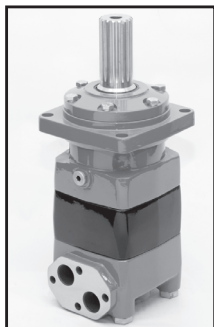
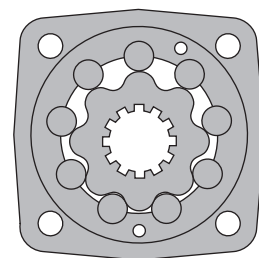
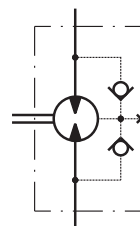


HYDRAULIC MOTORS MLHT



APPLICATION

- » Conveyors
- » Metal working machines
- » Agricultural machines
- » Road building machines
- » Mining machinery
- » Food industries
- » Special vehicles etc.



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OPTIONS

- » Model - Disc valve, roll-gerotor
- » Flange and wheel mount
- » Short motor
- » Tacho connection
- » Speed sensing
- » Side and rear ports
- » Shafts- straight, splined and tapered
- » SAE, Metric and BSPP ports
- » Other special features

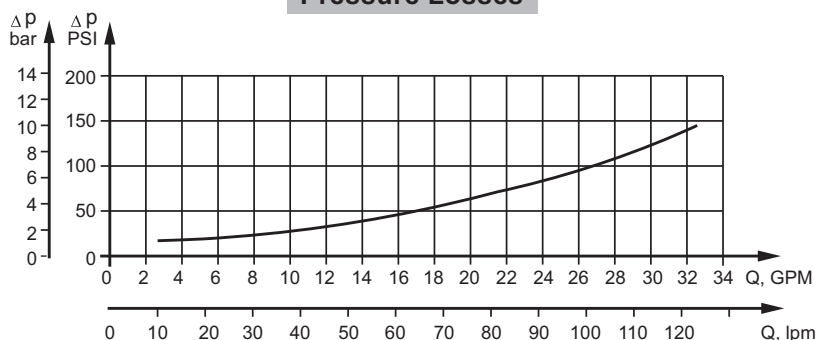
GENERAL

Max. Displacement, in ³ /rev [cm ³ /rev]	44.2 [724,3]
Max. Speed, [RPM]	775
Max. Torque, lb-in [daNm]	cont.: 11500 [130] int.: 13100 [148]
Max. Output, HP [kW]	54 [40]
Max. Pressure Drop, PSI [bar]	cont.: 2900 [200] int. 3480 [240]
Max. Oil Flow, GPM [lpm]	39.6 [150]
Min. Speed, [RPM]	5
Permissible Shaft Loads, lbs [daN]	P _a =2250 [1000]
Pressure fluid	Mineral based- HLP(DIN 51524) or HM(ISO 6743/4)
Temperature range, °F [°C]	-40÷284 [-40÷140]
Optimal Viscosity range, SUS [mm ² /s]	98÷347 [20÷75]
Filtration	ISO code 20/16 (Min. recommended fluid filtration of 25 microns)

Oil flow in drain line

Pressure drop PSI [bar]	Viscosity SUS [mm ² /s]	Oil flow in drain line GPM [lpm]
2030 [140]	98 [20]	.660 [2,5]
	164 [35]	.396 [1,5]
3045 [210]	98 [20]	1.321 [5]
	164 [35]	.793 [3]

Pressure Losses



SPECIFICATION DATA

Type		MLHT 160	MLHT 200	MLHT 250	MLHT 315
Displacement, in ³ /rev [cm ³ /rev]		9.83 [161,1]	12.29 [201,4]	15.36 [251,8]	19.90 [326,3]
Max. Speed, [RPM]	Cont.	622	620	496	382
	Int.*	775	752	601	461
Max. Torque lb-in [daNm]	Cont.	4160 [47]	5220 [59]	6460 [73]	8410 [95]
	Int.*	4960 [56]	6285 [71]	7790 [88]	10090 [114]
	Peak**	5840 [66]	7260 [82]	9030 [102]	11770 [133]
Max. Output HP [kW]	Cont.	36 [26,5]	45 [33,5]	45 [33,5]	45 [33,5]
	Int.*	43 [32]	54 [40]	54 [40]	54 [40]
Max. Pressure Drop PSI [bar]	Cont.	2900 [200]	2900 [200]	2900 [200]	2900 [200]
	Int.*	3450 [240]	3450 [240]	3450 [240]	3450 [240]
	Peak**	4050 [280]	4050 [280]	4050 [280]	4050 [280]
Max. Oil Flow GPM [lpm]	Cont.	26.4 [100]	33 [125]	33 [125]	33 [125]
	Int.*	33 [125]	39.6 [150]	39.6 [150]	39.6 [150]
Max. Inlet Pressure PSI [bar]	Cont.	3050 [210]	3050 [210]	3050 [210]	3050 [210]
	Int.*	3600 [250]	3600 [250]	3600 [250]	3600 [250]
	Peak**	4350 [300]	4350 [300]	4350 [300]	4350 [300]
Max. Return Pressure with Drain Line PSI [bar]	Cont.	2030 [140]	2030 [140]	2030 [140]	2000 [140]
	Int.*	2540 [175]	2540 [175]	2540 [175]	2500 [175]
	Peak**	3050 [210]	3050 [210]	3050 [210]	3000 [210]
Max. Starting Pressure with Unloaded Shaft, PSI [bar]		150 [10]	150 [10]	150 [10]	150 [10]
Min. Starting Torque lb-in [daNm]	At max. press. drop Cont.	3010 [34]	3800 [43]	4690 [53]	6550 [74]
	At max. press. drop Int.*	3630 [41]	4600 [52]	5580 [63]	7880 [89]
Min. Speed***, [RPM]		10	9	8	7
Weight, lb [kg]	MLHT	44.1 [20]	47.4 [21,5]	46.3 [21]	48.5 [22]
For Rear Ports	MLHTW	48.5 [22]	49.6 [22,5]	50.7 [23]	52.9 [24]
+0,450[.992]	MLHTS	33.1 [15]	34.2 [15,5]	35.3 [16]	37.5 [17]
	MLHTV	24.3 [11]	25.4 [11,5]	26.5 [12]	28.7 [13]

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

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

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

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

SPECIFICATION DATA (continued)

Type		MLHT 400	MLHT 500	MLHT 630	MLHT 725
Displacement, in³/rev [cm³/rev]		25.06 [410,9]	31.95 [523,6]	38.52 [631,2]	44.2 [724,3]
Max. Speed, [RPM]	Cont.	304	238	197	172
	Int.*	368	289	234	209
Max. Torque lb-in [daNm]	Cont.	9560 [108]	10800 [122]	11500 [130]	11240 [127]
	Int.*	11150 [126]	12125 [137]	13100 [148]	13010 [147]
	Peak**	12745 [144]	14160 [160]	15580 [176]	15490 [175]
Max. Output HP [kW]	Cont.	40 [30]	36 [26,5]	33 [24,3]	27 [20,2]
	Int.*	47 [35]	40 [30]	37 [27,5]	36 [26,8]
Max. Pressure Drop PSI [bar]	Cont.	2600 [180]	2300 [160]	2010 [140]	1740 [120]
	Int.*	3050 [210]	2600 [180]	2310 [160]	2010 [140]
	Peak**	3450 [240]	3050 [210]	2760 [190]	2395 [165]
Max. Oil Flow GPM [lpm]	Cont.	33 [125]	33 [125]	33 [125]	33 [125]
	Int.*	39.6 [150]	39.6 [150]	39.6 [150]	39.6 [150]
Max. Inlet Pressure PSI [bar]	Cont.	3050 [210]	3050 [210]	3050 [210]	3050 [210]
	Int.*	3600 [250]	3600 [250]	3600 [250]	3600 [250]
	Peak**	4350 [300]	4350 [300]	4350 [300]	4350 [300]
Max. Return Pressure with Drain Line PSI [bar]	Cont.	2000 [140]	2000 [140]	2000 [140]	2000 [140]
	Int.*	2500 [175]	2500 [175]	2500 [175]	2500 [175]
	Peak**	3000 [210]	3000 [210]	3000 [210]	3000 [210]
Max. Starting Pressure with Unloaded Shaft, PSI [bar]		150 [10]	150 [10]	150 [10]	150 [10]
Min. Starting Torque lb-in [daNm]	At max. press. drop Cont.	7435 [84]	8410 [95]	8410 [95]	8410 [95]
	At max. press. drop Int.*	8585 [97]	9380 [106]	9740 [110]	10180 [115]
Min. Speed***, [RPM]		6	5	5	5
Weight, lb [kg] For Rear Ports +0,450[.992]	MLHT	50.7 [23]	52.9 [24]	51.8 [23,5]	54.0 [24,5]
	MLHTW	55.1 [25]	57.3 [26]	56.2 [25,5]	58.4 [26,5]
	MLHTS	39.7 [18]	41.9 [19]	40.8 [18,5]	43.0 [19,5]
	MLHTV	30.9 [14]	33.1 [15]	32.0 [14,5]	34.2 [15,5]

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

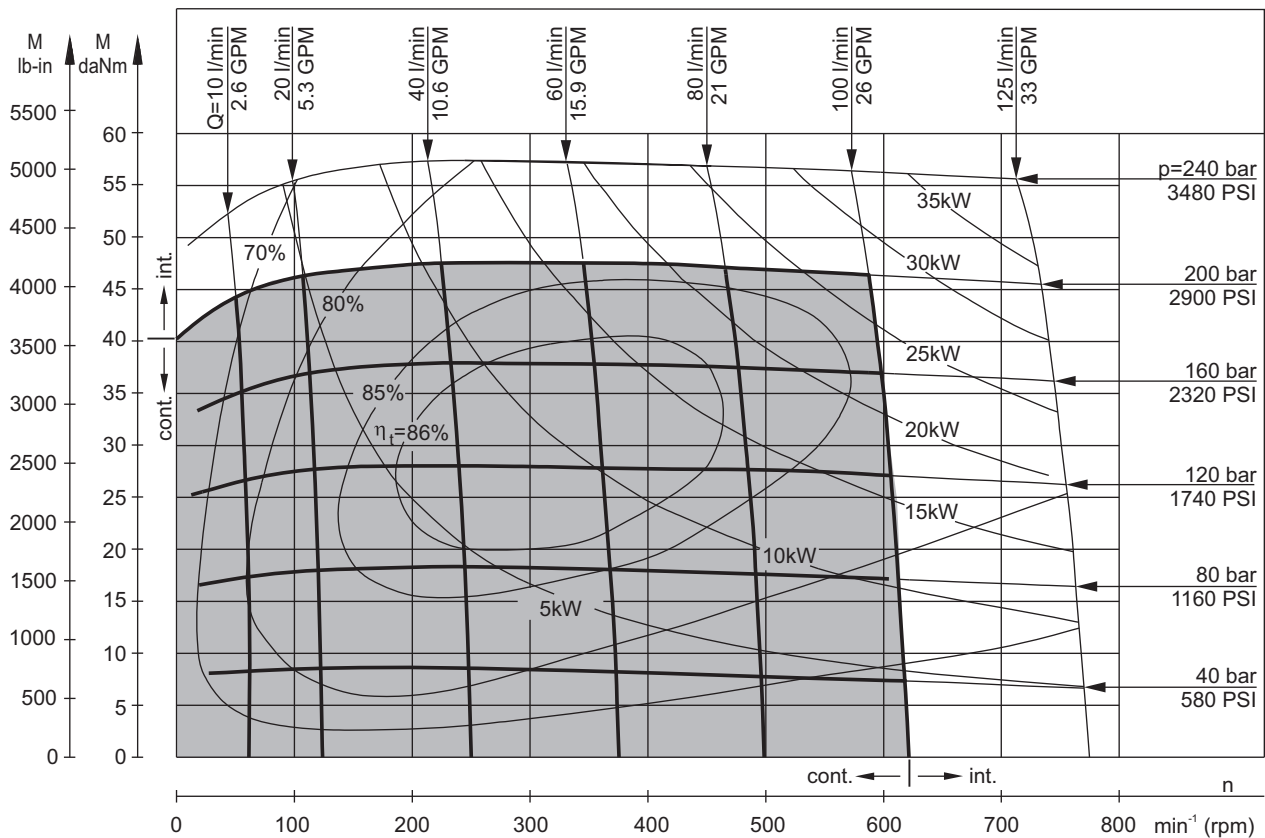
** Peak load: the permissible values may occur for max. 1% of every minute.

