



Instruction Manual

Alfa Laval GJ 4



Covering:
Standard Machines
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Original manual

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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 Tank Equipment Inc.

Company name

604 Jeffers Circle – Exton, PA – 19341, United States

Address

+1 610 408 9940

Phone no.

hereby declare that

Tank Cleaning Machine

Denomination

Alfa Laval GJ 4

Type

From serial numbers from GT-0050 to GT-XXXXXX

is in conformity with the following regulations and directives with amendments:

- The 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

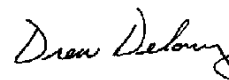
The person authorised to compile the technical file is the signer of this document.

Executive VP Operations

Title

Andrew Delaney

Name



Signature

2015-05-18

Date

Exton, United States

Place



2. Safety

Unsafe practices and other important information are emphasized in this manual. Warnings are emphasized 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 summarized 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 chapter 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 vapor having a risk of ignition or explosion, it is imperative to have the Alfa Laval Gamajet properly grounded using the provided location on the unit.

Operation:

Always read the technical data thoroughly. (See chapter 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 Gamajet 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 Gamajet properly grounded using the provided location on the unit.

Maintenance:

Always read the technical data thoroughly. (See chapter 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.

4. Installation

3.1 Description

The Alfa Laval GJ 4 is a turbine-driven 360° rotary nozzle machine designed for cleaning the interior surfaces of a wide variety of process, transport, and storage tanks. It is powered entirely by the cleaning solution and requires no electricity or compressed air for operation.

To handle the broadest possible range of applications, the Alfa Laval GJ 4 is available in stainless steel construction -- with dual or triple nozzles- oil or cleaning-solution (Flo-Thru) lubricated gearbox; and with 105°, 180° or 360° spherical washing coverage. For additional flexibility, an extensive selection of optional nozzle sizes, turbines, and gear ratios can adapt the Alfa Laval GJ 4 to clean tanks ranging in size from a few hundred gallons up to several million. The performance capabilities of these options are detailed in Chapter 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.

3.3 Patents and trademarks

This Instruction Manual is published by Alfa Laval Tank Equipment without any warranty. Improvements and changes to this Instruction Manual may at any time be made by Alfa Laval Tank Equipment 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 Tank Equipment. The Alfa Laval GJ 4 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 placed 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

Remove any packing material.

Step 3

Inspect the tank cleaning machine for visible transport damage.

Inspection!

4. Installation

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 chapter 7 Technical Data)

Step 2

Assembly

Every Alfa Laval Gamajet is operationally tested at the specified pressure and flow before shipment and is ready to run after unpacking. No assembly is required prior to use except for clean-in-place (CIP) models equipped with the Self-rinse Nozzle Assembly (7).

Reference numbers {such as (7)} appearing below may be used to identify parts in the exploded view in Chapter 8.

To install the Self-rinse Nozzle Assembly (7):

- a. Screw the locknut onto the (7) tube threads until it stops.
 - b. Screw the (7) into the Nozzle Housing (11) hand tight.
 - c. Unscrew the (7) just far enough (less than one turn) so that the nozzle tip is pointing directly toward the body of the Alfa Laval GJ 4. The correct position is shown in the Drawing 11.
 - d. Hold the (7) in position and tighten the locknut against the (11) with a 9/16" wrench.
-

Step 3

Inlet Connections

All Alfa Laval Gamajets are supplied with a 2" NPT/ 2" BSP female inlet connection. Additionally, they will have either a 2-1/2" male quick-disconnect coupling (MIL-C-27487) or a 2-1/2" NST male hose thread (same as 2-1/2" NH).

If the NPT/ BSP thread is to be used, the mating male thread is usually wrapped with PTFE pipe joint tape prior to assembly. This will minimize any chance of leakage and will make subsequent removal much easier.

Step 4

Mounting

The full-coverage 360° Dual Nozzle Alfa Laval GJ 4 is hydraulically balanced and may be mounted on rigid piping, hung from a hose, or used with a tripod or cart. The Triple Nozzle and Directional 105° or 180° machine develops an unbalanced reaction force when operating and therefore must be rigidly mounted.

Most applications will mount the Alfa Laval GJ 4 in an "upright" position (inlet connection pointing up), but the Alfa Laval GJ 4 will function equally well inverted (as on a tripod), or even horizontally, if required.

4. Installation

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

Step 5

Location inside Tank

Generally, a single Alfa Laval GJ 4 should be mounted at the approximate center of the tank in order to equalize the cleaning radius in all directions. Some tanks may have specific cleaning problems such as heating coils or heavy deposits at the liquid level line. In these applications, the Alfa Laval GJ 4 may need to be positioned for best effect on the more difficult areas.

Tanks with internal mechanisms or structures such as agitators or baffles may require careful positioning to minimize "shadows" 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 completely avoid shadow problems.

When choosing a mounting position, it is essential to allow sufficient clearance around the Alfa Laval Gamajet so that its rotating parts do not strike any obstructions. The operating clearances required are shown in Chapter 7 Technical Data.

Step 6

Entry Openings

When Alfa Laval Gamajets are used in portable service, the tanks being cleaned must be provided with entry openings large enough to avoid interference during insertion and removal. The minimum opening size required will range from 6.7" to 12.7" (170 mm to 322mm) in diameter, depending on the Alfa Laval Gamajet configuration. An optional Nozzle Housing (11) can be used to reduce the minimum opening size to 6" (152 mm) if required.

Step 7

Vessel Drainage

If it is necessary to clean the floor of a tank, standing liquid will diminish the effectiveness of the jet. Wherever possible, the tank floor should be pitched toward the drain and the discharge opening should be large enough to keep the liquid depth to a minimum. If gravity alone is insufficient, scavenge or stripper pump should be connected to the drain. In extreme cases, it may be necessary to run smaller nozzles on the Alfa Laval Gamajet, 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 strainer that will trap solids 1/16" (4.23mm) or larger, as these will not pass through the Alfa Laval Gamajet. These large particles will not harm the machine, but they can get caught in the Rotor (19) or Nozzles (8) and cause it to stop. It will then be necessary to disassemble the Alfa Laval Gamajet and remove the blockage.

In recirculation cleaning or any 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 Gamajet, as well as 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.

Step 9

Safety

When Alfa Laval Gamajets are operating, the covers for the tank entry openings should be sealed well enough to withstand the full force of the jet striking the cover plate. If the cleaning solution is hot, corrosive, or toxic, a leak could present a serious hazard to any personnel in the immediate vicinity.

Any tank cleaning machine can develop a static electricity charge while in operation. If the tank being cleaned contains combustible liquid or vapor there is considerable risk of ignition or explosion. It is therefore imperative to insure that the Alfa Laval Gamajet is properly grounded whenever there is any likelihood of combustible material being present.

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.
-

5. Operation

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

5.1 Operation/Control

Step 1



Always read the technical data thoroughly. See chapter 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 4 that ships is accompanied by a Birth Certificate. This document indicates how the Alfa Laval GJ 4 performed in our testing tank before it shipped based on the operating conditions supplied to Alfa Laval Tank Equipment. To ensure the longest possible life of the Alfa Laval GJ 4, 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.

5. Operation

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

5.2 Tee Housing Rotation Problems

-Insufficient Flow

Look for restrictions in the fluid supply such as a clogged filter, kinked hose, or deposits in the piping. Inspect also for partially plugged nozzles, as these will have the same effect.

- Tight Clearances

In low-flow applications (below 50 gpm/ 11.3 m³/Hr), a newly-overhauled Alfa Laval GJ 4 may fail to operate when first returned to service. If the machine seems otherwise all right, try running it with the Nozzles (9) removed. The additional flow will often be enough to overcome the extra resistance of new Bearings and Seals. A few minutes of operation should loosen tight clearances enough for the machine to run normally.

-Debris Inside

Remove Stator Retaining Ring (16), and lift out Stator (17). Look for and remove any debris caught between the (17) and Rotor (19) vanes. Remove any material wound around the Rotor Shaft (42).

-Rotor Shaft Binding

Try to spin Rotor (19) by hand. The Rotor Shaft (42) should turn very easily with one finger and should be approximately centered in the Inlet Stem (20) bore. If the (19) is difficult to turn or is visibly off-center, look for a bent Gearbox (33), Gearbox Cover (65), or (20). This kind of damage is particularly likely if the Alfa Laval Gamajet has been struck hard or dropped. If the (42) will turn freely in one direction, but not the reverse, check inside the (33).

-Gear Train Damage

If the Rotor Shaft (42) turns freely continue turning it to see if the Tee Housing (26) also rotates. Failure to rotate may indicate worn or damaged gearbox internal parts. Another check on the Gear Train (drawing 5) can be made by trying to rotate the (26) directly by hand. It should have a small amount of free play, but it should not turn in a full circle.

-Damages Tee Housing Key Slot

If the Tee Housing (26) rotates freely, look for damage to the key that engages the Ring Gear (28). Also inspect the (28) for damage where it contacts the tee housing key.

5. Operation

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

5.3 Nozzle Carrier Rotation Problems

-Bearings Binding

Grasp one of the Nozzles (9) tips and try to rotate the Nozzle Housing (11) in both directions. It should have a few degrees of free play before it stops (pin-drive) or becomes more difficult to turn (clutch-drive). If there is no free play, remove the (11) and check the fit of Nozzle Housing Bearings (4) in Cups (6). If a (4) does not spin freely in its (6), look for deposit build-up or damaged parts and correct as required.

Binding can also be caused by incorrect installation of a (4). On the Alfa Laval GJ 4, each (4) is located by Nozzle Housing Drive Pins (12) in the Nameplate (3) and the Tee Housing (26). These Pins must enter their mating holes in the (4) flanges or the (11) will be locked when the Nameplate Screws (1) are tightened. A (4) that is incorrectly installed will show indentations or cracks in their flanges where they contact the (12).

-Drive Pin or Clutch Damage

If the Nozzle Housing (11) rotates freely in a full circle, remove the (11) and disassemble the Bevel Gear Retaining Ring (15) and Nozzle Housing Bevel Gear (14). Look for a damaged Drive Pin (12) or Clutch O-ring (13). Examine the (14) and (11) for wear caused by slippage where they contact each other.

The (13) should be flush with the surface of the (11) or slightly protruding. If it is deeply sunken into its groove, it may be frozen in place and unable to engage the (14). Remove the (13), taking care not to scratch the groove walls. The (13) should be replaced with a new one if it is hard or deformed. Install the (13) so that it protrudes slightly and will be compressed when the (14) and (15) are reinstalled.

-Worn Housing Bearings

Look for excessive wear of Nozzle and Tee Housing Bearings (4) and (23). Excessive clearance (over 0.015") between the Bearing Cups (6) and (25) can allow the Bevel Gears (14) and (27) to disengage under load. Replace worn parts as required.

-Worn Bevel Gear

Examine Bevel Gears (14) and (27) for worn or damaged teeth, and replace as required.

-Damaged Gearbox Nose Slot Key

Remove Nozzle Housing (11). Using a screwdriver, try to rotate the Tee Housing Bevel Gear (27) where it is exposed near the bottom of the Tee Housing (26). If the (27) can be turned more than a few degrees, look for a worn or broken key on the Gearbox (33). Inspect (27) for damage to its slot that engages the key.

5. Operation

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

5.4 Cleaning Solution Leakage

Note: All Alfa Laval Gamajets can be expected to show some apparent leakage at the gap between the Tee Housing (26) and Gearbox (33). This comes from an internal bypass system that cools and lubricates the waterside Bearings and Seals and also keeps the Ring Gear (28) and Bevel Gears (14) and (27) flushed, free of debris. CIP models incorporate additional internal passages and drain holes, so these machines will also show some leakage around the Nozzle Housing (11). Flo-Thru machines have a vent near the top of the (33), and the discharge from this will emerge at the bottom of the (26). On any of these units, this apparent leakage is entirely normal and does not impair the operating efficiency or cleaning performance of the Alfa Laval Gamajet.

- Worn or Improperly Installed Seals

Excessive leakage from the Tee Housing (26) or Nozzle Housing (11) usually indicates worn Housing Seals (24) and (5). Inspect the Seals for worn or damaged lips or loss of spring tension, and replace as required.

If the Seals were recently replaced, verify that they are installed in the correct direction. These Seals are designed to seal in one direction only and, therefore, must be installed with their sealing lips facing toward the pressure. They are installed correctly when the side of the Seal with the exposed spring faces away from the adjacent bearing.

- Worn Bearing Cups

Inspect Housing Bearing Cups (6) and (25) for excessive wear, particularly near the inside flange where they contact Housing Seals (5) and (24). Replace any that show distinct grooves.

- Worn Bearings

Inspect Housing Bearings (4) and (23). Replace any that are excessively worn. Bearing clearances greater than 0.015 " can prevent the Seals from functioning properly.

- Worn or Eroded Castings

Inspect the seal contact surfaces of the Inlet Stem (20) and the Tee Housing (26). If these are worn or grooved, new Seals will be ineffective. Replace the damaged parts as required.

- Clutch O-Ring Damage

On clutch-drive machines, severe leakage at the Nozzle Housing (11) may indicate a damaged Clutch O-ring (13). Remove the Bevel Gear Retaining Ring (15), and lift the Bevel Gear (14) off to inspect the (13).

5. Operation

Pay attention to possible faults

Read the instructions carefully.

5.5 Poor Cleaning Performance

- Inadequate Flow and Pressure

Check the pressure at the Alfa Laval Gamajet 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, so the line size must be increased accordingly for long runs. Although the Alfa Laval Gamajet will rotate at flow rates as low as 30 gpm to 40 gpm (6.8 to 9 m³/Hr), effective cleaning may require considerably more flow.

- Chemical Concentration and Temperature

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

- Plugged Nozzles

Unscrew the nozzles (9) to see if there is any debris caught in stream straighteners (10). If removal is required for cleaning, the straighteners may be driven out with a rod through the nozzle bore. These straighteners are an essential part of the nozzle design and must be reinstalled in the nozzles to ensure proper jet impact.

- 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 Gamajet 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 Gamajet nozzle size, rotor, and gearing are correct for the specific application. Alfa Laval Gamajet performance tables are available that show flow rate, cycle time, and jet impact force for various combinations of pressure, nozzle size, rotor, and gear ratio. Contact an Alfa Laval Tank Equipment Inc. representative if assistance is required.

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.

5.6 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 sterilizing.

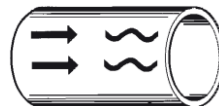
Danger of burns!

Step 3



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

Always rinse!



Clean Water Cleaning agent

NOTE

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

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.*

6.1 General Maintenance

Step 1



Always read the technical data thoroughly. (see chapter 7 technical Data) .

Step 2

Recommended spare parts:

Order service kits from the service kits list

(See 8.7 Minor Service Kit & 8.8 Major Service Kit)

Ordering spare parts:

Contact your local Alfa Laval Sales Company.

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.

6.2 General Dismantling Set Up

FLO-THRU NOTE: Two types of gearboxes (33) are used: sealed, which contains oil, and Flo-Thru, which is lubricated by the cleaning solution. The Flo-Thru will have one or more holes visible on the bottom gearbox cover (65), while the sealed will have none. Most of the service procedures are the same for both types. Whenever the two differ, the sealed procedure will be given first, followed by a "**FLO-THRU NOTE:**" detailing any differences.

The reference numbers appearing below may be used to identify parts in the exploded view in Chapter 8 Assembly Drawing.

Step 1

Remove the nameplate screws (1) with a 7/16" socket and pull the nozzle housing (11) off of the tee housing (26). If tight bearings (4) prevent removal, pry carefully between the nozzle housing and tee housing.

Step 2

Remove stator retaining ring (16) with pliers and lift out the stator (17).

Step 3

Insert a screwdriver between the vanes of the rotor (19) and unscrew the rotor retaining nut (18) with a 7/16" deep socket and 6" extension. Lift out the rotor with pliers or invert the machine and shake it out.

Step 4

Invert the Alfa Laval Gamajet and remove the gearbox cover screws (52) with a 7/16" socket. Remove the gearbox cover (65) by prying with a thin-bladed screwdriver between the cover and gearbox (33). Pry near the screw holes and lift each side a little at a time or use two screwdrivers on opposite sides.

Step 5

Remove two idler gear thrust washers (50) to prevent their loss and drain the oil into a suitable container for reuse if it is clean. Contaminated oil should be disposed of properly.

Step 6

Pull out rotor shaft (42) and spacer (41). If the shaft is tight, tap the rotor end with a soft hammer until it is free. Pull out the idler shaft (44) and remove the gears (45), (47), and (48).

Step 7

Remove the gearbox bolts (35) with a 3/8" deep socket and 6" extension. Separate the gearbox (33) from inlet stem (20) by prying between the gearbox and tee housing (26).

Step 8

Lift the tee housing (26) off of the inlet stem (20). If the tee housing cannot be removed easily, pry carefully between the inlet stem and the tee housing.

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.

6.3 Difficult Disassembly - Hints

NOTE

Most disassembly problems are caused by deposit build-up on the relevant parts, usually from lack of maintenance. Prevent future occurrences by adhering to a regular schedule of inspection, disassembly, and removal of deposits before they can cause difficulties. In applications particularly prone to scale accumulation, build-up can be minimized by periodically circulating a descaling compound through the Alfa Laval Gamajet.

If parts resist disassembly avoid using excessive force except as a last resort. First, try soaking the machine in a 5% to 10% citric acid solution for water scale or carbonate deposits, or an appropriate solvent for other types. Often, this is all that is needed.

STATOR

Invert the Alfa Laval Gamajet and remove the gearbox cover (65). Place the machine in a press with the inlet end resting on the press table. Protect the end of rotor shaft (42) with a small piece of brass or aluminum and press the shaft until its end is nearly flush with the rotor shaft pinion carbide thrust washer (66) on pinion (61). Do not press against the washer itself, as it may crack. At this point, the pinion (61) will have been separated from the rotor shaft (42). If the stator (17) is not yet loose, lift out the pinion and spacer (41) and continue pressing the shaft until the stator is free. If additional clearance is needed for the press ram, pull out idler shaft (44) and remove the three idler shaft gears (45), (47), and (48) from the gearbox (33).

ROTOR

Invert the Alfa Laval Gamajet and remove the gearbox cover (65). Support the gearbox (33) to allow clearance for the rotor shaft (42) and tap the rotor end of the shaft with a soft hammer until the shaft end is flush with the top of the rotor (19). The rotor will now be free.

GEARBOX COVER

Drive a knife blade into the joint between the gearbox cover (65) and gearbox (33). Repeat at several points around the cover until there is enough clearance to insert a screwdriver and pry the cover off.

GEARBOX

If the gearbox will not separate from the inlet stem (20), clamp the stem in a vise, making sure the gearbox (33) is free to move. Use a hammer and brass rod against the exposed end of the rotor shaft upper bearing (30) visible inside the inlet stem. Hammer carefully against the bearing and pry between the gearbox and tee housing (26) until the gearbox separates from the stem.

6. Maintenance

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

6.4 Inspection and Service of Components

NOTE: Wherever lubrication of parts is called for, gearbox lubricant is satisfactory. On Flo-Thru machines, use any lubricant compatible with the application.

NOZZLE CARRIER

Drawing 11 Nozzle

Unscrew the nozzles (9) with a 1-1/4" open-end wrench and inspect for debris plugging stream straighteners (10). Remove the straighteners for cleaning by pressing them out with a 5/16" (8 mm) rod inserted through the nozzle tip. Nozzle sizes smaller than 5/16" will require a rod small enough to be inserted at an angle so that it can bear against one of the fins on the straightener.

