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Service Technician Instruction	ST-158	30 January 2015

Engine type **J412, J416 and J420**

Subject **Crankshaft thrust bearings**
Repair method for engines in the field

Service Technician Instruction ST-158 describes a method of repairing and modifying Type 4 thrust bearings in the field.

PURPOSE OF THIS BULLETIN / NEED FOR ACTION

No proactive action is required, i.e. if the thrust bearings on the below specified potentially affected engines are to be modified then ST-158 can be used as an aid in organising and carrying out the work. It is not the purpose of this bulletin recommend a proactive implementation of this modification.

AFFECTED ENGINES / SCOPE OF THIS BULLETIN

ST-158 applies to all Type J4xx engines regardless of their number of cylinders or speed.

DESCRIPTION OF THE CONTENT

GE has developed a method of repairing/replacing the thrust bearings on Type 4 engines in the field. As the crankshaft does not need to be removed, the procedure is as follows:

- Only the thrust bearing halves on the main bearing cap are replaced and they are now fastened using screws instead of pins.
- The thrust bearing halves on the bearing housing are not replaced. If the upper thrust bearing halves are damaged the engine can be run without them, in other words with only the new lower thrust bearing halves screwed on the main bearing cap.
 - In case of an upper thrust bearing damage (thrust bearings in the crankcase) any fragments, loose pins or loose material on the pins should be removed and left debris free. Stuck roll pins do not have to be removed as this is not possible without disassembling the crankshaft. At least they should be pushed as far into the bores as possible.

An appropriate jig, part no. 1228035, is now available for carrying out this repair.
The following section describes how to use it.

CAUTION

ST-158 contains illustrations of two different versions of the jig. The phosphate (black) version is the latest current version optimised for the user. The previous version is identical to the latest version in shape, size and principle of operation. The descriptions of individual specific parts in ST-158 match the illustrations of the latest current version only.

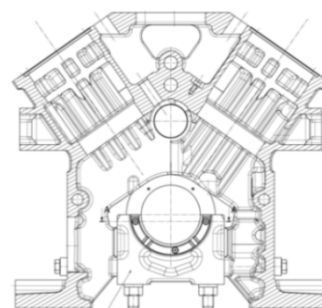


Fig. 1: Remachined big-end bearing cap with part no. 9016817

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DIFFERENCES BETWEEN THE OLD AND NEW METHOD OF FASTENING THE THRUST BEARINGS ON J4xx ENGINES

