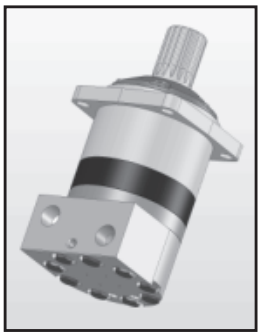
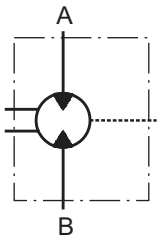
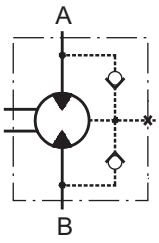
HYDRAULIC MOTORS MVM

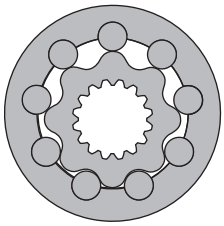


APPLICATION

» Conveyors
» Metal working machines
» Agricultural machines
» Road building machines
» Mining machinery
» Food industries
» Special vehicles
» Plastic and rubber machinery etc.







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OPTIONS

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

EXCELLENCE

» High torque and pressure drop
» High inlet pressure
» High starting torque
» Improved efficiency at high pressure drop and frequent reversing
» Smooth operation at low speed
» High radial and axial bearing capacity

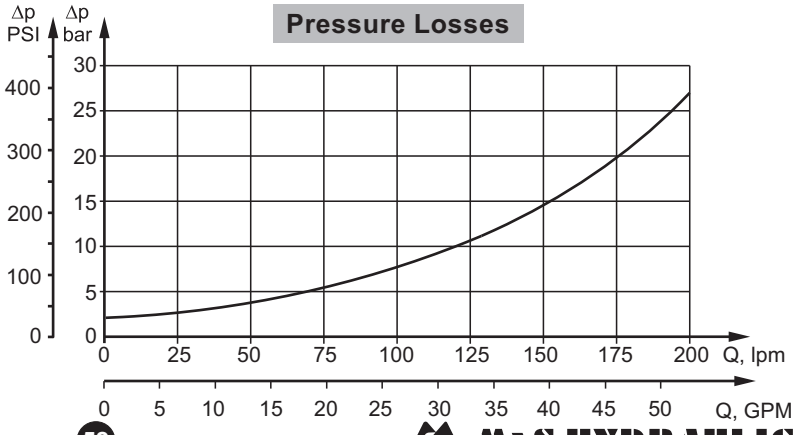
GENERAL

Max. Displacement, in^3/rev [cm^3/rev]	48.91 [801,8]
Max. Speed, [RPM]	763
Max. Torque, lb-in [daNm]	cont.: 22920 [259] int.: 30090 [340]
Max. Output, HP [kW]	150 [112]
Max. Pressure Drop, PSI [bar]	cont.: 3630 [250] int.: 5080 [350]
Max. Oil Flow, GPM [lpm]	63.4 [240]
Min. Speed, [RPM]	5
Permissible Shaft Loads, lbs [daN]	Pa=3370 [1500]
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]	.793 [3]
	164 [35]	.528 [2]
3045 [210]	98 [20]	.1.585 [6]
	164 [35]	1.057 [4]

Pressure Losses



SPECIFICATION DATA

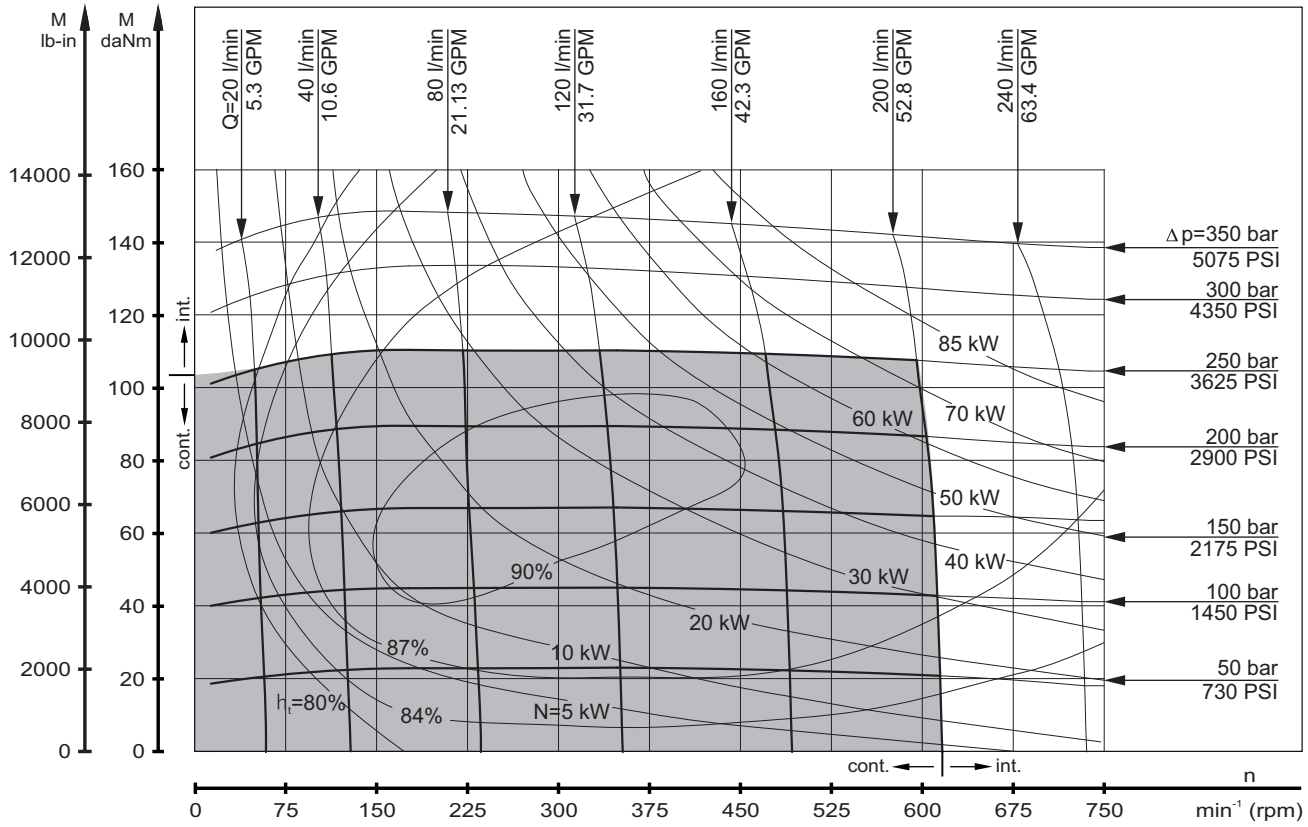
Type		MVM 315	MVM 400	MVM 500	MVM 630	MVM 677	MVM 800
Displacement, in³/rev [cm³/rev]		19.19 [314,5]	24.5 [400,9]	30.5 [499,6]	38.38 [629,1]	41.24 [675,8]	48.91 [801,8]
Max. Speed, [RPM]	Cont.	636	500	400	315	296	250
	Int.*	763	600	480	380	355	300
Max. Torque, lb-in [daNm]	Cont.	10180 [115]	12745 [144]	15930 [180]	20090 [227]	21420 [242]	22920 [259]
	Int.*	14160 [160]	17700 [200]	23010 [260]	27440 [310]	25670 [290]	30090 [340]
	Peak**	15930 [180]	20355 [230]	25315 [286]	31860 [360]	34250 [387]	35580 [402]
Max. Output, HP [kW]	Cont.	90 [67]	90 [67]	90 [67]	90 [67]	90 [67]	90 [67]
	Int.*	150 [112]	150 [112]	150 [112]	150 [112]	150 [112]	150 [112]
Max. Pressure Drop, PSI [bar]	Cont.	3630 [250]	3630 [250]	3630 [250]	3630 [250]	3630 [250]	3260 [225]
	Int.*	5080 [350]	5080 [350]	5080 [350]	5080 [350]	5000 [310]	4350 [300]
	Peak**	5800 [400]	5800 [400]	5800 [400]	5800 [400]	5800 [400]	5080 [350]
Max. Oil Flow, GPM [lpm]	Cont.	52.8 [200]	52.8 [200]	52.8 [200]	52.8 [200]	52.8 [200]	52.8 [200]
	Int.*	63.4 [240]	63.4 [240]	63.4 [240]	63.4 [240]	63.4 [240]	63.4 [240]
Max. Inlet Pressure, PSI [bar]	Cont.	3915 [270]	3915 [270]	3915 [270]	3915 [270]	3915 [270]	3915 [270]
	Int.*	5365 [370]	5365 [370]	5365 [370]	5365 [370]	5365 [370]	5365 [370]
	Peak**	6090 [420]	6090 [420]	6090 [420]	6090 [420]	6090 [420]	6090 [420]
Max. Return Pressure with Drain Line, PSI [bar]	Cont.	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]	2030 [140]
	Int.*	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]	2540 [175]
	Peak**	3045 [210]	3045 [210]	3045 [210]	3045 [210]	3045 [210]	3045 [210]
Max. Starting Pressure with Unloaded Shaft, PSI [bar]		70 [5]	70 [5]	70 [5]	70 [5]	70 [5]	70 [5]
Min. Starting Torque, lb-in [daNm]		8140 [92]	10180 [115]	12745 [144]	15930 [180]	17170 [194]	18145 [205]
Min. Speed*, [RPM]**		10	9	8	6	6	5
Weight, lb [kg]	MVM	91 [41,3]	93 [42,1]	95 [43]	98 [44,5]	99.65 [45,2]	101.4 [46]
	MVMC	96.6 [43,8]	99 [44,9]	101 [45,8]	106.5 [48,3]	108.03 [49]	111.1 [50,4]
	MVMCA	84.88 [38,5]	87.3 [39,6]	89.29 [40,5]	94.8 [43]	96.34 [43,7]	99.43 [45,1]

