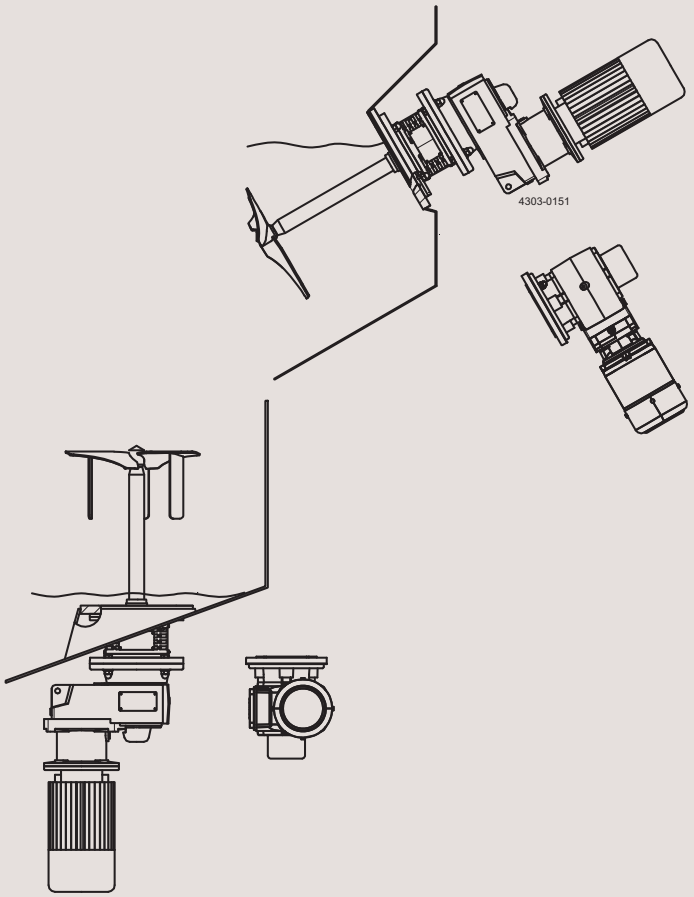
# Instruction Manual

## Alfa Laval Agitator - ALS / ALB ATEX




100000818-EN2 2020-02

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

Revision of Declaration of Conformity: 2018-11-01

The Designated Company

| Alfa Laval Kolding A/S | Albuen 31, DK-6000 Kolding, Denmark | +45 79 32 22 00 |
|---|---|---|
| Company name | Address | Phone no. |

hereby declare that

Agitator - EnSaFoil
Designation

| Type | Agitator marking options | Serial nos. |
|---|---|---|
| ALS-ME-GR-30_40LF-S3-…<br>ALS-ME-GP-30_40LF-S3-…<br>ALB-ME-GR-30_40LF-S3-…<br>ALB-ME-GP-30_40LF-S3-… | II -/2G<br>Ex h IIB T4 Gb | Serial number from AAC000000001<br>to AAC999999999<br>Serial number from 100700000001<br>to 100799999999 |

is in conformity with Machinery Directive 2006/42/EC and the following harmonized standard is used:
*DS/EN ISO 12100:2011 Safety of Machinery - Risk Assessment*

is in conformity with (Ex/ATEX) Directive 2014/34/EU
The following harmonised standards and regulations have been applied for non-electrical equipment for ATEX:
*- EN ISO 80079-36: 2016 Basic method and requirements*
*- EN ISO 80079-37: 2016 Protection by constructional safety 'c' and control of ignition source 'b'*

The Agitator technical file is stored with: Teknologisk Institut, Kongsvang Allé 29, 8000 Aarhus C, Denmark
Certification body no.: 0396. Archive no.: Archive no.: 2018-1-0292A

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

| Global Product Quality Manager<br>Pumps, Valves, Fittings and Tank Equipment | | Lars Kruse Andersen |
|---|---|---|
| Title | | Name |
| Kolding | 2020-02-01 | |
| Place | Date (YYYY-MM-DD) | Signature |

*Unsafe practices and other important information are emphasised in this manual.*
*Warnings are emphasised by means of special signs.*
***Always read the manual before using the Agitator!***
*Illustrations are only to illustrate the problem and is NOT a drawing of the current Agitator!*

## 2.1 Important information

WARNING
Indicates that special procedures must be followed to avoid serious personal injury.

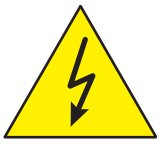
CAUTION
Indicates that special procedures must be followed to avoid damage to the agitator!

NOTE
Indicates important information to simplify or clarify procedures.

## 2.2 Warning signs

General warning:

Dangerous electrical voltage:



## 2.3 Intended use

- The Alfa Laval Agitator is only for mixing/stirring of liquids in a tank.
- The Agitator is only for mounting positions as specified on the nameplate by the first group of letters of the type designation.

ALT(B)- is for top mounting, ALS- is for side mounting and ALB- is for bottom mounting.
The exact mounting angle is specified on the Name Plate and must be followed. Definitions on mounting angles can be seen in section 6.2 Mounting angle for side mounted Agitator type ALS and section 6.3 Mounting angle for bottom mounted Agitator type ALB.

- The different duties and operation data like pressure, speed and media temperature, which the Agitator is designed for, can be found in the Alfa Laval quotation agreement[1)] and may not be exceeded by all means.
- If the Agitator is installed in pressurized tanks, local regulations and legislations must be met.

*[1)] The Alfa Laval quotation agreement has been exchanged during the quote process between a technical purchaser and Alfa Laval. If you are not in hold of the Alfa Laval quotation agreement, please get through to your local Alfa Laval contact, inform the Agitator serial number and article number which is stated on the Name Plate and you will obtain the Alfa Laval quotation agreement.*

# 2 Safety

*All warnings in the manual are summarised on this page.*
*Pay special attention to the instructions below so that severe personal injury and/or damage to the Agitator are avoided.*

## 2.4 Safety precautions

Installation:

**Always** read the technical data thoroughly (see chapter 6.1 Technical data).
**Always** follow installation instructions thoroughly (see chapter 3 Installation).
**Never** expose the Agitator to undue vibrations or shocks.
**Never** start Agitator in the wrong rotation direction.
**Always** follow drive unit installation instruction thoroughly (see chapter 8 Appendix).
Ensure that the tank media is not corrosive to the Agitator.
Only install the Agitator in environments within temperature limit: -20°C and +40°C.
Only install the Agitator in altitudes less than 1000 m above sea level.
**Always** ensure that the Agitator has sufficient cooling around the lantern, may not be wrapped with isolating materials.

**Ensure that installation is in accordance with EN 60079-14.**
**Beware of ignition temperature can be decreased when enclosed by the equipment/tank (see EN 14522).**
**Never** touch the moving parts while the Agitator is connected to the power supply.

Operation:

**Always** read the technical data thoroughly (see chapter 6.1 Technical data).
**Always** read supplier instructions thoroughly (see chapter 8 Appendix).
**Always make sure that the Agitator corresponds to the category marked on the name plate:**
Gas atmosphere:  II -/2G
Ex h IIB T4 Gb

**Never** start Agitator in the wrong rotation direction.
**Never** use the Agitator for hybrid mixture.
**Always** rinse well with clean water after cleaning.
Beware of temperature limitations.
Beware of Agitator in operation can produce sound levels in excess of 85dB(A).
**Never** operate continuously within 20% of critical oscillation speed (see chapter 6.1 Technical data).

**Beware of static electricity risk when the media conductivity is below 1000pS/m. (Recommendations: CLC/TR 50404 or IEC/TS60079-32).**
**Never** touch the moving parts while the Agitator is connected to the power supply.

Maintenance:

**Always** read the technical data thoroughly (see chapter 6.1 Technical data
**Always** follow the maintenance instruction thoroughly (see chapter 5 Maintenance).
**Always** follow the maintenance instruction from drive unit supplier (see chapter 8 Appendix).
**Always** study the parts list and assembly drawing carefully (see chapter 7 Parts list and drawing & service kits).
**Never replace ATEX Agitator with other type of Alfa Laval Agitator.**
**Ensure that maintenance is in accordance with relevant standards EN 60079-17 and EN 60079-19.**

**Never** touch the moving parts while the Agitator is connected to the power supply.
**Always** disconnect the power supply while servicing the Agitator.

Transportation:

**Always** transport the Agitator in original packaging.
**Always** support the shaft adequately, to protect shaft and bearings.
**Never** expose the Agitator to undue vibrations or shocks.
Control for oil leakage on gears with vent screw.

Ensure correct rotation direction of impeller before startup and after any maintains there might have impact on the direction.

*The instructions manual is part of the delivery.*
*Study the instructions carefully*

## 3.1 Unpacking/delivery

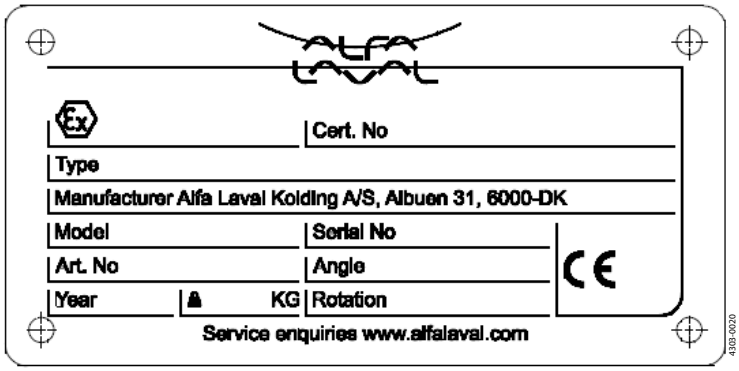
Always use lifting equipment when handling the Agitator (see Step 3).

CAUTION
Alfa Laval cannot be held responsible for incorrect unpacking.
Alfa Laval cannot be held responsible for incorrect unpacking.

Step 1

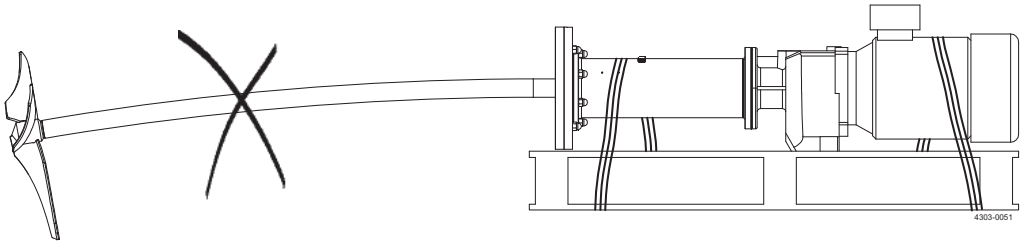
Inspect the delivery for visible transportation damages - all issues to be reported to carrier.

Step 2
Check the delivery for:
1. Complete Agitator
2. Nameplate designations
3. Delivery note
4. Separate instruction manuals from suppliers (see chapter 8 Appendix).



