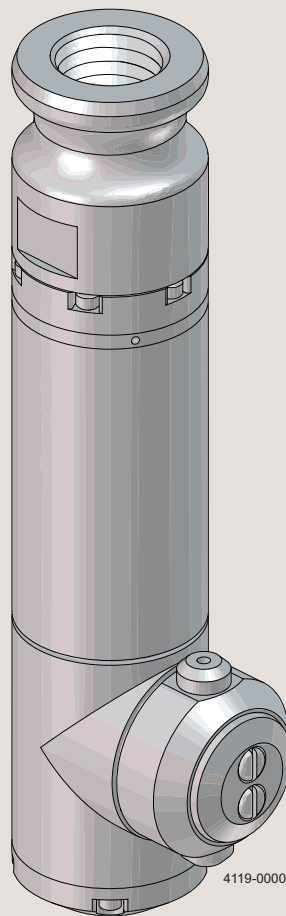




Instruction Manual

Alfa Laval GJ 9



Covering: Standard machines
First published: 2015-07

ESE03154-EN2 2017-02

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 9

Type

From serial numbers from T-0100 to T-XXXX

is in conformity with the following directive with amendments:
Machinery Directive 2006/42/EC
- DS/EN ISO 12100:2011

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
Pumps, Valves, Fittings and Tank Equipment

Title

Lars Kruse Andersen

Name

Kolding

Place

2015-05-18

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 in order to avoid serious personal injury.

CAUTION

Indicates that special procedures must be followed in order 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.
Any tank cleaning machine can develop a static electricity charge while in operation.



If the tank being cleaned contains a combustible liquid or vapour having a risk of ignition or explosion, it is imperative to have the Alfa Laval GJ 9 properly grounded using the provided location on the unit.

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 the Alfa Laval GJ 9 is operating, there should be covers over every tank opening.
These covers should be secured tight enough in order to withstand the full force of the jet striking the cover plate.

If the cleaning solution is hot, corrosive or toxic, a leak will 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 vapour having a risk of ignition or explosion, it is imperative to have the Alfa Laval GJ 9 properly grounded using the provided location on the unit.



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 9 is a fluid-driven (turbine-driven) 360° rotary nozzle machine designed for cleaning the interior surfaces of a wide variety of process vessels with a minimum opening of 71.1 mm (2.80 inches) in diameter. It is powered entirely by the cleaning solution and it requires no electricity, compressed air or lubricant for operation.

The Alfa Laval GJ 9 is designed for both portable and CIP (Clean In Place) applications. If the Alfa Laval GJ 9 is permanently mounted inside a tank, we strongly recommend inspecting the unit every 200-300 hours of operation. See section 6 Maintenance for more information.



WARNING

In some conditions, the Alfa Laval GJ 9 may be allowed to be immersed while left in the tank. It is strongly recommended that you have prior approval from Alfa Laval to ensure this will not harm the machine in any way. Failure to comply with this restriction may void the warranty!

In order to handle the broadest possible range of applications, the stainless steel Alfa Laval GJ 9 is available with an extensive selection of nozzle sizes, guides (non-rotating turbine), and O-ring materials. The nozzles are available in several interchangeable sizes that range from 1.78 mm to 5.72 mm (0.070" to 0.225").

The Alfa Laval GJ 9 wash cycle time can be adjusted for special applications by changing the guide and/or nozzle size. Interchangeable guides 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 the tank, vessel or container size in which it will be used.
 - That the construction materials (both metallic and non-metallic) are compatible with the product, flushing media, cleaning media, temperatures and pressure under the intended use.
-

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 the registered trademark of Alfa Laval Corporate AB. "Gamajet" is a trademark or registered trademark of Alfa Laval. The Alfa Laval Gamajet™ 9 product has patent in the US (US 6,123,271). 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 located on the body of the tank cleaning machine.

Alfa Laval Tank Equipment — Exton, PA
Patent #: 6,123,271



4 Installation

4.1 Unpacking/delivery

Step 1

CAUTION

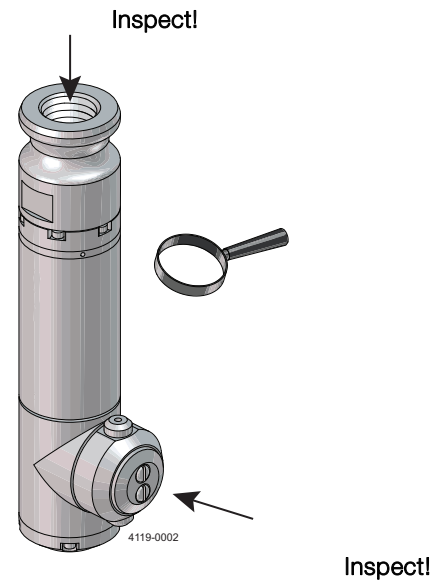
Alfa Laval cannot be held responsible for incorrect unpacking.

Check the delivery for:

1. Complete cleaning machine.
2. Delivery note.

Step 2

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



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

4.2 Installation

Step 1



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

Step 2

Assembly

Every Alfa Laval GJ 9 is operationally tested before shipment and is ready for use after unpacking.

No assembly is required prior to use.

The Alfa Laval GJ 9 has been configured to meet the operating conditions (at the Alfa Laval GJ 9, not at the pump) given to us, e.g. pressure, flow, temperature, cycle time, chemical adders etc.

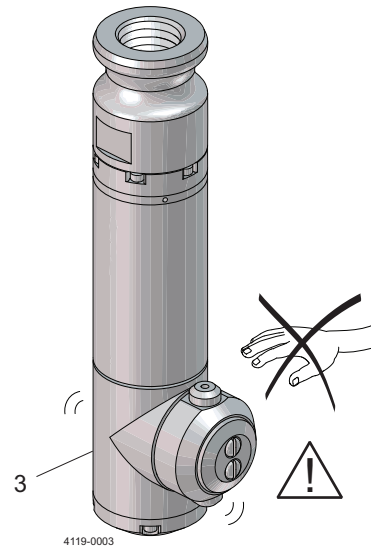
NOTE

Any change to the original operating conditions will affect the Alfa Laval GJ 9 accordingly.



WARNING

Do not force tee housing (3) to rotate. In doing so, damage may be caused to the internal components.



Step 3

Inlet connections

The standard inlet connections for the Alfa Laval GJ 9 is a $\frac{3}{4}$ " NPT female/ $1\text{-}\frac{1}{4}$ " male camlock adapter and $\frac{3}{4}$ " BSP/ $1\text{-}\frac{1}{4}$ " male camlock adapter. 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 minimise any chance of leakage and will make subsequent removal much easier.

4 Installation

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

Step 4

Mounting

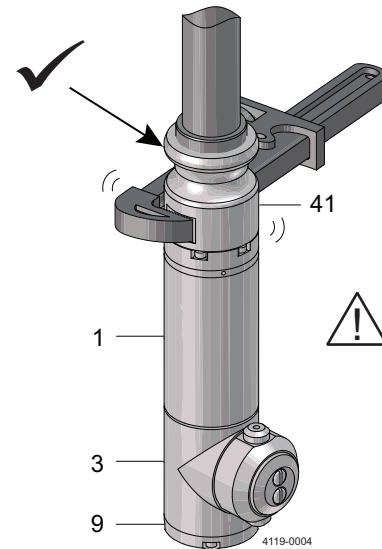
Before mounting the Alfa Laval GJ 9, make sure the supply line has been adequately flushed. It can be mounted on a rigid 3/4" pipe using a pipe wrench. For most applications, the Alfa Laval GJ 9 will be mounted with the inlet connection pointing up; however, the Alfa Laval GJ 9 will function at any orientation.

The Alfa Laval GJ 9 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 centred, 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 stable and, thus, will not maintain the Alfa Laval GJ 9's position in the tank.



WARNING

When attaching the Alfa Laval GJ 9 onto the supply pipe, **ALWAYS** apply the wrench to the inlet collar (41) at the top/inlet of the unit. Never use a wrench on stem (1), tee housing (3) or tee housing base (9) to tighten the unit onto the pipe. Doing so risks internally damaging the machine. Refer to step 1 in chapter 6.1 General maintenance .



Step 5

Location inside tank

Generally, a single Alfa Laval GJ 9 will be positioned in the approximate centre of the vessel in order to equalise 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, it is recommended that the Alfa Laval GJ 9 is 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 minimise 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 problems or "striping."

Step 6

Entry openings

When using the Alfa Laval GJ 9, the vessels being cleaned must provide entry openings large enough to avoid interference during insertion and removal. The minimum opening size required for the Alfa Laval GJ 9 is 71.1 mm diameter (2.80 inches) for free-hand installation and 96.0 mm (3.78") for automated (fixed-centreline) installation.

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 9 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 9 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 0.006" (150 micron, 100 mesh) or larger**, as these will not pass through the Alfa Laval GJ 9. 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 9 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 9, pumps, valves, and other system components. Filters, properly installed and maintained, will more than pay for themselves with lower overall operating costs for these applications. Furthermore, to ensure that clogged filters or strainers are cleaned, we recommend using automatic self-cleaning models.

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

Step 9

Capacity of supply pump

The Alfa Laval GJ 9 can be used with either a centrifugal or positive displacement (PD) (constant volume) style pump. In most cases, if the Alfa Laval GJ 9 is to be used with a centrifugal pump, the Alfa Laval GJ 9 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 Alfa Laval GJ 9 pressure/flow rate requirements into account.

