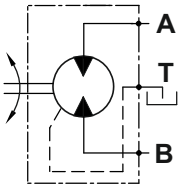
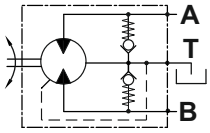
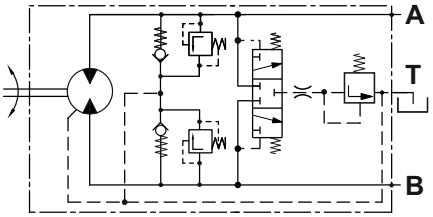
Hydraulic Motors Type MAP100

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

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

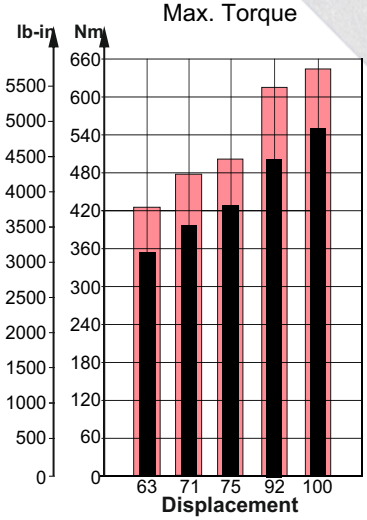
ADVANTAGES

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

GENERAL

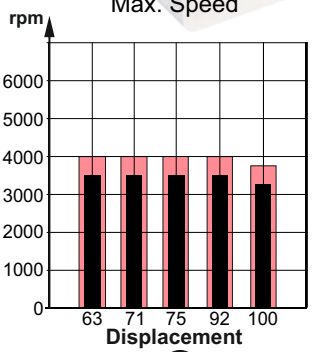
Displacement,	cm^3/rev [in^3/rev]	**63.58÷98.75 [3.88÷6.03]**
Max. Speed,	RPM	**3500**
Max. Torque,	Nm [lb-in]	**550 [4870]**
Max. Output,	kW [HP]	**130 [174]**
Max. Pressure Drop,	bar [PSI]	**350 [5080]**
Max. Oil Flow,	l/min [GPM]	**326 [86.1]**
Min. Speed,	RPM	**500**
Fluid		**Mineral based- HLP(DIN 51524) or HM(ISO 6743/4)**
Temperature Range,	°C [°F]	**-40÷82 [-40÷180]**
Optimal Viscosity Range,	mm^2/s [SUS]	**12÷68 [66÷311]**
Filtration		**ISO code 18/16/13 (Min. recommended fluid filtration of 10 micron)**

Max. Torque

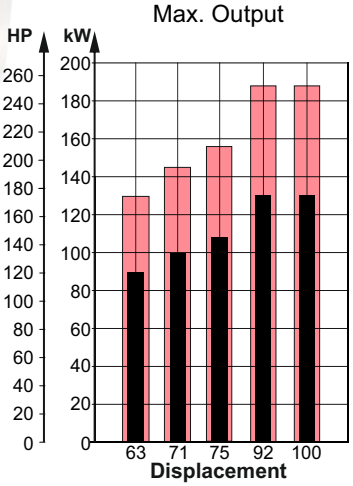


Intermittent values | Continuous values

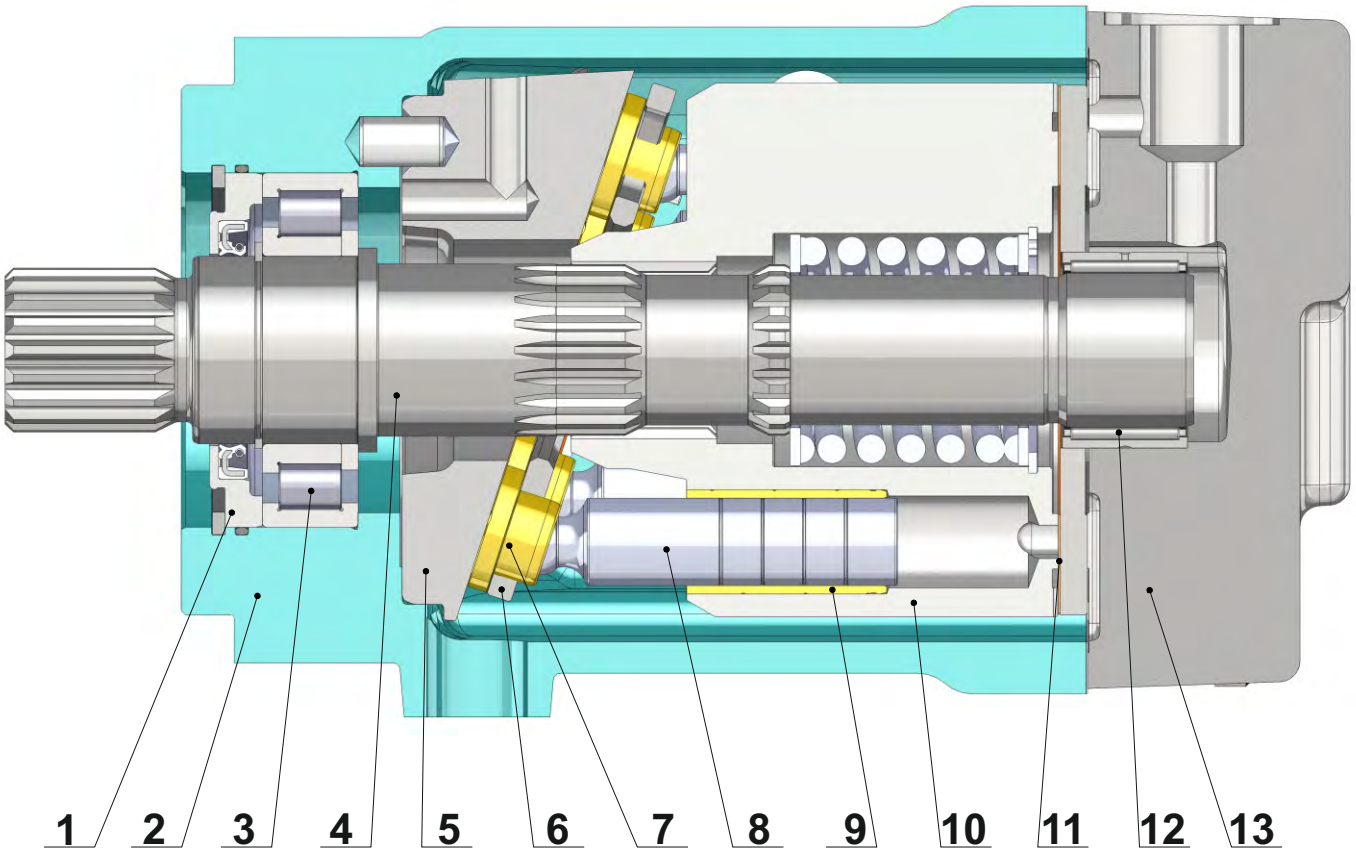
Max. Speed



Max. Output



SECTION VIEW



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

The main advantages of the heavy duty design of the MAP motors over the typical swash plate motors are the higher starting torque and the higher total efficiency. In regards to these two parameters, under normal working mode, the MAP is comparable to the bent axis motors. The advantages of the MAP over the bent axis motors are the higher reliability and the lower degree of pulsation and vibration during operation.

SPECIFICATION DATA

Type		MAP 63	MAP 71	MAP 75	MAP 92	MAP 100
Displacement, cm^3/rev [in^3/rev]		63.58 [3.88]	71.5 [4.36]	76.84 [4.69]	93.18 [5.69]	98.75 [6.03]
Max. Speed, [RPM]	Cont.	3500	3500	3500	3500	3240
	Int.*	4000	4000	4000	4000	3750
Max. Torque,*** Nm [lb-in]	Cont.	354 [3133]	398 [3523]	428 [3788]	514 [4549]	550 [4870]
	Int.**	425 [3762]	478 [4230]	514 [4549]	616 [5452]	645 [5710]
Output, kW [HP]	Cont.	89 [120]	100 [134]	108 [145]	130 [174]	130 [174]
	Int.**	129 [173]	145 [195]	156 [209]	188 [252]	188 [252]
Max. Pressure, bar [PSI]	Cont.	350 [5080]	350 [5080]	350 [5080]	350 [5080]	350 [5080]
	Int.**	420 [6100]	420 [6100]	420 [6100]	420 [6100]	410 [5950]
	Peak	450 [6527]	450 [6527]	450 [6527]	450 [6527]	450 [6527]
Max. Oil Flow, l/min [GPM]	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]
Torque Constant ***** Nm/bar [lb-in/PSI]		0.91 [0.56]	1.03 [0.63]	1.1 [0.67]	1.32 [0.81]	1.42 [0.87]
Speed Constants ***** RPM/(l/min) [RPM/GPM]		14.94 [56.56]	13.3 [50.3]	12.36 [46.8]	10.2 [38.6]	9.62 [36.42]
Permissible Shaft Load max Axial**** N[lb]		Fa=2500 [562]				
max Radial**** N[lb]		Fr=4500 [1010]				
Min. Speed, [RPM]		500				
Max. Pressure in Drain Line, bar [PSI]		5 [70] open drain line is always required				
Weight, kg [lb]		34.3 [75.62] for SAE-**4C** flange; 35.3 [77.82] for SAE-**4M** flange				

Peak pressure is the 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 η_v=0.95 and η_{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 84.
5. Recommended maximum system operating temperature - 82°[180°] C[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.

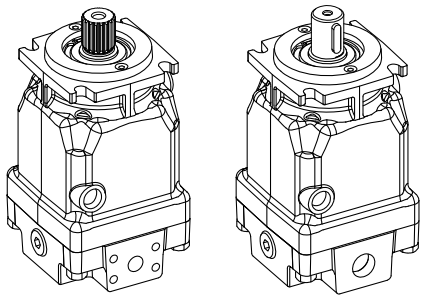
Hint: Motor Torque = Torque Constant * Pressure Drop **Rotation Speed = Speed Constant * Oil Flow**

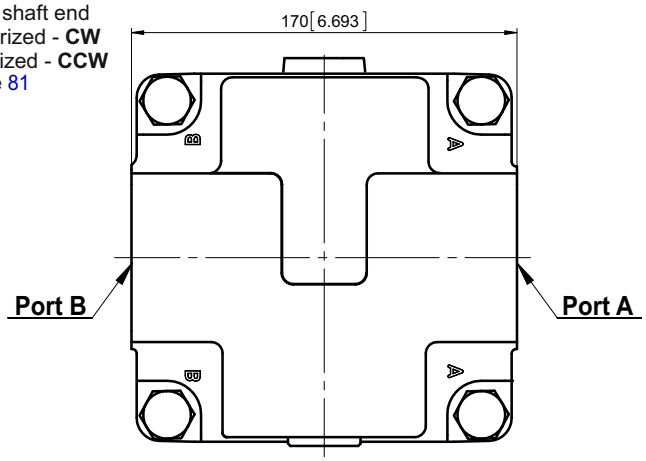
The constant values are approximate. Motor torque and rotation speed for a particular project are depending on the real operating conditions. For more detailed calculations please see efficiencies on page 74 and formulas on page 85.

OVERALL DIMENSIONS AND PORTS

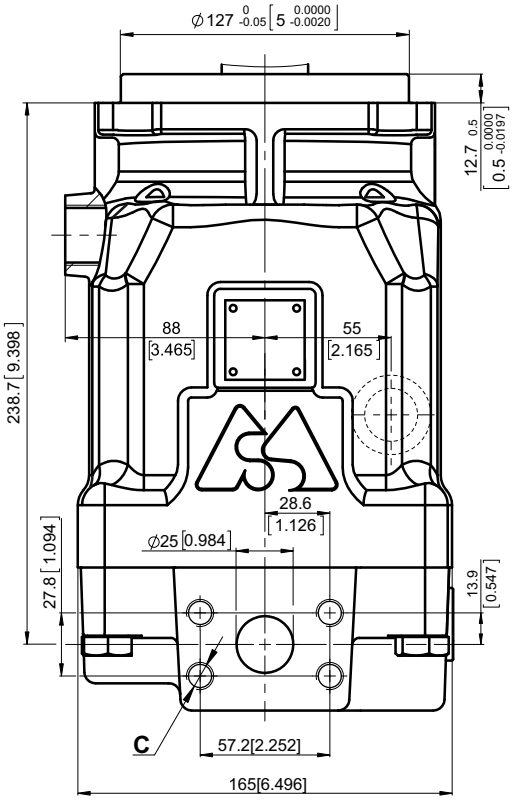
Side Ports - **Default** Mounting Flange - Type **SAE-4C**

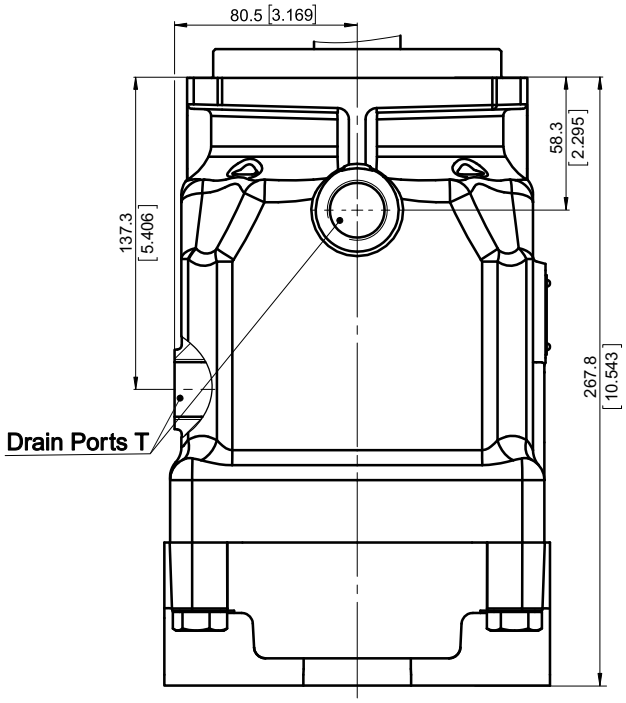
Standard Rotation
Viewed from shaft end
Port **A** Pressurized - **CW**
Port **B** Pressurized - **CCW**
see page 81