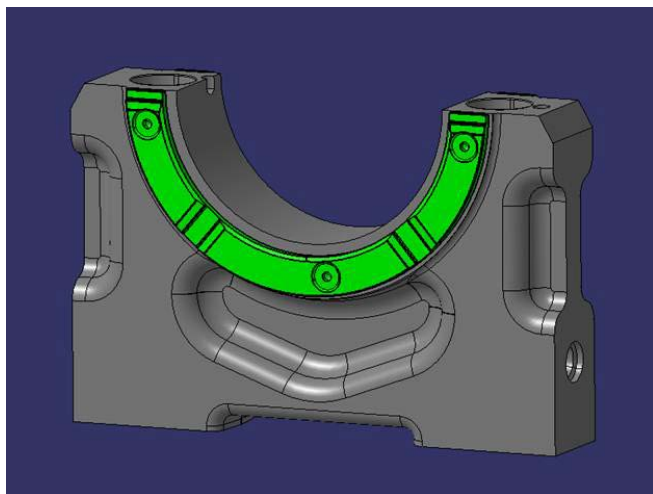


Fig. 2: New fastening method

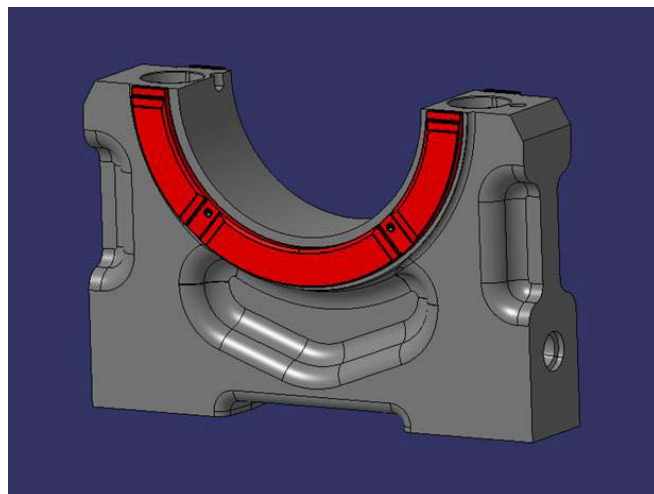


Fig. 3: Previous fastening method

CARRYING OUT THE THRUST BEARING MODIFICATION ON THE MAIN BEARING CAP

REQUIRED JIG



Fig. 4: General view of the jig with part no. 1228035



Fig. 5: Backside of the jig

- A Machining position
- B Guide sleeve stowage position



Fig. 6: Individual components provided with part no. 1228035

- 13 3 drill jig bushes (1 ring on the end face)
- 14 3 tapping bushes (2 rings on the end face)
- 15 2 M8 nuts
- 16 2 washers

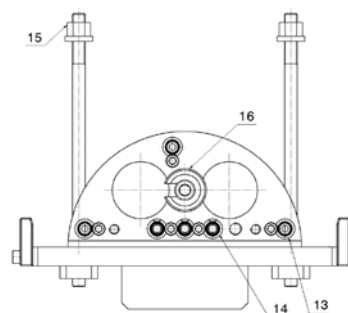


Fig. 7: General view of relevant parts



REQUIRED TOOLS



Fig. 8: General view of the required tools

Item No.	comments/specifications	
1	countersink, 8.3mm dia.	Part No. 124632 8,3mm dia., HSS, 90°, DIN335RN
2	M6 tap	Part No. 419604 HSS-E, DIN 371, M6, right hand, Form C, Shank dia.: h9, 6mm
3	Twist drill, 5 mm dia.	Part No. 124375 5mm dia., HSS, DIN338
4	Tap wrench	
5	Size 5 Allen key	
6	Size 6 Allen key	
7	caliper	
8	hand drill	

In order to provide a precise guiding of the Twist drill, 5mm dia. (3) and the M6 tap (2) in the bushes (to guarantee the required perpendicularity) the specifications/tolerances apparent from the part no. must be adhered to.



WORK STEPS

The following procedure can be regarded as the guideline for the thrust bearing replacement:

- Shut down the engine in accordance with Technical Instruction TI 1100-0105 and protect it against unauthorized restarts, observing TI 2300-0010.
- Observe the safety instructions in TI 2300-0213 and any local safety regulations.
- Any torques not stated explicitly should be taken from TI 1902-0213.
- Remove the appropriate main bearing cap (lift the engine, lower the oil pan).
- Clean the main bearing cap in accordance with the cleaning instructions in TI 1100-0113 and then remove the two thrust bearings.
- Pull out, drive in or level the roll pins on the main bearing cap (so that a clean, flat seating surface is achieved).

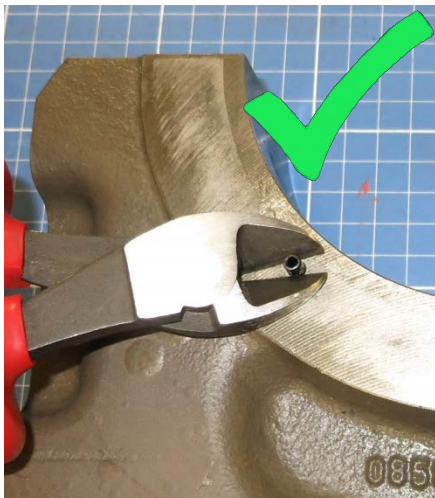


Fig. 9: Pulling out a roll pin

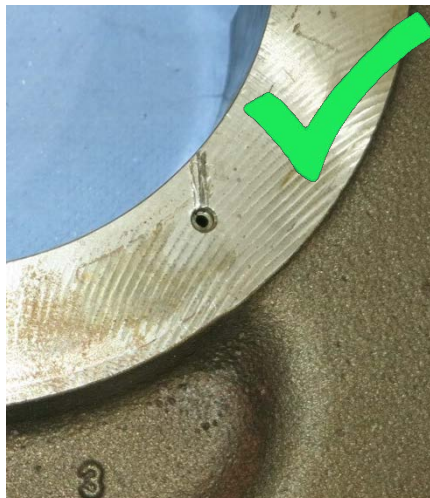


Fig. 10: Driving in a roll pin



Fig. 11: Projecting roll pin – WRONG!

