Instruction Manual

Alfa Laval Rotary Jet Mixer IM 25

Covering:
Standard Machines
Machines Delivered with ATEX Certification in Accordance with Directive 2014/34/EU
TE91I550-EN8

ESE02186-EN8 2016-10
Original manual
# Table of contents

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

1. EC/EU Declaration of Conformity ................................................................. 4

2. Safety ........................................................................................................ 5
   2.1. Important information .................................................................. 5
   2.2. Warning signs .............................................................................. 5

3. Introduction ............................................................................................... 6
   3.1. Introduction ............................................................................... 6
   3.2. Intended use ............................................................................ 7
   3.3. Patents and trademarks .......................................................... 7
   3.4. ATEX marking ......................................................................... 8
   3.5. General description ............................................................... 9
   3.6. Functioning ............................................................................ 10

4. Installation ............................................................................................... 12
   4.1. General safety and installation instructions ................................ 12
   4.2. Special conditions for safe use in accordance with ATEX Certification 14

5. Operation ................................................................................................. 15
   5.1. Normal operation ................................................................... 15

6. Maintenance ............................................................................................ 16
   6.1. Preventive maintenance ....................................................... 16
   6.2. Service and repair of ATEX certified machines ...................... 17
   6.3. Service intervals ................................................................... 17
   6.4. Top assembly ......................................................................... 18
   6.5. Bottom assembly ................................................................... 20
   6.6. Hub subassembly .................................................................. 22
   6.7. Stem subassembly .................................................................. 24
   6.8. Gear subassembly .................................................................. 26
   6.9. Replacement of collar bushes .............................................. 28
   6.10. Replacement of ball races ..................................................... 30
   6.11. Replacement of main collars .................................................. 32

7. Trouble Shooting Guide ........................................................................... 33

8. Technical Data .......................................................................................... 34

9. Product programme .................................................................................... 37
   9.2. Available add-ons ................................................................... 37

10. Parts list and drawing, service kit and tools .......................................... 38
    10.1. Parts list, parts drawing and spare part kits ............................. 38
    10.2. Tools ..................................................................................... 40

11. General information ................................................................................... 42
    11.1. Service & repair ..................................................................... 42
    11.2. How to order spare parts ..................................................... 42
    11.3. How to contact Alfa Laval Kolding A/S ................................ 42

12. Miscellaneous .......................................................................................... 43
    12.1. ATEX - Special conditions for safe use .................................. 43
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

Alfa Laval Rotary Jet Mixer

Designation

IM-25

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

Equipment Explosive Atmospheres (ATEX) Directive 2014/34/EU

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


EC Type Examination Certificate no. Baseefa10ATEX0188X

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

SGS 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

Lars Kruse Andersen

Title Name Signature

ATEX Responsible Engineer

Denniz Høxbroe

Title Name Signature

Kolding 2016-10-01

Place 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 Introduction

3.1 Introduction

This manual has been prepared as a guide for the persons who will be operating and maintaining your Alfa Laval Rotary Jet Mixer IM 25. The key to long life for your mixer will always be a system of carefully planned maintenance procedures; you will appreciate that a mixer which has a rough job to do will need more frequent attention than one working in ideal conditions.

Note: Get the best and most economical performance from Alfa Laval Rotary Jet Mixer IM 25. Insufficient preventive maintenance means poor performance, unscheduled stops, shorter lifetime and extra costs. Good preventive maintenance on the contrary means good performance, no unscheduled stops and superior total economy.

This manual has been prepared as a guide for installing, operating and maintaining your Alfa Laval Rotary Jet Mixer. Should you require further assistance, our Technical Sales Support department and worldwide net of sales offices are 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 body of the mixer.

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.

Important information: Before installing the machine and setting it into operation, carefully read the General Safety and Installation Instructions (page 12) and the special conditions for safe use in accordance with ATEX Certification Directive 2014/34/EU (page 14) and take all necessary precautions according to your application and local regulations.
3.2 Intended use

It is to be verified by the end-user:
- that the Rotary Jet Mixer is in conformity with respect to tank, vessel or container size in which it will be used.
- the constructions materials (both metallic and non-metallic) are compatible with product, flushing media, cleaning media, temperatures and pressure under the intended use.

3.3 Patents and trademarks

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

Alfa Laval Kolding A/S. All rights reserved.

