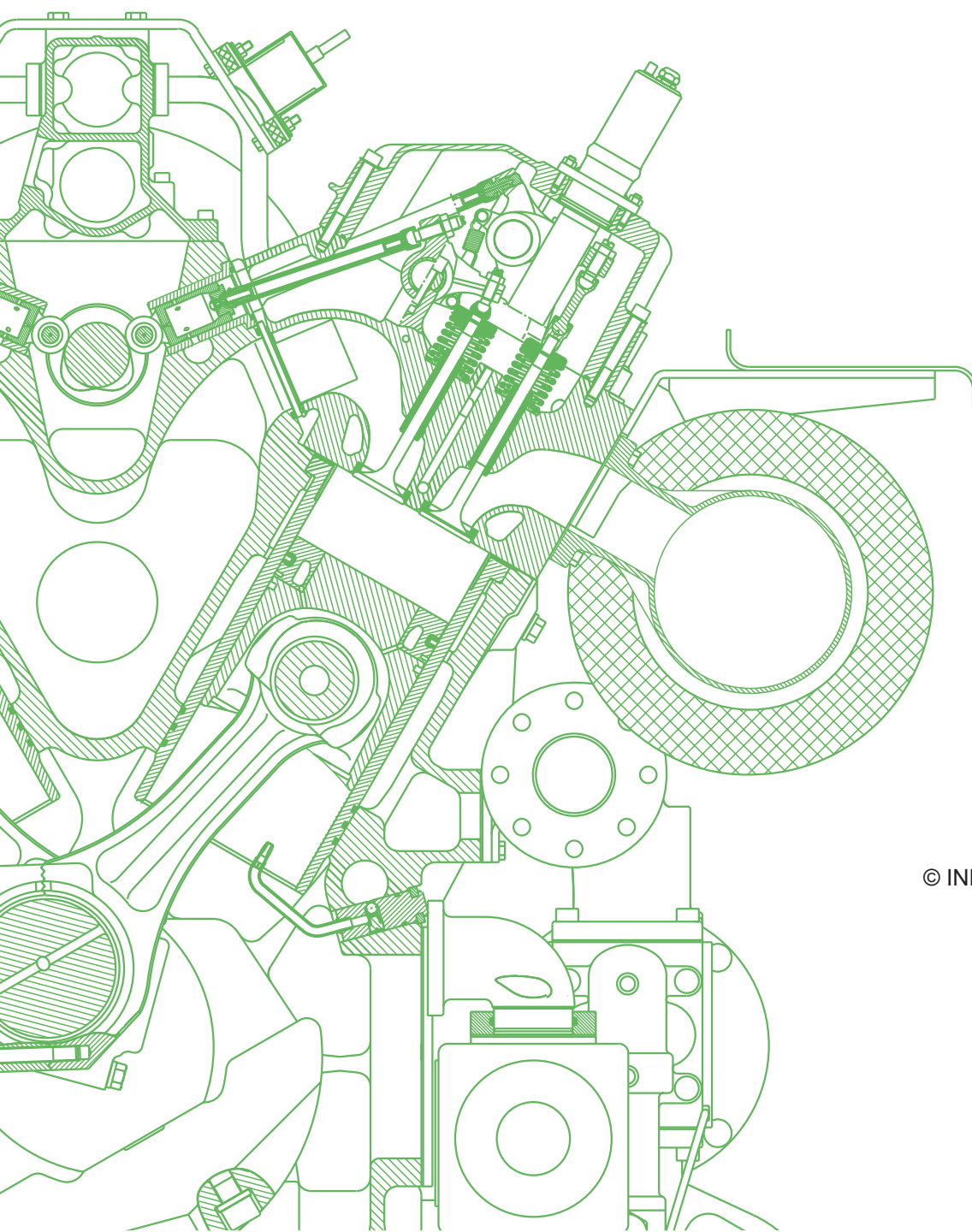


TA 1400-0172

Technical Instruction



Big-end bearing replacement on type J612, J616 and J620 engines



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The target recipients of this document are:

Service Partners, commissioning partners, subsidiaries/branches, Jenbach location

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1 Scope

This Technical Instruction (TA) applies to the following Jenbacher Gas Engines:

- Type 612, 616 and 620 engines

NOTE



Engine damage due to incorrect handling

There is a danger of engine damage through incorrect handling

- All work may only be carried out by trained personnel and only under direction of INNIO Jenbacher GmbH & Co OG.
- Work must be carried in accordance with these specific instructions.

2 Purpose

This Technical Instruction (TA) describes how to replace big-end bearings while the pistons are installed.

3 Safety information

⚠ WARNING



Danger from unauthorised restarting

Serious injuries such as cutting, crushing, severing or shearing of body parts due to unintentional contact with rotating or moving machine parts.

- Shut down the engine as described in TA 1100-0105.
- Secure the engine against unauthorised restarting in accordance with TA 2300-0010.



⚠ WARNING



Personal injury

Failure to use personal protective equipment and comply with safety instructions or employee protection information may lead to personal injury.

- Wear the relevant personal protective equipment (PPE).
- Observe the safety instructions as per TA 2300-0005.
- Observe the employee protection information as per TA 2300-0001.

⚠ WARNING



Activities entailing potential risks!

