



# MS HYDRAULIC

## AXIAL PISTON MOTORS AND PUMPS

In cooperation with  **HES**  
HYDRAULIC ELEMENTS & SYSTEMS



**NEW**  
PRODUCTS

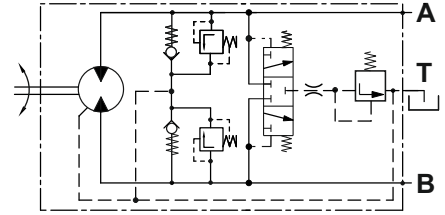
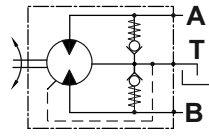
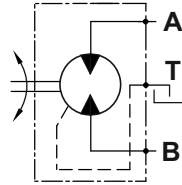


68, Kozloduy St., 6100 Kazanlak, BULGARIA  
tel.: + 359 431 65167, + 359 431 64271, fax: + 359 431 64114  
msh@ms-hydraulic.com www.ms-hydraulic.com



# Hydraulic Motors Type MAP100

## 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

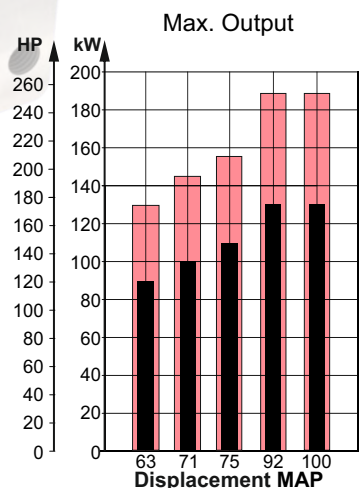
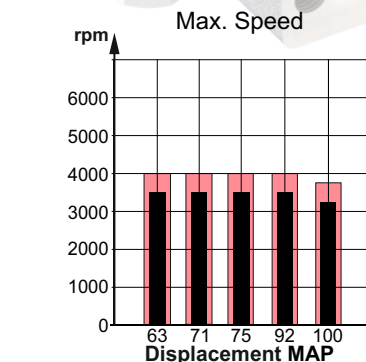
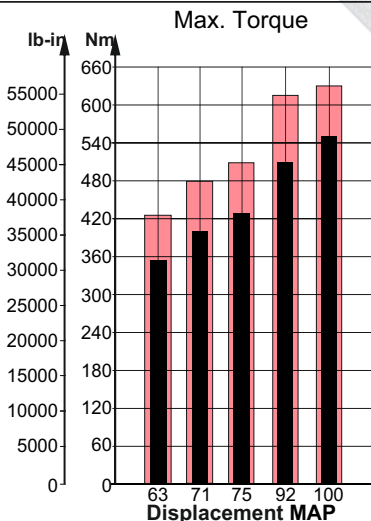
- » Swash plate
- » Flange options
- » Port options
- » Shaft options
- » High pressure ports
- » Integrated valves

### ADVANTAGES

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

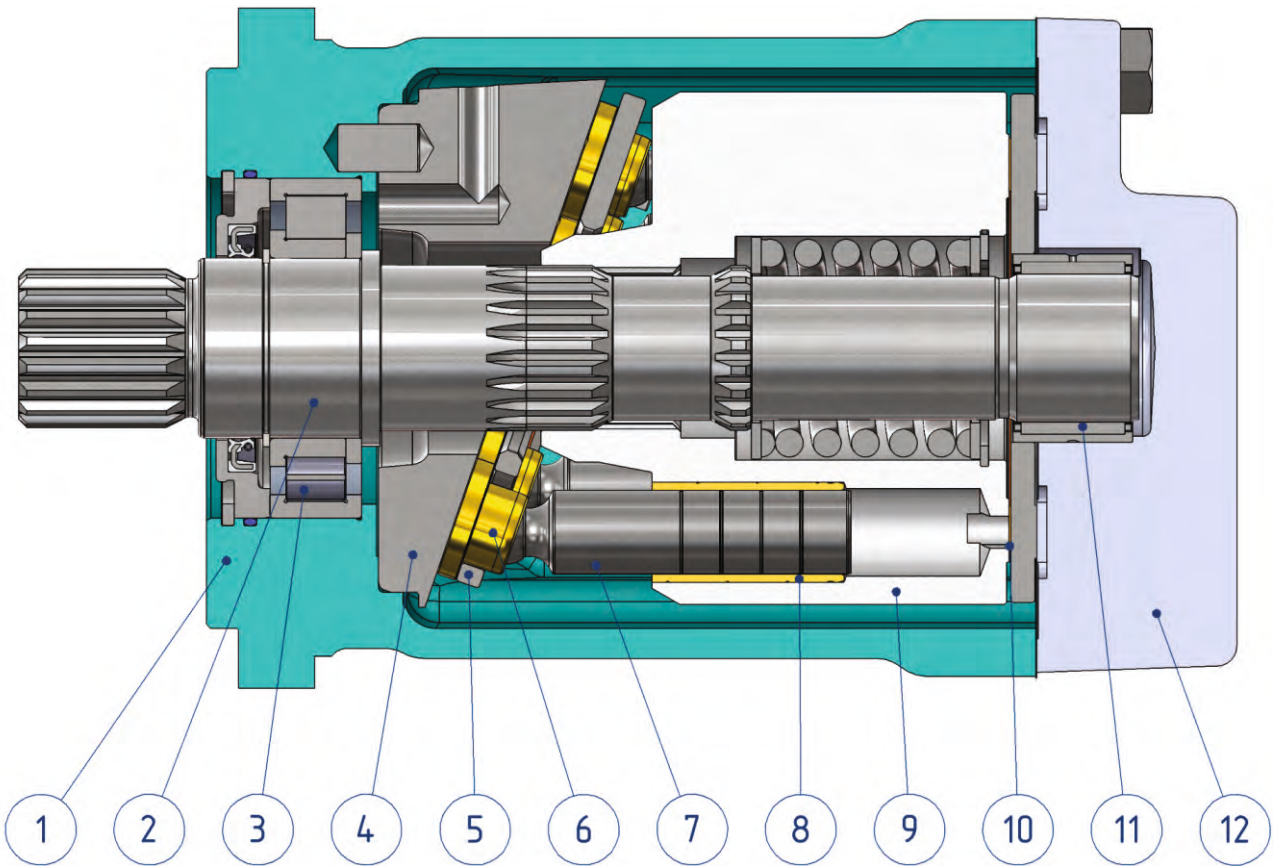
### GENERAL

Displacement,	cm <sup>3</sup> /rev [in <sup>3</sup> /rev]	63.58+98.75 [3.88+6.03]
Max. Speed,	RPM	3500
Max. Torque,	Nm [lb-in]	550 [4870]
Max. Output,	kW [HP]	130 [174]
Max. Pressure Drop,	bar [PSI]	350 [5080]
Max. Oil Flow,	lpm [GPM]	326 [86.1]
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)	





