TÜV CERT
EN ISO 9001:2000
Zertifikat:75.100.40141
TÜV Rheinland InterCert

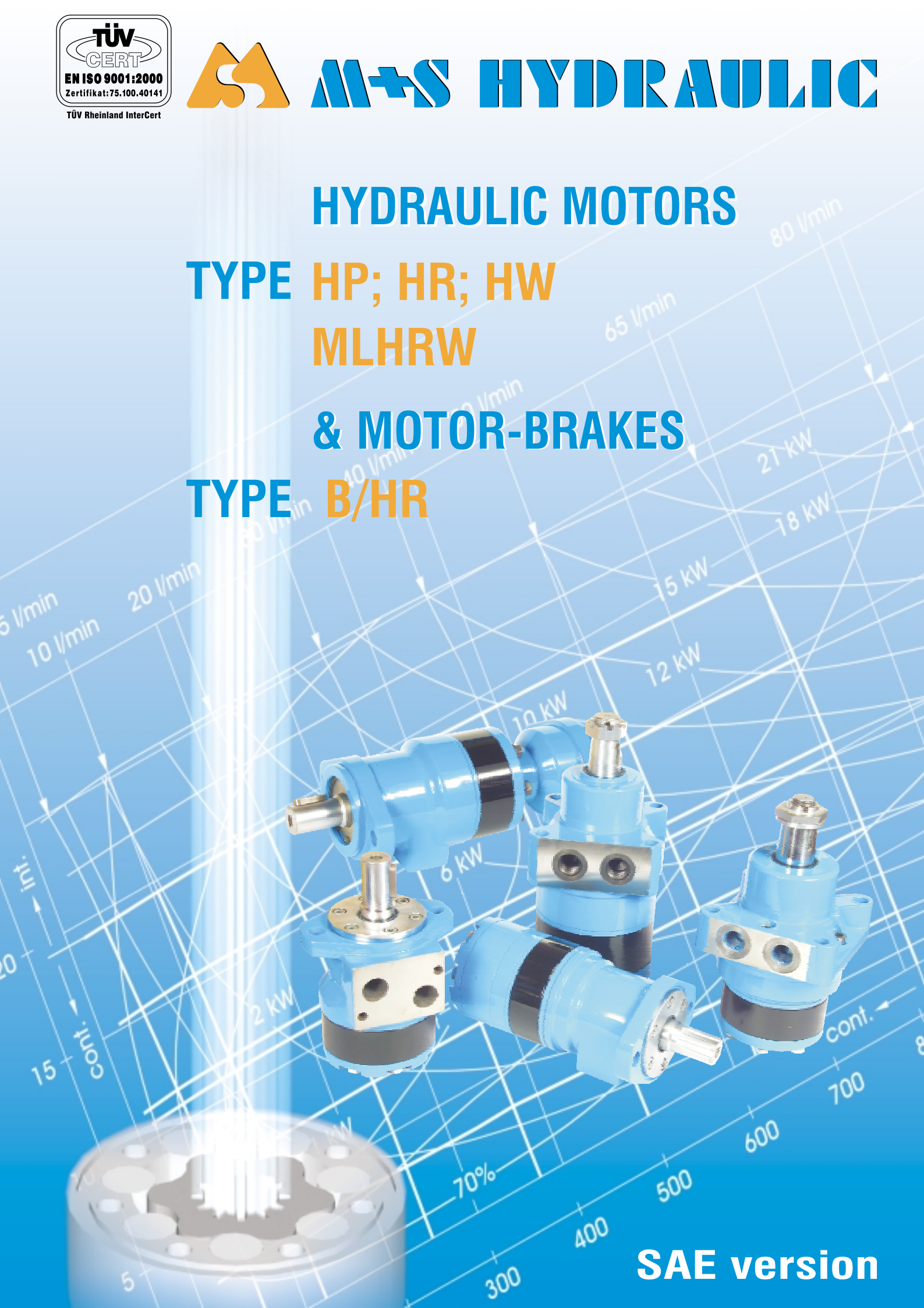
M+S HYDRAULIC

HYDRAULIC MOTORS

TYPE HP; HR; HW
MLHRW

& MOTOR-BRAKES

TYPE B/HR



SAE version

SPECIAL HYDRAULIC MOTORS AND MOTOR-BRAKES

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SPECIAL HYDRAULIC MOTORS AND MOTOR-BRAKES

GENERAL INFORMATION:

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

DISTRIBUTOR VALVE

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

GEARWHEEL SET

There are two forms of gearwheel set:

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

- Roll-gerotor set 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. Roll-gerotor sets are recommended for operation with thin oil and for applications with continually reversing loads. HR, MLHRW and HW series motors have roll-gerotor set.

FEATURES:

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

Wheel Motor **W** mounting flange makes the motors MLHRW and HW possible to fit a wheel hub or a winch drum so that the radial load acts closer to motor bearings. The output shaft is supported on needle bearings and it makes MLHRW and HW suitable to absorb static and dynamic loads. This gives the best utilization of the bearing capacity and is a very compact solution.

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

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

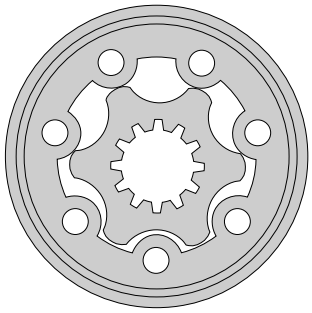
Free Running **FR** motors are with increased clearance at all friction parts, allowing the shaft to rotate more freely with less mechanical drag. The increased clearance also improves lubrication of the wear surfaces of gear set and friction parts. Additional advantages of “FR” version are prolonging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

Motor-brake B/HR **B/HR** is a combination between spool valve hydraulic motors, type HR and parking brake with friction discs, built in the end side of the hydraulic motor. The disk brake is released by hydraulic pressure. This motor-brakes is very compact solution for applications like winches and small automotive transmission systems.

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

OPTIONS

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

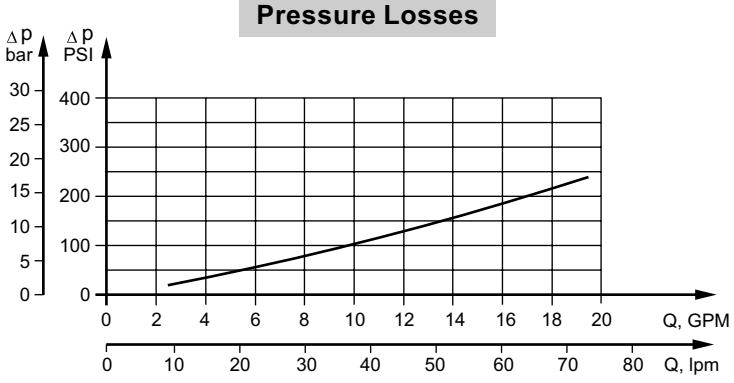
GENERAL

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

Oil flow in drain line

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

Pressure Losses



SPECIFICATION DATA

Type		HP 25	HP 32	HP 40	HP 50	HP 80	HP 100
Displacement, in.³/rev. [cm.³/rev.]		1.52 [25]	1.95 [32]	2.44 [40]	3.02 [49,5]	4.83 [79,2]	6.04 [99,0]
Max. Speed,	Cont.	1600	1560	1515	1210	755	605
[RPM]	Int.*	1815	1720	1760	1515	945	755
Max. Torque	Cont.	290 [3,3]	380 [4,3]	550 [6,2]	725 [8,2]	1210 [13,7]	1500 [17,0]
in-lb [daNm]	Int.*	415 [4,7]	540 [6,1]	730 [8,2]	1050 [11,9]	1725 [19,5]	2100 [23,7]
Max. Output	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]
HP [kW]	Int.*	8.2 [6,1]	10.5 [7,8]	15.5 [11,6]	18.8 [14]	19.7 [14,7]	19.4 [14,5]
Max. Pressure Drop	Cont.	1450 [100]	1450 [100]	1750 [120]	1815 [125]	1815 [125]	1815 [125]
PSI [bar]	Int.*	2030 [140]	2030 [140]	2250 [155]	2540 [175]	2540 [175]	2540 [175]
Max. Oil Flow	Cont.	10.5 [40]	13.2 [50]	16 [60,6]	16 [60,6]	16 [60,6]	16 [60,6]
GPM [lpm]	Int.*	12 [45,4]	14.5 [55]	18.5 [70]	20 [75,7]	20 [75,7]	20 [75,7]
Max. Inlet Pressure	Cont.	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]
PSI [bar]	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]
Max. Return Pres-	Cont.	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]
sure with Drain Line	Int.*	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]
PSI [bar]	Peak**	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]
Max. Starting Pressure with Unloaded Shaft, PSI [bar]		145 [10]	145 [10]	145 [10]	145 [10]	145 [10]	145 [10]
Min. Starting Torque	At max.press. drop Cont.	265 [3,0]	355 [4,0]	480 [5,4]	610 [6,9]	1040 [11,7]	1310 [14,8]
in-lb [daNm]	At max.press. drop Int.*	370 [4,2]	500 [5,6]	600 [6,8]	885 [10]	1490 [16,8]	1860 [21]
Min. Speed*, [RPM]**		20	15	10	10	10	10
Weight, lb [kg]	HP	11.9 [5,4]	11.9 [5,4]	12.1 [5,5]	12.3 [5,6]	12.6 [5,7]	13.0 [5,9]
	HPQ	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.
1. Intermittent speed and intermittent pressure drop must not occur simultaneously.
2. Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
3. Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP(DIN51524) or HM (ISO 6743/4). If using synthetic fluids consult the factory for alternative seal materials.
4. Recommended minimum oil viscosity 70 SUS [13 mm²/s] at 122ºF [50ºC].
5. Recommended maximum system operating temperature is 180ºF [82ºC].
6. To assure optimum motor life fill with fluid prior to loading and run at moderate load and speed for 10-15 minutes.

SPECIFICATION DATA (continued)

Type		HP 125	HP 160	HP 200	HP 250	HP 315	HP 400
Displacement, in.³/rev. [cm.³/rev.]		7.55 [123,8]	9.66 [158,4]	12.1 [198]	15.1 [247,5]	19.3 [316,8]	24.16 [396]
Max. Speed,	Cont.	486	378	303	242	190	150
[RPM]	Int.*	605	472	378	303	236	189
Max. Torque	Cont.	1885 [21,3]	2335 [26,4]	2655 [30,0]	2920 [33,0]	3060 [34,6]	2965 [33,5]
in-lb [daNm]	Int.*	2640 [29,8]	2920 [33,0]	3090 [34,9]	3585 [40,5]	3560 [40,2]	3630 [41,0]
Max. Output	Cont.	11.8 [8,8]	11.4 [8,5]	10.6 [7,9]	9 [6,7]	7 [5,2]	5.5 [4,1]
HP [kW]	Int.*	17.4 [13]	16.1 [12]	16.1 [12]	13 [9,7]	9.5 [7,1]	8 [6]
Max. Pressure Drop	Cont.	1815 [125]	1740 [120]	1670 [115]	1450 [100]	1235 [85]	945 [65]
PSI [bar]	Int.*	2540 [175]	2250 [155]	2175 [150]	1815 [125]	1450 [100]	1160 [80]
Max. Oil Flow	Cont.	16 [60,6]	16 [60,6]	16 [60,6]	16 [60,6]	16 [60,6]	16 [60,6]
GPM [lpm]	Int.*	20 [75,7]	20 [75,7]	20 [75,7]	20 [75,7]	20 [75,7]	20 [75,7]
Max. Inlet Pressure	Cont.	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]
PSI [bar]	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]
Max. Return Pres-	Cont.	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]
sure with Drain Line	Int.*	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]
PSI [bar]	Peak**	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]
Max. Starting Pressure with Unloaded Shaft, PSI [bar]		145 [10]	145 [10]	100 [7]	100 [7]	100 [7]	100 [7]
Min. Starting Torque	At max.press. drop Cont.	1630 [18,4]	2130 [24,1]	2440 [27,5]	2700 [30,5]	2870 [32,4]	2840 [32]
in-lb [daNm]	At max.press. drop Int.*	2360 [26,6]	2780 [31,4]	3230 [36,5]	3430 [38,7]	3920 [44,2]	3740 [42,2]
Min. Speed*, [RPM]**		10	10	10	10	10	10
Weight, lb [kg]	HP	13.23 [6,0]	13.67 [6,2]	14.11 [6,4]	14.56 [6,6]	15.22 [6,9]	16.32 [7,4]
	HPQ	11.91 [5,4]	12.35 [5,6]	12.79 [5,8]	13.23 [6,0]	13.89 [6,3]	15.00 [6,8]

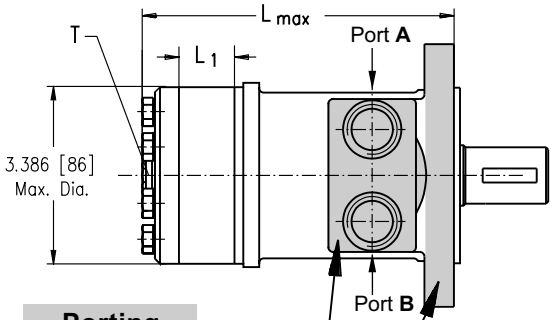
* Intermittent operation: the permissible values may occur for max. 10% of every minute.

** 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 mm²/s] at 122ºF [50ºC].
5. Recommended maximum system operating temperature is 180ºF [82ºC].
6. To assure optimum motor life fill with fluid prior to loading and run at moderate load and speed for 10-15 minutes.