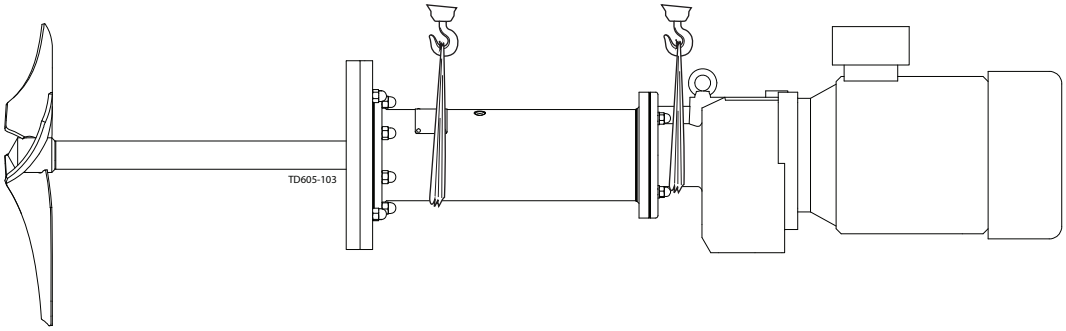

Step 3
Lifting instructions:

Always use the correct lifting equipment (see Agitator weight on name plate).
Locate Centre of gravity before moving the Agitator.

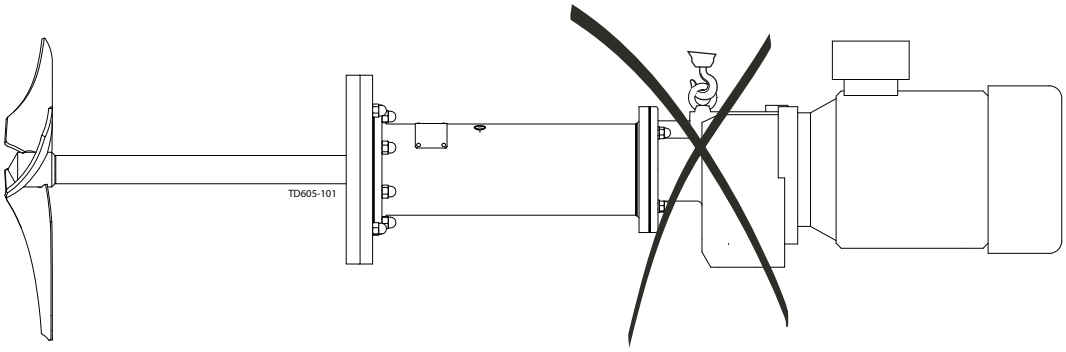


# 3 Installation

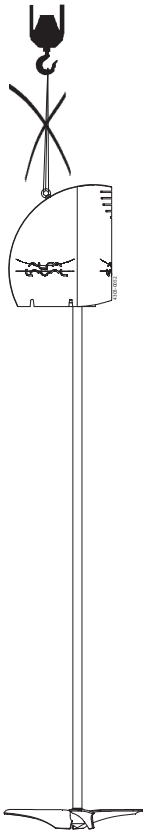
*The instructions manual is part of the delivery.*
*Study the instructions carefully*




WARNING
Do NOT use eye bolts on gear motor to lift the Agitator. They are only for gear motor removal.

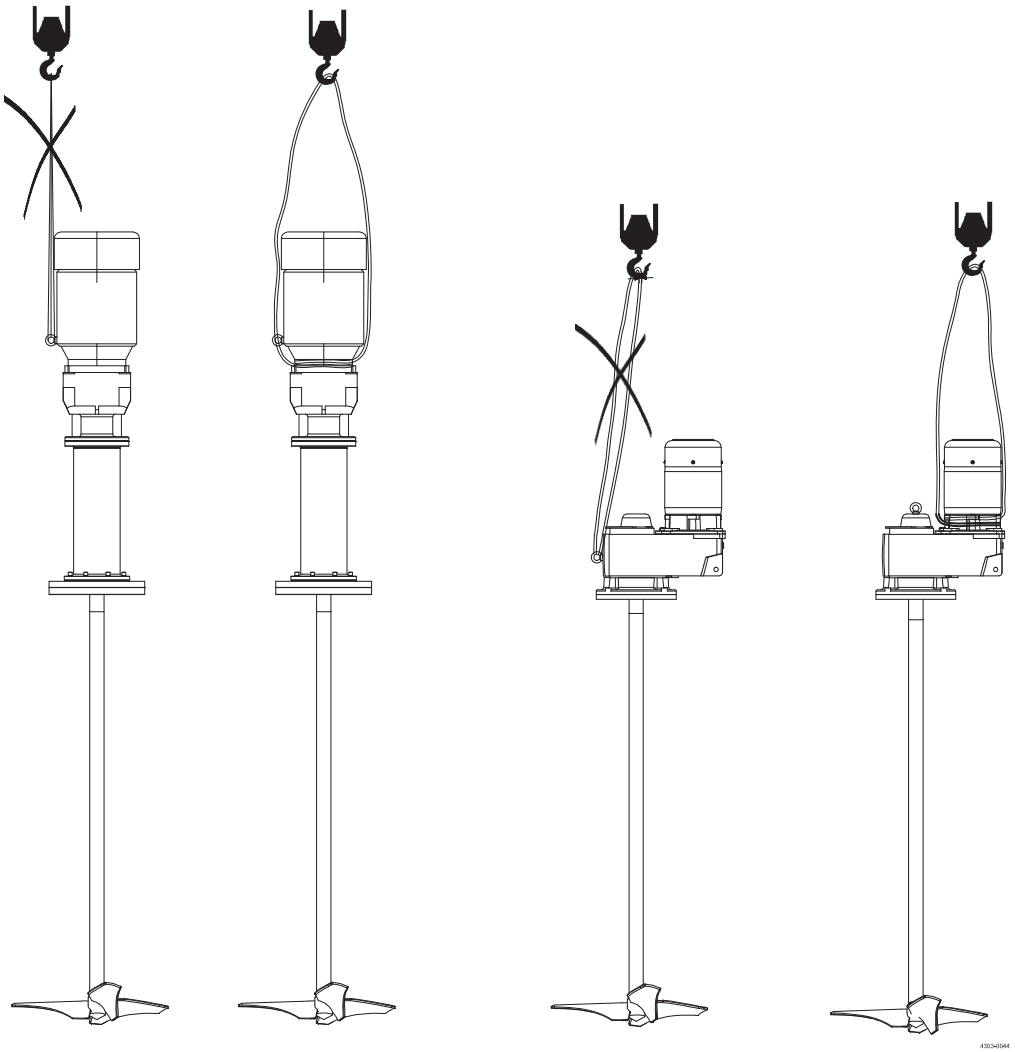



WARNING
Do NOT use eye bolts on shroud (if any) to lift the Agitator.
They are only for shroud removal.



*The instructions manual is part of the delivery.*
*Study the instructions carefully*

CAUTION
Alfa Laval recommends NOT to use shaft as lifting point but long shafts must be supported adequately during lifting to protect shaft, bearings and seals arrangements.
Gear motor / motor may be used for lifting the assembled Agitator.



Step 4
During transportation

1. Always support the shaft adequately, to protect shaft and bearings.
2. Never expose the Agitator to undue vibrations or shocks.
3. Control for oil leakage on gears with vent screw.

# 3 Installation

*Study the instructions carefully and pay special attention to the warnings!*
*Always check the Agitator before operation - see chapter 3.3 Pre-use check.*
*The Agitator is for permanent fastening.*
*Make sure that the motor correspond to the environment.*

## 3.2 Installation

**Always** read the technical data thoroughly (see chapter 6.1 Technical data).
Only install this Agitator in mounting angle according to the name plate (see chapter 6.1 Technical data).
**Always** use lifting equipment when handling the Agitator (see Step 2).
**Always** have safety elements removed by authorized personnel.
**Never** cover or remove the nameplate.

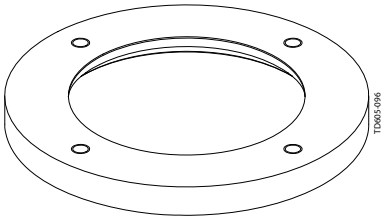
**Never** connect to power supply during installation or service.
**Always** have the Agitator connected to power supply by authorized personnel.

NOTE
Alfa Laval highly recommend to install motor protection guard to protect the motor from overloading.
Never install a none Alfa Laval shroud on the Agitator as it can lead to overheat and a breakdown of the motor.

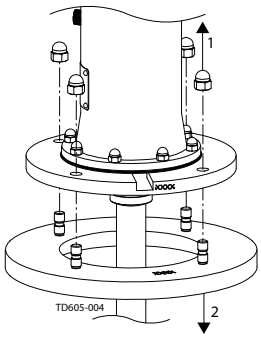
**Welding flange:**

CAUTION

Only authorized personnel to weld in flanges.
Alfa Laval cannot be held responsible for incorrect installation.



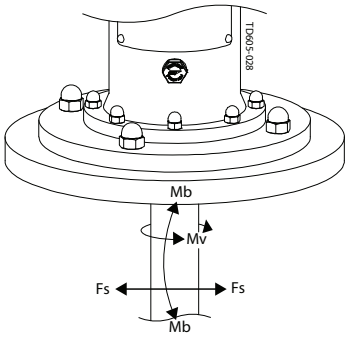

**Step 1**
Dismantle the welding flange if fitted onto the Agitator.



*Study the instructions carefully and pay special attention to the warnings!*
*Always check the Agitator before operation - see chapter 3.3 Pre-use check.*
*The Agitator is for permanent fastening.*
*Make sure that the motor correspond to the environment.*

### Step 2

Ensure that the tank, where the welding flange are to be welded in, can handle the forces applied by the Agitator: Torque Mv, Bending torque Mb and Side thrust Fs.




