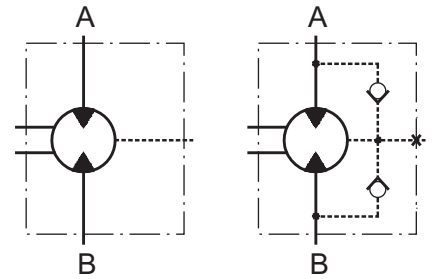


HYDRAULIC MOTORS MTK



APPLICATION

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



CONTENTS

Specification data	9
Dimensions and mounting	10÷13
Shaft extensions	14
Permissible shaft loads	15
Order code	16

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

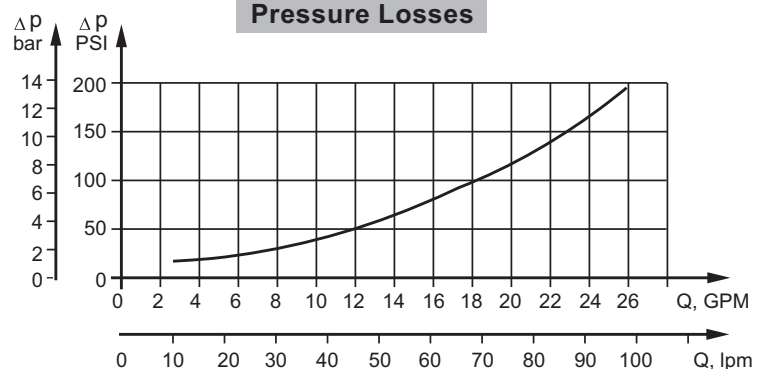
GENERAL

Displacement,	cm ³ /rev [in ³ /rev]	157,9÷502,4 [9.63÷30.7]
Max. Speed,	RPM	159÷505
Max. Torque,	daNm [lb-in]	57÷109 [5045÷9650]
Max. Output,	kW [HP]	22 [30]
Max. Pressure Drop,	bar [PSI]	160÷250 [2320÷3626]
Max. Oil Flow,	lpm [GPM]	80 [21]
Min. Speed,	RPM	5÷10
Permissible Shaft Loads,	daN [lb]	Pa=1000 [2250]
Pressure fluid		Mineral based- HLP(DIN 51524) or HM(ISO 6743/4)
Temperature range,	°C [°F]	-30÷90 [-22÷194]
Optimal Viscosity range,	mm ² /s [SUS]	20÷75 [98÷347]
Filtration		ISO code 20/16 (Min. recommended fluid filtration of 25 micron)

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, cm³/rev [in³/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
	Int.*	630	500	400	315	250	210
Max. Torque, daNm [lb-in]	Cont.	57 [5045]	72 [6373]	91 [8055]	105 [9293]	107 [9470]	102 [9028]
	Int.*	72,5 [6420]	92 [8143]	107 [9470]	131 [11595]	140 [12390]	133 [11772]
Max. Output, kW [HP]	Cont.	22 [29.5]	22 [29.5]	21 [28.2]	20 [26.8]	17,5 [23.5]	14 [18.8]
	Int.*	27 [36.2]	27 [36.2]	25 [33.5]	23,5 [31.5]	22 [29.5]	17,5 [23.5]
Max. Pressure Drop, bar [PSI]	Cont.	250 [3626]	250 [3626]	250 [3626]	250 [3626]	200 [2900]	160 [2320]
	Int.*	325 [4714]	325 [4714]	300 [4350]	300 [4350]	250 [3626]	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]
	at max. pressure drop int.*	54.5 [4824]	69 [6107]	80 [7080]	98,5 [8720]	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]					

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

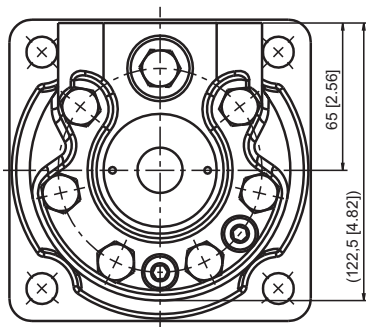
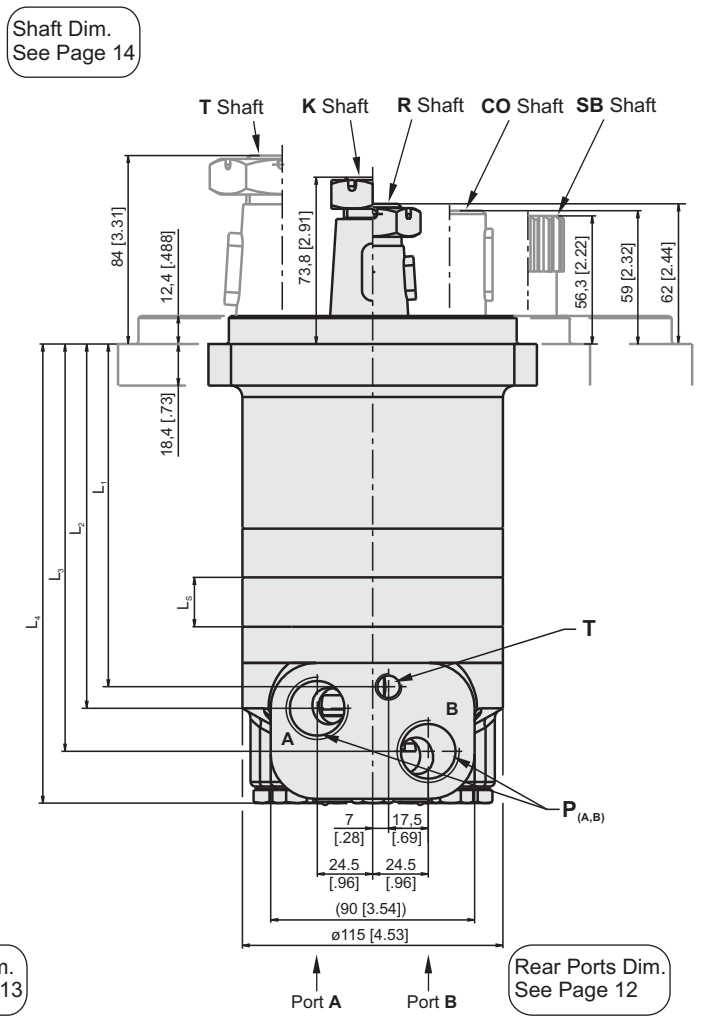
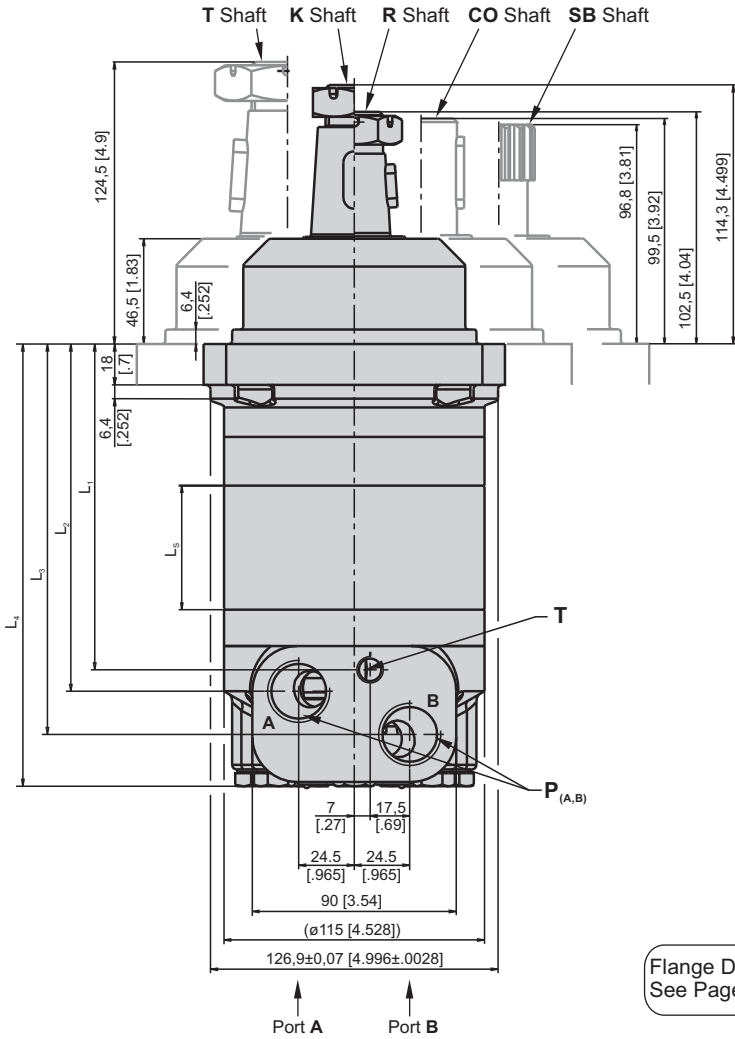
** Peak load: the permissible values may occur for max. 1% of every minute.