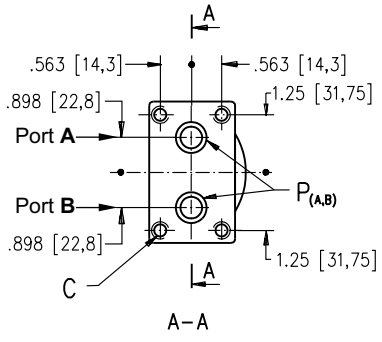
DIMENSIONS AND MOUNTING DATA FOR HP

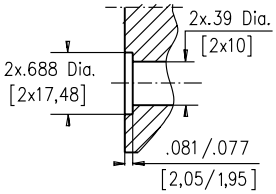


Porting

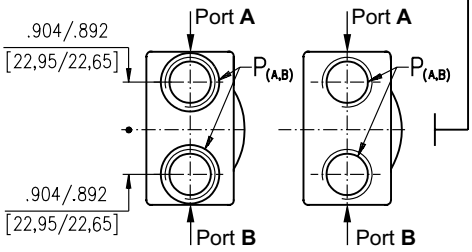
Side Ports

Version 1 3



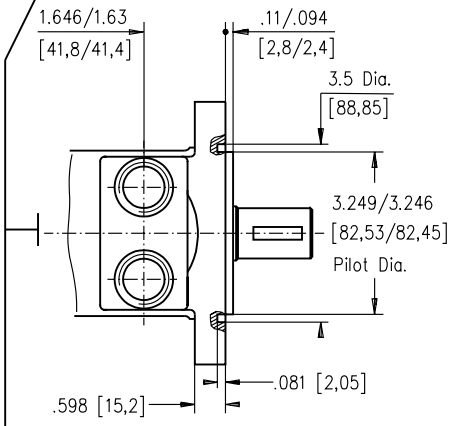


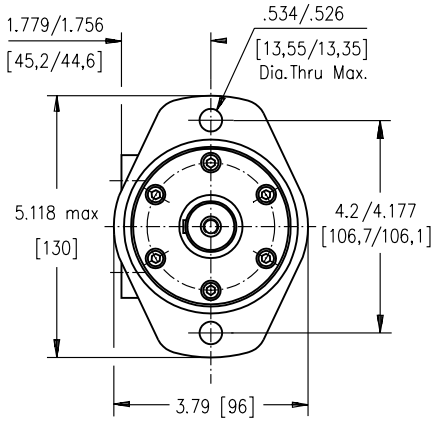
Version 4 Version 5



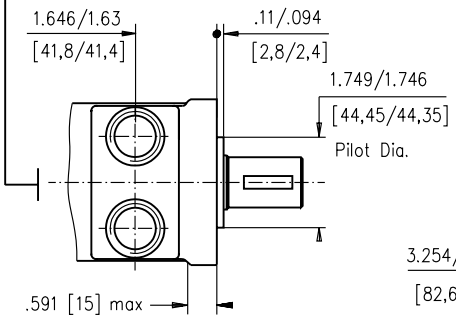
Mounting

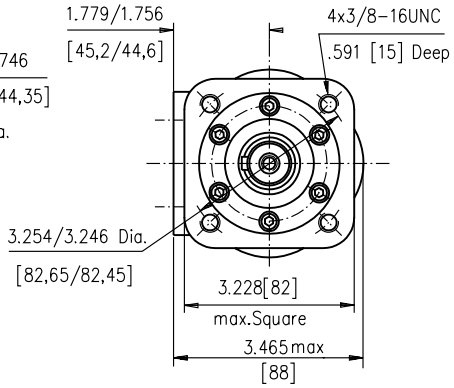
SAE A Flange

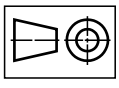




Q Square Flange







Type	Lmax,in. [mm]	L_1, 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]

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

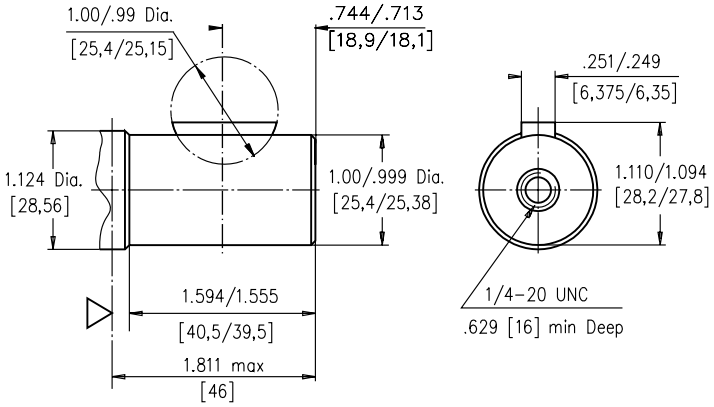
Reverse Rotation
Viewed from Shaft End
Port **A** Pressurized - **CCW**
Port **B** Pressurized - **CW**

Versions				
	1	3	4	5
C	4x 5/16-18UNC	4x M8	-	-
P(A,B)	2x.39 Dia. [2x10]	2x.39 Dia. [2x10]	2x 7/8-14UNF	2x½-14NPTF
T	7/16 -20UNF	7/16 -20UNF	7/16 -20UNF	7/16 -20UNF

SHAFT EXTENSIONS FOR HP AND HR MOTORS

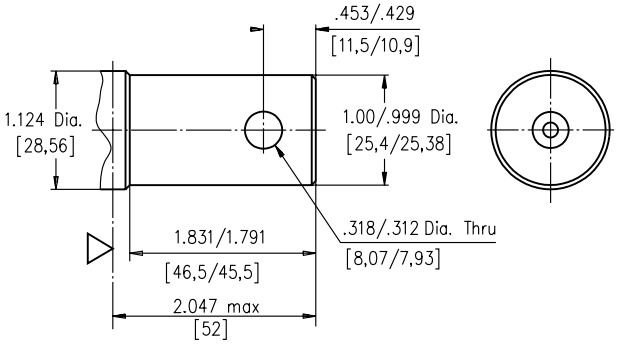
C

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



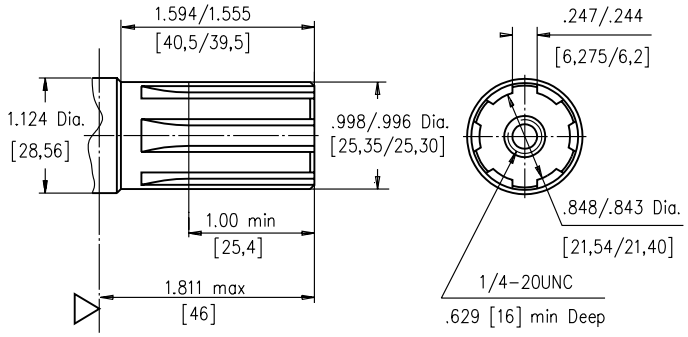
H

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



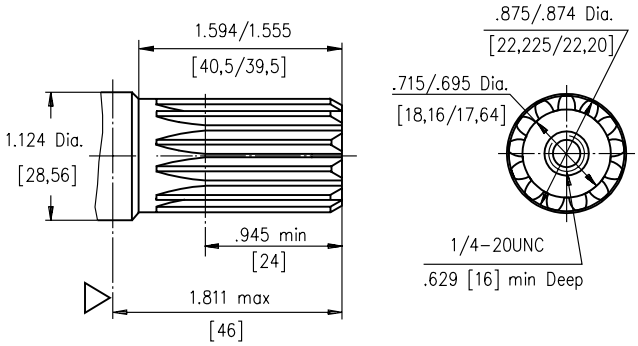
G

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



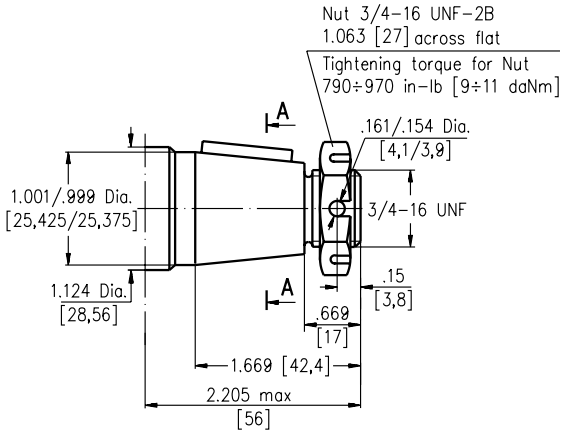
S

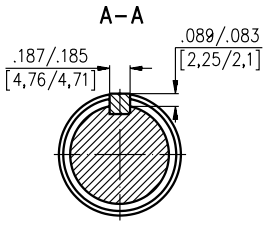
13T Splined, 7/8" [22,2], ANS B 92.1-1976
Max. Torque 3200 in-lb [36 daNm]



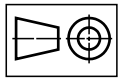
T

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





1.5 Taper per Foot
[cone 1:8]



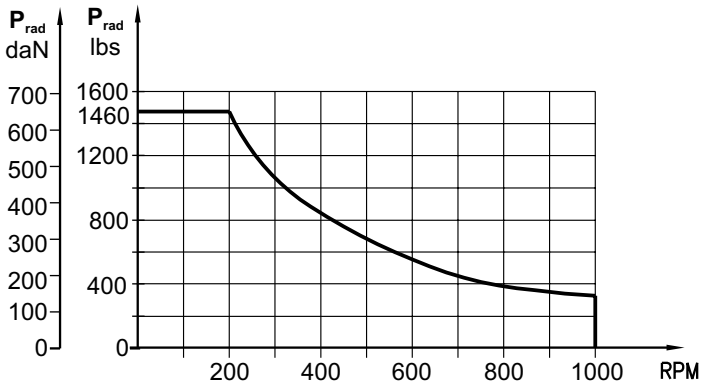
∇- Motor Mounting Surface
Requirement max. Torque must be not exceeded.

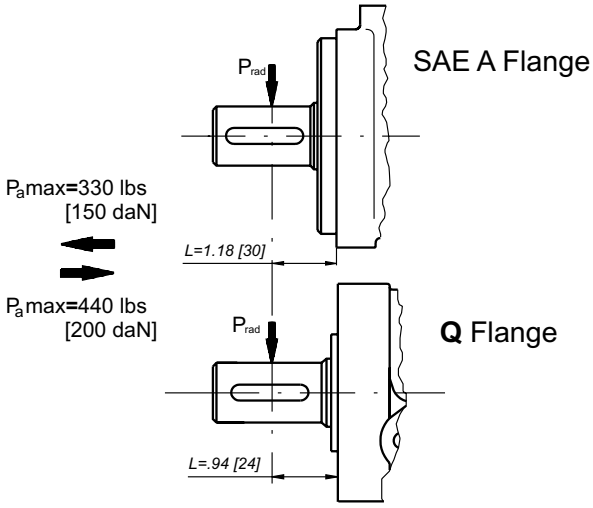
PERMISSIBLE SHAFT LOADS FOR HP AND HR MOTORS

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

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

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



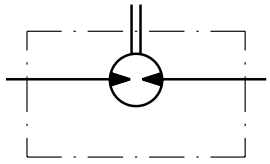


MAX. PERMISSIBLE SHAFT SEAL PRESSURE FOR HP AND HR MOTORS

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

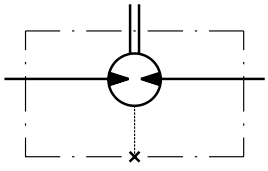
The shaft seal pressure equals the average of input pressure and return pressure.

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

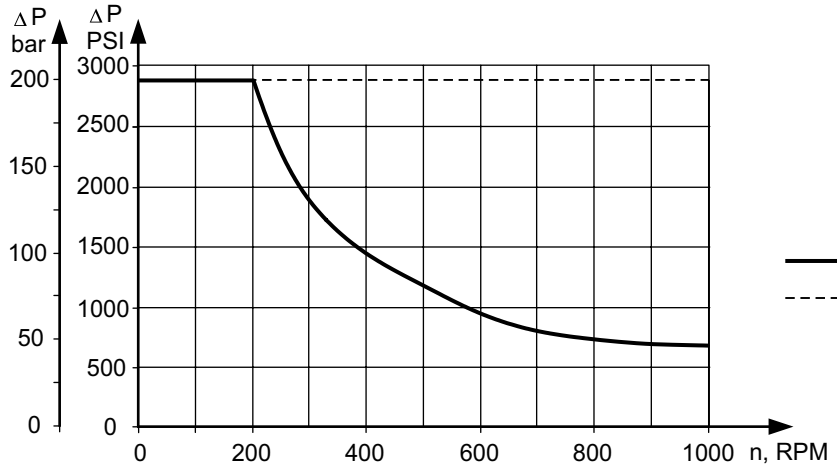


HP...U and HR...U motors with high pressure seal and drain connection:

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
H P					**U**			

Pos.1 - Mounting Flange

omit - SAE A, two holes

Q - Square, four bolts

Pos.2 - Displacement code*

25	- 1.52 [25,0] in.^{3}/rev. [cm.^{3}/rev.]
32	- 1.95 [32,0] in.^{3}/rev. [cm.^{3}/rev.]
40	- 2.44 [40,0] in.^{3}/rev. [cm.^{3}/rev.]
50	- 3.02 [49,5] in.^{3}/rev. [cm.^{3}/rev.]
80	- 4.83 [79,2] in.^{3}/rev. [cm.^{3}/rev.]
100	- 6.04 [99,0] in.^{3}/rev. [cm.^{3}/rev.]
125	- 9.66 [123,8] in.^{3}/rev. [cm.^{3}/rev.]
160	- 9.74 [158,4] in.^{3}/rev. [cm.^{3}/rev.]
200	- 12.10 [198,0] in.^{3}/rev. [cm.^{3}/rev.]
250	- 15.10 [247,5] in.^{3}/rev. [cm.^{3}/rev.]
315	- 19.30 [316,8] in.^{3}/rev. [cm.^{3}/rev.]
400	- 24.16 [396,0] in.^{3}/rev. [cm.^{3}/rev.]

