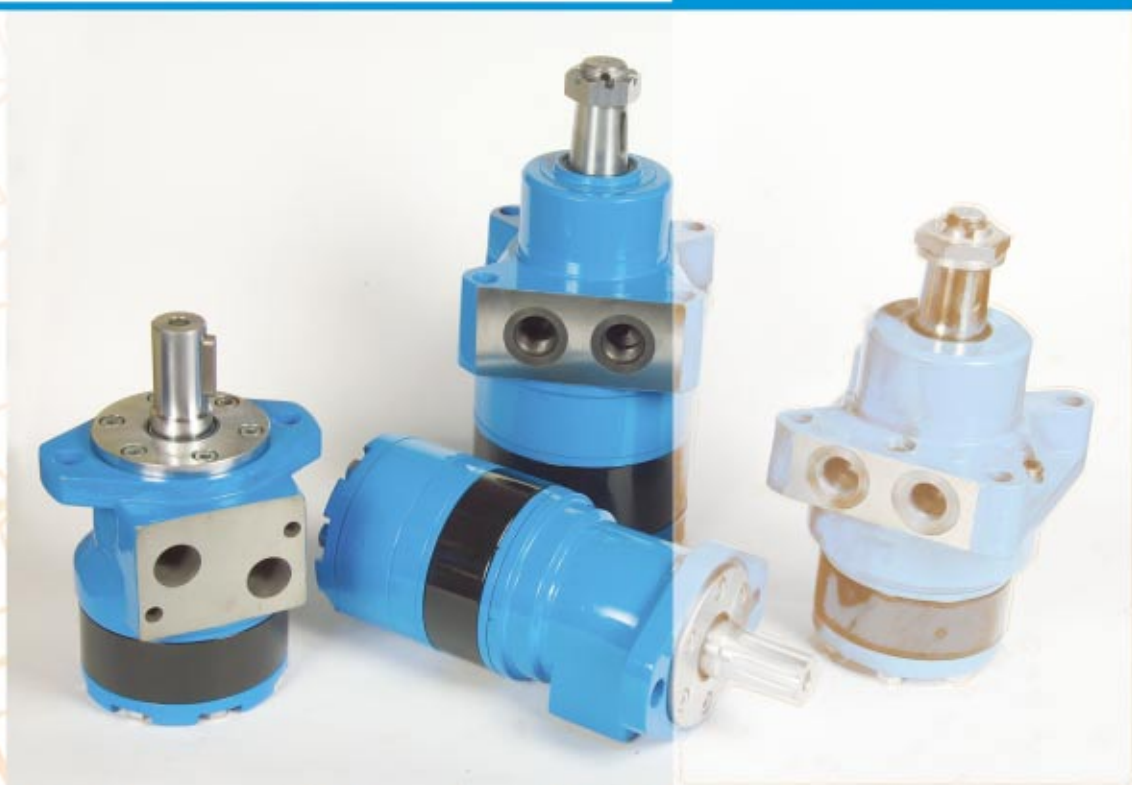


# HYDRAULIC MOTORS & MOTOR-BRAKE



**TYPE MLHPL, MLHRL**

**HP; HR; HW**

**MLHRW**

**MLHLW**

**TYPE B/HR;**

**B/MLHLW**

# SPECIAL HYDRAULIC MOTORS AND MOTOR-BRAKES

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# SPECIAL HYDRAULIC MOTORS AND MOTOR-BRAKES

The operating principle of the motors is based on an internal gear design, consisting of a stator and rotor through which the output torque and speed are transmitted. The distributor valve is driven synchronously by the rotor through a cardan shaft ensuring that each one of the chambers of the motor are filled and emptied precisely.

MLHPL, MLHRL, MLHRW and HW motors have a Spool Valve.

**SPOOL VALVE** - The distributor valve has been integrated with the output shaft. The valve has hydrodynamic bearings, and has infinite life when load ratings are not exceeded.

**GEAR SET** - There are two forms of stator, hence and of gear set:

MLHPL and HP have plain teeth. These types motors are suitable for long operating periods at moderate pressures- or short operating periods at high pressures.

MLHRL, HR, MLHRW, HW and MLHLW have 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. Roller Gear Sets are recommended for operation with thin oil and for applications having continually reversing loads.

**MOTOR-BRAKES** - This development represents a combination between hydraulic motors, type HR or MLHLW and parking brake with friction discs, which unit is built in the end side of the hydraulic motor.

---

**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.

---

**Low Leakage** LL Series hydraulic motors have been 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 drainage ports. Their main purpose is to operate as series-connected motors in hydraulic systems.  
For this version is permissible decreasing of the maximal torque with up to 5% (at middle speed) and up to 10% (at high speed) in comparison to the standard versions of motors.

---

**Low Speed Valve** LSV Series hydraulic motors have been designed to operate with normal pressure drop and to ensure smooth run at low speed (up to  $200 \text{ min}^{-1}$ ), as the best security for operation is guaranteed at frequency of rotation  $20 \div 50 \text{ min}^{-1}$ . They have an increased starting pressure drop and are not recommended for using at pressure less than 40 bar.

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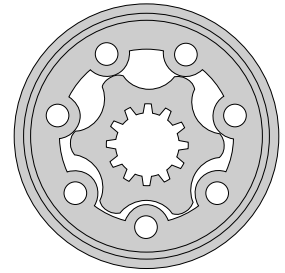
**Free Running** FR Series hydraulic motors have been designed to operate with high frequencies of rotation /over than  $300 \text{ min}^{-1}$ / and low pressure drop. These motors are produced with increased clearance at all friction parts.  
Additional advantages of "FR" version are prolonging of the life of the hydraulic motors at high frequencies of rotation, as well as the possibility to use them in systems with big variation of the loading.  
Volumetric efficiency can be affected.

# HYDRAULIC MOTORS MLHPL



## APPLICATION

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



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## OPTIONS

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

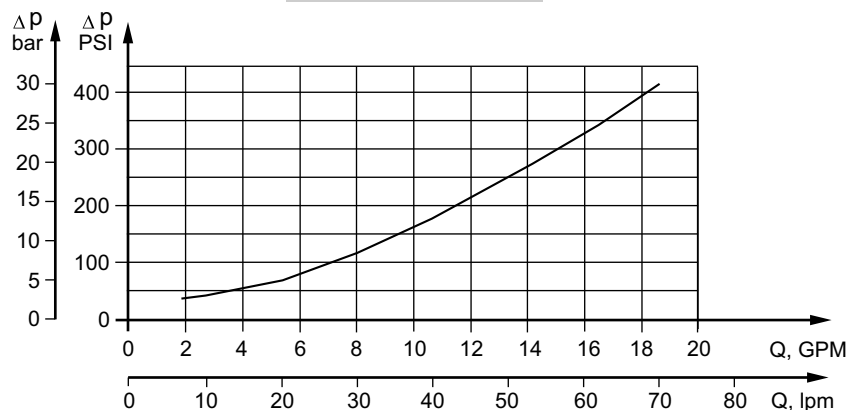
## GENERAL

<b>Displacement,</b>	in <sup>3</sup> /rev [cm <sup>3</sup> /rev.]	1.52÷38.5 [49,5÷396]
<b>Max. Speed,</b>	[RPM]	150÷1210
<b>Max. Torque,</b>	in-lb [daNm]	290÷4415 [3,3÷50]
<b>Max. Output,</b>	HP [kW]	4.4÷14.1 [9,9÷11,7]
<b>Max. Pressure Drop,</b>	PSI [bar]	800÷2030 [95÷140]
<b>Max. Oil Flow,</b>	GPM [lpm]	16 [60]
<b>Min. Speed,</b>	[RPM]	10
<b>Pressure fluid</b>		Mineral based- HLP(DIN 51524) or HM(ISO 6743/4)
<b>Temperature range,</b>	°F [°C]	-22÷194 [-30÷90]
<b>Optimal Viscosity range, SUS [mm<sup>2</sup>/s]</b>		98÷347 [20÷75]
<b>Filtration</b>		ISO code 20/16 (Min. recommended fluid filtration of 25 micron)

### Oil flow in drain line

Pressure drop PSI [bar]	Viscosity SUS [mm <sup>2</sup> /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	
<b>Displacement, in.<sup>3</sup>/rev. [cm.<sup>3</sup>/rev.]</b>	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]	
<b>Max. Speed, [RPM]</b>	Cont.	1210	755	605	485	378	303	242	190	150
	Int.*	1515	945	755	605	472	378	303	236	189
<b>Max. Torque in-lb [daNm]</b>	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]
<b>Max. Output HP [kW]</b>	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]
<b>Max. Pressure Drop PSI [bar]</b>	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]
<b>Max. Oil Flow GPM [lpm]</b>	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]
<b>Max. Inlet Pressure PSI [bar]</b>	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]
<b>Max. Return Pressure without Drain Line or Max. Pressure in Drain Line, PSI [bar]</b>	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]
<b>Max. Return Pressure with Drain Line PSI [bar]</b>	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]	3262 [225]
<b>Max. Starting Pressure with Unloaded Shaft, PSI [bar]</b>	145 [10]	145 [10]	145 [10]	131 [9]	116 [8]	100 [7]	87 [6]	73 [5]	73 [5]	
<b>Min. Starting Torque in-lb [daNm]</b>	681 [7,7]	1150 [13]	1487 [16,8]	1860 [21,0]	2478 [28,0]	2850 [32,2]	3665 [41,4]	3805 [43,0]	3900 [44,0]	
<b>Min. Speed***, [RPM]</b>	10	10	10	10	10	10	10	10	10	
<b>Weight, lb [kg]</b>	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]	

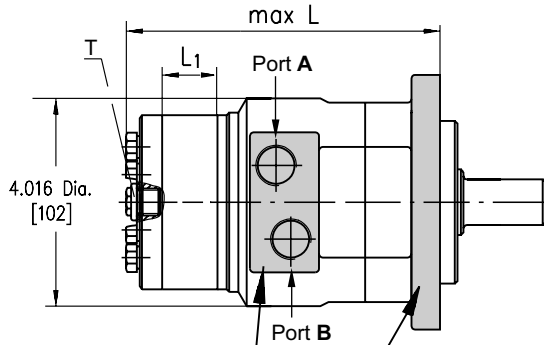
\* Intermittent operation: the permissible values may occur for max. 10% of every minute.

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

\*\*\* For speeds of 10 RPM or lower, consult factory or your regional manager.

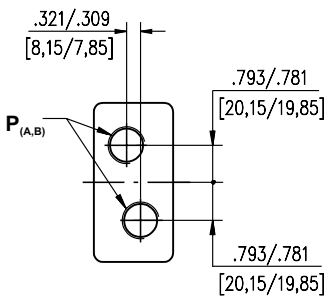
- Intermittent speed and intermittent pressure drop must not occur simultaneously.
- Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
- Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP(DIN51524) or HM (ISO 6743/4).  
If using synthetic fluids consult the factory for alternative seal materials.
- Recommended minimum oil viscosity 70 SUS [13 mm<sup>2</sup>/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**

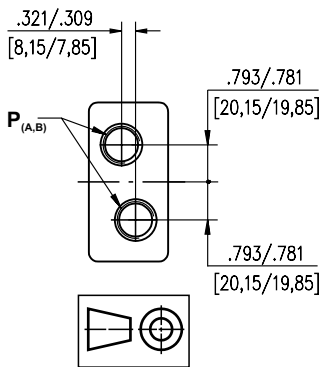


**Porting**

Side Ports  
Version **2** **5**

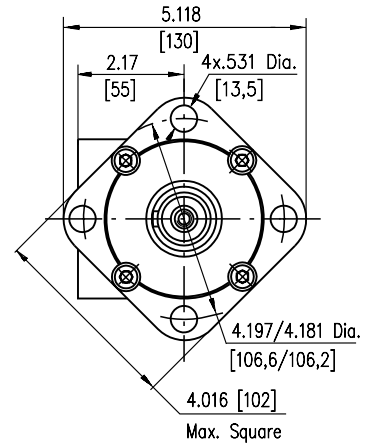
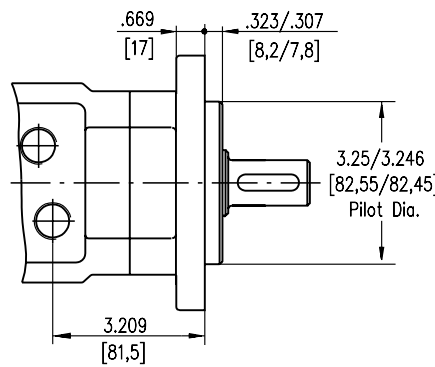


Version **4**

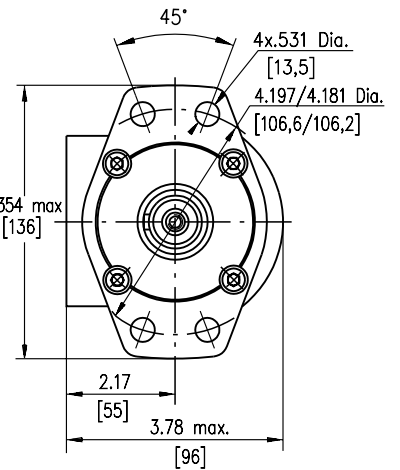
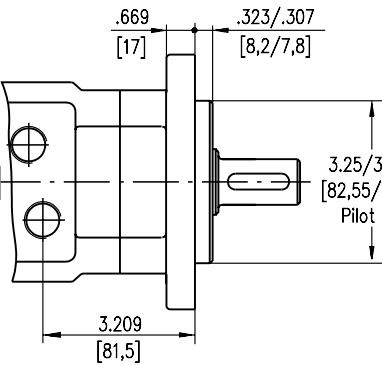


**Mounting**

Square Mount (4 Holes)



**F** Oval Mount (4 Holes)



Type	Lmax, in.[mm]	L <sub>1</sub> , in.[mm]
MLHPL 50	5.83 [148]	.26[6,67]
MLHPL 80	5.98 [152]	.42[10,67]
MLHPL 100	6.10 [155]	.52[13,33]
MLHPL 125	6.22 [158]	.66[16,67]
MLHPL 160	6.42 [163]	.84[21,33]
MLHPL 200	6.61 [168]	1.05[26,67]
MLHPL 250	6.89 [175]	1.31[33,33]
MLHPL 315	7.24 [184]	1.68[42,67]
MLHPL 400	7.68 [195]	2.10[53,33]

**Standard Rotation**

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

**Reverse Rotation**

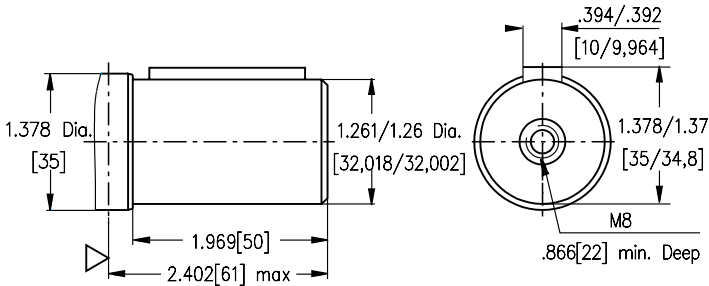
Viewed from Shaft End  
Port A Pressurized - CCW  
Port B Pressurized - CW

	Versions		
	<b>2</b>	<b>4</b>	<b>5</b>
<b>P<sub>(A,B)</sub></b>	2xG <sup>1</sup> / <sub>2</sub>	2x <sup>7</sup> / <sub>8</sub> -14 UNF	2x <sup>1</sup> / <sub>2</sub> -14 NPTF
<b>T</b>	G <sup>1</sup> / <sub>4</sub>	<sup>1</sup> / <sub>16</sub> -20 UNF	<sup>1</sup> / <sub>16</sub> -20 UNF

SHAFT EXTENSIONS FOR MLHPL AND MLHRL

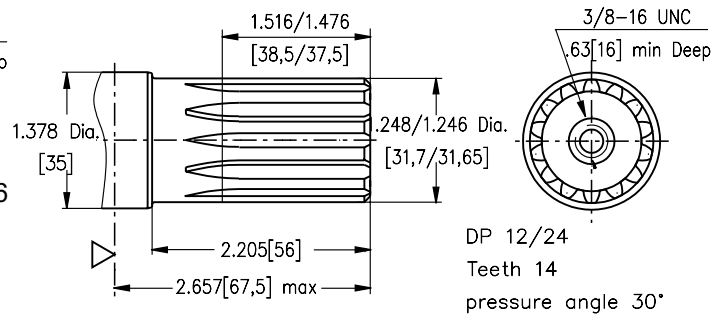
**B**

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



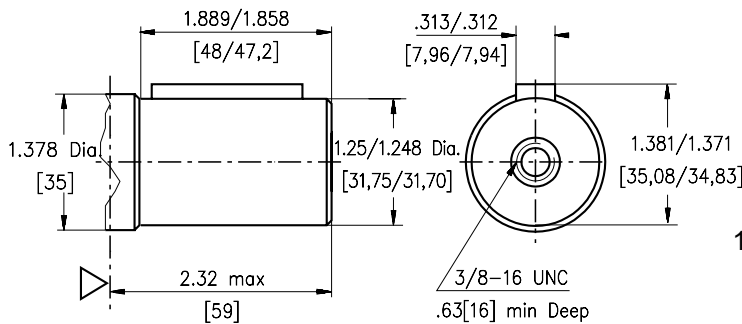
**L**

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



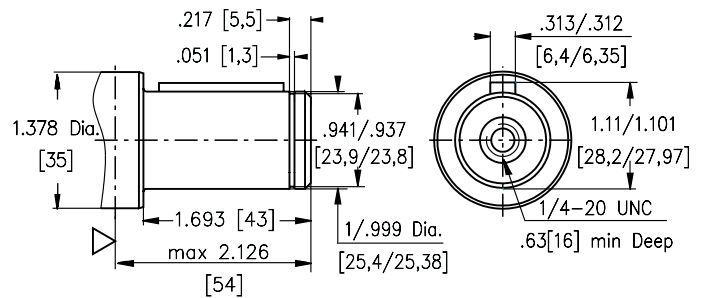
**K**

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



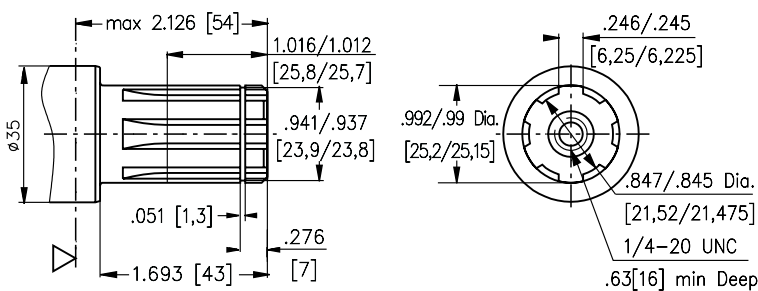
**C**

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



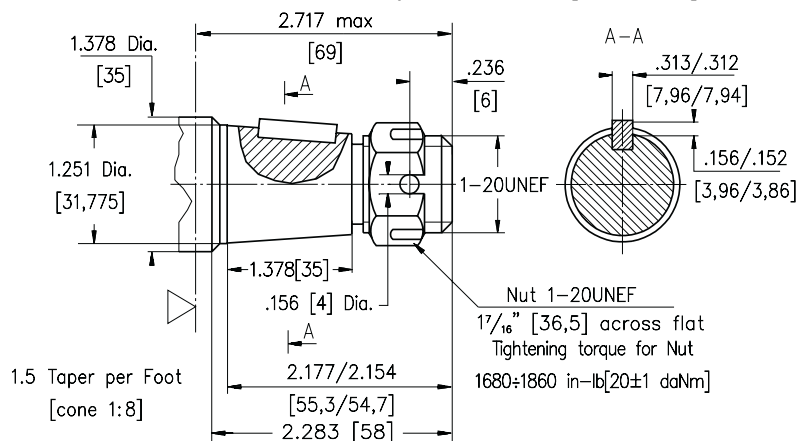
**G**

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



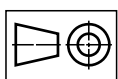
**R**

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

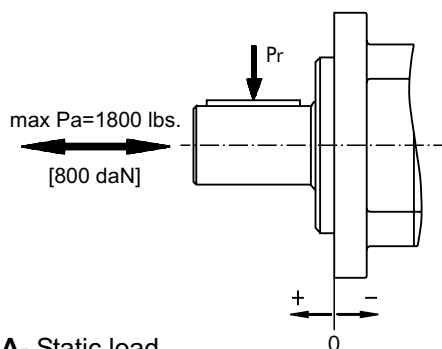


▽ - Motor Mounting Surface

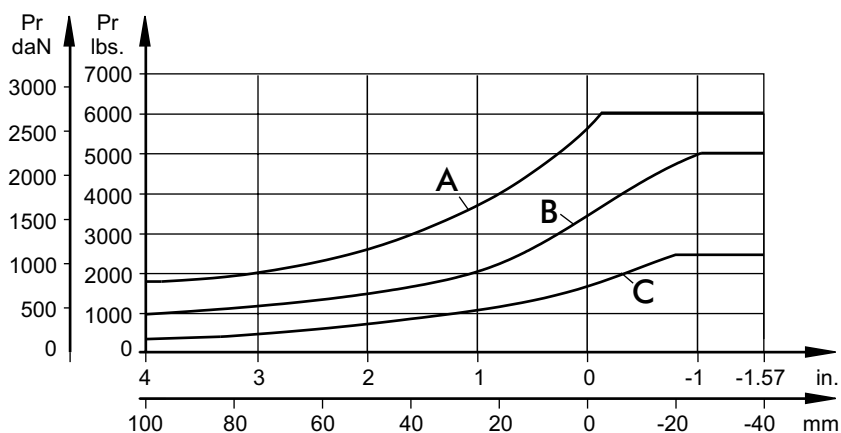
Requirement max. Torque must be not exceeded.



**PERMISSIBLE SHAFT LOADS FOR MLHPL AND MLHRL**



- A-** Static load
- B-** Pa=450 lbs. [200 daN]
- C-** Pa=1800 lbs. [800 daN]



**ORDER CODE**

	1	2	3	4	5	6
<b>MLHPL</b>						

**Pos.1 - Mounting Flange**

omit - Square mount, four holes

**F** - Oval mount, four holes

**Pos.2 - Displacement code\***

<b>50</b>	-	3.02	[49,5]	in. <sup>3</sup> /rev.	[cm. <sup>3</sup> /rev.]
<b>80</b>	-	4.83	[79,2]	in. <sup>3</sup> /rev.	[cm. <sup>3</sup> /rev.]
<b>100</b>	-	6.04	[99,0]	in. <sup>3</sup> /rev.	[cm. <sup>3</sup> /rev.]
<b>125</b>	-	7.55	[123,8]	in. <sup>3</sup> /rev.	[cm. <sup>3</sup> /rev.]
<b>160</b>	-	9.66	[158,4]	in. <sup>3</sup> /rev.	[cm. <sup>3</sup> /rev.]
<b>200</b>	-	12.1	[198,0]	in. <sup>3</sup> /rev.	[cm. <sup>3</sup> /rev.]
<b>250</b>	-	15.1	[247,5]	in. <sup>3</sup> /rev.	[cm. <sup>3</sup> /rev.]
<b>315</b>	-	19.3	[316,8]	in. <sup>3</sup> /rev.	[cm. <sup>3</sup> /rev.]
<b>400</b>	-	24.16	[396,0]	in. <sup>3</sup> /rev.	[cm. <sup>3</sup> /rev.]

**Pos.3 - Shaft Extensions\*\***

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

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

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

**Pos. 5 - Special Features [see page 55]**

**Pos. 6 - Design Series**

omit - Factory specified

NOTES: \* For the Performance Data please look at "M+S Hydraulic" Catalogue for MLHP motors, pages 18÷23.

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

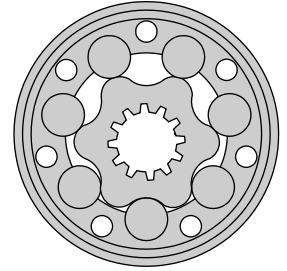
The hydraulic motors are mangano-phosphatized as standard.

