Operating Instructions

Diaphragm Pumps

19 060

19 061

19 062

81 555 932 A401 GB

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Operating instructions translation

Date of issue: 10/2017
We reserve the right to make design and product modifications, which serve to improve the product.

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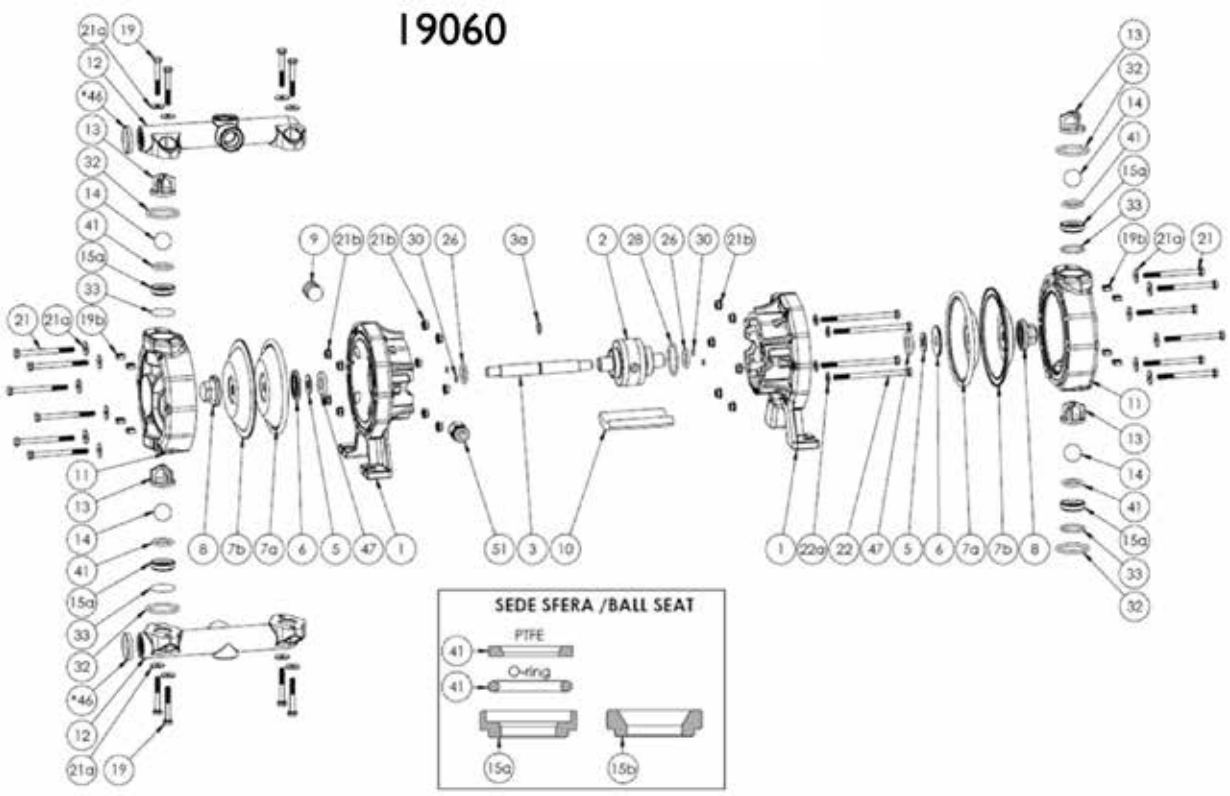
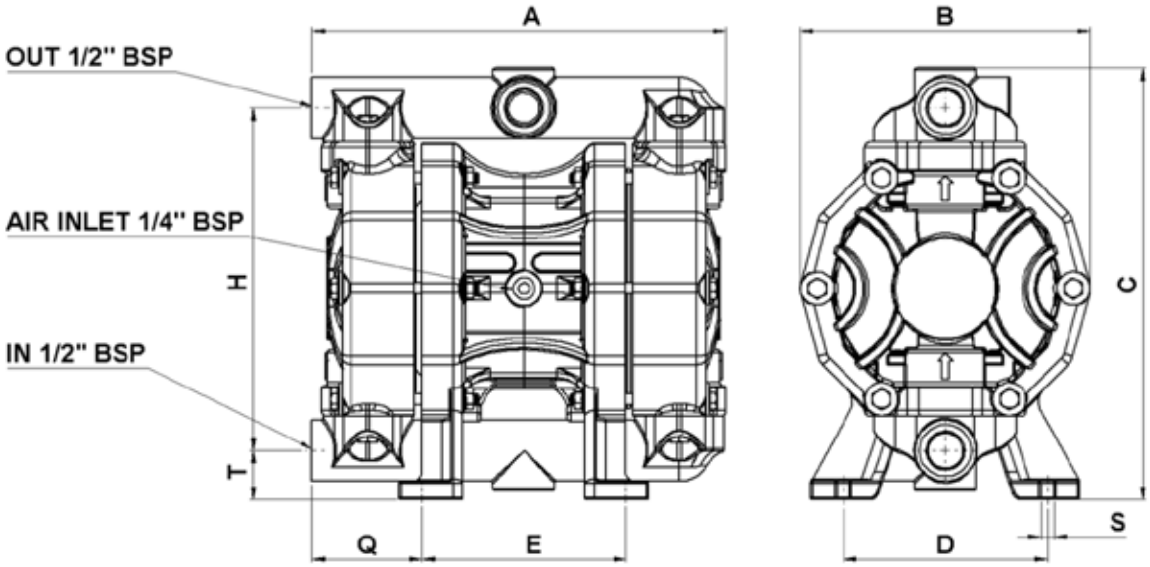
1. IDENTIFICATION CODE

Pump Model	Pump Body	Air Diaphragm	Fluid Diaphragm	Balls	Ball Seats	O-ring	Connection	Version Atex Zone 1
19 060 19 061 19 062	P - PP	H - HYTREL	T - PTFE	T - PTFE	P - PP	V - FPM	1 - BSP THREATED	x

Each pump is supplied with the serial and model abbreviation and the serial number on the rating plate, applied onto the support side. Check this data upon receiving the goods. Any discrepancy between the order and the delivery must be communicated immediately. In order to be able to trace data and information, the abbreviation, model and serial number of the pump must be quoted in all correspondence.

