PLP Sanitary Lobe Pumps

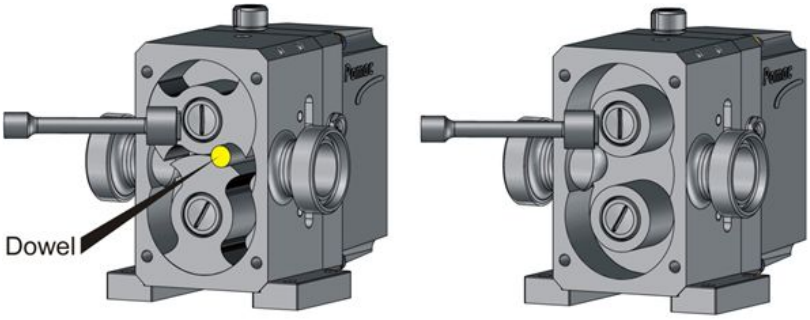
The PLP Sanitary Lobe Pumps have been produced specifically for hygienic and sanitary applications within the food, chemical and pharmaceutical industries. The series is fully compliant with EHEDG standards and has been designed with a heavy emphasis on achieving maximum performance & efficiency whilst offering compactness, robustness, cleanability & low maintenance costs thanks to its front pull-out design.

The range consists of 11 pump sizes, depending on the flow and solids passage requirements.

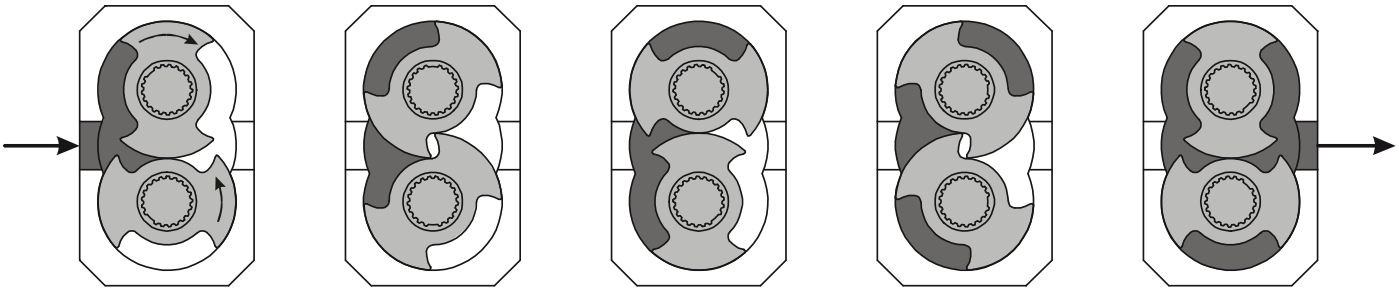
Like the PDSP Double Screw Pumps, the PLP Lobe Pumps are entirely machined from cast Stainless Steel AISI 316L with a surface roughness of <0.8 as standard (<0.5 on request) to provide increased corrosion resistance. Competitors units employ a cast iron gear box with epoxy paint which can become eroded over time and need replacing / repairing. The pump shafts are constructed from Duplex Stainless Steel 1.4462 to provide extra rigidity in operation and the pump can be fitted with a number of different sealing options and elastomer materials to suit almost any application.

With capacities up to 110 m^3/hr and discharge pressures up to 15 Bar this range of Sanitary Lobe Pumps is suitable for a wide variety of applications. This coupled with some key features and benefits puts it apart from its competition as one of the most versatile Lobe Pumps on the market today.

With delivery of each product the customer receives a lobe rotor tool and dummy rotors to facilitate easy removal and replacement of lobes and mechanical seals. Further reducing downtime.

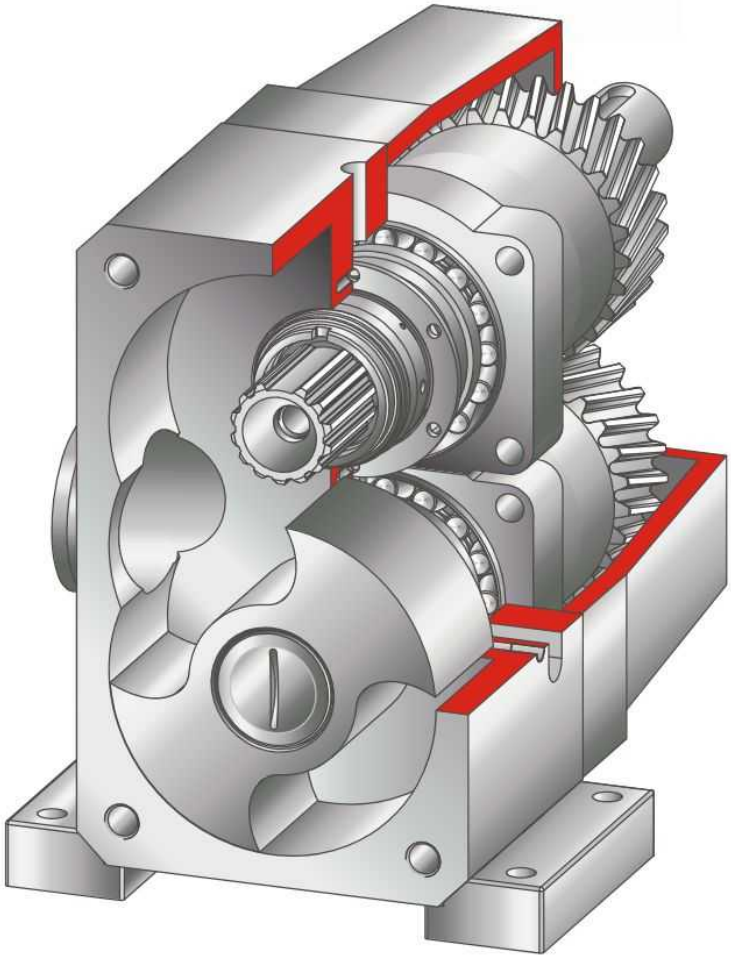


Operating Principle:



The PLP Sanitary Lobe Pump is a Rotary Positive Displacement Pump. Its operation is based on the counter rotation of 2 lobes in the pump casing. Both lobes are mounted onto their own shafts which are supported by bearing cartridges mounted directly onto the pump casing. One of the pump shafts is externally driven and an internal gear assembly drives the other shaft in the opposing direction. The screws rotate synchronously in opposing directions without touching.

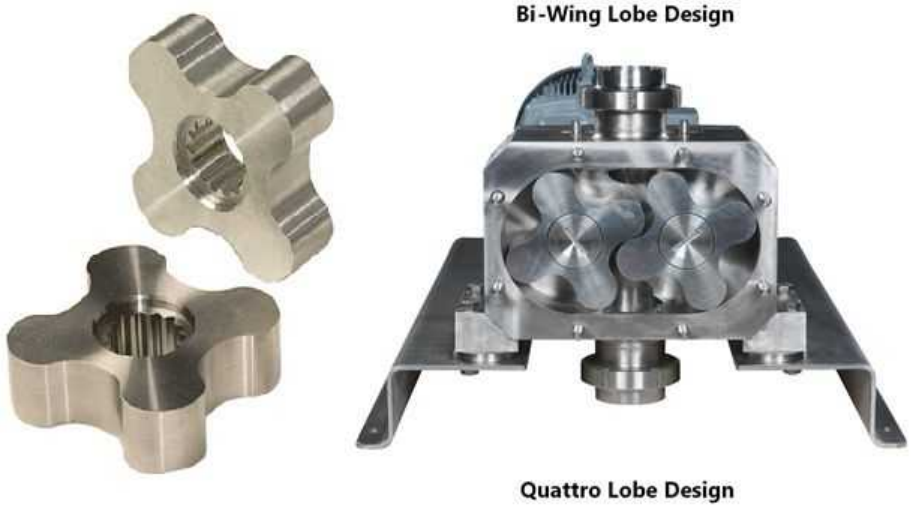
When the lobes rotate and pass the suction port the volume between them increases and creates a vacuum which causes liquid to enter the suction port and the pump casing. During the rotation of the lobes the fixed amount of fluid is conveyed through the pump. As the lobes approach the discharge port the volume between them decreases which creates a pressure build-up, causing the fluid to flow out of the discharge port.



Features & Benefits:

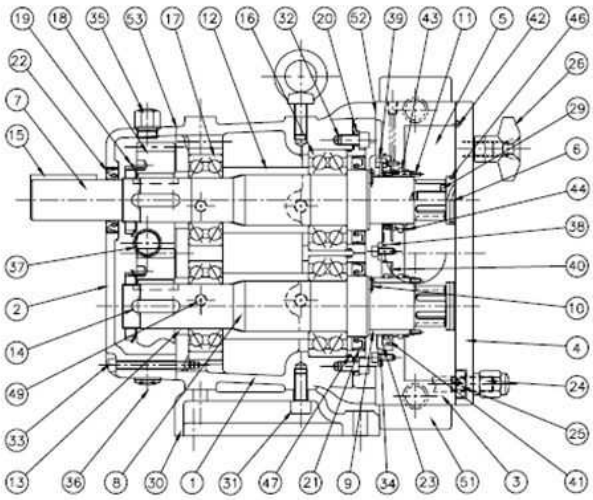
- Speed range up to 1500 rpm
- Fully EHEDG Compliant
- Wide Variety Interchangeable Sealing Options – Modular design
- Complete Front Pull-Out of Mechanical Seal & Lobes
- High Efficiency B-Wing or Low Pulsation Quattro Lobe Designs available
- Flat Front Cover to ensure more efficient cleaning
- Can be mounted Horizontally or Vertically in pipework
- When mounted vertically the pump is self-draining
- Accurate flow control from 0.04 – 2.5 l/rev
- Discharge Pressures up to 15 Bar
- Variable fluid temperatures up to 140ºC
- CIP / SIP friendly – minimal dead spaces
- Suitable for Shear Sensitive Fluids
- Suitable for pumping fragile solids
- Wide variety of connection types
- Optional Heating & Cooling Jackets
- Optional Air or Spring Loaded Integral Safety Valves
- ATEX Rated

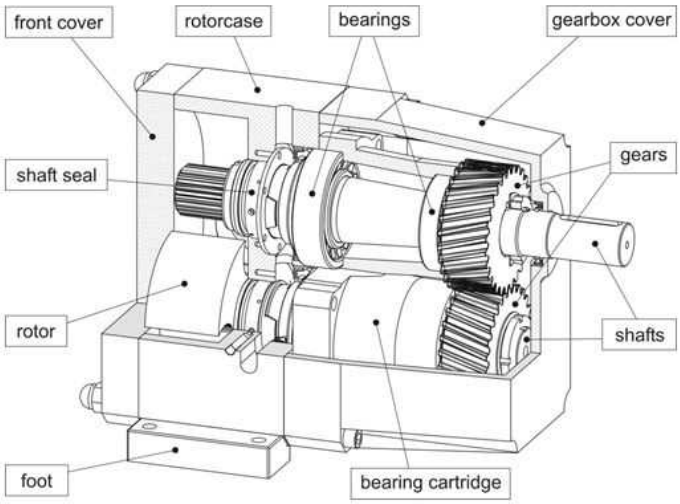
Bi-Wing Lobe Design



Quattro Lobe Design

- **Traditional Construction vs Advanced PLP Construction**





Traditional Construction Disadvantages:

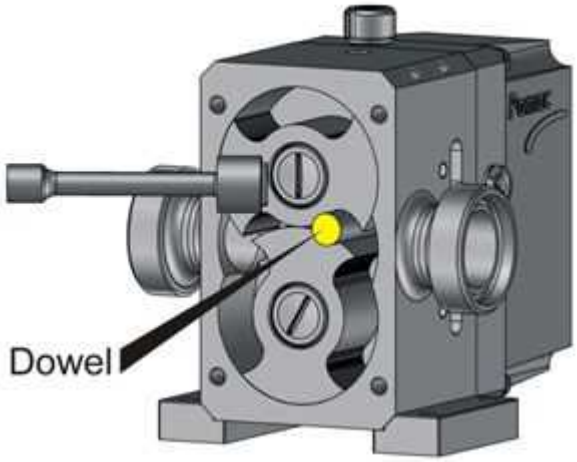
- Long shaft overhang
- Shaft deflection
- Sensitive to temperature shock
- No Front Pull Out construction
- Not CIP approvable
- Heavy construction

Advanced PLP Construction Advantages:

- Short shaft overhang – Less expansion of shaft due to high temperatures during CIP procedures.
- Very low shaft deflection
- Less sensitive to temperature shock
- Complete stainless steel design – enhanced cleanliness
- Modular design: All mechanical seal variants can be fitted to the same housing & pump can easily be switched from horizontal to vertical execution – all holes for mounting feet are pre-drilled.
- Front Pull Out construction
- CIP cleanable
- "Light weight" construction

Mechanical Seals:

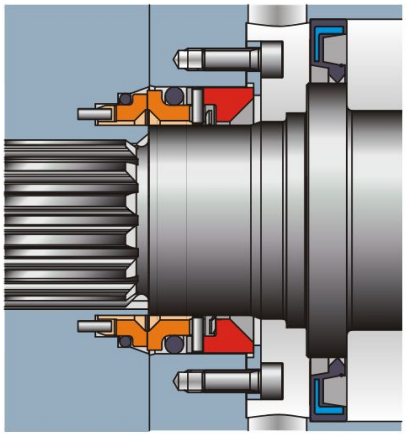
PLP Sanitary Lobe Pumps are available with several, interchangeable, shaft sealing options. They are modularly built and are front pull-out by design making replacement and re-assembly very quick and easy. The type of sealing is dependent on the application requirements and can be supplied in the following variants & material combinations:



Variants:

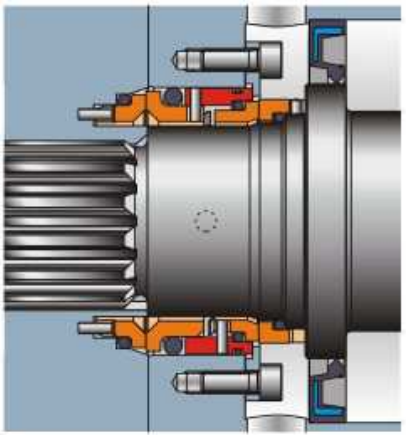
- M1 = single mechanical seal SIC/SIC
- M2 = double mechanical seal, quenched, SIC/SIC
- M4 = single mechanical seal TC/TC
- M5 = double mechanical seal, quenched, TC/TC
- O1 = single O-ring seal
- O2 = double O-ring seal, quenched
- L3 = WDR Lip Seal

Materials: Silicon Carbide/Silicon Carbide and Tungsten Carbide/Tungsten Carbide sliding rings
Elastomers: NBR, EPDM, Viton, PTFE, Kalrez



Single Mechanical Seal

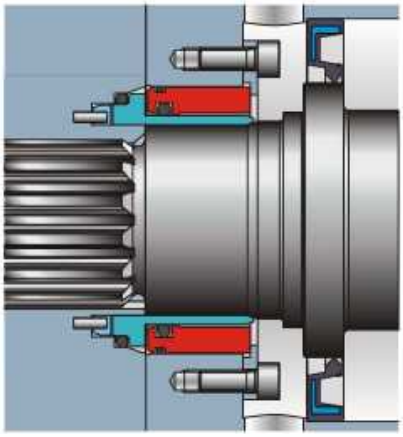
Can be used for smooth & non crystallising, non-sticky or slightly abrasive products.



Double Mechanical Seal

Can be used for crystalising, sticky products and those that will burn between the faces such as eff & milk.

Can be fitted with either Quench of Flushing Systems

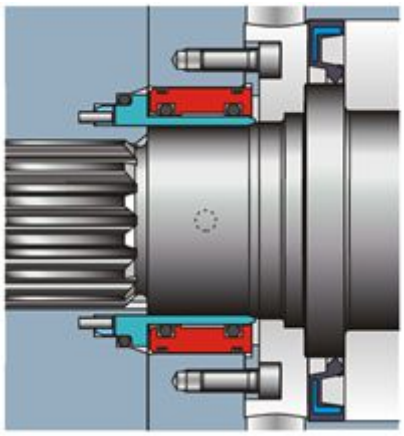


Single O-Ring Seal

O-Ring operate on a ceramic hardened SS316L Shaft Sleeve.

Can be used for smooth products which will not crystallise or temper.

Suitable for butters, creams, chocolates etc...

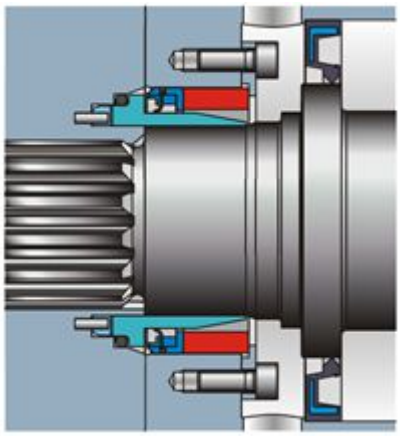


Double O-Ring, Quenched

O-Rings operate on a ceramic hardened SS316L Shaft Sleeve.

For use on chocolates, glucose, liquorice and other products containing sugar.

Can be quenched, not flushed.



Lip Seal

Operate on a ceramic hardened SS316L Shaft Sleeve. Only in a single seal execution. No quench needed and suitable for dry running.

Frequently used for very abrasive, crystallising, tempering & sticky products such as liquorice, chocolates, mashed potatoes, polyester & fondants.

Safety Relief Valve:

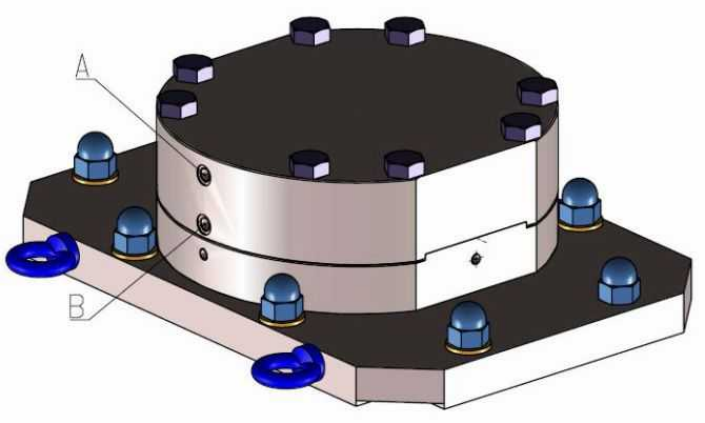
The PLP Sanitary Lobe Pumps can be fitted with either Spring-Loaded or Air Operated Safety Relief Valves. The opening pressures of which are adjustable by means of a set screw.

The valve is mounted directly to the pump cover to facilitate easy maintenance and to guarantee optimal hygienic conditions. When the valve is opened a by-pass is created between the pressure and suction sides of the pump.

When the differential pressure within the pump head exceeds the pre-set value on the valve, the valve will open and protect the pump from dead heading.

Below is a table detailing the models of pumps which can be fitted with either type:

Safety Relief Valve Type	PLP 1-¾ PLP 1-1 PLP 1-1.5	PLP 1.5-2	PLP 2-1.5 PLP 2-2 PLP 2-2.5	PLP 3-2 PLP 3-3 PLP 3-4	PLP 4-4
Spring Loaded	**X**	**X**	**X**	**X**	
Air Operated					**X**

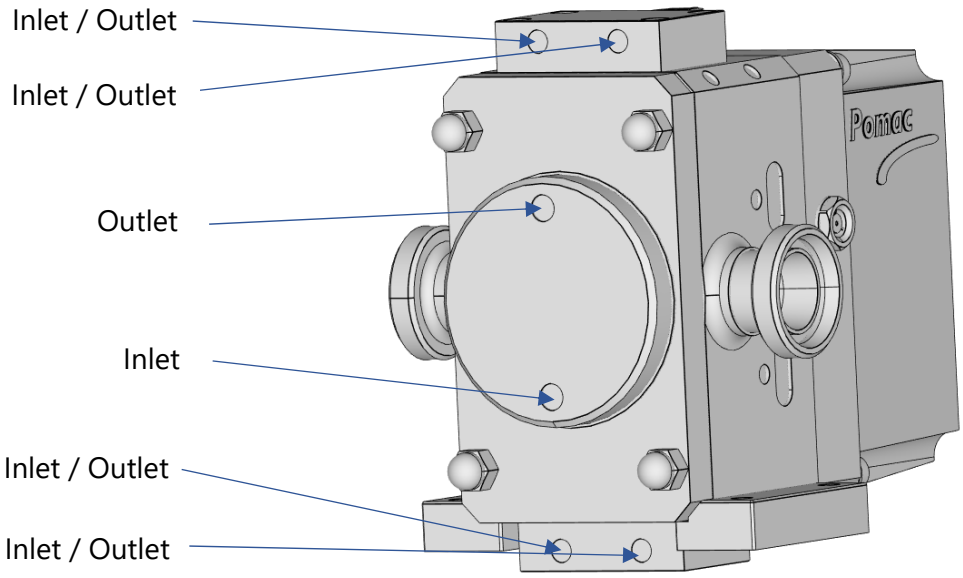


Air Operated Safety Relief Valve

Spring-Loaded Safety Relief Valve

A = Air Pressure Connection
B = Valve Vent (Always open)

Heating / Cooling Jackets:



PLP Sanitary Lobe Pumps can be fitted with Heating / Cooling Jackets to maintain fluid temperatures which are optimal to the pump performance and system requirements.

