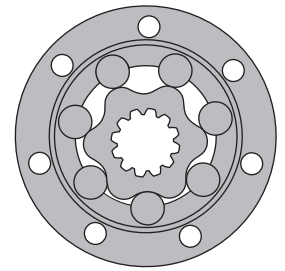


HYDRAULIC MOTORS HW



APPLICATION

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



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OPTIONS

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

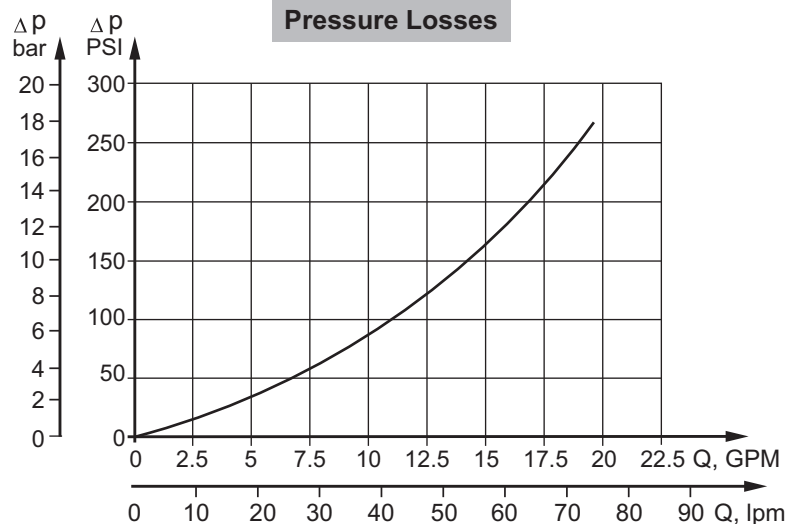
GENERAL

Max. Displacement, in ³ /rev [cm ³ /rev]	45.99 [753,8]
Max. Speed, [RPM]	750
Max. Torque, lb-in [daNm]	cont.: 96 [8500] int.: 106 [9382]
Max. Output, HP [kW]	23,1 [31]
Max. Pressure Drop, PSI [bar]	cont.: 205 [3000] int.: 225 [3260]
Max. Oil Flow, GPM [lpm]	115 [30.4]
Min. Speed, [RPM]	10
Pressure fluid	Mineral based- HLP(DIN 51524) or HM(ISO 6743/4)
Temperature range, °F [°C]	-40÷284 [-40÷140]
Optimal Viscosity range, SUS [mm²/s]	98÷347 [20÷75]
Filtration	ISO code 20/16 (Min. recommended fluid filtration of 25 microns)

Oil flow in drain line

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

Pressure Losses



SPECIFICATION DATA

Type		HW 80	HW 100	HW 125	HW 160	HW 200	HW 235
Displacement, in ³ /rev [cm ³ /rev]		4.86 [79,7]	6.19 [101,4]	7.69 [126]	9.63 [157,8]	12.28 [201,3]	14.36 [235,3]
Max. Speed, [RPM]	Cont.	565	445	357	380	373	319
	Int.*	750	590	476	475	497	425
Max. Torque, lb-in [daNm]	Cont.	1664 [18,8]	2124 [24]	3098 [35]	3894 [44]	4868 [55]	5710 [64,5]
	Int.*	1956 [22,1]	2496 [28,2]	3408 [38,5]	4248 [48]	5310 [60]	6196 [70]
Max. Output, HP [kW]	Cont.	20.7 [15,4]	21.2 [15,8]	21.7 [16,2]	23.6 [17,6]	24.9 [18,6]	24.4 [18,2]
	Int.*	23.3 [17,4]	24.3 [18,1]	26.6 [19,8]	29 [21,6]	31 [23,1]	30.3 [22,6]
Max. Pressure Drop, PSI [bar]	Cont.	2540 [175]	2540 [175]	2970 [205]	2970 [205]	2970 [205]	2970 [205]
	Int.*	2970 [205]	2970 [205]	3260 [225]	3260 [225]	3260 [225]	3260 [225]
Max. Oil Flow, GPM [lpm]	Cont.	12 [45]	12 [45]	12 [45]	16 [60]	20 [75]	20 [75]
	Int.*	16 [60]	16 [60]	16 [60]	20 [75]	26.4 [100]	26.4 [100]
Max. Inlet Pressure, PSI [bar]	Cont.	2900 [200]	2900 [200]	3050 [210]	3050 [210]	3050 [210]	3050 [210]
	Int.*	3260 [225]	3260 [225]	3625 [250]	3625 [250]	3625 [250]	3625 [250]
Max. Starting Pressure with Unloaded Shaft, PSI [bar]		174 [12]	174 [12]	145 [10]	145 [10]	145 [10]	145 [10]
Min. Starting Torque, lb-in [daNm]	At max. press. drop Cont.	1328 [15]	1699 [19,2]	2540 [28,7]	3186 [36]	3991 [45,1]	4673 [52,8]
	At max. press. drop Int.*	1558 [17,6]	1991 [22,5]	2788 [31,5]	3478 [39,3]	4355 [49,2]	5080 [57,4]
Min. Speed***, [RPM]		12	12	10	10	10	10
Weight, lb [kg]	HW	31.1 [14,1]	31.3 [14,2]	31.5 [14,3]	32.2 [14,6]	33.3 [33,3]	34.2 [15,5]
	HWF	27.8 [12,6]	28.0 [12,7]	28.2 [12,8]	28.9 [13,1]	30.0 [13,6]	30.9 [14,0]
	HWFR	32.2 [14,6]	32.4 [14,7]	32.6 [14,8]	33.3 [15,1]	34.4 [15,6]	35.3 [16,0]
	HWFV	27.8 [12,6]	28.0 [12,7]	28.2 [12,8]	28.9 [13,1]	30.0 [13,6]	30.9 [14,0]
	HWS	30.4 [13,8]	30.6 [13,9]	30.9 [14,0]	31.5 [14,3]	32.6 [14,8]	33.5 [15,2]
	HWSW	29.8 [13,5]	30.0 [13,6]	30.2 [13,7]	30.9 [14,0]	31.9 [14,5]	32.8 [14,9]
	HWSR	34.8 [15,8]	35.1 [15,9]	35.3 [16,0]	35.9 [16,3]	37.0 [16,8]	37.9 [17,2]
	HWD	31.5 [14,3]	31.8 [14,4]	31.9 [14,5]	32.6 [14,8]	33.7 [15,3]	34.6 [15,7]
	HWV	30.4 [13,8]	30.6 [13,9]	30.9 [14,0]	31.5 [14,3]	32.6 [14,8]	33.5 [15,2]
	HWE	31.9 [14,5]	32.2 [14,6]	32.4 [14,7]	33.1 [15,0]	34.2 [15,5]	35.1 [15,9]
	HWSE	31.3 [14,2]	31.5 [14,3]	31.8 [14,4]	32.4 [14,7]	33.5 [15,2]	34.4 [15,6]
	HWFE	28.7 [13,0]	28.9 [13,1]	29.1 [13,2]	29.8 [13,5]	30.9 [14,0]	31.8 [14,4]
	HW(7,8,9,10)	35.3 [16,0]	35.5 [16,1]	35.7 [16,2]	36.4 [16,5]	37.5 [17,0]	38.4 [17,4]
	HWF(7,8,9,10)	31.9 [14,5]	32.2 [14,6]	32.4 [14,7]	33.1 [15,0]	34.2 [15,5]	35.1 [15,9]
	HWS(7,8,9,10)	34.6 [15,7]	34.8 [15,8]	35.1 [15,9]	35.7 [16,2]	36.8 [16,7]	37.7 [17,1]

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

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

*** For "E"-option and versions 7,8,9,10 it is not recommendable a flow bigger than 75% of the nominal flow rate.

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

SPECIFICATION DATA

Type		HW 250	HW 300	HW 315	HW 350	HW 370	HW 400
Displacement, in ³ /rev [cm ³ /rev]		15.38 [252]	300 [18.31]	314,9 [19.22]	21.22 [347,8]	22.53 [369,2]	24.21 [396,8]
Max. Speed, [RPM]	Cont.	298	250	238	216	203	189
	Int.*	397	333	318	288	271	252
Max. Torque, lb-in [daNm]	Cont.	6107 [69]	7170 [81]	7523 [85]	8320 [94]	8497 [96]	8497 [96]
	Int.*	6638 [75]	7877 [89]	8230 [93]	9028 [102]	9293 [105]	8674 [98]
Max. Output, HP [kW]	Cont.	22.5 [16,8]	22 [16,5]	21.9 [16,4]	22 [16,5]	17.7 [13,2]	16.8 [12,5]
	Int.*	27.9 [20,8]	27.9 [20,8]	27.9 [20,8]	27.9 [20,8]	25.7 [19,2]	24.8 [18,5]
Max. Pressure Drop, PSI [bar]	Cont.	2970 [205]	2970 [205]	2970 [205]	2970 [205]	200 [2900]	2680 [185]
	Int.*	3260 [225]	3260 [225]	3260 [225]	3260 [225]	3200 [220]	2760 [190]
Max. Oil Flow, GPM [lpm]	Cont.	20 [75]	20 [75]	20 [75]	20 [75]	20 [75]	20 [75]
	Int.*	26.4 [100]	26.4 [100]	26.4 [100]	26.4 [100]	26.4 [100]	26.4 [100]
Max. Inlet Pressure, PSI [bar]	Cont.	3050 [210]	3050 [210]	3050 [210]	3050 [210]	3050 [210]	3050 [210]
	Int.*	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]
Min. Starting Torque, lb-in [daNm]	At max. press. drop Cont.	5000 [56,5]	5877 [66,4]	6169 [69,7]	6815 [77]	7036 [79,5]	6966 [78,7]
	At max. press. drop Int.*	5443 [61,5]	6452 [72,9]	6744 [76,2]	7400 [83,6]	7612 [86]	7107 [80,3]
Min. Speed***, [RPM]		10	10	10	8	8	8
Weight, lb [kg]	HW	34.6 [15,7]	16,1 [35.5]	35.9 [16,3]	36.8 [16,7]	37.3 [16,9]	38.1 [17,3]
	HWF	31.3 [14,2]	14,6 [32.2]	32.6 [14,8]	33.5 [15,2]	34.0 [15,4]	34.8 [15,8]
	HWFR	35.7 [16,2]	16,6 [36.6]	37.0 [16,8]	37.9 [17,2]	38.4 [17,4]	39.2 [17,8]
	HWFV	31.3 [14,2]	14,6 [32.2]	32.6 [14,8]	33.5 [15,2]	34.0 [15,4]	34.8 [15,8]
	HWS	34.0 [15,4]	15,8 [34.8]	35.3 [16,0]	36.2 [16,4]	36.6 [16,6]	37.5 [17,0]
	HWSW	33.3 [15,1]	15,5 [34.2]	34.6 [15,7]	35.5 [16,1]	35.9 [16,3]	36.8 [16,7]
	HWSR	38.4 [17,4]	17,8 [39.2]	39.7 [18,0]	40.6 [18,4]	41.0 [18,6]	41.9 [19,0]
	HWD	35.1 [15,9]	35,9 [35.9]	36.4 [16,5]	37.0 [16,8]	37.7 [17,1]	38.6 [17,5]
	HWV	34.0 [15,4]	15,8 [34.8]	35.3 [16,0]	36.2 [16,4]	36.6 [16,6]	37.5 [17,0]
	HWE	35.5 [16,1]	16,5 [36.4]	36.8 [16,7]	37.7 [17,1]	38.1 [17,3]	39.0 [17,7]
	HWSE	34.8 [15,8]	16,2 [35.7]	36.2 [16,4]	37.0 [16,8]	37.5 [17,0]	38.4 [17,4]
	HWFE	32.2 [14,6]	15,0 [33.1]	33.5 [15,2]	34.4 [15,6]	34.8 [15,8]	35.7 [16,2]
	HW(7,8,9,10)	38.8 [17,6]	18,0 [39.7]	40.1 [18,2]	41.0 [18,6]	41.4 [18,8]	42.3 [19,2]
	HWF(7,8,9,10)	35.5 [16,1]	16,5 [36.4]	36.8 [16,7]	37.7 [17,1]	38.1 [17,3]	39.0 [17,7]
	HWS(7,8,9,10)	38.1 [17,3]	17,7 [39.0]	39.5 [17,9]	40.3 [18,3]	40.8 [18,5]	41.7 [18,9]

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

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

*** For "E"-option and versions 7,8,9,10 it is not recommendable a flow bigger than 75% of the nominal flow rate.

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

SPECIFICATION DATA

Type		HW 470	HW 500	HW 535	HW 550	HW 600	HW 750
Displacement, in³/rev [cm³/rev]		28.72 [470,6]	30.66 [502,4]	32.65 [535]	33.56 [550]	36.55 [598,9]	45.99 [753,8]
Max. Speed, [RPM]	Cont.	159	149	140	136	125	99
	Int.*	244	229	215	209	192	152
Max. Torque, lb-in [daNm]	Cont.	8143 [92]	8054 [91]	7966 [90]	7877 [89]	8054 [91]	8143 [92]
	Int.*	8939 [101]	8939 [101]	9205 [104]	9293 [105]	9382 [106]	9382 [106]
Max. Output, HP [kW]	Cont.	14.2 [10,6]	14.5 [10,8]	9,4 [12,6]	12 [9]	11.7 [8,7]	9.8 [7,3]
	Int.*	23.3 [17,4]	23.9 [17,8]	16,4 [22]	21.2 [15,8]	20.2 [20,2]	16.8 [12,5]
Max. Pressure Drop, PSI [bar]	Cont.	2180 [150]	2030 [140]	130 [1885]	1815 [125]	1670 [115]	1380 [95]
	Int.*	2390 [165]	2250 [155]	150 [2180]	2105 [145]	1960 [135]	1520 [105]
Max. Oil Flow, GPM [lpm]	Cont.	20 [75]	20 [75]	20 [75]	20 [75]	20 [75]	20 [75]
	Int.*	30.4 [115]	30.4 [115]	30.4 [115]	30.4 [115]	30.4 [115]	30.4 [115]
Max. Inlet Pressure, PSI [bar]	Cont.	3050 [210]	3050 [210]	3050 [210]	3050 [210]	3050 [210]	3050 [210]
	Int.*	250 [250]	250 [250]	250 [250]	250 [250]	250 [250]	250 [250]
Max. Starting Pressure with Unloaded Shaft, PSI [bar]		145 [10]	145 [10]	145 [10]	145 [10]	145 [10]	145 [10]
Min. Starting Torque, lb-in [daNm]	At max. press. drop Cont.	6674 [75,4]	6603 [74,6]	6532 [73,8]	6452 [72,9]	6373 [72,0]	6515 [73,6]
	At max. press. drop Int.*	7328 [82,8]	7328 [82,8]	7540 [85,2]	7470 [84,4]	7417 [83,8]	7505 [84,8]
Min. Speed***, [RPM]		8	8	5	5	5	4
Weight, lb [kg]	HW	39.9 [18,1]	40.6 [18,4]	41.5 [18,8]	41.7 [18,9]	44.9 [20,4]	48.3 [21,9]
	HWF	36.6 [16,6]	37.3 [16,9]	38.1 [17,3]	38.4 [17,4]	41.4 [18,8]	44.6 [20,3]
	HWFR	41.0 [18,6]	41.7 [18,9]	42.5 [19,3]	42.8 [19,4]	46.3 [21,0]	49.6 [22,5]
	HWFV	36.6 [16,6]	37.3 [16,9]	38.1 [17,3]	38.4 [17,4]	41.4 [18,8]	44.6 [20,3]
	HWS	39.2 [17,8]	39.9 [18,1]	40.8 [18,5]	41.0 [18,6]	44.3 [20,1]	47.6 [21,6]
	HWSW	38.6 [17,5]	39.2 [17,8]	40.1 [18,2]	40.3 [18,3]	43.7 [19,8]	46.9 [21,3]
	HWSR	43.7 [19,8]	44.3 [20,1]	45.2 [20,5]	45.4 [20,6]	48.9 [22,2]	52.2 [23,7]
	HWD	40.3 [18,3]	41.0 [18,6]	41.9 [19,0]	42.1 [19,1]	45.4 [20,6]	48.7 [22,1]
	HWV	39.2 [17,8]	39.9 [18,1]	40.8 [18,5]	41.0 [18,6]	44.3 [20,1]	47.6 [21,6]
	HWE	40.8 [18,5]	41.7 [18,9]	42.3 [19,2]	42.5 [19,3]	45.9 [20,8]	49.2 [22,3]
	HWSE	40.1 [18,2]	40.8 [18,5]	41.7 [18,9]	41.9 [19,0]	45.2 [20,5]	48.5 [22,0]
	HWFE	37.5 [17,0]	38.1 [17,3]	39.0 [17,7]	39.2 [17,8]	42.3 [19,2]	45.6 [20,7]
	HW(7,8,9,10)	44.1 [20,0]	44.6 [20,3]	45.6 [20,7]	45.9 [20,8]	49.2 [22,3]	52.5 [23,8]
	HWF(7,8,9,10)	40.8 [18,5]	41.4 [18,8]	42.3 [19,2]	42.5 [19,3]	45.6 [20,7]	48.9 [22,2]
	HWS(7,8,9,10)	43.4 [19,7]	44.1 [20,0]	44.9 [20,4]	45.2 [20,5]	48.5 [22,0]	51.8 [23,5]

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

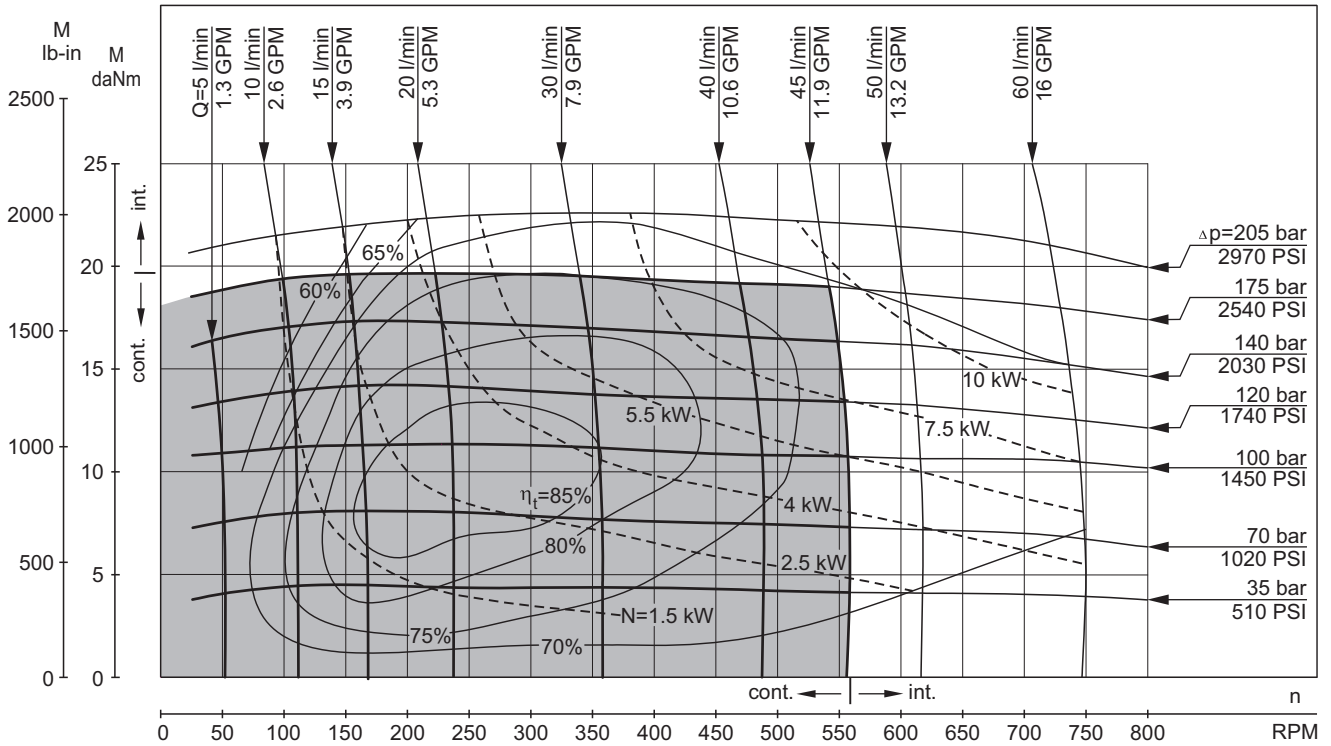
** For speeds lower than given, consult factory or your regional manager.

