



Instruction Manual

Alfa Laval Rotary Jet Mixer IM 25



Covering:
Standard machines
Machines delivered with ATEX/IECEx Certification in accordance with Directive 2014/34/EU

ESE02186-EN10 2022-11

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 Declarations of Conformity

EU Declaration of Conformity

The Designated Company

Alfa Laval Kolding A/S, Albuen 31, DK-6000 Kolding, Denmark, +45 79 32 22 00

Company name, address and phone number

Hereby declare that

Rotary Jet Mixer

Designation

IM25

Type

Serial number from 2019-0001 to 2030-99999


is in conformity with the following directives with amendments:

- Machinery Directive 2006/42/EC

- ATEX Directive 2014/34/EU and the following harmonized standards are used:

EN ISO 80079-36:2016, EN ISO 80079-37:2016, DS/EN ISO/IEC 80079-34:2011, Annex A, paragraph A.5.3 Rotating machines

EC Type Examination Certificate no. Baseefa10ATEX0188X and IECEx BAS 19.0087X

Marking:  II 1G Ex h IIC 85°C... 175°C Ga
II 1D Ex h IIIC T85°C... T140°C Da

The QAN (Quality Assurance Notification) is carried out by SGS Fimko Oy, Särkiniementie 3, Helsinki 00211, Finland. Notified Body No. 0598.
EU Type Examination Certification is carried out by SGS Fimko Oy, Särkiniementie 3, Helsinki 00211, Finland. Notified Body no. 0598.

IECEx Certificate of Conformity is carried out by Baseefa Ltd., Rockhead Business Park, Staden Lane, Buxton, Derbyshire SK17 9RZ, United Kingdom. IECEx Accepted Certification Body (ExCB).

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

Global Product Quality Manager

Title

Lars Kruse Andersen

Name

Kolding, Denmark

Place

2022-11-08

Date (YYYY-MM-DD)

Signature

This Declaration of Conformity replaces Declaration of Conformity dated 2019-06-01



1 Declarations of Conformity

UK Declaration of Conformity

The Designated Company

Alfa Laval Kolding A/S, Albuen 31, DK-6000 Kolding, Denmark, +45 79 32 22 00

Company name, address and phone number

Hereby declare that

Rotary Jet Mixer

Designation

IM25


Type

Serial number from 2019-0001 to 2030-99999

is in conformity with the following directives with amendments:

- The Supply of Machinery (Safety) Regulations 2008
 - The Equipment and Protective Systems Intended for use in Potentially Explosive Atmospheres Regulations 2016
- EN ISO 80079-36:2016, EN ISO 80079-37:2016, DS/EN ISO/IEC 80079-34:2011, Annex A, paragraph A.5.3 Rotating machines

UKEx Type Examination Certificate no. BAS22UKEX0071X and IECEx BAS 19.0087X

Marking:  II 1G Ex h IIC 85°C... 175°C Ga
II 1D Ex h IIC T85°C... T140°C Da

The UK QAN (Quality Assurance Notification) is carried out by Baseefa Ltd., Rockhead Buisness Park, Staden Lane, Buxton, Derbyshire SK17 9RZ, United Kingdom, Notified Body No. 1180.

UKType Examination Certification is carried out by Baseefa Ltd., Rockhead Buisness Park, Staden Lane, Buxton, Derbyshire SK17 9RZ, United Kingdom, Notified Body No. 1180.

IECEX Certificate of Conformity is carried out by Baseefa Ltd., Rockhead Business Park, Staden Lane, Buxton, Derbyshire SK17 9RZ, United Kingdom. IECEx Accepted Certification Body (ExCB).

Signed on behalf of: Alfa Laval Kolding A/S

Global Product Quality Manager

Title

Lars Kruse Andersen

Name

Kolding, Denmark

Place

2022-11-08

Date (YYYY-MM-DD)

Signature

DoC Revison_01_112022



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 mixer!

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 mixer.

NOTE

Indicates important information to simplify or clarify procedures.

2.2 Warning signs

General warning:



ATEX/IECEx warning:



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 your Rotary Jet Mixer. 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.

You will find the information contained in this manual simple to follow, but 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 and serial number with all your enquiries; this will help us to help you. The type and serial number are placed on the body of the mixer.

Warning:



Before installing the machine and setting it into operation, carefully read the General Safety and Installation Instructions (page 14) and the special conditions for safe use in accordance with ATEX/IECEX directive 2014/34/EU (page 16) and take all necessary precautions according to your application and local regulations.

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.

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.
- that the construction materials (both metallic and non-metallic) are compatibility with product, flushing media, cleaning media, temperatures and pressure under the intended use.

The rotary jet mixer is intended for use in closed tank, vessel or container. If used in open environment see 4.3 General safety and installation instructions (page 14).

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

Rotary Jet Mixer IM 25

3.4 Marking

Alfa Laval Rotary Jet Mixers are marked to allow for recognition of type of machine, machine name, serial number and manufacturing address. The marking is placed on the body of the mixer.

Rotary Jet Mixer
IsoMix IM25
Patent: EP 1 324 818
s/n.: yyyy-xxxxx
Alfa Laval, DK-6000 Kolding, Albuen 31
CE

Serial number explanation

Machines supplied with or without standard documentation:

yyyy-xxxxx: serial number

yyyy: year

xxxxx: 5 digit sequential number

3.5 ATEX/IECEx marking

The Alfa Laval Rotary Jet Mixer IM 25 is certified as category I component. The ATEX certification is carried out by the Notified Body SGS Fimko Oy, who has issued the certificate no. Baseefa10ATEX0188X.

The IECEx certification is carried out by the Certification Body SGS Baseefa Ltd., who has issued the certificate no. IECEx BAS 19.0087X.

Note

Explosion protection type is constructional safety "c".

The marking on the ATEX/IECEx certified Alfa Laval Rotary Jet Mixer IM 25 is as follows (for information on marking position see section 3.1 Introduction):

Rotary Jet Mixer
IsoMix IM25
Patent: EP 1 324 818
s/n.: yyyy-xxxxx
Alfa Laval, DK-6000 Kolding, Albuen 31
 II 1G Ex h IIC 85°C...175°C Ga
II 1D Ex h IIIC T85°C...T140°C Da
CE 0598 Baseefa 10ATEX0188X IECEx BAS 19.0087X

Serial number explanation

Machines supplied with or without standard documentation:

yyyy-xxxxx: serial number

yyyy: year

xxxxx: 5 digit sequential number

3.6 ATEX/IECEx temperature class and code

The maximum surface temperature depends mainly on operating conditions which are the temperature of the mixing fluid and the ambient temperature.

Group II EPL Ga

The gas temperature class is corrected with a safety margin of 80% due to a requirement for Group II EPL Ga equipment. The gas temperature class depends on the mixing fluid temperature or the ambient temperature, whichever of the two is the highest.

Table for determining temperature class (gas atmospheres)		
Gas Temperature class	Mixing fluid temperature, T_p (°C)	Ambient temperature, T_{amb} (°C)
85°C (T6)	$\leq +68^\circ\text{C}$	$\leq +68^\circ\text{C}$
100°C (T5)	$\leq +80^\circ\text{C}$	$\leq +80^\circ\text{C}$
135°C (T4)	$\leq +108^\circ\text{C}$	$\leq +108^\circ\text{C}$
175°C	$\leq +140^\circ\text{C}$	$\leq +140^\circ\text{C}$

Group III EPL Da

The dust temperature class depends on the mixing fluid temperature or the ambient temperature, whichever of the two is the highest.

No dust layer is considered.

Table for determining temperature class (dust atmospheres)		
Dust Temperature code	Mixing fluid temperature, T_p (°C)	Ambient temperature, T_{amb} (°C)
T85°C	$\leq +85^\circ\text{C}$	$\leq +85^\circ\text{C}$
T100°C	$\leq +100^\circ\text{C}$	$\leq +100^\circ\text{C}$
T135°C	$\leq +135^\circ\text{C}$	$\leq +135^\circ\text{C}$
T140°C	$\leq +140^\circ\text{C}$	$\leq +140^\circ\text{C}$

Example of gas class determination

Mixing fluid temperature is 67°C and ambient temperature is 75°C.

Gas class = T5

ATEX/IECEx marking on the equipment:

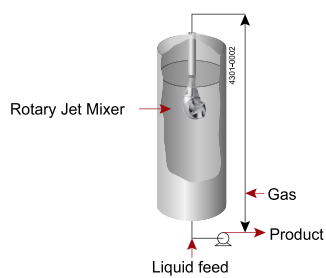


II 1G Ex h IIC 85°C...175°C Ga
II 1D Ex h IIIC T85°C...T140°C Da

4.1 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. For use in explosive hazard zones the Alfa Laval Rotary Jet Mixer IM 25 ATEX/IECEx version can be used, provided it is installed according to safety instructions in local regulations.