If a PD style pump (i.e. piston pump, plunger pump, or mechanical diaphragm pump etc.) is to supply the wash fluid to the Alfa Laval GJ 9, a different set of rules applies. 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 9 / plumbing system.

If a PD pump is used, the Alfa Laval GJ 9 should be sized, first, to match the flow capability of the pump and then, to not exceed the Alfa Laval GJ 9's or pump's maximum operating pressure (taking the pressure rating of the plumbing system into account, also).



WARNING

For high-pressure applications (over 10bar (150 psig)), 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 affect is not covered by the warranty.

4.3 Recycling Information

Unpacking

- Packing material consists of wood, plastics, cardboard boxes and in some cases metal straps.
- Wooden 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.
-

5 Operation

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.

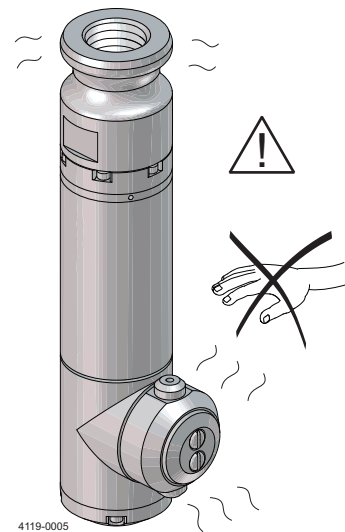
CAUTION

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.



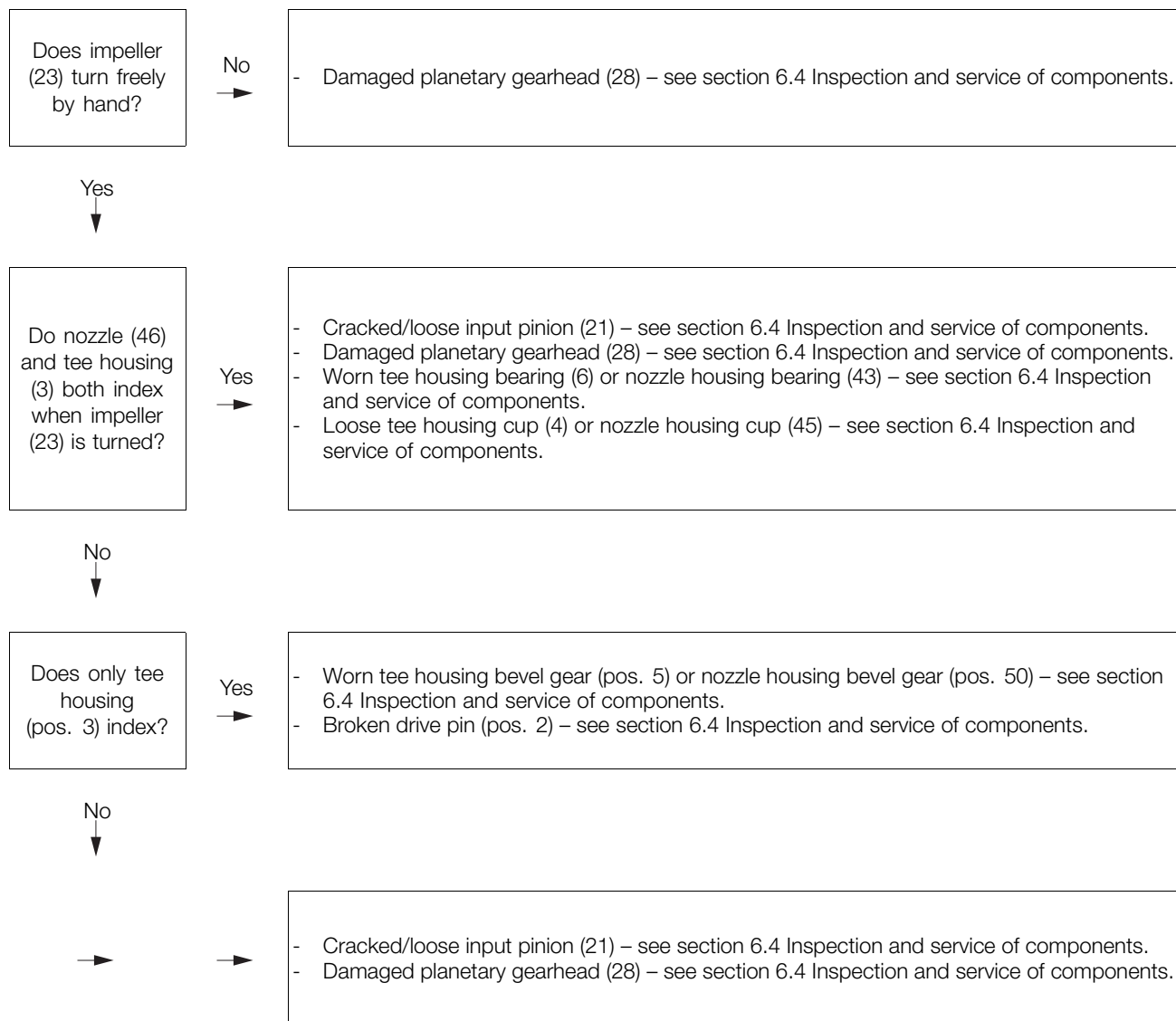
Step 3

Initial startup

Every Alfa Laval GJ 9 that ships is accompanied by a birth certificate. This document indicates how the Alfa Laval GJ 9 performed in our testing tank before it shipped based on the operating conditions supplied to Alfa Laval. To ensure the longest possible life of the 9, 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 machines full cycle time in minutes. In other words, a single 10-second rotation translates to a 10 minute full cycle time.

Pay attention to possible faults.
Read the instructions carefully.

5.2 Troubleshooting



5 Operation

*Pay attention to possible faults.
Read the instructions carefully.*

Step 1

INSUFFICIENT FLOW

The Alfa Laval GJ 9 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 guide (40) is too large, the tee housing (3) will not turn.
Look for restrictions in the fluid supply such as a clogged filter, kinked hose, or deposits in the piping.

Step 2

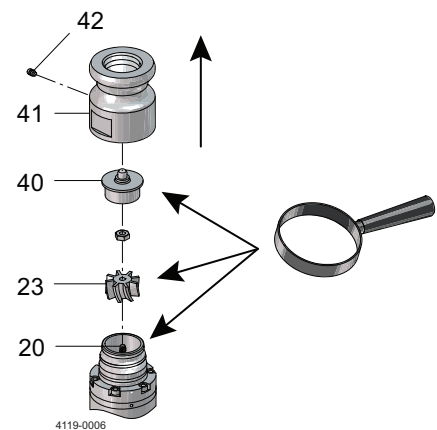
TIGHT CLEARANCES

A recently overhauled Alfa Laval GJ 9 may fail to operate when first returned to service. If the machine seems otherwise fine, try running it with at least one nozzle (46) removed. The reduction in pressure and additional flow will invariably be enough to overcome the extra resistance of new bearings and seals. 20 minutes of operation should loosen the machine to run normally with the nozzles (46) reinstalled.

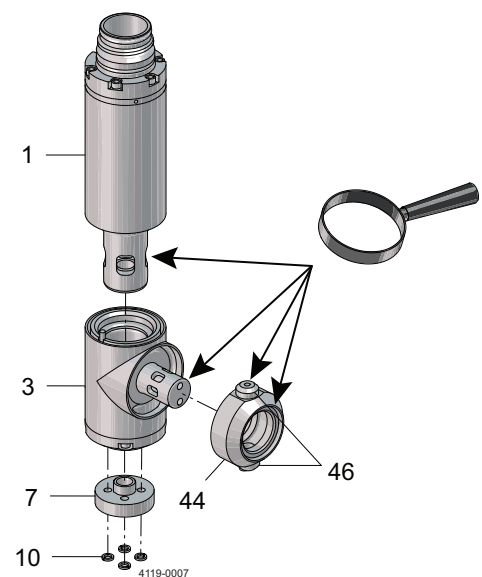
Step 3

DEBRIS INSIDE

1. Loosen the collar set screw (42), remove the collar (41), and then lift out the guide (40).
2. Look for and remove any debris caught in the guide and the vanes of the impeller (23).
3. Remove any material wound around the input shaft (20).



4. In addition, check for any debris caught in the outlet holes of the stem (1), the nose of the tee housing (3), the nozzle housing (44), and the nozzles (46).



*Pay attention to possible faults.
Read the instructions carefully.*

5.3 Cleaning solution leakage

Cleaning solution leakage

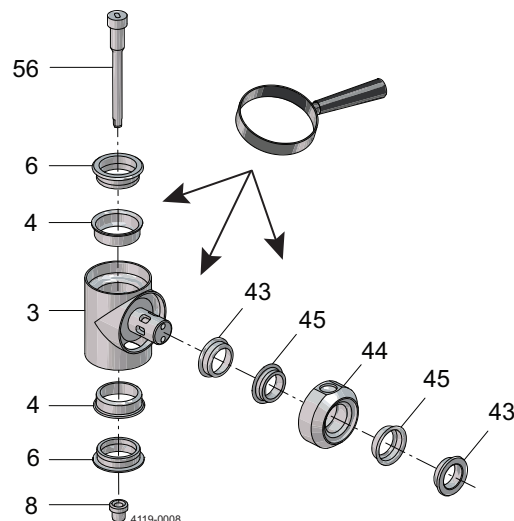
The Alfa Laval GJ 9 is a self-flushing machine and thus has 2-3% leakage designed into the machine. Excessive leakage may indicate a larger issue.