* 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.

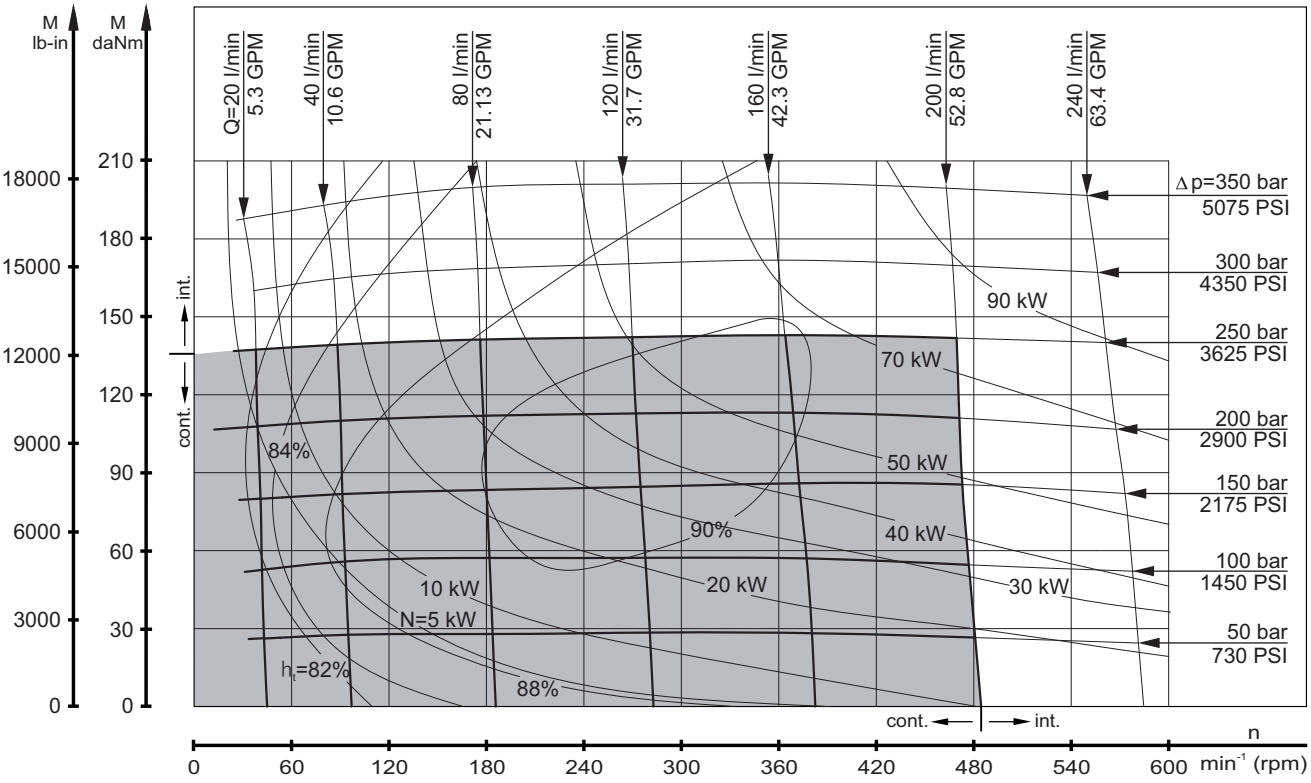
1. Intermittent speed and intermittent pressure drop must not occur simultaneously.
2. Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
3. Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP(DIN51524) or HM (ISO 6743/4). If using synthetic fluids consult the factory for alternative seal materials.
4. Recommended minimum oil viscosity 70 SUS [13 mm²/s] at 122ºF [50ºC].
5. Recommended maximum system operating temperature is 180ºF [82ºC].
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

