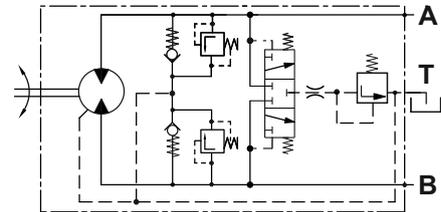
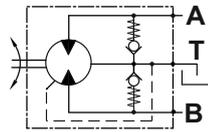
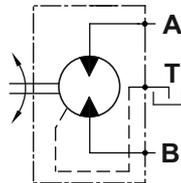




# Hydraulic Motors Type MAP50

## Heavy Duty Axial Piston Motors Fixed Displacement



open drain line is always required

### APPLICATION

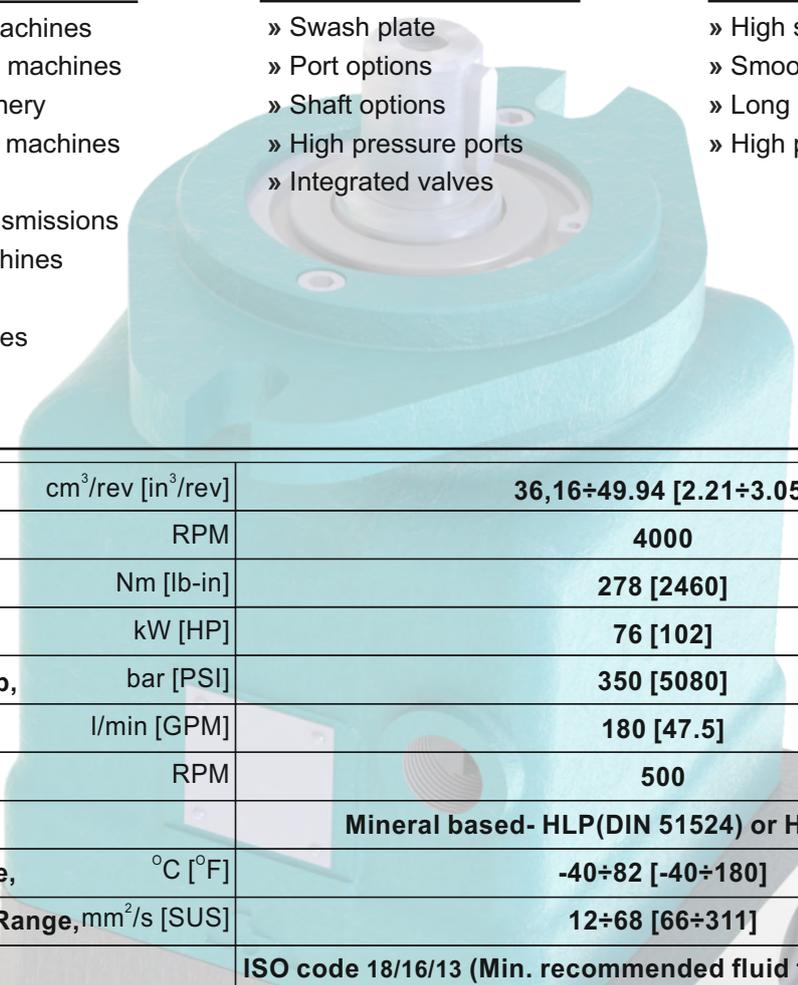
- » Agricultural machines
- » Road building machines
- » Mining machinery
- » Food industry machines
- » Swing drives
- » Hydraulic transmissions
- » Vibration machines
- » Fan drives
- » Special vehicles

### OPTIONS

- » Swash plate
- » Port options
- » Shaft options
- » High pressure ports
- » Integrated valves

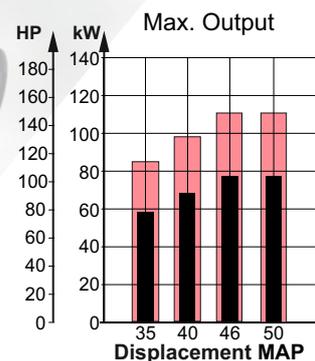
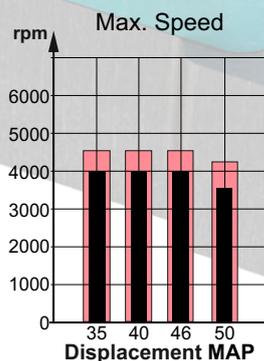
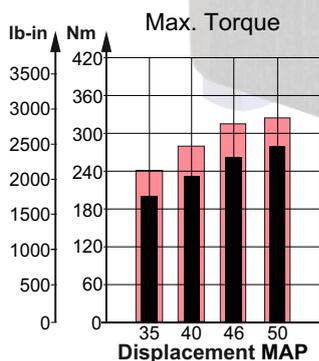
### ADVANTAGES

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



### GENERAL

Displacement,	cm <sup>3</sup> /rev [in <sup>3</sup> /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,	l/min [GPM]	180 [47.5]
Min. Speed,	RPM	500
Fluid	Mineral based- HLP(DIN 51524) or HM(ISO 6743/4)	
Temperature Range,	°C [°F]	-40÷82 [-40÷180]
Optimal Viscosity Range,	mm <sup>2</sup> /s [SUS]	12÷68 [66÷311]
Filtration	ISO code 18/16/13 (Min. recommended fluid filtration of 10 micron)	

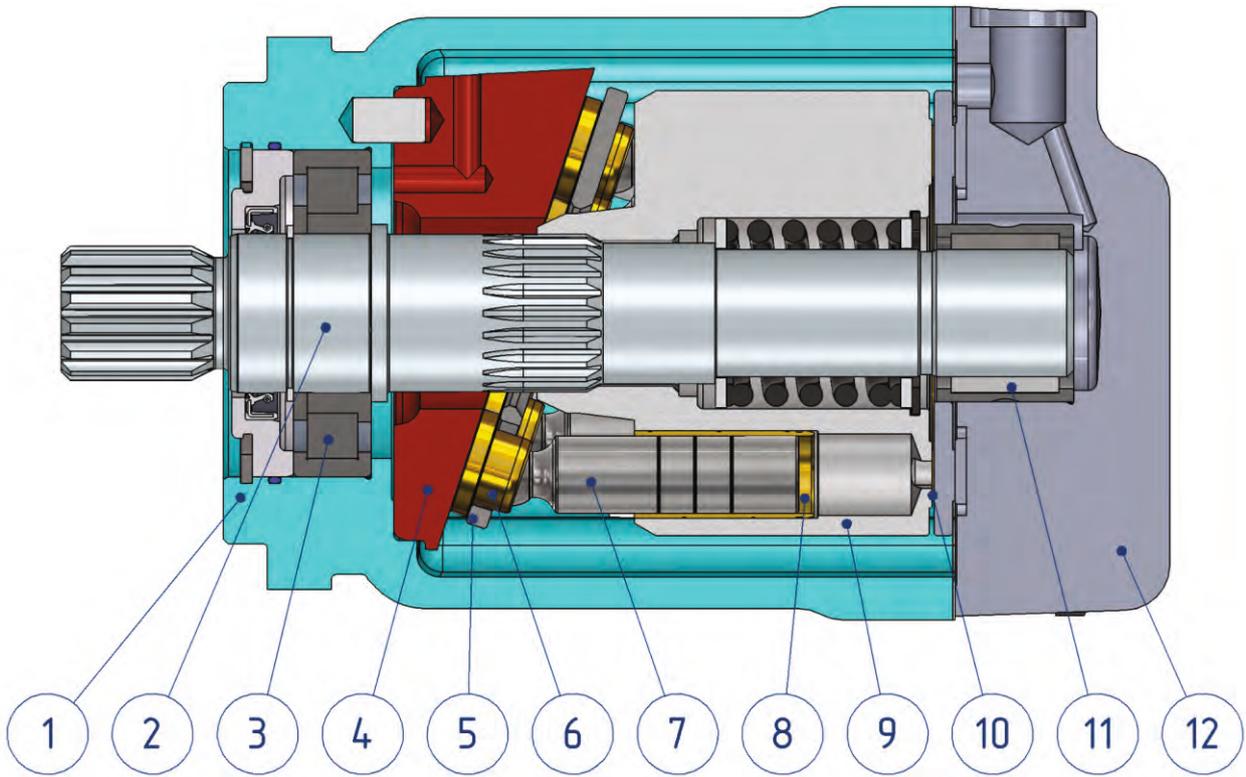


Intermittent values

Continuous values



**SECTION VIEW**



1. Cast iron body
2. Hardened shaft
3. Robust radial - axial roller bearing
4. Solid swash plate
5. Retainer plate
6. Improved piston shoes
7. Improved pistons
8. Brass bushings
9. Hardened steel cylinder block
10. Bimetal distributor
11. Needle bearing
12. Solid end cover

The heavy duty design of MAP motor gains big advantage over the typical swash plate motors. The starting torque is close to the starting torque of the bent axis motors and the total efficiency of our design in normal working modes is similar to the bent axis motors. The main advantage of our design over the bent axis motors is that the pulsations and vibrations during the operation are much less. Another advantage is that the swash plate motors are more reliable than the bent axis motors.