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

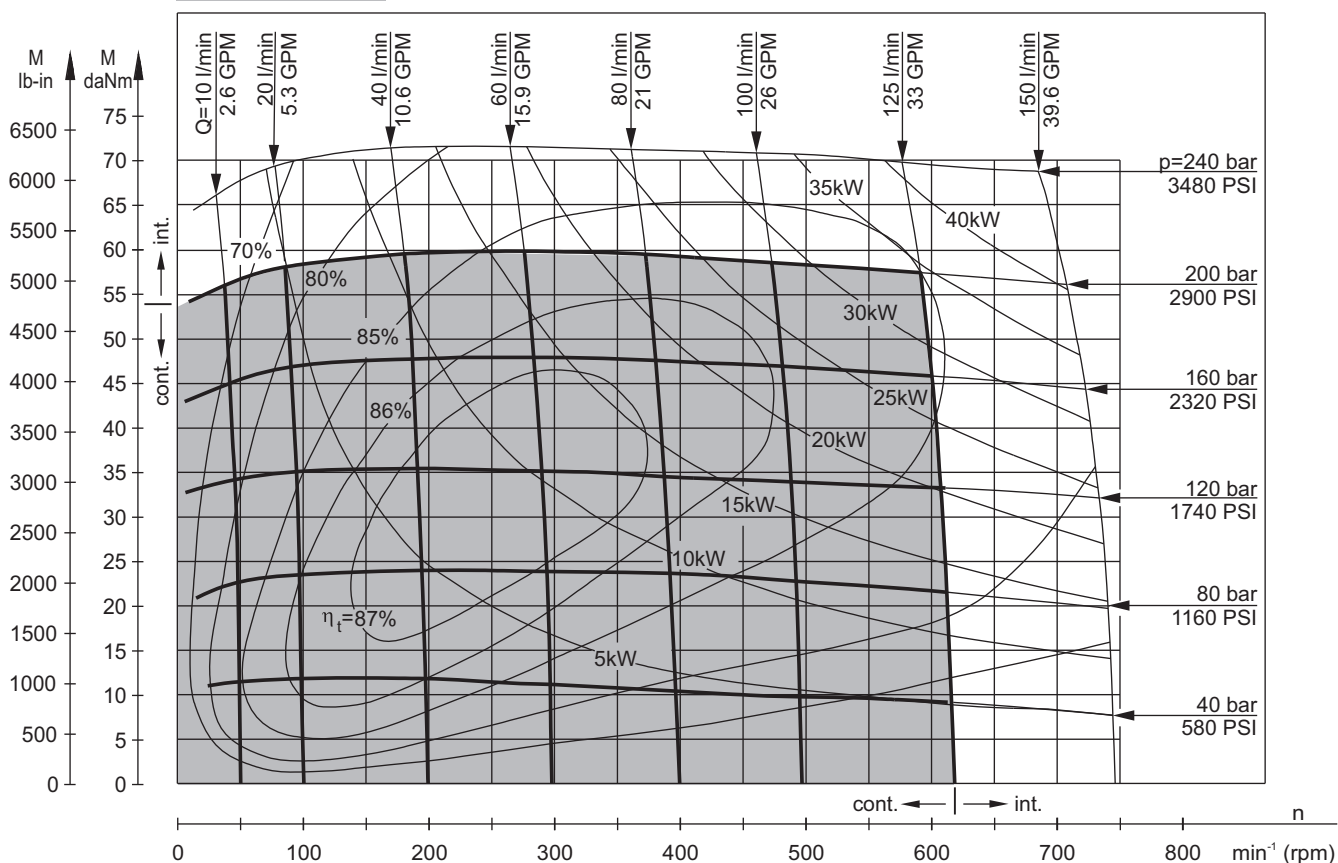
- Intermittent speed and intermittent pressure drop must not occur simultaneously.
- Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
- Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP(DIN51524) or HM (ISO 6743/4).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

FUNCTION DIAGRAMS

MLHT 160



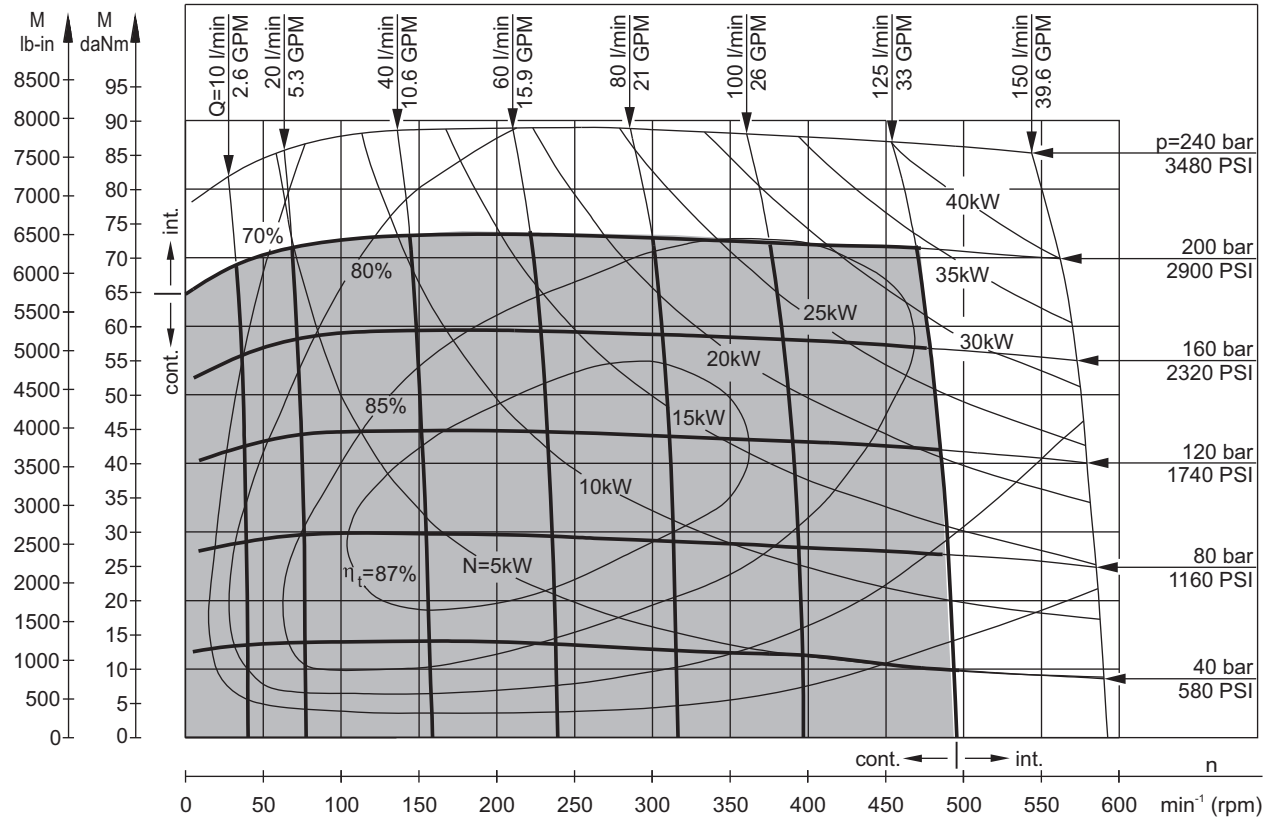
MLHT 200



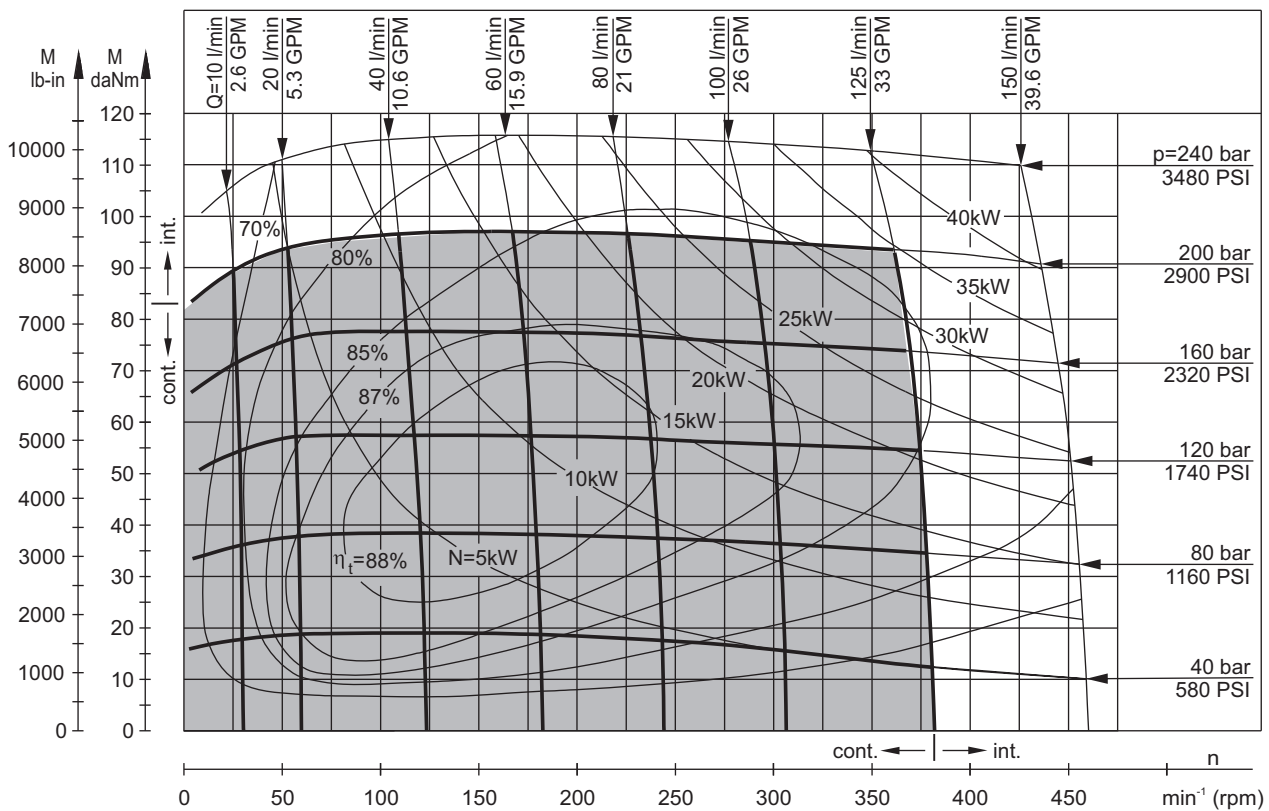
The function diagrams data is for average performance of randomly selected motors at back pressure 5÷10 bar [72.5÷145 PSI] and oil with viscosity of 32 mm²/s [150 SUS] at 50°C [122°F].