**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.

GUIDE

MAP28

MAP50

MAP100

PAP50

SHAFT

INFO



**SPECIFICATION DATA**

Type		MAP 63	MAP 71	MAP 75	MAP 92	MAP 100
<b>Displacement,</b> <b>cm.<sup>3</sup>/rev. [in.<sup>3</sup>/rev.]</b>		63.58	71.5	76.84	93.18	98.75
		[3.88]	[4.36]	[4.69]	[5.69]	[6.03]
<b>Max. Speed,</b> <b>[RPM]</b>	Cont.	3500	3500	3500	3500	3240
	Int.*	4000	4000	4000	4000	3750
<b>Max. Torque,***</b> <b>Nm [lb-in]</b>	Cont.	354 [3133]	398 [3523]	428 [3788]	514 [4549]	550 [4870]
	Int.**	425 [3762]	478 [4230]	514 [4549]	616 [5452]	645 [5710]
<b>Output,</b> <b>kW [HP]</b>	Cont.	89 [120]	100 [134]	108 [145]	130 [174]	130 [174]
	Int.**	129 [173]	145 [195]	156 [209]	188 [252]	188 [252]
<b>Max. Pressure,</b> <b>bar [PSI]</b>	Cont.	350 [5080]	350 [5080]	350 [5080]	350 [5080]	350 [5080]
	Int.**	420 [6100]	420 [6100]	420 [6100]	420 [6100]	410 [5950]
<b>Max. Oil Flow,</b> <b>lpm [GPM]</b>	Cont.	223 [58.9]	250 [66]	269 [71.1]	326 [86.1]	320 [84.5]
	Int.*	255 [67.4]	286 [75.6]	308 [81.4]	373 [98.5]	370 [97.7]
<b>Permissible Shaft Load</b> <b>max Axial**** N[lb]</b>		Fa=2500 [562]				
	<b>max Radial**** N[lb]</b>					
<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>		32.5 [71.7]				

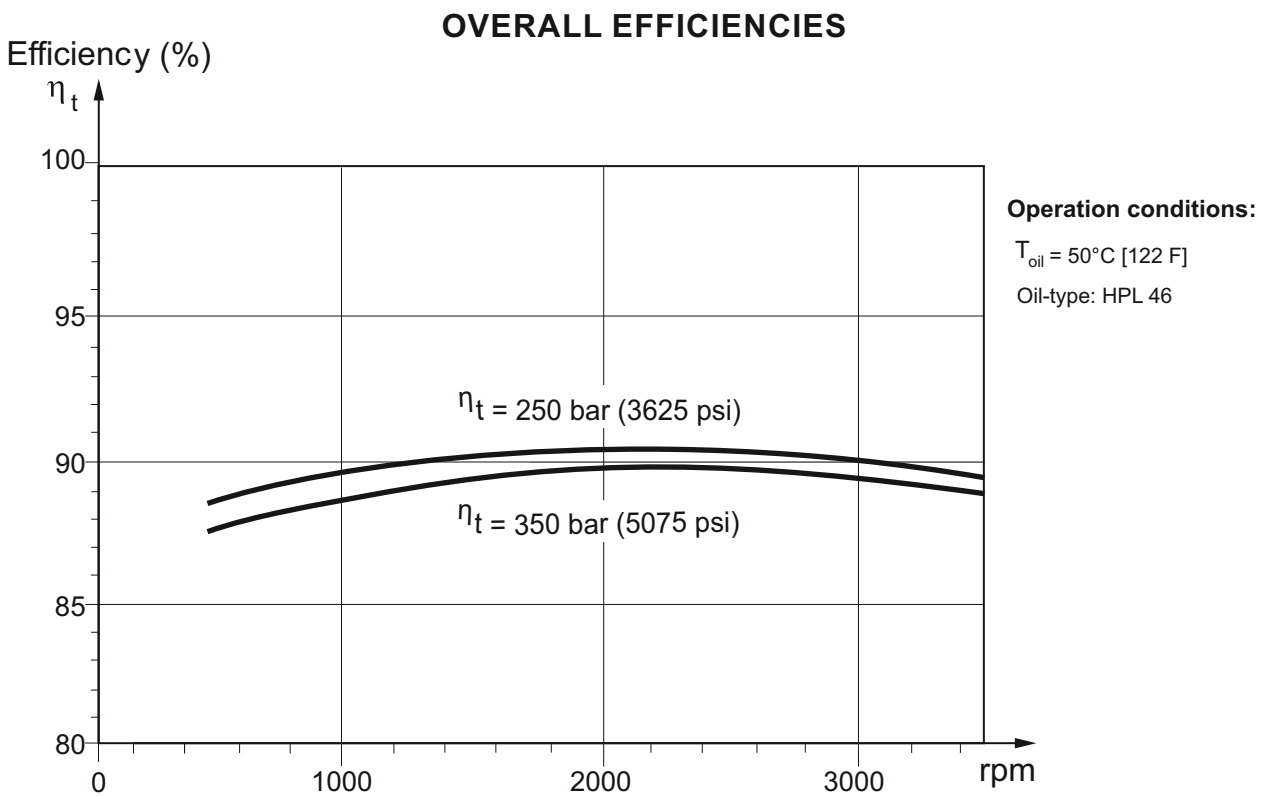
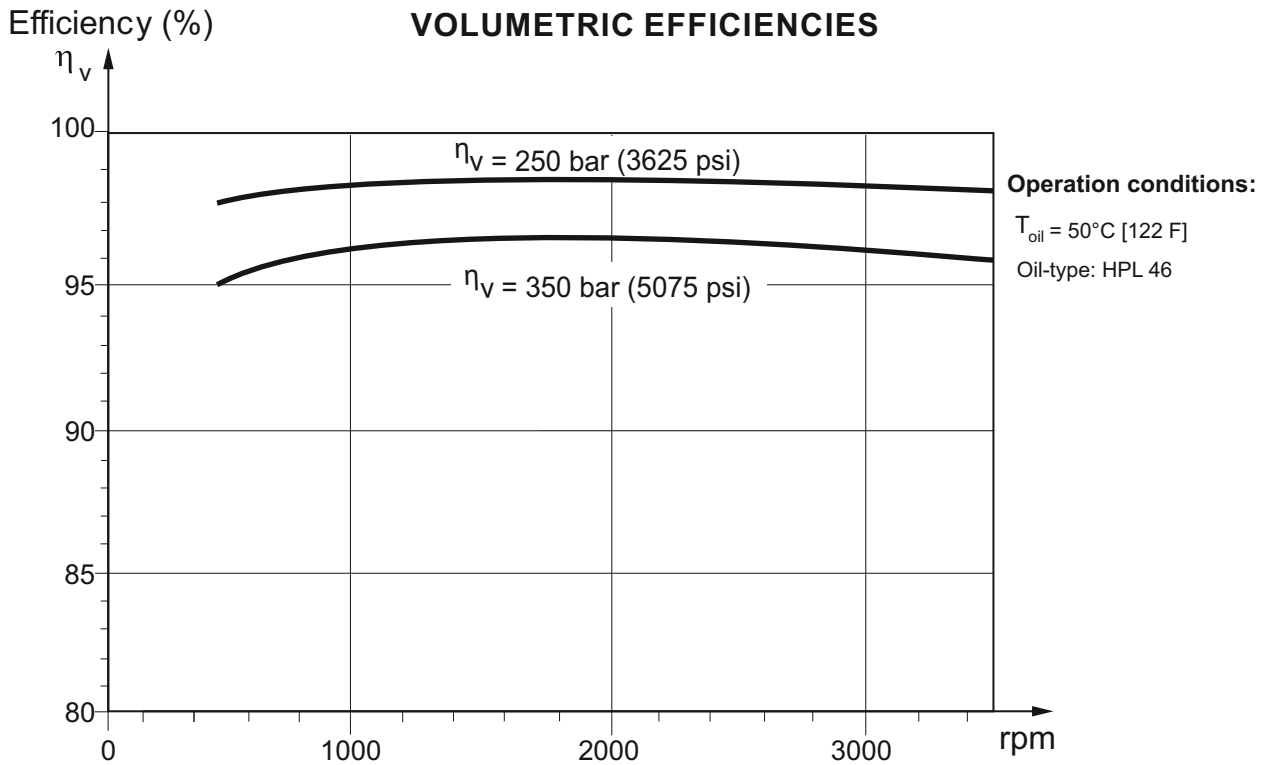
\* Intermittent speed (flow): for pressure up to 150[2200] bar[PSI];  
 \*\* Intermittent load: the permissible values may occur for max. 10% of every minute;  
 \*\*\* Theoretical torque;  
 \*\*\*\* The calculated max values are based on the optimal direction of the forces Fr, Fa and optimal position of the shaft.