Nozzle bores must be smooth, round, and free of damage for maximum jet impact. Replace worn or oversized nozzles if the original flow rate is required. Stream straighteners (10) must be reinstalled in the nozzles if they were removed for cleaning.

Self-Rinse Nozzle

If the machine is equipped with a self-rinse nozzle, remove it by loosening the locknut with a 9/16" open-end wrench and unscrewing the nozzle by hand. Blow through the nozzle to check for blockage and, if necessary, use a stiff wire or paper clip to clear the orifice in the tip.

Bevel Gear

Remove retaining ring (15) with a screwdriver and lift off bevel gear (14). Inspect the bevel gear for worn or broken teeth and for wear caused by slippage on the carrier. Removal of the bevel gear will reveal whether the carrier is the pin-type or clutch-type. The pin type requires no further attention if the pin is undamaged.

Clutch O-ring

If the carrier is the clutch-type, inspect O-ring (13) and replace it if necessary. Inspect also for wear caused by slippage between the bevel gear and the nozzle carrier. Slippage can result from incorrectly installed nozzle carrier bearings, deposit build-up, or anything else that could make the carrier difficult to turn.

If desired, the clutch-type carrier can be converted to pin-type by installing a drive pin (12) in the hole just inboard of the O-ring, but the O-ring must remain in place to avoid leakage.

Nozzle Carrier Bearings

Inspect the bearings and discard any that are broken, cracked, or deeply scored. Clean any deposits from the bearings and check their fit in nozzle carrier cups (6). The bearings should turn freely in their cups, but the clearance should be less than 0.015" (0.38 mm) to avoid shortening the life of the seals or bevel gears.

Nozzle Housing Seals

Examine the seals for loss of spring tension or excessive wear of the sealing lips and replace as required.

6. Maintenance

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

Nozzle Housing Cups

Clean any deposits from the cups and examine for excessive wear. Light scoring is acceptable, but the cups should be replaced if they are grooved in the seal contact area or if the clearance with a new bearing is more than 0.015" (0.38 mm).

If a lot of cups need to be replaced, it will be worthwhile to make or obtain press tools to fit the cups. If the tools are not available, support the housing and drive the cups out with a hammer and brass rod against their inner flange, using care to avoid damage to the bores in carrier (11).

If the cups are extremely tight and resist removal cut them nearly through with a fine-tooth hacksaw blade. Work very slowly and carefully to avoid cutting into the carrier. The cup will collapse at the cut, relieving the press-fit and allowing easy removal.

Before installing new cups, clean the carrier bores and remove any burrs resulting from cup removal. Lubricate the outside of the new cups and press them in until their flanges are fully seated against the carrier.

TEE HOUSING

Drawing 1 & 2 Disassembly

Remove retaining ring (29) with a screwdriver and lift out ring gear (28). If the gear is tight in the tee housing, strike the bottom of the tee housing sharply against a block of wood until the gear is free. Next, lift out bevel gear (27), bearing (23), and seal (24). If inner nozzle carrier bearing (4) needs replacement and is too tight to remove by hand, pry under the flange using two screwdrivers on opposite sides

Drawing 12 Inspection

Inspect the tee housing for wear or damage, particularly on the areas that contact bearings (4) and seals (5). Inspect also for damage to the tee housing key that engages ring gear (28). If the ring gear was difficult to remove, check if the tee housing is out-of-round where the gear seats.

Drawing 2 Bevel Gear

Inspect gear (27) for worn or damaged teeth and for damage to the slot that engages the key on gearbox (33).

Ring Gear

Inspect gear (28) for worn or damaged teeth and for damage to the slot that engages the key in tee housing (26). If the gear was difficult to remove from the tee housing, check if it is out-of-round.

Tee Housing Bearing

Inspect the bearings and discard any that are broken, cracked, or deeply scored. Clean any deposits from the bearings and check their fit in tee housing cups (25). The bearings should turn freely in their cups, but the clearance should be less than 0.015" to avoid shortening the life of the seals or bevel gears.

Tee Housing Seals

Examine the seals for loss of spring tension or excessive wear of the sealing lips and replace as required.

6. Maintenance

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

Drawing 11 Tee Housing Bearing Cups

Clean any deposits from the cups and examine for excessive wear. Light scoring is acceptable, but the cups should be replaced if they are grooved in the seal contact area or if the clearance with a new bearing is more than 0.015" (0.38 mm). If the bearing cups require replacement, follow the procedure given for nozzle housing bearing cups (6) in previous sub-section. Replacement cups must be fully seated in order for the tee housing to turn freely when the machine is reassembled.

INLET STEM

Drawing 1 Disassembly

Remove three O-rings (21) from their seats around the screw holes in the bottom of the stem and discard them. These should be replaced with new ones when the machine is reassembled. If upper tee housing bearing (23) or seal (24) requires replacement, first clean any deposits from the stem before attempting removal. If the bearing is tight, use two screwdrivers on opposite sides of the flange to pry it free.

Inspection

Inspect the stem for wear or damage, particularly on the areas that contact bearings (23) and seals (24).

FLO-THRU NOTE (Drawing A1): Check that restrictor (22) is in place and that its orifice is clear by pushing a stiff wire or paper clip all the way through. If the orifice is blocked and cannot be cleared, push the restrictor out with a piece of heavy wire (like a coat hanger) and replace it. The Alfa Laval Gamajet must not be operated with a plugged restrictor or with no restrictor in place.

GEARBOX COVER

Drawing 9 Inspection

Inspect bushings (43), (62), and (63) for cracks or other damage and look for noticeable wear of the flange faces. Insert an unworn shaft in the bushings and rock it from side to side to check for looseness. Any bushing having more than 0.003" (0.076 mm) clearance should be replaced. Pay particular attention to bushing (62); because if its flange wears through, the end of the rotor shaft can seriously damage the gearbox cover.

Make sure that dowel pin (51) is in place and undamaged. Inspect gearbox cover O-ring (64) for deterioration or damage and replace if necessary.

FLO-THRU NOTE: The plastic bushings used in these machines may have up to 0.005" (0.127 mm) clearance on their shafts.

Bushing Removal

To remove bushing (62), screw in a 5/16"-18 (or M8 x 1.25) tap until it hits bottom. Continue turning the tap, and the bushing will be pulled out of the gearbox cover. Bushings (43) and (63) are removed in the same way but will require a 3/8"-16 (or M10 x 1.5) tap instead.

6. Maintenance

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

GEARBOX

Drawing 3 Disassembly

Remove final shaft assembly (57) from the gearbox by prying between the (57) pinion and the housing lip immediately above it. Gears (59) and (60) will slide off the shaft after it is out of the gearbox. Remove upper bearing (30) by gripping the flange with pliers and pulling out with a twisting motion.

To remove center bearing (40) or seal housing (39), first remove bearing (30) (for GT Oil machines, also remove seal (68) and washer (67)) as described above. Then insert a length of 1/2" (12.7 mm) diameter soft steel rod through the gearbox from the top until it rests on spacer (36). Place the gearbox in a press and push against the rod to remove the spacer, seal housing (39), and bearing (40) together in one operation.

FLO-THRU NOTE: Parts (36) and (39) are not used. When the 1/2" (12.7 mm) rod is inserted it will bear directly against bearing (40).

Inspection

Examine the gearbox carefully for any signs of being bent. This is particularly likely if the Alfa Laval Gamajet has been dropped or struck hard. A rough check can be made with a square; but, to eliminate any doubt, the gearbox should be mounted on a lathe and checked with a dial indicator. Inspect for damage to the key that engages bevel gear (27). Inspect O-ring (32) near the top of the gearbox and replace if necessary.

If bearing (40) is removed, check its bore in gearbox (33) for any deep scores that could cause oil leaks past O-rings (38) or interfere with proper seating of the bearing when it is reinstalled.

NOTE: Field repair of damaged gearbox keys is not recommended. A factory repair service is available for this part. Contact Alfa Laval Tank Equipment Inc. for details.

Drawing 6/ 8 Upper Idler Shaft Bushing

Insert idler shaft (44) in the bushing and rock it to check for looseness. If the bushing needs replacement, follow the procedure given for the gearbox cover bushings.

Idler Shaft

Examine the shaft (44) for damage or wear and replace if worn more than 0.002" (0.05 mm).

Drawing 5/ 7 Final shaft

Disassemble the shaft by supporting gear (58) and pressing against the small end of the shaft. After gear (58) is removed, retainer (54) will slide off the shaft. Examine the shaft for worn or damaged gear teeth and for scoring or excessive wear on the areas that contact bushing (56) and idler gears (59) and (60). Replace if worn more than 0.002" (0.05 mm).

Final Shaft Gear

Inspect gear (58) for worn or damaged teeth. Inspect also for excessive wear on the face that contacts the flange of bushing (56) and replace if worn deeper than 0.005" (0.127 mm). The gear must be replaced if it will not maintain a press fit on shaft (57).

Final Shaft Retainer

Check for excessive wear of bushing (56) by inserting shaft (57) and trying to rock retainer (54) from side to side. Inspect O-ring (53) and replace if necessary.

If bushing (56) requires replacement, screw a 1/4" (6.35 mm) pipe tap into the bushing from the flange side. Place the assembly in a press so that retainer (54) is supported by its flange while leaving the flange of bushing (56) free to move.

6. Maintenance

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

Use a short length of 1/2" (12.7 mm) rod against the end of the tap to press the tap and bushing out together. Remove seal (55), as this must be replaced whenever the bushing is serviced. Clean any deposits from the retainer bore.

Idle Gears

Inspect the gears for worn or broken teeth or worn bushing flanges. Check for loose bushings by inserting an unworn shaft and rocking the gear from side to side. If the clearance is more than 0.003" (0.076 mm), replace the bushing. On lower gears (48) and (60), check if thrust washer (50) is damaged or missing and replace if necessary.

FLO-THRU NOTE: *The plastic bushings in these machines may have up to 0.005" (0.127 mm) clearance on their shafts.*

Drawing 3 Rotor Shaft

Clean the shaft thoroughly and examine the gray ceramic coating for wear or other damage. Replace the shaft if there is damage to the areas that come in contact with bearings (30), (40), and (62) or seals (37). Damage in other areas is less critical and may be ignored as long as it does not interfere with installation or removal of the shaft.

Drawing 10 Rotor Shaft Pinion

Inspect pinion (61) for worn teeth or damage to the thrust washer. If the pinion requires replacement, remove it by supporting the pinion and pressing against the end of shaft (42).

Before pressing the new pinion in place, lubricate the rotor shaft and the pinion bore. Carefully check the alignment of the pinion with the shaft and apply only enough pressure to seat the pinion against its shoulder on the shaft. The carbide thrust washer is quite brittle, and care must be used to avoid damage during installation.

Rotor Shaft Spacer

Excessive wear of spacer (41) can allow the rotor shaft pinion to strike the bottom gear (60) on final shaft (57). Measure the overall length of the spacer and replace if it is less than 2.230" (56.64 mm).

Drawing 3 Rotor Shaft Upper Bearing

Check for looseness by inserting the rotor shaft (42) and rocking the rotor shaft upper bearing (30) from side to side. If the clearance exceeds 0.003" (0.076 mm) or the bearing is cracked, it should be replaced. Inspect O-ring (31) and replace if required.

Rotor Shaft Center Bearing

Insert the rotor shaft and check for looseness by rocking the rotor shaft center bearing (40) from side to side. Bearing should be replaced if the clearance exceeds 0.003".

Seal Housing

If seals (37) need replacement, carefully pry the old ones out of housing (39). Pry from the inside diameter of the seals to avoid putting scratches in the housing bores. Clean any deposits from the housing bores that might interfere with the seals. Lubricate the new seals and push them into the housing with their spring sides facing out. Inspect O-rings (38) and replace if required.

6. Maintenance

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

6.5 Reassembly

General Notes

NOTE: All parts must be cleaned thoroughly before reassembly. Any deposits remaining on the parts can cause difficult disassembly the next time the Alfa Laval GJ 4 needs servicing. Wherever lubrication of parts is required for assembly, gearbox lubricant is satisfactory. On Flo-Thru units, use any assembly lubricant compatible with the machine application.

Drawing 1, 2, 3 & 4

Turn to (drawing 1): Slide assembled tee housing (26) onto inlet stem (20). Place three new O-rings (21) in the recesses around the screw holes in stem (20).

Turn to (drawing 3): Lubricate O-ring (32) on gearbox (33) and insert the gearbox into the inlet stem making sure that the key on the gearbox engages its slot in gear (27). Rotate the gearbox to align the screw holes.

Turn to (drawing 4): Install three screws (35) with lockwashers (34) and tighten to 20-25 lb. ft. (27-34 Nm) with a 3/8" (9.5 mm) deep socket and 6" (152 mm) extension. Check to see that the tee housing will rotate freely. Binding could indicate that the gearbox key is not properly engaged with bevel gear (27).

Drawing 5 & 6 / 7 & 8

Turn to (drawing 5/ 7): Install idler gear (59) on final shaft (57), followed by gear (60) without its thrust washer.

FLO-THRU NOTE: *The two bottom idler gears (48) and (60) are not interchangeable. Gear (48) is identified with the letter "N" and must be installed on idler shaft (44). Gear (60) is identified with the letter "T" and must be installed on final shaft (57).*

Lubricate O-ring (53) on bearing retainer (54) and insert the final shaft assembly into its bore in the gearbox. It may be necessary to use a spacer or sleeve to apply pressure to lower gear (60) until retainer (54) is seated against its flange.

Turn to (drawing 6/ 8): Install gears (45) and (47) on idler shaft (44) followed by gear (48) without its thrust washer.

Position the idler shaft assembly in the gearbox and insert the end of the shaft in bushing (43).

Install thrust washers (50) on shafts (44) & (57).

Drawing 10

Slide spacer (41) onto rotor shaft assembly (42). Slip plastic installation sleeve RS-1 over the threaded end of the shaft to protect the oil seals from damage.

Turn to (drawing 3): Lubricate the shaft and insert it into center bearing (40) with a twisting motion. Push the shaft in until the gears are engaged and spacer (41) is seated. Check to see that the shaft turns freely.

FLO-THRU NOTE: *It is not necessary to use the installation sleeve or to lubricate the shaft.*

Remove installation sleeve RS- 1. Fill the gearbox with lubricant to 1" (25 mm) below the cover seating face of the gearbox. This will require approximately 11 fluid ounces (325 ml). SAE 90 - 140 straight mineral gear oil is recommended, but food-grade lubricant of equivalent viscosity may be used if desired. Hypoid gear oil or other lubricants containing extreme-pressure additives should be avoided.

FLO-THRU NOTE: *Omit this step. Lubricant is not required*

6. Maintenance

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

Drawing 9 & 10

Turn to (drawing 9): Lubricate O-ring (64) on gearbox cover (65). Install gearbox cover (65) by positioning it so that the ends of the shafts enter the bushings. Align the locating dowel with its hole in the gearbox and tap the cover with a soft hammer until seated.

Turn to (drawing 10): Install two screws (52) with lockwashers (2) and tighten with a 7/16" (11 mm) socket. Stand the machine upright.

Drawing 12 & 13

Turn to (drawing 13): Place rotor (19) onto shaft (42) followed by lockwasher (2) and nut (18). Use a screwdriver to hold the rotor from turning and tighten the nut with a 7/16" (11 mm) deep socket and 6" (152 mm) extension.

Test for proper assembly by turning the rotor with a pencil. The shaft should turn very easily and the rotor vanes must not strike the stein wall. Continue turning and check to see that the tee housing turns also. Install stator (17) and secure it with retaining ring (16).

Turn to (drawing 12): Place assembled nozzle carrier (11) onto the tee housing. If the Alfa Laval Gamajet is equipped with self-rinse nozzle (7) the hole for the nozzle should point toward the inlet end of the machine. Rotate the carrier slightly to mesh the bevel gears.

Install outer seal (5) onto the tee housing with its spring side facing into bearing cup (6). Insert bearing (4) into nameplate (3), taking care that the locating pin enters the hole in the bearing flange. While keeping the nameplate and bearing engaged, push them all the way onto the tee housing. Rotate the nameplate to align the screw holes, making sure that the locating pin does not disengage from the bearing. Install two screws (1) with lockwashers (2) and tighten with a 7/16" socket.

Try to rotate the nozzle carrier in both directions. It should have a few degrees of free play before it stops (pin-drive) or becomes more difficult to turn (clutch-drive). If this free play cannot be felt, remove the nozzle carrier and check that both bearings (4) are fully seated and engaged with their locating pins.

Drawing 11

If the machine is equipped with self-rinse nozzle (7), screw it into nozzle carrier (11) hand tight. Unscrew the nozzle just far enough (less than one turn) so that the nozzle tip is pointing directly toward the body of the Alfa Laval Gamajet. The correct position is shown in Drawing 11. Hold the nozzle in this position and tighten the locknut against the nozzle carrier with a 9/16" (14 mm) open-end wrench.

This completes the assembly process.

7. Technical Data

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

7.1 Technical Data

The Alfa Laval GJ 4 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 30.5m (100 ft.)

Pressure

Working pressure 3 - 21 bar (40 - 300 PSI)
Recommended pressure 3.5 - 14 bar (50 - 200 PSI)

Cleaning 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

1.4404 (316L), PPS, PTFE, FKM (EPDM and FFKM available).

Temperature

Max. Working temperature 95°C (203°F)
Max. Ambient temperature 140°C (284°F)
Weight 12.7 - 13.2 kg (28 - 29 lbs.)

Connections

Standard thread 2" NPT, 2" BSP

Options

Electronic rotation sensor to verify 3D coverage. 180° and 105° directional version available.

Caution

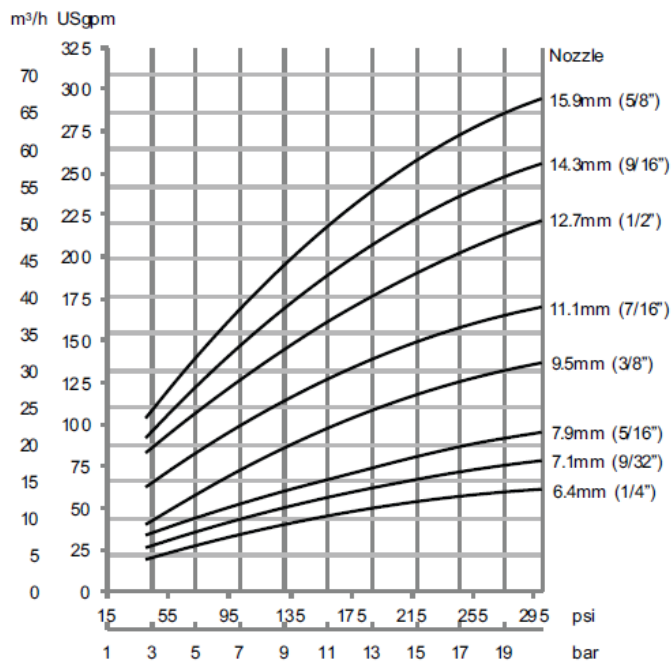
Do not use for gas evacuation or air dispersion.