2. TECHNICAL DATA





19 060	A	B	C	D	E	H	Q	S	T	Weight / Kg	Min/Max Temp.
	223	156	233	110	110	185	59	7	27	4	-4°C/65°C

Position	Material	Description	Q. for Pump
1	PP + VTR	Central half block	2
1	PP + CF	Central half block	2
2	POM-c	Pneumatic Exchanger	1
3	AISI 304	Shaft	1
3a	NBR	Shaft-ring	1
5	STEEL	Bellville washer	2
6	ALUMINIUM	Air side cap	2
7a	Hytrel	Air diaphragm	2
7a	Santoprene	Air diaphragm	2
7b	PTFE	Fluid diaphragm	2
8	PP + VTR	Fluid side cap	2
8	ECTFE	Fluid side cap	2
8	PP + CF	Fluid side cap	2
8	ALUMINIUM	Fluid side cap	2
8	AISI 316	Fluid side cap	3
9	PP	Stopper central half block	1
10	FELT	Silencer	1
11	PP + VTR	Pump casing	2
11	PVDF + CF	Pump casing	2
11	PP + CF	Pump casing	2
11	ALUMINIUM	Pump casing	2
11	AISI 316	Pump casing	2
11	AISI 316 POLISHED	Pump casing	2
12	PP + VTR	Upper / lower manifold	2
12	PVDF + CF	Upper / lower manifold	2
12	PP + CF	Upper / lower manifold	2
12	ALUMINIUM	Upper / lower manifold	2
12	AISI 316	Upper / lower manifold	2
12	AISI 316 POLISHED	Upper / lower manifold	2
13	PP + VTR	Ball cage guide	4
13	ECTFE	Ball cage guide	4
14	PTFE	Ball	4
14	AISI 316	Ball	4
14	EPDM	Ball	4
14	NBR	Ball	4
15a	PP	Ball seat with o-ring or gasket Nº 41	4
15a	PVDF	Ball seat with o-ring or gasket Nº 41	4
15b	UHMW HDPE	Ball seat	4
15b	ALUMINIUM	Ball seat	4
15b	AISI 304	Ball seat	4
19	AISI 304	Screw manifold	8
19b	AISI 304	Nuts collector	8
21	AISI 304	Screw casing	12
21a	AISI 304	Washers	20
21b	AISI 304	Nuts	16
22	AISI 304	Screw central half block	4
22a	AISI 305	Washers central half block	4
26	NBR	O-ring	2
28	NBR	O-ring	1
30	NBR	O-ring	4
32	NBR	O-ring upper	4

Position	Material	Description	Q. for Pump
32	FPM	O-ring upper	4
32	EPDM	O-ring upper	4
32	PTFE	Gasket upper	4
33	NBR	O-ring lower	4
33	FPM	O-ring lower	4
33	PTFE	Gasket lower	4
33	EPDM	O-ring lower	4
41	NBR	Internal O-ring seat	4
41	FPM	Internal O-ring seat	4
41	PTFE	Internal gasket seat	4
41	EPDM	Internal O-ring	4
46*	AISI 304	Reinforcing ring manifold	2
47	PP	Stroke Spacer	2
51	ALUMINIUM	Air connection with O-ring	1

