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.

TPLBA turbocharger
Taking on two-stroke for large marine applications
## Assembly Instructions

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<th>Page</th>
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</tbody>
</table>
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 and definitions

The following symbols are used in the documents:

- Prerequisite
- Step of a procedure
- List, first level
- List, second level
- [➙ ] 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 on questions regarding a design variant (see Contact information at 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

In this document, ABB Turbo Systems Ltd is abbreviated to ABB Turbo Systems.

Official ABB Turbo Systems Service Stations

In this document, official service stations are referred to as ABB Turbocharging Service Stations. They are inspected and certified regularly by ABB Turbo Systems. See also chapter Contact address and after-sales service.

1.4 Definition of warning, caution, note

**Definition of warning**

Serious personal injuries and even accidents with fatal consequences may occur if work and operating instructions marked with this symbol and the word **WARNING** are either not followed or not followed precisely.

- Warning signs must be observed at all times.

**Definition of caution**

Serious machine or property damage may occur if work and operating instructions marked with this symbol and the word **CAUTION** are either not followed or not followed precisely.

- Caution signs must be observed at all times.

**Note**

A note provides suggestions which facilitate the work on the product.
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 against mechanical hazards</td>
</tr>
</tbody>
</table>

Table 1

<table>
<thead>
<tr>
<th>To be worn according to the specific work</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety glasses</td>
<td>Safety goggles</td>
</tr>
<tr>
<td>Safety gloves against mechanical hazards</td>
<td>Respiratory mask against dust</td>
</tr>
<tr>
<td>- mechanical hazards</td>
<td>- gases</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

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

Table 3
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 loads

**Suspended loads**

Loads not suspended in compliance with regulations may lead to personal injury or accidents with fatal consequences.

- Loads must always be fastened to technically perfect lifting gear with sufficient loading capacity.
- Make sure the load is suspended properly on the crane hook.
- Do not let anyone stand beneath a suspended load.

Wear safety gloves against mechanical risks.
Wear safety helmet.

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 chapter.
- 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.

- 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**

- If welding work is being carried out above the turbocharger, make sure to cover the filter silencer so that the filter mat is not damaged.
- Remove combustible objects and substances out of the range of flying sparks.
Cover all connections on the turbocharger so that no foreign objects can get into the turbocharger.

Mechanical hazards when working on the turbocharger

**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.

**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.

**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.

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

<table>
<thead>
<tr>
<th>Weight [kg]</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TPL65BA</strong></td>
<td>1190</td>
</tr>
</tbody>
</table>

Table 4

<table>
<thead>
<tr>
<th>Weight [kg]</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TPL69BA</strong></td>
<td>1870</td>
</tr>
</tbody>
</table>

Table 5
4 Installing the turbocharger

On engines with three or four turbochargers, the turbocharger intended for flexible cut-out must be installed in the centre.

Remove the cover from the oil connection.

Attach one lifting gear each to the two fins of the bearing casing provided for this purpose. Ensure that the transport ropes are not touching the emergency oil tank

Under no circumstances must a rope be slung around the emergency oil tank and the turbocharger suspended from it.

**Oil orifice plates**

An orifice plate for adjusting the oil pressure is fitted in each of the two oil inlet channels in the bearing casing. When the cartridge group, the bearing casing or the turbocharger is fitted to the engine, it must be ensured that the orifice plates that are specified for the turbocharger have been installed in the two oil inlet channels.

- Check correct installation of oil orifice plates.

Adjust the turbocharger on the engine.

- Tighten fixing screws (Steps for fastening the turbocharger [➔ 11]).
4.1 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 ≥ 8.8</td>
</tr>
<tr>
<td>Washers</td>
<td>Hardened, thickness ≥ 15% nominal thread diameter</td>
</tr>
<tr>
<td>Dimension a (compressor end)</td>
<td>a = height of turbocharger foot a</td>
</tr>
<tr>
<td>Dimension a (turbine end)</td>
<td>a = height of turbocharger foot F + spacer sleeve D</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 6

NOTICE

**Strength classes of screws**

In order to install the turbocharger, screws with a higher strength class than 8.8 can also be used. The tightening torques and tightening angles remain the same as with strength class 8.8.

Compressor-end foot

![Compressor-end foot diagram]

Turbine-end foot

![Turbine-end foot diagram]
Tighten screws or nuts first by hand, then with 50%, and subsequently 100% of the pre-tightening torque, as per the selected tightening procedure in a Z configuration.

Use a feeler gauge (0.05 mm blade) to check whether 25% of the surface of the screw contact points is in contact with the bracket. If not, tighten until 25% of the surface is in contact with the bracket.

Tighten the screws with the specified tightening angle in a Z configuration.

(see Table 7)

(see Table 8)

### Torque-controlled tightening

<table>
<thead>
<tr>
<th>Product</th>
<th>Thread size</th>
<th>Tightening torque [Nm]</th>
<th>Pre-tightening torque [Nm]</th>
<th>Height a of tensioned turbocharger foot [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>TPL65BA</td>
<td>M20</td>
<td>340</td>
<td>100</td>
<td>64</td>
</tr>
<tr>
<td>TPL69BA</td>
<td>M24</td>
<td>560</td>
<td>160</td>
<td>75</td>
</tr>
</tbody>
</table>

Table 7

### Angle-controlled tightening

<table>
<thead>
<tr>
<th>Product</th>
<th>Thread size</th>
<th>Tightening angle for tensioned height a [DEG]</th>
<th>Additional tightening angle for every 10 mm of additional screw length b [DEG]</th>
<th>Pre-tightening torque [Nm]</th>
<th>Height a of tensioned turbocharger foot [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>TPL65BA</td>
<td>M20</td>
<td>24</td>
<td>2.7</td>
<td>100</td>
<td>64</td>
</tr>
<tr>
<td>TPL69BA</td>
<td>M24</td>
<td>23</td>
<td>2.6</td>
<td>160</td>
<td>75</td>
</tr>
</tbody>
</table>

Table 8

### 4.1.1 Completion work, if required

- Attach all gas, air, water and oil pipes in accordance with the enginebuilder's instructions.
- Fit insulation components.
- Fit speed sensor and plug in cable connector.
5 Storage of new turbochargers and spare parts

Storage of new turbochargers and spare parts up to 6 months

New turbochargers and spare parts from ABB Turbo Systems 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).

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 (VCI)

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
</table>

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:

- Ensure good room ventilation.
- Do not eat, drink or keep food at the workplace while working with VCIs.
- Wear safety gloves.
- Clean hands and face after working with VCIs.
- For further information refer to www.branopac.com.

Wear safety gloves against chemical risks.

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.
- 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 replacement turbochargers or spare parts

Per order, turbochargers or cartridge groups will be prepared by ABB Turbo Systems for prolonged storage. 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 or rotor must be inspected by an ABB Turbocharging Service Station and repacked.

- Inspect the package for damage. If the package is damaged, the turbocharger or cartridge group 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
- Exchange the desiccant agent
- Repackage the components.

**NOTICE**

Replacement components ready for operation

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

Unpacking replacement turbochargers or spare parts

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. In the case of turbochargers with insulation supplied by ABB Turbo Systems, 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

5. Follow the instructions on the website.