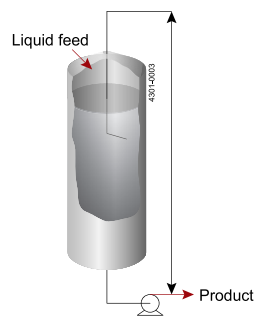
The Rotary Jet Mixing technology



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

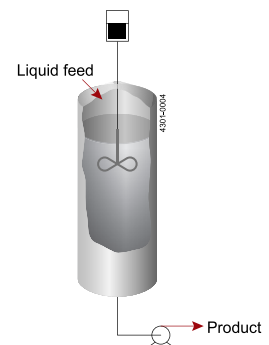
Traditional Mixing technology

Round pumping



A = Liquid feed
 B = Product

Propeller mixing



4 Installation

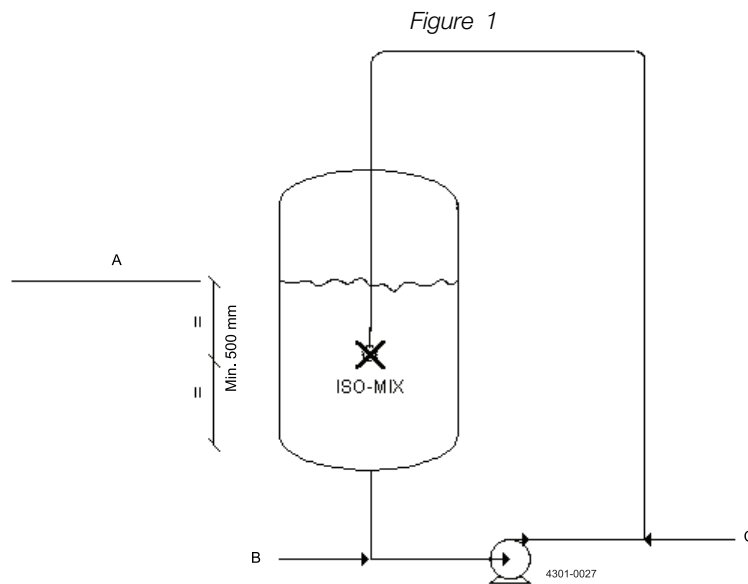
Rotary Jet Mixer IM 25

4.2 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 $\frac{1}{2}$ m under the liquid surface.



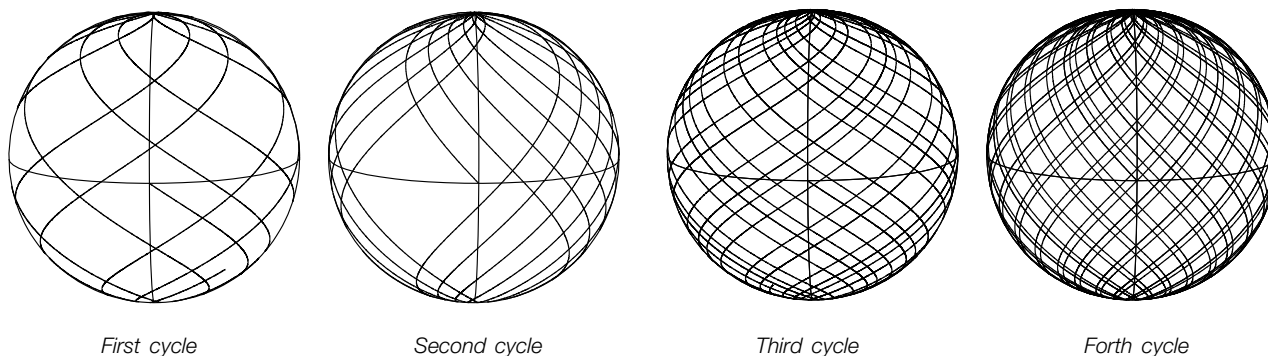
A: Normal liquid level

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 $11\frac{1}{4}$ revolutions of the hub with nozzles ($10\frac{3}{4}$ 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 $\frac{1}{4}$ 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 los-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/m^3 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

Rotary Jet Mixer IM 25

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

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.

Warning:



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

For information on use in potential explosive atmospheres see paragraph 4.4 Specific conditions for safe use in accordance with ATEX/IECEX certification page 16.

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.



TD523569

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

Recommended tightening torque: 75 Nm



TD523570

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

Rotary Jet Mixer IM 25

4.4 Specific conditions for safe use in accordance with ATEX/IECEx certification

Directive 2014/34/EU

NOTE

Explosion protection type is constructional safety “c”.

Warning: Operated in a hazardous area



The unit may be operated in a hazardous area only when completely filled with cleaning/mixing fluid/steam. If a medium other than the mixing/cleaning fluid/steam is passed through the equipment the flow must not be high enough to cause the equipment to operate.

Warning: Operating guidance



The unit shall be operated in line with guidance provided by IEC/TS 60079-32-1 for tank cleaning.

Warning: Temperature class and ambient temperature range



The maximum surface temperature depends mainly on operating conditions which are the temperature of the mixing/cleaning fluid and ambient temperature. The temperature class and ambient temperature range are shown in paragraph 3.6 ATEX/IECEx temperature class and code, page 9.

Warning: Max. permitted temperature



When working:
The maximum permitted mixing/cleaning fluid temperature and ambient temperature is 95°C.
When not working:
The maximum permitted ambient temperature is 140°C.

Warning: Draining using compressed air



Draining using compressed air must not be done in ex classified zone.
Draining using compressed air is possible in non ex classified zones (see page 43).

Warning: Earthing



All metal and other conductive or dissipative material should be connected to earth with the exception of very small items.
For further information see IEC/TS 60079-32-1:2013 Explosive atmospheres – Part 32-1: Electrostatic hazards, guidance. With focus on clause 6.2.3, 7.2.1, 7.3, 7.9.2, 13.

Warning: Earthed when in use



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

4.4 Specific conditions for safe use in accordance with ATEX/IECEx certification

Warning: Max. permitted steaming temperature

The maximum permitted steam temperature through the machine and ambient temperature is 140°C.

**Warning: Steaming tanks larger than 100 m³**

Tanks with capacities larger than 100 m³ that could contain a flammable atmosphere should not be steam cleaned, as steam cleaning tanks produces an electrostatically charged mist. Tanks smaller than 100 m³ may be steam cleaned.

For further information see IEC/TS 60079-32-1:2013 Explosive atmospheres – Part 32-1: Electrostatic hazards, guidance. With focus on clause 7.10 and 8.5.

**Tank size information**

NOTE: The tank cleaning machine has been certified by accredited notified body and can operate in tanks having an enclosed volume up to 100 m³ as long as all ATEX/IECEx warnings in the instruction manual are complied with.

General guidelines for tanks larger than 100 m³:

Tanks larger than 100 m³ must not be steam cleaned – See guide IEC/TS 60079-32-1:2013 clause 7.10.5 and 8.5

To use the unit 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 guidelines are described in the guide IEC/TS 60079-32-1:2013.

It must be ensured that the equipollently bonding of all conductive metal objects is in accordance with national regulations for use.

The cleaning fluid conductivity must correspond to the products in the group “High conductivity”, cf. IEC/TS 60079-32-1:2013 clause 7.1 and 7.2.

High conductivity	> 10 000 pS/m
Medium conductivity	between $25 \times \epsilon_r$ pS/m and 10 000 pS/m
Low conductivity	< $25 \times \epsilon_r$ pS/m

For liquids with a dielectric constant of around 2, (e.g. hydrocarbons), these classifications reduce to:

High conductivity	> 10 000 pS/m
Medium conductivity	between 50 pS/m and 10 000 pS/m
Low conductivity	< 50 pS/m

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/IECEx certification for this unit except for tanks up to 100 m³. For further information see IEC/TS 60079-32-1:2013 Explosive atmospheres – Part 32-1: Electrostatic hazards, guidance with focus on clause 7.1.3, 7.1.4, 7.2.1, 7.2.4.

4 Installation

Rotary Jet Mixer IM 25

4.4 Specific conditions for safe use in accordance with ATEX/IECEx certification

Warning: Process generated electrostatic



The user must address the electrostatic hazards generated from the process of the equipment in accordance with guidance document IEC/TS 60079-32-1:2013.

Warning: Electrostatically charged liquid



Liquids can become electrostatically charged when they move relative to contacting solids or the spraying of liquids can also create a highly charged mist or spray. The liquid must be made electrically conductive by additives or otherwise.

For further information see IEC/TS 60079-32-1:2013 Explosive atmospheres – Part 32-1: Electrostatic hazards, guidance. With focus on clause 7.1.3, 7.1.4, 7.2.1, 7.2.4.

Warning: Appropriate cleaning fluid



The cleaning fluid should be appropriate for the application (e.g. so no chemical reaction can take place between the cleaning fluid and the residue of process fluid/powder/compound which can generate heat or a hybrid mixture).

Chemical reactions in Zone 20 - Hybrid mixtures:

End-user must ensure that the cleaning fluid used does not create a hybrid mixture according to IEC 60079-10-1:2015 Annex I.1 in connection with powder / dust residues in the tank in zone 20.

This should ensure that the atmosphere does not change to a classification that lies outside the machine's certified scope. When the machine is used for cleaning tanks containing potentially flammable dust atmospheres, and a potentially flammable fluid is used as the cleaning fluid then an assessment of the hybrid mixture shall be undertaken by the user, prior to operation.

