

THE PRODUCTION LINE OF HANSA-TMP

**Heavy Duty Open Loop System
Fixed Displacement Axial Piston Pump**

**TPF 60
(35 ÷ 50 cm³/rev.)**

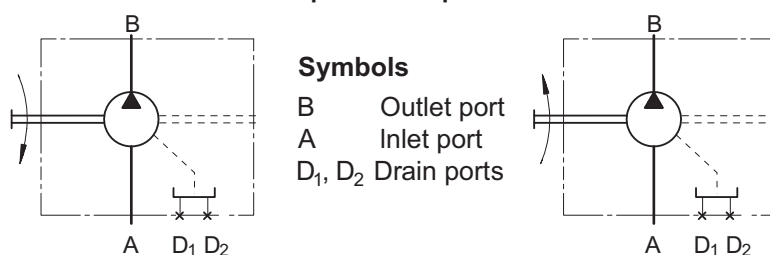


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Hydraulic Pumps Type TPF 60

Heavy Duty Axial Piston Pumps Fixed Displacement
for open loop circuit



open drain line is always required

APPLICATION

Open loop circuit
 Agricultural machines
 Road building machines
 Mining machinery
 Food industry machines
 Special vehicles

OPTIONS

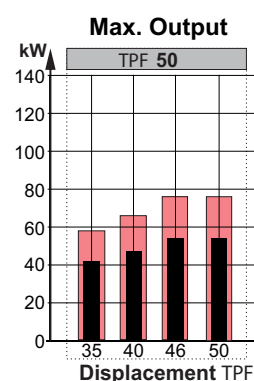
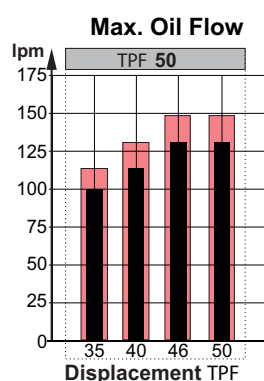
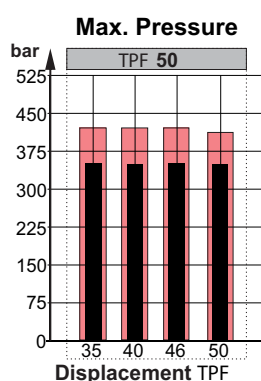
Swash plate
 Port options
 Shaft options
 High pressure ports

ADVANTAGES

Low noise
 Low pulsation
 Long service life
 High power density

GENERAL

Displacement,	cm ³ /rev	36,16÷49.94
Max. Driving Speed,	RPM	2800
Max. Driving Torque,	Nm	278
Max. Output,	kW	54
Max. Pressure Drop,	bar	350
Max. Oil Flow,	lpm	132
Min. Driving Speed,	RPM	500
Fluid	Mineral based- HLP (DIN 51524) or HM (ISO 6743/4)	
Temperature Range,	°C	-40÷82
Optimal Viscosity Range,	mm ² /s	12÷68
Filtration	ISO code 18/16/13 (Min. recommended fluid filtration of 10 micron)	



Intermittent values

Continuous values

Port, Shaft and Flange Types

Cross Table - Flange Types

TPF 60	Type of flanges
x	B - 2-Bolt, SAE B, SD. 101.6, BC. 146, BD. 14.3

Legend

BC (Bolt Circle) - Center point of bolt holes
 BD (Bolt Diameter) - Diameter of bolt holes
 SD (Spigot Diameter) - Center Diameter

Cross Table - Shaft Types

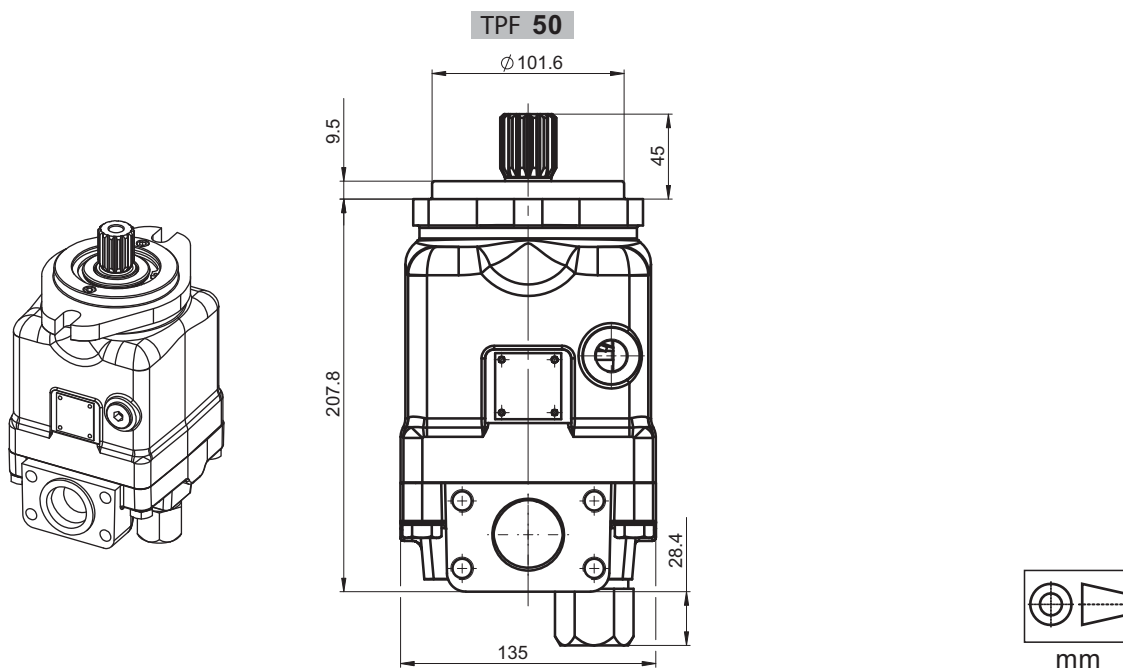
TPF60	Type of shafts
x	SD $\varnothing 21.72$ Spline SAE 13T 16/32 DP, M8-6H thread
x	GF $\varnothing 24.9$ Spline SAE 15T 16/32, 3/8-16 UNC-2B thread
x	CK $\varnothing 22.2$ Straight, M8-6H thread, parallel key 1/4"x1/4"x1" BS46
x	MK $\varnothing 22.2$ Straight, M8-6H thread, parallel key 1/4"x1/4"x1 1/2" BS46
x	CM $\varnothing 25.4$ Straight, M8-6H thread, parallel key 1/4"x1/4"x1" BS46
x	CS $\varnothing 32$ Straight, M8-6H thread, parallel key A10x8x45 DIN6885