The safety of persons is put at risk if activities involving potential risk are not subjected to a risk analysis

- The **risk analysis** specially prepared for these maintenance activities must be followed for all the activities here in order to remove the general risks. Risk analyses can be found under information.jenbacher.com - Unsere Abteilungen - Service - Service Rubrik - EHS - Risikoanalysen (Our departments - Service - Service heading - EHS - Risk analyses).
- To avoid risks associated with the activity, the **Short Duration Safety Checklist**, which must be carried by every service staff member engaged in work in the field, must be filled in.

⚠ WARNING**Danger of burns**

Hot surfaces

- Do not start any maintenance work until the surface temperatures in the working area are below 50°C.
- If appropriate protective gloves with the appropriate protection against direct contact with hot surfaces are worn (e.g. gloves tested in accordance with EN 504), maintenance work can be carried out at working area surface temperatures less than 60°C.
- If necessary, check the temperatures with a contact thermometer before starting the work.
- Wear the appropriate personal protective equipment.

⚠ WARNING**Deflagration**

The incorrect or excessive use of cleaning agents, particularly brake cleaner, in enclosed spaces may result in an accumulation of a potentially explosive gas mixture. Contact with hot surfaces, flames or flying sparks may cause the gas mixture to ignite.

- Keep the use of cleaning agents to a minimum in enclosed spaces.
- Ventilate enclosed spaces after using cleaning agents.
- Do not use cleaning agents if hot objects or hot engine components are in the immediate vicinity.
- Avoid naked flame, flying sparks and ignition sources, in particular DC electric tools, in contact with cleaning agents and potentially flammable atmospheres.

⚠ WARNING**Explosion hazard**

An explosion hazard exists when power tools (e.g. battery-operated screwdrivers) are used and when sparks are generated in the crankcase.

- Do not use any electrical power tools (e.g. battery-operated screwdrivers) inside the crankcase.

⚠ WARNING**Danger to persons if special tools are handled incorrectly!**

If the work involves special tools, training may have to be given before the tools are used.

- Pay attention to TA 1310-0010-x – Special tools catalogue.
- Only authorised specialist personnel may operate the equipment.

⚠ WARNING**Danger of injury due to heavy loads!**

The lifting of loads weighing more than 22 kg can result in injuries.

- Components with a weight of more than 22 kg may only be lifted by two persons or with a crane!

⚠ ATTENTION**Danger from chemicals!**

When you work with chemical substances (e.g. cleaning agents, oils etc.), your health can be damaged by skin contact, by being sprayed in the eyes and by inhaling vapours.



- Please read the relevant information in the safety data sheets (SDBs) and, where appropriate, in the Directory of Work Materials and Hazardous Substances (AGV) or the operating instructions.
- Wear appropriate personal protective equipment (PPE) (e.g. chemical-resistant gloves, close-fitting safety glasses; optionally with face mask/breathing mask, protective footwear, chemical protective suit).
- Keep unprotected persons away.

⚠ ATTENTION**Danger of crushing!**

Danger of hand injuries!

- Keep fingers clear from the underside of the piston-conrod-cylinder liner unit (power unit) when mounting it.
- Proceed carefully and cautiously when mounting the piston-conrod-cylinder liner unit (power unit)!

NOTE**Engine damage due to incorrect handling**

There is a danger of engine damage through incorrect handling

- All work may only be carried out by trained personnel and only under direction of INNIO Jenbacher GmbH & Co OG.
- Work must be carried in accordance with these specific instructions.

NOTE**Engine damage and leaks**

Engine damage or leaks may result if elastomer components are not replaced at the correct intervals.

- Observe the maintenance instruction for elastomer components.
- The instruction will explicitly mention whether a seal must be replaced at a set interval or after each removal.
- Please also refer to the document specified in "Additional Information - Relevant Documents".

NOTE**Engine damage due to incorrect tightening torques**

Engine damage may be caused if the torques specified for tightening the relevant components are not observed.

- Observe the tightening torques specified in TA 1902-...
- Any different torques will be stated explicitly in the instructions.
- Please also refer to the document specified in "Additional Information - Relevant Documents".

NOTE**Contaminants**

There is a danger of engine damage if cleanliness is inadequate.

- Pay particular attention to cleanliness.
- Do not contaminate open areas of the fuel system with dirt and seal them off quickly with blanking caps.
- Proceed in accordance with TA 1100-0113 in clean oil areas.

4 Preconditions

In order to carry out this work, the following requirements must be met:

- Remove the inspection hole cover.
- Remove the big-end bolts and big-end cap as described in **TA 1400-0171**.

5 Required tools, equipment and materials**⚠ WARNING****Danger to persons if special tools are handled incorrectly!**

If the work involves special tools, training may have to be given before the tools are used.








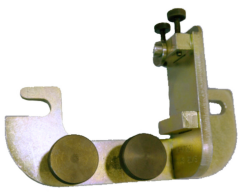
- Pay attention to TA 1310-0010-x – Special tools catalogue.
- Only authorised specialist personnel may operate the equipment.



All special tools are included in **TA 1310-0010-x** Special tools catalogue.

Please inform us if you use tools and equipment different to those on the list.

Tools and aids required for the following work are listed below.

