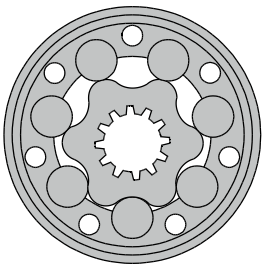
HYDRAULIC MOTORS MH

APPLICATION

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



CONTENTS

OPTIONS

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

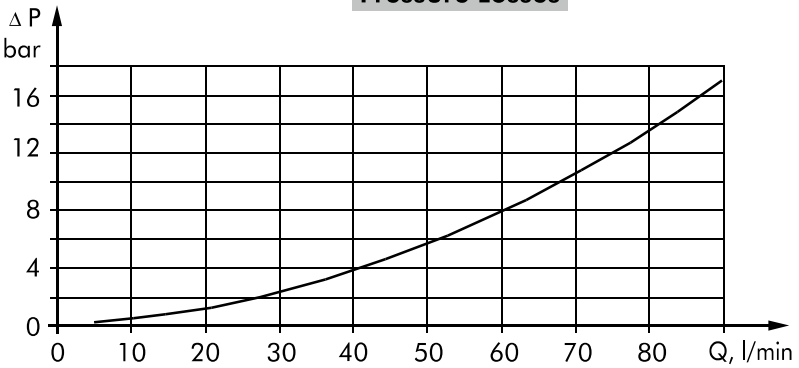
GENERAL

Displacement, [cm^3/rev.]	201,3÷502,4
Max. Speed, [RPM]	150÷370
Max. Torque, [daNm]	51÷85
Max. Output, [kW]	11÷16
Max. Pressure Drop, [bar]	175÷125
Max. Oil Flow, [l/min]	75
Min. Speed, [RPM]	5÷10
Pressure fluid	Mineral based- HLP(DIN 51524) or HM(ISO 6743/4)
Temperature range, [°C]	-30÷90
Optimal Viscosity range, [mm^2/s]	20÷75
Filtration	ISO code 20/16 (Min. recommended fluid filtration of 25 micron)

Oil flow in drain line

Pressure drop (bar)	Viscosity (mm^2/s)	Oil flow in drain line (l/min)
100	20	2,5
	35	1,8
140	20	3,5
	35	2,8

Pressure Losses



MH MOTORS

SPECIFICATION DATA

Type		MH				
		200	**250**	**315**	**400**	**500**
Displacement, [cm^3/rev.]		201,3	252	314,9	396,8	502,4
Max. Speed,	cont.	370	295	235	185	150
[RPM]	int.*	445	350	285	225	180
Max. Torque	cont.	51	61	74	84	85
[daNm]	int.*	58	70	82	98	104
	peak**	64	79	98	109	117
Max. Output,	cont.	16	16	14	12,5	11
[kW]	int.*	18,5	18,5	15,5	15	14
Max. Pressure Drop	cont.	175	175	175	155	125
[bar]	int.*	200	200	200	190	160
	peak**	225	225	225	210	180
Max. Oil Flow	cont.	75	75	75	75	75
[l/min]	int.*	90	90	90	90	90
Max. Inlet Pressure	cont.	200	200	200	200	200
[bar]	int.*	225	225	225	225	225
	peak**	250	250	250	250	250
Max. Starting Pressure with Unloaded Shaft, [bar]		5	5	5	5	5
Min. Starting Torque	at max. press. drop cont.	39	52	66	72	72
[daNm]	at max. press. drop int.*	45	59	73	88	88
Min. Speed***, [RPM]		10	10	8	5	5
Weight, avg. [kg]		10,5	11	11,5	12,3	13

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

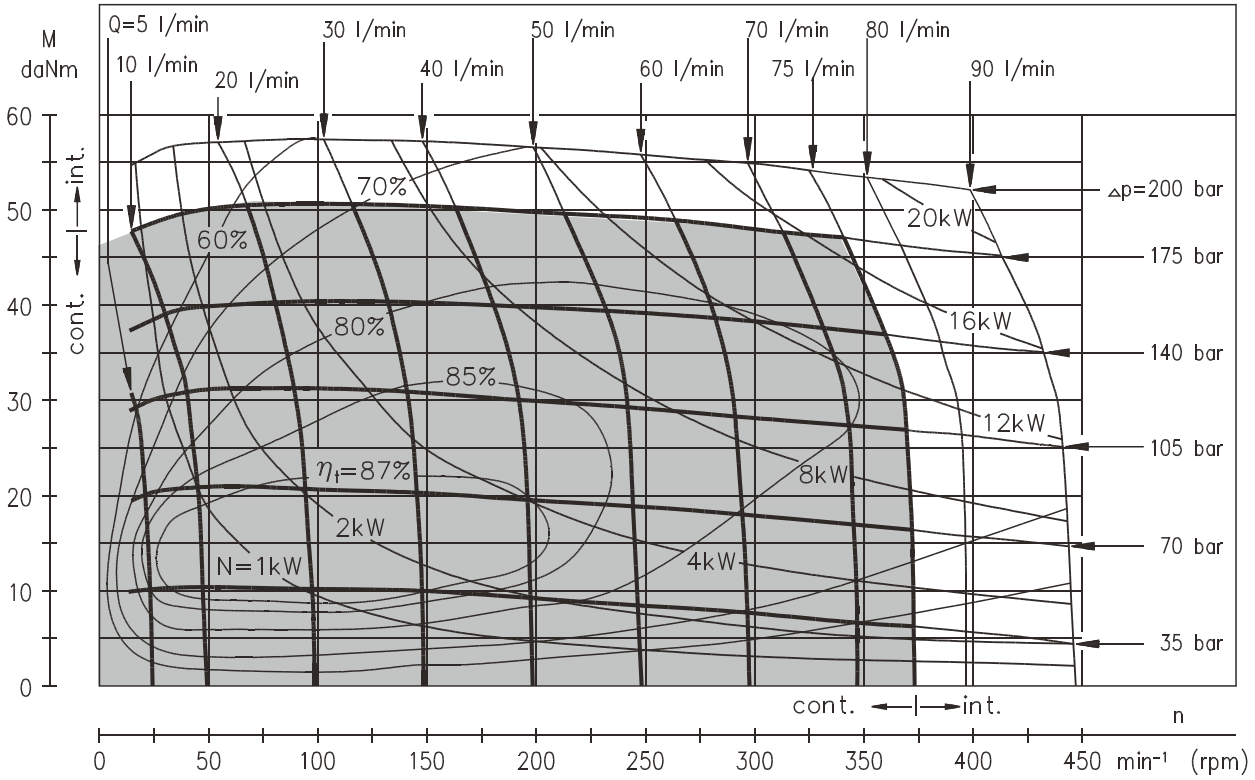
** Peak load: the permissible values may occur for max. 1% of every minute.

