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

A100-L turbocharger
High efficiency turbocharger for two-stroke diesel engines

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

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   - Purpose of the assembly instructions
   - Definition of target group
   - Symbols, definitions
   - Definition of warning, caution, note
   - Definition of mandatory signs

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   - Introduction
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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 Turbocharging
ABB Switzerland Ltd, Turbocharging is identified as ABB Turbocharging in this document.

Official service stations of ABB Turbocharging
Official service stations are regularly audited and certified by ABB Turbocharging. See "Contact Information" on our website at www.abb.com/turbocharging.

1.4 Definition of warning, caution, note

WARNING
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.

CAUTION
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.

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

To be worn at all times

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Safety footwear" /></td>
<td>Protective clothing</td>
</tr>
<tr>
<td><img src="image" alt="Safety footwear" /></td>
<td>Safety footwear to protect against mechanical hazard and risk of falling</td>
</tr>
</tbody>
</table>

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

To be worn specific to the respective task

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Safety glasses" /></td>
<td>Safety glasses</td>
</tr>
<tr>
<td><img src="image" alt="Safety glasses" /></td>
<td>Safety goggles</td>
</tr>
<tr>
<td><img src="image" alt="Safety gloves" /></td>
<td>Safety gloves to protect against</td>
</tr>
<tr>
<td><img src="image" alt="Safety gloves" /></td>
<td>Mechanical hazard</td>
</tr>
<tr>
<td><img src="image" alt="Safety gloves" /></td>
<td>Chemical hazard</td>
</tr>
<tr>
<td><img src="image" alt="Safety gloves" /></td>
<td>Thermal hazard</td>
</tr>
<tr>
<td><img src="image" alt="Respiratory mask" /></td>
<td>Respiratory mask to protect against</td>
</tr>
<tr>
<td><img src="image" alt="Respiratory mask" /></td>
<td>Dusts</td>
</tr>
<tr>
<td><img src="image" alt="Respiratory mask" /></td>
<td>Gases</td>
</tr>
<tr>
<td><img src="image" alt="Safety helmet" /></td>
<td>Safety helmet</td>
</tr>
<tr>
<td><img src="image" alt="Ear protection" /></td>
<td>Ear protection</td>
</tr>
</tbody>
</table>

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

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>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Tighten with specified torque" /></td>
<td>Affix</td>
</tr>
<tr>
<td><img src="image" alt="Tighten over specified tightening angle" /></td>
<td>Measure</td>
</tr>
<tr>
<td><img src="image" alt="Hand-tight, tighten without tools" /></td>
<td>Note</td>
</tr>
<tr>
<td><img src="image" alt="Oil" /></td>
<td>Visually inspect</td>
</tr>
<tr>
<td><img src="image" alt="Apply screw locking paste (e.g. Loctite)" /></td>
<td>Please note text for numbered work step.</td>
</tr>
<tr>
<td><img src="image" alt="Apply high-temperature grease" /></td>
<td>See document</td>
</tr>
<tr>
<td><img src="image" alt="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>
</tr>
<tr>
<td><img src="image" alt="Oil free, grease free and dry" /></td>
<td></td>
</tr>
</tbody>
</table>

Table 3: Definition of pictograms
2 Safety

2.1 Introduction

State of the art
Turbochargers manufactured by ABB Turbocharging 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

**WARNING**

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 to protect against mechanical hazards.

Wear safety helmet.

![Attachment of loads on the crane hook](Fig. 1)

![Attachment angle](Fig. 2)

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

⚠️ WARNING
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 to protect against mechanical hazard and risk of falling.

Wear protective clothing.

⚠️ WARNING
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.

► 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.

Wear personal protective equipment (PPE) for welding operations.

**Mechanical hazards when working on the turbocharger**

**WARNING**

**Mechanical hazard**

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 chapter.
- 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 to protect against mechanical hazards.

- 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 transporting the turbocharger. The weight specified below 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.