For further information see IEC 60079-10-1:2015 Explosive atmospheres – Part 10-1: Classification of areas – Explosive gas atmospheres. With focus on clause 3.6.6 and Annex I – Hybrid mixtures.

Warning: Appropriate mixing fluid



The mixing fluid should be appropriate for the application (e.g. so no chemical reaction can take place between the mixing fluid and the residue of process fluid/compound which can generate heat).

Warning: Mixing conditions



When the IM machine is used for mixing, it shall be fully submerged in the tank liquid and it shall only be used for submerged mixing/blending of liquids.

4.4 Specific conditions for safe use in accordance with ATEX/IECEx certification

Warning: Fluid pressure

The maximum permitted cleaning/mixing fluid pressure is 12 bar.



Warning: Risk due to tank liquid surface potential

When jet mixing there is a risk for the jet to break the liquid surface in the tank with a vapour space where a high field strength could occur.

If the jet breaks the liquid surface there is a risk due to the surface potential of the liquid in the tank.

The tank liquid and mixing fluid must be made electrically conductive by additives or otherwise.

For further information see IEC/TS 60079-32-1:2013 Explosive atmospheres – Part 32-1: Electrostatic hazards, guidance.

With focus on clause 7.9.5 – Jet mixing.



In addition to the above mentioned precautions relating to Directive 2014/34/EU, the Safety Precautions on page 14 must be observed.

5 Operation

Rotary Jet Mixer IM 25

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.

Pressure

Avoid hydraulic shocks. Increase pressure gradually. Do not exceed 12 bar inlet pressure. Recommended inlet pressure appears from Technical Data page 41. 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.

Draining using compressed air

If the machine is drained using compressed air, then the compressed air pressure must not cause the machine body rotation to exceed 4.5 rpm (corresponding to approx. 13 sec. per rev of the body) in order to avoid risk of machine breakdown.

Draining should always be done inside the tank.

See paragraph 4.4 Specific conditions for safe use in accordance with ATEX/IECEX certification (page 16).

Steam cleaning

If steam cleaning is done through the machine, the steam pressure must not cause the machine body rotation to exceed 15 rpm (corresponding to approx. 4 sec. per rev of the body) in order to avoid risk of machine breakdown. See paragraph 4.4 Specific conditions for safe use in accordance with ATEX/IECEX certification (page 16).

Temperature

The maximum recommended cleaning fluid temperature is 90°C. The maximum recommended steam temperature is 140°C. The maximum ambient temperature is 140°C.

See paragraph 4.4 Specific conditions for safe use in accordance with ATEX/IECEX certification (page 16).

After use cleaning

After use flush the mixer with fresh water. Fluids should never be allowed to dry or set-up in the Alfa Laval Rotary Jet Mixer IM 25 system due to possible "salting out" or "scaling" of the ingredient.

5.2 Safety precautions

The machine is intended for use inside a tank only. As peak velocity of main jets reaches 40 m/s, Alfa Laval Rotary Jet Mixer IM 25 must not be operated in open air or when tank is open.

Warning:



Hot chemicals and steam under pressure may be used for cleaning and sterilising. Protect against scalding and burning. Never tamper with or try to open clamps or other connections while system is in operation. Make sure that system is depressurised and drained before disassembly.

The cleaning jets impinging the tank surface are a source of noise. Depending on pressure and distance to the tank walls, noise level may reach up to 85 dB.

Warning:



Tanks may contain poisonous/hazardous products or products which represent an environmental or safety risk. Never open tank and dismount the machine without checking previous tank contents and necessary precautions.

See also 3.6 ATEX/IECEx temperature class and code, page 9 .

6 Maintenance

Rotary Jet Mixer IM 25

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 48). 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 34.

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/IECEX certified machines

Warning:



All service and repair of ATEX/IECEX 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.

Changes to the machine are not allowed without approval by the person responsible for the ATEX/IECEX 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/IECEX Directive) is no longer valid.