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 61.
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.



**FUNCTION DIAGRAMS**

The below efficiencies are applied for all displacements.



The motor size, pressure, torque, speed of rotation and flow rate required for a specific application can be calculated using the formulas on page [62](#)

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



**Overall Dimensions and Ports**

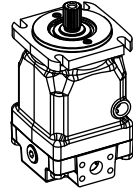
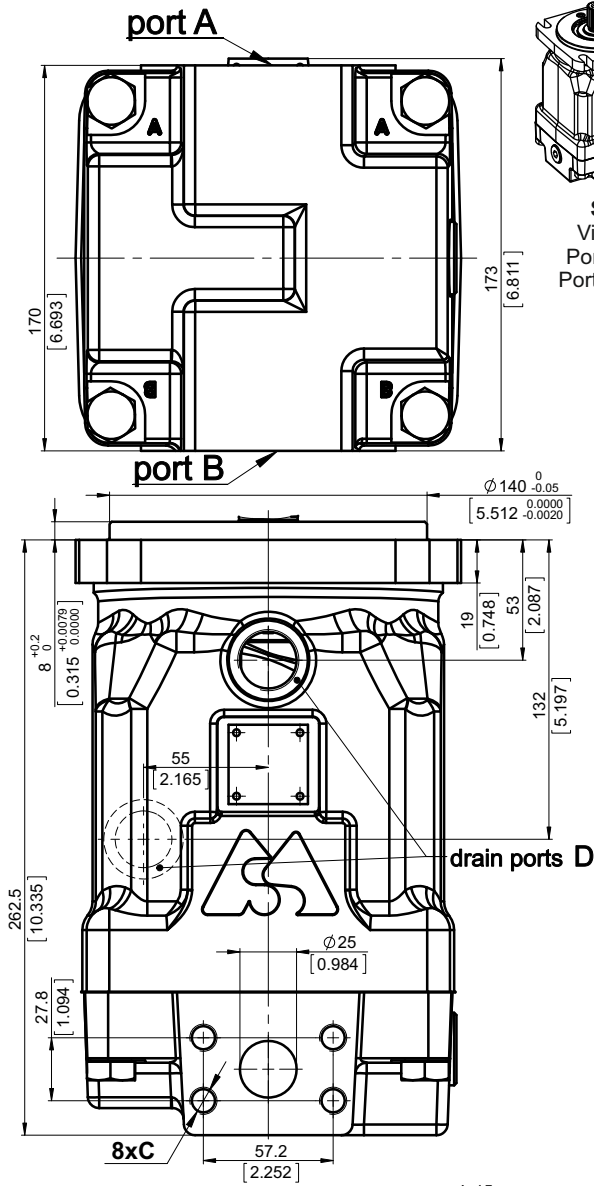
**Side Ports - Default Mounting Flange - Type SAE-4M**

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

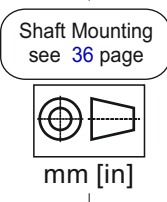
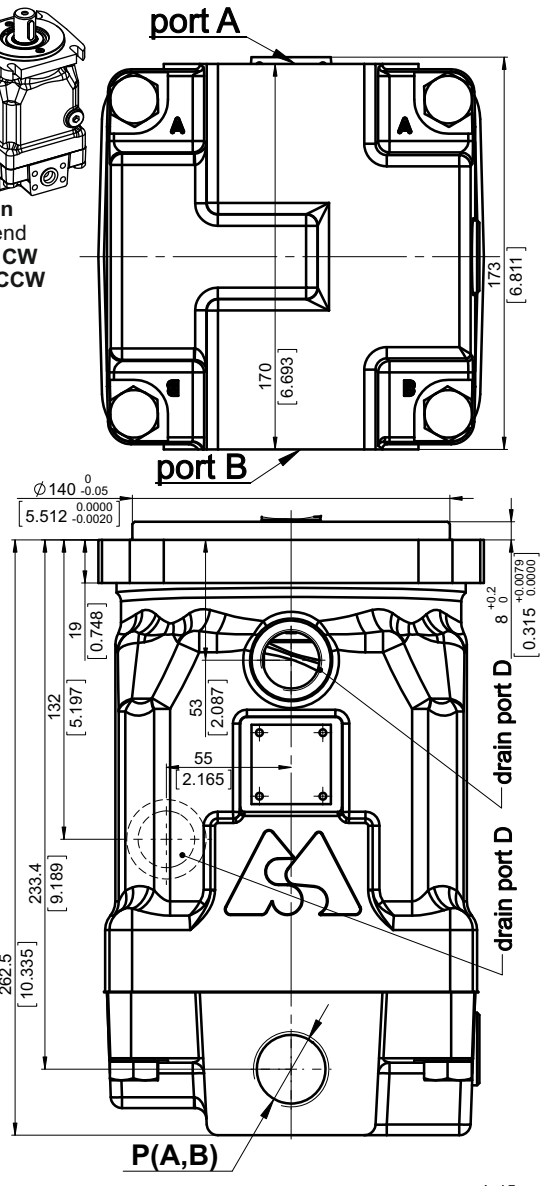
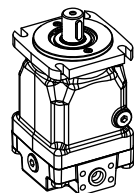
See the port sizes at the bottom of this page

**Side ports, port size 2 and 4**

See the port sizes at the bottom of this page

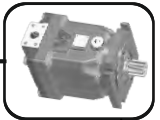


**Standard Rotation**  
Viewed from shaft end  
Port A Pressurized - CW  
Port B Pressurized - CCW  
see page 58



	Port Size	
	default	5
P <sub>(A,B)</sub>	2xISO 6162-2 DN25	2xSAE J518 1" PSI6000
D	M27x2-6H	1 1/16-12UN
C	M12-6H	7/16-14 UNC-2B

	Port Size	
	2	4
P <sub>(A,B)</sub>	2xG 1	2x1 5/16-12UN
D	G 3/4	1 1/16-12UN



**Overall Dimensions and Ports**

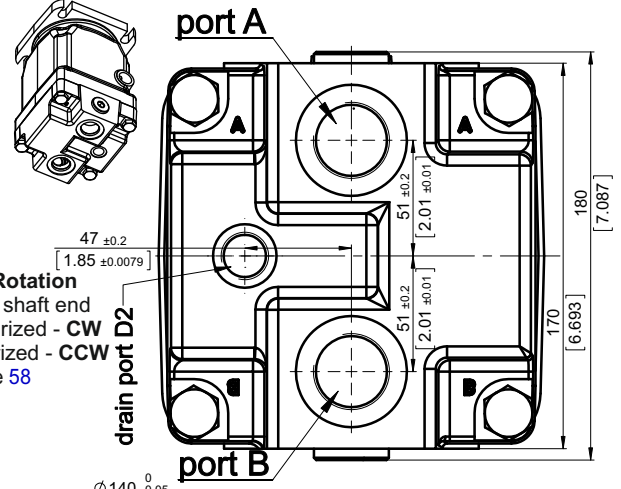
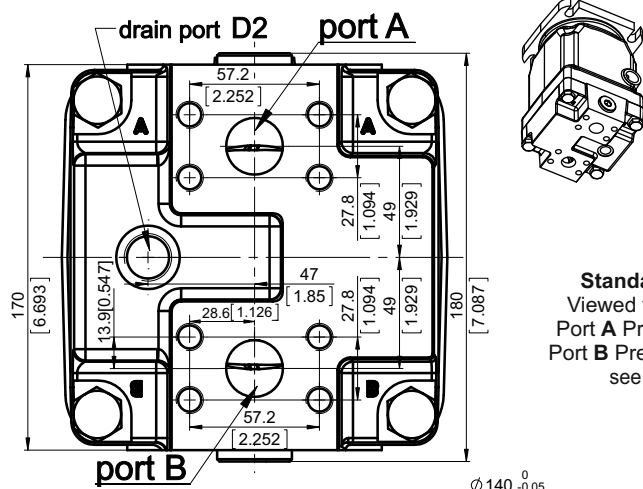
**Rear Ports - Type E Mounting Flange - Type SAE-4M**

