

Alfa Laval EnSaLine welding guidelines

Agitators



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Welding guidelines

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1 Safety

This guide provides general installation guidelines for the welding flange.

Before starting to weld make sure that you have received all necessary material certificates and approvals which are needed.

1.1 Warning signs in text

Pay attention to the safety instructions in these welding guidelines.

Below are definitions of the two grades of warning signs used in the text where there is a risk for damage to the supplied Alfa Laval product.



Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate damage to the supplied Alfa Laval product.



Indicates important information to simplify or clarify procedures.

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2 Installation

2.1 General welding guidelines

- 1 Ensure that the tank, where the welding flange is to be welded in, can handle the forces applied by the agitator: Torque M_v , Bending torque M_b and Side thrust F_s .

The values depend on the agitator configuration. The following information is required to calculate the forces:

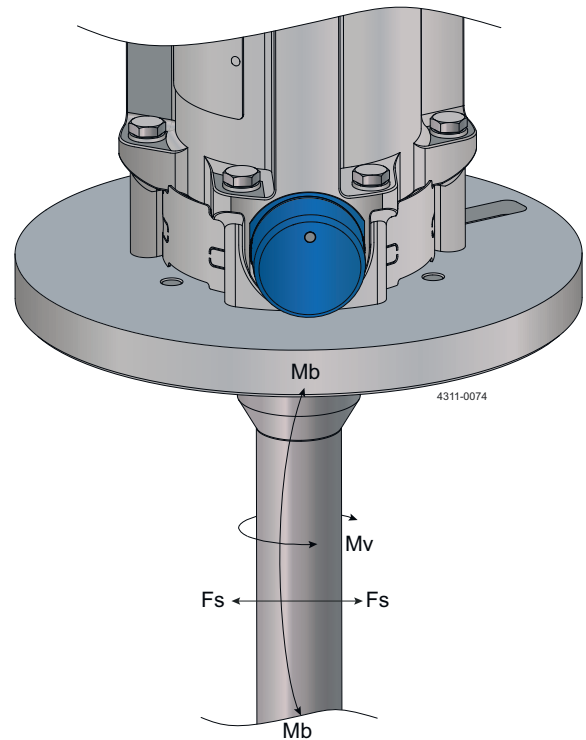
- P: Power of the motor in (kW)
- n: Speed of agitator shaft (RPM)
- S: Shaft length according to agitator configuration in (mm)
- D: Largest impeller diameter according to agitator configuration in (mm)

The values can be calculated as follows:

$$M_v \text{ (Nm)} = 23873 \times P / n$$

$$F_s \text{ (N)} = 1.8 \times M_v \times 1000 / D$$

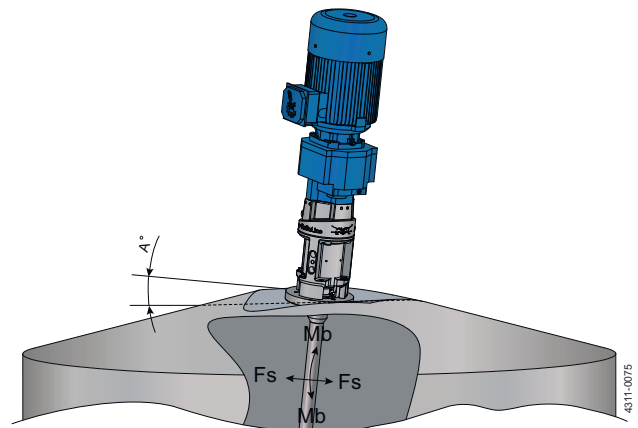
$$M_b \text{ (Nm)} = F_s \times S / 1000$$



- 2 During the design phase of the tank, ensure sufficient rigidity of the tank.

Ensure that the max bending angle (A), at loads specified in Step 1, does not exceed according to the scheme below.