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

6 Maintenance

Rotary Jet Mixer IM 25

6.3 Top assembly

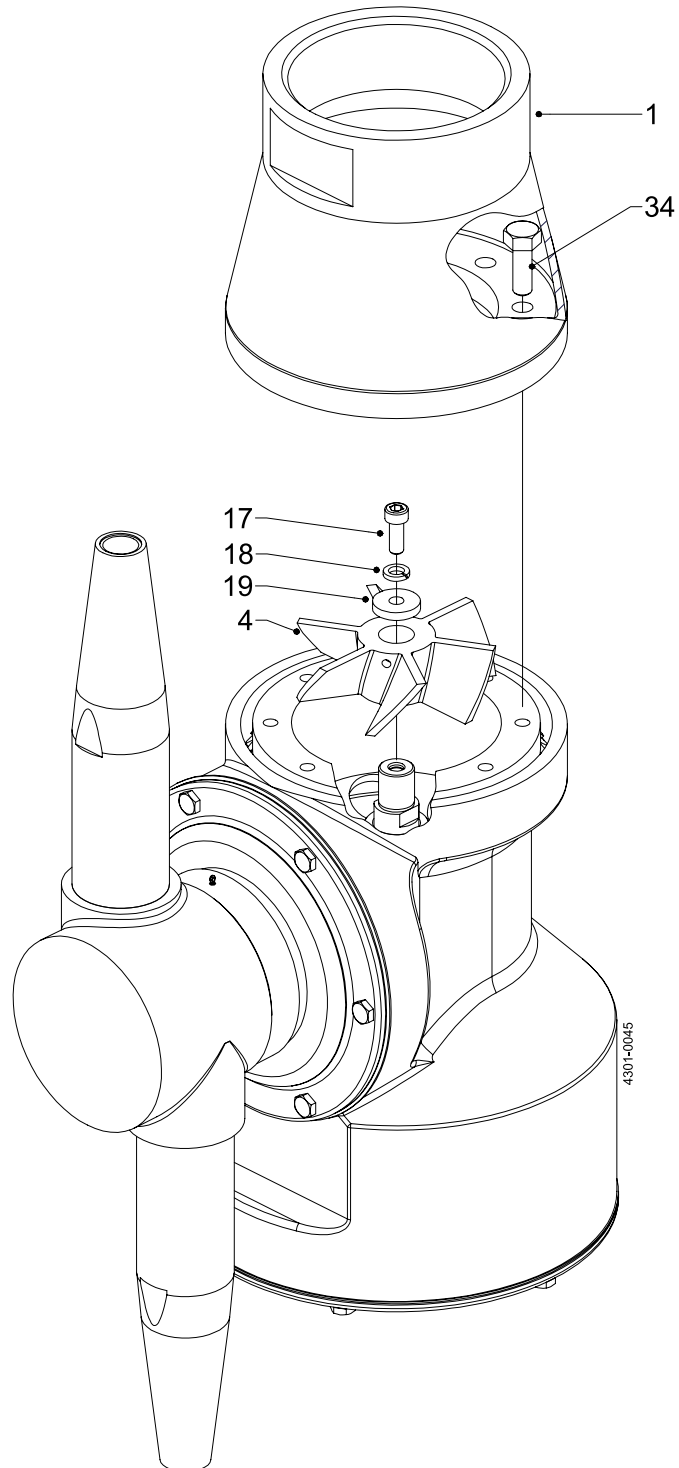
Disassembly

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

Rotary Jet Mixer IM 25

6.4 Bottom assembly

Disassembly

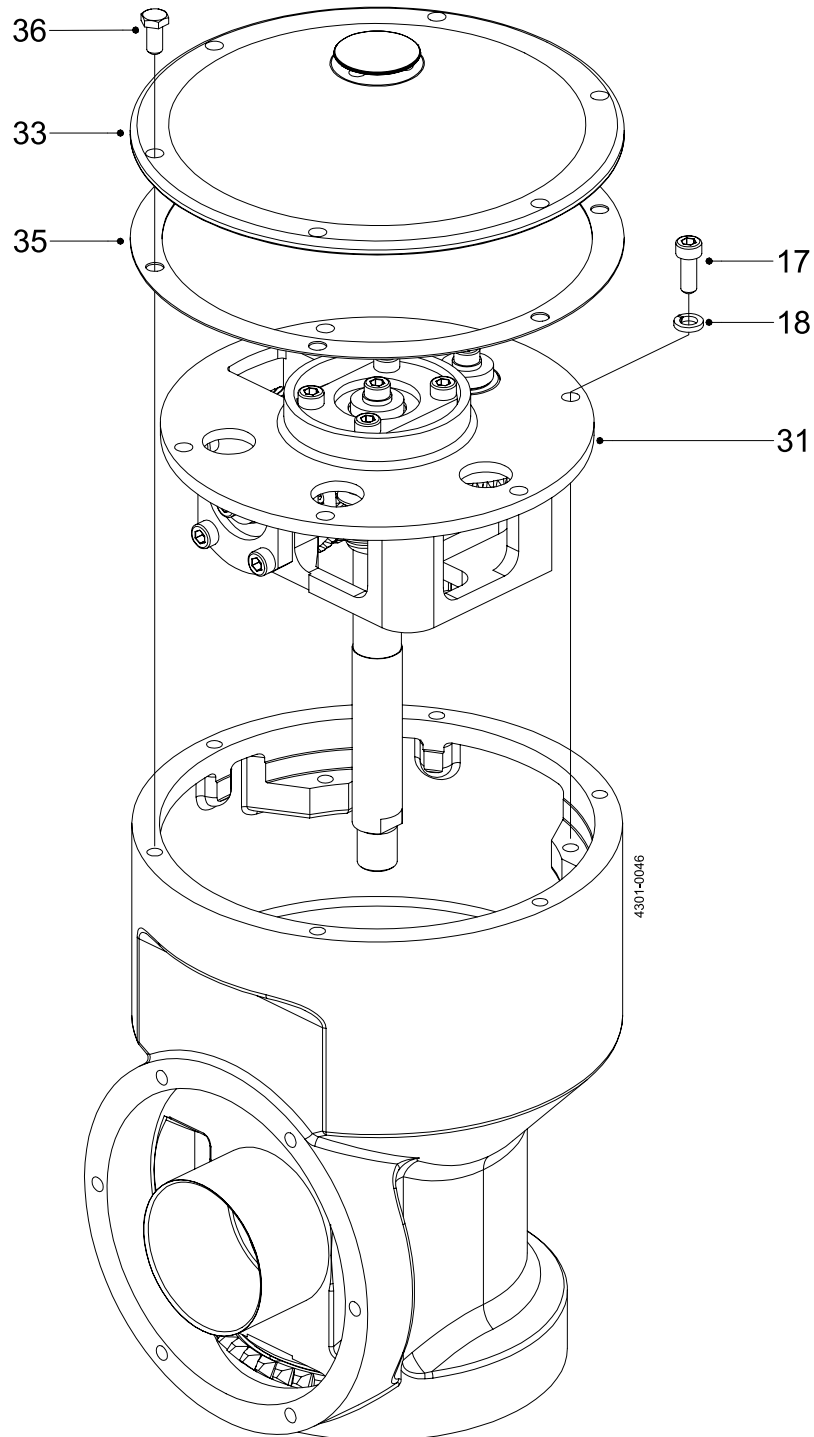
1. Turn mixer upside down.
2. Remove screws (36) from bottom cover (33).
3. Remove bottom cover (33) and bottom gasket (35).
4. Remove screws (36) and spring washers (18) along the circumference of gear frame (31). Draw out gear subassembly (holes in gear frame are excellent for holding gear subassembly).

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.

Bottom Assembly



6 Maintenance

Rotary Jet Mixer IM 25

6.5 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

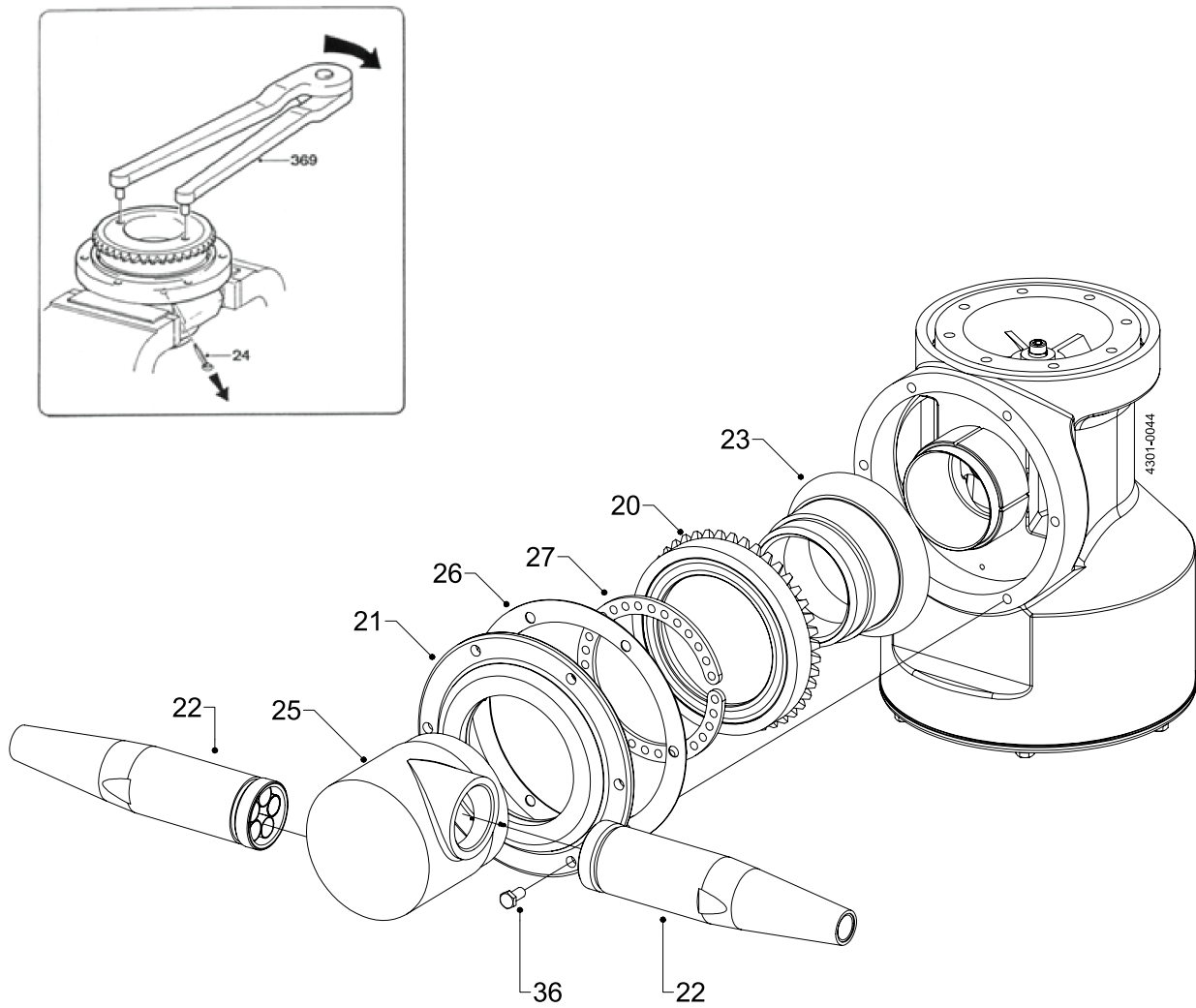
If Ball races (21.1 and 20.1) in hub cover (21) and in bevel gear (20) are extremely worn, they should be replaced as well as the ball retainer with balls (27). How to replace Ball races see page 36.

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 14.

Hub Subassembly



6 Maintenance

Rotary Jet Mixer IM 25

6.6 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 36.

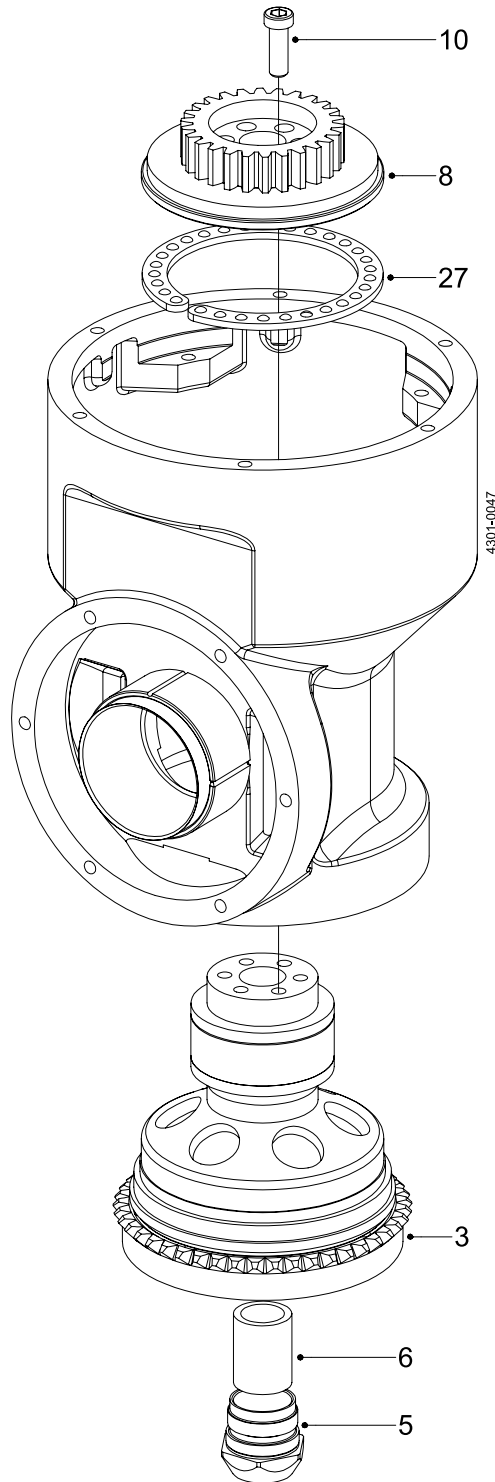
If blue liners on stem are extremely worn, they can be replaced. This part requires that a precise procedure is followed to accomplish installation. It is highly recommended that an authorized Alfa Laval Tank Equipment Service Center perform the replacement when necessary. Alternatively, in many cases it is possible to purchase a complete Stem With Liners mounted for your machine.

