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## Instruction Manual

### Toftejorg™ TZ-74 Brew Kettle

- Covering**
- **Standard Machines**
  - **Machines delivered with ATEX Certification in accordance with Directive 94/9/EC**

IM-TE91A160-EN6

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## Introduction

This manual has been prepared as a guide for the persons who will be operating and maintaining your tank cleaning machine. The key to long life for your tank cleaning machine will always be a system of carefully planned maintenance; you will appreciate that a tank cleaning machine which has a rough and dirty job to do will need more frequent attention than one working in ideal conditions.

It is in your own interest to get the best and most economical performance from your tank cleaning machine. Neglect of maintenance means poor performance, unscheduled stoppages, shorter life and expense. Good maintenance means good performance; no unscheduled stoppages and better total economy.

You will find the information contained in this manual simple to follow, but should you require further assistance, our Customer Service Department and world-wide net of Distributors will be pleased to help you. Please quote the type and serial number with all your enquiries; this will help us to help you. The type and serial number are placed on the gear house of the tank cleaning machine.

**Note:** The illustrations and specifications contained in this manual were effective at the date of printing. However, as continuous improvements are our policy, we reserve the right to alter or modify any unit specification on any product without prior notice or any obligation.

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## 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 compatibility with product, flushing media, cleaning media, temperatures and pressure under the intended use.

## Patents and trademarks

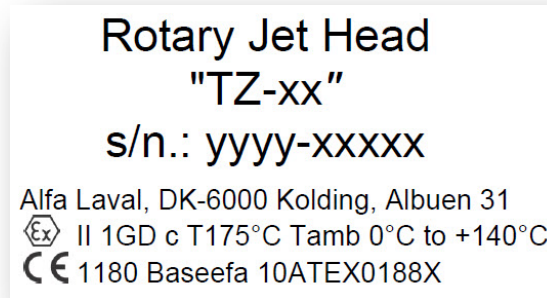
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## If ordered with ATEX certificate: ATEX Marking

The Toftejorg TZ-74 Brew Kettle is certified as category I components. The certification is carried out by the certified body Baseefa, who has issued the certificate no. 10ATEX0188X. The marking on the ATEX certified Gunclean Toftejorg TZ-82 is as follows:



*"TZ-xx": TZ machine type*

### Serial number explanation

Machines supplied with or without normal documentation:

- yyyy-xxxxx: serial number
- yyyy: year
- xxxxx: 5 digit sequential number

Changes to the machine are not allowed without approval by the person responsible for the ATEX certification at Alfa Laval Tank Equipment A/S. If changes are made – or spare parts other than Alfa Laval original spare parts are used - the EC Type Examination certification (the ATEX Directive) is no longer valid.

**Important  
ATEX  
information:**



Also see page 16 regarding special conditions for repair of ATEX certified machines.

## General Description

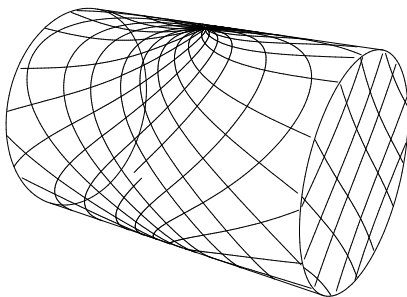
The Toftejorg TZ-74 Brew Kettle version is a special version of the Toftejorg TZ-74 machine. It is especially designed for rough working conditions in amongst others Brew Kettles where fibres, particles etc. may be recirculated in the cleaning media through the machine.

The Toftejorg TZ-74 Brew Kettle is a media driven and media lubricated tank cleaning machine. As it is self lubricating, there is no lubricating substances such as oil grease etc. in the machine which needs to be regularly changed.

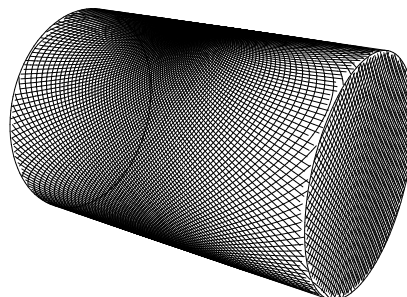
## Functioning

The flow of the cleaning fluid passes through a guide and a turbine, which accordingly is set into rotation. The turbine rotation is through a gearbox transformed into a combined horizontal rotation of the machine body and a vertical rotation of the nozzles.

The combined motion of the machine body and the nozzles ensures a fully indexed tank cleaning coverage. After  $5 \frac{5}{8}$  revolutions of the Hub with nozzles ( $5 \frac{3}{8}$  revolutions of the machine body) one coarse cleaning pattern is laid out on the tank surface. During the following rounds, this pattern is repeated 7 times, each of which is displaced  $\frac{1}{8}$  of the mesh in the pattern. After a total of 45 revolutions of Hub with nozzles (43 revolutions of the machine body), a complete cleaning pattern has been laid out, and the first pattern is repeated.



First cycle



Full pattern

The speed of rotation of the turbine depends on the flow rate through the machine. The higher the flow rate the higher the speed of rotation will be. In order to control the RPM of the machine for a wide range of flow rates, the efficiency of the turbine can be changed (100% and 0% Turbine/Inlet guide).

Apart from the jet flow through the nozzles, fluid is leaking through the top of the machine, at the hub and through the bottom cover. The leakage between the moving parts at the top and at the hub are cleaning the gabs and thus preventing build-up of material that might cause the friction. The flow through the bottom cover is due to the fact that the machine is media lubricated and that accordingly a flow through the gearbox is needed.



## General Description (continued)

### Standard Configurations

Connection	Turbine / Inlet Guide	Nozzles (mm) (½" thread conn.)	Article no.	
			Standard machines	ATEX certified machines
<u>Top Cone:</u>  1½"NPT, Female	100%	4 x ø6	TE21D108-11	TE21D108-71
		4 x ø7	TE21D110-11	TE21D110-71
		4 x ø8	TE21D112-11	TE21D112-71
	0%	4 x ø8	TE21D130-11	TE21D130-71
<u>Top Cone:</u>  1½" BSP, Female	100%	4 x ø6	TE21D208-11	TE21D208-71
		4 x ø7	TE21D210-11	TE21D210-71
		4 x ø8	TE21D212-11	TE21D212-71
	0%	4 x ø8	TE21D230-11	TE21D230-71
<u>Top Cone:</u>  2" NPT, Female	100%	4 x ø6	TE21D108-15	TE21D108-72
		4 x ø7	TE21D110-15	TE21D110-72
		4 x ø8	TE21D112-15	TE21D112-72
	0%	4 x ø8	TE21D130-15	TE21D130-72

The machine is equipped with a clutch in the hub, which gives the possibility of rotation by hand the nozzles, when the machine is to be lifted out through a tank opening.

### Available add-ons

- ATEX, category 1 for installation in zone 0/20  
TE21DXXX-71 or -72 ATEX

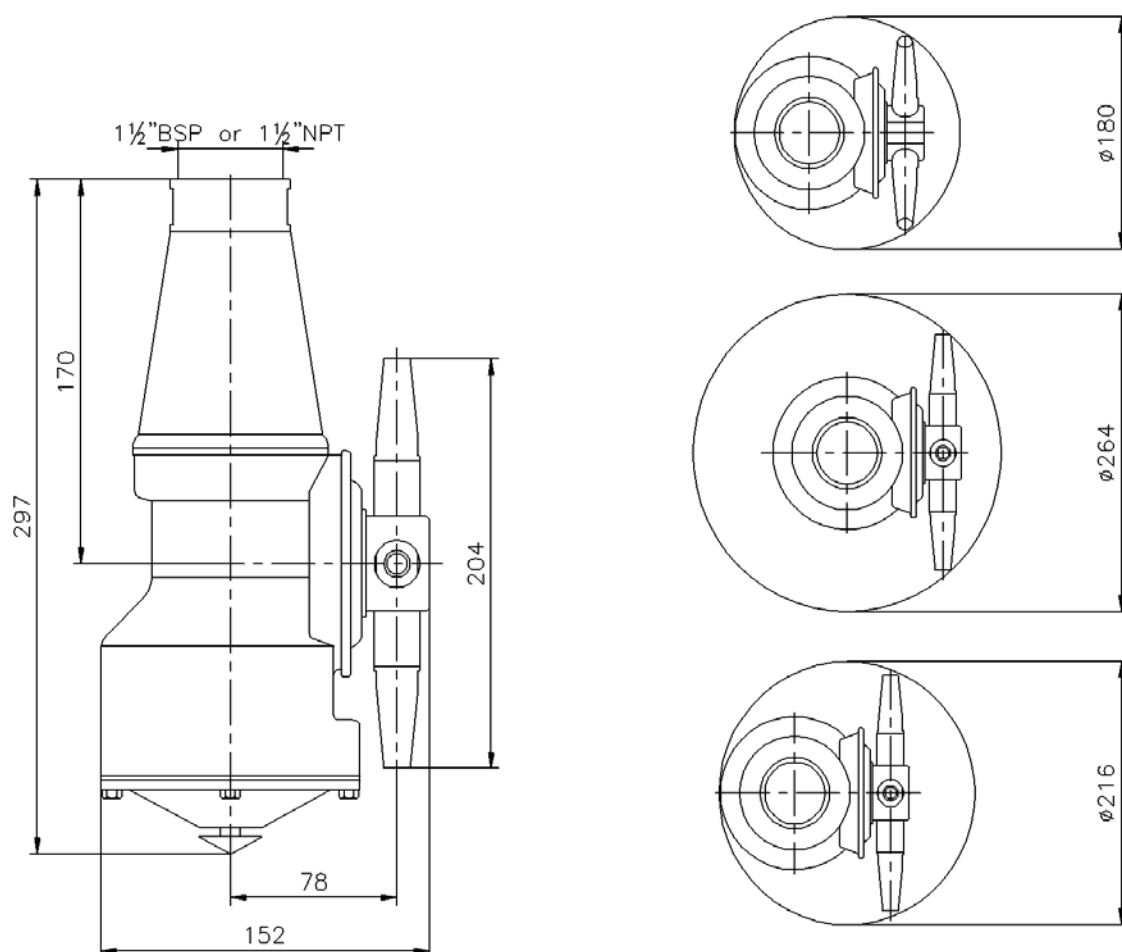
#### Explanation to Add-ons

*ATEX, category 1 for installation in zone 0/20 in accordance with Directive 94/9/EC*