# HYDRAULIC MOTORS MLHRL



## APPLICATION

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



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Shaft versions .....	7
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## OPTIONS

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

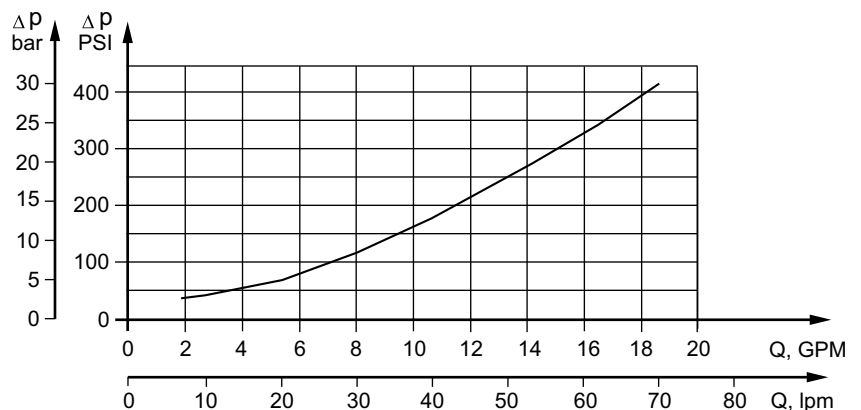
## GENERAL

<b>Displacement,</b>	in <sup>3</sup> /rev [cm <sup>3</sup> /rev.]	3.14÷24.4 [51,5÷397]
<b>Max. Speed,</b>	[RPM]	150÷775
<b>Max. Torque,</b>	in-lb [daNm]	900÷5400 [10,1÷61]
<b>Max. Output,</b>	HP [kW]	4.8÷17,4 [3,6÷13]
<b>Max. Pressure Drop,</b>	PSI [bar]	1670÷2540 [115÷175]
<b>Max. Oil Flow,</b>	GPM [lpm]	16 [60]
<b>Min. Speed,</b>	[RPM]	10
<b>Pressure fluid</b>		Mineral based- HLP(DIN 51524) or HM(ISO 6743/4)
<b>Temperature range,</b>	°F [°C]	-22÷194 [-30÷90]
<b>Optimal Viscosity range,</b>	SUS [mm <sup>2</sup> /s]	98÷347 [20÷75]
<b>Filtration</b>		ISO code 20/16 (Min. recommended fluid filtration of 25 micron)

### Oil flow in drain line

Pressure drop PSI [bar]	Viscosity SUS [mm <sup>2</sup> /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	
<b>Displacement, in.<sup>3</sup>/rev. [cm.<sup>3</sup>/rev.]</b>	3.14 [51,5]	4.90[80,3]	6.09[99,8]	7.67[125,7]	9.74 [159,6]	12.19[199,8]	1526[250,1]	19.26[315,7]	24.4[397]	
<b>Max. Speed, [RPM]</b>	Cont.	775	750	600	475	375	300	240	190	150
	Int.*	970	940	750	600	470	375	300	240	190
<b>Max. Torque in-lb [daNm]</b>	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]
<b>Max. Output HP [kW]</b>	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]
<b>Max. Pressure Drop PSI [bar]</b>	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]
<b>Max. Oil Flow GPM [lpm]</b>	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]
<b>Max. Inlet Pressure PSI [bar]</b>	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]
<b>Max. Return Pressure without Drain Line or Max. Pressure in Drain Line, PSI [bar]</b>	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]	
<b>Max. Return Pressure with Drain Line PSI [bar]</b>	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]
<b>Max. Starting Pressure with Unloaded Shaft, PSI [bar]</b>	145 [10]	145 [10]	145 [10]	130 [9]	102 [7]	73 [5]	58 [4]	44 [3]	44 [3]	
<b>Min. Starting Torque in-lb [daNm]</b>	710 [8]	1330[15]	1770[20]	2215[25]	2835[32]	3275[37]	4000[45]	4000[45]	4340[49]	
<b>Min. Speed***, [RPM]</b>	10	10	10	10	10	10	10	10	10	
<b>Weight, lb [kg]</b>	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]	

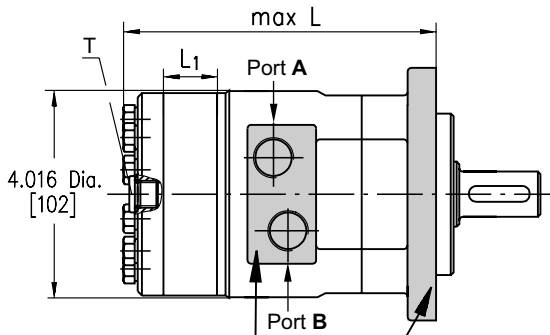
\* Intermittent operation: the permissible values may occur for max. 10% of every minute.

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

\*\*\* For speeds of 10 RPM or lower, consult factory or your regional manager.

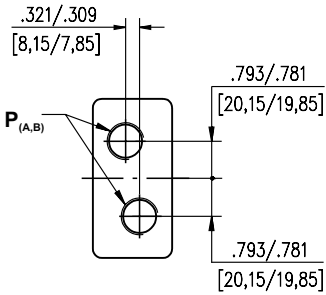
- Intermittent speed and intermittent pressure drop must not occur simultaneously.
- Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
- Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP(DIN51524) or HM (ISO 6743/4).  
If using synthetic fluids consult the factory for alternative seal materials.
- Recommended minimum oil viscosity 70 SUS [13 mm<sup>2</sup>/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**

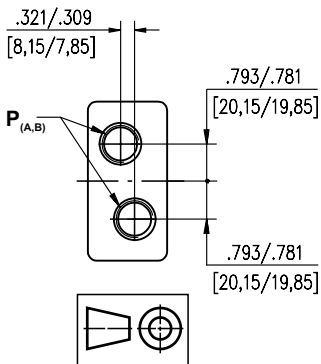


**Porting**

Side Ports  
Version **2** **5**

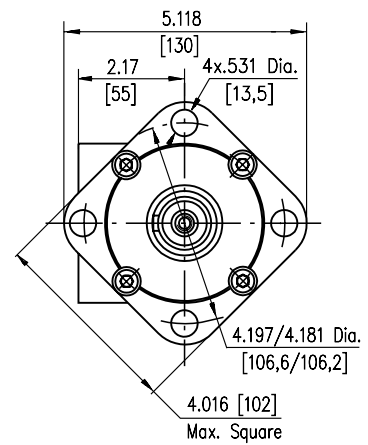
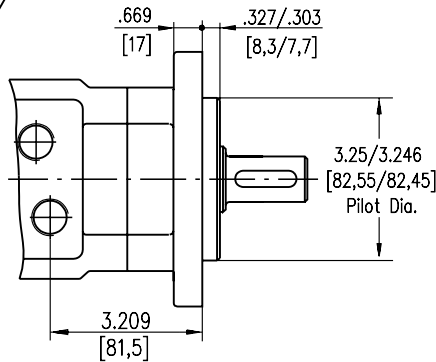


Version **4**

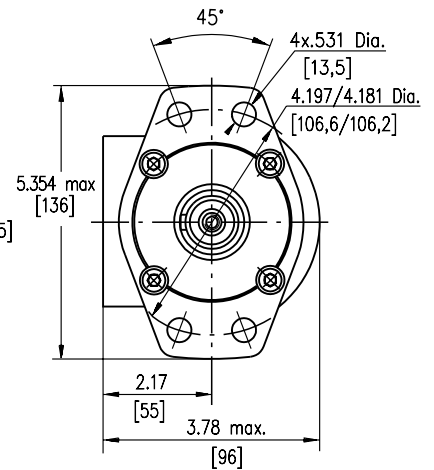
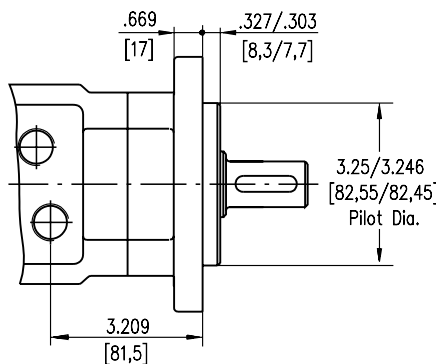


**Mounting**

Square Mount (4 Holes)



**F** Oval Mount (4 Holes)



Type	L max,in. [mm]	L <sub>1</sub> ,in.[mm]
MLHRL 50	5.98[152]	.35 [9,0]
MLHRL 80	6.18[157]	.55[14,0]
MLHRL 100	6.30[160]	.69[17,4]
MLHRL 125	6.50[165]	.86[21,8]
MLHRL 160	6.73[171]	1.09[27,8]
MLHRL 200	7.01[178]	1.37[34,8]
MLHRL 250	7.36[187]	1.71[43,5]
MLHRL 315	7.80[198]	2.16[54,8]
MLHRL 400	8.35[212]	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		
	<b>2</b>	<b>4</b>	<b>5</b>
<b>P</b> <sub>(A,B)</sub>	2xG $\frac{1}{2}$	2x $\frac{7}{8}$ -14 UNF	2x $\frac{1}{2}$ -14 NPTF
<b>T</b>	G $\frac{1}{4}$	$\frac{1}{16}$ -20 UNF	$\frac{1}{16}$ -20 UNF

## ORDER CODE

	1	2	3	4	5	6
M L H R L						

### Pos.1 - Mounting Flange

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

### Pos.2 - Displacement code\*

<b>50</b>	- 3.14 [51,5] in. <sup>3</sup> /rev. [cm. <sup>3</sup> /rev.]
<b>80</b>	- 4.90 [80,3] in. <sup>3</sup> /rev. [cm. <sup>3</sup> /rev.]
<b>100</b>	- 6.09 [99,8] in. <sup>3</sup> /rev. [cm. <sup>3</sup> /rev.]
<b>125</b>	- 7.67 [125,7] in. <sup>3</sup> /rev. [cm. <sup>3</sup> /rev.]
<b>160</b>	- 9.74 [159,6] in. <sup>3</sup> /rev. [cm. <sup>3</sup> /rev.]
<b>200</b>	- 12.19 [199,8] in. <sup>3</sup> /rev. [cm. <sup>3</sup> /rev.]
<b>250</b>	- 15.26 [250,1] in. <sup>3</sup> /rev. [cm. <sup>3</sup> /rev.]
<b>315</b>	- 19.26 [315,7] in. <sup>3</sup> /rev. [cm. <sup>3</sup> /rev.]
<b>400</b>	- 24.4 [397,0] in. <sup>3</sup> /rev. [cm. <sup>3</sup> /rev.]

### Pos.3 - Shaft Extensions\*\* [see page 7]

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

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

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

### Pos. 5 - Special Features [see page 55]

### Pos. 6 - Design Series

- omit - Factory specified

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

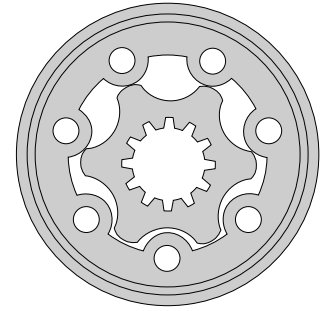
The hydraulic motors are mangano-phosphatized as standard.

# HYDRAULIC MOTORS HP



## APPLICATION

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



## CONTENTS

Specification data .....	14÷15
Dimensions and mounting .....	16
Shaft versions .....	17
Permissible shaft seal pressure.....	18
Permissible shaft loads.....	18
Order code .....	19

## OPTIONS

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

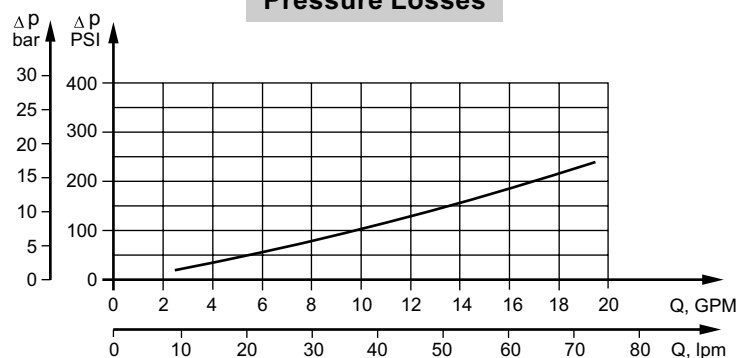
## GENERAL

<b>Displacement,</b>	in <sup>3</sup> /rev [cm <sup>3</sup> /rev.]	1.52÷24.16 [25÷396]
<b>Max. Speed,</b>	[RPM]	150÷1600
<b>Max. Torque,</b>	in-lb [daNm]	290÷3060 [3,3÷34,6]
<b>Max. Output,</b>	HP [kW]	5÷11.5 [3,7÷8,5]
<b>Max. Pressure Drop,</b>	PSI [bar]	945÷1815 [65÷125]
<b>Max. Oil Flow,</b>	GPM [lpm]	10.5÷16 [40÷60,6]
<b>Min. Speed,</b>	[RPM]	10
<b>Pressure fluid</b>		Mineral based- HLP(DIN 51524) or HM(ISO 6743/4)
<b>Temperature range,</b>	°F [°C]	-22÷194 [-30÷90]
<b>Optimal Viscosity range, SUS [mm<sup>2</sup>/s]</b>		98÷347 [20÷75]
<b>Filtration</b>		ISO code 20/16 (Min. recommended fluid filtration of 25 micron)

### Oil flow in drain line

Pressure drop PSI [bar]	Viscosity SUS [mm <sup>2</sup> /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
<b>Displacement, in.<sup>3</sup>/rev. [cm.<sup>3</sup>/rev.]</b>		1.52 [25]	1.95 [32]	2.44 [40]	3.02 [49,5]	4.83 [79,2]	6.04 [99,0]
<b>Max. Speed, [RPM]</b>	Cont.	1600	1560	1515	1210	755	605
	Int.*	1815	1720	1760	1515	945	755
<b>Max. Torque in-lb [daNm]</b>	Cont.	290 [3,3]	380 [4,3]	550 [6,2]	725 [8,2]	1210 [13,7]	1500 [17,0]
	Int.*	415 [4,7]	540 [6,1]	730 [8,2]	1050 [11,9]	1725 [19,5]	2100 [23,7]
<b>Max. Output HP [kW]</b>	Cont.	6.0 [4,5]	7.8 [5,8]	11.4 [8,5]	11.7 [8,7]	11.7 [8,7]	11.9 [8,9]
	Int.*	8.2 [6,1]	10.5 [7,8]	15.5 [11,6]	18.8 [14]	19.7 [14,7]	19.4 [14,5]
<b>Max. Pressure Drop PSI [bar]</b>	Cont.	1450 [100]	1450 [100]	1750 [120]	1815 [125]	1815 [125]	1815 [125]
	Int.*	2030 [140]	2030 [140]	2250 [155]	2540 [175]	2540 [175]	2540 [175]
<b>Max. Oil Flow GPM [lpm]</b>	Cont.	10.5 [40]	13.2 [50]	16 [60,6]	16 [60,6]	16 [60,6]	16 [60,6]
	Int.*	12 [45,4]	14.5 [55]	18.5 [70]	20 [75,7]	20 [75,7]	20 [75,7]
<b>Max. Inlet Pressure PSI [bar]</b>	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**	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]
<b>Max. Return Pressure with Drain Line PSI [bar]</b>	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**	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]
<b>Max. Starting Pressure with Unloaded Shaft, PSI [bar]</b>		145 [10]	145 [10]	145 [10]	145 [10]	145 [10]	145 [10]
<b>Min. Starting Torque in-lb [daNm]</b>	At max.press. drop Cont.	265 [3,0]	355 [4,0]	480 [5,4]	610 [6,9]	1040 [11,7]	1310 [14,8]
	At max.press. drop Int.*	370 [4,2]	500 [5,6]	600 [6,8]	885 [10]	1490 [16,8]	1860 [21]
<b>Min. Speed***, [RPM]</b>		20	15	10	10	10	10
<b>Weight, lb [kg]</b>	HR	11.9 [5,4]	11.9 [5,4]	12.1 [5,5]	12.3 [5,6]	12.6 [5,7]	13.0 [5,9]
	HRQ	10.6 [4,8]	10.6 [4,8]	10.8 [4,9]	11.00 [5,0]	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 of 10 RPM or lower, 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 mm<sup>2</sup>/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
<b>Displacement, in.<sup>3</sup>/rev. [cm.<sup>3</sup>/rev.]</b>		7.55 [123,8]	9.66 [158,4]	12.1 [198]	15.1 [247,5]	19.3 [316,8]	24.16 [396]
<b>Max. Speed, [RPM]</b>	Cont.	486	378	303	242	190	150
	Int.*	605	472	378	303	236	189
<b>Max. Torque in-lb [daNm]</b>	Cont.	1885 [21,3]	2335 [26,4]	2655 [30,0]	2920 [33,0]	3060 [34,6]	2965 [33,5]
	Int.*	2640 [29,8]	2920 [33,0]	3090 [34,9]	3585 [40,5]	3560 [40,2]	3630 [41,0]
<b>Max. Output HP [kW]</b>	Cont.	11.8 [8,8]	11.4 [8,5]	10.6 [7,9]	9 [6,7]	7 [5,2]	5.5 [4,1]
	Int.*	17.4 [13]	16.1 [12]	16.1 [12]	13 [9,7]	9.5 [7,1]	8 [6]
<b>Max. Pressure Drop PSI [bar]</b>	Cont.	1815 [125]	1740 [120]	1670 [115]	1450 [100]	1235 [85]	945 [65]
	Int.*	2540 [175]	2250 [155]	2175 [150]	1815 [125]	1450 [100]	1160 [80]
<b>Max. Oil Flow GPM [lpm]</b>	Cont.	16 [60,6]	16 [60,6]	16 [60,6]	16 [60,6]	16 [60,6]	16 [60,6]
	Int.*	20 [75,7]	20 [75,7]	20 [75,7]	20 [75,7]	20 [75,7]	20 [75,7]
<b>Max. Inlet Pressure PSI [bar]</b>	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**	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]
<b>Max. Return Pressure with Drain Line PSI [bar]</b>	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**	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]
<b>Max. Starting Pressure with Unloaded Shaft, PSI [bar]</b>		145 [10]	145 [10]	100 [7]	100 [7]	100 [7]	100 [7]
<b>Min. Starting Torque in-lb [daNm]</b>	At max.press. drop Cont.	1630 [18,4]	2130 [24,1]	2440 [27,5]	2700 [30,5]	2870 [32,4]	2840 [32]
	At max.press. drop Int.*	2360 [26,6]	2780 [31,4]	3230 [36,5]	3430 [38,7]	3920 [44,2]	3740 [42,2]
<b>Min. Speed***, [RPM]</b>		10	10	10	10	10	10
<b>Weight, lb [kg]</b>	HR	13.23 [6,0]	13.67 [6,2]	14.11 [6,4]	14.56 [6,6]	15.22 [6,9]	16.32 [7,4]
	HRQ	11.91 [5,4]	12.35 [5,6]	12.79 [5,8]	13.23 [6,0]	13.89 [6,3]	15.00 [6,8]

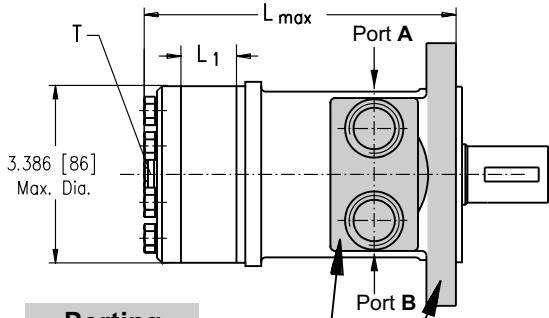
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\*\*\* For speeds of 10 RPM or lower, consult factory or your regional manager.

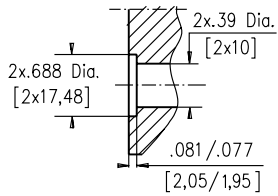
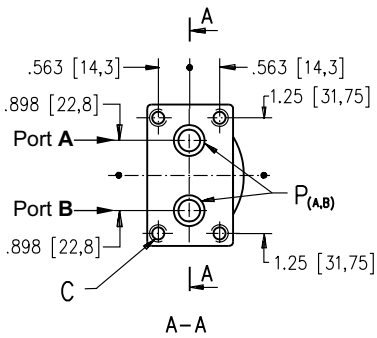
1. Intermittent speed and intermittent pressure drop must not occur simultaneously.
2. Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
3. Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP(DIN51524) or HM (ISO 6743/4).  
If using synthetic fluids consult the factory for alternative seal materials.
4. Recommended minimum oil viscosity 70 SUS [13 mm<sup>2</sup>/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**

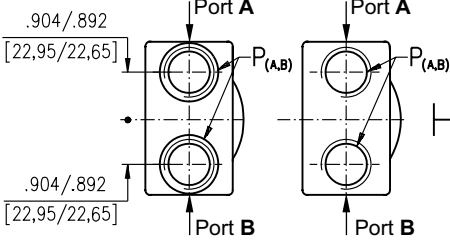


**Porting**

Side Ports  
Version **1** **3**

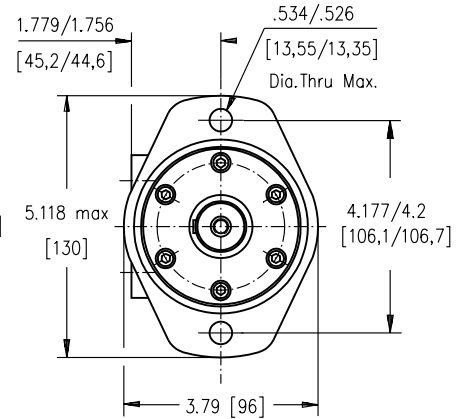
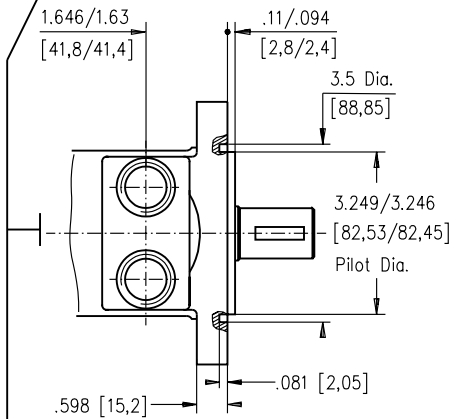


Version **4** Version **5**

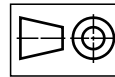
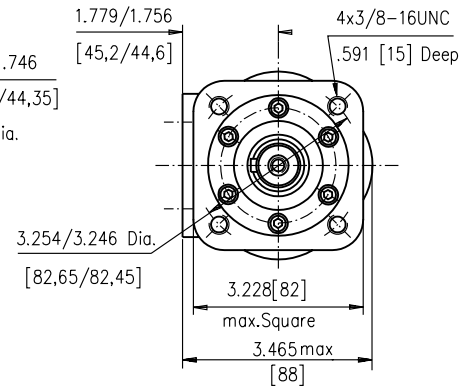
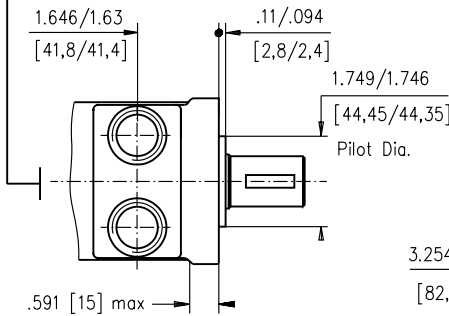


**Mounting**

SAE A Flange



**Q Square Flange**



**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**

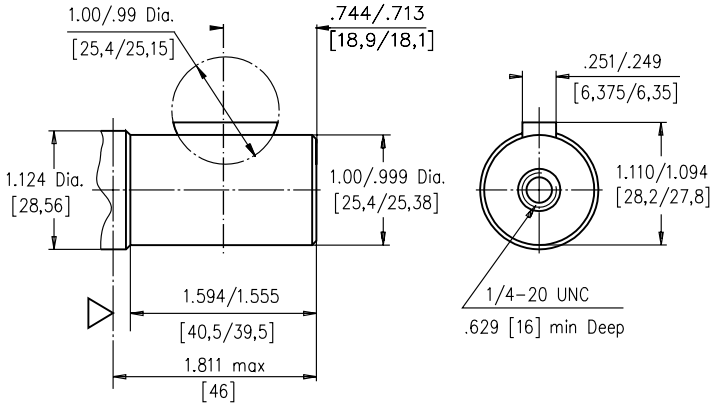
Type	L <sub>max</sub> , in. [mm]	L <sub>1</sub> , in. [mm]
HP(Q) 25	5.32 [135,0]	.21 [5,20]
HP(Q) 32	5.37 [136,5]	.25 [6,30]
HP(Q) 40	5.43 [138,0]	.29 [7,40]
HP(Q) 50	5.39 [137,0]	.26 [6,67]
HP(Q) 80	5.55 [141,0]	.42 [10,67]
HP(Q) 100	5.70 [144,0]	.52 [13,33]
HP(Q) 125	5.79 [147,0]	.66 [16,67]
HP(Q) 160	5.98 [152,0]	.84 [21,33]
HP(Q) 200	6.18 [157,0]	1.05 [26,67]
HP(Q) 250	6.46 [164,0]	1.31 [33,33]
HP(Q) 315	6.81 [173,0]	1.68 [42,67]
HP(Q) 400	7.24 [184,0]	2.10 [53,33]

	Versions			
	1	3	4	5
<b>C</b>	4x 3/8-18UNC	4x M8	-	-
<b>P<sub>(A,B)</sub></b>	2x.39 Dia. [2x10]	2x.39 Dia. [2x10]	2x 7/8-14UNF	2x 1/2-14NPTF
<b>T</b>	1/16 -20UNF	1/16 -20UNF	1/16 -20UNF	1/16 -20UNF

**SHAFT EXTENSIONS FOR HP AND HR MOTORS**

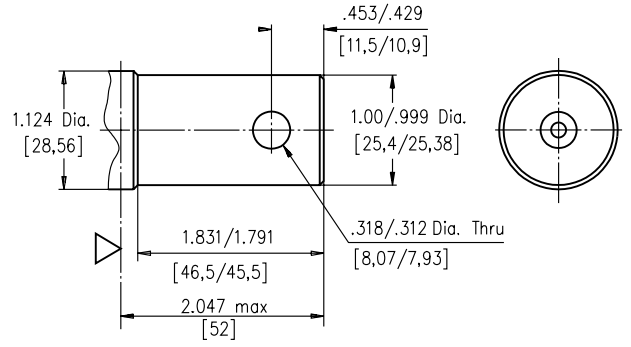
**C**

1" [25,4] straight, Woodruff key 1/4"x1" SAE J502  
Max. Torque 3900 in-lb [44 daNm]



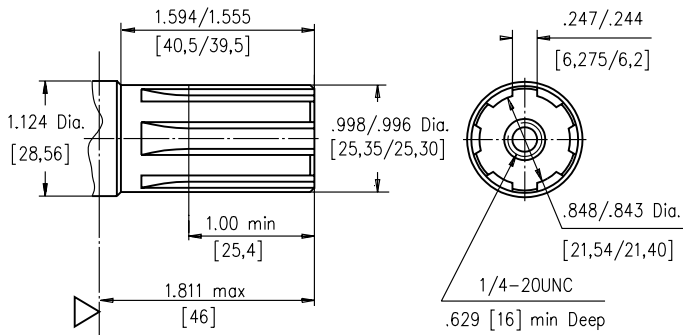
**H**

1" [25,4] straight, w/ .315 [8] Crosshole  
Max. Torque 3900 in-lb [44 daNm]



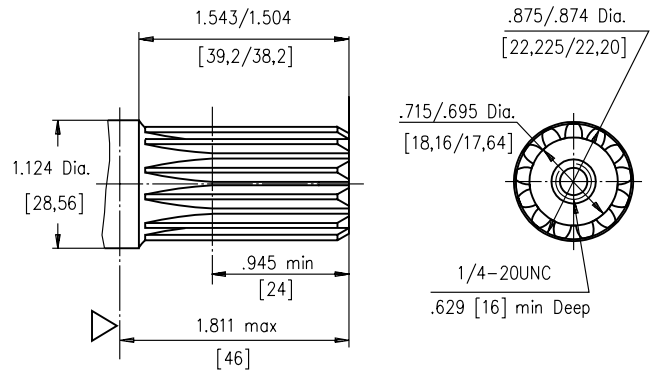
**G**

1" [25,4], SAE 6B Splined  
Max. Torque 3900 in-lb [44 daNm]



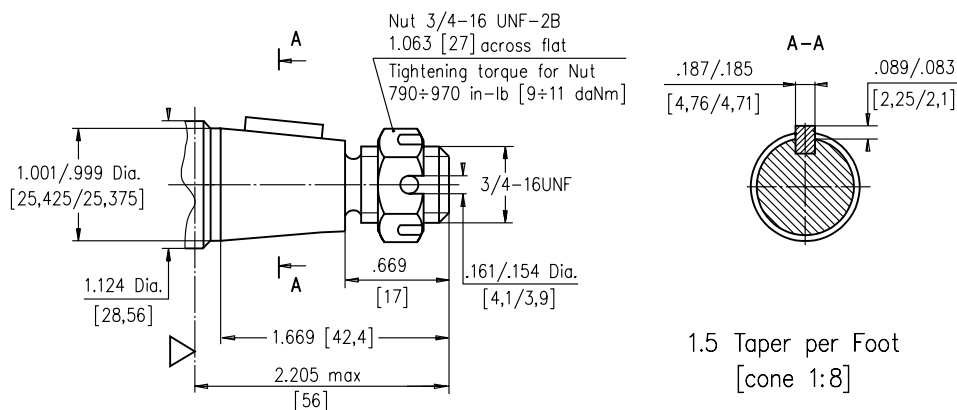
**S**

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



**T**

1" [25,4], SAE J501 Tapered  
Parallel key 3/16"x 3/16"x 3/4"  
Max. Torque 3900 in-lb [44 daNm]



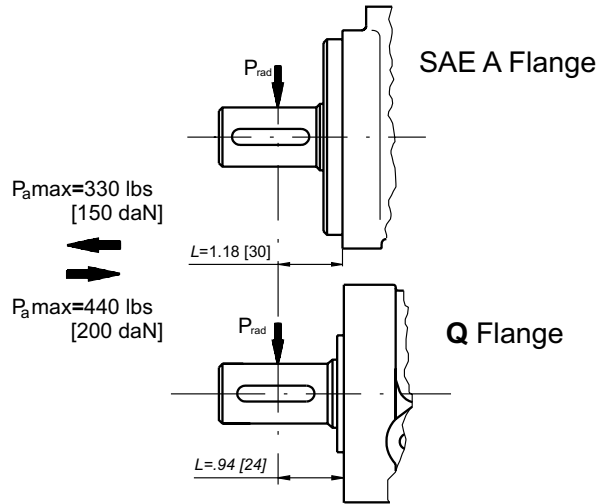
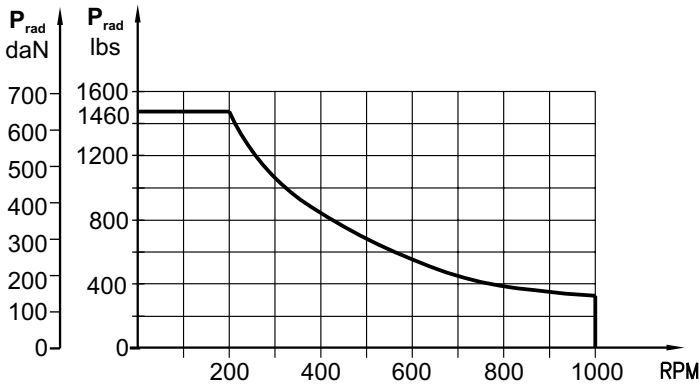
▽ - Motor Mounting Surface  
Requirement max. Torque must be not exceeded.