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

Rotary Jet Mixer IM 25

6.7 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.



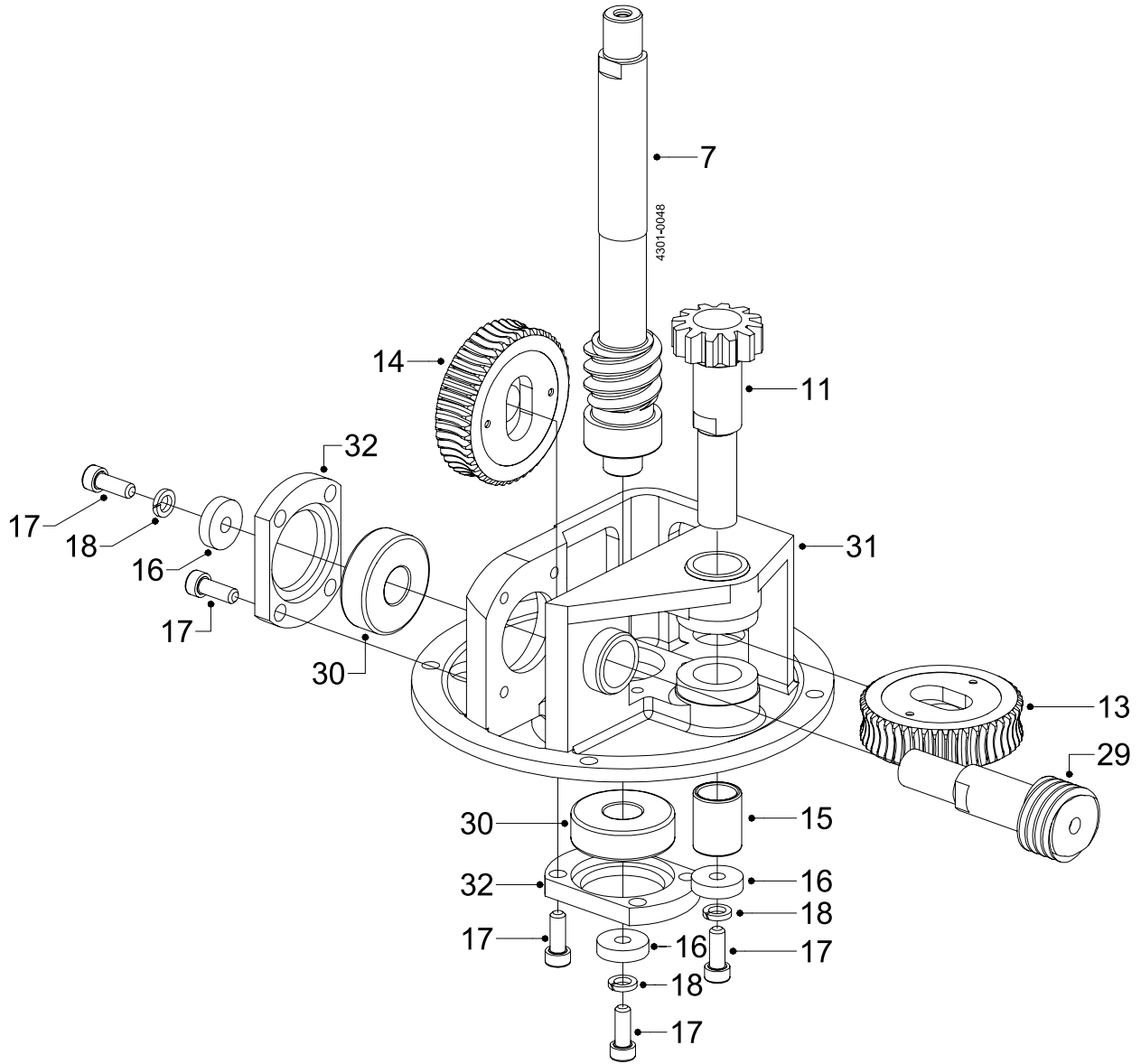
3. Draw out horizontal shaft (29) and 1st stage worm wheel (13) after removal of screw (17), spring washers (18) and washer (16).
4. Draw out pinion (11) and 2nd stage worm wheel (14), also freeing journal (15) after removal of screw (17), spring washer (18) and washer (16).
5. Remove bearing covers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

How to replace Collar bushes (12), see page 34.

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 Maintenance

Rotary Jet Mixer IM 25

6.8 Replacement of collar bushes

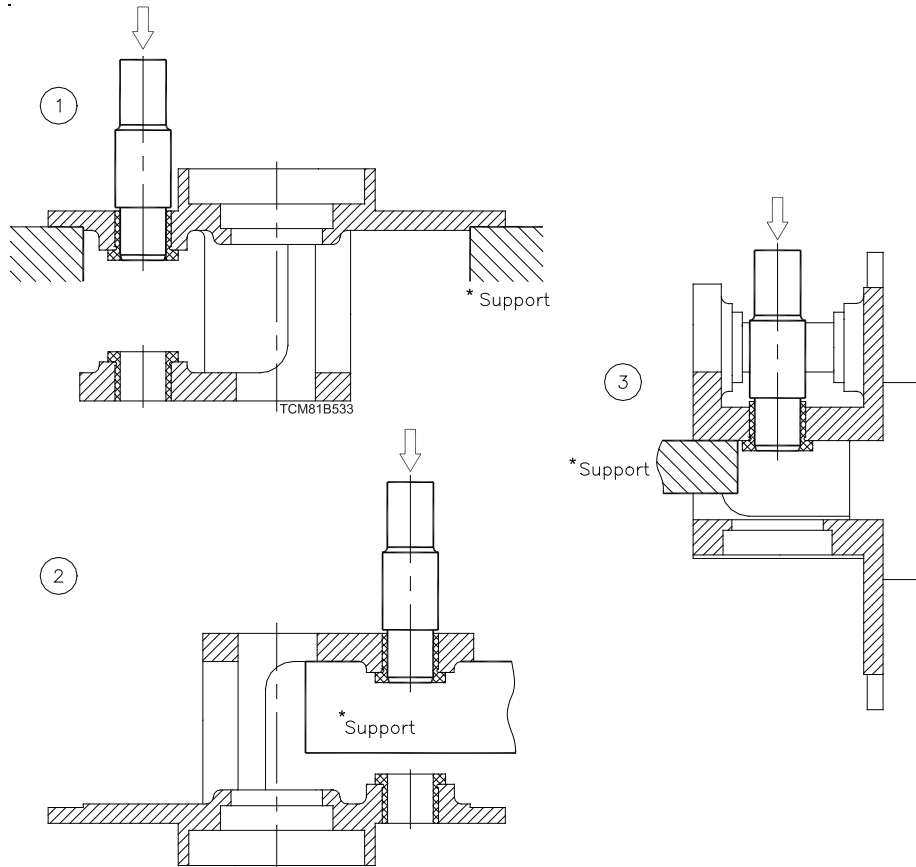
1. Place gear frame (31) upside down with a firm support under the top cone. Use for instance jaws of a vice. Do not clamp on machined surfaces. With pusher (tool no. TE81B031, see page 48) knock out collar bush.
2. Turn gear frame to upright position and hold over support such as flat steel bar clamped 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 48) 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.

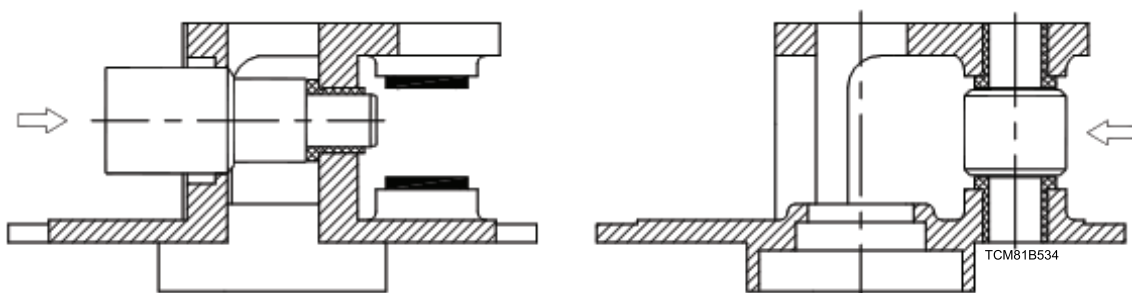


Removal of old Collar bushes

* Support



Mounting of new Collar bushes:



6 Maintenance

Rotary Jet Mixer IM 25

6.9 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 34.

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.

