paul forrer

Langsamlaufende Hydraulikmotoren
Serie PK, RW, HW

Moteurs hydrauliques semi-rapides
Série PK, RW, HW

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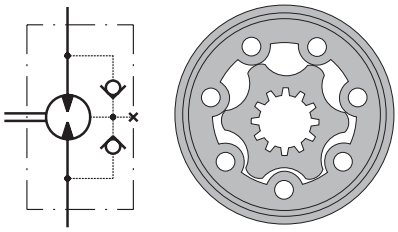
HYDRAULIC MOTORS PK

APPLICATION

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



CONTENTS

OPTIONS

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

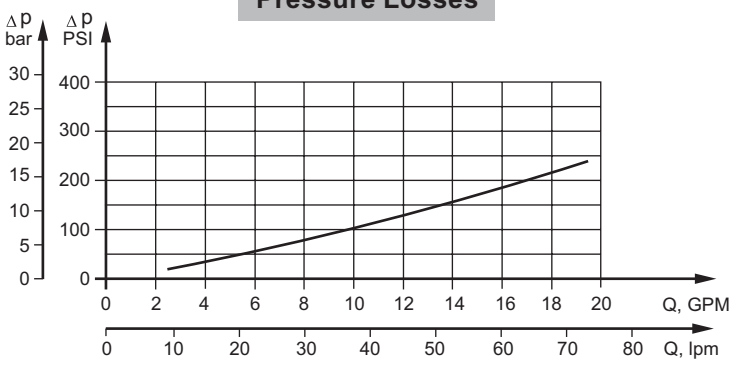
GENERAL

Max. Displacement, cm^3/rev [in^3/rev]	396 [24.16]
Max. Speed, [RPM]	1010
Max. Torque, daNm [lb-in]	cont.: 40,8 [3611] int.: 55,6 [4921]
Max. Output, kW [HP]	8,6 [11.5]
Max. Pressure Drop, bar [PSI]	cont.:105 [1520] int.: 140 [2030]
Max. Oil Flow, lpm [GPM]	50 [13.2]
Min. Speed, [RPM]	10
Pressure fluid	Mineral based- HLP(DIN 51524) or HM(ISO 6743/4)
Temperature range, ^oC [^oF]	-40÷140 [-40÷284]
Optimal Viscosity range, mm^2/s [SUS]	20÷75 [98÷347]
Filtration	ISO code 20/16 (Min. recommended fluid filtration of 25 micron)

Oil flow in drain line

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

Pressure Losses



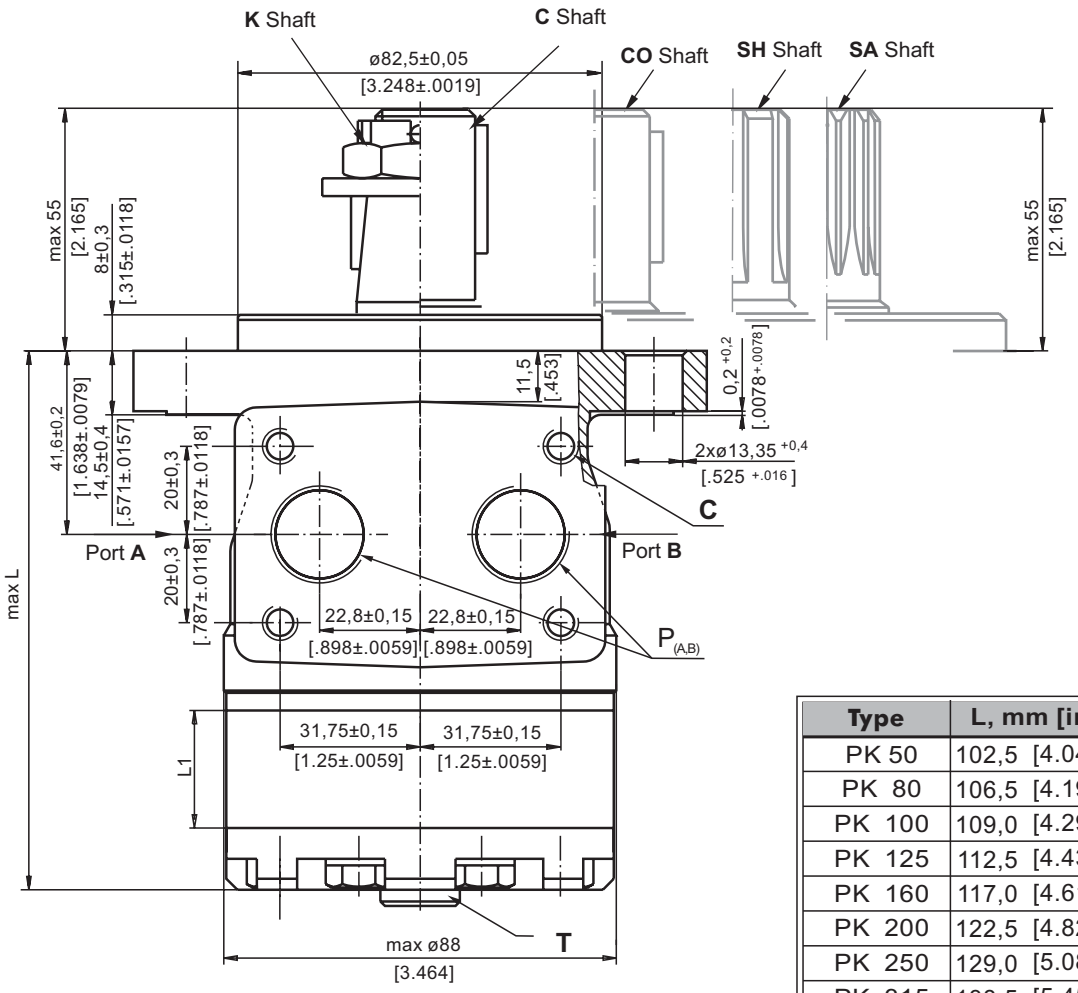
SPECIFICATION DATA

Type		PK 50	PK 80	PK 100	PK 125	PK 160	PK 200	PK 250	PK 315	PK 400
Displacement, cm³/rev [in³/rev]		49,5[3.02]	79,2 [4.83]	99 [6.04]	123,8 [7.55]	158,4 [966]	198 [12.1]	247,5 [15.1]	316,8 [19.3]	396 [24.16]
Max. Speed, [RPM]	Cont.	808	505	404	323	252	202	160	126	100
	Int.*	1010	630	505	403	315	252	202	157	126
Max. Torque daNm [lb-in]	Cont.	7 [619]	10,8 [956]	14,4 [1274]	17 [1504]	22 [1974]	27,5 [2434]	30,1 [2664]	31,7 [2805]	40,8 [3611]
	Int.*	9,2 [814]	14,6 [1292]	18,3 [1619]	22,9 [2026]	29,3 [2593]	36,6 [3239]	37,6 [3328]	44 [3894]	55,6 [4921]
	Peak**	13,6 [1203]	21,4 [1894]	26,1 [2310]	32,6 [2885]	41,8 [3700]	52,2 [4620]	51,5 [4558]	64,3 [5691]	80 [7080]
Max. Output kW [HP]	Cont.	5,2 [7.0]	5,2 [7.0]	5,2 [7.0]	5,2 [7.0]	5,2 [7.0]	5,2 [7.0]	4,6 [6.2]	3,4 [4.6]	3,4 [4.6]
	Int.*	8,6 [11.5]	8,6 [11.5]	8,6 [11.5]	8,6 [11.5]	8,6 [11.5]	8,6 [11.5]	7 [9.3]	5,8 [7.8]	5,8 [7.8]
Max. Pressure Drop bar [PSI]	Cont.	105 [1520]	105 [1520]	105 [1520]	105 [1520]	105 [1520]	105 [1520]	90 [1305]	70 [1015]	70 [1015]
	Int.*	140 [2030]	140 [2030]	140 [2030]	140 [2030]	140 [2030]	140 [2030]	115 [1665]	105 [1520]	105 [1520]
	Peak**	215 [3120]	215 [3120]	215 [3120]	215 [3120]	215 [3120]	215 [3120]	170 [2470]	170 [2470]	170 [2470]
Max. Oil Flow lpm [GPM]	Cont.	40 [10.5]	40 [10.5]	40 [10.5]	40 [10.5]	40 [10.5]	40 [10.5]	40 [10.5]	40 [10.5]	40 [10.5]
	Int.*	50 [13.2]	50 [13.2]	50 [13.2]	50 [13.2]	50 [13.2]	50 [13.2]	50 [13.2]	50 [13.2]	50 [13.2]
Max. Inlet Pressure bar [PSI]	Cont.	140 [2030]	140 [2030]	140 [2030]	140 [2030]	140 [2030]	140 [2030]	140 [2030]	140 [2030]	140 [2030]
	Int.*	175 [2540]	175 [2540]	175 [2540]	175 [2540]	175 [2540]	175 [2540]	175 [2540]	175 [2540]	175 [2540]
	Peak**	225 [3260]	225 [3260]	225 [3260]	225 [3260]	225 [3260]	225 [3260]	225 [3260]	225 [3260]	225 [3260]
Max. Return Pressure with Drain Line or Max. Pressure in Drain Line, bar [PSI]	Cont. 0-100 RPM	150 [2180]	150 [2180]	150 [2180]	150 [2180]	150 [2180]	150 [2180]	150 [2180]	150 [2180]	150 [2180]
	Cont. 100-300 RPM	75 [1090]	75 [1090]	75 [1090]	75 [1090]	75 [1090]	75 [1090]	75 [1090]	75 [1090]	75 [1090]
	Cont. 300-600 RPM	50 [725]	50 [725]	50 [725]	50 [725]	50 [725]	50 [725]	50 [725]	50 [725]	50 [725]
	Cont. >600 RPM	20 [290]	20 [290]	20 [290]	20 [290]	20 [290]	20 [290]	20 [290]	20 [290]	20 [290]
	Int.* 0-max. RPM	15 [220]	15 [220]	15 [220]	15 [220]	15 [220]	15 [220]	15 [220]	15 [220]	15 [220]
Max. Starting Pressure with Unloaded Shaft, bar [PSI]		10 [145]	10 [145]	10 [145]	10 [145]	10 [145]	10 [145]	10 [145]	10 [145]	10 [145]
Min. Starting Torque, daNm [lb-in]		5,8 [513]	9,1 [805]	12,2 [1079]	14,5 [1283]	19,5 [1725]	24,8 [2195]	27,5 [2433]	29 [2567]	35,9 [3278]
Min. Speed***, [RPM]		10	10	10	10	10	10	10	10	10
Weight, kg [lb]		5 [11.1]	5,1 [11.2]	5,3 [11.7]	5,4 [11.9]	5,6 [12.3]	5,8 [12.8]	6 [13.2]	6,3 [13.9]	6,8 [15]

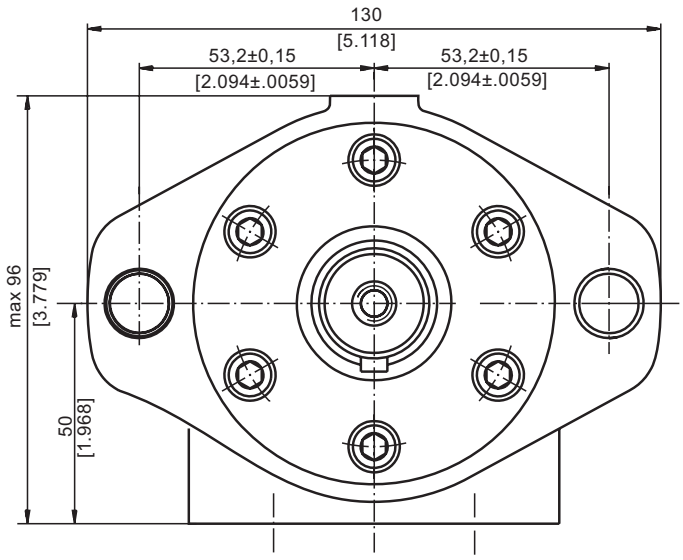
* Intermittent operation: the permissible values may occur for max. 10% of every minute.
** Peak load: the permissible values may occur for max. 1% of every minute.
*** For speeds lower than given, consult factory or your regional manager.

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

DIMENSIONS AND MOUNTING DATA



Type	L, mm [in]	L_1, mm [in]
PK 50	102,5 [4.04]	6,67 [.26]
PK 80	106,5 [4.19]	10,67 [.42]
PK 100	109,0 [4.29]	13,33 [.52]
PK 125	112,5 [4.43]	16,67 [.66]
PK 160	117,0 [4.61]	21,33 [.84]
PK 200	122,5 [4.82]	26,67 [1.05]
PK 250	129,0 [5.08]	33,33 [1.31]
PK 315	138,5 [5.45]	42,67 [1.68]
PK 400	149,0 [5.87]	53,33 [2.10]



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

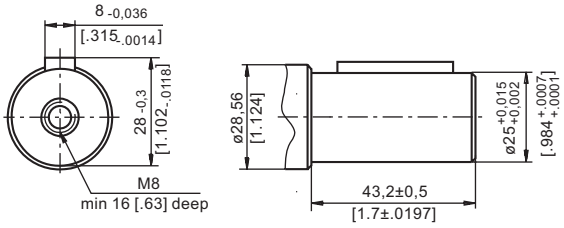
Reverse Rotation
Viewed from Shaft End
Port **A** Pressurized - **CCW**
Port **B** Pressurized - **CW**

C : 4xM8 - 13 mm [.51 in] depth
$P_{(A, B)}$: 2xG1/2 or 2xM22x1,5 - 15 mm [.59 in] depth
T : G1/4 or M14x1,5 - 8,5 mm [.33 in] depth (plugged)

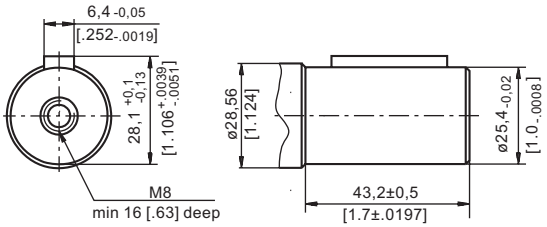
mm [in]

SHAFT EXTENSIONS

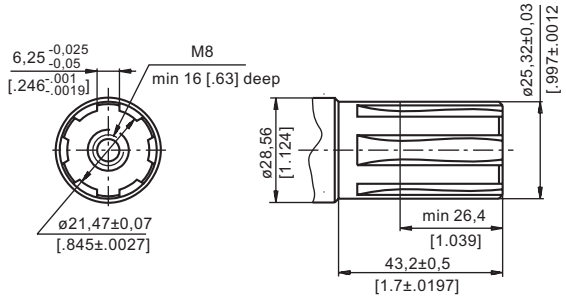
C - ø25 straight, Parallel key A8x7x32 DIN 6885
Max. Torque 34 daNm [3010 lb-in]



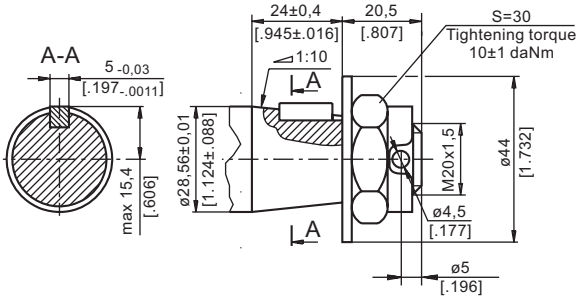
CO - ø1" straight, Parallel key ¼"x¼"x1¼" BS46
Max. Torque 34 daNm [3010 lb-in]



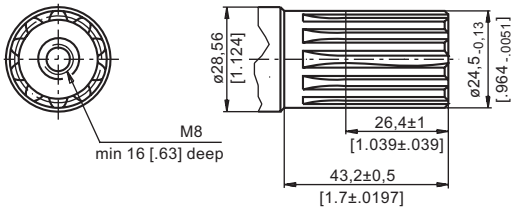
SH - splined, BS 2059 (SAE 6B)
Max. Torque 40 daNm [3540 lb-in]

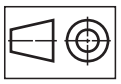


K - tapered 1:10, Parallel key B5x5x14 DIN 6885
Max. Torque 40 daNm [3540 lb-in]



SA - splined, B25x22h9 DIN 5482
Max. Torque 40 daNm [3540 lb-in]





mm [in]

ORDER CODE

	1	2	3	4	5
P K					

Pos.1 - Displacement code

50	- 49,5 cm³/rev [3.02 in³/rev]
80	- 79,2 cm³/rev [4.83 in³/rev]
100	- 99,0 cm³/rev [6.04 in³/rev]
125	- 123,8 cm³/rev [7.55 in³/rev]
160	- 158,4 cm³/rev [9.66 in³/rev]
200	- 198,0 cm³/rev [12.10 in³/rev]
250	- 247,5 cm³/rev [15.10 in³/rev]
315	- 316,8 cm³/rev [19.30 in³/rev]
400	- 396,0 cm³/rev [24.16 in³/rev]

Pos.2 - Shaft Extensions*

C	- ø25 straight, Parallel key A8x7x32 DIN6885
CO	- ø25,4 straight, Parallel key ¼"x¼"x1¼" BS46
SH	- ø25,32 splined BS 2059 (SAE 6B)
K	- ø28,56 tapered 1:10, Parallel key, B5x5x14 DIN6885
SA	- ø24,5 splined B25x22h9 DIN 5482

Pos. 3 - Ports

omit - BSPP (ISO 228)

M - Metric (ISO 262)

Pos. 4 - Special Features (see page 98)

Pos 5 - Design Series

omit - Factory specified

NOTE:

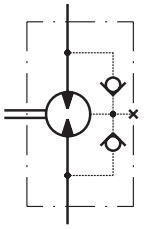
* The permissible output torque for shafts must be not exceeded!

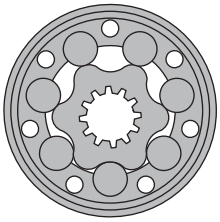
The hydraulic motors are mangano-phosphatized as standard.

HYDRAULIC MOTORS RK

APPLICATION

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





CONTENTS

OPTIONS

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

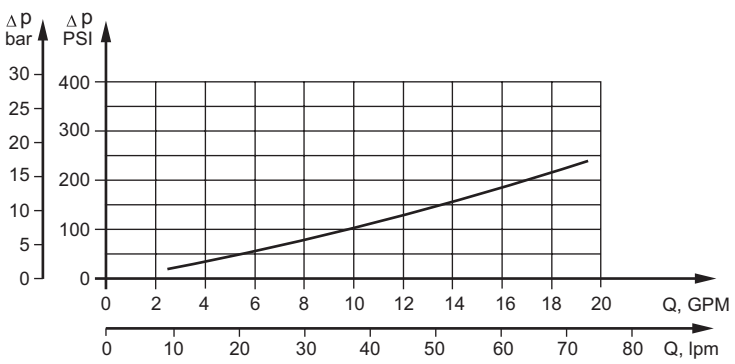
GENERAL

Max. Displacement, cm^3/rev [in^3/rev]	397 [24.4]
Max. Speed, [RPM]	970
Max. Torque, daNm [lb-in]	cont.: 40 [3540] int.: 50 [4425]
Max. Output, kW [HP]	12,8 [17.2]
Max. Pressure Drop, bar [PSI]	cont.: 140 [2030] int.: 175 [2540]
Max. Oil Flow, lpm [GPM]	75 [18.5]
Min. Speed, [RPM]	10
Pressure fluid	Mineral based- HLP(DIN 51524) or HM(ISO 6743/4)
Temperature range, ^oC [^oF]	-40÷140 [-40÷284]
Optimal Viscosity range, mm^2/s [SUS]	20÷75 [98÷347]
Filtration	ISO code 20/16 (Min. recommended fluid filtration of 25 micron)

Oil flow in drain line

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

Pressure Losses



SPECIFICATION DATA

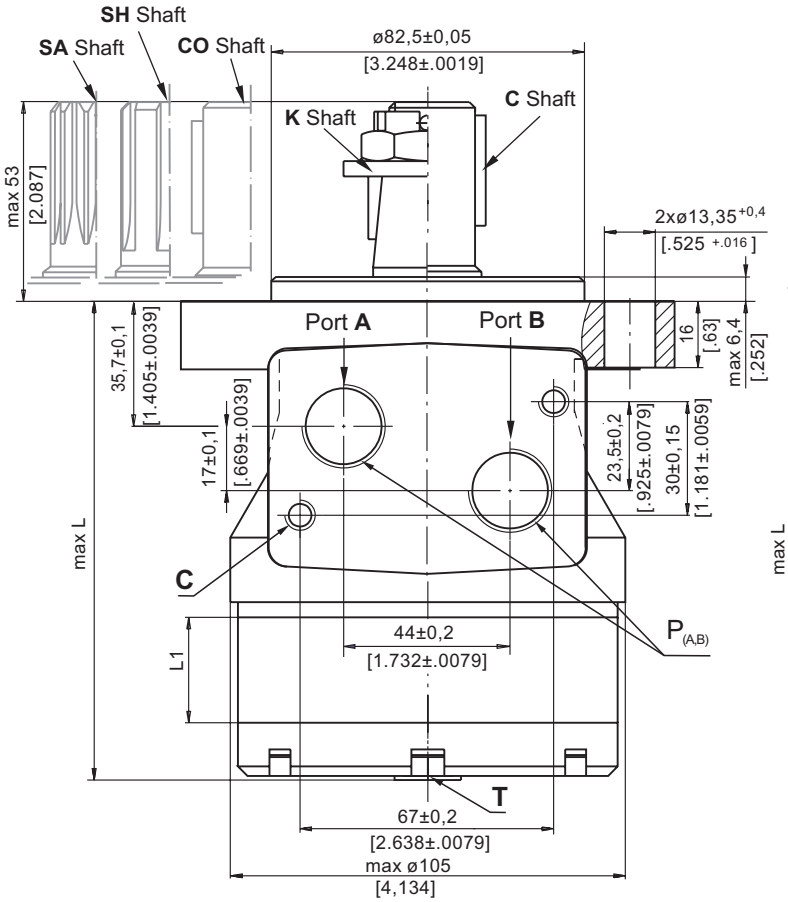
Type		RK 50	RK 80	RK 100	RK 125	RK 160	RK 200	RK 250	RK 315	RK 400
Displacement, cm³/rev [in³/rev]		51,5 [3.14]	80,3 [4.9]	99,8 [6.09]	125,5[7.67]	159,6[9.74]	199,8[12.19	250,1[15.26]	315,7[19.26]	397 [24.4]
Max. Speed, [RPM]	Cont.	775	750	600	475	375	300	240	190	150
	Int.*	970	940	750	600	470	375	300	240	185
Max. Torque daNm [lb-in]	Cont.	10 [850]	15,7 [1390]	19,8 [1750]	25 [2210]	32 [2830]	34 [3010]	40 [3540]	40 [3540]	40 [3540]
	Int.*	13 [1150]	19,5 [1725]	24 [2125]	30 [2655]	39 [3450]	42 [3717]	47 [4160]	50 [4425]	50 [4425]
	Peak**	17 [1505]	27 [2390]	32 [2830]	37 [3275]	46 [4070]	56 [4960]	64 [5665]	65 [5755]	65 [5755]
Max. Output kW [HP]	Cont.	9 [12.1]	10,4 [13.9]	10,8 [14.4]	10,8 [14.4]	10,4 [13.9]	8,8 [11.8]	8,1 [10.9]	7,4 [9.9]	6,2 [8.3]
	Int.*	10,4 [13.9]	12,6 [16.9]	12,8 [17.2]	12,5 [16.8]	11,5 [15.4]	10,2 [13.7]	9,4 [12.6]	7,8 [10.5]	7,1 [9.5]
Max. Pressure Drop bar [PSI]	Cont.	140 [2030]	140 [2030]	140 [2030]	140 [2030]	140 [2030]	125 [1810]	110 [1600]	[1300]	75 [1090]
	Int.*	175 [2540]	175 [2540]	175 [2540]	175 [2540]	175 [2540]	155 [2250]	140 [2030]	125 [1810]	90 [1305]
	Peak**	225 [3260]	225 [3260]	225 [3260]	225 [3260]	225 [3260]	225 [3260]	200 [2900]	150 [2175]	120 [1740]
Max. Oil Flow lpm [GPM]	Cont.	40 [10.5]	60 [15.9]	60 [15.9]	60 [15.9]	60 [15.9]	60 [15.9]	60 [15.9]	60 [15.9]	60 [15.9]
	Int.*	50 [13.2]	75 [18.5]	75 [18.5]	75 [18.5]	75 [18.5]	75 [18.5]	75 [18.5]	75 [18.5]	75 [18.5]
Max. Inlet Pressure bar [PSI]	Cont.	175 [2540]	175 [2540]	175 [2540]	175 [2540]	175 [2540]	175 [2540]	175 [2540]	175 [2540]	175 [2540]
	Int.*	200 [2900]	200 [2900]	200 [2900]	200 [2900]	200 [2900]	200 [2900]	200 [2900]	200 [2900]	200 [2900]
	Peak**	225 [3260]	225 [3260]	225 [3260]	225 [3260]	225 [3260]	225 [3260]	225 [3260]	225 [3260]	225 [3260]
Max. Return Pressure with Drain Line or Max. Pressure in Drain Line, bar [PSI]	Cont. 0-100 RPM	150 [2180]	150 [2180]	150 [2180]	150 [2180]	150 [2180]	150 [2180]	150 [2180]	150 [2180]	150 [2180]
	Cont. 100-300 RPM	75 [1090]	75 [1090]	75 [1090]	75 [1090]	75 [1090]	75 [1090]	75 [1090]	75 [1090]	75 [1090]
	Cont. 300-600 RPM	50 [725]	50 [725]	50 [725]	50 [725]	50 [725]	50 [725]	50 [725]	50 [725]	50 [725]
	Cont. >600 RPM	20 [290]	20 [290]	20 [290]	20 [290]	20 [290]	20 [290]	20 [290]	20 [290]	20 [290]
	Int.* 0-max. RPM	15 [220]	15 [220]	15 [220]	15 [220]	15 [220]	15 [220]	15 [220]	15 [220]	15 [220]
Max. Starting Pressure with Unloaded Shaft, bar [PSI]		10 [145]	10 [145]	10 [145]	10 [145]	10 [145]	10 [145]	10 [145]	10 [145]	10 [145]
Min. Starting Torque, daNm [lb-in]		8 [710]	12 [1060]	16 [1420]	20 [1770]	25 [2215]	29 [2570]	28 [2480]	32 [2832]	35 [3100]
Min. Speed***, [RPM]		10	10	10	10	10	10	10	10	10
Weight, kg [lb]		6,2 [13.7]	6,3 [13.9]	6,6 [14.6]	6,7 [14.8]	6,9 [15.2]	7,4 [16.3]	7,8 [17.2]	8,5 [18.7]	9,3 [20.5]