*** For speeds of 5 RPM lower than given, consult factory or your regional manager.

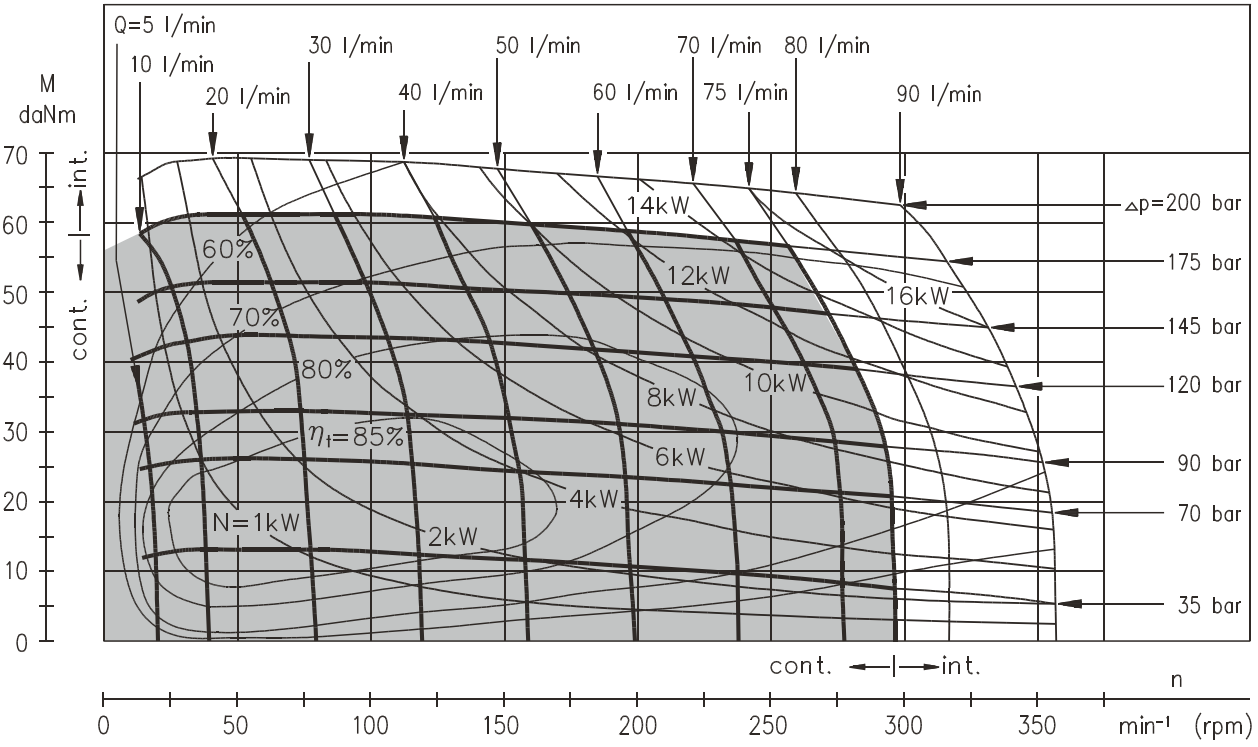
1) Intermittent speed and intermittent pressure must not occur simultaneously.
2) Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
3) Recommend using a premium quality, anti-wear type mineral based hydraulic oil, HLP(DIN51524) or HM(ISO6743/4). If using synthetic fluids consult the factory for alternative seal materials.
4) Recommended minimum oil viscosity 13 mm^2/s at 50°C.
5) Recommended maximum system operating temperature is 82°C.
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