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**SPECIFICATION DATA**

Type		MAP 35	MAP 40	MAP 46	MAP 50
<b>Displacement,</b> <b>cm.<sup>3</sup>/rev. [in.<sup>3</sup>/rev.]</b>		36.16 [2.21]	41.59 [2.54]	47.13 [2.88]	49.94 [3.05]
<b>Max. Speed,</b> <b>[RPM]</b>	Cont.	4000	4000	4000	3600
	Int.*	4500	4500	4500	4200
<b>Max. Torque,**</b> <b>Nm [lb-in]</b>	Cont.	202 [1789]	232 [2053]	263 [2328]	278 [2460]
	Int.**	242 [2142]	278 [2460]	315 [2788]	326 [2885]
<b>Output,</b> <b>kW [HP]</b>	Cont.	58 [78]	67 [90]	76 [102]	76 [102]
	Int.**	84 [113]	97 [130]	110 [148]	110 [148]
<b>Max. Pressure,</b> <b>bar [PSI]</b>	Cont.	350 [5080]	350 [5080]	350 [5080]	350 [5080]
	Int.**	420 [6100]	420 [6100]	420 [6100]	410 [5950]
	Peak	450 [6527]	450 [6527]	450 [6527]	450 [6527]
<b>Max. Oil Flow,</b> <b>l/min [GPM]</b>	Cont.	145 [38.3]	167 [44.1]	189 [50]	180 [47.5]
	Int.*	163 [43.1]	187 [49.4]	212 [56]	210 [55.5]
<b>Torque Constant</b> *****		0.52	0.6	0.68	0.72
<b>Nm/bar [lb-in/PSI]</b>		[0.32]	[0.364]	[0.41]	[0.437]
<b>Speed Constant</b> *****		26.3	22.84	20.2	19.02
<b>RPM/(l/min) [RPM/GPM]</b>		[99.4]	[86.5]	[76.3]	[72]
<b>Permissible Shaft Load</b>					
<b>max Axial**** N[lb]</b>		Fa=2000 [450]			
<b>max Radial**** N[lb]</b>		Fr=3600 [810]			
<b>Min. Speed, [RPM]</b>		500			
<b>Max. Pressure in Drain Line, bar [PSI]</b>		5 [70] open drain line is always required			
<b>Weight, kg [lb]</b>		17.8 [39.2]			

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Peak pressure is highest allowable pressure, may occur for max. 1% of every minute;

\* Intermittent speed (flow): for pressure up to 150[2200] bar[PSI];

\*\* Intermittent load: the permissible values may occur for max. 10% of motor lifetime;

\*\*\* Theoretical torque;

\*\*\*\* The calculated max values are based on the optimal direction of the forces Fr, Fa and optimal position of the shaft.

\*\*\*\*\* The constant values are used for calculation of torque and speed with motor efficiencies  $\eta_v=0.95$  and  $\eta_{mh}=0.9$ .

1. The recommended output power for continuous operations should not be exceeded.
2. Recommended filtration as per ISO 4406 cleanliness code 18/16/13 or better. This filtration corresponds to SAE AS 4059 8A/7B/7C. Nominal filtration - 10 micron or better.
3. Recommended a premium quality, anti-wear type mineral based hydraulic oil, HLP(DIN51524) or HM(ISO6743/4).
4. Recommended oil viscosity - 12...68 cSt or see page 68.
5. Recommended maximum system operating temperature - 82°C [180°F].
6. To ensure optimum life of the motor, fill it up with fluid prior to load it and run with moderate load and speed for about 10-15 minutes.

**Hint: Motor Torque = Torque Constant \* Pressure Drop**

**Rotation Speed = Speed Constant \* Oil Flow**

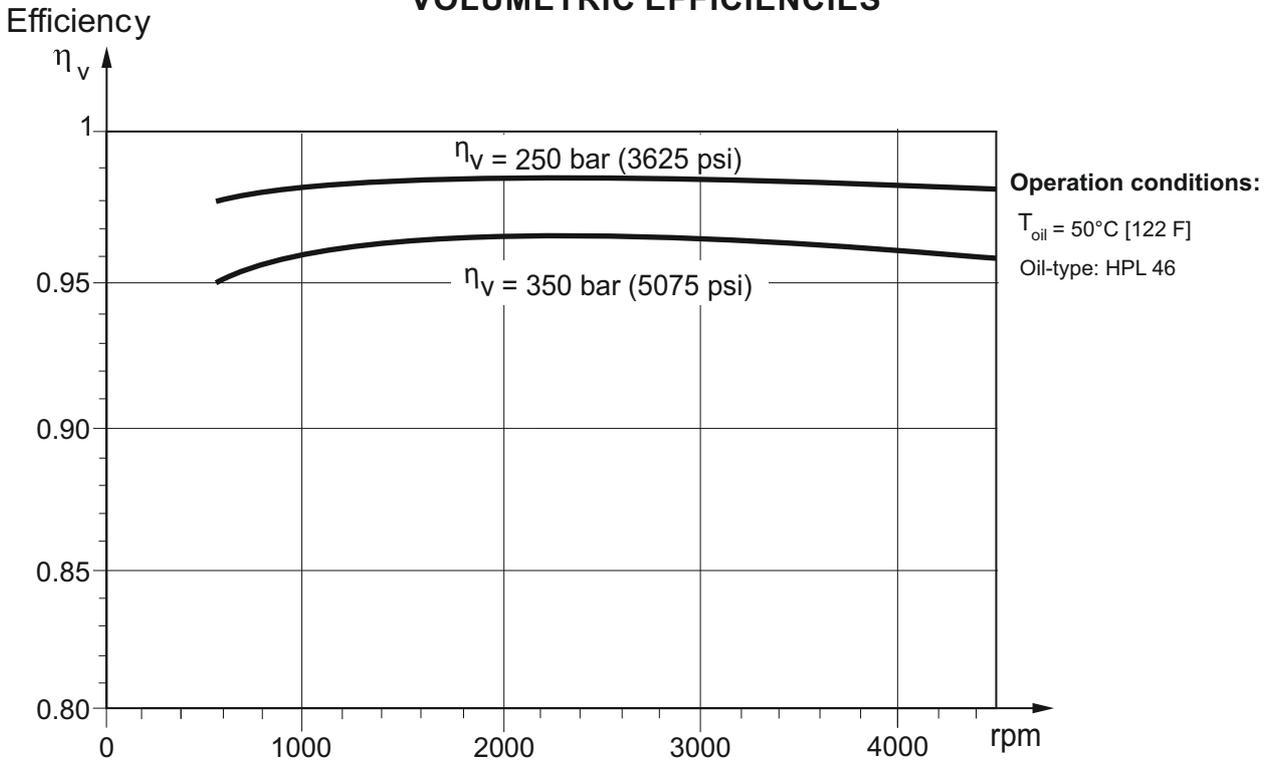
The constant values are mentioned for rough calculations. Motor torque and rotation speed for a particular project are depending on the real operating conditions. For more detail calculations please see efficiencies on next page and formulas on page 69.



