

## AIR DRIVEN HIGH PRESSURE PUMPS

TYPE P160 / TYPE P200

Single acting and Double acting



Available in ATEX version

## CONTENTS

- Principle of Resato air-driven pump types P160 and P200
- Introduction
- Advantages of the Resato air-driven pump types P160 and P200
- Why use an air-driven pump
- Conversion from single acting into double acting
- Changing the ratio of a Resato pump
- Operating the Resato air-driven pump
- Installation
- Selection tables Resato pump types P160 and P200
- Pump performance curves
- Cross-section
- Material specifications (DIN norms)
- Standard range performance of the high-pressure sealing
- Ordering example
- Dimensional and weight information
- Accessories

## PRINCIPLE OF RESATO AIR-DRIVEN PUMP TYPES P160 AND P200

Resato air-driven pumps operate on the simple but efficient principle of an automatic reciprocating differential area piston. A relatively large air-operated piston (160 mm for the P160 pump range and 200 mm for the P200 pump range) is connected to a smaller high-pressure piston to convert compressed air flow into fluid flow at high pressure.

## INTRODUCTION

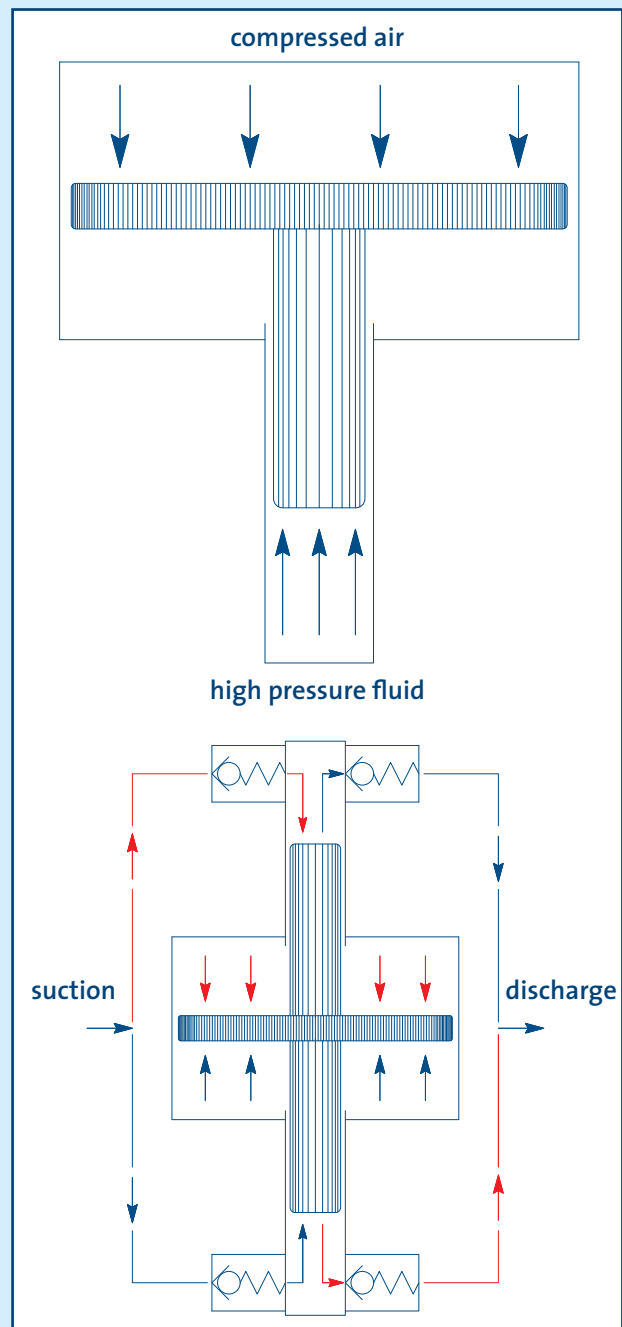
Resato offers a complete range of single and double acting pumps. The single acting pumps have one air piston and one high-pressure piston. The double acting pumps have one air piston and two high-pressure pistons. Because of the two pressure strokes, double acting pumps give a more continuous flow and pressure. Compared with a single acting pump, a double acting pump has almost half the air consumption for the same fluid flow.

The air piston of the single acting and double acting pump have the same diameter. However, the diameter of the hydraulic piston varies and determines the ratio of the pump: a higher ratio means a higher outlet pressure but a smaller flow. For both single and double acting pumps Resato offers 10 different ratios for the P160 range and 9 different ratios for the P200 range. Thus, we can offer you a choice of 20 Resato P160 pumps and 18 Resato P200 pumps.

Consider Resato pump P160-400-1.

This is a single acting pump with a nominal ratio of 400:1 (air drive piston area : hydraulic piston area is 400).

If the air pressure is 7 bar (100 psi), the maximum outlet pressure is  $400 \times 7 = 2800$  bar (40,000 psi).



## ADVANTAGES OF THE RESATO AIR-DRIVEN PUMP TYPES P160 AND P200

The pump ratio of an existing pump can be easily changed without dismantling the air drive section. This saves you the purchase of a complete new pump.

It is simple to convert a single acting pump into a double acting pump.

Air drive of the pump with only the air piston and cycling spool as moving parts.

Unlike most other air-driven pumps, there are no mechanical pilot valves and long internal pilot channels which have a negative influence on the reliability and cycling speed of the pump. The air cycling valve is mounted directly on top of the air cylinder.

Low noise level compared to other air-driven pumps with mechanical pilot valves.

Freezing of the pump is avoided by using an air cycling valve provided with light weight spool for high airflow at low air velocity.

Suitable for water because all wetted parts of the high-pressure pump section are made of special selected stainless steel and bronze.

Long working life of the seals because the pumps are standard provided with specially developed U-PE seals for optimum plunger sealing for a wide range of liquids.

The high-pressure seal can be replaced within minutes, without dismantling the air drive section. Costly downtime is reduced to a minimum.