Pos.3 - Shaft Extensions**

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

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 9]

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 38]

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.*

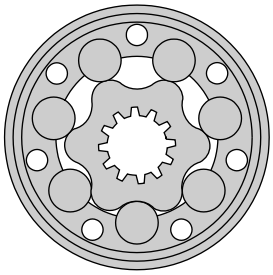
*** The permissible output torque for shafts must not be exceeded!*

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

OPTIONS

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

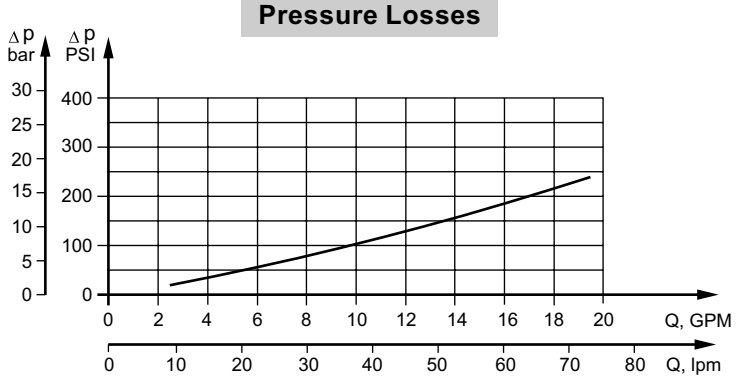
GENERAL

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

Oil flow in drain line

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

Pressure Losses



SPECIFICATION DATA

Type		HR 50	HR 80	HR 100	HR 125	HR 160	HR 200	HR 250	HR 315	HR 400
Displacement, in.³/rev. [cm.³/rev.]		3.14 [51,5]	4.90 [80,3]	6.09 [99,8]	7.67 [125,7]	9.74 [159,6]	12.19 [199,8]	15.26 [250,1]	19.26 [315,7]	24.23 [397]
Max. Speed,	Cont.	734	750	600	475	375	300	240	190	150
[RPM]	Int.*	1029	940	750	600	470	375	300	240	191
Max. Torque	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]
in-lb [daNm]	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]
Max. Output	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]
HP [kW]	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]
Max. Pressure Drop	Cont.	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]	1810 [125]	1595 [110]	1450 [100]	1305 [90]
PSI [bar]	Int.*	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2250 [155]	2030 [140]	1810 [125]	1520 [105]
Max. Oil Flow	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]
GPM [lpm]	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]
Max. Inlet Pressure	Cont.	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]
PSI [bar]	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]
Max. Return Pres-	Cont.	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]
sure with Drain Line	Int.*	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]
PSI [bar]	Peak**	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]
Max. Starting Pressure with Unloaded Shaft, PSI [bar]		145 [10]	145 [10]	145 [10]	130 [9]	102 [7]	73 [5]	58 [4]	44 [3]	44 [3]
Min. Starting Torque	At max.press.									
in-lb [daNm]	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]
Min. Speed*, [RPM]**		10	10	10	10	10	10	10	10	10
Weight, lb [kg]	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]

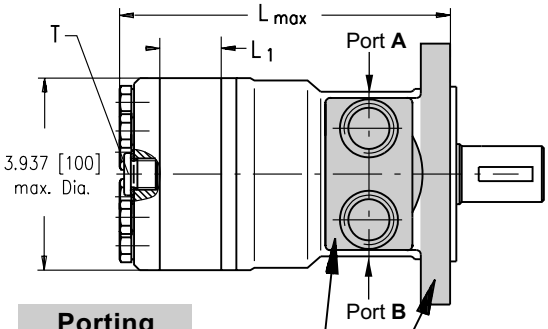
* Intermittent operation: the permissible values may occur for max. 10% of every minute.

** 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 mm²/s] at 122ºF [50ºC].
5. Recommended maximum system operating temperature is 180ºF [82ºC].
6. To assure optimum motor life fill with fluid prior to loading and run at moderate load and speed for 10-15 minutes.

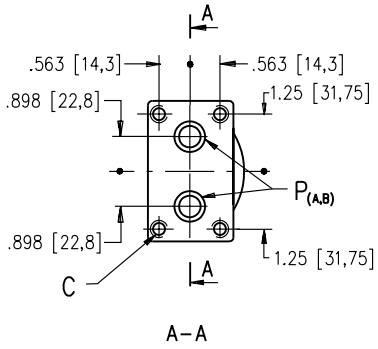
DIMENSIONS AND MOUNTING DATA FOR HR

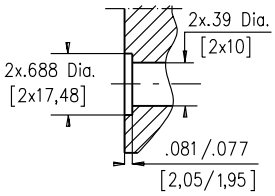


Porting

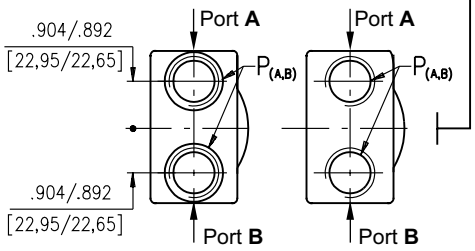
Side Ports

Version 1 3



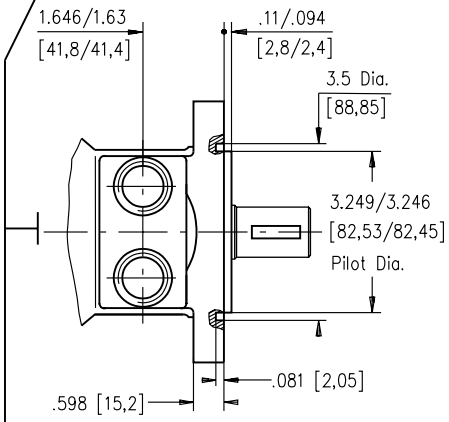


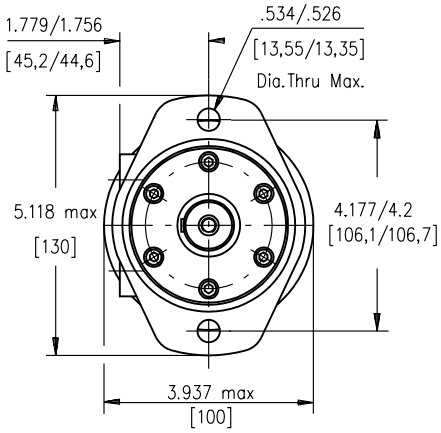
Version 4 Version 5



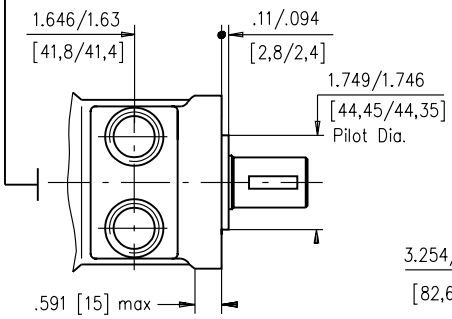
Mounting

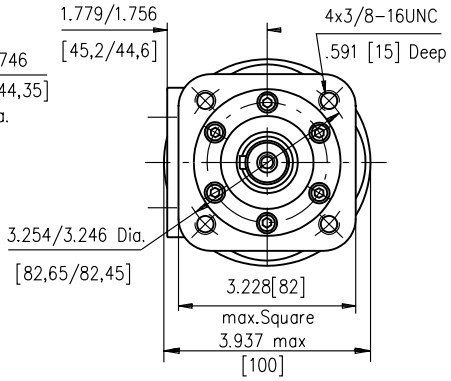
SAE A Flange

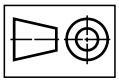




Q Square Flange







Type	Lmax,in. [mm]	L_1,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]

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

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

Versions				
	1	3	4	5
C	4x 5/16-18UNC	4x M8	-	-
$P_{(A,B)}$	2x.39 Dia. [2x10]	2x.39 Dia. [2x10]	2x 7/8-14UNF	2x½ -14NPTF
T	7/16 -20UNF	7/16 -20UNF	7/16 -20UNF	7/16 -20UNF

ORDER CODE

	1	2	3	4	5	6	7	8
H R					**U**			

Pos.1 - Mounting Flange

omit - SAE A, two holes

Q - Square, four bolts

Pos.2 - Displacement code*

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

Pos.3 - Shaft Extensions** [see page 8]

C	- 1" [25,4] straight, Woodruff key
G	- 1" [25,4] SAE 6B Splined
H	- 1" [25,4] straight, w/.315 [8] Cross-hole
S	- $^7/_8$" [22,2] 13T Splined
T	- 1" [25,4] SAE J501 Tapered

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 9]

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 38]

Pos. 8 - Design Series

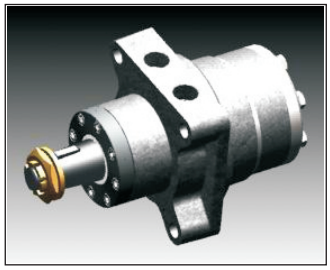
omit - Factory specified

*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!*

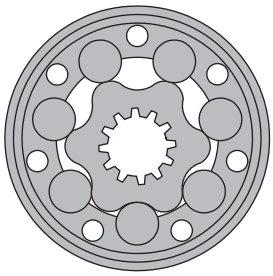
The hydraulic motors are mangano-phosphatized as standard.

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.



CONTENTS

OPTIONS

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

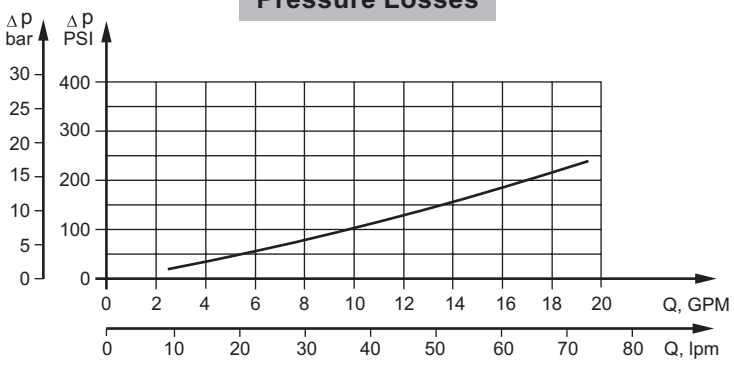
GENERAL

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

Oil flow in drain line

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

Pressure Losses



SPECIFICATION DATA

Type		MLHRW 50	MLHRW 80	MLHRW 100	MLHRW 125	MLHRW 160	MLHRW 200	MLHRW 250	MLHRW 315	MLHRW 400
Displacement, in.³/rev.		3.14	4.90	6.09	7.67	9.74	12.19	15.26	19.26	24.4
[cm.³/rev.]		[51,5]	[80,3]	[99,8]	[125,7]	[159,6]	[199,8]	[250,1]	[315,7]	[397]
Max. Speed,	Cont.	734	750	607	482	379	303	240	190	152
[RPM]	Int.*	1029	940	758	602	474	379	303	242	191
Max. Torque	Cont.	900 [10,1]	1725 [19,5]	2125 [24]	2655 [30]	3450 [39]	4000 [45]	4780 [54]	4870 [55]	5400 [61]
in-lb [daNm]	Int.*	1150 [13]	1947 [22]	2480 [28]	3010 [34]	3805 [43]	4425 [50]	5400 [61]	5580 [63]	6100 [69]
	Peak**	1505 [17]	2390 [27]	2832 [32]	3275 [37]	4070 [46]	4960 [56]	6280 [71]	7350 [83]	7700 [87]
Max. Output	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]
HP [kW]	Int.*	11.9 [8,5]	20.1 [15]	20.1 [15]	19.5 [14,5]	18.8 [14]	17.4 [13]	16.1 [12]	14.8 [11]	14.2 [10,6]
Max. Pressure Drop	Cont.	2030 [140]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	1960 [135]	1670 [115]
PSI [bar]	Int.*	2540 [175]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2320 [160]	2030 [140]
	Peak**	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3045 [210]	2540 [175]
Max. Oil Flow	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]
GPM [lpm]	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]
Max. Inlet Pressure	Cont.	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]
PSI [bar]	Int.*	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]
	Peak**	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]
Max. Return Pres-	Cont.	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]
sure with Drain Line	Int.*	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2900 [200]
PSI [bar]	Peak**	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3260 [225]
Max. Starting Pressure with Unloaded Shaft, PSI [bar]		145 [10]	145 [10]	145 [10]	130 [9]	102 [7]	73 [5]	73 [5]	73 [5]	73 [5]
Min. Starting Torque	At max.press.									
in-lb [daNm]	drop Cont.	710 [8]	1330 [15]	1770 [20]	2215 [25]	2832 [32]	3630 [41]	4425 [50]	4425 [50]	4425 [50]
	At max.press.									
	drop Int.*	885 [10]	1505 [17]	2035 [23]	2480 [28]	3275 [37]	4070 [46]	4870 [55]	5840 [66]	5400 [61]
Min. Speed***, [RPM]		10	10	10	9	7	5	6	5	5
Weight, lb [kg]		21.2	21.4	21.7	22.1	22.7	23.8	24.9	26	27.63
		[9,6]	[9,7]	[9.8]	[10,0]	[10,3]	[10,8]	[11,3]	[11,8]	[12,5]

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

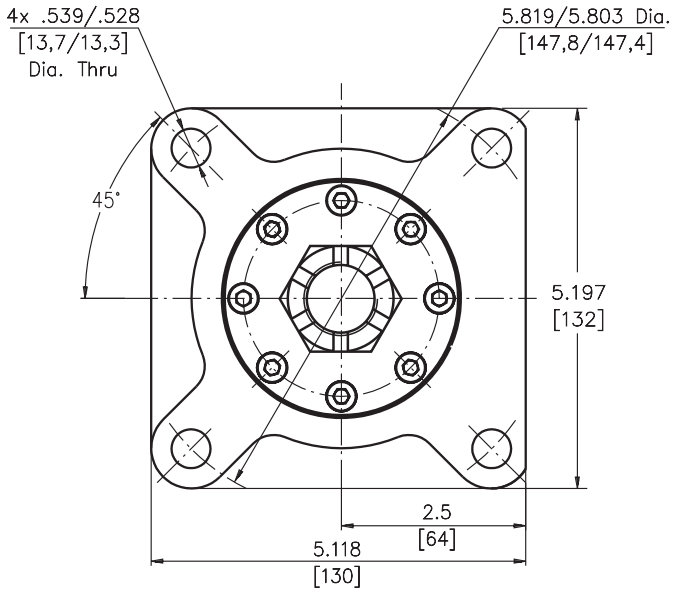
** Peak load: the permissible values may occur for max. 1% of every minute.

