[L in mm; L ≤ 80 mm]

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

[L in inch; L ≤ 3.15 in]



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

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

ORDER CODE

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|--|
| | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
| 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

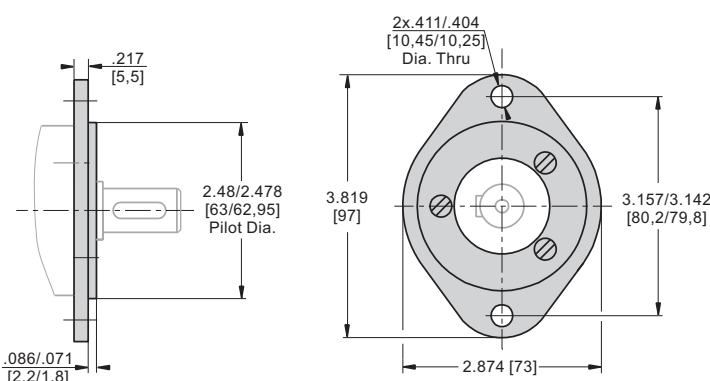
NOTES: * The permissible output torque for shafts must not be exceeded!
 ** Options **P**, **D** - for side ports (2, 3, 4) only.

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



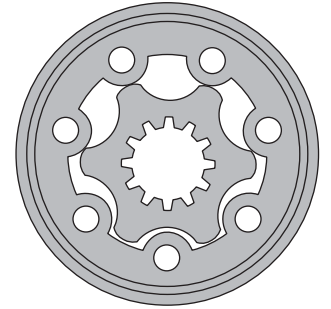
F Flange is mounted to the motor with 3 screws - 1/4-28 UNF.
 Tightening Torque: 45÷53 lb-in [5÷6 Nm].

HYDRAULIC MOTORS MLHP



APPLICATION

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



CONTENTS

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 Dimensions and mounting 25÷26
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 Shaft extensions 28÷29
 Permissible shaft loads 30
 Permissible shaft Seal Pressure ... 31
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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

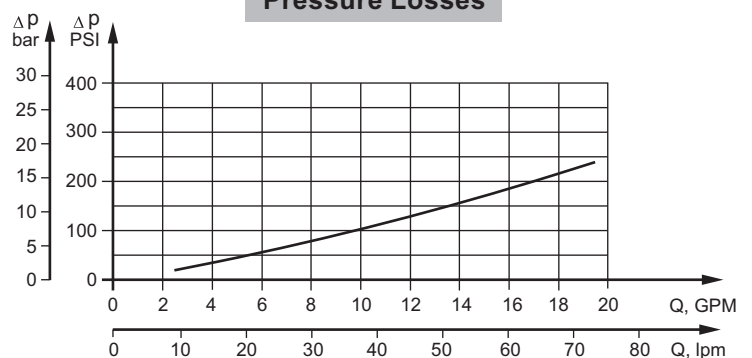
GENERAL

| | |
|---|--|
| 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] | 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] |
| | For rear ports 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] |
| | + .992 [0,450] 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 Pressure with Drain Line PSI [bar] | Cont. | 2540 [175] | 2540 [175] | 2540 [175] | 2540 [175] | 2540 [175] |
| | Int.* | 2900 [200] | 2900 [200] | 2900 [200] | 2900 [200] | 2900 [200] |
| | Peak** | 3260 [225] | 3260 [225] | 3260 [225] | 3260 [225] | 3260 [225] |
| Max. Starting Pressure with Unloaded Shaft, PSI [bar] | | 145 [10] | 145 [10] | 131 [9] | 116 [8] | 100 [7] |
| Min. Starting Torque lb-in [daNm] | At max.press. drop Cont. | 1170 [13,2] | 1470 [16,6] | 1830 [20,7] | 2500 [28,2] | 2950 [33,5] |
| | At max.press. drop Int.* | 1490 [16,8] | 1860 [21] | 2360 [26,6] | 3140 [35,5] | 3770 [42,6] |
| Min. Speed***, [RPM] | | 10 | 10 | 10 | 10 | 10 |
| Weight, lb [kg] | MLHP(F) | 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.

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.

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] |
| For rear ports: +.992 [0,450] | | | | | | |

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

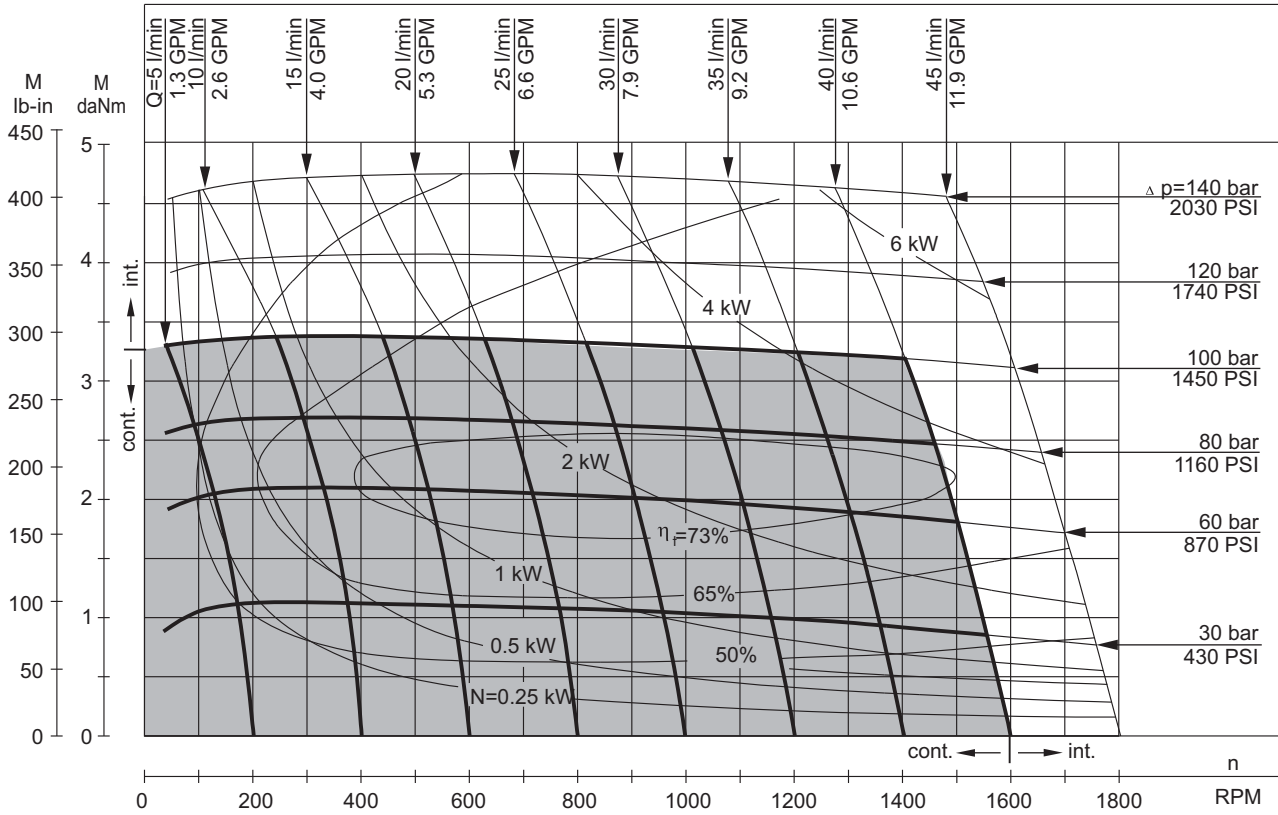
** Peak load: the permissible values may occur for max. 1% of every minute.

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

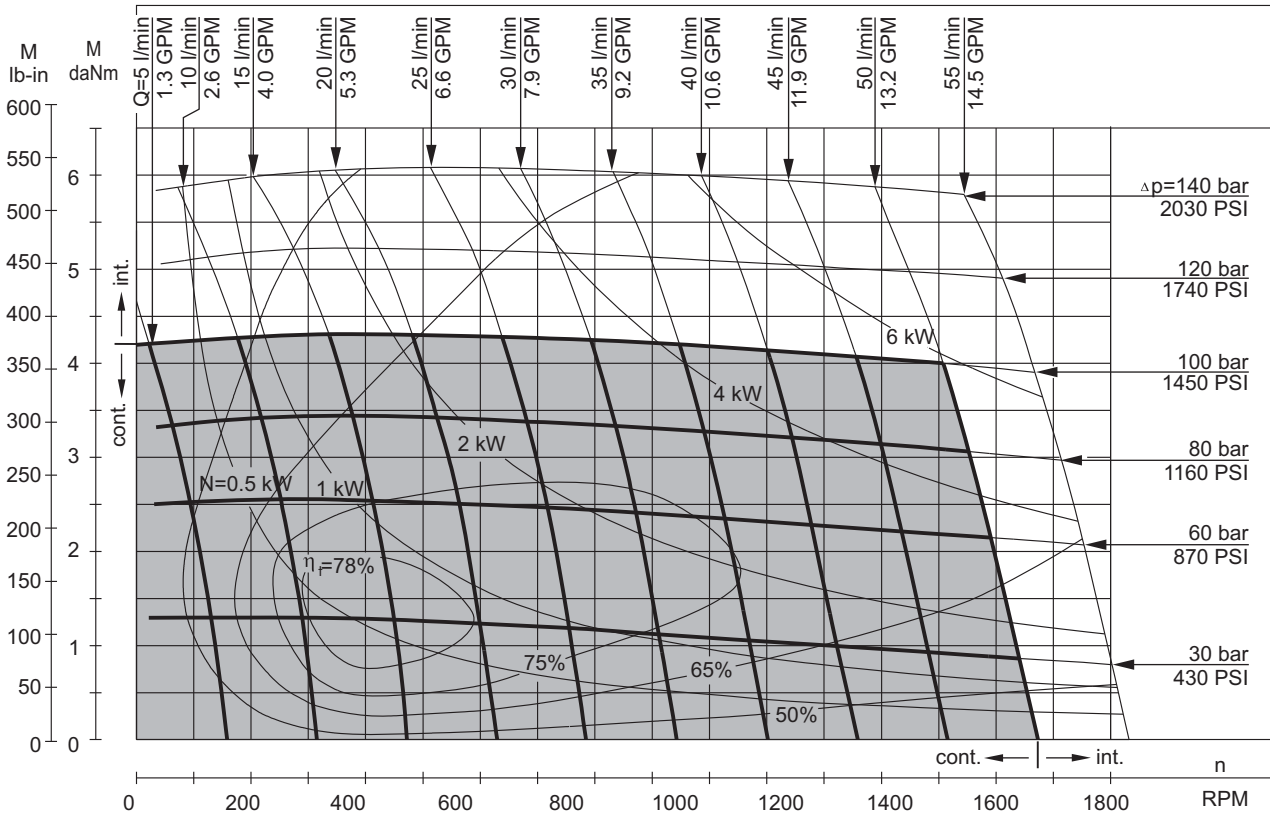
- Intermittent speed and intermittent pressure drop must not occur simultaneously.
- Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
- Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP(DIN51524) or HM (ISO 6743/4).
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



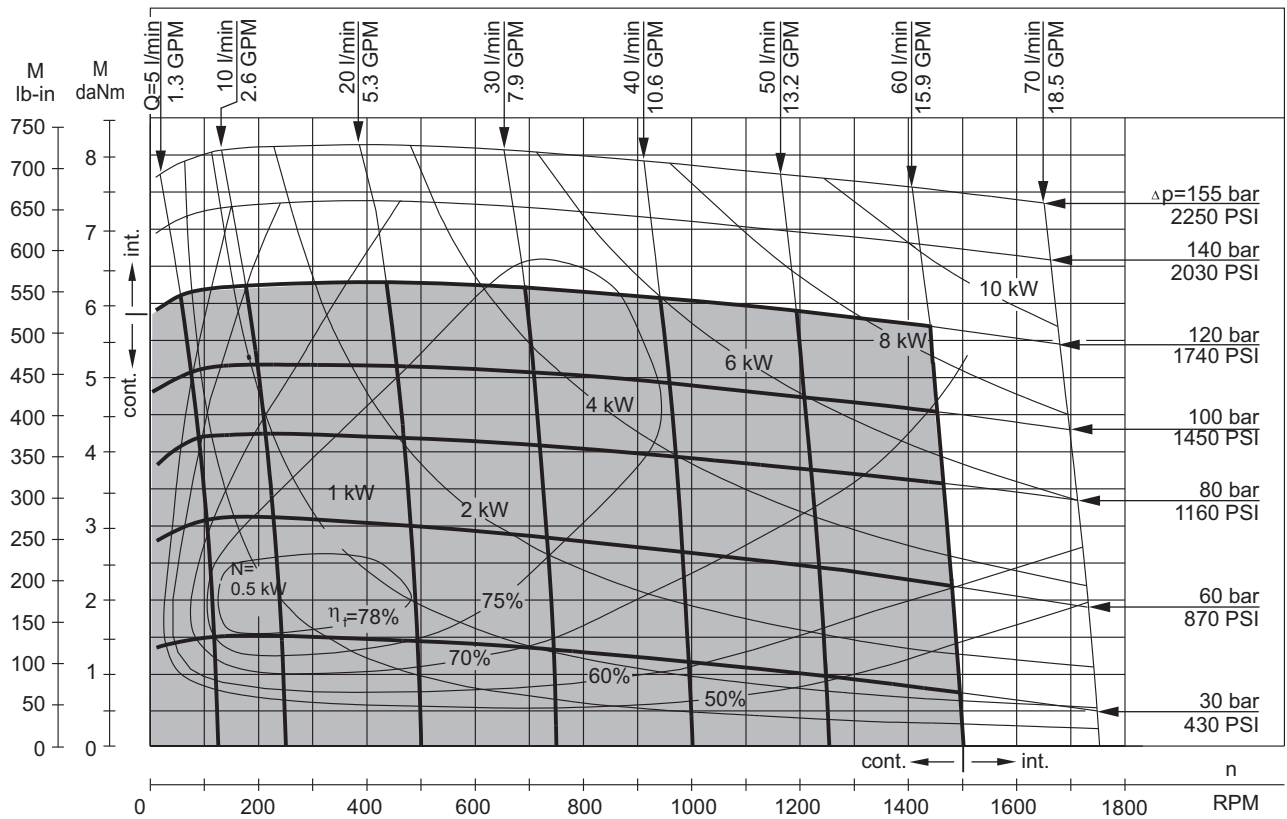
MLHP 32



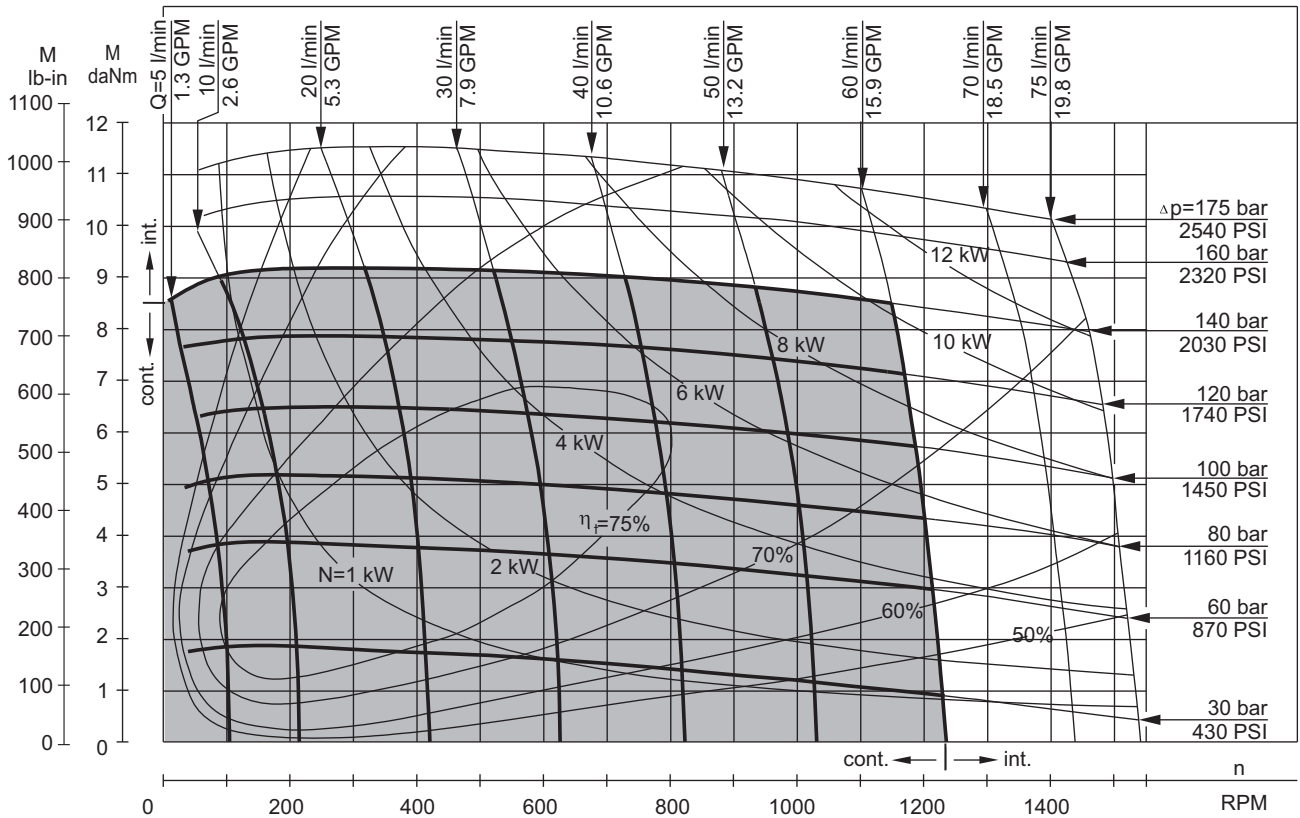
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHP 40



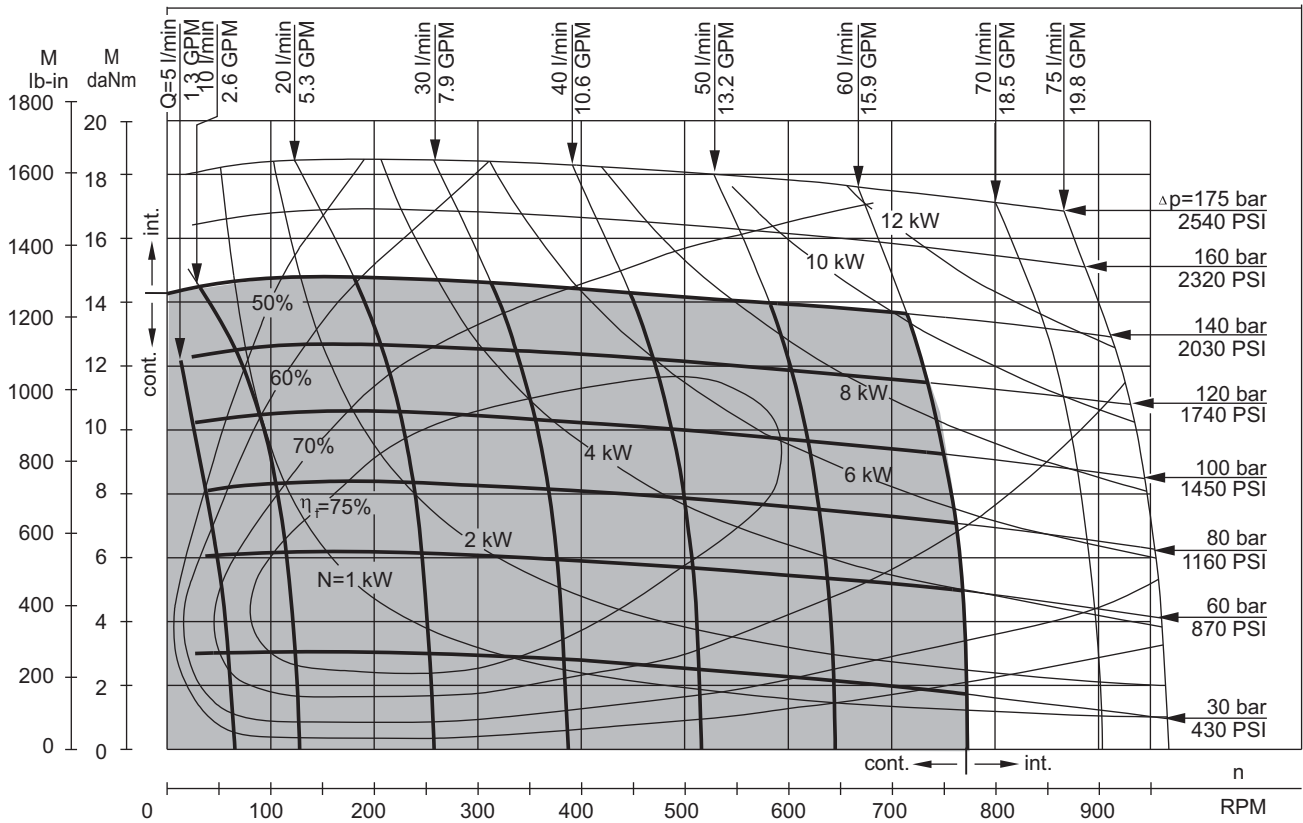
MLHP 50



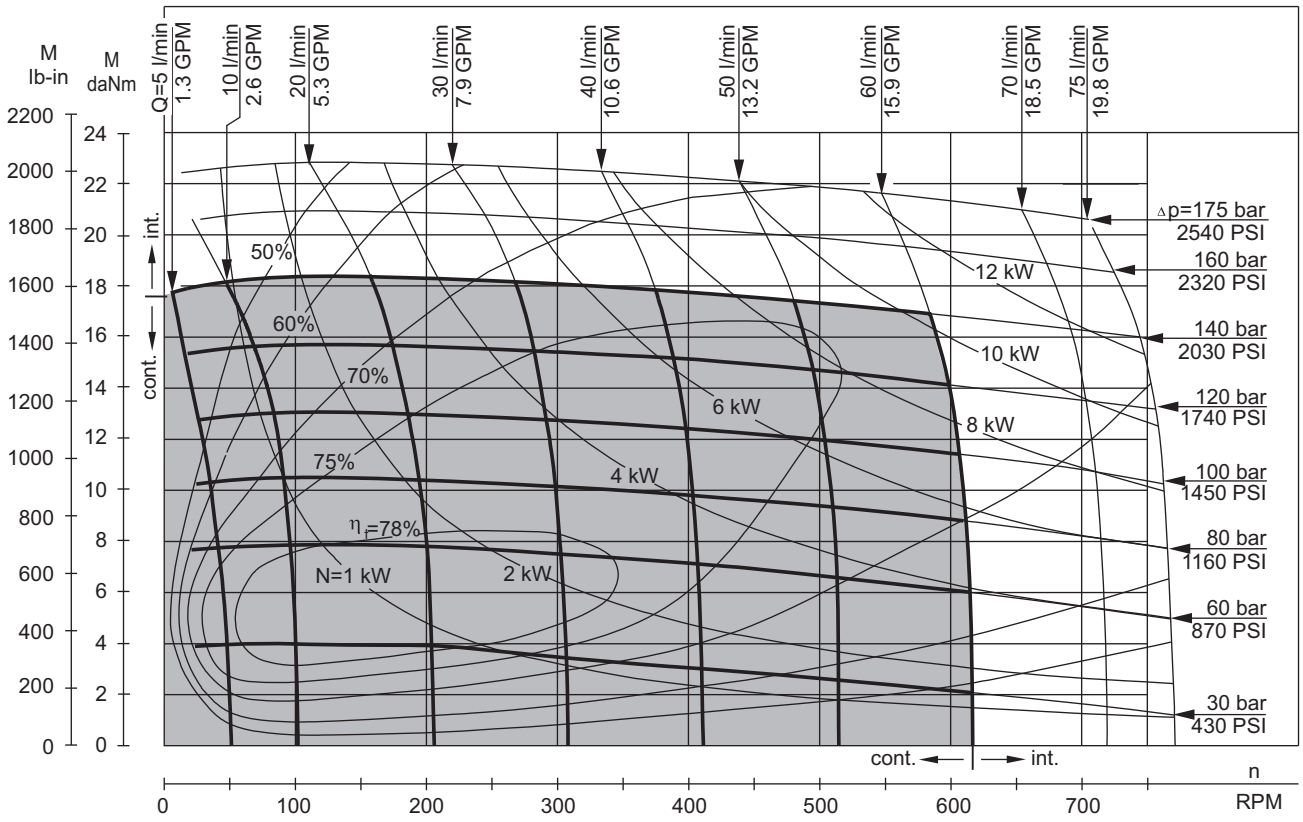
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHP 80



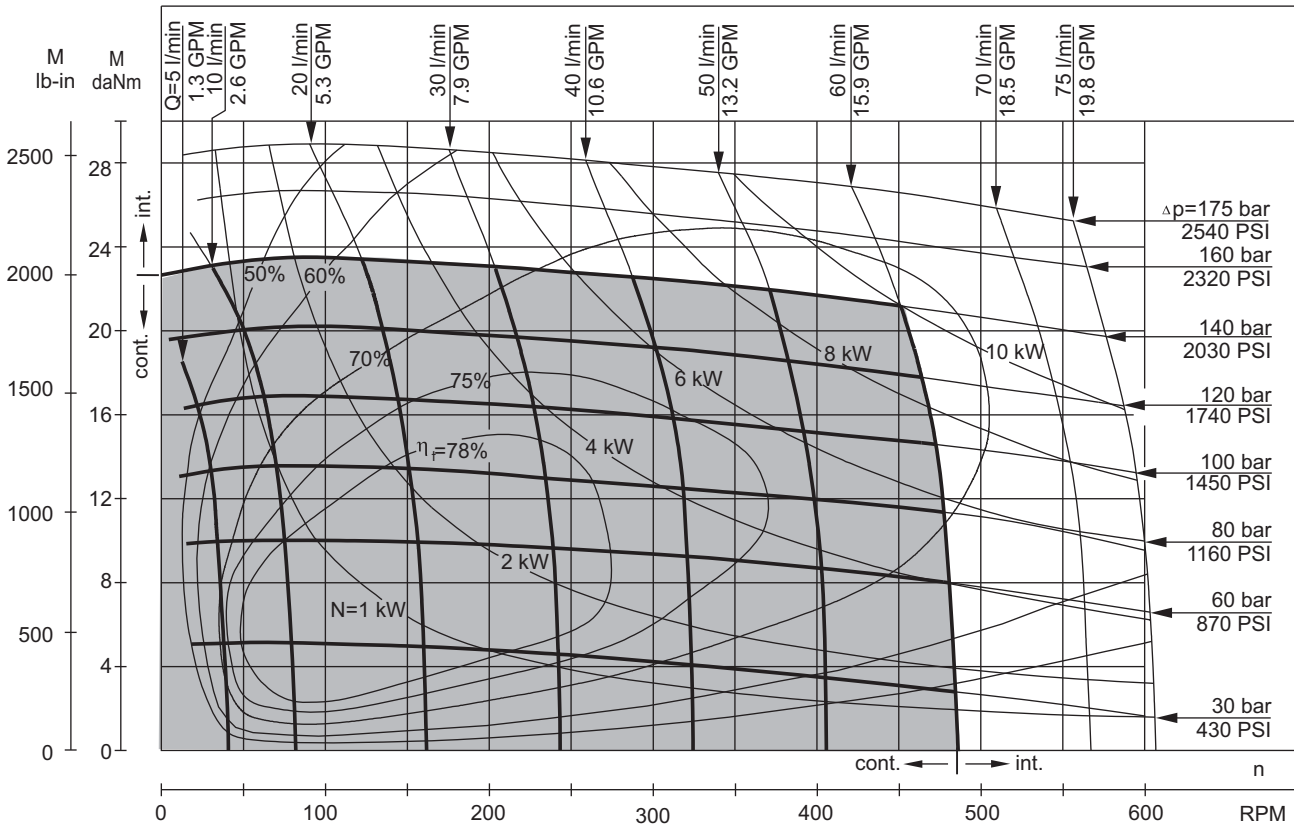
MLHP 100



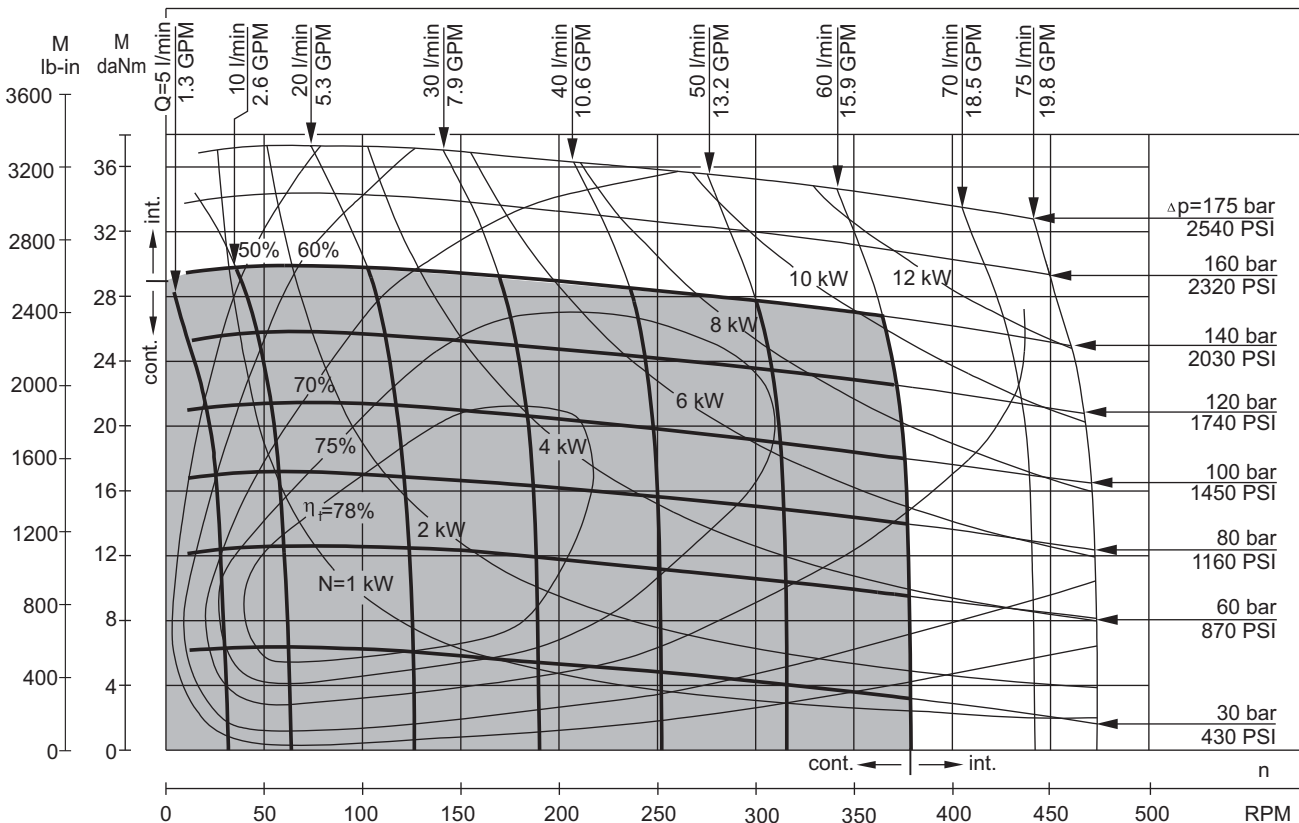
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHP 125



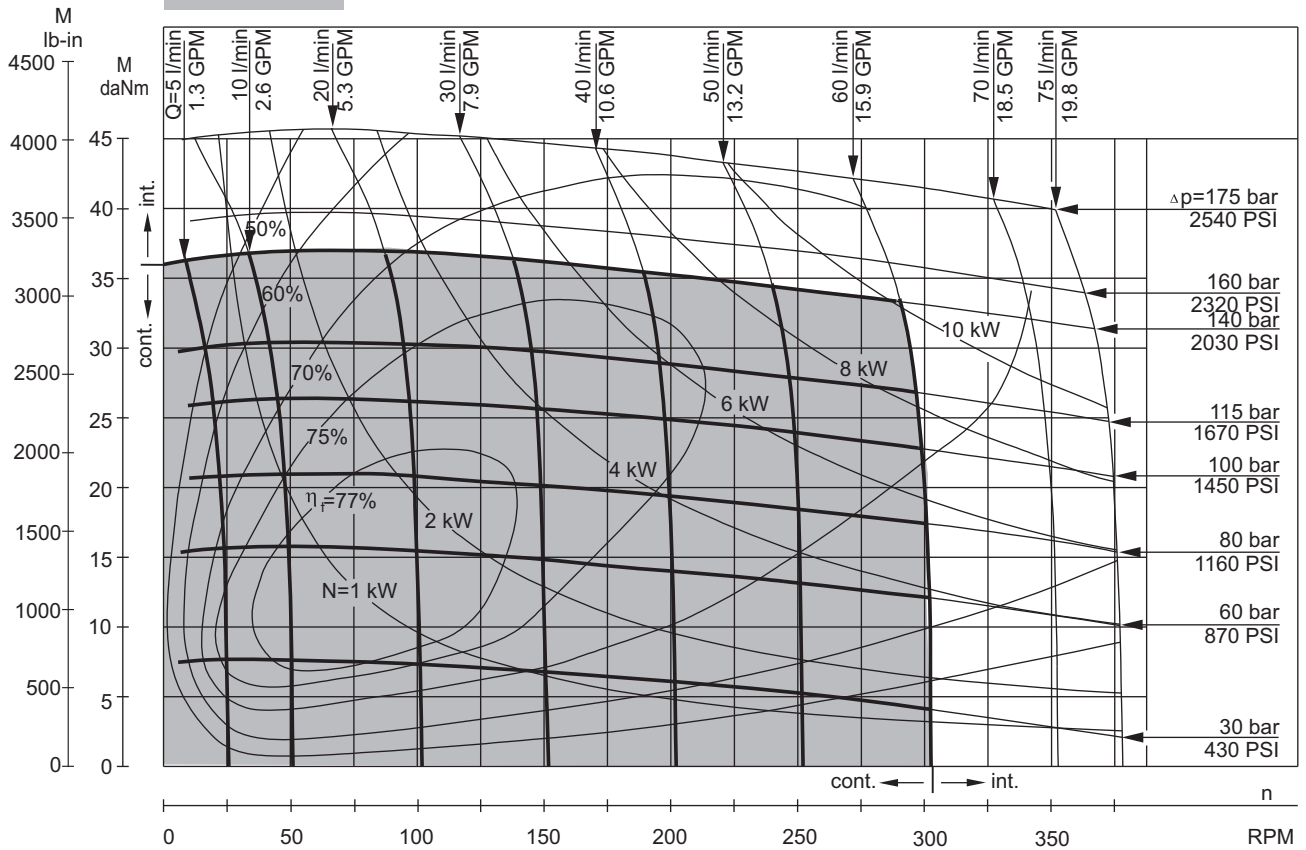
MLHP 160



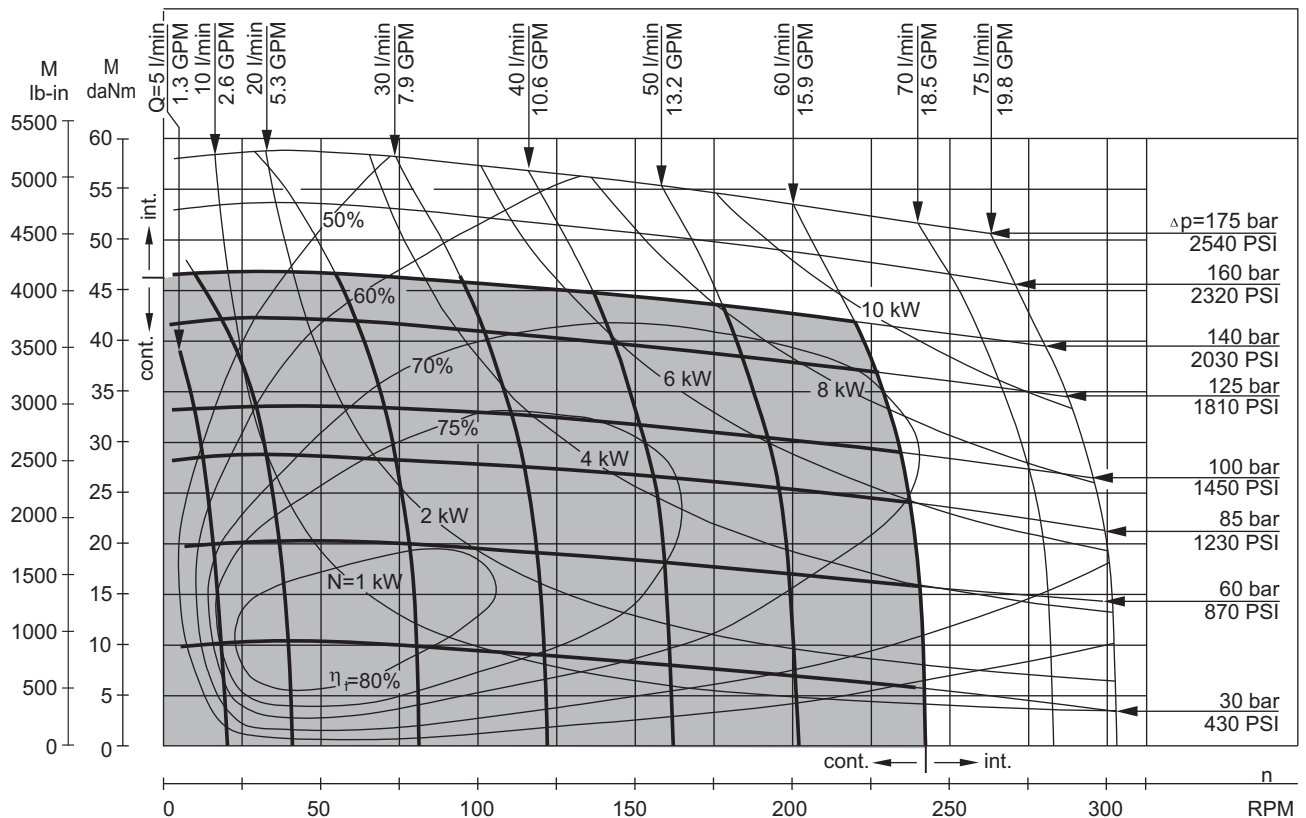
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHP 200



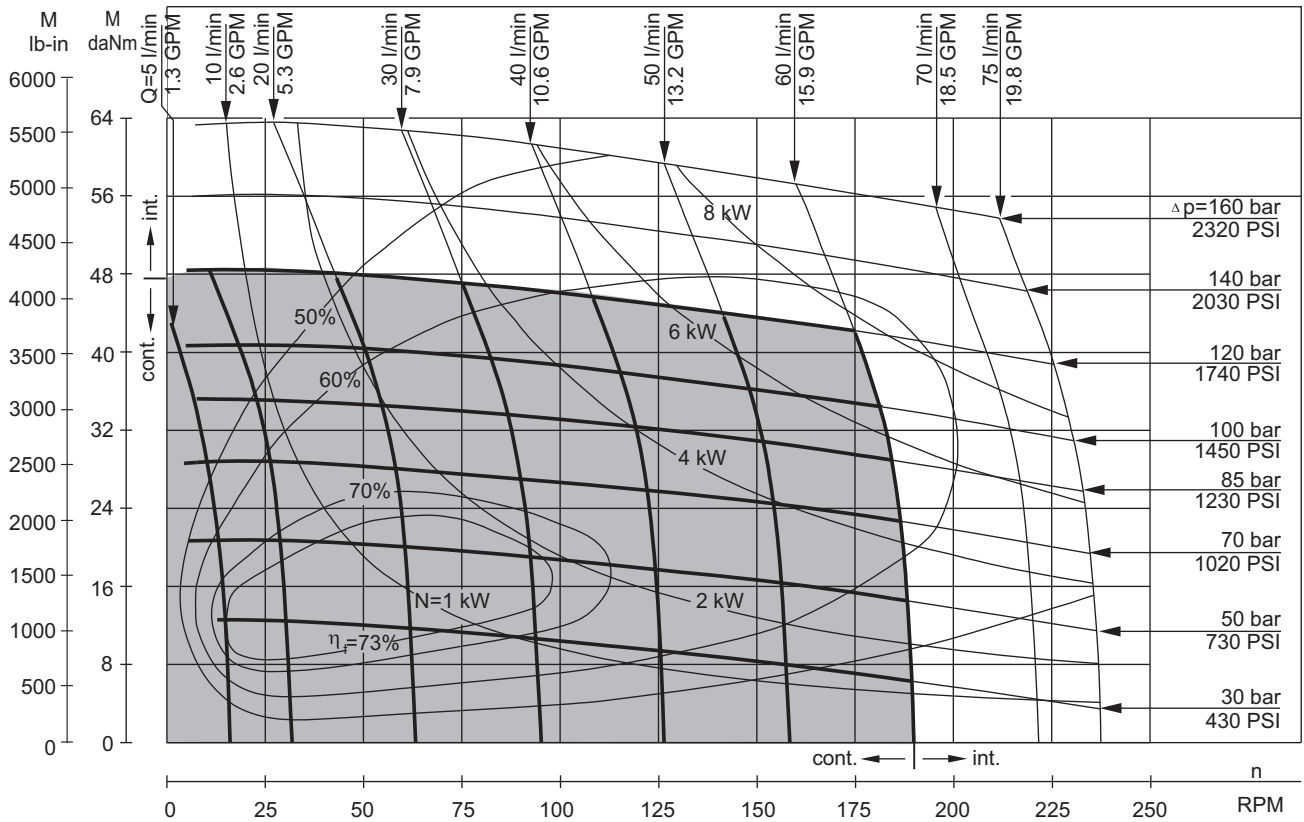
MLHP 250



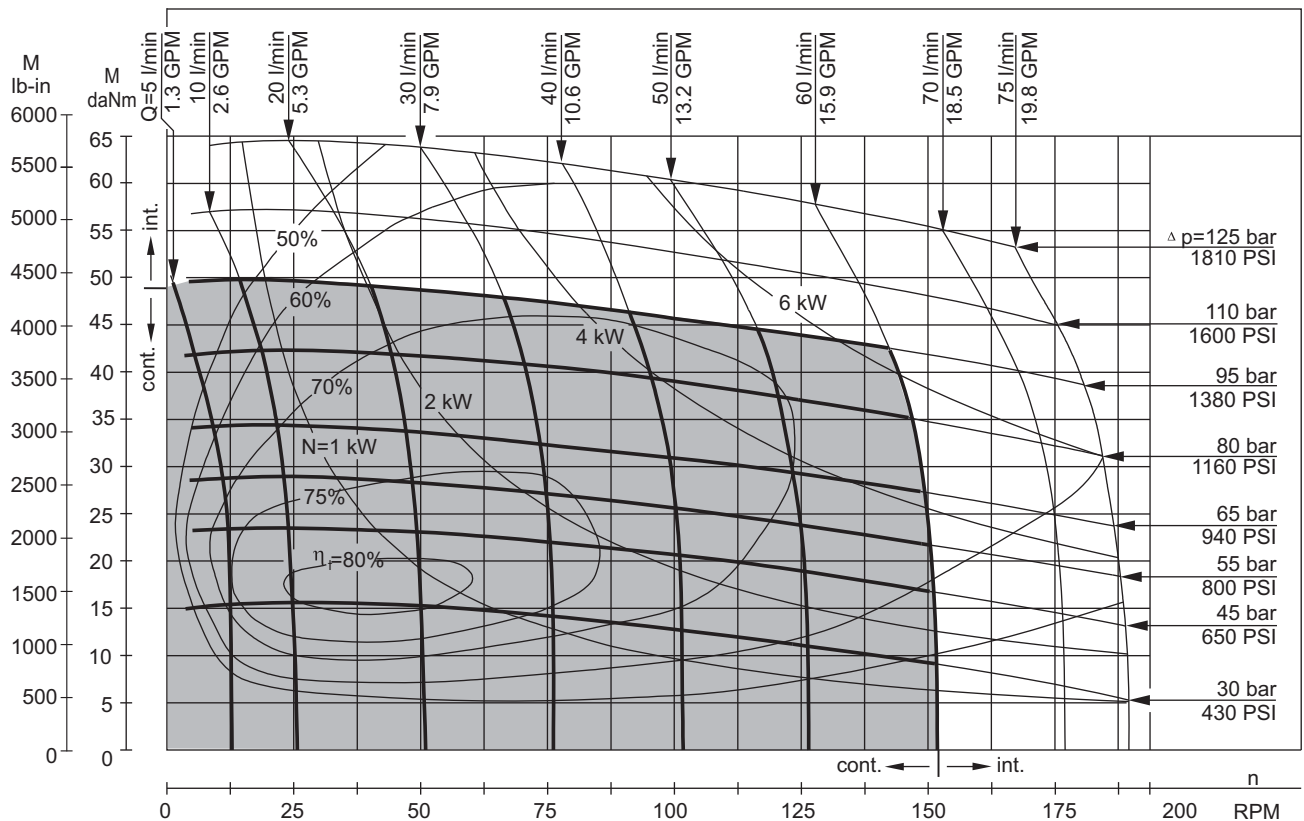
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHP 315



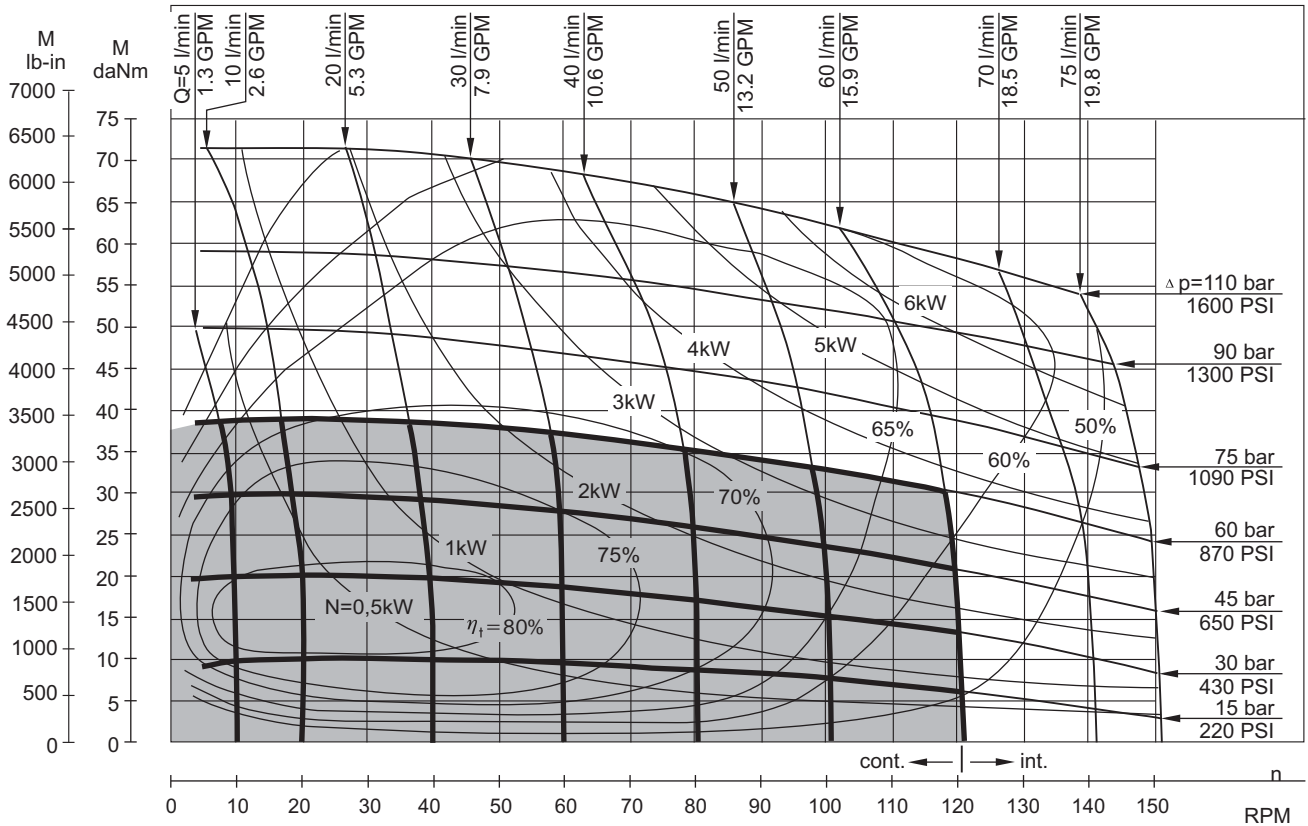
MLHP 400



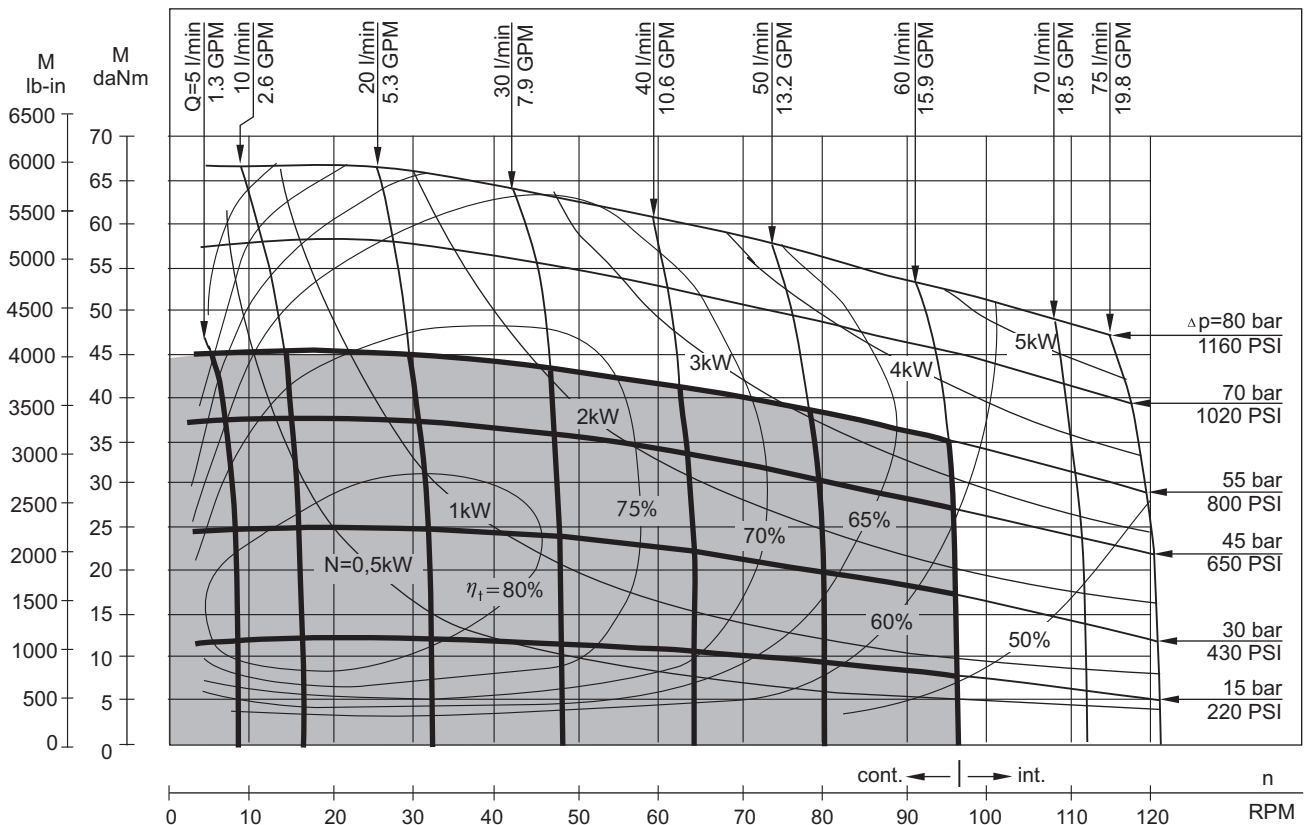
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHP 500

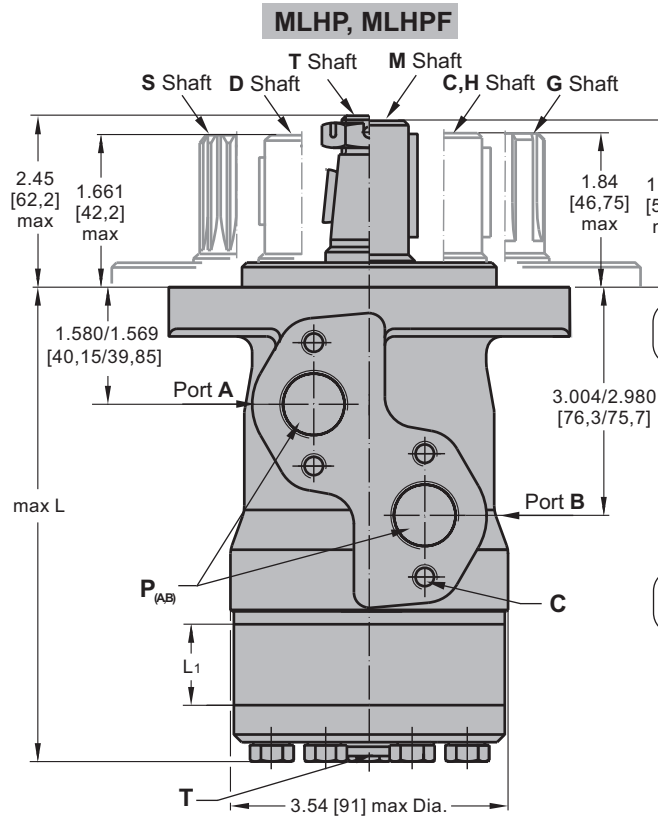


MLHP 630



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].