Alfa Laval Rotary Jet Mixer IM 25 product has patents in the EPO member states and in other countries. The Alfa Laval logotype is a trademark or a registered trademark of Alfa Laval Corporate AB. Other products or company names mentioned herein may be the trademarks of their respective owners. Any rights not expressly granted herein are reserved.
3 Introduction

3.4 ATEX marking

If ordered with ATEX certificate:

ATEX Marking

The Alfa Laval Rotary Jet Mixer IM-25 is certified as category I component. The certification is carried out by the certification body SGS Baseefa, who has issued the certificate no. 10ATEX0188X. The marking on the ATEX certified Alfa Laval Rotary Jet Mixer IM-25 is as follows:

```
IM25_ATEX
```

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 17 regarding special conditions for repair of ATEX certified machines.
3.5 General description

The Alfa Laval Rotary Jet Mixer Iso-Mix 25 is a media driven and media lubricated tank/reactor mixer. As it is self lubricating, there are no lubricating substances such as oil, grease etc. in the machine, which need to be regularly changed.

A = Rotary Jet Mixer
B = Gas
C = Product
D = Liquid feed

A = Liquid feed
B = Product
3 Introduction

3.6 Functioning

The Alfa Laval Rotary Jet Mixer IM 25 is placed inside the tank/reactor under the liquid surface of the liquid volume to be mixed.

The mixer is combined with an external recirculation loop. The fluid of the tank/reactor is recirculated through this loop and reintroduced in the tank/reactor through the Alfa Laval Rotary Jet Mixer IM 25. The more fluid being recirculated, the more effective mixing is obtained.

The mixer should be placed in the centre of the fluid to be mixed. Minimum ½ m under the liquid surface.

![Diagram of the mixer setup](image)

**Figure 1**

A: Normal liquid level  
B: Possible liquid or powder supply  
C: Possible gas supply

The flow of fluid to be mixed passes from the tank into the mixer through a turbine, which is set into rotation. The turbine rotation is through a gearbox transformed into a combined horizontal rotation of the mixer body and a vertical rotation of the nozzles.
The combined motion of the mixer body and the nozzles ensures a fully indexed tank mixing. After 11¼ revolutions of the hub with nozzles (10 3/4 revolutions of the mixer body), one coarse movement pattern has been established which when projected on the tank surface looks as first cycle figure below. During the following cycles, this pattern is repeated 3 times, each of which is displaced ¼ of the mesh in the pattern. After a total of 45 revolutions of the hub with nozzles (43 revolutions of the machine body), a complete “mixing pattern” has been laid out, and the first pattern is repeated. This feature eliminates “dead volumes” in the tank, and makes the Rotary Jet Mixer isos-Mix 25 very efficient automatic tank cleaning machine, when the tank is empty.

The speed of rotation of the turbine depends on the flow rate through the mixer. The higher the flow rate is, the higher the speed of rotation will be. In order to control the RPM of the mixer for a wide range of flow rates, the efficiency of the turbine can be changed by using 50%, 100% or 0% turbine/inlet guide. Apart from this the machine can be supplied with a special slow turning gear, the E-gearing gear box.

Apart from the jet flow through the nozzles, fluid is leaking through the top of the mixer, at the hub and through the bottom cover. The leakages 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 extra friction. The flow through the bottom cover is required to ensure proper lubrication of the gearbox.

The number of rotations required for a satisfactory mixing of a given tank volume depends on the energy input (kw/m³ tank volume), the viscosity of the liquid, required mixing time, and number of mixers per tank.

It is possible to add fluid, gas or solids in the recirculation loop. These ingredients will very effectively be mixed into the entire tank/reactor volume.

When the tank/reactor is empty the Alfa Laval Rotary Jet Mixer IM 25 can be used as a tank cleaning machine and the pattern shown above resembles the pattern of jets sweeping the vessel wall.
4 Installation

4.1 General safety and installation instructions

The Alfa Laval Rotary Jet Mixer IM 25 should be installed in 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 mixer into the system, all supply lines and valves should be flushed to remove foreign matter.

It is recommended to secure the bolted connection between machine and down pipe against loosening to vibrations. Use Locking wire, nabs or equivalent for the actual application.

**Note:** The mixer 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 fulfill 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, guidance and recommendations for the avoidance of hazards due to static electricity.

