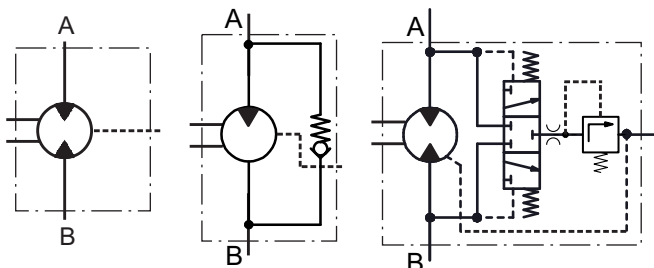


Product Tech News

beta version 3

Hydraulic motors type MAP50

Heavy duty axial piston fixed displacement motor



drain line always should be open



OPTIONS

- » Swash plate
- » Flange mount
- » Side ports, End ports, Twin ports
- » Shafts- splined, taper, straight
- » High pressure ports

APPLICATION

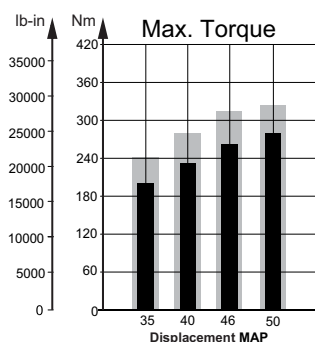
- » Machines for agriculture
- » Road building machines
- » Mining machinery
- » Food industries
- » Special vehicles

EXCELLENCE

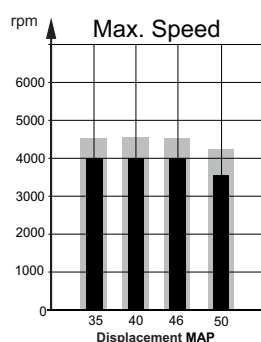
- » High starting torque
- » Smooth low - speed operation
- » Long service life
- » High power density

GENERAL

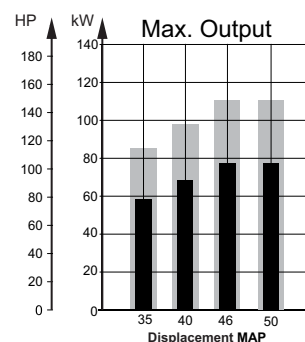
Displacement,	cm ³ /rev [in ³ /rev]	36,16÷49.94 [2.21÷3.05]
Max. Speed,	RPM	4000
Max. Torque,	Nm [lb-in]	278 [2460]
Max. Output,	kW [HP]	76 [102]
Max. Pressure Drop,	bar [PSI]	350 [5080]
Max. Oil Flow,	lpm [GPM]	180 [47.5]
Min. Speed,	RPM	500
Pressure fluid	Mineral based- HLP(DIN 51524) or HM(ISO 6743/4)	
Temperature range,	°C [°F]	-40÷82 [-40÷180]
Optimal Viscosity range, mm ² /s [SUS]	12÷60 [70÷278]	
Filtration	ISO code 18/16/13 (Min. recommended fluid filtration of 10 micron)	



Intermittent values



Continuous values



SPECIFICATION DATA

Type	MAP 35	MAP 40	MAP 46	MAP 50
Displacement, cm. ³ /rev. [in. ³ /rev.]	36.16 [2.21]	41.59 [2.54]	47.13 [2.88]	49.94 [3.05]
Max. Speed, [RPM]	Cont.	4000	4000	4000
	Int.*	4500	4500	4500
Max. Torque,** Nm [lb-in]	Cont.	202 [1789]	232 [2053]	263 [2328]
	Int.**	242 [2142]	278 [2460]	315 [2788]
Output, kW [HP]	Cont.	58 [78]	67 [90]	76 [102]
	Int.**	84 [113]	97 [130]	110 [148]
Max. Pressure bar [PSI]	Cont.	350 [5080]	350 [5080]	350 [5080]
	Int.**	420 [6100]	420 [6100]	420 [6100]
Max. Oil Flow, lpm [GPM]	Cont.	145 [38.3]	167 [44.1]	189 [50]
	Int.*	163 [43.1]	187 [49.4]	212 [56]
Permissible shaft load				
max Axial**** N[lb]	Fa=2000 [450]			
max Radial**** N[lb]	Fr=3600 [810]			
Min. speed [RPM]	500			
Max. Pressure in Drain Line, bar [PSI]	5 [70] drain line always should be open			
Weight kg [lb]	17.8 [39.2]			

* Intermittent speed (flow) is for pressure up to 150[2200] bar[PSI].

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

*** Theoretical torque

**** Given forces are in optimal direction and position

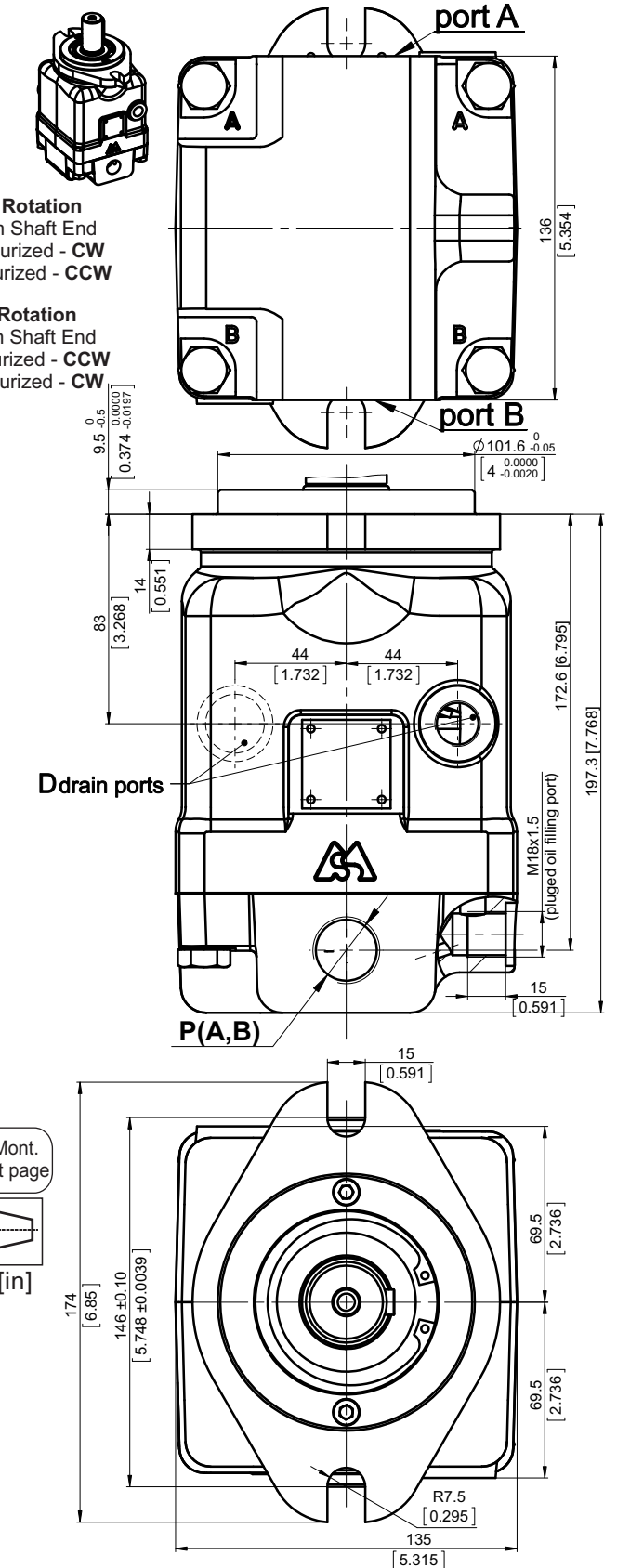
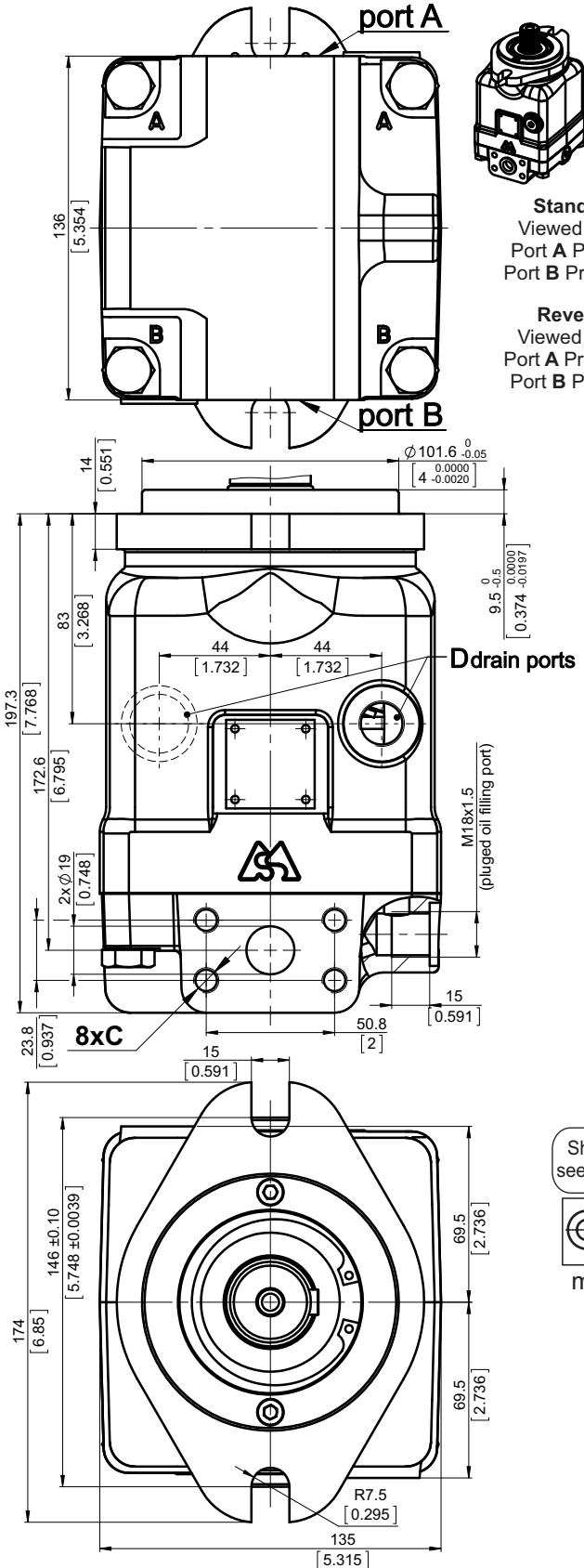
1. For continuous operations continuous the recommended output power should not be exceeded.
2. Recommended filtration is per ISO 4406 cleanliness code 18/16/13 or better. This filtration corresponds to SAE AS 4059 8A/7B/7C. A nominal filtration 10 micron or better.
3. Recommend using of a premium quality, anti-wear type mineral based hydraulic oil, HLP(DIN51524) or HM(ISO6743/4).
4. Recommended oil viscosity 15...30 cSt or less.
5. Recommended maximum system operating temperature is 82°C [180°F].
6. To ensure optimum motor life fill with fluid prior to loading and run at moderate load and speed for 10-15 minutes.