MH 200



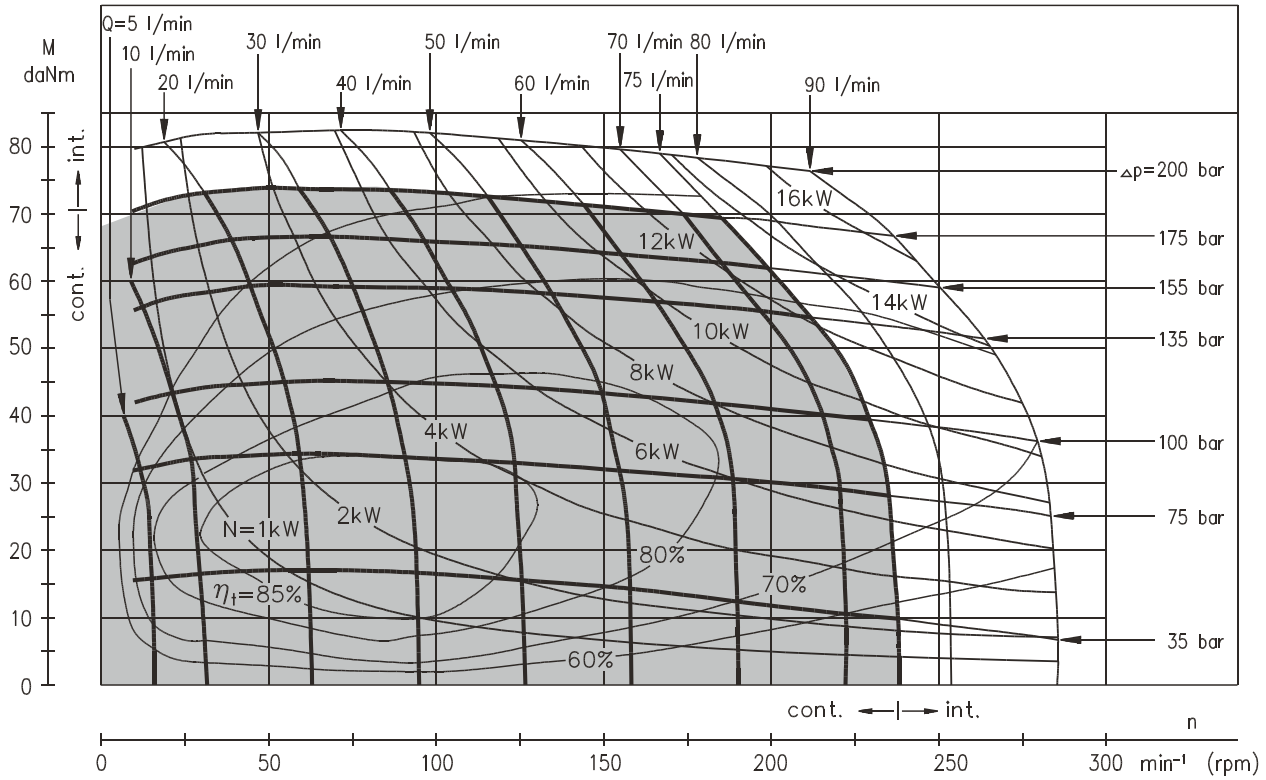
MH 250



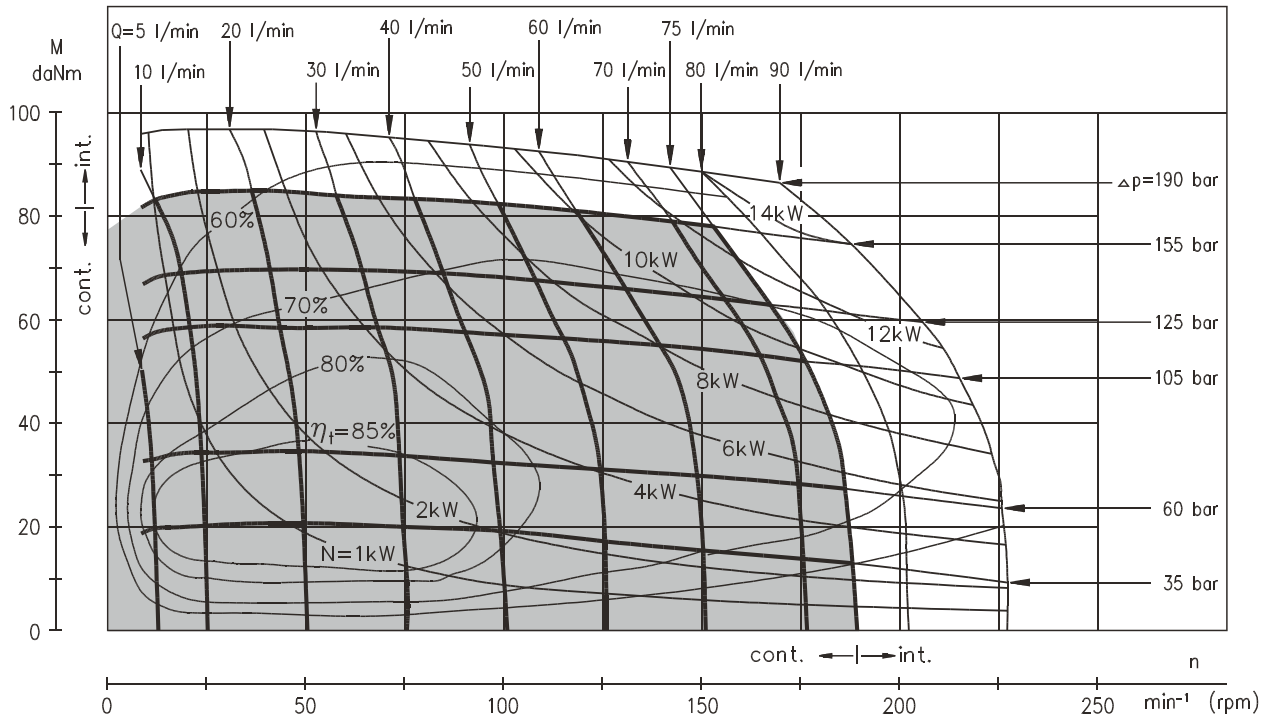
The function diagrams data was collected at back pressure 5÷10 bar and oil with viscosity of 32 mm²/s at 50° C.