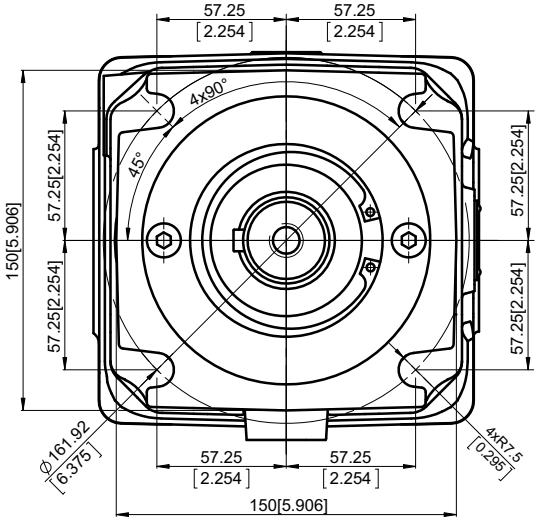


Side ports, port size **default,5** and **9**

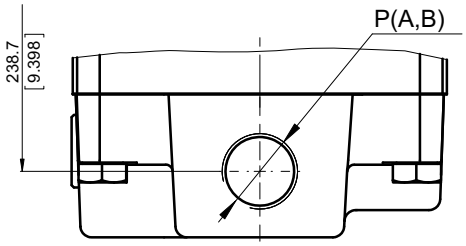




	Port Size		
	default	5	9
$P_{(A,B)}$	2xISO 6162-2 DN25	2xSAE J518 1" PSI6000	2xISO 6162-2 DN25
T	M27x2	1 1/16 -12 UN	G 3/4
C	8xM12	8x7/16-14 UNC	8xM12



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



	Port Size	
	2	4
$P_{(A,B)}$	2xG 1	2x1 5/16-12UN
T	G 3/4	1 1/16-12UN

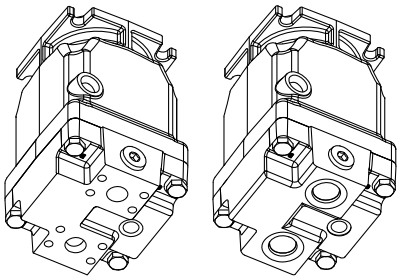
Shaft Mounting see page 38

mm [in]

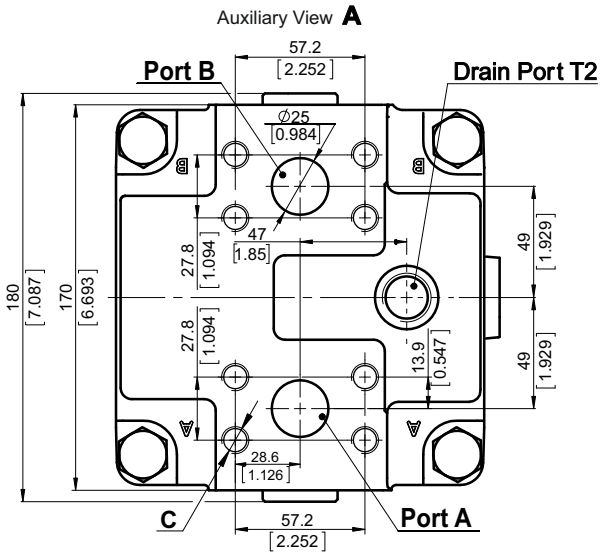
OVERALL DIMENSIONS AND PORTS

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

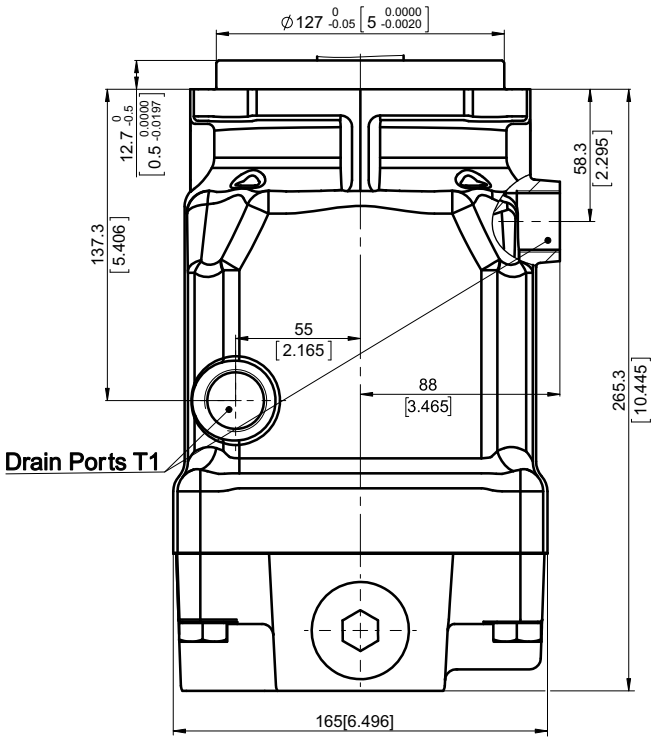
Standard Rotation
Viewed from shaft end
Port **A** Pressurized - **CW**
Port **B** Pressurized - **CCW**
see page 81



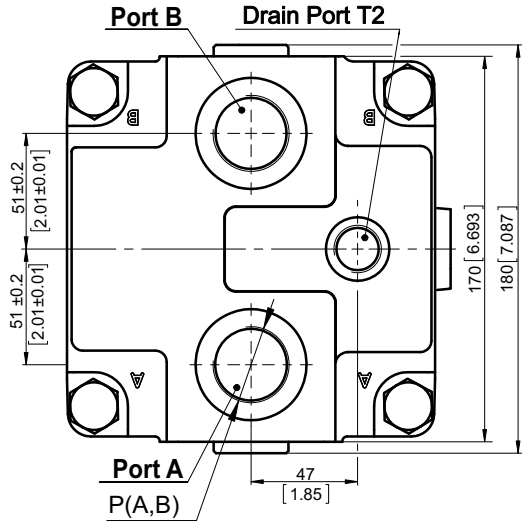
Rear ports, port size **default,5** and **9**



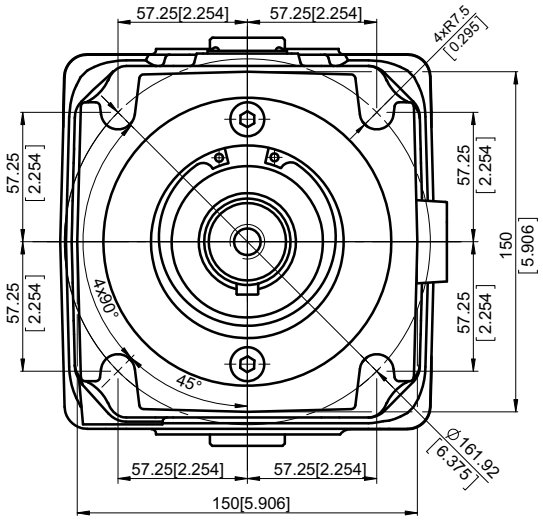
	Port Size		
	default	5	9
$P_{(A,B)}$	2xISO 6162-2 DN25	2xSAE J518 1" PSI6000	2xISO 6162-2 DN25
T1	M27x2	1 1/16 -12 UN	G 3/4
T2	M22x1.5	7/8-14 UNF	G 1/2
C	8xM12	8x7/16-14 UNC	8xM12



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



	Port Size	
	2	4
$P_{(A,B)}$	2xG 1	2x1 5/16-12UN
T1	G 3/4	1 1/16-12UN
T2	G 1/2	7/8 - 14 UNF

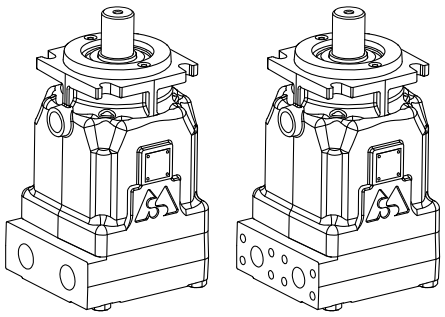


Shaft Mounting see page 38

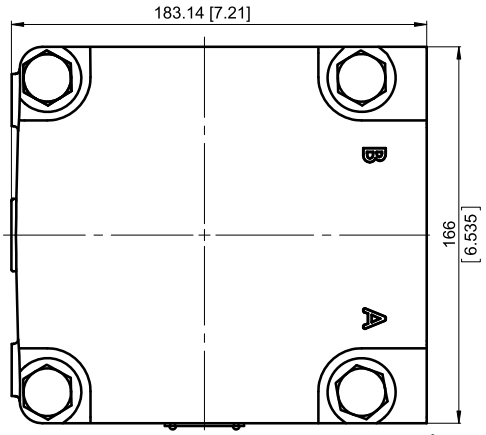
mm [in]

OVERALL DIMENSIONS AND PORTS

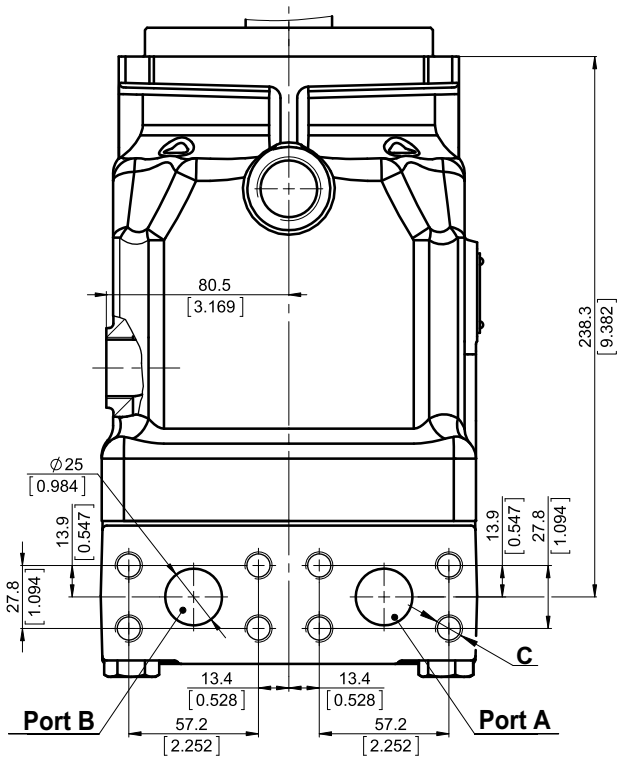
Twin Side Ports - Type **T** Mounting Flange - Type **SAE-4C**

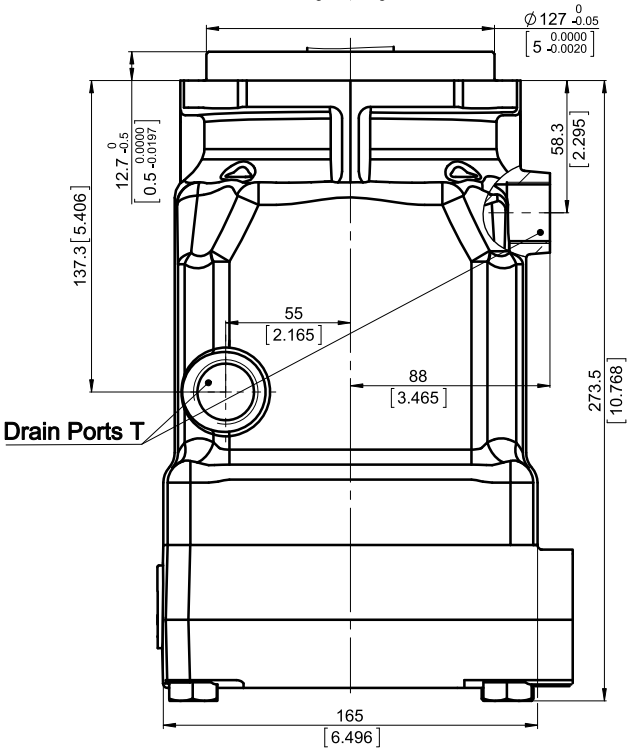


Standard Rotation
Viewed from shaft end
Port **A** Pressurized - **CW**
Port **B** Pressurized - **CCW**
see page 81

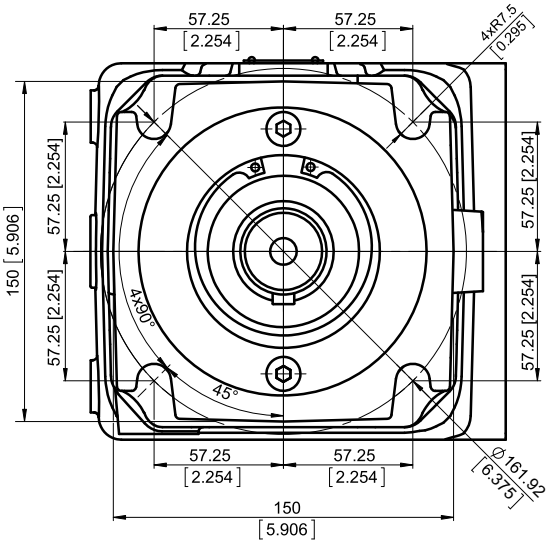


Twin side ports, port size **default**,**5** and **9**

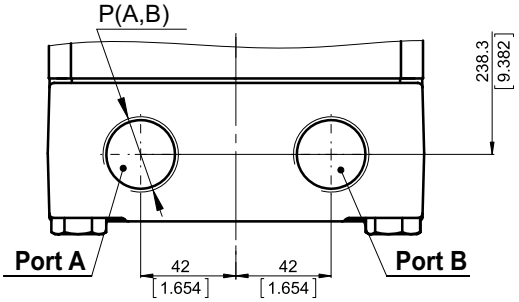




	Port Size		
	default	5	9
$P_{(A,B)}$	2xISO 6162-2 DN25	2xSAE J518 1" PSI6000	2xISO 6162-2 DN25
T	M27x2	1 1/16-12 UN	G 3/4
C	8xM12	8x7/16-14 UNC	8xM12



Twin side ports, port size **2** and **4**



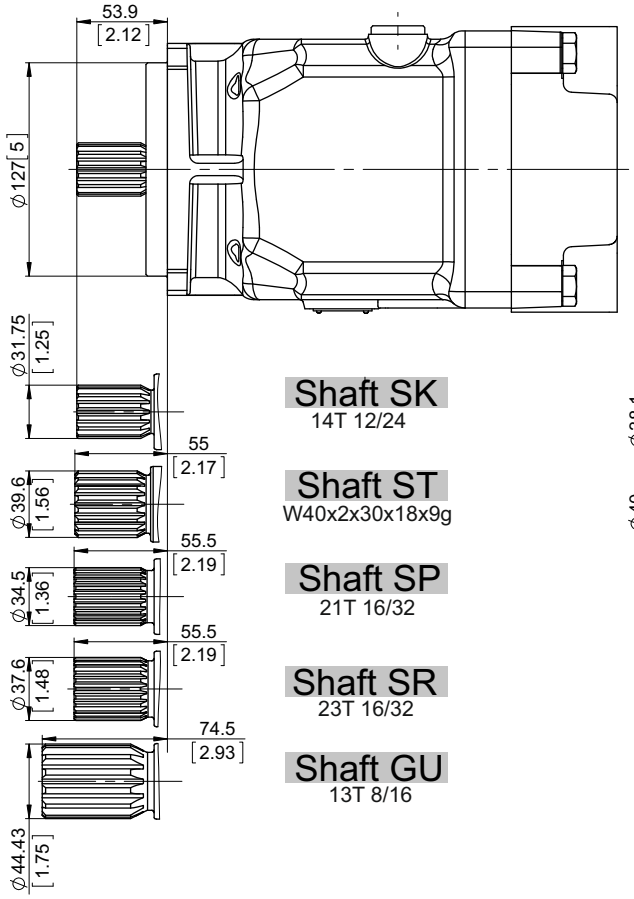
	Port Size	
	2	4
$P_{(A,B)}$	2xG 1	2x1 5/16-12UN
T	G 3/4	1 1/16-12UN