- Fit the main bearing cap in the jig and secure it with the three M6 x 70 bolts at the back and two M8 nuts (15) and washers (16) at the top.
- **NOTE:** The jig can be clamped in a vice for machining the main bearing cap or placed face down on a flat solid surface. The holes can be easily drilled with a hand drill. We recommend using a pillar drilling if such is available.



Fig. 12: Clamped jig



Fig. 13: Jig placed face down

- The front face of the jig is fitted with three bushes for pre-drilling (13, marked with 1 ring), and 3 bushes for tapping the threads (14, marked with 2 rings). The M6 x 10 threaded bore is tapped at position A, while position B acts as stowage for the bushes not currently being used. When pre-drilling touch the 5 mm dia. twist drill (3), to the surface of the bearing cap and set a depth mark at 14^{+2} mm.

CAUTION: The 4 holes in section B-B (see Fig. 16) must always be drilled all the way through (see detail "D", Fig. 18).

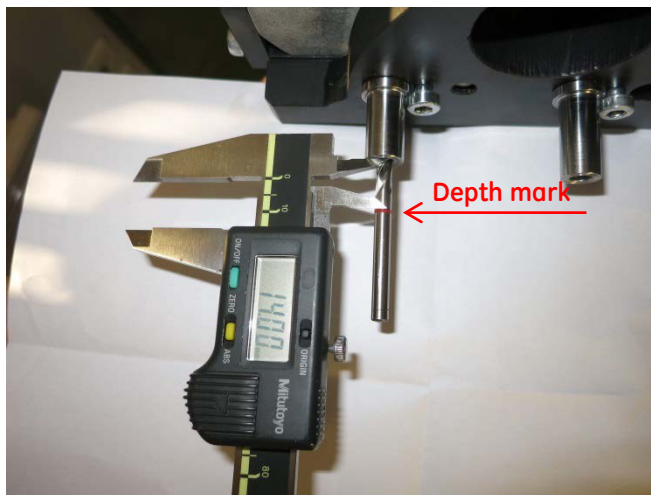