Standard provided with packing release holes to prevent liquid from the hydraulic section escaping to the air drive section.

Check valve seats can be replaced within minutes. The check valves have soft seats, preventing capacity loss after a certain time of operating.

Less frictional resistance of the air piston. Unlike other air-driven pumps the air piston sealing of a Resato air-driven pump is not an O-ring. It is a V-shaped expanding ring, which needs less preload than an O-ring. The air piston is provided with PTFE based slydrings (bearings) for excellent wear- and-slide qualities. The slyd-rings increase the service life of the sealing surface (air cylinder) and the air piston sealing.

Excellent control of flow and output pressure due to low frictional resistance of the air piston, even at low air drive pressure.

History of proven reliability under severe conditions, for instance in offshore use.

All pressure and flow output is based on 7 bar (100 psi) air drive pressure instead of 10 bar (150 psi).

## WHY USE AN AIR-DRIVEN PUMP

Compressed air used as a power drive offers enormous advantages over use of other power drives: risks of excessive heat, flame, spark or shock are reduced considerably.

Apart from that, both output pressure and flow can be controlled by simply regulating the air drive pressure of the air-driven pump. Varying the air inlet pressure will automatically and accurately adjust the hydraulic output pressure.

The cycling speed is at a maximum when the outlet pressure is low. As the outlet pressure builds up, the cycling speed is reduced until a stall condition is reached at the desired outlet pressure. The stall pressure can be held without any further use of energy.

Other gases such as nitrogen or CO<sub>2</sub> can be used as alternatives to drive the pump.

Resato air-driven pumps are simple to install, they are compact and very quick and easy to maintain.

## CONVERSION FROM SINGLE ACTING INTO DOUBLE ACTING

Your single acting Resato pump type P160 or P200 can be easily converted into a double acting pump. Order a conversion kit to bring this about.

For example, if you want to convert a P200-180-1, order conversion kit C200-180-1.

## CHANGING THE RATIO OF A RESATO PUMP

The modular design of Resato pumps also offers the possibility of adapting the pump ratio of an existing pump. This saves you the purchase of a complete new pump. The ratio of a pump can be changed without dismantling the air drive section.

For example, if you want to change a P160-65-1 into a P160-115-1, order ratio kit R160-115-1.

In case of a double acting pump, for example P160-65-2, order two ratio kits R160-115-1.

## OPERATING THE RESATO AIR-DRIVEN PUMP

The outlet pressure and flow can be controlled by regulating the air drive pressure with an air pressure regulator. When compressed air of a certain air pressure is applied to the pump, it will cycle at high speed producing high fluid flow. As the outlet pressure increases, the pump will start to cycle at a lower rate. As long as the total load in the high-pressure cylinder is less than that in the air cylinder, the pump will cycle. When a balance of loads is reached, the pump stops and no more air is used. The pump will automatically restart when the balance is disturbed by a hydraulic pressure drop or by increasing the air drive pressure. As the frictional resistance of the Resato air-driven piston is very low, only a small pressure drop or air drive pressure increase is required to restart the pump.

### PUMP SELECTION INFORMATION:

**P160** – 20 – 2/EX

Diameter of the air-driven piston: 160 mm.

P160 – **20** – 2/EX

Nominal working ratio of the pump: 20

P160 – 20 – **2/EX**

Double acting type (single acting is indicated by 1)

P160 – 20 – 2/**EX**

Atex version (EX)

### RATIO KITS:

To adapt the ratio of an existing single or double acting pump, the following ratio kits are required:

**For a single acting pump P160:**

1 ratio kit type R160-\*-1

**For a double acting pump P160:**

2 ratio kits type R160-\*-1

**For a single acting pump P200:**

1 ratio kit type R200-\*-1

**For a double acting pump P200:**

2 ratio kits type R200-\*-1

\* the new desired nominal ratio of the pump (see selection tables)



### CONVERSION KIT:

To convert a single acting pump into a double acting one, a conversion kit is required:

**For a P160 pump:**

1 conversion kit, code C160-\*-1.

**For a P200 pump:**

1 conversion kit, code C200-\*-1.

\* the nominal ratio of existing pump (see selection tables)

### INSTALLATION

The Resato pumps can be mounted in any position. For maintenance reasons you are advised to mount pumps in horizontal position, using the four thread holes in the air drive end caps. If it is not possible to use the standard thread holes, brackets can be used (see Accessories).

The pumps will deliver their rated capacity at 7 bar (100 psi) air drive pressure with the required air flow. The air supply line requires an air pressure regulator to control the output of the pump. Apart from that it is necessary to mount an oil lubricator and a filter/water separator in the air supply line. On request the pumps can be supplied with a long life lubrication. A start/stop air valve can be mounted in the air supply line as well.

## SELECTION TABLES RESATO PUMP TYPES P160 AND P200

### P160 SINGLE ACTING:

Pump type	Max.outlet Actual ratio	Volume pressure bar/psi	Max. per cycle cc	Flow l/min	Connections	
					Suction	Discharge
P160 - 10-1	10	70 / 1025	98	26.3	3/4" NPT	1/2" NPT
P160 - 20-1	21	145 / 2100	48	13.2	3/4" NPT	1/2" NPT
P160 - 30-1	28.5	200 / 2850	35.3	9.5	3/4" NPT	1/2" NPT
P160 - 40-1	41	285 / 4100	24.5	6.4	3/4" NPT	1/2" NPT
P160 - 65-1	64	450 / 6400	15.7	4.2	1/2" NPT	M20X1.5*
P160 - 115-1	114	800 / 11,400	8.8	2.4	1/2" NPT	M20X1.5*
P160 - 180-1	178	1245 / 17,800	5.7	1.5	1/2" NPT	M20X1.5*
P160 - 255-1	256	1790 / 25,600	3.9	1.1	1/2" NPT	M20X1.5*
P160 - 400-1	400	2800 / 40,000	2.5	0.7	1/2" NPT	M20X1.5*
P160 - 520-1	522	3655 / 52,200	1.9	0.5	1/2" NPT	M20X1.5*

\* High-pressure connections with conical sealing.

