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Distribution list
Jenbach, Subsidiaries, Service Providers

Service Technician Instruction

ST-213

Engine type **J612, J616, J620 & J624**

Subject **Engine cooling water system**
Trouble shooting guide in case of a 'Jacket water pressure high' alarm

The Service Technician Instruction ST-213 describes the actions that need to be executed to identify the reason for the alarm '1050 Jacket water pressure high'.

PURPOSE OF THIS BULLETIN / NEED FOR ACTION

No need for proactive action, i.e. if alarms/warnings concerning the engine cooling water pressure occur on all engine types during operation or shutdown, this instruction can be used as an aid.

AFFECTED ENGINES / SCOPE OF THIS BULLETIN

Type 6 engines where alarms/warnings – caused by the pressure sensor before the ECW pump*) – occur during operation, stand-by and after shutdown.

*) ECW…engine cooling water

Table of contents

1 GENERAL

This Service Technician Instruction describes the trouble shooting procedures in the event of alarms and warnings concerning cooling water pressure. If these alarms/warnings occur several times during operation, stand-by and after shutdown on Type 6 engines, this ST shows methods to resolve the problems. If the existing problem belongs to the listed problems described in this ST, a myPlant analytic gives additional information regarding the issue (see Figure 2).

In general, before checking anything else, one should check whether any work has been done on the engine that requires cooling circuit to be opened e.g. power unit exchange, head exchange. After such kind of work the system needs to vented according to W 8080 A0.

The increase of the engine cooling water pressure can mainly happen in three different situations:

a) During operation with stable running conditions
b) Shortly after shutdown of the engine, when cooling pumps stop
c) During stand-by

The nominal level of engine cooling water pressure is described per engine type in W 8080 A0.

Alarms and warnings could occur during operation or shutdowns of J624-H engines due to the arrangement of the sensor, therefore a change of position of the sensor would be required. Various engine cooling water pressure parameters are being changed in addition. The change in the minimum and maximum permissible pressures (see Section 5) will prevent potential alarms and warnings.

1.1 Error messages

The alarms/warnings are shown on the DIA.NE display as follows:

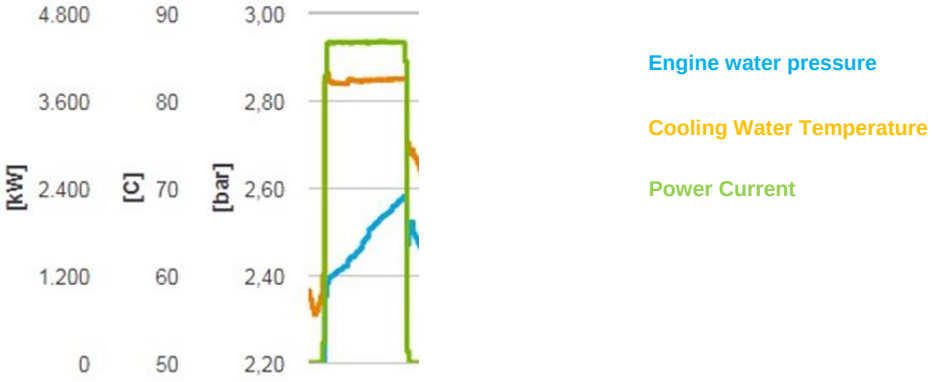
Warning	3406	Jacket water pressure high

Trip	1050	Jacket water pressure high

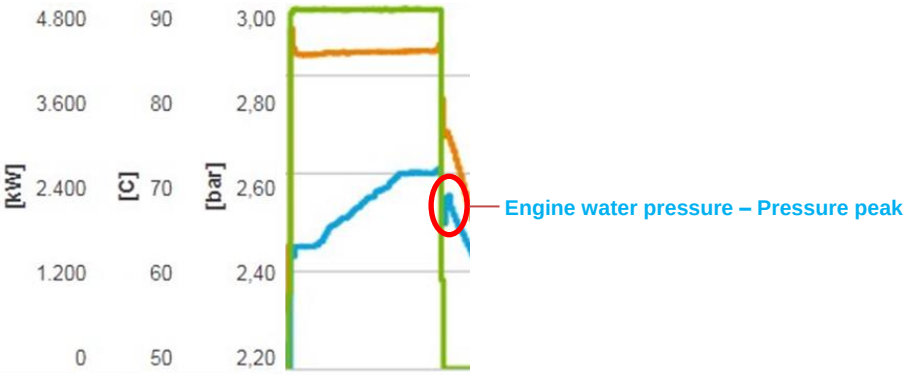
2 IDENTIFICATION OF FAILURE AND METHOD OF SOLUTION

Figure 1 shows screenshots of different scenarios (A, B, C) in myPlant. The particular cases for trouble shooting actions are shown in the flow chart in Figure 3.

