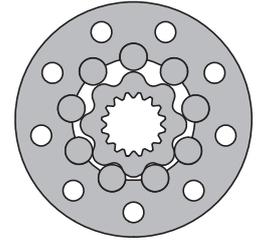
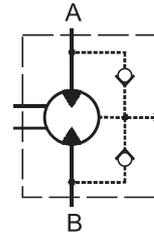
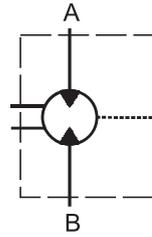


# HYDRAULIC MOTORS MTM



## APPLICATION

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



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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

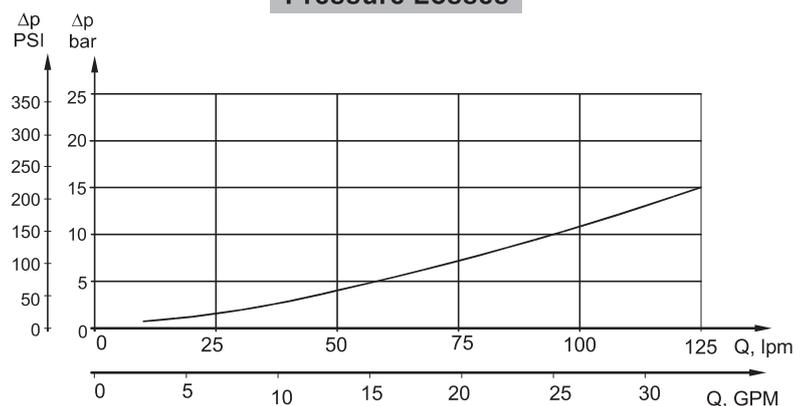
## GENERAL

<b>Max. Displacement,</b> cm <sup>3</sup> /rev [in <sup>3</sup> /rev]	724,3 [44.2]
<b>Max. Speed,</b> [RPM]	750
<b>Max. Torque,</b> daNm [lb-in]	cont.: 183 [16200] int.: 229 [20270]
<b>Max. Output,</b> kW [HP]	70 [94]
<b>Max. Pressure Drop,</b> bar [PSI]	cont.: 250 [3600] int.: 350 [5080]
<b>Max. Oil Flow,</b> lpm [GPM]	150 [40]
<b>Min. Speed,</b> [RPM]	5
<b>Permissible Shaft Loads</b> daN [lbs]	P <sub>a</sub> =1000 [2250]
<b>Pressure fluid</b>	Mineral based- HLP(DIN 51524) or HM(ISO 6743/4)
<b>Temperature range,</b> °C [°F]	-40÷140 [-40÷284]
<b>Optimal Viscosity range,</b> mm <sup>2</sup> /s [SUS]	20÷75 [98÷347]
<b>Filtration</b>	ISO code 20/16 (Min. recommended fluid filtration of 25 microns)

### Oil flow in drain line

Pressure drop bar [PSI]	Viscosity mm <sup>2</sup> /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	
<b>Displacement, cm<sup>3</sup>/rev [in<sup>3</sup>/rev]</b>	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]	
<b>Max. Speed, [RPM]</b>	Cont.	625	500	380	305	260	240	190	
	Int.*	750	600	460	365	315	285	230	
<b>Max. Torque daNm [lb-in]</b>	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]
<b>Max. Output kW [HP]</b>	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]
<b>Max. Pressure Drop bar [PSI]</b>	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]
<b>Max. Oil Flow lpm [GPM]</b>	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]
<b>Max. Inlet Pressure bar [PSI]</b>	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]
<b>Max. Return Pressure without Drain Line or Max. Pressure in Drain Line, bar [PSI]</b>	Cont. 0-100 RPM	75 [1100]	75 [1100]	75 [1100]	75 [1100]	75 [1100]	75 [1100]	75 [1100]	75 [1100]
	Cont. 100-300 RPM	40 [580]	40 [580]	40 [580]	40 [580]	40 [580]	40 [580]	40 [580]	40 [580]
	Cont. >300 RPM	20 [290]	20 [290]	20 [290]	20 [290]	20 [290]	-	-	-
	Int.* 0-max. RPM	75 [1100]	75 [1100]	75 [1100]	75 [1100]	75 [1100]	75 [1100]	75 [1100]	75 [1100]
<b>Max. Return Pressure with Drain Line bar [PSI]</b>	Cont.	140 [2000]	140 [2000]	140 [2000]	140 [2000]	140 [2000]	140 [2000]	140 [2000]	140 [2000]
	Int.*	175 [2500]	175 [2500]	175 [2500]	175 [2500]	175 [2500]	175 [2500]	175 [2500]	175 [2500]
	Peak**	210 [3000]	210 [3000]	210 [3000]	210 [3000]	210 [3000]	210 [3000]	210 [3000]	210 [3000]
<b>Max. Starting Pressure with Unloaded Shaft, bar [PSI]</b>	6 [90]	6 [90]	6 [90]	6 [90]	6 [90]	6 [90]	6 [90]	6 [90]	
<b>Min. Starting Torque daNm [lb-in]</b>	60[5310]	75[6640]	97[8585]	122[10800]	142[12570]	143[12655]	145[12830]	148[13100]	
<b>Min. Speed***, [RPM]</b>	5	5	5	5	5	5	5	5	
<b>Weight, kg [lb]</b>	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.

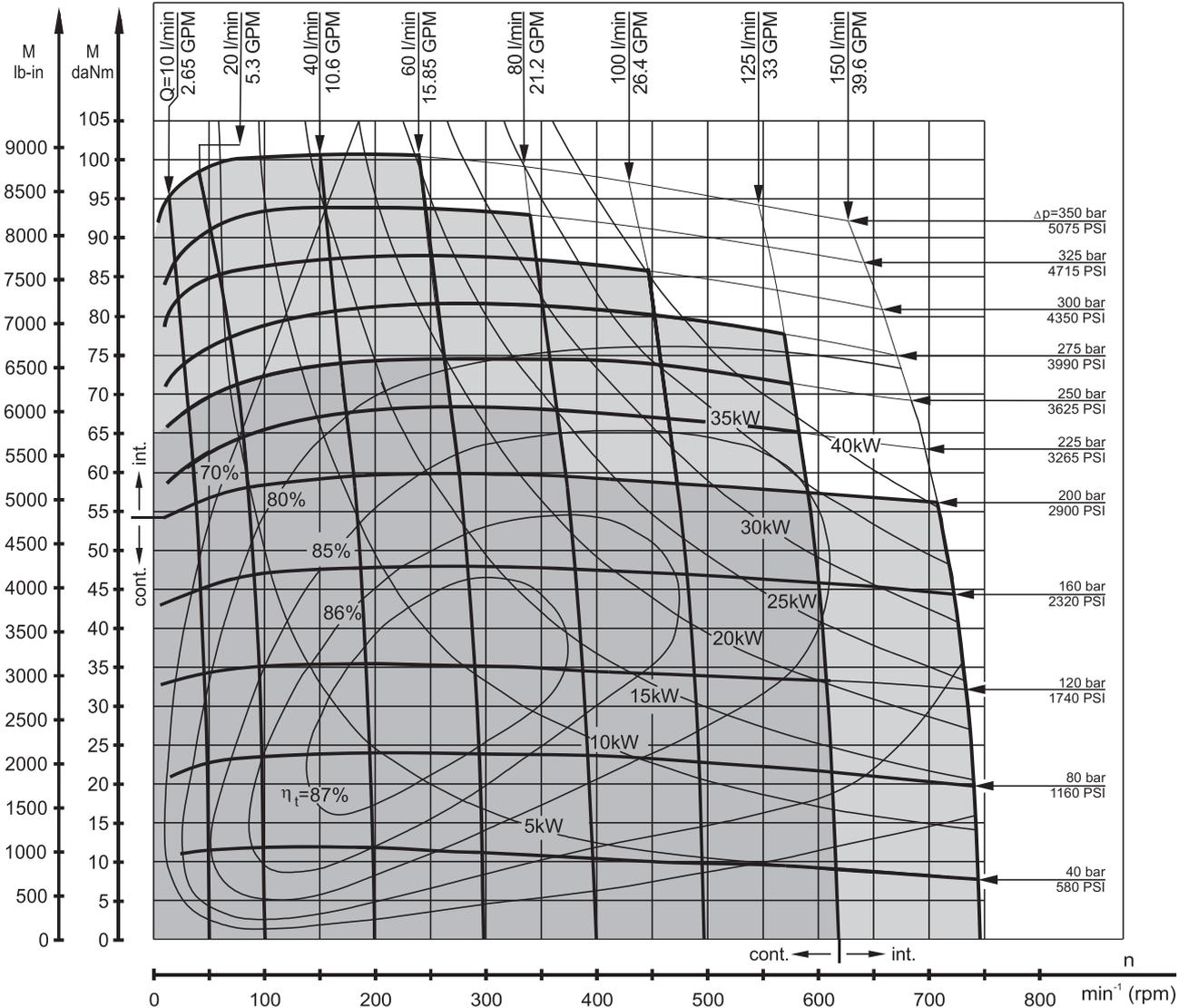
\*\* Peak load: the permissible values may occur for max. 1% of every minute.

