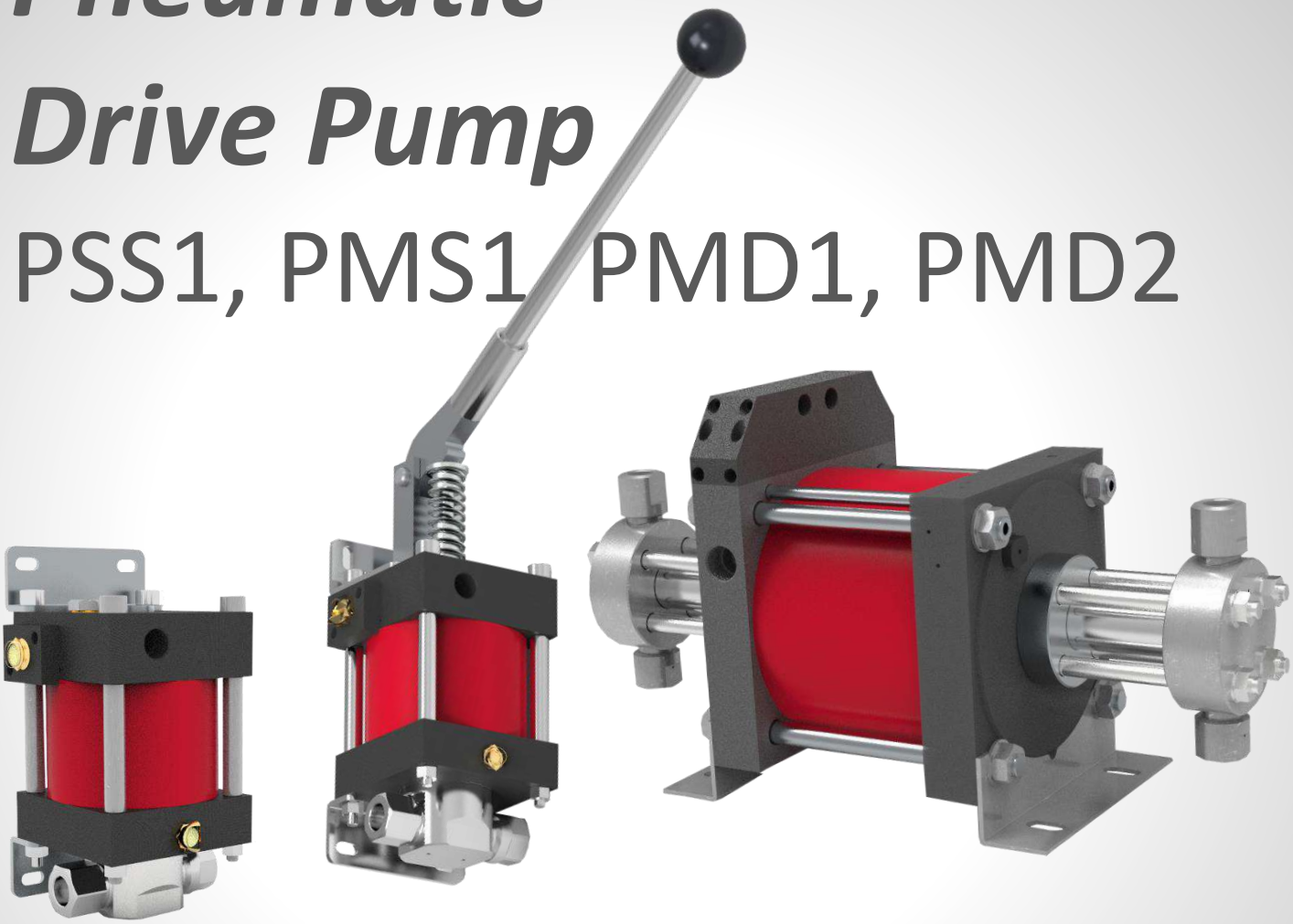
OPETCO

INDUSTRIAL HIGH PRESSURE SPECIALIST

Pneumatic Drive Pump

PSS1, PMS1, PMD1, PMD2



Dream Pressure:

10,000 bar (15,000 Psi)

41 MODEL

With:

ABDS & HPLI

Introduction

OPET-Co has always been a large user of Air-over-Liquid pump technology and has a lifetime of experience using all variety of pumps in many different configurations. We have used this experience to develop a best-in-breed line of air-driven, high pressure pumps that are efficient to operate, simple in design, and will stand the test of time. Compared to other types of hydraulic pumps, they provide cost effective and energy saving benefits for many applications in the Oil and Gas, Chemical, Industrial and Research industries. These pumps convert simple air pressure into high and ultra-high liquid pressures by utilizing a large area piston on the air side to move a small area plunger to compress the liquid into very high hydraulic pressures - as high as 60,000 psi (4137 bar). Some designs are for economy, some for manual use, some for low-flow & high pressure, some for high flow & medium pressure… Choice – what a concept! Pumps like these are perfect for product testing, valve actuation, chemical injection and other applications that require intense pressure. When used in conjunction with a Hydraulic Intensifier (another PAE product) pressures to 150,000 psi (10,000 bar) are normal. OPET-Co has been making pressure and corrosion test systems as well as high pressure laboratory reaction vessels. Packaged Pressure Systems incorporating these Air-Driven, High Pressure Liquid pumps, plus our valves, fittings and other instrumentation was an automatic success story. We have created a wide range of self-contained portable, custom framed modules that “plug and play” for virtually any pressure test, control, or injection system you can imagine. They vary in size, flow capability, output pressure and can include optional features such as chart recording, data logging, cycle counters, injection controllers and almost any kind of electric or pneumatic valve control option.






Tandem and Triplex Air piston / Pressure Ratio

As we know the ratio between air piston area and plunger area shows us the maximum pressure of pump.

High pressure Air driven Pump

Air driven pumps work by compressed Air up to 7 bar/100 psi or 10 bar /150 psi, In these type of pumps we don't need any electrical power.

Advantage of Air driven:

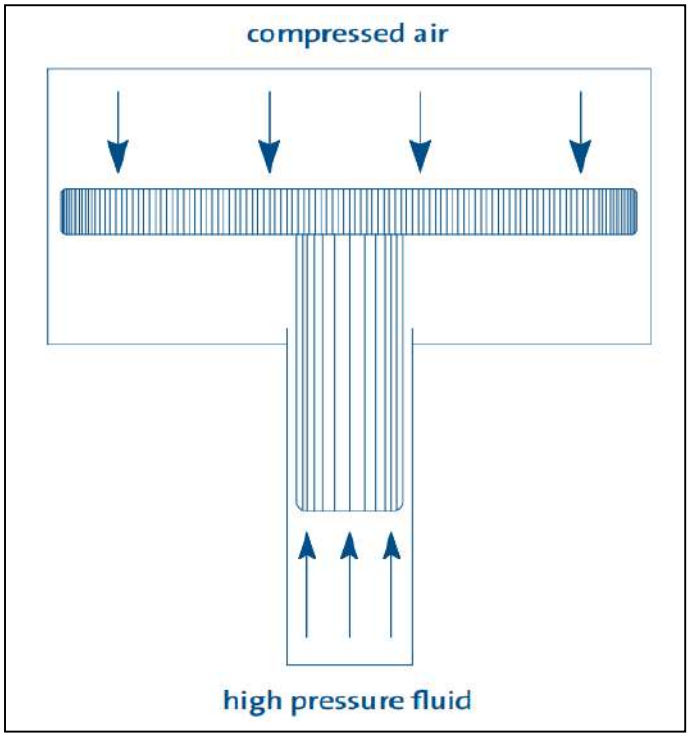
In comparison with electrical and other powers, Air driven pumps are safer and are explosion proof, because of no heat, flame, spark and or shock.
Pressure and flow can be controlled by simply regulating the air pressure.
There is no limitation for air, other gases same as Nitrogen, Argon, Co_2, sour gases and natural gases can be used.
Hold pre-determined pressure without consuming power.
Compatible with all hydraulic, Newtonian fluid, plain water, distilled & deionized water, solvents, mild chemicals and …. .

OPET Pump application:

Pressure Testing , Work holding and power clamping, Bolt tensioning, jacking and lifting, valve actuator control, Hydraulic cylinder actuation, chemical injection, Metering, liquefied gas transfer, precision lubrication and spraying, roller tensioning.

Principle of ***OPET*** pumps:

OPET pumps work according to simple concept of physics and mathematics. air pressure pushes a large area (Air piston), this large area connected to a rod, this rod (plunger) push the liquid via force of large Area same as picture;



For continues working, reciprocating piston must get a command and also needs a suction and discharge system, all of above needs, can make a pump design.

OPET Pump Advantage:

- **Liquid and pressure:**

There is not any limitation in ***OPET*** pump for Liquid and Air (Gas) drive. (Water, Oil, ethylene glycol, Alcohol, water base oil, ….)

- **Maintenance:**

It is important that how operator can distinguish about problem of pump, everywhere in ***OPET*** pumps, you can find what is the problem and how must be solved. Modular components help you for easy repair.

- **Lubrication for Air Drive not required**
- **Stainless Steel high pressure wet parts**
- **High tensile Aluminum air parts**
- **Low noise**
- **Air piston with two air seals and Guide ring**
- **Compact and light weight**
- **Easy to adapt automatic control**
- **Easy to install and operate**
- **Ideal for start-stop application under full load**
- **Available up to 4,000 bar/60,000psi (6,000 bar/90,000 Psi)**

- **More Flow and more pressure**

When you have an ***OPET*** pump for changing the maximum pressure and maximum flow rate, you can add some equipment to pump and increase the pressure up to 3 times and flow up to 2 times.

- **Infinitely variable cycle speed**
- **Using standard and international products**

For example if:
Air piston diameter=120 mm ⟹ Air Piston area= 113 Cm2
HP Plunger diameter=20 mm ⟹ HP Plunger area=3.1415 Cm2 ⟹ Ratio=36 ⟹ Max. Pressure=36 x 7 =252 bar

How can be changed the Ratio?

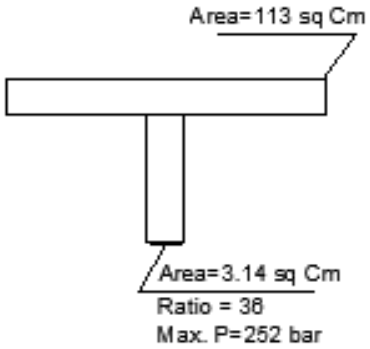
1- Changing HP plunger

With OPET pumps it can be simply changed HP plunger with another HP plunger with more or less Ratio. By this method flow rate of pumps will be changed also.

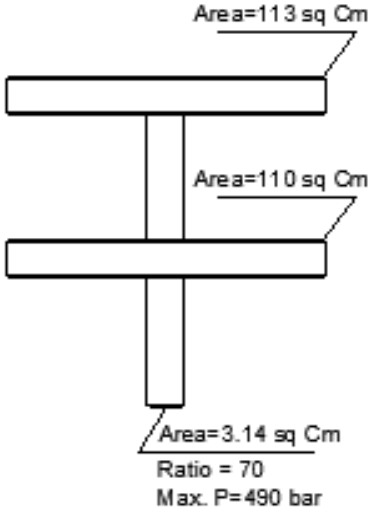
2- Adding Air piston (Tandem or Triplex)

In some applications by changing Air piston, the ratio of pump can be about two times or three time more than single piston, but the flow of pump will be fixed. In comparison a pump with single piston and same ratio and flowrate, triplex pumps consume less air and will be economical pump.
OPET coding for several pumps can help to understand different part numbering for simply choosing the pumps according to applications.

