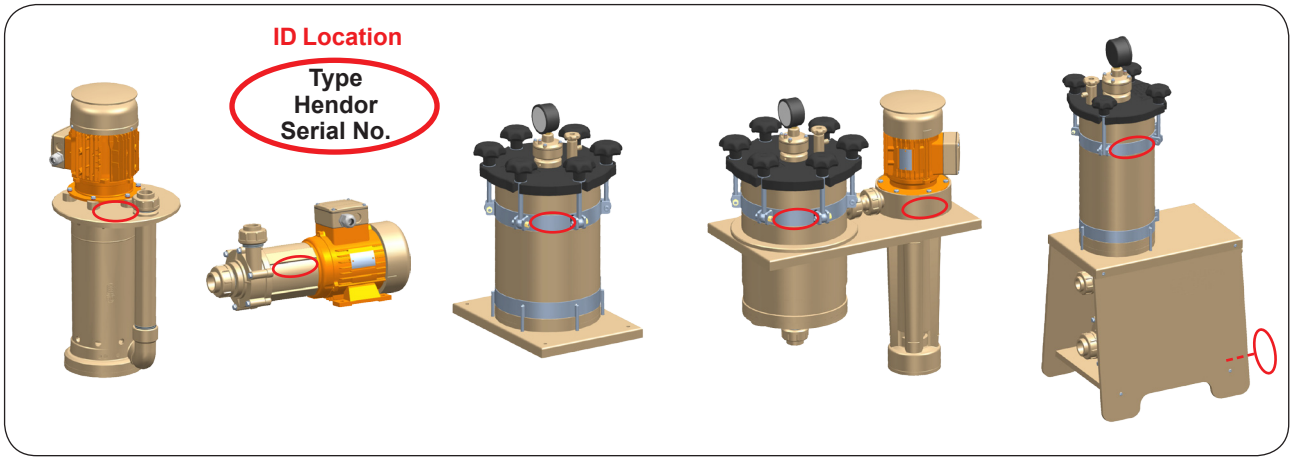
Operation Guide for Hendor Pumps & Filters



1. Introduction

Thank you for choosing this Hendor product. Before starting to use this product Hendor strongly recommends to read this operation guide thoroughly and to follow instructions as closely as possible. In this way your product will function reliable for years to come. This operation guide contains all obligatory safety precautions. It should be put at disposal of the end-user of this product and should be present at site in order to allow operator and maintenance crew to use it.

General Risks

Electricity
Electricity is a potential risk. Even without direct contact to the power grip. Components can be electrically charged by its usage. This can cause a local burn or even an injury by falling.
When operating the product make sure it is connected correctly . Check grounding and fuses for correct operation.
When applying maintenance make sure the product is disconnected from the power grid and static discharged.

Liquids
This product is intended to use in liquids of chemical nature. Be aware of possible spills and leakage. When installing this product it can splash in the liquid and cause exposure to the chemicals.
These liquids could cause injury to personnel. Personnel should wear appropriate personal protective equipment at any time.

Weight and dimensions
This product has a certain weight and dimension which can destabilize a person. Make sure there is supervision during maintenance. A person could be injured by fall or entrapment by lifting without the proper lifting tools.

Do take notifications on local standards and safety regulations regarding these general risks.

2. Receipt

At receipt of the product the identity of the product (by checking type plate data), the completeness of delivery as well as absence of visible damage should be ascertained. The end-user or his representative must ascertain the match of material specification and specific liquid used. Any problems arising from these checks should be made in writing and preferably signed by the forwarding agent as evidence.

3. Safety precautions

The presented symbols are safety alert symbols. Be alert to potential personal injury in case symbols on the product or in this manual are shown.

DANGER

This label warns for risk of electrical shock when failing to observe.

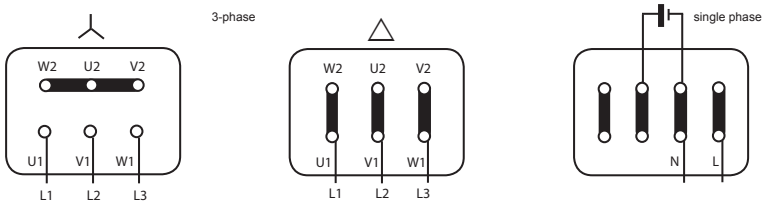
WARNING

This label warns about hazards that can cause personal injury, death or major property damage if ignored. Keep in mind that the product can contain chemical liquids.

Carefully read and follow all safety instructions in the manual and on the pump. Keep safety labels in good condition. Replace missing or damaged safety labels. Maintain at all times the local rules and regulations for safe operations.

3.1 Installation

Pumps and filters should be connected in the prescribed way.
The user always has to consider personal safety and health for himself as well as his direct vicinity.



3.2 Electrical

1. Only qualified electricians are allowed to connect pumps according to local regulations of the power supplier.
2. Grounding of the motor should be applied first; failure to ground can cause severe or fatal shock. Do not ground to gas supply lines.
3. Before connecting the motor check corresponding voltage of motor and power supply. Incorrect connection can cause fire or serious damage to the motor and voids warranty. See wiring diagram.
4. Check if frequency of power supply corresponds with frequency on label of pump.
5. Avoid unexpected or accidental starting of the motor by disconnecting and locking out power supply.
6. In case of repair and maintenance disconnect and lock out power supply.
7. Do not point a jet of water at the motor to avoid personal injury (risk of electrical shock).
8. Check wiring dimensions according to the power of the motor.
9. Check fuses on the power supply connection.
10. Thermal overload switch should be used on the connection to the pump. The current overload is adjusted to the value of the motor name plate including +10%.
11. To avoid damage, do not hoist the pump by the cord line.
12. Make sure the cord line is not jammed and avoid sharp edges.
13. General rule for Hendor pump shaft rotation: Always run clockwise (CW), looking at cooling fan side. Direction of rotation is also indicated on the motor by arrow.

A PTC is standard provided in motors of vertical pumps as of 4kW. Two extra connection wires will be available inside the terminal block. Hendor uses singular PTC's with a thermal limit of 160°C. The PTC is color coded according to DIN 44081 / DIN 44082.

Do not apply any voltage to the PTC, use a assigned relays.

As of 4kW a PTC is available in vertical pumps, the warranty will expire on the motor if the PTC is not used.

3.3 Checking direction of rotation

Vertical pumps: Always check the direction of rotation ***outside*** the liquid.
Horizontal pumps: Always check the direction of rotation ***flooded*** with liquid.
Briefly switching on the power will show direction of rotation, looking at cooling fan side. Ignoring these recommendations could damage the pump severely.

3.4 Plumbing

1. Connections to the pump and filter should be provided with reliable, persistent and chemical resistant materials.
2. Where hoses are used, take care of using correct hose clamps.
3. Use the right elastomers when making the connections.
4. Pipes and hoses should be internally cleared of any obstructions.
5. Check tightness of connections to prevent leakage and spills before starting up.
6. Thermoplastic pump components do not tolerate any plumbing stress.
7. Plumbing should be properly aligned and supported to prevent distortion and damage of parts.
8. Leave enough space around the pump or filter for easy access and maintenance.
9. Keep location of the pump away from any heaters or heater coils.
10. Pumps and filters should be mounted on a sturdy base.

3.5 Polution

Solids and mud are harmful for pumps. There are suitable strainers available to keep these substances out of the pump.

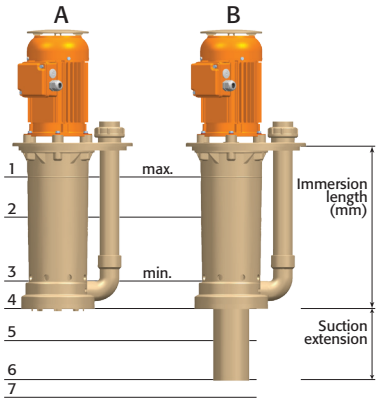
4.1 Vertical pumps

4.1.1 Installation

Take notice of enough bottom clearance at the suction side of vertical pumps.
See recommendations for bottom clearance.
Hendor vertical pumps are designed for in-tank installation.
Out-of-tank models are optional and require special installation instructions.

Ensure that the pump is connected correct to the power supply and that the plumbing is fitted leakfree.

Type	Minimum bottom distance (mm)
D90	50
D110	55
D120	55
D160	25..100
D18	65
D20	100
D24	100



1 maximum liquid level
2 normal working level
3 minimum starting level
4 pump A stops pumping
5 pump B will continue to work (if it is not switched off)
6 pump B stops pumping
7 bottom tank

4.1.2 Operation and maintenance

At start up the pump should be **checked for direction of rotation <u>OUTSIDE</u>** the liquid (see label on pump).
Contaminated strainers (if mounted) can reduce performance and should be cleaned regularly.

Regular pump inspection

During operation all pumps should be checked regularly. Check flow, pressure, manometer indication, pipe work, hoses, hose clamps and absorbed power by monitoring amperage of the motor. Pumps should be fitted with thermal overload switch. Check pumps for any unusual noise or vibration (this may indicate the moment of maintenance).

Maintenance precautions

To avoid dangerous or fatal electric shock hazard and to avoid injury from starting the motor unexpectedly, disconnect and lock out power supply to the motor. Always use genuine parts to assure good performance. When taking pump apart check for sequence of disassembly and reassembly. After having completed maintenance or repair, follow safety and installation instructions.

4.1.3 Dismantling and reassembly

For efficient maintenance of Hendor vertical pumps, some **special tools** are available (see page 5).

General precautions prior to dismantling

- always disconnect electric cables.
- disconnect discharge pipe.
- clean pump and remove remaining liquid in pump housing.
- do work on a clean bench.

When ordering Hendor parts always quote **serial number, pump type** and **drawing position number of the required part**.

Dismantling

Series D90

- remove drip cover (if applicable).
- remove fan cover.
- remove cooling fan by applying two screwdrivers.
- remove sealing ring and locking ring.
- turn pump upside down.
- remove volute cover (turning clockwise).
- secure shaft end against rotation and loosen impeller (turning anti-clockwise) by using impeller key.
- take off wiring casing of motor by removing 3 bolts; mind not to damage stator wiring!
- unscrew 4 screws that are accessible for removing pump house.
- take off pump house.
- loosen shaft protection pipe (turning anti-clockwise).

Series D110

- remove drip cover (if applicable).
- remove fan cover.
- remove cooling fan by applying two screwdrivers.
- remove sealing ring and locking ring.
- turn pump upside down.
- remove volute cover (turning clockwise).
- secure shaft end against rotation and loosen impeller (turning anti-clockwise) by using impeller key.
- remove bolts/nuts that connect motor to pump housing.
- take off pump housing completely.
- loosen impeller-shaft protection pipe (turning anti-clockwise).

Series D120

- remove drip cover (if applicable).
- remove fan cover.
- remove cooling fan by applying two screwdrivers.
- remove sealing ring and locking ring.
- turn pump upside down.
- remove volute cover (turning clockwise).
- secure shaft end against rotation and remove impeller (turning anti-clockwise) with impeller key.
- unscrew 6 screws that are accessible for removing pump house.
- take off pump house.
- loosen shaft protection pipe (turning anti-clockwise).

Series D160

- remove drip cover (if applicable).
- remove fan cover.
- remove cooling fan by applying two screwdrivers.
- remove sealing ring and locking ring.
- turn pump upside down.
- remove 5 bolts and remove volute cover.
- remove impeller screw 205 (turning anti-clockwise).
- secure shaft end against rotation and remove impeller (turning anti-clockwise) with impeller key.
- remove 4 bolts/nuts that are accessible for removing pump house.
- take off pump house.
- in case thrustring is worn, take out the ring by using special tool and turn clockwise.

Series D18

- remove drip cover (if applicable).
- remove fan cover.
- remove cooling fan by applying two screwdrivers.
- remove volute cover (turning clockwise).
- secure shaft end against rotation and remove impeller (turning anti-clockwise) with impeller key.
- remove bolts/nuts that connect motor to pump assembly

Series D20 - D24

- remove drip cover (if applicable).
- remove fan cover.
- remove cooling fan by applying two screwdrivers.
- remove volute cover (turning clockwise).
- secure shaft end against rotation and remove impeller lock bolt cover.
- remove M8 bolt to unlock impeller.
- remove M8 stud with hexagon key.
- remove impeller by screwing (clock wise) with M10x70 steel bolt.
- remove bolts/nuts that connect motor to pump assembly

Electric Motor

All motors are fitted with standard ball bearings.

- by removing rear-end and front-end cover, bearings are accessible.
- rear bearing can be taken off by standard puller.
- front bearing is only accessible after taking out spring ring and removing front shield (for easy removal, heat the front shield). front bearing of vertical pump motors can only be taken off by applying special Hendor bearing puller.

Replacing worn or damaged parts

Dismounting and refitting should be carried out very carefully.

Assembling motor is done in reverse order

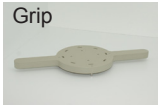
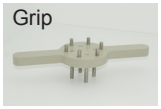
Ensure free rotation and check concentricity of the shaft of vertical pumps at 0,03 mm maximum.