FUNCTION DIAGRAMS

MH 315



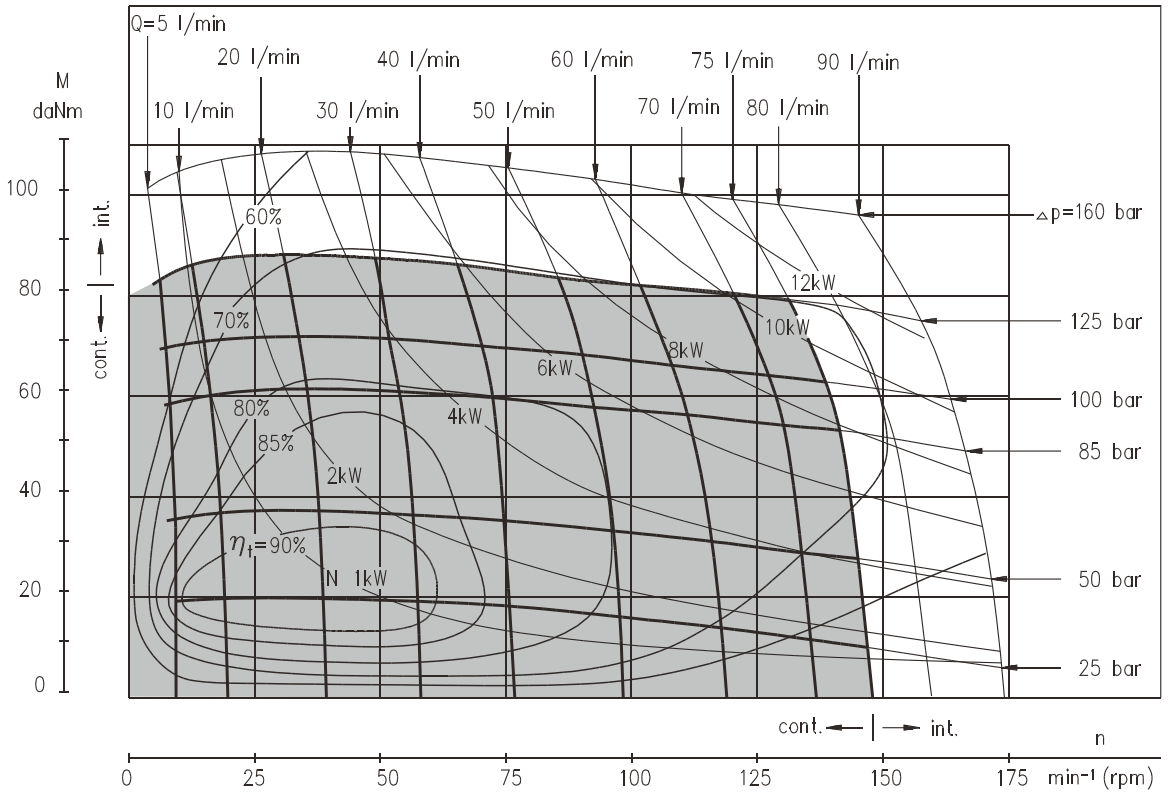
MH 400



The function diagrams data was collected at back pressure 5÷10 bar and oil with viscosity of 32 mm²/s at 50° C.

FUNCTION DIAGRAMS

MH 500



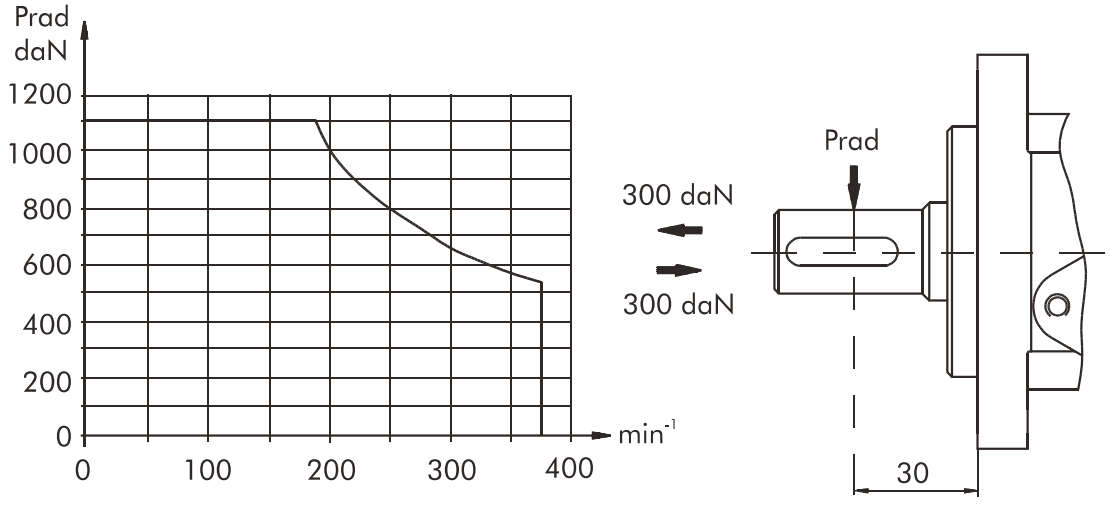
The function diagrams data was collected at back pressure 5÷10 bar and oil with viscosity of 32 mm²/s at 50° C.

