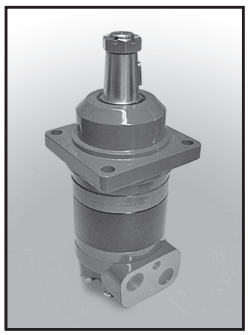
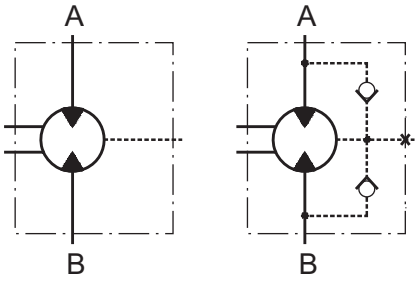
HYDRAULIC MOTORS MTK



APPLICATION

- Conveyors
- Metal working machines
- Machines for agriculture
- Road building machines
- Mining machinery
- Food industries
- Special vehicles
- Plastic and rubber machinery etc.



CONTENTS

OPTIONS

- Model- Disc valve, roll-gerotor
- Flange mount with wheel mount
- Side and rear ports
- Shafts- straight, splined and tapered
- Metric, SAE and BSPP ports
- Other special features

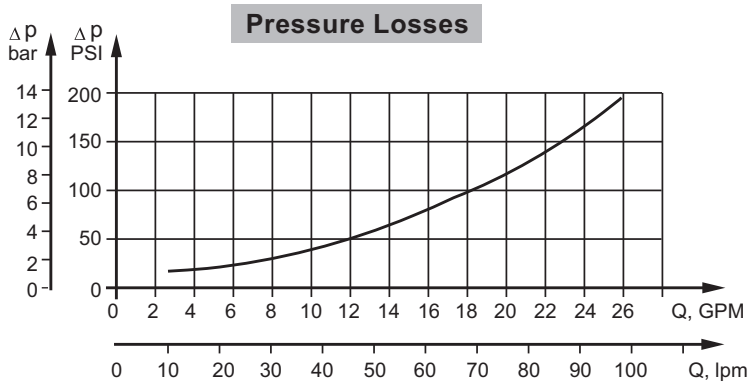
GENERAL

Max. Displacement, cm^3/rev [in^3/rev]	502,4 [30.65]
Max. Speed, [RPM]	630
Max. Torque, daNm [lb-in]	cont.: 109 [9648] int.: 136 [12037]
Max. Output, kW [HP]	27 [36.2]
Max. Pressure Drop, bar [PSI]	cont.: 250 [3626] int.: 325 [4714]
Max. Oil Flow, lpm [GPM]	100 [26.4]
Min. Speed, [RPM]	10
Permissible Shaft Loads, daN [lbs]	P_a=6000 [13488]
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: 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]
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

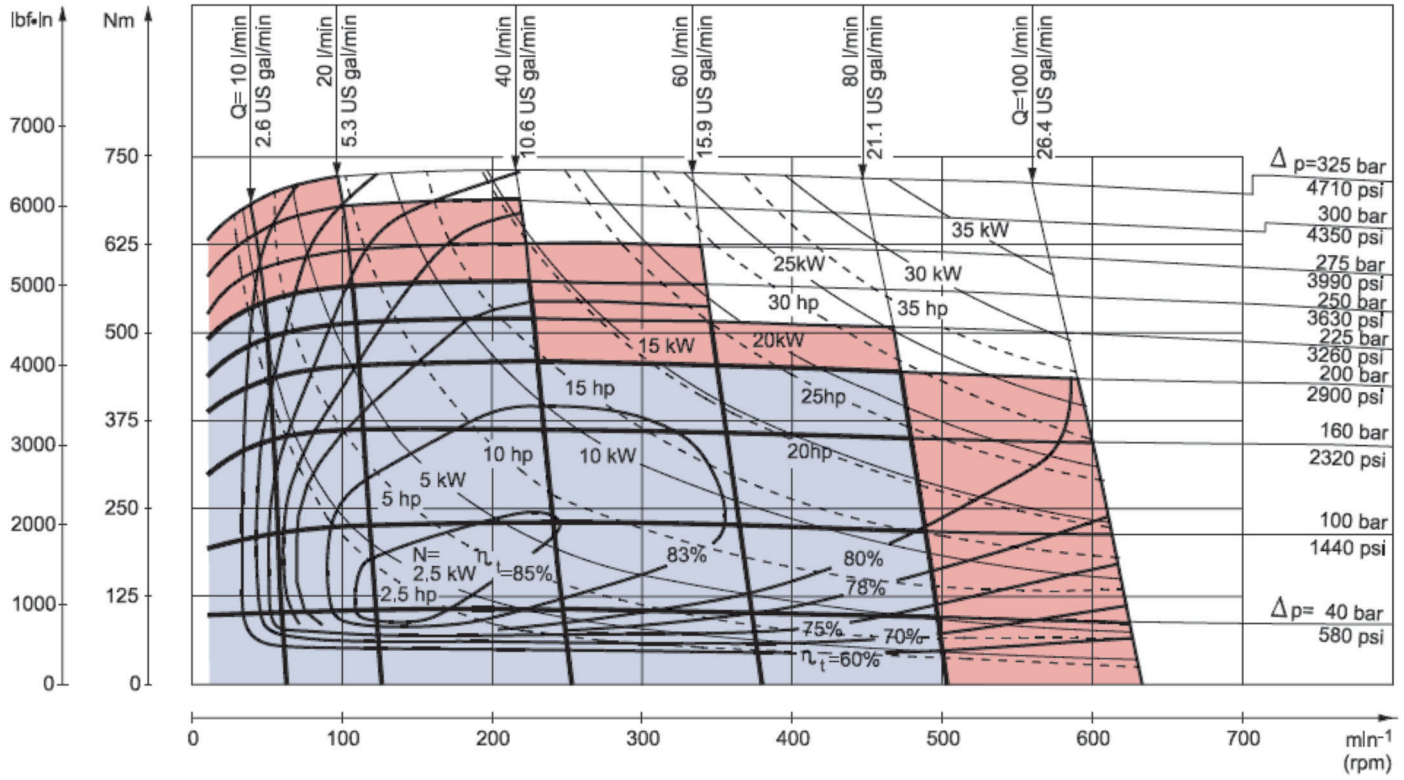
Type		MTK 160	MTK 200	MTK 250	MTK 315	MTK 400	MTK 470	MTK 500
Displacement, cm^3/rev [in^3/rev]		157,9 [9.63]	201,3 [12.28]	252,2 [15.38]	314,9 [19.2]	396,8 [24.2]	470,5 [28.7]	502,4 [30.65]
Max. Speed, [RPM]	Cont.	505	400	320	255	200	170	159
	Int.*	630	500	400	315	250	210	199
Max. Torque, daNm [lb-in]	Cont.	57 [5045]	72 [6373]	91 [8055]	105 [9293]	107 [9470]	102 [9028]	109 [9648]
	Int.*	72,5 [6420]	92 [8143]	107 [9470]	131 [11595]	140 [12390]	133 [11772]	136 [12037]
Max. Output, kW [HP]	Cont.	22 [29.5]	22 [29.5]	21 [28.2]	20 [26.8]	17,5 [23.5]	14 [18.8]	14 [18.8]
	Int.*	27 [36.2]	27 [36.2]	25 [33.5]	23,5 [31.5]	22 [29.5]	17,5 [23.5]	17 [22.8]
Max. Pressure Drop, bar [PSI]	Cont.	250 [3626]	250 [3626]	250 [3626]	250 [3626]	200 [2900]	160 [2320]	160 [2320]
	Int.*	325 [4714]	325 [4714]	300 [4350]	300 [4350]	250 [3626]	200 [2900]	200 [2900]
Max. Inlet Pressure, bar [PSI]	Cont.	250 [3626]						
	Int.*	350 [5077]						
Max. Oil Flow, lpm [GPM]	Cont.	80 [21.1]						
	Int.*	100 [26.4]						
Max. Starting Pressure with Unloaded Shaft, bar [PSI]		8 [116]	8 [116]	7 [102]	7 [102]	7 [102]	7 [102]	7 [102]
Min. Starting Torque, daNm [lb-in]	at max. pressure drop cont.	43 [3806]	54 [4780]	68 [6020]	79 [6992]	80 [7080]	83 [7346]	84 [7435]
	at max. pressure drop int.*	54.5 [4824]	69 [6107]	80 [7080]	98,5 [8720]	105 [9294]	105 [9294]	105 [9294]
Min. Speed**, RPM**		10						
Max. Return Pressure without Drain Line, bar [PSI]		see diagram						
Max. Return Pressure with Drain Line, bar [PSI]	Cont.	140 [2030]						
	Int.*	175 [2540]						
	Peak*	210 [3046]						
Weight, lb [kg]	MTKW	16,0 [35.3]	16,5 [36.4]	17,0 [37.5]	17,5 [38.6]	18,0 [39.7]	18,5 [40.8]	19,0 [41.9]
	MTKC	16,9 [37.3]	17,4 [38.4]	17,9 [39.5]	18,4 [40.6]	18,9 [41.7]	19,4 [42.8]	19,9 [43.9]
	MTKF	14,2 [31.3]	17,7 [32.4]	15,2 [33.5]	15,7 [34.6]	16,2 [35.7]	16,7 [36.8]	17,2 [37.9]