**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.

$$\text{Radial Shaft Load: } P_{rad} = \frac{1460}{\text{RPM}} \times \frac{976}{3.82+L}, \text{ lbs}^*$$

- \* 1.  $L$  - in inch
- 2. RPM < 200: max Prad=1460 lbs [650 daN]
- 3. RPM > 200:  $L < 2.2$  in.

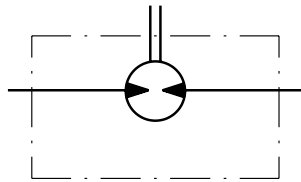


**MAX. PERMISSIBLE SHAFT SEAL PRESSURE FOR HP AND HR MOTORS**

**HP...U and HR...U1 motors with high pressure seal and without drain connection:**

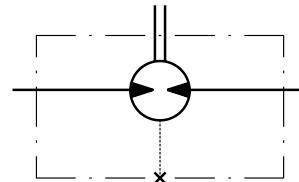
The shaft seal pressure equals the average of input pressure and return pressure.

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

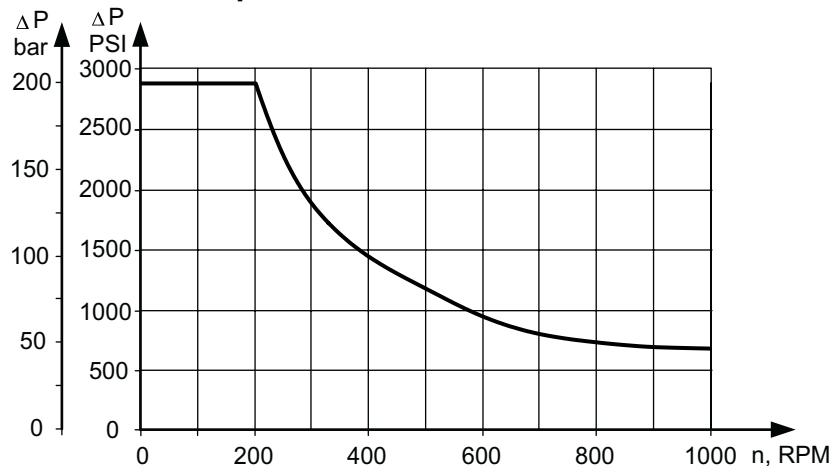


**HP...U and HR...U motors with high pressure seal and drain connection:**

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



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



## ORDER CODE

	1	2	3	4	5	6	7	8
<b>HP</b>					<b>U</b>			

**Pos.1 - Mounting Flange**

omit - SAE A, two holes

**Q** - Square, four bolts

**Pos.2 - Displacement code\***

**25** - 1.52 [ 25,0] in.<sup>3</sup>/rev. [cm.<sup>3</sup>/rev.]

**32** - 1.95 [ 32,0] in.<sup>3</sup>/rev. [cm.<sup>3</sup>/rev.]

**40** - 2.44 [ 40,0] in.<sup>3</sup>/rev. [cm.<sup>3</sup>/rev.]

**50** - 3.02 [ 49,5] in.<sup>3</sup>/rev. [cm.<sup>3</sup>/rev.]

**80** - 4.83 [ 79,2] in.<sup>3</sup>/rev. [cm.<sup>3</sup>/rev.]

**100** - 6.04 [ 99,0] in.<sup>3</sup>/rev. [cm.<sup>3</sup>/rev.]

**125** - 9.66 [123,8] in.<sup>3</sup>/rev. [cm.<sup>3</sup>/rev.]

**160** - 9.74 [158,4] in.<sup>3</sup>/rev. [cm.<sup>3</sup>/rev.]

**200** - 12.10 [198,0] in.<sup>3</sup>/rev. [cm.<sup>3</sup>/rev.]

**250** - 15.10 [247,5] in.<sup>3</sup>/rev. [cm.<sup>3</sup>/rev.]

**315** - 19.30 [316,8] in.<sup>3</sup>/rev. [cm.<sup>3</sup>/rev.]

**400** - 24.16 [396,0] in.<sup>3</sup>/rev. [cm.<sup>3</sup>/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** - <sup>7</sup>/<sub>8</sub>" [22,2] 13T Splined

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

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

**1** - side ports, Manifold [5/16-18 UNC Mounting Threads], 7/16-20 UNF

**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 18]

**U** - High pressure shaft seal (without check valves)

**Pos. 6 - Drain Port**

omit - with drain port

**1** - without drain port

**Pos. 7 - Special Features** [see page 55]

**Pos. 8 - Design Series**

omit - Factory specified

Notes : \* [For the Performance Data please look at "M+S Hydraulic" Catalogue for MLHP motors, pages 18÷24.](#)

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

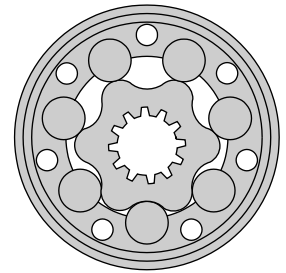
The hydraulic motors are mangano-phosphatized as standard.

# HYDRAULIC MOTORS HR



## APPLICATION

- » Conveyors
- » Feeding mechanism of robots and manipulators
- » Metal working machines
- » Textile machines
- » Machines for agriculture
- » Food industries
- » Wood working and sawmill machinery etc.



## CONTENTS

Specification data .....	21
Dimensions and mounting .....	22
Shaft versions .....	17
Permissible shaft seal pressure.....	18
Permissible shaft loads.....	18
Order code .....	23

## OPTIONS

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

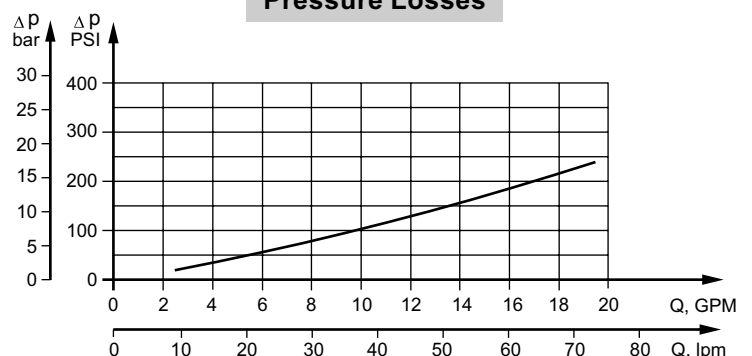
## GENERAL

<b>Displacement,</b>	in <sup>3</sup> /rev [cm <sup>3</sup> /rev.]	3.14÷24.4 [51,5÷397]
<b>Max. Speed,</b>	[RPM]	185÷1000
<b>Max. Torque,</b>	in-lb [daNm]	900÷4250 [10,1÷48]
<b>Max. Output,</b>	HP [kW]	6÷11 [4,5÷8,2]
<b>Max. Pressure Drop,</b>	PSI [bar]	1305÷2030 [90÷140]
<b>Max. Oil Flow,</b>	GPM [lpm]	16 [60,6]
<b>Min. Speed,</b>	[RPM]	10
<b>Pressure fluid</b>		Mineral based- HLP(DIN 51524) or HM(ISO 6743/4)
<b>Temperature range,</b>	°F [°C]	-22÷194 [-30÷90]
<b>Optimal Viscosity range, SUS [mm<sup>2</sup>/s]</b>		98÷347 [20÷75]
<b>Filtration</b>		ISO code 20/16 (Min. recommended fluid filtration of 25 micron)

### Oil flow in drain line

Pressure drop PSI [bar]	Viscosity SUS [mm <sup>2</sup> /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
<b>Displacement, in.<sup>3</sup>/rev. [cm.<sup>3</sup>/rev.]</b>		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]	24.23 [397]
<b>Max. Speed, [RPM]</b>	Cont.	734	750	600	475	375	300	240	190	150
	Int.*	1029	940	750	600	470	375	300	240	191
<b>Max. Torque in-lb [daNm]</b>	Cont.	900 [10,1]	1390 [15,7]	1750 [19,8]	2210 [25,0]	2830 [32,0]	3045 [34,4]	3540 [40,0]	3850 [43,5]	4250 [48,0]
	Int.*	1150 [13]	1725 [19,5]	2125 [24,0]	2655 [30,0]	3450 [39,0]	3450 [39,0]	4160 [47,0]	4515 [51,0]	4870 [55,0]
<b>Max. Output HP [kW]</b>	Cont.	9.3 [6,9]	14 [10,5]	14 [10,5]	14 [10,5]	13.7 [10,2]	12.6 [9,4]	10.7 [8]	8.7 [6,5]	8.2 [6,1]
	Int.*	13.4 [10]	20.1 [15]	20.1 [15]	20.1 [15]	18.8 [14]	18.7 [14]	15.4 [11,5]	12.1 [9]	11 [8,2]
<b>Max. Pressure Drop PSI [bar]</b>	Cont.	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]	1810 [125]	1595 [110]	1450 [100]	1305 [90]
	Int.*	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2250 [155]	2030 [140]	1810 [125]	1520 [105]
<b>Max. Oil Flow GPM [lpm]</b>	Cont.	10 [37,8]	16 [60,6]	16 [60,6]	16 [60,6]	16 [60,6]	16 [60,6]	16 [60,6]	16 [60,6]	16 [60,6]
	Int.*	14 [53]	20 [75,7]	20 [75,7]	20 [75,7]	20 [75,7]	20 [75,7]	20 [75,7]	20 [75,7]	20 [75,7]
<b>Max. Inlet Pressure PSI [bar]</b>	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**	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]
<b>Max. Return Pressure with Drain Line PSI [bar]</b>	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**	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]
<b>Max. Starting Pressure with Unloaded Shaft, PSI [bar]</b>		145 [10]	145 [10]	145 [10]	130 [9]	102 [7]	73 [5]	58 [4]	44 [3]	44 [3]
<b>Min. Starting Torque in-lb [daNm]</b>	At max.press.									
	drop Cont.	710 [8]	1060 [12]	1420 [16]	1770 [20]	2270 [25,6]	2620 [29,5]	2510 [28,3]	2840 [32]	3170 [35,8]
	At max.press. drop Int.*	885 [10]	1310 [14,8]	1780 [20,1]	1930 [21,8]	2860 [32,3]	3150 [35,6]	3400 [38,4]	4580 [51,7]	4040 [45,6]
<b>Min. Speed***, [RPM]</b>		10	10	10	10	10	10	10	10	10
<b>Weight, lb [kg]</b>	HR	14.56 [6,6]	14.77 [6,7]	15.44 [7,0]	15.66 [7,1]	16.10 [7,3]	17.20 [7,8]	18.10 [8,2]	19.62 [8,9]	21.17 [9,6]
	HRQ	13.23 [6,0]	13.45 [6,1]	14.11 [6,4]	14.33 [6,5]	14.77 [6,7]	15.88 [7,2]	16.76 [7,6]	18.30 [8,3]	19.85 [9,0]

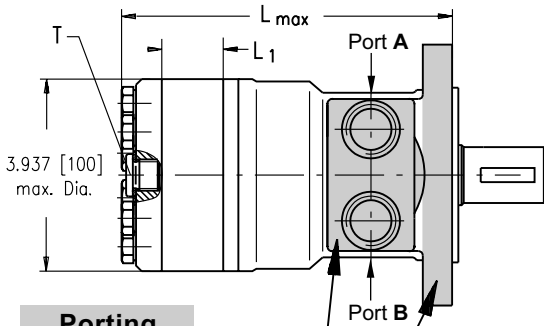
\* Intermittent operation: the permissible values may occur for max. 10% of every minute.

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

\*\*\* For speeds of 10 RPM or lower, consult factory or your regional manager.

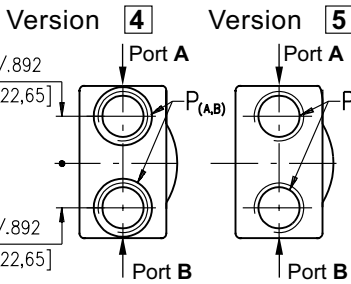
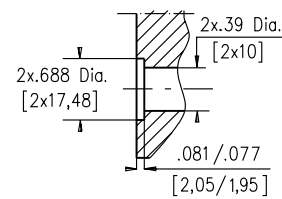
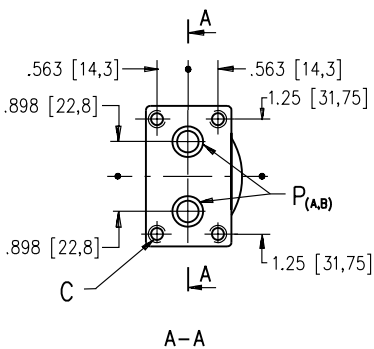
1. Intermittent speed and intermittent pressure drop must not occur simultaneously.
2. Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
3. Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP(DIN51524) or HM (ISO 6743/4).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

**DIMENSIONS AND MOUNTING DATA FOR HR**



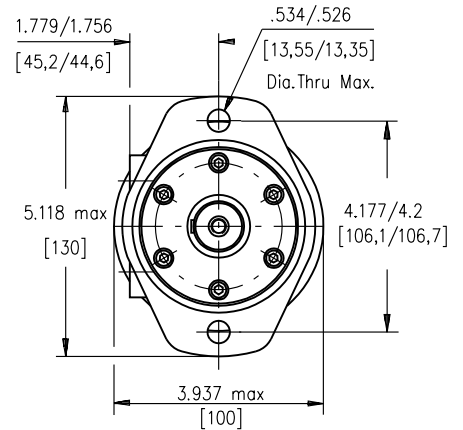
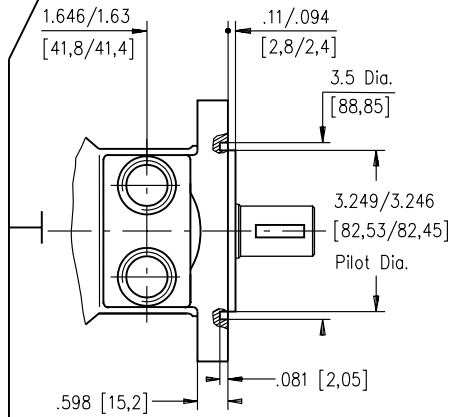
**Porting**

Side Ports  
Version **1** **3**

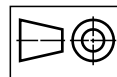
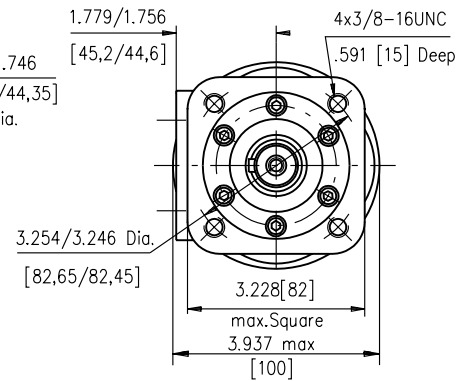
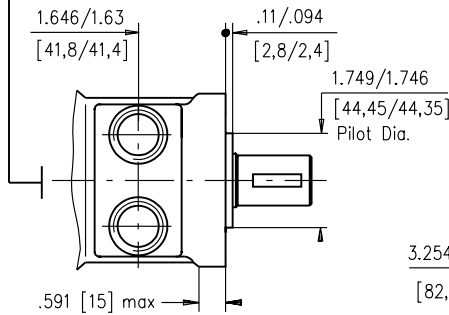


**Mounting**

SAE A Flange



**Q** Square Flange



**Standard Rotation**

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

**Reverse Rotation**

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

Type	Lmax,in. [mm]	L <sub>1</sub> ,in.[mm]
HR(Q) 50	5.49 [139,5]	.35 [9,0]
HR(Q) 80	5.69 [144,5]	.55[14,0]
HR(Q) 100	5.83 [148,0]	.69[17,4]
HR(Q) 125	6.00 [152,5]	.86[21,8]
HR(Q) 160	6.24 [158,5]	1.09[27,8]
HR(Q) 200	6.52 [165,5]	1.37[34,8]
HR(Q) 250	6.85 [174,0]	1.71[43,5]
HR(Q) 315	7.30 [185,5]	2.16[54,8]
HR(Q) 400	7.87 [200,0]	2.73[69,4]

Versions				
	<b>1</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>C</b>	4x 5/16-18UNC	4x M8	-	-
<b>P<sub>(A,B)</sub></b>	2x.39 Dia. [2x10]	2x.39 Dia. [2x10]	2x 3/8-14UNF	2x 1/2 -14NPTF
<b>T</b>	3/16 -20UNF	3/16 -20UNF	3/16 -20UNF	3/16 -20UNF

## ORDER CODE

	1	2	3	4	5	6	7	8
<b>H R</b>					<b>U</b>			

**Pos.1 - Mounting Flange**

omit - SAE A, two holes

**Q** - Square, four bolts

**Pos.2 - Displacement code\***

<b>50</b>	- 3.14 [ 51,5] in. <sup>3</sup> /rev. [cm. <sup>3</sup> /rev.]
<b>80</b>	- 4.90 [ 80,3] in. <sup>3</sup> /rev. [cm. <sup>3</sup> /rev.]
<b>100</b>	- 6.09 [ 99,8] in. <sup>3</sup> /rev. [cm. <sup>3</sup> /rev.]
<b>125</b>	- 7.67 [125,7] in. <sup>3</sup> /rev. [cm. <sup>3</sup> /rev.]
<b>160</b>	- 9.74 [159,6] in. <sup>3</sup> /rev. [cm. <sup>3</sup> /rev.]
<b>200</b>	- 12.19 [199,8] in. <sup>3</sup> /rev. [cm. <sup>3</sup> /rev.]
<b>250</b>	- 15.26 [250,1] in. <sup>3</sup> /rev. [cm. <sup>3</sup> /rev.]
<b>315</b>	- 19.26 [315,7] in. <sup>3</sup> /rev. [cm. <sup>3</sup> /rev.]
<b>400</b>	- 24.23 [397,0] in. <sup>3</sup> /rev. [cm. <sup>3</sup> /rev.]

**Pos.3 - Shaft Extensions\*\*** [see page 17]

<b>C</b>	- 1" [25,4] straight, Woodruff key
<b>G</b>	- 1" [25,4] SAE 6B Splined
<b>H</b>	- 1" [25,4] straight, w/.315 [8] Cross-hole
<b>S</b>	- 7/8" [22,2] 13T Splined
<b>T</b>	- 1" [25,4] SAE J501 Tapered

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

**1** - side ports, Manifold [5/16-18 UNC Mounting Threads], 7/16-20 UNF

**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 18]

**U** - High pressure shaft seal (without check valves)

**Pos. 6 - Drain Port**

omit - with drain port

**1** - without drain port

**Pos. 7 - Special Features** [see page 55]

**Pos. 8 - Design Series**

omit - Factory specified

Notes : \* [For the Performance Data please look at "M+S Hydraulic" Catalogue for MLHR motors, pages 36÷40.](#)

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

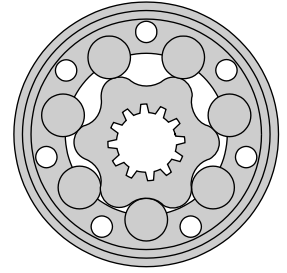
The hydraulic motors are mangano-phosphatized as standard.

# HYDRAULIC MOTORS MLHRW



## APPLICATION

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



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## OPTIONS

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

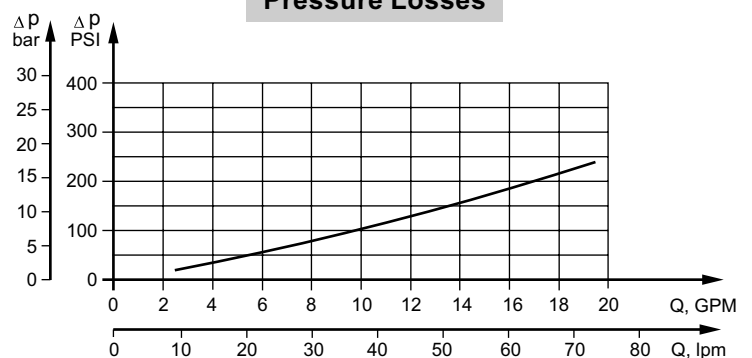
## GENERAL

<b>Displacement,</b>	in <sup>3</sup> /rev [cm <sup>3</sup> /rev.]	3.14÷24.4 [51,5÷397]
<b>Max. Speed,</b>	[RPM]	150÷750
<b>Max. Torque,</b>	in-lb [daNm]	900÷5400 [10,1÷61]
<b>Max. Output,</b>	HP [kW]	9.5÷17.4 [7÷13]
<b>Max. Pressure Drop,</b>	PSI [bar]	1670÷2540 [115÷175]
<b>Max. Oil Flow,</b>	GPM [lpm]	10÷16 [37,8÷60,6]
<b>Min. Speed,</b>	[RPM]	10
<b>Pressure fluid</b>		Mineral based- HLP(DIN 51524) or HM(ISO 6743/4)
<b>Temperature range,</b>	°F [°C]	-22÷194 [-30÷90]
<b>Optimal Viscosity range, SUS [mm<sup>2</sup>/s]</b>		98÷347 [20÷75]
<b>Filtration</b>		ISO code 20/16 (Min. recommended fluid filtration of 25 micron)

### Oil flow in drain line

Pressure drop PSI [bar]	Viscosity SUS [mm <sup>2</sup> /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	
<b>Displacement, in.<sup>3</sup>/rev.</b>		3.14	4.90	6.09	7.67	9.74	12.19	15.26	19.26	24.4	
<b>[cm.<sup>3</sup>/rev.]</b>		[51,5]	[80,3]	[99,8]	[125,7]	[159,6]	[199,8]	[250,1]	[315,7]	[397]	
<b>Max. Speed,</b>	Cont.	734	750	607	482	379	303	240	190	152	
	<b>[RPM]</b>	Int.*	1029	940	758	602	474	379	303	242	191
<b>Max. Torque</b>	Cont.	900 [10,1]	1725 [19,5]	2125 [24]	2655 [30]	3450 [39]	4000 [45]	4780 [54]	4870 [55]	5400 [61]	
	<b>in-lb [daNm]</b>	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]	
<b>Max. Output</b>	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]	
	<b>HP [kW]</b>	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]
<b>Max. Pressure Drop</b>	Cont.	2030 [140]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	1960 [135]	1670 [115]	
	<b>PSI [bar]</b>	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]	
<b>Max. Oil Flow</b>	Cont.	10 [37,8]	16 [60,6]	16 [60,6]	16 [60,6]	16 [60,6]	16 [60]	16 [60]	16 [60,6]	16 [60,6]	
	<b>GPM [lpm]</b>	Int.*	14 [53]	20 [75,7]	20 [75,7]	20 [75,7]	20 [75,7]	20 [75,7]	20 [75,7]	20 [75,7]	
<b>Max. Inlet Pressure</b>	Cont.	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	
	<b>PSI [bar]</b>	Int.*	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	
	Peak**	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	
<b>Max. Return Pres- sure with Drain Line</b>	Cont.	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	
	<b>PSI [bar]</b>	Int.*	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	
	Peak**	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	
<b>Max. Starting Pressure with Unloaded Shaft, PSI [bar]</b>		145 [10]	145 [10]	145 [10]	130 [9]	102 [7]	73 [5]	58 [4]	44 [3]	44 [3]	
<b>Min. Starting Torque</b>	At max.press.										
	<b>in-lb [daNm]</b>	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]
<b>Min. Speed***, [RPM]</b>		10	10	10	9	7	5	6	5	5	
<b>Weight, lb [kg]</b>		23 [10,4]	23.2 [10,5]	23.4 [10,6]	23.8 [10,8]	22.5 [11,1]	25.6 [11,6]	26.7 [12,1]	27.8 [12,6]	29.3 [13,3]	

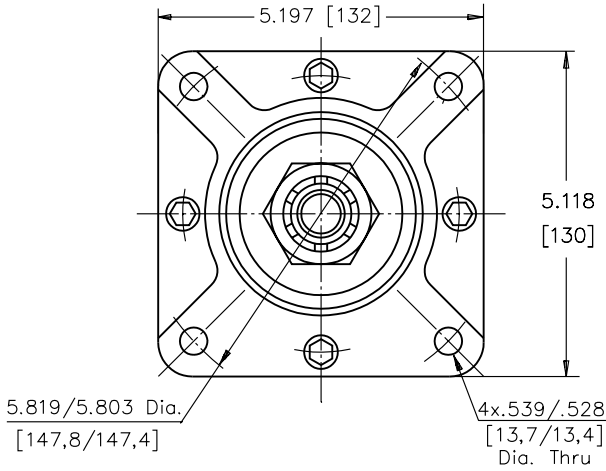
\* Intermittent operation: the permissible values may occur for max. 10% of every minute.