Part number	Designation	Note	Illustration
<ul style="list-style-type: none"> • Only use conventional tested workshop tools. 			

Part number	Designation	Note	Illustration
1237369	Standard tools for service technicians (EMER)	Case with mechanical hand tools and foam inserts For details see TA 1310-0011	 Illustration for information only
1210145	Cleaning materials	Various cleaning materials, preferably order on-site. For details see TA 1310-0011	 Illustration for information only
1234890	Turning device	For turning the crankshaft manually	
289936	Assembly plate for big-end bolts	Aid for fitting the big-end bolts	
660093	Device for fitting conrods, 2-part	For removing pistons and conrods	
9017492	Locking screw for big-end bearing, short arm	Fixing big-end bearing shells after separation of the conrod	
9017200	Locking screw for big-end bearing, long arm	Fixing big-end bearing shells after separation of the conrod	
1247921	Conrod ejection rod clamp	for clamping the conrod lever assembly when replacing the big-end bearing shells on type 612, 616 and 620 engines (without removing the cylinder head)	

Part number	Designation	Note	Illustration
9017515	Positioning device for big-end bearing cap, Type 6 engines		
9023213	Main bearing extractor	For removing the upper main bearing	

6 Additional information



Remove and inspect the big-end bearings for bank A only. Remove the big-end bearing support and push out the upper big-end bearing shell according to the process described in this document.

Inspect and diagnose the upper and lower big-end bearing supports on both sides according to ST-159 and document in data record sheet E1400-0172.

Depending on the condition of the big-end bearing support and the coking on the rear side of the big-end bearing shells, replace the conrods according to the criteria outlined in ST-159.

Install new upper and lower big-end bearing shells while observing TA 1400-0171 for fastening the conrod screws.

If the upper big-end bearing shells show signs of pitting, then the big-end bearings of cylinder bank B must also be replaced (follow the above steps).



Make sure that the correct big-end bearings are available and ready for replacement.



Work cannot be done by one person

The nature of the activity or the weight or nature of the parts requires at least 2 persons.

Relevant documents:

E 1400-0172 – Operational data: Big-end bearing inspection on type J612, J616 and J620 engines

ST-159 – BR6-E/F/J: Conrods and big-end bearings - re-use criteria

TA 1100-0105 – Engine shut-down

TA 1100-0111 – General Conditions - operation & maintenance

TA 1100-0113 – Cleanliness During Service Work Involving Clean Oil Parts

TA 1300-0050 – Turning device

TA 1310-0011 – Standard tool catalogue

TA 1400-0100 – Running-in procedure for INNIO Jenbacher engines

TA 1400-0171 – Steel pistons, connecting rods, cylinder liners with scraper ring - replacement on Type J612, J616 and J620 engines

TA 1902-0228E/F/J – Tightening torques for type J 6... engines, versions GS-E/F/J

TA 2300-0001 – Employee protection

TA 2300-0005 – Safety instruction

TA 2300-0010 – Guidelines for using the LOTO kit

TA 2300-0011 – LOTO procedure EHS

7 Work steps

7.1 Removing the big-end cap

7.1.1 Undoing the big-end bolts

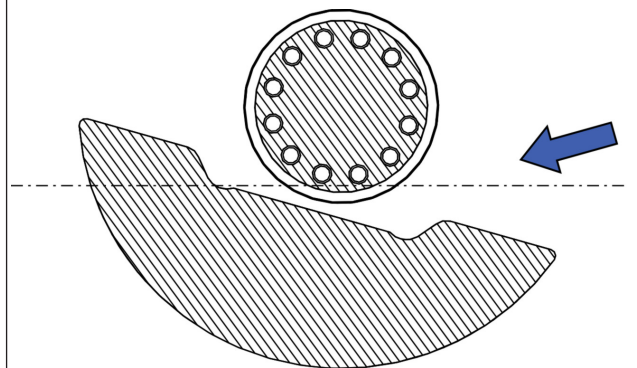
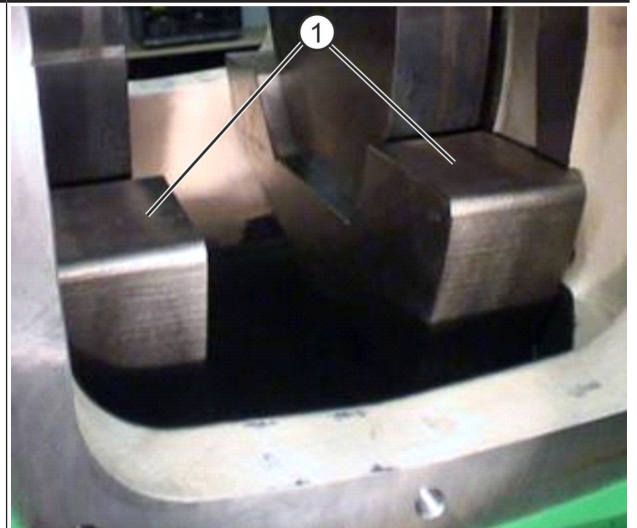
Undo the big-end bolts in accordance with **TA 1400-0171**.