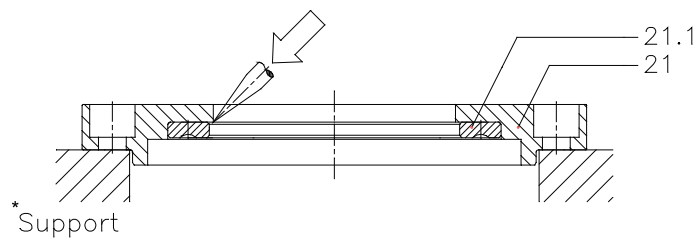
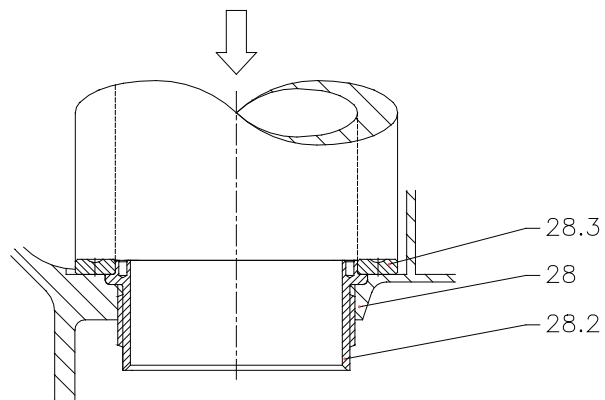
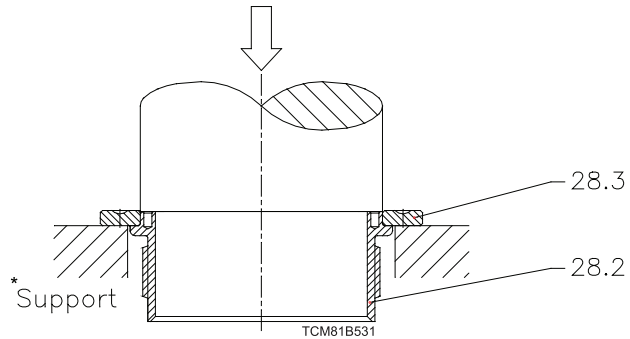
On Gear wheel

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



* Support

6 Maintenance

Rotary Jet Mixer IM 25

6.10 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

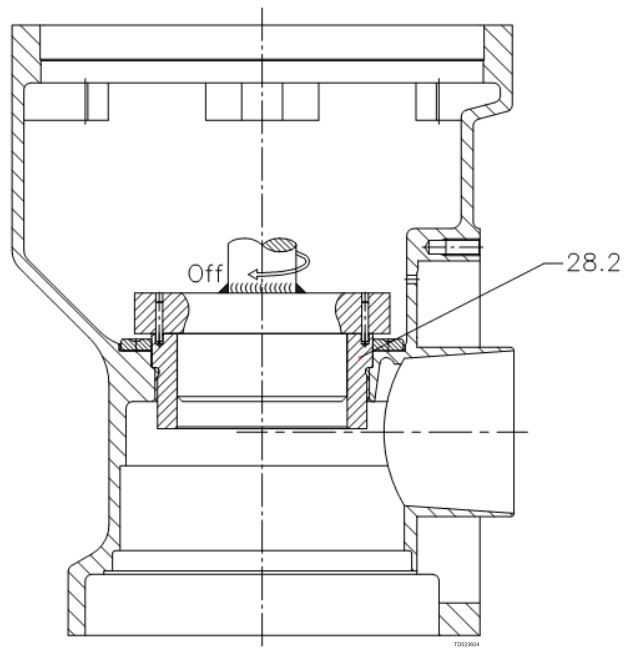
1. Place body (28) in a vice upright position. Do not clamp on machined faces. Insert tool (see page 48) into main collar (28). To loosen Loctite, knock hard on tool with hammer. Unscrew main collar.

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.

Replacement of main collars



7 Trouble shooting guide

Rotary Jet Mixer IM 25

Symptom: Slow or no rotation of machine

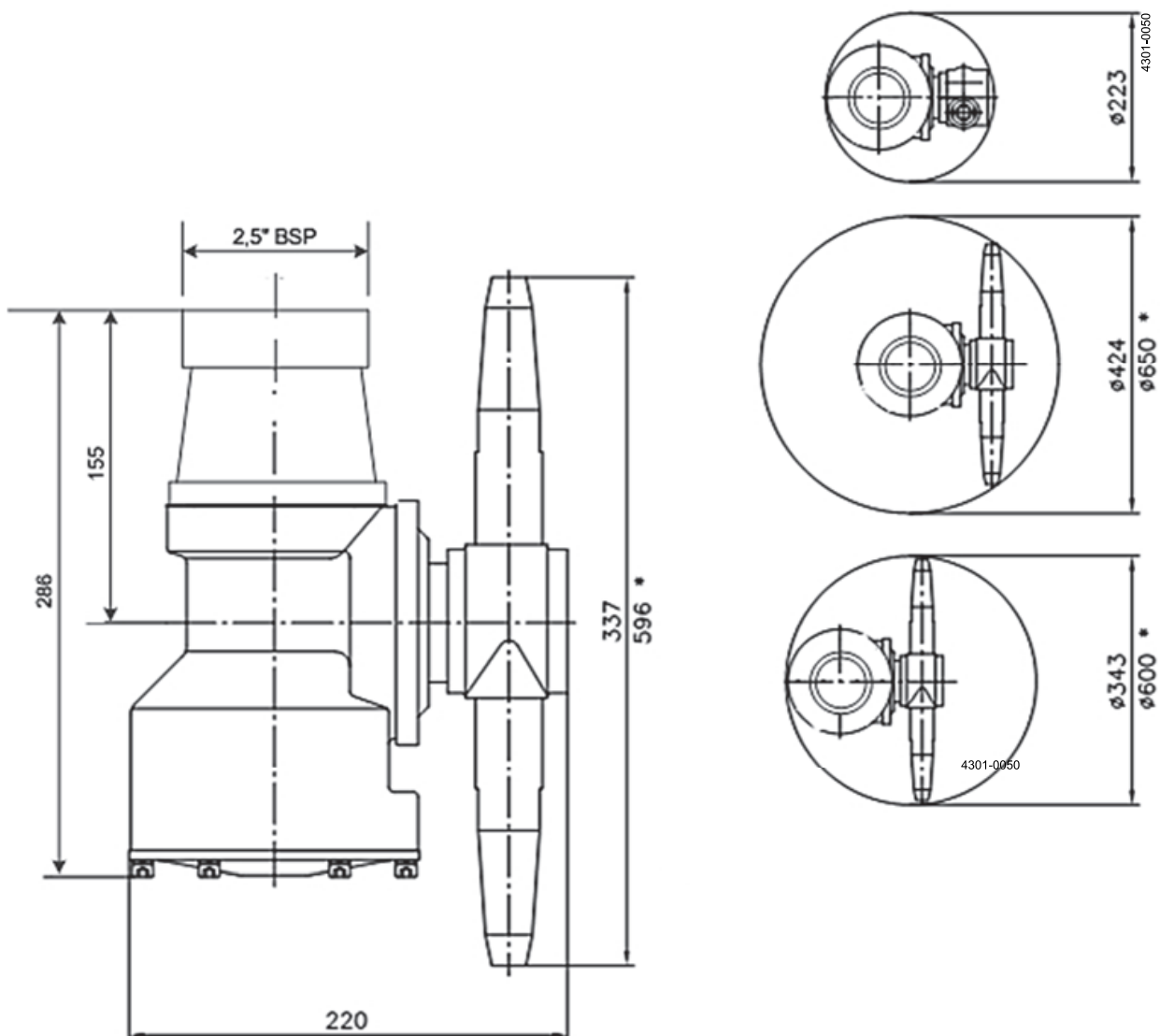
Possible Causes	Fault finding
No or insufficient liquid flow	<p>a). Check if supply valve is fully open. b). Check if inlet pressure to mixer is correct. c). Check supply line/filter for restrictions/clogging. d). Remove nozzles and check for clogging. If blocked, carefully clean nozzle without damaging steam straighteners and nozzle tip. e). Remove top cone/nipple, guide and impeller (see page 24) and check for clogging in impeller area. If large particles repeatedly get jammed in the mixer, install filter or reduce mesh size of installed filter in supply line.</p>
Foreign material or material build-up	<p>Insert hex screwdriver in screw in top of turbine shaft and easily turn turbine shaft clockwise. If any resistance is recognised, disassemble machine in order to localise the cause.</p>
<p>a). Impeller jammed b). Turbine shaft sluggish in main bush c). Bevel gear jammed/sluggish d). Stem jammed/sluggish</p>	<p>Remove guide and impeller (see page 28) and remove foreign material. Remove gear subassembly with turbine shaft (see page 26) and Gland (5) and clean Main bush. Remove Top cone/Nipple and hub Subassembly (see page 28) Clean teeth on stem and bevel gear. Remove gear subassembly (see page 26). Check free rotation of stem. Remove stem (see page 30). Remove foreign material/material build-up on stem and inside main collars. Clean ball races and ball retainer with balls. Also clean main bush.</p>
Wear	
<p>a). Slide bearings b). Main bush c). Worm wheels d). Collar bushes e). Turbine shaft f). Horizontal shaft</p>	<p>See page 22. See page 22. See page 22. See page 22. 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>
Mechanical defects	
<p>a). Worm wheel/teeth broken b). Worm wheel can rotate on Horizontal shaft/Pinion due to damaged driver faces. c). Damaged teeth on bevel gear</p>	<p>Replace Worm wheel. Replace Worm wheel. Inspect teeth on stem and bevel gear for deformation. Mount hub and stem in body (see page 28 and 26). Hold body in upside down position and rotate hub to check that bevel gears can work together. If damaged: Replace stem and/or bevel gear.</p>