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

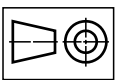
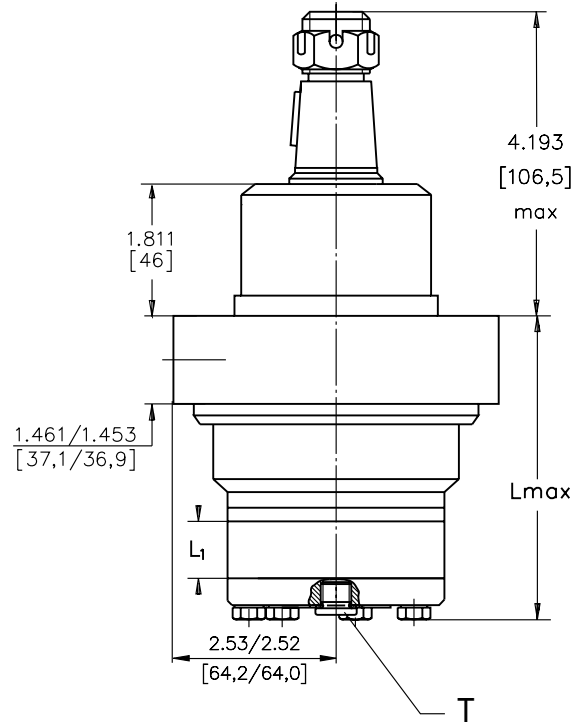
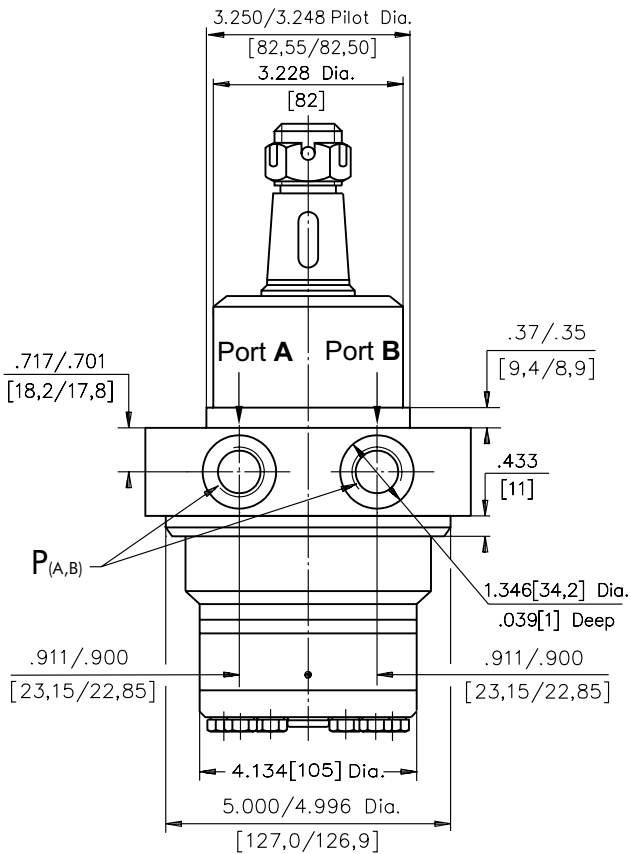
\*\*\* For speeds of 10 RPM or lower than given, consult factory or your regional manager.

1. Intermittent speed and intermittent pressure must not occur simultaneously.
2. Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
3. Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP(DIN51524) or HM (ISO 6743/4).  
If using synthetic fluids consult the factory for alternative seal materials.
4. Recommended minimum oil viscosity 70 SUS[13mm<sup>2</sup>/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 - MLHRW (WHEEL MOTOR)



Type	L <sub>max</sub> ,in. [mm]	L <sub>1</sub> ,in.[mm]
MLHRW 50	4.37 [111]	.35 [9,0]
MLHRW 80	4.57 [116]	.55 [14,0]
MLHRW 100	4.72 [120]	.69 [17,4]
MLHRW 125	4.88 [124]	.86 [21,8]
MLHRW 160	5.112 [130]	1.09 [27,8]
MLHRW 200	5.39 [137]	1.37 [34,8]
MLHRW 250	5.75 [146]	1.71 [43,5]
MLHRW 315	6.18 [157]	2.16 [54,8]
MLHRW 400	6.77 [172]	2.73 [69,4]

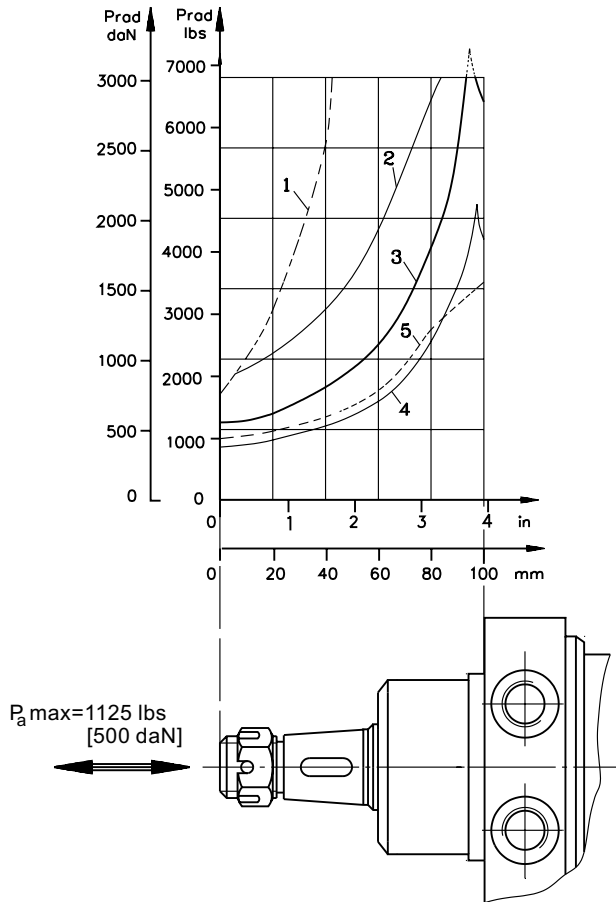


**Standard Rotation**  
Viewed from Shaft End  
Port A Pressurized - **CW**  
Port B Pressurized - **CCW**

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

	Versions			
	2	3	4	5
<b>P<sub>(A,B)</sub></b>	2xG $\frac{1}{2}$	2xM22x1,5	2x $\frac{7}{8}$ -14UNF	2x $\frac{1}{2}$ -14NPTF
<b>T</b>	G $\frac{1}{4}$	M14x1,5	$\frac{7}{16}$ -20UNF	$\frac{7}{16}$ -20UNF

### PERMISSIBLE SHAFT LOADS MLHRW



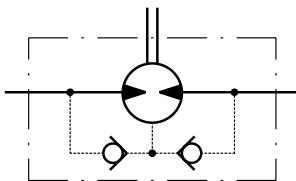
$L_h = 2500 \text{ h}$

1. Permissible radial shaft load
2. Drawing by  $n = 50 \text{ RPM}$
3. Drawing by  $n = 200 \text{ RPM}$
4. Drawing by  $n = 800 \text{ RPM}$
5. Drawing by  $n = 200 \text{ RPM}$  and  $P_a \text{ max} = 1125 \text{ lbs}$  [500 daN]

### MAX. PERMISSIBLE SHAFT SEAL PRESSURE

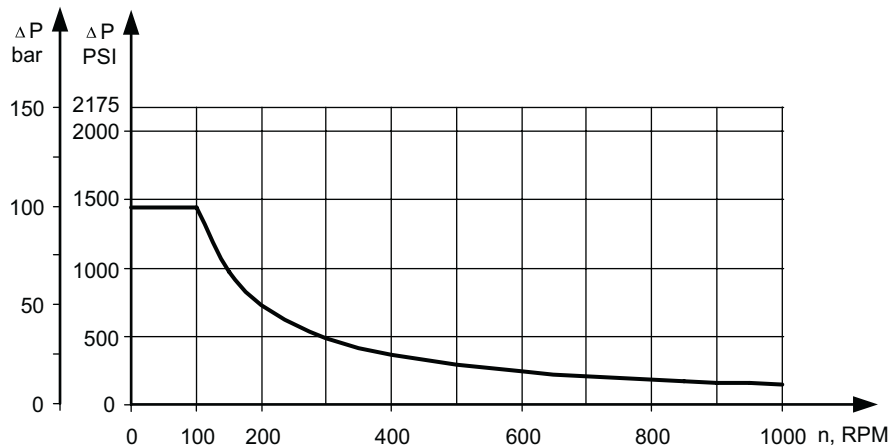
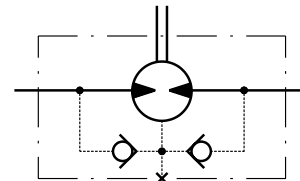
**MLHRW...1 motors without drain connection:**

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



**MLHRW... motors with drain connection:**

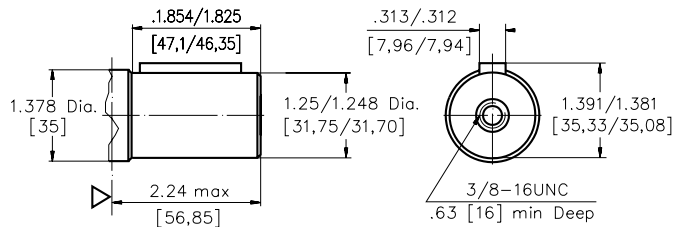
The shaft seal pressure equals the pressure in the drain line.



## SHAFT EXTENSIONS

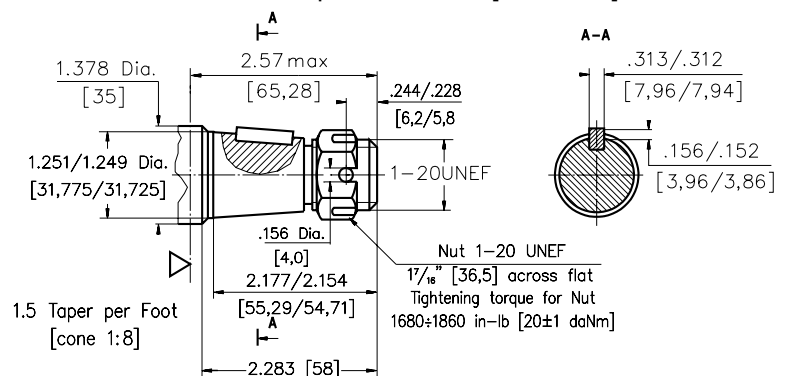
**K**

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



**R**

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



## ORDER CODE

	1	2	3	4	5	6
<b>MLHRW</b>						

### Pos.1 - Displacement code\*

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

### Pos.2 - Shaft Extensions\*\*

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

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

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

### Pos. 4 - Drain Port

omit	- with drain port
<b>1</b>	- without drain port

### Pos. 5 - Special Features [see page 55]

### Pos. 6 - Design Series

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

Notes : \* [For the Performance Data please look at "M+S Hydraulic" Catalogue for MLHR motors, pages 36+40.](#)

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

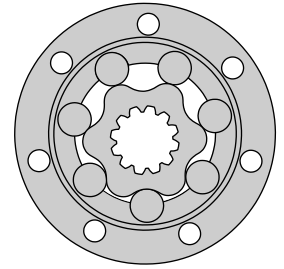
The hydraulic motors are mangano-phosphatized as standard.

# HYDRAULIC MOTORS HW



## APPLICATION

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



## CONTENTS

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## OPTIONS

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

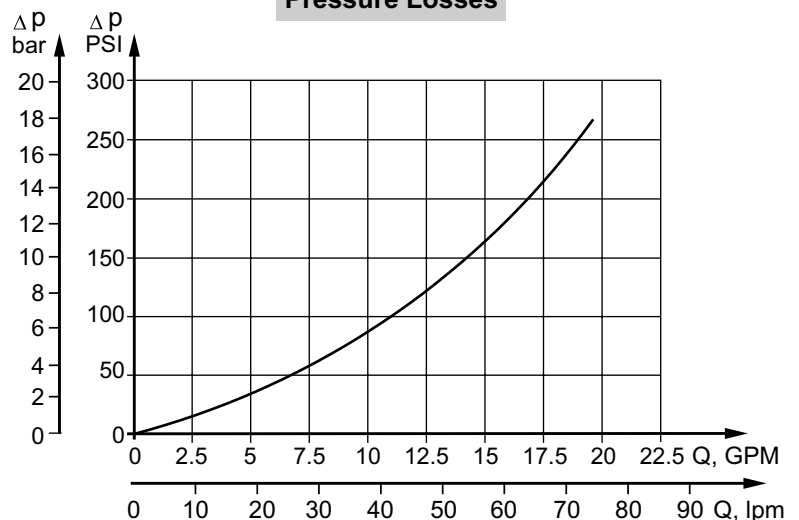
## GENERAL

<b>Displacement,</b>	in <sup>3</sup> /rev [cm <sup>3</sup> /rev.]	7.67÷33.55 [126÷550]
<b>Max. Speed,</b>	[RPM]	136÷380
<b>Max. Torque,</b>	in-lb [daNm]	3100÷8500 [35÷96]
<b>Max. Output,</b>	HP [kW]	12.1÷21.7 [9÷16,2]
<b>Max. Pressure Drop,</b>	PSI [bar]	1810÷3000 [125÷205]
<b>Max. Oil Flow,</b>	GPM [lpm]	12÷20 [45÷75]
<b>Min. Speed,</b>	[RPM]	[10]
<b>Pressure fluid</b>		Mineral based- HLP(DIN 51524) or HM(ISO 6743/4)
<b>Temperature range,</b>	°F [°C]	-22÷194 [-30÷90]
<b>Optimal Viscosity range, SUS [mm<sup>2</sup>/s]</b>		98÷347 [20÷75]
<b>Filtration</b>		ISO code 20/16 (Min. recommended fluid filtration of 25 micron)

### Oil flow in drain line

Pressure drop PSI [bar]	Viscosity SUS [mm <sup>2</sup> /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
<b>Displacement, in.3/rev. [cm3/rev.]</b>		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]
<b>Max. Speed, [RPM]</b>	cont.	357	380	348	298	298	250	238
	int.*	476	475	422	361	357	300	286
<b>Max. Torque in-lb [daNm]</b>	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]
<b>Max. Output, HP [kW]</b>	cont.	21.7 [16,2]	23.6 [17,6]	23.3 [17,4]	22.8 [17]	22.5 [16,8]	22 [16,5]	21.9 [16,4]
	int.*	26.6 [19,8]	29 [21,6]	26.3 [19,6]	25.7 [19,2]	25 [18,7]	25 [18,7]	25 [18,7]
<b>Max. Pressure Drop, PSI [bar]</b>	cont.	2973 [205]	2973 [205]	2973 [205]	2973 [205]	2973 [205]	2973 [205]	2973 [205]
	int.*	3263 [225]	3263 [225]	3263 [225]	3263 [225]	3263 [225]	3263 [225]	3263 [225]
<b>Max. Oil Flow GPM [lpm]</b>	cont.	12 [45]	16 [60]	18.5 [70]	18.5 [70]	20 [75]	20 [75]	20 [75]
	int.*	16 [60]	20 [75]	22.5 [85]	22.5 [85]	24 [90]	24 [90]	24 [90]
<b>Max. Inlet Pressure, PSI [bar]</b>	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]
<b>Max. Starting Pressure with Unloaded Shaft, PSI [bar]</b>		145 [10]	145 [10]	145 [10]	145 [10]	145 [10]	145 [10]	145 [10]
<b>Min. Starting Torque in-lb [daNm]</b>	at max. press. drop cont.	2540 [28,7]	3186 [36]	3673 [41,5]	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]
<b>Min. Speed**, [RPM]</b>		10	10	10	10	10	10	10
<b>Weight, avg. lb [kg]</b>		31.5 [14,3]	32.2 [14,6]	33.7 [15,3]	34.6 [15,7]	35 [15,9]	36 [16,3]	36.4 [16,5]

\* 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.

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 mm<sup>2</sup>/s] at 122°F [50°C].
5. Recommended maximum system operating temperature is 180°F [82°C].
6. To assure optimum motor life fill with fluid prior to loading and run at moderate load and speed for 10-15 minutes.

## SPECIFICATION DATA

Type	HW 350	HW 370	HW 400	HW 470	HW 500	HW 535	HW 550
<b>Displacement, in.3/rev. [cm3/rev.]</b>	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]
<b>Max. Speed, [RPM]</b>	cont. 216 int.* 259	203 244	189 227	159 191	149 179	140 168	136 164
<b>Max. Torque in-lb [daNm]</b>	cont. 8320 [94] int.* 9028 [102]	8497 [96] 9293 [105]	8497 [96] 8674 [98]	8143 [92] 8939 [101]	8054 [91] 8939 [101]	7966 [90] 9205 [104]	7877 [89] 9116 [103]
<b>Max. Output, HP [kW]</b>	cont. 22 [16,5] int.* 25 [18,7]	17.7 [13,2] 23.2 [17,3]	16.8 [12,5] 22.4 [16,7]	14.2 [10,6] 18.2 [13,6]	14.5 [10,8] 18.6 [13,9]	12.6 [9,4] 17.2 [12,8]	12 [9,0] 16.6 [12,4]
<b>Max. Pressure Drop, PSI [bar]</b>	cont. 2973 [205] int.* 3263 [225]	2900 [200] 3263 [225]	2683 [185] 2756 [190]	2176 [150] 2393 [165]	2030 [140] 2248 [155]	1885 [130] 2176 [150]	1813 [125] 2103 [145]
<b>Max. Oil Flow GPM [lpm]</b>	cont. 20 [75] int.* 24 [90]	20 [75] 24 [90]	20 [75] 22.5 [85]	20 [75] 22.5 [85]	20 [75] 24 [90]	20 [75] 24 [90]	20 [75] 24 [90]
<b>Max. Inlet Pressure, PSI [bar]</b>	cont. 3050 [210] int.* 3625 [250]	3050 [210] 3625 [250]	3050 [210] 3625 [250]	3050 [210] 3625 [250]	3050 [210] 3625 [250]	3050 [210] 3625 [250]	3050 [210] 3625 [250]
<b>Max. Starting Pressure with Unloaded Shaft, PSI [bar]</b>	145 [10]	145 [10]	145 [10]	145 [10]	145 [10]	145 [10]	145 [10]
<b>Min. Starting Torque in-lb [daNm]</b>	at max. press. drop cont. 6815 [77] at max. press. drop int.* 7400 [83,6]	7036 [79,5] 7612 [86]	6966 [78,7] 7107 [80,3]	6674 [75,4] 73.28 [82,8]	6603 [74,6] 7328 [82,8]	6532 [73,8] 7540 [85,2]	6452 [72,9] 7470 [84,4]
<b>Min. Speed**, [RPM]</b>	8	8	8	8	8	5	5
<b>Weight, avg. lb [kg]</b>	37.3 [19,9]	37.7 [17,1]	38.6 [17,5]	40.4 [18,3]	41 [18,6]	41.9 [19,0]	42.1 [19,1]

\* 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.

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 mm<sup>2</sup>/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.



### Performance Data HW 125

		Pressure, Δ PSI (bar)						Max. Cont.	Max. Int.	Speed (theor.)	Torque, in-lb [daNm] [34.5]	Speed [RPM] 40
		500 [35]	1000 [70]	1450 [100]	1710 [120]	2000 [140]	2500 [175]	2850 [200]	3200 [225]			
Flow GPM [l/min]	1.32 [5]	500 [5.64] <b>33</b>	1035 [11.7] <b>31</b>	1435 [16.2] <b>27</b>	1750 [19.8] <b>24</b>	2070 [23.4] <b>19</b>	-	-	-	-	<b>40</b>	
	2.64 [10]	525 [5.94] <b>76</b>	1078 [12.18] <b>70</b>	1550 [17.5] <b>64</b>	1820 [20.58] <b>60</b>	2115 [23.9] <b>55</b>	2515 [28.4] <b>50</b>	2745 [31.0] <b>46</b>	3045 [34.4] <b>40</b>	<b>80</b>		
	4 [15]	500 [5.64] <b>113</b>	1085 [12.25] <b>110</b>	1610 [18.2] <b>104</b>	1885 [21.3] <b>100</b>	2150 [24.3] <b>95</b>	2620 [29.6] <b>89</b>	2865 [32.4] <b>84</b>	3215 [36.3] <b>76</b>	<b>119</b>		
	5.28 [20]	460 [5.2] <b>154</b>	1078 [12.18] <b>151</b>	1585 [17.9] <b>145</b>	1860 [21.0] <b>141</b>	2140 [24.2] <b>136</b>	2630 [29.7] <b>131</b>	2930 [33.1] <b>125</b>	3240 [36.6] <b>116</b>	<b>159</b>		
	8 [30]	-	1035 [11.7] <b>230</b>	1495 [16.9] <b>224</b>	1815 [20.5] <b>219</b>	2105 [23.8] <b>214</b>	2595 [29.3] <b>207</b>	2910 [32.9] <b>200</b>	3250 [36.7] <b>193</b>	<b>238</b>		
	10.56 [40]	-	965 [10.9] <b>308</b>	1460 [16.5] <b>302</b>	1750 [19.8] <b>295</b>	2035 [23.0] <b>289</b>	2530 [28.6] <b>280</b>	2910 [32.9] <b>271</b>	3230 [36.5] <b>262</b>	<b>317</b>		
Max. Cont.	13.2 [50]	-	875 [9.9] <b>389</b>	1380 [15.6] <b>380</b>	1690 [19.1] <b>373</b>	1980 [22.4] <b>366</b>	2485 [28.1] <b>354</b>	2895 [32.7] <b>345</b>	3220 [36.4] <b>335</b>	<b>397</b>		
Max. Int.	16 [60]	-	785 [8.9] <b>471</b>	1285 [14.5] <b>463</b>	1635 [18.45] <b>453</b>	1860 [21.0] <b>446</b>	2435 [27.5] <b>431</b>	2790 [31.5] <b>423</b>	3210 [36.3] <b>410</b>	<b>476</b>		
Torque (theor.)		620 [7.0]	1240 [14.0]	1770 [20.0]	2125 [24.0]	2480 [28.0]	3105 [35.1]	3550 [40.1]	3990 [45.1]			

7.69 in.<sup>3</sup>/rev. [126 cm.<sup>3</sup>/rev.]

### Performance Data HW 160

		Pressure, Δ PSI (bar)						Max. Cont.	Max. Int.	Speed (theor.)	Torque, in-lb [daNm] [48.5]	Speed [RPM] 42
		500 [35]	1000 [70]	1450 [100]	1710 [120]	2320 [140]	2500 [175]	2850 [200]	3200 [225]			
Flow, GPM [l/min]	1.32 [5]	700 [7.91] <b>25</b>	1415 [16] <b>24</b>	2020 [22.8] <b>22</b>	2425 [27.4] <b>21</b>	3135 [35.4] <b>19</b>	3330 [37.6] <b>18</b>	3755 [42.4] <b>14</b>	-	-	<b>32</b>	
	2.64 [10]	680 [7.7] <b>58</b>	1410 [15.91] <b>56</b>	2010 [22.7] <b>54</b>	2410 [27.2] <b>52</b>	3135 [35.4] <b>51</b>	3310 [37.4] <b>49</b>	3835 [43.3] <b>44</b>	4295 [48.5] <b>42</b>	<b>63</b>		
	4 [15]	655 [7.4] <b>91</b>	1410 [15.91] <b>87</b>	2000 [22.6] <b>85</b>	2395 [27.05] <b>84</b>	3100 [35] <b>82</b>	3310 [37.4] <b>80</b>	3895 [44] <b>77</b>	4295 [48.5] <b>74</b>	<b>95</b>		
	5.28 [20]	630 [7.13] <b>124</b>	1390 [15.7] <b>121</b>	1980 [22.35] <b>118</b>	2365 [26.7] <b>115</b>	3055 [34.5] <b>110</b>	3295 [37.2] <b>106</b>	3860 [43.6] <b>101</b>	4295 [48.5] <b>96</b>	<b>127</b>		
	8 [30]	595 [6.7] <b>189</b>	1345 [15.2] <b>185</b>	1955 [22.1] <b>182</b>	2335 [26.4] <b>177</b>	3020 [34.1] <b>172</b>	3250 [36.7] <b>167</b>	3790 [42.8] <b>163</b>	4250 [48] <b>160</b>	<b>190</b>		
	10.56 [40]	585 [6.6] <b>252</b>	1275 [14.4] <b>249</b>	1910 [21.6] <b>243</b>	2285 [25.8] <b>238</b>	2985 [33.7] <b>230</b>	3230 [36.5] <b>225</b>	3725 [42.1] <b>219</b>	4195 [47.4] <b>213</b>	<b>253</b>		
Max. Cont.	13.2 [50]	-	1195 [13.5] <b>315</b>	1880 [21.2] <b>312</b>	2250 [25.4] <b>303</b>	2930 [33.1] <b>292</b>	3220 [36.4] <b>286</b>	3665 [41.4] <b>280</b>	4105 [46.4] <b>275</b>	<b>317</b>		
Max. Int.	16 [60]	-	1075 [12.15] <b>378</b>	1800 [20.3] <b>372</b>	2160 [24.4] <b>364</b>	2885 [32.6] <b>349</b>	3160 [35.7] <b>344</b>	3610 [40.8] <b>335</b>	4030 [45.5] <b>331</b>	<b>380</b>		
Max. Int.	20 [75]	-	920 [10.4] <b>474</b>	1655 [18.7] <b>472</b>	2070 [23.4] <b>458</b>	2770 [31.3] <b>447</b>	3055 [34.5] <b>443</b>	3490 [39.4] <b>435</b>	-	<b>475</b>		
Torque (theor.)		780 [8.8]	1560 [17.6]	2220 [25.1]	2665 [30.1]	3560 [40.2]	3895 [44]	4445 [50.2]	5000 [56.5]			

9.64 in.<sup>3</sup>/rev. [157.8 cm.<sup>3</sup>/rev.]

