



Instruction Manual

Alfa Laval Toftejorg™ TZ-74 Brew Kettle



Covering:

Standard Machines

Machines delivered with ATEX Certification in accordance with Directive 94/9/EC valid until 2016-04-19/

Directive 2014/34/EU valid from 2016-04-20

TE91A160-EN8

First published: 1974

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Original manual

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

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1 EC/EU Declaration of Conformity

The Designated Company

Alfa Laval Kolding A/S

Company Name

Albuen 31, DK-6000 Kolding, Denmark

Address

+45 79 32 22 00

Phone No.

hereby declare that

Tank Cleaning Machine

Designation

Alfa Laval Toftebjerg TZ-74 Brew Kettle

Type

From serial number 2016-0001 to 2030-99999

is in conformity with the following directive with amendments:

Machinery Directive 2006/42/EC

DS/EN ISO 12100:2011

The Pressure Directive 97/23/EC

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

FDA 21CFR§177

Regulation (EC) 1935/2004


Equipment Explosive Atmospheres (ATEX) Directive 94/9/EC, valid until 2016-04-19

Equipment Explosive Atmospheres (ATEX) Directive 2014/34/EU, valid from 2016-04-20

(Applicable for machine certified as category 1 and 2 component, see machine engraving)

DS/EN 13463-1:2009, DS/EN 13463-5:2011, DS/EN ISO/IEC 80079-34:2011, Annex A, paragraph A.5.3 Rotating machines

EC Type Examination Certificate no. Baseefa10ATEX0188X

Marking:  II 1 GD c T175°C Tamb 0°C to +140°C

Baseefa Ltd., Certification body number 1180, Rockhead Business Park, Staden Lane, Buxton, Derbyshire SK17 9RZ, United Kingdom

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

Global Product Quality Manager
Pumps, Valves, Fittings and Tank Equipment

Title

Lars Kruse Andersen

Name



Signature

ATEX Responsible Engineer

Title

Denniz Høxbroe

Name



Signature

Kolding

Place

2016-02-01

Date

(This Declaration of Conformity replaces Declaration of Conformity dated 2016-01-01)



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:



3.1 Introduction

This manual has been prepared as a guide for installing, operating and maintaining your Alfa Laval Toftejorg tank cleaning machine. Should you require further assistance, our Technical Sales Support department and worldwide net of sales offices will be pleased to help you. Please quote the type, article and serial numbers with all of your enquiries; this helps us to help you. The type and serial number are placed on the gear house of the tank cleaning machine.

Important information: Before installing the machine and setting it into operation, carefully read the General Safety and Installation Instructions (page 10) and the special conditions for safe use in accordance with ATEX Certification Directive 94/9/EC valid until 2016-04-19/Directive 2014/34/EU valid from 2016-04-20 (page 12) and take all necessary precautions according to your application and local regulations.s.



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.

The English version of the instruction manual is the original manual. We make reservations in regard to possible mistranslations in language versions of the instruction manual. In case of doubt, the English version of the instruction manual applies.

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3.2 Intended Use

The end-user should verify:

- that the tank cleaning machine is in conformity with respect to tank, vessel or container size in which it is 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.

3.3 Patents and Trademarks

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

Alfa Laval Kolding A/S. All rights reserved.

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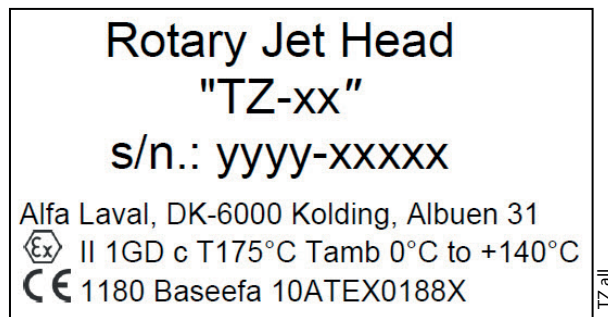
3 Introduction

3.4 ATEX Marking

If ordered with ATEX certificate:
ATEX Marking

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

Brew Kettle is as follows:



"TZ-xx": TZ machine type

Serial number explanation

Machines supplied with or without standard 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. 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 12 regarding special conditions for repair of ATEX certified machines.



3.5 Quality System

The Alfa Laval Toftejorg tank cleaning machines are produced according to Alfa Laval Kolding's ISO 9001 international Standard certified quality system.

4.1 General Description

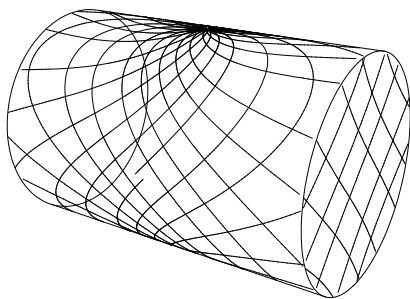
The Alfa Laval Toftejorg TZ-74 Brew Kettle version is a special version of the Alfa Laval Toftejorg TZ-74 machine. It is especially designed for rough working conditions in amongst others Brew Kettles where fibres, particles etc. may be recirculated in the cleaning media through the machine.

The Alfa Laval 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.

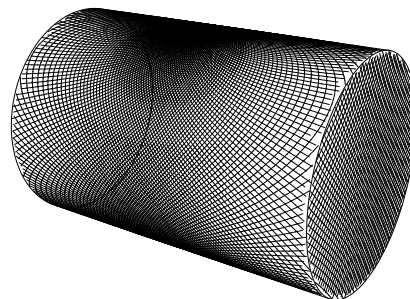
4.2 Functioning

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.

4 Installation

4.3 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 with mesh size of max. 3 mm 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:**



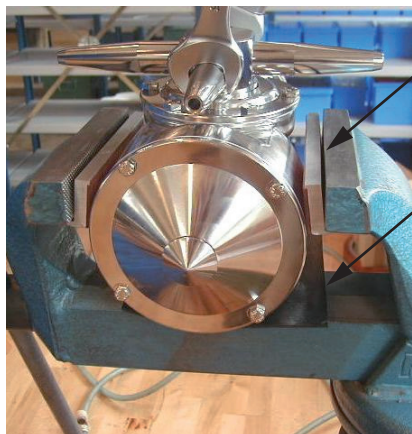
If the machine is used in potential explosive atmospheres, tapes or joint sealing compounds which are electrical insulators must not be used on threads or joints, unless an electrical connection is otherwise established to ensure an effective earthing. In addition, connecting pipe work, must be electrically 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 IEC/TS 60079-32-1:2013 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 screwed off after the test. 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.

1. 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.
2. 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



3. 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.
-

4 Installation

4.4 Special Conditions for Safe Use in Accordance with ATEX Certification

Directive 94/9/EC valid until 2016-04-19

Directive 2014/34/EU valid from 2016-04-20

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 is 95°C, with an ambient temperature range of 0°C to 140°C.



ATEX Warning: The maximum permitted process fluid pressure is 12 bar.



ATEX Warning: The unit must **not** be operated in a vessel having an enclosed volume of greater than 100m³.



Tanks larger than 100 m³:

To use Tank Cleaning Machines in tanks larger than 100m³ 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 "IEC/TS 60079-32-1:2013".

Following a guidance document such as "IEC/TS 60079-32-1:2013" 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 unit must be effectively earthed at all times when in use.



ATEX Warning: The user must address the electrostatic hazards generated from the process of the equipment in accordance with guidance document IEC/TS 60079-32-1.



In addition to the above mentioned precautions relating to the ATEX guidelines Directive 94/9/EC valid until 2016-04-19/Directive 2014/34/EU valid from 2016-04-20, the Safety Precautions on page 10 must be observed.

5.1 Normal operation

Cleaning Media

Use only cleaning media compatible with stainless steel AISI 316L, Tefzel 200, 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 acids and alkalis will be 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.

Pressure

Avoid hydraulic shocks. Put on pressure gradually. Do not exceed 12 bar inlet pressure. Recommended inlet pressure appears from Technical Data (page 31). High pressure in combination with high flow rate will increase consumption of wear parts.