### P160 DOUBLE ACTING:

Pump type	Max.outlet Actual ratio	Volume pressure bar/psi	Max. per cycle cc	Flow l/min	Connections	
					Suction	Discharge
P160 - 10-2	9.25	65 / 925	196	50.0	3/4" NPT	1/2" NPT
P160 - 20-2	20	140 / 1980	96	25.0	3/4" NPT	1/2" NPT
P160 - 30-2	27.5	190 / 2750	70.6	18.0	3/4" NPT	1/2" NPT
P160 - 40-2	40	280 / 4000	49	12.2	3/4" NPT	1/2" NPT
P160 - 65-2	63	440 / 6300	31.4	8.0	1/2" NPT	M20X1.5*
P160 - 115-2	113	790 / 11,300	17.6	4.5	1/2" NPT	M20X1.5*
P160 - 180-2	176	1230 / 17,600	11.4	2.9	1/2" NPT	M20X1.5*
P160 - 255-2	255	1785 / 25,500	7.8	2.1	1/2" NPT	M20X1.5*
P160 - 400-2	399	2790 / 39,900	5.0	1.3	1/2" NPT	M20X1.5*
P160 - 520-2	521	3645 / 52,150	3.8	0.9	1/2" NPT	M20X1.5*

\* High-pressure connections with conical sealing.

### P200 SINGLE ACTING:

Pump type	Max.outlet Actual ratio	Volume pressure bar/psi	Max. per cycle cc	Flow l/min	Connections	
					Suction	Discharge
P200 - 30-1	32.5	225 / 3250	48	11.0	3/4" NPT	1/2" NPT
P200 - 45-1	44.5	310 / 4450	35.3	7.8	3/4" NPT	1/2" NPT
P200 - 65-1	64	450 / 6400	24.5	5.4	3/4" NPT	1/2" NPT
P200 - 100-1	100	700 / 10,000	15.7	3.5	1/2" NPT	M20x1.5*
P200 - 180-1	178	1245 / 17,800	8.8	1.9	1/2" NPT	M20x1.5*
P200 - 280-1	278	1945 / 27,800	5.7	1.2	1/2" NPT	M20x1.5*
P200 - 400-1	400	2800 / 40,000	3.9	0.9	1/2" NPT	M20x1.5*
P200 - 625-1	625	4375 / 62,500	2.5	0.6	1/2" NPT	M20x1.5*
P200 - 815-1	816	5000 / 72,500	1.9	0.4	M16x1.5*	M16x1.5*

\* High-pressure connections with conical sealing.

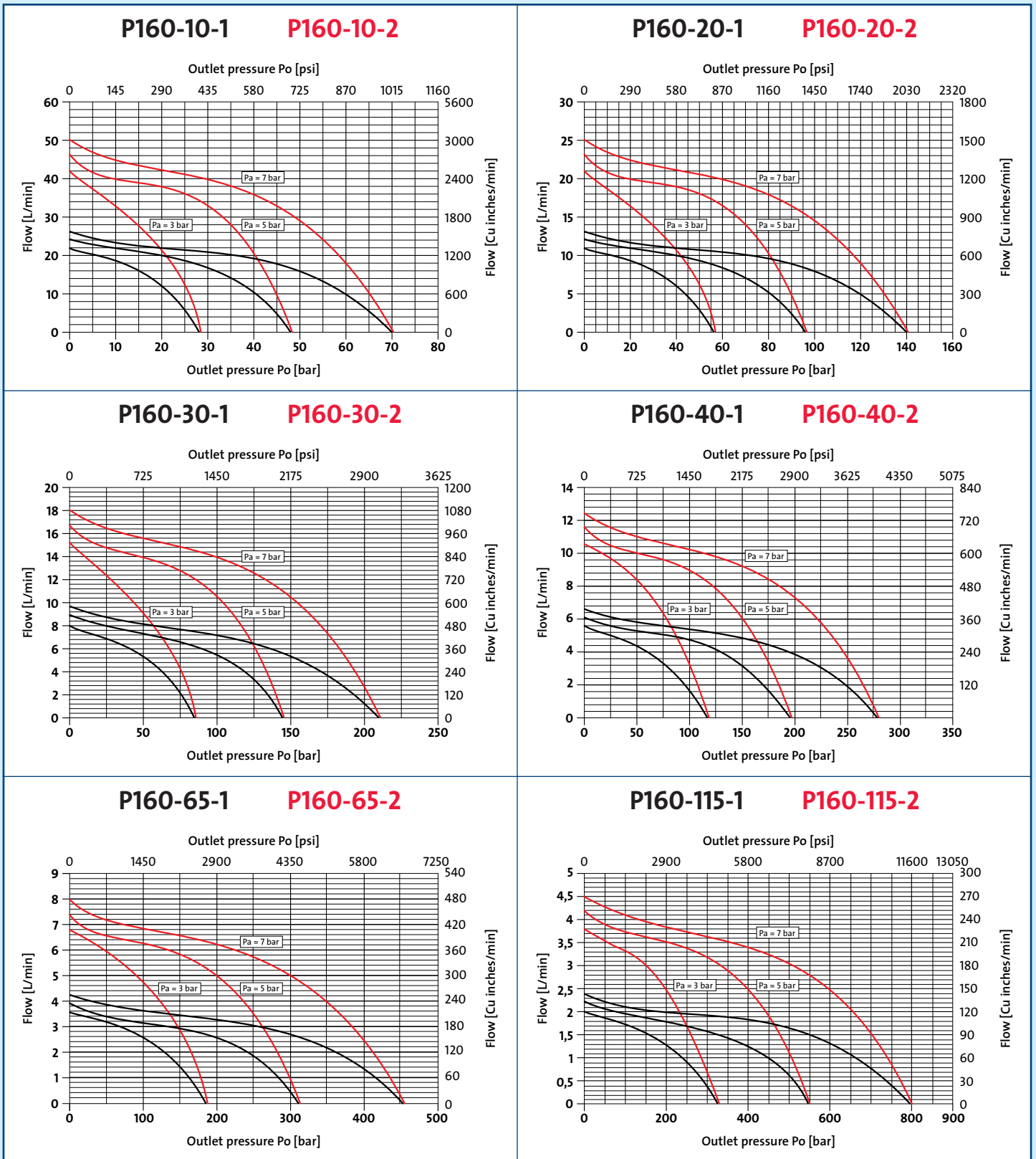
### P200 DOUBLE ACTING:

Pump type	Max.outlet Actual ratio	Volume pressure bar/psi	Max. per cycle cc	Flow l/min	Connections	
					Suction	Discharge
P200 - 30-2	31.5	220 / 3150	96	21.0	3/4" NPT	1/2" NPT
P200 - 45-2	43.5	305 / 4350	70.6	15.0	3/4" NPT	1/2" NPT
P200 - 65-2	63	440 / 6300	49	10.5	3/4" NPT	1/2" NPT
P200 - 100-2	99	695 / 9900	31.4	6.6	1/2" NPT	M20x1.5*
P200 - 180-2	177	1240 / 17,700	17.6	3.7	1/2" NPT	M20x1.5*
P200 - 280-2	277	1940 / 27,700	11.4	2.4	1/2" NPT	M20x1.5*
P200 - 400-2	399	2795 / 39,900	7.8	1.6	1/2" NPT	M20x1.5*
P200 - 625-2	624	4370 / 62,400	5.0	1.0	1/2" NPT	M20x1.5*
P200 - 815-2	815	5000 / 72,500	3.8	0.8	M16x1.5*	M16x1.5*

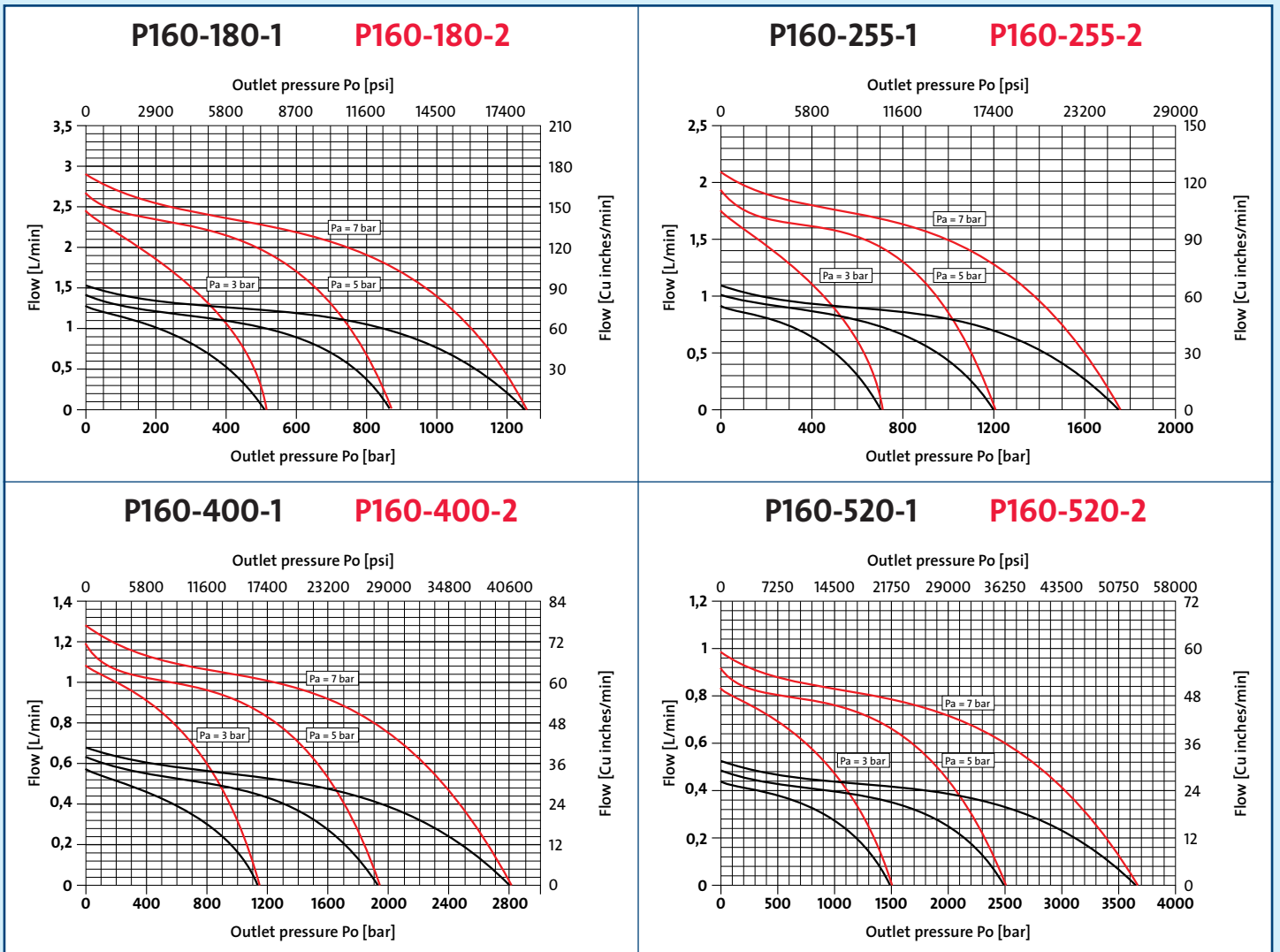
\* High-pressure connections with conical sealing.

