OPERATING INSTRUCTIONS

- **MODELS:**

· **NS 18 – P / K**

· **NS 50 – P / K**

· **NS 160 – P / K**

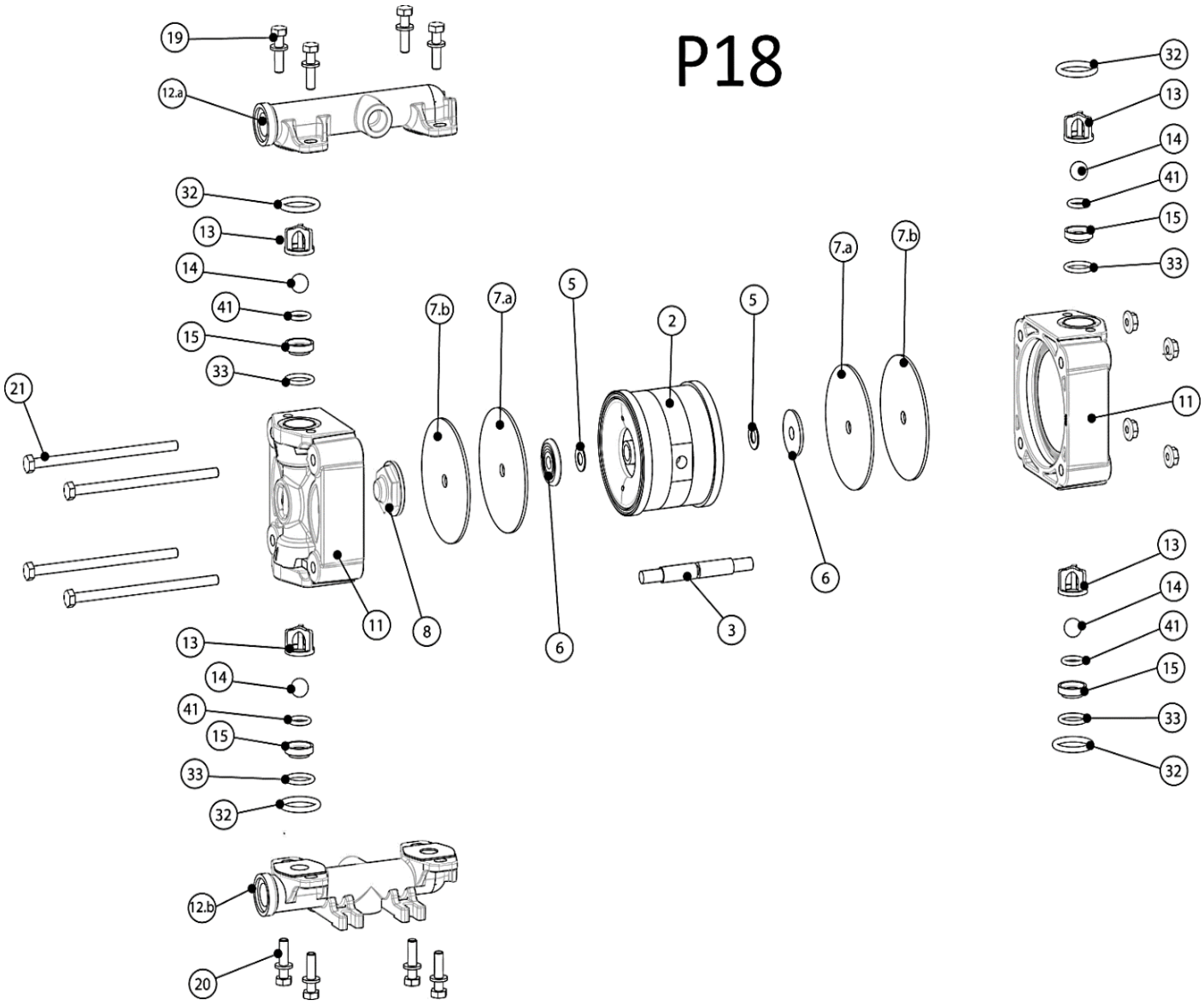
MADE IN HOLLAND - EU

NP NAUTIC PUMP

FDA compliant

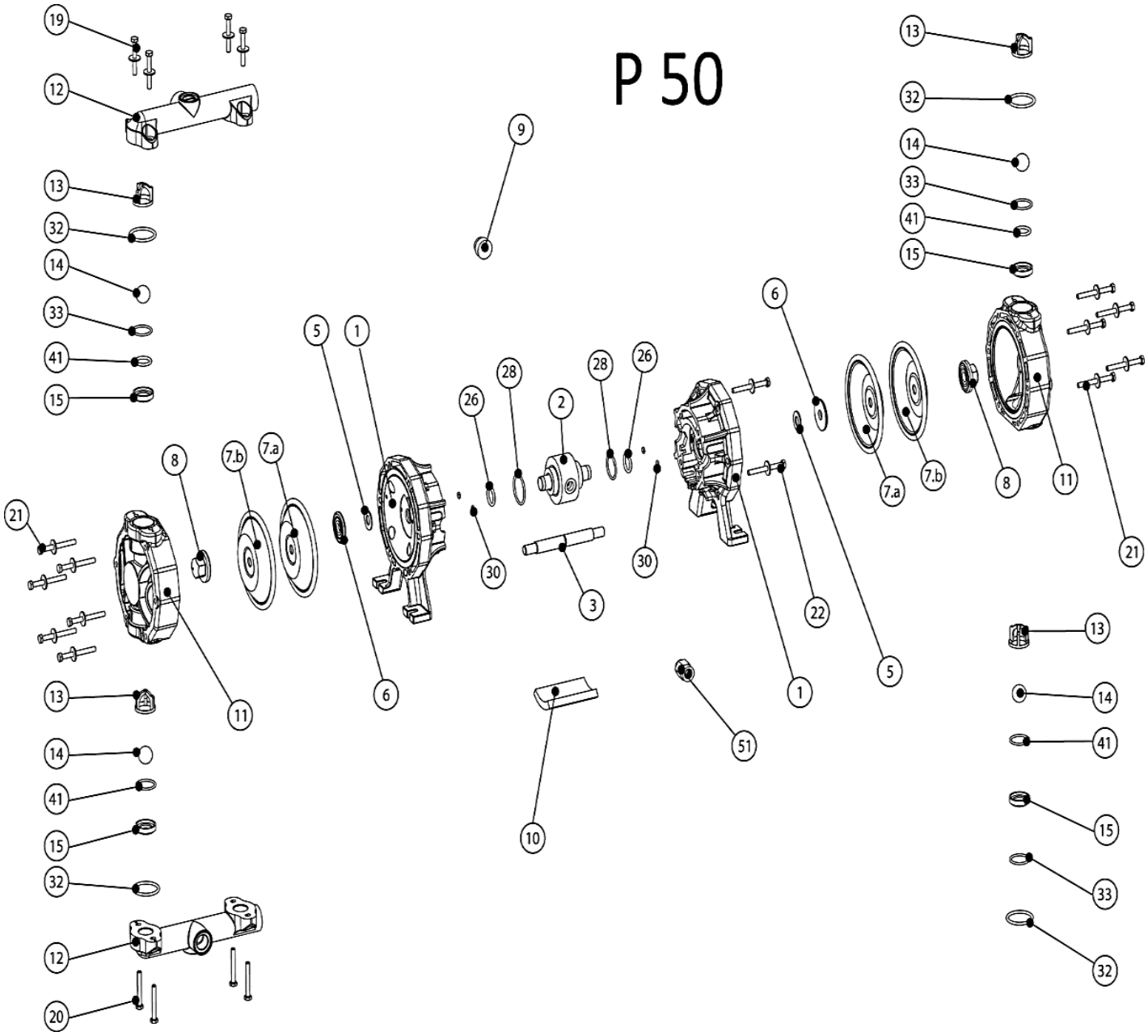
INDEX

P18



Code Reference	Position	Description	Quantity/ pump
677	677	Pneumatic Exchanger	1
210	210	Main Shaft	1
950	5	Belleville washer	2
488	6	Cap (air side)	2
418.1	7.a	Back-up Diaphragm / Hytrel	2
418.2	7.b	PTFE diaphragm	2
260	8	Cap (fluid side)	2
102	11	Pump Casing	2
705.1	12.a	Discharge Manifold	1
705.2	12.b	Suction Feet manifold	1
751	13	Ball runner cage	4
753	14	Valve Ball	4
752	15	Valve Ball seat	4
910.1	19	Manifold screws	1
910.3	20	Manifold screws	1
910.5	21	Body screws	1
412.8	32	O-ring	4
412.12	41	O-ring	4