Shaft Mounting
see page 38

mm [in]

SHAFTS MOUNTING

Flange - Type **4C**



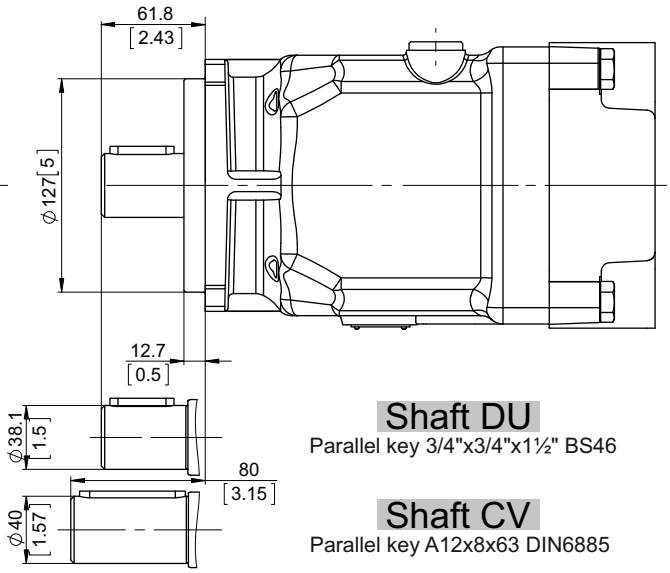
Shaft SK
14T 12/24

Shaft ST
W40x2x30x18x9g

Shaft SP
21T 16/32

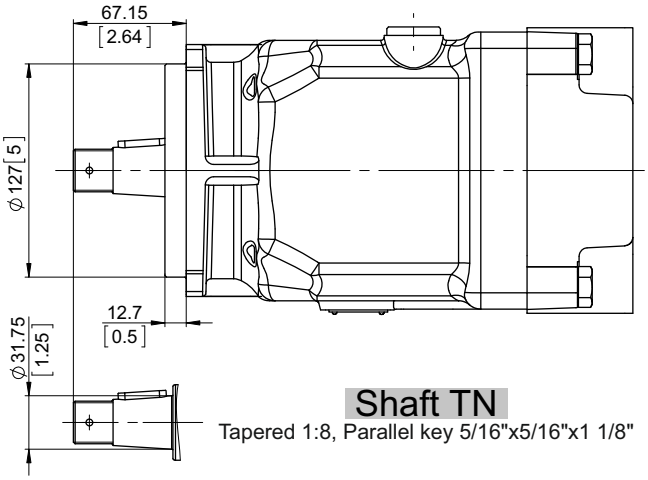
Shaft SR
23T 16/32

Shaft GU
13T 8/16



Shaft DU
Parallel key 3/4"x3/4"x1½" BS46

Shaft CV
Parallel key A12x8x63 DIN6885



Shaft TN
Tapered 1:8, Parallel key 5/16"x5/16"x1 1/8"

Shaft Dimensions
See Page 69÷73

PERMISSIBLE SHAFT LOAD

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

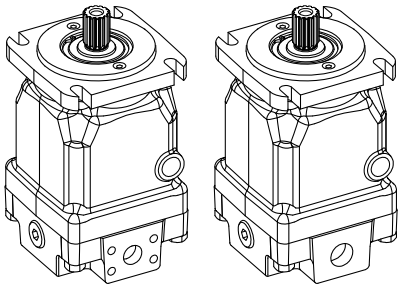
The calculated max values are based on the optimal direction of the forces Fr, Fa and optimal position of the shaft (see page 81).

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

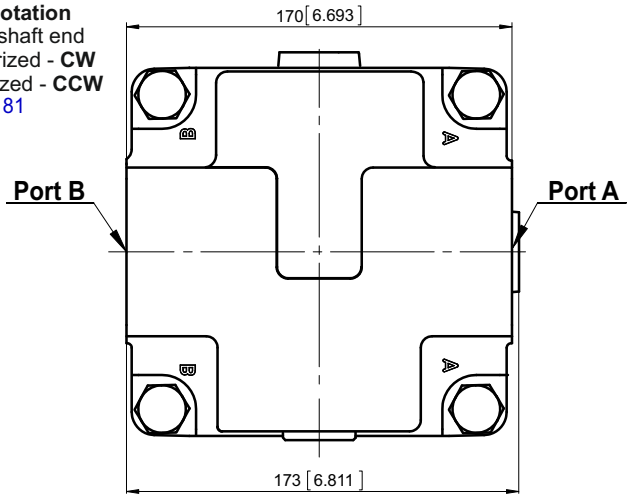
mm [in]

OVERALL DIMENSIONS AND PORTS

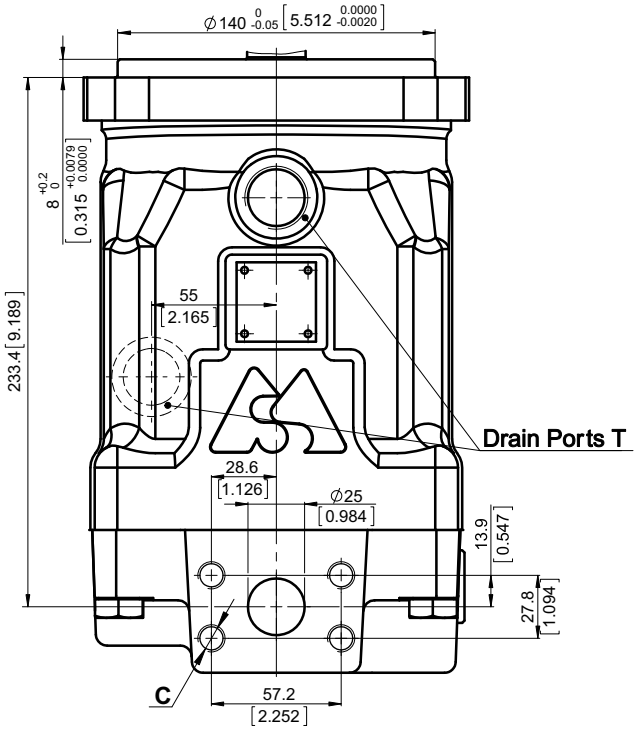
Side Ports - **Default** Mounting Flange - Type **SAE-4M**

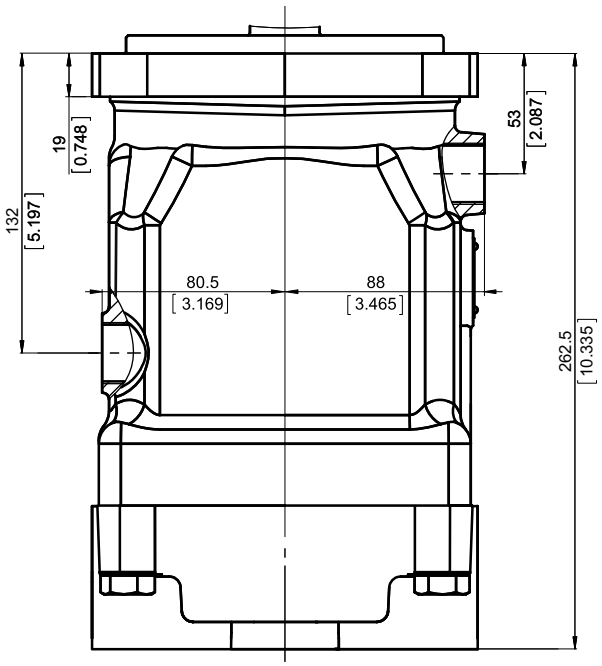


Standard Rotation
Viewed from shaft end
Port **A** Pressurized - **CW**
Port **B** Pressurized - **CCW**
see page 81

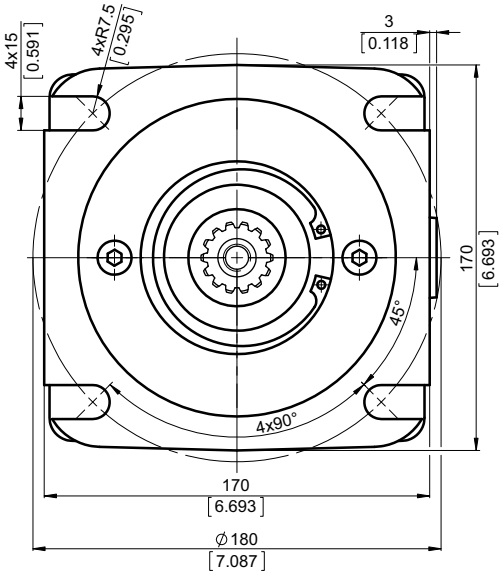


Side ports, port size **default,5** and **9**

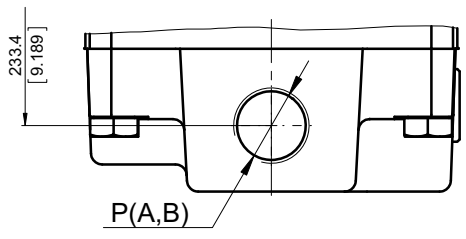




	Port Size		
	default	5	9
$P_{(A,B)}$	2xISO 6162-2 DN25	2xSAE J518 1" PSI6000	2xISO 6162-2 DN25
T	M27x2	1 1/16 -12 UN	G 3/4
C	8xM12	8x7/16-14 UNC	8xM12



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



	Port Size	
	2	4
$P_{(A,B)}$	2xG 1	2x1 5/16-12UN
T	G 3/4	1 1/16-12UN

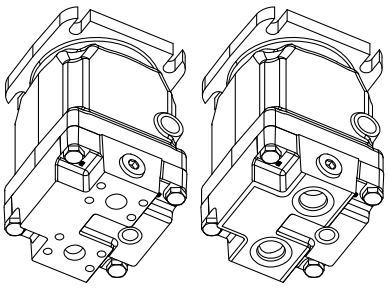
Shaft Mounting see page 42

mm [in]

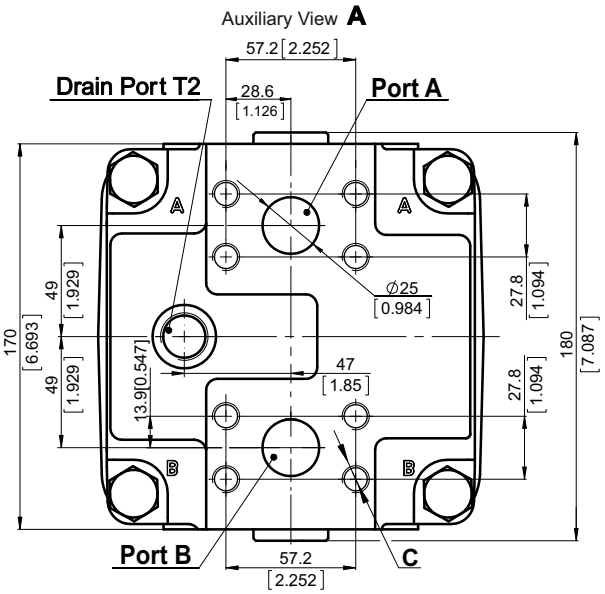
OVERALL DIMENSIONS AND PORTS

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

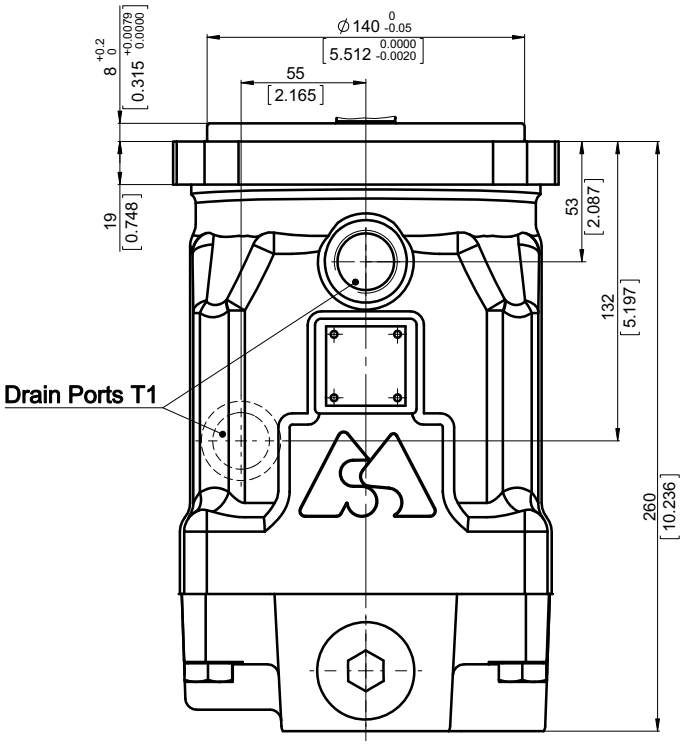
Standard Rotation
Viewed from shaft end
Port **A** Pressurized - **CW**
Port **B** Pressurized - **CCW**
see page 81



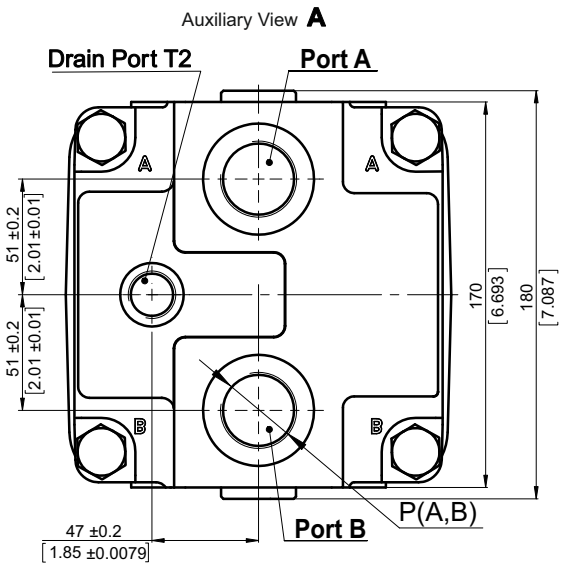
Rear ports, port size **default**,**5** and **9**