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



2.2 Guidelines for installing welding flange for side mounted agitator

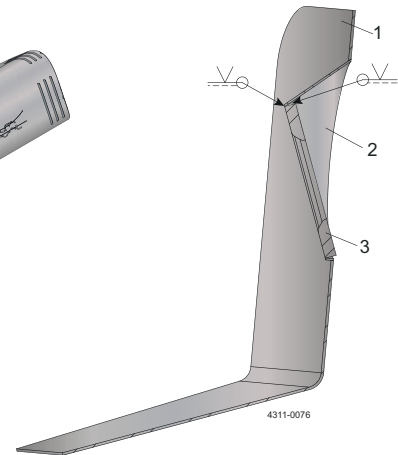
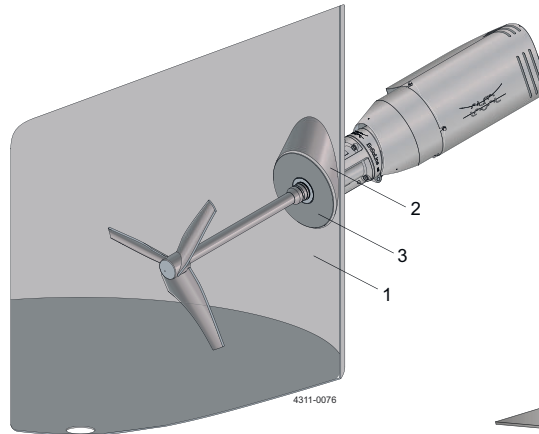
⚠ CAUTION

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

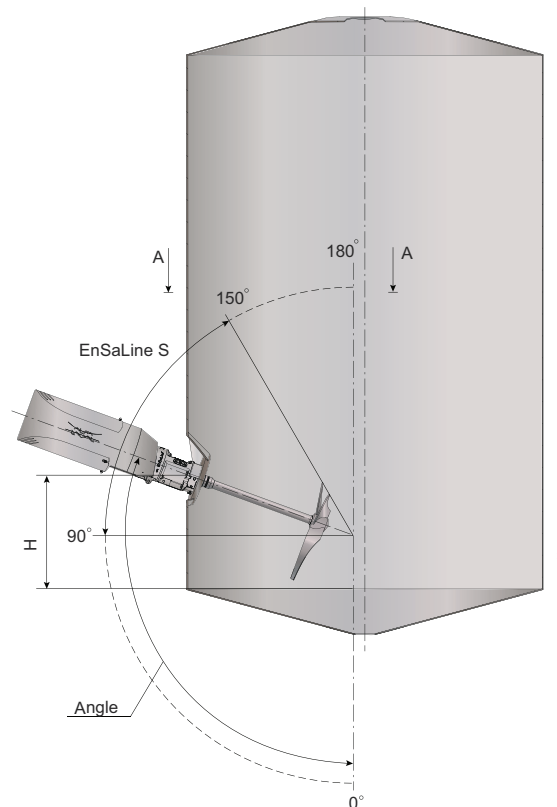
Only authorized personnel to weld in flanges.

Alfa Laval cannot be held responsible for incorrect installation.

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



To ensure optimal agitation, the side mounted agitator must be installed in the mounting angle specified on the name plate and height position (H), as described in the Alfa Laval quotation agreement and as shown on the illustration below.



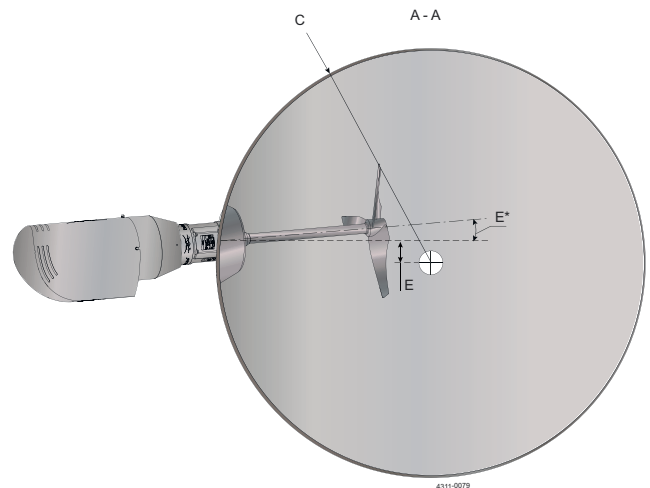
The side mounted agitator must also be installed in either an offset distance (E) from the center of the tank or it must be installed an offset angle (E*) from the center of the tank as shown on illustration section A-A.