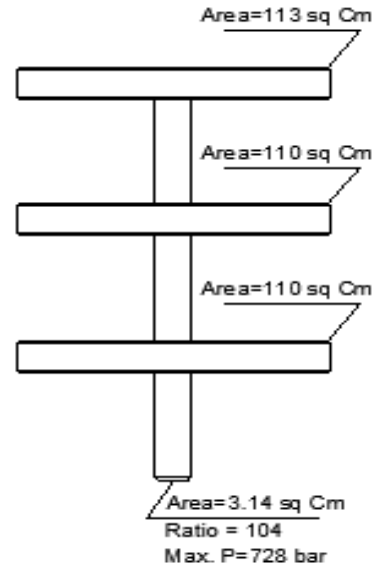
Single Piston



Tandem Pistons

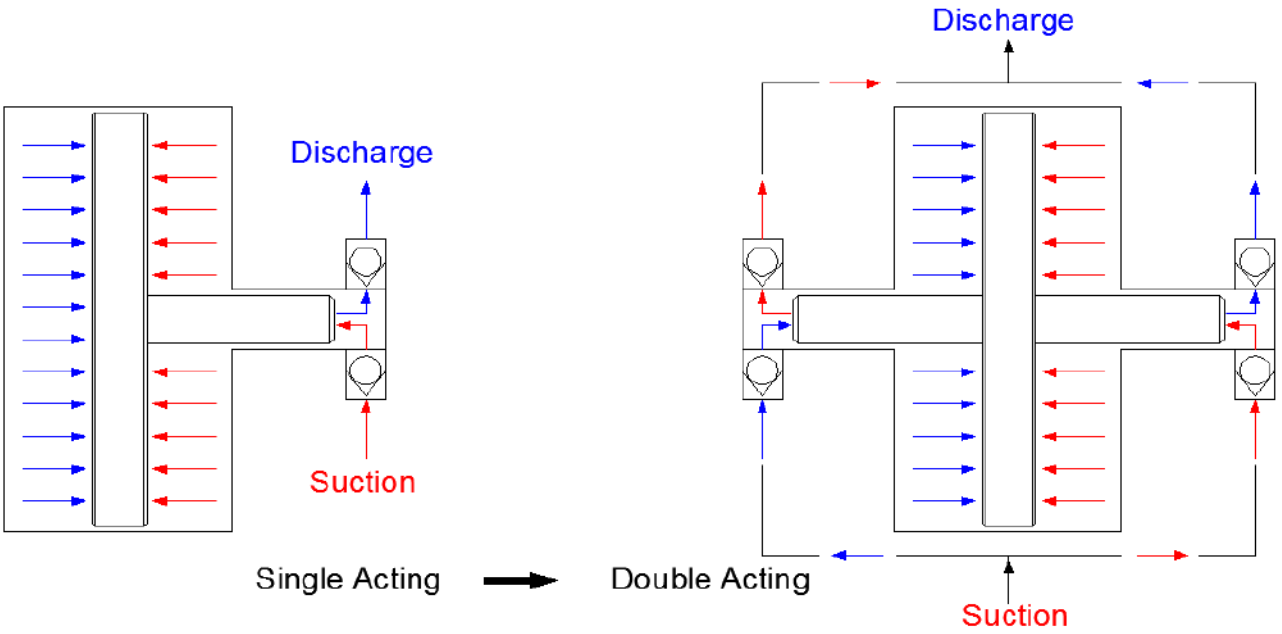


Triple Pistons

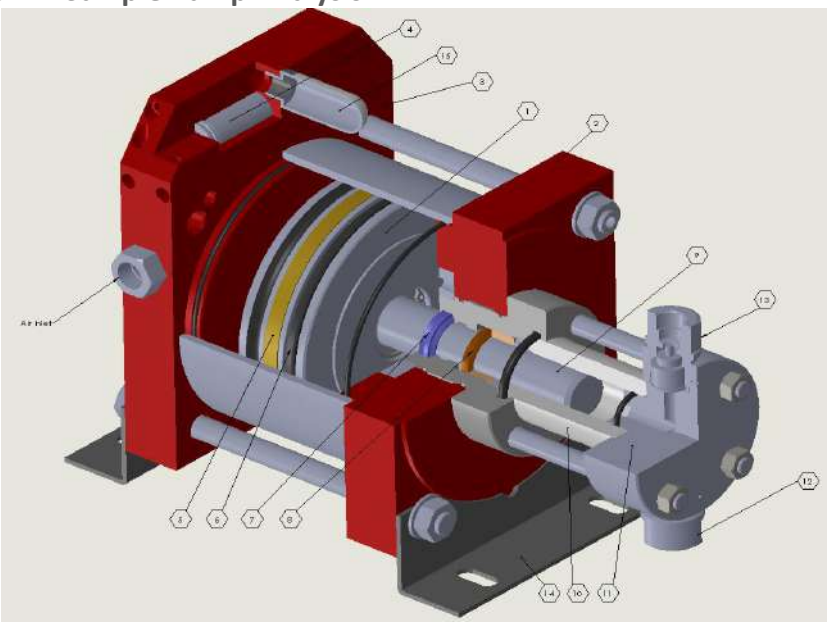


How can be changed the flow rate?

It is easy and economical by OPET pumps to change flow of pumps, twice. According to following picture, a single acting pump can be changed to double acting pump, when a plunger kit will be added to pump.



OPET Sample Pump Analysis.



Item	Description
1	Air Cylinder
2	Head Cap
3	End Cap
4	Air Cycling Valve
5	Guide Ring
6	V-Ring Piston Seal
7	Rod Seal Wiper
8	HP Plunger seal
9	HP Plunger
10	Pump Body
11	Pump Cap
12	Inlet Check Valve
13	Outlet Check Valve
14	Mounting Base
15	Air Muffler

OPET Pumps Applications:

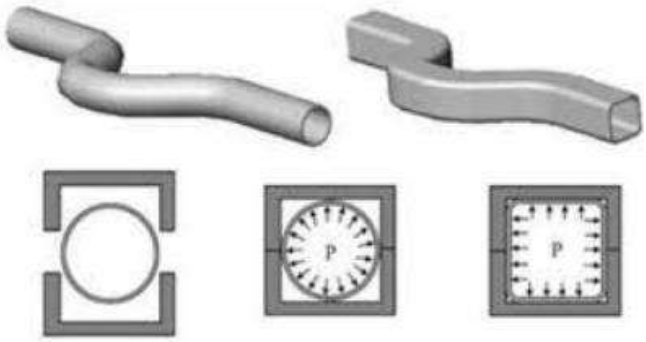
Air driven pumps are suitable for hydrostatic test and when we need high pressure and ultra-high pressure and flow is not important, high pressure Air driven pumps are best solution.

Automotive industry:

In the automotive industry is a large economic sector and safety and quality are essential. There are various high-pressure solutions for this industry and can make people sure for using cars. Pressure tests are carried out to guarantee the safety and quality of various automotive parts.

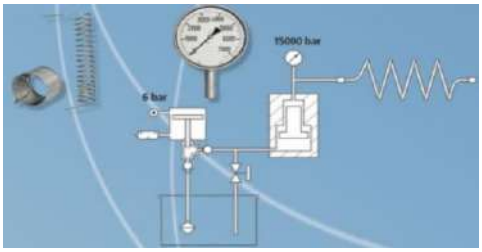
Forming

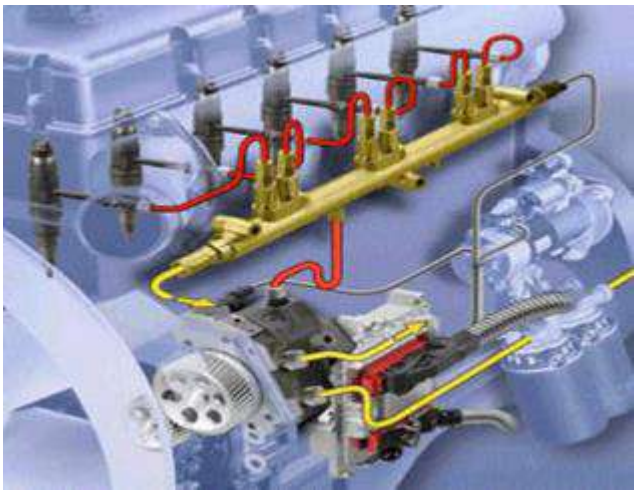
Using high pressure, very detailed components can be made. Components that are used in everyday products, such as cars and bicycles and toys. The components are produced by applying high pressure to metal or a liquid plastic. As a result, the medium forms itself to the mold.



Autofrettage System:

Autofrettage is a metal fabrication technique in which pressure vessel is subjected to enormous pressure, causing internal portions of the part to yield and resulting in internal compressive residual stresses. The goal of autofrettage is to increase durability of the final product.





Oil and Gas Industry:

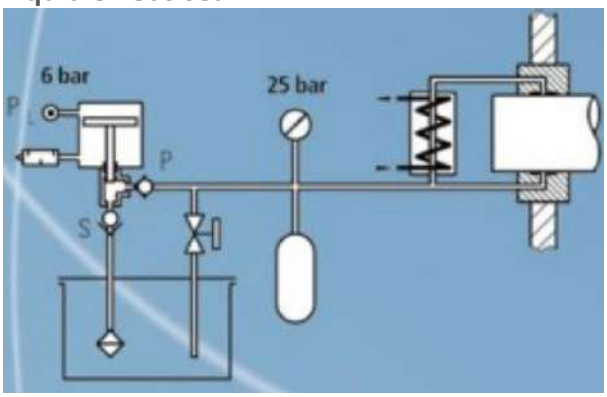
One of the most important industry in the world is oil and gas industry it means about energy, and energy is the important needs for people. ***OPET*** Pumps are applicable from Up-Stream (for well heads , BOP , ESD ,SSV, SSSV, Pipes, …) up to Down-Stream (General Valves, Pipes, Pressure Relief Valves, Vessels, Heat Exchangers, …) , in fact, the oil and gas industry is making highest demands to

high pressure equipment in its facilities, especially in terms of process safety and above-average service life.

Valve Test Bench:

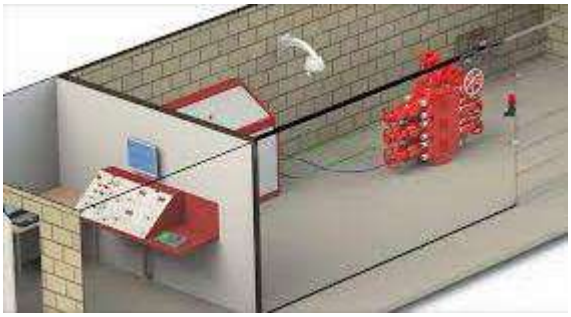
Down Stream General valves must be tested after every services or repair according to oil standards, for seat test and body test. Therefore OPET pump into valve test bench can help to ensure assemble valves, and make sure to use them in refinery or petrochemical site.

