



MS HYDRAULIC

AXIAL PISTON MOTORS AND PUMPS

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



NEW
PRODUCTS

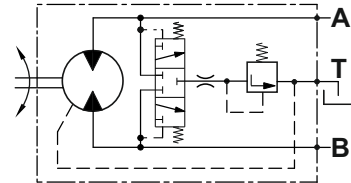
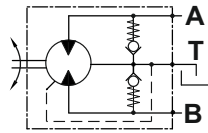
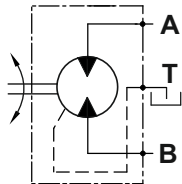


68, Kozloduy St., 6100 Kazanlak, BULGARIA
tel.: + 359 431 65167, + 359 431 64271, fax: + 359 431 64114
msh@ms-hydraulic.com www.ms-hydraulic.com



Hydraulic Motors Type MAP28

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

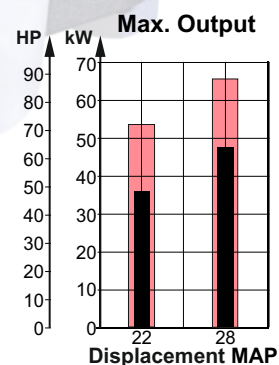
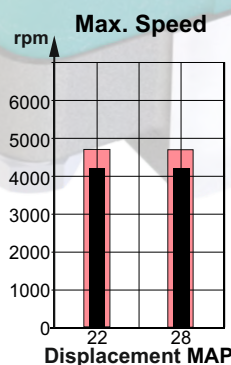
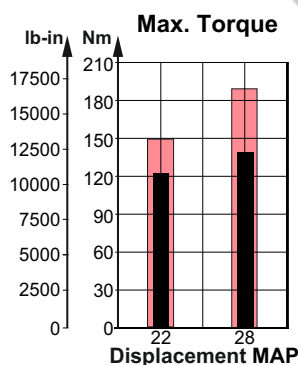
- » Swash plate
- » Flange options
- » Port options
- » Shaft options
- » High pressure ports
- » Integrated valves

ADVANTAGES

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

GENERAL

Displacement,	cm ³ /rev [in ³ /rev]	22,15÷28.47 [1.35÷1.74]
Max. Speed,	RPM	4200
Max. Torque,	Nm [lb-in]	159 [1407]
Max. Output,	kW [HP]	48 [64]
Max. Pressure Drop,	bar [PSI]	350 [5080]
Max. Oil Flow,	lpm [GPM]	120 [31.7]
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 ² /s [SUS]	12÷68 [66÷311]
Filtration	ISO code 18/16/13 (Min. recommended fluid filtration of 10 micron)	

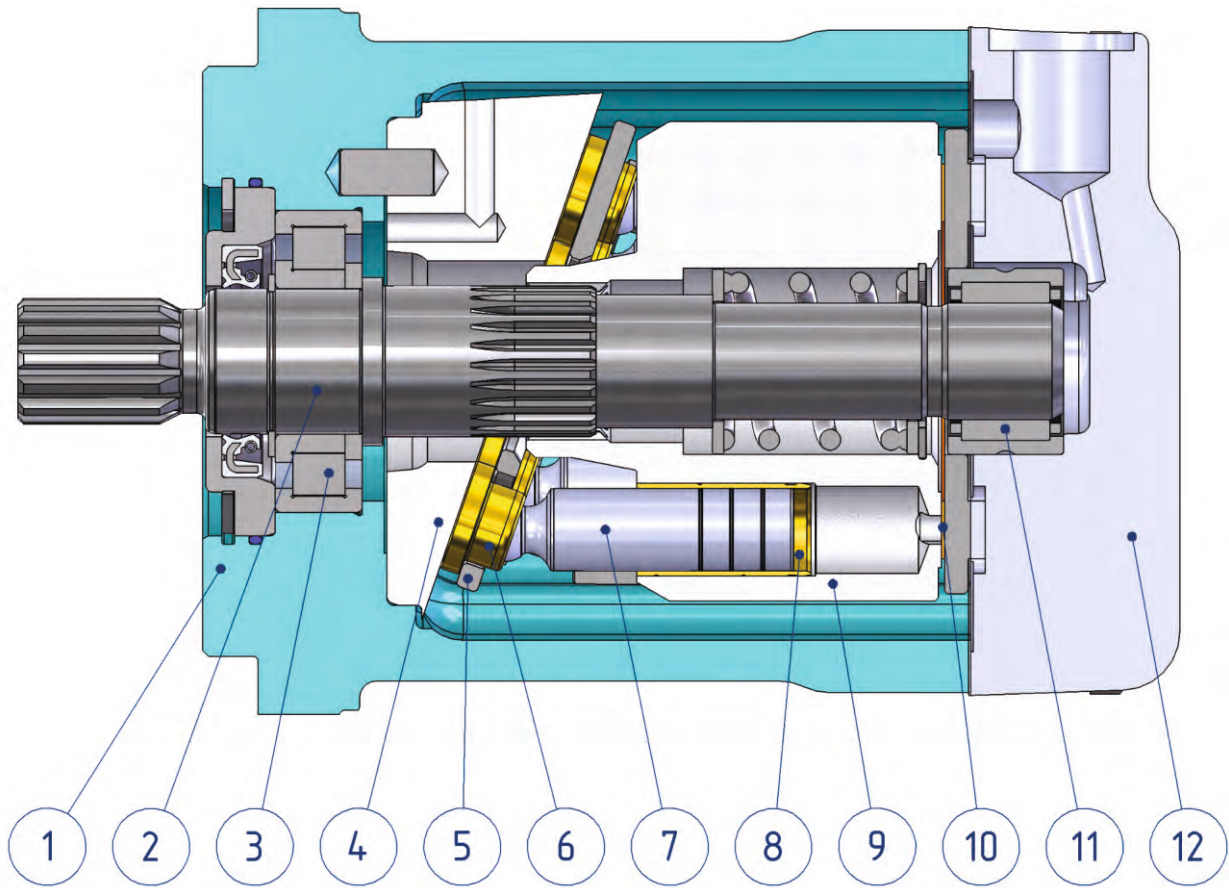


Intermittent values

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.