Default End cover

Motor overall dimension and ports

Port version standard, port size default and 5

Port version standard, port size 2,3,4,6,7,8



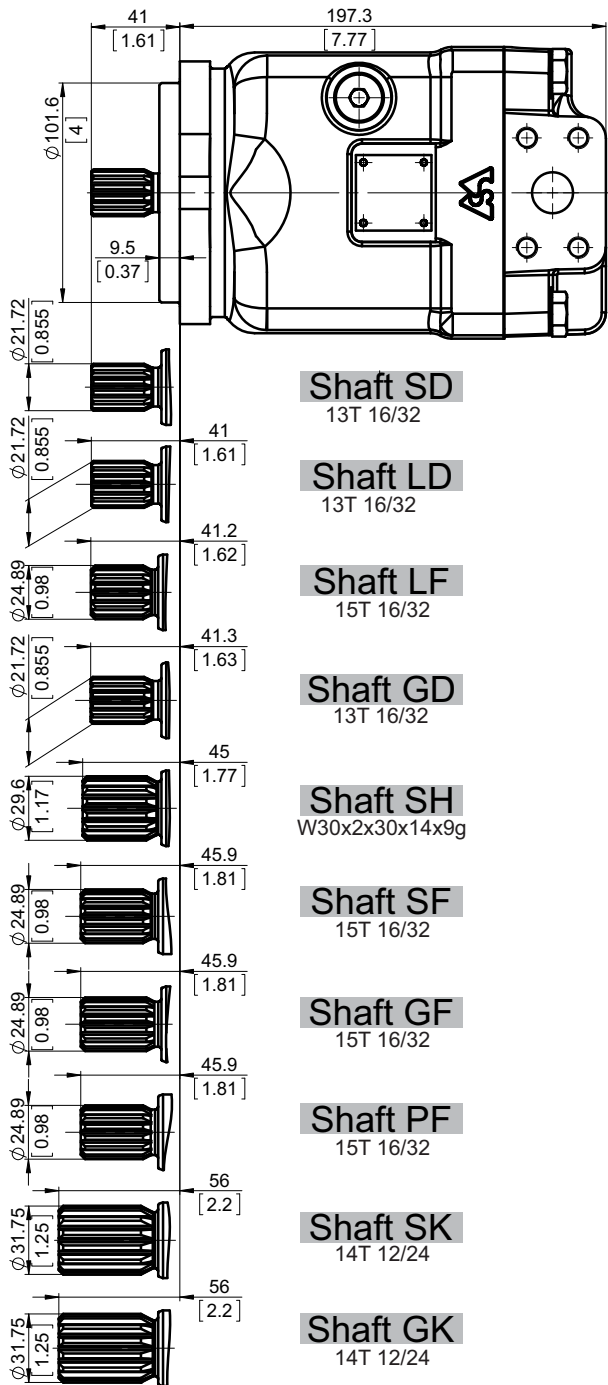
Shaft Mont.
see next page

mm [in]

	Port Size	
	default	5
P(A,B)	2xSAE J518 3/4 PSI6000	2xSAE J518 3/4 PSI6000
D	M18x1,5	7/8-16 UNF-2B
C	M10-6H	3/8-16 UNC-2B

	Port Size					
	2	3	4	6	7	8
P(A,B)	2xG 3/4	2xM27x2	2x1 ¹ / ₁₆ -12UN	2xG 1/2	2xM22x1,5	2x ⁷ / ₈ -14UNF
D	G 1/2	M18x1,5	⁷ / ₈ -14UNF	G 1/2	M18x1,5	³ / ₄ -16UNF

Default End cover
Shaft distance

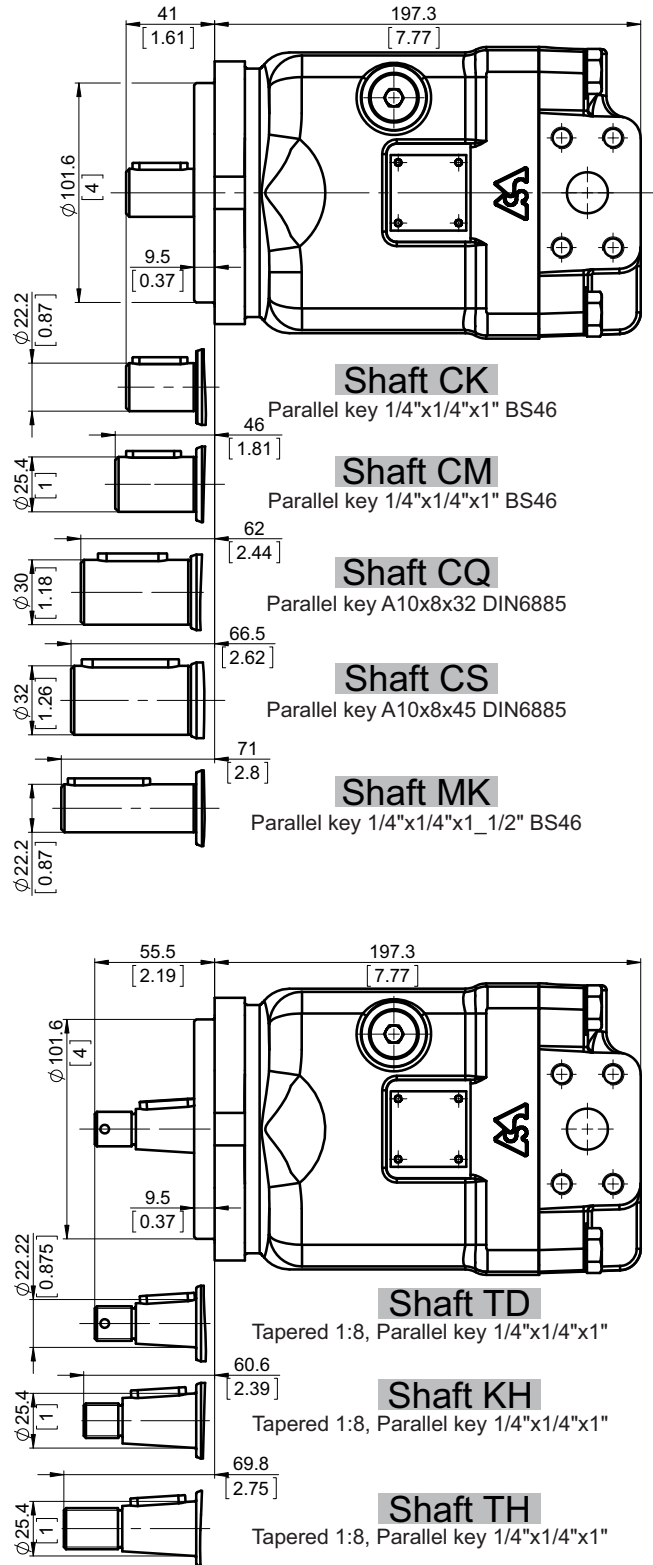


Shaft Dim.
See Page 9,10,11,12

PERMISSIBLE SHAFT LOADS

Permissible shaft load		
max Axial	N[lb]	Fa=2000 [450]
max Radial	N[lb]	Fr=3600 [810]

Given forces are in optimal direction and shaft position
For more information please ask