These are supplied in the following variants:

- H1 = Heating Jacket on the Front Cover
- H2 = Heating Jacket on the Rotor Case
- H3 = H1 + H2
- H4 = Electrical Heating Cover

Example Installation:

Customer: Cargill, The Netherlands

Product: Chocolate Compounds

Pump supplied: 18 x PLP4-4, 6 x PLP3-3, 7 x PLP2-2

Example Specification of PLP 4-4:

Product:	Chocolate Compound
Viscosity:	125-7000 cP
Capacity:	25000 kg/hr
Density:	1100-1300 kg/m3
Pressure:	8 max. bar
CIP temp.:	max. 85 °C
Pump casing:	stainless steel 1.4404
Gear casing:	stainless steel 1.4301
Lobes:	stainless steel 1.4404
Seal :	double o-ring with grease system
Connections:	4" / 4" acc. DIN 2633 – Horizontal configuration
Base plate:	stainless steel 1.4301
Oil:	food grade
O-rings:	Viton
Roughness :	> 0,8 micron
Drive:	Lenze GST09-2M, 11 kW / B3 / IP55 / 50Hz / 400/690V + PTC n= 163 rpm RAL 5010
Oil:	non-food grade
Coupling:	flexible coupling J-Flex 276

Data & Limits:

Max Capacity	110 m^3/hr
Max Pressure	15 Bar (25 Bar upon request)
Max Viscosity	<1'000'000 cPs
Max Temperature	140°C
Max Solids Passage	60 mm – Model & Screw Type Specific
Lobes	Bi-Wing or Quattro Lobe
Connections	¾" – 4"
Connection Types	Couplings: DIN11851, DIN11864-1, SMS1145 Flanges: EN1092-1, Rectangular, DIN11864-2, ANSI Tri-Clamps: ISO2852, DIN32676, DIN11864-3
Shaft Sealing	Single mech. seal SIC/SIC or TC/TC Double mech. seal SIC/SIC or TC/TC WDR Lip Seal Single O-ring Double O-ring with quench
Sealing Materials	SiC / SiC or Tungsten / Tungsten
Elastomer Materials	EPDM, Viton, NBR, Teflon, KALREZ, e.g. according to FDA
Wetted Parts	AISI 316L (AISI 316L Mo+Ni or Hastelloy CX2MW N26022 upon request)
Surface Roughness	<0.8 Micron (Std.), <0.5 upon request (Mechanical & Electro-Polished)
Hardening	Hard Inchromizing & Plasma Nitriding (Optional)
Drives	Standard: IEC, IE2, B3/B5, IP55, isolcl. F, PTC Optional: IE3, ATEX, CSA/UL, Decentralised variable speed drive

Applications:

- Viscous & vulnerable Dairy products such as: Yoghurt, Custard, Butter & Curdled Milk
- Bakery products such as: Dough, Fat, Paste, Fondant, Creams
- Beverages such as: Beer, Fruit Juice, Lemonade
- Cosmetic products such as: Creams, Shampoos etc…
- Meat products such as: Chopped Meat, Extracts, Animal Food
- Egg products such as: Albumen, Yolk
- Viscous Food products such as: Sauces, Salads, Soups, Glucose Syrup, Chocolate
- Starch products such as: Mashed Potatoes

Capacity Range:

Pump Model	Displacement Litres / 100 Rev	Max Solids Passage mm	Max Pressure Bar	Max Speed Rpm	Weight Kg
PLP 1-¾	4.2	13	15	1500	12
PLP 1-1	6	13	15	1500	12.5
PLP 1-1.5	10	13	15*	1200	14
PLP 1.5-2	20	22	8	1200	21
PLP 2-1.5	22	23	15	1200	37
PLP 2-2	30	23	15	1200	39
PLP 2-2.5	36	23	15*	1000	44
PLP 3-2	55	37	15	1000	101
PLP 3-3	100	37	15	1000	105
PLP 3-4	130	37	15*	750	115
PLP 4-4	250	52	15	750	250

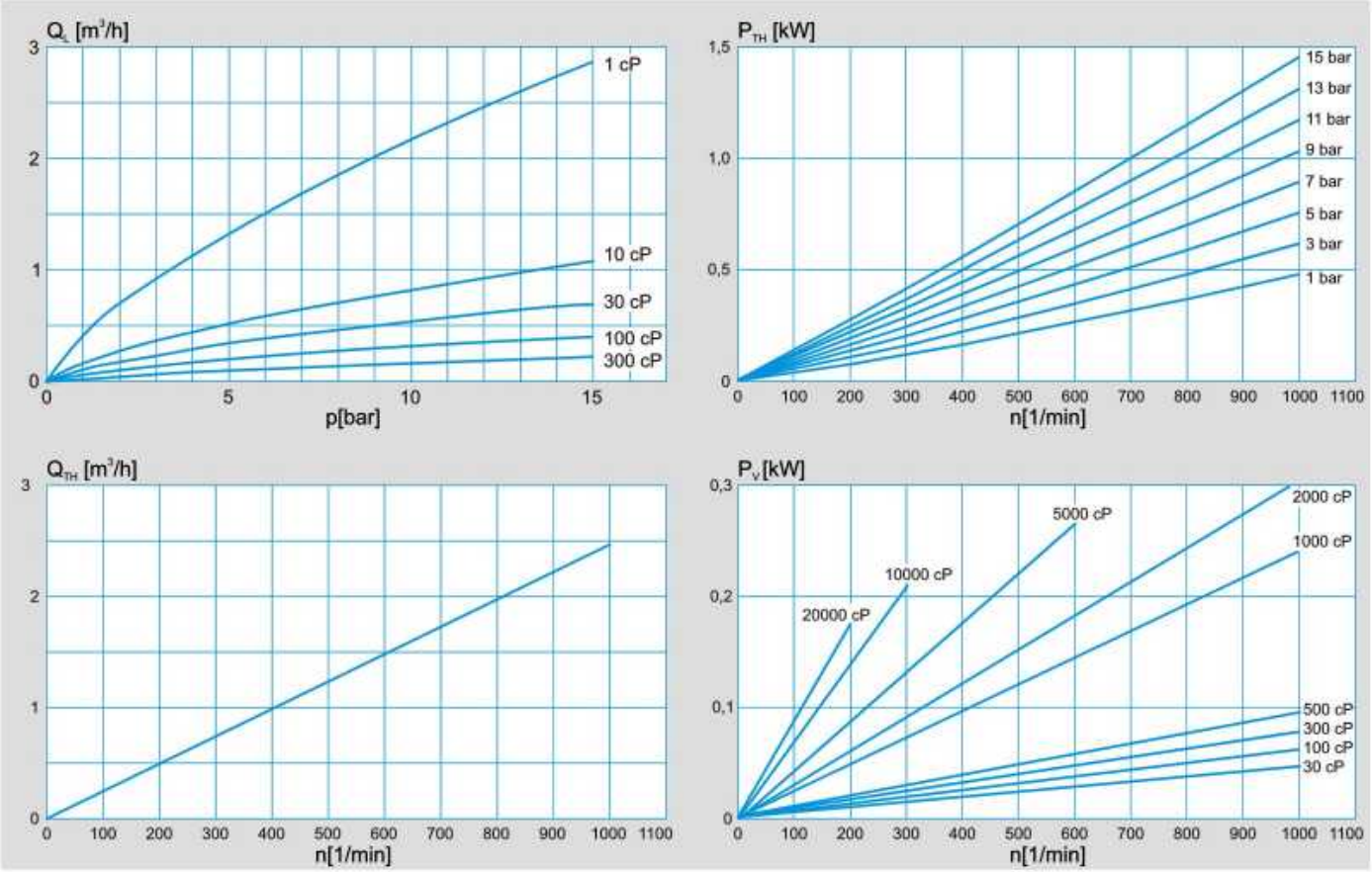
**Depends on the gap between the rotor and pump casing.*

The values mentioned above are maximum values. The operational values may be lower because of the liquid characteristics or the system design.

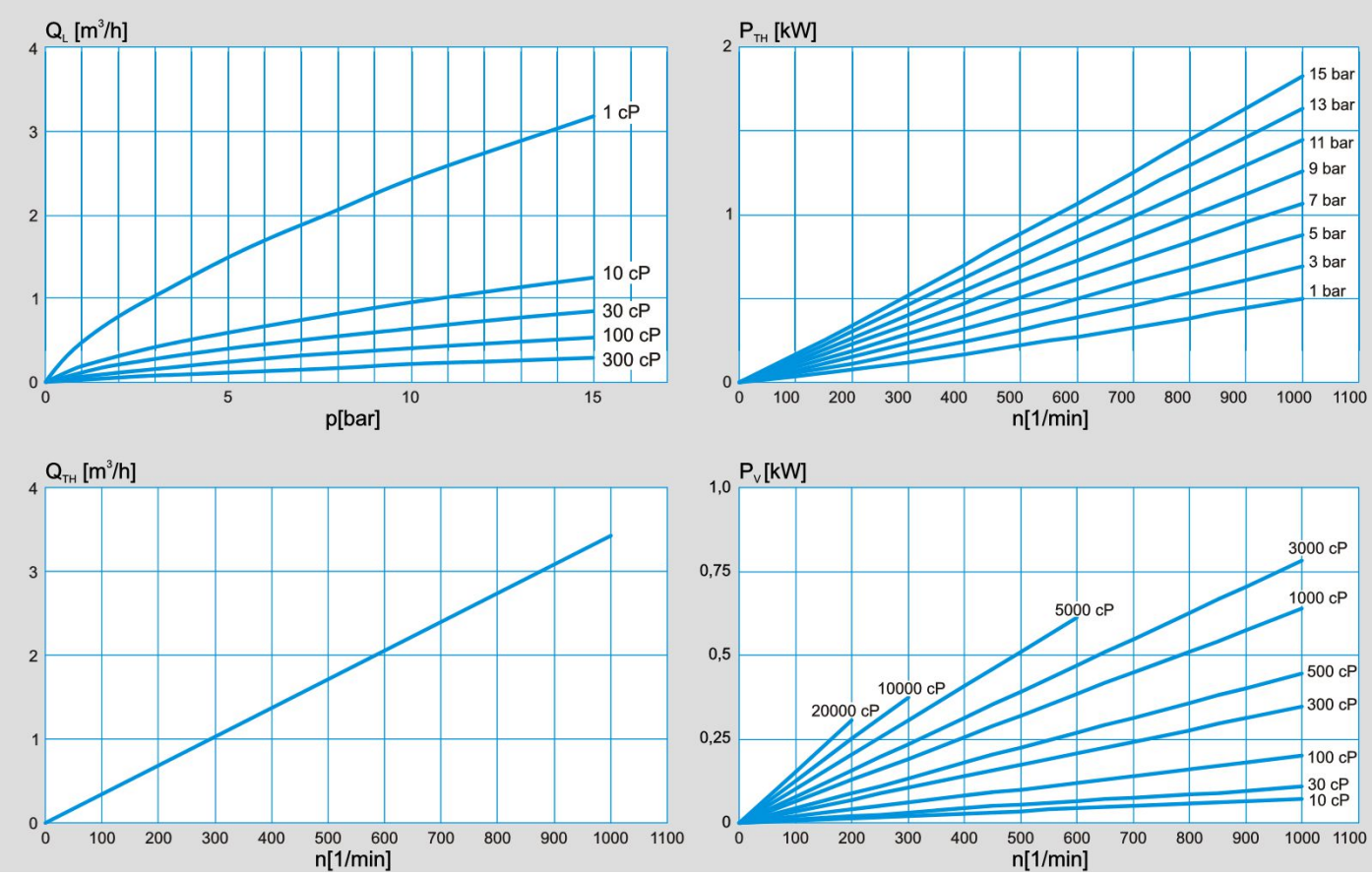
Performance Curves:

$Q_{TOT} = Q_{TH} - Q_{L,}$
$P_{TOT} = P_{TH} + P_V$

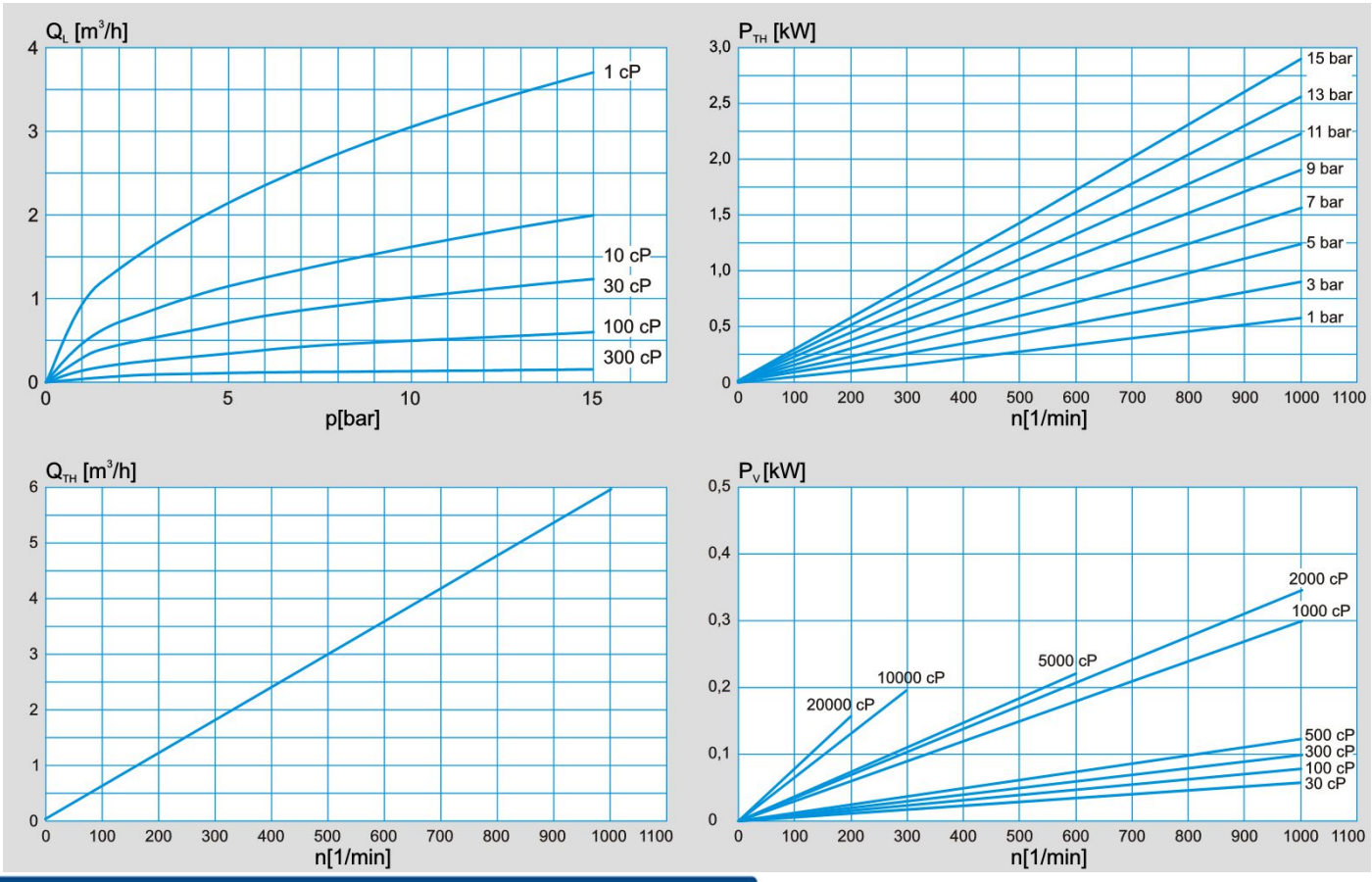
PLP 1-¾



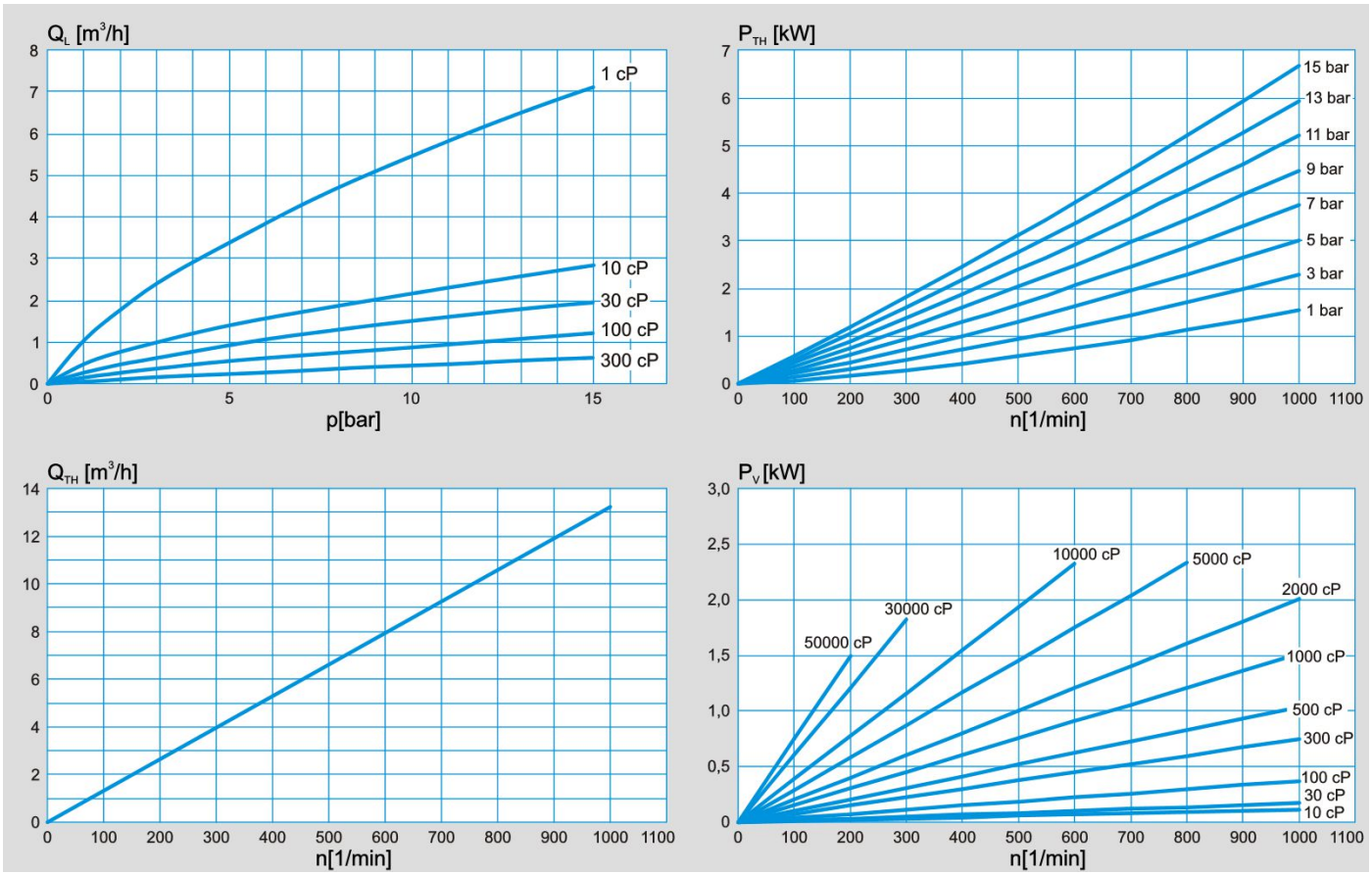
PLP 1-1



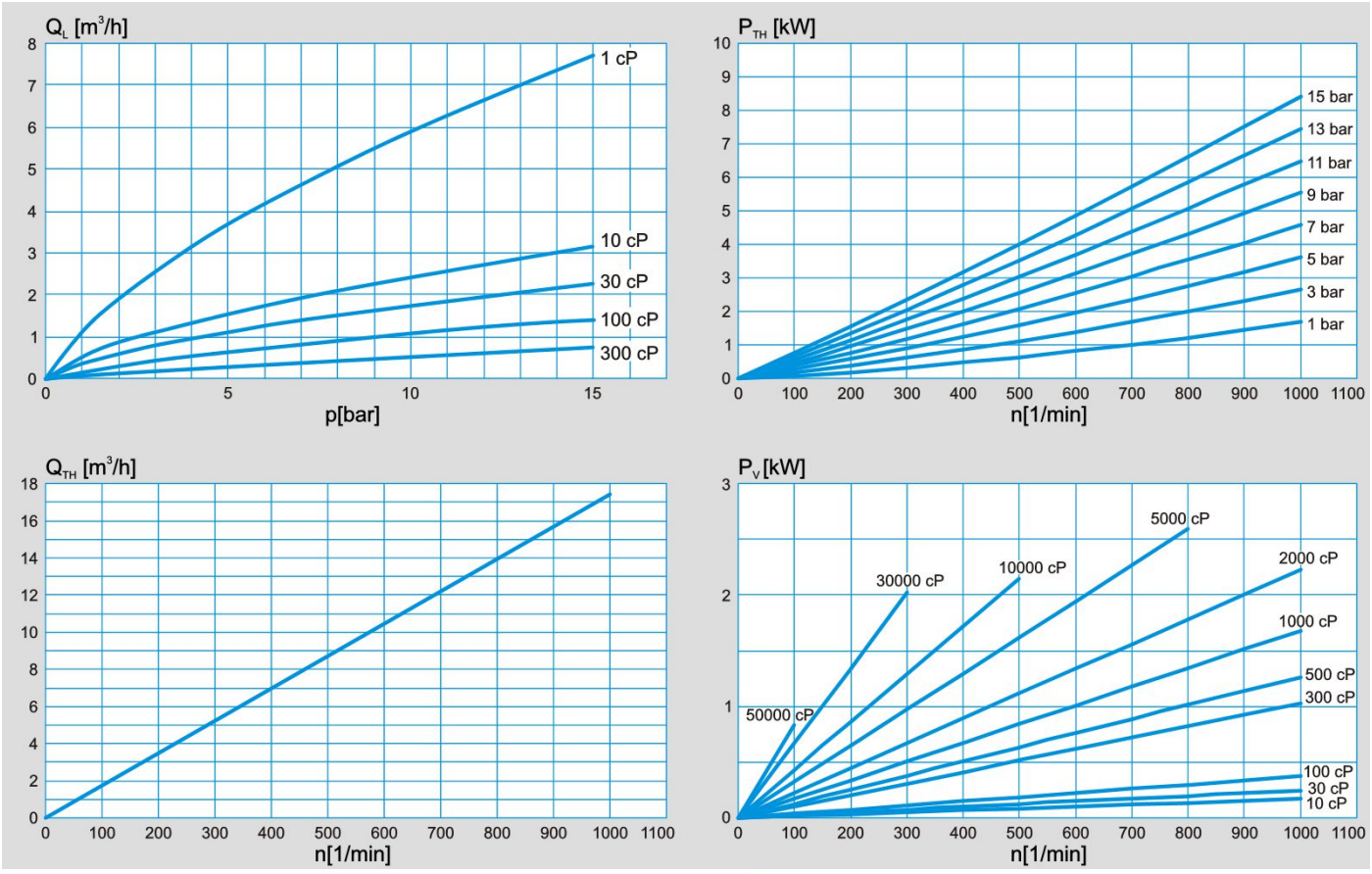
PLP 1-1.5



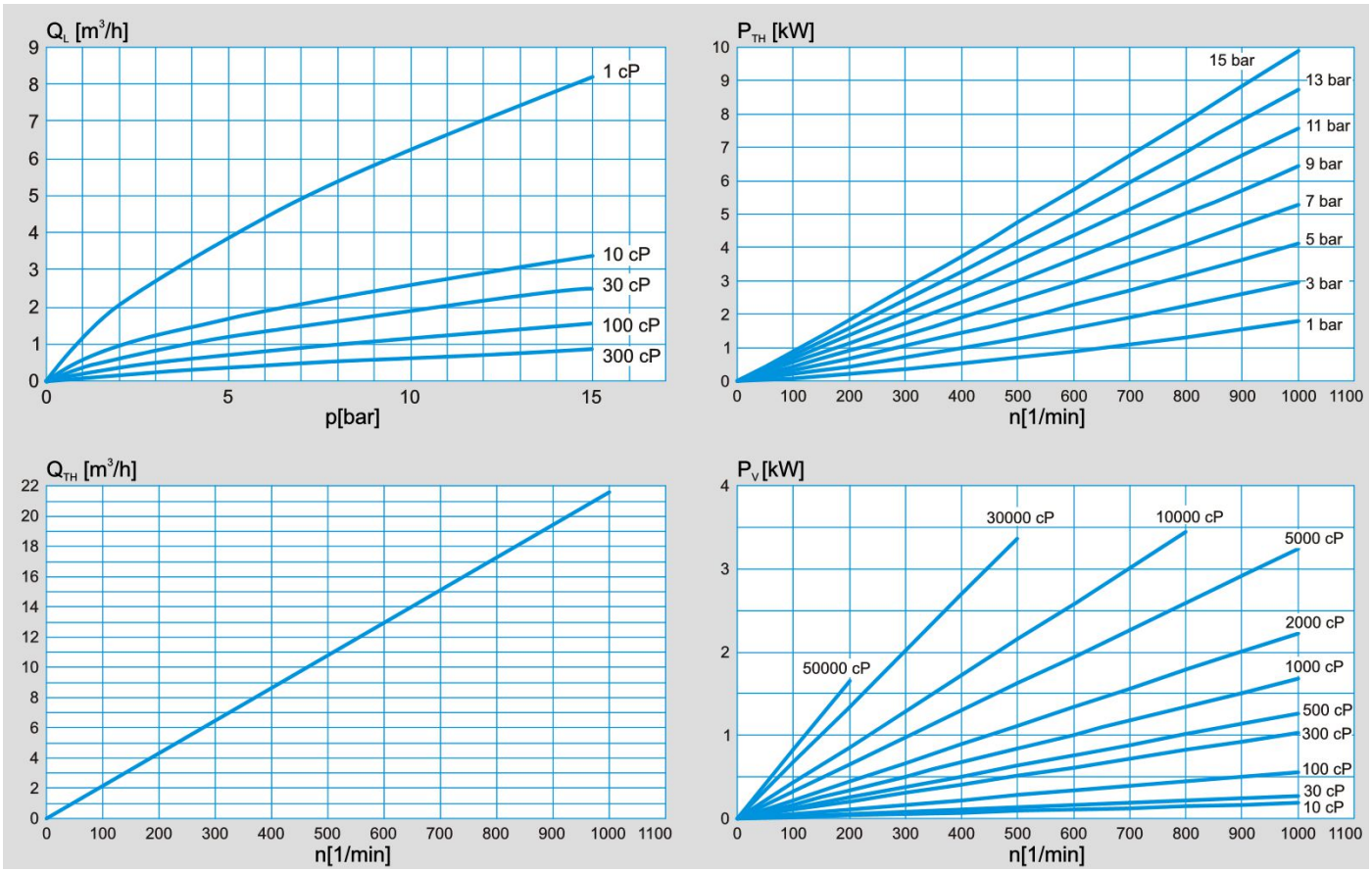