Worn bearings & seals

Excessive leakage from the tee housing (3) or nozzle housing (44) usually indicates a damaged tee housing bearing (6) and/or nozzle housing bearing (43). Inspect them for wear. Specifically, examine the condition of the external ring and internal O-ring. Also, check the output shaft lower bearing (8) and output shaft (56). Examine the condition of the internal ring. There should still be some interference with the output shaft (56) as it passes through it.

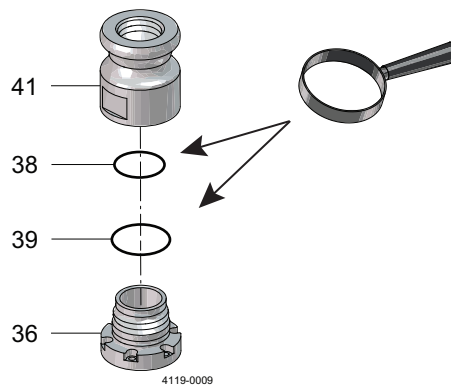
Worn housing cups

Inspect the housing cups (4) and (45) for excessive wear (grooved or scored). Replace any that show distinct grooves.



Worn collar O-rings

Severe leakage between the collar (41) and cap (36) may indicate worn or damaged collar O-rings (38) and (39). 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.*

5.4 Poor cleaning performance

- **Inadequate flow and pressure**

Check the pressure at the Alfa Laval GJ 9 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 in order to ensure adequate pressure. Insufficient pressure may also result from line losses when the machine is too far from the pump. If this is the case, the line size must be increased accordingly for long runs. Although the Alfa Laval GJ 9 will rotate at low flow rates, effective cleaning may require significantly 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 appropriate temperature.

- **Plugged nozzles**

Unscrew the nozzles (46) and inspect for any debris.

- **Slow housings or housings with no rotation**

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

- **Alfa Laval GJ 9 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 9 nozzle size, turbine, and gearing are correct for the necessary application. Refer to the machine's birth certificate for specific information regarding its configuration. Contact an Alfa Laval Tank representative if further 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 9. The floor of the vessel should be sloped or pitched toward the drain. The drainage opening should be large enough to gravity-drain the effluent from the vessel. If you still have puddling ('i.e. a build-up of wash fluid that is covering the floor and shielding the residue underneath, then use some form of pump to remove the effluent.

The tank cleaning machine is designed for 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 hazard!



Always use rubber gloves!



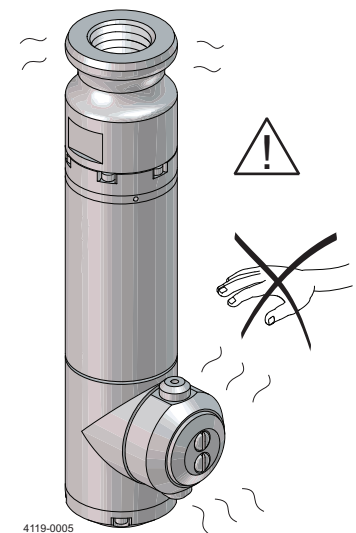
Always use protective goggles!

Step 2



Never touch the pump or the pipelines when sterilising.

**'Potential hazard:
 may cause burns!**



4119-0005

Step 3

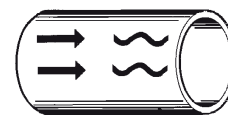


Always rinse well with clean water after using a cleaning agent.

Always rinse!

NOTE

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



Clean water

Cleaning agent

6 Maintenance

Maintain the tank cleaning machine with care.
Read the instructions carefully and pay special attention to the warnings!
Always keep a 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: service kits. 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 setup

Step 1

NOTE

A rigorously implemented preventative maintenance programme will significantly reduce repair costs over the life of the Alfa Laval GJ 9.

The foundation of such a program consists of regularly scheduled inspections in order to discover and replace worn or damaged parts in order to prevent failure of other, more costly, components. The inspection intervals described will depend on the severity of the application but a complete internal inspection at 100 hours of operation is recommended initially.

Step 2

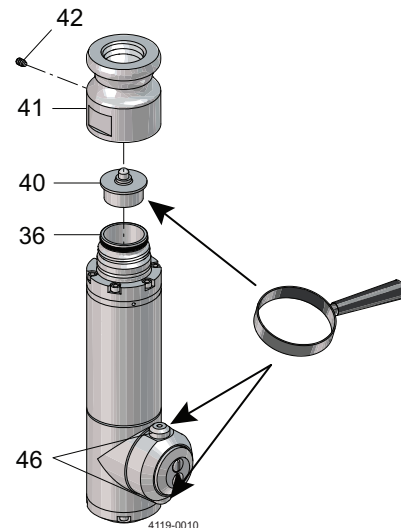
STORAGE

The Alfa Laval GJ 9 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 9 to seize or lock up. A clean water rinse through the Alfa Laval GJ 9 will also wash out any residue from the 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 9 is to stand it up with the inlet connection facing down.

Step 3

EXTERNAL INSPECTION INTERVALS

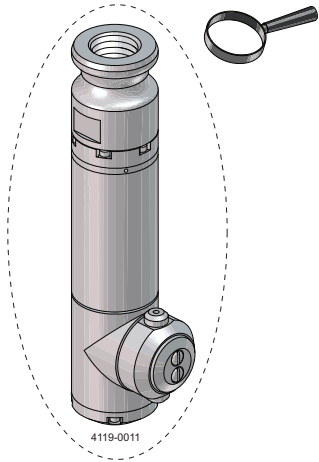
Before every shift, the guide (40) and the nozzles (46) should be inspected for debris. Examine the guide by loosening the collar set screw (42) while holding on the flats of the cap (36) and remove the main section of the machine from the collar (41). Look into each nozzle for signs of debris or build-up.



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.

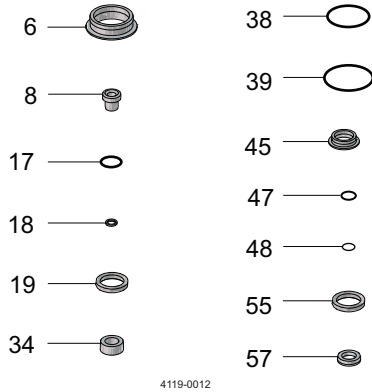
Step 4
INTERNAL INSPECTION INTERVALS

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 9 may then be inspected and undergo routing preventive maintenance every 300 to 500 hours of operation, depending on the severity of use.



Step 5
TIPS

All the bearings, bushings, seals and O-rings are wear parts. Ideally, they should all be replaced, as a group, every 300 to 500 hours of operation, depending on the severity of use. If just one bearing or seal is worn or damaged, it is still necessary to replace both the worn or damaged seal or bearing and its counterpart. Verify that the mating cups (4) and (45) 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.



6 Maintenance

Read the instructions carefully.

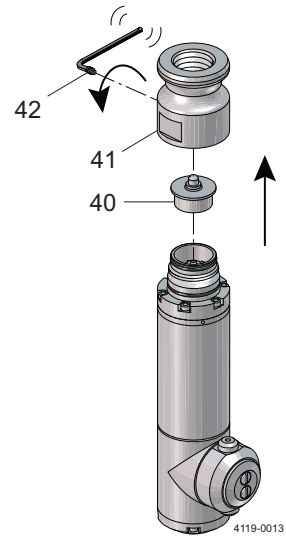
The items refer to the parts list and service kits section.

6.3 General dismantling

Step 1

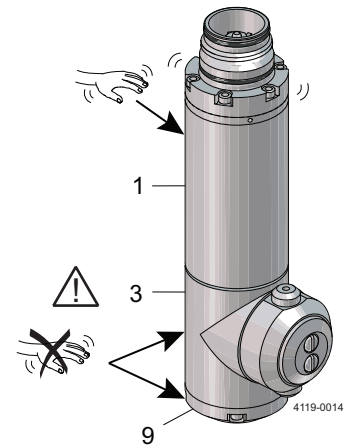
Inlet collar

1. Loosen the collar set screw (42) with a 5/64" hex key, minimum 2 turns.
2. Remove the inlet collar (41) and guide (40).



WARNING

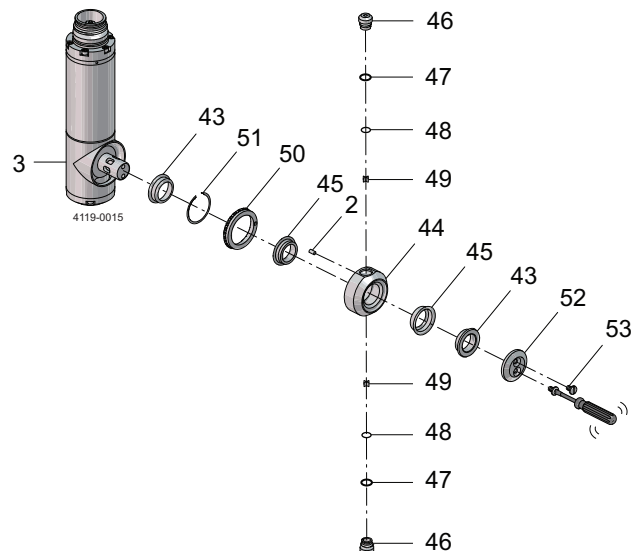
Hold or turn on stem (1). **DO NOT** hold or turn on tee housing (3) or tee housing base (9). Doing so will damage the gear train.