Electrical equipment such as magnetic valves and electric actuators must not be installed in Ex-zones without type approval and marking, corresponding to the EX-class in question.

**ATEX Warning:** In case potentially explosive liquids are used, precautions should be taken against incidental creation of an explosive mixture with oxygen in the tank atmosphere.

The Rotary Jet Mixer IM 25 as delivered has been tested at the factory before shipping. For transportation reasons, the nozzles have been screwed off after the test. All you will have to do to make the machine ready for use is to refit the nozzles and tighten with wrench. Secure with Loctite No. 242 or equivalent.
Method for tightening the nozzles

1. Clamp machine firmly in a vice: Place machine on top of vice with hub w. nozzles down wards as illustrated on the figure. Clamp on the hub. To protect machine use rubber jaws on the vice.

2. Set torque wrench at the specified tightening torque.
3. Tighten nozzle with the torque wrench.

Recommended tightening torque: 75 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 recognized, the machine should be disassembled to localize the cause.
4 Installation

4.2 Special conditions for safe use in accordance with ATEX Certification

Directive 2014/34/EU

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

ATEX Warning: The unit must be effectively earthed at all times when in use.

In addition to the above mentioned precautions relating to the ATEX guidelines Directive 2014/34/EU, the Safety Precautions on page 12 must be observed.
5.1 Normal operation

Media to be mixed
The Alfa Laval Rotary Jet Mixer IM 25 should be used only in fluids compatible with stainless steel AISI 316/316L, PTFE, PEEK 450G, SAF 2205, A4, ETFE, PTFE and ceramics (Al₂O₃). Please note that PEEK is not resistant to concentrated sulfuric acid. Furthermore, the fluids to be mixed should not contain abrasive materials and fibrous material and the viscosity should not be above 450 cP. Aggressive chemicals, excessive concentrations of chemicals at elevated temperatures, as well as certain hydrochlorides should be avoided. If you are in doubt, contact your local Alfa Laval Sales office.

After use cleaning
After use flush the machine with fresh water. Other fluids than water should never be allowed to dry or set-up in the system due to possible “salting out” or “scaling” of the ingredient.

Pressure
Avoid hydraulic shocks. Increase pressure gradually. Do not exceed 12 bar inlet pressure. Recommended inlet pressure appears from Technical Data (page 34). High pressure in combination with high flow rate will increase consumption of some of wear parts. It is recommended to install a hydrofor in the system, if a positive pump is used for recirculation.

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

ATEX Warning: Draining:
If the mixer 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 14.

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 Preventive maintenance

In order to keep your Alfa Laval Rotary Jet Mixer IM 25 servicing you as an efficient tool in your mixing operations, it is essential to maintain its high performance by following a simple preventive maintenance programme, which will always keep your mixer in good condition.

Good maintenance is careful and regular attention!

The following recommended preventive maintenance is based on a Alfa Laval Rotary Jet Mixer IM 25 working in average conditions. However, you will appreciate that a mixer, 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 for Alfa Laval Rotary Jet Mixer IM 25 (page 40). If not stated otherwise never use unnecessary force (i.e. 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.

Every 4000 working hours (depending on working conditions)

1. Disassemble mixer as described on the following pages.
2. Clean material build-up and deposits from internal parts with chemical cleaner and fine abrasive cloth.
3. Check slide bearings (30) for wear. If hole is worn oval to max diameter of more than 12.4 mm, slide bearing 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 (12) in gear frame. If holes are worn oval to max diameter of more than 15.4 mm, collar bush should be replaced. How to replace collar bushes, see page 28.

   Note: Timely replacement of ball bearings and collar bushes will prevent costly damage to the gearbox.

5. Check worm wheels (13 and 14). If extremely worn, they should be replaced.
6. Check main bush (6). If worn oval to max. diameter more than 15.4 mm, it should be replaced.
7. Assemble mixer as described in the following pages.
8. Check that the mixer is in operating condition by inserting 3/16" hex screwdriver in screw in top of turbine shaft and easily turn turbine shaft clockwise. If any resistance is recognised, the mixer should be disassembled in order to localise the cause.