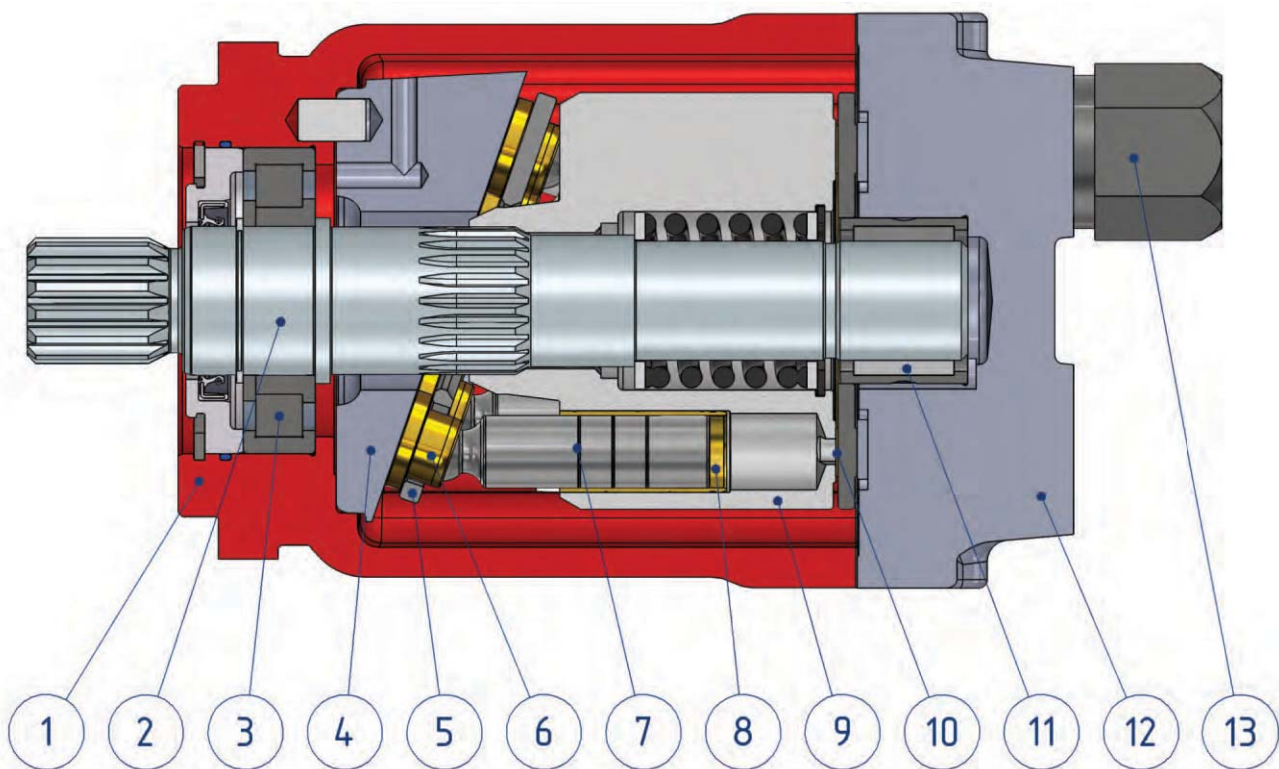
Cross Table - Port Types

PORTS SIZE - THREAD OPTION	
TPF 60	Type of threads
default	Inlet ISO 6162-1 DN38, Outlet ISO 6162-2 DN19, drain ports M18x1.5

PUMP DIMENSIONS

The bellow dimensions are for **comparison only**. The pumps can obtain different shafts and end covers.



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
13. Part of hydraulic system helps reduces pump noise and vibration

The heavy duty design of TPF pumps gains big advantage over the typical swash plate pumps. One of them is a special hydraulic system, which reduces noise and vibration created from pump. Another big advantage of our design, which in general is typical for swash plate pumps, is that the pulsations during the operation are much less. In general the swash plate pumps are more reliable than the bent axis pumps and gear pumps.

SPECIFICATION DATA

Type		TPF 35	TPF 40	TPF 46	TPF 50
Displacement, cm.³/rev.		36.16	41.59	47.13	49.94
Max. Driving Speed, Cont.		2800	2800	2800	2500
RPM	Int.*	3150	3150	3150	2800
Max. Driving Torque,** Cont.		202	232	263	278
Nm	Int.**	242	278	315	326
Output, Cont.		41	47	54	54
kW	Int.**	58	67	77	77
Max. Pressure, Cont.		350	350	350	350
bar	Int.**	420	420	420	410
Max. Oil Flow, Cont.		100	116	132	132
lpm	Int.*	114	131	148	148
Permissible Shaft Load					
max Axial**** N		Fa=2000			
max Radial**** N		Fr=3600			
Min. Speed, RPM		500			
Max. Pressure in		5			
Drain Line, bar		open drain line is always required			
Weight, kg		20,5			

* Intermittent speed (flow): for pressure up to 150 bar;

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

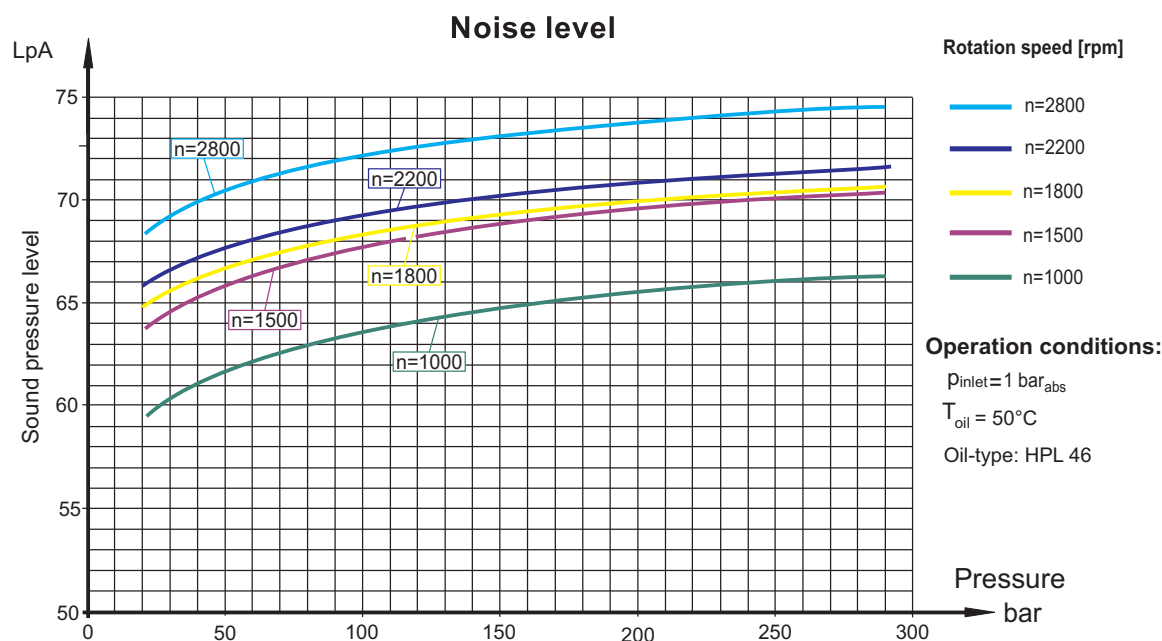
*** Theoretical torque;

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

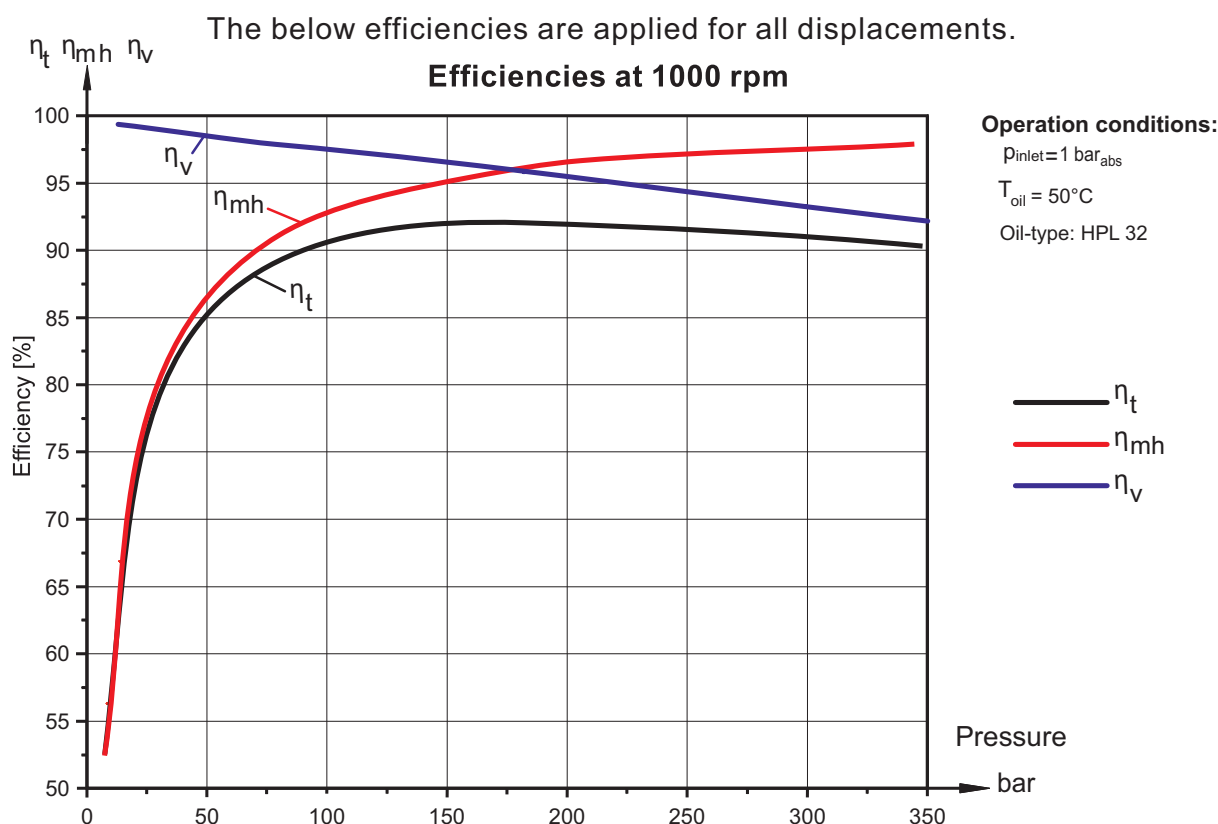
1. The recommended output power for continuous operations should not be exceeded.
2. Recommended filtration as per ISO 4406 cleanliness code 18/16/13 or better. This filtration corresponds to SAE AS 4059 8A/7B/7C. Nominal filtration - 10 micron or better.
3. Recommended a premium quality, anti-wear type mineral based hydraulic oil, HLP (DIN 51524) or HM (ISO6743/4).
4. Recommended oil viscosity - 12...68 cSt or see page 18.
5. Recommended maximum system operating temperature -82°C.
6. To ensure optimum life of the pump, fill it up with fluid prior to load it and run with moderate load and speed for about 10-15 minutes.