MVM 315



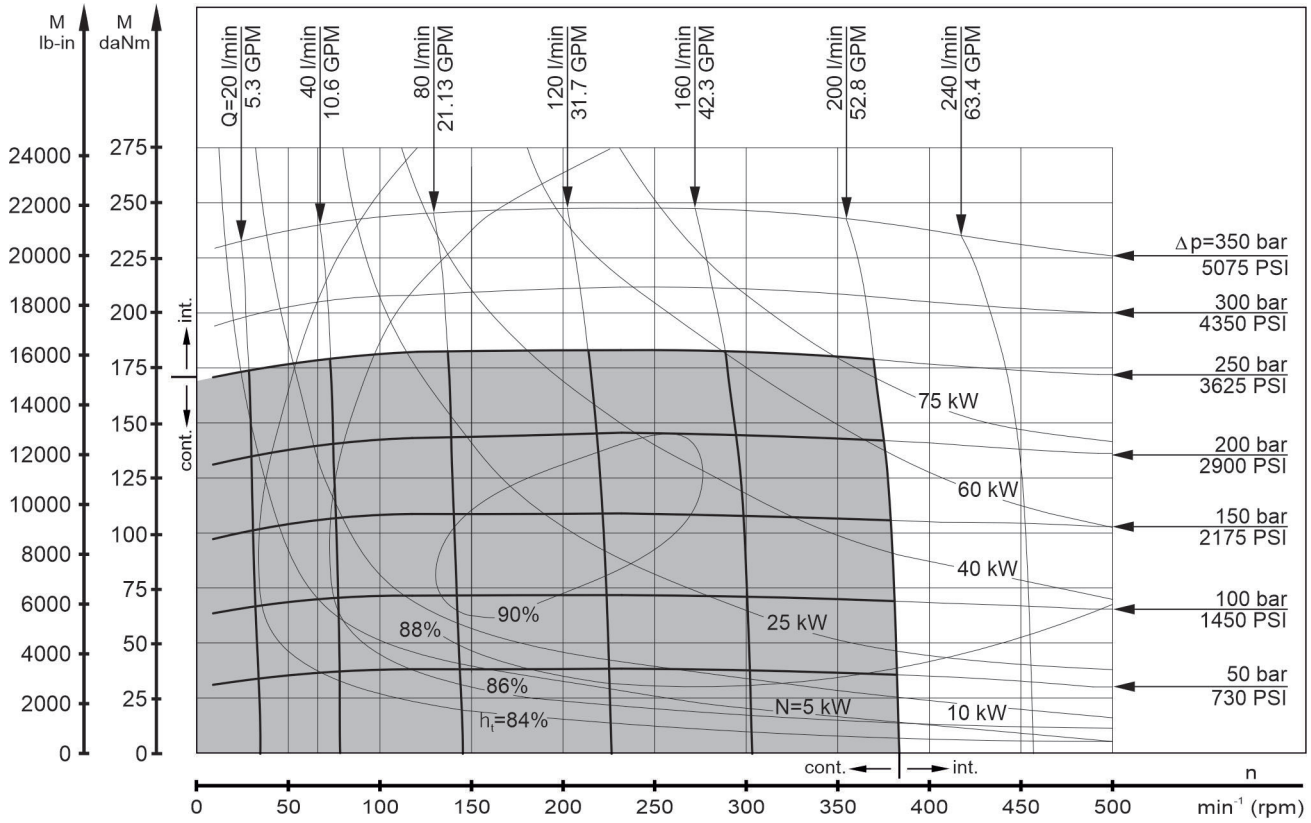
MVM 400



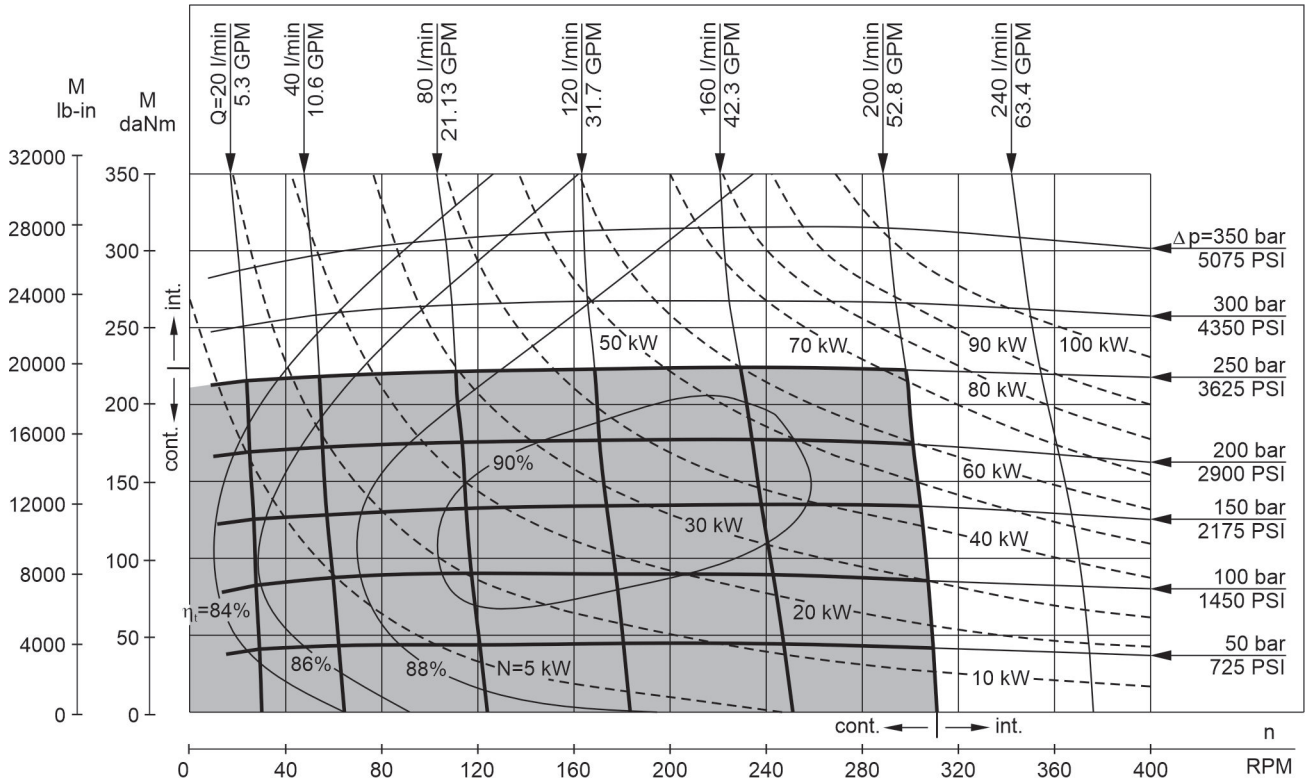
The function diagrams data was collected at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MVM 500