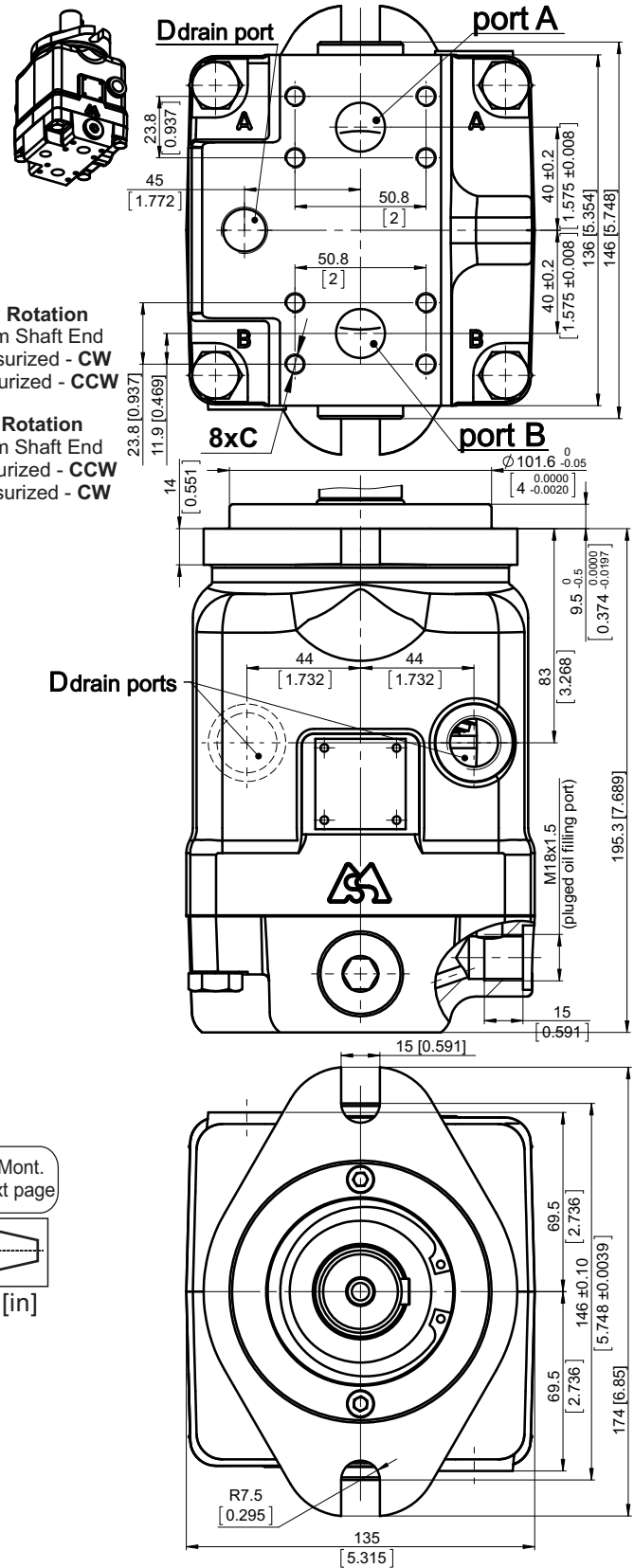
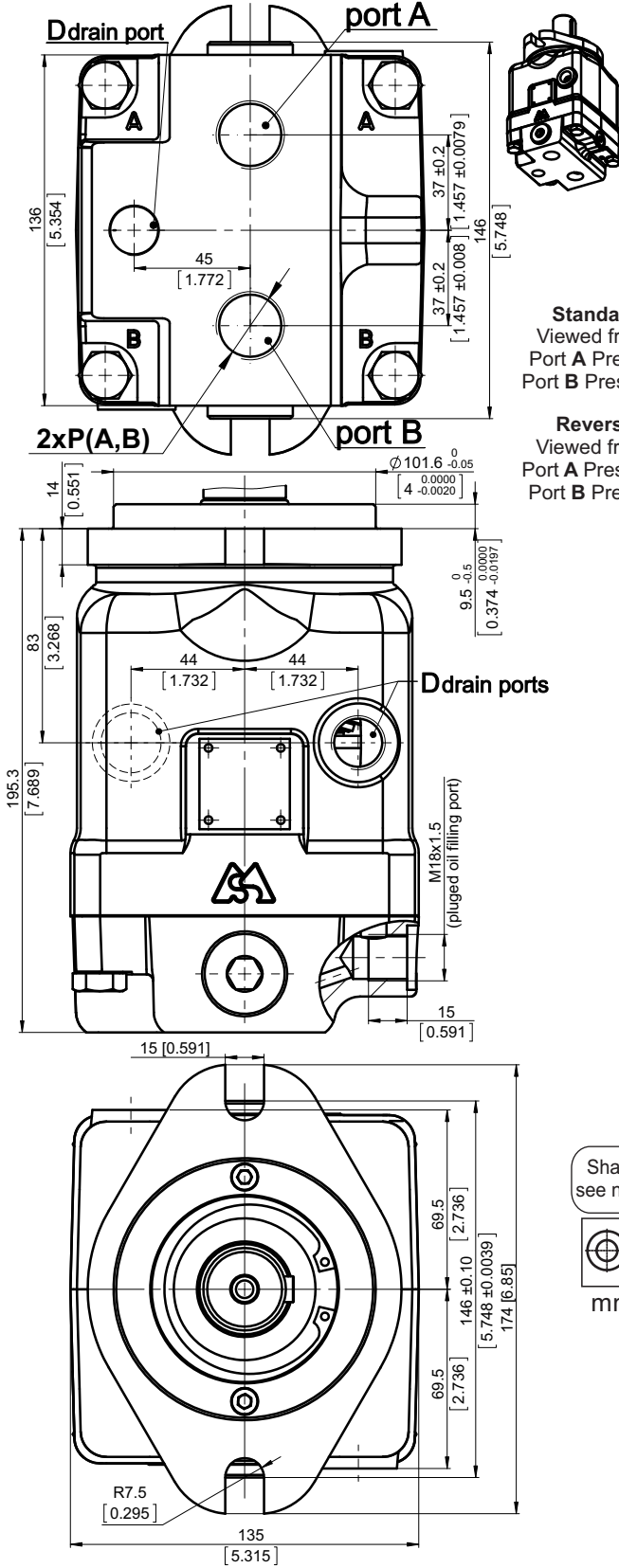


