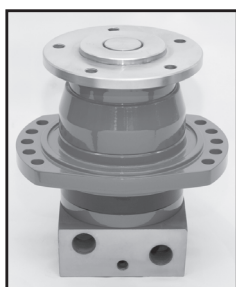
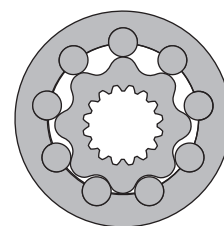
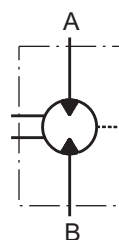


HYDRAULIC MOTORS VMF



APPLICATION

- » Marine equipment
- » Forestry equipment
- » Metal working machines
- » Agricultural machines
- » Road building machines
- » Mining machinery
- » Special vehicles etc.



CONTENTS

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Dimensions and mounting	68
Permissible shaft seal pressure	68
Order code	68

OPTIONS

- » Model - Disc valve, roll-gerotor
- » Wheel mounting flange
- » Side ports
- » Shaft - thread hole flange
- » SAE and BSPP ports
- » Other special features

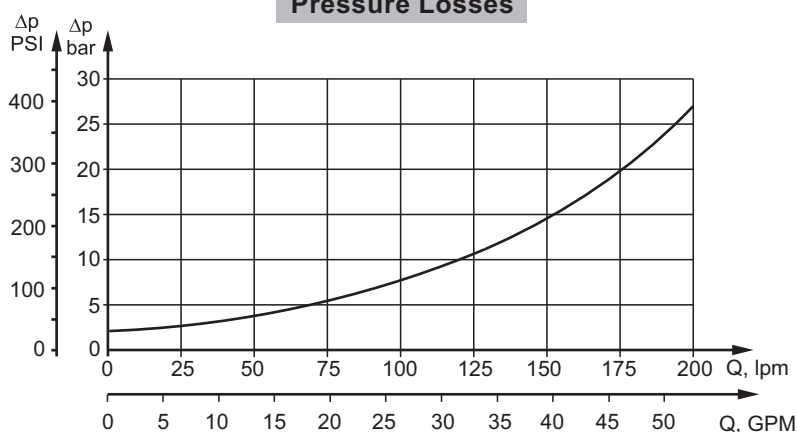
GENERAL

Max. Displacement, cm ³ /rev [in ³ /rev]	801,8 [48.91]	
Max. Speed, [RPM]	736	
Max. Torque, daNm [lb-in]	cont.: 259 [22920]	int.: 340 [30090]
Max. Output, kW [HP]	112 [150]	
Max. Pressure Drop, bar [PSI]	cont.: 250 [3630]	int.: 350 [5080]
Max. Oil Flow, lpm [GPM]	240 [63.4]	
Min. Speed, [RPM]	5	
Permissible Shaft Loads, daN [lbs]	P _a =1500 [3370]	
Pressure fluid	Mineral based- HLP(DIN 51524) or HM(ISO 6743/4)	
Temperature range, °C [°F]	-40÷140 [-40÷284]	
Optimal Viscosity range, mm ² /s [SUS]	20÷75 [98÷347]	
Filtration	ISO code: 18/16/13	According to ISO 4406-1999

Oil flow in drain line

Pressure drop bar [PSI]	Viscosity mm ² /s [SUS]	Oil flow in drain line lpm [GPM]
140 [2030]	20 [98]	3 [.793]
	35 [164]	2 [.528]
210 [3045]	20 [98]	6 [1.585]
	35 [164]	4 [1.057]

Pressure Losses



SPECIFICATION DATA

Type		VMF 315	VMF 400	VMF 500	VMF 630	VMF 800
Displacement, cm ³ /rev [in ³ /rev]		314,5 [19.18]	400,9 [24.5]	499,6 [30.5]	629,1 [38.38]	801,8 [48.91]
Max. Speed, [RPM]	Cont.	636	500	400	315	250
	Int.*	736	600	480	380	300
Max. Torque, daNm [lb-in]	Cont.	115 [10180]	144 [12745]	180 [15930]	227 [20090]	259 [22920]
	Int.*	160 [14160]	200 [17700]	260 [23010]	310 [27440]	340 [30090]
	Peak**	180 [15930]	230 [20355]	286 [25315]	360 [31860]	402 [35580]
Max. Output, kW [HP]	Cont.	67 [90]	67 [90]	67 [90]	67 [90]	67 [90]
	Int.*	112 [150]	112 [150]	112 [150]	112 [150]	112 [150]
Max. Pressure Drop, bar [PSI]	Cont.	250 [3630]	250 [3630]	250 [3630]	250 [3630]	225 [3260]
	Int.*	350 [5080]	350 [5080]	350 [5080]	350 [5080]	350 [5080]
	Peak**	400 [5800]	400 [5800]	400 [5800]	400 [5800]	400 [5800]
Max. Oil Flow, lpm [GPM]	Cont.	200 [52.8]	200 [52.8]	200 [52.8]	200 [52.8]	200 [52.8]
	Int.*	240 [63.4]	240 [63.4]	240 [63.4]	240 [63.4]	240 [63.4]
Max. Inlet Pressure, bar [PSI]	Cont.	270 [3915]	270 [3915]	270 [3915]	270 [3915]	270 [3915]
	Int.*	370 [5365]	370 [5365]	370 [5365]	370 [5365]	370 [5365]
	Peak**	420 [6090]	420 [6090]	420 [6090]	420 [6090]	420 [6090]
Max. Return Pressure with Drain Line, bar [PSI]	Cont.	140 [2030]	140 [2030]	140 [2030]	140 [2030]	140 [2030]
	Int.*	175 [2540]	175 [2540]	175 [2540]	175 [2540]	175 [2540]
	Peak**	210 [3045]	210 [3045]	210 [3045]	210 [3045]	210 [3045]
Max. Starting Pressure with Unloaded Shaft, bar [PSI]		5 [70]	5 [70]	5 [70]	5 [70]	5 [70]
Min. Starting Torque, daNm [lb-in]		92 [8140]	115 [10180]	144 [12745]	180 [15930]	205 [18145]
Min. Speed***, [RPM]		10	6	8	6	5
Weight, kg [lb]		46 [101.4]	47,2 [104,1]	48,5 [106.9]	50 [110.2]	51,5 [113.5]