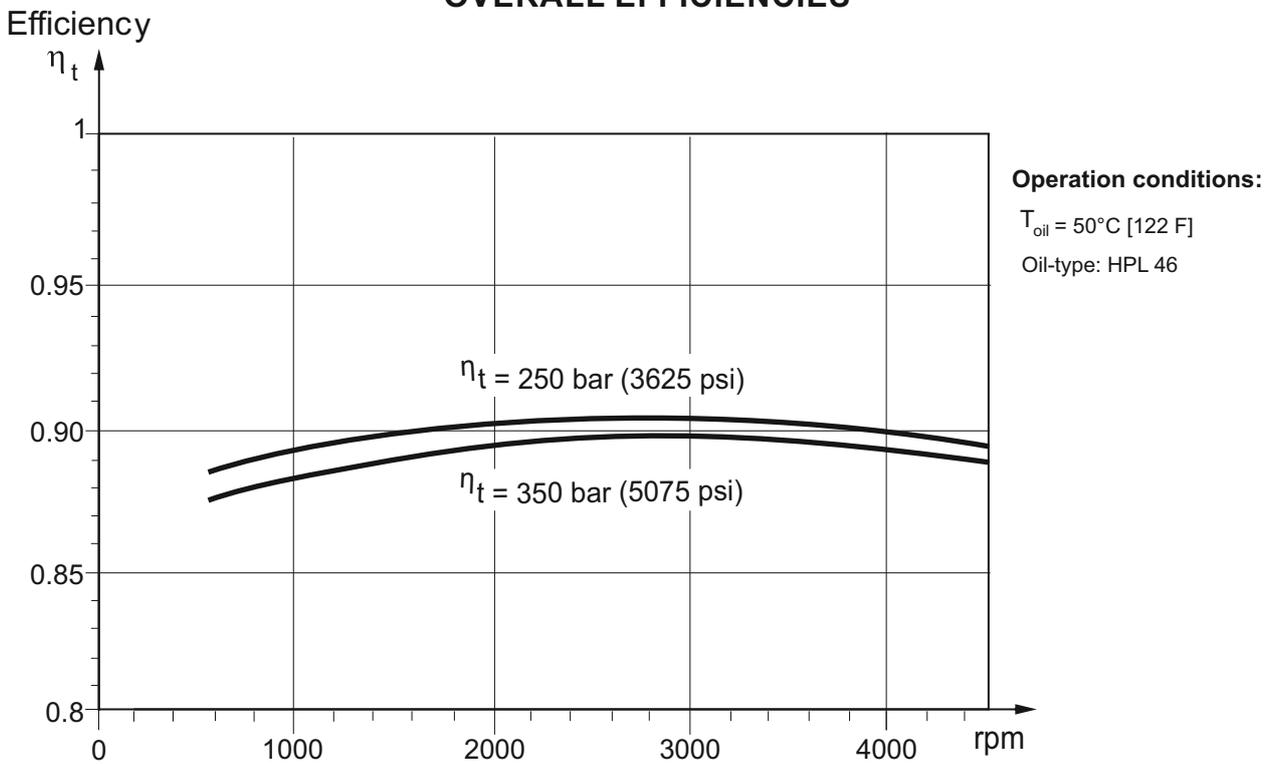
**FUNCTION DIAGRAMS**

The below efficiencies are applied for all displacements.

**VOLUMETRIC EFFICIENCIES**



**OVERALL EFFICIENCIES**



The motor size, pressure, torque, speed of rotation and flow rate required for a specific application can be calculated using the formulas on page 69

Efficiencies for a particular motor may vary from the shown in the diagram depending on the operating conditions.



**Overall Dimensions and Ports**

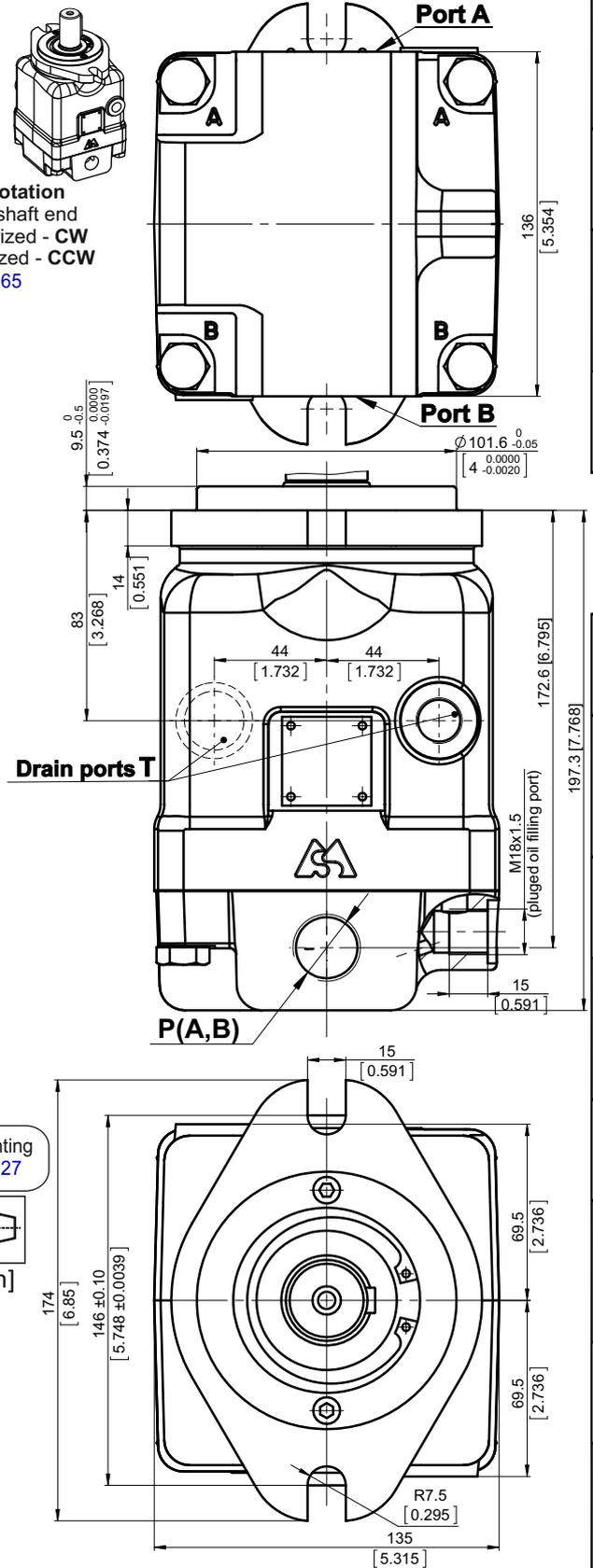
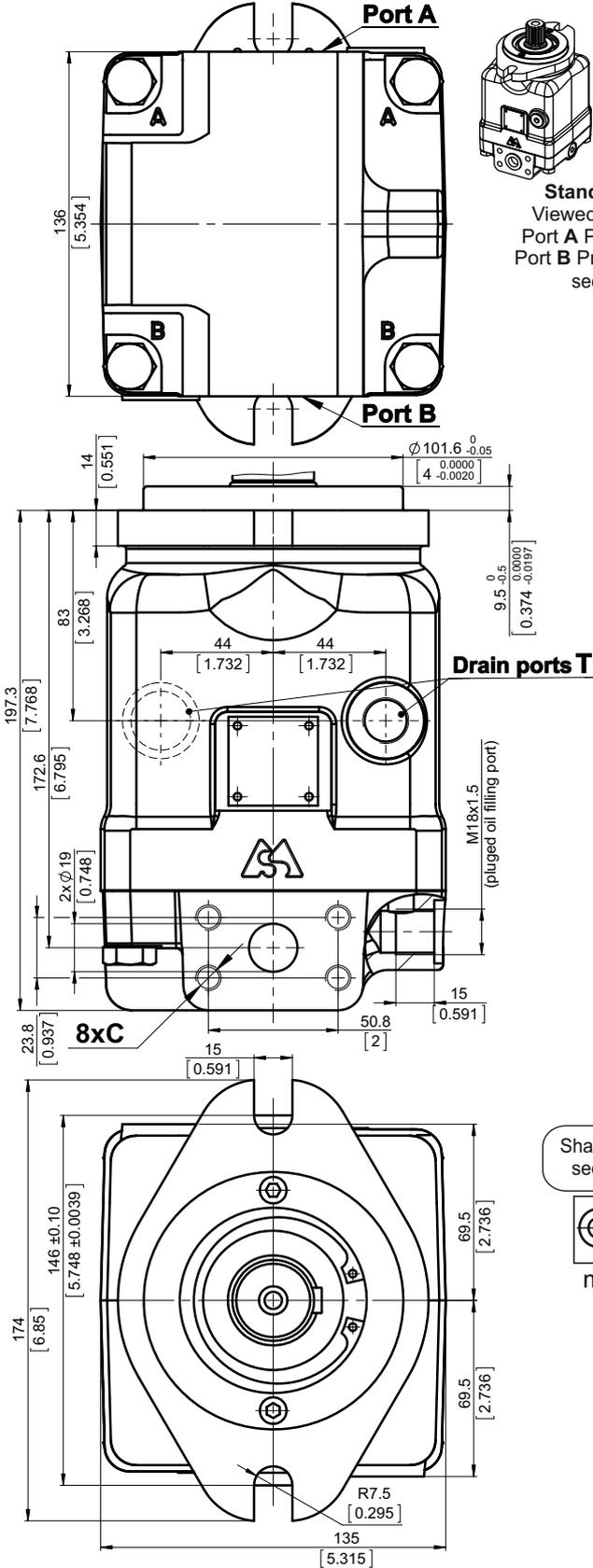
**Side Ports - Default**