* Intermittent operation: the permissible values may occur for max. 10% of every minute.
** Peak load: the permissible values may occur for max. 1% of every minute.
*** For speeds lower than given, consult factory or your regional manager.

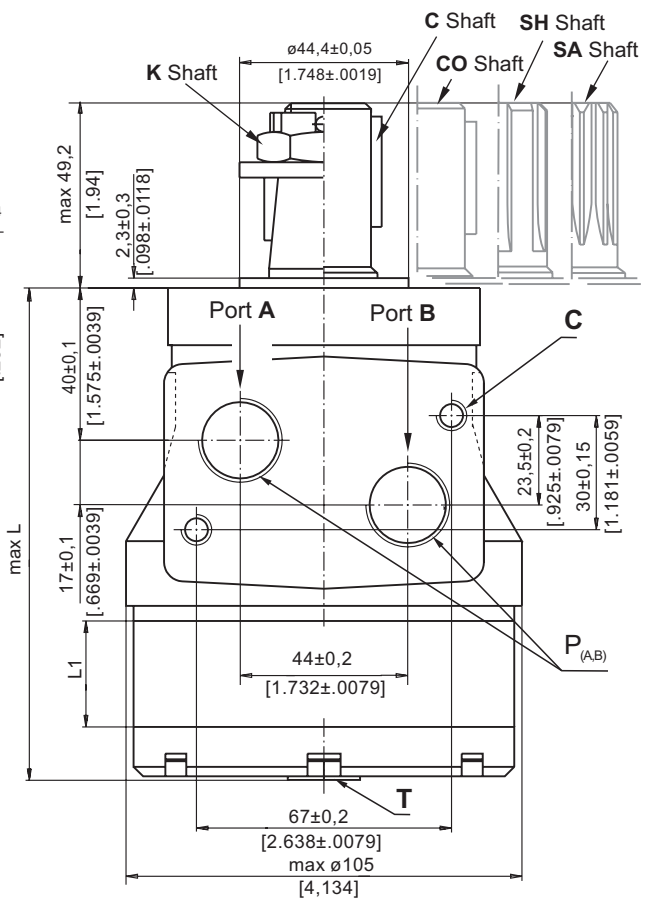
1. Intermittent speed and intermittent pressure must not occur simultaneously.
2. Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
3. Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP(DIN51524) or HM (ISO 6743/4). If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

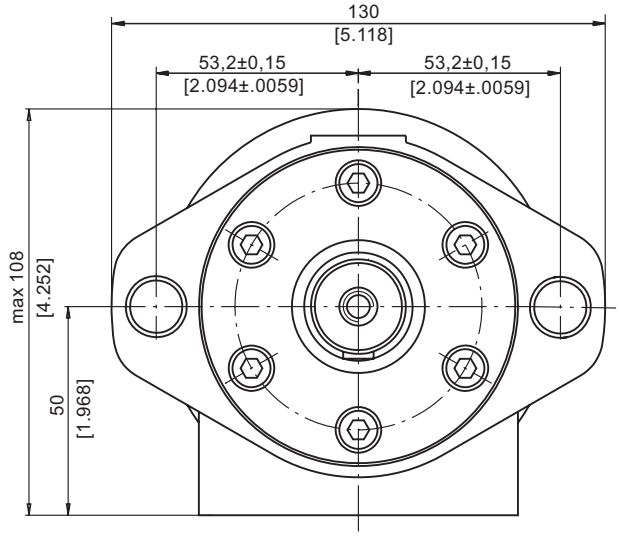
DIMENSIONS AND MOUNTING DATA

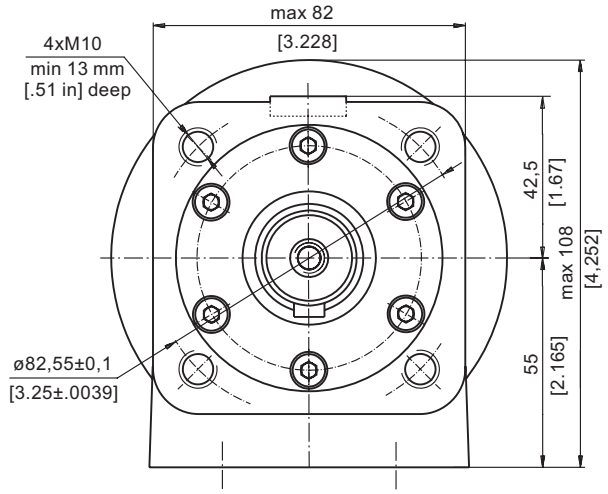
Oval Mount (2 Holes)



Q - Square Mount (4 Bolts)







Type	L, mm [in]	Type	L, mm [in]	L_1, mm [in]
RK 50	109,5[4.31]	RKQ 50	113,8 [4.48]	9,0 [.35]
RK 80	114,5[4.51]	RKQ 80	118,8 [4.68]	14,0 [.55]
RK 100	118,0[4.65]	RKQ 100	122,3 [4.82]	17,4 [.69]
RK 125	122,5[4.82]	RKQ 125	126,8 [4.99]	21,8 [.86]
RK 160	128,5[5.06]	RKQ 160	132,8 [5.23]	27,8 [1.09]
RK 200	135,5[5.33]	RKQ 200	139,8 [5.50]	34,8 [1.37]
RK 250	144,0[5.67]	RKQ 250	148,3 [5.84]	43,5 [1.71]
RK 315	155,5[6.12]	RKQ 315	159,8 [6.29]	54,8 [2.16]
RK 400	170,0[6.69]	RKQ 400	174,3 [6.86]	69,4 [2.73]

C : 4xM8 - 13 mm [.51 in] depth
$P_{(A, B)}$: 2xG1/2 or 2xM22x1,5 - 15 mm [.59 in] depth
T : G1/4 or M14x1,5 - 8,5 mm [.33 in] depth (plugged)

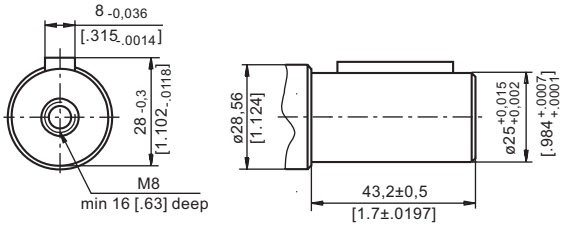
Standard Rotation
Viewed from Shaft End
Port **A** Pressurized - **CW**
Port **B** Pressurized - **CCW**

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

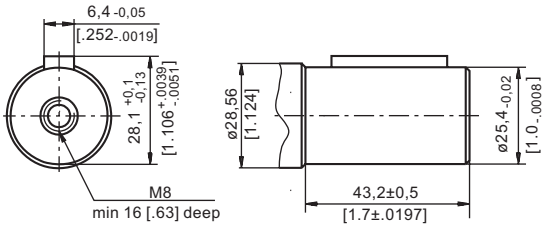
mm [in]

SHAFT EXTENSIONS

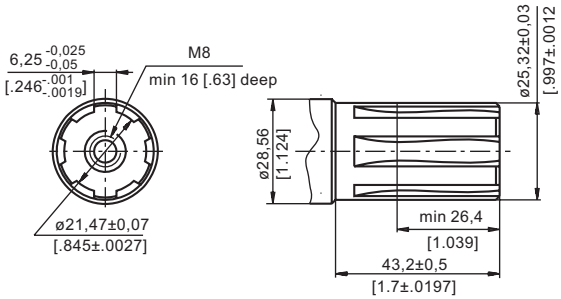
C - ø25 straight, Parallel key A8x7x32 DIN 6885
Max. Torque 34 daNm [3010 lb-in]



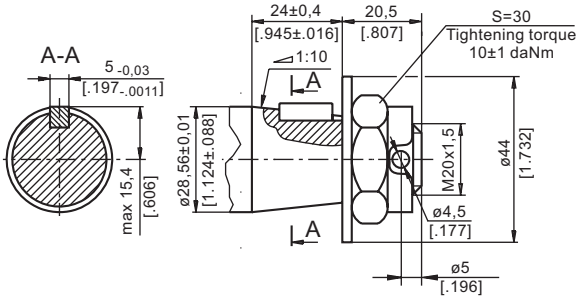
CO - ø1" straight, Parallel key ¼"x¼"x1¼" BS46
Max. Torque 34 daNm [3010 lb-in]



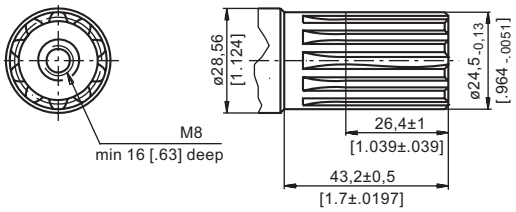
SH - splined, BS 2059 (SAE 6B)
Max. Torque 40 daNm [3540 lb-in]



K - tapered 1:10, Parallel key B5x5x14 DIN 6885
Max. Torque 40 daNm [3540 lb-in]



SA - splined, B25x22h9 DIN 5482
Max. Torque 40 daNm [3540 lb-in]



mm [in]

ORDER CODE

	1	2	3	4	5	6
R K						

Pos.1 - Mounting Flange

omit - Oval mount, two holes

Q - Square mount, four bolts

Pos.2 - Displacement code

50	- 51,5 cm³/rev [3.14 in³/rev]
80	- 80,3 cm³/rev [4.90 in³/rev]
100	- 99,8 cm³/rev [6.09 in³/rev]
125	- 125,7 cm³/rev [7.67 in³/rev]
160	- 159,6 cm³/rev [9.74 in³/rev]
200	- 199,8 cm³/rev [12.19 in³/rev]
250	- 250,1 cm³/rev [15.26 in³/rev]
315	- 315,7 cm³/rev [19.26 in³/rev]
400	- 397,0 cm³/rev [24.40 in³/rev]

Pos.3 - Shaft Extensions*

C	- ø25 straight, Parallel key A8x7x32 DIN6885
CO	- ø25,4 straight, Parallel key ¼"x¼"x1¼" BS46
SH	- ø25,32 splined BS 2059 (SAE 6B)
K	- ø28,56 tapered 1:10, Parallel key, B5x5x14 DIN6885
SA	- ø24,5 splined B25x22h9 DIN 5482

Pos.4 - Ports

omit - BSPP (ISO 228)

M - Metric (ISO 262)

Pos.5 - Special Features (see page 98)

Pos.6 - Design Series

omit - Factory specified

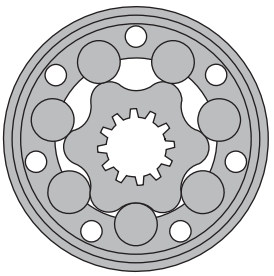
NOTE:
* The permissible output torque for shafts must be not exceeded!

The hydraulic motors are mangano-phosphatized as standard.

HYDRAULIC MOTORS RW

APPLICATION

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



CONTENTS

OPTIONS

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

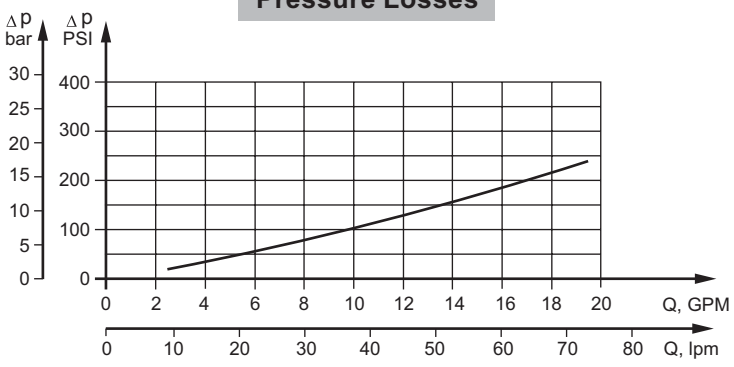
GENERAL

Max. Displacement, cm^3/rev [in^3/rev]	397 [24.4]
Max. Speed, [RPM]	1029
Max. Torque, daNm [lb-in]	cont.: 61 [5400] int.: 69 [6100]
Max. Output, kW [HP]	15 [20.1]
Max. Pressure Drop, bar [PSI]	cont.: 175 [2540] int.: 200 [2900]
Max. Oil Flow, lpm [GPM]	90 [23.8]
Min. Speed, [RPM]	10
Pressure fluid	Mineral based- HLP(DIN 51524) or HM(ISO 6743/4)
Temperature range, ^oC [^oF]	-40÷140 [-40÷284]
Optimal Viscosity range, mm^2/s [SUS]	20÷75 [98÷347]
Filtration	ISO code 20/16 (Min. recommended fluid filtration of 25 micron)

Oil flow in drain line

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

Pressure Losses



SPECIFICATION DATA

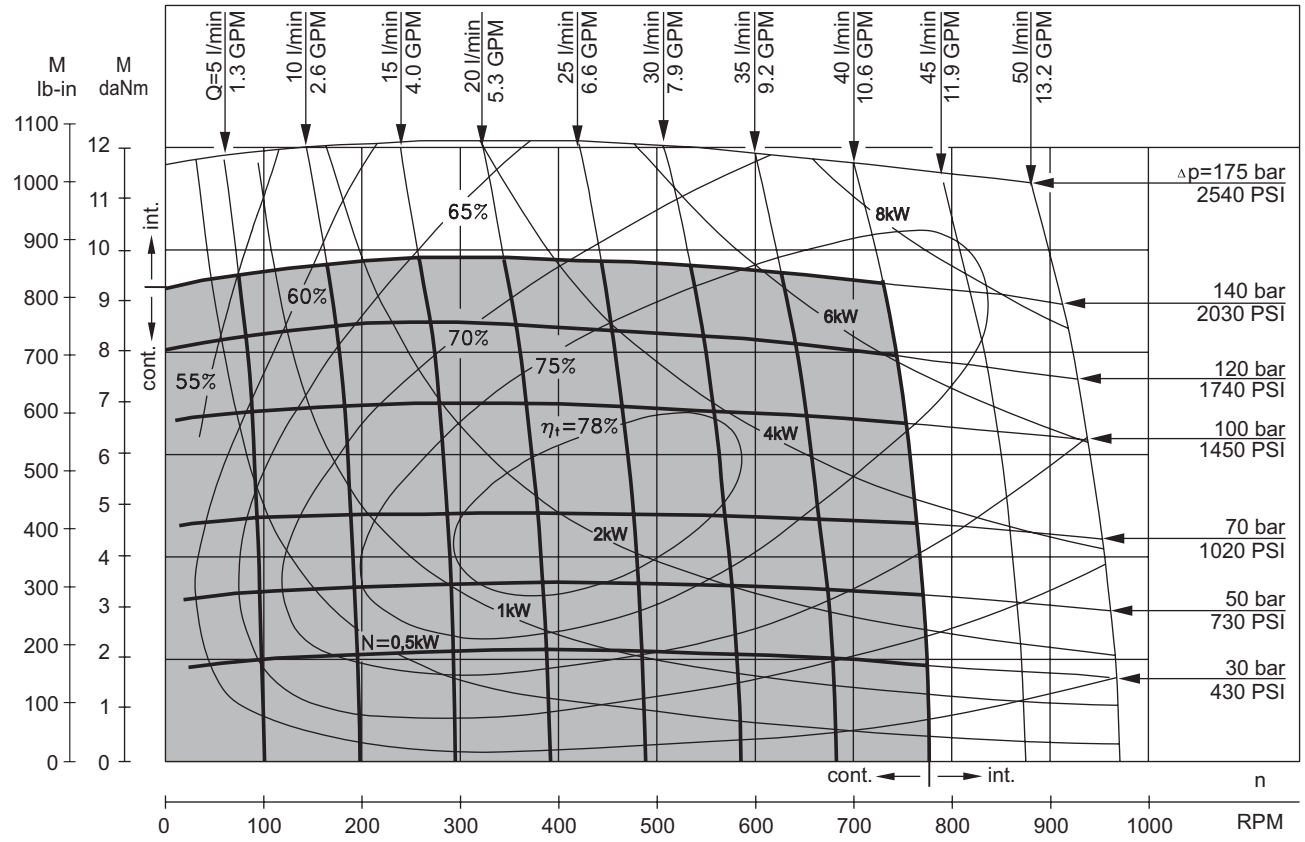
Type		RW 50	RW 80	RW 100	RW 125	RW 160	RW 200	RW 250	RW 315	RW 400
Displacement, cm³/rev.		51,5	80,3	99,8	125,7	159,6	199,8	250,1	315,7	397
[in³/rev.]		[3.14]	[4.90]	[6.09]	[7.67]	[9.74]	[12.19]	[15.26]	[19.26]	[24.4]
Max. Speed,	Cont.	734	750	600	475	375	300	300	240	190
[RPM]	Int.*	1029	940	750	600	470	375	360	285	226
Max. Torque	Cont.	10 [900]	20 [1770]	24 [2125]	30 [2655]	39 [3450]	45 [4000]	54 [4780]	55 [4870]	61 [5400]
daNm [lb-in]	Int.*	13 [1150]	22 [1947]	28 [2480]	34 [3010]	43 [3805]	50 [4425]	61 [5400]	69 [6100]	69 [6100]
	Peak**	17 [1505]	27 [2390]	32 [2832]	37 [3275]	46 [4070]	56 [4960]	71 [6280]	84 [7430]	87 [7700]
Max. Output	Cont.	7 [9.5]	12,5 [17]	13 [17.4]	12,5 [16.8]	11,5 [15.4]	11 [14.8]	10 [13.4]	9 [12]	7,8 [10.5]
kW [HP]	Int.*	8,5 [11.9]	15 [20.1]	15 [20.1]	14,5 [19.5]	14 [18.8]	13 [17.4]	12 [16.1]	10 [13.4]	10,6 [14.2]
Max. Pressure Drop	Cont.	140 [2030]	175 [2540]	175 [2540]	175 [2540]	175 [2540]	175 [2540]	175 [2540]	135 [1960]	110 [1600]
bar [PSI]	Int.*	175 [2540]	200 [2900]	200 [2900]	200 [2900]	200 [2900]	200 [2900]	200 [2900]	175 [2540]	140 [2030]
	Peak**	225 [3260]	225 [3260]	225 [3260]	225 [3260]	225 [3260]	225 [3260]	225 [3260]	210 [3045]	175 [2540]
Max. Oil Flow	Cont.	40 [11]	60 [16]	60 [16]	60 [16]	60 [16]	60 [16]	75 [20]	75 [20]	75 [20]
lpm [GPM]	Int.*	50 [13]	75 [20]	75 [20]	75 [20]	75 [20]	75 [20]	90 [23.8]	90 [23.8]	90 [23.8]
Max. Inlet Pressure	Cont.	175 [2540]	175 [2540]	175 [2540]	175 [2540]	175 [2540]	175 [2540]	175 [2540]	175 [2540]	175 [2540]
bar [PSI]	Int.*	200 [2900]	200 [2900]	200 [2900]	200 [2900]	200 [2900]	200 [2900]	200 [2900]	200 [2900]	200 [2900]
	Peak**	225 [3260]	225 [3260]	225 [3260]	225 [3260]	225 [3260]	225 [3260]	225 [3260]	225 [3260]	225 [3260]
Max. Return Pres-	Cont.	175 [2540]	175 [2540]	175 [2540]	175 [2540]	175 [2540]	175 [2540]	175 [2540]	175 [2540]	175 [2540]
sure with Drain Line	Int.*	200 [2900]	200 [2900]	200 [2900]	200 [2900]	200 [2900]	200 [2900]	200 [2900]	200 [2900]	200 [2900]
bar [PSI]	Peak**	225 [3260]	225 [3260]	225 [3260]	225 [3260]	225 [3260]	225 [3260]	225 [3260]	225 [3260]	225 [3260]
Max. Starting Pressure with Unloaded Shaft, bar [PSI]		10 [145]	10 [145]	10 [145]	9 [130]	7 [102]	5 [73]	5 [73]	5 [73]	5 [73]
Min. Starting Torque	At max.press.									
daNm [lb-in]	drop Cont.	8 [710]	15 [1330]	20 [1770]	25 [2215]	32 [2832]	41 [3630]	50 [4425]	50 [4425]	50 [4425]
	At max.press.									
	drop Int.*	10 [885]	17 [1505]	23 [2035]	28 [2480]	37 [3275]	46 [4070]	55 [4870]	66 [5840]	61 [5400]
Min. Speed***, [RPM]		10	10	10	10	10	10	10	10	10
Weight, kg [lb]		9,6	9,7	9.8	10,0	10,3	10,8	11,3	11,8	12,5
		[21.2]	[21.4]	[21.7]	[22.1]	[22.7]	[23.8]	[24.9]	[26]	[27.63]

* Intermittent operation: the permissible values may occur for max. 10% of every minute.
** Peak load: the permissible values may occur for max. 1% of every minute.
*** For speeds lower than given, consult factory or your regional manager.

