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Service Technician Instruction	ST-204	06 November 2017

Engine type **J312, J316 & J320**

Subject **Exhaust-gas manifolds/turbocharger connection**
Fitting modified sub-assemblies (connecting pipe, turbocharger mounting)

The Service Technician Instruction ST-204 describes how the version of the connecting pipe and turbocharger mounting sub-assemblies, in other words the connection from the exhaust-gas manifolds to the turbocharger, currently used in new plants can be retrofitted in field for Type J312, J316 and J320 engines.

PURPOSE OF THIS BULLETIN / NEED FOR ACTION

No need for proactive action, i.e. if the connecting pipe including the associated turbocharger mounting is to be modified on one of the engines defined below, ST-204 can be used as an aid for organising and carrying out the work.

AFFECTED ENGINES / SCOPE OF THIS BULLETIN

Type J312, J316 and J320 engines not yet fitted with the current/latest version of the connecting pipe and turbocharger mounting.

Note:

This document is not a basis for ordering the spare parts necessary for the conversion. GE provides a complete conversion package for the products defined below. If interested, you can request this from your local GE customer service representative or seller.

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1 GENERAL / OVERVIEW

The uncooled exhaust line on Type 3 engines is a sub-assembly subjected to extremely high stresses. The prevailing temperatures at this pipe during operation often exceed 650°C. The engine start-ups and shut-downs during operation and the resulting stresses (due to the engine heating up and cooling down) cause thermal stresses, which in turn can increase the stresses on the pipe.

These thermal stresses are accommodated partly by compensators, and partly by following the correct procedure when assembling and installing the sub-assembly, which is critical.

As part of our continuous development and improvement processes, GE have optimised and enhanced the relevant sub-assemblies. Appropriate conversion sub-assemblies have been designed as part of a CM&U project to allow engines in the field to be converted to the new exhaust gas line.

The following actions must be taken as part of this conversion:

- Removing the previous connecting pipe
- Removing the T-piece (part of the previous turbocharger conversion)
- Fitting the new turbocharger mounting (CM&U sub-assembly)
- Fitting the new the connecting pipe
- Fitting the insulation over the entire installed connecting pipe



Technicians must hold a "Level 1 Mechanical for Type 2/3 Engines" certificate to carry out this upgrade!

2 OVERVIEW OF THE PREVIOUS AND CURRENT SUB-ASSEMBLIES

The individual sub-assemblies are illustrated in the tables below to give an overview of the sub-assemblies and components used in the different engines (J312, J316, J320).

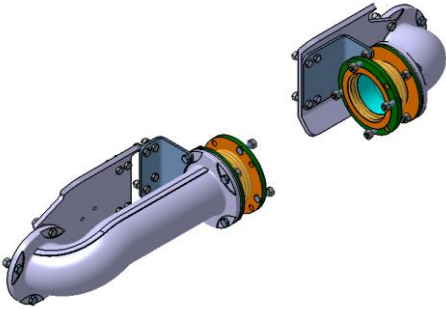
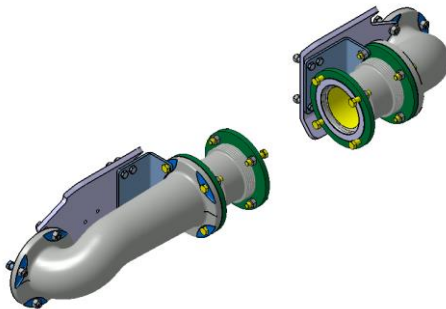
Engine	Connecting pipe	
	Previous version	Current version
J312 / J316 / J320 with turbocharger RR131, TCR12, RR151, TCR14, TPS52 or HPR4000	 Part number: 323977	 Part number: 7001844

Table 1: Connecting pipe



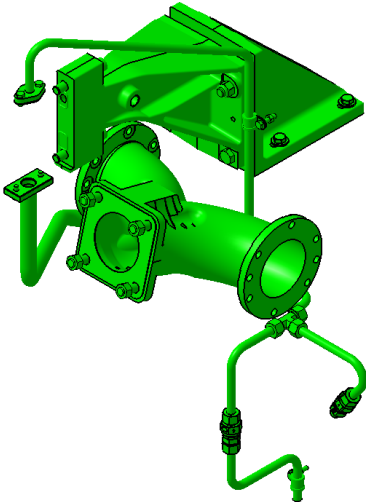
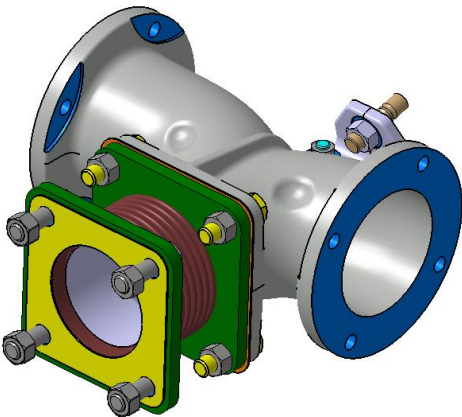
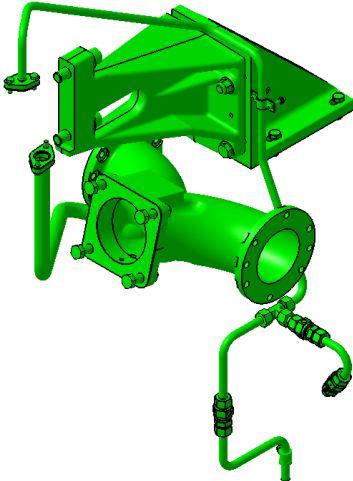
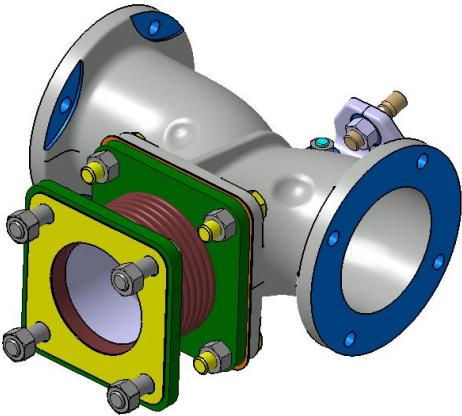
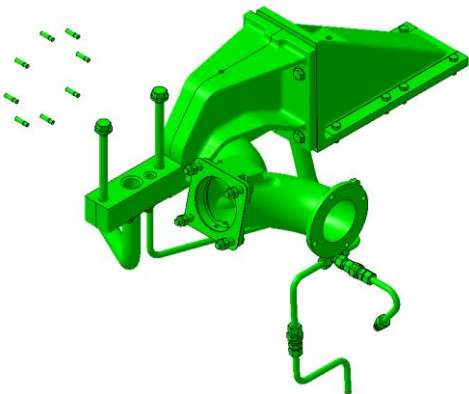
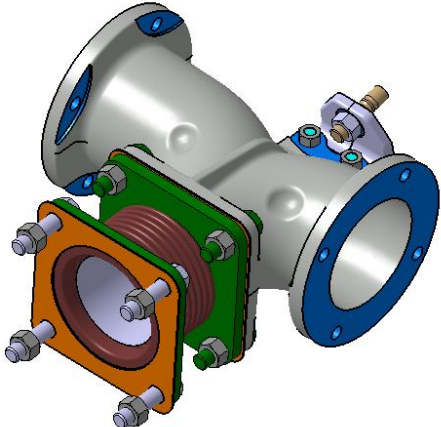
Engine	Turbocharger mounting	
	Previous version	Current version
J312 / J316 with turbocharger RR131 or TCR12	 Part number: 274302 (sub-assembly for new plants)	 Part number: 1240884 (CM&U sub-assembly) (Use drawing 7001845 for installation)
J316 / J320 with turbocharger RR151 or TCR14	 Part number: 274304 (sub-assembly for new plants)	 Part number: 1240888 (CM&U sub-assembly) (Use drawing 7004784 for installation)
J320 with turbocharger TPS52 or HPR4000	 Part number: 369451 (sub-assembly for new plants)	 Part number: 1240889 (CM&U sub-assembly) (Use drawing 7004785 for installation)