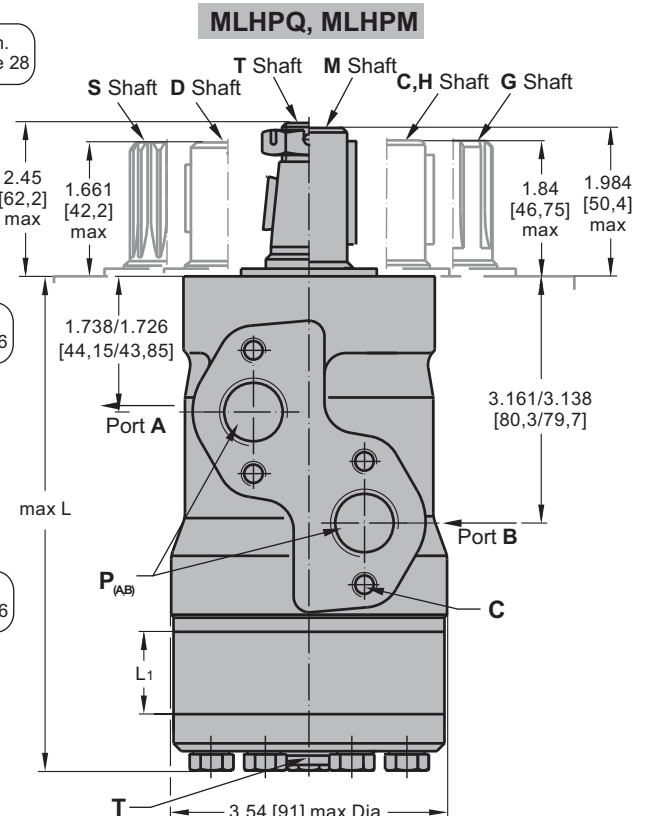
DIMENSIONS AND MOUNTING DATA



Shaft Dim.
See Page 28

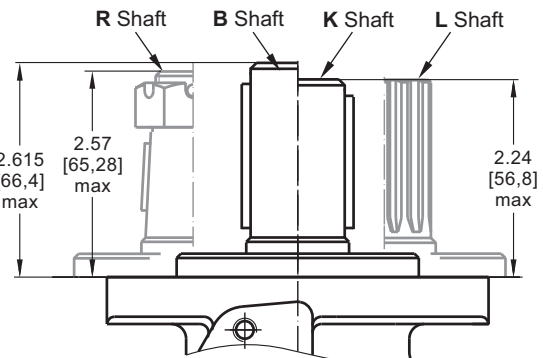
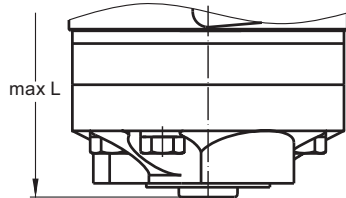
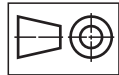
Flange Dim.
See Page 26

Port Dim.
See Page 26



Version **6** **7** **8** **9**
Rear ports

in [mm]



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**

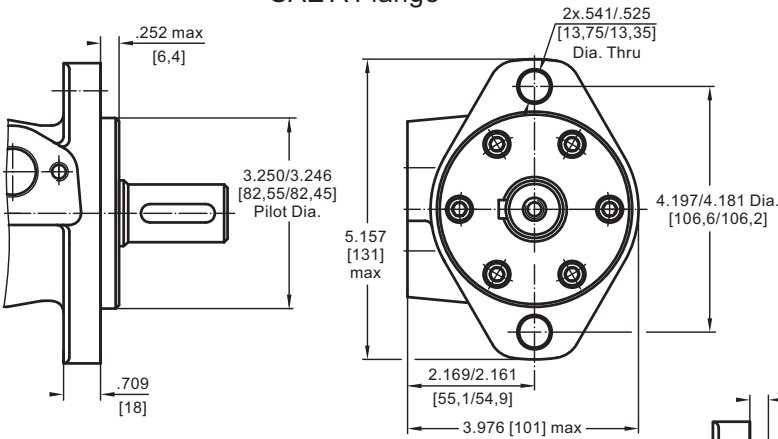
| | Versions | | | |
|--------------------------|---------------------------------|-----------|---|---|
| | 2, 6 | 3, 9 | 4, 7 | 5, 8 |
| C | 4xM8 | 4xM8 | 4x ⁵ / ₁₆ -18 UNC | 4x ⁵ / ₁₆ -18 UNC |
| P_(A,B) | 2xG ¹ / ₂ | 2xM22x1,5 | 2x ⁷ / ₈ -14 UNF | 2x ¹ / ₂ -14 NPTF |
| T | G ¹ / ₄ | M14x1,5 | ⁷ /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

| Type | L max, in [mm] | | Type | L max, in [mm] | | L ₁ , in [mm] |
|-------------|------------------|-------------------|--------------|------------------|-------------------|--------------------------|
| | Versions 2,3,4,5 | *Versions 6,7,8,9 | | Versions 2,3,4,5 | *Versions 6,7,8,9 | |
| MLHP(F) 25 | 5.35 [136,0] | 5.91 [150,0] | MLHPQ(M) 25 | 5.53 [140,5] | 6.08 [154,5] | .21 [5,20] |
| MLHP(F) 32 | 5.39 [137,0] | 5.96 [151,5] | MLHPQ(M) 32 | 5.57 [141,5] | 6.12 [155,5] | .25 [6,30] |
| MLHP(F) 40 | 5.45 [138,5] | 6.00 [152,5] | MLHPQ(M) 40 | 5.61 [142,5] | 6.16 [156,5] | .29 [7,40] |
| MLHP(F) 50 | 5.41 [137,5] | 5.96 [151,5] | MLHPQ(M) 50 | 5.59 [142,0] | 6.14 [156,0] | .26 [6,67] |
| MLHP(F) 80 | 5.57 [141,5] | 6.12 [155,5] | MLHPQ(M) 80 | 5.75 [146,0] | 6.29 [160,0] | .42 [10,67] |
| MLHP(F) 100 | 5.67 [144,0] | 6.24 [158,5] | MLHPQ(M) 100 | 5.85 [148,5] | 6.39 [162,5] | .52 [13,33] |
| MLHP(F) 125 | 5.81 [147,5] | 6.36 [161,5] | MLHPQ(M) 125 | 5.98 [152,0] | 6.54 [166,0] | .66 [16,67] |
| MLHP(F) 160 | 5.98 [152,0] | 6.56 [166,5] | MLHPQ(M) 160 | 6.16 [156,5] | 6.71 [170,5] | .84 [21,33] |
| MLHP(F) 200 | 6.20 [157,5] | 6.75 [171,5] | MLHPQ(M) 200 | 6.38 [162,0] | 6.93 [176,0] | 1.05 [26,67] |
| MLHP(F) 250 | 6.46 [164,0] | 7.03 [178,5] | MLHPQ(M) 250 | 6.63 [168,5] | 7.19 [182,5] | 1.31 [33,33] |
| MLHP(F) 315 | 6.83 [173,5] | 7.38 [187,5] | MLHPQ(M) 315 | 7.01 [178,0] | 7.56 [192,0] | 1.68 [42,67] |
| MLHP(F) 400 | 7.24 [184,0] | 7.81 [198,5] | MLHPQ(M) 400 | 7.42 [188,5] | 7.97 [202,5] | 2.10 [53,33] |
| MLHP(F) 500 | 7.78 [197,5] | 8.33 [211,5] | MLHPQ(M) 500 | 7.95 [202,0] | 8.50 [216,0] | 2.62 [66,63] |
| MLHP(F) 630 | 8.47 [215,0] | 9.02 [229,0] | MLHPQ(M) 630 | 8.62 [219,0] | 9.17 [233,0] | 3.31 [84,00] |

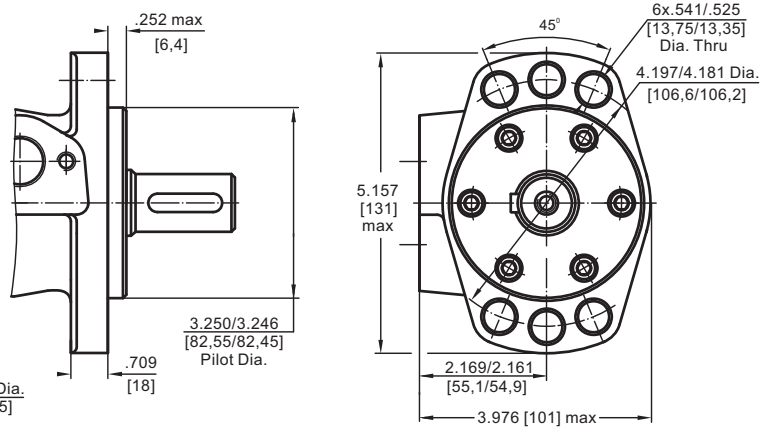
* - For Rear Ported Motors.

MOUNTING

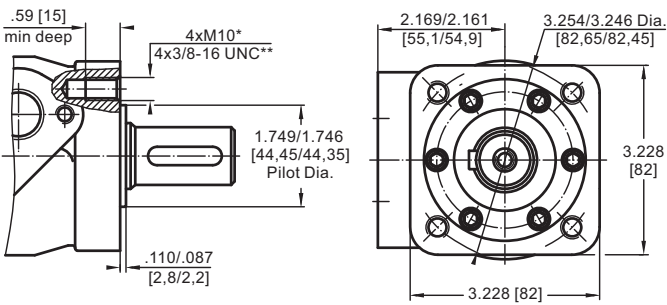
SAE A Flange



F - Magneto Flange



M and Q - Square Flange

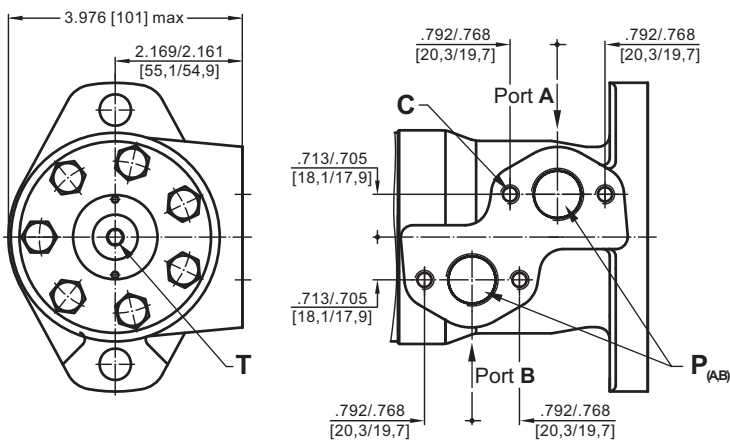


* For M Flange
** For Q Flange

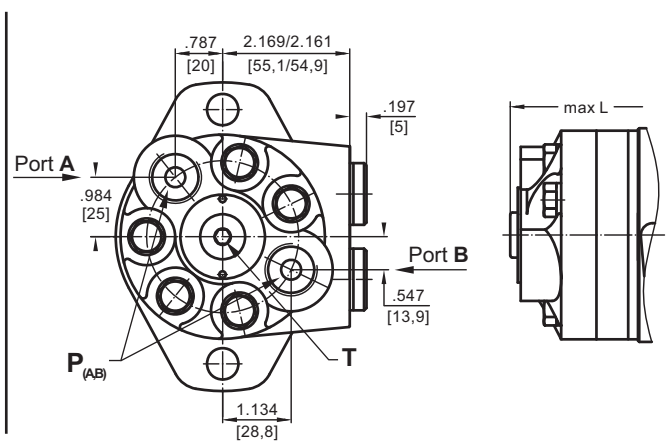


PORTS

Side Ports
Version **2 3 4 5**



Rear Ports
Version **6 7 8 9**

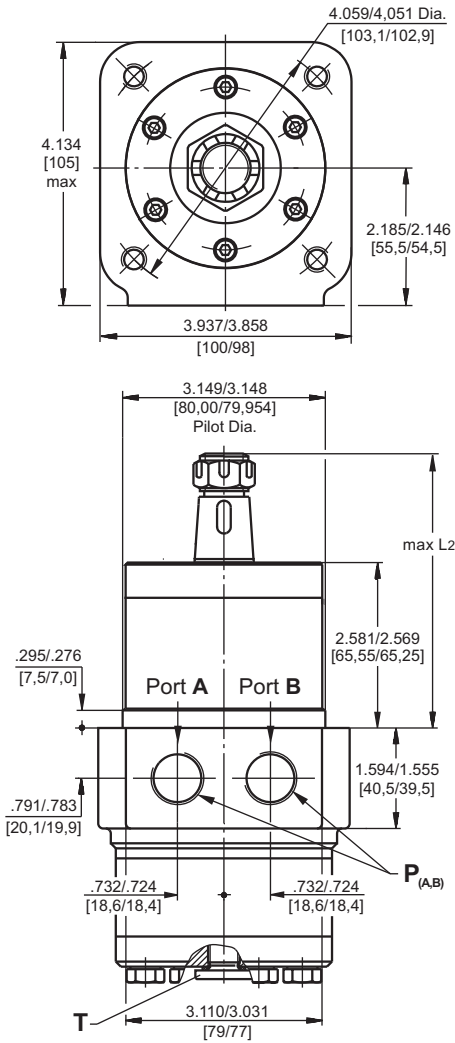


Standard Rotation
Viewed from Shaft End
Port A Pressurized - **CW**
Port B Pressurized - **CCW**

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 $\frac{9}{16}$ -18 UNC | 4x $\frac{9}{16}$ -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 |

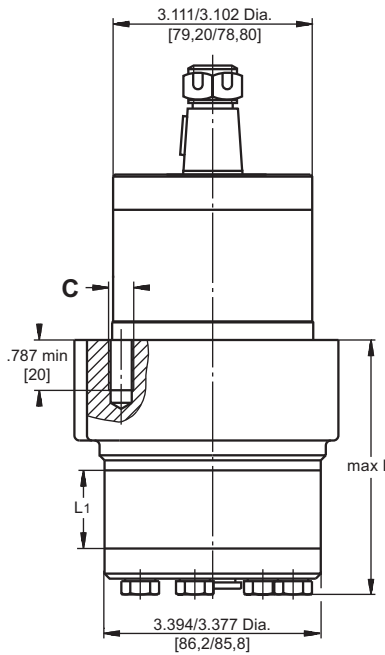
DIMENSIONS AND MOUNTING DATA - MLHPW (WHEEL MOTOR)



| 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 | 5 |
| C | 4xM10 | 4xM10 | 3/8-16 UNC | 3/8-16 UNC |
| P _(A,B) | 2xG1/2 | 2xM22x1,5 | 2x7/8-14 UNF | 2x1/2-14 NPTF |
| T | G1/4 | M14x1,5 | 7/16-20 UNF | 7/16-20 UNF |

| Type | L, in [mm] | L ₁ , in [mm] |
|--------------|--------------|--------------------------|
| MLHPW(N) 25 | 3.01 [76,5] | .21 [5,20] |
| MLHPW(N) 32 | 3.07 [78,0] | .25 [6,30] |
| MLHPW(N) 40 | 3.13 [79,5] | .29 [7,40] |
| MLHPW(N) 50 | 3.07 [78,0] | .26 [6,67] |
| MLHPW(N) 80 | 3.23 [82,0] | .42 [10,67] |
| MLHPW(N) 100 | 3.35 [85,0] | .52 [13,33] |
| MLHPW(N) 125 | 3.47 [88,0] | .66 [16,67] |
| MLHPW(N) 160 | 3.66 [93,0] | .84 [21,33] |
| MLHPW(N) 200 | 3.86 [98,0] | 1.05 [26,67] |
| MLHPW(N) 250 | 4.13 [105,0] | 1.31 [33,33] |
| MLHPW(N) 315 | 4.51 [114,5] | 1.68 [42,67] |
| MLHPW(N) 400 | 4.92 [125,0] | 2.10 [53,33] |



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



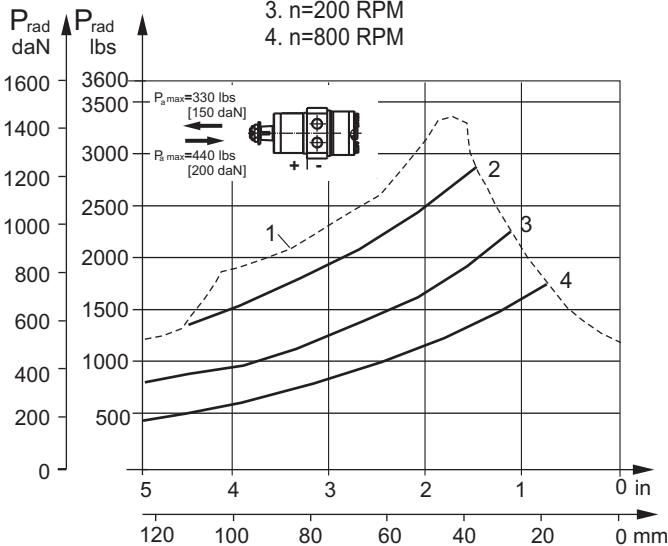
PERMISSIBLE SHAFT LOADS

MLHPWN

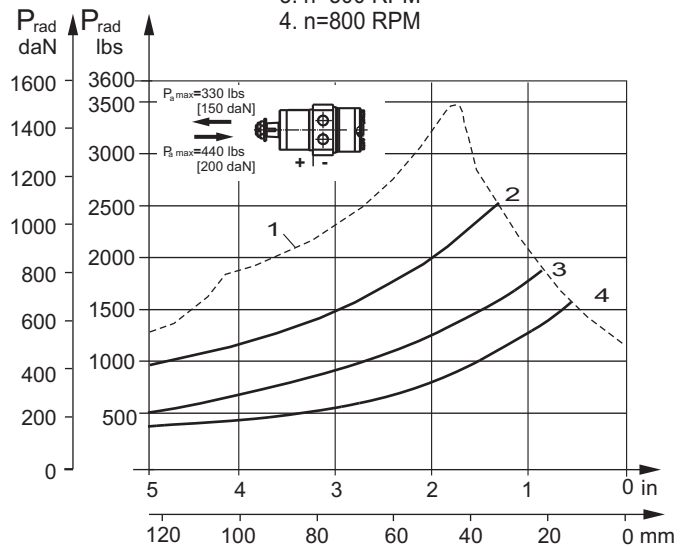
MLHPW

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



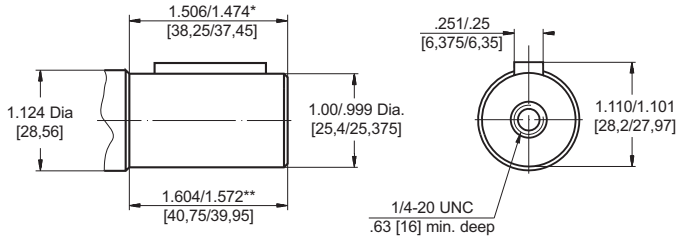
1. Max. radial shaft load
2. n=300 RPM
3. n=500 RPM
4. n=800 RPM



SHAFT EXTENSIONS FOR MLHP AND MLHR MOTORS
1.124 [28,56] sealing diameter

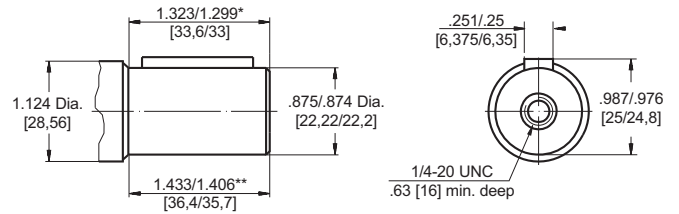
C

1" [25,4] straight, Parallel key 1/4"x1/4"x1 1/4" BS 46
Max. Torque 3009 lb-in [34 daNm]



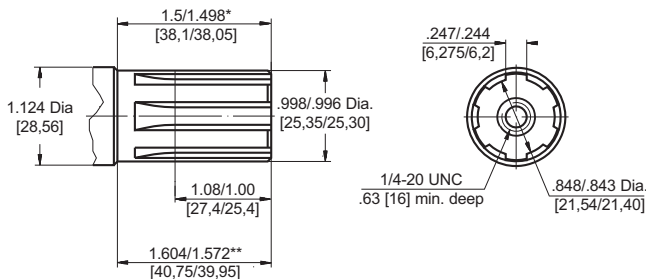
D

7/8" [22,2] straight, Parallel key 1/4"x1/4"x1" BS 46
Max. Torque 3200 lb-in [36 daNm]



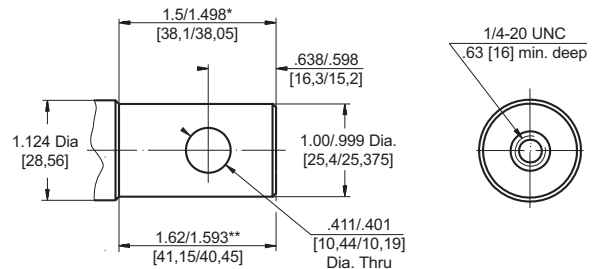
G

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



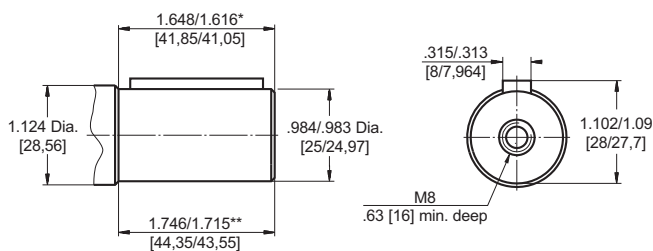
H

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



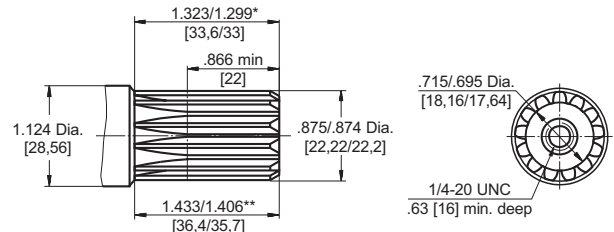
M

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



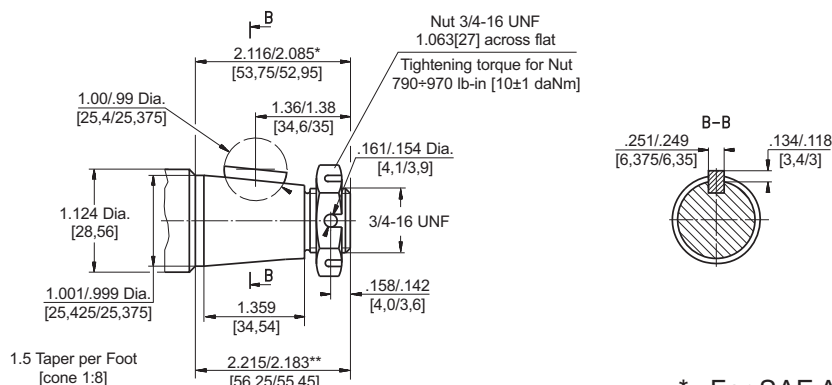
S

13T Splined, 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 1/4"x1" SAE J502
Max. Torque 3540 lb-in [40 daNm]



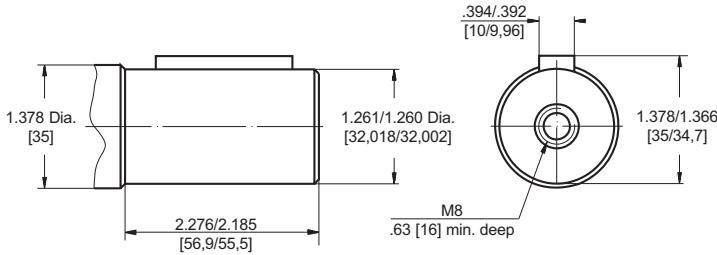
* For SAE A and F Flange
** For M and Q Flange

Requirement max. Torque must not be exceeded.

SHAFT EXTENSIONS FOR MLHP AND MLHR MOTORS (continued)
1.378 [35] sealing diameter

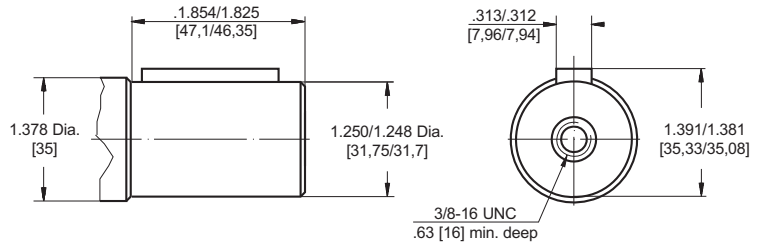
B

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



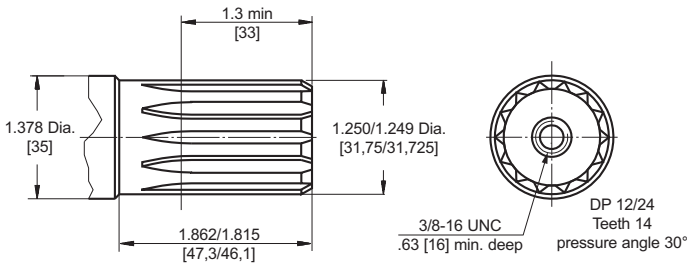
K

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



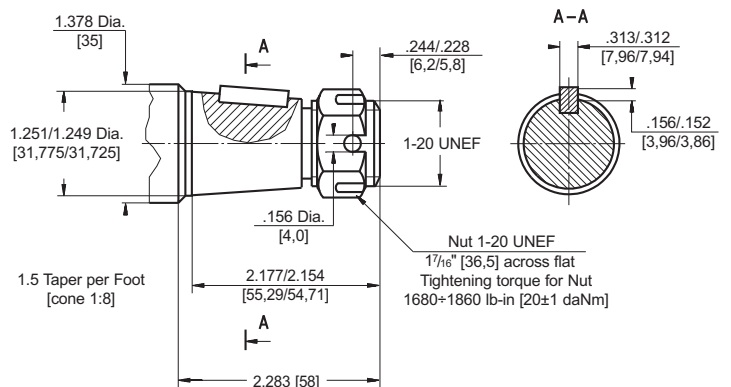
L

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



R

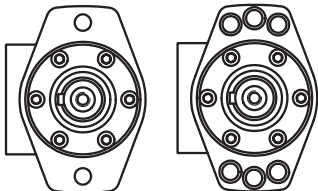
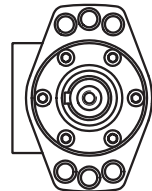
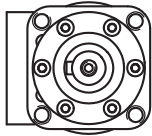
1¼" [31,75], SAE J501 Tapered
Parallel key 5/16"x5/16"x1"
Max. Torque 6815 lb-in [77 daNm]



Requirement max. Torque must not be exceeded.

PERMISSIBLE SHAFT LOADS FOR MLHP AND MLHR MOTORS

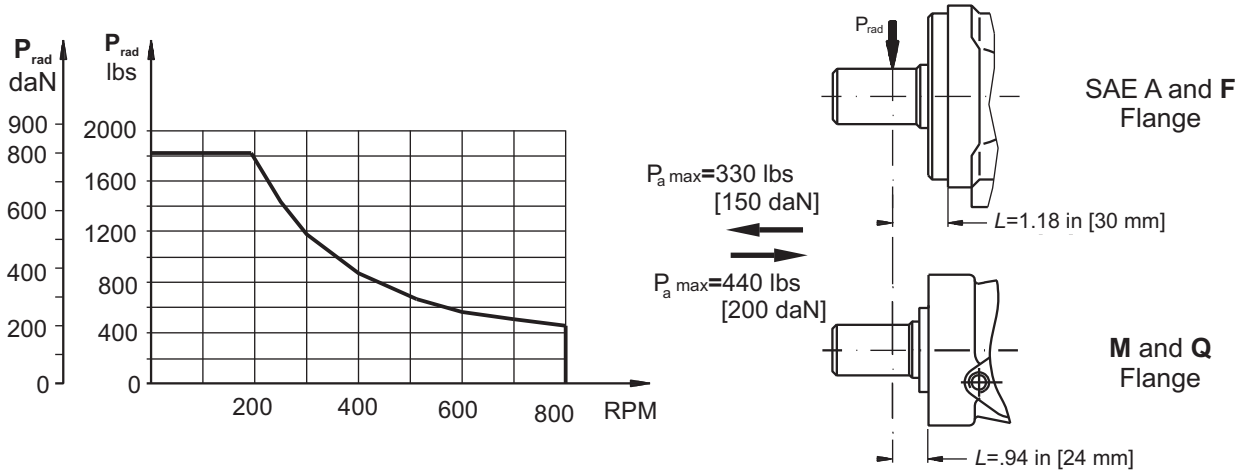
The permissible radial shaft load P_{rad} depends on the speed n , RPM, mounting flange, distance L from the point of load to the mounting flange and shaft version.

| 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* |

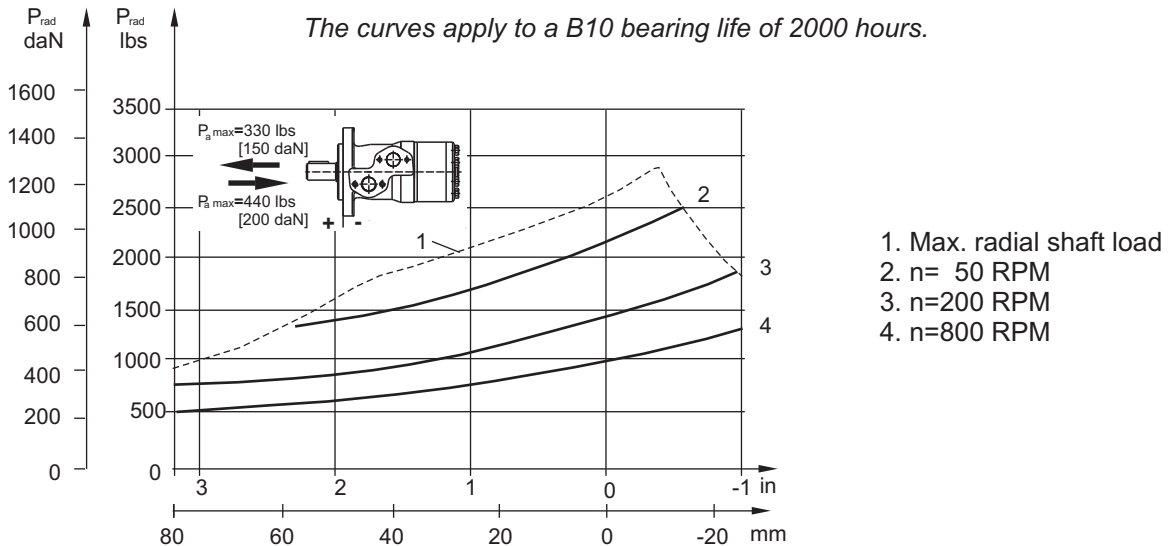
* $n < 200$ RPM; max Prad=1800 lbs [800 daN]
 $n \geq 200$ RPM; $L < 2.2$ in [55 mm]

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

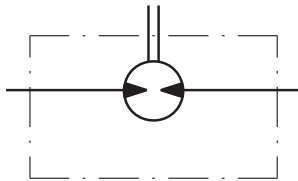


MAX. PERMISSIBLE SHAFT SEAL PRESSURE FOR MLHP AND MLHR MOTORS

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

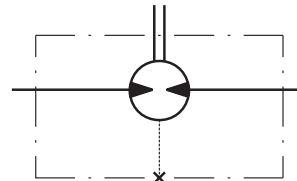
The shaft seal pressure equals the average of input pressure and return pressure.

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



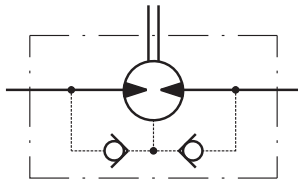
MLHP/MLHR...U motors with high pressure seal and drain connection:

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



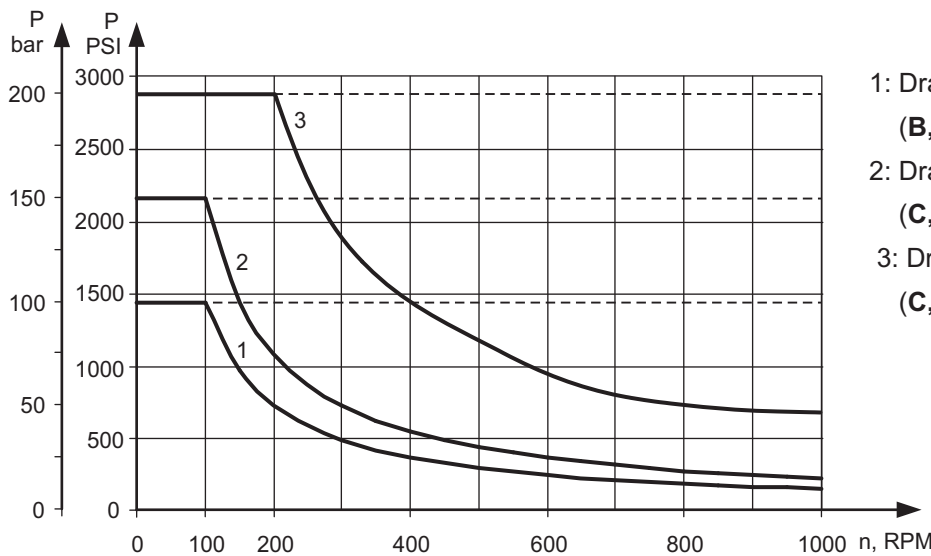
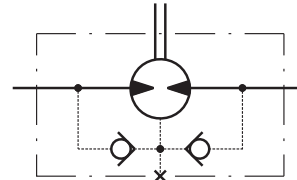
MLHP/MLHR...1 motors with standard shaft seal and without drain connection:

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!

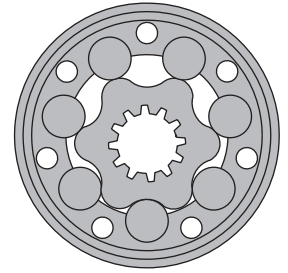
The hydraulic motors are mangano-phosphatized as standard.

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

Specification data34÷35
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 Dimensions and mounting 41÷42
 Shaft extensions 28÷29
 Permissible shaft loads 30
 Permissible shaft Seal Pressure ... 31
 Order code43

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

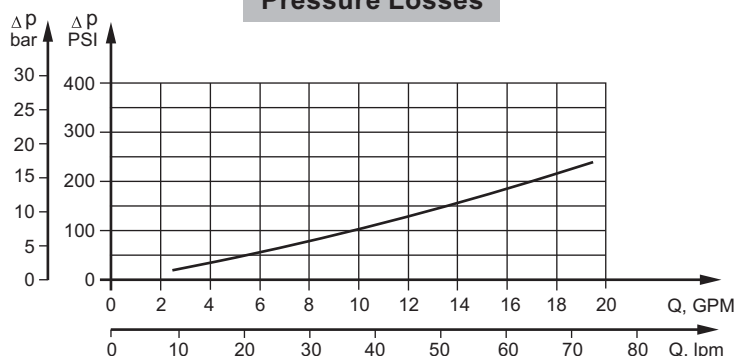
GENERAL

| | |
|---|--|
| 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, in³/rev [cm³/rev] | | 3.14 | 4.90 | 6.09 | 7.67 | 9.74 | 12.19 | 15.26 | 19.26 | 24.4 |
| | | [51,5] | [80,3] | [99,8] | [125,7] | [159,6] | [199,8] | [250,1] | [315,7] | [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, in³/rev [cm³/rev] | | 3.14 | 4.90 | 6.09 | 7.67 | 9.74 | 12.19 | 15.26 | 19.26 | 24.4 |
| | | [51,5] | [80,3] | [99,8] | [125,7] | [159,6] | [199,8] | [250,1] | [315,7] | [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.

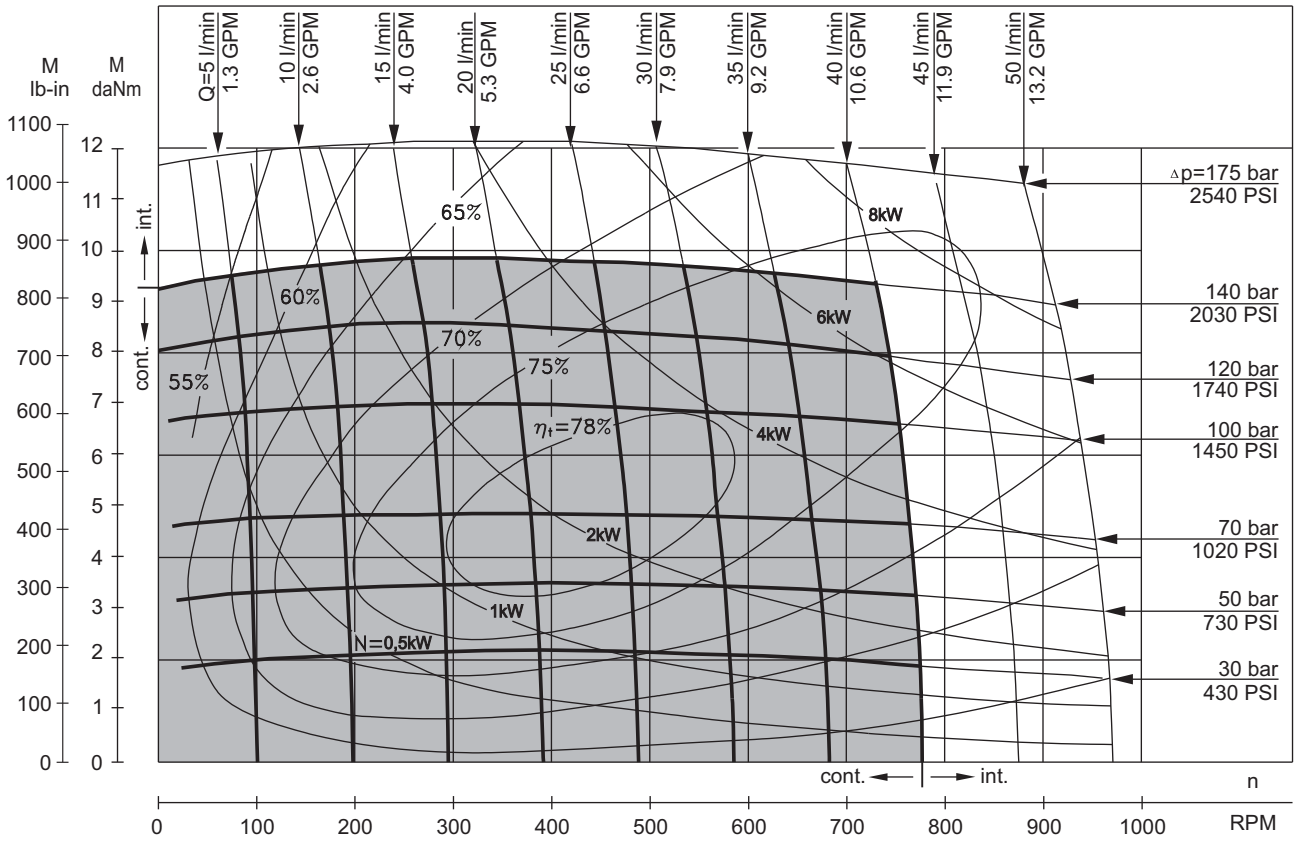
** Peak load: the permissible values may occur for max. 1% of every minute.