The values are depending on the Agitator configuration. The following information is required to calculate the forces:

P: Power of the motor in [kW]
n: Speed of Agitator shaft [RPM]
S: Shaft length according to Agitator type designation -Sxxxx- in [mm]
D: Largest impeller diameter according to Agitator designation -Pxxx- in [mm]

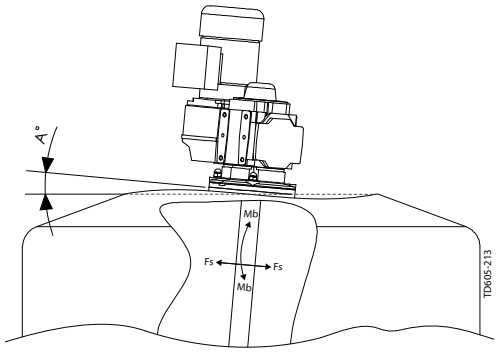
The values can be calculated as follows:

Type ALS/ALB:
Mv [Nm] = 23873 x P / n
Fs [N] = 4.5 x Mv x 1000 / D
Mb [Nm] = Fs x S / 1000

### Step 3

During the design phase of the tank, ensure sufficiently rigidity of the tank.
Ensure that the max. bending angle (A), at loads from Step 2 does not exceed according to below scheme

| RPM: | <100 | >100 |
|---|---|---|
| A° (max bending angle at applied loads): | 0.1 | 0.05 |



# 3 Installation

*Study the instructions carefully and pay special attention to the warnings!*
*Always check the Agitator before operation - see chapter 3.3 Pre-use check.*
*The Agitator is for permanent fastening.*
*Make sure that the motor correspond to the environment.*

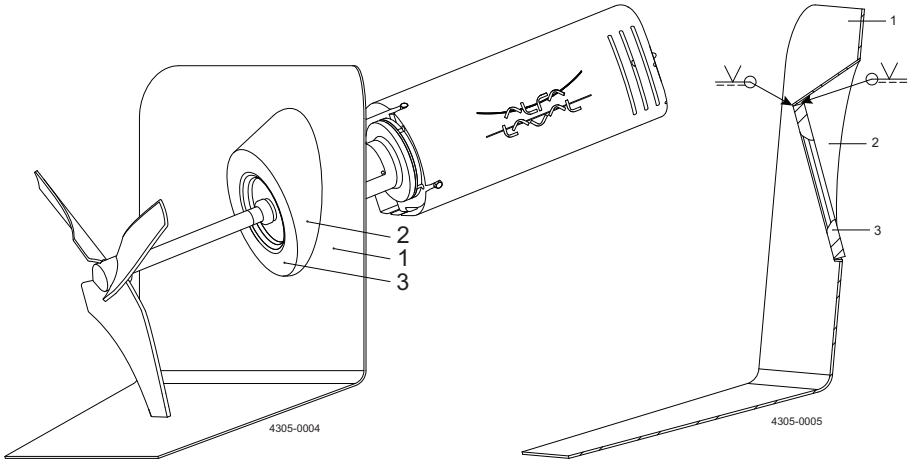
## Guidelines for installing Flat Shaped Welding Flange (FSWF), ALS Agitator:

*(for mounting flange without nose)*

CAUTION
Alfa Laval recommend that all other welding tasks on the tank are finished before installing welding flange in tank.

ALS Agitator must be installed in the tank as shown in chapter 6.2 Mounting angle for side mounted Agitator type ALS which can be achieved as shown on the illustration below.

1. Tank wall
2. Cone for welding flange
3. Welding flange



*Study the instructions carefully and pay special attention to the warnings!*
*Always check the Agitator before operation - see chapter 3.3 Pre-use check.*
*The Agitator is for permanent fastening.*
*Make sure that the motor correspond to the environment.*

## Guidelines for installing Flat Shaped Welding Flange (FSWF), ALB Agitator:

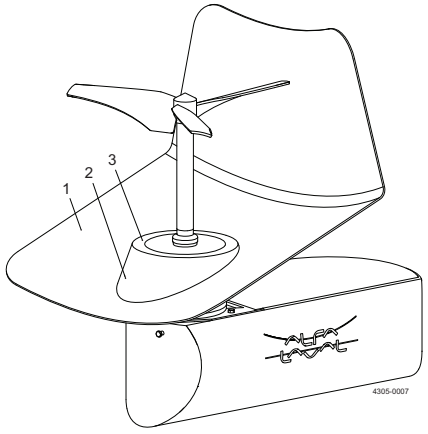
*(for mounting flange with nose)*

**CAUTION**
Alfa Laval recommend that all other welding tasks on the tank are finished before installing welding flange in tank.

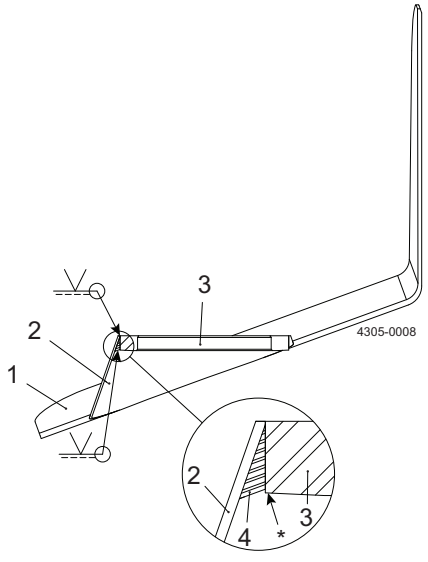
ALB Agitator must be installed in the tank as shown in chapter 6.3 Mounting angle for bottom mounted Agitator type ALB which can be achieved as shown on the illustration below.

In case of installation of Welding Flange parallel to tank bottom surface (shaft perpendicular to tank bottom surface) it is always recommended to use a bead/cone. This is to ensure that tank bottom stresses / forces are not transmitted directly to the Welding Flange increasing the risk of leakages.

1. Tank bottom
2. Cone for welding flange
3. Welding flange




1. Tank bottom
2. Cone for welding flange
3. Welding flange
4. Weldings




**CAUTION**
Ensure that no weldings are applied to the outside surface of the welding flange* as the Agitators mounting flange has the same size as the welding flange. If weldings by mistake are applied to the surface of the welding flange it must be removed by grinding, or the like, to ensure a correct fit and installation of the mounting flange.

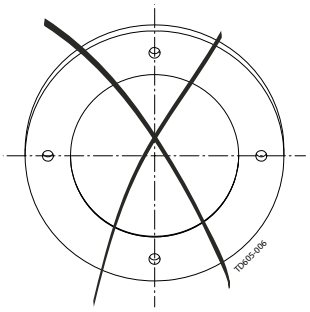
# 3 Installation

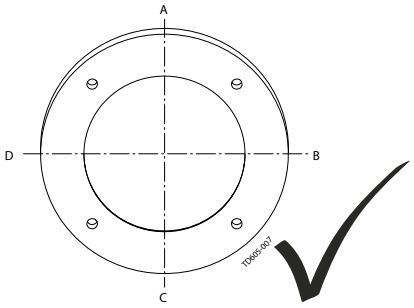
*Study the instructions carefully and pay special attention to the warnings!*
*Always check the Agitator before operation - see chapter 3.3 Pre-use check.*
*The Agitator is for permanent fastening.*
*Make sure that the motor correspond to the environment.*

Welding procedure FSWF, ALS Agitator:

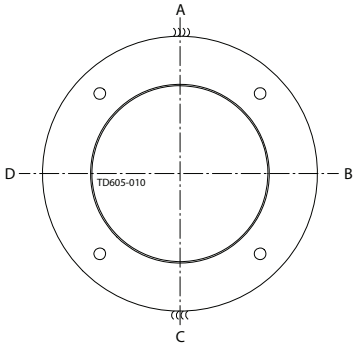
*(for mounting flange without nose)*

Step 1
Always allow flange to cool to ambient temperature after each section has been welded
Position the flange correctly




Step 2
Spot weld from outside.

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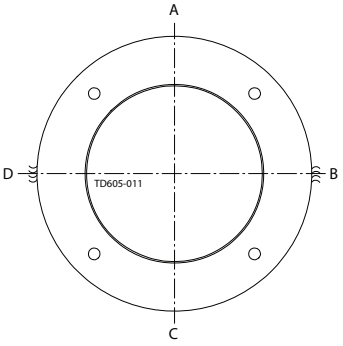
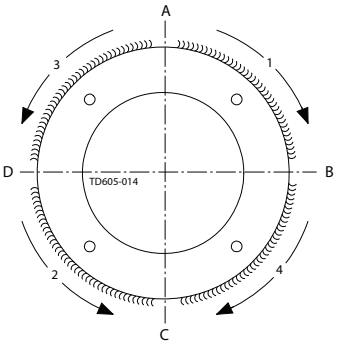



Step 3

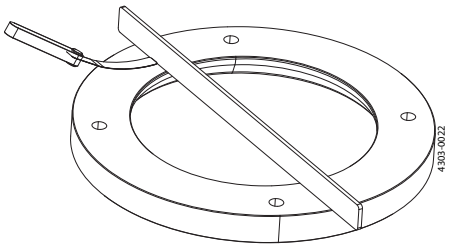
Weld the following sections first from outside then from inside, and cool with air between each section.



*Study the instructions carefully and pay special attention to the warnings!*
*Always check the Agitator before operation - see chapter 3.3 Pre-use check.*
*The Agitator is for permanent fastening.*
*Make sure that the motor correspond to the environment.*

### Step 4

Ensure that the surface flatness tolerance equals 0,25 after welding.
Grind and polish the welding flange.
Use a solid straight ruler and a feeler gauge to determine the flatness.



# 3 Installation

*Study the instructions carefully and pay special attention to the warnings!*
*Always check the Agitator before operation - see chapter 3.3 Pre-use check.*
*The Agitator is for permanent fastening.*
*Make sure that the motor correspond to the environment.*

## Welding procedure FSWF, ALB Agitator:

*(for mounting flange with nose)*

### NOTE

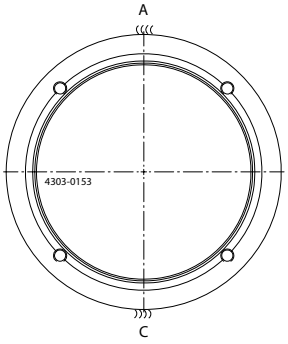
Alfa Laval recommend a welding tool with, if possible, build in cooling by flowing water, to be made and fixed to the FSWF to ensure shape and form of the FSWF during welding and installation.
In general Alfa Laval recommend to weld the welding flange onto a bended rim of the tank bottom plate – this is to secure adequate flexibility at high loads, e.g. when the tank is filled. If a bended rim is impossible to obtain due to a high plate thickness, Alfa Laval recommend to weld the welding flange onto a cone shaped plate section.
If not following the above recommendations there will be a risk that the flange can deform, especially at high tank fillings, which can cause a leakage between the welding flange and the Agitator mounting flange.

### Step 1

Position the flange correctly.
**Always** allow flange to cool to ambient temperature after each section has been welded.

### Step 2

Spot weld from outside.

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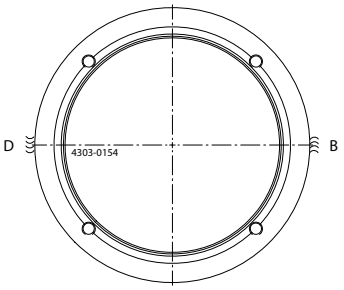
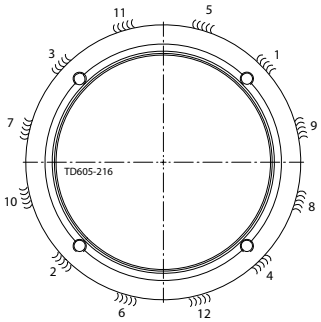



### Step 3

Spot weld from inside

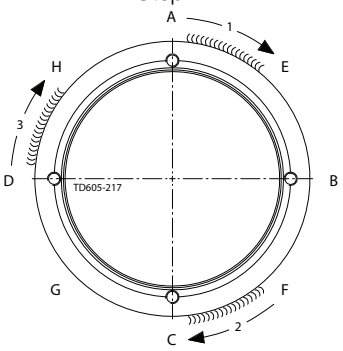


*Study the instructions carefully and pay special attention to the warnings!*
*Always check the Agitator before operation - see chapter 3.3 Pre-use check.*
*The Agitator is for permanent fastening.*
*Make sure that the motor correspond to the environment.*

### Step 4

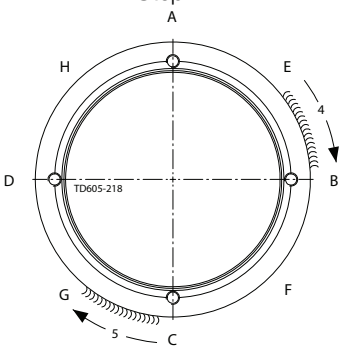
Weld the following sections first from inside then from outside and cool to ambient temperature after each section has been welded

Step 1



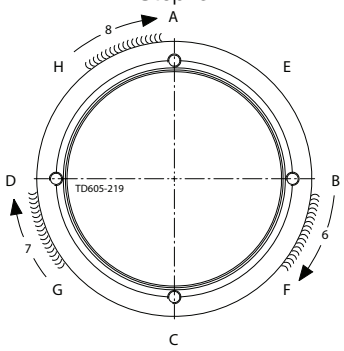

Cool with air!