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

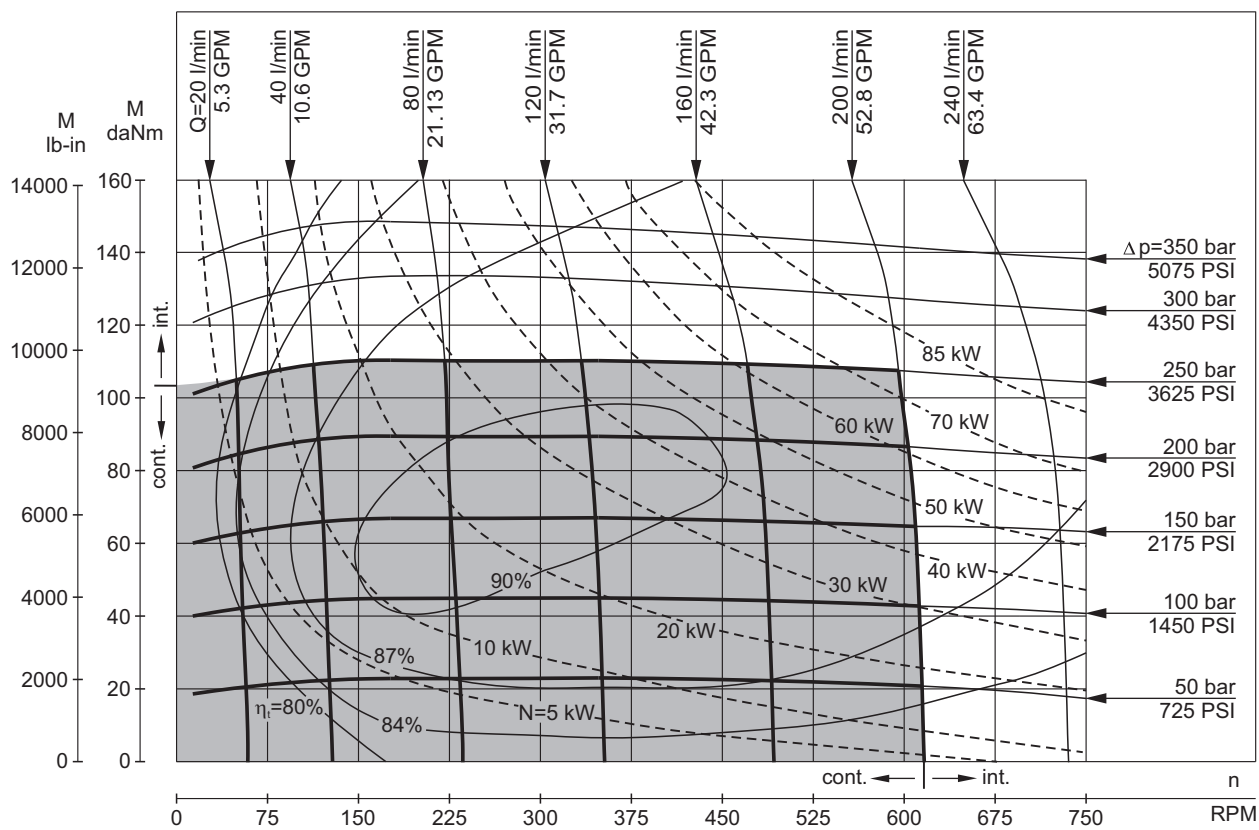
** Peak load: the permissible values may occur for max. 1% of every minute.