## Technical Data

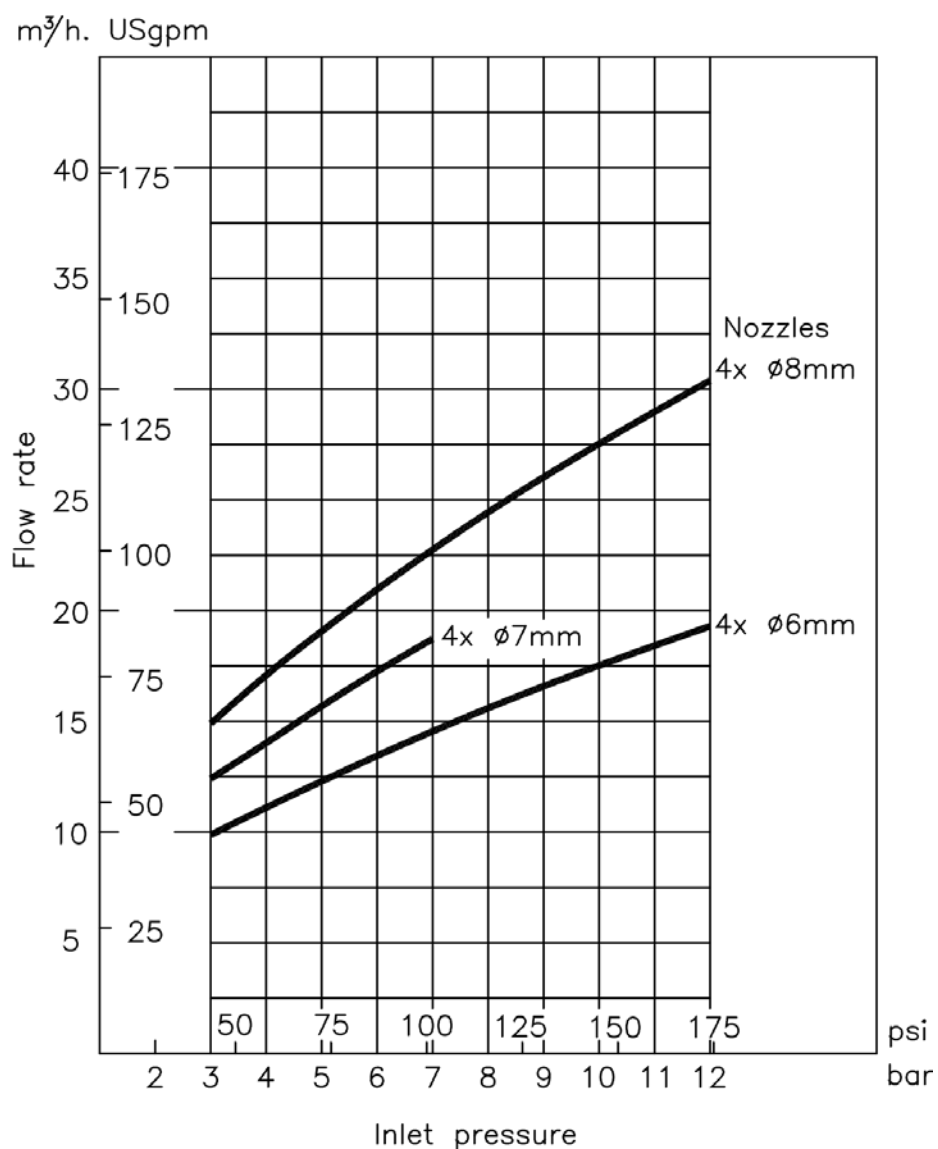
Weight of machine	:	6,1 kgs (13,6 lb)
Working pressure	:	3-12 bar (45-175 psi)
Recommended inlet pressure	:	3-8 bar (45-120 psi)
Working temperature max.	:	95° C (200 F)
Ambient temperature	:	0 – 140°C (95°C – 140°C when not operated)
Materials	:	Stainless steel AISI 316L, Tefzel200, Teflon TFM, PEEK, Viton

## Principal dimensions in mm



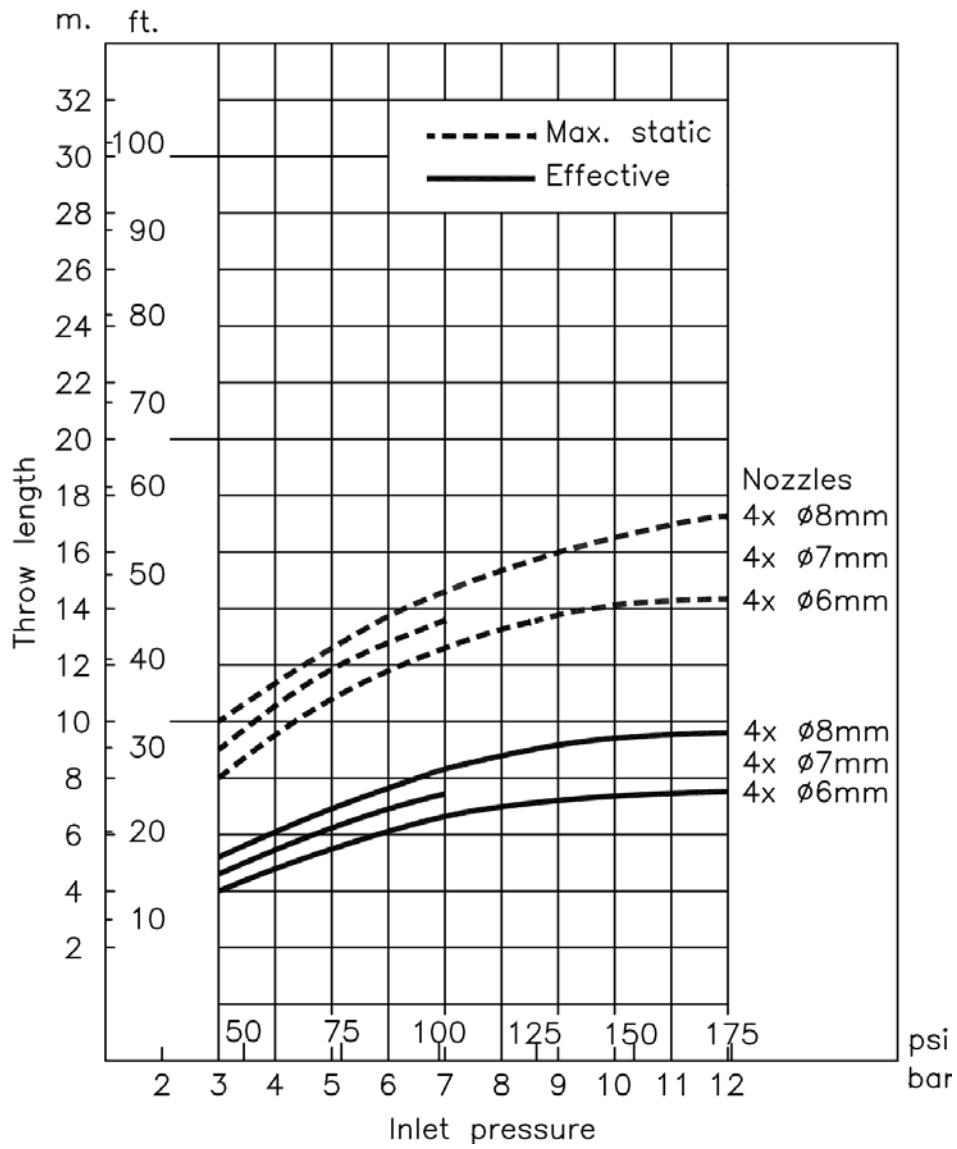
## Technical Data (continued)

### Flow rate



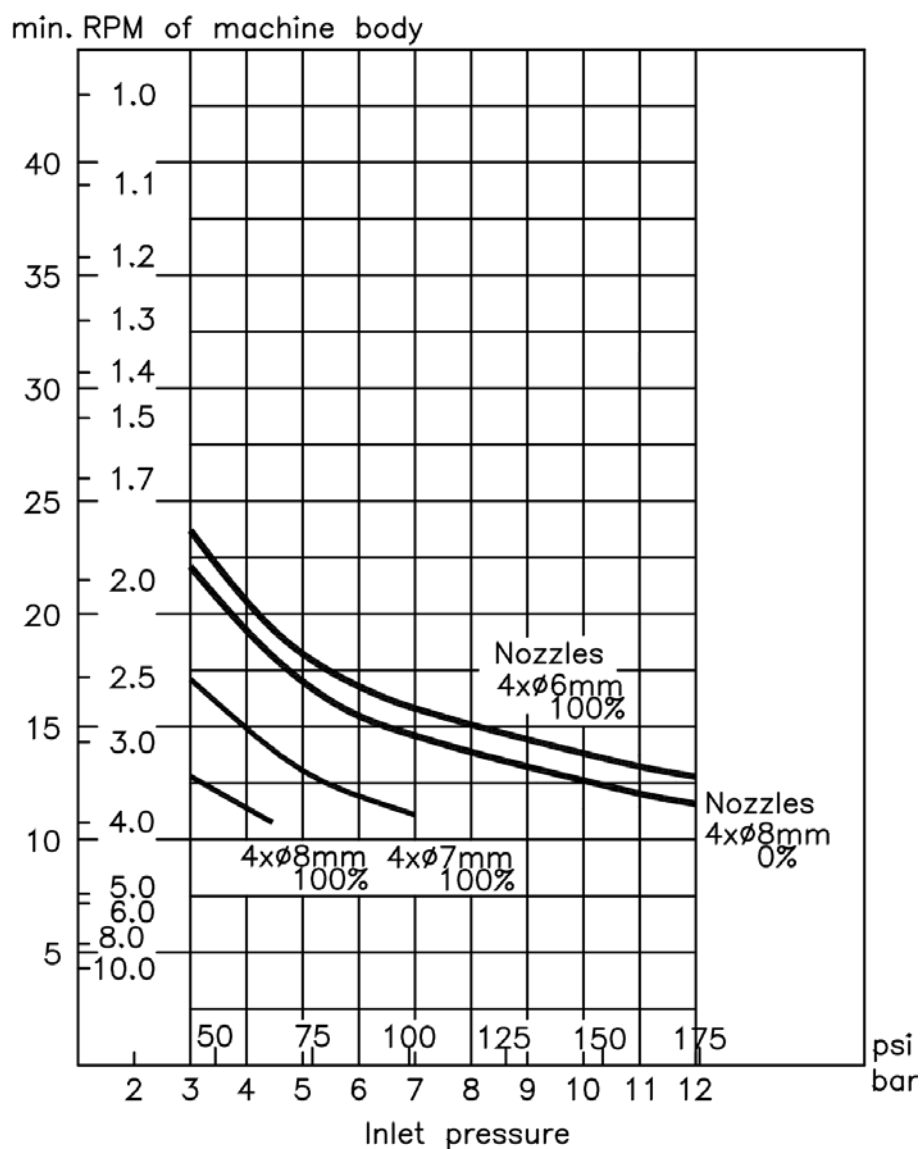
## Technical Data (continued)

### Throw length



## Technical Data (continued)

### Cleaning time, complete pattern



# Installation and Normal Operation

## General Safety and Installation Instructions

The tank cleaning machine should be installed in a vertical position (upright or upside down). It is recommended to install a filter in the supply line in order to avoid large particles to clog inside the machine. Before connecting the machine into the system, all supply lines and valves should be flushed to remove foreign matter. For devices with tapered thread connections to the down pipe, it is recommended that you secure the connection in a manner appropriate for the application. Subject to the intended use environment and any inhouse user requirements or policies, an adhesive such as Loctite No. 243 or equivalent could be used. Other methods could be acceptable and subject to customer preference.