PERMISSIBLE SHAFT LOADS FOR MH MOTORS

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

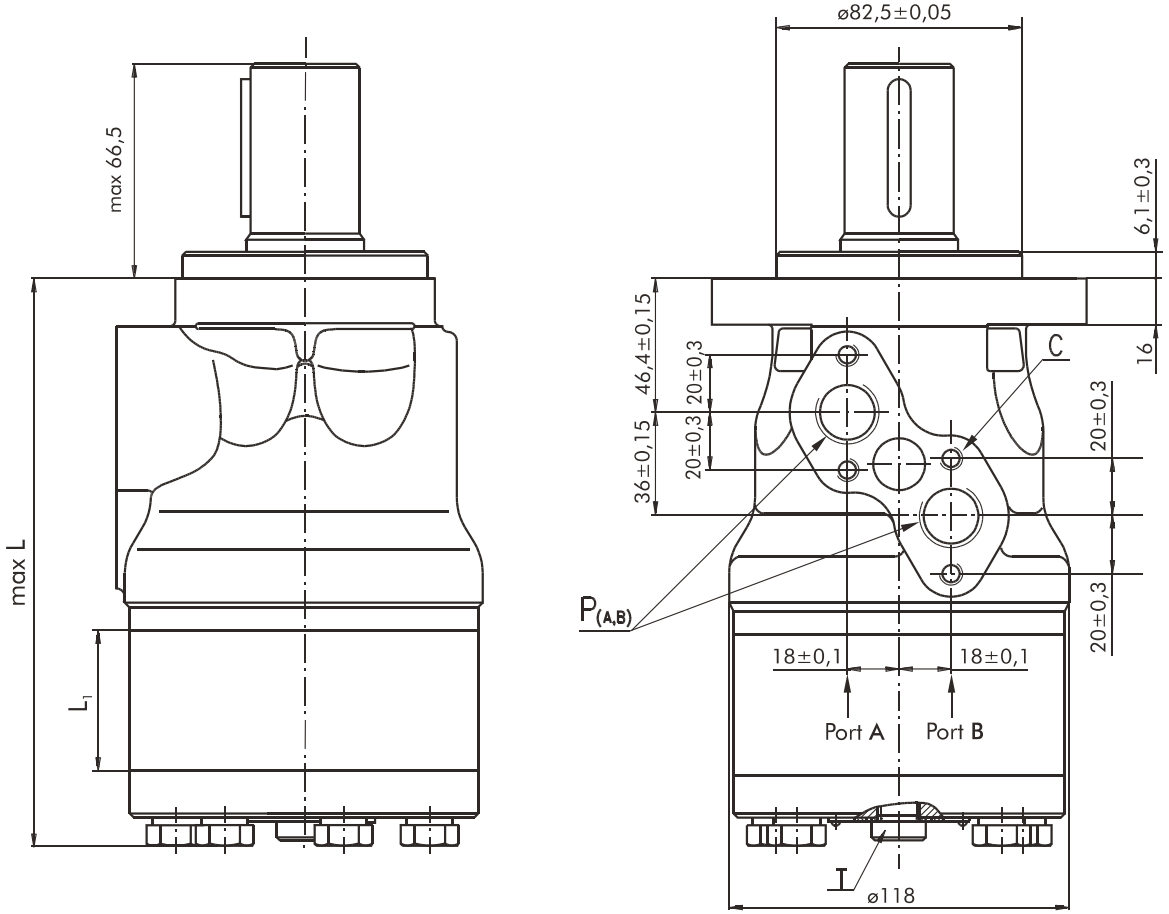
$$\text{Radial Shaft Load } P_{rad} = \frac{1100}{n} \times \frac{25000}{103{,}5+L}\text{, daN*}$$

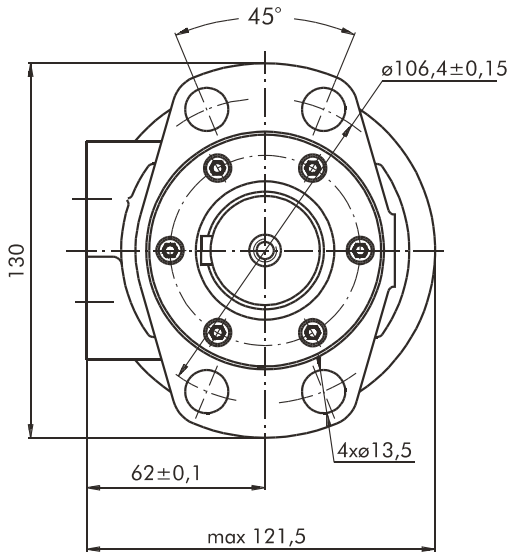
*L<60 mm; n ≥ 200 min⁻¹



DIMENSIONS AND MOUNTING DATA

Magneto Maunt (4 holes)





Type	L, mm	L1, mm
MH 200	169	27,8
MH 250	176	34,8
MH 315	184	43,5
MH 400	196	54,8
MH 500	211	69,4

C : 4xM8-13 mm depth
P(A, B): 2xG1/2 or 2xM22x1,5-15 mm depth
T : G1/4 or M14x1,5-12 mm depth (plugged)

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

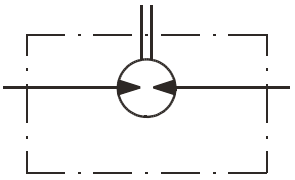
Reverse Rotation
Viewed from Shaft End
Port **A** Pressurized - **CCW**
Port **B** Pressurized - **CW**

MAX. PERMISSIBLE SHAFT SEAL PRESSURE FOR MH MOTORS

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

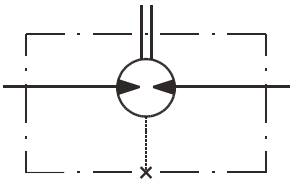
The shaft seal pressure equals the average of input pressure and return pressure.

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



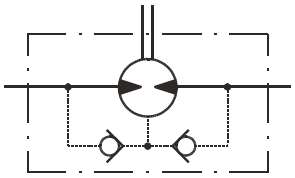
MH...U motors with high pressure seal and drain connection:

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



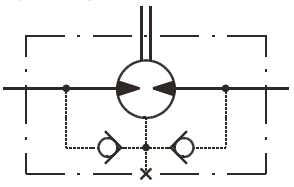
MH...1 motors with standard shaft seal and without drain connection:

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

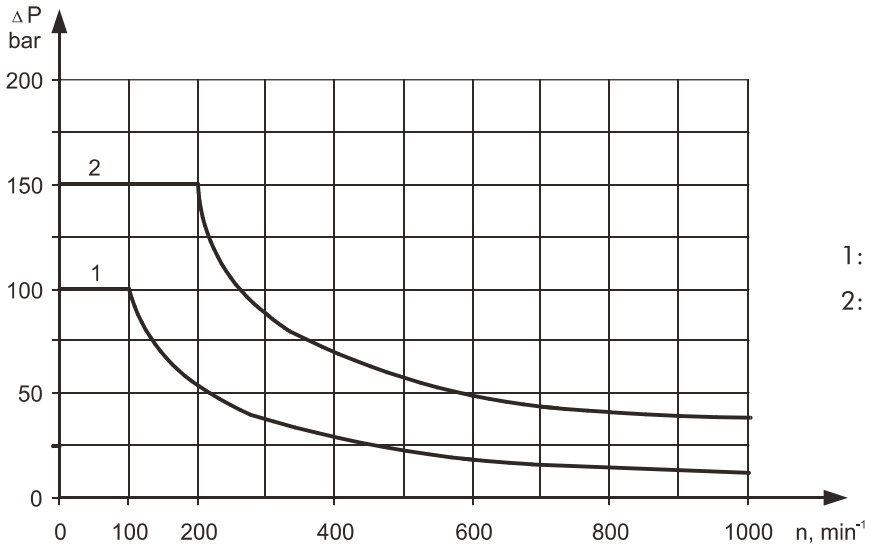


MH... motors with standard shaft seal and with drain connection:

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



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

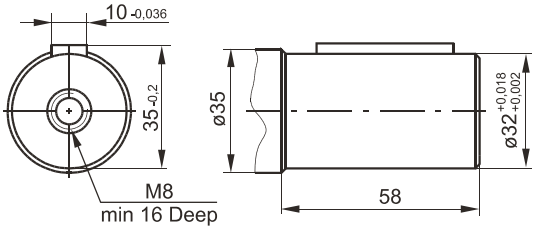


1: Drawing for Standard Shaft Seal

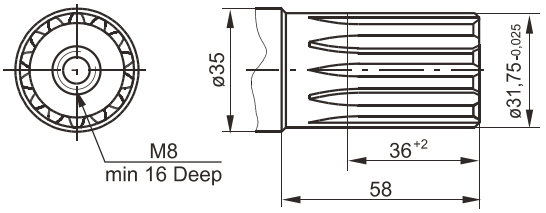
2: Drawing for High Pressure Seal ("**U**" Seal)

SHAFT EXTENSIONS

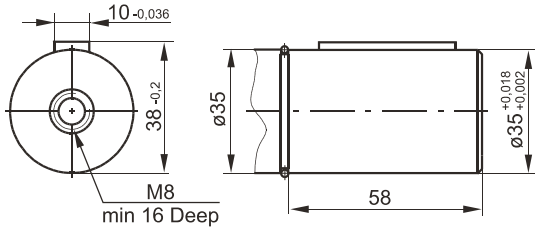
C - ø32 straight, Parallel key A10x8x45 DIN 6885
Max. Torque 77 daNm



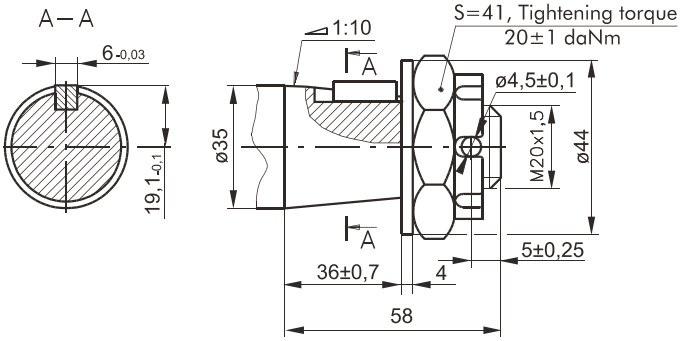
SH - ø1¼" splined 14T, DP 12/24 ANSI B92.1-1976
Max. Torque 95 daNm



CB - ø35 straight, Parallel key A10x8x45 DIN 6885
Max. Torque 95 daNm



K - tapered 1:10, Parallel key B6x6x20 DIN 6885
Max. Torque 95 daNm



ORDER CODE

	1	2	3	4	5	6	7
M H							

Pos.1 - Displacement code

200	- 201,3 [cm³/rev]
250	- 252,0 [cm³/rev]
315	- 314,9 [cm³/rev]
400	- 396,8 [cm³/rev]
500	- 502,4 [cm³/rev]

Pos.2 - Shaft Extensions *

C	- ø32 straight, Parallel key A10x8x45 DIN 6885
SH	- ø1¼" splined 14T ANSI B92.1-1970
CB	- ø35 straight, Parallel key A10x8x45 DIN 6885
K	- ø35 tapered 1:10, Parallel key B6x6x20 DIN 6885

Pos. 3 - Shaft Seal Version (see page 44)

omit	- Standard shaft seal
U	- High pressure shaft seal (without check valves)

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 46)

Pos. 7 - Design Series

omit - Factory specified

NOTES:

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

The hydraulic motors are mangano-phosphatized as standard.