*ACCESSOIRES

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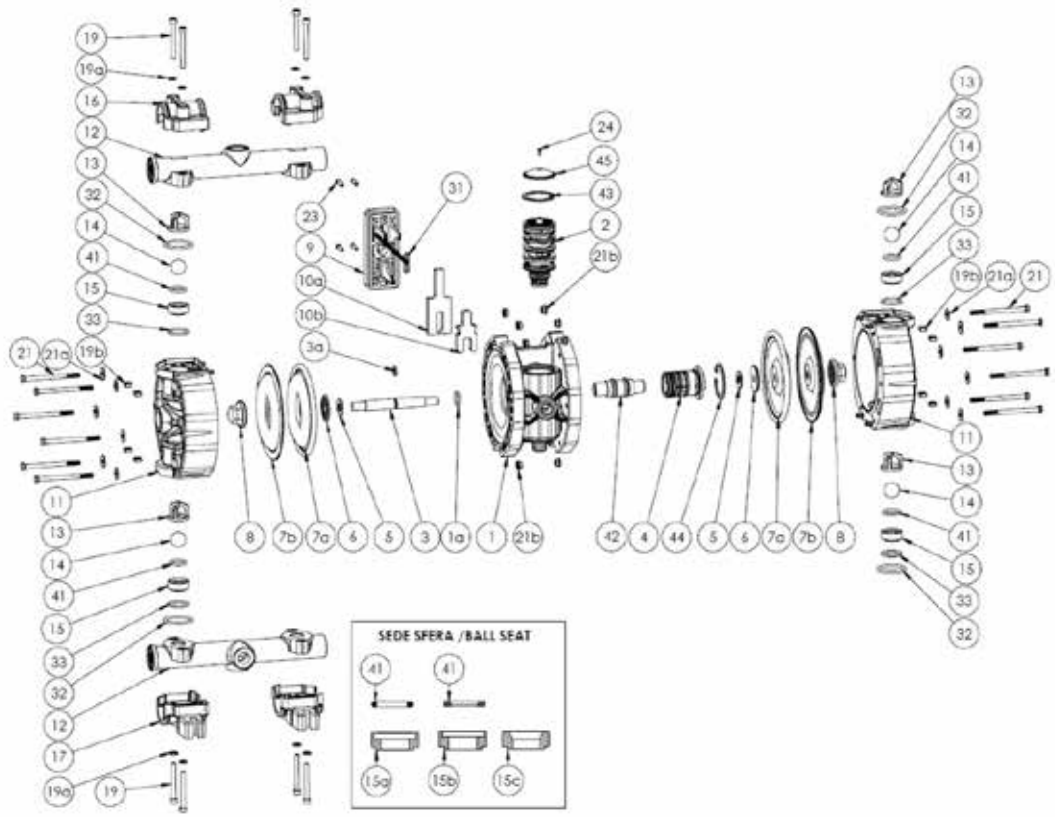
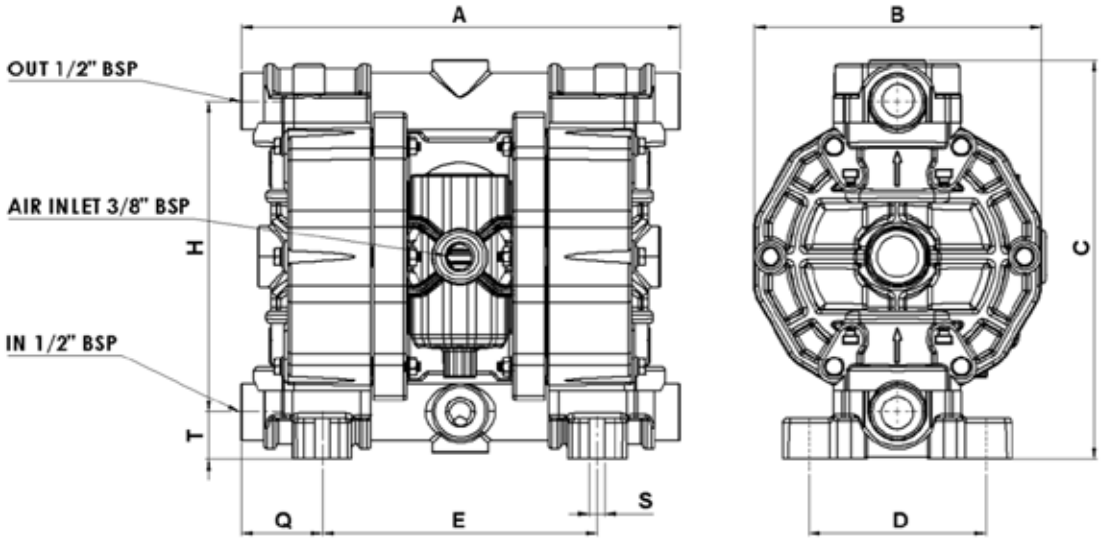
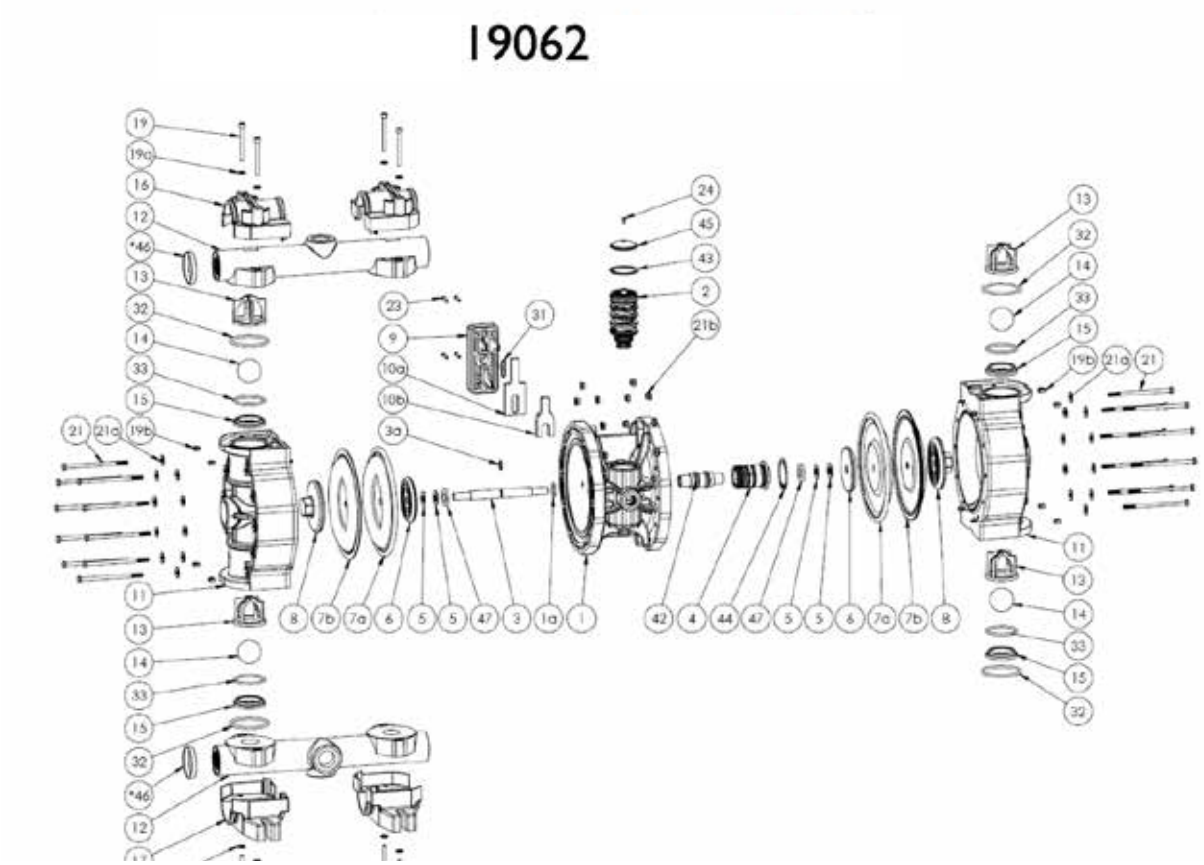