Liquid or Gas seal:

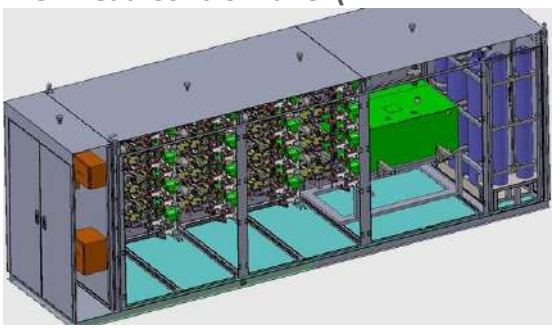


Test Bay:

For testing safely several components of oil and gas wells (same as oil well pipes , BOP , …)



Well Head Control Panel (WH



Hydrostatic workshop pressure test systems:

Water is often used to apply pressure to pipes, pressure vessels, BOPs and SCCVs during testing. The modular design of hydrostatic test systems allows systems to be combined.
OPET pumps offers a reliable test system that streamlines your operational process.

Hydraulic Tools:

Bolt tensioners and Hydraulic torque wrenches are used in every industries (wind turbine, Steel industry, Gas turbine, pipe line flanges….) . ***OPET*** pumps for 700 bar (for Torque Wrenches) and 1500 bar (for bolt tensioner) are useful and applicable.

Hose testing equipment

Hoses are important components in the oil and gas industry, steel industry, Cement industry and everywhere use hydraulic and high pressure. Hoses are used to produce and load oil and gas. They have a lot to offer. Testing your hoses is important in order to guarantee the safety of your employees, the oil installation and the environment.

Field pressure test systems

In certain circumstances in the oil and gas industry it is required that an object is tested on your production location. This way you can perform tests at a desired location and time. Many of our test systems can also be used as a controlling system, so that you can bleed in a controlled way. So you only need one device for different solutions.

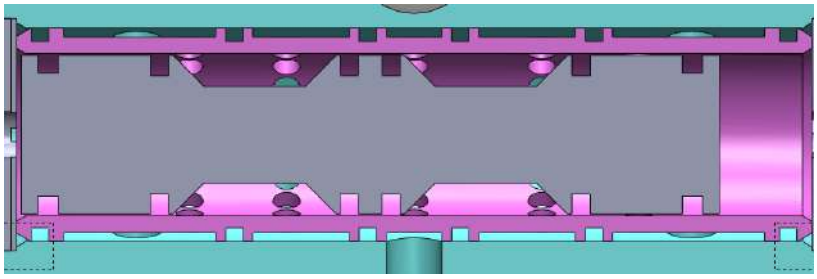
Why OPET Pumps:

Research and development division of OPET Co. starts to search about the most important components of air driven pumps and divide them in 4 parts.

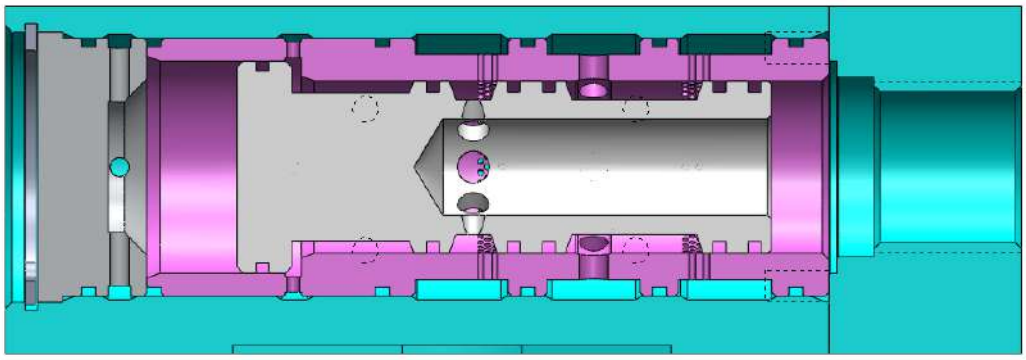
1- Cycling valve
2- Air piston and components
3- Check Valve
4- HP Plunger

Cycling Valve:

This part is the brain of the pump and determines the movement of the pump components. The most important part of this section is a spool, which can be seen in all similar equipment. In most cases, the spool is a stepped and symmetrical cylindrical piece. Since air is compressible, it affects the speed of operation or the time response of the pump.
OPET Co. start to design a new Air Balance Differential Spool (ABDS) with rapid action cycling. This spool reacts twice as fast as normal (symmetrical) spools.



Symmetrical Spool .



Air Balance Differential Spool (ABDS)

Air piston and components:

When we calculated speed, acceleration and Jerk (In physics, jerk or jolt is the rate at which an object's acceleration changes with respect to time) of piston, we understand the appearance of the piston is very important during its life, so selection of seals are designed to increase the life of the pump. As you can see in the picture, a guide ring with piston seal are used in the piston. The guide ring helps the piston to move in concentric and it helps to piston seal so its life is twice in comparison other types.

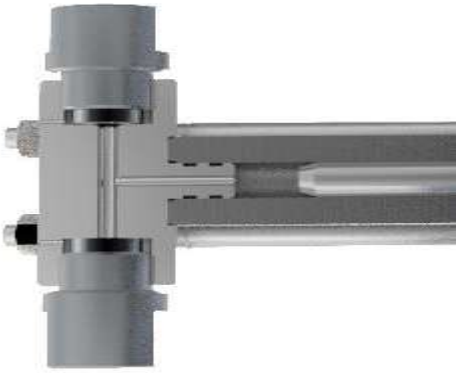
Check Valve:

Two things are important in checks valves, first rapid action and seal tight and the second easy maintenance and assembly. We suppose, pump is working in a desert and there is not enough facility, therefore these check valves must repair and assembly again easily. An adjustable wrench for disassembly and assembly of check valve will suffice.

HP plunger:

The tolerance between shaft and pipe makes a complete vacuum, and this makes the pump efficiency increase and the output flow is close to the calculated amount along with full suction in the pump. The amount of air trapped in the pump reaches its minimum level.

The tolerance value of the pump plunger is between 0.03 and 0.05 mm



Other important notes of *OPET* pumps:

Design and calculation for manufacturing OPET pumps was according to our 25 years' experience in close relation with end user for high pressure and ultra-high pressure hydrostatic units (in design, manufacturing, consultant and maintenance).

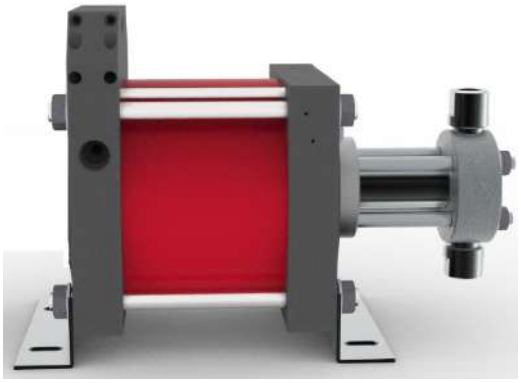
Modular Design:

As we told, pump has 4 components, OPET team make them modular, and they can check and disassemble individually.

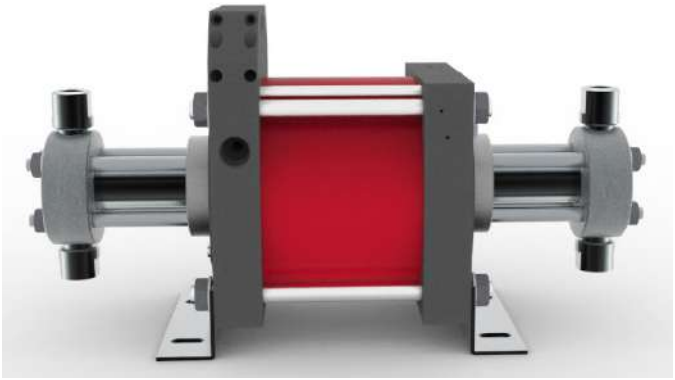
Change pressure rating and flow:

If you want to change pressure rate, it doesn't need to change pump, HP plunger of pump can be changed only by new one.

But about flow rate; can be increased twice if we add the same HP plunger in other side of pump.



Single Acting pump



Can be converted to Double acting pump

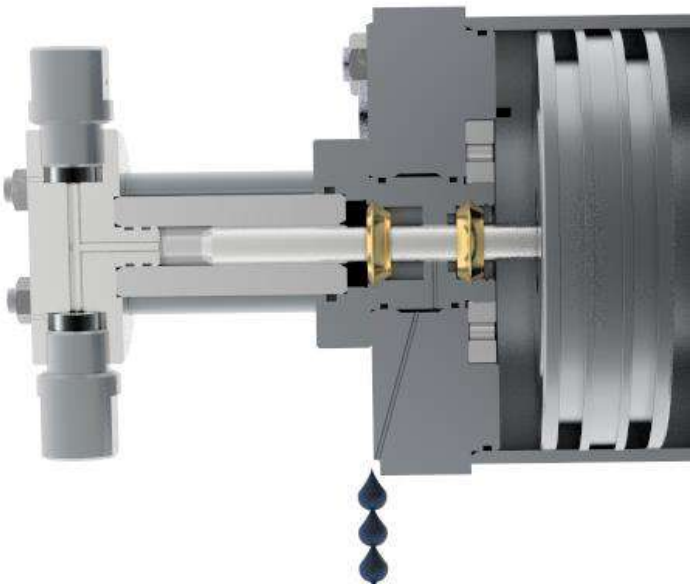
HP Plunger Leakage Indicator (HPLI):

When the HP Plunger seal breaks and leak starts, the flow path is designed in such a way that water (fluid) cannot enter into air section and the fluid leaves the specified path.

In this situation, the operator understands that the seal is damaged and must be replaced.

Golden Rings:

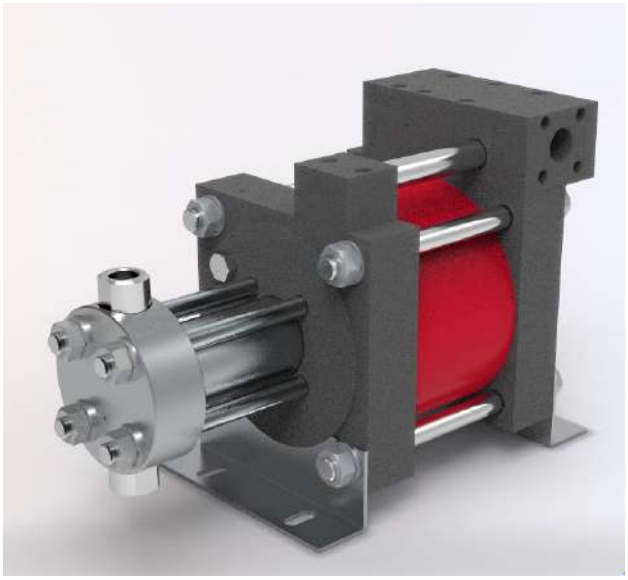
These golden rings prevents from buckling of HP plunger and helps it to be in concentric in every time, it means HP seal will be in best situation and useful for life time of all components.

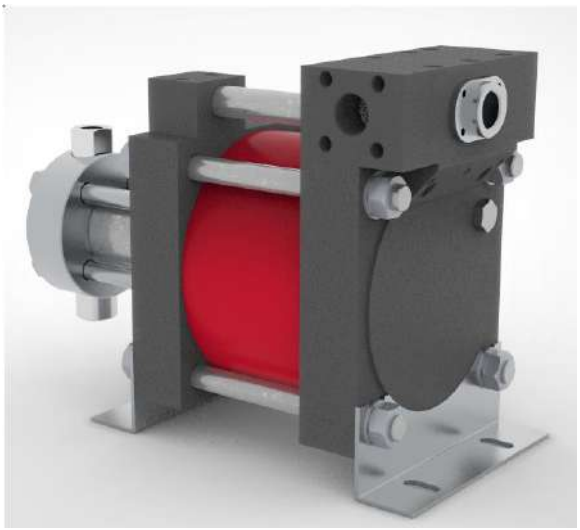


Pump PMS Series:

PMS series are Medium size of OPET product with Maximum Drive force F=2 ton (20,000 N), this type can use in industrial zone for heavy duty usage.

