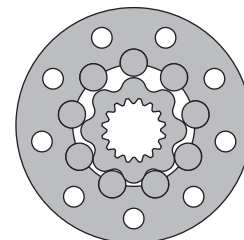
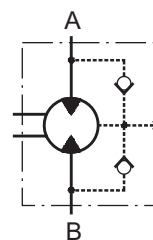
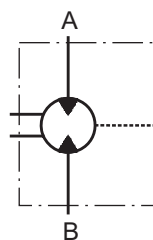


HYDRAULIC MOTORS MTM



APPLICATION

- » Skid Steer Loaders
- » Metal working machines
- » Trenchers
- » Augers
- » Agriculture machines
- » Road building machines
- » Special vehicles
- » Mine machines
- » Woodworking and sawmill machinery
- » Conveyors etc.



CONTENTS

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Shaft extensions	29
Permissible shaft loads	29
Dimensions and mounting MTMV	30
Dimensions and mounting MTM6V	31
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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;
- » Other special features.

EXCELLENCE

- » High torque and pressure drop
- » High inlet pressure
- » High starting torque
- » Improved efficiency at high pressure drop
- » Smooth operation at low speed

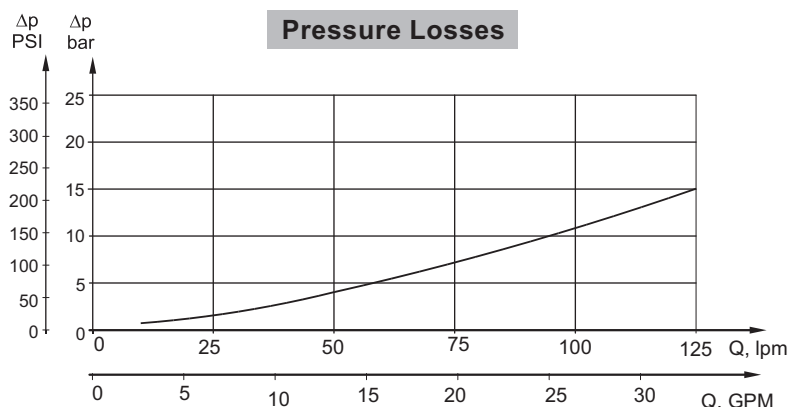
GENERAL

Max. Displacement,	cm ³ /rev [in ³ /rev]	724 [44.2]
Max. Speed,	[RPM]	750
Max. Torque,	daNm [lb-in]	cont.: 183 [16200] int.: 229 [20270]
Max. Output,	kW [HP]	70 [94]
Max. Pressure Drop,	bar [PSI]	cont.: 250 [3600] int.: 350 [5080]
Max. Oil Flow,	lpm [GPM]	150 [40]
Min. Speed,	[RPM]	5
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]	2,5 [.660]
	35 [164]	1,5 [.396]
210 [3045]	20 [98]	5 [1.321]
	35 [164]	3 [.793]

Pressure Losses



SPECIFICATION DATA

Type		MTM 200	MTM 250	MTM 315	MTM 400	MTM 470	MTM 500	MTM 630	MTM 725
Displacement, cm ³ /rev [in ³ /rev]		201,4 [12.29]	251,8 [15.36]	326,3 [19.9]	410,9 [25.06]	475 [28.97]	523,6 [31.95]	631,2 [38.52]	724 [44.2]
Max. Speed, [RPM]	Cont.	625	500	380	305	260	240	190	170
	Int.*	750	600	460	365	315	285	230	215
Max. Torque, daNm [lb-in]	Cont.	74 [6550]	90 [7965]	116 [10265]	147 [13010]	171 [15135]	172 [15225]	183 [16200]	160 [14160]
	Int.*	102 [9030]	128 [11330]	163 [14425]	206 [18232]	215 [16030]	215 [16030]	229 [20270]	192 [17000]
	Peak**	115 [10180]	144 [12745]	186 [16460]	235 [20800]	240 [21240]	240 [21240]	274 [24250]	240 [21240]
Max. Output, kW [HP]	Cont.	41 [55]	41 [55]	41 [55]	41 [55]	41 [55]	37,5 [50]	28 [37,5]	26 [35]
	Int.*	70 [94]	70 [94]	70 [94]	70 [94]	55 [74]	51 [68]	42 [56]	40 [54]
Max. Pressure Drop, bar [PSI]	Cont.	250 [3600]	250 [3600]	250 [3600]	250 [3600]	250 [3600]	230 [3340]	200 [2900]	160 [2320]
	Int.*	350 [5080]	350 [5080]	350 [5080]	350 [5080]	315 [4570]	280 [4060]	250 [3625]	210 [3045]
	Peak**	400 [5800]	400 [5800]	400 [5800]	400 [5800]	350 [5080]	320 [4640]	300 [4350]	260 [3770]
Max. Oil Flow, lpm [GPM]	Cont.	125 [33]	125 [33]	125 [33]	125 [33]	125 [33]	125 [33]	125 [33]	125 [33]
	Int.*	150 [40]	150 [40]	150 [40]	150 [40]	150 [40]	150 [40]	150 [40]	150 [40]
Max. Inlet Pressure, bar [PSI]	Cont.	270 [3920]	270 [3920]	270 [3920]	270 [3920]	270 [3920]	270 [3920]	270 [3920]	270 [3920]
	Int.*	370 [5370]	370 [5370]	370 [5370]	370 [5370]	370 [5370]	370 [5370]	370 [5370]	370 [5370]
	Peak**	420 [6100]	420 [6100]	420 [6100]	420 [6100]	420 [6100]	420 [6100]	420 [6100]	420 [6100]
Max. Starting Pressure with Unloaded Shaft, bar [PSI]		6 [90]	6 [90]	6 [90]	6 [90]	6 [90]	6 [90]	6 [90]	6 [90]
Min. Starting Torque, daNm [lb-in]		60 [5310]	75 [6640]	97 [8585]	122 [10800]	142 [12570]	143 [12655]	145 [12830]	148 [13100]
Min. Speed***, [RPM]		5	5	5	5	5	5	5	5
Weight, kg [lb]	MTM	26,9 [59.3]	27,3 [60.2]	28,1 [62]	29 [64]	29,7 [65.5]	30,2 [66.6]	29,7 [65.5]	31 [68.4]
	MTMW	27,4 [60.4]	27,8 [61.3]	28,6 [63.1]	29,5 [65.1]	30,2 [66.6]	30,7 [67.7]	30,2 [66.6]	31,5 [69.5]
	MTMV	15,7 [34.6]	16,1 [35.5]	16,9 [37.3]	17,8 [39.3]	18,5 [40.8]	19 [41.9]	18,5 [40.8]	19,8 [43.7]

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

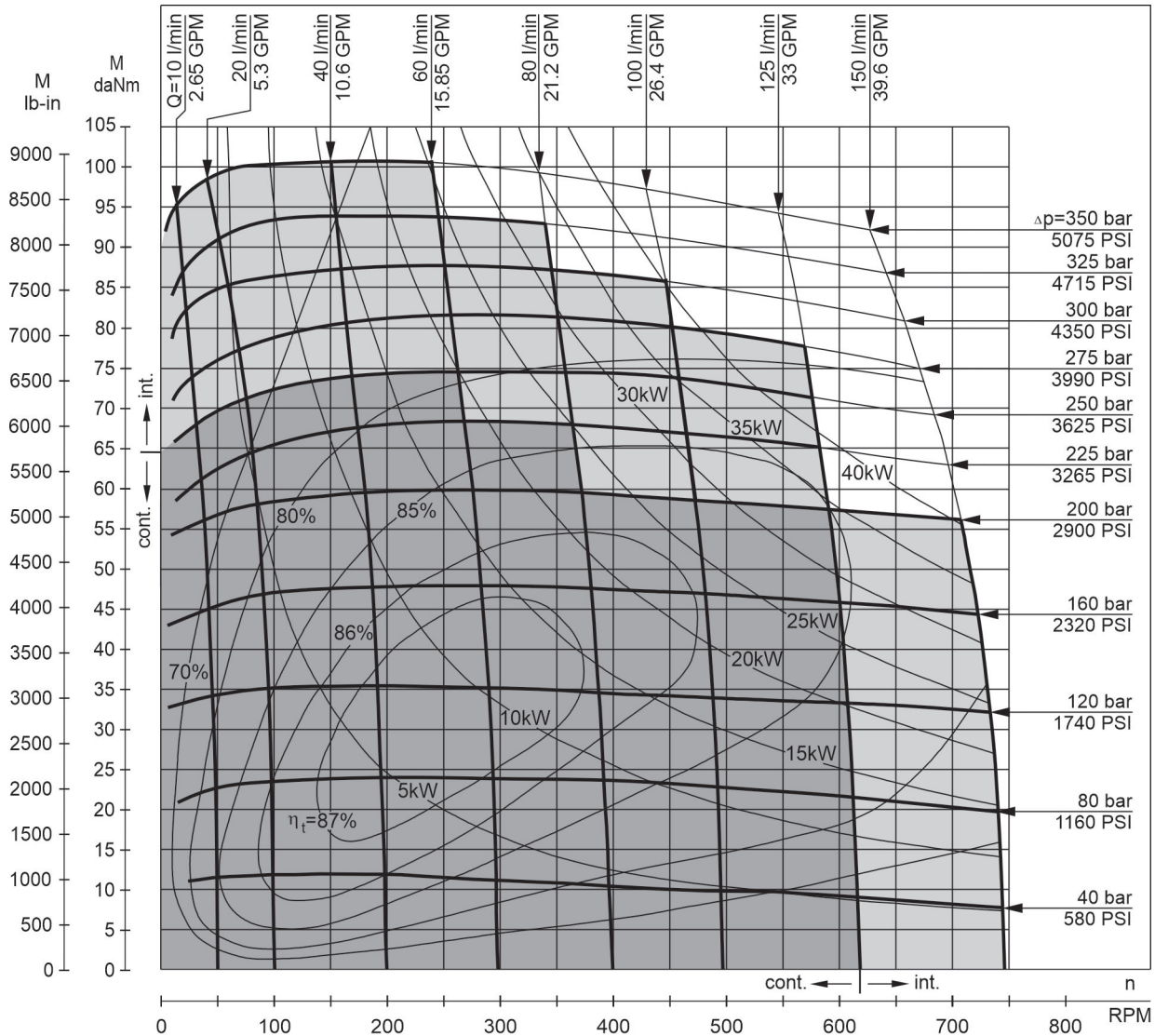
** Peak load: the permissible values may occur for max. 1% of every minute.