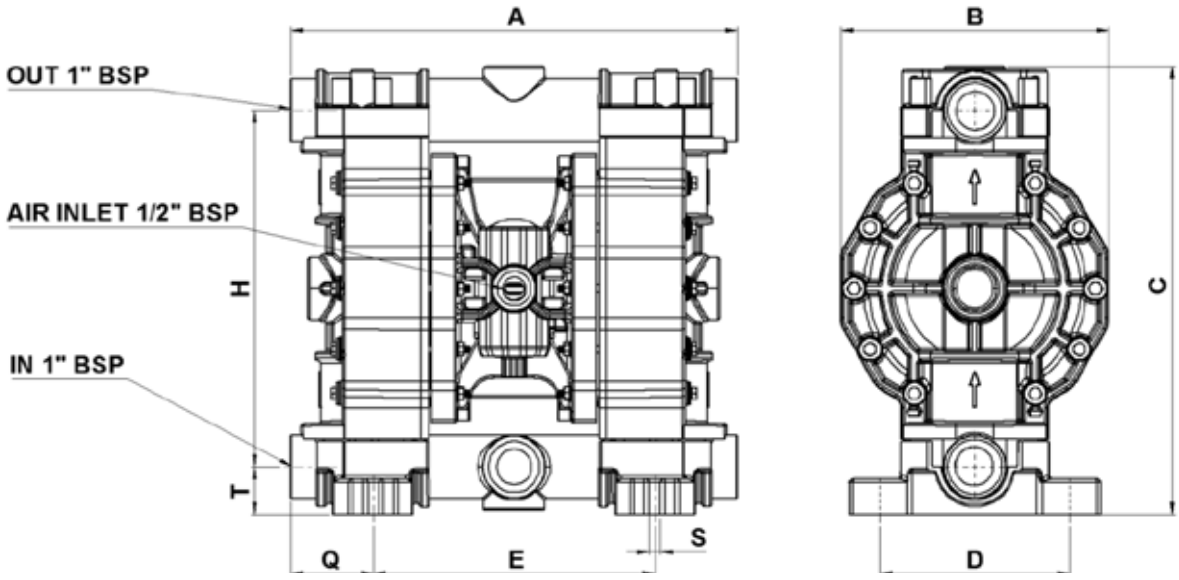


19 061	A	B	C	D	E	H	Q	S	T	Weight / Kg	Min/Max Temp.
	265	175	245	108	175	189	50	9	29	6,5	-4°C/65°C

Position	Material	Description	Q. for Pump
1	PP	Central block	1
1	PP + CF	Central block	1
1a	NBR	O-ring	1
2	POM-c	Pneumatic-Exchanger	1
3	AISI	Shaft	1
3a	NBR	O-ring	1
4	POM-c	Diaphragm with O-ring	1
5	STEEL	Bellville washer	2
6	ALUMINIUM	Air side cap	2
7a	Hytrel	Air diaphragm	2
7a	Santoprene	Air diaphragm	2
7a	EPDM	Air diaphragm	2
7a	NBR	Air diaphragm	2
7b	PTFE	Fluid diaphragm	2
8	PP + VTR	Fluid side cap	2
8	ECTFE	Fluid side cap	2
8	PP+CF	Fluid side cap	2
8	ALUMINIUM	Fluid side cap	2
8	AISI 316	Fluid side cap	3
9	PP + VTR	Silencer grid	1
10a	FELT	External silencer	1
10b	FELT	Internal silencer	1
11	PP + VTR	Pump casing	2
11	PVDF + CF	Pump casing	2
11	PP + CF	Pump casing	2
11	ALUMINIUM	Pump casing	2
11	AISI 316	Pump casing	2
11	AISI 316 POLISHED	Pump casing	2
12	PP + VTR	Upper/lower manifold	2
12	PVDF + CF	Upper/lower manifold	2
12	PP + CF	Upper/lower manifold	2
12	ALUMINIUM	Upper/lower manifold	2
12a	AISI 316	Upper manifold	2
12b	AISI 316	Lower manifold	2
12a	AISI 316	Upper manifold CLAMP	2
12b	AISI 316 POLISHED	Lower manifold CLAMP	2
13	PP + VTR	Ball cage guide	4
13	ECTFE	Ball cage guide	4
14	PTFE	Ball	4
14	AISI	Ball	4
14	EPDM	Ball	4
14	NBR	Ball	4
15	PP	Ball seat	4
15	PVDF	Ball seat	4
15	PP	Ball seat	4
15	PVDF	Ball seat	4
15	UHMW HDPE	Ball seat	4
15	ALUMINIUM	Ball seat	4
15	AISI	Ball seat	4
16	PP + VTR	Collar	2
17	PP + VTR	Foot	2

Position	Material	Description	Q. for Pump
19	AISI	Screw manifold	8
19b	AISI	Nuts collector	8
21	AISI	Screw casing	12
21a	AISI	Washers	20
21b	AISI	Nuts	12
23	AISI	Screw silencer grid	4
24	AISI	Screw cover pneumatic exchanger	1
31	NBR	O-ring silencer	1
32	NBR	O-ring	4
32	FPM	O-ring	4
32	EPDM	O-ring	4
32	PTFE	O-ring	4
33	NBR	O-ring	4
33	FPM	O-ring	4
33	PTFE	O-ring	4
33	EPDM	O-ring	4
41	NBR	O-ring	4
41	FPM	O-ring	4
41	PTFE	O-ring	4
41	EPDM	O-ring	4
42	POM-c	Bushing with O-ring	1
43	STEEL	Seeger pneumatic exchanger	1
44	STEEL	Seeger central block	1
45	PP + VTR	Cover pneumatic exchanger	1





19 062	A	B	C	D	E	H	Q	S	T	Weight / Kg	Min/Max Temp.
	370	222	370	157	238	294	69	9	39	15	-4°C/65°C