PMS1, is single acting pump with single air piston drive ***2.2 hp (1.65 KW)***

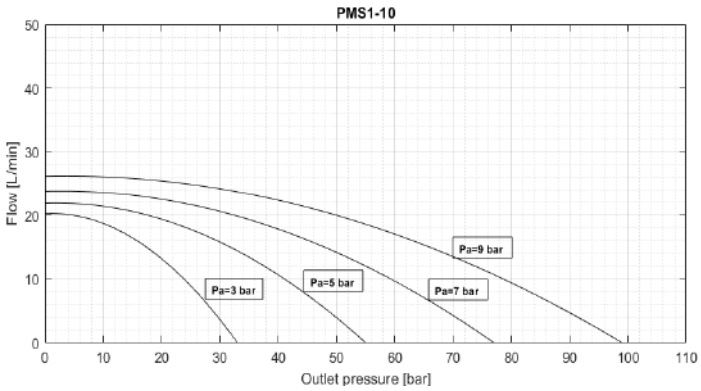


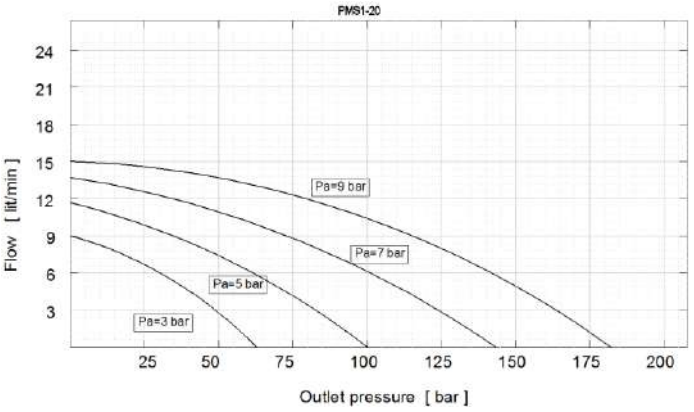


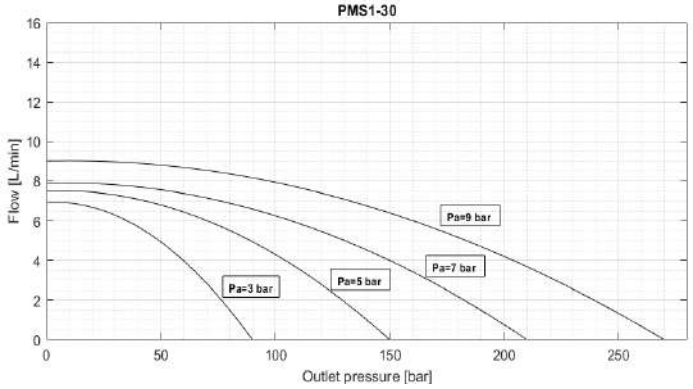
Quick Reference Table for: PMS Series (single Acting Pump with single Air piston)

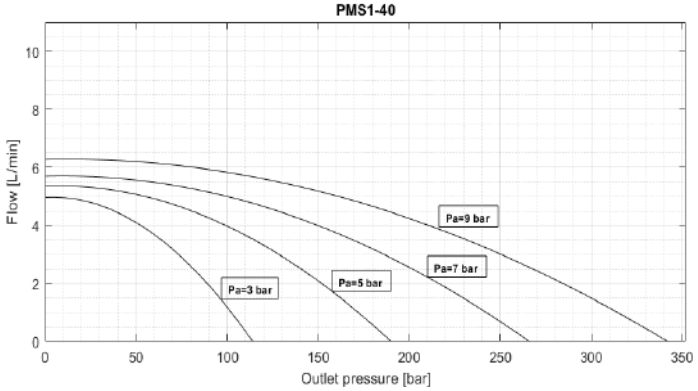
Pump Model	Ratio	Max pressure [Bar (PSI)]		Displacement [cc]	Max Flow [Lpm]	Inlet port	Outlet port
		@ 7 bar Air	@ 10 bar Air				
PMS1-10	10:1	70 (1015)	100 (1450)	100	23.8	3/4 NPT	1/2 NPT
PMS1-20	20:1	140 (2030)	200 (2900)	46	12.9	3/4 NPT	1/2 NPT
PMS1-30	30:1	210 (3045)	300 (4350)	35	8.8	1/2 NPT	1/2 NPT
PMS1-40	40:1	280 (4060)	400 (5800)	25	6.0	1/2 NPT	1/2 NPT
PMS1-65	65:1	455 (6600)	650 (9400)	16	4.0	1/2 NPT	3/8 HP
PMS1-110	110:1	770 (11200)	1100 (15950)	9.0	2.0	1/2 NPT	3/8 HP
PMS1-170	170:1	1200 (17400)	1700 (24650)	5.6	1.4	1/2 NPT	3/8 HP
PMS1-250	250:1	1750 (25380)	2500 (36260)	3.9	1.0	1/2 NPT	3/8 HP
PMS1-400	400:1	2800 (40600)	4000 (58000)	2.5	0.65	1/2 NPT	3/8 HP
PMS1-520	520:1	3640 (52790)	5200 (75420)	1.5	0.35	1/2 NPT	3/8 HP
PMS1-710	710:1	4970 (72000)	7100 (103000)	1.0	0.25	3/8 NPT	1/4 UHP
PMS1-1000	1000:1	7000(101500)	10000(145000)	0.7	0.18	3/8 NPT	1/4 UHP