MOTOR SPECIAL FEATURES

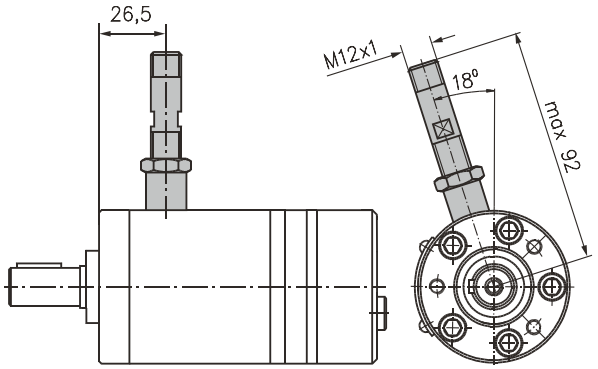
Special Feature Description	Order Code	Motor type						
		MM	MP	MPN	MPW	MR	MRN	MH
Motor for Speed Sensor*	RS	O	O	-	-	O	-	O
Low Leakage	LL	O	O	-	O	O	-	O
Low Speed Valving	LSV	O	O	-	O	O	-	O
Free Running	FR	O	O	-	O	O	-	O
Reverse Rotation	R	O	O	O	O	O	O	O
Paint**	P	O	O	O	O	O	O	O
Corrosion Protected Paint**	PC	O	O	O	O	O	O	O
Check Valves		S	S***	S	S	S***	S	S

O Optional
- Not applicable
S Standard

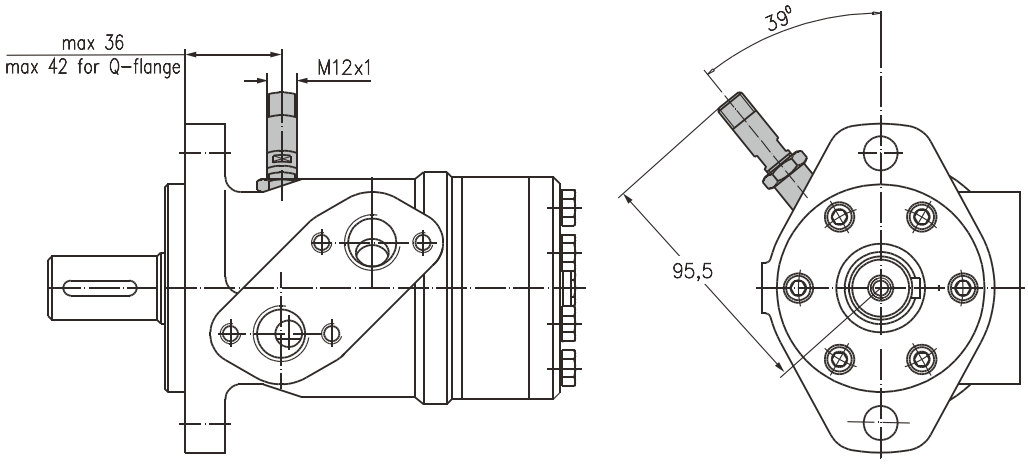
* for sensor ordering see pages 47-48
** color at customer's request.
*** without check valves for "U" shaft seal versions (see page 26)

MOTORS WITH SPEED SENSOR

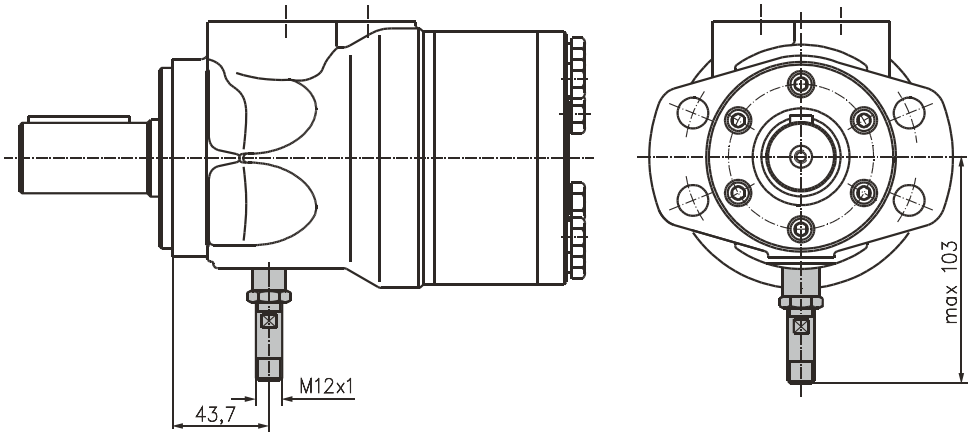
MM...RS



MP...RS and MR...RS



MH...RS



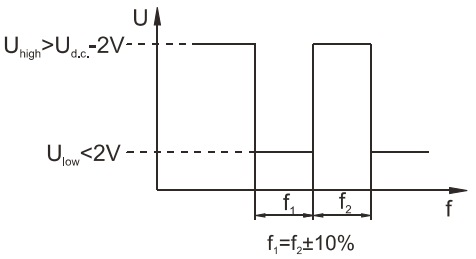
SPEED SENSOR MOTORS

TECHNICAL DATA OF THE SPEED SENSOR

Technical data

Frequency range	3...20 000 Hz
Output	PNP, NPN
Power supply	10...36 VDC
Current input	20 mA (@24 VDC)
Current load	500 mA (@24 VDC;24°C)
Ambient Temperature	minus 40... plus 125°C
Protection	IP 67
Plug connector	M12-Series
Mounting principle	ISO 6149

Output signal



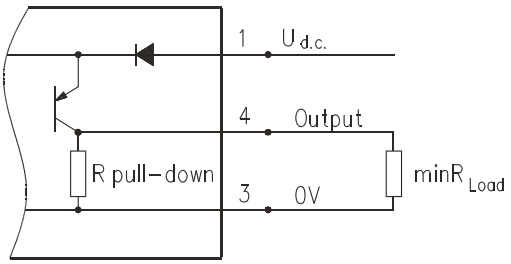
Load max.:I_{high}=I_{low}<50mA

No load current, max: 20 mA

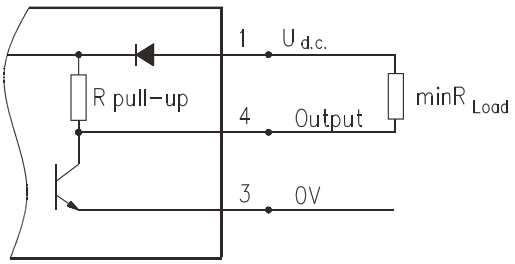
Motor type	MM	MP	MR	MH
Pulses per revolution	30	36	36	42