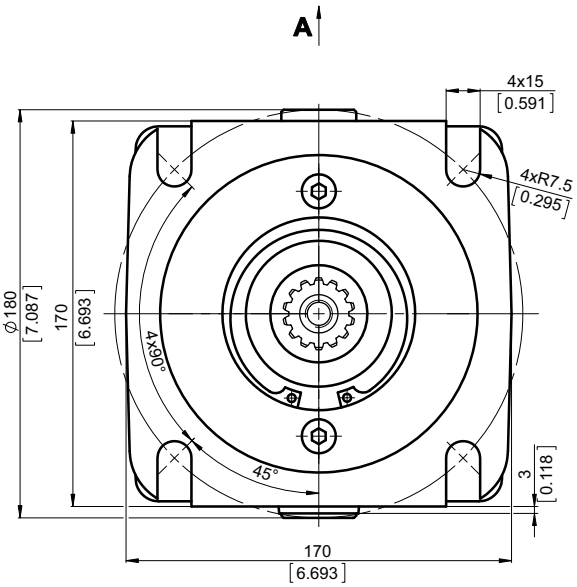


	Port Size		
	default	5	9
$P_{(A,B)}$	2xISO 6162-2 DN25	2xSAE J518 1" PSI6000	2xISO 6162-2 DN25
T1	M27x2	1 1/16 -12 UN	G 3/4
T2	M22x1.5	7/8-14 UNF	G 1/2
C	8xM12	8x7/16-14 UNC	8xM12



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





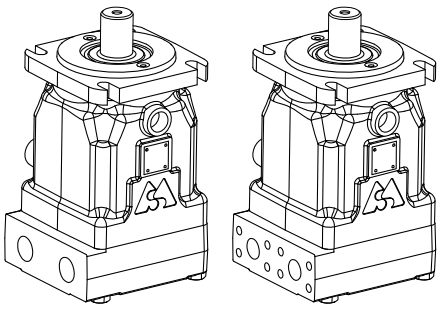
	Port Size	
	2	4
$P_{(A,B)}$	2xG 1	2x1 5/16-12UN
T1	G 3/4	1 1/16-12UN
T2	G 1/2	7/8 - 14 UNF

Shaft Mounting see page 42

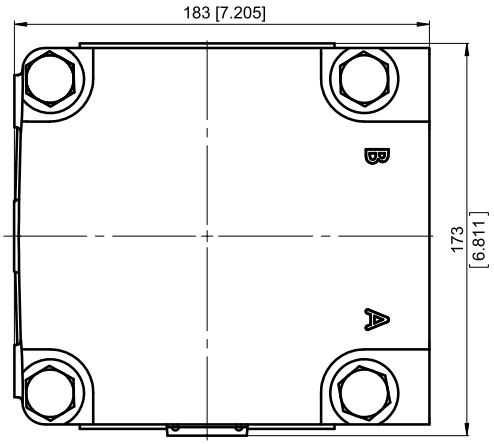
mm [in]

OVERALL DIMENSIONS AND PORTS

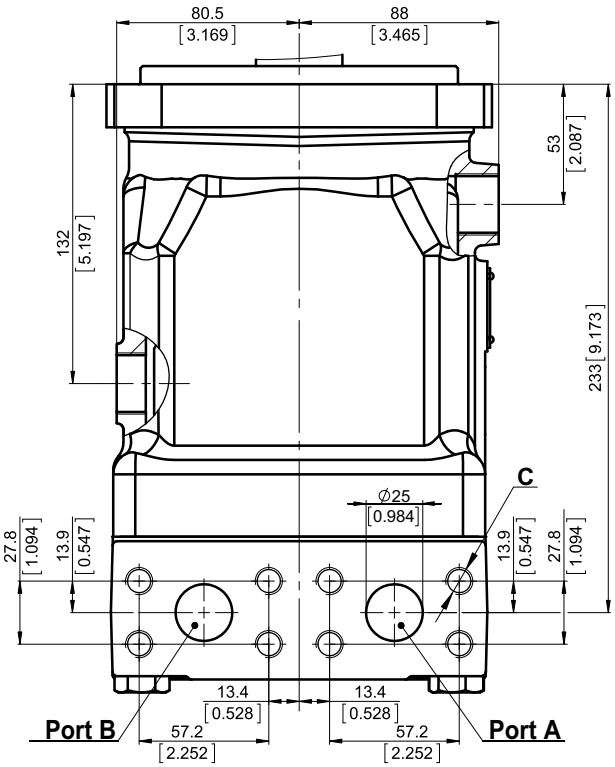
Twin Side Ports - Type **T** Mounting Flange - Type **SAE-4M**

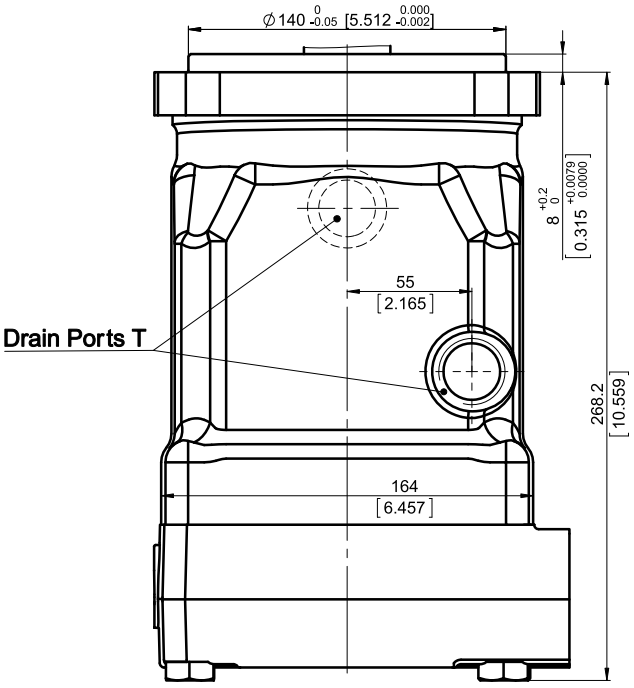


Standard Rotation
Viewed from shaft end
Port **A** Pressurized - **CW**
Port **B** Pressurized - **CCW**
see page 81

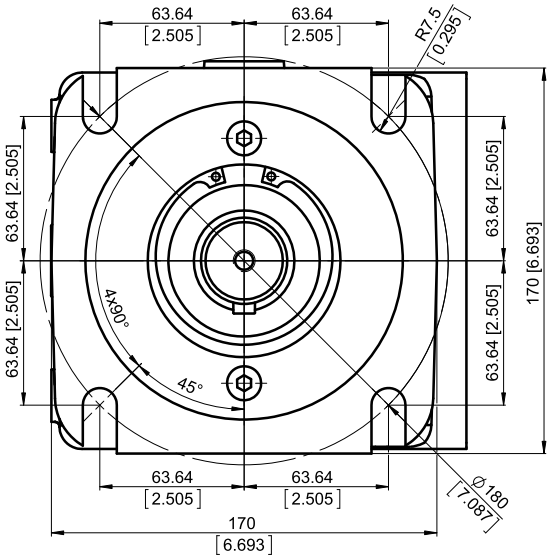


Twin side ports, port size **default,5** and **9**

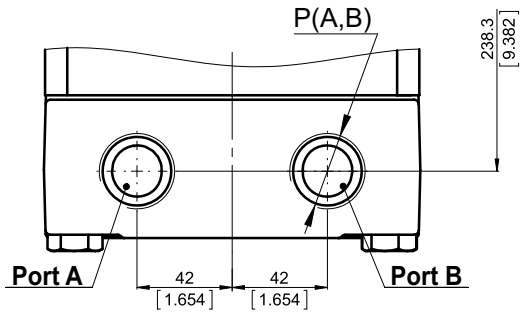




	Port Size		
	default	5	9
$P_{(A,B)}$	2xISO 6162-2 DN25	2xSAE J518 1" PSI6000	2xISO 6162-2 DN25
T	M27x2	1 1/16 -12 UN	G 3/4
C	8xM12	8x7/16-14 UNC	8xM12



Twin side ports, port size **2** and **4**



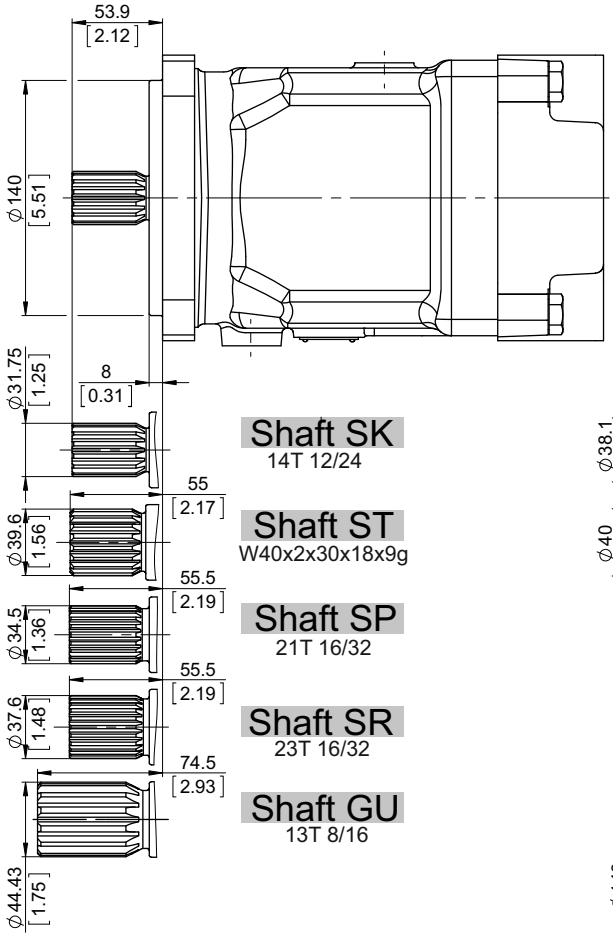
	Port Size	
	2	4
$P_{(A,B)}$	2xG 1	2x1 5/16-12UN
T	G 3/4	1 1/16-12UN

Shaft Mounting see page 42

mm [in]

SHAFTS MOUNTING

Flange - Type **4M**



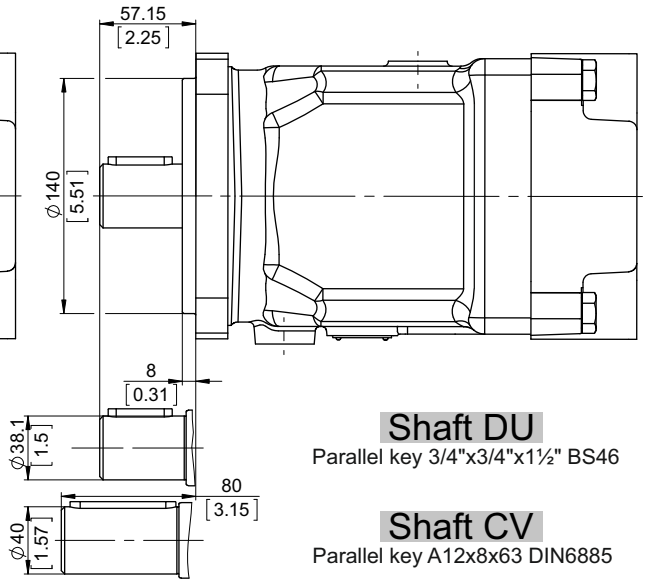
Shaft SK
14T 12/24

Shaft ST
W40x2x30x18x9g

Shaft SP
21T 16/32

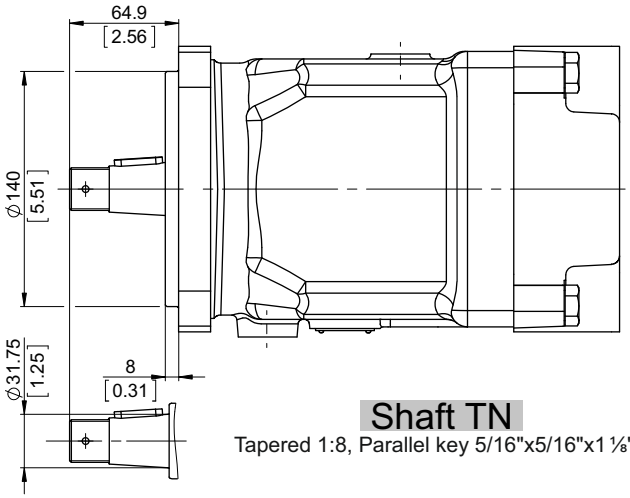
Shaft SR
23T 16/32

Shaft GU
13T 8/16



Shaft DU
Parallel key 3/4"x3/4"x1½" BS46

Shaft CV
Parallel key A12x8x63 DIN6885



Shaft TN
Tapered 1:8, Parallel key 5/16"x5/16"x1 ⅛"

Shaft Dimensions
See Page 69÷73

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 81).

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

mm [in]

ORDERING CODE

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

Pos.1 - Mounting Flange

4M - ISO3019-2 4-Bolt flange of spigot diam.140 [5.51"] - BC 180 [7.09"]

4C - SAE C - 4-Bolt flange spigot diam. 127 [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^3/rev [3.88 in^3/rev]

71 - 71.5 cm^3/rev [4.36 in^3/rev]

75 - 76.84 cm^3/rev [4.69 in^3/rev]

92 - 93.18 cm^3/rev [5.69 in^3/rev]

100 - 98.75 cm^3/rev [6.03 in^3/rev]

Pos.4 - Shaft Extensions**

SK - ø31.75 [1.25"] Spline SAE 14T 12/24 DP, M10

SP - ø34.5 [1.358"] Spline SAE 21T 16/32 DP, M12

SR - ø37.6 [1.48"] Spline SAE 23T 16/32 DP, M12

ST - ø40 [1.575"] Spline W40x2x30x18x9g DIN 5480, M12 thread

GU - ø43.71 [1.721"] Spline SAE 13T 8/16 DP, 3/8-16UNC

DU - ø38.1[1.5"] Straight, key 9.528[0.375"] L38.1[1.5"], 3/8-16 UNC thread

CV - ø40 [1.575"] Straight, M12 thread Parallel key A12x8x63 DIN6885

TN - ø31.75 [1.25"] Tapered 125:1000, key 7.94[5/16"] x7.94[5/16"] L28[1⅛"], 1-12 UNF

Pos.5 - Ports

omit - 2xISO 6162-2 DN25, drain ports M27x2, 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 1⅟₁₆ UNF for rear drain port 7/8-14 UNF

5 - 2xSAE 1", PSI6000, drain ports 1⅟₁₆ UNF for rear drain port 7/8-14 UNF

9 - 2xISO 6162-2 DN25, drain ports G3/4, for rear drain port G1/2

Pos.6 - Seal, Corrosion Resistant Seal Surface

omit - NBR seal type material

V - FKM seal type material

Pos.7 - Integrated Valves

See page 77÷78 for information about valves

omit - None

HR - Single anti-cavitation valve

AR - Dual anti-cavitation valve

PU - Purge valve - default - 7±2 l/min

FLU - Flush valve - default - 7±2 l/min at 20 bar

SAR - Single anti-cavitation and relief valve

DAR - Dual anti-cavitation and relief valve

DARP - Dual anti-cavitation, relief and purge valve, default flow - 7±2 l/min

DARF - Dual anti-cavitation, relief and flush valve, default flow - 7±2 l/min at 20 bar

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 - 250 | 300 | 350

for more information see page 77÷78

Pos.10 - Flow Setting of Integrated Valves

omit - None

Lx - For value - see page 77÷78

Pos.11 - Special Features*

omit - None

R2S - Speed Sensor Two Directional (see page 79)

R - Reverse Rotation (see page 81)