End cover type E

Motor overall dimension and ports

Port version E, port size 2,3,4,6,7,8

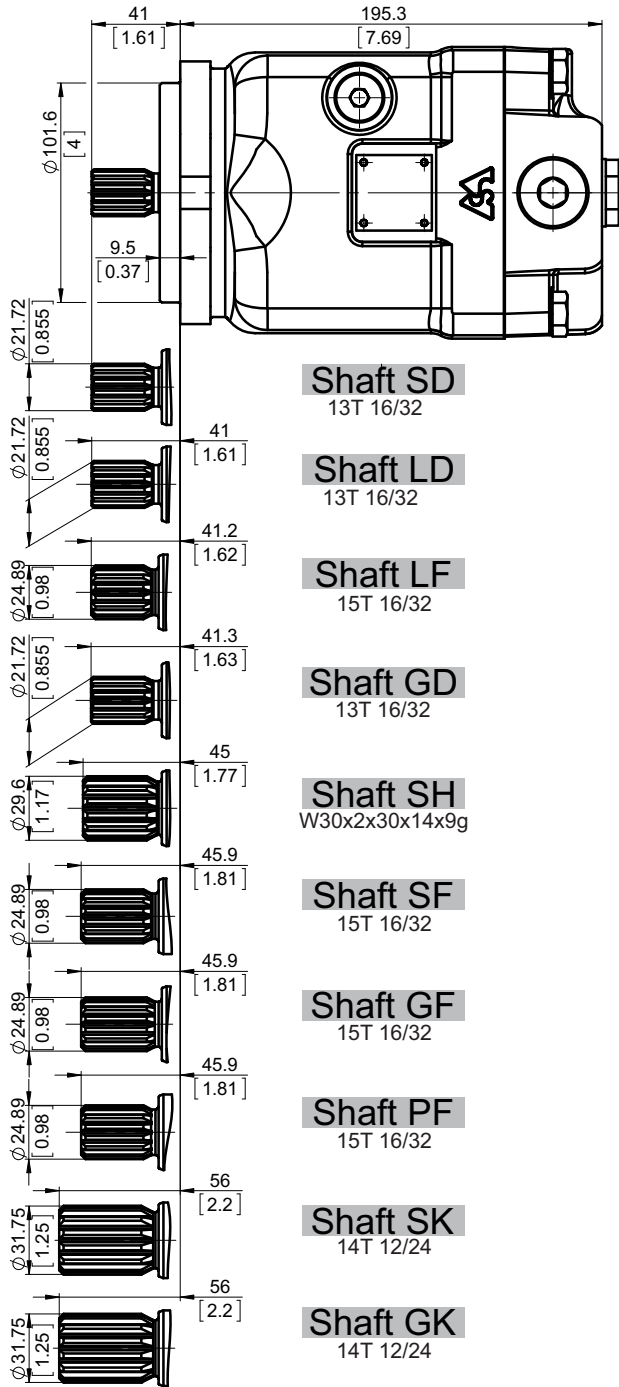
Port version E, port size default and 5



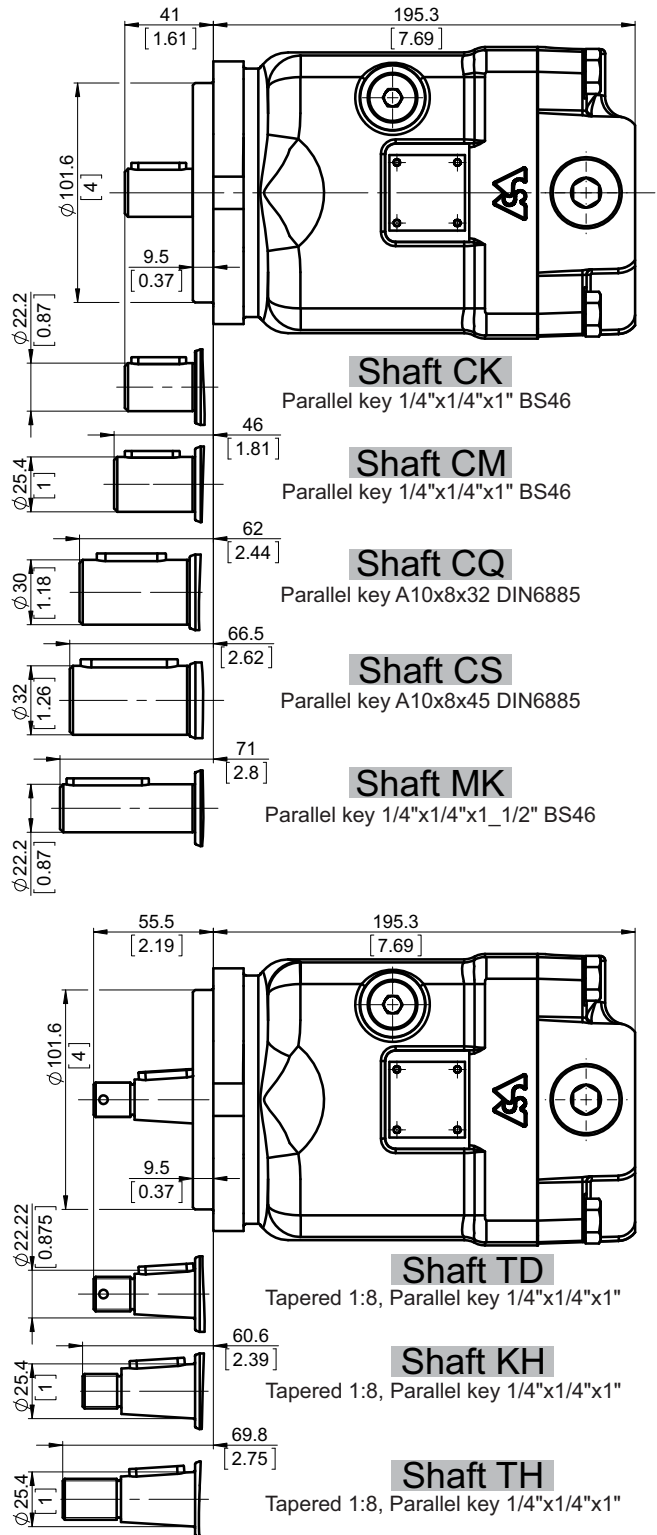
	Port Size						
	2	3	4	6	7	8	
P_(A,B)	2xG 3/4	2xM27x2	2x1 ¹ / ₁₆ -12UN	2xG 1/2	2xM22x1,5	2x ¹ / ₈ -14UNF	
D	G 1/2	M18x1,5	¹ / ₈ -14UNF	G 1/2	M18x1,5	³ / ₄ -16UNF	

	Port Size	
	default	5
P_(A,B)	2xSAE J518 3/4 PSI6000	2xSAE J518 3/4 PSI6000
D	M18x1,5	7/8-16 UNF-2B
C	M10-6H	3/8-16 UNC-2B

End cover type E
Shaft distance



Shaft Dim.
See Page 9,10,11,12



PERMISSIBLE SHAFT LOADS

Permissible shaft load		
max Axial	N[lb]	Fa=2000 [450]
max Radial	N[lb]	Fr=3600 [810]

Given forces are in optimal direction and shaft position
For more information please ask

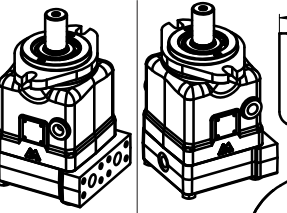
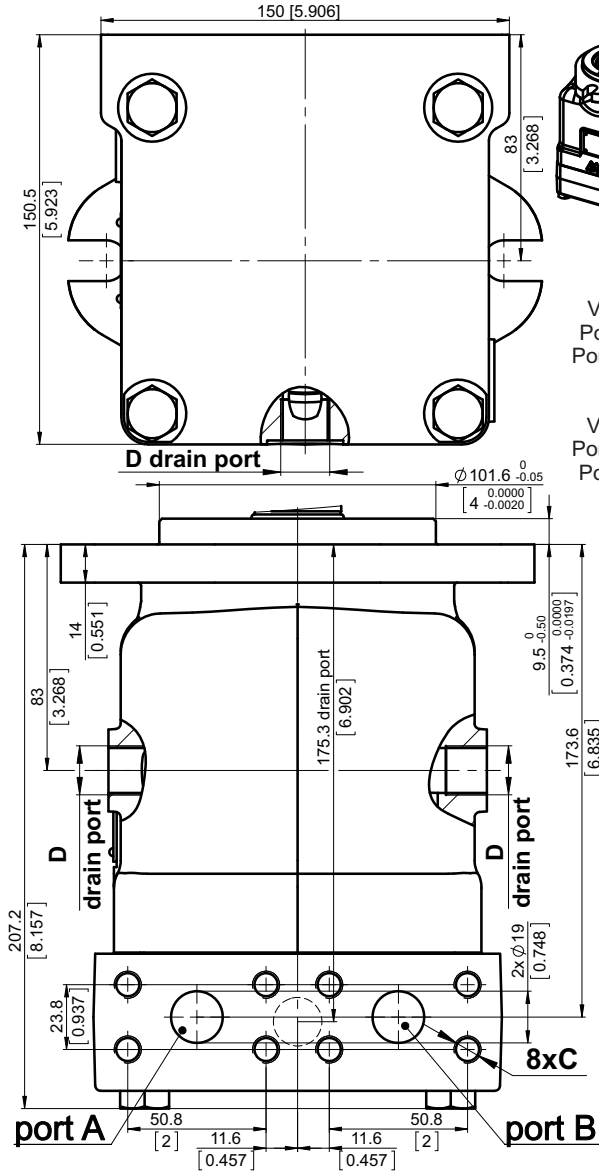


End cover type T

Motor overall dimension and ports

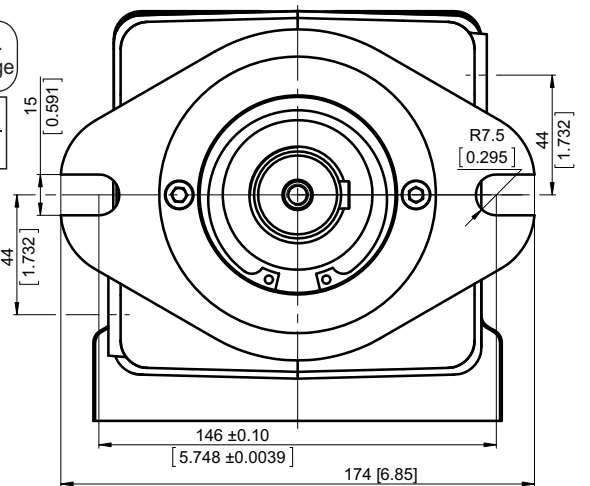
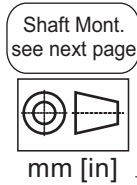
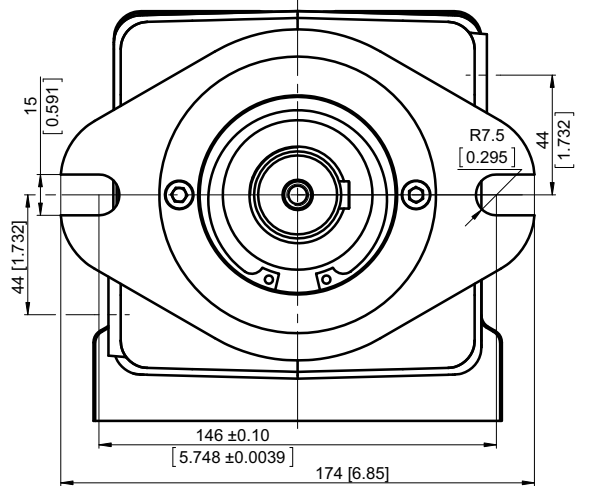
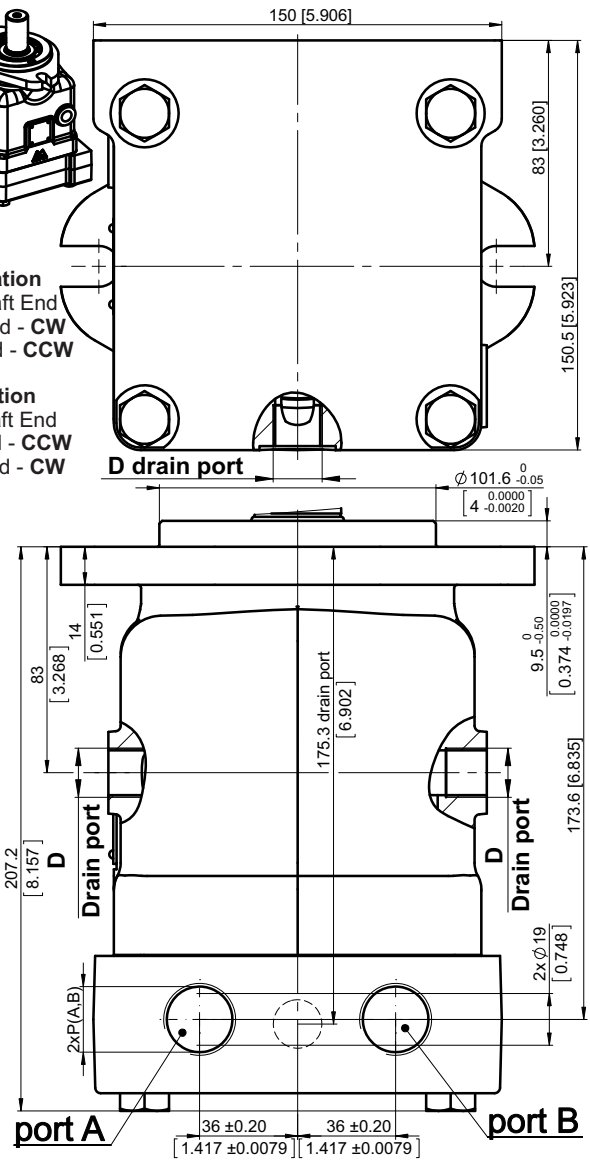
Port version T, port size default and 5