Wiring diagrams

PNP

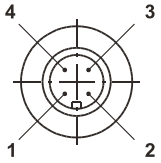


NPN



R_{Load}=$U_{d.c}$/I_{max} (=50mA)

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
PSNL5	NPN	Cable output 3x0,25; 5m long
RSPL5	PNP	Cable output 3x0,25; 5m long

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

MOTOR APPLICATION

VEHICLE DRIVE CALCULATIONS

1.Motor speed: n, [min^{-1}]

$$n=\frac{2,65 \times v \times i}{R}$$

v- vehicle speed, [km/h];
R- wheel rolling radius, [m];
i- gear ratio between motor and wheels.
If no gearbox, use i=1.

2.Rolling resistance: RR, [daN]
The resistance force resulted in wheels contact with different surfaces:

$$RR=G \times \rho$$

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

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

α- gradient negotiation angle (Table 2)

Table 2

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

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

$$FA=\frac{v \times G}{3,6 \times t}, \text{ [daN]}$$

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

5.Tractive effort: DP, [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, [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: M, [daNm]
Necessary torque moment for every hydraulic motor:

$$M=\frac{TE \times R}{N \times i \times \eta_M}$$

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

8.Cohesion between tire and road covering: M_W, [daNm]

$$M_W=\frac{G_W \times f \times R}{i \times \eta_M}$$

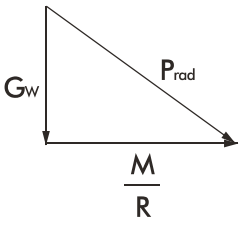
To avoid wheel slipping, it should be observed the following condition $M_W > M$
f - frictional factor;
G_W- total weight over the wheels, [daN].

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} , [daN]

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



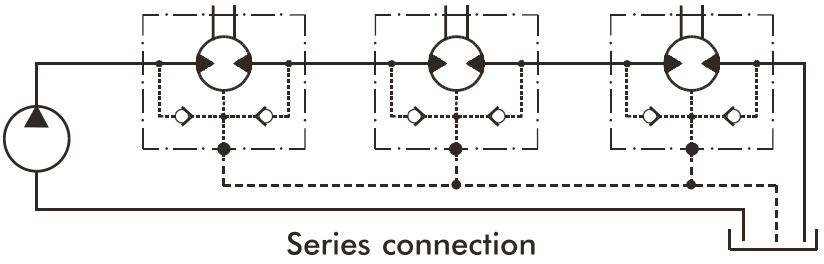
$$P_{rad} = \sqrt{G_w^2 + \left(\frac{M}{R}\right)^2}$$

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

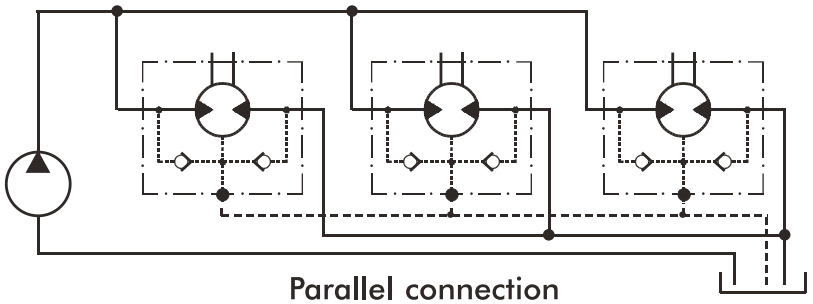
In accordance with calculated loadings the suitable motor from the catalogue is selected.

DRAINAGE SPACE AND DRAINAGE PRESSURE

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



Series connection



Parallel connection

DISC VALVE HYDRAULIC MOTORS

DISC VALVE 's function is to distribute fluid to the Roller Gear Set. The pressure balanced sealing surface on the valve face and the separately driven maintains minimal leakage and mechanical losses. These gives the motors high efficiency- even at high pressures, and good starting characteristics.

ROLLER GEAR SET minimizes friction and thereby increases efficiency while providing smooth output shaft rotation.

MS, MT and MV are suitable for continuous operation under rough operating conditions- high pressures, thin oil, or frequent reversals. The Tapered roller bearings permit high radial loads.

Standard Motor

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

Wheel Motor

The wheel motor mounting flange is located near the center of the motor which permits part or all of the motor to be located inside the wheel or roller hub. In traction drive applications, loads can be positioned over the motor bearings for best bearing life. This wheele motor mounting flange provides design flexibility in many applications.

Short Motor

This motor is assembled without the output shaft, bearings and bearing housing and has the same drive components as the standard and wheel motors. The short motor is especially suited for applications such as gear boxes, winch, reel and roll drives. Short motor applications must be designed with a bearing supported internal spline to mate with the bearing less motor drive. Product designs using these hydraulic motors provide considerable cost savings.

Low Leakage

LL Series hydraulic motors have been designed to operate at the whole standard range of working conditions (pressure drop and frequency of rotation) , but with considerable decreased volumetric losses in the drainage ports. Their main purpose is to operate as series-connected motors in hydraulic systems.
For this version is permissible decreasing of the maximal torque with up to 5% (at middle speed) and up to 10 % (at high speed) in comparison to the standard versions of motors.
This version is available for the EPMS motors.

Low Speed Valve

LSV Series hydraulic motors have been designed to operate with normal pressure drop and to ensure smooth run at low speed (up to 200 min^{-1}), as the best security for operation is guaranteed at frequency of rotation 20 ÷ 50 min^{-1} . They have an increased starting pressure drop and are not recommended for using at pressure less than 40 bar.
This version is available for the EPMS motors.