

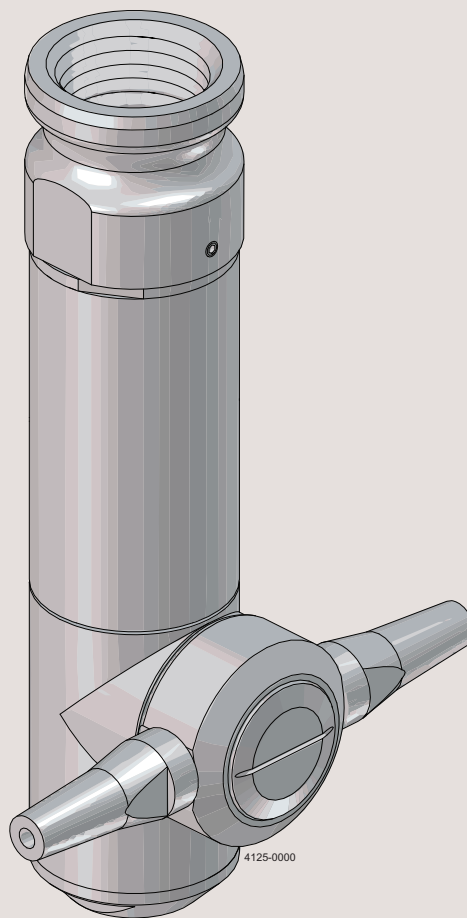


SMART SANITARY PROCESSES

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Instruction Manual

Alfa Laval GJ PF



Covering:
Standard machines
First published: 2015-07

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Original manual

The information herein is correct at the time of issue but may be subject to change without prior notice

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1 EC Declaration of Conformity

The Designated Company

Alfa Laval Kolding A/S

Company Name

Albuen 31, DK-6000 Kolding, Denmark

Address

+45 79 32 22 00

Phone No.

hereby declare that

Tank Cleaning Machine

Designation

Alfa Laval GJ PF

Type

From serial numbers from P-100 to P-9999

is in conformity with the following directive with amendments:

Machinery Directive 2006/42/EC

- DS/EN ISO 12100:2010

The Pressure Directive 97/23/EC

- According to its own volume and the rated pressure range, the product is regarded an Article 3, paragraph 3 Equipment

The person authorised to compile the technical file is the signer of this document

Global Product Quality Manager

Hygienic Fluid Handling

Title

Lars Kruse Andersen

Name

Kolding

Place

2020-07-01

Date



Signature



*Unsafe practices and other important information are emphasised in this manual.
Warnings are emphasised by means of special signs.
Always read the manual before using the tank cleaning machine!*

2.1 Important information

WARNING

Indicates that special procedures must be followed to avoid serious personal injury.

CAUTION

Indicates that special procedures must be followed to avoid damage to the tank cleaning machine.

NOTE

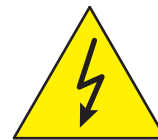
Indicates important information to simplify or clarify procedures.

2.2 Warning signs

General warning:



Dangerous electrical voltage:



Caustic agents:



2 Safety

All warnings in the manual are summarised on this page.

Pay special attention to the instructions below so that severe personal injury and/or damage to the tank cleaning machine are avoided.

2.3 Safety precautions

Installation

Always read the technical data thoroughly, see section 7 Technical data.



Operation

Always read the technical data thoroughly, see section 7 Technical data.



Necessary precautions must be taken if leakage occurs as this can lead to hazardous situations.

Always handle lye and acid with great care.



When an Alfa Laval GJ is operating, there should be covers over every tank opening. These covers should be sealed well enough to withstand the full force of the jet striking the cover plate.

If the cleaning solution were hot, corrosive, or toxic, a leak would present a serious hazard to any personnel.



In the immediate vicinity or to any exposed electrical equipment.



WARNING:

Any tank-cleaning machine can develop a static electricity charge while in operation. If the tank being cleaned contains a combustible liquid or vapor having a risk of ignition or explosion, it is imperative to have the Alfa Laval GJ PF properly grounded. While grounding the unit is important, there is no provided location for grounding on the Alfa Laval GJ PF.



Maintenance

Always read the technical data thoroughly, see section 7 Technical data.

Never service the tank cleaning machine when it is hot.

Always use Alfa Laval genuine spare parts.



Transportation of the tank cleaning machine

Always drain the tank cleaning machine head and accessories of any liquid.

Always use original packaging or similar during transportation.

3.1 Description

The Alfa Laval GJ PF is a fluid-driven (turbine-driven) 360° rotary nozzle machine designed for cleaning the interior surfaces of a wide variety of process vessels. This unit fits into tank openings ranging in size from 97.3 mm (3.830 inches) to 174.7 mm (6.875 inches), depending on the configuration. See section 4.2 Installation, Step 6 for more details. It is powered entirely by the cleaning solution and it requires no electricity, compressed air or lubricant¹ for operation. The Alfa Laval GJ PF is designed for both portable and CIP (Clean In Place) applications. If the Alfa Laval GJ PF is permanently mounted inside a tank, we strongly recommend inspecting the unit every few hundred hours of operation, see section 6 Maintenance for more information.

Note

¹As the standard form of the PF does include food-grade lubricant inside the gear train, no additional lubricant needs to be added by the customer for operation.



WARNING

In nearly every instance, it is strongly advised to avoid submerging the machine in the process vessel contents. Any situations leading to partial or complete submersion of the unit should be verified with Alfa Laval beforehand. Failure to comply with this restriction may void the warranty on the machine.

In order to handle the broadest possible range of applications, the stainless steel Alfa Laval GJ PF is available with an extensive selection of nozzle sizes, stators (non-rotating turbine), and O-ring materials. The nozzles are available in several interchangeable sizes that range from 1/4" to 3/8". The Alfa Laval GJ wash cycle time can be adjusted for special applications by changing the stator and/or nozzle size. Interchangeable stators and nozzle sizes are available for either low or high pressures and/or flow rates. The performance capabilities of these options are detailed in section 7 Technical data.

3.2 Intended use

It is to be verified by the end-user:

- that the tank cleaning machine is in conformity with respect to tank, vessel or container size in which it will be used.
 - that the construction materials (both metallic and non-metallic) are compatible with product, flushing media, cleaning media, temperatures and pressure under the intended use.
-

3 Introduction

3.3 Patents and trademarks

This instruction manual is published by Alfa Laval without any warranty. Improvements and changes to this instruction manual may at any time be made by Alfa Laval without prior notice. Such changes will, however, be incorporated in new editions of this instruction manual.

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The Alfa Laval logotype is a trademark or a registered trademark of Alfa Laval Corporate AB. "Gamajet" is a trademark or registered trademark of Alfa Laval. The Alfa Laval GJ PF product has patent in the US (US 6.123.271 & US 6.561.199). Other products or company names mentioned herein may be the trademarks of their respective owners. Any rights not expressly granted herein are reserved.

3.4 Marking

Alfa Laval tank cleaning machines are all marked to allow recognition of machine type, machine name, serial number and manufacturing address. The marking is placed on the body of the tank cleaning machine.

Alfa Laval Tank Equipment - Coatesville, PA
Patent #: 6,123,271 & 6,561,199

*Read the instructions carefully and pay special attention to the warnings!
Always check the tank cleaning machine before operation.*

4.1 Unpacking/delivery

Step 1

1. Remove any packing materials.
2. Inspect the tank cleaning machine for visible transport damage.

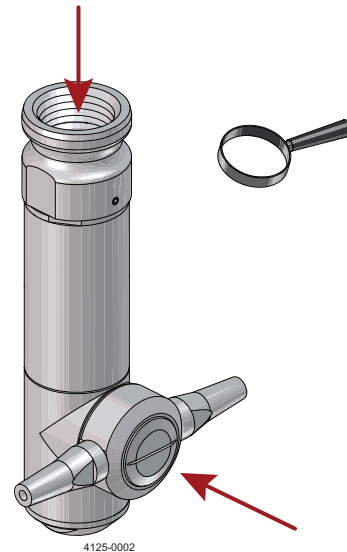
CAUTION

Alfa Laval cannot be held responsible for incorrect unpacking.

Step 2

Check the delivery for:

1. Complete cleaning machine
2. Delivery note



4.2 Installation

Step 1



Always read the technical data thoroughly, see section 7 Technical data.

Step 2

Assembly

Every Alfa Laval GJ is operationally tested before shipment and is ready to run after unpacking. **No assembly is required prior to use.** The Alfa Laval GJ has been configured to meet the operating conditions (at the Alfa Laval GJ, not at the pump) given to us, e.g. pressure, flow, temperature, cycle time, chemical adders, etc.

NOTE

Any changes to the operating conditions as originally provided to Alfa Laval, may adversely affect the performance of the tank cleaning machine.



WARNING

Do not force tee housing (8) to rotate. Doing so may cause damage to the internal components.

4 Installation

*Read the instructions carefully and pay special attention to the warnings!
Always check the tank cleaning machine before operation.*

Step 3

Inlet connections

The standard inlet connections for the Alfa Laval GJ PF are a 1-1/2" NPT female/2" male camlock or a 1-1/2" Tri-Clover. Other inlets are available. It is recommended that when using the pipe thread the mating male thread should be wrapped with PTFE pipe joint tape prior to mounting. This will minimize any risk of leakage and will make subsequent removal much easier.

Step 4

Mounting

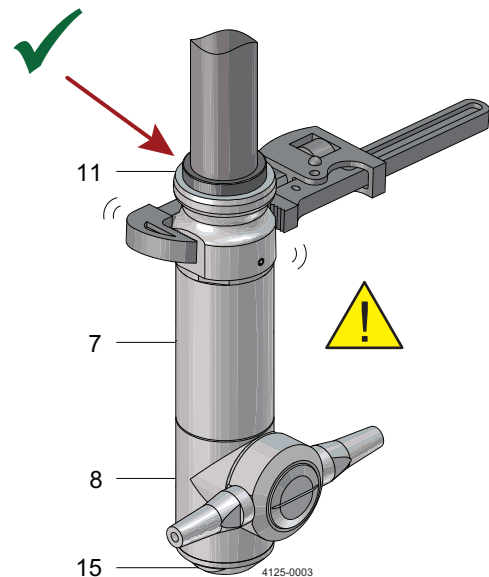
Before mounting the Alfa Laval GJ PF, make sure the supply line has been adequately flushed. It can be mounted on a rigid 1-1/2" pipe using a pipe wrench. In most applications, the Alfa Laval GJ PF will be mounted with the inlet connection pointing up; however, the PowerFlex will function at any orientation. The PowerFlex can also be mounted to a 1-1/2" Tri-Clover ferrule via the use of a Tri-Clover gasket and clamp or a 2" female camlock.

The Alfa Laval GJ PF can be suspended from the top of the tank via a flexible hose. The dual nozzle machine is designed to have balanced forces in order to keep it centered even while hanging. We do not, however, recommend attaching the machine to a flexible hose while in the inverted or horizontal orientation. This form of mounting is not rigid and, thus, will not maintain the Alfa Laval GJ's position in the tank.



WARNING

When attaching the Alfa Laval GJ PF onto the supply pipe, **ALWAYS** apply the wrench to the inlet collar (11) at the top/inlet of the unit. Never use a wrench on stem (7), tee housing (8) or tee housing cap (15) to tighten the unit onto the pipe. Doing so risks internally damaging the machine. Refer to section 6.1 General maintenance.



Step 5

Location inside tank

Generally, a single Alfa Laval GJ will be positioned in the approximate center of the vessel in order to equalize the cleaning radius in all directions. Some vessels, however, may have specific cleaning problems such as coils or heavy deposits such as the liquid level line (bathtub ring). In these situations the Alfa Laval GJ should be located closer to the difficult area for the best cleaning results.

Tanks with internal mechanisms or structures such as an agitator shaft, impellers or baffles will require careful positioning to minimize the "shadow" on areas which do not receive direct jet impact. Sometimes, more than one machine, or, more than one placement of a single machine, may be necessary to avoid shadow areas or "striping."

Step 6

Entry openings

Depending on the configuration, an Alfa Laval GJ PF can fit through a range of tank inlet sizes. For a pin drive machine with long nozzles, the minimum opening size is 174.7 mm (6.875 inches), while a clutch machine with long nozzles can fit through a 98.5 mm (3.875 inch) opening with the nozzles oriented vertically. A low-profile nozzle machine can fit through a 97.3 mm (3.830 inch) opening regardless of nozzle orientation.