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

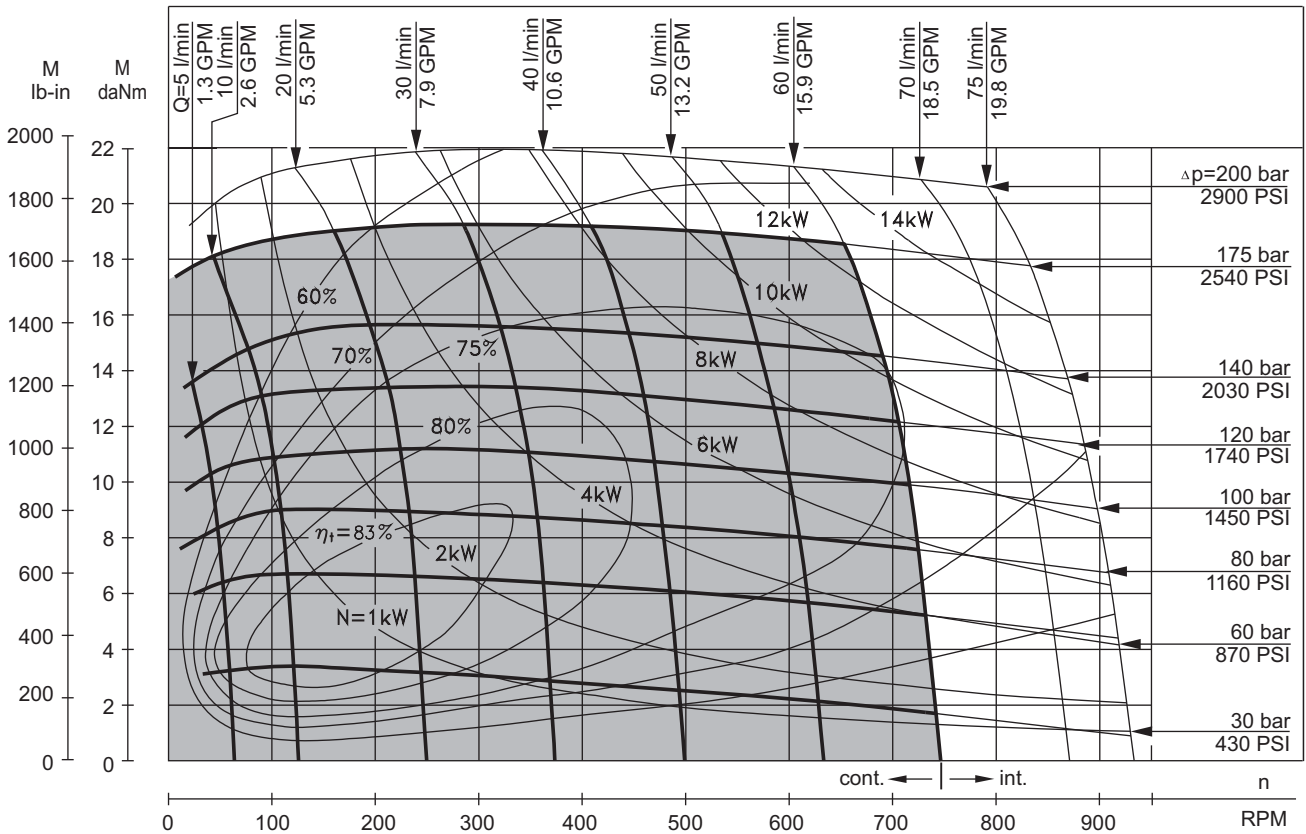
- Intermittent speed and intermittent pressure must not occur simultaneously.
- Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
- Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP(DIN51524) or HM (ISO 6743/4).
If using 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



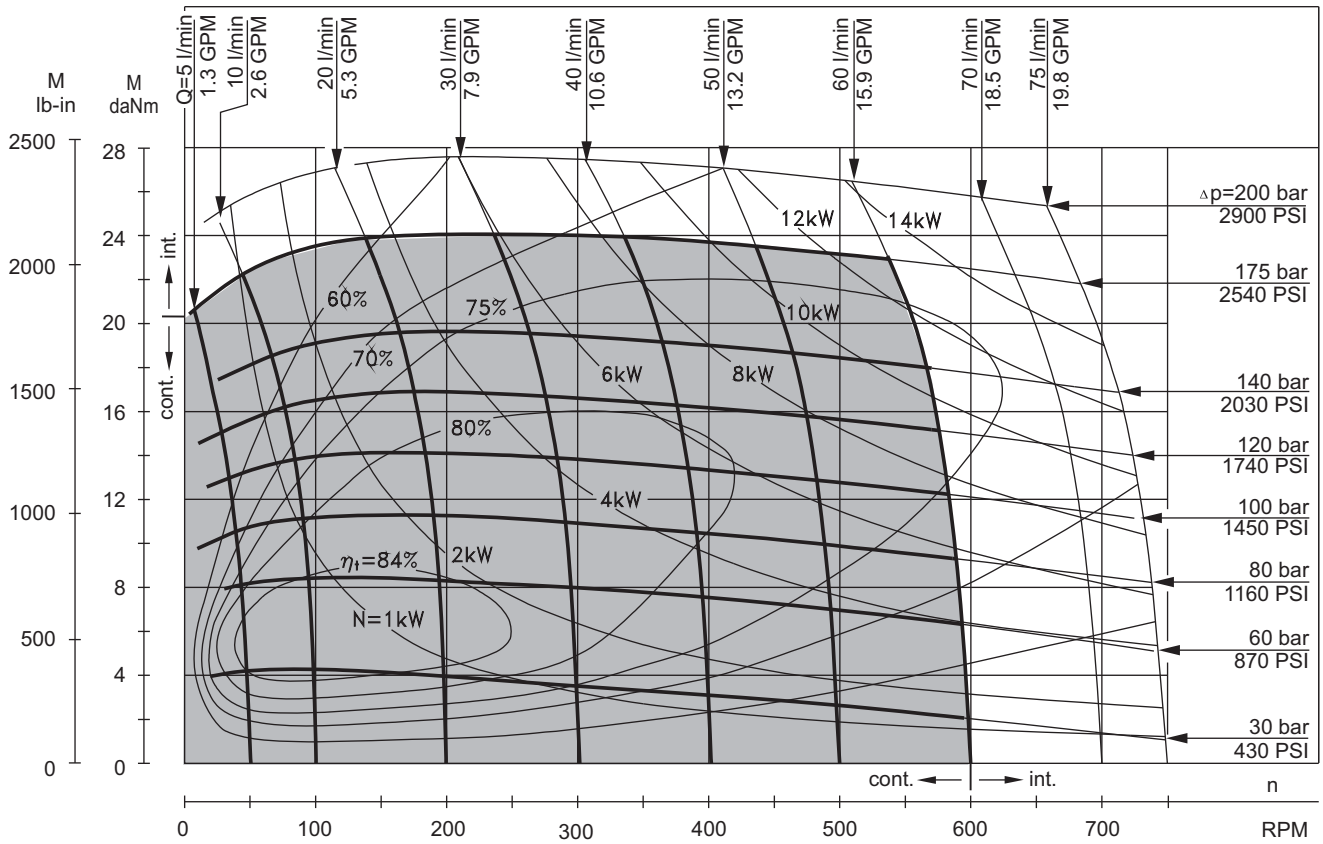
MLHR 80



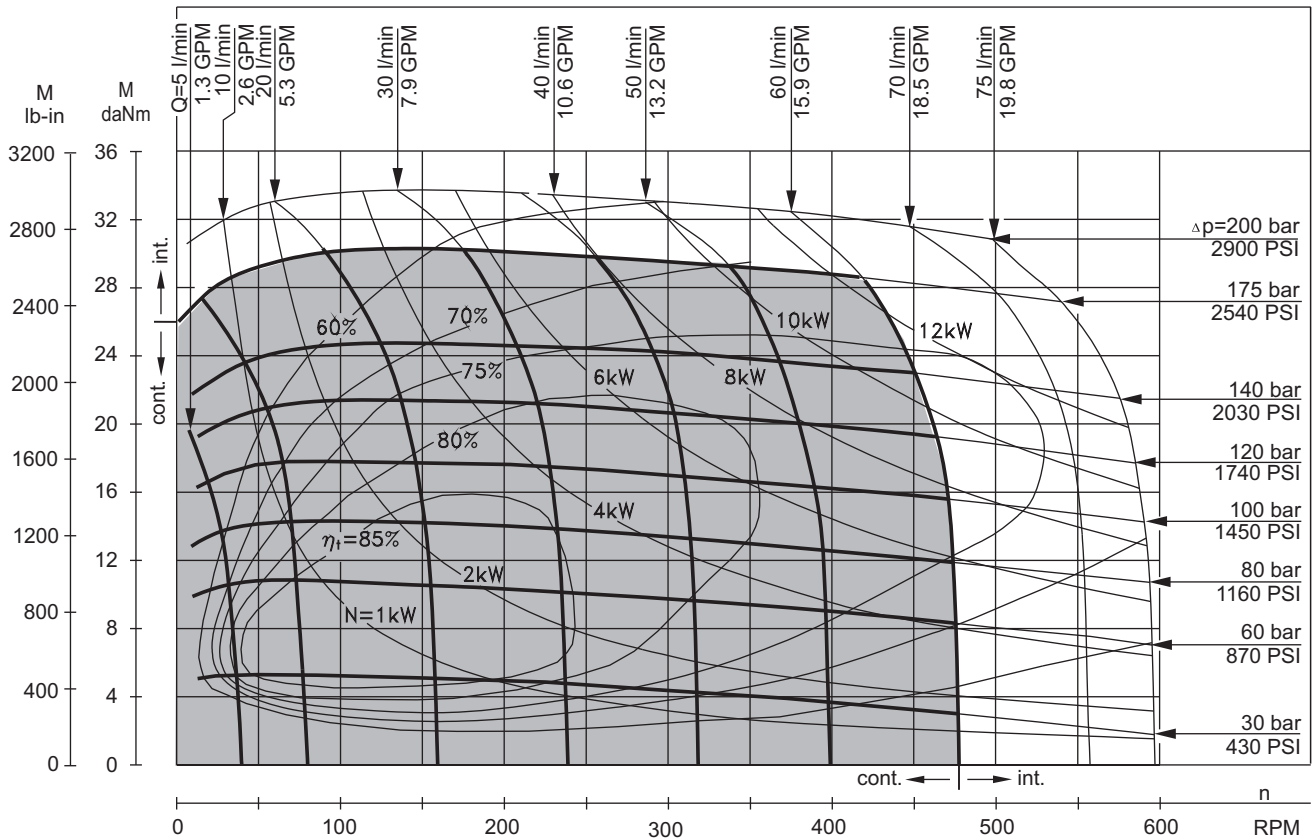
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHR 100



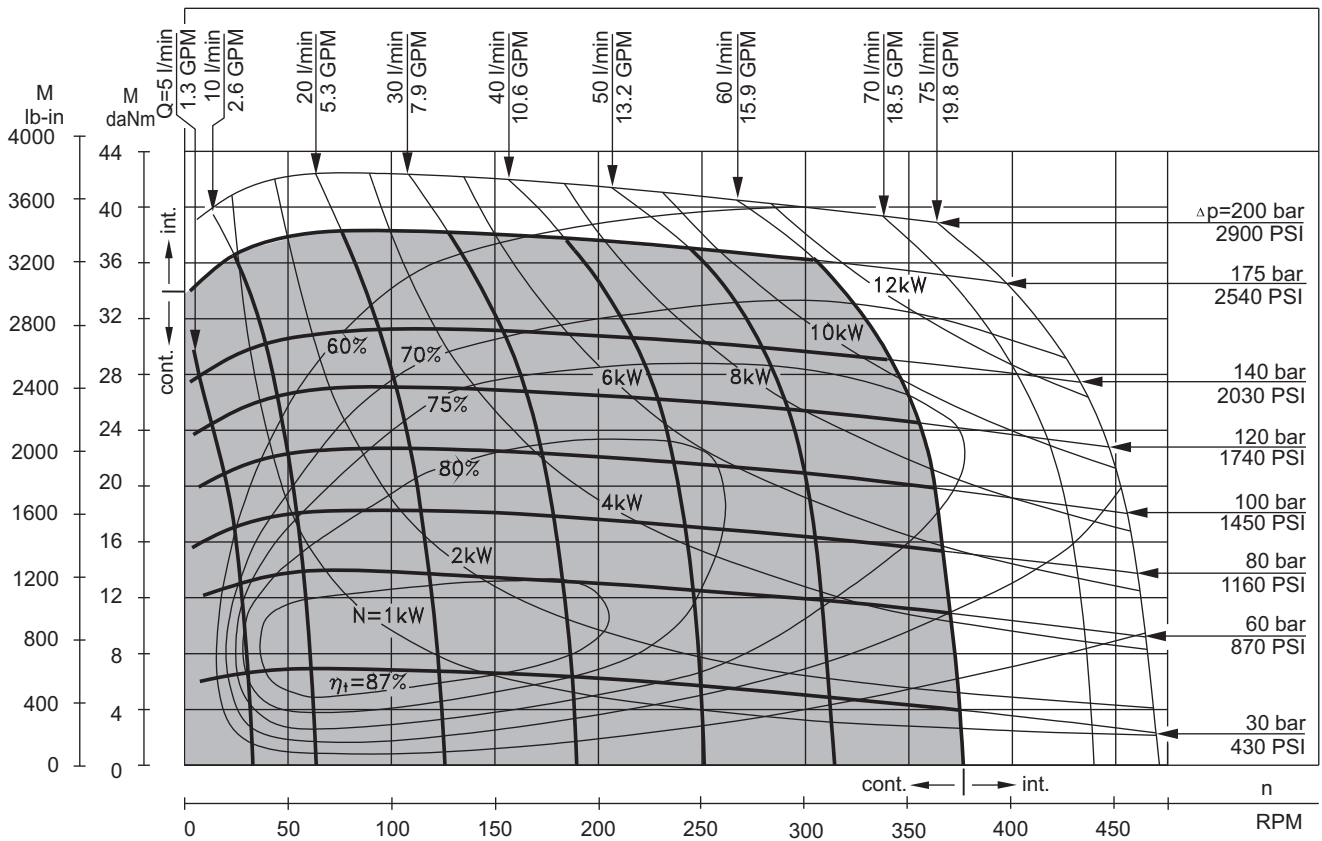
MLHR 125



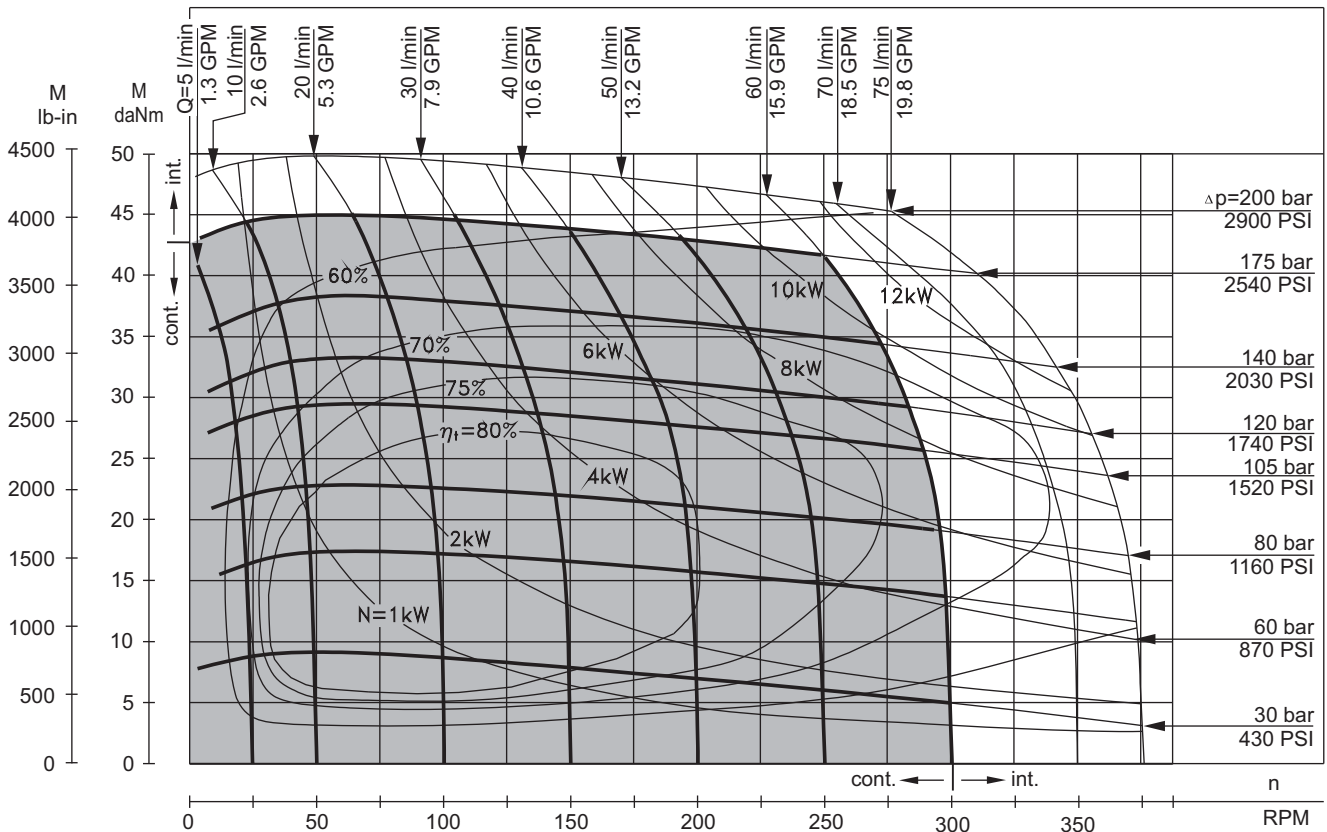
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHR 160



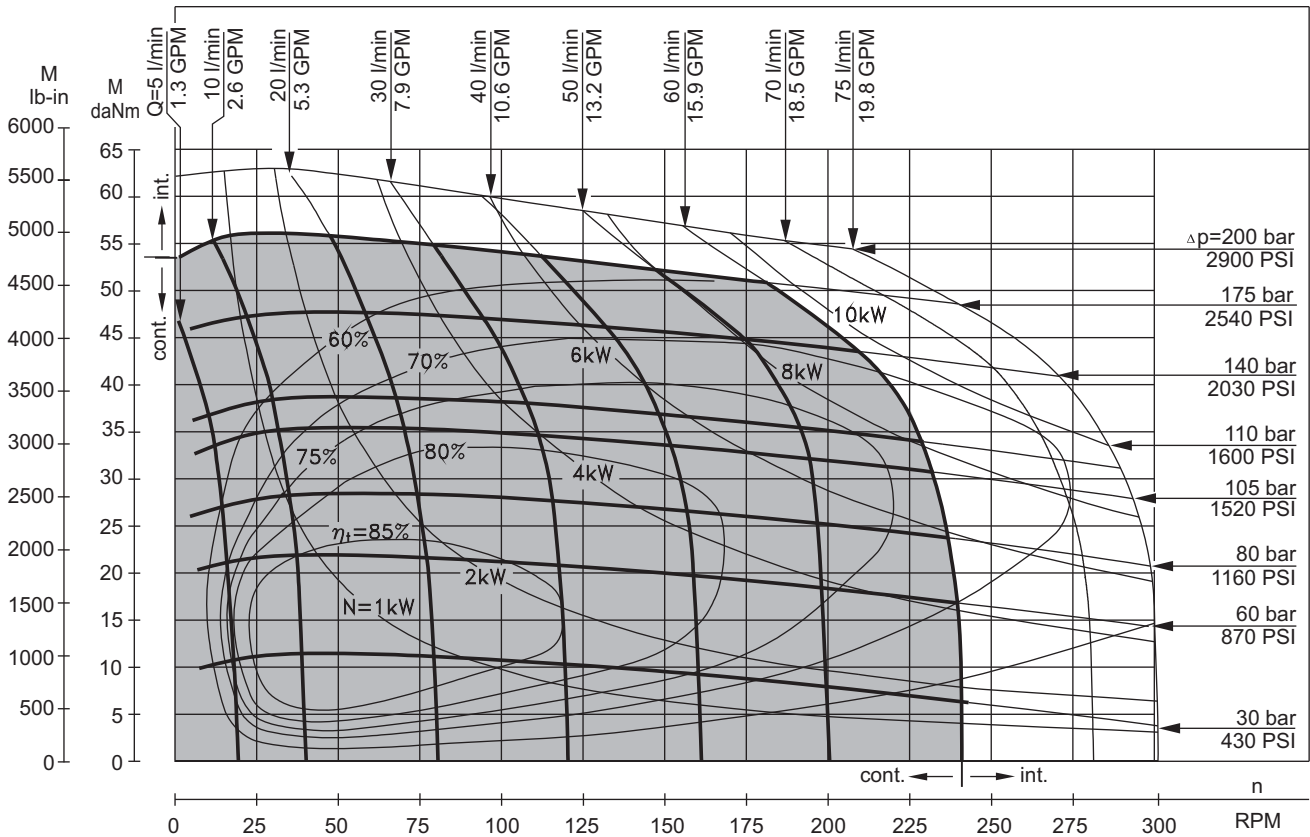
MLHR 200



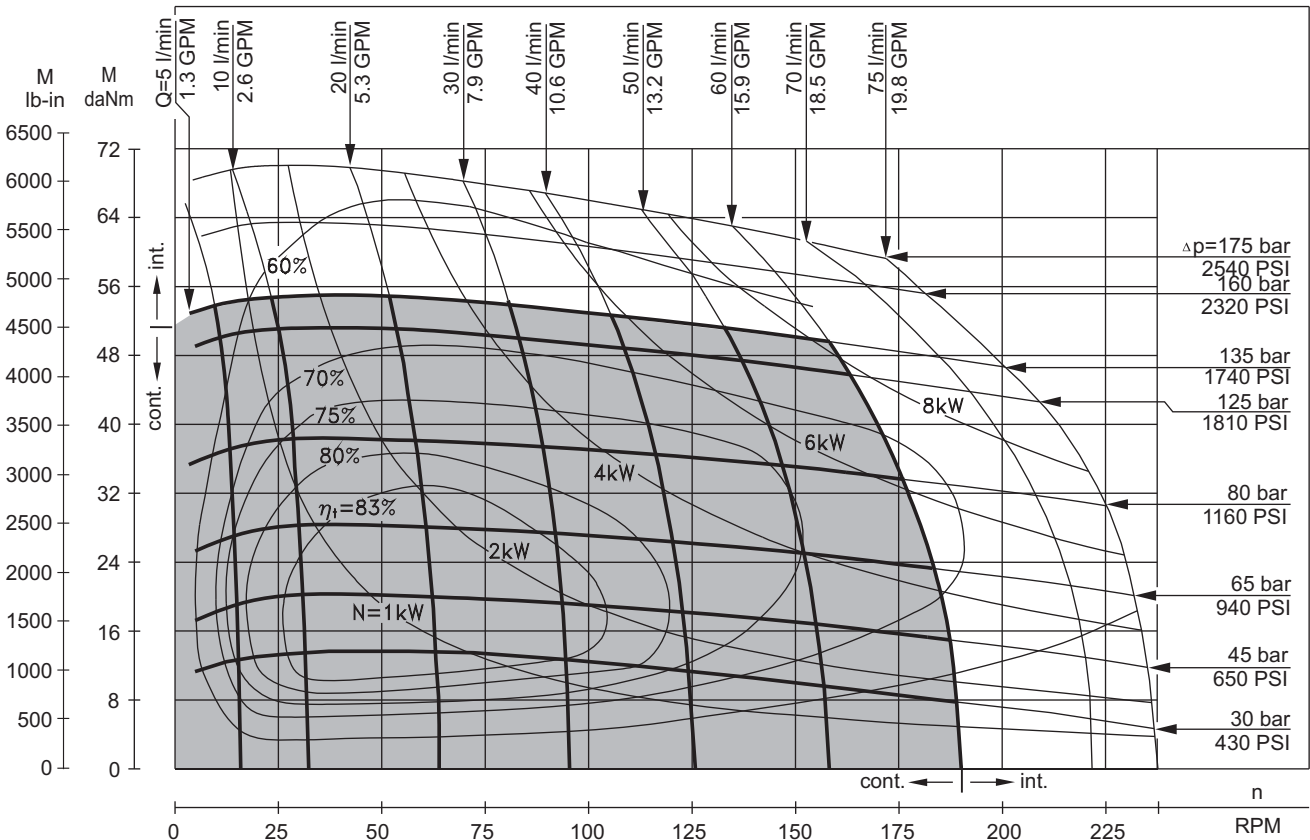
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHR 250



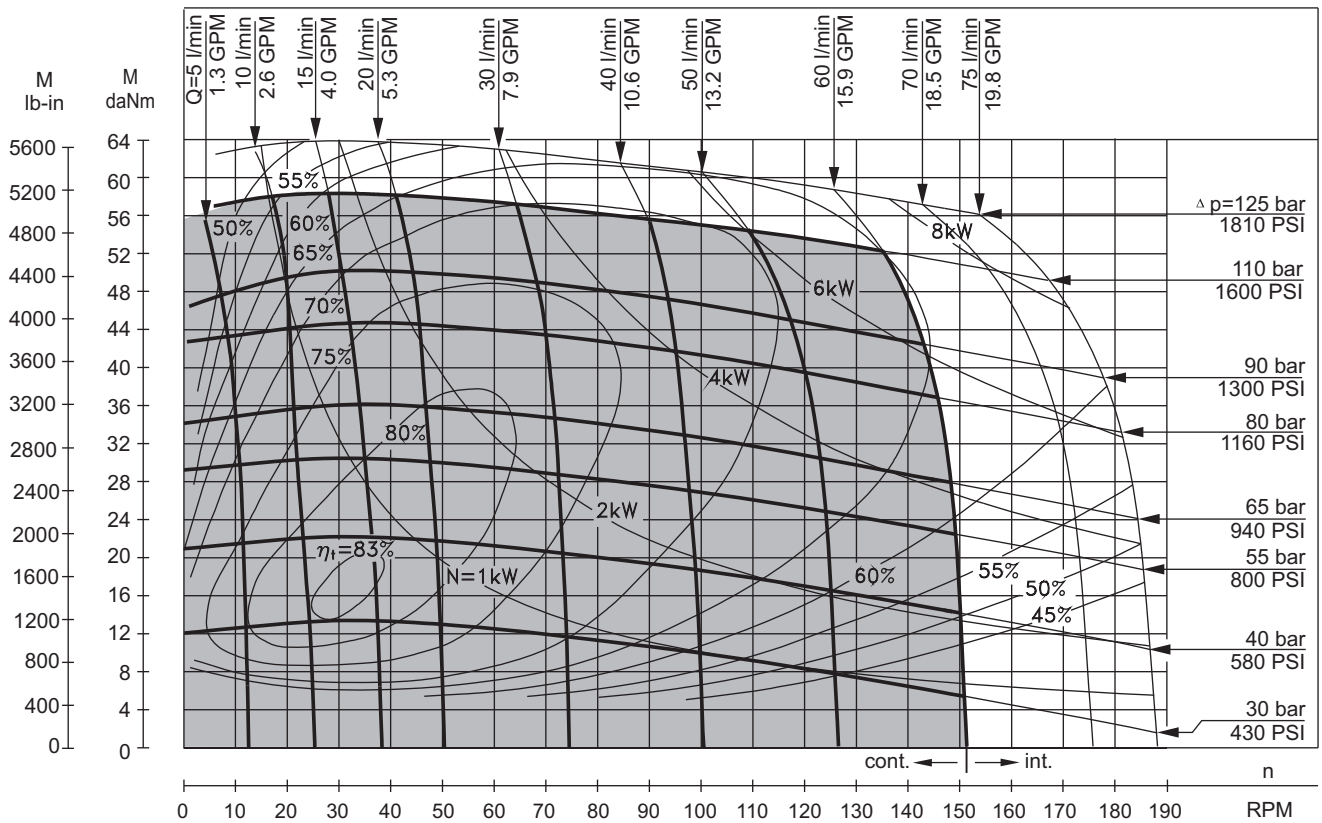
MLHR 315



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].

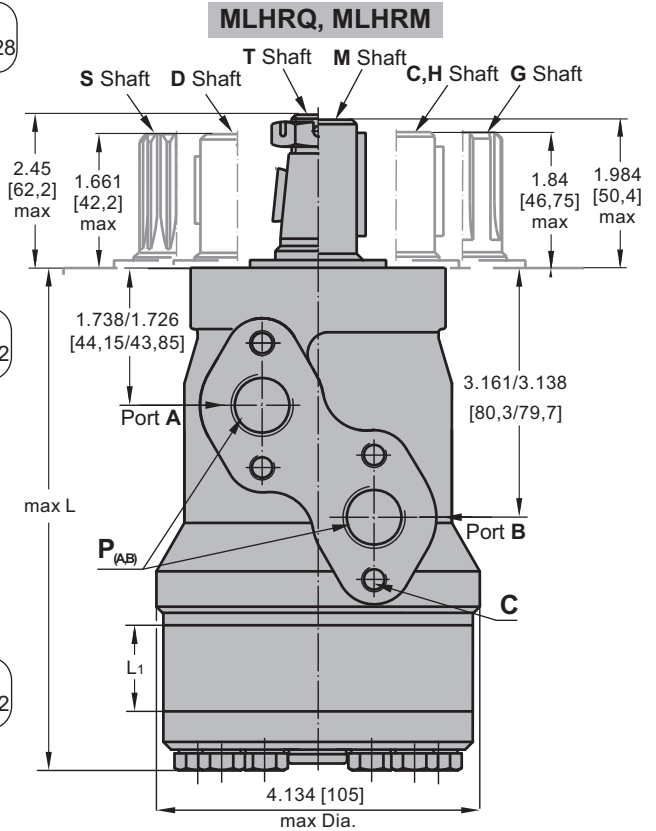
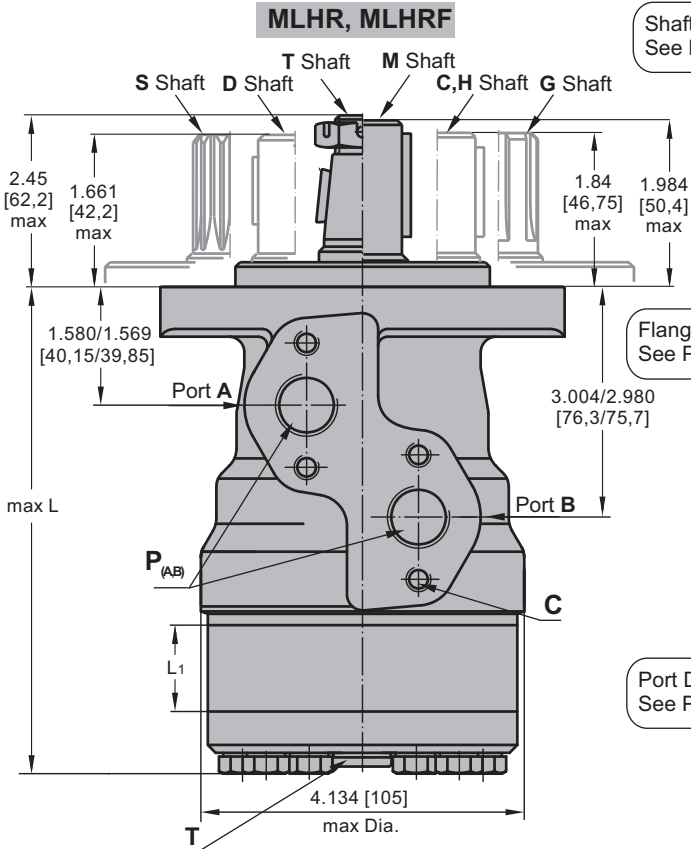
FUNCTION DIAGRAMS

MLHR 400

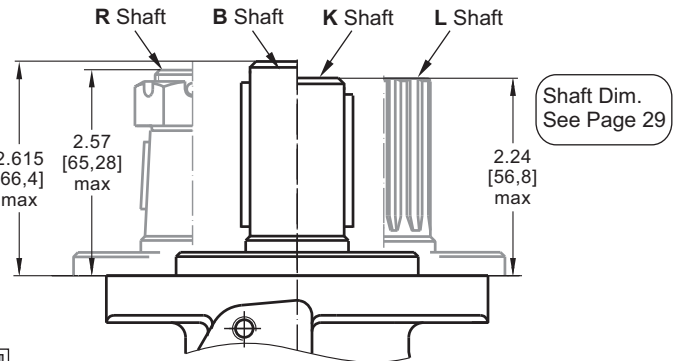
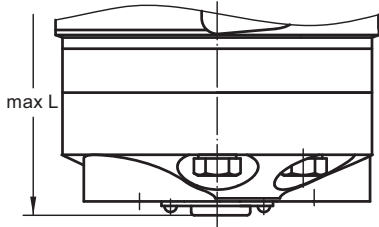


The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

DIMENSIONS AND MOUNTING DATA



Version **6 7 8 9**
Rear ports



in [mm]

| | Versions | | | |
|--------------------------|-------------------|-----------|---------------------------|---------------------------|
| | 2, 6 | 3, 9 | 4, 7 | 5, 8 |
| C | 4xM8 | 4xM8 | 4x $\frac{7}{16}$ -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

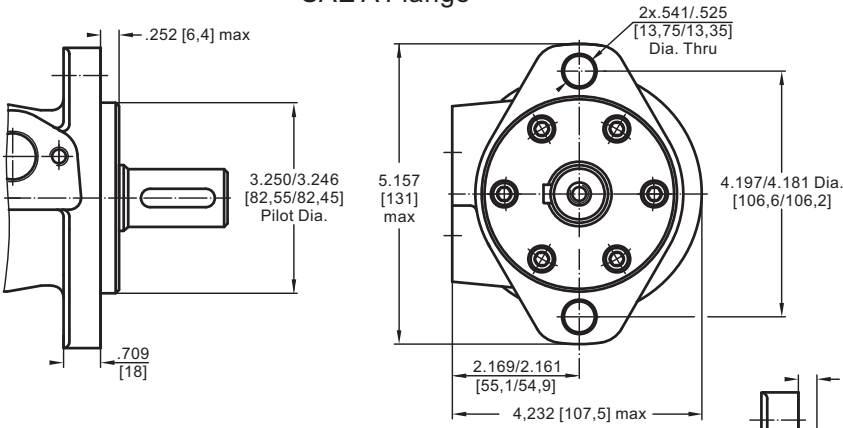
Viewed from Shaft End
Port A Pressurized - **CCW**
Port B Pressurized - **CW**

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

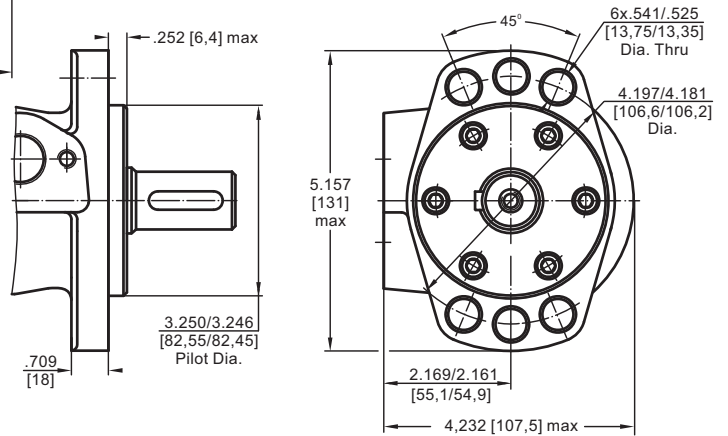
* - For Rear Ported Motors.

MOUNTING

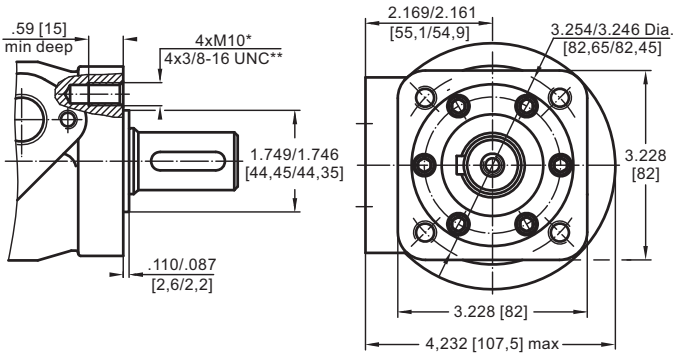
SAE A Flange



F - Magneto Flange



M and Q - Square Flange

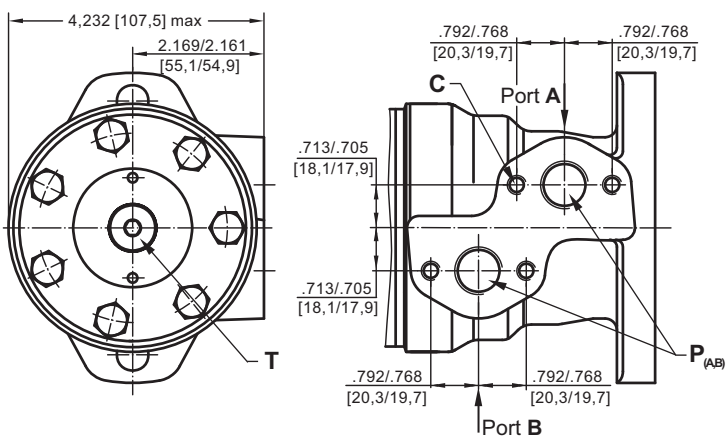


* For M Flange
** For Q Flange

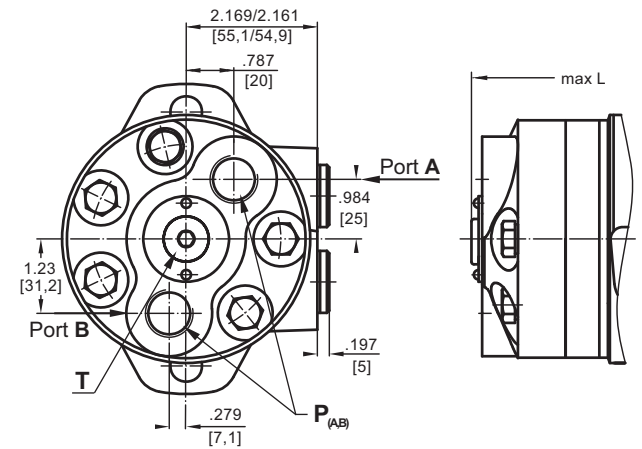


PORTS

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 | $\frac{1}{8}$ -20 UNF | $\frac{1}{8}$ -20 UNF |

ORDER CODE

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

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 - ⁷/₈" [22,2] straight, Parallel key

G - 1" [25,4] SAE 6B Splined

H - 1" [25,4] straight w/ .406 [10,3] Crosshole

M - 25 mm straight, Parallel key

VM - 25 mm straight, Parallel key w/ corrosion resistant bushing

S - ⁷/₈" [22,2] 13T Splined

T - 1" [25,4] SAE J501 Tapered

B - 32 mm straight, Parallel key

K - 1¼" [31,75] straight, Parallel key

L - 1¼" [31,75] 14T Splined

R - 1¼" [31,75] SAE J501 Tapered

Pos.4 - Option [needle bearings]

omit - none

N - with needle bearings

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

2 - side ports, 2xG1/2, G1/4, BSP thread, ISO 228

3 - side ports, 2xM22x1,5, M14x1,5, metric thread, ISO 262

4 - side ports, 2x7/8-14 UNF, O-ring, 7/16-20 UNF

5 - side ports, 2x1/2-14 NPTF, 7/16-20 UNF

6 - rear ports, 2xG1/2, G1/4, BSP thread, ISO 228

7 - rear ports, 2x7/8-14 UNF, O-ring, 7/16-20 UNF

8 - rear ports, 2x1/2-14 NPTF, 7/16-20 UNF

9 - rear ports, 2xM22x1,5, M14x1,5, metric thread, ISO 262

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

omit - Standard shaft seal

U - High pressure shaft seal (without check valves)

Pos.7 - Drain Port

omit - with drain port

1 - without drain port

Pos.8 - Special Features [see page 103]

Pos.9 - Design Series

omit - Factory specified

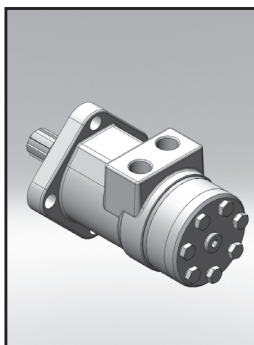
Notes:

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!

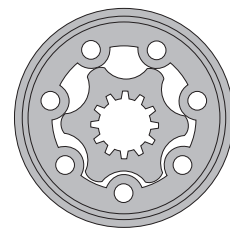
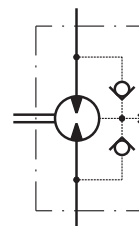
The hydraulic motors are mangano-phosphatized as standard.

HYDRAULIC MOTORS MLHPL



APPLICATION

- ≈ Conveyors
- ≈ Feeding mechanism of robots and manipulators
- ≈ Metal working machines
- ≈ Textile machines
- ≈ Agricultural machines
- ≈ Food industries



CONTENTS

Specification data 45
 Dimensions and mounting 46
 Shaft extensions 47
 Permissible shaft loads 48
 Order code 48

OPTIONS

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

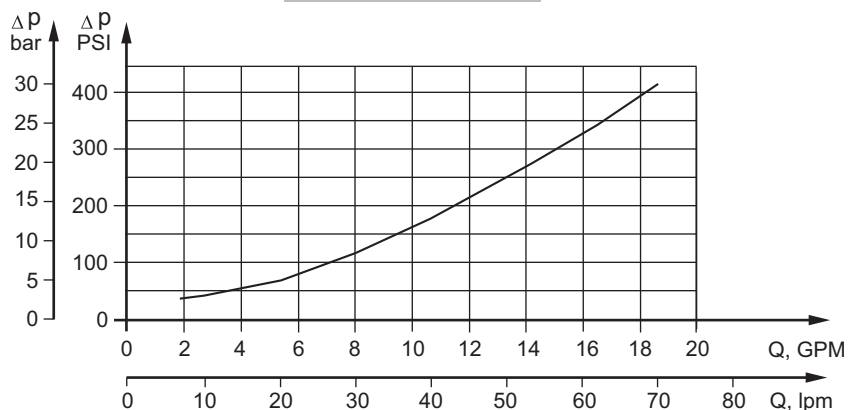
GENERAL

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

Oil flow in drain line

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

Pressure Losses



SPECIFICATION DATA

| Type | MLHPL 50 | MLHPL 80 | MLHPL 100 | MLHPL 125 | MLHPL 160 | MLHPL 200 | MLHPL 250 | MLHPL 315 | MLHPL 400 | |
|--|-------------------|-------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|-------------|
| Displacement, in³/rev [cm³/rev] | 3.02 [49,5] | 4.83 [79,2] | 6.04 [99] | 7.55 [123,8] | 9.66 [158,4] | 12.1 [198] | 15.1 [247,5] | 19.3 [316,8] | 24.16 [396] | |
| Max. Speed, [RPM] | Cont. | 1210 | 755 | 605 | 485 | 378 | 303 | 242 | 190 | 150 |
| | Int.* | 1515 | 945 | 755 | 605 | 472 | 378 | 303 | 236 | 189 |
| Max. Torque lb-in [daNm] | Cont. | 832 [9,4] | 1336 [15,1] | 1708 [19,3] | 2100 [23,7] | 2770 [31,3] | 3240 [36,6] | 4160 [47] | 4300 [48,6] | 4425 [50] |
| | Int.* | 1054 [11,9] | 1725 [19,5] | 2097 [23,7] | 2637 [29,8] | 3345 [37,8] | 4035 [45,6] | 5160 [58,3] | 4956 [56] | 5222 [59] |
| | Peak** | 1240 [14,0] | 1947 [22,0] | 2390 [27,0] | 3230 [36,5] | 3717 [42] | 4700 [53] | 5930 [67] | 7523 [85] | 7560 [85,4] |
| Max. Output HP [kW] | Cont. | 13.3 [9,9] | 13.3 [9,9] | 13.3 [9,9] | 13.3 [9,9] | 15.7 [11,7] | 13.8 [10,3] | 13.1 [9,8] | 10.2 [7,6] | 8.9 [6,6] |
| | Int.* | 16.8 [12,5] | 16.8 [12,5] | 16.8 [12,5] | 16.8 [12,5] | 16.8 [12,5] | 20.8 [15,5] | 23.5 [17,5] | 11 [8,2] | 12.3 [9,2] |
| Max. Pressure Drop PSI [bar] | Cont. | 2030 [140] | 2030 [140] | 2030 [140] | 2030 [140] | 2030 [140] | 2030 [140] | 2030 [140] | 1300 [120] | 1015 [95] |
| | Int.* | 2540 [175] | 2540 [175] | 2540 [175] | 2540 [175] | 2540 [175] | 2540 [175] | 2540 [175] | 2030 [140] | 1665 [115] |
| | Peak** | 3260 [225] | 3260 [225] | 3260 [225] | 3260 [225] | 3260 [225] | 3260 [225] | 3260 [225] | 3260 [225] | 2610 [180] |
| Max. Oil Flow GPM [lpm] | Cont. | 16 [60] | 16 [60] | 16 [60] | 16 [60] | 16 [60] | 16 [60] | 16 [60] | 16 [60] | 16 [60] |
| | Int.* | 20 [75] | 20 [75] | 20 [75] | 20 [75] | 20 [75] | 20 [75] | 20 [75] | 20 [75] | 20 [75] |
| Max. Inlet Pressure PSI [bar] | Cont. | 2540 [175] | 2540 [175] | 2540 [175] | 2540 [175] | 2540 [175] | 2540 [175] | 2540 [175] | 2540 [175] | 2540 [175] |
| | Int.* | 2900 [200] | 2900 [200] | 2900 [200] | 2900 [200] | 2900 [200] | 2900 [200] | 2900 [200] | 2900 [200] | 2900 [200] |
| | Peak** | 3260 [225] | 3260 [225] | 3260 [225] | 3260 [225] | 3260 [225] | 3260 [225] | 3260 [225] | 3260 [225] | 3260 [225] |
| Max. Return Pressure without Drain Line or Max. Pressure in Drain Line, PSI [bar] | Cont. 0-100 RPM | 1450 [100] | 1450 [100] | 1450 [100] | 1450 [100] | 1450 [100] | 1450 [100] | 1450 [100] | 1450 [100] | 1450 [100] |
| | Cont. 100-300 RPM | 725 [50] | 725 [50] | 725 [50] | 725 [50] | 725 [50] | 725 [50] | 725 [50] | 725 [50] | 725 [50] |
| | Cont. 300-600 RPM | 365 [25] | 365 [25] | 365 [25] | 365 [25] | 365 [25] | 365 [25] | 365 [25] | 365 [25] | 365 [25] |
| | Cont. >600 RPM | 220 [15] | 220 [15] | 220 [15] | 220 [15] | 220 [15] | 220 [15] | 220 [15] | 220 [15] | 220 [15] |
| 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] |
| 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] | 131 [9] | 116 [8] | 100 [7] | 87 [6] | 73 [5] | 73 [5] | |
| Min. Starting Torque lb-in [daNm] | 681 [7,7] | 1150 [13] | 1487 [16,8] | 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] | |

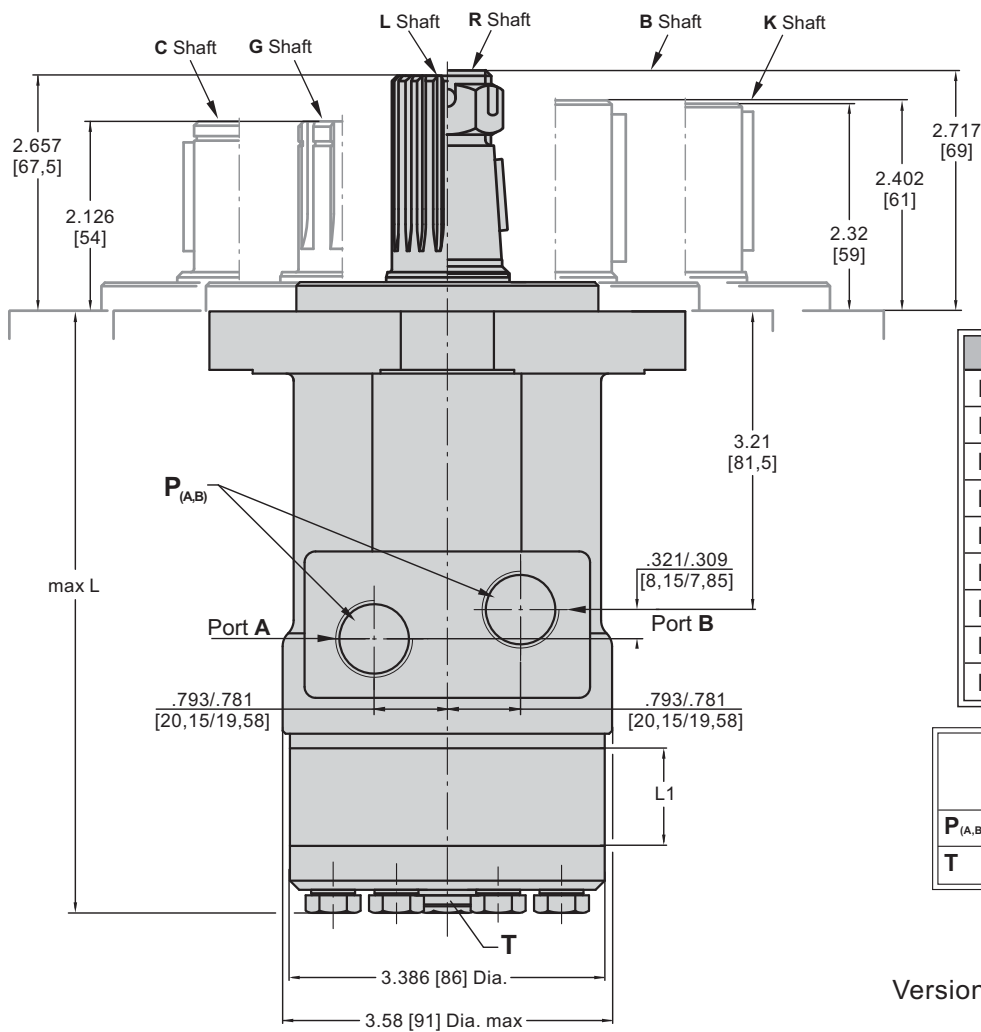
* Intermittent operation: the permissible values may occur for max. 10% of every minute.