GUIDE

MAP28

MAP50

MAP100

PAP50

SHAFT

INFO



SPECIFICATION DATA

GUIDE

MAP28

MAP50

MAP100

PAP50

SHAFT

INFO

Type	MAP 22	MAP 28
Displacement, cm.³/rev. [in.³/rev.]	22.15 [1.35]	28.47 [1.74]
Max. Speed, [RPM]	Cont. 4200 Int.* 4700	4200 4700
Max. Torque,*** Nm [lb-in]	Cont. 123 [1088] Int.** 148 [1310]	159 [1407] 190 [1682]
Output, kW [HP]	Cont. 37 [50] Int.** 54 [72]	48 [64] 70 [94]
Max. Pressure, bar [PSI]	Cont. 350 [5080] Int.** 420 [6100]	350 [5080] 420 [6100]
Max. Oil Flow, lpm [GPM]	Cont. 93 [24.6] Int.* 104 [27.5]	120 [31.7] 134 [35.4]
Permissible Shaft Load		
max Axial**** N[lb]	Fa=1300 [292]	
max Radial**** N[lb]	Fr=2200 [495]	
Min. Speed, [RPM]	500	
Max. Pressure in Drain Line, bar [PSI]	5 [70] open drain line is always required	
Weight, kg [lb]	11.3 [24.9]	

* 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.

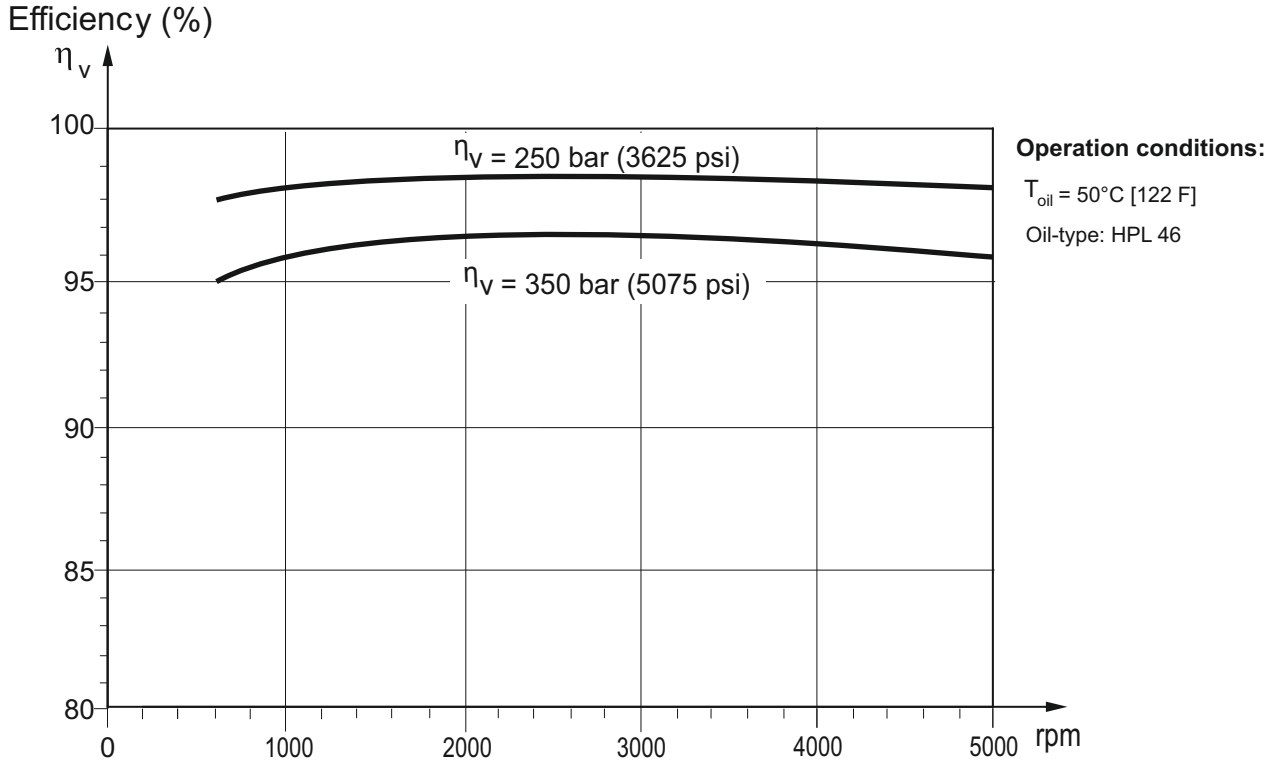
1. The recommended output power for continuous operations should not be exceeded.
2. Recommended filtration as per ISO 4406 cleanliness code 18/16/13 or better. This filtration corresponds to SAE AS 4059 8A/7B/7C. Nominal filtration - 10 micron or better.
3. Recommended a premium quality, anti-wear type 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.



