USER INFORMATION 6000306E

KEEP FOR FUTURE USE Rev. A

B.6.20.50

F 015.085-DP

ORION ® piston pumps
- with bellows

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REGULAR TESTING OF THE UNITS

Test certificate No.	Test date	Responsible person	
		Company	Name

Fluid spraying equipment is intended in particular for surface coating (e.g. airless paint spraying equipment, two-component coating equipment).

The operator must ensure that fluid spraying equipment is tested for proper operation after the unit has not operated for more than 6 months, and at least every 12 months by a competent person [1)].

The operator must ensure that the test results are properly recorded in writing for every unit [2)] and kept until the next test.

The operator must ensure that the test certificate is available at the place of use [3)] of the fluid spraying equipment.

1) A competent person is somebody that has sufficient knowledge in the field of fluid spraying equipment based on professional training and experience; and is sufficiently conversant with the relevant national health and safety regulations, accident prevention regulations, recommendations and generally accepted rules and industrial norms to evaluate the fluid spraying equipment.

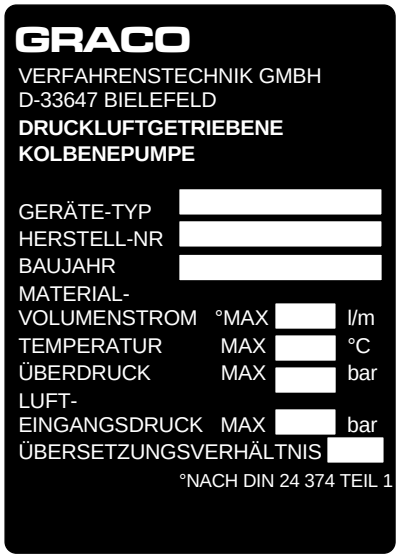
2) Written records (test results) can, for example, be in the form of test certificates.

3) At the place of use, a copy of the test certificate or a test stamp on the unit is considered as in compliance with the requirement.

- Extract from: Working with fluid spraying equipment (VBG 87)
  Issued on: 10 October 1993
  § 23 (1), (3) and (4)

  Implementation instructions VBG 87
  to § 1 Par. 1 and to §23 Par. 1, Par. 3, Par. 4

ORION ® PISTON PUMP



The original manufacturer's nameplate is located on the piston pump. Please compare the data and make corrections if required.

Read and understand the operators manual and the safety instructions before taking the pump into operation

All important sections in this Operator Manual have been marked with the following symbols:

Directions involving your safety

Important operational directions

Please pass on all safety information to other users.

CONTENTS

CONTENTS – CONT'D

CORRECT USE

Orion® piston pumps are exclusively manufactured for common applications in surfacing technology (to displace coatings or auxiliary agents or for spraying) or similar work.

Any other purpose above and beyond this is considered inappropriate use. We shall not be liable for any damage or injury resulting from this; the user shall bear sole responsibility in such cases.

Correct use includes observing operating, maintenance and inspection conditions and regulations laid down by us.

Orion® piston pumps should only be operated, maintained and serviced by personnel familiar with, and trained to recognize its inherent dangers.

The relevant hazard prevention regulations as well as safety and medical rules must be observed.

In case of unauthorized modifications of the appliance we cannot be held responsible for any damages or injury resulting from such modifications.

The user is responsible for the correct installation of the equipment.

TYPICAL INSTALLATION

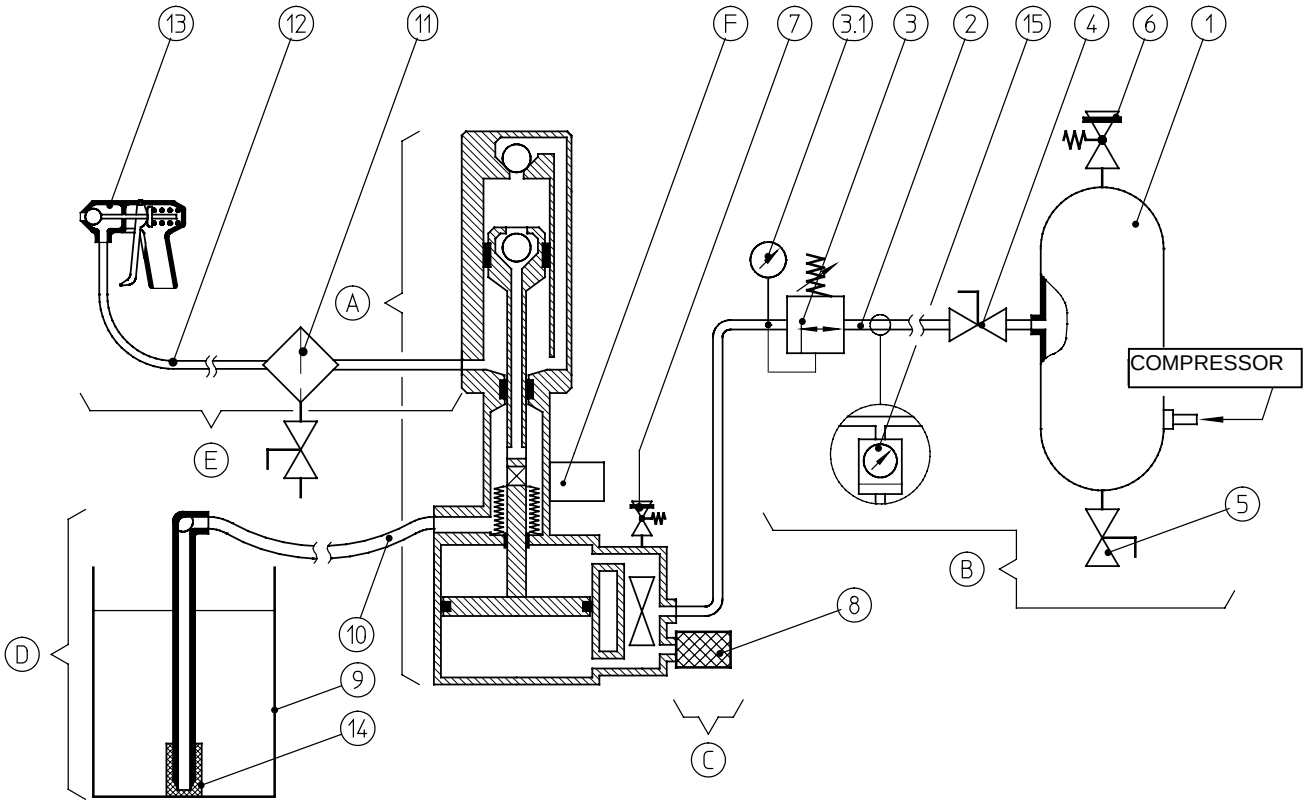


Fig. 2

Ⓐ PISTON PUMP

Ⓑ AIR SUPPLY

Ⓒ EXHAUST AIR MUFFLER

Ⓓ FLUID SUCTION SYSTEM

Ⓔ FLUID PRESSURE SYSTEM

Ⓕ PUMP SUPPORT

① Compressed air container

② Pipeline or hose

③ Pressure regulator

④ Ball valve

⑤ Ball valve

⑥ Safety valve

⑦ Safety valve

⑧ Muffler

⑨ Fluid container

⑩ Suction line (Suction tube)

⑪ Fluid filter

⑫ Pressure line

⑬ Spray gun

⑭ Strainer

⑮ Filter regulator

FUNCTION DESCRIPTION

The compressed air is supplied to the piston pump Ⓐ from a pressure tank ① via a tube or hose line ② and a pressure regulator ③.

The air supply from the compressed air vessel to the piston pump can be shut off with the ball valve ④.

The ball valve ⑤ is used to release condensation manually (an automatic water drain valve is recommended here).

The safety valve ⑥ protects the pressure tank against inadmissible rises in air pressure (e.g. when heated).

The piston pump also features a safety valve ⑦, because it is required and because the compressed air supply Ⓑ is usually not installed for the piston pump alone.

During operation, compressed air escapes from the drive mechanism (air motor) of the piston pump into the atmosphere via the muffler ⑧. This relieves the pressure.

The fluid (coating or auxiliary agents) is sucked from a fluid container ⑨ into the piston pump via the suction line ⑩ and supplied under pressure to the spray gun via the high-pressure screen ⑪ and the pressure line ⑫ (hose/tube) ⑬.

A strainer ⑭ protects the piston pump against foreign substances in the fluid.

The installation of the air filter/regulator ⑮ in the air line is recommended when the equipment is used for AIRLESS-PLUS spraying (high-pressure spraying with air support).

EQUIPMENT COMPONENTS – IMPORTANT INFORMATION

The following components are required in an operational system:

Ⓐ PISTON PUMP

See "Technical Manual B.6.20.50-P", for more detailed information on the functional description of the piston pump.

Ⓑ AIR SUPPLY

The air supply consists of a compressor, a pressure tank with water drain valve, an optional compressed air drier and an air line.
The user generally provides the air supply.

- When the air supply needs to be installed, the relevant hazard prevention regulations, safety rules and user information, and in particular the information supplied by the manufacturer of the compressor, must be observed.

There must be a flexible connection between the piston pump and the compressed air line (to avoid ruptures caused by vibrations). A hose line is most suitable

- rated diameter 9 or bigger
- operating pressure = max. air line pressure, preferably 16 bar
- air and ambient temperatures -20 to 50 °C
- free of silicone

In explosive hazardous environments air hoses and tubes must be conductive (- to avoid electrostatic charging).

- Discharge resistance < 10^6 Ω relative to earth.

In most cases, the pressure regulator is mounted directly to the piston pump.

- efficient flow rate
  at 6 bar and 25 m/s > 50 m^3/h
- air inlet pressure 16 bar
- air and ambient temperatures 0° C to 50 °C.

The pressure regulator can also be mounted between the hose and the air line.

The gauge – 3.1 in the functional diagram – enables accurate adjustment and monitoring of the required air pressure.

- display range 0 to 16 bar
- air and ambient temperatures 0 to 50 °C
- Construction to absorbe pressure fluctuations

A shut-off mechanism (e.g. a ball valve) should always be installed between the pressure regulator and the air hose, or between the air hose and the air supply line. This enables quick and safe shutdown of the piston pump for operational breaks, maintenance work and in cases of failures.

- the value set on the pressure regulator is not changed.
- rated pressure ≥ 15 bar
- material used CuZn, nickel-plated

The rule for ball valves: wing transverse to flow direction = line is closed off

Do not use PTFE tape or hemp to seal connections
(- Malfunctioning of pressure regulator - as a result of residue in compressed air supply).

There are no special requirements for the quality of the air supplied to the piston pump.

- condensation and residue oil from the compressor can be drained (pressure tank, air filter)
- oiling of the air is not necessary
- air temperature 10°C to 50 °C

The air must be free from any substances that may interfere with paint spraying, like silicone or oil.
– The same applies to all components of the air supply system

When air is used for atomizing the fluid, a filter regulator, branched off from the main compressed air supply –15 in functional diagram–, must be installed upstream.

- efficient flow rate at 6 bar and 25 m/s > 32 m^3/h
- air inlet pressure 16 bar
- air and ambient temperatures 0° C to 50 °C.

Ⓒ MUFFLER

Sound emissions of an air powered piston pump damages to hearing when a sound absorber is absent[> 100 dB(A)]. Because there is a relation between sound absorption and icing of the air motor of the pump, the sound level cannot be reduced with a sound absorber as much as would be desired [not (70 dB(A)].

Every piston pump is therefore fitted with a sound absorber with the right dimensions.

See "Technical Description of Product B.6.20.50-P", page 04 for more detailed information on the sound level.

Do not use the piston pump without the sound absorber.
Do not remove the sound absorber when the equipment is operating.

- The decision to wear ear protection depends on the operating pressure and the resulting sound level.

Ⓓ FLUID SUCTION KIT

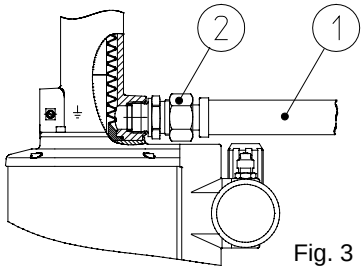


Fig. 3

The suction kit ① can be mounted to the threaded connector ② of the ORION® piston pump.

The diameter of the suction line is designed to enable suction of fluids with a cinematic viscosity of up to 750 mm^2/s (cSt) without difficulty.

A higher viscosity rating can result in reduced suction performance, or even interrupted suction, which can be identified by an increasing pressure drop during the changeover of the pump (pulsating pressure).

- Measures for improvement are:
- Suction tube and suction hose with a larger diameter, shorter suction hose, suction container.