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

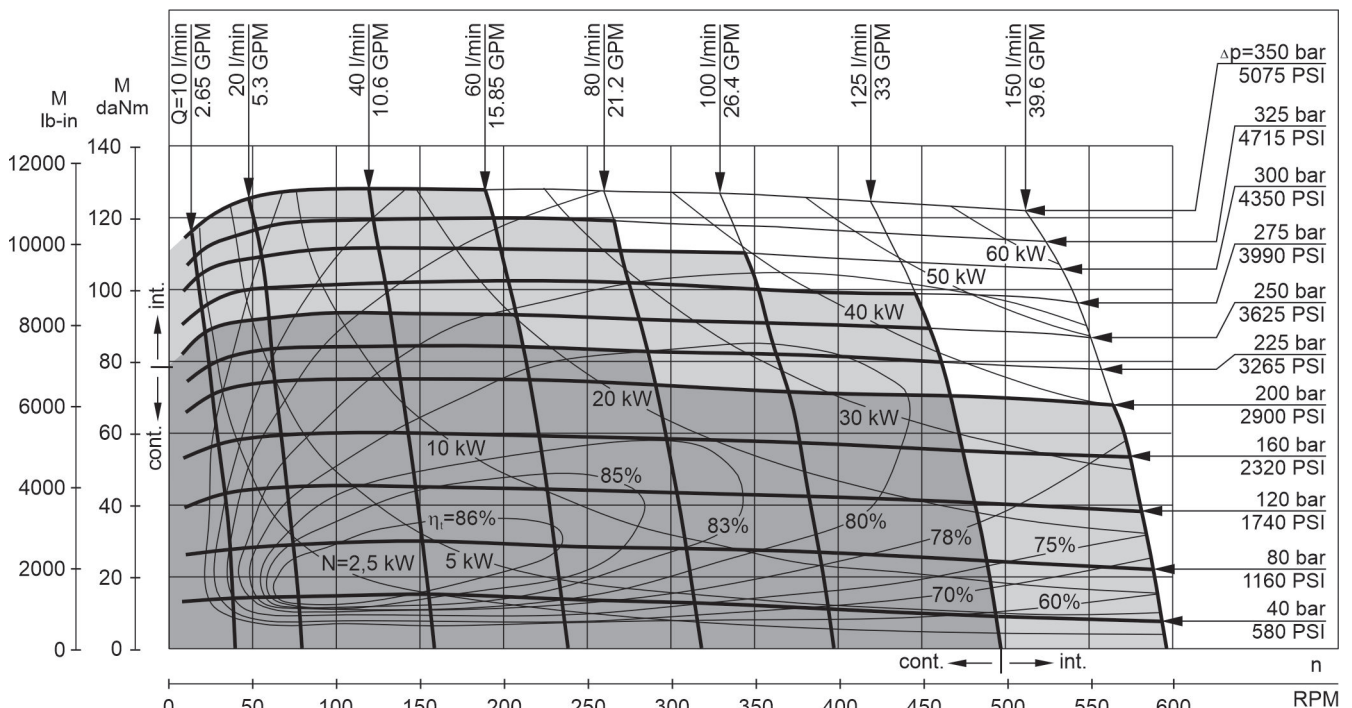
- Intermittent speed and intermittent pressure must not occur simultaneously.
- Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
- Recommend using a premium quality, anti-wear type mineral based hydraulic oil HLP(DIN51524) or HM (ISO 6743/4).
If using 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.

MTM 200

FUNCTION DIAGRAMS



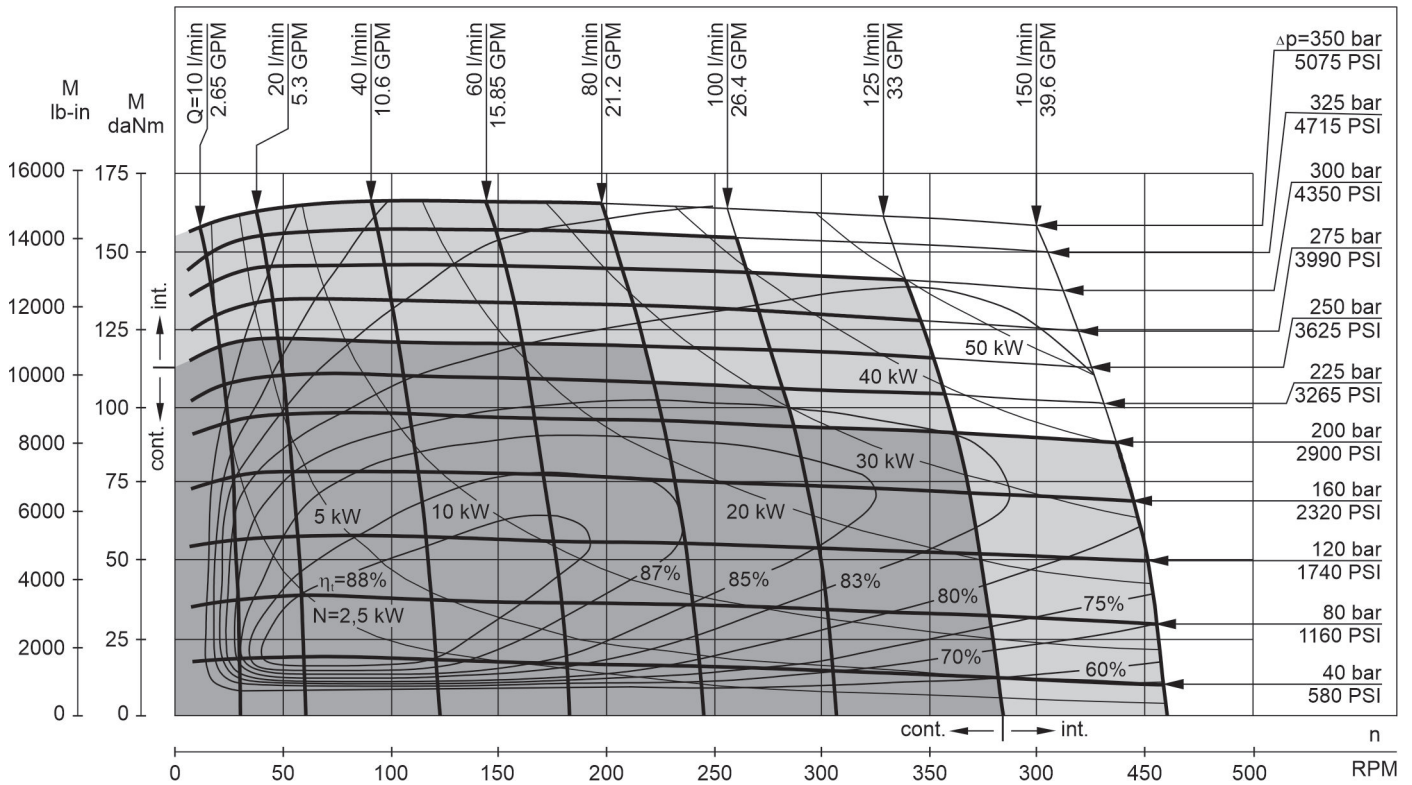
MTM 250



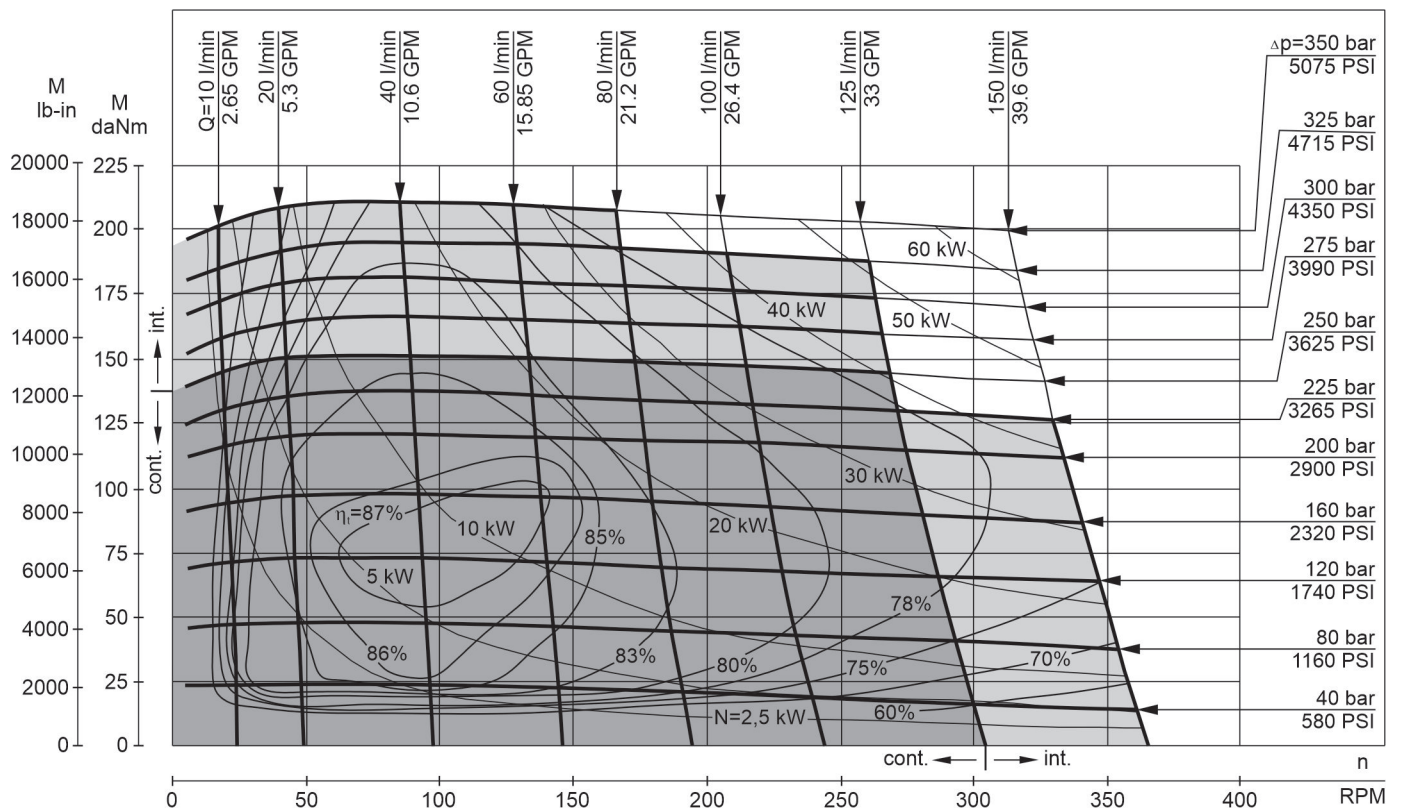
The function diagrams data is for average performance of randomly selected motors at back pressure 5÷10 bar [72.5 PSI÷145 PSI] and oil with viscosity of 32 mm²/s [150 SUS] at 50°C [122°F].