The distance (E) can be calculated as follows:

$$E = C \times \tan(5-7^\circ), \text{ where } C = \text{tank radius}$$

If the offset angle is chosen it must be as follows:

$$E^* = 5-7^\circ$$



NOTE

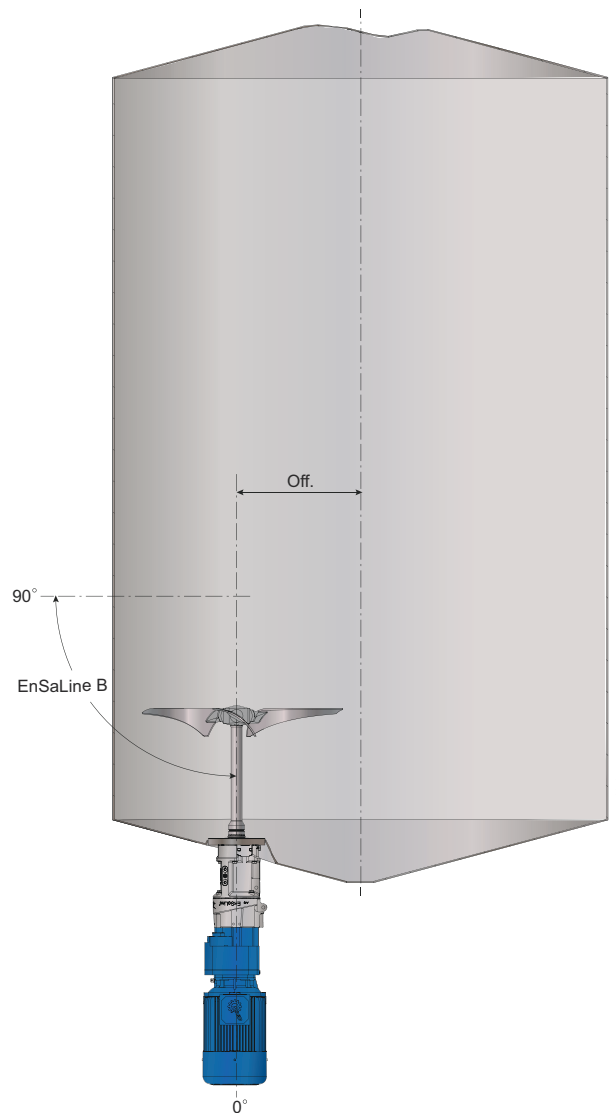
In certain cases the offset angle E* is recommended to be larger - e.g. 10-12°.
- it will be communicated via the Alfa Laval quotation agreement.

2.3 Guidelines for installing welding flange for a bottom mounted agitator

CAUTION

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

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



The welding flange can be installed in several ways:

1. Vertically inside a bead or cone (non-flush installation)
2. Perpendicular to the tank bottom surface
 - a. Flush with the tank bottom
 - b. Non-flush, installed in a bead or cone

Although method 2a - a flush installation - may appear to be the simplest solution, the tank bottom's geometry, thickness, and the forces/torques acting on it must be carefully considered. With a flush design, all stresses and loads from the tank bottom are transmitted directly into the welding flange, which may cause sufficient deformation of the flange to result in leakage. Please find the tolerance demands after welding under section [Welding procedure](#) on page 12.