Position	Material	Description	Q. for Pump
1	PP	Central block new version	1
1	PC + CF	Central block new version	1
1a	NBR	O-ring	1
2	POM-c	Pneumatic Exchanger	1
3	AISI	Shaft	1
3a	NBR	Shaft O-ring	1
4	POM-c	Intermediate plate with O-ring	1
5	STEEL	Belleville washer	4
6	ALUMINIUM	Air side cap	2
7a	Hytrel	Air diaphragm	2
7a	Santoprene	Air diaphragm	2
7a	EPDM	Air diaphragm	2
7a	NBR	Air diaphragm	2
7b	PTFE	Fluid diaphragm	2
8	PP + VTR	Fluid side cap	2
8	ECTFE	Fluid side cap	2
8	PP + CF	Fluid side cap	2
8	PVDF + CF	Fluid side cap	2
8	ALUMINIUM	Fluid side cap	2
8	AISI 316	Fluid side cap	2
9	PP + VTR	Silencer grid with O-ring	1
10a	FELT	External silencer	1
10b	FELT	Internal silencer	1
11	PP + VTR	Pump casing	2
11	PVDF + CF	Pump casing	2
11	PP + CF	Pump casing	2
11	ALUMINIUM	Pump casing	2
11	AISI 316	Pump casing	2
11	AISI 316 POLISHED	Pump casing	2
12	PP + VTR	Upper / lower manifold	2
12	PVDF + CF	Upper / lower manifold	2
12	PP + CF	Upper / lower manifold	2
12	ALUMINIUM	Upper / lower manifold	2
12a	AISI 316	Upper manifold	2
12b	AISI 316	Lower manifold	2
12a	AISI 316 POLISHED	Upper manifold CLAMP	2
12b	AISI 316 POLISHED	Lower manifold CLAMP	2
13	ECTFE	Ball cage guide	4
14	PTFE	Ball	4
14	AISI 316	Ball	4
14	EPDM	Ball	4
14	NBR	Ball	4
15	PVDF	Ball seat	4
15	PP	Ball seat	4
15	UHMW HDPE	Ball seat	4
15	ALUMINIUM	Ball seat	4
15	AISI	Ball seat	4
16	PP + VTR	Collar	2
17	PP + VTR	Foot	2
19	AISI	Screw manifold	8
19a	AISI	Washers	8

Position	Material	Description	Q. for Pump
19b	AISI	Nuts collector	8
21	AISI	Screw casing	20
21a	AISI	Washers	20
21b	AISI	Nuts	20
23	AISI	Screw silencer grid	4
24	AISI	Screw cover pneumatic exchanger	1
31	NBR	O-ring silencer	1
32	NBR	O-ring upper for plastic-aluminium	4
32	FPM	O-ring upper for plastic-aluminium	4
32	EPDM	O-ring upper for plastic-aluminium	4
32	PTFE	O-ring upper for plastic-aluminium	4
32	NBR	O-ring upper for AISI	4
32	FPM	O-ring upper for AISI	4
32	EPDM	O-ring upper for AISI	4
32	PTFE	O-ring upper for AISI	4
33	NBR	O-ring lower	4
33	FPM	O-ring lower	4
33	EPDM	O-ring lower	4
33	PTFE	Gasket lower	4
42	POM-c	Command bush with O-ring new version	1
43	STEEL	Seeger pneumatic exchanger	1
44	STEEL	Seeger pneumatic exchanger	1
45	PP + VTR	Cover pneumatic exchanger	1
46*	AISI	Reinforcing ring	2
47	PP	Stroke spacer	2

*ACCESSOIRES

3. GENERAL NOTES

The diaphragm 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. Pressol is not responsible for the pumped liquid. The customer must ensure that there is compatibility between the pumped liquids and pump materials.

The diaphragm pumps are self-priming; at 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) Diaphragm pumps may be used dry

Diaphragm 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 rating plate) and on the environment in which the pump will be installed:

VERSION	MAX TEMP. ATEX ZONE 2	MAX TEMP. ATEX ZONE1
PP / PC	60° C / 140° F	60° C / 140° F

VERSION	MAX - TEMP (°C / °F)
PP / PC	0 - 40° C / 14 - 104° F

The pump may be operated at a maximum pressure equal to 1.5 times the head value with closed delivery.

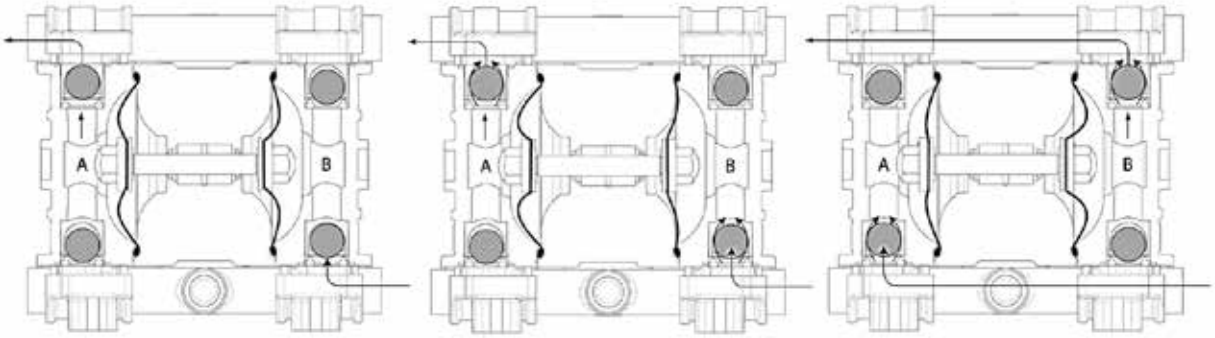
The value of the vapor pressure of the pumped fluid must be greater (of at least 3 mwc - meters of water column) than the difference between the total absolute head value (pressure on suction level subtracted of the suction height) and the leakages of the suction section.

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

MODEL	19 060	19 061	19 062
MAX DIM. mm.	3,5	3,5	7,5

4. OPERATING PRINCIPLE

The pneumatic distribution system sends compressed air behind one of the two Diaphragm (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 to the chamber on the Diaphragm air side, putting diaphragm (B) under pressure and diaphragm(A) 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.