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

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

- 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

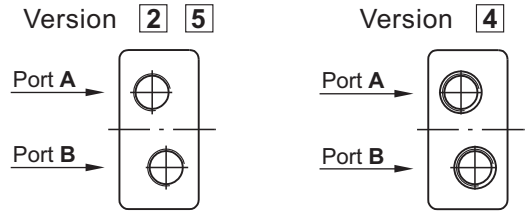
| Type | L_{max} , mm [in] | L_r , in [mm] |
|-----------|---------------------|-----------------|
| MLHPL 50 | 5.71 [145,0] | .26 [6,67] |
| MLHPL 80 | 5.87 [149,0] | .42 [10,67] |
| MLHPL 100 | 5.96 [151,5] | .52 [13,33] |
| MLHPL 125 | 6.10 [155,0] | .66 [16,67] |
| MLHPL 160 | 6.28 [159,5] | .84 [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

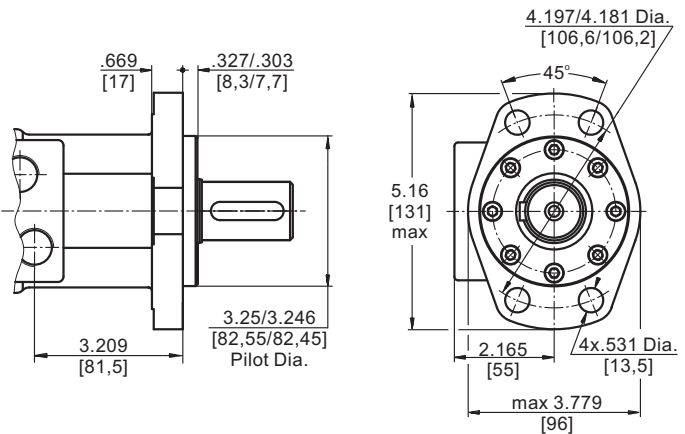
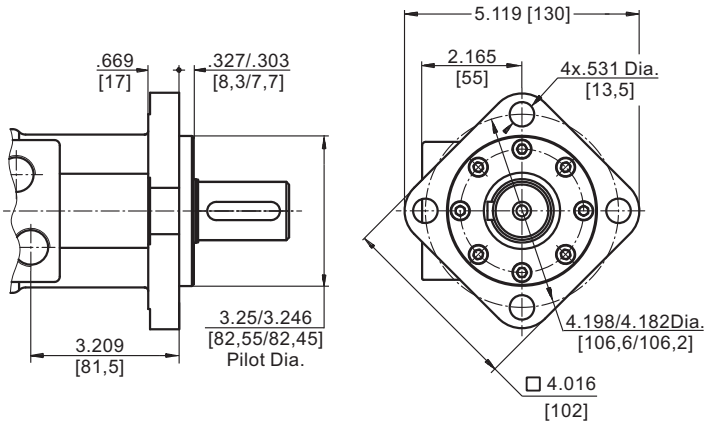
Side Ports



MOUNTING

Square Mount (4 Holes)

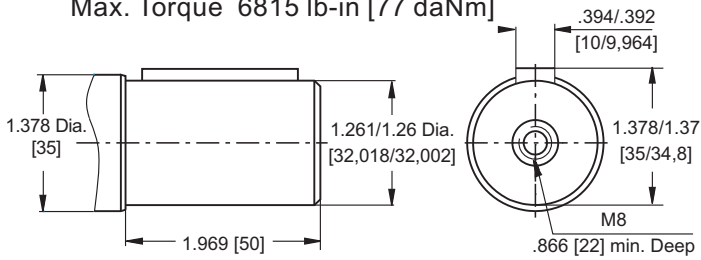
F Oval Mount (4 Holes)



SHAFT EXTENSIONS FOR MLHPL AND MLHRL

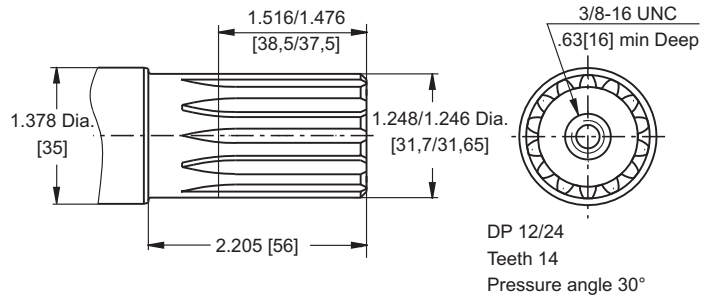
B

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



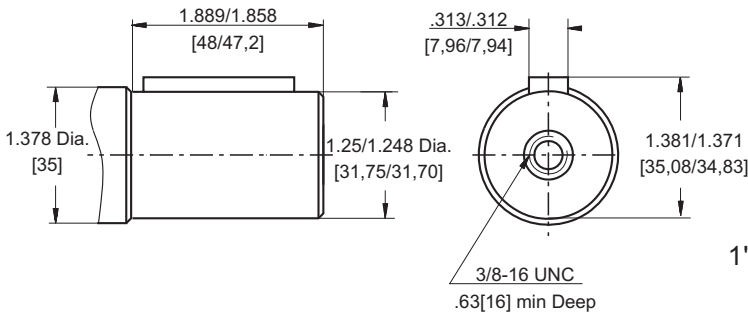
L

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



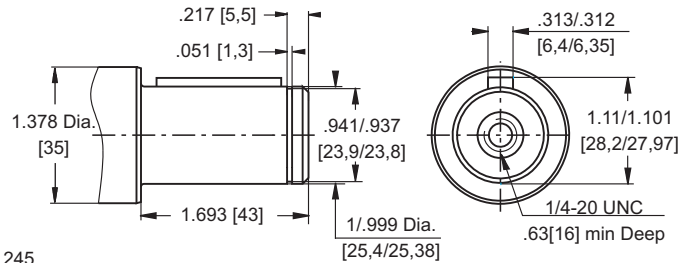
K

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



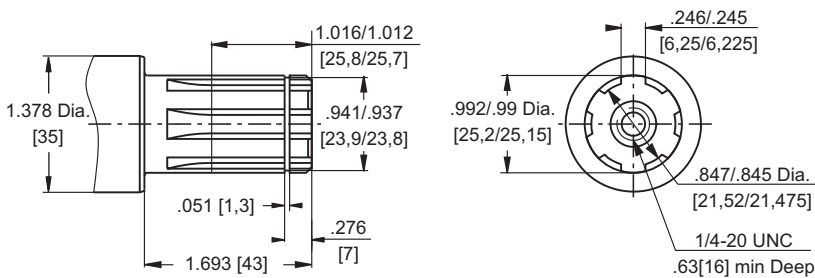
C

1" [25,4] straight, Parallel key ¼"x ¼"x 1¼" BS46
Max. Torque 3010 lb-in [34 daNm]



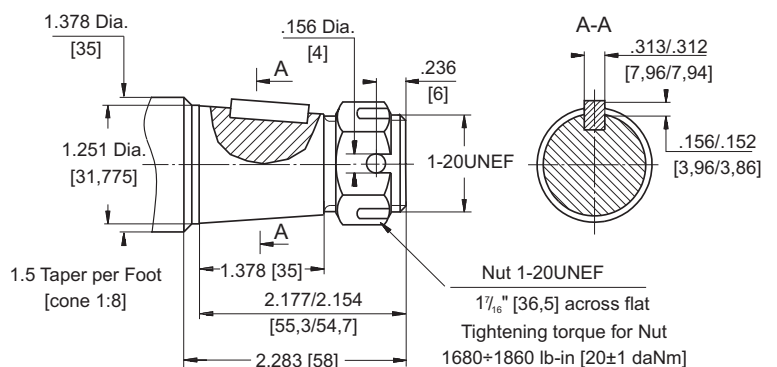
G

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



R

1¼" [31,75], SAE J501 Tapered
Parallel key 5/16"x 5/16"x 1"
Max. Torque 6815 lb-in [77 daNm]



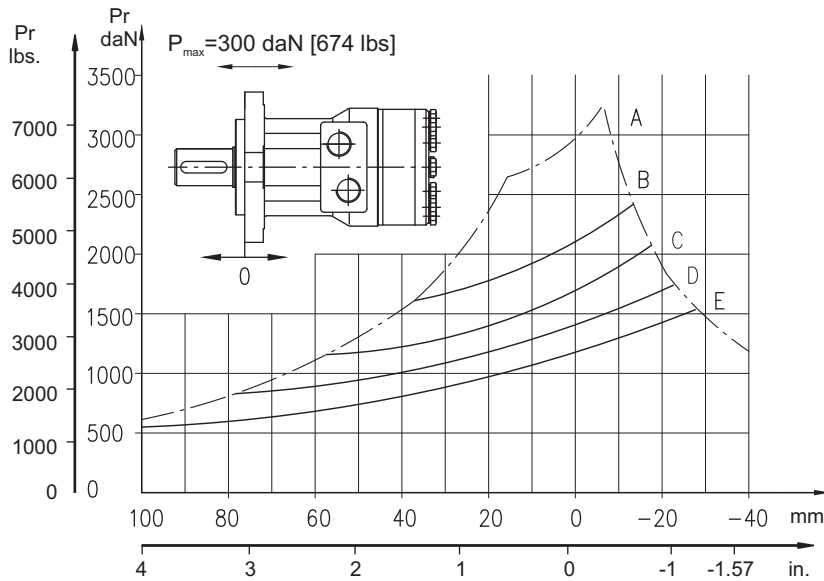
▽ - Motor Mounting Surface



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 - $\varnothing 32$ straight, Parallel key

K - 1 1/4" [31,75] straight, Parallel key

L - 1 1/4" [31,75] splined 14T ANS B 92.1-1976

R - 1 1/4" [31,75] tapered SAE J 501

C - $\varnothing 25,4$ straight, Parallel key

G - $\varnothing 25,4$ 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

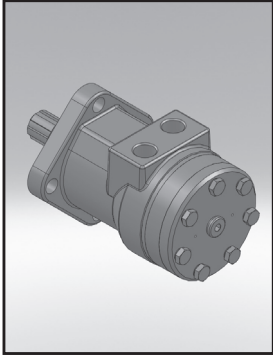
NOTES:

* 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!

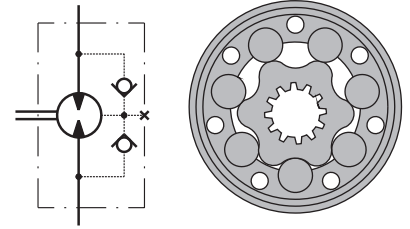
The hydraulic motors are mangano-phosphatized as standard.

HYDRAULIC MOTORS MLHRL



APPLICATION

- ≈ Conveyors
- ≈ Feeding mechanism of robots and manipulators
- ≈ Metal working machines
- ≈ Textile machines
- ≈ Agricultural machines
- ≈ Food industries



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| Shaft versions | 47 |
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OPTIONS

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

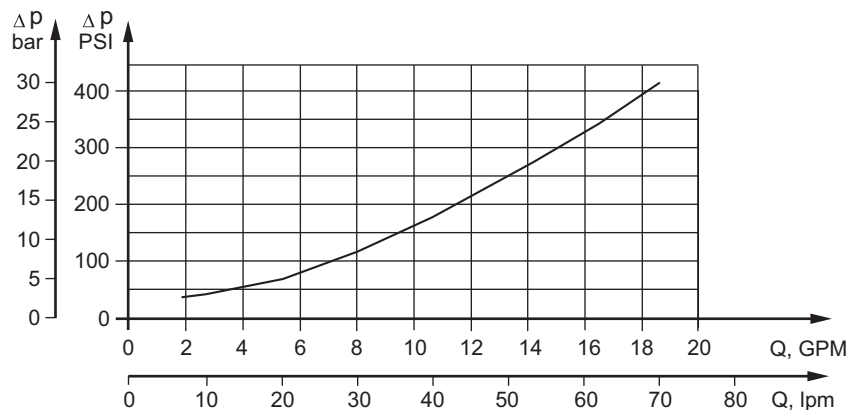
GENERAL

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

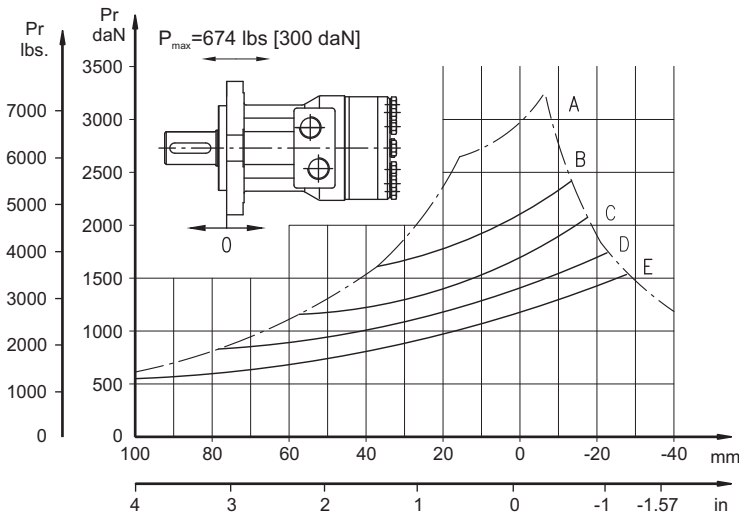
** Peak load: the permissible values may occur for max. 1% of every minute.

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

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.

Permissible Shaft Loads MLHPL and MLHRL

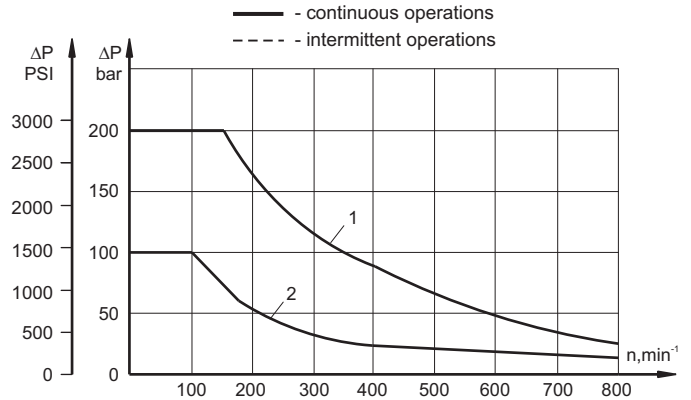
The curves apply to a B10 bearings life of 2000 hrs



- 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** - $\varnothing 32$ straight, Parallel key
- K** - 1 1/4" [31,75] straight, Parallel key
- L** - 1 1/4" [31,75] splined 14T ANS B 92.1-1976
- R** - 1 1/4" [31,75] tapered SAE J 501
- C** - $\varnothing 25,4$ straight, Parallel key
- G** - $\varnothing 25,4$ 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.

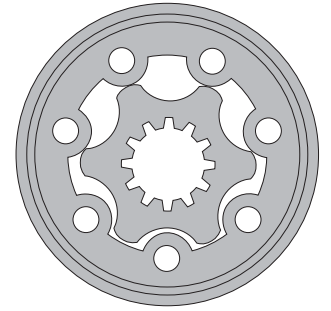
** The permissible output torque for shafts must not be exceeded!

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

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| 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

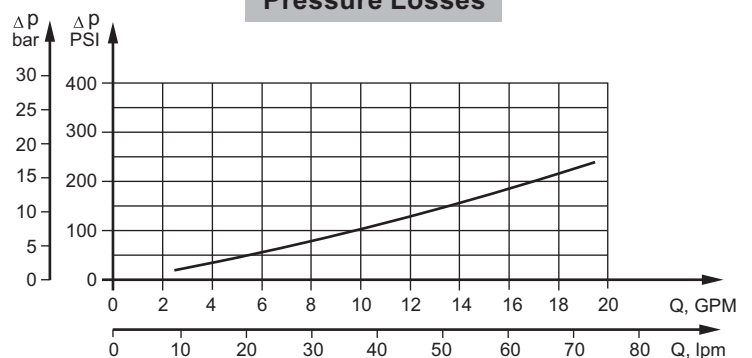
GENERAL

| | |
|---|--|
| 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, in³/rev [cm³/rev] | | 1.73 [28,4] | 2.11 [34,5] | 2.47 [40,5] | 3.02 [49,5] | 4.83 [79,2] | 6.04 [99,0] |
| Max. Speed, [RPM] | Cont. | 1055 | 1160 | 900 | 909 | 758 | 606 |
| | Int.* | 1600 | 1300 | 1110 | 1111 | 947 | 758 |
| Max. Torque lb-in [daNm] | Cont. | 290 [3,3] | 460 [5,2] | 575 [6,5] | 717 [8,1] | 1141 [12,9] | 1434 [16,2] |
| | Int.* | 400 [4,5] | 620 [7,0] | 795 [9,0] | 990 [11,2] | 1585 [17,9] | 1974 [22,3] |
| | Peak** | 610 [6,9] | 780 [8,8] | 975 [11] | 1210 [13,7] | 1930 [21,8] | 2420 [27,3] |
| Max. Output HP [kW] | Cont. | 4.60 [3,4] | 7.5 [5,6] | 7.5 [5,6] | 11.3 [8,4] | 11.3 [8,4] | 11.3 [8,4] |
| | Int.* | 8.2 [6,1] | 11.3 [8,4] | 11.5 [8,6] | 14.1 [10,5] | 16 [12] | 16 [12] |
| Max. Pressure Drop PSI [bar] | Cont. | 1450 [100] | 1815 [125] | 1815 [125] | 1815 [125] | 1815 [125] | 1815 [125] |
| | Int.* | 2030 [140] | 2465 [170] | 2540 [175] | 2540 [175] | 2540 [175] | 2540 [175] |
| | Peak** | 3260 [225] | 3260 [225] | 3260 [225] | 3260 [225] | 3260 [225] | 3260 [225] |
| Max. Oil Flow GPM [lpm] | Cont. | 8 [30] | 10.5 [40] | 10.5 [40] | 11.9 [45] | 15.9 [60] | 15.9 [60] |
| | Int.* | 10.5 [40] | 11.9 [45] | 11.9 [45] | 14.5 [55] | 19.8 [75] | 19.8 [75] |
| Max. Inlet Pressure PSI [bar] | Cont. | 2030 [140] | 2030 [140] | 2030 [140] | 2030 [140] | 2030 [140] | 2030 [140] |
| | Int.* | 2540 [175] | 2540 [175] | 2540 [175] | 2540 [175] | 2540 [175] | 2540 [175] |
| | Peak** | 3260 [225] | 3260 [225] | 3260 [225] | 3260 [225] | 3260 [225] | 3260 [225] |
| Max. Return Pressure with Drain Line PSI [bar] | Cont. | 2030 [140] | 2030 [140] | 2030 [140] | 2030 [140] | 2030 [140] | 2030 [140] |
| | Int.* | 2540 [175] | 2540 [175] | 2540 [175] | 2540 [175] | 2540 [175] | 2540 [175] |
| | Peak** | 3260 [225] | 3260 [225] | 3260 [225] | 3260 [225] | 3260 [225] | 3260 [225] |
| Max. Starting Pressure with Unloaded Shaft, PSI [bar] | | 145 [10] | 145 [10] | 145 [10] | 145 [10] | 145 [10] | 145 [10] |
| Min. Starting Torque lb-in [daNm] | At max.press. drop Cont. | 265 [3,0] | 425 [4,8] | 566 [6,4] | 655 [7,4] | 1045 [11,8] | 1300 [14,7] |
| | At max.press. drop Int.* | 362 [4,1] | 565 [6,4] | 725 [8,2] | 900 [10,2] | 1440 [16,3] | 1800 [20,3] |
| Min. Speed***, [RPM] | | 20 | 15 | 10 | 10 | 10 | 10 |
| Weight, lb [kg] | HP | 11.5 [5,2] | 11.5 [5,2] | 11.5 [5,2] | 11.7 [5,3] | 11.9 [5,4] | 12.3 [5,6] |
| | HPQ | 10.6 [4,8] | 10.6 [4,8] | 10.6 [4,8] | 10.8 [4,9] | 11.25 [5,1] | 11.69 [5,3] |

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

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

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

- 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, in³/rev [cm³/rev] | | 7.55 [123,8] | 9.66 [158,4] | 12.1 [198] | 15.1 [247,5] | 19.3 [316,8] | 24.16 [396] |
| Max. Speed, [RPM] | Cont. | 485 | 379 | 303 | 242 | 189 | 152 |
| | Int.* | 606 | 473 | 379 | 303 | 237 | 189 |
| Max. Torque lb-in [daNm] | Cont. | 1790 [20,2] | 2105 [23,8] | 2400 [27,1] | 2860 [32,3] | 3290 [37,2] | 3665 [41,4] |
| | Int.* | 2470 [27,9] | 2805 [31,7] | 3390 [38,3] | 3675 [41,5] | 4340 [49,0] | 4520 [51,1] |
| | Peak** | 3025 [34,2] | 3870 [43,7] | 4830 [54,6] | 4830 [54,6] | 5500 [62,1] | 5585 [63,1] |
| Max. Output HP [kW] | Cont. | 11.3 [8,4] | 10.3 [7,7] | 9.5 [7,1] | 9 [6,7] | 8.2 [6,1] | 7.2 [5,4] |
| | Int.* | 16 [12] | 16 [12] | 16 [12] | 14.3 [10,7] | 13.1 [9,8] | 11 [8,2] |
| Max. Pressure Drop PSI [bar] | Cont. | 1815 [125] | 1670 [115] | 1520 [105] | 1450 [100] | 1305 [90] | 1160 [80] |
| | Int.* | 2540 [175] | 2250 [155] | 2175 [150] | 1885 [130] | 1740 [120] | 1450 [100] |
| | Peak** | 3260 [225] | 3260 [225] | 3260 [225] | 2610 [180] | 2320 [160] | 1885 [130] |
| Max. Oil Flow GPM [lpm] | Cont. | 15.9 [60] | 15.9 [60] | 15.9 [60] | 15.9 [60] | 15.9 [60] | 15.9 [60] |
| | Int.* | 19.8 [75] | 19.8 [75] | 19.8 [75] | 19.8 [75] | 19.8 [75] | 19.8 [75] |
| Max. Inlet Pressure PSI [bar] | Cont. | 2030 [140] | 2030 [140] | 2030 [140] | 2030 [140] | 2030 [140] | 2030 [140] |
| | Int.* | 2540 [175] | 2540 [175] | 2540 [175] | 2540 [175] | 2540 [175] | 2540 [175] |
| | Peak** | 3260 [225] | 3260 [225] | 3260 [225] | 3260 [225] | 3260 [225] | 3260 [225] |
| Max. Return Pressure with Drain Line PSI [bar] | Cont. | 2030 [140] | 2030 [140] | 2030 [140] | 2030 [140] | 2030 [140] | 2030 [140] |
| | Int.* | 2540 [175] | 2540 [175] | 2540 [175] | 2540 [175] | 2540 [175] | 2540 [175] |
| | Peak** | 3260 [225] | 3260 [225] | 3260 [225] | 3260 [225] | 3260 [225] | 3260 [225] |
| Max. Starting Pressure with Unloaded Shaft, PSI [bar] | | 145 [10] | 145 [10] | 100 [7] | 100 [7] | 100 [7] | 100 [7] |
| Min. Starting Torque lb-in [daNm] | At max.press. drop Cont. | 1630 [18,4] | 1910 [21,6] | 2190 [24,7] | 2600 [29,4] | 3000 [33,9] | 3330 [37,6] |
| | At max.press. drop Int.* | 2250 [25,1] | 2550 [28,8] | 3090 [34,9] | 3345 [37,8] | 3950 [44,6] | 4115 [46,5] |
| Min. Speed***, [RPM] | | 10 | 10 | 10 | 10 | 10 | 10 |
| Weight, lb [kg] | HP | 12.6 [5,7] | 13.0 [5,9] | 13.4 [6,1] | 13.9 [6,3] | 14.6 [6,6] | 15.7 [7,1] |
| | HPQ | 11.91 [5,4] | 12.35 [5,6] | 12.79 [5,8] | 13.23 [6,0] | 13.89 [6,3] | 14.8 [6,7] |

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

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

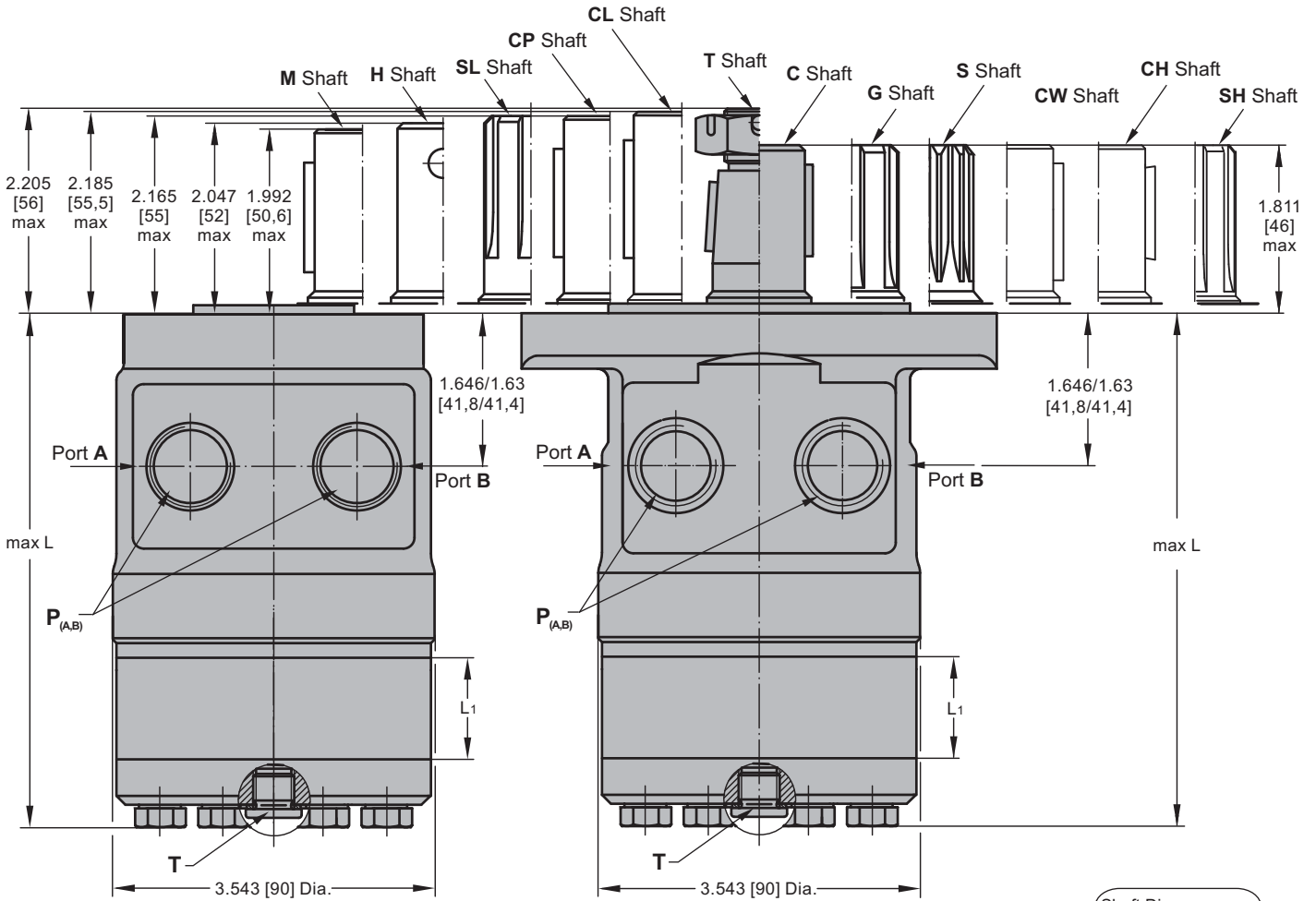
*** For speeds lower than given, consult factory or your regional manager.

1. Intermittent speed and intermittent pressure 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 FOR HP

HPQ

HP



Shaft Dim.
See Page 58 and 59

Flange Dim.
See Page 57

Port Dim.
See Page 57

| Type | L _{max} , in [mm] | L ₁ , in [mm] |
|-----------|----------------------------|--------------------------|
| HP(Q) 25 | 4.69 [119,0] | .21 [5,20] |
| HP(Q) 32 | 4.72 [120,0] | .25 [6,30] |
| HP(Q) 40 | 4.76 [121,0] | .29 [7,40] |
| HP(Q) 50 | 4.74 [120,5] | .26 [6,67] |
| HP(Q) 80 | 4.90 [124,5] | .42 [10,67] |
| HP(Q) 100 | 5.00 [127,0] | .52 [13,33] |
| HP(Q) 125 | 5.14 [130,5] | .66 [16,67] |
| HP(Q) 160 | 5.32 [135,0] | .84 [21,33] |
| HP(Q) 200 | 5.53 [140,5] | 1.05 [26,67] |
| HP(Q) 250 | 5.79 [147,0] | 1.31 [33,33] |
| HP(Q) 315 | 6.16 [156,5] | 1.68 [42,67] |
| HP(Q) 400 | 6.57 [167,0] | 2.10 [53,33] |

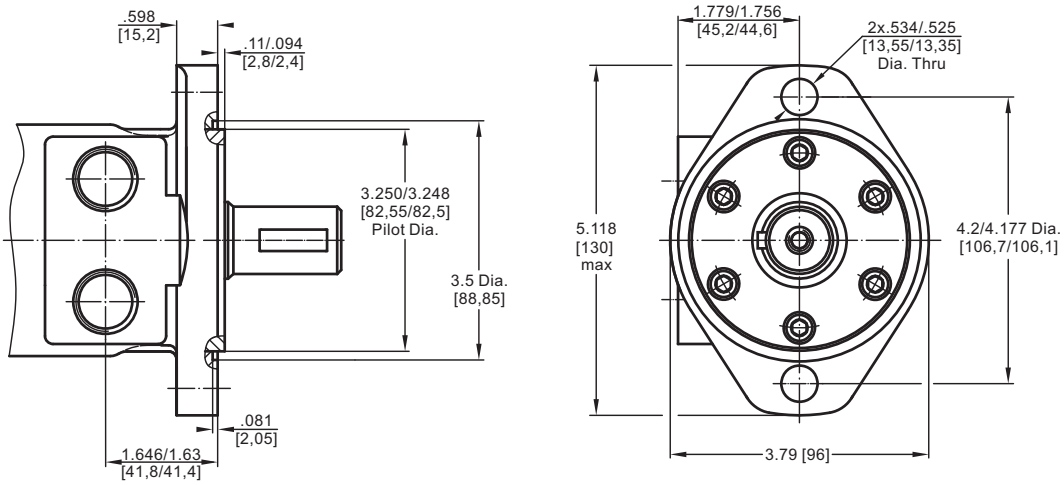
Standard Rotation
Viewed from Shaft End
Port A Pressurized - CW
Port B Pressurized - CCW

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

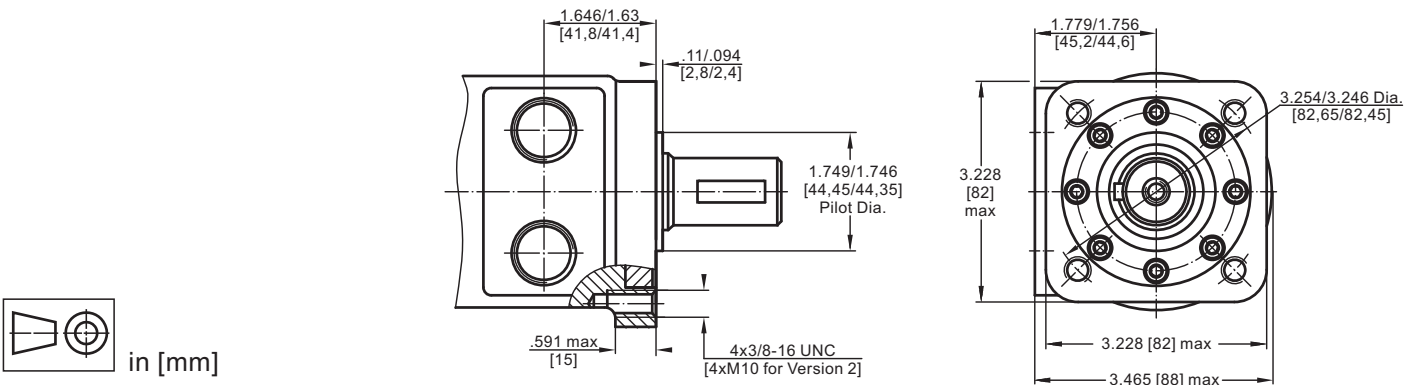


MOUNTING

SAE A Flange



Q - Square Flange



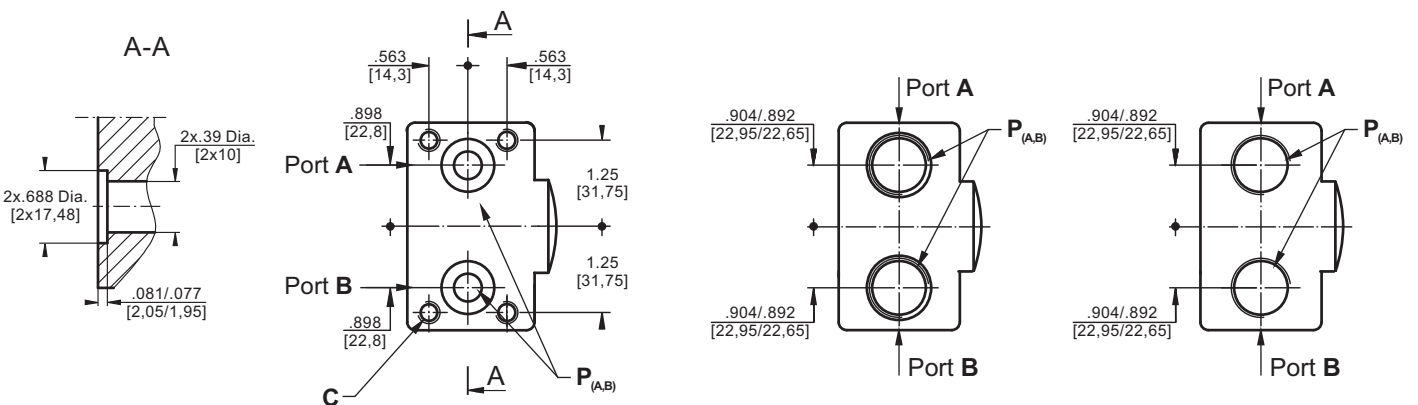
PORTS

Side Ports

Version **1**, **3**

Version **4**

Version **2**, **5**



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

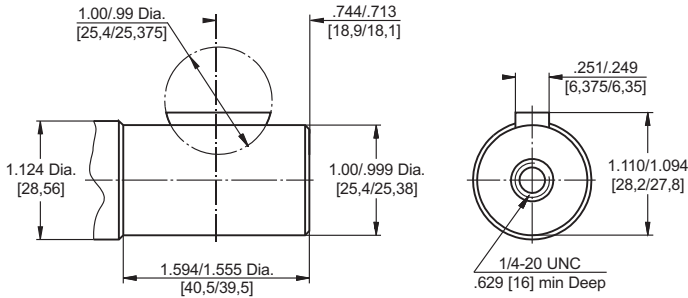
Reverse Rotation
Viewed from Shaft End
Port A Pressurized - CCW
Port B Pressurized - CW

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

SHAFT EXTENSIONS FOR HP AND HR MOTORS

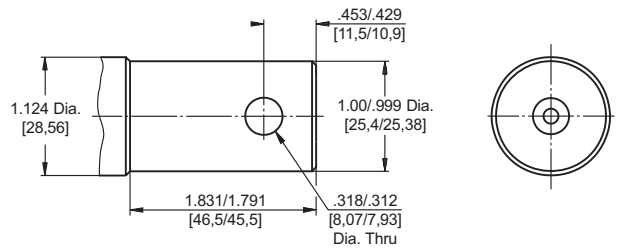
C

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



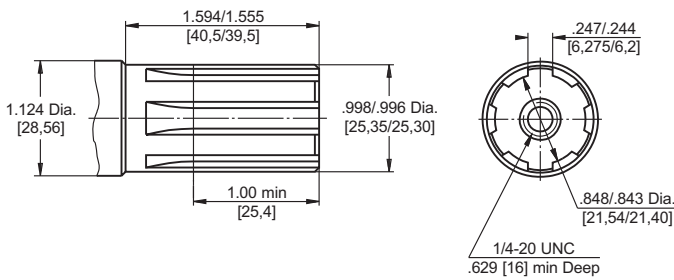
H

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



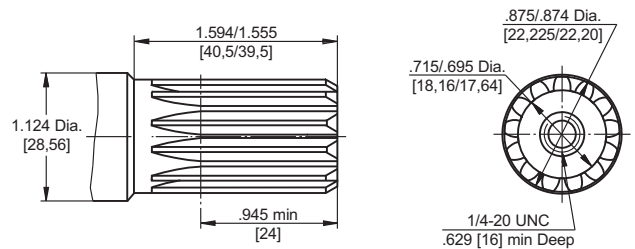
G

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



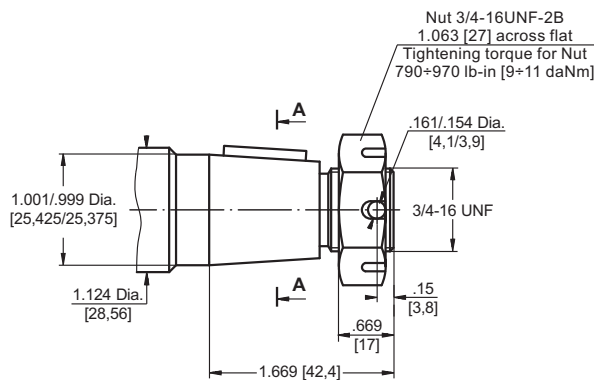
S

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

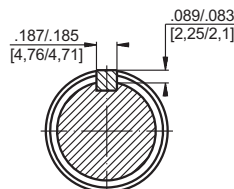


T

1" [25,4], SAE J501 Tapered
Parallel key 3/16"x3/16"x3/4"
Max. Torque 3540 lb-in [40 daNm]



A-A



1.5 Taper per Foot
[cone 1:8]

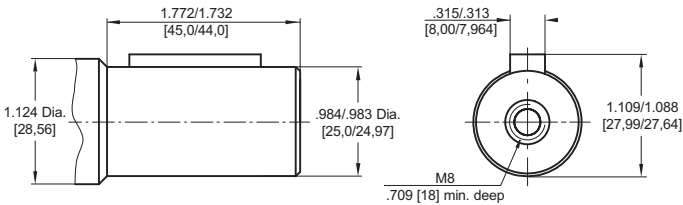
Requirement max. Torque must not be exceeded.



SHAFT EXTENSIONS FOR HP AND HR MOTORS

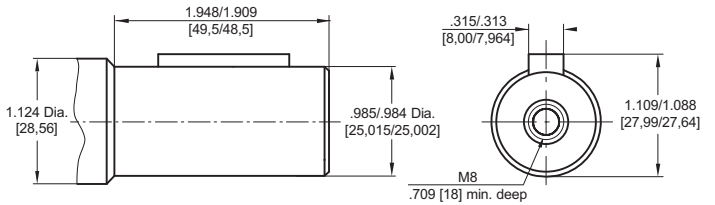
M

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



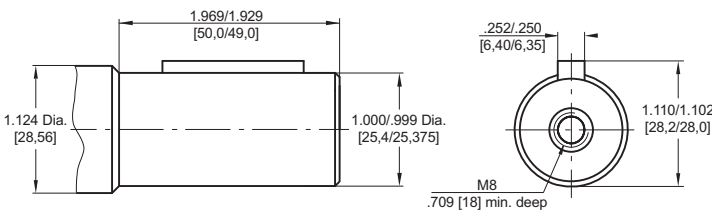
CP

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



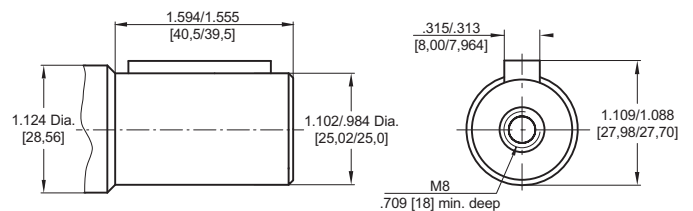
CL

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



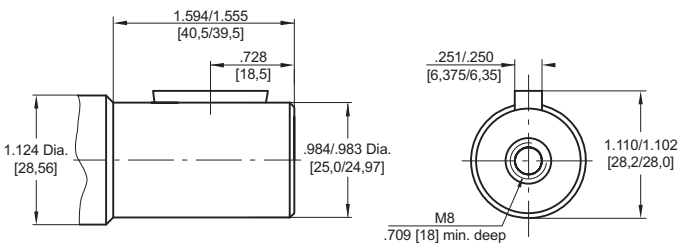
CW

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



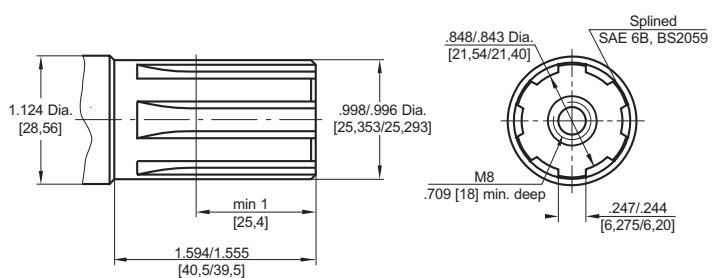
CH

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



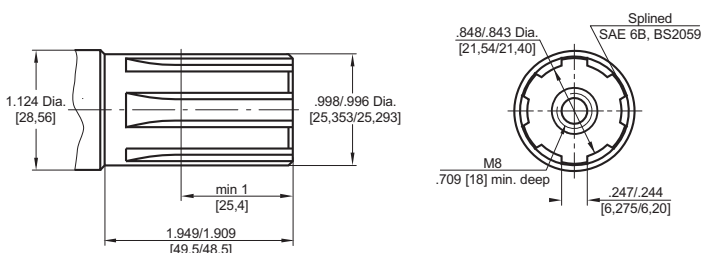
SH

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.

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

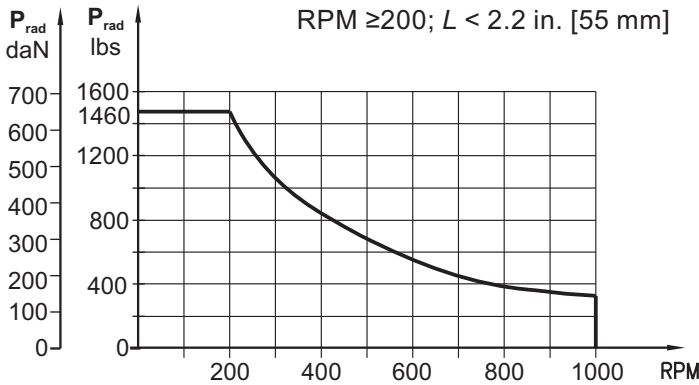
* L - in mm.

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

* L - in inch

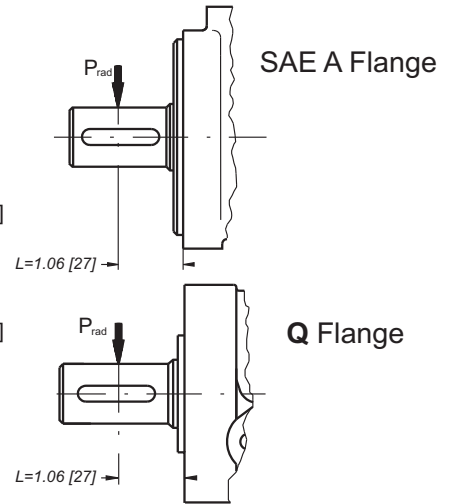
RPM < 200 => max Prad=1460 lbs [650 daN]

RPM ≥ 200; $L < 2.2$ in. [55 mm]



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

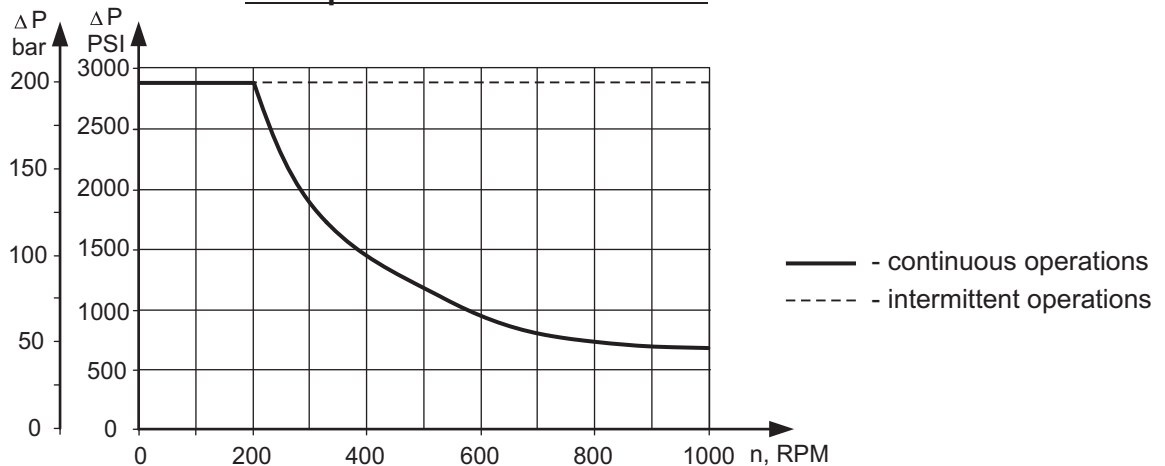
$P_a \text{ max} = 440 \text{ lbs}$
[200 daN]



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 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** - 9.66 in³/rev [123,8 cm³/rev]
- 160** - 9.74 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]

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:

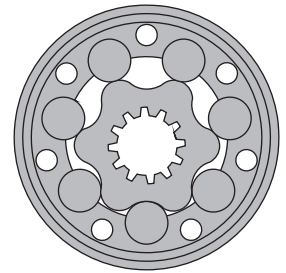
- * For the Function Diagrams please look at "M+S Hydraulic" Catalogue for MLHP motors, pages 18÷24.
- ** The permissible output torque for shafts must not be exceeded!