Assembly

- refit all parts in reverse order.
- prior to mounting volute cover measure distance between top of impeller and bottom of volute cover; this dimension should be in range of 1-2 mm.

Handle pump as a new installation (see page 2 and 3).
Prior to operation of the pump check direction of rotation as indicated by arrow on the motor.
Motor shaft rotation is clockwise, viewed from top of the motor. Testing the rotation of the shaft has to be done outside the liquid; running the pump backwards may loosen the impeller and damage the pump.

Special tools

Tool		For disassembly of	Use	Pump type	Article number
1	Strap wrench 	Suction extension pipe (if applicable)	Strap wrench	All types	9999-000-000-037
2	Grip 	Strainer (if applicable) Flat strainer Pump house cover	 Grip	 D18	 9011-000-001-499
3	Radius key 	High strainer	Radius key	All types	9062-600-999-002
4	Grip 	Pump house cover Impeller	Grip	D9*/D110/D12*	9011-000-001-551
5	Pen key 	Pump house cover	Pen key	D20/D24	9063-623-100-250
6	Grip 	Impeller	Grip Impeller key	D18 D18	9011-000-001-499 9011-891-001-080
7	Wrench+bit 	Motor	T-wrench and Toolbit M4 T-wrench and Toolbit M5 T-wrench and Toolbit M6	0,12 - 0,18 - 0,25 kW 0,37 .. 2,2 kW 3 .. 9 kW	9999-000-000-020 9999-000-000-021 9999-000-000-047
8	Bearing puller 	Motor bearings	Complete bearing puller set Bearing puller Bearing puller Bearing puller	All types D9* only D110 only D12*/D18/D20/D24 only	9999-000-000-031 9999-000-000-023 9999-000-000-024 9999-000-000-025
9	Radius key 	Thrustring	Radius key (bended)	D16*	9062-600-999-003
10	Wrench 	Union nut	Wrench	All types	
10		PU Paint	0.25L tin (RAL 1011)	All motors	9999-000-000-041

4.2 Horizontal Pumps

4.2.1 Installation

Horizontal magnetic drive & seal pumps are very sensitive to suction conditions. Often pump problems are caused by poor suction conditions. The bigger the pump and the higher the temperature, the more important the general hydraulic guidelines should be applied. Always try to respect the basic rules for liquid velocity v (m/s) and NPSH.
We recommend for Suction side v = 1 - 2 m/s; Discharge side v = 1,5 - 3 m/s

Flow (l/h)	Inner pipe diameter (mm)								
	15	**20**	**25**	**32**	**40**	**50**	**65**	**80**	**100**
	Velocity (m/s) at given flow (l/h)								
1000	1,57	0,88	0,57						
2000	3,15	1,77	1,13	0,69					
4000	6,29	3,54	2,26	1,38	0,88				
6000		5,31	3,4	2,07	1,33				
8000			4,53	2,76	1,77	1,13			
10000			5,66	3,46	2,21	1,42	0,84		
15000				5,18	3,32	2,12	1,26	0,83	
20000				6,91	4,42	2,83	1,68	1,11	
30000				10,4	6,63	4,25	2,51	1,66	1,1
40000					8,85	5,66	3,35	2,21	1,4

Golden rules for proper pipe work

1. Keep suction pipe as short as possible.
2. Increase pipe size on suction side by at least one pipe diameter for longer suction pipe and/or higher temperature.
3. Use eccentric adaptors at varying diameters to prevent air pockets.
4. Avoid elbows, bends and fittings at suction side. When unavoidable keep fittings at a distance of 10 times pipe diameter away from pump inlet.
5. Pipe work should slope up towards pump to prevent air pockets.
6. Pipe work should be completely leak free.
7. Support pipe work near to pump to prevent stress on plumbing.
8. Allow sufficient liquid level to prevent air intake on suction side.
9. Use generously oversized strainer in case of foreign particles.
10. Use siphon breaker when priming over top of tank.
11. Never throttle pump on suction side.
12. In case of doubt consult Hendor for proper sizing and NPSH calculation.

4.2.2 Operation and maintenance

Magnetic drive pumps. How it works?
Driver (motor) and impeller (driven) are physically separated by a shell.
Pump part (wet end) is completely sealed and therefore isolated from plating proces.
Power transmission is established by magnetic force between motor shaft and impeller.
Bearings are lubricated and cooled by liquid itself.

Mechanical seal pumps. How it works?
Impeller is directly attached to the motor shaft by shaft coupling.
Mechanical seal on pump shaft prevents liquid from coming out.
Mechanical seal is lubricated and cooled by liquid itself.

These type of pumps are not self priming and not designed to run dry or hot. Optional priming chambers and dry run protection devices are available.

Initial start-up

Priming instructions at **flooded suction**:

1. Open all valves on suction and discharge side.
2. The pump should always be flooded with liquid to prevent any damage on bearings.
3. These type of pumps are not self priming. Therefore liquid level in the bath should be ample above entrance level of the pump.
4. Check for direction of rotation before start-up by shortly switching on/off.
5. Start the pump when no air remains in the pump.
6. When pumping liquid with higher density than water, start up with almost closed discharge valve to reduce power consumption.

Priming instructions at **non flooded suction**:

1. Ensure entrance of suction pipe is in liquid.
2. Slowly fill pump casing and suction pipe. Use discharge connection to fill.
3. Check if pump is free of air.
4. Close discharge valve and check for direction of rotation before start-up by shortly switching on/off.
5. Start the pump.
6. Wait until pump is building up pressure, and slowly open discharge valve.

Restart after power failure: Check if the pump is able to prime again. Suction pipe and pump housing should be filled.
Contaminated strainers (if applicable) can reduce flow, therefore: clean strainers regular.

Regular pump inspection

During operation all pumps should be checked regularly. Check flow, pressure, manometer indication, pipe work, hoses, hose clamps and absorbed power by monitoring amperage of the motor. Pumps should be fitted with thermal overload switch. Check pumps for any unusual noise or vibration (this may indicate the moment of maintenance).

Maintenance precautions

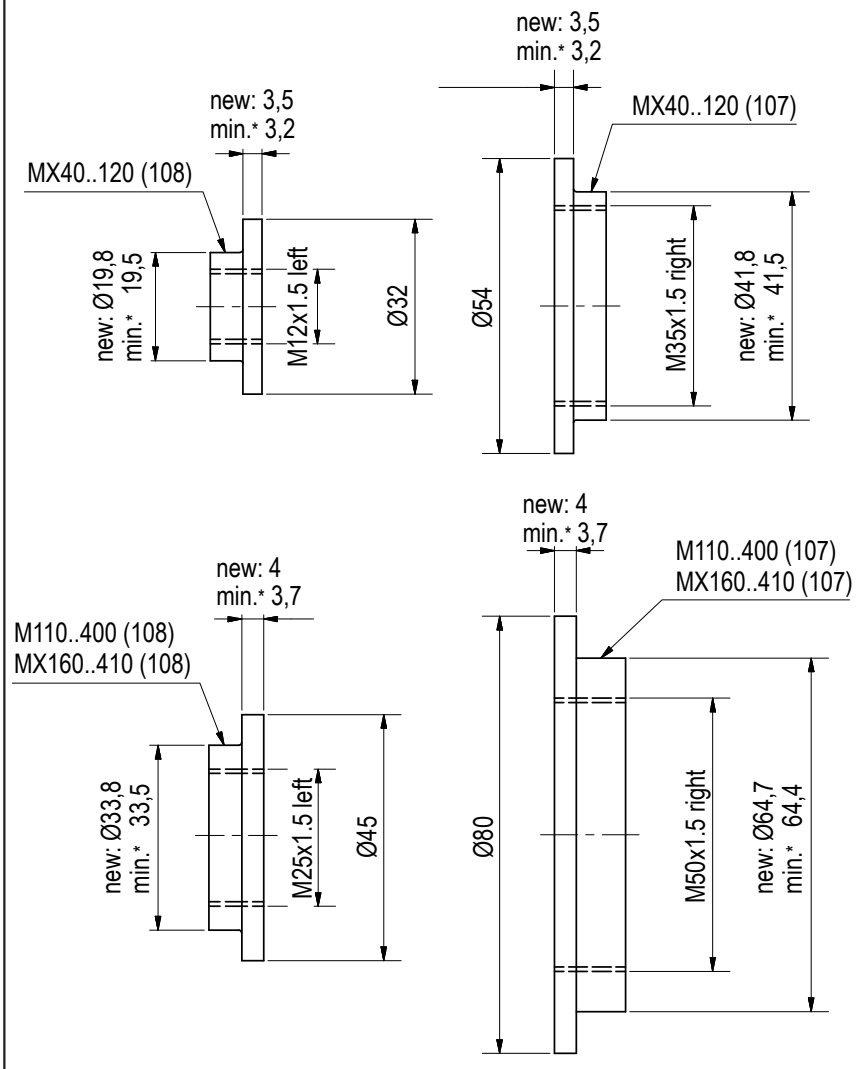
To avoid dangerous or fatal electric shock hazard and to avoid injury from starting the motor unexpectedly, disconnect and lock out power supply to the motor. Always use genuine parts to assure good performance. When taking pump apart check for sequence of disassembly and reassembly. After having completed maintenance or repair, follow safety and installation instructions.

Recommended maintenance schedule

The recommended maintenance schedule depends upon the nature of the fluid being pumped and the specific application. If the pump is used in a clean fluid, it is recommended that the pump be removed from service and examined after six months of operation or after 1500 hours of operation. If the pump is used on fluids with solids, high temperatures or other items that could cause accelerated wear, then this initial examination should be sooner.

After the initial examination of the internal components and wear items are measured, a specific maintenance schedule can be determined. For best results, it is recommended that the pump be removed from service annually for examination.

Wear dimensions of impeller bearings



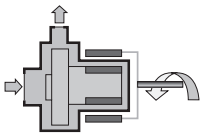
* Minimum value should not be exceeded in use

4.2.3 Dismantling and reassembly

4.2.3.1 Magnetic drive pumps

General precautions prior to dismantling

- always drain liquid from pump.
- disconnect all necessary electric cables or use switch on pump.
- disconnect suction and discharge piping (watch spilling liquid).
- do work on a clean bench.



When ordering Hendor parts always quote **serial number, pump type** and **drawing position number of the required part**.

Dismantling

- remove bolts from pump casing.
- take out impeller and impeller shell; **mind strong magnetic force**

Replacing worn or damaged wet end parts

Series M10..M15

- take ceramic shaft out of casing and replace it.
- rotating bushing is molded into impeller; replacing only possible by exchanging complete impeller.

Series MX40..MX410 and M110..M400

- static bearings cannot be replaced (heat shrinked); when damaged replace complete part.
- rotating bearings are mounted by thread; front = right-handed thread (dismantling = turning CCW); rear = left-handed thread (dismantling = turning CW).

General description of dismounting a drive magnet

- loosen hex. screws through hole in bracket.
- by means of a lever drive magnet down the shaft; mind strong magnetic force.
- check for remaining metal particles on the magnet and remove them.

General description of mounting a drive magnet

- slightly grease shaft of motor.
- replace drive magnet on shaft by hand watching position of key.
- ensure that drive magnet goes up to shaft end (when using a hammer, be sure motor bearings are not damaged).
- secure hex. screws.

Assembly

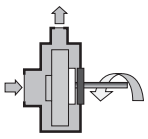
- mount impeller shell (check for free rotation by hand).
- put impeller into shell; **mind strong magnetic force**.
- place O-ring and put pump casing into place (outlet up).
- mount bolts and tighten them crosswise.

After assembly always check for free rotation by hand. Verify direction of rotation indicated by arrow on pump/motor prior to regular operation.
Horizontal pumps: Always check the direction of rotation ***flooded*** with liquid.
Briefly switching on the power will show direction of rotation, looking at cooling fan side. Ignoring these recommendations could damage the pump severely.

4.2.3.2 Mechanical seal pumps S55 .. S300-PP

General precautions prior to dismantling

- always drain liquid from pump.
- disconnect electric cables or use switch on pump.
- disconnect suction and discharge piping.
- do work on a clean bench.



When ordering Hendor parts always quote **serial number, pump type** and **drawing position number of the required part**.

Dismantling

- remove bolts from pump casing.
- take off SS plate and pump casing.
- turn safety guard so that hex. screw on coupling is accessible.
- loosen front screw in coupling (pump side).
- take out impeller together with rotating parts of mechanical seal.

Replacing worn or damaged parts

- rear static seal ring is easy to replace; mind position of seal ring according to locking pin; always renew O-rings after removing parts.
- take off rotating part; mind position of coil and hook; at replacing seal ring do position O-ring, coil and hook.