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

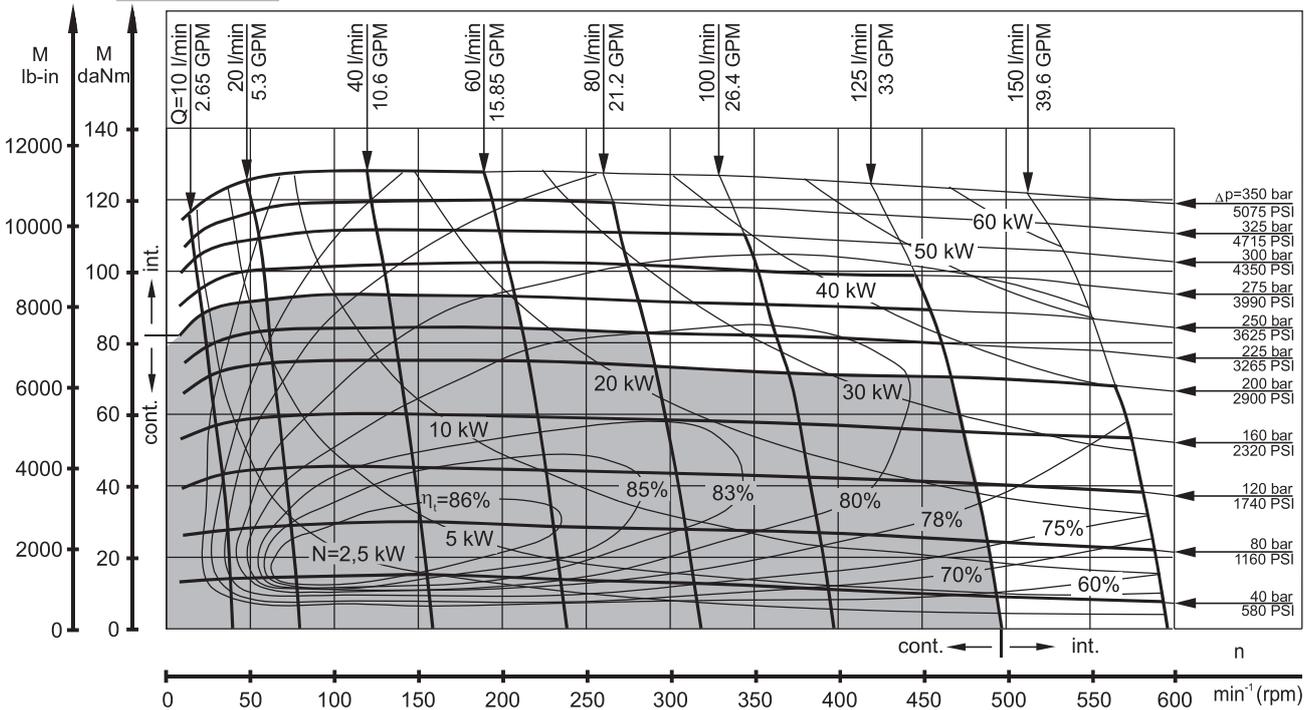
- Intermittent speed and intermittent pressure must not occur simultaneously.
- Recommended filtration is per ISO cleanliness code 20/16. A nominal filtration of 25 micron or better.
- Recommend using a premium quality, anti-wear type mineral based hydraulic oil, HLP(DIN51524) or HM(ISO6743/4). If using synthetic fluids consult the factory for alternative seal materials.
- Recommended minimum oil viscosity 13 mm<sup>2</sup>/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.

**FUNCTION DIAGRAMS**

**MTM 200**



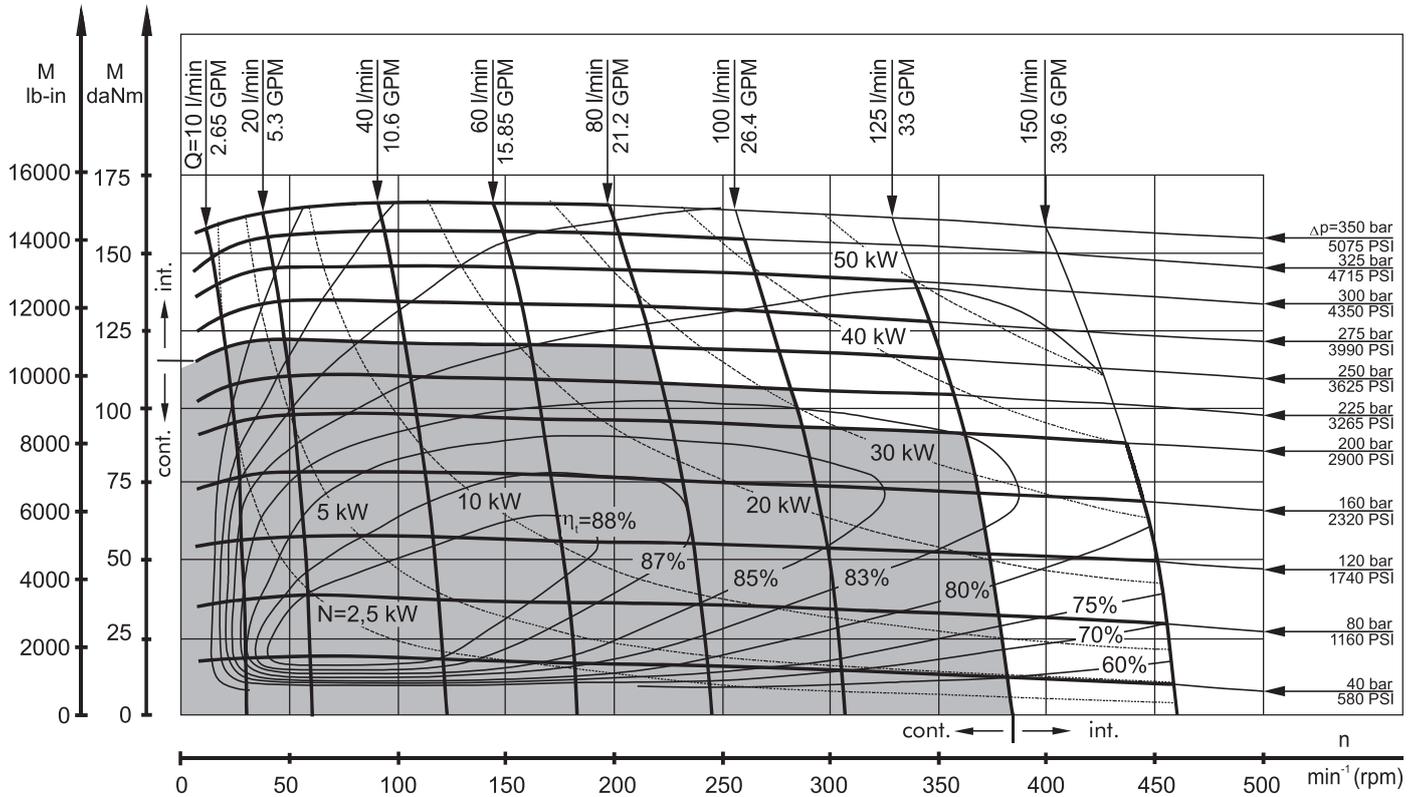
**MTM 250**



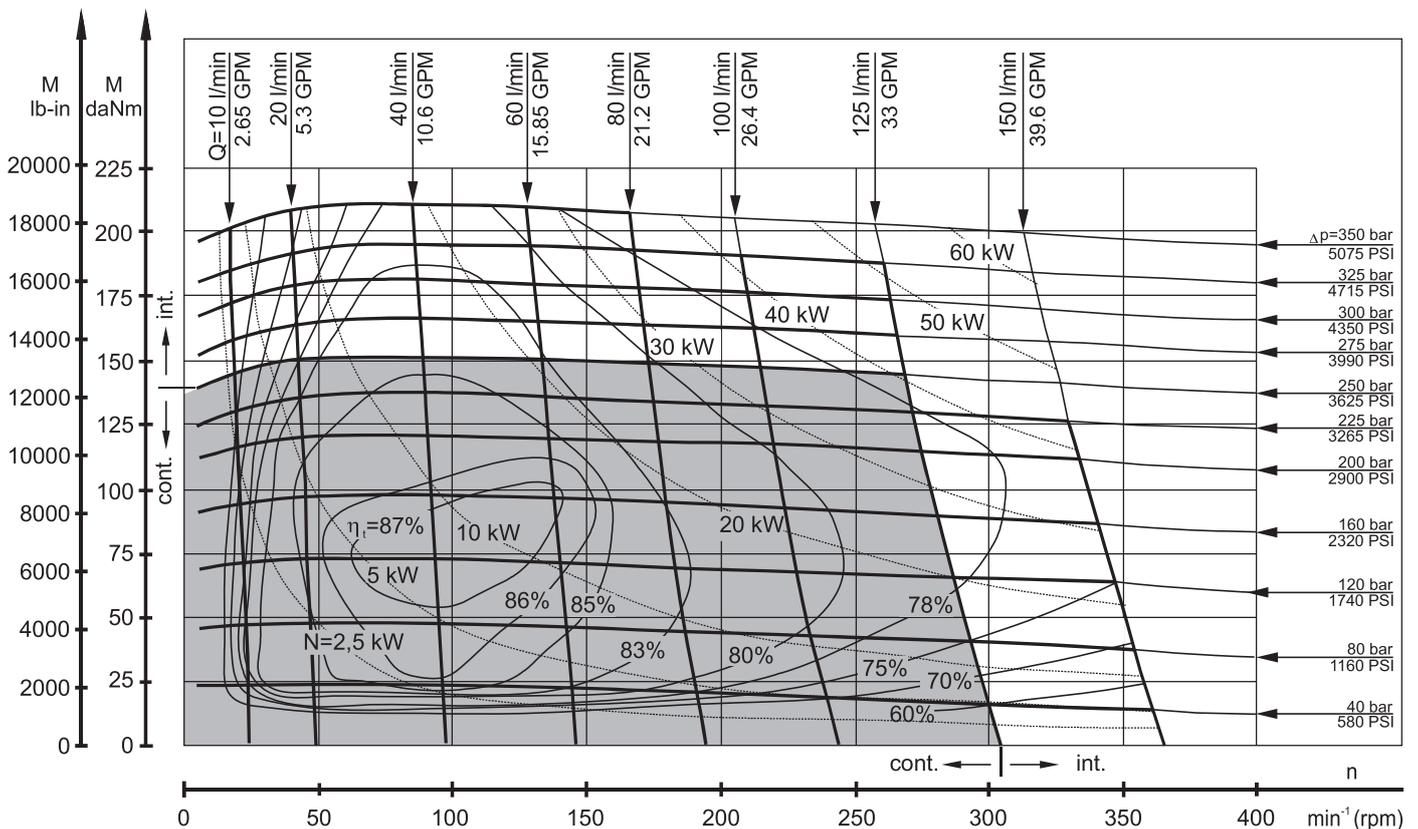
The function diagrams data was collected at back pressure 5÷10 bar (72.5÷145 PSI) and oil with viscosity of 32 mm<sup>2</sup>/s [150 SUS] at 50° C [122°F].