- Remove insulation jacket from bearing casing.
- Fit lifting gear to turbocharger

<table>
<thead>
<tr>
<th>Product</th>
<th>Weight [kg]</th>
</tr>
</thead>
<tbody>
<tr>
<td>A160-L</td>
<td>1300</td>
</tr>
</tbody>
</table>

Table 4: Turbocharger weight
4 Installing the turbocharger

4.1 Placing the turbocharger on the bracket

Fig. 3: Attach lifting gear to the turbocharger

- Remove covers from the oil connections.
- Align turbocharger and place on engine bracket.
- Tighten the fixing screws (Steps for fastening the turbocharger) while only slightly loosening the lifting gear.
- Remove lifting gear from turbocharger.

See also

- Steps for fastening the turbocharger [11]

- Connect cable to speed sensor.
- Connect all gas, air, oil and drain pipes according to the instructions of the enginebuilder.
4.2 Steps for fastening the turbocharger

General information

<table>
<thead>
<tr>
<th>Subject</th>
<th>Requirement / Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turbocharger fixing elements</td>
<td>ISO strength class 10.9 or 12.9</td>
</tr>
<tr>
<td>Washers</td>
<td>Hardened, thickness ≥ 15 % nominal thread diameter</td>
</tr>
<tr>
<td>Dimension a</td>
<td>Height of turbocharger foot</td>
</tr>
<tr>
<td>Dimension b</td>
<td>Hole in bracket</td>
</tr>
<tr>
<td>Dimension c</td>
<td>Thread length ≥ 1.5 times the nominal thread diameter</td>
</tr>
<tr>
<td>Coefficient of friction</td>
<td>0.12 (lightly oiled)</td>
</tr>
</tbody>
</table>

Table 5: General information about fastening the turbocharger

- Tighten the foot fixing screws or nuts as per the selected tightening procedure in a Z configuration.

Fig. 4: Z tightening method

Torque-controlled tightening

Fig. 5: Turbocharger foot fixing types

<table>
<thead>
<tr>
<th>Product</th>
<th>Thread size</th>
<th>Height a of foot [mm]</th>
<th>Tightening torque [Nm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>A160-L</td>
<td>M20</td>
<td>64</td>
<td>340</td>
</tr>
</tbody>
</table>

Table 6: Tightening torques (foot screws)

1. In Z configuration, hand-tighten without tools.
2. In Z configuration, tighten to 50% of tightening torque.
3. In Z configuration, tighten to 100% of tightening torque.
Installing the turbocharger / 4.2 Steps for fastening the turbocharger

**Angle-controlled tightening**

![Diagram of turbocharger foot fixing types]

**Table 7: Tightening angle (foot screws)**

<table>
<thead>
<tr>
<th>Product</th>
<th>Thread size</th>
<th>Height a of foot [mm]</th>
<th>Pre-tightening torque [Nm]</th>
<th>Tightening angle for height a [DEG]</th>
<th>Additional tightening angle¹ per 10 mm of additional screw length (b + thickness of washer) [DEG]</th>
</tr>
</thead>
<tbody>
<tr>
<td>A160-L</td>
<td>M20</td>
<td>64</td>
<td>100</td>
<td>24</td>
<td>2.7</td>
</tr>
</tbody>
</table>

¹) Some brackets have through-holes for attaching the turbocharger or the threads start just a few millimetres below the contact surface. This additional tightening angle must be taken into consideration (after meaningful rounding) so that the screw always has the same high preload force.

Due to the special foot design of this turbocharger, the foot is not in contact with the bracket in the area of the screw holes as long as the screws have not been tightened. Initially, the foot only touches the bracket at the centre of the foot.

1. In Z configuration, hand-tighten without tools.
2. In Z configuration, tighten to 50% of pre-tightening torque.
3. In Z configuration, tighten to 100% of pre-tightening torque.