*** 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(ISO6743/4).
If using synthetic fluids consult the factory for alternative seal materials.
4. Recommended minimum oil viscosity 70 SUS [13 cSt] at 122°F [50°C].
5. Recommended maximum system operating temperature is 180°F [82°C].
6. To assure optimum motor life fill with fluid prior to loading and run at moderate load and speed for 10-15 minutes.

DIMENSIONS - MTK W and MTK C



Flange Dim.
See Page 13

Rear Ports Dim.
See Page 12

	Versions				
	Side			Rear	
	2	3	4	6	8
P (A,B)	2xG 3/4	2xM27x2	2x1 1/16-12UN	2xG 1/2	2x 7/8-14UNF
T	G 1/4	M14x1,5	7/16-20UNF	G 1/4	7/16-20UNF

Type	L _s , mm [in]	
MTKW160	MTKC160	21,8 [.86]
MTKW200	MTKC200	27,8 [1.09]
MTKW250	MTKC250	34,8 [1.37]
MTKW315	MTKC315	43,5 [1.71]
MTKW400	MTKC400	54,8 [2.16]
MTKW470	MTKC470	65,0 [2.56]
MTKW500	MTKC500	69,4 [2.73]

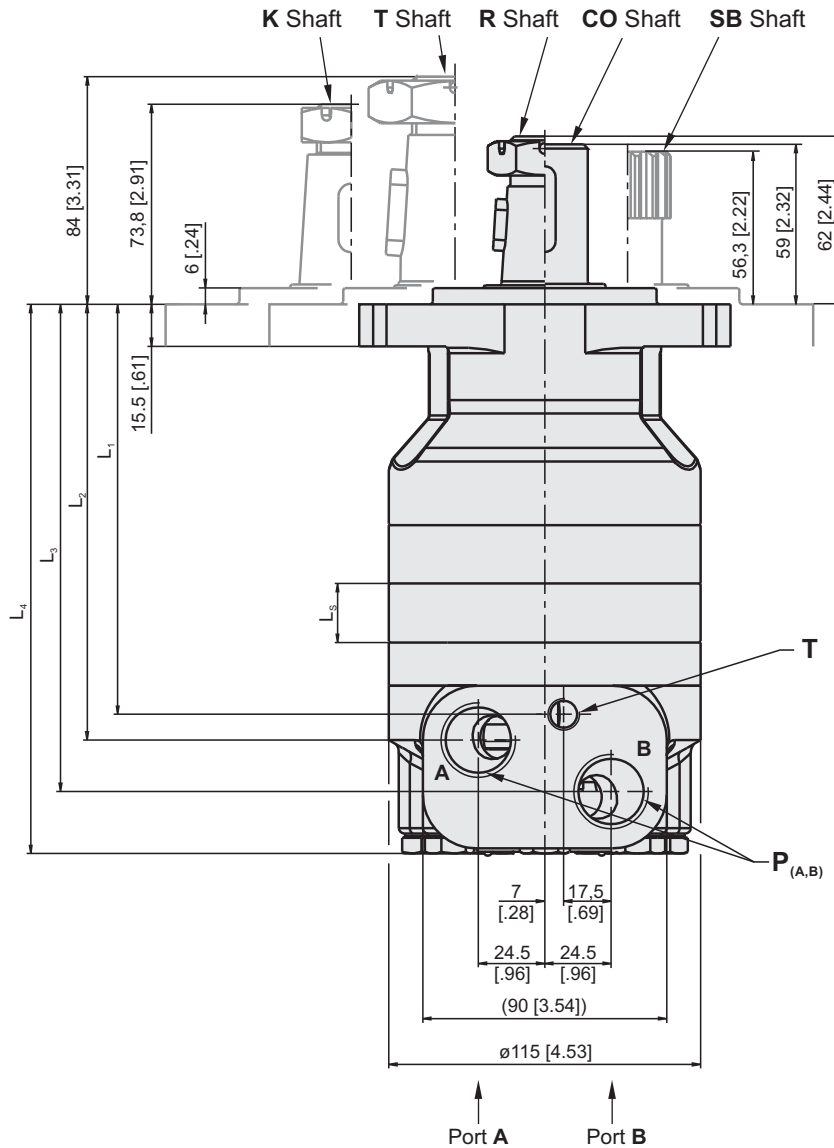
Standard Rotation
Viewed from Shaft End
Port A Pressurized - CW
Port B Pressurized - CCW