FUNCTION DIAGRAMS

MLHT 250



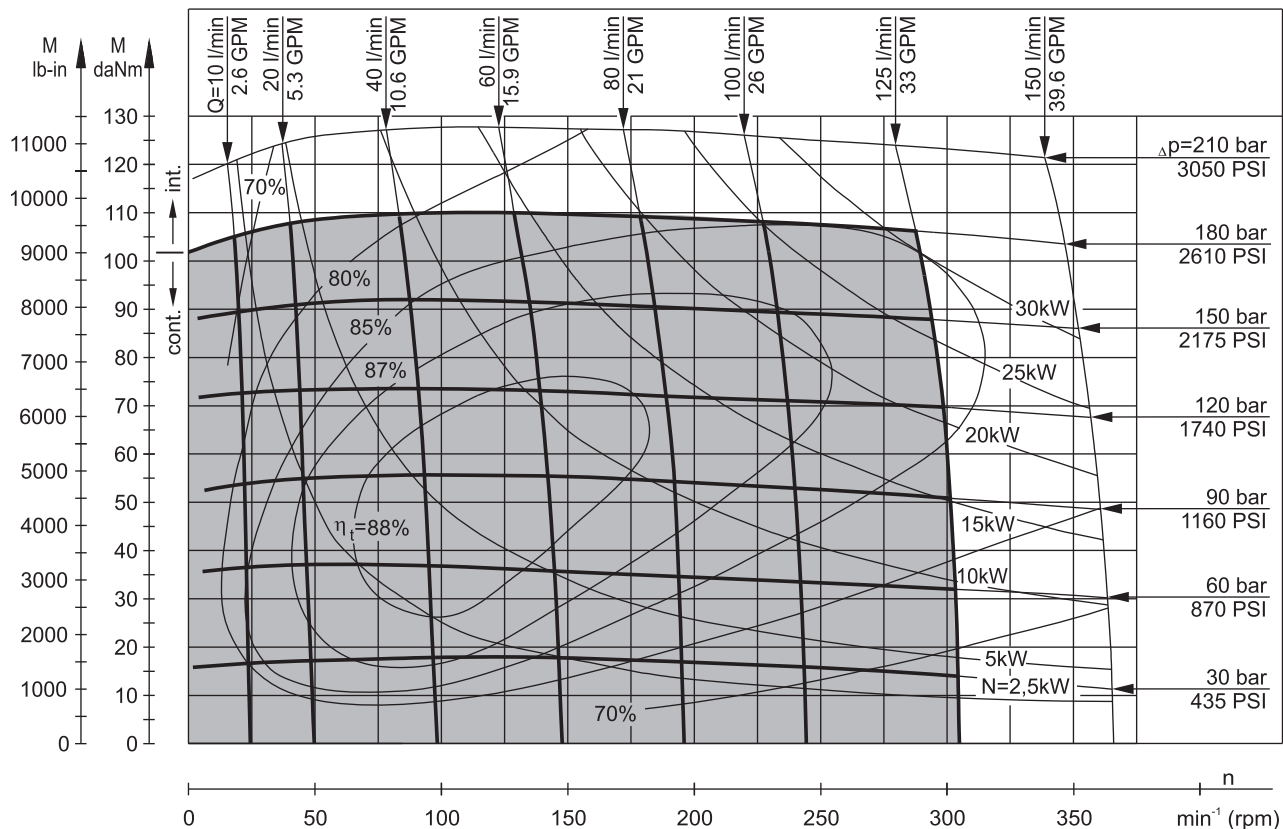
MLHT 315



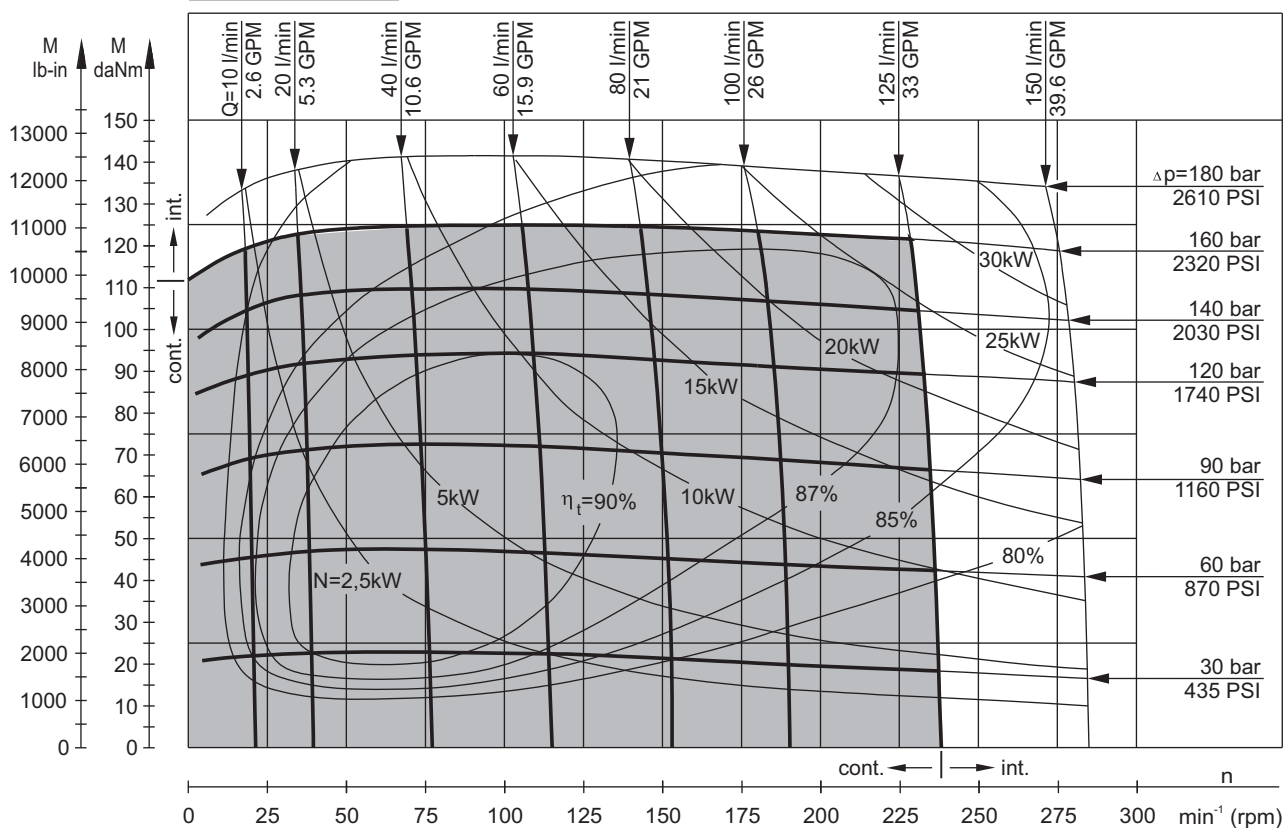
The function diagrams data is for average performance of randomly selected motors at back pressure 5÷10 bar [72.5÷145 PSI] and oil with viscosity of 32 mm²/s [150 SUS] at 50°C [122°F].