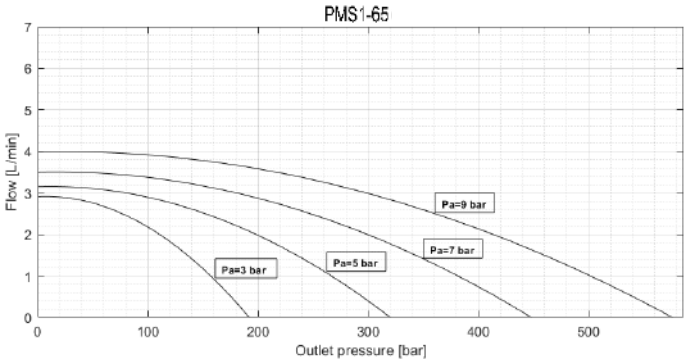
PMS1 series, Pressure- Flow chart

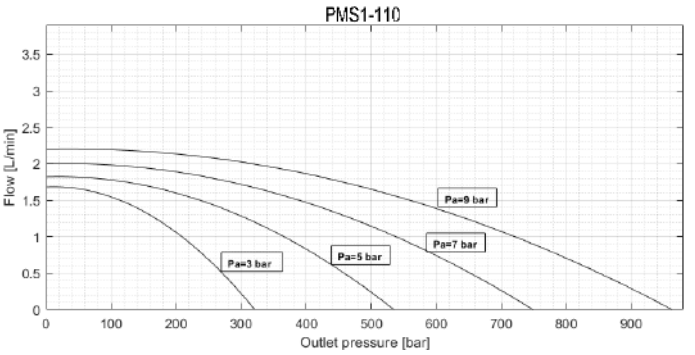


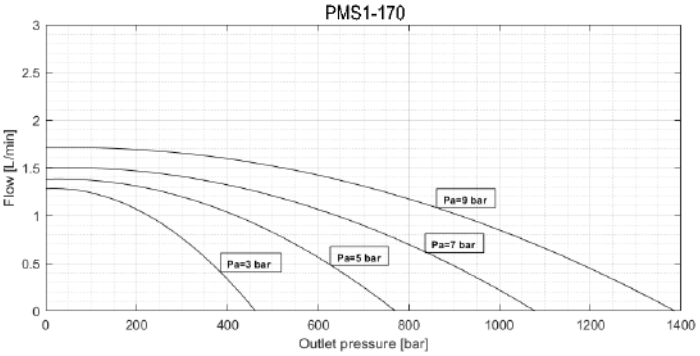


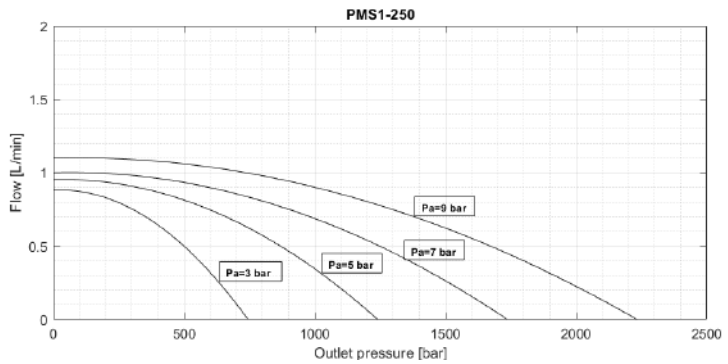


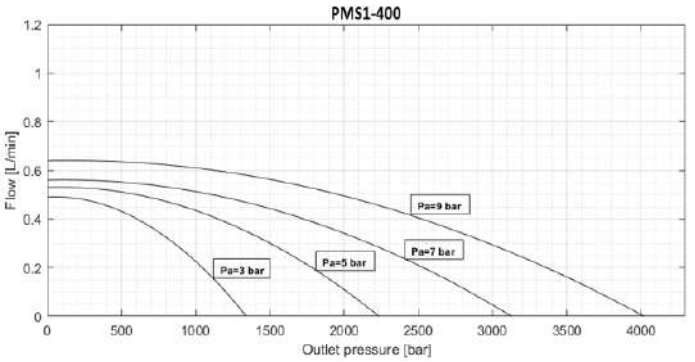


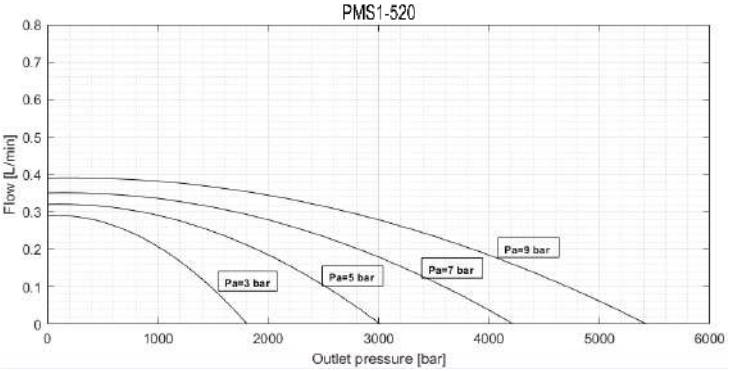


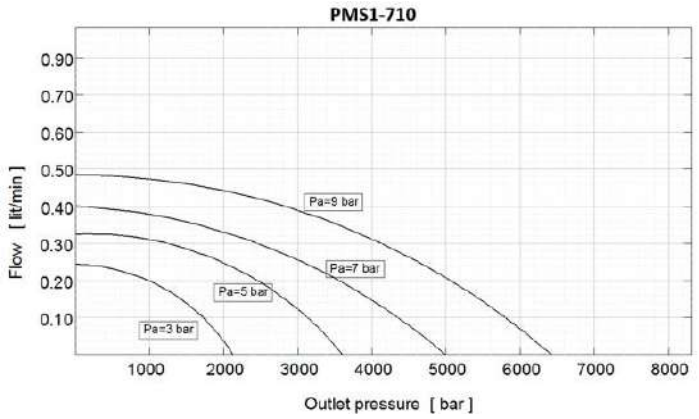


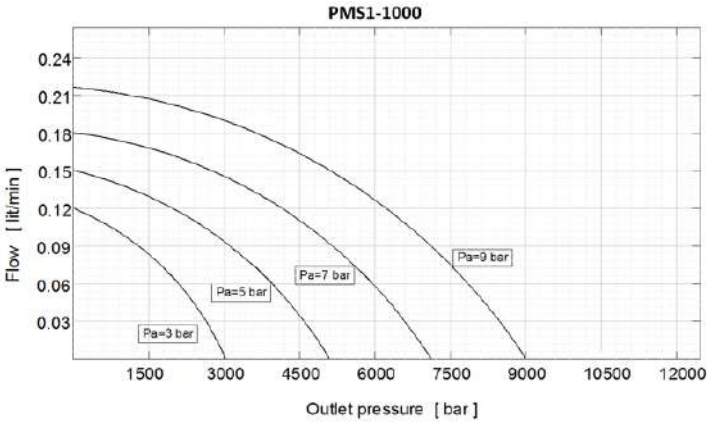










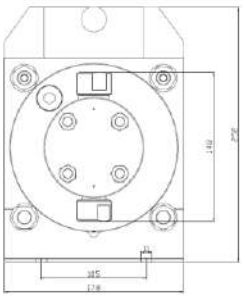


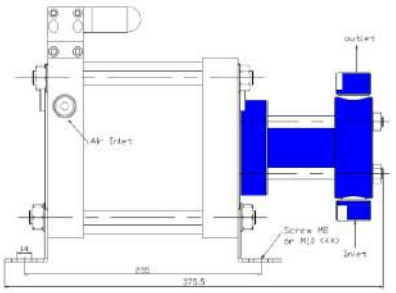
Max. Air Consumption: 2700 *Nlpm*

Net Weight : 16.2 Kg

Wet Parts: Stainless Steel

Air Parts: Aluminium Alloy



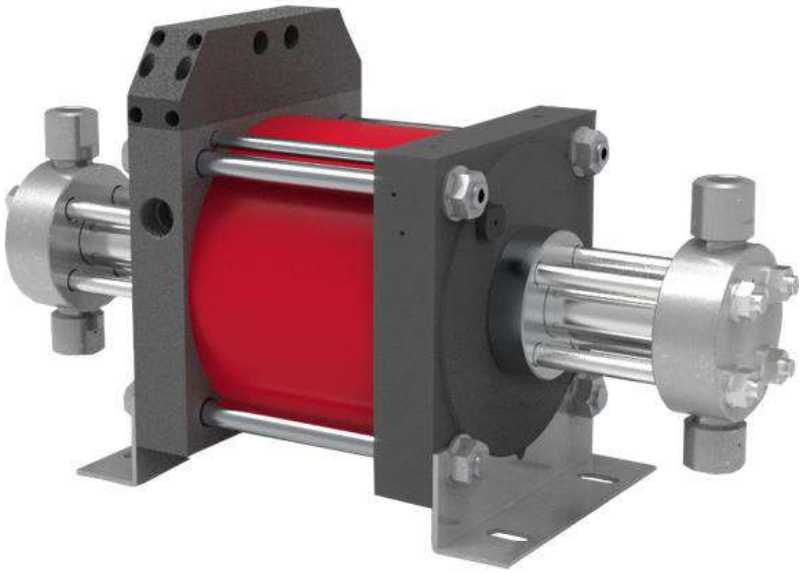


Pump PMD Series:

PMD series are Medium size of OPET product with Maximum Drive force F=2 ton (20,000 N), this type can use in industrial zone for heavy duty usage.

PMD1, is double acting pump with single air piston drive. In comparison with PMs series in the same pressure there are twice flow rate. (PMS series can be converted to PMD easily)

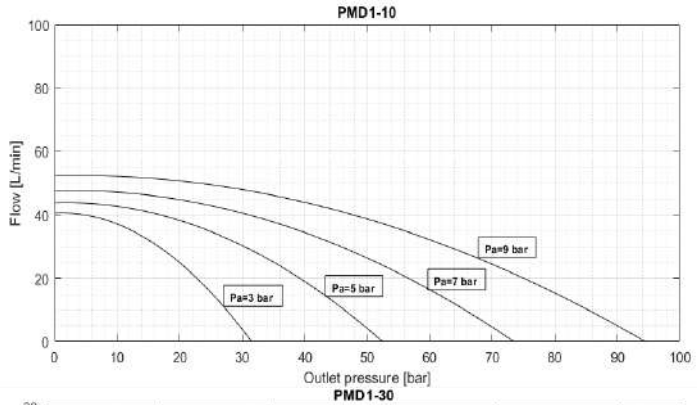
4.0 hp (3.0 KW)

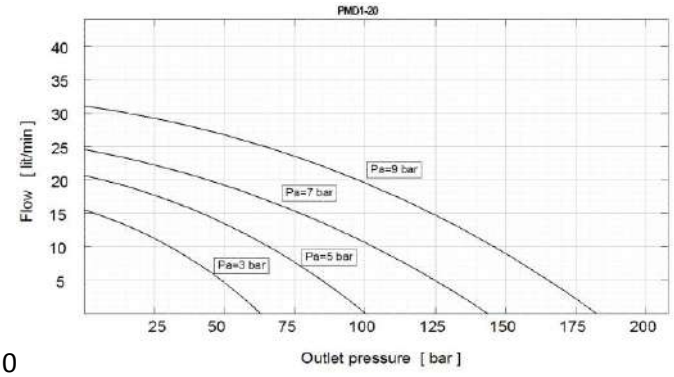


Quick Reference Table for: PMD Series (Double Acting Pump with single Air piston)

Pump Model	Ratio	Max pressure [Bar (PSI)]		Displacement [cc]	Max Flow [Lpm]	Inlet port	Outlet port
		@ 7 bar Air	@ 10 bar Air				
PMD1-10	9:1	63 (1015)	100 (1450)	200	47.6	3/4 NPT	1/2 NPT
PMD1-20	20:1	140 (2030)	200 (2900)	92	24.5	3/4 NPT	1/2 NPT
PMD1-30	29:1	203 (2944)	290 (4200)	70	16.7	1/2 NPT	1/2 NPT
PMD1-40	40:1	280 (4060)	400 (5800)	50	11.0	1/2 NPT	1/2 NPT
PMD1-65	64:1	448 (6497)	640 (9280)	32	7.6	1/2 NPT	3/8 HP
PMD1-110	110:1	770 (11200)	1100 (15950)	18.0	3.8	1/2 NPT	3/8 HP
PMD1-170	170:1	1200 (17400)	1700 (24650)	11.2	2.6	1/2 NPT	3/8 HP
PMD1-250	250:1	1750 (25380)	2500 (36260)	7.8	1.9	1/2 NPT	3/8 HP
PMD1-400	400:1	2800 (40600)	4000 (58000)	5.0	1.2	1/2 NPT	3/8 HP
PMD1-520	520:1	3640 (52790)	5200 (75420)	3.0	0.6	1/2 NPT	3/8 HP
PMD1-710	710:1	4970 (72000)	7100 (103000)	2.0	0.4	3/8 NPT	1/4 UHP
PMD1-1000	1000:1	7000(101500)	10000(145000)	1.4	0.35	3/8 NPT	1/4 UHP

PMD1 series, Pressure- Flow chart





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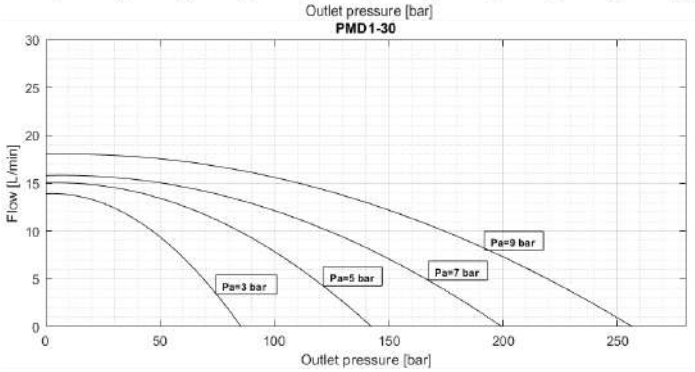
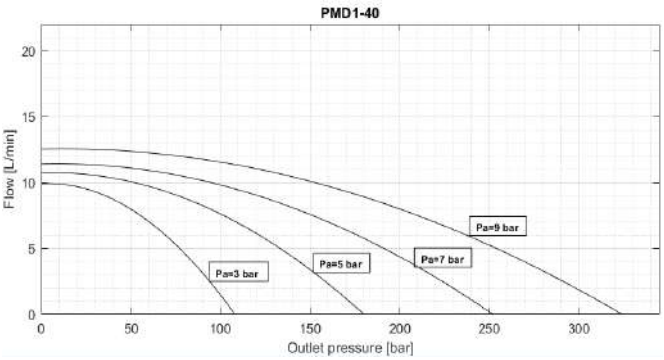
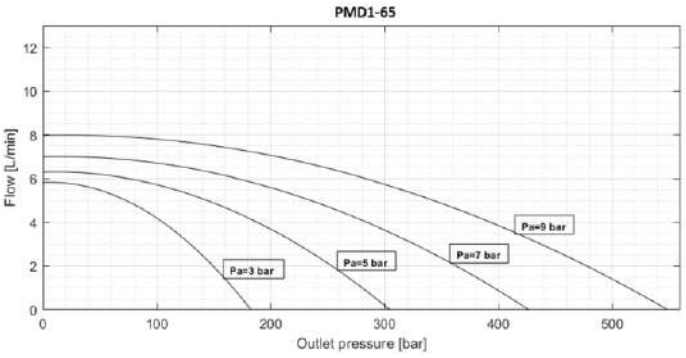
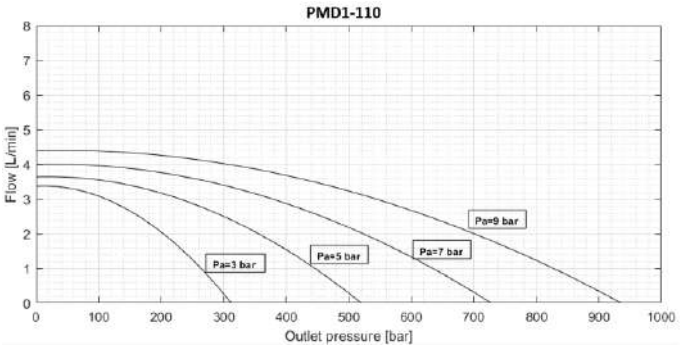
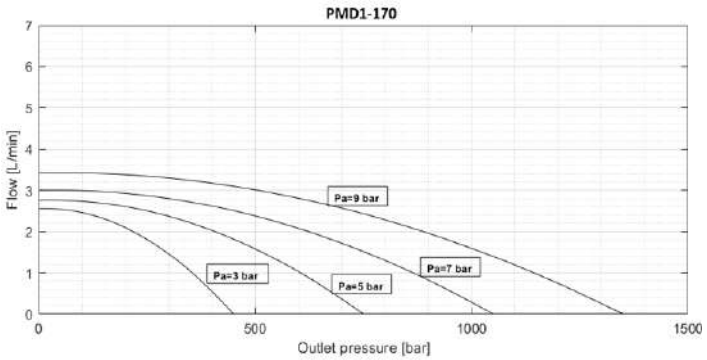
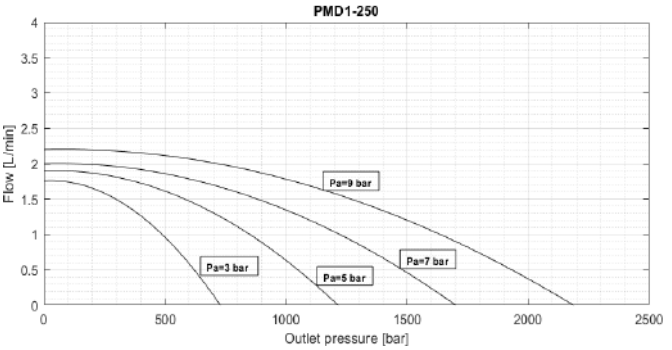