*** For "E"-option and versions 7,8,9,10 it is not recommendable a flow bigger than 75% of the nominal flow rate.

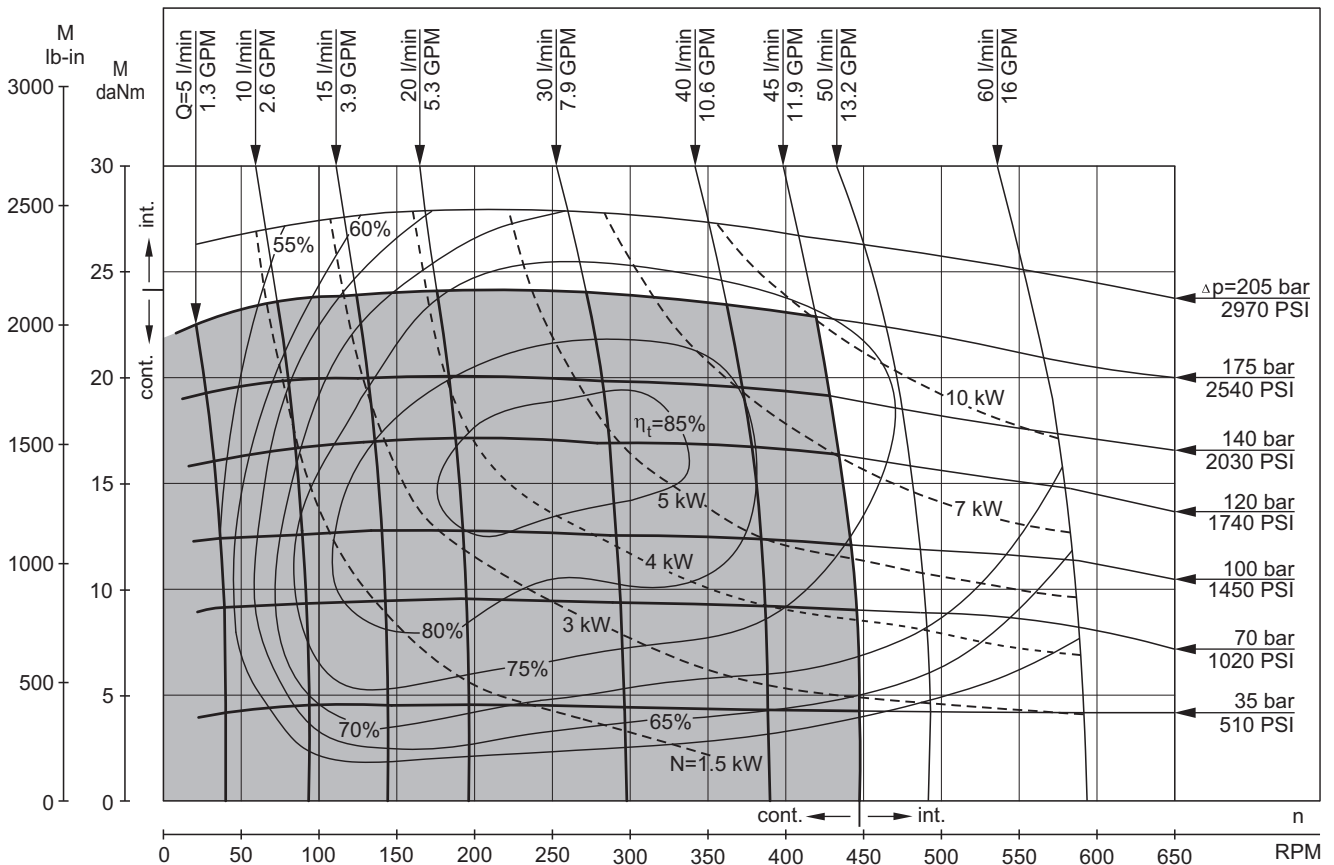
- Intermittent speed and intermittent pressure must not occur simultaneously.
- Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
- Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP(DIN51524) or HM (ISO 6743/4).
If using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

FUNCTION DIAGRAMS

HW 80



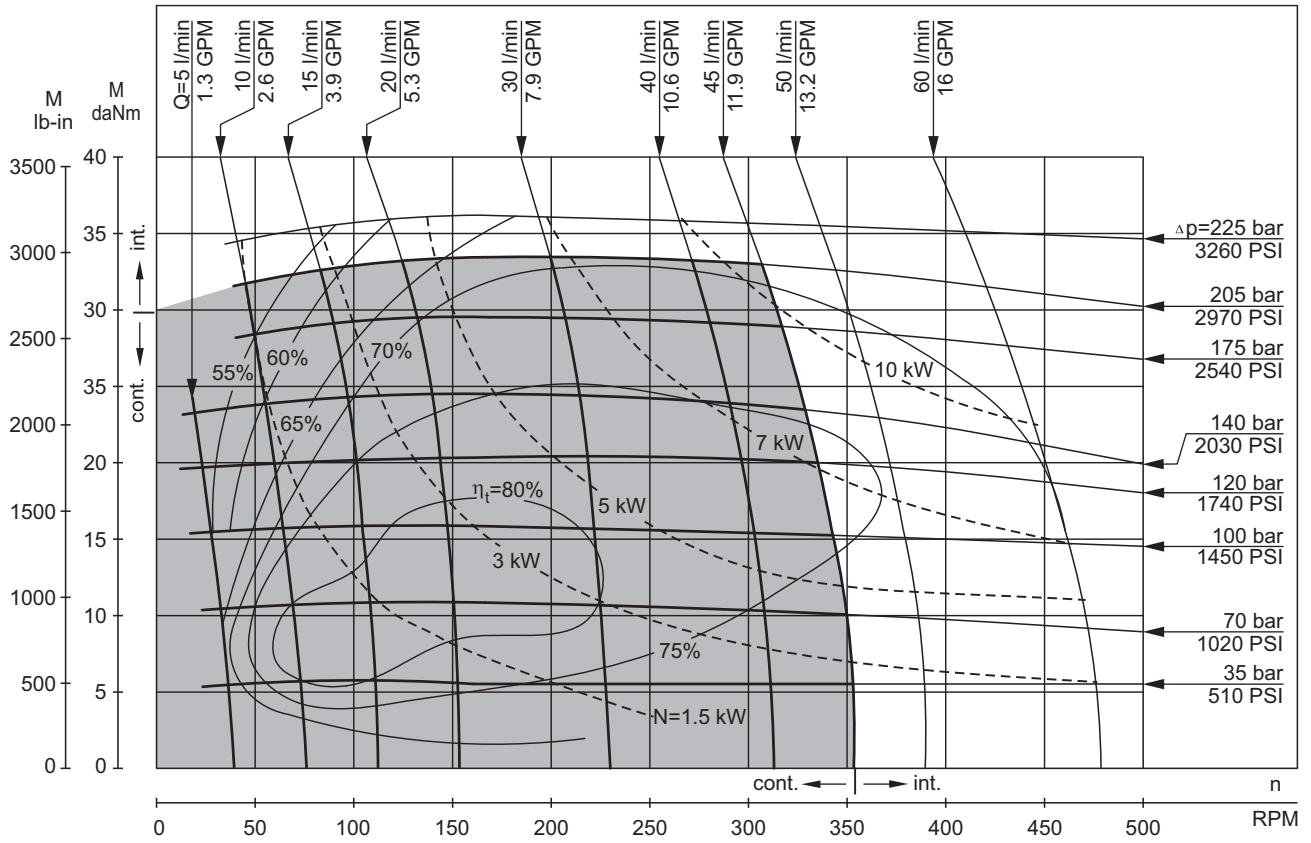
HW 100



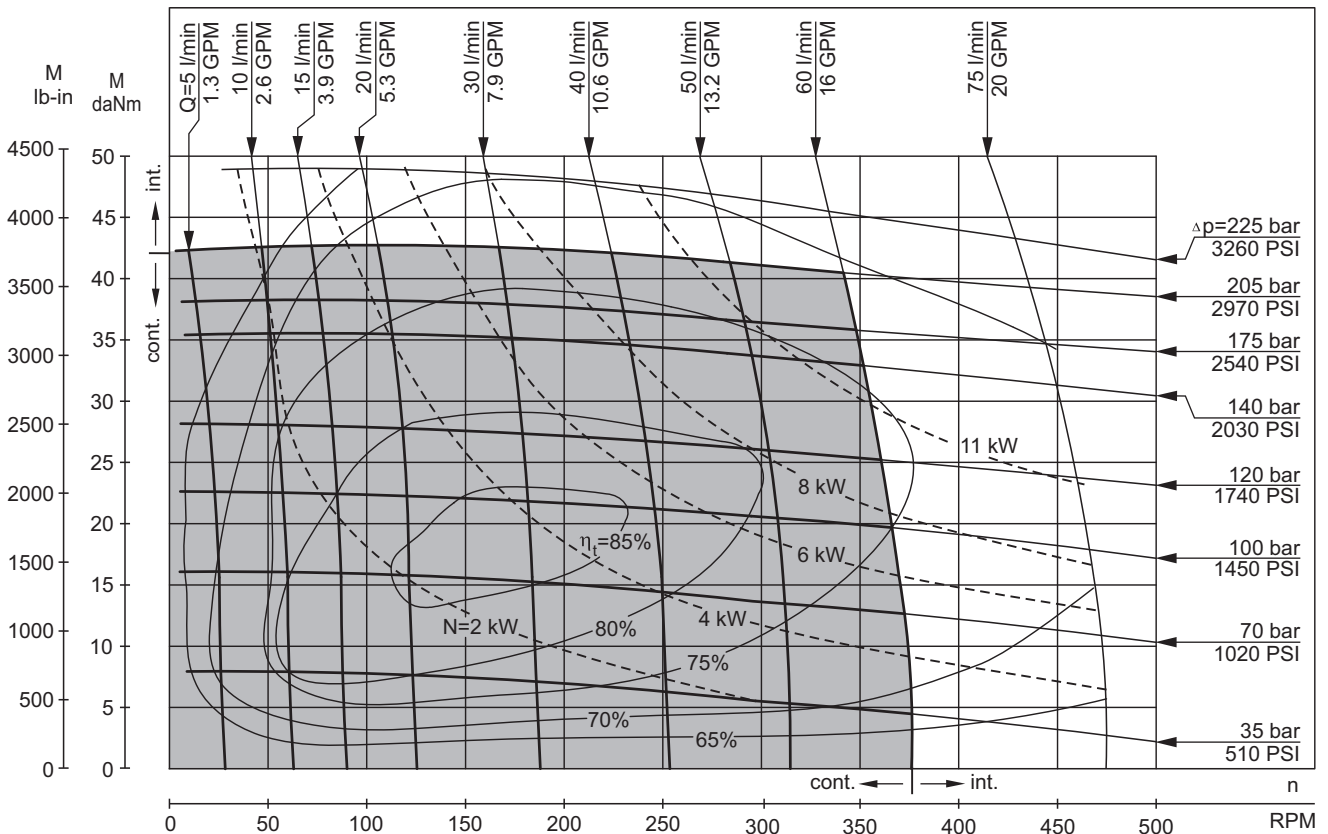
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5 PSI÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

HW 125



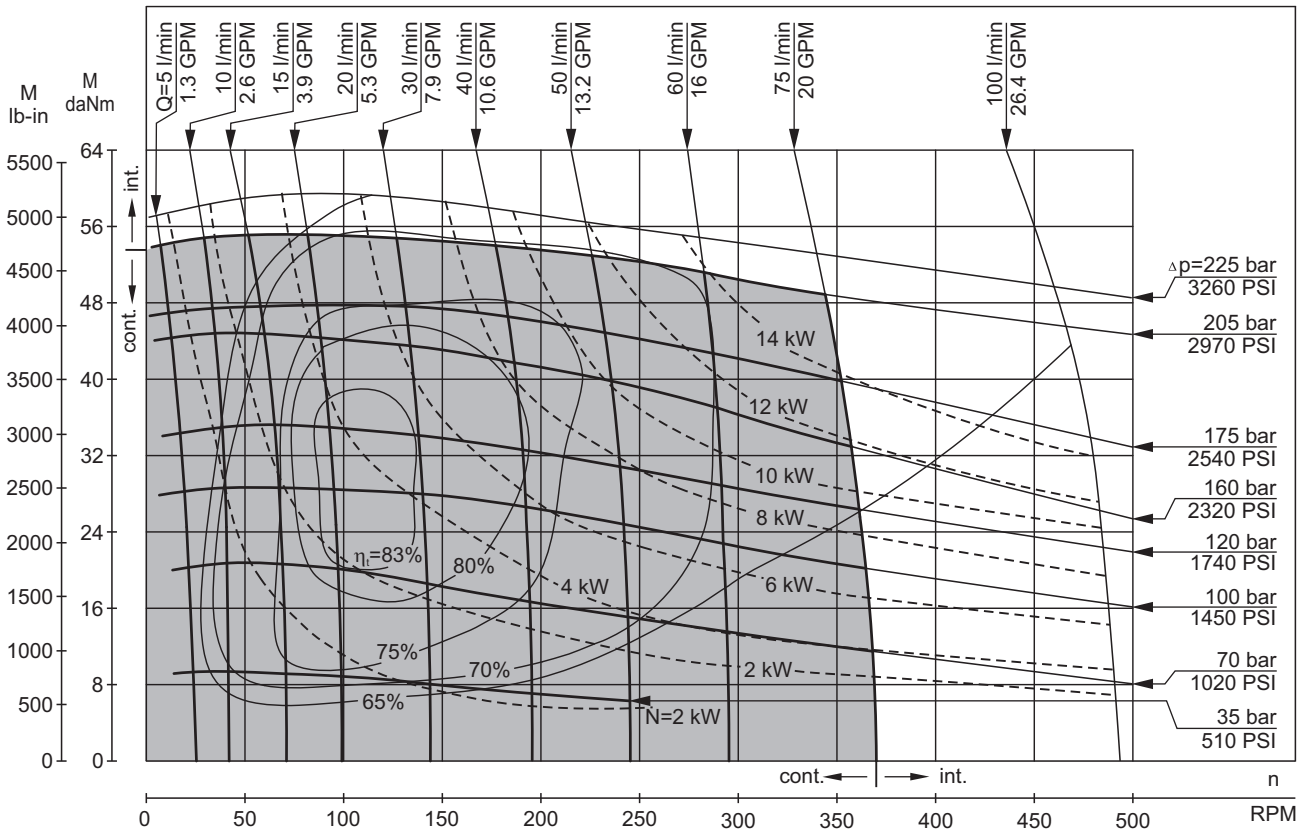
HW 160



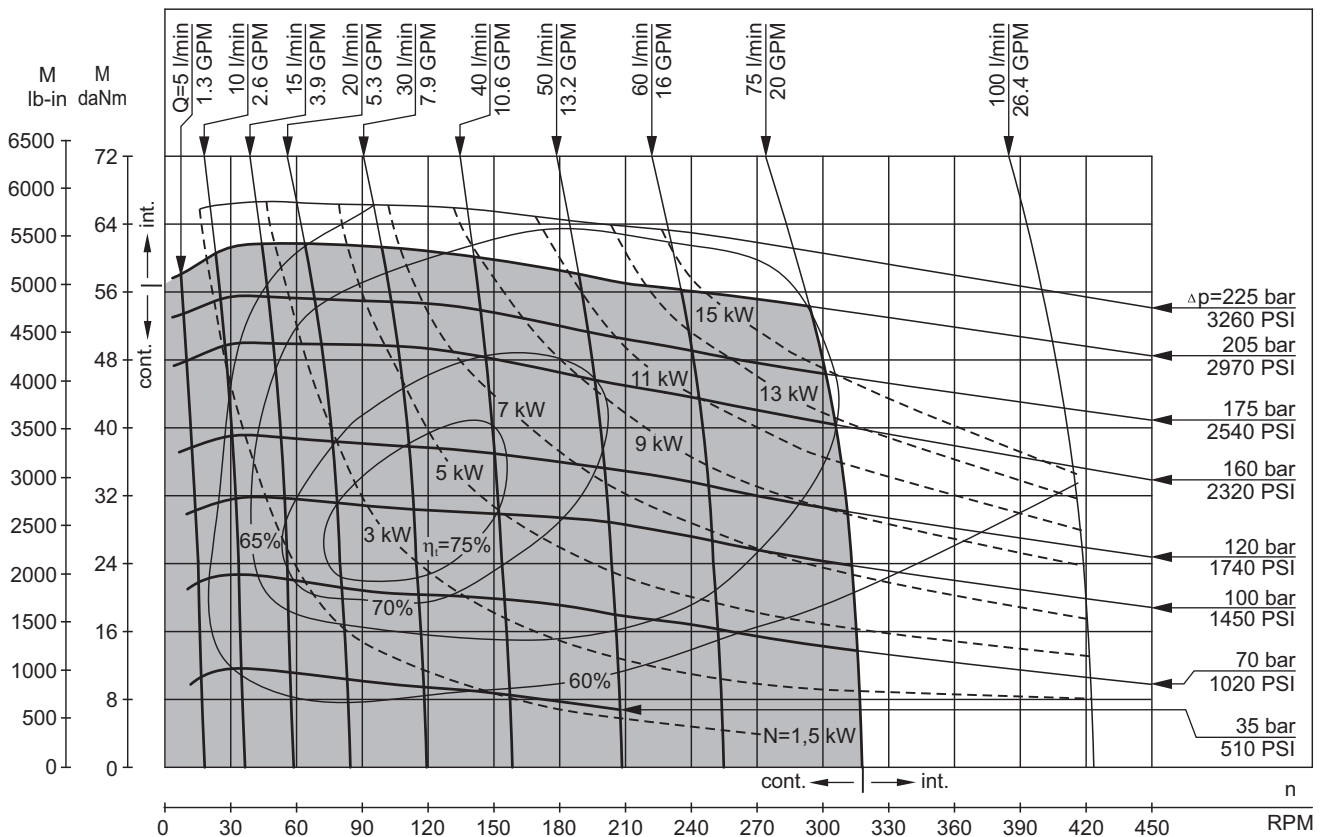
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5 PSI ± 145 PSI [5 ± 10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