TA 1400-0171 – Steel pistons, connecting rods, cylinder liners with scraper ring - replacement on Type J612, J616 and J620 engines

7.1.2 Bringing the crankshaft into the correct position for removal

The counterweights ① on the crankshaft must be at a slight angle.



7.1.3 Removing the big-end cap

Remove the big-end cap as described in **TA 1400-0171**.



TA 1400-0171 – Steel pistons, connecting rods, cylinder liners with scraper ring - replacement on Type J612, J616 and J620 engines

7.1.4 Inspecting the big-end bearing support



- Inspect the big-end bearing support in accordance with **ST-159**.
- Document the results of the inspection in the data record sheet **E 1400-0172**.



ST-159 – BR6-E/F/J: Conrods and big-end bearings — re-use criteria

E 1400-0172 – Operational data: Big-end bearing inspection on type J612, J616 and J620 engines



7.2 Replacing the lower big-end bearing shell

- Remove the lower big-end bearing shell as per **TA 1400-0171**.
- Inspect the lower big-end bearing shell as per **ST-159**.
- Document the results of the inspection in the data record sheet **E 1400-0172**.
- Mount the lower big-end bearing shell as per **TA 1400-0171**.



TA 1400-0171 – Steel pistons, connecting rods, cylinder liners with scraper ring - replacement on Type J612, J616 and J620 engines

ST-159 – BR6-E/F/J: Conrods and big-end bearings — re-use criteria

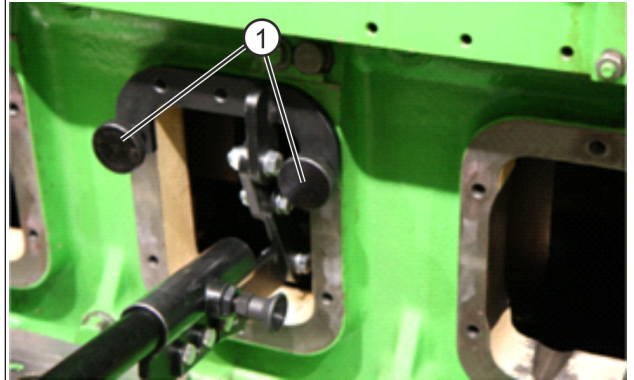
E 1400-0172 – Operational data: Big-end bearing inspection on type J612, J616 and J620 engines

7.3 Replacing the upper big-end bearing shell

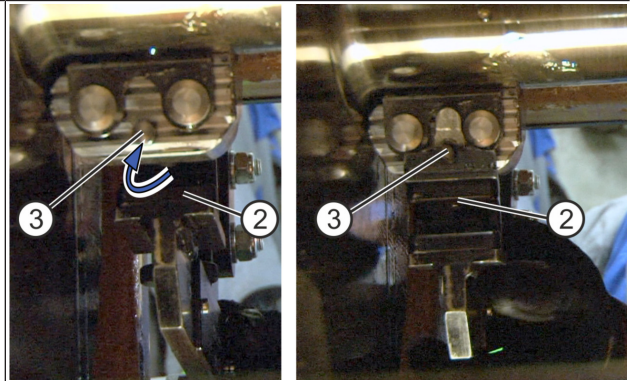
7.3.1 Removing the upper big-end bearing shell

Fastening the lever assembly to the engine block

- Secure the lever assembly on the crankcase opening with the knurled screws ①.



- Engage the lever assembly ② over the dowel pin ③ on the conrod.



NOTE



Damage to the crankshaft

The crankshaft can be damaged if the conrod is placed on it too hard.

- Carefully lift the conrod off, or place it on, the crankshaft.

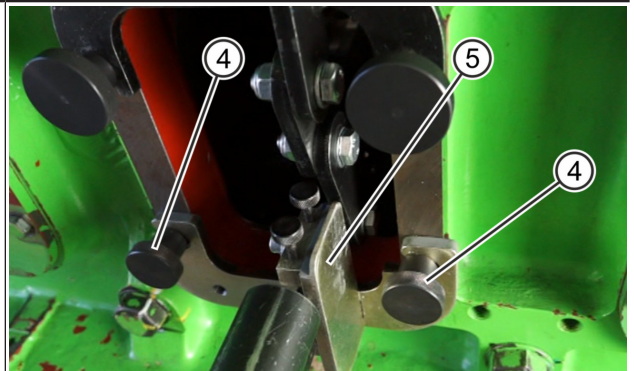


A second person is required for this work step.

- Pull the lever assembly outwards carefully and slowly lift the conrod off the crankpin journal.
- Apply continuous pressure on the lever assembly to push the piston and conrod upwards.



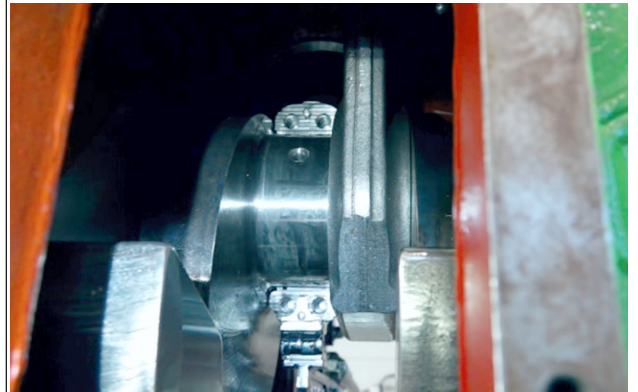
The valves of the cylinder where the big-end bearing is being replaced must be closed and must not project into the combustion chamber!