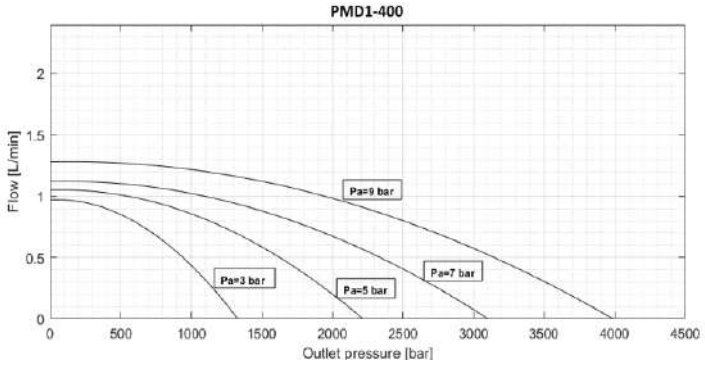


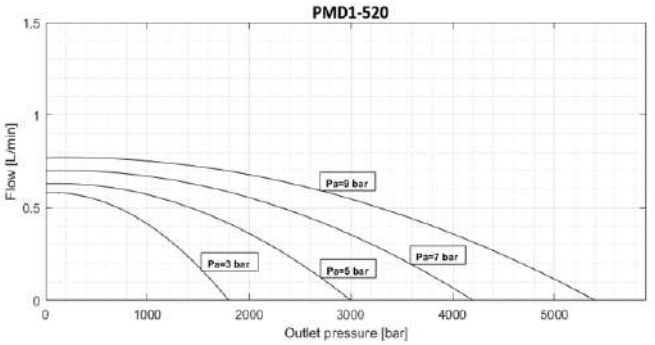


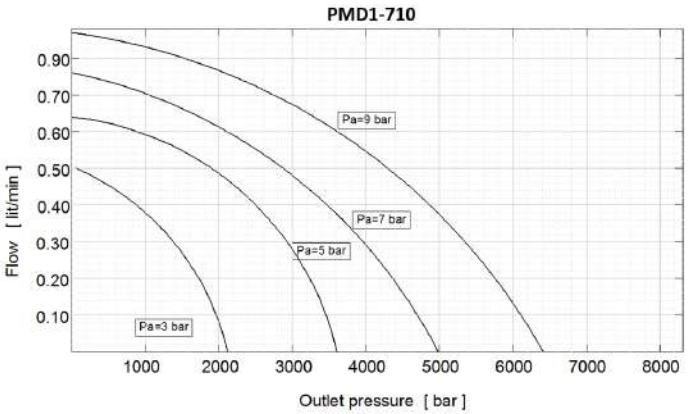


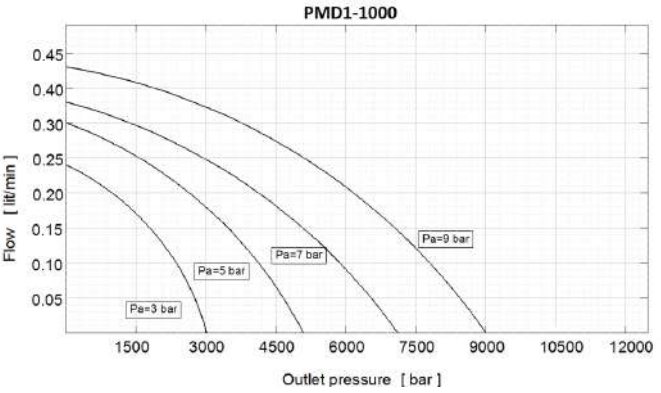










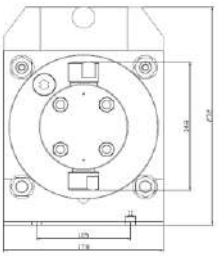


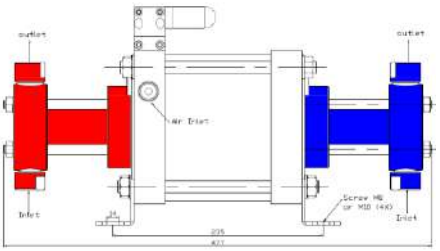
Max. Air Consumption: 2700 *Nlpm*

Net Weight : 19.3 Kg

Wet Parts: Stainless Steel

Air Parts: Aluminium Alloy



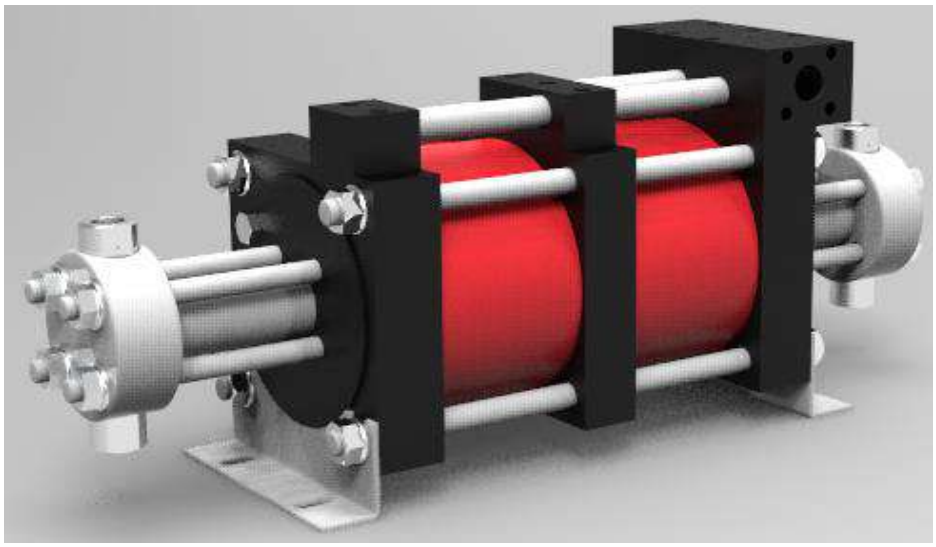


Pump PMD2 Series (TANDEM):

PMD2 series are Medium size of OPET product with Maximum Drive force F=4 ton (20,000 N), this type can use in industrial zone for heavy duty usage.

PMD2, is double acting pump with Tandem air piston drive. In comparison with PMD1 series in the same Size there are twice Pressure

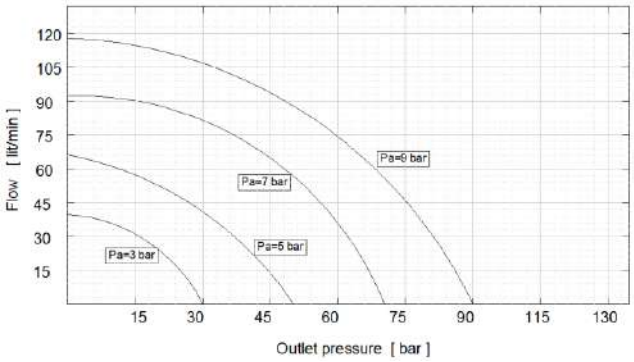
6.0 hp (4.5 KW)



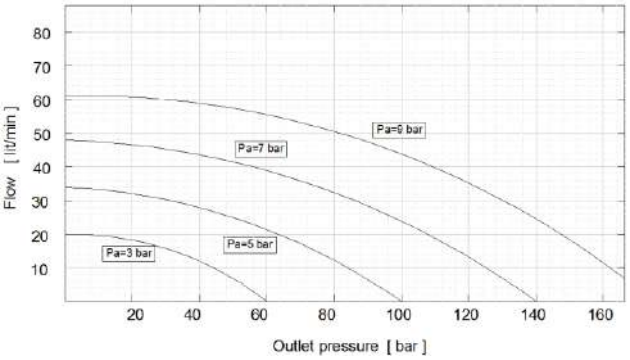
Quick Reference Table for: PMD2 Series (Double Acting Pump with tandem Air piston)

Pump Model	Ratio	Max pressure [Bar (PSI)]		Displacement [cc]	Max Flow [Lpm]	Inlet port	Outlet port
		@ 7 bar Air	@ 10 bar Air				
PMD2-10	10:1	70 (1010)	100 (1450)	385	92.0	1 NPT	3/4 NPT
PMD2-20	20:1	140 (2030)	200 (2900)	200	47.6	3/4 NPT	1/2 NPT
PMD2-40	40:1	280 (4060)	400 (5800)	92	24.5	1/2 NPT	1/2 NPT
PMD2-60	60:1	420 (2944)	600 (8700)	70	16.7	1/2 NPT	3/8 HP
PMD2-75	75:1	525 (7600)	750 (10880)	50	11.0	1/2 NPT	3/8 HP
PMD2-120	120:1	840 (12200)	1200 (17400)	32	7.6	1/2 NPT	3/8 HP
PMD2-200	200:1	1400 (20300)	2000 (29000)	18.0	3.8	1/2 NPT	3/8 HP
PMD2-320	320:1	2240 (32490)	3200 (46400)	11.2	2.6	1/2 NPT	3/8 HP
PMD2-475	475:1	3325 (48225)	4750 (68890)	7.8	1.9	3/8 NPT	1/4 UHP
PMD2-760	760:1	5320 (77100)	7600 (110300)	5.0	1.2	3/8 NPT	1/4 UHP
PMD2-980	980:1	6860(99500)	9800(142100)	3.0	0.6	3/8 NPT	1/4 UHP
PMD2-1350	1350:1	9450 (137000)	----------	2.0	0.4	3/8 NPT	1/4 UHP