**Note:** The machine shall be installed in accordance with national regulations for safety and other relevant regulations and standards.

Precautions shall be made to prevent starting of the cleaning operation, while personnel are inside the tank or otherwise can be hit by jets from the nozzles.

In EU-countries the complete system must fulfil the EU-Machine Directive and depending of application, the EU-Pressure Equipment Directive, the EU-ATEX Directive and other relevant Directives and shall be CE-marked before it is set into operation.

**ATEX  
Warning:**



If the machine is used in potential explosive atmospheres, tapes or joint sealing compounds which are electrical insulators must not be used on threads or joints, unless an electrical connection is otherwise established to ensure an effective earthing. In addition, connecting pipe work, must be electrically conductive and earthed to the tank structure. The resistance between the nozzles and the tank structure should not exceed 20,000 Ohm. This is essential to avoid the build-up of static electricity on the machine.

For further information see DS/CLC/TR 50404:2003 Safety of Machinery, guidance and recommendations for the avoidance of hazards due to static electricity.

The machine as delivered has been tested at the factory before shipping. For transportation reasons, the nozzles have been removed prior to shipment. In order to secure the nozzles against falling off due to vibrations and other external strains it is important that the nozzles are tightened properly after mounting. If not, the nozzles may be blown off during tank cleaning and cause severe damage on tank, valves and pump. This is especially important if machines are fixed installed in tanks and vessels within the transportation sector in trucks, railcars and onboard ships.

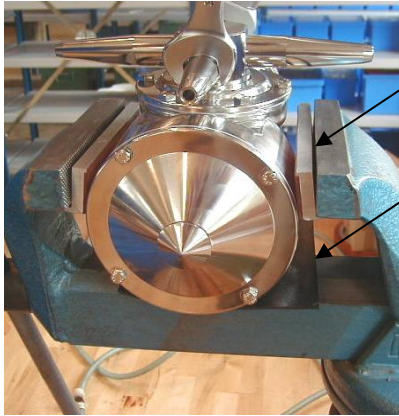
Normally, it is sufficient to tighten the nozzles with the specified torque. However, depending on the application and local policies an extra securing may be preferred.

Subject to the intended use, environment and any inhouse user requirements or policies, a liquid threadlocker such as Loctite No. 243 or equivalent could be used. Other methods could be acceptable and subject to customer preference. For detailed instruction on pre-cleaning and application of the product carefully follow the instruction on the used locking system.

## Installation and Normal Operation (continued)

Clamp machine firmly in a vice. Protect machine with rubber pad under the machine and use rubber jaws on the vice. Mount jaws upside down to ensure firm grip on the machine. Set torque wrench at the specified tightening torque.

Hold one nozzle with flat spanner to counteract while tightening the opposite nozzle with the torque wrench.



Rubber jaw mounted upside down

Protect with rubber pad



Recommended tightening torque: 40 Nm

Check that the machine is in operating condition by inserting 3/16" hex Screwdriver (tool No. TE134A) in screw in top of Turbine shaft and easily turn Turbine shaft clockwise. If any resistance is recognised, the machine should be disassembled to localise the cause.

### Normal operation

**Cleaning Media:** Use only cleaning media compatible with Stainless Steel AISI 316L, Tefzel200, Teflon TFM, PEEK and Viton. Please note that PEEK is not resistant to concentrated sulfuric acid. Please note that Viton is not resistant to a number of organic solvents as esters, ethers and ketones. Normal detergents, moderate solutions of mineral acids and alkalis are acceptable. Aggressive chemicals, excessive concentrations of chemicals at elevated temperatures as well as hydrochlorides should be avoided. If you are in doubt, contact your local Alfa Laval Tank Equipment sales office.

**After Use Cleaning:** After use flush the machine with fresh water. Cleaning solutions should never be allowed to dry or set-up in the system due to possible "salting out" or "scaling" of the cleaning ingredient. If cleaning media contains volatile chloride solvents, it is recommended not to flush with water after use, in case this can create hydrochloric acid.

## Installation and Normal Operation (continued)

### Normal operation

**Pressure:** Avoid hydraulic shocks. Put on pressure gradually. Do not exceed 12 bar inlet pressure. Recommended inlet pressure appears from Technical Data (page 8-9). High pressure in combination with high flow rate will increase consumption of wear parts.

**ATEX Warning:** If steam cleaning is done through the machine, the steam pressure must not cause the machine to rotate.



**ATEX Warning:** If the machine is drained using compressed air, then the compressed air pressure must not cause the machine to rotate.



**Temperature:** In accordance with the ATEX specifications regarding special conditions for safe use, see page 15.

**ATEX Warning:** Tanks with capacities greater than 100 m<sup>3</sup> that could contain a flammable atmosphere should not be steam cleaned, as steam issuing from a nozzle could contain charged droplets.



Tanks smaller than this may be steam cleaned providing that: the steam nozzles and other metal parts of the system are reliably earthed and grounded to the tank structure.

**ATEX Warning:** In potentially explosive atmospheres, the temperature must not exceed the maximum surface temperature according to the temperature class for the combustible gas or liquid.





## Installation and Normal Operation (continued)

### Special Conditions for Safe Use in accordance with the ATEX Certification, Directive 94/9/EC

**ATEX Warning:** The unit may be operated, in a hazardous area, only when filled with the process fluid.



**ATEX Warning:** The maximum permitted process fluid temperature and ambient temperature when the machine is operating is 95°C.



When the machine is **not** operating, the maximum permitted ambient temperature is 140°C.

**ATEX Warning:** The maximum permitted flush or cleaning fluid pressure difference across the machine is 12 bar.



**ATEX Warning:** The unit must not be operated in a vessel having an enclosed volume of greater than 100m<sup>3</sup>.



Tanks larger than 100 m<sup>3</sup>

To use Tank Cleaning Machines in tanks larger than 100m<sup>3</sup> is possible under certain conditions.

It is necessary to know the current factors such as tank size, cleaning solvent and product.

Additives can be used in the cleaning solvent, or, for example, the tank can be filled with nitrogen. The basic rules are described in the guide "CLC / TR 50404:2003".

Following a guidance document such as "CLC / TR 50404:2003" to establish safe use of machinery and process is the users own responsibility and is not covered by the ATEX certification for this product.

**ATEX Warning:** The user must address the electrostatic hazards generated from the process of the equipment in accordance with guidance document CLC/TR 50404:2003.





In addition to the above mentioned precautions relating to the ATEX guidelines Directive 94/9/EC of March 23 1994, the Safety Precautions on page 12 must be observed.

## Maintenance and repair

### Service and Repair of ATEX Approved Machines

In order to ensure compliance with the ATEX regulations for service and repair in accordance with EN 60079-19, all service and repair of ATEX approved machines should be performed by Alfa Laval Tank Equipment, Kolding, Denmark.

<b>ATEX Warning:</b>	ATEX requirements regarding repair of ATEX approved machines according to EN 60079-19.
	<p>A tag with the following labelling information must be attached to the machine:</p> <ul style="list-style-type: none"><li>- Repair symbol </li><li>- Alfa Laval logo and address</li><li>- Repair number</li><li>- Date of repair</li><li>- Machine serial number</li></ul> <p>The tag must be laminated and attached to the machine-downpipe outside the tank using a cable tie.</p>

If a customer wishes to carry out service or repair himself, it is the responsibility of the repair shop to ensure that the ATEX requirements are met in any way possible. After performing service or repair, the repair shop thus carries the full responsibility for the ATEX approval of the machine.

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## Maintenance and Repair (continued)

### Preventive Maintenance

In order to keep your tank cleaning machine servicing you as an efficient tool in your tank cleaning operations, it is essential to maintain its high performance by following a simple preventive maintenance programme, which will always keep your tank cleaning machine in good condition.

Good maintenance is careful and regular attention!

The following recommended preventive maintenance is based on tank cleaning machines working in average conditions. However, you will appreciate that a tank cleaning machine, which has a rough and dirty job to do, will need more frequent attention than one working in ideal conditions. We trust that you will adjust your maintenance programme to suit.

Always use only proper tools. Use standard tool kit. Never force, hammer or pry components together or apart. Always perform all assembly/disassembly steps in the order described in this manual.

Never assemble components without previous cleaning. This is especially important at all mating surfaces. Work in a clear well lighted work area.

**Note:** Recommended tightening torque for all screws: 4-5 Nm.

### Every 300 working hours

1. Disassemble machine as described on the following pages.
2. Clean material build-up and deposits from internal parts with Scotch-brite, S-Ultrafine, eventually chemical cleaner and fine abrasive cloth.
3. Check Slide bearings (pos. 28 on the cross sectional drawing, page 41) for wear. If hole is worn oval to max. diameter more than 10.4 mm, Slide bearings should be replaced. If endface of Slide bearing is worn more than x mm into Slide bearing, it should be replaced.

Under Turbine shaft : x = 1.5 mm

At Horizontal shaft : x = 0.5 mm

4. Check Collar bushes (pos. 10) in Gear frame. If holes are worn oval to max. diameter more than 10.4 mm, Collar bush should be replaced. How to replace Collar bushes, see page 30.

**Note:** Timely replacement of Slide bearings and Collar bushes will prevent costly damage to the gear box.

## **Maintenance and Repair** (continued)

### **Preventive Maintenance**

5. Check Worm wheels (pos. 11 and pos. 33). If extremely worn, they should be replaced.
6. Check Main bush (pos. 5). If worn it should be replaced.
7. Assemble machines as described in the following pages.
8. Check that the machine is in operating condition by inserting Hex Screwdriver (tool No. TE134A) in screw in top of Turbine shaft and easily turn Turbine shaft clockwise. If any resistance is recognised, the machine should be disassembled to localise the cause.

Apart from the parts specifically mentioned above, all the remaining wear parts should regularly be inspected for wear. Which parts that are wear parts appear from Reference List of Parts, page 40.