HW 200



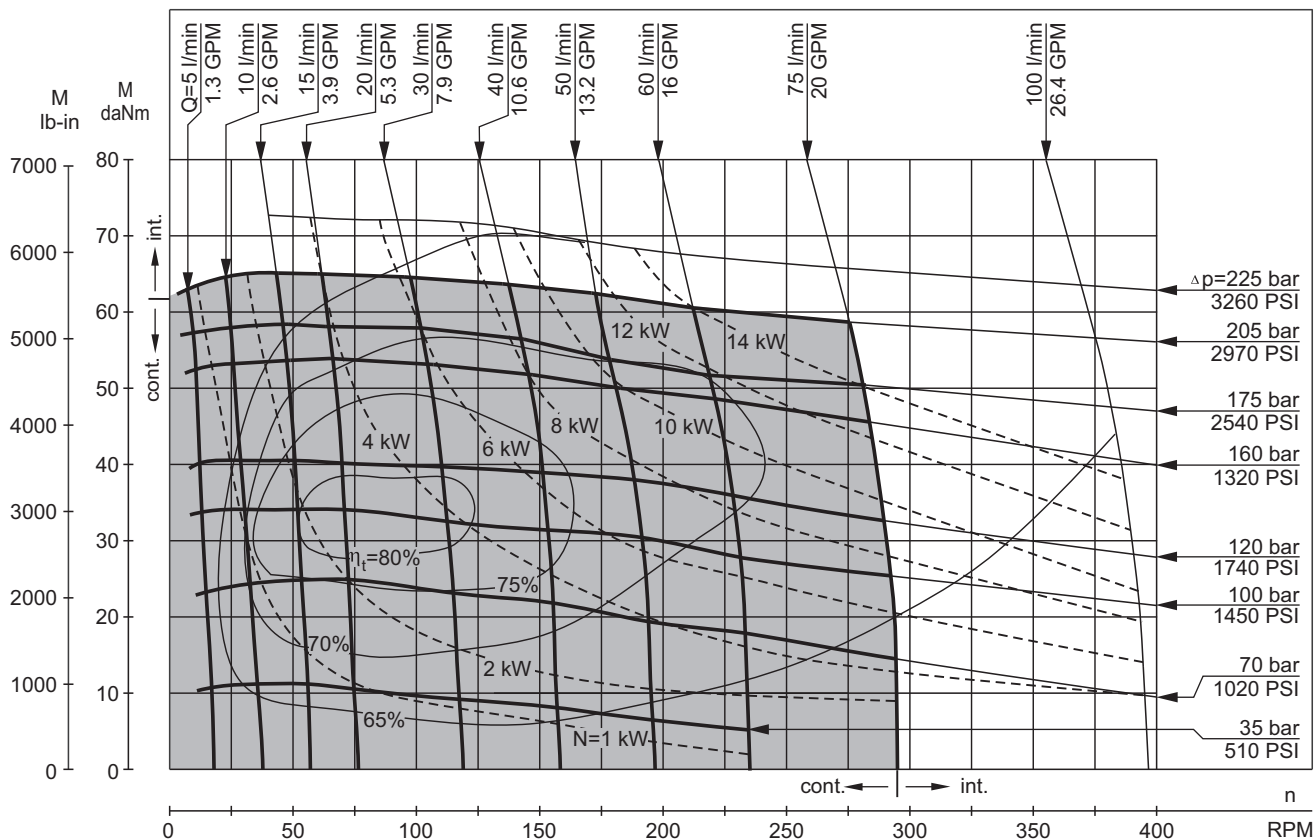
HW 235



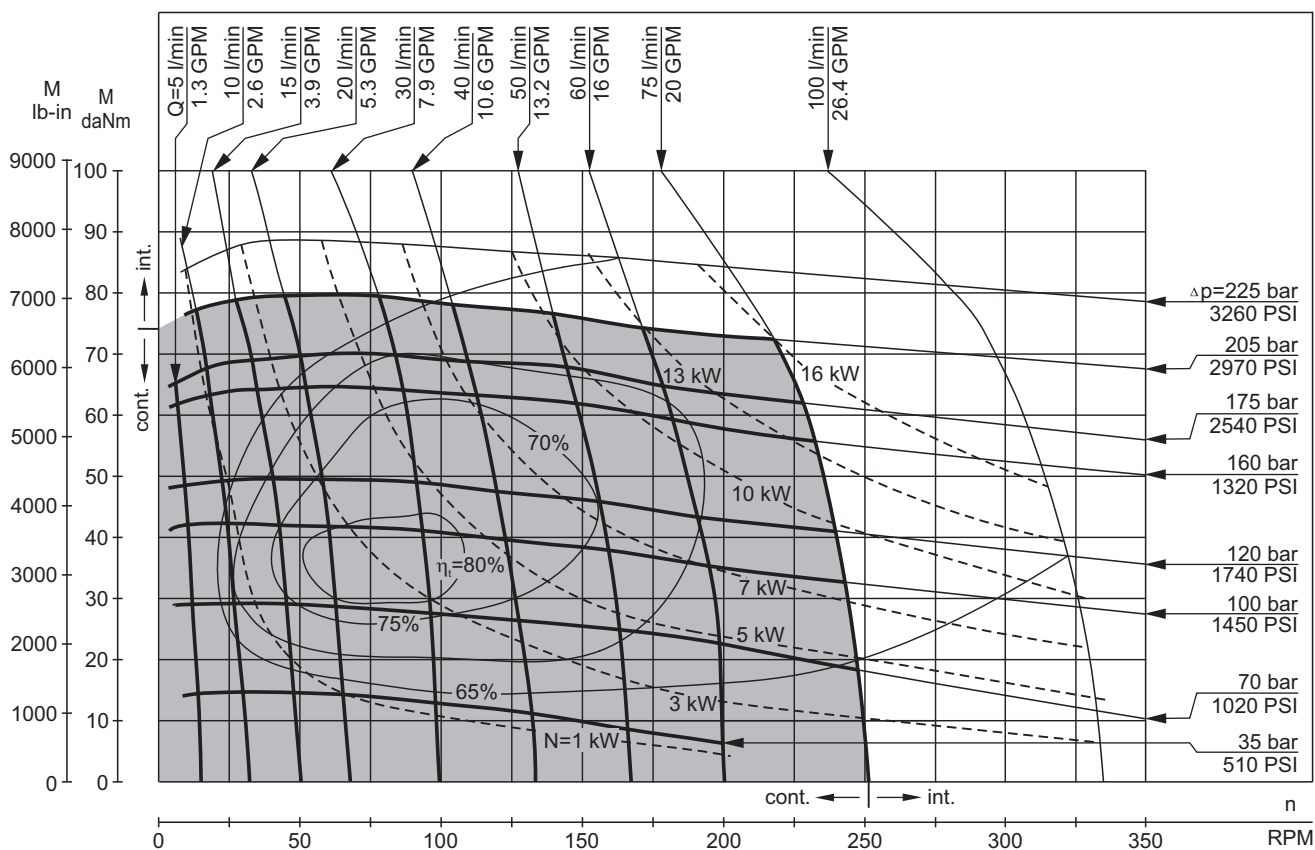
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5 PSI $\pm$ 145 PSI [5 $\pm$ 10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

HW 250



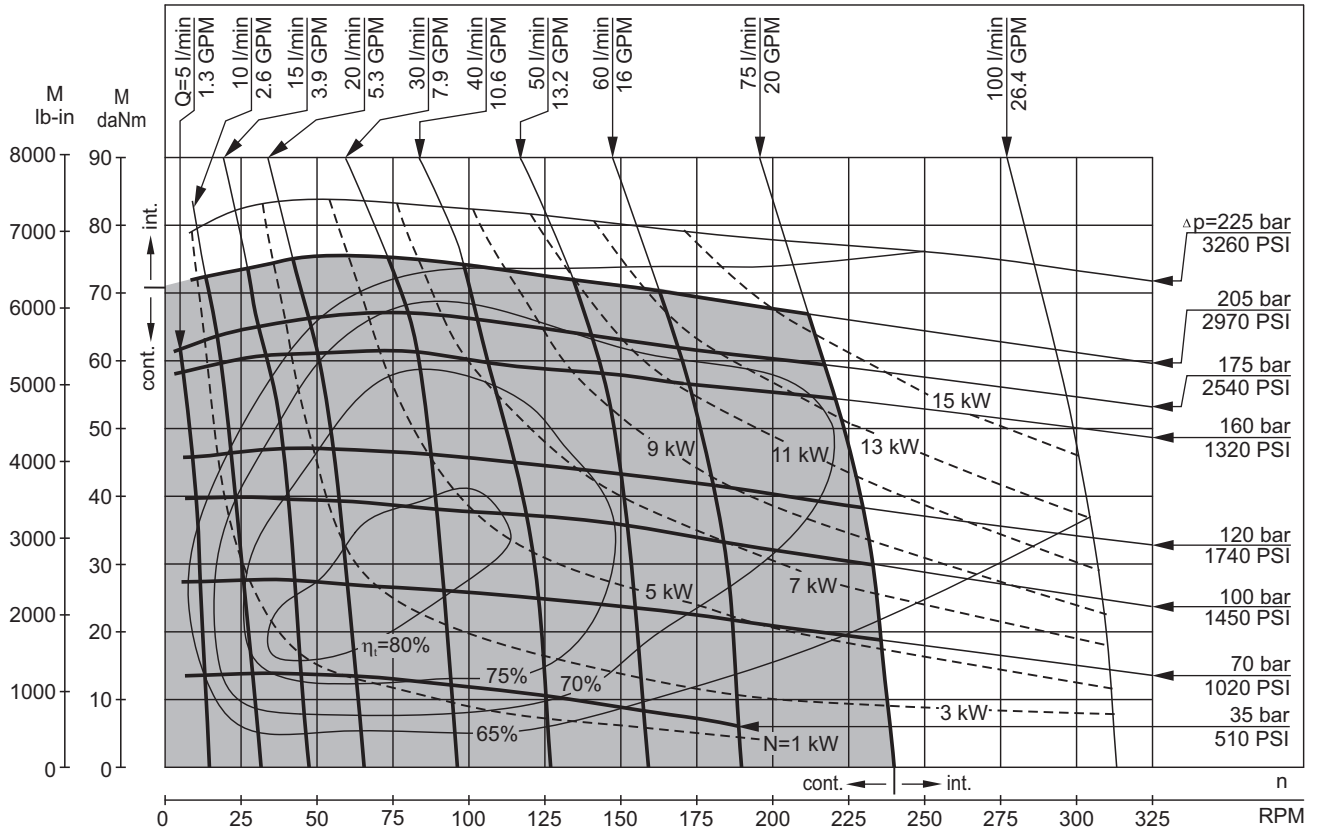
HW 300



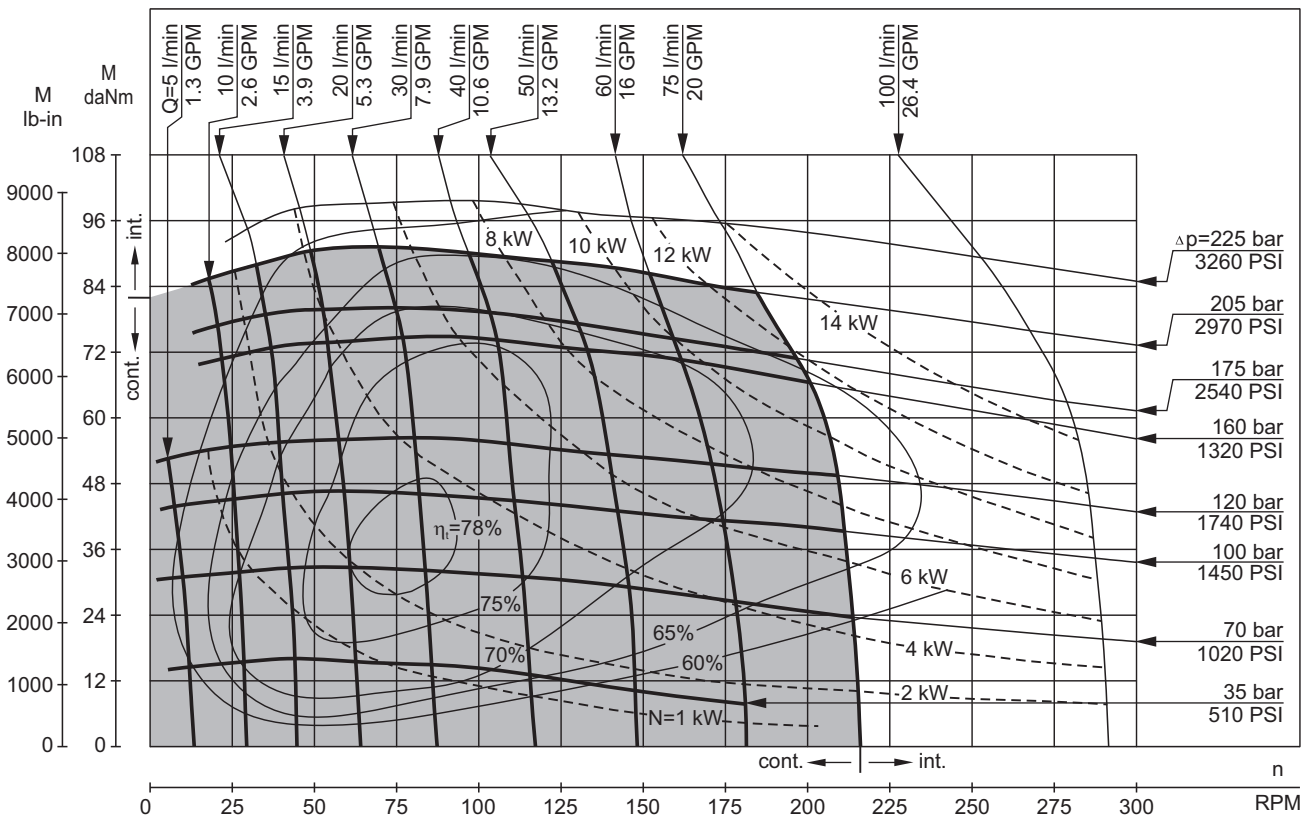
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5 PSI÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

HW 315



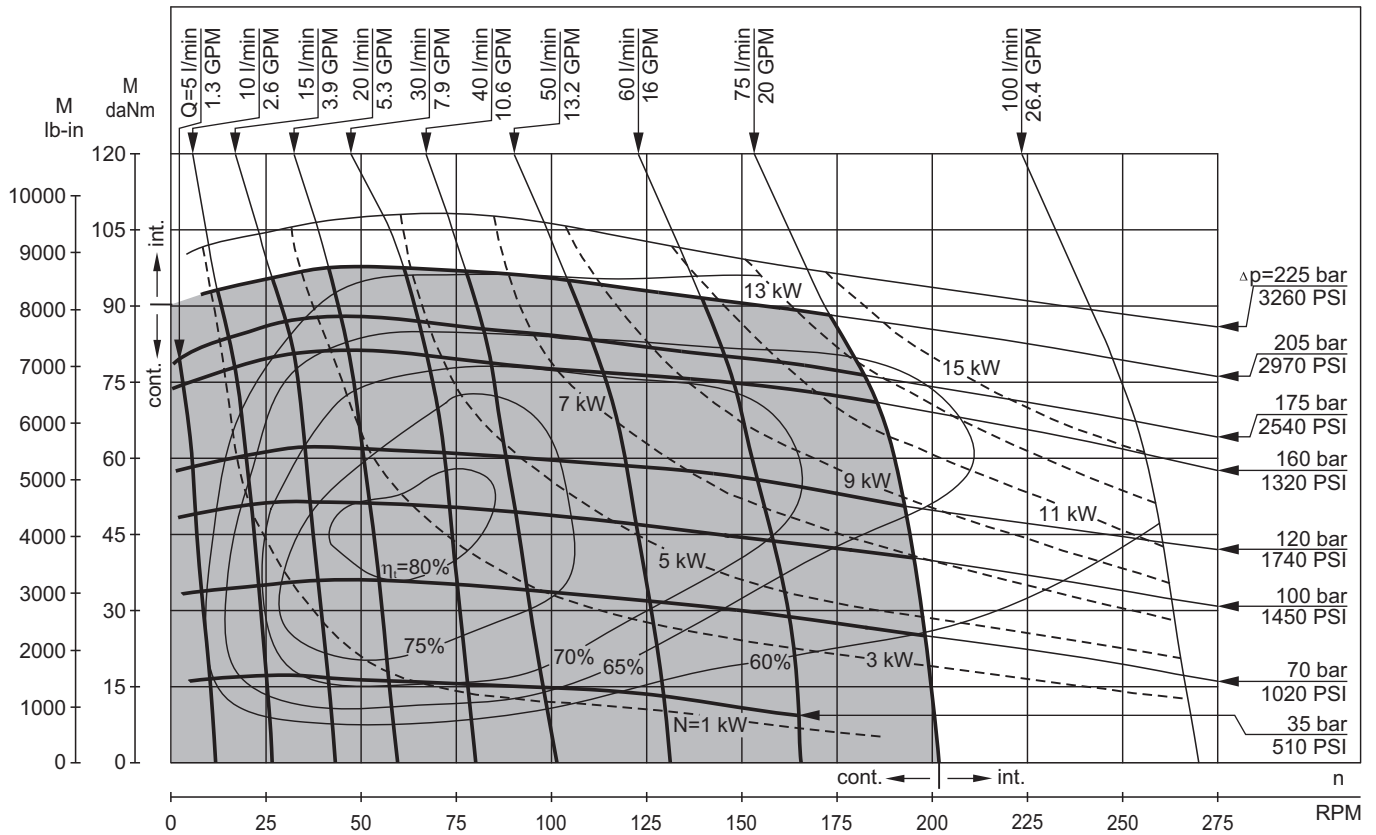
HW 350



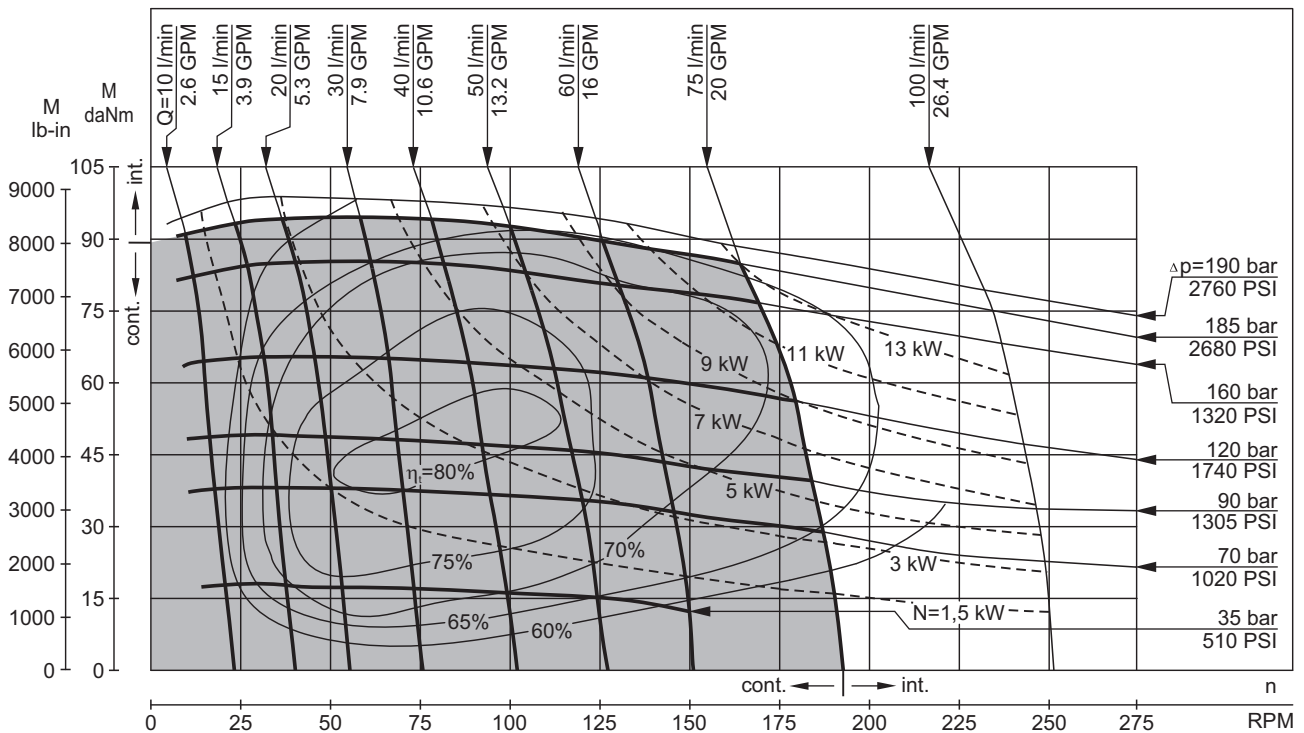
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5 PSI÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