![Diagram of contact surface, turbocharger attachment]

4. Use the feeler gauge (0.05 mm) to check whether 25% of the surface of the screw contact points is in contact with the bracket (see diagram).

**CAUTION**

**Insufficient pre-tensioning force**

If the surface (A) of the contact points has insufficient contact before applying the tightening angle, the pre-tensioning force will be too small and the screws will become loose and break.

- Tighten the screw until 25% of the surface (A) is in contact with the bracket.

5. Tighten the screws with the specified tightening angle in a Z configuration.
5 Storage of new turbochargers and spare parts

Storage of new turbochargers and spare parts up to 6 months

New turbochargers and spare parts can be stored in sealed packaging without additional mothballing measures for up to 6 months from the date of delivery (marked by the VCI label on the package).

![VCI](image)

**Fig. 8: Volatile Corrosion Inhibitor (VCI)**

Only dry rooms in which the relative humidity is between 40…70 % and no condensation can form are suitable for storage.

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

**WARNING**

*Protection of health when handling VCIs*

VCI products are not hazardous in the sense of the Hazardous Substances Ordinance. Nevertheless, the following points are to be observed when handling VCIs:

- Observe specifications in the safety data sheet
- Ensure good room ventilation.
- Do not eat, drink or keep food at the workplace while working with VCIs.
- Clean hands and face after working with VCIs.
- For further information refer to [www.branopac.com](http://www.branopac.com).

Wear safety gloves to protect against mechanical hazards.

The following mothballing measures are required every 6 months:

- Open the package.
- Remove the VCI corrosion protection emitter from the package and replace it with a new, identical VCI corrosion protection emitter. New VCI corrosion protection emitters can be obtained at [www.branopac.com](http://www.branopac.com).
- Dispose of the old VCI corrosion protection emitter in an environmentally compatible manner, professionally and in accordance with local regulations.
- Seal the package. The better the external seal is designed, the more permanent the protection.
Long-term storage of turbochargers

The turbochargers will be prepared for prolonged storage by ABB Turbocharging on request. The package is equipped with a hygrometer (see illustration).

The following measures are required every 6 months:

- Check the hygrometer (02) in the sight-glass. There is an opening (01) in the wooden crate which allows this check to be carried out. When the display field has changed colour at the 70% level, the maximum permissible humidity has been exceeded. In this case the turbocharger must be inspected by an ABB Turbocharging Service Station and repacked.

- Inspect the package for damage. If the package is damaged, the turbocharger must be inspected by an ABB Turbocharging Service Station and repacked.

After every 3 years the following work steps must be performed by an ABB Turbocharging Service Station:

- Inspect the components
- Replace the desiccant agent
- Repackage the components.

If the 70% display field of the hygrometer (02) has not changed colour and the package is undamaged, the turbocharger can be placed into operation without any prior testing by an ABB Turbocharging Service Station.

Unpacking turbochargers

The corrosion protection effect ends after the material is unpacked from the VCI package.

To avoid the formation of condensation, the surroundings and the content of the package must have the same temperature during unpacking.
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.

A rating plate is attached to the turbocharger foot, one on the left and one on the right. On turbochargers with insulation from ABB, at least one additional rating plate is attached to the insulation of the gas outlet casing.

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

ABB Turbocharging

ABB Turbocharging is a technology and market leader in the manufacture and maintenance of turbochargers for 500 kW to 80+ MW diesel and gas engines. With 100+ ABB-owned Service Stations worldwide and 200,000+ ABB turbochargers in operation across the globe on ships, power stations, gensets, diesel locomotives and large, off-highway vehicles, ABB Turbocharging is

3. Operation Manuals

Download Operation Manuals specific to your ABB turbocharger to ensure safe and efficient turbocharger operations.

4. Follow the instructions on the website.

Fig. 10: Finding the Operation Manual online
Further information

Find your nearest Service Station on our website (see “Find your nearest Service Station”).

Find and download the Operation Manual of your product on our website (see “Operation Manuals”).

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