Table 2: Turbocharger mounting



Note:

Since the two CM&U sub-assemblies are kit items, there is no drawing for them. However, the drawings for the new plant sub-assemblies can be used for installation (see the appendix for the part numbers, and table 2). The item numbers in the kit are identical with those of the sub-assemblies for new plants. The respective drawings will be made available on web portal together with this document.

Note:

The expansion joints in modules part no. 1240884, 1240888 and 1240889 are different versions. The compensators differ only by means of a flange whose bore pattern differs from the respective other compensators. This is necessary due to the different connection flanges of the exhaust gas turbochargers.



General view of the exhaust-gas manifold to be fitted, including turbocharger mounting



Warning:

When installing the exhaust manifold and the turbocharger assembly, make sure that the expansion joints are installed correctly! In the sectional views shown in Figure 2, the direction of flow is represented by the compensator. Figure 1 shows the flow direction and the correct installation of the compensators.



Warning:

If the expansion joints are installed incorrectly, they may be damaged by incorrect flowing gas.

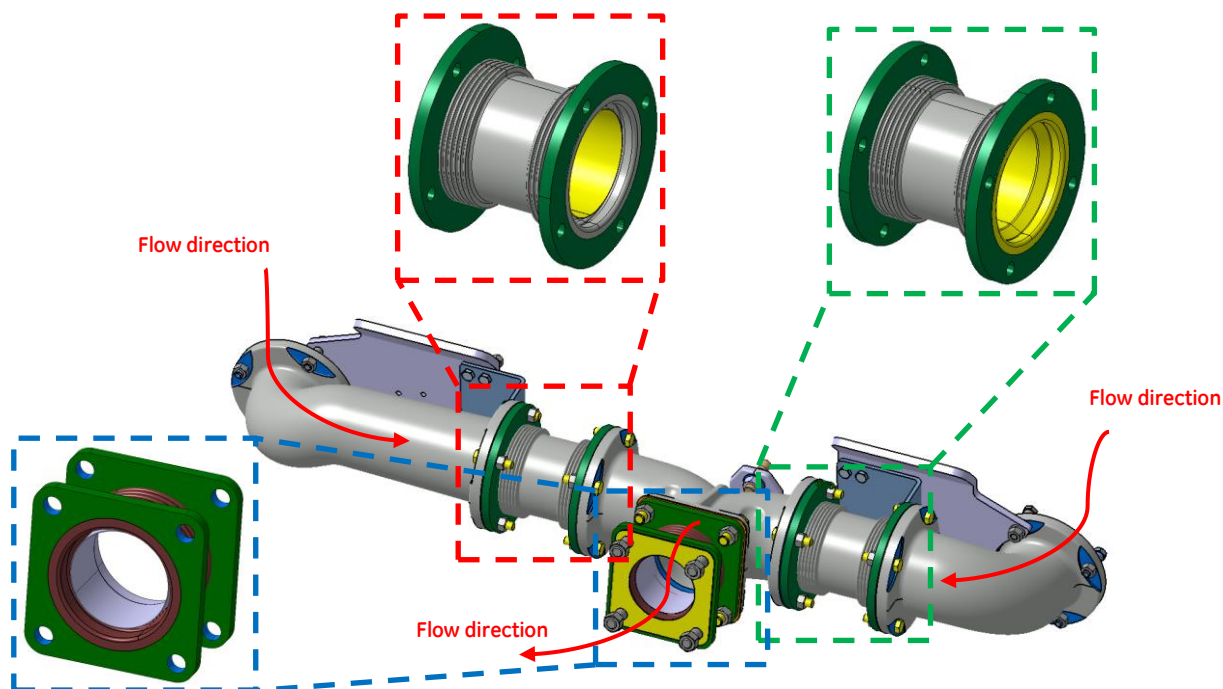


Figure 1: Exhaust-gas manifold to be fitted, including turbocharger mounting

The Figure above shows the connected assemblies of the exhaust-gas manifold and the turbocharger mounting. Also, the flow direction of the exhaust gas is clearly shown.