P 50


19
12
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33
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15
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7.b
7.a
21
30
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30
22
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7.a
7.b
8
11
21
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7.b
7.a
11
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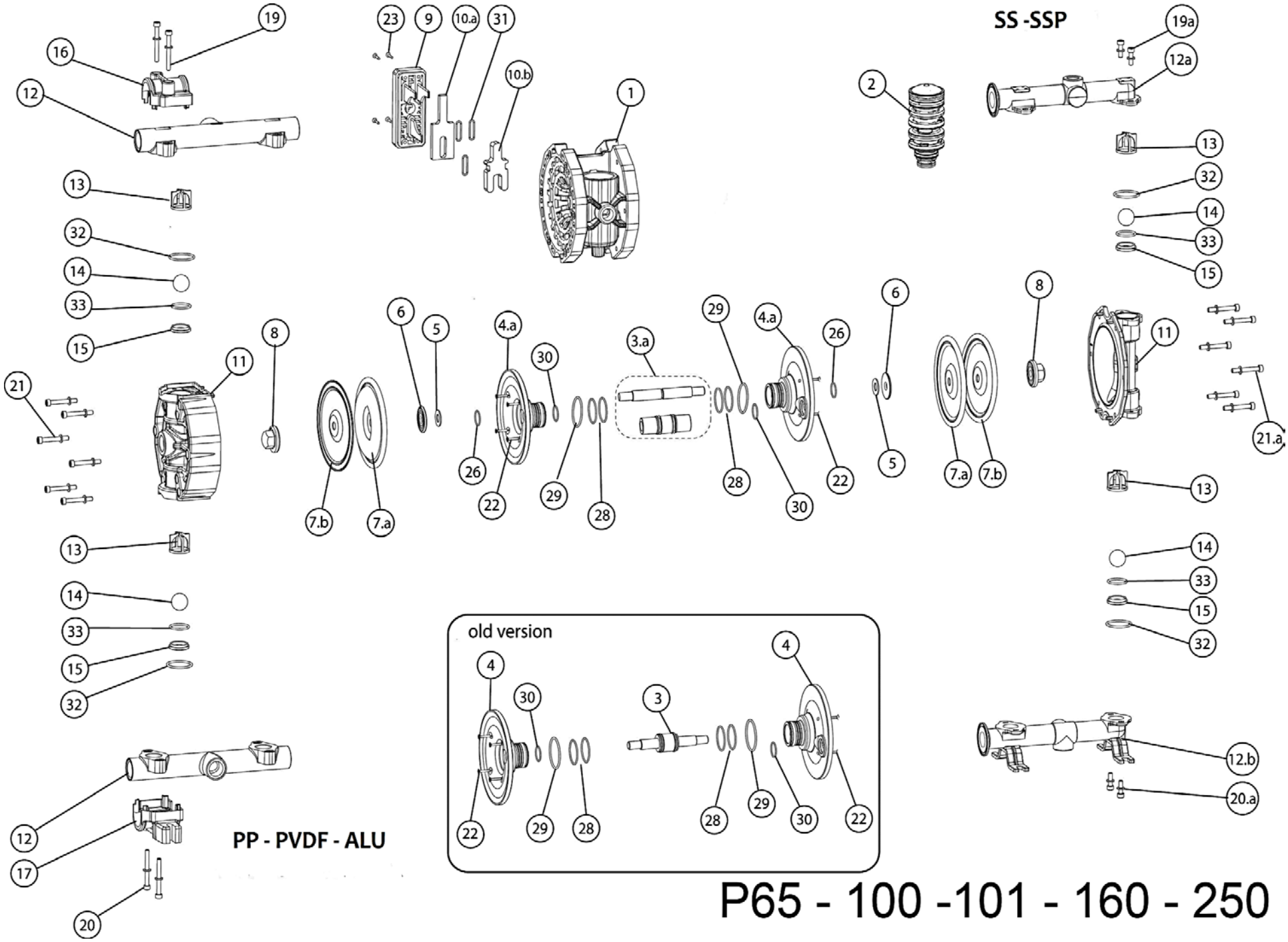
51