*Read the instructions carefully and pay special attention to the warnings!
Always check the tank cleaning machine before operation.*

Step 7

Vessel drainage

If it is necessary to clean the floor of a vessel, remember that standing liquid will diminish the effectiveness of the Alfa Laval GJ by covering any soils underneath. Wherever possible, the tank floor should be pitched toward the drain and the drainage opening should be large enough to eliminate or reduce any liquid buildup or puddling. If gravity alone is insufficient, a scavenger or stripper pump should be connected to the drain to suck out the excess wash fluid. In extreme cases, it may be necessary to use smaller nozzles on the Alfa Laval GJ, or even to operate it intermittently to allow time for draining.

Step 8

Filters and strainers

All tank cleaning systems should be equipped with a filter or strainer that will trap solids 1.5 mm/1500 micron and larger, as these will not pass through the Alfa Laval GJ. These particles can become caught in one of the internal passages of the machine and cause it to stop turning or reduce its cleaning effectiveness due to a loss of flow. It will then be necessary to disassemble the Alfa Laval GJ and remove the blockage.

In recirculated (closed-loop) cleaning or any other application where the cleaning solution may carry abrasive solids in suspension, adequate filtration is a must. These particles can be extremely destructive to the Alfa Laval GJ, pumps, valves, and other system components. Filters, properly installed and maintained, will more than pay for themselves with lower overall operating costs in these applications. Furthermore, to ensure that clogged filters or strainers are cleaned, we recommend using automatic self-cleaning models.

Step 9

Capacity of supply pump

The Alfa Laval GJ PF can be used with either a centrifugal or positive displacement (constant volume), PD, style pump. In most cases, if the PowerFlex is to be used with a centrifugal pump, the PowerFlex should be configured so that the pump will operate close to its best efficiency point. The end user must, therefore, take all of the plumbing, elevation, and PowerFlex pressure/flow rate requirements into account.

If a PD style pump (i.e. piston pump, plunger pump, or mechanical diaphragm pump, etc.) will be supplying the wash fluid to the Alfa Laval GJ PF, a different set of rules apply. PD pumps are fixed volume pumps whose flow rate is dependent upon the rotational speed of the pump; the pumps also have a pressure rating which is the maximum operating pressure.

NOTE

Do not confuse the maximum operating pressure of a PD pump with the actual operating pressure, the actual operating pressure is dictated by the fixed flow rate of the pump and the Alfa Laval GJ PF / plumbing system. If a PD pump is used, the Alfa Laval GJ PF should be sized to, first, match the flow capability of the pump and, second, not exceed the PowerFlex's or pump's maximum operating pressure (taking the pressure rating of the plumbing system into account, also).



WARNING

For all applications the pressure of the system must "ramp up" to its operating pressure. If the system experiences a pressure spike or pressure increases at a rate of more than 10bar (150 psi) per second, the machine may be damaged and parts will wear out prematurely. Damage resulting from this water hammer effect is not covered by the warranty.

4 Installation

*Read the instructions carefully and pay special attention to the warnings!
Always check the tank cleaning machine before operation.*

4.3 Recycling Information

Unpacking

- Packing material consists of wood, plastics, cardboard boxes and in some cases metal straps.
- Wood and cardboard boxes can be reused, recycled or used for energy recovery.
- Plastics should be recycled or burnt at a licensed waste incineration plant.
- Metal straps should be sent for material recycling.

Maintenance

- All metal parts should be sent for material recycling.

Scrapping

- At end of use, the equipment must be recycled according to relevant, local regulations. Beside the equipment itself, any hazardous residues from the process liquid must be considered and dealt with in a proper manner. When in doubt, or in the absence of local regulations, please contact your local Alfa Laval sales company.
-

Read the instruction carefully and pay special attention to the warnings!

5.1 Operation/control

Step 1



Always read the technical data thoroughly, see section 7 Technical data.

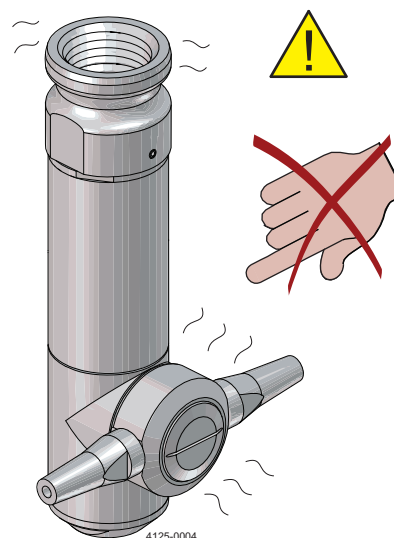
CAUTION

Alfa Laval cannot be held responsible for incorrect operation/control.

Step 2



Never touch the tank cleaning machine or the pipelines when pumping hot liquids.



Step 3

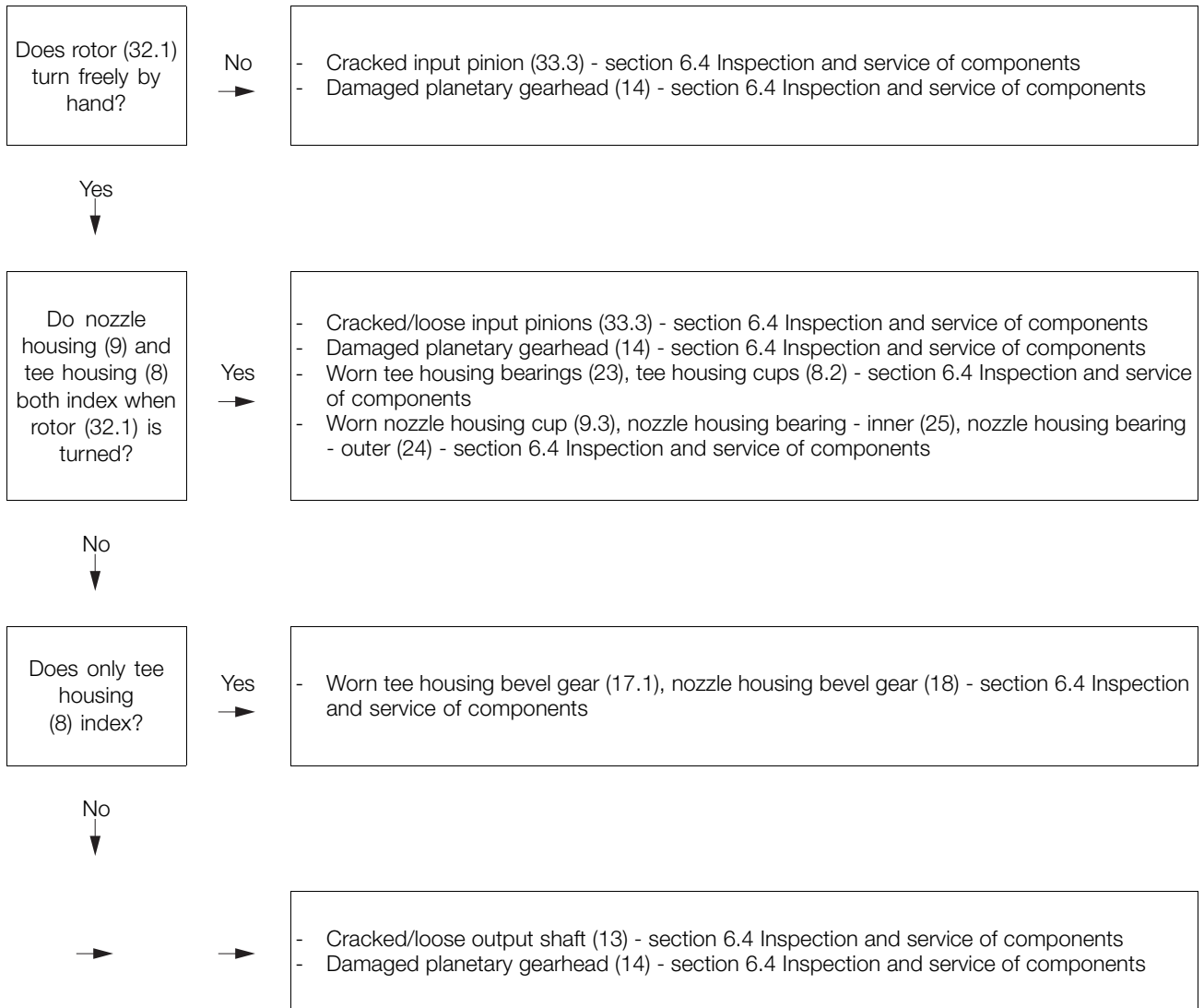
Initial startup

Every PowerFlex that ships is accompanied by a birth certificate. This document indicates how the PowerFlex performed in our testing tank before it shipped based on the operating conditions supplied to Alfa Laval GJ. To ensure the longest possible life of the PowerFlex, please verify the operating conditions and, most importantly, the machine's cycle time. The cycle time can be measured by, first, picking a fixed point inside of a vessel as a reference and, second, timing how long it takes the same nozzle to pass back over that point in the vessel. (This, naturally, will not be the exact same spot because the spray pattern is indexing.) The measured time in seconds directly corresponds to the machine's full cycle time in minutes. In other words, a single 10-second rotation translates to a 10 minute full cycle time.

5 Operation

*Pay attention to possible faults
Read the instructions carefully*

5.2 Trouble shooting



*Pay attention to possible faults
Read the instructions carefully*

Step 1

INSUFFICIENT FLOW

The Alfa Laval GJ was configured to meet certain operating conditions outlined at the time of the initial sale, such as flow rate (m³/h)(GPM), pressure (bar)(PSI), temperature, chemical content of the wash fluid, cycle time, etc. If the nozzle size is too small and/or the opening at the bottom of the stator is too large, the tee housing will not turn.

Look for restrictions in the fluid supply such as a clogged filter, kinked hose, or deposits in the piping.

Step 2

TIGHT CLEARANCES

A recently overhauled Alfa Laval GJ Power Flex may fail to operate when first returned to service. If the machine seems otherwise fine, try running it with at least one nozzle removed. The reduction in pressure and additional flow will invariably be enough to overcome the extra resistance of new bearings and seals. Twenty minutes of operation should loosen the machine to run normally with the nozzles reinstalled.

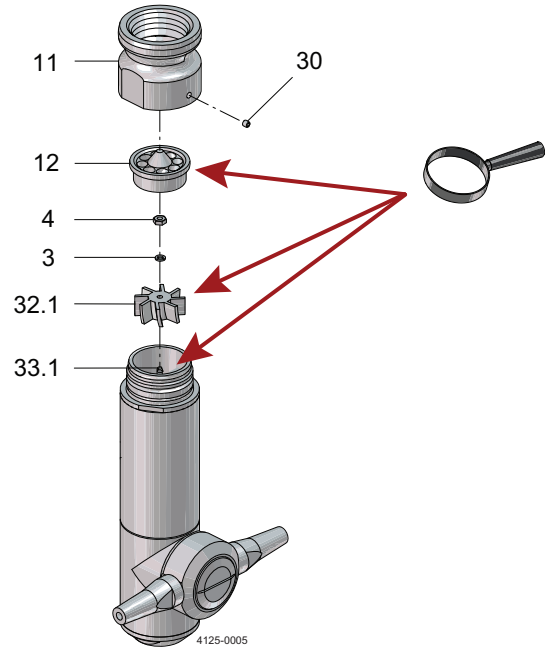
5 Operation

*Pay attention to possible faults
Read the instructions carefully*

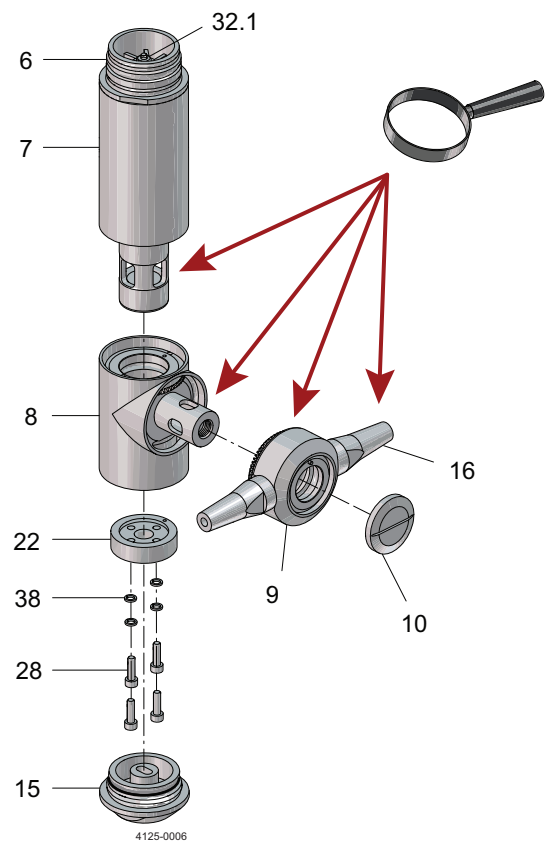
Step 3

DEBRIS INSIDE

Loosen the collar set screw (30), remove the collar (11), and then lift out the stator (12). Look for and remove any debris caught in the stator and the vanes of the rotor (32.1). Remove any material wound around the input shaft (33.1).



