Purpose
The assembly instructions explain how the ABB turbocharger is fitted to the engine correctly and without any health and safety risks.

Target group
The assembly instructions are intended for engineers and mechanics responsible for fitting the turbocharger on the engine.

A100-M turbocharger
More power, more options
Assembly Instructions

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1 Introduction

1.1 Purpose of the assembly instructions

The assembly instructions explain how the ABB turbocharger is fitted to the engine correctly and without any health and safety risks. This element of the documentation is supplied with the product, as is required for partly completed machinery in accordance with machinery directive 2006/42EC.

The assembly instructions are a complement to and expansion of existing national regulations for occupational safety, accident prevention and environmental protection.

1.2 Definition of target group

The assembly instructions are intended for engineers and mechanics responsible for fitting the turbocharger on the engine. Basic mechanical training is a prerequisite.

All persons who are involved in the transportation and installation of the turbocharger have read and understood the assembly instructions.

1.3 Symbols, definitions

Symbols

The following symbols are used in this document:

- Indicates an action step.

1. Indicates a numbered action step.

- Indicates a list.

[➙ ] Refers to a page number

The trademarks of outside companies are used in this document. These are marked with the ® symbol.

Design variants

This document is valid for different design variants of turbochargers. There may be sections and descriptions of components that are not relevant for a specific turbocharger variant.

ABB Turbocharging Service Stations will be happy to provide information about questions regarding a design variant (see "Contact Information" on our website www.abb.com/turbocharging).
Accuracy of illustrations

The illustrations in this document are general in nature and intended for ease of understanding. Differences in detail are therefore possible.

ABB Turbo Systems

ABB Turbo Systems Ltd is identified as ABB Turbo Systems in this document.

Official service stations of ABB Turbo Systems

Official service stations are identified in this document as ABB Turbocharging Service Stations. They are regularly audited and certified by ABB Turbo Systems. See "Contact Information" on our website at www.abb.com/turbocharging.

1.4 Definition of warning, caution, note

Definition of Warning

Non-compliance or inaccurate compliance with working or operating instructions indicated by this symbol and the word WARNING can lead to serious injuries to personnel and even to fatal accidents.

► Warning signs must always be observed.

Definition of Caution

Non-compliance or inaccurate compliance with working or operating instructions indicated by this symbol and the word CAUTION can lead to serious damage to engine or property with grave consequences.

► Caution signs must always be observed.

Note

The note provides advice which facilitates the work.
1.5 Definition of mandatory signs

<table>
<thead>
<tr>
<th>To be worn at all times</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Protective clothing</td>
<td>Safety footwear to protect against mechanical hazards</td>
</tr>
</tbody>
</table>

Table 1: Personal protective equipment to be worn at all times

<table>
<thead>
<tr>
<th>To be worn specific to the respective task</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety glasses</td>
<td>Safety goggles</td>
</tr>
<tr>
<td>Safety gloves to protect against</td>
<td>Respiratory mask to protect against dusts and gases</td>
</tr>
<tr>
<td>- Mechanical hazards</td>
<td></td>
</tr>
<tr>
<td>- Chemical hazards</td>
<td></td>
</tr>
<tr>
<td>- Heat hazards</td>
<td></td>
</tr>
<tr>
<td>Safety helmet</td>
<td>Ear protection</td>
</tr>
</tbody>
</table>

Table 2: Personal protective equipment to be worn specific to the respective task

1.6 Definition of pictograms

The following pictograms can occur in this document. These point out actions that must be taken in accordance with the meaning of the relevant pictogram.

<table>
<thead>
<tr>
<th>Pictogram</th>
<th>Meaning</th>
<th>Pictogram</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tighten with specified torque</td>
<td>Tighten with specified torque</td>
<td>Oil free, grease free and dry</td>
<td></td>
</tr>
<tr>
<td>Tighten over specified tightening angle</td>
<td>Tighten over specified tightening angle</td>
<td>Affix</td>
<td></td>
</tr>
<tr>
<td>Hand-tight, tighten without tools</td>
<td>Hand-tight, tighten without tools</td>
<td>Measure</td>
<td></td>
</tr>
<tr>
<td>Oil</td>
<td>Oil</td>
<td>Note</td>
<td></td>
</tr>
<tr>
<td>Apply screw locking paste (e.g. Loctite)</td>
<td>Apply screw locking paste (e.g. Loctite)</td>
<td>Visually inspect</td>
<td></td>
</tr>
<tr>
<td>Apply high-temperature grease</td>
<td>Apply high-temperature grease</td>
<td>See document</td>
<td></td>
</tr>
<tr>
<td>Apply other paste in accordance with specifications</td>
<td>Apply other paste in accordance with specifications</td>
<td>Dispose of in an environmentally compatible, professional way and in compliance with locally applicable regulations.</td>
<td></td>
</tr>
</tbody>
</table>
2 Safety

2.1 Introduction

State of the art

Turbochargers manufactured by ABB Turbo Systems are state of the art and comply with the respective health and safety standards in effect at the time the turbocharger was built. This ensures safe operation of the turbocharger.

