Purpose

The assembly instructions explain how the low- and high-pressure stage of ABB Turbo Systems 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 low- and high-pressure stage on the engine.

Power2 performance package

Two-stage turbocharging solution for highest turbocharging efficiency
# Assembly Instructions

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<td>8</td>
<td>Further information</td>
<td>28</td>
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</tbody>
</table>
1 Introduction

1.1 Purpose of the assembly instructions

The assembly instructions explain how the low- and high-pressure stage of ABB Turbo Systems 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 low- and high-pressure stage on the engine. Basic mechanical training is a prerequisite.

All persons who are involved in the transportation and installation of the low and high-pressure stage 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

Terms used

The following terms are used in this document:

- Two-stage turbocharging (Power2)
- Low-pressure stage (Power2 LP)
- High-pressure stage (Power2 HP)
- Low-pressure and high-pressure stage

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 low and high-pressure stages. There may be sections and descriptions of components that are not relevant for a specific low or high-pressure stage.

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.

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

Table 1: Definition of pictograms
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>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Icon" /></td>
</tr>
</tbody>
</table>

Table 2: Personal protective equipment to be worn at all times

<table>
<thead>
<tr>
<th>To be worn specific to the respective task</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Icon" /></td>
</tr>
<tr>
<td><img src="image" alt="Icon" /></td>
</tr>
<tr>
<td><img src="image" alt="Icon" /></td>
</tr>
</tbody>
</table>

Table 3: Personal protective equipment to be worn specific to the respective task
2 Safety

2.1 Introduction

The two-stage turbocharging system (Power2) manufactured by ABB Turbo Systems is state of the art and complies with the respective health and safety standards in effect at the time the system was built. Thus Power2 is safe to operate. Nevertheless, there may be some residual risks during operation of the Power2 and work on Power2 components, such as low-pressure stage and high-pressure stage, which:

- Are caused by Power2 itself or its accessories.
- Are caused by the operating equipment used or supplies and materials.
- Are a consequence of insufficient compliance with safety instructions.
- Are a consequence of insufficient or inappropriate performance of maintenance and inspection work.

The operating company is responsible for defining measures that regulate safe access to and safe handling of the Power2.

All instructions contained in this chapter must be observed for safe and trouble-free operation of the Power2 and during all work on the Power2 components.

All further safety instructions contained and specifically identified in every chapter of this document (see section Definition of safety instructions) must also be observed.

Information

Low-pressure and high-pressure stages from ABB Turbo Systems comply with the Machinery Directive 2006/42/EC and are partly completed machinery as defined by Article 2 g.

Responsibility of the operating company

In awareness of its responsibility, the operating company must ensure that only authorised personnel work on the Power2, who:

- Are versed in the general and locally applicable regulations for occupational safety and accident prevention
- Are equipped with the prescribed personal protective equipment
- Have read and understood the Operation Manual
- Have been instructed in the use of the Power2.

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

Suitable working materials and personal protective equipment must be kept in a perfect condition.

Only authorised personnel may remain in the vicinity of the Power2 when the engine is running.
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](image)

![Figure 2: Attachment angle](image)

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

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 Power2, 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 work is performed on the low-pressure or high-pressure stage, there is a risk of falling.

- Do not climb onto the low-pressure or high-pressure stage 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 low-pressure or high-pressure stage 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 the low-pressure and high-pressure stage clean.
- Have oil binding agents ready and provide or keep oil pans at hand.

Welding work

- When performing welding work in the vicinity of the low-pressure stage, 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 low-pressure and high-pressure stage so that no foreign objects can enter the low-pressure or high-pressure stage.

Mechanical hazards when working on the low-pressure and high-pressure stage

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 low-pressure and the high-pressure stages

Lifting gear with a sufficient load limit must be used for installing the low-pressure and high-pressure stages. The following weight specifications apply to the heaviest variant possible. Depending on the specification, the weight specified on the rating plate may be lower than the standard values specified here.