Scenario A: During Operation



Scenario B: After shutdown



Scenario C: During Stand-by

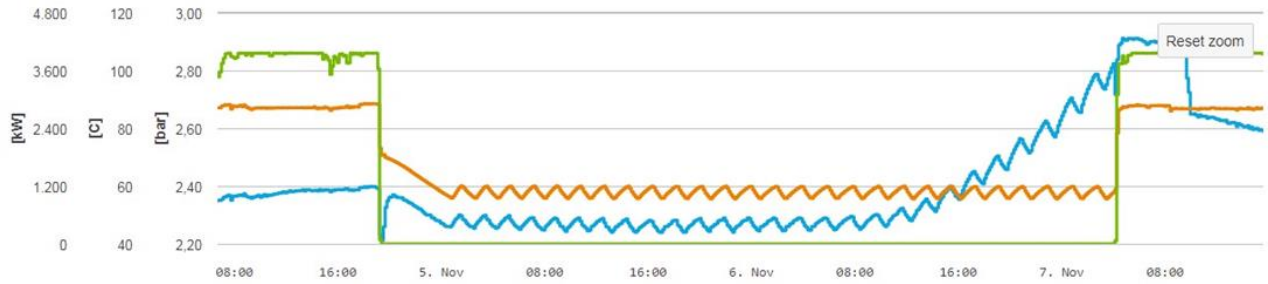


Figure 1: Different scenarios of cooling water pressure increase

Example for analytic in myPlant: In this case the scenario A – Power Unit Leakage is pictured.

Fleet Analytics

Configure

Region	Engine Model	Site	JNumber	Serial Number	Contract Type	Contract Start Date	Contract End Date	Item name	Alert type	Affected component	Activation date
Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter	power	alarm	Filter	Filter
NL North	J-Engine	Wagenweijdt 4	J499	1025538	PREVENTIVE & CORRECTIVE	2011-10-25	2023-10-24	Power Unit Leakage	ALARM	Exhaust System	15.05.2018 10:20:43

Figure 2: myPlant analytic in case of scenario A

The numbers in the flow chart refer to the numbers in Table 1. In this table the corresponding trouble shooting actions are listed.