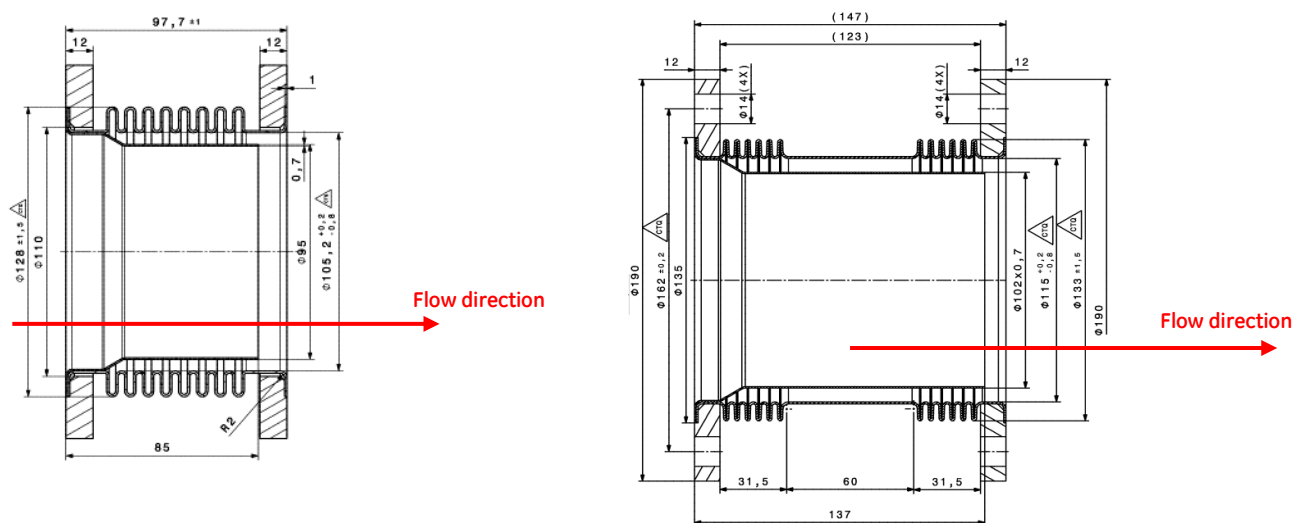


Figure 2: Flow direction compensator



3 REQUIRED EQUIPMENT

3.1 Tool

- EMER case
- OVER case

3.2 Miscellaneous

- Cleaning agents and cleaning cloths
- High-performance solid lubricant paste
- Wire for insulating the connecting pipe (provided by the EZ-Isolierungen company; included in the insulation materials scope of supply)



4 CONVERSION PROCEDURE



Shut down the engine in accordance with Technical Instruction No. 1100-0105 and secure it against inadvertent restarting in accordance with TA 2300-0010.
Observe the safety and hazard advice in the safety instructions (TA 2300-0005) and wear the appropriate personal protective equipment.

Note:

The conversion to the current/latest version of the connecting pipe and turbocharger mounting is described in the following steps, taking the mounting on a J320 engine as an example. The procedures for the J312 and J316 engines are identical.

4.1 Removing the previous connecting pipe

The following work must be completed first to allow removal of the connecting pipe:

➤ Removing the previous connecting pipe

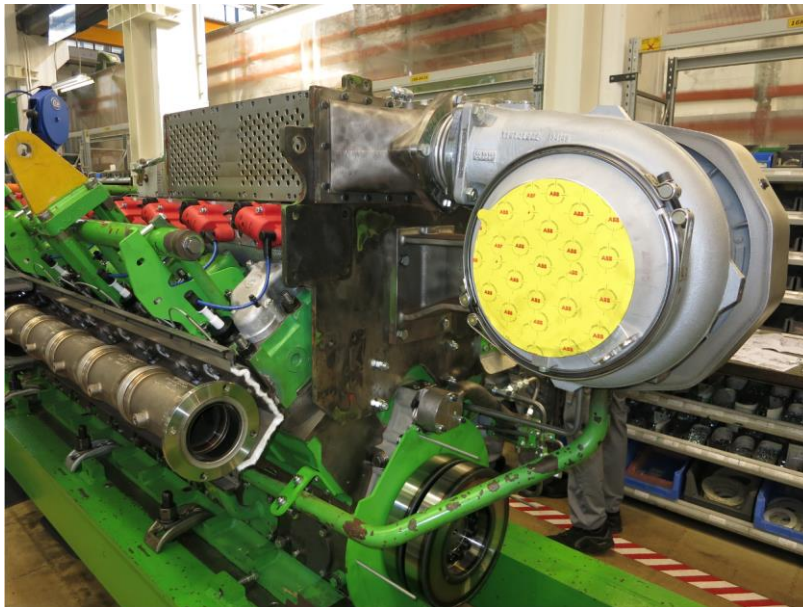


Figure 3: Engine after removing the previous connecting pipe

- ✓ See Figure 3 for removing the previous connecting pipe



4.2 Fitting the new the connecting pipe

➤ Fitting the mounting bracket (cylinder bank A)

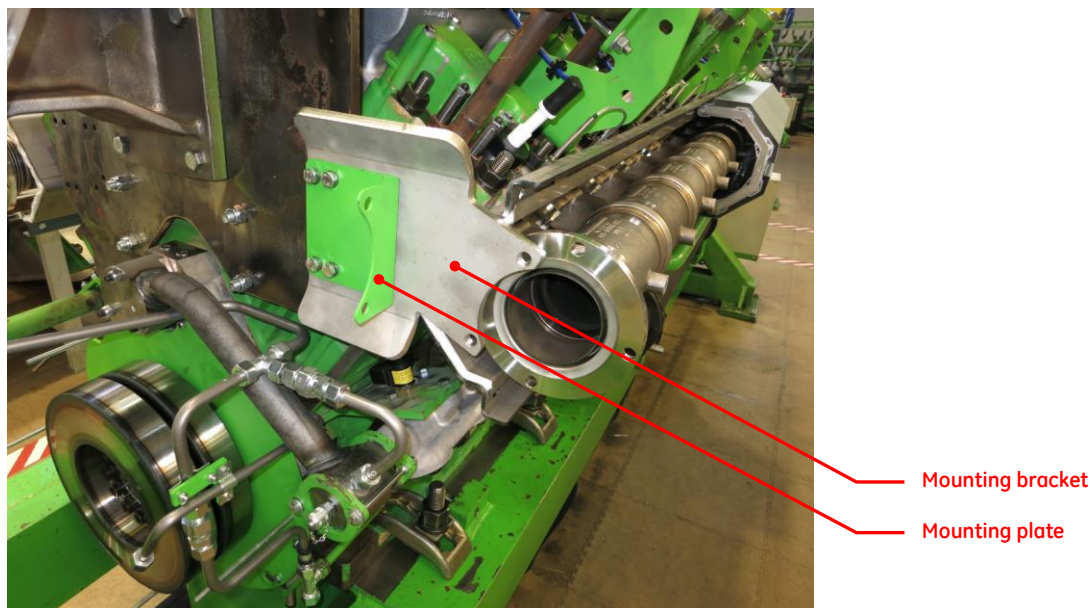


Figure 4: Fitting the mounting bracket (cylinder bank A)

- ✓ Fit the mounting bracket and plate in place as shown in Figure 4
- ✓ Do not fully tighten the bolts, to allow for subsequent alignment!