FUNCTION DIAGRAMS

Sound pressure level (noise) is measured in acoustic chamber according to DIN 45635 Part 1 and Part 26. These diagram is applied for all displacements.



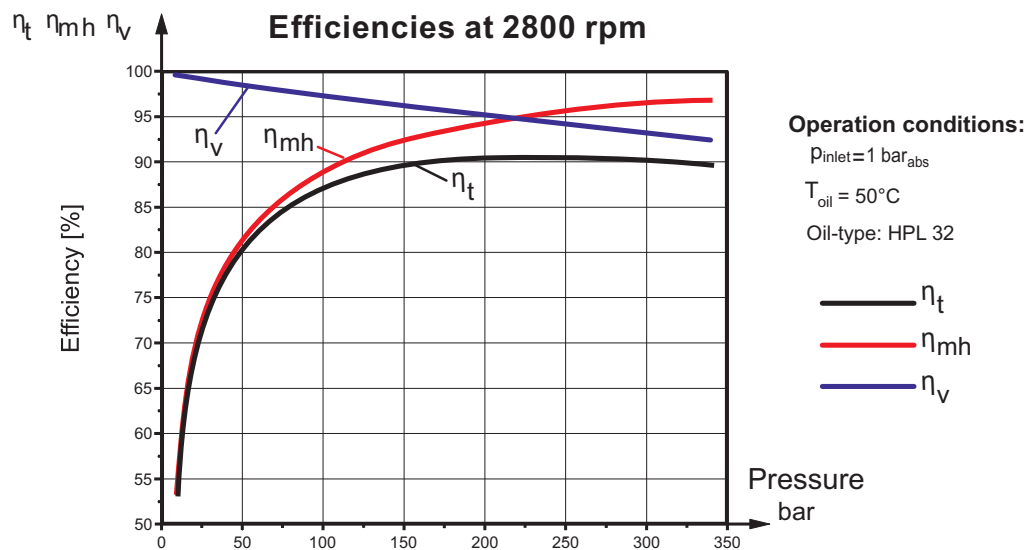
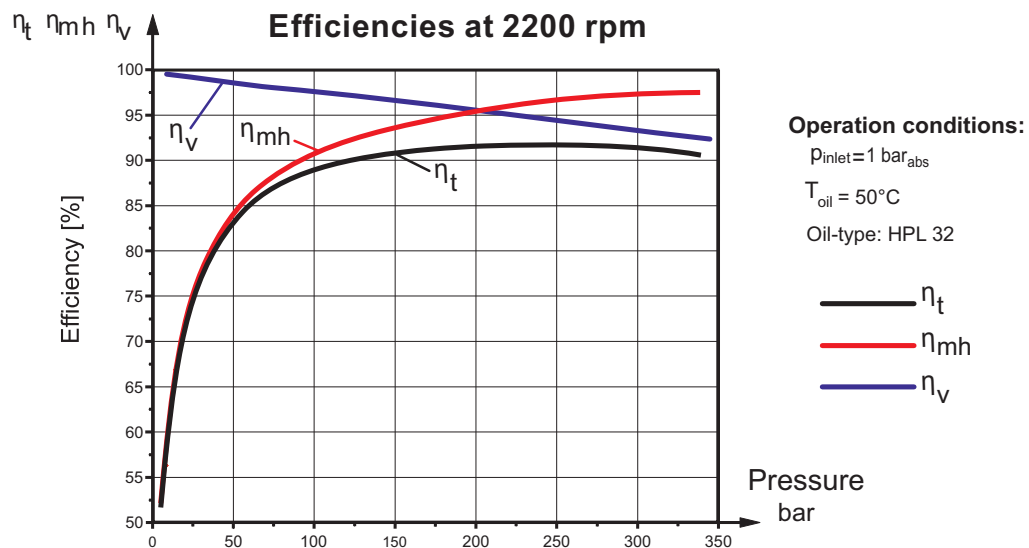
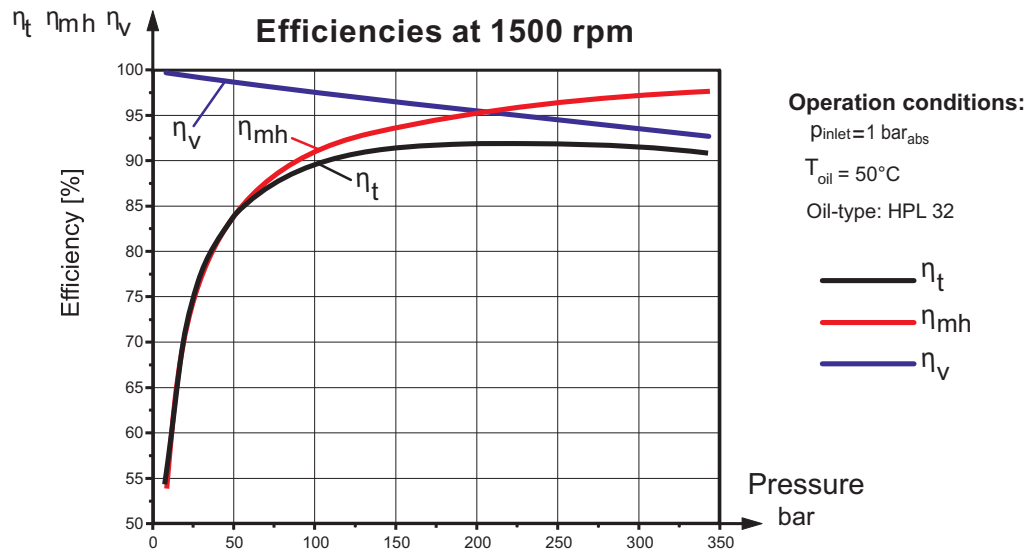
The sound pressure level for a particular pump may vary $\pm 2 \text{ dB(A)}$ compared to what is shown in the diagram.



The pump size, pressure, torque, speed of rotation and flow rate required for a specific application can be calculated using the formulas on page 19.