Step 2




Cool with air!

Step 3




Cool with air!

### Step 5

Remove the welding tool.
Ensure that the surface flatness tolerance equals ±0.1mm.
Grind and polish the welding flange.

# 3 Installation

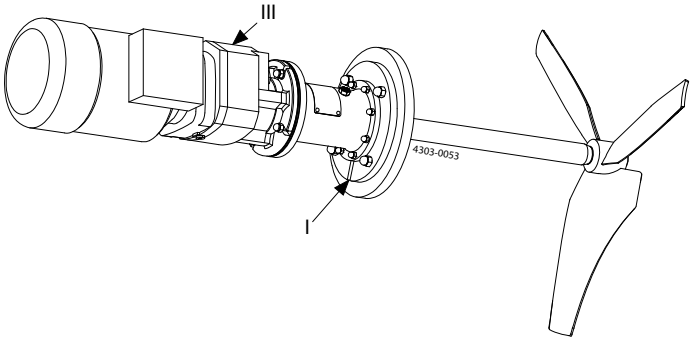
*Study the instructions carefully and pay special attention to the warnings!*
*Always check the Agitator before operation - see chapter 3.3 Pre-use check.*
*The Agitator is for permanent fastening.*
*Make sure that the motor correspond to the environment.*

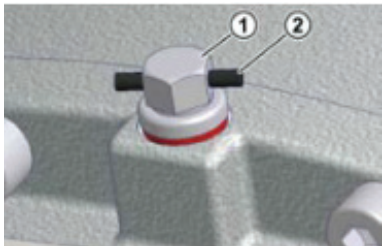
Mounting Agitator:

CAUTION

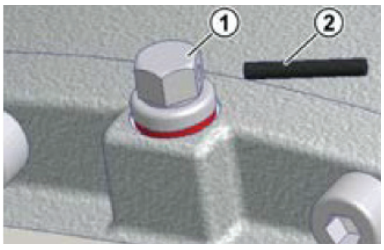
**Always** ensure that mounting is carried out according to description shown in chapter 6.2 Mounting angle for side mounted Agitator type ALS and chapter 6.3 Mounting angle for bottom mounted Agitator type ALB.
**Always** refer to tightening torques in chapter 6.5 Tightening torques for bolt connections when tightening bolts.

Step 1
Place impeller device(s) in the tank.
Ensure that tank and Agitator surfaces are clean.
Ensure that drain (I) is pointing downwards.
For gears with vent screw, ensure the vent is pointing upwards and the rubber plug (III) is removed (see chapter 8.1 Drive unit instructions).



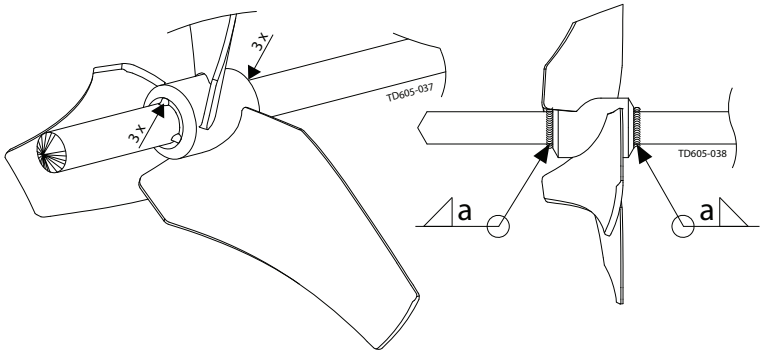

1) Standard vent plug
2) Transport securing device




Step 2
Mount the Agitator onto the tank.

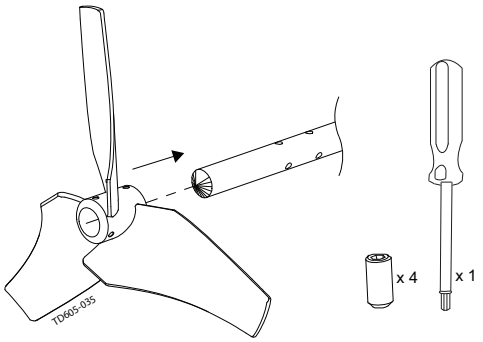
*Study the instructions carefully and pay special attention to the warnings!*
*Always check the Agitator before operation - see chapter 3.3 Pre-use check.*
*The Agitator is for permanent fastening.*
*Make sure that the motor correspond to the environment.*

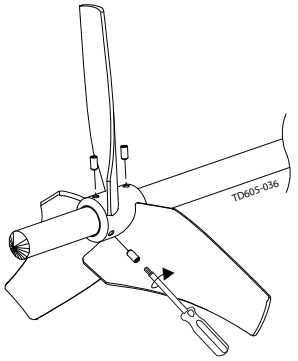
Step 3
Mount impeller device(s) onto shaft.

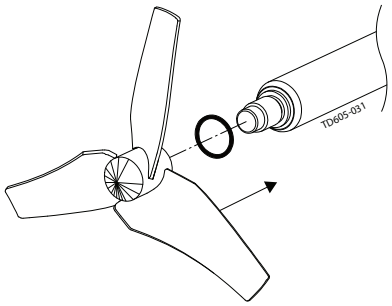


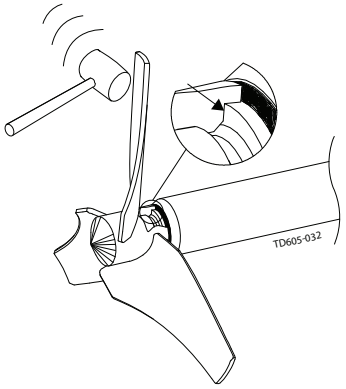

| Hub diameter [mm] | a - dimension [mm] |
|---|---|
| Ø30 | 1,1 |
| Ø40 | 1,8 |
| Ø55, Ø80, Ø120 | 2,8 |

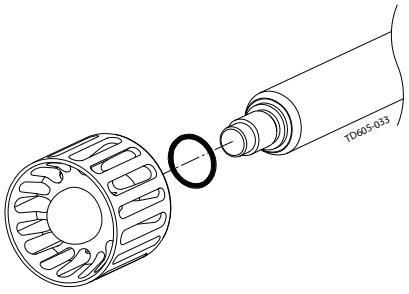
All-weld propeller to shaft with one welding seam at a time, cool with air and continue with one welding until welding is according to illustration. Use welding procedures which introduce as less heat, tension and bending to the shaft as possible.

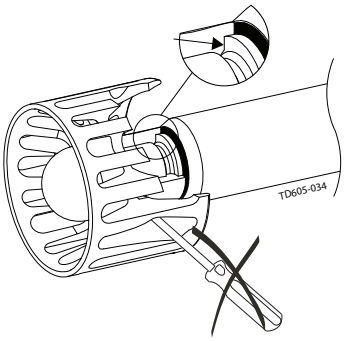


# 3 Installation

*Study the instructions carefully and pay special attention to the warnings!*
*Always check the Agitator before operation - see chapter 3.3 Pre-use check.*
*The Agitator is for permanent fastening.*
*Make sure that the motor correspond to the environment.*

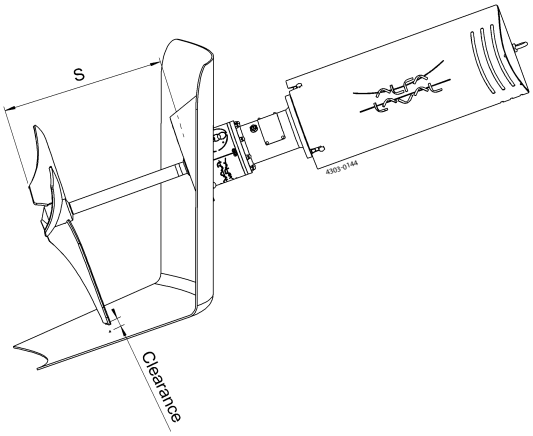
Step 4
Ensure the impeller device orientation is correct according to the direction of the desired flow. The direction is determined by the letter "D" or "U" in the last part of the Agitator type description. E.g. -E400D3P has the letter "D" which means the flow direction is away from the drive unit. -E400U3P has the letter "U" which means the flow direction is towards the drive unit.

Step 5

Ensure the impeller is positioned, keeping minimum radial distance to the tank.

**Further installation requirements regarding the position can be found in chapter 6.2 Mounting angle for side mounted Agitator type ALS and chapter 6.3 Mounting angle for bottom mounted Agitator type ALB to ensure optimum performance.**

Clearance > S/15
and
Clearance > 20mm




Step 6
If propellers has been all-welded to the shaft (not if it has been all-welded to the shaft-end) it can be necessary to align the shaft, using heat and or bending forces according to specifications and instructions in chapter 6.6 Shaft alignment.

WARNING
Step 7

CAUTION
Do **NOT** connect the power supply until installation is completed.
Follow instructions in chapter 8.1 Drive unit instructions.
Ensure that the rotation direction is according to nameplate.
**Always** perform pre-use check before operation (see chapter 3.3 Pre-use check).

NOTE
On closed tanks, Alfa Laval recommends installing a manhole circuit breaker, cutting power supply if hatch is open.

*Study the instructions carefully and pay special attention to the warnings!*
*Always check the Agitator before operation - see chapter 3.3 Pre-use check.*
*The Agitator is for permanent fastening.*
*Make sure that the motor correspond to the environment.*

## 3.3 Pre-use check

**Always make sure that the ATEX category stated on the Agitator name plate corresponds with the environment it is installed in.**
**Never** install the Agitator in environments which deviate from those given in chapter 2.3 Intended use and 6.1 Technical data.
**Always** ensure that all alignment specifications given in chapter 6.6 Shaft alignment are followed.
**Always** make sure that the motor corresponds to the environment.

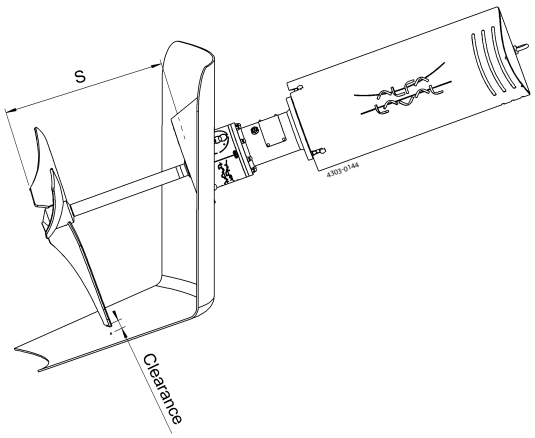
**Step 1**
Go through chapter 2.4 Safety precautions.