![Figure 3: Suspending the low-pressure and high-pressure stages](image)

A High-pressure stage
B Low-pressure stage

<table>
<thead>
<tr>
<th>Product</th>
<th>Weight [kg]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-pressure stage</td>
<td>1420</td>
</tr>
<tr>
<td>High-pressure stage</td>
<td>750</td>
</tr>
</tbody>
</table>

Table 4: Weights of the low-pressure and high-pressure stages

Swivel lifting eyes to be used

Two swivel lifting eyes are required for the safe lifting of loads. These are not included in the ABB Turbo Systems scope of delivery.

<table>
<thead>
<tr>
<th>Swivel lifting eyes</th>
<th>Power2</th>
<th>Thread</th>
<th>Length L</th>
<th>Minimum load limit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>550 HP</td>
<td>M16</td>
<td>25 mm</td>
<td>400 kg</td>
</tr>
</tbody>
</table>

Table 5: Swivel lifting eyes
4 Installing the low-pressure stage

The fixing screws for fastening the low-pressure stage are not included in the ABB Turbo Systems scope of delivery and must be provided by the enginebuilder.

General information

<table>
<thead>
<tr>
<th>Subject</th>
<th>Related requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material of fixing elements</td>
<td>ISO strength class 10.9 and 12.9 according to DIN/ISO 898</td>
</tr>
<tr>
<td>(for securing low-pressure stage on bracket)</td>
<td></td>
</tr>
<tr>
<td>Washers under the screw head or nut</td>
<td>Use hardened washers, thickness ≥ 15% of the nominal thread diameter</td>
</tr>
<tr>
<td>Dimension a</td>
<td>Height of low-pressure stage foot, see Chapter 4.5</td>
</tr>
<tr>
<td>Dimension b</td>
<td>Thread set deeper in bracket, see Chapter 4.5</td>
</tr>
<tr>
<td>Depth of thread c</td>
<td>≥ 1.5 times the nominal thread diameter</td>
</tr>
<tr>
<td>Coefficient of friction</td>
<td>0.12 (lightly oiled)</td>
</tr>
<tr>
<td>Thread sizes</td>
<td>M20 (one-piece foot)</td>
</tr>
<tr>
<td></td>
<td>M24 (two-piece foot)</td>
</tr>
</tbody>
</table>

Table 6: General information about fastening the low-pressure stage
4.1 Placing the low-pressure stage on the bracket and aligning

Attaching the Lift Gear

Attach one lifting gear each to the two fins of the bearing casing provided for this purpose and, depending on the design, loop one lifting gear around the gas inlet casing.

Checking Orifices

Check to make sure that the orifices with the correct diameter are present in the two oil inlet channels of the bearing casing.

Adjusting the Stage

Adjust the low-pressure stage on the engine.

Tightening the Fixing Screws

Tighten the fixing screws at the foot.

For a one-piece foot, see One-piece foot [➡ 12]
For a two-piece foot, see Two-piece foot [➡ 14]
4.2 Steps for fastening the low-pressure stage

4.2.1 One-piece foot

Angle-controlled tightening

Due to the special design of the foot of the low-pressure stage, 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. Therefore the screws must be pre-tightened with the pre-tightening torque before angle-controlled tightening can be used. We recommend tightening the foot screws to the pre-tightening torque in three steps in a Z configuration.

![Figure 5: Z tightening method and minimum contact surface]

01 25 % of surface in contact

► Pre-tighten the foot screws by hand, then tighten with 50 % and subsequently with 100 % of the pre-tightening torque. 25 % of the surface of the screw contact points must be in contact with the bracket. If the surface contact is not sufficient, the screw must be re-tightened until 25 % of the surface rests on the bracket.

► Perform check using the feeler gauge (0.05 mm).