FUNCTION DIAGRAMS

MLHT 400



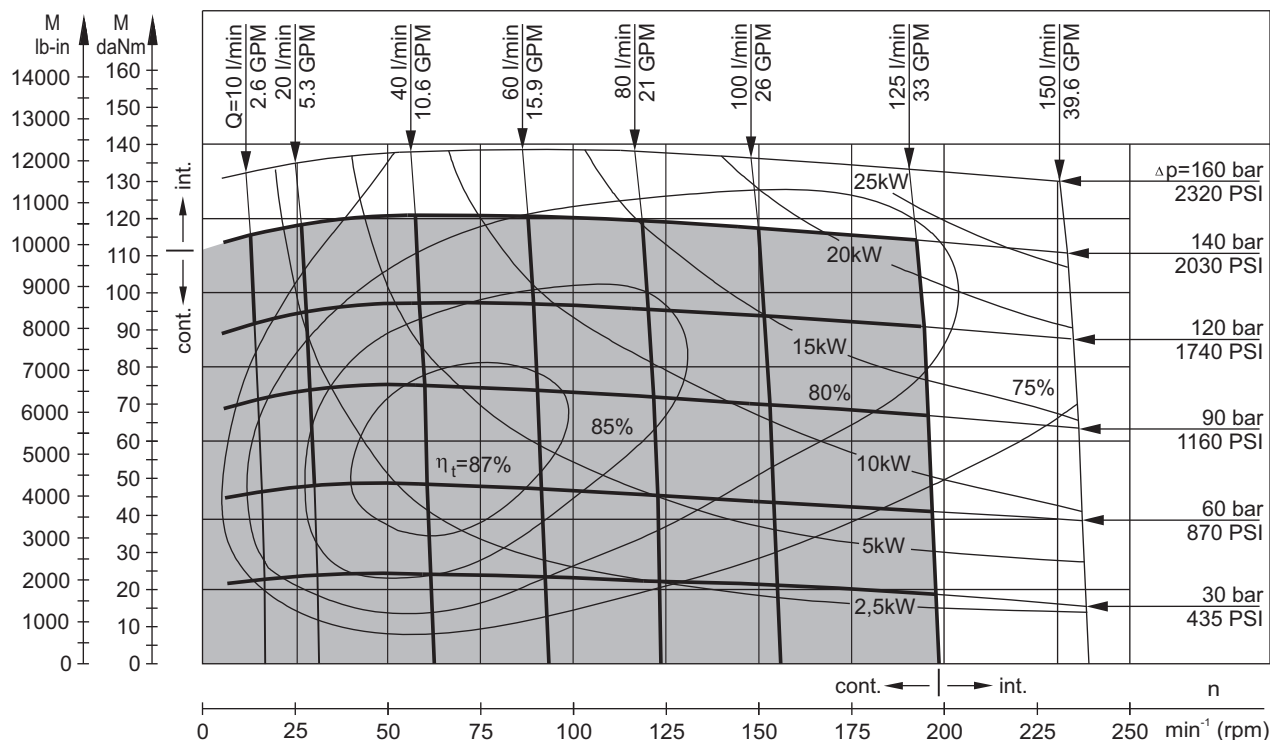
MLHT 500



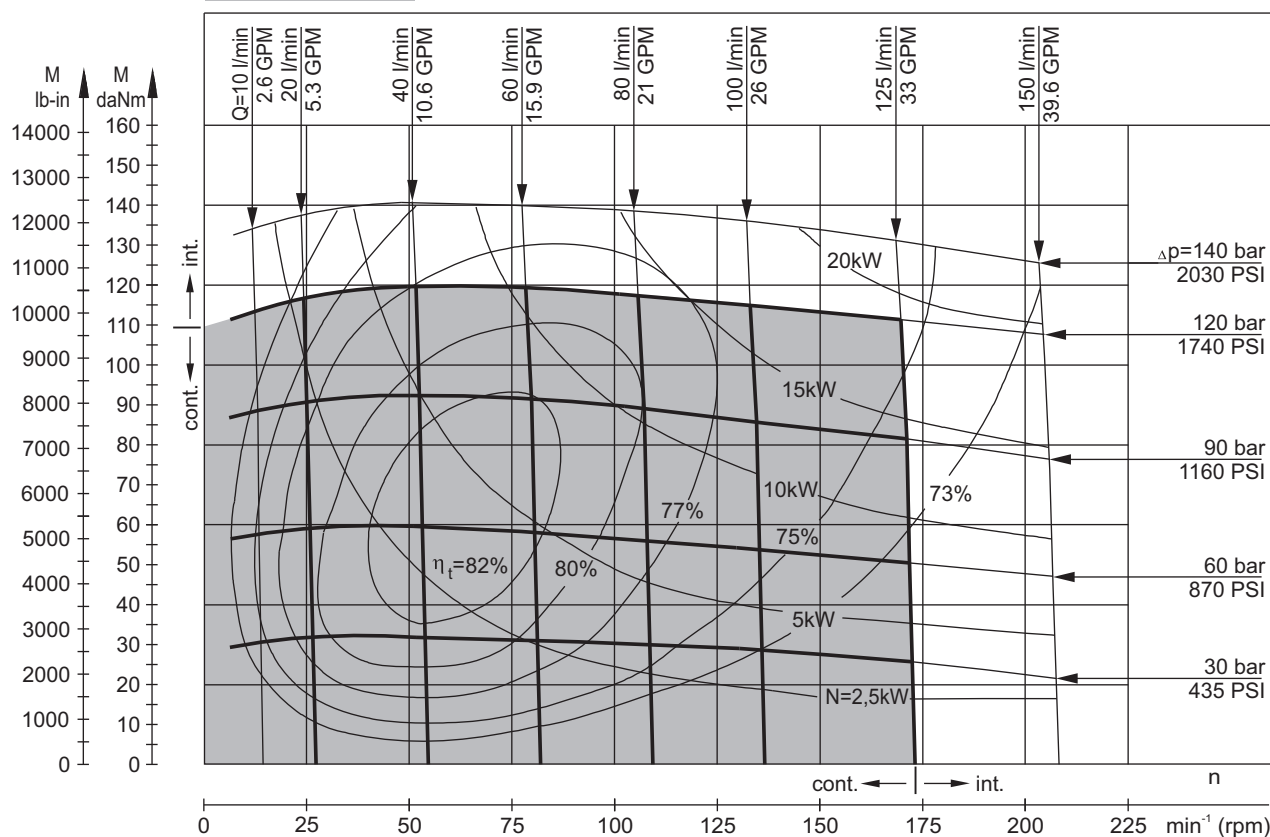
The function diagrams data is for average performance of randomly selected motors at back pressure 5÷10 bar [72.5÷145 PSI] and oil with viscosity of 32 mm²/s [150 SUS] at 50°C [122°F].

FUNCTION DIAGRAMS

MLHT 630



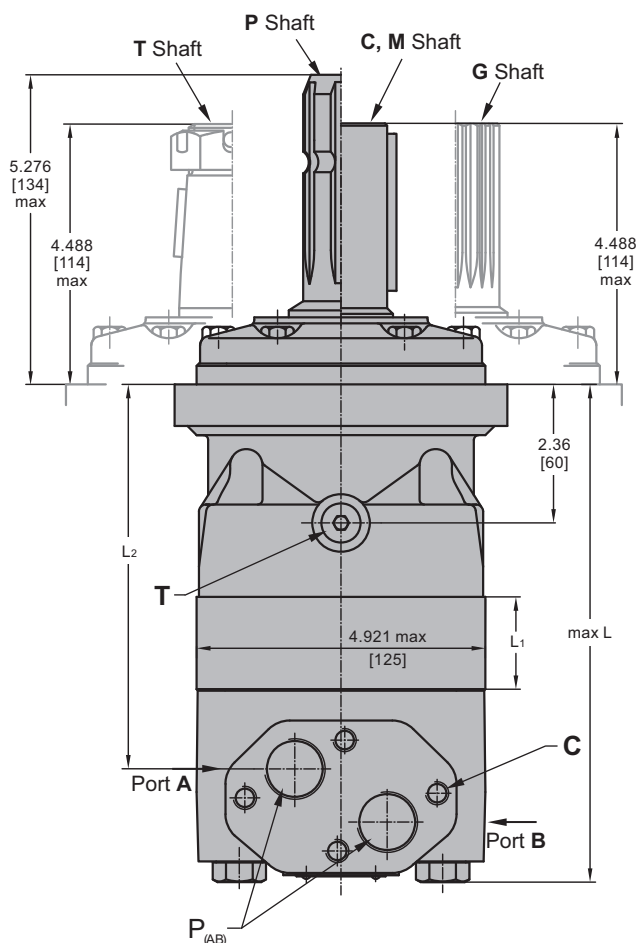
MLHT 725



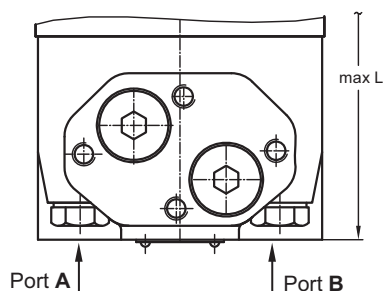
The function diagrams data is for average performance of randomly selected motors at back pressure 5÷10 bar [72.5÷145 PSI] and oil with viscosity of 32 mm²/s [150 SUS] at 50°C [122°F].

DIMENSIONS AND MOUNTING DATA

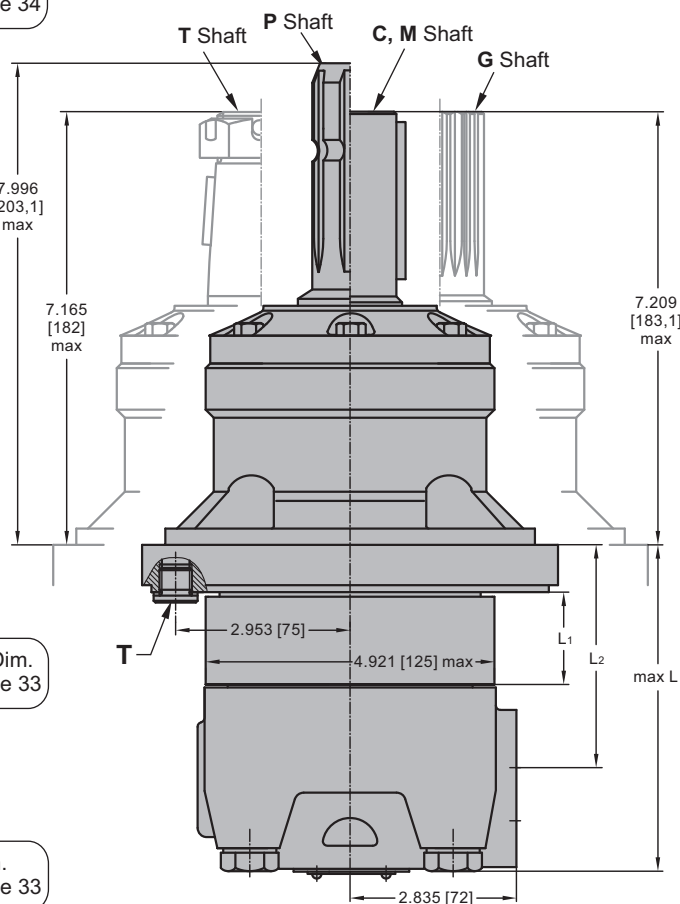
MLHT



Versions **6 7 9**
Rear ports



MLHTW



	Versions		
	2, 6	3, 9	4, 7
C	4xM10	4xM10	-
P (A,B)	2xG ³ / ₄	2xM27x2	2x1 ¹ / ₁₆ -12UN
T	G ¹ / ₄	M14x1,5	9 ¹ / ₁₆ -18UNF

