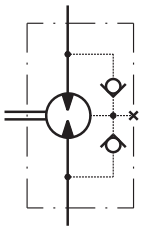
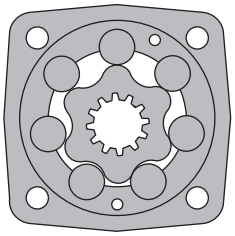
HYDRAULIC MOTORS MLHSEM

APPLICATION

» Sawmill machines
» Woodworking machines
» Metal working machines
» Agricultural machines
» Road building machines
» Mining machinery
» Food industries
» Special vehicles etc.





CONTENTS

OPTIONS

» Model - Disc valve, roll-gerotor
» Wheel mount
» Side ports
» Shaft - tapered
» SAE and Metric ports
» Other special features

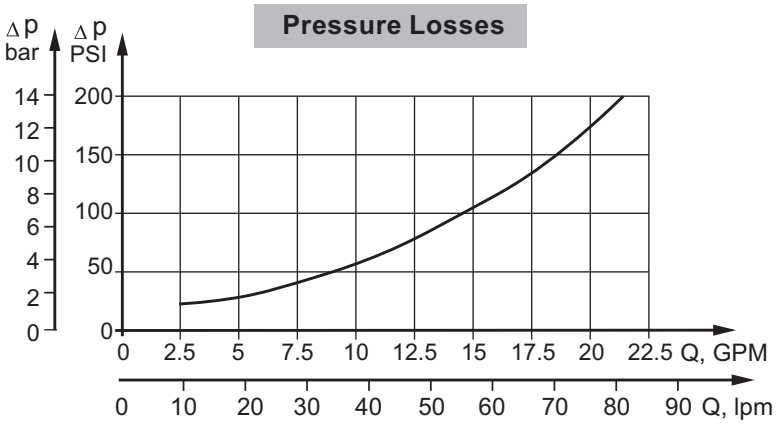
GENERAL

Max. Displacement, in^3/rev [cm^3/rev]	397 [24.2]
Max. Speed, [RPM]	560
Max. Torque, lb-in [daNm]	cont.: 90 [7965] int: 110 [9735]
Max. Output, HP [kW]	24 [32.2]
Max. Pressure Drop, PSI [bar]	cont.: 200 [2900] int: 225 [3270]
Max. Oil Flow, GPM [lpm]	90 [24]
Min. Speed, [RPM]	5
Pressure fluid	Mineral based- HLP(DIN 51524) or HM(ISO 6743/4)
Temperature range, ^oF [^oC]	-40÷284 [-40÷140]
Optimal Viscosity range, SUS [mm^2/s]	98÷347 [20÷75]
Filtration	ISO code 20/16 (Min. recommended fluid filtration of 25 microns)

Oil flow in drain line

Pressure drop PSI [bar]	Viscosity SUS [mm^2/s]	Oil flow in drain line GPM [lpm]
2030 [140]	98 [20]	.396 [1,5]
	164 [35]	.264 [1]
3045 [210]	98 [20]	.793 [3]
	164 [35]	.528 [2]