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



Type	L ₁ , mm [in]	L ₂ , mm [in]	L ₃ , mm [in]	L ₄ , mm [in]	Type	L ₁ , mm [in]	L ₂ , mm [in]	L ₃ , mm [in]	L ₄ , mm [in]
MTKW160	110,8 [4.36]	120,3 [4.74]	139,3 [5.48]	162,2 [6.39]	MTKC160	151,3 [5.96]	160,8 [6.33]	179,8 [7.08]	202,7 [7.98]
MTKW200	116,8 [4.59]	126,3 [4.97]	145,3 [5.72]	168,2 [6.62]	MTKC200	157,3 [6.19]	166,8 [6.57]	185,8 [7.32]	208,7 [8.22]
MTKW250	123,8 [4.87]	133,3 [5.25]	152,3 [5.99]	175,2 [6.89]	MTKC250	164,3 [6.47]	173,8 [6.84]	192,8 [7.59]	215,7 [8.49]
MTKW315	132,5 [5.22]	142,0 [5.59]	161,0 [6.34]	183,9 [7.24]	MTKC315	173,0 [6.81]	182,5 [7.19]	201,5 [7.93]	224,4 [8.84]
MTKW400	143,8 [5.66]	153,3 [6.04]	172,3 [6.78]	195,2 [7.69]	MTKC400	184,3 [7.26]	193,8 [7.63]	212,8 [8.38]	235,7 [9.28]
MTKW470	154,0 [6.06]	163,5 [6.44]	182,5 [7.19]	205,4 [8.09]	MTKC470	194,5 [7.66]	204,0 [8.03]	223,0 [8.78]	245,9 [9.68]
MTKW500	158,4 [6.24]	167,9 [6.61]	186,9 [7.36]	209,8 [8.26]	MTKC500	198,9 [7.83]	208,4 [8.20]	227,4 [8.95]	250,3 [9.85]

DIMENSIONS - MTK F



Standard Rotation

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

Reverse Rotation

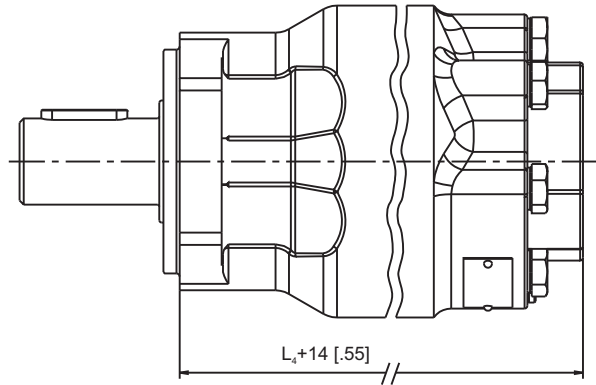
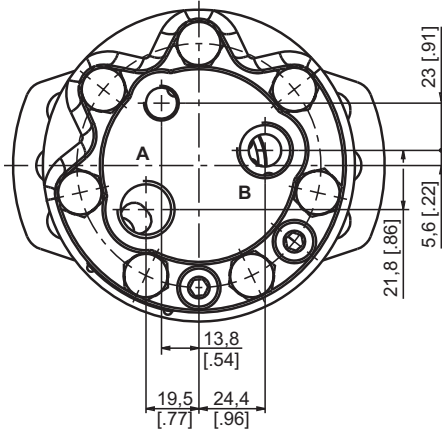
Viewed from Shaft End
Port A Pressurized - CCW
Port B Pressurized - CW

	Versions				
	Side			Rear	
	2	3	4	6	8
P (A,B)	2xG 3/4	2xM27x2	2x1 1/16-12UN	2xG 1/2	2x 7/8-14UNF
T	G 1/4	M14x1,5	7/16-20UNF	G 1/4	7/16-20UNF

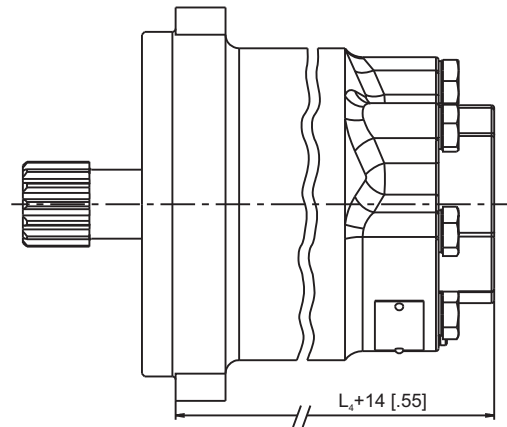
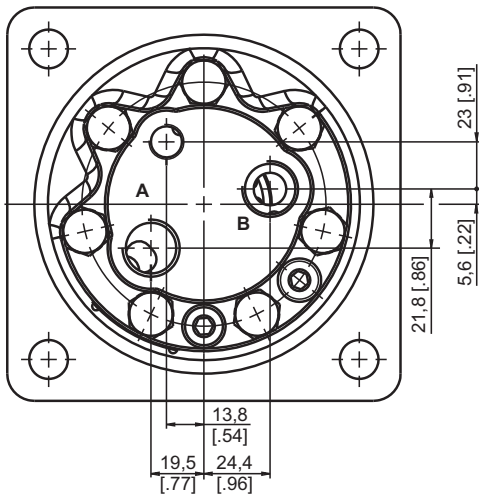
Type	L ₁ , mm [in]	L ₂ , mm [in]	L ₃ , mm [in]	L ₄ , mm [in]	L ₅ , mm [in]
MTKF 160	151,3 [5.96]	160,8 [6.33]	179,8 [7.08]	202,7 [7.98]	21,8 [.86]
MTKF 200	157,3 [6.19]	166,8 [6.57]	185,8 [7.32]	208,7 [8.22]	27,8 [1.09]
MTKF 250	164,3 [6.47]	173,8 [6.84]	192,8 [7.59]	215,7 [8.49]	34,8 [1.37]
MTKF 315	173,0 [6.81]	182,5 [7.19]	201,5 [7.93]	224,4 [8.84]	43,5 [1.71]
MTKF 400	184,3 [7.26]	193,8 [7.63]	212,8 [8.38]	235,7 [9.28]	54,8 [2.16]
MTKF 470	194,5 [7.66]	204,0 [8.03]	223,0 [8.78]	245,9 [9.68]	65,0 [2.56]
MTKF 500	198,9 [7.83]	208,4 [8.21]	227,4 [8.95]	250,3 [9.85]	69,4 [2.73]