**Step 2**
Check the fastenings.

**Step 3**
Check o-ring and impeller are correctly fitted.

**Step 4**
Check impellers CANNOT collide with tank vessel at any point during a full rotation.

Clearance > S/15
and
Clearance > 20mm

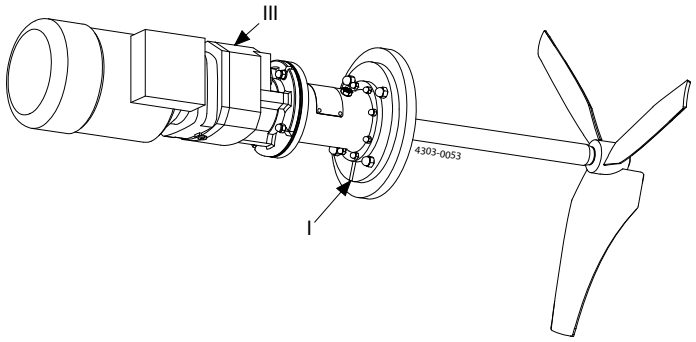



**Step 5**
**Seal**
- Ensure the sealing surfaces are not stuck together, by slowly turning shaft by hand.
- Ensure that the seal never runs dry.

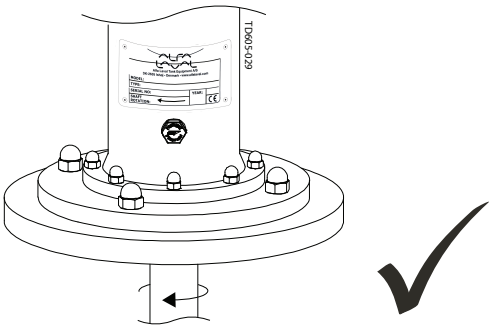
# 3 Installation

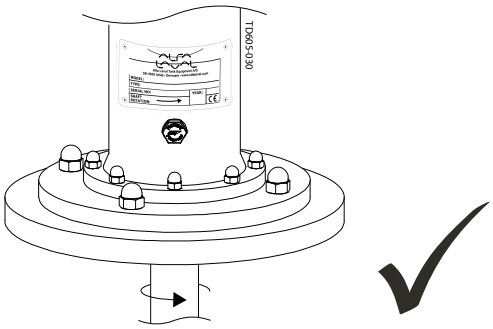
*Study the instructions carefully and pay special attention to the warnings!*
*Always check the Agitator before operation - see chapter 3.3 Pre-use check.*
*The Agitator is for permanent fastening.*
*Make sure that the motor correspond to the environment.*

Step 6
Ensure that drain (I) is pointing downwards.
For gears with vent screw, ensure the vent is pointing upwards and the rubber plug (III) is removed (see chapter 8.1 Drive unit instructions and mounting instructions in Step 1 on page 18.




Step 7
Ensure that the rotation direction is according to nameplate, before starting the Agitator.



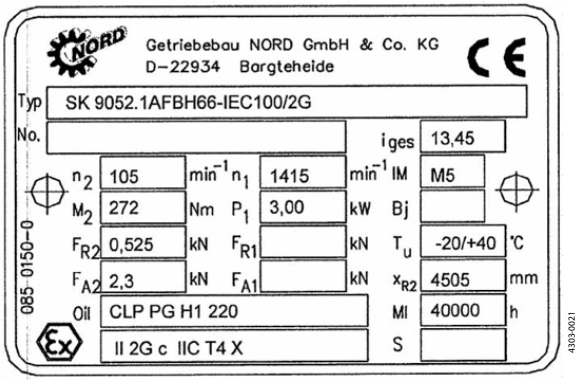




Step 8
If frequency converter drive is used the speed must be monitored according to section 6.7 Use of frequency converter drive (VLT). It must be ensured NOT to operate continuously within +/- 20% of critical oscillation speed.
(The critical oscillation speed can be found in the supplied Alfa Laval quotation agreement. In any doubt please advise with Alfa Laval).

Step 9
Check forces FR2, FA2 and XR2 applied to the gear box are higher or equal to the value listed in the supplied ATEX addendum.

NOTE!
Please pay special attention to the stated maintenance interval (MI) of the gear box.
The gear can have a shorter live time than the agitator.

The axial force FA2 is depended on the density of the media and must therefore not be higher than the density stated in the ATEX addendum.




If frequency converter drive is used please pay special attention to the maximum motor speed n1 stated on the gear box.

Step 10
Alfa Laval recommend a soft starter or a frequency converter for the Agitator to reduce the load on tank and Agitator. For operation instructions from suppliers see 2.4 Safety precautions.
The ramp up and ramp down time should be about 2-5 seconds.

## 3.4 Recycling information

• Unpacking

- Packing material consists of wood, plastics, cardboard boxes and in some cases metal straps.
- Wood and cardboard boxes can be re-used, recycled or used for energy recovery.
- Plastics should be recycled or burnt at a licensed waste incineration plant.
- Metal straps should be sent for material recycling.

• Maintenance

- During maintenance, oil and wear parts in the machine are replaced.
- All metal parts should be sent for material recycling.
- Worn out or defective electronic parts should be sent to a licensed handler for material recycling.
- Oil and all non-metal wear parts must be disposed of in accordance with local regulations.

• Scrapping

- At the end of use, the equipment must be recycled according to the relevant, local regulations. Besides the equipment itself, any hazardous residues from the process liquid must be considered and dealt with in a proper manner. When in doubt, or in the absence of local regulations, please contact your local Alfa Laval sales company.

# 4 Operation

*Study the instructions carefully and pay special attention to warnings!* ***Always*** *check the Agitator before operation (see chapter 3.3 Pre-use check). Alfa Laval recommend a soft starter or a frequency converter for the Agitator to reduce the load on tank and Agitator. For operation instructions from suppliers (see chapter 8 Appendix).*

## 4.1 Operation/Control

If deviation from normal operation and intended use shown in chapter 2.3 Intended use, immediately switch off the Agitator and find the cause of failure (see chapter 4.2 Troubleshooting).
The Agitator is designed to max 5 starts per hour.

Inspect the Agitator regularly

| | Inspect / Clean / Lubricate | | | |
|---|---|---|---|---|
| | Supplier instruction | Weekly | Monthly | Half-yearly |
| **Drive unit** | | | | |
| **Motor** | x | | | |
| - Clean surfaces - to avoid overheating | | x | | |
| **Gear** | x | | | |
| - Clean vent screw (if any) | | x | | |
| - Check for oil leakage | | x | | |
| **Flange** | | | | |
| Clean drain | | | x | |
| **Sealing** | | | | |
| **Mechanical seal** | | | | |
| - NOT flushed: S3 | | | x | |
| **Impeller device** | | | | |
| **Sticky media** | | | | |
| - Clean impeller device | | | x | |
| **Abrasive media** | | | | |
| - Check blade thickness* | | | x | |
| Check fastening of pointed set screws | | | x | |

** If any suspicion of reduction in blade thickness, contact Alfa Laval and inform serial no stated on the name plate.*

*Study the instructions carefully and pay special attention to warnings!* ***Always*** *check the Agitator before operation (see chapter 3.3 Pre-use check). Alfa Laval recommend a soft starter or a frequency converter for the Agitator to reduce the load on tank and Agitator. For operation instructions from suppliers (see chapter 8 Appendix).*

## 4.2 Troubleshooting

| Problem | Cause/result | Remedy |
|---|---|---|
| **Not starting** | | |
| - Drive unit | - Defect | Dismantle drive unit, check for correct rotation. Replace drive unit |
| | - Fault at power supply | Check power supply connection |
| | | Check voltage and frequency correspond with name plate |
| | | Check frequency converter adjustment correspond to name plate |
| - Agitator | - Obstructed | Check Agitator can rotate freely without striking anything |
| **Vibrations** | | |
| - Impeller device | - Damaged | Contact Alfa Laval |
| | - Unbalanced impeller | Clean impeller device |
| | - Damage to shaft seal | Replace sealing |
| - Shaft | - Damaged | Contact Alfa Laval |
| - Other | - Deviation from normal operation | Operation circumstances must equal to those it was designed for [1] |
| | - Increased / decreased temperature | |
| **Unusual noise** | | |
| - Drive unit | - Defect | Replace drive unit |
| | - Bearing gap | Renovate or change the drive unit immediately |
| | - Increased / decreased power | Switch of power supply |
| | - No grease | Replace drive unit |
| - Sealing | - Wear sealing | Replace sealing |
| | - Seal are not flushed | Replace sealing and ensure that the seal never run dry |
| | - Seal surfaces stick together | Separate surfaces carefully and clean them - ensure that seals are sufficient cleaned before still stand |
| - Other | - Deviation from normal operation | Operation circumstances must be equal to those it was designed for [1] |
| | - Circuit overload | Operation circumstances must be equal to those it was designed for [1] |
| **Leakage** | | |
| - Gear | - Oil leakage | Renovate or change the gear immediately |
| - Sealing | - CIP fluid or other | Replace sealing |
| **Continuous breakdown** | | |
| - Drive unit | - Defect | Replace motor |
| | - Too high frequency | Regulate frequency down |
| - Other | - Deviation from normal operation | Operation circumstances must be equal to those it was designed for [1] |
| **Performance** | | |
| - Drive unit | - Wrong frequency | Check frequency connection |
| - Agitator | - Reverse direction | Inspect the Agitator carefully |
| - Other | - Deviation from normal operation | Operation circumstances must be equal to those it was designed for [1] |

[1] *See chapter 2.3 Intended use.*

# 4 Operation

*Study the instructions carefully and pay special attention to warnings!* ***Always*** *check the Agitator before operation (see chapter 3.3 Pre-use check). Alfa Laval recommend a soft starter or a frequency converter for the Agitator to reduce the load on tank and Agitator. For operation instructions from suppliers (see chapter 8 Appendix).*

## 4.3 Cleaning - recommendations

Ensure the drain in flange is not clogged up, by cleaning drain regularly.

Ensure that all surfaces in contact with product are totally clean in order not to contaminate the product.
Pay special attention to:
- Impeller device surfaces
- Surfaces between impeller devices and shaft
- Surfaces around sealing
- Surfaces around weldings

CAUTION
Mechanical seals are designed for cleaning in place (CIP) and sterilising in place (SIP).
CIP = Cleaning In Place. SIP = Sterilising In Place.

Always rinse well with clean water after cleaning.

## 4.4 Temperature limits

The highest allowable ambient temperature is 40ºC.

The highest allowable operating temperature of the media when an Ex zone is present is 90°C to comply with a temperature class T4 (Maximum surface temperature 135°C).