Specifications of suction kit:

- Electrically conductive, maximum permissible resistance 3 x 10^4 Ω/m (tested to ISO 8031) and resistance to earth < 10^6 Ω.
  (- suitable for use in explosive hazardous locations.)
- The individual parts of the suction assembly are designed to withstand an overpressure of 8 bar (- suitable for suction heights of up to 6 m).
- The suction hose and the suction screen are silicone-free and resistant to the usual solvents used in the surface coating industry.
- Minimum rated diameter 25
- Fluid temperature 10 °C to 85 °C
- Screen mesh size: 1.8

All metal parts in contact with the suction area material are made of stainless steel or PTFE impregnated (- suitable for water-based paints).

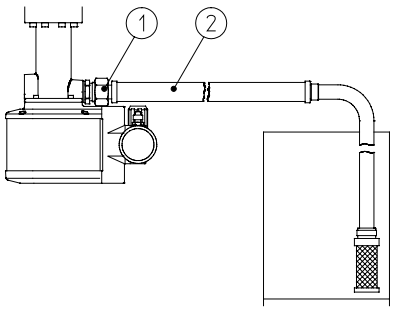
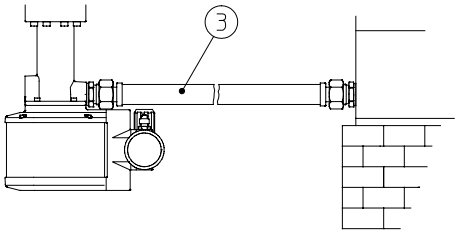


Fig. 4

Most piston pumps feature a threaded connector ① and a suction kit ② (suction hose, line and screen).



In case of a fixed installation the connection between piston pump and fluid container must be flexible (- to avoid rupture caused by vibration). The ratings for this connecting suction line ③ must correspond with those of the suction equipment.

Fig. 5

The pump may not be subjected to inlet pressure (pressure in a supply system, e.g. in a ring line).

When a threaded line is used in the suction assembly, the manufacturer's directions for installation of the threaded connection apply.

Piston pumps with a fixed container are particularly useful for smaller quantities of coating agent (e.g. for repair paint jobs) or for higher viscosity fluids.

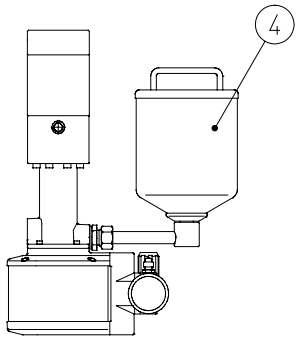


Fig. 6

- All wetted parts of the container ④ are made from stainless steel (- suitable for water-based paints).
- Container capacity 5 l
- Design certification for highly inflammable liquids of classes AI and AII is not required, since the container is made entirely from stainless steel.
- Suitable for use in explosive hazardous atmospheres, because electrostatic charging cannot occur.

Ⓔ FLUID PRESSURE SYSTEM

The fluid pressure system usually consists of a high-pressure screen, a hose line and or spray gun.

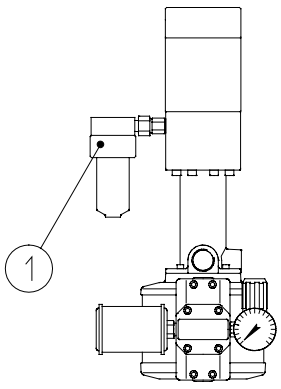


Fig. 7

For most of the piston pumps, the Filter PN 500 ① has been factory installed and tested in combination with the pump (final pump test).

The filter consists of the housing parts, the filter element and a pressure relief system (drain valve).

The filter ↔ and piston pump are connected via an adjustable nipple.

Specifications of filter PN 500:

- Max. working pressure 500 bar
- Max. working temperature 120° C

F22.060.02, issued on 01.98

- Filter area: 78 cm^2
- Rated width 6 mm
- Material of wetted housing: Stainless steel (1.4305)
- Pressure vessel: Group V of pressure container regulations; no test required.
- Filter element: Stainless steel with various mesh sizes (catalogue 01.2050, page 11)

A pressure regulator ② may be installed instead of or immediately behind the filter.

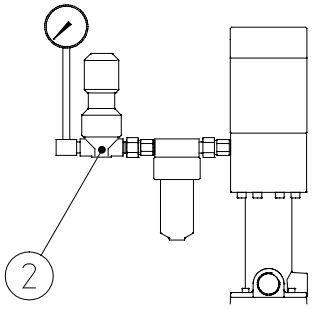


Fig. 8

- Observe the relevant user information.
- The user information is provided if the pressure regulator has been provided by us**.**

The hose line ③ connects the piston pump with the spray gun. In most cases, however, it has been screwed onto the filter. The connection between the hose line ↔ and the piston pump – or the connection with the filter or the pressure regulator is made without seals.

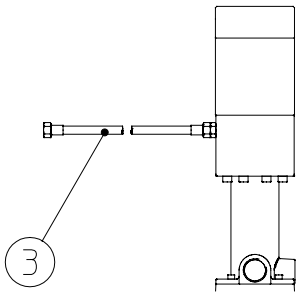


Fig. 9

- The nipples of the hose fittings are made from stainless steel or Zinc plated and yellow chromated steel.

The spray gun ④ is installed at the end of the hose line, G ¼ thread.

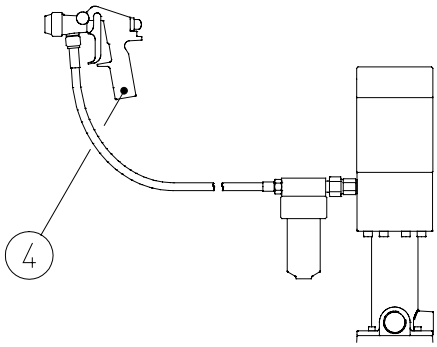


Fig. 10

- Observe the relevant user information.
- The user information is provided if the nozzle/spray gun has been provided by us.

In special cases, the pump outlet will be connected to a tube ⑤. The connection must be flexible (- to avoid rupture caused by vibration).

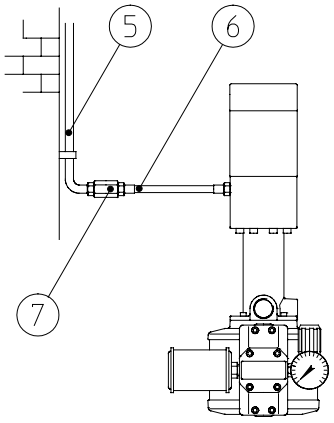


Fig. 11

The specifications for the flexible pressure line ⑥:

- Minimum rated width 8
- Operating temperature 10 to 90 °C or higher.
- Connection thread generally G ¼ or G•.
- Working pressure > max. permissible working pressure of piston pump

Hose material:

- The internal hose material resistant to most common solvents,
  - the external hose material is partially resistant.
- Free from any substances that may interfere with paint spraying, like silicon.
- Electrically conductive, max. resistance 3 x 10^4 Ω/m (tested to ISO 8031).

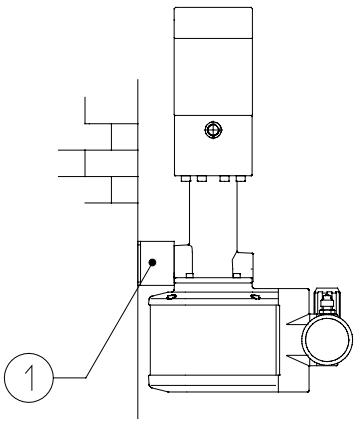
⚠ In a large fluid pressure system and in cases where the pressure system is influenced by heat (sun, heating systems, etc.) it is necessary to fit a suitable one way valve ⑦ between the tube and the pressure hose (- to prevent damage caused by heat expansion).

Ⓕ EQUIPMENT SUPPORT

The following devices may serve as supports for the ORION® piston pump:

Tube brackets (wall supports), pump carts, columns, pneumatic elevators and rams.

Most piston pumps are secured to the wall of a building or a machine frame with a tube bracket ①.



When bolts are used to secure a pump to a wall, the holes and the length of the nuts must be in accordance with the manufacturer's instructions.

When we have supplied the dowels and screws, they meet the specifications of Technical Product Description B.17.90.01-P.

Fig. 12

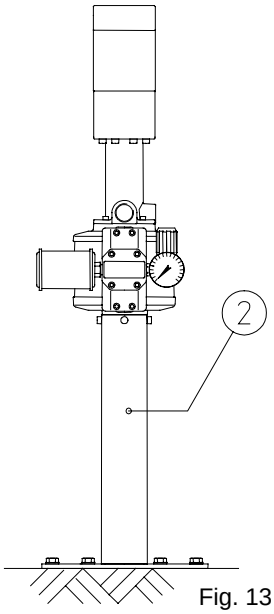


Fig. 13

If no suitable wall bracket is available on which the pump can be secured, it can be mounted on a column ①. Please ensure that the mounting surface is stable and, if possible, straight.

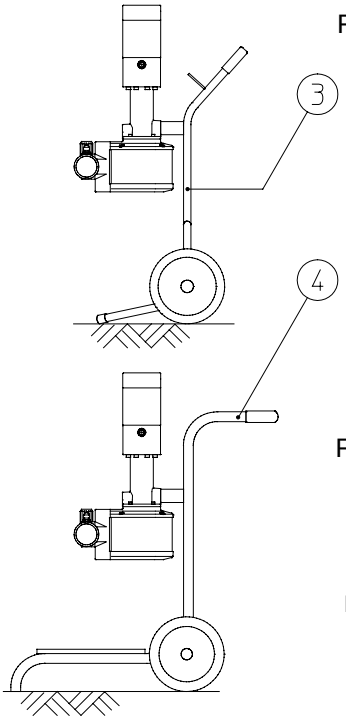
Piston pumps on columns should not be installed standing free; they must be secured to the floor.

When the nuts and bolts have been supplied by us, the following specifications apply:

- Drill diameter: 18 mm
- min. drill hole depth: 100 mm

The pump carts have a 2-wheel base. The can be used like hand trucks.

– In its resting position, the center of gravity of the unit is in front of the wheels, in its riding position slightly behind the wheels.



Form I

Form II

Fig. 14

Only a ORION® piston pump can be mounted onto pump cart frame I ③, without any additional aggregate.

Pump cart frame II ④ allows the additional mounting of a heater.

The wheels have no breaks; therefore the floor on which the pump carts are moved must be as horizontal as possible (tilt angle < 5°).

Fully fitted pump carts should not be put down roughly with a hoist. The wheels are not electrically conductive. As a result, these pump carts can only be used in explosive hazardous atmospheres, Zone 1, when specific safety measures are taken. There are no objections to their use in Zone 2.

The label on the right is affixed to the pump carts and refers to the guidelines to be observed.

Observe
VBG 23, ZH 1/200

An elevator ⑤ enables quick container changes.

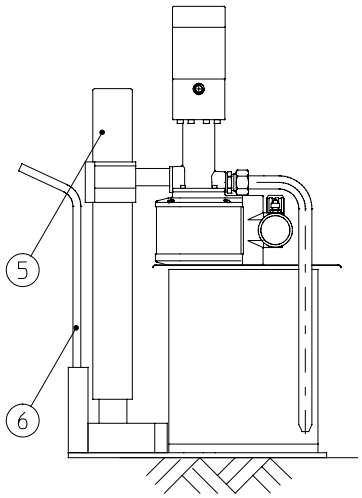


Fig. 15

The lift is a single-post design (vertical lifting cylinder).

The advantage of this design is its horizontal rotating capability.

- The piston can be turned from an empty to a full container.

Lifting, maintaining the position and lowering the pump to starting position is effected by means of a pneumatic hand lever valve mounted on the side ⑥.

A built-in air flow adjustment valve prevents rapid lifting and lowering motion.

Specifications of elevator equipment:

- Stroke 430 mm
- Air pressure 0.3 bar to 1.5 bar
- Pressure line DN 6

Only a ORION® piston pump can be mounted onto the lift without any additional aggregate.

The elevator must be secured to the floor. The supplied screws and plugs comply with the Technical Product Description B.17.90.01-P.

It is possible to install an agitator ⑦ attached onto the container cover ⑧.

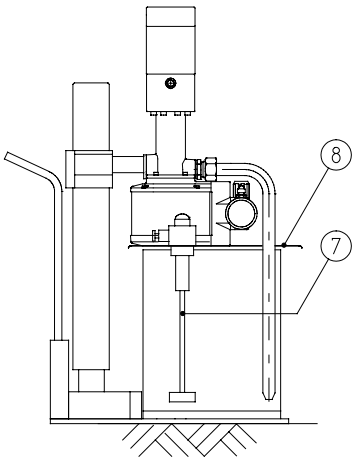


Fig. 16

Stirring reduces the viscosity of thixotrophic fluids; this improves e.g. the suction performance of the piston pump. The agitator is fitted to the container cover. This ensures correct positioning of the propeller of the agitator relative to the wall and base of the container as well as to the suction tube.