Port version T, port size 2,3,4,6,7,8



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

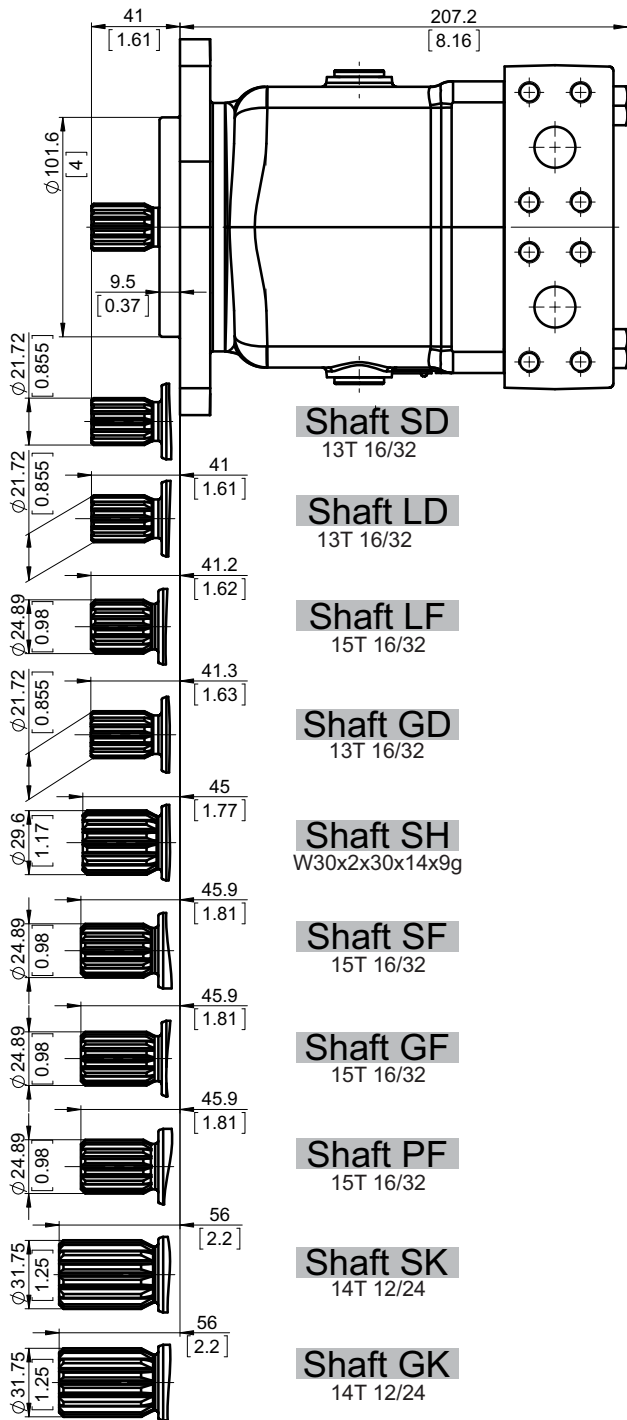
Reverse Rotation
Viewed from Shaft End
Port A Pressurized - CCW
Port B Pressurized - CW



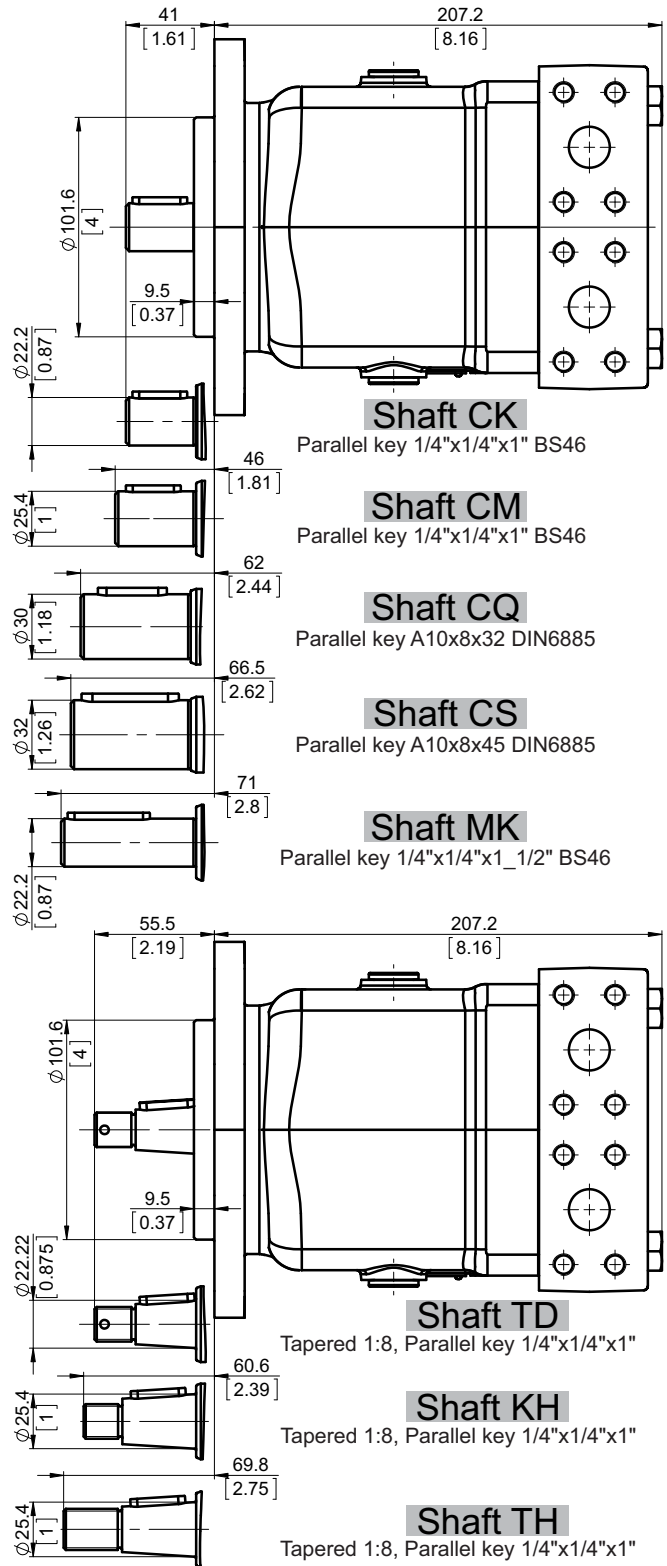
	Port Size	
	default	5
P _(A,B)	2xSAE J518 3/4 PSI6000	2xSAE J518 3/4 PSI6000
D	M18x1,5	7/8-16 UNF-2B
C	M10-6H	3/8-16 UNC-2B

	Port Size					
	2	3	4	6	7	8
P _(A,B)	2xG 3/4	2xM27x2	2x1 ¹ / ₁₆ -12UN	2xG 1/2	2xM22x1,5	2x ⁷ / ₈ -14UNF
D	G 1/2	M18x1,5	⁷ / ₈ -14UNF	G 1/2	M18x1,5	³ / ₄ -16UNF

End cover type T
Shaft distance



Shaft Dim.
See Page 9,10,11,12



PERMISSIBLE SHAFT LOADS

Permissible shaft load		
max Axial	N[lb]	Fa=2000 [450]
max Radial	N[lb]	Fr=3600 [810]

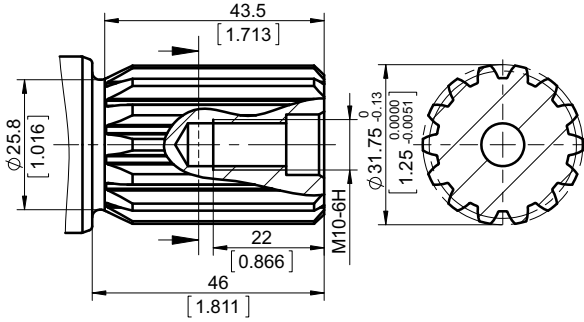
Given forces are in optimal direction and shaft position
For more information please ask