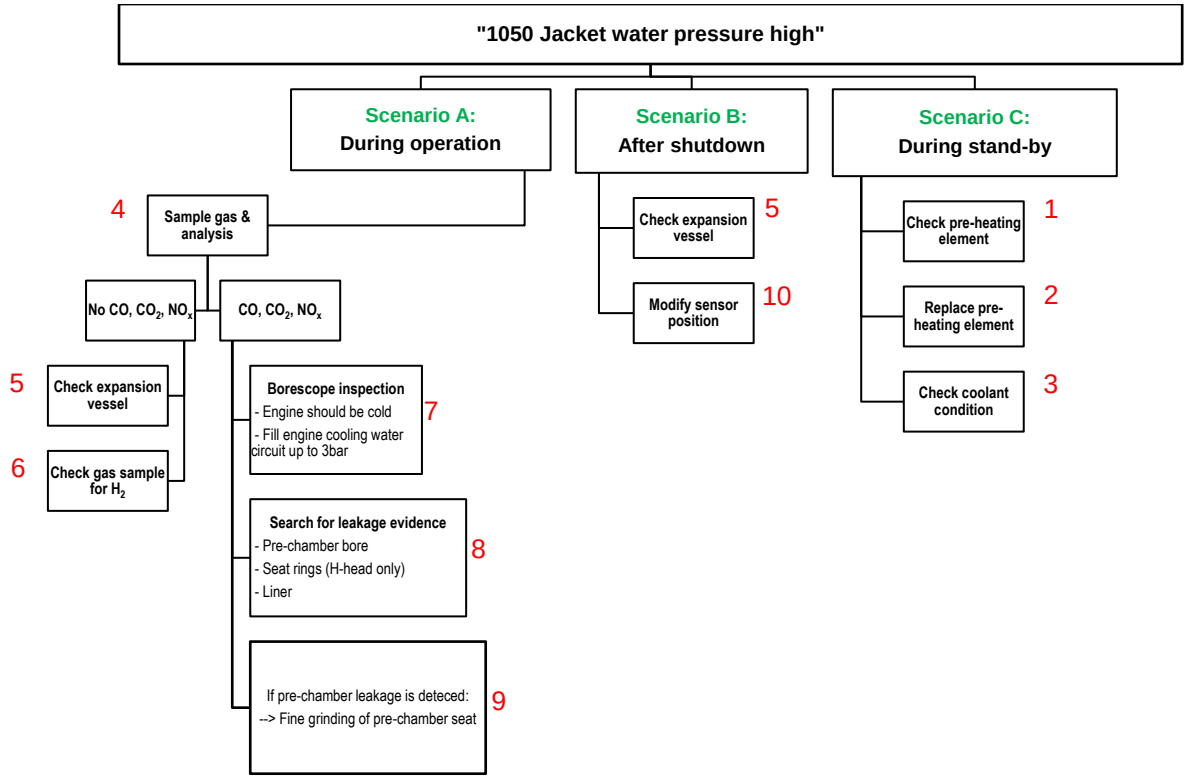


Figure 3: Trouble shooting flow chart

In general: Check coolant and whether it is approved by Jenbacher according to TA 1000-0200. Review last results of coolant analysis also according to TA 1000-0200.

2.1 Trouble shooting actions

In the following table all trouble shooting actions for the cases **A, B, C** are represented in a collected form. Depending on the case, the necessary actions to resolve the problem are established from the flow chart in Figure 3.

STEP	ACTION
1	Disassemble the pre-heating element and inspect visually for any deposits on the element (see Figure 4). This process is only valid for J624 engines. Part numbers for new pre-heating elements are listed in Table 4.
2	If deposits are present follow ST-213 and replace heating element, see section 3.
3	Coolant condition should be checked by taking a water sample according to TA 1000-0200.
4	Sample of exhaust gas should be collected from the de-aeration location and analysed using the standard field tech exhaust gas measuring device (TESTO 350), PN1219400 (see Figure 19 and TA 1310-0011). • If $CO/CO_2/NO_x$ is detected proceed with borescope inspection (step 7) • If no $CO/CO_2/NO_x$ go to step 5
5	Coolant circuit drain to ambient pressure. a) Check expansion tank pressure is not above limits of ~1.3 bar (J612-J620) and ~2.2 bar (J624) b) Check membrane in expansion tank is not damaged or cracked c) In case of Gensets: If cooling water pressure & engine water cooling pressures are too high → borescope air intake tract, if leakage of water is present d) If found OK go to step 6
6	Gas sample collected and analysed by external lab to check for presence of H_2. If H_2 is found it can be due to overheating / boiling of coolant. Engine operating conditions should be reviewed to check for potential cause of overheating / coolant boiling. Review engine layout to determine if hydraulic connection exists between engine and customer cooling circuit i.e. Genset arrangement. If yes, customer cooling circuit should be isolated from engine to determine if issue is on engine or customer side. Contact Jenbacher Service Engineering.
7	If a borescope inspection is necessary, execute following steps: a) Engine must be cooled down b) Cooling pressure should be increased to 3bar through additional filling c) Borescope through inspection bore in cylinder head (areas which must be checked are listed in point 8) d) If no leakage can be found borescope again with pre-heating on
8	General inspection of cylinder bore for evidence of leakage – rust, corrosion, water in cylinder • Inspection of exhaust seat rings for signs of leakage ("H" head) (see Figure 22), ONLY T6 • Inspection of pre-chamber tip for signs of leakage (see Figure 21) → ST-177 • Inspection of liner for evidence of crack with special focus on upper 100mm of the liner (see Figure 20)

9	If leak is identified then Jenbacher service engineer should be contacted to define next steps. • In case of leakage on the exhaust seat rings of the "H" cylinder head → Exchange of cylinder head necessary • If leakage is detected on the pre-chamber tip → fine grinding of pre-chamber sealing seat, see chapter 6. • Leakage on the liner → Liner replacement necessary **(don't continue to run the engine!)** In principle all leaking parts must be exchanged however, in the event these are not immediately available or engine downtime is not immediately possible the engine can continue to be operated for limited period with regular de-aeration of the cooling circuit performed to control cooling pressure and will be remotely monitored via myPlant by Jenbacher Engineering.
10	Modify sensor position (if J624-H) according to ST-213, chapter 5. Document affected part with part operating hours and replace.