Code Reference	Position	Description	Quantity/ pump
491	1	Central Half body	2
677	2	Pneumatic Exchanger	1
210	3	Main Shaft	1
950	5	Belleville washer	2
488	6	Cap (air side)	2
418.1	7.a	Back-up Diaphragm	2
418.2	7.b	PTFE diaphragm	2
260	8	Cap (fluid side)	2
160	9	Exhaust cover	1
675.1	10	Silencer	1
102	11	Pump Casing	2
705	12	Manifold	2
751	13	Ball runner cage	4
753	14	Ball	4
752	15	Ball seat	4
910.1	19	Manifold screws	1
910.3	20	Manifold screws	1
910.5	21	Body screws	1
910.7	22	Half Body screws	1
412.4	28	O-ring	2
412.6	30	O-ring	4
412.8	32	O-ring	4
412.9	33	O-ring	4
412.12	41	O-ring	4
	51	Air connection	1


SS -SSP
PP - PVDF - ALU
old version
P65 - 100 -101 - 160 - 250

Code Reference	Position	Description	Quantity/ pump
491	1	Central body / Corpo centrale	1
677	2	Pneumatic Exchanger	1
210.1	3	Shaft / albero di comando	1
210.2	3.a	Shaft	1
134.1	4	intermediate plate	2
134.2	4.a	intermediate plate	2
950	5	Belleville washer	2
488	6	Cap (air side)	2
418.1	7.a	Back - up Diaphragm	2
418.2	7.b	PTFE diaphragm	2
260	8	Cap (fluid side)	2
160	9	Exhaust cover	1
675.1	10.a	External Silencer /Muffler	1
675.2	10.b	Internal Silencer / Muffler	1
102	11	Pump Casing	2
705	12	Manifold	2
705.1	12.A	Manifold (SS)	1
705.2	12.B	Manifold (SS)	1
751	13	Ball runner cage	4
753	14	Ball	4
752	15	Ball seat	4
193	16	Manifold cover	2
182	17	Foot	2
910.1	19	Delivery manifold screws	1
910.2	19.A	Delivery manifold screws	1
910.3	20	Suction manifold screws	1
910.6	21.A	Body screws	2
910.7	22	Intermediate plate screws	2
910.8	23	Silencer screws	1
412.4	28	O-ring	2
412.5	29	O-ring (solo per modelli 160 - 250)	2
412.6	30	O-ring	2
412.7	31	O-ring	3
412.9	33	O-ring	4

GENERAL NOTES

"NAUTIC" series pumps are air-operated, double-diaphragm positive-displacement pumps, designed and manufactured for pumping fluids that are chemically compatible with the constructive materials of the pump. The characteristics of the fluid (pressure, temperature, chemical reactivity, specific weight, viscosity, vapor pressure) and of the environment must be compatible with the pump characteristics and are defined in the ordering phase. The pump performances (flow rate, head, and minimum pressure) are decided in the ordering phase and indicated on the nameplate.

"NAUTIC" series pumps are self-priming; at the start-up the pipes can be empty.
The declared dry negative suction is referred to intake of water at a temperature of 20°C/ 68°F. The priming time and the diaphragm's life depend on.

- the suction circuit (total length and diameter)
- specific weight of the pumped fluid
- viscosity of the pumped fluid
- negative suction: max 5.000 cps (at 18°C / 64,4°F)
- below head suction: max 50.000 cps (at 18°C / 64,4°F) "PHOENIX" series pumps may be used dry

"NAUTIC" series pumps cannot be used to generate a vacuum
Make sure that the physical-chemical characteristics of the fluid have been correctly evaluated.
The maximum temperature referred to water in continuous operation depends on the version of the materials (indicated on the nameplate) and on the environment in which the pump will be installed:

VERSION	MAX TEMP. ATEX ZONE 2	MAX TEMP. ATEX ZONE 1
PP / PC	60°C / 140°F	60°C / 140°F
PVDF+CF	95°C / 203°F	80°C / 176°F
ALU	95°C / 203°F	80°C / 176°F
SS	95°C / 203°F	80°C / 176°F
POMc	95°C / 203°F	80°C / 176°F

materials

VERSION	**MAX ΔT (°C / °F)**
PP / PC	0÷40°C / 14÷104°F
PVDF+CF	0÷40°C / 14÷104°F
ALU	0÷40°C / 14÷104°F
SS	0÷40°C / 14÷104°F
POMc	0÷40°C / 14÷104°F

(specified on the identification plate)