ATEX Warning: Steam Cleaning pressure:



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

ATEX Warning: Draining:



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

Temperature:

ATEX Warning: Steam Cleaning:



Tanks with capacities greater than 100 m³ 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: Atmosphere/surface temperature:



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

6 Maintenance

6.1 Service and Repair of ATEX Certified Machines

All service and repair of ATEX certified machines can be performed by Alfa Laval Tank Equipment, Kolding, Denmark or by an Alfa Laval service center approved by Alfa Laval Tank Equipment.

**ATEX
Warning:**



In order to ensure compliance with the ATEX regulations and keep the machine ATEX certification valid the service or repair must be performed by an authorized person with knowledge of the ATEX requirements and regulations.

All spare parts must be original Alfa Laval spare parts and the repair or service must be done according to the instructions in the related manual.

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 traceability of all relevant documents in order to ensuring the retention of the ATEX certification of the machine.

6.2 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 37) for wear. If hole is worn oval to max. diameter more than 10.4 mm, Slide bearings should be replaced. If end face 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 26.

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

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 Screw-driver (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 Lists of Parts, page 36.

6 Maintenance

6.3 Top Assembly

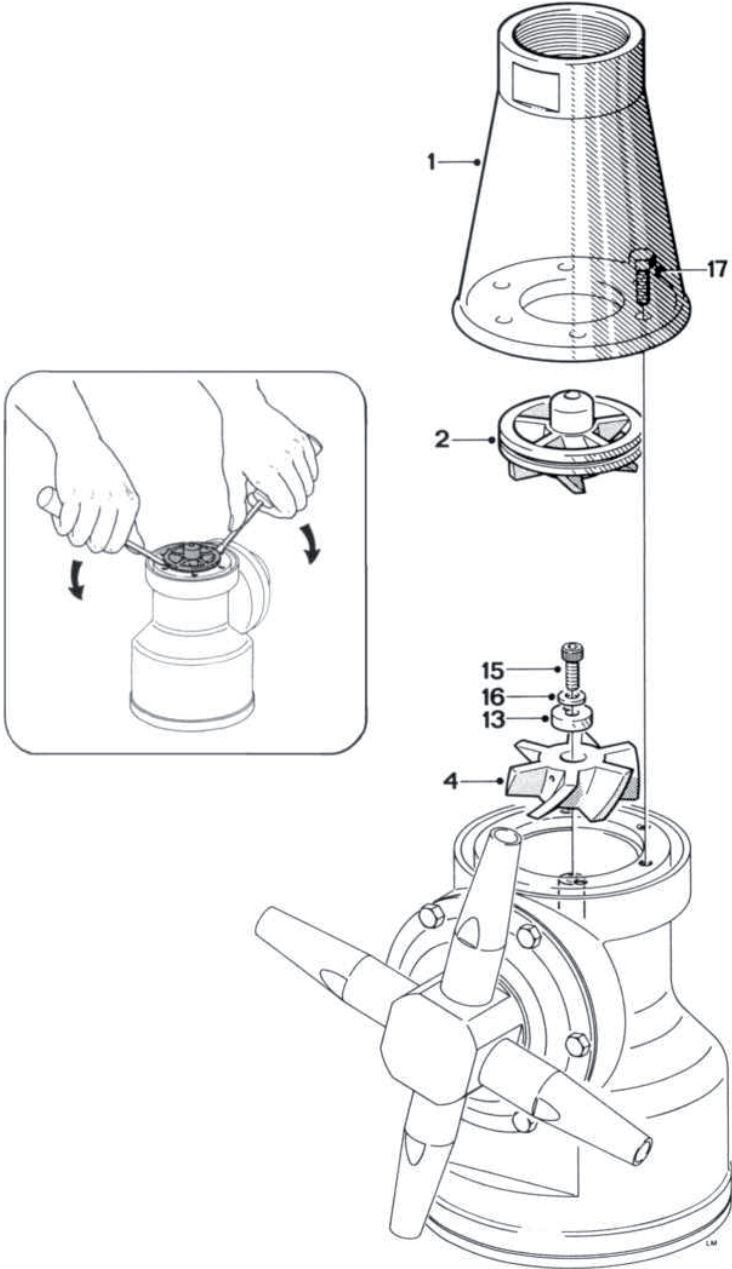
Disassembly

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 damage 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).

Top Assembly



6 Maintenance

6.4 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 3/16" 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 damage Slide bearing and O-ring.
5. Remove Screws (pos. 15) and Spring Washers (pos. 16) along the circumference of Gear frame (pos. 29). Turn Gear frame about 1 cm (1/2"). Draw out Gear Subassembly (holes in Gear frame are excellent for holding Gear Subassembly).

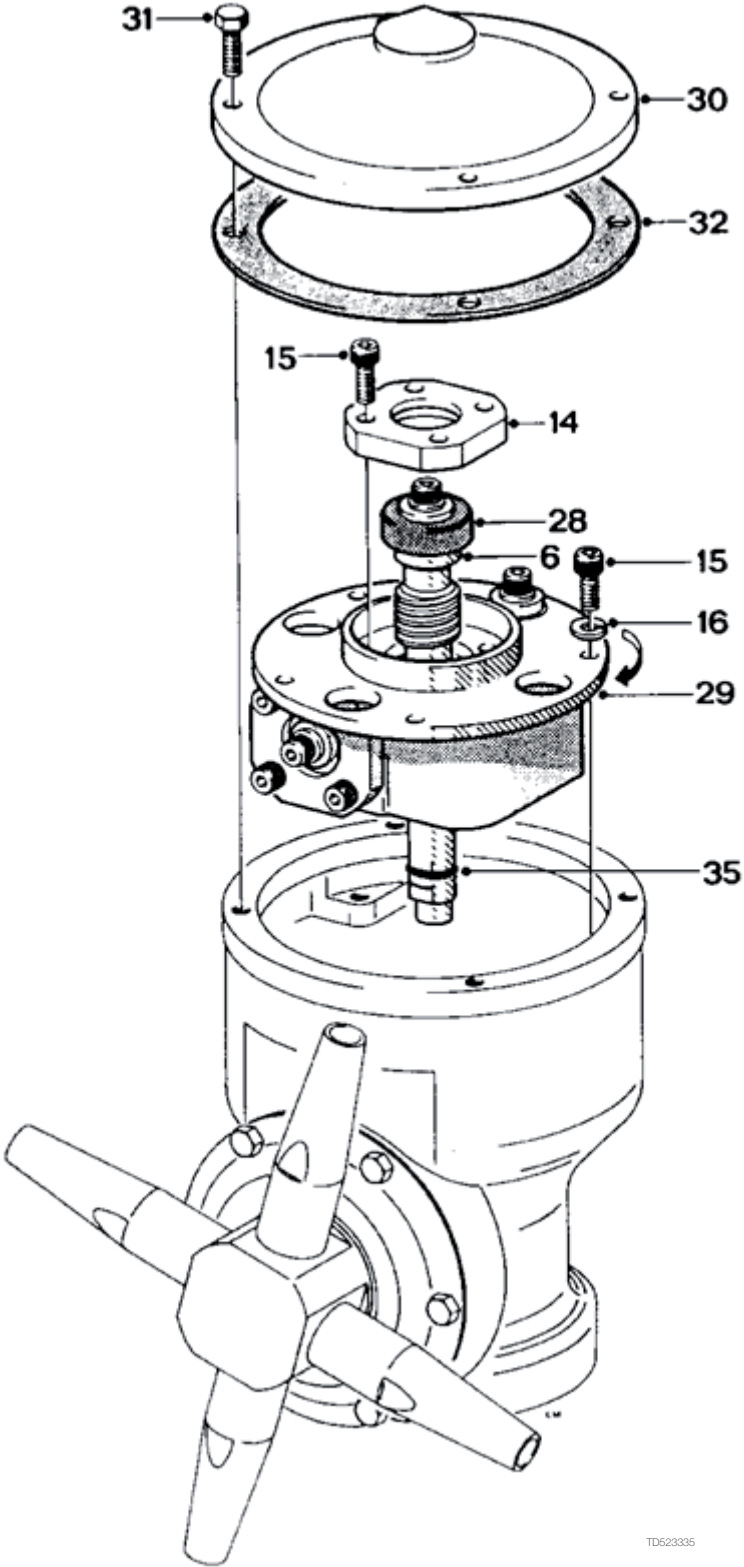
Reassembly

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 3/16" Screws (pos. 15). Tighten crosswise.
3. Place Bottom gasket (pos. 32) and Bottom cover (pos. 30).
4. Mount Screws (pos. 31) and tighten crosswise.