FUNCTION DIAGRAMS

MTM 315



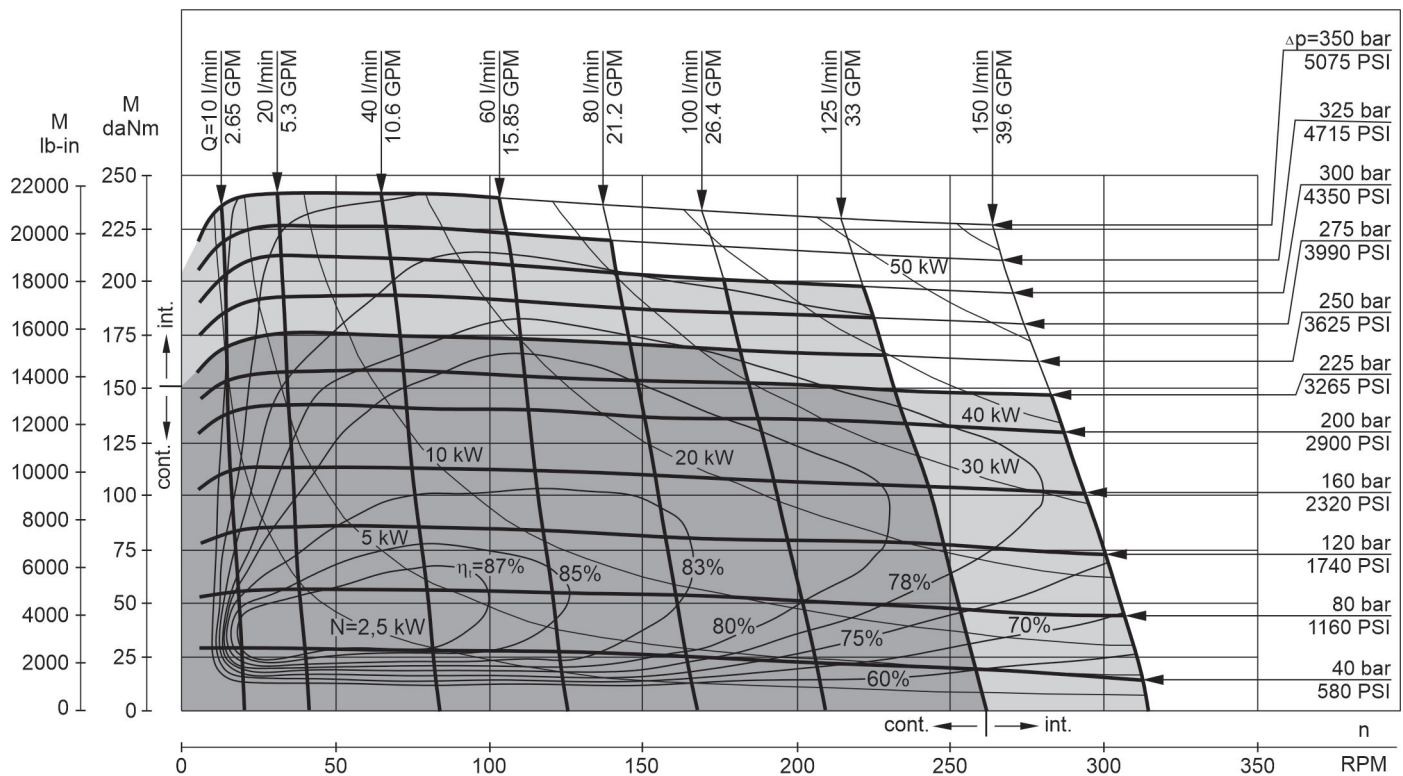
MTM 400



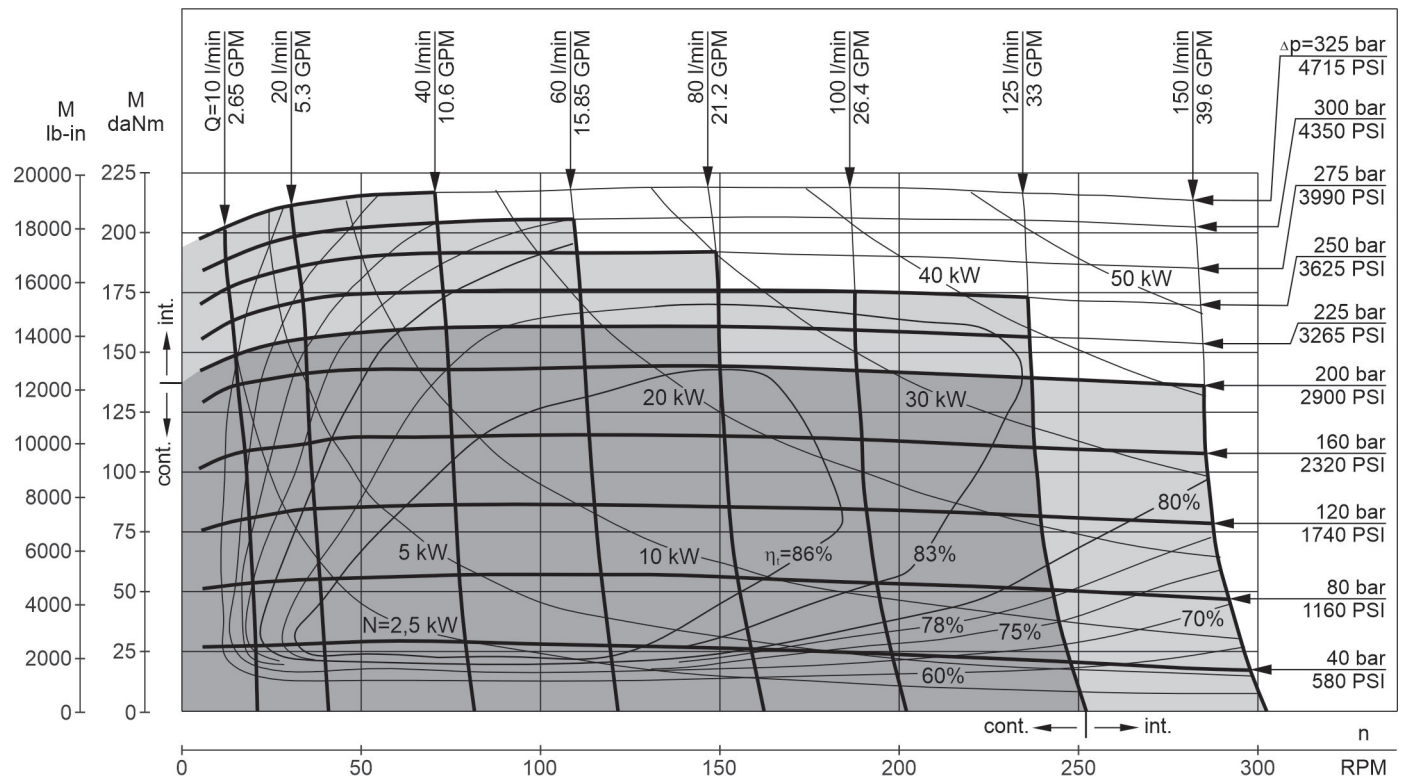
The function diagrams data is for average performance of randomly selected motors at back pressure 5÷10 bar [72.5 PSI÷145 PSI] and oil with viscosity of 32 mm²/s [150 SUS] at 50°C [122°F].

FUNCTION DIAGRAMS

MTM 470



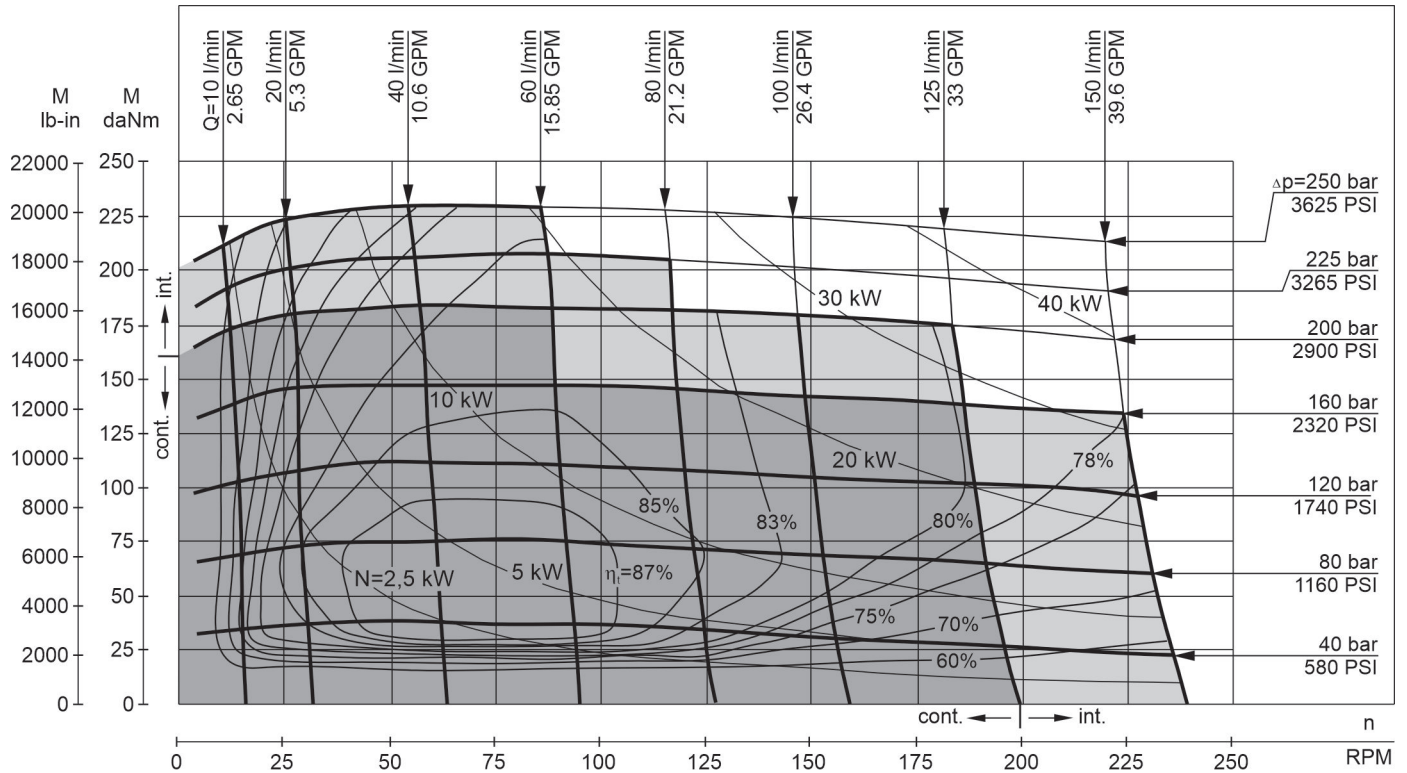
MTM 500



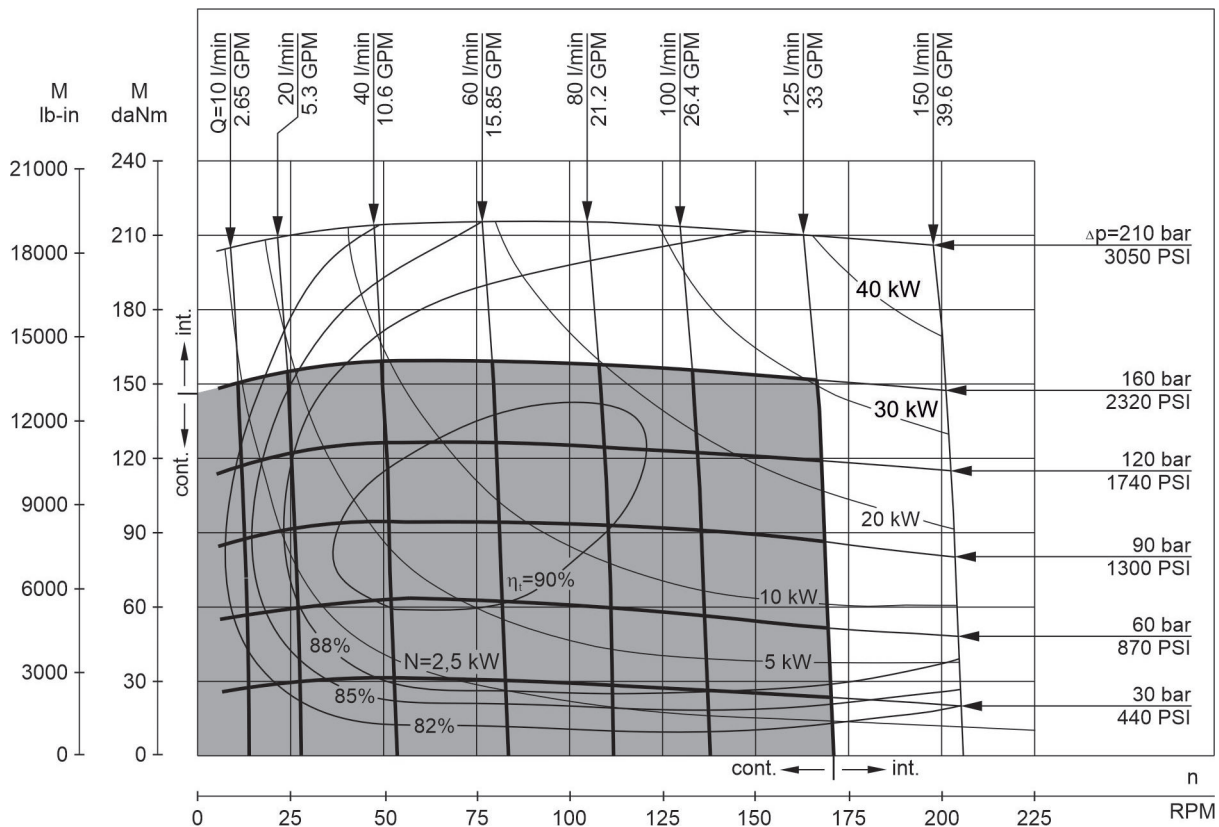
The function diagrams data is for average performance of randomly selected motors at back pressure 5÷10 bar [72.5 PSI÷145 PSI] and oil with viscosity of 32 mm²/s [150 SUS] at 50°C [122°F].