In addition, check for any debris caught in the nose of the tee housing (8), the nozzle housing (9), the nozzles (16), and the outlet holes of the stem (7). In order to check (7), the cap (6) must be removed and the gear train assembly pulled up and out of the stem (7) via the rotor (32.1).



*Pay attention to possible faults
Read the instructions carefully*

5.3 Cleaning solution leakage

Cleaning solution leakage

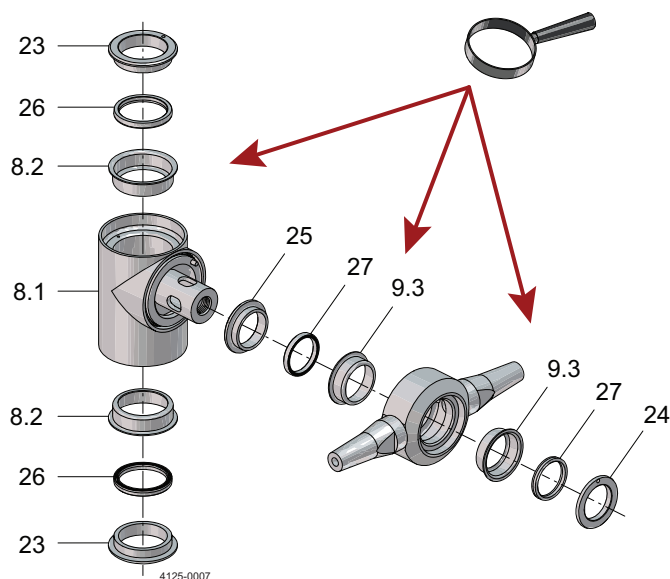
The Alfa Laval GJ PF is a self-flushing machine and thus has 5% leakage designed into the machine. Excessive leakage may indicate a larger issue.

Worn bearings & seals

Excessive leakage from the tee housing or nozzle housing usually indicates worn housing bearings and seals. Inspect them for wear (sealing lips are worn to a smooth surface) or damaged lips or loss of spring tension (indicated by excessive dry deposits of dirty or abrasive cleaning solution on the spring), and replace as required.

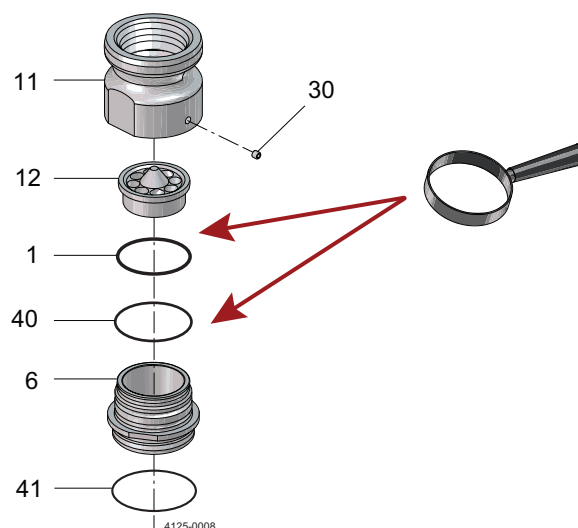
Worn housing cups

Inspect the housing cups (8.2) and (9.3) for excessive wear (grooved or scored). Replace any that show distinct grooves.



Worn collar O-rings

Severe leakage between the collar (11) and cap (6) may indicate worn or damaged collar O-rings (1) and (40). Remove the collar as described in section 6 Maintenance, and inspect the O-rings for signs of damage or wear.



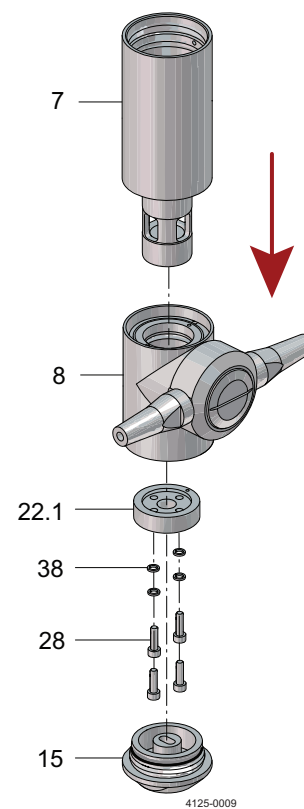
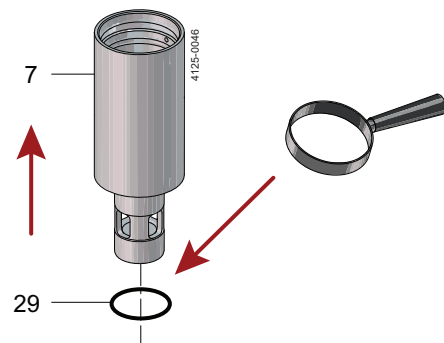
5 Operation

*Pay attention to possible faults
Read the instructions carefully*

Worn clutch O-ring

Severe leakage above the tee housing may be the result of excess wear on the clutch O-ring (29). There will be leakage through this point regardless due to the normal clutch operation, but severe leakage is not ordinary. Remove the tee housing as described in the general disassembly instructions and inspect the clutch O-ring (29) for damage or wear.

The tee housing cap (15), stem base (22), stem screws (28) and lockwashers (38) cannot be installed into the tee housing (8) before the stem.



*Pay attention to possible faults
Read the instructions carefully*

5.4 Poor cleaning performance

- **Inadequate flow and pressure**

Check the pressure at the Alfa Laval GJ inlet under actual operating conditions. The supply piping and hoses must be large enough to handle the flow rate required for the nozzle size being used to ensure adequate pressure. Insufficient pressure may also result from line losses when the machine is far from the pump. If this is the case, the line size must be increased accordingly for long runs. Although the Alfa Laval GJ will rotate at low flow rates, effective cleaning may require considerably more flow. Proper mechanical operation (the unit turns) is **NOT** the same thing as effective cleaning (the soils have been removed)! Contact Alfa Laval if assistance is required.

- **Chemical concentration and temperature**

Verify that the cleaning solution is the correct compound and in the concentration needed for the deposit being cleaned. If heating is necessary, also check that the solution is at the proper temperature.

- **Plugged nozzles**

Unscrew the nozzles (16) and inspect for any debris.

- **Slow or no rotation of the housings**

This will result in partial or erratic washing coverage. Refer to previous sections for more information.

- **Alfa Laval GJ configuration**

Determine if the deposit being cleaned requires greater jet impact or longer jet dwell time (slower rotation) for more thorough scrubbing. Confirm that the Alfa Laval GJ nozzle size, turbine, and gearing are correct for the specific application. Refer to the machine's birth certificate for specific information regarding its configuration. Contact an Alfa Laval representative if assistance is required.

- **Inadequate drainage**

Ensure that the vessel drains the effluent (used wash fluid) as fast as it's being sprayed in through the Alfa Laval GJ. The floor of the vessel should be sloped or pitched toward the drain and the drainage opening should be large enough to gravity-drain the effluent from the vessel. If you still have puddling (build-up of the wash fluid so it covers the floor and shields the residues underneath), use some form of pump to remove the effluent.

5 Operation

The Tank Cleaning machine is designed for cleaning in place (CIP). CIP = Cleaning In Place.
Study the instructions carefully and pay special attention to the warnings!
NaOH = Caustic Soda. HNO₃ = Nitric acid.

5.5 Recommended cleaning

Step 1



Always handle lye and acid with great care.

Caustic danger!



Always use rubber gloves!



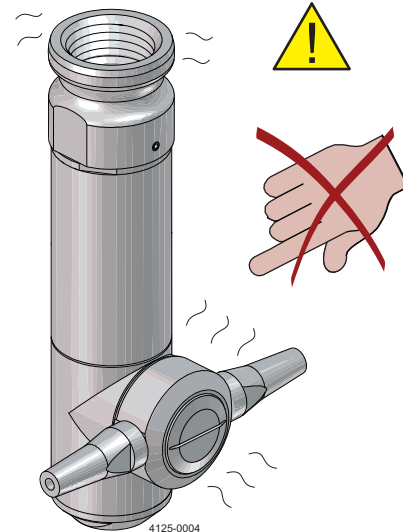
Always use protective goggles!

Step 2



Never touch the pump or the pipelines when sterilising.

Danger of burns!

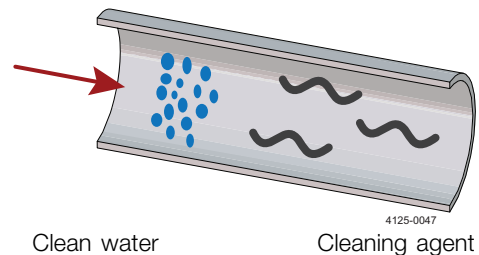


Step 3



Always rinse well with clean water after using a cleaning agent.

Always rinse!



NOTE

Cleaning agents must be stored/disposed of in accordance with current regulations/directives.

Maintain the tank cleaning machine with care.
 Read the instructions carefully and pay special attention to the warnings!
 Always keep minor spare parts kit in stock.

6.1 General maintenance

Step 1



Always read the technical data thoroughly, see section 7 Technical data.

Recommended spare parts: Order service kits from the service kits list, see section 8 Parts list and service kits
 Ordering spare parts: Contact your local Alfa Laval sales company.

6.2 General dismantling set up

NOTE

A rigorously implemented preventative maintenance program will significantly reduce repair costs over the life of the Alfa Laval GJ. The foundation of such a program is regularly scheduled inspections to discover and replace worn or damaged parts before they can cause the failure of other, more costly, components. The inspection intervals required will depend on the severity of the application, but a complete internal inspection at 100 hours of operation is recommended initially.

Step 1

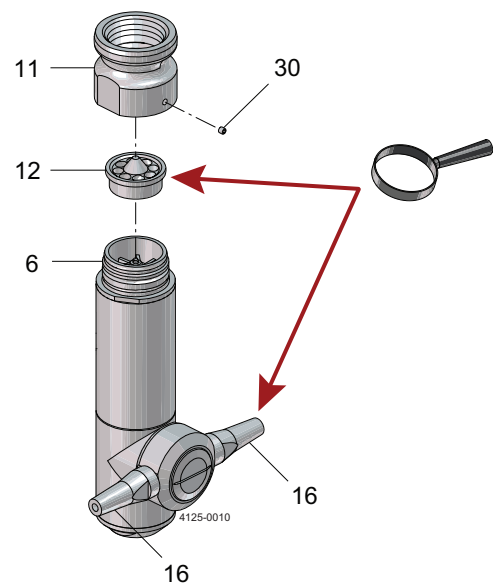
STORAGE

The Alfa Laval GJ should be washed out with clean water after each use to remove any foreign material or soft substances left in the machine that may harden during storage and cause the Alfa Laval GJ to seize or lock up. A clean water rinse through the Alfa Laval GJ will also wash out any residues of chemical cleaners or recirculated wash water that could adversely affect the seals and O-rings during prolonged contact in storage. The best position to store the Alfa Laval GJ is to stand it up with the inlet connection facing down.

Step 2

EXTERNAL INSPECTION INTERVALS

Before every shift, the stator (12) and the nozzles (16) should be inspected for debris. Examine the stator (12) by loosening the collar set screw (30), while holding on the flats of the cap (6) and remove the main section of the machine from the collar (11). Look into each nozzle for signs of debris or build-up



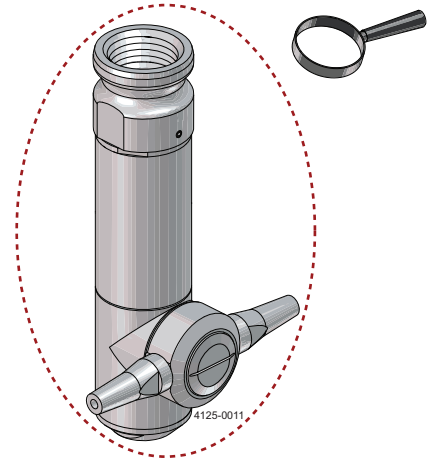
6 Maintenance

Maintain the tank cleaning machine with care.
Read the instructions carefully and pay special attention to the warnings!
Always keep minor spare parts kit in stock.