**FUNCTION DIAGRAMS**

**MTM 315**



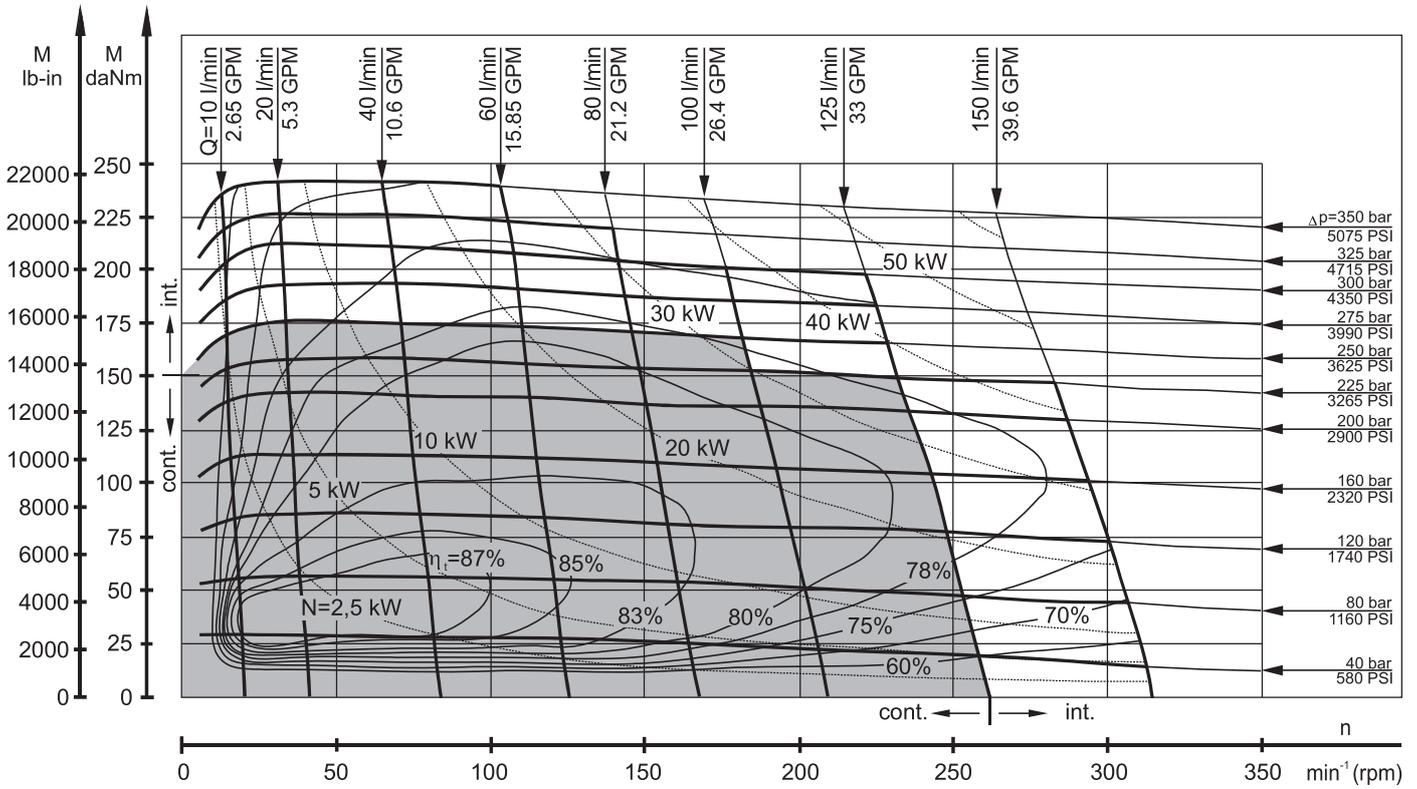
**MTM 400**



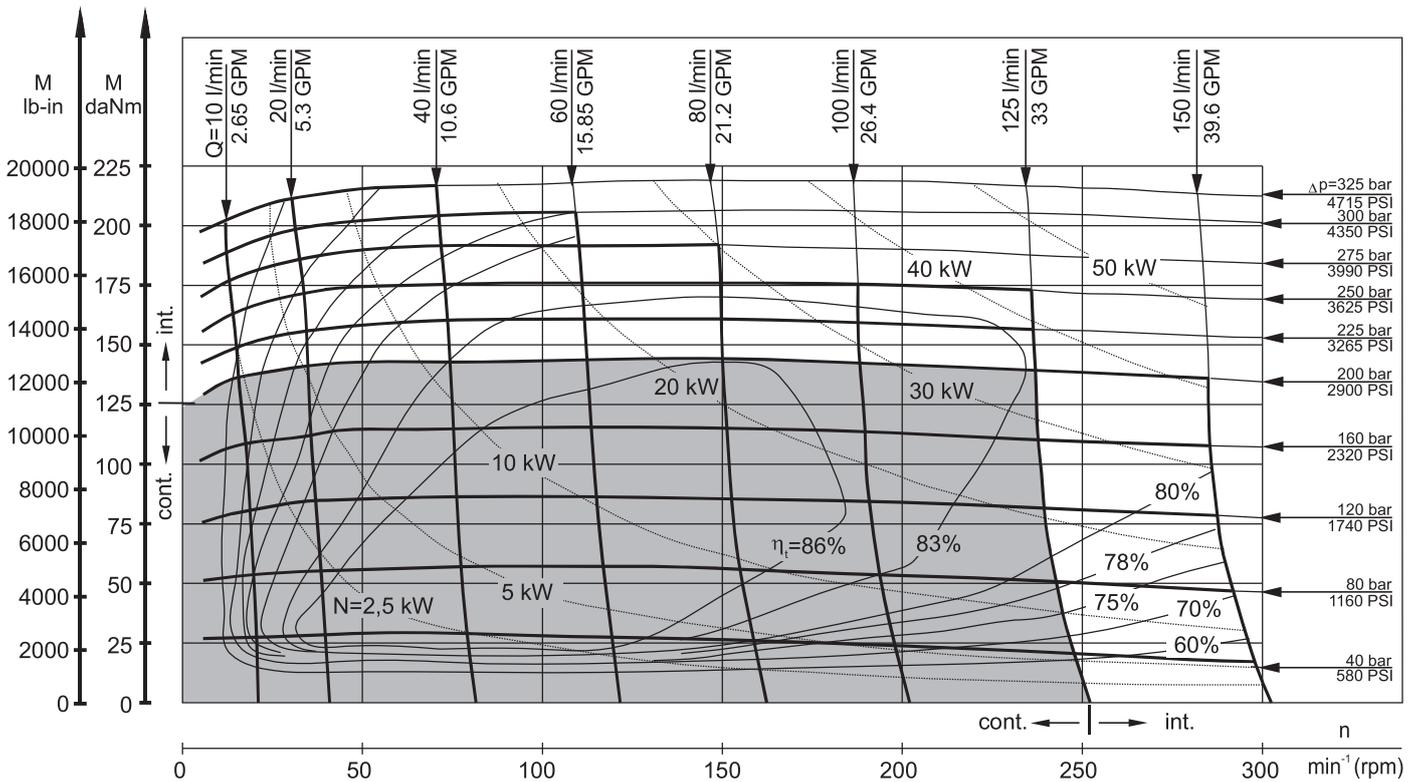
The function diagrams data was collected at back pressure 5÷10 bar (72.5÷145 PSI) and oil with viscosity of 32 mm<sup>2</sup>/s [150 SUS] at 50° C [122°F].