PLP 2-1.5



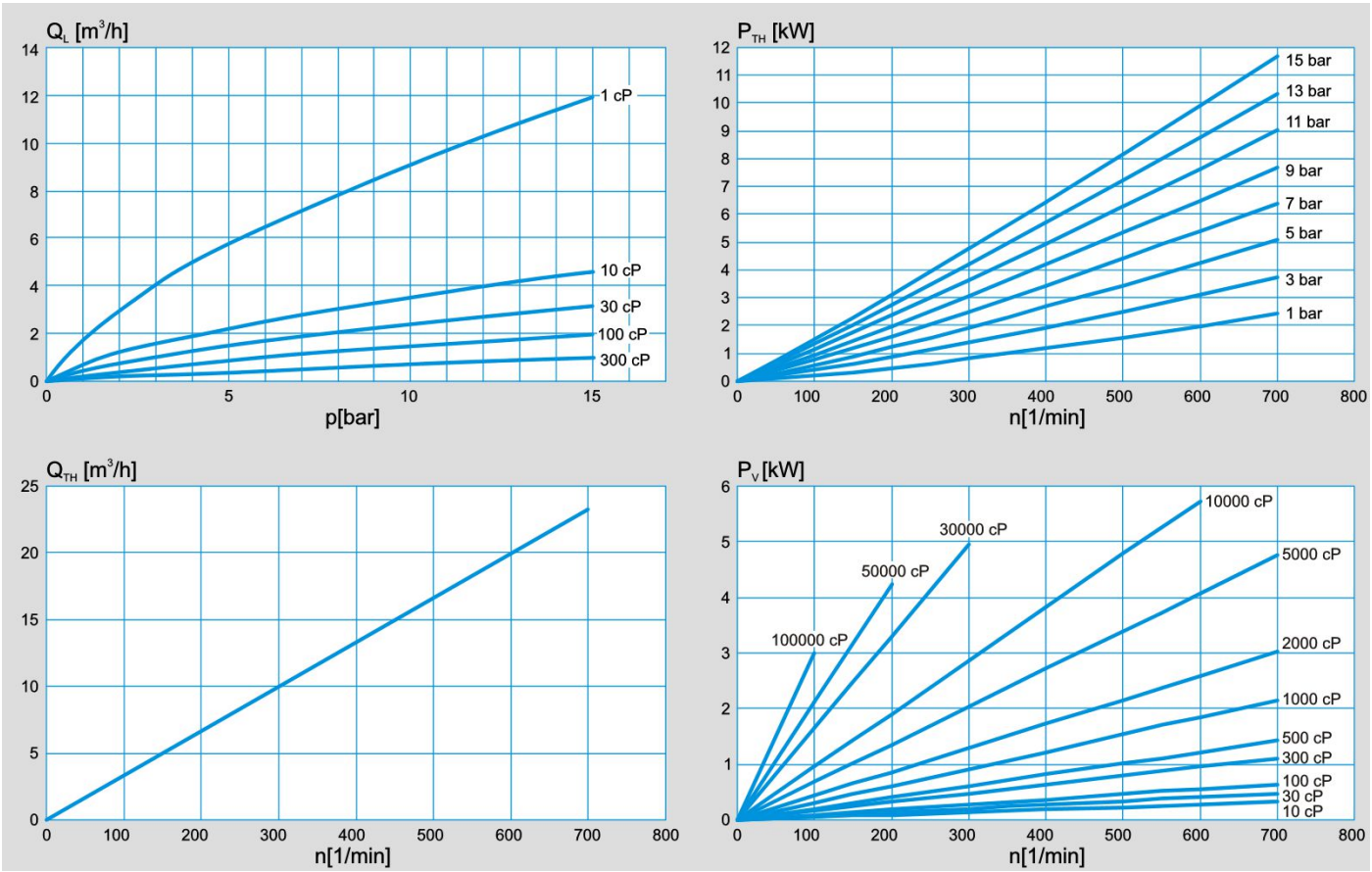
PLP 2-2



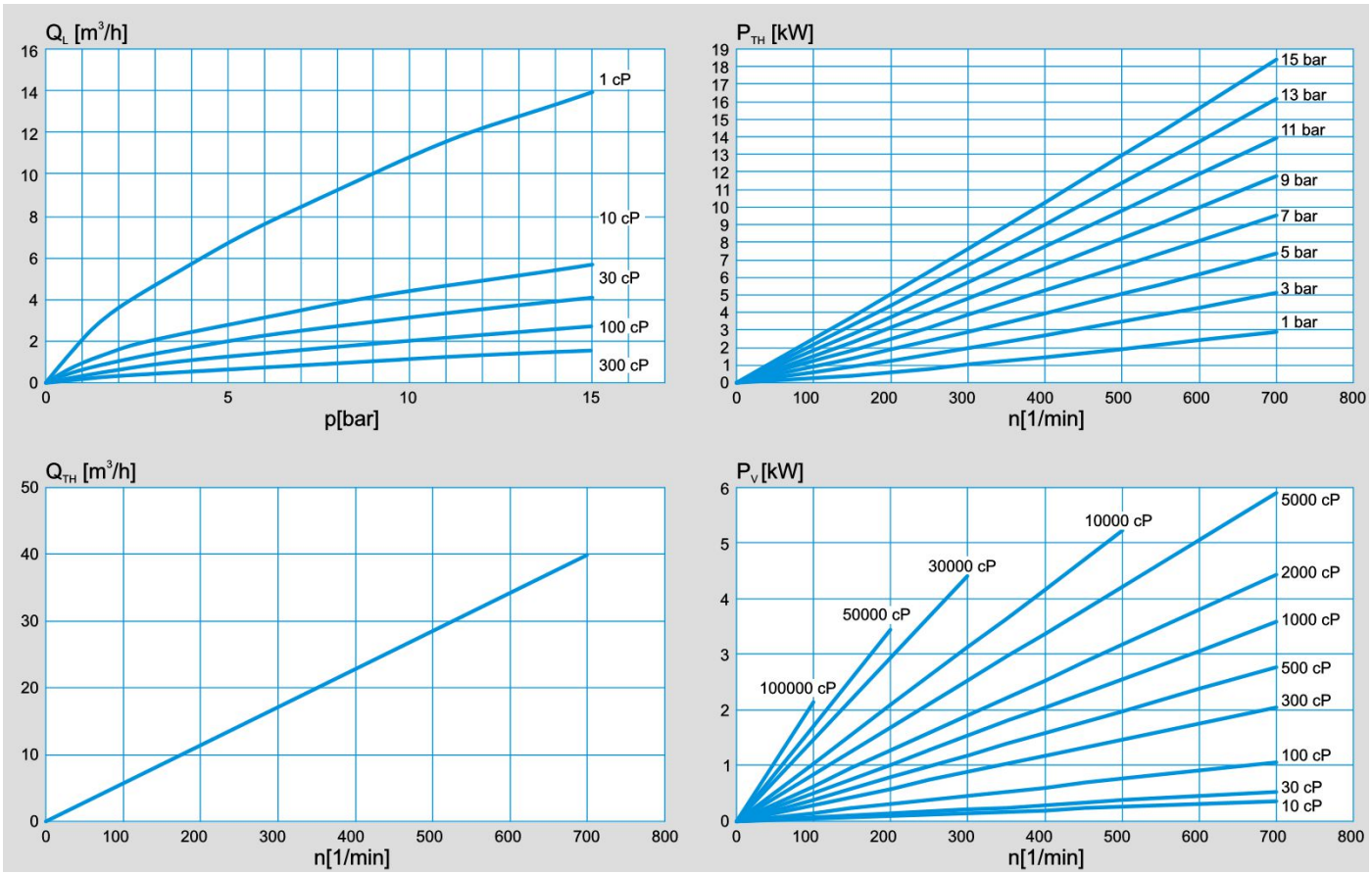
PLP 2-2.5



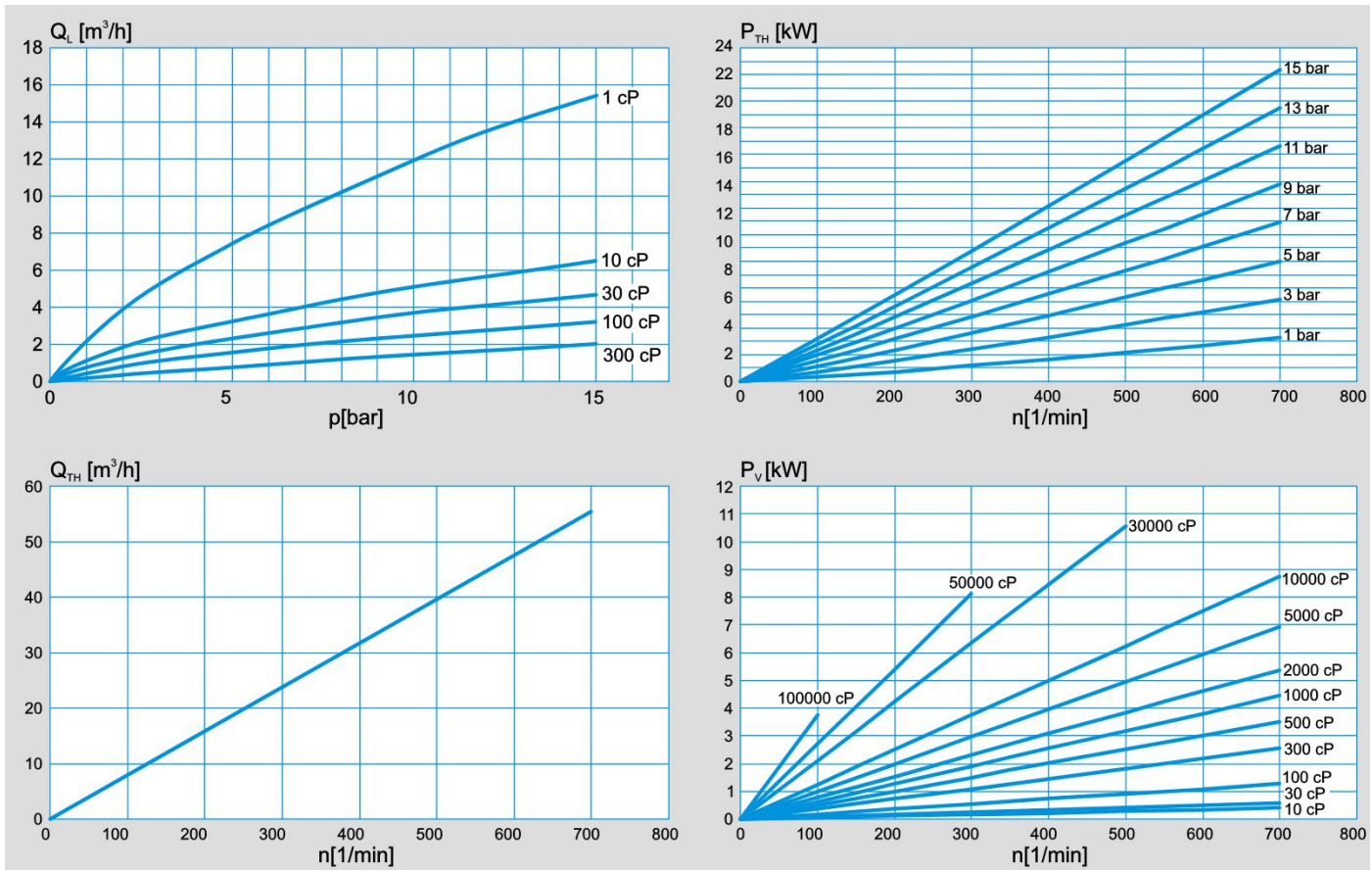
PLP 3-2



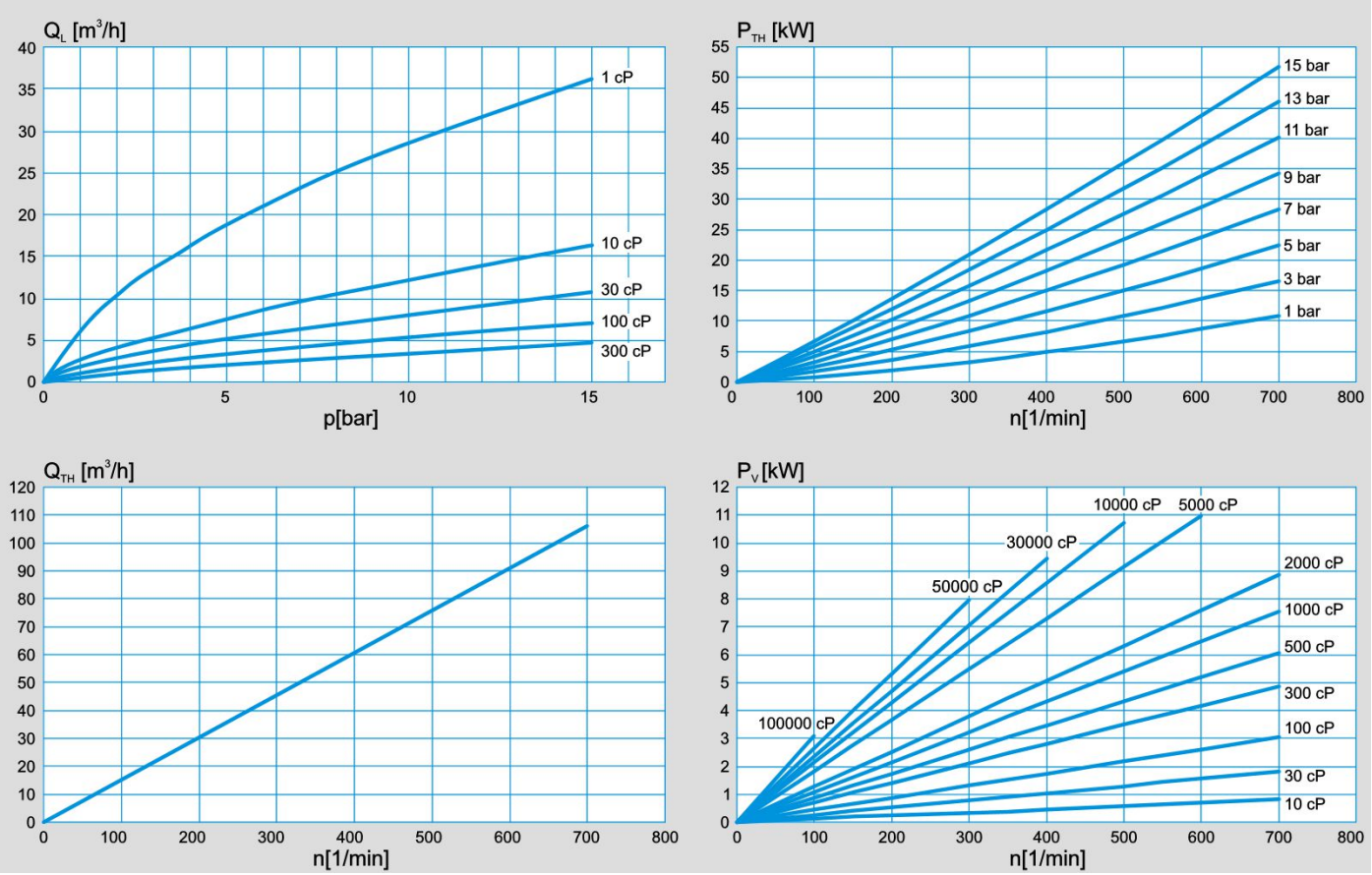
PLP 3-3


Q_L [m³/h]
1 cP
10 cP
30 cP
100 cP
300 cP
p[bar]
P_{TH} [kW]
15 bar
13 bar
11 bar
9 bar
7 bar
5 bar
3 bar
1 bar
n[1/min]
Q_{TH} [m³/h]
n[1/min]
P_V [kW]
100000 cP
50000 cP
30000 cP
10000 cP
5000 cP
2000 cP
1000 cP
500 cP
300 cP
100 cP
30 cP
10 cP
n[1/min]