All immersed parts of the agitator (spindle and propeller) are made from stainless steel (- suitable for water-based paints).

The agitator is pneumatically driven: maximum permissible air inlet pressure: 6 bar. Speed can be set on the built-in flow control valve. The user must determine the ideal agitator speed for a particular fluid. The agitator propeller is enclosed within a protection ring.
– Technical Product Description B.18.10.05-P

WHEN A DIAPHRAGM PUMP WITH CONTAINER COVER AND AGITATOR IS AFFIXED TO THE LIFT, THE DIRECTIVE ON FLAMMABLE LIQUIDS (VBF) PROHIBITS THE USE OF THIS ASSEMBLY FOR HIGHLY FLAMMABLE LIQUIDS CLASS AI AND AII (AGITATOR DESIGN NOT APPROVED).

THE DIRECTIVE DOES NOT APPLY IF AT THE PLACE OF WORK (IN THE CONTAINER) AI OR AII LIQUID IS ONLY KEPT IN SUCH QUANTITY AS IS SUFFICIENT TO CONTINUE WORK.

LIST OF TOOLS

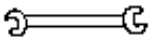
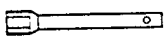
Piston pump	 Allen wrench DIN 911							 Open-ended Spanner DIN 895		 Pliers DIN 5256-C ø 19 - 60	 Open-ended socket DIN 659 12
	3	5	6	8	10	14	17	22	30		
F 015.085-DP	X	X	X	X	X	X	X	X	X	X	X

Fig. 17

Open-ended spanner DIN 895

SW 27 Threaded fitting for suction and pressure connectors

SW 41 Threaded fitting for suction kit / union nut

SW 41/36 Threaded fitting for suction reservoir / union nut

SW 17 Hose DN 6, G 1/4 (fluid pressure system)

SW 22 Hose DN10, G 3/8 (fluid pressure system)

INSTALLATION

INSTALLATION AND MOUNTING

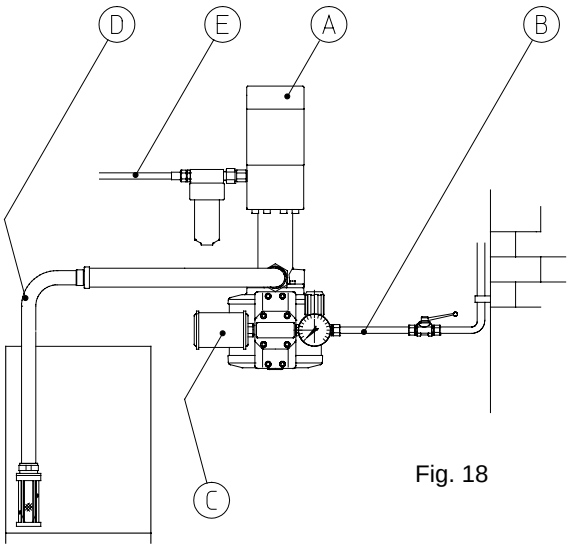


Fig. 18

Install or mount the piston pumps in a vertical position.

- The wall should be level and offer suitable support
- Plugs and mounting hardware must have correct dimensions

Do not install in narrow, enclosed spaces (e.g. cabinets (- danger of malfunctioning due to icing of the air motor control). When the pump is installed in explosive hazardous atmospheres, Zone 1, the guidelines for explosion prevention (EX-RL) ZH 1/10 (section E2) must be met regarding assembly aids.

Do not install the pumps in zone 0 locations (containers).

GROUNDING

The units must be grounded when used in explosive-hazardous locations.

In accordance with the directive on "Static Electricity" ZH 1/200, the following applies:

The grounding wire must be mechanically resistant and corrosion-proof to withstand all conditions to which it may be subjected during operation. The conductors who establish the grounding should be connected to unit and the earth by soldering, welding or stable screw fittings. Do not use chains. When making connections, in particular to pipelines, ensure that the conductor is not interrupted by non-conductive parts or during repair work.

A qualified engineer must test the grounding connection for correct working conditions.

- Grounding points on the units are appropriately marked: 

Movable, conductive vessels or units, which could store an electric charge, should also be grounded. This is usually achieved with a flexible connection that is secured, for example, with a clip.

- Chains may not be used.

VENTILATION OF WORK AREA

- Must be ensured

COMPRESSED AIR SUPPLY

The compressor and air storage receptacle (pressure tank) must be of sufficient size
- Check thoroughly

- see also page 6, "Quality of Compressed Air".

CONNECTIONS

Compressed air tube ↔ piston pump,

Suction tube ↔ piston pump,

Pressure line ↔ piston pump

Flexible and, in explosive locations, electrically conductive

- see pages 7 to 10

COMPRESSED AIR LINE

When an air line needs to be installed, it must have a gradient of <u>3 to 5 mm per metre</u> down to the compressed air tank or the water drain.

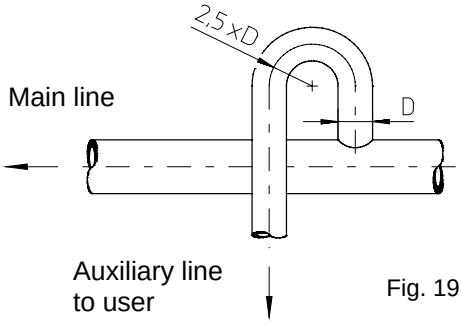


Fig. 19

When a branch line has to be installed from an existing air line, it should connect above the line axis.

In the case of bends in metal air pipes these should be selected with a bend radius of the pipe axis not smaller than 2.5 x the pipe outside diameter.

- Plastic tubes in hazardous locations must have a resistance to earth of < 10^6 Ω.

AIR REGULATOR (PRESSURE REGULATOR), GAUGE AND BALL VALVE

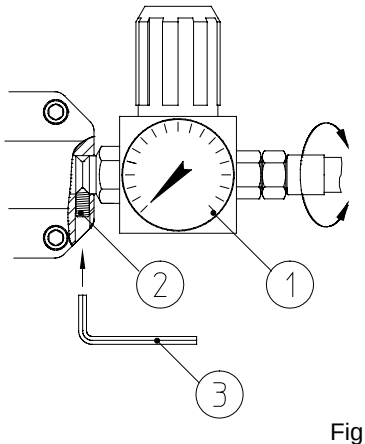


Fig. 20

- See page 5

When the pressure regulator ① has been factory-fitted to the piston pump, it can be adjusted for easy reading of the pressure gauge.

- Loosen the threaded pin ② in the slide housing with an Allen wrench ③
- Adjust the pressure regulator
- Tighten the threaded pin

MUFFLER

see page 6

- Manually check whether the muffler is well tightened

FLUID SUCTION SYSTEM

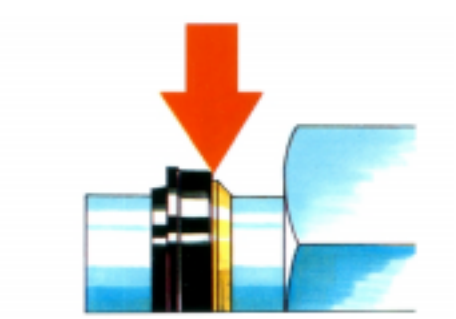
When attaching the suction kit to the threaded connection:

- Insert the tube end of the suction kit into the connector and press it against the stop in the internal taper.

When the end of the tube does not touch the stop, the installation is incorrect.

- Continue until clear resistance is felt
  - Use the connector as a hold

Assembly check



Loosen swivel and check whether there is no clearance between the sealing ring and the retaining ring.

Reassemble after loosening; apply the same torque as during the final assembly.

Use the connector as a hold.

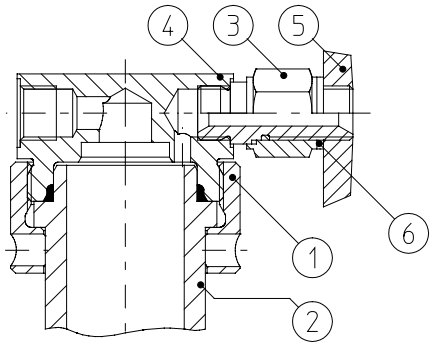
Fig. 21

FLUID PRESSURE SYSTEM

see pages 8 to 10

Usually, the piston pump is fitted with filter screen PN 500.

If it must be fitted later, please follow the procedure below:



- Loosen the swivel ① and remove the filter housing ②.
- Turn the nut ③ softly against the hollow screw stop.
- Screw the connector ④ (with hollow screw and nut) as far as possible into the piston pump ⑤.
  – Do not forget to fit seal ring A 17x21 ⑥.
- Turn the nut ③ against the piston pump (anti-clockwise).

Fig. 22

For the connection of a hose line, a connector with G ¼ or G•thread is screwed into filter PN 500.

– Do not forget to fit seal ring A 17x21 ⑥.

The connections of connectors and hose lines supplied by us have no seals (sealing head connections) and no special directions are needed for them.

– The same applies to the connection of a hose line to a spray gun supplied by us.

GENERAL ASSEMBLY INSTRUCTIONS

- Always apply the recommended torques.
- Grease thread lightly.
- Do not use PTFE tape or hemp.
- Components not supplied by us must have dimensions that correspond to the given dimensions of the piston pump.
  – Observe the manufacturer's instructions

- Observe manufacturer's assembly instructions when using cutting rings or double conical rings.

When fluids which contain chlorinated hydrocarbons (carbon hydrides), e.g. trichloroethane or dichloromethane, are to be pumped, the wetted parts of the suction and pressure systems may not be made of aluminum or have a zinc-plated surface.
- Explosive and extremely caustic metal organic reactions may occur.

COMMISSIONING

INSTALL THE FILTER ELEMENT

Filter elements mounted on the piston pumps have no screen element.

Screen inserts must be installed later (choice of mesh size depends on spray tip used).

- Remove the union nut and take of screen housing.
  Insert the filter element over the support spring into the housing and re-install the housing.

FLUSHING THE PUMP

Because every piston pump is factory-tested with an anti-corrosion fluid after assembly, it is necessary to flush out the remainder of that fluid thoroughly with solvent (flushing agent), as well as any other contaminants that have entered during installation.

Air-drying does this.

– Air inlet pressure < 1 bar.

SETUP OF THE UNIT / EQUIPMENT

Because the piston pump air motor works automatically with back pressure, it can only be set up (i.e. fluid be supplied) when fluid is discharged from the pressure system, e.g. by using a spraying gun.

Release the air supply to the pressure regulator.

- Open pressure regulator.

- Ball retaining valve handle parallel to compressed air line

Open the fluid supply.

- Open pressure line (spray gun).

BLEEDING THE PUMP / EQUIPMENT

Any air remaining in the piston pump or the system must be removed completely.

Check whether the suction system (suction tube) is immersed in the fluid.

- Open air regulator slowly until the piston pump starts
  (air pressure approx. 0.5 bar).

- Operate the piston pump with low working pressure
  until no more air is pumped.

- Piston pump / equipment is ready for operation.

LOW AMBIENT TEMPERATURE

During setup or operating the equipment in ambient temperatures of around 10 °C, anti-freeze should be added to the air from a dosing apparatus (air lubricator). We recommend ethylene glycol, diluted, with high-pressure additives, 1000 ml , article no. 75682 114002).

IMPORTANT INFORMATION CONCERNING SETUP AND OPERATION

The piston pump should only run dry for short periods of time under supervision and with low air inlet pressure. Running dry after a fluid has passed through it must be strictly avoided. It will damage or destroy important component parts.

Continuous operation at very high frequency can accelerate icing (see Technical Product Description B.6.20.50-P, page 03)
(Increased pulsation, or even stalling of the pump) and it will reduce the life of the equipment as a result of increased wear of the seals.

Do not remove the suction hose/suction tube from the fluid, while the pump is in operation.
– Air will enter into the system, causing spray pattern irregularities.

Do not remove any parts (e.g. mufflers) from the piston pump during operation.

Never immerse a running agitator propeller into a filled fluid container.
– Increase the speed of the immersed agitator propeller only gradually.

Wear personal protection (respirator, goggles, gloves, etc.) when working with fluid that has a health hazard.

When the spray system is activated, be aware of the recoil forces that are released (keep a tight grip on the gun, use a secured stand, work with care).

Because of the risk of fluid injection into skin, never place the spraying equipment directly on any part of the body (thumb, flat of the hand, etc.)

Never direct spraying equipment at humans or animals.

OPERATION

The piston pumps run automatically, i.e. during operational shutdown (outlet of the fluid pressure system is closed) no fluid is pumped. If there is a slight leakage, however, pumping will start.