## FUNCTION DIAGRAMS

### MTM 470



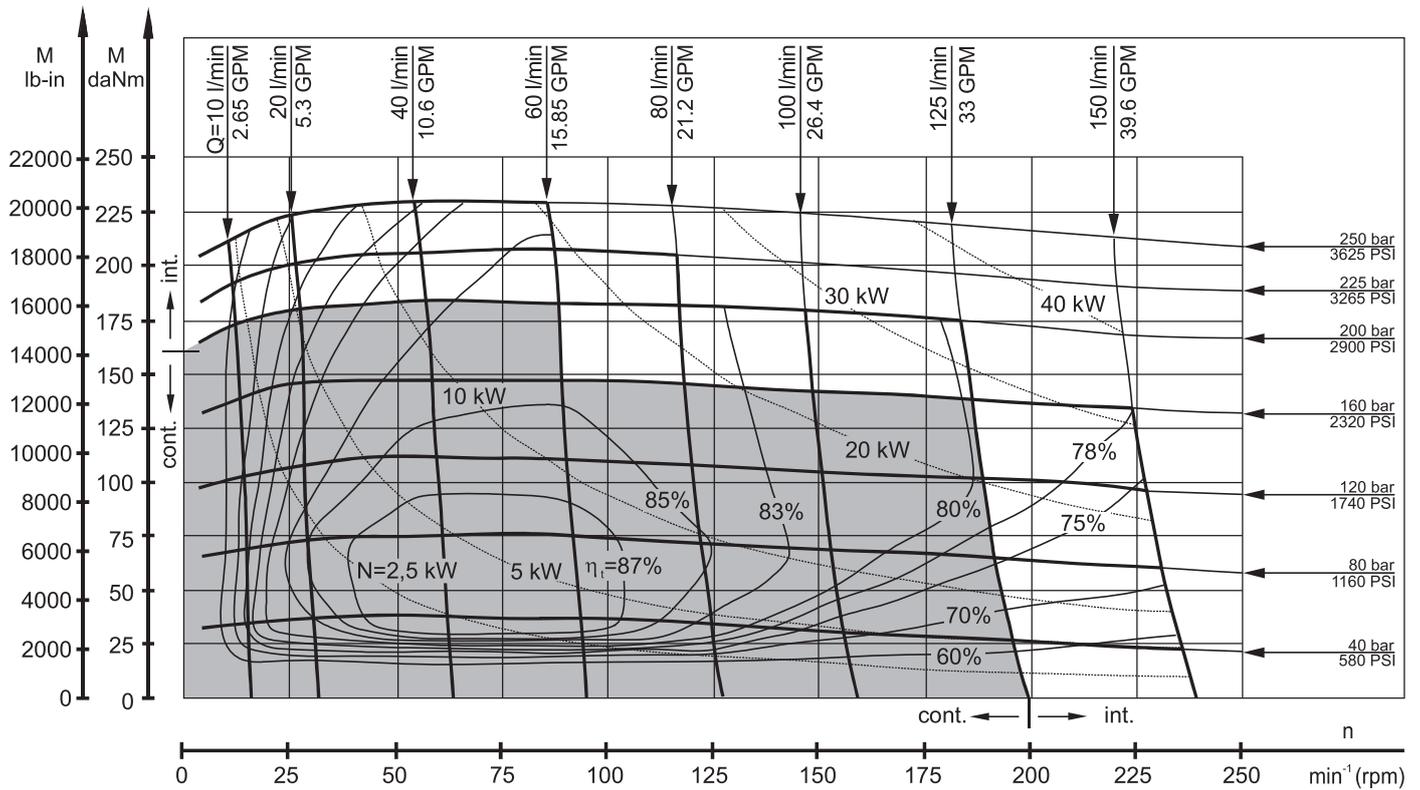
### MTM 500



The function diagrams data was collected at back pressure 5÷10 bar (72.5÷145 PSI) and oil with viscosity of 32 mm<sup>2</sup>/s [150 SUS] at 50° C [122°F].

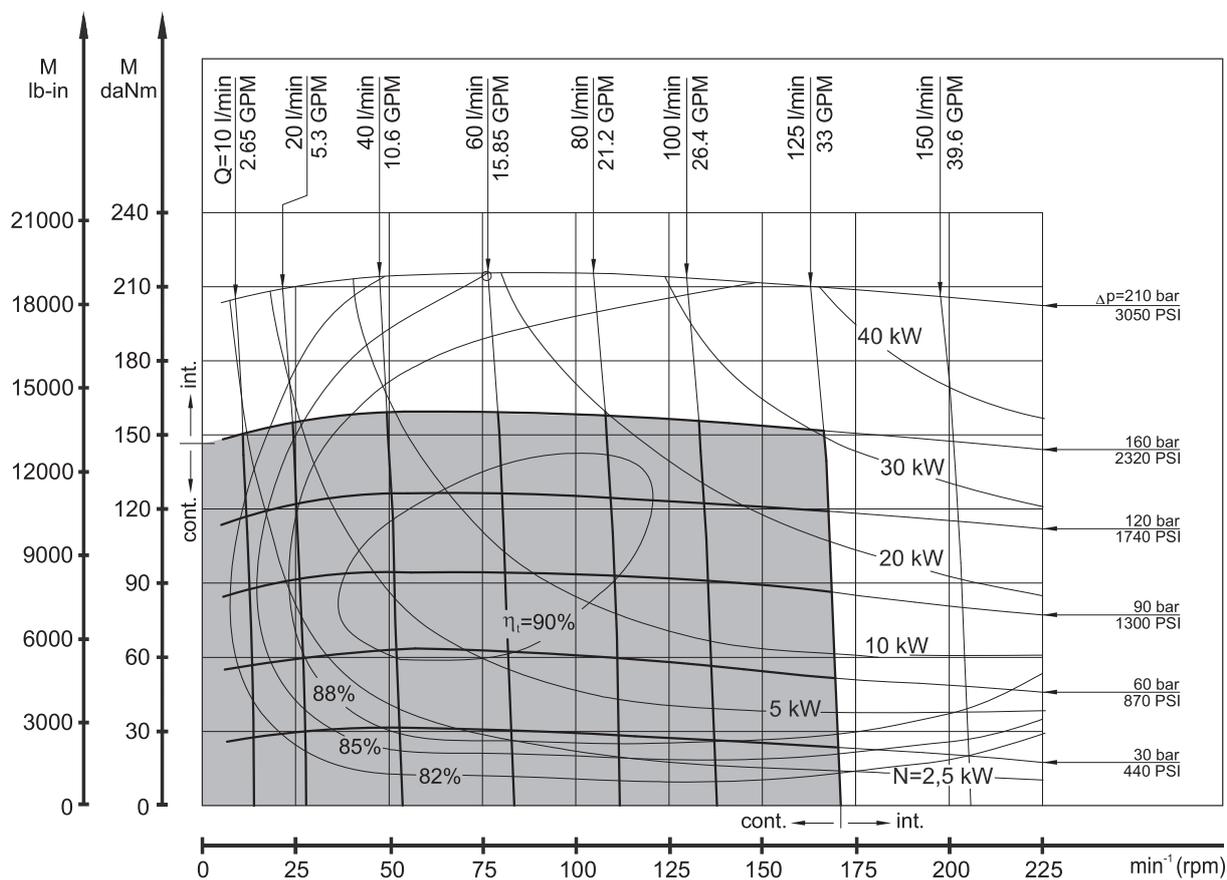
**FUNCTION DIAGRAMS**

**MTM 630**



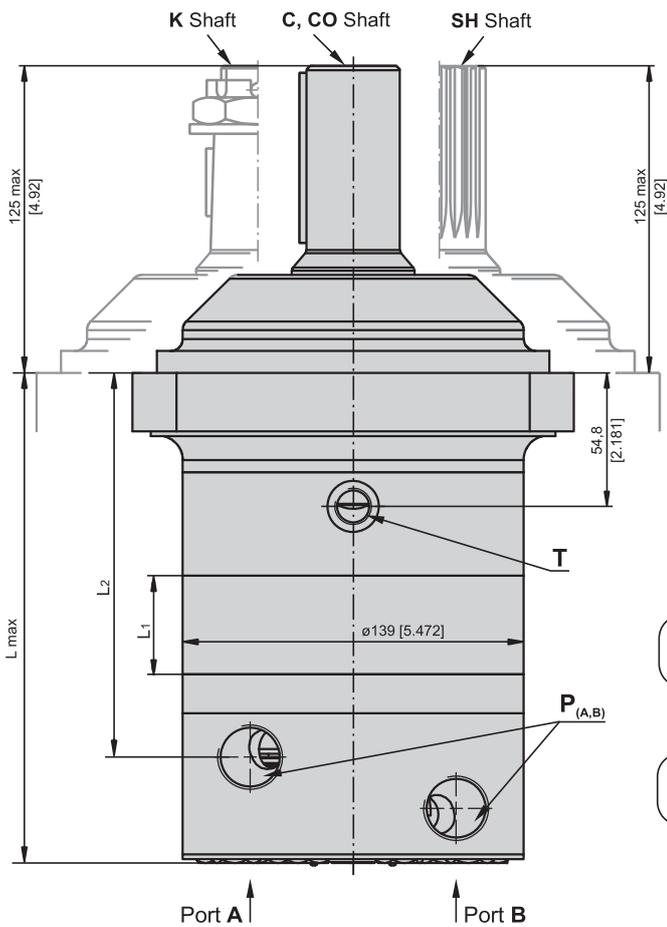
The function diagrams data was collected at back pressure 5÷10 bar (72.5÷145 PSI) and oil with viscosity of 32 mm<sup>2</sup>/s [150 SUS] at 50° C [122°F].