Rear Ports

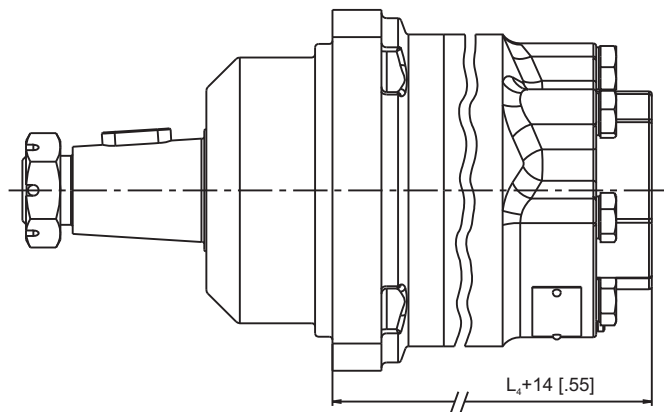
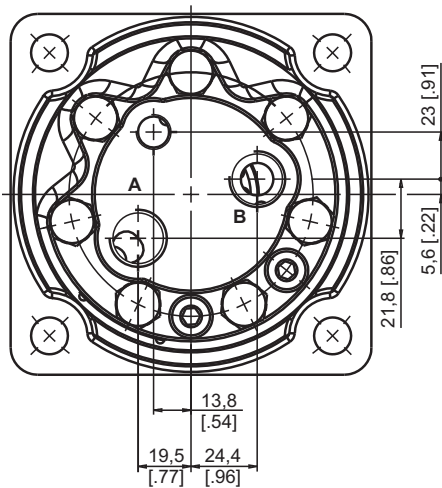
MTK F



MTK C

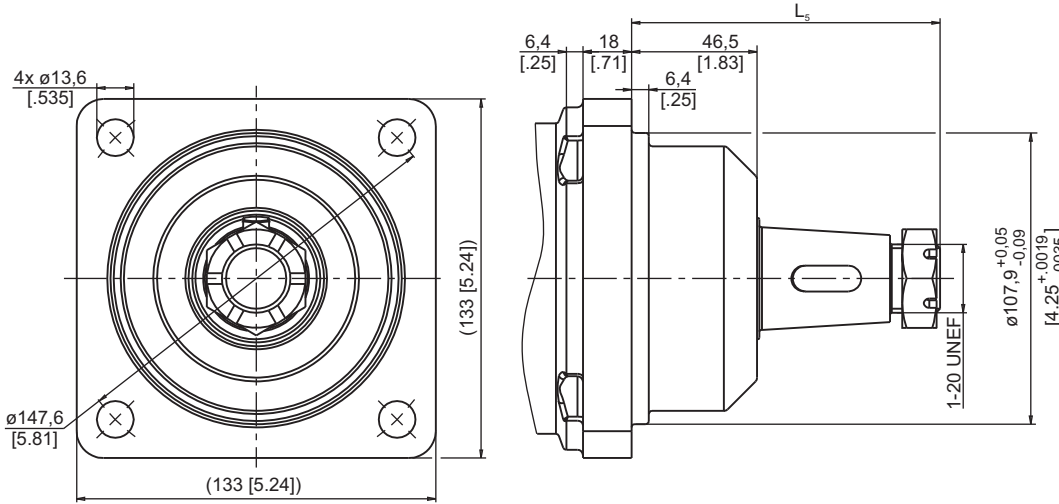


MTK W



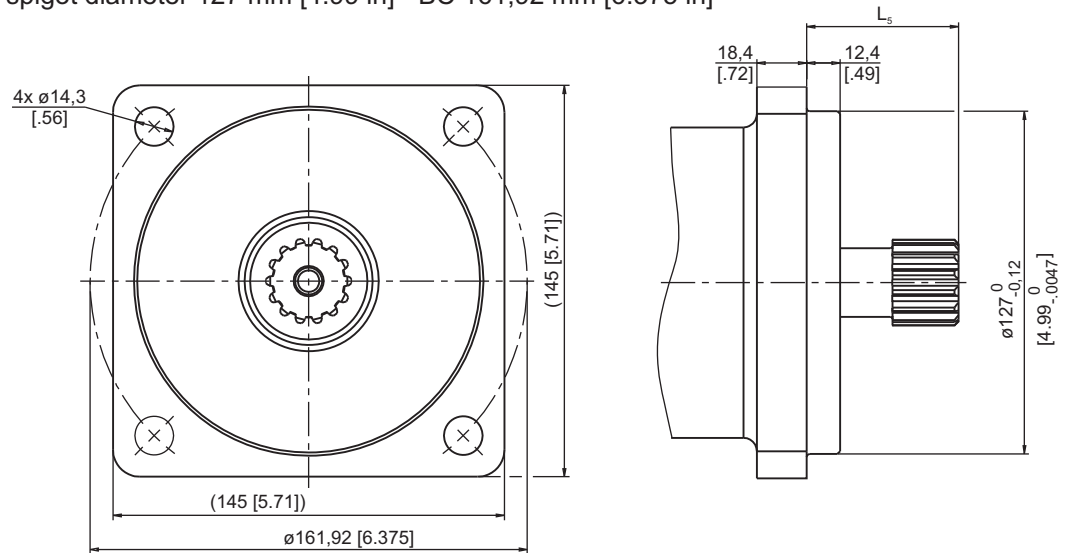
DIMENSIONS OF MOUNTING

W 4-Bolt flange, Wheel Motor
spigot diameter 107,9 mm [2.25 in] - BC 147,6 mm [5.81 in]