Bottom Assembly



TD523335

6 Maintenance

6.5 Hub Assembly

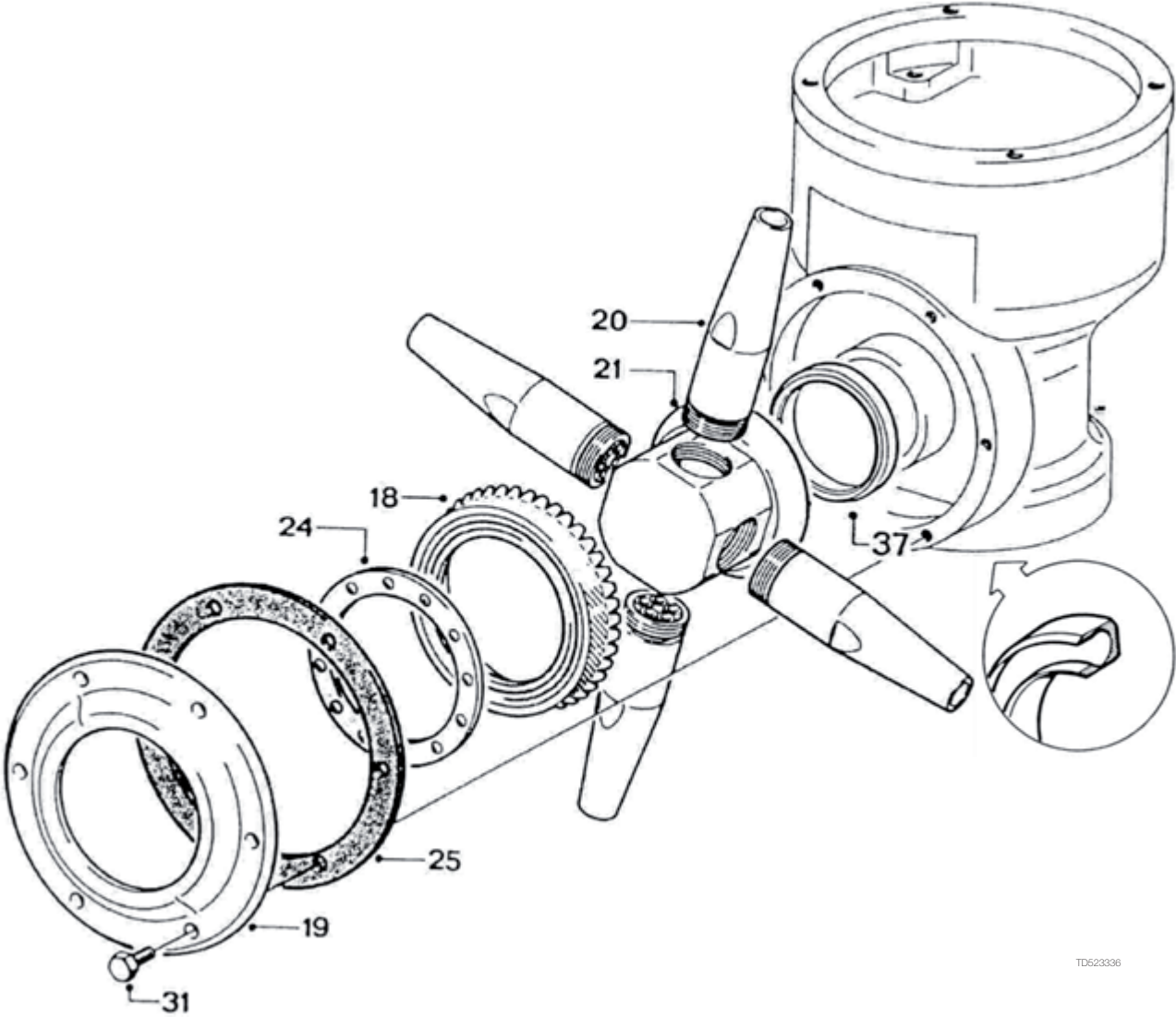
Disassembly

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 27).

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.

Hub Assembly



TD523336

6 Maintenance

6.6 Stem Assembly

Disassembly

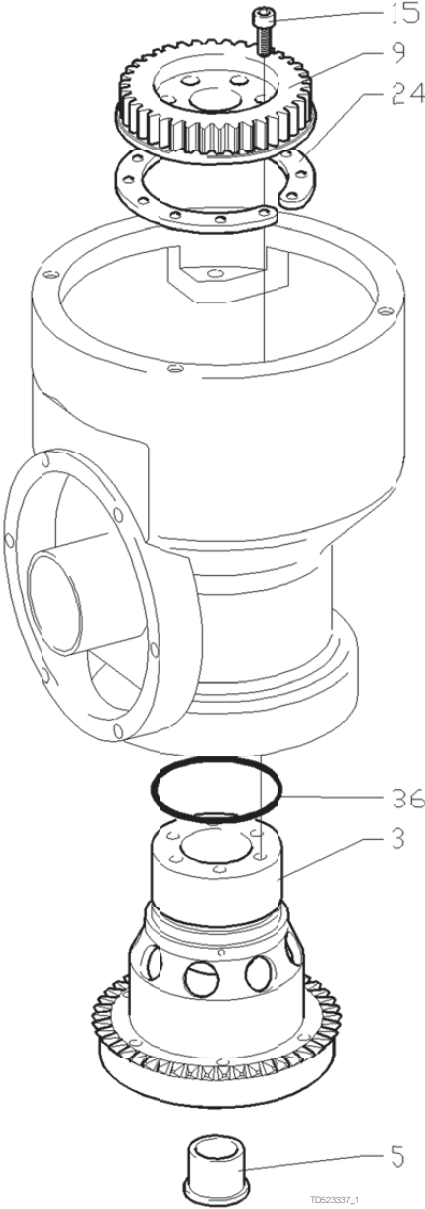
1. Place machine in upside-down position.
2. Remove Screws (pos. 15) in Gear wheel (pos. 7). To prevent rotation of Stem (pos. 3) mount two screws in two holes opposite one another in BIG end of Stem. Place Stem in a vice held by the heads of the two screws.
3. Draw out Gear wheel with ball races (pos. 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 27

Reassembly

1. If replaced press Main bush (pos. 5) into Stem (pos. 3).
2. Push 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.

Stem Assembly



TD623337_1

6 Maintenance

6.7 Gear Subassembly

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 1st 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 1st 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 2nd 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) and Slide bearing (pos. 28) 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.