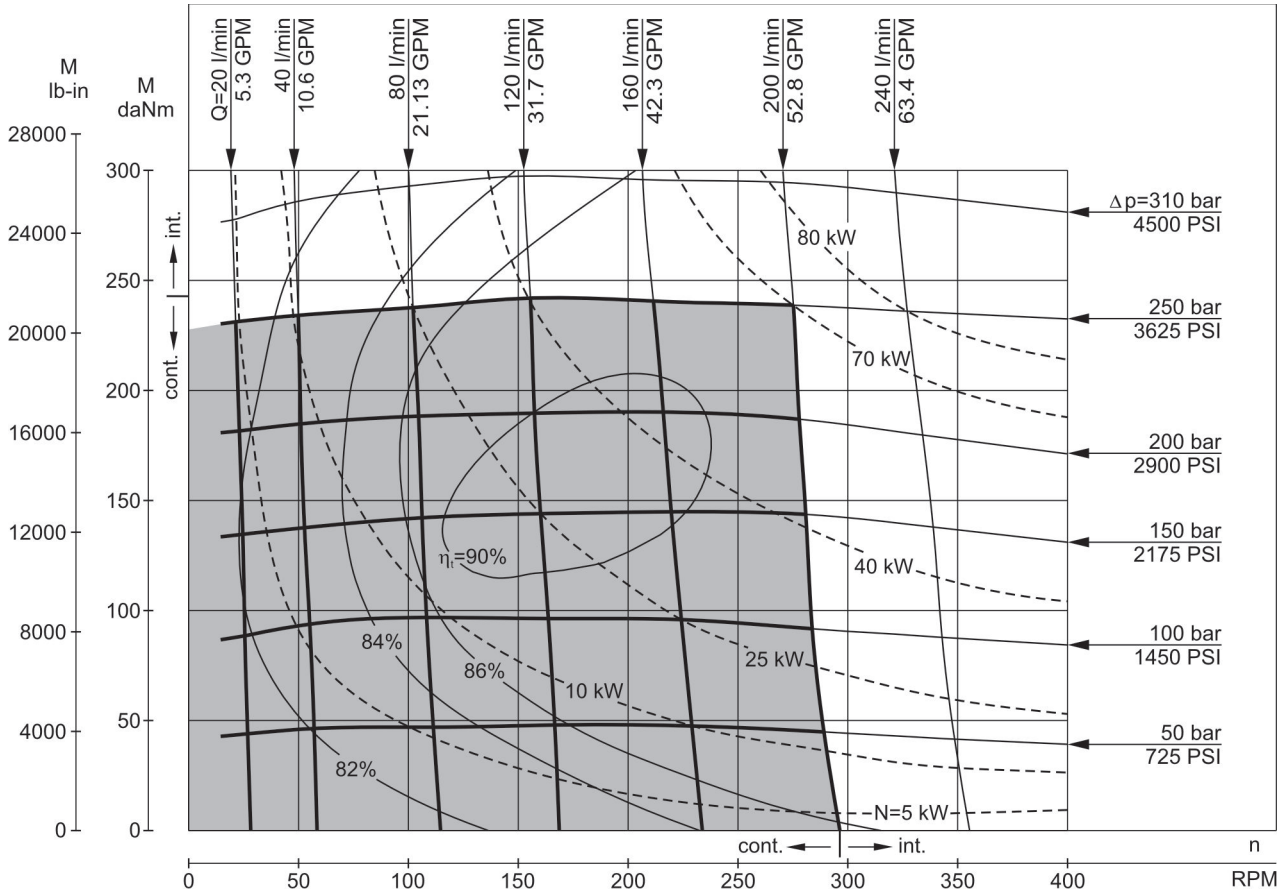
MVM 630



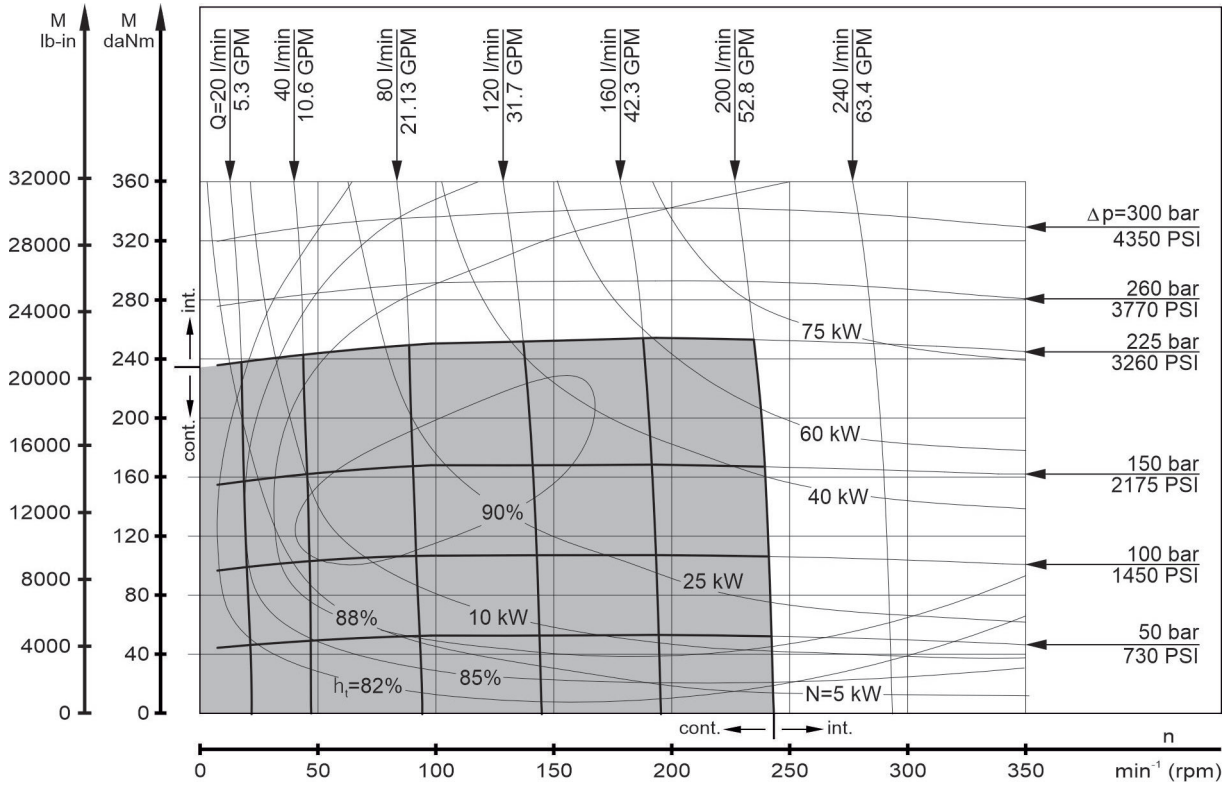
The function diagrams data was collected at back pressure 72.5÷145 PSI [5÷10 bar] and oil with viscosity of 150 SUS [32 mm²/s] at 122°F [50°C].

FUNCTION DIAGRAMS

MVM 677

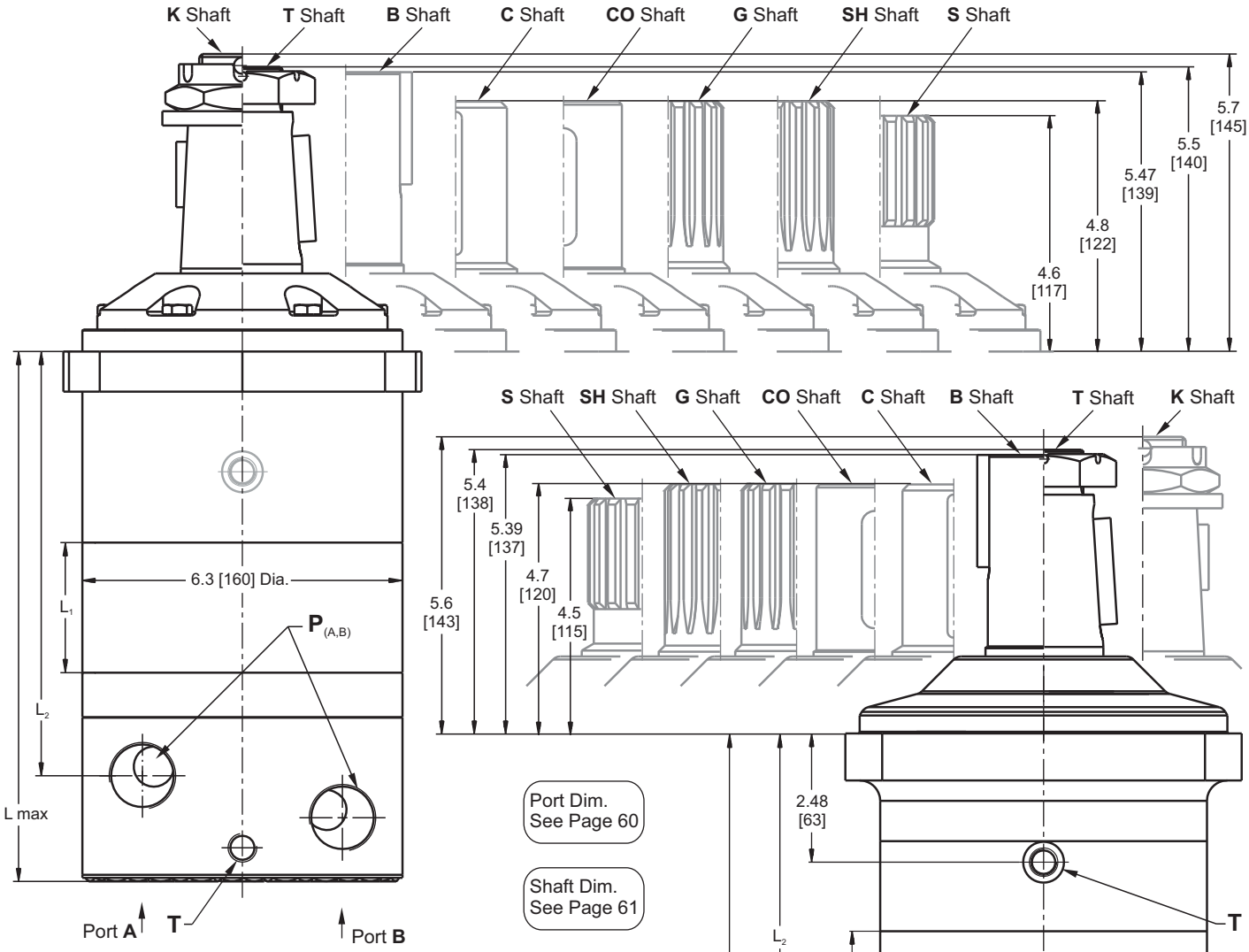


MVM 800



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

DIMENSIONS AND MOUNTING DATA MVM and MVMC



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

in [mm]

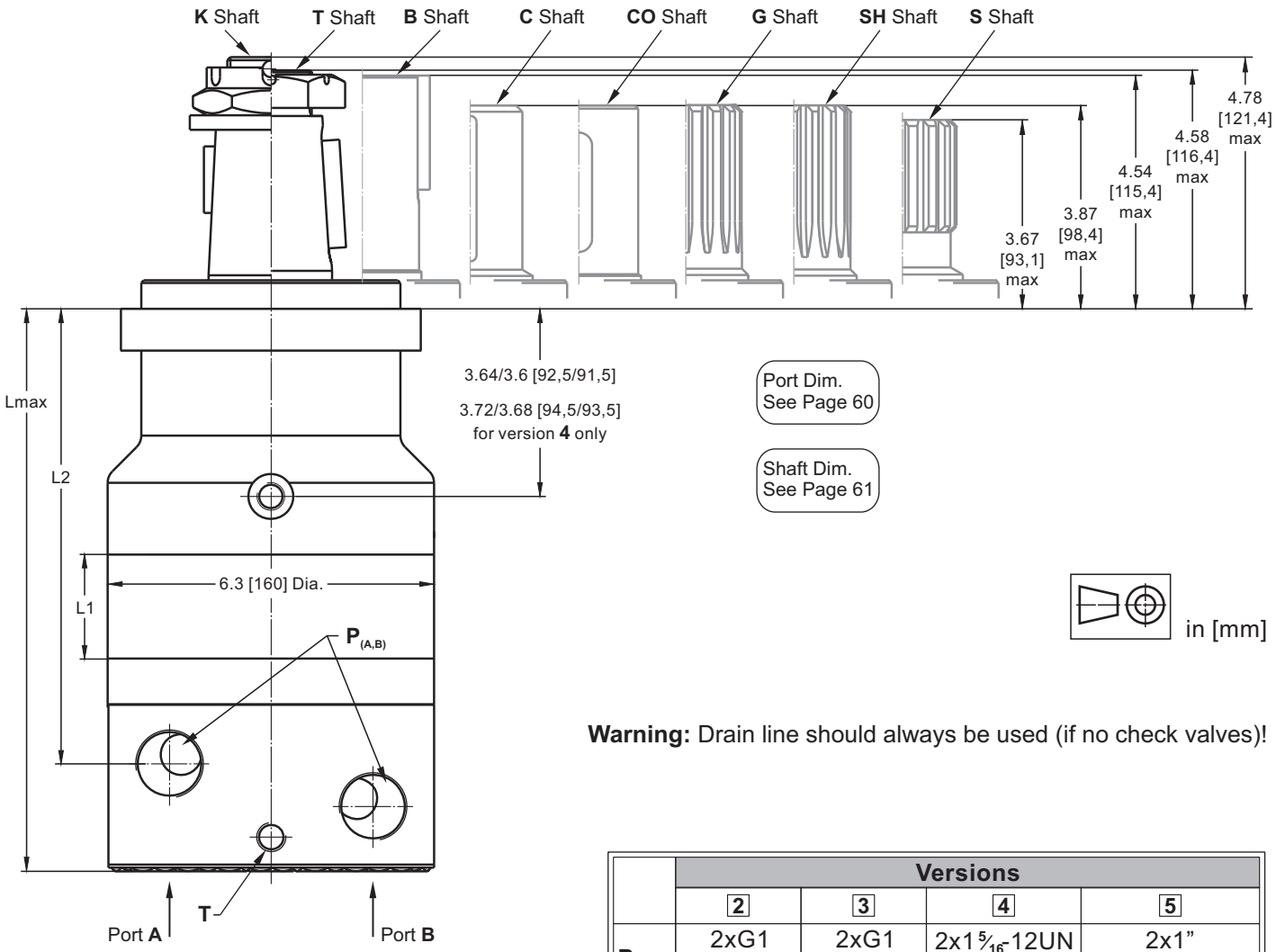
	Versions			
	2	3	4	5
$P_{(A,B)}$	2xG1 .787 in [20] depth	2xG1 .787 in [20] depth	2x1 5/16-12UN .787 in [20] depth	2x1" (SAE PSI3000)
T	G¼ .472 in [12] depth	G¼ .472 in [12] depth	9/16-18UNF .472 in [12] depth	G¼ .472 in [12] depth
C	-	6xM10 .59 in [15] depth	-	8xM10 .512 in [13] depth