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

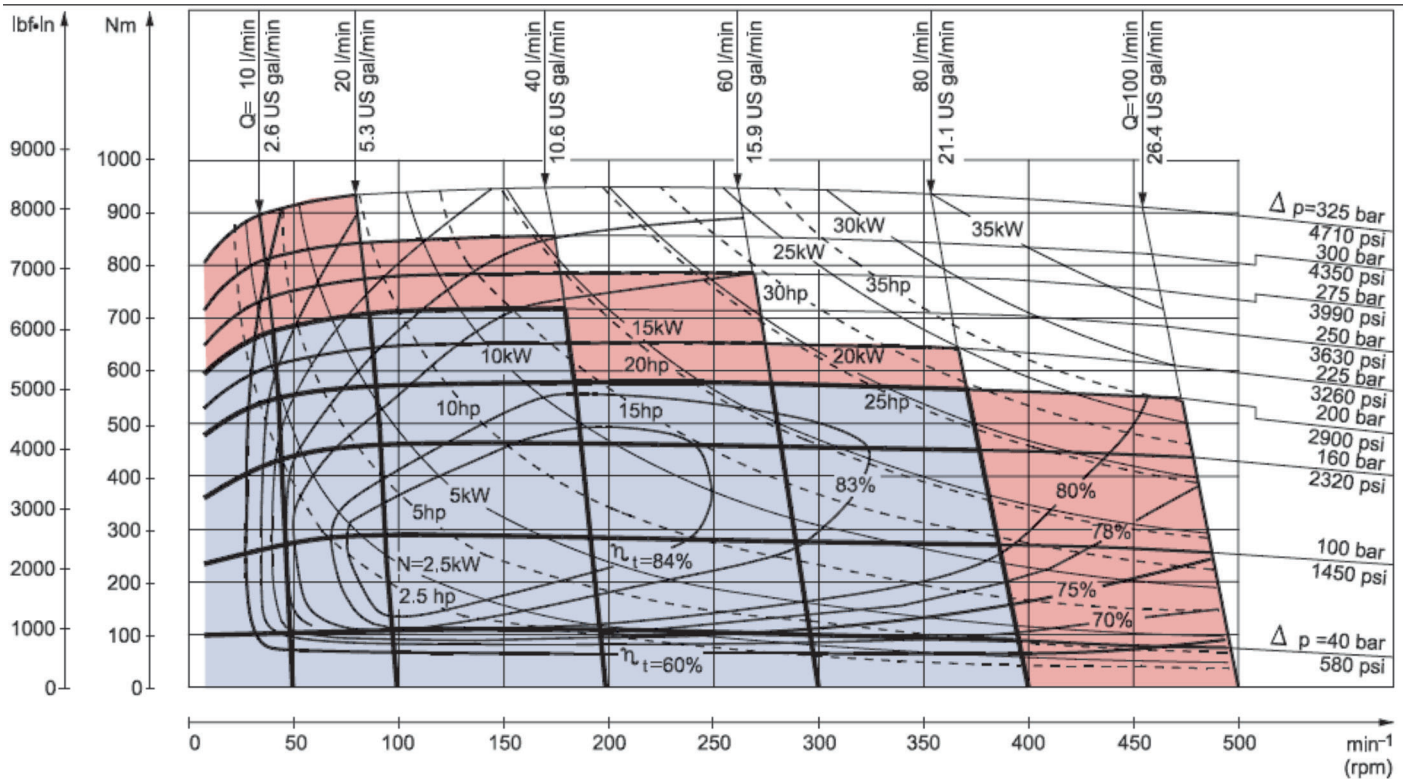
1. Intermittent speed and intermittent pressure must not occur simultaneously.
2. Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
3. Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP(DIN51524) or HM (ISO 6743/4). If using synthetic fluids consult the factory for alternative seal materials.
4. Recommended minimum oil viscosity 13 mm^2/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