It is therefore recommended that the pump is disconnected from the air supply overnight or at the weekend and, if possible, material pressure is released (after the air is disconnected.) This can be achieved by using a spray gun for example.

Before a long-term shutdown, e.g. before the holidays, paint pumps must be flushed. To prevent paint residue in the pump from hardening out, flushing agent should be left in the pump during the shutdown period.

We recommend an alkyl sulfon acidic detergent for long-term shutdowns, e.g. "ASE".

Consult the material supplier concerning the compatibility of the detergent.

Do not use nitro thinners or solvents as flushing agents.

MAINTENANCE AND INSPECTION, REPAIR

MAINTENANCE AND INSPECTION

ORION® PISTON PUMPS REQUIRE LITTLE MAINTENANCE

- If there is no automatic water drain from the compressed air supply, condensation water should be drained from the pressure tank, filter or filter regulator daily.
- When using anti-freeze (when operating at around 10 °C), refill it after use.
- Check the strainer at the suction side regularly.
  - The cleaning interval depends on the process fluid or solvent and must be determined by the user.

- Check the performance of the safety valve in the piston pump once a year. They have been installed in the air motor. Exceed the maximum working pressure slightly (opening pressure up to 1.1 times the maximum working pressure).

- Empty filter PN 500 regularly.
  – The upper part remains on the pump; clean all other parts thoroughly.
  The cleaning interval depends on the process fluid or solvent and must be determined by the user.

- The service life of the hose lines is shortened, by surrounding influences (oxygen in air, temperature, light, etc.), even if they are handled correctly.
  It is recommended that they undergo regular visual checks and occasional checking of performance.
  – As a precaution, hose lines should be replaced at intervals set by the operator (- after 2 to 3 years).

Do not carry out any dismantling work on a pressurized piston pump.

Check piston pumps regularly while in operation (on a daily basis!) while in operation

When an increase in the pressure pulsation is observed during the daily inspections, this can be caused by one of the following:

- Piston valve worn
  – Check or replace valve

- Packing worn
  – Check or replace packing

If the working pressure drops in a closed fluid pressure system (gun not triggered), this is caused by a suction valve (valve in pump piston) leakage.

– Replace the valve

When a fluid leakage is observed from the drain hole in the cylinder cover during the daily inspections, the bellow is defective.

Turn off the pump immediately to prevent any further damage.

- When the bellows are defective, the pump cannot be operated and must be replaced immediately.

When, during the daily inspection, the sound of escaping air is heard from the muffler while the piston pump is not operating, this may be an indication of advanced wear of air motor components.

- When the sound level increases in the course of a few days, the carriage and plate should be changed.

REPAIR

Repairs must be carried out by qualified engineers (VBG 87).

Before disassembly, ensure that the air supply to the piston pump is shut off safely, and relieve the pressure of the piston pump.

Use only genuine replacement parts. Our obligation to replace pumps / aggregates no longer applies if non-genuine replacement parts are used (Product Liability Law of 15 December, 12 1989).

After disassembly, thoroughly clean all parts to be reused.

Do not damage sealing surfaces; do not throw parts around or hit them; do not use any cutting tools.

Renew all removed seals.

Lubricate all threads and fittings before assembly (grease lightly).

When traces of wear can be seen on running or sealing surfaces the components affected must be replaced.

CHANGING WORN PARTS IN AIR MOTOR

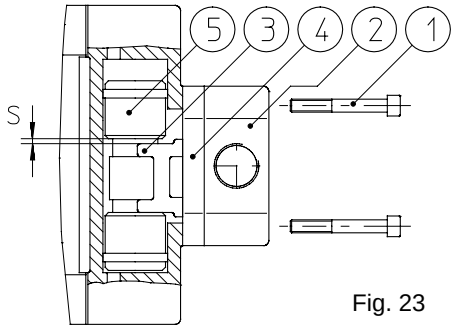


Fig. 23

- Unscrew and remove cylinder screws ①
- Remove the connection part ②
- Replace carriage ③ and plate ④

The carriage ③ and plate ④ should always be replaced together as a kit.

When it appears, during replacement of the carriage, that the clearance (“S”) between the friction rod ⑤ and the new carriage is > 0.8 (i.e. rod worn), the rod should be replaced as well.

The rod is supplied with tensioned piston rings.
Do not disassemble.

REPLACING THE PACKINGS

Separate the pump lower from the air motor.

- Unscrew and remove cylinder screws ①.
- Unscrew and remove cylinder screws ②.
- Loosen the piston ③ using spanner SW30
  - Hold the threaded connector ④.

Then:

- Remove valve housing ⑤.
- Take out cylinder ⑥ and piston from the top.
- Remove the screw ⑦ from the piston using the hex wrench.
  – Clamp the piston to the flat side of the spanner.
- The profiled sleeve ⑧ can now be replaced.
- Pull the profiled sleeve ⑨ with washer ⑩ from the housing ⑪.

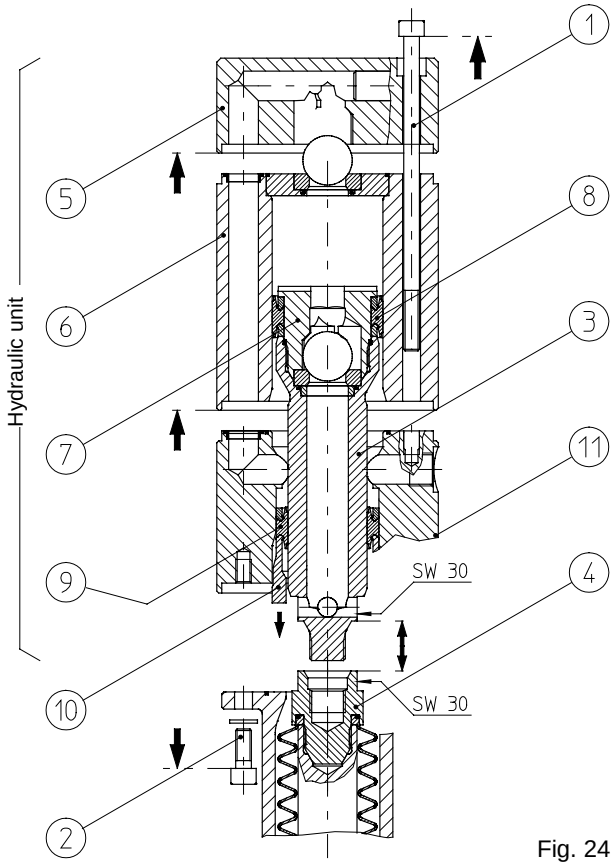


Fig. 24

Assemble in reverse order.

When, during disassembly, the piston or cylinder show clear signs of wear (scoring, indentations), any worn component must be replaced, too.

Retighten the hollow screw firmly, loosen it again and tighten it again every Monday. Check during loosening whether the loosening torque is substantially above the tightening torque.

Do <u>not</u> damage the running surfaces of the piston during maintenance or repair work. The flat side of the sides (“X“) should be used for clamp this part.

REPLACING THE VALVES

- Unscrew and remove cylinder screws ①.
- Unscrew and remove cylinder screws ②.
- Remove valve housing ⑤.
  – The pressure valve can now be accessed.
- Take off the cylinder ⑥ and move the piston ③ to its highest position.
- Lift off the hydraulic unit far enough from the air motor such that the piston can be held by the flat side “X” of the spanner.
- Remove the hollow screw ⑦ from the piston using the hex wrench.
  – The suction valve can now be accessed.

The valve seats ⑫ have been designed to be turned over and reused if one side is worn (dual-side seats).

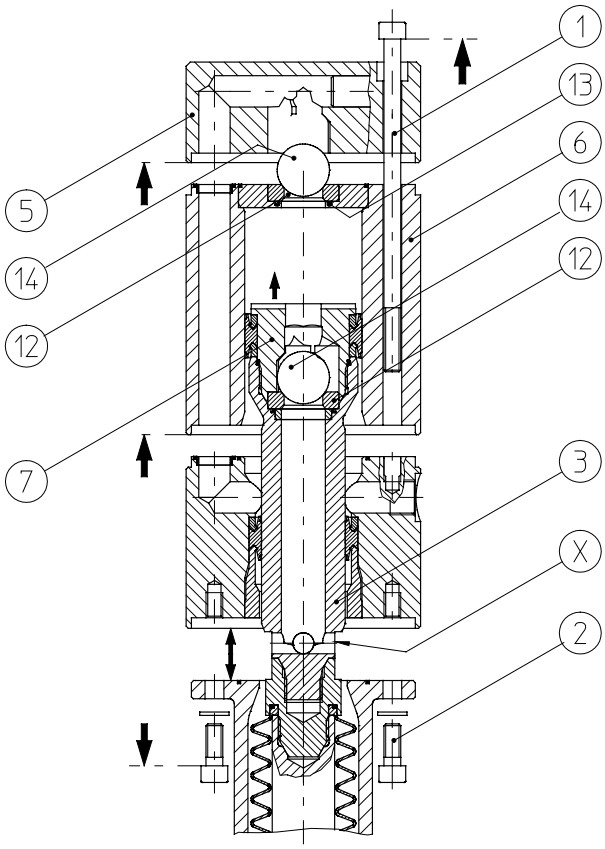


Fig. 25

Replace the profiled seal ring ⑬ under the valve seat when it is worn (clearly deformed). Note the positions of the seal rings.

Whether the balls ⑭ can be reused depends on the extent to which they are worn. We recommend replacing the balls, since ball wear is hard to determine.

REPLACING THE BELLOWS

Separate the pump lower unit from the air motor.
– see page 22

Separate the housing ① from the air motor.

- Unscrew and remove cylinder screws ②. Remove the housing.
- Move the piston rod ③ with the threaded connector ④ to its highest position.
- Loosen and remove threaded connector.
- Replace bellows ⑤ and O-rings ⑥.

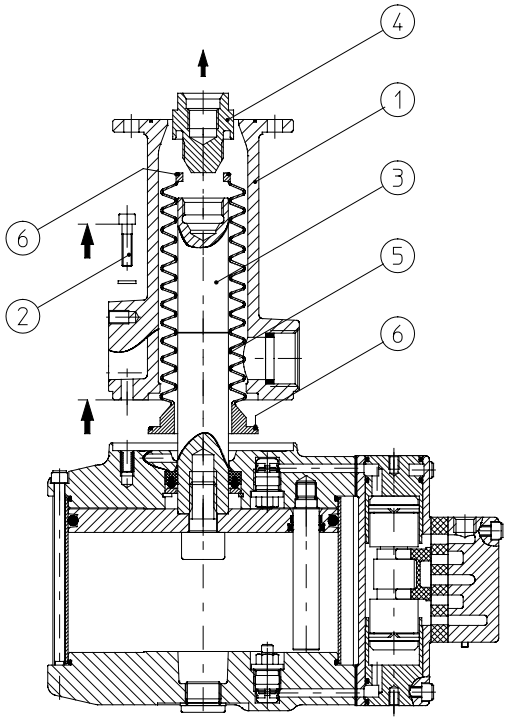


Fig. 26

Assemble in reverse order.

- Attach the bellows first to the piston rod using the threaded connector. Only then should the gear housing be tightened.

Do not twist the bellows while installing them.
– Danger of damage

Do not damage the corrosion protection impregnation of the housing
– Do not use any sharp or metal removing tools.

REPLACING THE SUCTION UNIT

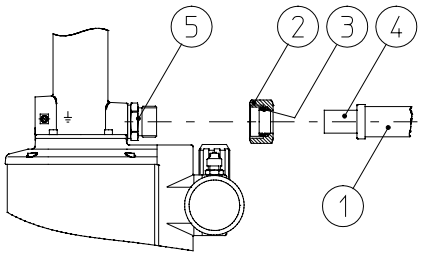


Fig. 27

When the suction unit ① must be replaced, the union nut ② must be replaced along with it.
- Swivel nut with seal ring, Part No. 75089 100003.

When the seal ring ③ is defective, it can be pulled off the free end of the tube, after removing the swivel nut. After this, slide the new seal ring on the tube end ④, with the inner metal taper directed to the stop ring.
– Sealing ring, Part No. 75188 097003.