➤ Replacing the studs

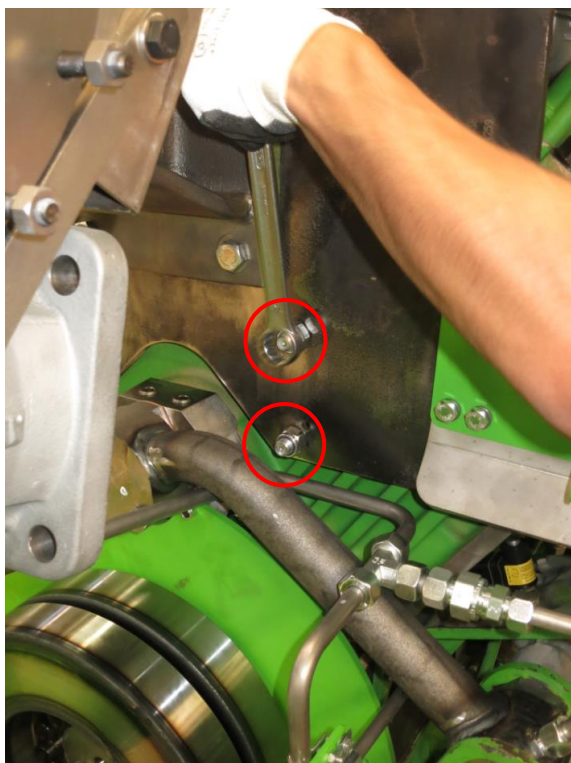


Figure 6: Replacing the studs

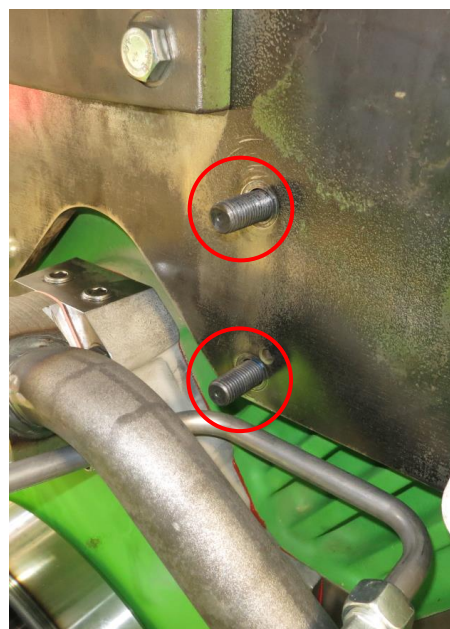


Figure 5: NEW studs

- ✓ Remove the hexagonal nuts
- ✓ See Figure 5 for removing the existing studs
- ✓ See Figure 5 for fitting the new studs (M16 x 50 - part no. 608383)