7. Technical Data

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

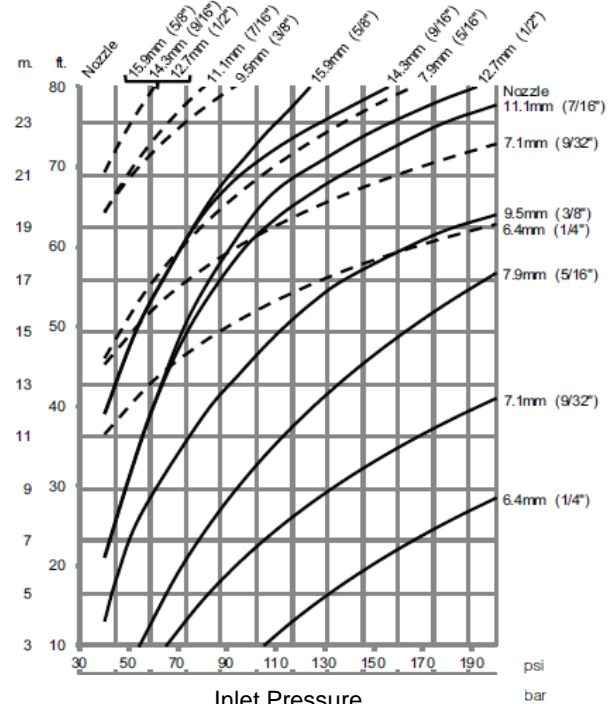
7.2 Performance Data

Flow Rate



Inlet Pressure

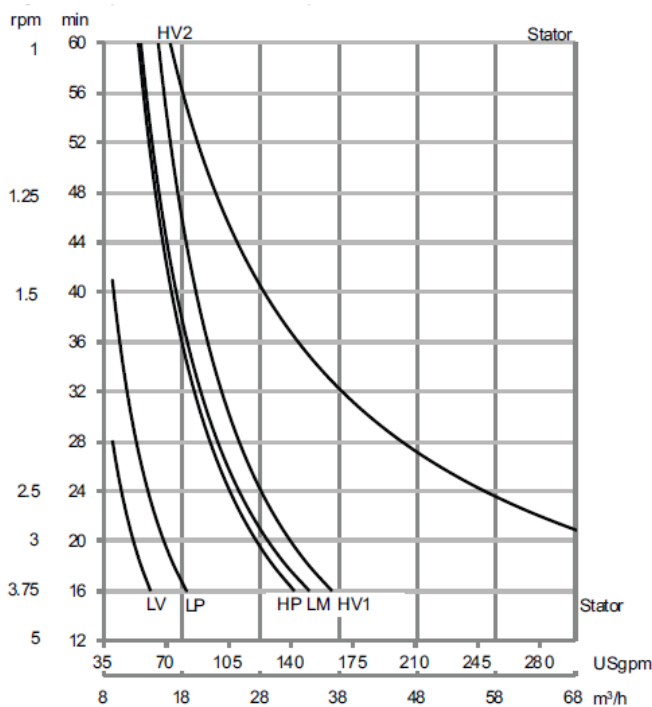
Impact Throw Length



Inlet Pressure

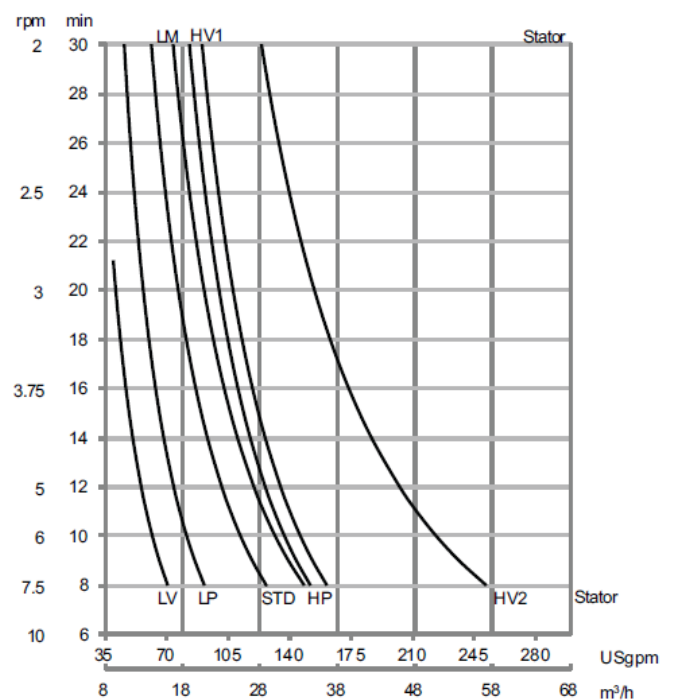
--- Wetting, --- Impact cleaning

Cleaning Time (Gear Ratio 655:1)



Flow Rate

Cleaning Time (Gear Ratio 273:1)



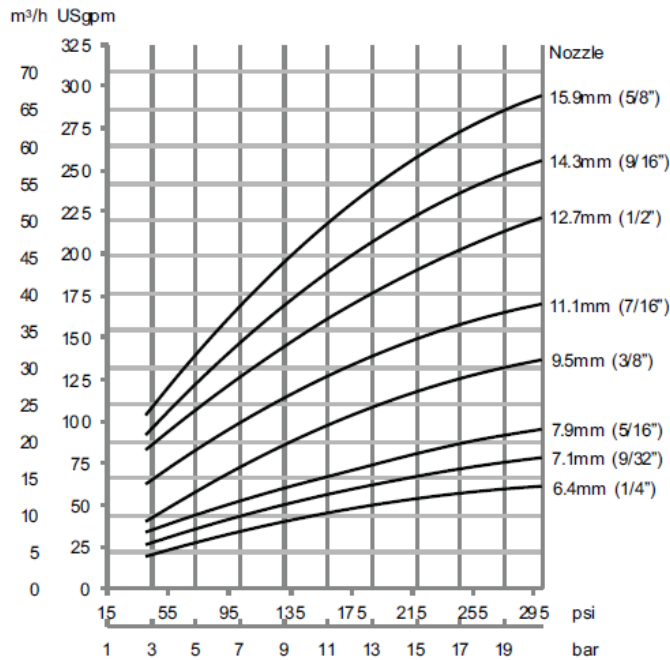
Flow Rate

7. Technical Data

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

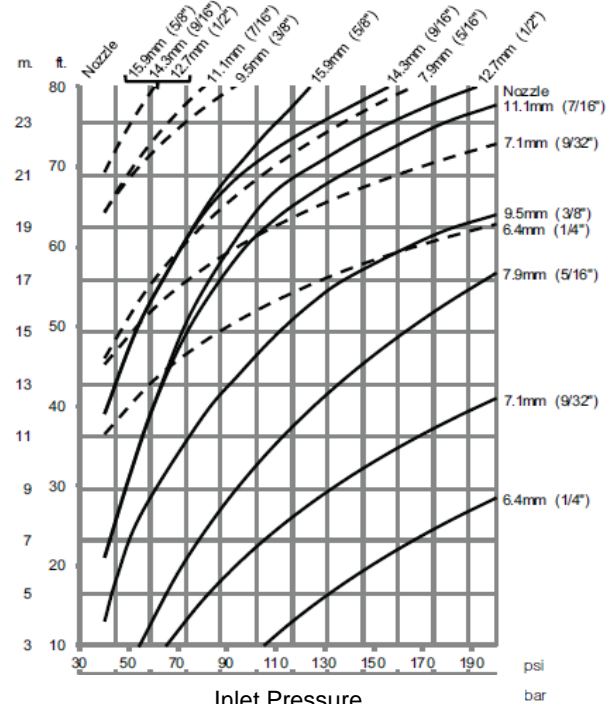
Flo Thru Machine Performance Data

Flow Rate



Inlet Pressure

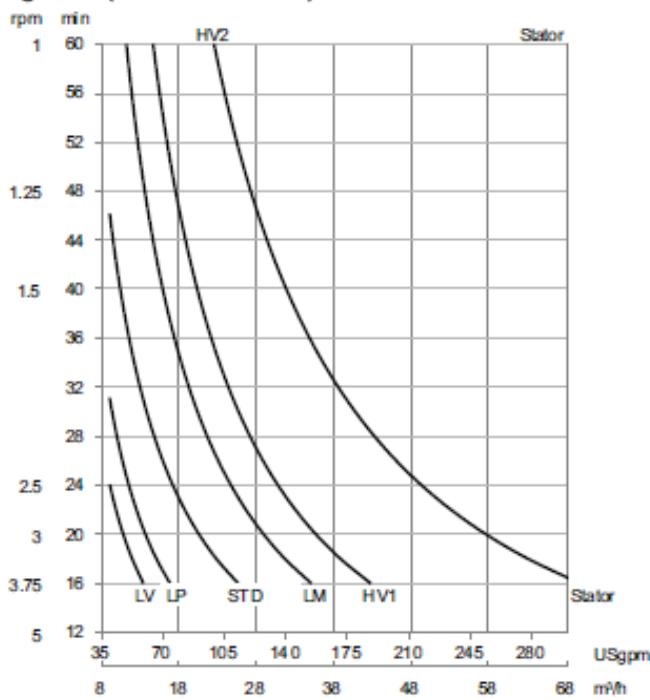
Impact Throw Length



Inlet Pressure

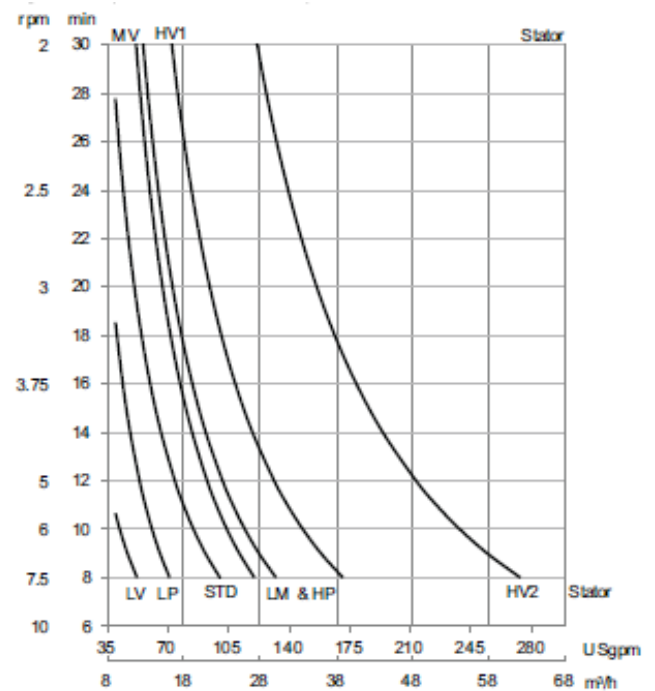
--- Wetting, --- Impact cleaning

Cleaning Time (Gear Ratio 655:1)



Flow Rate

Cleaning Time (Gear Ratio 273:1)



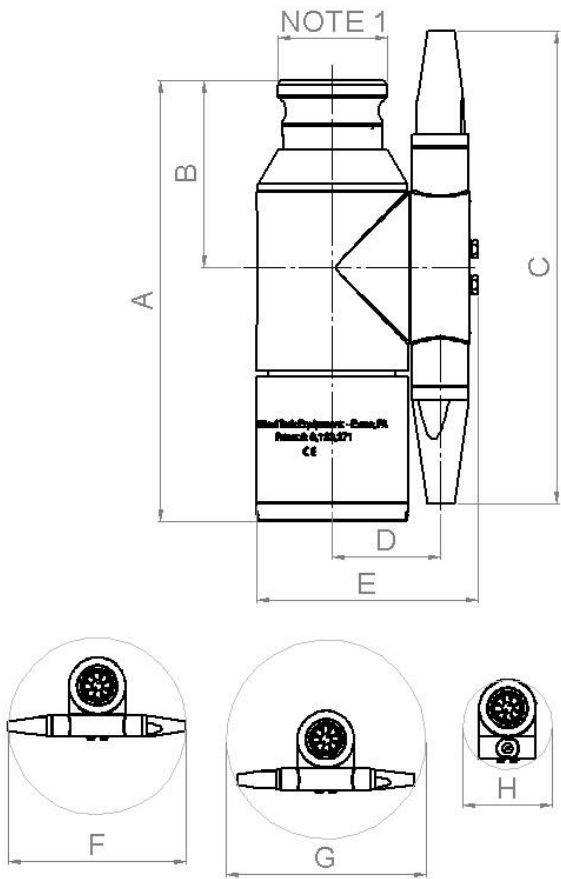
Flow Rate

7. Technical Data

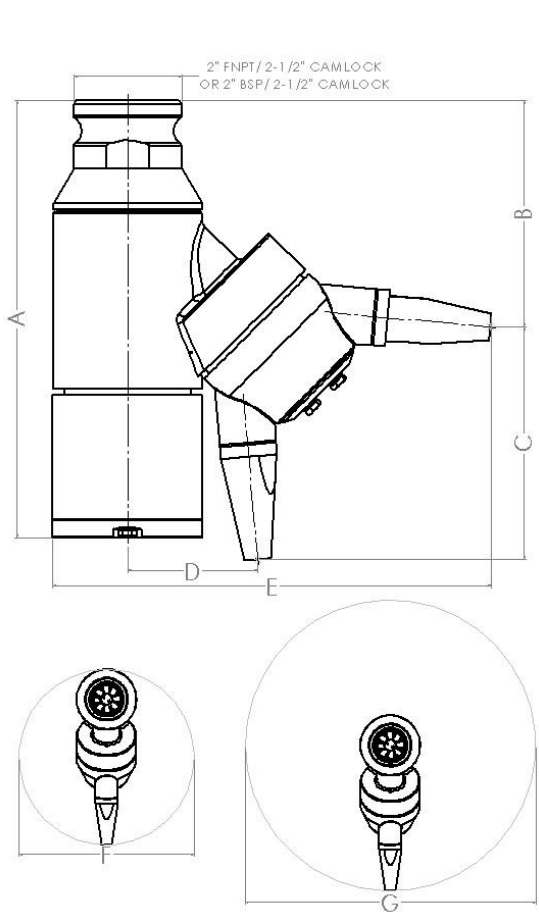
It is important to observe the technical data during installation, operation and maintenance. Inform personnel about the technical data.

7.3 Dimensions

Dimensions



Dimensions 180° directional version



Dimensions

	A	B	C	D	E	F	G	H	I
mm	308	131	331	76	155	331	372	168	219
in	12.1	5.14	13	2.97	6.07	13	14.62	6.59	8.61
NOTE 1: 2" NPT FEMALE/ 2-1/2" CAMLOCK. 2" NPT FEMALE/ 2-1/2" NST									

Dimensions 180° directional version

	A	B	C	D	E	F	G
mm	308	159	163	91	308	308	511
in	12.1	6.2	6.4	3.5	12.1	12.1	20.1

*For 105° Directional Machine, refer to Appendix B

7. Technical Data

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

7.4 Trax Simulation Tool

Standard Design

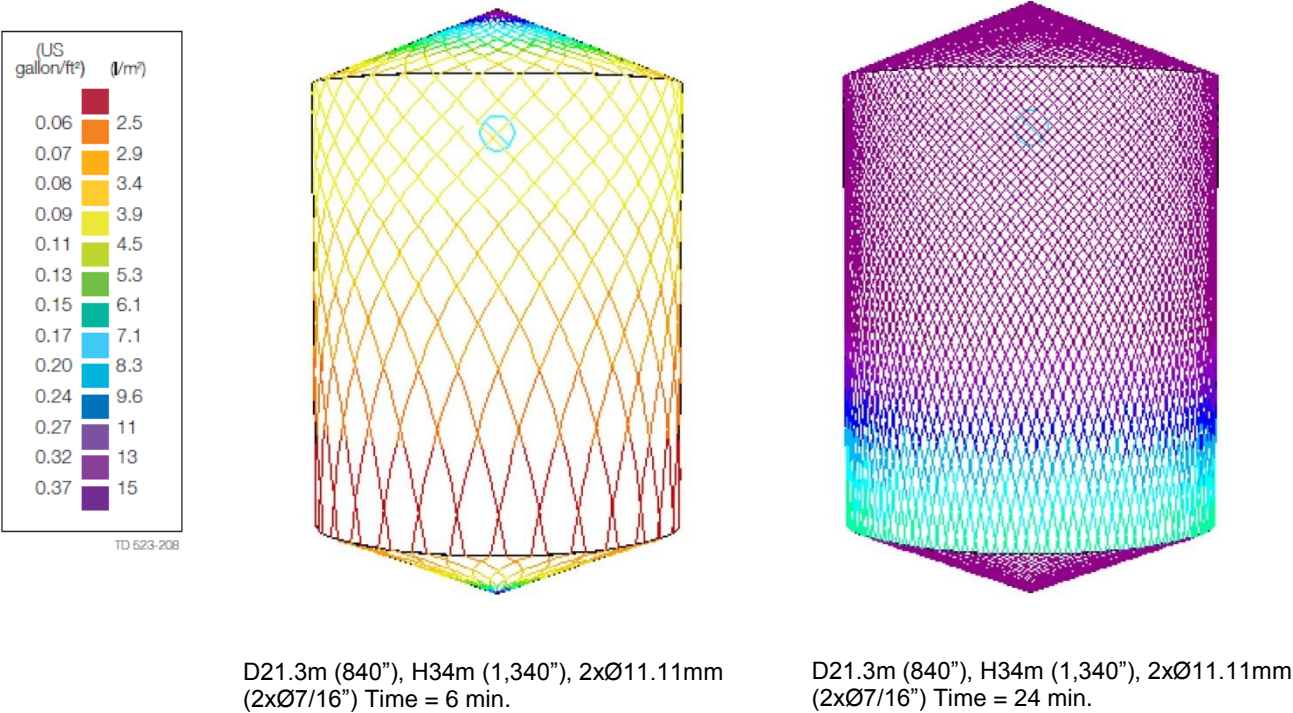
The choice of nozzle diameters can optimize jet impact length and flow rate at the desired pressure. As standard documentation, the Alfa Laval GJ 4 can be supplied with a “Declaration of Conformity” for material specifications.

TRAX simulation tool

TRAX is an unique software that simulates how the Alfa Laval GJ 4 performs in a specific tank or vessel. The simulation gives information on wetting intensity, pattern mesh width and cleaning jet velocity. This information is used to determine the best location of the tank cleaning device and the correct combination of flow, time, and pressure to implement.

A TRAX demo containing different cleaning simulations covering a variety of applications can be used as a reference and documentation for tank cleaning applications. The TRAX demo is free and available upon request.