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

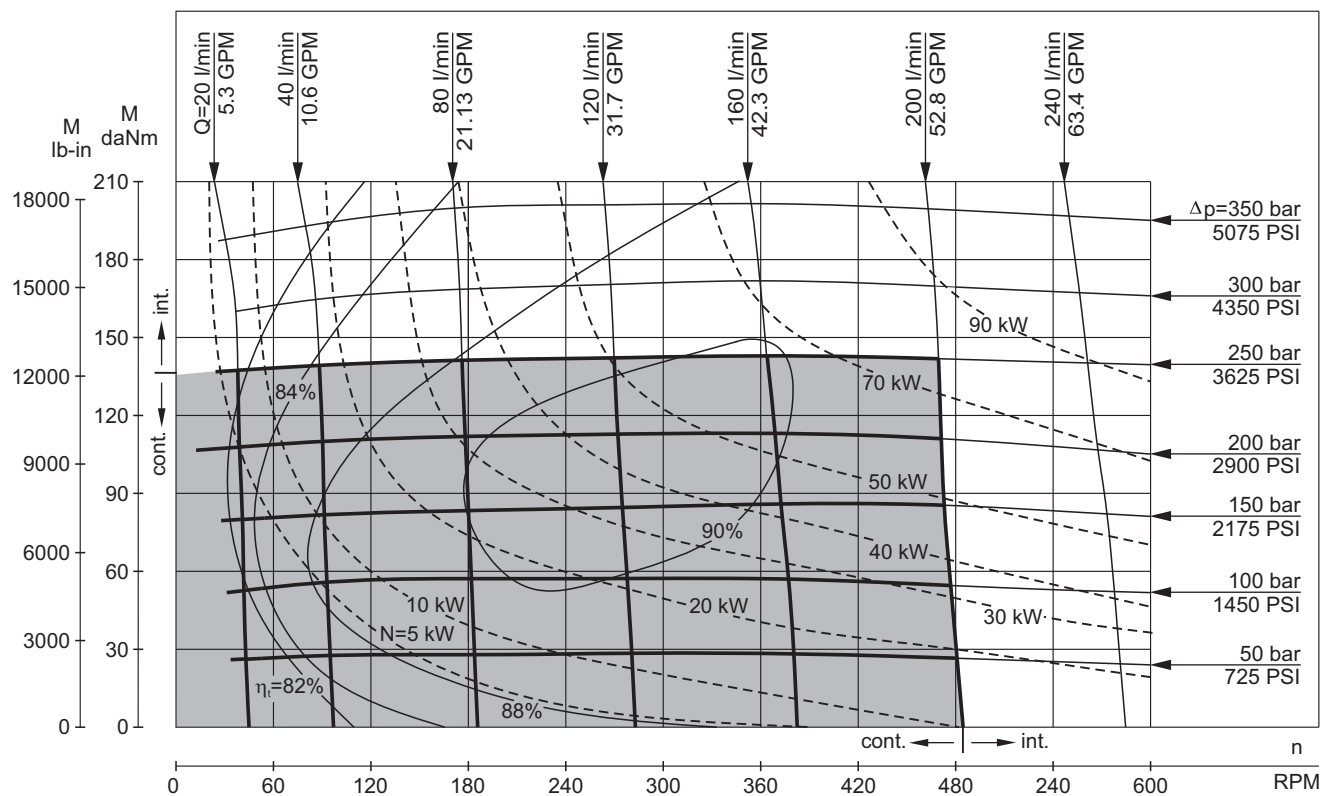
- Intermittent speed and intermittent pressure must not occur simultaneously.
- Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
- Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP(DIN51524) or HM (ISO 6743/4).
If using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