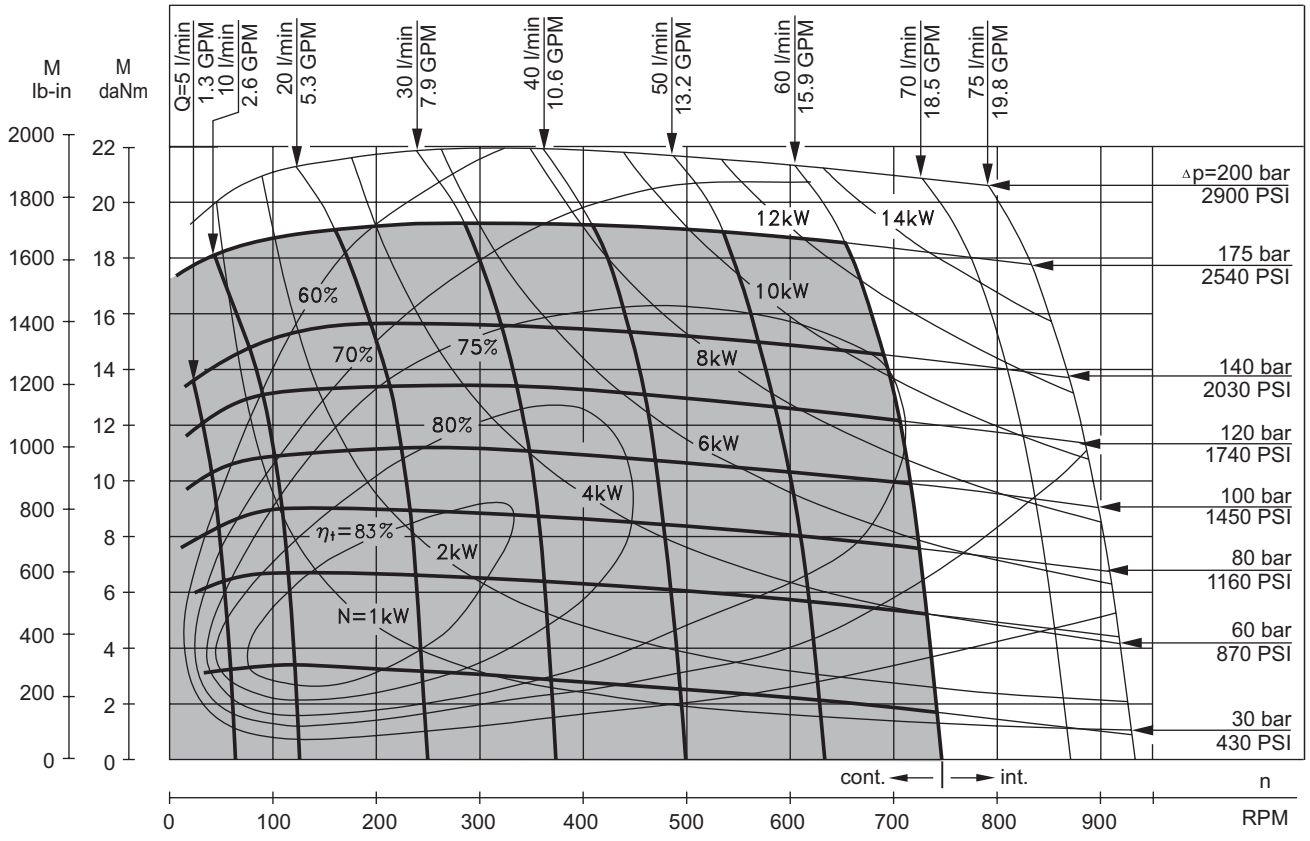
1. Intermittent speed and intermittent pressure must not occur simultaneously.
2. Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
3. Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP(DIN51524) or HM (ISO 6743/4). If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

FUNCTION DIAGRAMS

RW 50



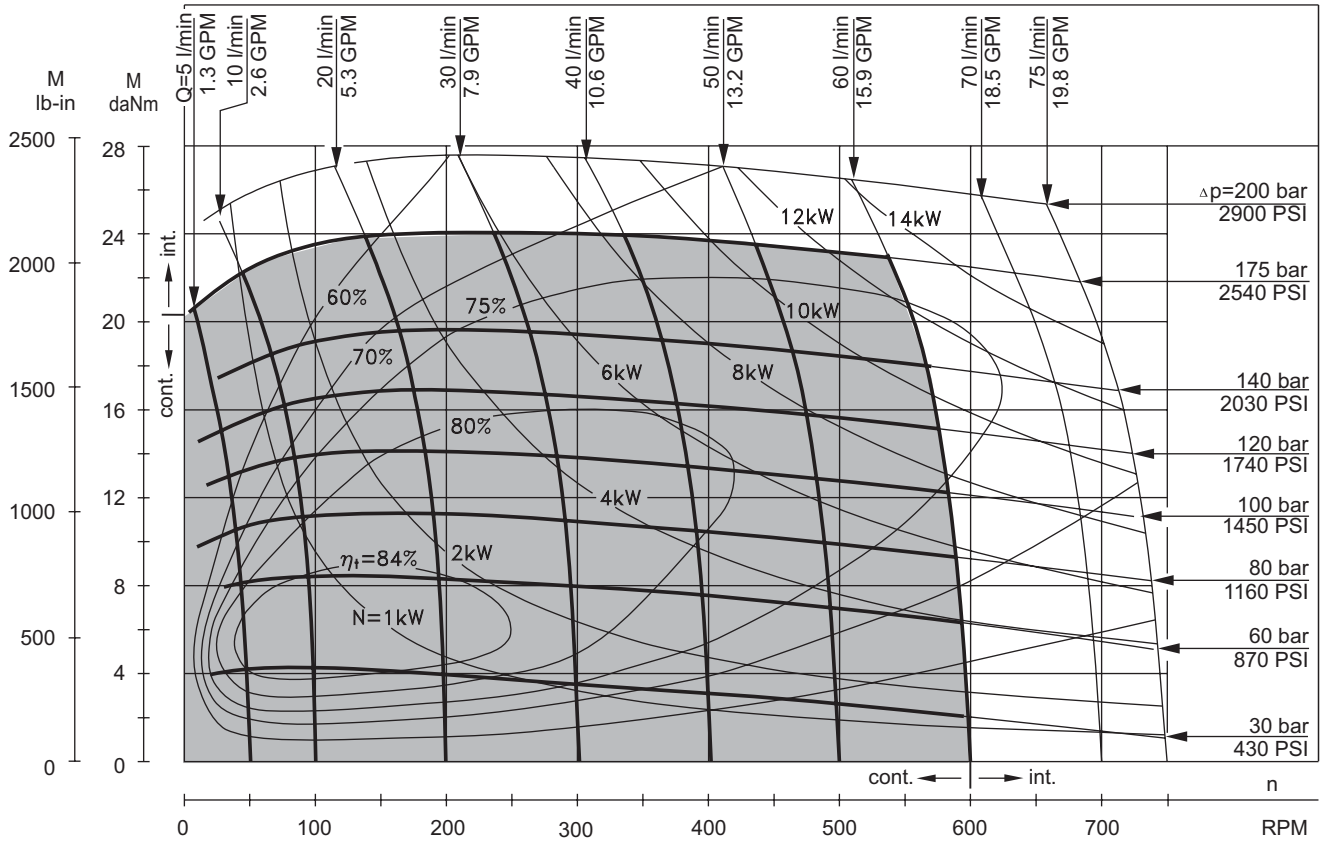
RW 80



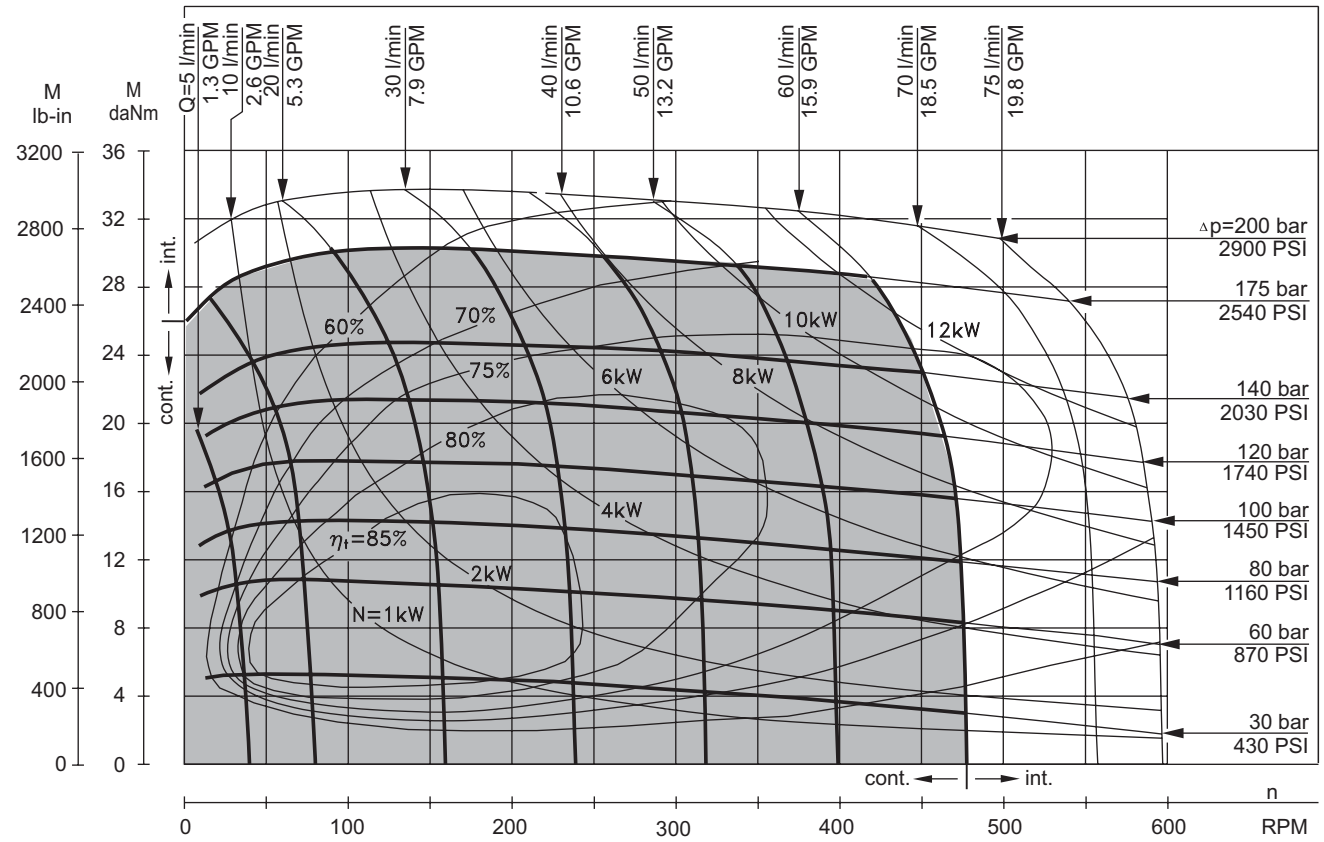
The function diagrams data is for average performance of randomly selected motors at back pressure 5÷10 bar [72.5÷145 PSI] and oil with viscosity of 32 mm²/s [150 SUS] at 50°C [122°F].

FUNCTION DIAGRAMS

RW 100



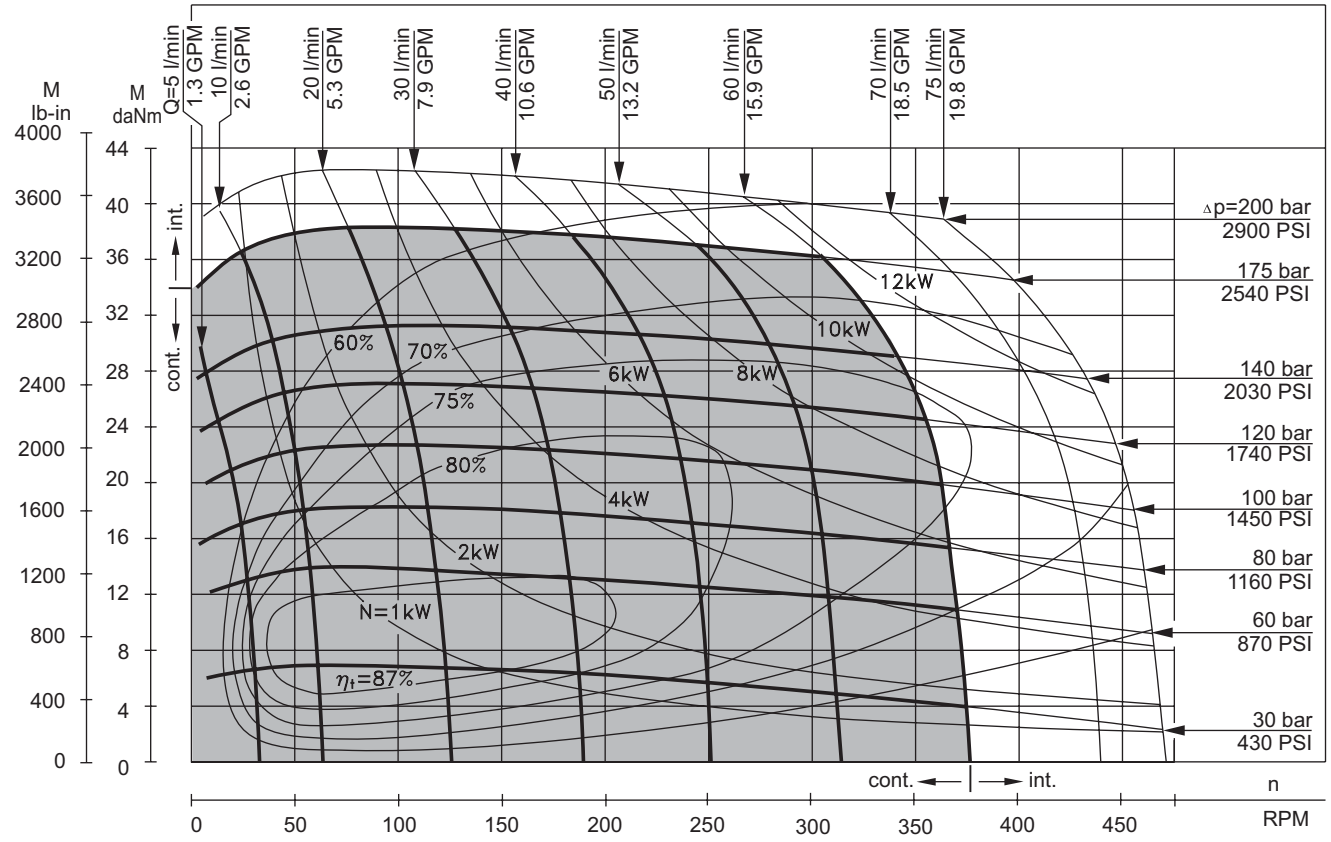
RW 125



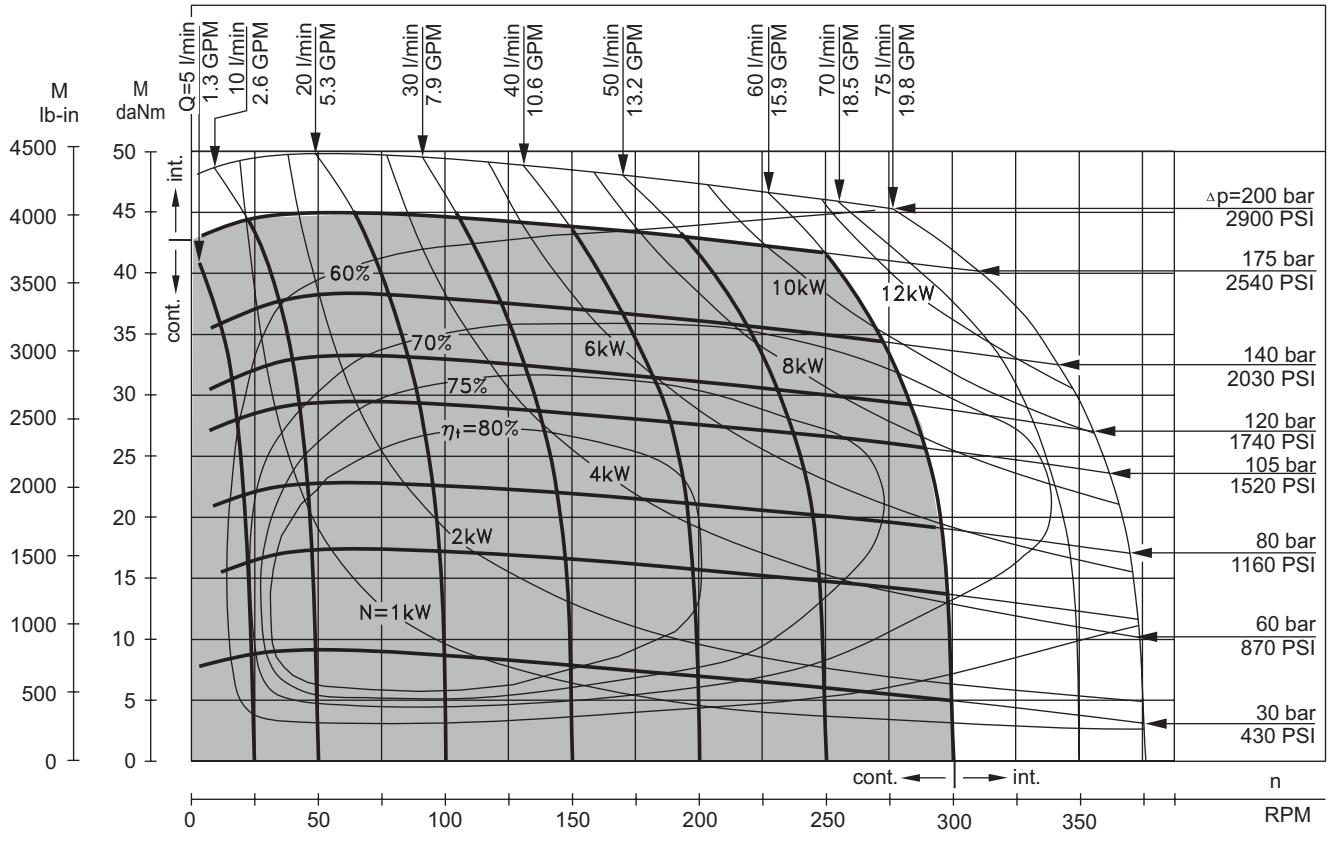
The function diagrams data is for average performance of randomly selected motors at back pressure 5÷10 bar [72.5÷145 PSI] and oil with viscosity of 32 mm²/s [150 SUS] at 50°C [122°F].