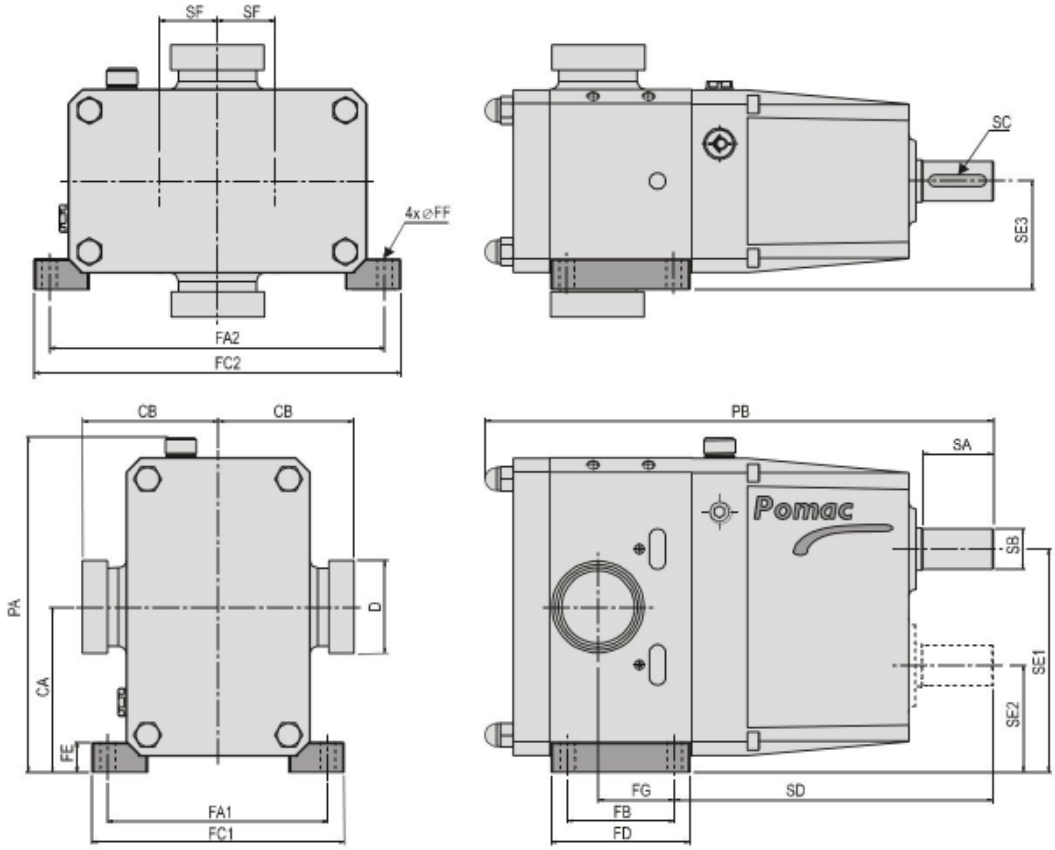
PLP 3-4


Q_L [m³/h]
1 cP
10 cP
30 cP
100 cP
300 cP
p[bar]
P_{TH} [kW]
15 bar
13 bar
11 bar
9 bar
7 bar
5 bar
3 bar
1 bar
n[1/min]
Q_{TH} [m³/h]
n[1/min]
P_V [kW]
100000 cP
50000 cP
30000 cP
10000 cP
5000 cP
2000 cP
1000 cP
500 cP
300 cP
100 cP
30 cP
10 cP
n[1/min]

PLP 4-4


Q_L [m³/h]
1 cP
10 cP
30 cP
100 cP
300 cP
p[bar]
P_{TH} [kW]
15 bar
13 bar
11 bar
9 bar
7 bar
5 bar
3 bar
1 bar
n[1/min]
Q_{TH} [m³/h]
n[1/min]
P_V [kW]
10000 cP
5000 cP
30000 cP
50000 cP
100000 cP
2000 cP
1000 cP
500 cP
300 cP
100 cP
30 cP
10 cP
n[1/min]

Dimensional Data:

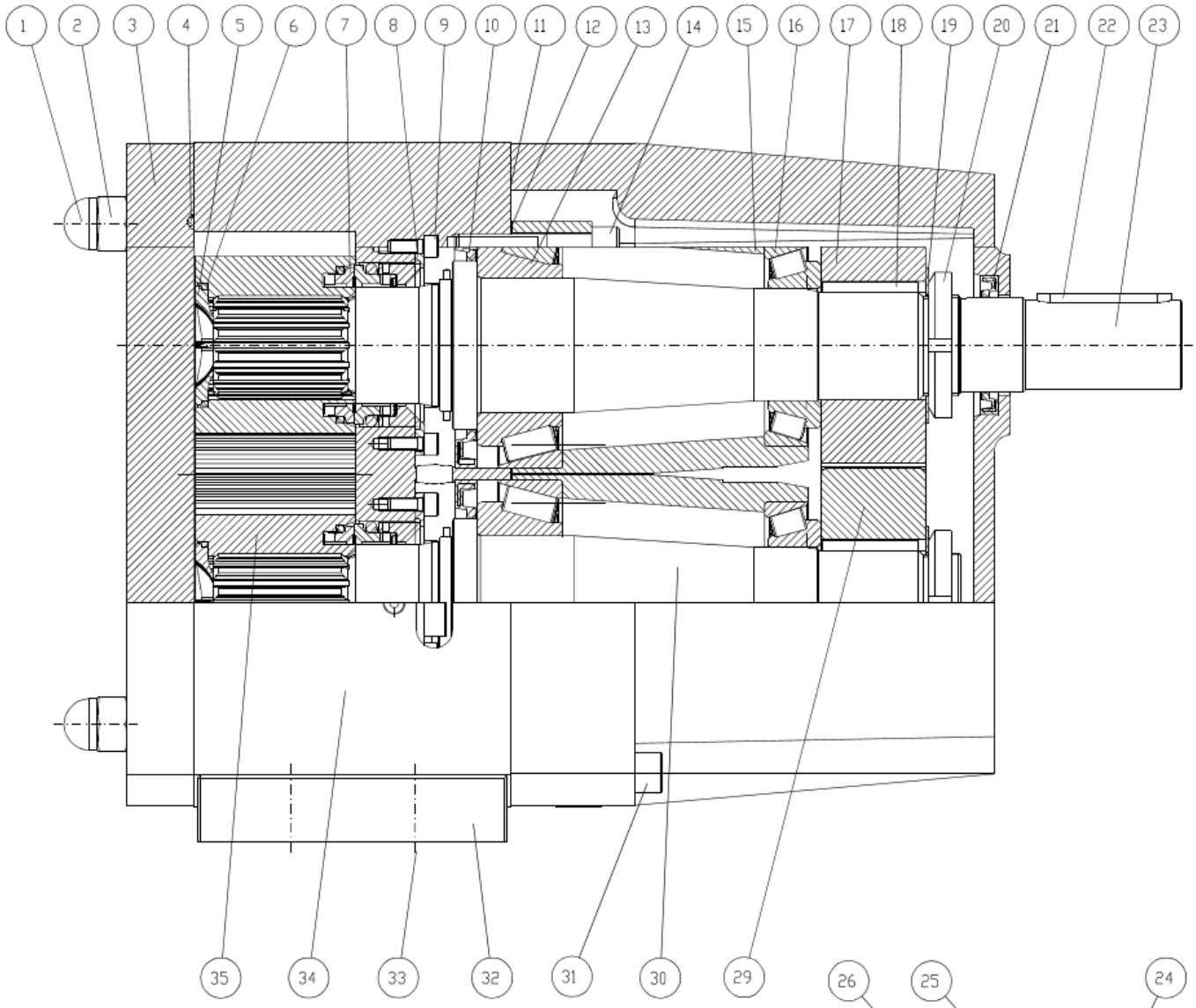


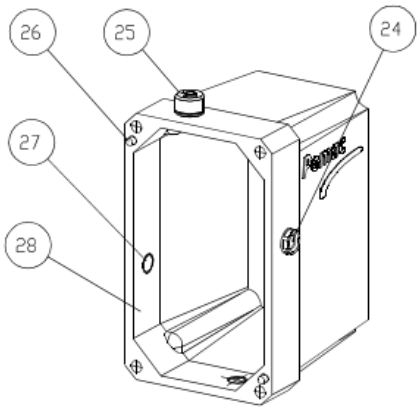
Pump Type	D	CA	CB	FA1	FA2	FB	FC1	FC2	FD	FE	FF	FG	PA	PB	SA	SB	SC	SD	SE1	SE2	SE3
PLP 1-¾	NW15	84	65.5	114	168	50	136	190	72	19	9	41.5	177.5	219	30	15	25x5	137	111.5	56.5	57
PLP 1-1	1"	84	84	114	168	50	136	190	72	19	9	44.5	177.5	226	30	15	25x5	137	111.5	56.5	57
PLP 1-1.5	1.5"	84	77.5	114	168	50	136	190	72	19	9	50.5	177.5	245	30	15	25x5	137	111.5	56.5	57
PLP 1.5-2	2"	97	106	132	194	50	154	216	72	19	9	57.5	203	295	45	20	40x6	172.5	129	65	66
PLP 2-1.5	1.5"	123	111	162	248	80	190	276	106	24	11	57.5	253	344	48	25	40x8	219	165.5	80.5	80
PLP 2-2	2"	123	113	162	248	80	190	276	106	24	11	62.5	253	355	48	25	40x8	219	165.5	80.5	80
PLP 2-2.5	2.5"	123	118	162	248	80	190	276	106	24	11	67	253	367	48	25	40x8	219	165.5	80.5	80
PLP 3-2	2"	164	141	218	332	106	250	364	138	30	13	63	334	468	70	40	60x12	317	221.5	106.5	107
PLP 3-3	3"	164	135	218	332	106	250	364	138	30	13	75.5	334	498	70	40	60x12	317	221.5	106.5	107
PLP 3-4	4"	164	160	218	332	106	250	364	138	30	13	90.5	334	526	70	40	60x12	317	221.5	106.5	107
PLP 4-4	4"	230	214	338	472	142	378	512	182	58	18	99.5	463	675	98	55	90x16	448	310	150	163

Dimensions in mm
Connections shown according to DIN 11851

Spare Parts:

Depending on what sizes of PLP Sanitary Lobe Pumps you have on site, some models have common spares, detailed in the following tables, which can vastly reduce the amount of different spares that are required on site.





Item No	Description	Material
3	Front Cover	AISI 316 L
5	Rotor Retainer	AISI 316 L
15	Bearing Cartridge	Cast Steel
17	Right Hand Gear	Hardened Steel 1.6582
29	Left Hand Gear	Tempered Steel 1.7225
23	Drive Shaft	Duplex Stainless Steel 1.4462
30	Lay Shaft	
34	Rotor Case	AISI 316 L
35	Rotor	AISI 316 L

PLP 1 Parts List:

Item No	Qty	Description	Part Number		
			PLP 1-¾	PLP 1-1	PLP 1-1.5
1	4	Cap Nut	051.022-08-000-5		
2	4	Stud	051.073-08-020-5		
3	1	Pump Cover	700.117-000		
4	1	O-Ring	051.741-100034		
5	2	Rotor Retainer	700.118-000		700.118-002
6	2	O-Ring	051.741-100000		
7		** Shaft Seal **			
8	2	Seal Cover	700.150-007		
9	8	Allen Screw	051.000-04-012-5		
10	2	Oil Retaining Ring	051.763-012		
11	1	Gasket Gearbox Cover	700.161-000-A		
12	4	Shim	700.160-000-A		
13	2	Cone Bearing	051.658-028-007		
14	8	Allen Screw	051.000-06-025-5		
15	2	Bearing Cartridge	700.115-000-B		
16	2	Cone Bearing	051.658-022-008		
17	1	Right Hand Gear	700.120-000-B		
18	2	Key	051.607-06-015-10		
19	2	Tab Washer	051.670-020-000		
20	2	Lock Nut	051.669-020-000		
21	1	Oil Retaining Ring	051.763-013		
22	1	Key	051.607-05-025-00		
23	1	Drive Shaft	700.113-002	700.113-000-C	700.113-001
24	1	Oil Sight Glass	054.210-012		
25	1	Oil Fill Plug with Breather	054.211-010		
26	2	Cylindrical Pin	051.074-050-010-6		
27	2	Plug	054.108-031-3		
28	1	Gearbox Cover	700.116-000		
29	1	Left Hand Gear	700.121-000-B		
30	1	Lay Shaft	700.114-002	700.114-000-C	700.114-001
31	4	Allen Screw	051.000-06-040-5		
32	2	Foot	700.132-000		
33	4	Allen Screw	051.000-08-020-5		
34	1	Rotor Casing	700.110.007	700.110.005	700.110.012
35	2	Rotor	700.111-007	700.111-000	700.111-006