Assembly

- put back cover including static seal ring in place against steel bracket; mind upright position of supply channel for seal.
- lubricate seal with a little detergent.
- place flat rubber gasket in position.
- put a spacer (thickness 2 mm) between back cover (124) and steel bracket (103) (adjusting pre-load on seal).
- put impeller back into position; mind correct position of all rotating parts.
- push impeller firmly as far as possible; hold that position and secure front hex. screw in coupling.
- remove spacer from back cover.
- put pump casing and SS plate back into place.
- mount bolts and tighten them gradually.
- turn safety guard so that holes are pointing downwards (drain in case of leakage).

Handle pump as a new installation (see page 2).
After assembly always check for free rotation by hand. Verify direction of rotation indicated by arrow on pump/motor prior to regular operation.
Horizontal pumps: Always check the direction of rotation ***flooded*** with liquid.
Briefly switching on the power will show direction of rotation, looking at cooling fan side. Ignoring these recommendations could damage the pump severely.

4.3 Filter chambers

4.3.1 Installation

Following rules should be respected when installing :
Bottom of filter chamber (by preference) is placed at the same height as bath level; this will ensure an easy medium change and prevents unwanted emptying of tank.

1. Maximum pressure should not exceed indication on dial of manometer.
2. Maximum allowable pressure at temperature range is indicated on top of filter chamber.
3. Adjust diameter of in- and outlet of the filter to required capacity of the system.
4. Return pipe from filter chamber should be placed as far as possible from pump inlet in order to promote good bath movement.
5. Filter chamber 362 has a tiltable lid. Position of lid can be changed by positioning top ring (304).

4.3.2 Operation and Maintenance

Maximum pressure in filter chamber
The maximum pressure in Hendor filter chamber should not exceed the engraved value on top of the cover plate.

Pressure gauge
A pressure gauge is fitted on most Hendor filter chambers. An anti-freeze filled chamber above a membrane separates the pressure gauge from the process liquid. During normal operation the filter chamber regularly should be inspected for flow (dial indication on gauge).

If pressure on manometer is less than usual, the chamber below the manometer should be refilled.
Topping up manometer liquid:
After removing gauge (328) and air release screw, top up casing (327) with anti-freeze.
When assembling gauge (mind O-ring 335) liquid must show up.
Put back air release screw into casing and tighten it.
If liquid does not show up repeat procedure here above. If still no liquid shows up the membrane should be replaced.
Remove gauge (328), unscrew 4 screws, take off the lid (327), replace membrane (326), refit 4 screws lightly, holding down the membrane with unsharp object through lid, tighten 4 screws and repeat above mentioned procedure.
If pressure on the dial of the gauge is not coming back to zero, when the pump is switched off, there may exist a difference of pressure between inside gauge and open air. To correct dial indication cut off the top of the rubber cap on top of the gauge.

4.3.3 Dismantling and reassembly

Replacement of filter elements

Depending on the type of filter, the filter element(s) should be exchanged reaching a maximum pressure difference of 1-2,5 bar.

Sequence of operation

- switch off pump (ensure pump cannot be started unexpectedly).
- close all main taps.
- open drain valve.
- open air release tap (turning CCW maximum 2 rotations) to empty filter chamber
- loosen all star buttons.
- remove or tilt the lid of the filter chamber; sometimes the gasket sticks to the chamber and extra lifting effort is required to remove the lid.

Hendor filter chambers are equipped with cartridges, discs or bags.
After removing the contaminated filter medium it should be disposed off according to environmental guidelines.
Properly install the new filter medium to prevent by-pass of unfiltrated liquid.

Closing sequence
- check sealing rubber of chamber on distortion.
- close lid.
- tighten star buttons firmly crosswise.
- close drain valve, open main taps and start-up the pump.
- check unit for any leakage.
- after bleeding the unit, close air release tap.

Particular instructions series 362
- when loosening star buttons, two fixed star buttons should be turned clockwise, which will slightly lift the lid (because of sticking gasket) after removing other star buttons.
- after lifting, two star buttons have to be turned 4 times anti-clockwise in order to lift the lid by handgrip into leaning position.

Closing sequence
- check sealing rubber of chamber on distortion
- close lid by tilting down
- turn two fixed star button 4 times clockwise
- tighten remaining star buttons firmly crosswise and at last two remaining fixed star buttons.
- close drain valve, open main taps and start-up the pump.

5. EC-Declaration of conformity

Manufacturer: Hendor Pompen BV
Address: P.O. box 9
5530 AA Bladel
The Netherlands

Herewith we declare, that the product:

Pump
- is in conformity with the provisions of the Machinery Directive, as amended, and with national implementing legislation (Directive 2006/42/EC second edition)
- is in conformity with the provisions of the following other EC directives: Low voltage directive (Directive 2014/35/EC)

Filter
- is in conformity with the provisions of the Pressure Equipment Directive PED97/23/EC conformity assessment procedure: Module A

Confirmed at Bladel

Signature

Technical Director H.F.G. Bohncke

5.1 Warranty and Service-Support

1. The warranty on goods delivered by Hendor delivered for defects that are caused by manufacturing and/or materials errors is valid during a period of a maximum of 8000 operating hours within 12 months after the delivery ex-factory by Hendor. Solely when as a consequence of transport of the delivered goods to a destination outside Europe the putting into operation of the good does not take place immediately after delivery, the aforementioned warranty period is extended with the duration of the transport, it being understood that the warranty period in no case will be longer than 18 months from the delivery ex-factory. After expiry of this term any warranty becomes void. Hendor is not liable and offers no warranty for defects that are not caused by manufacturing and/or materials errors. Each warrant becomes forfeit if the defect is not reported in writing to Hendor within 14 days after discovery, albeit after it could reasonably have been discovered, accompanied by a precise description of the complaint as well as the work conditions.
2. The warranty consists of replacement or repair of the defect product or parts thereof, such at the discretion of Hendor. All other costs that must be made in connection with the replacement or repair, such as freight costs, import duties, possible costs of a service mechanic, will be for the account of the counterparty. Products which are sent in connection with a warranty claim to Hendor, must be sent clean and free of chemical residue and free of charge. Replacement or repair is executed in accordance with the directions of Hendor and in the manner that it deems fit. Replacement or repair shall solely be executed after permission in writing of Hendor.
3. Each warranty or liability of Hendor becomes void, if the aforementioned conditions are not complied with.
4. Warranty claims are furthermore excluded in any case if:
   a) the products are used for an application not accepted in writing by Hendor or have been modified;
   b) the products have not been used according to the technical manual or have been used incorrectly or inexpertly, have been maintained insufficiently or the damage or the defect is the consequence of normal wear and tear;
   c) the counterparty does not comply with any obligation (financially or otherwise) towards Hendor deriving from whichever agreement;
5. Defects in a part of the delivered do not give the counterparty the right to disapprove of the entire delivered party.

6. Trouble shooting

In case of problems please read the manual and particularly this page. If the problem still exists or parts should be replaced, contact us and always quote serial number, pump type, running conditions and/or defect of the pump. In case of returning a pump or filter for repair always send the “Security Certificate” with the shipment.

Pump problem	Possible reason - horizontal pump	Possible reason - vertical pump
No liquid flow	2-3-4-5-6-7-8-12-15-22-24-31	4-5-7-8-12-15-17-22-24-28-31
Insufficient liquid flow	1-3-6-8-10-11-13-14-15-16-18-19-20-25-28-29	8-10-13-14-15-16-18-19-20-25-28-29-30
Insufficient pressure	8-10-13-14-15-16-18-20-25-29-30	10-13-14-16-18-30-25-29-30
Rising liquid temperature	8-15-19-25	8-15-18-19
Noisy pump or excessive vibration	1-3-6-13-14-15-20-21-22-23-28-34	9-13-14-15-16-17-21-22-23-32
Motor is overheating	13-15-16-20-21-22-23-24-25-27-28-29-30	15-16-21-22-23-24-25-27
Motor overload activated	20-25-26-28-29-30	22-25-26-29-30
Cracking/deformation	9-34-49	9-34-49
Corrosion	27-50	27-50

Filter problem	Possible reason
No or insufficient liquid flow	8-19-28-38-39-41-42-48
Leakage	39-40-49
Pressure gauge reading not correct	35-36-37-38
High dial indication on pressure gauge	8-42-48
Bad filtering result	33-42-43-45-47
Foam formation in the bath	11-31-46

System / Pipework

1 Suction pipe too long or diameter too small
2 Air pocket in suction pipe
3 Leak in suction pipe
4 Suction pipe or strainer blocked
5 Suction height too high
6 Air supply close to suction inlet
7 Foot valve or suction pipe insufficiently submerged
8 Valve in pipework (partly) closed
9 Discharge pipe under tension
10 Leak in discharge pipe
11 Return pipe not submerged (air intake)
12 Liquid level in tank too low

Pump

13 Impeller damaged or worn out by abrasives
14 Impeller out of balance
15 Impeller / volute blocked by foreign matter
16 Wrong impeller choice (50 or 60 Hz)
17 Volute not immerged sufficiently in the liquid
18 Wrong choice of pump size
19 Pump is running at very low flow

Motor

20 Wrong direction of rotation
21 Cooling fan blocked or loose
22 Motor bearings jammed or worn out
23 Motor bearings incorrectly installed
24 Motor down on a phase
25 Incorrect voltage
26 Thermal overload setting incorrect
27 Insufficient cleaning

Liquid

28 Liquid has crystallised
29 Specific gravity of liquid too high
30 Viscosity of liquid too high
31 Air / gas in liquid
32 Abrasive particles in liquid
33 Colloïdal liquid
34 Liquid temperature too high

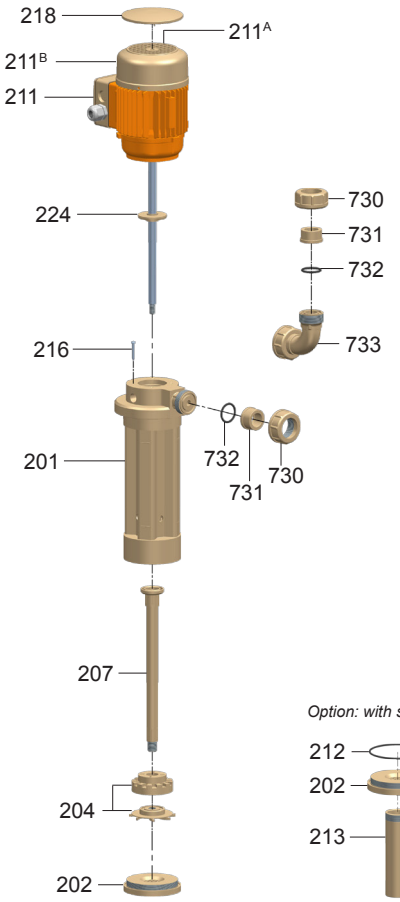
Filter

35 Not enough anti-freeze in chamber below pressure gauge
36 Membrane in chamber below pressure gauge deformed/damaged
37 Pressure gauge defect
38 Filter chamber insufficiently bled
39 Filter chamber not closed properly
40 Filter chamber gasket damaged of deformed
41 Filter element incorrectly installed
42 Filter system element saturated
43 Bypass of unfiltrated liquid
44 Filter medium is too coarse
45 Filter material damaged or torn
46 Unwashed cartridges used (residues of wetting agents)
47 Wrong choice of filter medium
48 Wrong choice of micron rating

Material / Environment

49 Wrong choice of pump / o-ring material
50 Aggressive environment

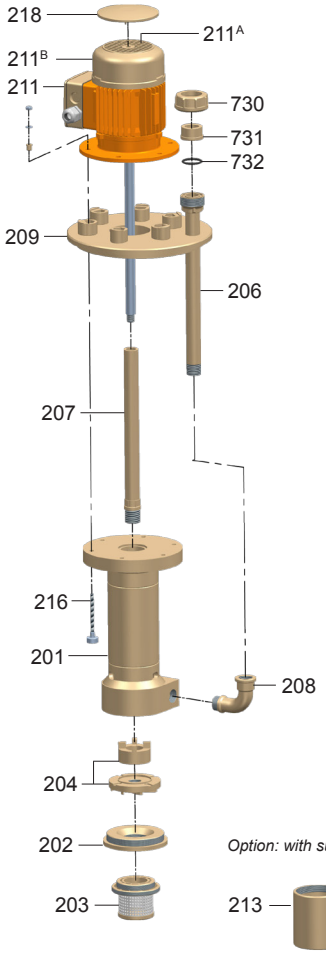
Series D90 - PP/PVDF



201 Volute
202 Volute cover
204 Impeller
207 Shaft protection pipe
211 Electric motor
211A Cooling fan
211B Cooling fan cover
212 O-ring
213 Suction extension pipe
216 Fastener kit motor
218 Motor drip cover
224 Splash guard
730 Union nut
731 Union end
732 O-ring
733 Discharge elbow