FUNCTION DIAGRAMS

RW 160



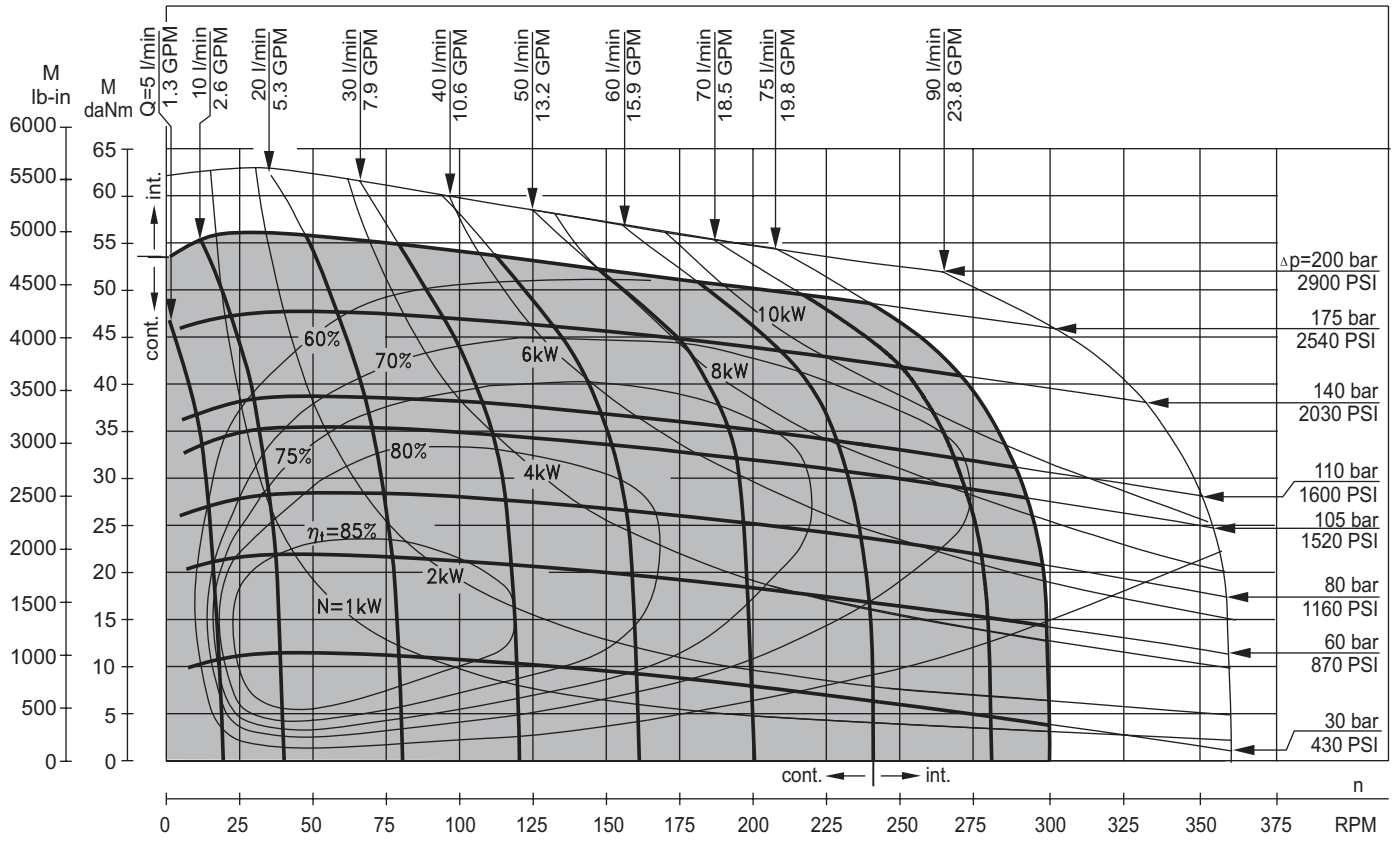
RW 200



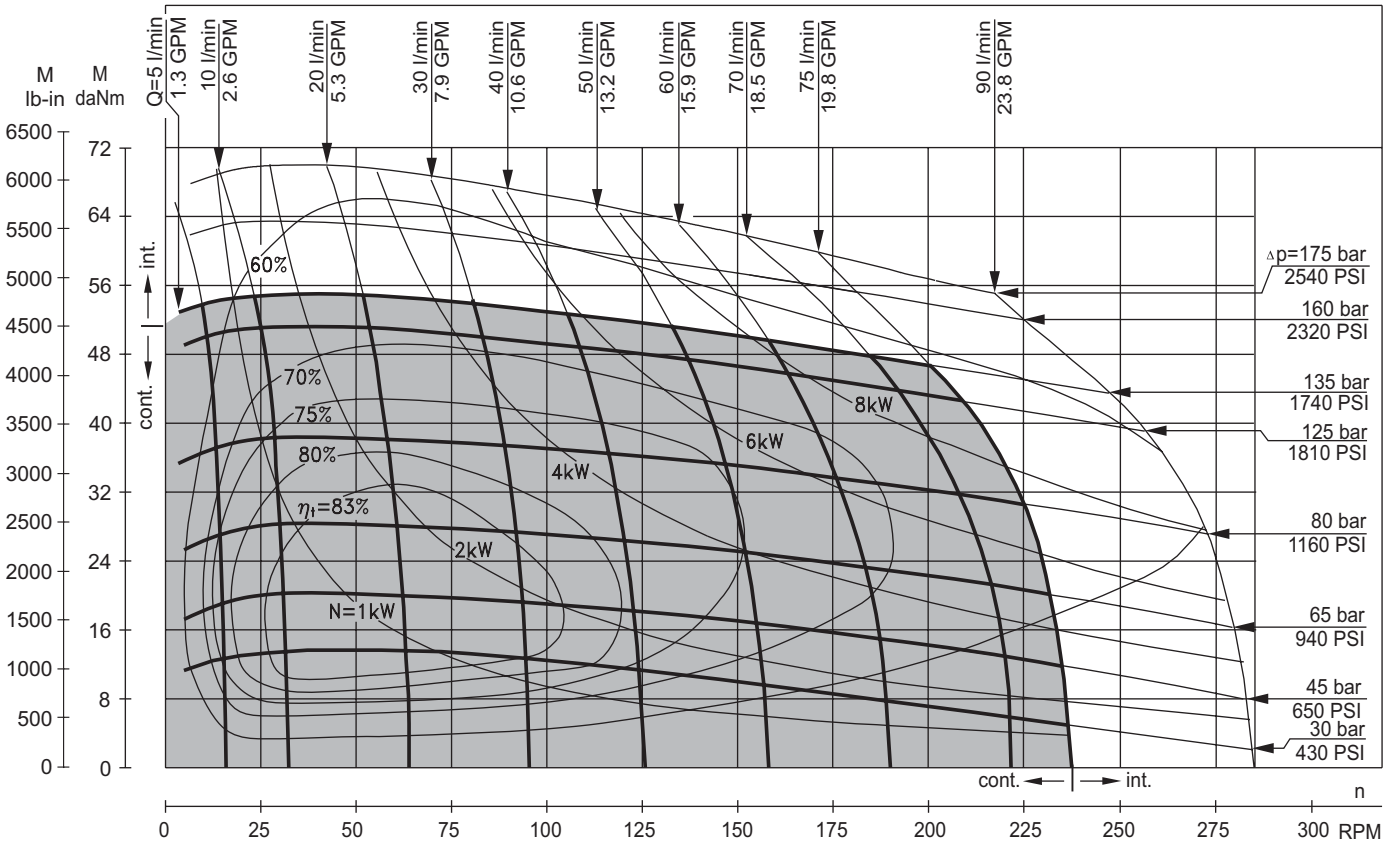
The function diagrams data is for average performance of randomly selected motors at back pressure 5÷10 bar [72.5÷145 PSI] and oil with viscosity of 32 mm²/s [150 SUS] at 50°C [122°F].

FUNCTION DIAGRAMS

RW 250



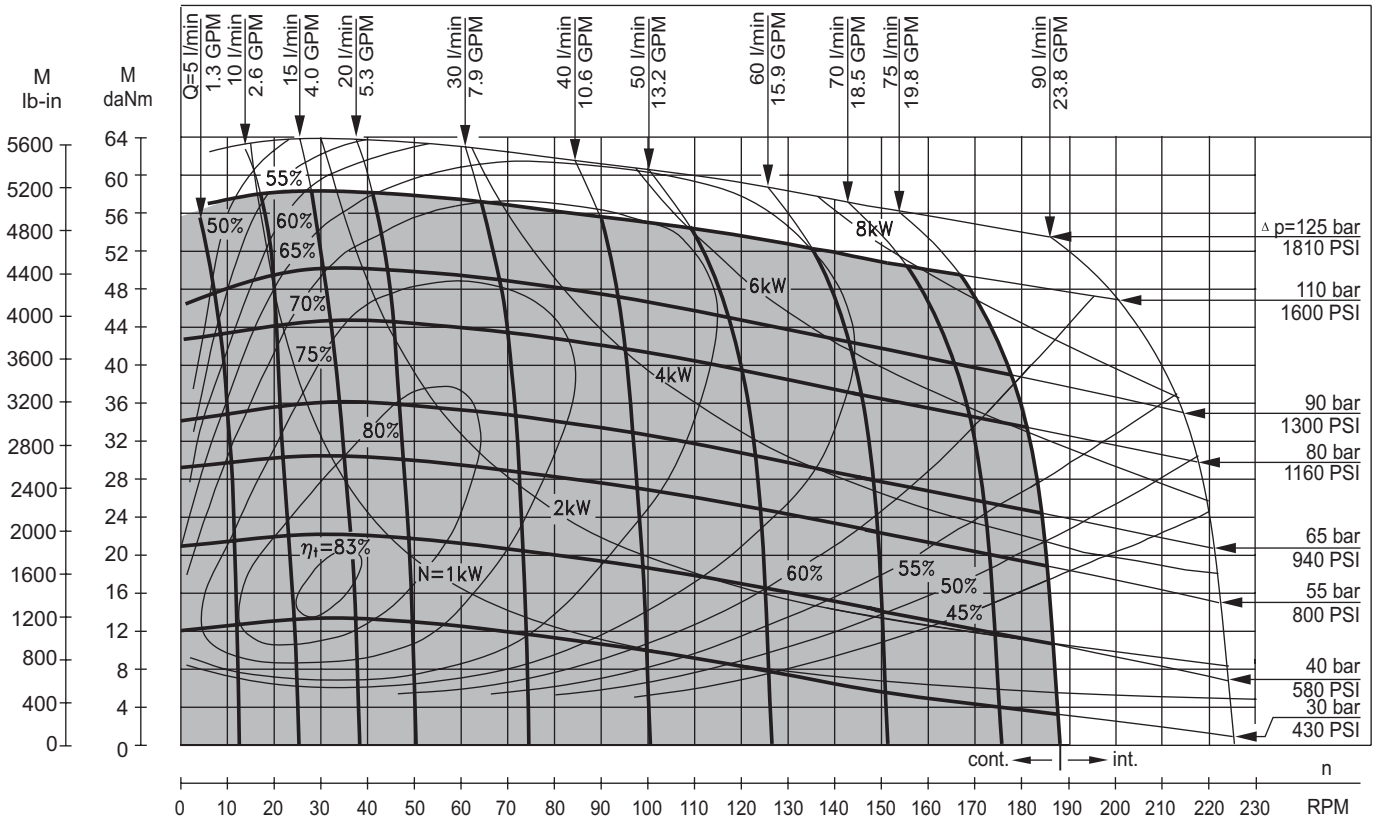
RW 315



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].

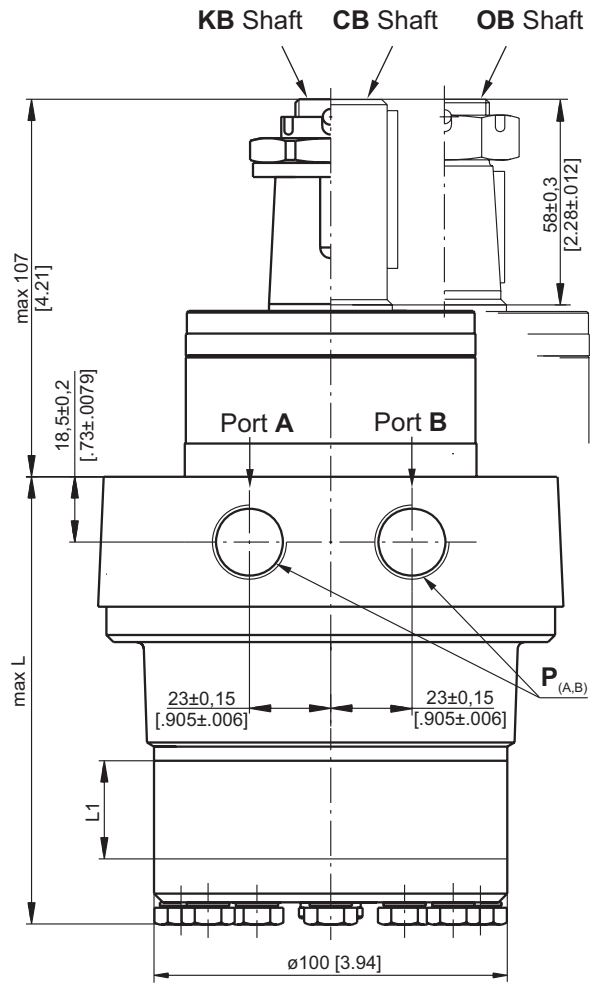
FUNCTION DIAGRAMS

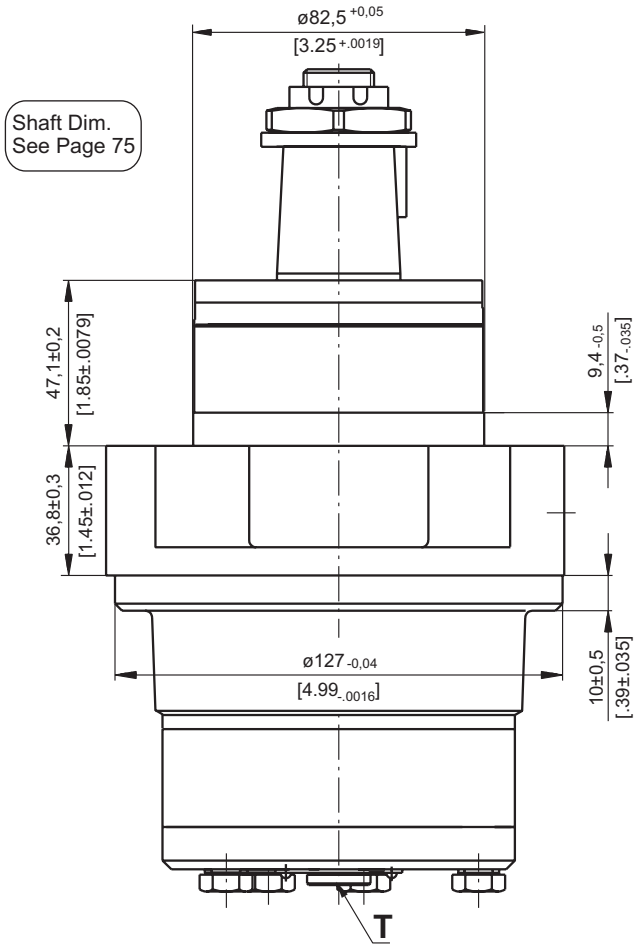
RW 400



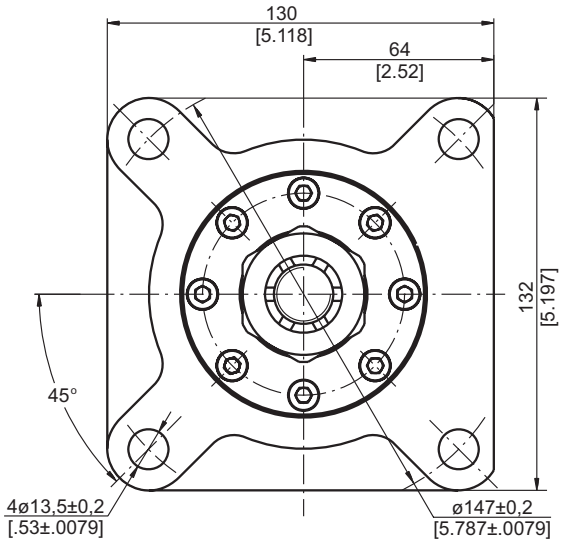
The function diagrams data is for average performance of randomly selected motors at back pressure 5÷10 bar [72.5÷145 PSI] and oil with viscosity of 32 mm²/s [150 SUS] at 50°C [122°F].

DIMENSIONS AND MOUNTING DATA





Type	L, mm [in]	L1, mm [in]
RW 50	108,0 [4.25]	9,0 [.35]
RW 80	113,0 [4.45]	14,0 [.55]
RW 100	116,5 [4.59]	17,4 [.69]
RW 125	120,5 [4.74]	21,8 [.86]
RW 160	126,5 [4.98]	27,8 [1.09]
RW 200	133,5 [5.26]	34,8 [1.37]
RW 250	142,5 [5.61]	43,5 [1.71]
RW 315	153,5 [6.04]	54,8 [2.16]
RW 400	168,5 [6.63]	69,4 [2.73]



P(A,B): 2xG1/2 or 2xM22x1,5 - 17 mm [.67 in.] depth
T : G1/4 or M14x1,5 - 12 mm [.47 in.] depth (plugged)

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

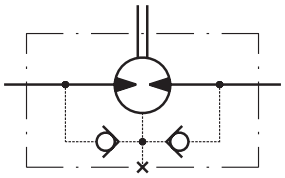
Reverse Rotation
Viewed from Shaft End
Port **A** Pressurized - **CCW**
Port **B** Pressurized - **CW**

mm [in]

MAX. PERMISSIBLE SHAFT SEAL PRESSURE

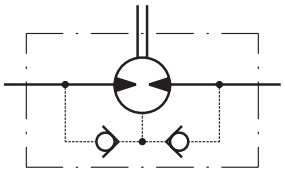
RW...; RW...UK motors with drain connection:

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



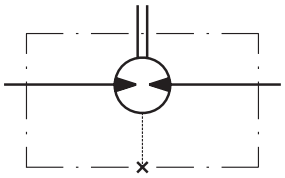
RW...1 motors without drain connection:

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

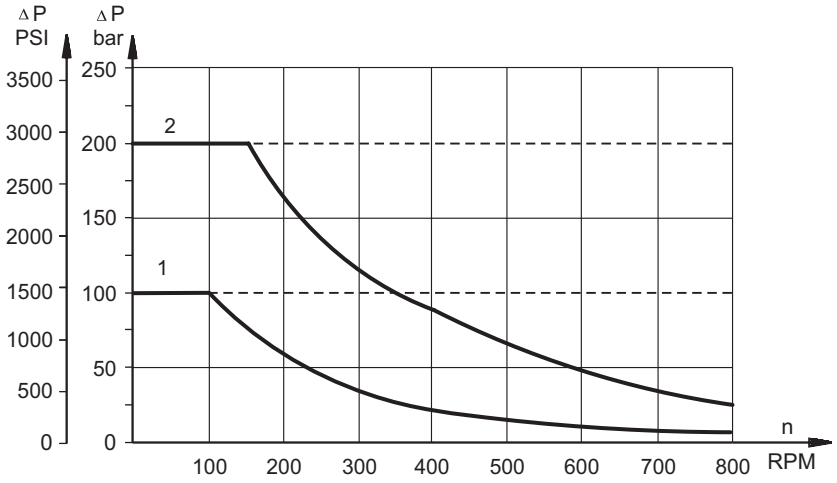


RW...U motors with high pressure seal and drain connection:

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

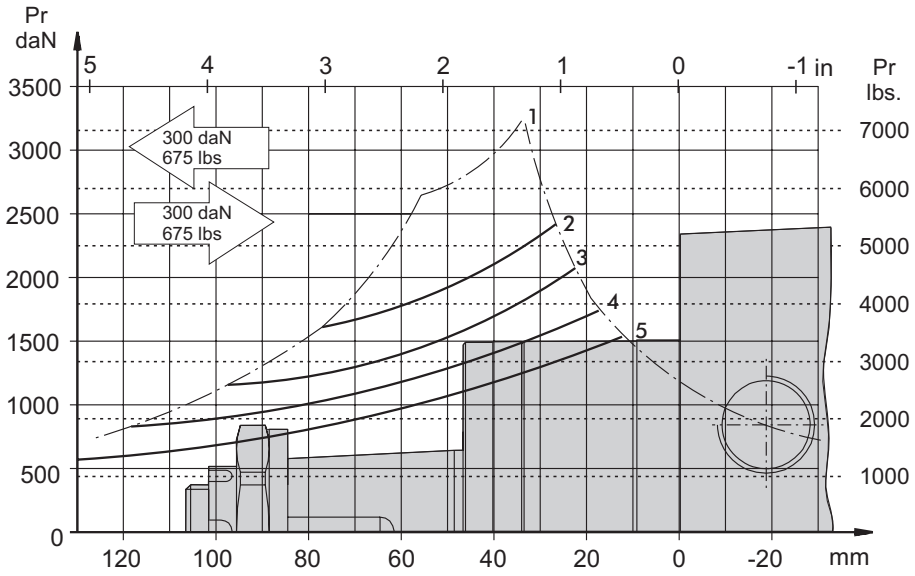
2: Drawing for High Pressure Seal (**"U"** Seal)

——— - continuous operations

- - - - - - intermittent operations

PERMISSIBLE SHAFT LOADS

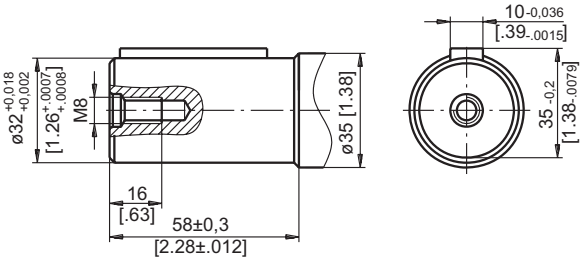
The curve applies to a B10 bearing life of 2000 hours.



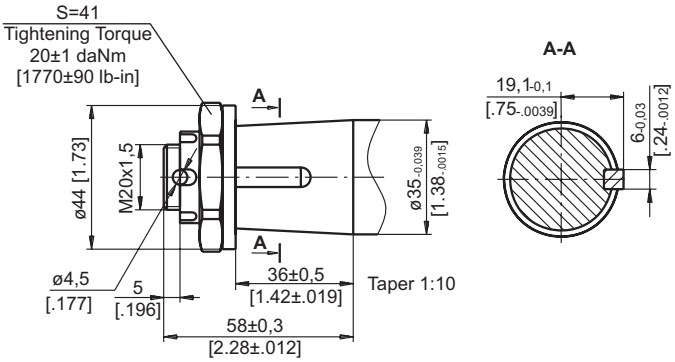
1. Permissible radial shaft load
2. Drawing by n= 50 rpm
3. Drawing by n=100 rpm
4. Drawing by n=200 rpm
5. Drawing by n=400 rpm

SHAFT EXTENSIONS

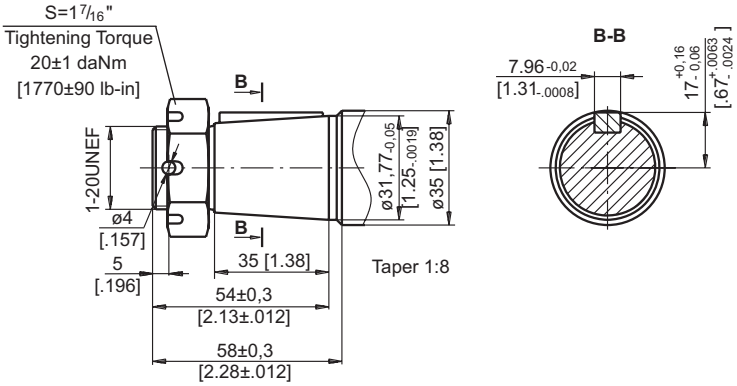
CB - ø32 straight, Parallel key A10x8x45 DIN 6885
Max. Torque 77 daNm [6815 lb-in]



KB - tapered 1:10, Parallel key B6x6x20 DIN 6885
Max. Torque 77 daNm [6815 lb-in]



OB - tapered 1:8 SAEJ 501, Parallel key 5/16"x5/16"x1¼" BS46
Max. Torque 77 daNm [6815 lb-in]



mm [in]

ORDER CODE

	1	2	3	4	5	6	7
R W							

Pos.1 - Displacement code

50	- 51,5 cm³/rev [3.14 in³/rev]
80	- 80,3 cm³/rev [4.90 in³/rev]
100	- 99,8 cm³/rev [6.09 in³/rev]
125	- 125,7 cm³/rev [7.67 in³/rev]
160	- 159,6 cm³/rev [9.74 in³/rev]
200	- 199,8 cm³/rev [12.19 in³/rev]
250	- 250,1 cm³/rev [15.26 in³/rev]
315	- 315,7 cm³/rev [19.26 in³/rev]
400	- 397,0 cm³/rev [24.40 in³/rev]

Pos.2 - Shaft Extensions*

CB	- ø32 straight, Parallel key A10x8x45 DIN6885
KB	- ø35 tapered 1:10, Parallel key B6x6x20 DIN6888
HB	- ø1 1/4" tapered1:8, Parallel key 5/16"x5/16"x1¼" BS46

Pos.3 - Shaft Seal Pressure

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

Pos.4 - Drain Port

omit	- with drain port
1	- without drain port

Pos.5 - Ports

omit	- BSPP (ISO 228)
M	- Metric (ISO 262)

Pos.6 - Special Features (see page 98)

Pos.7 - Design Series

omit - Factory specified

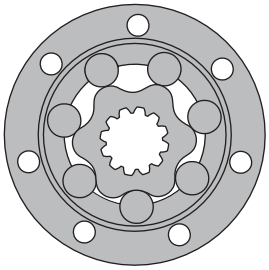
NOTE:
* The permissible output torque for shafts must not be exceeded!

The hydraulic motors are mangano-phosphatized as standard.