The above performance figures are based on a 7 bar / 100 psi air driven pressure (Pa).

## PUMP PERFORMANCE CURVES P160



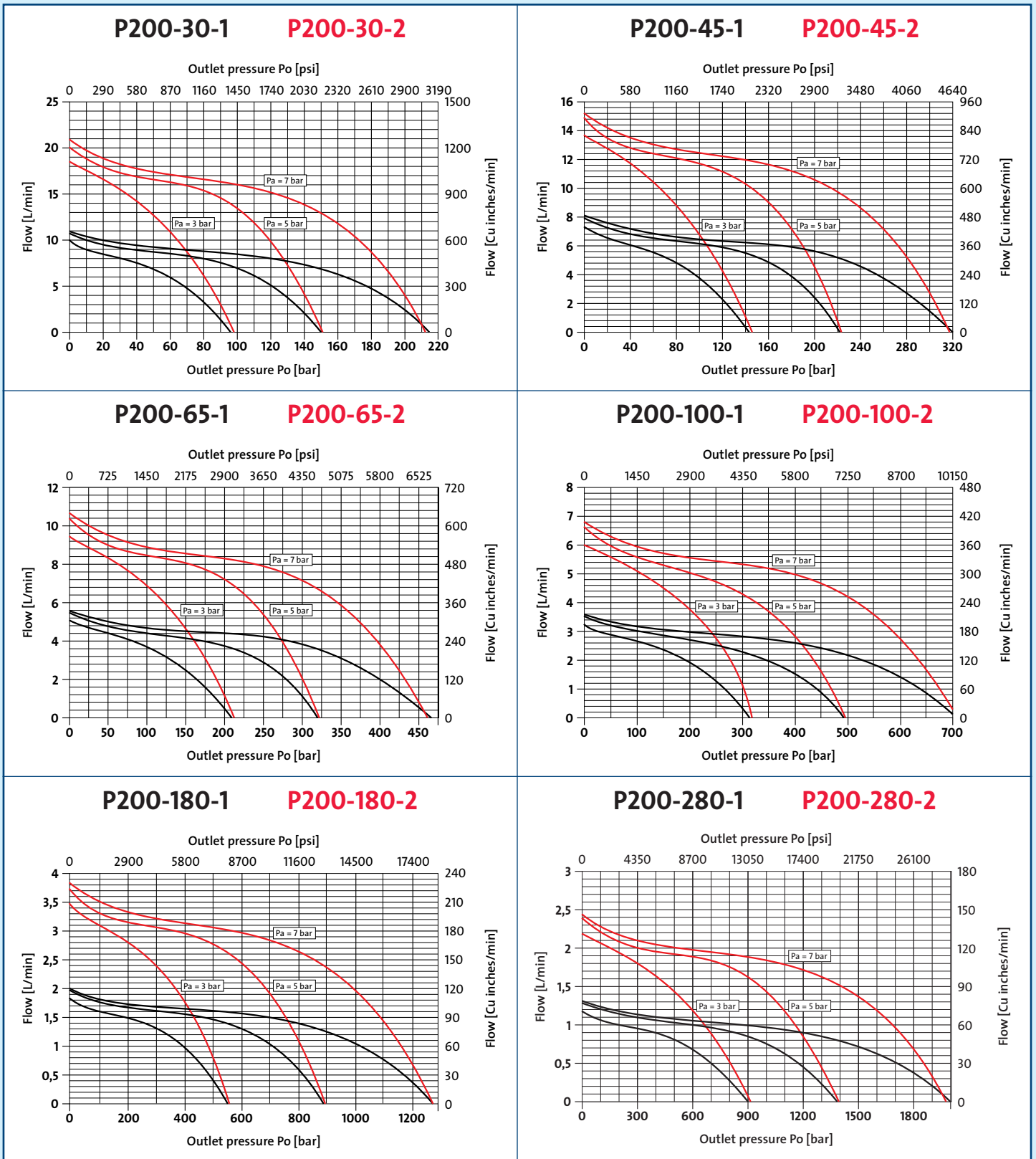
**PUMP PERFORMANCE CURVES P160**



Approximate air consumption for P160 pumps is 3.0 Nm<sup>3</sup>/min.