Step 2

Nozzle housing

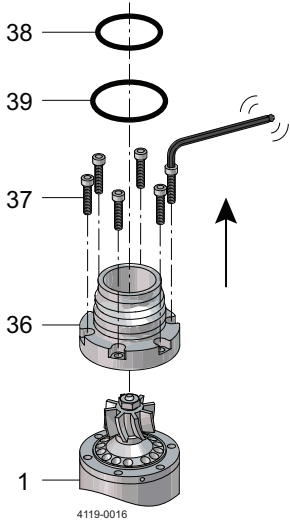
1. Unscrew the name plate screws (53) with a slotted screwdriver.
2. Pull the nozzle housing assembly from the nose of the tee housing (3).



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

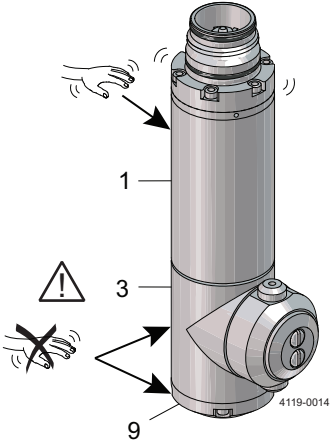
Step 3
Cap and gear train

- 1. Using a 7/64" hex key, remove the cap screws (37) from the stem (1).
- 2. Remove the cap (36) from the body.
- 3. Pull the gear train from the remainder of the body.



WARNING

Hold or turn on stem (1). **DO NOT** hold or turn on tee housing (3) or tee housing base (9). Doing so will damage the gear train.



6 Maintenance

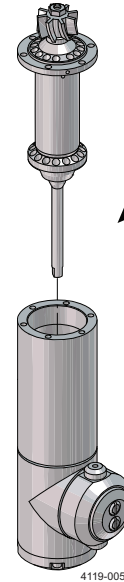
Read the instructions carefully.

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

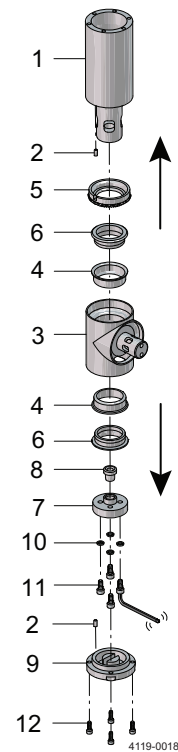
Step 4

Body assembly

1. Remove the tee housing base screws (12) with a 3/32" hex key and the tee housing base from the tee housing.



2. Unscrew the stem base screws (11) with a 9/64" hex key and remove the stem base.
3. Remove the tee housing by pulling it from the stem.
4. Remove the lower tee housing bearing (6) and bevel gear (5).



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

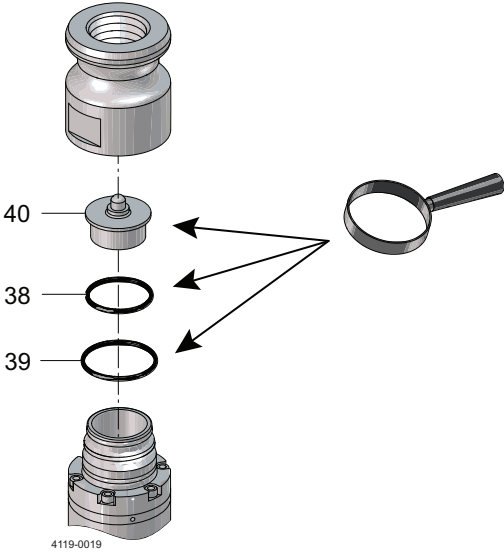
6.4 Inspection and service of components

Guide

Inspect the guide's (40) trough holes to be sure that they are clear.

Collar O-rings

Inspect the small and large collar O-rings, (39 and 38), for damage (clipped or cut) or deterioration (compression set or hardening) and replace if necessary.



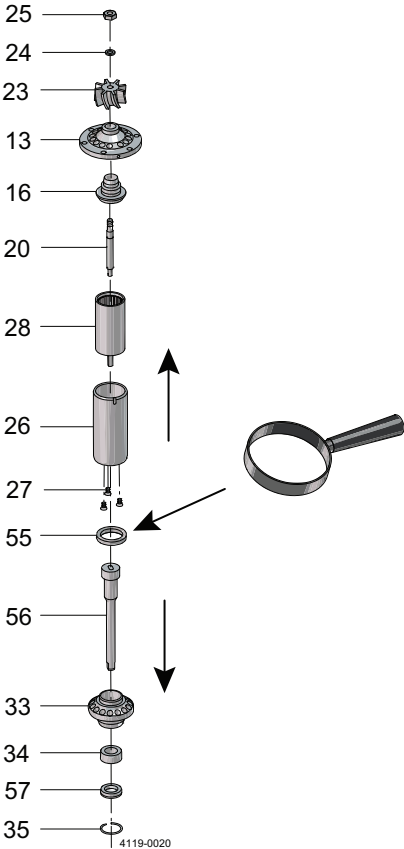
Planetary gear train assembly

General disassembly and inspection

- 1. Pull and twist the gearhead lower bearing housing (33) from the gearbox (26).
- 2. Remove the output shaft (56) from the planetary gearhead (28).
- 3. If the lower gearbox seal (57) did not come out of the (26) when the (33) was removed, remove it at this time.

WARNING

To reduce the likelihood of scratching any sealing surface, use a pick made from brass. Inspect the (55) for loss of spring tension (indicated by excessively dry deposits of dirty or abrasive cleaning solution on the spring); replace as required.



6 Maintenance

Read the instructions carefully.

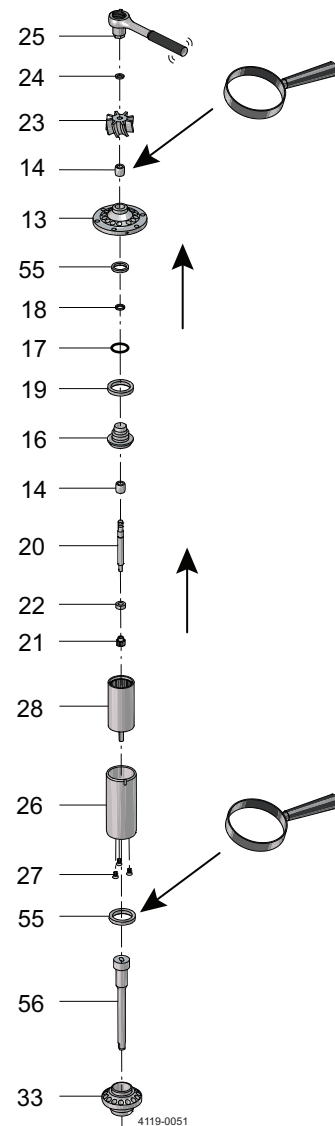
The items refer to the parts list and service kits section.

4. Unscrew the impeller nut (25) with an 11/32" socket and remove it with the lockwasher (24) from the input shaft upper bearing housing (13).
5. Remove the impeller (23) from the input shaft (20). If needed, use a slotted screwdriver for assistance.
6. Check that the carbide bushing (14), pressed into (23), protrudes slightly, and is not chipped or cracked.
7. Ensuring that the gear train assembly is oriented up, similarly to the direction of the (20), carefully remove the (13) by holding down the (20) with one finger and pulling and twisting the (13) from the gear train. Applying downward pressure on the (20) ensures that none of the internal gearing is dislodged when the (13) is removed.
8. Remove the (20) from the (26).
9. Inspect the upper (55) for loss of spring tension (indicated by excessively dry deposits of dirty or abrasive cleaning solution on the spring), replace as required.



WARNING

To reduce the likelihood of scratching any sealing surface, use a pick made from brass. Inspect the (55) for loss of spring tension (indicated by excessively 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.

Gearhead internals

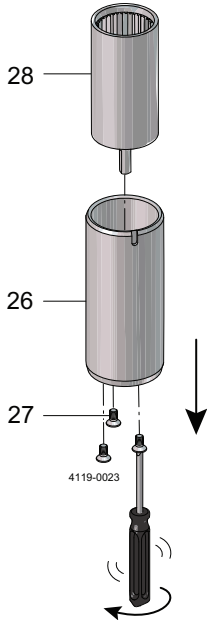
Tip

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.

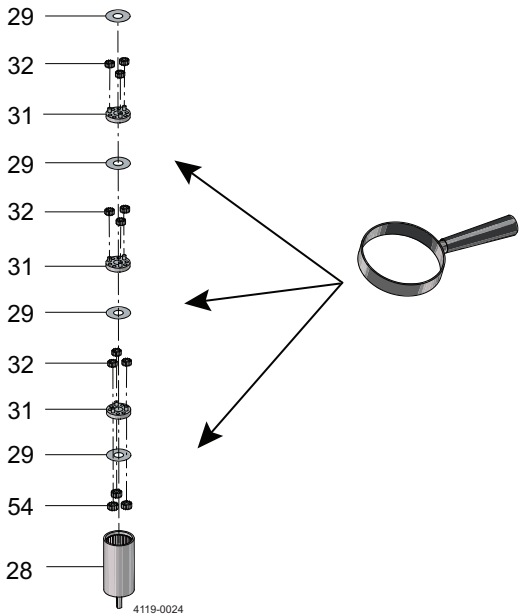
- 1. Using a #1 Phillips screwdriver, unscrew the gearhead screws (27) from the gearbox (26).
- 2. Remove the planetary gearhead (28) from the (26) by pushing up on the shaft of the (28).


WARNING

If you suspect that the planetary gearhead (28) requires service, proceed with caution. If at any time you do not feel completely comfortable servicing planetary gearhead (28), contact Alfa Laval immediately.