5. PNEUMATIC CONNECTION

WARNING: the pneumatic supply of the 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.

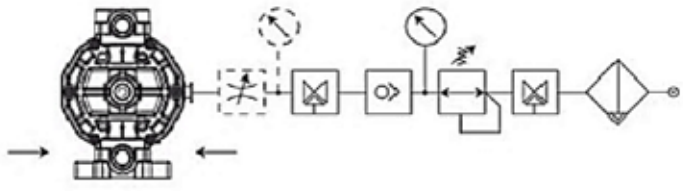
Minimum pressure supply: 2 bar Maximum pressure supply: 7 bar

1 – pressure regulator with gauge

2 - shut-off valve

3 – way valve

4 – flow regulator



MODELL	Ø
19 060	6 mm
19 061	8 mm
19 062	10 mm
Max. length between tube and pump plant: 5m	

6. INSTALLATION AND USE INSTRUCTIONS

6.1 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

6.2 STORAGE

- In case of long breaks before installation, store in original boxes. The boxes should be stored off the ground, in a closed, clean and dry environment.
- In the event that the packaging was not received intact, it will be necessary to take the pump out of it, check its integrity and repack it in a new package.
- The storage place should be in a closed environment with a temperature not lower than -5 ° C, not higher 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 placed above it.

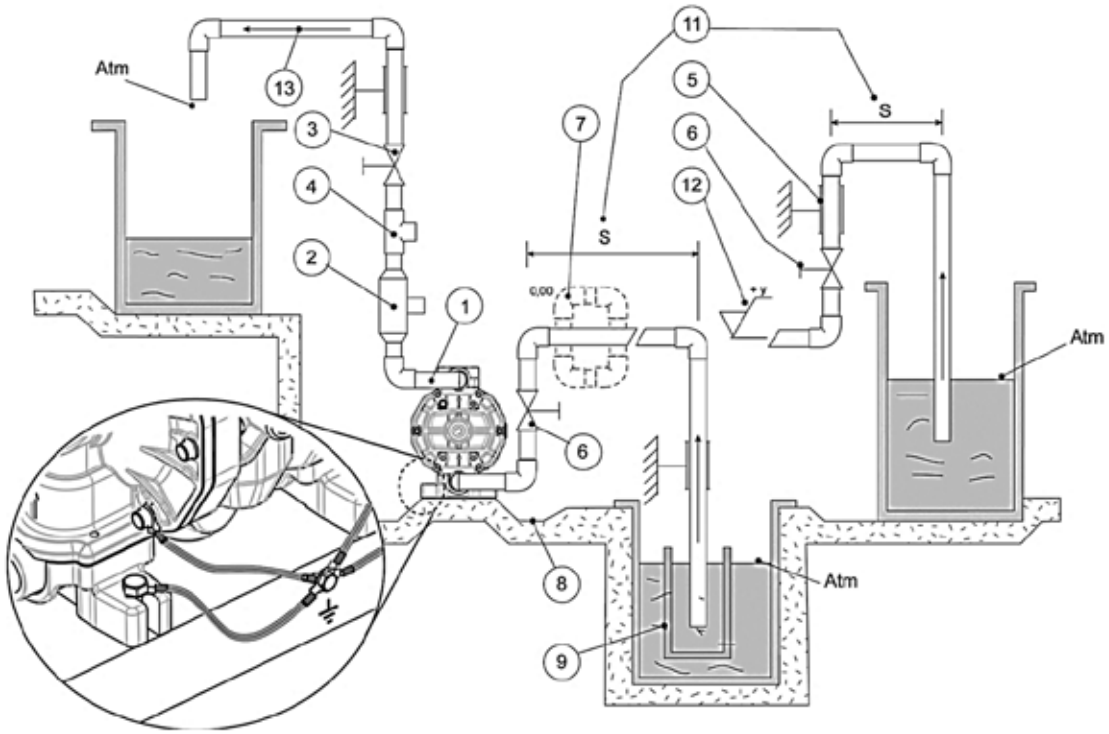
6.3 INSTALLATION

- 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

- Before starting the pump check the tightness of the screws of the pump bodies and manifolds.
- 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 extraction point.

Use the installation applications 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. The length of the horizontal S as short as possible,
12. Slope of the pipe to the pump
13. The flow velocity of the fluid max. 3.5 m / s



- Ensure drainage of fluids which may come out of the pump.
- Fasten 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 fluids 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 falling objects 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 always be 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 other body to which it is connected. Lack of grounding or incorrect grounding will void the safety requiremenents and protection against the risk of explosion.
- The pump during operation is under PRESSURE, check appropriately for hazardous conditions.

6.4 START UP

- Check the correct execution of what is 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 pump circuit.
- Open the 3-way valve of the air circuit.
- Set the requested operation point requested for the pump: properly adjust the air pressure delivery rate, with which the pump is supplied. 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 Diaphragm breaking.
- Check that there are no anomalous vibrations or noise due to a too elastic support structure, unsui table fastening or cavitation.
- Stop the pump correctly after 2 hours of operation and check the tightening of all the bolts on the pump.

6.5 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).
- Accurately 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 a suitable solvent that does not generate hazardous exothermic reactions.
- Consult the fluid supplier to evaluate the most suitable fire-prevention method.
- Empty the pump in case of long periods of non-operation (particularly with fluids which have a particular tendency to crystallize).
- Check that there is no gas in the delivering fluid, if there is stop the pump.

6.6 STOP

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

WARNING:

- Never stop the pump by completely closing the suction and/or delivery valves of the hydraulic circuit.
- It is prohibited to stop the pump by means of completely closing valves in the suction and / or di scharge of the hydraulic circuit.

7. 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 cleanli ness of the filtering elements.
- Carry out periodic inspections (3 - 5 months in accordance with the fluid pumped and with the envi ronmental conditions) to ensure correct operation of the system's start/stop units.
- The presence of fluid under the pump casing may indicate pump failures.
- 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 environment.