FUNCTION DIAGRAMS

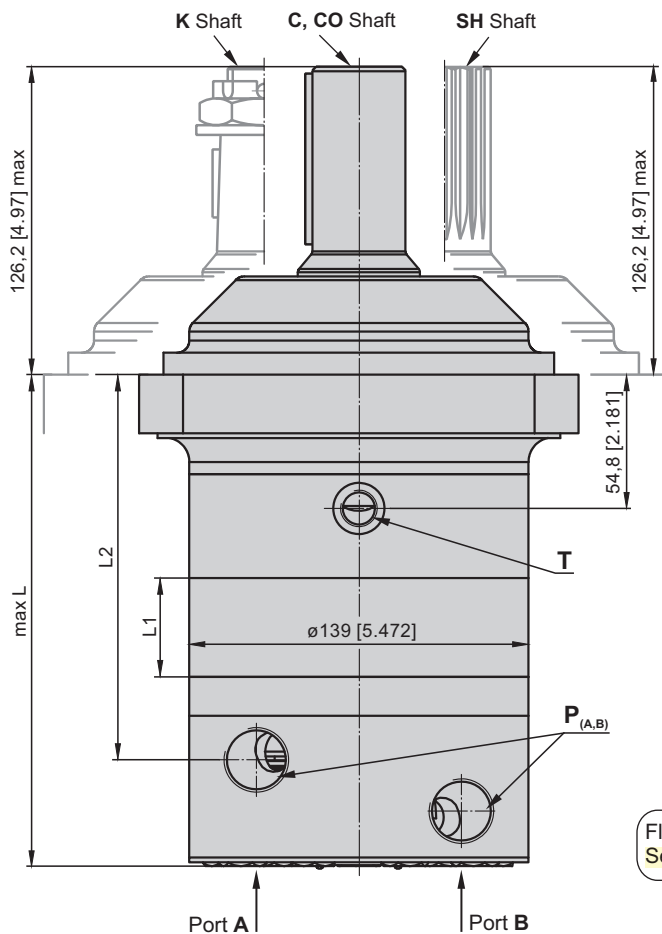
MTM 630



MTM 725

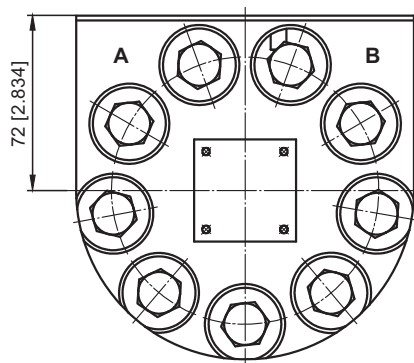
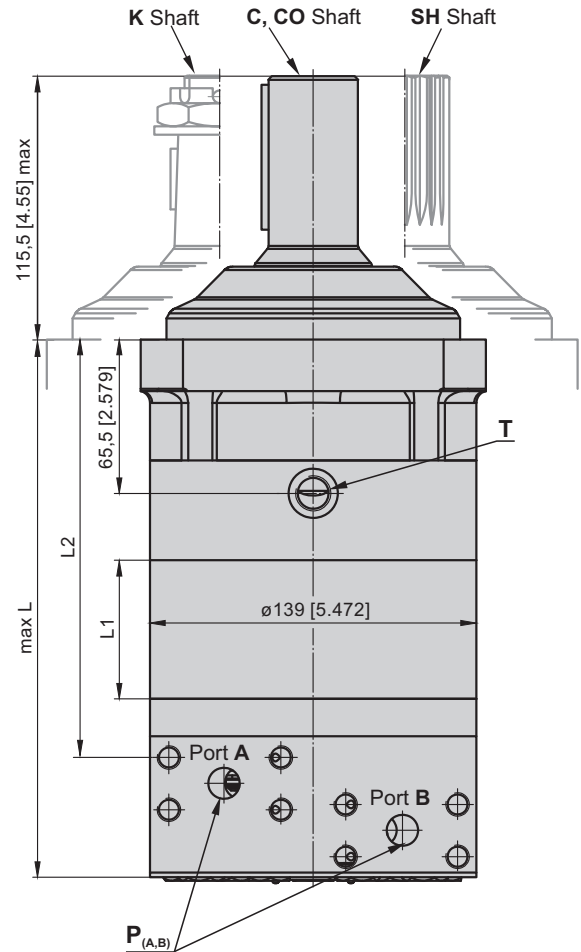


The function diagrams data is for average performance of randomly selected motors at back pressure 5÷10 bar [72.5 PSI÷145 PSI] and oil with viscosity of 32 mm²/s [150 SUS] at 50°C [122°F].

DIMENSIONS and MOUNTING DATA for MTM and MTMC - versions ..., 4, 5


Flange Dim.
See Page 27

Shaft Dim.
See Page 29



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

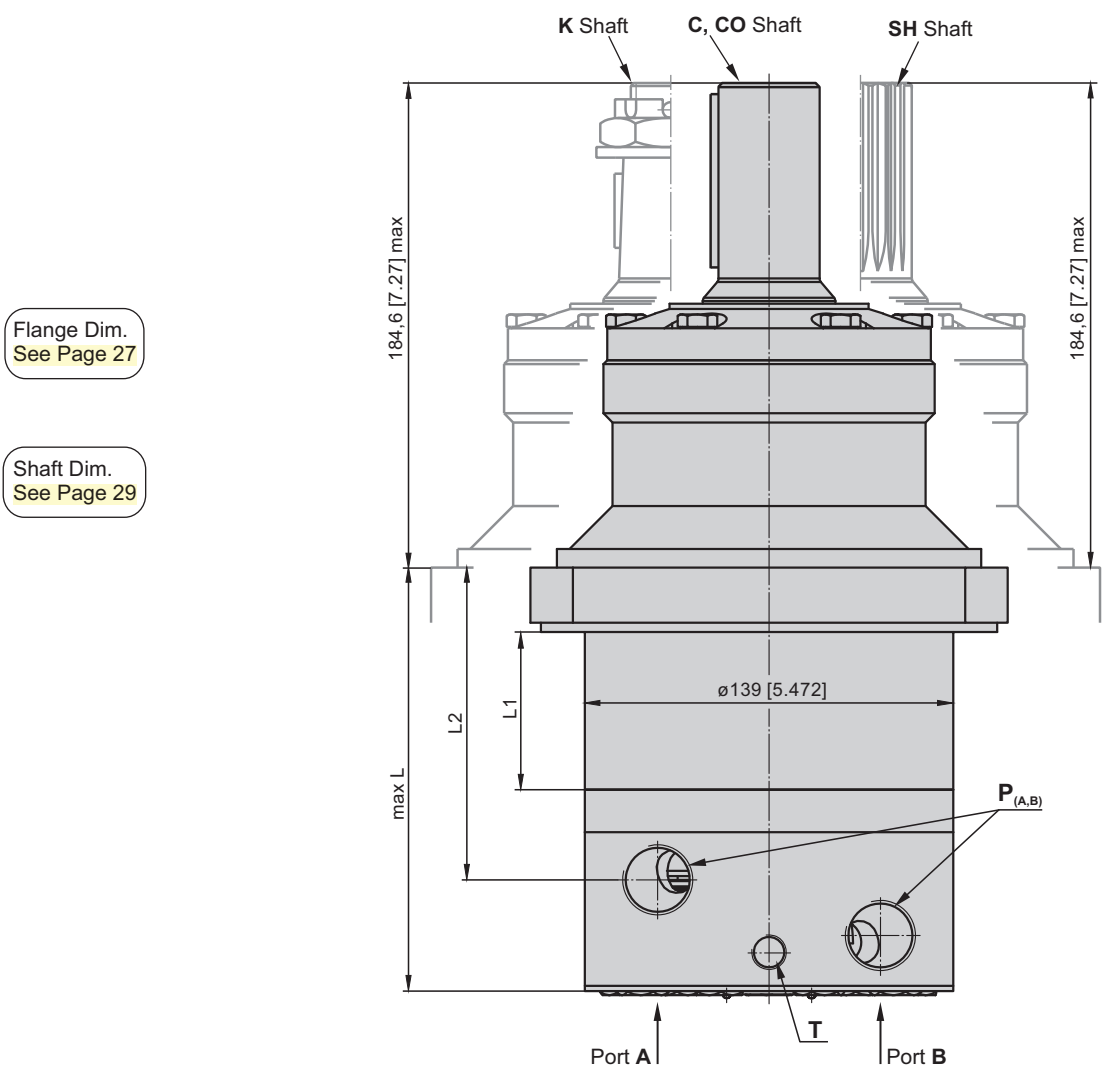


Standard Rotation
 Viewed from Shaft End
 Port A Pressurized - CW
 Port B Pressurized - CCW

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

	Versions		
	-	4	5
P_(A,B)	2xG3/4 17 mm [.67] depth	2x1 ¹ / ₁₆ -12UN O-ring 17 mm [.67] depth	2x3/4"SAE PSI3000 with 8xM10 threads 10 mm [.39] depth
T	G1/4 12 mm [.47] depth	9 ¹ / ₁₆ -18UN 13 mm [.51] depth	G1/4 12 mm [.47] depth

Type	L, mm [in]	L ₂ , mm [in]	Type	L, mm [in]	L ₂ , mm [in]	Type	L, mm [in]	L ₂ , mm [in]	Type	L, mm [in]	L ₃ , mm [in]	L ₁ , mm [in]
MTM200 ...,4	188 [7.40]	142,3 [5.60]	MTMC200 ...,4	198 [7.79]	153 [6.02]	MTM200 5	188 [7.40]	133,5 [5.26]	MTMC200 5	198 [7.79]	144 [5.67]	25 [.98]
MTM250 ...,4	194 [7.64]	148,6 [5.85]	MTMC250 ...,4	204,5 [8.05]	159,3 [6.27]	MTM250 5	194 [7.64]	139,5 [5.49]	MTMC250 5	204,3 [8.04]	150,3 [5.92]	31,3 [1.23]
MTM315 ...,4	203 [7.99]	157,8 [6.21]	MTMC315 ...,4	213,5 [8.40]	168,5 [6.63]	MTM315 5	203 [7.99]	149,0 [5.87]	MTMC315 5	213,5 [8.41]	159,5 [6.28]	40,5 [1.59]
MTM400 ...,4	214 [8.43]	168,3 [6.63]	MTMC400 ...,4	224 [8.82]	179 [7.04]	MTM400 5	214 [8.43]	159,5 [6.28]	MTMC400 5	224 [8.82]	170 [6.69]	51 [2.01]
MTM470 ...,4	222 [8.74]	176,3 [6.94]	MTMC470 ...,4	232 [9.13]	187 [7.36]	MTM470 5	222 [8.74]	167,5 [6.59]	MTMC470 5	232 [9.13]	178 [7.01]	59 [2.32]
MTM500 ...,4	228 [8.98]	182,3 [7.18]	MTMC500 ...,4	238 [9.37]	193 [7.60]	MTM500 5	228 [8.98]	173,5 [6.83]	MTMC500 5	238 [9.37]	184 [7.24]	65 [2.56]
MTM630 ...,4	224 [8.82]	178,3 [7.02]	MTMC630 ...,4	234 [9.21]	189 [7.44]	MTM630 5	224 [8.82]	169,5 [6.67]	MTMC630 5	234 [9.21]	180 [7.09]	61 [2.40]
MTM725 ...,4	233 [9.17]	187,3 [7.37]	MTMC725 ...,4	243 [9.56]	198 [7.79]	MTM725 5	233 [9.17]	178,5 [7.03]	MTMC725 5	243 [9.57]	189 [7.44]	70 [2.76]