## **Maintenance and Repair** (continued)

### **Top Assembly**

#### **Disassembly**

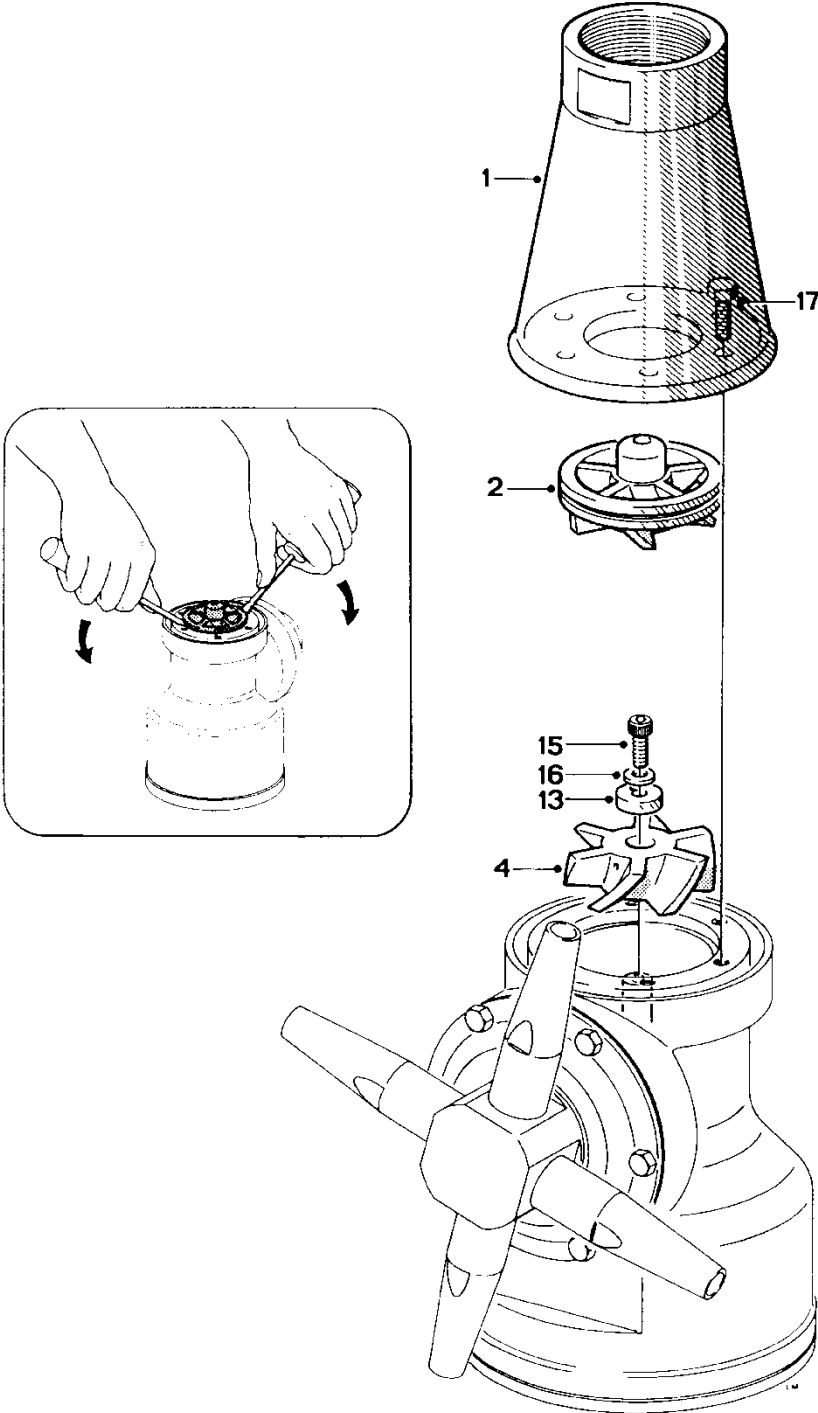
1. Remove Screws (pos. 17). Loosen and unscrew with a socket wrench (tool No. TE462A).
2. Lift off Top Cone (pos. 1).
3. Remove Guide /Guide ring (pos. 2). The Guide has a groove in the outer diameter. The Guide is easily lifted out of the Stem by means of two ordinary Screwdrivers inserted into the groove.
4. Remove Screw (pos. 15), Spring washer (pos. 16) and Washer (pos. 13). To secure Impeller against rotation, insert carefully Screwdriver (tool No. TE134A), through Impeller (pos. 4) into a hole in the Stem.
5. Pull off Impeller (pos. 4).

#### **Reassembly**

1. Reinstall Impeller (pos. 4). Make sure that Impeller is correctly rotated to be pushed onto Turbine shaft. Do not try to hammer Impeller in position, as this will destroy Slide bearing under Turbine shaft.
2. Mount Washer (pos. 13), Spring washer (pos. 16) and Screw (pos. 15) and tighten. To secure Impeller against rotation insert carefully Screwdriver (tool No. TE134A) through Impeller (pos. 4) into a hole in the Stem.
3. Reinstall Guide /Guide ring (pos. 2).
4. Mount Top Cone (pos. 1). Make sure that it is in correct position over Guide/Guide ring (pos. 2) Rotate Top cone to align holes in Top cone and Stem.
5. Mount and tighten Screws (pos. 17) with a socket wrench (tool No. TE462A).

# Maintenance and Repair (continued)

## Top Assembly



## Maintenance and Repair (continued)

### Bottom Assembly

#### Disassembly

1. Turn machine upside down.
2. Remove Screws (pos. 31) from Bottom cover (pos. 30).
3. Remove Bottom cover (pos. 30) and Gasket (pos. 32).
4. Remove Screws (pos. 15) in Bearing cover (pos. 14). Carefully push out Turbine shaft (pos. 6) from opposite end. Do not try to hammer out Turbine shaft, since this can destroy Slide bearing and O-ring.
5. Check O-ring (pos. 35) and replace if worn.
6. Remove Screws (pos. 15) and Spring Washers (pos. 16) along the circumference of Gear frame (pos. 29). Turn Gear frame about 1 cm ( $\frac{1}{2}$ " ). Draw out Gear Subassembly (holes in Gear frame are excellent for holding Gear Subassembly).

#### Reassembly

1. Reinsert Gear subassembly in bottom of machine body. Turn Gear Frame (pos. 29) to align holes in Gear frame and threads in body. Mount Spring washers (pos. 16) and Screws (pos. 15) along circumference of Gear frame (pos. 29). Tighten screw crosswise.

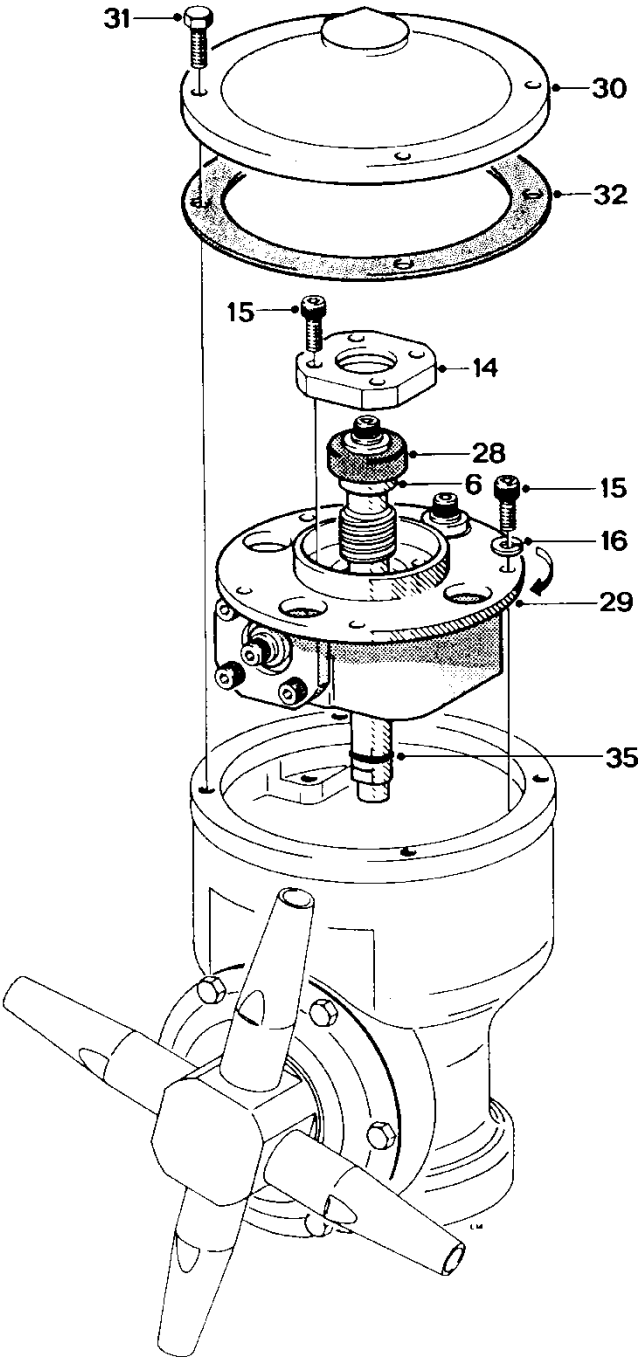
**Note:** To secure meshing between Gear wheel (pos. 7) and Pinion (pos. 9). It might be necessary to rotate slightly either the whole Gear Subassembly or the Gear wheel.

2. Reinsert Turbine shaft (pos. 6) with Slide bearing carefully through Gear wheel (pos. 7). Push carefully Slide bearing (pos. 28) into position. Mount Bearing cover (pos. 14) with Screws (pos. 15). Tighten crosswise.
3. Place Bottom gasket (pos. 32) and Bottom cover (pos. 30).
4. Mount Screws (pos. 31) and tighten crosswise.