Standard Rotation

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

Reverse Rotation

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

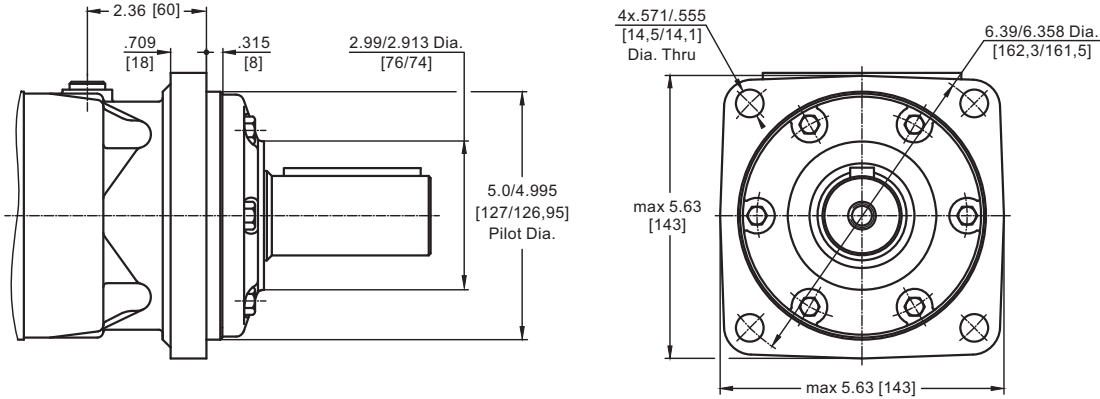
Type	L max, in [mm]		L2, in [mm]	Type	L max, in [mm]		L2, in [mm]	**L1, in [mm]
	Versions 2, 3, 4	*Versions 6, 7, 9			Versions 2, 3, 4	*Versions 6, 7, 9		
MLHT 160	7.60 [193,1]	8.00 [203,1]	5.65 [143,5]	MLHTW 160	4.89 [124,1]	5.28 [134,1]	2.93 [74,3]	.65 [16,5]
MLHT 200	7.80 [198,1]	8.19 [208,1]	5.85 [148,5]	MLHTW 200	5.08 [129,1]	5.48 [139,1]	3.12 [79,3]	.85 [21,5]
MLHT 250	8.05 [204,4]	8.44 [214,4]	6.09 [154,8]	MLHTW 250	5.33 [135,4]	5.72 [145,4]	3.37 [85,6]	1.09 [27,8]
MLHT 315	8.41 [213,6]	8.80 [223,6]	6.46 [164,0]	MLHTW 315	5.69 [144,6]	6.09 [154,6]	3.73 [94,8]	1.46 [37,0]
MLHT 400	8.82 [224,1]	9.22 [234,1]	6.87 [174,5]	MLHTW 400	6.11 [155,1]	6.50 [165,1]	4.15 [105,3]	1.87 [47,5]
MLHT 500	9.37 [238,1]	9.77 [248,1]	7.42 [188,5]	MLHTW 500	6.66 [169,1]	7.05 [179,1]	4.70 [119,3]	2.42 [61,5]
MLHT 630	9.22 [234,1]	9.61 [244,1]	7.26 [184,5]	MLHTW 630	6.50 [165,1]	6.89 [175,1]	4.54 [115,3]	2.26 [57,5]
MLHT 725	9.57 [243,1]	9.96 [253,1]	7.62 [193,5]	MLHTW 725	6.85 [174,1]	7.25 [184,1]	4.89 [124,3]	2.62 [66,5]

* - For Rear Ported Motors.

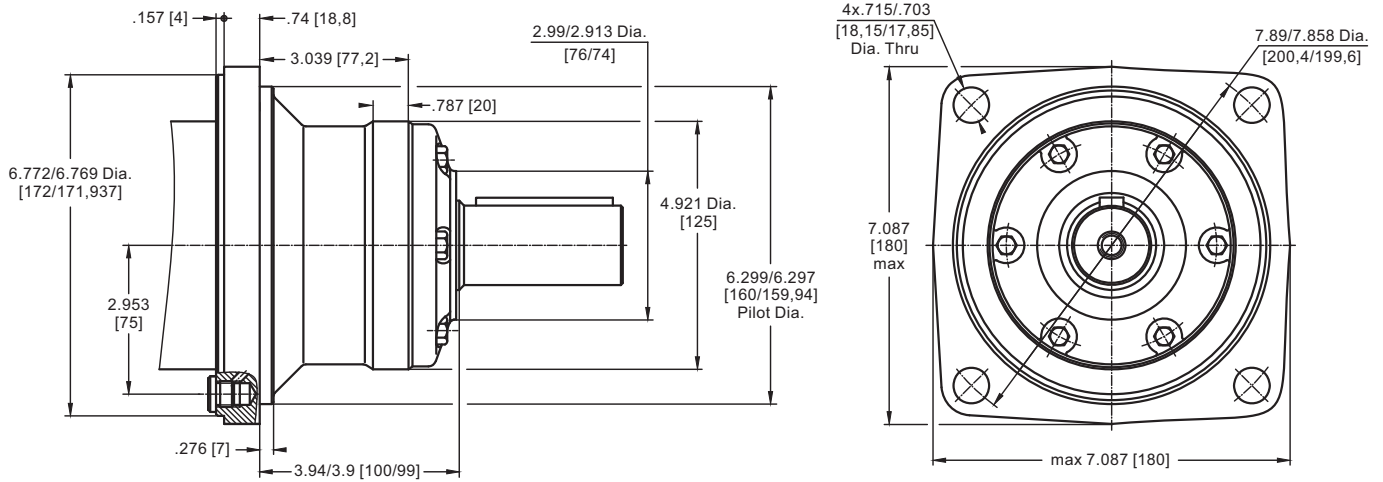
** - The width of the roll-gerotor is .138 in [3,5 mm] greater than L₁.

MOUNTING

SAE C Flange

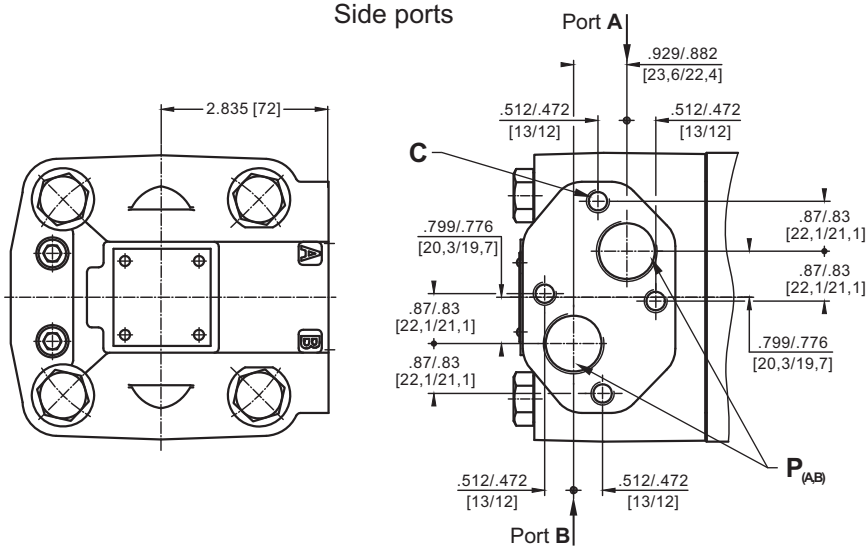


W Wheel Mount

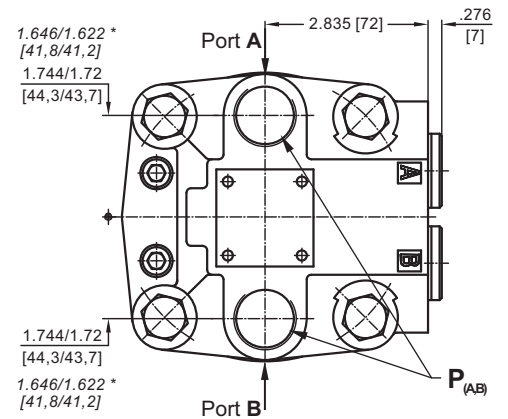


PORTS

Versions 2 3 4 Side ports



Versions 6 7 9 Rear ports

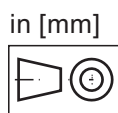


* For Version 7 only!

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

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

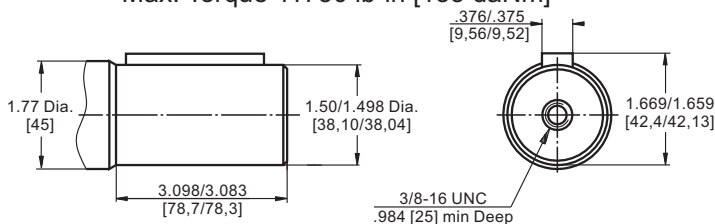
	Versions		
	2, 6	3, 9	4, 7
C	4xM10	4xM10	-
P (A,B)	2xG ³ / ₄	2xM27x2	2x1 ¹ / ₁₆ -12UN
T	G ¹ / ₄	M14x1,5	9 ¹ / ₁₆ -18UNF



SHAFT EXTENSIONS

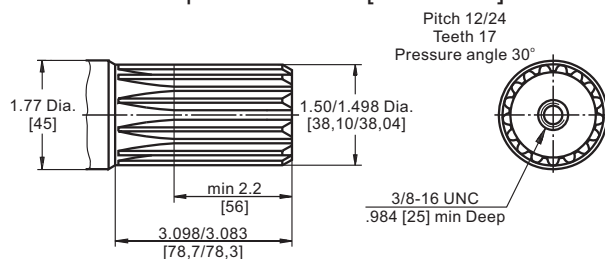
C

1½" [38,1] straight, Parallel key ¾" x ¾" x 2¼" BS46
Max. Torque 11750 lb-in [133 daNm]



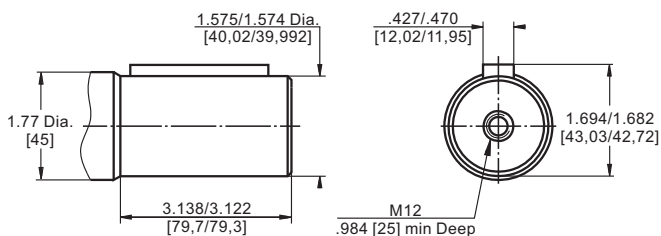
G

17T Splined, 1½" [38,1] ANS B92.1-1976
Max. Torque 11750 lb-in [133 daNm]



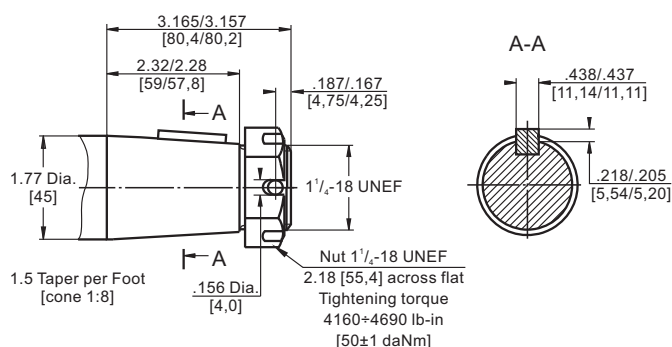
M

ø40 straight, Parallel key A12x8x70 DIN 6885
Max. Torque 11750 lb-in [133 daNm]



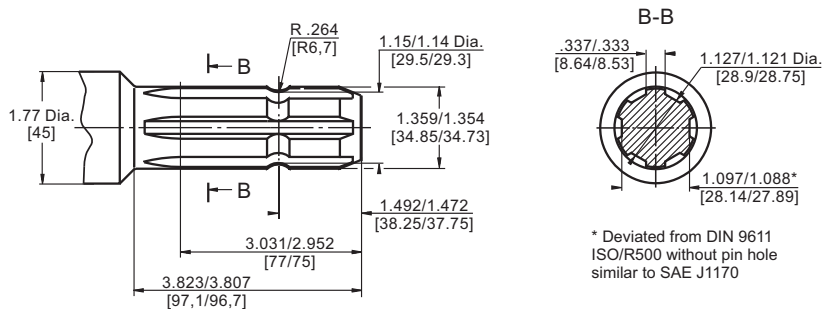
T

SAE J501 Tapered 1:8
Parallel key 7/16" x 7/16" x 1¼" BS46
Max. Torque 18650 lb-in [210 daNm]