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**

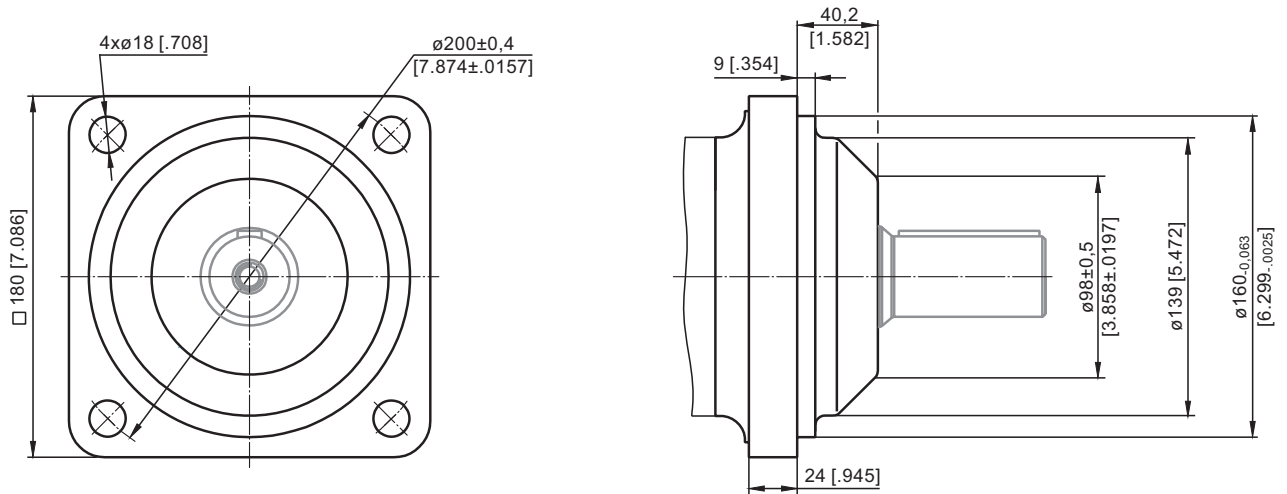
	Versions	
	-	4
P _(A,B)	2xG3/4	2x1 ¹ / ₁₆ -12UN
	17 mm [.67] depth	O-ring 17 mm [.67] depth
T	G1/4	9 ¹ / ₁₆ -18UN
	12 mm [.47] depth	13 mm [.51] depth

Type	L, mm [in]	L ₂ , mm [in]	L ₁ , mm [in]
MTMW 200 ...,4	129 [5.08]	83,8 [3.30]	25 [.98]
MTMW 250 ...,4	135 [5.32]	90,1 [3.55]	31,3 [1.23]
MTMW 315 ...,4	144 [5.67]	99,3 [3.91]	40,5 [1.59]
MTMW 400 ...,4	155 [6.10]	109,8 [4.32]	51 [2.01]
MTMW 470 ...,4	163 [6.42]	117,8 [4.64]	59 [2.32]
MTMW 500 ...,4	169 [6.65]	123,8 [4.87]	65 [2.56]
MTMW 630 ...,4	165 [6.50]	119,8 [4.72]	61 [2.40]
MTMW 725 ...,4	174 [6.85]	128,8 [5.07]	70 [2.76]

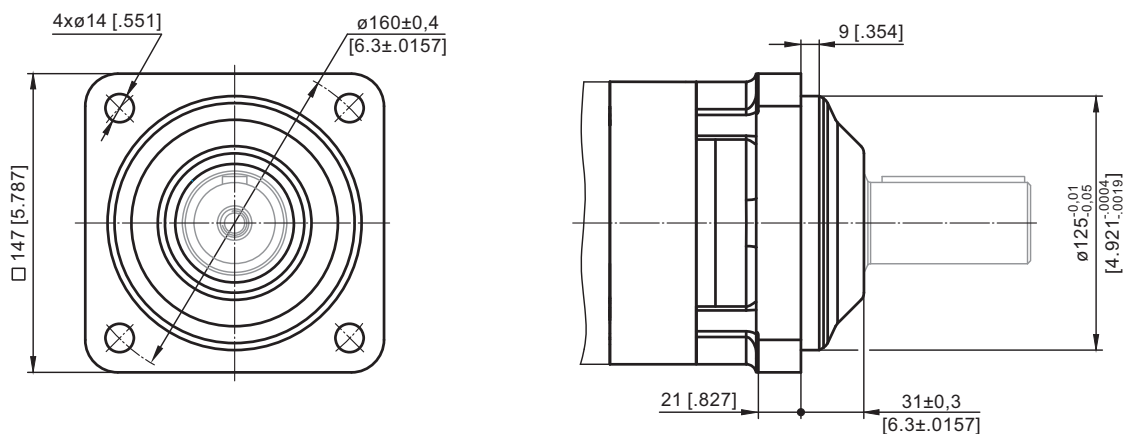


MOUNTING

4-Bolt flange
spigot diameter $\varnothing 160$ mm [6.3 in] - BC $\varnothing 200$ mm [7.874 in]



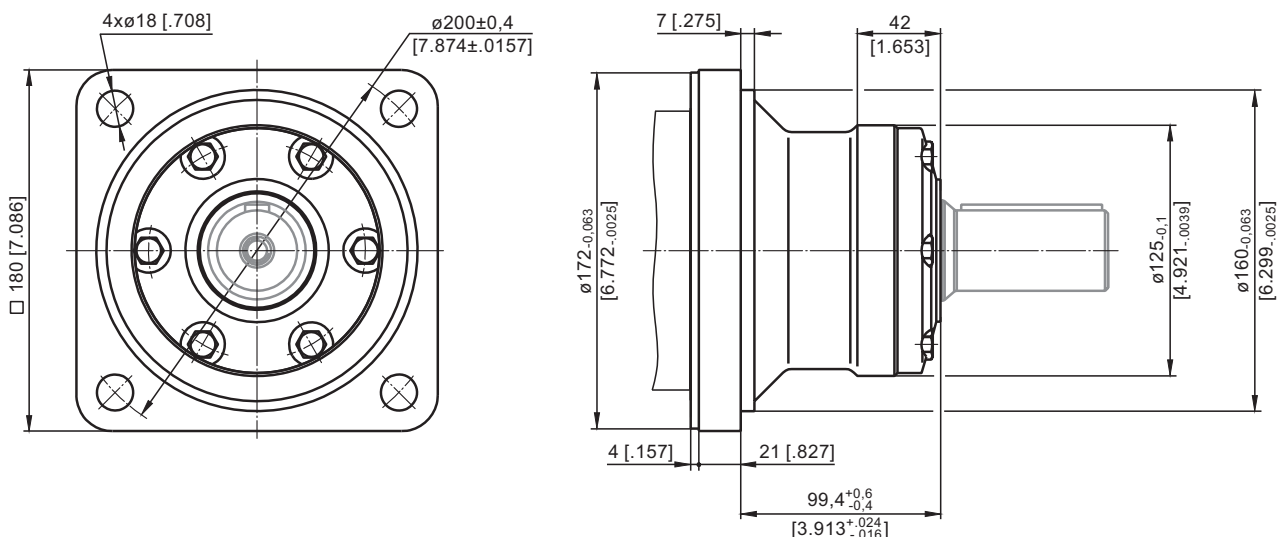
C 4-Bolt flange
spigot diameter $\varnothing 125$ mm [4.921 in] - BC $\varnothing 160$ mm [6.3 in]



W 4-Bolt flange, Wheel Motor
spigot diameter $\varnothing 160$ mm [6.3 in] - BC $\varnothing 200$ mm [7.874 in]



mm [in]

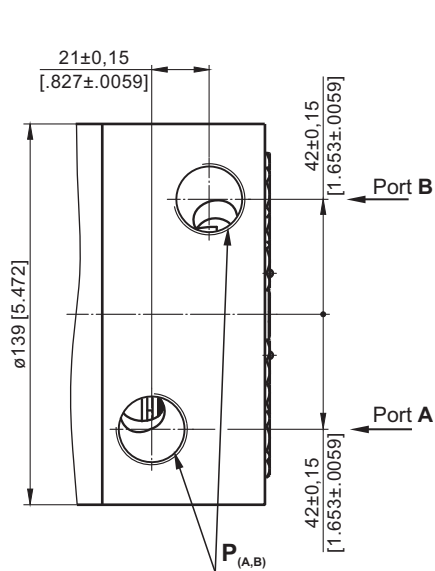


PORTS

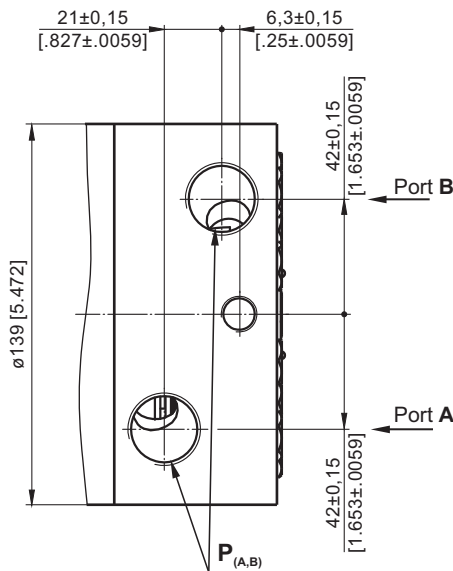
Versions ☐ 4

Version ☒ 5

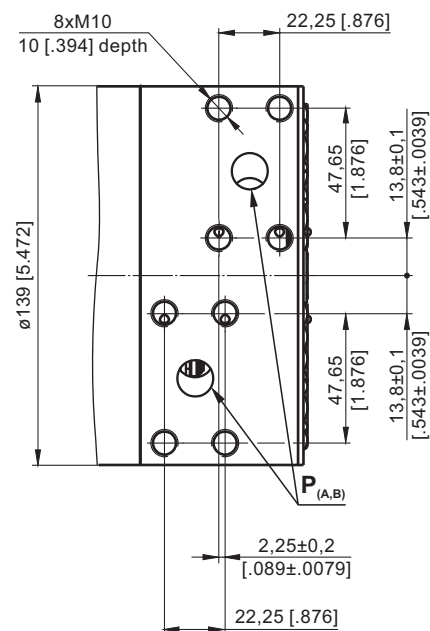
For **MTM** and **MTMC**



For **MTMW**



For **MTM** and **MTMC**



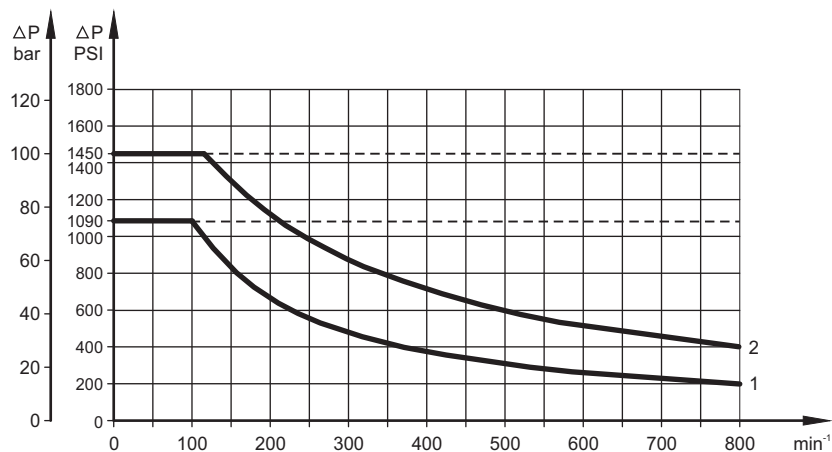
	Versions		
	-	4	5
P_(A,B)	2xG3/4 17 mm [.67] depth	2x1 1/16-12UN O-ring 17 mm [.67] depth	2x3/4"SAE PSI3000 with 8xM10 threads 10 mm [.39] depth
T	G1/4 12 mm [.47] depth	9/16-18UN 13 mm [.51] depth	G1/4 12 mm [.47] depth



mm [in]