Mounting the suction unit

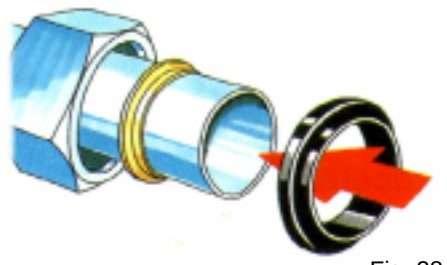


Fig. 28

- Insert the tube end ① of the suction assembly into the connector ⑤ and press it against the stop in the internal taper.
- Tighten until clear resistance is felt.
- Use the connector as a hold.
- Assembly check
  - see page 16

Replacing the O-ring of filter PN 500

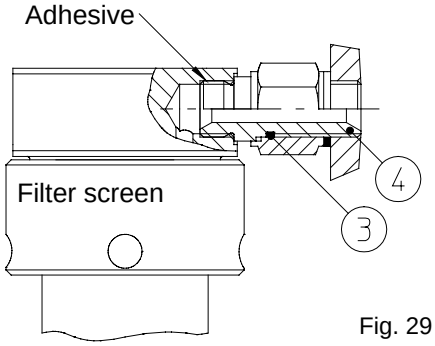


Fig. 29

If the O-ring ③ is damaged during the installation of filter PN 500 (see page 16) as a result of incorrect installation, a new O-ring must be pulled over the covered (taped) threaded part of the hollow screw ④ only.

THREADED CONNECTIONS

Do not exceed the tightening torques below when tightening threaded connections.

TIGHTENING TORQUES

Pos.	Screw	Tightening torque
1	M 8 – 10.9	25 Nm
2	M 8 – 10.9	25 Nm
3	M 6 – 10.9	12 Nm
4	M 6 – 10.9	9 Nm
5	M16 – 8.8	160 Nm
6	M 6 – 8.8	9 Nm
7	M 6 – 8.8	7 Nm

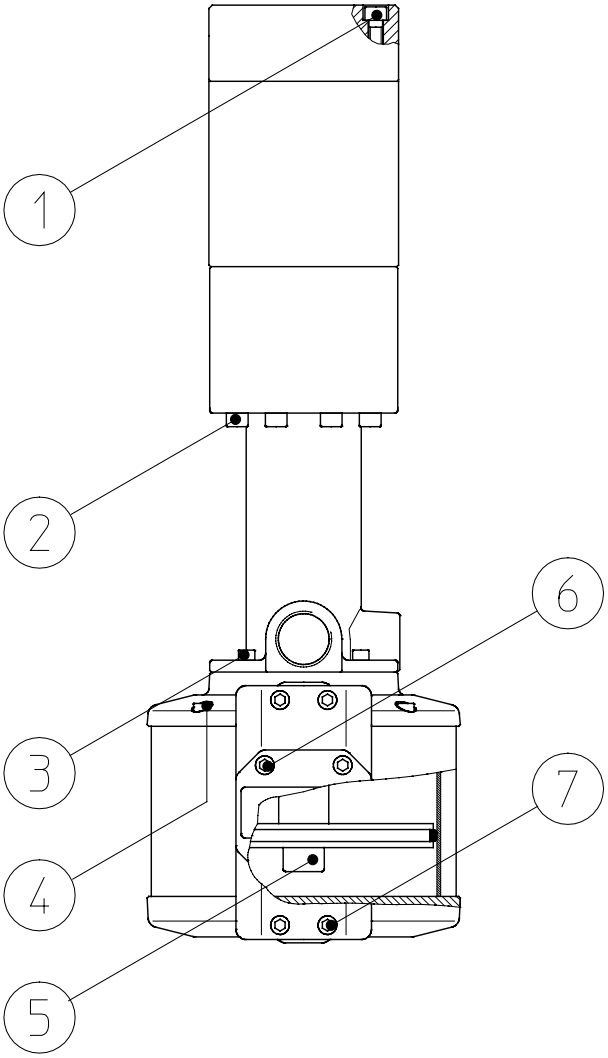


Fig. 30

SHUT DOWN

When the air motor pressure is relieved while the fluid pressure system is still pressurized, fluid pressure can increase under certain system conditions.
Relieve the pressure of the piston pump (air and fluid) only by discharging fluid when the air feed is shut off.

FOR A SHORT PERIOD

- Shut off the air supply
- Relieve pressure in the piston pump by discharging fluid (e.g. by using the spray gun)

FOR A LONGER PERIOD, FOR A HOLIDAY PERIOD

- Flush piston pump well
- Leave solvent in the piston pump
- Shut off the air supply
- Relieve pressure in the piston pump by discharging flushing solvent (e.g. by triggering the spray gun)

FOR A LONG PERIOD

- Flush piston pump thoroughly
- Pump solvent out of the piston pump
- Shortly run the piston pump empty at the lowest air pressure level
- Interrupt air supply to the piston pump (screw off)

TROUBLESHOOTING

- Error analysis on next page

ERROR ANALYSIS

Component group	Nature of defect	Defect symptoms	Possible causes	Solution
Air supply	Drop in fluid pressure	Heavy leakage	Defective fitting	Replace defective fitting
		Narrowing of cross section	Hose line kinked, dirty fittings	Check hoses, clean fittings
Air motor, control	Irregular operation, stroke frequency drop, pump stalls	Icing	Air too moist, stroke frequency too high, ambient temperatures too low	Remove ice, change operating conditions
	Air escapes continuously from the air exit	Carriage or plate defective	Foreign substances have entered system, wear	Replace defective parts, check air filter
Lower pump	Suction not effective, running irregularly	Leakage in suction system, loose connections	Rigid pipework, damaged seal	Flexible connection between pump and suction system, replace seal
	Pressure variations		Pump not bled	Bleed pump
		Packings defective	Wear	Replace worn parts
Bellows	Fluid drains out of drain hole in air motor	Bellows ruptured, O-rings defective	Incorrect application, worn	
Suction valve	Pump does not hold fluid in down stroke	Valve seat, - ball defective	Wear	
Drain valve	Pump does not hold fluid in down stroke	Valve seat, - ball defective		
Piston	Pressure variations	Scratches on the working surface		
Of suction unit	Pump runs irregularly	Strainer clogged	Fluid contaminated	Clean strainer

NOTES

NOISE REDUCING MEASURES

- Important for the demanding paint spray company

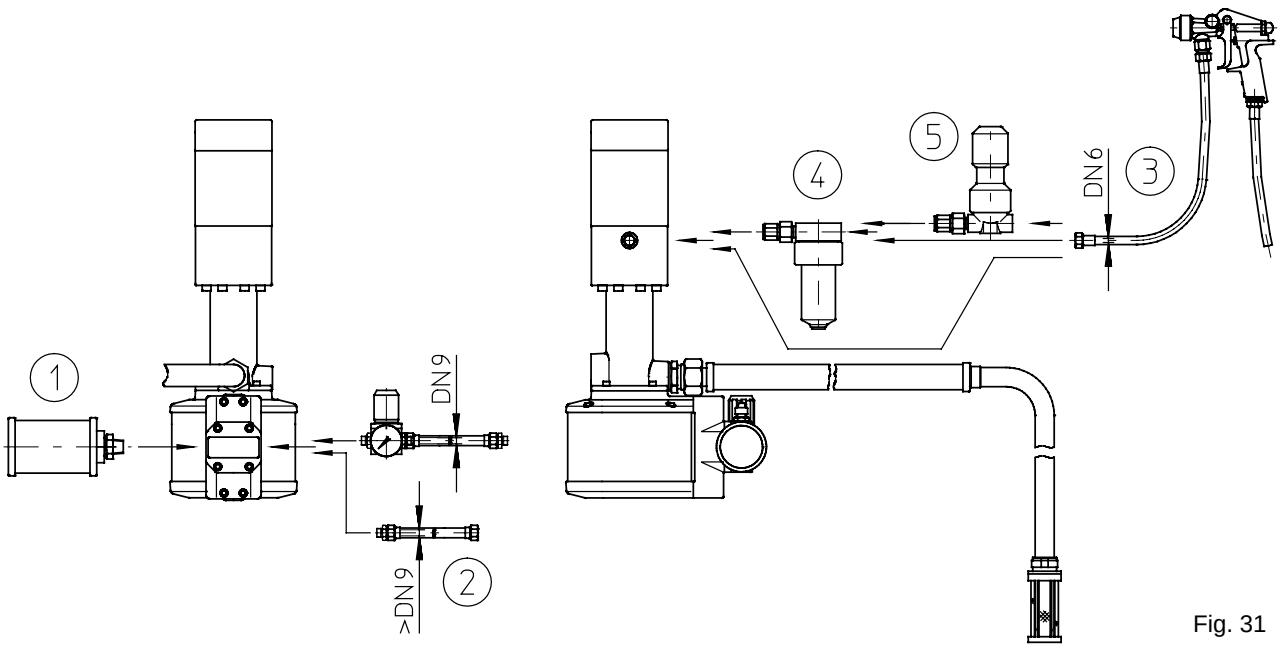


Fig. 31

It is good working practice to ensure that the air is available in sufficient quantities without great variations in pressure.

(1) Using a larger volume muffler
Part No. 77655 001001

(2) Using a large diameter air hose line ≥ DN9 between the pressure regulator and the air inlet of the piston pump

(3) Using fluid hoses with a ≥ DN6 diameter
Application of pulse dampening fluid hoses
– P250/6 G1/4 length 7500 Part No. 75844 024005
– P250/6 G1/4 length 10000 Part No. 75844 024006

(4) Installing a filter

(5) Installing a pressure regulator

Added measures affect the increase of the pressure drop correspondingly.

The largest pulse reduction is achieved by using the pulse reducing hose line P250/6 G1/4.

SELF-CHECK

When ORION® piston pumps are operated unsupervised, dangerous situations can be avoided with the automatic self-check feature.

A stop valve, is particularly suitable for this purpose as it interrupts (shuts off) the air supply to the piston pump when the set limit is exceeded (e.g. due to excessive stroke frequency in case of a line breakage).

GUIDELINES AND DIRECTIVES TO COMPLY WITH

VBG 23	Verarbeiten von Beschichtungsstoffen*
VBG 23 DA	Durchführungsanweisung zur Unfallverhütungsvorschrift "Verarbeiten von Beschichtungsstoffen"*
VBG 87	Arbeiten mit Flüssigkeitsstrahlern*
VbF	Verordnung über brennbare Flüssigkeiten*
ZH1/10/EX-RL	Richtlinien für die Vermeidung der Gefahren durch explosionsfähige Atmosphäre mit Beispielsammlung - Explosionsschutz-Richlinien - (EX-RL)*
ZH1/200	Richtlinien für die Vermeidung von Zündgefahren infolge elektrostatischer Aufladung*
ZH1/406	Richtlinien für Flüssigkeitsstrahler (Spritzgeräte)*
DruckbehV	Druckbehälterverordnung*
Merkblätter	Gefährliche Arbeitsstoffe (Band 1 bis 5) Kühn, Birett / Druckerei Laub GmbH / Elztal-Dallau

* Carl Heymanns Verlag KG, Luxemburger Str. 449, 50939 Köln

USER INFORMATION

The user information (operating instructions) contains all necessary information about Orion piston pumps, in accordance with the sales catalogue 01.2050.

The Technical Product Description B.6.20.50-P, and the Replacement Parts List are standard parts of every operating manual. For organizational reasons they are issued as separate documents.

Air-powered, double action
piston pumps recommended for
coating materials and process materials.

DESCRIPTION OF THE PISTON PUMPS

Piston pumps consist of an oscillating air motor Ⓐ and a lower pump Ⓑ. The air motor piston ① is connected to the piston ② of the lower pump via the piston rod ③ and the coupling ④. The bellows ⑤ protect the piston rod against contact with the fluid.

- No flushing agent reservoir required

Compressed air is applied alternately to the ring piston via the control ⑥ which leads to the upwards and downwards strokes. The area ratio between the ring piston and the thinner part of the piston represents a pressure ratio of [D^2 : d^2].

The downstroke causes the process fluid to be sucked into the upper section of the hydraulic cylinder ⑦ via the suction valve ⑧, while the fluid in the lower cylinder section exits the pump under pressure at the fluid outlet ⑨. The upstroke forces the fluid that is drawn (which is prevented from flowing back by the suction valve) into the lower cylinder section via the check valve ⑩ while, at the same time, it is pressed into the pressure system (line) via the pressure connection.
The process fluid volume is equal for the upstroke and the downstroke.

In a closed pressure system, there is a balance of forces [air pressure (p_L) x piston surface (A_D) = fluid pressure (p_M) x surface area of thin part of piston (A_d)] and the pump is standing.