➤ **Fitting the mounting bracket**

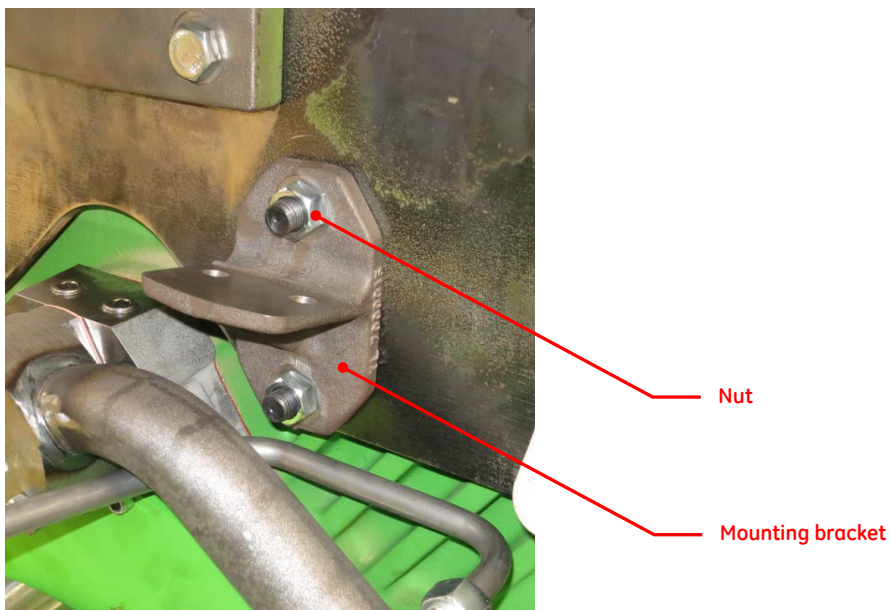


Figure 7: Fitting the mounting bracket

- ✓ Fit the mounting bracket, part no. 7000016, using 2 x M12 hexagonal nuts

➤ **Preassembling the T-piece including compensators**

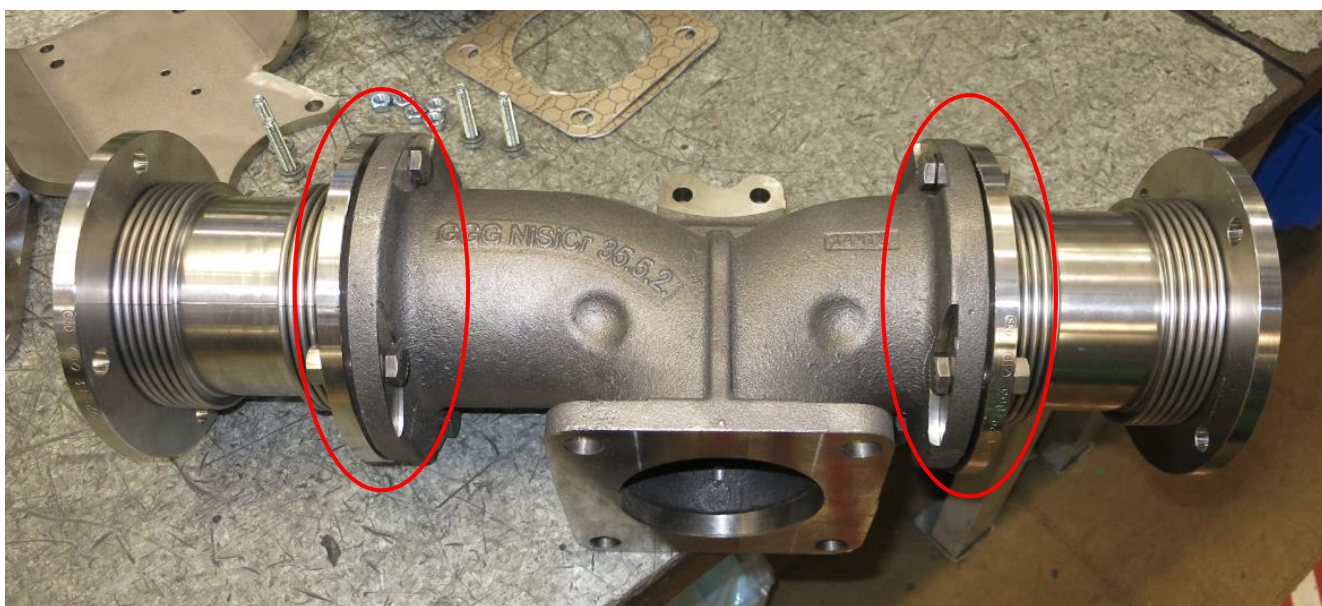


Figure 8: Preassembling the T-piece including compensators

- ✓ Preassemble the T-piece including compensators as shown in Figure 8



Note:

Use high-temperature gaskets between T-piece and compensators, see Figure 8. Furthermore, attention must be paid to the correct installation position (flow direction)! See also Figure 1.

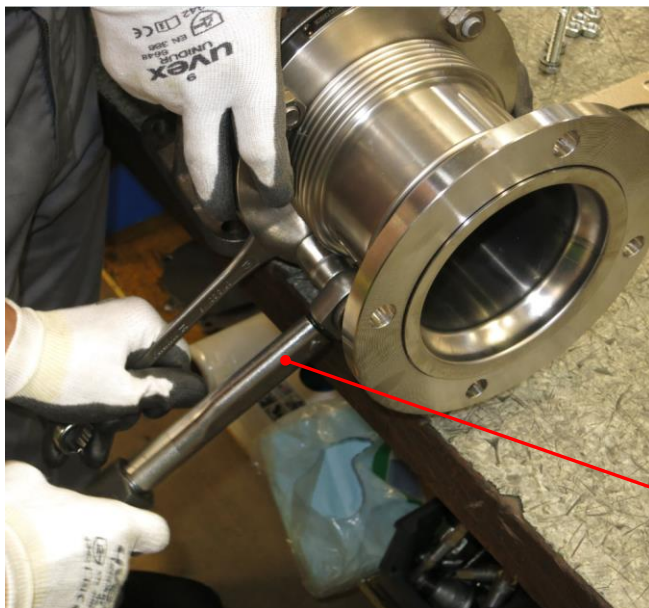


Note:

Use temperature-resistant bolts and nuts, see Figure 8. Coat the bolt threads with a high-performance solid lubricant paste to prevent corrosion, wear and seizing at high temperatures!



➤ Tightening the compensators on the T-piece



Torque wrench

Figure 9: Tightening the compensators on the T-piece

- ✓ Tighten the two compensators on to the T-piece, observing Technical Instruction **TA 1902-0212 – Screwing and tightening torques for Type 2 and 3 engines**

➤ Mounting the preassembled pipe section on the bracket

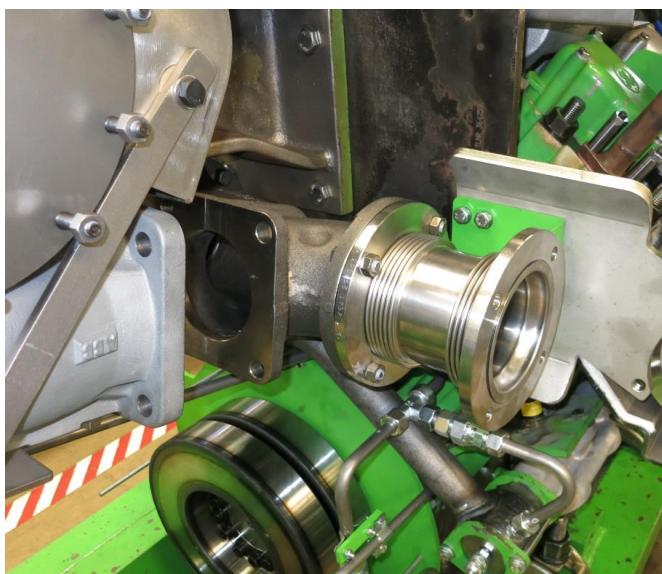


Figure 11: Mounting the preassembled pipe section



Figure 10: Mounting the pipe section on the bracket

- ✓ Mount the preassembled pipe section on the bracket
- ✓ Fasten the pipe section with hexagon-head bolts and hexagonal nuts



➤ Undoing the bolts on the turbocharger housing



Figure 13: Undoing the bolts on the exhaust-side turbocharger housing (exhaust-gas side)

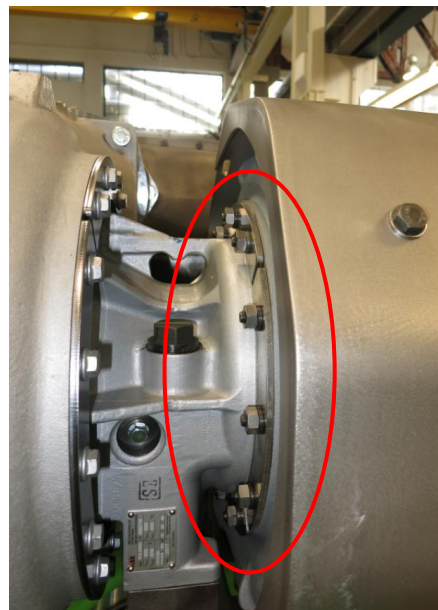


Figure 12: Bolts on exhaust-side turbocharger housing

- ✓ Loosen the bolts on the exhaust-side turbocharger housing to position it better, and align the compensator between the turbocharger housing and T-piece