FUNCTION DIAGRAMS

VMF 315



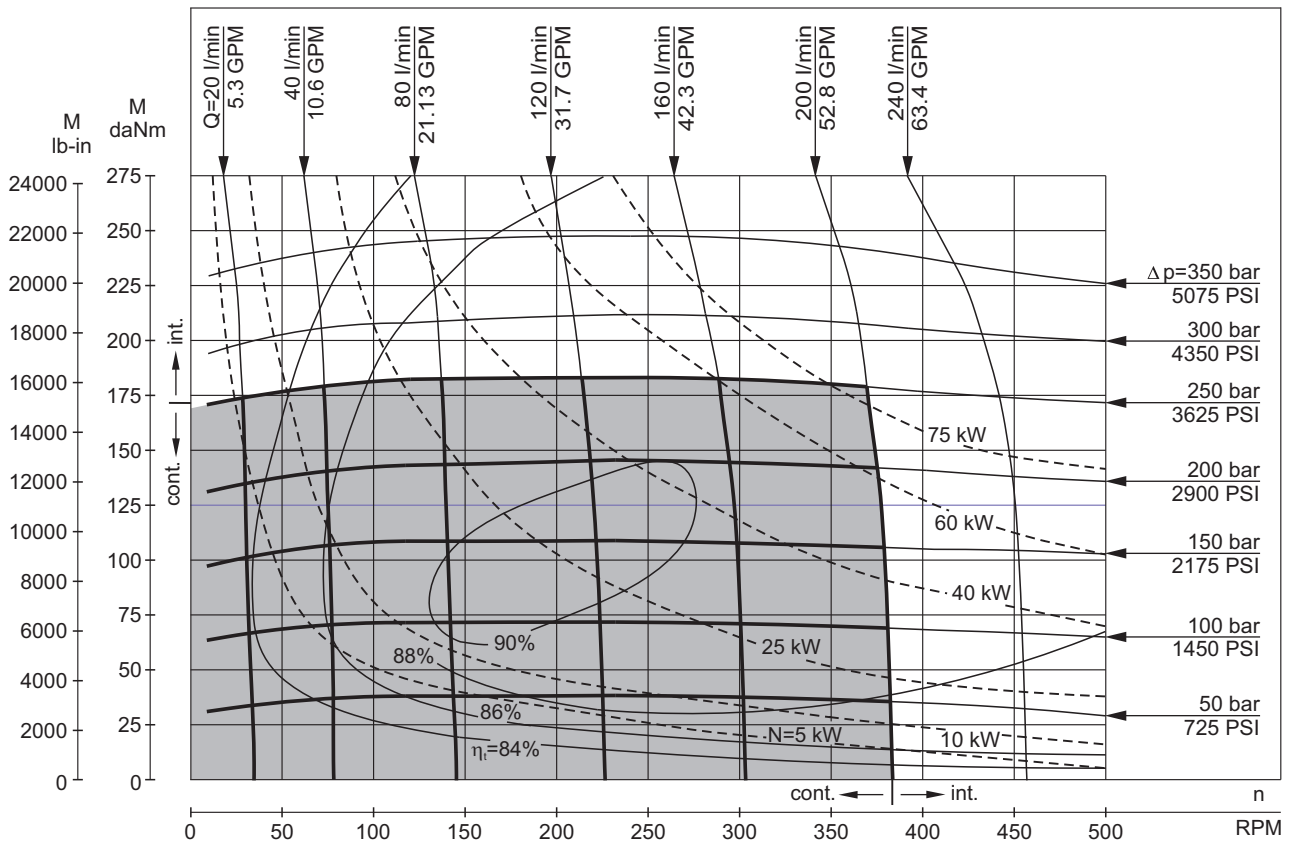
VMF 400



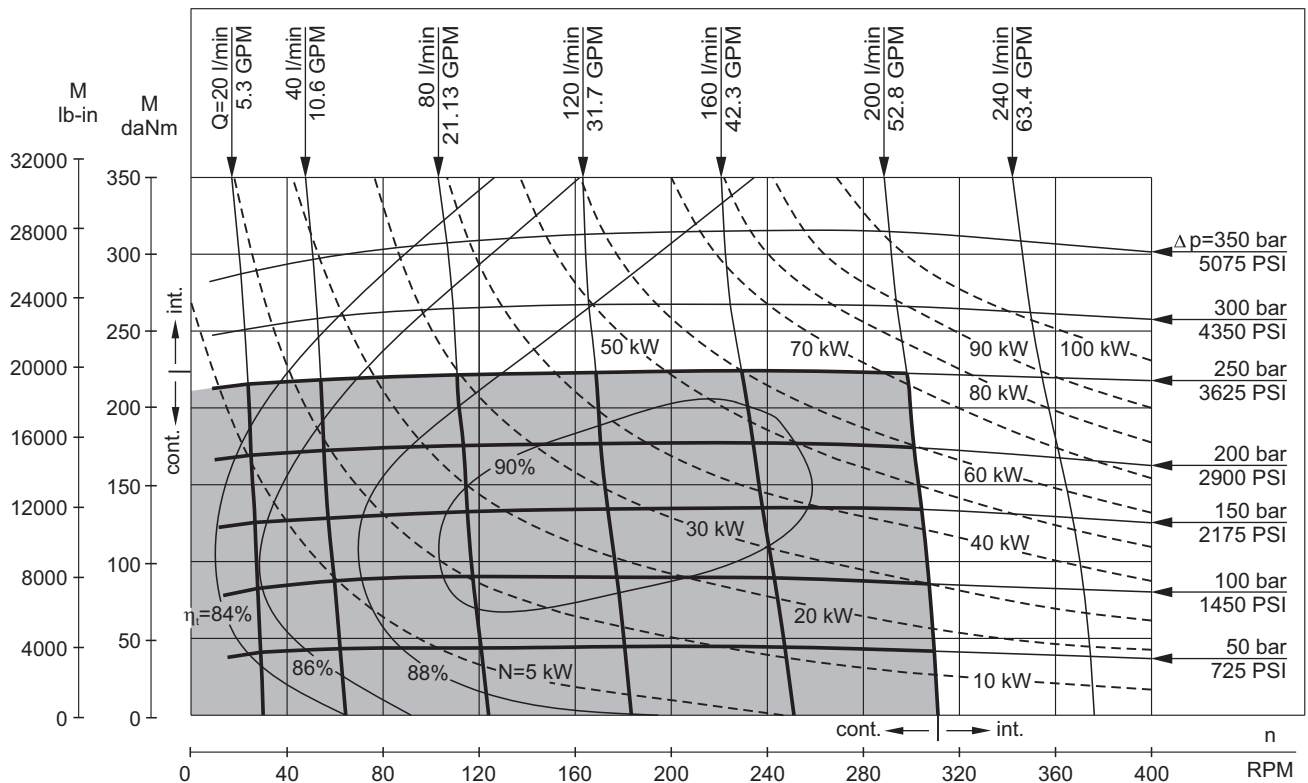
The function diagrams data was collected at back pressure 5÷10 bar (72.5PSI÷145PSI) and oil with viscosity of 32 mm²/s [150SUS] at 50° C [122°F].