Apart from the parts specifically mentioned above, all the remaining wear parts should regularly be inspected for wear. Wear parts are specified in the Spare Part Manual EPS00176 available in the on-line Spare Part catalogue Close at Hand or in Alfa Laval Anytime on www.alfalaval.com.
6.2 Service and repair of ATEX certified machines

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

---

**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.

---

6.3 Service intervals

---

**Service intervals**

<table>
<thead>
<tr>
<th>4000 hours (*)</th>
<th>4000 hours (*)</th>
<th>4000 hour (*)</th>
</tr>
</thead>
<tbody>
<tr>
<td>As per above:</td>
<td>As per above:</td>
<td>As per above:</td>
</tr>
<tr>
<td>Service Kit:</td>
<td>Service Kit:</td>
<td>Service Kit:</td>
</tr>
<tr>
<td>TE33B299</td>
<td>TE33B299</td>
<td>TE337B299</td>
</tr>
<tr>
<td>(*) Service check</td>
<td>(*) Service check</td>
<td>(*) Service check</td>
</tr>
</tbody>
</table>

*Note:* The service intervals are recommended on the basis of pure liquids. When liquids contain particles and other kind of abrasives, we recommend shorter service intervals depending on the actual running conditions.
6 Maintenance

6.4 Top assembly

Disassembly
1. Remove screws (34). Loosen with key (tool No. TE135) and unscrew with screwdriver (tool No. TE135A) through holes in the top cone (1).
2. Lift off top cone (1)
3. Remove Screw (17), Spring washer (18) and washer (19). To secure Impeller against rotation, insert carefully screwdriver (tool No. TE135A), through Impeller (4) into a hole in the stem.
4. Pull off impeller (4).

Reassembly
1. Reinstall impeller (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 (19), spring washer (18) and screw (17) and tighten. To secure Impeller against rotation insert carefully screwdriver through Impeller (4) into a hole in the stem.
3. Mount top cone (1). Rotate top cone to align holes in top cone and stem.
4. Mount screws (34) with screwdriver through holes in the top cone. Tighten with key.
Top Assembly
6 Maintenance

6.5 Bottom assembly

Disassembly
1. Turn mixer upside down.
2. Remove screws (36) from bottom cover (33).
3. Remove bottom cover (33) and bottom gasket (35).
4. Remove screws (36) and spring washers (18) along the circumference of gear frame (31). Draw out gear subassembly (holes in gear frame are excellent for holding gear subassembly).

Reassembly
1. Reinsert gear subassembly in bottom of machine body. Mount Spring washers (18) and screws (36) along circumference of Gear frame (31). Tighten screws crosswise.
2. Replace bottom gasket (35) and bottom cover (33).
3. Mount screws (36) and tighten crosswise.

Note: Turbine shaft is inserted carefully through gear wheel and stem. Note also that to secure meshing between gear wheel (8) and pinion (11), it might be necessary to rotate slightly either the whole gear subassembly or the Gear wheel.
6 Maintenance

Bottom Assembly
6 Maintenance

6.6 Hub subassembly

Disassembly
1. Remove nozzles (22). Nozzles are untightened with a wrench on the faces of the nozzles.
2. Remove screws (36) from hub cover (21).
3. Draw out hub subassembly and hub gasket (26). If hub cover (21) clings into body, knock carefully with plastic hammer on outer diameter to loosen.
4. Remove cotter pin (24). Unscrew contra clockwise hub conical part (23) freeing hub cover (21), Ball retainer w. balls (27) and bevel gear (20). To unscrew hub conical part (23), hub nozzle part (25) is held in a vice. caliper (tool No. TE369) is used for the unscrewing using the two holes in end face of hub conical part.

Note: Left-hand thread

If Ball races (21.1 and 20.1) in hub cover (21) and in bevel gear (20) are extremely worn, they should be replaced as well as the ball retainer with balls (27). How to replace Ball races see page 30.

If PEEK hub collar (28.4) is extremely worn it can be replaced.

Reassembly
1. Mount bevel gear (20), ball retainer with balls (27) and hub cover (21) on hub conical part (23). Screw on hub nozzle part (25). Note: Left-handed thread. To tighten, place hub nozzle part in a vice and use caliper (tool No. TE369). Tighten until holes are aligned to pass cotter pin (24). Insert cotter pin and split (preferably new cotter pin).
2. Mount hub gasket (26) on hub subassembly and slide on the hub subassembly. Fit hub cover (21) into body and mount screws (36).
3. Screw on Nozzles (22) and tighten with wrench. If desired secure with Loctite No. 242 or equivalent, see page 12.
Hub Subassembly
6 Maintenance

6.7 Stem subassembly

Disassembly

1. Place mixer in upside-down position.
2. UnScrew gland (5). Note: Left-hand thread. Push out main bush (6).
3. Turn mixer upside down.
4. Remove screws (10) in Gear wheel (8). To prevent rotation of stem (3) mount two 1/4" 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.
5. Draw out Gear wheel with Ball race (8) and ball retainer with balls (27).
6. Push out stem (3).