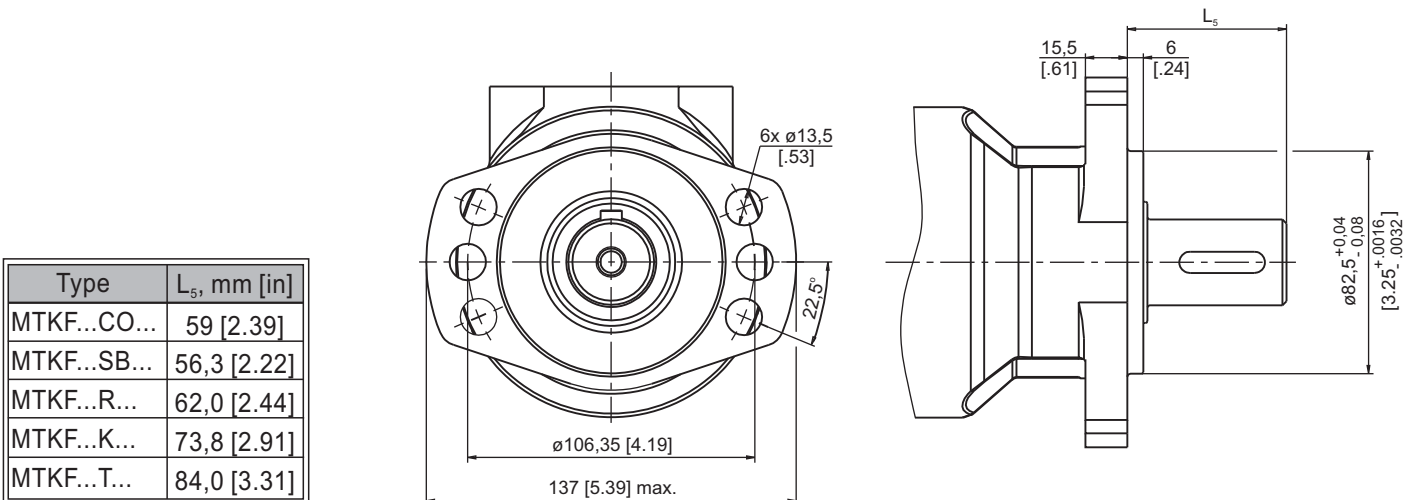
Type	L ₅ , mm [in]
MTKW...CO...	99,5 [3.92]
MTKW...SB...	96,8 [3.81]
MTKW...R...	102,5 [4.04]
MTKW...K...	114,3 [4.49]
MTKW...T...	124,5 [4.91]

C 4-Bolt flange,
spigot diameter 127 mm [4.99 in] - BC 161,92 mm [6.375 in]



Type	L ₅ , mm [in]
MTKC...CO...	59 [2.39]
MTKC...SB...	56,3 [2.22]
MTKC...R...	62,0 [2.44]
MTKC...K...	73,8 [2.91]
MTKC...T...	84,0 [3.31]

F 6-Bolt flange,
spigot diameter 82,5 mm [3.25 in] - BC 106,35 mm [4.19 in]

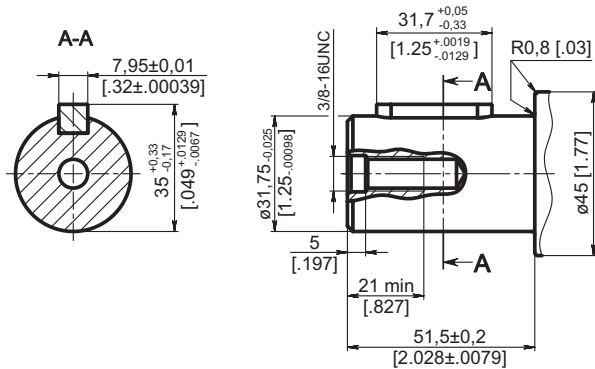


Type	L ₅ , mm [in]
MTKF...CO...	59 [2.39]
MTKF...SB...	56,3 [2.22]
MTKF...R...	62,0 [2.44]
MTKF...K...	73,8 [2.91]
MTKF...T...	84,0 [3.31]

SHAFT EXTENSIONS

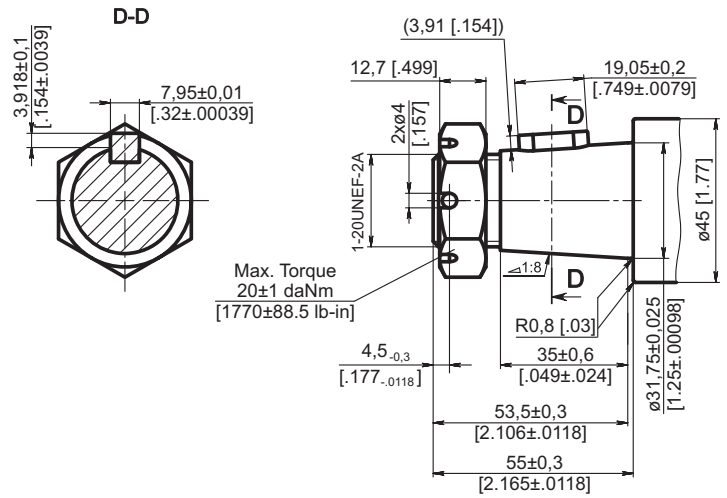
CO

ø1.25" [31,75] sraight, Parallel key 5/16"x 5/16"x 1 1/4"
Max. Torque 77 daNm [6815 lb-in]



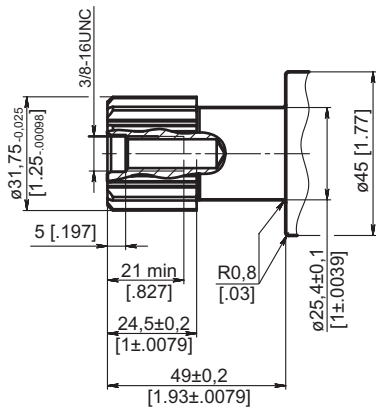
R

ø1.25" [31,75] tapered 1:8, Parallel key 5/16"x 5/16"x 3/4"
Max. Torque 77 daNm [6815 lb-in]