**MTM 725**



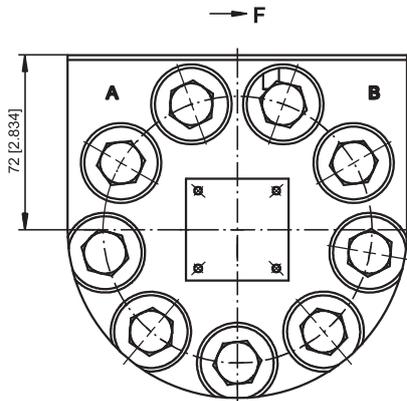
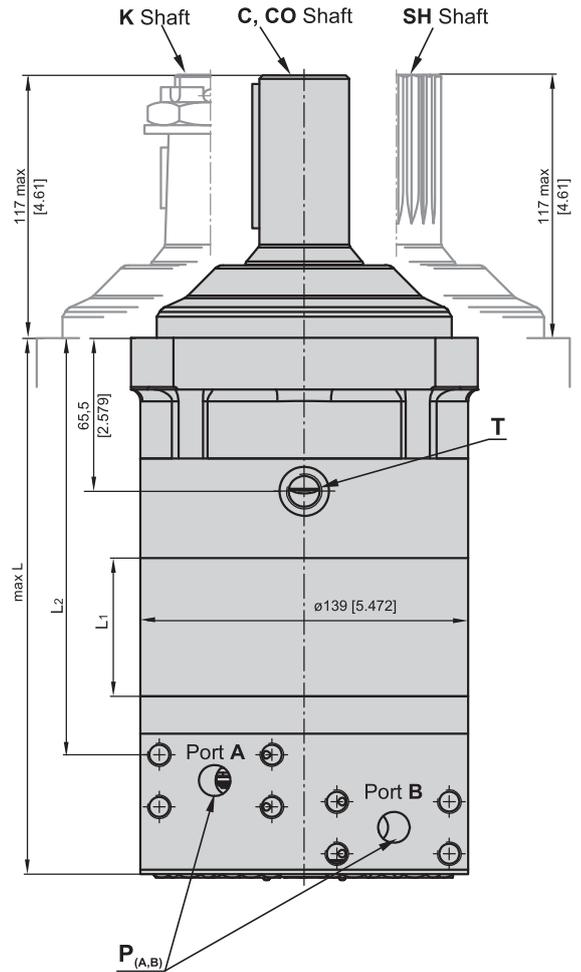
The function diagrams data was collected at back pressure 5÷10 bar (72.5÷145 PSI) and oil with viscosity of 32 mm<sup>2</sup>/s [150 SUS] at 50° C [122°F].

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



Flange Dim.  
See Page 27

Shaft Dim.  
See Page 28



**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

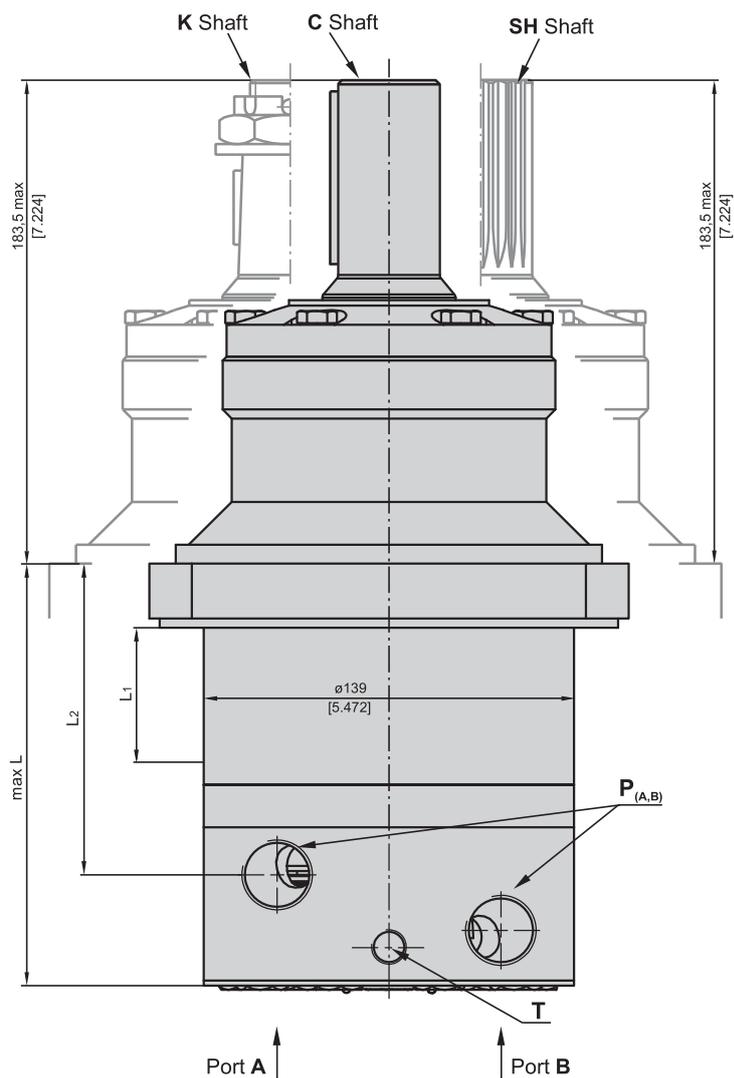
**Reverse Rotation**  
Viewed from Shaft End  
Port A Pressurized - CCW  
Port B Pressurized - CW

	Versions		
	-	4	5
<b>P<sub>(A,B)</sub></b>	2xG 3/4	2x1 <sup>1</sup> / <sub>16</sub> -12UN O-ring	2x3/4"SAE PSI3000 with 8xM10 threads
<b>T</b>	G 1/4	<sup>9</sup> / <sub>16</sub> -18UNF	G 1/4

Type	L, mm [in]	L <sub>2</sub> , mm [in]	Type	L, mm [in]	L <sub>2</sub> , mm [in]	Type	L, mm [in]	L <sub>2</sub> , mm [in]	Type	L, mm [in]	L <sub>3</sub> , mm [in]	L <sub>1</sub> , 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 [0.98]
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]

Flange Dim.  
See Page 27

Shaft Dim.  
See Page 28



**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**

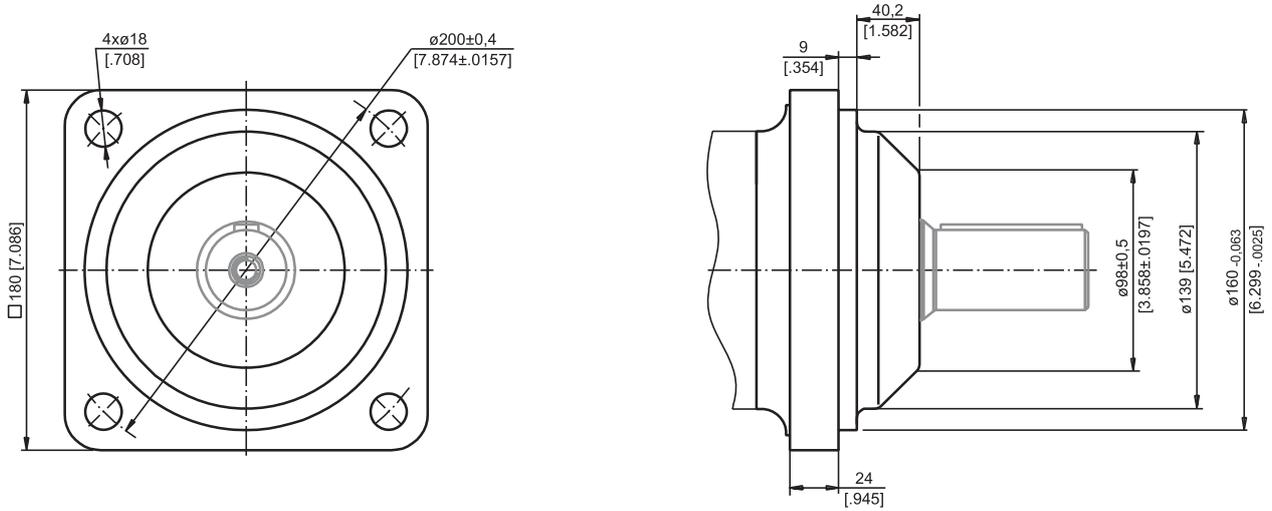
	Versions	
	-	4
P <sub>(A,B)</sub>	2xG 3/4	2x1 <sup>1</sup> / <sub>16</sub> -12UN, O-ring
T	G 1/4	9 <sup>9</sup> / <sub>16</sub> -18UNF

Type	L, mm [in]	L <sub>2</sub> , mm [in]	L <sub>1</sub> , 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]