Pressure Losses



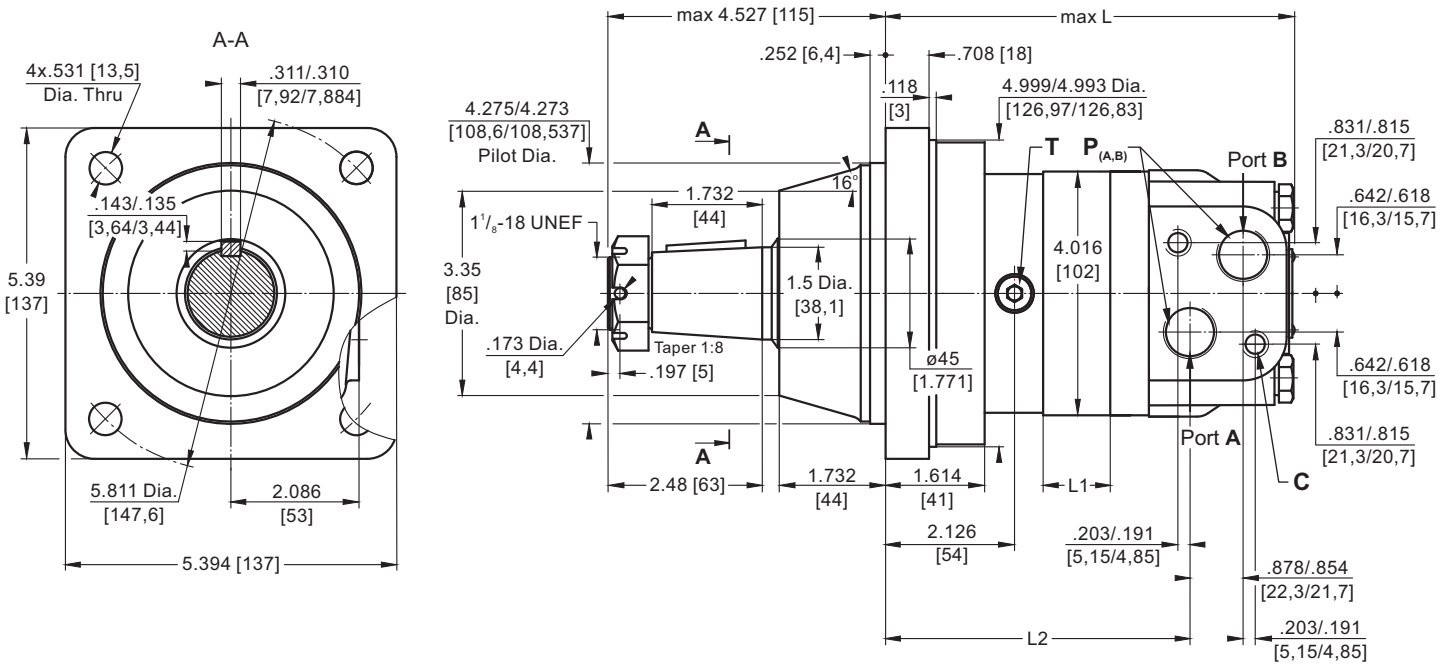
SPECIFICATION DATA

Type		MLHSEM 160	MLHSEM 200	MLHSEM 250	MLHSEM 315	MLHSEM 400
Displacement, in^3/rev [cm^3/rev]		9.74 [159,7]	12.2 [200]	15.3 [250]	19.2 [314,9]	24.2 [397]
Max. Speed,	cont.	470	375	300	240	185
[RPM]	Int.*	560	450	360	285	225
Max. Torque	cont.	4070 [46]	5010 [56,6]	6270 [70,8]	7965 [90,0]	7965 [90,0]
lb-in [daNm]	Int.*	4560 [51,5]	5710 [64,5]	7135 [80,6]	8500 [96,0]	8585 [97,0]
	peak**	4560 [51,5]	5755 [65]	7135 [80,6]	9560 [108]	9735 [110]
Max. Output	cont.	24.9 [18,6]	24.3 [18,1]	24.1 [18,0]	22.8 [17,0]	14.7 [11,0]
HP [kW]	int.*	32.2 [24,0]	32.2 [24,0]	31.9 [23,8]	27.1 [20,2]	16.1 [12]
Max. Pressure Drop	cont.	2900 [200]	2900 [200]	2900 [200]	2900 [200]	2320 [160]
PSI [bar]	Int.*	3270 [225]	3270 [225]	3270 [225]	3190 [220]	2540 [175]
	peak**	3270 [225]	3270 [225]	3270 [225]	3270 [225]	2900 [200]
Max. Oil Flow	cont.	20 [75]	20 [75]	20 [75]	20 [75]	20 [75]
GPM [lpm]	Int.*	24 [90]	24 [90]	24 [90]	24 [90]	24 [90]
Max. Inlet Pressure	cont.	3045 [210]	3045 [210]	3045 [210]	3045 [210]	3045 [210]
PSI [bar]	Int.*	3625 [250]	3625 [250]	3625 [250]	3625 [250]	3625 [250]
	peak**	4350 [300]	4350 [300]	4350 [300]	4350 [300]	4350 [300]
Max. Return Pressure	cont.	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]
with Drain Line	Int.*	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]
PSI [bar]	peak**	3045 [210]	3045 [210]	3045 [210]	3045 [210]	3045 [210]
Max. Starting Pressure with Unloaded Shaft, PSI [bar]		145 [10]	145 [10]	145 [10]	145 [10]	145 [10]
Min. Starting Torque lb-in [daNm]		3270 [36,9]	4090 [46,2]	5135 [58,0]	6530 [73,8]	6370 [72,0]
Min. Speed***, [RPM]		6	6	6	5	5
Weight, kg [lb]		14,3 [31.5]	14,7 [32.4]	15,2 [33.5]	15,9 [35.1]	16,8 [37.0]

* 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 70 SUS [13 mm^2/s] at 122°F [50°C].
5. Recommended maximum system operating temperature is 180°F [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.