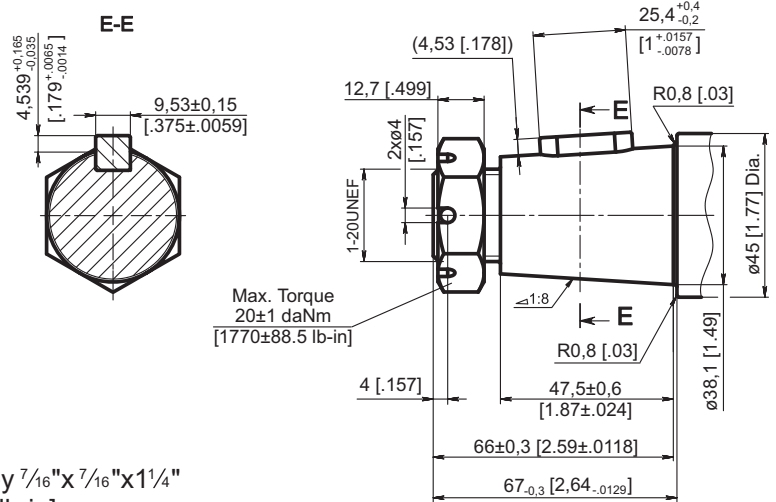
SB

ø1.25" [31,75] 14T Splined ANSI B92.1-1970, 12/24
Max. Torque 77 daNm [6815 lb-in]



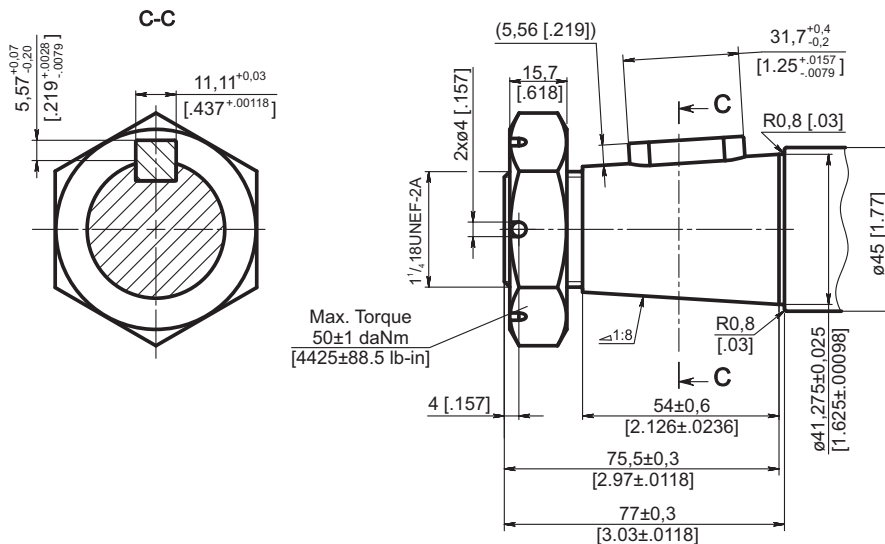
K

ø1.5" [38,1] tapered 1:8, Parallel key 3/8"x 3/8"x 1"
Max. Torque 89 daNm [7878 lb-in]



T

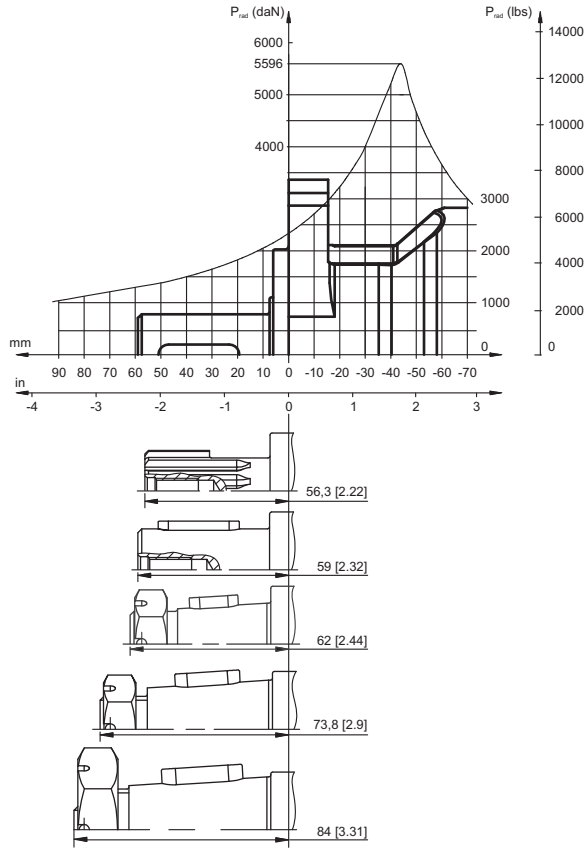
ø1.625" [41,275] tapered 1:8, Parallel key 7/16"x 7/16"x 1 1/4"
Max. Torque 100 daNm [8850 lb-in]



PERMISSIBLE SHAFT LOADS

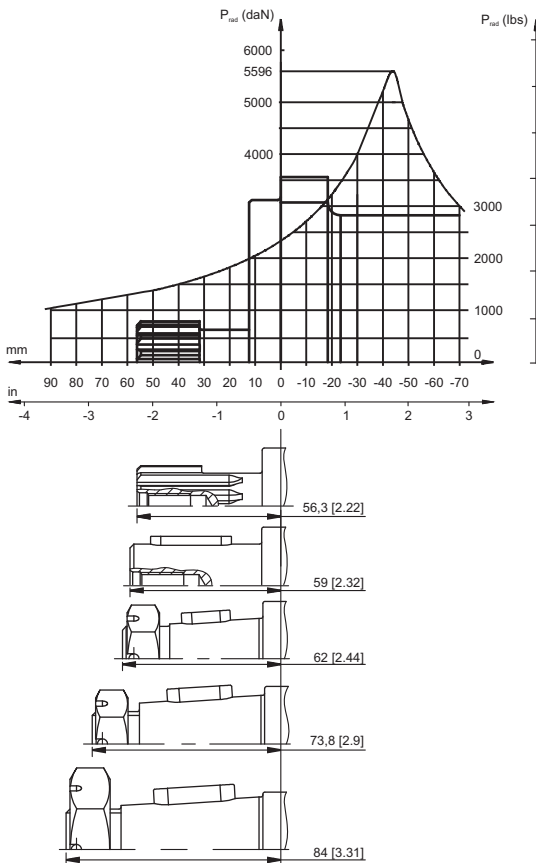
The curves apply to a B10 bearing life (ISO281) of 2000 hours at 100 RPM.