FUNCTION DIAGRAMS

VMF 500



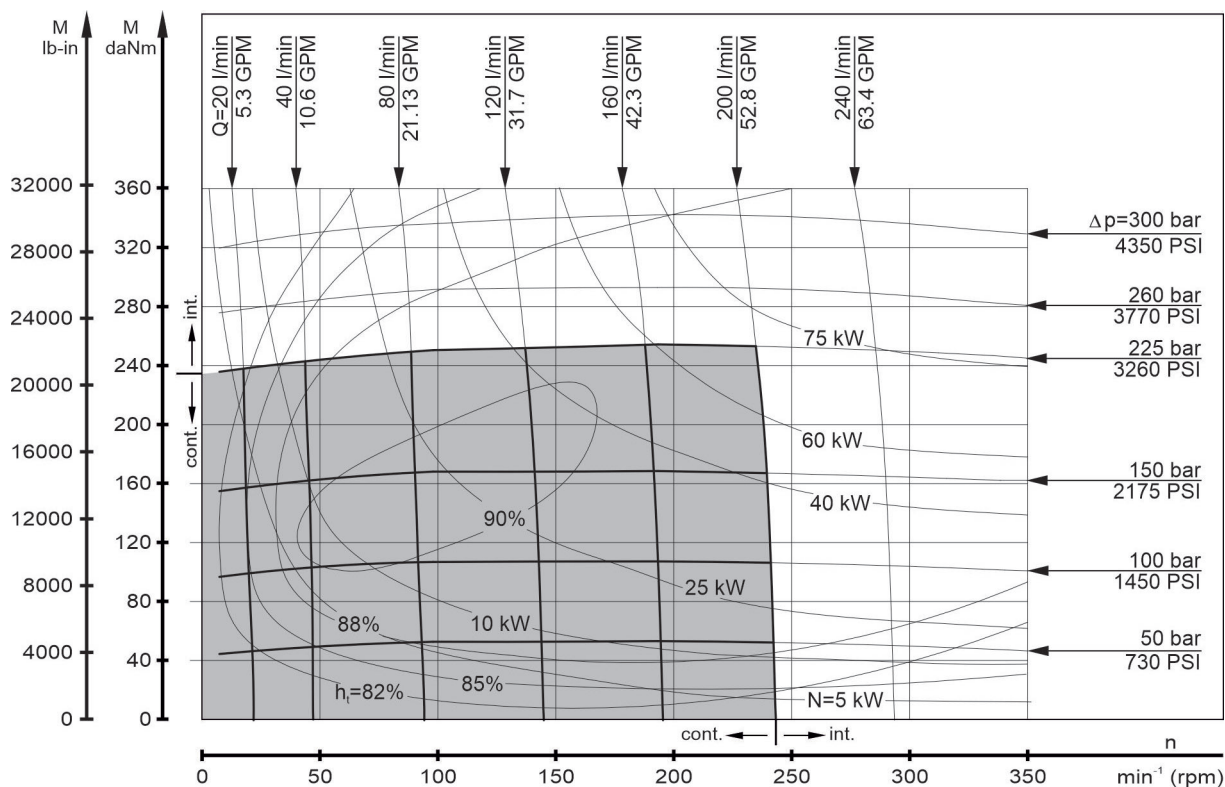
VMF 630



The function diagrams data was collected at back pressure 5÷10 bar (72.5 PSI÷145 PSI) and oil with viscosity of 32 mm²/s [150 SUS] at 50°C [122°F].

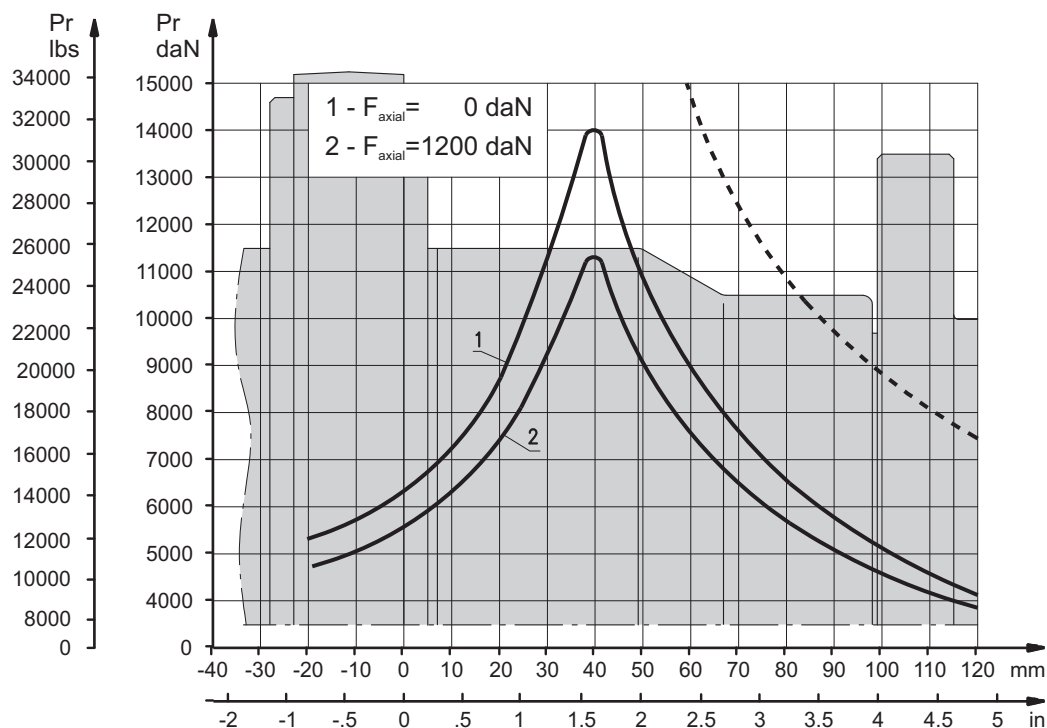
FUNCTION DIAGRAMS

VMF 800



The function diagrams data was collected at back pressure 5÷10 bar (72.5PSI÷145PSI) and oil with viscosity of 32 mm²/s [150SUS] at 50° C [122°F].