Option: with suction extension pipe

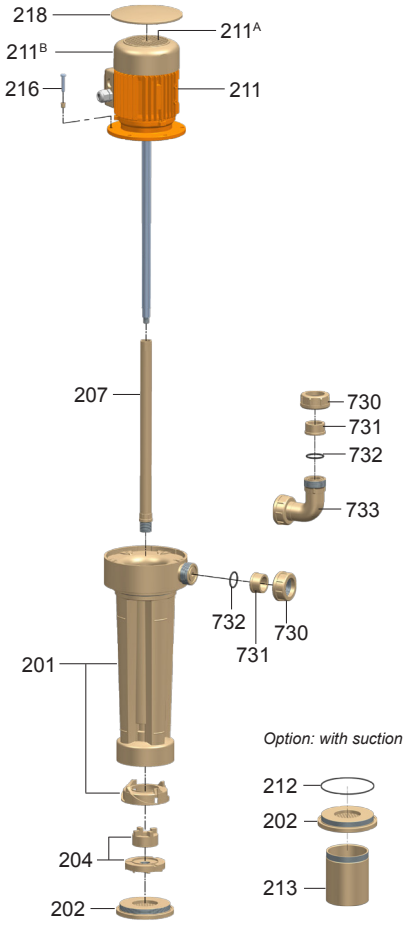
Series D110 - PP



201 Volute
202 Volute cover
203 Strainer
204 Impeller
206 Discharge pipe
207 Shaft protection pipe
208 Discharge elbow
209 Mounting plate
211 Electric motor
211A Cooling fan
211B Cooling fan cover
213 Suction extension pipe
216 Fastener kit
218 Motor drip cover
730 Union nut
731 Union end
732 O-ring

Option: with suction extension pipe

Series D120 - PP/PVDF

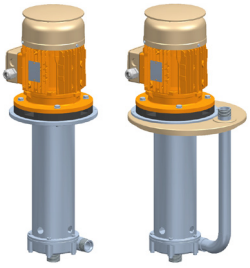


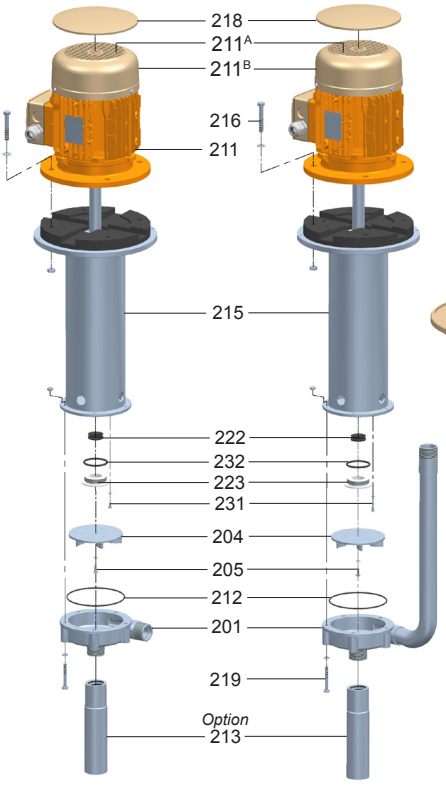
201 Volute
202 Volute cover
204 Impeller
207 Shaft protection pipe
211 Electric motor
211A Cooling fan
211B Cooling fan cover
212 O-ring
213 Suction extension pipe
216 Fastener kit motor
218 Motor drip cover
730 Union nut
731 Union end
732 O-ring
733 Discharge elbow

Option: with suction extension pipe

Series D160 - SS316

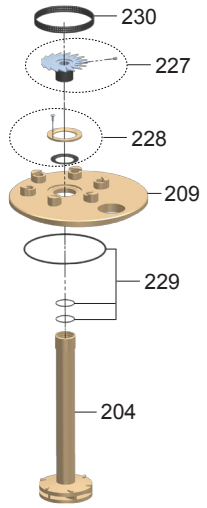
D160-SS **D160-X-SS**





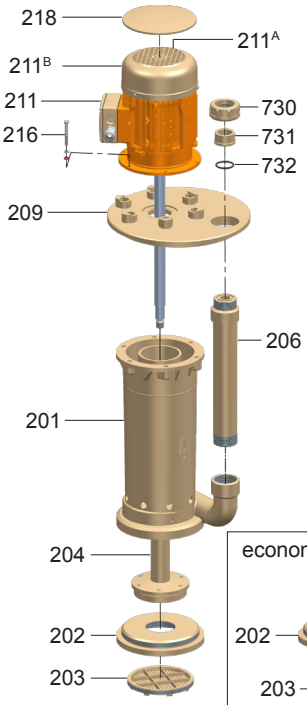
201 Volute
204 Impeller
205 Impeller screw
209 Mounting plate
211 Electric motor
211A Cooling fan
211B Cooling fan cover
212 O-ring
213 Suction extension pipe
215 Bracket
216 Fastener kit
218 Motor drip cover
219 Fixation set
222 V-ring
223 Thrustring
231 Fixation set
232 O-ring (D161 only)

Series D18 - PP/PVDF



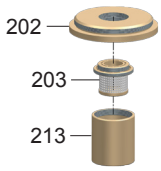
model with vapour lock

204 Impeller
209 Mounting plate
227 Vapour lock impeller
228 Vapour lock mounting plate
229 O-ring kit
230 Protection guard

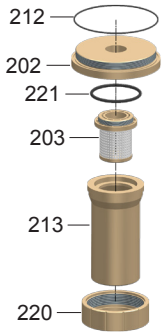


201 Volute
202 Volute cover
203 Strainer
204 Impeller
206 Discharge pipe
209 Mounting plate
211 Electric motor
211A Cooling fan
211B Cooling fan cover
212 O-ring
213 Suction extension
216 Fastener kit motor
218 Motor drip cover
220 Union nut
221 O-ring
730 Union nut
731 Union end
732 O-ring

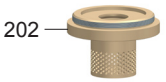
economy



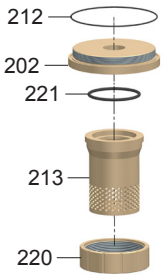
reinforced



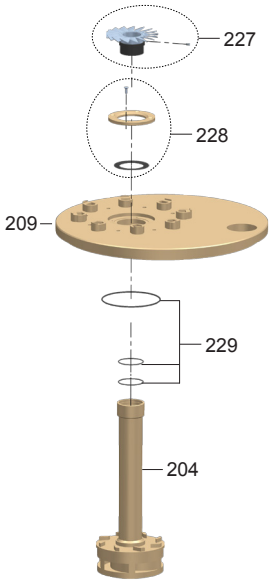
D18-43 economy



D18-43 reinforced

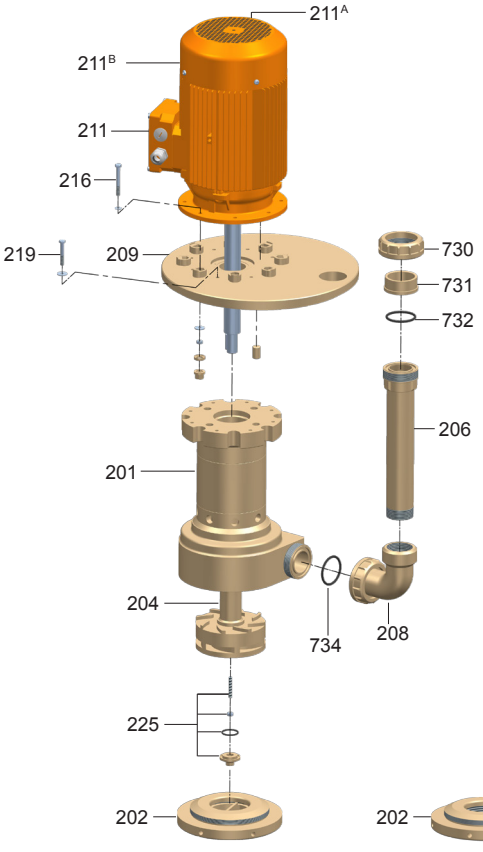


Series D20 - D24 - PP

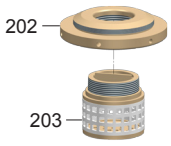


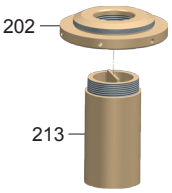
model with vapour lock

204 Impeller
209 Mounting plate
227 Vapour lock impeller
228 Vapour lock mounting plate
229 O-ring kit

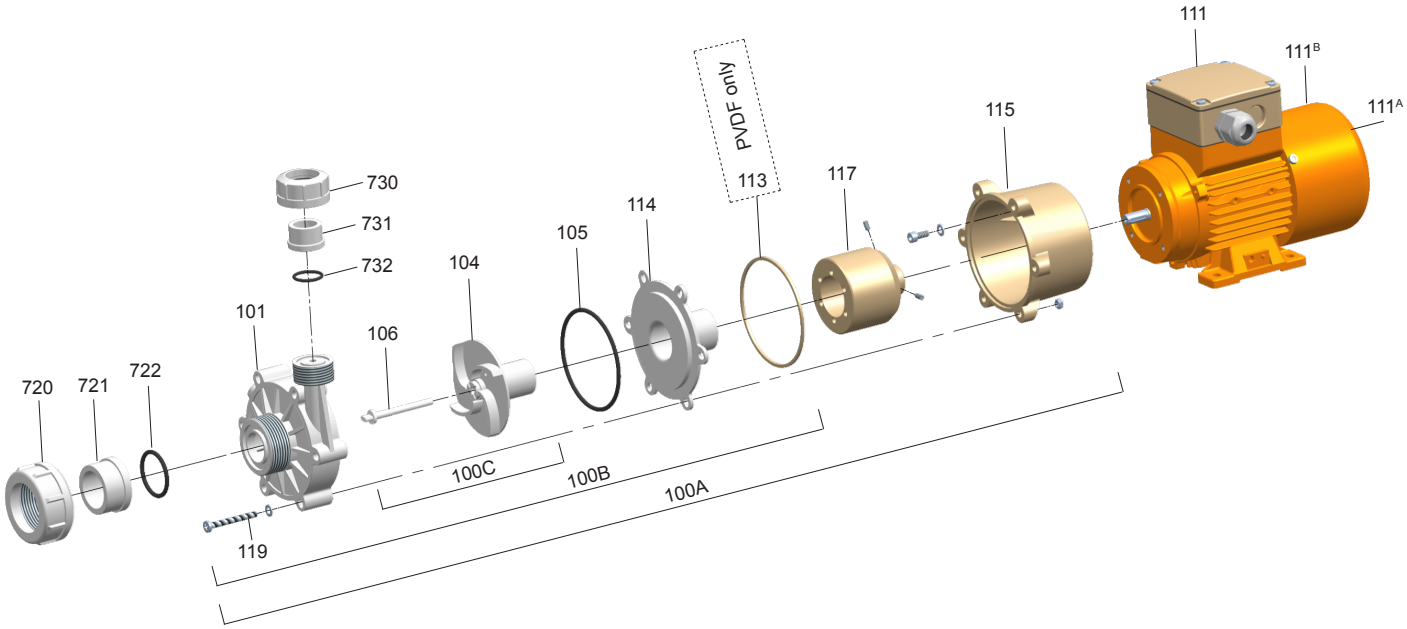


201 Volute
202 Volute cover
203 Strainer
204 Impeller
206 Discharge pipe
208 Discharge elbow
209 Mounting plate
211 Electric motor
211A Cooling fan
211B Cooling fan cover
213 Suction extension
216 Fastener kit motor
219 Fastener kit flange
225 Fastener kit impeller
730 Union nut
731 Union end
732 O-ring
734 O-ring