MAX. PERMISSIBLE SHAFT SEAL PRESSURE

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



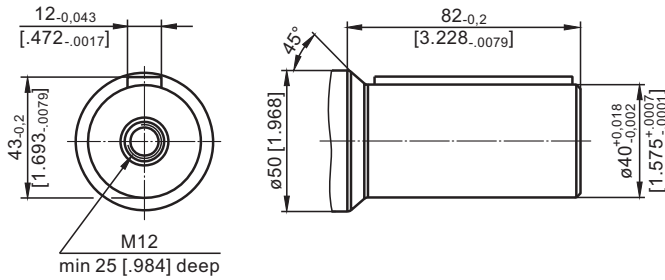
1: Drawing for Standard Shaft Seal

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

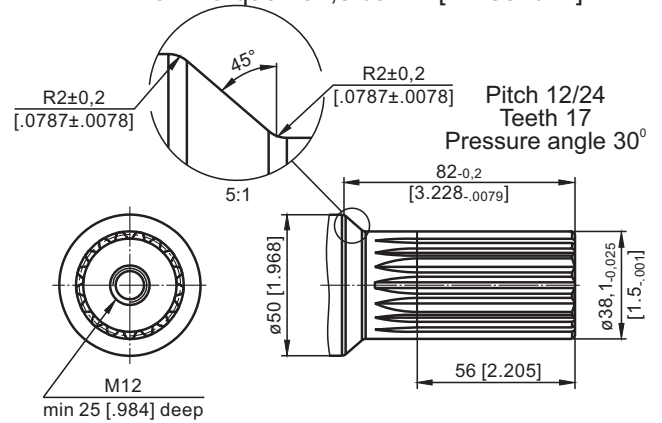
— - continuous operations
- - - - - intermittent operations

SHAFT EXTENSIONS

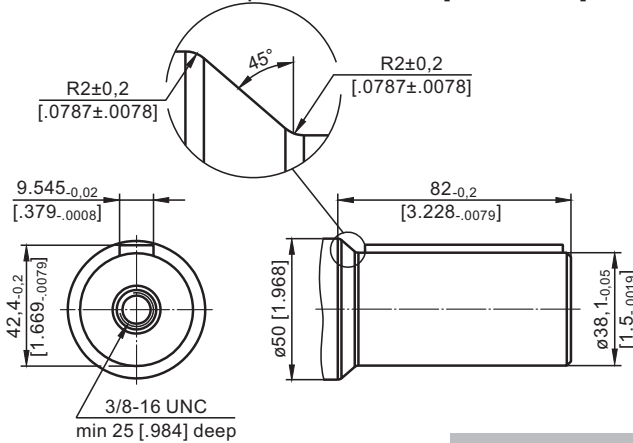
C - $\varnothing 40$ straight, Parallel key A12x8x70 DIN 6885
Max. Torque 132,8 daNm [11755 lb-in]



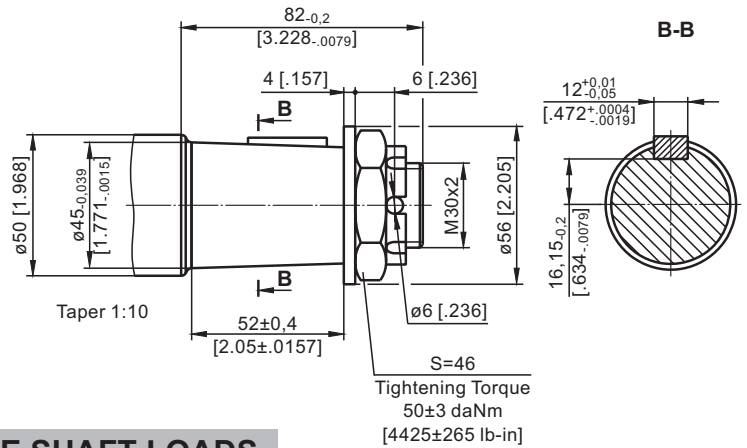
SH - $\varnothing 1\frac{1}{2}$ " splined 17T, DP 12/24 ANSI B92.1-1976
Max. Torque 132,8 daNm [11755 lb-in]



CO - $\varnothing 1\frac{1}{2}$ " straight, Parallel key $\frac{3}{8}$ "x $\frac{3}{8}$ "x $\frac{1}{4}$ " BS46
Max. Torque 132,8 daNm [11755 lb-in]

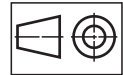


K - tapered 1:10, Parallel key B12x8x28 DIN 6885
Max. Torque 210,7 daNm [18650 lb-in]

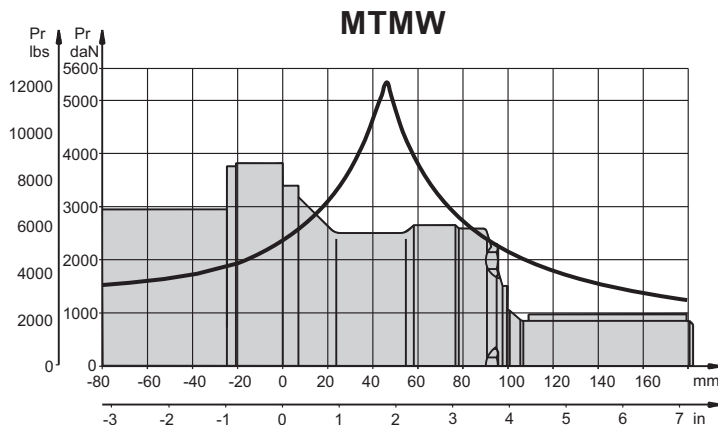
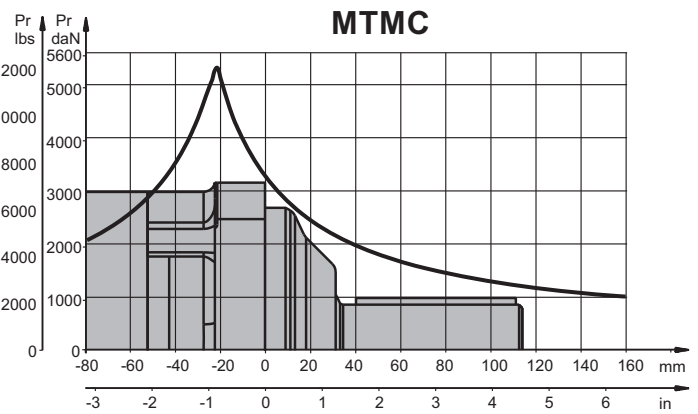
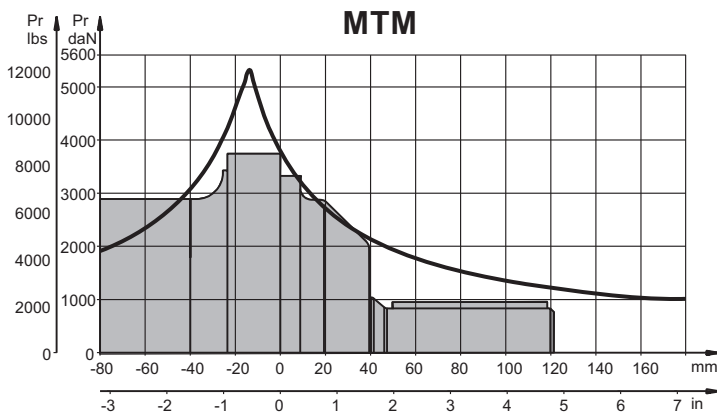


PERMISSIBLE SHAFT LOADS

The curves apply to a B10 bearing life (ISO281) of 2000 hours at 200 RPM.

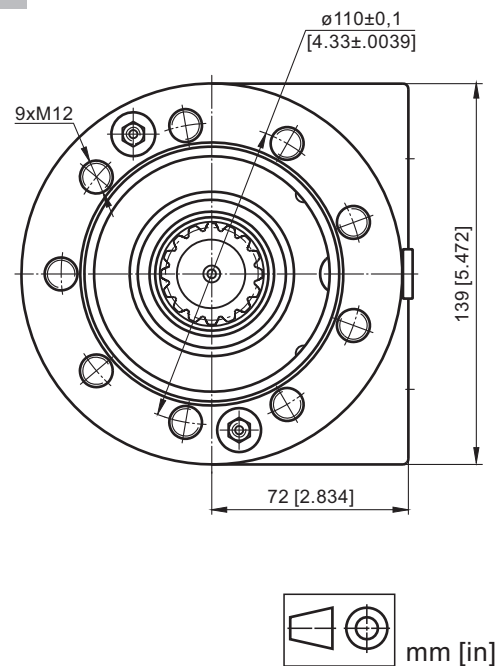
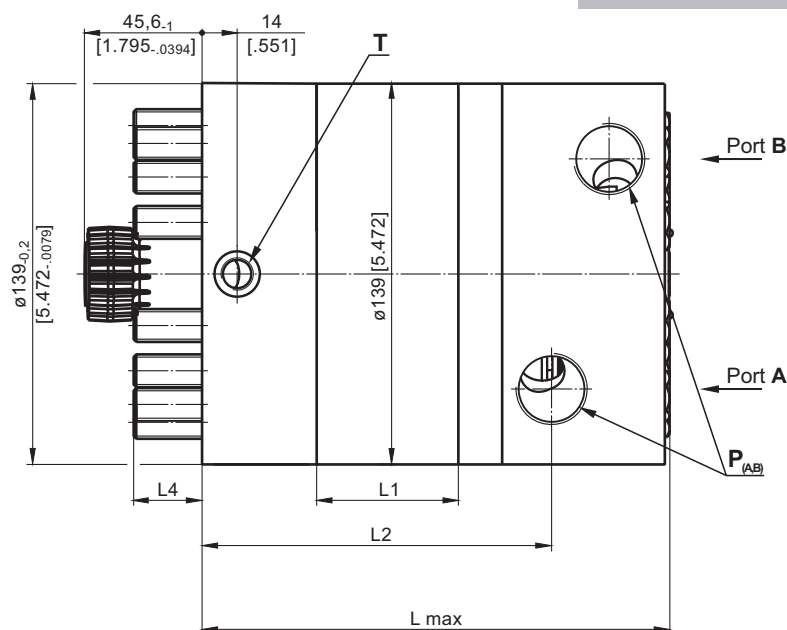


mm [in]

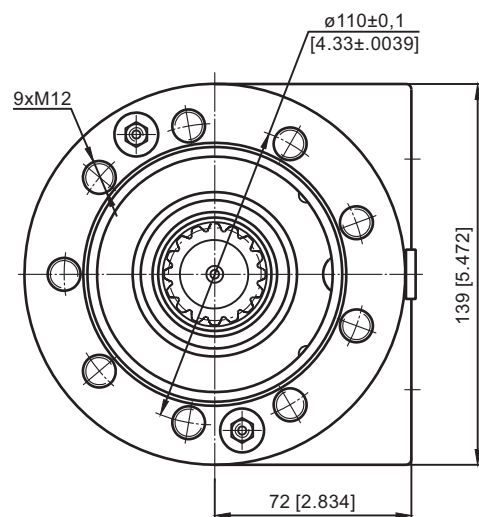
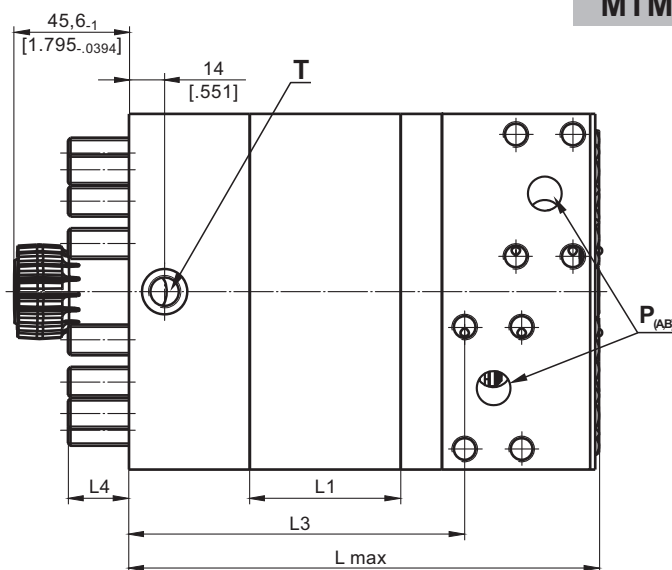