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

| | |
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| 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

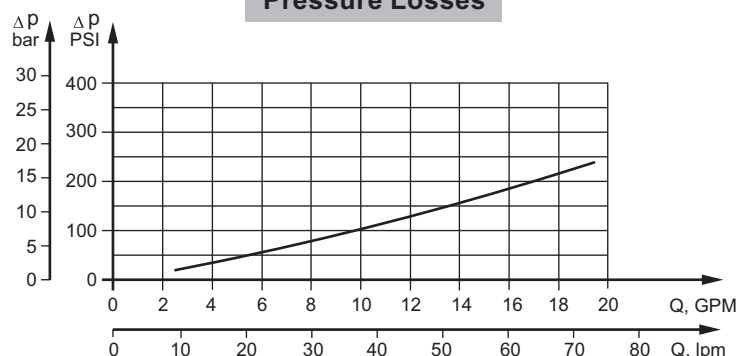
GENERAL

| | |
|---|--|
| 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, in³/rev [cm³/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 Pressure with Drain Line PSI [bar] | Cont. | 2030 [140] | 2030 [140] | 2030 [140] | 2030 [140] | 2030 [140] | 2030 [140] | 2030 [140] | 2030 [140] | 2030 [140] |
| | Int.* | 2540 [175] | 2540 [175] | 2540 [175] | 2540 [175] | 2540 [175] | 2540 [175] | 2540 [175] | 2540 [175] | 2540 [175] |
| | Peak** | 3260 [225] | 3260 [225] | 3260 [225] | 3260 [225] | 3260 [225] | 3260 [225] | 3260 [225] | 3260 [225] | 3260 [225] |
| Max. Starting Pressure with Unloaded Shaft, PSI [bar] | | 145 [10] | 145 [10] | 145 [10] | 145 [10] | 145 [10] | 145 [10] | 102 [7] | 102 [7] | 102 [7] |
| Min. Starting Torque lb-in [daNm] | At max.press. | | | | | | | | | |
| | drop Cont. | 710 [7,9] | 1090 [12,3] | 1355 [15,3] | 1665 [18,8] | 2090 [23,6] | 2370 [26,8] | 2495 [28,2] | 2965 [33,5] | 3190 [36,0] |
| | At max.press. drop Int.* | 870 [9,8] | 1345 [15,2] | 1670 [18,9] | 2055 [23,2] | 2575 [29,1] | 2910 [32,9] | 3170 [35,8] | 3375 [38,1] | 3515 [39,7] |
| Min. Speed***, [RPM] | | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| Weight, lb [kg] | HR | 13.45 [6,1] | 14.11 [6,4] | 14.55 [6,6] | 14.55 [6,6] | 15.21 [6,9] | 15.87 [7,2] | 16.53 [7,5] | 17.64 [8,0] | 18.96 [8,6] |
| | HRQ | 12.57 [5,7] | 13.23 [6,0] | 13.67 [6,2] | 13.67 [6,2] | 14.33 [6,5] | 14.77 [6,7] | 15.65 [7,1] | 16.76 [7,6] | 18.08 [8,2] |

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

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

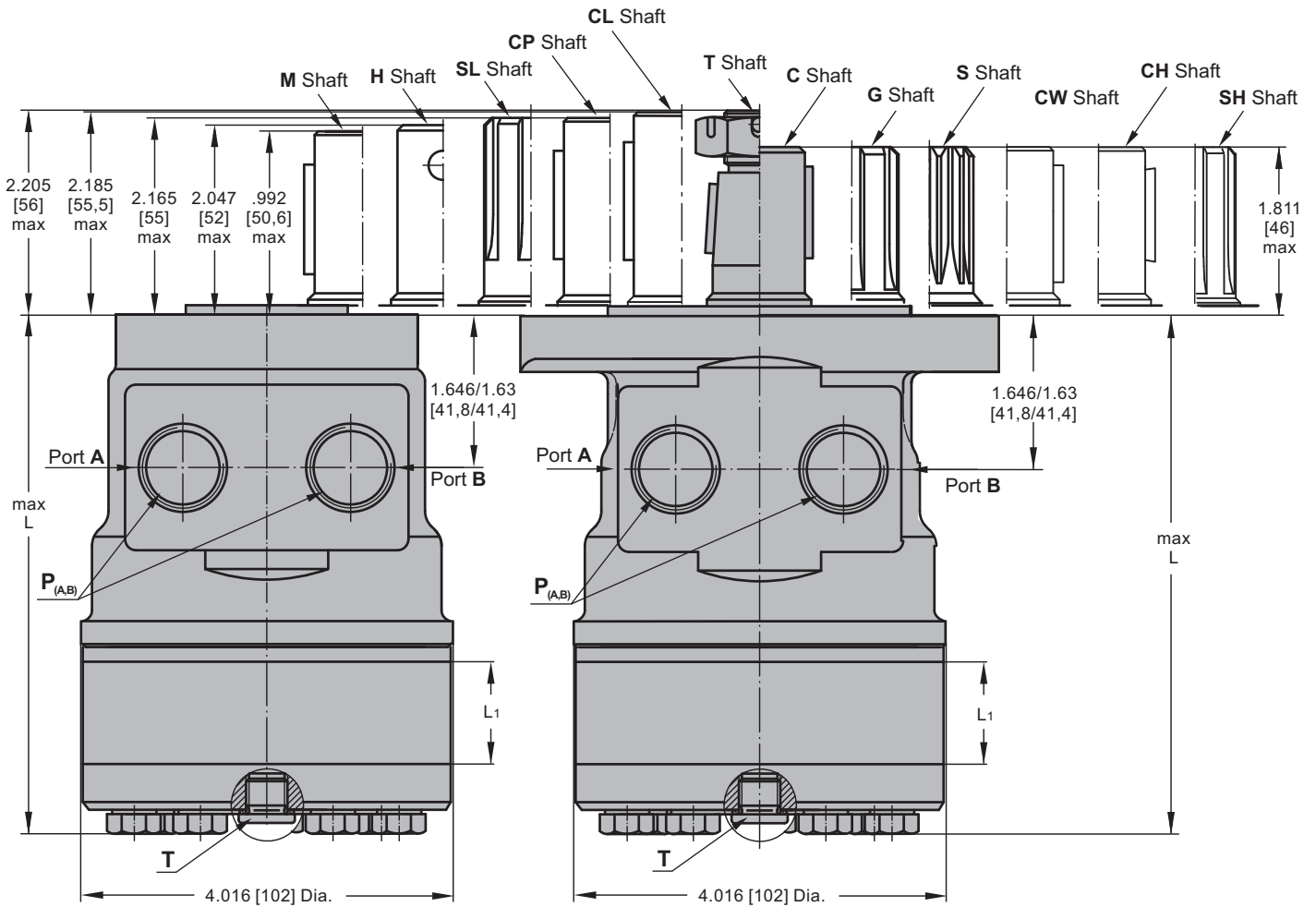
*** For speeds lower than given, consult factory or your regional manager.

- 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

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

Standard Rotation

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

Reverse Rotation

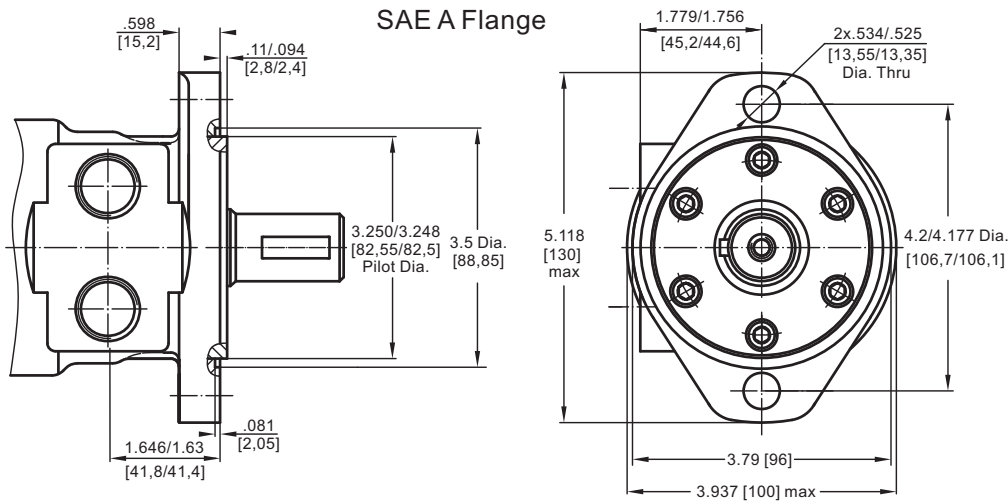
Viewed from Shaft End
Port A Pressurized - **CCW**
Port B Pressurized - **CW**

Flange Dim.
See Page 65

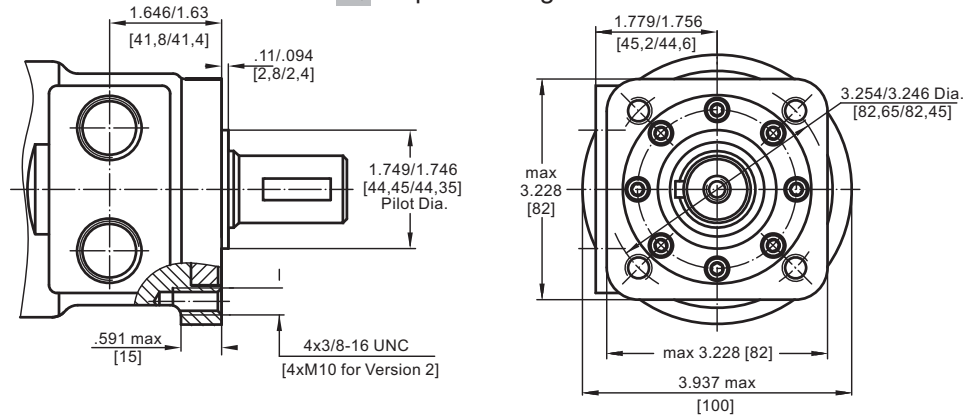


Port Dim.
See Page 65

MOUNTING



Q - Square Flange



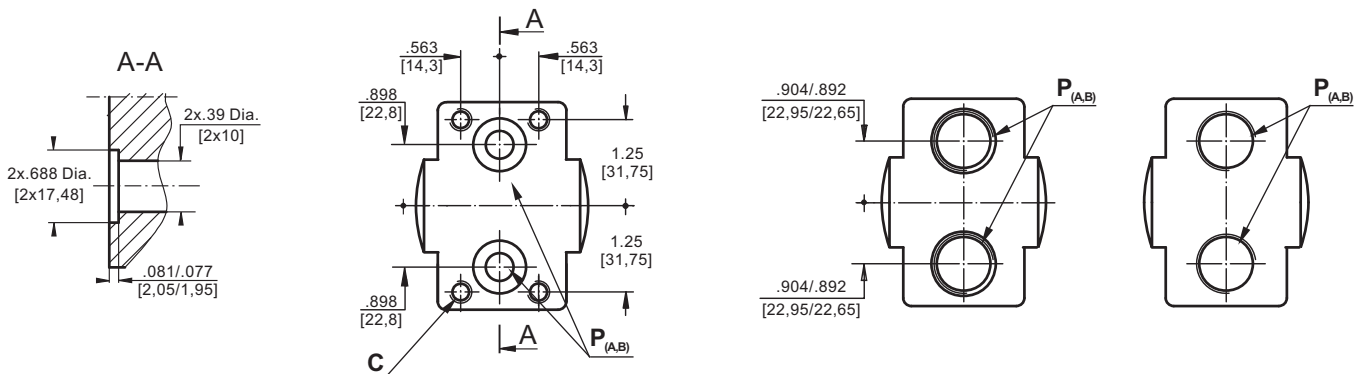
PORTS

Side Ports

Version **1**, **3**

Version **4**

Version **2**, **5**



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

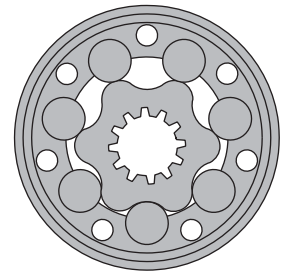
The hydraulic motors are manganophosphatized as standard.

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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Specification data 68
 Function diagrams 69÷73
 Dimensions and mounting 74
 Permissible shaft Seal Pressure 75
 Permissible shaft loads 75
 Shaft extensions 76
 Order code 76

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

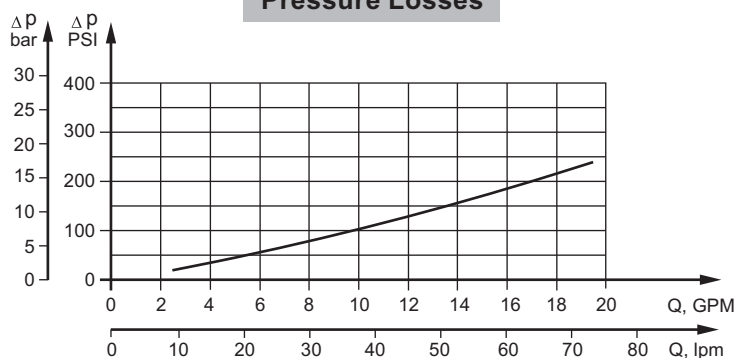
GENERAL

| | |
|---|--|
| 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, in³/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 Pressure with Drain Line PSI [bar] | Cont. | 2540 [175] | 2540 [175] | 2540 [175] | 2540 [175] | 2540 [175] | 2540 [175] | 2540 [175] | 2540 [175] | 2540 [175] |
| | Int.* | 2900 [200] | 2900 [200] | 2900 [200] | 2900 [200] | 2900 [200] | 2900 [200] | 2900 [200] | 2900 [200] | 2900 [200] |
| | Peak** | 3260 [225] | 3260 [225] | 3260 [225] | 3260 [225] | 3260 [225] | 3260 [225] | 3260 [225] | 3260 [225] | 3260 [225] |
| Max. Starting Pressure with Unloaded Shaft, PSI [bar] | 145 [10] | 145 [10] | 145 [10] | 130 [9] | 102 [7] | 73 [5] | 73 [5] | 73 [5] | 73 [5] | |
| Min. Starting Torque lb-in [daNm] | At max.press. | | | | | | | | | |
| | drop Cont. | 710 [8] | 1330 [15] | 1770 [20] | 2215 [25] | 2832 [32] | 3630 [41] | 4425 [50] | 4425 [50] | 4425 [50] |
| | At max.press. drop Int.* | 885 [10] | 1505 [17] | 2035 [23] | 2480 [28] | 3275 [37] | 4070 [46] | 4870 [55] | 5840 [66] | 5400 [61] |
| Min. Speed***, [RPM] | 10 | 10 | 10 | 9 | 7 | 5 | 6 | 5 | 5 | |
| Weight, lb [kg] | | 21.2 | 21.4 | 21.7 | 22.1 | 22.7 | 23.8 | 24.9 | 26 | 27.63 |
| | | [9,6] | [9,7] | [9,8] | [10,0] | [10,3] | [10,8] | [11,3] | [11,8] | [12,5] |

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

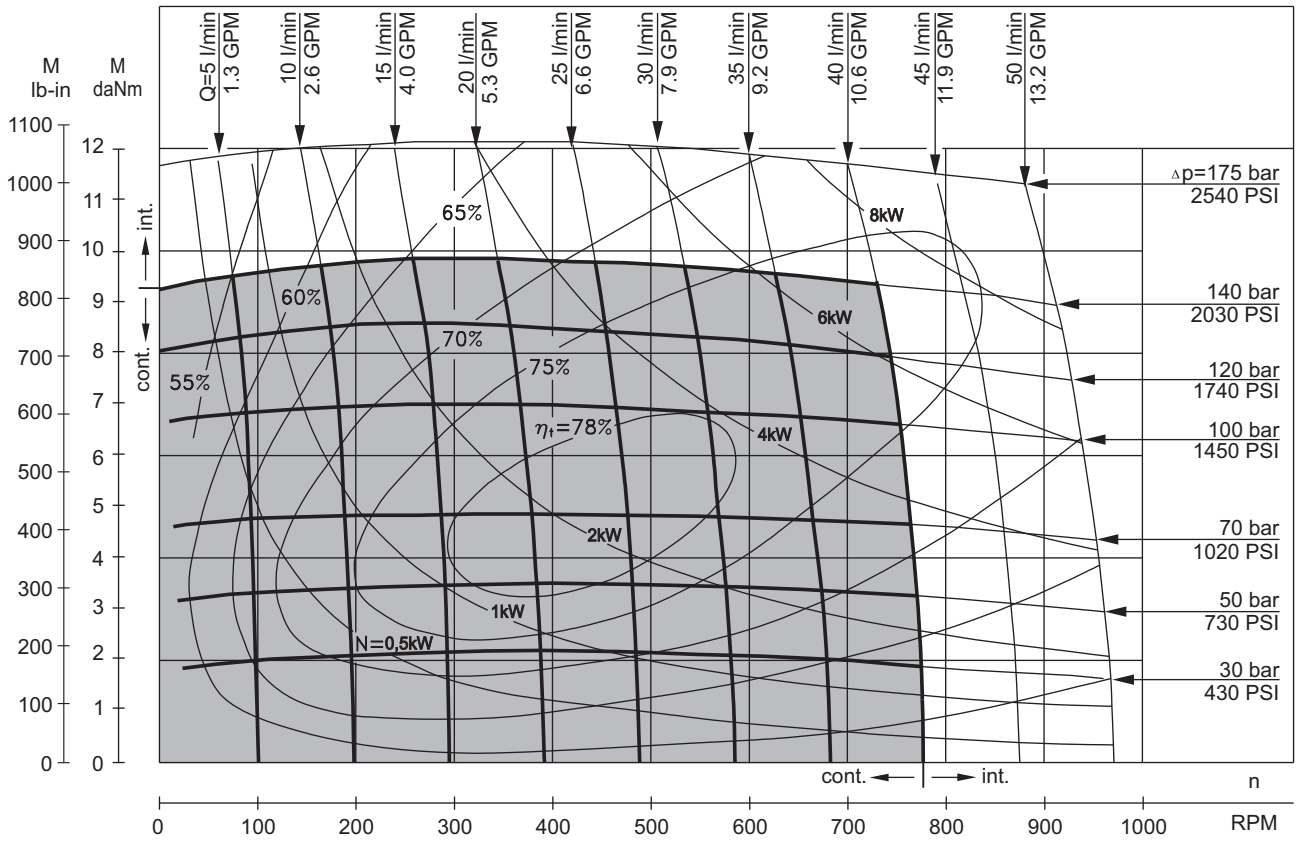
** Peak load: the permissible values may occur for max. 1% of every minute.

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

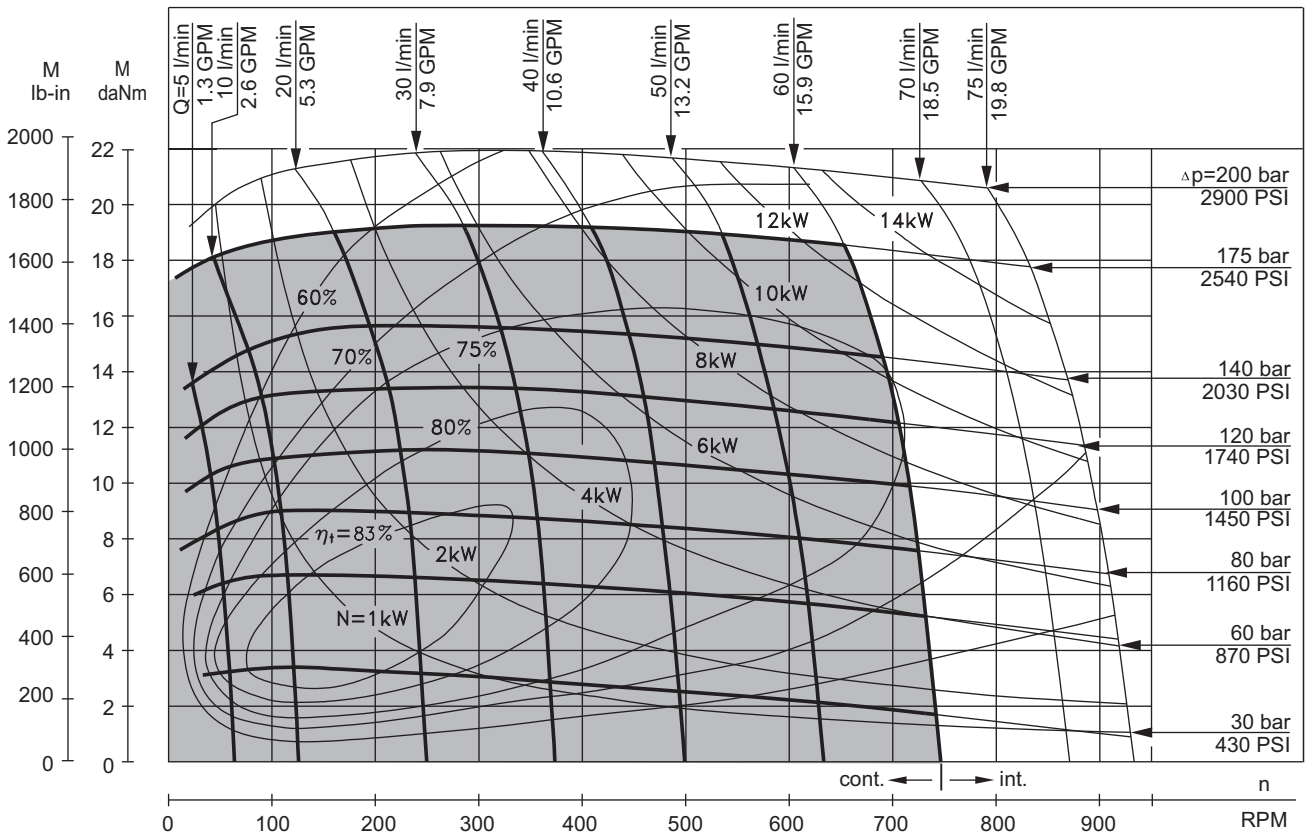
- Intermittent speed and intermittent pressure drop must not occur simultaneously.
- Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
- Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP(DIN51524) or HM (ISO 6743/4).
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



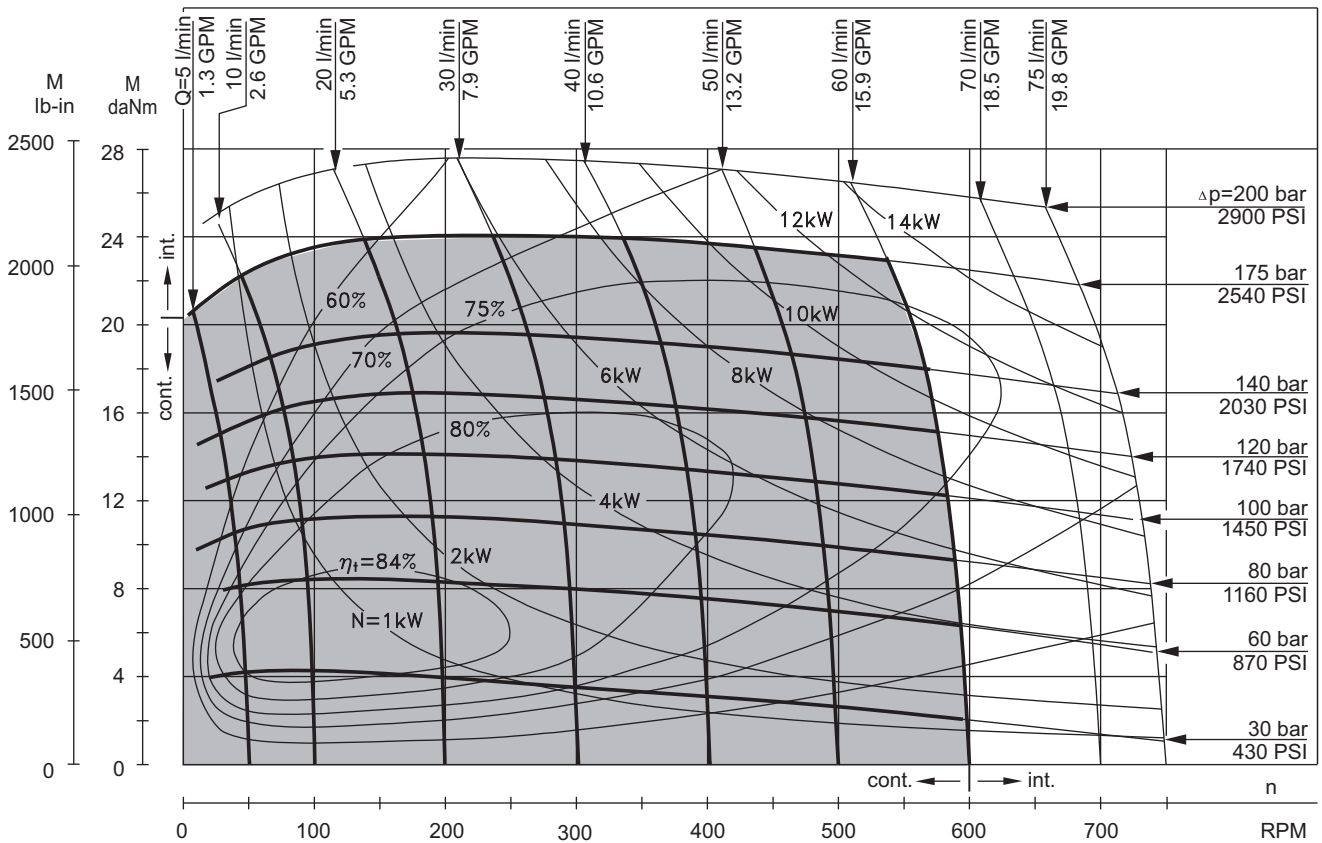
MLHRW 80



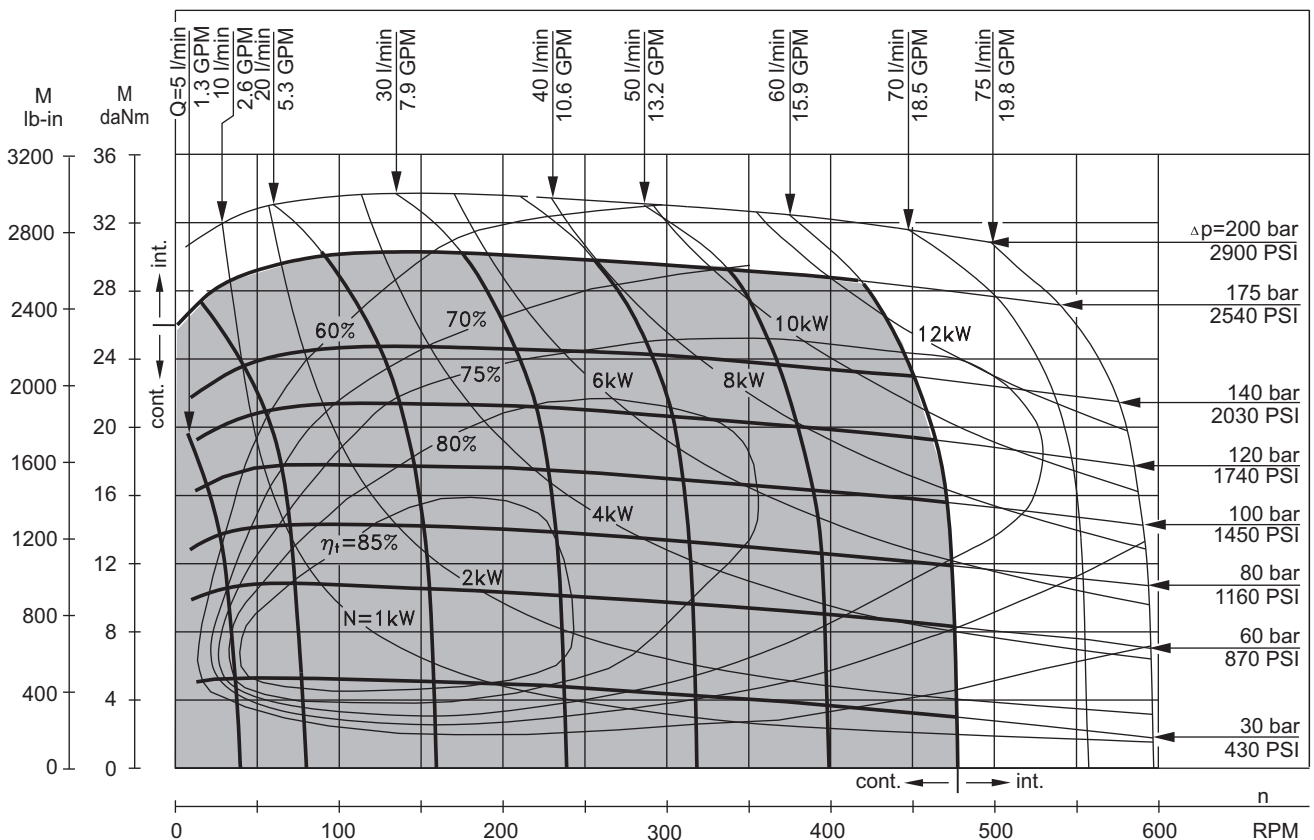
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHRW 100



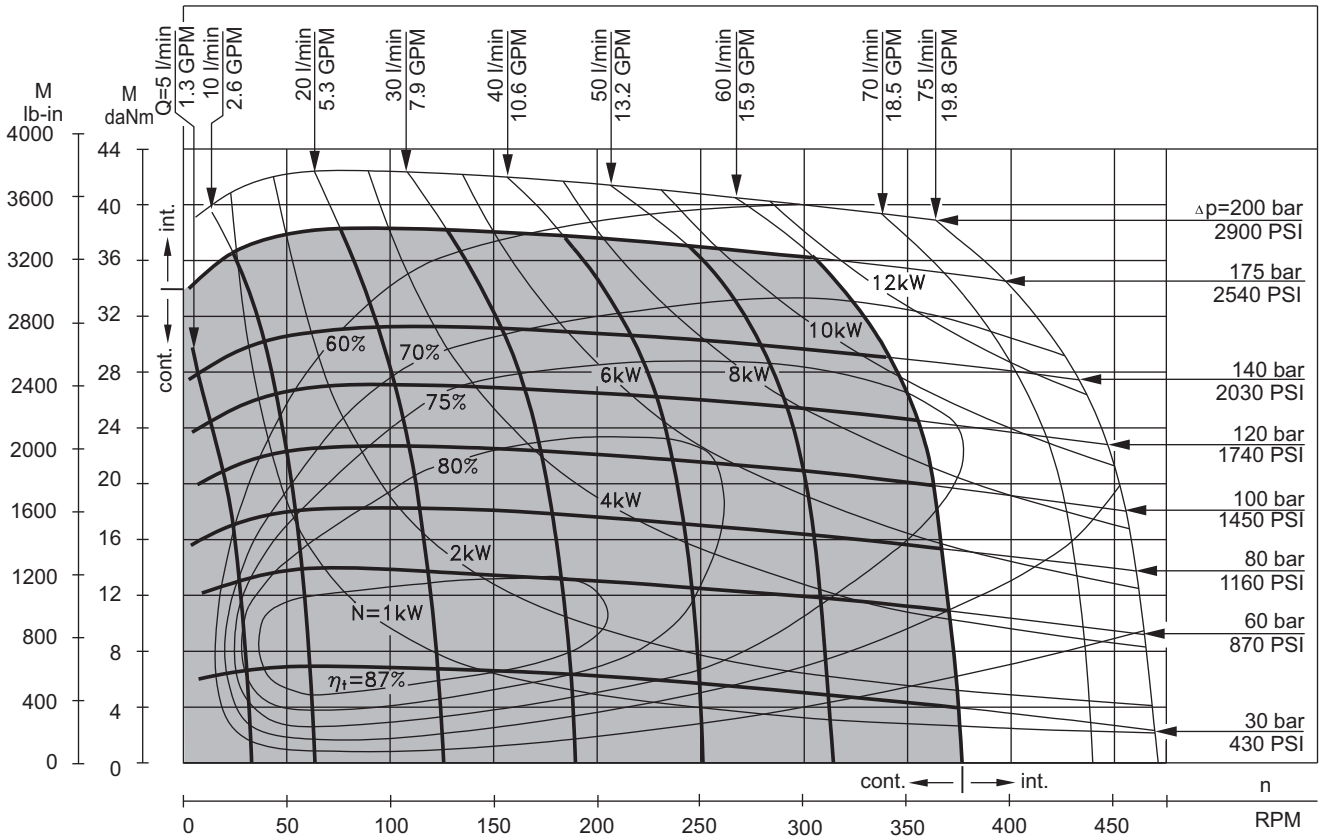
MLHRW 125



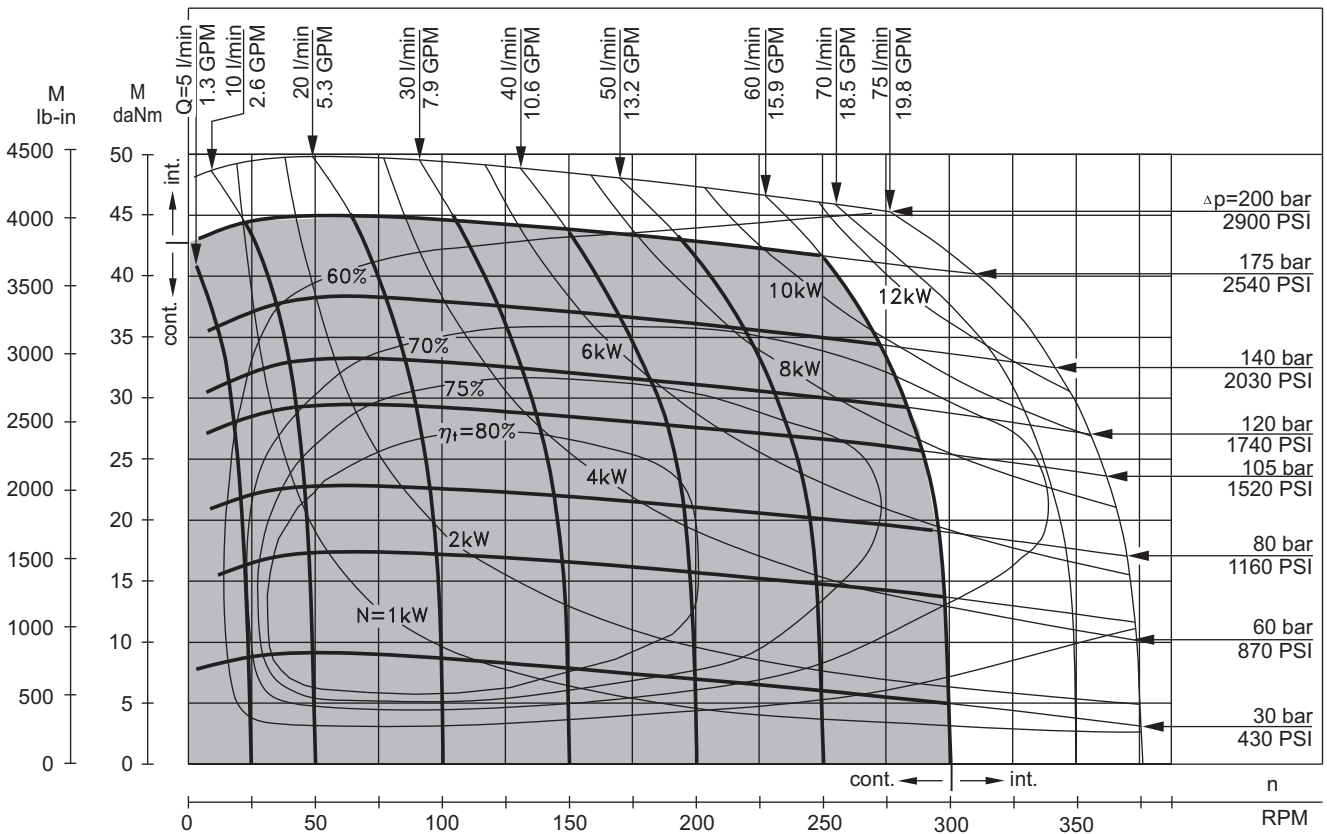
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHRW 160



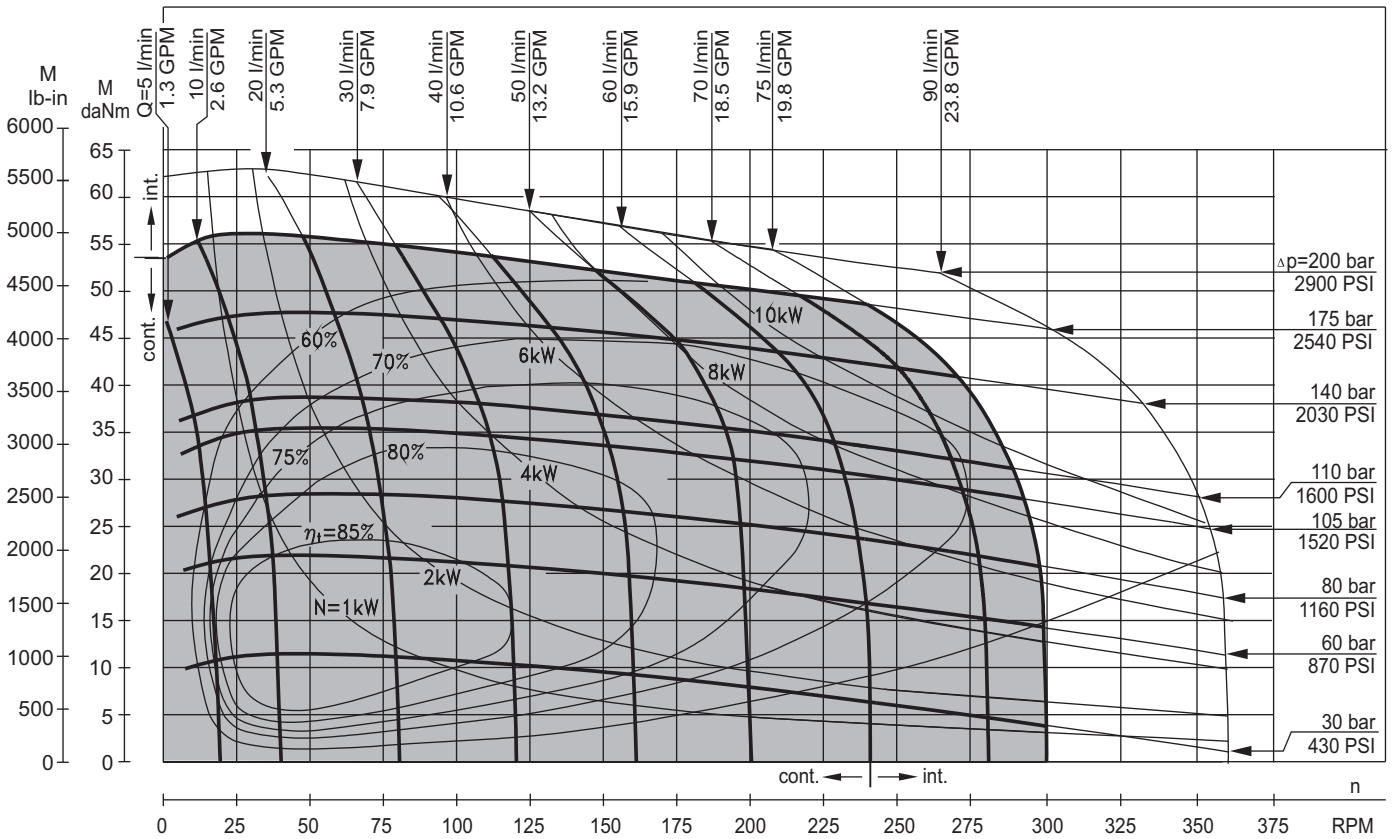
MLHRW 200



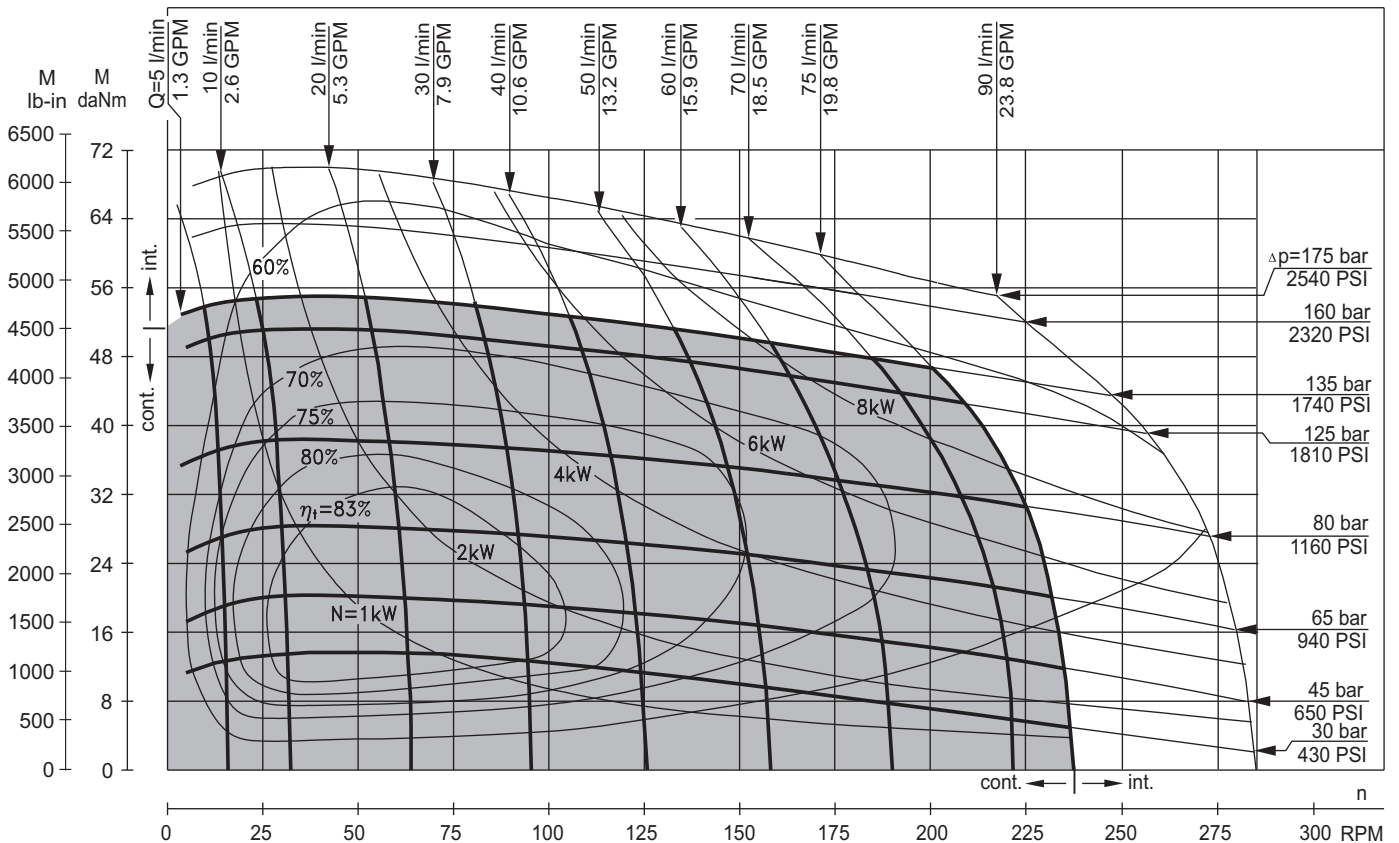
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHRW 250



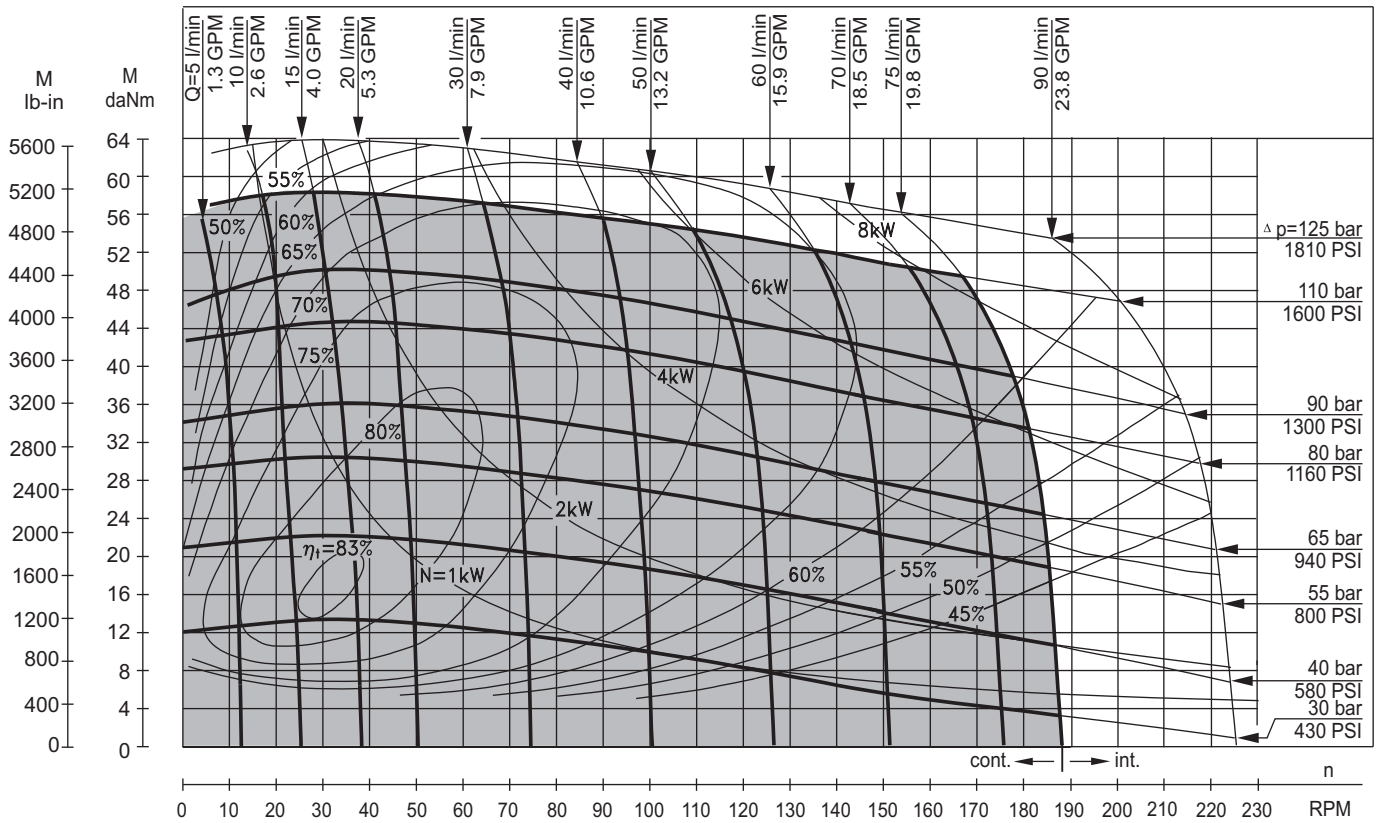
MLHRW 315



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].