P

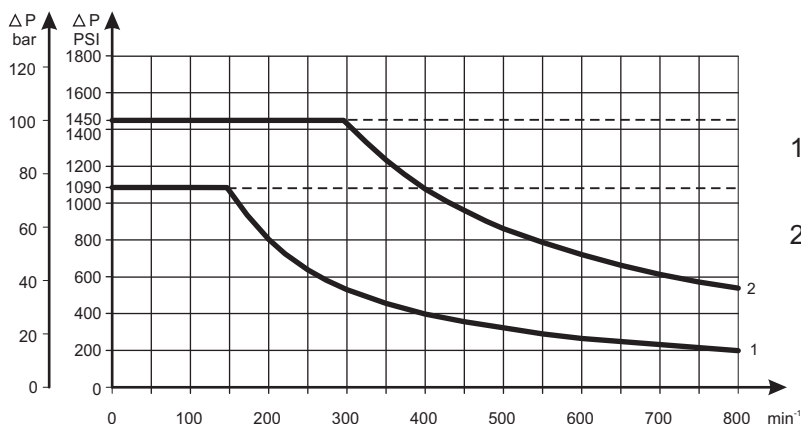
ø34,85 p.t.o. DIN 9611 Form 1
Max. Torque 6815 lb-in [77 daNm]



Required max. Torque
must not be exceeded.

MAX. PERMISSIBLE SHAFT SEAL PRESSURE

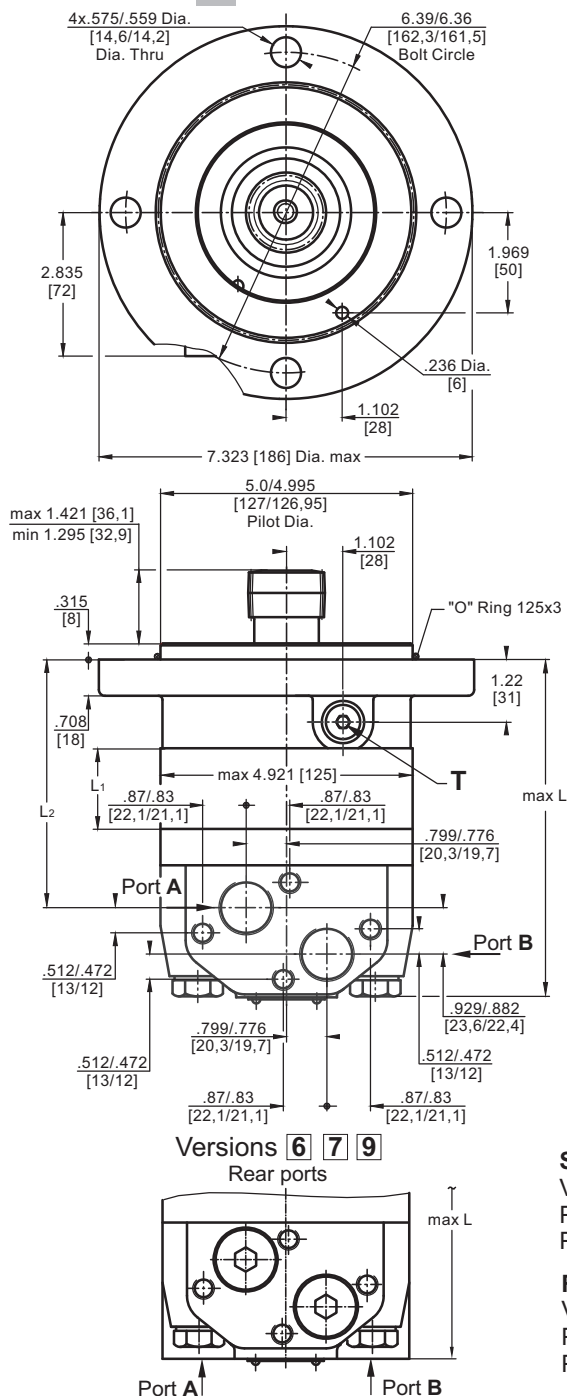
**Max. return pressure without drain line or
max. pressure in the drain line**



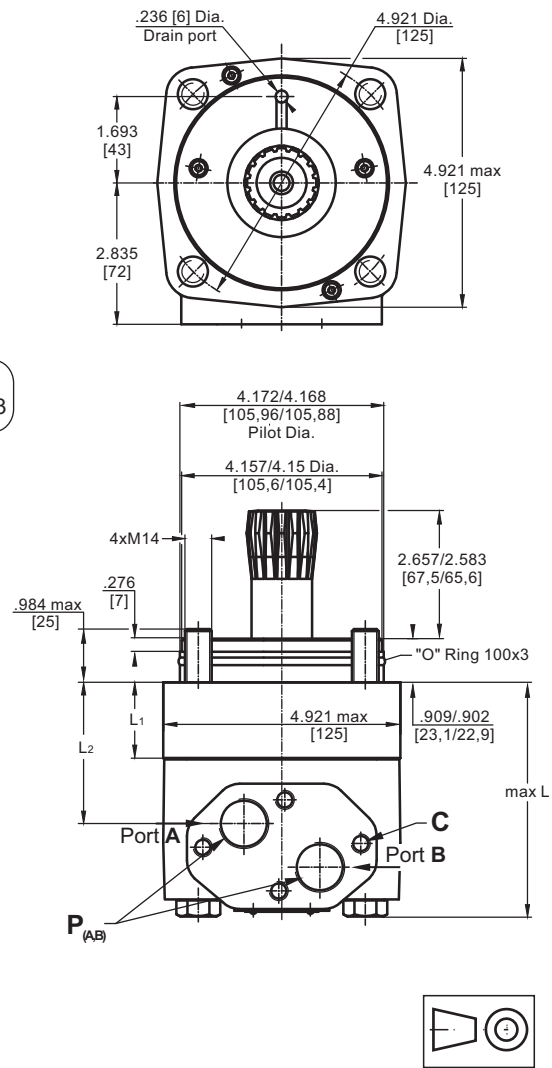
1: Drawing for Standard Shaft Seal

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

— - continuous operations
- - - - intermittent operations

S Short Mount


Port Dim.
See Page 33

V Very Short Mount


in [mm]

Standard Rotation

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

Reverse Rotation

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

	Versions		
	2, 6	3, 9	4, 7
C	4xM10	4xM10	-
P (A,B)	2xG ³ / ₄	2xM27x2	2x1 ¹ / ₁₆ -12UN
T	G ¹ / ₄	M14x1,5	9 ¹ / ₁₆ -18UNF

Type	L max, in [mm]		L2, in [mm]	**L1, in [mm]	Type	L max, in [mm]		L2, in [mm]	**L1, in [mm]
	Versions 2, 3, 4	*Versions 6, 7, 9				Versions 2, 3, 4	*Versions 6, 7, 9		
MLHTS 160	5.90 [150]	6.10 [155]	4.07 [103,6]	.79 [20,0]	MLHTV 160	3.97 [100,8]	4.36 [110,8]	2.02 [51,5]	.65 [16,5]
MLHTS 200	6.10 [155]	6.30 [160]	4.27 [108,5]	.98 [25,0]	MLHTV 200	4.17 [105,8]	4.56 [115,8]	2.22 [56,5]	.85 [21,5]
MLHTS 250	6.34 [161]	6.57 [167]	4.52 [114,8]	1.23 [31,3]	MLHTV 250	4.41 [112,1]	4.81 [122,1]	2.47 [62,8]	1.09 [27,8]
MLHTS 315	6.69 [170]	6.93 [176]	4.88 [124,0]	1.59 [40,5]	MLHTV 315	4.76 [121,3]	5.17 [131,3]	2.83 [72,0]	1.46 [37,0]
MLHTS 400	7.13 [181]	7.32 [186]	5.30 [134,5]	2.01 [51,0]	MLHTV 400	5.19 [131,8]	5.58 [141,8]	3.25 [82,5]	1.87 [47,5]
MLHTS 500	7.68 [195]	7.87 [200]	5.85 [148,5]	2.56 [65,0]	MLHTV 500	5.74 [145,8]	6.13 [155,8]	3.80 [96,5]	2.42 [61,5]
MLHTS 630	7.52 [191]	7.72 [196]	5.69 [144,5]	2.40 [61,0]	MLHTV 630	5.58 [141,8]	5.98 [151,8]	3.64 [92,5]	2.26 [57,5]
MLHTS 725	7.87 [200]	8.07 [205]	6.04 [153,5]	2.76 [70,0]	MLHTV 725	5.94 [150,8]	6.33 [160,8]	4.00 [101,5]	2.62 [66,5]

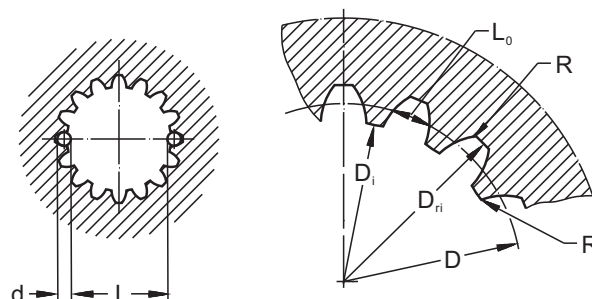
* - For Rear Ported Motors.