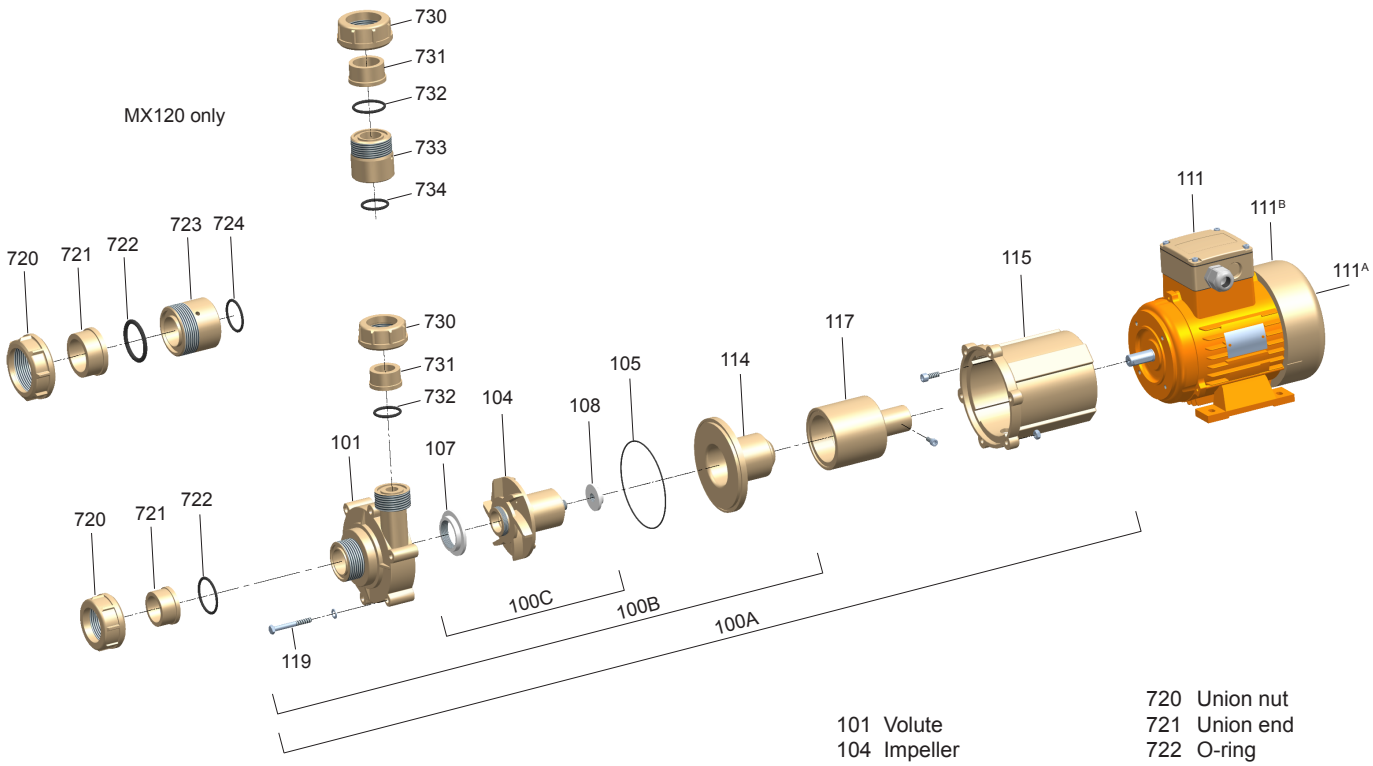


Series M10 - M11 - M15 - PP/PVDF



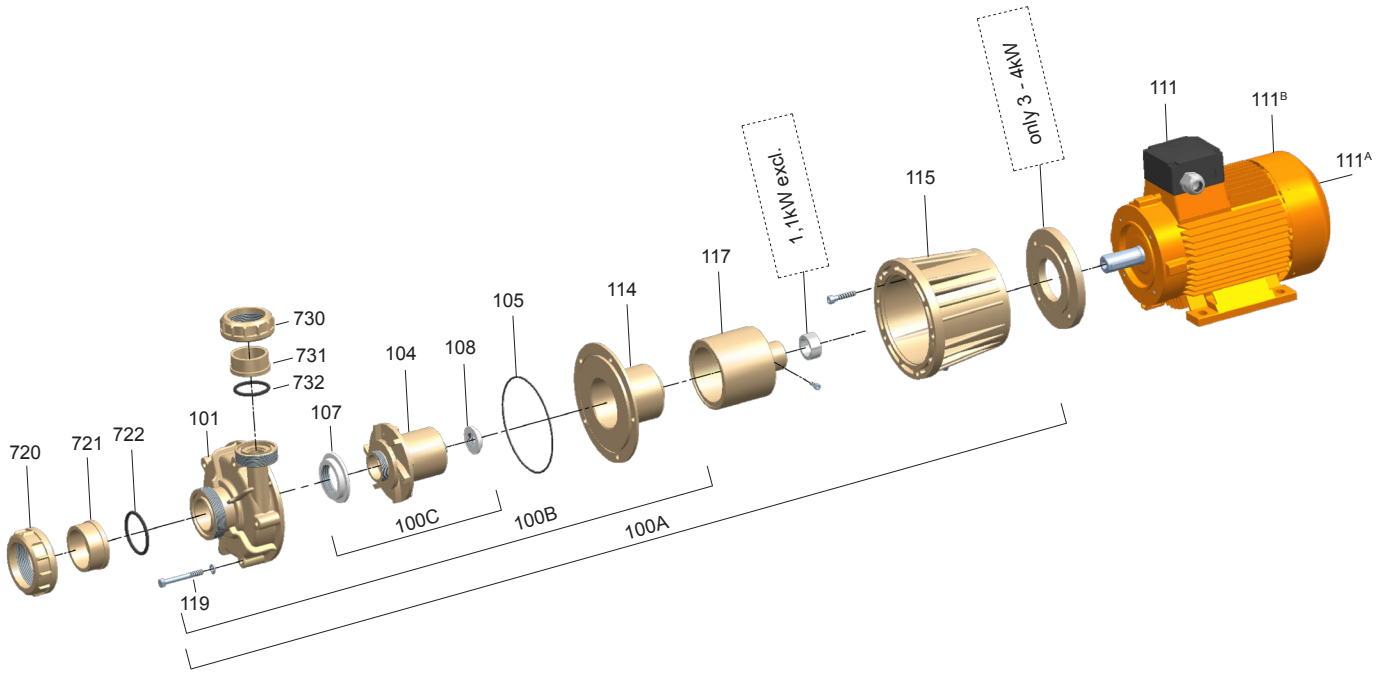
		101	Volute		
		104	Impeller		
		105	O-ring		
100A	Pump without motor	106	Shaft	720	Union nut
100B	Wet end	113	O-ring (PVDF only)	721	Union end
100C	Impeller complete	114	Impeller housing	722	O-ring
111	Electric motor	115	Bracket	730	Union nut
111A	Cooling fan	117	Drive magnet	731	Union end
111B	Cooling fan cover	119	Fastener kit	732	O-ring

Series MX40 - MX60 - MX90 - MX120 - PP/PVDF



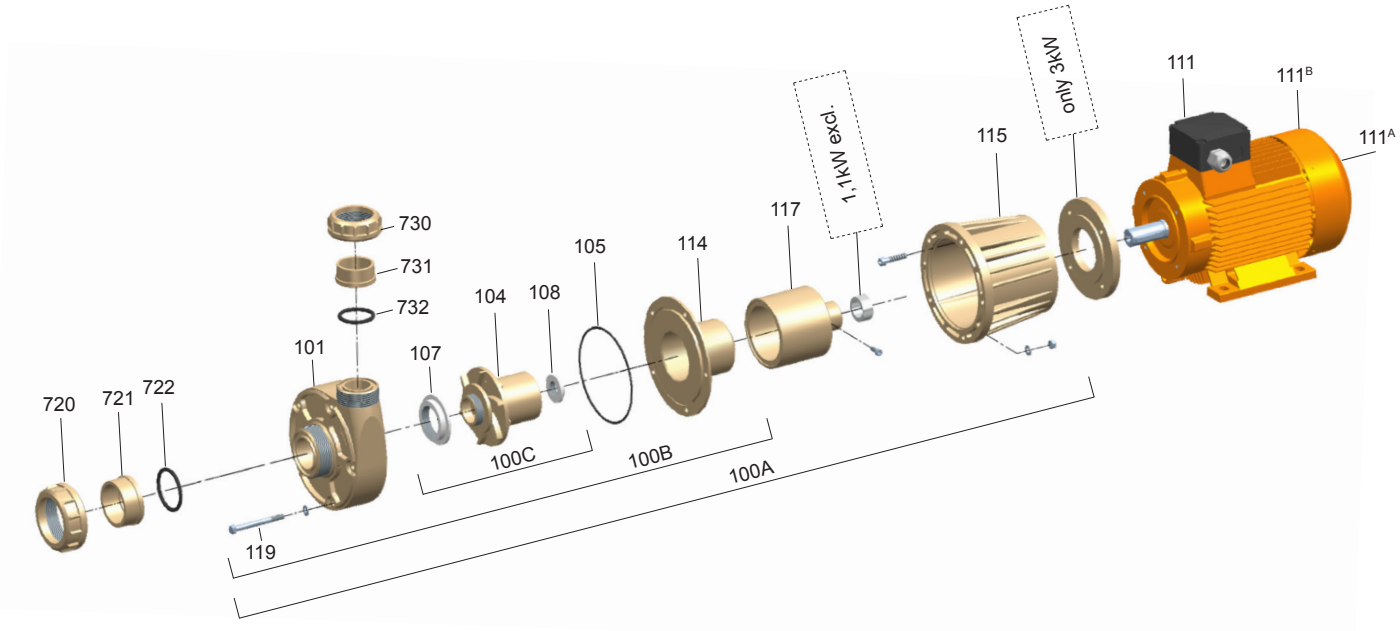
		101	Volute	720	Union nut
		104	Impeller	721	Union end
		105	O-ring	722	O-ring
100A	Pump without motor	107	Impeller front bearing	723	Adapter
100B	Wet end	108	Impeller rear bearing	724	O-ring
100C	Impeller complete	114	Impeller housing	730	Union nut
111	Electric motor	115	Bracket	731	Union end
111A	Cooling fan	117	Drive magnet	732	O-ring
111B	Cooling fan cover	119	Fastener kit	733	Adapter
				734	O-ring

Series M110 - M150 - M220 - M300 - M400 - PP/PVDF



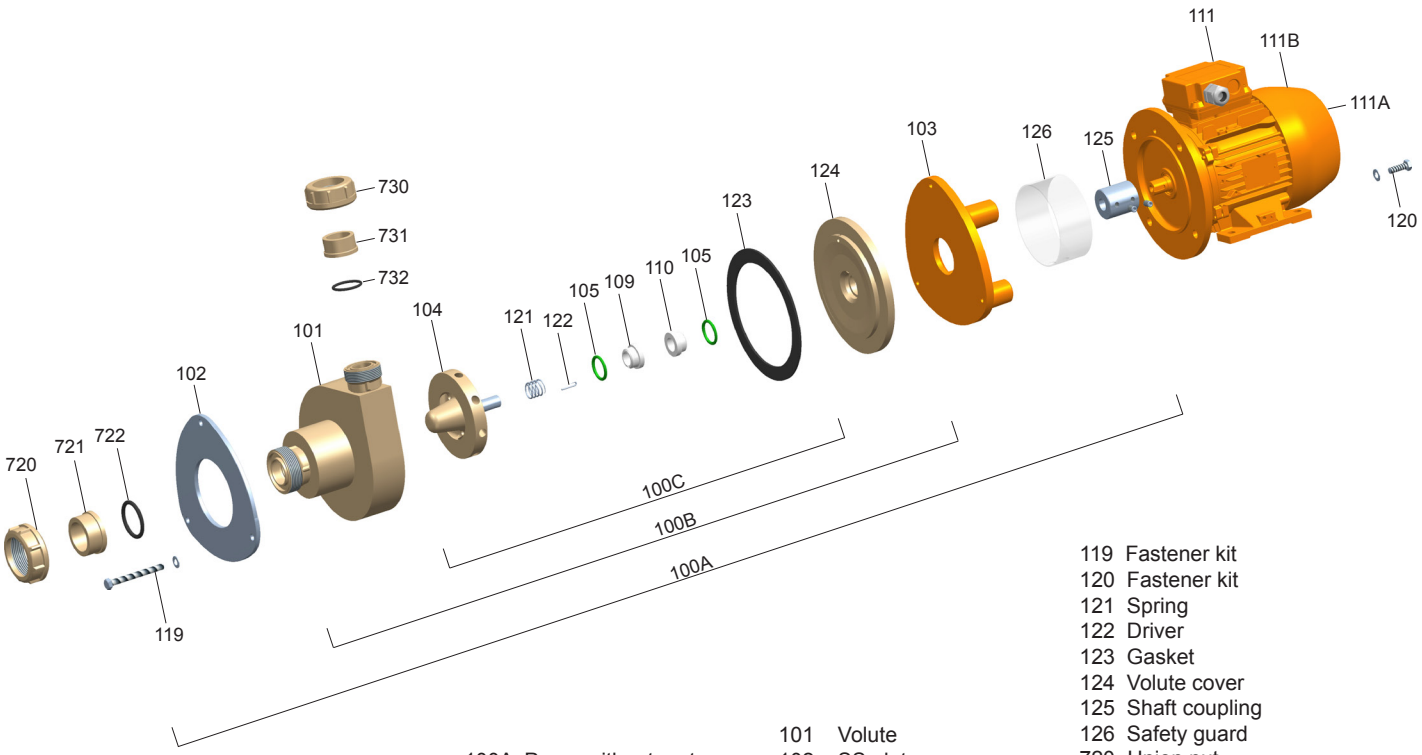
		101	Volute		
		104	Impeller		
		105	O-ring		
100A	Pump without motor	107	Impeller front bearing	720	Union nut
100B	Wet end	108	Impeller rear bearing	721	Union end
100C	Impeller complete	114	Impeller housing	722	O-ring
111	Electric motor	115	Bracket	730	Union nut
111A	Cooling fan	117	Drive magnet	731	Union end
111B	Cooling fan cover	119	Fastener kit	732	O-ring