CE conformity information

ABB turbochargers comply with the Machinery Directive 2006/42/EC and are partly completed machinery as defined by Article 2 g.

Residual risks

Nevertheless, there may be some residual risks during operation of and work on the turbocharger which:

- Are caused by the turbocharger itself or its accessories.
- Are caused by the operating equipment used or supplies and materials.
- Are a consequence of insufficient compliance with safety instructions.

All of the instructions contained within this chapter must be followed when working on the turbocharger.

Responsibility of the operating company

In awareness of its responsibility, the operating company must ensure that only authorised personnel work on the turbocharger, who:

- Correspond to the target group (see Definition of target group [➙ 2]).
- Are versed in the general and locally applicable regulations for occupational safety and accident prevention
- Are equipped with the prescribed personal protective equipment
- Have been instructed in the use of the turbocharger.

The safety-conscious work of the personnel and adherence to the assembly instructions must be checked periodically.

Suitable working materials and personal protective equipment must be kept in a perfect condition.
2.2 Lifting of loads

**Suspended loads**

Loads that are not attached according to regulations can cause injury to personnel or fatal accidents.

- Loads must always be fastened to properly functional lifting gear with a sufficient load limit.
- Pay attention to the correct attachment of loads on the crane hook.
- People must not stand beneath suspended loads.

Wear safety gloves against mechanical risks.

Wear safety helmet.

---

**Figure 1: Attachment of loads on the crane hook**

**Figure 2: Attachment angle**

If there are two or more suspension points, the attachment angle of 45° must not be exceeded. This prevents excessive loading due to diagonal pull.

- Use a suitable edge guard if there are sharp edges.
- The assembly devices must be completely screwed in and must not unscrew during use.
- Use assembly devices only for the described applications.
2.3 Occupational safety

General

**Injuries to persons**
Severe injuries to personnel or fatal accidents can be caused by mechanical influences as a consequence of hazardous and inadequate operational procedures or non-compliance with safety and health standards.

- When working on the turbocharger always wear safety footwear and protective clothing to protect against mechanical hazards.
- Keep personal protective equipment in perfect condition.
- Obey mandatory signs.
- Observe the general rules for occupational safety and prevention of accidents.
- Only perform operations that are described in this document.
- Only perform operations for which you have received instruction or training.

Wear safety footwear against mechanical risks.

Wear protective clothing.

**Risk of falling**
When working on the turbocharger, there is a risk of falling.

- Do not climb onto the turbocharger or onto attached parts and do not use them as climbing aids.
- Use suitable climbing aids and working platforms for work above body height.

Injuries to persons

- Only perform work on the turbocharger when you are in a physically and psychologically stable condition.
- Only work with suitable tools, equipment and appliances that function properly.
- Keep the workplace clean; clear away any loose objects and obstacles on the floor.
- Keep the floor, equipment, and turbocharger clean.
- Have oil binding agents ready and provide or keep oil pans at hand.

**Welding work in the vicinity of the turbocharger**

- When performing welding work in the vicinity of the turbocharger, always cover the filter silencer to prevent the filter mat from being damaged.
- Keep flammable objects and substances out of the vicinity of flying sparks.
Cover all connections on the turbocharger so that no foreign objects can enter the turbocharger.

Mechanical hazards when working on the turbocharger

WARNING

Physical hazards due to rotating parts
The rotor can rotate due to the stack draught alone. Contact with rotating parts can cause severe injury.
► Secure rotor against turning.

WARNING

Mechanical hazards
Severe injuries to personnel or fatal accidents can be caused by mechanical influences as a consequence of hazardous and inadequate operational procedures.
► Observe the general rules for occupational safety and prevention of accidents.
► Ensure workplace safety.
► Only perform operations that are described in this document.
► Only perform operations for which you have previously received instruction or training.

Hazards due to operating materials and supplies

Operating materials and supplies can include: Oils, greases, coolants, cleaning agents and solvents, acids or similar substances.

WARNING

Handling operating materials and supplies
Swallowing or inhaling vapours of operating materials and supplies or contact with them may be harmful to health. Flammable and combustible operating materials and supplies can catch fire or resulting vapours can lead to an explosion.
► Do not breathe in these substances and avoid contact with the skin.
► Ensure proper ventilation.
► Observe the information in the material safety data sheet for the operating materials and supplies.
► Comply with local legislation.