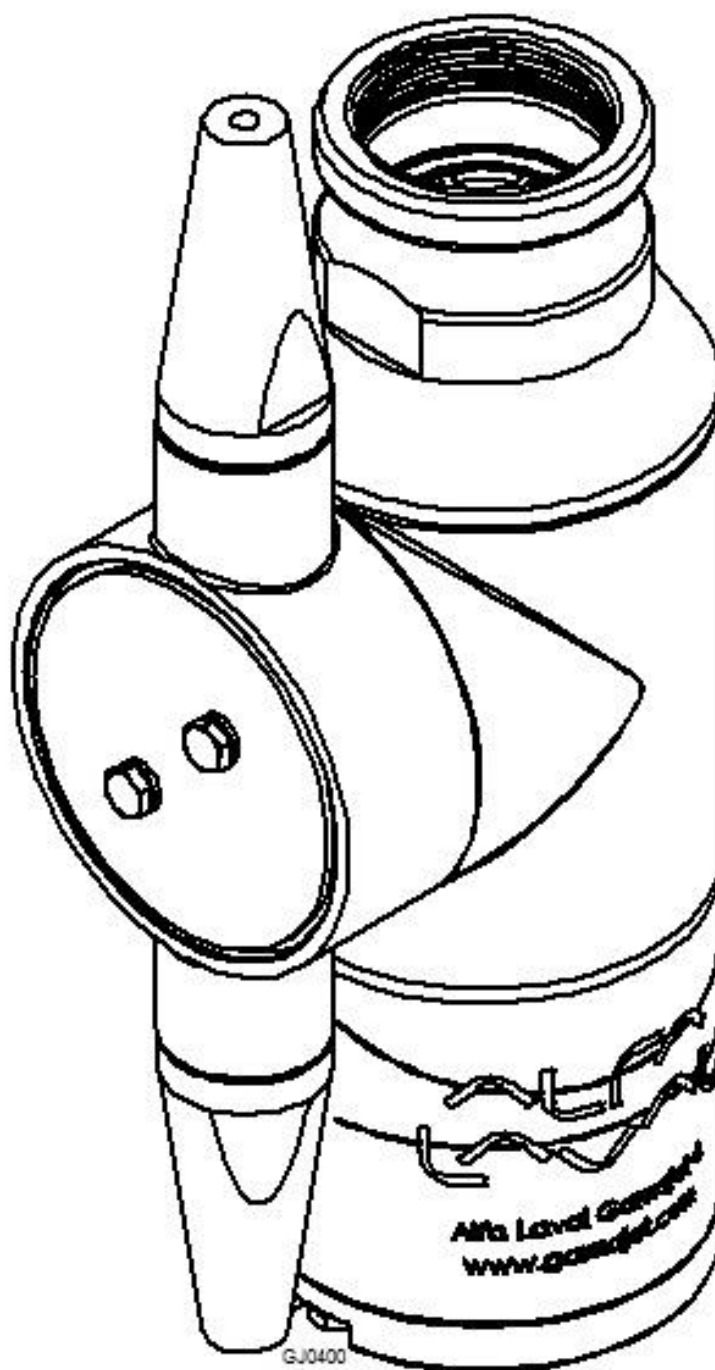
Wetting Intensity



8. Parts List and Service Kits

The drawing shows Alfa Laval GJ 4 Tank Cleaning Machine

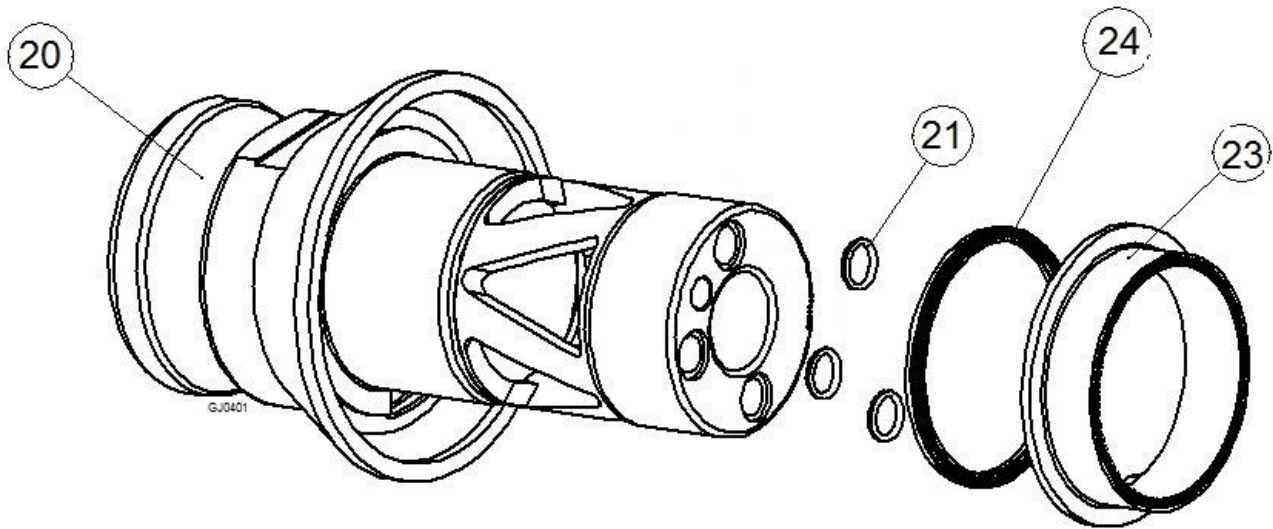
8.1 GJ4 View 4



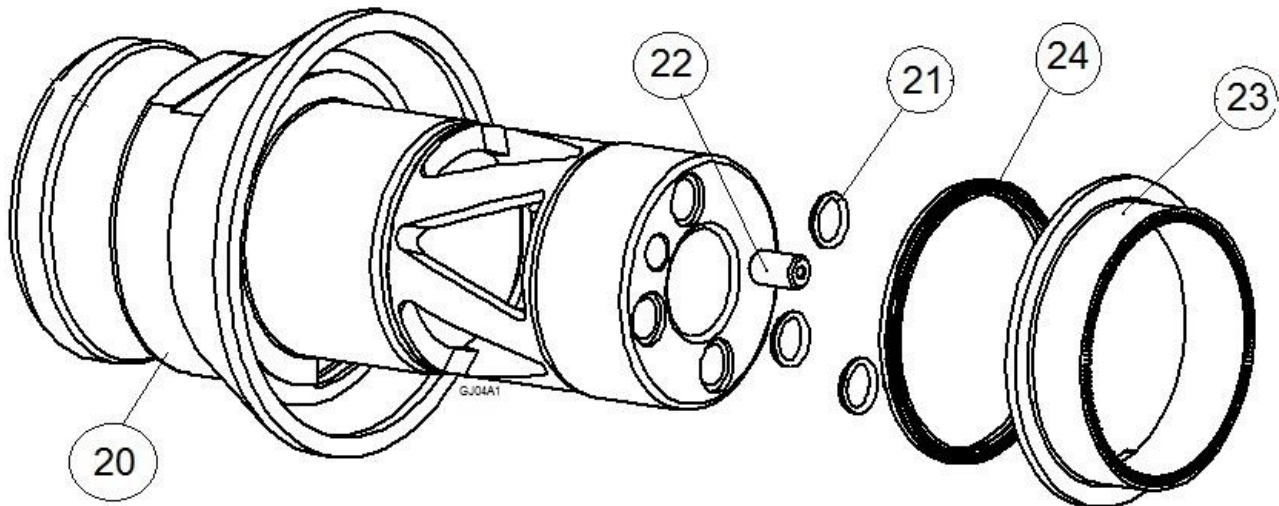
8. Parts List and Service Kits

The drawing shows Alfa Laval GJ 4 Tank Cleaning Machine

8.2 Assembly Drawings – 1, 2, 3 & 4



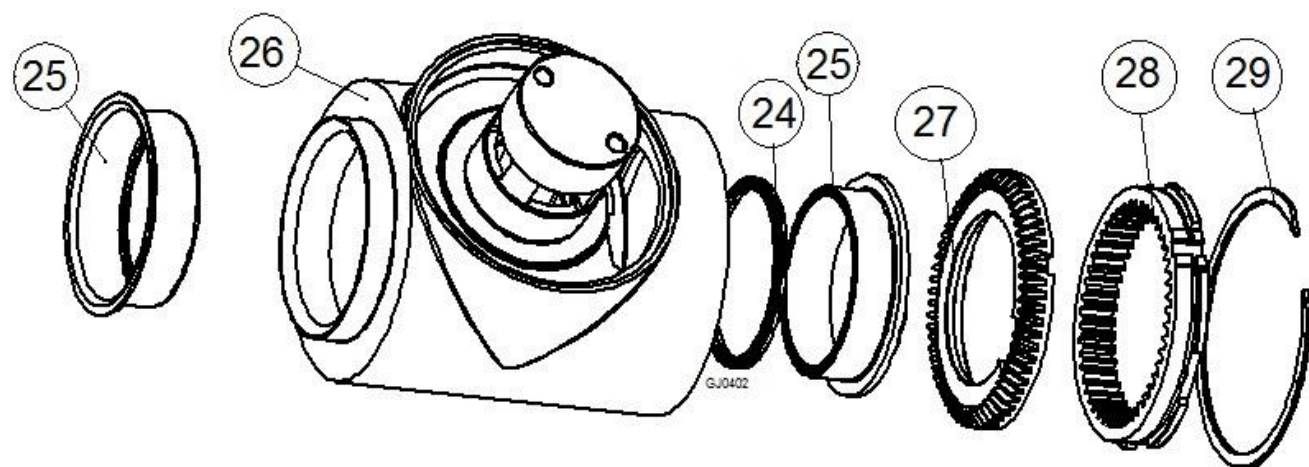
Drawing 1.1: Alfa Laval GJ 4 **Oil** Inlet Stem Assembly



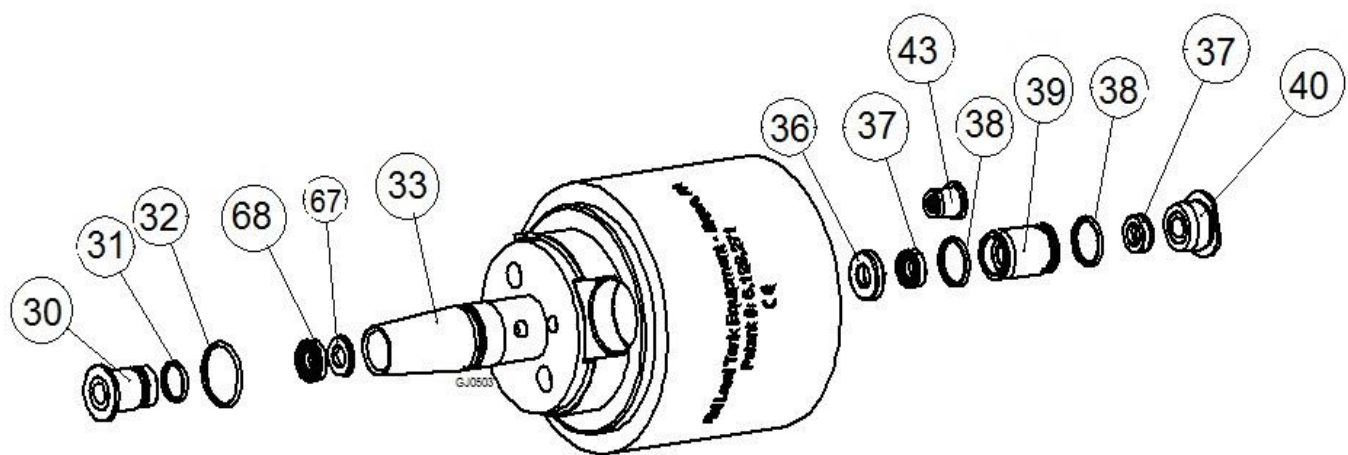
Drawing 1.2: Alfa Laval GJ 4 **Flo Thru** Inlet Stem Assembly

8. Parts List and Service Kits

The drawing shows Alfa Laval GJ 4 Tank Cleaning Machine



Drawing 2: Alfa Laval GJ 4 Tee Housing Assembly

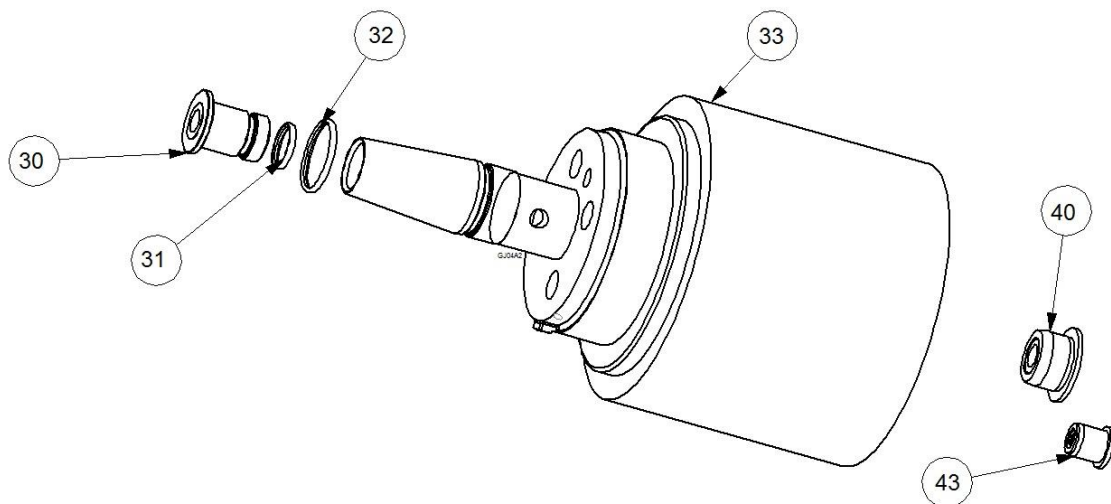


Drawing 3.1: Alfa Laval GJ 4 Oil Gearbox Assembly

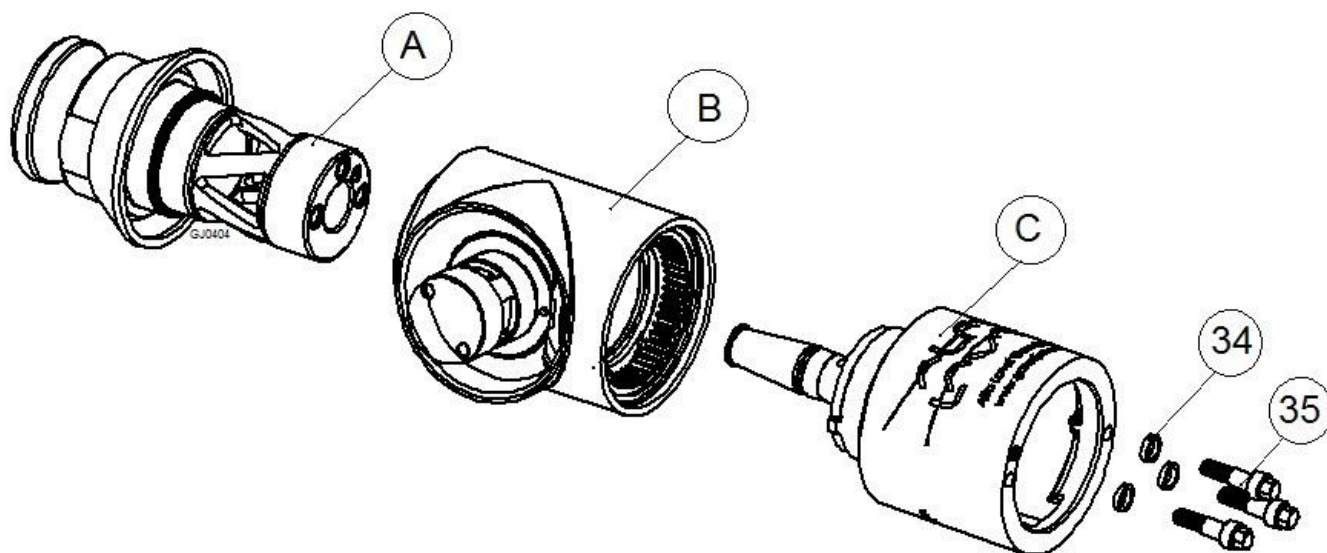
**For Directional Machine, refer to Appendix A (180°) /Appendix B (105°)*