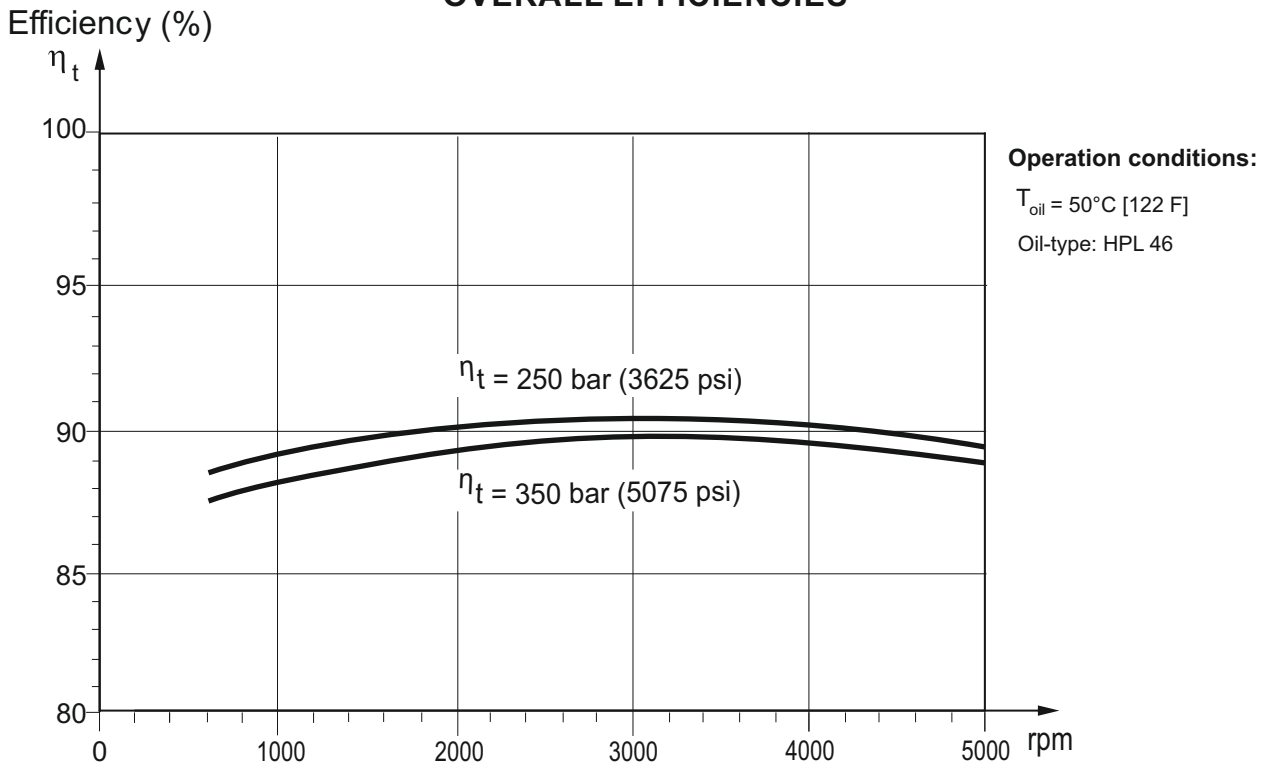
FUNCTION DIAGRAMS

The below efficiencies are applied for all displacements.

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 62

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



Overall Dimensions and Ports

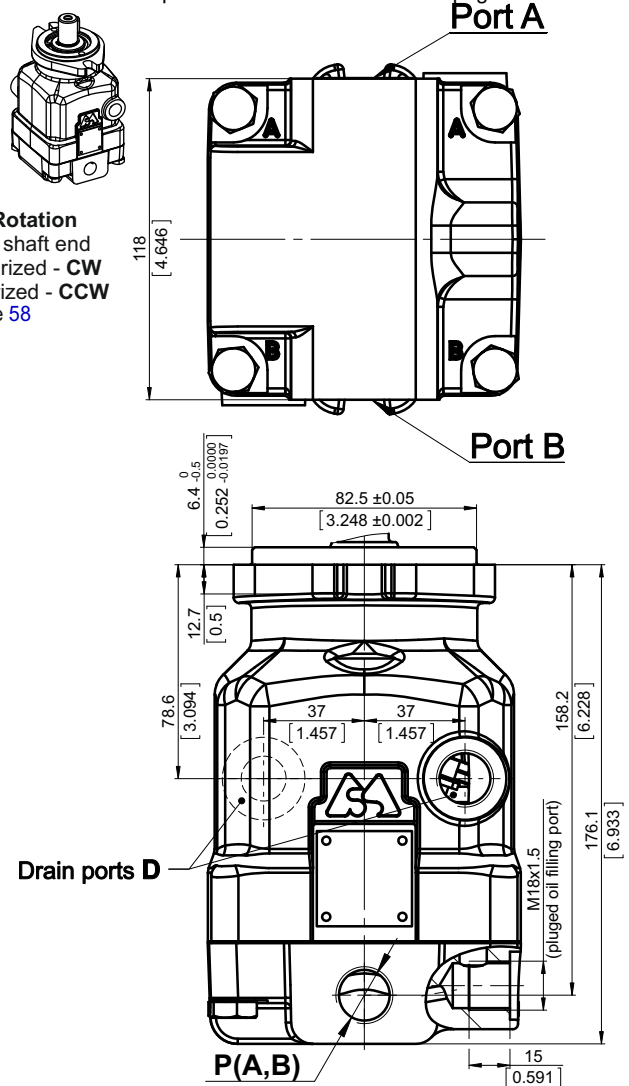
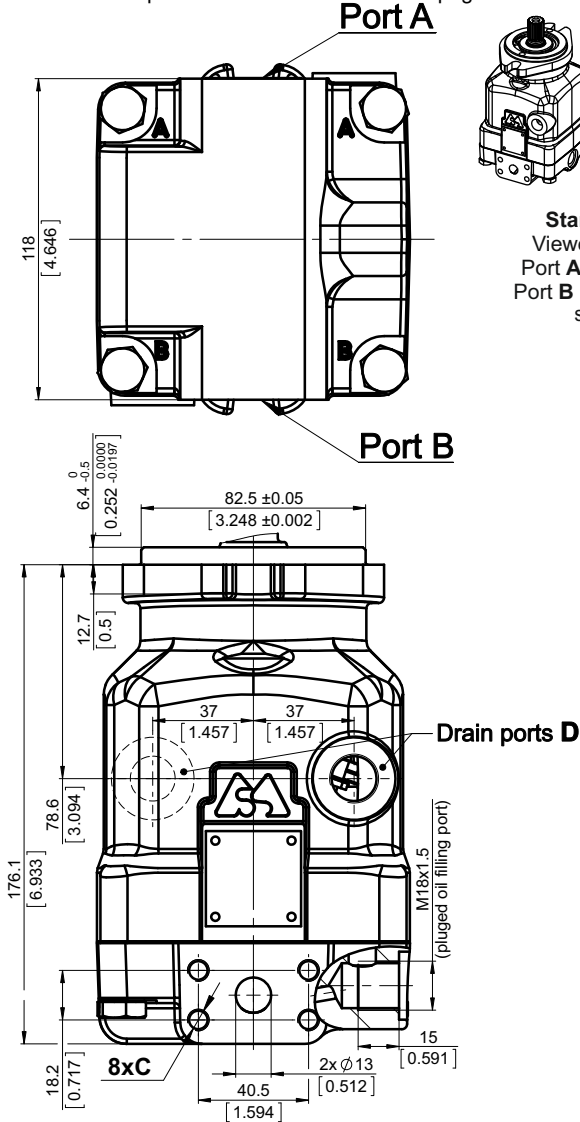
Side Ports - Default Mounting Flange - Type SAE-A