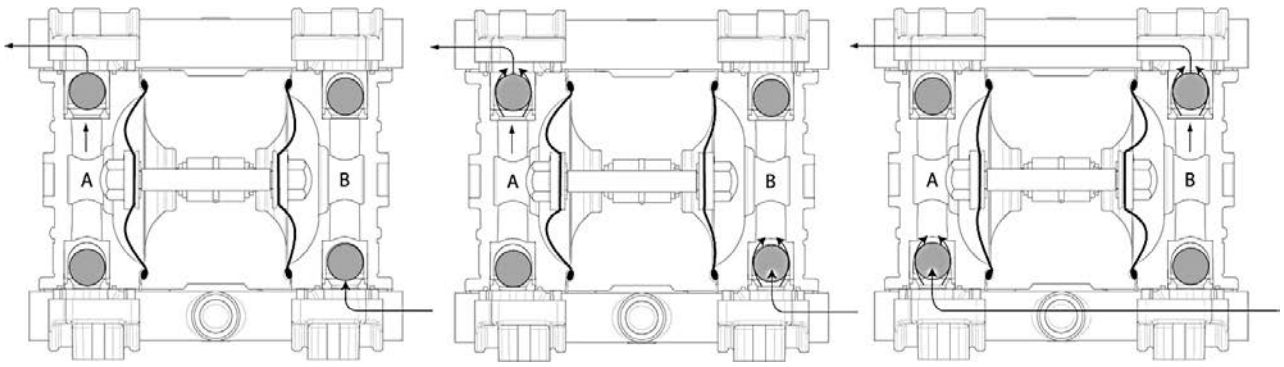
The pump may be operated at a maximum pressure equal to 1.5 times the head value with closed delivery.
The value of the vapor pressure of the pumped fluid must be greater (of at least 3 mwc - meters of water column) than the difference between the total absolute head value (pressure on suction level subtracted of the suction height)

The pumped fluid may contain particles suspended in different concentrations in accordance with the type of valve assembled:

MODEL	P10/20/30	P18	P50		
MAX DIM. mm.	2	2,5	3		

OPERATING PRINCIPLE

The pneumatic distribution system sends compressed air behind one of the two diaphragms (A), which pushes the fluid towards the delivery circuit. Simultaneously, the opposite diaphragm (B) is in the intake phase since it is dragged by the shaft that connects it to the other diaphragm (A) under pressure; air present behind it is discharged into the environment through the flow rate regulator present on the pump, while a pressure drop is created in the fluid chamber which sucks the fluid from the suction circuit. When the diaphragm (A), under pressure, reaches the stroke limit, the distributor switches the two inputs in discharge. When the pump reaches its original starting point, each diaphragm has carried out one air discharge stroke and one fluid delivery stroke. This sequence of movements makes up a complete pumping cycle.

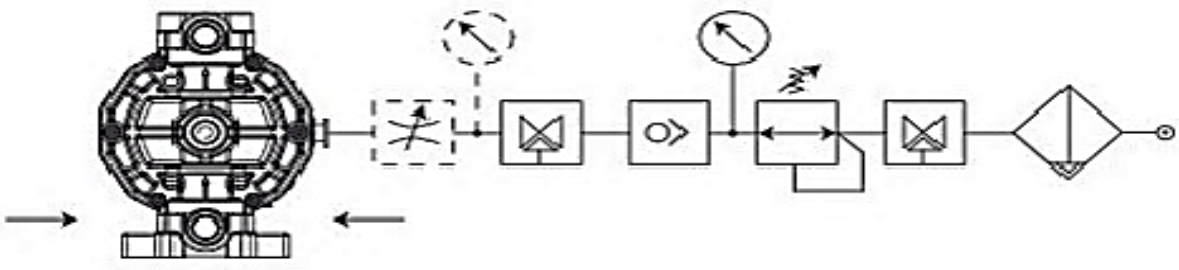


PNEUMATIC CONNECTION

WARNING: the pneumatic supply of "NAUTIC" series pumps must be carried out with oil-free, filtered, dry and unlubricated air Avoid pressure drops by using pipes and adjusting and controlling elements having characteristics suitable for the pump In case of installation in atex zone, the compressor must suck air from outside the area classified as atex or use inert gas.

Minimum pressure supply 2 bar
Maximum pressure supply 7 bar

1 – pressure regulator with gauge
2 - shut-off valve
3 – way valve
4 – flow regulator



INSTALLATION AND USE INSTRUCTIONS

TRANSPORT

- cover the hydraulic connections
- lift the hydraulic plastic parts without mechanical stress
- for transport on irregular roads, cushion the bumps with suitable support plane
- blows and impacts may damage parts that are important for the machine operation and safety

STORAGE

- In case you need to get away for a period of time the pumps before installation, store in original boxes.