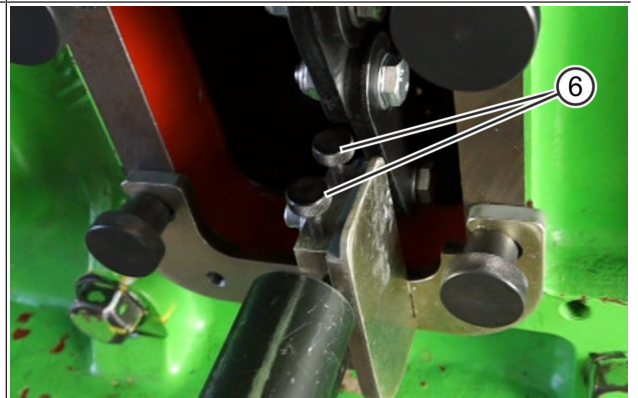


Carefully move the piston and conrod upwards so as not to damage the prechamber.

- Screw on the knurled screws ④ and fit the conrod ejection rod clamp ⑤.



- Secure the lever assembly with the knurled screws ⑥.



Removing the upper big-end bearing shell

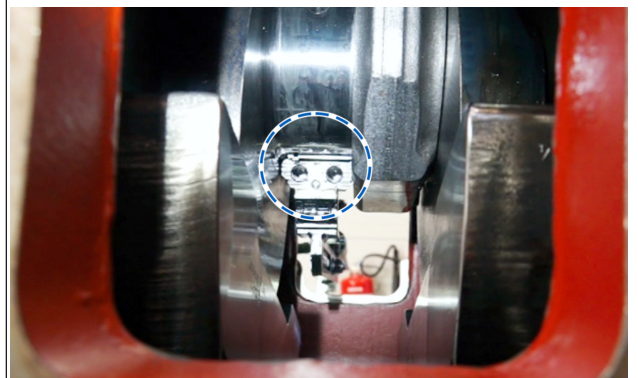
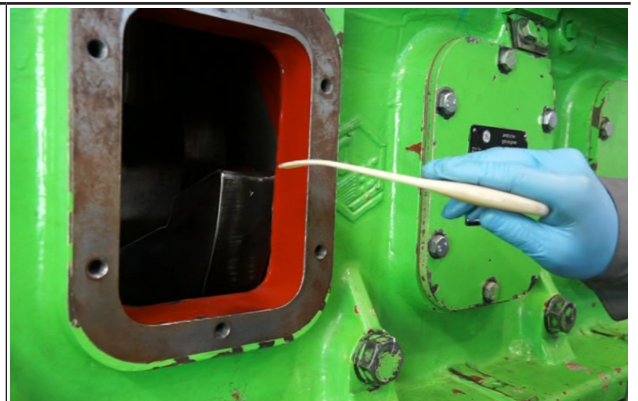


Use latex gloves for this work step.

- Push the upper big-end bearing shell from the top out of the conrod as far as possible with the main bearing removal tool.



Main bearing removal tool as per ⇒ Required tools, equipment and materials



⚠ ATTENTION**Danger of crushing!**

Hand injuries may result from turning the crankshaft.

- Keep hands out of the crankcase when turning the crankshaft.

- Position the crankshaft with the turning device and lock it as described in **TA 1300-0050**.



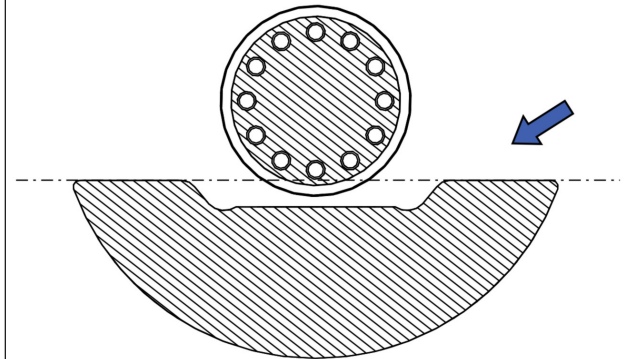
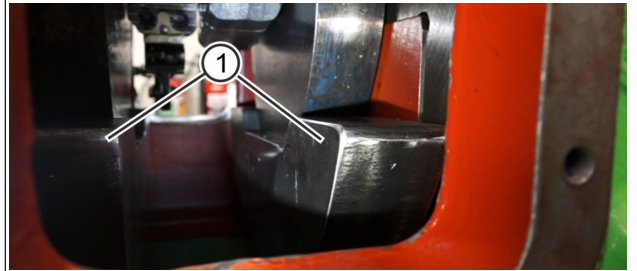
Turning device as per Chapter ⇒ Required tools, equipment and materials.