Step 3

INTERNAL INSPECTION INTERVALS

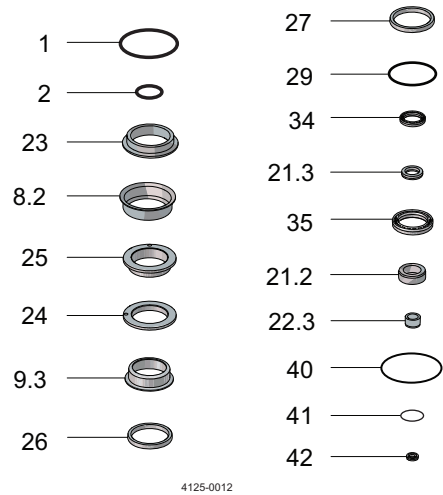
An interval of 100 hours is recommended initially. If all of the components are found to be in acceptable condition after the first 100 hours, the Alfa Laval GJ may then be inspected and routine preventive maintenance should be performed every 500 to 700 hours of operation, depending on the severity of use.



Step 4

TIPS

All the bearings, bushings, seals and O-rings are wear parts. Ideally, they should all be replaced, as a group, every 500 to 700 hours of operation, depending on the severity of use. If just one bearing or seal is worn or damaged, replace both it and its mate, not just the worn or damaged part. Verify that the mating cups (8.2) and (9.3) are not scored. Replacing new bearings and seals in scored cups may prematurely wear the new bearings and may cause premature failure of the bearings and seals.



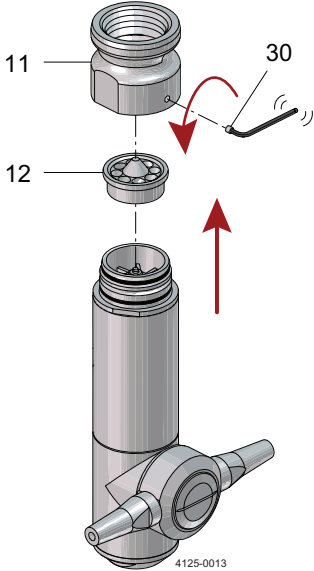
Read the instructions carefully.
The items refer to the parts list and service kits section.

6.3 General dismantling

Step 1

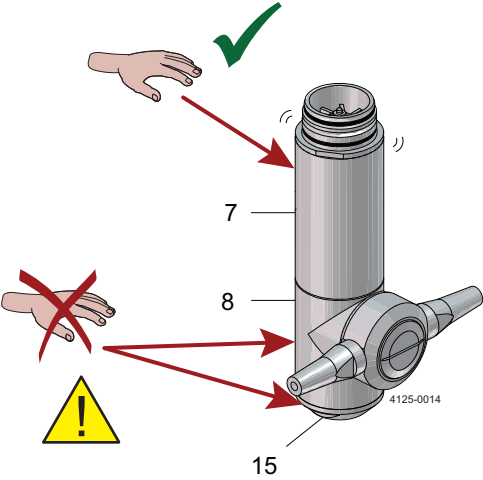
Inlet collar

- 1. Loosen the collar set screw (30) with a 3/32" hex key, minimum 2 turns.
- 2. Remove the inlet collar (11) and stator (12).



WARNING

Hold or turn on stem. **DO NOT** hold or turn on tee housing (8) or tee housing cap (15). Doing so will damage the gear train.



6 Maintenance

Read the instructions carefully.

The items refer to the parts list and service kits section.

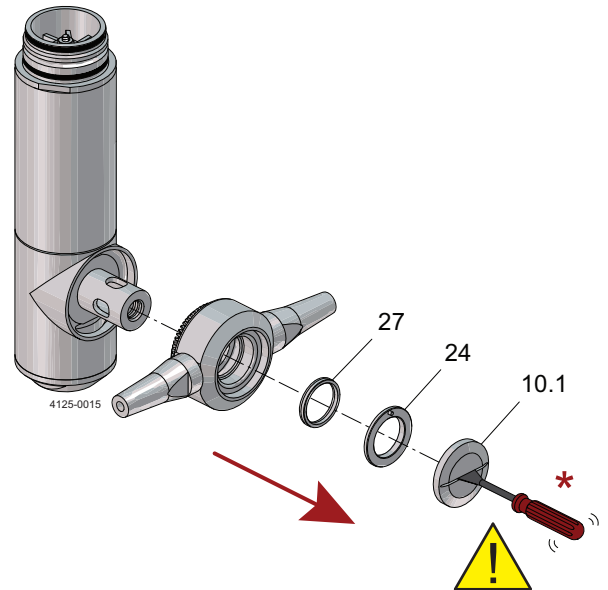
Step 2

Nozzle housing

1. Unscrew the nose plate (10.1) with a screwdriver.
2. Pull the nozzle housing assembly from the nose of the tee housing with the outer nozzle housing bearing (24) and nozzle housing seal (27) included.
3. Remove the inner nozzle housing seal (27) and inner bearing (25).

NOTE

* Important to use a wide blade screw driver.



Step 3

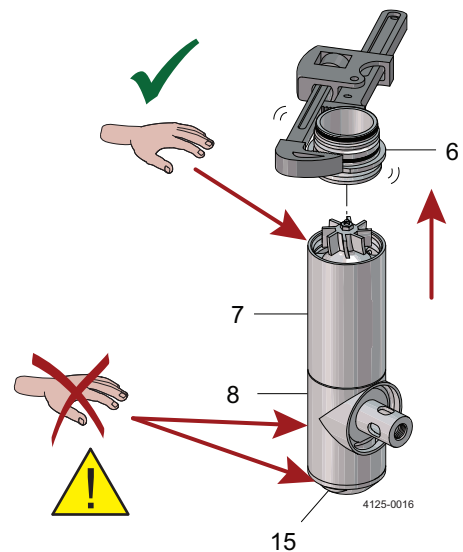
Cap and gear train

1. Using pliers or a bench vise on the flats of the cap (6), unthread it from the body.
2. Pulling upward gently on the rotor (32.1), remove the gear train assembly from inside the stem (7).



WARNING

Hold or turn on stem (7). Do **NOT** hold or turn on tee housing (8) or tee housing cap (15). Doing so will damage the gear train.



Read the instructions carefully.
The items refer to the parts list and service kits section.

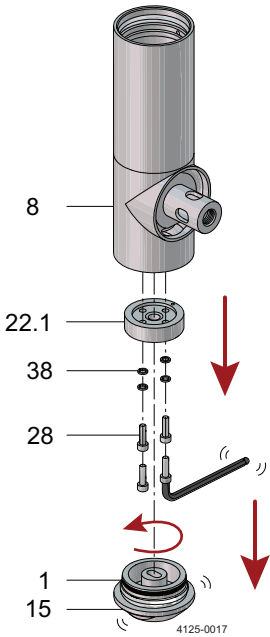
Step 4

Body assembly

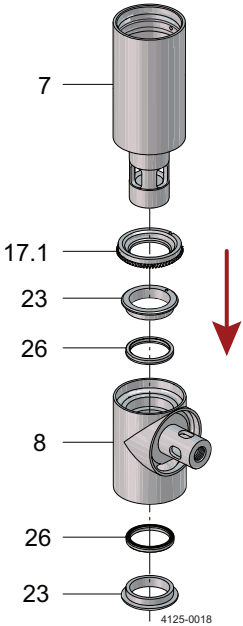
- 1. Unthread the tee housing cap (15) from the tee housing (8).
Note: This is a **left hand** thread.
- 2. Remove the stem screws (28) with a 5/32" hex key, and stem base (22.1) from the tee housing (8).

NOTE

The full gear train **MUST** be removed from the stem (7) **BEFORE** doing any of the steps on this page, or it will be damaged.



- 3. Remove the tee housing (8) by pulling it from the stem (7). The upper tee housing seal (26) and bearing (23) will pull off with the tee housing.
- 4. Remove the lower (26), (23) and bevel gear (17.1).



6 Maintenance

Read the instructions carefully.

The items refer to the parts list and service kits section.

6.4 Inspection and service of components

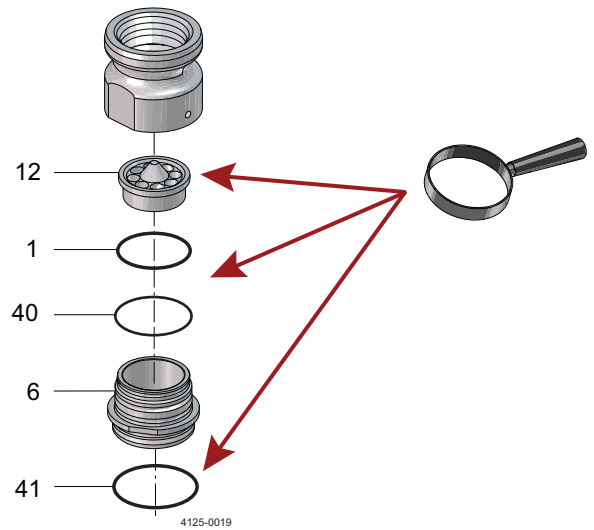
Step 1

Stator

1. Inspect the through holes of the stator (12) to be sure that they are clear.

Collar O-rings

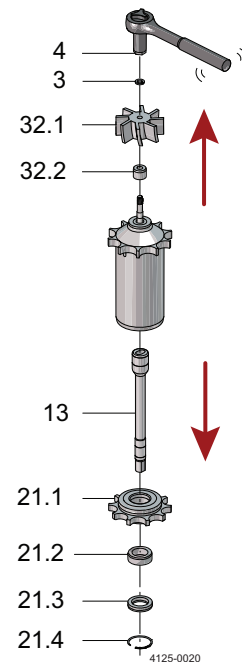
1. Inspect the small and large collar O-rings, (1) and (40), for damage (clipped or cut) or deterioration (compression set or hardening) and replace if necessary.
2. Inspect the collar-stem O-ring (41) for damage (clipped or cut) or deterioration (compression set or hardening) and replace if necessary.



Planetary gear train assembly, general disassembly and inspection

Step 1

1. Pull the output shaft (13) from the planetary gearhead.
2. Unscrew the rotor nut (4) with an 1 1/32" socket and remove it with the rotor lockwasher (3) from the gear train.
3. Remove the rotor (32.1). If needed, use a slotted screwdriver for assistance.
4. Ensure the Carbide (32.2), pressed into (32.1), protrudes slightly, and is not chipped or cracked.



Read the instructions carefully.
The items refer to the parts list and service kits section.

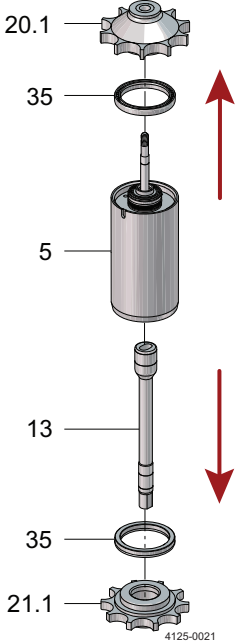
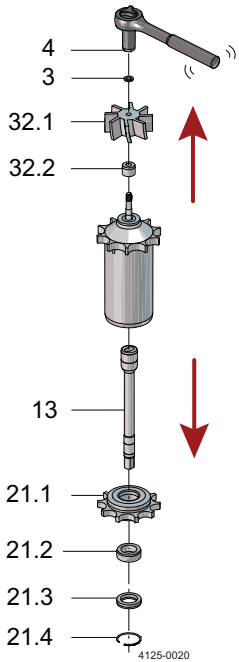
Step 2

- 1. Pull and twist the gearhead lower bearing housing (21.1) and input shaft upper bearing housing (20.1) from the gearbox (5).
- 2. If the gearbox seals (35) did not come out of the gearbox (5) when the (21.1) and (20.1) were removed, remove them at this time.



WARNING

To reduce the likelihood of scratching any sealing surface, use a pick made from brass. Inspect the (35) for loss of spring tension (indicated by excessive dry deposits of dirty or abrasive cleaning solution on the spring), replace as required.