**Maintenance and Repair** (continued)

**Bottom Assembly**



## **Maintenance and Repair** (continued)

### **Hub Assembly**

#### **Disassembly**

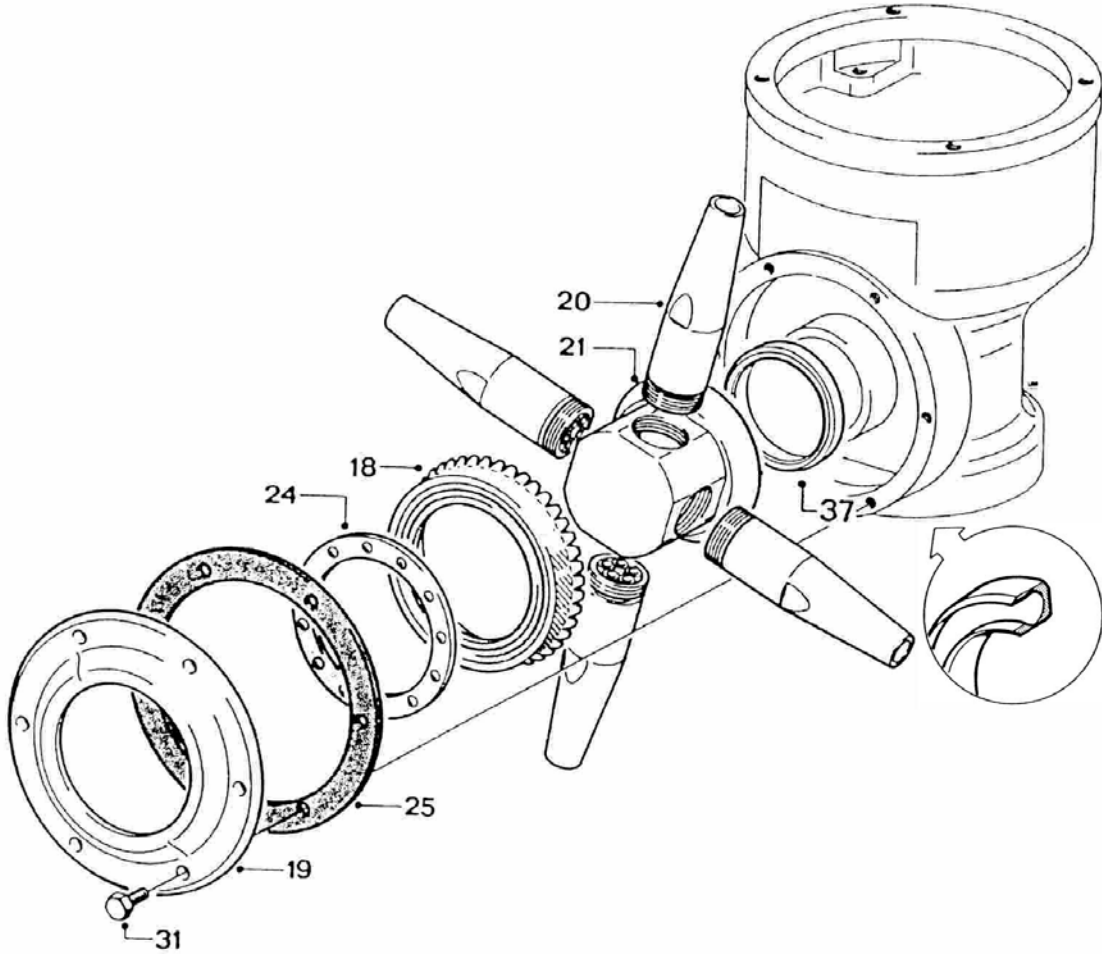
1. Remove Nozzles (pos. 20). Nozzles are untightened with a wrench on the faces of the Nozzles.
2. Remove Screws (pos. 31), Hub cover (pos. 19), and Gasket (pos. 25).
3. Draw out Hub (pos. 21) together with Ball retainer with balls (pos. 24) and Bevel gear (pos. 18).
4. Check Lip seal (pos. 37), if it is worn it should be replaced.
5. If Ball races (pos. 18.1 and 19.1) in Hub cover and in Bevel gear are extremely worn, they should be replaced as well as the Ball retainer with balls (pos. 24). How to replace Ball races see page 32).

#### **Reassembly**

1. Carefully replace Lip seal (pos. 37) in the Hub (pos. 21)
2. Slide on Hub (pos. 21). Reinsert Bevel gear with race (pos. 18) and Ball retainer with balls (pos. 24).
3. Mount Gasket (pos. 25) and Hub cover with race (pos. 19), and set with Screws (pos. 31).
4. Screw on Nozzles (pos. 20) and tighten with wrench.

**Maintenance and Repair** (continued)

**Hub Assembly**



## Maintenance and Repair (continued)

### Stem Assembly

#### Disassembly

1. Place machine in upside-down position.
2. Remove Screws (pos. 15) in Gear wheel (pos. 7). To prevent rotation of Stem (pos. 3) mount two screws in two holes opposite one another in BIG end of Stem. Place Stem in a vice held by the heads of the two screws.
3. Draw out Gear wheel with ball races (pos. 7) and Ball retainer with balls (pos. 24).
4. Push out Stem (pos. 3).
5. Check O-ring on Stem (pos. 36) and O-ring in Upper collar main (pos. 34), replace if worn.
6. If worn, press out Main bush (pos. 5).

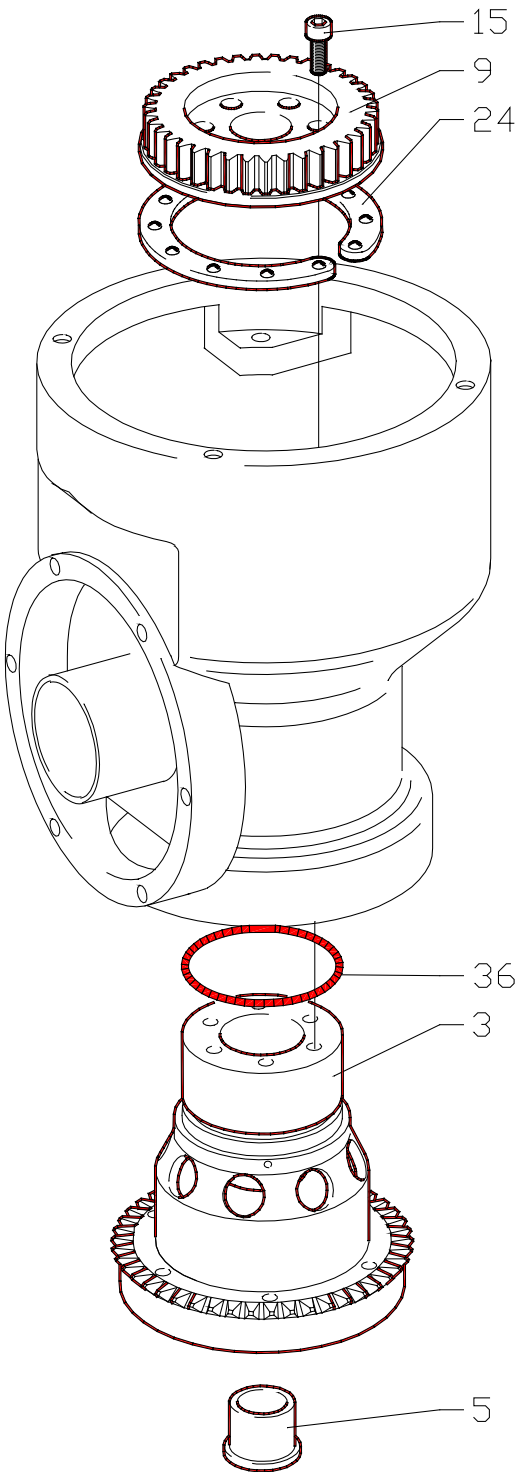
If Ball races in Body (pos. 26.3) and on Gearwheel (pos. 7.1) are extremely worn they should be replaced together with Ball retainer with balls (pos. 24). How to replace Ball races see page 32.

#### Reassembly

1. If replaced press Main bush (pos. 5) into Stem (pos. 3).
2. Push carefully Stem into Body. Turn machine upside-down.
3. Place Ball retainer with balls (pos. 24) and Gear wheel (pos. 7) into Body on Ball race. Rotate Gearwheel to check free rotation. Mount gearwheel with Screws (pos. 15) and tighten crosswise. To prevent rotation of Stem (pos. 3) mount two screws in two holes opposite one another in BIG end of Stem. Place Stem in a vice held by the heads of the two screws.

**Maintenance and Repair** (continued)

**Stem Assembly**



## Maintenance and Repair (continued)

### Gear Assembly

#### Disassembly

1. To make a backstop, remount Turbine shaft (pos. 6) with Slide bearing (pos. 28) and O-ring (pos. 35) into Gear frame (pos. 29). Mount Bearing cover (pos. 14) with Screws (pos. 15).
2. Hold Turbine shaft (pos. 6) against 1<sup>st</sup> stage Worm wheel (pos. 33) with one hand and loosen Screws (pos. 15) in Pinion (pos. 9) and Horizontal shaft (pos. 27) with the other hand.
3. Remove Screws (pos. 15) in Bearing cover (pos. 14) and take out Turbine shaft (pos. 6).
4. Draw out Horizontal shaft (pos. 27) and 1<sup>st</sup> stage Worm wheel (pos. 33) after removal of Screw (pos. 15), Spring washer (pos. 16) and Washer (pos. 13).
5. Draw out Pinion (pos. 9) and 2<sup>nd</sup> stage Worm wheel (pos 11), also freeing Journal (pos. 12) after removal of Screw (pos. 15), Spring washer (pos. 16) and Washer (pos. 13).
6. Remove Bearing cover (pos. 14) and Slide bearing (pos. 28) after removal of Screw (pos. 15).
7. Remove Screw (pos. 15), Spring washer (pos. 16), Washer (pos. 13), Slide bearing (pos. 28) and O-ring (pos. 35) from Turbine shaft (pos. 6). Use faces on Turbine shaft to hold against rotation.

**Warning:** Do not destroy driver faces on Turbine shaft. Use only proper tools providing a firm grip such as a wrench or a vice.



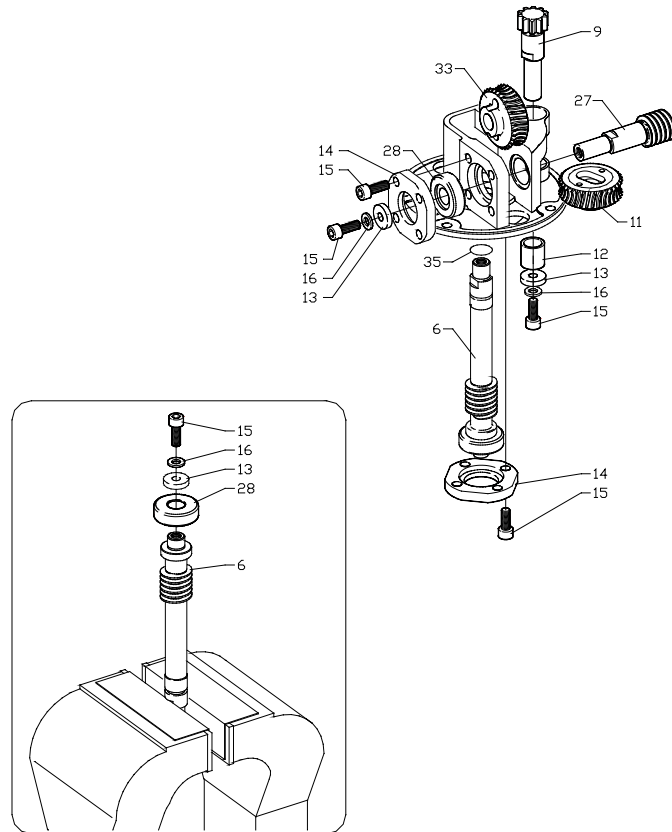
How to replace Collar bushes (pos. 10), see page 30.