TA 1300-0050 - Turning device

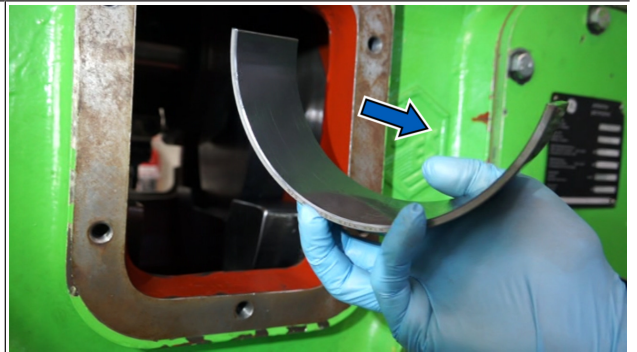


Carefully turn the crankshaft away from the conrod; the counterweights ① must be horizontal.



Use latex gloves for this work step.

- Rotate the upper big-end bearing shell out from underneath and remove it.



7.3.2 Inspecting the upper big-end bearing shell

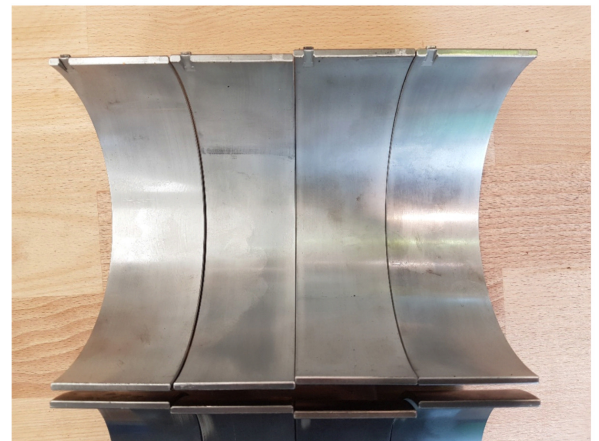


- Inspect the upper big-end bearing shell ① as per **ST-159**.
- Document the results of the inspection in the data record sheet **E 1400-0172**.



ST-159 – BR6-E/F/J: Conrods and big-end bearings — re-use criteria

E 1400-0172 – Operational data: Big-end bearing inspection on type J612, J616 and J620 engines

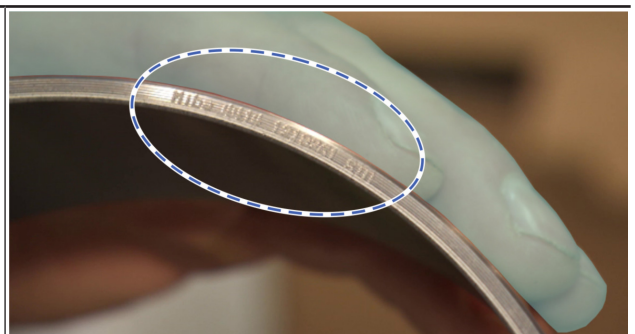


7.3.3 Fitting the upper big-end bearing shell

Prepare the upper big-end bearing shell



- Check the part number.

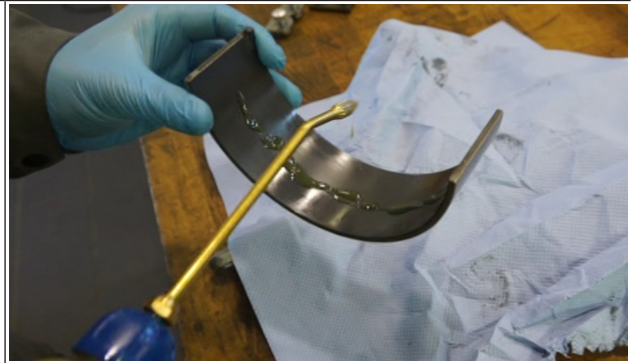




Use **new** latex gloves for this work step!



- Wet the big-end bearing shell running surface with clean engine oil from the oil can.



Fitting the upper big-end bearing shell



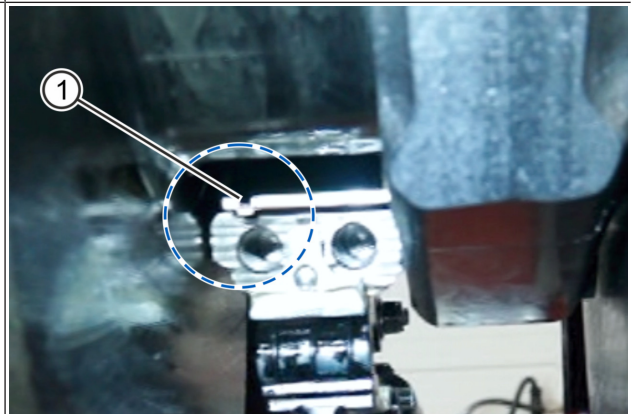
Use latex gloves for this work step.

- Insert the upper big-end bearing shell and push it into the conrod from below.



Check if the bearing shell locating lip is correctly positioned.

- Push in the upper big-end bearing shell as far as possible.,



⚠ ATTENTION**Danger of crushing!**

Hand injuries may result from turning the crankshaft.

- Keep hands out of the crankcase when turning the crankshaft.

- Position the crankshaft with the turning device and lock it as described in **TA 1300-0050**.