HYDRAULIC MOTORS HW

APPLICATION

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



CONTENTS

OPTIONS

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

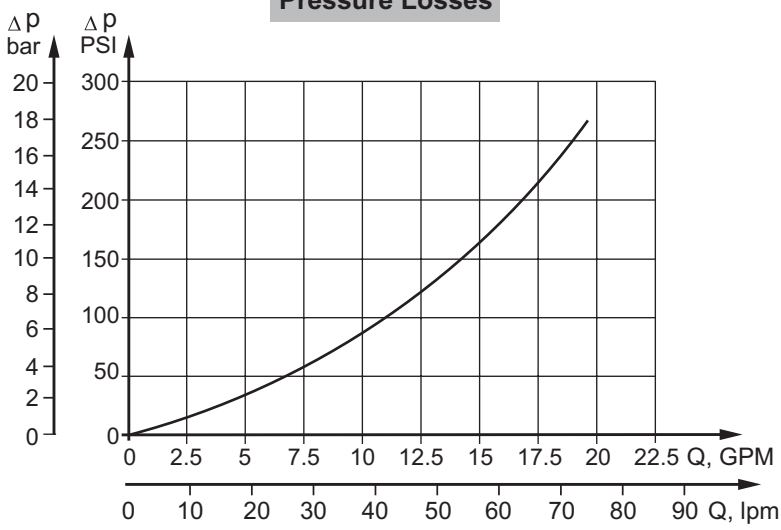
GENERAL

Max. Displacement, cm^3/rev [in^3/rev]	550 [33.55]
Max. Speed, [RPM]	497
Max. Torque, daNm [in-lb]	cont.: 96 [8500] int.: 105 [9293]
Max. Output, kW [HP]	23,1 [31]
Max. Pressure Drop, bar [PSI]	cont.: 205 [3000] int.: 225 [3260]
Max. Oil Flow, lpm [GPM]	115 [30.4]
Min. Speed, [RPM]	10
Pressure fluid	Mineral based- HLP(DIN 51524) or HM(ISO 6743/4)
Temperature range, ^oC [^oF]	-40÷140 [-40÷284]
Optimal Viscosity range, mm^2/s [SUS]	20÷75 [98÷347]
Filtration	ISO code 20/16 (Min. recommended fluid filtration of 25 micron)

Oil flow in drain line

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

Pressure Losses



SPECIFICATION DATA

Type		HW 125	HW 160	HW 200	HW 235	HW 250	HW 300	HW 315
Displacement, cm^3/rev [in^3/rev]		126 [7.69]	157,8 [9.64]	201,3 [12.28]	235,3 [14.33]	252 [15.37]	300 [18.3]	314,9 [19.21]
Max. Speed,	cont.	357	380	373	319	298	250	238
[RPM]	int.*	476	475	497	425	397	333	318
Max. Torque	cont.	35 [3098]	44 [3894]	55 [4868]	64,5 [5710]	69 [6107]	81 [7170]	85 [7523]
daNm [in-lb]	int.*	38,5 [3408]	48 [4248]	60 [5310]	70 [6196]	75 [6638]	89 [7877]	93 [8230]
Max. Output,	cont.	16,2 [21.7]	17,6 [23.6]	18,6 [24.9]	18,2 [24.4]	16,8 [22.5]	16,5 [22]	16,4 [21.9]
kW [HP]	int.*	19,8 [26.6]	21,6 [29]	23,1 [31]	22,6 [30.3]	20,8 [27.9]	20,8 [27.9]	20,8 [27.9]
Max. Pressure	cont.	205 [2970]	205 [2970]	205 [2970]	205 [2970]	205 [2970]	205 [2970]	205 [2970]
Drop, bar [PSI]	int.*	225 [3260]	225 [3260]	225 [3260]	225 [3260]	225 [3260]	225 [3260]	225 [3260]
Max. Oil Flow	cont.	45 [12]	60 [16]	75 [20]	75 [20]	75 [20]	75 [20]	75 [20]
lpm [GPM]	int.*	60 [16]	75 [20]	100 [26.4]	100 [26.4]	100 [26.4]	100 [26.4]	100 [26.4]
Max. Inlet Pressure,	cont.	210 [3050]	210 [3050]	210 [3050]	210 [3050]	210 [3050]	210 [3050]	210 [3050]
bar [PSI]	int.*	250 [3625]	250 [3625]	250 [3625]	250 [3625]	250 [3625]	250 [3625]	250 [3625]
Max. Starting Pressure with Unloaded Shaft, bar [PSI]		10 [145]	10 [145]	10 [145]	10 [145]	10 [145]	10 [145]	10 [145]
Min. Starting Torque	at max. press. drop cont.	28,7 [2540]	36 [3186]	45,1 [3991]	52,8 [4673]	56,5 [5000]	66,4 [5877]	69,7 [6169]
daNm [in-lb]	at max. press. drop int.*	31,5 [2788]	39,3 [3478]	49,2 [4355]	57,4 [5080]	61,5 [5443]	72,9 [6452]	76,2 [6744]
Min. Speed, [RPM]**		10	10	10	10	10	10	10
Weight, avg. kg [lb]	HW	14,3 [31.5]	14,6 [32.2]	15,1 [33.3]	15,5 [34.2]	15,7 [34.6]	16,1 [35.5]	16,3 [35.9]
	HWF	12,8 [28.2]	13,1 [28.9]	13,6 [30]	14,0 [30.9]	14,2 [31.3]	14,6 [32.2]	14,8 [32.6]
	HWS	14 [30.9]	14,3 [31.5]	14,8 [32.6]	15,2 [33.5]	15,4 [34]	15,8 [34.8]	16 [35.3]

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

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

1. Intermittent speed and intermittent pressure drop must not occur simultaneously.
2. Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
3. Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP(DIN51524) or HM (ISO 6743/4). If using synthetic fluids consult the factory for alternative seal materials.
4. Recommended minimum oil viscosity 13 mm^2/s [70 SUS] at 50ºC [122ºF].
5. Recommended maximum system operating temperature is 82ºC [180ºF].
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, cm^3/rev [in^3/rev]		347,8 [21.21]	369,2 [22.51]	396,8 [24.2]	470,6 [28.71]	502,4 [30.65]	535 [32.7]	550 [33.55]
Max. Speed,	cont.	216	203	189	159	149	140	136
[RPM]	int.*	288	271	252	244	229	215	209
Max. Torque	cont.	94 [8320]	96 [8497]	96 [8497]	92 [8143]	91 [8054]	90 [7966]	89 [7877]
daNm [in-lb]	int.*	102 [9028]	105 [9293]	98 [8674]	101 [8939]	101 [8939]	104 [9205]	105 [9293]
Max. Output,	cont.	16,5 [22]	13,2 [17.7]	12,5 [16.8]	10,6 [14.2]	10,8 [14.5]	9,4 [12.6]	9 [12]
kW [HP]	int.*	20,8 [27.9]	19,2 [25.7]	18,5 [24.8]	17,4 [23.3]	17,8 [23.9]	16,4 [22]	15,8 [21.2]
Max. Pressure	cont.	205 [2970]	205 [2970]	185 [2680]	150 [2180]	140 [2030]	130 [1885]	125 [18153]
Drop, bar [PSI]	int.*	225 [3260]	225 [3260]	190 [2760]	165 [2390]	155 [2250]	150 [2180]	145 [2105]
Max. Oil Flow	cont.	75 [20]	75 [20]	75 [20]	75 [20]	75 [20]	75 [20]	75 [20]
lpm [GPM]	int.*	100 [26.4]	100 [26.4]	100 [26.4]	115 [30.4]	115 [30.4]	115 [30.4]	115 [30.4]
Max. Inlet Pressure,	cont.	210 [3050]	210 [3050]	210 [3050]	210 [3050]	210 [3050]	210 [3050]	210 [3050]
bar [PSI]	int.*	250 [3625]	250 [3625]	250 [3625]	250 [3625]	250 [3625]	250 [3625]	250 [3625]
Max. Starting Pressure with Unloaded Shaft, bar [PSI]		10 [145]	10 [145]	10 [145]	10 [145]	10 [145]	10 [145]	10 [145]
Min. Starting Torque	at max. press. drop cont.	77 [6815]	79,5 [7036]	78,7 [6966]	75,4 [6674]	74,6 [6603]	73,8 [6532]	72,9 [6452]
daNm [in-lb]	at max. press. drop int.*	83,6 [7400]	86 [7612]	80,3 [7107]	82,8 [73.28]	82,8 [7328]	85,2 [7540]	84,4 [7470]
Min. Speed, [RPM]**		8	8	8	8	8	5	5
Weight, avg. kg [lb]	HW	16,7 [36.8]	16,9 [37.3]	17,3 [38.1]	18,1 [39.9]	18,4 [40.6]	18,8 [41.5]	18.9 [41.7]
	HWF	15,2 [33.5]	15,4 [34]	15,8 [34.8]	16,6 [36.6]	16,9 [37.3]	17,3 [38.1]	17,4 [38.3]
	HWS	16,4 [36.2]	16,6 [36.6]	17 [37.5]	17,8 [39.2]	18.1 [39.9]	18,5 [40.8]	18,6 [41]

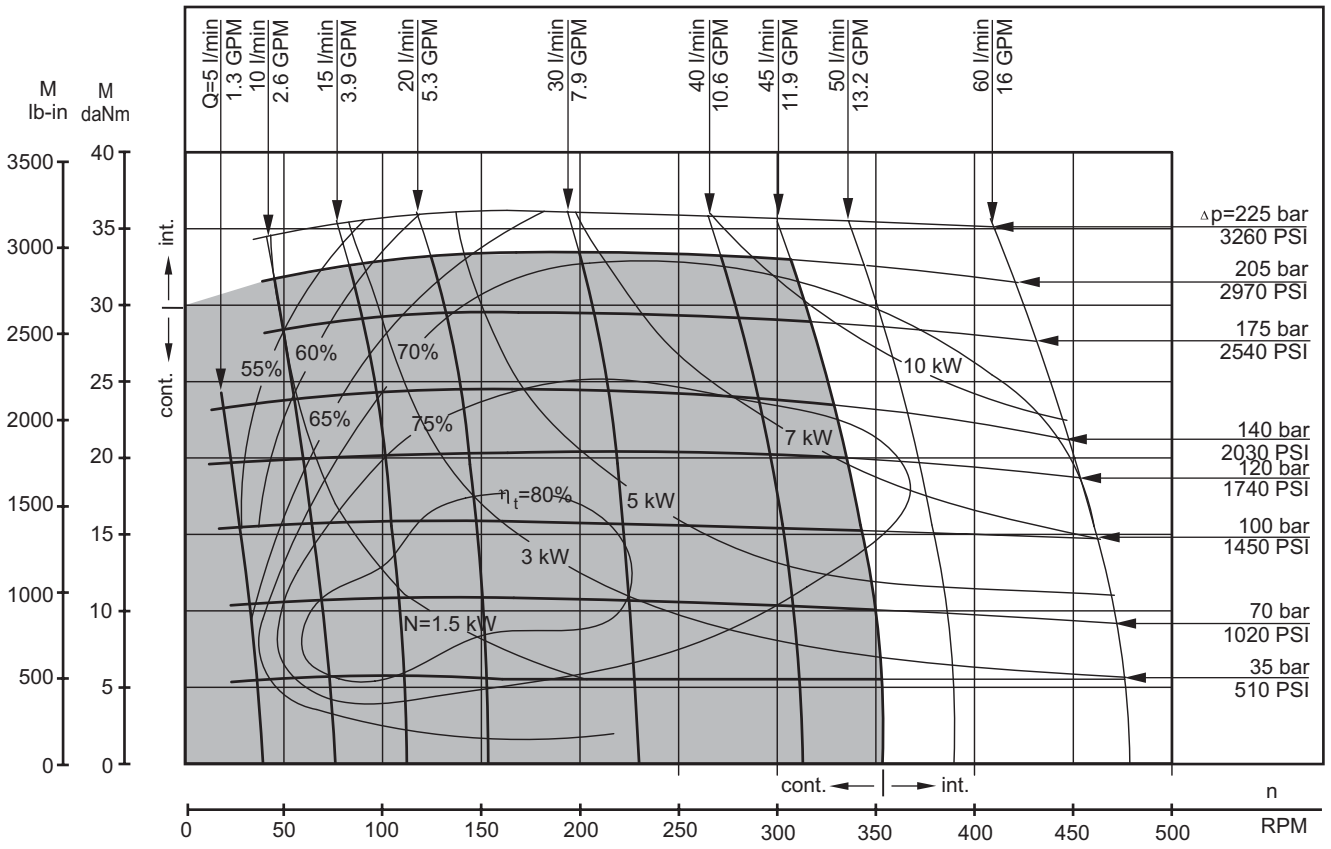
* Intermittent operation: the permissible values may occur for max. 10% of every minute.

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

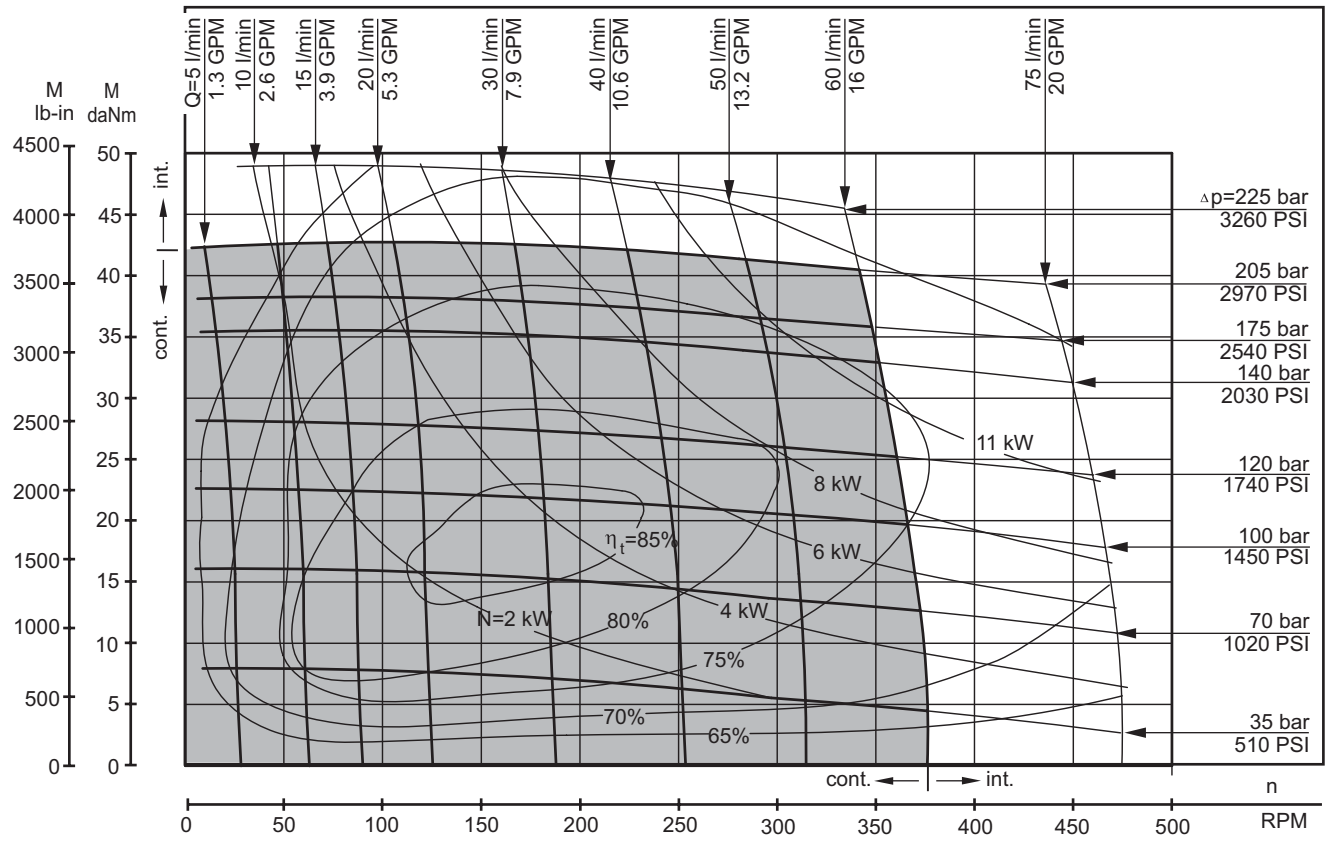
1. Intermittent speed and intermittent pressure drop must not occur simultaneously.
2. Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
3. Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP(DIN51524) or HM (ISO 6743/4).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

FUNCTION DIAGRAMS

HW 125



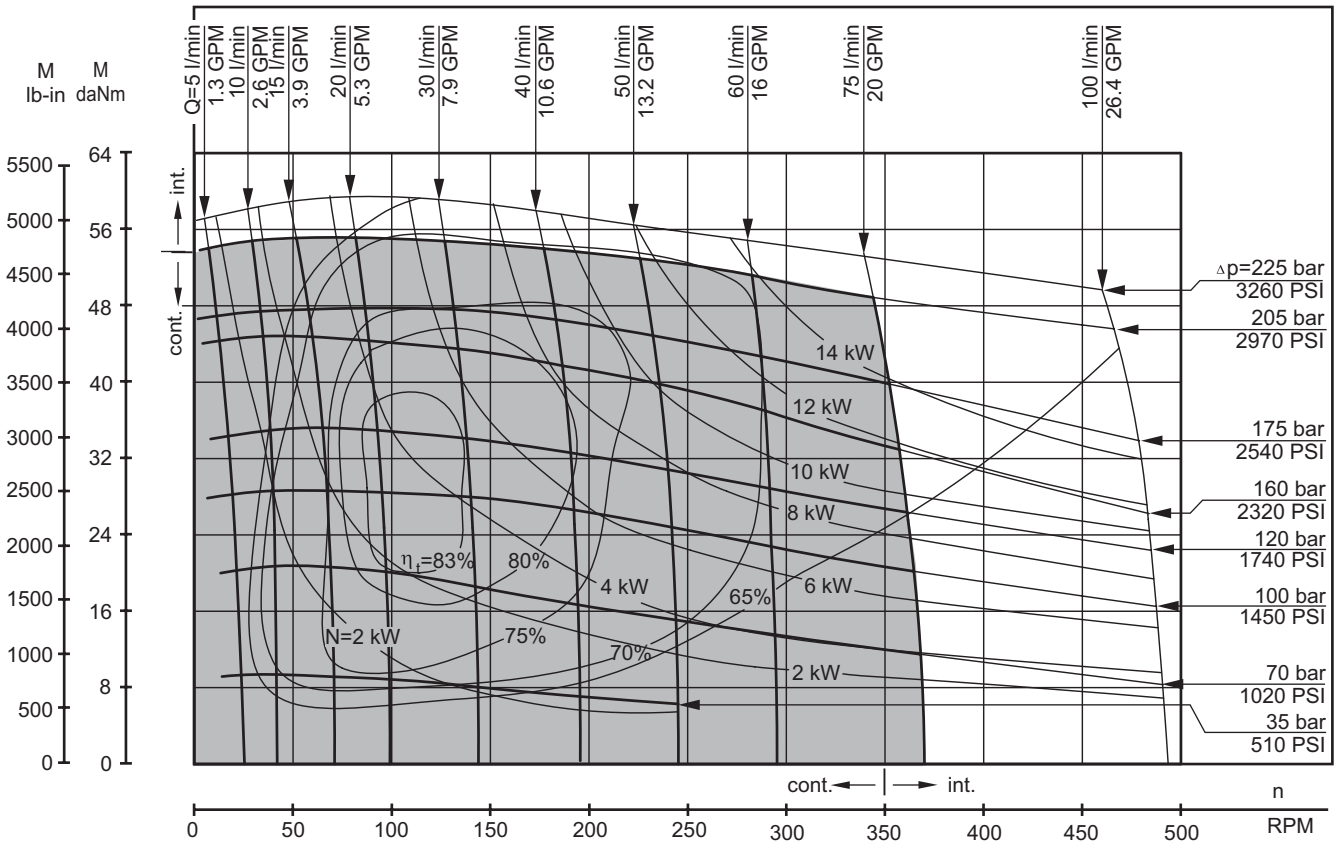
HW 160



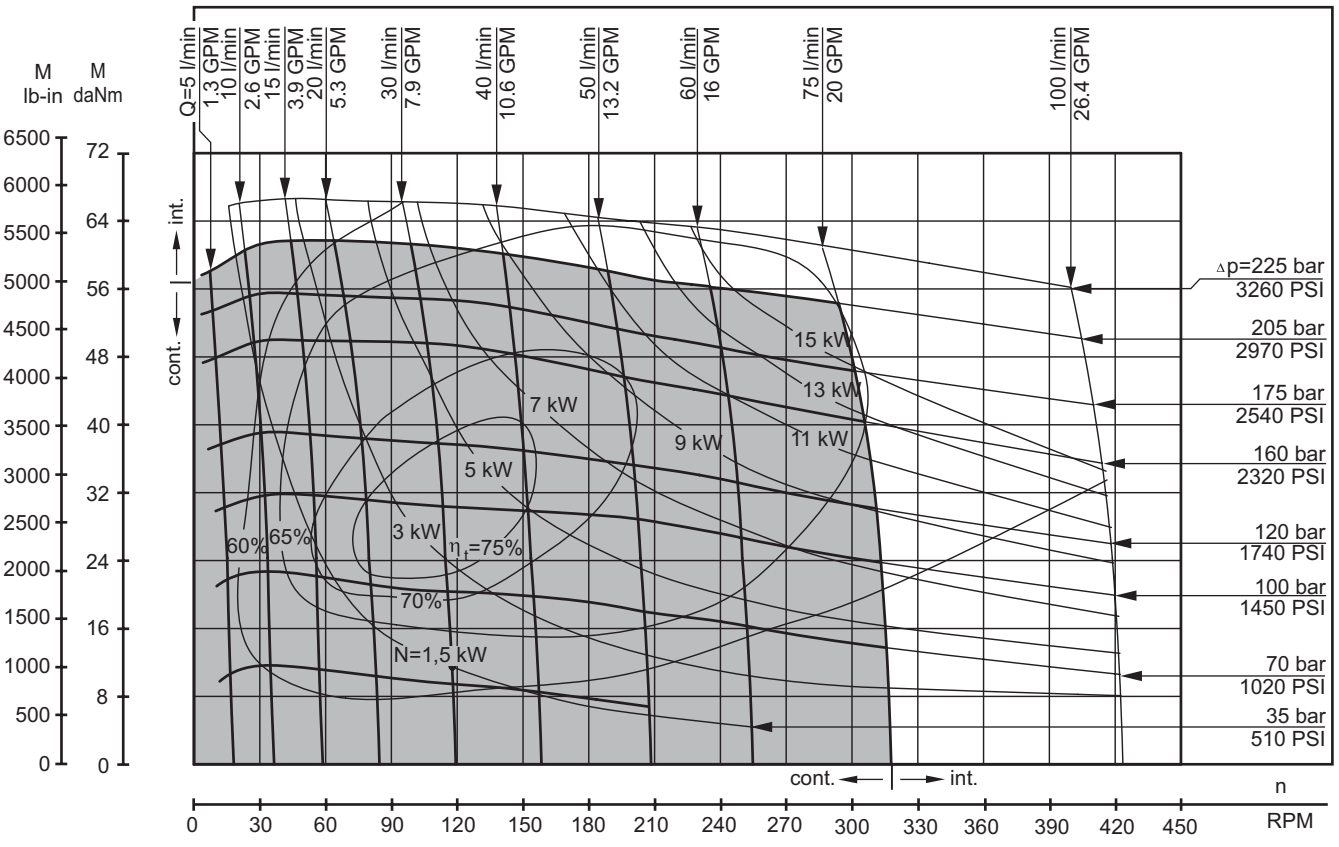
The function diagrams data is for average performance of randomly selected motors at back pressure 5÷10 bar [72.5÷145 PSI] and oil with viscosity of 32 mm²/s [150 SUS] at 50°C [122°F].