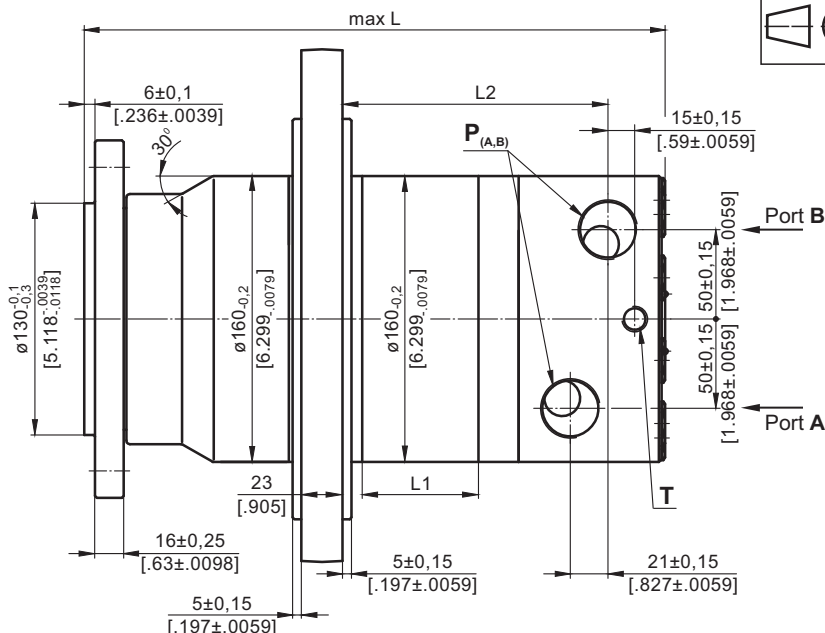
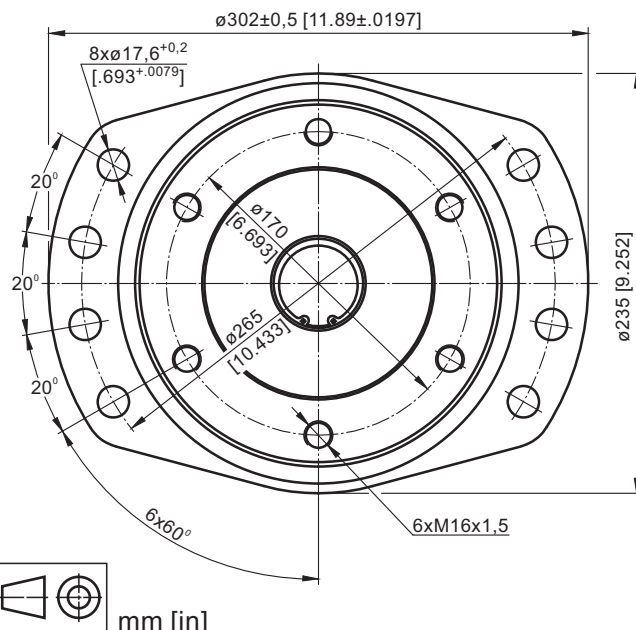
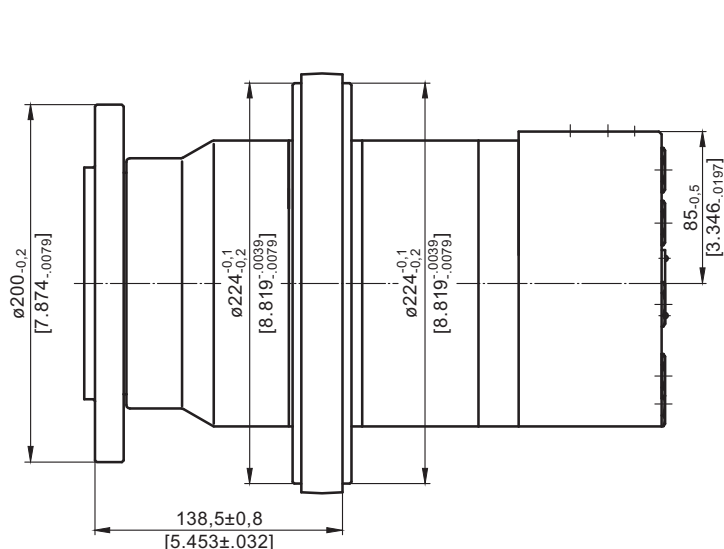
PERMISSIBLE SHAFT LOADS



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 2:1.