HW 370



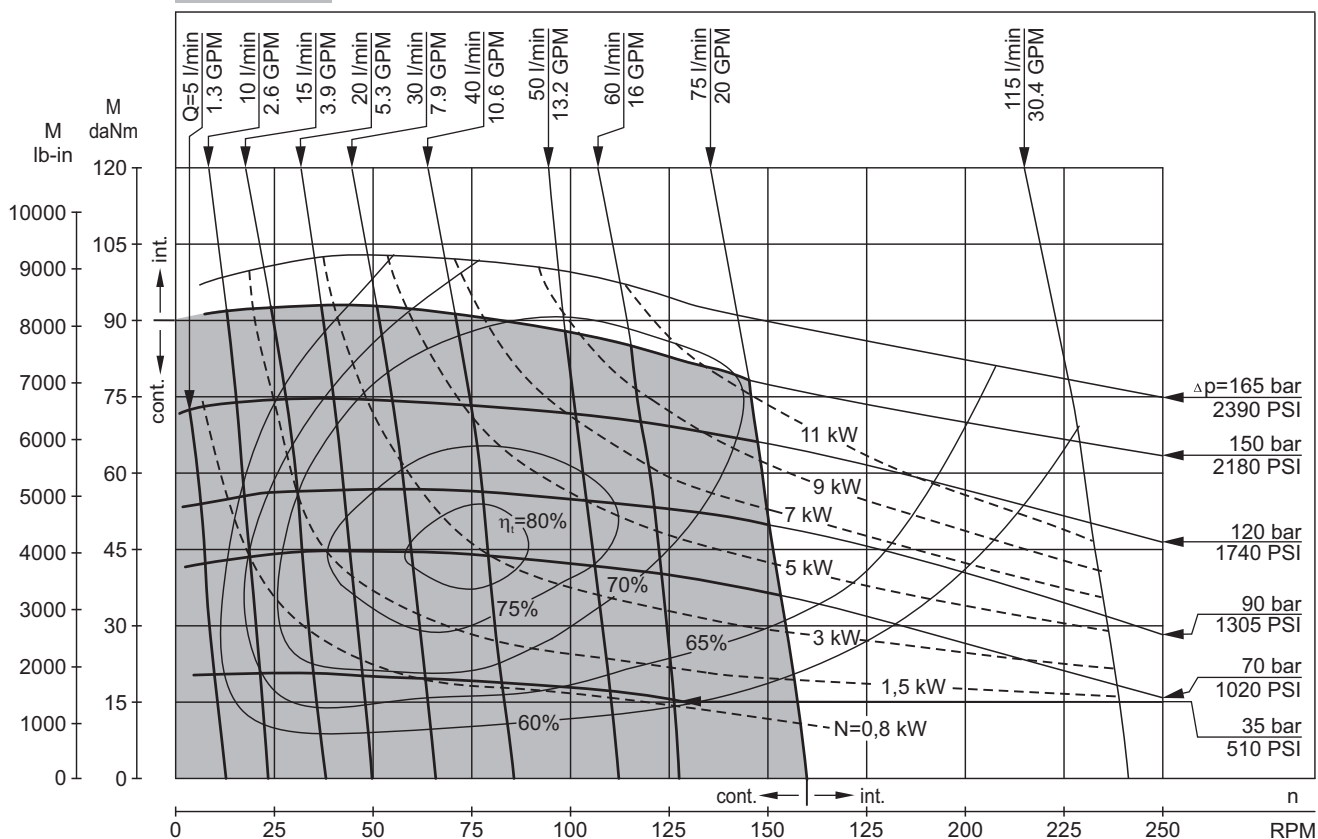
HW 400



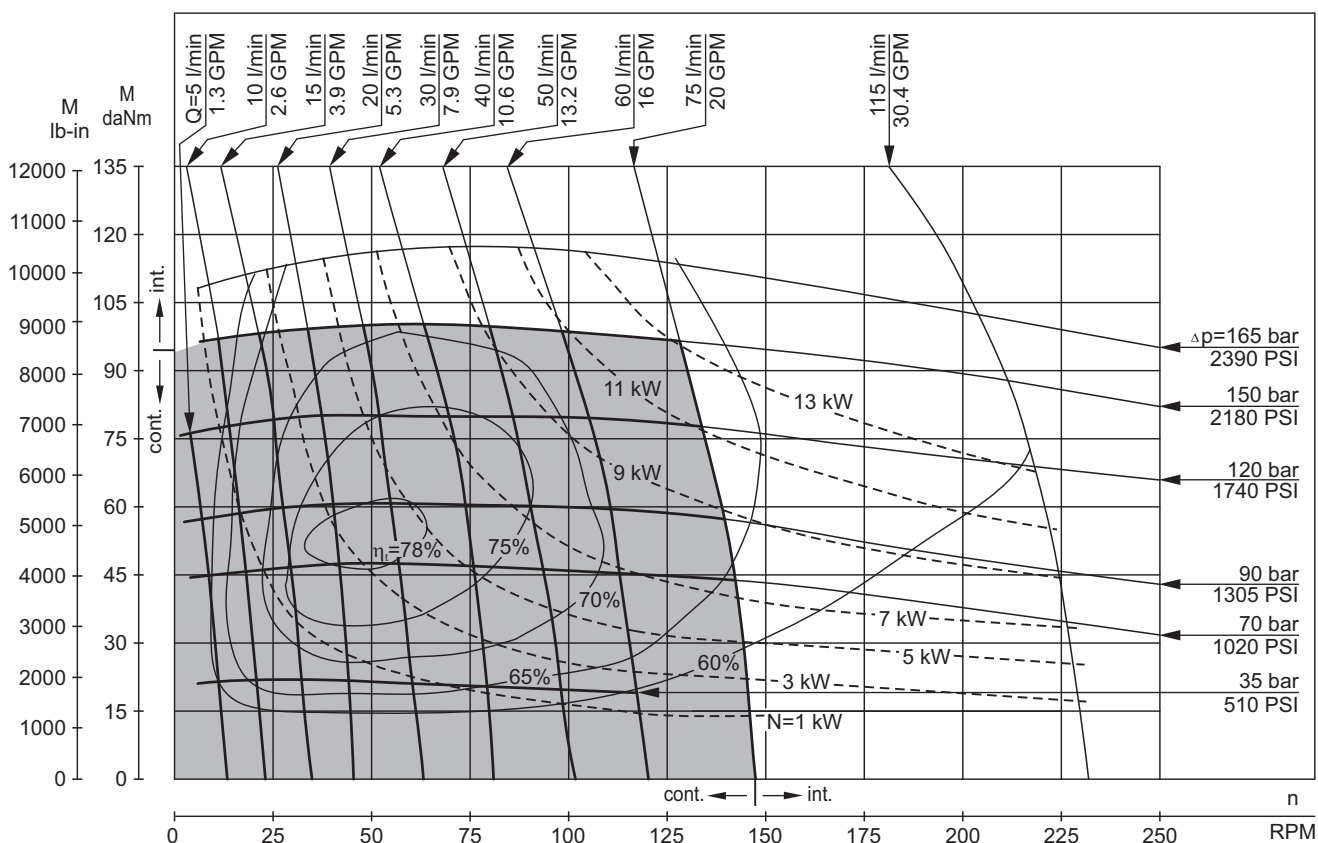
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5 PSI ± 145 PSI [5 ± 10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

HW 470



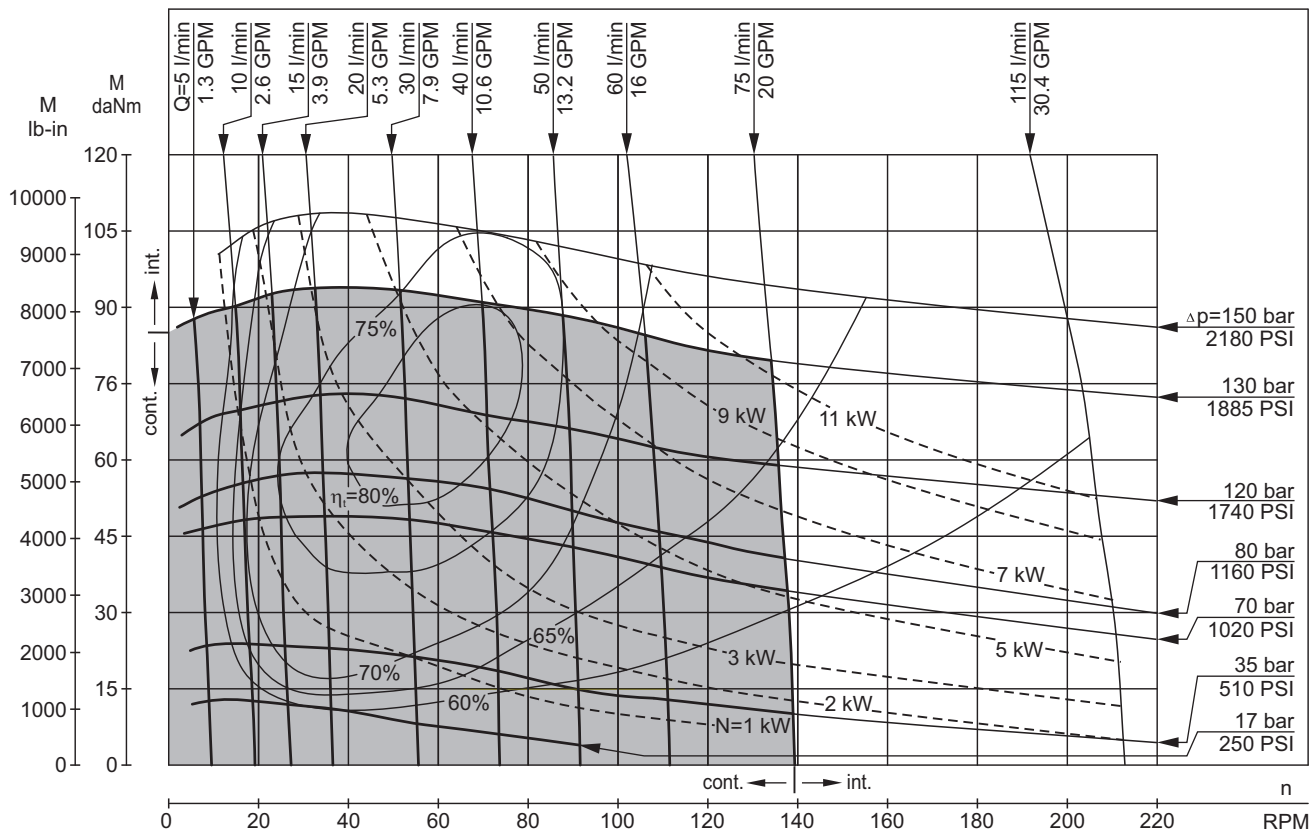
HW 500



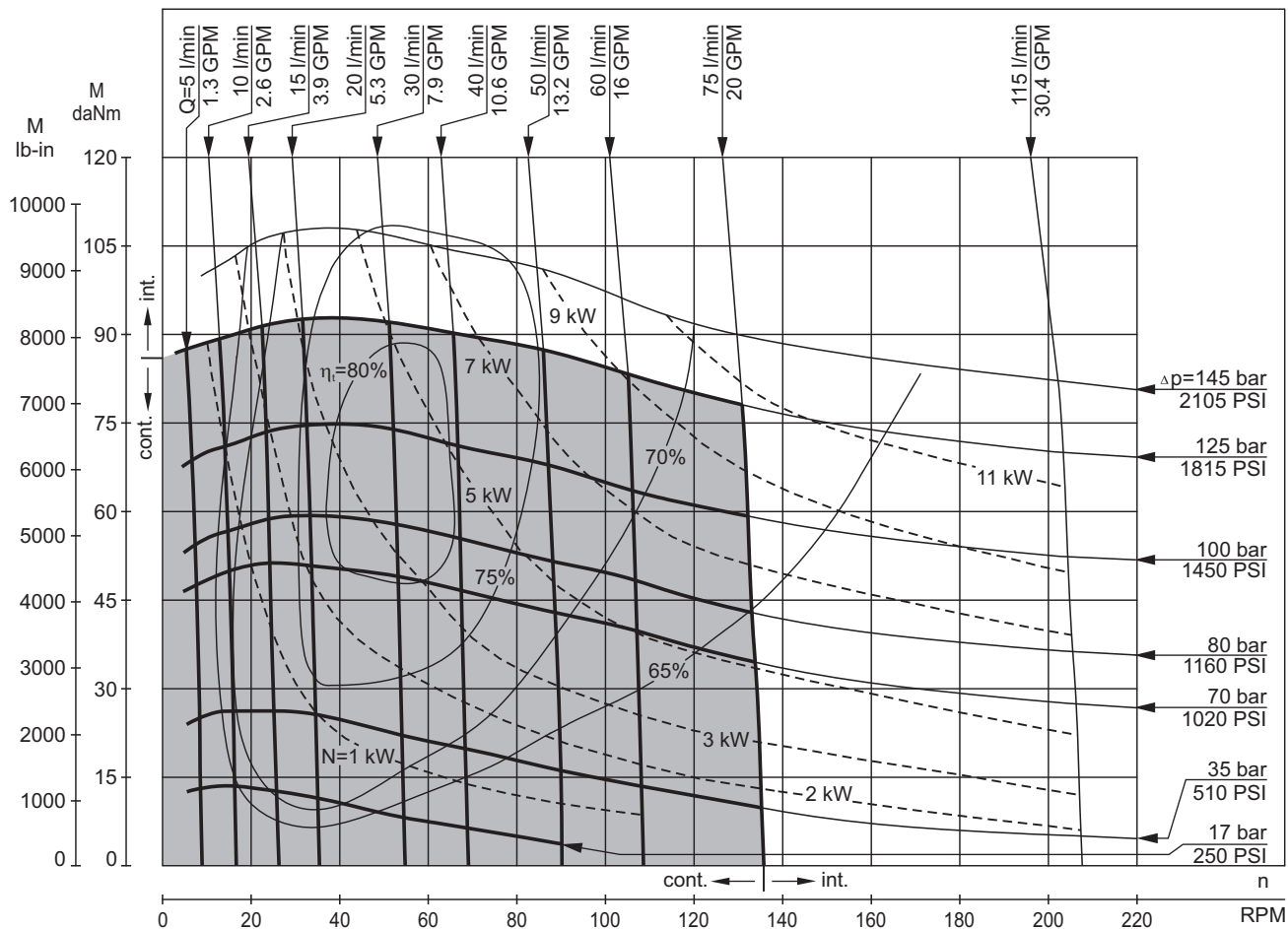
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5 PSI $\pm$ 145 PSI [5 $\pm$ 10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

HW 535



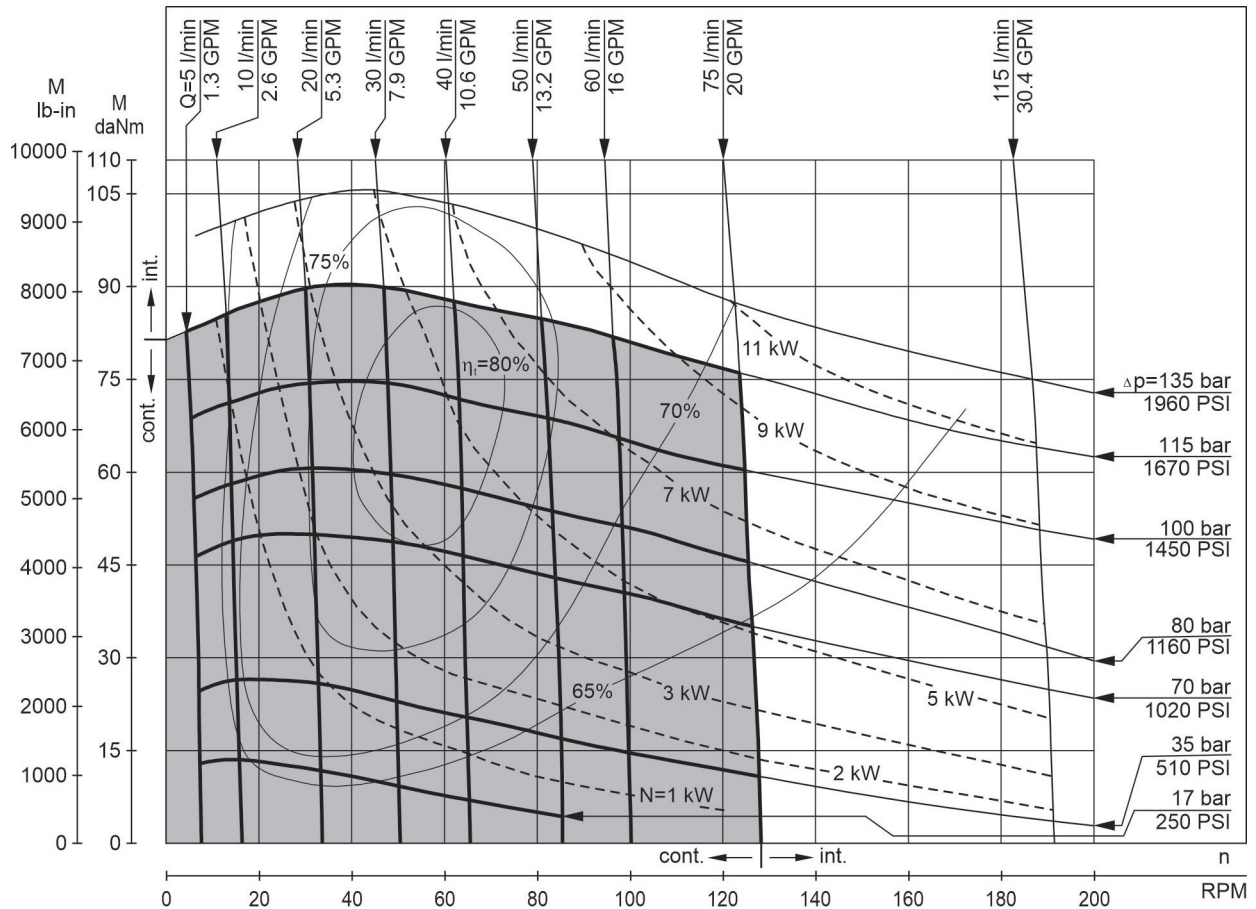
HW 550



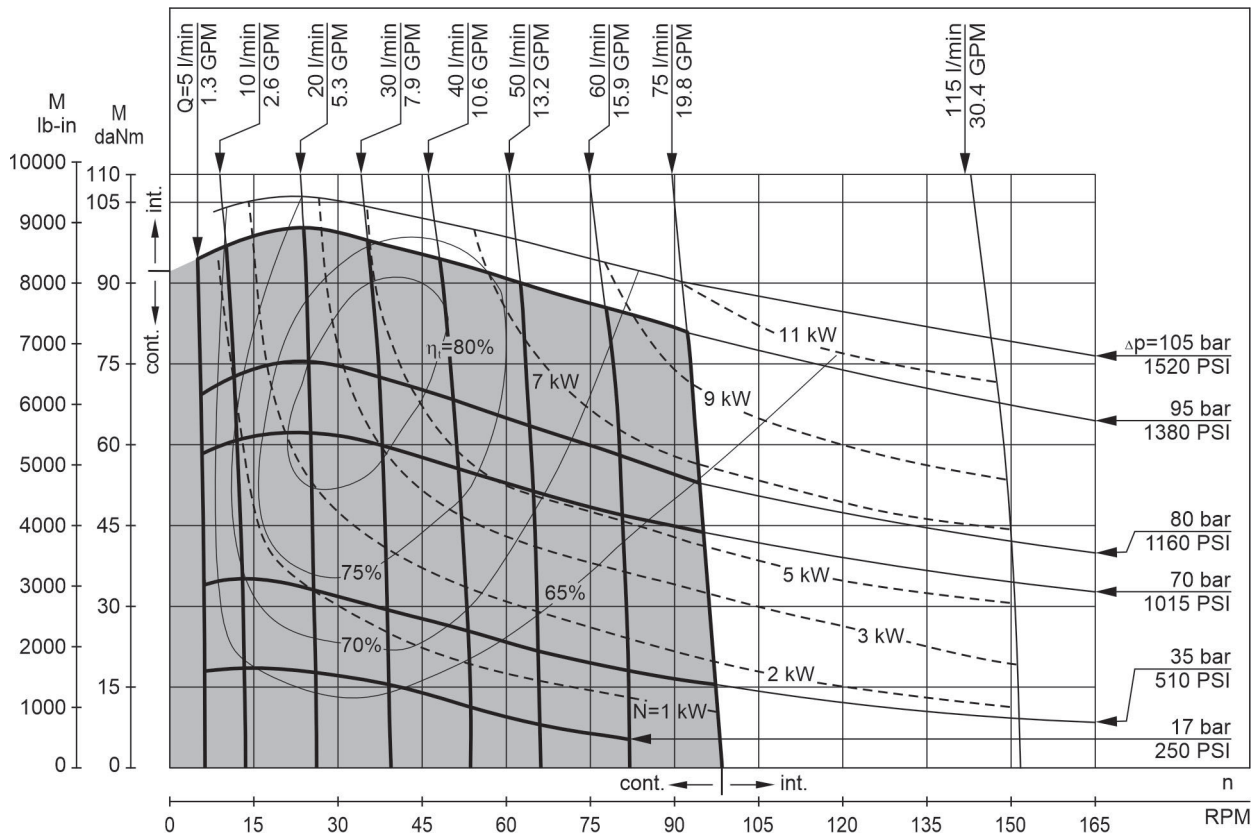
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5 PSI÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

HW 600



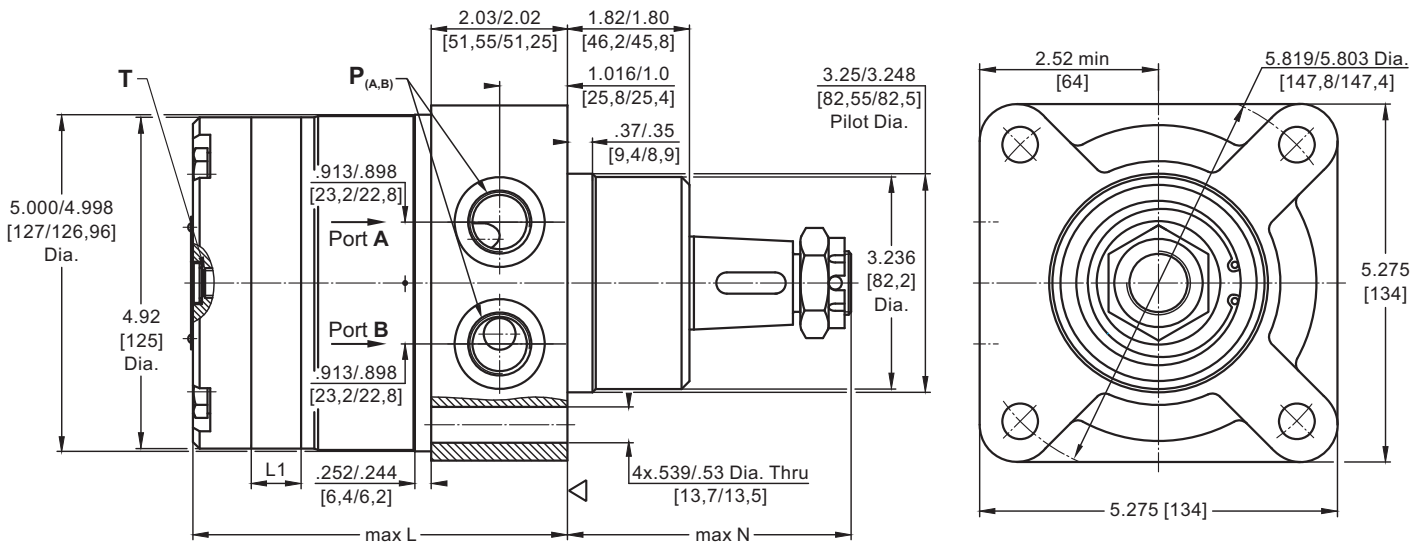
HW 750



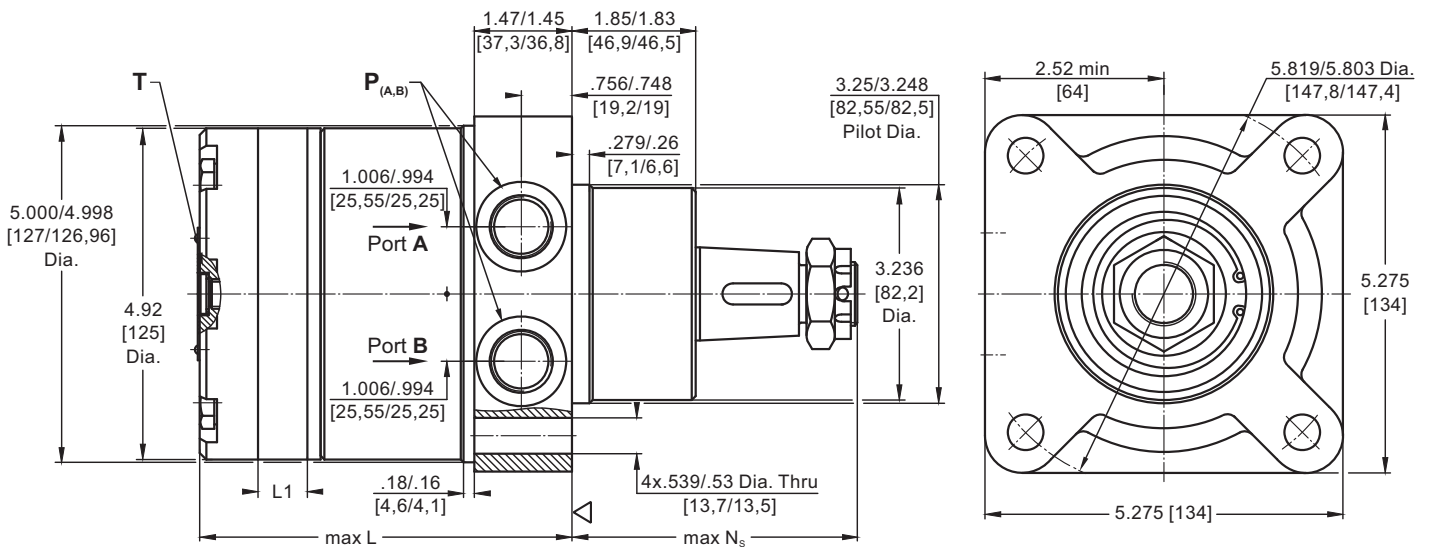
The function diagrams data is for average performance of randomly selected motors at back pressure 72.5 PSI ± 145 PSI [5 ± 10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