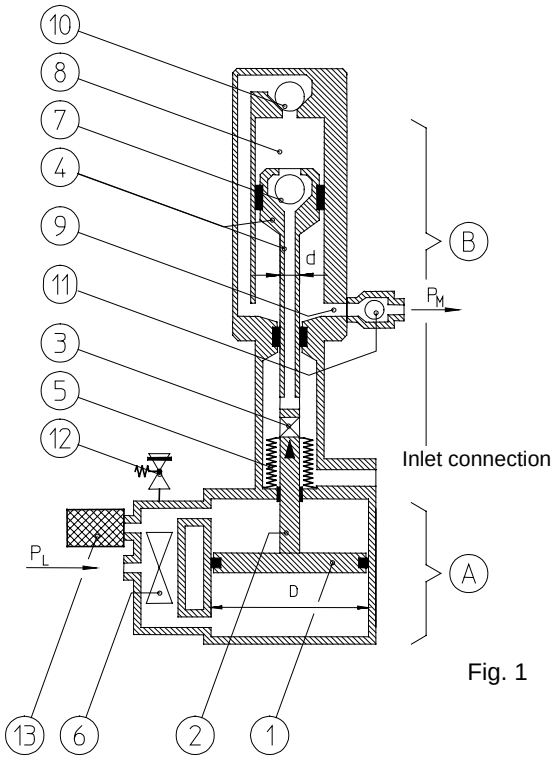


Fig. 1

Once the pressure system is opened, the pump starts automatically.
Even minor fluid leakage will be replaced.

In a large pressure system, a check valve ⑪ must be fitted to the fluid outlet because of natural variations in temperature (pressure rise due to heat causes increase in volume) – this also applies to hot spraying systems.

A safety valve ⑫ protects the piston pump and the pressure system when the air pressure exceeds its maximum permissible value.

The muffler ⑬ at the air outlet of the control reduces the sound of the exhaust air.

SUITABILITY, FLUID

FLUID	Suitability
Neutral	highly suitable
Corrosive	highly suitable
Abrasive	suitable under certain conditions
Caustic	suitable under certain conditions
Inflammable [1)]	highly suitable
Hardener	suitable under certain conditions
Hardener	highly suitable

[1)] Danger Classes AI, AII, AIII, piston pump grounded.

In the case of strongly abrasive and aggressive materials, please contact us.

Cinematic viscosity in mm^2/s			Suitability
	up to	500	Highly suitable
500	up to	750	Suitable
	over	750	Suitable under certain conditions (must be tested)

Solids content	Suitability
Low	Highly suitable
Low to 1%	Suitable
Medium 1 to 3%	Suitable under certain conditions
over 3%	must be tested – not suitable

TECHNICAL DATA

KEY TO DESIGNATION

PISTON PUMP WITH BELLOWS — F 015 . 085 - D P W

- F — PISTON PUMP WITH BELLOWS
- 015 — PRESSURE RATIO, E.G. 015 = 15:1
- 085 — FLUID FLOW (VOL.) IN CM^3/stroke, e.g. 085 = 85 cm^3/stroke
- D — ACTION: DOUBLE-ACTION
- P — DRIVE UNIT PNEUMATIC
- W — ADDITIONAL DETAIL: W = WALL MOUNT

THE MODULES

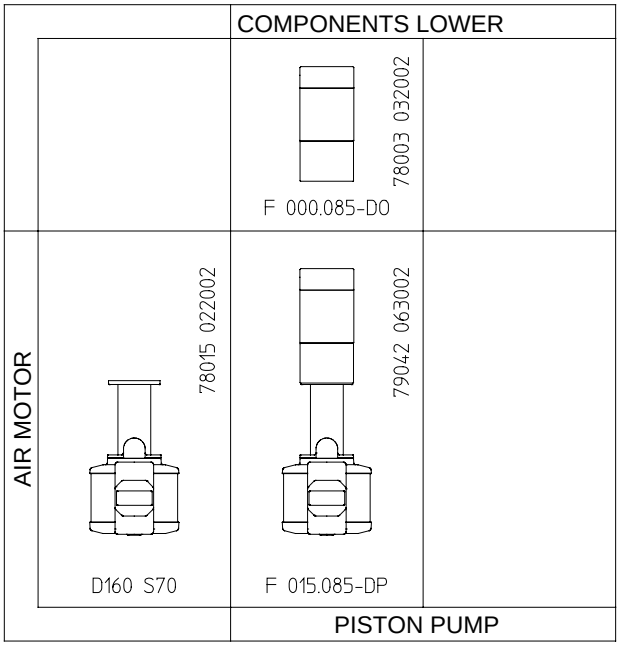


Fig. 2

DATA

Piston pump	Fluid Volume [cm^3 /DH]	Theoretic ratio I	Working pressure max. [bar]	Air pumping volume V_H [l]
F 015.085-DP	170	15 : 1	120	1.38

Air inlet pressure min.	0.5	Bar
Air inlet pressure max.	8	Bar
Operating temperature	10-80	°C
Suction height (pump empty)	2.5	M
Suction height (system full)	6.7	M

Never pre-pressure the pump.

Piston pump	Max. stroke frequency in DH/min			
	Continuous		Intermittent operation	
	- Full load	- Part load	- Part load	- Full load
F 015.085-DP	14	18	30	45

Key:

V = Flow velocity

DH = Double stroke

$I = \frac{\text{Fluid working pressure}}{\text{Air inlet pressure}}$

V_H = Stroke volumes – see table above

F = Actual stroke volume in DH/min

P = Actual air inlet pressure in bar

Air

$$\dot{V}_I = V_H \bullet f \bullet p \bullet 2.6 \quad \text{in l/min}$$

When piston pumps are working in continuous operation (day and night operation). the stroke frequency should be reduced, and extra noise reduction measures taken if necessary.

Piston pump	Fluid flow max. in l/min *	v = 0.4 m/s		v = 0.7 m/s	
		Stroke frequency in DH/min	Volume flow in l/min	Stroke frequency in DH/min	Volume flow in l/min
F 015.085-DP	25.6	4.2	0.8	7.1	1.3

When used for paint spraying: use silicone-free process materials (air) and accessories only.

* Free outlet (conform to DIN 24374 T1)

Sound emission

As the working places cannot be anticipated the highest possible sound level is shown.

Measurement distance

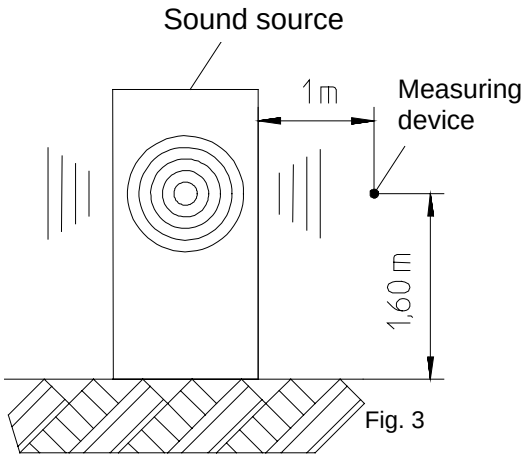
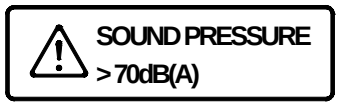


Fig. 3

	Air inlet pressure in bar			
	2	4	6	8
Sound pressure level in dB(A) at 50 DH/min	78	82	85	89



A warning information sign is attached to the piston pump.

CONSTRUCTION MATERIALS

OF WETTED PARTS

Pos.	Description	Material
1	Ball valve	1.4125
2	Seal ring	PE
3	Seal ring	PE
4	Valve seat	Hard metal
5	Packing	1.4305/Cr*
6	Piston	PE
7	O-ring	FPM
8	Bellows	PTFE
9	Coupling housing	Al, PTFE *
10	Bolts	POM
11	Seal ring	1.4571

* zinc plated

All wetted parts not listed here are made of 1.4305.

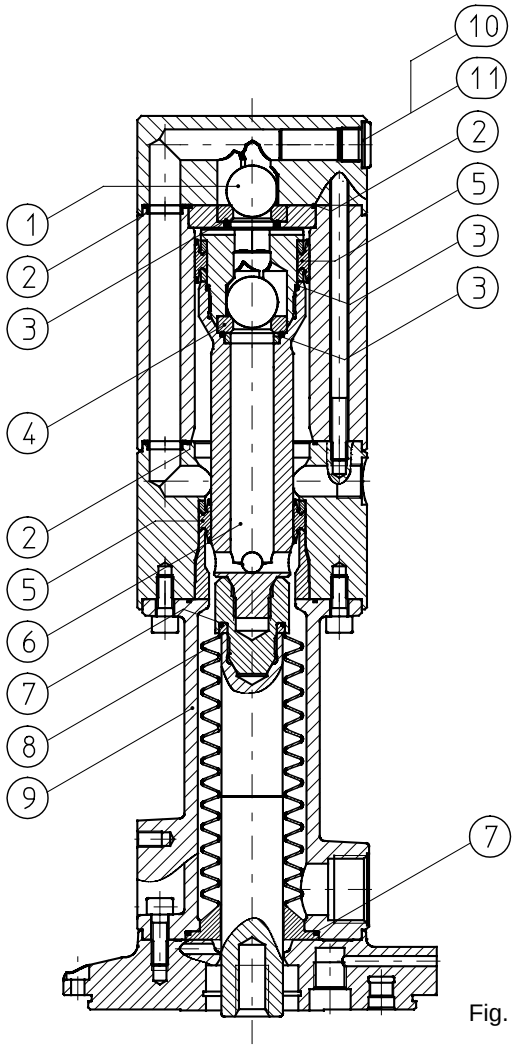
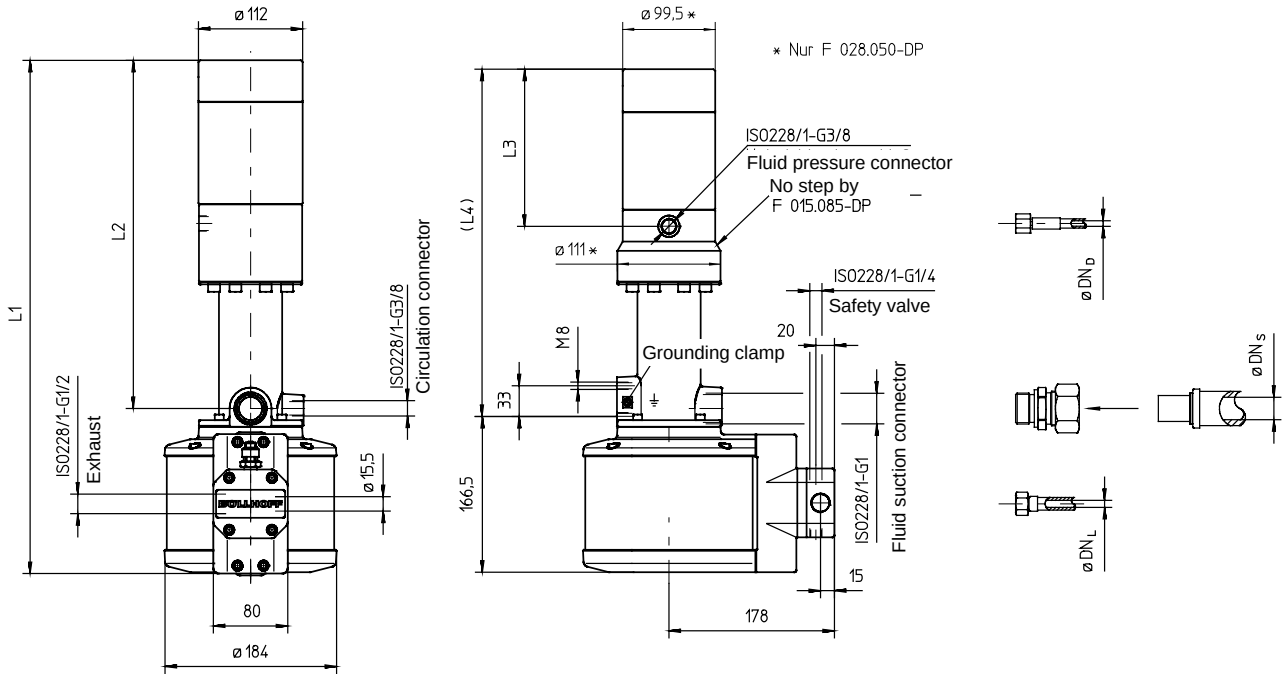