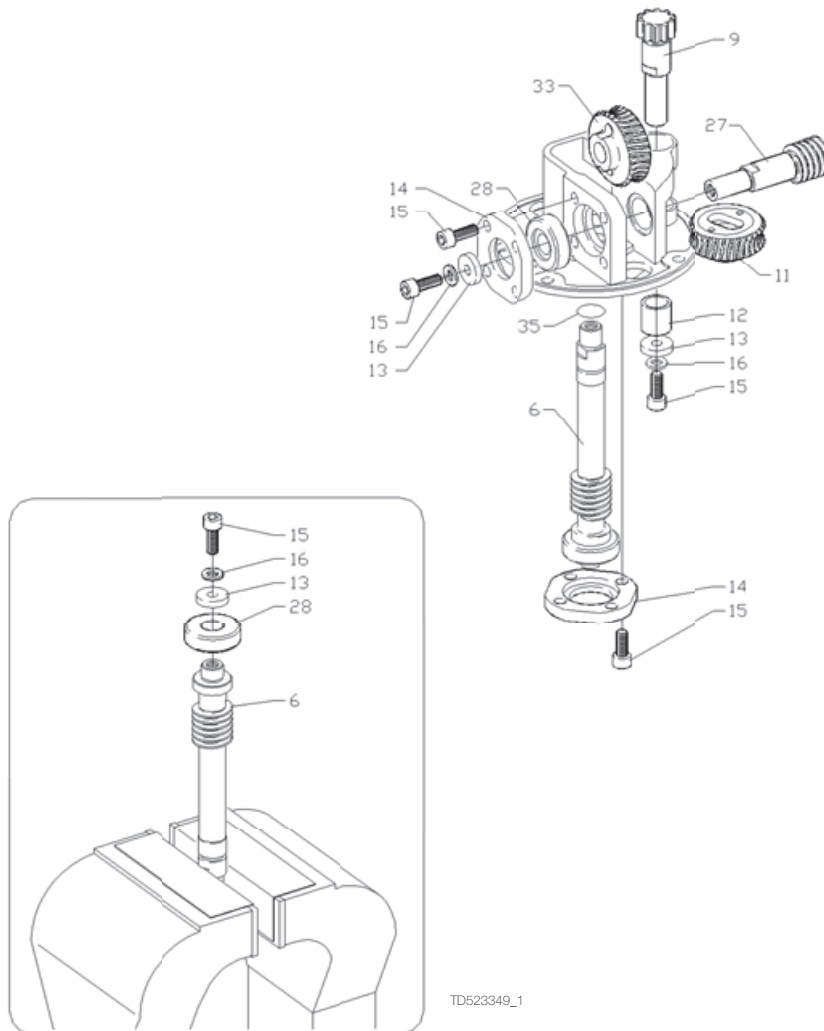
How to replace Collar bushes (pos. 10), see page 26.

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.

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

Gear Assembly



TD523349_1

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.
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.

6 Maintenance

6.8 Replacement of Collar Bushes

Replacement of Collar Bushes

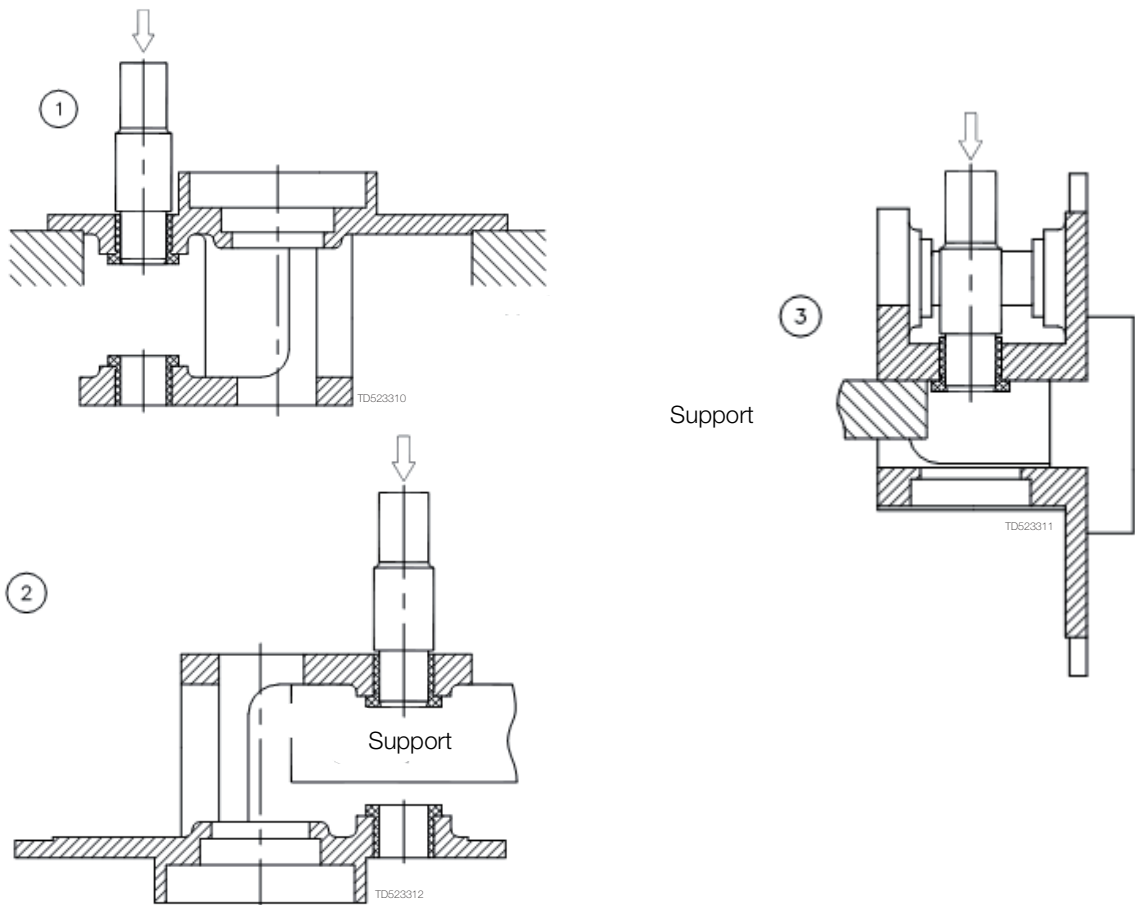
1. Place Gear frame (pos. 29) upside down with a firm support under the flange. Use for instance jaws of a vice. Do not clamp on machined surfaces. With Pusher (tool No. TE81B033, see page 39) knock out Collar bush.
2. Turn Gear frame to upright position and hold over support such as flat steel bar clamped in a vice. Knock out Collar bush with Pusher.
3. Turn Gear frame 90° and hold over support. Knock out collar bush with Pusher.
4. Clean holes and push in new Collar bushes into Gear frame.

Warning:



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

Removal of old Collar bushes.



6.9 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.
 - 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 28. 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 28.
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.

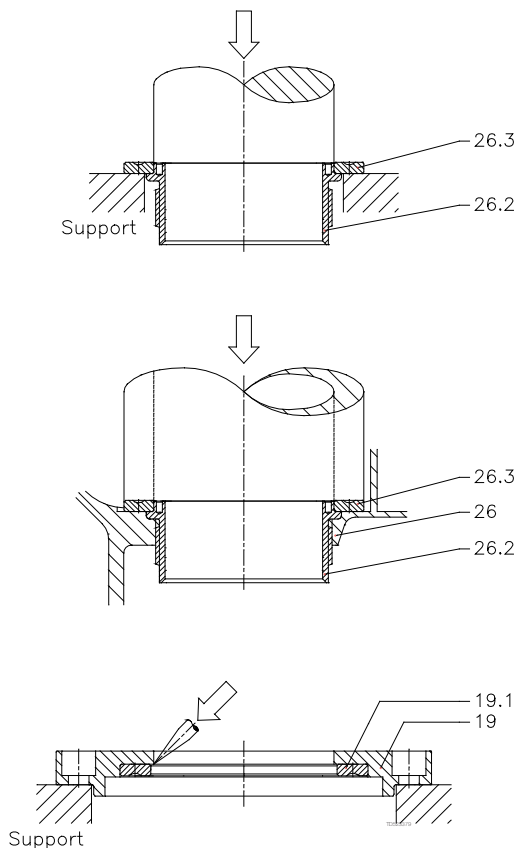
On Gear wheel

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.

Replacement of Ball races



6 Maintenance

6.10 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 39) into Main collar upper (pos. 26.1). To loosen Loctite, knock hard on tool with hammer. Unscrew Main collar.
2. Carefully clean thread and recess in Body. Do not damage special thread in Body. Recess must be absolutely clean and free from remains of old Loctite. If desired, use solution of ethylene glycol.
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. Several times knock hard on tool and tighten up.
7. Check that Main collar is fully home: install Stem, Ball retainer with balls and Gear wheel (see page 22). Check that there is sufficient axial clearance to allow for free rotation of Stem.