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

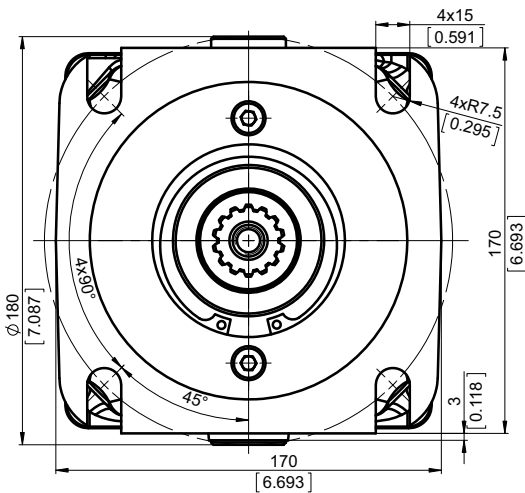
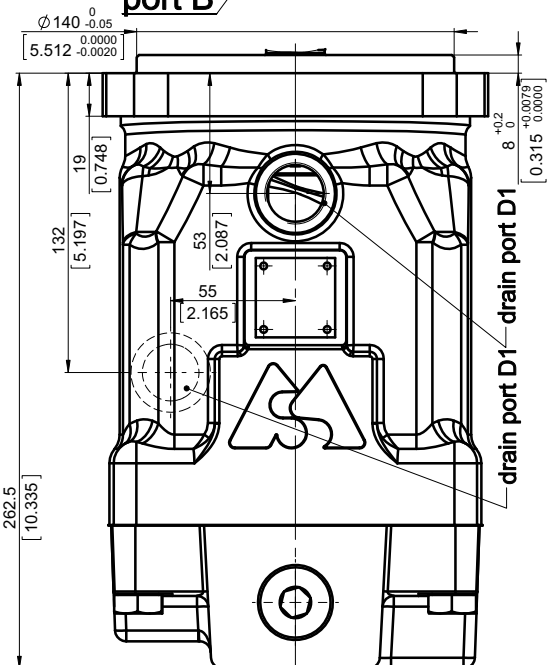
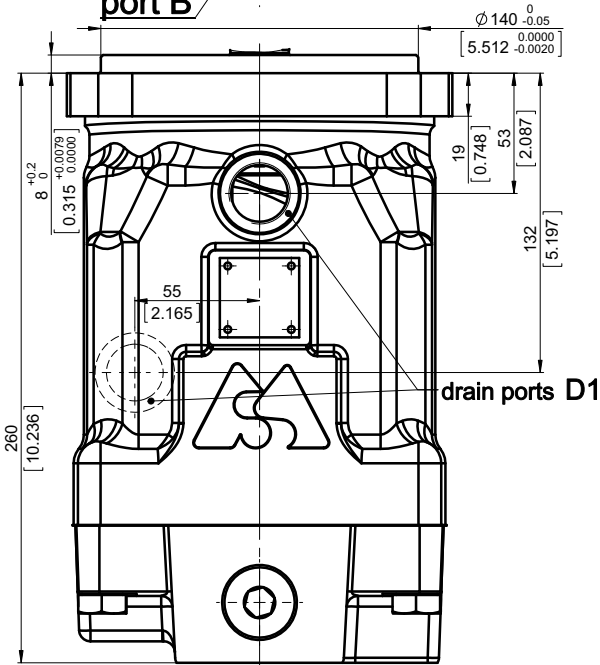
See the port sizes at the bottom of this page

**Side ports, port size 2 and 4**

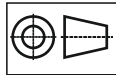
See the port sizes at the bottom of this page



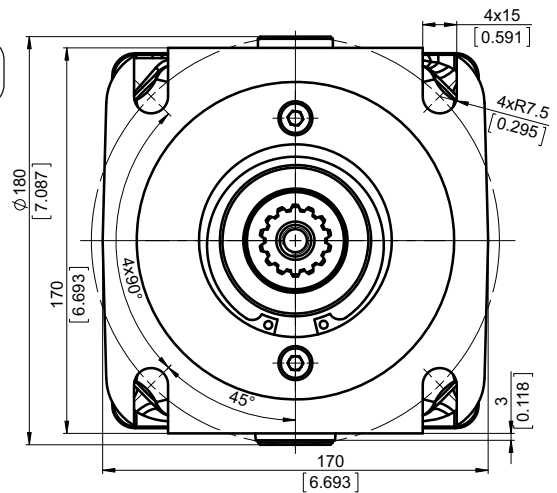
**Standard Rotation**  
Viewed from shaft end  
Port A Pressurized - CW  
Port B Pressurized - CCW  
see page 58



Shaft Mounting  
see the next page



mm [in]

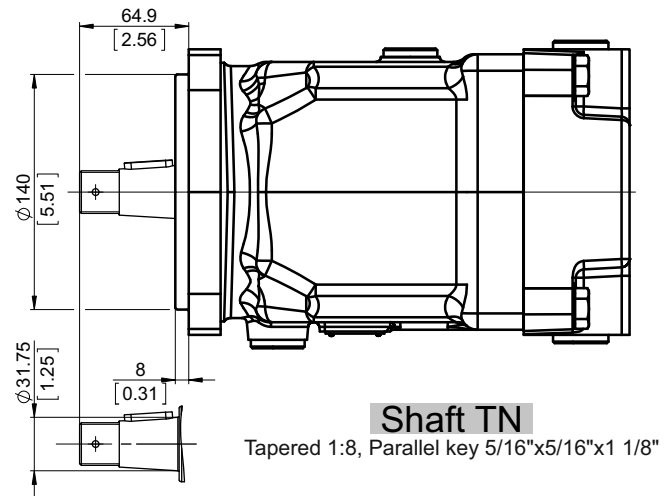
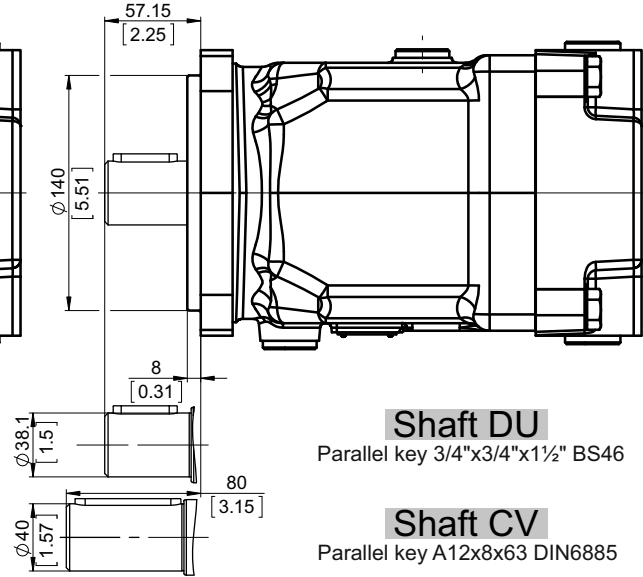
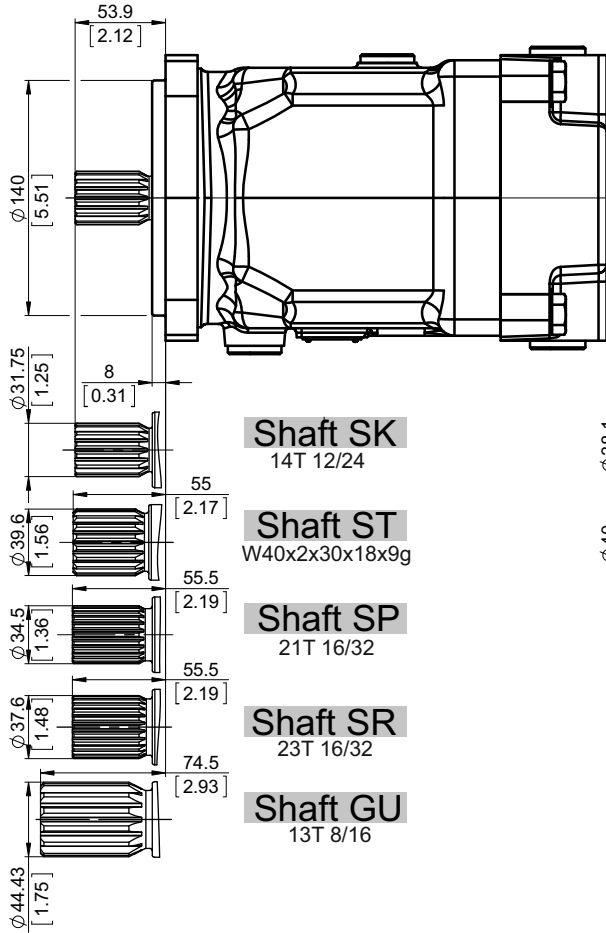