Fig. 14: Setting the hole depth to 14^{+2} mm

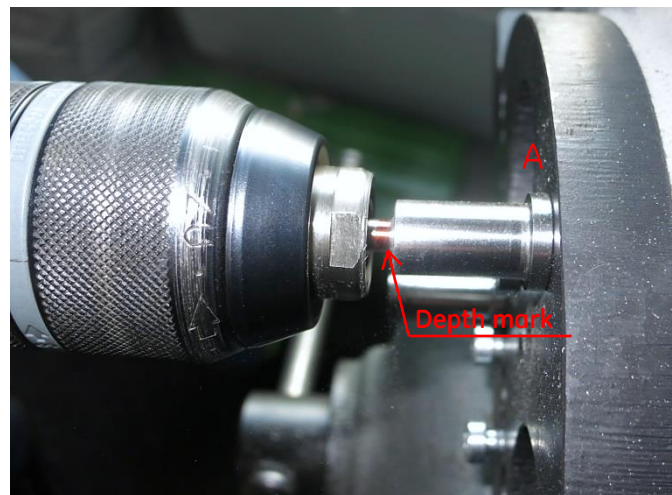


Fig. 15: Pre-drilling at position A

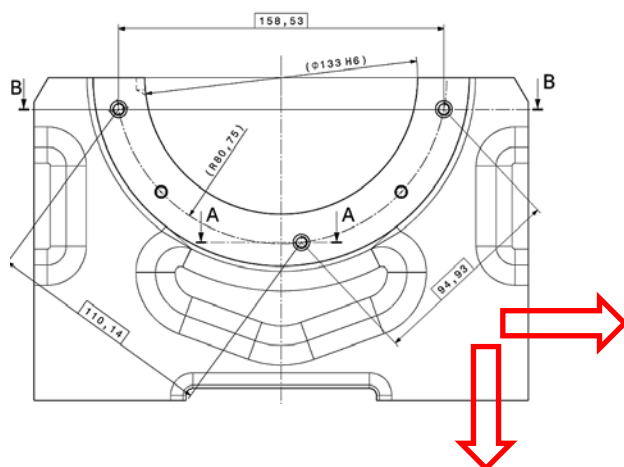


Fig. 16: Front elevation of the main bearing cap

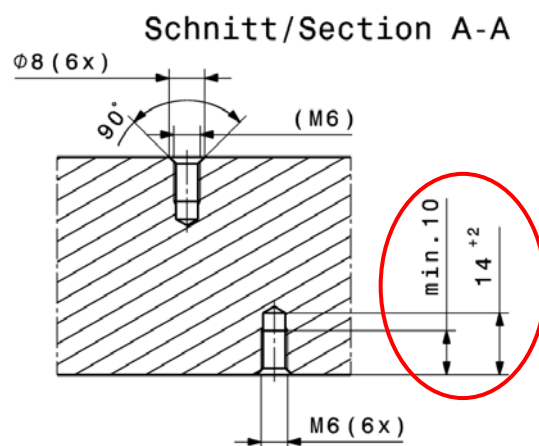


Fig. 17: Section A-A through the main bearing cap

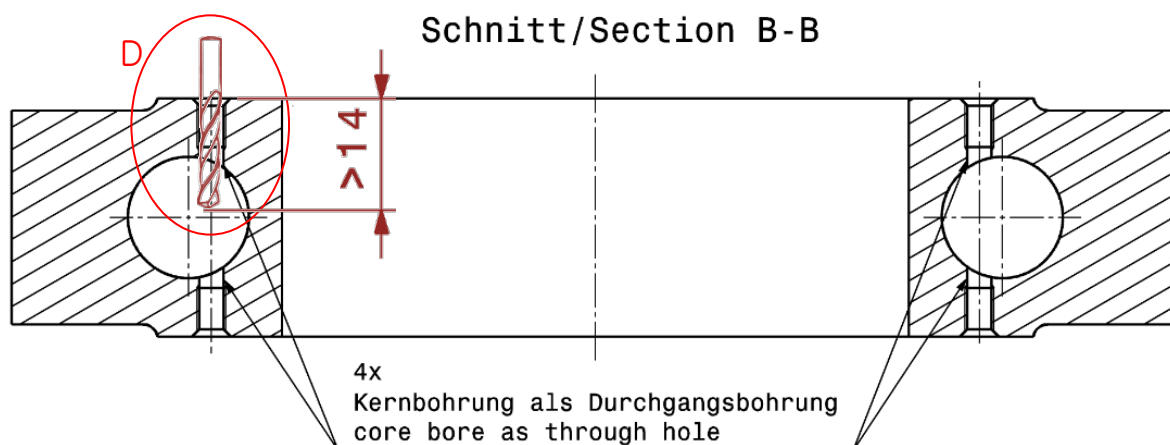


Fig. 18: Section B-B through the main bearing cap



- After drilling the 3 holes, clamp the 90° countersink (1) in the drill chuck and countersink the holes by $1.5 \times 45^\circ$.



Fig. 19: 90° countersink



Fig. 20: Example: countersink $1.5 \times 45^\circ$

- When tapping the threads, change the bushes over as shown in Fig. 21 and secure them with the projecting screw head. Tap the threads with an M6 tap (2) to a depth of at least 10 mm.
- **CAUTION:** Firmly tighten the projecting screw heads to secure the bushes against twisting!
The material is self-lubricating, so no additional lubricating oil is necessary.