- 3. Using needle nose pliers carefully remove the internal components of the (28).
- 4. 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 immediately.
- 5. The gears of the bottom (17 teeth) and top (14 teeth) stages must be reinstalled in their respective locations. The gears in the second and third level are interchangeable, however. During reassembly, Alfa Laval recommends the gearhead to be lightly repacked using food-grade grease. Please contact Alfa Laval for a specific grease recommendation.



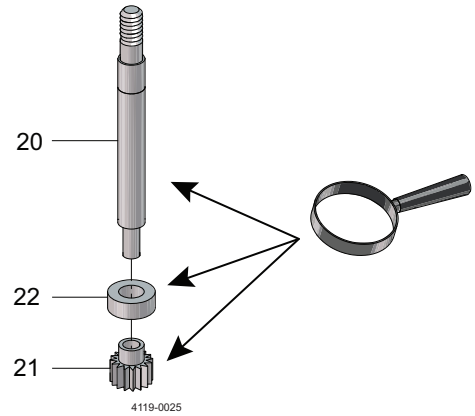
6 Maintenance

Read the instructions carefully.

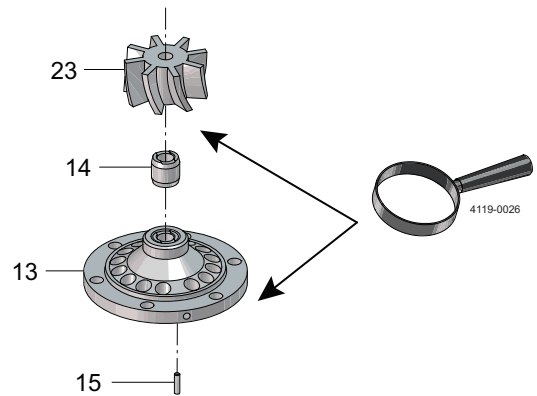
The items refer to the parts list and service kits section.

Input shaft and housings

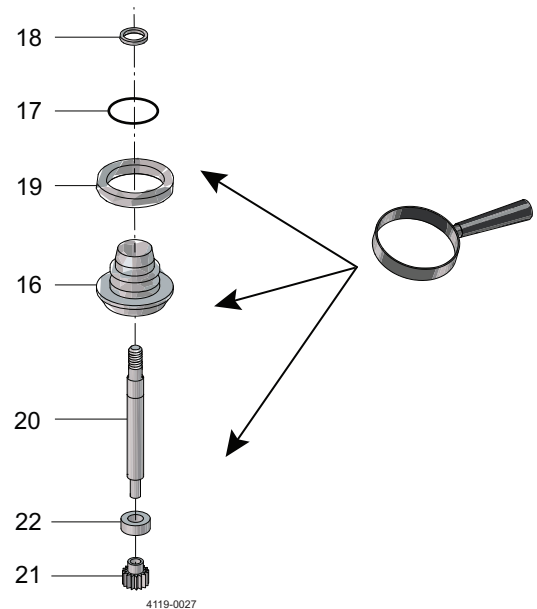
1. Inspect the input pinion (21) for hairline cracks on the end face or for worn, damaged or sharp/pointed teeth. It should be tightly secured to the input shaft (20) and the input pinion washer (22). The (22) should not be able to spin on the (20).
2. Press the (21) back onto the (20) if it has slipped or replace if cracked or worn.
3. Check for signs of scoring and wear on (20). Replace if the coating has been chipped or cracked.



4. The pin (15) should be firmly pressed into the input shaft upper bearing housing (13). The through holes of the (13) should be clear and free of debris.
5. The carbide (14) in the (23) should protrude slightly. In addition, its running surfaces should be smooth, flat, and free of chips and cracks.



6. Inspect the input shaft seal (18) (inside the input shaft lower bearing housing (16)) for wear by placing the (20) back through it. There will be drag if the (18) is still good. If it needs to be replaced, pry out the old (18) (using a brass pick), and replace it with a new one.
7. Ensure that the seal is as square as possible to the (16) when installing it. The internal spring should be up and visible.
Tip: use a soft object, such as a pencil's rubber, to apply even pressure when installing the (18).
8. Check the lower bearing housing O-ring (17) and seal (19) for deterioration or damage; replace, if necessary, using a brass pick to remove the old components. The (19) should be installed so its internal spring 'is facing upwards' or 'pointing upwards'.



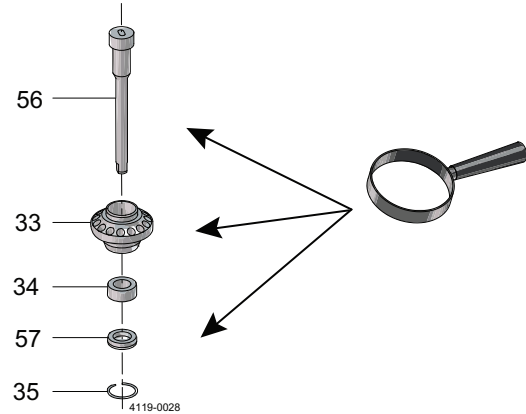
Read the instructions carefully.

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

Gearhead lower bearing housing and output shaft

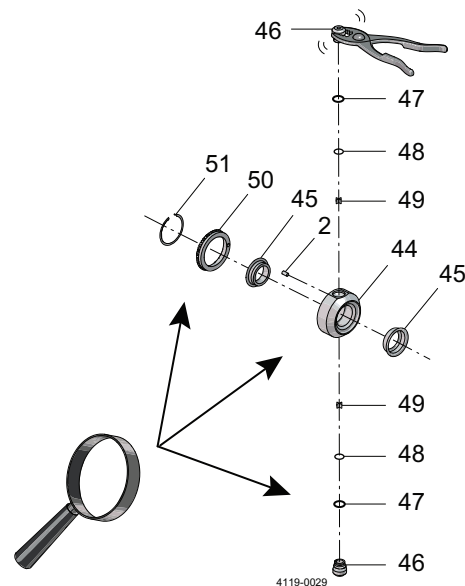
Inspect the through holes of the gearhead lower bearing housing (33). They should be clear and free of debris.

1. Check the output shaft (56) for signs of scoring or wear, especially in the area of contact with the gearhead lower housing seal (57). Replace if worn.
2. Examine the (57) for loss of spring tension (indicated by excessively dry deposits of dirty or abrasive cleaning solution on the spring). Also, ensure that it still has interference with the (56) by passing the (56) through the centre of the seal. There will be a noticeable drag if the seal is still good.
3. If the (57) must be replaced, remove the snap ring (35) using a small slotted screwdriver. Pry out the old (35) (using a brass pick), and replace it with a new one. Push or tap the output shaft upper Carbide bearing (34) in the direction of the (57). Check the inside diameter of the (34). It should not be greater than 0.380". Replace if necessary. Ensure that the seal is square to the (33) when installing it. The new (57) should be installed with the spring facing out and visible after it is installed. Reinstall the (35).



Nozzle housing

1. Unscrew the nozzles (46) with pliers and inspect for debris caught on the nozzle vanes (49) or in the nozzle orifice. The inside diameter of (46) 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. Verify the (49) is tight in the bore of the (46).
2. Inspect the nozzle housing bevel gear (50) for wear such as sharp/pointed or worn teeth. If it needs to be replaced, remove the bevel gear retaining ring (51) with a small slotted screwdriver and pry (50) from the nozzle housing (44).
3. Inspect the nozzle O-rings (47) and (48) for compression set or deterioration. Replace, if needed.
4. Inspect the nozzle housing bearings (43). Clean any deposits from the exterior of (43) and check they fit in the (45). Though the external ring may be a tight fit with the inside of the (45), they should turn freely. Also, the internal O-ring should be free from damage, compression set, or deterioration.
5. Clean any deposits from (45) and examine for excessive wear. Light scoring is acceptable, but the (45) should be replaced if the inside diameter exceeds 0.890". A good maintenance program will require replacing many (45), therefore, it may be worthwhile to make or obtain press tools for pressing (45) out of (44). The press tools are available from Alfa Laval. Before installing new (45), clean the housing bores and remove any burrs resulting from the removal of (45). Press them in so that their flanges are flush against (44).



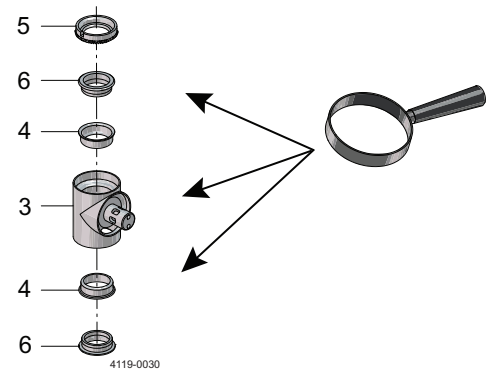
6 Maintenance

Read the instructions carefully.

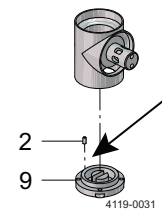
The items refer to the parts list and service kits section.

Tee housing and tee housing base

1. Check the water outlets on the nose of the tee housing (3); they should be free of debris.
2. Inspect the tee housing bevel gear (5) for worn, damaged or sharp/pointed teeth.
3. Inspect the tee housing bearings (6). Clean any deposits from the exterior of (6) and that they fit in the tee housing cups (4).
Although the external ring may be a tight fit around the inside of the (4), they should turn freely. Also, the internal O-ring should be free from damage, compression set or deterioration.
4. Clean any deposits from the (4) and examine for excessive wear. Light scoring is acceptable; however, the cups (4) should be replaced if the inside diameter exceeds 1.165". A good maintenance programme will require replacing many (4), therefore, it may be worthwhile to make or obtain press tools for pressing (4) out of (3). The press tools are available from Alfa Laval. Before installing new (4), clean the housing bores and remove any burrs resulting from the removal of (4). Press them in so that their flanges are flush against (3).