MTK 160



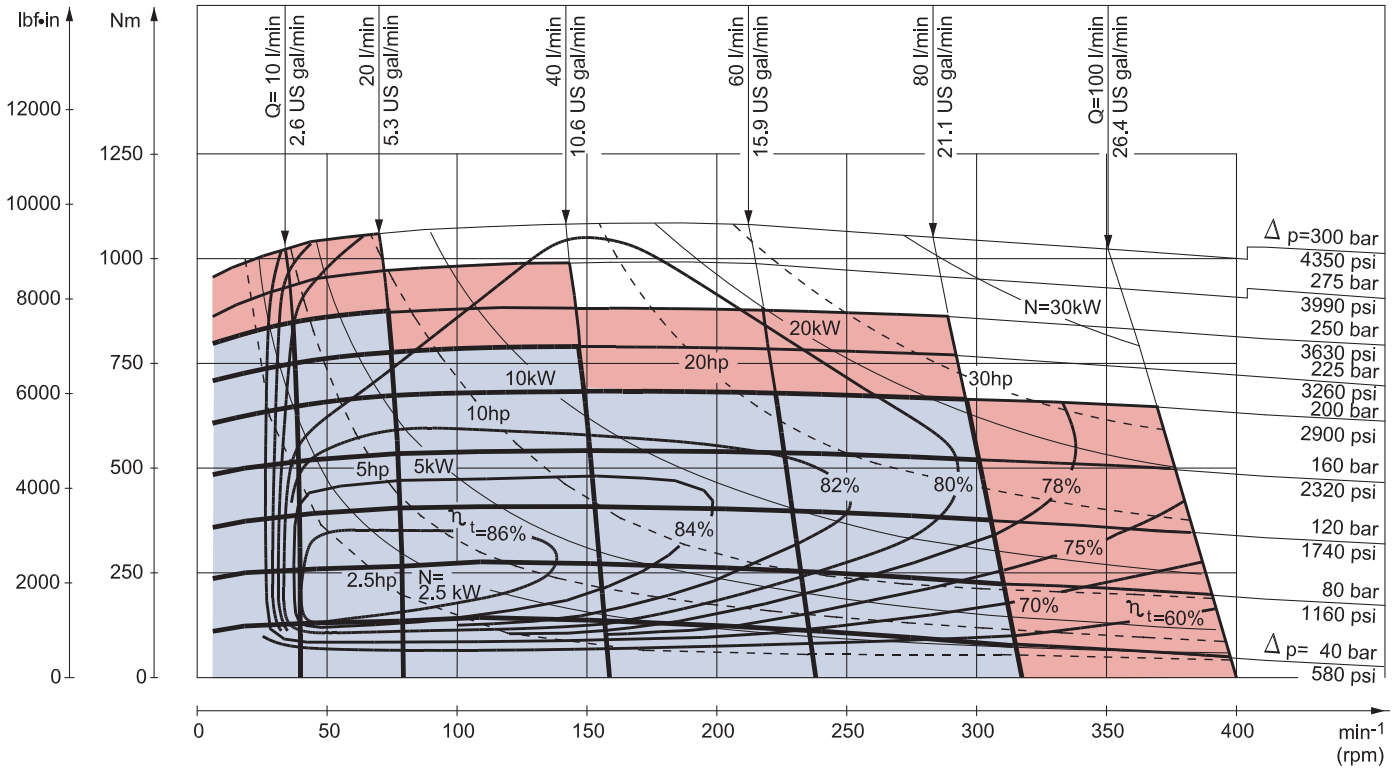
MTK 200



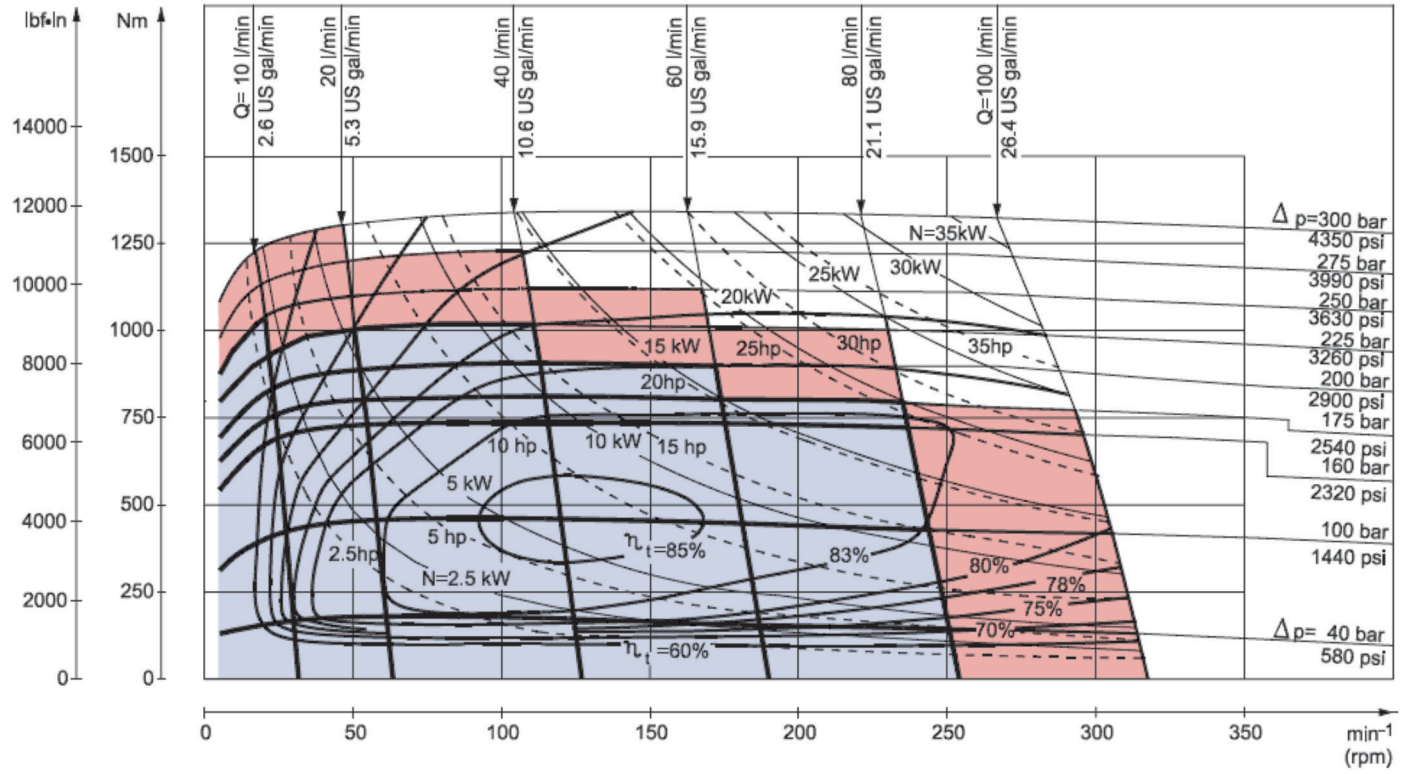
The function diagrams data is for average performance of randomly selected motors at back pressure 5÷10 bar [72.5 PSI÷145 PSI] and oil with viscosity of 32 mm²/s [150 SUS] at 50°C [122°F].

FUNCTION DIAGRAMS

MTK 250



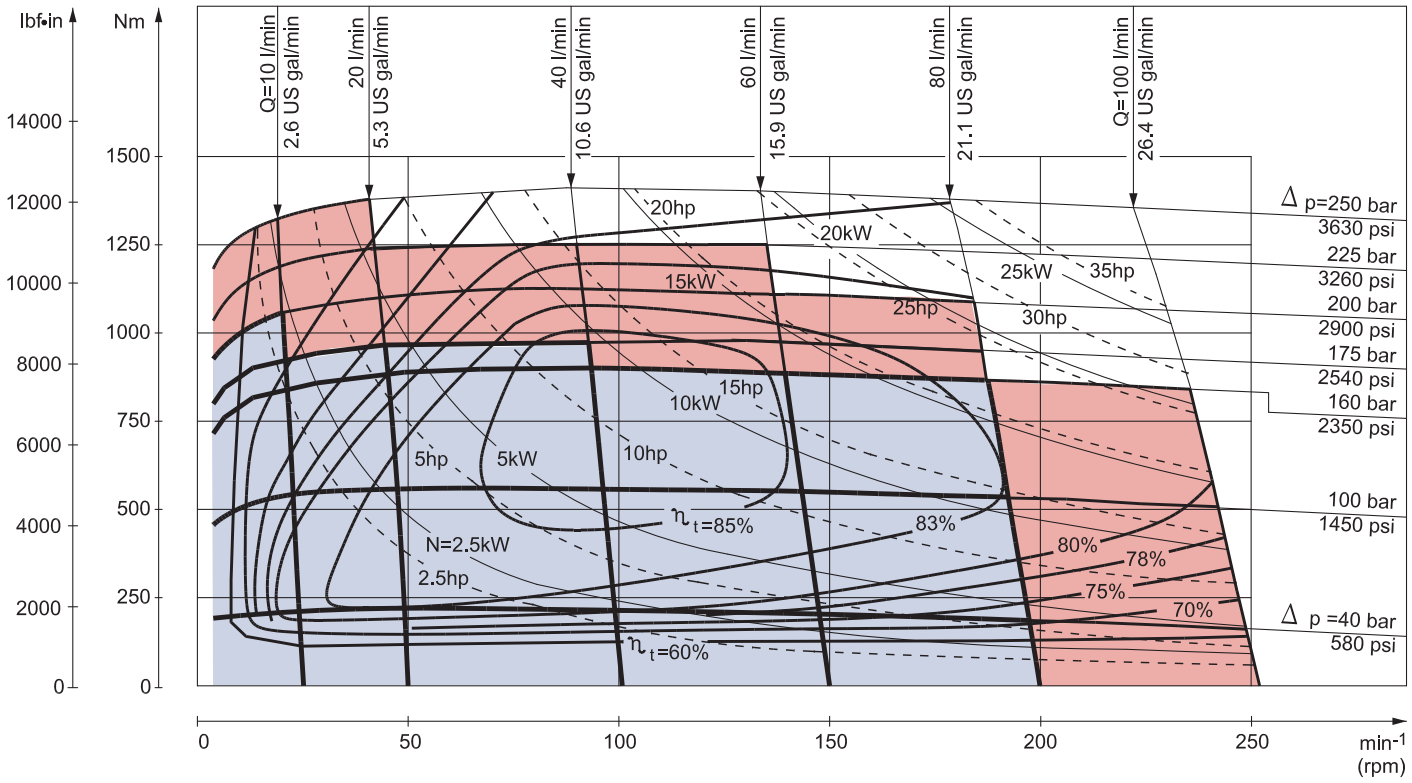
MTK 315



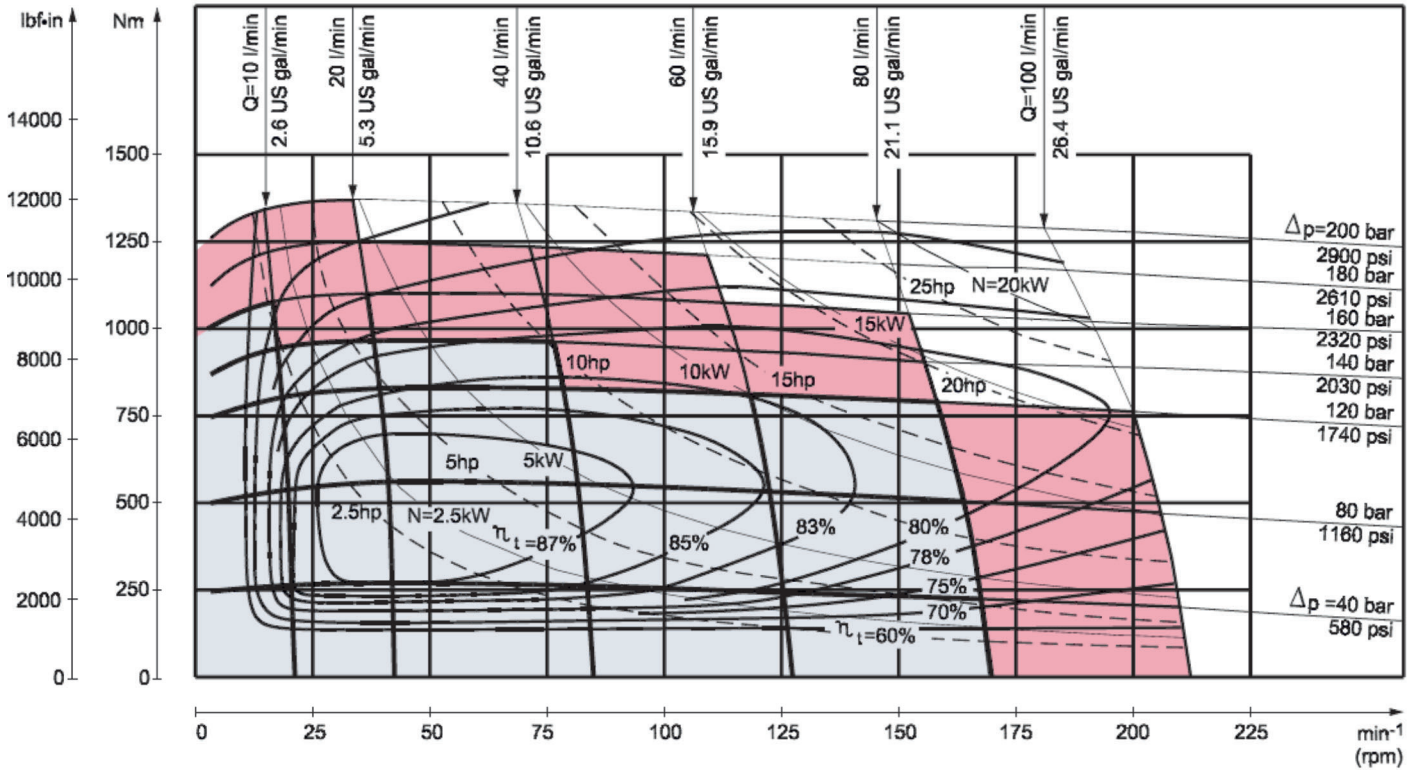
The function diagrams data is for average performance of randomly selected motors at back pressure 5÷10 bar [72.5 PSI÷145 PSI] and oil with viscosity of 32 mm²/s [150 SUS] at 50°C [122°F].