FUNCTION DIAGRAMS

HW 200



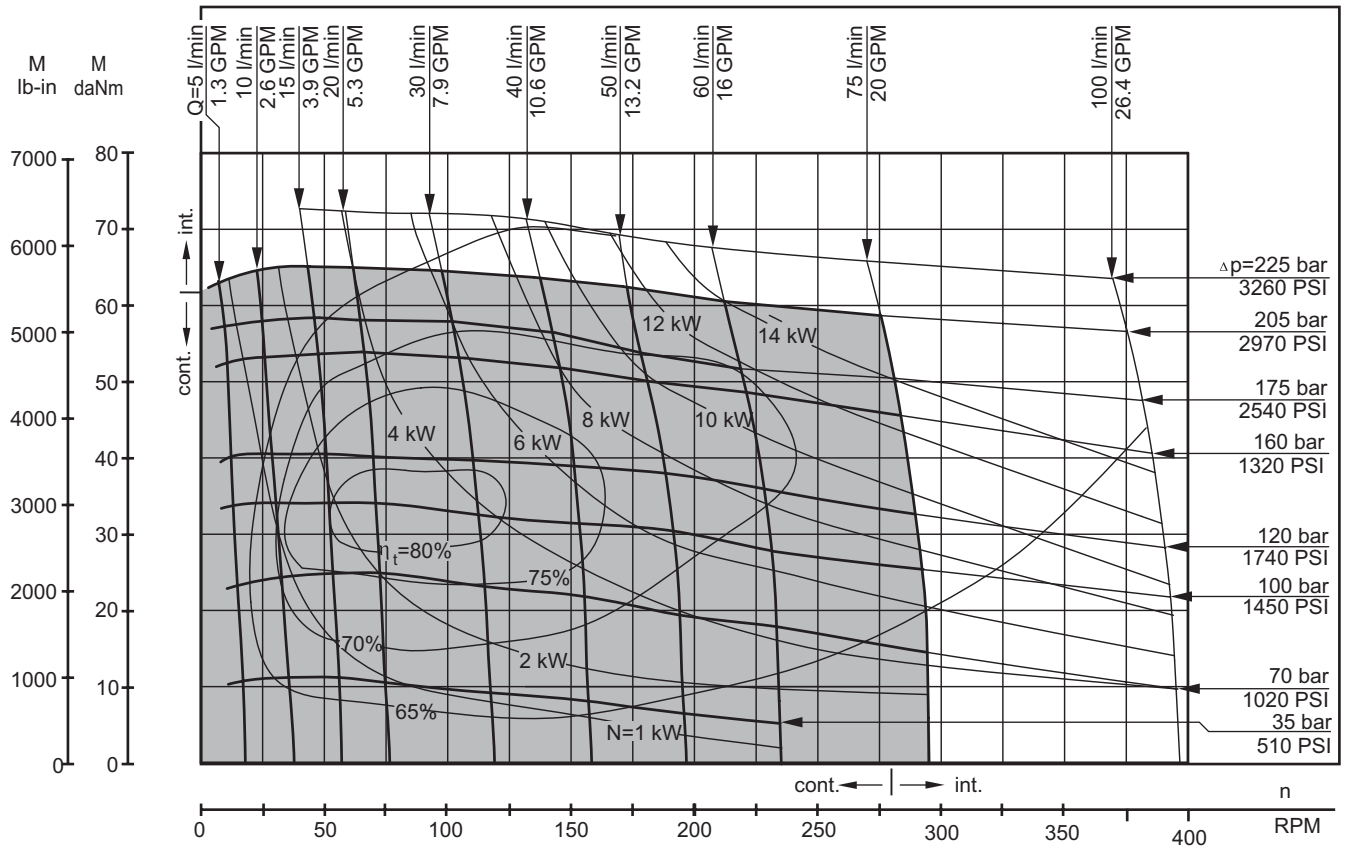
HW 235



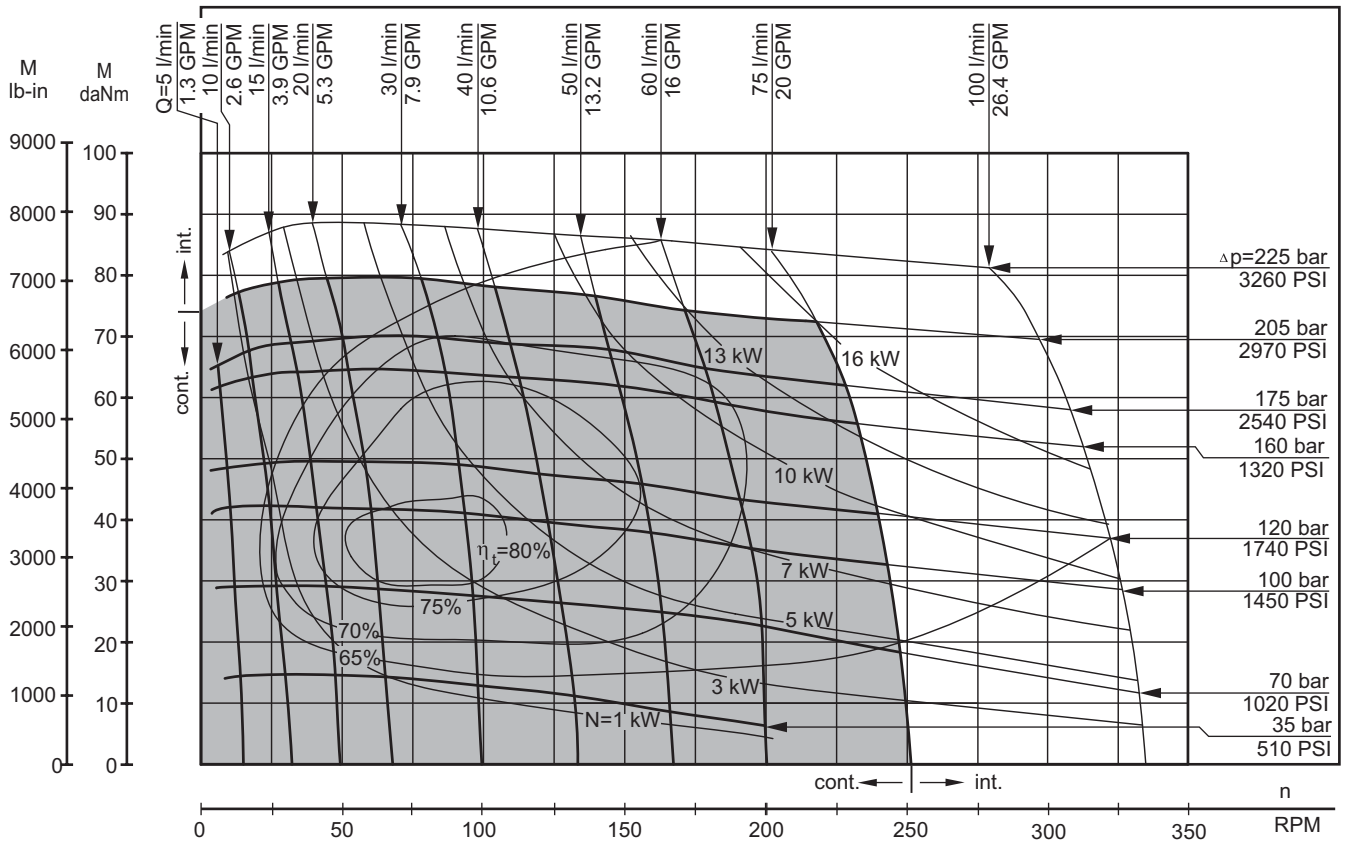
The function diagrams data is for average performance of randomly selected motors at back pressure 5÷10 bar [72.5÷145 PSI] and oil with viscosity of 32 mm²/s [150 SUS] at 50°C [122°F].

FUNCTION DIAGRAMS

HW 250



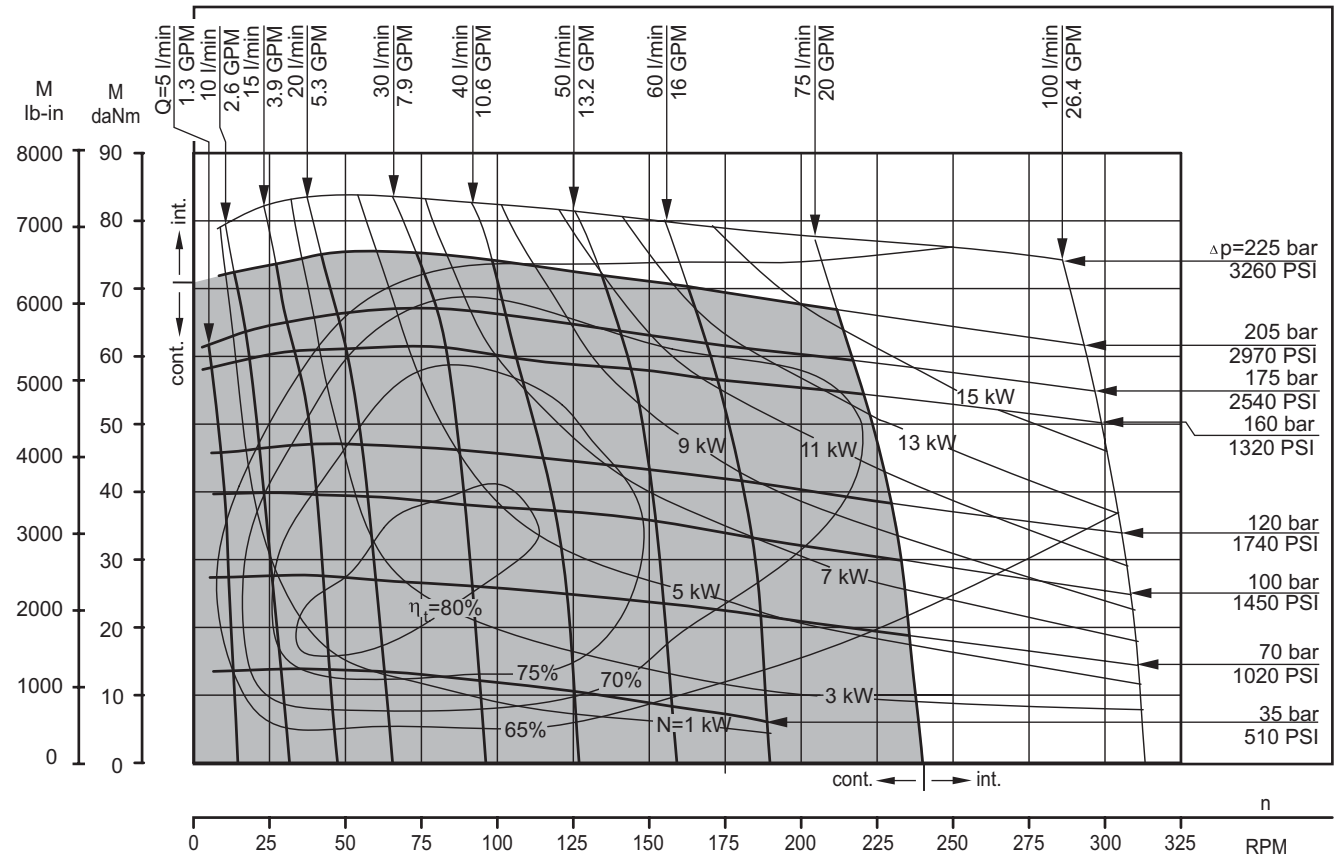
HW 300



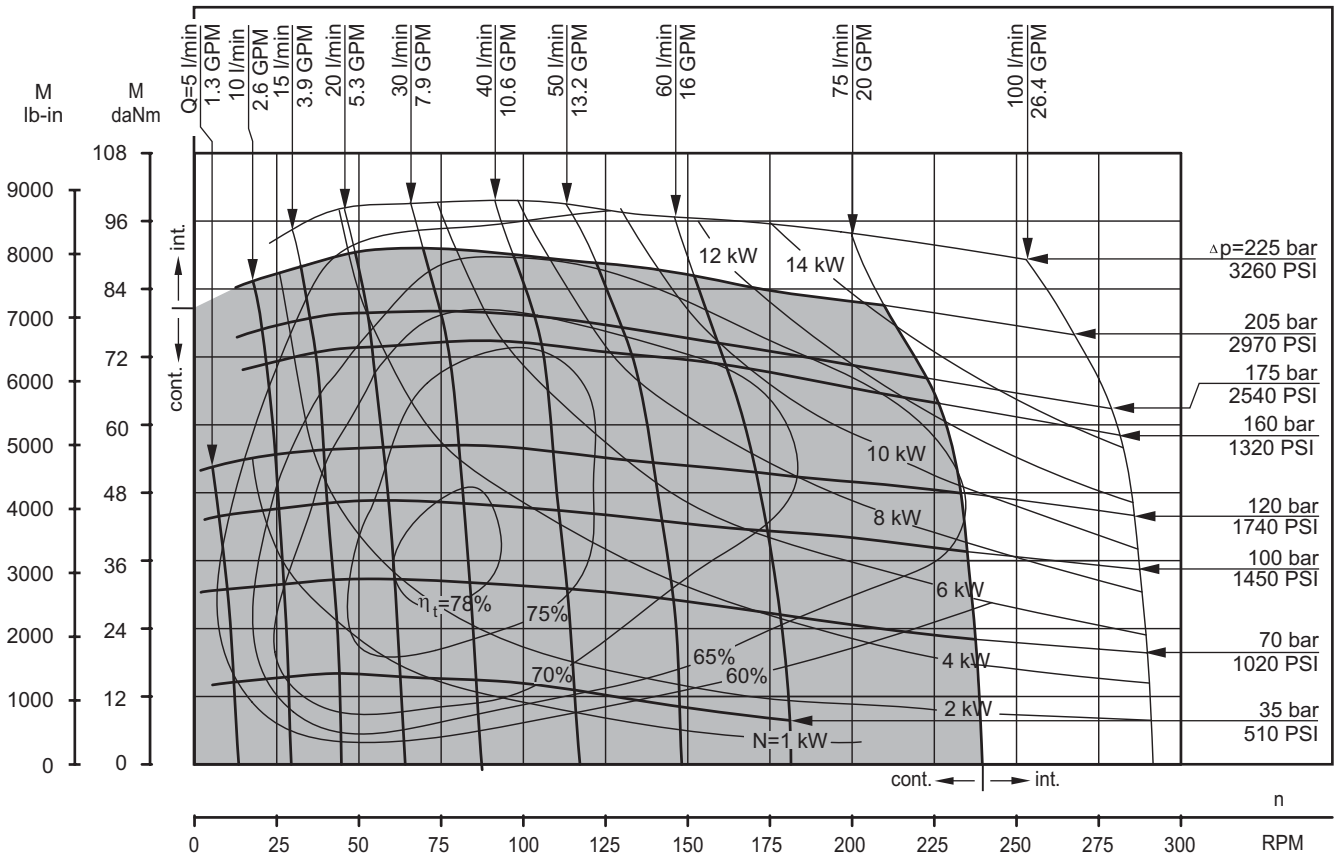
The function diagrams data is for average performance of randomly selected motors at back pressure 5÷10 bar [72.5÷145 PSI] and oil with viscosity of 32 mm²/s [150 SUS] at 50°C [122°F].

FUNCTION DIAGRAMS

HW 315



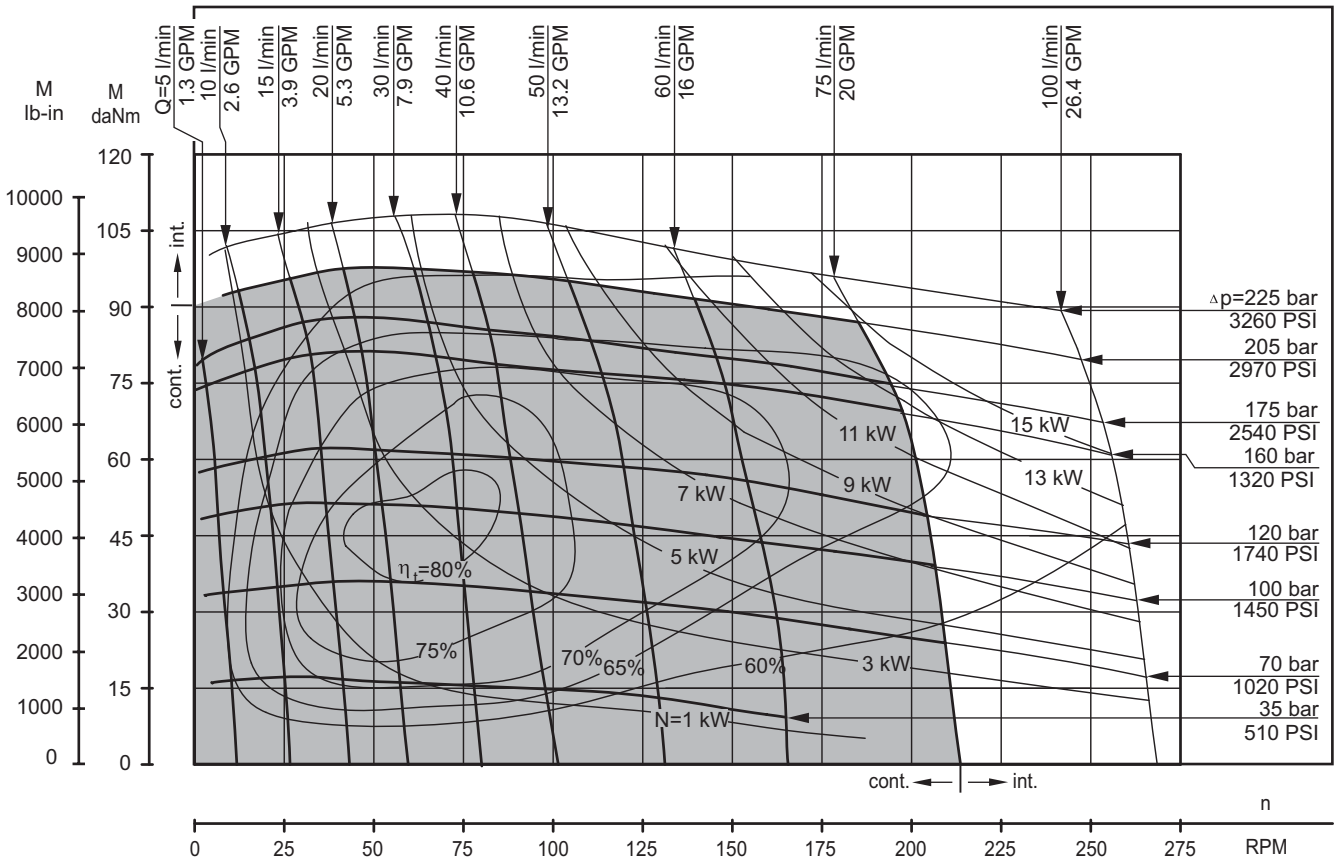
HW 350



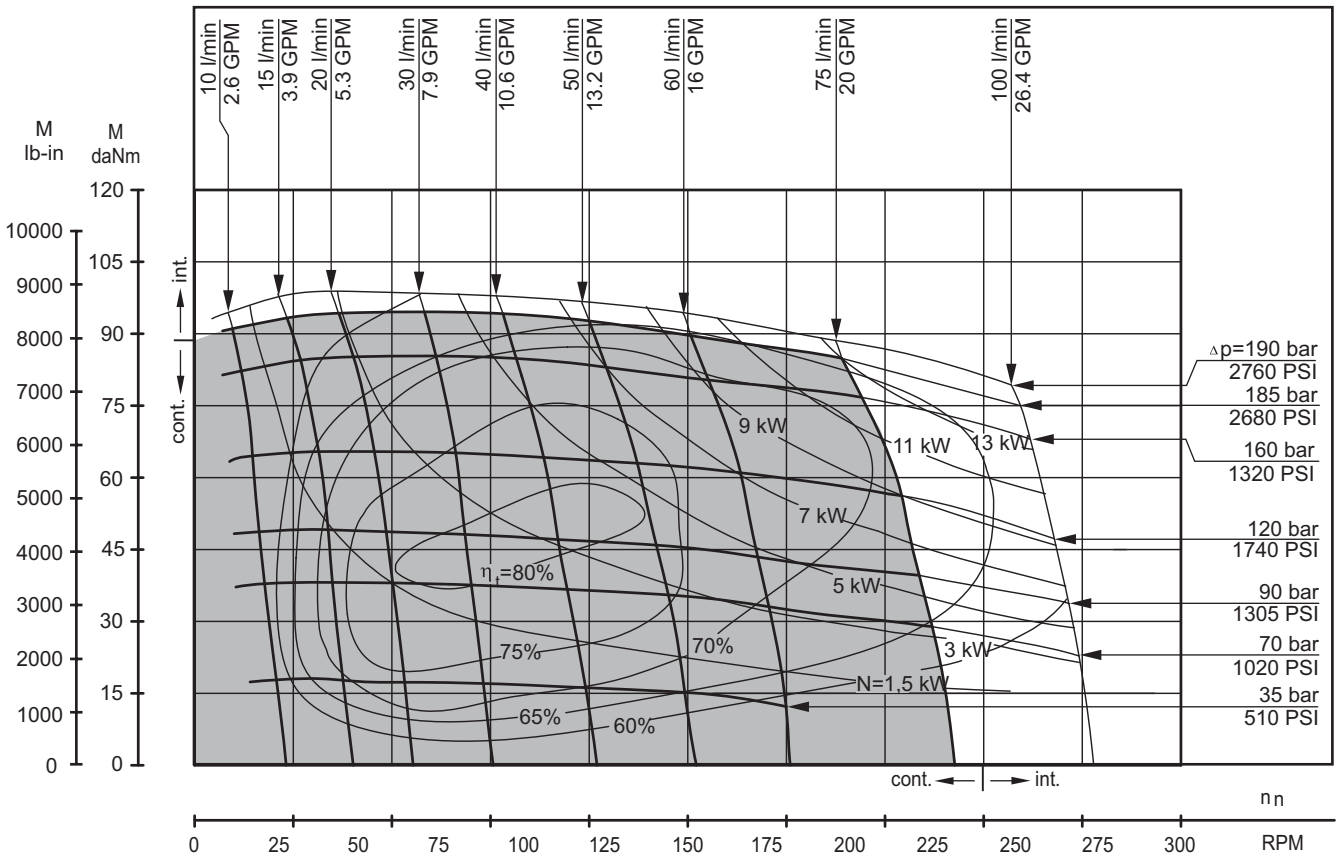
The function diagrams data is for average performance of randomly selected motors at back pressure 5÷10 bar [72.5÷145 PSI] and oil with viscosity of 32 mm²/s [150 SUS] at 50°C [122°F].