DIMENSIONS and MOUNTING DATA

HW Wheel mount



HWS Wheel mount



Type	*L, in [mm]	L1, in [mm]
HW(S) 80	5.28 [134,0]	.43 [11,0]
HW(S) 100	5.39 [137,0]	.55 [14,0]
HW(S) 125	5.51 [140,5]	.68 [17,4]
HW(S) 160	5.71 [145,0]	.86 [21,8]
HW(S) 200	5.95 [151,0]	1.09 [27,8]
HW(S) 235	6.12 [155,5]	1.28 [32,5]
HW(S) 250	6.22 [158,0]	1.37 [34,8]
HW(S) 300	6.48 [164,5]	1.63 [41,4]
HW(S) 315	6.56 [166,5]	1.71 [43,5]
HW(S) 350	6.73 [171,0]	1.89 [48,0]
HW(S) 370	6.85 [174,0]	2.01 [51,0]
HW(S) 400	7.01 [178,0]	2.16 [54,8]
HW(S) 470	7.40 [188,0]	2.56 [65,0]
HW(S) 500	7.58 [192,5]	2.73 [69,4]
HW(S) 535	7.76 [197,0]	2.92 [74,1]
HW(S) 550	7.84 [199,0]	2.99 [76,0]
HW(S) 600	8.11 [206,0]	3.25 [82,6]
HW(S) 750	8.96 [227,5]	4.09 [104,0]



▽ - Motor Mounting Surface

Note: For N see pages 107+108.

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

Standard Rotation

Viewed from Shaft End

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

Reverse Rotation

Viewed from Shaft End

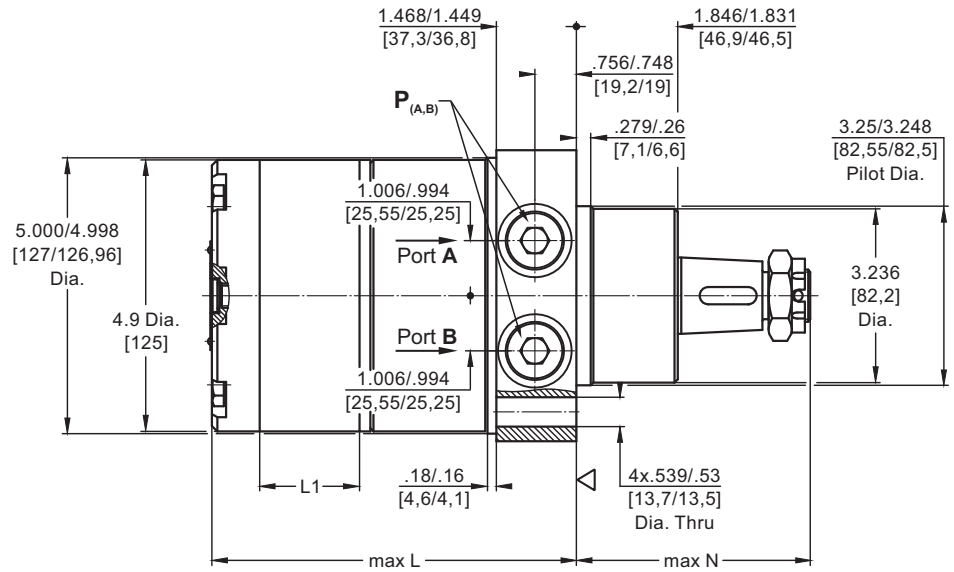
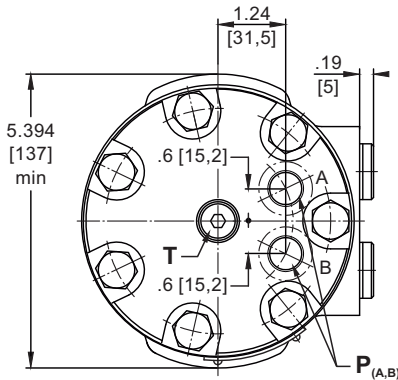
Port A Pressurized - **CCW**
 Port B Pressurized - **CW**

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

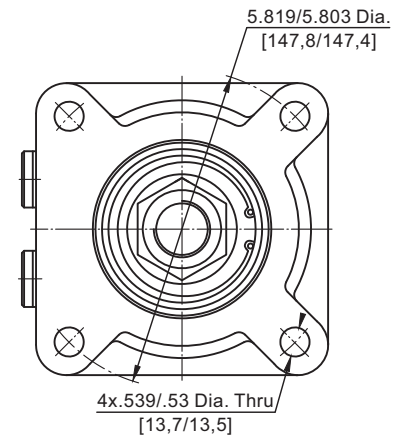
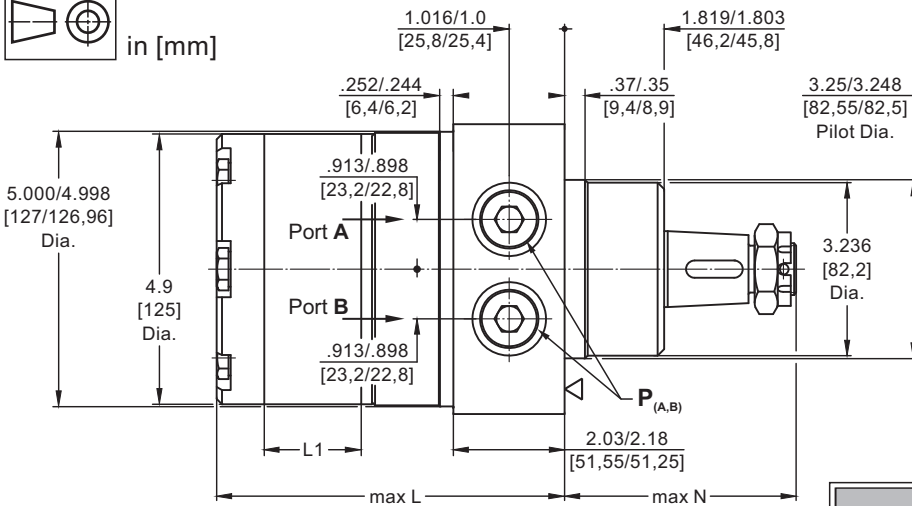
DIMENSIONS and MOUNTING DATA

HWSE Wheel mount, rear ports

HWFE Magneto mount



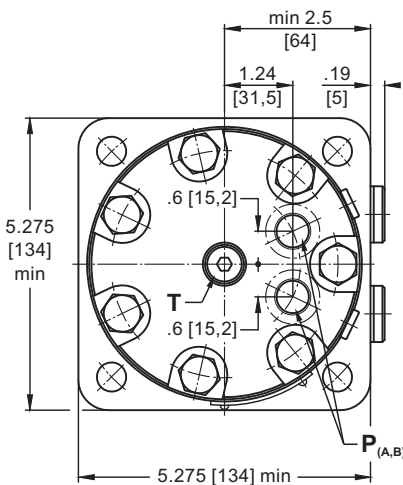
HWE Wheel mount, rear ports



HW(S)E

▽ - Motor Mounting Surface

Note: For N see pages 107-108.



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

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

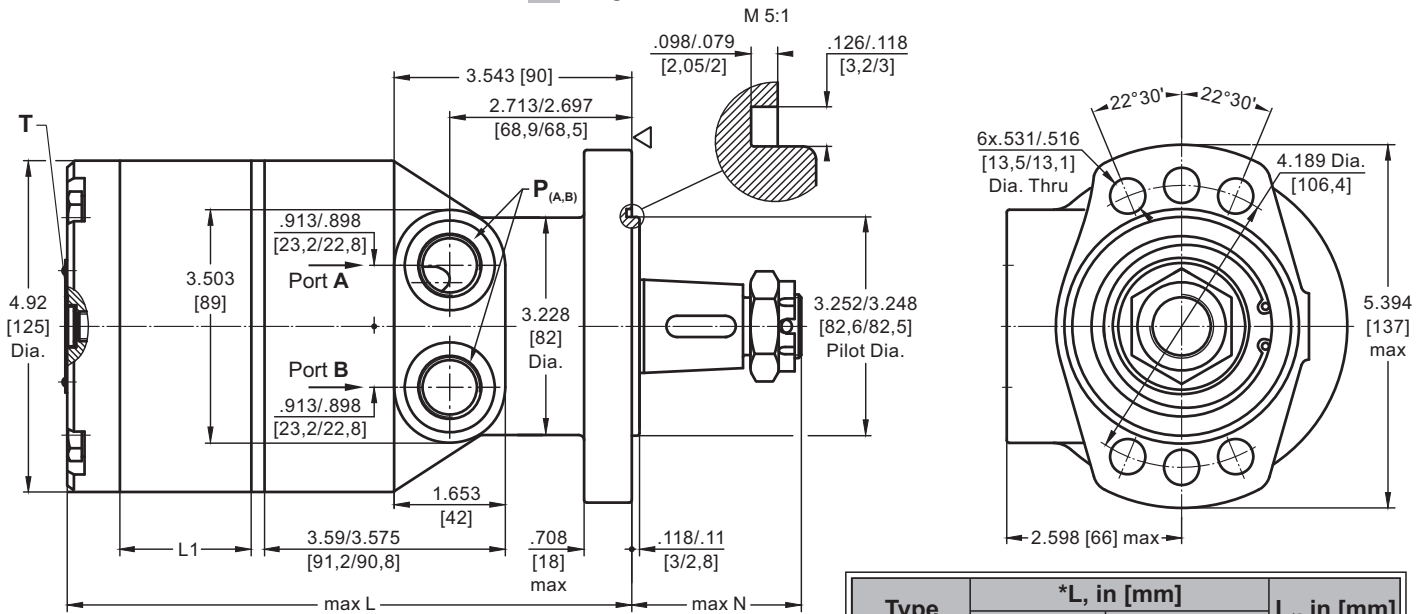
Standard Rotation
Viewed from Shaft End
Port A Pressurized - CW
Port B Pressurized - CCW

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

Type	*L, in [mm]		L ₁ , in [mm]
	HWE, HWSE	HWFE	
HW... 80	5.47 [139,0]	7.19 [182,5]	.43 [11,0]
HW... 100	5.59 [142,0]	7.30 [185,5]	.55 [14,0]
HW... 125	5.73 [145,5]	7.44 [189,0]	.68 [17,4]
HW... 160	5.91 [150,0]	7.62 [193,5]	.86 [21,8]
HW... 200	6.14 [156,0]	7.85 [199,5]	1.09 [27,8]
HW... 235	6.32 [160,5]	8.03 [204,0]	1.28 [32,5]
HW... 250	6.42 [163,0]	8.13 [206,5]	1.37 [34,8]
HW... 300	6.67 [169,5]	8.39 [213,0]	1.63 [41,4]
HW... 315	6.75 [171,5]	8.46 [215,0]	1.71 [43,5]
HW... 350	6.93 [176,0]	8.64 [219,5]	1.89 [48,0]
HW... 370	7.05 [179,0]	8.76 [222,5]	2.01 [51,0]
HW... 400	7.20 [183,0]	8.92 [226,5]	2.16 [54,8]
HW... 470	7.60 [193,0]	9.31 [236,5]	2.56 [65,0]
HW... 500	7.78 [197,5]	9.49 [241,0]	2.73 [69,4]
HW... 535	7.95 [202,0]	9.67 [245,5]	2.92 [74,1]
HW... 550	8.03 [204,0]	9.74 [247,5]	2.99 [76,0]
HW... 600	8.29 [210,6]	10.00 [254,1]	3.25 [82,6]
HW... 750	9.15 [232,5]	10.85 [275,5]	4.09 [104,0]

DIMENSIONS and MOUNTING DATA

F Magneto mount, six holes



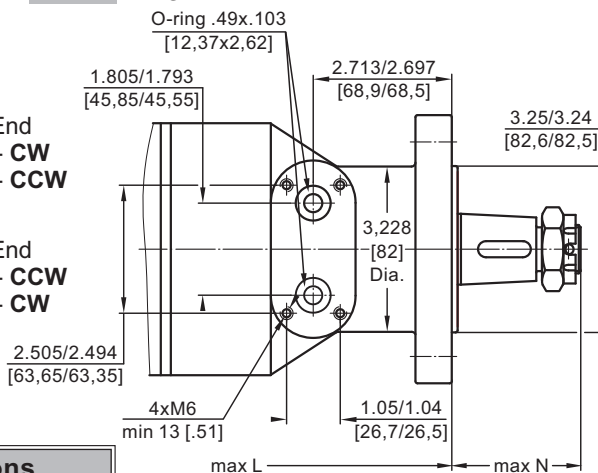
Standard Rotation

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

HWFV Magneto mount, six holes, relief valves



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

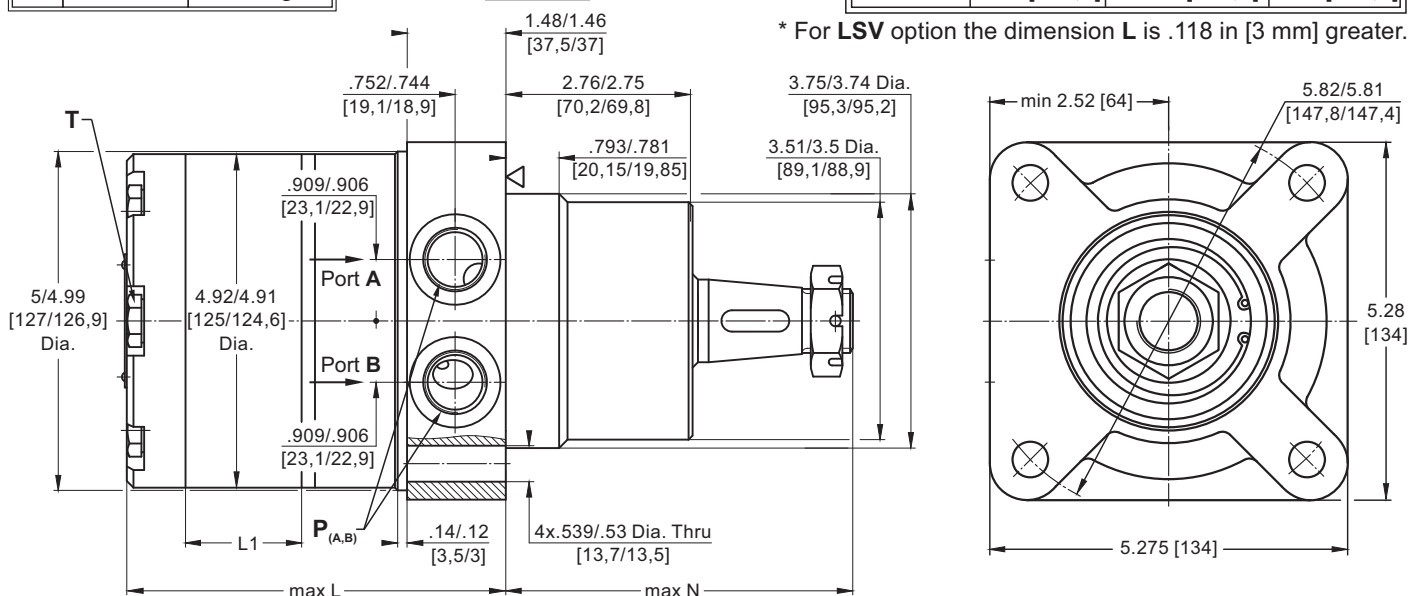
▽ - Motor Mounting Surface

Note: For N see pages 107+108.

Type		*L, in [mm]		L ₁ , in [mm]
		HWSW	HWF(V)	
HW...	80	4.35 [110,5]	7.01 [178,0]	.43 [11,0]
HW...	100	4.47 [113,5]	7.11 [180,5]	.55 [14,0]
HW...	125	4.61 [117,0]	7.24 [184,0]	.68 [17,4]
HW...	160	4.78 [121,5]	7.42 [188,5]	.86 [21,8]
HW...	200	5.00 [127,0]	7.66 [194,5]	1.09 [27,8]
HW...	235	5.20 [132,0]	7.84 [199,0]	1.28 [32,5]
HW...	250	5.30 [134,5]	7.93 [201,5]	1.37 [34,8]
HW...	300	5.55 [141,0]	8.20 [208,0]	1.63 [41,4]
HW...	315	5.63 [143,0]	8.27 [210,0]	1.71 [43,5]
HW...	350	5.81 [147,5]	8.45 [214,5]	1.89 [48,0]
HW...	370	5.94 [151,0]	8.56 [217,5]	2.01 [51,0]
HW...	400	6.08 [154,5]	8.72 [221,5]	2.16 [54,8]
HW...	470	6.48 [164,5]	9.11 [231,5]	2.56 [65,0]
HW...	500	6.65 [169,0]	9.29 [236,0]	2.73 [69,4]
HW...	535	6.85 [174,0]	9.47 [240,5]	2.92 [74,1]
HW...	550	6.91 [175,5]	9.55 [242,5]	2.99 [76,0]
HW...	600	7.16 [182,1]	9.81 [249,1]	3.25 [82,6]
HW...	750	8.01 [203,5]	10.65 [270,5]	4.09 [104,0]

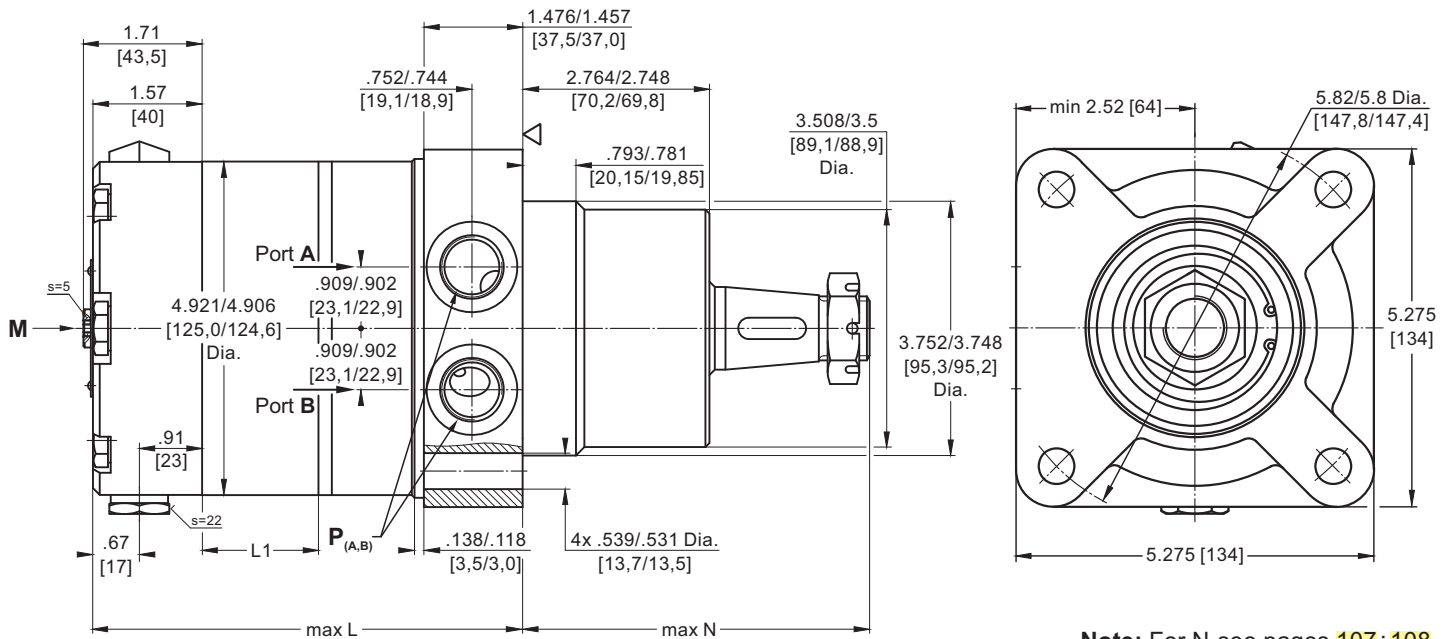
* For LSV option the dimension L is .118 in [3 mm] greater.