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

FUNCTION DIAGRAMS

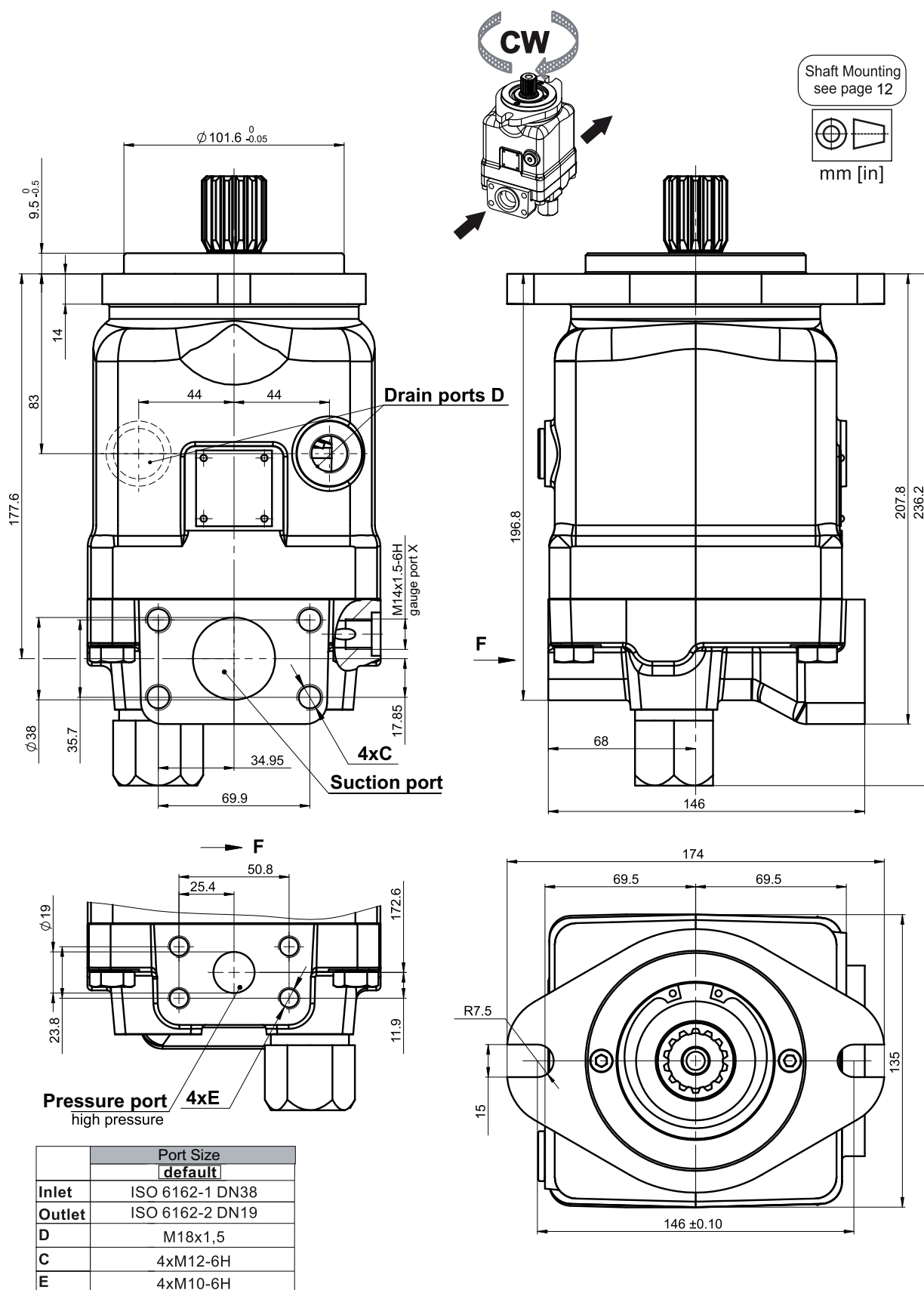


The pump size, pressure, torque, speed of rotation and flow rate required for a specific application can be calculated using the formulas on page 19.

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

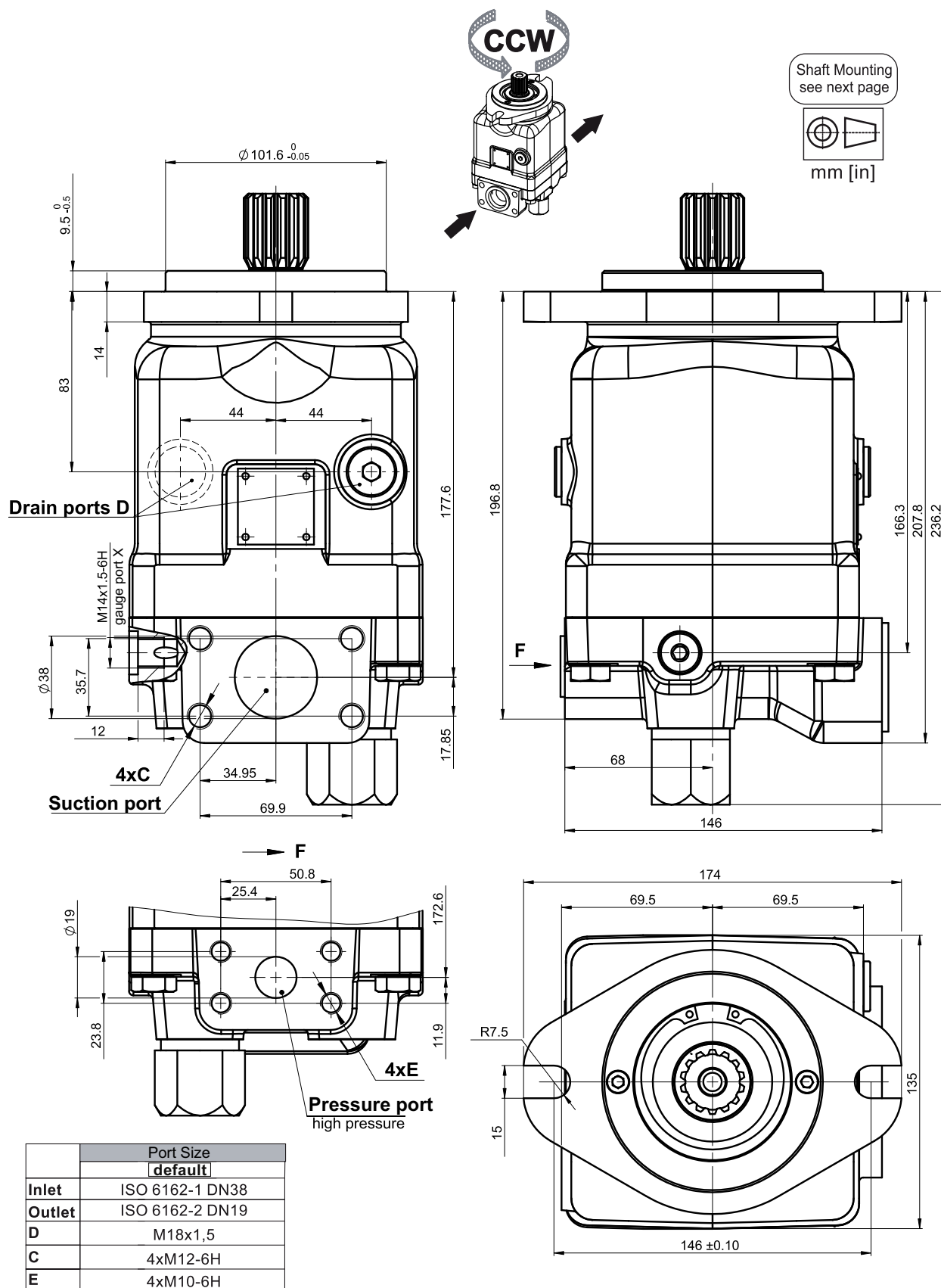
Overall Dimensions and Ports

Direction of Rotation **CW**(Right)