SHAFTS

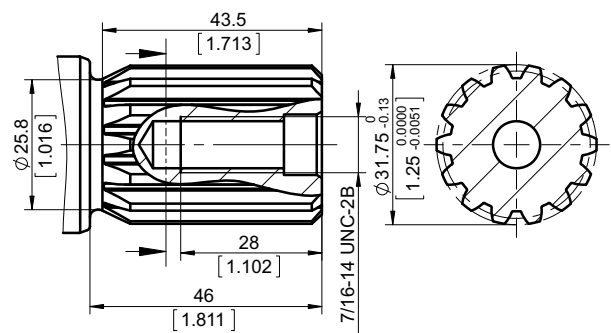
SK

ø31,75 [ø1.25"], M10-6H thread
14T 12/24 DP Splined ANSI B92.1-1970
Max. Torque 600 Nm [5310 lb-in]



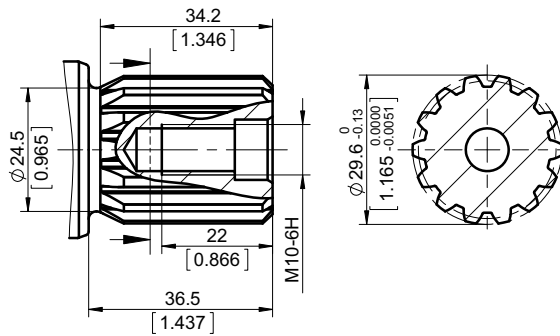
GK

ø31,75 [ø1.25"], 7/16-14 UNC-2B thread
14T 12/24 DP Splined ANSI B92.1-1970
Max. Torque 600 Nm [5310 lb-in]



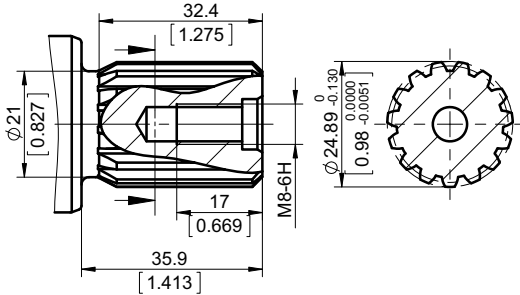
SH

ø29,6 [ø1.165"], M10-6H thread
W30x2x30x14x9g Splined DIN 5480
Max. Torque 600 Nm [5310 lb-in]



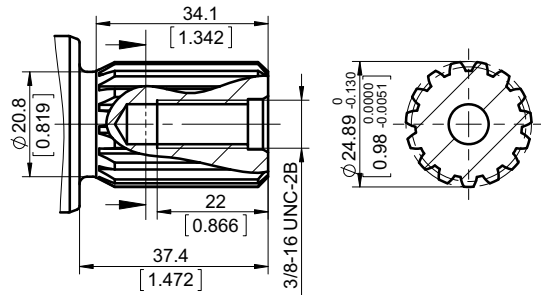
SF

ø24.89 [ø0.98"], M8-6H thread
15T 16/32 DP Splined ANSI B92.1-1970
Max. Torque 360 Nm [3180 lb-in]



GF

ø24.89 [ø0.98"], 3/8-16 UNC-2B thread
15T 16/32 DP Splined ANSI B92.1-1970
Max. Torque 360 Nm [3180 lb-in]



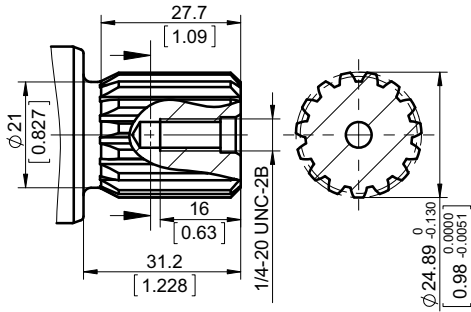
Requirement max. Torque must be not exceeded



SHAFTS

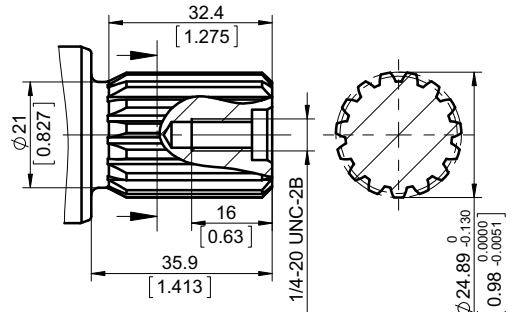
LF

ø24.89 [ø0.98"], 1/4-20 UNC-2B thread
15T 16/32 DP Splined ANSI B92.1-1970
Max. Torque 360 Nm [3180 lb-in]



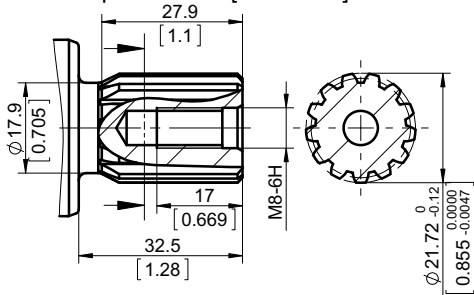
PF

ø24.89 [ø0.98"], 1/4-20 UNC-2B thread
15T 16/32 DP Splined ANSI B92.1-1970
Max. Torque 360 Nm [3180 lb-in]



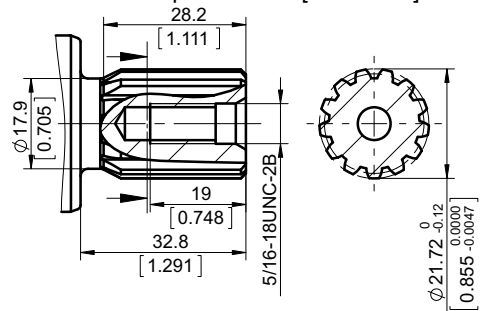
SD

ø21.72 [ø0.855"], M8-6H thread
13T 16/32 DP Splined ANSI B92.1-1970
Max. Torque 220 Nm [1950 lb-in]



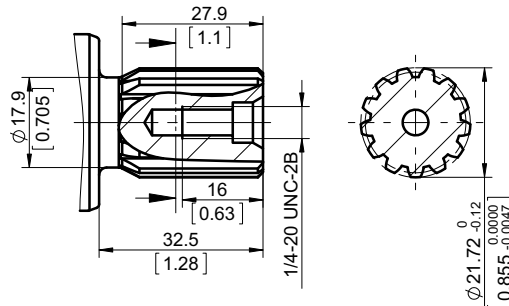
GD

ø21.72 [ø0.855"], 5/16-18 UNC-2B thread
13T 16/32 DP Splined ANSI B92.1-1970
Max. Torque 220 Nm [1950 lb-in]



LD

ø21.72 [ø0.855"], 1/4-20 UNC-2B thread
13T 16/32 DP Splined ANSI B92.1-1970
Max. Torque 220 Nm [1950 lb-in]



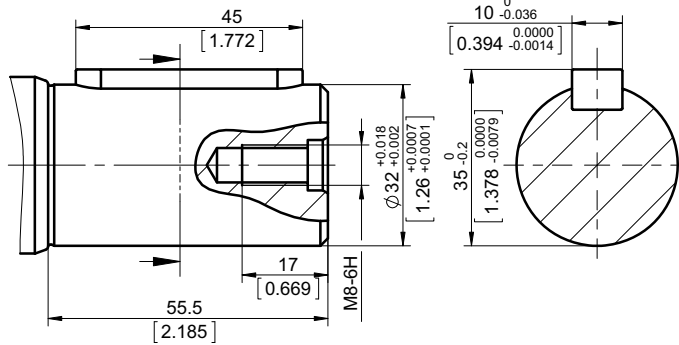
Requirement max. Torque must be not exceeded



SHAFTS

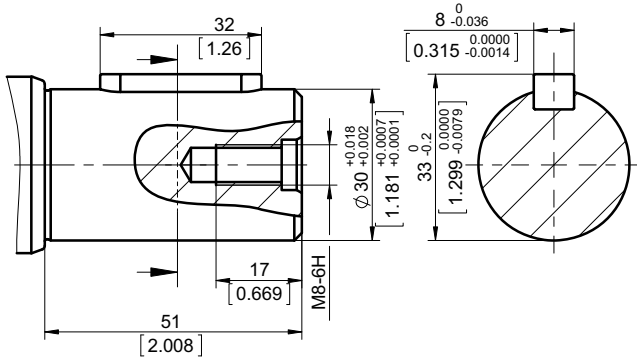
CS

ø32 [ø1.26"] straight, M8-6H thread
Parallel key **A10x8x45** DIN6885
Max. Torque 565 Nm [5000 lb-in]