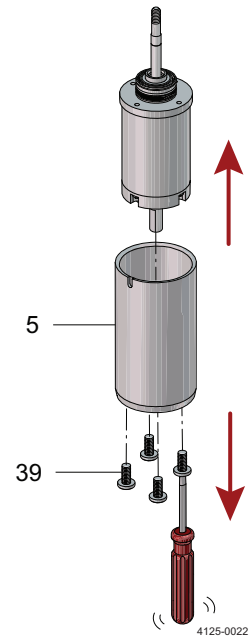
6 Maintenance

Read the instructions carefully.

The items refer to the parts list and service kits section.

Step 3

1. Using a #2 Phillips screwdriver, unscrew the gearbox screws (39) from the gearbox (5).
2. Remove the planetary gearhead from gearbox (5) by pushing on its output shaft.



Gearhead internals

Tip: To prevent the internal components of the planetary gearhead from unexpectedly spilling out, make sure that all steps are done with the input side of the assembly facing up.

Step 1

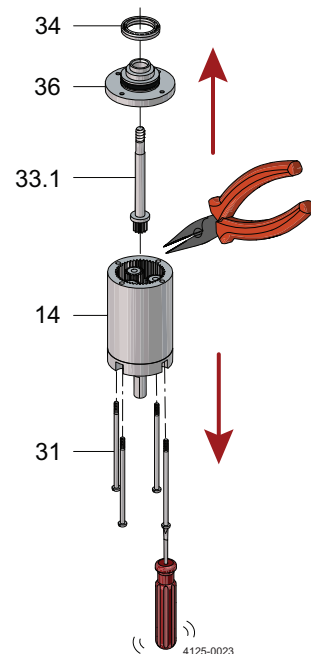
1. Using a flat-head screwdriver, unscrew the gearhead screws (31) from the gearhead (14).
2. Remove the input shaft lower bearing housing (36) from the (31).



WARNING

If you suspect that the planetary gearhead (14) requires service, proceed with caution. If at any time you do not feel completely comfortable servicing (14), contact Alfa Laval immediately.

1. Using a needle nose pliers carefully remove the internal components of the planetary gearhead (14).
2. Examine the gears of the four different stages for any worn or broken teeth. Also, examine the main internal ring gear for bent or sharp teeth. If any damage is found contact Alfa Laval GJ immediately.
3. The gears of the bottom (14 teeth) and top (17 teeth) stages must be reinstalled in their respective locations. The gears in the second and third level (18 teeth) are interchangeable, however.
4. Examine the washers that sit between the stages of the gear train for cupping and/or scoring. If severely worn, the (14) should likely be replaced. Contact Alfa Laval GJ immediately if this is the case.
5. During reassembly, Alfa Laval recommends the gearhead be lightly repacked using food-grade grease. Please contact Alfa Laval for a specific grease recommendation.



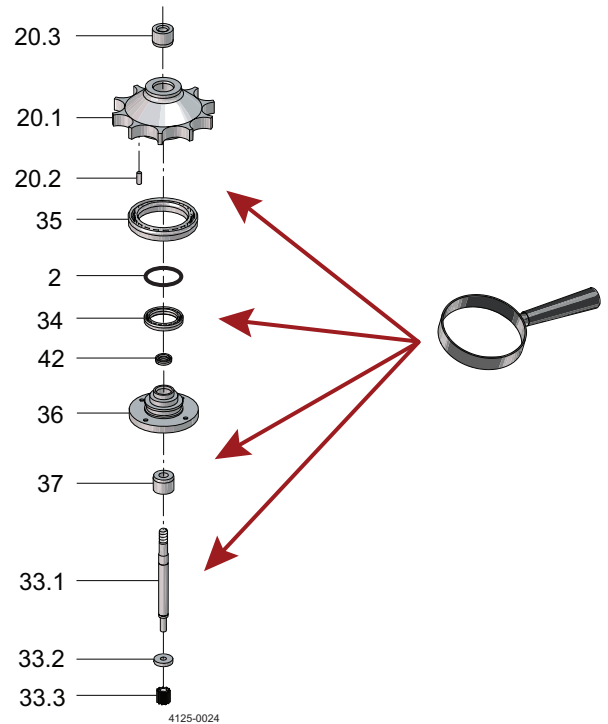
Read the instructions carefully.

The items refer to the parts list and service kits section.

Input shaft and housings

Step 1

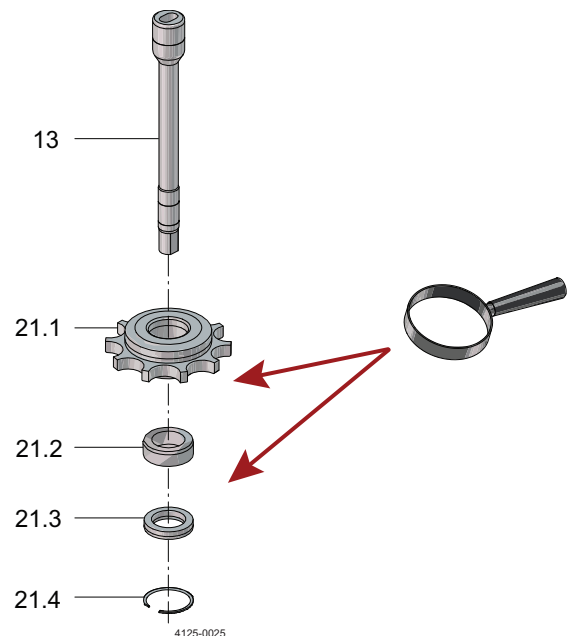
1. Inspect the input pinion (33.3) for hairline cracks on the end face or for worn, damaged, or sharp/pointed teeth. (33.3) should be tight to the input shaft (33.1) and the input shaft washer (33.2). (33.2) should not be able to spin on the (33.1).
2. Press (33.3) back onto (33.1) if it has slipped, or replace if cracked or worn.
3. Check for signs of scoring and wear on (33.1). Replace if the coating has been chipped or cracked.
4. Inspect the input shaft seal (42) inside the input shaft lower bearing housing (36) for wear by placing the (33.1) back through it. There will be drag if the (42) is still good. If it needs to be replaced, pry out the old (42) (using a brass pick), and replace it with a new one. Ensure that the seal is as square as possible to the (36) when installing it. The internal spring should be up and visible. Tip: Use a soft object, such as a pencil's eraser, to apply even pressure when installing (42).
5. Check the lower bearing housing O-ring (2) and seal (34) for deterioration or damage, replace (using a brass pick to remove the old components) if necessary. The (34) should be installed so its internal spring is up and visible.
6. The pin (20.2) should be firmly pressed into the input shaft upper bearing housing (20.1). The carbide (20.3) in the (20.1) should protrude slightly. In addition, its running surfaces should be smooth, flat, and free of chips and cracks.



Gearhead lower bearing housing and output shaft

Step 1

1. Check the output shaft (13) for signs of scoring or wear, especially in the area of contact with the output shaft upper seal (21.3).
2. Replace if worn.
3. Examine the (21.3) for loss of spring tension (indicated by excessive dry deposits of dirty or abrasive cleaning solution on the spring). Also, ensure that it still has interference with the (13) by passing the (13) through the center of the seal. There will be a noticeable drag if the seal is still good.
4. If the (21.3) must be replaced, remove the retaining ring (21.4) using a small slotted screwdriver.
5. Pry out the old (21.3) (using a brass pick), and replace it with a new one. Ensure that the seal is square to the (21.1) when installing it. The new (21.3) should be installed with the spring facing out and visible after it is installed.
6. Reinstall the (21.4).



6 Maintenance

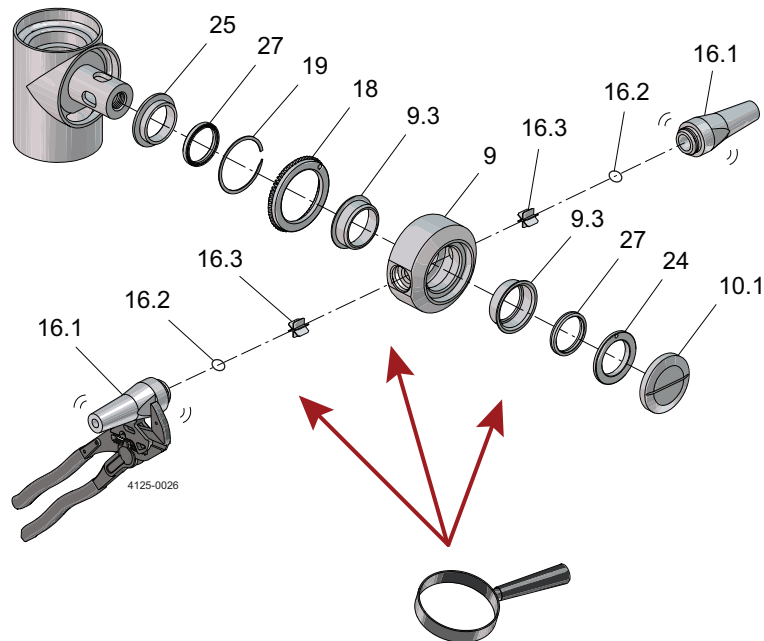
Read the instructions carefully.

The items refer to the parts list and service kits section.

Nozzle housing

Step 1

1. Unscrew the nozzles (16) with pliers and inspect for debris caught on the stream straightener (16.3) or in the nozzle orifice. The inside diameter of (16.1) must be smooth, round, and free of damage (especially any nicks) for maximum jet impact. Replace worn or oversized nozzles if the original flow rate and pressure are required.
2. Verify the (16.3) is tight in the bore of the (16.1).
3. Inspect the nozzle housing bevel gear (18) for wear such as sharp/pointed or worn teeth. If it needs to be replaced, remove the bevel gear retaining ring (19) with a small slotted screwdriver and pry (18) from the nozzle housing (9).
4. Clean any deposits from (9.3) and examine for excessive wear. Light scoring is acceptable, but the (9.3) should be replaced if they are grooved in the seal contact area. A good maintenance program will require replacing many (9.3), therefore, it may be worthwhile to make or obtain press tools for pressing (9.3) out of (9). The press tools are available from Alfa Laval GJ cleaning systems. Before installing new (9.3), clean the housing bores and remove any burrs resulting from (9.3) removal. Press them in so that their flanges are flush against (9).
5. Inspect the nozzle housing bearings (24 and 25) and seals (27).
6. Clean any deposits from the exterior of (24 and 25) and check their fit in the (9.3). While they should turn freely, (24 and 25) should be replaced if the thickness of the flange is 0.086", or less, to avoid shortening the life of the bevel gears.
7. Inspect the interior of (27) for loss of spring tension (indicated by excessive dry deposits of dirty or abrasive cleaning solution on the spring), replace as required.

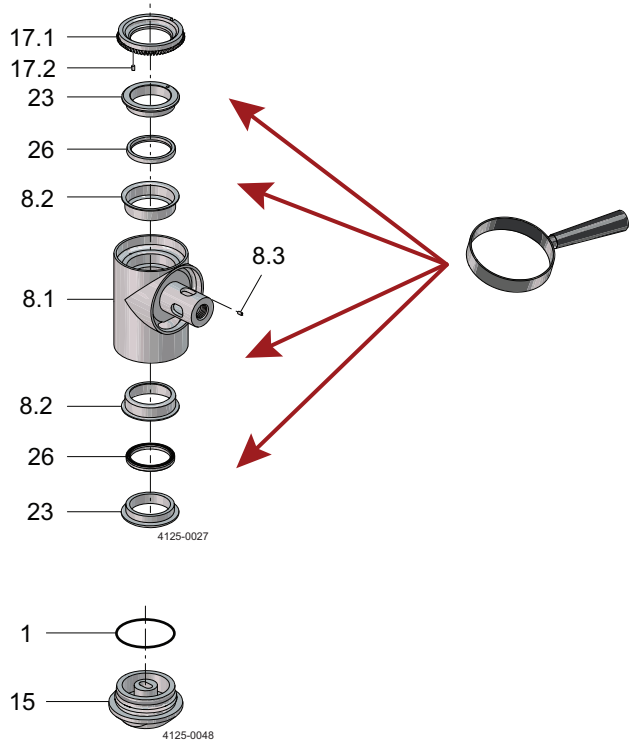


Read the instructions carefully.
The items refer to the parts list and service kits section.