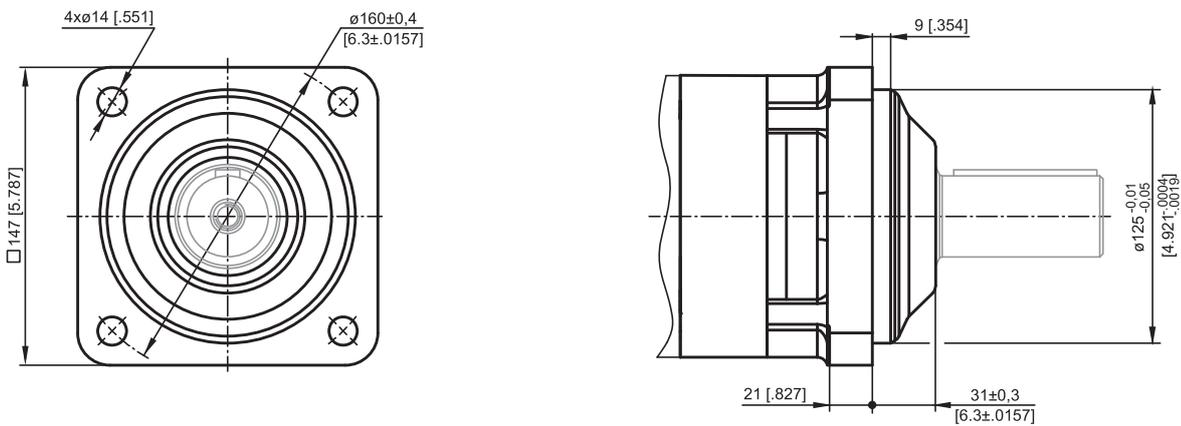


**MOUNTING**

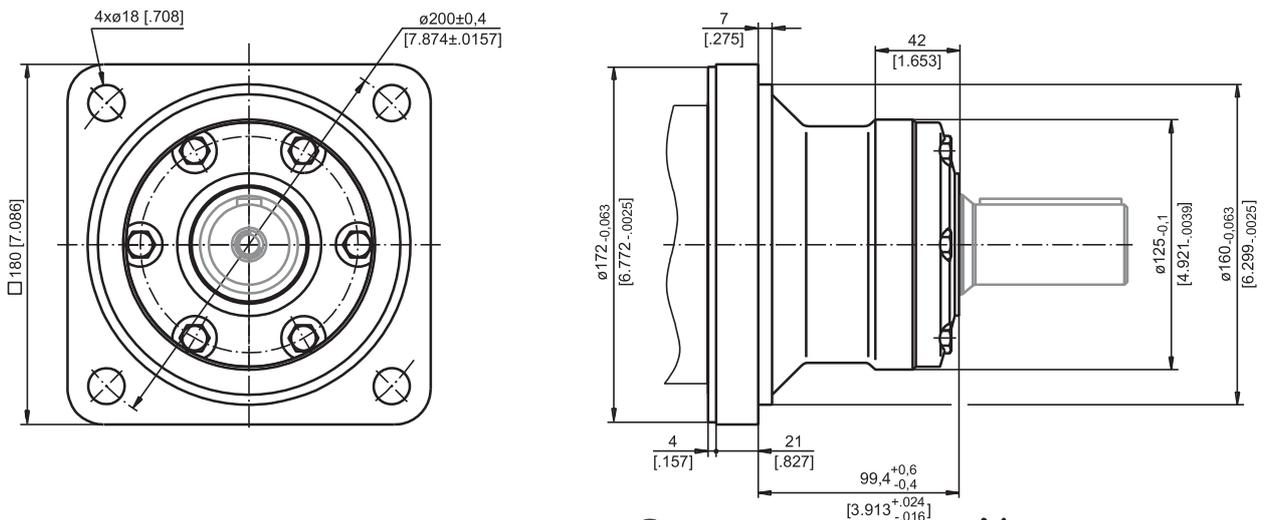
**4-Bolt flange**  
spigot diameter  $\varnothing 160$  mm [6.3 in] - BC  $\varnothing 200$  [7.874 in] mm



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



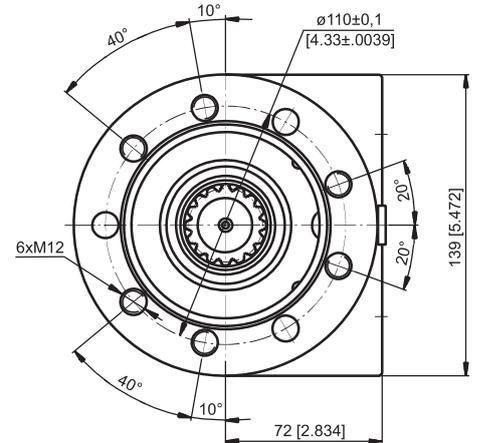
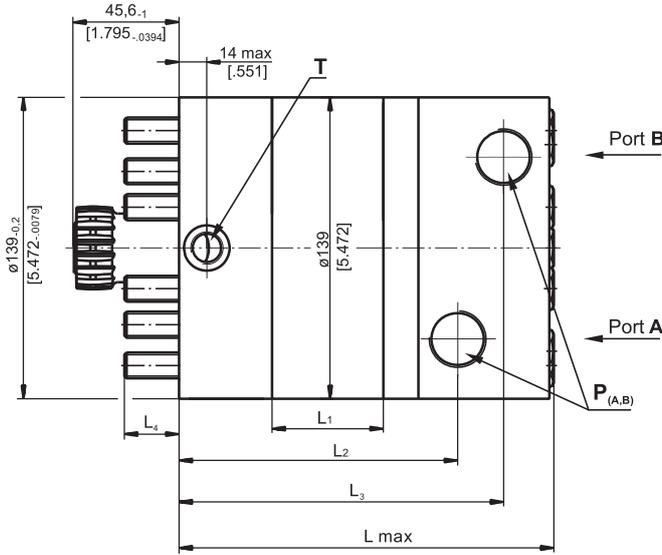
**W 4-Bolt flange, Wheel Motor**  
spigot diameter  $\varnothing 160$  mm [6.3 in] - BC  $\varnothing 200$  mm [7.874 in]



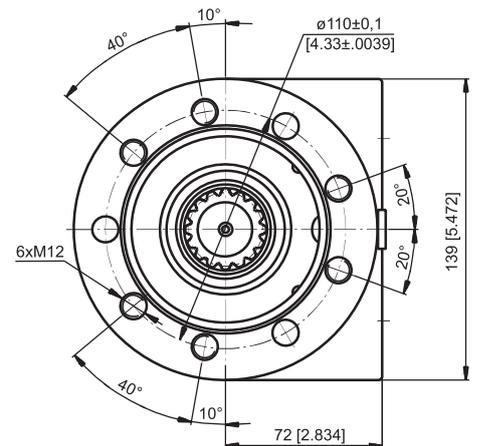
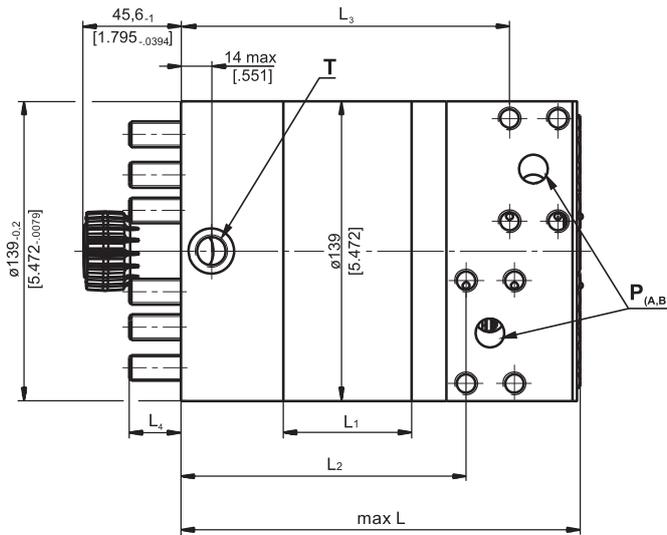




**MTM6V... and MTM6V...4**



**MTM6V...5**



	Versions		
	-	4	5
<b>P<sub>(A,B)</sub></b>	2xG 3/4	2x1 <sup>1</sup> / <sub>16</sub> -12UN O-ring	2x3/4"SAE PSI3000 with 8xM10 threads
<b>T</b>	G 1/4	<sup>9</sup> / <sub>16</sub> -18UNF	G 1/4

**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**

Type	L <sub>2</sub> , mm [in]	L <sub>3</sub> , mm [in]	Type	L <sub>2</sub> , mm [in]	L <sub>3</sub> , mm [in]	L <sub>4</sub> , mm [in]	L, mm [in]	L <sub>1</sub> , mm [in]
MTM6V 200...(4)	97,2 [3.827]	117,2 [4.614]	MTM6V 200...5	106,5 [4.193]	127,5 [5.019]	27,8 [1.094]	151 [5.945]	25 [.98]
MTM6V 250...(4)	103,5 [4.075]	123,5 [4.862]	MTM6V 250...5	112,8 [4.441]	133,8 [5.268]	26,5 [1.043]	157 [6.181]	31,3 [1.23]
MTM6V 315...(4)	112,7 [4.437]	132,7 [5.224]	MTM6V 315...5	122,0 [4.803]	143,0 [5.629]	22,3 [.878]	167 [6.575]	40,5 [1.59]
MTM6V 400...(4)	123,2 [4.850]	143,2 [5.638]	MTM6V 400...5	132,5 [5.217]	153,5 [6.043]	21,8 [.858]	177 [6.968]	51 [2.01]
MTM6V 470...(4)	131,2 [5.165]	151,2 [5.953]	MTM6V 470...5	140,5 [5.531]	161,5 [6.358]	23,8 [.937]	185 [7.283]	59 [2.32]
MTM6V 500...(4)	137,2 [5.402]	157,2 [6.189]	MTM6V 500...5	146,5 [5.768]	167,5 [6.594]	27,8 [1.094]	191 [7.520]	65 [2.56]
MTM6V 630...(4)	133,2 [5.244]	153,2 [6.031]	MTM6V 630...5	142,5 [5.610]	163,5 [6.437]	21,8 [.858]	187 [7.362]	61 [2.40]
MTM6V 725...(4)	142,2 [5.598]	162,2 [6.386]	MTM6V 725...5	151,5 [5.965]	172,5 [6.791]	22,8 [.898]	196 [7.717]	70 [2.76]

## PORTS

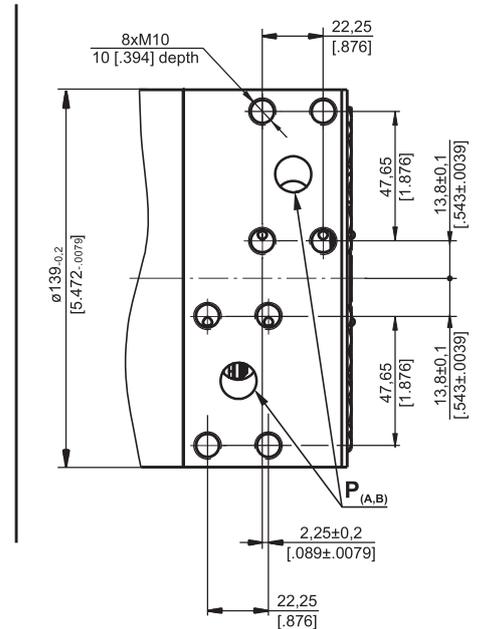
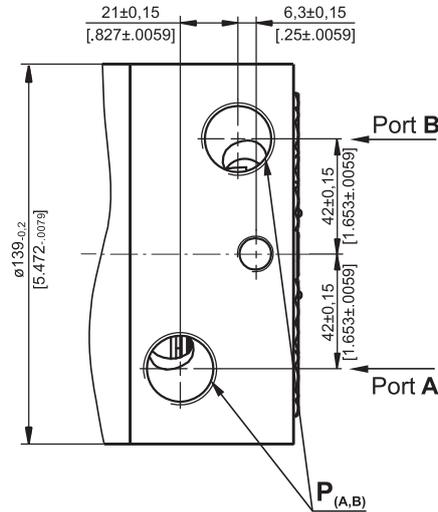
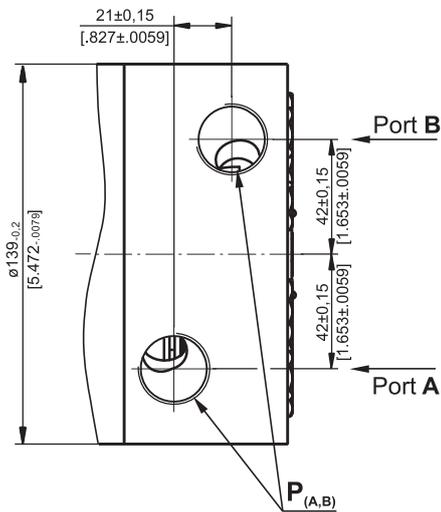
Versions - **4**