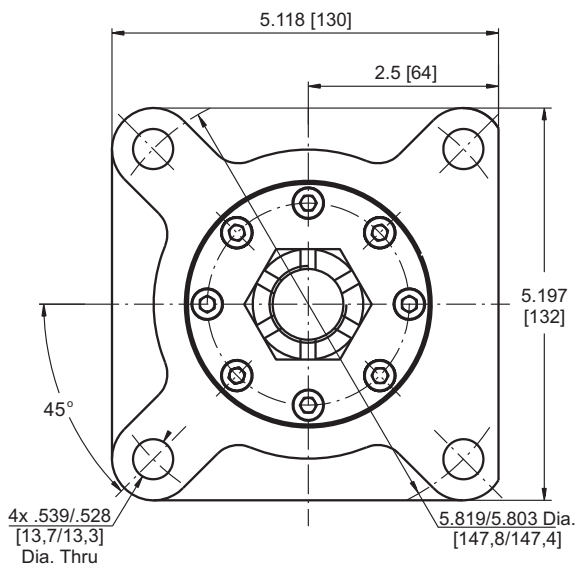
FUNCTION DIAGRAMS

MLHRW 400

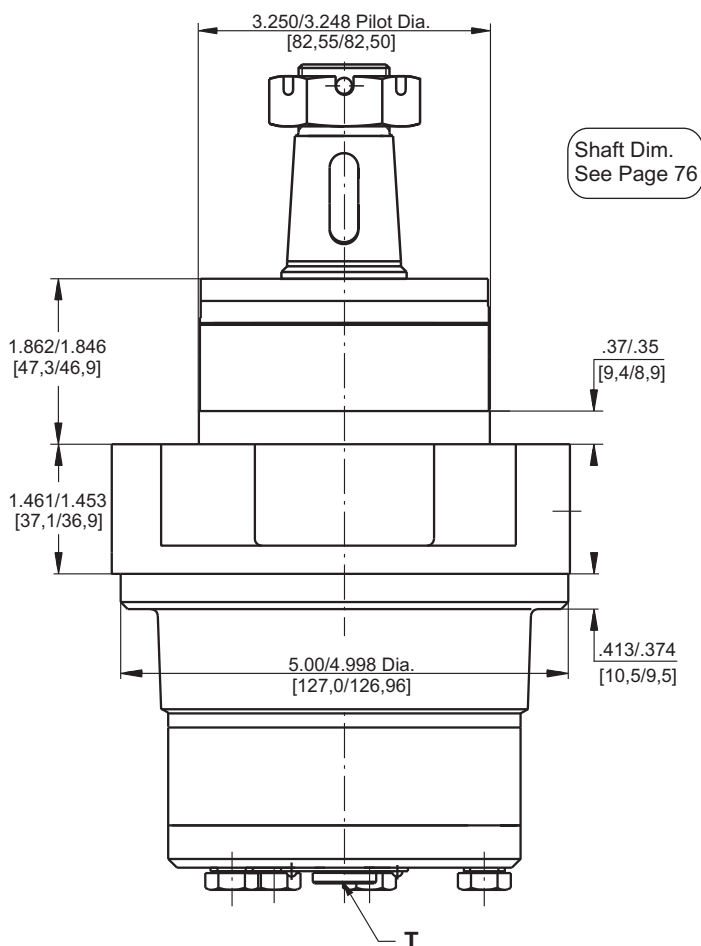


The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

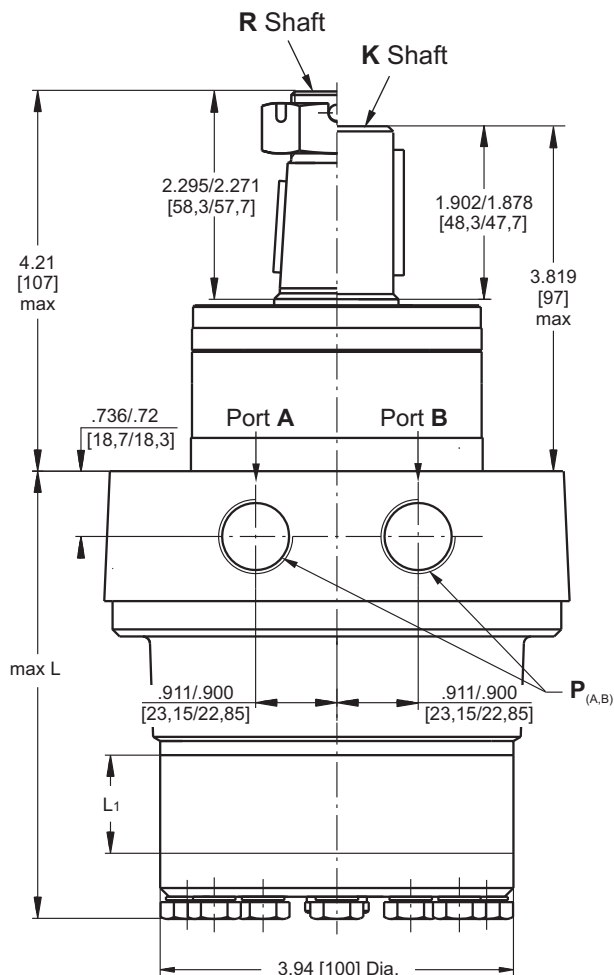
DIMENSIONS AND MOUNTING DATA - MLHRW (WHEEL MOTOR)



| Type | L _{max} , in [mm] | L ₁ , 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



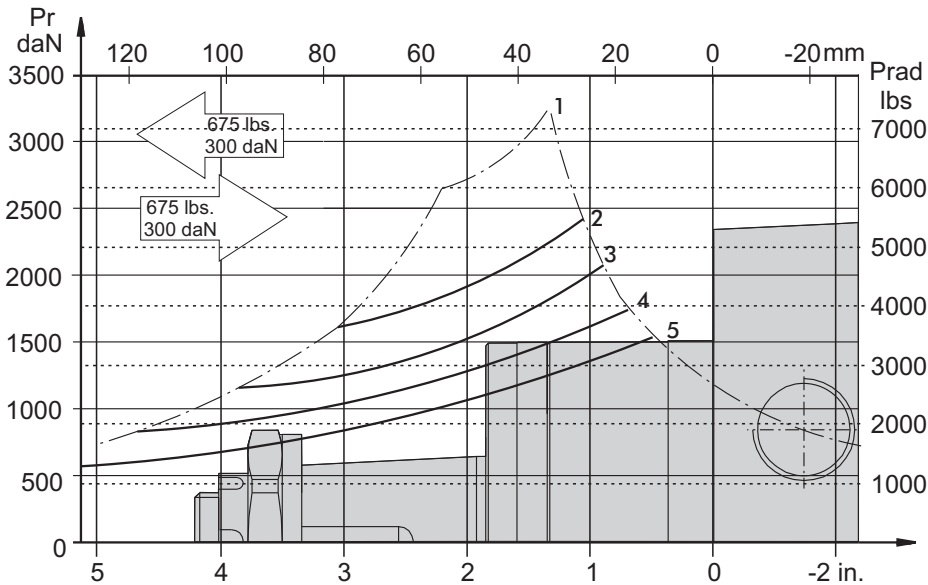
Standard Rotation
Viewed from Shaft End
Port A Pressurized - **CW**
Port B Pressurized - **CCW**

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

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

PERMISSIBLE SHAFT LOADS MLHRW

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

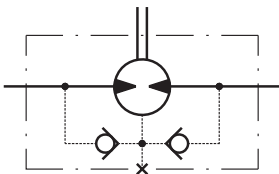


1. Permissible radial shaft load
2. Drawing by n= 50 RPM
3. Drawing by n=100 RPM
4. Drawing by n=200 RPM
5. Drawing by n=400 RPM

MAX. PERMISSIBLE SHAFT SEAL PRESSURE

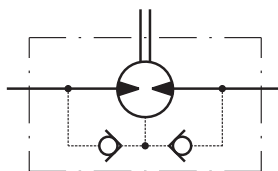
MLHRW...; MLHRW...UK motors with drain connection:

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



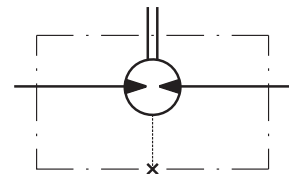
MLHRW...1 motors without drain connection:

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

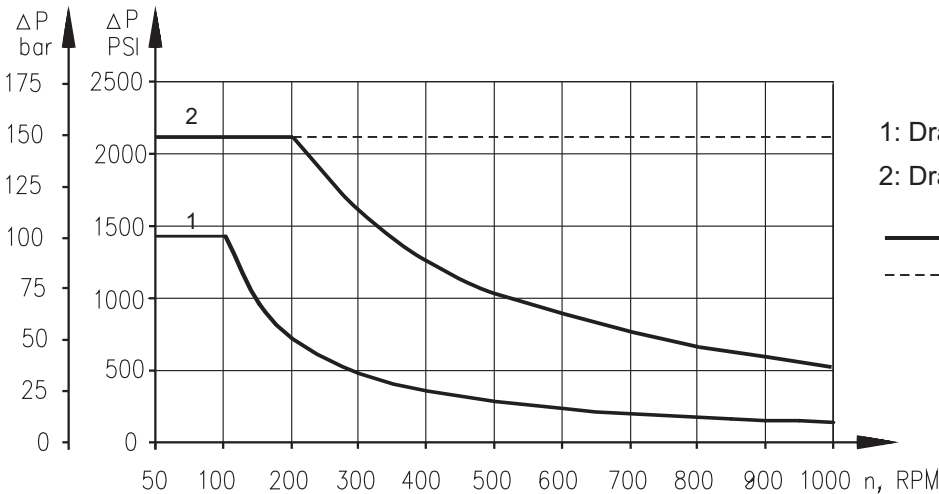


MLHRW...U motors with high pressure seal and drain connection:

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



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

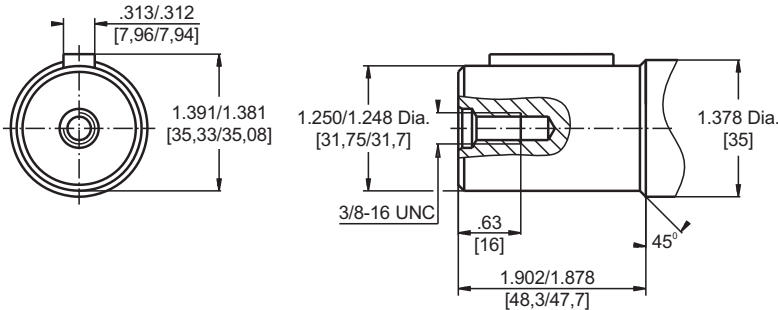


- 1: Drawing for Standard Shaft Seal
 - 2: Drawing for High Pressure Seal ("U" Seal)
- - continuous operations
 - - - - intermittent operations

SHAFT EXTENSIONS

K

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

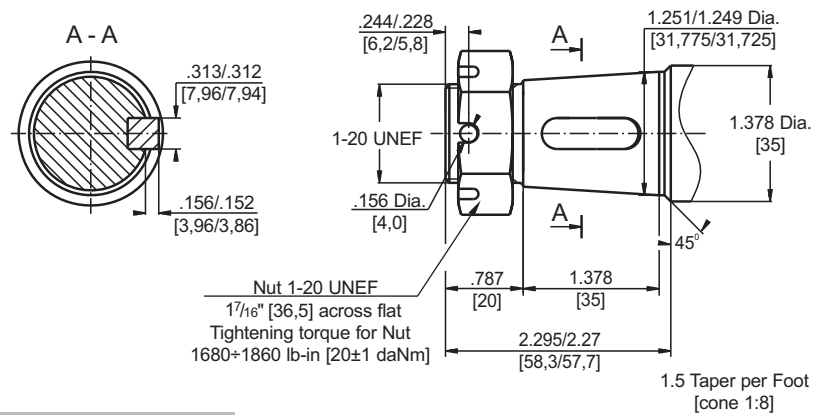


Requirement max. Torque must be not exceeded.



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 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.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!

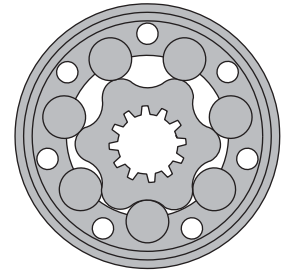
The hydraulic motors are mangano-phosphatized as standard.

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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 Permissible shaft loads 81
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 Permissible shaft seal pressure...83
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 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

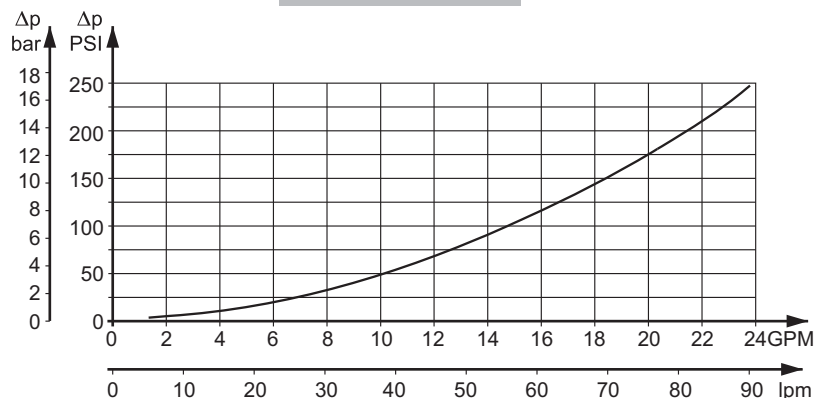
GENERAL

| | |
|--|--|
| 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 [mm ² /s] | 98÷347 [20÷75] |
| Filtration | ISO code 20/16 (Min. recommended fluid filtration of 25 microns) |

Oil flow in drain line

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

Pressure Losses



SPECIFICATION DATA

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

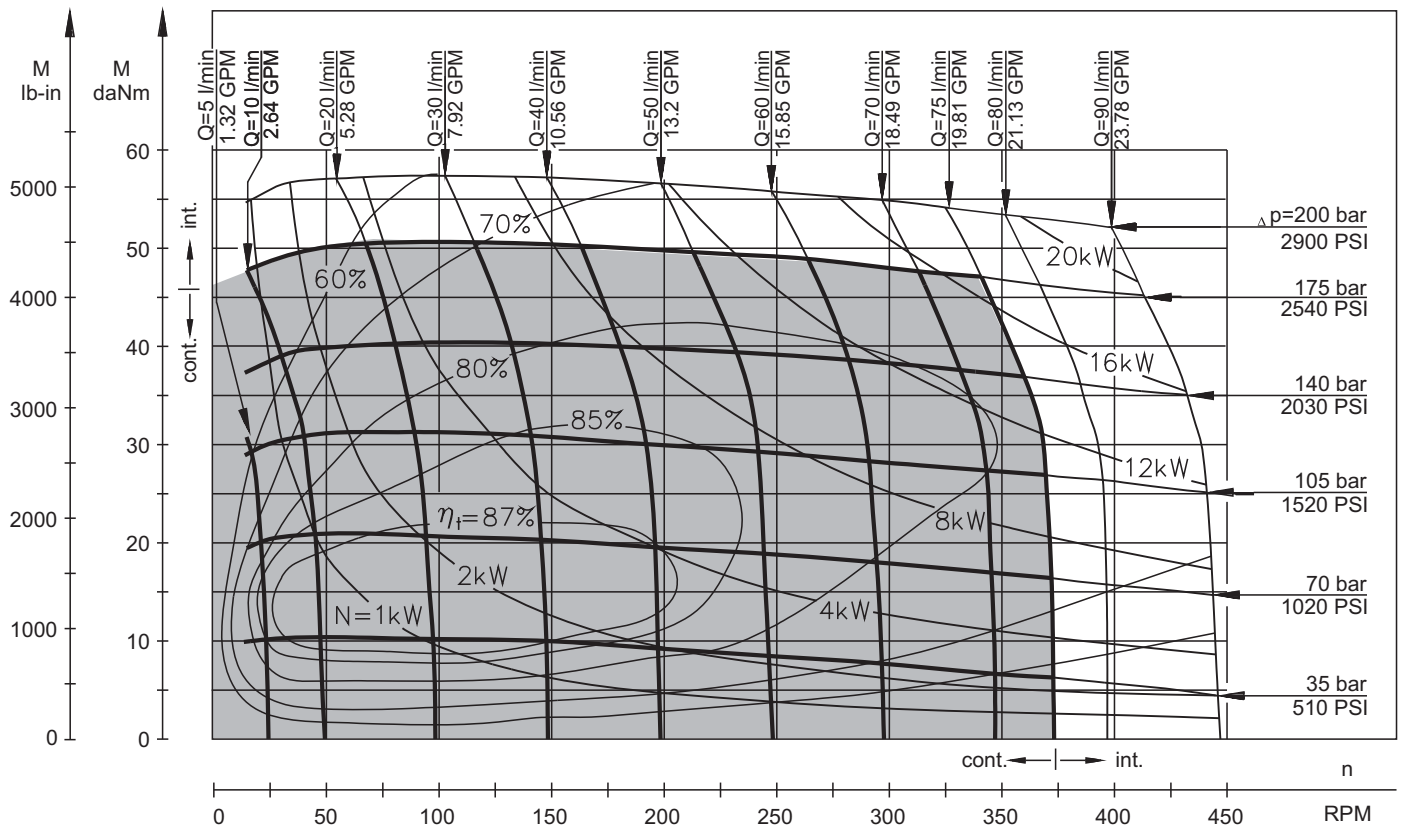
** Peak load: the permissible values may occur for max. 1% of every minute.

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

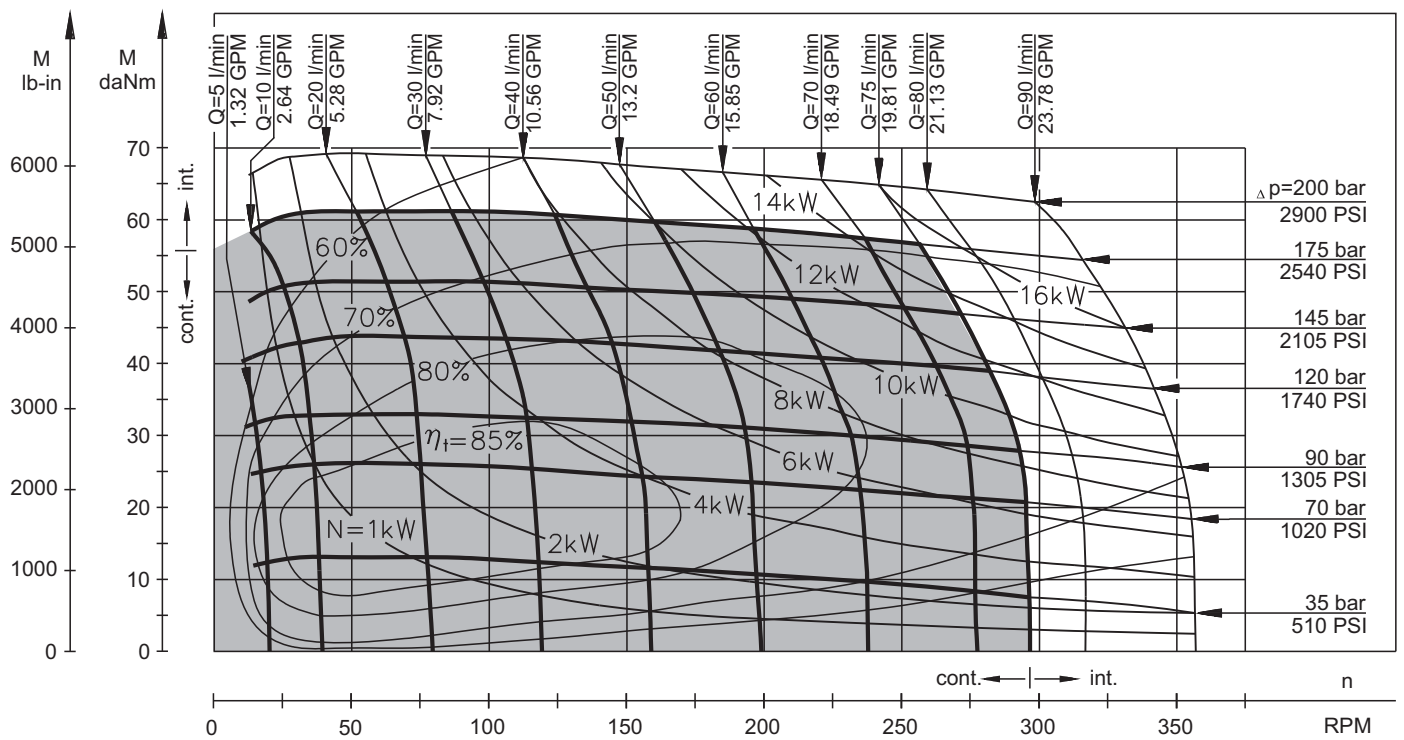
- 1) Intermittent speed and intermittent pressure must not occur simultaneously.
- 2) Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
- 3) Recommend using a premium quality, anti-wear type mineral based hydraulic oil, HLP(DIN51524) or HM(ISO6743/4).
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



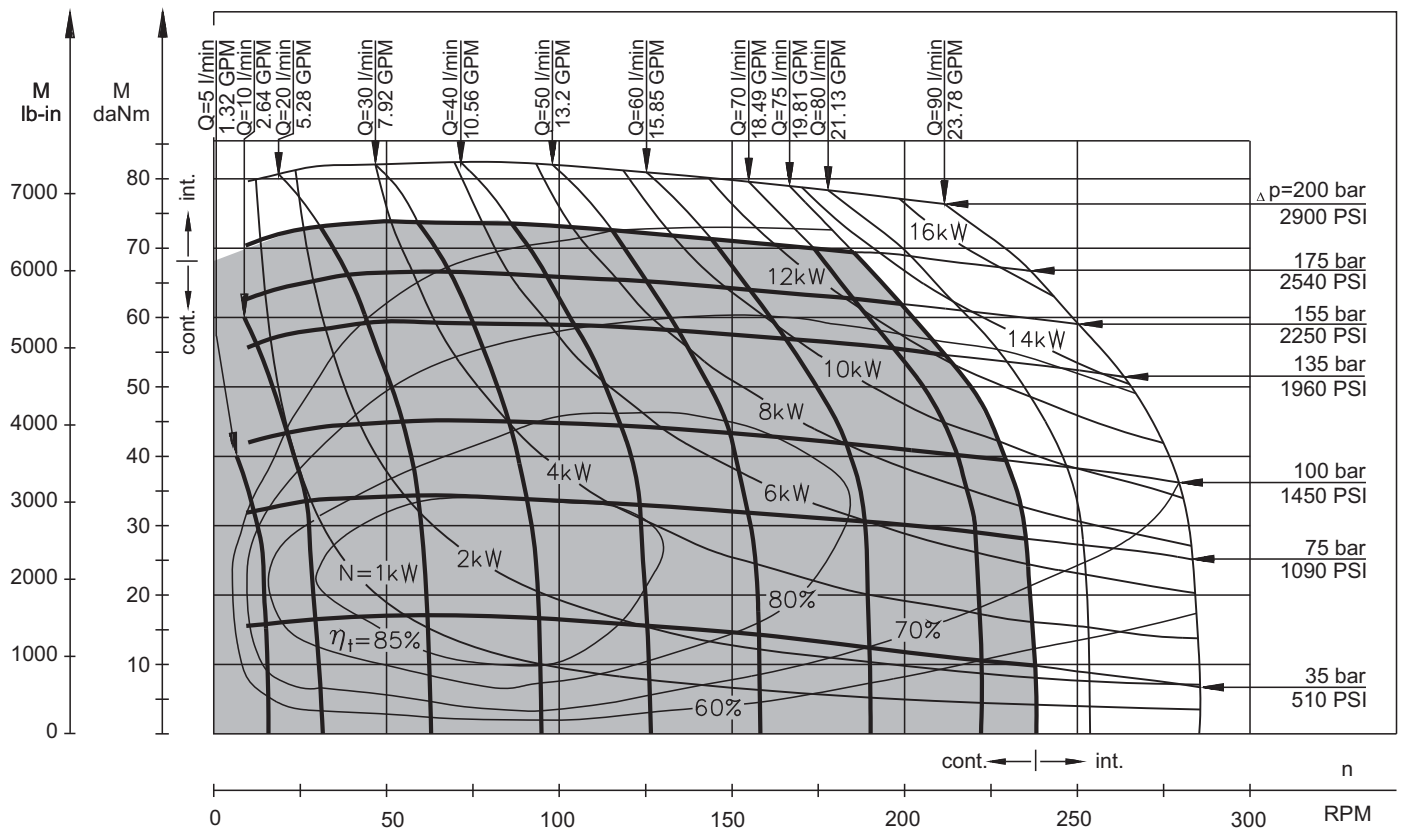
MLHH 250



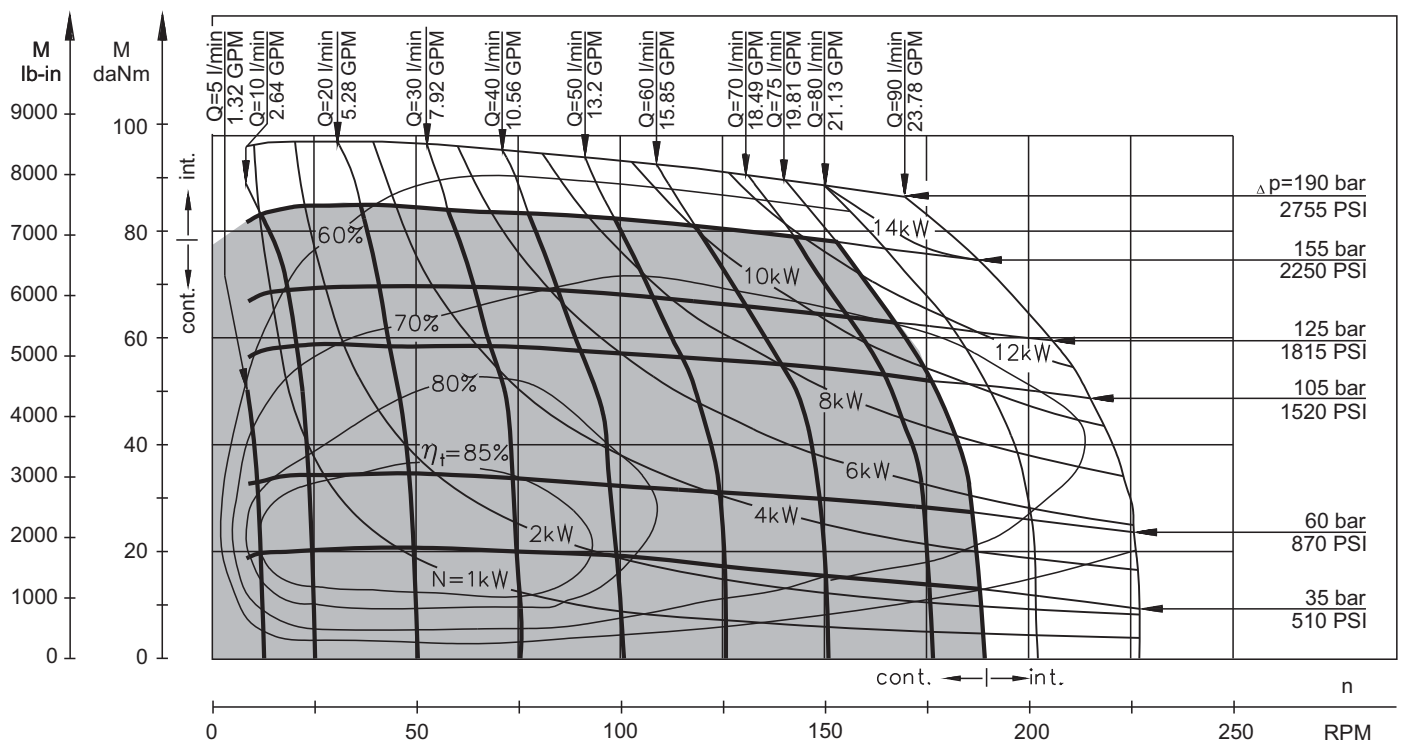
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MLHH 315



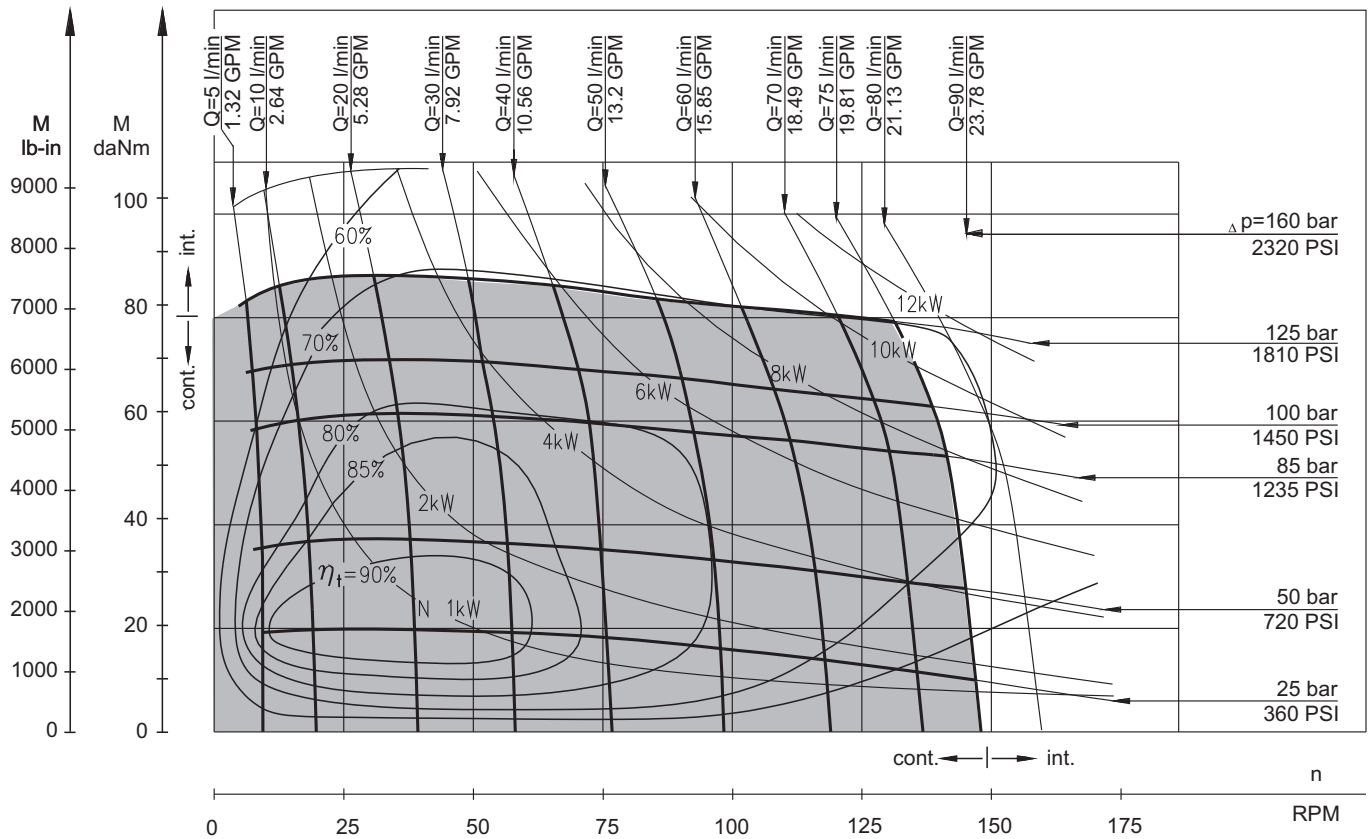
MLHH 400



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

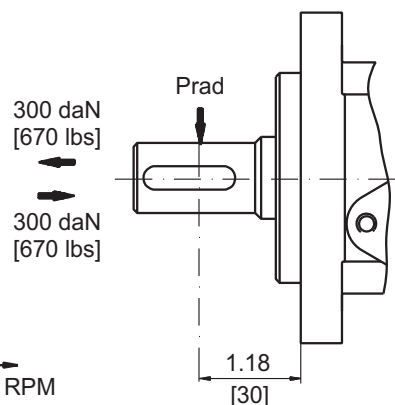
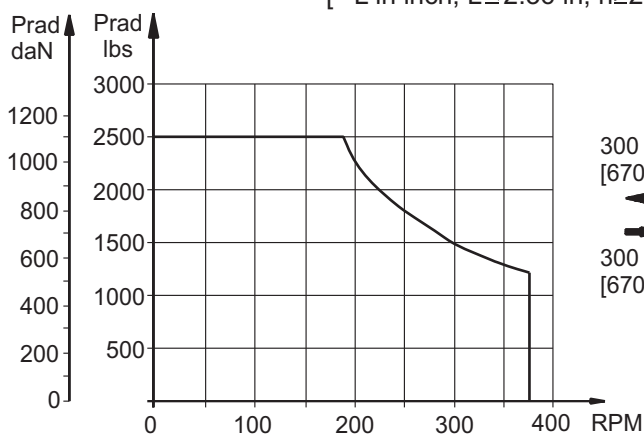
The permissible radial shaft load P_{rad} depends on the speed (RPM) and distance (L) from the point of load to the mounting flange.

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

[*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

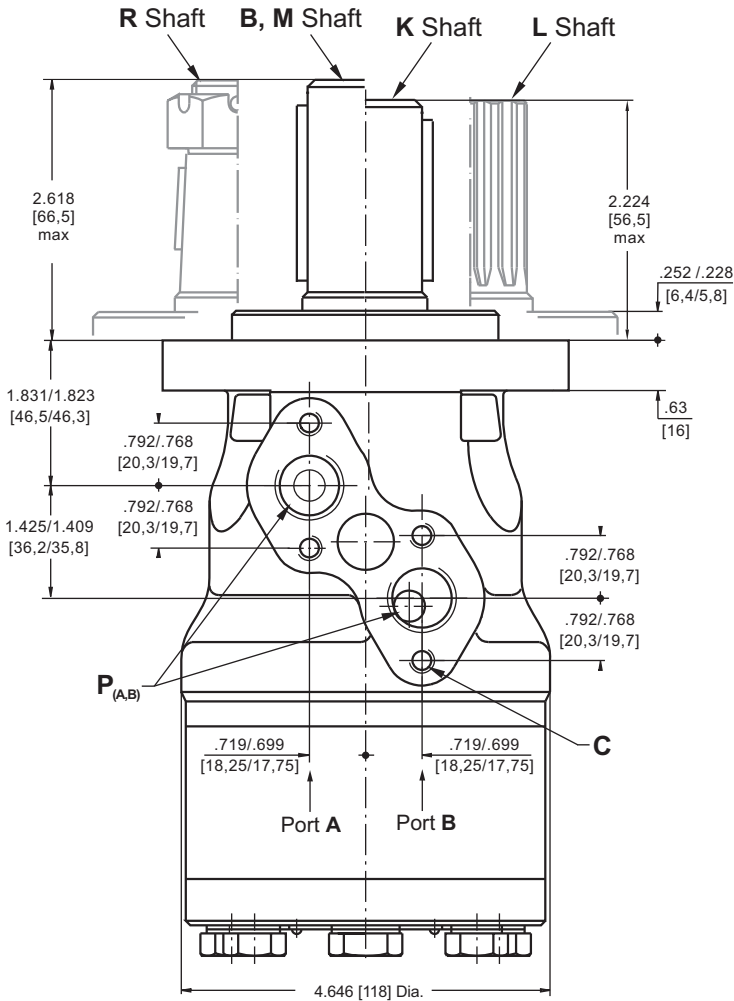
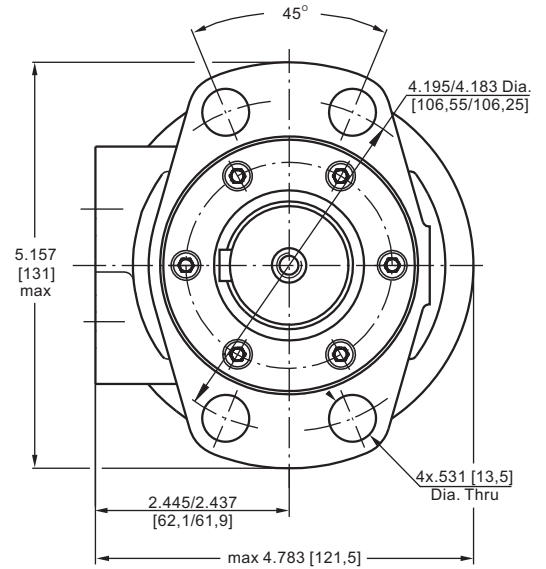
Magneto Mounting Flange with 4 hole

| 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] |

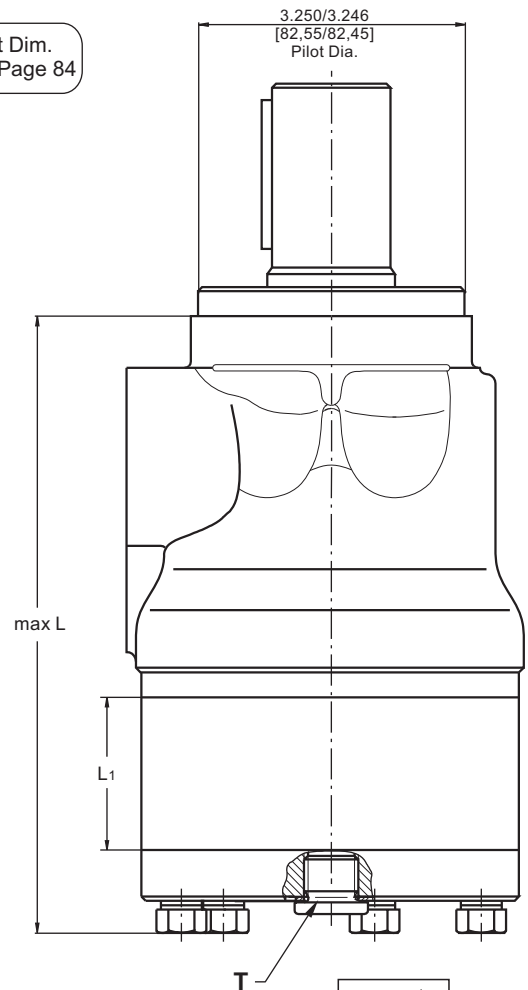
Standard Rotation
Viewed from Shaft End
Port A Pressurized - CW
Port B Pressurized - CCW

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

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



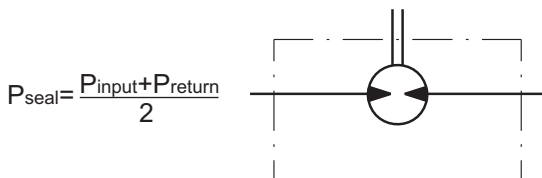
Shaft Dim.
See Page 84



**MAX. PERMISSIBLE SHAFT SEAL PRESSURE
FOR MLHH MOTORS**

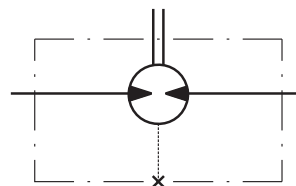
MLHH...U1 motors with high pressure seal and without drain connection:

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



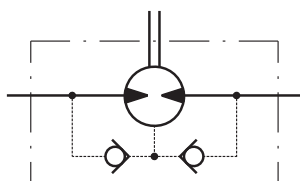
MLHH...U motors with high pressure seal and drain connection:

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



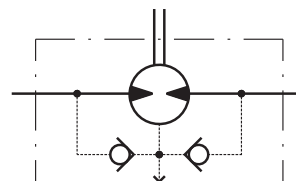
MLHH...1 motors with standard shaft seal and without drain connection:

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

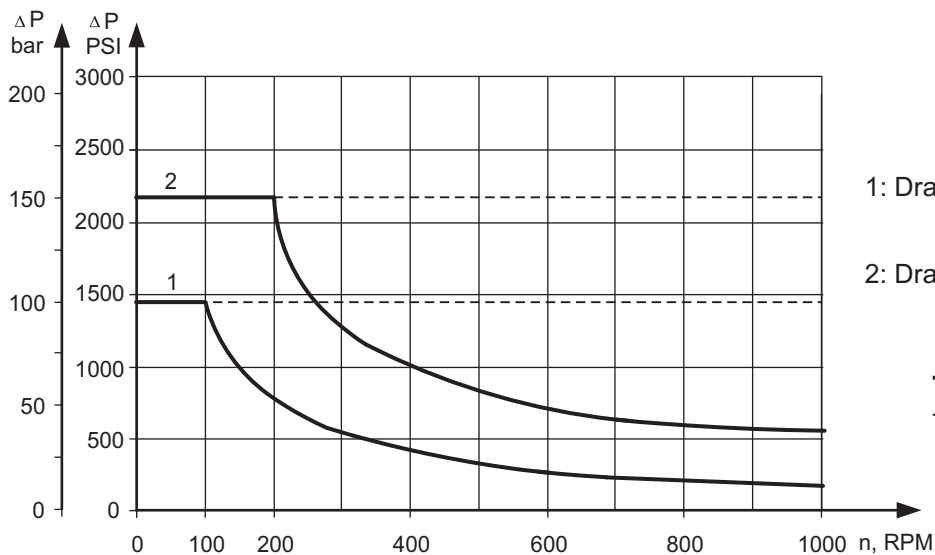


MLHH... motors with standard shaft seal and with drain connection:

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)

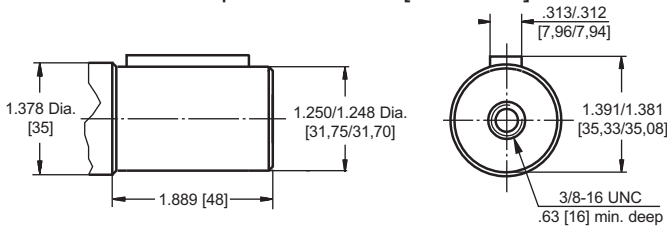
— - continuous operations

- - - - - intermittent operations

SHAFT EXTENSIONS

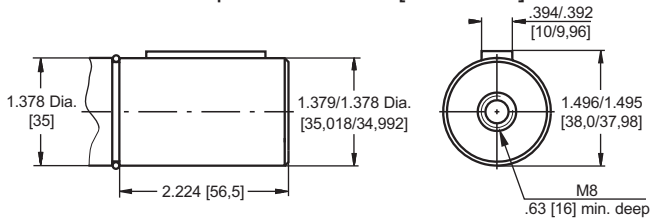
K

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



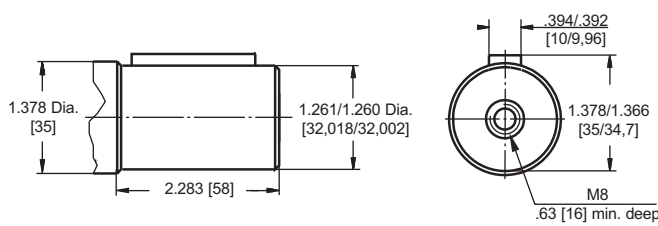
B

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



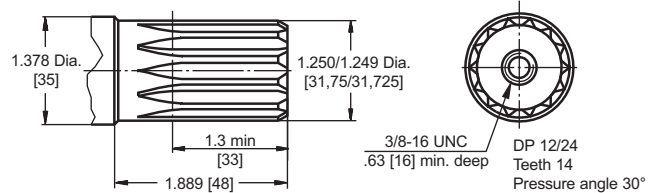
M

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



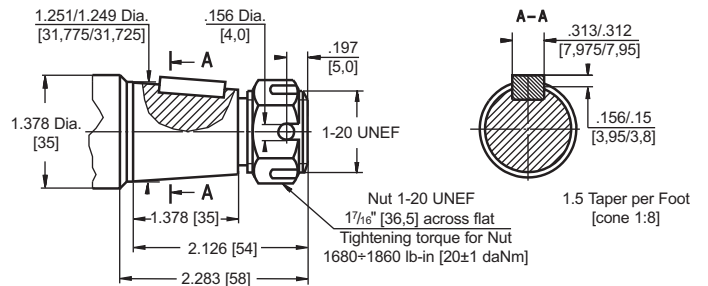
L

14T Splined, 1 1/4" [31,75], ANS B 92.1-1976
Max. Torque 8400 lb-in [95 daNm]



R

1 1/4" [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 in³/rev [201,3 cm³/rev]
- 250** - 15.4 in³/rev [252,0 cm³/rev]
- 315** - 16.4 in³/rev [314,9 cm³/rev]
- 400** - 24.2 in³/rev [396,8 cm³/rev]
- 500** - 30.7 in³/rev [502,4 cm³/rev]

Pos.2 - Shaft Extensions*

- K** - 1 1/4" [31,75] straight, Parallel key
- L** - 1 1/4" [31,75] Splined 14T ANS B92.1-1970
- B**** - ø35 straight, Parallel key
- R** - 1 1/4" [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.

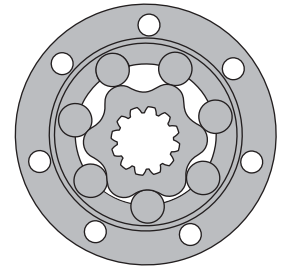
The hydraulic motors are manganophosphatized as standard.

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

| | |
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| 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

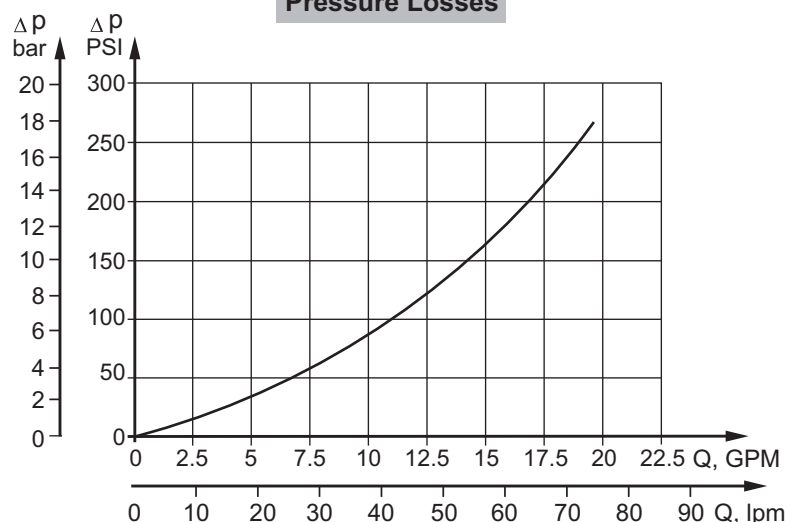
GENERAL

| | |
|---|--|
| 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] |
| | HWFRR | 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.

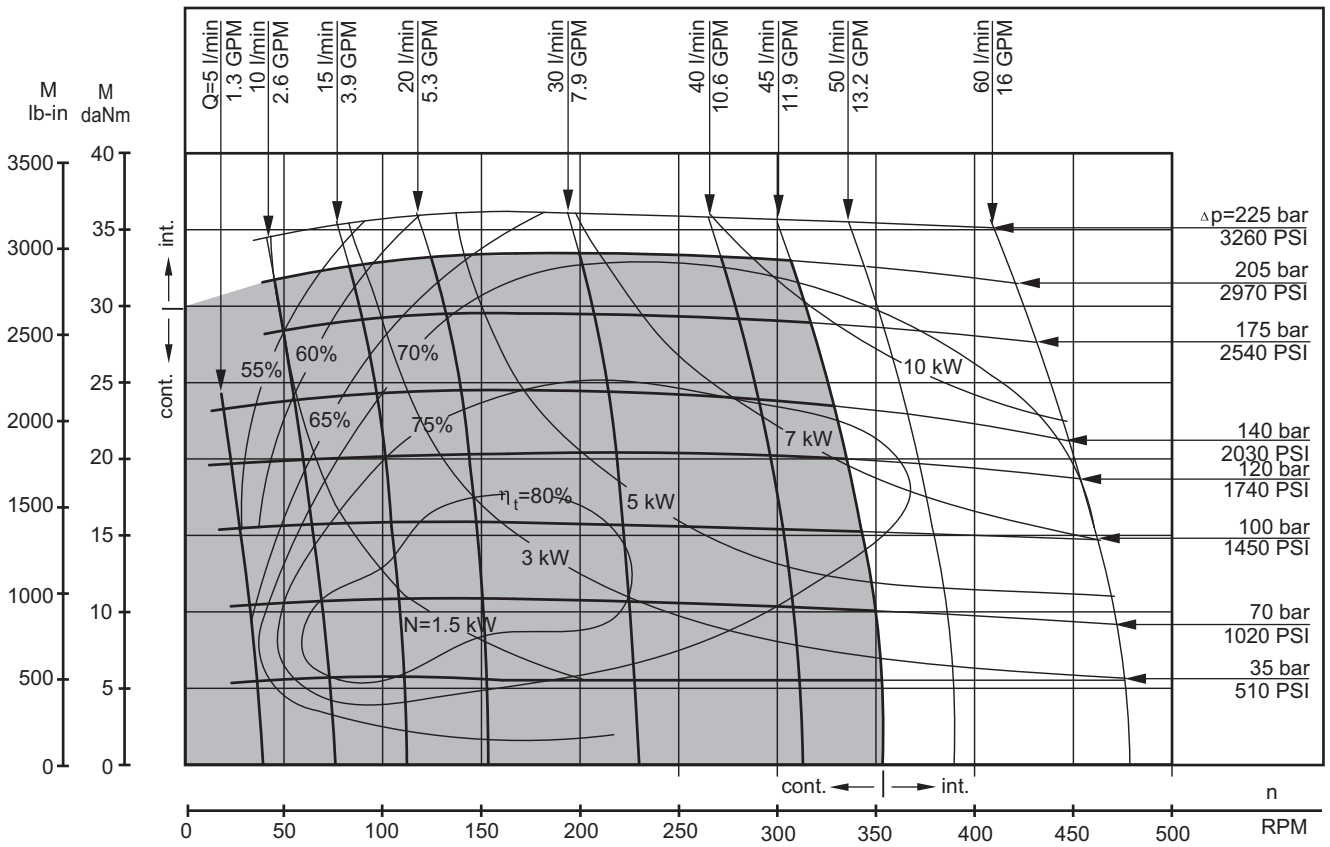
** For speeds lower than given, consult factory or your regional manager.