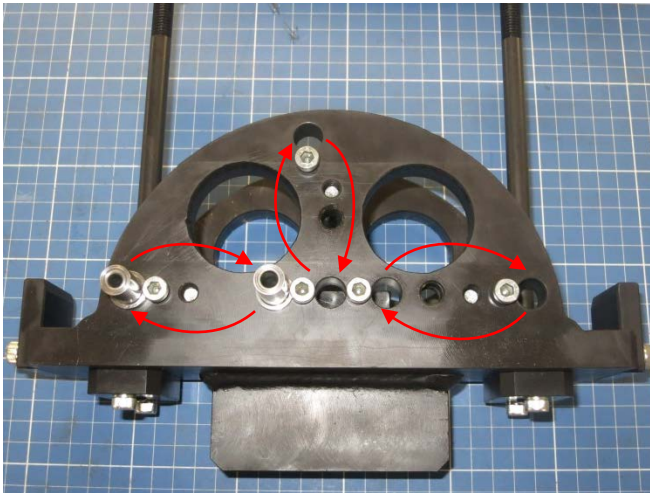


Fig. 21: Changing over the drilling guide bushes



Fig. 22: Securing the bushes with a screw head against twisting



Fig. 23: Tapping the thread at position A

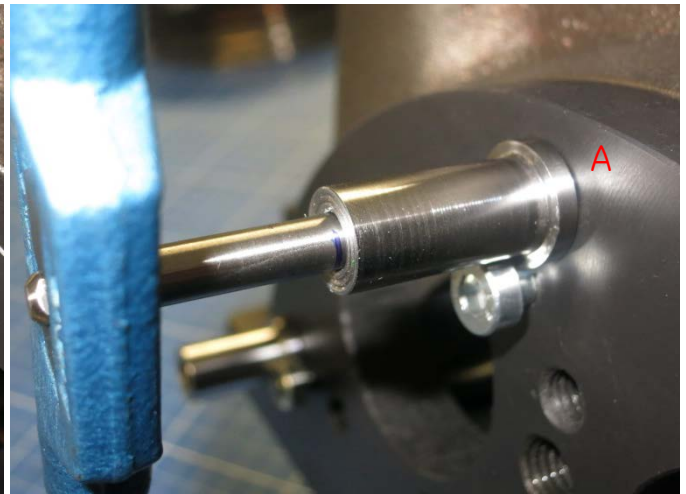


Fig. 24: Thread depth at least 10 mm

- Thread depth at least 10mm – check with M6 screw!



Fig. 25: set a mark at 10mm

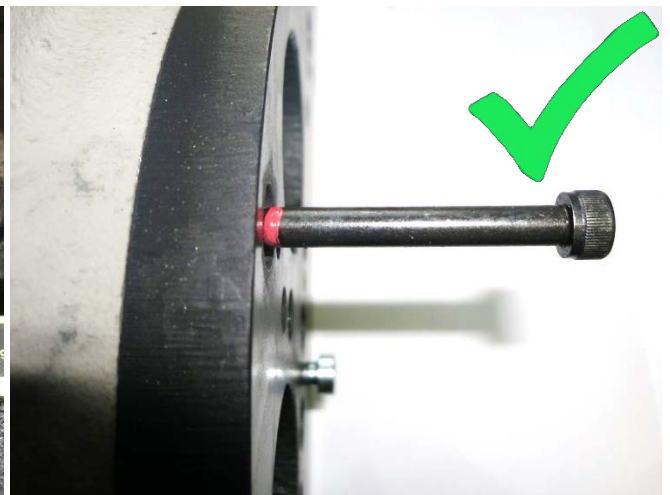


Fig. 26: check thread depth > 10mm

- Deburr the two outer through holes at the stud passages

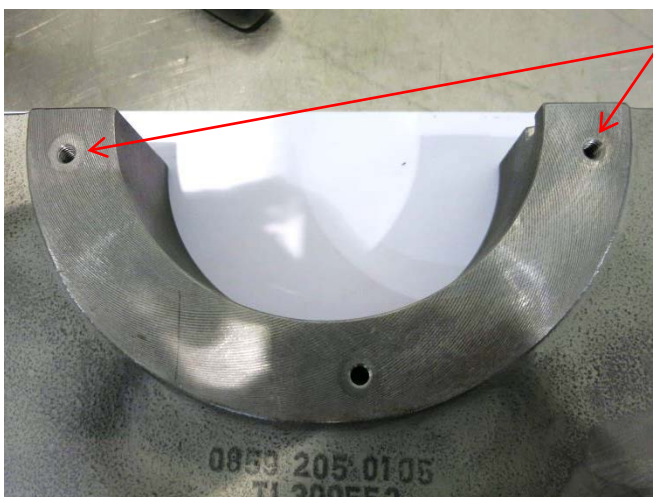


Fig. 27: Outer through holes

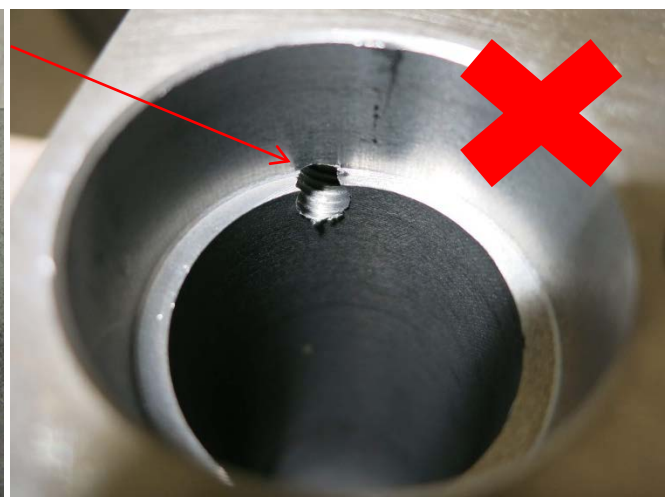


Fig. 28: Through hole not deburred - WRONG!