Version **5**

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

For **MTMW**

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

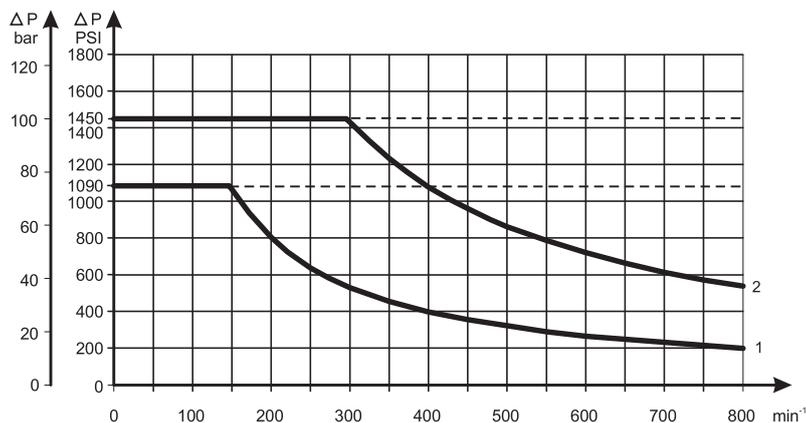


	Versions		
	-	<b>4</b>	<b>5</b>
<b>P<sub>(A,B)</sub></b>	2xG 3/4	2x1 <sup>1</sup> / <sub>16</sub> -12UN O-ring	2x3/4"SAE PSI3000 with 8xM10 threads
<b>T</b>	G 1/4	<sup>9</sup> / <sub>16</sub> -18UNF	G 1/4



## MAX. PERMISSIBLE SHAFT SEAL PRESSURE

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

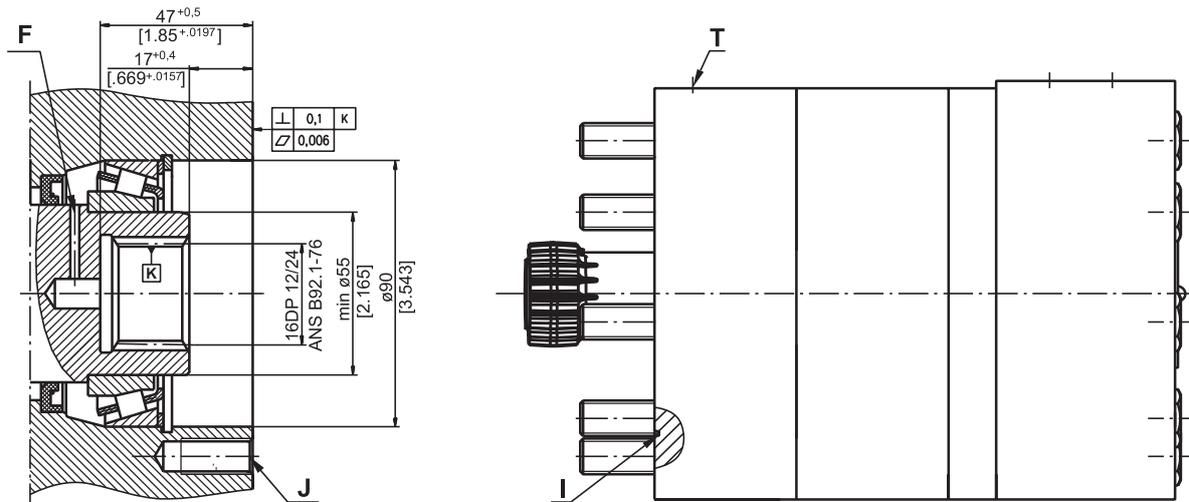


1: Drawing for Standard Shaft Seal

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

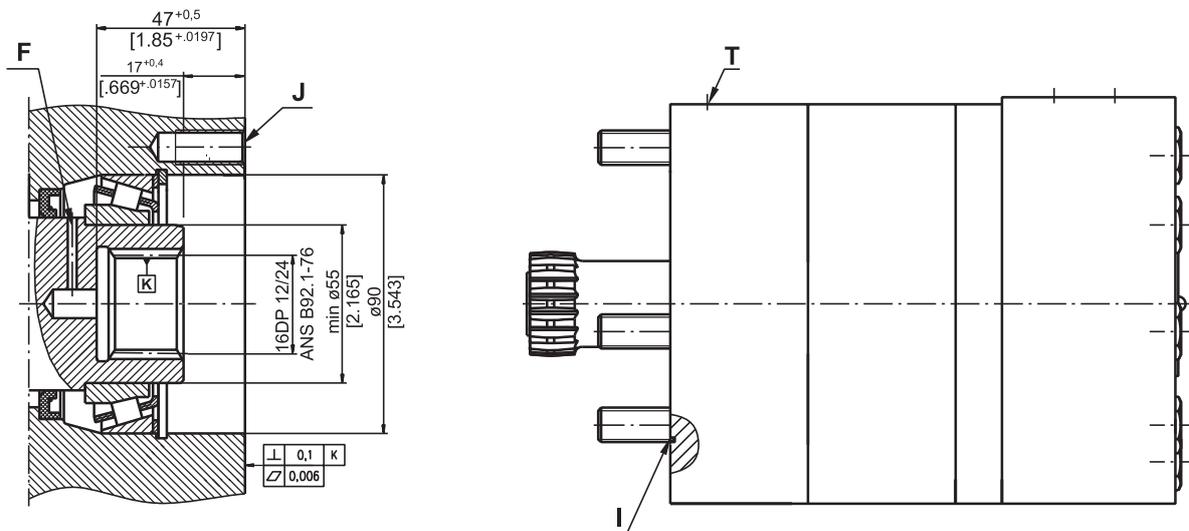
— - continuous operations  
- - - - - intermittent operations

**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±.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°,  $\varnothing 110 \pm 0,1$  [4.33±.0039] or 6xM12-30 mm [1.181 in] depth, situated in accordance with the bolts M12, shown on Fig.1,  $\varnothing 110 \pm 0,1$  [4.33±.0039]
- I: O- Ring 93x1,5mm [3.661x.059 in]
- T: Drain connection G1/4



**DRAIN CONNECTION**

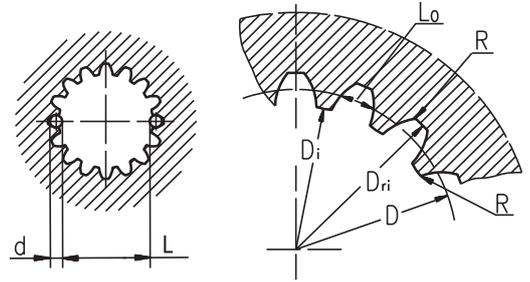
A drain line ought to be used when pressure in the return line can exceed the permissible pressure. It can be connected at the drain connection of the attached component. The maximum pressure in the drain line is limited by the attached component and its shaft seal.

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  
 $[m=2.1166; \text{corrected } x.m=+1,0]$

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.	$D_{ri}$	$1.5118 \pm 1.5275$	$38,4^{+0,4}$
Minor Dia.	$D_i$	$1.2657 \pm 1.2673$	$32,15^{+0,04}$
Circular Space Width	$L_o$	$.1763 \pm .1791$	$4,516 \pm 0,037$
Fillet Radius	R	.02	0,5
Dimension Between Two Pins	L	$1.063 \pm 1.059$	$26,9^{+0,10}$
Pin Dia.	d	$.19026 \pm .19034$	$4,835 \pm 0,001$



**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
<b>MTM</b>								

**Pos.1 - Mounting Flange**

omit - 4-Bolt flange, spigot dia.  $\varnothing 160$ , BC  $\varnothing 200$

**C** - 4-Bolt flange, spigot dia.  $\varnothing 125$ , BC  $\varnothing 160$

**W\*** - Wheel motor

**V** - Very short mount, 9xM12 mounting bolts

**6V** - Very short mount, 6xM12 mounting bolts

**Pos.2 - Displacement code**

**200** - 201,4 cm<sup>3</sup>/rev [12.29 in<sup>3</sup>/rev]

**250** - 251,8 cm<sup>3</sup>/rev [15.36 in<sup>3</sup>/rev]

**315** - 326,3 cm<sup>3</sup>/rev [19.90 in<sup>3</sup>/rev]

**400** - 410,9 cm<sup>3</sup>/rev [25.06 in<sup>3</sup>/rev]

**470** - 475,0 cm<sup>3</sup>/rev [28.97 in<sup>3</sup>/rev]

**500** - 523,6 cm<sup>3</sup>/rev [31.95 in<sup>3</sup>/rev]

**630** - 631,2 cm<sup>3</sup>/rev [38.52 in<sup>3</sup>/rev]

**725** - 724,3 cm<sup>3</sup>/rev [44.20 in<sup>3</sup>/rev]

**Pos.3 - Shaft Extensions\*\***

**C** -  $\varnothing 40$  straight, Parallel key A12x8x70 DIN6885

**CO** -  $\varnothing 1\frac{1}{2}$ " straight, Parallel key  $\frac{3}{8}$ "x $\frac{3}{8}$ "x $2\frac{1}{4}$ " BS46

**K** -  $\varnothing 45$  tapered 1:10, Parallel key B12x8x28 DIN6885

**SH** -  $\varnothing 1\frac{1}{2}$ " splined 17T ANSI B92.1-1976

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

omit - Low pressure seal

**U** - High pressure seal

**Pos.5 - Check Valves**

omit - without check valves

**1** - with check valves

**Pos.6 - Ports**

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

**4** - 2x $1\frac{1}{16}$ "-12 UN, O-ring,  $\frac{9}{16}$ "-18 UNF

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

**Pos.7 - Special Features (see page 58)**

**Pos.8 - Design Series**

omit - Factory specified

**NOTES:**

\* Not applicable for "5" version.