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

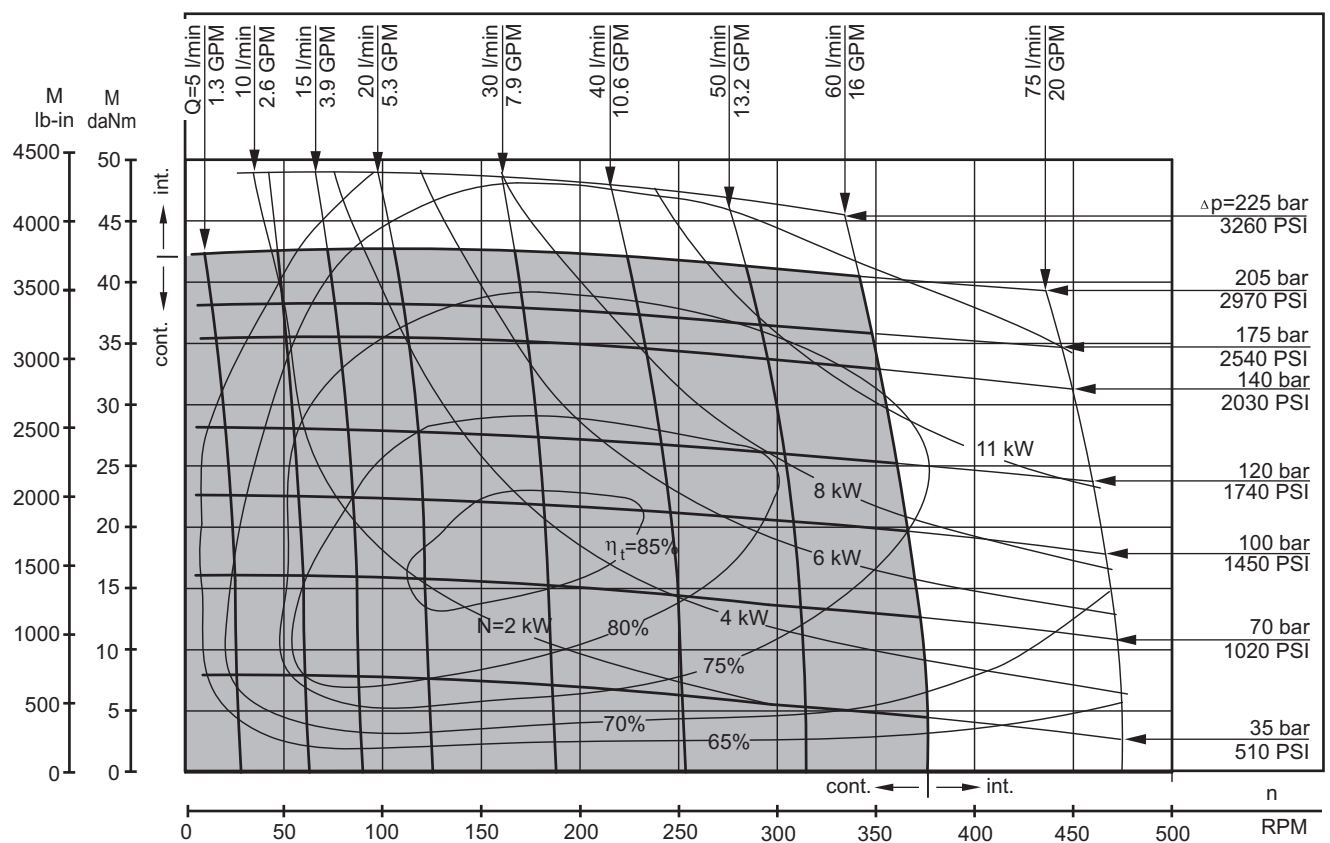
- Intermittent speed and intermittent pressure drop must not occur simultaneously.
- Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
- Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP(DIN51524) or HM (ISO 6743/4).
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



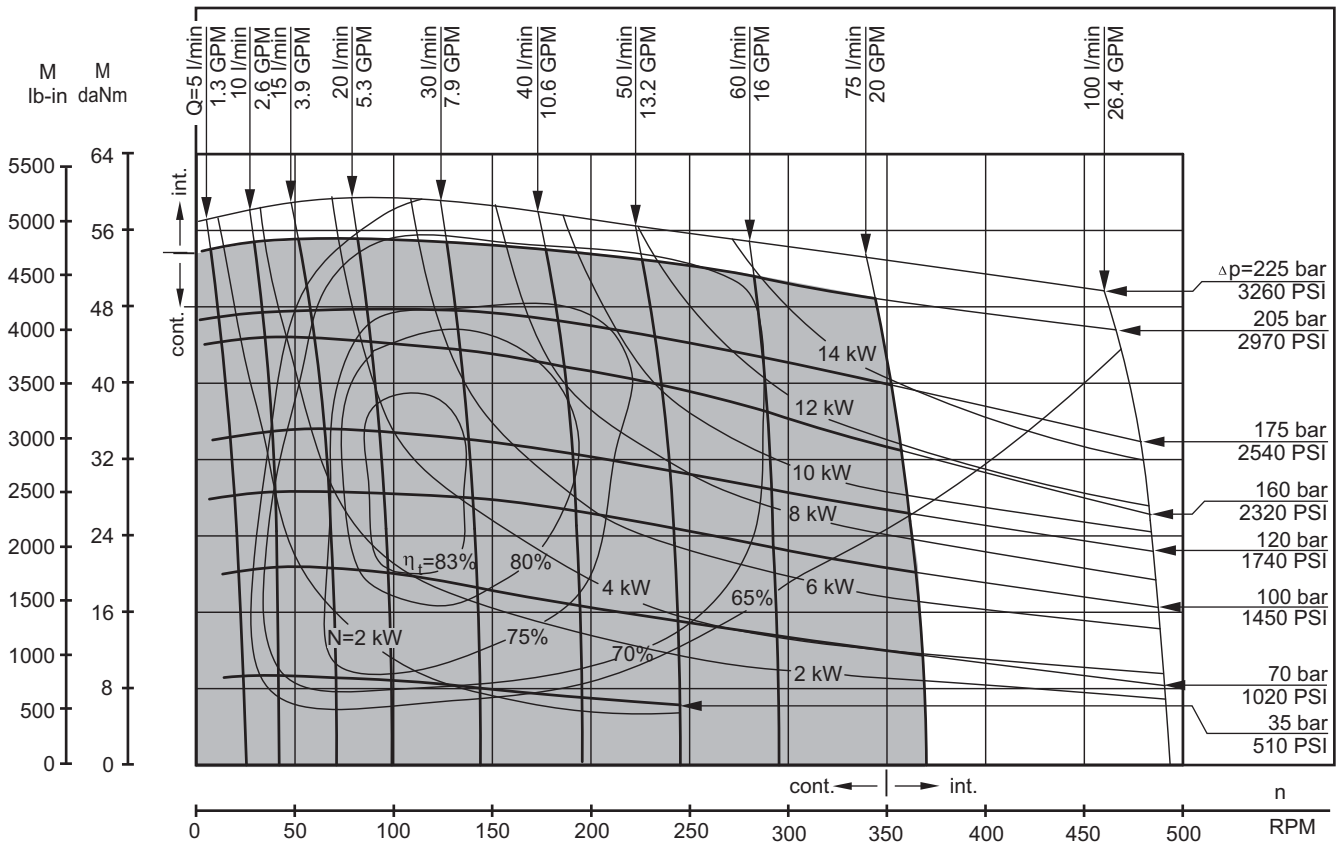
HW 160



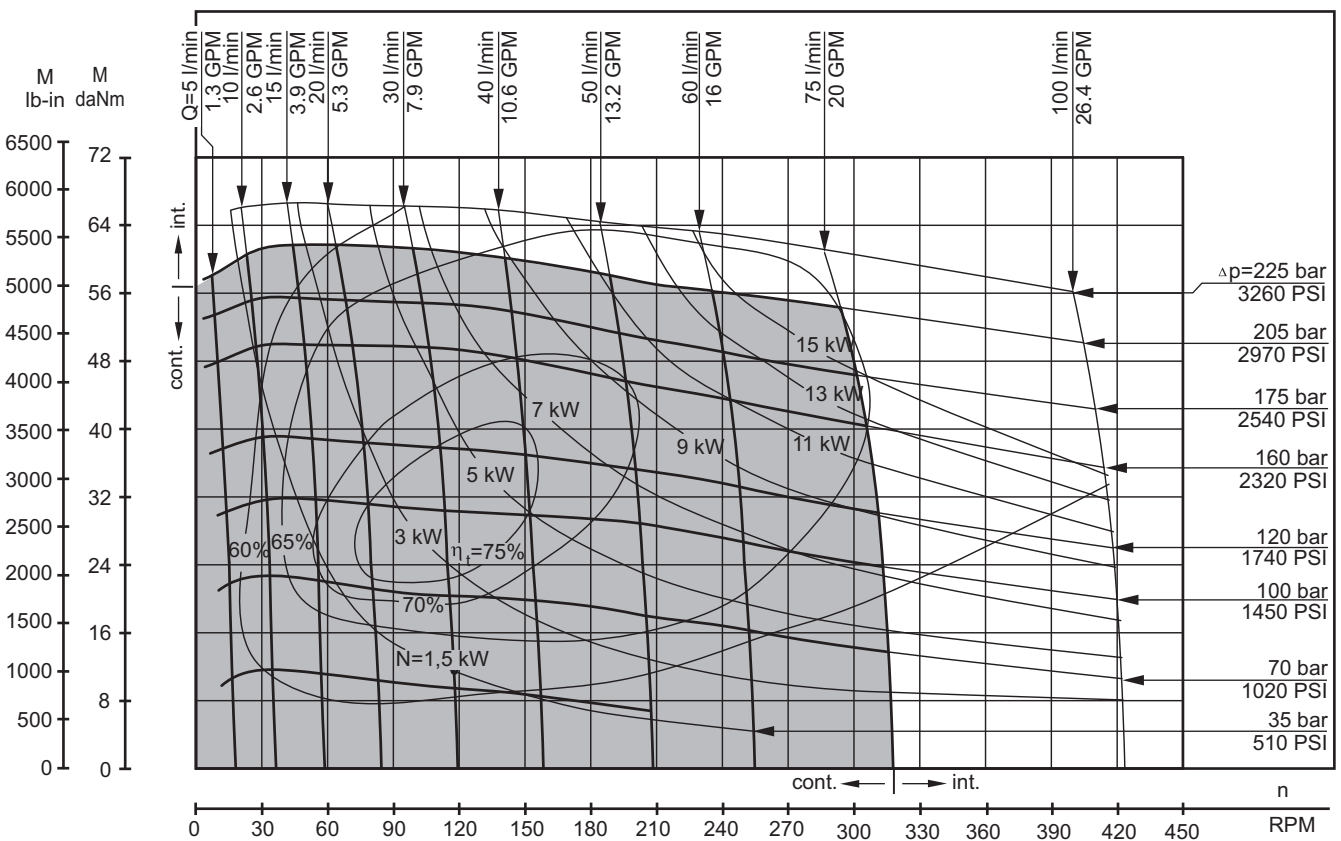
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

HW 200



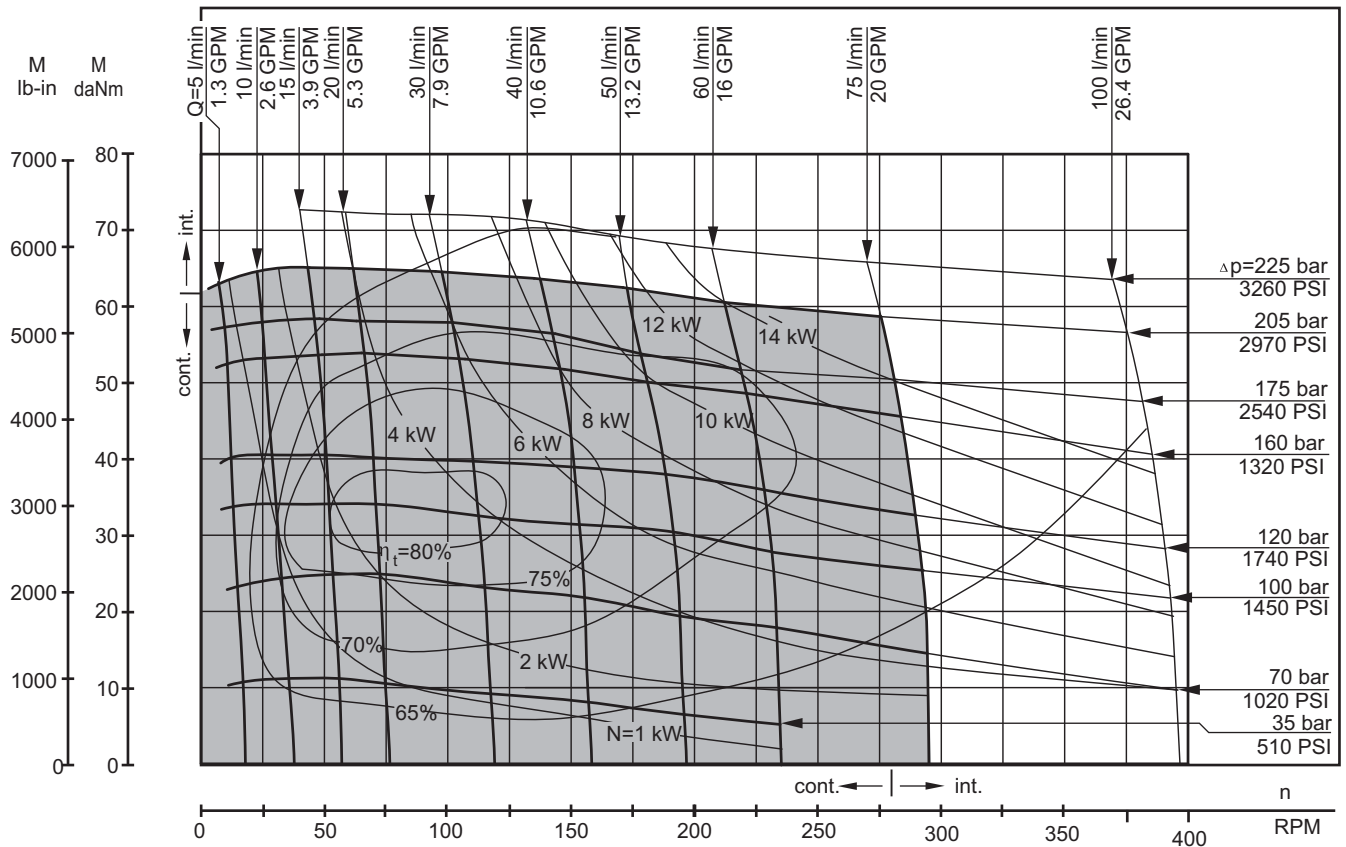
HW 235



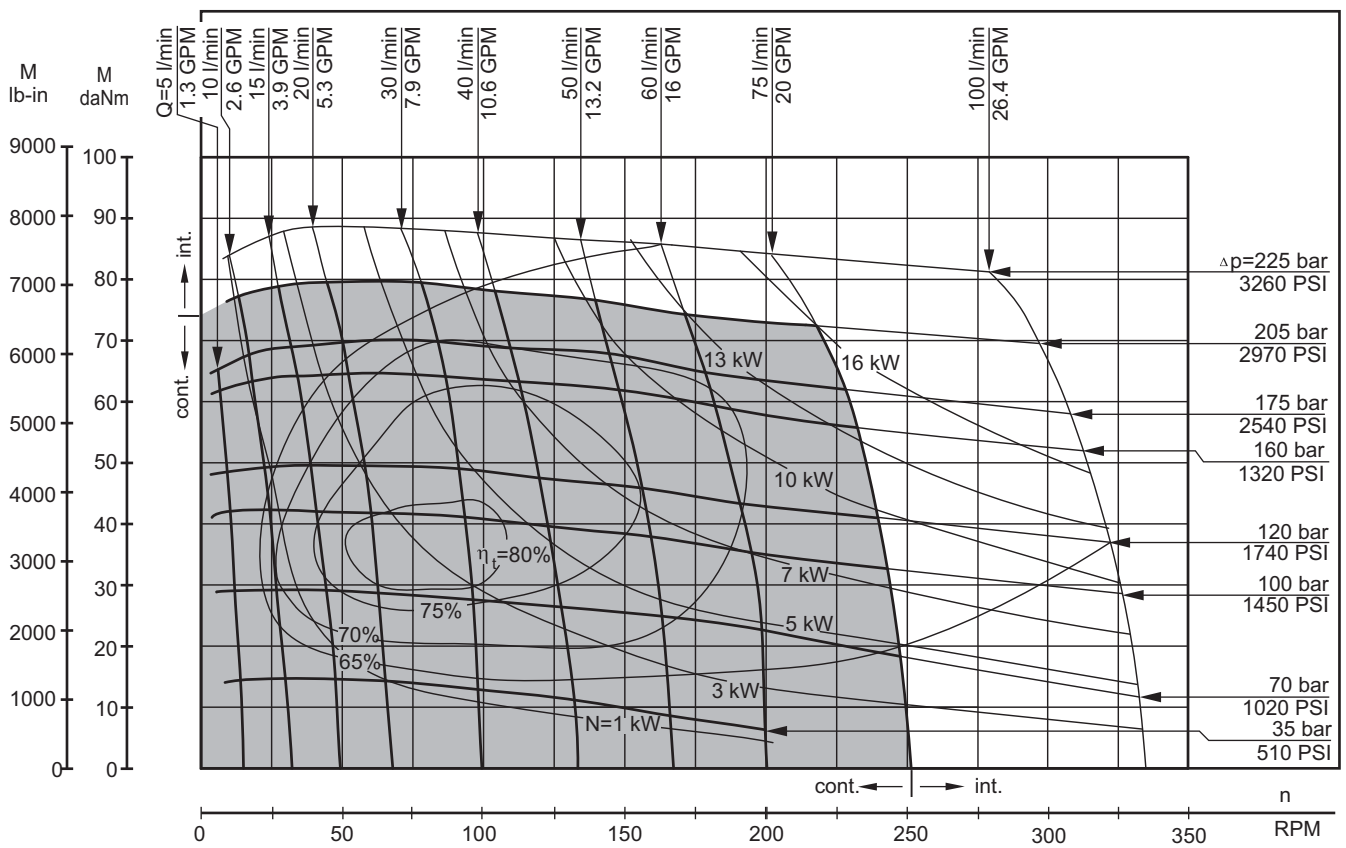
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

HW 250



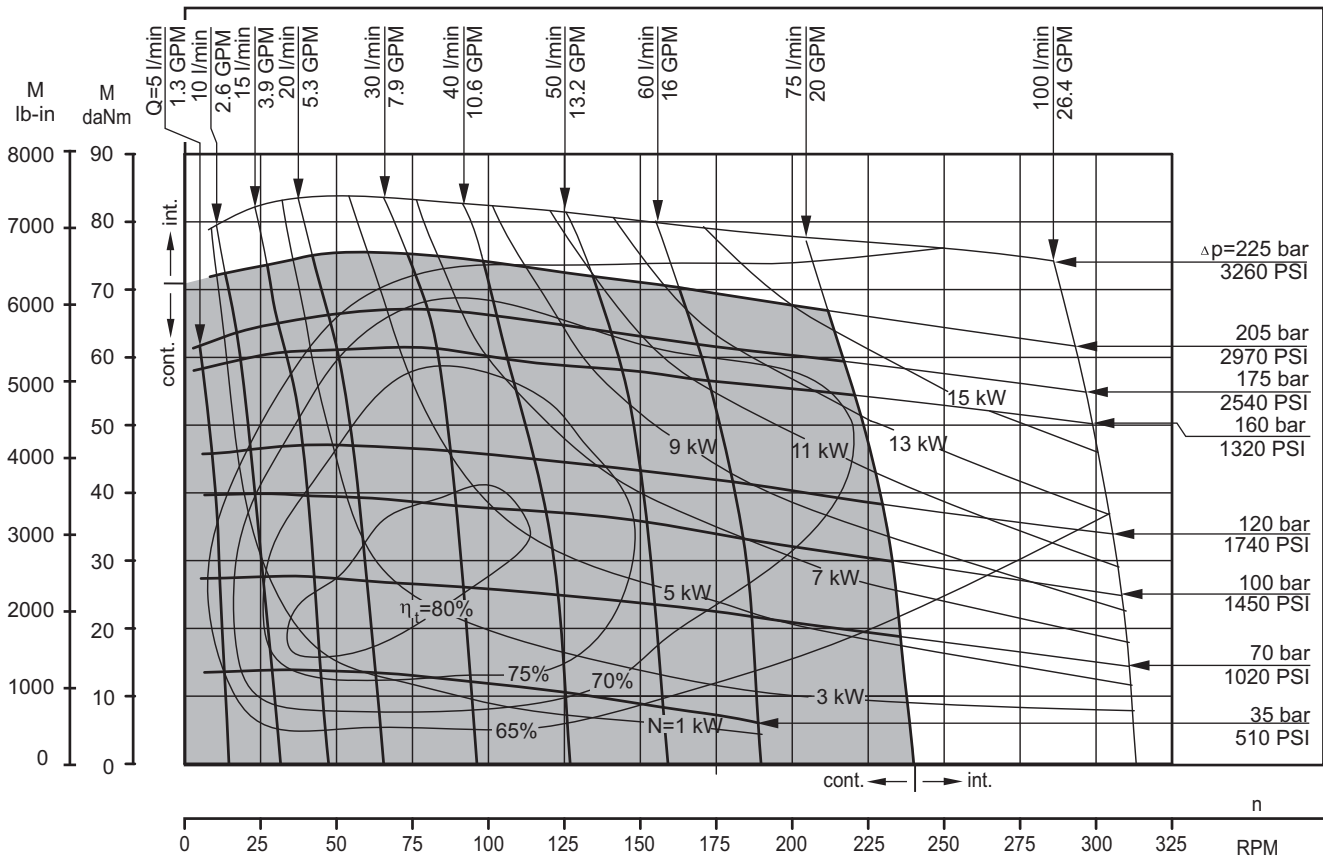
HW 300



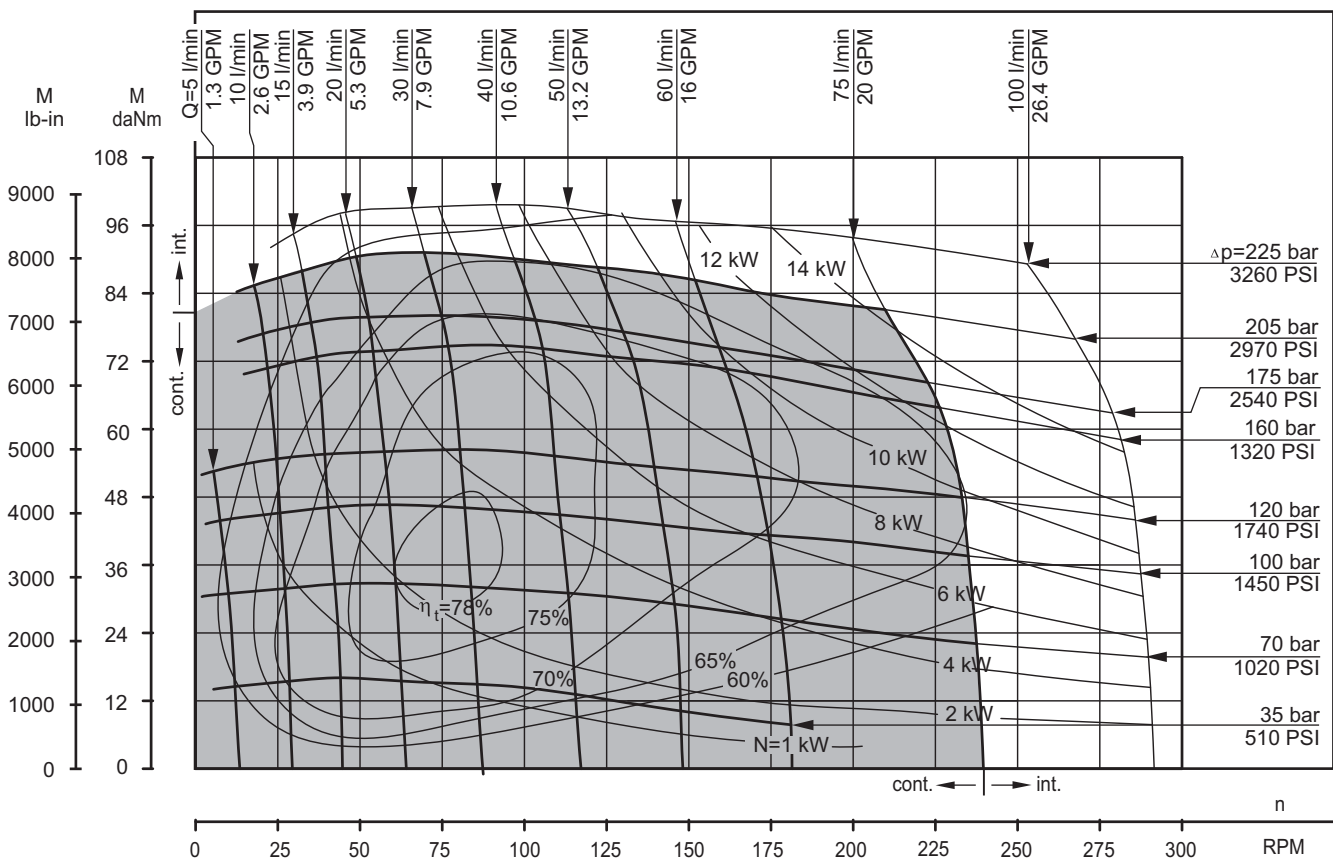
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

HW 315



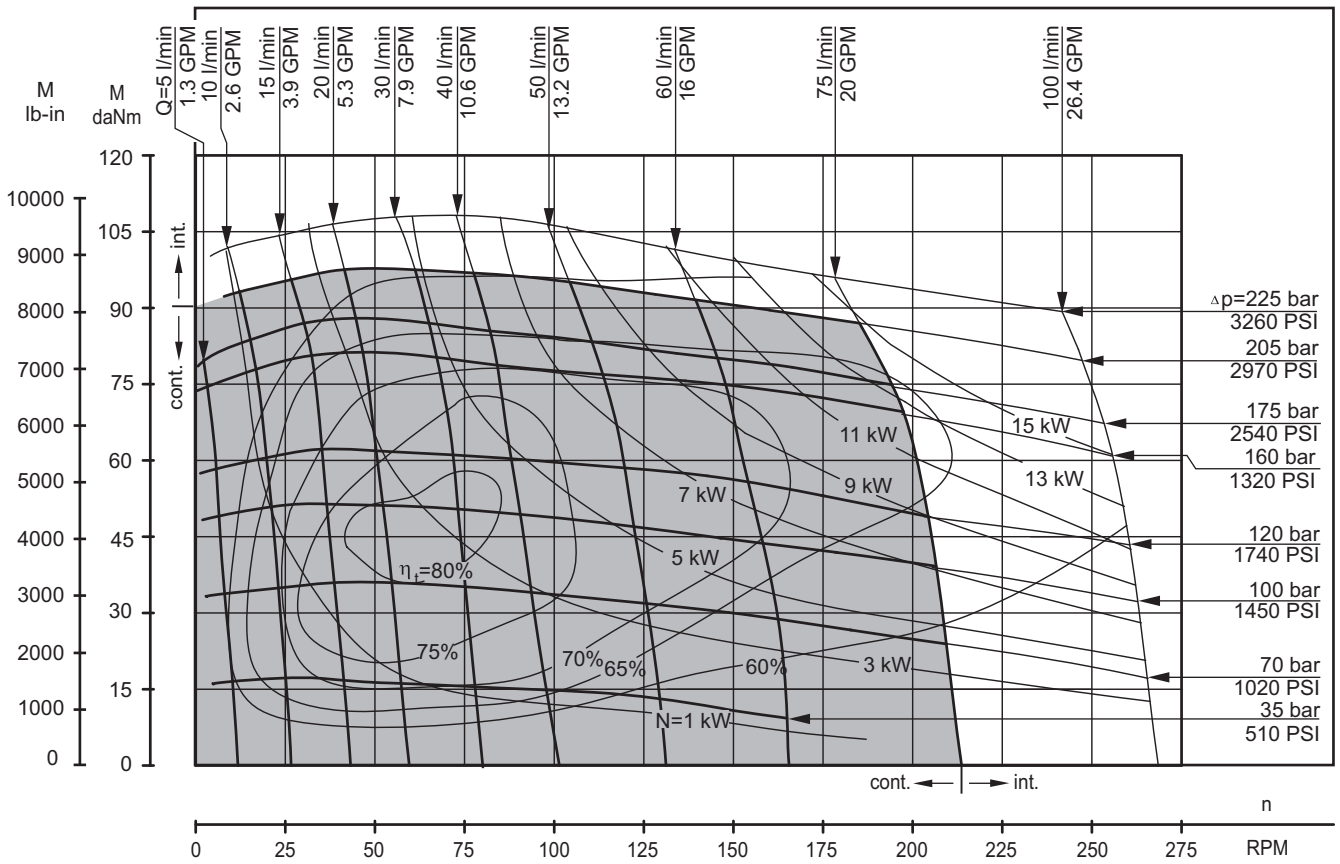
HW 350



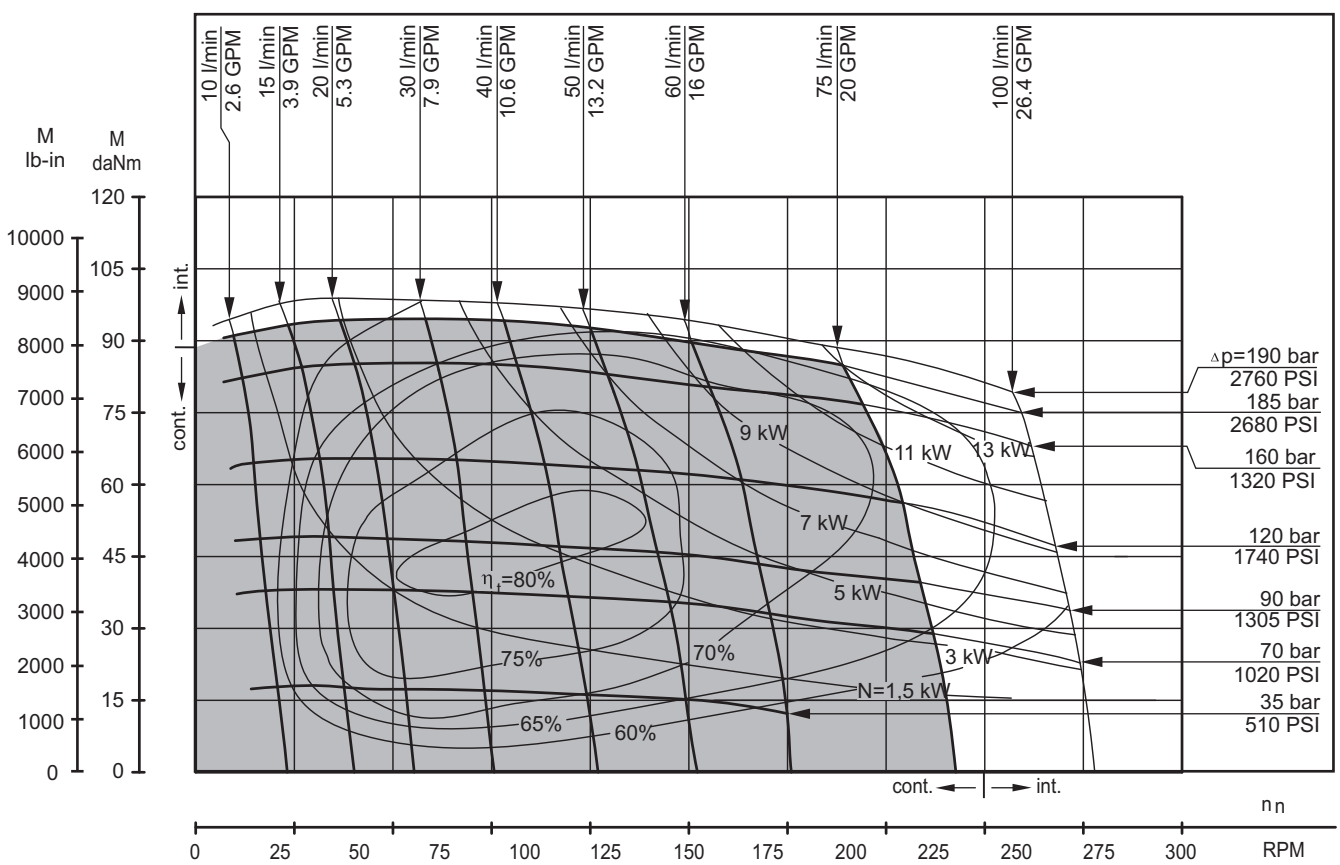
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

HW 370



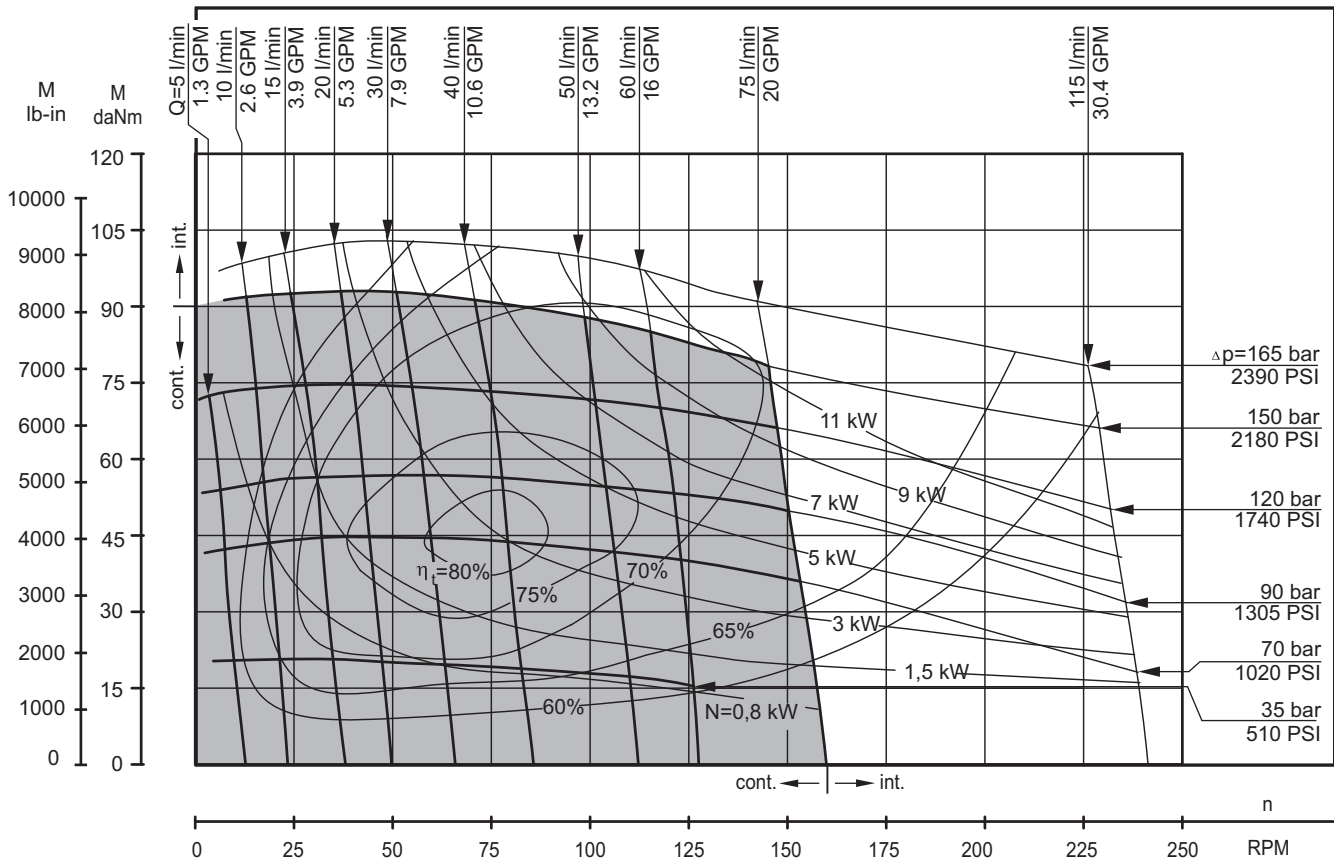
HW 400



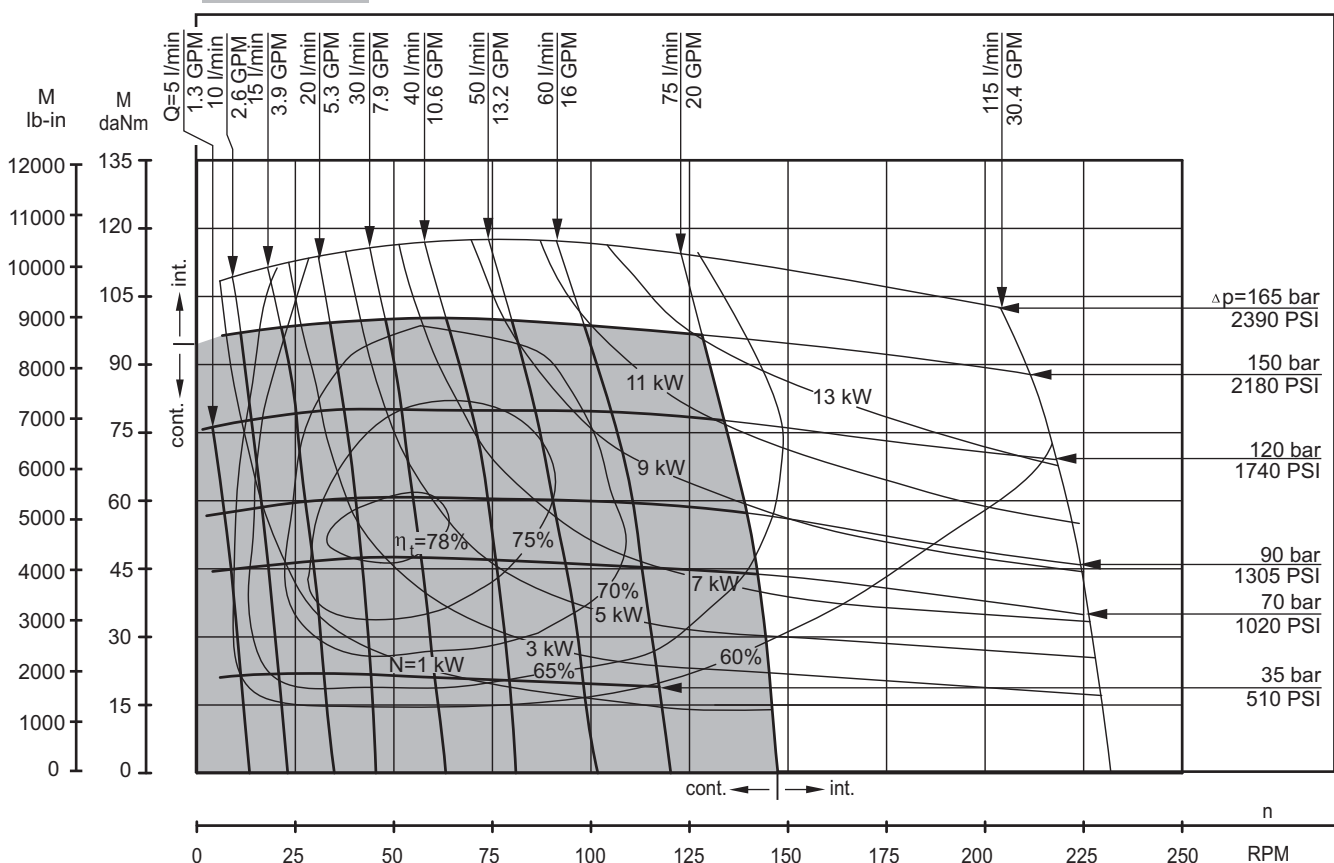
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

HW 470



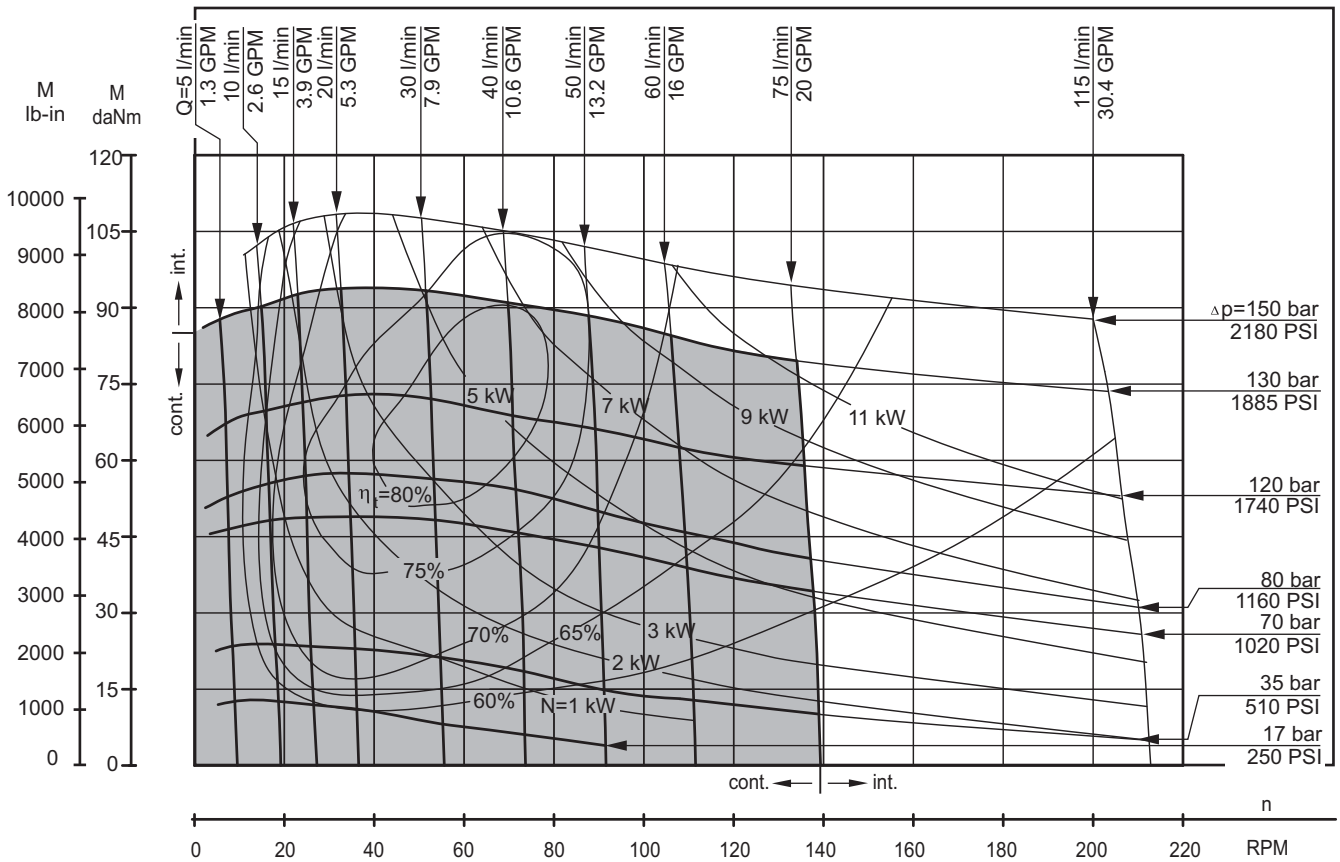
HW 500



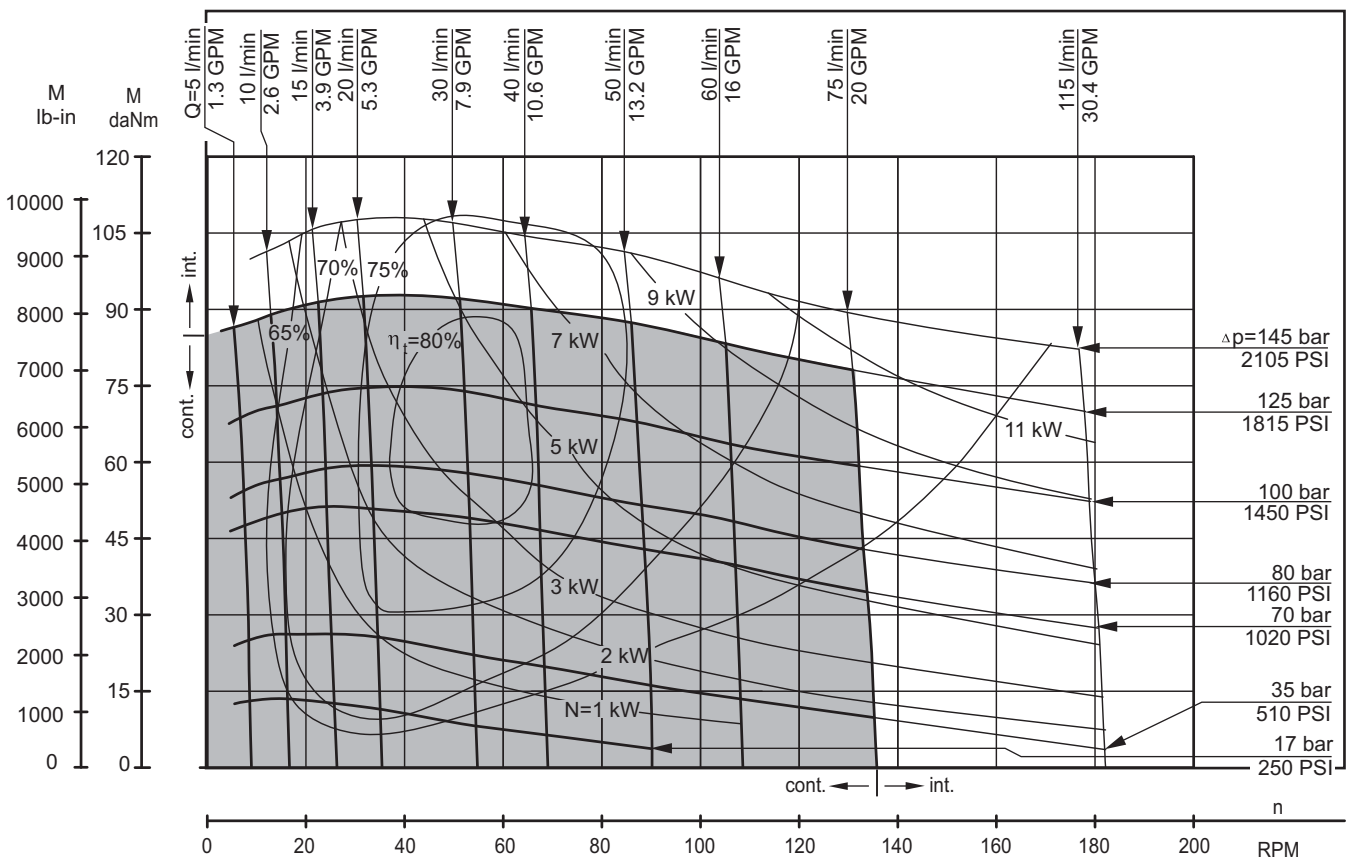
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

HW 535



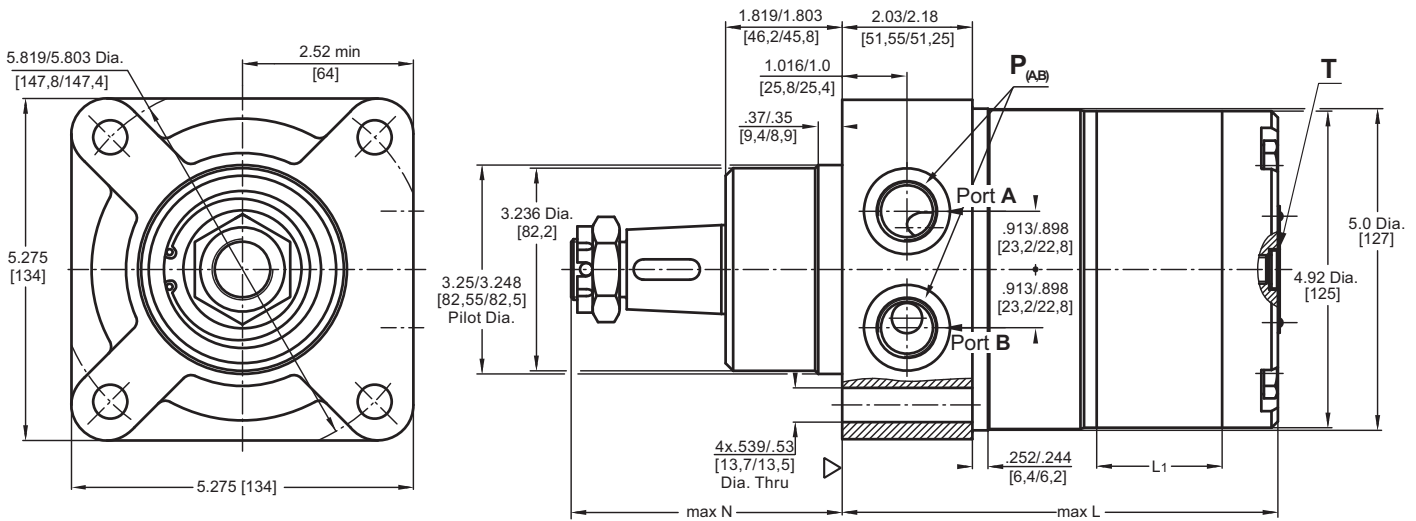
HW 550



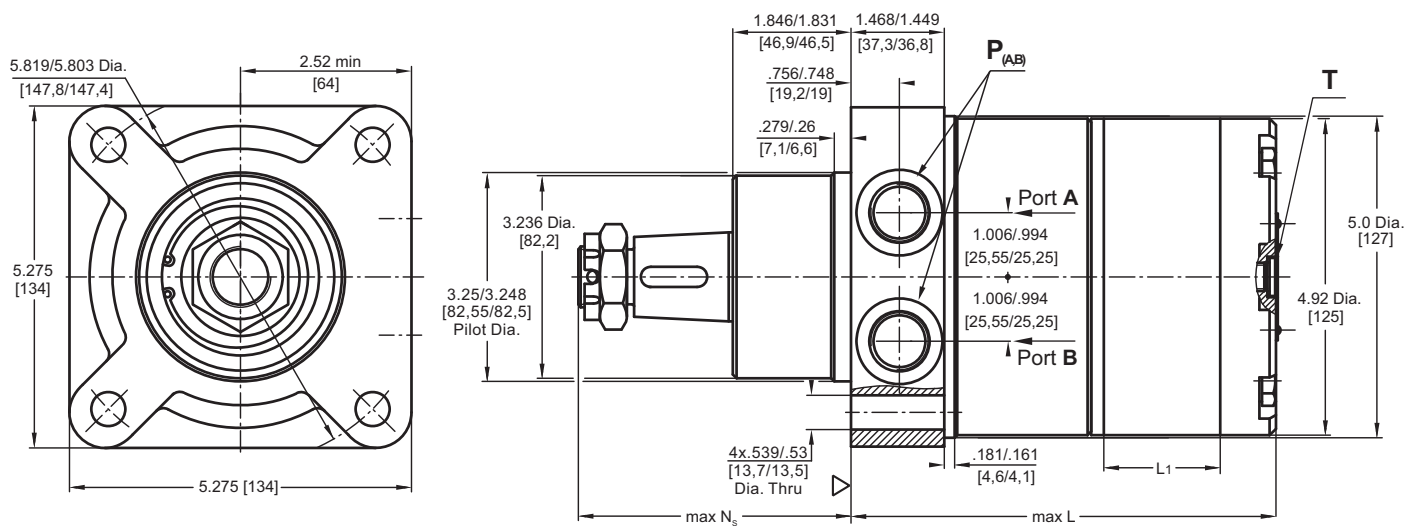
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

DIMENSIONS AND MOUNTING DATA

HW - Wheel Mount



HWS - 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 |

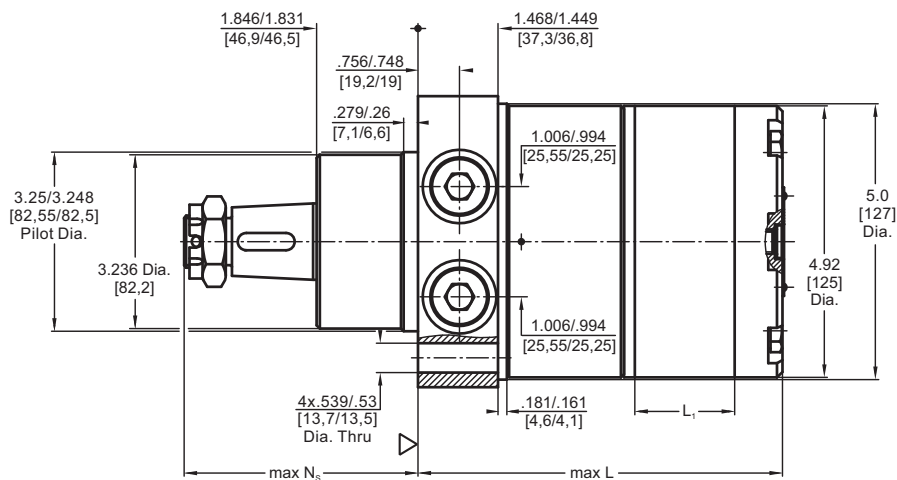


| Type | *L, in [mm] | L ₁ , in [mm] |
|-----------|--------------|--------------------------|
| HW(S) 125 | 5.51 [140,5] | .68 [17,4] |
| HW(S) 160 | 5.71 [145,0] | .86 [21,8] |
| HW(S) 200 | 5.95 [151,0] | 1.09 [27,8] |
| HW(S) 235 | 6.12 [155,5] | 1.28 [32,5] |
| HW(S) 250 | 6.22 [158,0] | 1.37 [34,8] |
| 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] |

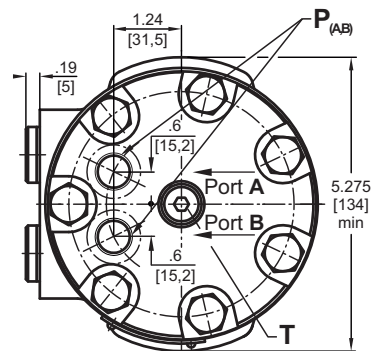
* For LSV option the dimension L is .118 in [3 mm] greater.