7.1 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 operations 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.

7.2 DISASSEMBLY

- Bolts are right thread type.
- Clean all the external surfaces of the pump 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.

Diaphragm 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 Diaphragm.
- Remove the Diaphragm and the related backing plates.
- If it would be necessary to disassemble the shaft, remove one of the two Diaphragm on air side and then pull off the shaft.

Pneumatic distributor removal

- Slip off the pneumatic exchanger cap and the spool (if necessary use a M6 screw in order to slip off the spool).

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

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- Remove the Seeger ring of the transverse sleeve of the central casing
- Overturn the pump and with the aid of a Ø 6 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 do not obstruct removal of the distri butor).

- **WARNING:** the pneumatic distributor shall not be opened to prevent an incorrect reassembling that may cause the pump to malfunction.

7.3 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 Diaphragm.
- Deformations and/or fractures on the valve seats.

Replace parts which are broken, cracked or deformed.

Reopen all clogged ducts and eliminate any chemical agglomerates.

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

CLEANING AND REPLACING THE Diaphragm

- Control and internal cleaning every 500.000 cycles .
- Diaphragm check every 5.000.000 cycles.
- Diaphragm replacement every 20.000.000 cycles.

8. SAFETY RISKS

WARNING! CHEMICAL RISK. Pumps are intended for operation with different types of fluids and chemical solutions. Follow the specific internal instructions for decontamination during the inspection or maintenance operations.

WARNING! ELECTRICAL RISK. The pump must always be earthed independently to other elements connected to it. Safety requirements and explosion risk prevention are not fulfilled if the pump is not earthed or is incorrectly earthed.

WARNING:

• The Diaphragm (in contact with the product and external) are components subject to extreme wear. Their duration is strongly affected by the conditions of use and by chemical and physical stresses. By tests carried out on thousands of pumps installed with head value from 0° to 18°C, the ordinary life exceeds one hundred million cycles. For safety reasons, in environments with explosion risk it is necessary to disassemble and check the Diaphragm every five million cycles and to replace them every twenty million cycles.

• In the case of Diaphragm breaking completely, fluid may enter into the pneumatic circuit, damage it and come out through the discharge port. Therefore it is necessary to direct the air discharge up to a safe area (using pipes).

• In situations where the user foresees the possibility of exceeding the temperature limits indicated in this manual, it is necessary to install a protection device on the equipment that prevents to achieve the maximum operating temperature allowed to be exceeded. If exceeded, respect to the maximum marking temperature is not guaranteed.

REMEMBER! Safety risks to persons are mainly caused by improper use or accidental damage.

These risks may be caused by operators working on the open pump, or caused by the nature of the fluids that are conveyed by this type of pump. Therefore it is extremely important to diligently carry out all the instructions contained in this manual in order to eliminate the causes of accidents that may

lead to the pump failure and to the subsequent spillage of that are harmful to persons and to the environment.

For installation and use in a potentially explosive environment, comply with these general precautions:

- Ascertain that the pump is full and if possible, that the fluid level is above 0.5 m.
- Ascertain that the conveyed fluid does not contain or cannot contain large solids or solids of a dangerous shape.
- Ensure that the intake or delivery ports are not obstructed nor limited to avoid cavitation or pneumatic motor strain.
- Also ascertain that the connection piping is strong enough and cannot be deformed by the pump weight or by the intake. Also check that the pump is not burdened by the weight of the piping.
- If the pump is not used for a long period of time, clean it carefully by running a non-flammable liquid detergent through it which is compatible with the pump's construction materials.
- If the pump was turned off for a long period of time, circulate clean water in it for a couple of minutes to avoid incrustations
- Before operation, after long periods of disuse, clean the internal and external surfaces with a damp cloth, check the grounding ATEX ZONE.

- Always protect the pump against possible collisions caused by moving objects or by various blunt materials that may damage it or react with its materials.
- Protect the pump's surroundings ambient from splashes caused by accidental pump failure.

WARNING:

- The air supply pressure must never be over 7 bar or below 2 bar.
- When using the pump with aggressive or toxic liquids or with liquids that may represent a health hazard you must install suitable protection on the pump to contain, collect and signal any spills: DANGER OF POLLUTION, CONTAMINATIONS, INJURIES AND/OR DEATH.
- The pump must not be used with fluids that are not compatible with its construction materials or in a place containing incompatible fluids.

CAUTION: It is prohibited to install the pumps without on-off valves on the intake and delivery sides which intercept fluids in case of spillage.

CAUTION: It is prohibited to install the pumps without on-off, three-way or check valves on the air supply piping to prevent the pumped liquid from entering the pneumatic circuit if the diaphragms are broken: danger of fluid entering the compressed air circuit and being discharged into the environment.

WARNING:

- In situations where the user foresees the possibility of exceeding the temperature limits indicated in this manual, it is necessary to install a protection device on the equipment that prevents to achieve the maximum operating temperature allowed. If exceeded, respect to the maximum marking temperature is not guaranteed.
- 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.
- It is prohibited to use pumps made with non-conductive material, which can be statically charged and that are not properly grounded for flammable liquids: RISK OF EXPLOSIONS DUE TO STATIC CHARGE.

CAUTION: Aggressive, toxic or dangerous liquids may cause serious injuries or hazard to health, therefore it is prohibited to return a pump containing such products to the manufacturer or to a service

center. You must empty the internal circuits from the product first and wash and treat them.

CAUTION: Pumps containing aluminium parts or components coming into contact with the product cannot be used to pump III-trichloroethane, methylene chloride or solvents based on other halogenated hydrocarbons: DANGER OF AN EXPLOSION CAUSED BY A CHEMICAL REACTION.

CAUTION: The pumps cannot pump Acetylene, Hydrogen, Carbon disulfide.

CAUTION: The components of the pneumatic exchanger, including the shaft are made from materials that are not specifically resistant to chemical products. If the diaphragm should break, replace these elements completely if they have come into contact with the product.