If ball races in body (28.3) and on gear wheel (8.1) are extremely worn they should be replaced together with ball retainer with balls (27). How to replace ball races see page 30.

If blue liners on stem are extremely worn, they can be replaced. This part requires that a precise procedure is followed to accomplish installation. It is highly recommended that an authorized Alfa Laval Tank Equipment Service Center perform the replacement when necessary.

Reassembly

1. Push stem (3) into body. Turn mixer upside-down.
2. Place ball retainer with balls (27) and gear wheel (8) into body on ball race. Rotate gear wheel to check free rotation.
3. Mount gear wheel (8) with 1/4" screws and tighten crosswise.
4. Turn mixer to upright position. Remount main bush (6) in gland (5) and screw into stem (3).

Note: Left-hand thread.
Stem Subassembly
6 Maintenance

6.8 Gear subassembly

Disassembly
1. Hold turbine shaft (7) against 1st stage Worm wheel (13) with one hand and loosen screws (17) in pinion (11) and horizontal shaft (29) with the other hand.
2. Draw out turbine shaft (7) after screw (17), spring washer (18) and washer (16) have been removed. Use faces on turbine shaft to hold against rotation.

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

3. Draw out horizontal shaft (29) and 1st stage worm wheel (13) after removal of screw (17), spring washers (18) and washer (16).
4. Draw out pinion (11) and 2nd stage worm wheel (14), also freeing journal (15) after removal of screw (17), spring washer (18) and washer (16).
5. Remove bearing covers (32) and slide bearings (30) after removal of screws (17).

How to replace Collar bushes (12), see page 28.

Reassembly
1. Push slide bearing (30) into gear frame (31) and fix bearing covers (32) with screws (17). Tighten crosswise.
2. Insert 2nd stage worm wheel (14), pinion (11) and journal (15). Mount washer (16), spring washer (18) and fix with screw (17). Check rotation.
3. Insert 1st stage worm wheel (13) and horizontal shaft (29). Mount washer (16), spring washer (18) and fix with screw (17). Check rotation.
4. Insert turbine shaft (7). Mount washer (16), spring washer (18) and fix with screw (17). Use faces on turbine shaft to hold against rotation when tightening screw.
5. Hold turbine shaft (7) against 1st stage worm wheel and tighten screws (17) in horizontal shaft (29) and pinion (11). Check rotation on turbine shaft.
Gear subassembly
6.9 Replacement of collar bushes

1. Place gear frame (31) upside down with a firm support under the top cone. Use for instance jaws of a vice. Do not clamp on machined surfaces. With pusher (tool no. TE81B031, see page 40) 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. Remove all remains of old Araldite etc. Holes must be perfectly clean before mounting new collar bushes. Rinse with chemical cleaner.
5. Coat new collar bushes with CIBA-GEIGY two component Standard blue Araldite and push into gear frame.
6. To hold collar bushes in correct position, insert fixtures (tool no. TE81B032, see page 40) and let harden according to instructions.

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

Removal of old Collar bushes

Mounting of new Collar bushes:
6 Maintenance

6.10 Replacement of ball races

**In body**

1. A. With big end downwards knock several times body with bearings (28) hard against firm wooden support until ball race (28.3) 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 (28.2). 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 (28.2) must be remounted into body – see page 28.

2. Clean surfaces and place ball race (28.3) on main collar lower (28.2). 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 (8) on support. Support only under ball race (8.1). 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 (21) 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

6.11 Replacement of main collars

Although normally exposed to very limited wear, it is possible to replace Main collar (28.2) in Body. The procedure to do this is described below.

**Warning:** Replacement of Main Collars involves risk of damaging the special threads and accordingly the body. It is recommended to let an authorized Alfa Laval distributor do the replacement.