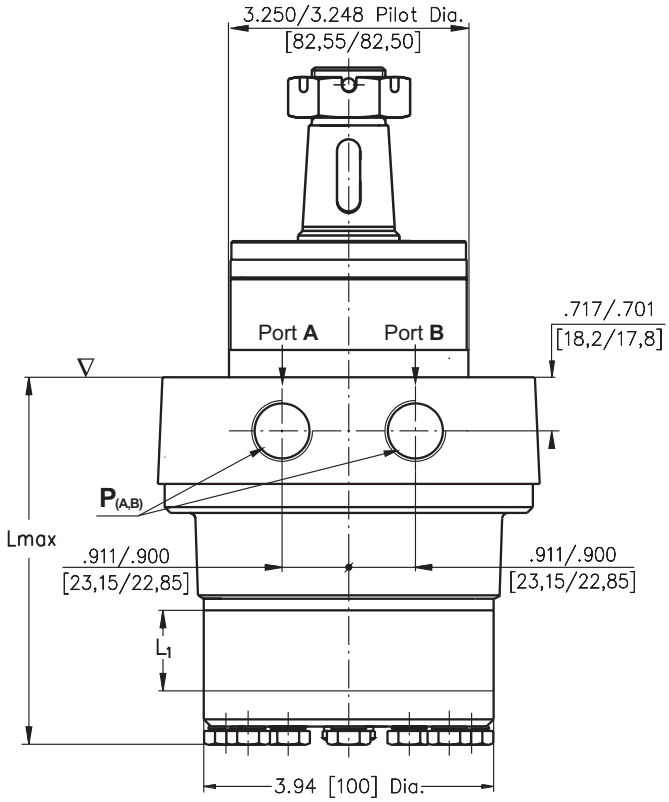
*** For speeds of 10 RPM or lower than given, consult factory or your regional manager.

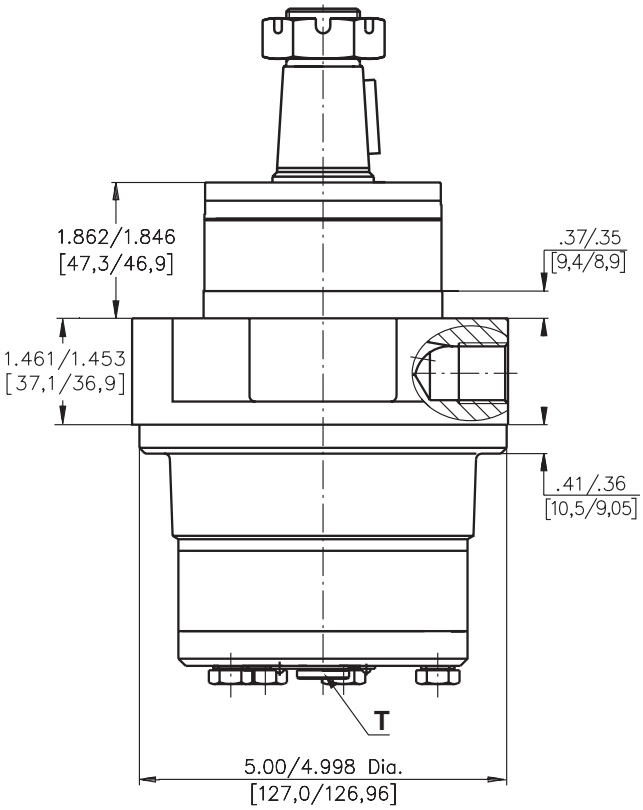
1. Intermittent speed and intermittent pressure must not occur simultaneously.
2. Recommended filtration is per ISO cleanliness code 20/16. A nominal foltration of 25 micron or better.
3. Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP(DIN51524) or HM (ISO 6743/4). If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

DIMENSIONS AND MOUNTING DATA - MLHRW (WHEEL MOTOR)

Type	L_{max},in. [mm]	L_1,in.[mm]
MLHRW 50	4.25 [108,0]	.35 [9,0]
MLHRW 80	4.45 [113,0]	.55 [14,0]
MLHRW 100	4.59 [116,5]	.69 [17,4]
MLHRW 125	4.74 [120,5]	.86 [21,8]
MLHRW 160	4.98 [126,5]	1.09 [27,8]
MLHRW 200	5.26 [133,5]	1.37 [34,8]
MLHRW 250	5.61 [142,5]	1.71 [43,5]
MLHRW 315	6.04 [153,5]	2.16 [54,8]
MLHRW 400	6.63 [168,5]	2.73 [69,4]







∇- Motor Mounting Surface

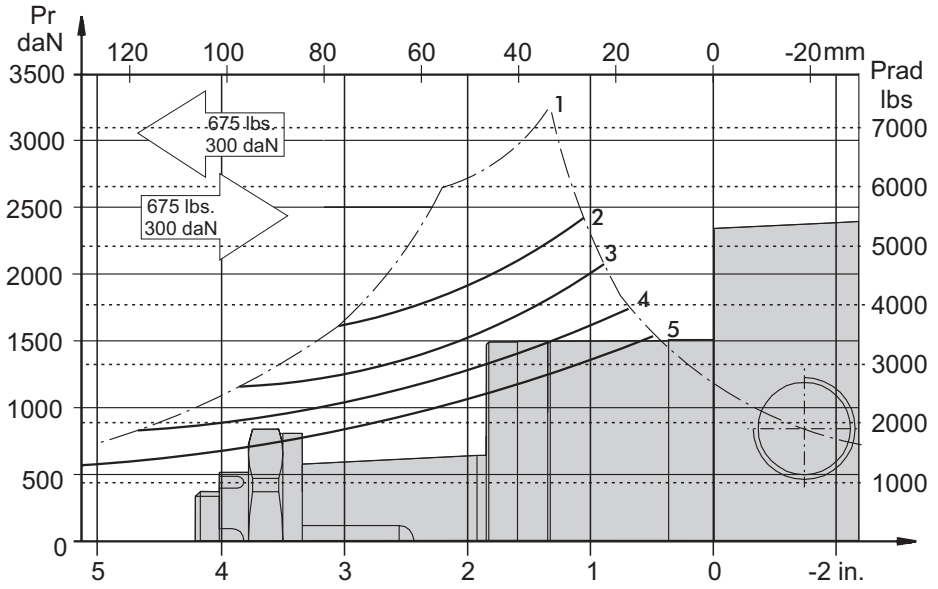
Standard Rotation
Viewed from Shaft End
Port A Pressurized - **CW**
Port B Pressurized - **CCW**

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

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

PERMISSIBLE SHAFT LOADS MLHRW

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

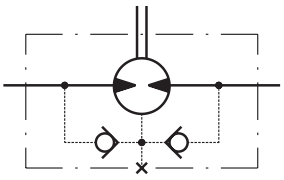


1. Permissible radial shaft load
2. Drawing by n= 50 RPM
3. Drawing by n=100 RPM
4. Drawing by n=200 RPM
5. Drawing by n=400 RPM

MAX. PERMISSIBLE SHAFT SEAL PRESSURE

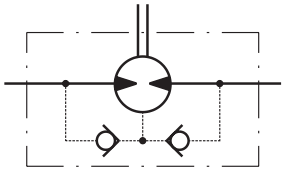
MLHRW...; MLHRW...UK motors with drain connection:

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



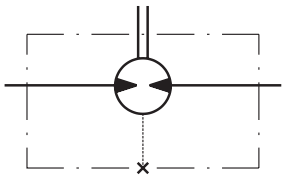
MLHRW...1 motors without drain connection:

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

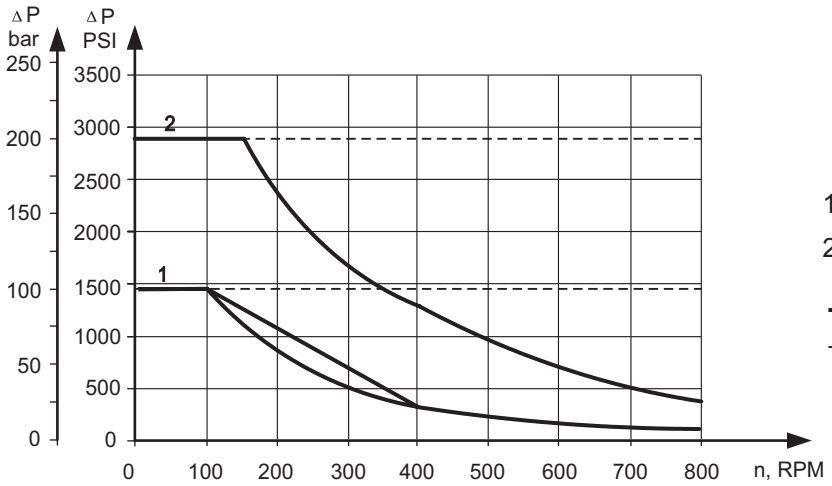


MLHRW...U motors with high pressure seal and drain connection:

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



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



1: Drawing for Standard Shaft Seal

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

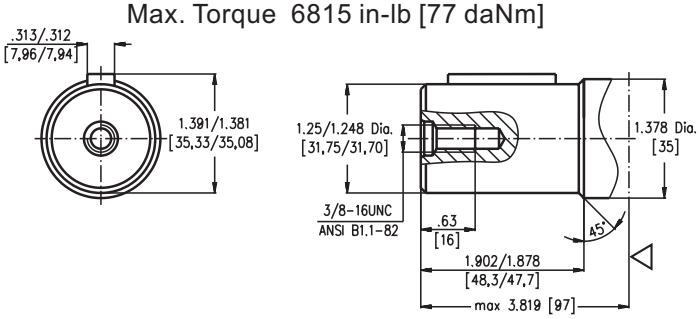
——— - continuous operations

- - - - - - intermittent operations

SHAFT EXTENSIONS

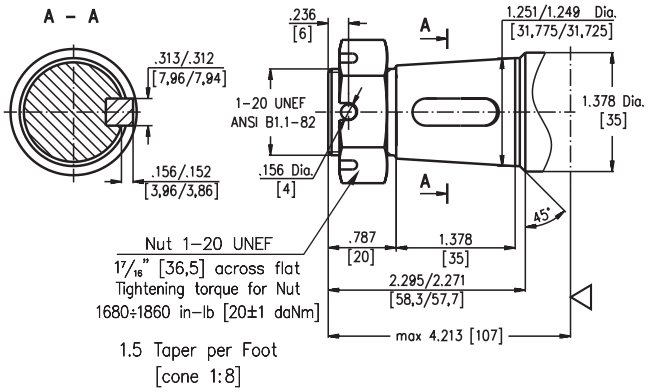
K

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

ORDER CODE

	1	2	3	4	5	6
MLHRW						

Pos.1 - Displacement code*

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

Pos.2 - Shaft Extensions**

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

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

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

Pos. 4 - Shaft Seal Version

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

Pos. 5 - Drain Port

omit	- with drain port
1	- without drain port

Pos. 6 - Special Features [see page 38]

Pos. 7 - Design Series

omit - Factory specified

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

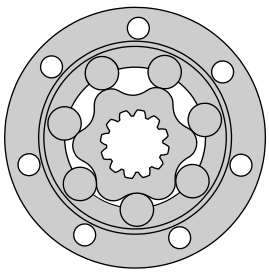
*** The permissible output torque for shafts must not be exceeded!*