HWSW Wheel mount



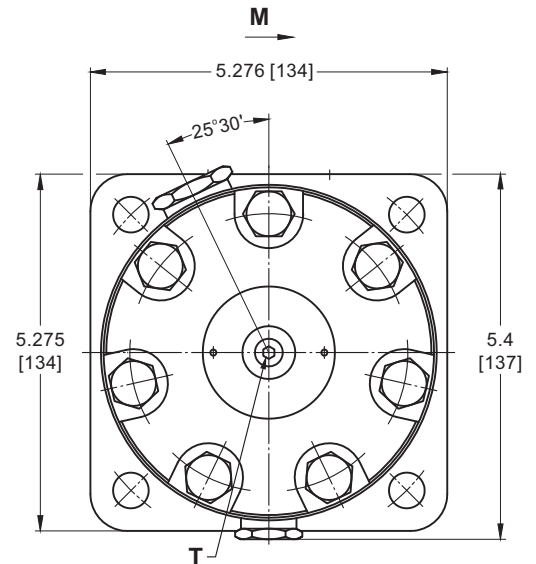
DIMENSIONS and MOUNTING DATA

HWSWR Wheel mount, relief valves



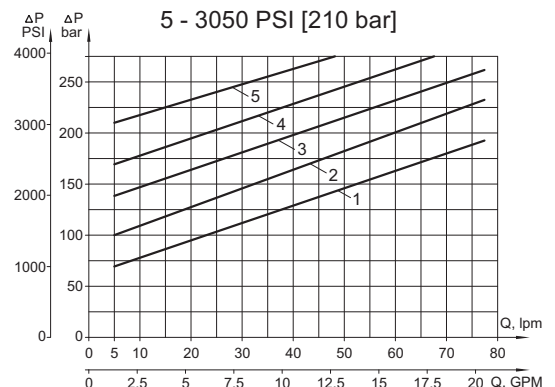
Note: For N see pages 107+108.

Type	*L, in [mm]	L1, in [mm]
HWSWR 80	5.28 [128,5]	.43 [11,0]
HWSWR 100	5.39 [131,5]	.55 [14,0]
HWSWR 125	5.51 [135,0]	.68 [17,4]
HWSWR 160	5.71 [139,5]	.86 [21,8]
HWSWR 200	5.95 [145,0]	1.09 [27,8]
HWSWR 235	6.12 [150,0]	1.28 [32,5]
HWSWR 250	6.22 [152,5]	1.37 [34,8]
HWSWR 300	6.48 [159,0]	1.63 [41,4]
HWSWR 315	6.56 [161,0]	1.71 [43,5]
HWSWR 350	6.73 [165,5]	1.89 [48,0]
HWSWR 370	6.85 [169,0]	2.01 [51,0]
HWSWR 400	7.01 [172,5]	2.16 [54,8]
HWSWR 470	7.40 [182,5]	2.56 [65,0]
HWSWR 500	7.58 [187,0]	2.73 [69,4]
HWSWR 535	7.76 [192,0]	2.92 [74,1]
HWSWR 550	7.84 [193,5]	2.99 [76,0]
HWSWR 600	8.09 [200,0]	3.25 [82,6]
HWSWR 750	8.70 [221,0]	4.09 [104,0]



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

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



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

▽ - Motor mounting surface

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

Standard Rotation

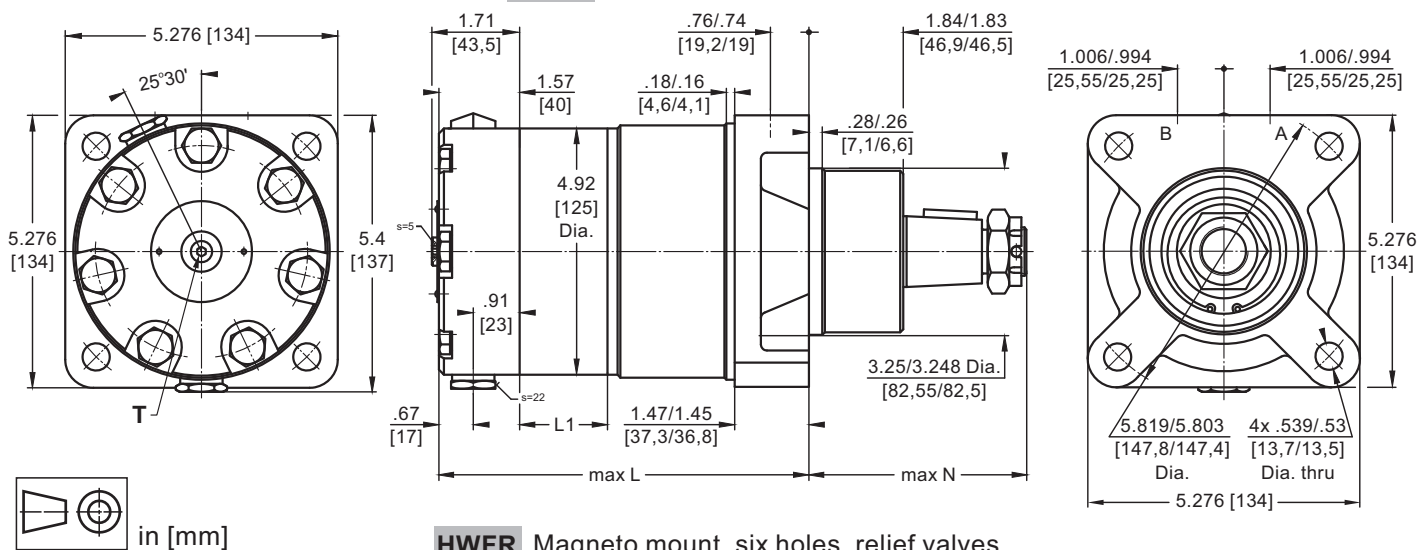
Viewed from Shaft End
Port A Pressurized - **CW**
Port B Pressurized - **CCW**

Reverse Rotation

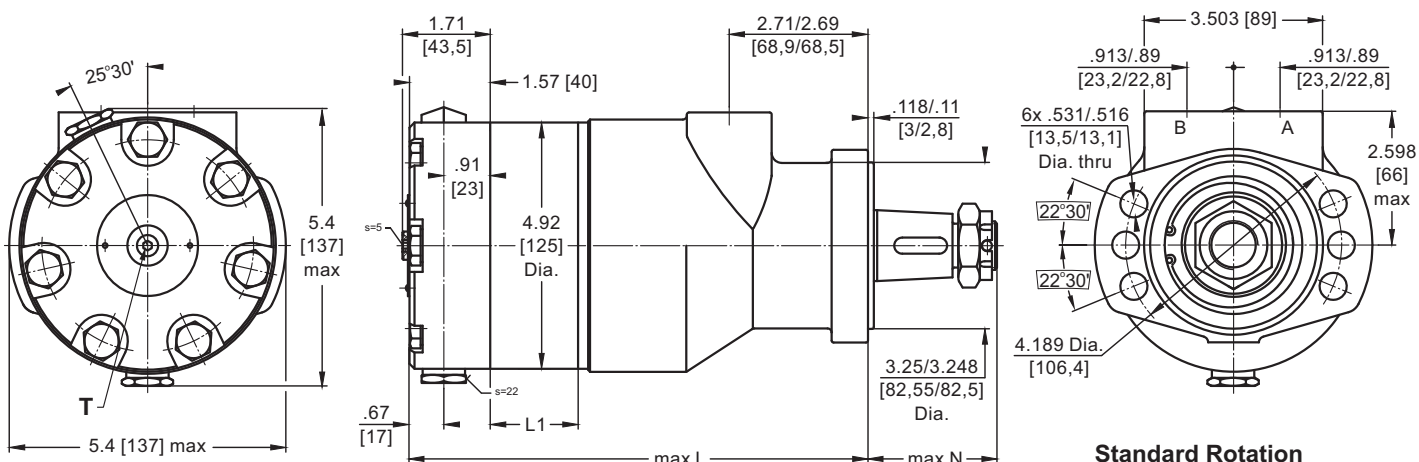
Viewed from Shaft End
Port A Pressurized - **CCW**
Port B Pressurized - **CW**

DIMENSIONS and MOUNTING DATA

HWSR Wheel mount, relief valves



HWFR Magneto mount, six holes, relief valves



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, in [mm]		L, in [mm]
	HWSR	HWFR	
HW... 80	5.98 [152,0]	7.69 [195,5]	.43 [11,0]
HW... 100	6.10 [155,0]	7.81 [198,5]	.55 [14,0]
HW... 125	6.24 [158,5]	7.95 [202,0]	.68 [17,4]
HW... 160	6.42 [163,0]	8.13 [206,5]	.86 [21,8]
HW... 200	6.65 [169,0]	8.37 [212,5]	1.09 [27,8]
HW... 235	6.83 [173,5]	8.54 [217,0]	1.28 [32,5]
HW... 250	6.93 [176,0]	8.64 [219,5]	1.37 [34,8]
HW... 300	7.19 [182,5]	8.89 [226,0]	1.63 [41,4]
HW... 315	7.26 [184,5]	8.98 [228,0]	1.71 [43,5]
HW... 350	7.44 [189,0]	9.15 [232,5]	1.89 [48,0]
HW... 370	7.56 [192,0]	9.27 [235,5]	2.01 [51,0]
HW... 400	7.72 [196,0]	9.43 [239,5]	2.16 [54,8]
HW... 470	8.11 [206,0]	9.82 [249,5]	2.56 [65,0]
HW... 500	8.29 [210,5]	10.00 [254,0]	2.73 [69,4]
HW... 535	8.46 [215,0]	10.19 [258,8]	2.92 [74,1]
HW... 550	8.54 [217,0]	10.26 [260,5]	2.99 [76,0]
HW... 600	8.92 [226,6]	10.52 [267,1]	3.25 [82,6]
HW... 750	9.63 [244,5]	11.34 [288,0]	4.09 [104,0]

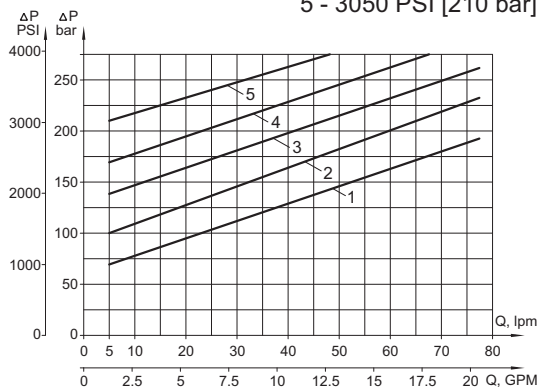
Versions		
	2	4
P _(A,B)	2xG $\frac{1}{2}$	2x $\frac{7}{8}$ -14UNF, O-ring
T	G $\frac{1}{8}$	G $\frac{1}{8}$

▽ - Motor Mounting Surface

Note: For N see pages 107÷108.

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

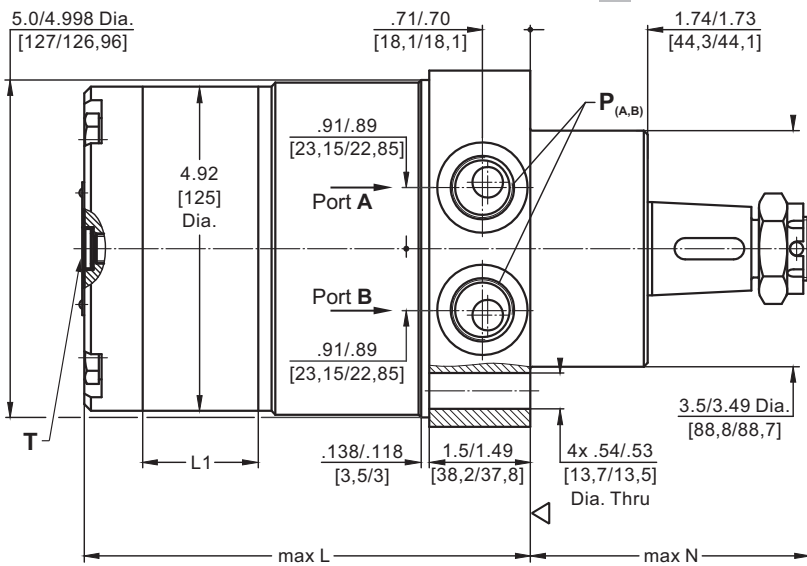
- 1 - 1015 PSI [70 bar]
- 2 - 1450 PSI [100 bar]
- 3 - 2030 PSI [140 bar]
- 4 - 2470 PSI [170 bar]
- 5 - 3050 PSI [210 bar]



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

DIMENSIONS and MOUNTING DATA

D Wheel mount



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

▽ - Motor Mounting Surface

Note: For N see pages 107÷108.

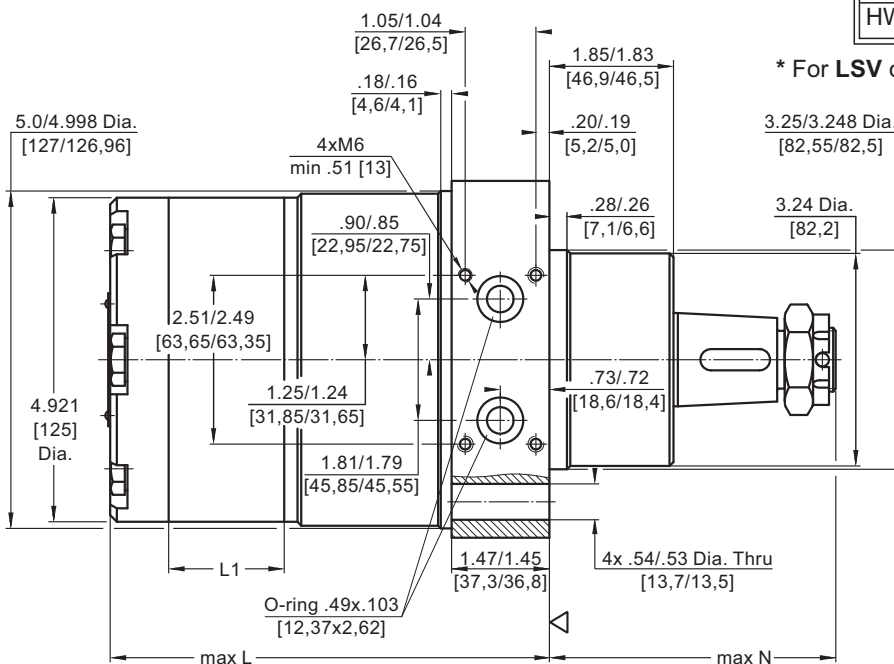


Standard Rotation
 Viewed from Shaft End
 Port A Pressurized - **CW**
 Port B Pressurized - **CCW**

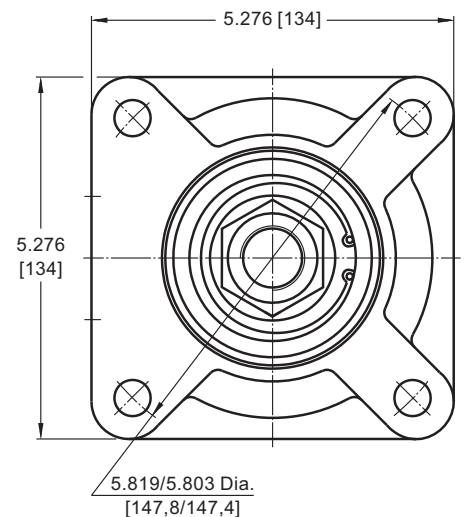
Reverse Rotation
 Viewed from Shaft End
 Port A Pressurized - **CCW**
 Port B Pressurized - **CW**

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

V Wheel mount, four holes, manifold 4xM6

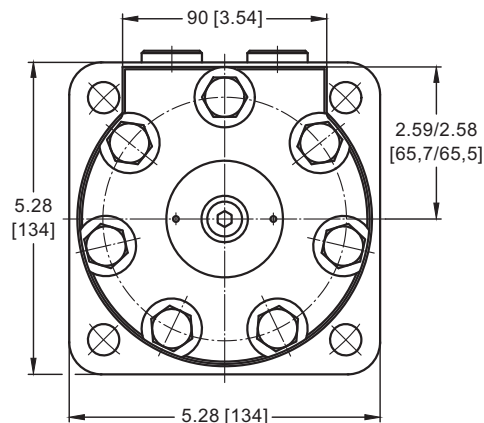
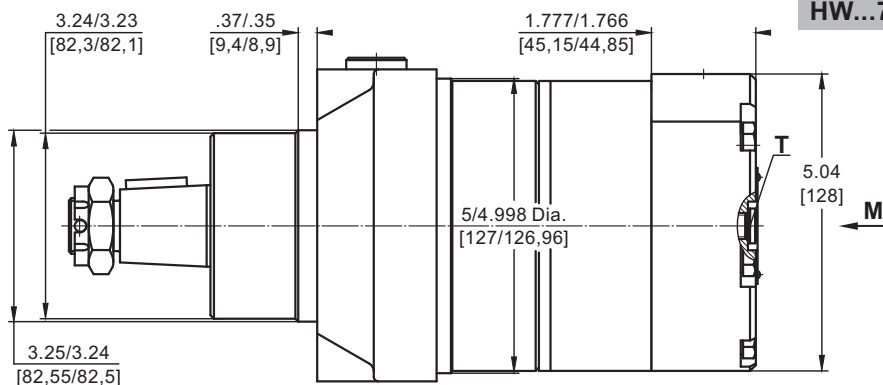


* For LSV option the dimension L is .118 in [3 mm] greater.