Fig. 4

DIMENSIONS, SCREW CONNECTION THREADS, RATED DIAMETER OF CONNECTIONS, MOUNTING POSITION



Piston pump	L1	L2	L3	L4
F 015.085-DP	552	377	178	385,5

Fig. 5

Air line	DN_L	≥	9
Fluid pressure line	DN_D	≥	6
Fluid suction pipe	DN_S	≥	25

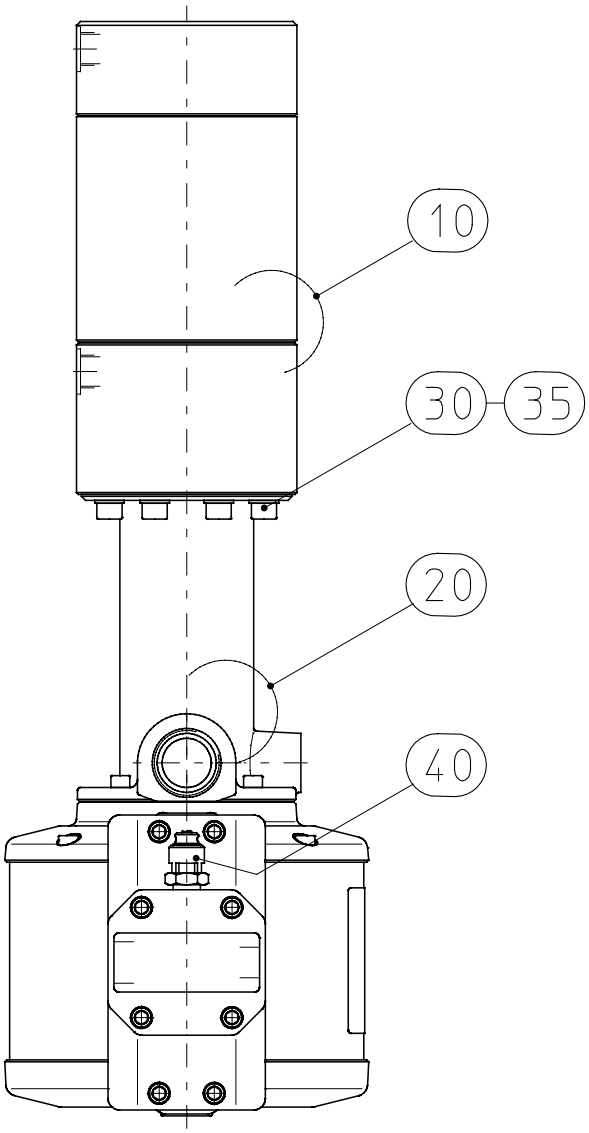
Elastic connections

Piston pump - compressed air supply

Piston pump - fluid container / line required

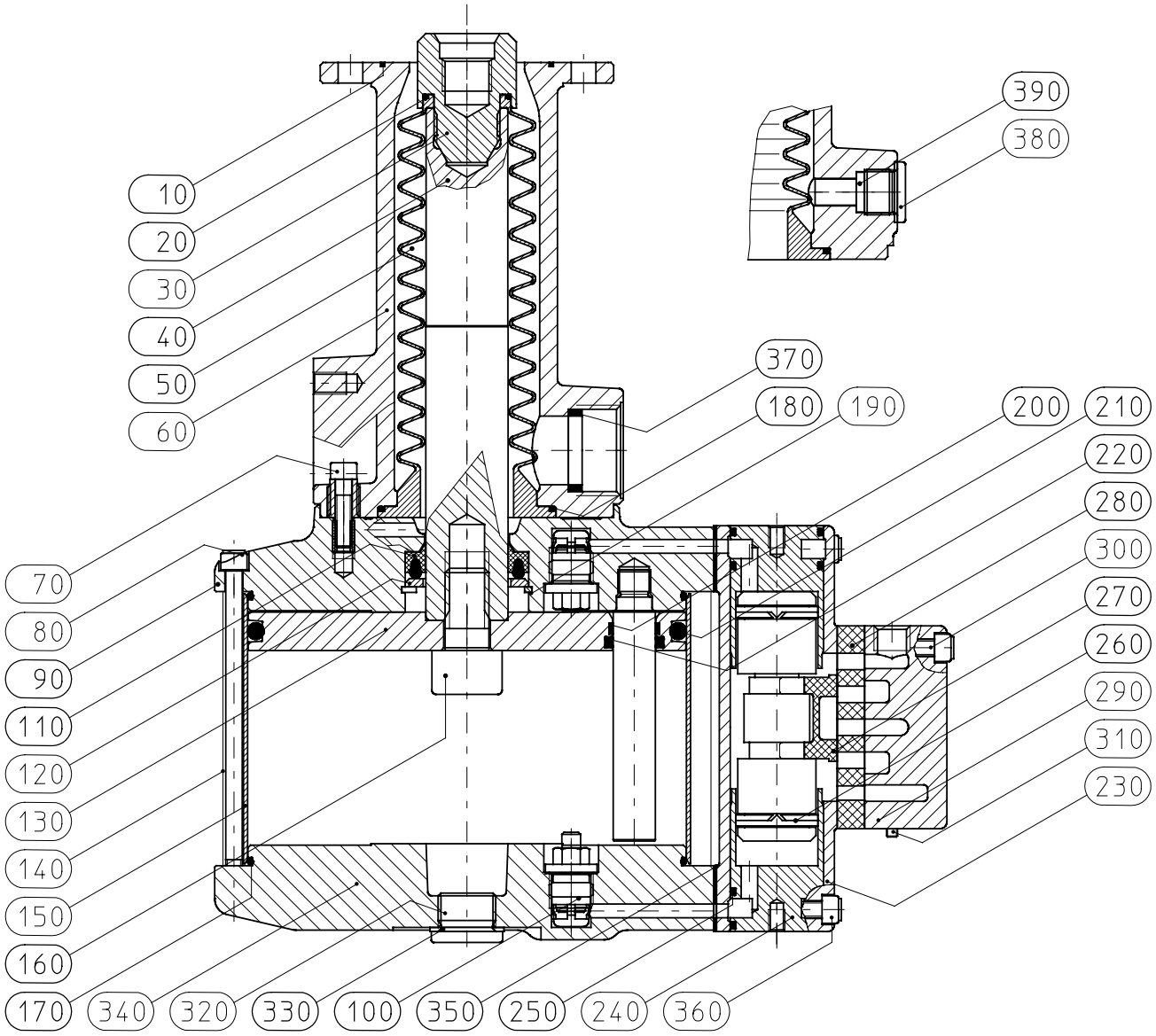
The piston pumps have ball valves which are not spring-loaded and therefore can only be operated in a vertical position or in a position slightly departing from the vertical.

Air motor in assembly in lower part of pump. Reversed installation not allowed – total functional failure.



	Lower pump Pos. 10	Air motor Pos. 20	Cylinder screw Pos. 30	Mounting plate Pos 35	Safety valve Pos. 40
Piston pump	Part No.				
F 015.085-DP	F 000.085-DO 78003 063002	F D160 S70 78015 022002	8 x M 8 x 20 74006 592033	8 x S8 75112 008007	1 x R ¼ PN 8 75591 008006

AIR MOTOR F D160 S70



AIR MOTOR F D160 S70

Spare part kit, air motor control				Part No. 79978 080001
Pos 250	4 pcs.	O-ring	30 x 2 B	
Pos 260	1 pce.	Drive pin		
Pos. 270	1 pce.	Carriage	31.5 x 31.5	
Pos. 280	1 pce.	Plate	For carriage 31.5	
Pos 350	2 pcs.	Flat packing	80 x 25 x 0.75	

Spare part kit, piston rod				Part No. 79978 081001
Pos 40	1 pce.	Piston rod	D30 L187	
Pos 160	1 pce.	Parallel pin	M16 x 30 PLAS	

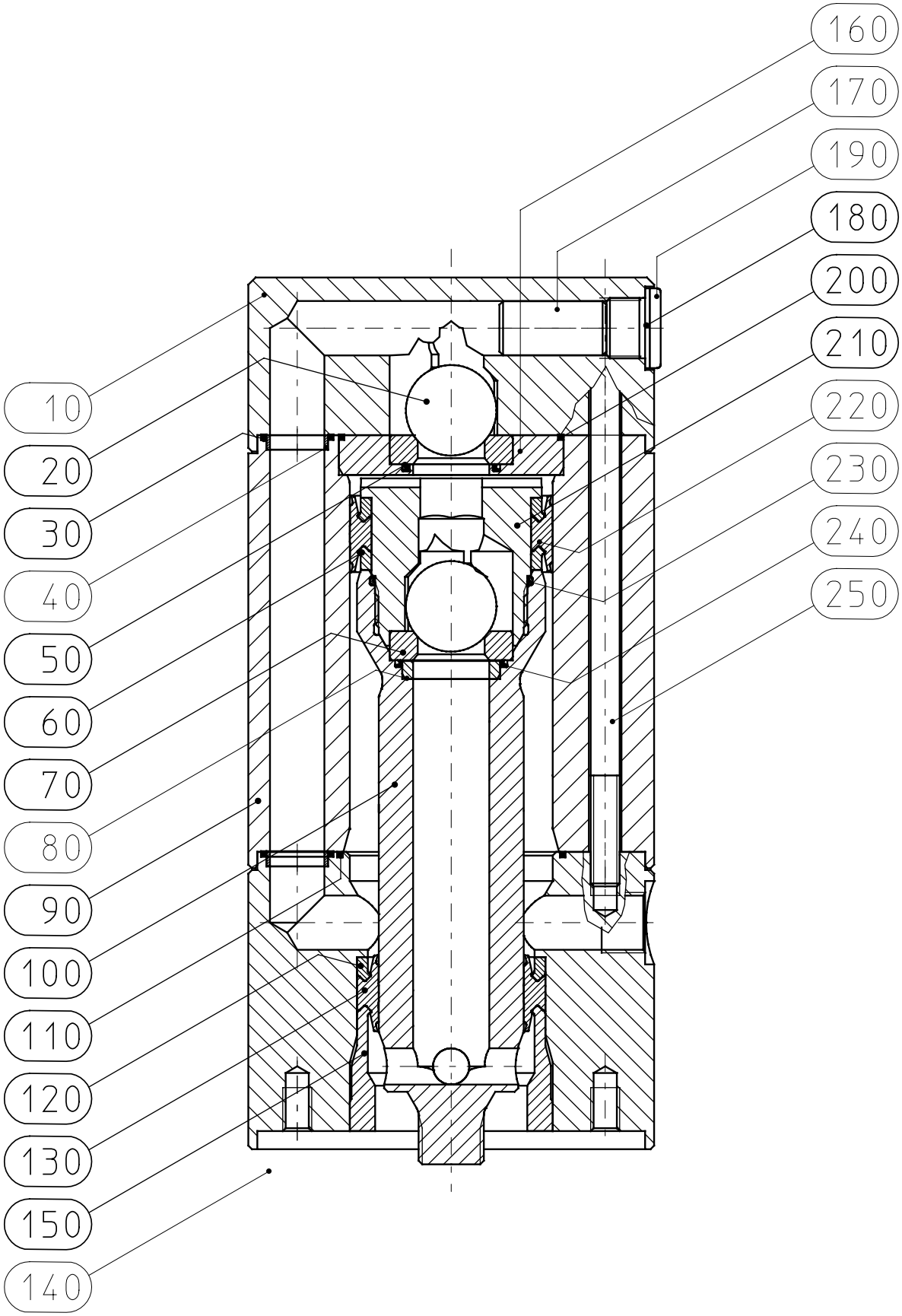
Spare part kit, air motor seals				Part No. 79978 082001
Pos 10	1 pce.	Seal ring	60 x 63 x 1.5	
Pos 20	1 pce.	O-ring	28 x 2 B	
Pos 110	1 pce.	Ring	G 30 x 45 x 12.5B	
Pos 170	2 pcs.	O-ring	150 x 3 B	
Pos 180	2 pcs.	O-ring	60 x 2.5 B	
Pos 200	1 pce.	Bearing	4 x 1.55 x 45	
Pos 210	1 pce.	O-ring	148 x 6 B	
Pos 220	1 pce.	X-ring	15.55 x 2.62	
Pos 250	4 pcs.	O-ring	30 x 2 B	
Pos 330	1 pce.	Seal ring	A 21 x 26	
Pos 350	2 pcs.	Flat packing	80 x 25 x 0.75	
Pos 370	1 pce.	Seal ring	25 x 30 x 5	
Pos. 390	1 pce.	Bolts	9.5 x 15	

Spare part kit, bellows				Part No. 79978 083001
Pos 20	1 pce.	O-ring	28 x 2 B	
Pos 50	1 pce.	Bellows	D50 L157/70	
Pos 110	1 pce.	Ring	G 30 x 45 x 12.5B	
Pos 180	1 pce.	O-ring	60 x 2.5 B	

Single part, cylinder cover				Part No. 77536 042001
Pos 90	1 pce.	Cylinder cover	D160	

Single part, end valve				Part No. 78592 010001
Pos 100	1 pce.	End valve	DN5 M16x1.5	

LOWER UNIT F 000.085-DO



Spare part kit, packing				Part No. 79978 084001
Pos 60	2 pcs.	Profiled ring	44 x 50 x 6.4	
Pos 120	1 pce.	Profiled ring	46 x 52 x 6.4	
Pos. 130	1 pce.	Packing	DN40 P120	
Pos 220	1 pce.	Packing	DN56 P120	