FUNCTION DIAGRAMS

MTK 400

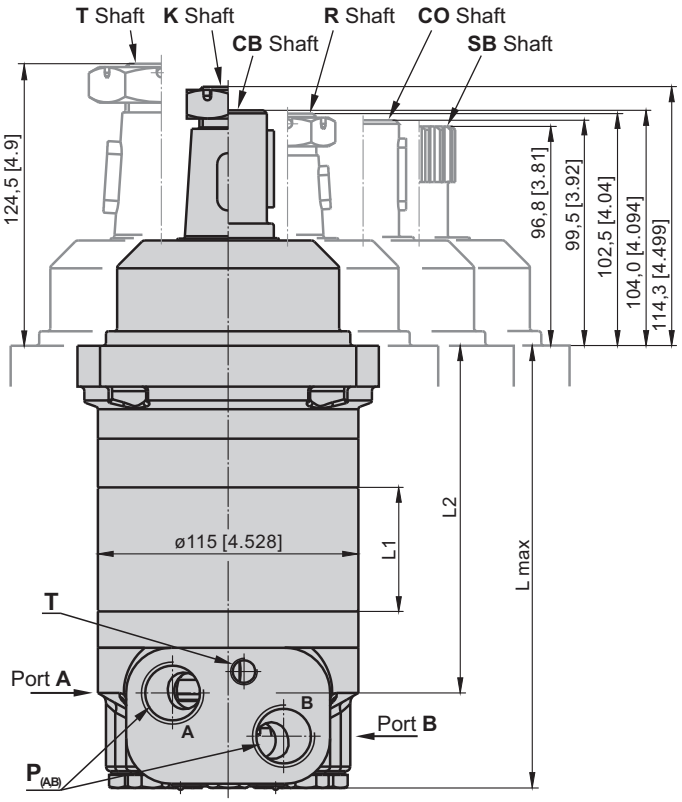


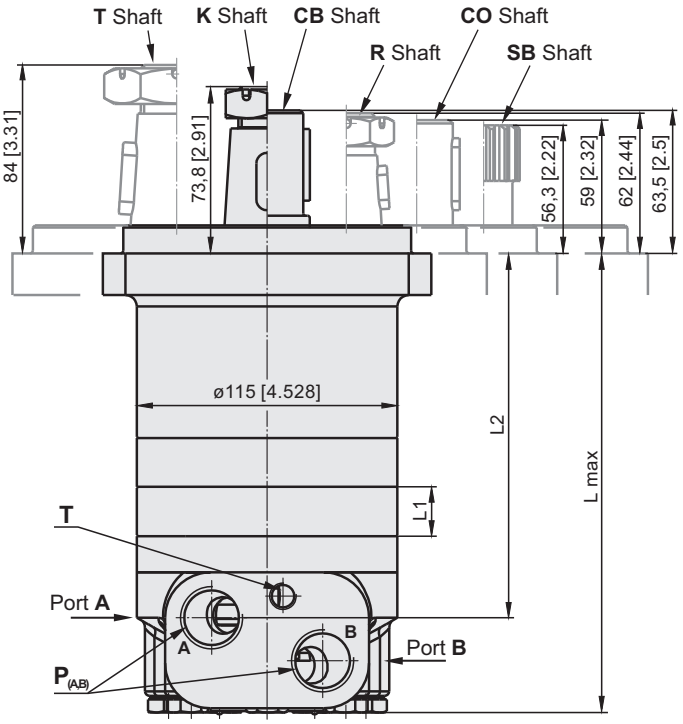
MTK 470



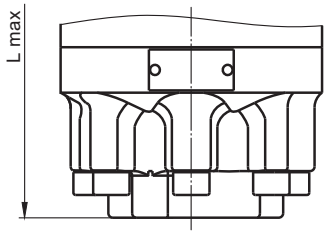
The function diagrams data is for average performance of randomly selected motors at back pressure 5÷10 bar [72.5 PSI÷145 PSI] and oil with viscosity of 32 mm²/s [150 SUS] at 50°C [122°F].

DIMENSIONS - MTK W and MTK C





E Rear ports



Flange Dim. See Page 15

Ports Dim. See Page 16

Shaft Dim. See Page 17

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**

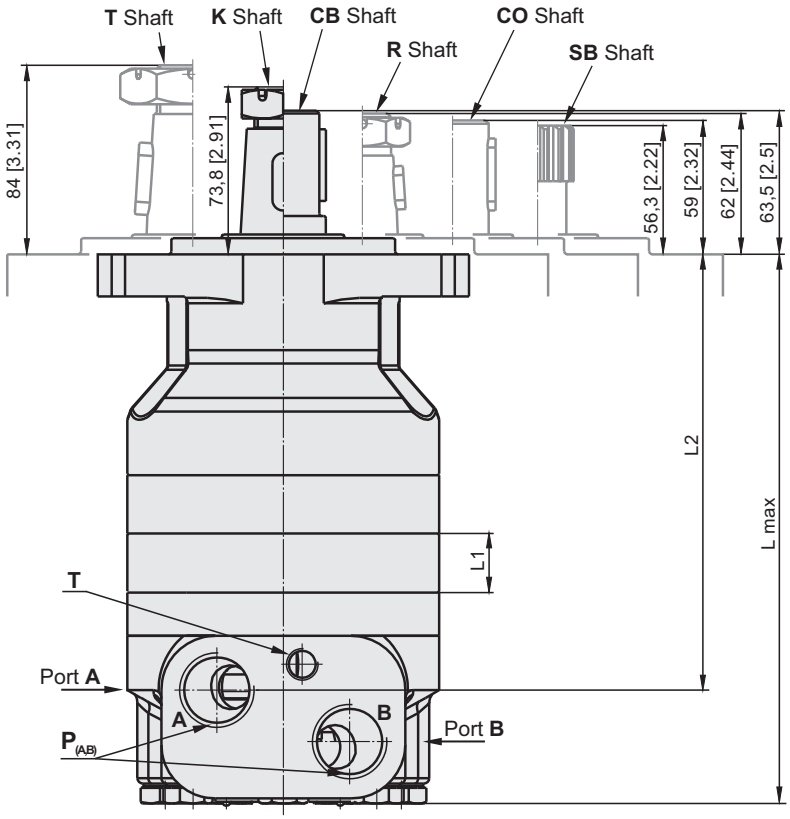
Warning: Drain line should always be used (if no check valves)!

mm [in]

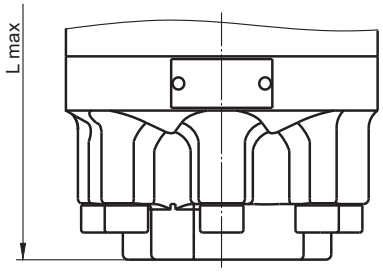
	Versions				
	Side			Rear	
	2	3	4	6	8
$P_{(A,B)}$	2xG3/4 17 mm [.67 in] depth	2xM27x2 17 mm [.67 in] depth	2x1 1/16-12UN 15 mm [.59 in] depth	2xG1/2 15 mm [.59 in] depth	2x 7/8 -14UNF 17 mm [.67 in] depth
T	G1/4 12 mm [.472 in] depth	M14x1,5 12 mm [.472 in] depth	7/16 -20UNF 12 mm [.472 in] depth	G1/4 12 mm [.472 in] depth	7/16 -20UNF 12 mm [.472 in] depth