Tee housing and tee housing cap

Step 1

- 1. Check the water outlets on the nose of the tee housing (8.1); they should be free of debris.
- 2. Inspect the tee housing bearings (23) and seals (26).
- 3. Clean any deposits from the exterior of (23) and check their fit in the tee housing cups (8.2). While they should turn freely, (23) should be replaced if the thickness of the **flange** is **0.095"**, or less, to avoid shortening the life of the bevel gears.
- 4. Inspect the interior of (26) for loss of spring tension (indicated by excessive dry deposits of dirty or abrasive cleaning solution on the spring), replace as required.
- 5. Inspect the tee housing cap O-ring (1) for compression set or deterioration.
- 6. Inspect the tee housing bevel gear (17.1) for worn, damaged or sharp/pointed teeth.
- 7. Ensure that the pin (17.2) is pressed firmly into (17.1).
- 8. Replace, if needed
- 9. Clean any deposits from (8.2) and examine for excessive wear. Light scoring is acceptable, but the cups should be replaced if they are grooved in the seal contact area. A good maintenance program will require replacing many (8.2), therefore, it may be worthwhile to make or obtain press tools for pressing (8.2) out of (8.1). The press tools are available from Alfa Laval.
- 10. Before installing new (8.2), clean the housing bores and remove any burrs resulting from (8.2) removal. Press them in so that their flanges are flush against (8.1).
- 11. Ensure that the pin (8.3) is pressed firmly into (8.1).



6 Maintenance

Read the instructions carefully.

The items refer to the parts list and service kits section.

Stem and stem base

Step 1

1. The pin (22.2) should be firmly pressed into the (22.1).
2. Inspect the water outlets of the stem (7.1); they should be free of debris.
The pins (7.2) and (7.3) should be firmly pressed into the (7.1).
3. Check O-ring (29) for signs of damage (clipped or cut), deterioration (compression set or hardening) or wear (flat edge developing or ring has thinned) and replace if necessary.

* This is the pin drive pin - so if the unit is pin drive, it will be here; otherwise, if it is a clutch machine, there will be no pin installed.

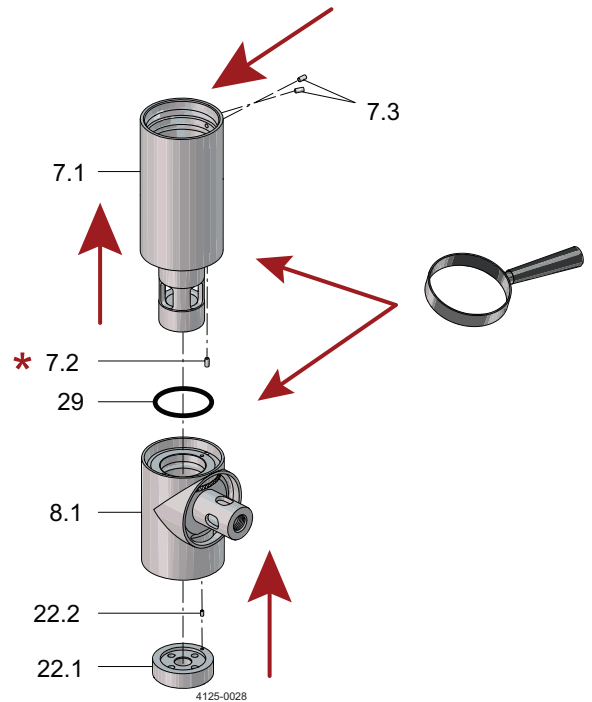
CLUTCH TO PIN DRIVE, PIN DRIVE TO CLUTCH

The pin (7.2) should not be present in the stem (7.1) if the machine is a clutch machine. In order to make the machine a pin-driven machine, (7.2) must be pressed into the hole in (7.1). The clutch o-ring (29) remains in place even if the machine is pin drive.

WARNING

Once a machine is converted to pin drive, the nozzle housing (9) will no longer rotate freely by hand. Forcing (9) to rotate WILL damage the machine.

* To convert a pin machine back into a clutch machine, use a pair of pliers to grip the pin (7.2) and pull it out of the stem (7.1). If the pin cannot be pulled out, use a grinder to grind away the exposed portion of the pin that engages with the notch in the tee housing bevel gear (17). Note that grinding the old (7.2) away will require replacement of the stem (7.1) if it is later desired to revert back to a pin drive. The clutch o-ring (29) should remain installed and will run as normal.



Read the instructions carefully.

The items refer to the parts list and service kits section.

6.5 Reassembly

General notes

All parts must be cleaned thoroughly before reassembling. Any deposits remaining on the parts can cause difficult disassembly the next time the Alfa Laval GJ needs to be serviced. Also, it may cause misalignment of parts and the potential for premature failure.

Unless otherwise stated, apply a dab of a **PTFE-based anti-seize compound** to all threads when reassembling; this will prevent galling of threads and ease any future disassembly.

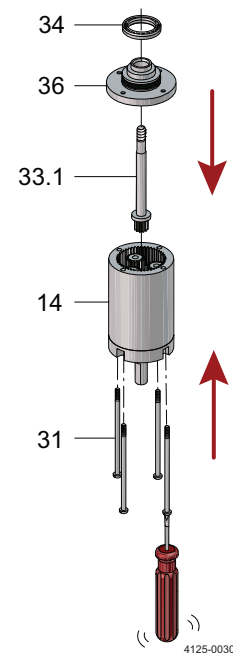
To ease installation of all O-rings, they should be lubricated prior to reassembly. Lithium-based grease is acceptable, for Viton® O-rings, however, silicone based lubricant must be used for EP O-rings. Do **NOT** grease the clutch O-ring (29).

Refer to the illustrations in Appendix C for clarification during reassembly.

Gear train

Step 1

1. Insert the gearbox screws (31) through the gearhead (14).
2. Push the input shaft through the input shaft lower bearing housing (36).
3. While installing the lower bearing housing onto the (14), ensure the input pinion meshes properly with the top layer of gears.
4. Using a flat-head screwdriver, screw the (31) into the lower bearing housing.



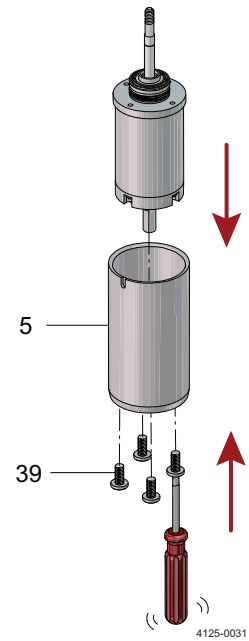
6 Maintenance

Read the instructions carefully.

The items refer to the parts list and service kits section.

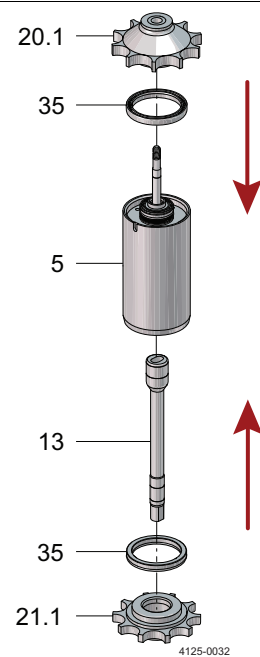
Step 2

1. Install the planetary gearhead back into the gearbox (5).
2. After aligning the screw holes, thread the gearhead screws (39) back into the gearhead using a #2 Phillips screwdriver. Make hand tight.



Step 3

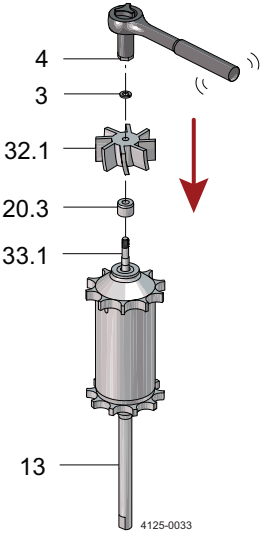
1. Install the gearbox seals (35) into gearbox. The seal's internal spring should be face out and be visible.
2. Install the upper (20.1) and lower bearing housings (21.1) into the proper ends of the gearbox by using equal pressure around the parts. They will snap into place.



*Read the instructions carefully.
The items refer to the parts list and service kits section.*

Step 4

- 1. Place the rotor (32.1) over the end of the input shaft (33.1).
- 2. Install the rotor lockwasher (3) and rotor nut (4) using an 1 1/32" socket. Hold the (32.1) stationary with a pair of pliers while tightening the (4).



6 Maintenance

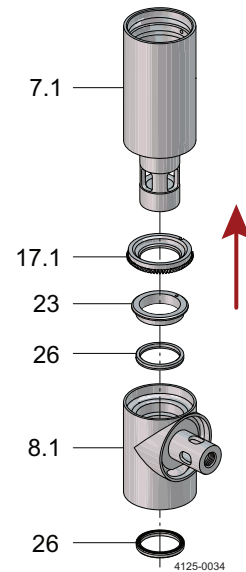
Read the instructions carefully.

The items refer to the parts list and service kits section.

Body assembly

Step 1

1. Slide the tee housing bevel gear (17.1) over the end of the stem (7.1). Align the hole in the (17.1) with the pin (7.2).
2. Place the first tee housing bearing (23) and seal (26) (spring side up) onto the (7.1).
3. Push the tee housing (8.1) over it until it is flush and fully seated.
4. Install the second (26), spring side down, over the (7.1).



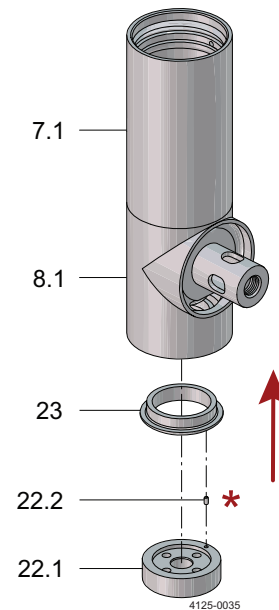
Step 2

Tip:

1. Place the second tee housing bearing (23) into stem base (22.1), aligning its hole with the bearing locating pin (22.2).
2. Invert the (8.1/7.1) assembly and place it over (23/22.1) assembly. This technique ensures correct alignment of (23) and (22.2).
3. Apply pressure to (22.1) to drive it, (23), and (26) into (8.1).

NOTE

* Note that failure to align the pin (22.2) in the stem base (22.1) with the bearing (23) will crack the bearing and render it unusable.



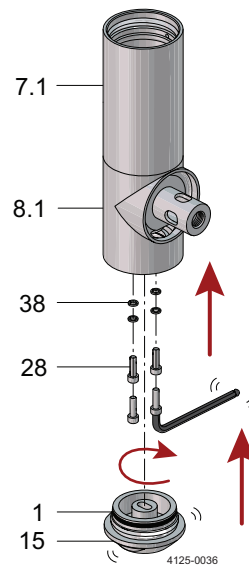
Read the instructions carefully.
The items refer to the parts list and service kits section.

Step 3

1. Align the through-holes of the (22.1) with the threaded holes in the top of the (7.1).
2. Using a 5/32" hex key, thread cap screws (28) and lockwasher (38) into the (7.1). Tighten in a star pattern.
3. Thread the tee housing cap (15) to the end of the (8.1).

NOTE

This is a **left hand** thread



Gear train installation

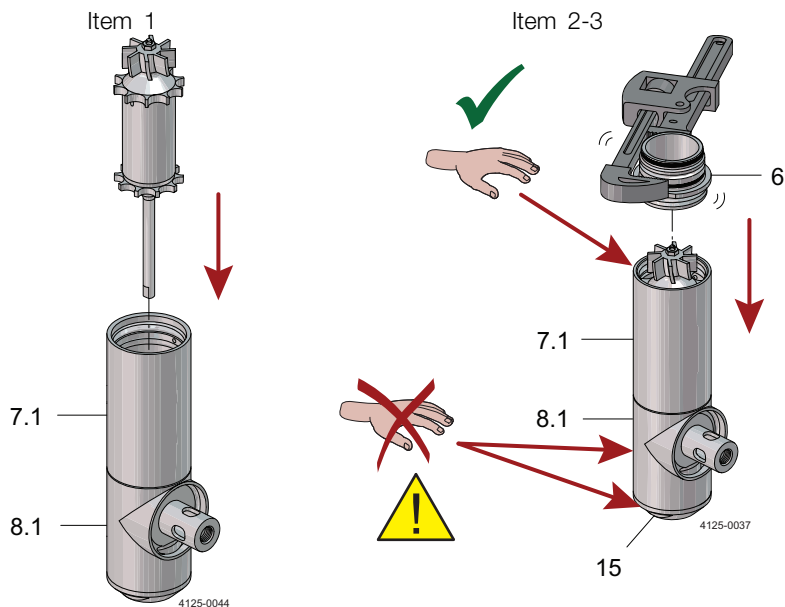
Step 1

1. Insert the gear train from 6.4 Inspection and service of components into the body assembly.
2. Rotate the tee housing (8.1) until the output shaft (13) falls into the slot of the tee housing cap (15).
3. Thread the cap (6) into the body assembly. Be sure to use the flats provided on the (6). Tighten.