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

OPTIONS

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

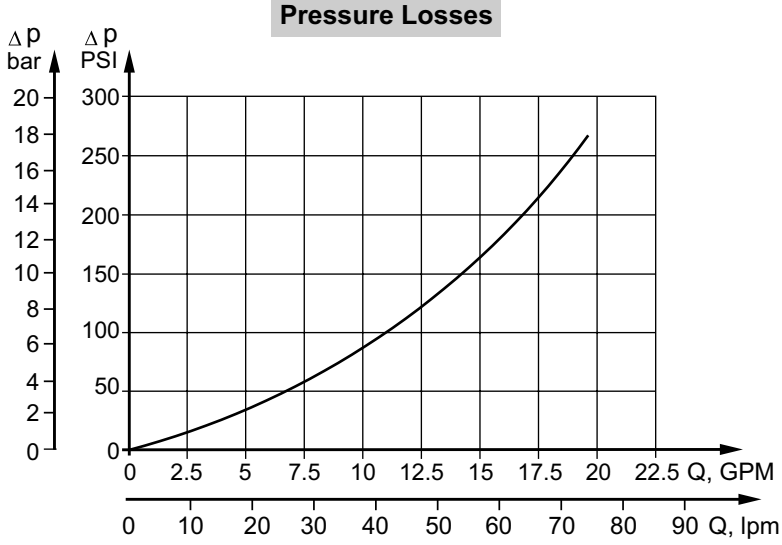
GENERAL

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

Oil flow in drain line

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

Pressure Losses



SPECIFICATION DATA

Type		HW 125	HW 160	HW 200	HW 235	HW 250	HW 300	HW 315
Displacement, in.^{3}/rev. [cm^3/rev.]		7.69 [126]	9.64 [157,8]	12.28 [201,3]	14.33 [235,3]	15.37 [252]	18.3 [300]	19.21 [314,9]
Max. Speed,	cont.	357	380	348	298	298	250	238
[RPM]	int.*	476	475	422	361	357	300	286
Max. Torque	cont.	3098 [35]	3894 [44]	4868 [55]	5710 [64,5]	6107 [69]	7170 [81]	7523 [85]
in-lb [daNm]	int.*	3408 [38,5]	4248 [48]	5310 [60]	6196 [70]	6638 [75]	7877 [89]	8230 [93]
Max. Output,	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]
HP [kW]	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]
Max. Pressure	cont.	2973 [205]	2973 [205]	2973 [205]	2973 [205]	2973 [205]	2973 [205]	2973 [205]
Drop, PSI [bar]	int.*	3263 [225]	3263 [225]	3263 [225]	3263 [225]	3263 [225]	3263 [225]	3263 [225]
Max. Oil Flow	cont.	12 [45]	16 [60]	18.5 [70]	18.5 [70]	20 [75]	20 [75]	20 [75]
GPM [lpm]	int.*	16 [60]	20 [75]	22.5 [85]	22.5 [85]	24 [90]	24 [90]	24 [90]
Max. Inlet Pressure,	cont.	3050 [210]	3050 [210]	3050 [210]	3050 [210]	3050 [210]	3050 [210]	3050 [210]
PSI [bar]	int.*	3625 [250]	3625 [250]	3625 [250]	3625 [250]	3625 [250]	3625 [250]	3625 [250]
Max. Starting Pressure with Unloaded Shaft, PSI [bar]		145 [10]	145 [10]	145 [10]	145 [10]	145 [10]	145 [10]	145 [10]
Min. Starting Torque	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]
in-lb [daNm]	at max. press. drop int.*	2788 [31,5]	3478 [39,3]	4355 [49,2]	5080 [57,4]	5443 [61,5]	6452 [72,9]	6744 [76,2]
Min. Speed, [RPM]**		10	10	10	10	10	10	10
Weight, avg. lb [kg]		31.5 [14,3]	32.2 [14,6]	33.3 [15,1]	34.2 [15,5]	34.6 [15,7]	35.5 [16,1]	35.9 [16,3]

* 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 mm²/s] at 122ºF [50ºC].
5. Recommended maximum system operating temperature is 180ºF [82ºC].
6. To assure optimum motor life fill with fluid prior to loading and run at moderate load and speed for 10-15 minutes.

SPECIFICATION DATA

Type		HW 350	HW 370	HW 400	HW 470	HW 500	HW 535	HW 550
Displacement, in.^{3}/rev. [cm^3/rev.]		21.21 [347,8]	22.51 [369,2]	24.2 [396,8]	28.71 [470,6]	30.65 [502,4]	32.7 [535]	33.55 [550]
Max. Speed,	cont.	216	203	189	159	149	140	136
[RPM]	int.*	259	244	227	191	179	168	164
Max. Torque	cont.	8320 [94]	8497 [96]	8497 [96]	8143 [92]	8054 [91]	7966 [90]	7877 [89]
in-lb [daNm]	int.*	9028 [102]	9293 [105]	8674 [98	8939 [101]	8939 [101]	9205 [104]	9116 [103]
Max. Output,	cont.	22 [16,5]	17.7 [13,2]	16.8 [12,5]	14.2 [10,6]	14.5 [10,8]	12.6 [9,4]	12 [9,0]
HP [kW]	int.*	25 [18,7]	23.2 [17,3]	22.4 [16,7]	18.2 [13,6]	18.6 [13,9]	17.2 [12,8]	16.6 [12,4]
Max. Pressure	cont.	2973 [205]	2900 [200]	2683 [185]	2176 [150]	2030 [140]	1885 [130]	1813 [125]
Drop, PSI [bar]	int.*	3263 [225]	3263 [225]	2756 [190]	2393 [165]	2248 [155]	2176 [150]	2103 [145]
Max. Oil Flow	cont.	20 [75]	20 [75]	20 [75]	20 [75]	20 [75]	20 [75]	20 [75]
GPM [lpm]	int.*	24 [90]	24 [90]	22.5 [85]	22.5 [85]	24 [90]	24 [90]	24 [90]
Max. Inlet Pressure,	cont.	3050 [210]	3050 [210]	3050 [210]	3050 [210]	3050 [210]	3050 [210]	3050 [210]
PSI [bar]	int.*	3625 [250]	3625 [250]	3625 [250]	3625 [250]	3625 [250]	3625 [250]	3625 [250]
Max. Starting Pressure with Unloaded Shaft, PSI [bar]		145 [10]	145 [10]	145 [10]	145 [10]	145 [10]	145 [10]	145 [10]
Min. Starting Torque	at max. press. drop cont.	6815 [77]	7036 [79,5]	6966 [78,7]	6674 [75,4]	6603 [74,6]	6532 [73,8]	6452 [72,9]
in-lb [daNm]	at max. press. drop int.*	7400 [83,6]	7612 [86]	7107 [80,3]	73.28 [82,8]	7328 [82,8]	7540 [85,2]	7470 [84,4]
Min. Speed, [RPM]**		8	8	8	8	8	5	5
Weight, avg. lb [kg]		36.8 [16,7]	37.3 [16,9]	38.1 [17,3]	39.9 [18,1]	40.6 [18,4]	41.5 [18,8]	41.7 [18.9]

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

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

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

Performance Data HW 125

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

Torque, in-lb 3045 [daNm] [34.5] **Speed [RPM] 40**

7.69 in.^{3}/rev. [126 cm.^{3}/rev.]

Performance Data HW 160

Flow, GPM [l/min]	Pressure, Δ PSI (bar) 500 [35]	1000 [70]	1450 [100]	1710 [120]	2320 [140]	2500 [175]	Max. Cont. 2850 [200]	Max. Int. 3200 [225]	Speed (theor.)
1.32 [5]	700 [7.91] **25**	1415 [16] **24**	2020 [22.8] **22**	2425 [27.4] **21**	3135 [35.4] **19**	3330 [37.6] **18**	3755 [42.4] **14**	-	**32**
2.64 [10]	680 [7.7] **58**	1410 [15.91] **56**	2010 [22.7] **54**	2410 [27.2] **52**	3135 [35.4] **51**	3310 [37.4] **49**	3835 [43.3] **44**	4295 [48.5] **42**	**63**
4 [15]	655 [7.4] **91**	1410 [15.91] **87**	2000 [22.6] **85**	2395 [27.05] **84**	3100 [35] **82**	3310 [37.4] **80**	3895 [44] **77**	4295 [48.5] **74**	**95**
5.28 [20]	630 [7.13] **124**	1390 [15.7] **121**	1980 [22.35] **118**	2365 [26.7] **115**	3055 [34.5] **110**	3295 [37.2] **106**	3860 [43.6] **101**	4295 [48.5] **96**	**127**
8 [30]	595 [6.7] **189**	1345 [15.2] **185**	1955 [22.1] **182**	2335 [26.4] **177**	3020 [34.1] **172**	3250 [36.7] **167**	3790 [42.8] **163**	4250 [48] **160**	**190**
10.56 [40]	585 [6.6] **252**	1275 [14.4] **249**	1910 [21.6] **243**	2285 [25.8] **238**	2985 [33.7] **230**	3230 [365] **225**	3725 [42.1] **219**	4195 [47.4] **213**	**253**
13.2 [50]	-	1195 [13.5] **315**	1880 [21.2] **312**	2250 [25.4] **303**	2930 [33.1] **292**	3220 [36.4] **286**	3665 41.4] **280**	4105 [46.4] **275**	**317**
Max. Cont. 16 [60]	-	1075 [12.15] **378**	1800 [20.3] **372**	2160 [24.4] **364**	2885 [32.6] **349**	3160 [35.7] **344**	3610 [40.8] **335**	4030 [45.5] **331**	**380**
Max. Int. 20 [75]	-	920 [10.4] **474**	1655 [18.7] **472**	2070 [23.4] **458**	2770 [31.3] **447**	3055 [34.5] **443**	3490 [39.4] **435**	-	**475**
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]	

Torque, in-lb 4295 [daNm] [48.5] **Speed [RPM] 42**

9.64 in.^{3}/rev. [157.8 cm.^{3}/rev.]

The Performance data was collected at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122ºF [50ºC].

Performance Data HW 200

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

Torque, in-lb 5090 [daNm] [57.5] **Speed [RPM] 3**

12.28 in.^{3}/rev. [201,3 cm.^{3}/rev.]

Performance Data HW 235

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

Torque, in-lb 5965 [daNm] [67.4] **Speed [RPM] 19**

14.33 in.^{3}/rev. [235,3 cm.^{3}/rev.]

The Performance data was collected at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122ºF [50ºC].

Performance Data HW 250

Flow, GPM [l/min]	Pressure, Δ PSI (bar) 500 [35]	1000 [70]	1450 [100]	1710 [120]	2320 [160]	2500 [175]	Max. Cont. 2850 [200]	Max. Int. 3200 [225]	Speed (theor.)
1.32 [5]	975 [11] **17**	2090 [23.6] **14**	3020 [34.1] **13**	3615 [40.8] **12**	4710 [53.2] **11**	5090 [57.5] **10**	5595 [63.2] **7**	-	**20**
2.64 [10]	990 [11.2] **36**	2180 [24.6] **34**	3020 [34.1] **32**	3620 [40.9] **28**	4745 [53.6] **26**	5135 [58] **25**	5770 [65.2] **21**	-	**40**
4 [15]	990 [11.2] **56**	2340 [26.4] **54**	3020 [34.1] **51**	3640 [41.1] **50**	4770 [53.9] **49**	5170 [58.4] **48**	5765 [65.1] **44**	6435 [72.7] **40**	**60**
5.28 [20]	930 [10.5] **76**	2310 [26.1] **72**	3020 [34.1] **69**	3640 [41.1] **68**	4770 [53.9] **65**	5145 [58.1] **63**	5755 [65] **60**	6410 [72.4] **57**	**79**
8 [30]	815 [9.2] **117**	2000 [22.6] **115**	2880 [32.5] **113**	3515 [39.7] **111**	4700 [53.1] **107**	5125 [57.9] **102**	5720 [64.6] **95**	6380 [72.1] **91**	**119**
10.56 [40]	720 [8.1] **157**	1950 [22] **156**	2790 [31.5] **154**	3445 [38.9] **152**	4610 [52.1] **147**	5035 [57.2] **143**	5640 [63.7] **135**	6320 [71.4] **131**	**159**
13.2 [50]	550 [6.2] **196**	1725 [19.5] **194**	2730 [30.8] **192**	3365 [38] **188**	4560 [51.5] **182**	4950 [56] **176**	5530 [62.5] **171**	6135 [69.3] **169**	**198**
Max. Cont. **16 [60]**	-	1575 [17.8] **235**	2500 [28.2] **231**	3180 [35.9] **229**	4355 [49.2] **221**	4800 [54.2] **216**	5380 [60.8] **211**	6000 [67.8] **207**	**238**
Max. Int. **20 [75]**	-	1180 [13.3] **295**	2295 [25.9] **293**	2790 [31.5] **290**	3975 [44.9] **284**	4525 [51.1] **280**	5260 [59.4] **276**	5880 [66.4] **268**	**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.^{3}/rev. [252 cm.^{3}/rev.]

Performance Data HW 300

Flow, GPM [l/min]	Pressure, Δ PSI (bar) 500 [35]	1000 [70]	1450 [100]	1710 [120]	2320 [160]	2500 [175]	Max. Cont. 2850 [200]	Max. Int. 3200 [225]	Speed (theor.)
1.32 [5]	1265 [14.3] **14**	2560 [28.9] **12**	3720 [42] **10**	4285 [48.4] **9**	5445 [61.5] **7**	5770 [65.2] **6**	-	-	**17**
2.64 [10]	1300 [14.7] **30**	2585 [29.2] **27**	3745 [42.3] **24**	4355 [49.2] **22**	5615 [63.4] **19**	5975 [67.5] **18**	6815 [77] **13**	7435 [84] **10**	**33**
4 [15]	1295 [14.6] **47**	2585 [29.2] **44**	3720 [42] **42**	4435 [50.1] **40**	5710 [64.5] **37**	6110 [69] **33**	7010 [79.2] **27**	7710 [87.1] **24**	**50**
5.28 [20]	1265 [14.3] **65**	2530 [28.6] **63**	3700 [41.8] **60**	4385 [49.5] **58**	5780 [65.3] **53**	6215 [70.2] **50**	7040 [79.5] **45**	7870 [88.9] **37**	**67**
8 [30]	1140 [12.9] **98**	2445 [27.6] **96**	3575 [40.4] **94**	4340 [49] **92**	5765 [65.1] **89**	6285 [71] **86**	7065 [79.8] **76**	7845 [88.6] **66**	**100**
10.56 [40]	995 [11.2] **132**	2330 [26.3] **130**	3490 [39.4] **127**	4205 [47.5] **120**	5600 [63.2] **112**	6100 [68.9] **105**	6940 [78.4] **100**	7765 [87.7] **94**	**133**
13.2 [50]	760 [8.6] **166**	2195 [24.8] **165**	3345 [37.8] **161**	4055 [45.8] **157**	5460 [61.7] **150**	5990 [67.7] **145**	6765 [76.4] **138**	7620 [86.1] **134**	**167**
Max. Cont. **16 [60]**	560 [6.3] **199**	2010 [22.7] **198**	3125 [35.3] **195**	3805 [43] **191**	5240 [59.2] **183**	5695 [64.3] **179**	6595 [74.5] **168**	7585 [85.7] **161**	**200**
Max. Int. **20 [75]**	-	1540 [17.4] **248**	2800 [31.6] **242**	3540 [40] **240**	4960 [56] **232**	5410 [61.1] **228**	6375 [72] **214**	7425 [83.9] **202**	**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.^{3}/rev. [300 cm.^{3}/rev.]