#### Reassembly

1. Mount O-ring (pos. 35) and Slide bearing (pos. 28) carefully on Turbine shaft (pos. 6) and secure with Washer (pos. 13), Spring washer (pos. 16) and Screw (pos. 15). Hold Turbine shaft in a vice or with wrench on driver faces and tighten.
2. Push Slide bearing (pos. 28) for Horizontal shaft (pos. 27) into Gear frame (pos. 29) and fix Bearing cover (pos. 14) with Screws (pos. 15). Tighten crosswise.

## Maintenance and Repair (continued)

### Gear Assembly



3. Insert 2nd stage Worm wheel (pos. 11), Pinion (pos 9) and Journal (pos. 12). Mount Washer (pos. 13), Spring washer (pos. 16) and fix with Screw (pos. 15). Check rotation.

**Note:** It is important that the Screw holding the Pinion is fastened to a torque moment of 5 Nm, to secure it from loosening.

4. Insert 1st stage Worm wheel (pos. 33) and Horizontal shaft (pos. 27). Mount Washer (pos. 13), Spring washer (pos. 16) and fix with Screw (pos. 15). Check rotation.
5. Reinstall Turbine shaft (pos. 6) against 1st stage Worm wheel and tighten Screws (pos. 15) in Horizontal shaft (pos. 27) and Pinion (pos. 9).
6. Remove Turbine shaft (pos. 6) with O-ring (pos. 35) and Slide bearing (pos. 28) before Gear subassembly is inserted in machine body.

## Maintenance and Repair (continued)

### Replacement of Collar Bushes

1. Place Gear frame (pos. 29) upside down with a firm support under the flange. Use for instance jaws of a vice. Do not clamp on machined surfaces. With Pusher (tool No. TE81B033, see page 36) knock out Collar bush.
2. Turn Gear frame to upright position and hold over support such as flat steel bar clamped in a vice. Knock out Collar bush with Pusher.
3. Turn Gearframe 90° and hold over support. Knock out collar bush with Pusher.

**Warning:** To avoid risk of deforming Gear frame, it is utmost important that it is supported while the Collar bushes are being knocked out.

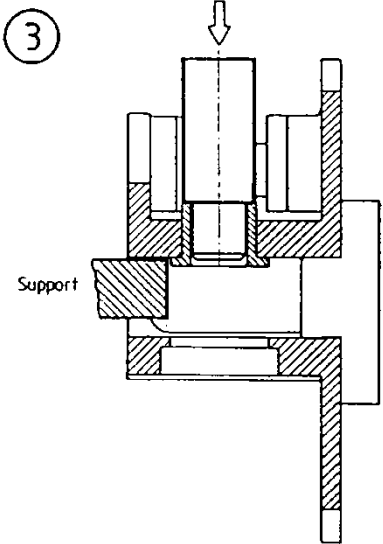
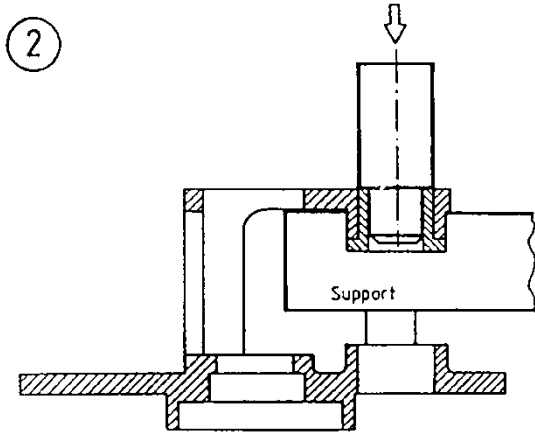
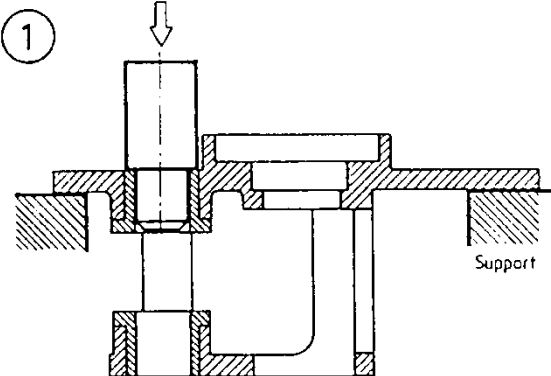


4. Clean holes and push in new Collar bushes into Gear frame.



**Maintenance and Repair** (continued)

**Replacement of Collar Bushes**



Removal of old Collar bushes.

## **Maintenance and Repair** (continued)

### **Replacement of Ball Races**

#### **In body**

1. A. With big end downwards knock several times Body with bearings (pos. 26) hard against firm wooden support until Ball race (pos. 26.3) drops out.
1. B. If it is not possible to knock out Ball race in this way, it is necessary first to screw out Main collar lower (pos. 26.2) – see page 34. Carefully push off old Ball race without damaging Main collar lower. Use mandrel and firm support.

Before mounting of new Ball race, Main collar lower (pos. 26.2) must be remounted into Body – see page 34.

2. Clean surfaces and place Ball race (pos. 26.3) on Main collar lower (pos. 26.2). Press by hand as long as possible. By means of a tube mandrel or if desired wooden block, carefully hammer Ball races home.

Ball races must not project over end-face of Main collar lower. To avoid tilting mandrel must push along the whole circumference of Ball race. Do not damage surface of Ball race.

#### **On Gear wheel**

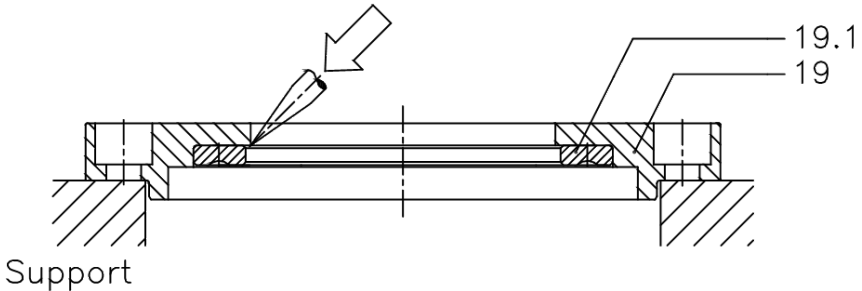
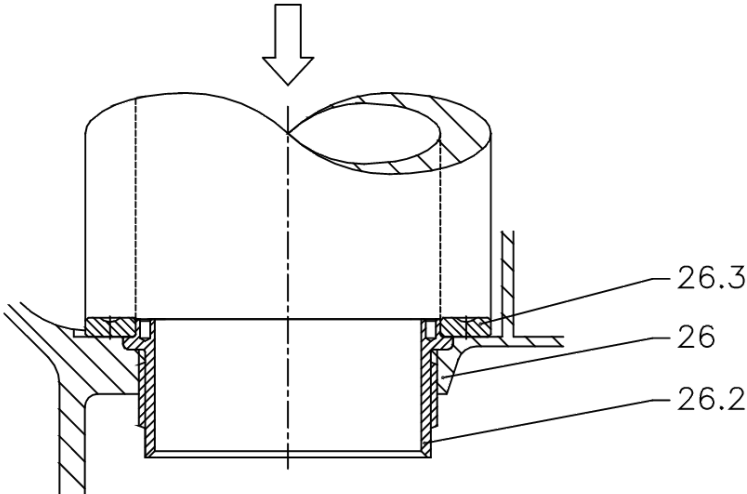
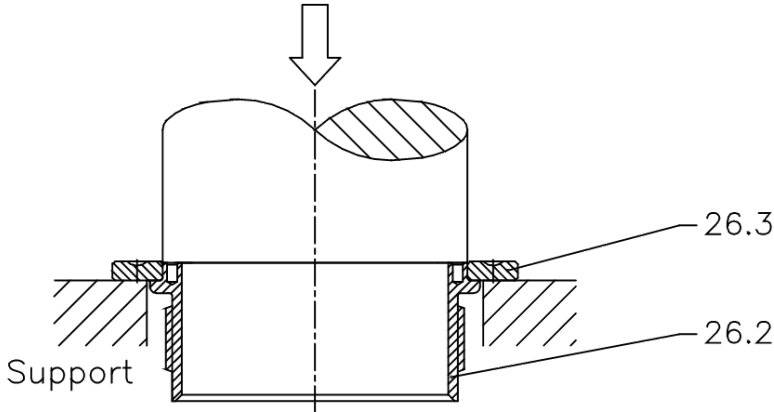
1. Place Gear wheel with ball race (pos. 7) on support. Support only under Ball race (pos. 7.1). With mandrel press off old Ball race.
2. Clean surfaces and press on new Ball race. Ball race must be pressed fully home on Gear. Press parallel. Use press or vice. Do not damage surface of Ball race.

#### **In Hub cover**

1. Place Hub cover with ball race (pos. 19) on support. Carefully knock out old Ball race by means of small mandrel or if desired screwdriver. Knock several times around the circumference to avoid tilting.
2. Clean surfaces and press in new Ball race. Ball race must be pressed fully home. Press parallel. Do not damage surface of Ball race.

**Maintenance and Repair** (continued)

**Replacement of Ball races**



## Maintenance and Repair (continued)

### Replacement of Main Collars

Although normally exposed to very limited wear, it is possible to replace Main collars (pos. 26.1 and 26.2) in Body. The procedure to do this is described below.

#### Main collar upper:

1. Place Body (pos. 26) in a vice upright position. Do not clamp on machined faces. Insert tool (see page 37) into Main collar upper (pos. 26.1). Unscrew Main collar.
2. Carefully clean thread and recess in Body. Do not damage special thread in Body. Recess must be absolutely clean.
3. Make sure that new Main collar is clean and free from impurities.
4. Remove O-ring (pos. 34) from old Upper main collar and place it in the new one. (inspect O-ring, if worn it should be replaced also)
5. Screw in new Main collar. Attention should be given to make sure that thread is in correct engagement before screwing in Main collar.
6. Tighten Main collar fully home and tighten up.
7. Check that Main collar is fully home: install Stem, Ball retainer with balls and Gear wheel (see page 26). Check that there is sufficient axial clearance to allow for free rotation of Stem.

#### Main collar lower:

1. Place Body in a vice in upside down position. Do not clamp on machined faces. Insert tool (see page 37) into Main collar lower (pos. 26.2). Unscrew Main collar.