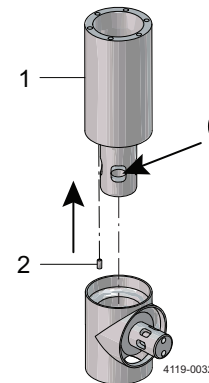


5. Ensure that the pin (2) is pressed firmly into (9).

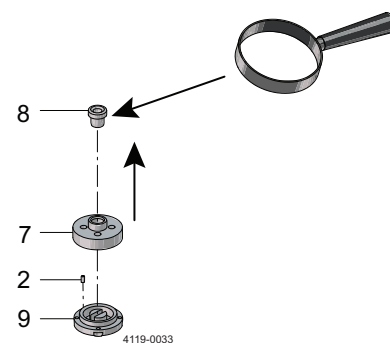


Stem and stem base

1. Inspect the water outlets of the stem (1); they should be free of debris. The pin (2) should be firmly pressed into the (1).



2. Inspect the output shaft lower bearing (8) for wear. The inside diameter of the (8) should not exceed 0.257". If it needs to be replaced, pull it out of the stem base (7) and install a new one.



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 difficulty when coming to disassemble the Alfa Laval GJ the next time it needs to be serviced. Also, it may cause misalignment of parts and the potential for premature failure.

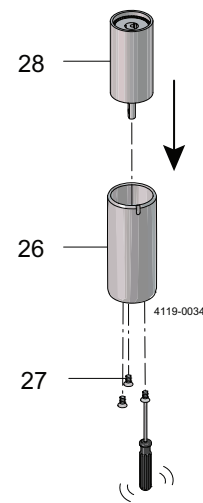
Unless otherwise stated, apply a dab of a Teflon-based anti-seize compound to all threads when reassembling; this will prevent threads from galling and ease any future disassembling issues.

To facilitate installation of all O-rings, they should be lubricated prior to reassembly. Lithium-based grease is acceptable; for Viton® O-rings, however, Silicon based lubricant must be used for EP O-rings.

Gear train

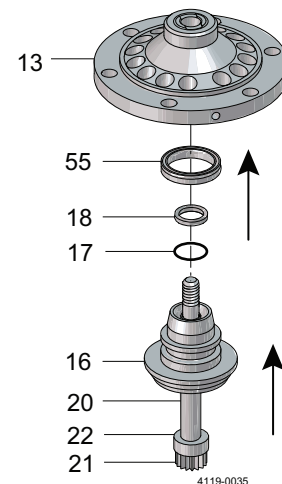
Step 1

1. Install the planetary gearhead (28) back into the gearbox (26).
2. After aligning the screw holes, thread the gearhead screws (27) back into the (28) using a #1 Phillips screwdriver. Make hand tight.



Step 2

1. Press the upper gearbox seal (55) onto the input shaft upper bearing housing (13). The seal's internal spring should not be visible and should be oriented toward the part.
2. Insert the input shaft (20) through the input shaft lower bearing housing (16).
3. Insert the (16) into the (13).



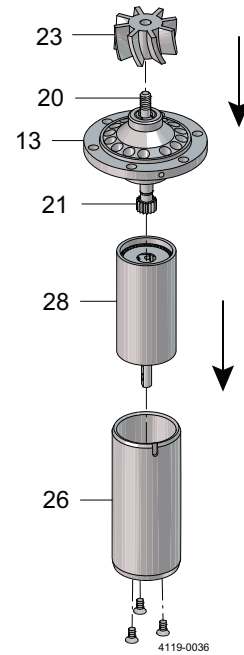
6 Maintenance

Read the instructions carefully.

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

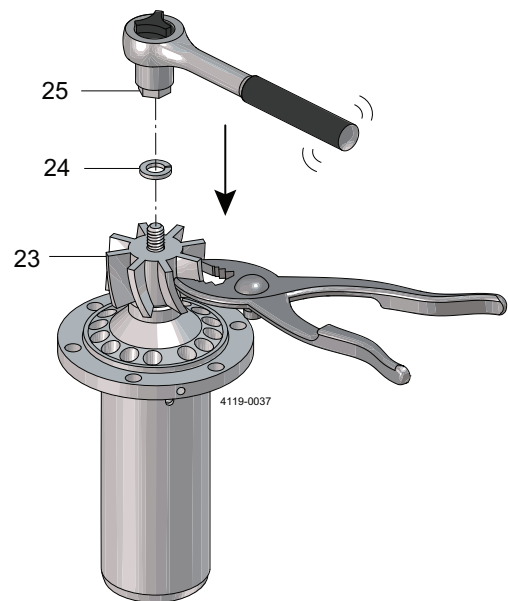
Step 3

1. To facilitate installation of this assembly into the planetary gearhead (28), extend the (20) slightly so the engagement of the input pinion (21) with the top gears of the (28) is visible.
2. Once they are engaged, push the (13) assembly into the (26).
3. Place impeller (23) over the end of the (20).



Step 4

1. Install the lockwasher (24) and nut (25) using an 11/32" socket.
2. Hold the (23) stationary with a pair of pliers while tightening the (25).

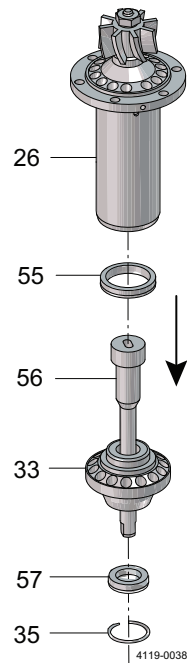


Read the instructions carefully.

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

Step 5

1. Place the output shaft (56) over the shaft of the (28).
2. Install the lower (55) into the (33). The seal's internal spring should not be visible.
3. Place the gearhead lower bearing housing (33) over the (56) and then, push them into the (26).



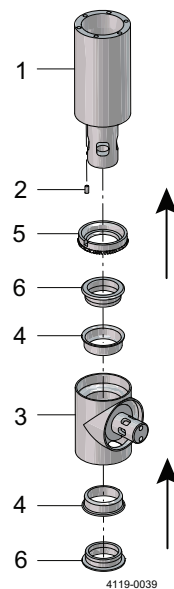
Body assembly

Step 1

1. Slide the tee housing bevel gear (5) over the end of the stem (1).
2. Align the hole in the (5) with the pin (2).
3. Place the first tee housing bearing (6) onto the (1).

Tip: To prevent the internal O-ring from being cut by the windows in the (1), twist the (6) as you slide it over the (1).

4. Push the tee housing (3) over it until it is flush and fully seated. If a new set of (6) has been installed, there will be a slight resistance as the external ring of the (6) is inserted into the tee housing cup (4).
5. Place the second (6) over the stem (1) and push it down into the annular space between the (1) and (4). Lubrication of the internal O-ring is recommended.

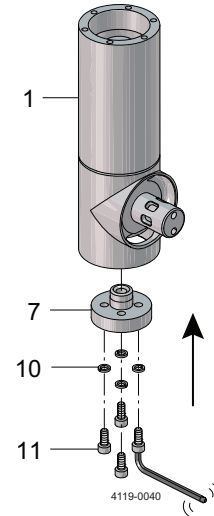


6 Maintenance

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

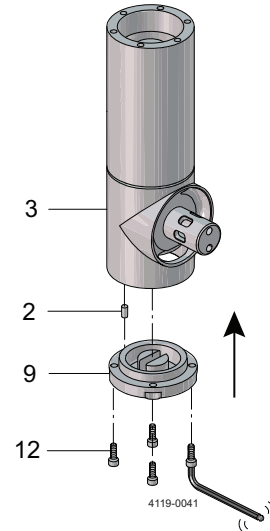
Step 2

- 1. Align the through holes of the stem base (7) with the threaded holes in the top of the (1).
- 2. Using a 9/64" hex key, screw the cap screws (11) and lockwashers (10) into the (1). Tighten in a star pattern.



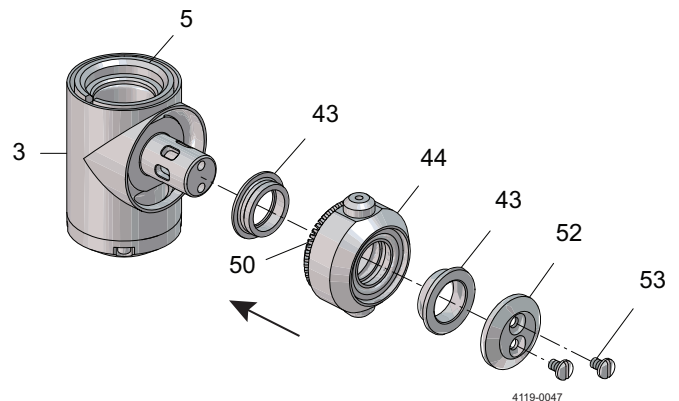
Step 3

- 1. Attach the tee housing base (9) to the end of the (3), ensuring that the pin (2) is aligned with the locating hole in the (3).
- 2. Using a set of NEW base screws (12) and a 3/32" hex key. Tighten in a star pattern.