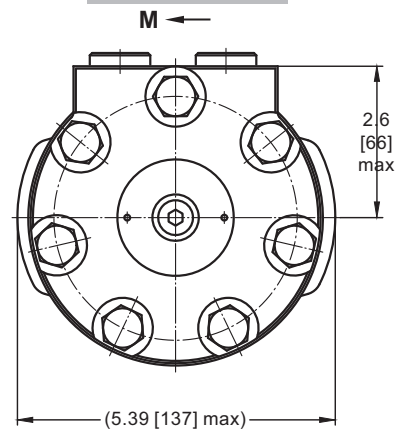
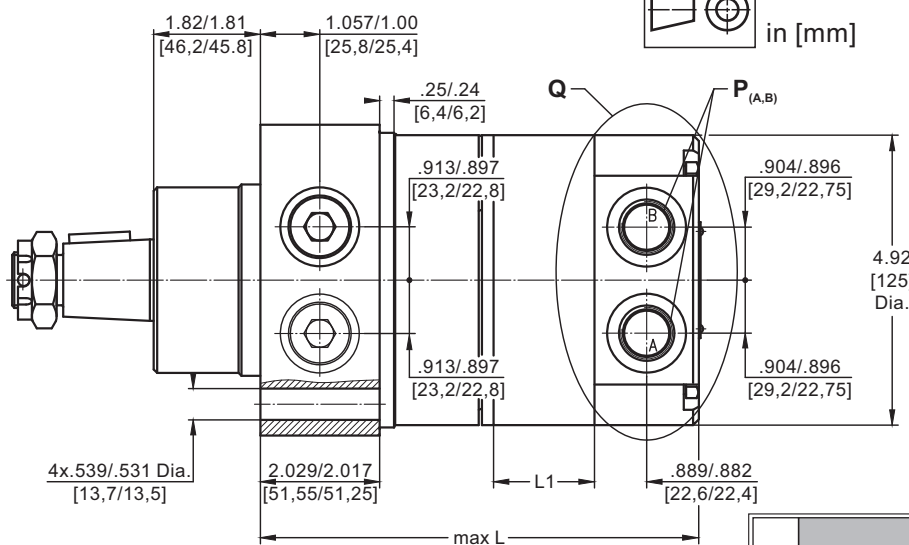


DIMENSIONS and MOUNTING DATA

HW...7

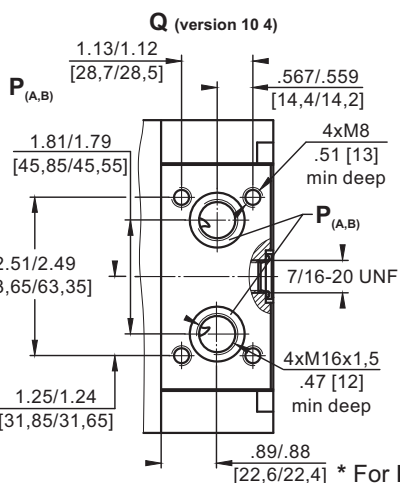
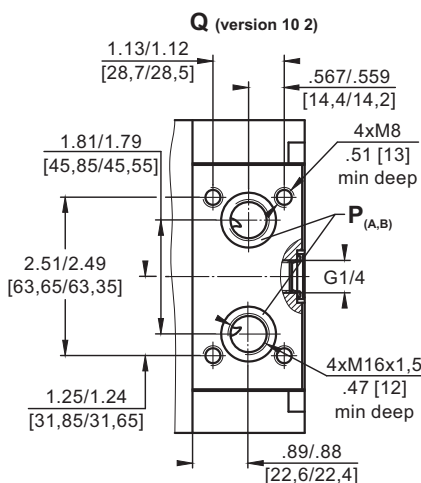
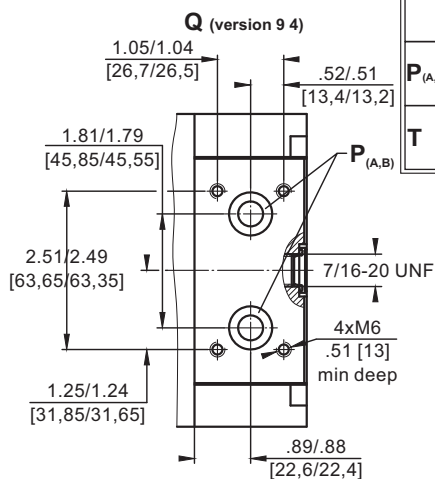
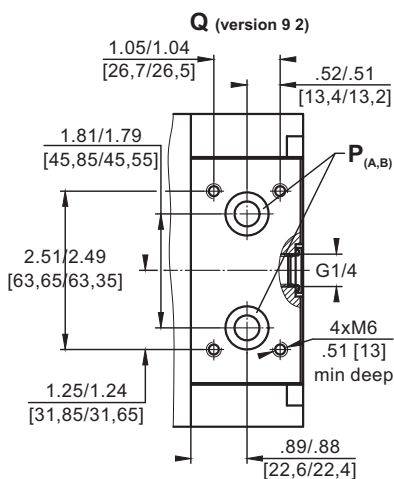


HWF...7,8,9,10



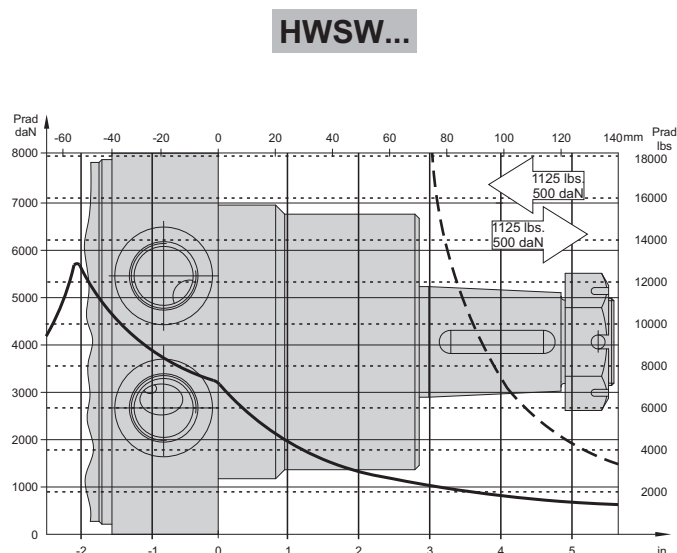
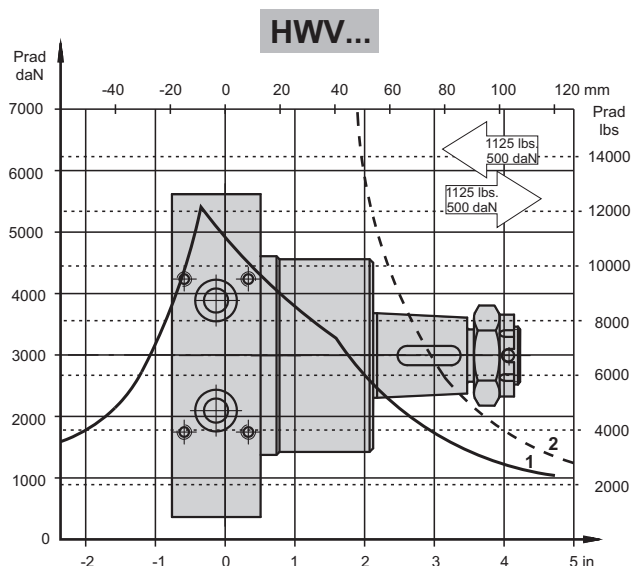
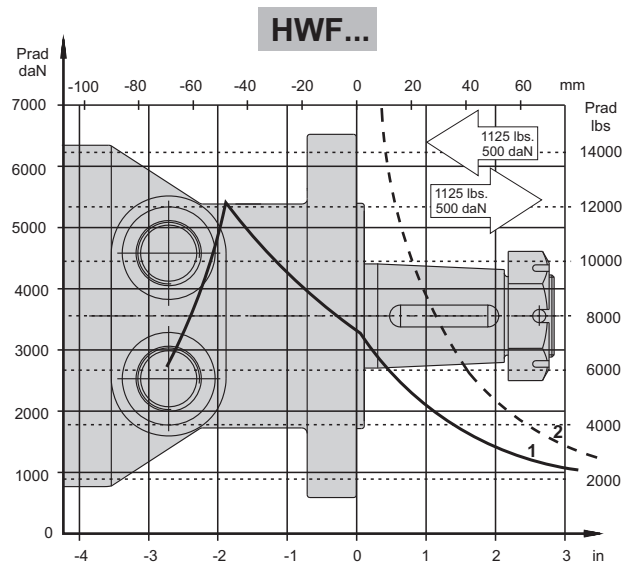
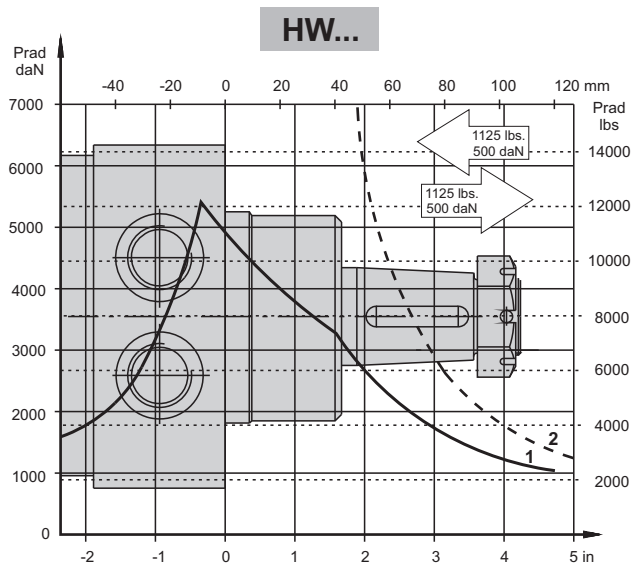
Versions					
	7	8	9 2	9 4	10 2 10 4
P _(A,B)	2xG _{1/2}	2x ⁷ / ₈ -14UNF, O-ring	2xø9 O-ring 12,37x2,62 [49x.103]	2xM16x1,5 O-ring 18x2 [709x.787]	
T	G _{1/4}	⁷ / ₁₆ -20UNF, O-ring	G _{1/4} ⁷ / ₁₆ -20UNF, O-ring	G _{1/4} ⁷ / ₁₆ -20UNF, O-ring	

Type	*L, in [mm]		L ₁ , in [mm]
	HW(S)...7,8,9,10	HWF...7,8,9,10	
HW... 80	6.20 [157,5]	7.89 [200,5]	.43 [11,0]
HW...100	6.32 [160,5]	8.01 [203,5]	.55 [14,0]
HW...125	6.46 [164,0]	8.15 [207,0]	.68 [17,4]
HW...160	6.61 [168,0]	8.31 [211,0]	.86 [21,8]
HW...200	6.85 [174,0]	8.54 [217,0]	1.09 [27,8]
HW...235	7.05 [179,0]	8.74 [222,0]	1.28 [32,5]
HW...250	7.13 [181,0]	8.82 [224,0]	1.37 [34,8]
HW...300	7.38 [187,5]	9.07 [230,5]	1.63 [41,4]
HW...315	7.48 [190,0]	9.17 [233,0]	1.71 [43,5]
HW...350	7.66 [194,5]	9.35 [237,5]	1.89 [48,0]
HW...370	7.78 [197,5]	9.47 [240,5]	2.01 [51,0]
HW...400	7.91 [201,0]	9.61 [244,0]	2.16 [54,8]
HW...470	8.33 [211,5]	10.02 [254,5]	2.56 [65,0]
HW...500	8.50 [216,0]	10.20 [259,0]	2.73 [69,4]
HW...535	8.68 [220,5]	10.37 [263,5]	2.92 [74,1]
HW...550	8.76 [222,5]	10.45 [265,5]	2.99 [76,0]
HW...600	9.02 [229,0]	10.71 [272,0]	3.25 [82,6]
HW...750	9.86 [250,5]	11.56 [293,5]	4.09 [104]



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

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

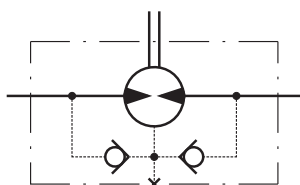
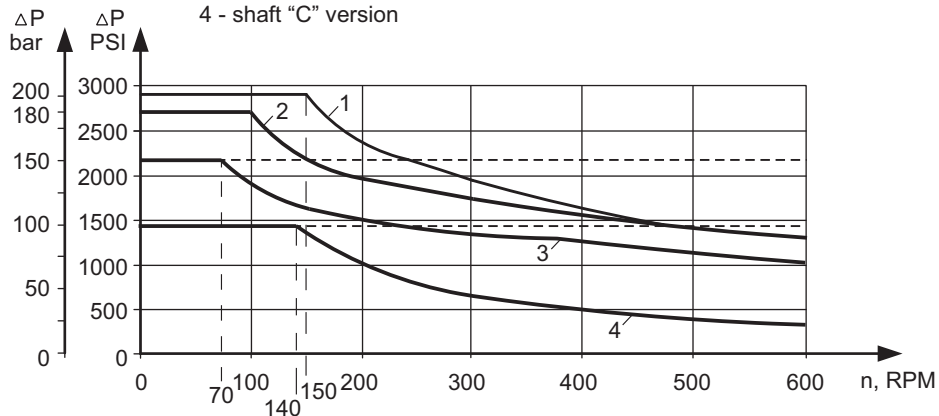
HW, HWF, HWS, HWD,
HWV, HWSW,
HW(S)(F)...7,8,9,10

HW...U(Q) motors with drain connection:

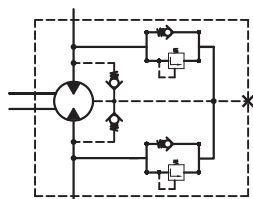
The shaft seal pressure equals the pressure in the drain line.

- 1 - extreme high pressure "Q" version
- 2 - high pressure "U" version
- 3 - standard version
- 4 - shaft "C" version

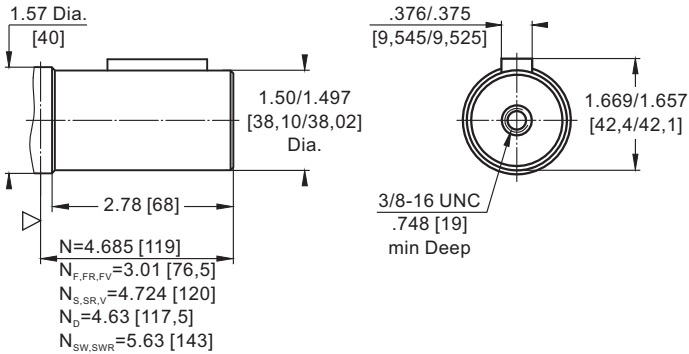
— - continuous operations
----- - intermittent operations



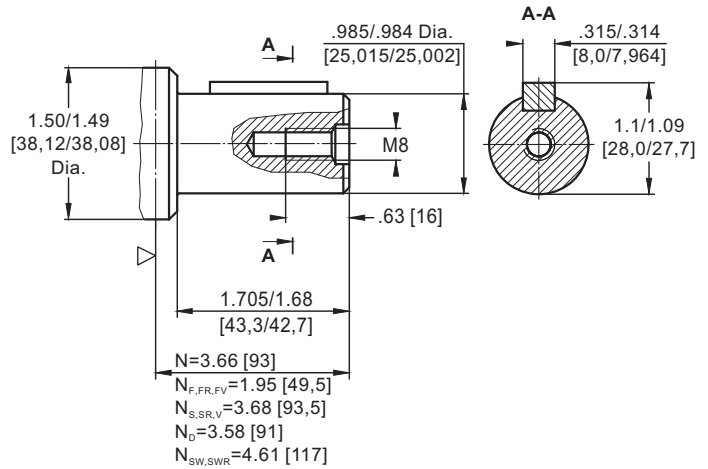
HWFR, HWSR, HWSWR



C - 1½" [38,1] straight, Parallel key ¾"x ¾"x1½" BS46
Max. Torque 10630 lb-in [120 daNm]

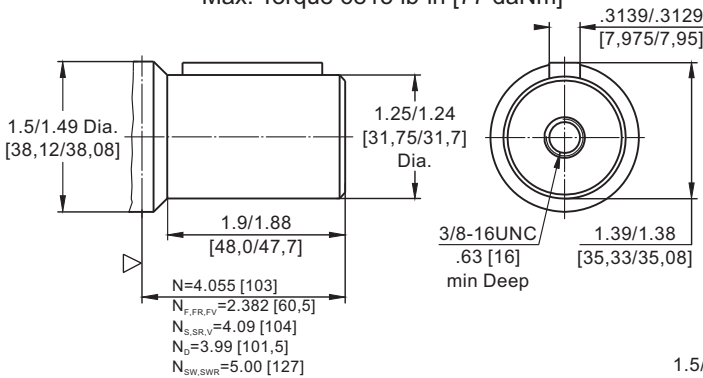


CO - ø25, straight, Parallel key A8x7x32 DIN 6885
Max. Torque 3540 lb-in [40 daNm]

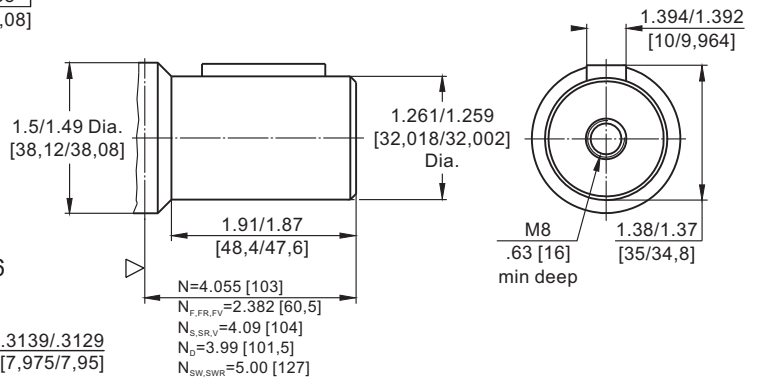


▽ - Motor Mounting Surface

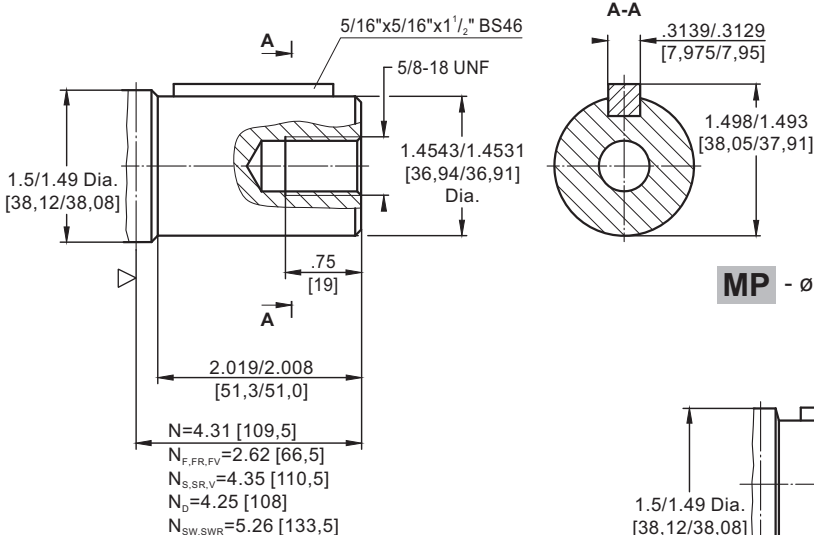
K - 1¼" [31,75] straight, Parallel key 5/16"x5/16"x1½" BS46
Max. Torque 6815 lb-in [77 daNm]



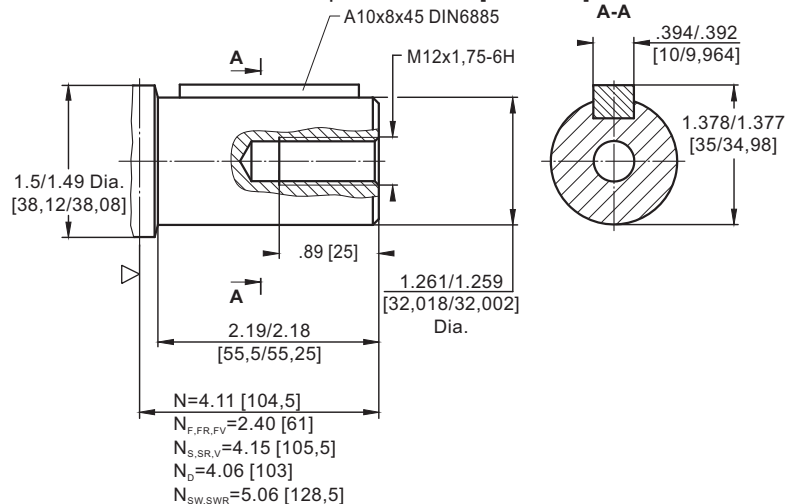
M - ø32 straight, Parallel key A10x8x32 DIN 6885
Max. Torque 6815 lb-in [77 daNm]



H - 1⅜" [35] straight, Parallel key 5/16"x5/16"x1½" BS46
Max. Torque 7965 lb-in [90 daNm]



MP - ø32 straight, Parallel key A10x8x45 DIN 6885
Max. Torque 7520 lb-in [85 daNm]

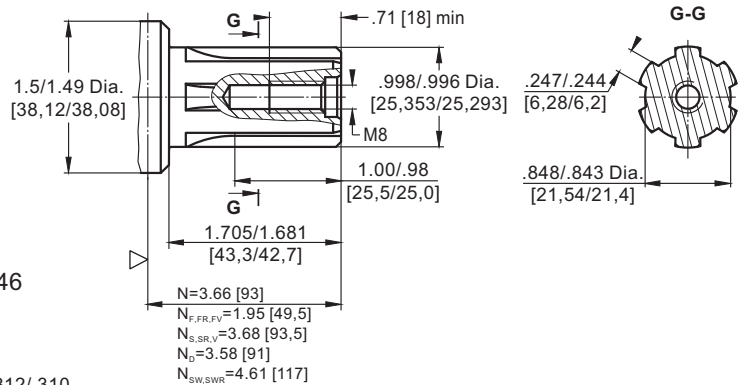


N - for standard flange
N_F - for F flange
N_{FR} - for FR flange
N_{FV} - for FV flange
N_S - for S flange
N_{SR} - for SR flange
N_D - for D flange
N_V - for V flange
N_{SW} - for SW flange
N_{SWR} - for SWR flange

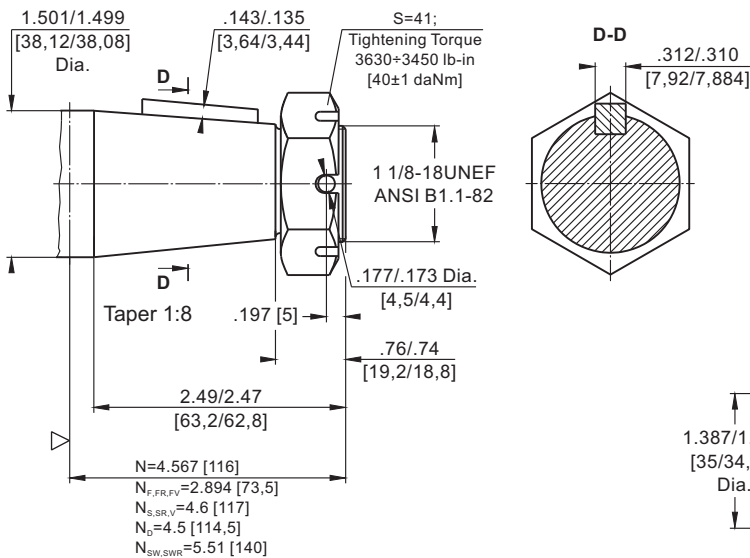


▽ - Motor Mounting Surface

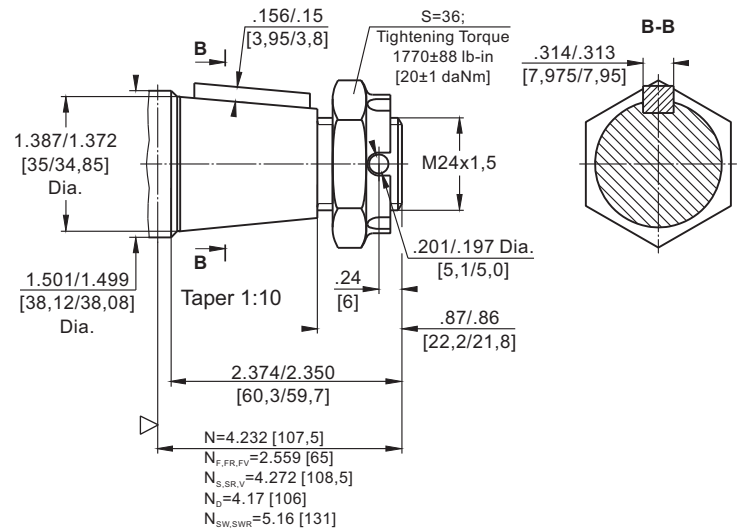
SH - $\varnothing 1"$ splined BS 2059, SAE 6B
Max. Torque 3540 lb-in [40 daNm]