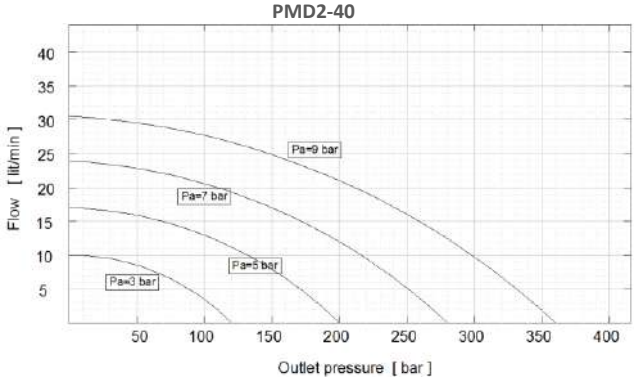
PMD2-10



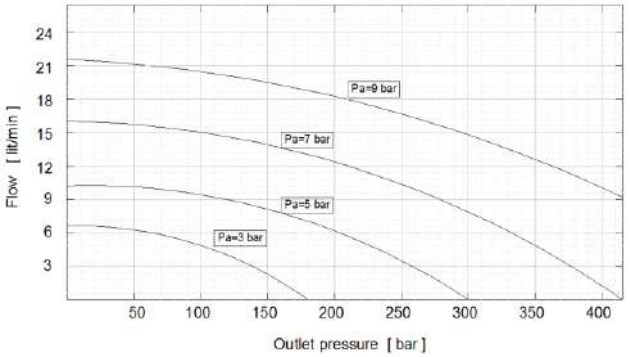
PMD2-20



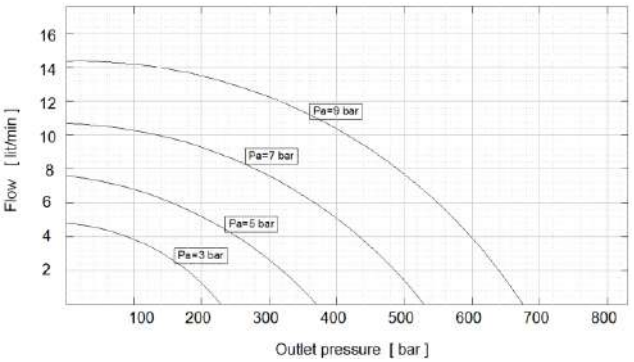
PMD2-40



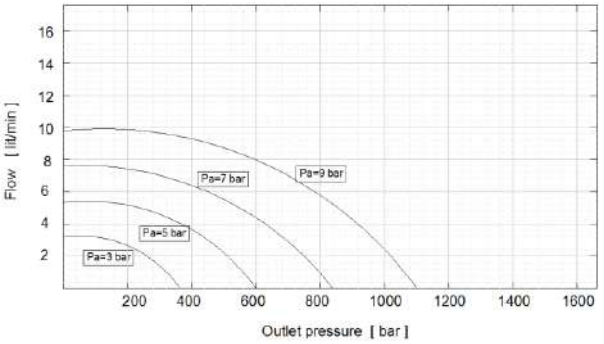
PMD2-60



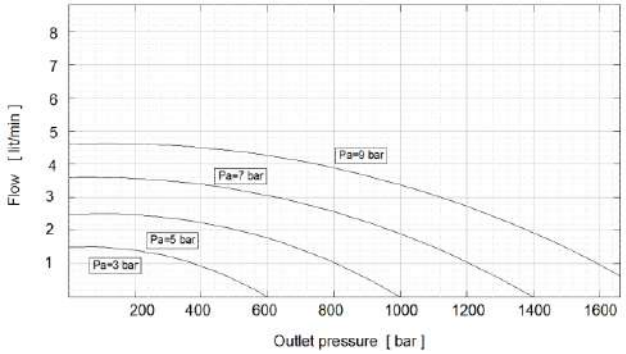
PMD2-75



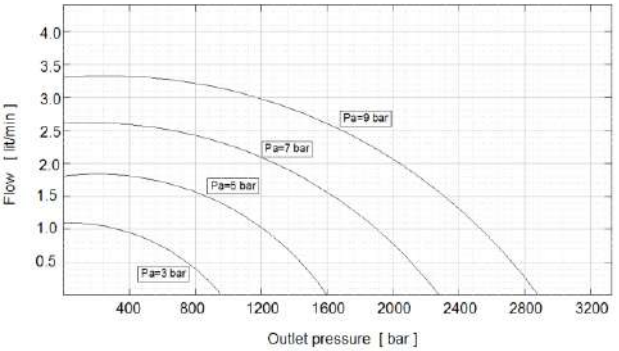
PMD2-120



PMD2-200

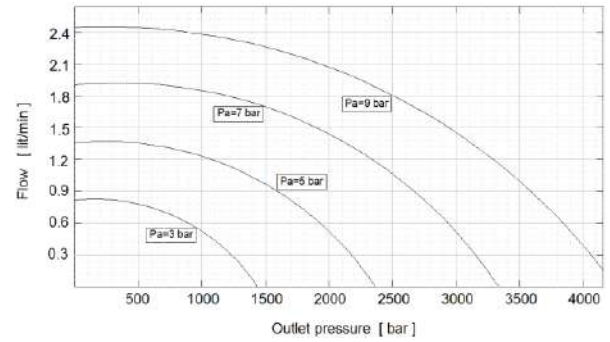


PMD2-320

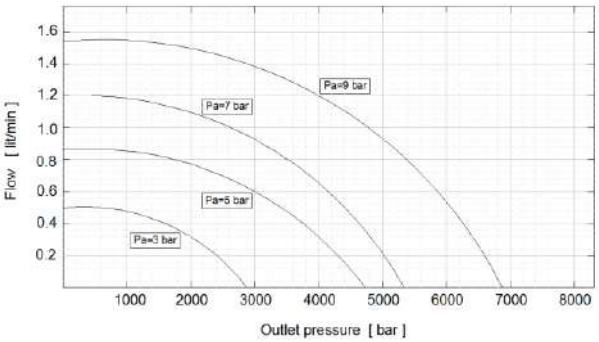


PMD2-475

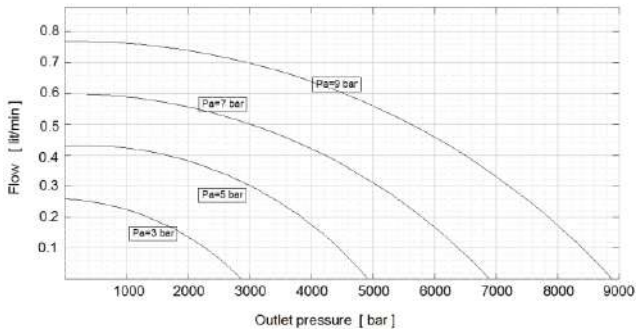
PMD2-760

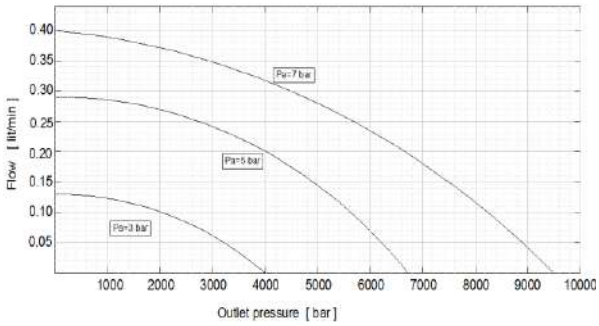


PMD2-980



PMD2-1350



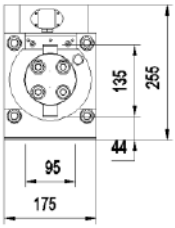


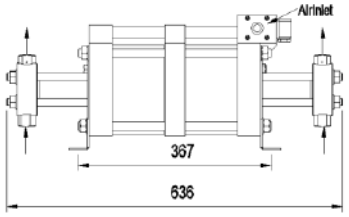
Max. Air Consumption: 5100 *Nlpm*

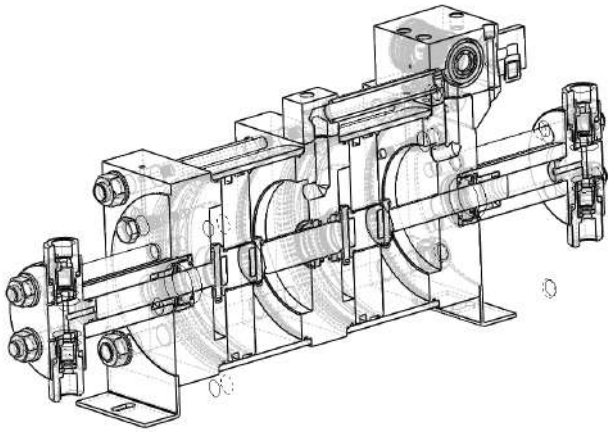
Net Weight : 26.1 Kg

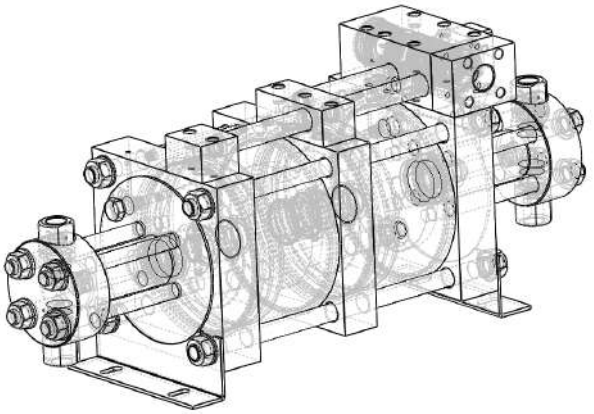
Wet Parts: Stainless Steel

Air Parts: Aluminium Alloy









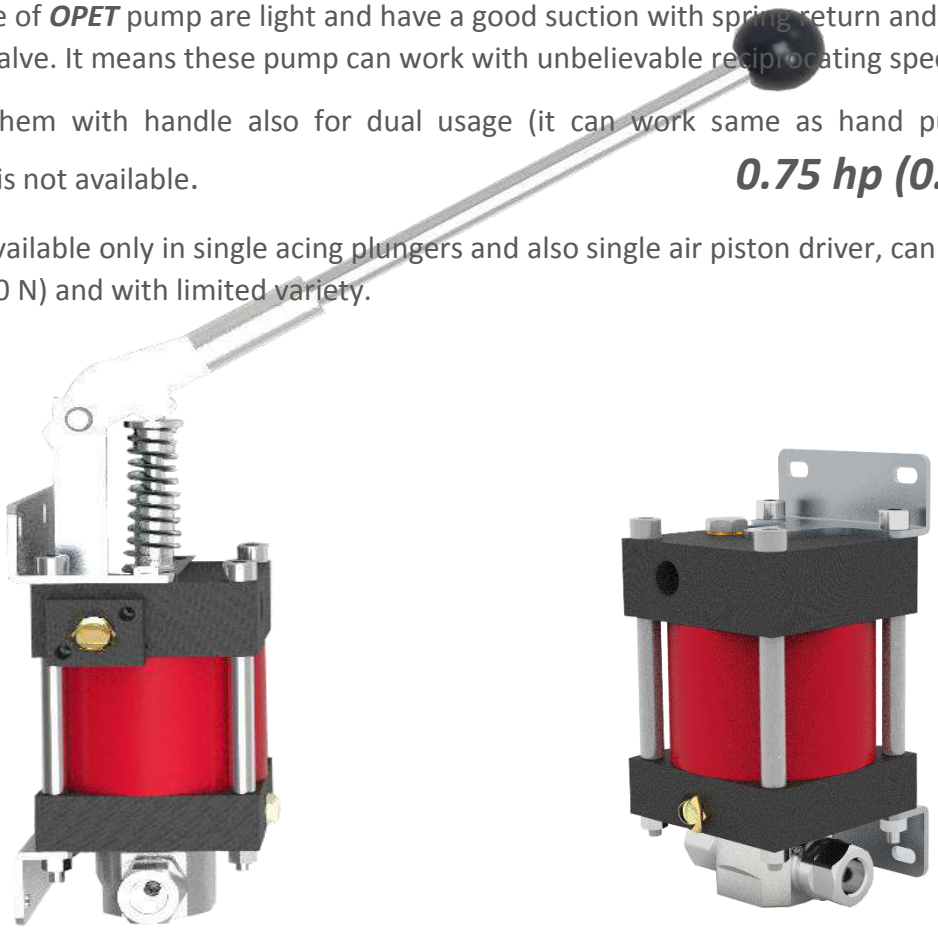
Pump PSS series:

These small type of ***OPET*** pump are light and have a good suction with spring return and differential area in cycling valve. It means these pump can work with unbelievable reciprocating speed.