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

<table>
<thead>
<tr>
<th>Power2</th>
<th>Thread size [mm]</th>
<th>Pre-tightening torque [Nm]</th>
<th>Tightening angle for tightened height a [degree]</th>
<th>Additional tightening angle for every 10 mm of additional screw length b [degree]</th>
</tr>
</thead>
<tbody>
<tr>
<td>550 LP</td>
<td>M20</td>
<td>90</td>
<td>33</td>
<td>4.4</td>
</tr>
</tbody>
</table>

Table 7: Fixing screw tightening angle

CAUTION

If the contact points do not touch the bracket before the tightening angle is applied, the pre-tensioning force will be too small. The screws will loosen and break. The correct tightening angle results from the length $a + b$ and the thickness of the washer.

Some brackets have through-holes for attaching the low-pressure stage or threads in blind holes and start only a few millimetres under the contact surface (recessed). To ensure that the screws still have the same high pre-tensioning force, the tightening angle must be increased by the specified amount for every 10 mm of additional screw length.
Torque-controlled tightening

The tightening torque must be applied with a torque spanner in a Z-wise fashion.

<table>
<thead>
<tr>
<th>Power2</th>
<th>Thread size [mm]</th>
<th>Maximum tightening torque [Nm]</th>
<th>Pre-tightening torque [Nm]</th>
<th>Checking torque [Nm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>550 LP</td>
<td>M20</td>
<td>560</td>
<td>455</td>
<td>350</td>
</tr>
</tbody>
</table>

Table 8: Tightening torque for fixing screws

4.2.2 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.
4.2.3 Two-piece foot

Foot contact surfaces

If the low-pressure stage has a two-piece foot, this consists of the foot at the turbine end (TE) and the foot at the compressor end (CE).

![Diagram of two-piece foot]

Figure 6: Contact surfaces of a two-piece foot

- TE Foot on turbine end
- CE Foot on compressor end
- A Foot contact surface

Gas outlet casing with horizontal gas outlet

When the gas outlet casing has horizontal gas outlet NB090 or NB270 (see outline drawings documentation), it is not possible to fit all eight foot screws to the engine support.

Only three screws can be fitted in each case (see Table 9) and (see Table 11).

If the maximum allowable forces and torques on the casing of the low-pressure stage, as well as the maximum allowable vibrations in the low-pressure stages, are observed, the low-pressure stages can also operate with a reduced number of foot screws.

- With a reduced number of foot screws, the same steps and tightening procedure shall apply to secure the low-pressure stage as with the complete number of foot screws. The tightening sequence for the foot screws with a reduced number of screws can be found in the appropriate tables.

We recommend that you contact ABB Turbo Systems for new applications of the low-pressure stage with horizontally-mounted gas outlet NB090 or NB270.

Step 1:

- Check screws in accordance with the General Information table [⇒ 10].
Step 2:

- Insert the foot screws with one washer each. Take into account the thickness of the washers (at least 15% of the nominal thread diameter).

Step 3:

Figure 7: Fixing screws of a two-piece foot

- Tighten the CE foot screws (3, 4, 5, 6) with the pre-tightening torque.

<table>
<thead>
<tr>
<th>Power2</th>
<th>Gas outlet branch position</th>
<th>Sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>550 LP</td>
<td>NB000 (045 / 315)</td>
<td>3, 4, 5, 6</td>
</tr>
<tr>
<td></td>
<td>NB090</td>
<td>3, 6, 5</td>
</tr>
<tr>
<td></td>
<td>NB270</td>
<td>4, 5, 6</td>
</tr>
</tbody>
</table>

Table 9: Pre-tightening torque sequence

<table>
<thead>
<tr>
<th>Power2</th>
<th>Thread size [mm]</th>
<th>Pre-tightening torque [Nm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>550 LP</td>
<td>M24</td>
<td>160</td>
</tr>
</tbody>
</table>

Table 10: Pre-tightening torque
**Step 4:**

Tighten the TE foot screws (1, 2, 7, 8) with the pre-tightening torque.