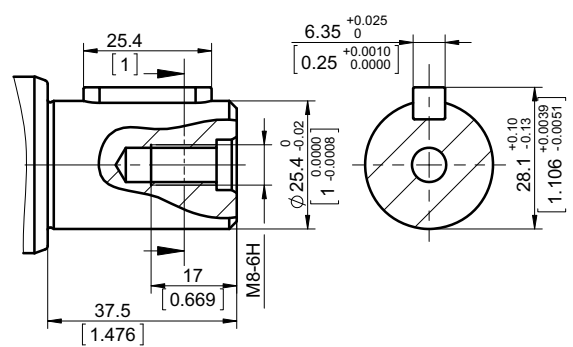
CQ

ø30 [ø1.181"] straight, M8-6H thread
Parallel key **A10x8x32** DIN6885
Max. Torque 300 Nm [2655 lb-in]



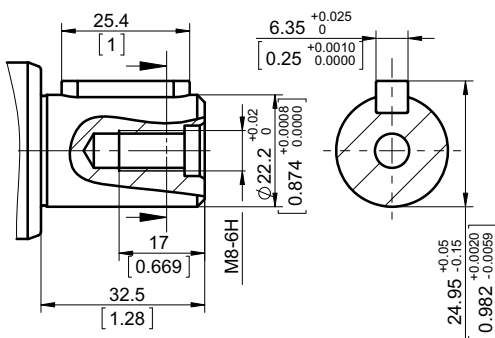
CM

ø25.4 [ø1"] straight, M8-6H thread
Parallel key **1/4"x1/4"x1"** BS46
Max. Torque 250 Nm [2210 lb-in]



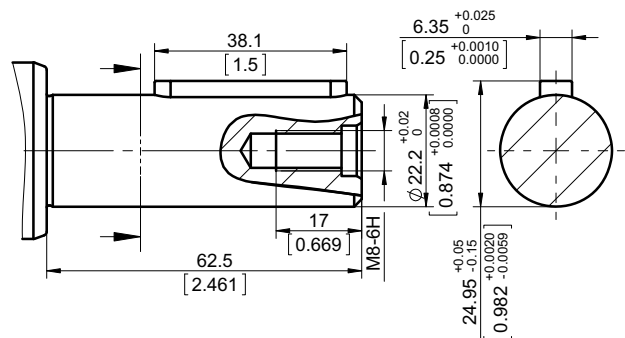
CK

ø22.2 [ø7/8"] straight, M8-6H thread
Parallel key **1/4"x1/4"x1"** BS46
Max. Torque 180 Nm [1600 lb-in]



MK

ø22.2 [ø7/8"] straight, M8-6H thread
Parallel key **1/4"x1/4"x1 1/2"** BS46
Max. Torque 180 Nm [1600 lb-in]



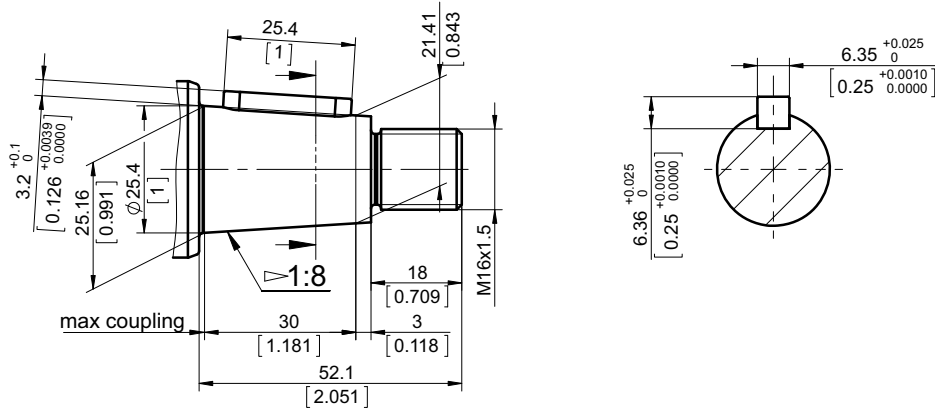
Requirement max. Torque must be not exceeded



SHAFTS

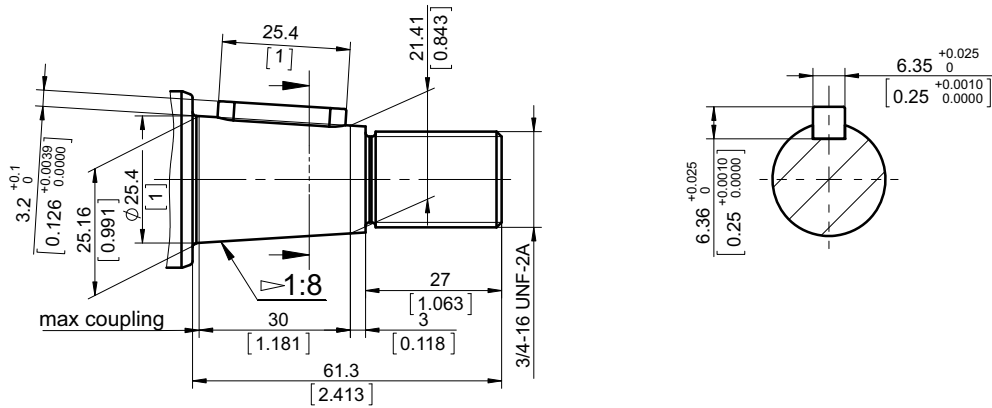
KH

ø25.4 [1"] Tapered 1:8 [125:1000],
Parallel key 1/4"x1/4"x1", M16x1.5
Max. Torque 300 Nm [2650 lb-in]



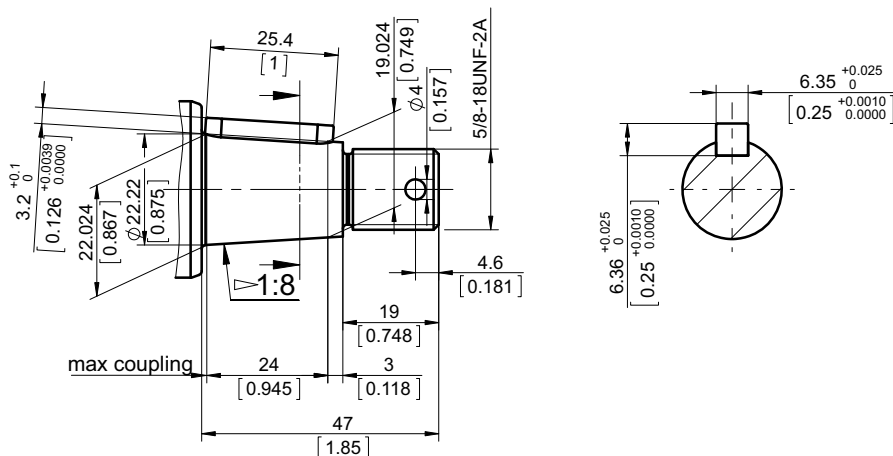
TH

ø25.4 [1"] Tapered 1:8 [125:1000],
Parallel key 1/4"x1/4"x1", 3/4-16 UNF-2A
Max. Torque 300 Nm [2650 lb-in]



TD

ø22.22 [7/8"] Tapered 1:8 [125:1000],
Parallel key 1/4"x1/4"x1", 5/8-18 UNF-2A
Max. Torque 220 Nm [1950 lb-in]



Requirement max. Torque must be not exceeded



	1	2	3	4	5	6	7	8	9	10	11	12	13
M A P												/	

Pos.1 - Mounting Flange

B - SAE B - 2-Bolt flange
spigot diam. 101,6 mm [4 in] - BC 146 mm [5.75 in]

Pos.2 - Port type

omit - Side ports on opposite sides
T - Twin (Two) side ports on one side
E - Rear ports

Pos.3 - Displacement code

35 - 36.16 cm.³/rev. [2.21 in.³/rev.]
40 - 41.59 cm.³/rev. [2.54 in.³/rev.]
46 - 47.13 cm.³/rev. [2.88 in.³/rev.]
50 - 49.94 cm.³/rev. [3.05 in.³/rev.]

Pos.4 - Shaft Extensions**

SD - \varnothing 21,72 [0.855"] spline SAE 13T 16/32 DP, M8
GD - \varnothing 21,72 [0.855"] spline SAE 13T 16/32 DP, 5/16-18 UNC-2B thread
LD - \varnothing 21,72 [0.855"] spline SAE 13T 16/32 DP, 1/4-20 UNC-2B thread
SF - \varnothing 24.9 [0.98"] spline SAE 15T 16/32, M8-6H
GF - \varnothing 24,9 [0.98"] spline SAE 15T 16/32, 3/8-16UNC-2B
LF - \varnothing 24.9 [0.98"] spline SAE 15T 16/32 DP, 1/4-20UNC-2B thread
PF - \varnothing 24.9 [0.98"] spline SAE 15T 16/32 DP, 1/4-20UNC-2B thread
SH - \varnothing 29.6 [1,165"] spline W30x2x30x14x9g DIN, M10-6H thread
SK - \varnothing 31,75 [1,25"] spline SAE 14T 12/24 DP, M10
GK - \varnothing 31,75 [1,25"] spline SAE 14T 12/24 DP, 7/16-14UNC-2B thread
CK - \varnothing 22.2 [\varnothing 7/8"] straight, M8-6H thread
Parallel key 1/4"x1/4"x1" BS46
MK - \varnothing 22.2 [\varnothing 7/8"] straight, M8-6H thread
Parallel key 1/4"x1/4"x1 1/2" BS46
CM - \varnothing 25.4 [\varnothing 1"] straight, M8-6H thread
Parallel key 1/4"x1/4"x1" BS46
CQ - \varnothing 30 [\varnothing 1.181"] straight, M8-6H thread
Parallel key A10x8x32 DIN6885
CS - \varnothing 32 [\varnothing 1.26"] straight, M8-6H thread
Parallel key A10x8x45 DIN6885
TD - \varnothing 22.22 [7/8"] Tapered 1:8 [125:1000],
Parallel key 1/4"x1/4"x1", 5/8-18 UNF-2A
TH - \varnothing 25.4 [1"] Tapered 1:8 [125:1000],
Parallel key 1/4"x1/4"x1", 3/4-16 UNF-2A
KH - \varnothing 25.4 [1"] Tapered 1:8 [125:1000],
Parallel key 1/4"x1/4"x1", M16x1.5

*Under development

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

***Non painted feeding surface

We are open for modification upon your request.