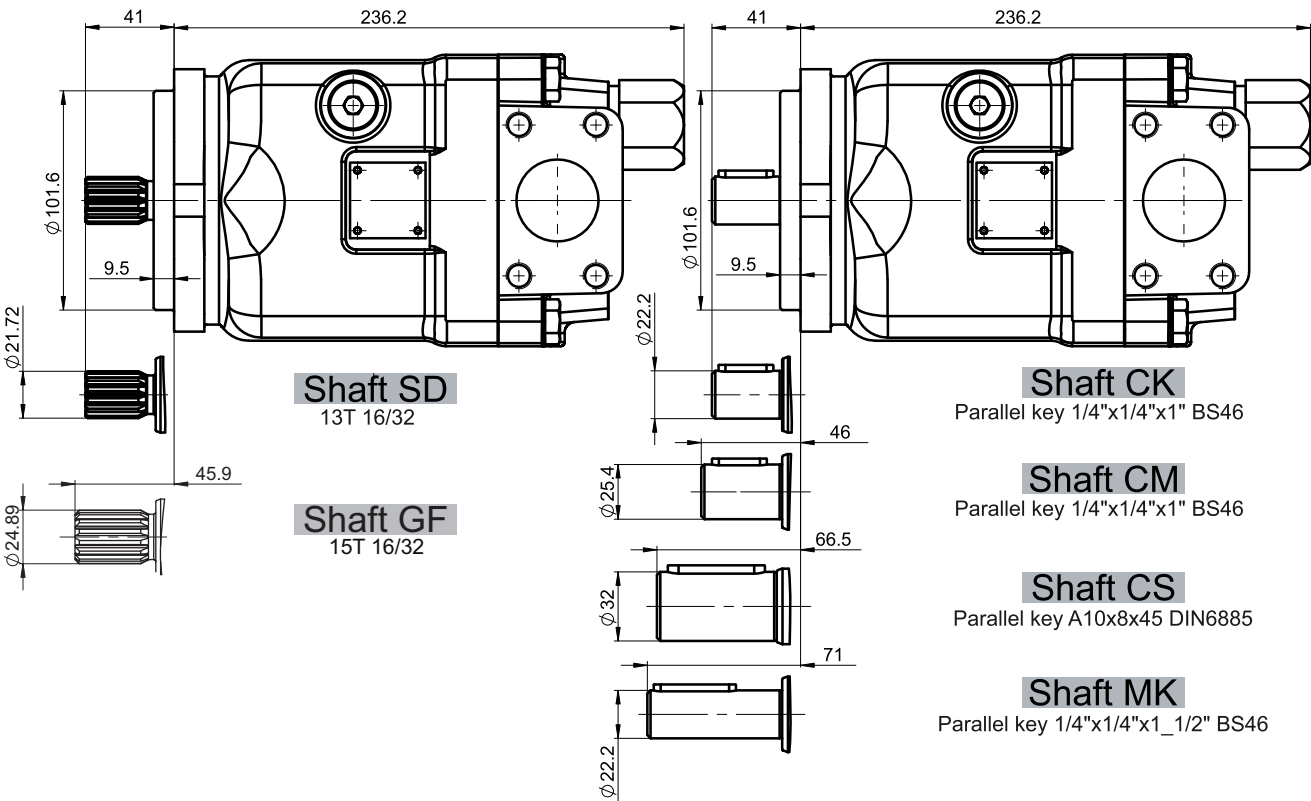


Overall Dimensions and Ports

Direction of Rotation **CCW**(Left)



Shafts Mounting

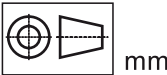


Shaft Dimensions
See Page 13

PERMISSIBLE SHAFT LOAD

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

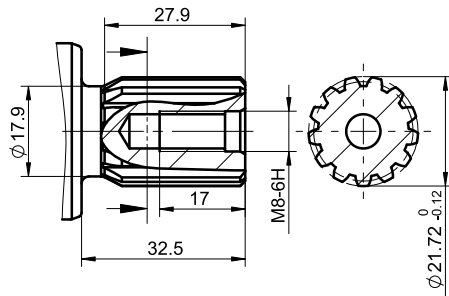
The calculated max values are based on the optimal direction of the forces Fr, Fa and optimal position of the shaft (see page 15).



Shaft Types and Dimensions

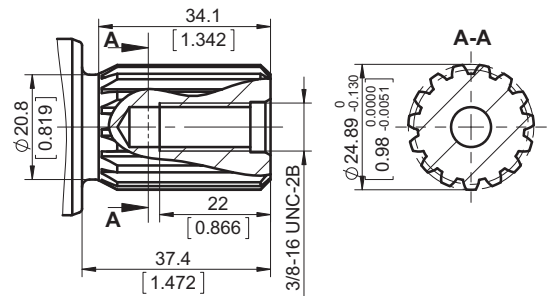
SD

ø21.72 M8-6H thread
13T 16/32 DP splined ANSI B92.1-1970
Max. torque 220 Nm



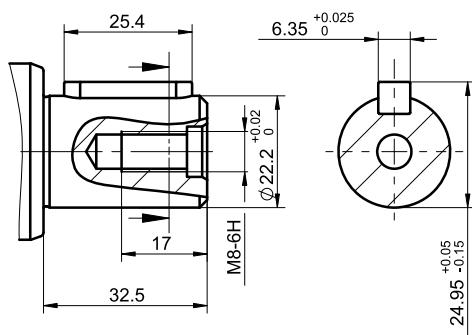
GF

ø 24.89 SAE-BB 3/8-16 UNC-2B thread
15T 16/32 DP splined ANSI B92.1-1970
Max. torque 360 Nm



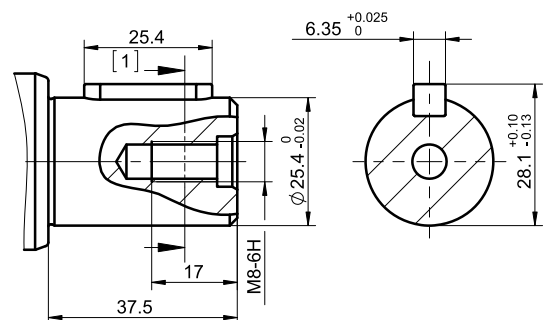
CK

ø22.2 straight, M8-6H thread
Parallel key **1/4"x1/4"x1"** BS46
Max. torque 180 Nm



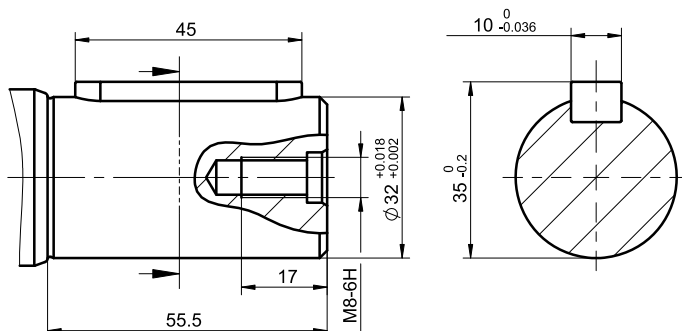
CM

ø25.4 straight, M8-6H thread
Parallel key **1/4"x1/4"x1"** BS46
Max. torque 250 Nm



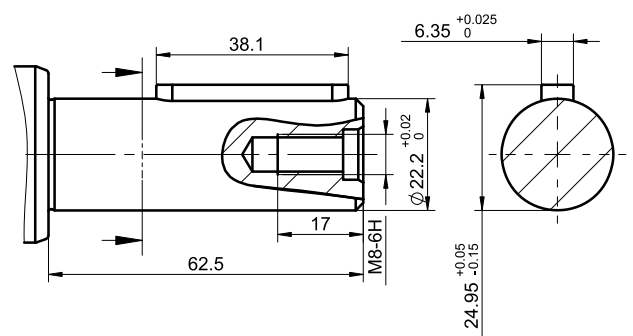
CS

ø32 straight, M8-6H thread
Parallel key **A10x8x45** DIN6885
Max. torque 565 Nm

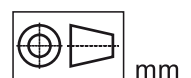


MK

ø22.2 straight, M8-6H thread
Parallel key **1/4"x1/4"x1 1/2"** BS46
Max. torque 180 Nm



The required max. torque
must not be exceeded



ORDERING CODE

	1	2	3	4	5	6	7
TPF							

Pos.1 - Mounting Flange

B - SAE B - 2-Bolt flange
spigot diam. 101,6 mm - BC 146 mm

Pos.5 - Port Size

omit - Inlet ISO 6162-1 DN38, Outlet ISO 6162-2
DN19, metric thread, drain ports M18x1.5

Pos.2 - Displacement Code

35 - 36.16 cm.³/rev.
40 - 41.59 cm.³/rev.
46 - 47.13 cm.³/rev.
50 - 49.94 cm.³/rev.