**Side ports, port size default and 5**

See the port sizes at the bottom of this page

**Side ports, port size 2,3,4,6,7 and 8**

See the port sizes at the bottom of this page



	Port Size		
	default	5	9
<b>P(A,B)</b>	2xISO 6162-2 DN19	2xSAE J518 3/4 PSI6000	2xISO 6162-2 DN19
<b>T</b>	M18x1,5	7/8-14 UNF-2B	G1/2
<b>C</b>	M10-6H	3/8-16 UNC-2B	M10-6H

	Port Size		
	2	3	4
<b>P(A,B)</b>	2xG 3/4	2xM27x2	2x1 $\frac{1}{16}$ -12UN
<b>T</b>	G 1/2	M18x1,5	$\frac{7}{8}$ -14UNF



**Overall Dimensions and Ports**

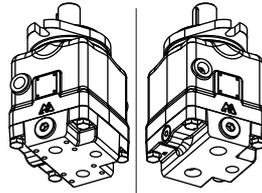
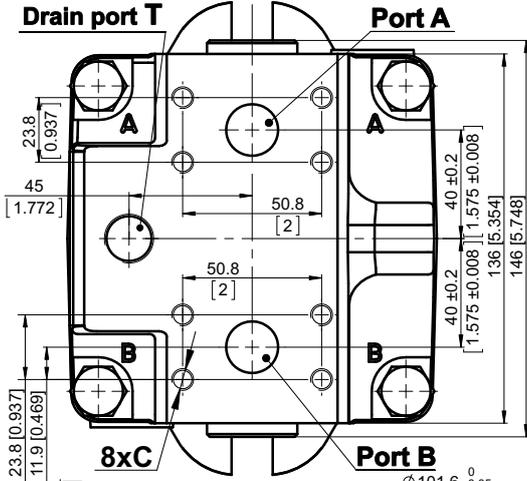
**Rear Ports - Type E**

**Rear ports E, port size default and 5**

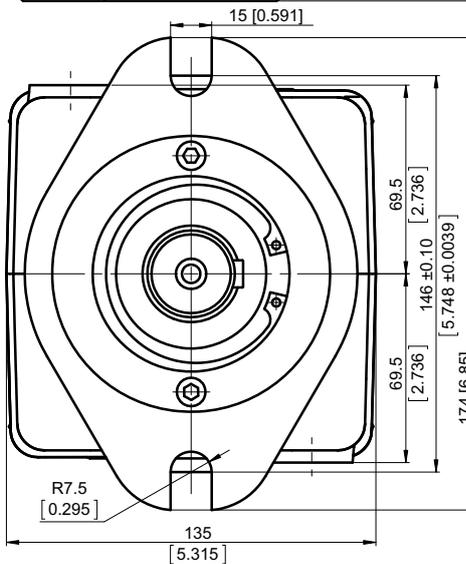
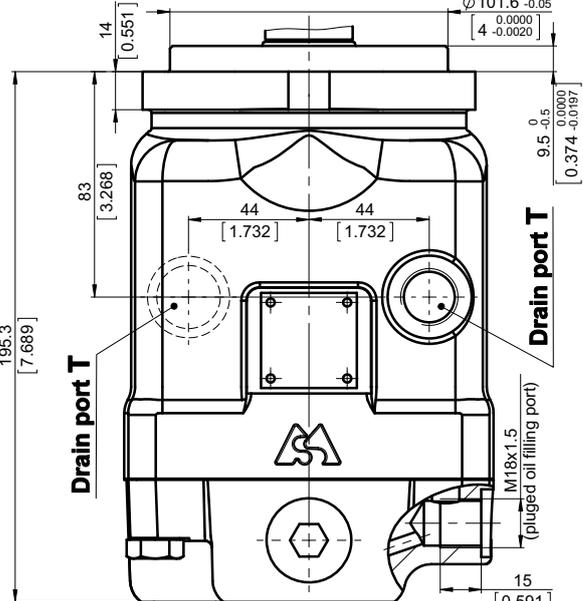
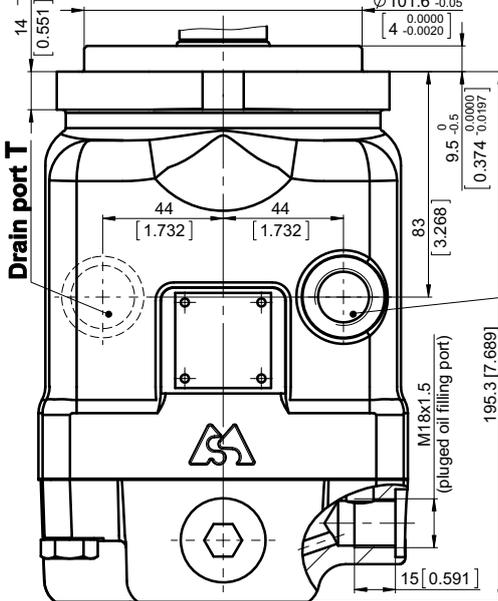
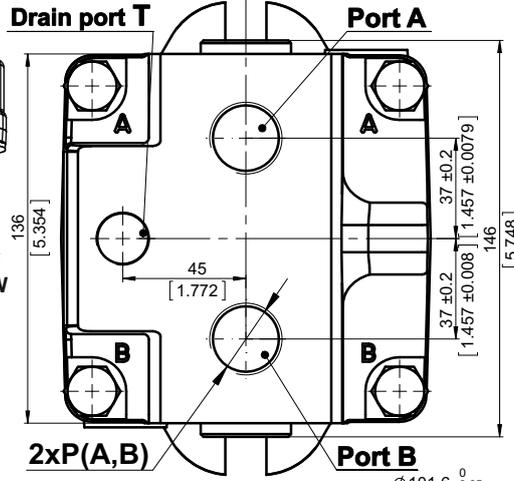
See the port sizes at the bottom of this page

**Rear ports E, port size 2,3,4,6,7 and 8**

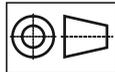
See the port sizes at the bottom of this page



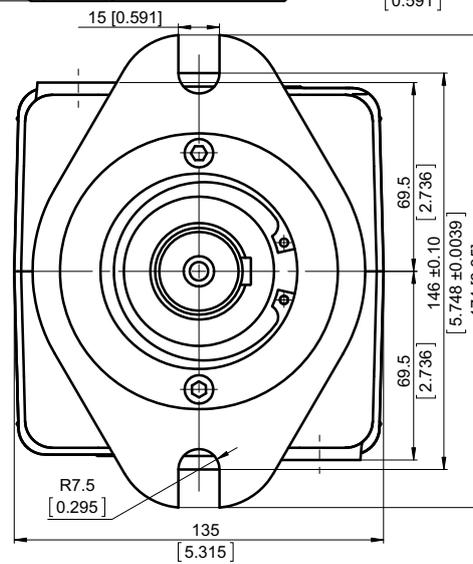
**Standard Rotation**  
Viewed from shaft end  
Port A Pressurized - CW  
Port B Pressurized - CCW  
see page 65



Shaft Mounting  
see the next page



mm [in]



	Port Size		
	default	5	9
<b>P<sub>(A,B)</sub></b>	2xISO 6162-2 DN19	2xSAE J518 3/4 PSI6000	2xISO 6162-2 DN19
<b>T</b>	M18x1,5	7/8-14 UNF-2B	G1/2
<b>C</b>	M10-6H	3/8-16 UNC-2B	M10-6H