The Performance data was collected at back pressure 72.5±145 PSI [5±10 bar] and oil with viscosity of 150 SUS [32 mm<sup>2</sup>/s] at 122°F [50°C].



### Performance Data HW 200

		Pressure, Δ PSI (bar)						Max. Cont.	Max. Int.	Speed (theor.)	Torque, in-lb [daNm]	5090 [57.5]
		500 [35]	1000 [70]	1450 [100]	1710 [120]	2320 [160]	2500 [175]	2850 [200]	3200 [225]		Speed [RPM]	3
Flow, GPM [l/min]	1.32 [5]	840 [9.5] <b>23</b>	1770 [20] <b>20</b>	2525 [28.5] <b>16</b>	3000 [33.9] <b>11</b>	3965 [44.8] <b>9</b>	4135 [46.7] <b>9</b>	4540 [51.3] <b>4</b>	5090 [57.5] <b>3</b>		<b>25</b>	
	2.64 [10]	825 [9.3] <b>42</b>	1760 [19.9] <b>40</b>	2560 [28.9] <b>37</b>	3055 [34.5] <b>36</b>	4020 [45.4] <b>35</b>	4195 [47.4] <b>34</b>	4595 [51.9] <b>31</b>	5115 [57.8] <b>27</b>		<b>50</b>	
	4 [15]	805 [9.1] <b>69</b>	1735 [19.6] <b>66</b>	2565 [29] <b>62</b>	3115 [35.2] <b>60</b>	4020 [45.4] <b>58</b>	4275 [48.3] <b>57</b>	4620 [52.2] <b>54</b>	5145 [58.1] <b>46</b>		<b>74.5</b>	
	5.28 [20]	760 [8.6] <b>98</b>	1710 [19.3] <b>96</b>	2515 [28.4] <b>94</b>	3090 [34.9] <b>92</b>	3985 [45.0] <b>90</b>	4295 [48.5] <b>88</b>	4675 [52.8] <b>86</b>	5170 [58.4] <b>81</b>		<b>99</b>	
	8 [30]	710 [8.0] <b>147</b>	1640 [18.5] <b>145</b>	2435 [27.5] <b>142</b>	3000 [33.9] <b>140</b>	3895 [44.0] <b>134</b>	4295 [48.5] <b>132</b>	4610 [52.1] <b>129</b>	5115 [57.8] <b>122</b>		<b>149</b>	
	10.56 [40]	645 [7.3] <b>197</b>	1525 [17.2] <b>194</b>	2345 [26.5] <b>191</b>	2910 [32.9] <b>188</b>	3730 [42.1] <b>184</b>	4205 [47.5] <b>182</b>	4570 [51.6] <b>174</b>	5170 [57.3] <b>163</b>		<b>199</b>	
Max. Cont.	13.2 [50]	-	1355 [15.3] <b>244</b>	2240 [25.3] <b>242</b>	2735 [30.9] <b>238</b>	3575 [40.4] <b>234</b>	4090 [46.2] <b>228</b>	4480 [50.6] <b>225</b>	5000 [56.5] <b>220</b>		<b>248</b>	
	16 [60]	-	1195 [13.5] <b>295</b>	2070 [23.4] <b>291</b>	2575 [29.1] <b>286</b>	3345 [37.8] <b>278</b>	3950 [44.6] <b>274</b>	4435 [50.1] <b>267</b>	4885 [55.2] <b>262</b>		<b>298</b>	
Max. Int.	20 [75]	-	985 [11.1] <b>371</b>	1745 [19.7] <b>367</b>	2215 [25] <b>362</b>	2835 [32] <b>355</b>	3575 [40.4] <b>349</b>	4300 [48.6] <b>342</b>	4755 [53.7] <b>335</b>		<b>372.5</b>	
Torque (theor.)		990 [11.2]	1985 [22.43]	2835 [32.05]	3410 [38.5]	4540 [51.3]	4965 [56.1]	5675 [64.1]	6380 [72.1]			

12.28 in.<sup>3</sup>/rev. [201,3 cm.<sup>3</sup>/rev.]

### Performance Data HW 235

		Pressure, Δ PSI (bar)						Max. Cont.	Max. Int.	Speed (theor.)	Torque, in-lb [daNm]	5965 [67.4]
		500 [35]	1000 [70]	1450 [100]	1710 [120]	2320 [160]	2500 [175]	2850 [200]	3200 [225]		Speed [RPM]	19
Flow, GPM [l/min]	1.32 [5]	920 [10.4] <b>16</b>	1950 [22] <b>14</b>	2760 [31.2] <b>12</b>	3285 [37.1] <b>11</b>	4295 [48.5] <b>10</b>	4640 [52.4] <b>8</b>	5150 [58.2] <b>5</b>	-		<b>21</b>	
	2.64 [10]	955 [10.8] <b>35</b>	1940 [21.9] <b>33</b>	2830 [32] <b>31</b>	3365 [38] <b>30</b>	4380 [49.5] <b>29</b>	4780 [54] <b>28</b>	5400 [61] <b>24</b>	5965 [67.4] <b>19</b>		<b>42</b>	
	4 [15]	975 [11] <b>58</b>	1930 [21.8] <b>55</b>	2825 [31.9] <b>52</b>	3375 [38.1] <b>51</b>	4460 [50.4] <b>49</b>	4885 [55.2] <b>47</b>	5490 [62] <b>40</b>	6010 [67.9] <b>38</b>		<b>64</b>	
	5.28 [20]	930 [10.5] <b>83</b>	1905 [21.5] <b>79</b>	2790 [31.5] <b>75</b>	3345 [37.8] <b>73</b>	4450 [50.3] <b>70</b>	4870 [55] <b>67</b>	5470 [61.8] <b>63</b>	5990 [67.7] <b>60</b>		<b>85</b>	
	8 [30]	805 [9.1] <b>126</b>	1870 [21.1] <b>123</b>	2735 [30.9] <b>119</b>	3285 [37.1] <b>117</b>	4390 [49.6] <b>114</b>	4780 [54] <b>104</b>	5400 [61] <b>100</b>	5965 [67.4] <b>95</b>		<b>127</b>	
	10.56 [40]	700 [7.9] <b>168</b>	1780 [20.1] <b>164</b>	2680 [30.3] <b>157</b>	3215 [36.3] <b>153</b>	4270 [48.2] <b>148</b>	4665 [52.7] <b>145</b>	5250 [59.3] <b>142</b>	5860 [66.2] <b>138</b>		<b>170</b>	
Max. Cont.	13.2 [50]	-	1620 [18.3] <b>208</b>	2585 [29.2] <b>200</b>	3115 [35.2] <b>196</b>	4150 [46.9] <b>191</b>	4550 [51.4] <b>189</b>	5170 [58.4] <b>186</b>	5685 [64.2] <b>183</b>		<b>212</b>	
	16 [60]	-	1420 [16] <b>252</b>	2355 [26.6] <b>249</b>	2920 [33] <b>245</b>	4000 [45.2] <b>237</b>	4390 [49.6] <b>232</b>	4960 [56] <b>226</b>	5575 [63] <b>221</b>		<b>255</b>	
Max. Int.	20 [75]	-	1110 [12.5] <b>316</b>	2045 [23.1] <b>313</b>	2620 [29.6] <b>308</b>	3655 [41.3] <b>301</b>	4110 [46.4] <b>298</b>	4870 [55] <b>293</b>	5285 [59.7] <b>292</b>		<b>319</b>	
Torque (theor.)		1160 [13.1]	2320 [26.2]	3320 [37.5]	3985 [45]	5300 [59.9]	5800 [65.5]	6630 [74.9]	7460 [84.3]			

14.33 in.<sup>3</sup>/rev. [235,3 cm.<sup>3</sup>/rev.]

The Performance data was collected at back pressure 72.5±145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm<sup>2</sup>/s] at 122°F [50°C].



### Performance Data HW 250

		Pressure, Δ PSI (bar)						Max. Cont.	Max. Int.	Speed (theor.)
		500 [35]	1000 [70]	1450 [100]	1710 [120]	2320 [160]	2500 [175]	2850 [200]	3200 [225]	
Flow, GPM [l/min]	1.32 [5]	975 [11] <b>17</b>	2090 [23.6] <b>14</b>	3020 [34.1] <b>13</b>	3615 [40.8] <b>12</b>	4710 [53.2] <b>11</b>	5090 [57.5] <b>10</b>	5595 [63.2] <b>7</b>	-	20
	2.64 [10]	990 [11.2] <b>36</b>	2180 [24.6] <b>34</b>	3020 [34.1] <b>32</b>	3620 [40.9] <b>28</b>	4745 [53.6] <b>26</b>	5135 [58] <b>25</b>	5770 [65.2] <b>21</b>	-	40
	4 [15]	990 [11.2] <b>56</b>	2340 [26.4] <b>54</b>	3020 [34.1] <b>51</b>	3640 [41.1] <b>50</b>	4770 [53.9] <b>49</b>	5170 [58.4] <b>48</b>	5765 [65.1] <b>44</b>	6435 [72.7] <b>40</b>	60
	5.28 [20]	930 [10.5] <b>76</b>	2310 [26.1] <b>72</b>	3020 [34.1] <b>69</b>	3640 [41.1] <b>68</b>	4770 [53.9] <b>65</b>	5145 [58.1] <b>63</b>	5755 [65] <b>60</b>	6410 [72.4] <b>57</b>	79
	8 [30]	815 [9.2] <b>117</b>	2000 [22.6] <b>115</b>	2880 [32.5] <b>113</b>	3515 [39.7] <b>111</b>	4700 [53.1] <b>107</b>	5125 [57.9] <b>102</b>	5720 [64.6] <b>95</b>	6380 [72.1] <b>91</b>	119
	10.56 [40]	720 [8.1] <b>157</b>	1950 [22] <b>156</b>	2790 [31.5] <b>154</b>	3445 [38.9] <b>152</b>	4610 [52.1] <b>147</b>	5035 [57.2] <b>143</b>	5640 [63.7] <b>135</b>	6320 [71.4] <b>131</b>	159
	13.2 [50]	550 [6.2] <b>196</b>	1725 [19.5] <b>194</b>	2730 [30.8] <b>192</b>	3365 [38] <b>188</b>	4560 [51.5] <b>182</b>	4950 [56] <b>176</b>	5530 [62.5] <b>171</b>	6135 [69.3] <b>169</b>	198
Max. Cont.	16 [60]	-	1575 [17.8] <b>235</b>	2500 [28.2] <b>231</b>	3180 [35.9] <b>229</b>	4355 [49.2] <b>221</b>	4800 [54.2] <b>216</b>	5380 [60.8] <b>211</b>	6000 [67.8] <b>207</b>	238
Max. Int.	20 [75]	-	1180 [13.3] <b>295</b>	2295 [25.9] <b>293</b>	2790 [31.5] <b>290</b>	3975 [44.9] <b>284</b>	4525 [51.1] <b>280</b>	5260 [59.4] <b>276</b>	5880 [66.4] <b>268</b>	298
Torque (theor.)		1240 [14]	2480 [28]	3550 [40.1]	4260 [48.1]	5685 [64.2]	6215 [70.2]	7100 [80.2]	7985 [90.2]	

Torque, in-lb 6435  
[daNm] [72.7]  
Speed [RPM] 40

15.37 in.<sup>3</sup>/rev. [252 cm.<sup>3</sup>/rev.]

### Performance Data HW 300

		Pressure, Δ PSI (bar)						Max. Cont.	Max. Int.	Speed (theor.)
		500 [35]	1000 [70]	1450 [100]	1710 [120]	2320 [160]	2500 [175]	2850 [200]	3200 [225]	
Flow, GPM [l/min]	1.32 [5]	1265 [14.3] <b>14</b>	2560 [28.9] <b>12</b>	3720 [42] <b>10</b>	4285 [48.4] <b>9</b>	5445 [61.5] <b>7</b>	5770 [65.2] <b>6</b>	-	-	17
	2.64 [10]	1300 [14.7] <b>30</b>	2585 [29.2] <b>27</b>	3745 [42.3] <b>24</b>	4355 [49.2] <b>22</b>	5615 [63.4] <b>19</b>	5975 [67.5] <b>18</b>	6815 [77] <b>13</b>	7435 [84] <b>10</b>	33
	4 [15]	1295 [14.6] <b>47</b>	2585 [29.2] <b>44</b>	3720 [42] <b>42</b>	4435 [50.1] <b>40</b>	5710 [64.5] <b>37</b>	6110 [69] <b>33</b>	7010 [79.2] <b>27</b>	7710 [87.1] <b>24</b>	50
	5.28 [20]	1265 [14.3] <b>65</b>	2530 [28.6] <b>63</b>	3700 [41.8] <b>60</b>	4385 [49.5] <b>58</b>	5780 [65.3] <b>53</b>	6215 [70.2] <b>50</b>	7040 [79.5] <b>45</b>	7870 [88.9] <b>37</b>	67
	8 [30]	1140 [12.9] <b>98</b>	2445 [27.6] <b>96</b>	3575 [40.4] <b>94</b>	4340 [49] <b>92</b>	5765 [65.1] <b>89</b>	6285 [71] <b>86</b>	7065 [79.8] <b>76</b>	7845 [88.6] <b>66</b>	100
	10.56 [40]	995 [11.2] <b>132</b>	2330 [26.3] <b>130</b>	3490 [39.4] <b>127</b>	4205 [47.5] <b>120</b>	5600 [63.2] <b>112</b>	6100 [68.9] <b>105</b>	6940 [78.4] <b>100</b>	7765 [87.7] <b>94</b>	133
	13.2 [50]	760 [8.6] <b>166</b>	2195 [24.8] <b>165</b>	3345 [37.8] <b>161</b>	4055 [45.8] <b>157</b>	5460 [61.7] <b>150</b>	5990 [67.7] <b>145</b>	6765 [76.4] <b>138</b>	7620 [86.1] <b>134</b>	167
Max. Cont.	16 [60]	560 [6.3] <b>199</b>	2010 [22.7] <b>198</b>	3125 [35.3] <b>195</b>	3805 [43] <b>191</b>	5240 [59.2] <b>183</b>	5695 [64.3] <b>179</b>	6595 [74.5] <b>168</b>	7585 [85.7] <b>161</b>	200
Max. Int.	20 [75]	-	1540 [17.4] <b>248</b>	2800 [31.6] <b>242</b>	3540 [40] <b>240</b>	4960 [56] <b>232</b>	5410 [61.1] <b>228</b>	6375 [72] <b>214</b>	7425 [83.9] <b>202</b>	250
Torque (theor.)		1480 [16.7]	2960 [33.4]	4230 [47.8]	5070 [57.3]	6765 [76.4]	7400 [83.6]	8455 [95.5]	9505 [107.4]	

Torque, in-lb 7435  
[daNm] [84]  
Speed [RPM] 10

18.3 in.<sup>3</sup>/rev. [300 cm.<sup>3</sup>/rev.]

The Performance data was collected at back pressure 72.5±145 PSI [5±10 bar] and oil with viscosity of 150 SUS [32 mm<sup>2</sup>/s] at 122°F [50°C].



### Performance Data HW 315

		Pressure, $\Delta$ PSI (bar)						Max. Cont.	Max. Int.	Speed (theor.)	
		500 [35]	1000 [70]	1450 [100]	1710 [120]	2320 [160]	2500 [175]	2850 [200]	3200 [225]		
Flow,	1.32 [5]	1130 [15] <b>13</b>	2685 [30.3] <b>11</b>	3895 [44] <b>10</b>	4490 [50.7] <b>9</b>	5710 [64.5] <b>7</b>	6055 [68.4] <b>5</b>	-	-	<b>16</b>	Torque, in-lb 8080 [daNm] [91.3] Speed [RPM] 23
	2.64 [10]	1365 [15.4] <b>29</b>	2720 [30.7] <b>26</b>	3920 [44.3] <b>23</b>	4570 [51.6] <b>22</b>	5885 [66.5] <b>18</b>	6260 [70.7] <b>17</b>	7145 [80.7] <b>13</b>	7810 [88.2] <b>10</b>	<b>32</b>	
	4 [15]	1355 [15.3] <b>45</b>	2720 [30.7] <b>42</b>	3895 [44] <b>40</b>	4650 [52.5] <b>39</b>	5995 [67.7] <b>35</b>	6400 [72.3] <b>31</b>	7355 [83.1] <b>26</b>	8080 [91.3] <b>23</b>	<b>48</b>	
	GPM [l/min]	5.28 [20]	1330 [15] <b>62</b>	2655 [30] <b>60</b>	3870 [43.7] <b>57</b>	4605 [52] <b>55</b>	6065 [68.5] <b>50</b>	6515 [73.6] <b>47</b>	7385 [83.4] <b>42</b>	8260 [93.3] <b>35</b>	<b>64</b>
	8 [30]	1195 [13.5] <b>94</b>	2570 [29] <b>92</b>	3745 [42.3] <b>90</b>	4540 [51.3] <b>88</b>	6045 [68.3] <b>85</b>	6595 [74.5] <b>81</b>	7410 [83.7] <b>72</b>	8235 [93] <b>62</b>	<b>95</b>	
	10.56 [40]	1035 [11.7] <b>126</b>	2445 [27.6] <b>125</b>	3655 [41.3] <b>121</b>	4425 [50] <b>115</b>	5880 [66.4] <b>108</b>	6400 [72.3] <b>103</b>	7310 [82.6] <b>96</b>	8145 [92] <b>89</b>	<b>127</b>	
	13.2 [50]	800 [9] <b>158</b>	2310 [26.1] <b>156</b>	3505 [39.6] <b>153</b>	4250 [48] <b>149</b>	5735 [64.8] <b>148</b>	6285 [71] <b>138</b>	7090 [80.1] <b>132</b>	8000 [90.4] <b>127</b>	<b>159</b>	
Max. Cont.	16 [60]	595 [6.7] <b>189</b>	2110 [23.8] <b>187</b>	3275 [37] <b>183</b>	4000 [45.2] <b>181</b>	5525 [62.4] <b>173</b>	5965 [67.4] <b>170</b>	6915 [78.1] <b>163</b>	7965 [90] <b>134</b>	<b>190</b>	
Max. Int.	20 [75]	-	1620 [18.3] <b>236</b>	2930 [33.1] <b>234</b>	3710 [41.9] <b>228</b>	5205 [58.8] <b>222</b>	5965 [67.4] <b>218</b>	6685 [75.5] <b>201</b>	7685 [86.8] <b>193</b>	<b>238</b>	
Torque (theor.)		1550 [17.5]	3110 [35.1]	4435 [50.1]	5320 [60.1]	7100 [80.2]	7765 [87.7]	8870 [100.2]	9985 [112.8]		

19.21 in.<sup>3</sup>/rev. [315,9 cm.<sup>3</sup>/rev.]

### Performance Data HW 350

		Pressure, $\Delta$ PSI (bar)						Max. Cont.	Max. Int.	Speed (theor.)	
		500 [35]	1000 [70]	1450 [100]	1710 [120]	2320 [160]	2500 [175]	2850 [200]	3200 [225]		
Flow,	1.32 [5]	1240 [14] <b>12</b>	2680 [30.3] <b>10</b>	3780 [42.7] <b>8</b>	4515 [51] <b>6</b>	-	-	-	-	<b>14</b>	Torque, in-lb 8160 [daNm] [92.2] Speed [RPM] 29
	2.64 [10]	[14.8] <b>27</b>	[31] <b>25</b>	[44.2] <b>24</b>	[52.4] <b>23</b>	[69.6] <b>22</b>	[75.8] <b>20</b>	[83.7] <b>18</b>	-	<b>29</b>	
	4 [15]	1355 [15.3] <b>41</b>	2835 [32] <b>39</b>	4030 [45.5] <b>38</b>	4835 [54.6] <b>37</b>	6445 [72.8] <b>35</b>	6930 [78.3] <b>34</b>	7610 [86] <b>32</b>	8160 [92.2] <b>29</b>	<b>43</b>	
	GPM [l/min]	5.28 [20]	1330 [15] <b>55</b>	2840 [32.1] <b>53</b>	4070 [46] <b>52</b>	4790 [54.1] <b>51</b>	6460 [73] <b>48</b>	6920 [78.2] <b>46</b>	7850 [88.7] <b>44</b>	8480 [95.8] <b>40</b>	<b>58</b>
	8 [30]	1250 [14.1] <b>85</b>	2755 [31.1] <b>83</b>	3940 [44.5] <b>82</b>	4860 [54.9] <b>80</b>	6500 [73.4] <b>78</b>	6940 [78.4] <b>76</b>	7940 [89.7] <b>71</b>	8595 [97.1] <b>65</b>	<b>86</b>	
	10.56 [40]	1000 [11.3] <b>114</b>	2610 [29.5] <b>113</b>	3805 [43] <b>111</b>	4690 [53] <b>109</b>	6330 [71.5] <b>107</b>	6770 [76.5] <b>104</b>	7735 [87.4] <b>97</b>	8710 [98.4] <b>91</b>	<b>115</b>	
	13.2 [50]	780 [8.8] <b>143</b>	2380 [26.9] <b>142</b>	3620 [40.9] <b>140</b>	4525 [51.1] <b>137</b>	6180 [69.8] <b>132</b>	6550 [74] <b>127</b>	7580 [85.6] <b>122</b>	8490 [95.9] <b>113</b>	<b>144</b>	
Max. Cont.	16 [60]	570 [6.4] <b>172</b>	2145 [24.2] <b>170</b>	3500 [39.5] <b>167</b>	4375 [49.4] <b>163</b>	5915 [66.8] <b>158</b>	6270 [70.8] <b>155</b>	7275 [82.2] <b>148</b>	8270 [93.4] <b>143</b>	<b>173</b>	
Max. Int.	20 [75]	-	1870 [21.1] <b>214</b>	3205 [36.2] <b>212</b>	3930 [44.4] <b>210</b>	5410 [61.1] <b>206</b>	5800 [65.5] <b>203</b>	6995 [79] <b>189</b>	7995 [90.3] <b>183</b>	<b>216</b>	
Torque (theor.)		1720 [19.4]	3425 [38.7]	4895 [55.3]	5880 [66.4]	7845 [88.6]	8580 [96.9]	9800 [110.7]	11030 [124.6]		

21.21 in.<sup>3</sup>/rev. [347,8 cm.<sup>3</sup>/rev.]

The Performance data was collected at back pressure 72.5±145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm<sup>2</sup>/s] at 122°F [50°C].



### Performance Data HW 370

		Pressure, $\Delta$ PSI (bar)						Max. Cont.	Max. Int.	Speed (theor.)		
		500 [35]	1000 [70]	1450 [100]	1710 [120]	2320 [160]	2500 [175]	2850 [200]	3200 [225]			
Flow,	1.32 [5]	14 500 [16.4] <b>11</b>	2965 [33.5] <b>9</b>	4295 [48.5] <b>7</b>	5010 [57.4] <b>6</b>	6500 [73.4] <b>5</b>	6965 [78.7] <b>4</b>	-	-	14	Torque, in-lb 8950 [daNm] [101.1] Speed [RPM] 10	
	2.64 [10]	1505 [17] <b>25</b>	3125 [35.3] <b>23</b>	4470 [50.5] <b>21</b>	5310 [60] <b>20</b>	683 [77.2] <b>17</b>	7285 [82.3] <b>16</b>	8160 [92.2] <b>13</b>	8950 [101.1] <b>10</b>	27		
	4 [15]	1445 [16.3] <b>38</b>	3170 [35.8] <b>36</b>	4540 [51.3] <b>34</b>	5445 [61.5] <b>33</b>	7065 [79.8] <b>31</b>	7605 [85.9] <b>29</b>	8350 [94.3] <b>25</b>	9125 [103.1] <b>21</b>	41		
	GPM [l/min]	5.28 [20]	1410 [15.9] <b>52</b>	3145 [35.5] <b>50</b>	4410 [49.8] <b>48</b>	5110 [61.1] <b>46</b>	7110 [80.3] <b>43</b>	7695 [86.9] <b>41</b>	8580 [96.9] <b>36</b>	9535 [107.7] <b>32</b>		54
	8 [30]	1320 [14.9] <b>80</b>	3010 [34] <b>78</b>	4310 [48.7] <b>76</b>	5295 [59.8] <b>75</b>	6895 [77.9] <b>73</b>	7490 [84.6] <b>71</b>	8515 [96.2] <b>62</b>	9470 [107] <b>55</b>	81		
	10.56 [40]	1190 [13.4] <b>106</b>	2835 [32] <b>104</b>	4160 [47] <b>101</b>	5160 [58.3] <b>98</b>	6770 [76.5] <b>91</b>	7375 [83.3] <b>87</b>	8400 [94.9] <b>82</b>	9420 [106.4] <b>76</b>	108		
Max. Cont.	13.2 [50]	825 [9.3] <b>134</b>	2995 [28.2] <b>132</b>	3920 [44.3] <b>129</b>	4975 [56.2] <b>126</b>	6615 [74.7] <b>121</b>	7090 [80.1] <b>118</b>	8110 [91.6] <b>109</b>	9125 [103.1] <b>100</b>	135		
	16 [60]	650 [7.3] <b>1162</b>	2310 [26.1] <b>160</b>	3630 [41] <b>157</b>	4650 [52.5] <b>153</b>	6375 [72] <b>149</b>	6825 [77.1] <b>146</b>	7880 [89] <b>137</b>	8835 [99.8] <b>130</b>	163		
Max. Int.	20 [75]	-	1860 [21] <b>201</b>	3250 [36.7] <b>199</b>	4055 [45.8] <b>196</b>	5780 [65.3] <b>192</b>	6340 [71.6] <b>188</b>	7400 [83.6] <b>181</b>	8365 [94.5] <b>173</b>	203		
Torque (theor.)		1825 [20.6]	3640 [41.1]	5205 [58.8]	6240 [70.5]	8330 [94.1]	9110 [102.9]	10400 [117.5]	11700 [132.2]			

22.51 in.<sup>3</sup>/rev. [369,2 cm.<sup>3</sup>/rev.]