DIMENSIONS and MOUNTING DATA



Versions		
	2	4
P _(A,B)	2xG1	2x1 ⁵ / ₁₆ -12UN
T	G ¹ / ₄	9 ¹ / ₁₆ -18UNF

Type	L, mm [in]	L1, mm [in]	L2, mm [in]
VMF 315	286,5 [11.28]	25,5 [1.00]	109,5 [4.31]
VMF 400	293,5 [11.56]	32,5 [1.28]	116,5 [4.59]
VMF 500	301,5 [11.87]	40,5 [1.59]	124,5 [4.90]
VMF 630	312,0 [12.28]	51,0 [2.01]	135,0 [5.31]
VMF 800	326,0 [12.83]	65,0 [2.56]	149,0 [5.87]

ORDER CODE

VMF	1	2	3	4
			HD	

Pos.1 - Displacement code

315	- 314,5 cm ³ /rev [19.18 in ³ /rev]
400	- 400,9 cm ³ /rev [24.45 in ³ /rev]
500	- 499,6 cm ³ /rev [30.48 in ³ /rev]
630	- 629,1 cm ³ /rev [38.38 in ³ /rev]
800	- 801,8 cm ³ /rev [48.91 in ³ /rev]

Pos.2 - Ports

2	- side ports, 2xG1, G ¹ / ₄ , BSP thread, ISO 228
4	- side ports, 2x1 ⁵ / ₁₆ -12 UN, O-ring, 9 ¹ / ₁₆ -18 UNF

Pos.3 - Additional Options

HD	- Reinforced motor HD*
	For Other Additional Options see page 69

Pos.4 - Design Series

omit	- Factory specified
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* Drain line should always be used.

Warning: Drain line should always be used.

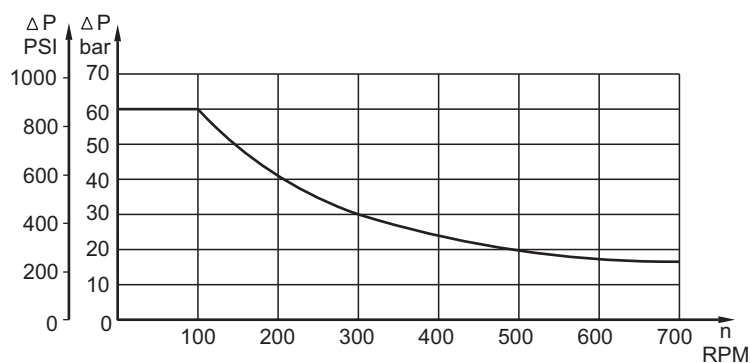
Standard Rotation

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

MAX. PERMISSIBLE SHAFT SEAL PRESSURE



The hydraulic motors are manganophosphatized as standard.

MOTOR ADDITIONAL OPTIONS

Additional Options Description	Order Code	Motor type							
		MSWM	MTK	MTM	TMF	TMYF	MVM	MVMC	VMF
Speed Sensor*	RS	O	O	O	O	O	O	-	O
Reinforced motor	HD	-	S	S	S	S	S	S	S
Low Leakage	LL	O	O	O	O	O	O	O	O
Low Speed Valving	LSV	O	O	O	O	O	O	O	O
Free Running	FR	-	O	-	-	O	-	O	-
Reverse Rotation	R	O	O	O	O	O	O	O	O
Paint**	P	O	O	O	O	O	O	O	O
Corrosion Protected Paint**	PC	O	O	O	O	O	O	O	O
Special Paint***	PS	O	O	O	O	O****	O	O	O
	PCS								
Check Valves		S	O	O	-	O	O	O	-

O	Optional
-	Not applicable
S	Standard

* For sensor ordering see pages 70÷71.

** Colour at customer's request.

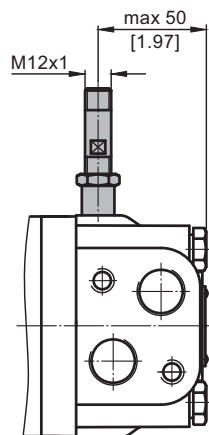
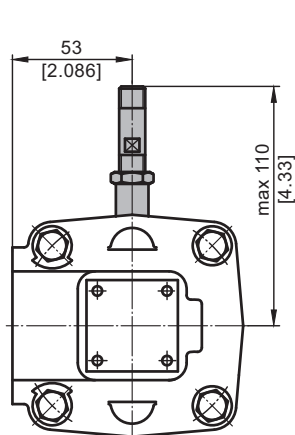
*** Non painted feeding surfaces, colour at customer's request.

**** For Port Size Version 5 only!

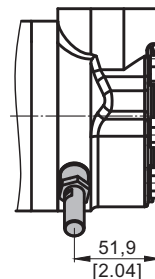
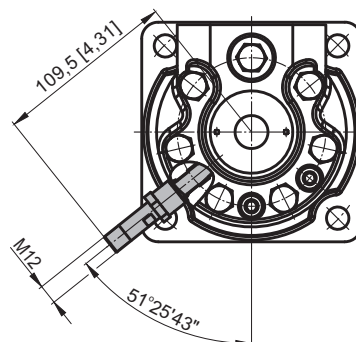
 For more information about **HD** option please contact with "M+S Hydraulic".

MOTORS WITH SPEED SENSOR

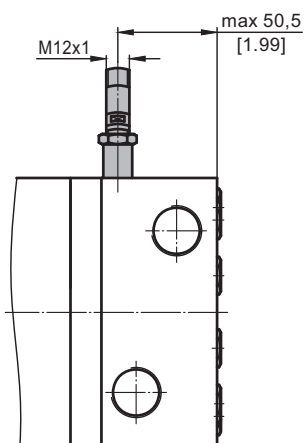
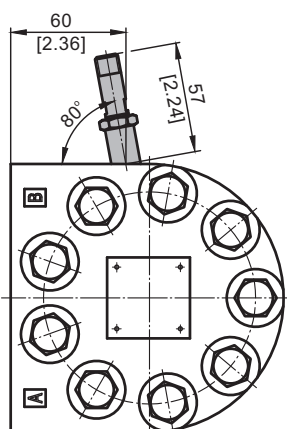
MSWM...RS