CAUTION: The air-driven motor of the pump is self-lubricating and will not require any greasing. Therefore avoid using lubricated and non-dried air.

WARNING:

• Ascertain that no anomalous noise appears during service. If it is the case, stop the pump immediately. WARNING: ascertain that the fluid at the delivery side does not contain gas. Otherwise stop the pump immediately.

• The Diaphragm (in contact with the product or the external ones) are highly subject to wear. Their duration is strongly affected by the conditions of use and by chemical and physical stress. Fields tests carried out on thousands of pumps with a head value from 0° to 18° C have shown that normal service life exceeds one hundred million cycles. However, in places at risk of explosion, the diaphragm must be disassembled and checked every 5 million cycles and replaced every 20 million cycles.

• Periodic controls must be performed to ensure that there is no powder and/or deposits on the external and internal surfaces of the pump and, if necessary, they must be cleaned with a damp cloth.

• Removal of the silencer and the air supply fitting must be done when free from powder. Before restarting the pump, ensure that no powder has entered the pneumatic distributor.

• Always protect the site and the persons operating it from accidental failure by installing a protection guard to hold and collect any product leakage. Danger of serious injuries and damage to health and/or objects.

Only use original spare parts to replace worn parts.

Failure to comply with the above may give rise to risks for the operator, the technicians, the persons, the pump and/or the environment that cannot be ascribed to the manufacturer.

However five general elements are important:

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

B- put in place all necessary safety measures for personnel (when the pump is installed in places frequented more than occasionally) against splashes of leaking fluid due to accidental breakage and always during the conveying of possible fluid leakage 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 power supply to the pneumatic circuit during the disassembly

Please note that it is very important to assemble systems with well-arranged, clearly identifiable and suitably equipped pipes with shut-off valves and compartments and passages which allow operators who must carry out inspections to confortably and effectively do so (as the pressure developed by the pump might cause failures to the system if its construction is defective or worn).

8.1 OPERATORS FOR INSTALLATION AND START-UP

Interventions to be carried out only by skilled personnel who may delegate some operations to others (required technical skills: plumbing, pneumatic and/or electric qualification as appropriate)

8.2 OPERATORS FOR USE AND MAINTENANCE

Interventions to be carried out by generic operators (after being instructed on the correct use of the equipment):

- Pump start-up/stop
- Valves opening / closing with stopped pump
- Casing emptying and washing by means of the prearranged valves and pipes
- Filtering elements cleaning interventions to be carried out by skilled personnel (required technical skills: general knowledge of the mechanical, electrical, chemical aspects of the equipment supplied by the pump and of the pump itself):
- Environmental conditions check
- Pumped fluid conditions check
- Inspections of start-up/stop devices
- Detection of malfunctions

8.3 OPERATORS FOR REPAIR

work to be carried out by generic operators supervised by skilled personnel:

- Pump stop
- Valves closing
- Emptying of pump casing
- Disconnecting pipes from connections
- Unlocking of fastening screws to the base
- Washing with water or suitable solvent as appropriate
- Transport

Work to be carried out by skilled personnel (required technical skills: notions of mechanical processing, sensitivity with regard to damage to parts for impacts or abrasions during handling, familiarity with bolts and different plastic/metal materials, use of precision measuring instruments):

- casing opening and reclosing
- removal and replacement of damaged parts

8.4 DISPOSAL

For type of material: separate plastic parts from metal parts and dispose of by authorized companies.

9. TROUBLESHOOTING AND POSSIBLE CAUSES

	DEFECT	CAUSE	SUGGESTION
1	The pump does not start	Circuit without air	Check the circuit (valves, connections, regulators, etc.)
		Insufficient air pressure	Adjust the air pressure
		Insufficient air flow rate	Check that the pipes and fittings have suitable passages
		Damaged control valve	Replace
		Damaged pneumatic distributor	Replace
		Pump delivery or intake closed	Open some valves, or remove the pipes and check if the pump starts
		Damaged discharge cover	Replace
		Broken diaphragm	Check if air comes out of the product delivery pipe, if yes replace the diaphragm
2	The pump works but it does not pump	The balls do not close	Disassemble the manifolds and clean the seats or replace the balls and the seats
		Excessive intake height	Reduce the intake height
		Too viscous fluid	Install pipes with greater size especially for intake and decrease the pumps cycles
		Clogged intake	Check and clean
3	The pump works with slow cycles	Excessively viscous fluid	No remedy
		Clogged delivery pipe	Check and clean
		Clogged intake	Check and clean
4	The pump works irregularly	Internal pneumatic exchanger clogged or defective	Replace the pneumatic exchanger
		Worn shaft	Replace the pneumatic exchanger
		Ice on the discharge	Dehumidify and filter air
		Air volume is lacking	Check all the air control fittings, especially the quick couplings
		Internal exchanger dirty	Replace

5	The pump stalls	Intake clogs during operation.	Replace the intake pipe
		Dirty air, full of condensate or oil.	Check the air line
		Insufficient air volume or pressure.	Check the pressure with a gauge installed on thepump and with running pump. If pressurein that point is too low related to the mains pressure, check all the air connections, especially the quick couplings Check that all the air control devices have a sufficient flow rate. WARNING: In 90% of the cases stall conditions depends on the quick couplings.
		Defective distributor.	Replace it
		The stop procedure was not respected.	Respect the stop procedure
6	The pump does not deliver the flow rate indicated on the table.	The product intake pipe is not correctly connected	Check
		Clogged pipes	Check and clean
		Too viscous fluid.	Install pipes with greater size especially for intake and decrease the pumps cycles
		The balls do not close	Disassemble the manifolds and clean the seats or replace the balls and the seats
		Insufficient air volume.	Check pressure with a gauge installed on the pump and with running pump. If pressure in that point is too low related to the mains pressure, check all the air connections, especially the quick couplings. Check that all the air control devices have a sufficient flow rate. WARNING: In 90% of the cases stall conditions depend on the quick couplings.

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