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

The hydraulic motors are manganophosphatized as standard.

# MOTOR SPECIAL FEATURES

Special Feature Description	Order Code	Motor type						
		MSWM	MTK	MTM	TMF	MVM	MVMC	VMF
Speed Sensor*	RS	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	-
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	-

<b>O</b>	Optional
<b>-</b>	Not applicable
<b>S</b>	Standard

\* For sensor ordering see pages 59÷60.

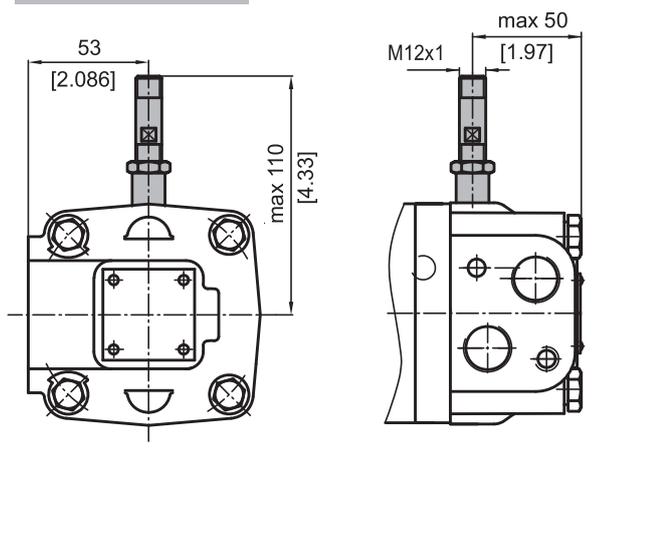
\*\* Colour at customer's request.

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

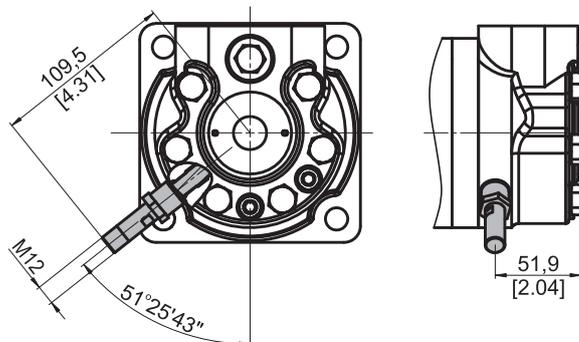
 For more information about **HD** option please contact with "M+S Hydraulic".

# MOTORS WITH SPEED SENSOR

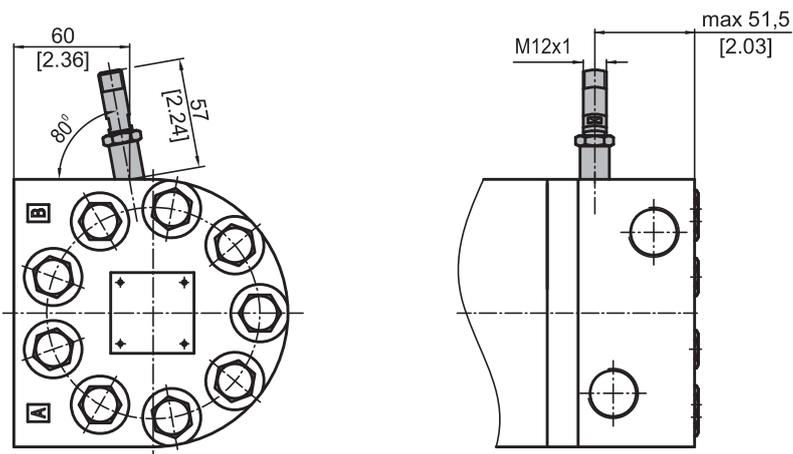
## MSWM...RS



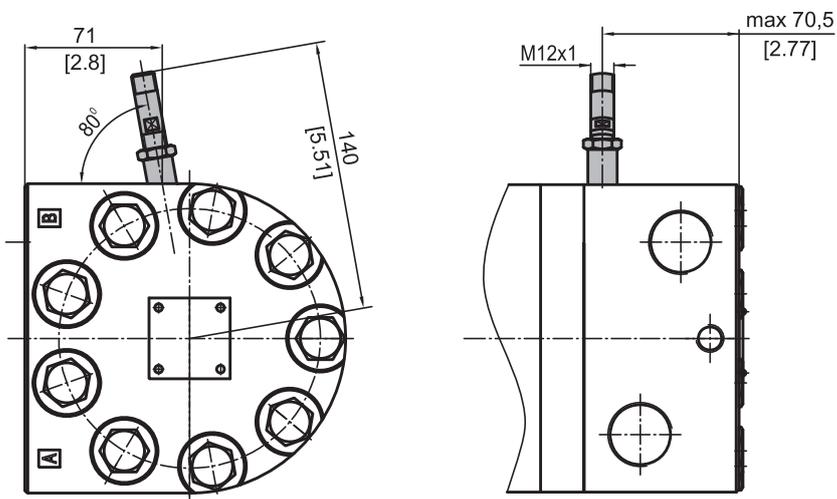
## MTK...RS



## MTM...RS TMF...RS

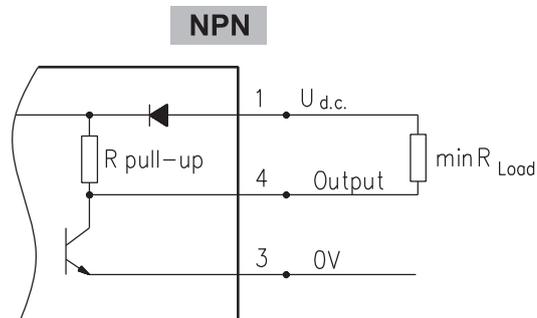
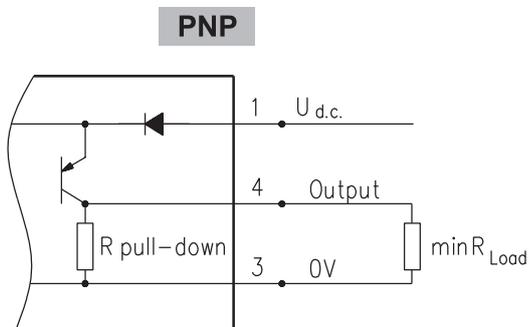


## MVM...RS VMF...RS



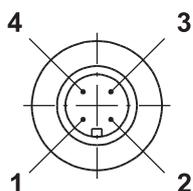
**TECHNICAL DATA OF THE SPEED SENSOR**

**Wiring diagrams**



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

**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
<b>RS</b>	Connector BINDER 713 series
<b>RSL2,5</b>	Cable output 3x0,25; 2,5 m [98 in] long
<b>RSL3,5</b>	Cable output 3x0,25; 3,5 m [138 in] long
<b>RSL5</b>	Cable output 3x0,25; 5 m [196 in] long
<b>RSL10</b>	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

$$n = \frac{2,65 \times v_{km} \times i}{R_m} \quad n = \frac{168 \times v_{mi} \times i}{R_m}$$

$v_{km}$ - vehicle speed, km/h;

$v_{mi}$ - vehicle speed, mil/h;

$R_m$ - wheel rolling radius, m;

$R_m$ - 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];

$\rho$ - rolling resistance coefficient (Table 1).

Table 1

Rolling resistance coefficient In case of rubber tire rolling on different surfaces	
Surface	$\rho$
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]

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

$\alpha$ - gradient negotiation angle (Table 2)

Table 2

Grade %	$\alpha$ Degrees	Grade %	$\alpha$ 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:

$$FA = \frac{v_{km} \times G}{3,6 \times t}, \text{ [daN]} \quad FA = \frac{v_{mi} \times G}{22 \times t}, \text{ [lbs];}$$

$FA$ - 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:

$$M = \frac{TE \times R_m [R_m]}{N \times i \times \eta_m}$$

$N$ - motor numbers;

$\eta_m$ - mechanical gear efficiency (if it is available).

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

$$M_w = \frac{G_w \times f \times R_m [R_m]}{i \times \eta_m}$$

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].

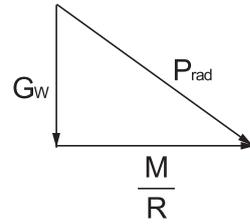
Table 3

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.

**DRAINAGE SPACE AND DRAINAGE PRESSURE**

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