Type	L_{max}, mm [in]	L_2, mm [in]	*L_E, mm [in]	Type	L_{max}, mm [in]	L_2, mm [in]	*L_E, mm [in]	L_1, mm [in]
MTKW160	162,7 [6.41]	120,3 [4.74]	176,3 [6.94]	MTKC160	203,2 [8.00]	160,8 [6.33]	216,8 [8.54]	21,8 [.86]
MTKW200	168,7 [6.64]	126,3 [4.97]	182,3 [7.18]	MTKC200	209,2 [8.24]	166,8 [6.57]	222,8 [8.77]	27,8 [1.09]
MTKW250	175,7 [6.92]	133,3 [5.25]	189,3 [7.45]	MTKC250	216,2 [8.51]	173,8 [6.84]	229,8 [9.05]	34,8 [1.37]
MTKW315	183,4 [7.22]	142,0 [5.59]	198,0 [7.79]	MTKC315	224,9 [8.85]	182,5 [7.19]	238,5 [9.39]	43,5 [1.71]
MTKW400	195,7 [7.70]	153,3 [6.04]	209,3 [8.24]	MTKC400	236,2 [9.29]	193,8 [7.63]	249,8 [9.83]	54,8 [2.16]
MTKW470	205,9 [8.12]	163,5 [6.44]	219,5 [8.64]	MTKC470	246,4 [9.70]	204,0 [8.03]	260,0 [10.24]	65,0 [2.56]
MTKW500	209,3 [8.24]	167,9 [6.61]	223,9 [8.81]	MTKC500	250,8 [9.87]	208,4 [8.20]	264,4 [10.41]	69,4 [2.73]

DIMENSIONS - MTK F



E Rear ports



Flange Dim. See Page 15

Ports Dim. See Page 16

Shaft Dim. See Page 17

Warning: Drain line should always be used (if no check valves)!

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

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

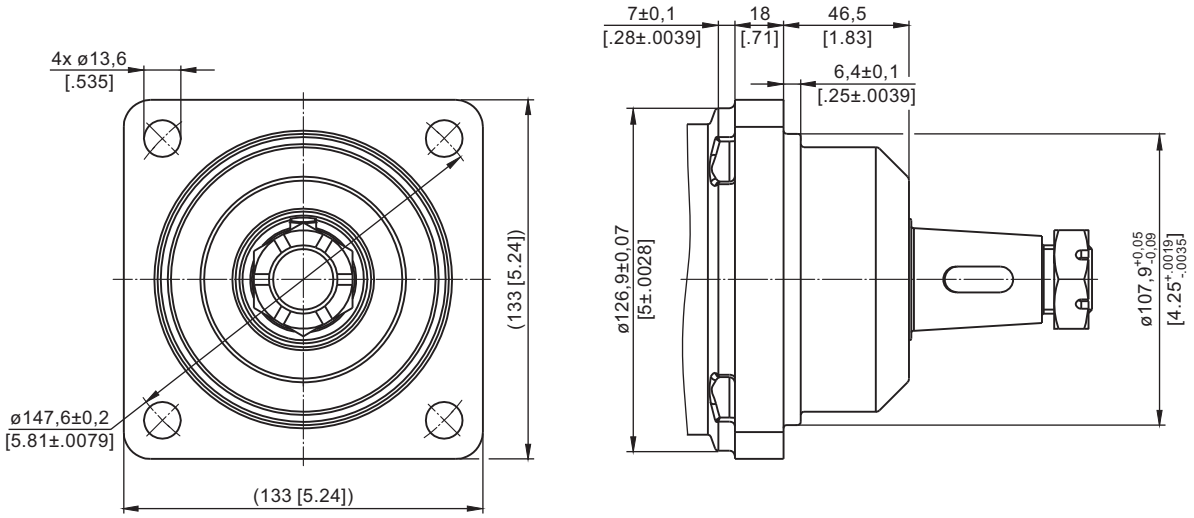
	Versions				
	Side			Rear	
	2	3	4	6	8
$P_{(A,B)}$	2xG3/4 17 mm [.67 in] depth	2xM27x2 17 mm [.67 in] depth	2x1 1/16-12UN 15 mm [.59 in] depth	2xG1/2 15 mm [.59 in] depth	2x 7/8 -14UNF 17 mm [.67 in] depth
T	G1/4 12 mm [.472 in] depth	M14x1,5 12 mm [.472 in] depth	7/16-20UNF 12 mm [.472 in] depth	G1/4 12 mm [.472 in] depth	7/16-20UNF 12 mm [.472 in] depth

Type	L_{max}, mm [in]	L_2, mm [in]	*L_E, mm [in]	L_1, mm [in]
MTKF 160	203,2 [8.00]	160,8 [6.33]	216,8 [8.54]	21,8 [.86]
MTKF 200	209,2 [8.24]	166,8 [6.57]	222,8 [8.77]	27,8 [1.09]
MTKF 250	216,2 [8.51]	173,8 [6.84]	229,8 [9.05]	34,8 [1.37]
MTKF 315	224,9 [8.85]	182,5 [7.19]	238,5 [9.39]	43,5 [1.71]
MTKF 400	236,2 [9.29]	193,8 [7.63]	249,8 [9.83]	54,8 [2.16]
MTKF 470	246,4 [9.70]	204,0 [8.03]	260,0 [10.24]	65,0 [2.56]
MTKF 500	250,8 [9.87]	208,4 [8.20]	264,4 [10.41]	69,4 [2.73]

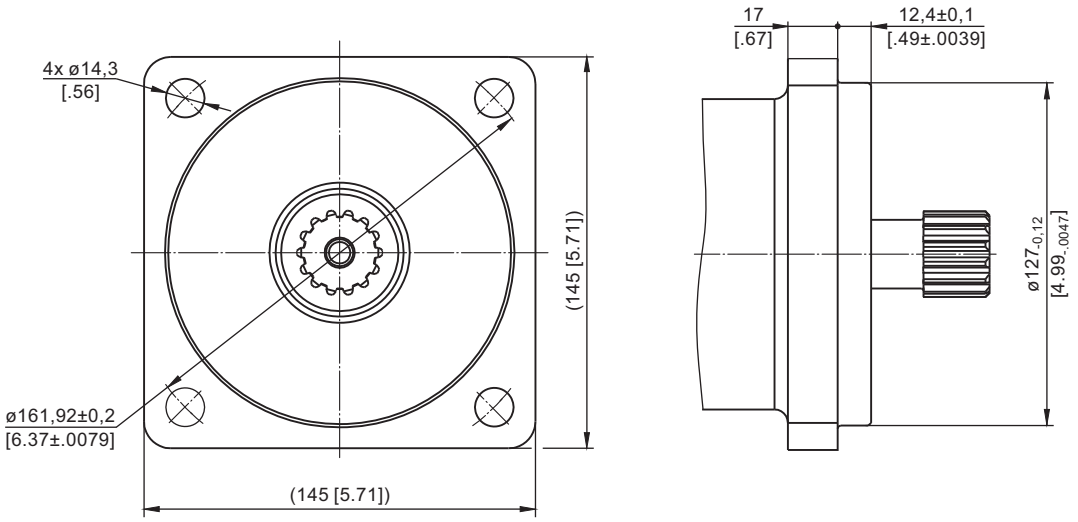
mm [in]

MOUNTING

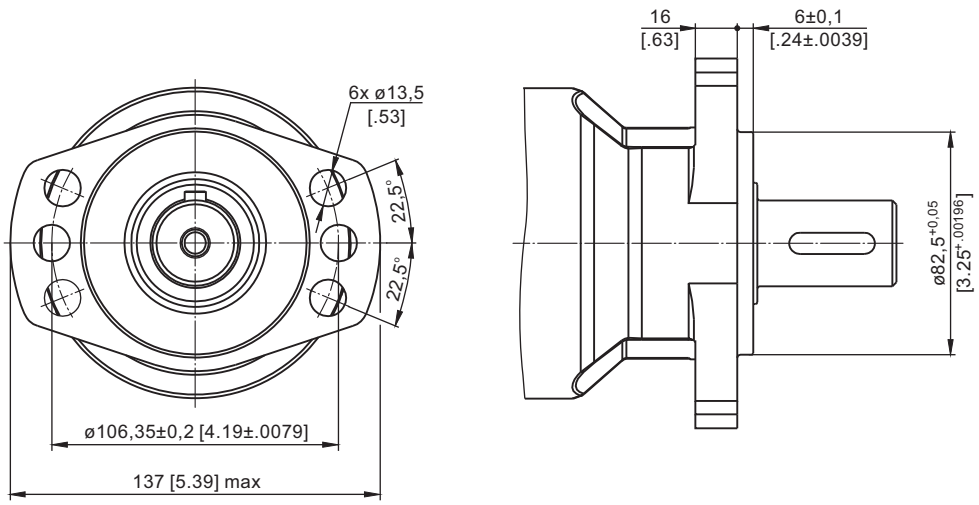
W Wheel Mount (4 Holes)



C Square Mount (4 Holes)