Series MX160 - MX210 - MX260 - MX350 - MX410 - PP



		101	Volute		
		104	Impeller		
		105	O-ring		
100A	Pump without motor	107	Impeller front bearing	720	Union nut
100B	Wet end	108	Impeller rear bearing	721	Union end
100C	Impeller complete	114	Impeller housing	722	O-ring
111	Electric motor	115	Bracket	730	Union nut
111A	Cooling fan	117	Drive magnet	731	Union end
111B	Cooling fan cover	119	Fastener kit	732	O-ring

Series S55 - S75 - S110 - S150 - S220 - S300 - PP

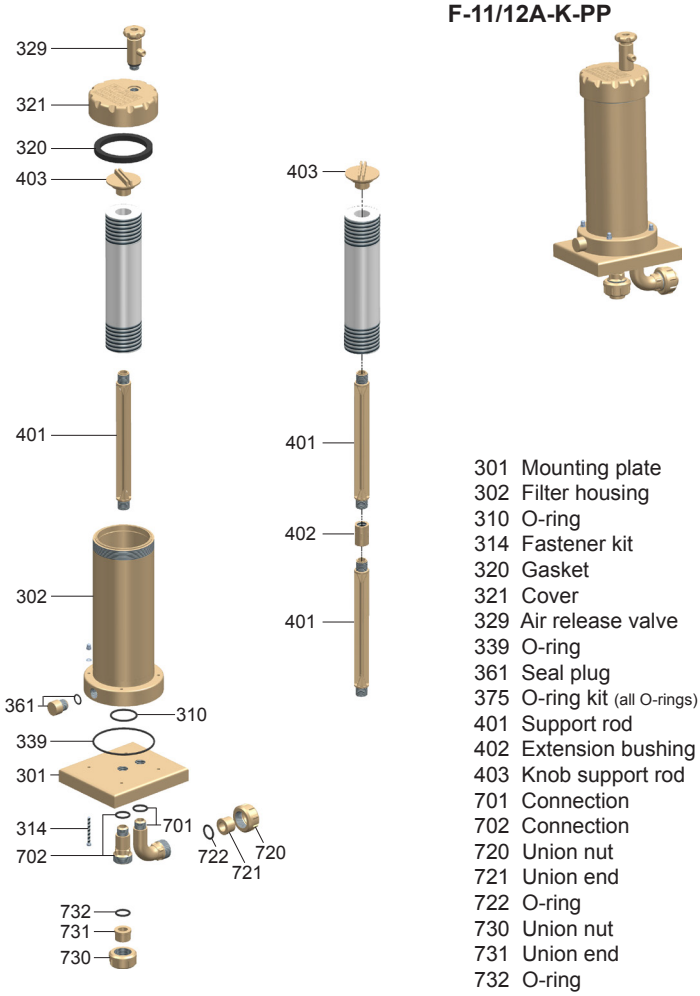


100A	Pump without motor
100B	Wet end
100C	Impeller complete
111	Electric motor
111A	Cooling fan
111B	Cooling fan cover

101	Volute
102	SS plate
103	Bracket
104	Impeller
105	O-ring
109	Rotary seat
110	Stationary seat

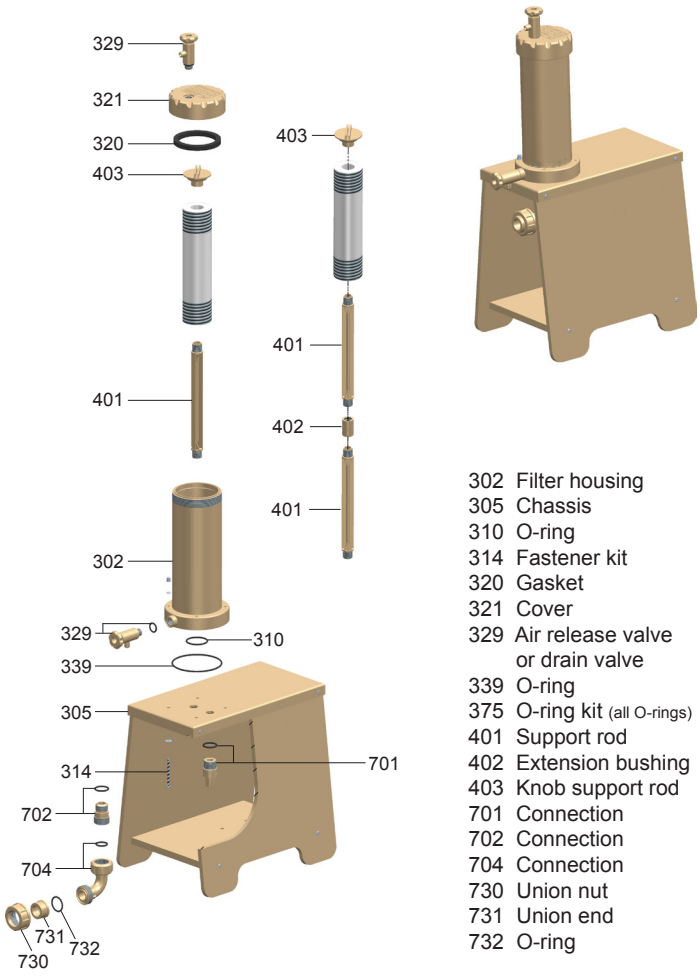
119	Fastener kit
120	Fastener kit
121	Spring
122	Driver
123	Gasket
124	Volute cover
125	Shaft coupling
126	Safety guard
720	Union nut
721	Union end
722	O-ring
730	Union nut
731	Union end
732	O-ring

F-11/12A-K-PP



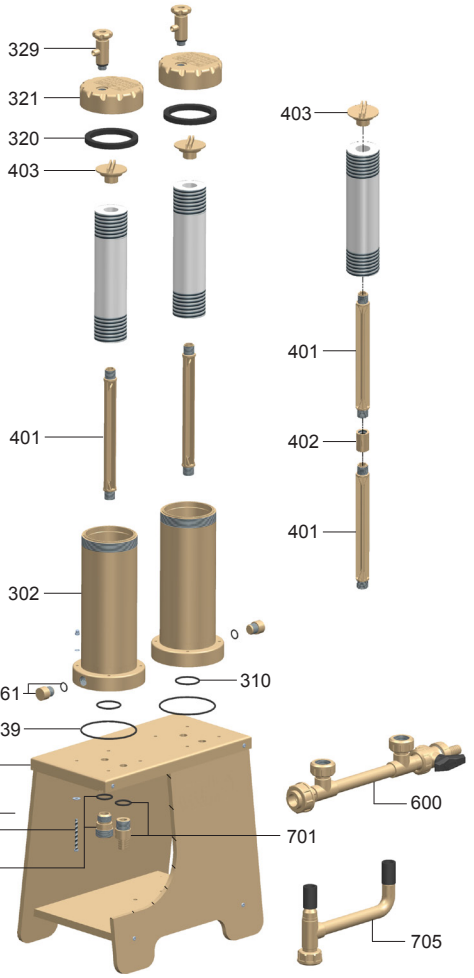
301 Mounting plate
302 Filter housing
310 O-ring
314 Fastener kit
320 Gasket
321 Cover
329 Air release valve
339 O-ring
361 Seal plug
375 O-ring kit (all O-rings)
401 Support rod
402 Extension bushing
403 Knob support rod
701 Connection
702 Connection
720 Union nut
721 Union end
722 O-ring
730 Union nut
731 Union end
732 O-ring

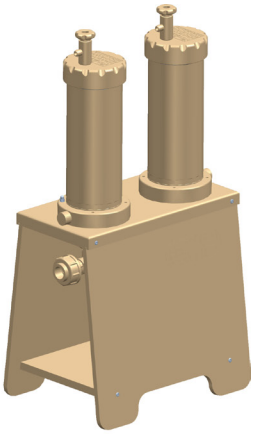
11/12-K-PP



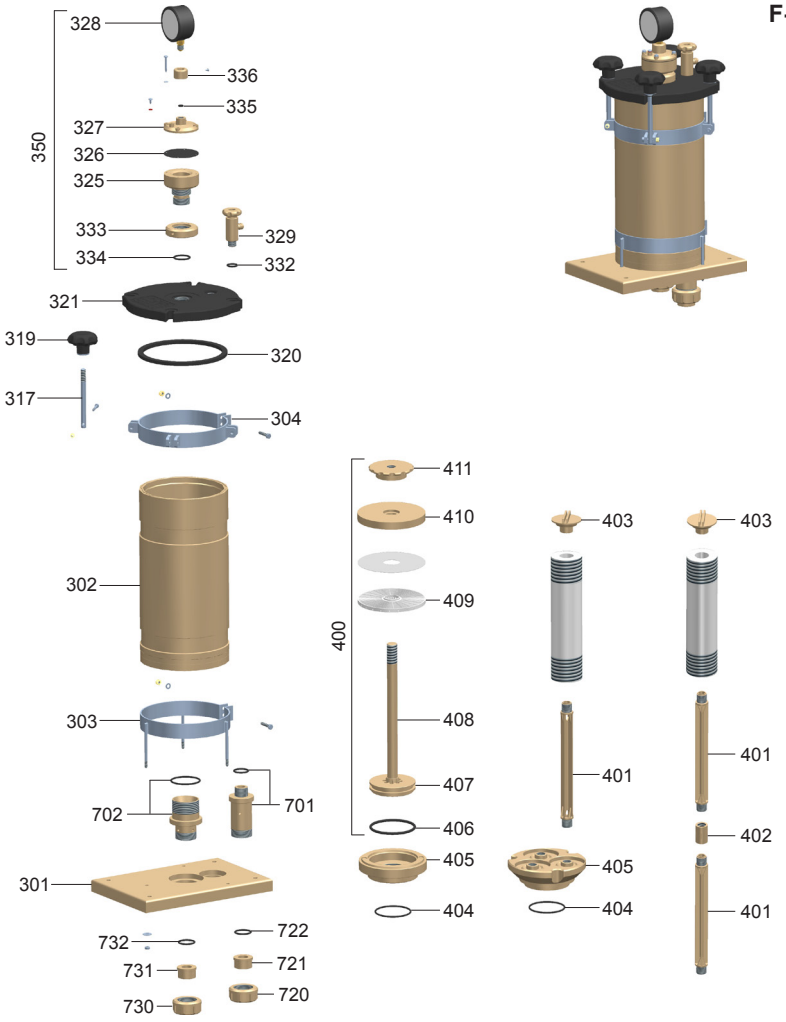
302 Filter housing
305 Chassis
310 O-ring
314 Fastener kit
320 Gasket
321 Cover
329 Air release valve or drain valve
339 O-ring
375 O-ring kit (all O-rings)
401 Support rod
402 Extension bushing
403 Knob support rod
701 Connection
702 Connection
704 Connection
730 Union nut
731 Union end
732 O-ring

21/22-K-PP



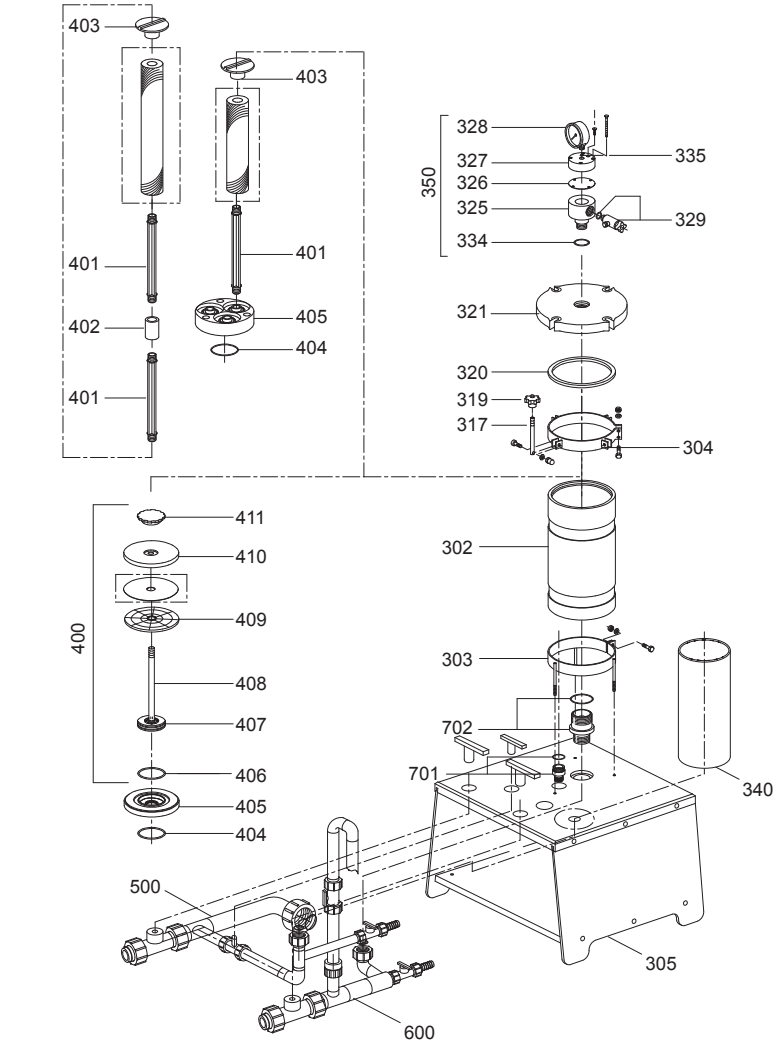


302 Filter housing
305 Chassis
310 O-ring
314 Fastener kit
320 Gasket
321 Cover
329 Air release valve
339 O-ring
361 Seal plug
375 O-ring kit (all O-rings)
401 Support rod
402 Extension bushing
403 Knob support rod
600 Pipe work discharge
701 Connection
702 Connection
705 Pipe work