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

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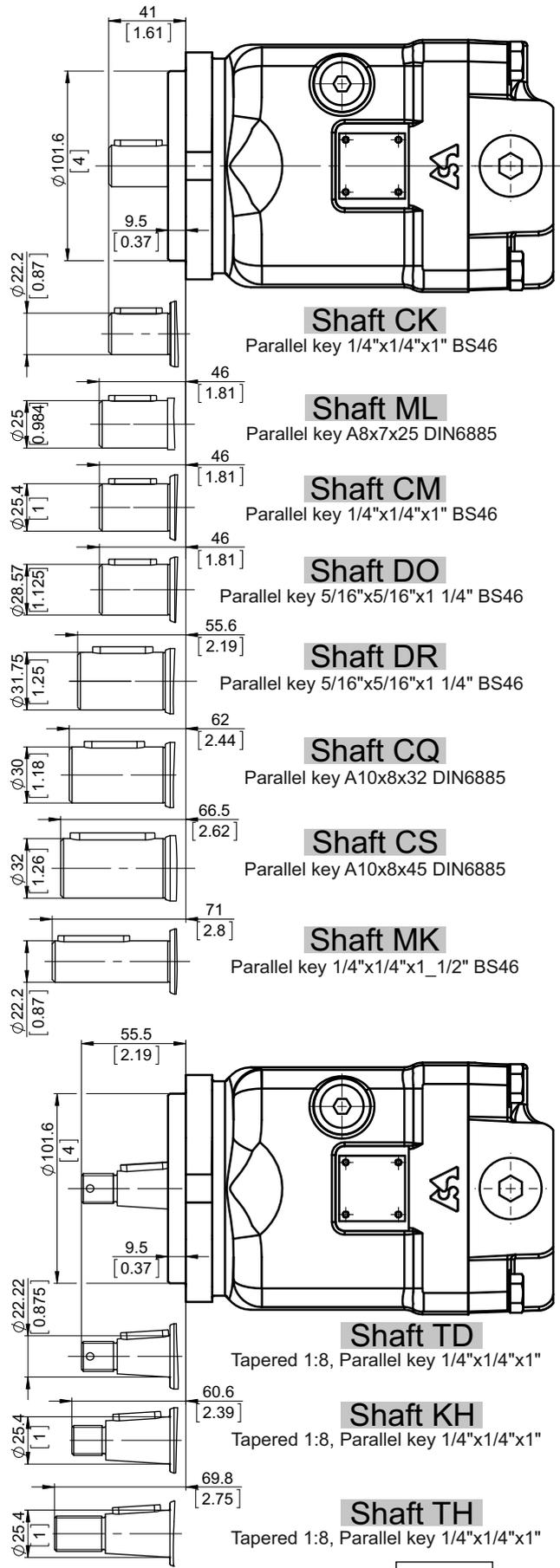
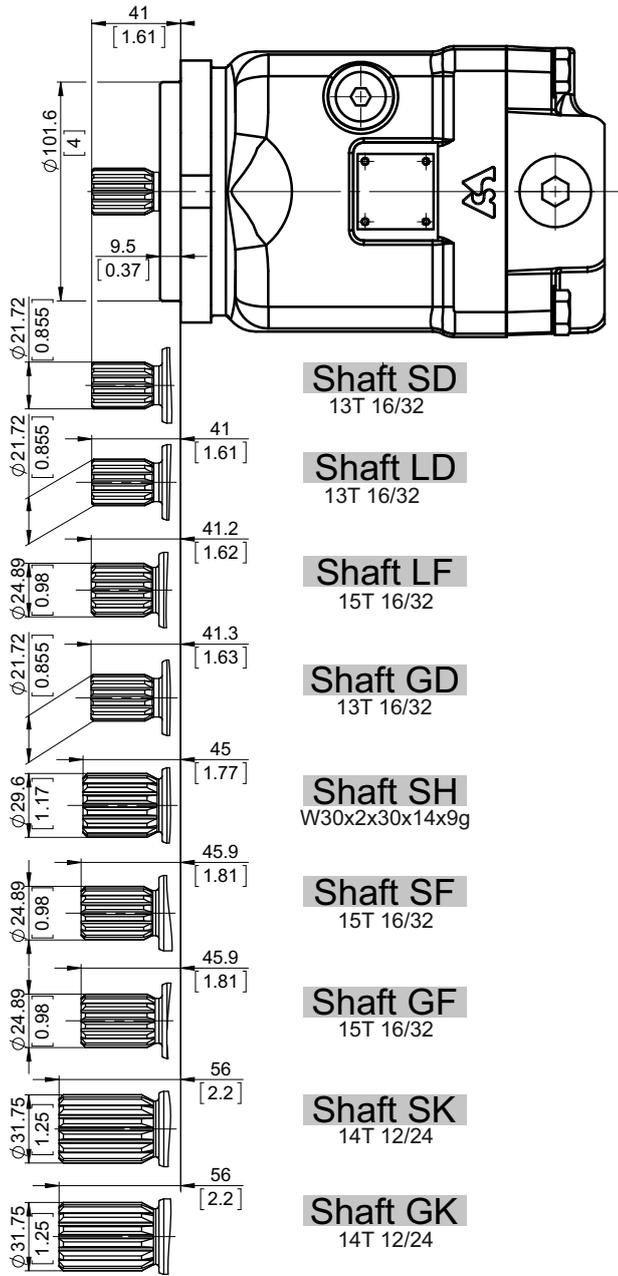
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**Shafts Mounting**  
**Ports - Type Default, Type E**



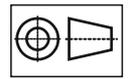
Shaft Dimensions  
See Page 57+62

**PERMISSIBLE SHAFT LOAD**

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

The calculated max values are based on the optimal direction of the forces Fr, Fa and optimal position of the shaft (see page 65).

For more information, please, feel free to contact us.





**Overall Dimensions and Ports**

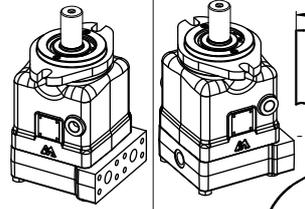
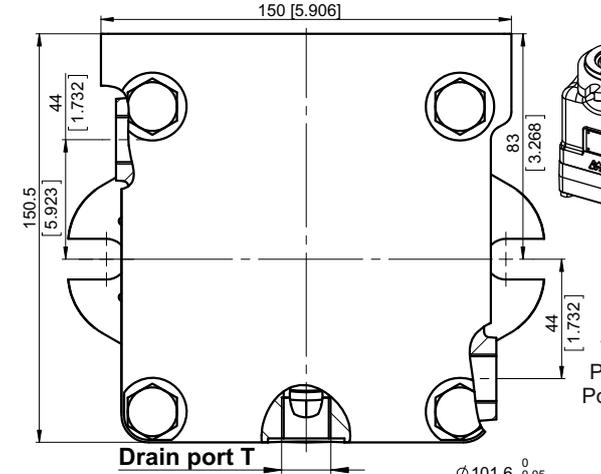
**Twin Side Ports - Type T**