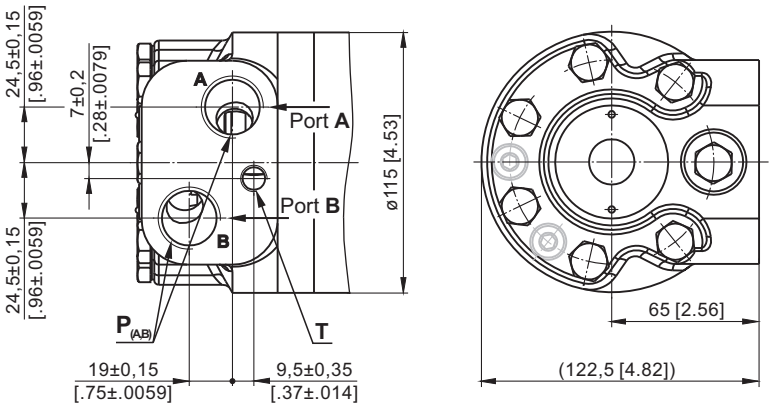
F Magneto Mount (6 Holes)



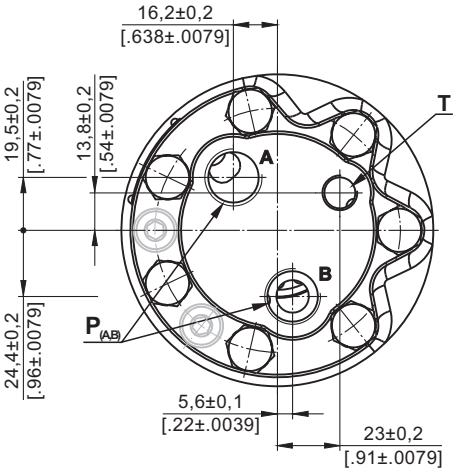
mm [in]

PORTS

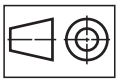
Versions 2 3 4



Versions 6 8



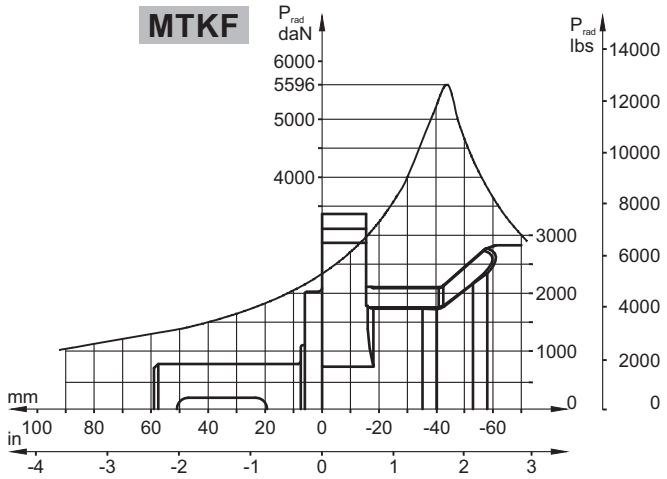
	Versions				
	Side			Rear	
	2	3	4	6	8
$P_{(A,B)}$	2xG3/4 17 mm [.67 in] depth	2xM27x2 17 mm [.67 in] depth	2x1 1/16-12UN 15 mm [.59 in] depth	2xG1/2 15 mm [.59 in] depth	2x 7/8 -14UNF 17 mm [.67 in] depth
T	G¼ 12 mm [.472 in] depth	M14x1,5 12 mm [.472 in] depth	7/16-20UNF 12 mm [.472 in] depth	G¼ 12 mm [.472 in] depth	7/16-20UNF 12 mm [.472 in] depth



mm [in]

PERMISSIBLE SHAFT LOADS

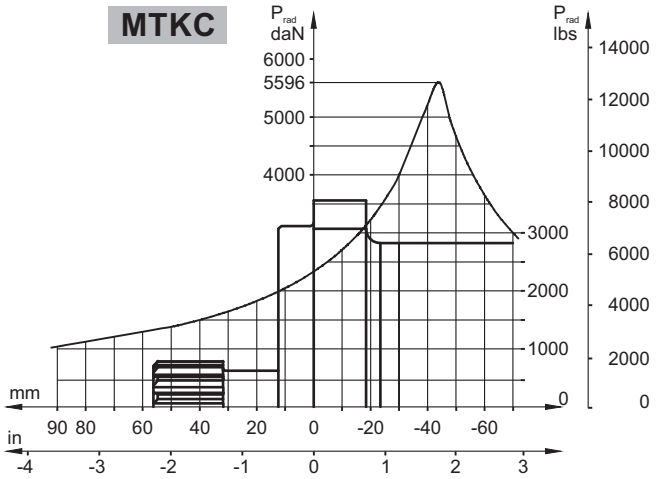
MTKF



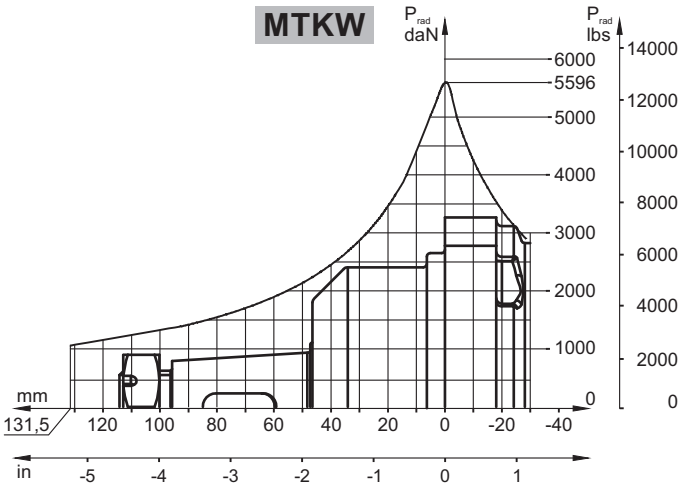
The curves apply to a B10 bearing life (ISO281) of 2000 hours at 100 RPM.

The curves apply to a B10 bearing life (ISO281) of 2000 hours at 100 RPM.

MTKC

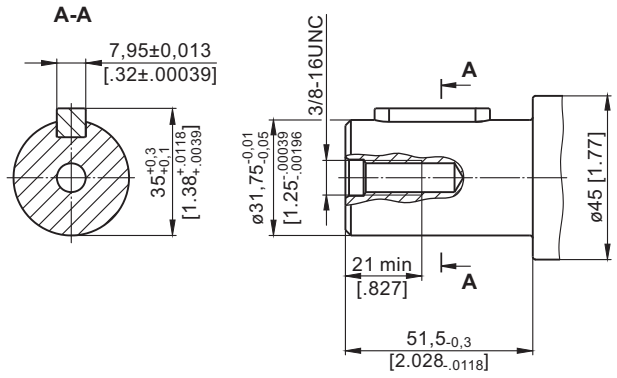


MTKW

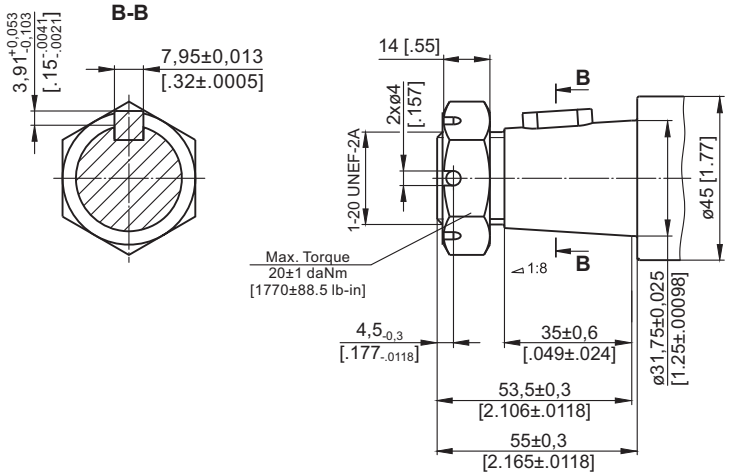


SHAFT EXTENSIONS

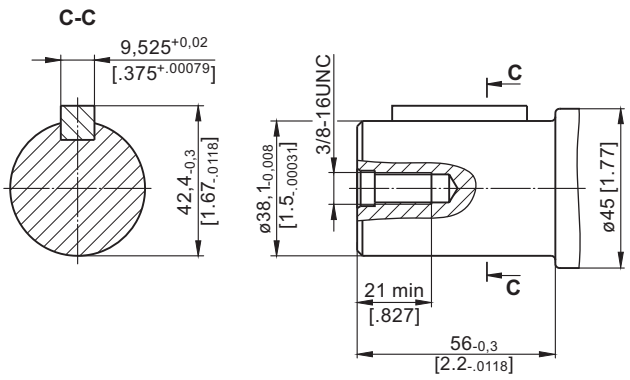
CO - ø1¼" [31,75] srtaight, Parallel key 5/16"x5/16"x1¼"
Max. Torque 77 daNm [6815 lb-in]