F-31/32A-K/P-PP

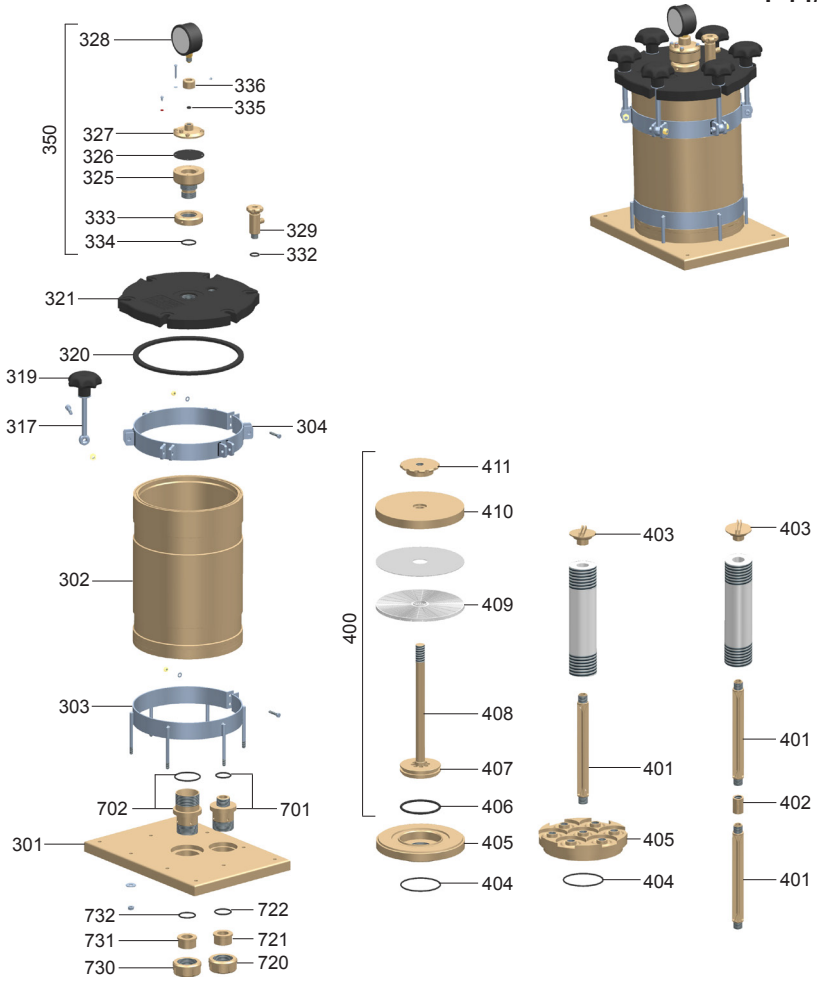
301 Mounting plate
302 Filter housing
303 Bottom ring
304 Top ring
317 Rod
319 Star knob
320 Gasket
321 Cover
325 Gauge housing
326 Membrane
327 Cover gauge housing
328 Pressure gauge
329 Air release valve
332 O-ring
333 Retaining ring gauge
334 O-ring
335 O-ring
336 Retaining ring gauge cover
350 Assembly pressure gauge
375 O-ring kit (all O-rings)
400 Filter element
401 Support rod
402 Extension bushing
403 Knob support rod
404 O-ring
405 Baseplate disc/cartridge
406 O-ring
407 Base disc holder
408 Rod disc holder
409 Disc
410 Top disc holder
411 Nut disc holder
701 Connection
702 Connection
720 Union nut
721 Union end
722 O-ring
730 Union nut
731 Union end
732 O-ring



31/32A-K/P-S-PP

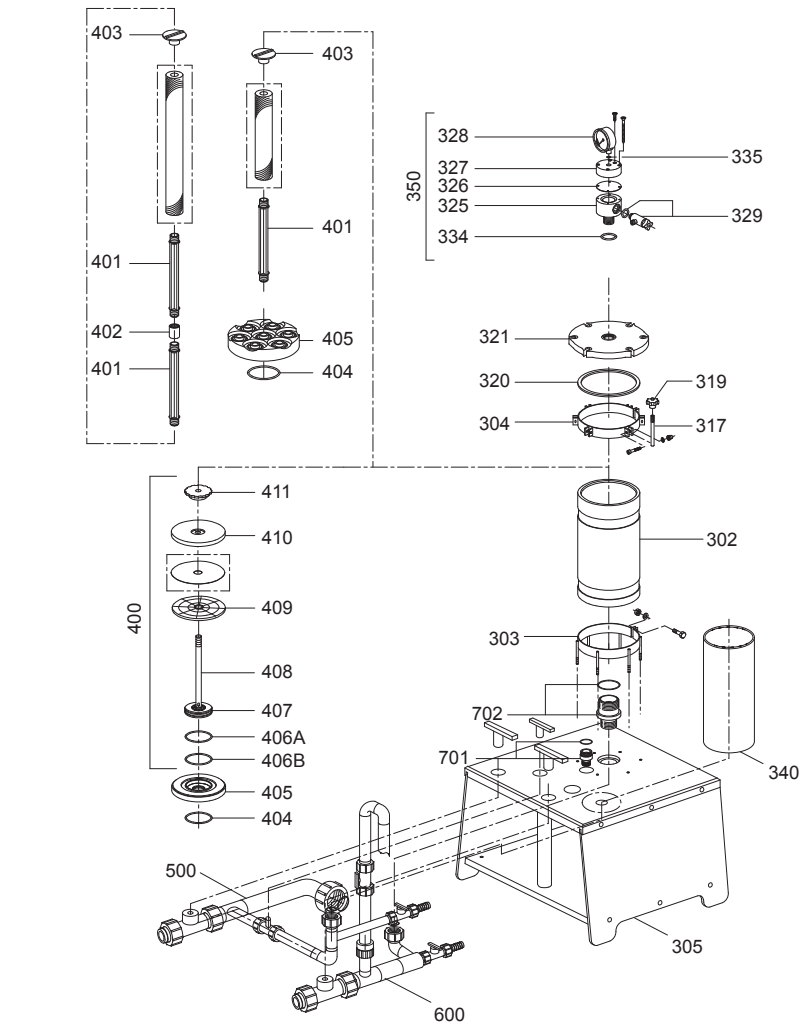
302 Filter housing
303 Bottom ring
304 Top ring
305 Chassis
317 Rod
319 Star knob
320 Gasket
321 Cover
325 Gauge housing
326 Membrane
327 Cover gauge housing
328 Pressure gauge
329 Air release valve
334 O-ring
335 O-ring
340 Slurry tank
350 Assembly pressure gauge
375 O-ring kit (all O-rings)
400 Filter element
401 Support rod
402 Extension bushing
403 Knob support rod
404 O-ring
405 Baseplate disc/cartridge
406 O-ring
407 Base disc holder
408 Rod disc holder
409 Disc
410 Top disc holder
411 Nut disc holder
500 Pipe work suction
600 Pipe work discharge
701 Connection
702 Connection

F-71/72A-K/P-PP

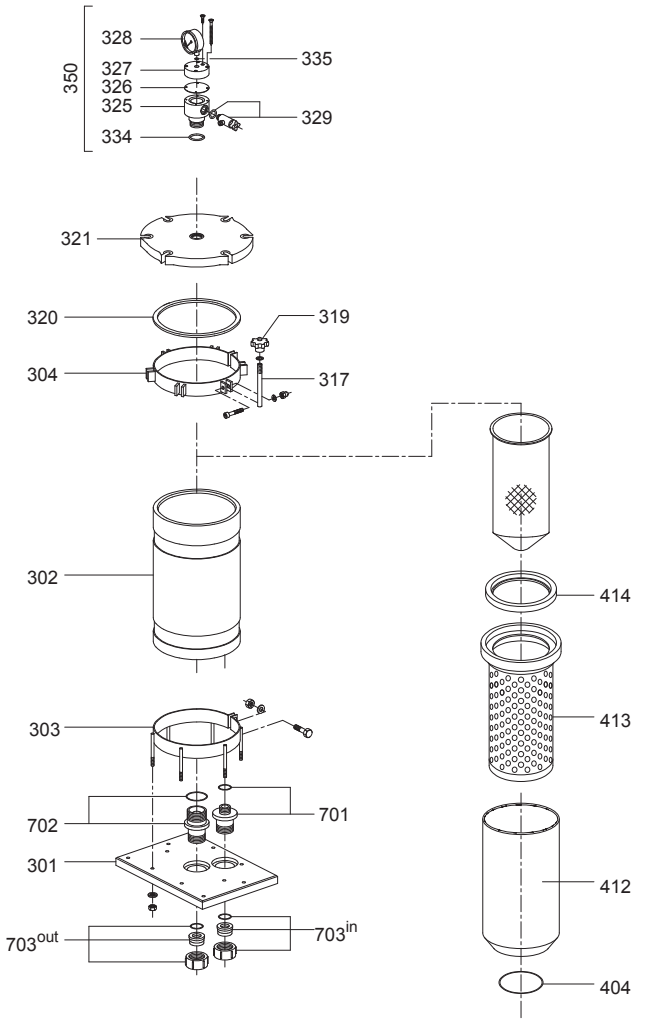


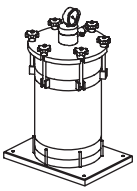
301 Mounting plate
302 Filter housing
303 Bottom ring
304 Top ring
317 Rod
319 Star knob
320 Gasket
321 Cover
325 Gauge housing
326 Membrane
327 Cover gauge housing
328 Pressure gauge
329 Air release valve
332 O-ring
333 Retaining ring gauge
334 O-ring
335 O-ring
336 Retaining ring gauge cover
350 Assembly pressure gauge
375 O-ring kit (all O-rings)
400 Filter element
401 Support rod
402 Extension bushing
403 Knob support rod
404 O-ring
405 Baseplate disc/cartridge
406 O-ring
407 Base disc holder
408 Rod disc holder
409 Disc
410 Top disc holder
411 Nut disc holder
701 Connection
702 Connection
720 Union nut
721 Union end
722 O-ring
730 Union nut
731 Union end
732 O-ring

71/72A-K/P-S-PP



302 Filter housing
303 Bottom ring
304 Top ring
305 Chassis
317 Rod
319 Star knob
320 Gasket
321 Cover
325 Gauge housing
326 Membrane
327 Cover gauge housing
328 Pressure gauge
329 Air release valve
334 O-ring
335 O-ring
340 Slurry tank
350 Assembly pressure gauge
375 O-ring kit (all O-rings)
400 Filter element
401 Support rod
402 Extension bushing
403 Knob support rod
404 O-ring
405 Baseplate disc/cartridge
406A O-ring
406B O-ring
407 Base disc holder
408 Rod disc holder
409 Disc
410 Top disc holder
411 Nut disc holder
500 Pipe work suction
600 Pipe work discharge
701 Connection
702 Connection