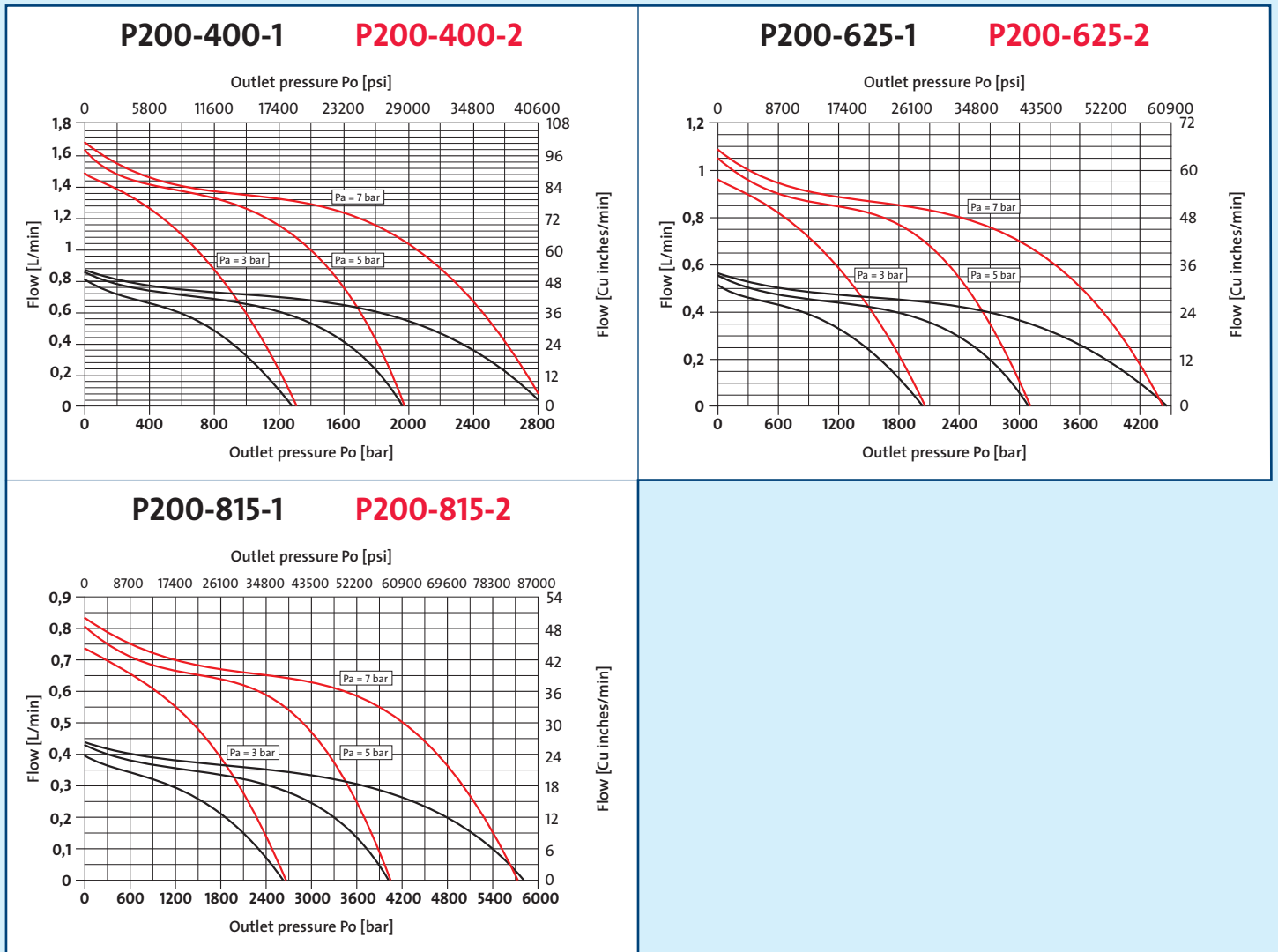
Pump performances in psi and cubic inches/minute are rounded figures, based on 7 bar/100 psi air drive pressure and U-PE high-pressure seals.

## PUMP PERFORMANCE CURVES P200





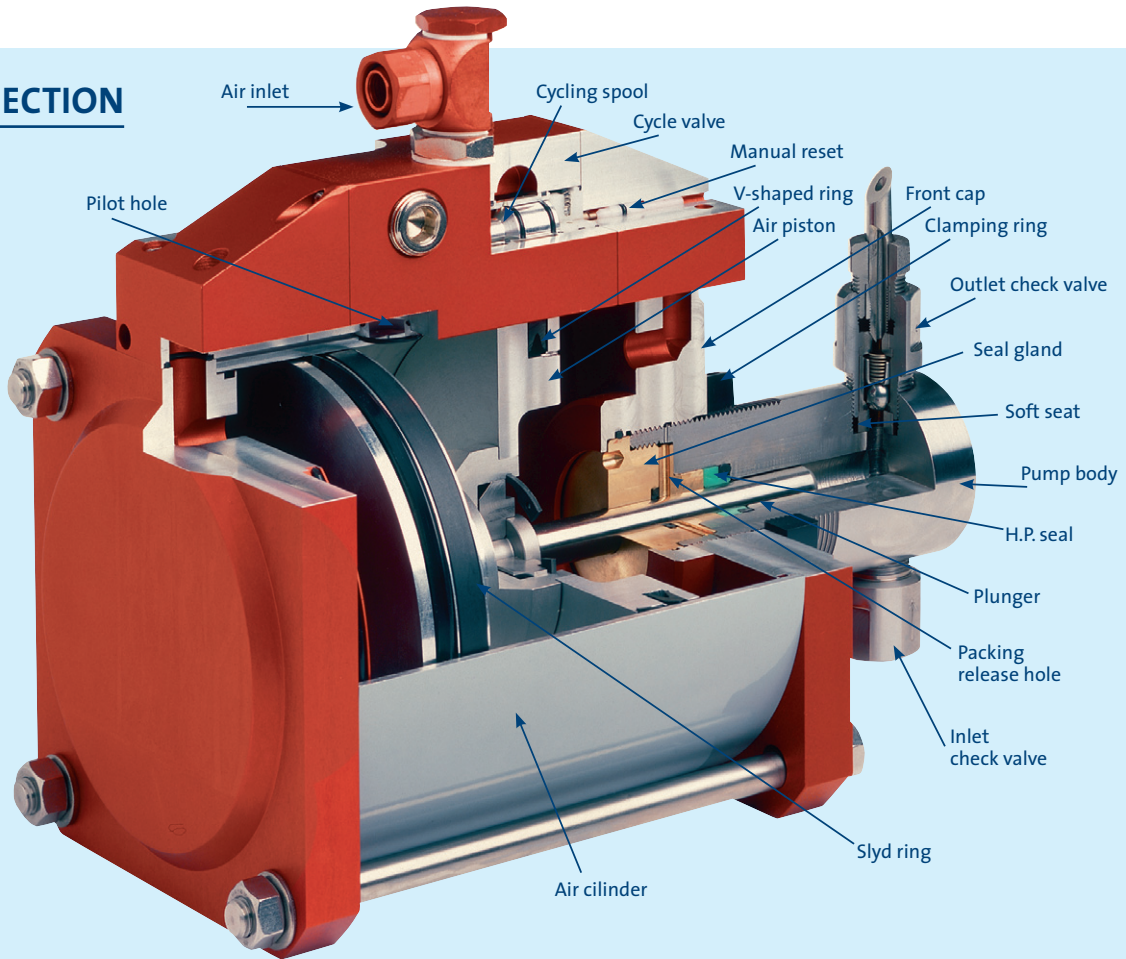
**PUMP PERFORMANCE CURVES P200**



Approximate air consumption for P200 pumps is 4.5 Nm<sup>3</sup>/min.