	Port Size	
	default	5
P <sub>(A,B)</sub>	2xISO 6162-2 DN25	2xSAE J518 1" PSI6000
D1	M27x2-6H	1 1/16-12UN
D2	M22x1.5-6H	7/8 - 14 UNF
C	M12-6H	7/16-14 UNC-2B

	Port Size	
	2	4
P <sub>(A,B)</sub>	2xG 1	2x1 5/16-12UN
D1	G 3/4	1 1/16-12UN
D2	G 1/2	7/8 - 14 UNF



**Shafts Mounting**  
**Flange - Type 4M**



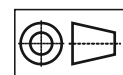
Shaft Dimensions  
See Page 52+57

**PERMISSIBLE SHAFT LOAD**

Permissible shaft load		
max Axial	N[lb]	Fa=2500 [562]
max Radial	N[lb]	Fr=4500 [1010]

The calculated max values are based on the optimal direction of the forces Fr, Fa and optimal position of the shaft (see page 58).

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







**Overall Dimensions and Ports**

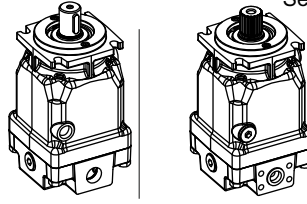
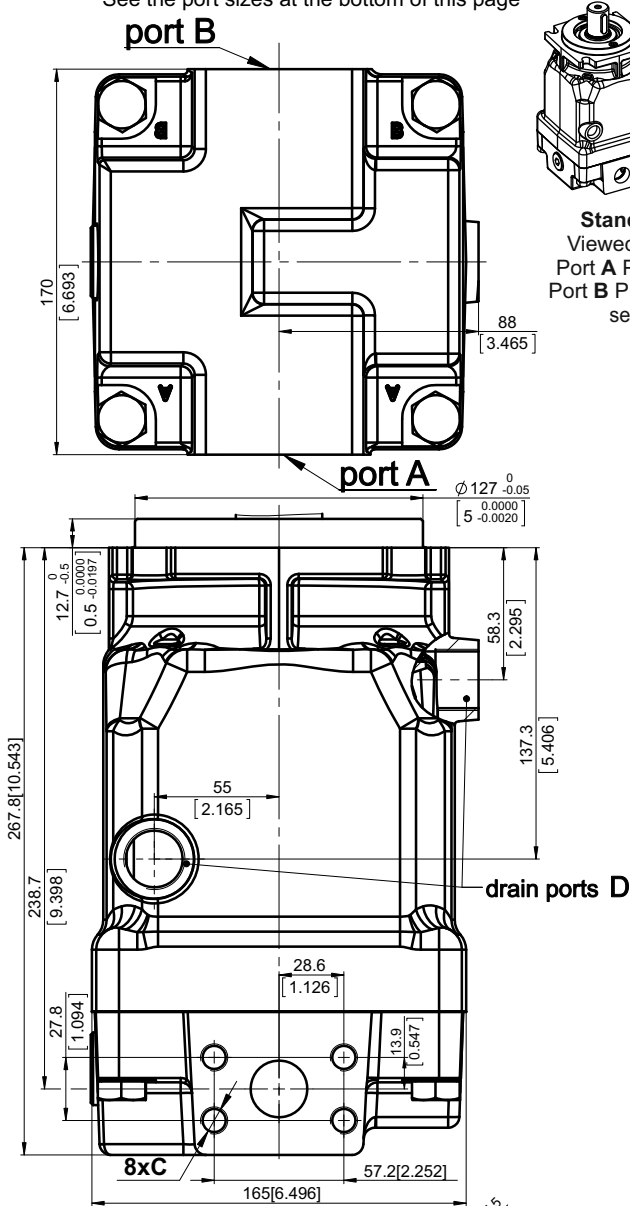
**Side Ports - Default Mounting Flange - Type SAE-4C**

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

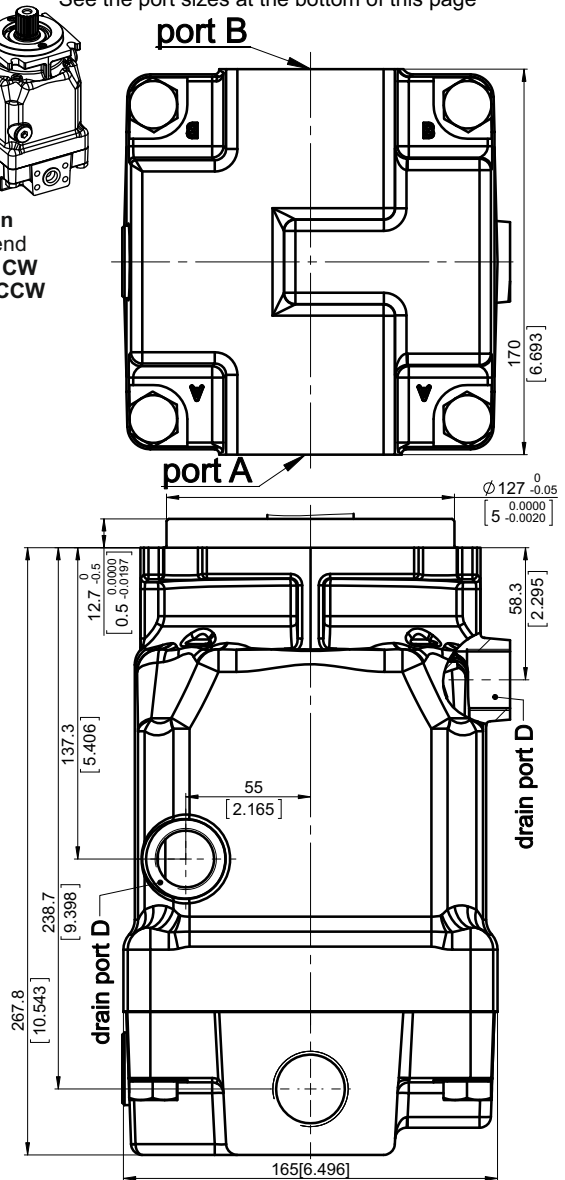
See the port sizes at the bottom of this page