PLP 1.5 Parts List:

Item No	Qty	Description	Part Number
			PLP 1.5-2
1	4	Cap Nut	051.022-10-000-5
2	4	Stud	P-000-001-527
3	1	Pump Cover	700.517-000
4	1	O-Ring	P-000-001-524
5	2	Rotor Retainer	700.118-000
6	2	O-Ring	051.741-100000
7		** Shaft Seal **	
8	2	Seal Cover	700.150-007
9	8	Allen Screw	051.000-04-012-5
10	2	Oil Retaining Ring	P-000-001-523
11	1	Gasket Gearbox Cover	700.561-000
12	4	Shim	700.560-xxx
13	2	Cone Bearing	P-000-001-502
14	8	Allen Screw	051.000-08-035-5
15	2	Bearing Cartridge	700.515-000
16	2	Cone Bearing	P-000-001-503
17	1	Right Hand Gear	700.520-000
18	2	Key	
19	2	Tab Washer	P-000-001-526
20	2	Lock Nut	P-000-001-525
21	1	Oil Retaining Ring	P-000-001-522
22	1	Key	051.607-06-040-02
23	1	Drive Shaft	700.513-000
24	1	Oil Sight Glass	054.210-012
25	1	Oil Fill Plug with Breather	054.211-011
26	2	Cylindrical Pin	051.074-050-010-6
27	2	Plug	054.108-031-3
28	1	Gearbox Cover	700.516-000
29	1	Left Hand Gear	700.521-000
30	1	Lay Shaft	700.514-000
31	4	Allen Screw	051.000-06-040-5
32	2	Foot	700.132-0004
33	4	Allen Screw	051.000-10-025-5
34	1	Rotor Casing	700.510-000
35	2	Rotor	700.511-000

PLP 2 Parts List:

Item No	Qty	Description	Part Number		
			PLP 2-1.5	PLP 2-2	PLP 2-2.5
1	4	Cap Nut	051.022-12-000-5		
2	4	Stud	051.073-12-030-5		
3	1	Pump Cover	700.217-000		
4	1	O-Ring	051.741-100041		
5	2	Rotor Retainer	700.218-000		700.218-001
6	2	O-Ring	051.741-100006		
7		** Shaft Seal **			
8	2	Seal Cover	700.250-007		
9	8	Allen Screw	051.000-05-012-5		
10	2	Oil Retaining Ring	051.763-019		
11	1	Gasket Gearbox Cover	700.261-000-A		
12	4	Shim	700.260-000-A		
13	2	Cone Bearing	051.658-045-010		
14	8	Allen Screw	051.000-10-045-5		
15	2	Bearing Cartridge	700.215-000		
16	2	Cone Bearing	051.658-035-009		
17	1	Right Hand Gear	700.220-000		
18	2	Key	051.607-10-027-10		
19	2	Tab Washer	051.670-030-000		
20	2	Lock Nut	051.669-030-000		
21	1	Oil Retaining Ring	051.763-018		
22	1	Key	051.607-08-040-00		
23	1	Drive Shaft	700.213-001	700.213-000	
24	1	Oil Sight Glass	054.210-012		
25	1	Oil Fill Plug with Breather	054.211-011		
26	2	Cylindrical Pin	051.074-060-010-6		
27	2	Plug	054.108-032-3		
28	1	Gearbox Cover	700.216-000		
29	1	Left Hand Gear	700.221-000		
30	1	Lay Shaft	700.214-001	700.214-000	
31	4	Allen Screw	051.000-10-055-5		
32	2	Foot	700.232-000		
33	4	Allen Screw	051.000-10-025-5		
34	1	Rotor Casing	700.210-000		700.210-015
35	2	Rotor	700.211-004	700.211-000	700.211-001

PLP 3 Parts List:

Item No	Qty	Description	Part Number		
			PLP 3-2	PLP 3-3	PLP 3-4
1	4	Cap Nut	051.022-16-000-5		
2	4	Stud	051.073-16-045-5		
3	1	Pump Cover	700.317-000		
4	1	O-Ring	051.741-100042		
5	2	Rotor Retainer	700.318-000-E		700.318-001-A
6	2	O-Ring	051.741-100067		
7		** Shaft Seal **			
8	2	Seal Cover	700.350-007		
9	12	Allen Screw	051.000-06-012-5		
10	2	Oil Retaining Ring	051.763-025		
11	1	Gasket Gearbox Cover	700.361-000		
12	4	Shim	700.360-000		
13	2	Cone Bearing	051.658-060-012		
14	8	Allen Screw	051.000-12-060-5		
15	2	Bearing Cartridge	700.315-000		
16	2	Cone Bearing	051.658-050-011		
17	1	Right Hand Gear	700.320-000		
18	2	Key	051.607-14-043-10		
19	2	Tab Washer	051.670-045-000		
20	2	Lock Nut	051.669-045-000		
21	1	Oil Retaining Ring	051.763-024		
22	1	Key	051.607-12-060-00		
23	1	Drive Shaft	700.313-001	700.313-000	
24	1	Oil Sight Glass	054.210-012		
25	1	Oil Fill Plug with Breather	054.211-011		
26	2	Cylindrical Pin	051.074-080-012-6		
27	2	Plug	054.108-032-3		
28	1	Gearbox Cover	700.316-000		
29	1	Left Hand Gear	700.321-000		
30	1	Lay Shaft	700.314-001	700.314-000	
31	4	Allen Screw	051.000-12-080-5		
32	2	Foot	700.332-000		
33	4	Allen Screw	051.000-12-030-5		
34	1	Rotor Casing	700.310-014	700.310-000	700.310-015
35	2	Rotor	700.311-004-A	700.311-000-E	700.311-001-D

PLP 4 Parts List:

Item No	Qty	Description	Part Number
			PLP 1.5-2
1	8	Cap Nut	051.022-16-000-5
2	8	Stud	051.073-16-050-5
3	1	Pump Cover	700.417-000
4	1	O-Ring	051-741-100043
5	2	Rotor Retainer	700.418-000
6	2	O-Ring	051.741-100023
7		** Shaft Seal **	
8	2	Seal Cover	700.450-007
9	12	Allen Screw	051.000-08-020-5
10	2	Oil Retaining Ring	051.763-031
11	1	Gasket Gearbox Cover	700.461-000
12	4	Shim	700.460-000
13	2	Cone Bearing	051.658-085-014
14	8	Allen Screw	051.000-16-070-5
15	2	Bearing Cartridge	700.415-000
16	2	Cone Bearing	051.658-070-013
17	1	Right Hand Gear	700.420-000
18	2	Key	051.607-20-055-10
19	2	Tab Washer	051.670-065-000
20	2	Lock Nut	051.669-065-000
21	1	Oil Retaining Ring	051.763-030
22	1	Key	051.607-16-090-00
23	1	Drive Shaft	700.413-000
24	1	Oil Sight Glass	054.210-012
25	1	Oil Fill Plug with Breather	054.211.011
26	2	Cylindrical Pin	051.074-080-018-6
27	2	Plug	054.108-032-3
28	1	Gearbox Cover	700.416-000
29	1	Left Hand Gear	700.421-000
30	1	Lay Shaft	700.414-000
31	6	Allen Screw	051.000-16-100-5
32	2	Foot	700.432-000
33	4	Allen Screw	051.000-16-030-5
34	1	Rotor Casing	700.410-000
35	2	Rotor	700.411-000

Trouble-Shooting:

A malfunction in a pump system may be caused by various reasons and is not necessarily the pump itself. Issues with the pipework or other fluid accessories within the system can be contributing factors. Furthermore, if the operating conditions differ too greatly from the provided specification for which the pump was selected for can also be a major contributing factor.

Consequently, it is always recommended to check the following first:

Has the pump been installed correctly?
Are the operating conditions still according to the initial specification?
Are the other fluid accessories within the pipework functioning correctly?

In general the following malfunctions can be identified:

1. Pump provides no flow
2. Pump provides irregular flow
3. Capacity is too low
4. Pump over heats
5. Motor overheats
6. Excessive Screw / Rotor wear
7. Excessive wear of shaft sealing
8. Pump vibrates excessively or makes too much noise
9. Pump has seized
10. Pump stops upon start up

Overleaf is a table of the possible causes and solutions of these malfunctions.

Malfunction										Cause	Solution
1	2	3	4	5	6	7	8	9	10		
X										Wrong Direction or Rotation	Have a qualified electrician revers the direction of rotation of the electric motor
X										Pump is not completely filled with liquid	Fill the pump casing entirely with fluid and fit a non-return valve to the suction side
X	X	X					X			Insufficient Suction Pressure / NPSHa	Increase the suction pressure, lower position of the pump further below the fluid level, enlarge suction pipe ø, shorten / simplify suction pipework, reduce operating speed, reduce product temperature
		X	X					X		Excessive vapour is present in the suction line	
	X	X					X			Air is entering the suction line	Check Connections
X	X	X					X			Gas in the suction line	Vent suction pipe / pump casing
	X	X					X			Insufficient static head	Increase liquid level
			X	X			X		X	Product viscosity is too high	Lower the operating speed / increase product temperature
		X								Product viscosity is too low	Increase the operating speed / lower the product temperature
		X	X		X		X		X	Product temperature is too high	Cool the product / pump casing
				X					X	Product temperature is too low	Heat the product / pump casing
					X	X	X	X		Foreign particles are in the product	Clean the system / install a suction filter sized according to the max solids passage of the pump
		X	X	X	X		X	X	X	Pressure at delivery side is too high	Check piping for obstructions / simplify the discharge pipework
			X	X	X		X	X		Pump casing distorted by piping	Check alignment / support the piping & install flexible couplings
				X			X			Speed too high	Lower the speed
		X								Speed too low	Increase the speed
			X	X	X	X	X	X		Insufficient flushing	Increase flushing capacity / pressure
			X	X	X	X	X	X	X	Worn out bearings / gears	Replace the worn out parts
X										Safety Valve is open	Check if the delivery valve is open / check piping for obstructions / check piping for pressure loss

Inspection & Maintenance Schedule:

Routine inspection and maintenance can avoid unnecessary and expensive downtime as well as operating costs. It is recommended to regularly check:

- If the pump functions properly – excessive noise levels may indicate wear problems to bearings and gears, dragging of rotors / lobes on the pump casing or cavitation.
- Pressure and Flow of the flushing system, if present
- Temperature of the heating / cooling system, if present
- Oil level in the gearbox – If the oil level has reduced, check the pump for oil leakages
- Monitor regularly the pump suction and discharge pressure conditions to ensure they are in line with typical system levels.

Oil Changes:

- 300 operating hours after initial commissioning
- Every 3000 operating hours or at least every 3 months
- If not being used regularly, every 2000 operating hours, or at least every 3 months