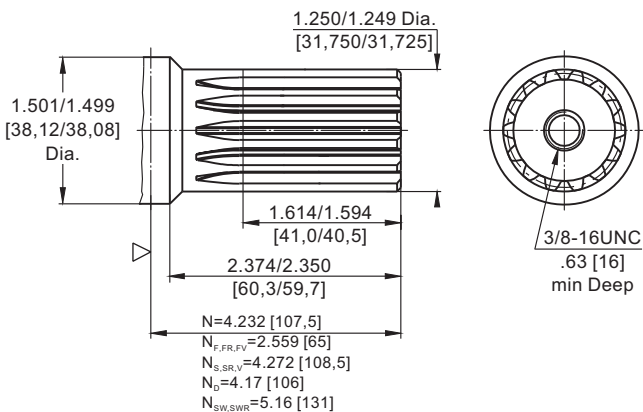
T - $1\frac{1}{2}"$ [38,1] tapered 1:8, Parallel key $\frac{5}{16}" \times \frac{5}{16}" \times 1\frac{1}{4}"$ BS46
Max. Torque 10620 lb-in [120 daNm]



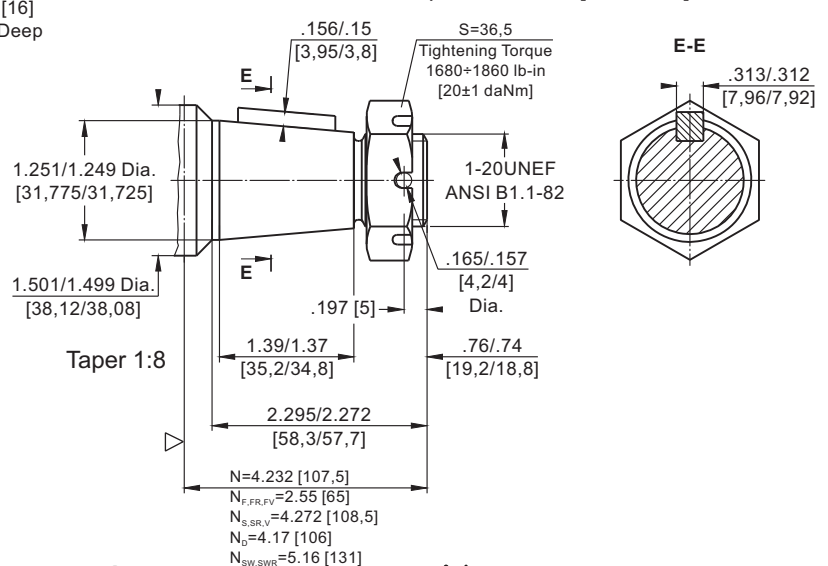
KB - $\varnothing 35$ tapered 1:10, Parallel key $\frac{5}{16}" \times \frac{5}{16}" \times 1\frac{1}{4}"$ BS46
Max. Torque 8410 lb-in [95 daNm]



L - $\varnothing 1\frac{1}{4}"$ [31,75] splined 14T, DP12/24 ANSI B92.1-1976
Max. Torque 8410 lb-in [95 daNm]



R - $1\frac{1}{4}"$ [31,75] tapered 1:8, Parallel key $\frac{5}{16}" \times \frac{5}{16}" \times 1"$ BS46
Max. Torque 8410 lb-in [95 daNm]



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

ORDER CODE

	1	2	3	4	5	6	7	8	9
HW								/	

Pos.1 - Mounting Flange

omit	- Wheel mount, four holes
E	- Wheel mount, four holes, rear ports
F	- Magneto mount, six holes
FR	- Magneto mount, six holes, relief valves
FV^{1)*}	- Magneto mount, six holes, manifold 4xM6
FE	- Magneto mount, six holes, rear ports
S	- Wheel mount, four holes
SR	- Wheel mount, four holes, relief valves
SW	- Wheel mount, four holes; mounting on ø95,3 [3.75]
SWR	- Wheel mount, four holes; mounting on ø95,3 [3.75], relief valves
SE	- Wheel mount, four holes, rear ports
D	- Wheel mount, four holes; mounting on ø88,8 [3.5]
V^{1)*}	- Wheel mount, four holes, manifold 4xM6

Pos.2 - Displacement code

80	- 4.86 in ³ /rev [79,7 cm ³ /rev]
100	- 6.19 in ³ /rev [101,4 cm ³ /rev]
125	- 7.69 in ³ /rev [126,0 cm ³ /rev]
160	- 9.63 in ³ /rev [157,8 cm ³ /rev]
200	- 12.28 in ³ /rev [201,3 cm ³ /rev]
235	- 14.36 in ³ /rev [235,3 cm ³ /rev]
250	- 15.38 in ³ /rev [252,0 cm ³ /rev]
300	- 18.31 in ³ /rev [300,0 cm ³ /rev]
315	- 19.22 in ³ /rev [314,9 cm ³ /rev]
350	- 21.22 in ³ /rev [347,8 cm ³ /rev]
370	- 22.52 in ³ /rev [369,0 cm ³ /rev]
400	- 24.21 in ³ /rev [396,8 cm ³ /rev]
470	- 28.72 in ³ /rev [470,6 cm ³ /rev]
500	- 30.66 in ³ /rev [502,4 cm ³ /rev]
535	- 32.65 in ³ /rev [535,0 cm ³ /rev]
550	- 33.56 in ³ /rev [550,0 cm ³ /rev]
600	- 36.55 in ³ /rev [598,9 cm ³ /rev]
750	- 45.99 in ³ /rev [753,8 cm ³ /rev]

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

K	- 1¼" [ø31,75] straight, Parallel key ⁵ / ₁₆ "x ⁵ / ₁₆ "x1½" BS46
KB	- ø35 tapered 1:10, Parallel key ⁵ / ₁₆ "x ⁵ / ₁₆ "x1½" BS46
L	- 1¼" [ø31,75] splined 14T, DP12/24 ANSI B92.1-1976
M	- ø32 straight, Parallel key A10x8x32 DIN 6885
MP	- ø32 straight, Parallel key A10x8x45 DIN 6885
R	- 1¼" [ø31,75] tapered 1:8, Parallel key ⁵ / ₁₆ "x ⁵ / ₁₆ "x1" BS46
T	- 1½" [ø38,1] tapered 1:8, Parallel key ⁵ / ₁₆ "x ⁵ / ₁₆ "x1½" BS46
C	- 1½" [ø38,1] straight, Parallel key ³ / ₈ "x ³ / ₈ "x1½" BS46
CO	- ø25, straight, Parallel key A8x7x32 DIN 6885
H	- 1¾" [ø35] straight, Parallel key ⁵ / ₁₆ "x ⁵ / ₁₆ "x1½" BS46
SH	- 1" [ø25,32] splined BS 2059, SAE 6B

Pos.4 - Ports

2	- side ports, 2xG1/2, G1/4, BSP thread, ISO 228
4	- side ports, 2x7/8-14 UNF, O-ring, 7/16-20 UNF
5^{3)*}	- rear ports, 2xG3/8, G1/4, BSP thread, ISO 228
6^{3)*}	- rear ports, 2x9/16-18 UNF, O-ring, 7/16-20 UNF
7^{8)*}	- side ports, 2xG1/2 thread in the cover
8^{8)*}	- side ports, 2x7/8-14 UNF, O-ring thread in the cover
9^{8)*}	- side ports, for valve mounting in the cover
10^{8)*}	- side ports, for valve mounting and 2xM16 in the cover

Pos.5 - Drain line

omit	- For versions 2,4,5,6,7 and 8
2	- G1/4, BSP thread, ISO 228
4	- 7/16-20 UNF

Pos.6 - Shaft Seal Version

omit	- Standard shaft seal up to 150 bar [2175 PSI]
U	- High pressure shaft seal up to 180 bar [2610 PSI]
Q	- Extreme high pressure shaft seal up to 2900 PSI [200 bar]

Pos.7 - Additional Options^{4)*, 5)*, 6)*} [see page 110]

Pos.8 - Valves Pressure Range, bar^{7)*}

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

Pos.9 - Design Series

omit	- Factory specified
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NOTES:

- ^{1)*} Flanges **V** and **FV** is for versions 2 and 4 - drainage only!
- ^{2)*} The permissible output torque for shafts must not be exceeded!
- ^{3)*} For **5** and **6**-versions only /rear ports/!
- ^{4)*} If the code on pos.7 is not specified in the order, it will be considered as LL-option.
- ^{5)*} Colour at customer's request.
- ^{6)*} Non painted feeding surfaces, colour at customer's request.
- ^{7)*} For **SR** and **FR** only!
- ^{8)*} Port versions 7,8,9 and 10 are available with HW(S)(F) flanges only!

Rear port-versions [5 and 6] and 7,8,9 and 10 are not available with **SR**, **SWR** and **FR**!!!
HW...R-version is not available with "**RS**"!

The hydraulic motors are manganophosphatized as standard.

MOTOR ADDITIONAL OPTIONS

Additional Options Description	Order Code	Motor type											
		MLHM	MLHP	MLHPW, MLHP(W)N	HP	MLHR	MLHRN	HR	MLHPL	MLHRL	MLHRW	MLHH	HW
Speed Sensor*	RS	O	O	-	O	O	-	O	-	-	-	O	O****
Low Leakage	LL	O	-	-	-	O	O	O	-	O	O	O	O
Low Speed Valving	LSV	-	-	-	-	O	-	-	-	-	-	O	O
Free Running	FR	O	O	O	O	O	O	O	O	O	O	O	O
Reverse Rotation	R	O	O	O	O	O	O	O	O	O	O	O	O
Paint**	P	O	O	O	O	O	O	O	O	O	O	O	O
Corrosion Protected Paint**	PC	O	O	O	O	O	O	O	O	O	O	O	O
Special Paint***	PS	O	O	O	O	O	O	O	O	O	O	O	O
	PCS												
Check Valves		S	S****	S	O	S****	S	O	S	S	S****	S****	S

O	Optional
-	Not applicable
S	Standard

* For sensor ordering see pages 111÷112.

** Colour at customer's request.

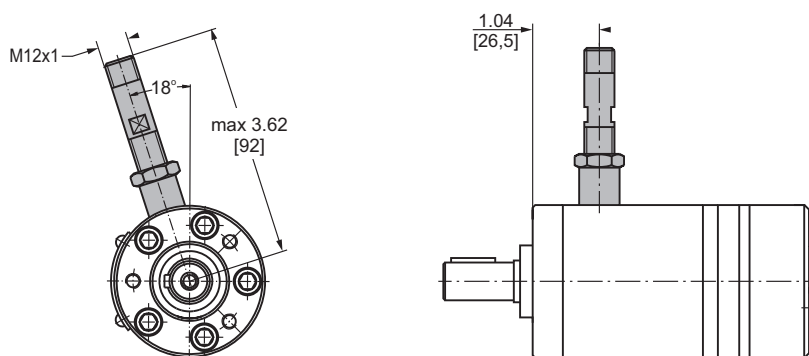
*** Non painted feeding surfaces, colour at customer's request.

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

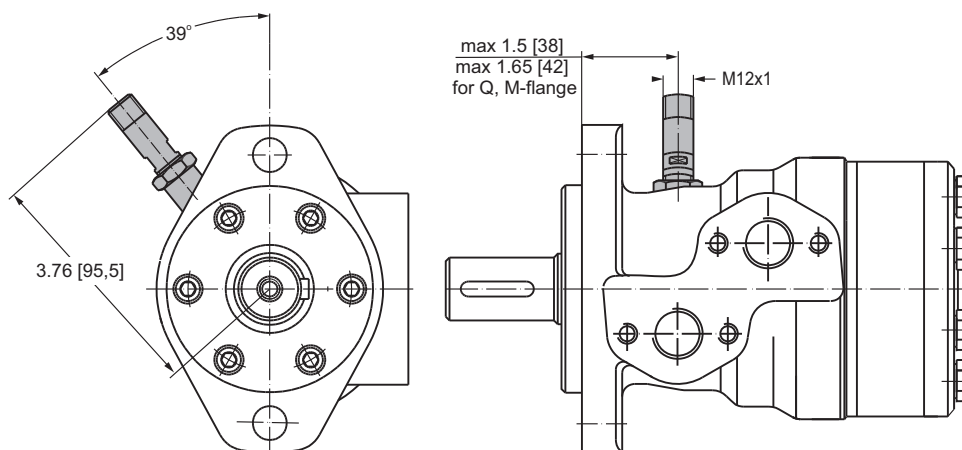
***** RS option is not available at HW...R (with relief valves).

MOTORS WITH SPEED SENSOR

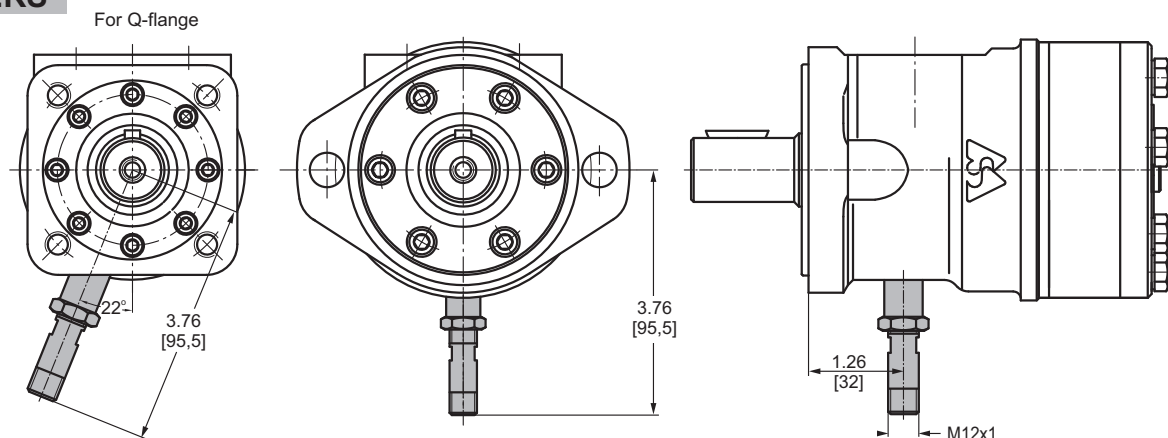
MLHM...RS



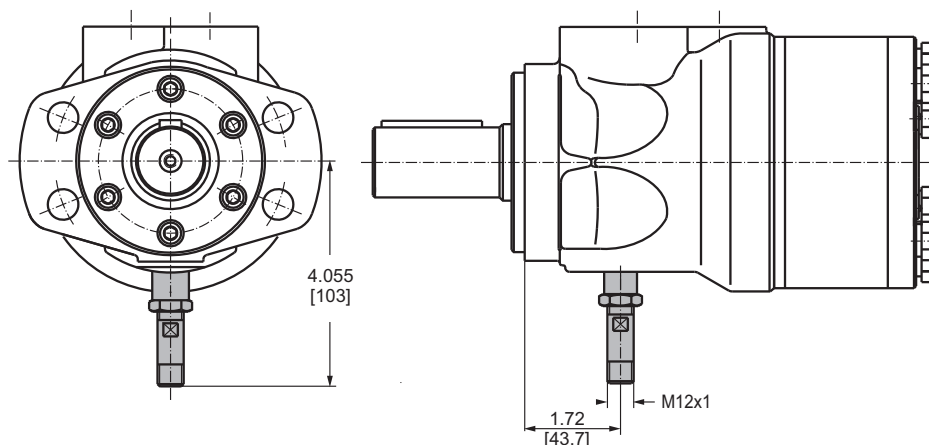
MLHP...RS MLHR...RS

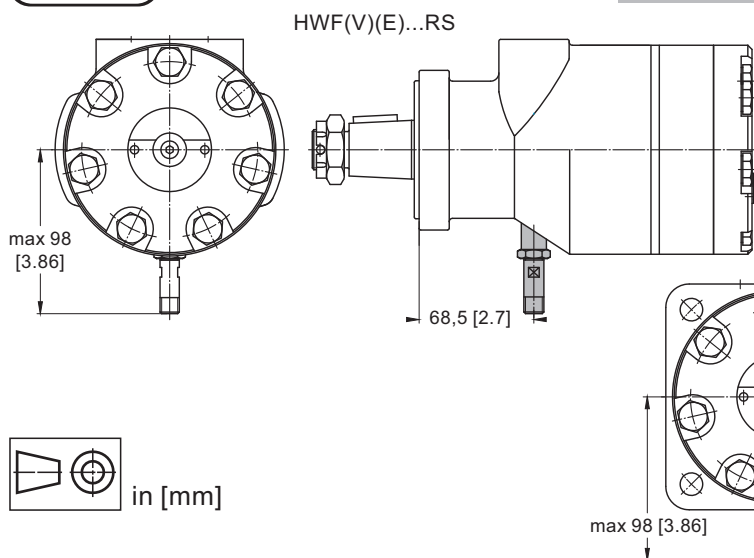


HP...RS HR...RS



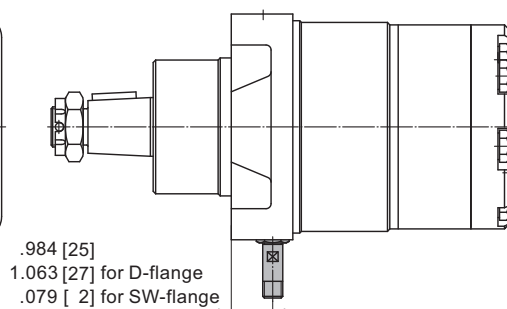
MLHH...RS





RS option is not available at HW...R (with relief valves).

HW(S)(D)(SW)(V)(E)...RS

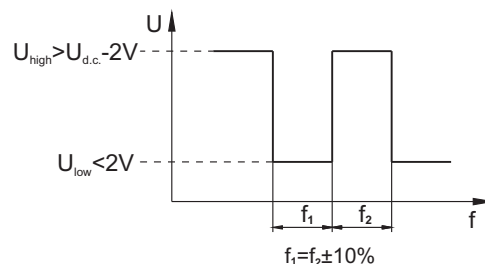


TECHNICAL DATA of the SPEED SENSOR

Technical data

Frequency range	0...15 000 Hz
Output	Universal PUSH PULL
Power supply	10-30 VDC
Current input	<20 mA (@24 VDC)
Maximum output current	500 mA
Ambient Temperature	-40...+125°C [-40...+257°F]
Protection	IP 67
Plug connector	M12-Series
Mounting principle	ISO 6149

Output signal

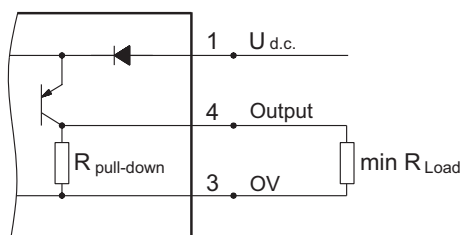


Load max.: $I_{high} = I_{low} < 50 \text{ mA}$

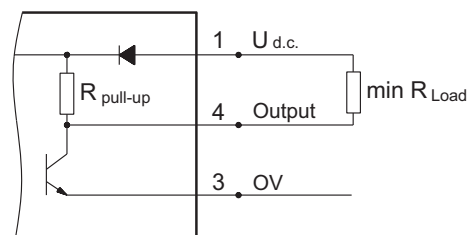
Motor type	MLHM	MLHP	MLHR	HP, HR	MLHH	HW
Pulses per revolution	30	36	36	36	42	12

Wiring diagrams

PNP

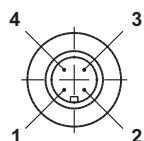


NPN



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

Stick type



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

Order Code for Speed Sensor

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

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

APPLICATION CALCULATION

VEHICLE DRIVE CALCULATIONS

1. Motor speed: n , RPM

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

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

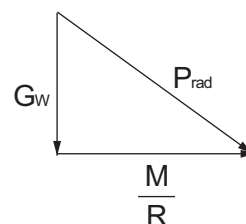
9.Radial motor loading: P_{rad} , lbs [daN]

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.