► Wear safety goggles.

► Wear safety gloves against mechanical risks.

► Wear a respiratory mask to protect against gases.
3 Weight and transportation of the turbocharger

Lifting gear with a sufficient load limit must be used for installing the turbocharger. The following weight specification applies to the heaviest variant possible. Depending on the specification, the weight specified on the rating plate may be lower than the standard value specified here.

![Turbocharger suspension points](image)

Figure 3: Turbocharger suspension points

**Weight of the entire turbocharger**

<table>
<thead>
<tr>
<th>Product</th>
<th>Weight [kg]</th>
</tr>
</thead>
<tbody>
<tr>
<td>A170-M</td>
<td>3100</td>
</tr>
<tr>
<td>A175-M</td>
<td>4600</td>
</tr>
</tbody>
</table>

Table 4: Weight of the turbocharger
4 Installing the turbocharger

4.1 Steps for fastening the turbocharger with clamping nuts

**WARNING**

Risk of tipping

If the turbocharger is not sufficiently supported or not supported at all during removal and installation, it may tip over and cause severe injury to personnel or accidents resulting in fatalities.

- Support the turbocharger at a suitable location.
- Secure with lifting gear wherever possible.

Wear safety helmet.

![Figure 4: Turbocharger suspension points](image)

- If present: Remove insulation segment on the bearing casing.
- Attach lifting gear to the suspension lug of the bearing casing and the turbine-end foot.
- Remove the covers from the oil connections.
- Align turbocharger and place on bracket.
Removing auxiliary screws

Figure 5: Removing auxiliary screw

- Remove shipping screws (90334 / 90335) on the left and right side of the foot and place in the toolbox.

The turbocharger is delivered with a pre-installed sliding block (68003). The shipping screws secure the sliding block in the preset position. In operation, the foot can slip due to thermal expansion.

- Tighten clamping nuts as described in the following sections.

- Connect all gas, air and oil pipes.
- If present: Re-fit the insulation segments.
- If present: Connect cable to speed sensor.
Installing the turbocharger

Compressor-end (CE) foot

![Compressor-end foot diagram]

Figure 6: Compressor-end foot

Turbine-end (TE) foot

![Turbine-end foot diagram]

Figure 7: Turbine-end foot

### Screw dimensions and number of cup springs

<table>
<thead>
<tr>
<th>Product</th>
<th>Foot bolt dimension [mm]</th>
<th>Strength class</th>
<th>Dimension CE [mm]</th>
<th>Dimension TE [mm]</th>
<th>Number of cup springs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a1</td>
<td>b1</td>
<td>c1</td>
<td>a2 / a3</td>
<td>b2</td>
</tr>
<tr>
<td>A170-M</td>
<td>M30</td>
<td>10.9</td>
<td>82</td>
<td>ø32x23</td>
<td>68</td>
</tr>
<tr>
<td>A175-M</td>
<td>M36</td>
<td>10.9</td>
<td>95</td>
<td>ø38x31</td>
<td>85</td>
</tr>
</tbody>
</table>

Table 5: Foot bolt dimensions

Holes b1/b2 are needed to achieve the required clamping length. An additional drill hole is not needed at the higher turbine-end foot side (01).
Fixing clamping nuts

Figure 8: CE foot contact surface

- Tighten clamping nuts on compressor end (CE) (see Tightening the clamping nut).

Figure 9: TE foot: Handling of cup spring contact surface / foot contact surface

- Coat the contact surface (F) for the cup springs (X) (see Table 5) at the foot of the turbine end (TE) with high-temperature grease.
- Tighten clamping nuts on turbine end (TE) (see Tightening the clamping nut).
4.1.1 Tightening the clamping nut

**CAUTION**

Do not clean pressure screws (d)

The pressure screws are equipped with a permanent sliding layer that must not be removed.

Do neither clean nor lubricate the pressure screws. In case of non-compliance, it cannot be ensured that the necessary tension force is reached.

- Do not clean pressure screws.
- Do not lubricate pressure screws.

**NOTICE**

Pressure screws (d) must not protrude from the clamping nut (c) in the direction of the thrust washer (b)

In order to correctly fit the clamping nuts, the pressure screws must not protrude in the direction of the thrust washer.

---

1. Clean bolt thread (a) and contact surface.
   Coat the bolt thread with grease.
2. Fit thrust washer (b) (component of clamping nut).
3. Tighten clamping nut (c) by hand.
4. Screw back clamping nut by ¼ of a turn (90°).