DIMENSIONS AND MOUNTING DATA



	Versions	
	2	4
C	2xM10	2x3/8-16UNC
P(A,B)	2xG½	2x7/8-14UNF
T	G¼	7/16-20UNF

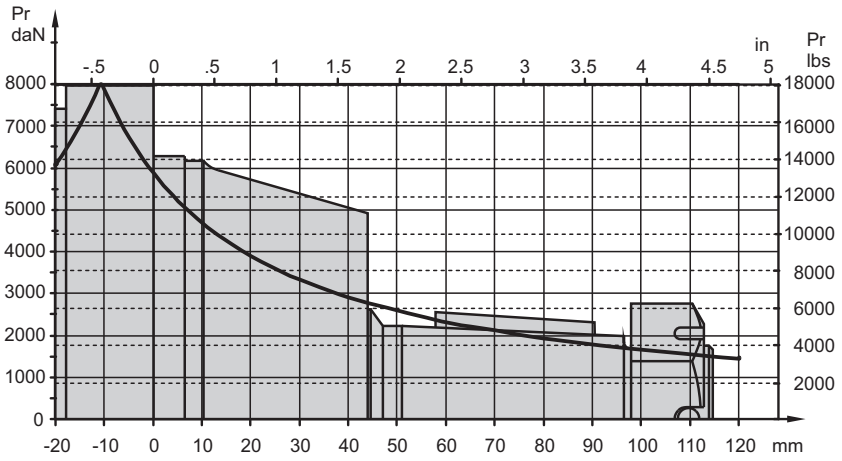
Type	L, in [mm]	L2, in [mm]	L1, in [mm]
MLHSEM 160	6.71 [170,5]	5.09 [129,3]	1.09 [27,8]
MLHSEM 200	6.99 [177,5]	5.37 [136,3]	1.37 [34,8]
MLHSEM 250	7.32 [186,0]	5.71 [145,0]	1.71 [43,5]
MLHSEM 315	7.78 [197,5]	6.19 [157,3]	2.16 [54,8]
MLHSEM 400	8.35 [212,0]	6.73 [171,0]	2.73 [69,4]

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**

PERMISSIBLE SHAFT LOADS

The output shaft runs in tapered bearings that permit high axial and radial forces.
Curve shows max. radial shaft load at bearing life of 2000 hours at 100 RPM.



ORDER CODE

	1	2	3	4	5
M L H S E M					

Pos.1 - Displacement code

160	- 9.74 in³/rev [159,7 cm³/rev]
200	- 12.20 in³/rev [200,0 cm³/rev]
250	- 15.30 in³/rev [250,0 cm³/rev]
315	- 19.20 in³/rev [314,9 cm³/rev]
400	- 24.20 in³/rev [397,0 cm³/rev]

Pos.2 - Shaft Extensions

T	- 1½"[38,1] Tapered, Parallel key 5/16"x5/16"x1 1/4" BS46

Pos.3 - Port Size/Type [standard manifold to each]

2	- side ports, 2xG1/2, G1/4, BSP thread, ISO 228
4	- side ports, 2x7/8-14 UNF, O-ring, 7/16-20 UNF

Pos.4 - Additional Options [see page 69]

Pos.5 - Design Series

omit - Factory specified

in [mm]

The hydraulic motors are mangano phosphatized as standard.

MOTOR ADDITIONAL OPTIONS

Additional Options Description	Order Code	Motor type						
		MLHSEM	MTK	MLHTM	TMF	TMYF	MVM	VMF
Speed Sensor*	RS	O	O	O	O	O	O	O
Reinforced motor	HD	–	S	S	S	S	S	S
Low Leakage	LL	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	–
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
Special Paint***	PS	O	O	O	O	O****	O	O
	PCS							
Check Valves		S	O	O	–	O	O	–

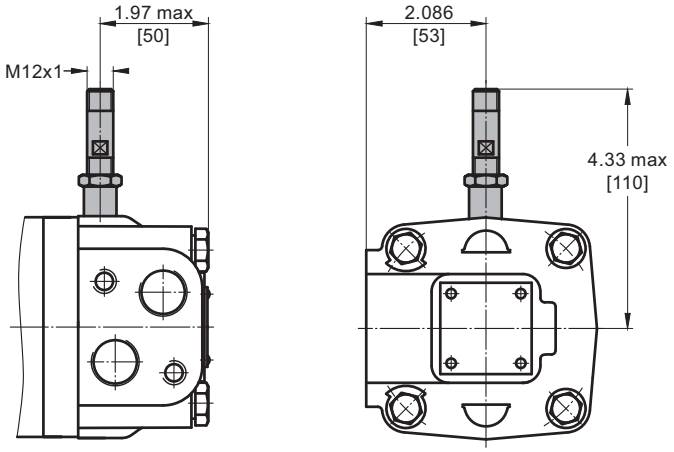
O	Optional
-	Not applicable
S	Standard

* For sensor ordering see pages 70÷71.
** Colour at customer's request.
*** Non painted feeding surfaces, colour at customer's request.