Main collar lower

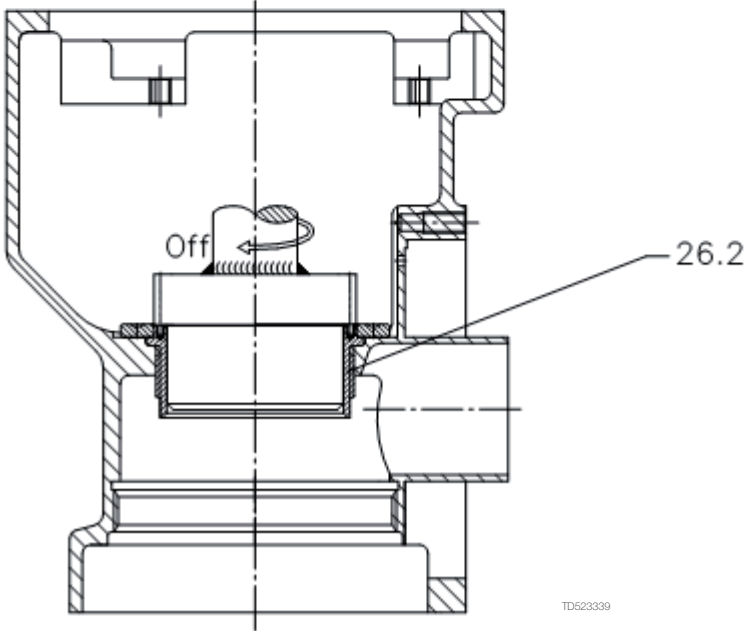
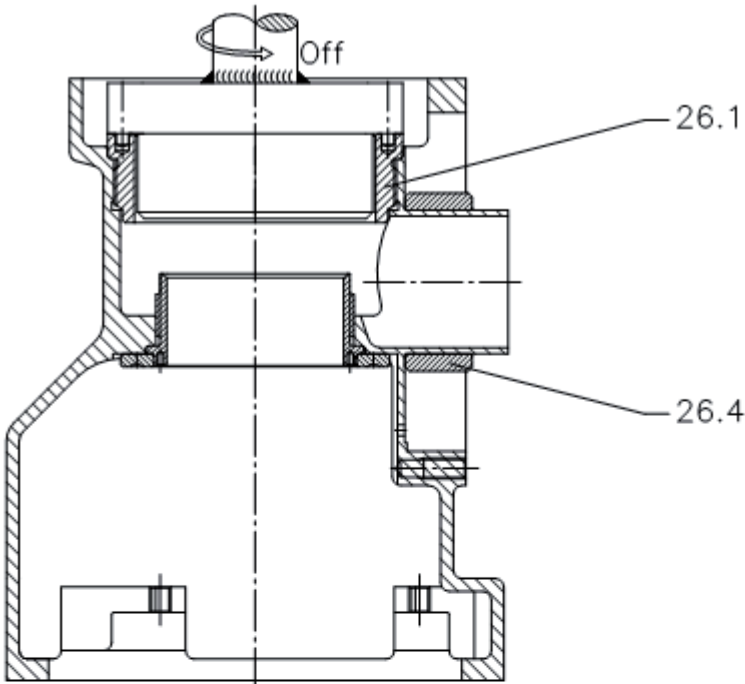
1. Place Body in a vice in upside down position. Do not clamp on machined faces. Insert tool (see page 39) into Main collar lower (pos. 26.2). Unscrew Main collar.

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 22). Check that there is sufficient axial clearance to allow for free rotation of Stem.