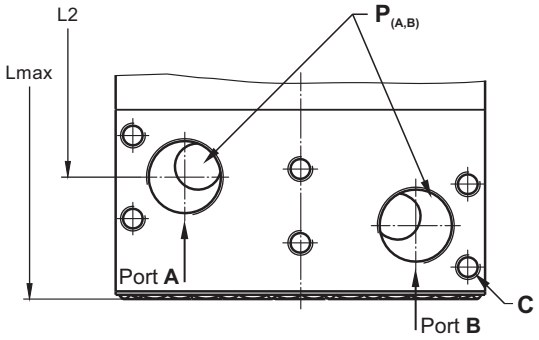
Standard Rotation
Viewed from Shaft End
Port **A** Pressurized - **CW**
Port **B** Pressurized - **CCW**

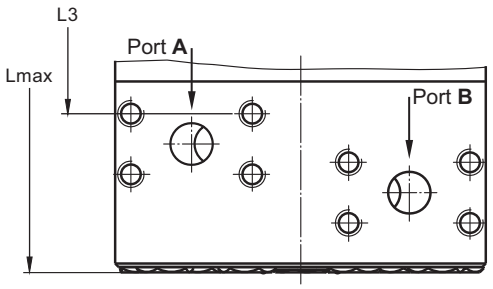
Reverse Rotation
Viewed from Shaft End
Port **A** Pressurized - **CCW**
Port **B** Pressurized - **CW**

Type	L_{max}, in [mm]	L_2, in [mm]	L_3, in [mm]	Type	L_{max}, in [mm]	L_2, in [mm]	L_3, in [mm]	L_1, in [mm]
MVM 315	8.92 [226,5]	6.79 [172,5]	6.20 [157,4]	MVMC 315	8.957 [227,5]	6.84 [173,8]	6.25 [158,7]	1.00 [25,5]
MVM 400	9.19 [233,5]	7.07 [179,5]	6.47 [164,4]	MVMC 400	9.232 [234,5]	7.12 [180,8]	6.52 [165,7]	1.28 [32,5]
MVM 500	8.51 [241,5]	7.38 [187,5]	6.79 [172,4]	MVMC 500	9.547 [242,5]	7.43 [188,8]	6.84 [173,7]	1.59 [40,5]
MVM 630	9.92 [252,0]	7.79 [198,0]	7.20 [182,9]	MVMC 630	9.961 [253,0]	7.85 [199,3]	7.25 [184,2]	2.01 [51,0]
MVM 677	10.08 [256,0]	7.94 [201,8]	7.5 [186,7]	MVMC 677	10.10 [256,5]	8.00 [203,1]	7.40 [188,0]	2.16 [54,8]
MVM 800	10.47 [266,0]	8.35 [212,0]	7.75 [196,9]	MVMC 800	10.518 [267,0]	8.39 [213,3]	7.80 [198,2]	2.56 [65,0]

DIMENSIONS AND MOUNTING DATA MVMCA







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

	Versions			
	2	3	4	5
$P_{(A,B)}$	2xG1 .787 in [20] depth	2xG1 .787 in [20] depth	2x1 5/16-12UN .787 in [20] depth	2x1" (SAE PSI3000)
T	G¼ .472 in [12] depth	G¼ .472 in [12] depth	9/16-18UNF .472 in [12] depth	G¼ .472 in [12] depth
C	-	6xM10 .59 in [15] depth	-	8xM10 .512 in [13] depth

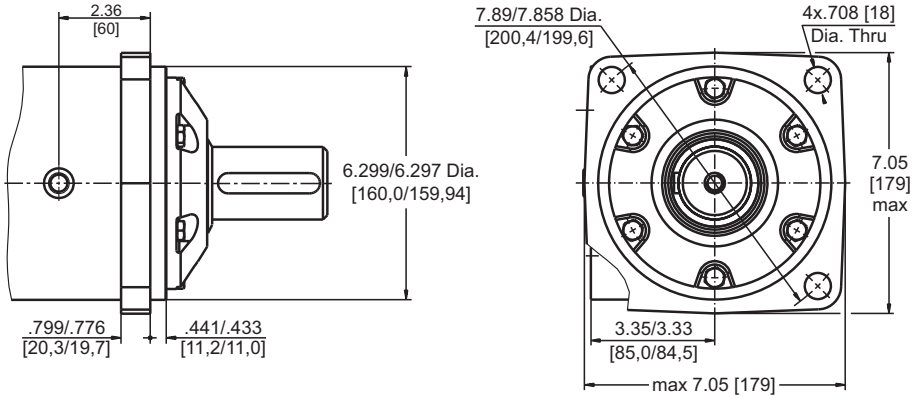
Standard Rotation
Viewed from Shaft End
Port **A** Pressurized - **CW**
Port **B** Pressurized - **CCW**

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

Type	L_{max}, in [mm]	L_2, in [mm]	L_3, in [mm]	L_1, in [mm]
MVMCA 315	9.90 [251,5]	7.78 [7.78]	7.18 [182,4]	1.00 [25,5]
MVMCA 400	10.18 [258,5]	8.05 [204,5]	7.46 [189,4]	1.28 [32,5]
MVMCA 500	10.49 [266,5]	8.37 [212,5]	7.77 [197,4]	1.59 [40,5]
MVMCA 630	10.91 [277,0]	8.78 [223,0]	8.19 [207,9]	2.01 [51,0]
MVMCA 677	11.06 [281,0]	8.93 [226,8]	8.33 [211,7]	2.16 [54,8]
MVMCA 800	11.46 [291,0]	9.33 [237,0]	8.74 [221,9]	2.56 [65,0]

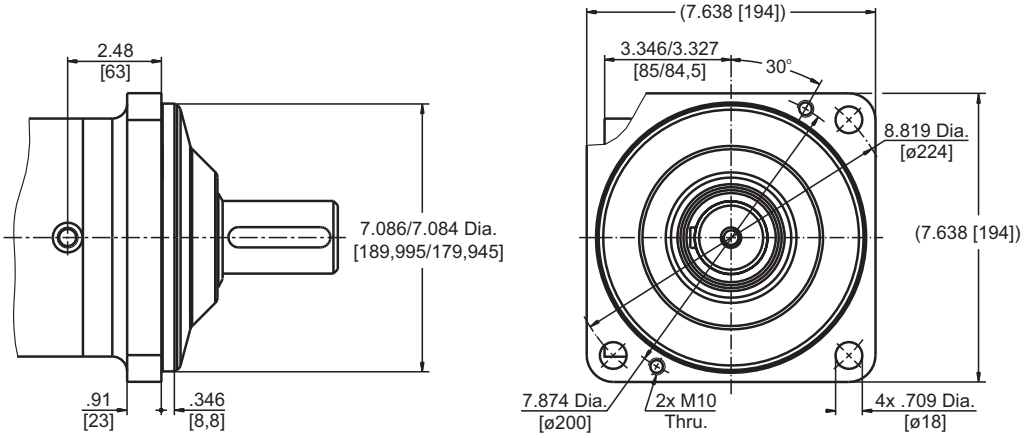
MOUNTING

Square Mount (4 Holes)