The Performance data was collected at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122ºF [50ºC].

Performance Data HW 315

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

Torque, in-lb 8080 [daNm] [91.3] **Speed [RPM] 23**

19.21 in.^{3}/rev. [315,9 cm.^{3}/rev.]

Performance Data HW 350

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

Torque, in-lb 8160 [daNm] [92.2] **Speed [RPM] 29**

21.21 in.^{3}/rev. [347,8 cm.^{3}/rev.]

The Performance data was collected at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122ºF [50ºC].

Performance Data HW 370

Flow, GPM [l/min]	Pressure, Δ PSI (bar) 500 [35]	1000 [70]	1450 [100]	1710 [120]	2320 [160]	2500 [175]	Max. Cont. 2850 [200]	Max. Int. 3200 [225]	Speed (theor.)
1.32 [5]	14 500 [16.4] **11**	2965 [33.5] **9**	4295 [48.5] **7**	5010 [57.4] **6**	6500 [73.4] **5**	6965 [78.7] **4**	-	-	**14**
2.64 [10]	1505 [17] **25**	3125 [35.3] **23**	4470 [50.5] **21**	5310 [60] **20**	683 [77.2] **17**	7285 [82. 3] **16**	8160 [92.2] **13**	8950 [101.1] **10**	**27**
4 [15]	1445 [16.3] **38**	3170 [35.8] **36**	4540 [51.3] **34**	5445 [61.5] **33**	7065 [79.8] **31**	7605 [85.9] **29**	8350 [94.3] **25**	9125 [103.1] **21**	**41**
5.28 [20]	1410 [15.9] **52**	3145 [35.5] **50**	4410 [49.8] **48**	5110 [61.1] **46**	7110 [80.3] **43**	7695 [86.9] **41**	8580 [96.9] **36**	9535 [107.7] **32**	**54**
8 [30]	1320 [14.9] **80**	3010 [34] **78**	4310 [48.7] **76**	5295 [59.8] **75**	6895 [77.9] **73**	7490 [84.6] **71**	8515 [96.2] **62**	9470 [107] **55**	**81**
10.56 [40]	1190 [13.4] **106**	2835 [32] **104**	4160 [47] **101**	5160 [58.3] **98**	6770 [76.5] **91**	7375 [83.3] **87**	8400 [94.9] **82**	9420 [106.4] **76**	**108**
13.2 [50]	825 [9.3] **134**	2995 [28.2] **132**	3920 [44.3] **129**	4975 [56.2] **126**	6615 [74.7] **121**	7090 [80.1] **118**	8110 [91.6] **109**	9125 [103.1] **100**	**135**
Max. Cont. 16 [60]	650 [7.3] **1162**	2310 [26.1] **160**	3630 [41] **157**	4650 [52.5] **153**	6375 [72] **149**	6825 [77.1] **146**	7880 [89] **137**	8835 [99.8] **130**	**163**
Max. Int. 20 [75]	-	1860 [21] **201**	3250 [36.7] **199**	4055 [45.8] **196**	57 80 [65.3] **192**	6340 [71.6] **188**	7400 [83.6] **181**	8365 [94.5] **173**	**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]	

Torque, in-lb 8950 [daNm] [101.1] **Speed [RPM] 10**

22.51 in.^{3}/rev. [369,2 cm.^{3}/rev.]

Performance Data HW 400

Flow, GPM [l/m in]	Pressure, Δ PSI (bar) 500 [35]	1000 [70]	1 300 [90]	1710 [120]	2320 [160]	Max. Cont. 2 68 [1 85]	Max. Int. 276 0 [190]	Speed (theor.)
2.64 [10]	1620 [18.3] **22**	3425 [38.7] **20**	4345 [49.1] **19**	5710 [64.5] **18**	7350 [83] **16**	8170 [92.3] **15**	8330 [94.2] **14**	**25**
4 [15]	1560 [17.6] **36**	3410 [38.5] **34**	4381 [49.5] **33**	5850 [66.1] **32**	7595 [85.8] **29**	8585 [97] **26**	8765 [99] **24**	**38**
5.28 [20]	1515 [17.1] **48**	3380 [38.2] **46**	4330 [48.9] **45**	5840 [66] **43**	7640 [86.3] **40**	8700 [98.3] **36**	8815 [99.6] **34**	**50**
8 [30]	1420 [16] **75**	3240 [36.6] **73**	4170 [47.1] **71**	5690 [64.3] **69**	7550 [85.3] **67**	8480 [95.8] **65**	8660 [97.8] **63**	**76**
10.56 [40]	1265 [14.3] **100**	3045 [34.4] **98**	3 990 [45.1] **96**	5540 [62.6] **94**	7270 [82.1] **90**	8375 [94.6] **85**	8550 [96.6] **83**	**101**
13.2 [50]	885 [10] **124**	2690 [30.4] **122**	3685 [41.6] **120**	5355 [60.5] **116**	7090 [80.1] **112**	79 60 [89.9] **108**	8410 [95] **105**	**126**
Max. Cont. 16 [60]	690 [7.8] **150**	2490 [28.1] **148**	3525 [39.8] **146**	5030 [56.8] **143**	6845 [77.3] **139**	7700 [87] **133**	7965 [90] **132**	**151**
Max. Int. 20 [75]	-	1990 [22.5] **187**	2985 [33.7] **185**	4355 [49.2] **182**	6215 [70.2] **177**	7185 [81.3] **173**	7540 [85.2] **169**	**189**
Torque (theor.)	1960 [22.1]	3915 [44.2]	5030 [56.8]	6710 [75.8]	8950 [101.1]	10350 [116.9]	10620 [12 0]	

Torque, in-lb 8765 [daNm] [99] **Speed [RPM] 24**

24.2 in.^{3}/rev. [396,8 cm.^{3}/rev.]

The Performance data was collected at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122ºF [50ºC].

Performance Data HW 470

		Pressure, Δ PSI (bar)					Max. Cont.	Max. Int.	Speed (theor.)
		500 [35]	1000 [70]	1300 [90]	1710 [120]	2170 [150]	2390 [165]	
	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**
Flow,	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**
GPM [l/min]	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]	

Torque, in-lb 8850 [daNm] [100] **Speed [RPM] 13**

28.71 in.^{3}/rev. [470,6 cm.^{3}/rev.]

Performance Data HW 500

		Pressure, Δ PSI (bar)					Max. Cont.	Max. Int.	Speed (theor.)
		500 [35]	1000 [70]	1300 [90]	1710 [120]	2170 [150]	2390 [165]	
	1.32 [5]	1985 [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**
Flow,	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**
GPM [l/min]	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]	

Torque, in-lb 9735 [daNm] [100] **Speed [RPM] 19**

30.65 in.^{3}/rev. [502,4 cm.^{3}/rev.]

The Performance data was collected at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122ºF [50ºC].

Performance Data HW 535

Flow, GPM [l/min]	Pressure, Δ PSI (bar) 246 [17]	500 [35]	1000 [70]	1160 [80]	1 45 [1 00]	Max. Cont. 1885 0 [1 30]	Max. Int. 2175 [150]	Speed (theor.)
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**
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] **1 04**	**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	

Torque, in-lb 9040 [daNm] [102.1] **Speed [RPM] 13**

32.7 in.^{3}/rev. [535 cm.^{3}/rev.]

Performance Data HW 550

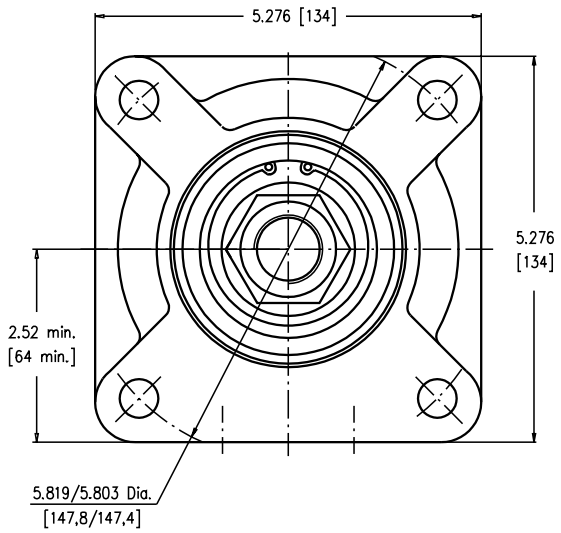
Flow, GPM [l/min]	Pressure, Δ PSI (bar) 246 [17]	500 [35]	1000 [70]	1160 [80]	1 450 [1 00]	Max. Cont. 1812 [1 25]	Max. Int. 2103 [145]	Speed (theor.)
1.32 [5]	1135 [12.8] **8**	2190 [24.7] **8**	4230 [47.8] **7**	4780 [54] **7**	6080 [68.7] **6**	7675 [86.7] **5**	-	**9**
2.64 [10]	1190 [13.4] **17**	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]	

Torque, in-lb 9385 [daNm] [106] **Speed [RPM] 21**

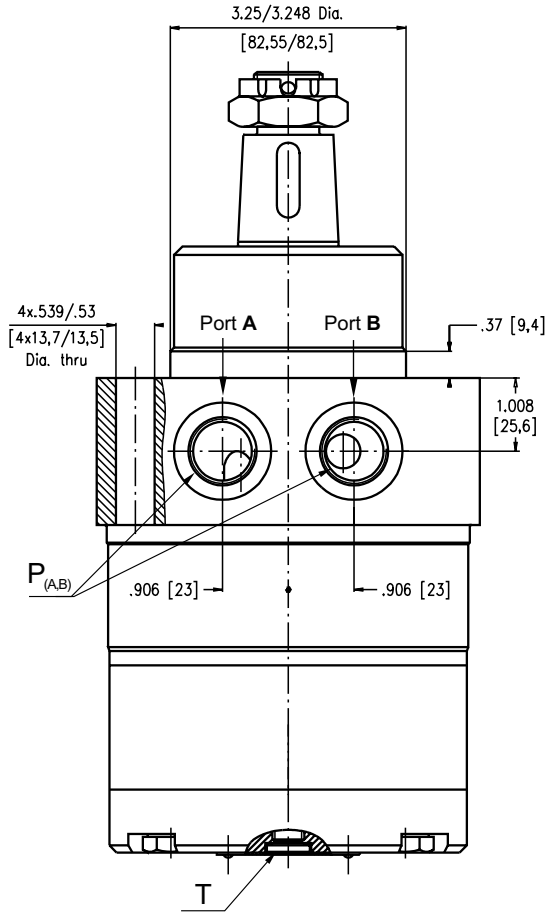
33.55 in.^{3}/rev. [550 cm.^{3}/rev.]

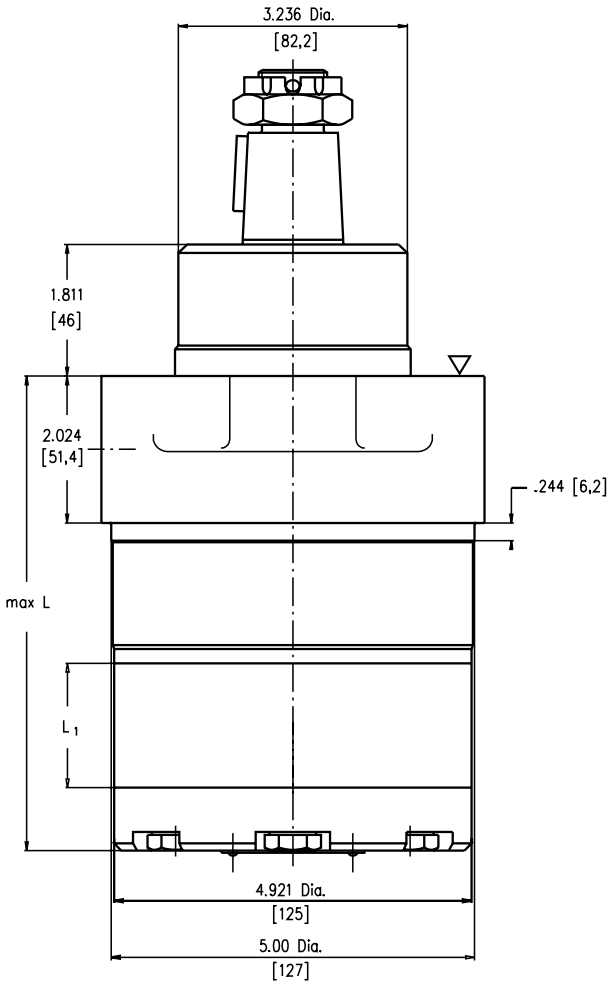
The Performance data was collected at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122ºF [50ºC].