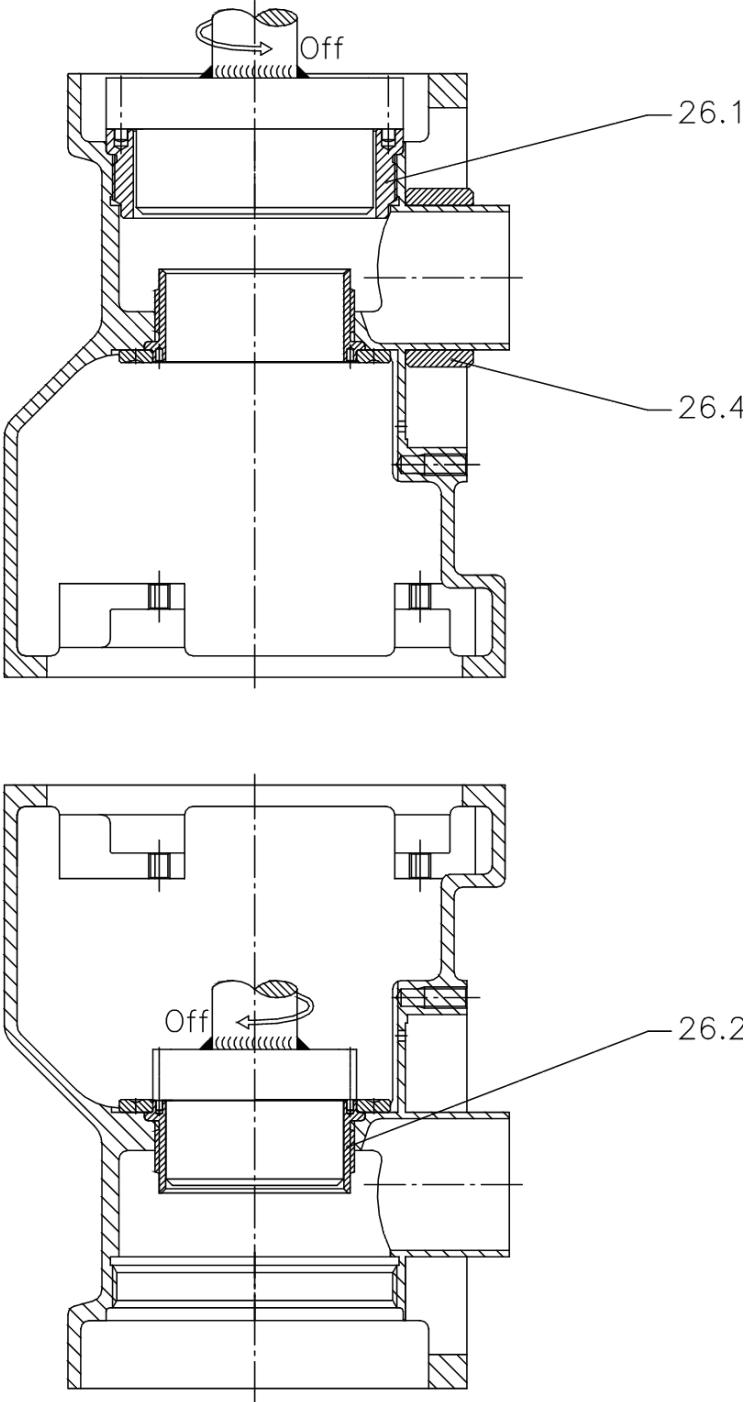
**Warning:** Thread on Main collar lower is left-handed.



2. Carefully clean thread and recess in Body. Do not damage special thread in Body. Recess must be absolutely clean.
3. Make sure that new Main collar is clean and free from impurities.
4. Inspect O-ring on stem (pos. 36), if worn it should be replaced.
5. Screw in new Main collar. Attention should be given to make sure that thread is in correct engagement before screwing in Main collar.
6. Tighten Main collar fully home and tighten up.
7. Check that Main collar is fully home: install Stem, Ball retainer with balls and Gear wheel (see page 27). Check that there is sufficient axial clearance to allow for free rotation of Stem.

**Maintenance and Repair** (continued)

**Replacement of Main Collars**



## Tools

### Standard Tool kit for Toftejorg TZ-74 Brew Kettle, Article No. TE81B055

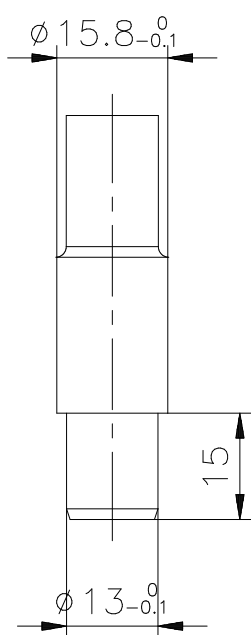
Tool No.	Description
TE134	Hex Key for Screw
TE134A	Hex Screwdriver for Screw
TE462A	Socket wrench for Hex Screw

TE81B033 Pusher for 1½" Collar bush

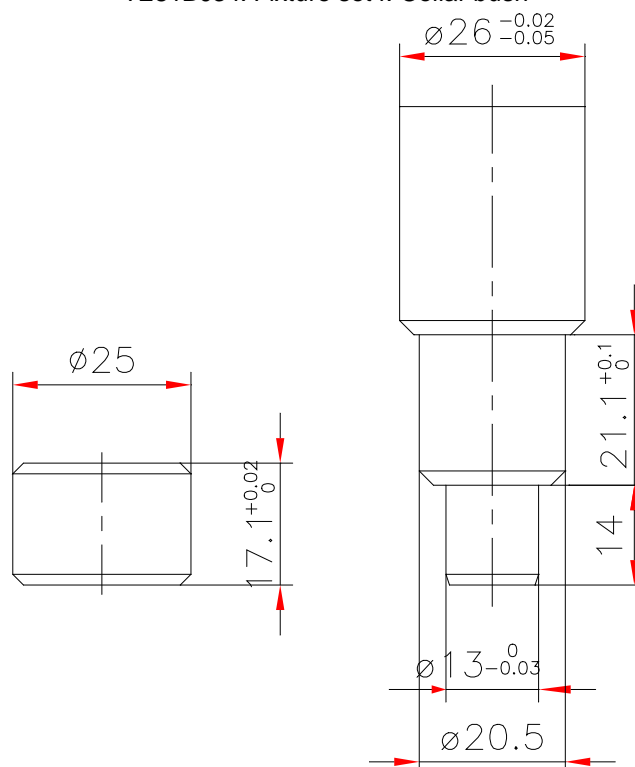
TE81B034 Fixture set f. Collar bush

#### Sketch of Tools for replacement of Collar bush:

TE81B033 Pusher for 1½" Collar bush:

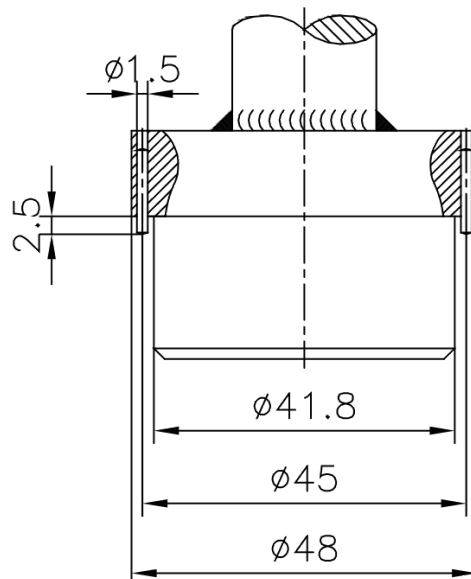
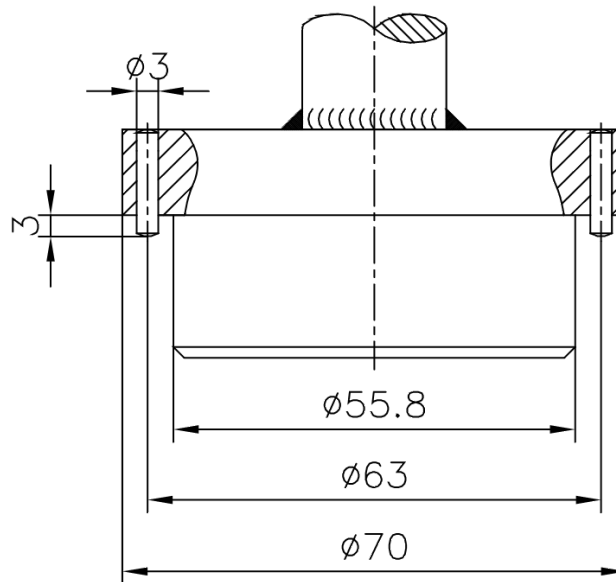


TE81B034: Fixture set f. Collar bush



**Tools** (continued)

**Sketch of tools for replacement of Main collars**



# Trouble Shooting Guide

## Symptom: Slow rotation or failure of machine to rotate

Possible Causes	Fault finding
<b>No or insufficient liquid flow</b>	<p>a). Check if supply valve is fully open</p> <p>b). Check if inlet pressure to machine is correct</p> <p>c). Check supply line and filter for restriction/clogging</p> <p>d). Remove Nozzles and check for clogging. If blocked, carefully clean Nozzle without damaging stream straighteners and Nozzle tip.</p> <p>e). Remove Top cone Guide and Impeller (see page 20) and check for clogging in Impeller area.</p> <p>If large particles repeatedly get jammed in the machine, install filter or reduce mesh size of installed filter in supply line.</p>
<b>Foreign material or material build-up</b>	<p>Insert hex Screwdriver in Screw in top of Turbine shaft and easily turn Turbine shaft clockwise. If any resistance is recognised, disassemble machine in order to localise the cause.</p>
a). Impeller jammed	Remove Guide and Impeller (see page 20) and remove foreign material.
b). Turbine shaft sluggish in Main bush	Remove Turbine shaft (see page 22) and clean Main bush.
c). Bevel gears jammed	Remove Top cone and Hub Subassembly (see page 24). Clean teeth on Stem and Bevel gear.
d). Stem jammed/sluggish	Remove Gear subassembly (see page 22). Check free rotation of Stem. Remove Stem (see page 26). Remove foreign material/material build-up on Stem and inside Main collars. Clean Ball races and Ball retainer with balls. Also clean main bush.



## Trouble Shooting Guide (continued)

Possible Causes	Fault finding
e). Gearbox jammed/sluggish	Remove foreign material from Gearbox. Check rotation of shafts. If restriction is recognized, disassemble gearbox (see page 28) and remove material build up, especially on 2. Stage Worm wheel and mating Collar bushes.
f). Hub jammed/sluggish	Disassemble Hub Subassembly (see page 24). Remove foreign material inside Hub. Clean Ball races and Ball retainer with balls. Also clean nose of Body.

### Wear

a) Slide bearings	See page 18.
b) Main bush	See page 19.
c) Worm wheels	See page 19.
d) Collar bushes	See page 18.
e) Turbine shaft	Check clearance in Main bush and in Slide bearing. Transverse movement should not exceed 0.5 mm. Also inspect Worm wheel for wear.
f) Horizontal shaft	Check clearance in Collar bushes. Transverse movement should not exceed 0.5 mm. Also inspect worm for wear.