Side ports, port size default and 5

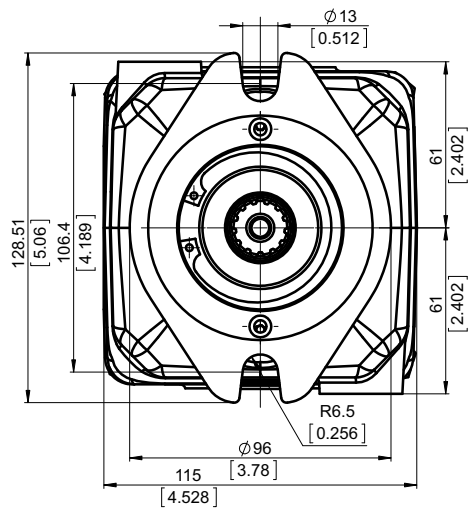
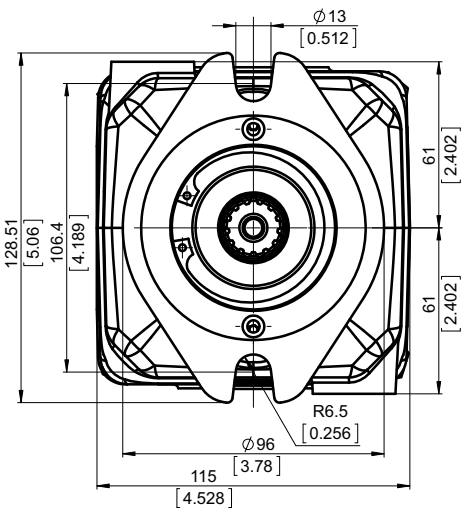
See the port sizes at the bottom of this page

Side ports, port size 2, 3 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(A,B)	2xISO 6162-2 DN13	2xSAE J518 1/2 PSI6000
D	M18x1,5	3/4-16 UNF
C	M8-6H	5/16-18 UNC-2B

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



Overall Dimensions and Ports

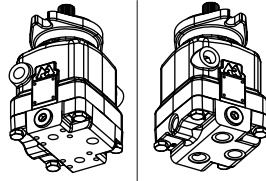
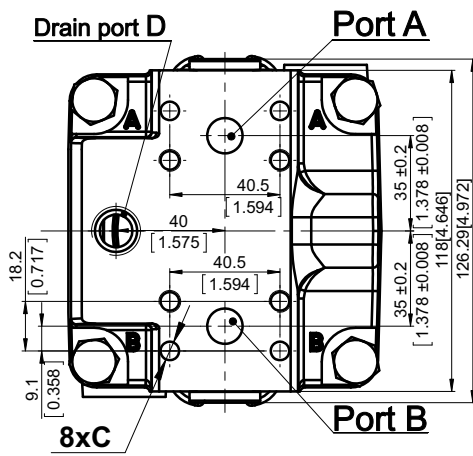
Rear Ports - Type E Mounting Flange - Type SAE-A

Rear ports E, port size default and 5

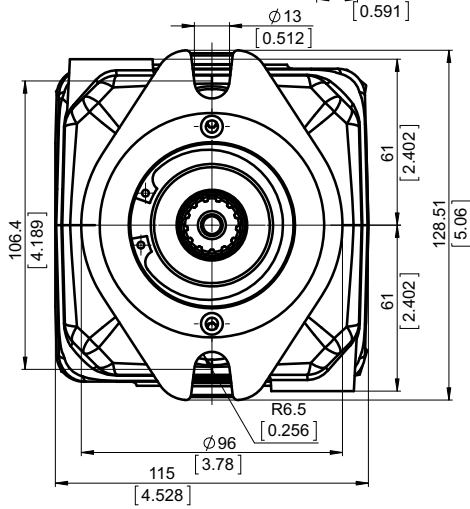
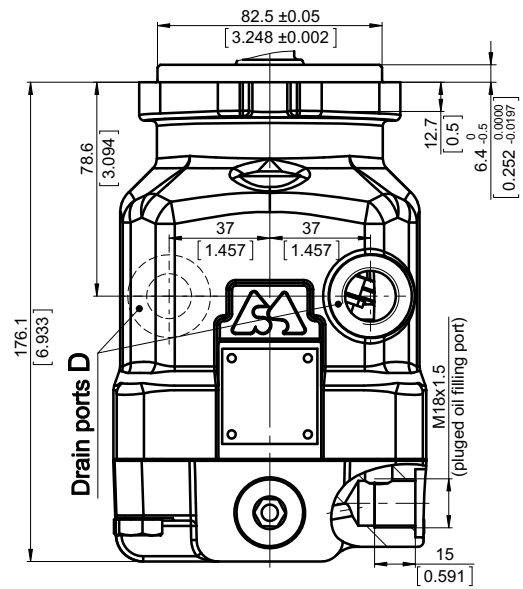
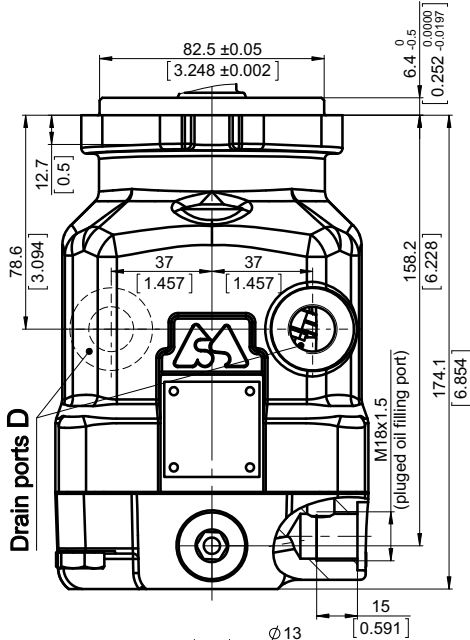
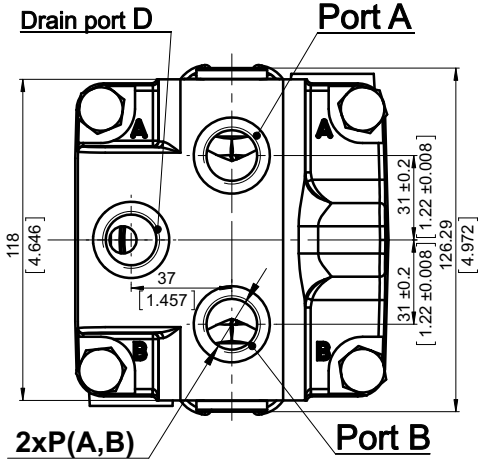
See the port sizes at the bottom of this page

Rear ports E, port size 2,3,4

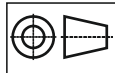
See the port sizes at the bottom of this page



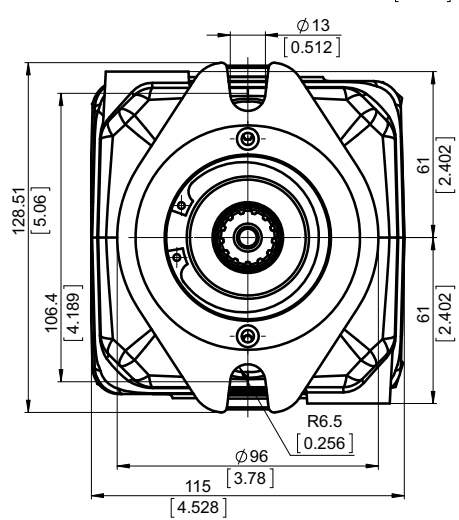
Standard Rotation
Viewed from shaft end
Port A Pressurized - CW
Port B Pressurized - CCW
see page 58