8 Technical data

Rotary Jet Mixer IM 25

Weight of machine:	13 kg (29.1 lbs)
Working pressure:	2-12 bar (30-175 psi)
Recommended inlet pressure:	5-10 bar (45-120 psi)
Working temperature max.:	95°C (200°F)
Max. temperature:	140°C (284°F)
Ambient temperature:	0-140°C (95°C -140°C when NOT operated)
Materials:	AISI 316/316L, PTFE, PEEK 450G, SAF 2205, A4, Teflon TFM, Tefzel, ceramics (AL ₂ O ₃)

Dimensions in mm
Shown with flange connection

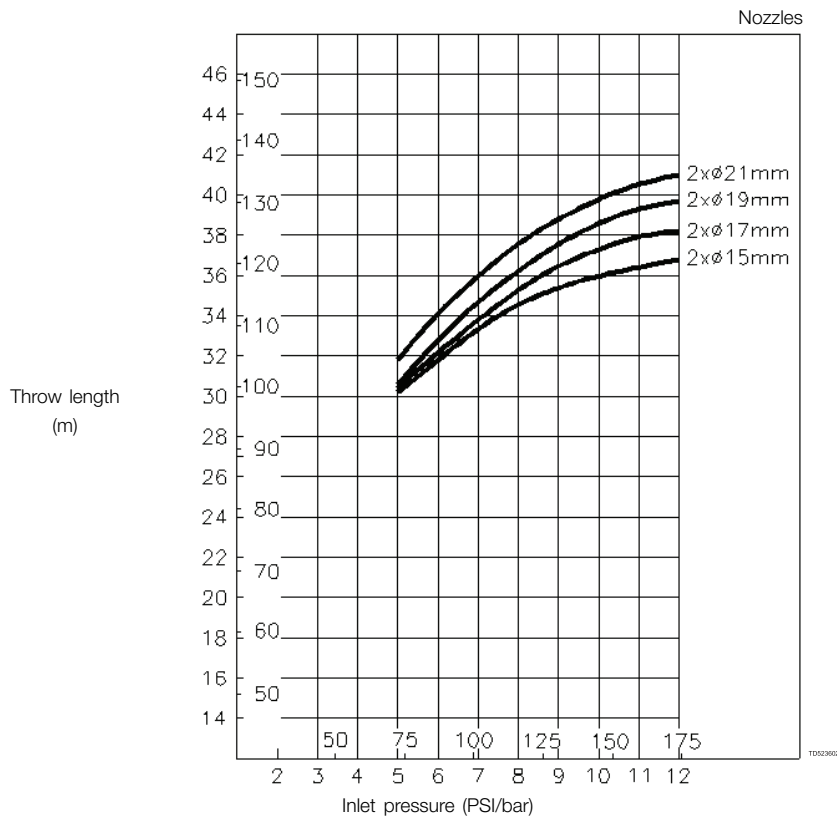
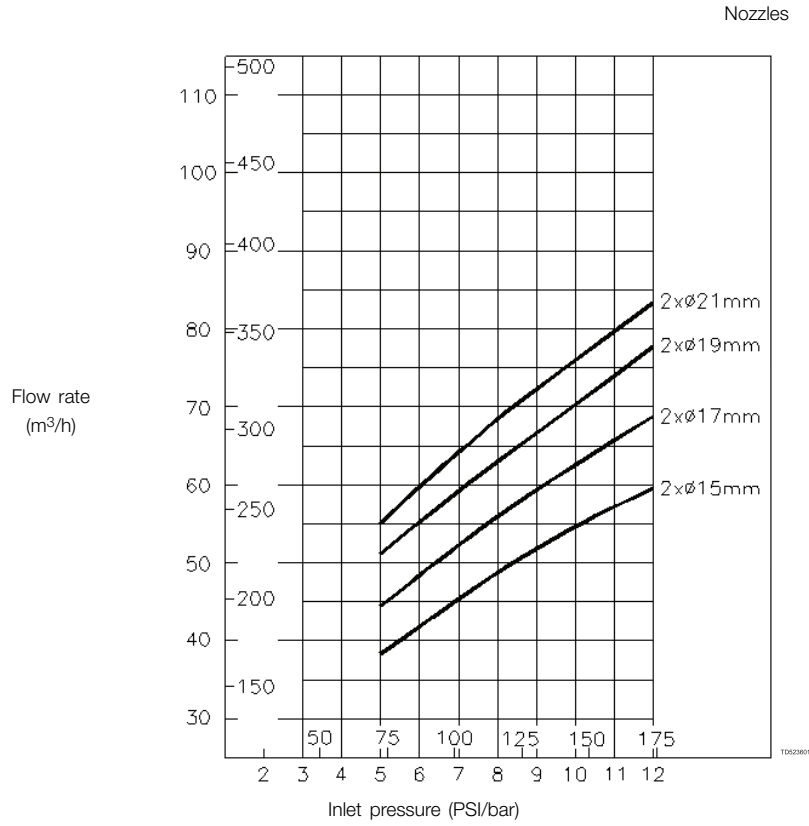


* with nozzle extensions

8 Technical data

Rotary Jet Mixer IM 25

Performance Data



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

Connection	Nozzles (mm), 2½ thread conn.	Item no.
2½" BSP	2 x ø15	TE33E015
	2 x ø17	TE33E017
	2 x ø19	TE33E019
	2 x ø21	TE33E021

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

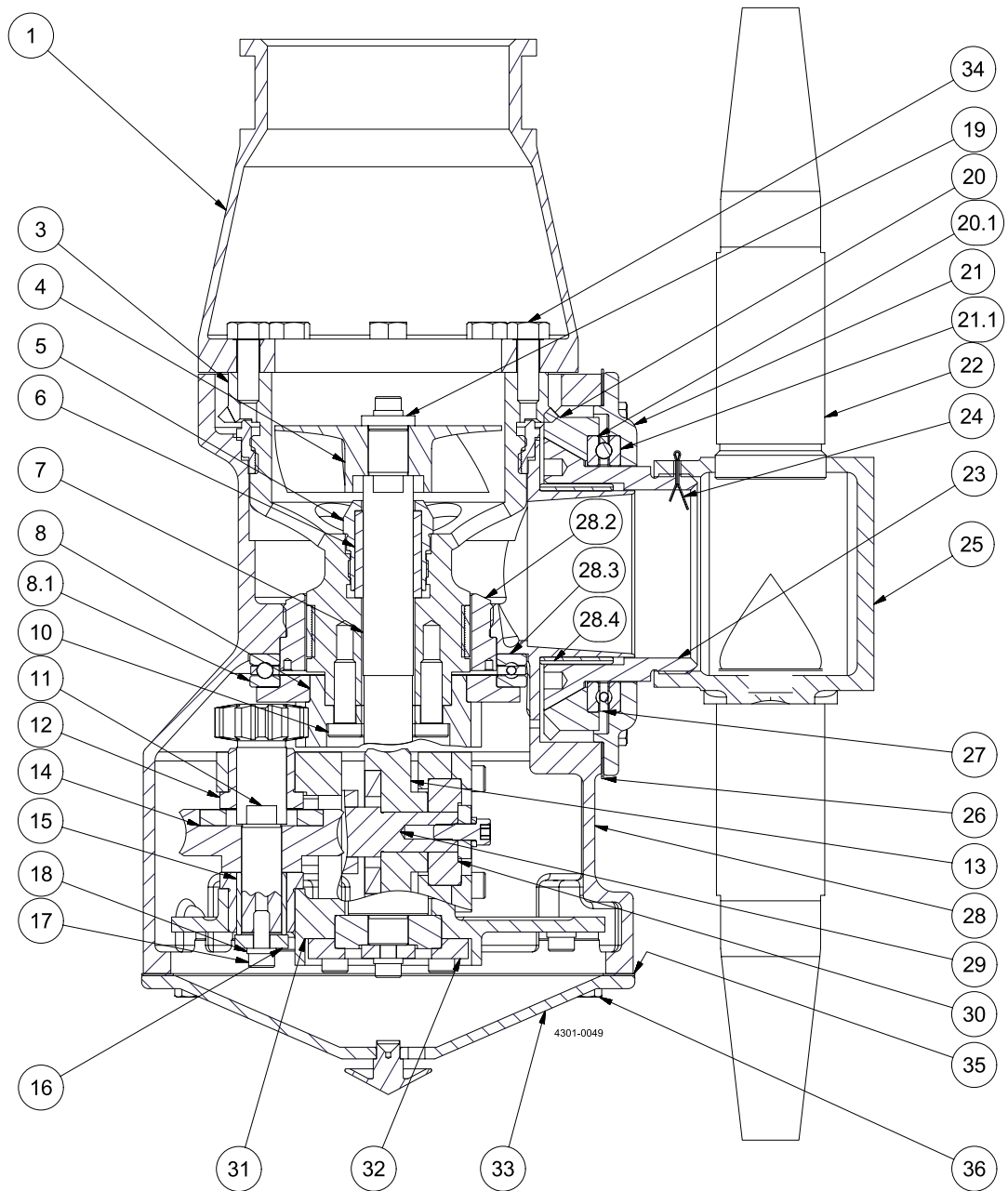
TE33BXXX70	ATEX/IECEX
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Explanation to Add-ons		
ATEX/IECEX		<p>ATEX/IECEX includes: ATEX/IECEX approved machine for use in explosive atmospheres. Category 1 for installation in zone 0/20 (inside tank) in accordance with Directive 2014/34/EU.</p> <p>II 1G Ex h IIC 85°C...175°C Ga II 1D Ex h IIIC T85°C...T140°C Da</p>

10 Parts list and drawing, service kit and tools

Rotary Jet Mixer IM 25

10.1 Parts list, parts drawing and spare part kits



10 Parts list and drawing, service kit and tools

Rotary Jet Mixer IM 25

Parts list

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

Service kits

Denomination

Service kits

- ♦ Spare part kit standard TE33B299
- Standard service kit for ATEX/IECEX machines TE33B29970

¹⁾ Pos. 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.