FUNCTION DIAGRAMS

HW 370

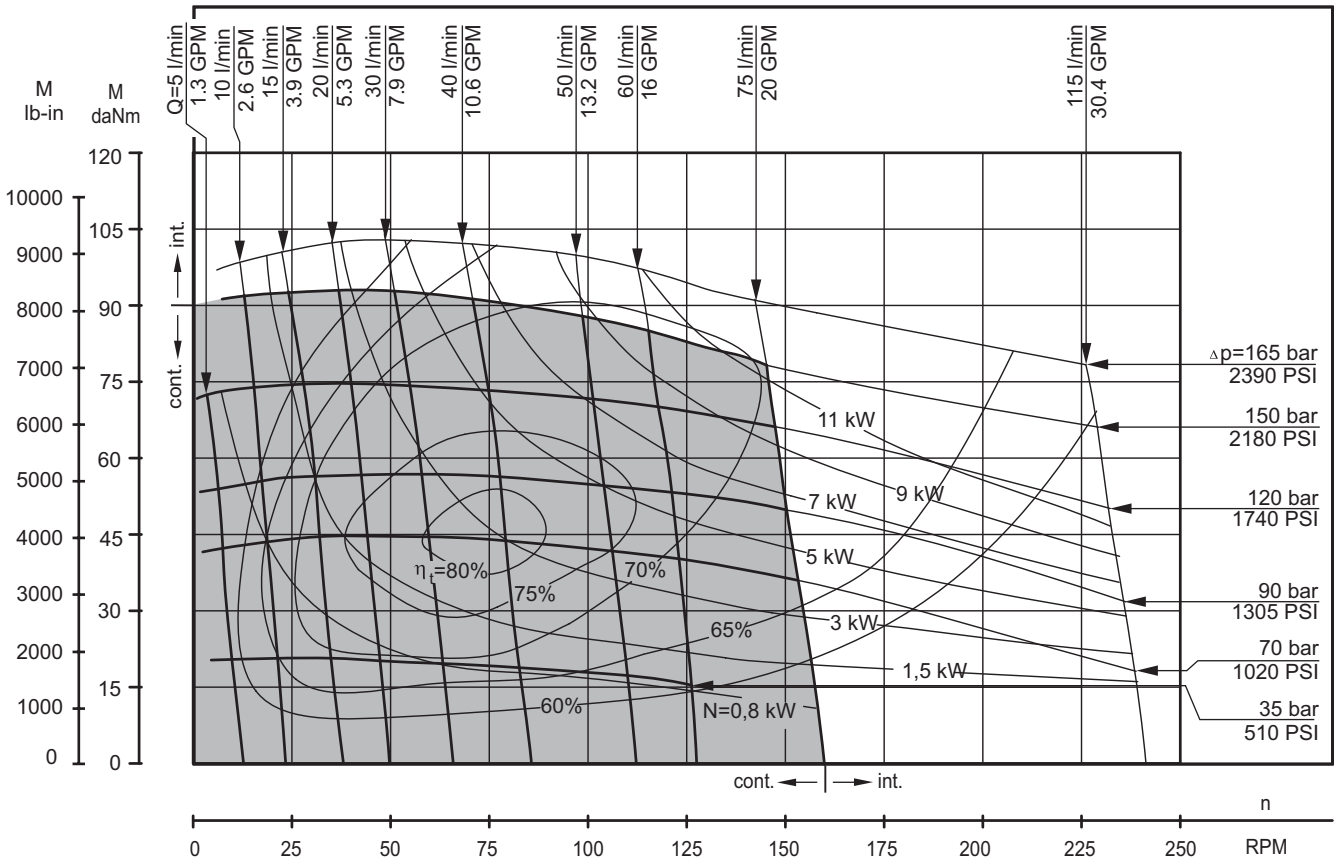


HW 400

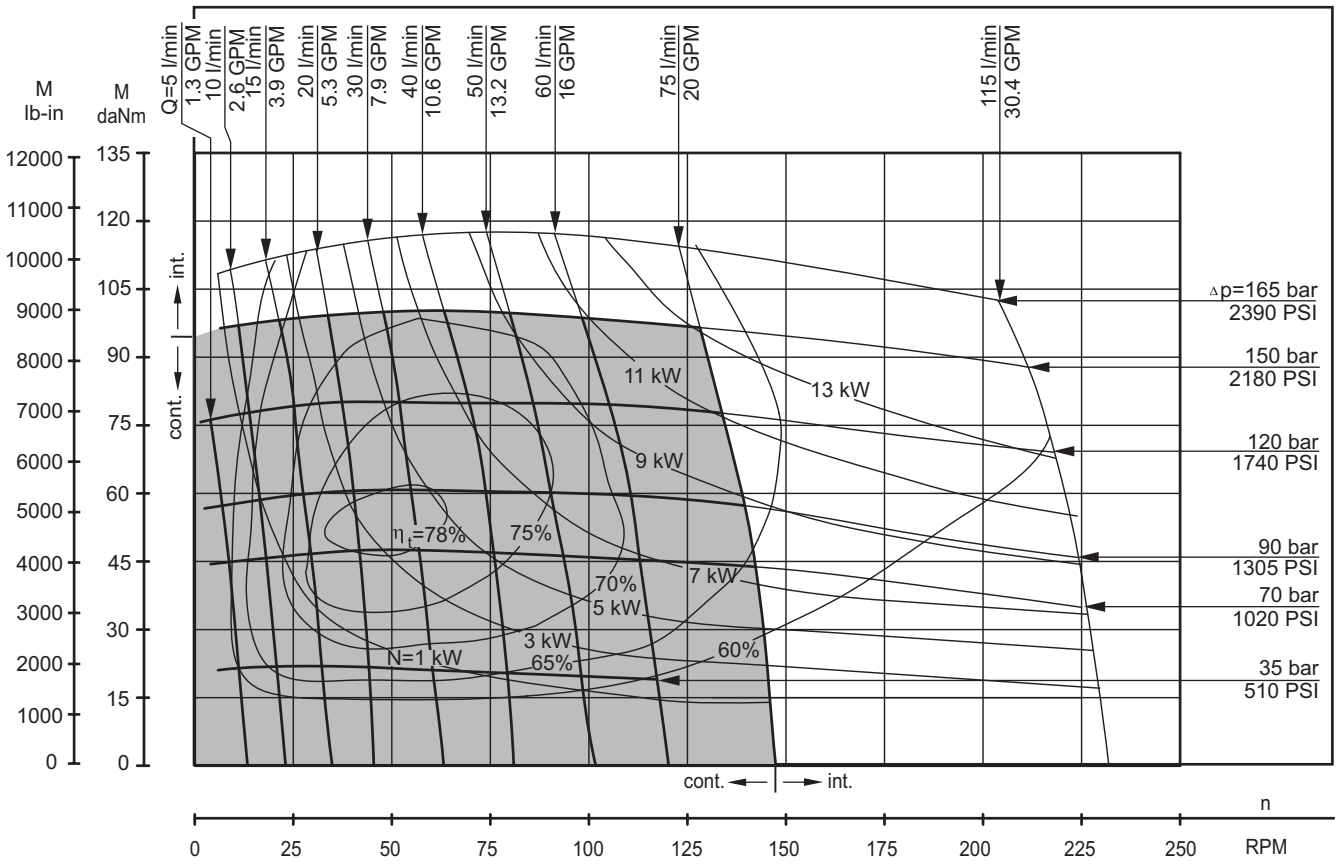


FUNCTION DIAGRAMS

HW 470



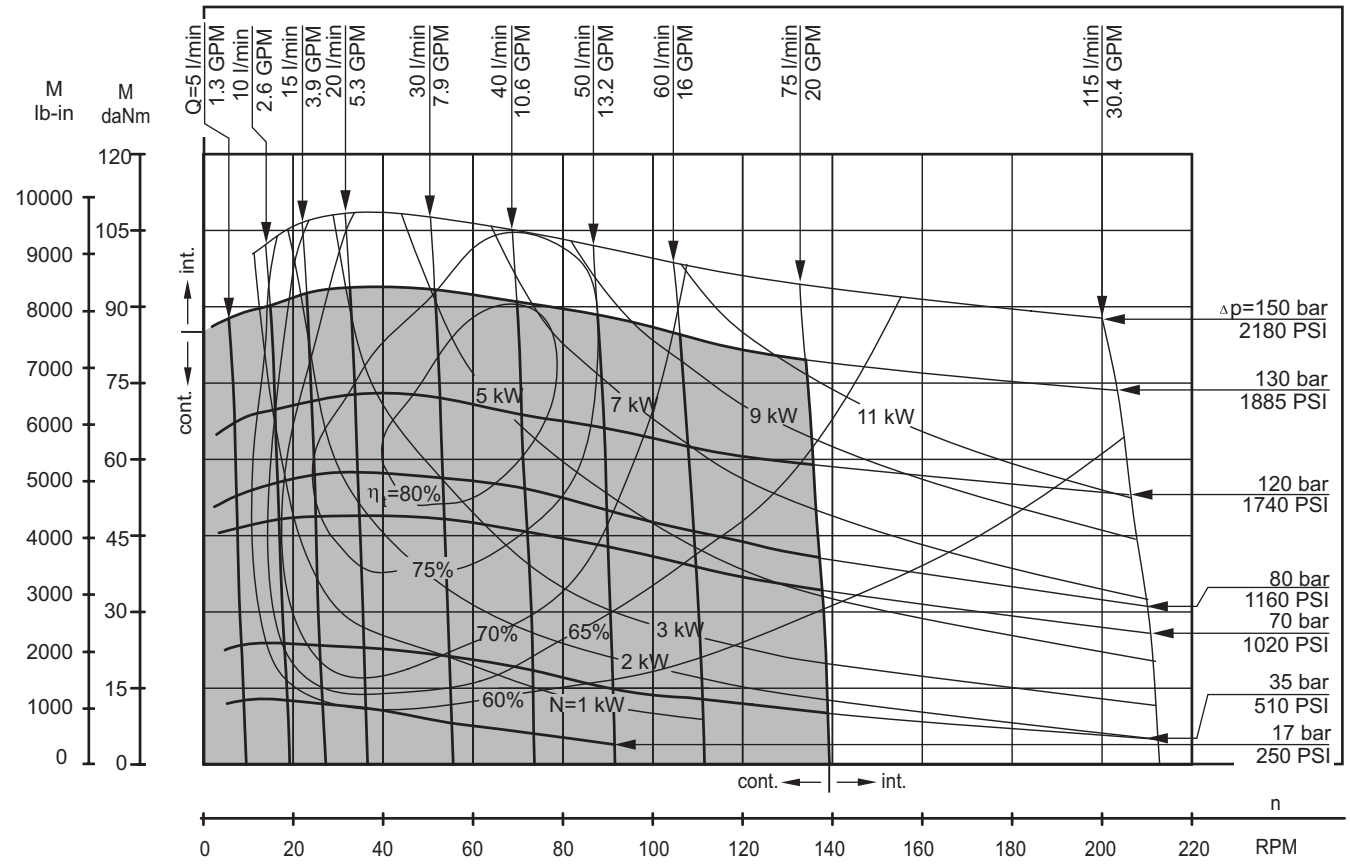
HW 500



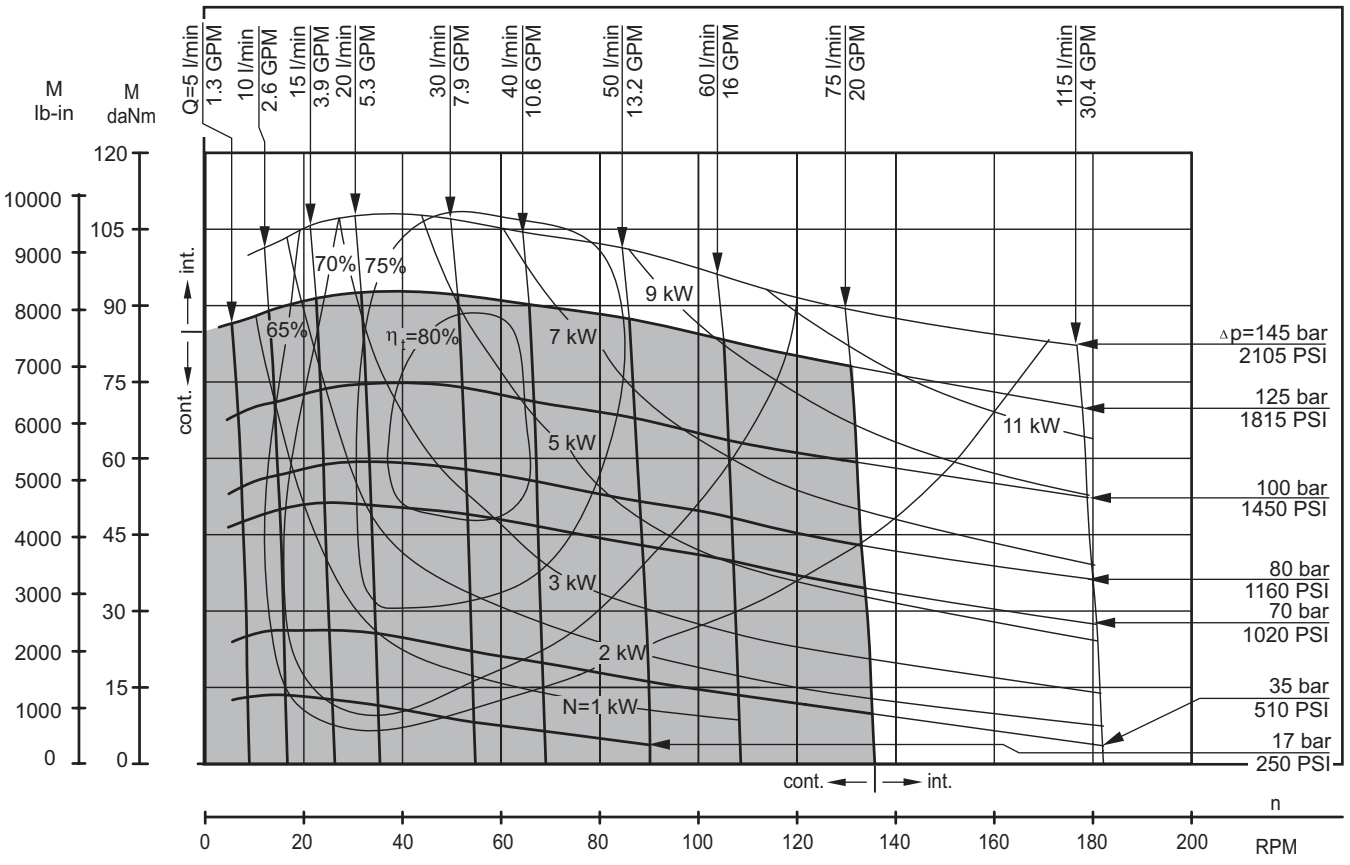
The function diagrams data is for average performance of randomly selected motors at back pressure 5÷10 bar [72.5÷145 PSI] and oil with viscosity of 32 mm²/s [150 SUS] at 50°C [122°F].

FUNCTION DIAGRAMS

HW 535



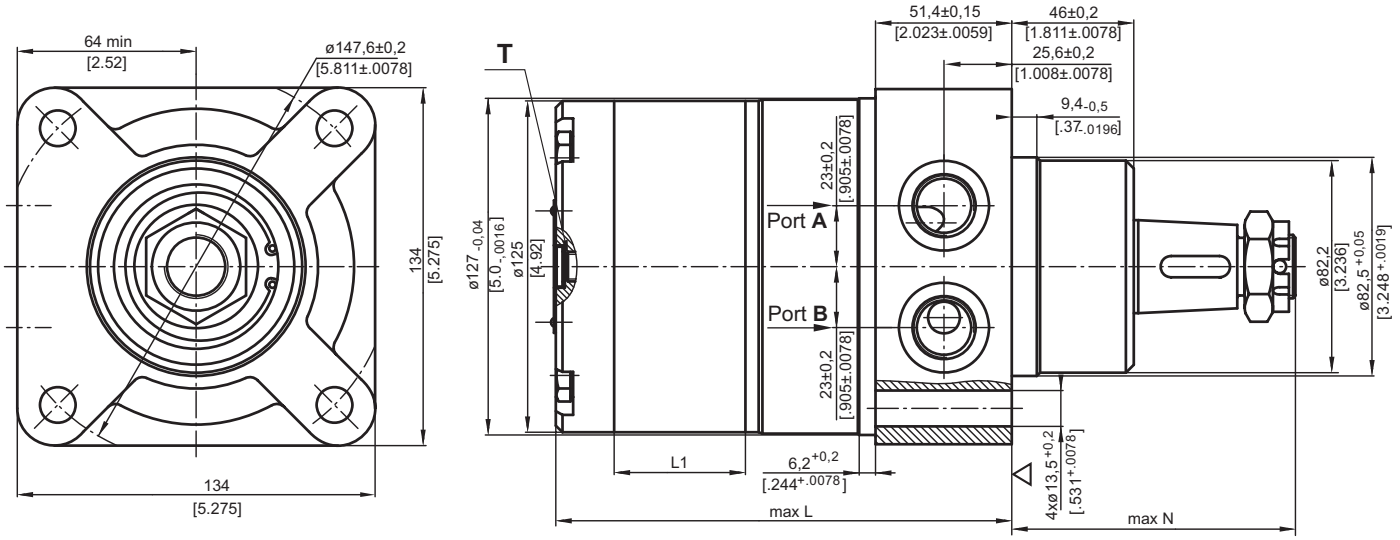
HW 550



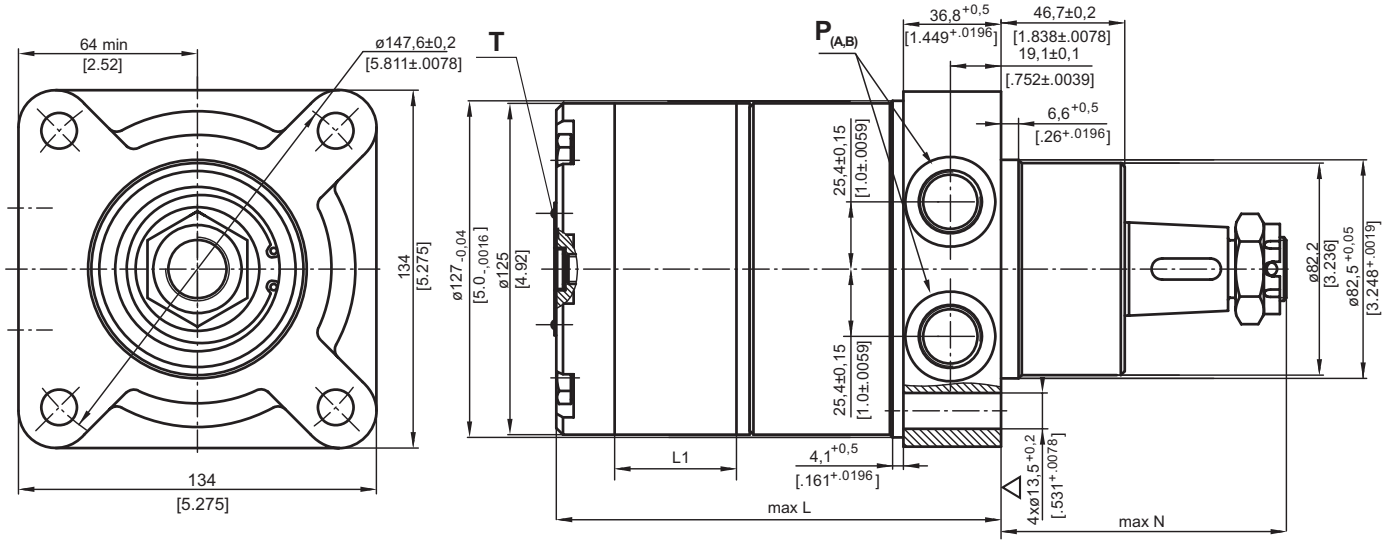
The function diagrams data is for average performance of randomly selected motors at back pressure 5÷10 bar [72.5÷145 PSI] and oil with viscosity of 32 mm²/s [150 SUS] at 50°C [122°F].

DIMENSIONS AND MOUNTING DATA

HW - Wheel Mount



HWS - Wheel Mount



Type	*L, mm [in.]	L_1,mm [in.]
HW 125	140,5 [5.51]	17,4 [.68]
HW 160	145,0 [5.71]	21,8 [.86]
HW 200	151,0 [5.95]	27,8 [1.09]
HW 235	155,5 [6.12]	32,5 [1.28]
HW 250	158,0 [6.22]	34,8 [1.37]
HW 300	164,5 [6.48]	41,4 [1.63]
HW 315	166,5 [6.56]	43,5 [1.71]
HW 350	171,0 [6.73]	48,0 [1.89]
HW 370	174,0 [6.85]	51,0 [2.01]
HW 400	178,0 [7.01]	54,8 [2.16]
HW 470	188,0 [7.40]	65,0 [2.56]
HW 500	192,5 [7.58]	69,4 [2.73]
HW 535	197,0 [7.76]	74,1 [2.92]
HW 550	199,0 [7.84]	76,0 [2.99]

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

Note: For N see page 96.

▽ - Motor Mounting Surface

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

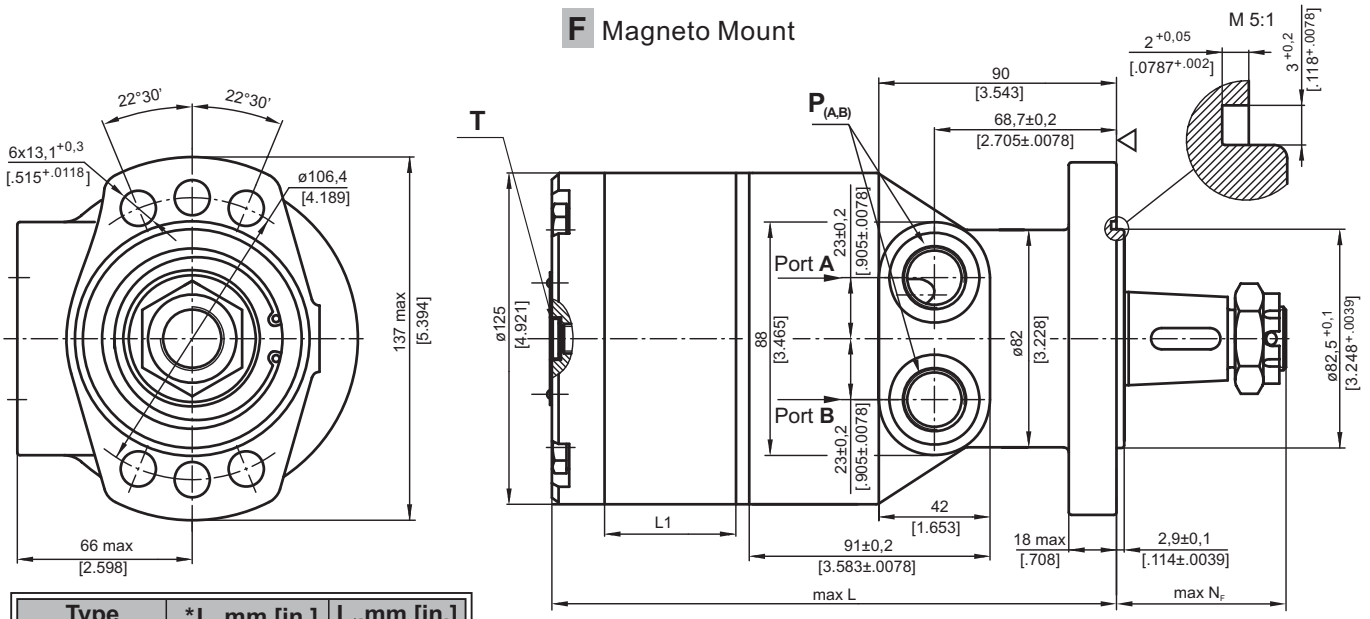
Standard Rotation
Viewed from Shaft End
Port **A** Pressurized - **CW**
Port **B** Pressurized - **CCW**

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

mm [in]

DIMENSIONS AND MOUNTING DATA - HWF

F Magneto Mount



Type	*L, mm [in.]	L_1,mm [in.]
HWF 125	184,0 [7.24]	17,4 [.68]
HWF 160	188,5 [7.42]	21,8 [.86]
HWF 200	194,5 [7.66]	27,8 [1.09]
HWF 235	199,0 [7.84]	32,5 [1.28]
HWF 250	201,5 [7.93]	34,8 [1.37]
HWF 300	208,0 [8.20]	41,4 [1.63]
HWF 315	210,0 [8.27]	43,5 [1.71]
HWF 350	214,5 [8.45]	48,0 [1.89]
HWF 370	217,5 [8.56]	51,0 [2.01]
HWF 400	221,5 [8.72]	54,8 [2.16]
HWF 470	231,5 [9.11]	65,0 [2.56]
HWF 500	236,0 [9.29]	69,4 [2.73]
HWF 535	240,5 [9.47]	74,1 [2.92]
HWF 550	242,5 [9.55]	76,0 [2.99]

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

Note: For N_F see page 96.