** - The width of the roll-gerotor is .138 in. [3,5 mm] greater than L₁.

INTERNAL SPLINE DATA FOR THE ATTACHED COMPONENT

Standard ANS B92.1-1976, class 5
[$m=2.1166$; corrected $x.m=1$]

Flat Root Side Fit		inch	mm
Number of Teeth	z	16	16
Diametral Pitch	DP	12/24	12/24
Pressure Angle		30°	30°
Pitch Dia.	D	1.3333	33,8656
Major Dia.	D _{ri}	1.5118÷1.5275	38,4 ^{+0,4}
Minor Dia.	D _i	1.2657÷1.2673	32,15 ^{+0,04}
Space Width [Circular]	Lo	.1763÷.1791	4,516±0,037
Fillet Radius	R	.02	0,5
Max. Measurement between Pins	L	1.063÷1.059	26,9 ^{+0,10}
Pin Dia.	d	.19026÷.19034	4,835±0,001

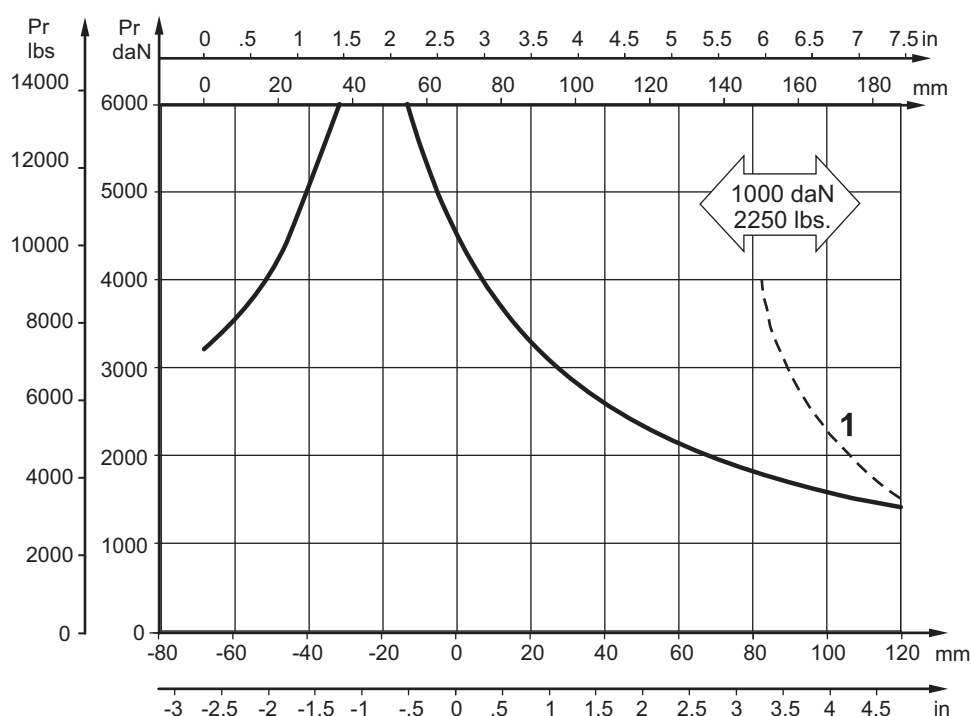


Hardening Specification:
HV=750±50 on the surface.
HV=560 at .035÷.019 [0,7±0,2] case depth
Material: 20 MoCr4 EN 10084 or SAE8620.

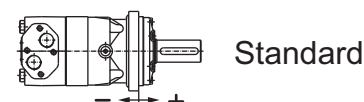
PERMISSIBLE SHAFT LOADS

The output shaft runs in tapered bearings that permit high axial and radial forces. The permissible radial load on the shaft is shown for an axial load of 0 N as function of the distance from the mounting flange to the point of load application. The curves apply to a B10 bearing life of 2000 hours at 100 RPM.

Curve "1" shows max. radial shaft load. Any shaft load exceeding the values shown by the curve will seriously reduce motor life.

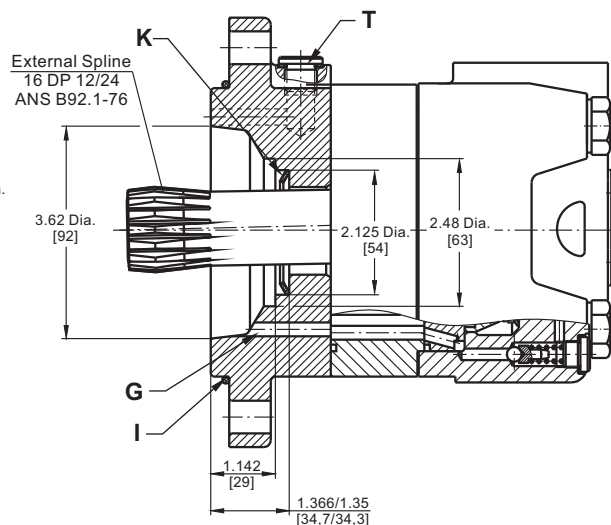
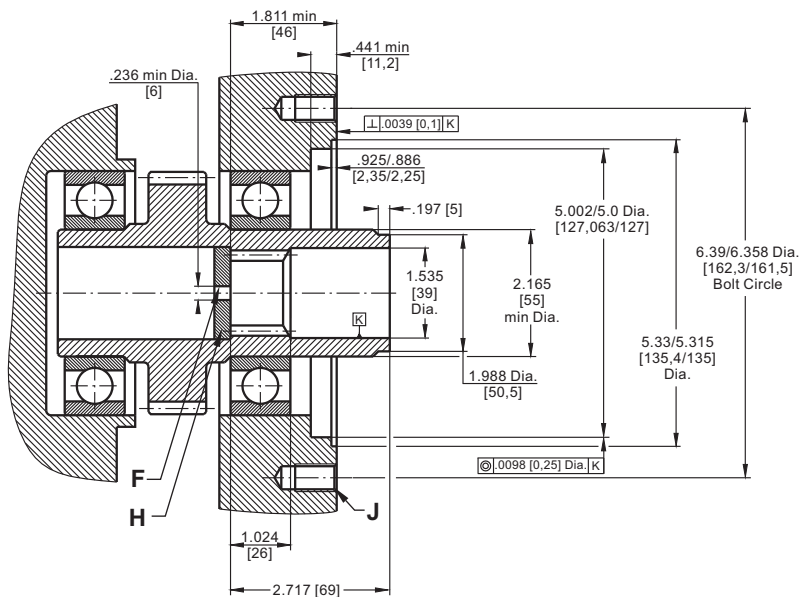


Mounting Flange:



DIMENSIONS OF THE ATTACHED COMPONENT

For MLHTS



F : Oil circulation hole

G : Internal drain channel

H : Hardened stop plate

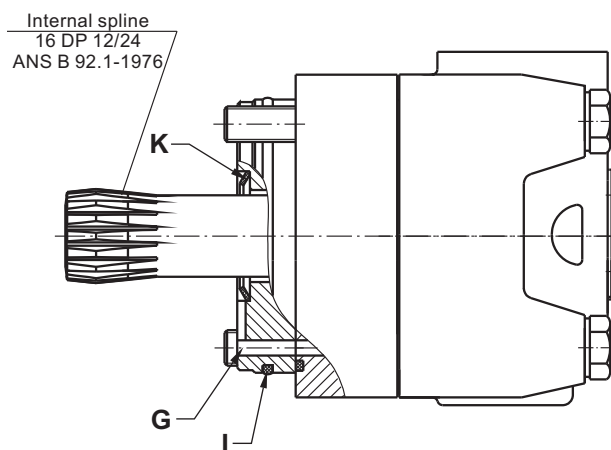
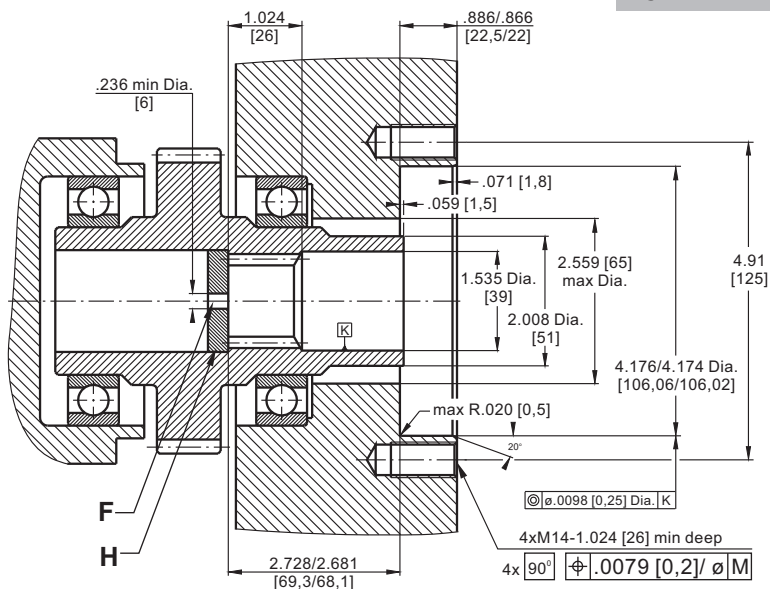
I : O-ring 4.921x.118 [125x3]

J : 4x1/2 UN; .71 [18] deep, 90°, 6.375 [162] Dia. B.C.

K : Conical seal ring

T : Drain connection G1/4. M14x1,5 or 9/16-18 UNF

For MLHTV



F : Oil circulation hole

G : Internal drain channel

H : Hardened stop plate

I : O-ring 3.94x.118 [100x3]

K : Conical seal ring

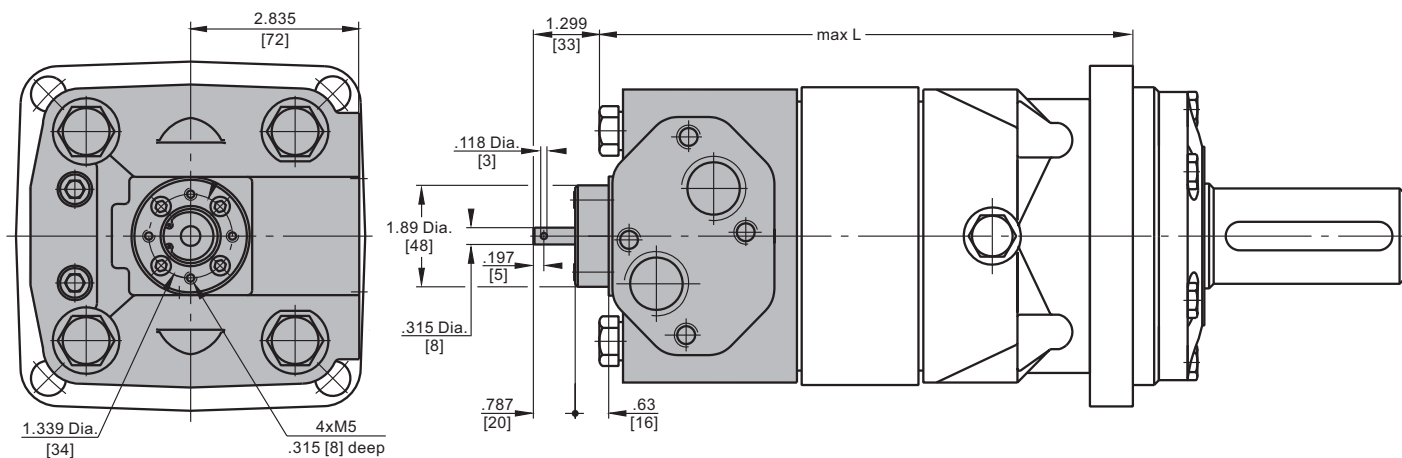
DRAIN CONNECTION

A drain line has to be used when pressure in the return line can exceed the permissible pressure. It can be connected:

- For MLHTS at the drain port of the motor;
- For MLHTV at the drain connection of the attached component. The maximum pressure in the drain line is limited by the attached component and its shaft seal.

The drain line must be possible for oil to flow freely between motor and attached component and must be led to the tank. The maximum pressure in the drain line is limited by the attached component and its seal.