Pos.12 - Paint and Coating

omit - No paint or coating

P - Painted

PC - 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

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

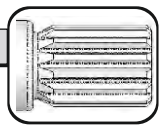
EXAMPLE

M A P 4 C E 1 0 0 S T 2

MAP	4C		100	ST	2							[		]
Flange 4C	Side Ports		Disp.100cc		Shaft ST						Port size 2			no paint

M A P 4 M E 9 2 G S 4 P

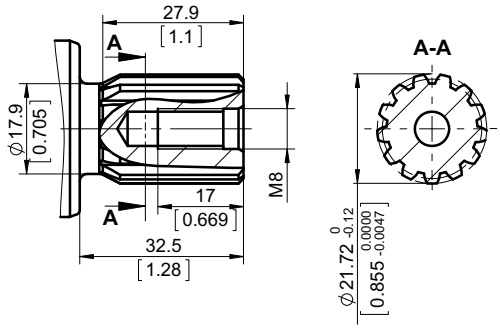
MAP	4M	E	92	GS	4							P	[		]
Flange 4M	Rear Ports		Disp. 92cc		Shaft GS						Port size 4			Painted	



SHAFT TYPES AND DIMENSIONS

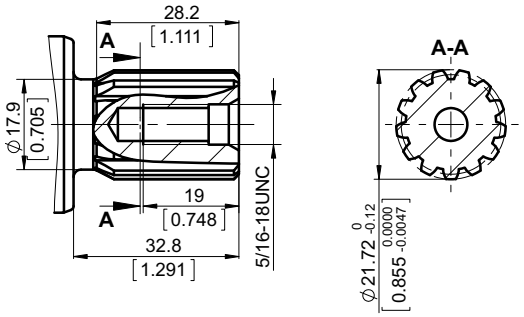
SD

ø21.72 [0.855], M8 thread
13T 16/32 DP splined ANSI B92.1-1970
Max. torque 220 Nm [1950 lb-in]



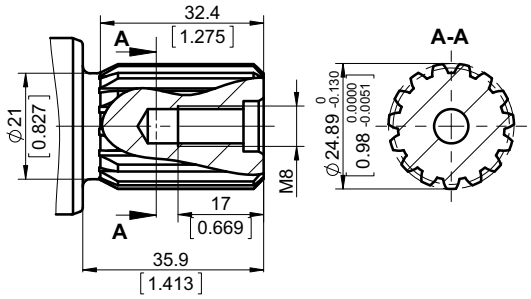
GD

ø21.72 [0.855], 5/16-18 UNC thread
13T 16/32 DP splined ANSI B92.1-1970
Max. torque 220 Nm [1950 lb-in]



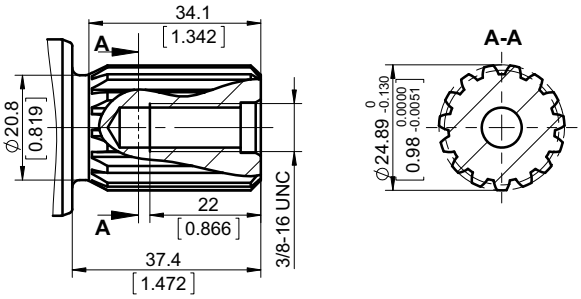
SF

ø24.89 [0.98], M8 thread
15T 16/32 DP splined ANSI B92.1-1970
Max. torque 360 Nm [3180 lb-in]



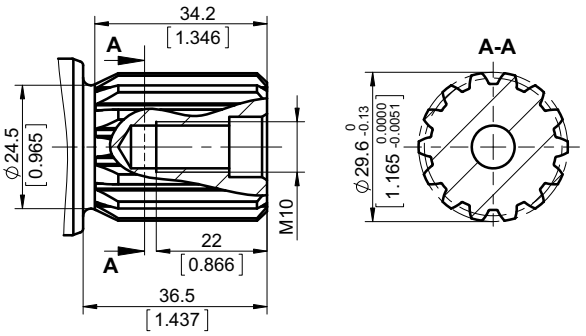
GF

ø24.89 [0.98], 3/8-16 UNC thread
15T 16/32 DP splined ANSI B92.1-1970
Max. torque 360 Nm [3180 lb-in]



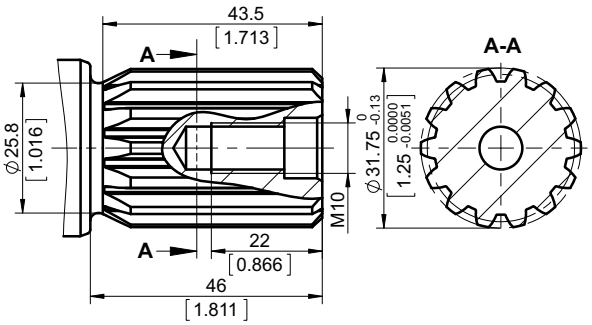
SH

ø29.6 [1.165], M10 thread
W30x2x30x14x9g splined DIN 5480
Max. torque 600 Nm [5310 lb-in]



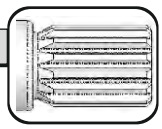
SK

ø31.75 [1.25], M10 thread
14T 12/24 DP splined ANSI B92.1-1970
Max. torque 600 Nm [5310 lb-in]



The required max. torque must not be exceeded

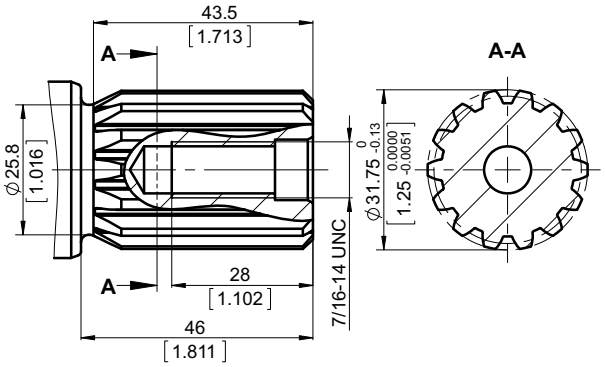
mm [in]



SHAFT TYPES AND DIMENSIONS

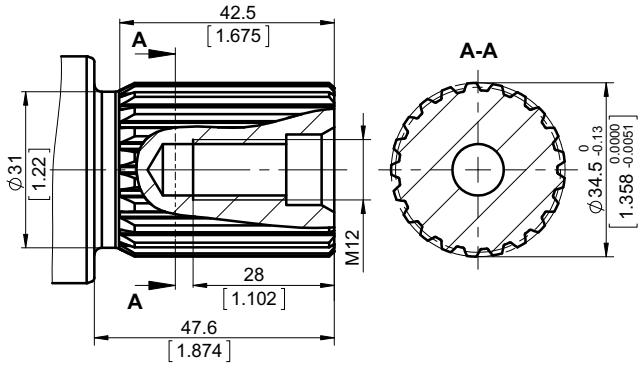
GK

ø31.75 [1.25], 7/16-14 UNC thread
14T 12/24 DP splined ANSI B92.1-1970
Max. torque 600 Nm [5310 lb-in]



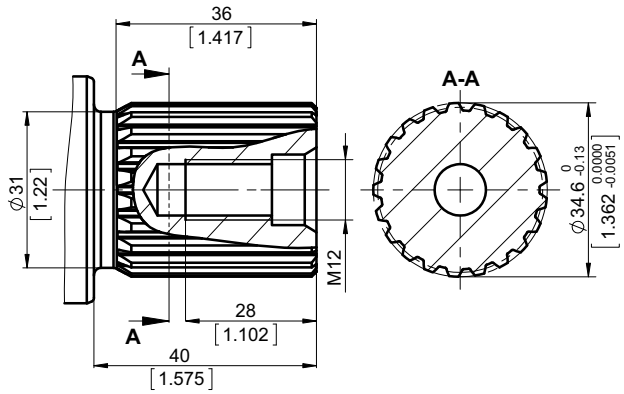
SP

ø34.5 [1.358], M12 thread
21T 16/32 DP splined ANSI B92.1-1970
Max. torque 1085 Nm [9600 lb-in]



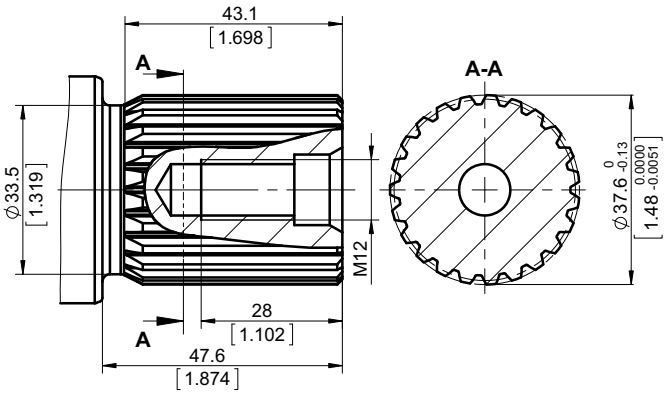
QH

ø34.6 [1.36], M12 thread
W35x2x30x16x9g splined DIN 5480
Max. torque 1085 Nm [9600 lb-in]



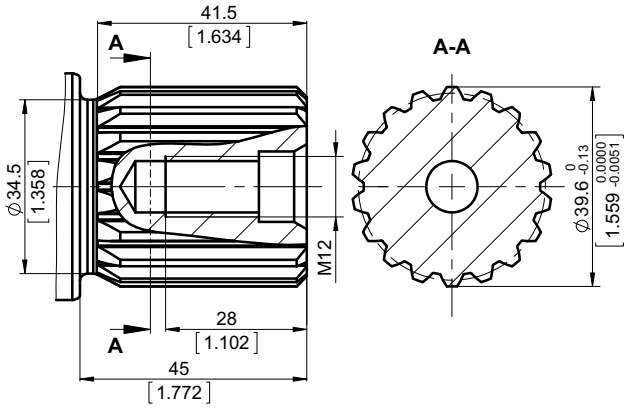
SR

ø37.6 [1½], M12 thread
23T 16/32 DP splined ANSI B92.1-1970
Max. torque 1300 Nm [11500 lb-in]



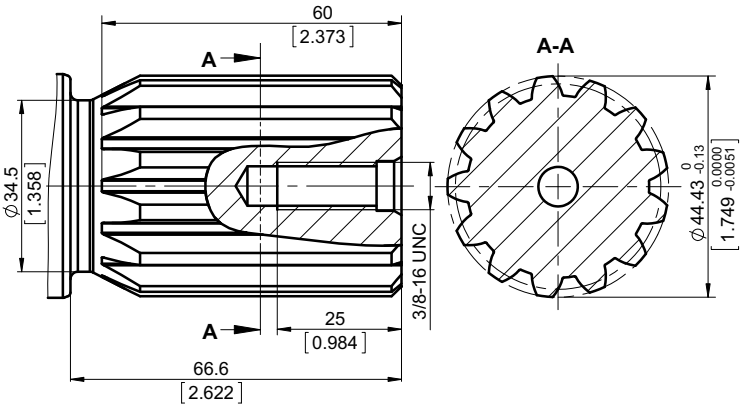
ST

ø39.6 [1.559], M12 thread
W40x2x30x18x9g splined DIN 5480
Max. torque 1400 Nm [12400 lb-in]

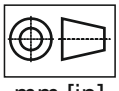


GU

ø44.43 [1¾], 3/8-16 UNC thread
13T 8/16 DP splined ANSI B92.1-1970
Max. torque 2000 Nm [17700 lb-in]



The required max. torque must not be exceeded

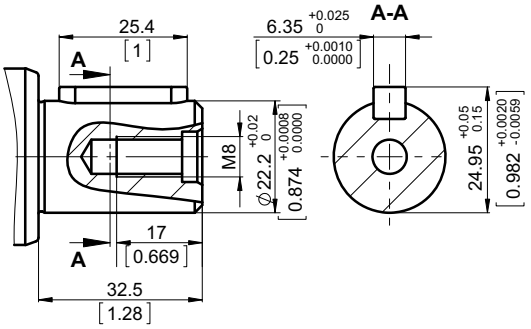


mm [in]

SHAFT TYPES AND DIMENSIONS

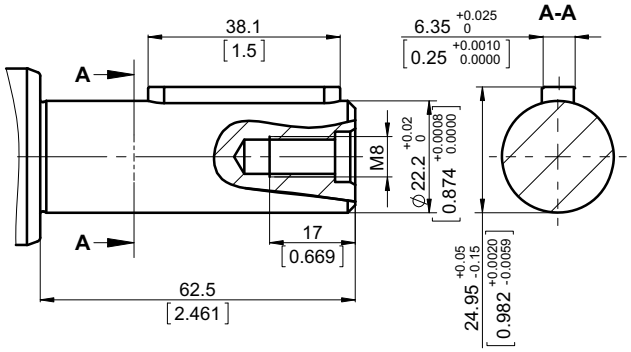
CK

ø22.2 [7/8] straight, M8 thread
Parallel key **1/4"x1/4"x1**" BS46
Max. torque 180 Nm [1600 lb-in]



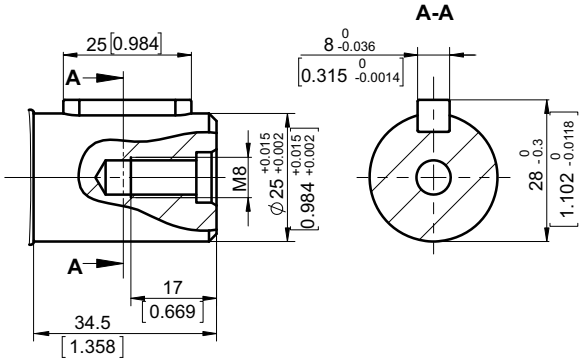
MK

ø22.2 [7/8] straight, M8 thread
Parallel key **1/4"x1/4"x1½**" BS46
Max. torque 180 Nm [1600 lb-in]



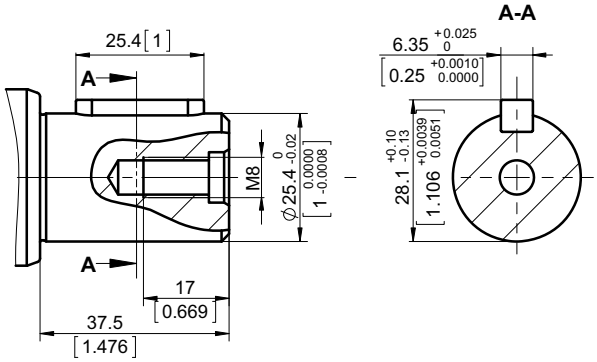
ML

ø25 [0.984] straight, M8 thread
Parallel key **A8x7x25** DIN6885
Max. torque 250 Nm [2210 lb-in]