Pos.5 - Port size

omit - 2xSAE 3/4" PSI6000, metric, M18x1,5
2 - 2xG3/4, G1/2
3 - 2xM27x2, M18x1,5-6H
4 - 2x1_1/16 -12 UN, 7/8-14 UNF
5 - 2xSAE 3/4" PSI6000, SAE, 7/8-16 UNF
6 - 2xG1/2, G1/2
7 - 2xM22x1.5, M18x1,5-6H
8 - 2x7/8-14 UNF Ports, 3/4-16 UNF

Pos.6 - Seal, corrosion resistant seal surface

omit - NBR seal type material
V - FKM seal type material

Pos.7 - Integrated valves

omit - none
DR* - Dual crossover relief Valve
PR* - Single crossover relief Valve
FL* - Flush Valve
PU* - Purge Valve

Pos.8 - Pressure setting of Integrated valves

omit - none
250* - 250 bars

Pos.9 - Flow setting of Integrated valves

omit - none
L5* - 5 liter/min

Pos.10 - Special Features

omit - none
RS* - Speed Sensor
R2S* - Speed Sensor Two directional

Pos.11 - Paint and Coating

omit - no Paint or Coating
P - Painted
PC - Corrosion Protected Paint
PS - Special Painted ***
PCS - Special Corrosion Protected Paint****
If a painting option is required, the standard color is black Alkyd-styrenated enamel, Black RAL 9005.
Other color by customer's request

Pos.12 - Special unit

omit - none

Pos.13 - Design Series

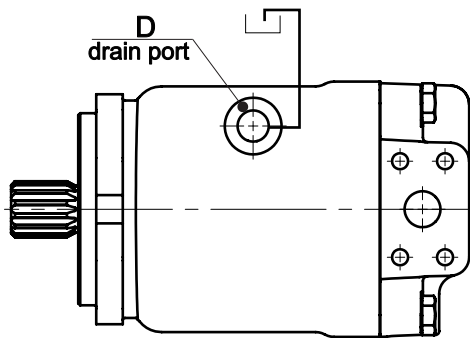
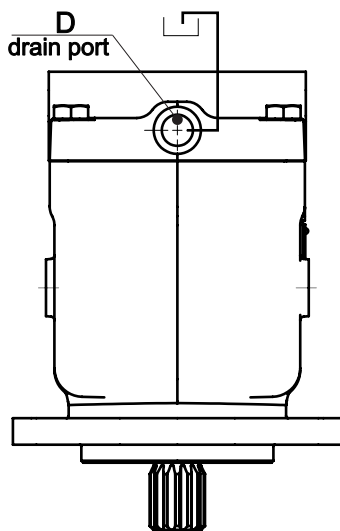
omit - Factory specified

At start-up and during operation the motor housing has to be filled up with hydraulic fluid. Start-up has to be carried out at low or moderate speed and without load (for example 1000 rpm and pressure 50 bar [725 PSI]) till the motor and hydraulic system is filled up with oil. Typically start-up need 10-15 minutes to finish.

The leakage oil in the housing has to be discharged to the tank via highest positioned drain port D.

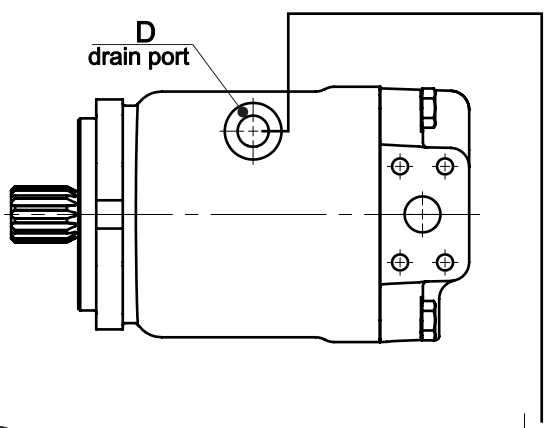
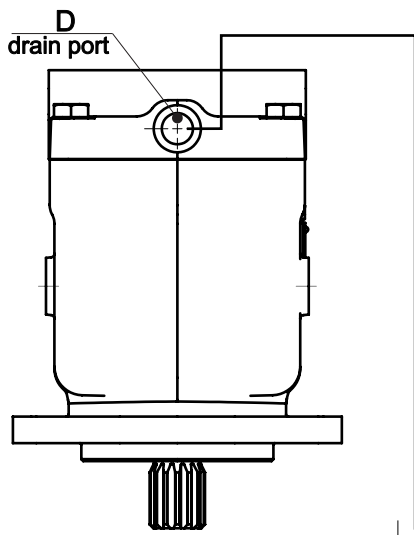
Installation below tank level (preferred)

- Fill up axial piston motor before start-up via highest positioned drain port D.
- Operate motor at low speed till motor system is completely filled up.
- Minimum immersion depth of the drain line in the tank is 200 mm relative to the minimum oil level in the tank.



Installation on top of tank level

- Fill up axial piston motor before start-up via highest positioned drain port D.
- Operate motor at low speed till motor system is completely filled up.
- Minimum immersion depth of the drain line in the tank is 200 mm relative to the minimum oil level in the tank.



Hydraulic Equations

The motor size, pressure and flow required for a specific application can be calculated using the equations below.

Metric System			Inch System		
Input flow	$Q = \frac{Vg \cdot n}{1000 \cdot \eta_v}$	[l/min]	Input flow	$Q = \frac{Vg \cdot n}{231 \cdot \eta_v}$	[GPM]
Output torque	$M = \frac{Vg \cdot \Delta p \cdot \eta_{mh}}{2 \cdot \pi}$	[Nm]	Output torque	$M = \frac{Vg \cdot \Delta p \cdot \eta_{mh}}{2 \cdot \pi}$	[lb-in]
Output power	$P = \frac{M \cdot n}{9550} = \frac{Q \cdot \Delta p \cdot \eta_t}{60}$	[kW]	Output power	$P = \frac{Vg \cdot n \cdot \Delta p \cdot \eta_t}{396000}$	[hp]
Speed	$n = \frac{Q \cdot 1000 \cdot \eta_v}{Vg}$	[min ⁻¹]	Speed	$n = \frac{Q \cdot 231 \cdot \eta_v}{Vg}$	[min ⁻¹]
$Vg =$	Motor displacement per rev.	[cm ³]	$Vg =$	Motor displacement per rev.	[in ³]
$\Delta p =$	$p_{HD} - p_{ND}$	[bar]	$\Delta p =$	$p_{HD} - p_{ND}$	[PSI]
$p_{HD} =$	High pressure	[bar]	$p_{HD} =$	High pressure	[PSI]
$p_{ND} =$	Low pressure	[bar]	$p_{ND} =$	Low pressure	[PSI]
$\eta_v =$	Volumetric efficiency		$\eta_v =$	Volumetric efficiency	
$\eta_{mh} =$	Mechanical-hydraulic efficiency		$\eta_{mh} =$	Mechanical-hydraulic efficiency	
$\eta_t =$	Overall efficiency		$\eta_t =$	Overall efficiency	

Application Equations

Motor speed: n [min⁻¹]

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

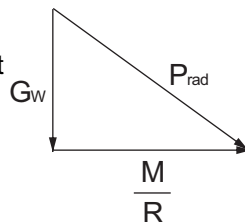
v_{km} - vehicle speed [km/h]
 v_{mi} - vehicle speed [mil/h]
 R_m - wheel rolling radius [m]
 R_{in} - wheel rolling radius [in]
 i - gear ratio between motor and wheels.
 If no gearbox, use $i=1$.

Radial motor loading: P_{rad}, N [lbs]

When motor is used for motion with ring or gear 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 ring.

G_w - Weight held by shaft
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.

Total tractive effort: TE, N [lbs]

Total tractive effort **TE** is total effort necessary for vehicle motion; that the sum of forces calculated and increased with 10 % because of air resistance.

$$TE = 1,1 \cdot (RR + GR + FA + DP)$$

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)

Motor Torque moment: M, Nm [lb-in]

Necessary torque moment for hydraulic motor:

$$M = \frac{TE \cdot R_m \cdot R_{in}}{N \cdot i \cdot \eta_M}$$

i – motor numbers

η_M -mechanical gearbox efficiency (if it is available)



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http://www.ms-hydraulic.com/product_catalog.php

MS HYDRAULIC

68, Kozloduy St., 6100 Kazanlak, Bulgaria

Tel.: ++359 431 65167

Fax: +359 431 64114

E-Mail: msh@ms-hydraulic.com

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