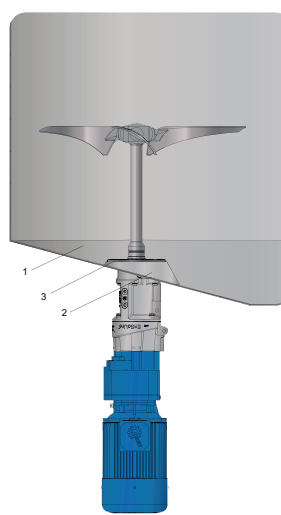
NOTE

In order to secure enough space for service tools, the correct welding flange size (Outer Diameter, OD) must be used.

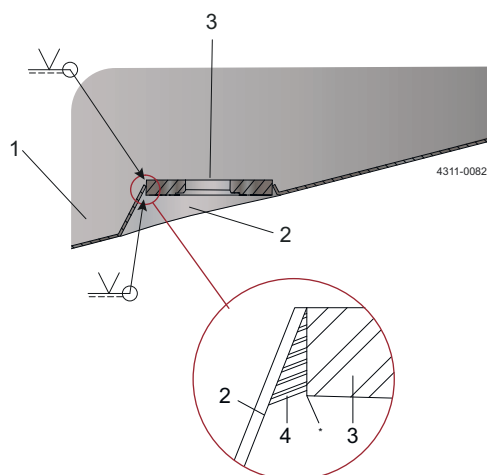
The appropriate welding flange size must be selected based on the agitator size and the chosen installation method, as specified in the table below.