➤ Aligning the exhaust-side turbocharger housing

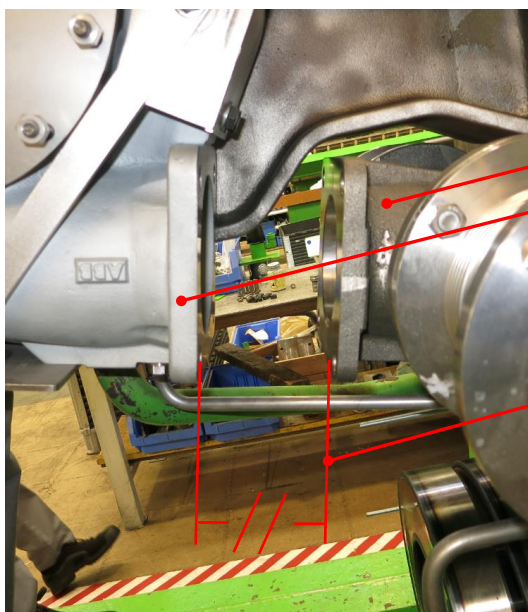


Figure 14: Aligning the exhaust-side turbocharger housing

- ✓ Align the exhaust-side turbocharger housing and the T-piece (make sure the flanges are parallel, see Figure 14)
- After the alignment, the mounting bolts for the turbocharger housing must be retightened! (**Observe TA 1902-0212: Screwing and tightening torques for Type 2 and 3 engines**)



➤ **Fitting the compensator between the turbocharger and T-piece**

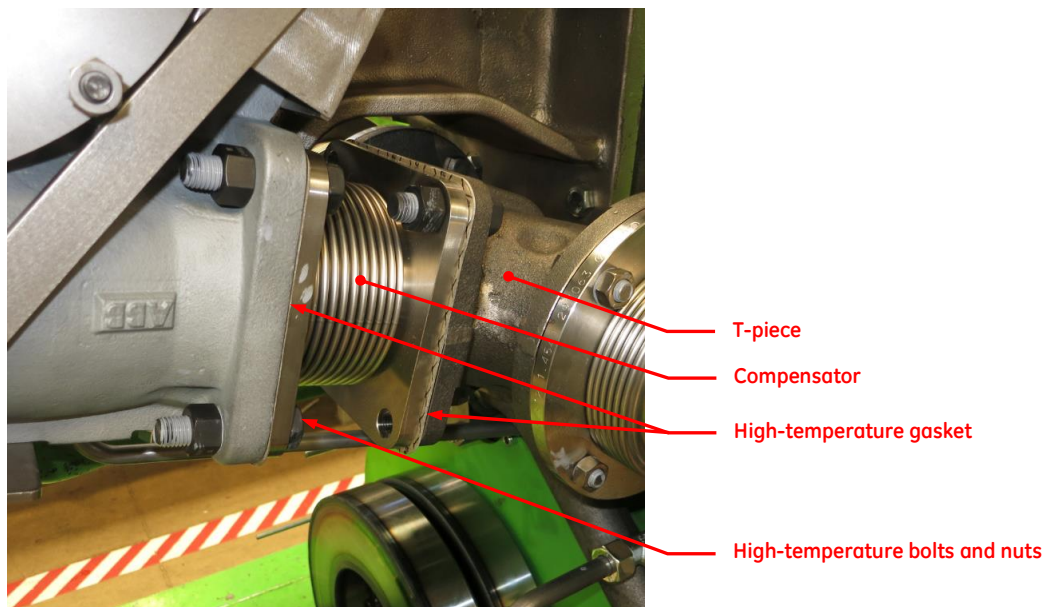


Figure 15: Fitting the compensator between the turbocharger and T-piece

- ✓ Preassemble the compensator as shown in Figure 15



Note:

Use high-temperature gaskets between the T-piece and compensator, and between the compensator and turbocharger housing, see Figure 15.



Note:

See Figure 15 for the use of temperature-resistant bolts and nuts. Coat the bolt threads with a high-performance solid lubricant paste to prevent corrosion, wear and seizing at high temperatures!

- ✓ Do not fully tighten the bolts, to allow for subsequent alignment!



➤ **Fitting the exhaust-gas bends (cylinder bank A)**

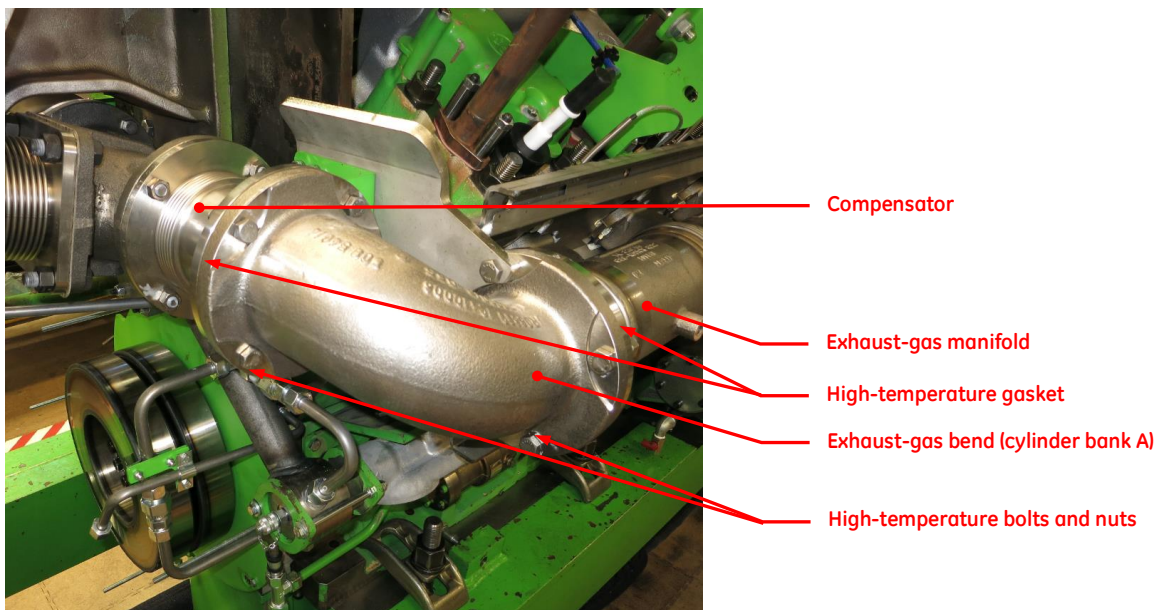


Figure 16: Fitting the exhaust-gas bends (cylinder bank A)

- ✓ Fitting the exhaust-gas bend for cylinder bank A



Note:

Use high-temperature gaskets between the exhaust-gas manifold and exhaust-gas bend and between the exhaust-gas bend and compensator, see Figure 16.