Replacement of Main Collars



TD523339

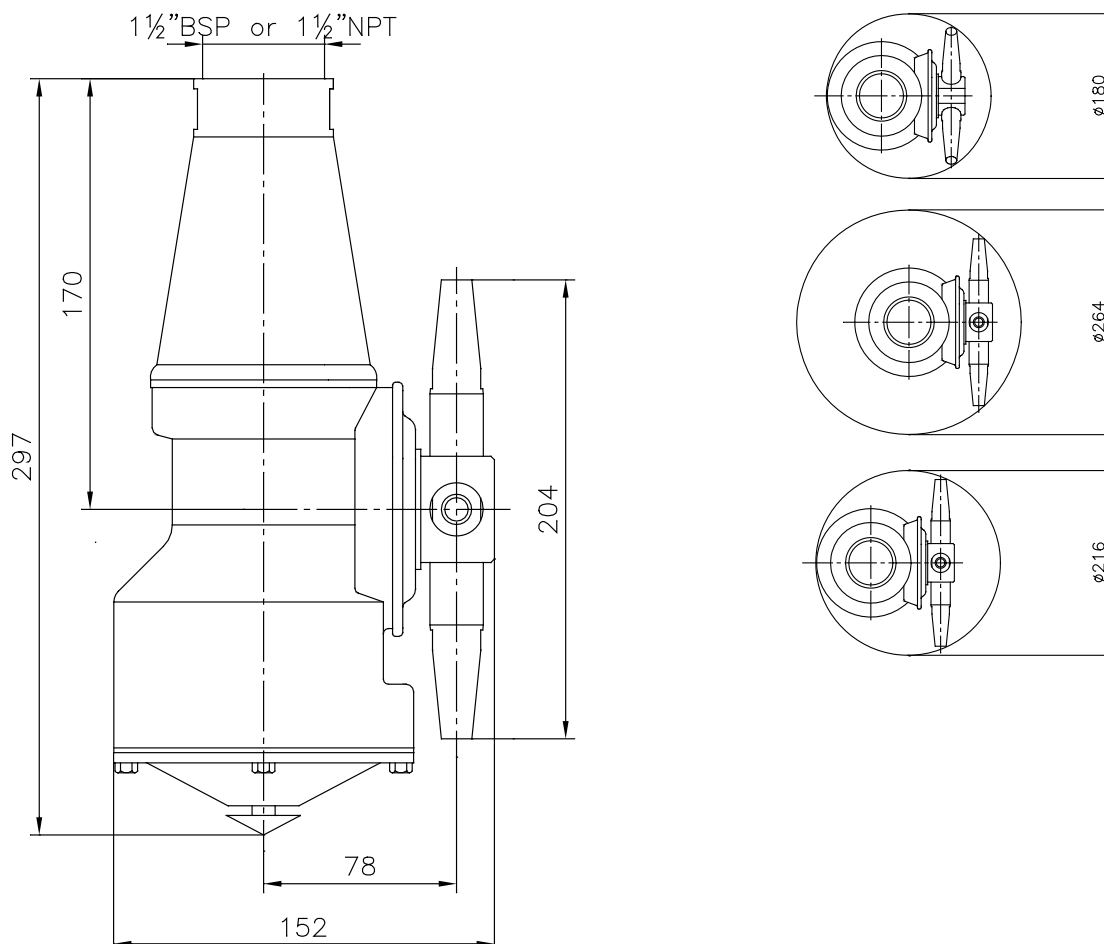
7 Trouble Shooting Guide

Slow rotation or failure of machine to rotate

Possible Causes	Fault finding
<p>No or insufficient liquid flow</p>	<p>a). Check if supply valve is fully open b). Check if inlet pressure to machine is correct c). Check supply line and filter for restriction/clogging d). Remove Nozzles and check for clogging. If blocked, carefully clean Nozzle without damaging stream straighteners and Nozzle tip. e). Remove Top cone, Guide and Impeller (see page 16) and check for clogging in Impeller area. If large particles repeatedly get jammed in the machine, install filter or reduce mesh size of installed filter in supply line.</p>
<p>Foreign material or material build-up</p> <p>a). Impeller jammed b). Turbine shaft sluggish in Main bush c). Bevel gears jammed</p> <p>d). Stem jammed/sluggish</p> <p>e). Gearbox jammed/sluggish</p> <p>f). Hub jammed/sluggish</p>	<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. Remove Guide and Impeller (see page 16) and remove foreign material. Remove Turbine shaft (see page 18) and clean Main bush. Remove Top cone and Hub Assembly (see page 20). Clean teeth on Stem and Bevel gear. Remove Gear Assembly (see page 24). Check free rotation of Stem. Remove Stem (see page 22). Remove foreign material/material build-up on Stem and inside Main collars. Clean Ball races and Ball retainer with balls. Also clean main bush. Remove foreign material from Gearbox. Check rotation of shafts. If restriction is recognized, disassemble gearbox (see page 24) and remove material build up, especially on 2. Stage Worm wheel and mating Collar bushes. Disassemble Hub Assembly (see page 20). Remove foreign material inside Hub. Clean Ball races and Ball retainer with balls. Also clean nose of Body.</p>
<p>Wear</p> <p>a) Slide bearings b) Main bush c) Worm wheels d) Collar bushes e) Turbine shaft</p> <p>f) Horizontal shaft</p>	<p>See page 15. See page 15. See page 15. See page 15. Check clearance in Main bush and in Slide bearing. Transverse movement should not exceed 0.5 mm. Also inspect Worm wheel for wear. Check clearance in Collar bushes. Transverse movement should not exceed 0.5 mm. Also inspect worm for wear.</p>
<p>Mechanical defects</p> <p>a). Worm wheels. Teeth broken b). Worm wheel can rotate on Horizontal shaft/Pinion due to damaged driver faces. c). Damaged teeth on gear</p>	<p>Replace Worm wheel. Replace Worm wheel. Inspect teeth on Stem and Hub for deformation. Mount Hub and Stem in Body (see page 20 and 22). 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.</p>

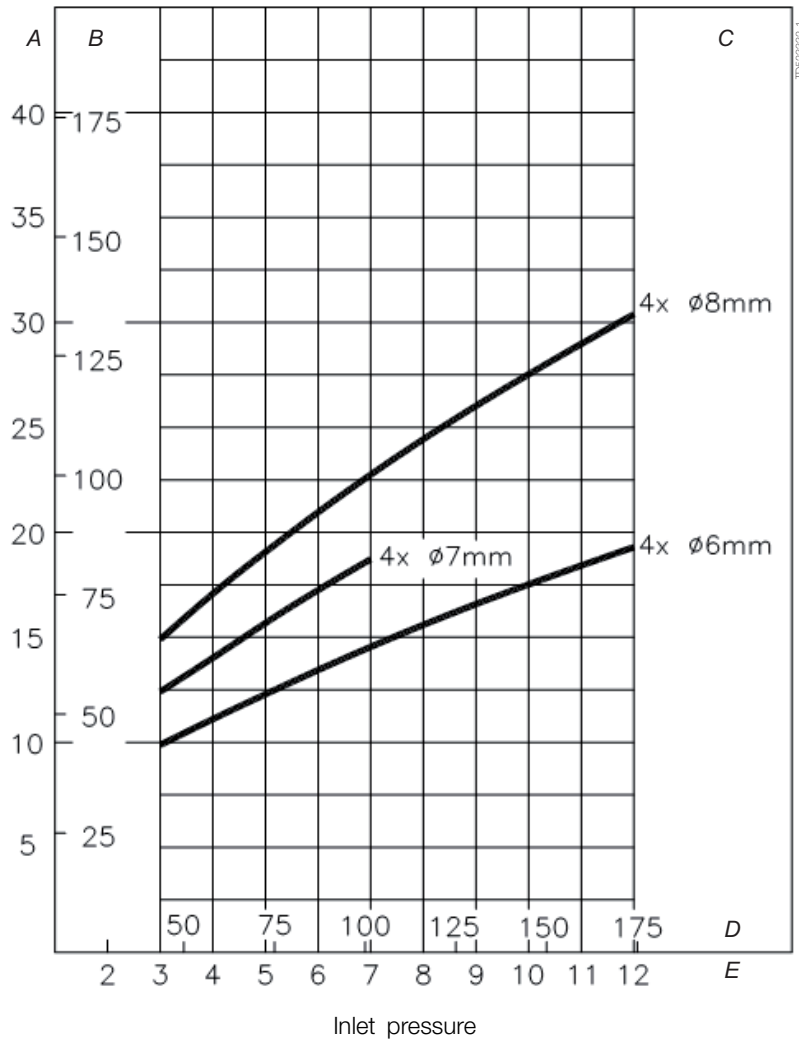
Weight of machine:	6.1 kg (13,6 lb)
Working pressure:	3-12 bar (45-175 psi)
Recommended inlet pressure:	3-8 bar (45-120 psi)
Working temperature max.:	95°C (200°F)
Ambient temperature:	0 -140°C (95°C - 140°C when not operated)
Materials:	Stainless steel AISI 316L, Tefzel 200, Teflon TFM, PEEK, Viton

Principal dimensions in mm



8 Technical Data

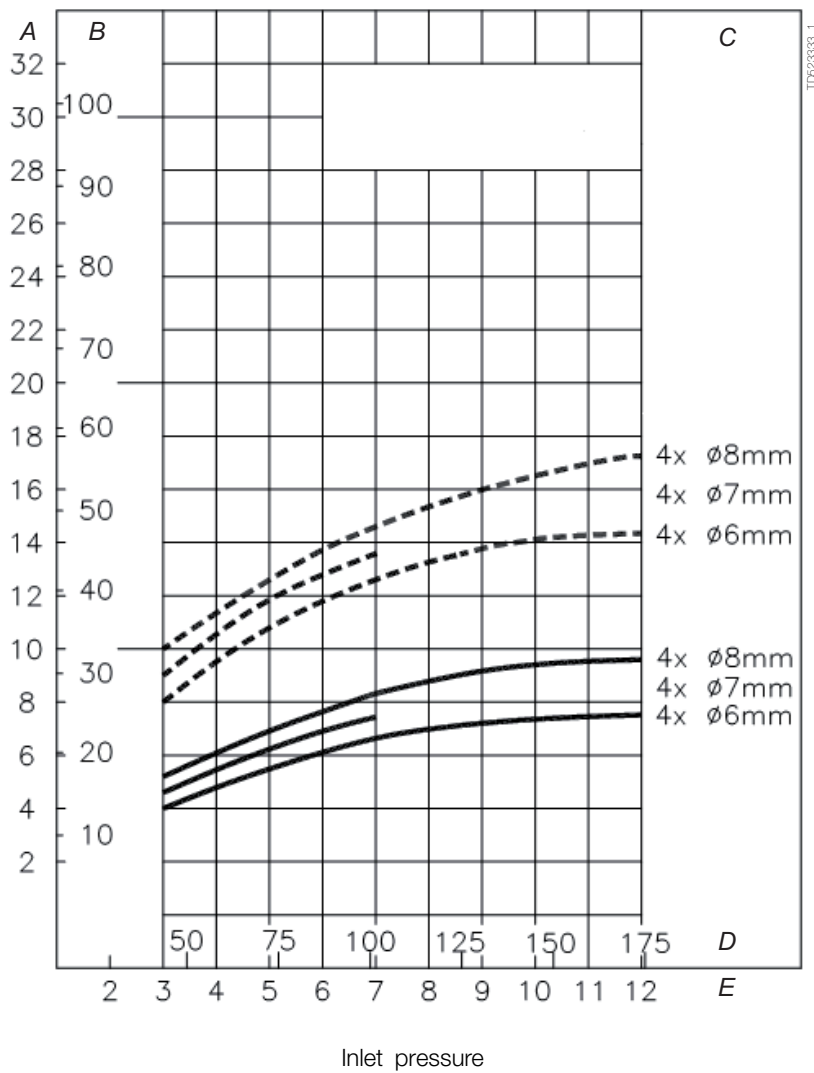
Flow rate



A: m ³ /h	B: USgpm	C: nozzle sizes	D: psi	E: bar
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Throw length