The boxes should be stored off the ground, in a closed, clean and dry.

- in the event that the packaging has not received any is intact, it will be necessary to free the pump from it.

Checking the integrity and restore a new packaging

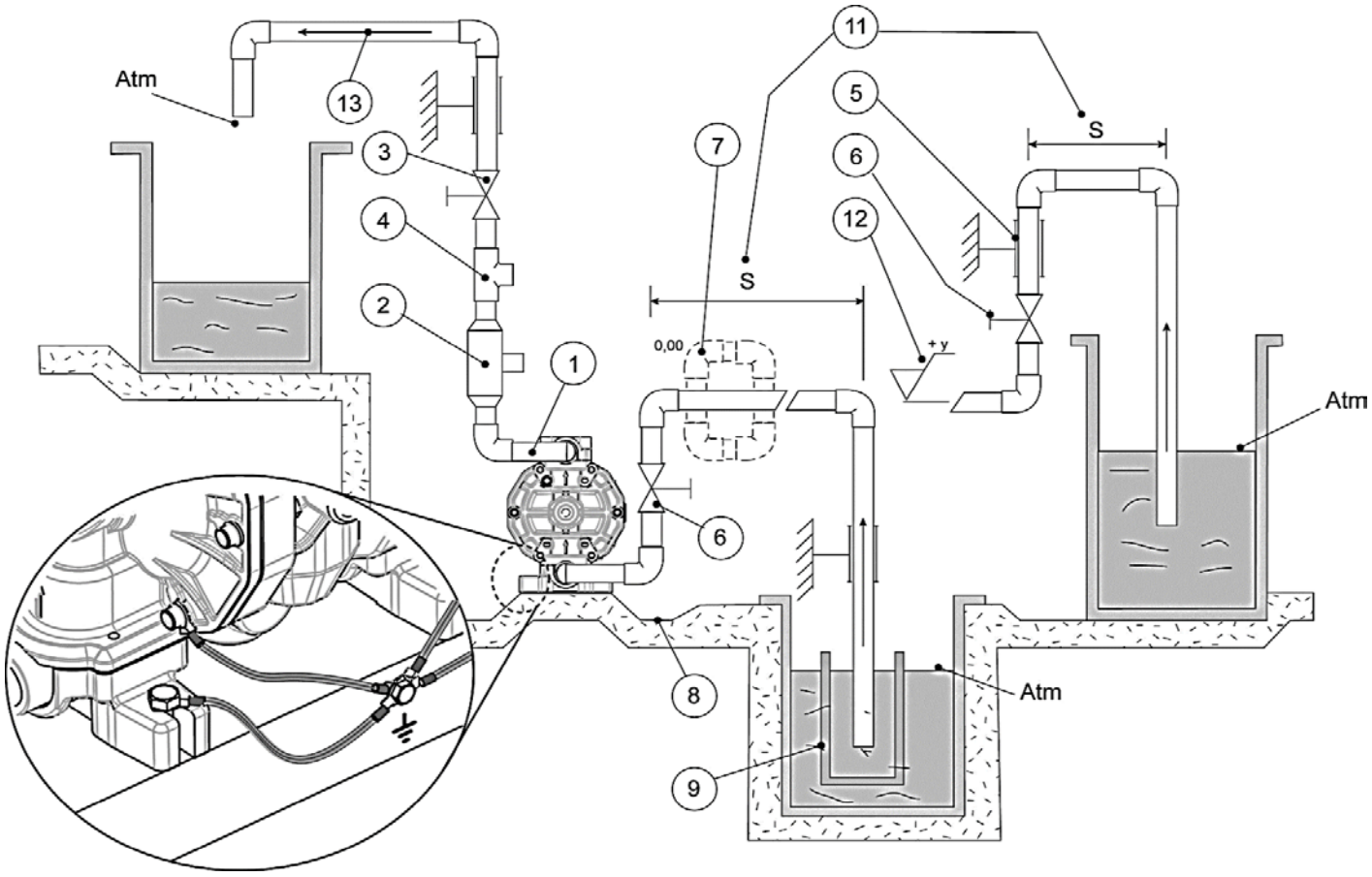
- The storage place should be closed environment with a temperature not lower than -5 ° C, not more than 40 ° C

and with a moisture content not exceeding the value of 80%; any packaging must not be subjected to shocks, vibrations and loads above you.