**Twin side ports, port size default and 5**

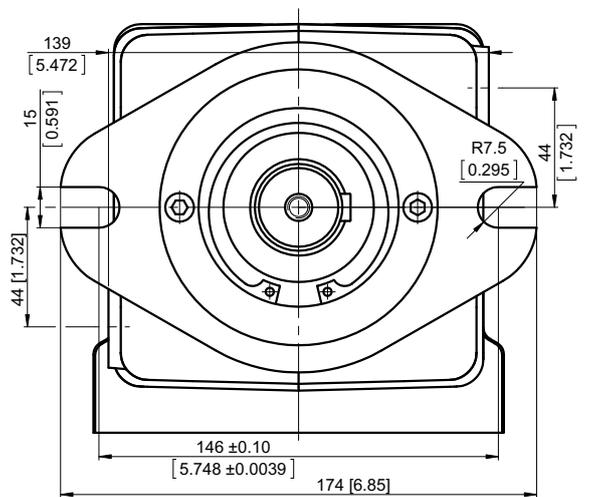
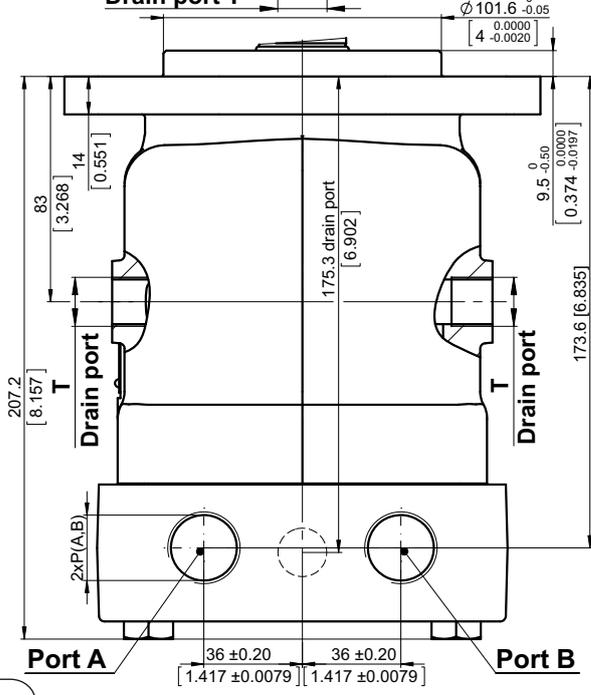
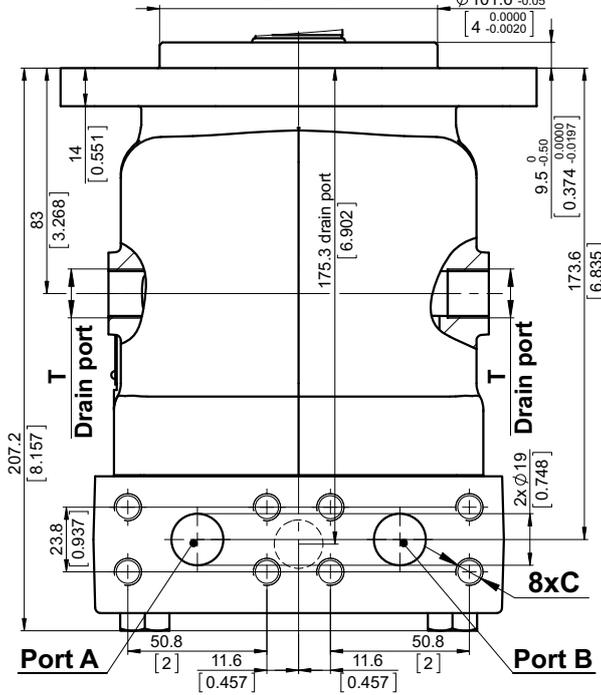
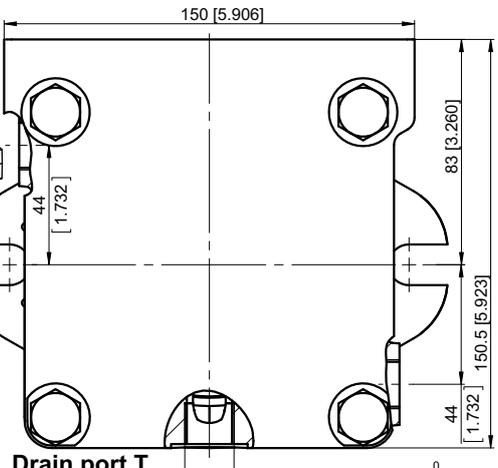
See the port sizes at the bottom of this page

**Twin side ports, port size 2,3,4,6,7 and 8**

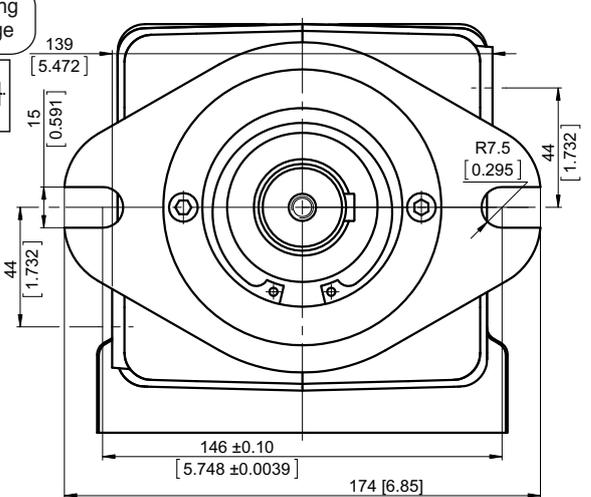
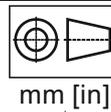
See the port sizes at the bottom of this page



**Standard Rotation**  
Viewed from shaft end  
Port A Pressurized - CW  
Port B Pressurized - CCW  
see page 65



Shaft Mounting  
see next page



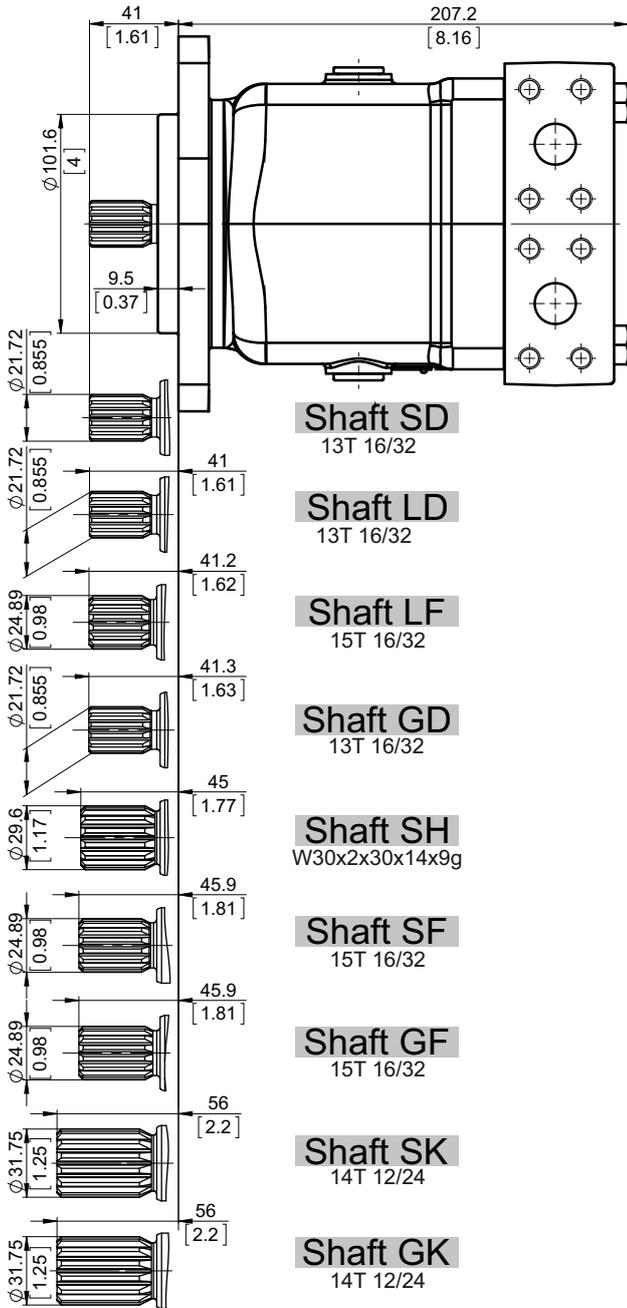
	Port Size		
	default	5	9
P <sub>(A,B)</sub>	2xISO 6162-2 DN19	2xSAE J518 3/4 PSI6000	2xISO 6162-2 DN19
T	M18x1,5	7/8-14 UNF-2B	G1/2
C	M10-6H	3/8-16 UNC-2B	M10-6H

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

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**Shafts Mounting**  
**Twin Side Ports - Type T**