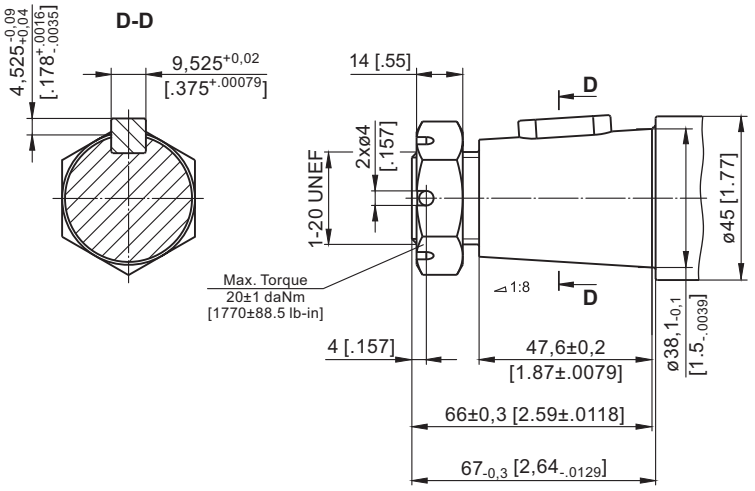
R - ø1¼" [31,75] tapered 1:8, Parallel key 5/16"x5/16"x¾"
Max. Torque 77 daNm [6815 lb-in]



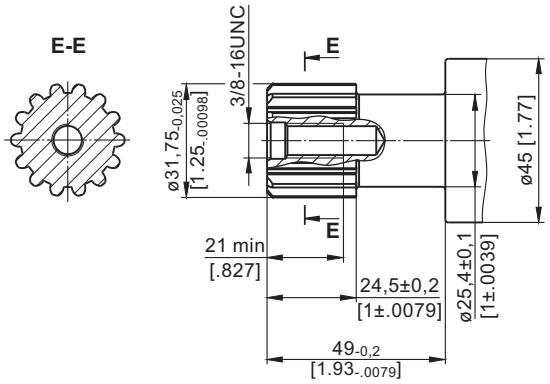
CB - ø1½" [38,1] straight, Parallel key 3/8"x3/8"x1¼" BS46
Max. Torque 132,8 daNm [11755 lb-in]



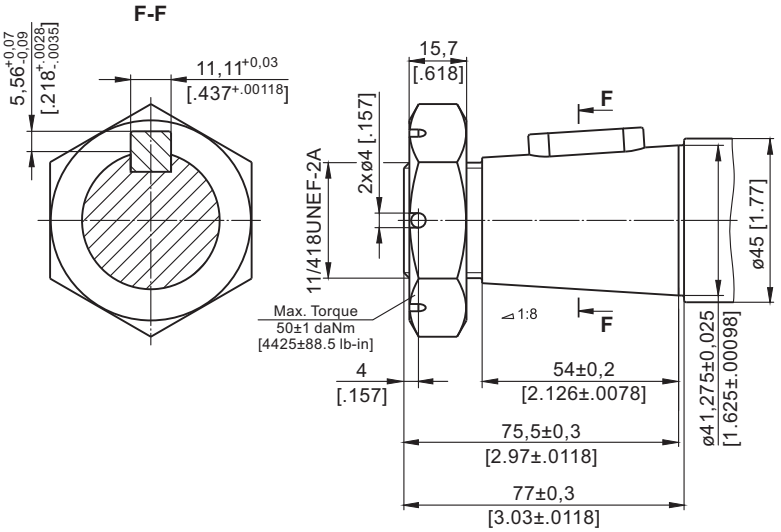
K - ø1½" [38,1] tapered 1:8, Parallel key 3/8"x3/8"x1"
Max. Torque 89 daNm [7878 lb-in]



SB - ø1¼" [31,75] 14T Splined ANSI B92.1-1970, 12/24
Max. Torque 77 daNm [6815 lb-in]



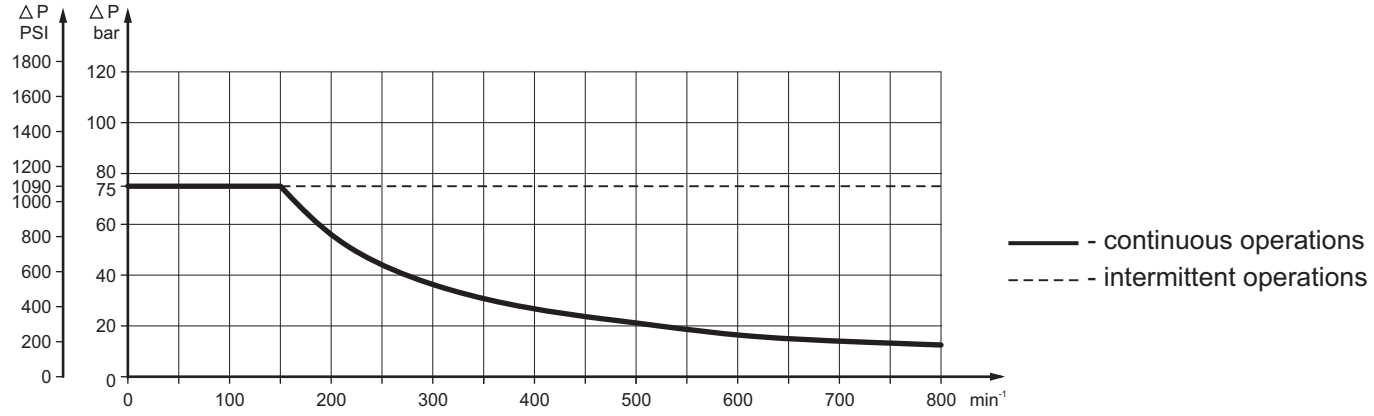
T - ø1 1/16" [41,275] tapered 1:8, Parallel key 7/16"x7/16"x1¼"
Max. Torque 100 daNm [8850 lb-in]



mm [in]

MAX. PERMISSIBLE SHAFT SEAL PRESSURE

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



ORDER CODE

	1	2	3	4	5	6	7	8
M T K							**HD**	

Pos.1 - Mounting Flange

- **W** - 4-Bolt flange, Wheel Motor spigot diameter 107,9 mm [2.25 in] - BC 147,6 mm [5.81 in]
- **C** - 4-Bolt flange, spigot diameter 127 mm [4.99 in]- BC 161,92 mm [6.375 in]
- **F** - Bolt flange, spigot diameter 82,5 mm [3.25 in]- BC 106,35 mm [4.19 in]

Pos.2 - Port type

- omit - Side ports
- **E** - Rear ports

Pos.3 - Displacement code

- **160** - 157,9 cm^3/rev [9.63 in^3/rev]
- **200** - 201,3 cm^3/rev [12.28 in^3/rev]
- **250** - 252,2 cm^3/rev [15.38 in^3/rev]
- **315** - 314,9 cm^3/rev [19.20 in^3/rev]
- **400** - 396,8 cm^3/rev [24.20 in^3/rev]
- **470** - 470,5 cm^3/rev [28.70 in^3/rev]
- **500** - 502,4 cm^3/rev [30.65 in^3/rev]

Pos.4 - Shaft Extensions*

- **CO** - ø1¼" [31,75] straight, Parallel key 5/16"x5/16"x1¼", 3/8-16 UNC
- **CB** - ø1½" [38,1] straight, Parallel key 3/8"x3/8"x1 7/4B S46
- **SB** - ø1¼" [31,75] 14T Splined ANSI B92.1-1970, 12/24
- **R** - ø1¼" [31,75] tapered 1:8, Parallel key 5/16"x5/16"x3/4", 1-20 UNEF
- **K** - ø1½" [38,1] tapered 1:8, Parallel key 3/8"x3/8"x1", 1-20 UNEF
- **T** - ø1 1/16" [41,275] tapered 1:8, Parallel key 7/16"x7/16"x1¼"

Pos.5 - Port Size/Type

- **2** - side ports, 2xG 3/4, G1/4 BSP (ISO 228)
- **3** - side ports, 2xM27x2, M14x1,5 - 6H (ISO 262)
- **4** - side ports, 2x1 1/16-12 UN, 7/16-20 UNF
- **6** - rear ports, 2xG 1/2, G1/4 BSP (ISO 228)
- **8** - rear ports, 2x7/8-14 UNF, 7/16-20 UNF

Pos.6 - Check Valves

- omit - without check valves
- **1** - with check valves

Pos.7 - Additional Options

- **HD** - Reinforced motor **HD****

For Other **Additional Options** see page 69

Pos.8 - Design Series

- omit - Factory specified

Notes: * The permissible output torque for shafts must be not exceeded!
** Drain line should always be used.