8. Parts List and Service Kits

The drawing shows Alfa Laval GJ 4 Tank Cleaning Machine



Drawing 3.2: Alfa Laval GJ 4 **Flo Thru** Gearbox Assembly



Drawing 4: Alfa Laval GJ 4 Body Assembly

A : Drawing 1

B : Drawing 2

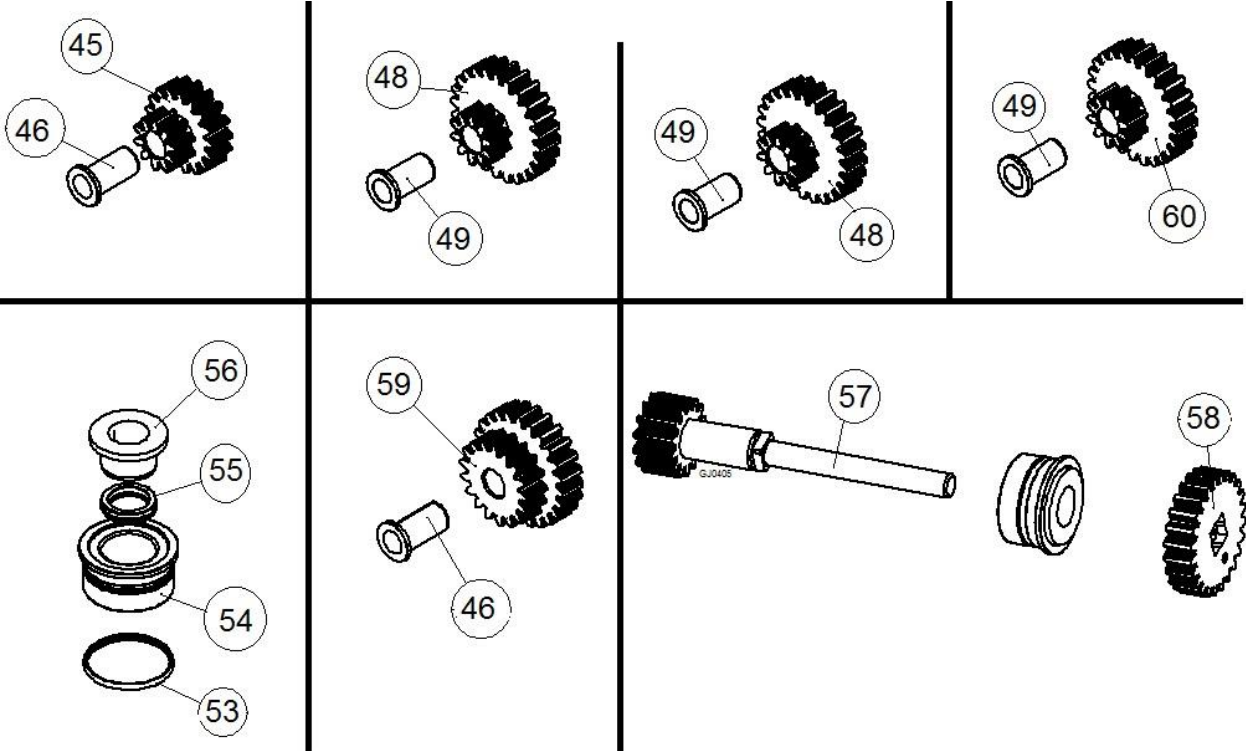
C : Drawing 3

**For Directional Machine, refer to Appendix A (180°) /Appendix B (105°)*

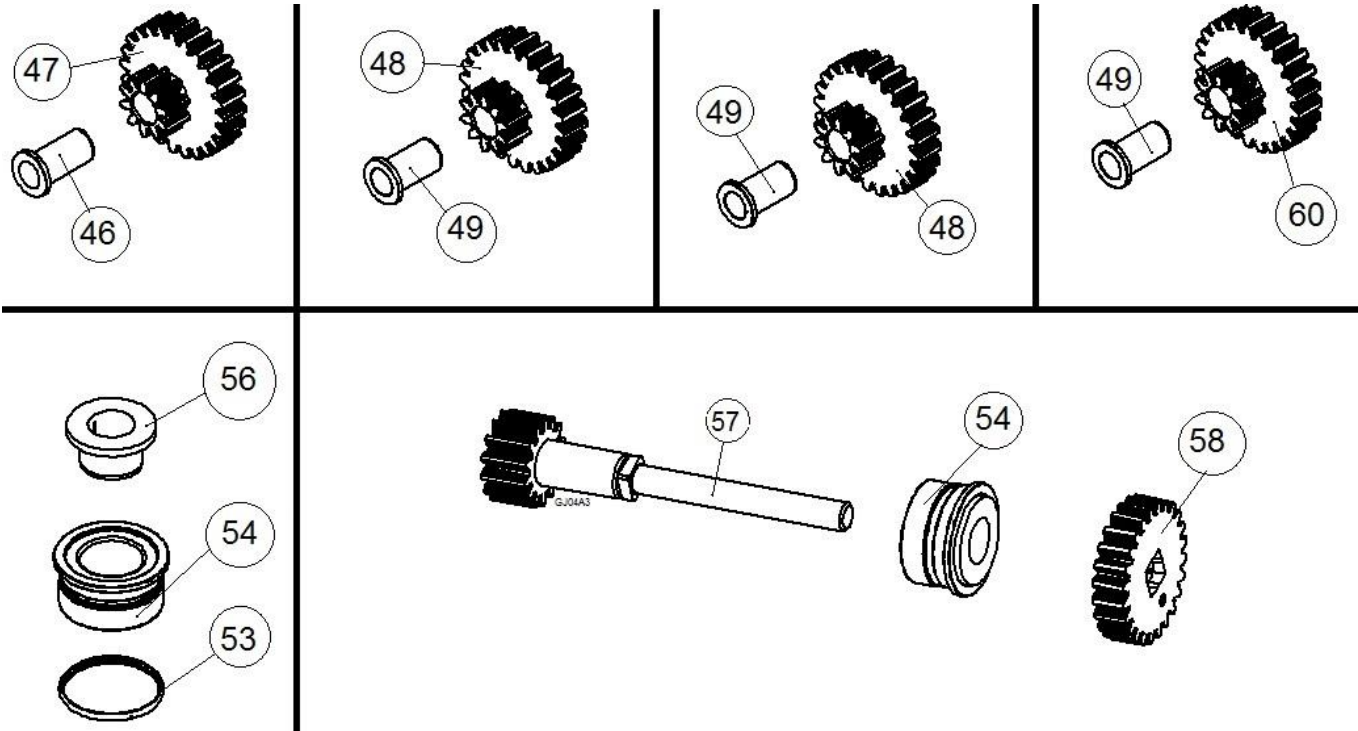
8. Parts List and Service Kits

The drawing shows Alfa Laval GJ 4 Tank Cleaning Machine

8.3 Assembly Drawings – 5, 6, 7 & 8



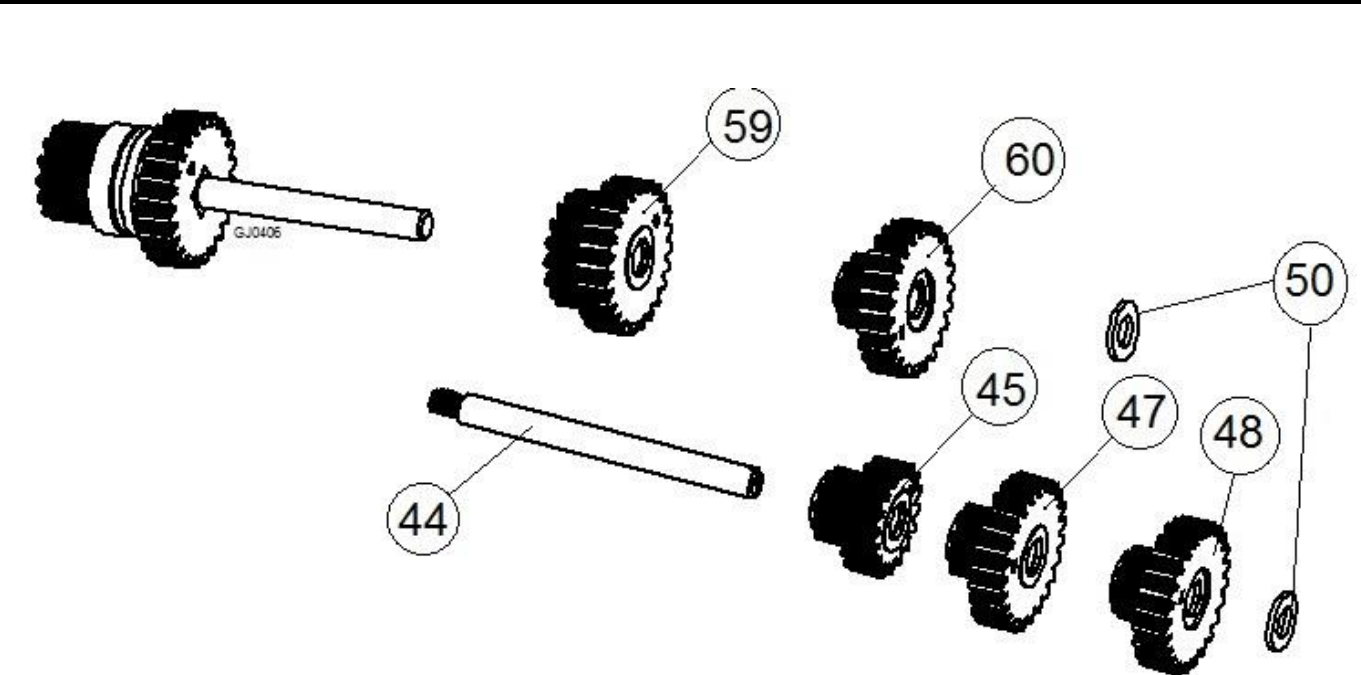
Drawing 5.1: Alfa Laval GJ 4 273:1 Oil Gear Train Assembly



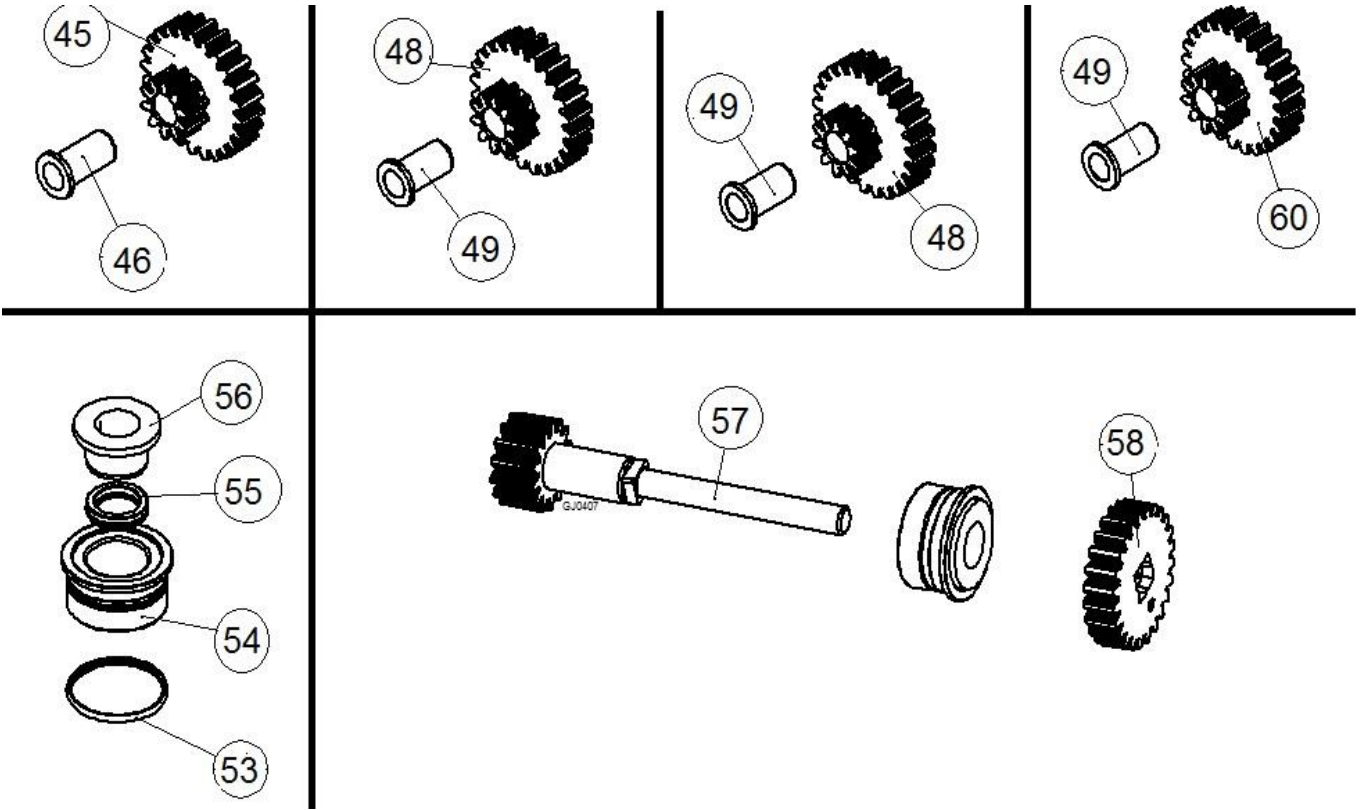
Drawing 5.2: Alfa Laval GJ 4 273:1 Flo Thru Gear Train Assembly

8. Parts List and Service Kits

The drawing shows Alfa Laval GJ 4 Tank Cleaning Machine



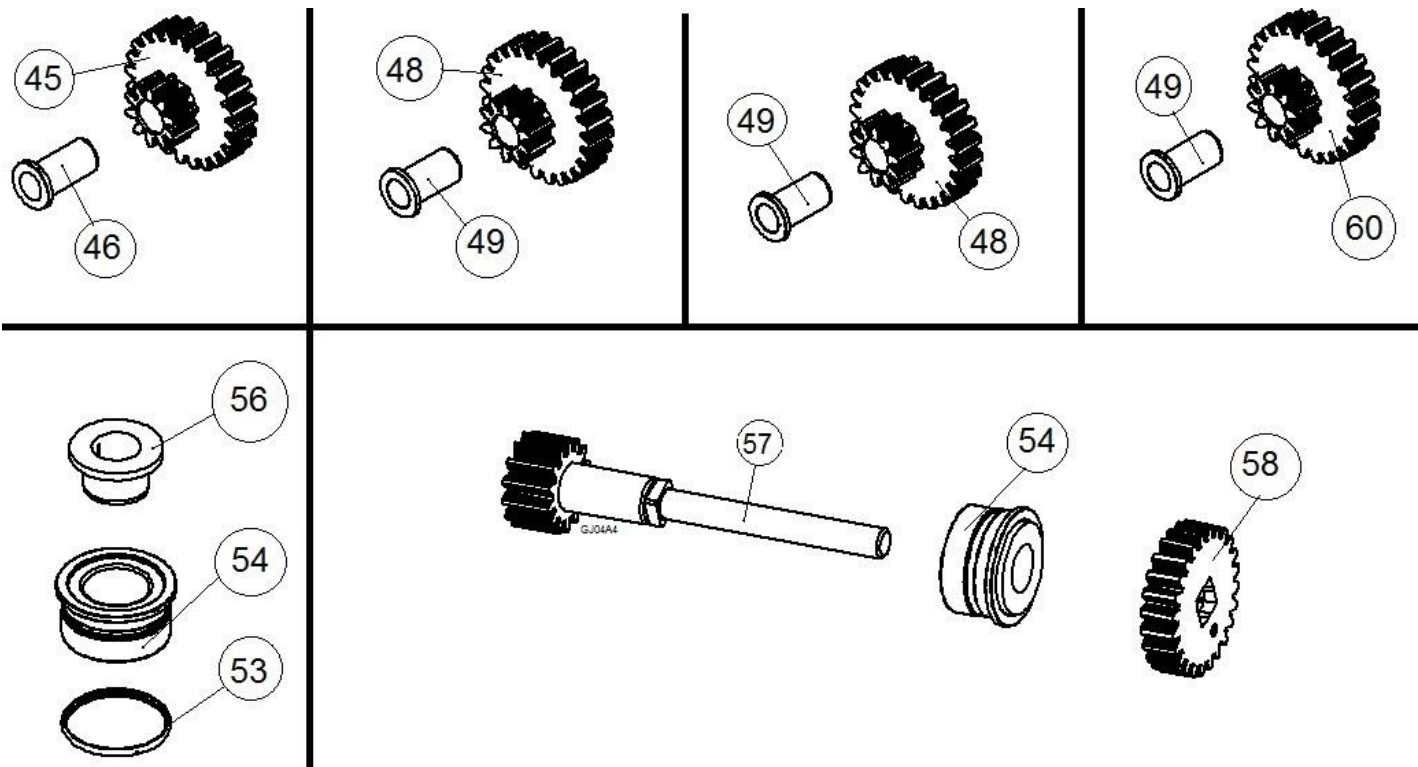
Drawing 6: Alfa Laval GJ 4 273:1 Sub-Assembly



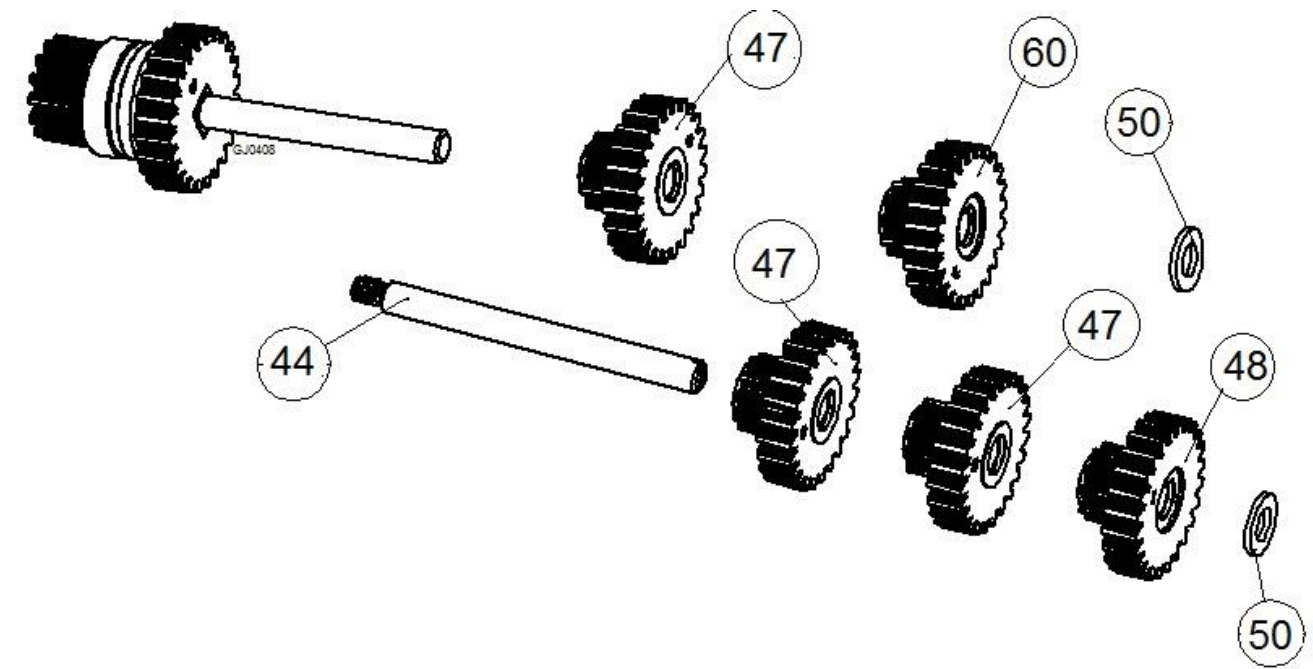
Drawing 7.1: Alfa Laval GJ 4 655:1 Oil Gear Train Assembly