Size	Installation method	
	Flush	None-flush
A30	OD 200	OD 250
A45	OD 230	OD 300

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

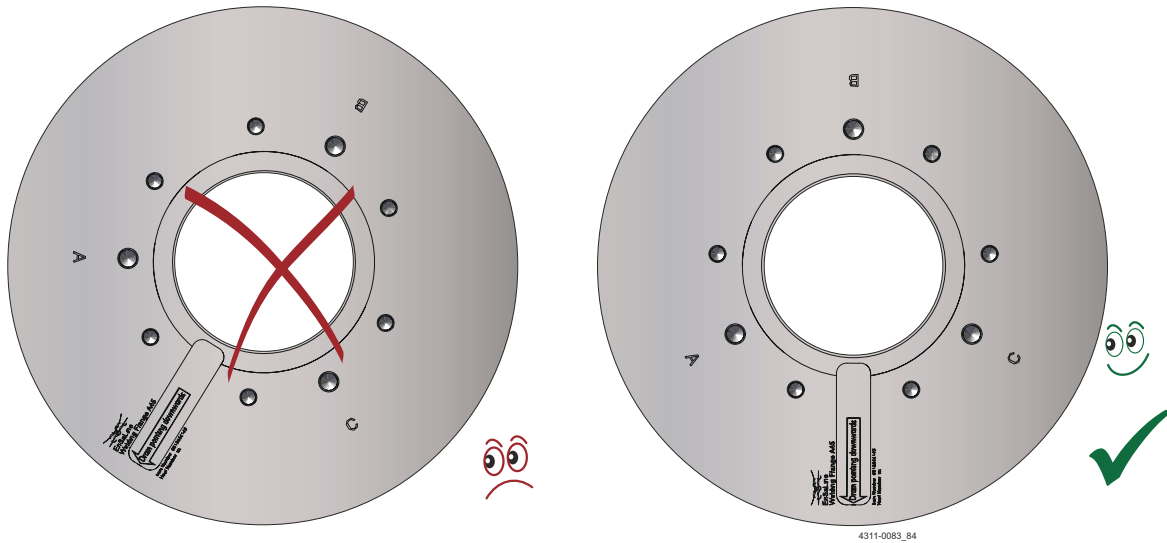


1. Tank bottom
2. Cone for welding flange
3. Welding flange
4. Welding seal



2.4 Welding procedure

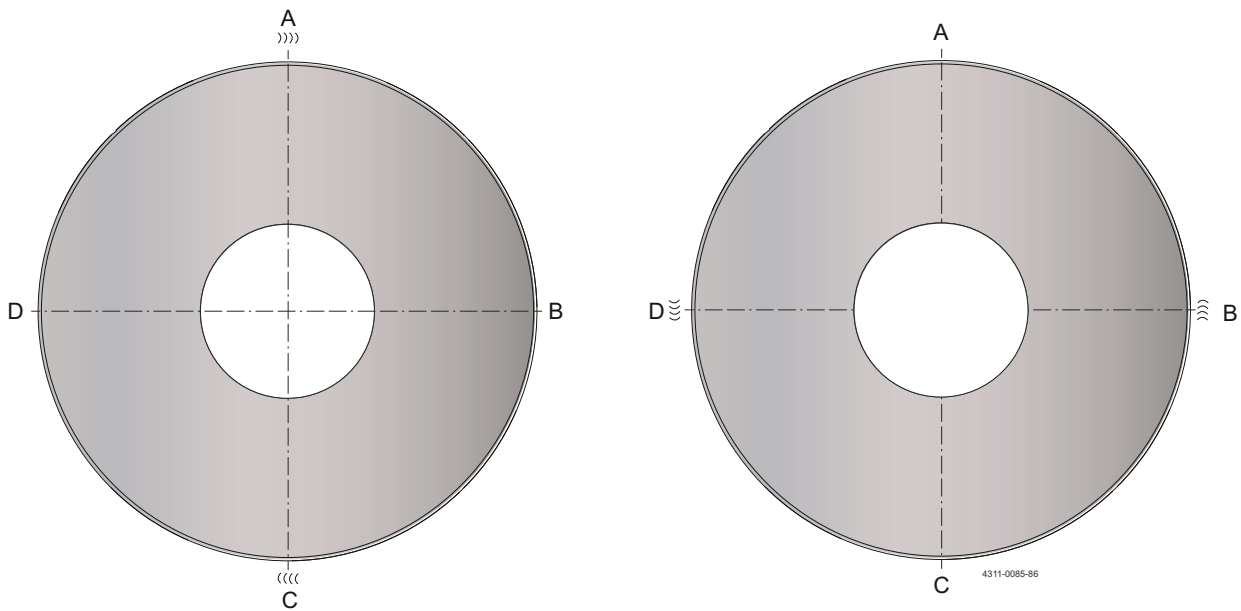
- 1 Position the flange correctly with the drain pointing downwards to the lowest point.



- 2 Spot weld from the outside starting at the drain and opposite of the drain.

Next, align flange to fit straight in the hole and make two additional spot welds.

Ensure that the mounting angle is met.



- 3 Spot weld from the inside all around to get a good fixation.

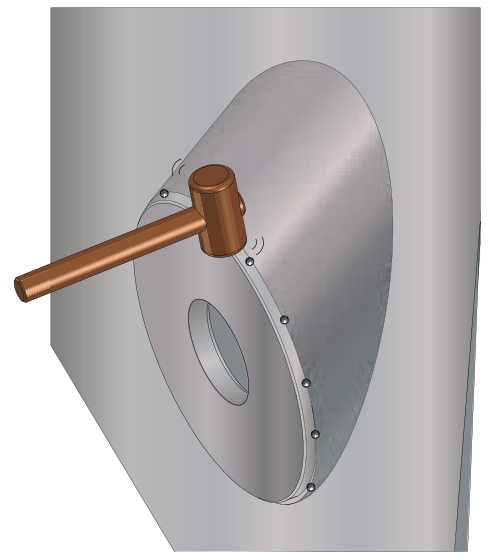


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- 4 Close the gap between the welding flange and the cone by hammering down the sheet metal between the previous spot welds.

It is important to get snug fit.

A heat pass with the weld torch can also be used to shrink the gap.