Shaft Mounting
see the next page



mm [in]



	Port Size	
	default	5
P _(A,B)	2xISO 6162-2 DN13	2xSAE J518 1/2 PSI6000
D	M18x1,5	3/4-16 UNF
C	M8-6H	5/16-18 UNC-2B

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

GUIDE

MAP28

MAP50

MAP100

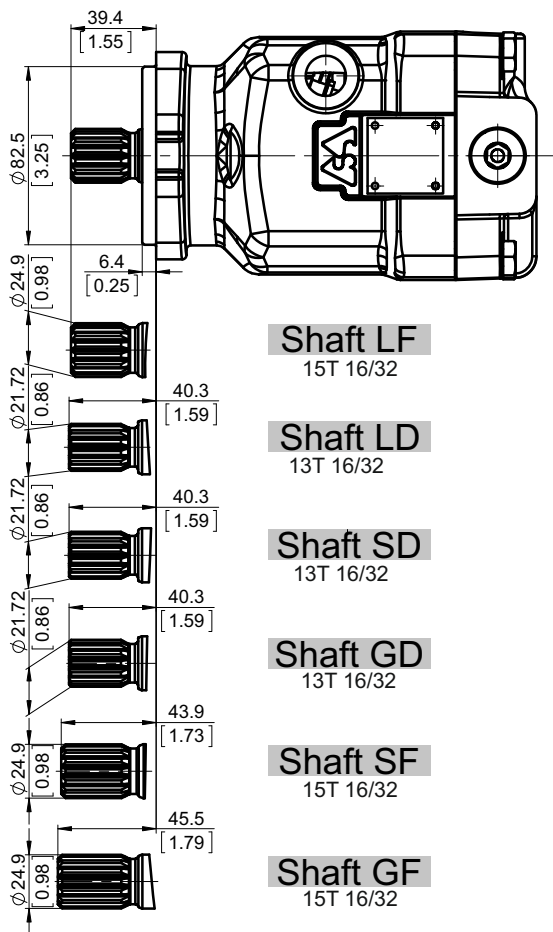
PAP50

SHAFT

INFO



Shafts Mounting
Mounting Flange - Type SAE-A



Shaft LF

15T 16/32

Shaft LD

13T 16/32

Shaft SD

13T 16/32

Shaft GD

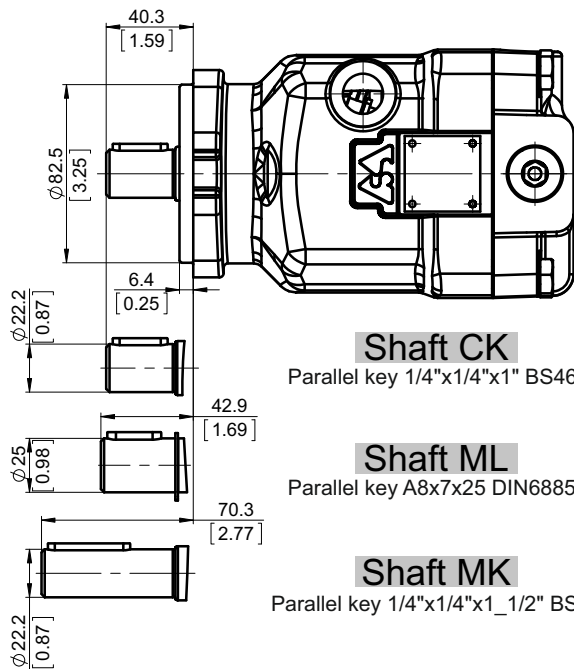
13T 16/32

Shaft SF

15T 16/32

Shaft GF

15T 16/32



Shaft CK

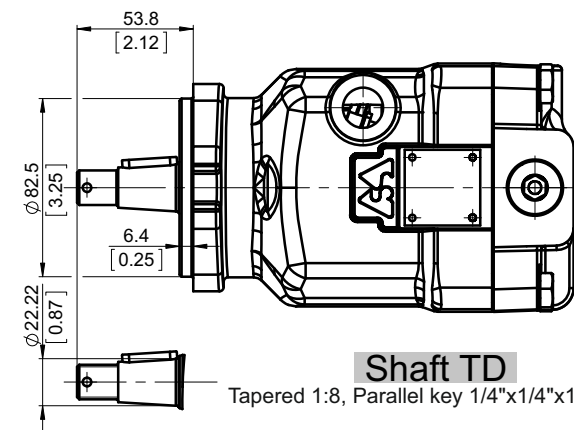
Parallel key 1/4"x1/4"x1" BS46

Shaft ML

Parallel key A8x7x25 DIN6885

Shaft MK

Parallel key 1/4"x1/4"x1_1/2" BS46



Shaft TD

Tapered 1:8, Parallel key 1/4"x1/4"x1"

Shaft Dimensions
See Page 52+57

PERMISSIBLE SHAFT LOAD

Permissible shaft load		
max Axial	N[lb]	Fa=1300 [292]
max Radial	N[lb]	Fr=2200 [495]

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

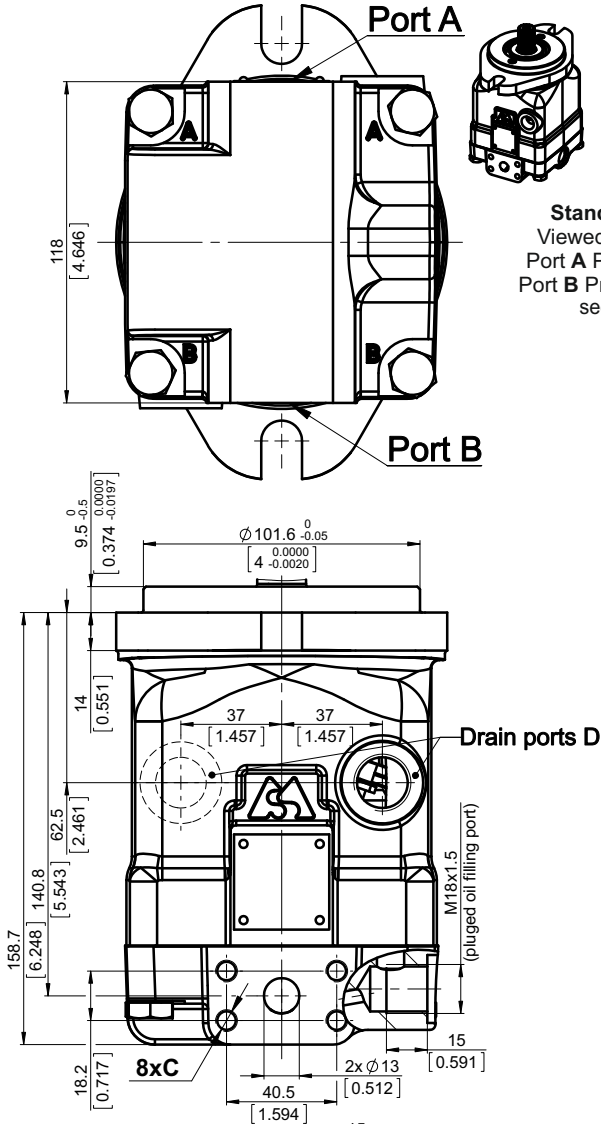
Side Ports - Default Mounting Flange - Type SAE-B