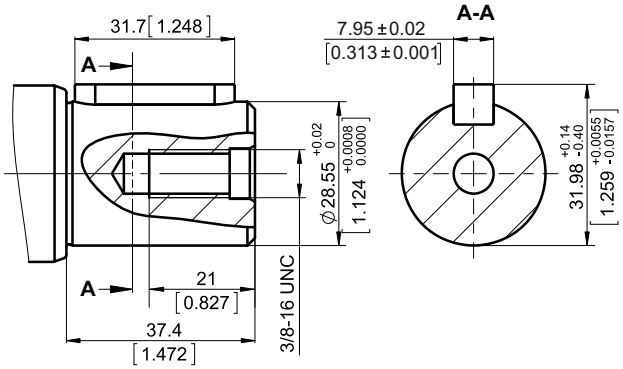
CM CMN

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



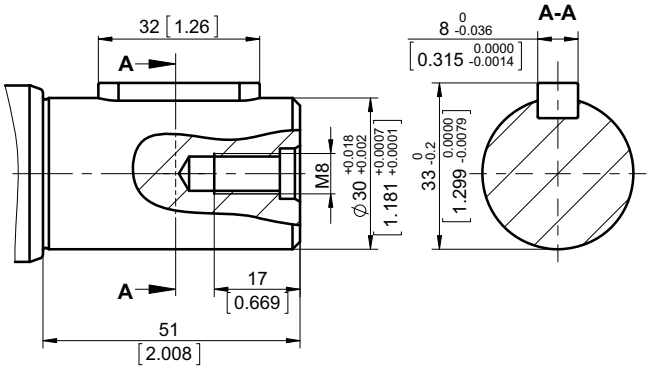
DO

ø28.55 [1.125] straight, 3/8-16 UNC thread
Parallel key **5/16"x5/16"x1¼**"
Max. torque 280 Nm [2480 lb-in]



CQ

ø30 [1.181] straight, M8 thread
Parallel key **A8x7x32** DIN6885
Max. torque 300 Nm [2655 lb-in]



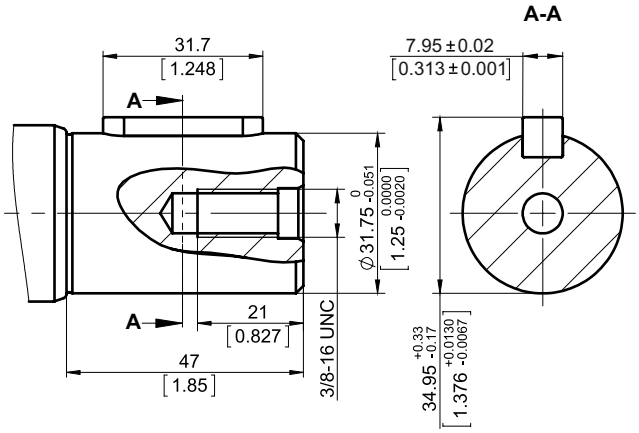
The required max. torque must not be exceeded

mm [in]

SHAFT TYPES AND DIMENSIONS

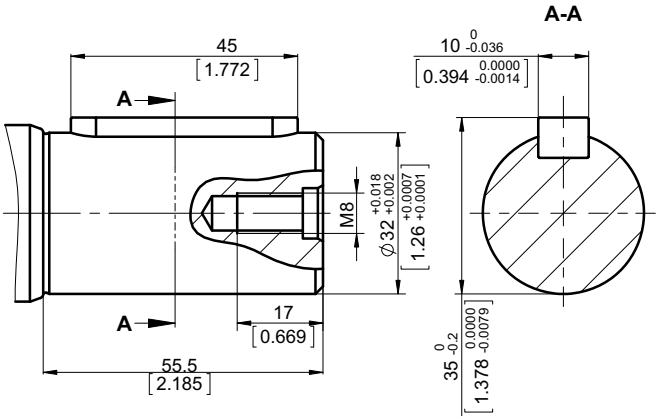
DR

ø31.75 [1.25] straight, 3/8-16 UNC thread
Parallel key **5/16"x5/16"x1¼"**
Max. torque 770 Nm [6815 lb-in]



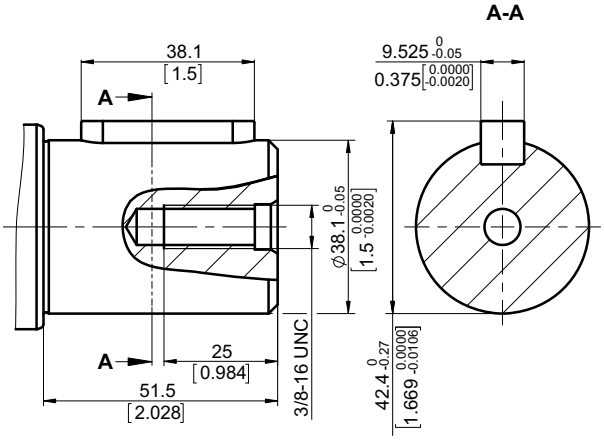
CS

ø32 [1.26] straight, M8 thread
Parallel key **A10x8x45** DIN6885
Max. torque 565 Nm [5000 lb-in]



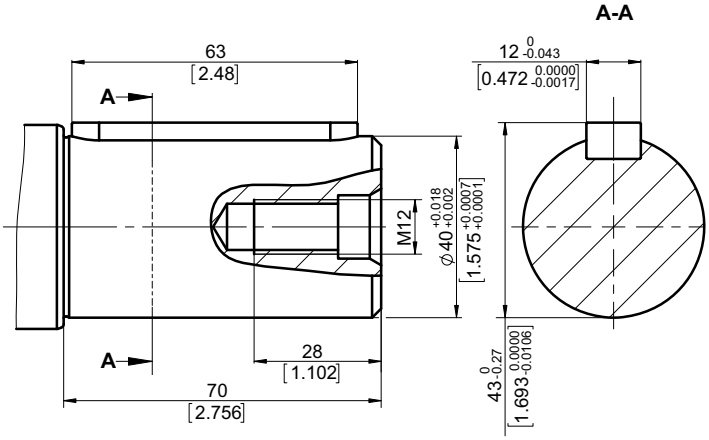
DU

ø38.1 [1½] straight, 3/8-16 UNC thread
Parallel key **3/4"x3/4"x1½"** BS46
Max. torque 1000 Nm [8850 lb-in]



CV

ø40 [1.575] straight, M12 thread
Parallel key **A12x8x63** DIN6885
Max. torque 1100 Nm [9735 lb-in]



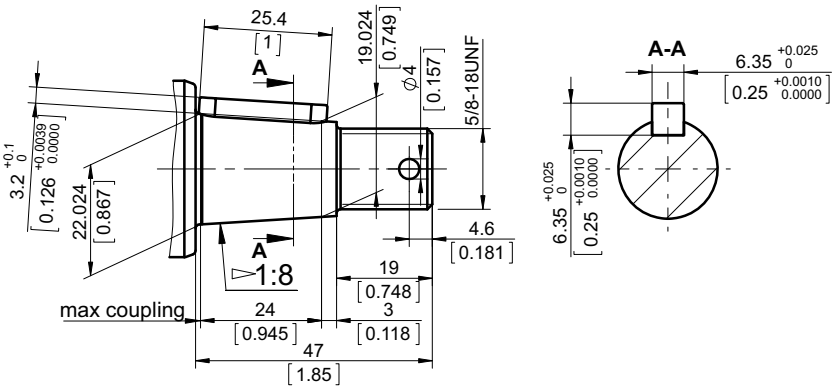
The required max. torque must not be exceeded

mm [in]

SHAFT TYPES AND DIMENSIONS

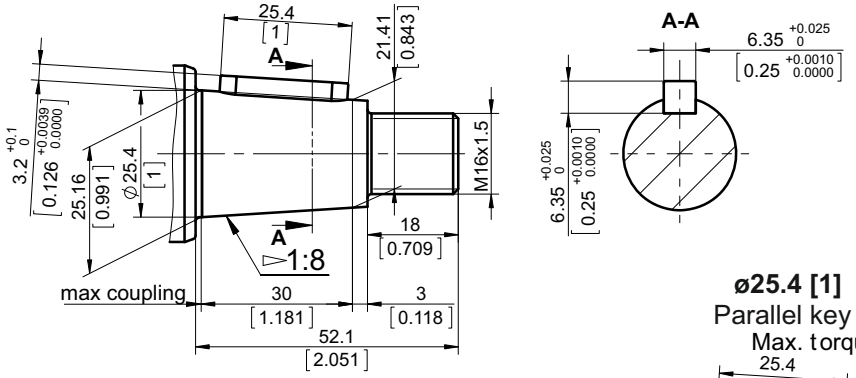
TD

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



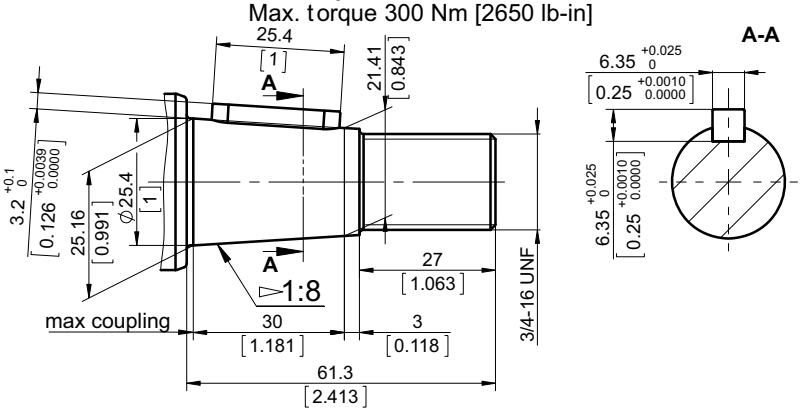
KH

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



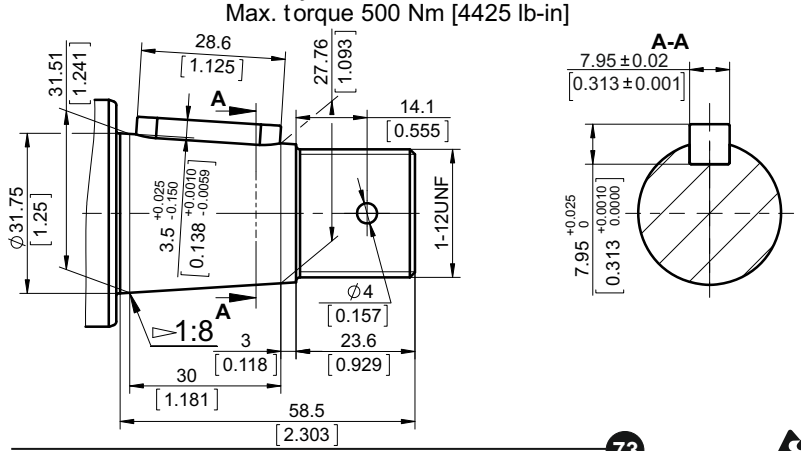
TH

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



TN

ø31.75 [1¼] Tapered **1:8 [125:1000],**
Parallel key **5/16"x5/16"x1⅛**", 1-12UNF
Max. torque 500 Nm [4425 lb-in]



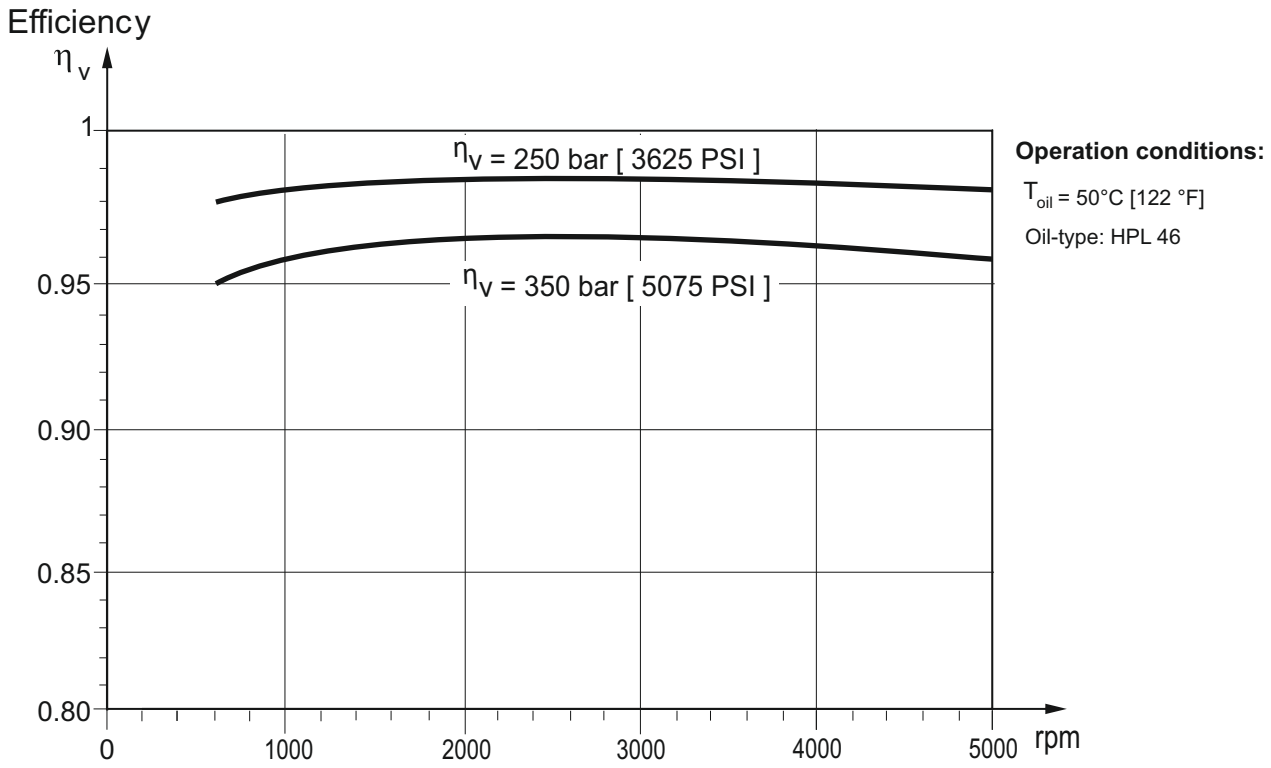
The required max. torque must not be exceeded

mm [in]

MOTOR FUNCTION DIAGRAMS

The below efficiencies are applied for all motor displacements.