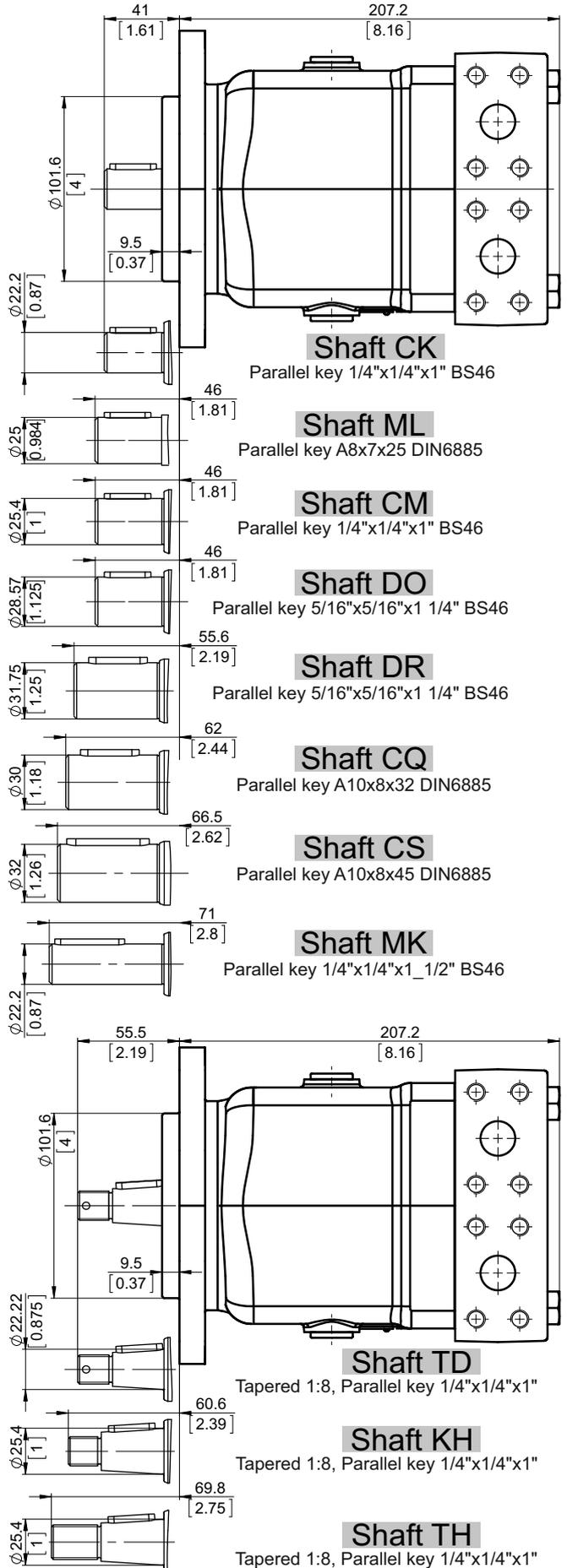
Shaft Dimensions  
See Page 57+62

**PERMISSIBLE SHAFT LOAD**

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

The calculated max values are based on the optimal direction of the forces Fr, Fa and optimal position of the shaft (see page 65).

For more information, please, feel free to contact us.



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**ORDERING CODE**

	1	2	3	4	5	6	7	8	9	10	11	12	13	13
<b>M A P</b>												[		]

**Pos.1 - Mounting Flange**

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

**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.<sup>3</sup>/rev. [2.21 in.<sup>3</sup>/rev.]  
**40** - 41.59 cm.<sup>3</sup>/rev. [2.54 in.<sup>3</sup>/rev.]  
**46** - 47.13 cm.<sup>3</sup>/rev. [2.88 in.<sup>3</sup>/rev.]  
**50** - 49.94 cm.<sup>3</sup>/rev. [3.05 in.<sup>3</sup>/rev.]

**Pos.4 - Shaft Extensions\*\***

**SD** - ø21,72 [0.855"] Spline SAE 13T 16/32 DP, M8  
**GD** - ø21,72 [0.855"] Spline SAE 13T 16/32 DP, 5/16-18 UNC-2B thread  
**LD** - ø21,72 [0.855"] Spline SAE 13T 16/32 DP, 1/4-20 UNC-2B thread  
**SF** - ø24,9 [0.98"] Spline SAE 15T 16/32, M8-6H  
**GF** - ø24,9 [0.98"] Spline SAE 15T 16/32, 3/8-16UNC-2B  
**LF** - ø24,9 [0.98"] Spline SAE 15T 16/32 DP, 1/4-20UNC-2B thread  
**SH** - ø29,6 [1,165"] Spline W30x2x30x14x9g, M10-6H  
**SK** - ø31,75 [1,25"] Spline SAE 14T 12/24 DP, M10  
**GK** - ø31,75 [1,25"] Spline SAE 14T 12/24 DP, 7/16-14UNC-2B thread  
**CK** - ø22,2 [ø7/8"] Straight, M8-6H thread  
Parallel key 1/4"x1/4"x1" BS46  
**MK** - ø22,2 [ø7/8"] Straight, M8-6H thread  
Parallel key 1/4"x1/4"x1\_1/2" BS46  
**ML** - ø25 [ø0.984"] Straight, M8-6H thread  
Parallel key A8x7x25 DIN6885  
**CM** - ø25,4 [ø1"] Straight, M8-6H thread  
Parallel key 1/4"x1/4"x1" BS46  
**DO** - ø28,75 [ø1,125"] Straight, 3/8-16UNC-2B  
Parallel key 5/16"x5/16"x1\_1/4" BS46  
**CQ** - ø30 [ø1,181"] Straight, M8-6H, key  
Parallel key A8x7x32 DIN6885  
**DR** - ø31,75 [ø1,25"] Straight, 3/8-16UNC-2B  
Parallel key 5/16"x5/16"x1\_1/4" BS46  
**CS** - ø32 [ø1,26"] Straight, M8-6H thread  
Parallel key A10x8x45 DIN6885  
**TD** - ø22,22 [7/8"] Tapered 1:8 [125:1000],  
Parallel key 1/4"x1/4"x1", 5/8-18 UNF-2A  
**TH** - ø25,4 [1"] Tapered 1:8 [125:1000],  
Parallel key 1/4"x1/4"x1", 3/4-16 UNF-2A  
**KH** - ø25,4 [1"] Tapered 1:8 [125:1000],  
Parallel key 1/4"x1/4"x1", M16x1.5

**Pos.5 - Port Size**

omit - 2xISO 6162-2 DN19, drain port M18x1,5  
**2** - 2xG3/4, drain ports G1/2  
**3** - 2xM27x2, drain ports M18x1,5-6H  
**4** - 2x1\_1/16 -12 UN, drain ports 7/8-14 UNF  
**5** - 2xSAE 3/4" PSI6000, drain port 7/8-14 UNF  
**6** - 2xG1/2, drain ports G1/2  
**7** - 2xM22x1.5, drain ports M18x1,5-6H  
**8** - 2x7/8-14 UNF Ports, drain ports 3/4-16 UNF  
**9** - 2xISO 6162-2 DN19, drain port G1/2  
Option 6;7 and 8 are not available for Pos.2 option omit

**Pos.6 - Seal, Corrosion Resistant Seal Surface**

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

**Pos.7 - Integrated Valves**

See next page for information about valves  
omit - None  
**HR** - Single anti-cavitation valve  
**AR** - Dual anti-cavitation valve  
**PU** - Purge valve  
**FLU** - Flush valve  
**SAR** - Single anti-cavitation and relief valve  
**DAR** - Dual anti-cavitation and relief valve  
**DARP** - Dual anti-cavitation, relief and purge valve  
**DARF** - Dual anti-cavitation, relief and flush valve

Option DAR,DARF,DARP,SAR, AR and HR are not available for Pos.2 option E

**Pos.8 - Valve's Port for Single Valves**

omit - None  
**A** - Port A  
**B** - Port B

**Pos.9 - Pressure Setting of Integrated Valves**

omit - None  
**x** - For value - see next page

**Pos.10 - Flow Setting of Integrated Valves**

omit - None  
**Lx** - For value - see next page

**Pos.11 - Special Features\***

omit - None  
**R2S** - Speed Sensor Two Directional (see page 63)  
**R** - Reverse Rotation (see page 65)

**Pos.12 - 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.13 - Design Series**

omit - Factory specified

\*Available on enquiry  
\*\*The permissible output torque for shafts must not be exceeded!  
\*\*\*Non painted feeding surface

**We remain open to meet your special requirements upon request.**

**EXAMPLE**

**M A P B E 40 G D 4 P [ ]**



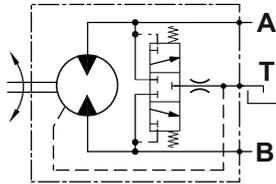
Flange B Rear Ports Disp. 40cc Shaft GD Port size 4 Painted



**Valve Options**

The overall dimensions of the motor with integrated valves could vary compared to the standard motors.