WARNING

Hold or turn on stem. Do **NOT** hold or turn on tee housing or tee housing cap. Doing so will damage the gear train.



6 Maintenance

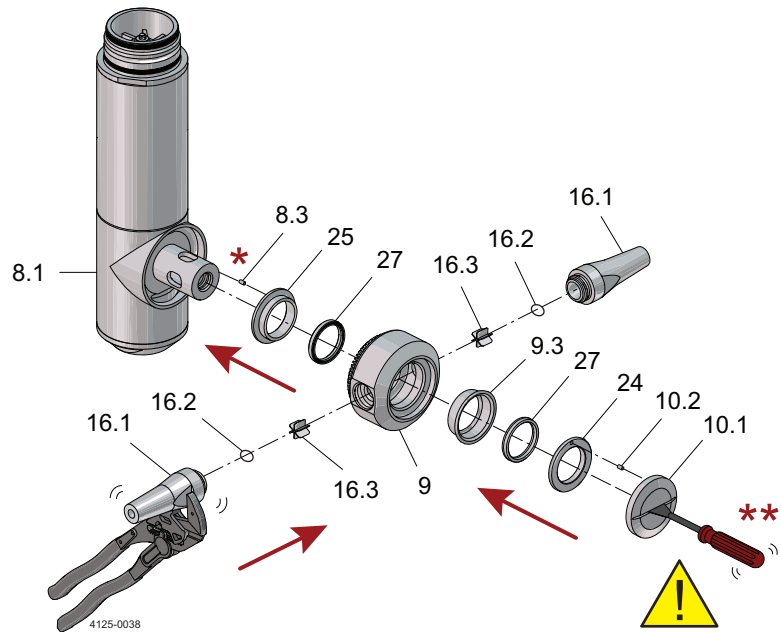
Read the instructions carefully.

The items refer to the parts list and service kits section.

Nozzle housing

Step 1

1. Place the larger nozzle housing bearing (25) and seal (27) (spring side out) onto the nose of the tee housing (8.1). Ensure the pin (8.3) is aligned with the hole in the (25). Failure to align the inner and outer pins (8.3, 10.2) may crack and permanently damage the bearings.
2. Push the nozzle housing assembly onto the nose of the (8.1).
3. Rotate the nozzle housing assembly slightly to mesh the bevel gears (17.1 and 18). Failure to ensure that the bevel gears have properly mated could damage them.
4. Place the outer (27) (spring side in) over the nose of the (8.1).
5. Install the thin bearing (24) into the nose plate (10.1). Ensure the pin (10.2) aligns with the hole in the (24).
6. Then, using the (10.1/24), push the (27) into the annular space between the (8.1) and nozzle housing cup (9.3).
7. Using a screwdriver, screw the nose plate (10.1) into the (8.1).



NOTE

* Note that failure to align the pin (8.3) into the inner tee housing bearing (25) and the outer pin (10.2) pin into the outer tee housing bearing (24) will crack the bearing and render it unusable.

NOTE

** Important to use a wide blade screw driver.

Completed assembly

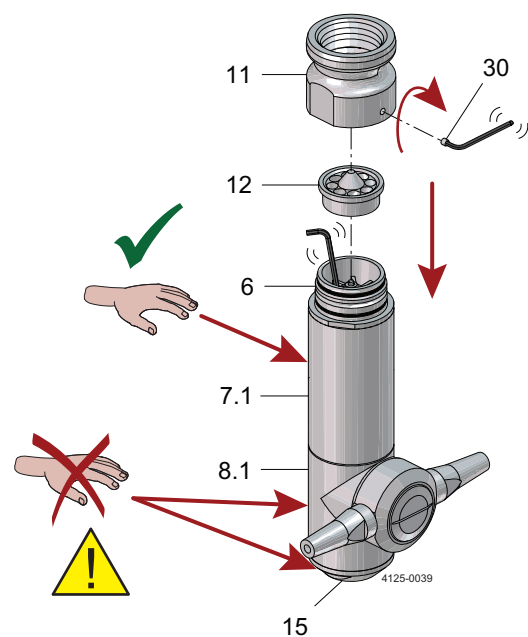
Step 1

1. Rotate the rotor (32.1) using a hex key. It should spin easily and its vanes must not strike the walls of the cap (6). Continue turning the rotor several dozen times. The nozzle and tee housing will slowly rotate if everything has been assembled correctly.
2. Insert the stator (12) into the (6).
3. Screw on the collar (11) (hand-tight only), and tighten the collar set screw (30) with a 3/32" hex key.



WARNING

Hold or turn on stem (7.1). Do **NOT** hold or turn on tee housing (8.1) or tee housing cap (15). Doing so will damage the gear train.



*It is important to observe the technical data during installation, operation and maintenance.
Inform personnel about the technical data.*

7.1 Technical data

The PF tank cleaning machine is a highly efficient machine at a range of pressures and flows.
The instruction manual is part of the delivery. Read the instructions carefully.

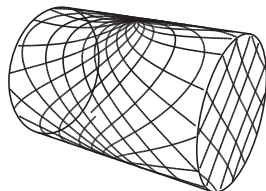
TECHNICAL DATA

Lubricant Food grade
Max. throw length 14 - 20 m (45-65 ft.)

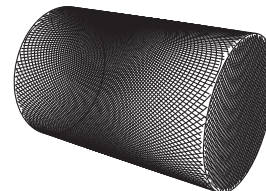
Pressure

Working pressure 3 - 28+ bar (40 - 400+ PSI)
Recommended pressure 4 - 20 bar (50 - 300 PSI)

Cleaning pattern



First cycle



Full pattern

The above drawings show the cleaning pattern achieved on a cylindrical horizontal vessel. The difference between the first cycle and the full pattern represents the number of additional cycles available to increase the density of the cleaning.

Certificate

2.1 material certificate

PHYSICAL DATA

Materials

316L, PPS, PTFE, EPDM (FKM and FFKM available).

Temperature

Max. working temperature 90°C (195°F)
Max. ambient temperature 140°C (284°F)

Weight 4.5 kg (10 lbs.)

Connections

Standard thread 1½" Rp (BSP) or NPT, female
Available option 1.5" weld, 1.5" tri-clamp, 1.5" ISO 2037 slip fit, 1.5" DIN R1 slip fit, 1.5" DIN R2 slip fit

Options

Electronic rotation sensor to verify 3D coverage.

Caution

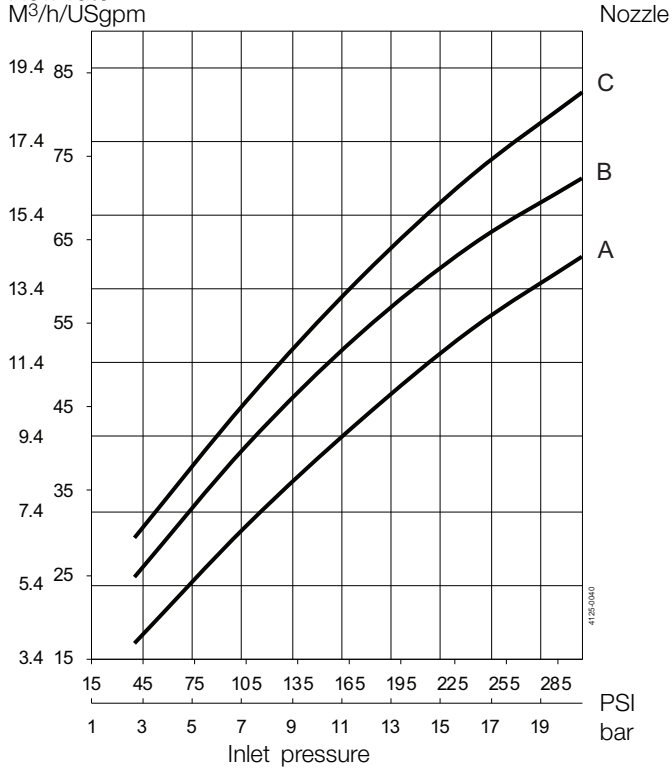
Do not use for gas evacuation or air dispersion.

7 Technical data

It is important to observe the technical data during installation, operation and maintenance.
Inform personnel about the technical data.

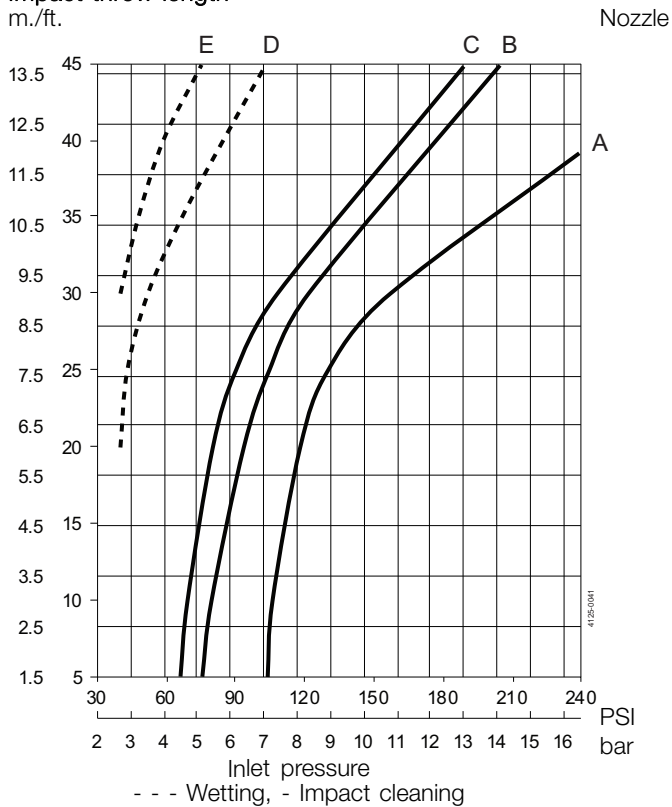
7.2 Performance data

Flow rate
M³/h/USgpm



- A. = 6.4 mm (1/4in)
- B. = 7.9 mm (5/16in)
- C. = 9.5 mm (3/8in)

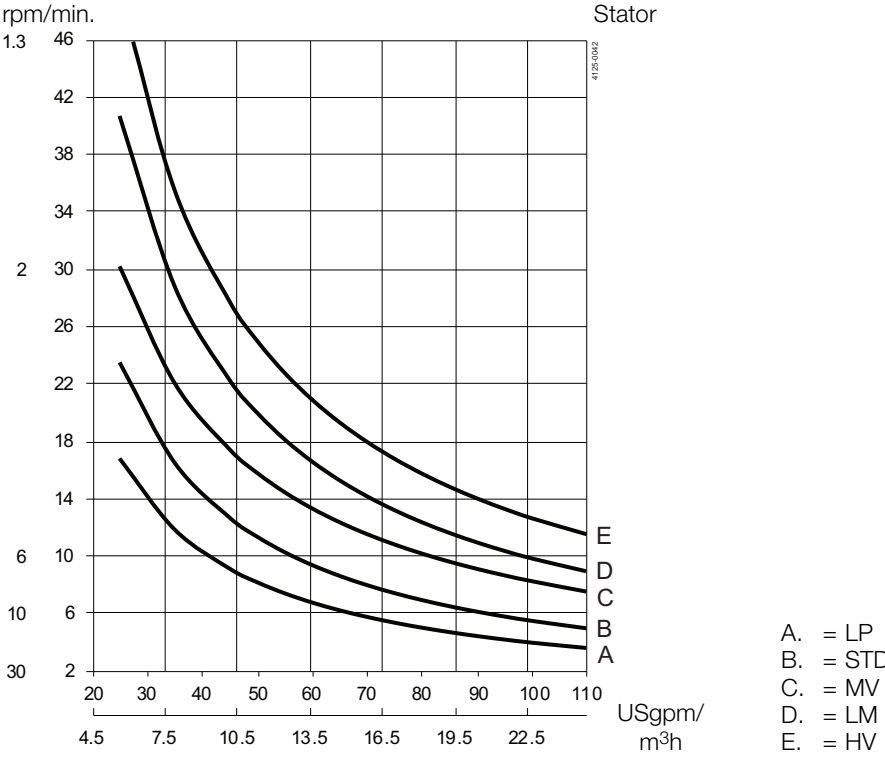
Impact throw length
m./ft.