Step 4

- 1. Push the first nozzle housing bearing (43) onto the (3). Lubrication of the internal O-ring is recommended.
- 2. Again, to prevent the internal O-ring from being cut by the windows in the (3), twist the (43) as you slide it over the (3).
- 3. Push the (44) onto the nose of the (3). If a new set of (43) has been installed, there will be a slight resistance as the external ring of the (43) is inserted into the nozzle housing cup (45).
- 4. Rotate the tee housing assembly slightly to mesh the bevel gears (5) and (50). Failure to ensure that the bevel gears have properly mated could damage them.

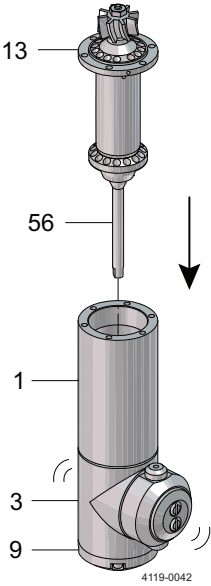


Read the instructions carefully.
The items refer to the parts list and service kits section.

Gear train installation

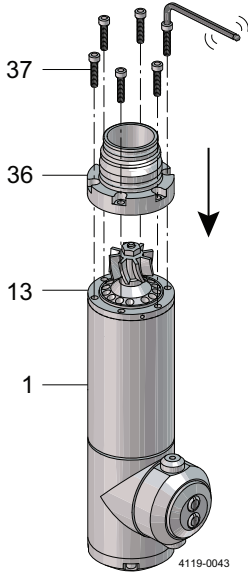
Step 1

- 1. Insert the geartrain assembled in section 6.4 Inspection and service of components into the body assembly from above step.
- 2. Rotate the tee housing (3) until the output shaft (56) falls into the slot of the tee housing base (9). Continue rotating until the holes of the input shaft upper bearing housing (13) are aligned with the threaded holes of the stem (1).



Step 2

- 1. Place the cap (36) on the (13), aligning through the holes.
- 2. Using a 7/64" hex key, screw the cap screws (37) into the (1). Tighten in a star pattern.



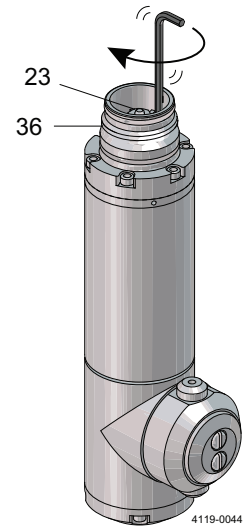
6 Maintenance

Read the instructions carefully.

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

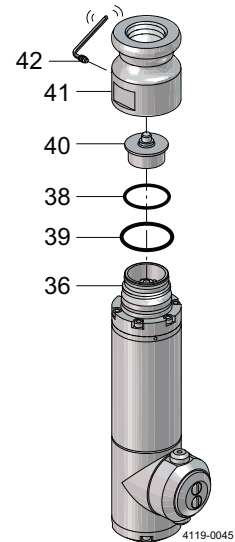
Step 3

1. Rotate the impeller (23) using a hex key. It should spin easily and its veins must not strike the walls of the cap (36). Continue turning the impeller (23). The nozzle and tee housing will slowly rotate if everything has been assembled correctly.



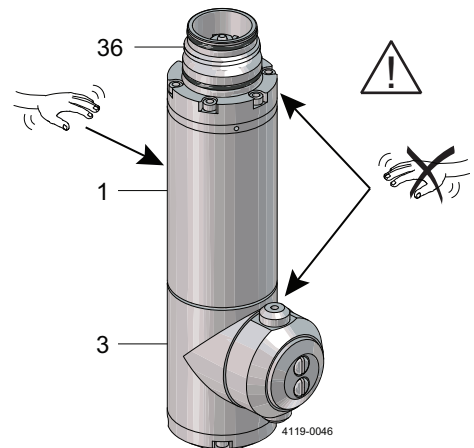
Step 4

1. Insert the guide (40) into the (36).
2. Lubricate the small and large collar O-rings, (39) and (38).
3. Screw on the collar (41) (hand-tight only), and tighten the collar set screw (42) with a 5/64" hex key.



WARNING

Hold or turn on stem (1). **DO NOT** hold or turn on tee housing (3) or cap (36). Doing so will damage the gear train.



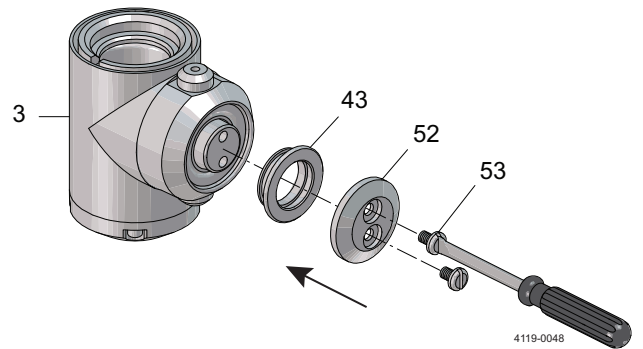
Read the instructions carefully.

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

Completed assembly

Step 5

1. Place the second (43) onto the nose of the (3); push it into the annual space between the (3) and the (45). Lubrication of the internal O-ring is recommended.
2. Place the name plate (52) onto the nose of the (3).
3. Using a ¼" slotted screwdriver, screw the name plate screw (53) into the (3).



7 Technical data

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

7.1 Technical data

The Alfa Laval GJ 9 tank cleaning machine is a highly efficient machine with a range of pressures and flows. The instruction manual is part of the delivery. Read the instructions carefully.

Standard design

The choice of nozzle diameters can optimize jet impact length and flow rate at the desired pressure.

As standard documentation, the Alfa Laval GJ 9 can be supplied with a "Declaration of Conformity" for material specifications.

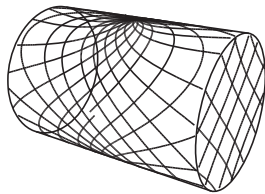
TECHNICAL DATA

Lubricant Food grade
Max. throw length 1.2 to 6 m (4 to 20 ft.)

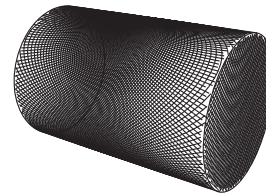
Pressure

Working pressure 3 to 70 bar (40 to 1000 PSI)
Recommended pressure 4 to 40 bar (50 to 600 PSI)

Cleaning pattern



First cycle



Full pattern

The above drawings show the cleaning pattern achieved using 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 95°C (203°F)
Max. ambient temperature 140°C (284°F)

Weight 2.2 kg (5 lbs.)

Connections

Standard thread ¾" Rp NPT, female/ 1 ¼" camlock
Available option ¾" BSP, female/ 1 ¼" camlock, 1 ½" tube weld on

Options

Electronic rotation sensor to verify 3D coverage.

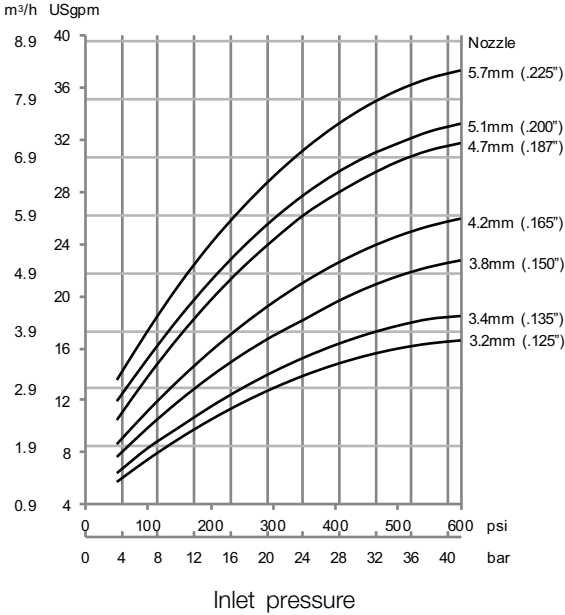
Caution

Do not use for gas evacuation or air dispersion.

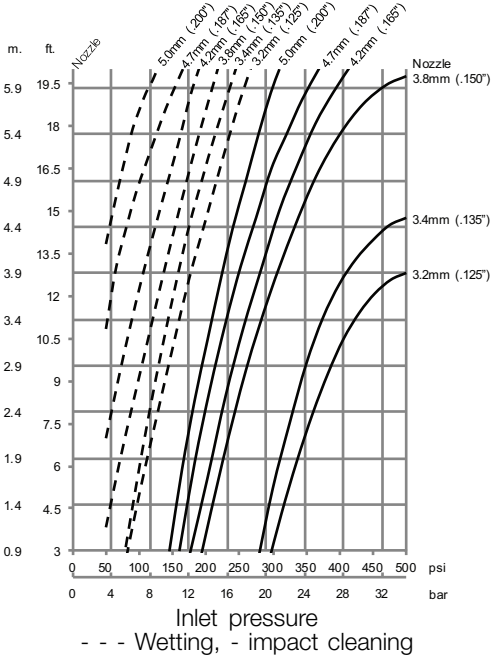
It is important to monitor the technical data during installation, operation and maintenance.
Inform personnel about the technical data.