The hydraulic motors are mangano phosphatized 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	–

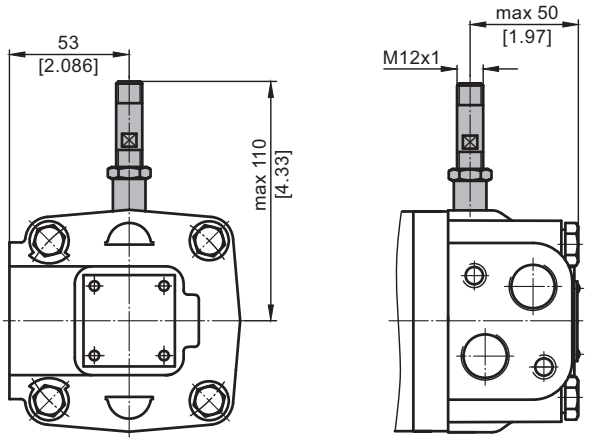
O	Optional
–	Not applicable
S	Standard

* 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!

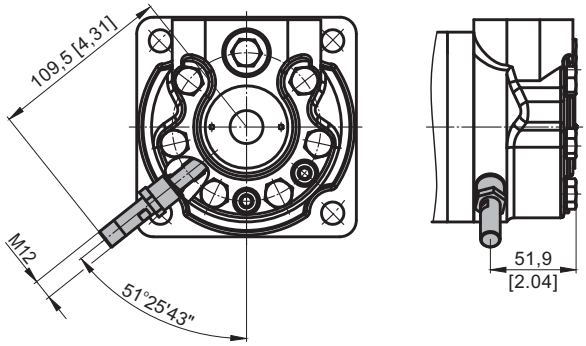
⚠ For more information about **HD** option please contact with "M+S Hydraulic".

MOTORS WITH SPEED SENSOR

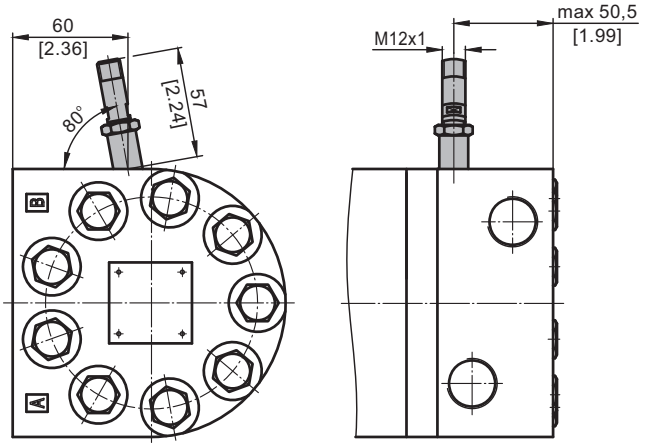
MSWM...RS



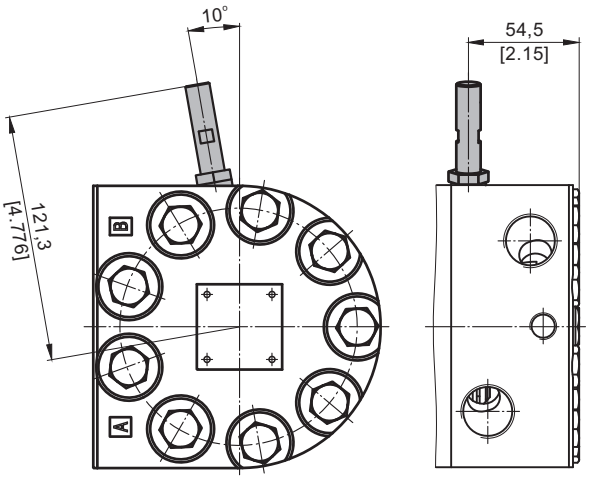
MTK...RS



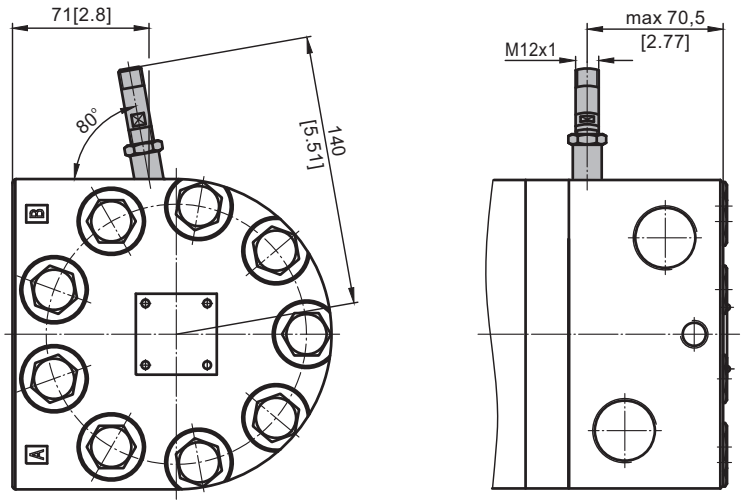
MTM...RS
TMF...RS



TMYF...RS



MVM...RS
VMF...RS



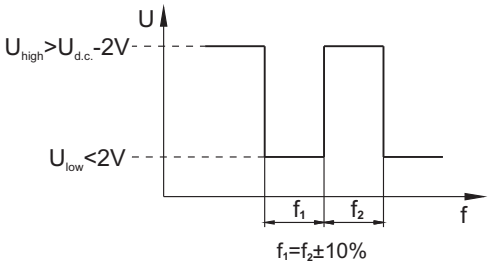
mm [in]

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

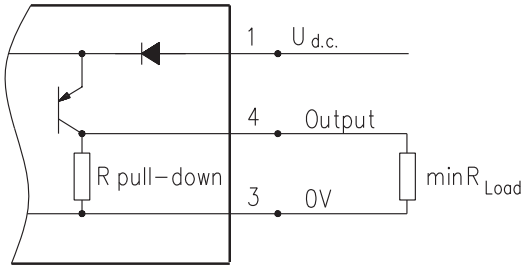


Load max.:I_{high}=I_{low}<50mA

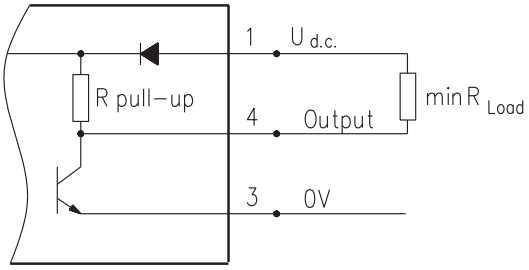
Motor type	MSWM MTK	MTM TMF, TMYF	MVM VMF
Pulses per revolution	54	84	102

Wiring diagrams

PNP

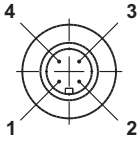


NPN



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	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]

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

$\mathbf{v_{km}}$ - 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, 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%	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, daN [lbs]

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

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

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 $M_W > M$

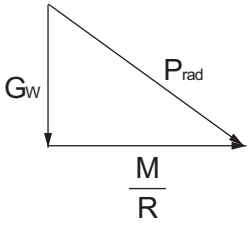
f - frictional factor;
$\mathbf{G_W}$ - total weight over the wheels, daN [lbs].

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]

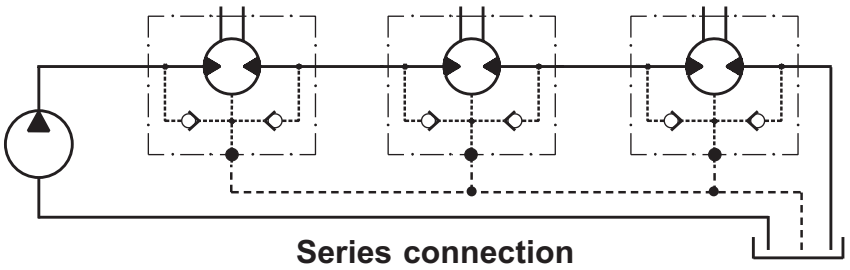
When motor is used for vehicle motion with wheels mounted directly on motor shaft, the total radial loading of motor shaft Prad is a sum of motion force and weight force acting on one wheel.



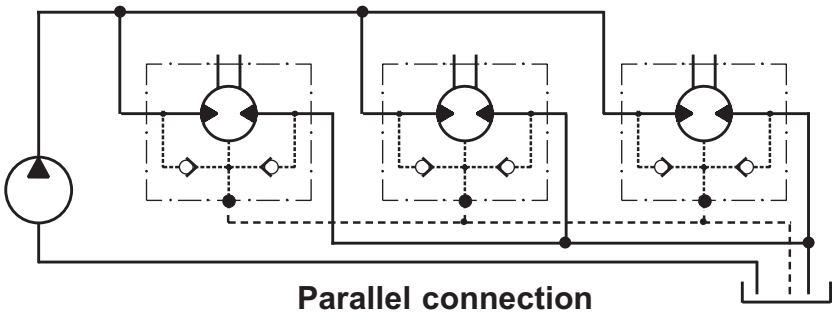
G_w - weight held by wheel;
P_{rad} - total radial loading of motor shaft;
M/R - motion force.

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

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



Series connection



Parallel connection