MTKF

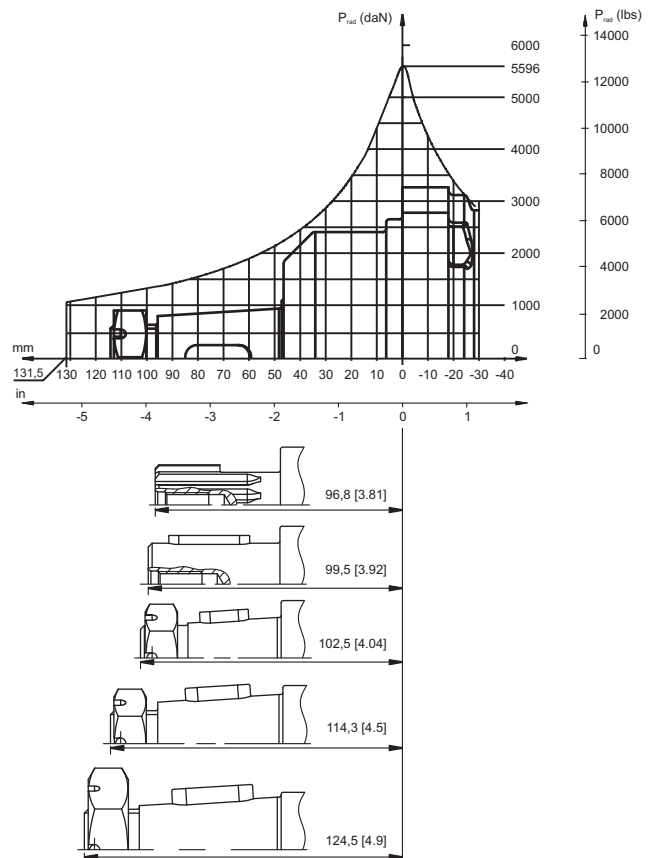


The curves apply to a B10 bearing life (ISO281) of 2000 hours at 100 RPM.

MTKC

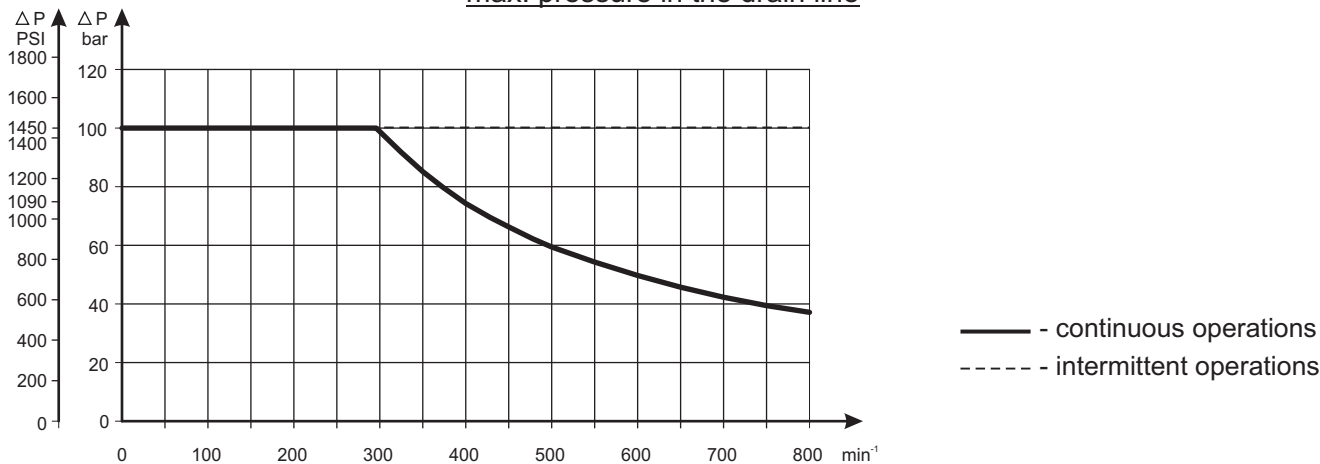


MTKW



MAX. PERMISSIBLE SHAFT SEAL PRESSURE for MTK motors

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



ORDER CODE

	1	2	3	4	5	6	7	8
MTK							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 cm³/rev [9.63 in³/rev]
- 200** - 201,3 cm³/rev [12.28 in³/rev]
- 250** - 252,2 cm³/rev [15.38 in³/rev]
- 315** - 314,9 cm³/rev [19.20 in³/rev]
- 400** - 396,8 cm³/rev [24.20 in³/rev]
- 470** - 470,5 cm³/rev [28.70 in³/rev]
- 500** - 502,4 cm³/rev [30.65 in³/rev]

Pos.4 - Shaft Extensions*

- CO** - ø1.25" [31,75] straight, Parallel key 5/16"x5/16"x1 1/4", 3/8-16 UNC
- SB** - ø1.25" [31,75] 14T Splined ANSI B92.1-1970, 12/24, 3/8-16 UNC
- R** - ø1.25" [31,75] Tapered 1:8, Parallel key 5/16"x5/16"x3/4", 1-20 UNEF
- K** - ø1.5" [38,1] Tapered 1:8, Parallel key 3/8"x3/8"x1", 1-20 UNEF
- T** - ø1.625" [41,275] Tapered 1:8, Parallel key 7/16"x7/16"x1 1/4", 1 1/4-18 UNEF

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 - Special Features

- HD** - Reinforced motor HD**
For Other **Special Features** [see page 52](#)

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 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	O	O	O	O	O	O	O
Check Valves		S	O	O	-	O	O	-

O	Optional
-	Not applicable
S	Standard

* For sensor ordering see pages 53÷54.

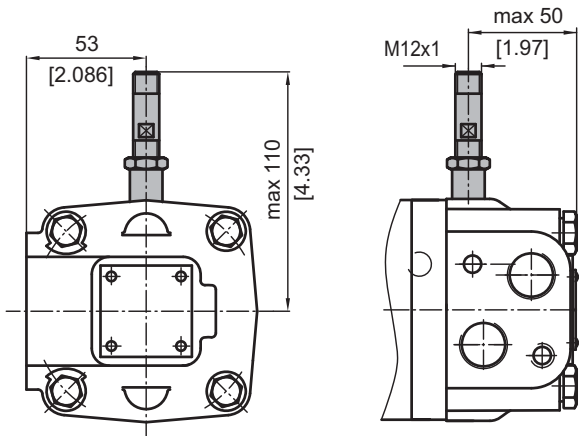
** Colour at customer's request.