DIMENSIONS and MOUNTING DATA for MTMV

MTMV... and MTMV...4



MTMV...5



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		
	-	4	5
P_(A,B)	2xG3/4 17 mm [.67] depth	2x1 $\frac{1}{16}$ -12UN O-ring 17 mm [.67] depth	2x3/4"SAE PSI3000 with 8xM10 threads 10 mm [.39] depth
T	G1/4 12 mm [.47] depth	$\frac{9}{16}$ -18UN 13 mm [.51] depth	G1/4 12 mm [.47] depth

Type	L, mm [in]	L ₂ , mm [in]	L ₃ , mm [in]	L ₄ , mm [in]	L ₁ , mm [in]
MTMV 200	151 [5.945]	106,5 [4.193]	97,2 [3.827]	27,8 [1.094]	25,0 [.98]
MTMV 250	157 [6.181]	112,8 [4.441]	103,5 [4.075]	26,5 [1.043]	31,3 [1.23]
MTMV 315	167 [6.575]	122,0 [4.803]	112,7 [4.437]	22,3 [.878]	40,5 [1.59]
MTMV 400	177 [6.968]	132,5 [5.217]	123,2 [4.850]	21,8 [.858]	51,0 [2.01]
MTMV 470	185 [7.283]	140,5 [5.531]	131,2 [5.165]	23,8 [.937]	59,0 [2.32]
MTMV 500	191 [7.520]	146,5 [5.768]	137,2 [5.402]	27,8 [1.094]	65,0 [2.56]
MTMV 630	187 [7.362]	142,5 [5.610]	133,2 [5.244]	21,8 [.858]	61,0 [2.40]
MTMV 725	196 [7.717]	151,5 [5.965]	142,2 [5.598]	22,8 [.898]	70,0 [2.76]

MTM6V... and MTM6V...4

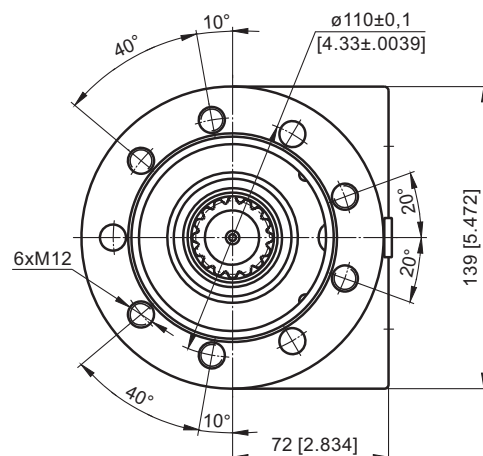
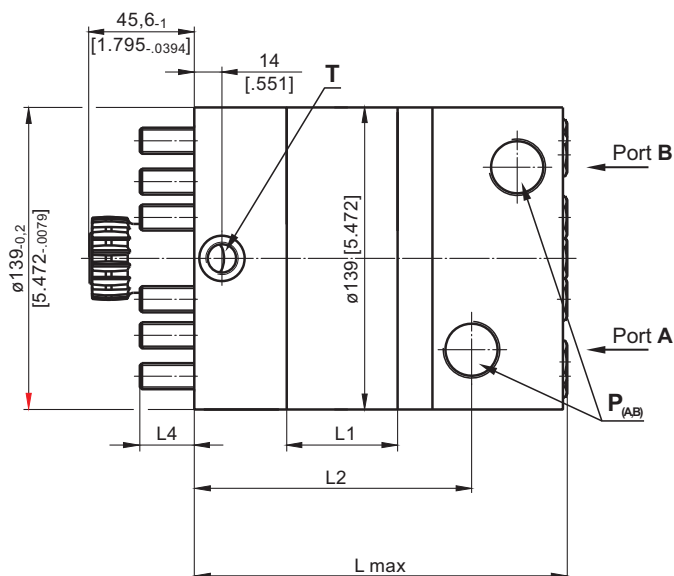


Fig.1



MTM6V...5

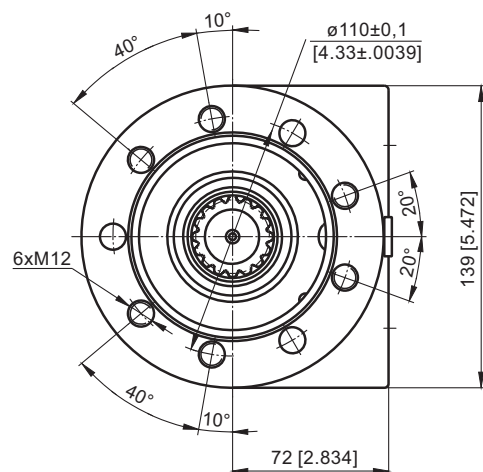
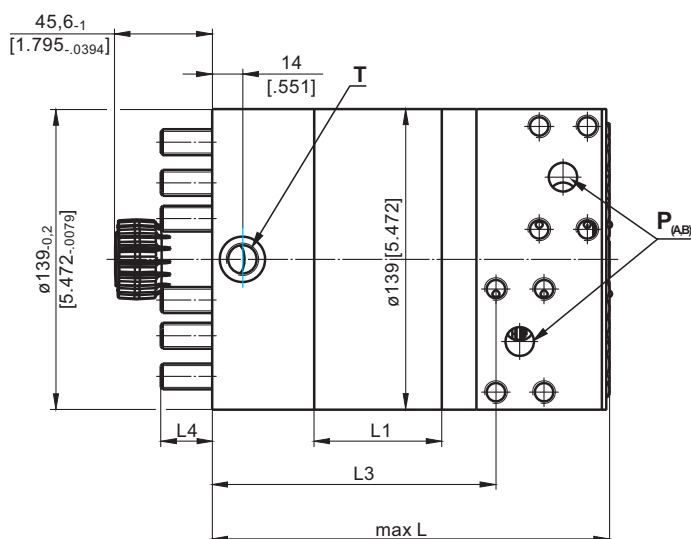


Fig.1

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

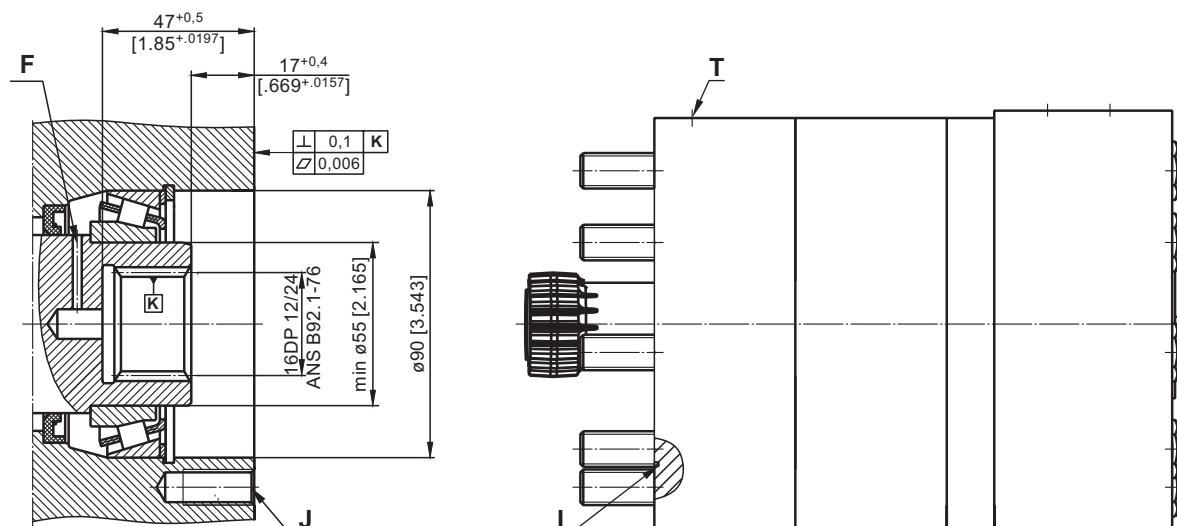
Port A Pressurized - **CCW**

Port B Pressurized - **CW**

	Versions		
	-	4	5
$P_{(A,B)}$	2xG3/4 17 mm [.67] depth	2x1 $\frac{1}{16}$ -12UN O-ring 17 mm [.67] depth	2x3/4"SAE PSI3000 with 8xM10 threads 10 mm [.39] depth
T	G1/4 12 mm [.47] depth	9/16-18UN 13 mm [.51] depth	G1/4 12 mm [.47] depth

Type	L, mm [in]	L ₂ , mm [in]	L ₃ , mm [in]	L ₄ , mm [in]	L ₁ , mm [in]
MTM6V 200...	151 [5.945]	106,5 [4.193]	97,2 [3.827]	27,8 [1.094]	25 [.98]
MTM6V 250...	157 [6.181]	112,8 [4.441]	103,5 [4.075]	26,5 [1.043]	31,3 [1.23]
MTM6V 315...	167 [6.575]	122,0 [4.803]	112,7 [4.437]	22,3 [.878]	40,5 [1.59]
MTM6V 400...	177 [6.968]	132,5 [5.217]	123,2 [4.850]	21,8 [.858]	51 [2.01]
MTM6V 470...	185 [7.283]	140,5 [5.531]	131,2 [5.165]	23,8 [.937]	59 [2.32]
MTM6V 500...	191 [7.520]	146,5 [5.768]	137,2 [5.402]	27,8 [1.094]	65 [2.56]
MTM6V 630...	187 [7.362]	142,5 [5.610]	133,2 [5.244]	21,8 [.858]	61 [2.40]
MTM6V 725...	196 [7.717]	151,5 [5.965]	142,2 [5.598]	22,8 [.898]	70 [2.76]

DIMENSIONS of THE ATTACHED COMPONENT



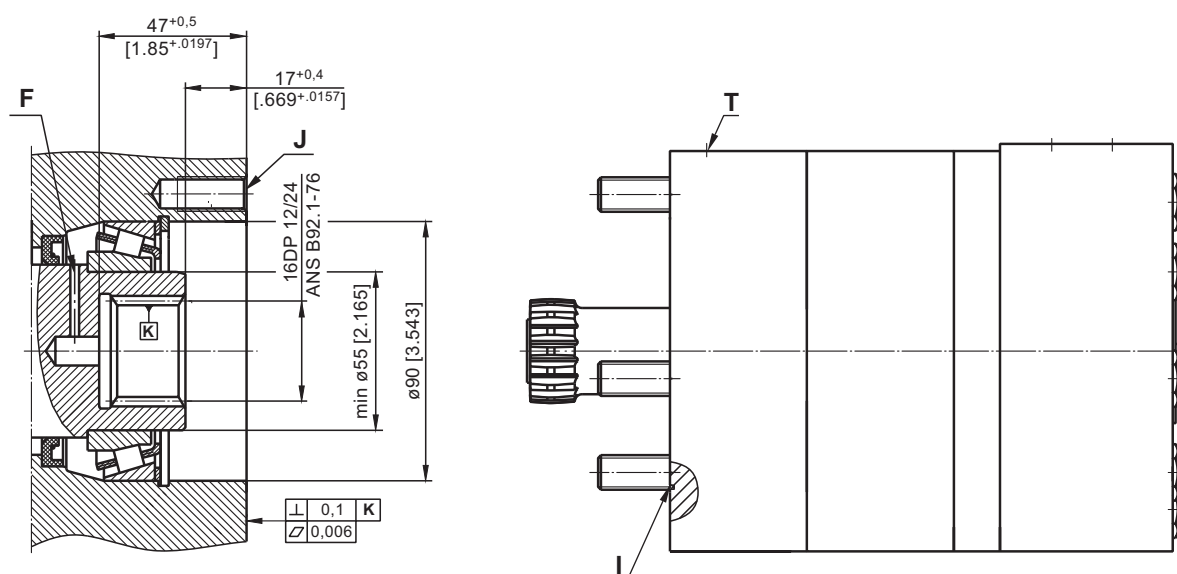
F: Oil circulation hole

J: 9xM12 - 30 mm [1.181 in] depth, 40°, $\varnothing 110 \pm 0,1$ [4.33 $\pm$.0039]