Pos.6 - Seal, Corrosion Resistant Seal Surface

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

Pos.3 - Direction of Rotation

R - CW, Right direction
L - CCW, Left direction

Pos.7 - Special Features

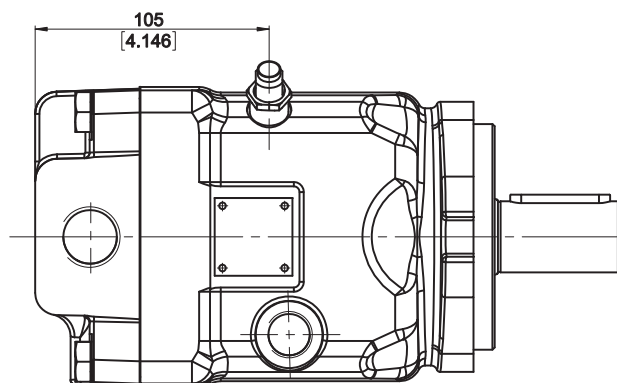
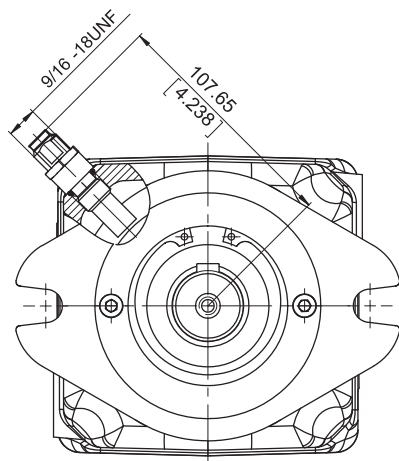
omit - None
R2S - Speed sensor two directional

Pos.4 - Shaft Extensions*

SD - ø21,72 spline SAE 13T 16/32 DP, M8
GF - ø24.9 Spline SAE 15T 16/32, 3/8-16 UNC-2B
CK - ø22.2 straight, M8-6H thread
Parallel key 1/4"x1/4"x1" BS46
MK - ø22.2 straight, M8-6H thread
Parallel key 1/4"x1/4"x1_1/2" BS46
CM - ø25.4 straight, M8-6H thread
Parallel key 1/4"x1/4"x1" BS46
CS - ø32 straight, M8-6H thread
Parallel key A10x8x45 DIN6885

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

We remain open to meet your special requirements upon request.

Speed Sensors
MOUNTING DIMENSIONS
TPF 60

INSTALLATION

1. Turn in (CW) by hand until bottom end gently touches the speed ring.
2. Back out (CCW) 1/4 turn. Continue backing out until the flats are 22° either side of pump or motor shaft center line (20° to 30° is acceptable). Do not back out the sensor more than 3/4 of a turn from touching.
3. Using the 1/2 inch wrench to hold the sensor, torque the lock nut to 13[115] Nm [lb-in] with an 11/16 inch hew wrench.



Speed Sensors

TECHNICAL DATA OF THE SPEED SENSOR

TECHNICAL DATA

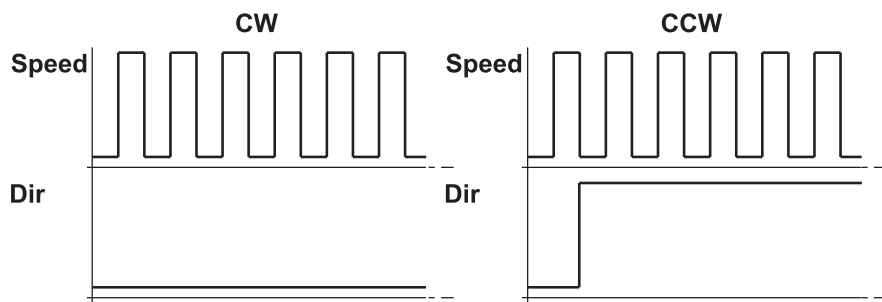
Power supply	4.5 ... 30 VDC
Power consumption	< 15 mA without load
Pin connector	universal /PUSH-PULL/ 4P Delphi Connector DJ3042&-2.5-21
Output measurements	Speed, Direction
Output maximum current	100 mA
Resident output voltage	1.5 V with 100 mA of the output 0.5 V without load of the output
Frequency range	0 ... 15 000 Hz
Degree of protection	IP 67
Temperature	-40 ... + 100 °C
Humidity	0 ... 95% RH

OUTPUT PULSES

per revolution

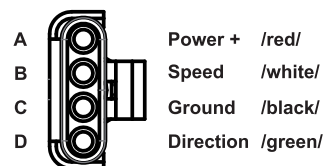
Pump Type	TPF 60
Output Pulses	50

OUTPUT DIAGRAMS



PIN CONNECTOR

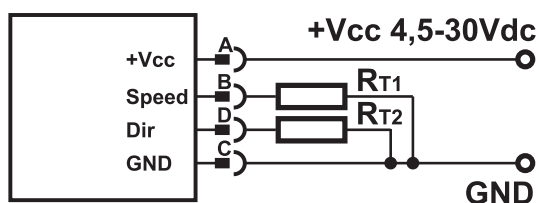
4 pin Delphi Connector



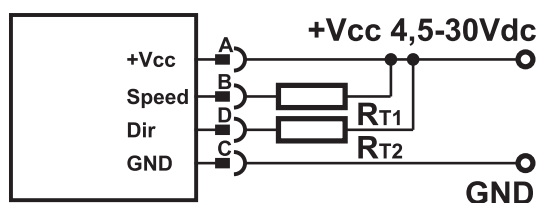
WIRING DIAGRAMS

Sensor could be in use for both type of connections - PNP or NPN

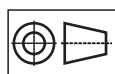
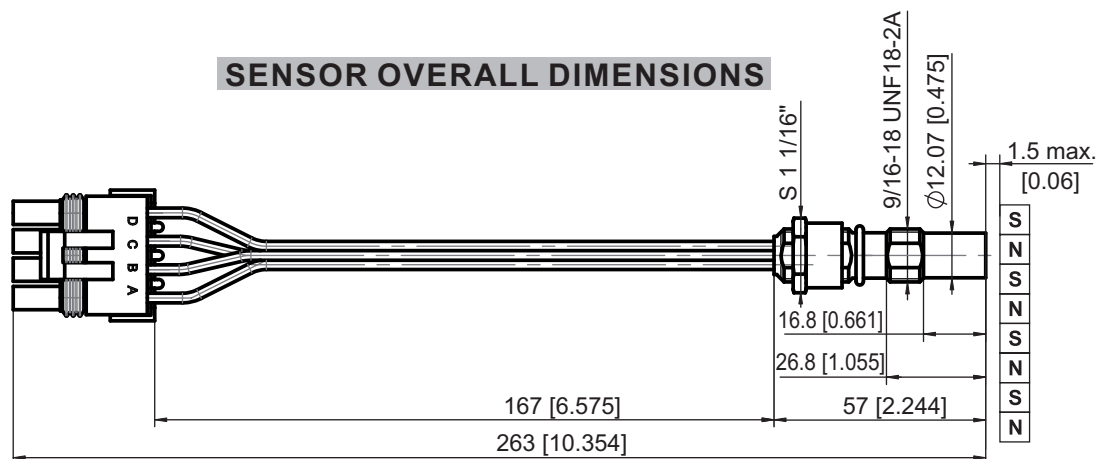
PNP



NPN



SENSOR OVERALL DIMENSIONS

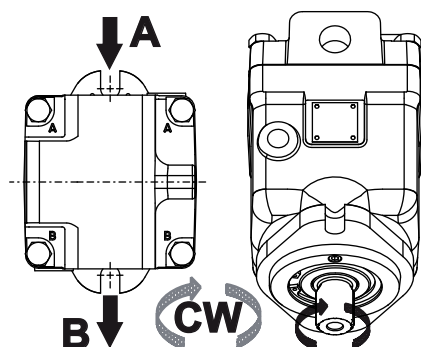


INSTALLATION

DIRECTION OF ROTATION

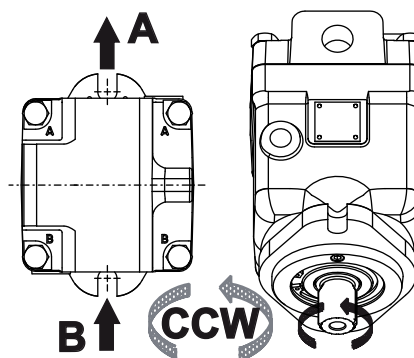
Standard Rotation

Viewed from shaft end
Port A Pressurized - CW
Port B Pressurized - CCW



Reverse Rotation

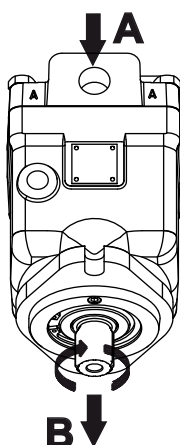
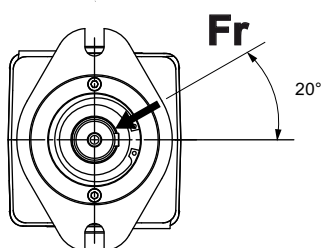
Viewed from shaft end
Port A Pressurized - CCW
Port B Pressurized - CW