Pump performances in psi and cubic inches/minute are rounded figures, based on 7 bar/100 psi air drive pressure and U-PE high-pressure seals.

**CROSS SECTION**



**RESATO PUMPS P160 AND P200 MATERIAL SPECIFICATIONS (DIN NORMS)**

**AIR SECTION:**

- Air piston:** aluminium
- Air piston bearings:** PTFE-based slydrings filled with carbon
- Air cylinder:** aluminium, hard anodized inside and epoxy coated outside
- Cycling valve:** aluminium color anodized
- Cylinder clamping bolts and nuts:** stainless steel 1.4301
- Air drive end caps:** aluminium color anodized

**HIGH-PRESSURE SECTION:**

- Pump body:** bronze RG7; stainless steel 1.4122/15-5PH\*
- High pressure plunger:** stainless steel 1.4112/1.3980/17-4PH\*
- Check valves:** housing: stainless steel 1.4122/15-5PH\*  
balls: stainless steel 1.4034  
springs: stainless steel 1.4310  
other internal parts: stainless steel 1.4404/17-4PH\*

- Clamping rings:** PVC
- \* No DIN norms

**SEALINGS:**

- Check valves:** Viton rings (code V)  
**Alternative:** EPDM (code E)  
BUNA-NBR (code B)
- High-pressure plunger:** U-PE (code U)  
**Alternative:** Chevron style (code C)
- Air piston:** NBR V-shaped rings

**STANDARD RANGE PERFORMANCE OF THE HIGH-PRESSURE SEALING**

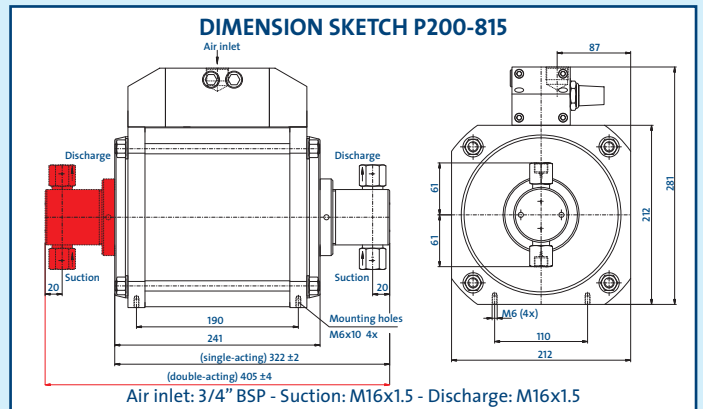
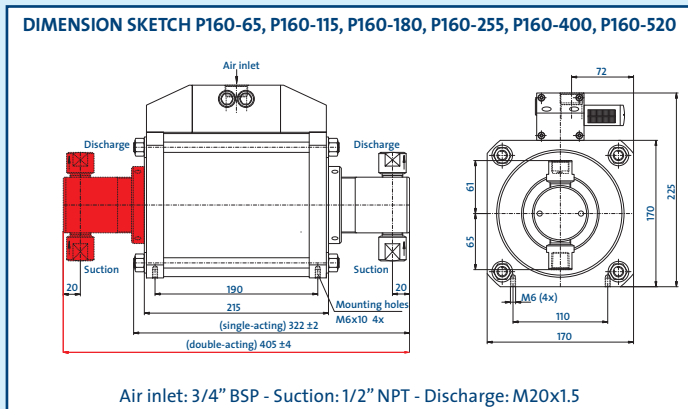
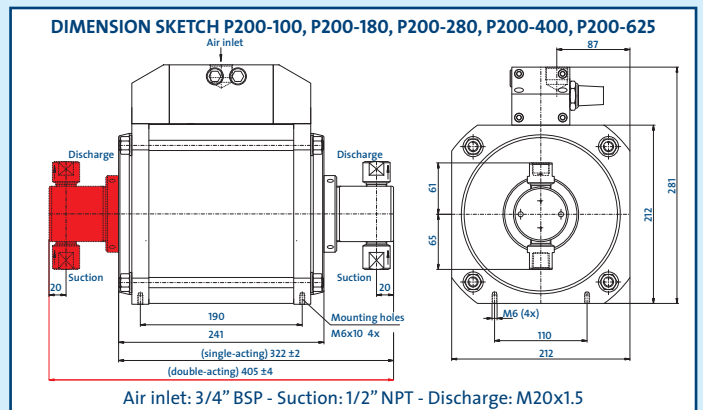
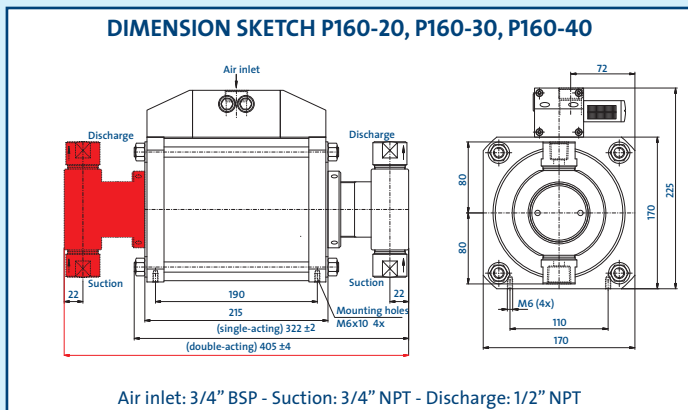
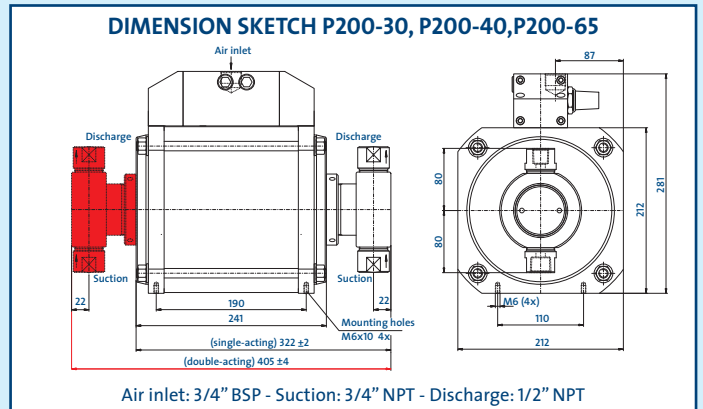
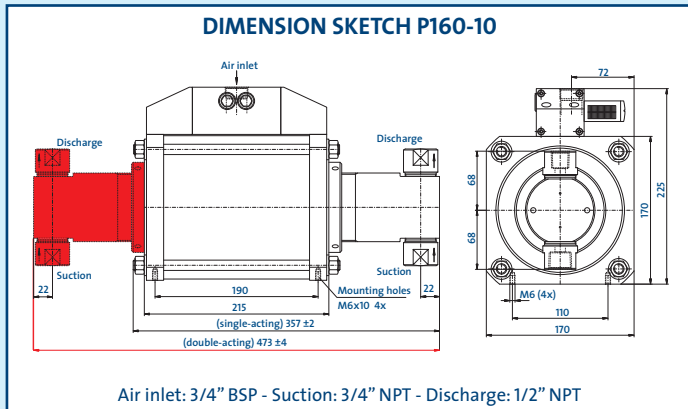
One of the most important features of Resato pumps is the high-pressure seal for the high-pressure plunger. The standard installed U-PE seals (code U) offer a long seal life, even for non-lubricating fluid. The seals are suitable for:

- water
- mineral base fluids
- hydraulic and lubrication oils
- fluid of the water/oil emulsion or water glycol types.

For slightly contaminated fluids we recommend use of chevron style packings (code C).

Alternative materials for wetted parts and sealings are available depending on the media used and on the operating conditions. Please contact Resato International BV for more information.

## DIMENSIONAL AND WEIGHT INFORMATION PUMP TYPES P160-\*-1/2 AND P200-\*-1/2 (SINGLE/DOUBLE ACTING)



**DIMENSIONS IN MM.** (nominal +4 or +2)

**Weight**

P160-x-1: 15.5 kg.  
P160-x-2: 19.5 kg.

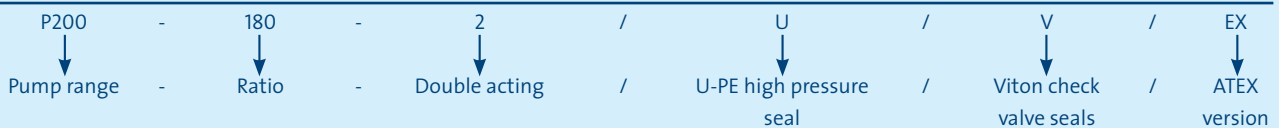
**Weight**

P200-x-1: 17.0 kg.  
P200-x-2: 21.0 kg.

\* Inlet and outlet connections can be fixed in any desired position.

\*\*High-pressure connection with conical sealing.

### ORDERING EXAMPLE



## ACCESSORIES

### AIR CONTROLS

Every Resato air driven pump must be fitted with a set of air controls to control pump performance, to lubricate the air and to prevent dirt and water from entering the air drive section.

All air controls for the P160 range have 1/2" BSP connections; air controls for the P200 range have 3/4" BSP connections. The set of air controls can be delivered as one unit, or as two separate units:

- unit for the P160 range, ordering code C-1/2
- unit for the P200 range, ordering code C-3/4
- filter/water separator with lubricator, ordering code FL-1/2 (P160) or FL-3/4 (P200)
- air pressure regulator, ordering code R-1/2 (P160) or R-3/4 (P200).

For the P160 range a start/stop valve is available which can be connected directly to the air controls. Ordering code for the start/stop valve is V-1/2.

**Option:**

On request the pumps can be supplied with special grease to ensure "long life lubrication".

### EXHAUST MUFFLER

To suppress noise and prevent ingress of contamination into the air cycling valve, the pumps are standard supplied with exhaust mufflers:

- type S-16 for the P160 range
- type S-20 for the P200 range.

If no exhaust muffler is required or available and noise levels are above acceptable, exhaust pipes can be led away to a remote location.

### BRACKETS

If for any reason the thread holes in the air drive end caps cannot be used to mount the pump, four welding brackets (4) can be used. The nuts of the air cylinder clamping bolts can be used to mount the brackets to the pump. Ordering code for the brackets is B-16/20 for pump types P160 and P200.

### ADAPTERS

Many pump types have a high-pressure connection (see selection tables). If necessary, Resato can provide high-pressure adapters with UNF high-pressure NPT or BSP thread connections. Please refer to our catalog of high-pressure fittings, adapters and tubing for more information.

### ATEX

As an option Resato air driven pumps can be delivered in an ATEX 94/9/EC compliant version. The user of the pump is responsible for classifying the area of use, while identifying the equipment category is the responsibility of the manufacturer. The Resato pumps are ATEX approved for Group II, category 2 zones G & D (code EX).

## RESATO INTERNATIONAL BV



1e Energieweg 13 NL-9301 LK Roden - Nederland Phone: +31 (0) 50 501 6877 E-mail: [hpsales@resato.com](mailto:hpsales@resato.com)  
Postbus 30 NL-9300 AA Roden - Nederland Fax: +31 (0) 50 501 2402 Internet: [www.resato.com/highpressure](http://www.resato.com/highpressure)

Please note that general data and specifications given in this brochure are subject to change without notice.  
Feel free to contact our sales department if you need more definite information.