I: O-Ring 93x1,5 mm [3.661x.059 in]

T: Drain connection G1/4

DIMENSIONS of THE ATTACHED COMPONENT for MTM6V



F: Oil circulation hole

J: 9xM12 - 30 mm [1.181 in] depth, 40°, $\varnothing 110 \pm 0,1$ mm [4.33 $\pm$.0039 in] or 6xM12 - 30 mm [1.181 in] depth, situated in accordance with the bolts M12, shown on Fig.1, $\varnothing 110 \pm 0,1$ mm [4.33 $\pm$.0039 in]

I: O-Ring 93x1,5 mm [3.661x.059 in]

T: Drain connection G1/4



mm [in]

DRAIN CONNECTION

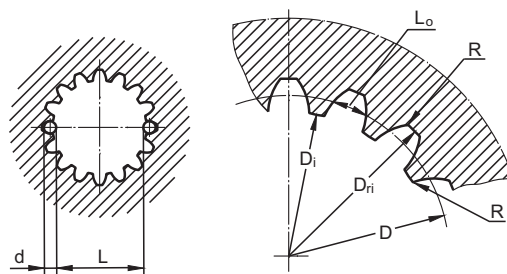
A drain line ought to be used when pressure in the return line can exceed the permissible pressure. It can be connected at the drain connection of the attached component. The maximum pressure in the drain line is limited by the attached component and its shaft seal.

The drain line must be possible for oil to flow freely between motor and attached component and must be led to the tank. The maximum pressure in the drain line is limited by the attached component and its seal.

INTERNAL SPLINE DATA for the ATTACHED COMPONENT

Standard *ANS B92.1-1976, class 5*
[m=2.1166; corrected x.m=+1,0]

Fillet Root Side Fit		inch	mm
Number of Teeth	z	16	16
Diametral Pitch	DP	12/24	12/24
Pressure Angle		30 ⁰	30 ⁰
Pitch Dia.	D	1.3333	33,8656
Major Dia.	D _{ri}	1.5118÷1.5275	38,4 ^{+0,4}
Minor Dia.	D _i	1.2657÷1.2673	32,15 ^{+0,04}
Circular Space Width	L _o	.1763÷.1791	4,516±0,037
Fillet Radius	R	.02	0,5
Dimension Between Two Pins	L	1.063÷1.059	26,9 ^{+0,10}
Pin Dia.	d	.19026÷.19034	4,835±0,001



Hardening Specification:

HV=750±50 on the surface.
 HV=560 at 0,7±0,2 [.035÷.019] case depth
 Material: 20 MoCr4 EN 10084 or SAE8620.

ORDER CODE

	1	2	3	4	5	6	7	8
MTM							HD	

Pos.1 - Mounting Flange

omit - 4-Bolt flange, spigot dia. ø160, BC ø200

C - 4-Bolt flange, spigot dia. ø125, BC ø160

W* - Wheel motor

V - Very short mount, 9xM12 mounting bolts

6V - Very short mount, 6xM12 mounting bolts

Pos.2 - Displacement code

200 - 201,4 cm³/rev [12.29 in³/rev]

250 - 251,8 cm³/rev [15.36 in³/rev]

315 - 326,3 cm³/rev [19.90 in³/rev]

400 - 410,9 cm³/rev [25.06 in³/rev]

470 - 475,0 cm³/rev [28.97 in³/rev]

500 - 523,6 cm³/rev [31.95 in³/rev]

630 - 631,2 cm³/rev [38.52 in³/rev]

725 - 724,3 cm³/rev [44.20 in³/rev]

Pos.3 - Shaft Extensions**

C - ø40 straight, Parallel key A12x8x70 DIN6885

CO - ø1½" straight, Parallel key 3/8"x3/8"x2¼" BS46

K - ø45 tapered 1:10, Parallel key B12x8x28 DIN6885

SH - ø1½" splined 17T ANSI B92.1-1976

Pos.4 - Shaft Seal Version*** (see page 31)

omit - Low pressure seal

U - High pressure seal

Pos.5 - Ports

omit - 2xG3/4, G1/4, BSPP (ISO 228)

4 - 2x1½-12 UN, O-ring, 9/16-18 UNF

5 - 2x3/4"SAE PSI3000 with 8xM10 threads, G1/4

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:

* Not applicable for "5" version.

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

*** Shaft seal is available with the "omit" and "W" mounting flange only!

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.

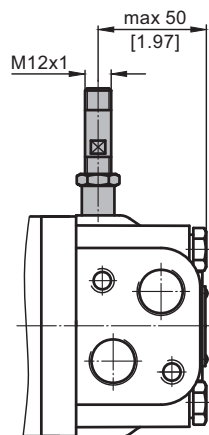
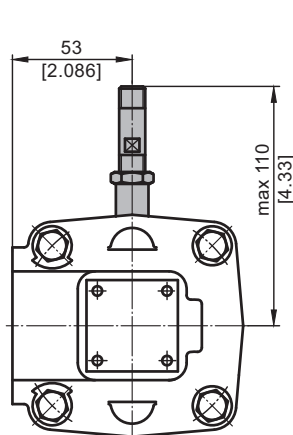
*** Non painted feeding surfaces, colour at customer's request.

**** For Port Size Version 5 only!

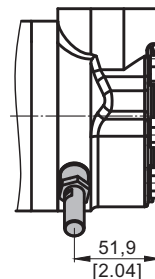
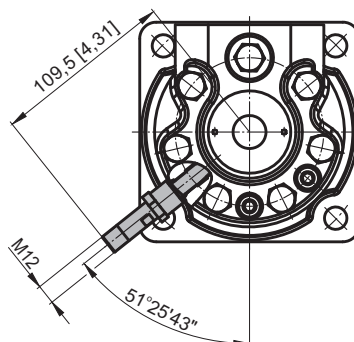
 For more information about **HD** option please contact with "M+S Hydraulic".

MOTORS WITH SPEED SENSOR

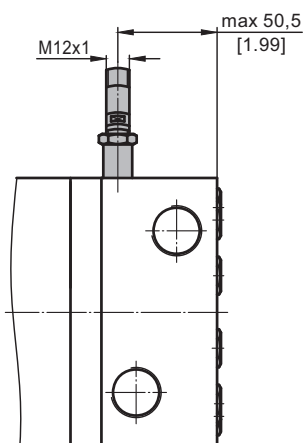
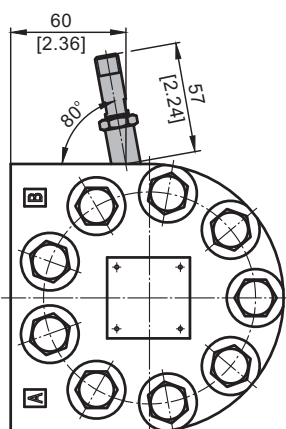
MSWM...RS



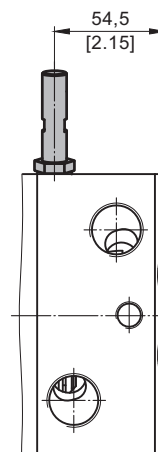
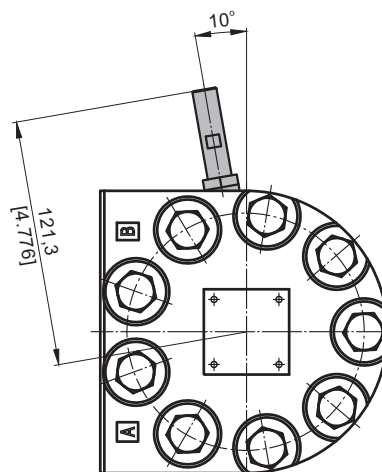
MTK...RS



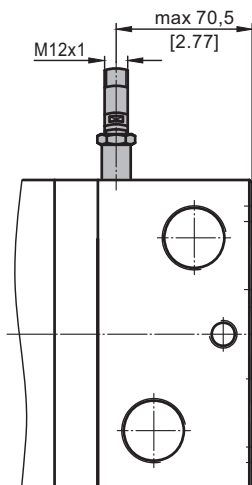
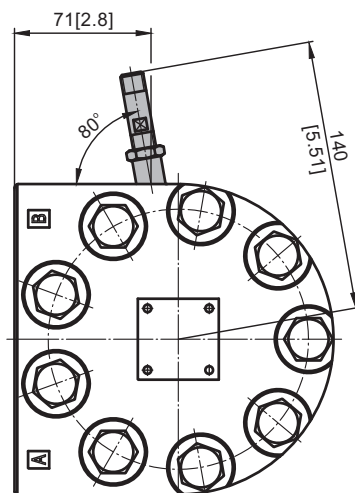
MTM...RS TMF...RS



TMYF...RS



MVM...RS VMF...RS

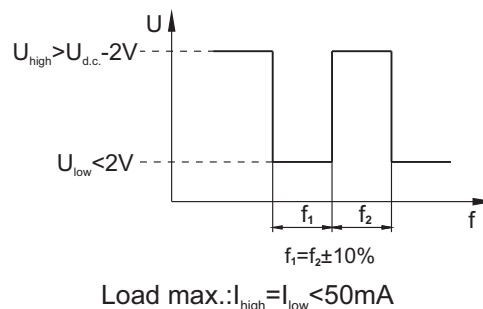


TECHNICAL DATA OF THE SPEED SENSOR

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

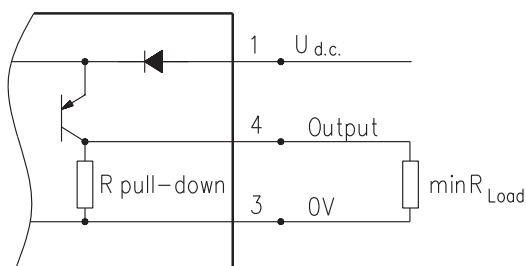
Output signal



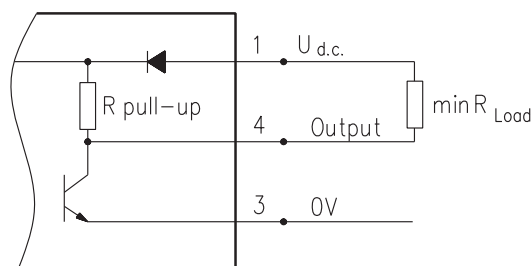
Motor type	MSWM MTK	MTM TMF, TMYF	MVM VMF
Pulses per revolution	54	84	102

Wiring diagrams

PNP

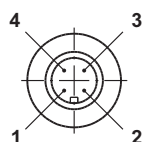


NPN



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

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

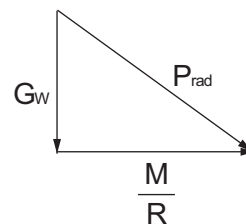
9. Radial motor loading: P_{rad} , daN [lbs]

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.