Side ports, port size default and 5

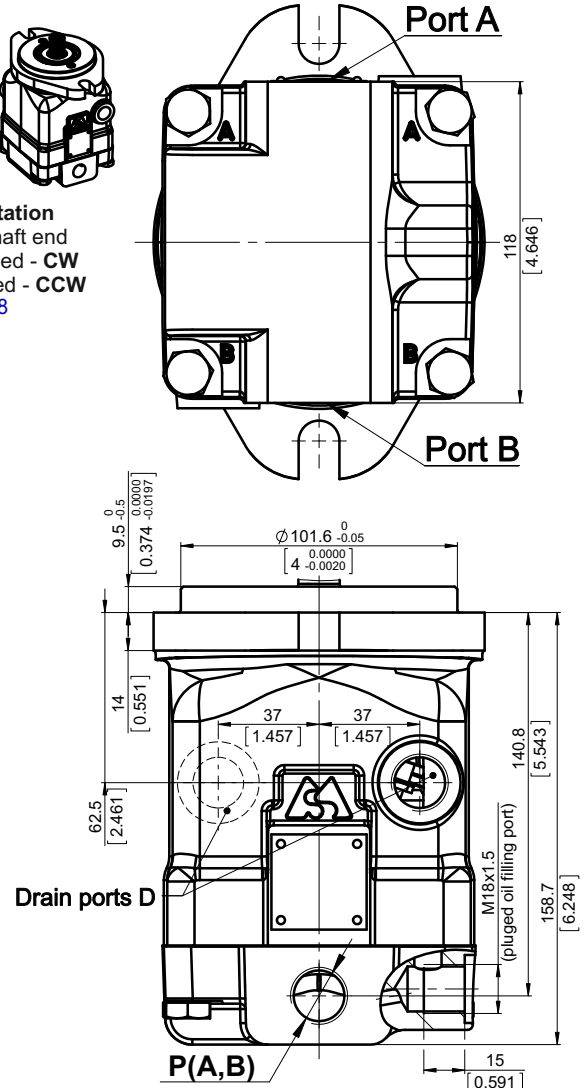
See the port sizes at the bottom of this page

Side ports, port size 2, 3 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(A,B)	2xISO 6162-2 DN13	2xSAE J518 1/2 PSI6000
D	M18x1,5	3/4-16 UNF
C	M8-6H	5/16-18 UNC-2B

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



Overall Dimensions and Ports

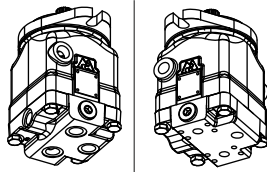
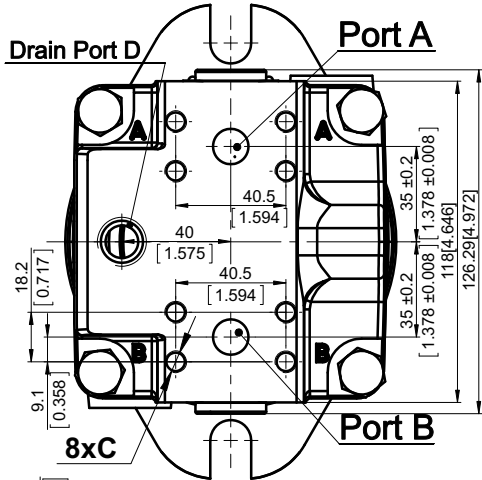
Rear Ports - Type E Mounting Flange - Type SAE-B

Rear ports E, port size default and 5

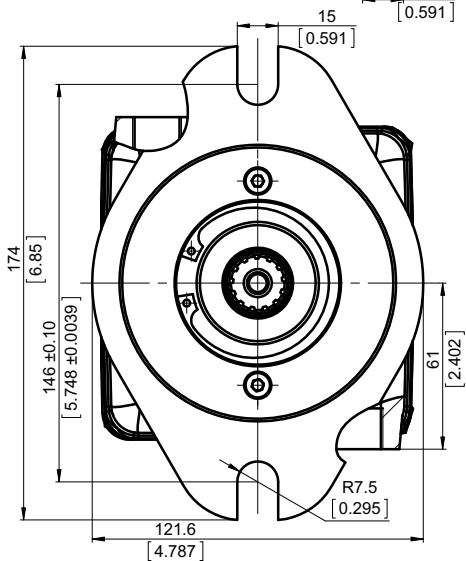
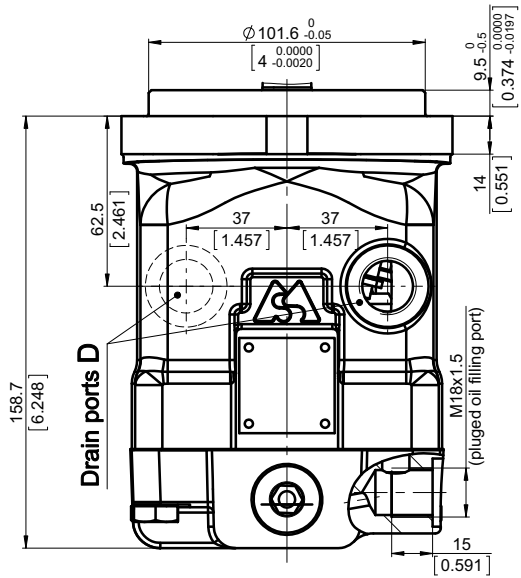
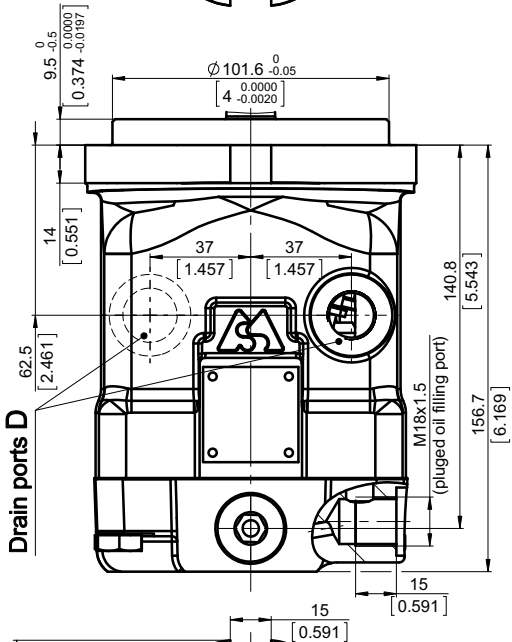
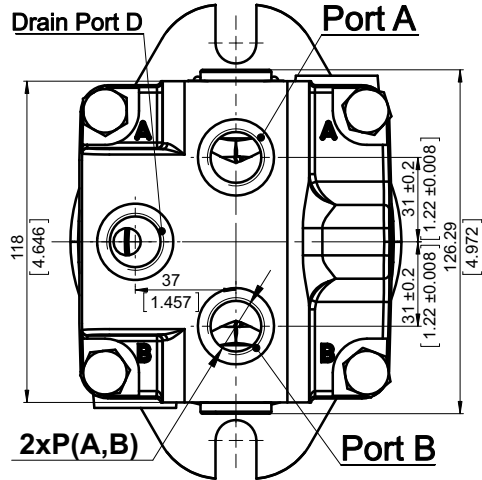
See the port sizes at the bottom of this page