Note:

Use temperature-resistant bolts and nuts, see Figure 16. Coat the bolt threads with a high-performance solid lubricant paste to prevent corrosion, wear and seizing at high temperatures!

- ✓ Do not fully tighten the bolts, to allow for subsequent alignment!

➤ **Fitting the exhaust gas bend (cylinder bank B)**

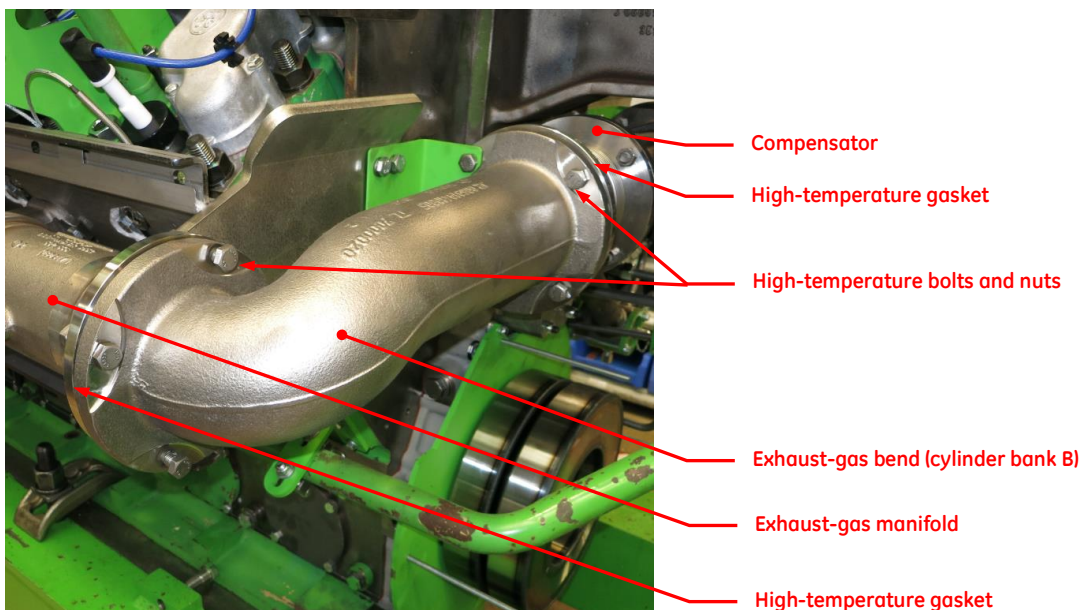


Figure 17: Fitting the exhaust-gas bends (cylinder bank B)



- ✓ Fitting the exhaust-gas bend for cylinder bank B



Note:

Use high-temperature gaskets between the exhaust-gas manifold and exhaust-gas bend and between the exhaust-gas bend and compensator, see Figure 17.



Note:

Use temperature-resistant bolts and nuts, see Figure 17. Coat the bolt threads with a high-performance solid lubricant paste to prevent corrosion, wear and seizing at high temperatures!

- ✓ Do not fully tighten the bolts, to allow for subsequent alignment!



Tightening all the components of the connecting pipe

- ✓ Tighten all the fitted components, observing Technical Instruction TA 1902-0212 – Screwing and tightening torques for Type 2 and 3 engines.

Procedure: (see also Figure 18)

➔ Always tighten flanged joints from "inside to outside", i.e.

- ① tighten the flanged joint between the exhaust-gas manifold at cylinder bank A and the exhaust bend at cylinder bank A
- ② tighten the flanged joint between the exhaust-gas manifold at cylinder bank B and the exhaust bend at cylinder bank B
- ③ tighten the flanged joint between the exhaust bend at cylinder bank A and the compensator at cylinder bank A
- ④ tighten the flanged joint between the exhaust manifold at cylinder bank B and the compensator at cylinder bank B
- ⑤ tighten the flanged joint between the compensator at cylinder bank A and the T-piece at cylinder bank A
- ⑥ tighten the flanged joint between the compensator at cylinder bank B and the T-piece at cylinder bank B
- ⑦ tighten the flange at the exhaust-side turbocharger housing and compensator
- ⑧ tighten the compensator and T-piece
- ⑨ tighten the mounting brackets and plates

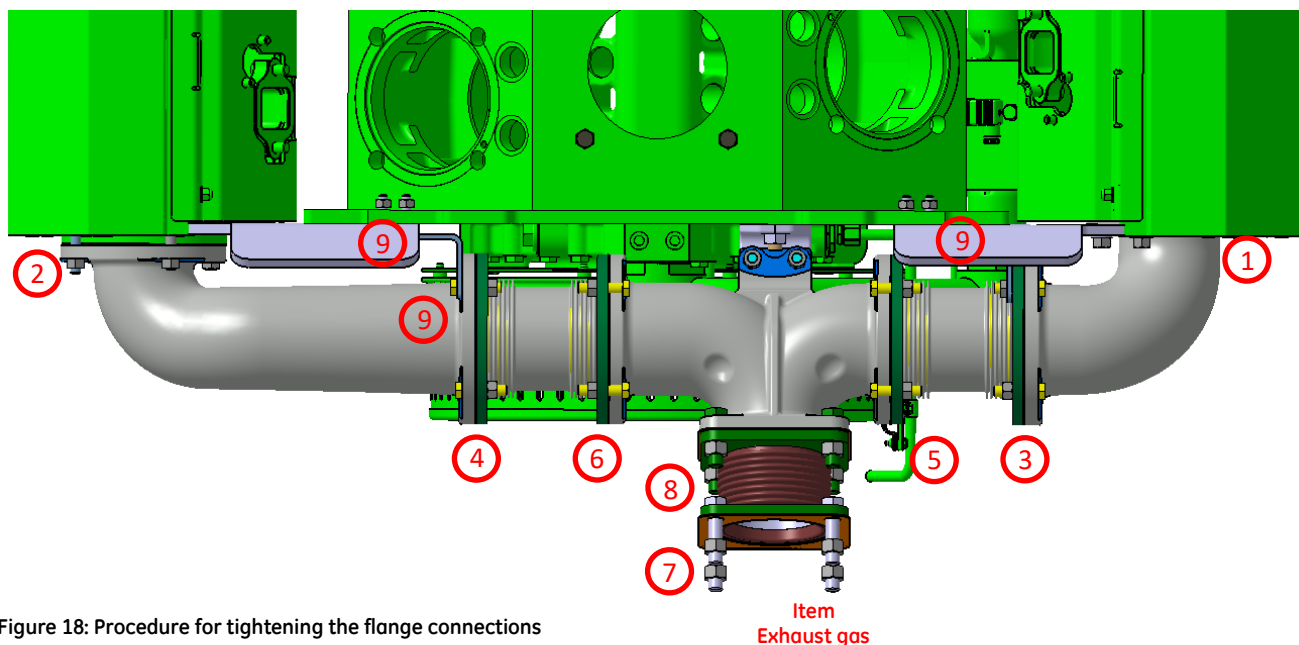


Figure 18: Procedure for tightening the flange connections



Note:

Make sure that the correct bolts are used during assembly! The conversion kit nuts and bolts are made of 1.4828 material (high-temperature resistant).



Note:

NEVER use bolts made of normal steel, as these cannot withstand the temperatures.



➤ Closing off the T-piece

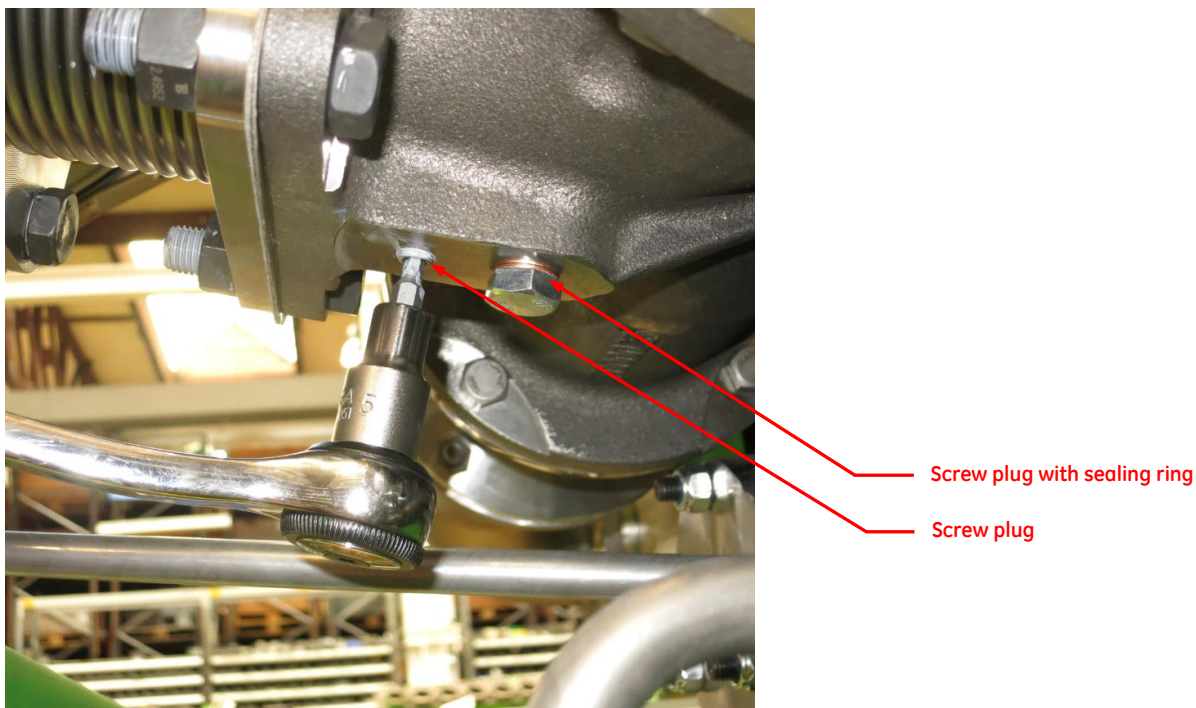


Figure 19: Closing off the T-piece

- ✓ Close off the T-piece with a screw plug
- ✓ Close off the T-piece with a high-temperature resistant screw plug and sealing ring

➤ Fitting the insulation



Figure 20: Insulation of the connecting pipe

- ✓ Applying the insulation to the connecting pipe (see Figure 20).
The complete insulation for the connecting pipe consists of 3 insulation pieces.

Engine	Insulation of the connecting pipe	
	Previous version	Current version
J312 J316 J320	Part number: 437244	Part number: 1215267

Table 3: Insulation of the connecting pipe



5 MISCELLANEOUS

5.1 Required time

The following table shows roughly how much time should be allocated to converting the exhaust gas compensator and turbocharger mounting for Type 3 engines.

ACTIVITY	ENGINE	REQUIRED TIME
Retrofitting exhaust gas compensator and turbocharger mounting on 1 engine	J312	Approx. 1 day for 2 technicians
Retrofitting exhaust gas compensator and turbocharger mounting on 1 engine	J316	Approx. 1 day for 2 technicians
Retrofitting exhaust gas compensator and turbocharger mounting on 1 engine	J320	Approx. 1 day for 2 technicians

Table 4: Required time

5.2 Relevant documents

When working on GE Jenbacher modules, all applicable local regulations must of course be observed in addition to our documentation. In relation to this Service Technician Instruction we stress the fact that the following documents must also be observed:

- Technical Instruction TA 1100-0105: Engine shut-down
- Technical Instruction TA 1100-0111: General Conditions - operation & maintenance
- Technical Instruction TA 1310-0011: Standard tool catalogue
- Technical Instruction TA 1511-0067: Fitting the exhaust gas line insulation – Type 3 engines
- Technical Instruction TA 1902-0212: Screwing and tightening torques for Type 2 and 3 engines
- Technical Instruction TA 2300-0005: Safety regulations
- Technical Instruction TA 2300-0010: Guidelines for using the LOTO kit
- Technical drawing for part no. 7001844: Drawing number J 0667 1321 00
- Technical drawing for part no. 7001845: Drawing number J 0667 2441 00
- Technical drawing for part no. 7004784: Drawing number J 0668 1541 00
- Technical drawing for part no. 7004785: Drawing number J 0669 2041 00

5.3 Revision history

INDEX	DATE	DESCRIPTION / REVISION SUMMARY
01	06/11/2017	First version of this document

Table 5: Revision history



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