**Main collar lower**

1. Place body (28) in a vice upright position. Do not clamp on machined faces. Insert tool (see page 40) into main collar (28). To loosen Loctite, knock hard on tool with hammer. 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 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. Apply Loctite no. 242 on thread.

4. Screw in new main collar. Attention should be given to make sure that thread is in correct engagement before screwing in main collar.

5. Tighten main collar fully home. Several times knock hard on tool and tighten up.
### Symptom: Slow or no rotation of machine

<table>
<thead>
<tr>
<th>Possible Causes</th>
<th>Fault finding</th>
</tr>
</thead>
<tbody>
<tr>
<td>No or insufficient liquid flow</td>
<td>a). Check if supply valve is fully open.</td>
</tr>
<tr>
<td></td>
<td>b). Check if inlet pressure to mixer is correct.</td>
</tr>
<tr>
<td></td>
<td>c). Check supply line/filter for restrictions/clogging.</td>
</tr>
<tr>
<td></td>
<td>d). Remove nozzles and check for clogging. If blocked, carefully clean nozzle</td>
</tr>
<tr>
<td></td>
<td>without damaging steam straighteners and nozzle tip.</td>
</tr>
<tr>
<td></td>
<td>e). Remove top cone/nipple, guide and impeller (see page 18) and check for</td>
</tr>
<tr>
<td></td>
<td>clogging in impeller area.</td>
</tr>
<tr>
<td></td>
<td>If large particles repeatedly get jammed in the mixer, install filter or reduce mesh size of installed filter in supply line.</td>
</tr>
<tr>
<td>Foreign material or material build-up</td>
<td>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.</td>
</tr>
<tr>
<td>a). Impeller jammed</td>
<td>Remove guide and impeller (see page 22) and remove foreign material.</td>
</tr>
<tr>
<td>b). Turbine shaft sluggish in main bush</td>
<td>Remove gear subassembly with turbine shaft (see page 20) and Gland (5) and</td>
</tr>
<tr>
<td></td>
<td>clean Main bush.</td>
</tr>
<tr>
<td>c). Bevel gear jammed/sluggish</td>
<td>Remove Top cone/Nipple and hub Subassembly (see page 22) Clean teeth on stem and bevel gear.</td>
</tr>
<tr>
<td>d). Stem jammed/sluggish</td>
<td>Remove gear subassembly (see page 20). Check free rotation of stem. Remove stem (see page 24). Remove foreign material/material build-up on stem and inside main collars. Clean ball races and ball retainer with balls. Also clean Main bush.</td>
</tr>
<tr>
<td>Wear</td>
<td>a). Slide bearings See page 16.</td>
</tr>
<tr>
<td></td>
<td>b). Main bush See page 16.</td>
</tr>
<tr>
<td></td>
<td>c). Worm wheels See page 16.</td>
</tr>
<tr>
<td></td>
<td>d). Collar bushes See page 16.</td>
</tr>
<tr>
<td></td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>f). Horizontal shaft Check clearance in Collar bushes. Transverse movement should not exceed 0.5 mm. Also inspect worm for wear.</td>
</tr>
<tr>
<td>Mechanical defects</td>
<td>Replace Worm wheel.</td>
</tr>
<tr>
<td>a). Worn wheel/teeth broken</td>
<td>Replace Worm wheel.</td>
</tr>
<tr>
<td>b). Worm wheel can rotate on Horizontal shaft/Pinion due to damaged driver faces.</td>
<td>Inspect teeth on stem and bevel gear for deformation. Mount hub and stem in body (see page 22 and 20). 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.</td>
</tr>
<tr>
<td>c). Damaged teeth on bevel gear</td>
<td></td>
</tr>
</tbody>
</table>
### Technical Data

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight of machine</td>
<td>13 kg (29.1 lbs)</td>
</tr>
<tr>
<td>Working pressure</td>
<td>2-12 bar (30-175 psi)</td>
</tr>
<tr>
<td>Recommended inlet pressure</td>
<td>5-10 bar (45-120 psi)</td>
</tr>
<tr>
<td>Working temperature max.</td>
<td>95°C (200°F)</td>
</tr>
<tr>
<td>Max. temperature</td>
<td>140°C (284°F)</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>0-140°C (95°C - 140°C when <strong>NOT</strong> operated)</td>
</tr>
<tr>
<td>Materials</td>
<td>AISI 316/316L, PTFE, PEEK 450G, SAF 2205, A4, Teflon TFM, Tefzel, ceramics (AL₂O₃)</td>
</tr>
</tbody>
</table>