**Side ports, port size 2 and 4**

See the port sizes at the bottom of this page

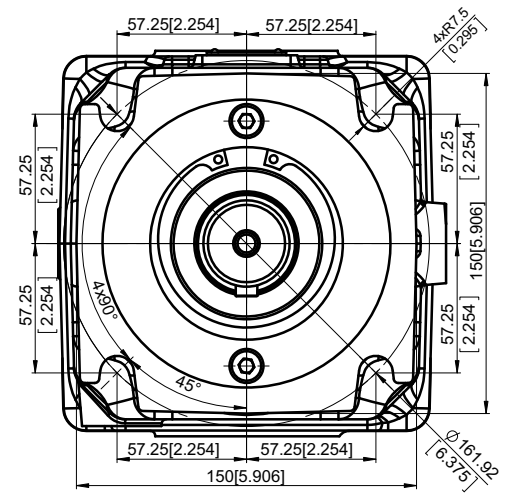
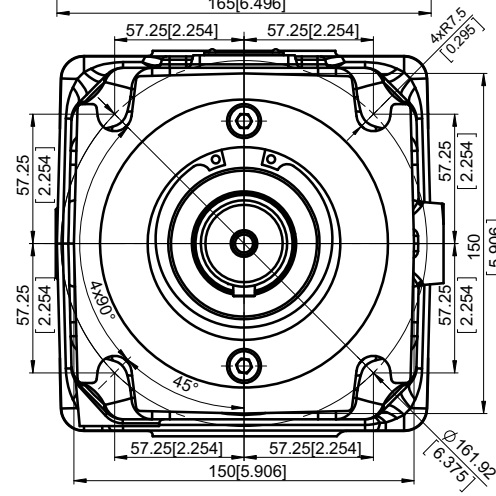


**Standard Rotation**  
Viewed from shaft end  
Port A Pressurized - CW  
Port B Pressurized - CCW  
see page 58



Shaft Mounting  
see the 39 page

mm [in]



	Port Size	
	default	5
<b>P<sub>(A,B)</sub></b>	2xISO 6162-2 DN25	2xSAE J518 1" PSI6000
<b>D</b>	M27x2-6H	1 1/16-12UN
<b>C</b>	M12-6H	7/16-14 UNC-2B

	Port Size	
	2	4
<b>P<sub>(A,B)</sub></b>	2xG 1	2x1 5/16-12UN
<b>D</b>	G 3/4	1 1/16-12UN

GUIDE  
MAP28  
MAP50  
MAP100  
PAP50  
SHAFT  
INFO



**Overall Dimensions and Ports**

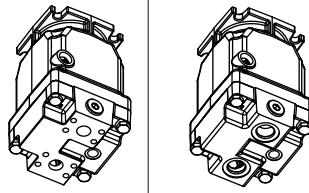
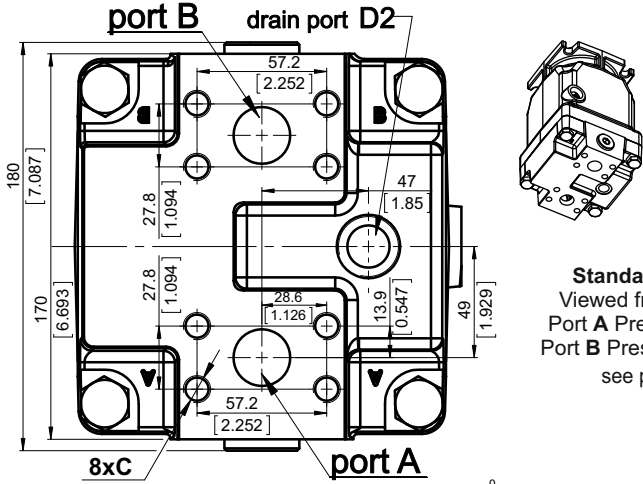
**Rear Ports - Type E Mounting Flange - Type SAE-4C**

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

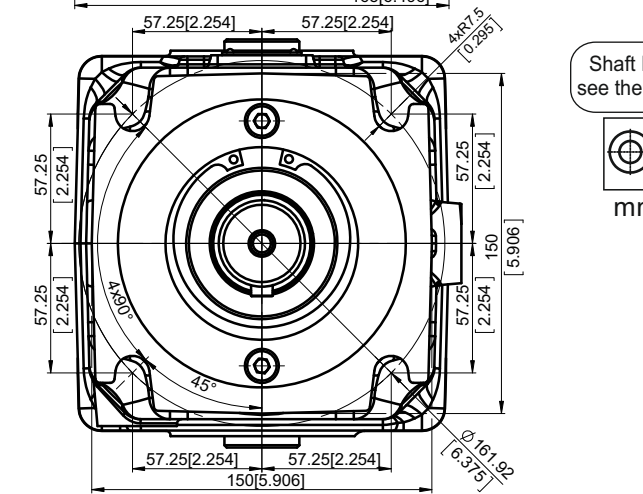
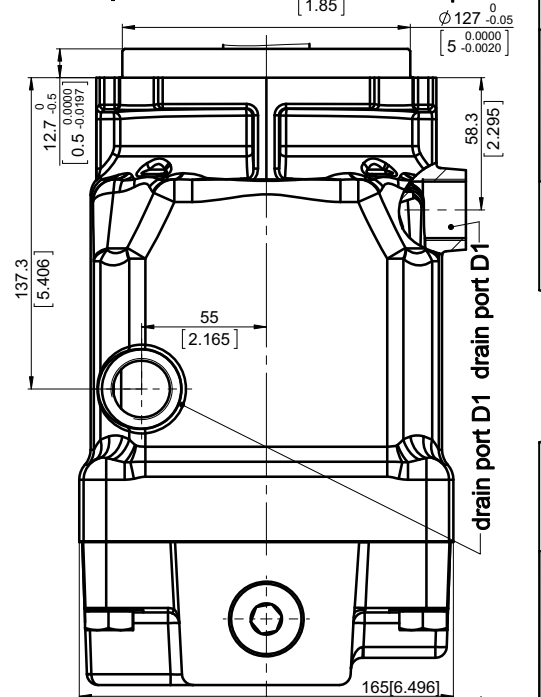
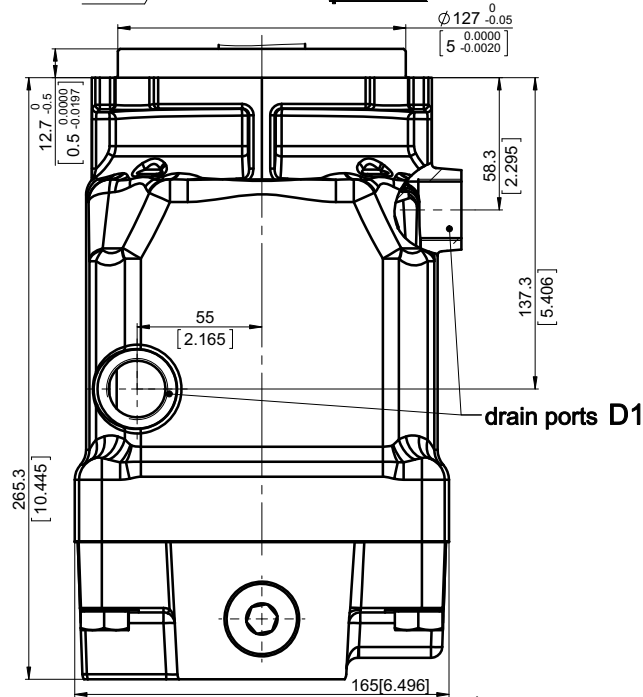
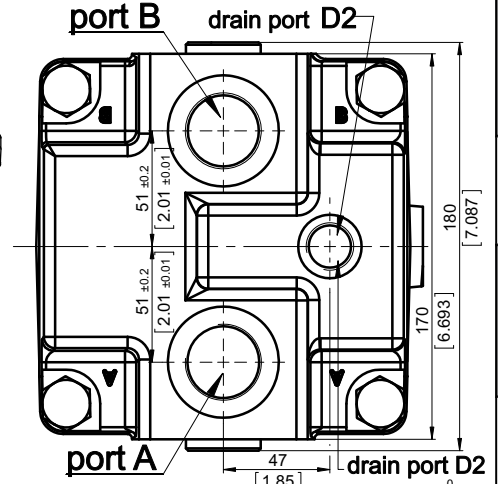
See the port sizes at the bottom of this page