▽ - Motor Mounting Surface

	Versions	
	2	4
$P_{(A,B)}$	2xG½	2x⅞-14UNF, O-ring
T	G ¼	7/16-20UNF, O-ring

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

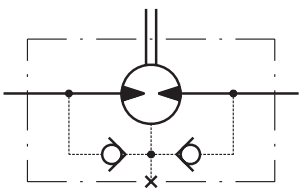
Reverse Rotation
Viewed from Shaft End
Port **A** Pressurized - **CCW**
Port **B** Pressurized - **CW**

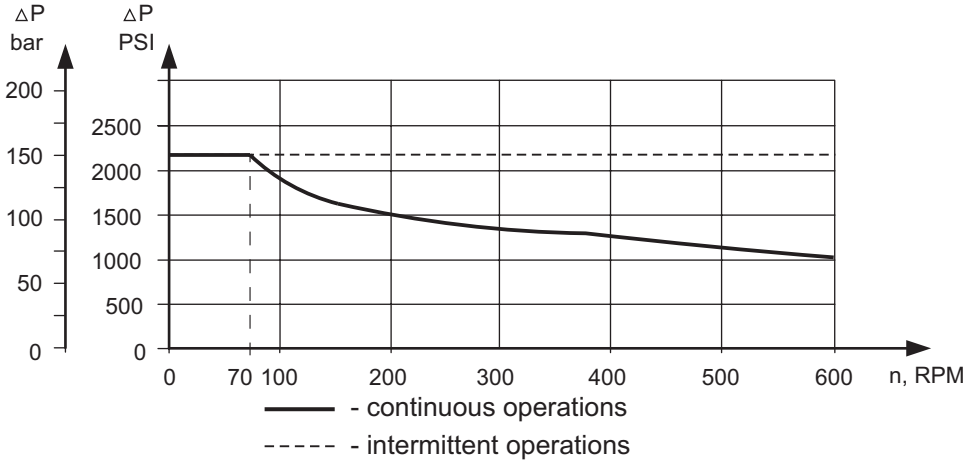
mm [in]

MAX. PERMISSIBLE SHAFT SEAL PRESSURE

HW... motors with drain connection:

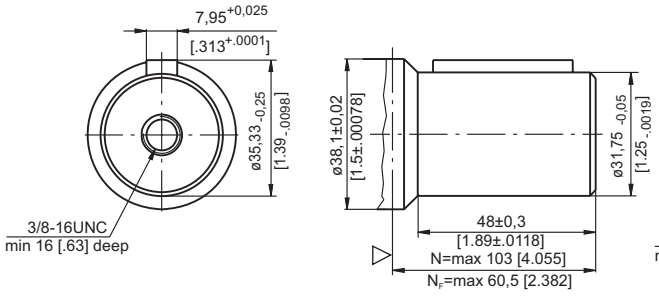
The shaft seal pressure equals the pressure in the drain line.



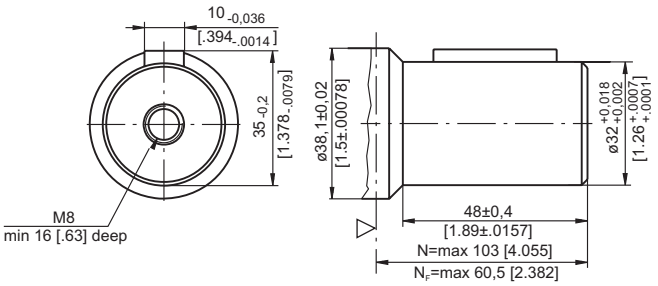


SHAFT EXTENSIONS

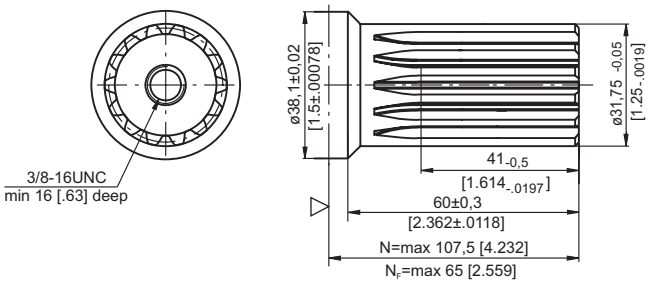
K - 1 ¼" straight, Parallel key 5/16"x 5/16"x 1 ½" BS46
Max. Torque 77 daNm [6815 in-lb]



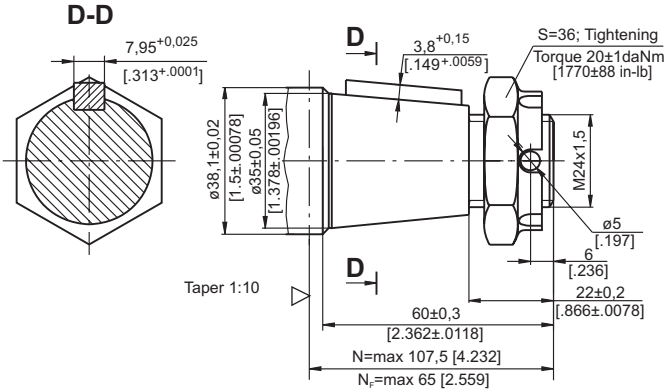
M - ø32 straight, Parallel key A10x8x32 DIN 6885
Max. Torque 77 daNm [6815 in-lb]



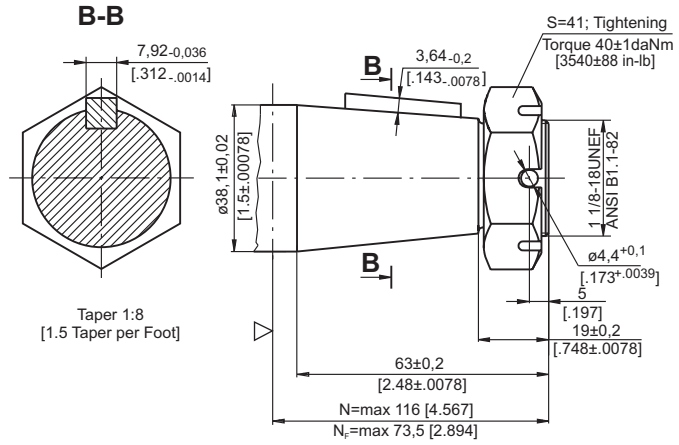
L - ø1 ¼" splined 14T, DP12/24 ANSI B92.1-1976 Norm
Max. Torque 77 daNm [6815 in-lb]



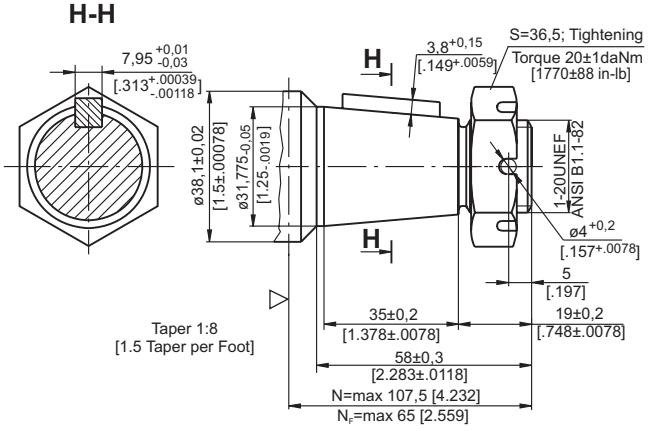
KB - ø35 tapered 1:10 , Parallel key 5/16"x5/16"x1¼" BS46
Max. Torque 95 daNm [8410 in-lb]



T - 1 ½ " tapered 1:8 , Parallel key 5/16"x5/16"x1 ¼" Bs46
Max. Torque 120 daNm [10620 in-lb]



R - 1 ¼ " tapered 1:8 , Parallel key 5/16"x5/16"x1" BS46
Max. Torque 77 daNm [6815 in-lb]



▽ - Motor Mounting Surface

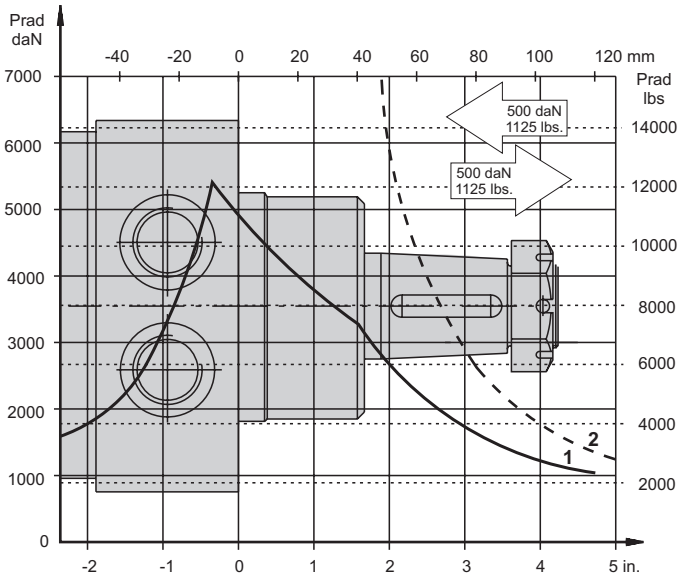
N - for standart and **S** flange

N_F - for **F** flange

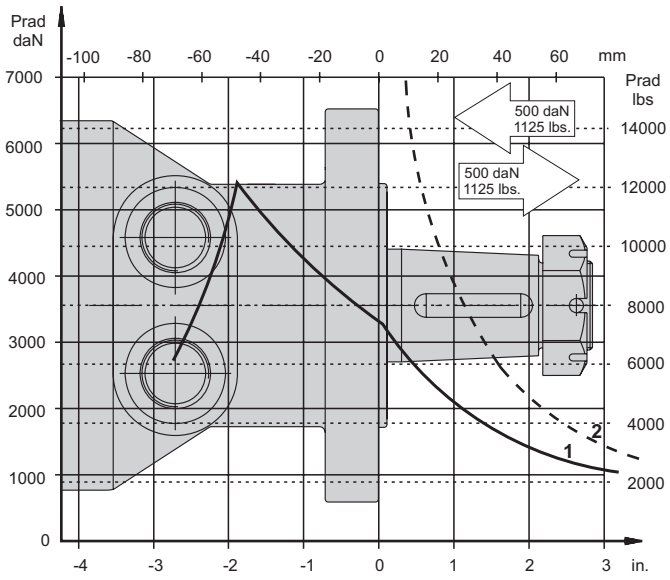
mm [in]

PERMISSIBLE SHAFT LOADS

HW..., HWS...



HWF...



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.

ORDER CODE

	1	2	3	4	5	6
HW						

Pos.1 - Mounting Flange

omit - Wheel mount, four holes

F	- Oval mount, six holes
S	- Wheel mount, four holes

Pos.2 - Displacement code

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

Pos.3 - Shaft Extensions*

K	- 1¼"[31,75] straight, Parallel key 5/16"x5/16"x1½" BS46
KB	- ø35 tapered 1:10, Parallel key 5/16"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 key 5/16"x5/16"x1" BS46
T	- 1½"[38,1] Tapered 1:8, Parallel key 5/16"x5/16"x1¼" BS46

Pos.4 - Ports

2	- BSPP (ISO 228)
4	- SAE (ANSI B1.1-1982)

Pos.5 - Special Features [see page 98]

Pos.6 - Design Series

omit - Factory specified

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

The hydraulic motors are mangano-phosphatized as standard.

MOTOR SPECIAL FEATURES

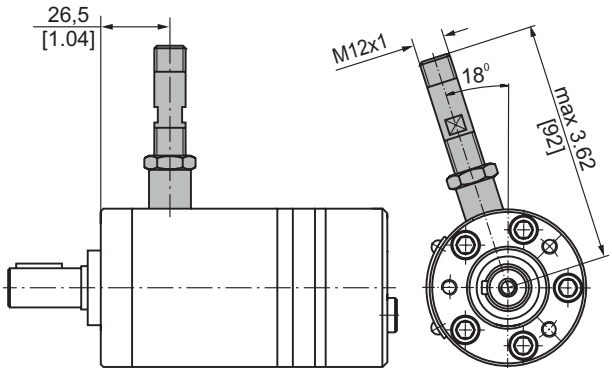
Special Feature Description	Order Code	Motor type										
		MM	MP	MPN	MPW	MR	MRN	PL, RL	PK, RK	RW	MH	HW
Speed Sensor*	RS	O	O	-	-	O	-	-	-	-	O	-
Tacho connection	T	-	-	-	-	O	-	-	-	-	-	-
Low Leakage	LL	O	O	-	O	O	-	O	O	O	O	O
Low Speed Valving	LSV	-	-	-	O	O	-	O	O	O	O	O
Free Running	FR	O	O	-	O	O	-	O	O	O	O	O
Reverse Rotation	R	O	O	O	O	O	O	O	O	O	O	O
Paint**	P	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
Check Valves		S	S***	S	S***	S***	S	S	S	S	S***	S

O Optional
- Not applicable
S Standard

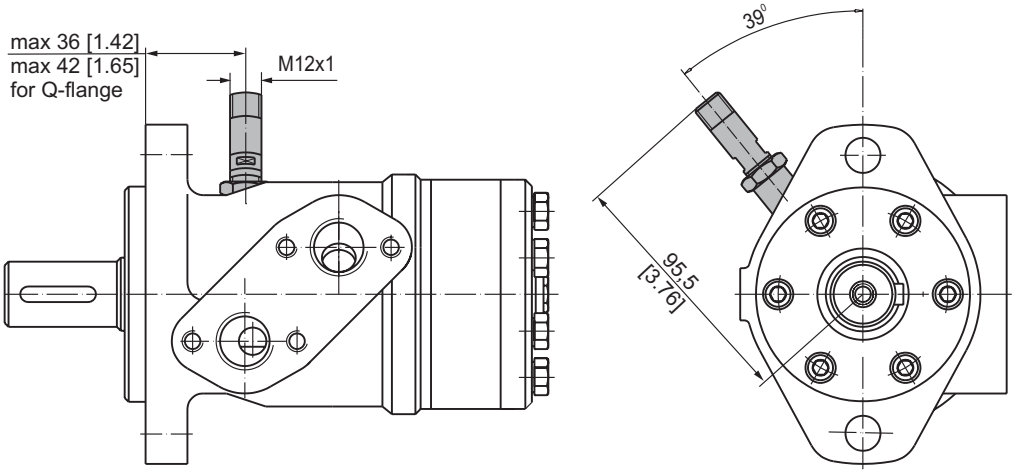
* For sensor ordering see pages 99-100.
** Color at customer's request.
*** Without check valves for "**U**" shaft seal versions.

MOTORS WITH SPEED SENSOR

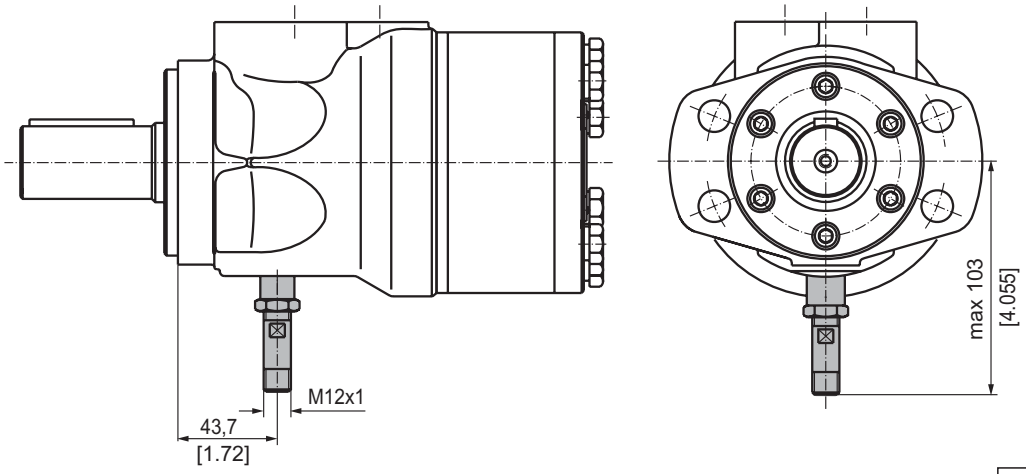
MM...RS



MP...RS and MR...RS



MH...RS



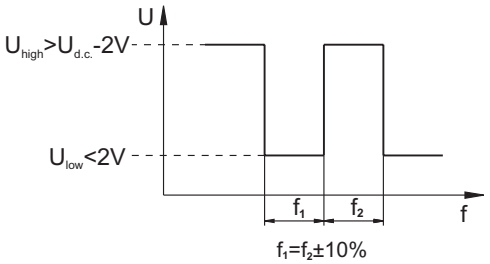
mm [in]

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...+125^{0}C [-40...+257^{0}F]
Protection	IP 67
Plug connector	M12-Series
Mounting principle	ISO 6149

Output signal

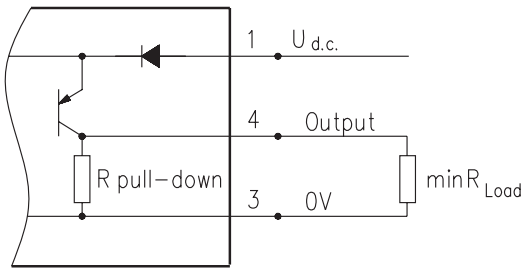


Load max.:$I_{high}=I_{low}$<50mA

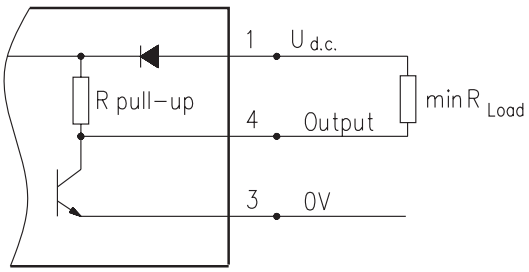
Motor type	MM	MP	MR	MH
Pulses per revolution	30	36	36	42

Wiring diagrams

PNP

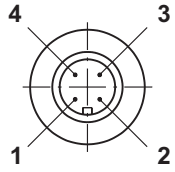


NPN



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; 5 m [196 in] long
RSPL5	PNP	Cable output 3x0,25; 5 m [196 in] 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

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

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, daN [lbs]
The resistance force resulted in wheels contact with different surfaces:

$$RR=G \times \rho$$

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

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

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, daN [lbs]
Force **FA** necessary for acceleration from 0 to maximum speed **v** and time **t** can be calculated with a formula:

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

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

5.Tractive effort: DP,daN [lbs]
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, daN [lbs]
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.

$$TE=1{,}1x(RR + GR + FA + DP)$$

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, daNm [in-lb]
Necessary torque moment for every hydraulic motor:

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

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

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

$$M_W=\frac{G_W \times f \times R_{in}[R_m]}{i \times h_M}$$

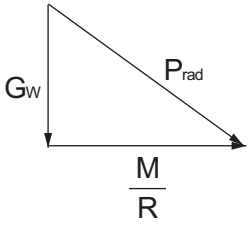
To avoid wheel slipping, it should be observed the following condition $M_w > M$
f - frictional factor;
G_w - total weight over the wheels, daN [lbs].

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} , daN [lbs]

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.



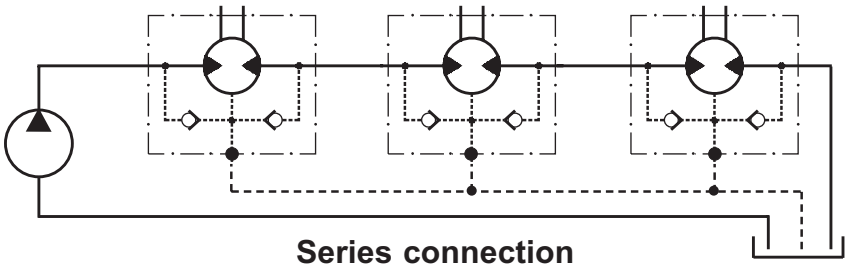
$$P_{rad}=\sqrt{G_w^2+\left(\frac{M}{R}\right)^2}$$

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

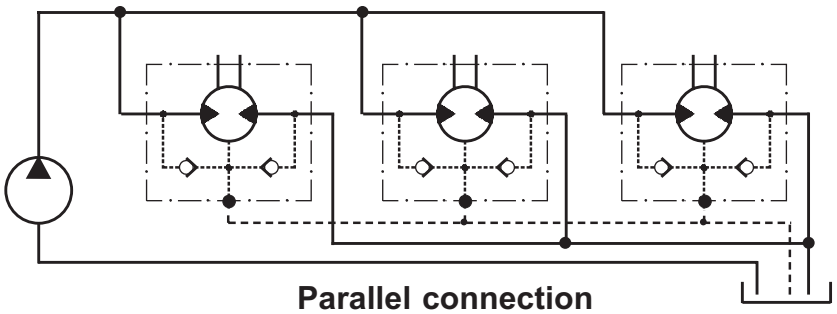
In accordance with calculated loadings the suitable motor from the catalogue is selected.

DRAINAGE SPACE AND DRAINAGE PRESSURE

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



Series connection



Parallel connection

WARRANTY

M+S Hydraulic warrants, what its products, supplied directly to original equipment manufacturer, authorized distributor or other customer, will be free of defects in material or workmanship at the time of shipment from M+S Hydraulic and will conform to the products technical documentation (drawings and specifications) under sale agreement with Buyer.

This warranty will apply only to defects appearing within applicable Warranty period, mentioned below. If Buyer notify M+S Hydraulic within the Warranty period about any such defects, M+S , at its sole option will replace or repair the defective products or their parts found by M+S Hydraulic to be defective in material or workmanship.

THE FOREGOING LIMITED WARRANTY IS AVAILABLE ONLY IF “M+S HYDRAULIC” IS PROMPTLY NOTIFIED IN WRITING OF THE ALLEGED DEFECT AND DOES NOT COVER FAILURE TO FUNCTION CAUSED BY DAMAGE TO THE PRODUCT, IMPROPER INSTALLATION, UNREASONABLE USE OR ABUSE OF THE PRODUCT, FAILURE TO PROVIDE OR USE OF IMPROPER MAINTENANCE OR USUAL, DEGRADATION OF THE PRODUCT DUE TO PHYSICAL ENVIRONMENTS OF AN USUAL NATURE. THE FOREGOING REMEDIES ARE THE SOLE AND EXCLUSIVE REMEDIES AVAILABLE TO CUSTOMER. To facilitate the inspection, M+S Hydraulic may require return of the product/part, which Buyer claims to be defective.

M+S Hydraulic shall not be liable for labor costs or any other expenses incurred during the disassembling or reinstalling of the product/part.

In case the claimed products are returned to M+S Hydraulic in bad condition: dirty, disassembled, with damaged or missing parts during transportation, the warranty will be considered as not applicable and the products will not be liable to repair.

Warranty periods

New products: The Warranty period is limited to 24 consecutive months (2 years) from the date of production of the product.

Repaired products: If the product is repaired in M+S Hydraulic during its warranty period, the warranty period of the repaired item shall continue for the balance of original Warranty period or for a period equal to 50% of the original new product Warranty period, whichever is later.

Spare parts: The Warranty period for Spare parts shall be 12 consecutive months (1 year) from the dispatch date of such parts from M+S Hydraulic.

LIMITATION OF LIABILITY M+S Hydraulic's liability for any claim of any kind , for any loss or damage arising out of, connected with or resulting from an order, or from the performance or branch thereof, or from the design, manufacture, sale delivery, operation or use of any of its products shall be limited to , at M+S 's sole option, replacement, repair of any defective product or the issuance of a credit to Customer against any future purchases. Cash refunds will not be made under any circumstances and Customer will not be entitled to recover any damages of any kind against M+S Hydraulic, including but not limited to incidental or consequential damages, whether direct or indirect, known or unknown, foreseen or unforeseen.