*Dimensions in mm

Shown with flange connection

* with nozzle extensions
Performance Data

Flow rate (m³/h)

Inlet pressure (PSI/bar)

Throw length (m)

Inlet pressure (PSI/bar)

Nozzles

- 2x0.21mm
- 2x0.19mm
- 2x0.17mm
- 2x0.15mm
**Note:**

The distance (reach) of the jet from the rotary nozzles at which the jets still have a reasonable mixing effect depends i.a. of pressure, the diameter of the nozzles, the viscosity of the fluid, the desired mixing time and various other parameters.

The effective reach of the jets as indicated above is in a fluid with a viscosity of 1 cP.

The pressure is measured at the mixer. This means that due consideration shall be taken to pressure drops in the recirculation line from the pump to the mixer as well as to static pressure differences, when the jet mixing system is being dimensioned.
This manual covers the product programme for Alfa Laval Rotary Jet Mixer IM-25

9.1 Standard configuration for Alfa Laval Rotary Jet Mixer IM 25

<table>
<thead>
<tr>
<th>Connection</th>
<th>Nozzles (mm), 2½ thread conn.</th>
<th>Item no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2½” BSP</td>
<td>2 x ø15</td>
<td>TE33E015</td>
</tr>
<tr>
<td></td>
<td>2 x ø17</td>
<td>TE33E017</td>
</tr>
<tr>
<td></td>
<td>2 x ø19</td>
<td>TE33E019</td>
</tr>
<tr>
<td></td>
<td>2 x ø21</td>
<td>TE33E021</td>
</tr>
</tbody>
</table>

The mixer is equipped with a clutch in the hub, which gives the possibility of rotating 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
  TE33BXXX70 ATEX.

Explanation to Add-ons
ATEX, category 1 for installation in zone 0/20 in accordance with Directive 2014/34/EU.
10 Parts list and drawing, service kit and tools

10.1 Parts list, parts drawing and spare part kits
### Parts list

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Qty</th>
<th>Denomination</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Top Cone 2½” BSP</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>Stem with liners</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>Impeller 100%</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>Gland</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>Main Bush</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>Turbine shaft</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>Gear wheel w. Ball race</td>
</tr>
<tr>
<td>8.1</td>
<td>1</td>
<td>Ball race</td>
</tr>
<tr>
<td>10</td>
<td>6</td>
<td>Screw</td>
</tr>
<tr>
<td>11</td>
<td>1</td>
<td>Pinion</td>
</tr>
<tr>
<td>12</td>
<td>3</td>
<td>Collar bush</td>
</tr>
<tr>
<td>13</td>
<td>1</td>
<td>Worm wheel w. reinforcem.</td>
</tr>
<tr>
<td>14</td>
<td>1</td>
<td>Worm wheel w. reinforcem.</td>
</tr>
<tr>
<td>15</td>
<td>1</td>
<td>Journal</td>
</tr>
<tr>
<td>16</td>
<td>3</td>
<td>Washer</td>
</tr>
<tr>
<td>17</td>
<td>17</td>
<td>Screw</td>
</tr>
<tr>
<td>18</td>
<td>9</td>
<td>Spring washer</td>
</tr>
<tr>
<td>19</td>
<td>1</td>
<td>Washer</td>
</tr>
<tr>
<td>20</td>
<td>1</td>
<td>Bevel gear w. Ball race</td>
</tr>
<tr>
<td>20.1</td>
<td>1</td>
<td>Ball race</td>
</tr>
<tr>
<td>21</td>
<td>1</td>
<td>Hub cover w. Ball race</td>
</tr>
<tr>
<td>21.1</td>
<td>1</td>
<td>Ball race</td>
</tr>
<tr>
<td>22</td>
<td>2</td>
<td>Nozzle</td>
</tr>
<tr>
<td>23</td>
<td>1</td>
<td>Hub conical part</td>
</tr>
<tr>
<td>24</td>
<td>1</td>
<td>Cotter Pin</td>
</tr>
<tr>
<td>25</td>
<td>1</td>
<td>Hub nozzle part</td>
</tr>
<tr>
<td>26</td>
<td>1</td>
<td>Hub gasket</td>
</tr>
<tr>
<td>27</td>
<td>2</td>
<td>Ball retainer w. balls</td>
</tr>
<tr>
<td>28</td>
<td>1</td>
<td>Body</td>
</tr>
<tr>
<td>28.2</td>
<td>1</td>
<td>Main collar lower</td>
</tr>
<tr>
<td>28.3</td>
<td>1</td>
<td>Ball race</td>
</tr>
<tr>
<td>28.4</td>
<td>1</td>
<td>Hub collar</td>
</tr>
<tr>
<td>29</td>
<td>1</td>
<td>Horizontal shaft</td>
</tr>
<tr>
<td>30</td>
<td>2</td>
<td>Slide Bearing</td>
</tr>
<tr>
<td>31</td>
<td>1</td>
<td>Gear frame</td>
</tr>
<tr>
<td>32</td>
<td>2</td>
<td>Bearing cover</td>
</tr>
<tr>
<td>33</td>
<td>1</td>
<td>Bottom cover</td>
</tr>
<tr>
<td>34</td>
<td>8</td>
<td>Screw</td>
</tr>
<tr>
<td>35</td>
<td>1</td>
<td>Bottom gasket</td>
</tr>
<tr>
<td>36</td>
<td>12</td>
<td>Screw</td>
</tr>
</tbody>
</table>