INSTALLATION

- it is essential for the pump self-priming operation that the hydraulic system is leak-proof
- clean the system before connecting the pump
- the pump must not contain foreign bodies and all the seals on the hydraulic connections must be removed
- check the correct tightness of all the screws on the pump
- the pump positioning is horizontal, the fluid delivery manifold must always be positioned in the upper part (see arrows on the pump casing)
- fastening may be on the floor or on the ceiling
- position the pump the closest possible to the point of collection

Use the plant solutions indicated in the following diagram:



1. YES: use flexible pipes reinforced with rigid spiral to connect the hydraulic circuit of the pump. Rigid piping may cause strong vibrations and manifolds breaking. Do not use pipes with nominal diameter smaller than the diameter of the pump connections. For negative installations and/or viscous fluids use pipes with greater diameter related to the nominal diameter of the pump.
2. YES: pulse damper
3. YES: gate valve for delivery adjustment
4. YES: intake for gauge or protection pressure switch
5. YES: pipe anchoring
6. YES: shut-off valve
7. NO: air pockets; the circuit must be linear and short
8. YES: discharge duct around the base
9. YES: wide and rigid filtering separator in case of open tanks
10. YES: wide and rigid filtering separator in case of open tanks
11. Make it as short as possible the length of the horizontal S no vent for the air
12. Slope of the pipe to the pump
13. In the flow velocity of the fluid max. 3.5 m / s

- ensure drainage of fluids which may come out of the pump
- fix the pump using all the available locking holes, the support points must be levelled
- arrange for enough room around the pump for the movements of an operator
- arrange for free space above the pump for lifting it
- inform about the presence of aggressive fluid with suitable colored labels in accordance with the related standard
- do not install the pump (built with thermoplastic material) near heat sources
- do not install the pump in places with risk of fall of solids or fluids
- do not install the pump close to fixed workplaces or visited areas
- install additional protection shield, for the pump or for the persons as appropriate. If the diaphragm breaks the fluid may enter into the pneumatic circuit and come out from the pump discharge port
- install a spare equivalent pump connected in parallel
- the pump must be always electrically earthed
- if the pump is made from conductive materials and is suitable for flammable products, each pump casing must be equipped with a suitable ear thing cable: DANGER OF EXPLOSION AND/OR FIRE
- **WARNING** The pumps must always be grounded irrespective of any organ to which it is connected. Lack of grounding or incorrect grounding will cancel the requirements for safety and protection against the risk of explosion

START UP

- check the correct execution of what indicated in the INSTALLATION paragraph
- check that the intake and delivery pipes of the hydraulic circuit are correctly connected
- open the intake and delivery valves of the pump hydraulic circuit
- open the 3-way valve on the air circuit
- set the operation point requested for the pump: properly adjust the air pressure and delivery that supplies the pump. With pressure values under 2 bar the pump may stall, with pressure values above 7 bar it is possible that breakdowns and/or yields may occur with consequent spillage of the pumped fluid
- for pumps with split manifold the two pumped fluids must have the same viscosity value, very different viscosity values may lead to stall problems and/or diaphragms breaking
- do not operate at the limits of the operation curves: the maximum head or maximum delivery (total absence of leaks and intake height in the delivery circuit)
- check that there are no anomalous vibrations or noise due to the too elastic support structure, unsuitable fastening or cavitation
- **after 2 hours of operation stop the pump correctly and check the tightening of all the bolts on the pump**

USE

- do not operate valves or shunts during the pump operation
- Risk of harmful water hammers in case of incorrect or sudden operations (valves must be operated only by trained personnel)
- empty and wash accurately inside the pump in case different fluids must be pumped
- insulate or empty the pump if the fluid crystallization temperature is equal to or below the ambient temperature
- stop the pump if the fluid temperature exceeds the maximum allowed temperature indicated in the GENERAL NOTES; if the exceeding temperature is about 20% it is necessary to inspect the status of the internal parts
- stop the pump and close the valves in case of leaks
- Wash with water only if chemical compatibility allows it ; alternatively use the suitable solvent that does not generate hazardous exothermic reactions
- consult the fluid supplier to decide the most suitable fire-prevention method
- Empty the pump in case of long periods of disuse (particularly with fluids which are particularly tending to crystallize)
- check that there is no gas in the delivering fluid, if there is stop the pump

STOP

To stop the pump, operate exclusively on the air supply closing the 3-way valve, discharging in this way residual pressure from the pneumatic system of the pump.