VOLUMETRIC EFFICIENCIES

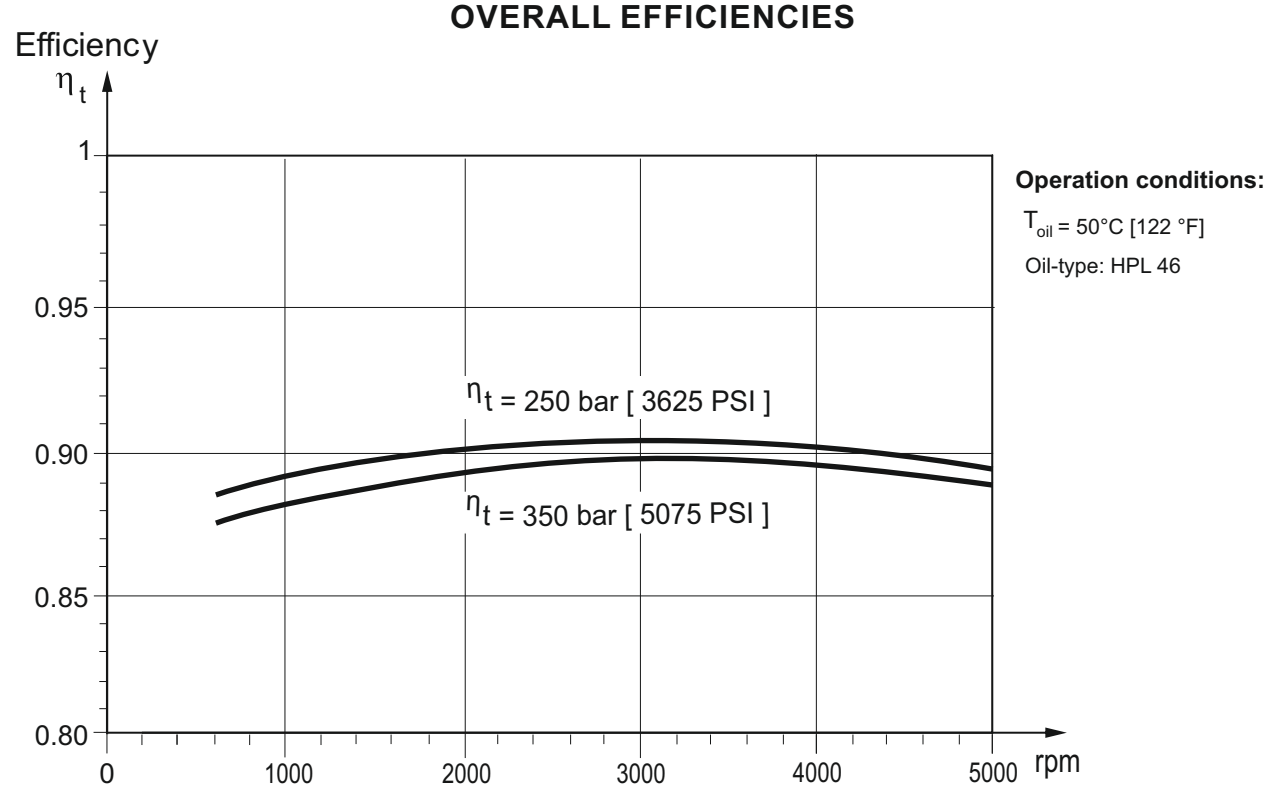


Operation conditions:

T_{oil} = 50°C [122 °F]

Oil-type: HPL 46

OVERALL EFFICIENCIES



Operation conditions:

T_{oil} = 50°C [122 °F]

Oil-type: HPL 46

The motor size, pressure, torque, speed of rotation and flow rate required for a specific application can be calculated using the formulas on page 85

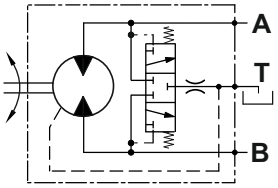
Efficiencies for a particular motor may vary from the shown in the diagram depending on the operating conditions.

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 :**

Motors	MAP28	MAP62	MAP100	MAPW62
default	5±2 l/min	6±2 l/min	7±2 l/min	6±2 l/min

- For other options, please see Flow Setting of ordering code, considering the following possible values:

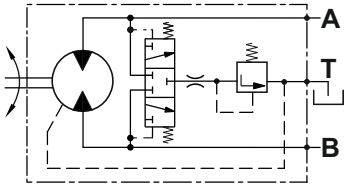
Flow setting | **omit** | **L3.5** | **L5.5** | ⇒ flow rate

EXAMPLE

M A P B 5 0 S H 2 **P U** — purge valve flow rate 6±2 l/min
M A P B 5 0 S H 2 **P U L 3 . 5** — purge valve flow rate 3.5±1 l/min
M A P B 5 0 S H 2 **P U L 5 . 5** — purge valve flow rate 5.5±1 l/min

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**

Motors	MAP28	MAP62	MAP100	MAPW62
default	5±2 l/min	6±2 l/min	7±2 l/min	6±2 l/min

and charge (opening) pressure 16 bar with 20 bar feed pressure for close loop circuit;
- For other options, please see Pressure Setting and Flow Setting of ordering code, considering the following possible values:

Pressure setting | **omit** | **10** | ⇒ pressure
Flow setting | **omit** | **L3.5** | **L5.5** | ⇒ flow rate

EXAMPLE

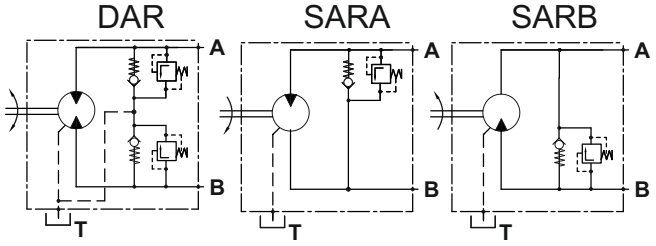
M A P B 5 0 S H 2 **F L U** — flow rate 6±2 l/min, charge pressure 16 bar
M A P B 5 0 S H 2 **F L U 1 0 L 5 . 5** — flow rate 5.5±1 l/min, charge pressure 10 bar
M A P B 5 0 S H 2 **F L U L 3 . 5** — flow rate 3.5±1 l/min, charge pressure 16 bar

Option **DAR, SARA, SARB**

Combined Anti-Cavitation and Reliev 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:

Pressure setting | **250** | **300** | **350** | ⇒ pressure

EXAMPLE

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

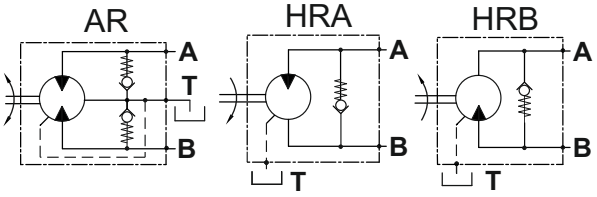
M A P B 5 0 S H 2 **S A R A 2 5 0**
Single Anti-Cavitation and Relief Valve, relief valve setting 250 bar
The valve is placed on port A

M A P B 5 0 S H 2 **S A R B 3 0 0**
Single Anti-Cavitation and ReliefValve, relief valve setting 300 bar
The valve is placed on port B

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 5 0 S H 2 **A R**
Double Anti-Cavitation Valve

M A P B 5 0 S H 2 **H R A**
Single Anti-Cavitation Valve, the valve is placed on port A

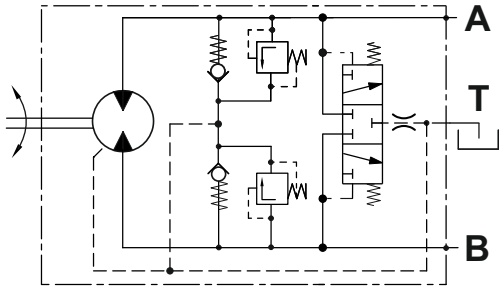
M A P B 5 0 S H 2 **H R B**
Single Anti-Cavitation Valve, the valve is placed on port B

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-cavitaion, 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:

Pressure setting **250** | **300** | **350** ⇨ pressure

- Flow rate of purge valve by **default**

Motors	MAP28	MAP62	MAP100	MAPW62
default	5±2 l/min	6±2 l/min	7±2 l/min	6±2 l/min

The possible values are as follow:

Flow setting **omit** | **L3.5** | **L5.5** ⇨ flow rate

EXAMPLE

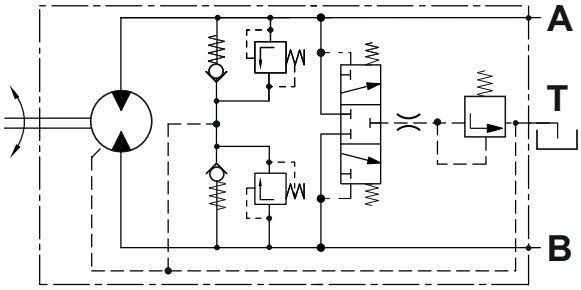
M A P B 5 0 S H 2 **D A R P 3 5 0**
Double Anti-Cavitation, Relief and Purge Valve,
relief valve setting 350 bar, purge valve flow rate 6±2 l/min

M A P B 5 0 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 5 0 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-cavitaion, 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:

Pressure setting **250** | **300** | **350** ⇨ pressure

- Flow rate of flush valve by **default**

Motors	MAP28	MAP62	MAP100	MAPW62
default	5±2 l/min	6±2 l/min	7±2 l/min	6±2 l/min

and charge pressure 16 bar with 20 bar feed pressure for close loop circuit. The possible values are as follow:

Flow setting **omit** | **L3.5** | **L5.5** ⇨ flow rate

- Other values for charge pressure are possible. Please see Pressure Setting. Example: For charge pressure 10 bar the options are as follow:

Pressure setting 250-**10** | 300-**10** | 350-**10**

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

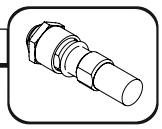
EXAMPLE

M A P B 5 0 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 5 0 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

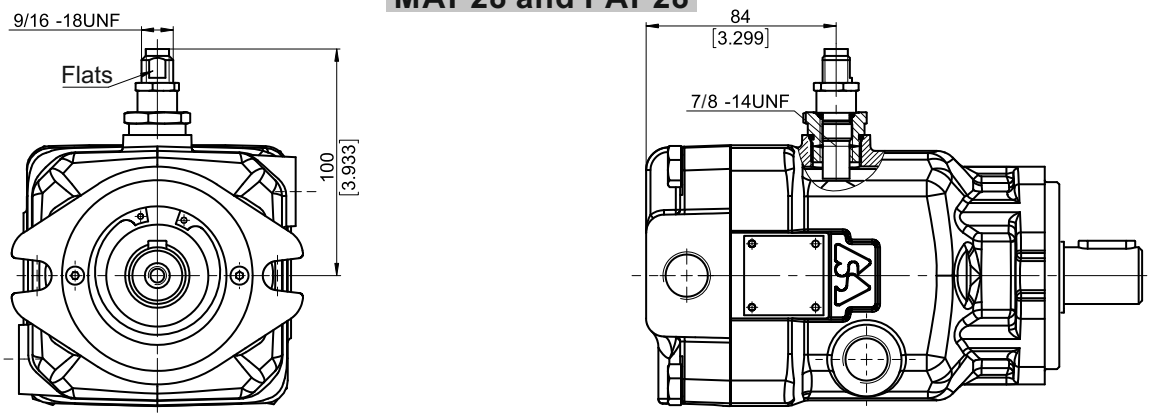
M A P B 5 0 S H 2 **D A R F 3 0 0 - 1 0 L 5 . 5**
Double Anti-Cavitation, Relief and Flush Valve, relief valve setting 300 bar
flush valve charge pressure 10 bar, flush valve flow rate 5.5±1 l/min



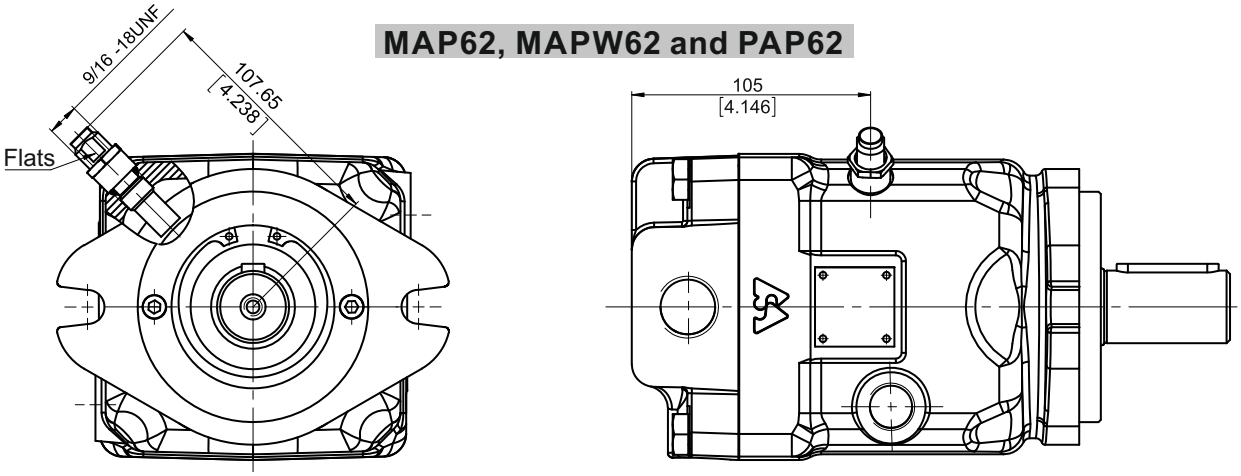
SPEED SENSORS

MOUNTING DIMENSIONS

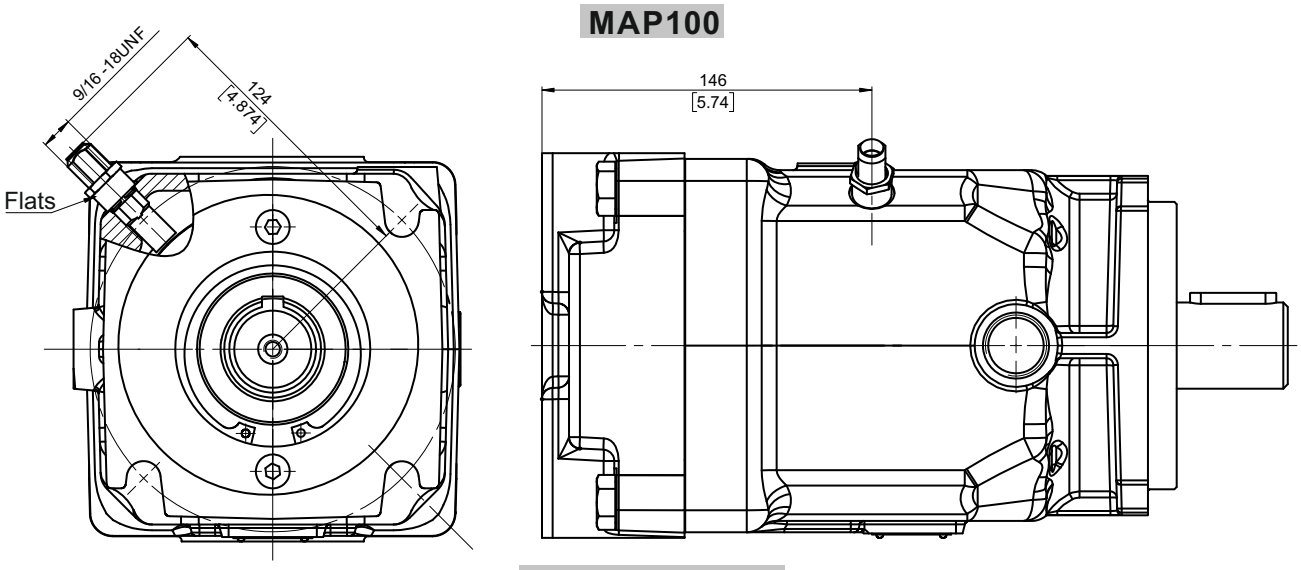
MAP28 and PAP28



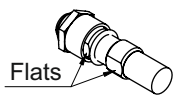
MAP62, MAPW62 and PAP62



MAP100

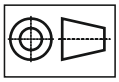


INSTALLATION



1. Remove the plug.
2. Screw in the (CW) sensor by hand until the bottom end gently touches the speed ring.
3. Unscrew (CCW) sensor 1/4 turn. Continue unscrewing until the flats are perpendicular to motor or pump shaft center line (tolerance 20° to 30° is acceptable). Do not unscrew the sensor more than 3/4 of a turn from the touching.
4. Using the 1/2 inch wrench to hold the sensor, tighten the lock nut to 10^{+5}[115] Nm [lb-in]. with an 1 1⁄16 inch hew wrench.