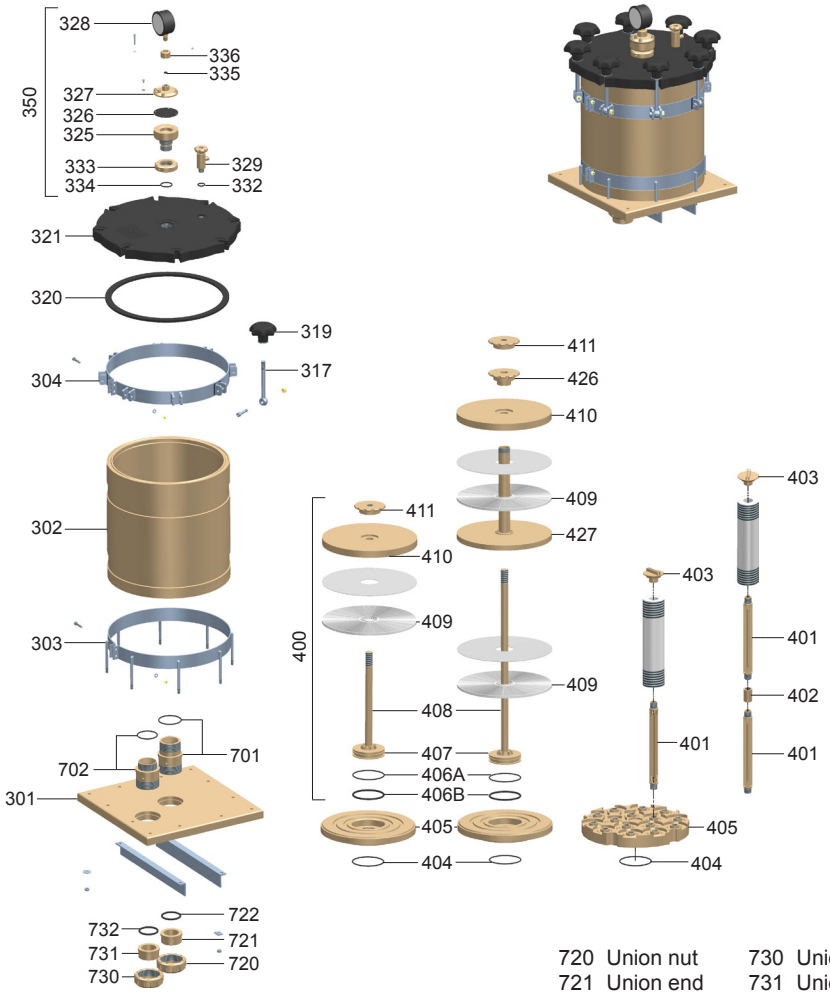




F-71/72A-B-PP

301 Mounting plate
302 Filter housing
303 Bottom ring
304 Top ring
317 Rod
319 Star knob
320 Gasket
321 Cover
325 Gauge housing
326 Membrane
327 Cover gauge housing
328 Pressure gauge
329 Air release valve
334 O-ring
335 O-ring
350 Assembly pressure gauge
375 O-ring kit (all O-rings)
404 O-ring
412 Inner cylinder
413 Basket
414 Sealing
701 Connection
702 Connection
703 Connection

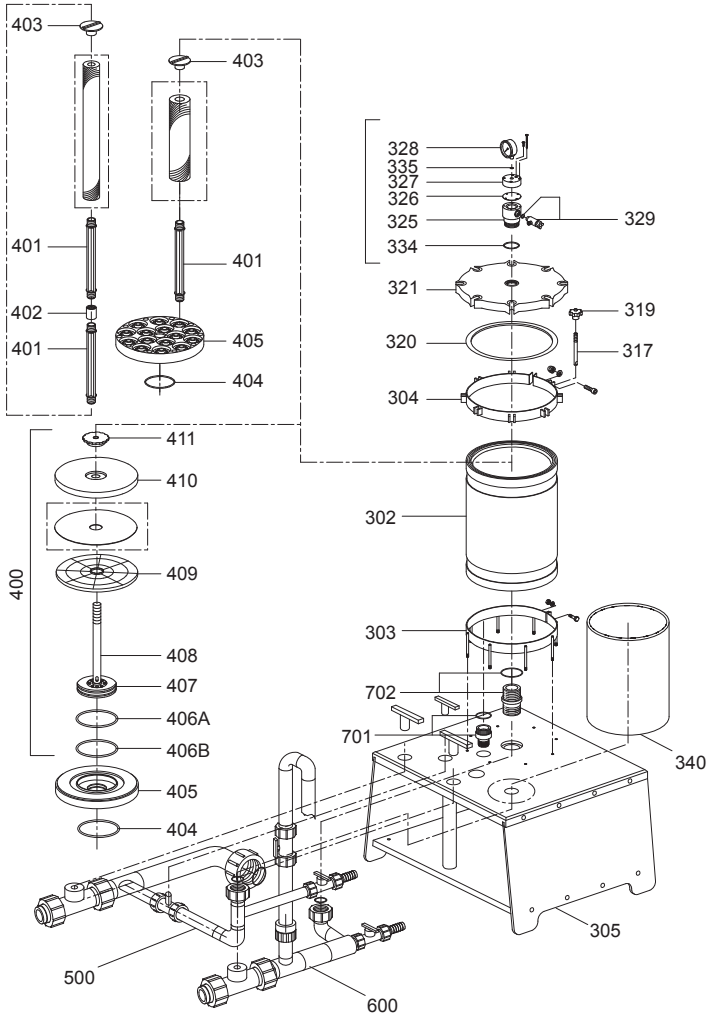
F-151/152A-K/P-PP



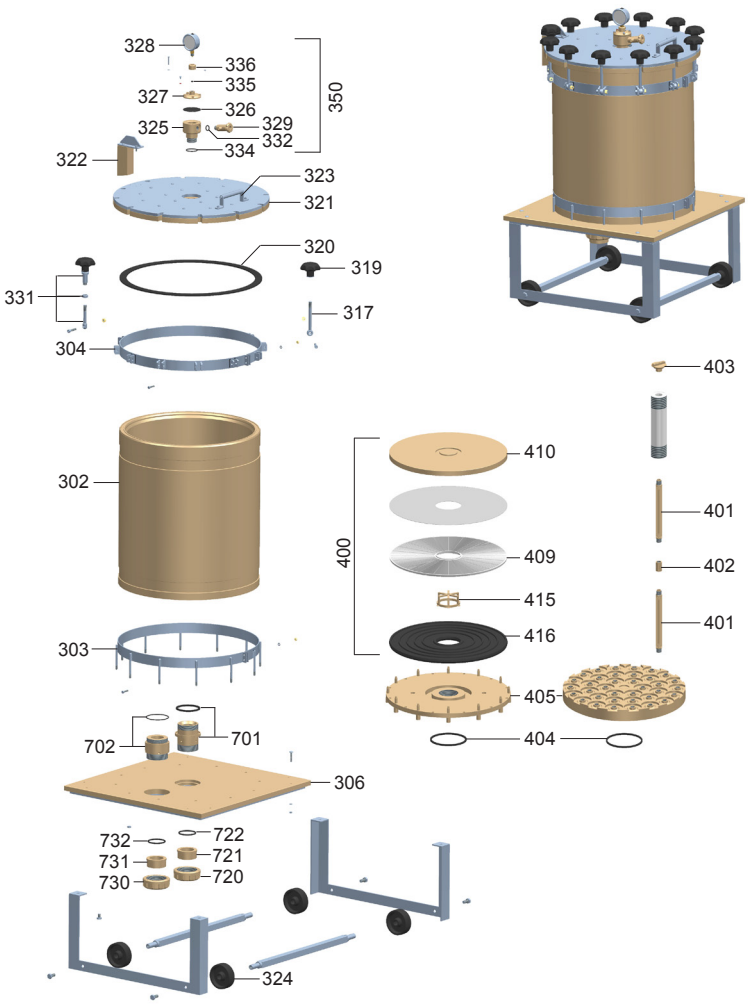
301 Mounting plate
302 Filter housing
303 Bottom ring
304 Top ring
317 Rod
319 Star knob
320 Gasket
321 Cover
325 Gauge housing
326 Membrane
327 Cover gauge housing
328 Pressure gauge
329 Air release valve
332 O-ring
333 Retaining ring gauge
334 O-ring
335 O-ring
336 Retaining ring gauge cover
350 Assembly pressure gauge
375 O-ring kit (all O-rings)
400 Filter element
401 Support rod
402 Extension bushing
403 Knob support rod
404 O-ring
405 Baseplate disc/cartridge
406A O-ring
406B O-ring
407 Base disc holder
408 Rod disc holder
409 Disc
410 Top disc holder
411 Nut disc holder
426 Nut disc assembly
427 Baseplate disc assembly
701 Connection
702 Connection

720 Union nut
721 Union end
722 O-ring
730 Union nut
731 Union end
732 O-ring

151/152A-K/P-S-PP



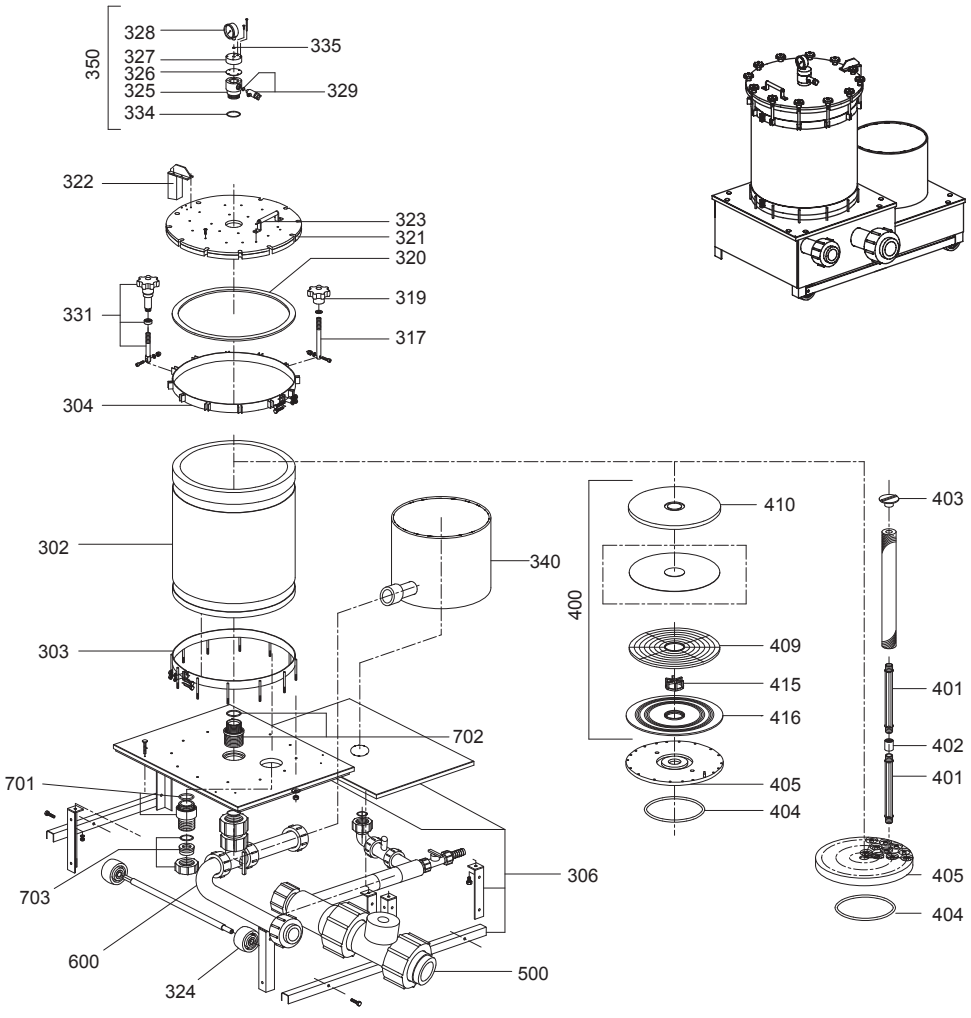
302 Filter housing
303 Bottom ring
304 Top ring
305 Chassis
317 Rod
319 Star knob
320 Gasket
321 Cover
325 Gauge housing
326 Membrane
327 Cover gauge housing
328 Pressure gauge
329 Air release valve
334 O-ring
335 O-ring
340 Slurry tank
350 Assembly pressure gauge
375 O-ring kit (all O-rings)
400 Filter element
401 Support rod
402 Extension bushing
403 Knob support rod
404 O-ring
405 Baseplate disc/cartridge
406A O-ring
406B O-ring
407 Base disc holder
408 Rod disc holder
409 Disc
410 Top disc holder
411 Nut disc holder
500 Pipe work suction
600 Pipe work discharge
701 Connection
702 Connection



720 Union nut
721 Union end
722 O-ring
730 Union nut
731 Union end
732 O-ring

F-362A-K/P-PP

302 Filter housing
303 Bottom ring
304 Top ring
306 Chassis
317 Rod
319 Star knob
320 Gasket
321 Cover
322 Tilt stop
323 Handle
324 Wheel set
325 Gauge housing
326 Membrane
327 Cover gauge housing
328 Pressure gauge
329 Air release valve
331 Tilting set
332 O-ring
334 O-ring
335 O-ring
336 Retaining ring gauge cover
350 Assembly pressure gauge
375 O-ring kit (all O-rings)
400 Filter element
401 Support rod
402 Extension bushing
403 Knob support rod
404 O-ring
405 Baseplate disc/cartridge
409 Disc
410 Top disc holder
415 Crown
416 Sealing plate
701 Connection
702 Connection



362A-K/P-S-PP

302 Filter housing
303 Bottom ring
304 Top ring
306 Chassis
317 Rod
319 Star knob
320 Gasket
321 Cover
322 Tilt stop
323 Handle
324 Wheel set
325 Gauge housing
326 Membrane
327 Cover gauge housing
328 Pressure gauge
329 Air release valve
331 Tilting set
334 O-ring
335 O-ring
340 Slurry tank
350 Assembly pressure gauge
375 O-ring kit (all O-rings)
400 Filter element
401 Support rod
402 Extension bushing
403 Knob support rod
404 O-ring
405 Baseplate disc/cartridge
409 Disc
410 Top disc holder
415 Crown
416 Sealing plate
500 Pipework suction
600 Pipework discharge
701 Connection
702 Connection
703 Connection