**Side ports, port size 2 and 4**

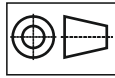
See the port sizes at the bottom of this page



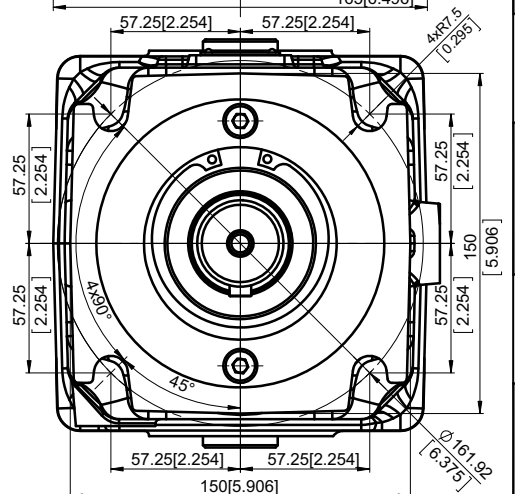
**Standard Rotation**  
Viewed from shaft end  
Port A Pressurized - CW  
Port B Pressurized - CCW  
see page 58



Shaft Mounting  
see the next page



mm [in]

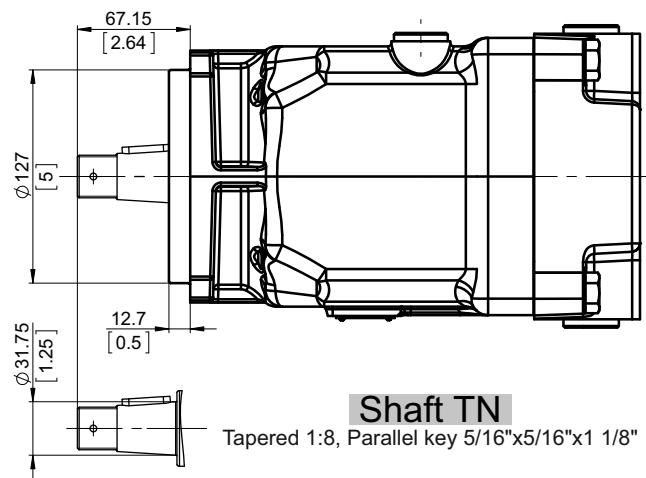
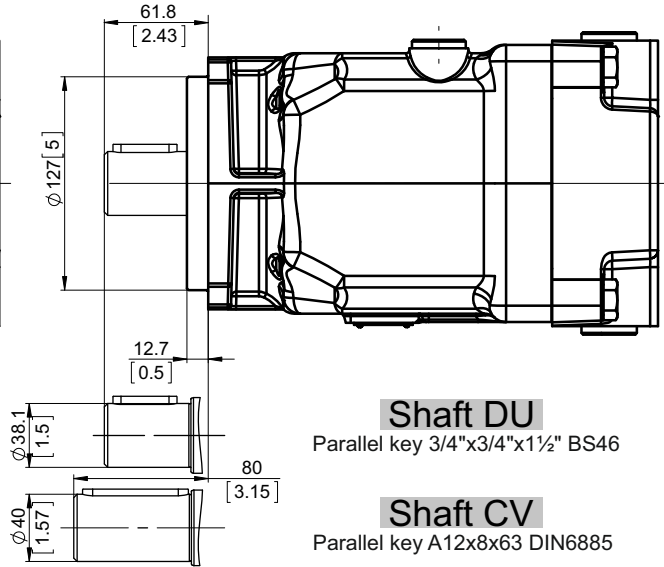
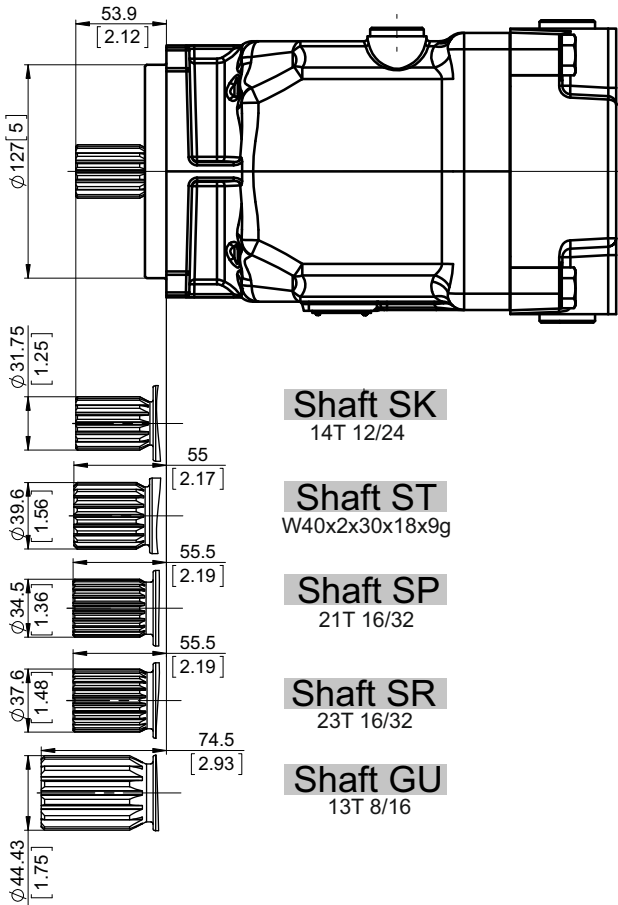


	Port Size	
	default	5
P <sub>(A,B)</sub>	2xISO 6162-2 DN25	2xSAE J518 1" PSI6000
D1	M27x2-6H	1 1/16-12UN
D2	M22x1.5-6H	7/8 - 14 UNF
C	M12-6H	7/16-14 UNC-2B

	Port Size	
	2	4
P <sub>(A,B)</sub>	2xG 1	2x1 5/16-12UN
D1	G 3/4	1 1/16-12UN
D2	G 1/2	7/8 - 14 UNF



**Shafts Mounting**  
**Flange - Type 4C**



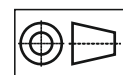
Shaft Dimensions  
See Page 52+57

**PERMISSIBLE SHAFT LOAD**

Permissible shaft load		
max Axial	N[lb]	Fa=2500 [562]
max Radial	N[lb]	Fr=4500 [1010]

The calculated max values are based on the optimal direction of the forces Fr, Fa and optimal position of the shaft (see page 58).

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





**ORDERING CODE**

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

**Pos.1 - Mounting Flange**

- 4M** - ISO3019-2 4-Bolt flange of spigot diam.140 mm [5.51"] - BC 180 mm [7.09"]
- 4C\*** - SAE C - 4-Bolt flange spigot diam. 127mm [5"] - BC 161.92 [6.375"]

**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**

- 63** - 63.58 cm.<sup>3</sup>/rev. [3.88 in.<sup>3</sup>/rev.]
- 71** - 71.5 cm.<sup>3</sup>/rev. [4.36 in.<sup>3</sup>/rev.]
- 75** - 76.84 cm.<sup>3</sup>/rev. [4.69 in.<sup>3</sup>/rev.]
- 92** - 93.18 cm.<sup>3</sup>/rev. [5.69 in.<sup>3</sup>/rev.]
- 100** - 98.75 cm.<sup>3</sup>/rev. [6.03 in.<sup>3</sup>/rev.]