### Mechanical defects

a). Worm wheels. Teeth broken	Replace Worm wheel.
b). Worm wheel can rotate on Horizontal shaft/Pinion due to damaged driver faces.	Replace Worm wheel.
c). Damaged teeth on gear	Inspect teeth on Stem and Hub for deformation. Mount Hub and Stem in Body (see page 24 and 26). Hold Body in upside down position and rotate Hub to check that Bevel gears can work together. If damaged: Replace Stem and/or Bevel gear.

## Reference List of Parts

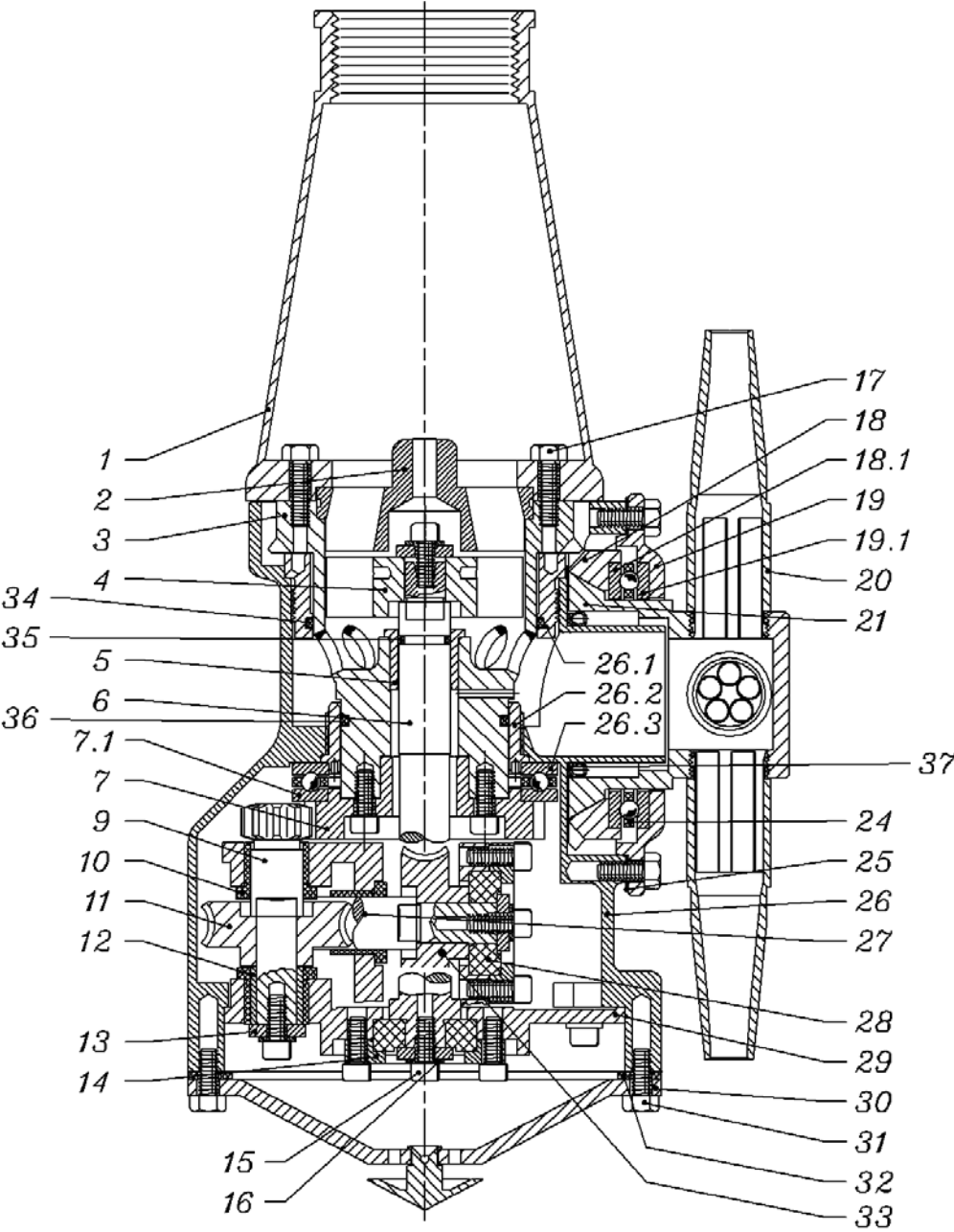
### Toftejorg TZ-74 Brew Kettle, Part List

Pos.	Ref. No.	No/Unit	Description	Material	Remarks
1	<input type="checkbox"/> TE21D500	1	Top Cone 1½" BSP	Stainless steel	Spare part
	<input type="checkbox"/> TE21D501	1	Top Cone 1½" NPT	Stainless steel	Spare part
	<input type="checkbox"/> TE21D511	1	Top Cone 2" NPT	Stainless steel	Spare part
2	<input type="checkbox"/> TE703	1	Guide 100%	Stainless steel	Spare part
	<input type="checkbox"/> TE803-0	1	Guide ring 0%	Stainless steel	Spare part
3	TE21D557	1	Stem	Stainless steel	Spare part
4	TE705	1	Impeller	Stainless steel	Spare part
5	TE21A525	1	Main bush	Polymer	Wear part
6	TE21F503	1	Turbine shaft	Stainless steel	Wear part
7	TE712-13	1	Gear wheel w. ball race	Stainless steel	Spare part
7.1	TE826-1	(1)	Ball race	Stainless steel	Wear part
9	TE814	1	Pinion	Stainless steel	Spare part
10	TE21A585	3	Collar bush	Polymer	Wear part
11	TE21A367	1	Wormwheel w. reinforcem.	Polymer	Wear part
12	TE817	1	Journal	Stainless steel	Spare part
13	TE719A	4	Washer	Stainless steel	Spare part
14	TE731	2	Bearing cover	Stainless steel	Spare part
15	TE118	22	Screw	Stainless steel	Spare part
16	TE156	8	Spring washer	Stainless steel	Spare part
17	TE402H	6	Screw	Stainless steel	Spare part
18	TE722S	1	Bevel gear w. ball race	Stainless steel	Spare part
18.1	TE826-1	(1)	Ball race	Stainless steel	Wear part
19	TE21D340	1	Hub cover w. ball race	Stainless steel	Spare part
19.1	TE826-1	(1)	Ball race	Stainless steel	Wear part
20	<input type="checkbox"/> TE50A006	4	Nozzle, ø6 mm	Stainless steel	Spare part
	<input type="checkbox"/> TE50A007	4	Nozzle, ø7 mm	Stainless steel	Spare part
	<input type="checkbox"/> TE50A008	4	Nozzle, ø8 mm	Stainless steel	Spare part
21	TE21C536	1	Hub	Stainless steel	Spare part
24	TE21A380	2	Ball retainer w. balls	Polymer/Stainless steel	Spare part
25	TE21D562	1	Hub gasket	Polymer	Spare part
26	TE727Z4	1	Body	Stainless steel	Not available
26.1	TE21D558	(1)	Main collar upper	Polymer	Wear part
26.2	TE21B521	(1)	Main collar lower	Polymer	Wear part
26.3	TE826-1	(1)	Ball race	Stainless steel	Wear part
27	TE828Z	1	Horizontal shaft	Stainless steel	Wear part
28	TE21A570	2	Slide bearing	Polymer	Wear part
29	TE730	1	Gear frame	Stainless steel	Spare part
30	TE21D350	1	Bottom cover compl.	Stainless steel	Spare part
31	TE421H	10	Screw	Stainless steel	Spare part
32	TE21D563	1	Bottom gasket	Modified polymer, elastomer	Spare part
33	TE21A367	1	Wormwheel w. reinforcem.	Polymer	Wear part
34	TE807	1	O-ring	Elastomer	Wear part
35	TE810	1	O-ring	Elastomer	Wear part
36	TE825	1	O-ring	Elastomer	Wear part
37	TE21B549	1	Lip seal	Elastomer	Wear part

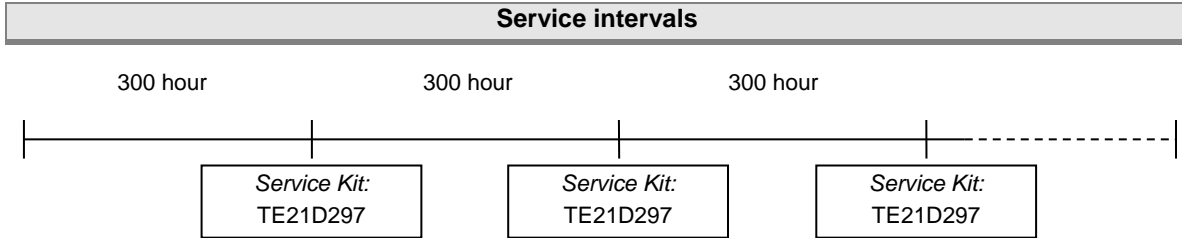
Configuration as delivered marked

Please note that some of the polymer parts are in PEEK, which is not resistant to concentrated sulfuric acid.

# Cross Sectional Drawing



## Standard Spare Parts Kit



### Standard Spare Part Kit for Toftejorg TZ-74 Brew Kettle, Article No. TE21D297

Part No.	Description	No.
TE21A525	Main bush	1 pcs.
TE21A585	Collar bush	3 pcs.
TE21A570	Slide bearing	2 pcs.
TE21A367	Worm wheel	2 pcs.
TE807	O-ring	1 pcs.
TE810	O-ring	1 pcs.
TE825	O-ring	1 pcs.
TE21B549	Lip Seal	1 pcs.

## **General Information**

### **How to Order Spare Parts**

On the Cross Sectional Drawing as well as on all instruction drawings, the individual parts have a pos. No., which is the same on all drawings. From the pos. No. the part is easily identified in the Reference List of Parts, page 40.

Individual parts should always be ordered from the Reference List of Parts, page 40. Ref. No. and Description should be clearly stated.

Please also quote the type of machine and serial No. This will help us to help you. The type and serial Nos. are stamped on the Body of the tank cleaning machine.

### **Service and Repair**

Upon every return of a product, no matter if for modifications or repair, it is necessary to contact your local Alfa Laval office to guarantee a quick execution of your request.

You will receive instructions regarding the return procedure from your local Alfa Laval office. Be sure to follow the instructions closely.

### **How to contact Alfa Laval Tank Equipment**

For further information please feel free to contact:

#### **Alfa Laval Tank Equipment**

##### **Alfa Laval Kolding A/S**

31, Albuen - DK 6000 Kolding - Denmark

Registration number: 30938011

Tel switchboard: +45 79 32 22 00 - Fax switchboard: +45 79 32 25 80

[www.toftejorg.com](http://www.toftejorg.com) , [www.alfalaval.dk](http://www.alfalaval.dk) - [info.dk@alfalaval.com](mailto:info.dk@alfalaval.com)

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