When an Ex zone is **NOT** present (both inside and outside the tank) the temperature can be increased for shorter periods of time, eg. 10-20 minutes during a sterilization phase or the like, can be allowed and accepted without changing the oil service interval and without reducing the lifetime of the gear motor. The highest allowable oil temperature of the gear motor is 140°C and the oil service interval, which at 70°C is about 40.000 hours, will be reduced by 50% for each 15K the oil temperature is increased above the 70°C. Therefore the oil temperature must be observed if the temperature is increased. The service interval of the gear is stated on the gear name plate.

*For maintenance instructions from suppliers, see chapter 8 Appendix.* ***Always*** *ensure that mounting is according to chapter 6.1 Technical data.*
*Ensure totally clean surfaces during mounting - also remove remaining loctite residue on threads.* ***Always*** *refer to tightening torques in chapter 6.1 Technical data.*

## 5.1 General maintenance

Maintenance of the Agitator should only be performed by authorized personnel.
For maintenance instructions from suppliers, see chapter 8 Appendix.
Ensure totally clean surfaces during maintenance.

Ensure nonexplosive atmosphere during maintenance.

If possible, **always** dismount the Agitator from tank before dismantling it.
For lifting instruction, please refer to chapter 3 Installation.

**Always** read the technical data thoroughly (see chapter 6.1 Technical data).
**Always** ensure that the mounting is according to Agitator described in chapter 2.3 Intended use and chapter 6.1 Technical data.
**Always** refer to tightening torques in chapter 6.1 Technical data.
**Always** disconnect the power supply when servicing the Agitator.
**Always** use proper tools.
**Always** replace sealing elements before reassembling.

WARNING

Follow the dismantling and assembly instructions to the letter.
After maintenance, chapter 3.3 Pre-use check must be read thoroughly before operation.

NOTE

All scrap must be stored/disposed of in accordance with current rules/directives.
Use original Alfa Laval spare parts.

PREVENTIVE MAINTENANCE
To ensure that your Alfa Laval machine operates efficiently, it is essential to follow a simple preventive maintenance programme, which will keep your machine in good working conditions. Good maintenance requires careful attention at regular intervals!

The following recommended preventive maintenance procedures are based on the average operating conditions of most Alfa Laval machines. However, you will appreciate that a machine, which is subject to rough and dirty conditions, will need more frequent attention than one working in ideal conditions. We trust that you will adjust your maintenance programme to meet the demands of your normal operating conditions.

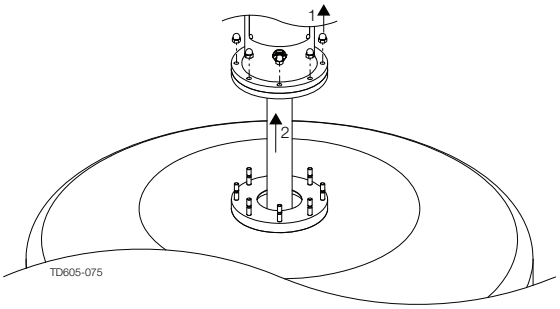
| | Replace every: | | | | |
|---|---|---|---|---|---|
| | 500 hour or yearly | 1000 hour or yearly | 3000 hour or yearly | 3000 hour or every 3rd year | 6000 hour or every 3rd year |
| **Sealing** | | | | | |
| **Mechanical seal**<br>-NOT flushed: S3 | | | | x | |
| **Drive unit** | | | | | |
| Gear unit | According to gear box name plate | | | | |

# 5 Maintenance

*For maintenance instructions from suppliers, see chapter 8 Appendix.* ***Always*** *ensure that mounting is according to chapter 6.1 Technical data.*
*Ensure totally clean surfaces during mounting - also remove remaining loctite residue on threads.* ***Always*** *refer to tightening torques in chapter 6.1 Technical data.*

## 5.2 Replacement of drive unit

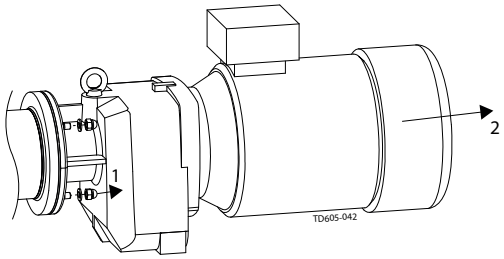
**Step 1**
1. Dismantle Agitator from welding flange.
2. Lift up Agitator.



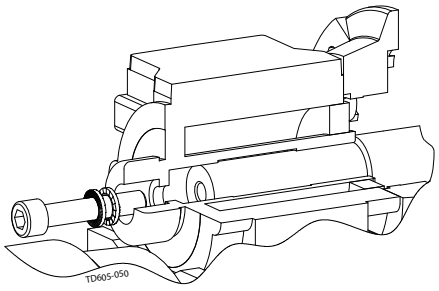

**Step 2**
Before dismantling drive unit, please see instructions in 5.3 Replacement of shaft seal, type S3.

**Step 3**
Loosen cap nuts.

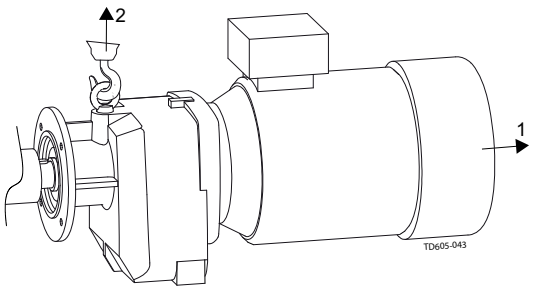
**CAUTION**
If dismantling motor from gear:
Follow supplier instructions.
Ensure that the gear oil is contained.
A cog wheel may be mounted onto the motor shaft.




**Step 4**
Release the gear motor from the Agitator. Refer to supplier instructions.




**Step 5**
Lift up the drive unit and pull it away.



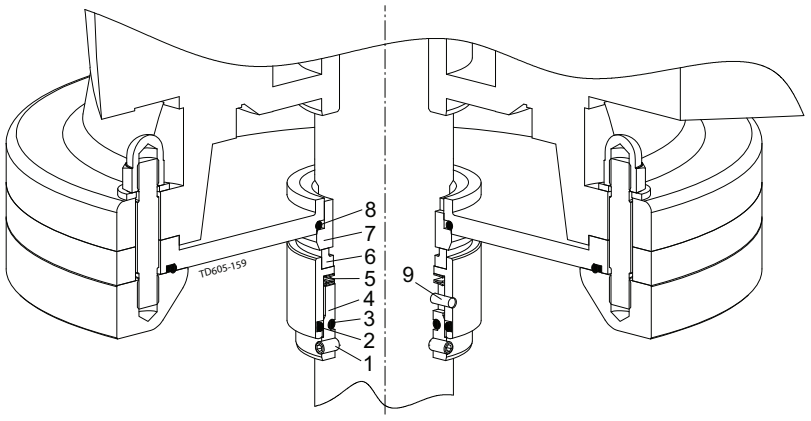

**Step 6**
Replace drive unit.

**Step 7**
Use Loctite® 243 before fastening screws.
Always refer to tightening torques in chapter 6.1 Technical data when tightening bolts.

**Step 8**
Mount drive unit reverse as dismantling.

*For maintenance instructions from suppliers, see chapter 8 Appendix.* ***Always*** *ensure that mounting is according to chapter 6.1 Technical data.*
*Ensure totally clean surfaces during mounting - also remove remaining loctite residue on threads.* ***Always*** *refer to tightening torques in chapter 6.1 Technical data.*

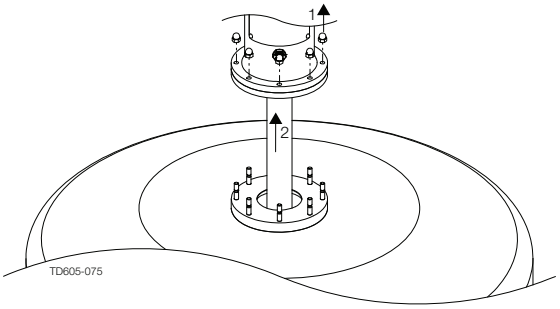
## 5.3 Replacement of shaft seal, type S3



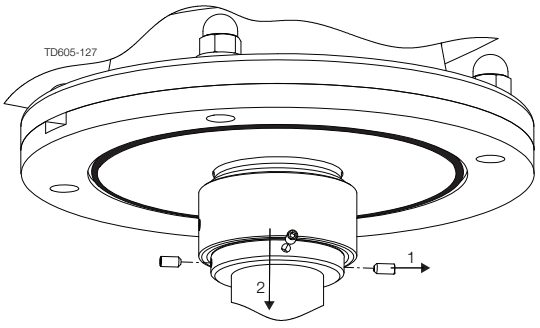

NOTE
To replace seals easier, use detergent.
Ensure subsequent to seal replacement, that all seal faces are totally clean, using alcohol.
If possible, **always** dismantle the Agitator from the tank before dismounting any parts.
The seal (see chapter 2.3 Intended use) is designed for dry running, so a whining noise during operation is quite normal.

Positions referred to in following instructions can be seen in the above illustration.

Step 1
1. Dismantle Agitator from welding flange.
2. Lift up Agitator




Step 2
1. Loosen pointed screws (1), securing rotary seal housing onto the shaft.
2. Move the seal housing, including rotary seal part, by pulling it carefully along the shaft, avoiding contact.

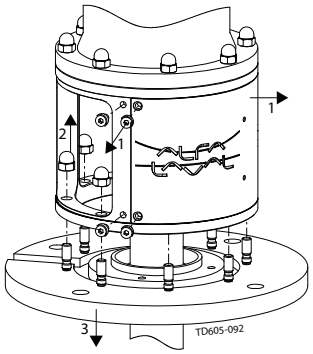



NOTE
Use mild detergent to reduce friction.

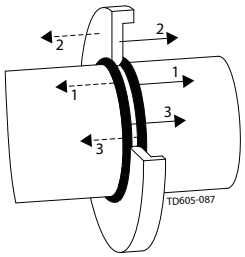
# 5 Maintenance

*For maintenance instructions from suppliers, see chapter 8 Appendix.* ***Always*** *ensure that mounting is according to chapter 6.1 Technical data.*
*Ensure totally clean surfaces during mounting - also remove remaining loctite residue on threads.* ***Always*** *refer to tightening torques in chapter 6.1 Technical data.*

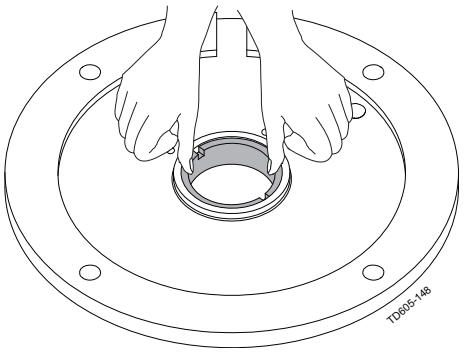
### Step 3
1. Remove guards from lantern.
2. Remover cap nuts.
3. Move the mounting flange, including stationary seal ring, carefully along the shaft, avoiding contact.