Spare part kit, seal rings				Part No. 79978 085001
Pos 30	2 pcs.	Seal ring	17 x 20 x 1.5	
Pos 50	1 pce.	Seal ring	23 x 27 x 1.5	
Pos 110	1 pce.	Seal ring	60 x 63 x 1.5	
Pos 180	1 pce.	Seal ring	A 17 x 21	
Pos 200	1 pce.	Seal ring	59 x 62 x 1.5	
Pos 230	1 pce.	Seal ring	42 x 44.7 x 2.6	
Pos. 240	1 pce.	Seal ring	27 x 31 x 2.3	

Spare part kit, suction valve + drain valve				Part No. 79978 086001
Pos 20	2 pcs.	Ball	25 mm	
Pos 70	2 pcs.	Valve seat	D 18.5	

Single part, cylinder				Part No. 76570 034002
Pos 90	1 pce.	Cylinder	D56 L115	

Single part, piston				Part No. 76592 068002
Pos 100	1 pce.	Piston	Hyd. DN56	

Single part, gland				Part No. 76106 044002
Pos. 150	1 pce.	Gland	42 x 56 x 34.4	

Single part, screw				Part No. 76031 072002
Pos 210	1 pce.	Screw	M42x1.5 x 46	

REPLACEMENT PISTON PUMPS
REPLACEMENT ACCESSORIES

(Extract from sales catalogue 01.2050)

Piston pumps, basic models

Piston pumps

F _____-DP

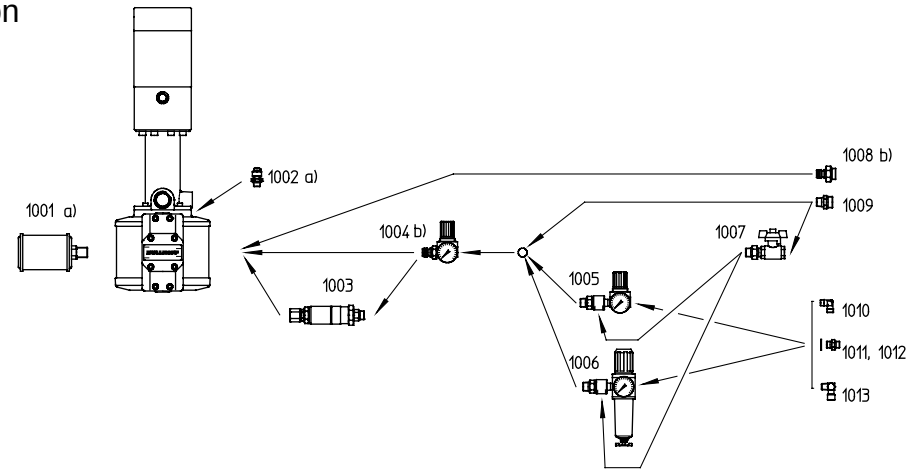
Model type

- without safety valve
- without muffler
- without connector

Pos.	Model type	Material	Weight (kg)	Part No.
002	F 015.085-DP	SST/PE	25	79042 063002

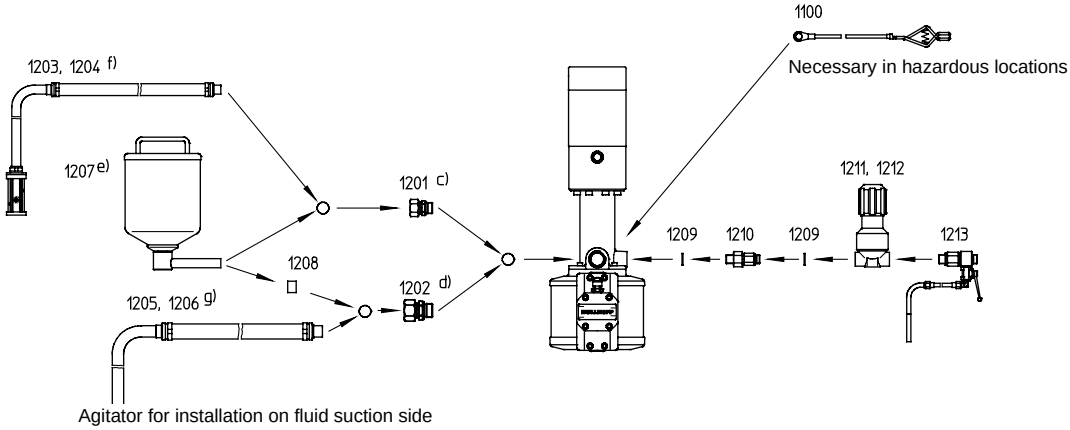
Accessories

Air connection

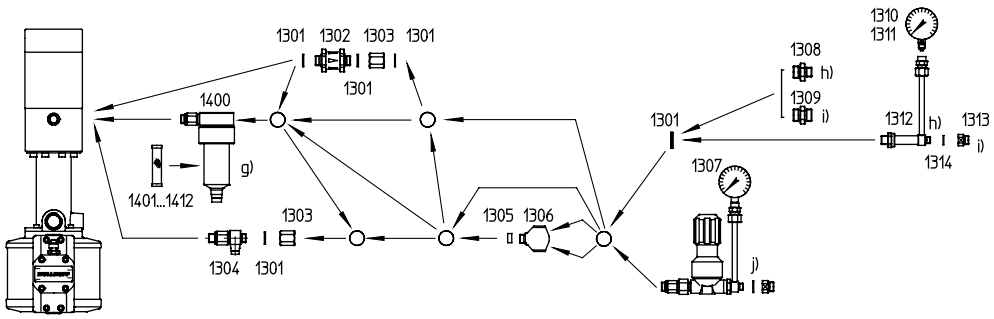


Grounding

Suction connection



Pressure connection



COMPLY WITH DIN 34 SAFETY STANDARD

	Pos	Description	Material	Notes	Part No.
Air connection .	1001	Muffler	-	G ½	75665007005
	1002	Safety valve	-	G¼ PN 8	75591008006
	1003	Stop valve cpl	-	G 3/8 PN 12	78594 001002
	1004	Pressure regulator complete	-	D15.5 G 3/8	77631 015002
	1005	Air connection complete	-	R 3/8 for gun	77522 011003
	1006	Air connection complete	-	R 3/8 for gun with filter	77522 007003
	1007	Ball valve complete	-	PN 50 R 3/8-G 3/8	77601 013002
	1008	Union complete	-	D 15.5- G 3/8	77638 002003
	1009	Connector	-	8 R 3/8 tap. –	76639 208001
	1010	Angular union	-	R ¼ tap. – M14x1	75214 006002
	1011	Connector	-	6-G ¼ A-M14x1	76639 014001
	1012	Seal ring	-	14 x 18	74188 015070
	1013	Bolted connection -W	-	R ¼ tap. - 8	75202 001008
Grounding	1100	Grounding cable	-	Length 8m	73483 001011
Suction connection	1201	Nipple	SST	GE 22 – ZLR 1-ED	75204 010003
	1202	Nipple	SST	GE 28 – ZLR -ED	75204 010005
	1203	Suction hose	SST	D22 30l container	78848 020006
	1204	Suction hose	SST	D22 200l container	78848 020007
	1205	Suction hose	SST	D28 30l container	78848 020008
	1206	Suction hose	SST	D28 200l container	78848 020009
	1207	Cup, cpld.	SST	5l – D22	77683 057002
	1208	Bushing	POM	22 x 28 x 20	76157 038002
	1209	Seal ring	SST	17 x 21	74188 012090
	1210	Adjustable nipple	SST	G 3/8 – G 3/8 L49	77239 008003
	1211	Pressure regulator	SST	P 100 – RM	79638 002004
	1212	Pressure regulator	SST	P 200 – RM	79638 002005
	1213	Drain valve	SST	G 3/8	79666 001001
Pressure connection	1301	Seal ring	SST	17 x 22 x 3	76188 105003
	1302	Check valve	SST	G 3/8 – DN 8 PN 350	78586 008002
	1303	Hex nut	SST	G 3/8 – 25 long	76074 030001
	1304	Drain valve	SST	G 3/8	78666 001002
	1305	Seal ring	SST	17.2 x 21 x 6	76188 017002
	1306	Connector	SST	G 3/8	76741 143002
	1307	Pressure regulator	SST	P 200 – VM; PE 360	79637 010001
	1308	Connector	SST	G 3/8 – G 1/4	76639 016003
	1309	Connector	SST	G 3/8	76640 005001
	1310	Gauge	CuZn	0 – 160 bar	75782 012001
	1311	Gauge	CuZn	0 – 250 bar	75782 013001
	1312	Pipe complete	SST	G 3/8 – G 1/4 PN	77796 063003
	1313	Connector	SST	G 3/8 outer -G 1/4	76641 017001
	1314	Seal ring	SST	A 14 x 18	74188 012090
Screen	1400	Screen	SST	PN 500	79648 004006
	1401	Filter element	SST	Screen No. 00, 0.02	76648 045011
	1402	Filter element	SST	Screen No. 0, 0.04	76648 045013
	1403	Filter element	SST	Screen No. 1 , 0.06	76648 045002
	1404	Filter element	SST	Screen No. 2 , 0.07	76648 045004
	1405	Filter element	SST	Screen No. 3 , 0.08	76648 045006
	1406	Filter element	SST	Screen No. 4 , 0.09	76648 045008
	1407	Filter element	SST	Screen No. 5 , 0.14	76648 045009
	1408	Filter element	SST	Screen No. 6 0.19,	76648 045010
	1409	Filter element	SST	Screen No. 9 , 0.24	76648 045012
	1410	Filter element	SST	Screen No. 12 , 0.32	76648 045014
	1411	Filter element	SST	Screen No. 15 , 0.41	76648 045016
	1412	Filter element	SST	Screen No. 20 , 0,53	76648 045018

a) Further information on request
b) Replacement O-ring Part No. 74186 025020
c) Replacement seal ring Part No. 75188 097002
d) Replacement seal ring Part No. 75188 097003
e) Replacement seal ring Part No. 75188 014002
f) Replacement cap nut Part No. 75089 100002
g) Replacement cap nut Part No. 75089 100003
h) Hose connection G 1/4
i) Hose connection G 3/8
j) Hose connection either G 1/4 or G 3/8

Order Example

Please lay out each order as follows:

Description	Pos. No.	Part No.
Piston pump F 015.085-DP	002	79042 063002

GRACO STANDARD WARRANTY

Graco warrants all equipment referenced in this document which is manufactured by Graco and bearing its name to be free from defects in material and workmanship on the date of sale by an authorized Graco distributor to the original purchaser for use. With the exception of any special, extended, or limited warranty published by Graco, Graco will, for a period of twelve month from the date of sale, repair or replace any part of the equipment determined by Graco to be defective. This warranty applies only when the equipment is installed, operated and maintained in accordance with Graco´s written recommendations.

This warranty does not cover, and Graco shall not be liable for general wear an tear, or any malfunction, damage or wear caused by faulty installation, misapplication, abrasion, corrosion, inadequate or improper maintenance, negligence, accident, tampering, or substitution of non-Graco component parts. Nor shall Graco be liable for malfunction, damage or wear caused by the incompatibility of Graco equipment with structures, accessories, equipment or materials not supplied by Graco, or improper design, manufacture, installation, operation or maintenance of structures, accessories, equipment or materials not supplied by Graco.

This warranty is conditioned upon the repaid return of equipment claimed to be defective to an authorized Graco distributor for verification of claimed defect. If the claimed defect is verified, Graco will repair or replace free of charge any defective parts. The equipment will be returned to the original purchaser transportation prepaid. If inspection of the equipment does not disclose any defect in material or workmanship, repairs will be made at a reasonable charge, which charges may include the costs of parts, labor, and transportation.

THIS WARRANTY IS EXCLUSIVE, AND IS IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO WARRANTY OF MERCHANTABILITY OR WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.

Graco´s sole obligation and buyer´s sole remedy for any breach of warranty shall be as set forth above. The buyer agrees that no other remedy (including, but not limited to, incidental or consequential damages for lost profits, lost sales, injury to person or property, or any other incidental or consequential loss) shall be available. Any action for breach of warranty must be brought within two (2) years of the date of sale.

Graco does not extend its warranty to accessories, appliances, materials or components which are sold by Graco but are not manufactured by Graco and makes no guarantee, however implied, with regard to the brand capability and suitability for a certain purpose. These parts sold by Graco but not manufactured by Graco (such as electric motors, switches, hoses, etc.) are covered by the warranties of the respective manufacturers. Graco will support the buyer in enforcing any warranty claim with the proviso that in no event can Graco be made liable for indirect, incidental, special or consequential damages which arise from the supply of appliances by Graco under the conditions governed by these provisions, or the supply, performance or use of any products or other goods which are sold under the conditions governed by these provisions, whether as the result of breach of contract, breach of warranty, negligence on the part of Graco or for any other reason.

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