8. Parts List and Service Kits

The drawing shows Alfa Laval GJ 4 Tank Cleaning Machine



Drawing 7.2: Alfa Laval GJ 4 655:1 Flo Thru Gear Train Assembly

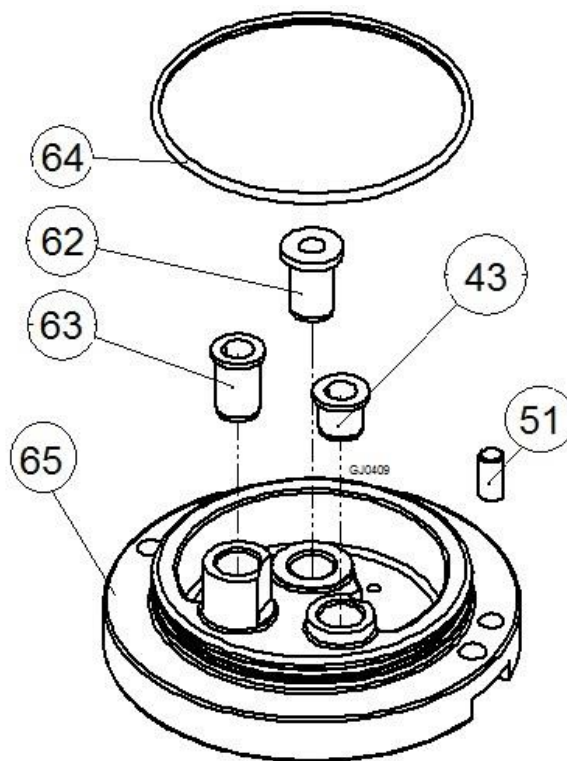


Drawing 8: Alfa Laval GJ 4 655:1 Sub-Assembly

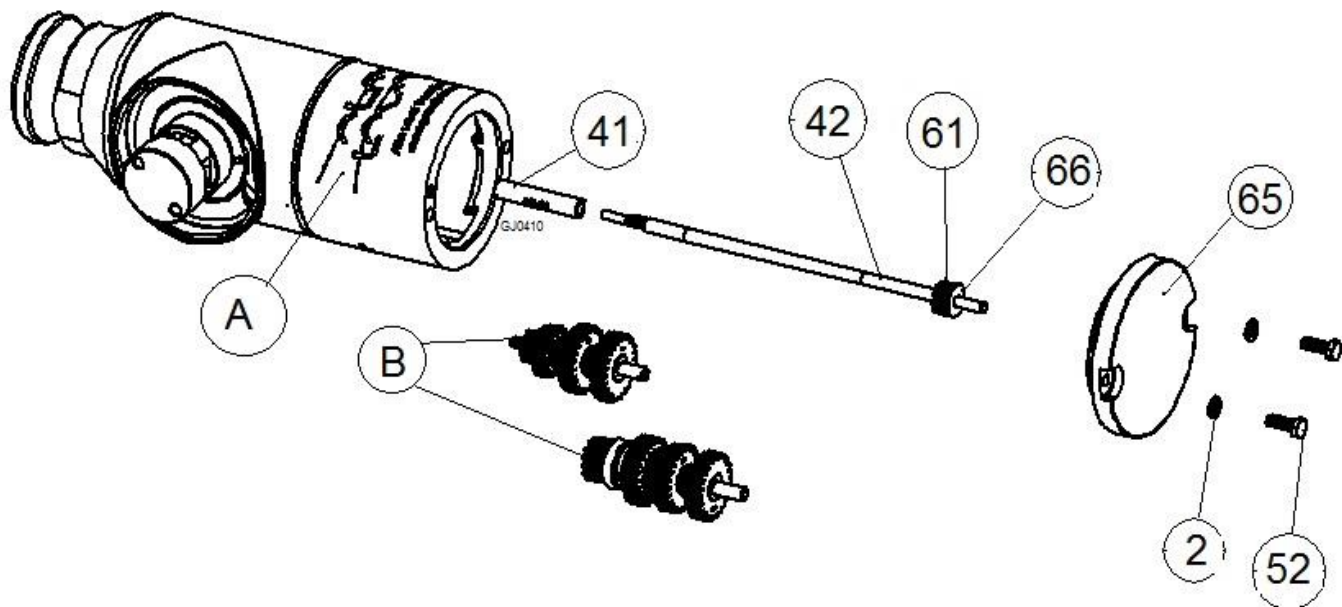
8. Parts List and Service Kits

The drawing shows Alfa Laval GJ 4 Tank Cleaning Machine

8.4 Assembly Drawings – 9, 10 & 11



Drawing 9: Alfa Laval GJ 4 Gearbox Cover Assembly



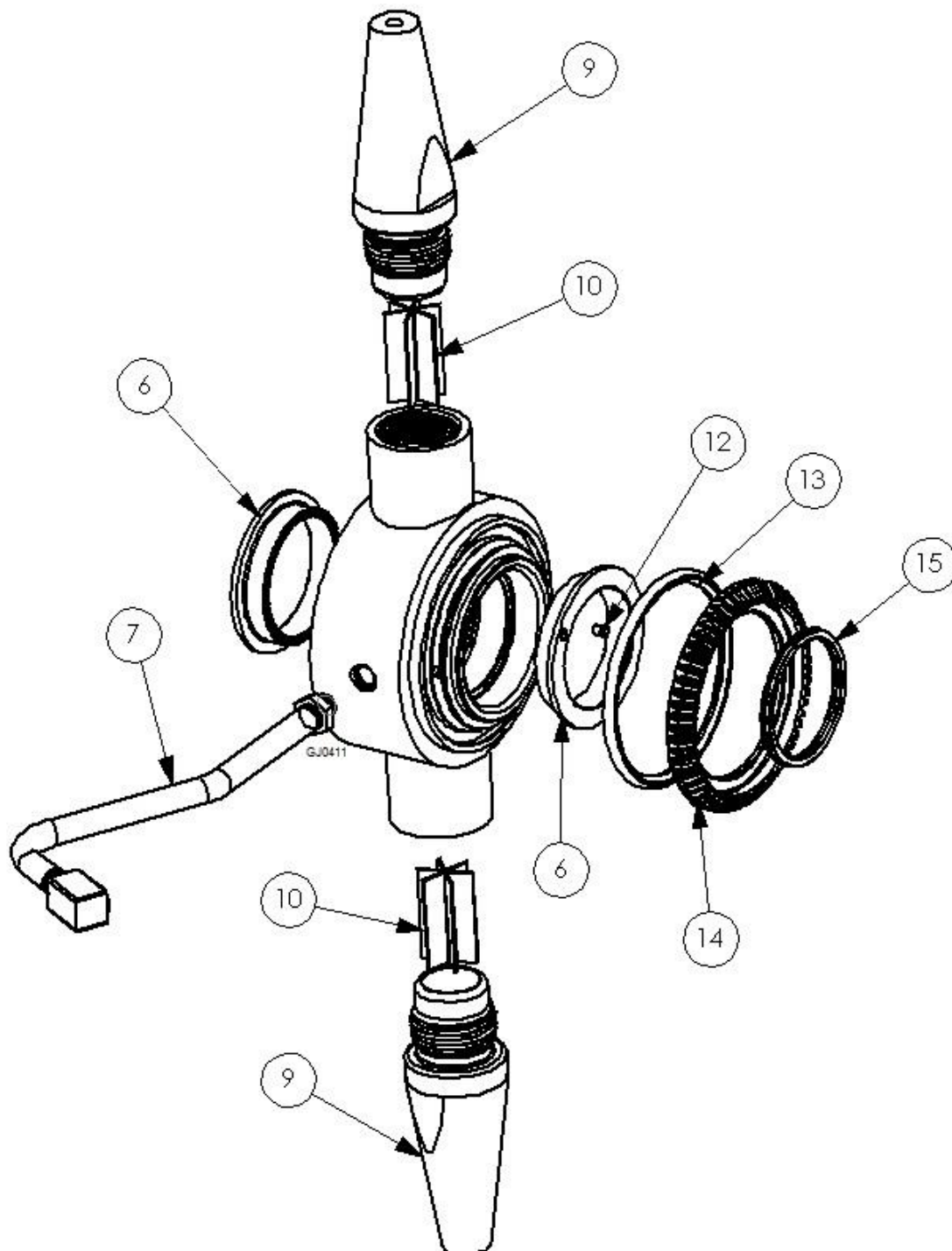
Drawing 10: Installing Gear Train

A : Drawing 4

B : Drawing 5 & 6/ (7 & 8)

8. Parts List and Service Kits

The drawing shows Alfa Laval GJ 4 Tank Cleaning Machine



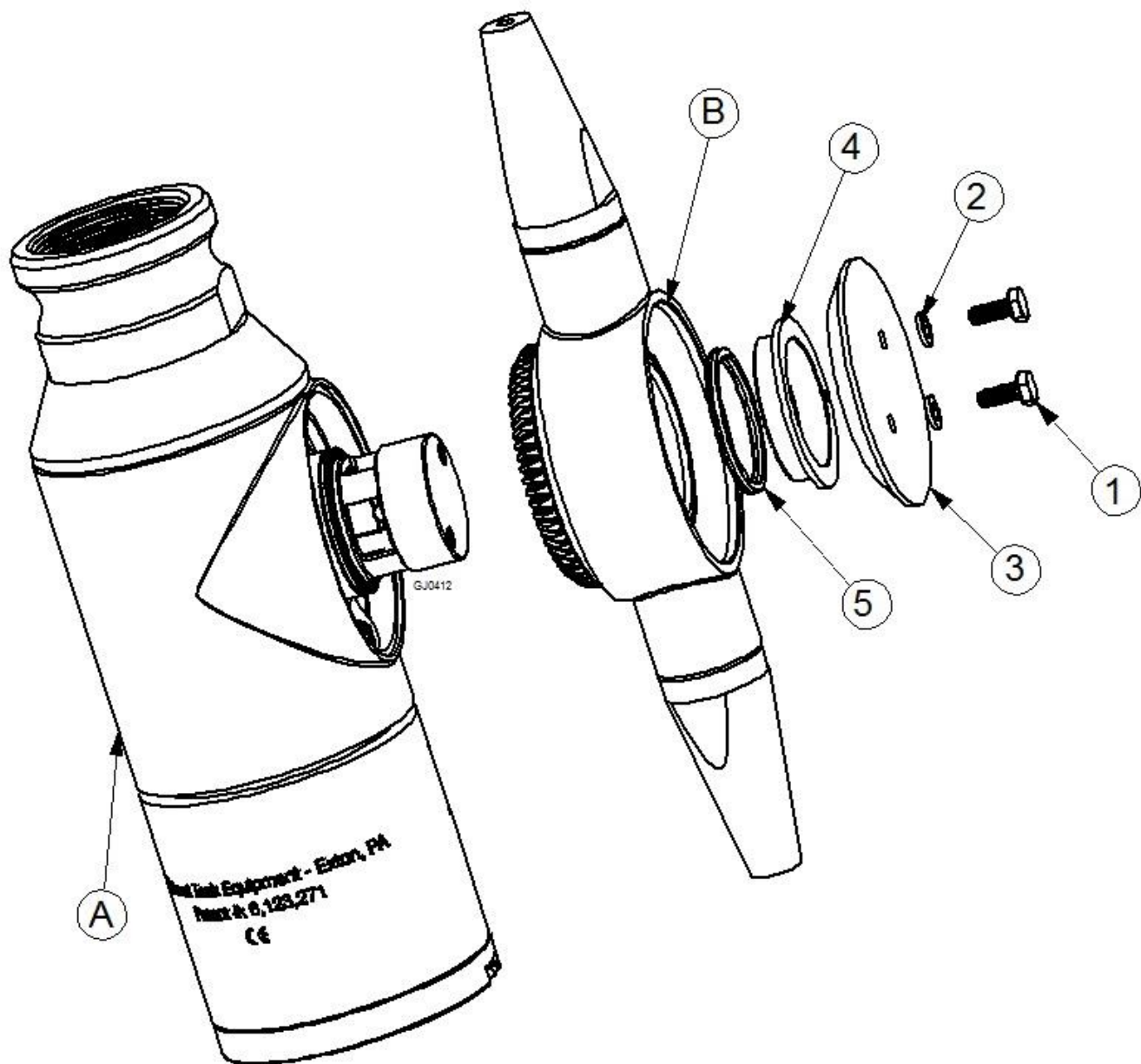
Drawing 11: Alfa Laval GJ 4 Nozzle Housing Assembly

** For Directional Machine, refer to Appendix A (180°) /Appendix B (105°)*

8. Parts List and Service Kits

The drawing shows Alfa Laval GJ 4 Tank Cleaning Machine

8.5 Assembly Drawings – 12 & 13



Drawing 12: Alfa Laval GJ 4 Nozzle Housing Assembly Exploded View

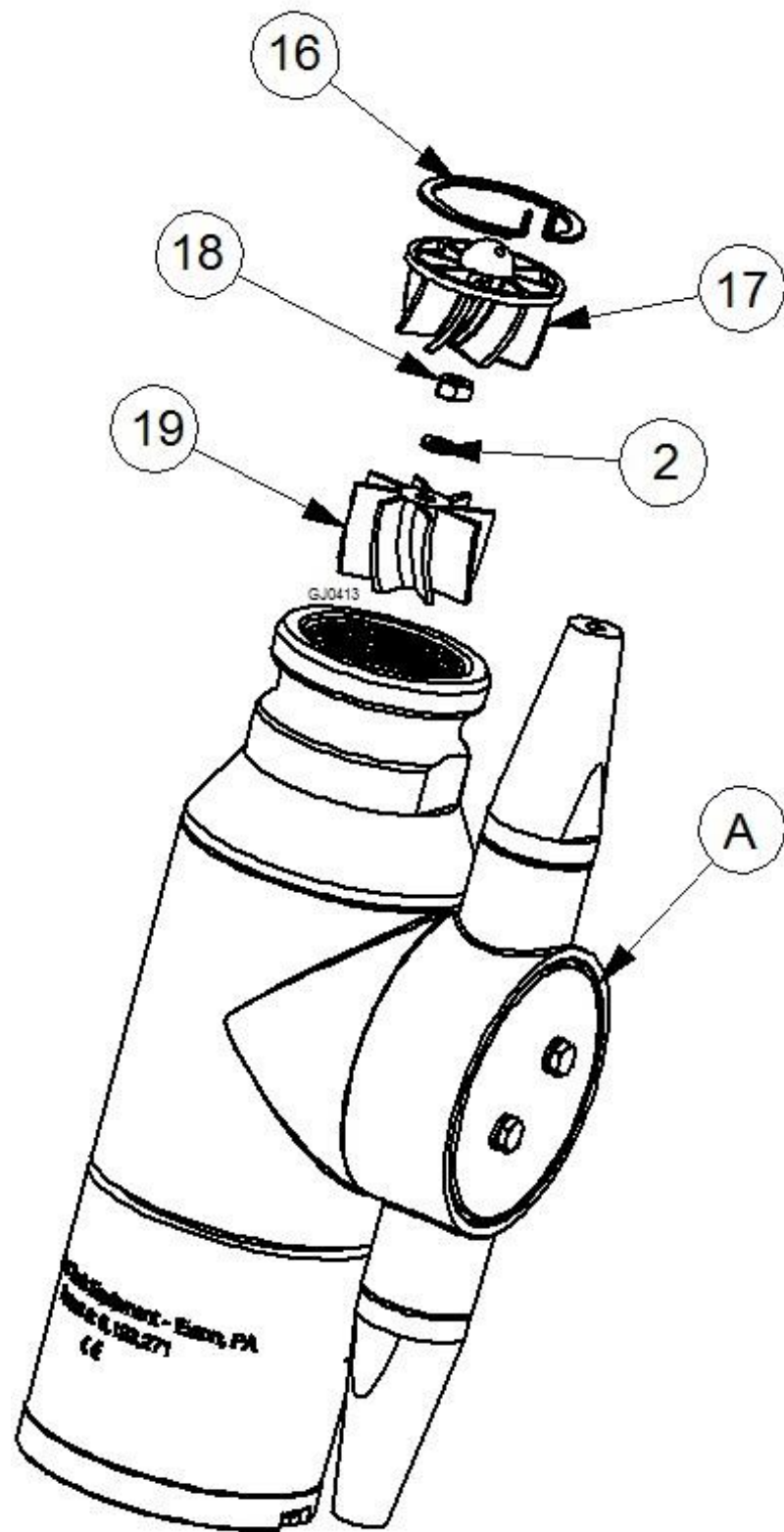
A: Drawing 10

B : Drawing 11

** For Directional Machine, refer to Appendix A (180°) /Appendix B (105°)*

8. Parts List and Service Kits

The drawing shows Alfa Laval GJ 4 Tank Cleaning Machine



Drawing 13: Installing Rotor & Stator

A: Drawing 12

8. Parts List and Service Kits

8.6 Parts List

Pos.	AL No.	Gamajet No.		Description	No.
		Flo-thru	Sealed		
1	9614663301	648-BS	648-BS	Nameplate Screw	2
2	9614662901	647-S	647-S	Lockwasher	5
3.1	9614655401	606-SS	606-SS	Nameplate 360° 180° & 105° (Directional)	1
3.2	9614699701	606-BS	606-BS		
4	9614660801	633-S	633-S	Nozzle Housing Bearing	2
5	9614661201	636-TG	636-TG	Nozzle Housing Seal	2
6	9614661001	634-A	634-A	Nozzle Housing Bearing Cup	2
7	9614655601	607-SRD	607-SRD	Self-rinse Nozzle Assembly (CIP Model only)	1
8	9614667001	668	668	Nozzle Housing Plug	1
9.1	9614655701	607-SS	607-SS	Nozzle Assembly (included Pos. 10) 1/4" 9/32" 5/16" 3/8" 7/16" 1/2" 9/16" 5/8"	2 Or 3
9.2	9614655702	607-SS	607-SS		
9.3	9614655703	607-SS	607-SS		
9.4	9614655704	607-SS	607-SS		
9.5	9614655705	607-SS	607-SS		
9.6	9614655706	607-SS	607-SS		
9.7	9614655707	607-SS	607-SS		
9.8	9614655708	607-SS	607-SS		
10	9614655801	608	608	Stream Straightener	2 or 3
11.1	9614655001	605-2N	605-2N	Nozzle Housing Assembly	1
11.2	9614655101	605-2N	605-2N	Dual, Clutch Drive (incl. Pos. 6 & 13)	
11.3	9614655201	605-3N	605-3N	Dual, Pin Drive (incl. Pos. 6, 12 & 13)	
11.4	9614655301	605-3N	605-3N	Triple, Clutch Drive (incl. Pos. 6 & 13)	
11.5	9614666101	605-D 2N	605-D 2N	Triple, Pin Drive (incl. Pos. 6, 12 & 13)	
11.6	9614666001	605-D 3N	605-D 3N	180° Directional, Dual, Pin Drive (incl. Pos. 6 & 12)	
11.7	9614666201	605-D 2N	605-D 2N	180° Directional, Triple, Pin Drive (incl. Pos. 6 & 12)	
				105° Directional, Pin Drive (incl. Pos. 6 & 12)	
12	9614664401	658-A	658-A	Nozzle Housing Drive Pin	1
13	9614661304	637-B	637-B	Clutch O-ring	1
14.1	9614657101	618-SS	618-SS	Nozzle Housing Bevel Gear 360° 180° Directional 105° Directional 105° Directional	1
14.2	9614666301	618-D	618-D		
14.3	9614666201	617-D	617-D		
14.4	9614666401	618-D	618-D		
15	9614657201	619	619	Bevel Gear Retaining Ring	1
16	9614662601	645-3	645-3	Stator Retaining Ring	1
17.1	9614655901	609-4LVS	609-4LVS	Stator LV LP STD HP LM HV1 HV2 MV	1
17.2	9614655902	609-4LPS	609-4LPS		
17.3	9614655903	609-4S	609-4S		
17.4	9614655904	609-4HPS	609-4HPS		
17.5	9614655905	609-4LMS	609-4LMS		
17.6	9614655906	609-4HV1S	609-4HV1S		
17.7	9614655907	609-4HV2S	609-4HV2S		
17.8	9614655908	609-4MVS	609-4MVS		

8. Parts List and Service Kits

18	9614663901	654-S	654-S	Rotor Retaining Nut	1
				Rotor	1
19.1	9614656001	610-4LPS	610-4LPS	LP	
19.2	9614656002	610-4S	610-4S	STD	
				Inlet Stem	1
20.1	9614654701	603-SS-OT	603-SS-OT	Dual Threaded	
20.2	9614654801	603-SS	603-SS	Camlock (Quick Disconnect)	
21	9614661702	641-V	641-V	Gearbox Screw O-ring	3
22	9614666601	667	NU	Flow Restrictor	1
23	9614660401	631-S	631-S	Tee Housing Bearing	2
24	9614661101	635-TG	635-TG	Tee Housing Seal	2
25	9614660701	632-A	632-A	Tee Housing Bearing Cup	2
				Tee Housing Assembly (incl. Pos. 25)	1
26.1	9614654901	604-SS	604-SS	360°	
26.2	9614665701	604-D	604-D	180° (Directional)	
26.3	9614665801	604-D	604-D	105° (Directional)	
27	9614657001	617-S	617-S	Tee Housing Bevel Gear	1
28	9614657301	620-S	620-S	Ring Gear	1
29	9614657401	621	621	Ring Gear Retaining Ring	1
30	9614664701	660-D	660-D	Rotor Shaft Upper Bearing Assy. (incl. Pos. 31)	1
31	9614662102	643-V	643-V	Cartridge O-ring	1
32	9614662002	642-3	642-3	Gearbox-Stem O-ring	1
33.1	9614654201	601-GT-FT	N/A	Gearbox Assembly (incl. Pos. 43)	1
33.2	9614654001	N/A	601-GT	Gearbox Assembly (incl. Pos. 43)	1
34	9614663701	652-3	652-3	Gearbox Bolt Lockwasher	3
35	9614663501	650-3	650-3	Gearbox Bolt	3
36	9614664601	N/A	659-3	Seal Housing Spacer	1
37	9614661801	N/A	641-TG	Rotor Shaft Seal	2
38	9614661502	N/A	639-V	Seal Housing O-ring	2
39	9614656101	N/A	611-3B	Rotor Shaft Seal Housing Assy.(incl. Pos.37 & 38)	1
40	9614664901	660-3B	660-3B	Rotor Shaft Center Bearing	1
41	9614664101	655-GT	655-GT	Rotor Shaft Spacer	1
42	9614657503	622-GT	622-GT	Rotor Shaft Assembly (incl. Pos. 61)	1
43.1	9614659901	628-ATC	628-ATC	Idler Shaft Bushing (Lower Bushing for GT Machine)	2 (1 for GT)
43.2	9614659801	628-GT	628-GT	Idler Shaft Upper Bushing (for GT Machine only)	1 for GT
44	9614656802	615-GT	615-GT	Idler Shaft	1
				Idler Gear # 5 (incl. Pos. 46)	1
45.1	9614657801	623-GTS	623-GTS	For 655:1 Gear Ratio, 24/10 Teeth	
45.2	9614658601	623-GTC	623-GTC	For 273:1 Gear Ratio, 17/10 Teeth	
46	9614665601	623-4TC	623-4TC	Idler Gear Bushing (for Gear # 3, 4, & 5)	3
47	9614657801	623-GTS	623-GTS	Idler Gear # 3 (incl. Pos. 46)	1
48	9614659001	623-GTN	623-GTN	Idler Gear # 1 (incl. Pos. 49 & 50)	1
49	9614665501	623-3TC	623-3TC	Idler Gear Bushing (for Gear # 1 & 2)	2
50	9614665201	623-W	623-W	Idler Gear Thrust Washer	2
51	9614664301	658	658	Gearbox Cover Dowel	1
52	9614662801	646-AS	646-AS	Gearbox Cover Screw	2
53	9614661602	640-V	640-V	Final Shaft Retainer O-ring	1
54.1	9614656501	613-ASTC	N/A	Final Shaft Retainer Assy. (incl. Pos. 53, 55 & 56)	1
54.2	9614656401	N/A	613-ASTL	Final Shaft Retainer Assy. (incl. Pos. 53, 55 & 56)	1
55	9614662401	N/A	643-ATG	Final Shaft Seal	1