Rear ports E, port size 2,3,4

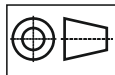
See the port sizes at the bottom of this page



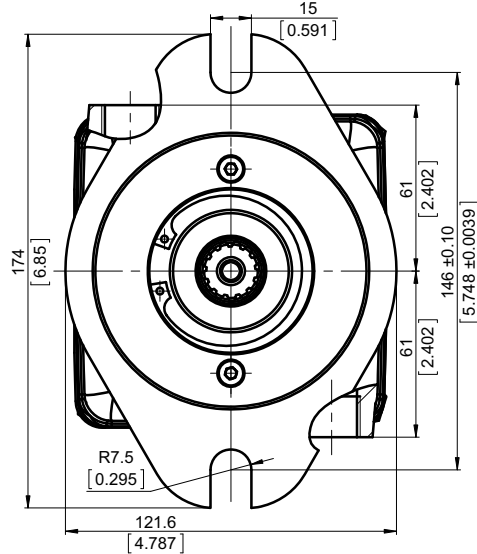
Standard Rotation
Viewed from shaft end
Port A Pressurized - CW
Port B Pressurized - CCW
see page 58



Shaft Mounting
see the next page



mm [in]

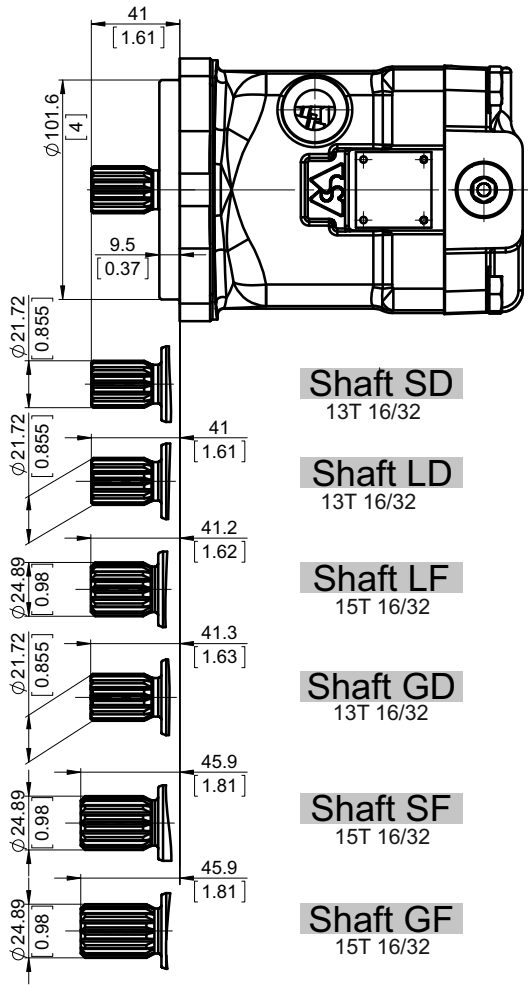


	Port Size	
	default	5
P _(A,B)	2xISO 6162-2 DN13	2xSAE J518 1/2 PSI6000
D	M18x1,5	3/4-16 UNF
C	M8-6H	5/16-18 UNC-2B