![Figure 8: Pre-tightening torque sequence 2](image)

> **Tighten the TE foot screws (1, 2, 7, 8) with the pre-tightening torque.**

<table>
<thead>
<tr>
<th>Power2</th>
<th>Gas outlet branch position</th>
<th>Sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>550 LP</td>
<td>NB000 (045 / 315)</td>
<td>1, 2, 7, 8</td>
</tr>
<tr>
<td></td>
<td>NB090</td>
<td>1, 8, 7</td>
</tr>
<tr>
<td></td>
<td>NB270</td>
<td>2, 7, 8</td>
</tr>
</tbody>
</table>

Table 11: Pre-tightening torque sequence

<table>
<thead>
<tr>
<th>Power2</th>
<th>Thread size [mm]</th>
<th>Pre-tightening torque [Nm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>550 LP</td>
<td>M24</td>
<td>160</td>
</tr>
</tbody>
</table>

Table 12: Pre-tightening torque
Step 5:

Now tighten all TE and CE foot screws with the tightening torque in sequence (1, 2, 3, 4, 5, 6, 7, 8).

![Diagram showing screw tightening sequence]

Figure 9: Screw tightening sequence

- Now tighten all TE and CE foot screws with the tightening torque in sequence (1, 2, 3, 4, 5, 6, 7, 8).

<table>
<thead>
<tr>
<th>Power2</th>
<th>Gas outlet branch position</th>
<th>Sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>550 LP</td>
<td>NB000 (045 / 315)</td>
<td>1, 2, 3, 4, 5, 6, 7, 8</td>
</tr>
<tr>
<td></td>
<td>NB090</td>
<td>1, 6, 3, 5, 8, 7</td>
</tr>
<tr>
<td></td>
<td>NB270</td>
<td>2, 5, 4, 6, 7, 8</td>
</tr>
</tbody>
</table>

Table 13: Tightening sequence

<table>
<thead>
<tr>
<th>Power2</th>
<th>Thread size [mm]</th>
<th>Tightening torque [Nm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>550 LP</td>
<td>M24</td>
<td>800</td>
</tr>
</tbody>
</table>

Table 14: Tightening torque

4.2.4 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 Installing the high-pressure stage

5.1 Inserting gaskets

**Inserting the gaskets**
Damaged or improperly inserted gaskets lead to oil leaks.
- Always use new gaskets and insert them carefully into the slot.

Figure 10: Gaskets in the slots of the bearing casing

- 42001 Bearing casing
- 42198 O-ring
- 42199 O-ring
- 01 Oil supply
- 02 Oil drains

The oil is supplied (01) and drained (02) through the bracket.
- Insert the O-rings (42198 and 42199) into the slots of the bearing casing.
5.2 Placing the high-pressure stage on the bracket

1. Insert expansion bush (42190) into bearing casing.
2. Screw the clamping nut (42201) flush onto the threaded rod (42191). The hexagon of the thread screw is at the top.
3. Place thrust washer (01) of clamping nut onto expansion bush.
4. Lead threaded rod (42191) with screwed-on clamping nut through thrust washer, expansion bush and bearing casing.
5. Screw the centering bush (42193) flush onto the threaded rod from below.

Figure 11: Preparing the fastening elements of the high-pressure stage
1. Lightly lubricate hole into which centering bush (42193) is inserted with screw grease.

2. Position threaded rod with centering bush into bracket and insert until stop.

3. Carefully lower high-pressure stage onto bracket and position using the centering bushes (42193) located in the bracket.

4. Check value x.
   If value x is not reached, the high-pressure stage must be lifted up from the bracket and realigned.