8. Parts List and Service Kits

56	9614660101	629-ATC	629-ATC	Final Shaft Upper Bushing	1
57	9614656901	616	616	Final Shaft & Pinion	1
58	9614659102	624-GT	624-GT	Final Shaft Drive Gear	1
				Idler Gear # 4 (incl. Pos. 46)	1
59.1	9614657801	623-GTS	623-GTS	For 655:1 Gear Ratio, 24/10 Teeth	1
59.2	9614658301	623-GTB	623-GTB	For 273:1 Gear Ratio, 24/17 Teeth	1
60	9614658801	623-GTT	623-GTT	Idler Gear # 2 (incl. Pos. 49 & 50)	1
61	9614656703	614-GT	614-GT	Rotor Shaft Pinion Assembly (incl. Pos. 66)	1
62	9614659401	626-GT	626-GT	Rotor Shaft Thrust Bushing	1
63	9614660301	630-TC	630-TC	Final Shaft Lower Bushing	1
64	9614662502	644-V	644-V	Gearbox Cover O-ring	1
65.1	9614654601	602-GT-FT	N/A	Gearbox Cover Assy. (incl. Pos. 43, 51, 62 & 63)	1
65.2	9614654401	N/A	602-GTS	Gearbox Cover Assy. (incl. Pos. 43, 51, 62 & 63)	1
66	9614656601	614-W	614-W	Rotor Shaft Pinion Carbide Thrust Washer	1
67	9614667101	N/A	669	Rotor Shaft Upper Seal Thrust Washer	1
68	9614664801	N/A	660-TG	Rotor Shaft Upper Seal	1

CIP = Cleaning In
Place

NA = Not Applicable

8. Parts List and Service Kits

8.7 Minor Service Kit

Article no: 9614667601 1GTFT ALFA LAVAL GJ 4 KIT				
Pos. no.	Part No.	Gamajet Part No.	Description	No.
62	9614659401	264130	626-GT THRUST BUSHING (REF	1 pcs.
43.1	9614659901	283230	628-ATC ID SHAFT LOW BUSG CARB	1 pcs.
56	9614660101	293130	629-ATC FS UPPER BUSH CARBON	1 pcs.
63	9614660301	303130	630-TC FS LOW BUSH CARBON	1 pcs.
23	9614660401	311150	631-S TEE-HSG BEARING PPS	2 pcs.
4	9614660801	331150	633-S NZL HSG BEARING PPS	2 pcs.
24	9614661101	351230	635-TG TEE-HOUSING SEAL	2 pcs.
5	9614661201	361230	636-TG NOZZLE HOUSING SEAL	2 pcs.
13	9614661304	373170	637-B CLUTCH O-RING VITON	1 pcs.
53	9614661602	401160	640-V FIN SHFT RET O-RING	1 pcs.
21	9614661702	411160	641-V GRBOX SCR O-RING	3 pcs.
49	9614665501	633130	623-3TC IDLER BUSH CARBON 080	2 pcs.
46	9614665601	633140	623-4TC IDLER BUSH CARBON 086	3 pcs.
32	9614662002	422160	642-3 GEARBOX STEM O-RING	1 pcs.
31	9614662102	431160	643-V/VIII O-RING VITON	1 pcs.
64	9614662502	441160	644-V GRBOX COVER O-RING	1 pcs.

Article no: 9614667801 1GTOIL ALFA LAVAL GJ 4 KIT				
Pos. no.	Part No.	Gamajet Part No.	Description	No.
62	9614659401	264130	626-GT THRUST BUSHING (REF	1 pcs.
43.1	9614659901	283230	628-ATC ID SHAFT LOW BUSG CARB	1 pcs.
56	9614660101	293130	629-ATC FS UPPER BUSH CARBON	1 pcs.
63	9614660301	303130	630-TC FS LOW BUSH CARBON	1 pcs.
23	9614660401	311150	631-S TEE-HSG BEARING PPS	2 pcs.
4	9614660801	331150	633-S NZL HSG BEARING PPS	2 pcs.
24	9614661101	351230	635-TG TEE-HOUSING SEAL	2 pcs.
5	9614661201	361230	636-TG NOZZLE HOUSING SEAL	2 pcs.
13	9614661304	373170	637-B CLUTCH O-RING VITON	1 pcs.
38	9614661502	391160	639-V HSG O-RING VITON	2 pcs.
53	9614661602	401160	640-V FIN SHFT RET O-RING	1 pcs.
21	9614661702	411160	641-V GRBOX SCR O-RING	3 pcs.
37	9614661801	412130	641-TG ROTOR SHAFT SEAL	2 pcs.
32	9614662002	422160	642-3 GEARBOX STEM O-RING	1 pcs.
31	9614662102	431160	643-V/VIII O-RING VITON	1 pcs.
55	9614662401	432230	643-ATG FINAL SHAFT SEAL	1 pcs.

8. Parts List and Service Kits

8.8 Major Service Kit

Article no: 9614667701 1GTFTMAJ ALFA LAVAL GJ 4 MAJOR KIT				
Pos. no.	Part No.	Gamajet Part No.	Description	No.
62	9614659401	264130	626-GT THRUST BUSHING	1 pcs.
43.1	9614659901	283230	628-ATC ID SHAFT LOW BUSG CARB	1 pcs.
56	9614660101	293130	629-ATC FS UPPER BUSH CARBON	1 pcs.
63	9614660301	303130	630-TC FS LOW BUSH CARBON	1 pcs.
23	9614660401	311150	631-S TEE-HSG BEARING PPS	2 pcs.
4	9614660801	331150	633-S NZL HSG BEARING PPS	2 pcs.
24	9614661101	351230	635-TG TEE-HOUSING SEAL	2 pcs.
5	9614661201	361230	636-TG NOZZLE HOUSING SEAL	2 pcs.
13	9614661304	373170	637-B CLUTCH O-RING VITON	1 pcs.
53	9614661602	401160	640-V FIN SHFT RET O-RING	1 pcs.
21	9614661702	411160	641-V GRBOX SCR O-RING	3 pcs.
32	9614662002	422160	642-3 GEARBOX STEM O-RING	1 pcs.
31	9614662102	431160	643-V/VIII O-RING VITON	1 pcs.
64	9614662502	441160	644-V GRBOX COVER O-RING	1 pcs.
61	9614656703	144120	614-GT RTR SHFT PINION ASY GT	1 pcs.
44	9614656802	151140	615-GT THREADED IDLER SHAFT	1 pcs.
57	9614656901	161120	616 FINAL SHAFT WITH PINION	1 pcs.
58	9614659102	241140	624-GT FINAL SHAFT DRIVE GEAR	1 pcs.
25	9614660701	321220	632-A TEE-HSG BEARING CUP	2 pcs.
6	9614661001	341220	634-A NZL HSG BEARING CUP	2 pcs.
42.1	9614657501	222120	622-B RTR SHFT ASSY W/20 DEG	1 pcs.
59.1	9614657801	231240	623-GTS IDLER GEAR CARBON	1 pcs.
59.2	9614658301	233240	623-GTB IDLER GEAR CARBON	1 pcs.
45.2	9614658501	234240	623-GTC IDLER GEAR CARBON	1 pcs.
60	9614658801	235140	623-GTT TRANSITION GEAR CARBO	1 pcs.
48	9614659001	236140	623-GTN NITRONIC 25 PA CARBON	1 pcs.

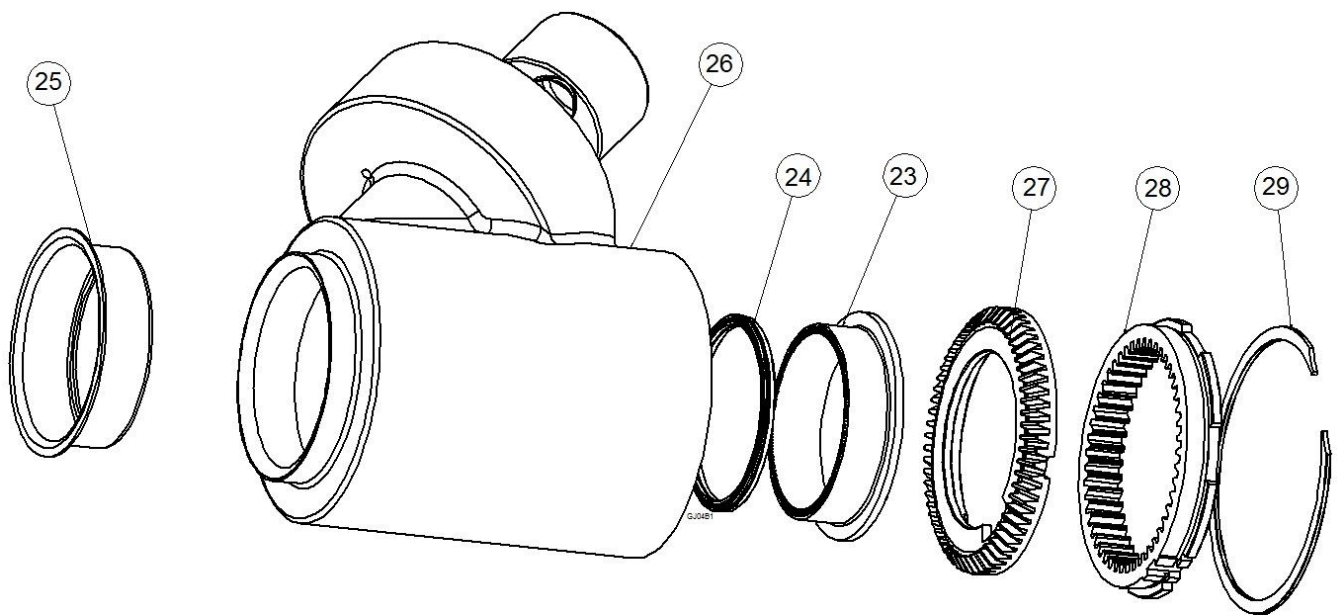
8. Parts List and Service Kits

Article no: 9614667901 1GTOILMAJ ALFA LAVAL GJ 4 MAJOR KIT				
Pos. no.	Part No.	Gamajet Part No.	Description	No.
62	9614659401	264130	626-GT THRUST BUSHING	1 pcs.
43.1	9614659901	283230	628-ATC ID SHAFT LOW BUSG CARB	1 pcs.
56	9614660101	293130	629-ATC FS UPPER BUSH CARBON	1 pcs.
63	9614660301	303130	630-TC FS LOW BUSH CARBON	1 pcs.
23	9614660401	311150	631-S TEE-HSG BEARING PPS	2 pcs.
4	9614660801	331150	633-S NZL HSG BEARING PPS	2 pcs.
24	9614661101	351230	635-TG TEE-HOUSING SEAL	2 pcs.
5	9614661201	361230	636-TG NOZZLE HOUSING SEAL	2 pcs.
13	9614661304	373170	637-B CLUTCH O-RING VITON	1 pcs.
38	9614661502	391160	639-V HSG O-RING VITON	2 pcs.
53	9614661602	401160	640-V FIN SHFT RET O-RING	1 pcs.
21	9614661702	411160	641-V GRBOX SCR O-RING	3 pcs.
37	9614661801	412130	641-TG ROTOR SHAFT SEAL	2 pcs.
32	9614662002	422160	642-3 GEARBOX STEM O-RING	1 pcs.
31	9614662102	431160	643-V/VIII O-RING VITON	1 pcs.
55	9614662401	432230	643-ATG FINAL SHAFT SEAL	1 pcs.
64	9614662502	441160	644-V GRBOX COVER O-RING	1 pcs.
68	9614664801	603120	660-TG ROTOR SHAFT UPPER SEAL	1 pcs.
61	9614656703	144120	614-GT RTR SHFT PINION ASY GT	1 pcs.
44	9614656802	151140	615-GT THREADED IDLER SHAFT	1 pcs.
57	9614656901	161120	616 FINAL SHAFT WITH PINION	1 pcs.
58	9614659102	241140	624-GT FINAL SHAFT DRIVE GEAR	1 pcs.
25	9614660701	321220	632-A TEE-HSG BEARING CUP	2 pcs.
6	9614661001	341220	634-A NZL HSG BEARING CUP	2 pcs.
42.1	9614657501	222120	622-B RTR SHFT ASSY W/20 DEG	1 pcs.
59.1	9614657801	231240	623-GTS IDLER GEAR CARBON	1 pcs.
59.2	9614658301	233240	623-GTB IDLER GEAR CARBON	1 pcs.
45.2	9614658601	234240	623-GTC IDLER GEAR CARBON	1 pcs.
60	9614658801	235140	623-GTT TRANSITION GEAR CARBO	1 pcs.
48	9614659001	236140	623-GTN NITRONIC 25 PA CARBON	1 pcs.