We can offer them with handle also for dual usage (it can work same as hand pump, when compressed air is not available.

0.75 hp (0.55 KW)

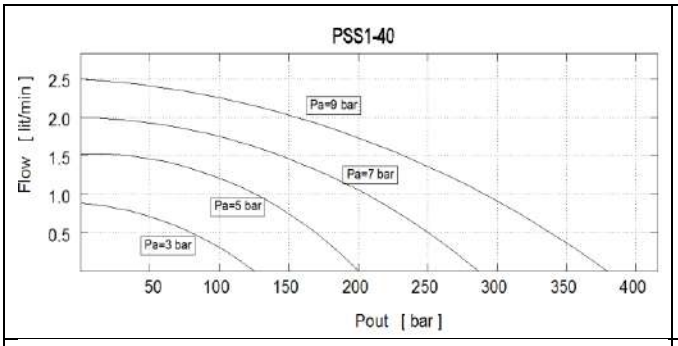
PSS pump are available only in single acing plungers and also single air piston driver, can make force F= 0.5 ton (5,000 N) and with limited variety.

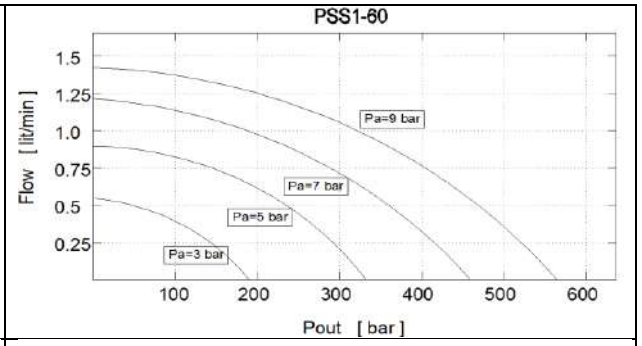


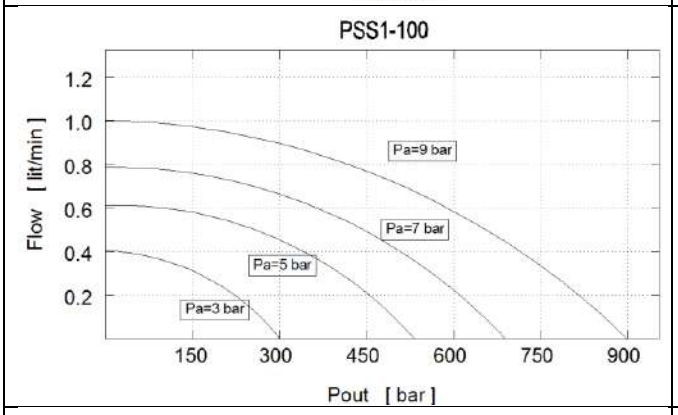
Quick Reference Table for: PSS Series (single Acting Pump with single Air piston)

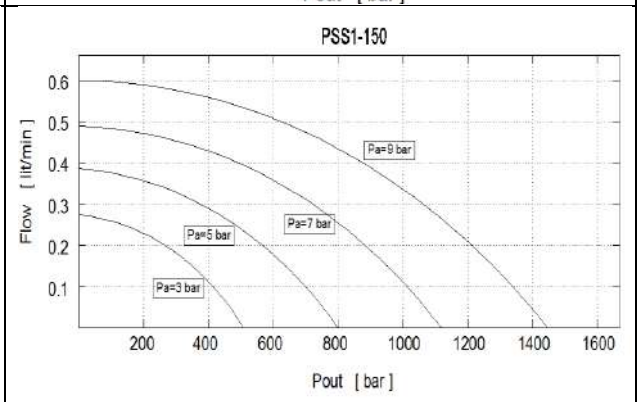
Pump Model	Ratio	Max pressure [Bar (PSI)]		Dis. [cc]	Max Flow [Lpm]	Inlet port	Outlet port
		@ 7 bar Air	@ 10 bar Air				
PSS1-40	40:1	280 (4060)	400 (5800)	4.32	2.0	3/8 NPT	1/4 NPT
PSS1-60	60:1	420 (6900)	600 (8700)	2.72	1.22	3/8 NPT	1/4 NPT
PSS1-100	100:1	700 (10150)	1000 (14500)	1.74	0.78	3/8 NPT	1/4 HP
PSS1-180	180:1	1260 (18270)	1800 (26100)	1.1	0.49	3/8 NPT	1/4 HP
PSS1-250	250:1	1750 (25380)	2500 (36260)	0.68	0.30	3/8 NPT	1/4 HP

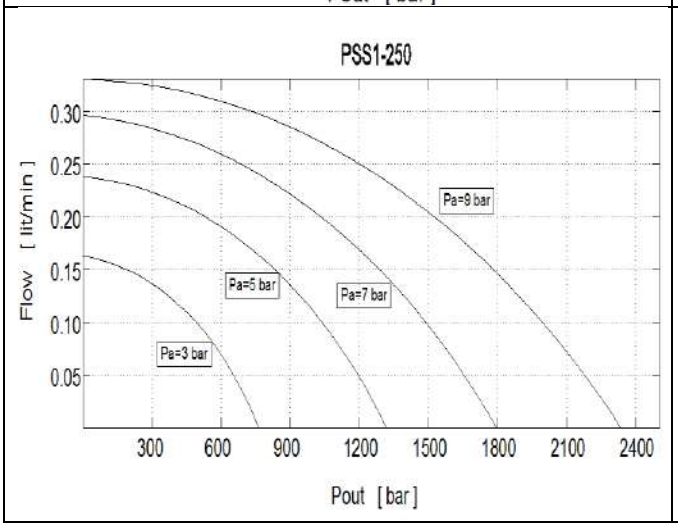
Note: Por PSS series with Lever Please add “L” end of pump model for example: PSS1-100 L

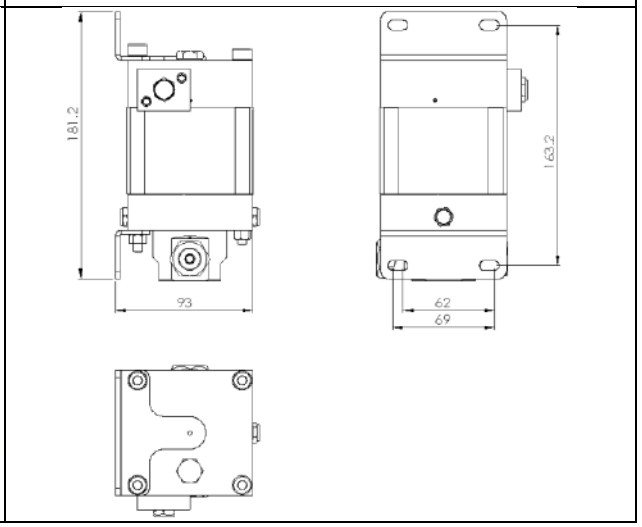

PSS1-40
Flow [lit/min]
2.5
2.0
1.5
1.0
0.5
Pa=9 bar
Pa=7 bar
Pa=5 bar
Pa=3 bar
50 100 150 200 250 300 350 400
Pout [bar]

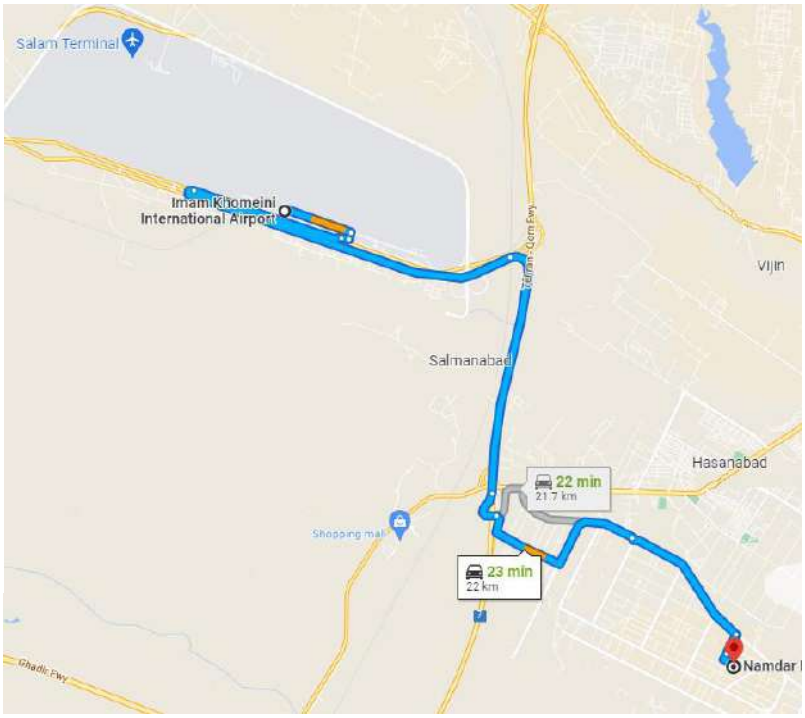

PSS1-60
Flow [lit/min]
1.5
1.25
1.0
0.75
0.5
0.25
Pa=9 bar
Pa=7 bar
Pa=5 bar
Pa=3 bar
100 200 300 400 500 600
Pout [bar]


PSS1-100
Flow [lit/min]
1.2
1.0
0.8
0.6
0.4
0.2
Pa=9 bar
Pa=7 bar
Pa=5 bar
Pa=3 bar
150 300 450 600 750 900
Pout [bar]


PSS1-150
Flow [lit/min]
0.6
0.5
0.4
0.3
0.2
0.1
Pa=9 bar
Pa=7 bar
Pa=5 bar
Pa=3 bar
200 400 600 800 1000 1200 1400 1600
Pout [bar]


PSS1-250
Flow [lit/min]
0.30
0.25
0.20
0.15
0.10
0.05
Pa=9 bar
Pa=5 bar
Pa=7 bar
Pa=3 bar
300 600 900 1200 1500 1800 2100 2400
Pout [bar]


181.2
93
163.2
62
69



OPET Products:

- Pneumatic Driven Pumps Up to 10,000 bar (150,000 Psi)
- Pneumatic Driven Gas Boosters up to 1,500 bar (22,500 Psi)
- High pressure Needle Valves up to 14,000 bar(200,000 Psi)
- High pressure Connectors up to 14,000 bar (200,000 Psi)
- Hydraulic Driven Pumps up to 10,000 bar (150,000 Psi) on request
- Hydraulic Driven Gas Boosters up to 4,000 bar (60,000 Psi)
- Industrial Valve and Safety Valve Test Bench (1/2” up to 56”)
- ESD , BOP , SSV ,SSSV test Bench
- Injection unit
- Workshop Pressure Unit
- Portable Pressure test (Light Weight / medium Weight)
- Hose Test Bench / tube and fitting test bench
- High pressure Power Units