5. Screw threaded rod into bracket up to value L using hexagon.
   If value L is not reached or the threaded rod jams while being screwed in, the threaded rod must be loosened by no more than ½ revolution (this will loosen the centering bush which may have jammed the rod). Then continue screwing in.
   If value L is not reached, undo the screw connection, carefully take the high-pressure stage off the bracket and repeat the procedure starting with Step 1.

▶ Observe the steps for fastening the high-pressure stage (see following section).

<table>
<thead>
<tr>
<th>Value X</th>
<th>Value L</th>
</tr>
</thead>
<tbody>
<tr>
<td>135 ±2 mm</td>
<td>70 mm</td>
</tr>
</tbody>
</table>

Table 15: Values X and L
5.3 Steps for fastening the high-pressure stage

Support (61300)
In radial gas outlet casings, the gas forces cause high torques to act on the high-pressure stage. If the high-pressure stage is fastened improperly, this can damage the high-pressure stage and cause serious injuries to persons or even fatal accidents.

- When using a radial gas outlet casing, only operate the high-pressure stage with a completely fitted support (61300).

![Diagram of the high-pressure stage]

Figure 13: Steps for fastening the high-pressure stage

<table>
<thead>
<tr>
<th>Power2</th>
<th>Part number</th>
<th>Thread size and tightening torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>550 HP</td>
<td>01</td>
<td>M16 260 Nm</td>
</tr>
<tr>
<td>550 HP</td>
<td>61003</td>
<td>M20 365 Nm</td>
</tr>
</tbody>
</table>

Table 16: Tightening torque (01, 61003)

1. Tighten the clamping nuts (42201) (see section Tightening the clamping nut).
2. Tighten the fixing screws (01) of the support (61300) according to the following table.
3. Tighten the screw (61003) of the connection between gas outlet casing (61001) and support (61300).
5.4 Tightening the clamping nut

Preparations for tightening the clamping nut

**CAUTION**

Do not clean pressure screws (04)
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 (04) must not protrude from the clamping nut (03) in the direction of the thrust washer (02)
In order to correctly fit the clamping nut, the pressure screws must not protrude in the direction of the thrust washer.

Figure 14: Preparing the clamping nut for the tightening procedure

1. Clean the thread of the bolt (01) and the contact surface.
2. Lightly oil the bolt thread.
3. Position the thrust washer (02) in place.
4. Tighten clamping nut (03) by hand.
5. Unscrew clamping nut (03) by ¼ of a turn (90°).

The distance between the thrust washer and the clamping nut is now about 1 mm.
Tightening pressure screws

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.

5.5 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.
6 Storage of new low-pressure and high-pressure stages

Storage of new low-pressure and high-pressure stages and cartridge groups for up to 6 months

New low-pressure and high-pressure stages and cartridge groups 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).

Figure 16: 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 low-pressure and high-pressure stages and cartridge groups for more than 6 months (VCI)

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:

► Ensure proper space ventilation.
► Do not eat, drink or store food at the workplace while working with VCI.
► Wear safety gloves.
► Clean hands and face after working with VCI.
► For more information, see www.branopac.com.

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 low-pressure and high-pressure stages or replacement cartridge groups

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

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 low-pressure or high-pressure stage or the cartridge group must be checked and repackaged by an ABB Turbocharging Service Station.

- Check the package for damage. If the package is damaged, the low or high-pressure stage or the 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.

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 low-pressure or high-pressure stage or the replacement cartridge group can be put into operation without previously having been checked by an ABB Turbocharging Service Station.
8  Further information

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

**NOTICE**

The Operation Manual for the low-pressure and high-pressure stage with the relevant serial number is available online on our website www.abb.com/turbocharging.

![Diagram of serial number location]

**Figure 18:** Serial number of the low-pressure and high-pressure stage on the rating plate

A  Low-pressure stage  
B  Low-pressure stage  
C  High-pressure stage

1. Read the serial number (02) on the rating plate (01) of the low-pressure and high-pressure stage.

- 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

Figure 19: Finding the Operation Manual online

4.

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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