Parts marked with ● are included in the Standard Spare Part Kit standard: TE33B299

### Service kits

<table>
<thead>
<tr>
<th>Denomination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spar e part k it sta nda r d ......................... TE33B299</td>
</tr>
</tbody>
</table>

The machine can be delivered with ATEX certification.

Configuration according to delivery note/order.

*Note: Position 28 is not sold as single spare part component. Only sold as part of a machine maintenance/repair order. For further information please contact Alfa Laval Customer Support.*
10 Parts list and drawing, service kit and tools

10.2 Tools

Standard Tool Kit, Article no. TE81B065

<table>
<thead>
<tr>
<th>Denomination</th>
<th>Qty x tool item no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hex key for 3/16” screw</td>
<td>1 x TE134</td>
</tr>
<tr>
<td>Hex screwdriver unbraco for 5/32”</td>
<td>2 x TE134A</td>
</tr>
<tr>
<td>Hex key for 1/4” screw</td>
<td>1 x TE135</td>
</tr>
<tr>
<td>Hex screwdriver for 1/4” screw</td>
<td>1 x TE135A</td>
</tr>
<tr>
<td>Caliper</td>
<td>1 x TE369</td>
</tr>
</tbody>
</table>

Available on request

- TE81B031 Pusher for Collar bush 2”
- TE81B032 Fixture set for Collar bush 2”

Sketch of tools for replacement of Collar Bush

- TE81B031 Pusher for 2” gear frame
- TE81B032 Fixture set for gear frame

![Sketch of tools for replacement of Collar Bush](image)
Sketch of tools for replacement of Main Collars

Available on request
TE81B132: Tool for lower collar (2” + 3” TCM) complete
11 General information

11.1 Service & 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 parts drawing as well as on all instruction drawings, the individual parts have a number, which is the same on all drawings. From the number, the part is easily identified in the parts list, page 38.

Individual parts should always be ordered from the parts list, page 38. Item number and denomination should be clearly stated. Please refer to the Spare Part Manual for Alfa Laval Rotary Jet Mixer IM 25, EPS00176, for information on item numbers. The Spare Part manual is available from the on-line Alfa Laval product catalogue Anytime at www.alfalaval.com or in the Close at Hand Spare Part Catalogue.

Please also quote the type of machine and serial number. This will help us to help you. The type and serial number are stamped on the body of the mixer.

11.3 How to contact Alfa Laval Kolding A/S

For further information please feel free to contact:

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
12.1 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.

© Alfa Laval Corporate AB
This document and its contents is owned by Alfa Laval Corporate AB and protected by laws governing intellectual property and thereto related rights. It is the responsibility of the user of this document to comply with all applicable intellectual property laws. Without limiting any rights related to this document, no part of this document may be copied, reproduced or transmitted in any form or by any means (electronic, mechanical, photocopying, recording, or otherwise), or for any purpose, without the expressed permission of Alfa Laval Corporate AB. Alfa Laval Corporate AB will enforce its rights related to this document to the fullest extent of the law, including the seeking of criminal prosecution.