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



Shafts Mounting
Mounting Flange - Type SAE-B



Shaft SD
13T 16/32

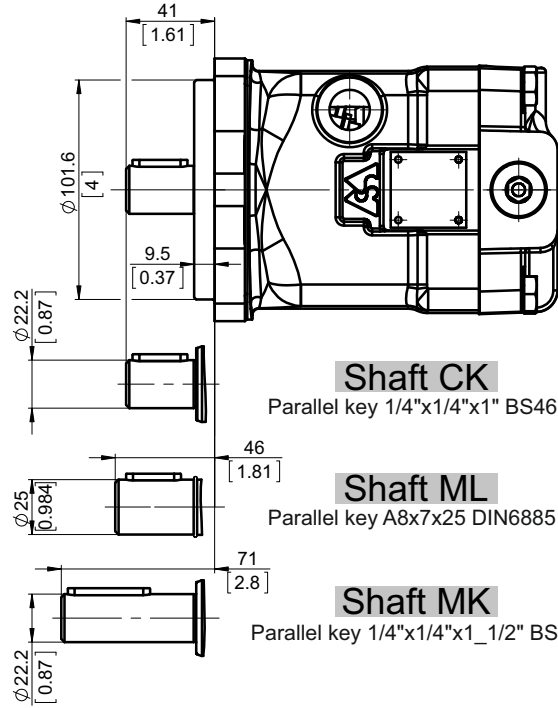
Shaft LD
13T 16/32

Shaft LF
15T 16/32

Shaft GD
13T 16/32

Shaft SF
15T 16/32

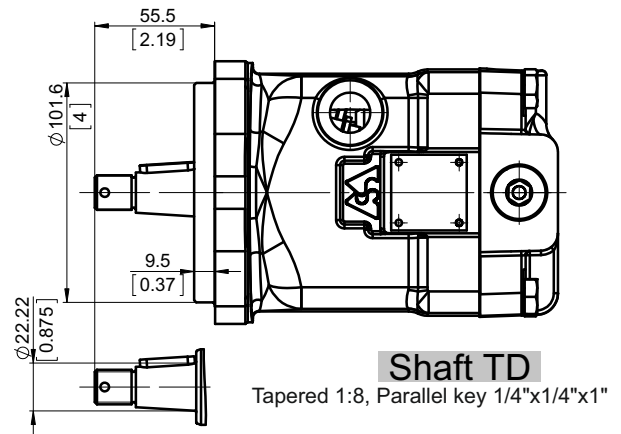
Shaft GF
15T 16/32



Shaft CK
Parallel key 1/4"x1/4"x1" BS46

Shaft ML
Parallel key A8x7x25 DIN6885

Shaft MK
Parallel key 1/4"x1/4"x1_1/2" BS46



Shaft TD
Tapered 1:8, Parallel key 1/4"x1/4"x1"

Shaft Dimensions
See Page 52+57

PERMISSIBLE SHAFT LOAD

Permissible shaft load		
max Axial	N[lb]	Fa=1300 [292]
max Radial	N[lb]	Fr=2200 [495]

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
M A P													[]

GUIDE

MAP28

MAP50

MAP100

PAP50

SHAFT

INFO

Pos.1 - Mounting Flange

- A** - 2-Bolt flange, SAE A, spigot dia. 82,5[3.25"], BC 106,35 [4.19"], Bolt Dia. 13.5 [0.53"]
- B** - 2-Bolt flange, SAE B, spigot dia. 101.6[4"], BC 146 [5.748"], Bolt Dia. 14.3 [0.563"]

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

- 22** - 22.15 cm.³/rev. [1.35 in.³/rev.]
- 28** - 28.47 cm.³/rev. [1.74 in.³/rev.]

Pos.4 - Shaft Extensions**

- SD** - ø21,72 [0.855"] Spline SAE 13T 16/32 DP, M8-6H thread
- 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 thread
- GF** - ø24.9 [0.98"] Spline SAE 15T 16/32, 3/8-16UNC-2B thread
- LF** - ø24.9 [0.98"] Spline SAE 15T 16/32 DP, 1/4-20UNC-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
- TD** - ø22.22 [7/8"] Tapered 1:8 [125:1000], Parallel key 1/4"x1/4"x1", 5/8-18 UNF-2A

Pos.5 - Port Size

- omit - 2xISO 6162-2 DN13, metric, M18x1,5-6H
- 2** - 2xG1/2, drain ports G1/2
- 3** - 2xM22x2, drain ports M22x2-6H
- 4** - 2x7/8-14 UNF Ports, drain ports 3/4-16 UNF
- 5** - 2xSAE 1/2" PSI6000, drain 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

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

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

Pos.8 - Valve Ports 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 colors - on customer's request.

Pos.12 - Special Unit

- omit - None

Pos.13 - Design Series

- omit - Factory specified

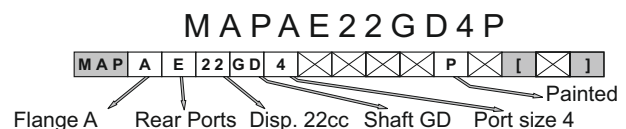
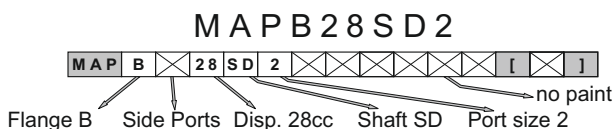
*Available on enquiry

**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

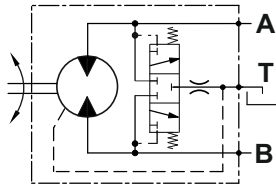




Valve Options

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)** - 3 ÷ 7 lit/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

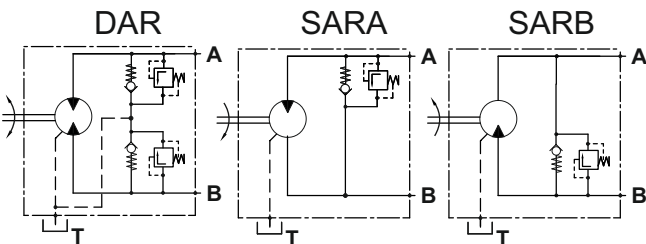
EXAMPLE

M A P B 2 8 S D 2 P U purge valve flow rate 5±2 lit/min
M A P B 2 8 S D 2 P U L 3 . 5 purge valve flow rate 3.5±1 lit/min
M A P B 2 8 S D 2 P U L 5 . 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

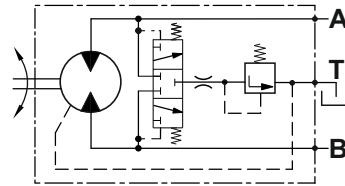
EXAMPLE

M A P B 2 8 S D 2 D A R 3 5 0
Double Anti-Cavitation and Relief Valve, relief valve setting 350 bar

M A P B 2 8 S D 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 2 8 S D 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)** - 3 ÷ 7 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	L3.5	L5.5
------	------	------

 → flow rate

EXAMPLE

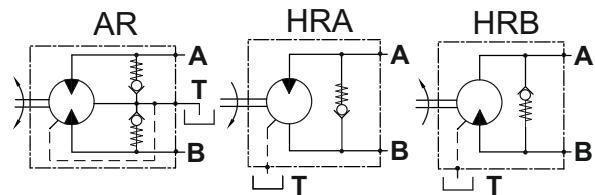
M A P B 2 8 S D 2 F L U flow rate 5±2 lit/min,
charge pressure 16 bar

M A P B 2 8 S D 2 F L U 1 0 L 5 . 5 flow rate 5.5±1 lit/min,
charge pressure 10 bar

M A P B 2 8 S D 2 F L U L 3 . 5 flow rate 3.5±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

M A P B 2 8 S D 2 A R
Double Anti-Cavitation Valve

M A P B 2 8 S D 2 H R A
Single Anti-Cavitation Valve, the valve is placed on port A

M A P B 2 8 S D 2 H R B
Single Anti-Cavitation Valve, the valve is placed on port B

GUIDE

MAP28

MAP50

MAP100

PAP50

SHAFT

INFO