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

- SK** -  $\phi$ 31,75 [1,25"] Spline SAE 14T 12/24 DP, M10
- SP** -  $\phi$ 34.5 [1,358"] Spline SAE 21T 16/32 DP, M12
- SR** -  $\phi$ 37.6 [1,48"] Spline SAE 23T 16/32 DP, M12
- ST** -  $\phi$ 40 [1,575"] Spline W40x2x30x18x9g DIN 5480, M12-6H thread
- GU** -  $\phi$ 43.71 [1,721"] Spline SAE 13T 8/16 DP, 3/8-16UNC
- DU** -  $\phi$ 38.1[1,5"] Straight, key 9.528[0.375"] L38.1[1.5"], 3/8-16 UNC thread
- CV** -  $\phi$ 40 [ $\phi$ 1.575"] Straight, M12-6H thread Parallel key A12x8x63 DIN6885
- TN** -  $\phi$ 31.75 [1.25"] Tapered 125:1000, key 7.94[5/16] x7.94[5/16] L28[1 1/8], 1-12 UNF-2A

**Pos.5 - Ports**

- omit - 2xISO 6162-2 DN25, drain ports M27x2-6H, for rear drain port M22x1.5
- 2** - 2xG1, drain G3/4, for rear drain ports G1/2
- 4** - 2x1 5/16-12 UN Ports, drain ports 1 1/16 UNF for rear drain port 7/8-14 UNF
- 5** - 2xSAE 1", PSI6000, drain ports 1 1/16 UNF for rear drain port 7/8-14 UNF

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

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

**Pos.7 - Integrated Valves**

- omit - 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

**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 - 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

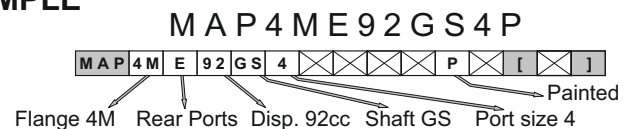
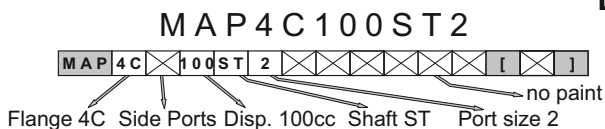
**Pos.13 - Design Series**

- omit - Factory specified

\*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**

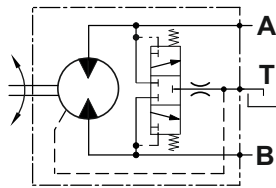




**Valve Options**

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)** - 5 ÷ 9 lit/min.
- For other options, please see Pos.10 of ordering code, considering the following possible values:

Pos.10 

omit	L5.5	L9
------	------	----

 → flow rate

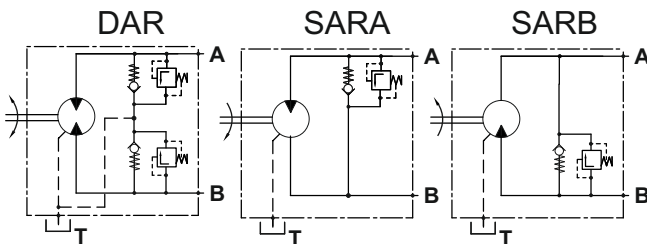
**EXAMPLE**

MAP4C100ST2PU purge valve flow rate 7±2 lit/min  
 MAP4C100ST2PUL9 purge valve flow rate 9±1 lit/min  
 MAP4C100ST2PUL5.5 purge valve flow rate 5.5±1 lit/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

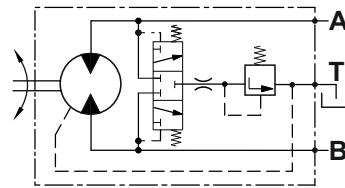
**EXAMPLE**

**MAP4C100ST2DAR350**  
 Double Anti-Cavitation and Relief Valve, relief valve setting 350 bar

**MAP4C100ST2SARA250**  
 Single Anti-Cavitation and Relief Valve, relief valve setting 250 bar  
 The valve is placed on port A

**MAP4C100ST2SARB300**  
 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)** - 5 ÷ 9 lit/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	L5.5	L9
------	------	----

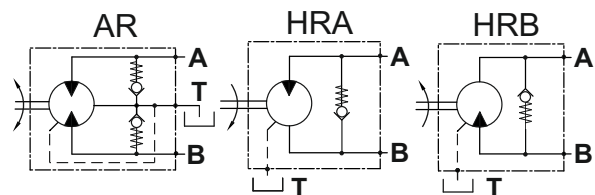
 → flow rate

**EXAMPLE**

MAP4C100ST2FLU flow rate 7±2 lit/min, charge pressure 16 bar  
 MAP4C100ST2FLU10L5.5 flow rate 5.5±1 lit/min, charge pressure 10 bar  
 MAP4C100ST2FLUL9 flow rate 9±1 lit/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**

**MAP4C100ST2AR**  
 Double Anti-Cavitation Valve

**MAP4C100ST2HRA**  
 Single Anti-Cavitation Valve, the valve is placed on port A

**MAP4C100ST2HRB**  
 Single Anti-Cavitation Valve, the valve is placed on port B

GUIDE  
MAP28  
MAP50  
MAP100  
PAP50  
SHAFT  
INFO

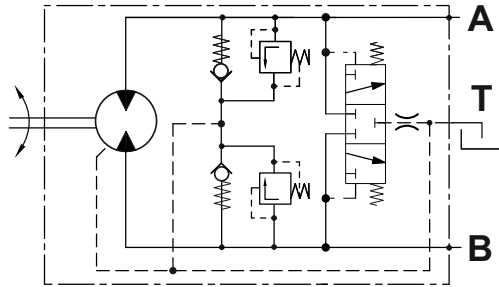


**Valve Options**

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) - 5 ÷ 9 lit/min**. The possible values are as follow:

Pos.10 

omit	L5.5	L9
------	------	----

 → flow rate

**EXAMPLE**

**MAP4C100ST2DARP350**

Double Anti-Cavitation, Relief and Purge Valve, relief valve setting 350 bar, purge valve flow rate 7±2 lit/min

**MAP4C100ST2DARP250L9**

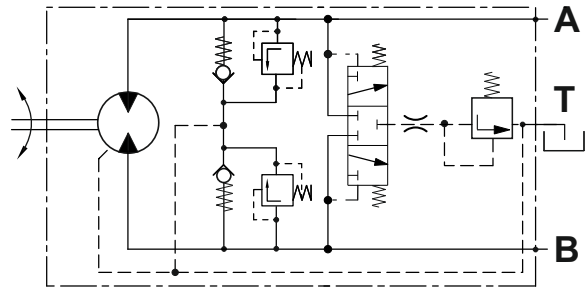
Double Anti-Cavitation, Relief and Purge Valve, relief valve setting is 250 bar, purge valve flow rate 9±1 lit/min

**MAP4C100ST2DARP300L5.5**

Double Anti-Cavitation, Relief and Purge Valve, relief valve setting 300 bar, purge valve flow rate 5.5±1 lit/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) - 5 ÷ 9 lit/min and charge pressure 16 bar** with 20 bar feed pressure for close loop circuit. The possible values are as follow:

Pos.10 

omit	L5.5	L9
------	------	----

 → 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**

**MAP4C100ST2DARF350**

Double Anti-Cavitation, Relief and Flush Valve, relief valve setting 350 bar flush valve charge pressure 16 bar, flush valve flow rate 7±2 lit/min

**MAP4C100ST2DARF350-10**

Double Anti-Cavitation, Relief and Flush Valve, relief valve setting 350 bar flush valve charge pressure 10 bar, flush valve flow rate is 7±2 lit/min

**MAP4C100ST2DARF250L9**

Double Anti-Cavitation, Relief and Flush Valve, relief valve setting 250 bar flush valve charge pressure 16 bar, flush valve flow rate is 9±1 lit/min

**MAP4C100ST2DARF300-10L5.5**

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 lit/min