MOTORS WITH TACHO CONNECTION



ORDER CODE

	1	2	3	4	5	6	7
MLHT							

Pos.1 - Mounting Flange

omit - SAE C, four holes

S - Short

V - Very short

W - Wheel mount

Pos.2 - Displacement code

160 - 9.83 in³/rev [61,6 cm³/rev]

200 - 12.29 in³/rev [201,4 cm³/rev]

250 - 15.36 in³/rev [251,8 cm³/rev]

315 - 19.90 in³/rev [326,3 cm³/rev]

400 - 25.06 in³/rev [410,9 cm³/rev]

500 - 31.95 in³/rev [523,6 cm³/rev]

630 - 38.52 in³/rev [631,2 cm³/rev]

725 - 44.20 in³/rev [724,3 cm³/rev]

Pos.3 - Shaft Extensions*

omit - for **S** and **V** mounting flange

C - 1 1/2" [38,10] straight, Parallel key

G - 1 1/2" [38,10] 17T Splined

M - 40 mm straight, Parallel key

P - 34,85 mm Splined, p.t.o. DIN 9611 Form 1

T - 1 3/4" [44,50] J501 Tapered

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

2 - side ports, 2xG³/₄, G¹/₄, BSP thread, ISO 228

3 - side ports, 2xM27x2; M14x1,5; metric thread, ISO 262

4 - side ports, 2x 1 1/16-12 UN, O-ring, 9/16-18 UNF

6 - rear ports, 2xG³/₄, G¹/₄; BSP thread, ISO 228

7 - rear ports, 2x 1 1/16-12 UN, O-ring, 9/16-18 UNF

9 - rear ports, 2xM27x2; M14x1,5; metric thread, ISO 262

Pos.5 - Shaft Seal Version** [see page 34]

omit - Low pressure seal

U - High pressure seal

Pos.6 - Additional Options [see page 58]

Pos.7 - Design Series

omit - Factory specified

NOTES:

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

** Shaft seal is available with the "omit" and "W" mounting flange only!

Version 7 is not applicable at S (Short) motors.

The hydraulic motors are mangano-phosphatized as standard.

MOTOR ADDITIONAL OPTIONS

Additional Options Description	Order Code	Motor type			
		MLHS	MLHT	MLHV	MLHHW
Speed Sensor*	RS	O	O	O	O
Tacho Connection**	T	O	O	O	O
Reinforced motor	HD	-	O	O	O
Reinforced motor (with check valves)	1HD	-	O	O	O
Low Leakage	LL	O	O	O	O
Low Speed Valving	LSV	O	O	O	O
Free Running	FR	O	O	O	O
Reverse Rotation	R	O	O	O	O
Paint***	P	O	O	O	O
Corrosion Protected Paint***	PC	O	O	O	O
Special Paint****	PS	O	O	O	O
	PCS				

O	Optional
-	Not applicable

* For sensor ordering see pages 59÷60.

** For side ports only!

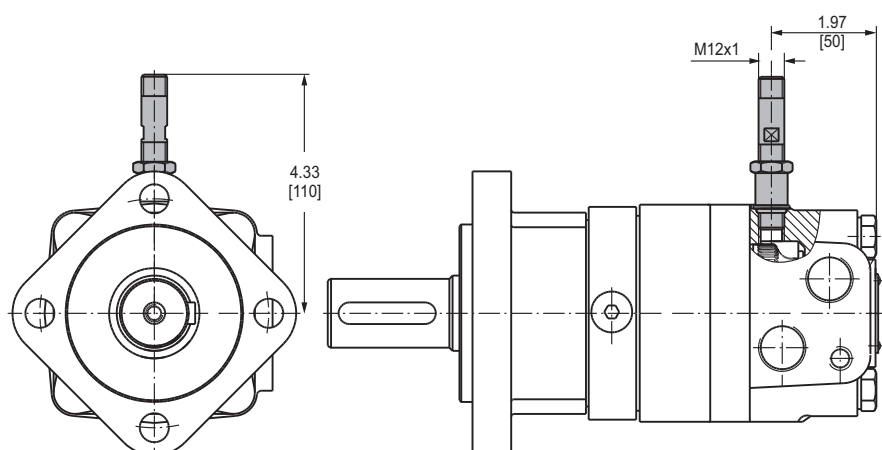
*** Colour at customer's request.

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

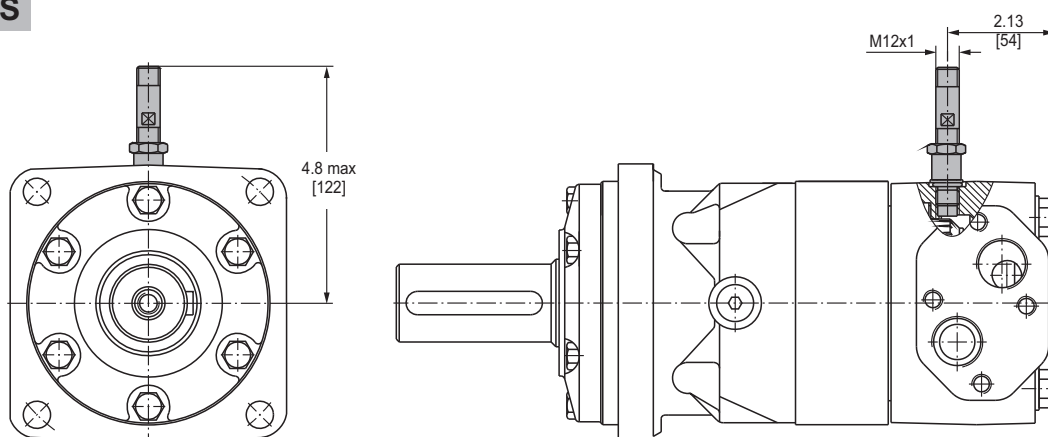
△ For more information about HD option please contact with "M+S Hydraulic".

MOTORS WITH SPEED SENSOR

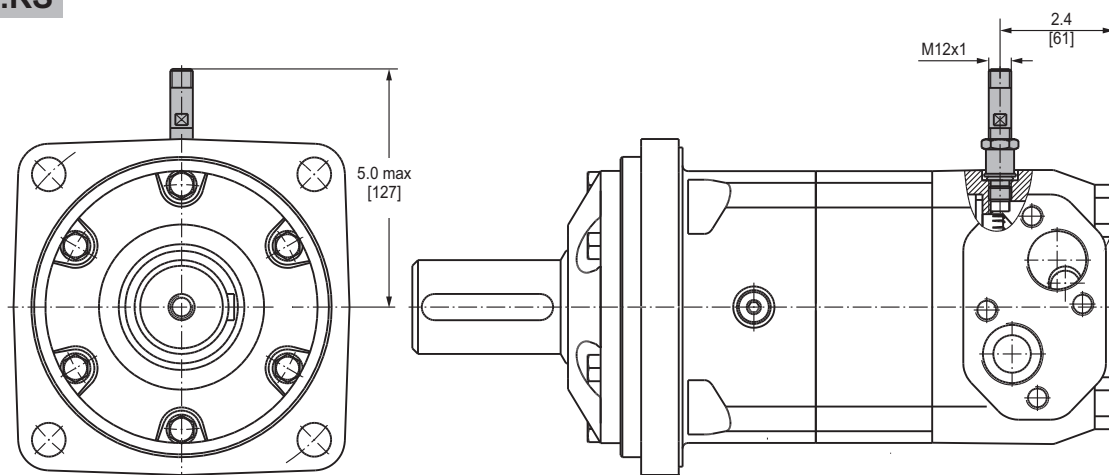
MLHS...RS



MLHT...RS

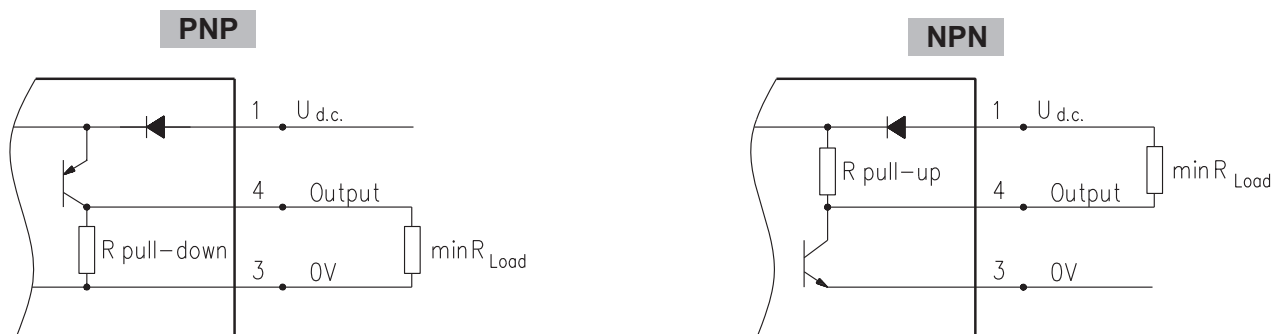


MLHV...RS



TECHNICAL DATA OF THE SPEED SENSOR

Wiring diagrams

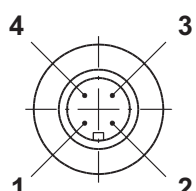


$$R_{Load} [k\Omega] = U_{d.c.} [V] / I_{max} [mA]$$

Motor type	MLHS	MLHT	MLHV
Pulses per revolution	54	84	102

Stick type

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



Order Code for Speed Sensor

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

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

APPLICATION CALCULATION

VEHICLE DRIVE CALCULATIONS

1. Motor speed: n , RPM

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

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

2. Rolling resistance: RR , lbs [daN]

The resistance force resulted in wheels contact with different surfaces:

$$RR = G \times \rho$$

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

Table 1

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

3. Grade resistance: GR , lbs [daN]

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

α - gradient negotiation angle (Table 2)

Table 2

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

4. Acceleration force: FA , lbs [daN]

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

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

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

5. Tractive effort: DP , lbs [daN]

Tractive effort DP is the additional force of trailer. This value will be established as follows:

-acc.to constructor's assessment;
 -as calculating forces in items 2, 3 and 4 of trailer; the calculated sum corresponds to the tractive effort requested.

6. Total tractive effort: TE , lbs [daN]

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

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

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

7. Motor Torque moment: M , lb-in [daNm]

Necessary torque moment for every hydraulic motor:

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

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

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

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

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

f - frictional factor;

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

Table 3

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

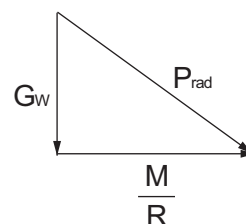
9.Radial motor loading: P_{rad} , lbs [daN]

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

G_w - Weight held by wheel;

P_{rad} - Total radial loading of motor shaft;

M/R - Motion force.



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

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

DRAINAGE SPACE AND DRAINAGE PRESSURE

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