7.2 Performance data

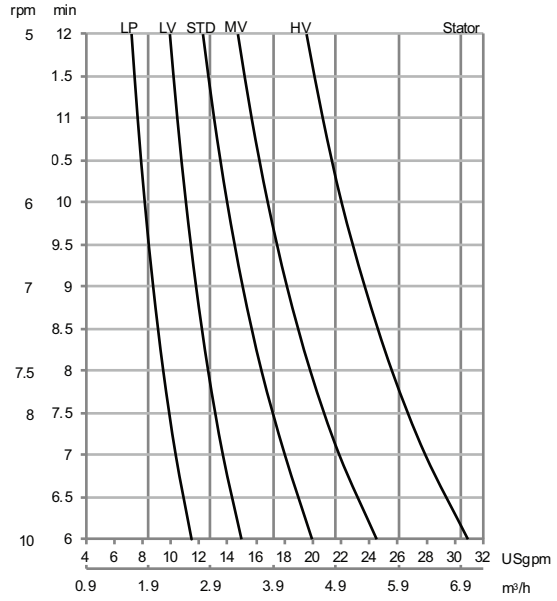
Flow rate



Impact throw length



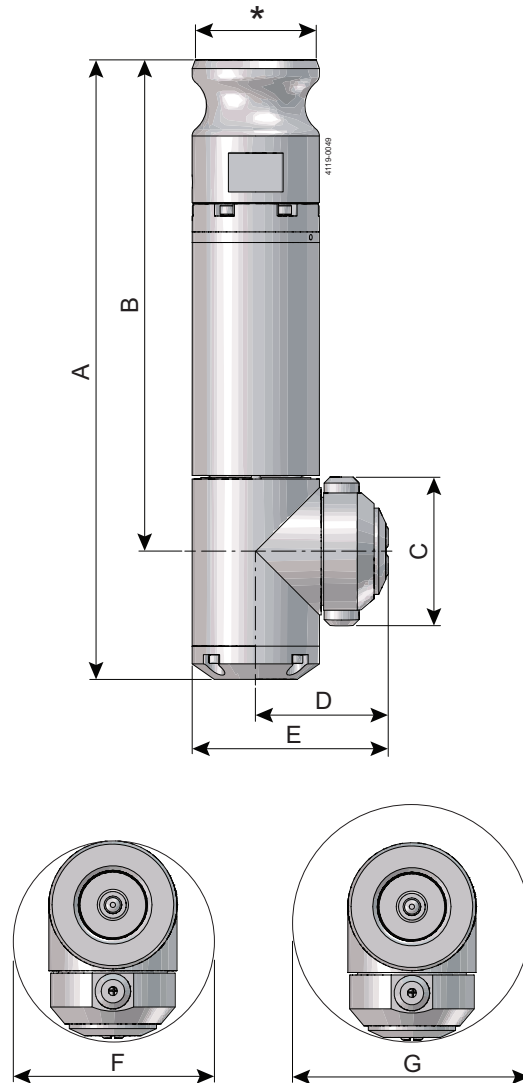
Cleaning time



7 Technical data

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

7.3 Dimensions



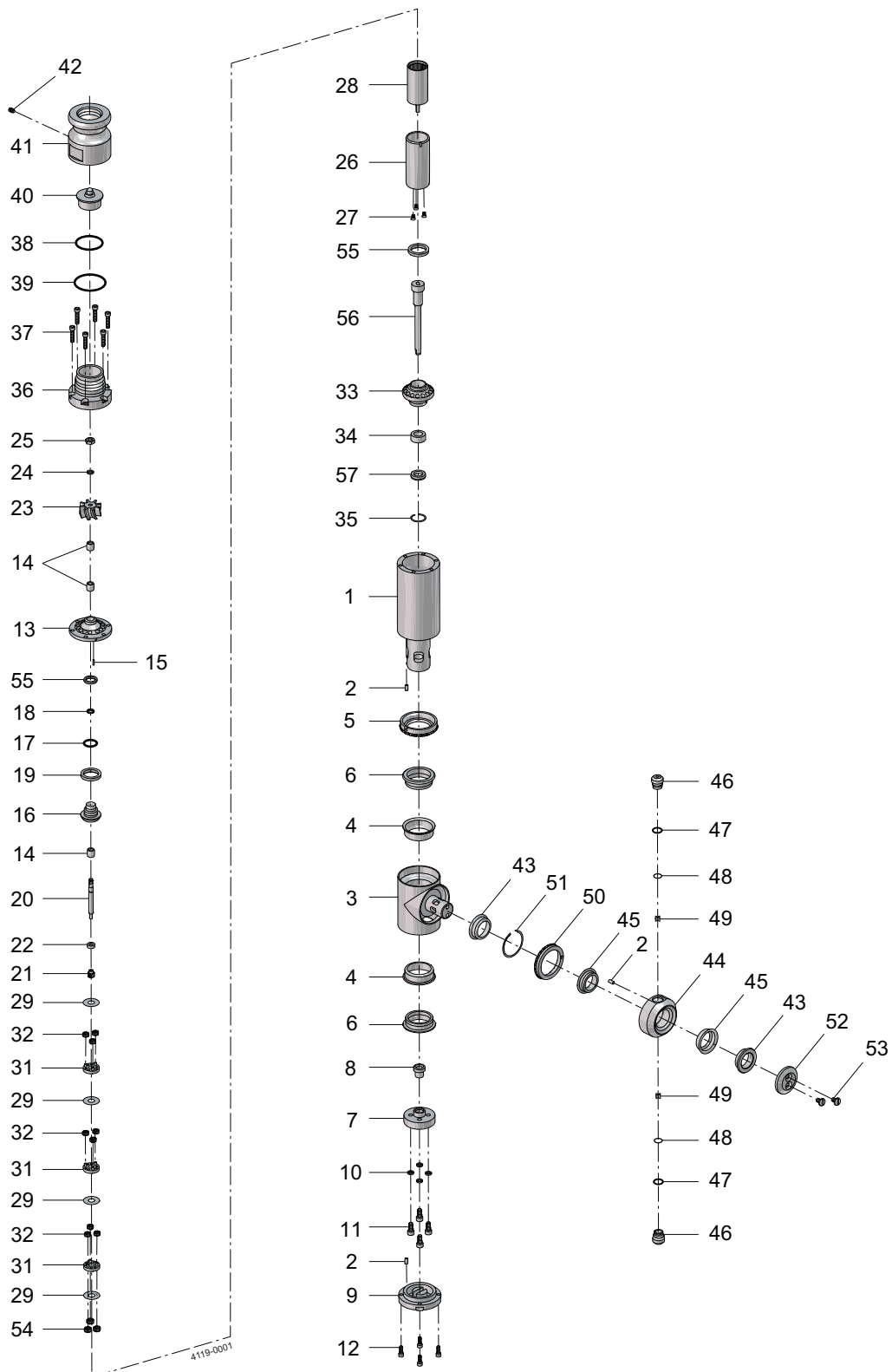
Dimensions

	A	B	C	D	E	F	G
mm	223	177	54	48	71	72	96
in	8.77	6.96	2.1	1.88	2.78	2.80	3.77

NOTE: 3/4" FNPT/1-1/4" camlock or 1-1/2" Tri-Clamp

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

8.1 Parts list and service kits



8 Parts list and service kits

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

Parts list

Pos.	Qty	Denomination
1	1	Stem
2	3	Drive pin
3	1	Tee housing
4	2	Tee housing cup
5	1	Tee housing bevel gear
6	2	Tee housing bearing
7	1	Stem base
8	1	Output shaft lower carbide bearing
9	1	Tee housing base
10	4	Stem base screw lock washer
11	4	Stem base screw
12	4	Tee housing base screw
13	1	Input shaft upper bearing housing
14	3	Carbide bearing
15	1	Planetary gearhead pin
16	1	Input shaft lower bearing housing
17.1	1	Input shaft housing seal
18	1	Input shaft seal
19	1	Input shaft lower housing seal
20	1	Input shaft
21	1	Input pinion
22	1	Input pinion washer
23	1	Impeller
24	1	Impeller, lock washer
25	1	Impeller, nut
26	1	Gear box
27	3	Planetary gearhead screw
28	1	Planetary gearhead
29	4	Planetary gearhead components
30	2	Gearhead carrier
31	1	Gearhead carrier
32	9	Planetary gears
33	1	Gearhead lower bearing housing
34	1	Output shaft upper carbide bearing
35	1	Snap ring
36	1	Cap
37	6	Input cap screw
38.1	1	Collar large O-ring
39.1	1	Collar small O-ring
40.1	1	Guide
41	1	Inlet collar
42	1	Collar set screw
43	2	Nozzle housing bearing
44	1	Dual nozzle housing
45	2	Nozzle housing cup
46.1	2	Nozzle assembly
47.1	2	Nozzle outer O-ring
48.1	2	Nozzle inner O-ring
49	2	Nozzle vanes
50	1	Nozzle housing bevel gear
51	1	Nozzle carrier bevel gear snap ring
52	1	Name plate
53	2	Name plate screw
54	3	Planetary gearhead gears
55	2	Static seal: planetary gearhead
56	1	Output shaft
57	1	Gearhead lower housing seal

8 Parts list and service kits

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

Service kits

	Denomination	Item no.	Gamajet no.
Minor service kits			
◆	EPDM	9614618201	9MINEPDMKIT
▲	Viton (FKM)	9614618601	9MINVITONKIT
*	Kalrez (FFKM)	9614618401	9MINKALREZKIT
 Major service kits			
□	EPDM	9614618301	9MAJEPDMKIT
○	Viton (FKM)	9614618701	9MAJVITONKIT
◇	Kalrez (FFKM)	9614618501	9MA- JKALREZKIT

Parts marked with □◆○★▲◇ are included in the service kits.

How to contact Alfa Laval

Contact details for all countries are continually updated on our website.

Please visit www.alfalaval.com to access the information directly.

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