WARNING never stop the pump by totally closing the suction and/or delivery valves of the hydraulic circuit

WARNING is prohibited to stop the pump by means of the complete closure of the valves in the suction and / or discharge of the hydraulic circuit

MAINTENANCE

- all the operation must be carried out by qualified personnel
- do not carry out maintenance and/or repairs with the air circuit under pressure
- carry out periodic inspections (2 ÷ 30 days in accordance with the fluid pumped) to check the filtering elements cleaning
- carry out periodic inspections (3 ÷ 5 months in accordance with the fluid pumped and with the environment conditions) to ensure the correct operation of the system start/stop units
- the presence of fluid under the pump casing may indicate failures to the pump
- damaged parts must be replaced with complete original parts and not with repaired parts
- the replacement of damaged parts must be carried out in a clean and dry place

RECOMMENDATIONS

WARNING: before performing any maintenance or repair work on the pump, disconnect the pump from the air supply line. Disconnect the hydraulic connections and discharge the product that is being pumped

- all the operation must be carried out by qualified personnel
- use gloves, goggles and acid-resistant clothing when disconnecting from the system and washing the pump
- wash the pump before carrying out maintenance operations
- do not disperse the washing waste into the environment

DISASSEMBLY

- Bolts are the type with right thread
- Clean all the pump external surfaces using a damp cloth Ball seats removal (for all models)
- Remove the delivery and intake manifolds removing the tightening bolts
- Pull off the seats, the balls and the related cages
- Check the condition of the gasket

Diaphragms removal

- Remove the delivery and intake manifolds removing the tightening bolts
- Remove the deposits from the internal surfaces
- Remove the two pump casings
- Remove the plates that lock the diaphragms
- Remove the diaphragms and the related backing plates
- If it would be necessary to disassemble the shaft, remove one of the two diaphragms on air side and then pull off the shaft

Pneumatic distributor removal

NAUTIC 18-50

- remove the manifolds, pump casing and diaphragms
- remove the bolts (pos.22) and divide the semi-central casing

NAUTIC 160

- Remove the Seeger ring of the transverse sleeve of the central casing

· Overturn the pump and with the aid of a Ø6 mm punch and a press, pull off the distributor (this operation may be carried out with pump casings assembled, check that the tightening bolts of the pump casings located on the upper area of the distributor to not obstacle the distributor removal)

· **WARNING** the pneumatic distributor shall not be opened to prevent an incorrect reassembling that may cause the pump malfunctioning

INSPECTION

Check the absence of:

• excessive abrasion of the thermoplastic parts
• clots and/or agglomerates due to the pumped fluid
• deformations and/or surface lesions of the diaphragms
• deformations and/or breakages on the valve seats

Replace the parts: broken, cracked, deformed.

Reopen all the clogged ducts and eliminate any chemical agglomerates.

Clean all the surfaces before reassembly, particularly the OR gaskets seats (risk of leaks for dripping).

CLEANING AND REPLACING THE DIAPHRAGMS

- control and internal cleaning every 500.000 cycles
- diaphragm check every 5.000.000 cycles
- diaphragm replacement every 20.000.000 cycles

<u>To replace worn parts, use only original spare parts.</u>

However five general elements are important:

A- all the operations must be carried out by skilled personnel or monitored by qualified personal as appropriate

B- implement personal protection works (when the pump is installed in places involving more than occasional visits) against splashes of fluorescent fluid for accidental breakage and conveying works(always) of possible fluid leakages towards collection tanks

C- wear acid-resistant clothing and protection whenever operating on the pump

D- make sure that the Intake and delivery valves are correctly closed during the disassembly

E- make sure that there is no supply to the pneumatic circuit during the disassembly

It should be noted that it is very important to realize systems with pipes well arranged, identifiable, suitably equipped with shut-off valves, with comfortable compartments and passages for operators who must inspect their status (since the pressure developed by the pump may promote failures to the system if it is of defective construction or worn).

● The INSTRUCTION MANUAL must be delivered to the pump-user , who takes diligent note of it, keeps the file for subsequent reference. Possible modifications do not imply updating of the existing manuals