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Add additional spot welds to keep the gap closed during the full weld pass.



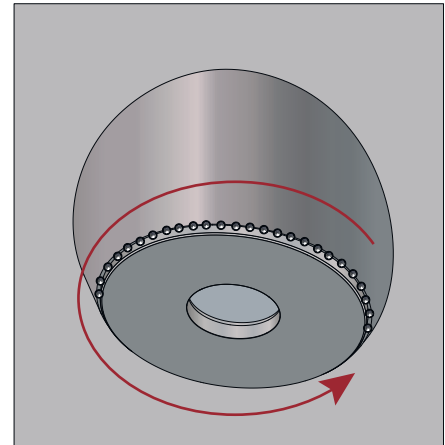
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5 Make a full weld pass on the inside.

To avoid too much heat stress, be sure to weld fast and consistently in one direction around the welding flange.

Welding parameters example:

TIG Weld, Current 137Amps, 2 mm cord,
Cone material thickness 3 mm, speed 3-5 mm/s.



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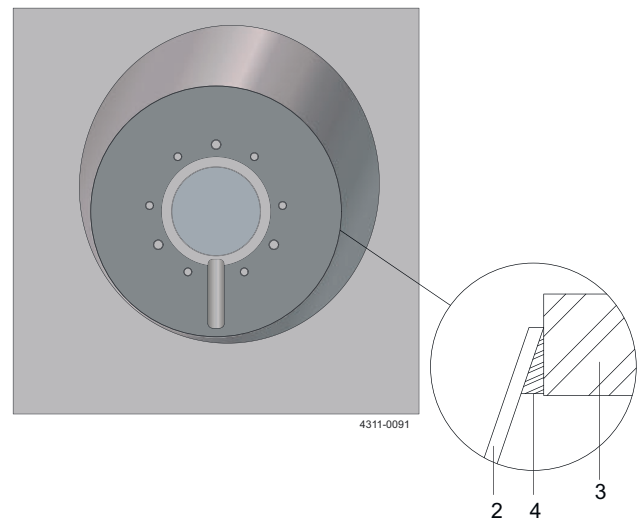
6 Fill the gap on the outside with multiple, small-diameter weld beads to control the overall heat input. Bigger weld beads cause more powerful stress due to shrinkage during cooling.

The pulse setting on the welding apparatus with a low current can minimize the heat input.

Cool to ambient temperature between each pass.

Welding parameters example:

TIG Weld, Current 83Amps, Pulse setting



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7 Inspect the welding flange for deformation.

Use a solid straight ruler and a feeler gauge to determine the flatness.

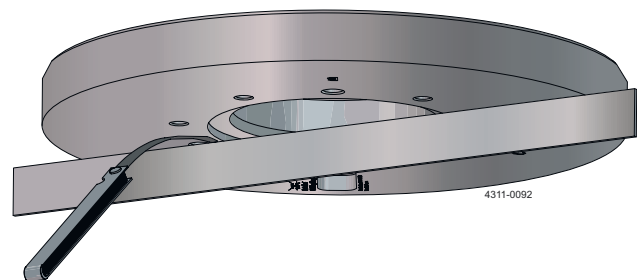
Ensure that the flatness tolerance is ≤ 0.35 mm after welding.

Inspect that the inner hole diameter is within tolerance.

For A30 the inner diameter must be:
 $\text{Ø}85\pm 0.5$

For A45 the inner diameter must be:
 $\text{Ø}105\pm 0.5$

When the measures are confirmed grind and polish the welds to the desired finish.



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Should the flatness exceed acceptable tolerances, it can be adjusted back into specification using a hydraulic jack, as illustrated.

- a. Pull
- b. Apply hydraulic pressure
- c. Flatness

- 1. Rod
- 2. Nut
- 3. Disc
- 4. Hydraulic jack with hollow shaft
- 5. Support beam
- 6. Disc
- 7. Nut
- 8. Welding flange