NOTE: The speed sensor is not fitted at the factory, but is supplied in plastic bag with the motor. For installation see enclosed insructions.

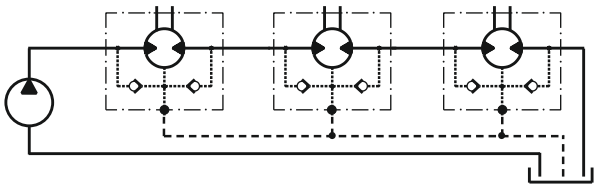


mm [in]

INSTALLATION

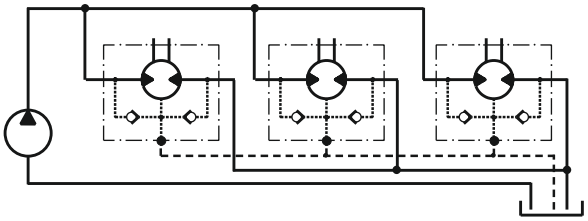
TYPE OF CONNECTION

Series connection
not recommended



open drain line is always required

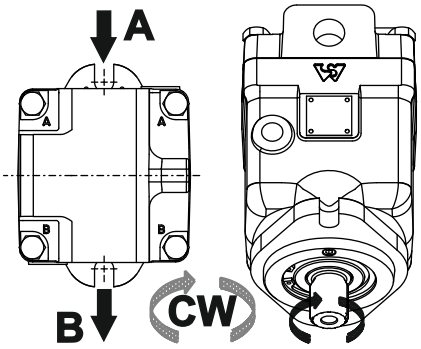
Parallel connection
recomended



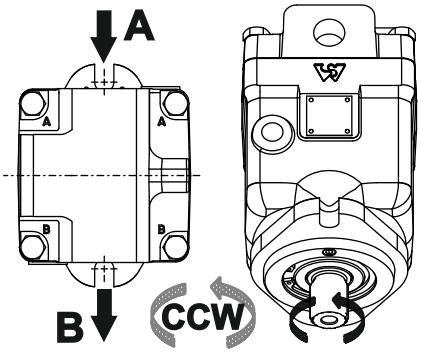
open drain line is always required

DIRECTION OF ROTATION

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



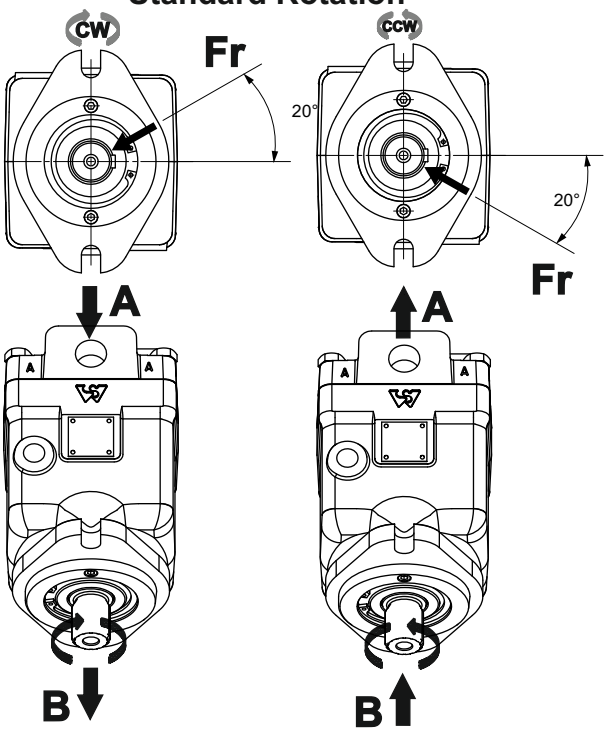
Reverse Rotation
Viewed from shaft end
Port **A** Pressurized - **CCW**
Port **B** Pressurized - **CW**



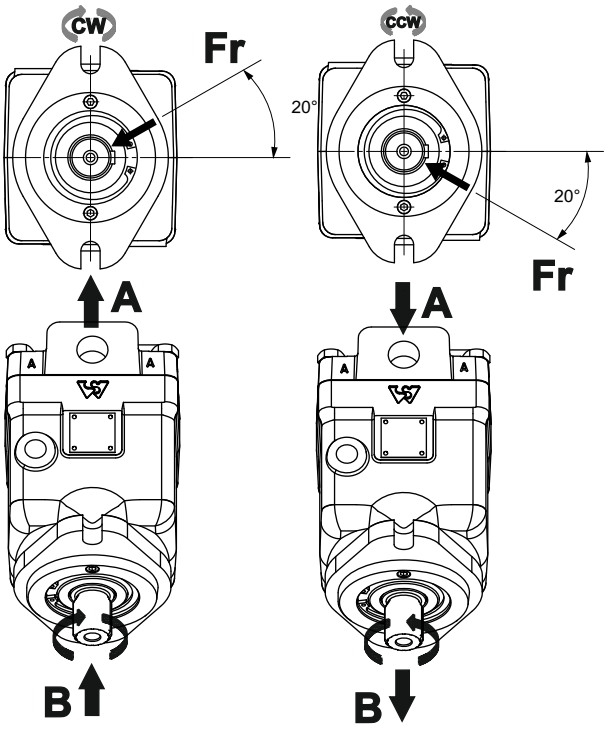
BEST POSITION FOR APPLYING RADIAL LOAD

Optimal position for applying radial load depending on the direction of rotation

Standard Rotation

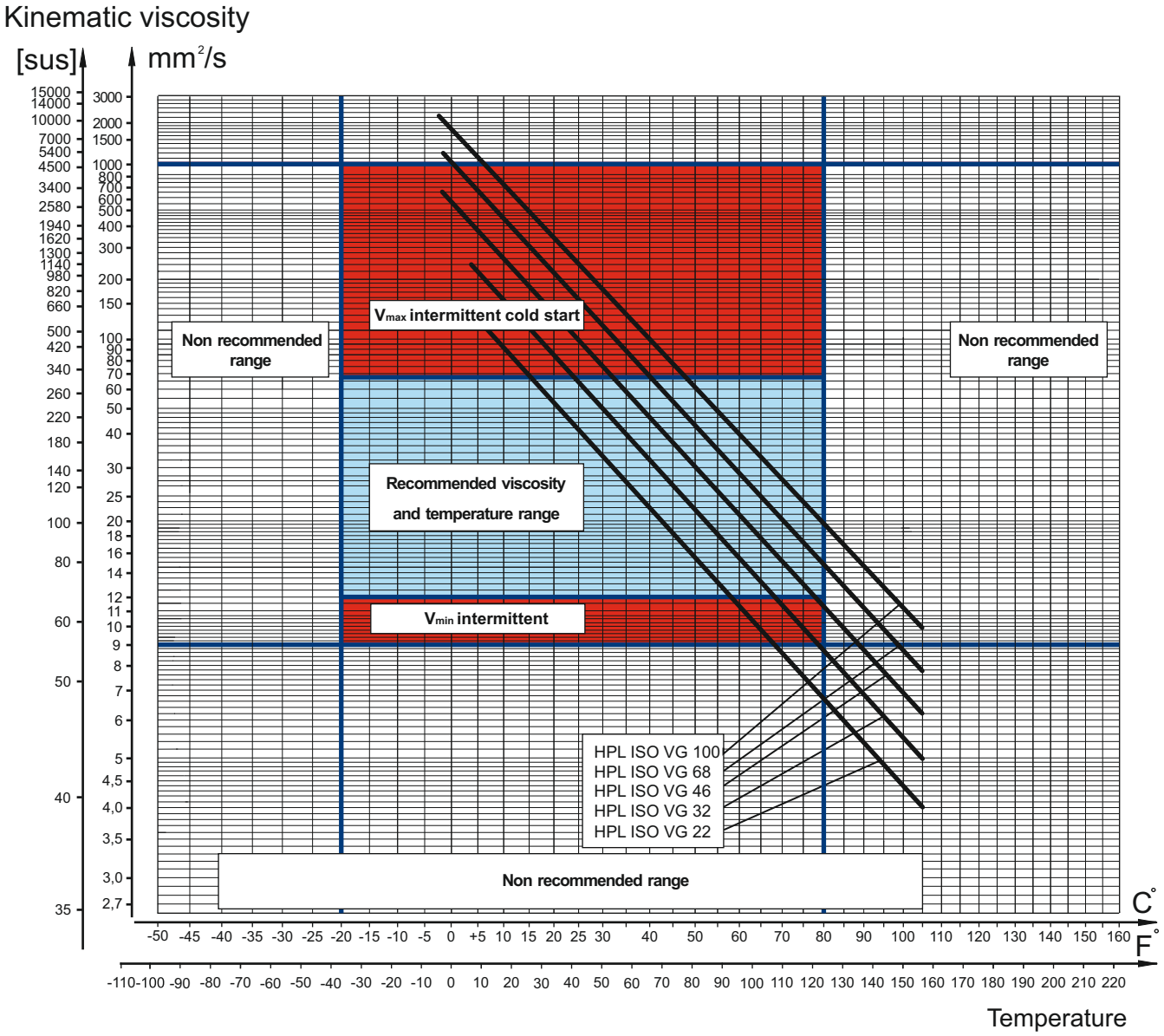


Reverse Rotation



FLUID VISCOSITY LIMITS

In order to obtain optimum efficiency and service life, we recommend to select the operating viscosity (at operating temperature) within the range shown on diagram below.



The above - shown viscosity characteristics are for reference only. Please, check the actual viscosity with the manufacturer of the fluid.

BASIC FORMULAS

The motor(pump) size, pressure and flow required for a specific application can be calculated using the formulas below.

Metric System

Efficiency $\eta_t = \eta_{mh} \cdot \eta_v \quad \eta_{mh} = \frac{\eta_t}{\eta_v} \quad \eta_v = \frac{\eta_t}{\eta_{mh}}$

Input flow (for Motor) $Q = \frac{Vg \cdot n}{1000 \cdot \eta_v}$ [l/min]

Output torque (for Motor) $M = \frac{Vg \cdot \Delta p \cdot \eta_{mh}}{62,8}$ or $M = \Delta p \cdot T_{con.}$ [Nm]

Output power (for Motor) $P = \frac{M \cdot n}{9550} = \frac{Q \cdot \Delta p \cdot \eta_t}{600}$ [kW]

Speed (for Motor) $n = \frac{Q \cdot 1000 \cdot \eta_v}{Vg}$ or $n = Q \cdot N_{con.}$ [min^{-1}]

Output flow (for pump) $Q = \frac{Vg \cdot n \cdot \eta_v}{1000}$ [l/min]

Driving torque (for pump) $M = \frac{Vg \cdot \Delta p}{62,8 \cdot \eta_{mh}}$ [Nm]

Input power (for pump) $P = \frac{M \cdot n}{9550} = \frac{Q \cdot \Delta p}{600 \cdot \eta_t}$ [kW]

Vg =	Displacement per rev.	[cm^3]
Δp =	$p_{HP} - p_{LP}$	[bar]
p_{HP} =	High pressure	[bar]
p_{LP} =	Low pressure	[bar]
n =	Rotation speed	[RPM]
Q =	Oil flow	[l/min]
$T_{con.}$ =	Toque constant	[Nm/bar]
$N_{con.}$ =	Speed constant	[RPM/(l/min)]
η_v =	Volumetric efficiency	
η_{mh} =	Mechanical-hydraulic efficiency	
η_t =	Overall efficiency	

Inch System

Efficiency $\eta_t = \eta_{mh} \cdot \eta_v \quad \eta_{mh} = \frac{\eta_t}{\eta_v} \quad \eta_v = \frac{\eta_t}{\eta_{mh}}$

Input flow (for Motor) $Q = \frac{Vg \cdot n}{231 \cdot \eta_v}$ [GPM]

Output torque (for Motor) $M = \frac{Vg \cdot \Delta p \cdot \eta_{mh}}{2 \cdot \pi}$ or $M = \Delta p \cdot T_{con.}$ [lb-in]

Output power (for Motor) $P = \frac{Vg \cdot n \cdot \Delta p \cdot \eta_t}{396000}$ [hp]

Speed (for Motor) $n = \frac{Q \cdot 231 \cdot \eta_v}{Vg}$ or $n = Q \cdot N_{con.}$ [min^{-1}]

Output flow (for pump) $Q = \frac{Vg \cdot n \cdot \eta_v}{231}$ [GPM]

Driving torque (for pump) $M = \frac{Vg \cdot \Delta p}{2 \cdot \pi \cdot \eta_{mh}}$ [lb-in]

Input power (for pump) $P = \frac{Vg \cdot n \cdot \Delta p}{396000 \cdot \eta_t}$ [hp]

Vg =	Displacement per rev.	[in^3]
Δp =	$p_{HP} - p_{LP}$	[PSI]
p_{HP} =	High pressure	[PSI]
p_{LP} =	Low pressure	[PSI]
n =	Rotation speed	[RPM]
Q =	Oil flow	[GPM]
$T_{con.}$ =	Toque constant	[lb-in/PSI]
$N_{con.}$ =	Speed constant	[RPM/GPM]
η_v =	Volumetric efficiency	
η_{mh} =	Mechanical-hydraulic efficiency	
η_t =	Overall efficiency	

Depending on the results of the load calculations, the most appropriate type of motor from the catalogue is selected.

Table 1

Rolling resistance coefficient In case of rubber tire rolling on different surfaces			
Surface	**ρ**	**Surface**	**ρ**
Concrete- faultless	0.010	Macadam- bad	0.037
Concrete- good	0.015	Snow- 5 cm	0.025
Concrete- bad	0.020	Snow- 10 cm	0.037
Asphalt- faultless	0.012	Polluted covering- smooth	0.025
Asphalt- good	0.017	Polluted covering- sandy	0.040
Asphalt- bad	0.022	Mud	0.037÷0.150
Macadam- faultless	0.015	Sand- Gravel	0.060÷0.150
Macadam- good	0.022	Sand- loose	0.160÷0.300