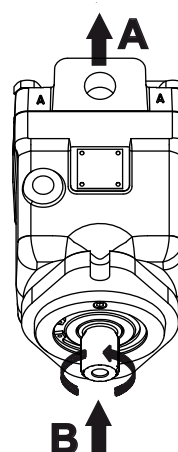
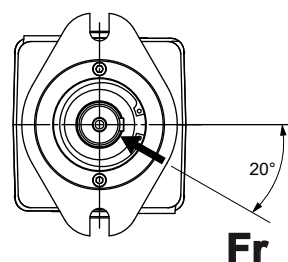
BEST POSITION FOR APPLYING RADIAL LOAD

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

Standard Rotation

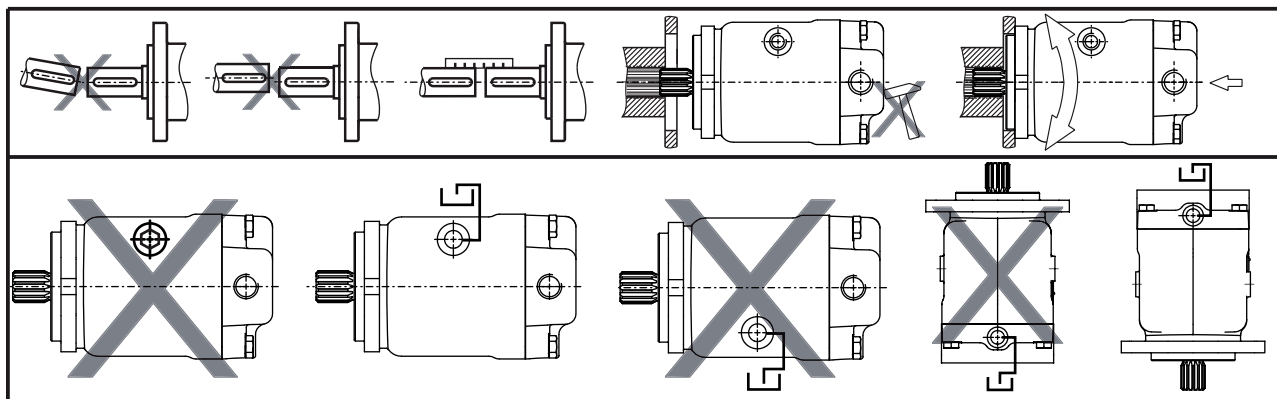


Reverse Rotation

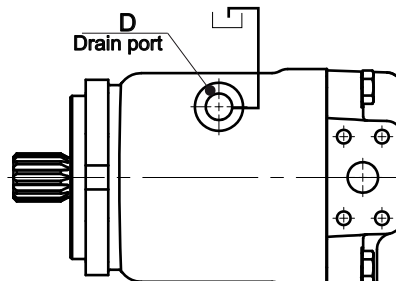
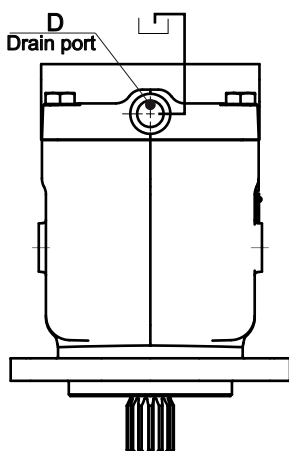


INSTALLATION

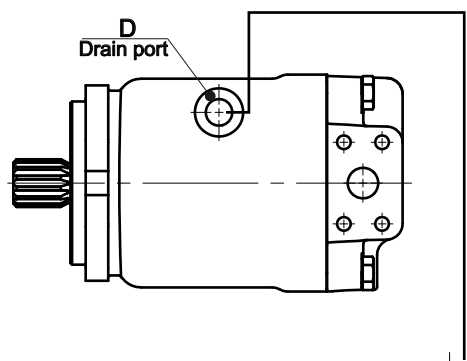
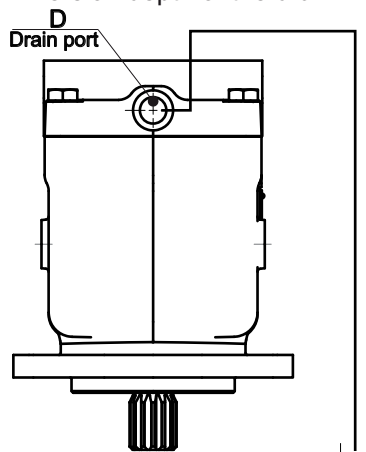
At start-up and during operation the pump housing has to be filled up with hydraulic fluid. Start-up has to be carried out at low or moderate speed and without load (for example 1000 rpm and pressure 50 bar [725 PSI]) till the pump and the hydraulic scheme are filled up with oil. Typically the start-up needs 10-15 minutes to finish. The leakage oil in the housing has to be discharged to the tank through the highest positioned drain port D. The max. pressure in the drain line is 5 bar.

**Installation below tank level (recommended)**

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

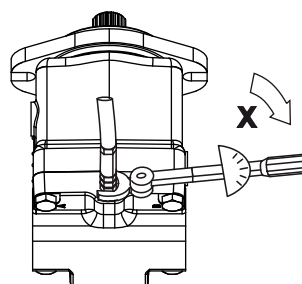
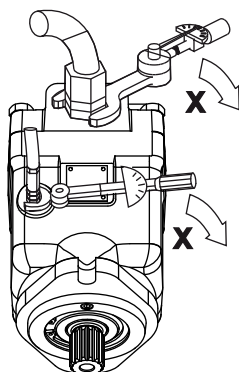
**Installation on top of tank level**