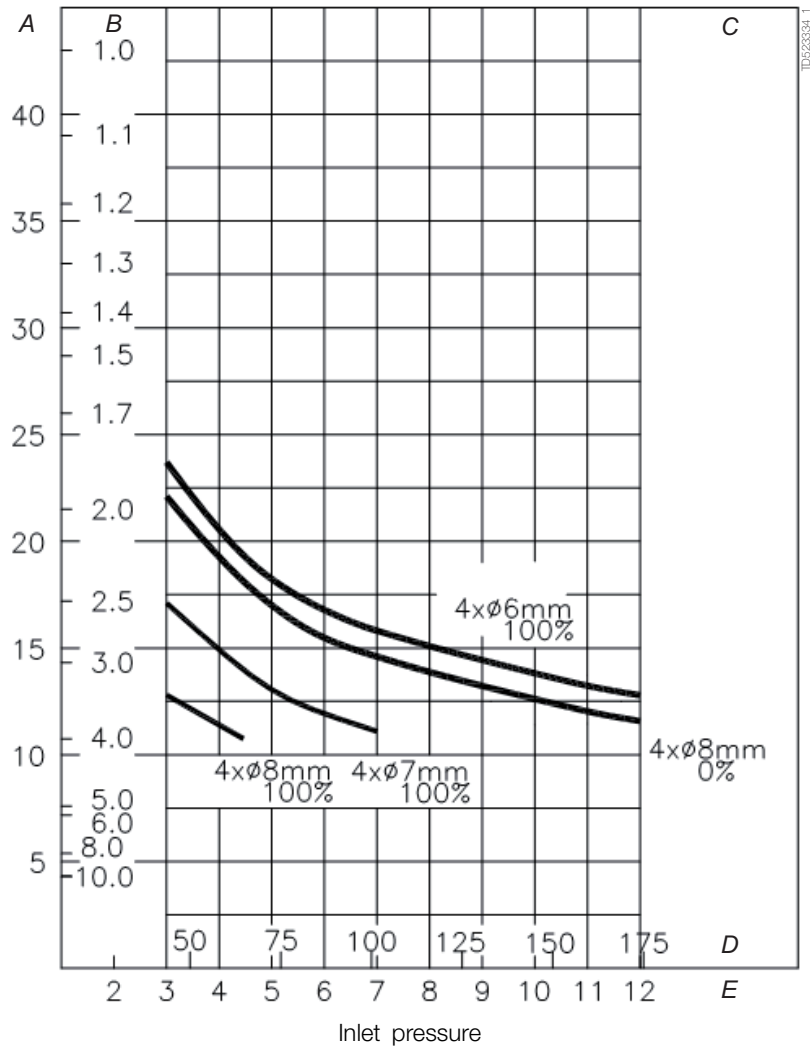
 Max. static
 Effective
TD623321



A: m	B: ft	C: nozzle sizes	D: psi	E: bar
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8 Technical Data

Cleaning Time, f. complete Pattern



A: min.	B: RPM of machine body	C: nozzle sizes	D: psi	E: bar
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9.1 Standard Configurations

Standard Configurations for Alfa Laval Toftejorg TZ-74

Connection	Turbine/ Inlet Guide	Nozzles (mm) (1/2" thread conn.)	Article No. Standard machines	Article No. ATEX certified machines
Top Cone: 1 1/2" NPT, Female	100%	4 x ø6	TE21D10811	TE21D10871
		4 x ø7	TE21D11011	TE21D11071
		4 x ø8	TE21D11211	TE21D11271
	0%	4 x ø8	TE21D13011	TE21D13071
Top Cone: 1 1/2" BSP, Female	100%	4 x ø6	TE21D20811	TE21D20871
		4 x ø7	TE21D21011	TE21D21071
		4 x ø8	TE21D21211	TE21D21271
	0%	4 x ø8	TE21D23011	TE21D23071
Top Cone: 2" NPT, Female	100%	4 x ø6	TE21D10815	TE21D10872
		4 x ø7	TE21D11015	TE21D11072
		4 x ø8	TE21D11215	TE21D11272
	0%	4 x ø8	TE21D13015	TE21D13072

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.

9.2 Available add-ons

- ATEX, category 1 for installation in zone 0/20 TE21DXXX71 or 72 ATEX.

Explanation to Add-ons

ATEX, category 1 for installation in zone 0/20 in accordance with Directive 94/9/EC. valid until 2016-04-19/Directive 2014/34/EU valid from 2016-04-20.

10 Part List and Drawing, Service Kit and Tools

10.1 Reference List of Parts TZ-74 Brew Kettle

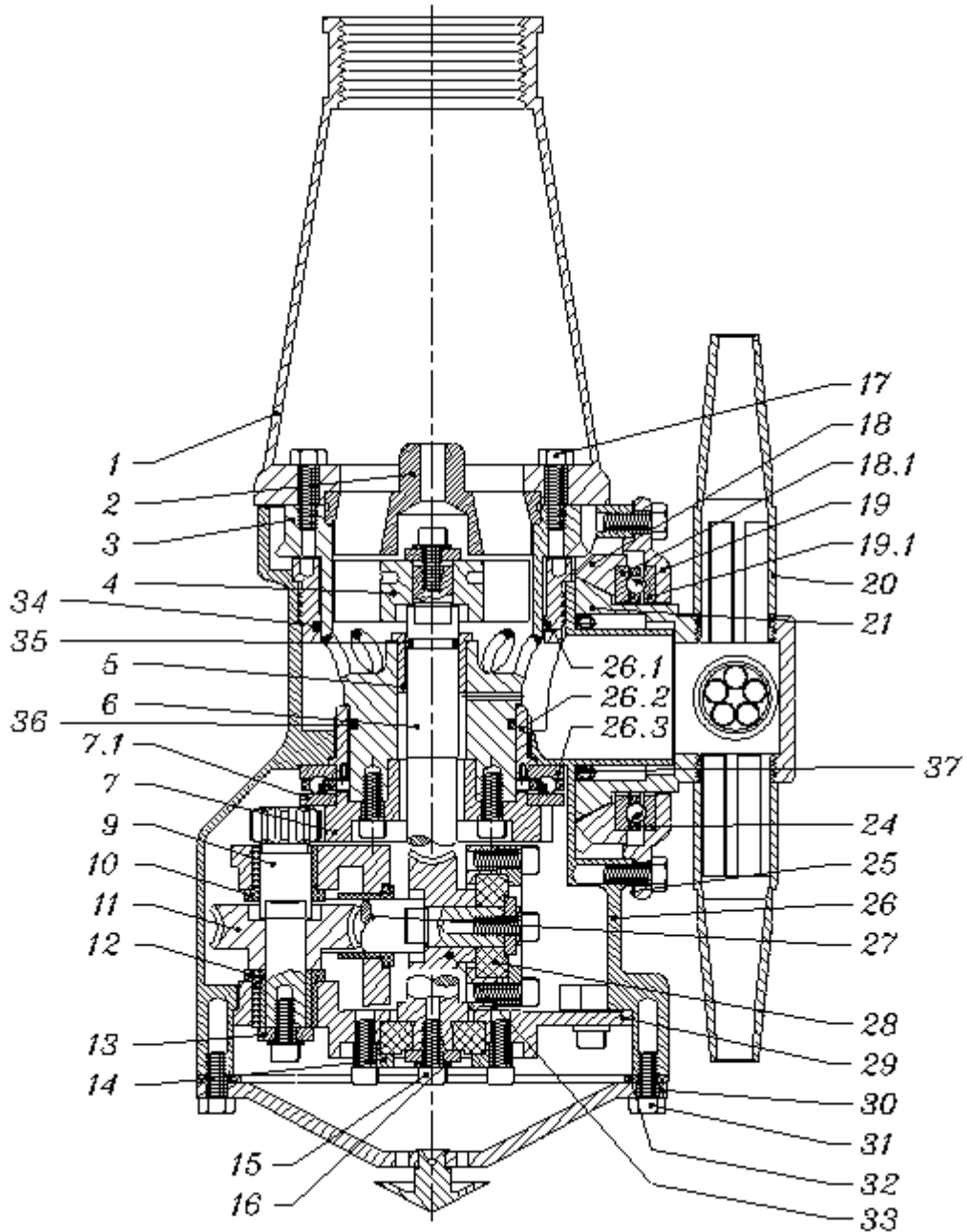
Pos.	Ref. No.	No./Unit	Description	Material	Remarks
1	# TE21B500	1	Top Cone 1½" BSP	Stainless steel	Spare part
	# TE21B501	1	Top Cone 1½" NPT	Stainless steel	Spare part
	# TE21D511	1	Top Cone 2" NPT	Stainless steel	Spare part
2	# TE703	1	Guide 100%	Stainless steel	Spare part
	# TE8030	1	Guide ring 0%	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	TE71213	1	Gear wheel w. ball race	Stainless steel	Spare part
7.1	TE8261	(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	TE8261	(1)	Ball race	Stainless steel	Wear part
19	TE21D340	1	Hub cover w. ball race	Stainless steel	Spare part
19.1	TE8261	(1)	Ball race	Stainless steel	Wear part
20	# TE50A006	4	Nozzle, ø6 mm	Stainless steel	Spare part
	# TE50A007	4	Nozzle, ø7 mm	Stainless steel	Spare part
	# 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		1	Body	Stainless steel	*Note
26.1	TE21D558	(1)	Main collar upper	Polymer	Wear part
26.2	TE21B521	(1)	Main collar lower	Polymer	Wear part
26.3	TE8261	(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 according to delivery note/order confirmation.