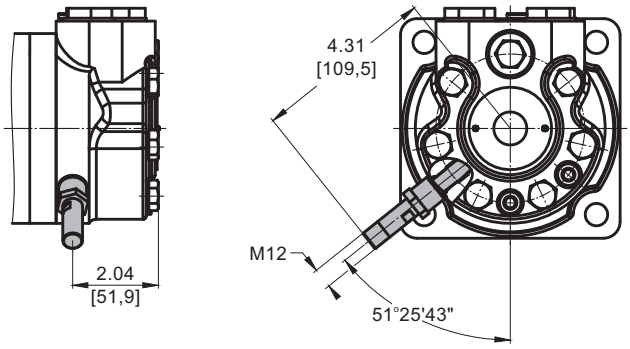
⚠ For more information about **HD** option please contact with "M+S Hydraulic".

MOTORS WITH SPEED SENSOR

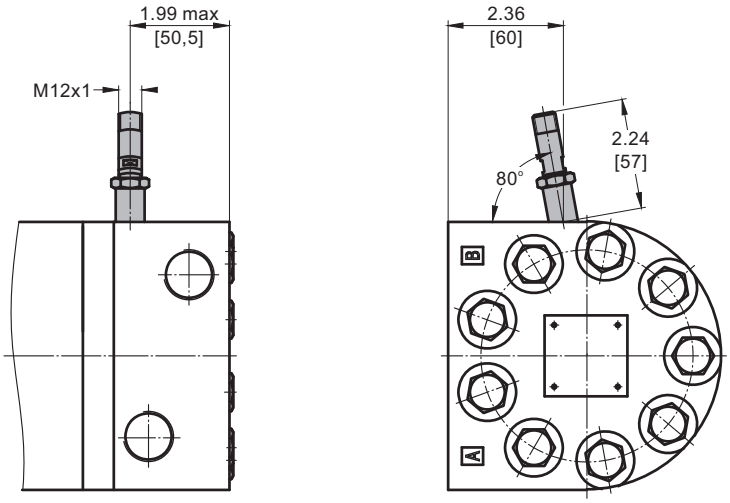
MLHSEM...RS



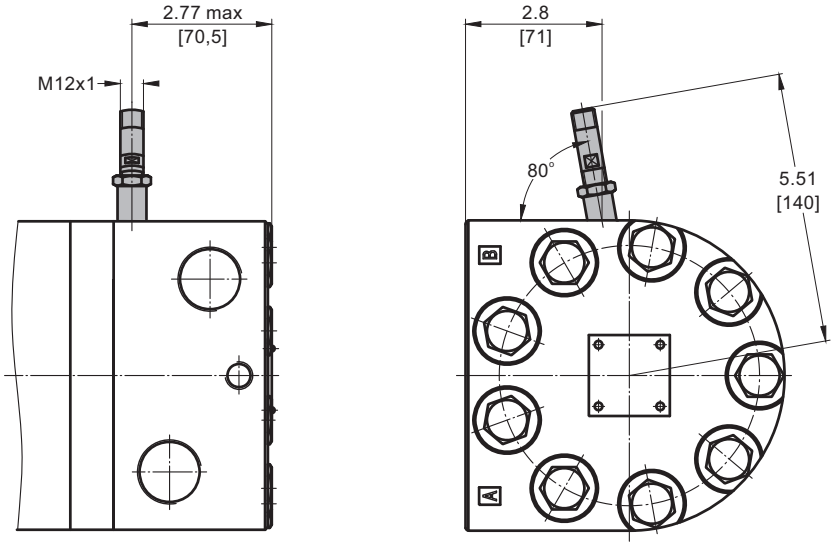
MTK...RS



MLHTM...RS
TMF...RS



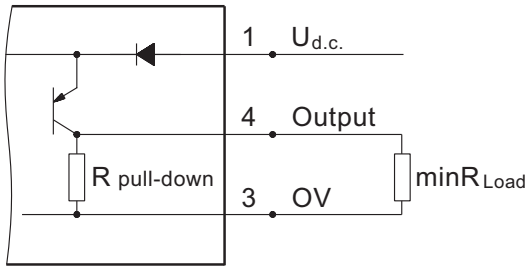
MVM...RS
VMF...RS



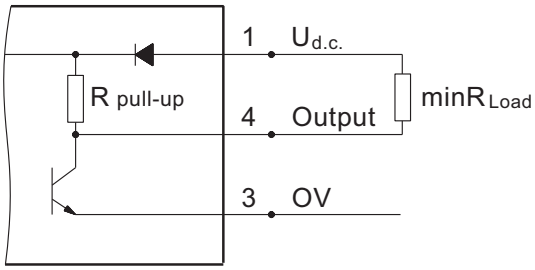
TECHNICAL DATA of the SPEED SENSOR

Wiring diagrams

PNP



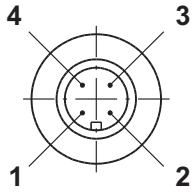
NPN



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

Motor type	MLHSEM MTK	MLHTM TMF	MVM VMF	DW
Pulses per revolution	54	84	102	30

Stick type



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

Order Code for Speed Sensor

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

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

APPLICATION CALCULATION

VEHICLE DRIVE CALCULATIONS

1. Motor speed: n [RPM]

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

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

2. Rolling resistance: RR, lbs [daN]

The resistance force resulted in wheels contact with different surfaces:

$$RR=G \times \rho$$

G - total weight loaded on vehicle, 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%	0º 35'	12%	6º 5'
2%	1º 9'	15%	8º 31'
5%	2º 51'	20%	11º 19'
6%	3º 26'	25%	14º 3'
8%	4º 35'	32%	18º
10%	5º 43'	60%	31º

4. Accelerarion force: FA, lbs [daN]

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

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

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

5. Tractive effort: DP, lbs [daN]