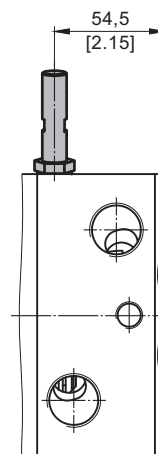
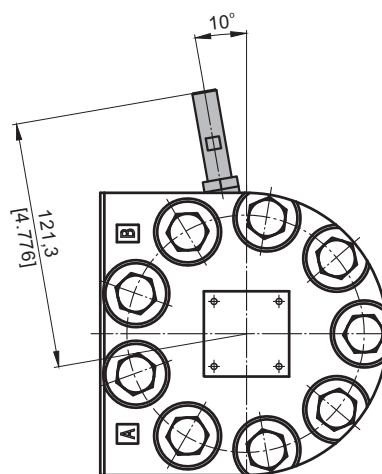
MTK...RS



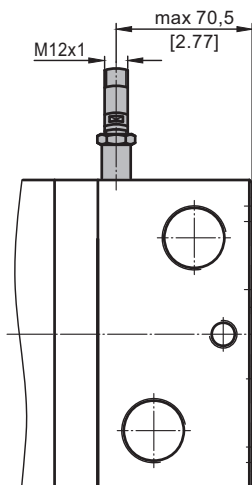
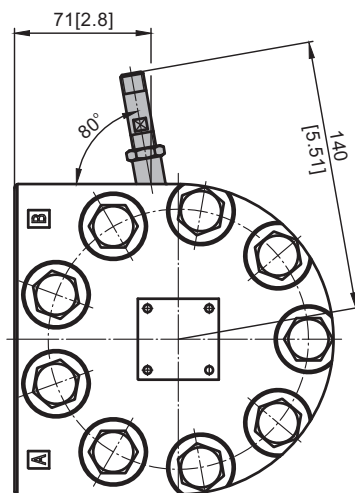
MTM...RS TMF...RS



TMYF...RS



MVM...RS VMF...RS

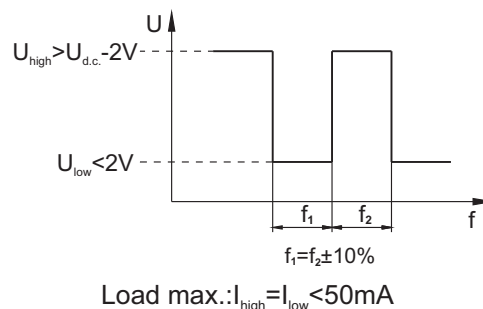


TECHNICAL DATA OF THE SPEED SENSOR

Technical data

Frequency range	0...15 000 Hz
Output	Universal PUSH PULL
Power supply	10-30 VDC (10-36 for TMYF)
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

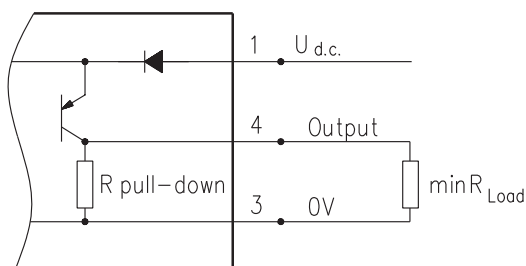
Output signal



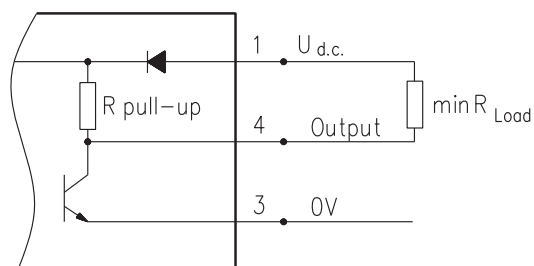
Motor type	MSWM MTK	MTM TMF, TMYF	MVM VMF
Pulses per revolution	54	84	102

Wiring diagrams

PNP

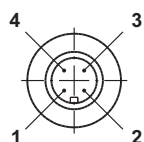


NPN



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

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; 2,5 m [98 in] long
RSL3,5	Cable output 3x0,25; 3,5 m [138 in] long
RSL5	Cable output 3x0,25; 5 m [196 in] long
RSL10	Cable output 3x0,25; 10 m [394 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]

$$n = \frac{2.65 \times V_{km} \times i}{R_m} \quad n = \frac{168 \times V_{mi} \times i}{R_{in}}$$

V_{km} - vehicle speed, km/h;

V_{mi} - 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. Acceleration force: FA , daN [lbs]

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

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

FA - acceleration 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.

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

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 , daNm [lb-in]

Necessary torque moment for every hydraulic motor:

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

N - motor numbers;

η_m - mechanical gear efficiency (if it is available).

8. Cohesion between tire and road covering:

M_w , daNm [lb-in]

Necessary torque moment for every hydraulic motor:

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

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

f - frictional factor;

G_w - total weight over the wheels, 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

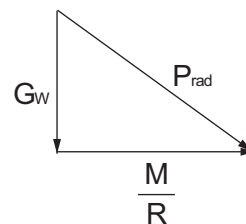
9. Radial motor loading: P_{rad} , daN [lbs]

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.

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.