DIMENSIONS AND MOUNTING DATA



Type	Lmax,in. [mm]	L_1,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]





▽ - Motor Mounting Surface

	Versions	
	2	**4**
P(A,B)	2xG½	2x⅞-14UNF, O-ring
T	G ¼	7/16-20UNF, O-ring

in
[mm]

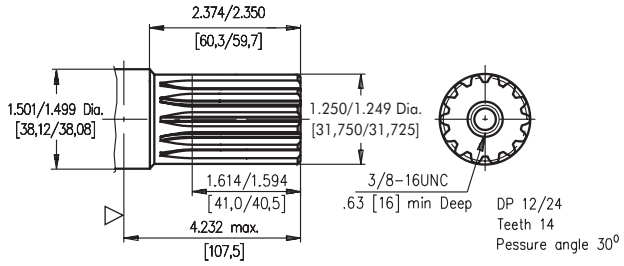
Standard Rotation
Viewed from Shaft End
Port **A** Pressurized - **CW**
Port **B** Pressurized - **CCW**

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

SHAFT EXTENSIONS

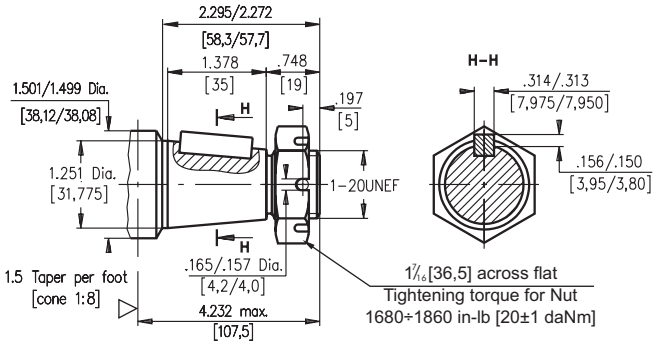
L

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



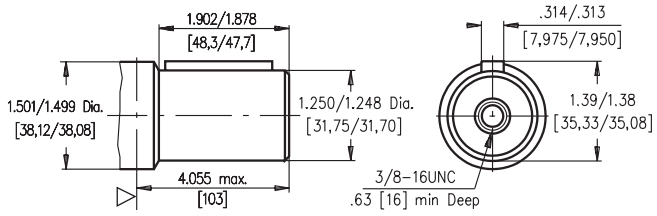
R

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



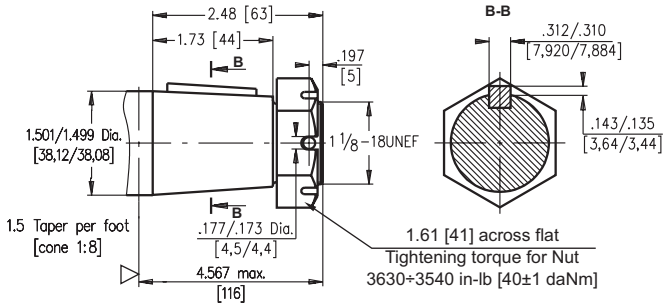
K

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



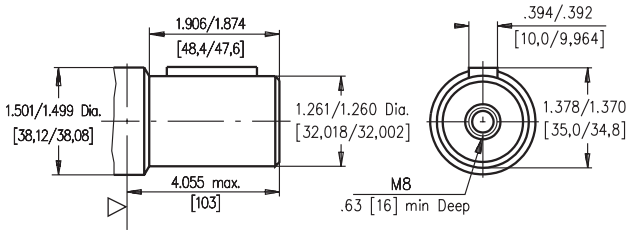
T

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



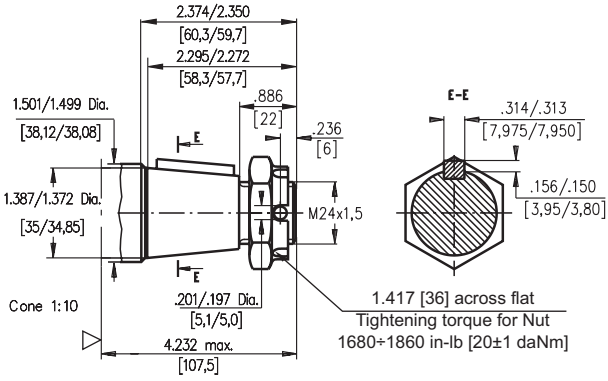
M

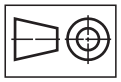
ø32 straight, Parallel key A10x8x32 DIN 6885
Max. Torque 6815 in-lb [77 daNm]



KB

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

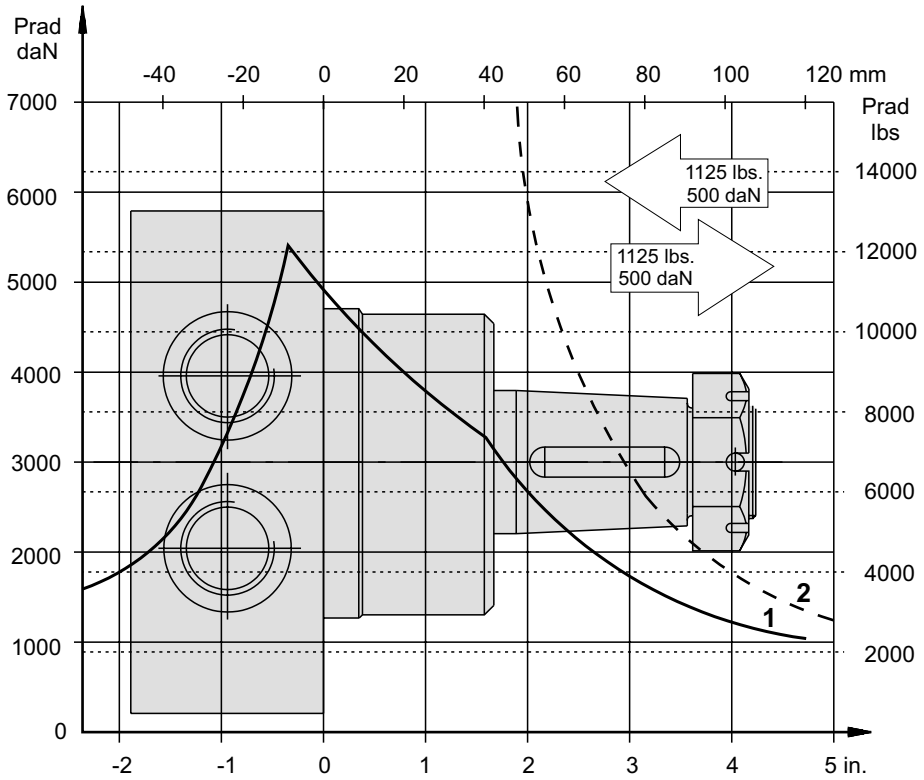




in
[mm]

▽ - Motor Mounting Surface

PERMISSIBLE SHAFT LOADS



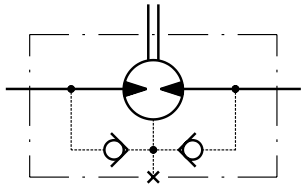
1 - Bearing curve: The curve applies to a B10 bearing life of 2000 hours at 100 RPM.

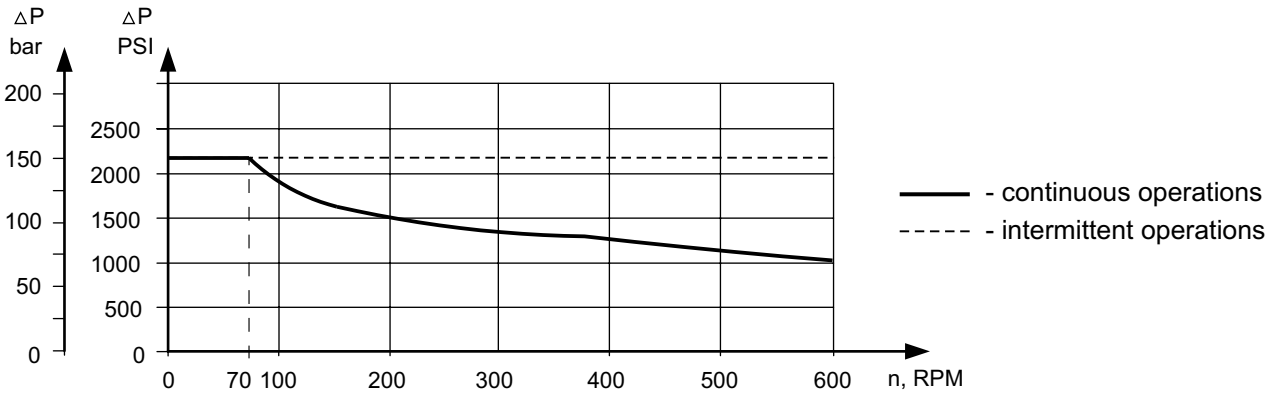
2 - Shaft curve: The curve represents Max. permissible radial shaft load with safety factor 3:1.

MAX. PERMISSIBLE SHAFT SEAL PRESSURE

HW... motors with drain connection:

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





ORDER CODE

	1	2	3	4	5
HW					

Pos.1 - Displacement code

125	- 7.69 [126,00] in³/rev [cm³/rev]
160	- 9.64 [158,00] in³/rev [cm³/rev]
200	- 12.28 [201,30] in³/rev [cm³/rev]
235	- 14.33 [235,00] in³/rev [cm³/rev]
250	- 15.37 [252,00] in³/rev [cm³/rev]
300	- 18.30 [300,00] in³/rev [cm³/rev]
315	- 19.21 [314,90] in³/rev [cm³/rev]
350	- 21.21 [347,80] in³/rev [cm³/rev]
370	- 22.51 [369,00] in³/rev [cm³/rev]
400	- 24.20 [396,80] in³/rev [cm³/rev]
470	- 28.71 [470,60] in³/rev [cm³/rev]
500	- 30.65 [502,40] in³/rev [cm³/rev]
535	- 32.70 [536,00] in³/rev [cm³/rev]
550	- 33.55 [550,00] in³/rev [cm³/rev]

Pos.2 - Shaft Extensions*

K	- 1¼"[31,75] straight, Parallel key 5/16"x5/16"x1½" BS46
KB	- ø35 tapered 1:10, Parallel key5/16"x5/16"x1¼" BS46
L	- 1¼"[31,75] splined 14T, ANSI B92.1-1976
M	- ø32 straight, Parallel key A10x8x32 DIN 6885
R	- 1¼"[31,75] Tapered 1:8, Parallel key5/16"x5/16"x1" BS46
T	- 1½"[38,1] Tapered 1:8, Parallel key 5/16"x5/16"x1¼" BS46

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

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

Pos. 4 - Special Features [see page 38]

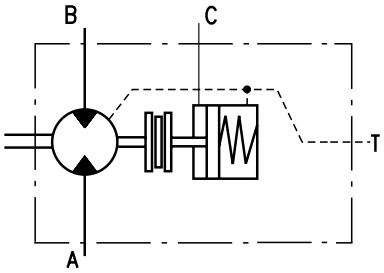
Pos. 5 - Design Series

omit - Factory specified

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

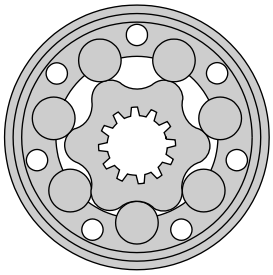
The hydraulic motors are mangano phosphatized as standard.

HYDRAULIC MOTORS 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.



CONTENTS

OPTIONS

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

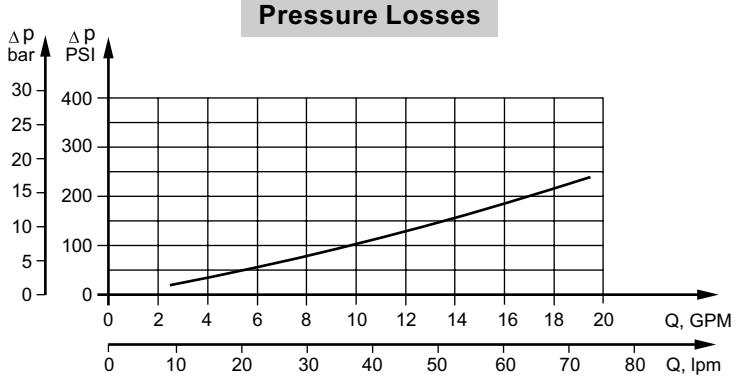
GENERAL

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

Oil flow in drain line

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

Pressure Losses



SPECIFICATION DATA

Type		B/HR 80	B/HR 100	B/HR 125	B/HR 160	B/HR 200	B/HR 250	B/HR 315	B/HR 400
Displacement, in.³/rev. [cm.³/rev.]		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]
Max. Speed, [RPM]	Cont.	500	500	475	375	300	240	190	150
	Int.*	600	600	600	470	375	300	240	191
Max. Torque in-lb [daNm]	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]
Max. Output HP [kW]	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]
Max. Pressure Drop PSI [bar]	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]
Max. Oil Flow GPM [lpm]	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]
Max. Inlet Pressure PSI [bar]	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]
Max. Return Pressure , PSI [bar]	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]
Max. Starting Pressure with Unloaded Shaft, PSI [bar]		145 [10]	145 [10]	130 [9]	102 [7]	73 [5]	58 [4]	44 [3]	44 [3]
Min. Starting Torque in-lb [daNm]	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]
Min. Speed***, [RPM]		10	10	10	10	10	10	10	10
Static Torque of Brake, in-lb [daNm]		4890 [55]							
Min. Brake Release Pressure****, PSI [bar]		305 [21]							
Max.Opening Pressure, PSI [bar]		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.