Tractive effort **DP** is the additional force of trailer. This value will be established as follows:
- acc. to constructor's assessment;
- as calculating forces in items 2, 3 and 4 of trailer; the calculated sum corresponds to the tractive effort requested.

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

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

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

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

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

Necessary torque moment for every hydraulic motor:

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

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

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

Necessary torque moment for every hydraulic motor:

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

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

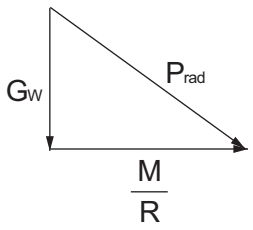
f - frictional factor;
$\mathbf{G_W}$ - total weight over the wheels, lbs [daN].

Table 3

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

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

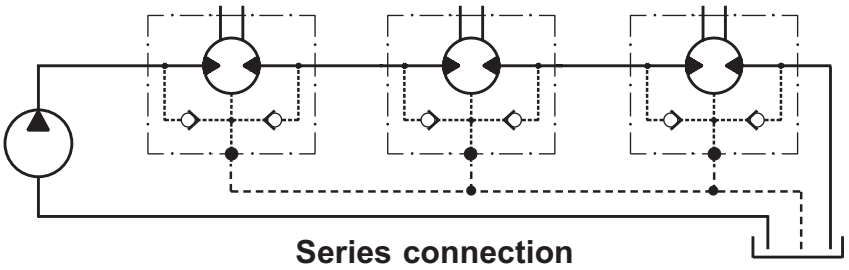
When motor is used for vehicle motion with wheels mounted directly on motor shaft, the total radial loading of motor shaft **Prad** is a sum of motion force and weight force acting on one wheel.



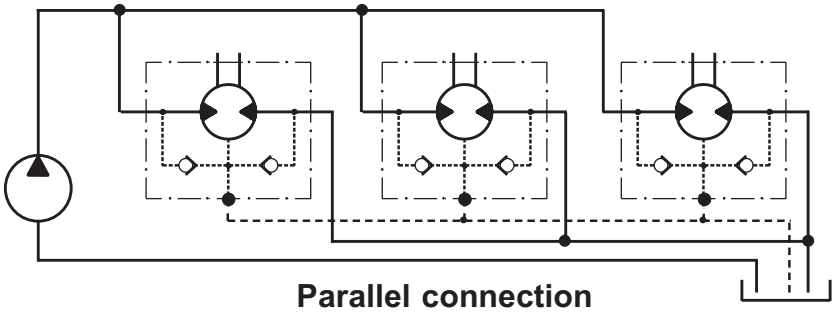
$$P_{rad}=\sqrt{G_W^2+\left(\frac{M}{R}\right)^2}$$

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.



Series connection



Parallel connection