### Step 4
Move oil trap ring and o-rings, if any, along the shaft.




### Step 5
1. Push stationary seal ring (7) out of the mounting flange.




### Step 6
Remove all seal parts from shaft.

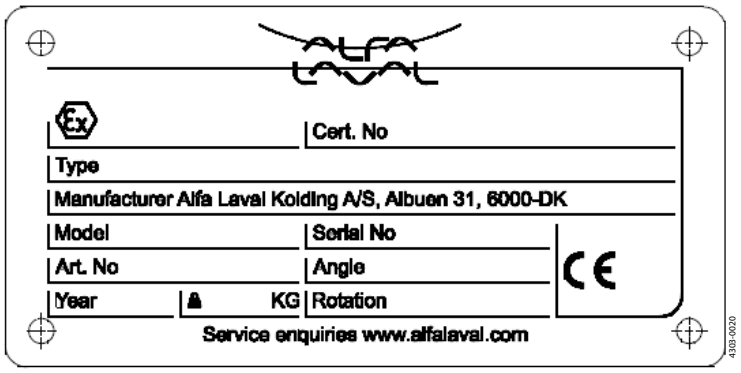
### Step 7
1. Replace all seal parts.
2. Assemble Agitator reverse as dismantling.

*All dimensions in mm unless otherwise stated.*

## 6.1 Technical data

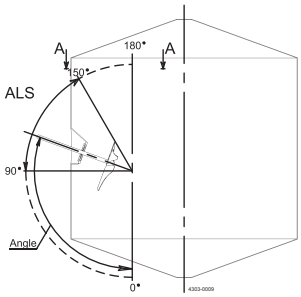
The Alfa Laval Agitator is available in various configurations and is configured to solve the specific application. Therefore specific information like weight, size, critical oscillation speed and duties can be found in the supplied Alfa Laval quotation agreement.

Important installation information about weight and mounting angle can be found on the supplied Agitator name plate as shown on the illustration.




## 6.2 Mounting angle for side mounted Agitator type ALS

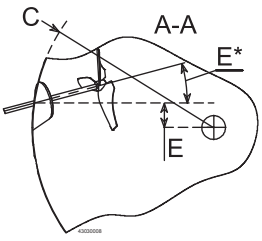
To ensure optimal agitation the side mounted Agitator must be installed in the mounting angle specified on the name plate, as described in the Alfa Laval quotation agreement and as shown on the illustration.




The side mounted Agitator must also be installed in either an offset distance (E) from the center of the tank or it must be installed an offset angle (E*) from the center of the tank as shown on illustration section A-A

The distance (E) can be calculated as follows:
E = C x tan(5-7°), where C = tank radius

If the offset angle is chosen it must be as follows: E* = 5-7°



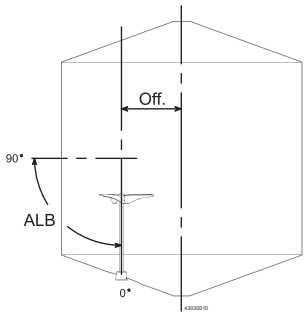

NOTE
In certain cases the offset angle E* is recommended to be larger - e.g. 10-12°.
- it will be communicated via the Alfa Laval quotation agreement.

# 6 Technical data

*All dimensions in mm unless otherwise stated.*

## 6.3 Mounting angle for bottom mounted Agitator type ALB

To ensure optimal agitation the bottom mounted Agitator must be installed in the mounting angle specified on the name plate, as described in the Alfa Laval quotation agreement and as shown on the illustration.



*All dimensions in mm unless otherwise stated.*

## 6.4 Specific conditions for safe use

The media properties has influence on the mechanical shaft seal properties and must not be change from what the agitator was designed for without advising with Alfa Laval.
The operating limits of the shaft seal must not be exceeded from below table.

NOTE
The rpm of the gear box can be the limiting factor.

| Øshaft | 6 | Pressure max. [Barg] |
|---|---|---|
| | 90 | Media temp. max. [°C] |
| Ø30 | 500 | Max. speed [rpm] |
| Ø40 | 500 | |

The shaft seal must always be submerged during operation since dry running will result in a temperature increase in the seal faces and a potential ignition source can become effective. With the Agitator's seal submerged the agitator is not subjected to any gas or dust inside the tank and is therefore outside any classification zone – even though the inside of the tank can be Atex classified to zone 0, 1 or 2 for Gas zones or 20, 21 or 22 for Dust zones.

To prevent dry running a level switch must be installed to shut down the agitator and depending on the zone classification inside the tank, the level switch must correspond to different safety levels:
- Zone 0/20 inside the tank – the level switch must correspond to b2 according to EN 80079-37
- Zone 1/21 inside the tank – the level switch must correspond to b1 according to EN 80079-37
- Zone 2/22 inside the tank – the level switch does not need to correspond to a specific safety integrity level.

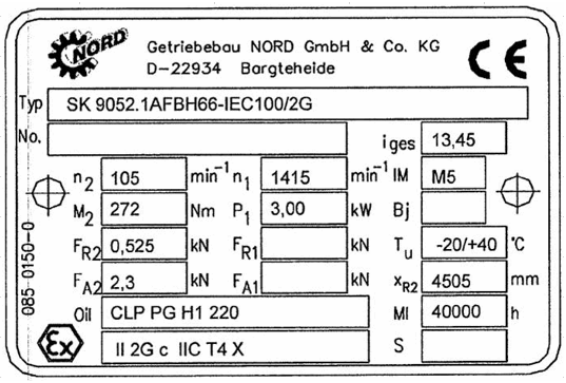
The level switch must ensure a liquid level of minimum 500mm above the seal faces to prevent dry running.

The gear box ATEX validation is depended on the forces applied to it and must therefore have values for FR2, FA2 and XR2 stated on the gear box name plate that are higher or equal to the values from the supplied ATEX addendum. See picture example of the gear box name plate below.

The oil level in the gear is adjusted to the agitator mounting angle and must be meet within +/-5°. The angle is to be found on the agitator name plate.

NOTE
The axial force FA2 is depended on the density of the media and must therefore not be higher than the density stated in the ATEX addendum.

Operating with variable speed please pay special attention to section 6.7 Use of frequency converter drive (VLT).



# 6 Technical data

*All dimensions in mm unless otherwise stated.*

## 6.5 Tightening torques for bolt connections

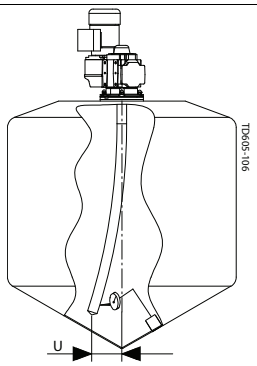
CAUTION
Use Loctite® before fastening.
Do NOT use air powered tools.

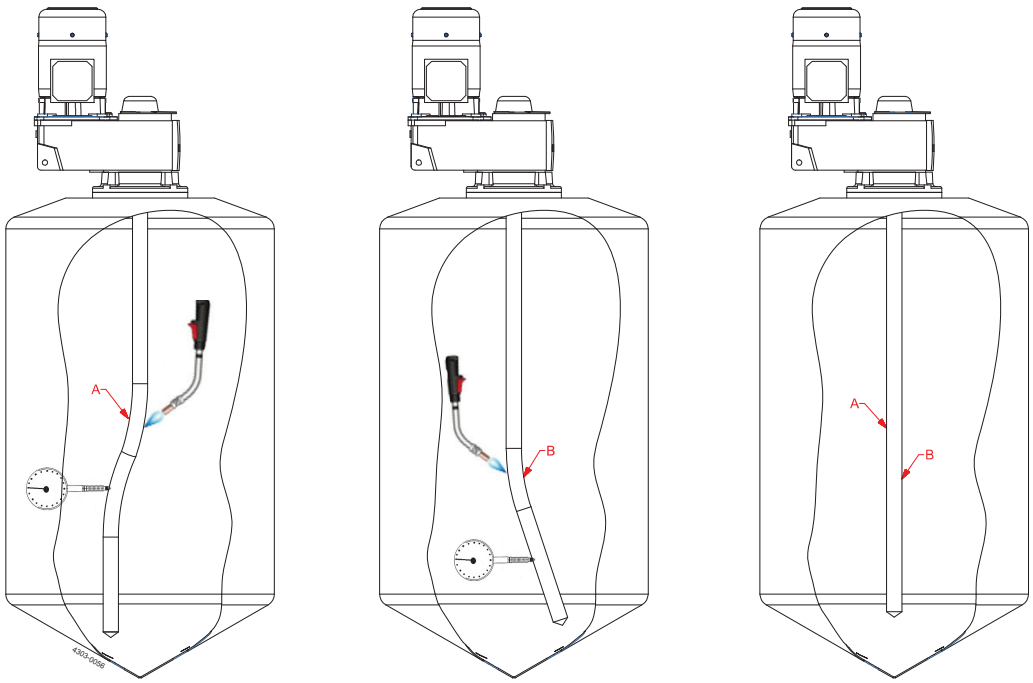
| M4 | M5 | M6 | M8 | M10 | M12 | M14 | M16 | M18 | M20 | M22 | M24 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3Nm | 6Nm | 11Nm | 26Nm | 51Nm | 88Nm | 141Nm | 218Nm | 308Nm | 439Nm | 582Nm | 724Nm |

## 6.6 Shaft alignment

**Shaft to be aligned in bearing frame or in gear motor.**

| RPM up to: | 50 | 100 | 500 | 1000 | 2800 |
|---|---|---|---|---|---|
| U (max radial tolerance, ALS/ALB) | 0.4 | 0.3 | 0.2 | 0.1 | 0.05 |




After propellers has been welded onto the shaft and / or two shaft parts has been welded together - the shaft must be aligned. If the shafts has been welded according to Alfa Lavals recommendations shown below – the required alignment will be very little as the amount of introduced heat to the shaft is minimized and due to the fact that all shafts has been aligned before delivery from Alfa Laval.

*"All-weld shaft connections and propellers to shaft with one welding seam at a time, cool with air and continue with one welding until welding is according to illustration. Use welding procedures which introduce as less heat, tension and bending to the shaft as possible."*

*All dimensions in mm unless otherwise stated.*

Required tool:
1. A gas-welding torch supplied with a mixture of Acetylene and Oxygen gas.
2. A dial indicator.