- Clean the holes in the main bearing cap (by using compressed, brake cleaner or similar solvent), then release the cap, turn it through 180° and clamp it again.
NOTE: We recommend using compressed air for cleaning the hole if it is available ⇒ but never in the engine room when the engine is opened up.

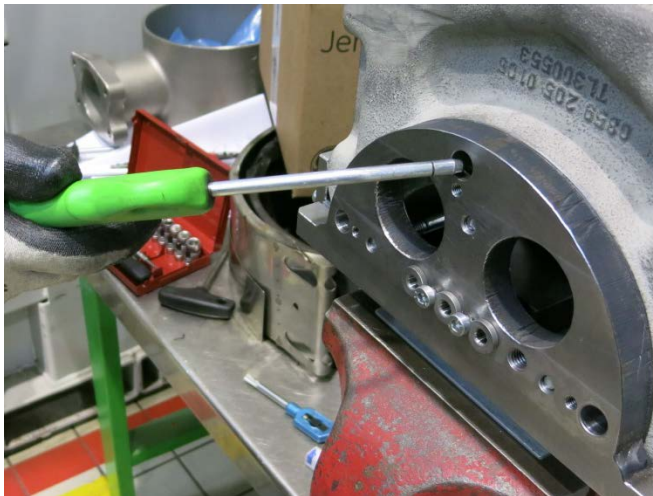


Fig. 29: Blowing out the holes

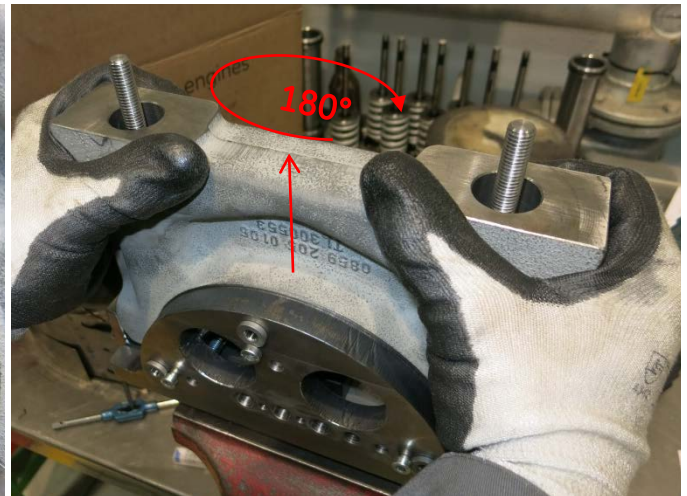


Fig. 30: Turn the main bearing cap

- Repeat the production of the M6 threaded bores on the other side of the main bearing cap as described on pages 4 to 7.
- Release the main bearing cap from the jig and fit the thrust bearings with M6 countersunk screws, tightened to 5 Nm.
ASSEMBLY NOTE: First slightly tighten the thrust bearing.
Then tighten the screws with 5Nm beginning at screw I (see Fig. 33).
- CAUTION: Degrease the M6 countersunk screws, then secure them with a drop of Loctite 243. For manufacturing reasons, the countersunk screw heads should be recessed at least 0.3 mm in the thrust bearing → always check this!