The distance between the thrust washer and the clamping nut is now about 1 mm.
1. Screw in pressure screws crosswise by hand until reaching the stop.
2. Tighten pressure screws crosswise to 50% of the tightening torque specified in the table.
3. Tighten pressure screws crosswise to 100% of the tightening torque specified in the table.
4. Work in a circle to tighten all pressure screws to 100% of the tightening torque specified in the table.
5. Tighten pressure screws to 100% in 5 … 7 rounds until the required residual tightening angle of < 20° is achieved.

Table 6: Clamping screw tightening torques

<table>
<thead>
<tr>
<th>Product</th>
<th>Fixing screw [mm]</th>
<th>Tightening torques of pressure screws [Nm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>A170-M</td>
<td>M30</td>
<td>45</td>
</tr>
<tr>
<td>A175-M</td>
<td>M36</td>
<td>85</td>
</tr>
</tbody>
</table>

Figure 11: Tightening the clamping nut (2)
5 Storage of new turbochargers and spare parts

Storage of new turbochargers and spare parts for up to 6 months

New turbochargers and spare parts from ABB Turbo Systems can be stored in their closed packages for 6 months from the date of delivery without additional mothballing measures, indicated by VCI label on package.

![VCI](image)

Figure 12: Volatile Corrosion Inhibitor (VCI)

Only dry rooms with 40 ... 70 % atmospheric humidity, in which no water condensation can form, are suitable as storage locations.

Storage of new turbochargers and spare parts for more than 6 months

**WARNING**

Health protection when handling VCI

VCI products are not hazardous in terms of the Ordinance on Hazardous Substances. Nevertheless, the following points must be observed when handling VCI:

- Observe information in material safety data sheet
- Ensure proper space ventilation.
- Do not eat, drink or store food at the workplace while working with VCI.
- Clean hands and face after working with VCI.
- For more information, see www.branopac.com.

Wear safety gloves against mechanical risks.

Every 6 months, the following mothballing measures are required:

- Open package.
- Remove VCI corrosion protection emitter from package and replace with a new VCI corrosion protection emitter of the same kind. New VCI corrosion protection emitters can be obtained from www.branopac.com.
- Old VCI corrosion protection emitters must be disposed of in an environmentally compatible, professional way and in compliance with locally applicable regulations.
- Close package. The more tightly the package is sealed, the longer the protection duration.
Long-term storage of replacement turbochargers or spare parts

ABB Turbo Systems will prepare turbochargers or cartridge groups for long-term storage if requested in the purchase order. The package is equipped with a hygrometer (see illustration).

![Figure 13: Package with hygrometer](image)

Every 6 months, the following measures are required:

- Check the hygrometer (02) in the sight-glass. There is an opening (01) in the wooden crate to enable you to perform this check. If the 70% indicator field has changed colour, the maximum admissible atmospheric humidity has been exceeded. In this case, the turbocharger or cartridge group must be checked and repackaged by an ABB Turbocharging Service Station.

- Check the package for damage. If the package is damaged, the turbocharger or cartridge group must be checked and repackaged by an ABB Turbocharging Service Station.

After every 3 years, the following steps must be carried out by an ABB Turbocharging Service Station:

- Checking the component
- Replacing the desiccant
- Repackaging the component.

**NOTICE**

**Replacement components which are ready for operation**

If the 70% field of the hygrometer (02) has not changed colour and the package is not damaged, the replacement turbocharger or replacement cartridge group can be put into operation without previously having been checked by an ABB Turbocharging Service Station.

**Unpackaging replacement turbochargers or spare parts**

Once the material has been unpackaged from the VCI package, the corrosion protection is no longer effective.

To prevent condensation, the temperature of the package contents must be the same as the ambient temperature.
7 Further information

The Operation Manual must be observed with regard to commissioning, operation, maintenance and ordering spare parts.

**NOTICE**

**Operation Manual**

The Operation Manual for the turbocharger with the relevant serial number is available online on our website www.abb.com/turbocharging.

![Figure 14: Serial number of the turbocharger on the rating plate](image)

One rating plate each is attached on the left and the right side of the foot of the turbocharger.

1. Read the serial number (02) on the rating plate (01) of the turbocharger.

   ▶ The Operation Manual can be found online in accordance with the details on the following page.
2A. www.abb.com/turbocharging

2B. www.abb.com/turbocharging

3. ABB Turbocharging

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Operating instructions
- Operation Manual
- Service instructions

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4. Figure 15: Finding the Operation Manual online

5. Follow the instructions on the website.
Further information

Find your local service team on our website (see section “contact us” / “Contact information”).

Find and download the Operation Manual of your product on our website (see “Need product information” / “Operating instructions”).

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