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

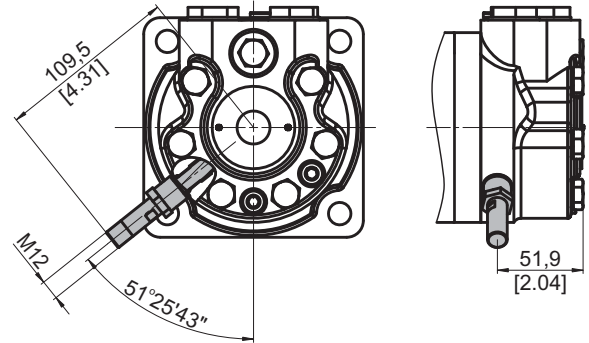
 For more information about **HD** option please contact with "M+S Hydraulic".

MOTORS WITH SPEED SENSOR

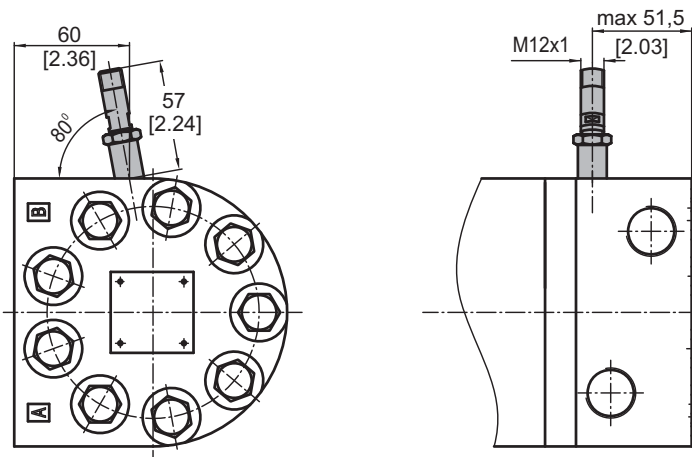
MSWM...RS



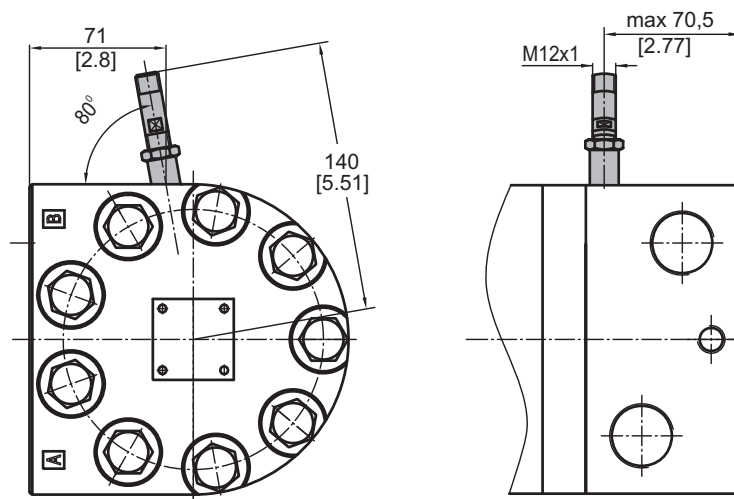
MTK...RS



MTM...RS TMF...RS



MVM...RS VMF...RS

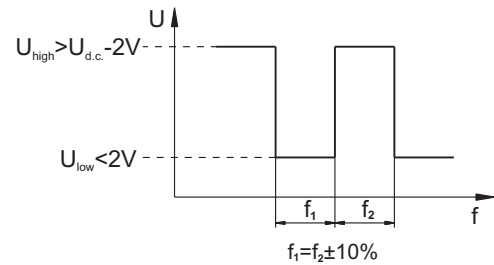


TECHNICAL DATA OF THE SPEED SENSOR

Technical data

Frequency range	0...15 000 Hz
Output	PNP, NPN
Power supply	10...36 VDC
Current input	20 mA (@24 VDC)
Ambient Temperature	-40...+125°C [-40...+257°F]
Protection	IP 67
Plug connector	M12-Series
Mounting principle	ISO 6149

Output signal

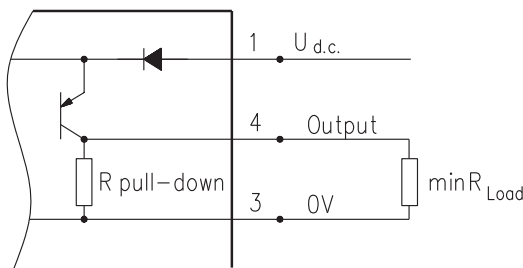


Load max.: $I_{high} = I_{low} < 50\text{mA}$

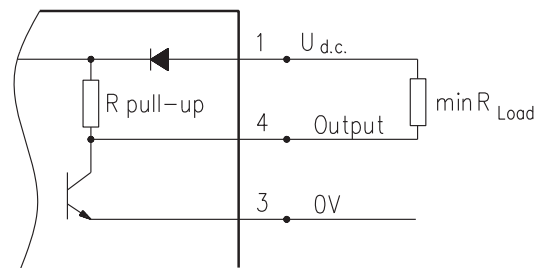
Motor type	MSWM MTK	MTM TMF	MVM VMF
Pulses per revolution	54	84	102

Wiring diagrams

PNP

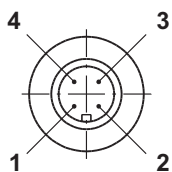


NPN



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

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	Output type	Electric connection
RSN	NPN	Connector BINDER 713 series
RSP	PNP	Connector BINDER 713 series
RSNL5	NPN	Cable output 3x0,25; 5 m [196 in] long
RSPL5	PNP	Cable output 3x0,25; 5 m [196 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:

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

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:

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

N - motor numbers;

η_m - mechanical gear efficiency (if it is available).

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

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

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].

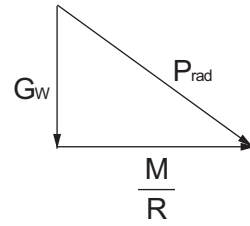
Table 3

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.

DRAINAGE SPACE AND DRAINAGE PRESSURE

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