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

*Note: Pos. 26 is not sold as single spare part component but only as part of a machine maintenance/repair order. For further information please contact Alfa Laval Customer Support.

10.2 Cross Sectional Drawing TZ-74 Brew Kettle

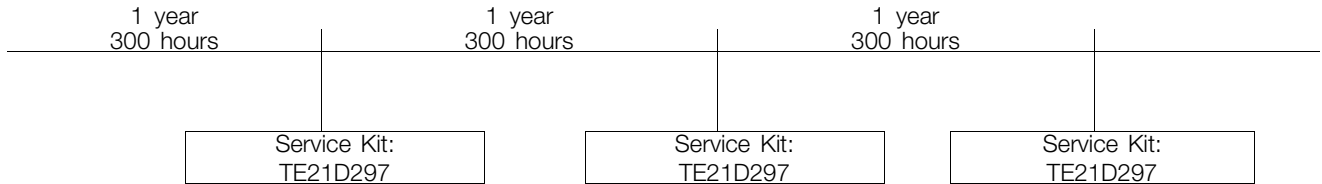


TD623342

10 Part List and Drawing, Service Kit and Tools

10.3 Spare Part Kit

Service Intervals



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

Item no.	Denomination	Qty.
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.

10.4 Tools

Standard Tool kit for Toftejord 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

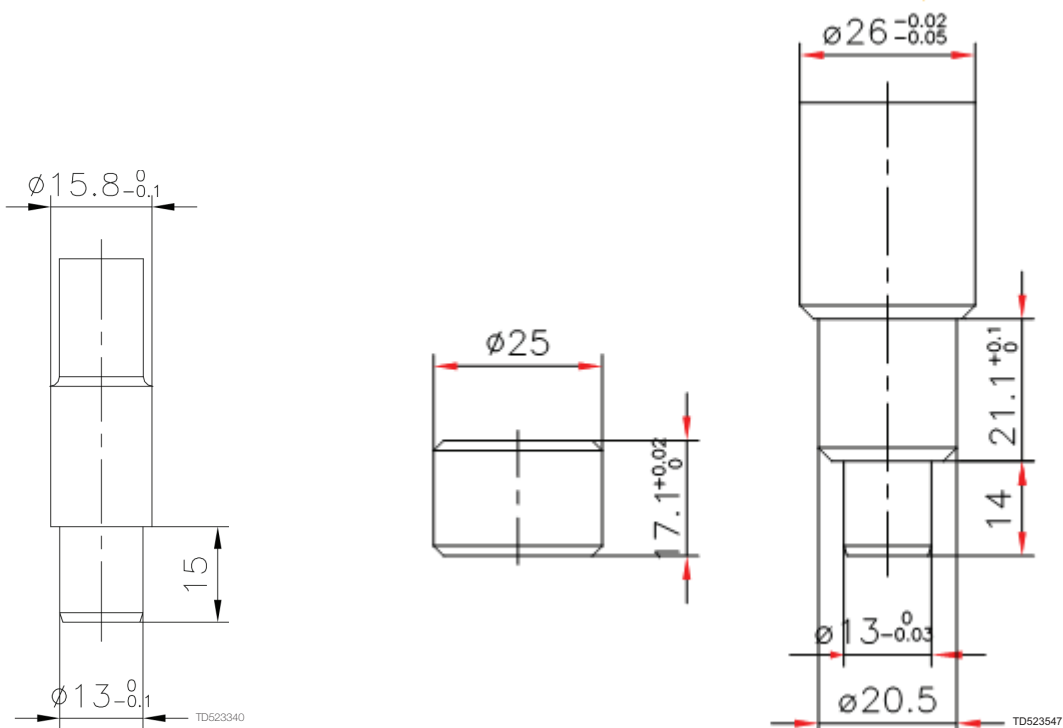
Available on request:

Tool No.	Description
TE81B033	Pusher for Collar bush, 1½"
TE81B034	Fixture set f. Gear frame

Sketch of tools for replacement of Collars bush:

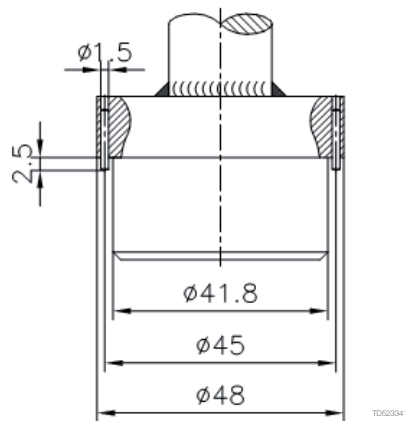
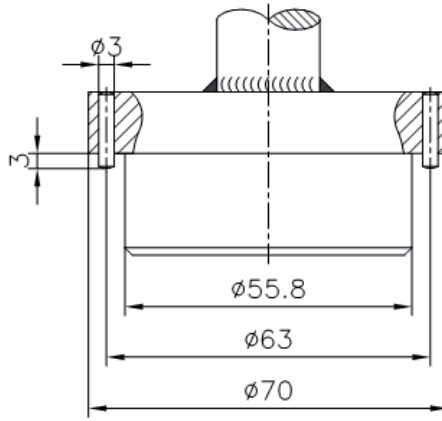
TE81B033: Pusher for Gear frame

TE81B034: Fixture set f. Gear frame



10 Part List and Drawing, Service Kit and Tools

Sketch of tools for replacement of Main collars



11.1 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.

11.2 How to Order Spare Parts

On the Cross Sectional Drawings 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 36.

Individual parts should always be ordered from the Reference Lists of Parts, page 36. 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.

11.3 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, www.alfalaval.dk - info.dk@alfalaval.com

Contact details for all countries are continually updated on our websites

12 Miscellaneous

12.1 ATEX - Special conditions for safe use

ATEX CERTIFICATION

EC – Type Examination Certificate Number: Baseefa10ATEX0188X

 II 1 GD c T175°C Tamb 0°C to +140°C

BASEEFA CUSTOMER REFERENCE No. 5102
PROJECT FILE No. 14/0990

Special Condition for Safe Use

1. The unit may be operated, in a hazardous area, only when filled with the process fluid.
2. The maximum permitted process fluid temperature is 95°C, with an ambient temperature range of 0°C to 140°C.
3. The maximum permitted process fluid pressure is 12 bar.
4. The unit must not be operated in a vessel having an enclosed volume of greater than 100m³.
5. The unit must be effectively earthed at all times when in use.
6. The user must address the electrostatic hazards generated from the process of the equipment in accordance with guidance document IEC/TS 60079-32-1

This product fully complies to ATEX category 1 as long as the 6 special conditions above are adhered to.

Please read the above conditions prior to installation & ensure that all conditions are met.

Explanation of T (temperature) rating.

The ATEX classification

The standard machine is approved for an ambient temperature range of 0°C to +140°C and is marked

 II 1 GD c T175°C Tamb 0°C to +140°C

How to contact Alfa Laval

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

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

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