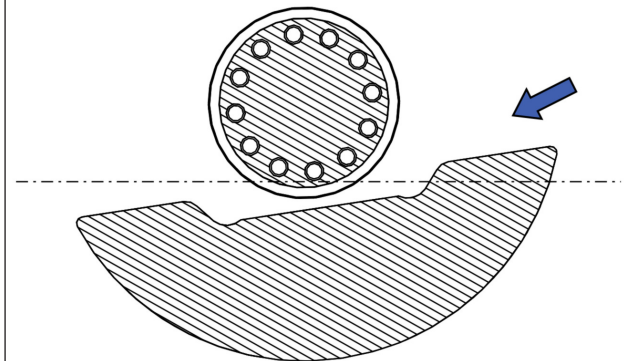


Turning device as per Chapter ⇒ Required tools, equipment and materials.



TA 1300-0050 - Turning device

Carefully turn the crankshaft up to the conrod; the counterweights ① must be at a slight angle.



Use latex gloves for this work step.

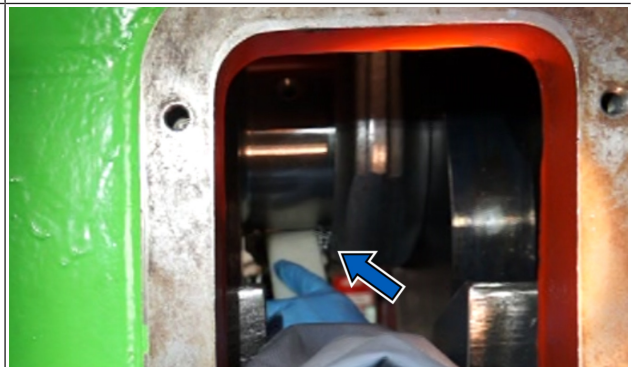
- Push the upper big-end bearing shell into the end position from underneath with the bearing removal tool.

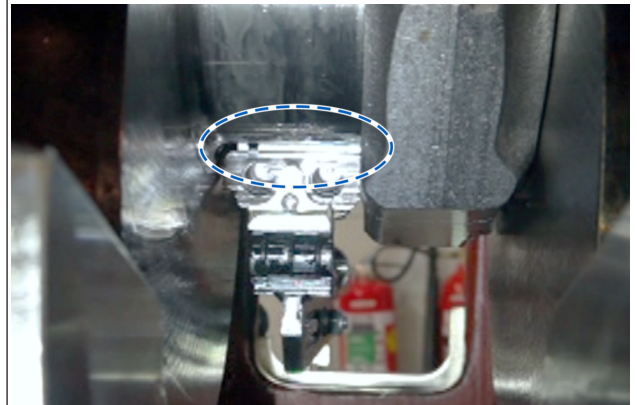


Main bearing removal tool as per ⇒ Required tools, equipment and materials



It must be possible to bring the upper big-end bearing shell into the end position without any great resistance. If this is not the case, repeat the previous step and rotate the crankshaft slightly to bring it into the correct position.

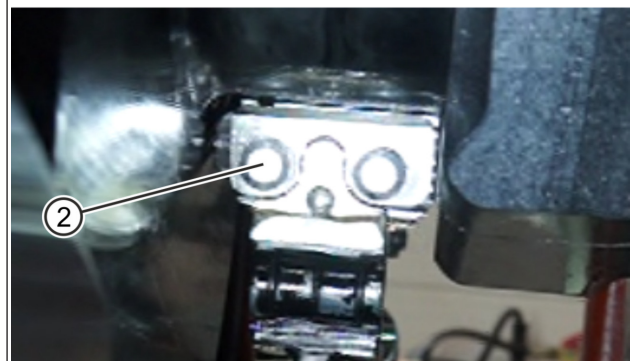




- Fit the big-end bearing shell retainers at the top ① and bottom ② and secure the big-end bearing shell.

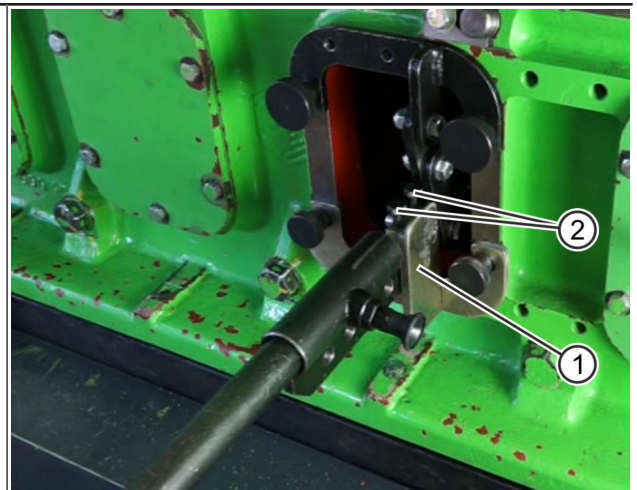


Retaining the big-end bearing shell as per Chapter
⇒ Required tools, equipment and materials

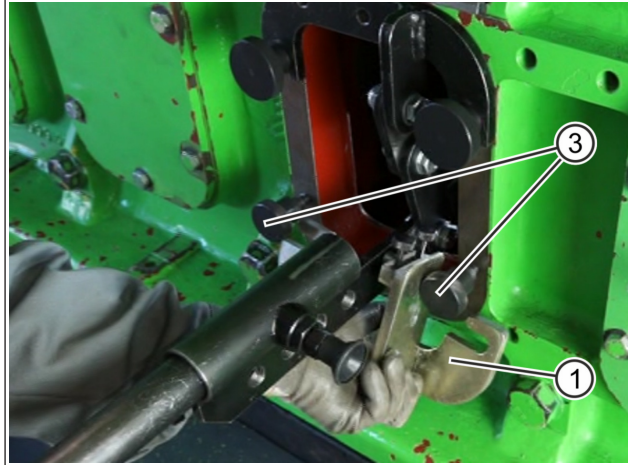


Lowering the piston and conrod

- Relieve the conrod ejection rod clamp ① by holding the lever assembly and undoing the knurled nuts ②.