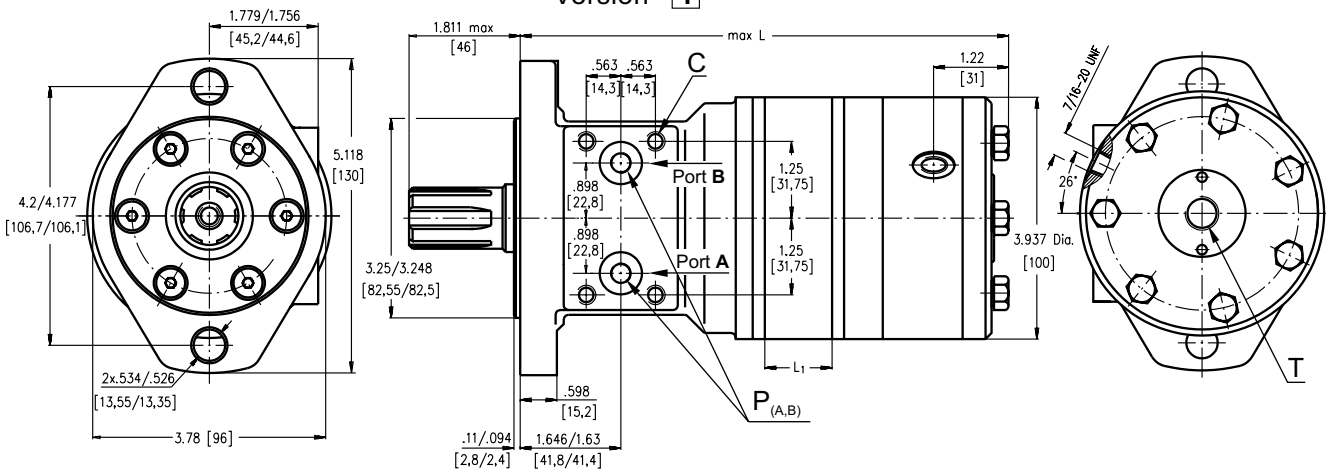
*** For speeds of 10 RPM or lower, consult factory or your regional manager.

**** 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.

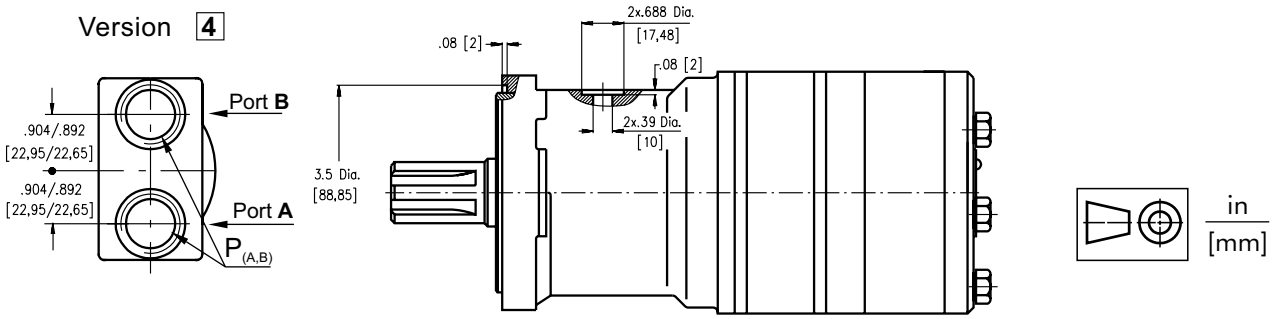
1. Intermittent speed and intermittent pressure drop must not occur simultaneously.
2. Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
3. Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP(DIN51524) or HM (ISO 6743/4).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

DIMENSIONS AND MOUNTING DATA

Version 1



Version 4



Type	Lmax,in. [mm]	L_1,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**

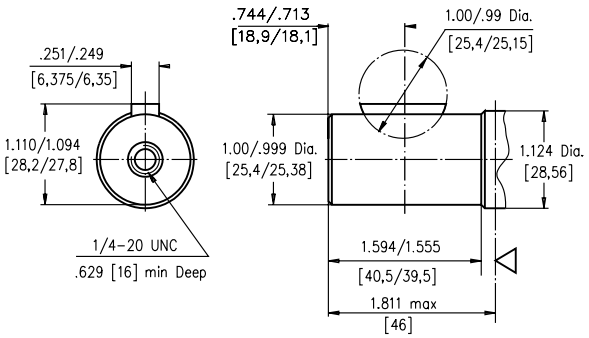
Reverse Rotation
Viewed from Shaft End
Port **A** Pressurized - **CCW**
Port **B** Pressurized - **CW**

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

SHAFT EXTENSIONS

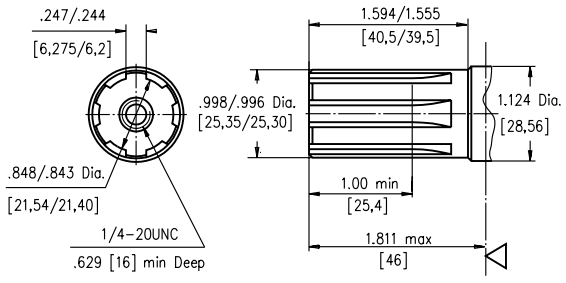
C

1" [25,4] straight, Woodruff key ¼"x1" SAE J502
Max. Torque 3900 in-lb [44 daNm]



G

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

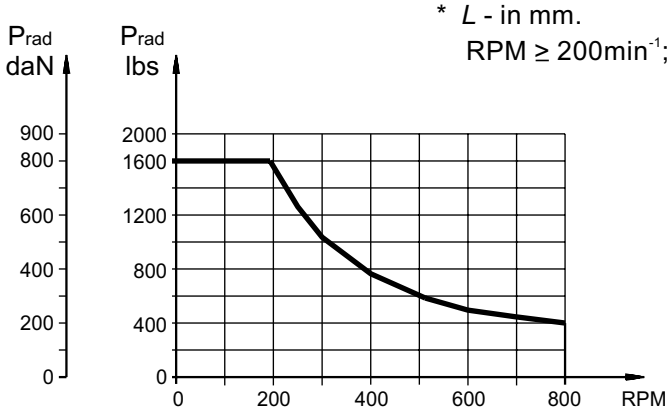


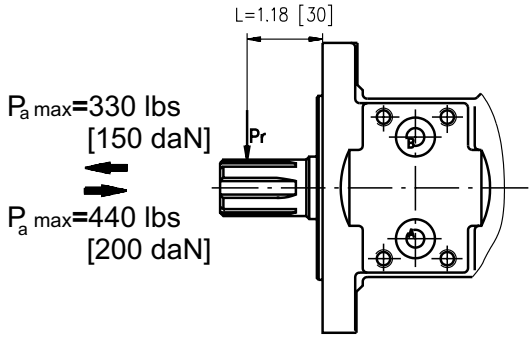
PERMISSIBLE SHAFT LOADS

Radial Shat Load $P^{*}_{rad} = \frac{800}{RPM} \times \frac{21000}{75+L}$,daN

* *L* - in mm.

RPM ≥ 200min^{-1}; *L* ≤ 30 mm





Warning: Drain line should always be used.

ORDER CODE

	1	2	3	4	5
B / H R					

Pos.1 - Displacement code*

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

Pos.2 - Shaft Extensions**

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

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

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

Pos. 4 - Special Features [See Page 38]

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.

MOTOR SPECIAL FEATURES

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

O Optional

- Not applicable

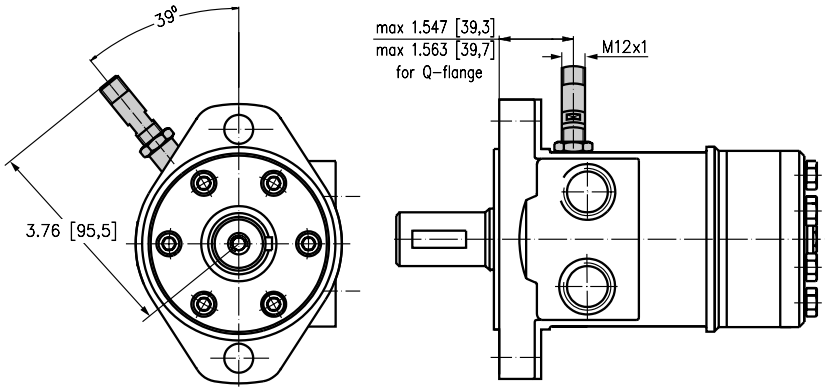
S Standard

* for sensor ordering see page 39

** color at customer's request.

MOTORS WITH SPEED SENSOR

HP...RS and HR...RS

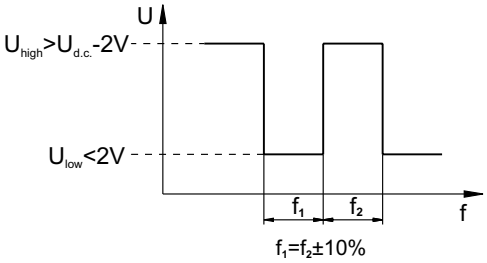


TECHNICAL DATA OF THE SPEED SENSOR

Technical data

Frequency range	0...15 000 Hz
Output	PNP, NPN
Power supply	10...36 VDC
Current input	20 mA (@24 VDC)
Ambient Temperature	-40...+257^{0}F [-40...+125^{0}C]
Protection	IP 67
Plug connector	M12-Series
Mounting principle	ISO 6149

Output signal

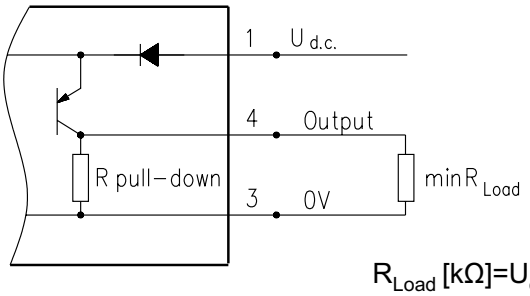


Load max.:I_{high}=I_{low}<50mA

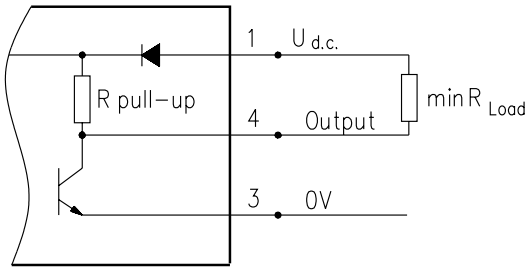
Motor type	HP	HR
Pulses per revolution	36	36

Wiring diagrams

PNP

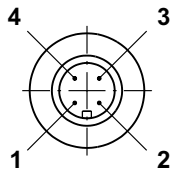


NPN



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

Stick type



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

Order Code for Speed Sensor

Sensor Code	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.

MOTOR APPLICATION

VEHICLE DRIVE CALCULATIONS

1.Motor speed: n, RPM

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

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

$$RR=G \times \rho$$

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

Table 1

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

3.Grade resistance: GR, lbs [daN]

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

α- gradient negotiation angle (Table 2)

Table 2

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

4. 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;
x_M- mechanical gear efficiency (if it is available).

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

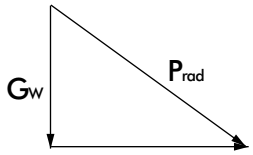
$$M_w=\frac{G_w \times f \times R_{in}[R_m]}{i \times \eta_M}$$

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.



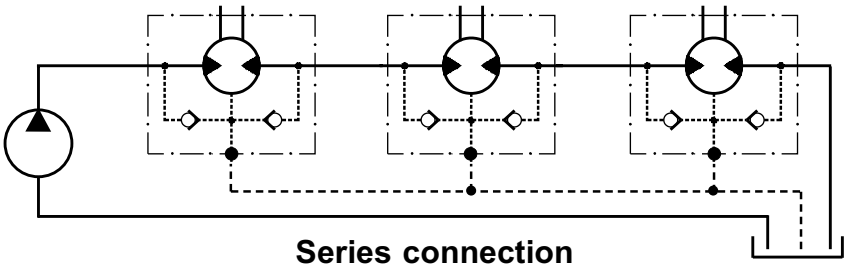
$$P_{rad} = \sqrt{G_w^2 + \left(\frac{M}{R}\right)^2}$$

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

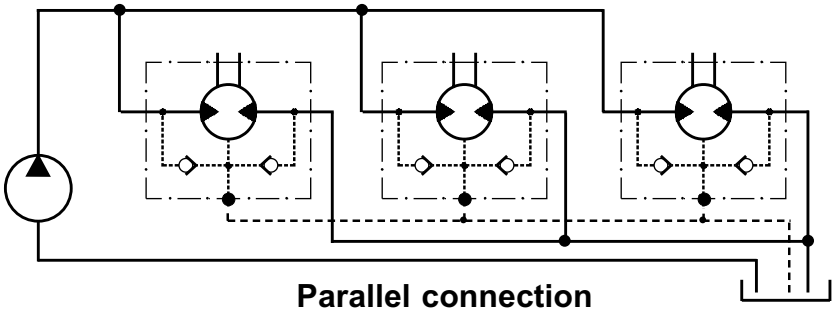
In accordance with calculated loadings the suitable motor from the catalogue is selected.

DRAINAGE SPACE AND DRAINAGE PRESSURE

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



Series connection



Parallel connection