### Performance Data HW 400

		Pressure, $\Delta$ PSI (bar)					Max. Cont.	Max. Int.	Speed (theor.)		
		500 [35]	1000 [70]	1300 [90]	1710 [120]	2320 [160]	268 [185]	2760 [190]			
Flow,	2.64 [10]	1620 [18.3] <b>22</b>	3425 [38.7] <b>20</b>	4345 [49.1] <b>19</b>	5710 [64.5] <b>18</b>	7350 [83] <b>16</b>	8170 [92.3] <b>15</b>	8330 [94.2] <b>14</b>	25	Torque, in-lb 8765 [daNm] [99] Speed [RPM] 24	
	4 [15]	1560 [17.6] <b>36</b>	3410 [38.5] <b>34</b>	4381 [49.5] <b>33</b>	5850 [66.1] <b>32</b>	7595 [85.8] <b>29</b>	8585 [97] <b>26</b>	8765 [99] <b>24</b>	38		
	GPM [l/m in]	5.28 [20]	1515 [17.1] <b>48</b>	3380 [38.2] <b>46</b>	4330 [48.9] <b>45</b>	5840 [66] <b>43</b>	7640 [86.3] <b>40</b>	8700 [98.3] <b>36</b>	8815 [99.6] <b>34</b>		50
	8 [30]	1420 [16] <b>75</b>	3240 [36.6] <b>73</b>	4170 [47.1] <b>71</b>	5690 [64.3] <b>69</b>	7550 [85.3] <b>67</b>	8480 [95.8] <b>65</b>	8660 [97.8] <b>63</b>	76		
	10.56 [40]	1265 [14.3] <b>100</b>	3045 [34.4] <b>98</b>	3990 [45.1] <b>96</b>	5540 [62.6] <b>94</b>	7270 [82.1] <b>90</b>	8375 [94.6] <b>85</b>	8550 [96.6] <b>83</b>	101		
	13.2 [50]	885 [10] <b>124</b>	2690 [30.4] <b>122</b>	3685 [41.6] <b>120</b>	5355 [60.5] <b>116</b>	7090 [80.1] <b>112</b>	7960 [89.9] <b>108</b>	8410 [95] <b>105</b>	126		
Max. Cont.	16 [60]	690 [7.8] <b>150</b>	2490 [28.1] <b>148</b>	3525 [39.8] <b>146</b>	5030 [56.8] <b>143</b>	6845 [77.3] <b>139</b>	7700 [87] <b>133</b>	7965 [90] <b>132</b>	151		
	20 [75]	-	1990 [22.5] <b>187</b>	2985 [33.7] <b>185</b>	4355 [49.2] <b>182</b>	6215 [70.2] <b>177</b>	7185 [81.3] <b>173</b>	7540 [85.2] <b>169</b>	189		
Torque (theor.)		1960 [22.1]	3915 [44.2]	5030 [56.8]	6710 [75.8]	8950 [101.1]	10350 [116.9]	10620 [120]			

24.2 in.<sup>3</sup>/rev. [396,8 cm.<sup>3</sup>/rev.]

The Performance data was collected at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm<sup>2</sup>/s] at 122°F [50°C].



### Performance Data HW 470

		Pressure, $\Delta$ PSI (bar)					Max. Cont.	Max. Int.	Speed (theor.)	Torque, in-lb [daNm] [100] Speed [RPM] 13
		500 [35]	1000 [70]	1 300 [90]	1710 [120]	2 170 [150]				
Flow, GPM [l/min]	1.32 [5]	1860 [21] 8	3780 [42.7] 6	4850 [54.8] 5	6480 [73.2] 4	-	-	-	11	
	2.64 [10]	1870 [21.1] 19	3965 [44.8] 17	5065 [57.2] 16	6745 [76.2] 15	8305 [93.8] 14	8850 [100] 13	21		
	4 [15]	1815 [20.5] 30	4035 [45.6] 28	5180 [58.5] 27	6925 [78.2] 25	8445 [95.4] 22	9120 [103] 20	32		
	5.28 [20]	1760 [19.9] 40	4010 [45.3] 38	5195 [58.7] 36	6860 [77.5] 35	8500 [96] 33	9365 [105.8] 32	42.5		
	8 [30]	1630 [18.4] 63	3860 [43.6] 61	5065 [57.2] 59	6765 [76.4] 58	8410 [95] 54	9380 [106] 51	64		
	10.56 [40]	1470 [16.6] 83	3675 [41.5] 81	4755 [53.9] 80	6525 [73.7] 77	8190 [92.5] 74	9205 [104] 72	85		
	13.2 [50]	1135 [12.8] 105	3215 [36.3] 103	4320 [48.8] 101	6170 [69.7] 98	7890 [89.1] 95	8810 [99.5] 93	106		
Max. Cont.	16 [60]	755 [8.5] 126	2930 [33.1] 125	4000 [45.2] 123	5800 [65.5] 120	7525 [85] 115	8390 [94.8] 113	127.5		
Max.	20 [75]	-	2135 [24.1] 156	3460 [39.1] 154	5170 [58.4] 151	6825 [77.1] 149	7700 [87] 147	159		
Torque (theor.)		2320 [26.2]	4640 [52.4]	5965 [67.4]	7960 [89.9]	9950 [112.4]	10940 [123.6]			

28.71 in.<sup>3</sup>/rev. [470,6 cm.<sup>3</sup>/rev.]

### Performance Data HW 500

		Pressure, $\Delta$ PSI (bar)					Max. Cont.	Max. Int.	Speed (theor.)	Torque, in-lb [daNm] [100] Speed [RPM] 19
		500 [35]	1000 [70]	1 300 [90]	1710 [120]	2 170 [150]				
Flow, GPM [l/min]	1.32 [5]	1 985 [22.4] 8	4035 [45.6] 6	5190 [58.6] 5	6925 [78.2] 4	-	-	-	10	
	2.64 [10]	1990 [22.5] 18	4230 [47.8] 16	5420 [61.2] 15	7205 [81.4] 14	8870 [100.2] 13	9445 [106.7] 12	20		
	4 [15]	1940 [21.9] 28	4320 [48.8] 26	5620 [63.5] 25	7390 [83.5] 23	9000 [101.7] 21	9735 [100] 19	30		
	5.28 [20]	1880 [21.2] 38	4285 [48.4] 36	5550 [62.7] 35	7320 [82.7] 34	9065 [102.4] 32	10000 [113] 31	40		
	8 [30]	1735 [19.6] 59	4125 [46.6] 57	5420 [61.2] 55	7225 [81.6] 54	8975 [101.4] 51	10100 [114.1] 48	60		
	10.56 [40]	1570 [17.7] 78	3920 [44.3] 77	5100 [57.6] 76	6965 [78.7] 73	8735 [98.7] 70	9825 [111] 68	80		
	13.2 [50]	1135 [12.8] 98	3540 [40] 96	4620 [52.2] 93	6585 [74.4] 91	8410 [95] 89	9400 [106.2] 87	99.5		
Max. Cont.	16 [60]	805 [9.1] 118	3135 [35.4] 116	4295 [48.5] 115	6250 [70.6] 112	8030 [90.7] 108	8890 [100.4] 106	119		
Max. Int.	20 [75]	-	2285 [25.8] 146	3690 [41.7] 145	6525 [62.4] 142	7285 [82.3] 139	8225 [92.9] 138	149		
Torque (theor.)		2480 [28]	4960 [56]	6375 [72]	8500 [96]	10620 [102]	11685 [132]			

30.65 in.<sup>3</sup>/rev. [502,4 cm.<sup>3</sup>/rev.]

The Performance data was collected at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm<sup>2</sup>/s] at 122°F [50°C].



### Performance Data HW 535

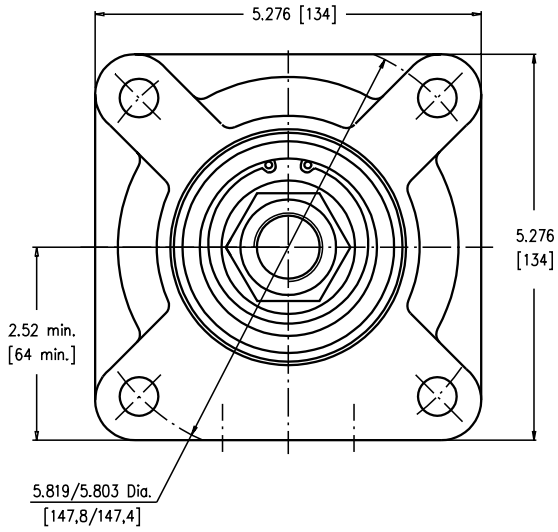
		Pressure, $\Delta$ PSI (bar)					Max. Cont.	Max. Int.	Speed (theor.)	
		246 [17]	500 [35]	1000 [70]	1160 [80]	145 [100]	1885.0 [130]	2175 [150]		
Flow, GPM [l/min]	1.32 [5]	1100 [12.5] 9	2135 [24.1] 8	4115 [46.5] 7	4650 [52.5] 6	5930 [67] 6	7770 [87.8] 5	-	9.5	Torque, in-lb 9040 [daNm] [102.1] Speed [RPM] 13
	2.64 [10]	1160 [13.1] 18	2115 [23.9] 17	4305 [48.6] 16	4850 [54.8] 15	6110 [69] 15	8000 [90.4] 14	9040 [102.1] 13	19	
	4 [15]	1045 [11.8] 27	2080 [23.5] 26	4425 [50] 25	5065 [57.2] 25	6330 [71.5] 24	8215 [92.8] 23	9435 [106.6] 22	28	
	5.28 [20]	975 [11] 36	2055 [23.2] 35	4460 [50.4] 34	5135 [58] 34	6455 [72.9] 33	8320 [94] 32	9610 [108.6] 31	37	
	8 [30]	675 [7.6] 55	1905 [21.5] 54	4340 [49] 53	5000 [56.5] 53	6400 [72.3] 52	8285 [93.6] 51	9550 [107.9] 50	56	
	10.56 [40]	515 [5.8] 74	1675 [18.9] 74	4035 [45.6] 73	4790 [54.1] 72	6110 [69] 71	7890 [89.1] 69	9330 [105.4] 70	75	
	13.2 [50]	-	1275 [14.4] 92	3800 [42.9] 91	4455 [50.1] 90	5880 [66.4] 89	7850 [88.7] 88	9040 [102.1] 87	93.5	
Max. Cont.	16 [60]	-	975 [11] 111	3445 [38.9] 110	4070 [46] 108	5525 [62.4] 106	7490 [84.6] 106	8620 [97.4] 104	112	
Max. Int.	20 [75]	-	-	2895 [32.7] 138	3250 [36.7] 136	5080 [57.4] 134	6860 [77.5] 133	7905 [89.3] 132	140	
Torque (theor.)		1285 [14.5]	2640 [29.8]	5275 [59.6]	6030 [68.1]	7540 [85.2]	9800 [110.7]	11305 [127.7]		
32.7 in. <sup>3</sup> /rev. [535 cm. <sup>3</sup> /rev.]										

### Performance Data HW 550

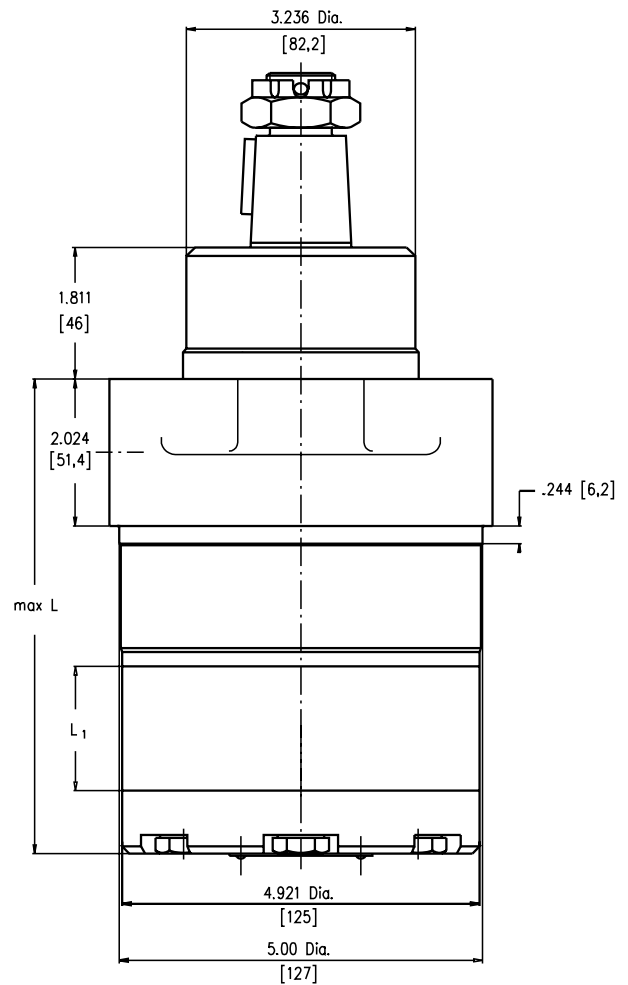
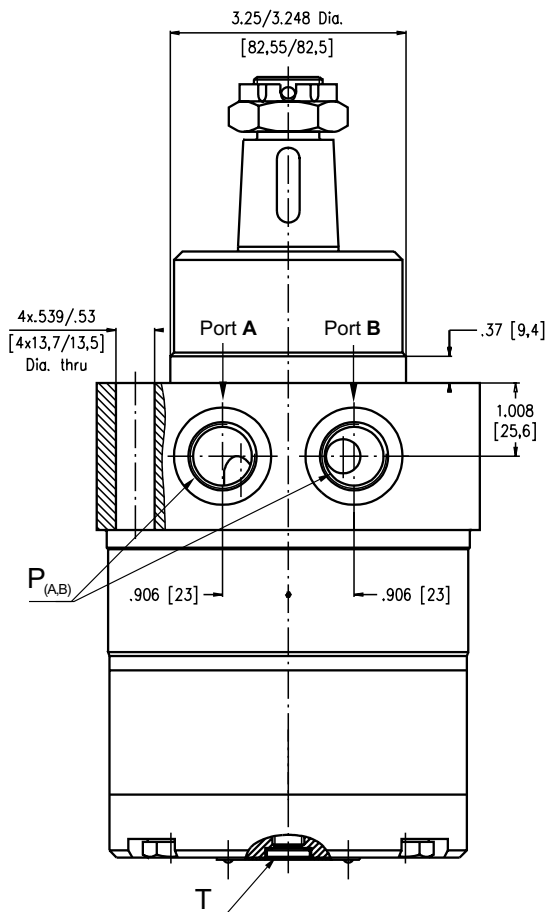
		Pressure, $\Delta$ PSI (bar)					Max. Cont.	Max. Int.	Speed (theor.)	
		246 [17]	500 [35]	1000 [70]	1160 [80]	1450 [100]	1812 [125]	2103 [145]		
Flow, GPM [l/min]	1.32 [5]	1135 [12.8] 8	2190 [24.7] 8	4230 [47.8] 7	4780 [54] 7	6080 [68.7] 6	7675 [86.7] 5	-	9	Torque, in-lb 9385 [daNm] [106] Speed [RPM] 21
	2.64 [10]	1190 [13.4] 17	2170 [24.5] 16	4425 [50] 15	4985 [56.3] 15	6270 [70.8] 14	7895 [89.2] 13	8995 [101.6] 12	18	
	4 [15]	1070 [12.1] 26	2135 [24.1] 25	4550 [51.4] 24	5205 [58.8] 24	6505 [73.5] 23	8110 [91.6] 22	9385 [106] 21	27	
	5.28 [20]	995 [11.2] 35	2110 [28.3] 34	4575 [51.7] 33	5270 [59.5] 33	6620 [74.8] 32	8215 [92.8] 31	9550 [107.9] 30	36	
	8 [30]	700 [7.9] 54	1960 [22.1] 53	4460 [50.4] 52	5135 [58] 52	6570 [74.2] 51	8180 [92.4] 50	9500 [107.3] 49	54.5	
	10.56 [40]	525 [5.9] 72	1720 [19.4] 71	4145 [46.8] 70	4925 [55.6] 70	6320 [71.4] 69	8010 [90.5] 68	9270 [104.7] 67	73	
	13.2 [50]	-	1310 [14.8] 90	3905 [44.1] 89	4585 [51.8] 87	6040 [68.2] 86	7765 [87.7] 85	8995 [101.6] 84	91	
Max. Cont.	16 [60]	-	1000 [11.3] 108	3540 [40] 106	4295 [48.5] 105	5665 [64] 105	7400 [83.6] 104	8560 [96.7] 103	109	
Max. Int.	20 [75]	-	-	2975 [33.6] 134	3515 [39.7] 132	5275 [59.6] 131	6770 [76.5] 131	7870 [88.9] 129	136	
Torque (theor.)		1320 [14.9]	2710 [30.6]	5425 [61.3]	6195 [70]	7745 [87.5]	9685 [109.4]	11240 [127]		
33.55 in. <sup>3</sup> /rev. [550 cm. <sup>3</sup> /rev.]										

The Performance data was collected at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm<sup>2</sup>/s] at 122°F [50°C].

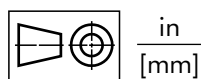
**DIMENSIONS AND MOUNTING DATA**



Type	L <sub>max</sub> ,in. [mm]	L <sub>1</sub> ,in.[mm]
HW 125	5.51 [140,5]	.68 [17,4]
HW 160	5.71 [145,0]	.86 [21,8]
HW 200	5.95 [151,0]	1.09 [27,8]
HW 235	6.12 [155,5]	1.28 [32,5]
HW 250	6.22 [158,0]	1.37 [34,8]
HW 300	6.48 [164,5]	1.63 [41,4]
HW 315	6.56 [166,5]	1.71 [43,5]
HW 350	6.73 [171,0]	1.89 [48,0]
HW 370	6.85 [174,0]	2.01 [51,0]
HW 400	7.01 [178,0]	2.16 [54,8]
HW 470	7.40 [188,0]	2.56 [65,0]
HW 500	7.58 [192,5]	2.73 [69,4]
HW 535	7.76 [197,0]	2.92 [74,1]
HW 550	7.84 [199,0]	2.99 [76,0]



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



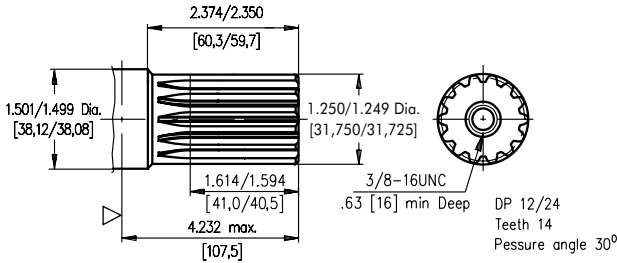
**Standard Rotation**  
Viewed from Shaft End  
Port A Pressurized - CW  
Port B Pressurized - CCW

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

**SHAFT EXTENSIONS**

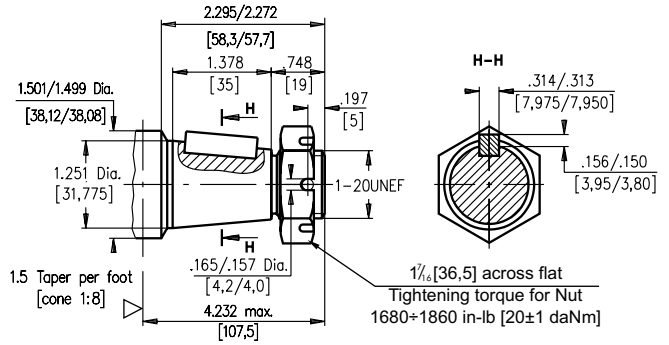
**L**

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



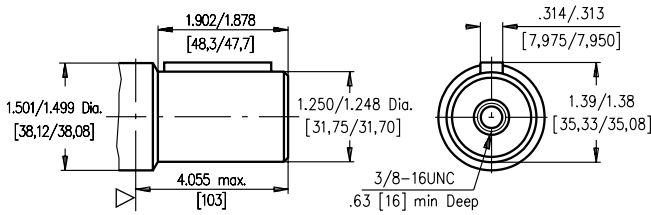
**R**

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



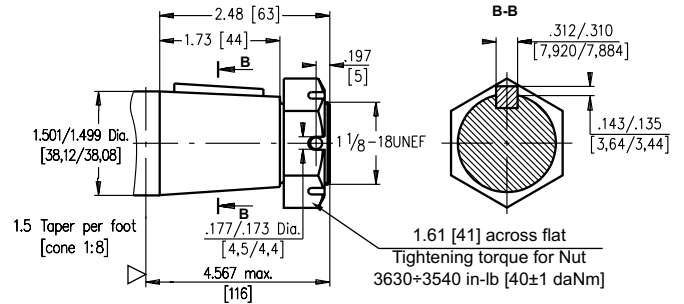
**K**

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



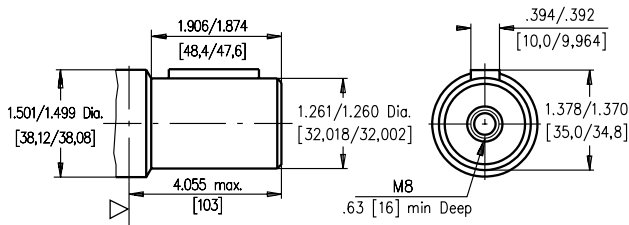
**T**

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



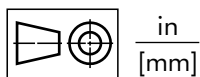
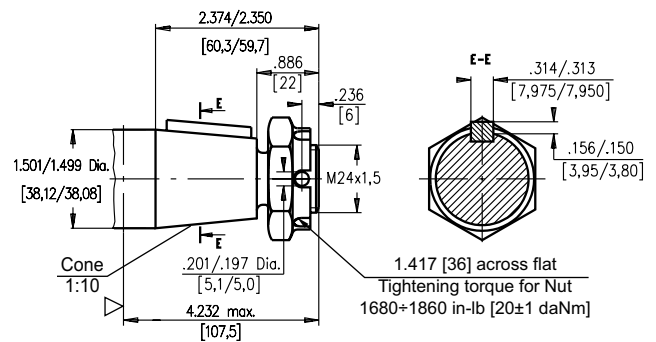
**M**

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



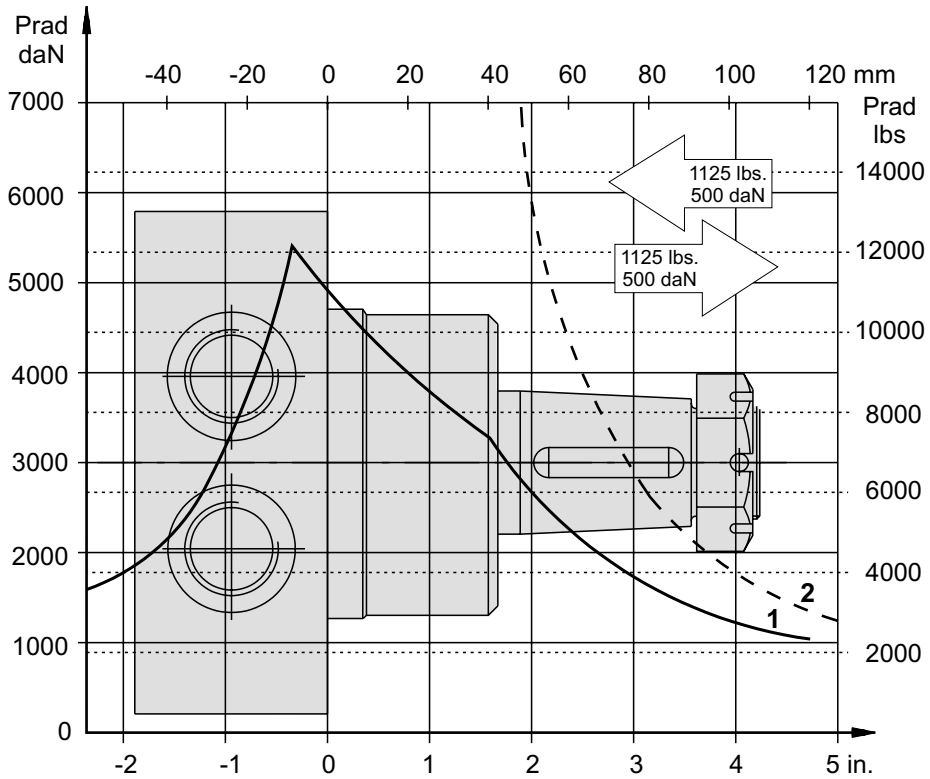
**KB**

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



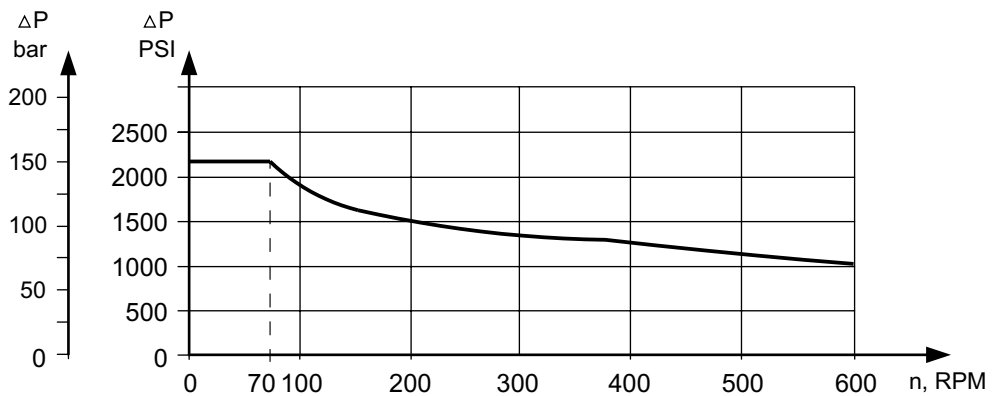
▽ - Motor Mounting Surface

**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.

**MAX. PERMISSIBLE SHAFT SEAL PRESSURE**



## ORDER CODE

	1	2	3	4	5
<b>HW</b>					

**Pos. 1 - Displacement code**

<b>125</b>	- 7.69 [126,00] in <sup>3</sup> /rev [cm <sup>3</sup> /rev]
<b>160</b>	- 9.64 [158,00] in <sup>3</sup> /rev [cm <sup>3</sup> /rev]
<b>200</b>	- 12.28 [201,30] in <sup>3</sup> /rev [cm <sup>3</sup> /rev]
<b>235</b>	- 14.33 [235,00] in <sup>3</sup> /rev [cm <sup>3</sup> /rev]
<b>250</b>	- 15.37 [252,00] in <sup>3</sup> /rev [cm <sup>3</sup> /rev]
<b>300</b>	- 18.30 [300,00] in <sup>3</sup> /rev [cm <sup>3</sup> /rev]
<b>315</b>	- 19.21 [314,90] in <sup>3</sup> /rev [cm <sup>3</sup> /rev]
<b>350</b>	- 21.21 [347,80] in <sup>3</sup> /rev [cm <sup>3</sup> /rev]
<b>370</b>	- 22.51 [369,00] in <sup>3</sup> /rev [cm <sup>3</sup> /rev]
<b>400</b>	- 24.20 [396,80] in <sup>3</sup> /rev [cm <sup>3</sup> /rev]
<b>470</b>	- 28.71 [470,60] in <sup>3</sup> /rev [cm <sup>3</sup> /rev]
<b>500</b>	- 30.65 [502,40] in <sup>3</sup> /rev [cm <sup>3</sup> /rev]
<b>535</b>	- 32.70 [536,00] in <sup>3</sup> /rev [cm <sup>3</sup> /rev]
<b>550</b>	- 33.55 [550,00] in <sup>3</sup> /rev [cm <sup>3</sup> /rev]