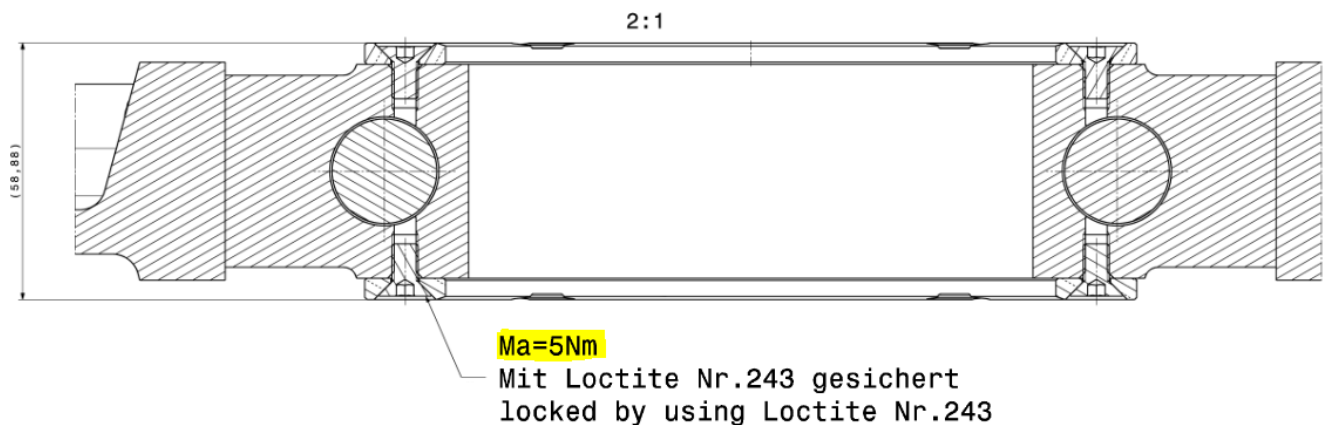


Fig. 31: Section through the upper countersunk screw heads in the main bearing cap



Fig. 32: Securing the countersunk screw with Loctite 243



Fig. 33: Completed main bearing cap with the thrust bearings fitted



Fig. 34: Screw correctly secured - no Loctite 243 visible.



Fig. 35: Loctite 243 oozing from the thread - WRONG!

- Clean crankcase and bearing cap in accordance with the cleaning instructions in TI 1100-0113.
- Refit the main bearing cap and reassemble the engine including the oil pan.
- Enter the modification in Oracle
 - Update the parts list (BOM)
 - Close the tasks and service requests

REQUIRED TIME

The time necessary for the modification to the main bearing cap will depend very largely on the on-site facilities (crane, sufficient room) and the experience of the technicians carrying out the work (generally, and as regards the modification itself). The modification on the bearing cap will take up to half a day. When carried out for the first time, an overall engine downtime of up to one week should be scheduled for the plant.

GENERAL CONDITIONS

- Work on the plant may only be carried out by specialist staff who have received relevant electrical and mechanical training.
- Machining operations should not be carried out in the engine room (if possible).



REQUIRED PARTS

- Jig Part No. 1228035
- Crankcase Part No. 9017100

POS.	PART NO.	QUANTITY	DESCRIPTION	COMMENTS
Kit Item	9017100	1	Crankcase	For reasons of custom barriers the device (Kit Item) with part no. 9017100 cannot be ordered. The individual components (pos. 1 and 2) of the assembly must be ordered.
1	9016819	2	Thrust bearing (spacer disk)	
2	451566	6	Countersunk-head-screw	

Table 01: Component list of the Kit Item with part no. 9017100

OTHER RELEVANT PART NUMBERS

- Thrust bearing cap Part No. 9016817

RELEVANT DOCUMENTS

The relevant instructions are all part of the plant documentation handed over to every customer on delivery of an engine. Furthermore, the latest versions of the documents referred to here can be downloaded from the Jenbacher Web portal (<http://information.jenbacher.com>) under the heading "Technical Knowledge Base".

- Technical Drawing E1-7204-90-00, Template 1228035
- Technical Drawing JY-0859-205-01-05-1, Thrust bearing bracket 9016817
- Technical Drawing E1-7173-05-00, Crankcase 9017100
- Technical Instruction TA 1100-0105 "Engine shutdown"
- Technical Instruction TA 1100-0113 "Fuel gas sampling using Tedlar bags"
- Technical Instruction TA 1902-0213 "Screwing and Tightening Torques for Type 4 engines"
- Technical Instruction TA 2300-0005 "Safety regulations"
- Technical Instruction TA 2300-0010 "Guidelines for using the LOTO kit"

REVISION CODE

INDEX	DATE	DESCRIPTION / REVISION SUMMARY
02	Jan. 30, 2015	Added Table 01 (Component list of the Kit Item with part no. 9017100)
01	Dec. 04, 2014	First version of this document

Table 02: Revision history