- A. = 6.4 mm (1/4in)
- B. = 7.9 mm (5/16in)
- C. = 9.5 mm (3/8in)
- D. = 6.4 mm (1/4in)
- E. = 7.9 mm (5/16in)

It is important to observe the technical data during installation, operation and maintenance.
Inform personnel about the technical data.

Cleaning time

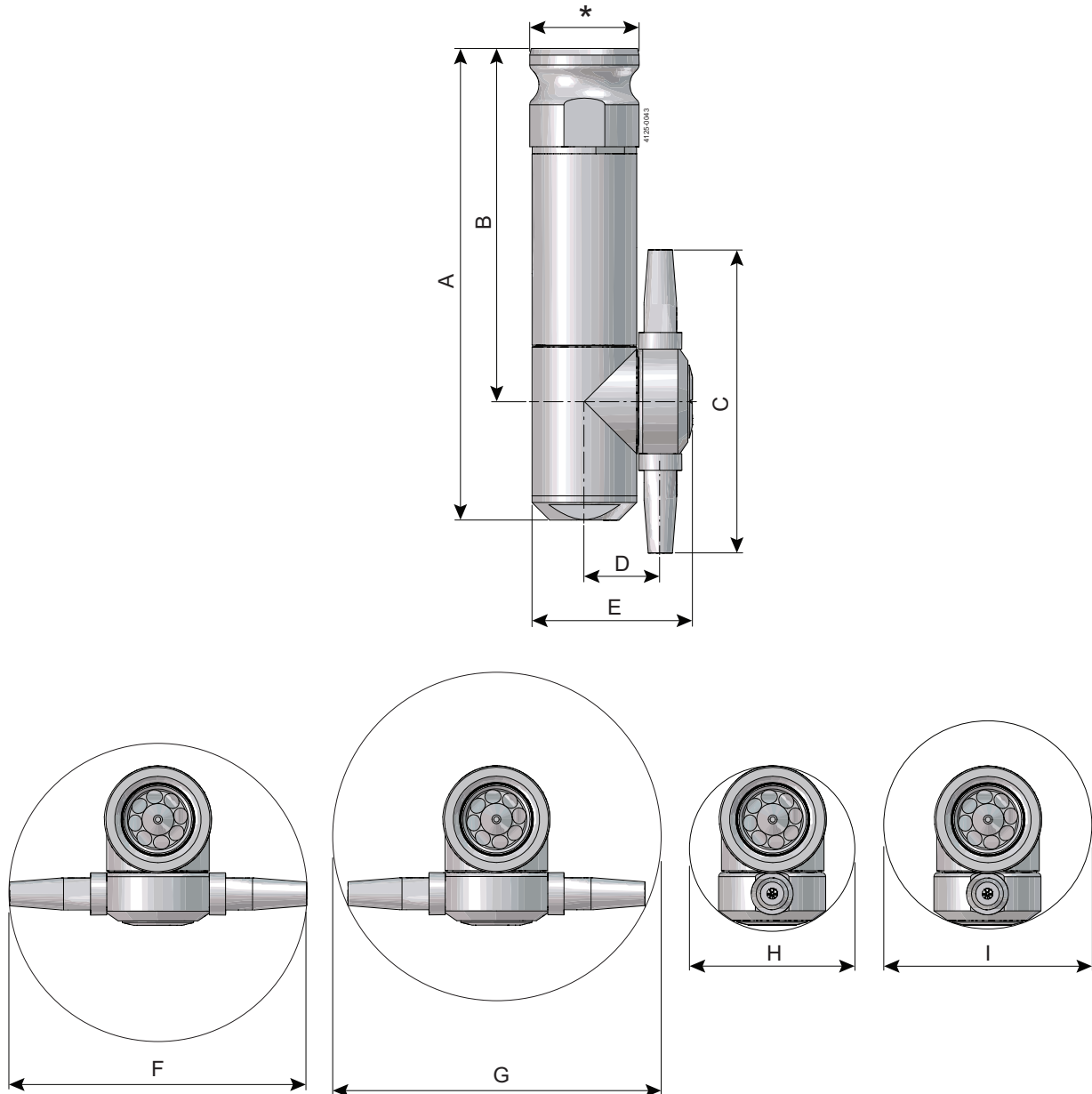


7 Technical data

It is important to observe the technical data during installation, operation and maintenance.
Inform personnel about the technical data.

7.3 Dimensions

Dimensions



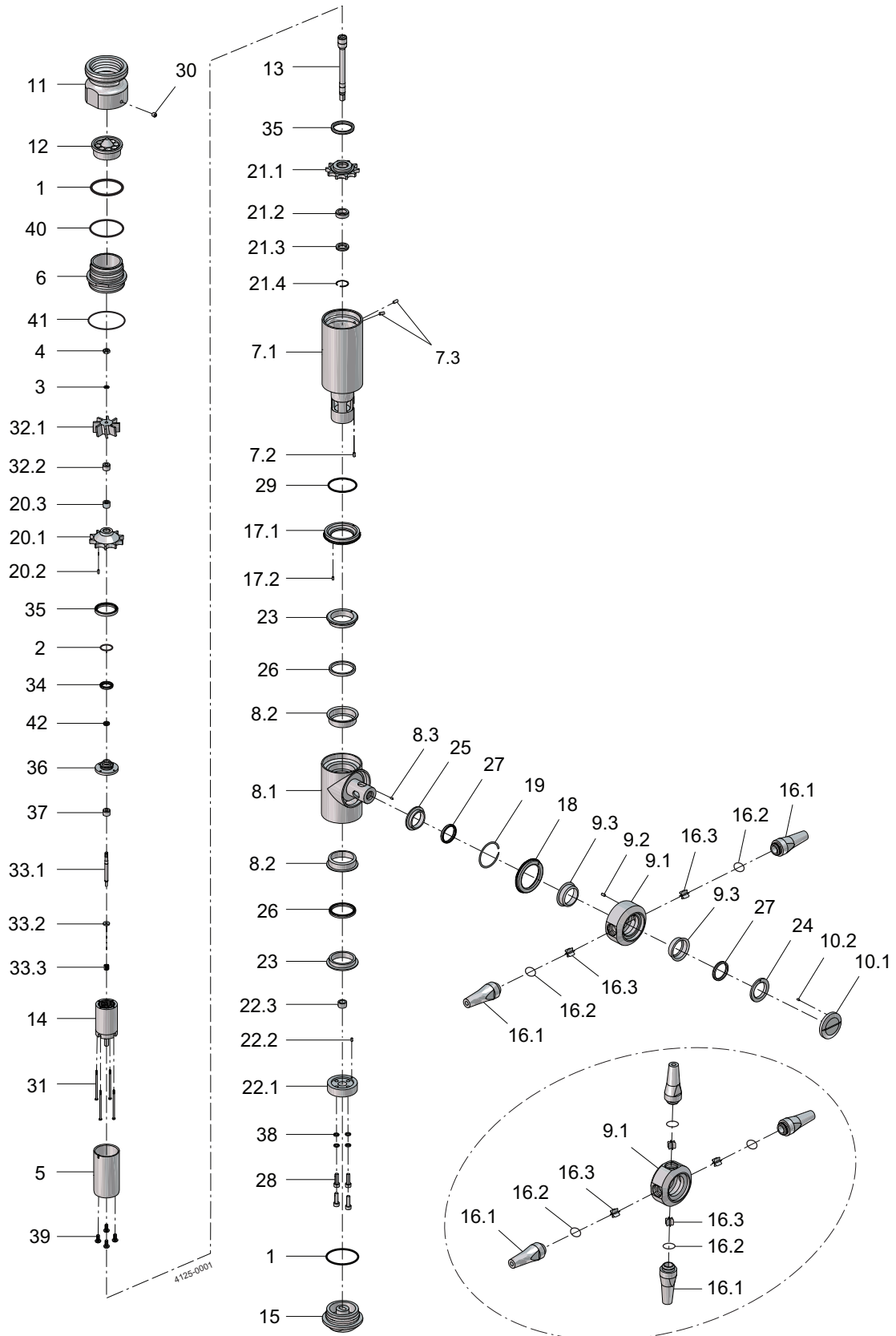
Dimensions

	A	B	C	D	E	F	G	H	I
mm	272	204	175	44	94	176	202	98	129
in	10.70	8.01	6.88	1.73	3.69	6.90	7.95	3.83	5.05

NOTE 1: 1-1/2" FNPT/2" camlock or 1-1/2" BSP/2" camlock (option shown above).

8 Parts list and service kits

8.1 Parts list and service kits



8 Parts list and service kits

Parts list

Pos.	Qty	Denomination
1	2	Small collar o-ring and tee housing cap o-ring
2	1	Rotor shaft lower bearing housing o-ring
3	1	Rotor lock washer
4	1	Rotor nut
5	1	Gearbox
6	1	Cap
7	1	Stem assembly
7.1	1	Stem
7.2	1	Dowel pin - stem
7.3	2	Tapered pin
8	1	Tee housing assembly
8.1	1	Tee housing
8.2	2	Tee housing cup
8.3	1	Bearing locating pin
9	1	Nozzle housing assembly
9.1	1	Nozzle housing
9.2	1	Dowel pin - nozzle housing bevel gear
9.3	2	Nozzle housing cup
10	1	Nozzle plate assembly
10.1	1	Nose plate
10.2	1	Bearing locating pin
11	1	Inlet collar
12	1	Stator
13	1	Output shaft
14	1	Planetary gearhead
15	1	Tee housing cap
16	2/4	Low-profile nozzle
16.1	2/4	PowerFlex nozzle
16.2	2/4	Low profile nozzle
16.3	2/4	Powerflex nozzle
17	1	Stream straightener
17.1	1	Nozzle housing bevel gear assembly
17.2	1	Tee housing bevel gear
18	1	Bearing locating pin
19	1	Nozzle housing bevel gear retaining ring
20	1	Input shaft upper bearing housing assembly

Parts list

Pos.	Qty	Denomination
20.1	1	Input shaft upper bearing housing
20.2	1	Gearbox pin
20.3	1	Input shaft carbide bearing - upper housing
21	1	Gearhead upper bearing housing assembly
21.1	1	Gearhead upper bearing housing
21.2	1	Output shaft upper carbide bearing
21.3	1	Output shaft upper seal
21.4	1	Output shaft retaining ring
22	1	Stem base assembly
22.1	1	Stem base
22.2	1	Bearing locating pin
22.3	1	Output shaft lower carbide bearing
23	2	Tee housing bearing
24	1	Nozzle housing bearing (outer)
25	1	Nozzle housing bearing (inner)
26	2	Tee housing seal
27	2	Nozzle housing seal
28	4	Stem screw
29	1	Clutch o-ring
30	1	Collar set screw
31	4	Gearhead long screw
32	1	Rotor assembly
32.1	1	Rotor
32.2	1	Input shaft carbide bearing - rotor
33	1	Input shaft assembly
33.1	1	Input shaft
33.2	1	Input shaft carbide thrust washer
33.3	1	Input pinion
34	1	Input shaft bearing housing static seal
35	2	Gearbox static seal
36	1	Input shaft lower bearing housing
37	1	Input shaft carbide bearing - lower housing
38	4	Stem & taper cap screw lockwasher
39	4	Gearhead short screw
40	1	Large collar o-ring
41	1	Collar stem o-ring
42	1	Input shaft seal

Service kits

Denomination	Item no.	Gamajet no.
Minor Service kits		
♦ Viton (FKM)	9614648401	10PFVITONMINKIT
▲ EPDM	9614648001	10PFEPDMMINKIT
* Kalrez	9614648201	10PFKALREZMINKIT
Major service kits		
□ Viton (FKM)	9614648501	10PFVITONMAJKIT
○ EPDM	9614648101	10PFEPDMMAJKIT
❖ Kalrez	9614648301	10PFKALREZMAJKIT

How to contact Alfa Laval

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