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

Configuration according to delivery note/order.

Parts marked with ♦ are included in the Standard Service Kit TE33B299

Parts marked with ○ are included in the Standard Service Kit TE33B29970 (ATEX/IECEX)

Parts marked with ♦ are included in the Standard Spare part Kit standard: TE33B299

The machine can be delivered with ATEX/IECEX certification.

Configuration according to delivery note/order.

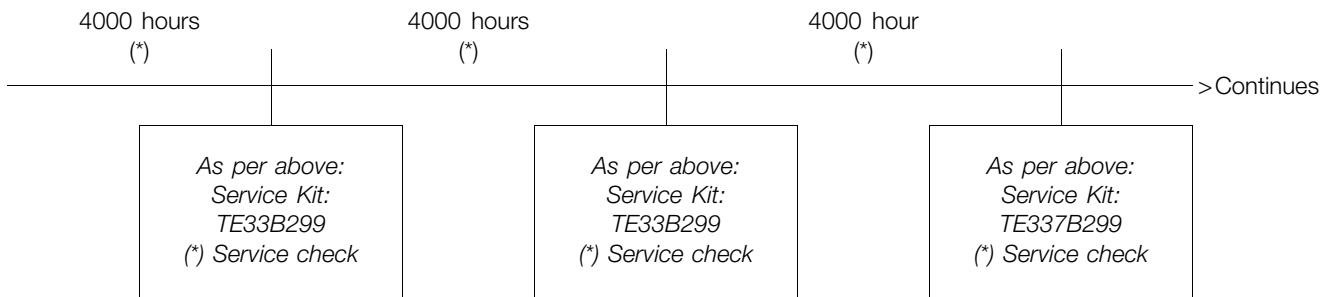
10 Parts list and drawing, service kit and tools

Rotary Jet Mixer IM 25

*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.

Please refer to the Spare Part Manual for information on item numbers and materials. The Spare Part manual is available from the on-line Alfa Laval product catalogue Anytime or the Close at hand spare part catalogue.

10.2 Service intervals



***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.

Please refer to the Spare Part Manual for information on item numbers and materials. The Spare Part Manual is available from the online Alfa Laval product catalogue Anytime or the Close at hand spare part catalogue.

10 Parts list and drawing, service kit and tools

Rotary Jet Mixer IM 25

10.3 Tools

Standard Tool Kit, Article no. TE81B065

Denomination	Qty x tool item no.
Hex key for 3/16" screw	1 x TE134
Hex screwdriver unbraco for 5/32"	2 x TE134A
Hex key for 1/4" screw	1 x TE135
Hex screwdriver for 1/4" screw	1 x TE135A
Caliper	1 x TE369

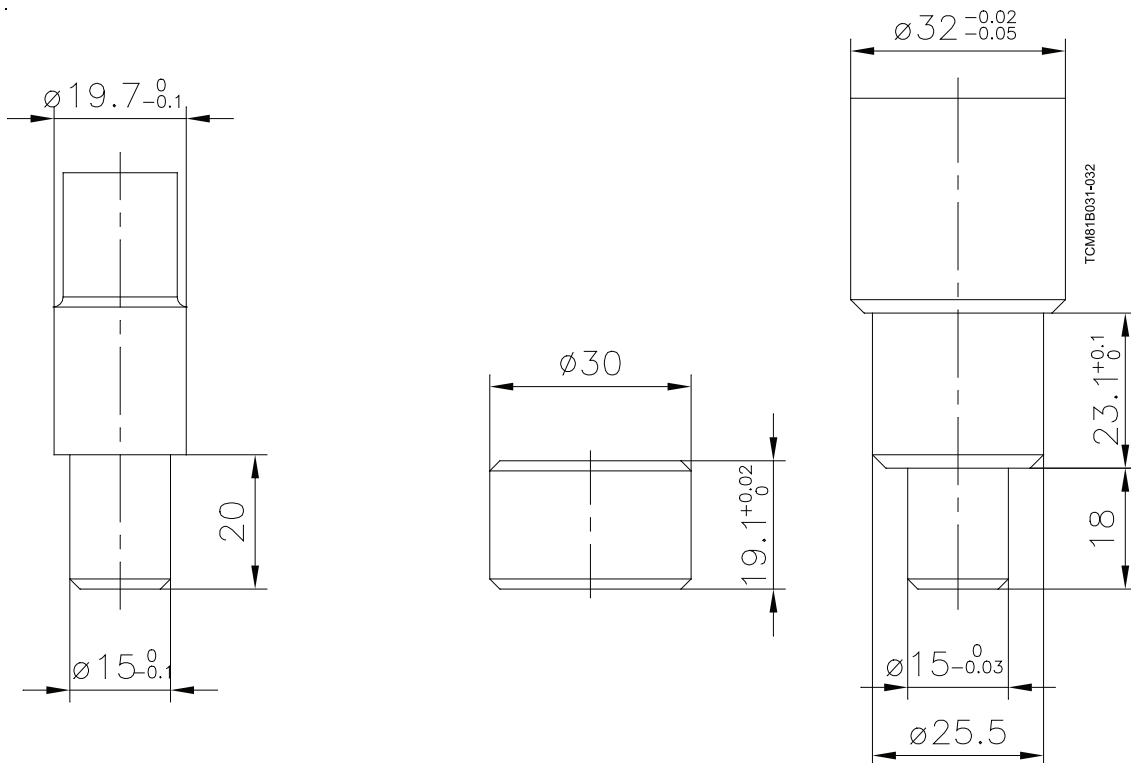
Available on request

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



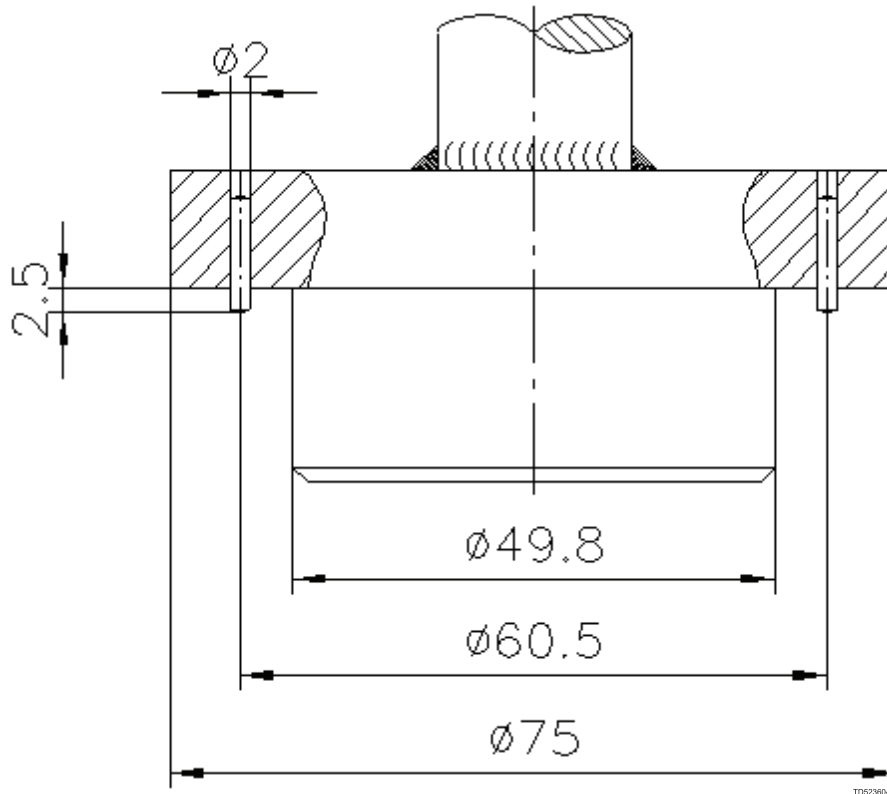
10 Parts list and drawing, service kit and tools

Rotary Jet Mixer IM 25

Sketch of tools for replacement of Main Collars

Available on request

TE81B132: Tool for lower collar (2" + 3" TCM) complete



11 General information

Rotary Jet Mixer IM 25

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 44.

Individual parts should always be ordered from the parts list, page 44. Item number and denomination should be clearly stated.

Please refer to the Spare Part Manual for information on item numbers and materials. The Spare Part Manual is available from the online Alfa Laval product catalogue Anytime or 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

How to contact Alfa Laval

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

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