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



INSTALLATION

Recommended max. tightening torque X for metal plugs and orifice

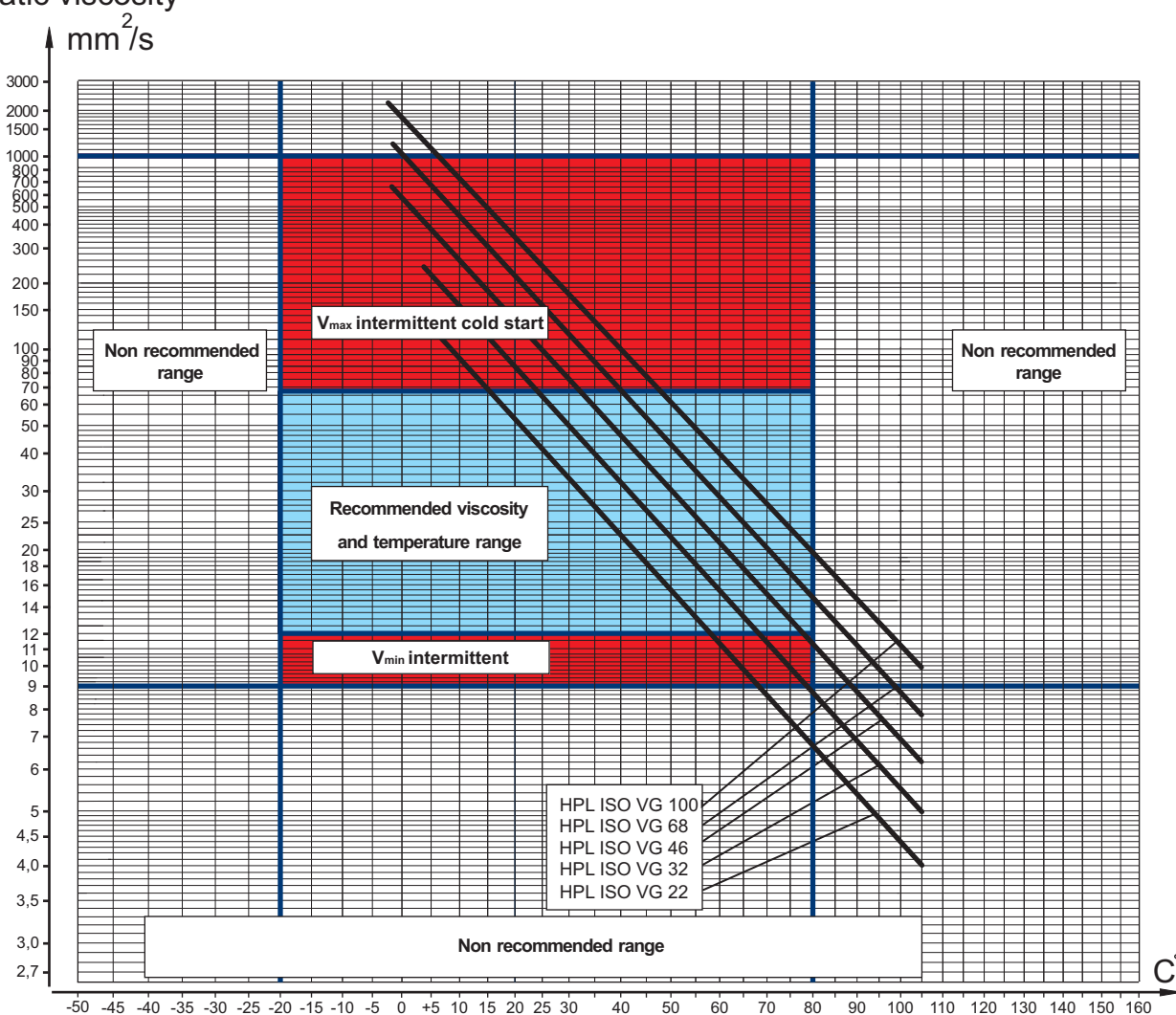


Screwed connection	Max. Tightening Torque X, Nm			
	With copper washer	With aluminium washer	With cutting edge	With "O" ring
G 1/4	20	30	40	20
G 3/8	20	50	60	20
G 1/2	30	80	100	30
G 3/4	50	130	160	50
G 1	80	200	250	80
M 8	20	10	20	
M 10	20	10	20	
M 12	20	30	40	
M 14x1,5	20	30	40	30
M 16x1,5	20	50	60	50
M 18x1,5	20	50	60	50
M 20x1,5	30	80	100	80
M 22x1,5	30	80	100	80
M 24x1,5	20	30	40	100
M 27x2	50	130	100	100

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.

Kinematic viscosity



Temperature

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	$\eta_t = \eta_{mh} \cdot \eta_v$ $\eta_{mh} = \frac{\eta_t}{\eta_v}$ $\eta_v = \frac{\eta_t}{\eta_{mh}}$	
Input flow (for Motor)	$Q = \frac{Vg \cdot n}{1000 \cdot \eta_v}$	[l/min]
Output torque (for Motor)	$M = \frac{Vg \cdot \Delta p \cdot \eta_{mh}}{62,8}$	[Nm]
Output power (for Motor)	$P = \frac{M \cdot n}{9550} = \frac{Q \cdot \Delta p \cdot \eta_t}{60}$	[kW]
Speed (for Motor)	$n = \frac{Q \cdot 1000 \cdot \eta_v}{Vg}$	[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)	$P = \frac{M \cdot n}{9550} = \frac{Q \cdot \Delta p}{60 \cdot \eta_t}$	[kW]
	$Vg =$ Displacement per rev.	[cm ³]
	$\Delta p =$ $p_{HP} - p_{LP}$	[bar]
	$p_{HP} =$ High pressure	[bar]
	$p_{LP} =$ Low pressure	[bar]
	$\eta_v =$ Volumetric efficiency	
	$\eta_{mh} =$ Mechanical-hydraulic efficiency	
	$\eta_t =$ Overall efficiency	

Application Formulas

Motorspeed: n

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

v_{km} - vehicle speed [km/h]

v_{mi} - vehicle speed [mil/h]

R_m - wheel rolling radius [m]

R_n - wheel rolling radius [in]

i - gear ratio between motor and wheels.

If no gearbox, use $i=1$.

Total tractive effort: TE, N

Total tractive effort **TE** is the total effort necessary for vehicle motion i.e. the sum of the calculated forces increased by 10 % because of air resistance.

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

RR - force required to overcome the rolling resistance

GR - force required to slope upwards

FA - force required to accelerate (acceleration force)

DP - additional tractive effort (trailer)

Motor Torque moment: M, Nm

Necessary torque for the hydraulic motor:

$$M = \frac{TE \cdot R_m [R_n]}{N \cdot i \cdot \eta_m}$$

N - motor numbers

η_m - mechanical gearbox efficiency (if it is available)

Radial motor loading: P_{rad} , N

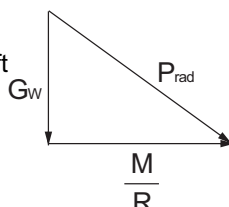
When the motor is used for motion with a ring or gear mounted directly on the motor shaft, the total radial load of the motor shaft P_{rad} is the sum of the motion force and the weight force acting on ring.

G_w - Weight held by the shaft

P_{rad} - Total radial load of the motor shaft

M/R - Motion force

$$P_{rad} = \sqrt{G_w^2 + \left(\frac{M}{R}\right)^2}$$



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

PUMPS



Closed Loop Axial Piston Pumps (Variable Displacement) - 6-110 cc

Model	Displacement cm ³ /n.	Rated Pressure MPa	Peak Pressure MPa	Maximum speed n/min.	Weight kg (single pump)
TPV 1000 TPV 1200 BTB	6, 8, 9, 11, 12, 13	21	30	3.600	8,8
	15, 17		28		
	18		27		
	19, 21	20	25	3.200	
TPV-TPVTC 1500	17, 18, 19, 21	35	40	3.600	14
TPV 3200	21, 28	25	35		22
TPV-TPVT 3600	26, 28, 30, 31, 32, 34, 36, 38	35	45		28
TPV 4300	32, 38, 45, 50	25	35		23
TPV 5000	46, 50, 64	30	40		29
TPV 9000	55	40	45	4.000	55
	72			4.100	68
	90			4.000	
	110			3.800	



Open Loop Axial Piston Pumps (Fixed Displacement) - 32-50 cc

Model	Displacement cm ³ /n.	Rated Pressure MPa	Peak Pressure MPa	Maximum speed n/min.	Weight kg (single pump)
TPF 60	35, 40, 46	35	42	2.800	20,5
	50		41	2.500	



Bent Axis Pumps - 12-130 cc

Model	Displacement cm ³ /n.	Rated Pressure MPa	Peak Pressure MPa	Maximum speed n/min.	Weight kg
TPB - TAP 70	12.6	35	40	3.300	7,5
	17.0			3.200	
	25.4			2.550	8,5
	34.2			2.250	
	41.2, 47.1			2.200	15,5
	56.0			2.100	
	63.6			2.050	
	83.6, 90.7, 108.0			1.700	27,0
	130.0			1.600	29,5
	The table values can change in function of the configuration.				

As HANSA-TMP has a very extensive range of products and some products have a variety of applications, the information supplied may often only apply to specific situations.

If the catalogue does not supply all the information required, please contact HANSA-TMP.

In order to provide a comprehensive reply to queries we may require specific data regarding the proposed application.

Whilst every reasonable endeavour has been made to ensure accuracy, this publication cannot be considered to represent part of any contract, whether expressed or implied.

The data in this catalogue refer to the standard product. The policy of HANSA-TMP consists of a continuous improvement of its products. It reserves the right to change the specifications of the different products whenever necessary and without giving prior information.



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