**Option PU**  
**PURGE VALVE**



- Mainly used in open loop circuit;
- Used for cooling purpose or oil cleanliness requirements;
- Flow rate by **default (omit)** - 4 ÷ 8 l/min.
- For other options, please see Pos.10 of ordering code, considering the following possible values:

Pos.10 

omit	L3.5	L5.5
------	------	------

 → flow rate

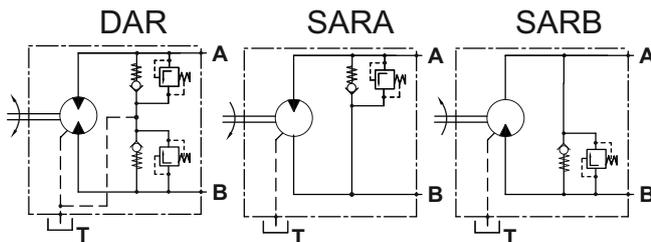
**EXAMPLE**

**M A P B 4 6 S H 2 P U** purge valve flow rate 6±2 l/min  
**M A P B 4 6 S H 2 P U L 3 . 5** purge valve flow rate 3.5±1 l/min  
**M A P B 4 6 S H 2 P U L 5 . 5** purge valve flow rate 5.5±1 l/min

**Option DAR, SARA, SARB**

**Combined Anti-Cavitation and Relief Valve**

- Anti-cavitation check valve is used for applications such as Fan drive control;
- Pressure relief valves prevent excessive pressures in the high pressure loop.



Please, consider the following possible values:

Pos.9 

250	300	350
-----	-----	-----

 → pressure

**EXAMPLE**

**M A P B 4 6 S H 2 D A R 3 5 0**

Double Anti-Cavitation and Relief Valve, relief valve setting 350 bar

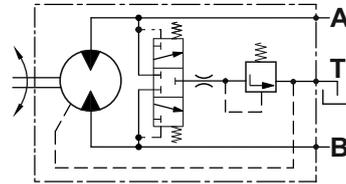
**M A P B 4 6 S H 2 S A R A 2 5 0**

Single Anti-Cavitation and Relief Valve, relief valve setting 250 bar  
The valve is placed on port A

**M A P B 4 6 S H 2 S A R B 3 0 0**

Single Anti-Cavitation and Relief Valve, relief valve setting 300 bar  
The valve is placed on port B

**Option FLU**  
**FLUSH VALVE**



- Mainly used in close loop circuit;
- The valve is a combination between a purge valve and check valve;
- Flow rate by **default (omit)** - 4 ÷ 8 l/min
- **and charge (opening) pressure 16 bar** with 20 bar feed pressure for close loop circuit;
- For other options, please see Pos.9 and Pos. 10 of ordering code, considering the following possible values:

Pos.9 

omit	10
------	----

 → pressure

Pos.10 

omit	L3.5	L5.5
------	------	------

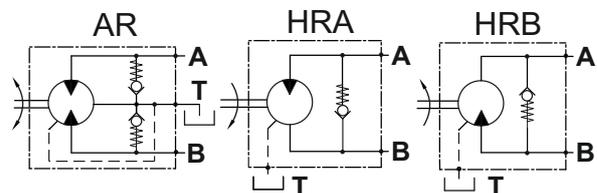
 → flow rate

**EXAMPLE**

**M A P B 4 6 S H 2 F L U** flow rate 6±2 l/min,  
charge pressure 16 bar  
**M A P B 4 6 S H 2 F L U 1 0 L 5 . 5** flow rate 5.5±1 l/min,  
charge pressure 10 bar  
**M A P B 4 6 S H 2 F L U L 3 . 5** flow rate 3.5±1 l/min,  
charge pressure 16 bar

**Option AR, HRA, HRB**  
**Anti-Cavitation Valve**

- Anti-cavitation check valve is used for applications such as Fan drive control.



**EXAMPLE**

**M A P B 4 6 S H 2 A R**

Double Anti-Cavitation Valve

**M A P B 4 6 S H 2 H R A**

Single Anti-Cavitation Valve, the valve is placed on port A

**M A P B 4 6 S H 2 H R B**

Single Anti-Cavitation Valve, the valve is placed on port B

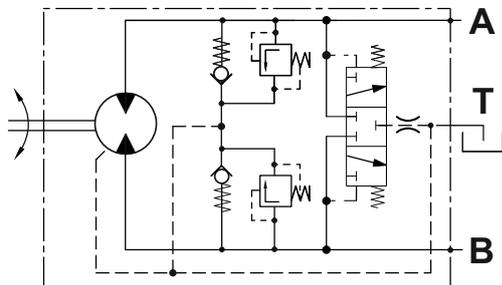


**Valve Options**

The overall dimensions of the motor with integrated valves could vary compared to the standard motors.

**Option DARP**

Dual Anti-Cavitation, Relief and Purge Valve



- Mainly used in open loop circuit;
- The valve is a combination between a dual anti-cavitation, relief and purge valve;
- Purge Valve is used for cooling purpose or cleanliness requirements;
- Anti-Cavitation Check Valve is used for applications such as Fan drive control;
- Pressure relief valves prevent excessive pressures in the high pressure loop;
- Please, consider the following possible values for pressure set of the relief valve:

Pos.9 

250	300	350
-----	-----	-----

 → pressure

- Flow rate of purge valve by **default (omit) - 4 ÷ 8 l/min**. The possible values are as follow:

Pos.10 

omit	L3.5	L5.5
------	------	------

 → flow rate

**EXAMPLE**

**M A P B 4 6 S H 2 D A R P 3 5 0**

Double Anti-Cavitation, Relief and Purge Valve, relief valve setting 350 bar, purge valve flow rate 6±2 l/min

**M A P B 4 6 S H 2 D A R P 2 5 0 L 3 . 5**

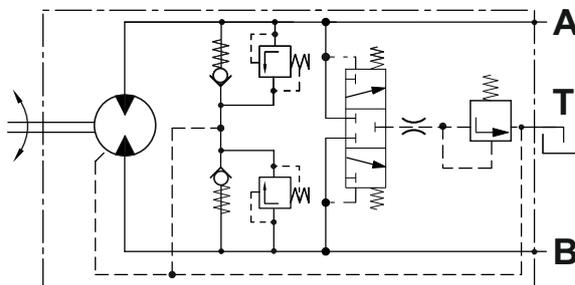
Double Anti-Cavitation, Relief and Purge Valve, relief valve setting is 250 bar, purge valve flow rate 3.5±1 l/min

**M A P B 4 6 S H 2 D A R P 3 0 0 L 5 . 5**

Double Anti-Cavitation, Relief and Purge Valve, relief valve setting 300 bar, purge valve flow rate 5.5±1 l/min

**Option DARF**

Dual Anti-Cavitation, Relief and Flush Valve



- Mainly used in close loop circuit;
- The valve is a combination between a dual anti-cavitation, relief and flush valve;
- Flush valve is used for cooling purpose or cleanliness requirements;
- Anti-Cavitation Check valve is used for applications such as Fan drive control;
- Pressure Relief Valves prevent excessive pressures in the high pressure loop;
- Please, consider the following possible values for pressure set of the relief valve:

Pos.9 

250	300	350
-----	-----	-----

 → pressure

- Flow rate of flush valve by **default (omit) - 4 ÷ 8 l/min and charge pressure 16 bar** with 20 bar feed pressure for close loop circuit. The possible values are as follow:

Pos.10 

omit	L3.5	L5.5
------	------	------

 → flow rate

- Other values for charge pressure are possible. Please see Pos.9.

Example: For charge pressure 10 bar the options are as follow:

Pos.9 

250-10	300-10	350-10
--------	--------	--------

Relief valve opening pressure      Flush valve opening pressure (charge pressure)

**EXAMPLE**

**M A P B 4 6 S H 2 D A R F 3 5 0**

Double Anti-Cavitation, Relief and Flush Valve, relief valve setting 350 bar flush valve charge pressure 16 bar, flush valve flow rate 6±2 l/min

**M A P B 4 6 S H 2 D A R F 3 5 0 - 1 0**

Double Anti-Cavitation, Relief and Flush Valve, relief valve setting 350 bar flush valve charge pressure 10 bar, flush valve flow rate is 6±2 l/min

**M A P B 5 0 S H 2 D A R F 2 5 0 L 3 . 5**

Double Anti-Cavitation, Relief and Flush Valve, relief valve setting 250 bar flush valve charge pressure 16 bar, flush valve flow rate is 3.5±1 l/min

**M A P B 4 6 S H 2 D A R F 3 0 0 - 1 0 L 5 . 5**

Double Anti-Cavitation, Relief and Flush Valve, relief valve setting 300 bar flush valve charge pressure 10 bar, flush valve flow rate 5.5±1 l/min