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

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

**Pos. 4 - Special Features** [see page 55]

**Pos. 5 - Design Series**

omit - Factory specified

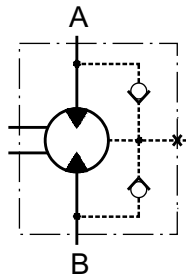
**Pos. 2 - Shaft Extensions\***

<b>K</b>	- 1¼"[31,75] straight, Parallel key 5/16"x5/16"x1½" BS46
<b>KB</b>	- ø35 tapered 1:10, Parallel key 5/16"x5/16"x1¼" BS46
<b>L</b>	- 1¼"[31,75] splined 14T, ANSI B92.1-1976
<b>M</b>	- ø32 straight, Parallel key A10x8x32 DIN 6885
<b>R</b>	- 1¼"[31,75] Tapered 1:8, Parallel key 5/16"x5/16"x1" BS46
<b>T</b>	- 1½"[38,1] Tapered 1:8, Parallel key 5/16"x5/16"x1¼" BS46

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

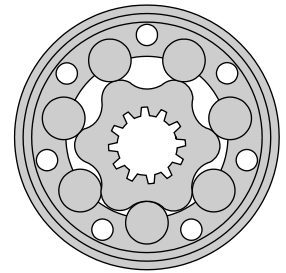
The hydraulic motors are mangano phosphatized as standard.

# HYDRAULIC MOTORS MLHLW



## APPLICATION

- » transport machines
- » industrial trucks
- » elevators
- » loaders
- » manipulators
- » agricultural machinery
- » extrusion machines
- » metallurgical machines
- » mining machines
- » metal-working machines
- » woodworking machines etc.



## CONTENTS

Specification data .....	44
Dimensions and mounting .....	45
Permissible shaft loads.....	45
Shaft versions .....	46
Order code .....	46

## OPTIONS

- » Model- Spool valve, roll-gerotor
- » Side ports
- » Shafts- straight, splined and tapered
- » SAE and BSPP ports.

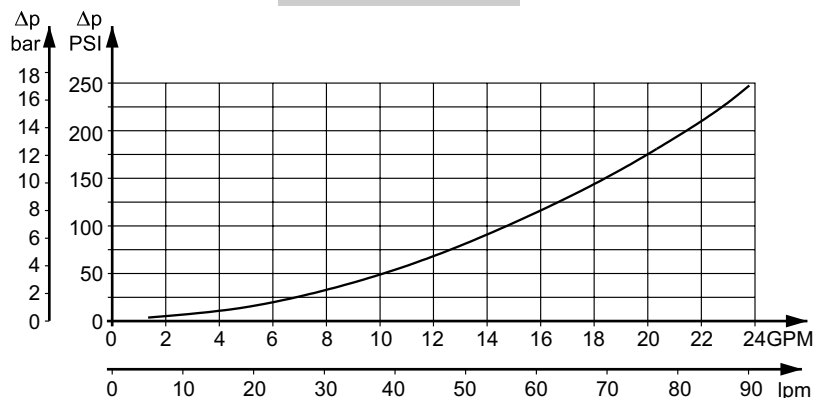
## GENERAL

<b>Displacement,</b> in <sup>3</sup> /rev [cm <sup>3</sup> /rev.]	6.18÷24.2 [101,3÷396,8]
<b>Max. Speed,</b> [RPM]	150÷250
<b>Max. Torque,</b> in-lb [daNm]	2125÷5310 [24÷60]
<b>Max. Output,</b> HP [kW]	7.9÷16.5 [5,9÷12,3]
<b>Max. Pressure Drop,</b> PSI [bar]	1670÷2540 [115÷175]
<b>Max. Oil Flow,</b> GPM [lpm]	6.6÷16 [25÷60]
<b>Min. Starting Torque,</b> in-lb [daNm]	1640÷4070 [18,5÷46]
<b>Pressure fluid</b>	Mineral based- HLP(DIN 51524) or HM(ISO 6743/4)
<b>Temperature range,</b> °F [°C]	-22÷194 [-30÷90]
<b>Optimal Viscosity range, SUS [mm<sup>2</sup>/s]</b>	98÷347 [20÷75]
<b>Filtration</b>	ISO code 20/16 (Min. recommended fluid filtration of 25 micron)

**Oil flow in drain line**

Pressure drop PSI [bar]	Viscosity SUS [mm <sup>2</sup> /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		MLHLW 100	MLHLW 125	MLHLW 160	MLHLW 200	MLHLW 250	MLHLW 315	MLHLW 400
<b>Displacement, in.<sup>3</sup>/rev. [cm.<sup>3</sup>/rev.]</b>		6.18 [101,3]	7.69 [126]	9.64 [157,8]	12.28 [201,3]	15.37 [252]	19.21 [314,9]	24.2 [396,8]
<b>Max. Speed, [RPM]</b>	Cont.	250	240	220	200	200	190	150
	Int.*	300	280	250	225	220	220	190
<b>Max. Torque in-lb [daNm]</b>	Cont.	2125 [24]	2640 [29,8]	3310 [37,4]	4090 [46,2]	5045 [57]	4950 [55,9]	5310 [60]
	Int.*	2390 [27]	2980 [33,7]	3735 [42,2]	4600 [52]	5930 [67]	5575 [63]	6020 [68]
<b>Max. Output HP [kW]</b>	Cont.	7.9 [5,9]	9.8 [7,3]	11.5 [8,6]	12.3 [9,2]	16.5 [12,3]	14.7 [11]	11.5 [8,6]
	Int.*	12.1 [9]	14.1 [10,5]	15.6 [11,6]	17.4 [13]	19.3 [14,4]	18 [13,4]	16.2 [12,1]
<b>Max. Pressure</b>		2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	1960 [135]	1670 [115]
<b>Drop, PSI [bar]</b>		2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2250 [155]	1960 [135]
<b>Max. Oil Flow</b>		6.6 [25]	8 [30]	9.2 [35]	10.6 [40]	13.2 [50]	16 [60]	16 [60]
<b>GPM [lpm]</b>		8 [30]	9.2 [35]	10.6 [40]	11.2 [45]	14.5 [55]	18.5 [70]	20 [75]
<b>Max. Inlet Pressure</b>		2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]
<b>PSI [bar]</b>		2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]
<b>Max. Pressure in Drain Line, PSI [bar]</b>	Cont. 0-100 RPM	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]
	Int.*	1450 [100]	1450 [100]	1450 [100]	1450 [100]	1450 [100]	1450 [100]	1450 [100]
<b>Min. Starting Torque, in-lb [daNm]</b>	At max.press.drop Cont.	1640 [18,5]	2035 [23]	2550 [28,8]	3150 [35,6]	3895 [44]	3805 [43]	4070 [46]
	At max.press.drop Int.*	1860 [21]	2300 [26]	2875 [32,5]	3540 [40]	4425 [50]	4335 [49]	4780 [54]
<b>Weight, lb [kg]</b>		22.7 [10,3]	23.4 [10,6]	24.3 [11]	25.4 [11,5]	27.1 [12,3]	28.9 [13,1]	29.3 [13,3]

\* 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 of 10 RPM or lower, consult factory or your regional manager.

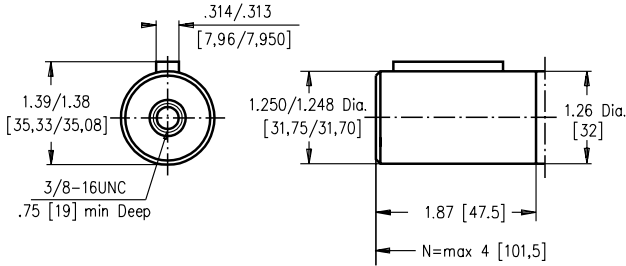
1. Intermittent speed and intermittent pressure drop must not occur simultaneously.
2. Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
3. Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP(DIN51524) or HM (ISO 6743/4). If using synthetic fluids consult the factory for alternative seal materials.
4. Recommended minimum oil viscosity 70 SUS [13 mm<sup>2</sup>/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.



**SHAFT EXTENSIONS**

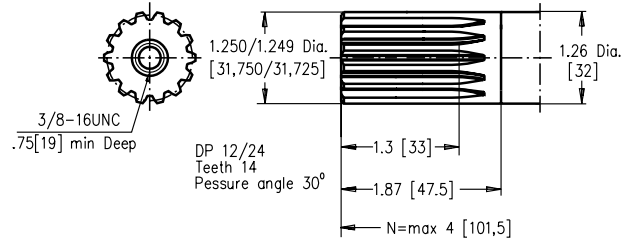
**C**

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



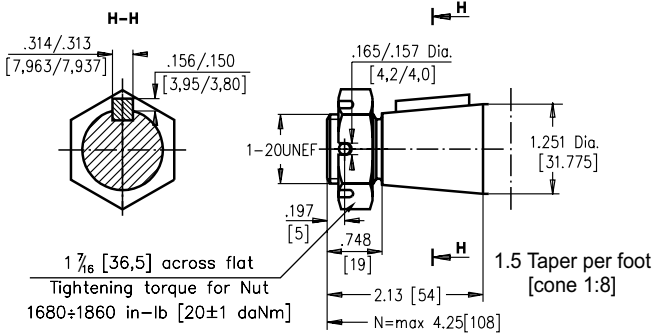
**G**

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



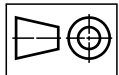
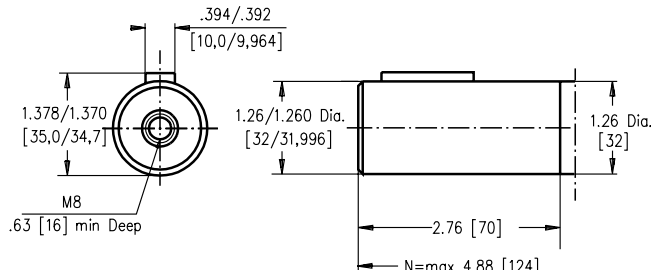
**T**

1 1/4" [31,75] SAE J501 Tapered, Parallel key 5/16"x5/16"x1 1/4" BS46  
Max. Torque 6815 in-lb [77 daNm]



**M**

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



**ORDER CODE**

1	2	3	4	5
<b>MLHLW</b>				

**Pos. 1 - Displacement code\***

<b>100</b>	- 6.18 [101,3] in <sup>3</sup> /rev [cm <sup>3</sup> /rev]
<b>125</b>	- 7.69 [126,0] in <sup>3</sup> /rev [cm <sup>3</sup> /rev]
<b>160</b>	- 9.64 [157,8] in <sup>3</sup> /rev [cm <sup>3</sup> /rev]
<b>200</b>	- 12.28 [201,3] in <sup>3</sup> /rev [cm <sup>3</sup> /rev]
<b>250</b>	- 15.37 [252,0] in <sup>3</sup> /rev [cm <sup>3</sup> /rev]
<b>315</b>	- 19.21 [314,9] in <sup>3</sup> /rev [cm <sup>3</sup> /rev]
<b>400</b>	- 24.20 [396,8] in <sup>3</sup> /rev [cm <sup>3</sup> /rev]

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

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

**Pos. 4 - Special Features [see page 55]**

**Pos. 5 - Design Series**

omit - Factory specified

**Pos. 2 - Shaft Extensions\*\***

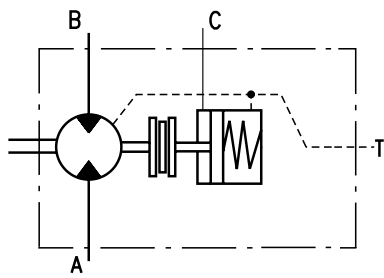
<b>C</b>	- 1 1/4" [31,75] straight, Parallel key 5/16"x5/16"x1 1/4" BS46
<b>G</b>	- 1 1/4" [31,75] splined 14T, ANSI B92.1-1976
<b>M</b>	- ø32 straight, Parallel key A10x8x32 DIN 6885
<b>T</b>	- 1 1/4" [31,75] Tapered, Parallel key 5/16"x5/16"x1 1/4" BS46

Notes : \* For the Performance Data please look at "M+S Hydraulic" Catalogue for MLHH motors, pages 46÷48.

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

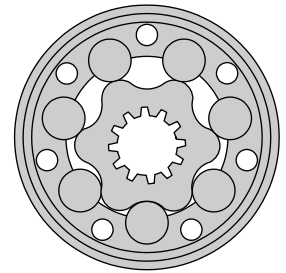
The hydraulic motors are mangano phosphatized as standard.

# HYDRAULIC MOTORS B/HR



## APPLICATION

- » Conveyors
- » Feeding mechanism of robots and manipulators
- » Metal working machines
- » Textile machines
- » Machines for agriculture
- » Food industries
- » Wood working and sawmill machinery etc.



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## OPTIONS

- » Model- Spool valve, roll-gerotor
- » Fully integrated friction disk brake;
- » Side ports
- » Shafts- straight, splined and tapered
- » Manifold ports.

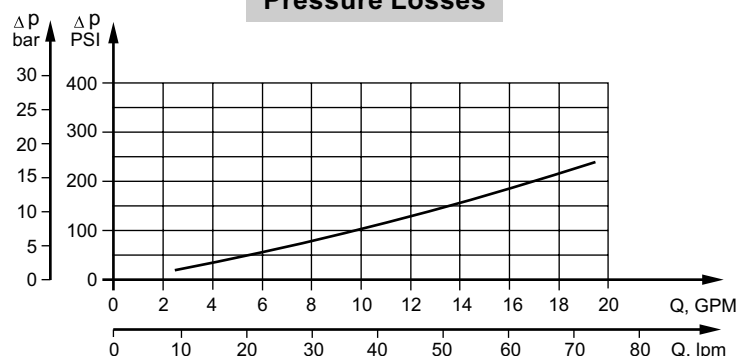
## GENERAL

<b>Displacement,</b>	in <sup>3</sup> /rev [cm <sup>3</sup> /rev.]	4.9÷24.4 [80,3÷397]
<b>Max. Speed,</b>	[RPM]	150÷600
<b>Max. Torque,</b>	in-lb [daNm]	1390÷4250 [15,7÷48]
<b>Max. Output,</b>	HP [kW]	8.2÷14 [6,1÷10,5]
<b>Max. Pressure Drop,</b>	PSI [bar]	1305÷2030 [90÷140]
<b>Max. Oil Flow,</b>	GPM [lpm]	16 [60,6]
<b>Min. Starting Torque,</b>	in-lb [daNm]	1060÷3170 [12÷35,8]
<b>Pressure fluid</b>		Mineral based- HLP(DIN 51524) or HM(ISO 6743/4)
<b>Temperature range,</b>	°F [°C]	-22÷194 [-30÷90]
<b>Optimal Viscosity range, SUS [mm<sup>2</sup>/s]</b>		98÷347 [20÷75]
<b>Filtration</b>		ISO code 20/16 (Min. recommended fluid filtration of 25 micron)

### Oil flow in drain line

Pressure drop PSI [bar]	Viscosity SUS [mm <sup>2</sup> /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	B/HR 80	B/HR 100	B/HR 125	B/HR 160	B/HR 200	B/HR 250	B/HR 315	B/HR 400	
<b>Displacement, in.<sup>3</sup>/rev. [cm.<sup>3</sup>/rev.]</b>	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]	24.23 [397]	
<b>Max. Speed, [RPM]</b>	Cont.	500	500	475	375	300	240	190	150
	Int.*	600	600	600	470	375	300	240	191
<b>Max. Torque in-lb [daNm]</b>	Cont.	1390 [15,7]	1750 [19,8]	2210 [25,0]	2830 [32,0]	3045 [34,4]	3540 [40,0]	3850 [43,5]	4250 [48,0]
	Int.*	1725 [19,5]	2125 [24,0]	2655 [30,0]	3450 [39,0]	3450 [39,0]	4160 [47,0]	4515 [51,0]	4870 [55,0]
<b>Max. Output HP [kW]</b>	Cont.	14 [10,5]	14 [10,5]	14 [10,5]	13.7 [10,2]	12.6 [9,4]	10.7 [8]	8.7 [6,5]	8.2 [6,1]
	Int.*	20.1 [15]	20.1 [15]	20.1 [15]	18.8 [14]	18.7 [14]	15.4 [11,5]	12.1 [9]	11 [8,2]
<b>Max. Pressure Drop PSI [bar]</b>	Cont.	2030 [140]	2030 [140]	2030 [140]	2030 [140]	1810 [125]	1595 [110]	1450 [100]	1305 [90]
	Int.*	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2250 [155]	2030 [140]	1810 [125]	1520 [105]
<b>Max. Oil Flow GPM [lpm]</b>	Cont.	10.6 [40]	13 [50]	16 [60]	16 [60]	16 [60]	16 [60]	16 [60]	16 [60]
	Int.*	13 [50]	16 [60]	20 [75]	20 [75]	20 [75]	20 [75]	20 [75]	20 [75]
<b>Max. Inlet Pressure PSI [bar]</b>	Cont.	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]
<b>Max. Return Pressure, PSI [bar]</b>	Cont.	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]
<b>Max. Starting Pressure with Unloaded Shaft, PSI [bar]</b>		145 [10]	145 [10]	130 [9]	102 [7]	73 [5]	58 [4]	44 [3]	44 [3]
<b>Min. Starting Torque in-lb [daNm]</b>	At max.press. drop Cont.	1060 [12]	1420 [16]	1770 [20]	2270 [25,6]	2620 [29,5]	2510 [28,3]	2840 [32]	3170 [35,8]
	At max.press. drop Int.*	1310 [14,8]	1780 [20,1]	1930 [21,8]	2860 [32,3]	3150 [35,6]	3400 [38,4]	4580 [51,7]	4040 [45,6]
<b>Min. Speed***, [RPM]</b>		10	10	10	10	10	10	10	
<b>Static Torque of Brake, in-lb [daNm]</b>		4890 [55]							
<b>Min. Brake Release Pressure****, PSI [bar]</b>		305 [21]							
<b>Max. Opening Pressure, PSI [bar]</b>		2900 [200]							

\* 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.

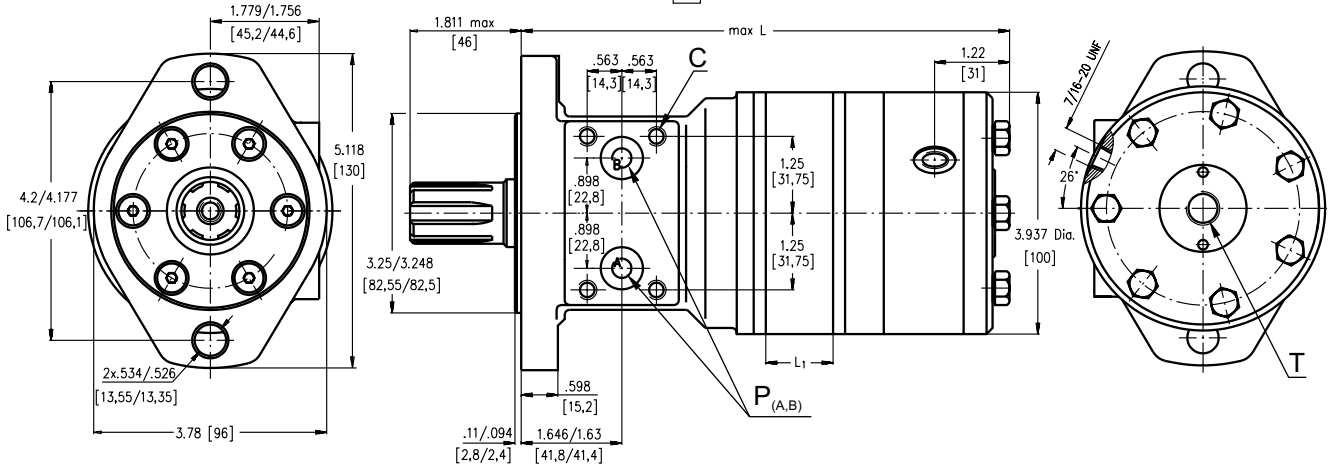
\*\*\* For speeds of 10 RPM or lower, consult factory or your regional manager.

\*\*\*\* Motor-brakes must always have a drain line. The brake release pressure is the difference between the pressure in the brake release line and the pressure in the drain line.

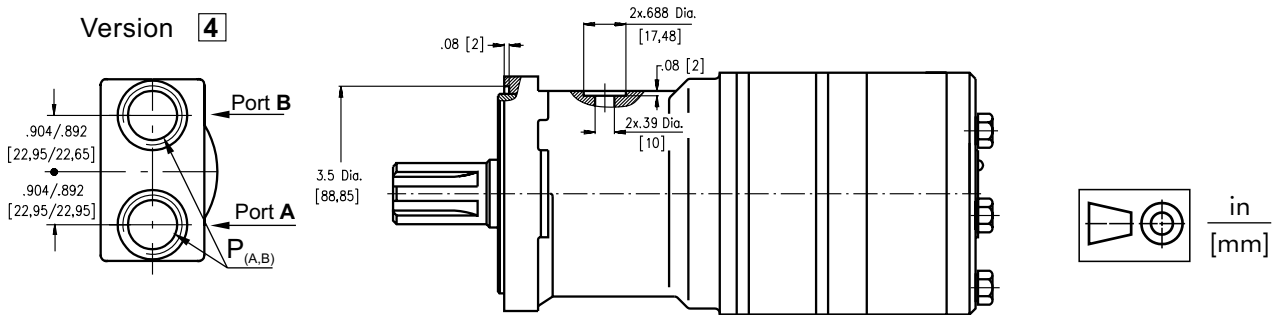
- Intermittent speed and intermittent pressure drop must not occur simultaneously.
- Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
- Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP(DIN51524) or HM (ISO 6743/4). If using synthetic fluids consult the factory for alternative seal materials.
- Recommended minimum oil viscosity 70 SUS [13 mm<sup>2</sup>/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**

Version **1**



Version **4**



Type	Lmax, in. [mm]	L <sub>1</sub> , in. [mm]
B/HR 80	8.47 [215,0]	.55 [14,0]
B/HR 100	8.58 [218,0]	.69 [17,4]
B/HR 125	8.76 [222,5]	.86 [21,8]
B/HR 160	9.00 [228,5]	1.09 [27,8]
B/HR 200	9.27 [235,5]	1.37 [34,8]
B/HR 250	9.61 [244,0]	1.71 [43,5]
B/HR 315	10.06 [255,5]	2.16 [54,8]
B/HR 400	10.63 [270,0]	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**

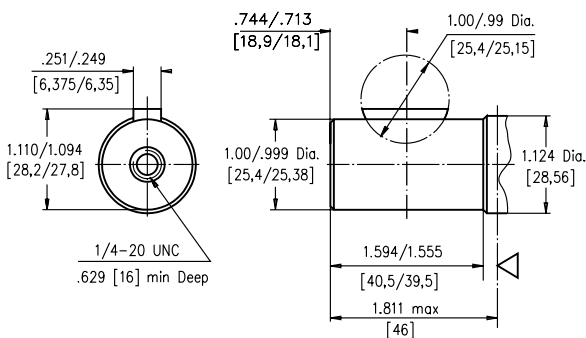
Port B Pressurized - **CW**

	Versions	
	<b>1</b>	<b>4</b>
<b>C</b>	4x 5/16-18UNC	-
<b>P<sub>(A,B)</sub></b>	2x.39 Dia [2x10]	2x 7/8-14UNF
<b>T</b>	7/16 -20UNF	7/16 -20UNF

**SHAFT EXTENSIONS**

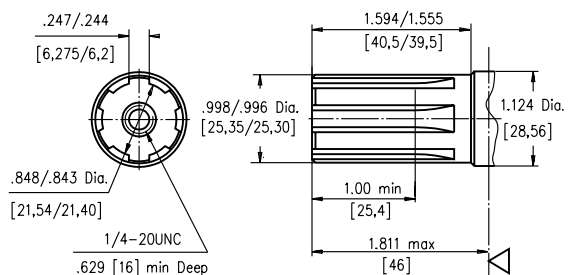
**C**

1" [25,4] straight, Woodruff key 1/4"x1" SAE J502  
Max. Torque 3900 in-lb [44 daNm]



**G**

1" [25,4], SAE 6B Splined  
Max. Torque 3900 in-lb [44 daNm]

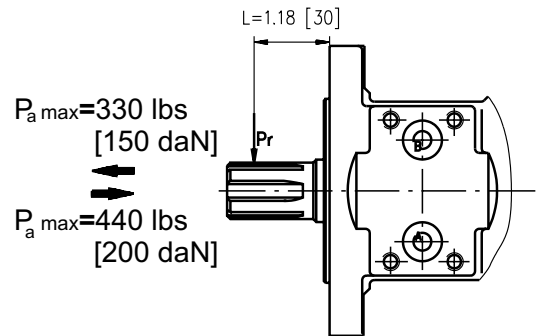
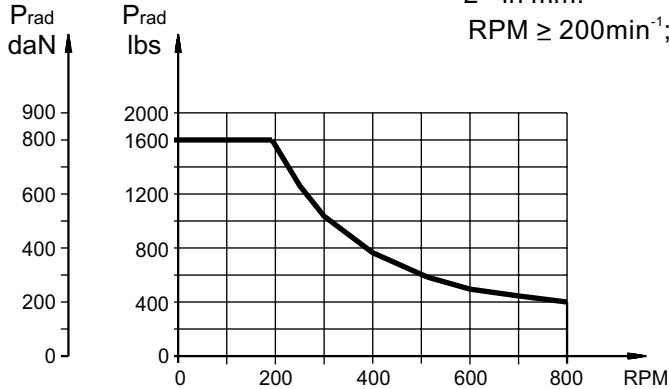


**PERMISSIBLE SHAFT LOADS**

$$\text{Radial Shaft Load } P_{\text{rad}}^* = \frac{800}{\text{RPM}} \times \frac{21000}{75+L} \text{ ,daN}$$

\* L - in mm.