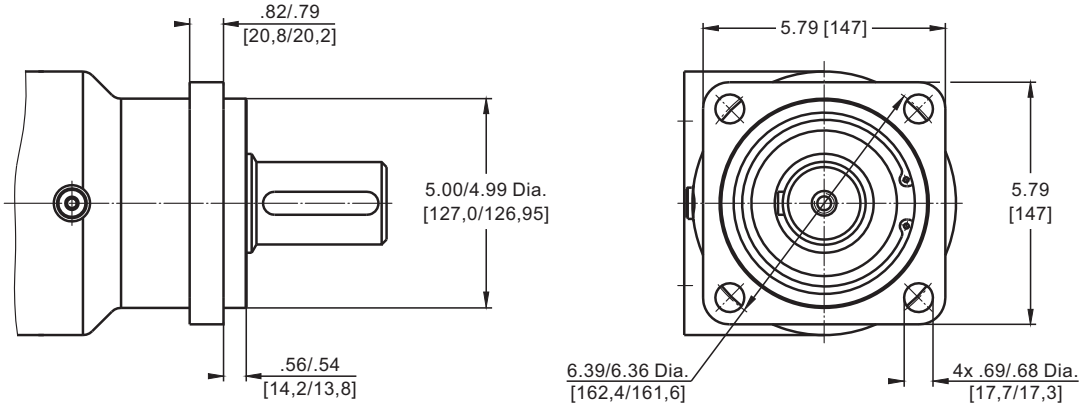


in [mm]

C Square Mount (four holes)



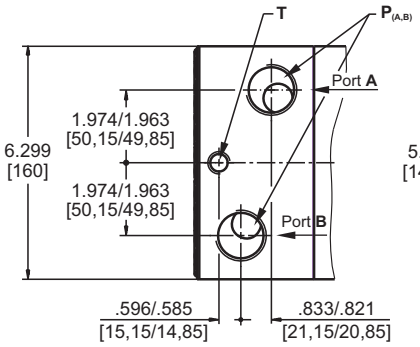
CA Square Mount (four holes)



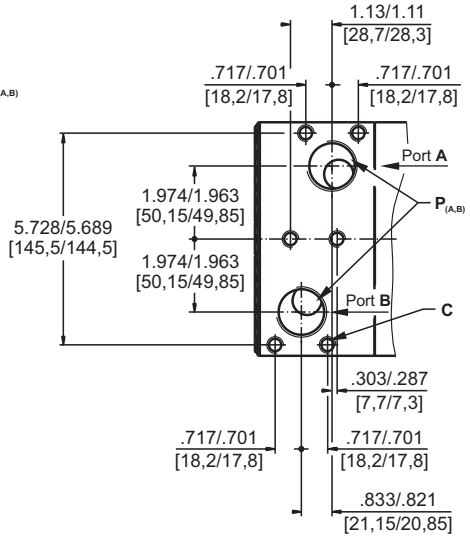
PORTS

Side Ports

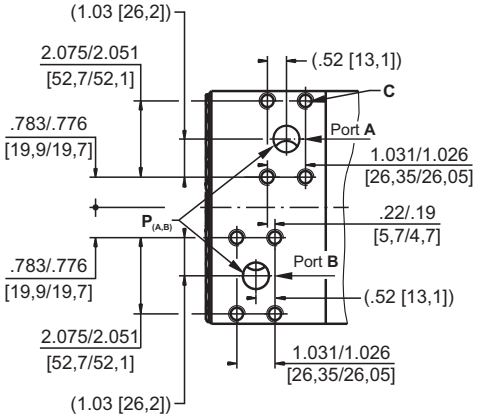
Versions 2 4



Versions 3

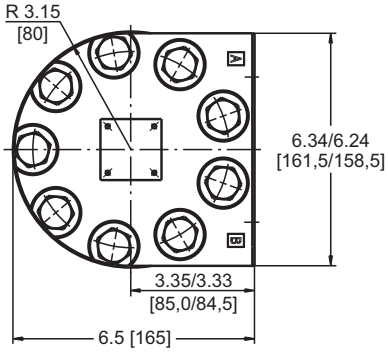


Versions 5



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

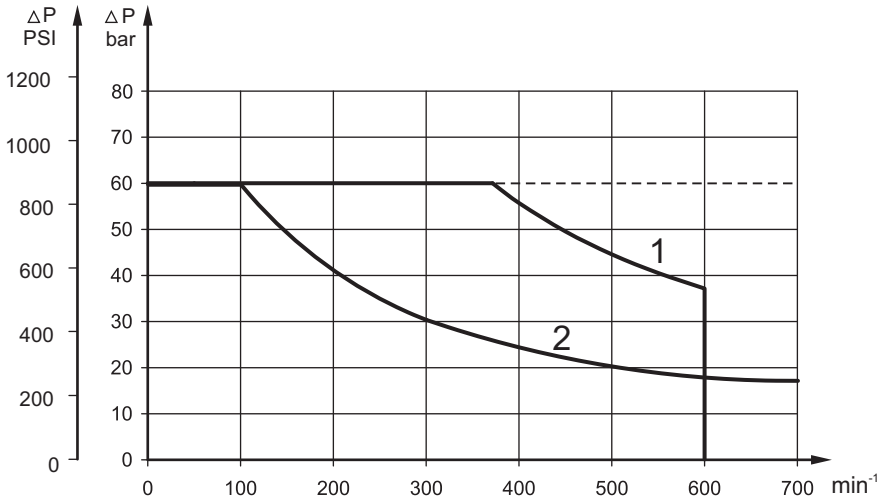
Reverse Rotation
Viewed from Shaft End
Port **A** Pressurized - **CCW**
Port **B** Pressurized - **CW**



	Versions			
	2	3	4	5
P(A,B)	2xG1	2xG1	2x1 5/16-12UN	2x1" (SAE PSI3000)
T	G¼	G¼	9/16-18UNF	G¼
C	-	6xM10	-	8xM10

MAX. PERMISSIBLE SHAFT SEAL PRESSURE

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

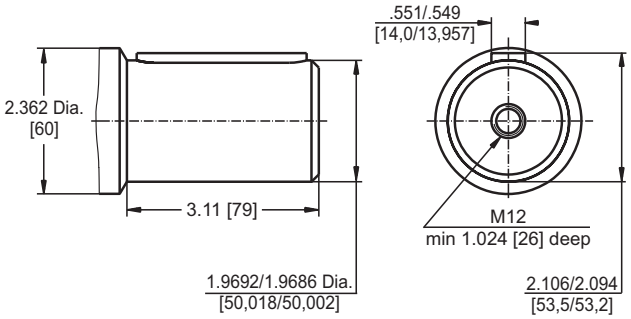


1: Drawing for High Pressure Seal ("U" Seal)
2: Drawing for Standard Shaft Seal

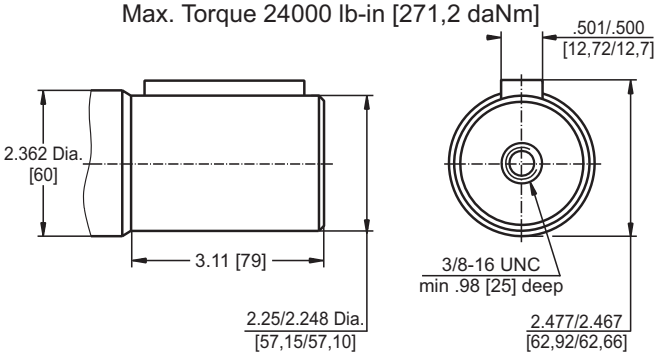
——— - continuous operations
- - - - - - intermittent operations

SHAFT EXTENSIONS

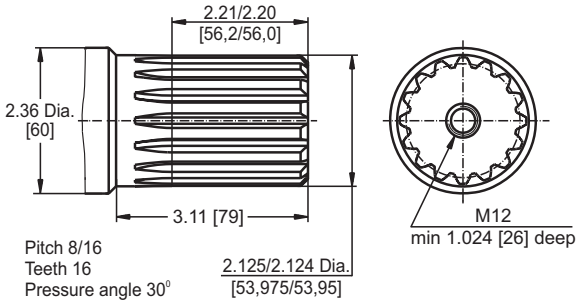
C - ø50 straight, Parallel key A14x9x70 DIN 6885
Max. Torque 24000 lb-in [271,2 daNm]