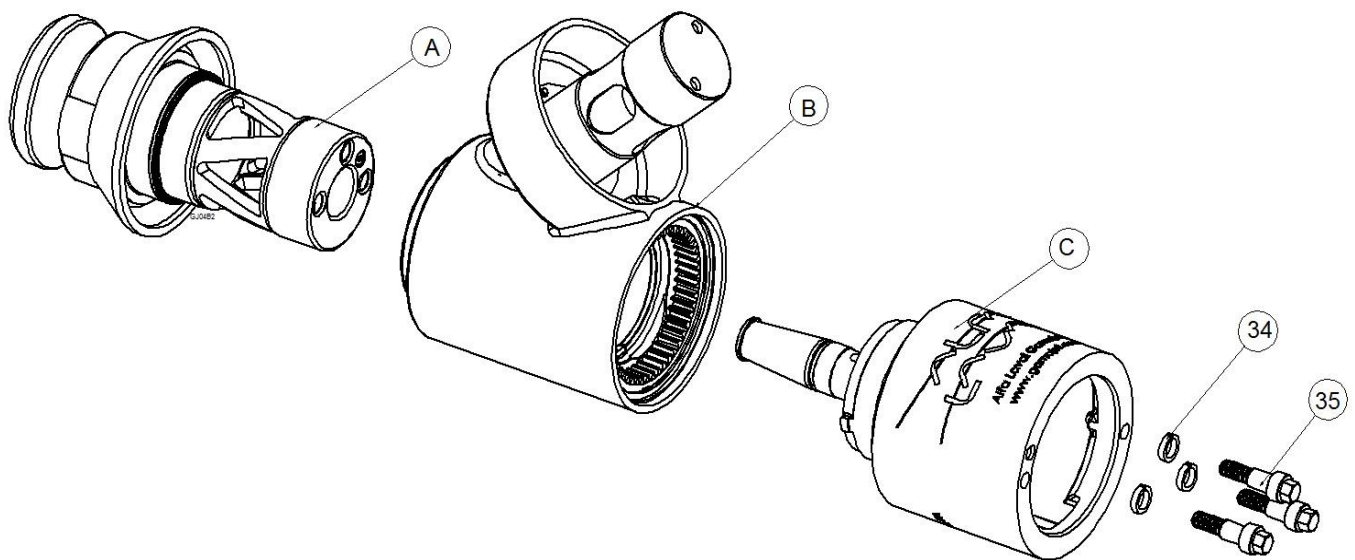
9. Appendix A

The drawing shows Alfa Laval GJ 4 180° Directional Tank Cleaning Machine

Appendix A



Drawing A1: Alfa Laval GJ 4 180° Directional Tee Housing Assembly



Drawing A2: Alfa Laval GJ 4 180° Directional Body Assembly

A : Drawing 1

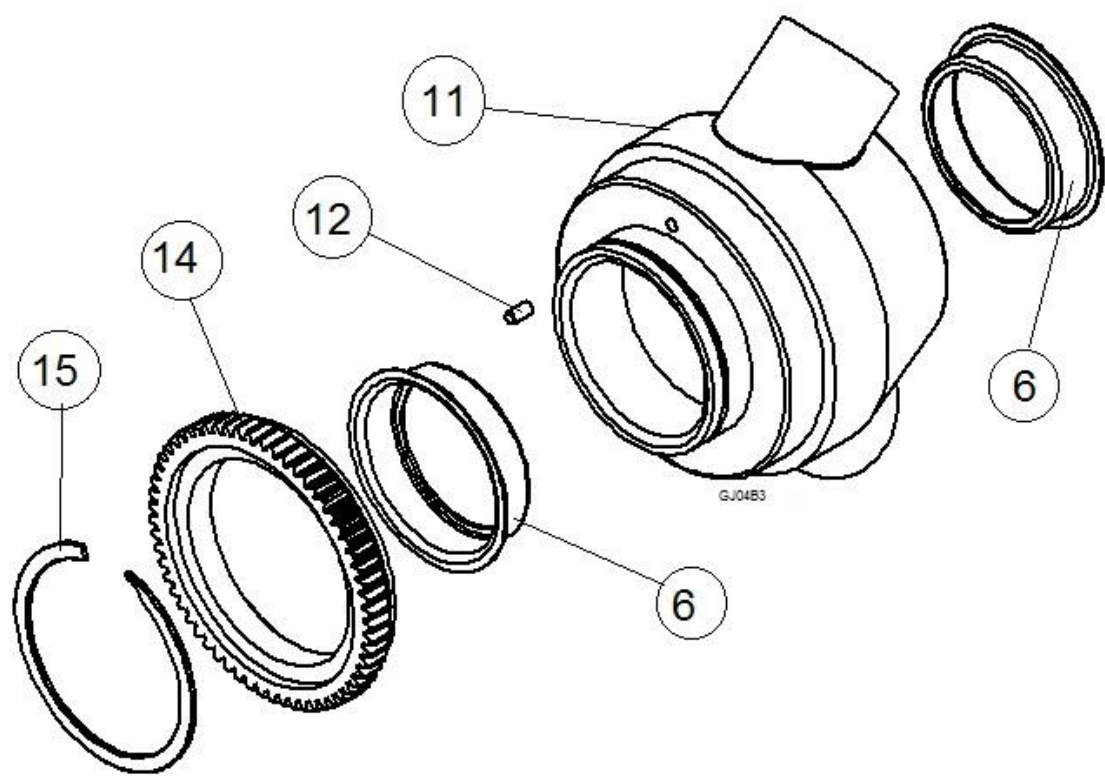
B : Drawing A1

C : Drawing 3

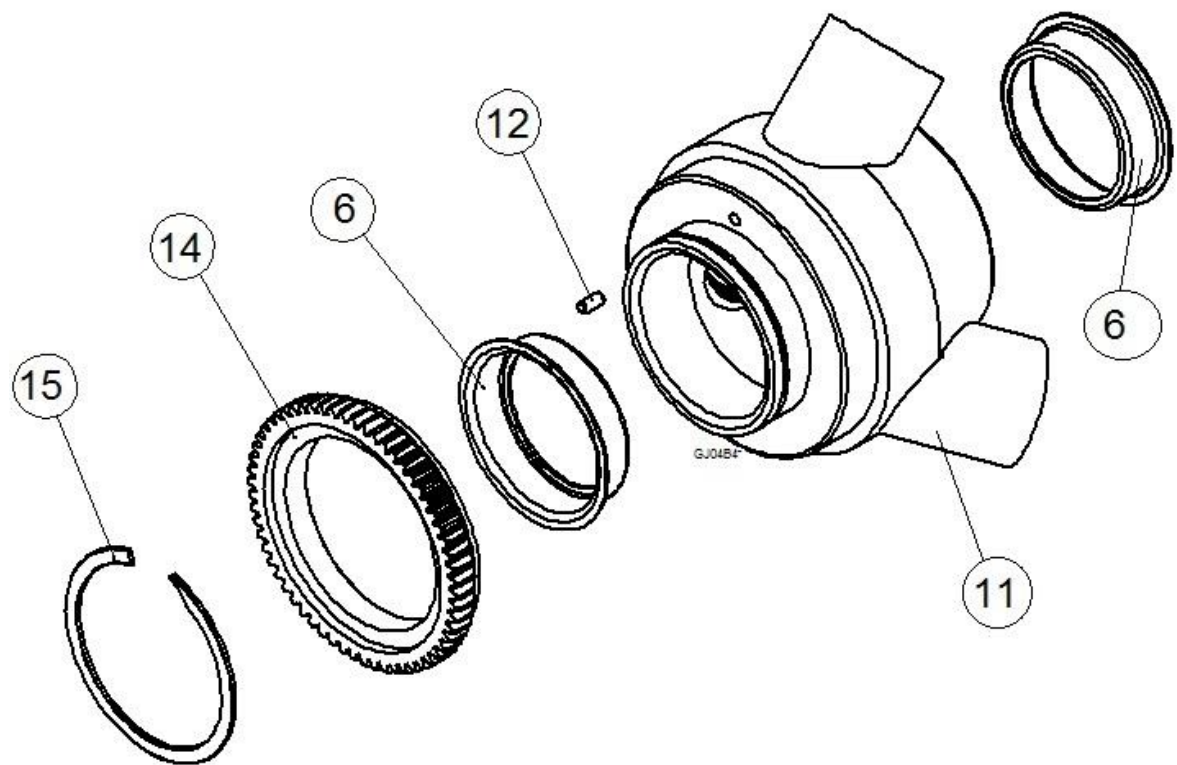
9. Appendix A

The drawing shows Alfa Laval GJ 4 180° Directional Tank Cleaning Machine

Appendix A



Drawing A3: Alfa Laval GJ 4 180° Directional Dual Nozzle Housing Assembly

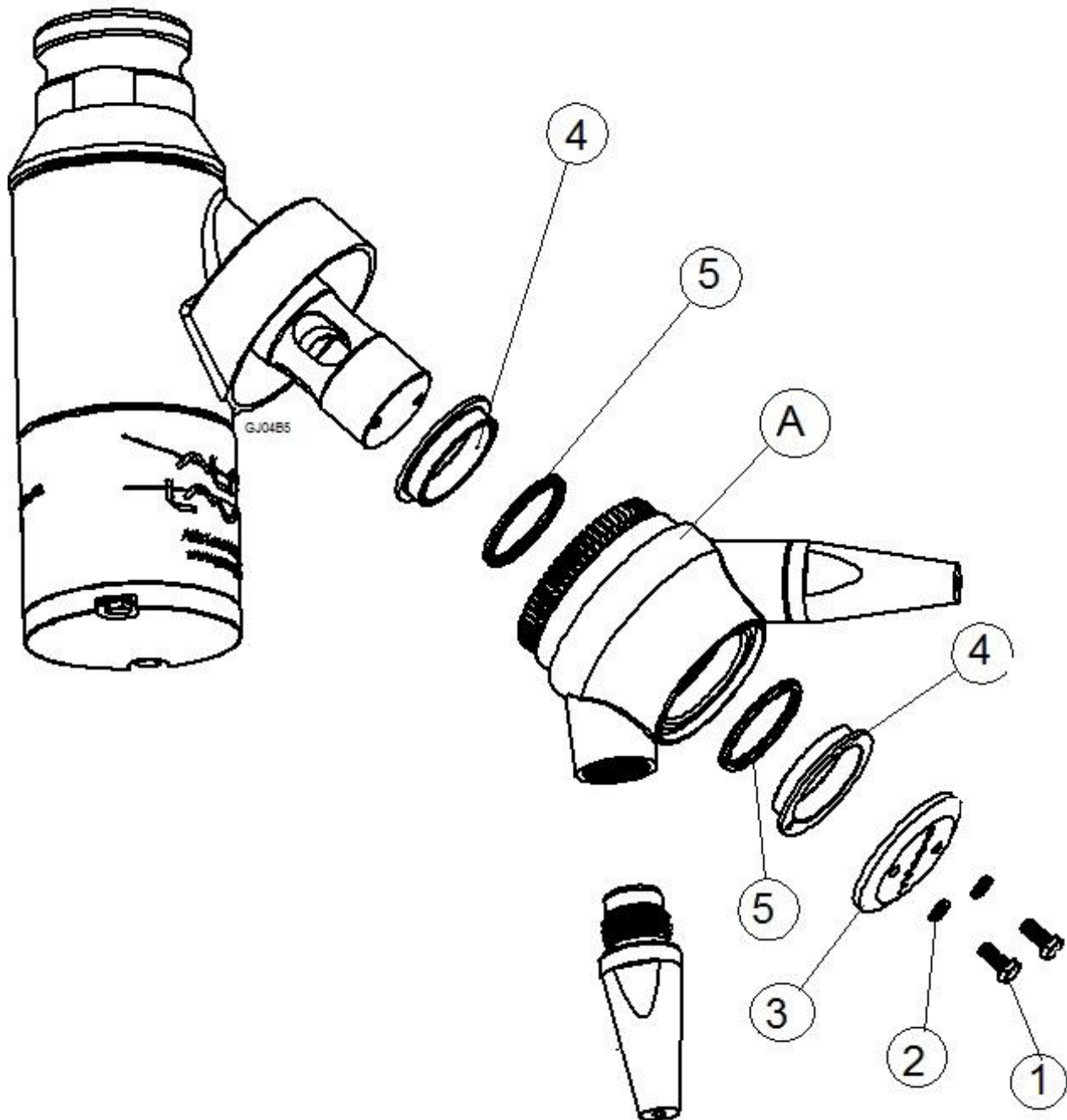


Drawing A4: Alfa Laval GJ 4 180° Directional Triple Nozzle Housing Assembly

9. Appendix A

The drawing shows Alfa Laval GJ 4 180° Directional Tank Cleaning Machine

Appendix A



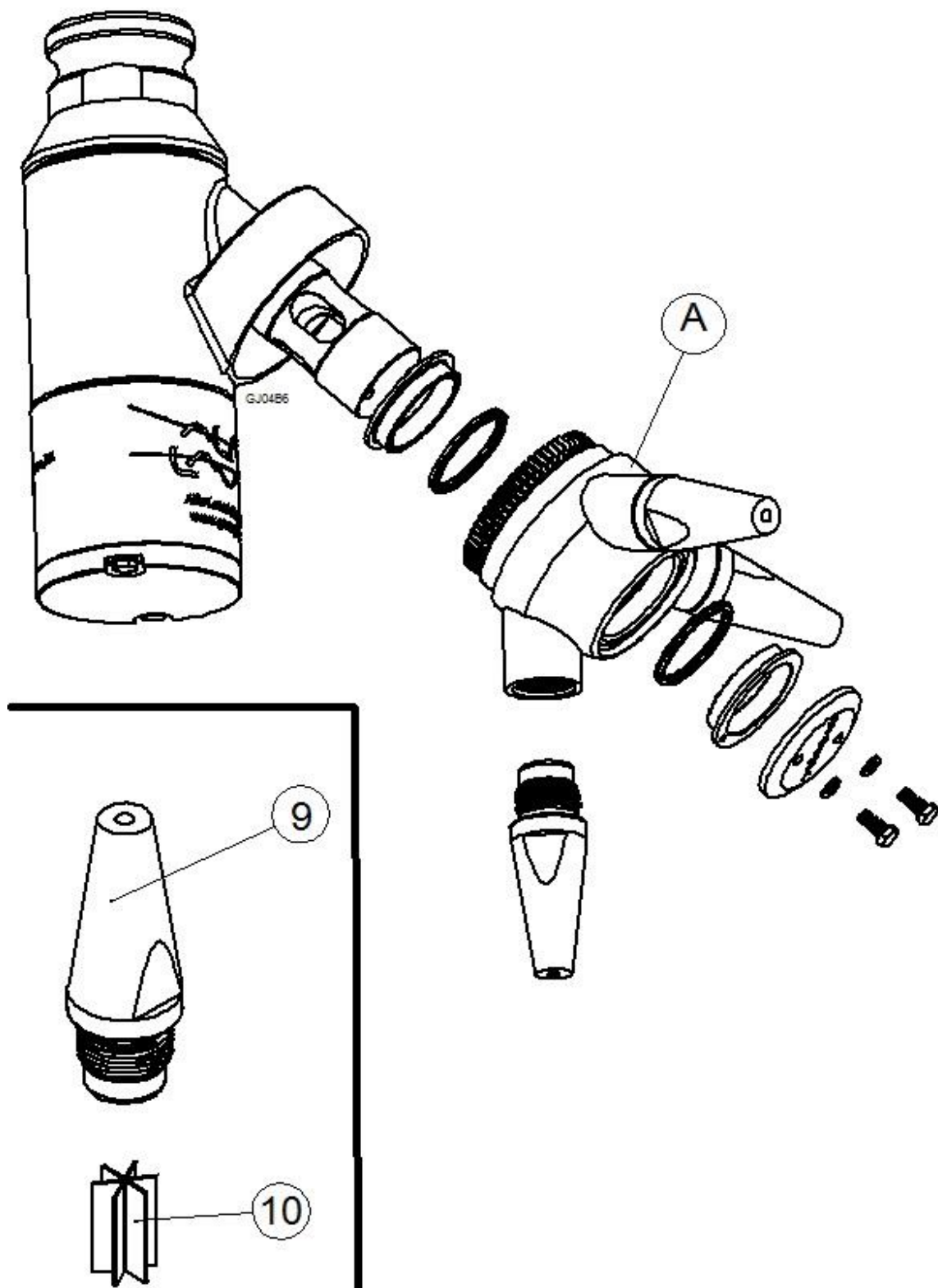
Drawing A5: Alfa Laval GJ 4 180° Directional Dual Nozzle Housing Assembly

A : Drawing A3

9. Appendix A

The drawing shows Alfa Laval GJ 4 **180°** Directional Tank Cleaning Machine

Appendix A



Drawing A6: Alfa Laval GJ 4 180° Directional Triple Nozzle Housing Assembly

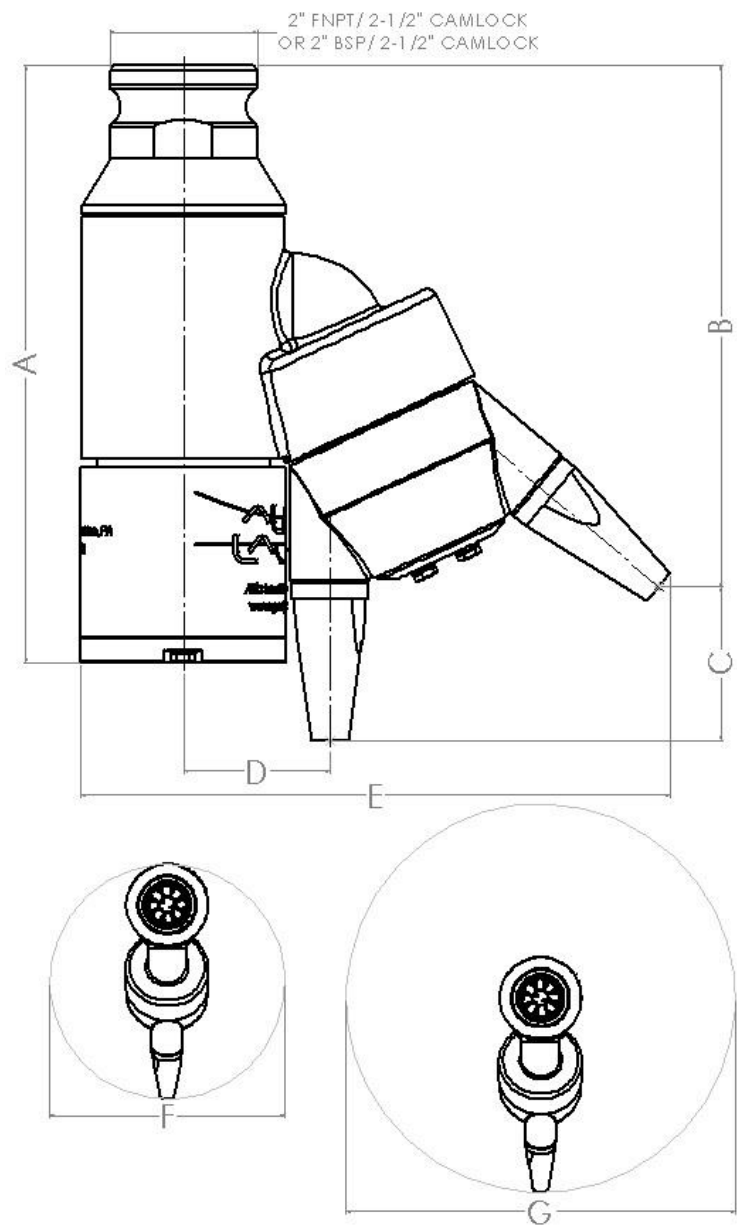
A : Drawing A4

10. Appendix B

The drawing shows Alfa Laval GJ 4 105° Directional Tank Cleaning Machine

Appendix B

Dimensions 105° directional version



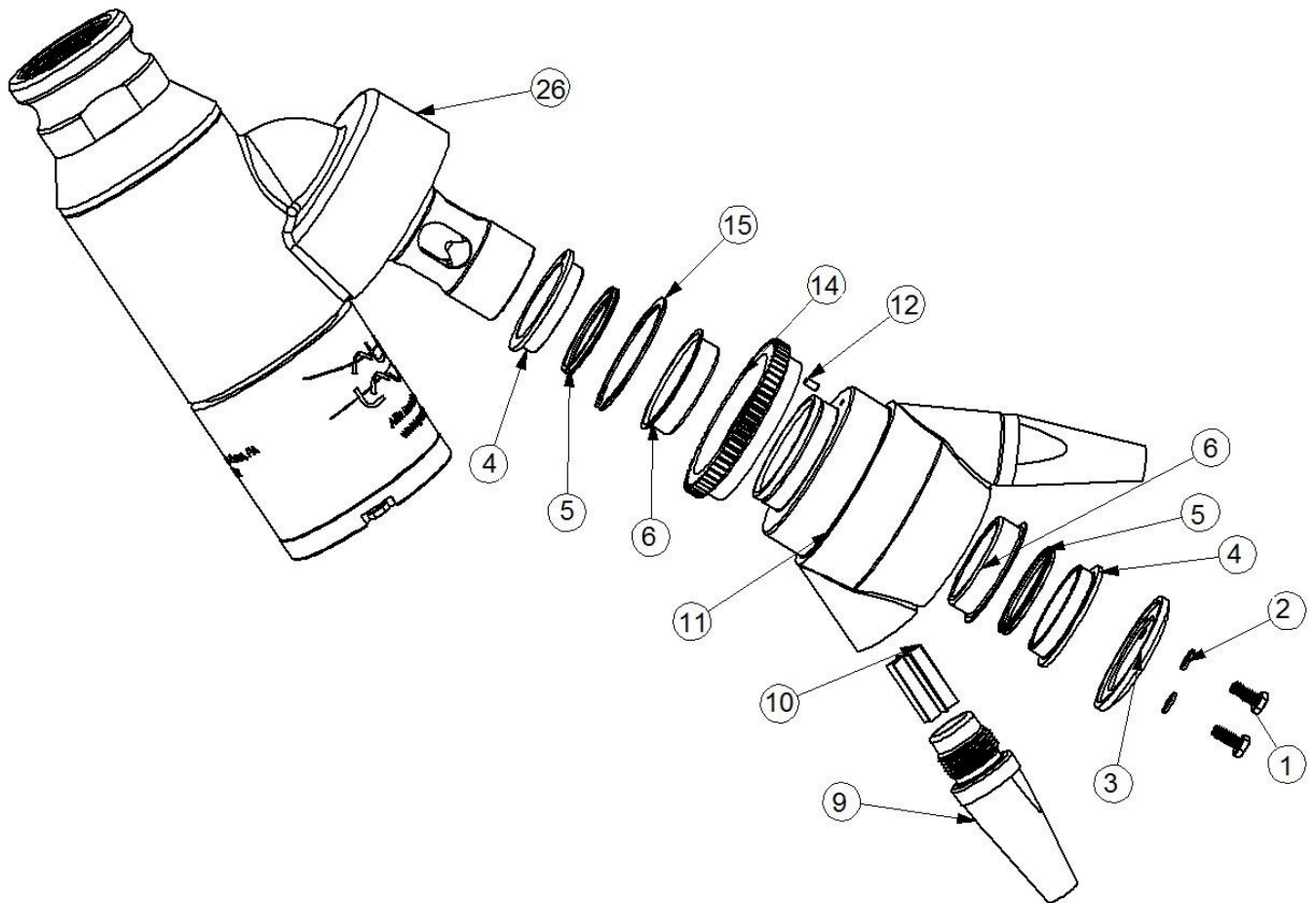
Dimensions 105° directional version

	A	B	C	D	E	F	G
mm	308	269	79	75	303	303	501
in	12.3	10.6	3.1	3	12	12	19.7

10. Appendix B

The drawing shows Alfa Laval GJ 4 105° Directional Tank Cleaning Machine

Appendix B



Drawing B1: Alfa Laval GJ 4 105° Directional Dual Nozzle Housing Assembly

How to contact Alfa Laval Tank Equipment

For further information please feel free to contact:

Alfa Laval Tank Equipment

604 Jeffers Circle, Exton, PA 19341 USA

Tel switchboard: +01 610 408 9940 - Fax switchboard: +01 610 408 9945

<http://www.gamajet.com>, www.alfalaval.com, customerservice.exton@alfalaval.com

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

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