RPM ≥ 200min<sup>-1</sup>; L ≤ 30 mm



**Warning: Drain line should always be used.**

**ORDER CODE**

	1	2	3	4	5
<b>B / H R</b>					

**Pos.1 - Displacement code\***

<b>80</b>	- 4.90 [ 80,3] in. <sup>3</sup> /rev. [cm. <sup>3</sup> /rev.]
<b>100</b>	- 6.09 [ 99,8] in. <sup>3</sup> /rev. [cm. <sup>3</sup> /rev.]
<b>125</b>	- 7.67 [125,7] in. <sup>3</sup> /rev. [cm. <sup>3</sup> /rev.]
<b>160</b>	- 9.74 [159,6] in. <sup>3</sup> /rev. [cm. <sup>3</sup> /rev.]
<b>200</b>	- 12.19 [199,8] in. <sup>3</sup> /rev. [cm. <sup>3</sup> /rev.]
<b>250</b>	- 15.26 [250,1] in. <sup>3</sup> /rev. [cm. <sup>3</sup> /rev.]
<b>315</b>	- 19.26 [315,7] in. <sup>3</sup> /rev. [cm. <sup>3</sup> /rev.]
<b>400</b>	- 24.23 [397,0] in. <sup>3</sup> /rev. [cm. <sup>3</sup> /rev.]

**Pos.2 - Shaft Extensions\*\***

<b>C</b>	- 1" [25,4] straight, Woodruff key
<b>G</b>	- 1" [25,4] SAE 6B Splined

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

<b>1</b>	- side ports, Manifold [5/16-18 UNC Mounting Threads], 7/16-20 UNF
<b>4</b>	- side ports, 2x7/8-14 UNF, O-ring, 7/16-20 UNF

**Pos. 4 - Special Features [See Page 55]**

**Pos. 5 - Design Series**

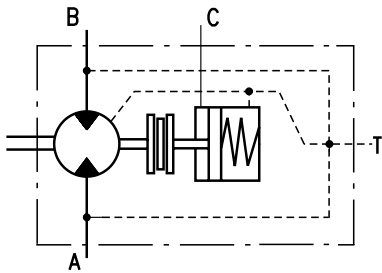
omit - Factory specified

Notes : \* For the Performance Data please look at "M+S Hydraulic" Catalogue for MLHR motors, pages 36÷40.

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

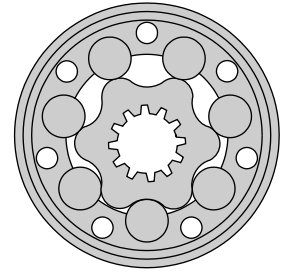
The hydraulic motors are mangano-phosphatized as standard.

# HYDRAULIC MOTORS B/MLHLW...



## APPLICATION

- » transport machines
- » industrial trucks
- » elevators
- » loaders
- » manipulators
- » agricultural machinery
- » extrusion machines
- » metallurgical machines
- » mining machines
- » metal-working machines
- » woodworking machines etc.



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## OPTIONS

- » Model- Spool valve, roll-gerotor
- » Fully integrated friction disk brake;
- » Side ports
- » Shafts- straight, splined and tapered
- » SAE and BSPP ports.

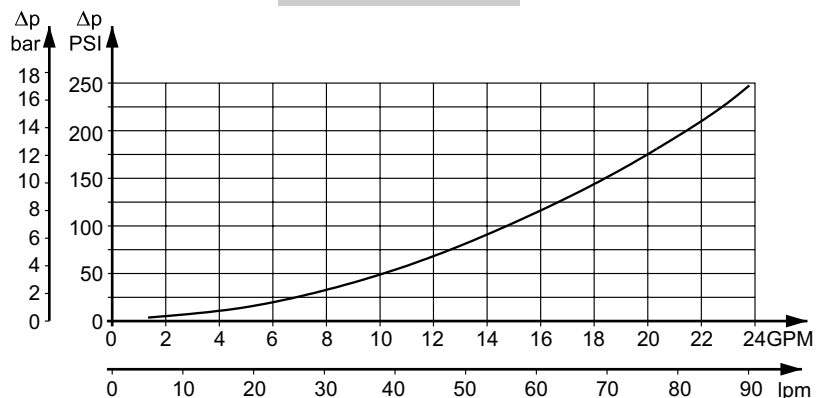
## GENERAL

<b>Displacement,</b> in <sup>3</sup> /rev [cm <sup>3</sup> /rev.]	6.18÷24.2 [101,3÷396,8]
<b>Max. Speed,</b> [RPM]	150÷250
<b>Max. Torque,</b> in-lb [daNm]	2125÷5310 [24÷60]
<b>Max. Output,</b> HP [kW]	7.9÷16.5 [5,9÷12,3]
<b>Max. Pressure Drop,</b> PSI [bar]	1670÷2540 [115÷175]
<b>Max. Oil Flow,</b> GPM [lpm]	6.6÷16 [25÷60]
<b>Min. Starting Torque,</b> in-lb [daNm]	1640÷4070 [18,5÷46]
<b>Pressure fluid</b>	Mineral based- HLP(DIN 51524) or HM(ISO 6743/4)
<b>Temperature range,</b> °F [°C]	-22÷194 [-30÷90]
<b>Optimal Viscosity range, SUS [mm<sup>2</sup>/s]</b>	98÷347 [20÷75]
<b>Filtration</b>	ISO code 20/16 (Min. recommended fluid filtration of 25 micron)

### Oil flow in drain line

Pressure drop PSI [bar]	Viscosity SUS [mm <sup>2</sup> /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



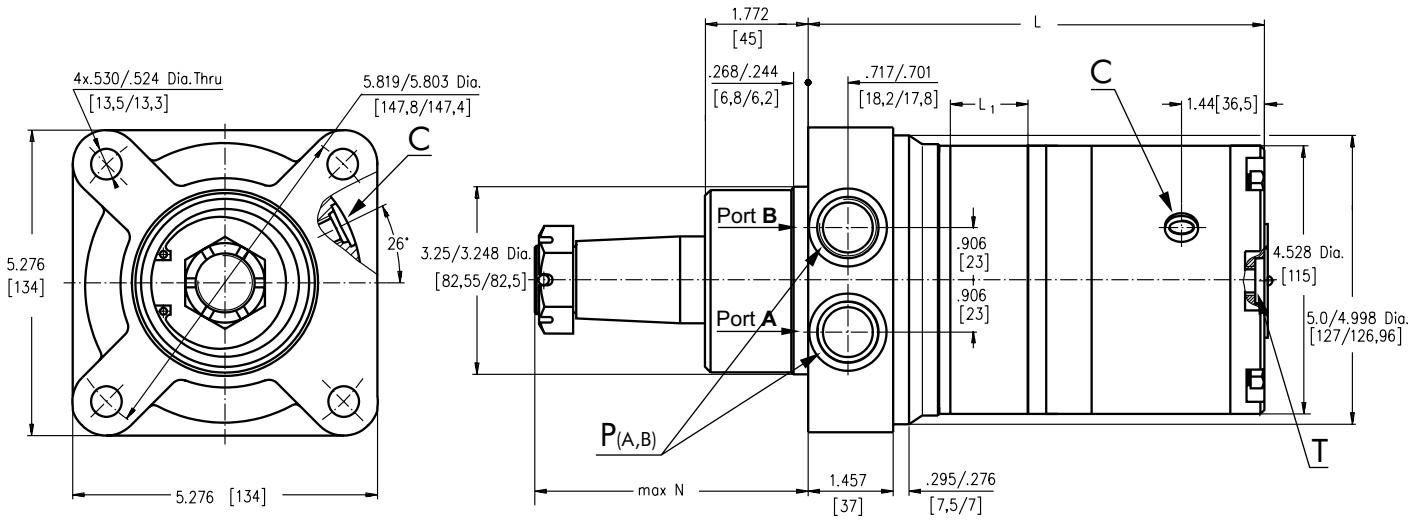
## SPECIFICATION DATA

Type		B/MLHLW 100	B/MLHLW 125	B/MLHLW 160	B/MLHLW 200	B/MLHLW 250	B/MLHLW 315	B/MLHLW 400
Displacement, in. <sup>3</sup> /rev. [cm. <sup>3</sup> /rev.]		6.18 [101,3]	7.69 [126]	9.64 [157,8]	12.28 [201,3]	15.37 [252]	19.21 [314,9]	24.2 [396,8]
Max. Speed, [RPM]	Cont.	250	240	220	200	200	190	150
	Int.*	300	280	250	225	220	220	190
Max. Torque in-lb [daNm]	Cont.	2125 [24]	2640 [29,8]	3310 [37,4]	4090 [46,2]	5045 [57]	4950 [55,9]	5310 [60]
	Int.*	2390 [27]	2980 [33,7]	3735 [42,2]	4600 [52]	5930 [67]	5575 [63]	6020 [68]
Max. Output HP [kW]	Cont.	7.9 [5,9]	9.8 [7,3]	11.5 [8,6]	12.3 [9,2]	16.5 [12,3]	14.7 [11]	11.5 [8,6]
	Int.*	12.1 [9]	14.1 [10,5]	15.6 [11,6]	17.4 [13]	19.3 [14,4]	18 [13,4]	16.2 [12,1]
Max. Pressure Drop, PSI [bar]	Cont.	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	1960 [135]	1670 [115]
	Int.*	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2250 [155]	1960 [135]
Max. Oil Flow GPM [lpm]	Cont.	6.6 [25]	8 [30]	9.2 [35]	10.6 [40]	13.2 [50]	16 [60]	16 [60]
	Int.*	8 [30]	9.2 [35]	10.6 [40]	11.2 [45]	14.5 [55]	18.5 [70]	20 [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]
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]
	Cont. 100-300 RPM	725 [50]	725 [50]	725 [50]	725 [50]	725 [50]	725 [50]	725 [50]
	Int.*	1450 [100]	1450 [100]	1450 [100]	1450 [100]	1450 [100]	1450 [100]	1450 [100]
Min. Starting Torque, in-lb [daNm]	At max.press.drop Cont.	1640 [18,5]	2035 [23]	2550 [28,8]	3150 [35,6]	3895 [44]	3805 [43]	4070 [46]
	At max.press.drop Int.*	1860 [21]	2300 [26]	2875 [32,5]	3540 [40]	4425 [50]	4335 [49]	4780 [54]
Min. Speed***, RPM		10						
Static Torque of Brake, in-lb [daNm]		7080 [80]						
Min. Brake Release Pressure****, PSI [bar]		210÷290 [15÷20]						
Max. Opening Pressure, PSI [bar]		3000 [210]						

- \* 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 of 10 RPM or lower, consult factory or your regional manager.
- \*\*\*\* Motor-brakes must always have a drain line. The brake release pressure is the difference between the pressure in the brake release line and the pressure in the drain line.

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 mm<sup>2</sup>/s] at 122°F [50°C].
5. Recommended maximum system operating temperature is 180°F [82°C].
6. To assure optimum motor life fill with fluid prior to loading and run at moderate load and speed for 10-15 minutes.

**DIMENSIONS AND MOUNTING DATA**



Type	L <sub>max</sub> , in. [mm]	L <sub>1</sub> , in. [mm]
B/MLHLW 100	7.34 [194]	.55 [14,0]
B/MLHLW 125	7.76 [197]	.68 [17,4]
B/MLHLW 160	7.93 [201,5]	.86 [21,8]
B/MLHLW 200	8.17 [207,5]	1.09 [27,8]
B/MLHLW 250	8.45 [214,5]	1.37 [34,8]
B/MLHLW 315	8.80 [223,5]	1.71 [43,5]
B/MLHLW 400	9.23 [234,5]	2.16 [54,8]

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

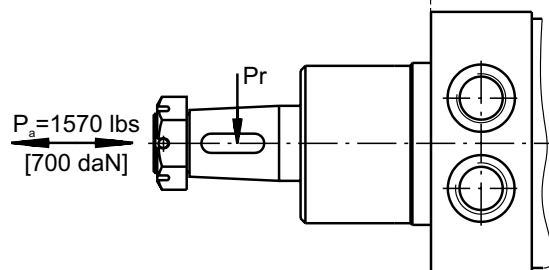
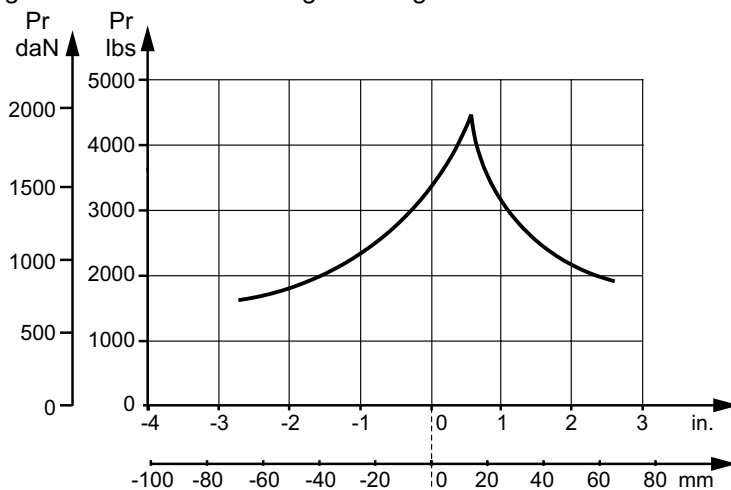
**Reverse Rotation**  
Viewed from Shaft End  
Port A Pressurized - CCW  
Port B Pressurized - CW

	Versions	
	2	4
C	2xG ¼	2x7/16-20UNF, O-ring
P <sub>(A,B)</sub>	2xG ½	2x7/8-14UNF, O-ring
T	G ¼	7/16-20UNF, O-ring



**PERMISSIBLE SHAFT LOADS**

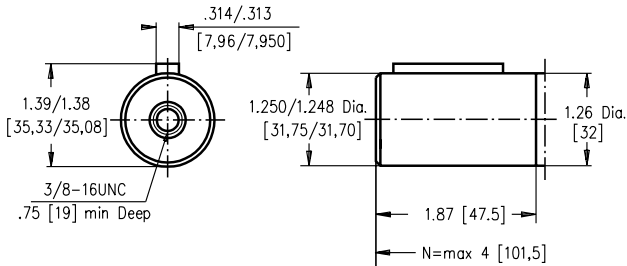
The load diagram is valid for an average bearings life of 2000 hours at 100 RPM



**SHAFT EXTENSIONS**

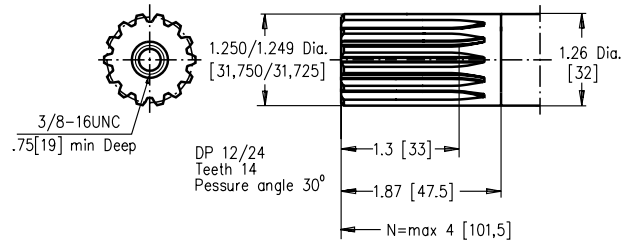
**C**

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



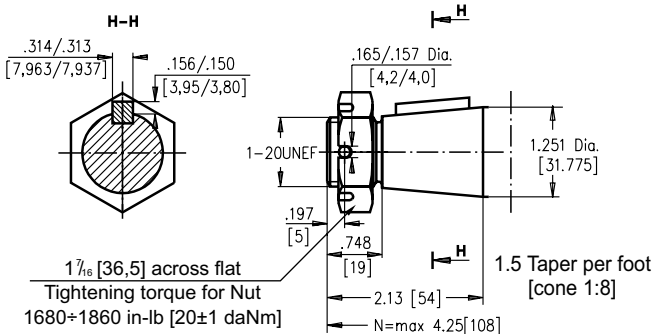
**G**

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



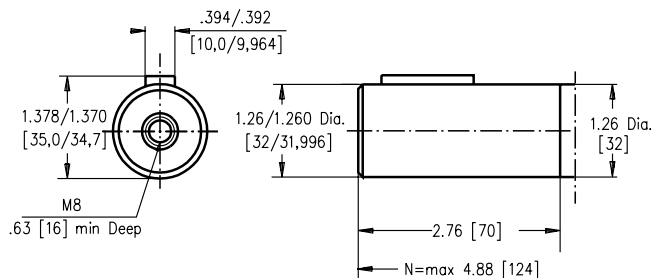
**T**

1/4" [31,75] SAE J501 Tapered, Parallel key 5/16"x5/16"x1/4" BS46  
Max. Torque 6815 in-lb [77 daNm]



**M**

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



**ORDER CODE**

	1	2	3	4	5
<b>B/MLHLW</b>					

**Pos.1 - Displacement code\***

<b>100</b>	- 6.18 [101,3] in <sup>3</sup> /rev [cm <sup>3</sup> /rev]
<b>125</b>	- 7.69 [126,0] in <sup>3</sup> /rev [cm <sup>3</sup> /rev]
<b>160</b>	- 9.64 [157,8] in <sup>3</sup> /rev [cm <sup>3</sup> /rev]
<b>200</b>	- 12.28 [201,3] in <sup>3</sup> /rev [cm <sup>3</sup> /rev]
<b>250</b>	- 15.37 [252,0] in <sup>3</sup> /rev [cm <sup>3</sup> /rev]
<b>315</b>	- 19.21 [314,9] in <sup>3</sup> /rev [cm <sup>3</sup> /rev]
<b>400</b>	- 24.20 [396,8] in <sup>3</sup> /rev [cm <sup>3</sup> /rev]

**Pos.2 - Shaft Extensions\*\***

<b>C</b>	- 1/4" [31,75] straight, Parallel key 5/16"x5/16"x1/4" BS46
<b>G</b>	- 1/4" [31,75] splined 14T, ANSI B92.1-1976
<b>M</b>	- ø32 straight, Parallel key A10x8x32 DIN 6885
<b>T</b>	- 1/4" [31,75] Tapered, Parallel key 5/16"x5/16"x1/4" BS46

**Pos.3 - Ports**

<b>2</b>	- BSPP (ISO 228)
<b>4</b>	- SAE (ANSI B1.1-1982)

**Pos.4 - Special Features [See Page 55]**

**Pos.5 - Design Series**

omit - Factory specified

Notes : \* For the Performance Data please look at "M+S Hydraulic" Catalogue for MLHH motors, pages 46÷48.

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

The hydraulic motors are mangano-phosphatized as standard.

# MOTOR SPECIAL FEATURES

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Special Feature Description	Order Code	Motor type								
		MLHPL	MLHRL	HP	HR	MLHRW	HW	MLHLW	B/HR	B/MLHLW
Motor for Speed Sensor*	RS	-	-	O	O	-	-	-	-	-
Low Leakage	LL	O	O	O	O	O	O	O	O	O
Low Speed Valving	LSV	O	O	O	O	O	O	O	O	O
Free Running	FR	O	O	O	O	-	-	-	-	-
Reverse Rotation	R	O	O	O	O	O	O	O	O	O
Paint**	P	O	O	O	O	O	O	O	O	O
Corrosion Protected Paint**	PC	O	O	O	O	O	O	O	O	O
Check Valves		S	S	-	-	S	S	S	-	-

**O** Optional

- Not applicable

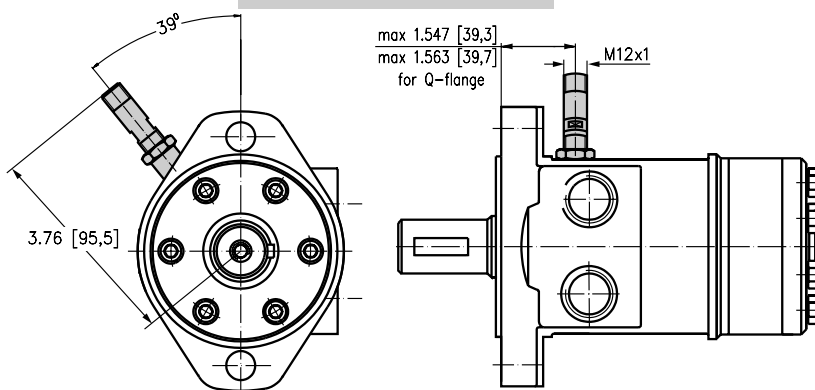
**S** Standard

\* for sensor ordering see page 56

\*\* color at customer's request.

# MOTORS WITH SPEED SENSOR

## HP...RS and HR...RS

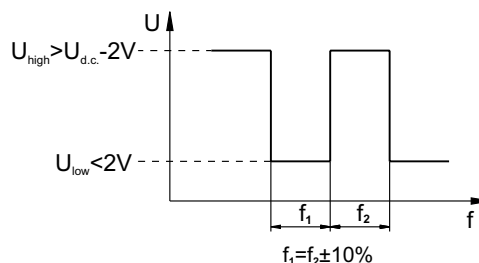


## TECHNICAL DATA OF THE SPEED SENSOR

### Technical data

Frequency range	3...20 000 Hz
Output	PNP, NPN
Power supply	10...36 VDC
Current input	20 mA (@24 VDC)
Current load	500 mA (@24 VDC; 75°F [24°C])
Ambient Temperature	-40...+257°F [-40...+125°C]
Protection	IP 67
Plug connector	M12-Series
Mounting principle	ISO 6149

### Output signal

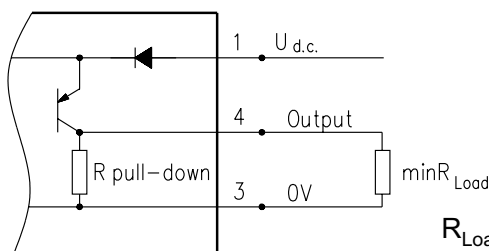


Load max.:  $I_{high} = I_{low} < 50\text{mA}$

Motor type	HP	HR
Pulses per revolution	36	36

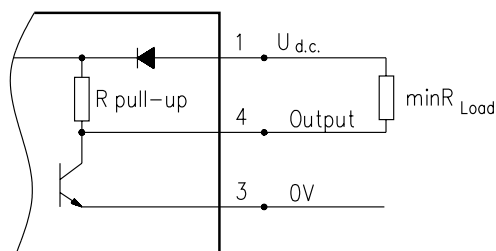
### Wiring diagrams

#### PNP

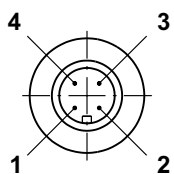


$$R_{Load} = U_{d.c.} / I_{max} (=50\text{mA})$$

#### NPN



### 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	Output type	Electric connection
RSN	NPN	Connector BINDER 713 series
RSP	PNP	Connector BINDER 713 series
RSNL5	NPN	Cable output 3x0,25; 196 in [5m] long
RSPL5	PNP	Cable output 3x0,25; 196 in [5m] 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.

# HYDRAULIC MOTORS

## MOTOR APPLICATION

### VEHICLE DRIVE CALCULATIONS

#### 1. Motor speed: n, RPM

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

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

$v_{ml}$ - vehicle speed, mil/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:

$$RR = G \times$$

$G$ - total weight loaded on vehicle, lbs [daN];

- rolling resistance coefficient (Table 1).

Table 1

Rolling resistance coefficient In case of rubber tire rolling on different surfaces	
Surface	
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]

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

- gradient negotiation angle (Table 2)

Table 2

Grade %	$\alpha$ Degrees	Grade %	$\alpha$ 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. Accelerate force: FA, lbs [daN]

Force  $FA$  necessary for acceleration from 0 to maximum speed  $v$  and time  $t$  can be calculated with a formula:

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

$FA$ - accelerate 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, in-lb[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;

$\eta_m$ -mechanical gear efficiency (if it is available).

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

$$M_w = \frac{G_w \times f \times R_{in} [R_m]}{i \times \eta_m}$$

To avoid wheel slipping, it should be observed the following condition  $M_w > M$

$f$  - frictional factor;

$G_w$ - total weight over the wheels, lbs [daN].

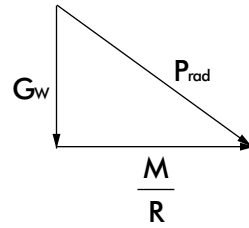
Table 3

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.