DIMENSIONS AND MOUNTING DATA

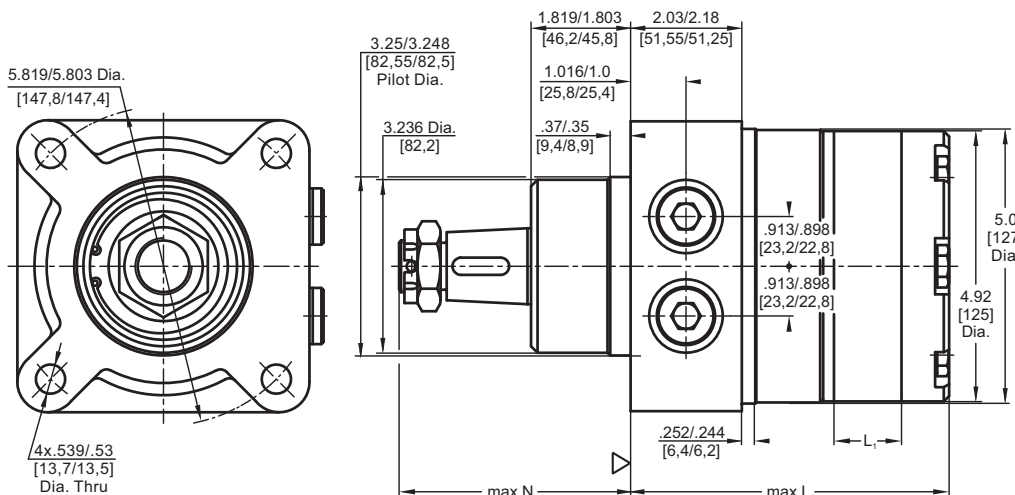
HWSE - Wheel Mount, rear ports



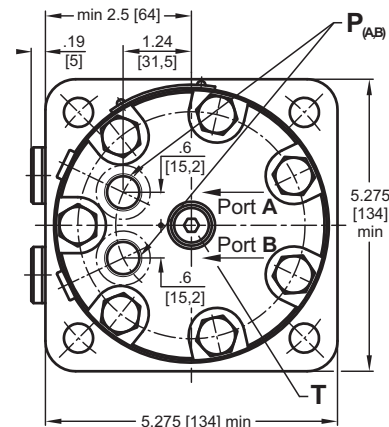
HWFE - Magneto Mount



HWE - Wheel Mount, rear ports



HW(S)E



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

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

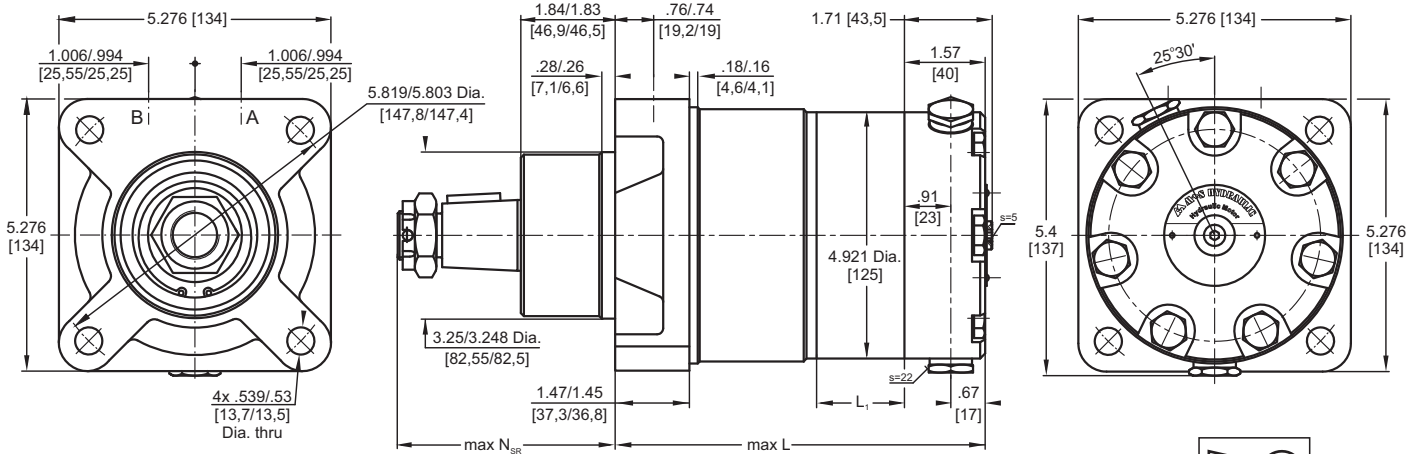
Reverse Rotation
Viewed from Shaft End
Port A Pressurized - **CCW**
Port B Pressurized - **CW**



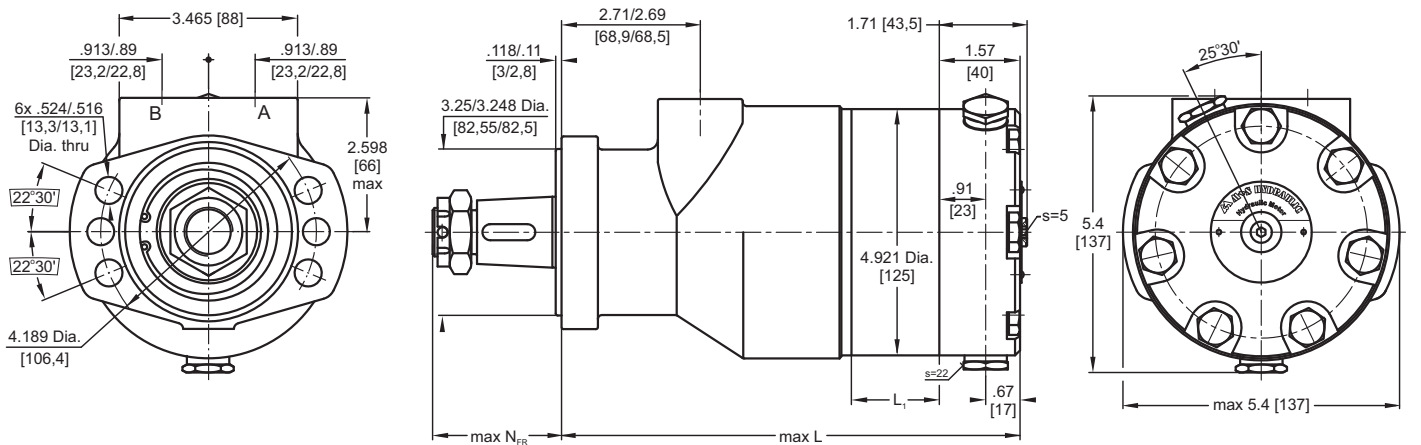
* For LSV option the dimension L is .118 in [3 mm] greater.

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.

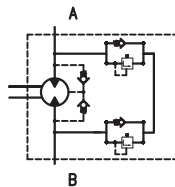
▽ - Motor Mounting Surface

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**

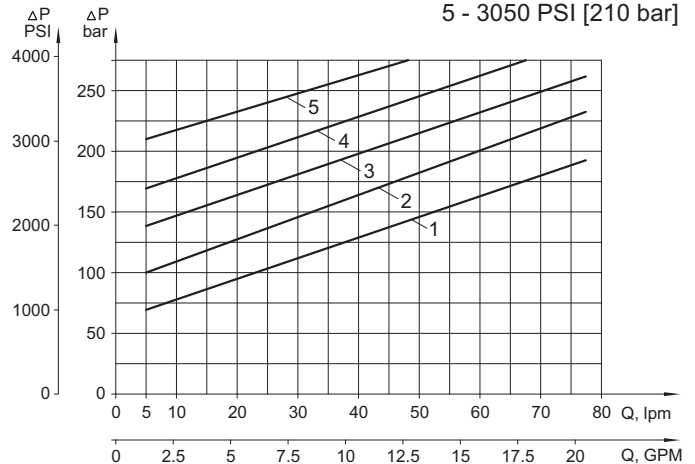


| | | Versions | |
|--------------------|--|---------------------------------|--|
| | | 2 | 4 |
| P _(A,B) | | 2xG ¹ / ₂ | 2x ⁷ / ₈ -14UNF, O-ring |

| Type | L*max,in [mm] | | L ₁ 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] |

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

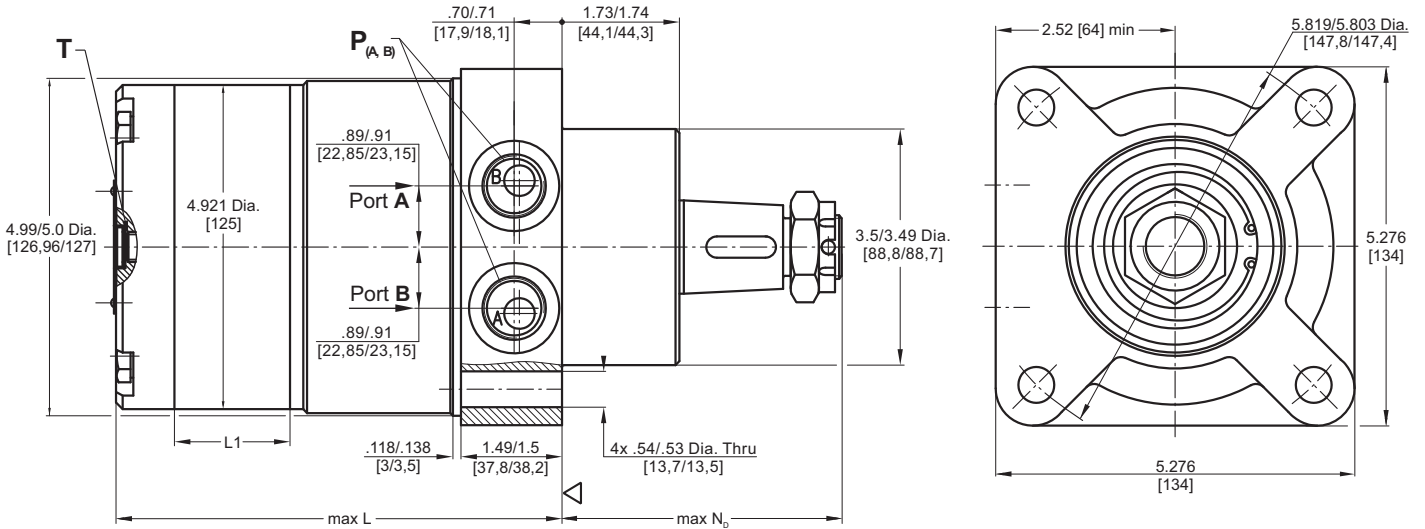
- 1 - 1015 PSI [70 bar]
- 2 - 1450 PSI [100 bar]
- 3 - 2030 PSI [140 bar]
- 4 - 2470 PSI [170 bar]
- 5 - 3050 PSI [210 bar]



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

DIMENSIONS AND MOUNTING DATA

HWD Wheel Mount



| Versions | | |
|-------------|--------------------------|--|
| | 2 | 4 |
| $P_{(A,B)}$ | $2 \times G \frac{1}{2}$ | $2 \times \frac{7}{8}-14UNF$, 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_1 , 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_b and N_v see pages 100+101.

▽ - Motor Mounting Surface

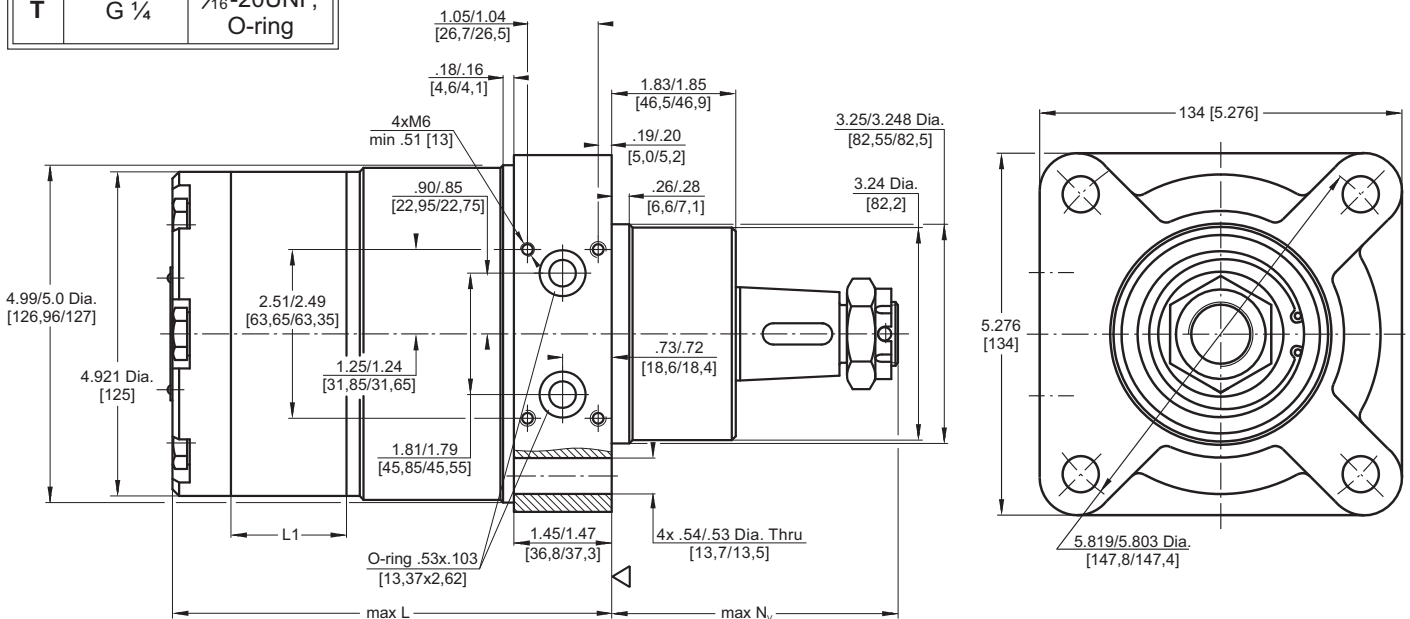


Standard Rotation
Viewed from Shaft End
Port A Pressurized - CW
Port B Pressurized - CCW

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 |

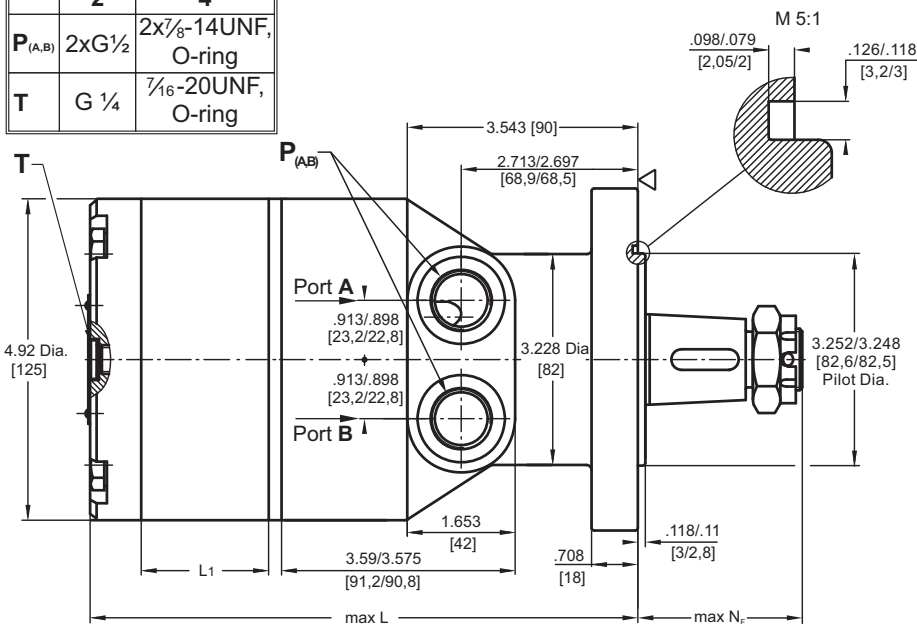
HWV Wheel Mount



DIMENSIONS AND MOUNTING DATA

| Versions | |
|---------------------------------|------------------------|
| 2 | 4 |
| P_(A,B) 2xG1/2 | 2x7/8-14UNF, O-ring |
| T G 1/4 | 7/16-20UNF, O-ring |

HWF - Magneto Mount



Note: For N_F see pages 100+101.

▽ - Motor Mounting Surface

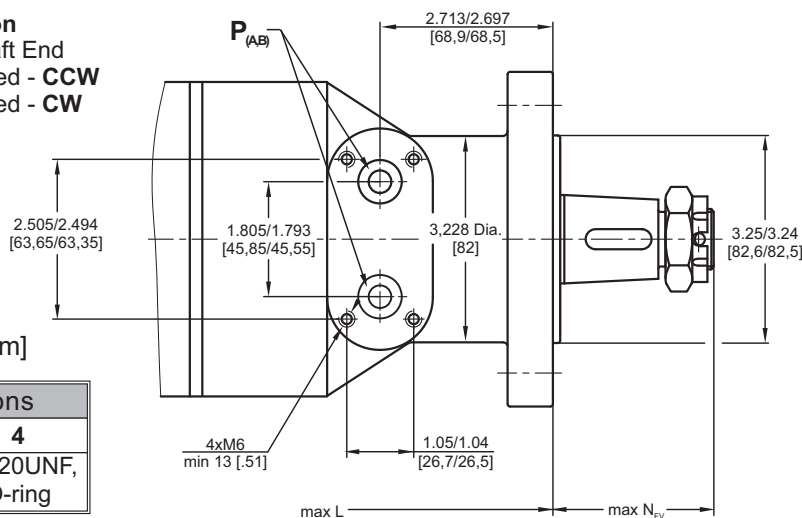
Standard Rotation

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

HWFV - Wheel mount, six holes, relief valves

Reverse Rotation

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



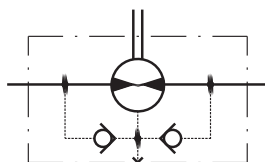
| Type | *L, in [mm] | L1, in [mm] |
|---------|--------------|-------------|
| HWF 125 | 7.24 [184,0] | .68 [17,4] |
| HWF 160 | 7.42 [188,5] | .86 [21,8] |
| HWF 200 | 7.66 [194,5] | 1.09 [27,8] |
| HWF 235 | 7.84 [199,0] | 1.28 [32,5] |
| HWF 250 | 7.93 [201,5] | 1.37 [34,8] |
| HWF 300 | 8.20 [208,0] | 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.

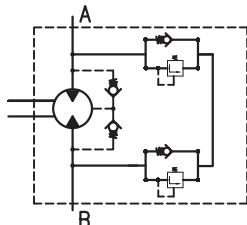


| Versions | |
|----------------|-----------------------|
| 2 | 4 |
| T G 1/4 | 7/16-20UNF, O-ring |

HW, HWF, HWS,
HWD, HWV



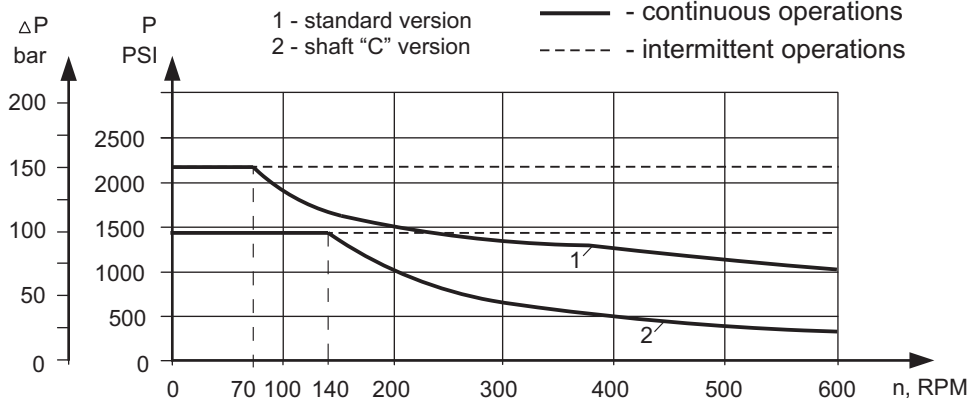
HWFR, HWSR



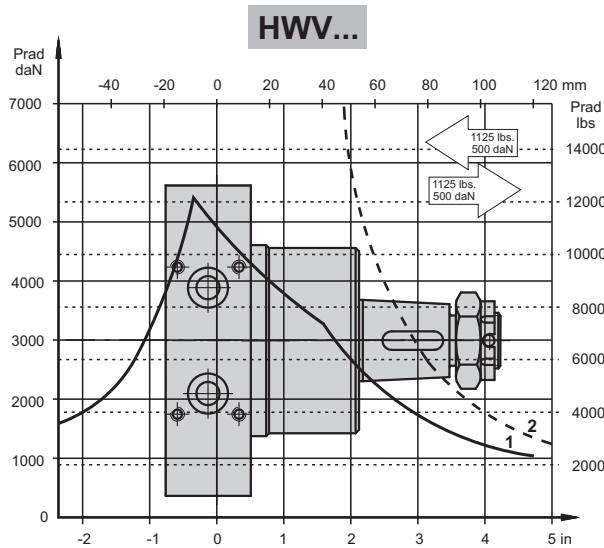
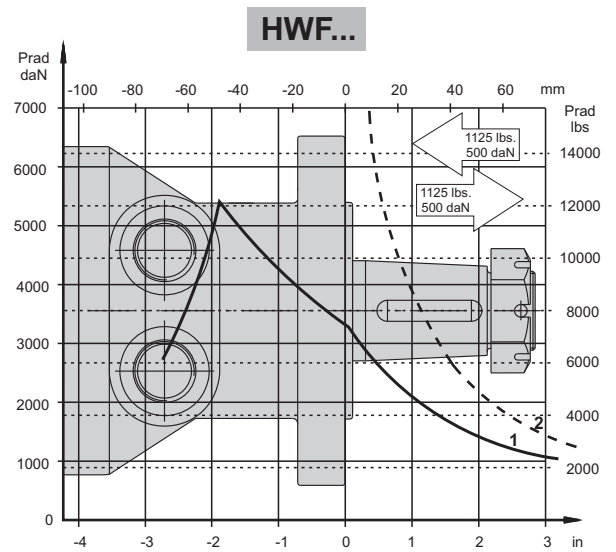
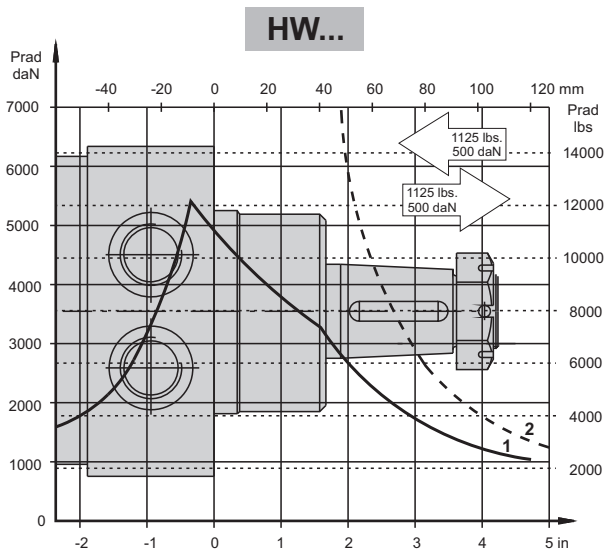
MAX. PERMISSIBLE SHAFT SEAL PRESSURE

HW... motors with drain connection:

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



PERMISSIBLE SHAFT LOADS

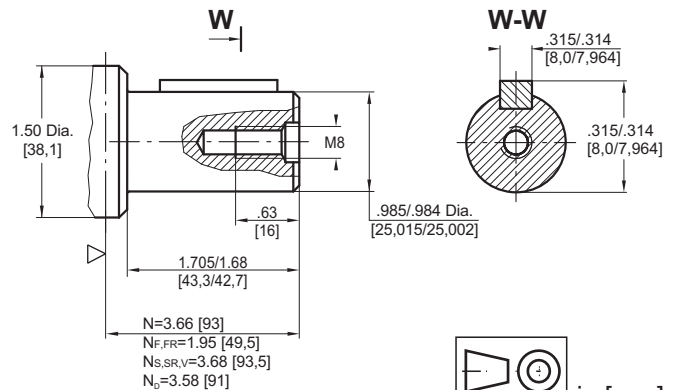
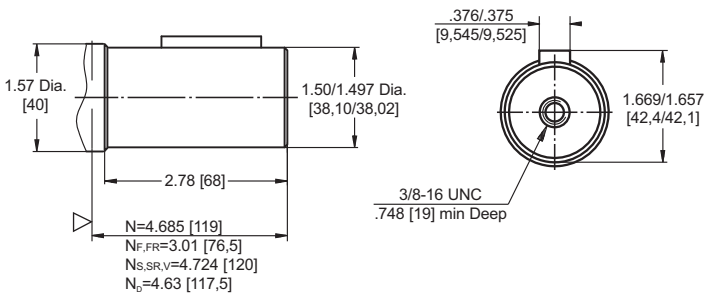


- 1 - Bearing curve: The curve applies to a B10 bearing life of 2000 hours at 100 RPM.
- 2 - Shaft curve: The curve represents Max. permissible radial shaft load with safety factor 3:1.

SHAFT EXTENSIONS

C - 1½"[38,1] straight, Parallel key 3/8"x 3/8"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]



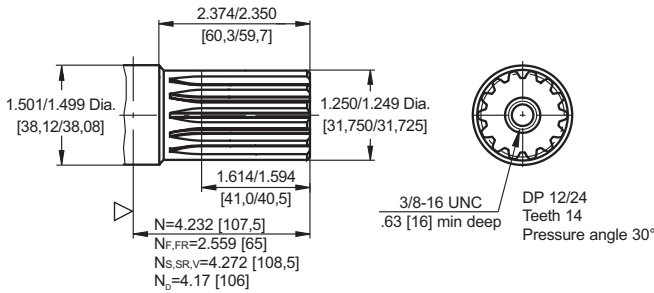
- N - for standard flange
- N_F - for F flange
- N_{FR} - for FR flange
- N_S - for S flange
- N_{SR} - for SR flange
- N_D - for D flange
- N_V - for V flange



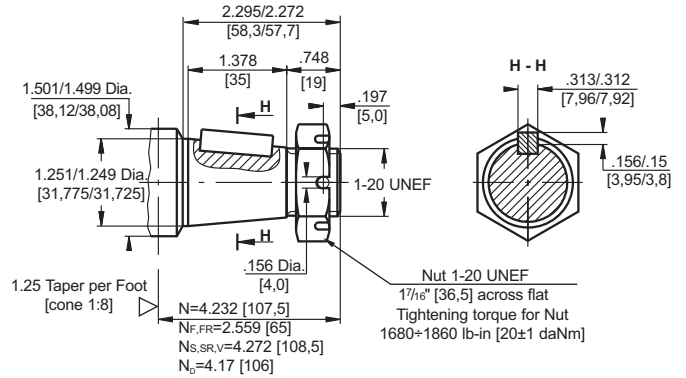
▽ - Motor Mounting Surface

SHAFT EXTENSIONS [continued]

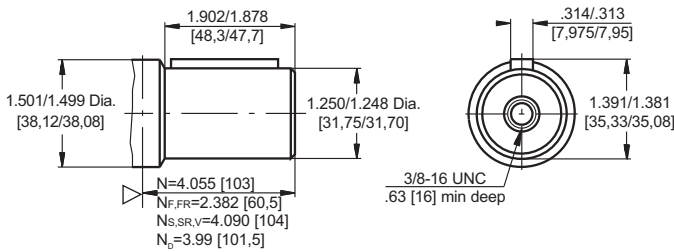
L - 1 1/4" [31,75] splined 14T, ANSI B92.1-1976
Max. Torque 8410 lb-in [95 daNm]



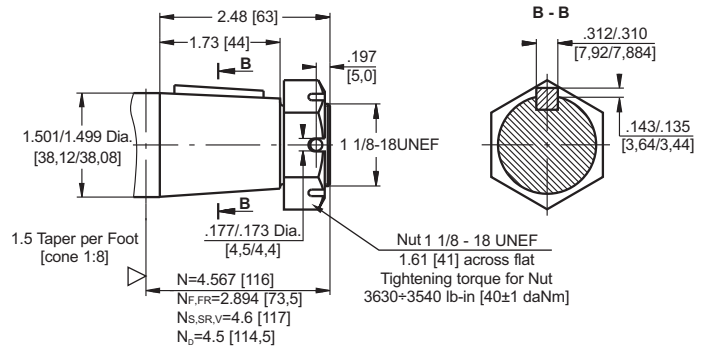
R - 1 1/4" [31,75] SAE J501 Tapered, Parallel key 5/16"x5/16"x1" BS46
Max. Torque 8410 lb-in [95 daNm]



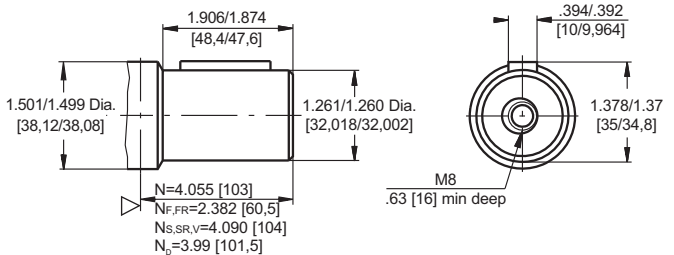
K - 1 1/4" [31,75] straight, Parallel key 5/16"x5/16"x1 1/2" BS46
Max. Torque 6815 lb-in [77 daNm]



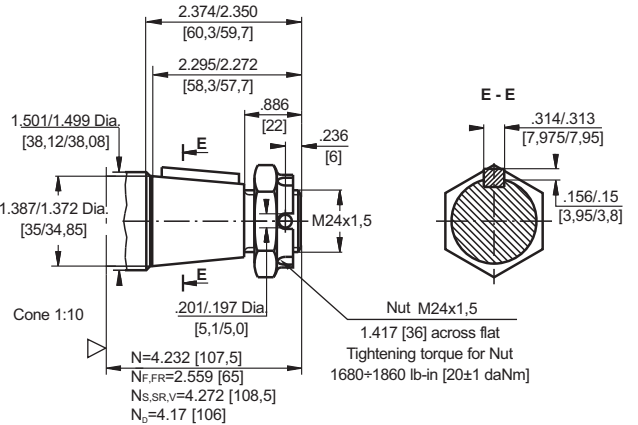
T - 1 1/2" [38,1] Tapered, Parallel key 5/16"x5/16"x1 1/4" BS46
Max. Torque 10630 lb-in [120 daNm]



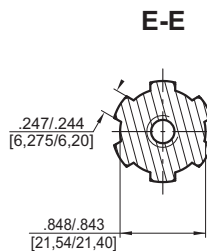
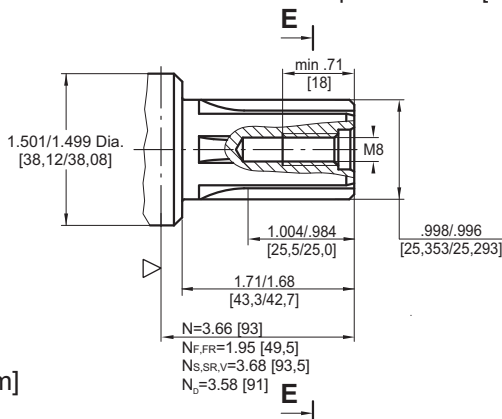
M - ø32 straight, Parallel key A10x8x32 DIN 6885
Max. Torque 6815 lb-in [77 daNm]



KB - ø35 tapered 1:10, Parallel key 5/16"x5/16"x1 1/4" BS46
Max. Torque 8410 lb-in [95 daNm]



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



- 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



▽ - Motor Mounting Surface

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 $\varnothing 88,8$ [3.5]
- V^{1)*}** - Wheel mount, four holes, valves

Pos.2 - Displacement code

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

Pos.3 - Shaft Extensions^{2)*}

- | | |
|-----------|---|
| K | - 1 1/4" [31,75] straight, Parallel key $5/16"$ x $5/16"$ x $1 1/2"$ BS46 |
| KB | - $\varnothing 35$ tapered 1:10, Parallel key $5/16"$ x $5/16"$ x $1 1/4"$ BS46 |
| L | - 1 1/4" [31,75] splined 14T, ANSI B92.1-1976 |
| M | - $\varnothing 32$ straight, Parallel key A10x8x32 DIN 6885 |
| R | - 1 1/4" [31,75] Tapered 1:8, Parallel key $5/16"$ x $5/16"$ x $1 1/4"$ BS46 |
| T | - 1 1/2" [38,1] Tapered 1:8, Parallel key $5/16"$ x $5/16"$ x $1 1/4"$ BS46 |
| C | - 1 1/2" [38,1] straight, Parallel key $3/8"$ x $3/8"$ x $1 1/2"$ BS46 |
| CO | - $\varnothing 25$, straight, Parallel key A8x7x32 DIN 6885 |
| SH | - $\varnothing 1"$ splined BS 2059, SAE 6B |

Pos.4 - Ports

- | | |
|------------------------|--|
| 2 | - side ports, 2xG1/2, G1/4, BSP thread, ISO 228 |
| 4 | - side ports, 2x7/8-14 UNF, O-ring, 7/16-20 UNF |
| 5^{3)*} | - rear ports, 2xG3/8, G1/4, BSP thread, ISO 228 |
| 6^{3)*} | - rear ports, 2x9/16-18 UNF, O-ring, 7/16-20 UNF |

Pos.5 - Special Features^{4)*, 5)*, 6)*} [see page 103]

Pos.6 - Valves Pressure Range, bar^{7)*}

- | | |
|---|--------------------------|
| / | - 70, 100, 140, 170, 210 |
|---|--------------------------|

Pos.7 - Design Series

- omit - Factory specified

NOTES:

- ^{1)*} Flange **V** is for versions 2 and 4 - drainage only!
- ^{2)*} The permissible output torque for shafts must not be exceeded!
- ^{3)*} For **E**-version only!
- ^{4)*} If the code on pos.5 is not specified in the order, it will be considered as LL-option.
- ^{5)*} Colour at customer's request.
- ^{6)*} Non painted feeding surfaces, colour at customer's request.
- ^{7)*} For **SR** and **FR** only!

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.

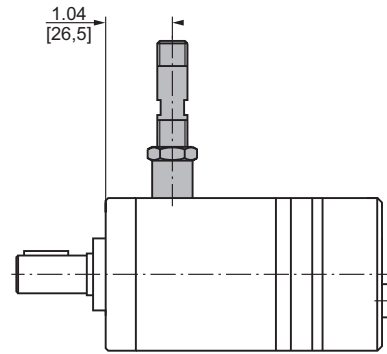
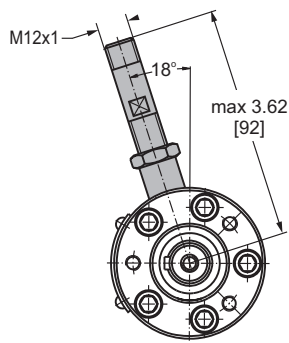
** Colour at customer's request.

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

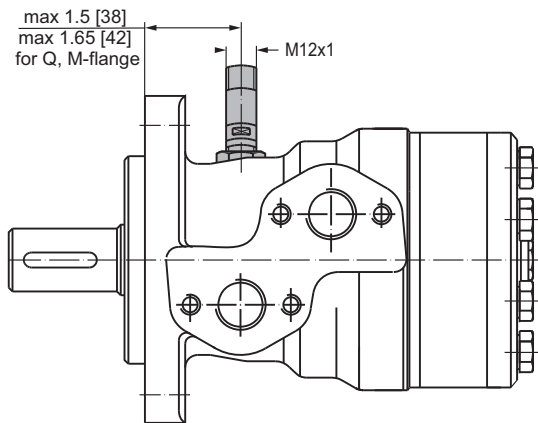
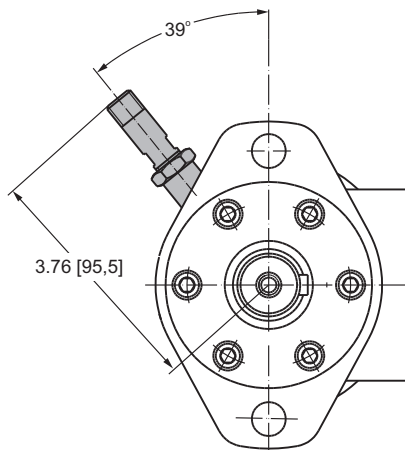
**** Without check valves for "U" shaft seal versions.

MOTORS WITH SPEED SENSOR

MLHM...RS

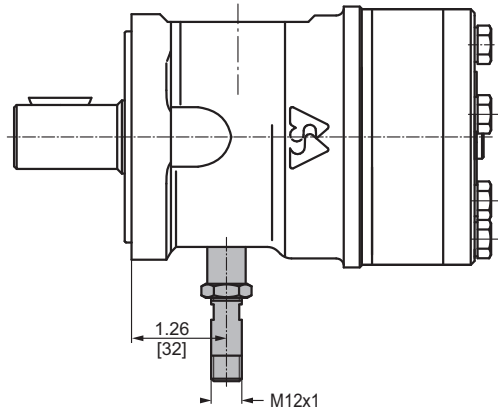
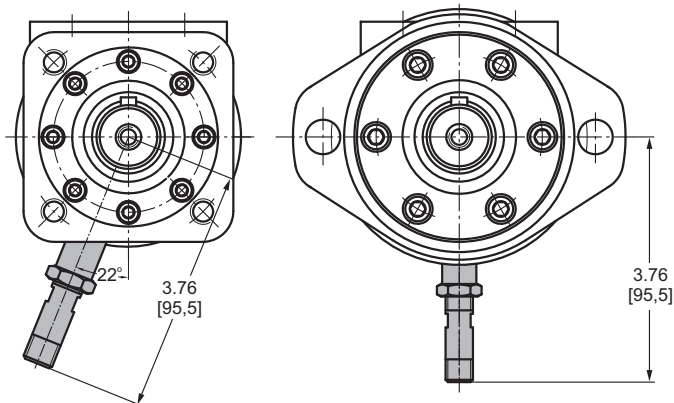


MLHP...RS MLHR...RS

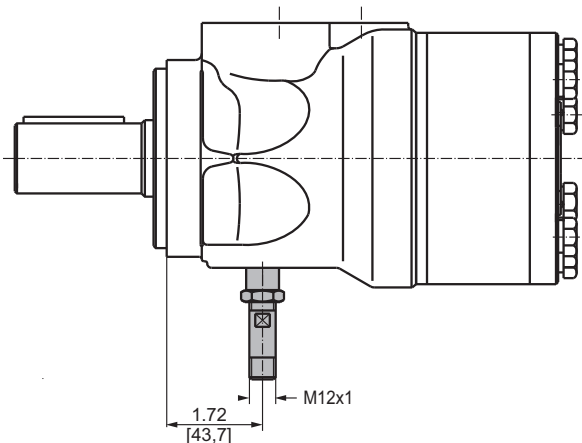
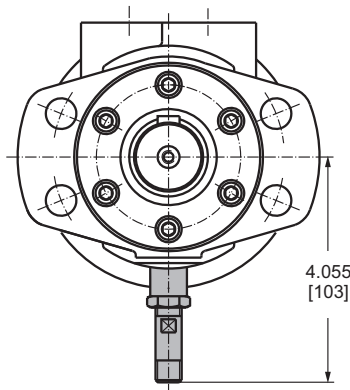


HP...RS HR...RS

For Q-flange

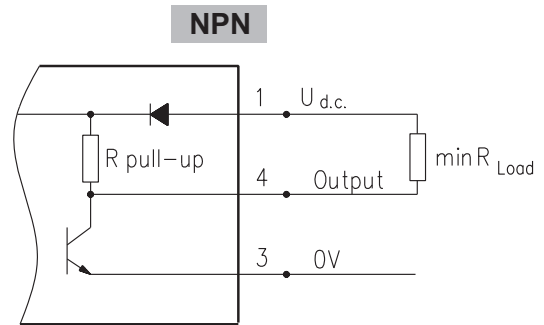
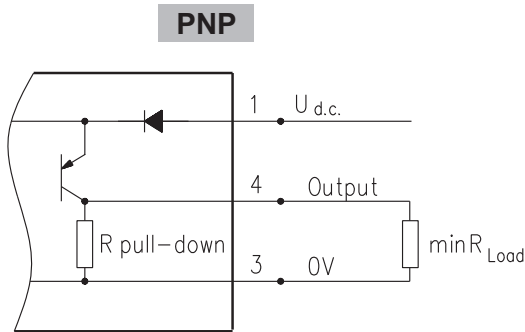


MLHH...RS



TECHNICAL DATA OF THE SPEED SENSOR

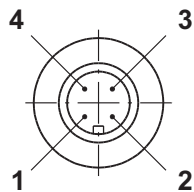
Wiring diagrams



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

| Motor type | MLHM | MLHP | MLHR | HP, HR | MLHH |
|-----------------------|------|------|------|--------|------|
| Pulses per revolution | 30 | 36 | 36 | 36 | 42 |

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

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

v_{km} - vehicle speed, km/h;

v_{mi} - 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:

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

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].

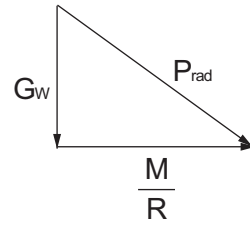
Table 3

| 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.

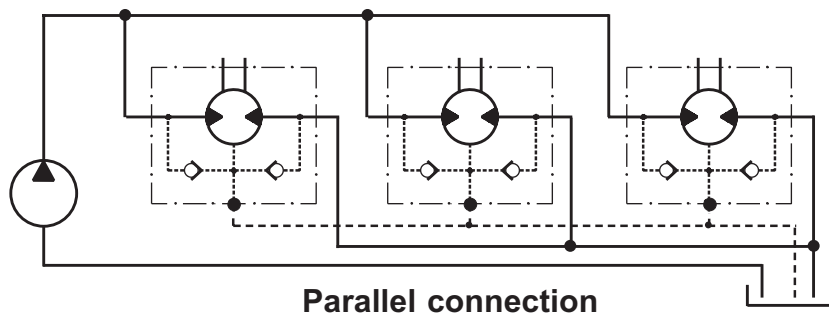
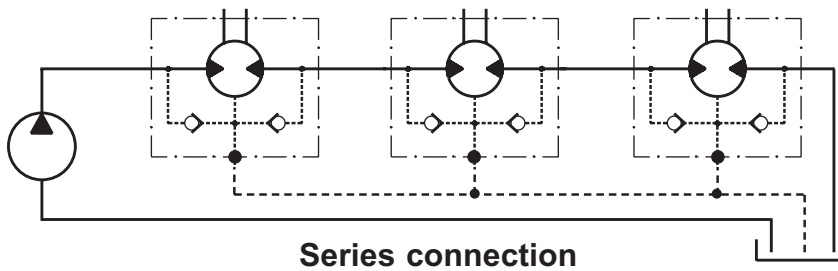


$$P_{rad} = \sqrt{G_w^2 + \left(\frac{M}{R}\right)^2}$$

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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