- Undo the knurled nuts ③ and remove the conrod ejection rod clamp ①.

**NOTE****Damage to the crankshaft**

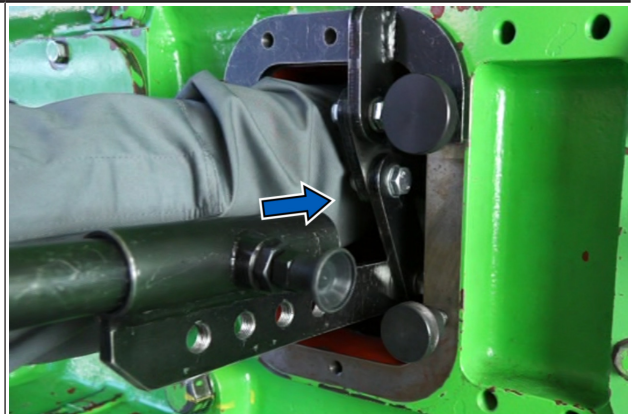
The crankshaft can be damaged if the conrod is placed on it too hard.

- Carefully lift the conrod off, or place it on, the crankshaft.

- Lower the conrod and carefully place it on the crankpin journal with the lever.

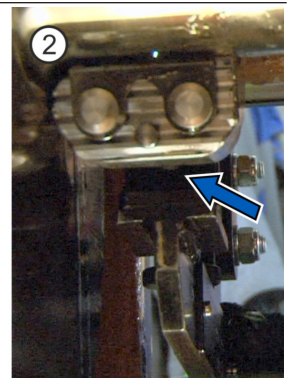
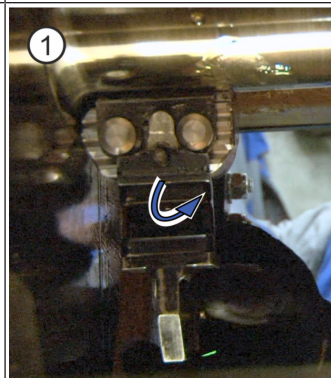


Do not release the conrod until it rests flush on the crankpin journal.



A second person is required for this work step.

- Disengage the lever assembly from the dowel pin of the conrod ① and press the conrod from the rear to secure it on the crankpin ②.

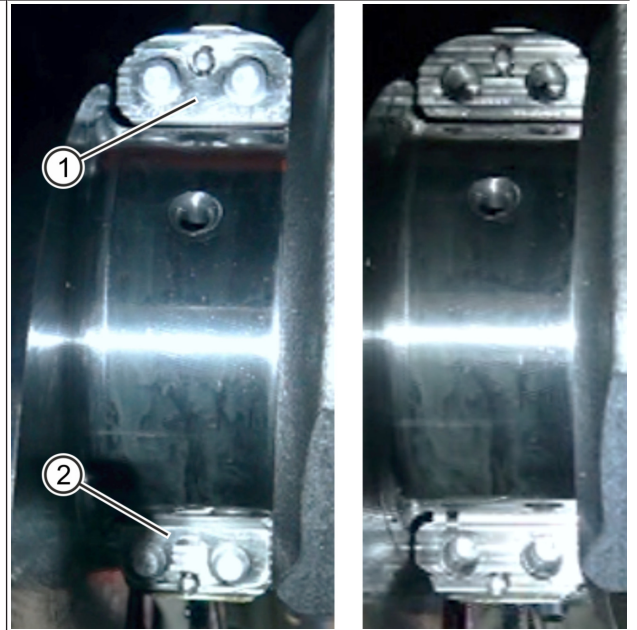


Removing the big-end bearing shell retainers



A second person is required for this work step.

- Remove the big-end bearing shell retainers ① and ② while simultaneously securing the conrod on the crankpin.



7.4 Fitting the big-end cap

Fit the big-end cap as per TA 1400-0171.



TA 1400-0171 – Steel pistons, connecting rods, cylinder liners with scraper ring - replacement on Type J612, J616 and J620 engines

7.5 Checking the axial clearance between the two conrods

Check the axial clearance as per TA 1400-0171.



TA 1400-0171 – Steel pistons, connecting rods, cylinder liners with scraper ring - replacement on Type J612, J616 and J620 engines

7.6 Carry out the engine running-in programme

Carry out the engine running-in programme according to TA 1400-0100.



TA 1400-0100 – Running-in procedure for INNIO Jenbacher engines

8 Revision code

Revision history

Index	Date	Description / Revision summary	Expert Auditor

Revision history

1	18.07.2019	Neuerstellung / First issue	Winterle H. Falls C.
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