Procedure:
1. Alignment of the shaft is carried out in steps from the bearing frame / gear motor and down to the shaft end.
2. If the shaft has been exposed to uneven heat around “A” (due to welding of shaft connection or welding of propeller onto shaft) a possible bend can be introduced around “A”.
3. The dial indicator is located about 500-2000 mm below “A” (but above the next bend “B”) and the shaft is rotated until the shaft is pointing to the left as shown on the picture.
4. The welding torch is used on the opposite site of the bend (the right side of the shaft in this example) about 25-50 mm further up or down from the welding area “A”. The welding torch is positioned very near the shaft surface without moving it and the surface of the shaft is rapidly heated up (1-10 seconds depending on shaft bend) until a Ø2-10 mm red spot is observed. Observing the dial indicator the shaft will, during the heating process, bend even more to the wrong direction but during cooling it bends back to a “more” align position.
5. The shaft is cooled down with compressed air until the temperature of the part of the shaft around A is the same as the rest of the shaft and the surrounding temperature (2-10 minutes depending on amount of heat introduced).
6. Step 3), 4) and 5) are repeated until the alignment is according the specified “U” (which is a function of speed and Agitator type).
7. The next position “B” where the shaft has been exposed to uneven heat is located (due to welding of shaft connection or welding of propeller onto shaft).
8. The dial indicator is located 500-2000 mm below “B” (but above the next bend) or at the shaft end if the shaft does not have any other bends and the shaft is rotated until the shaft is pointing to the right as shown on the picture.
9. The welding torch is used on the opposite site of the bend (the left side of the shaft in this example) about 25-50 mm further up or down from the welding area. The welding torch is positioned very near shaft surface without moving it and the surface of the shaft is rapidly heated up (1-10 seconds depending on shaft bend) until a Ø2-10 mm red spot is observed.
10. The shaft is cooled down with compressed air until the temperature of the part of the shaft around A is the same as the rest of the shaft and the surrounding temperature (2-10 minutes depending on amount of heat introduced).
11. Step 8), 9) and 10) are repeated until the alignment is according the specified “U” (which is a function of speed and Agitator type).
12. The spot areas where the shaft has been heated and aligned using the welding torch must be cleaning using chemical pickling and or mechanical abrasive polishing.

*All dimensions in mm unless otherwise stated.*

## 6.7 Use of frequency converter drive (VLT)

CAUTION!
The speed of the agitator must be monitored if frequency converter drive (VLT) is installed to regulate the speed.

When the motor is controlled by a frequency converter, the manual from the motor manufacturer and the information in the certificate for the motor shall be followed. Temperature monitoring devices must meet the requirements in the directive 2014/34/EU and EN1127-1.

In additional for the speed of agitator EnSaFoil, the operating limits **"Critical speed"** according to the ATEX addendum must **not** be **exceeded**.

NOTE!
The build in function in the frequency converter cannot be used for that.

If the operating limits is to be exceeded it can lead to an ignition source coming affective, **either** by large deflection of the shaft, resulting in mechanical contact to the tank wall, **or** by heat buildup in the mechanical shaft seal, resulting in exceeding the assigned temperature class of the product.

Equipment protective level / safety devices

The Equipment protective level (EPL) has to be realized and integrated completely in the ignition protection system according to the Directives 2014/34/EU, EN ISO 80079-37, §6 and EN ISO 80079-36. The system shall be evaluated and may marked "b2" according to EN ISO 80079-37, §6.

The functions of these ignition protective systems have to be checked before start-up according to the manual from the manufacturer of the system.

The Equipment protection level (EPL) for the monitoring have to meet the demands of EN ISO 80079-37, §6. The functions of these systems have to be checked regularly by the user, according to the manual from the manufacturer of the system.

The reaction time of the ignition protection system must not exceed 2 seconds.
- The reaction time is the period between reaching the shut-down value and until the power is shut-off of the machine.

Required measures of the end user to eliminate ignition hazards:
- With a zone 0/20 inside the tank and zone 1/21 outside, the speed of the agitator has to be monitored with an EPL, corresponding to b2 or two b1 according to EN ISO 80079-37, §6.
- With a zone 1/21 inside and outside the tank the speed of the agitator has to be monitored with an EPL, corresponding to b1 according to EN ISO 80079-37, §6.
- With a zone 2/22 inside and outside the tank no further measures needs to be taken.

*If the agitator is supplied with an incremental encoder attached to the motor shaft, it may be used as one of the two independent control measure devices b1. In regard to b2 a second control measure device must be applied and the complete EPL must be assessed acc. to the Directives 2014/34/EU, EN ISO 80079-37, §6 and EN ISO 80079-36.*

## 6.8 Storage

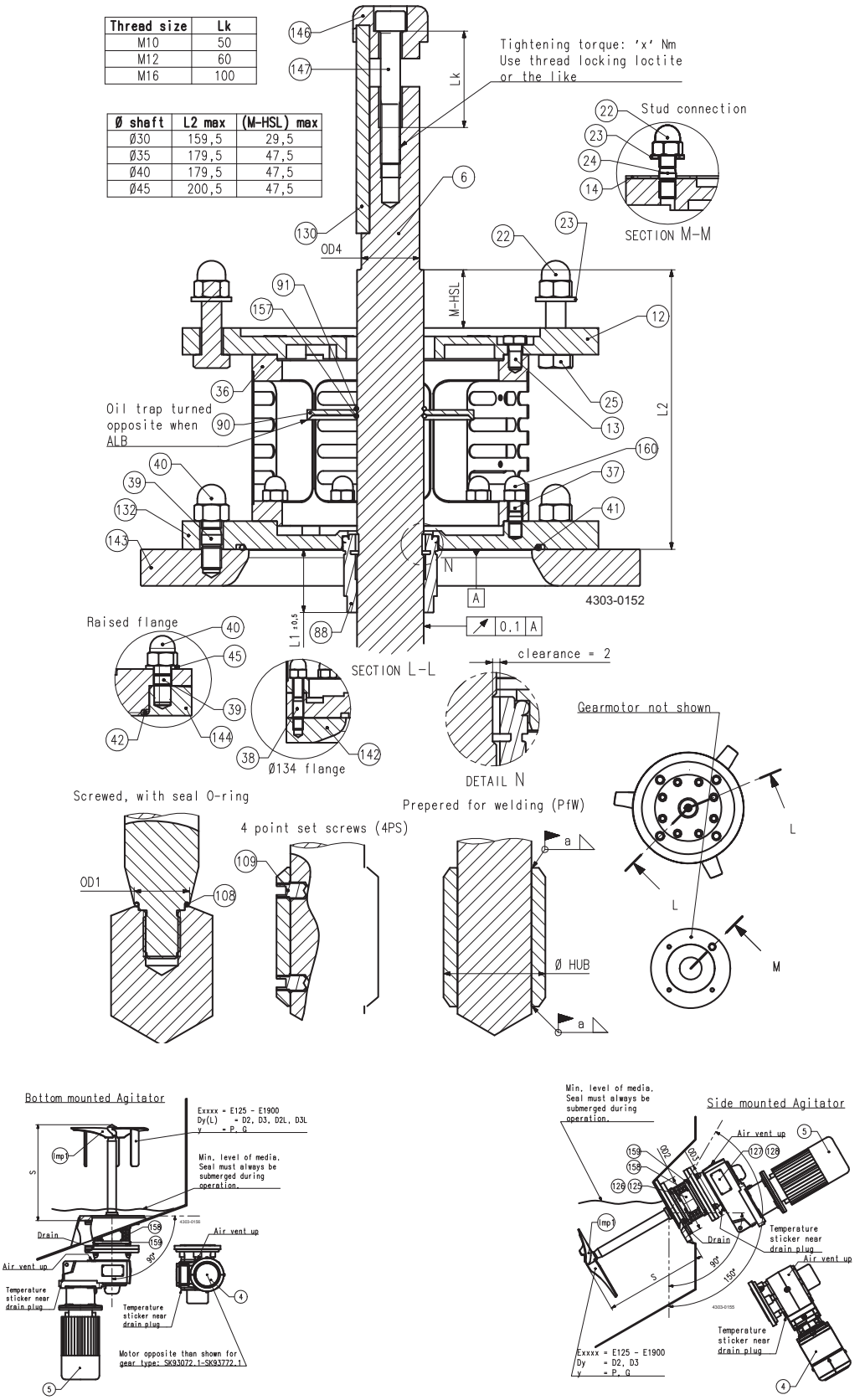
Store the Agitator in dry and clean environments.

Rotate shaft every second week to ensure seal faces do not stick together.

## 7.1 Agitator - ALS / ALB ATEX

| Thread size | Lk |
|---|---|
| M10 | 50 |
| M12 | 60 |
| M16 | 100 |

| Ø shaft | L2 max | (M-HSL) max |
|---|---|---|
| Ø30 | 159,5 | 29,5 |
| Ø35 | 179,5 | 47,5 |
| Ø40 | 179,5 | 47,5 |
| Ø45 | 200,5 | 47,5 |



## Parts list

| Pos. | Qty | Denomination |
|---|---|---|
| Imp1 | 1 | Impeller device, EnSaFoil (E125-E1900, D2(L), D3(L)) |
| 4 | 1 | GR gear motor, hollow shaft |
| 5 | 1 | GP gear motor, hollow shaft |
| 6 | 1 | Shaft |
| 12 | 1 | Drive unit flange |
| 13 | 8 | Screw |
| 22 | 4 | Cap nut |
| 23 | 4 | Washer |
| 24 | 4 | Stud |
| 25 | 4 | Screw |
| 36 | 1 | Lantern |
| 37 | 8 | Stud |
| 38 | 8 | Stud |
| 39 | 4 | Stud |
| 40 | 4 | Cap nut |
| 41 | 1 | O-ring |
| 42 | 1 | O-ring |
| 88 □ | 1 | S3 seal |
| ♦ | 1 | S3 seal |
| ○ | 1 | S3 seal |
| ⋆ | 1 | S3 seal |
| 90 | 1 | Oil trap |
| 91 | 1 | O-ring |
| 108 | 1 | O-ring |
| 109 | 4/Imp | Screw |
| 125 | 1 | Name plate |
| 126 | 4 | Rivet |
| 130 | 1 | Parallel key |
| 142 | 1 | Welding flange* |
| 143 | 1 | Welding flange |
| 144 | 1 | Welding flange, raised* |
| 146 | 1 | Fixing element |
| 147 | 1 | Screw |
| 157 | 1 | Spring, ring |
| 158 | 2 | Guard |
| 159 | 8 | Screw |
| 160 | 8 | Cap nut |

## Service kits

| | Denomination | size: Ø30 | size: Ø40 |
|---|---|---|---|
| **Seal kits** | | | |
| □ | S3 seal, C/SiC, FPM, ATEX II 2G c TX ..... | TE2602000293 | TE2602000294 |
| ♦ | S3 seal, C/SiC, EPDM, ATEX II 2G c TX ..... | TE2602000200 | TE2602000292 |
| ○ | S3 seal, SiC/SiC, FPM, ATEX II 2G c TX ..... | TE2602000296 | TE2602000298 |
| ⋆ | S3 seal, SiC/SiC, EPDM, ATEX II 2G c TX ..... | TE2602000290 | TE2602000295 |

* Only ALB agitators.

For information on item numbers, please refer to the Spare part manual, available from the online Alfa Laval product catalogue Anytime or the Close at hand spare part catalogue.

# 8 Appendix

*Appendix*

## 8.1 Drive unit instructions

The drive unit is supplied by sub supplier and all important installation requirement is transferred to the Agitator instruction manual. For further information regarding maintenance and storage of the drive unit please find the drive unit instruction manual by below links

For Agitators with gears please find the drive unit instruction manual by below link:
https://www.nord.com/cms/en/documentation/manuals/details_1139/detail_42075.jsp

For Agitators with direct drive (motor only) please find the motor instruction manual by below link:
http://www.hoyermotors.com/Catalogues-30304.htm

**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.