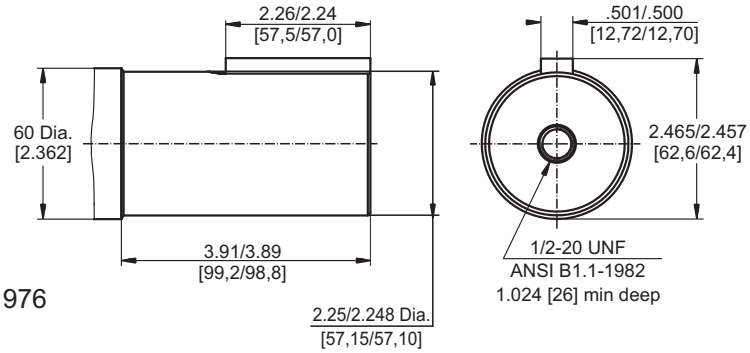
CO - ø2¼" [57,15] straight, Parallel key ½ "x½"x 2¼" BS46
Max. Torque 24000 lb-in [271,2 daNm]



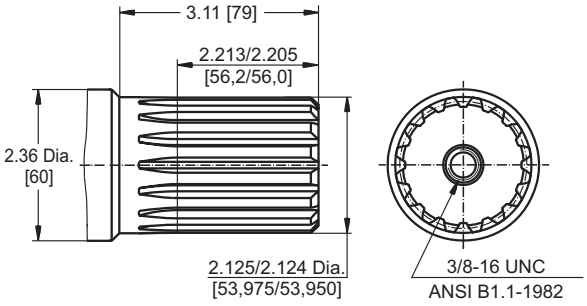
SH - ø2⅛" (ø53,975) splined 16 DP 8/16 ANS B92.1-1976
Max. Torque 24000 lb-in [271,2 daNm]



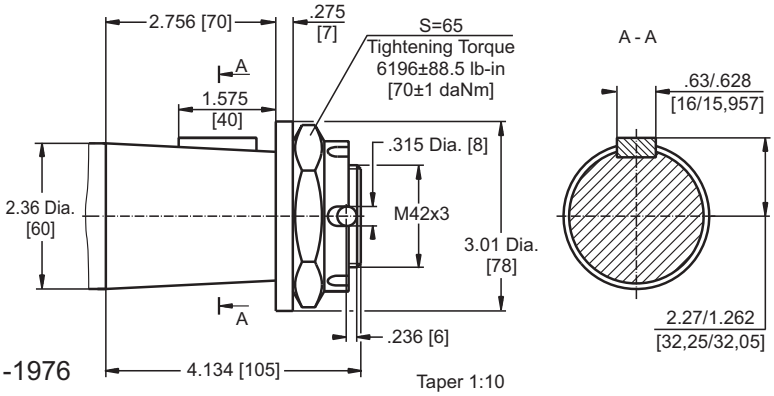
B - ø2¼" [57,15] straight, Parallel key ½ "x½"x 2¼" BS46
Max. Torque 24000 lb-in [271,2 daNm]



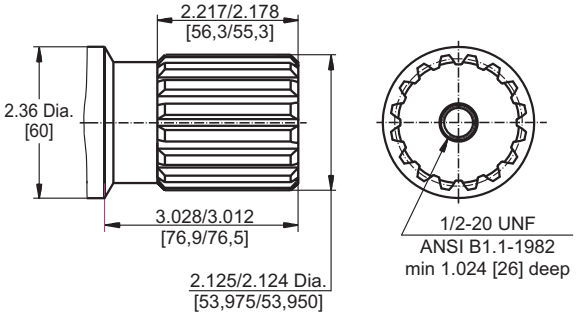
G - ø2⅛" (ø53,975) splined 16 DP 8/16 ANS B92.1-1976
Max. Torque 24000 lb-in [271,2 daNm]



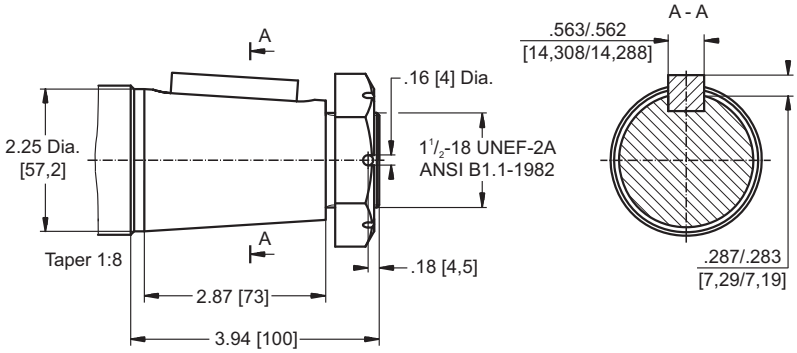
K - ø60, tapered 1:10, Parallel key B16x10x32 DIN 6885
Max. Torque 24000 lb-in [271,2 daNm]



S - ø2⅛" (ø53,975) splined 16 DP 8/16 ANS B92.1-1976
Max. Torque 24000 lb-in [271,2 daNm]



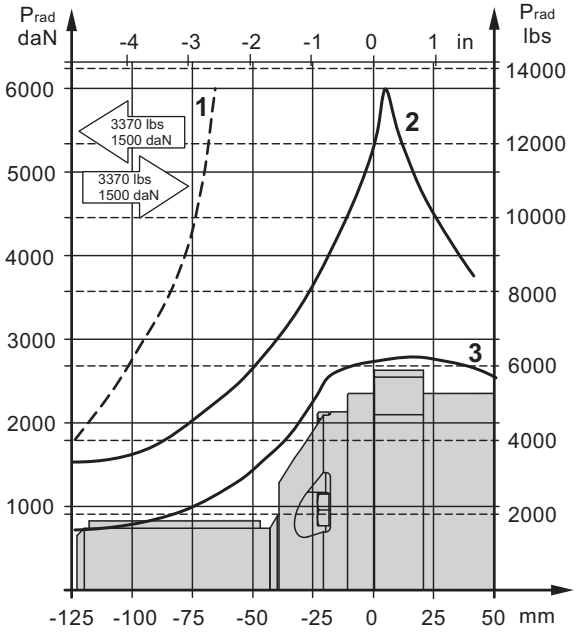
T - ø2¼" [57,15] SAE J501, tapered 1:8, key $^{9}/_{16}$"x$^{9}/_{16}$"x2" BS46
Max. Torque 24000 lb-in [271,2 daNm]



in [mm]

PERMISSIBLE SHAFT LOADS

The output shaft runs in tapered bearings that permit high axial and radial forces. Curve "**1**" shows max. radial shaft load. Any shaft load exceeding the values shown by the curve will seriously reduce motor life. The two other curves apply to a B10 bearing life of 3000 hours at 200 RPM.



2 - P_a=0 lbs [0 daN]

3 - P_a=3370 lbs [1500 daN]

ORDER CODE

	1	2	3	4	5	6	7	8
M V M							**HD**	

Pos.1 - Mounting Flange

omit - Standard square mount, four holes

C - Square mount, four holes

CA - Square mount, four holes

Pos.2 - Displacement code

315 - 19.80 in³/rev [314,5 cm³/rev]

400 - 24.45 in³/rev [400,9 cm³/rev]

500 - 30.48 in³/rev [499,6 cm³/rev]

630 - 38.38 in³/rev [629,1 cm³/rev]

677 - 41.24 in³/rev [675,8 cm³/rev]

800 - 48.91 in³/rev [801,8 cm³/rev]

Pos.3 - Shaft Extensions*

C - ø50 straight, Parallel key A14x9x70 DIN6885

CO - ø2¼" [57,15] straight, Parallel key $^1/_2$"x$^1/_2$"x2¼" BS46

B - ø2¼" [57,15] straight, Parallel key $^1/_2$"x$^1/_2$"x2¼" BS46

SH - ø2$^1/_8$" [53,975] splined, 16DP 8/16 ANS B92.1-1976

G - ø2$^1/_8$" [53,975] splined, 16DP 8/16 ANS B92.1-1976

S - ø2$^1/_8$" [53,975] splined, 16DP 8/16 ANS B92.1-1976

K - ø60 tapered 1:10, Parallel key B16x10x32 DIN6885

T - ø2¼" [57,15] SAE J501, tapered 1:8, key $^9/_{16}$"x$^9/_{16}$"x2" BS46

Pos.4 - Ports

2 - side ports 2xG1, G1/4, BSP thread, ISO 228

3 - side ports 2xG1, G1/4, BSP thread, ISO 228, 6xM10

4 - side ports 2x1 5/16-12 UN, O-ring, 9/16-18 UNF

5 - side ports 2x1" (SAE PSI3000), G1/4, BSP thread,SO 228, 8xM10

Pos.5 - Check Valves

omit - without check valves

1 - with check valves

Pos.6 - Shaft Seal Version

omit - Low pressure shaft seal

U - High pressure shaft seal

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 not be exceeded!
** Drain line should always be used (if no check valves).

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	–

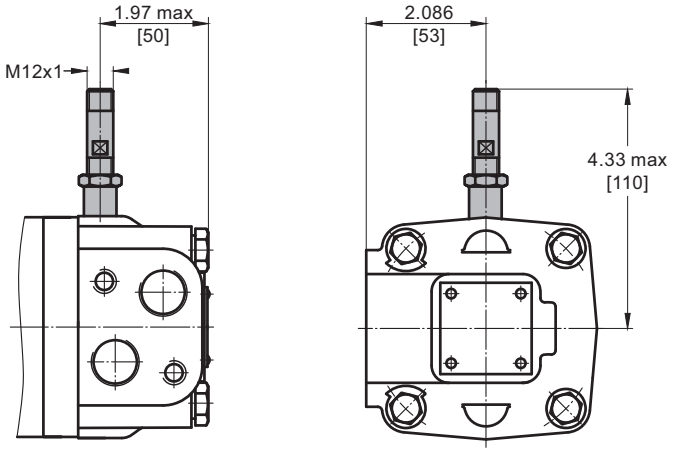
O	Optional
-	Not applicable
S	Standard

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

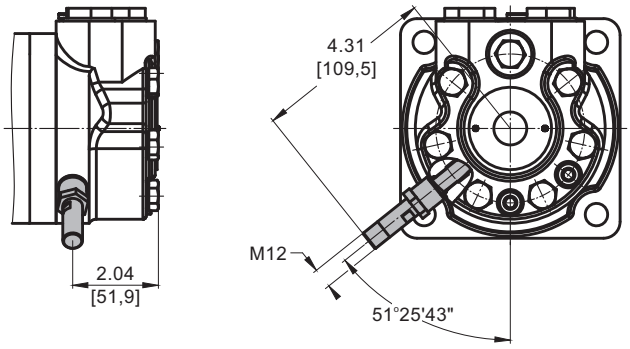
⚠ For more information about **HD** option please contact with "M+S Hydraulic".

MOTORS WITH SPEED SENSOR

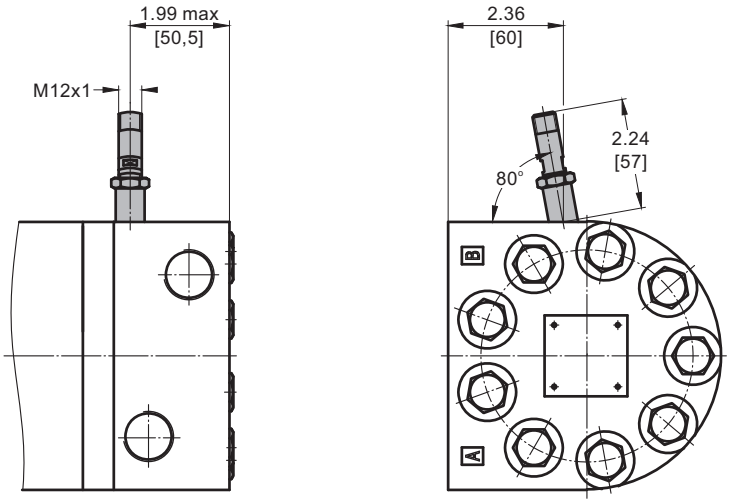
MLHSEM...RS



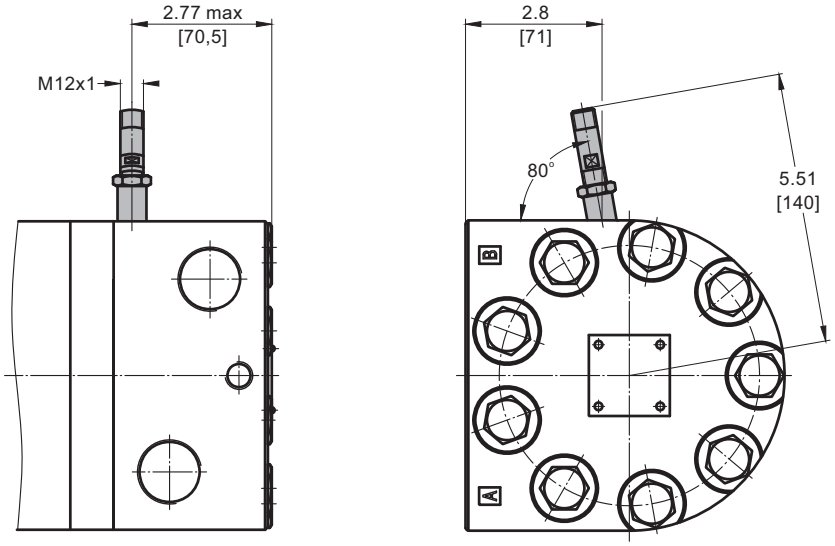
MTK...RS



MLHTM...RS
TMF...RS



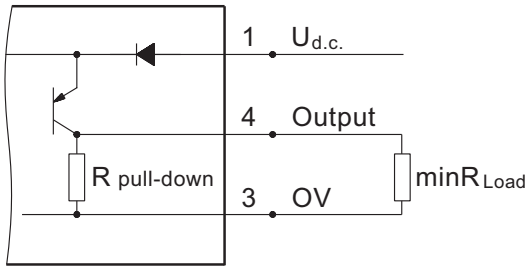
MVM...RS
VMF...RS



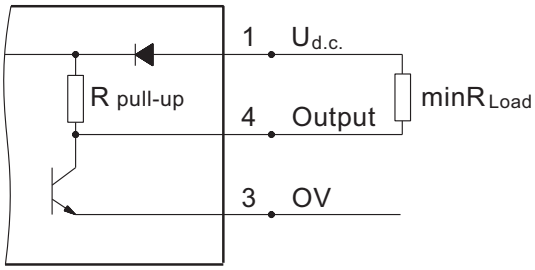
TECHNICAL DATA of the SPEED SENSOR

Wiring diagrams

PNP



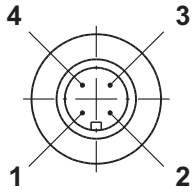
NPN



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

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 $M_W > M$

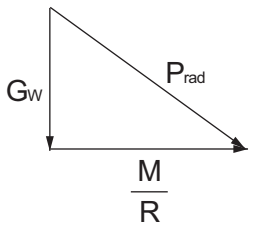
f - frictional factor;
$\mathbf{G_W}$ - total weight over the wheels, lbs [daN].

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]

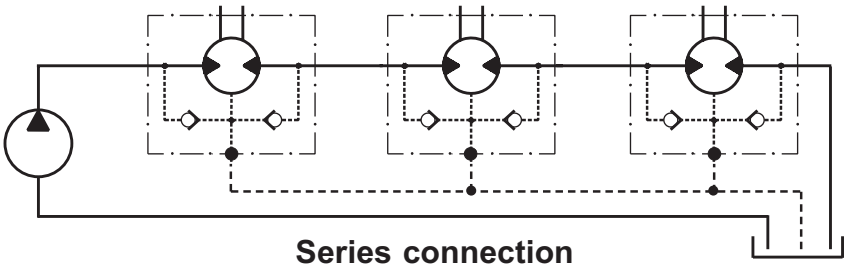
When motor is used for vehicle motion with wheels mounted directly on motor shaft, the total radial loading of motor shaft **Prad** is a sum of motion force and weight force acting on one wheel.



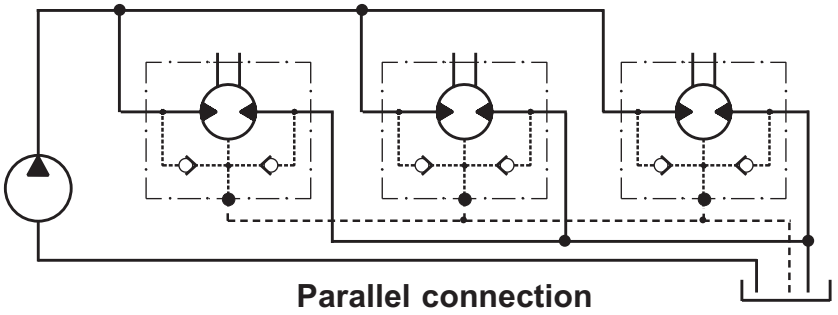
$$P_{rad}=\sqrt{G_W^2+\left(\frac{M}{R}\right)^2}$$

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