Table 1: Trouble shooting actions

3 REPLACING THE PRE-HEATING ELEMENTS

Deposits on the pre-heating elements are an indicator of a too high surface temperature on the pre-heating elements. The result is a pressure increase in the cooling system caused by gases from cracked coolant (glycol). To get rid of these problems two solutions were developed. The solutions are described in the table below.

Quick Fix Solution	Retrofit Kit (8001313)
To reduce the surface temperature on the pre-heating elements it is necessary to change the pre-heating elements from 9kW to 6kW. As a result, the pre-heating time increases due to the lower surface temperature.	If a short pre-heating time is desired it is necessary to install the retrofit kit. This system has two pre-heating elements with 9kW.

Table 2: Solution options

- If the **Quick Fix Solution** should be applied, the pre-heating elements (according to Table 4) must be exchanged.
- If a change to the **Retrofit Solution** of the pre-heating system (with 9kW heating-elements according to Table 4) should be executed, the old pre-heating system must be dismounted and the Retrofit Solution must be installed.
  The respective drawings of the pre-heating assembly are provided with this document on the INNIO Customer Portal (https://customer.innio.com/en/customer/dashboard).

The table below faces the previous solution and the retrofit solution of the pre-heating assemblies on J624 engines.

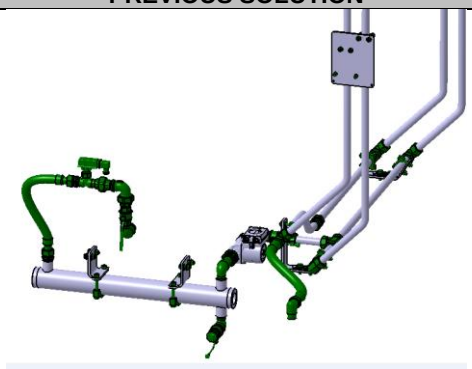
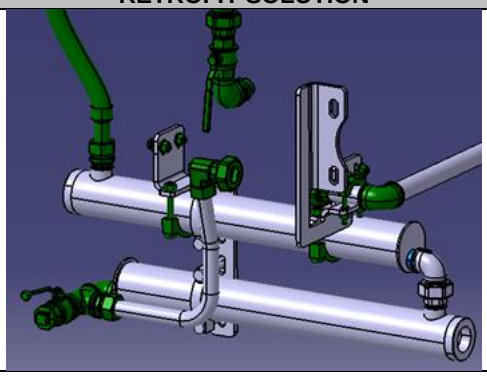
PREVIOUS SOLUTION	RETROFIT SOLUTION
	

Table 3: Previous and latest version of pre-heating assemblies

The part numbers for the heating elements subjected to voltage are listed in the table below.

P/N of pre-heater	Voltage [V]	Power [kW]	Frequency [Hz]	Certificate
426843	3 x 400 3 x 415 3 x 440	6 7.14 7.32 (max)	50+60 Hz	CE
513284	3 x 600	6	50+60 Hz	CE
631776	480	6	50+60 Hz	UL
631777	600	6	50+60 Hz	UL

Table 4: Part numbers of pre-heating elements

RETROFIT SOLUTION:
In case of the Retrofit Solution a longer cable for the pump is necessary.

- Pre-heating pump P/N 633448: 10x102253 – 10m 3x1.5mm²
- Pre-heating pump P/N 1232128: 10x102253 – 10m 3x1.5mm²

In Figure 4, the deposits on the pre-heating elements are shown.

Figure 4: Pre-heating elements with deposits

The figure below shows the latest version of the pre-heating assembly. The assembly drawing is shown in Figure 6. Furthermore, a PDF version of this drawing and the corresponding BOM are provided together with this ST on the INNIO Customer Portal (https://customer.innio.com/en/customer/dashboard).

Figure 5: Pre-heating system

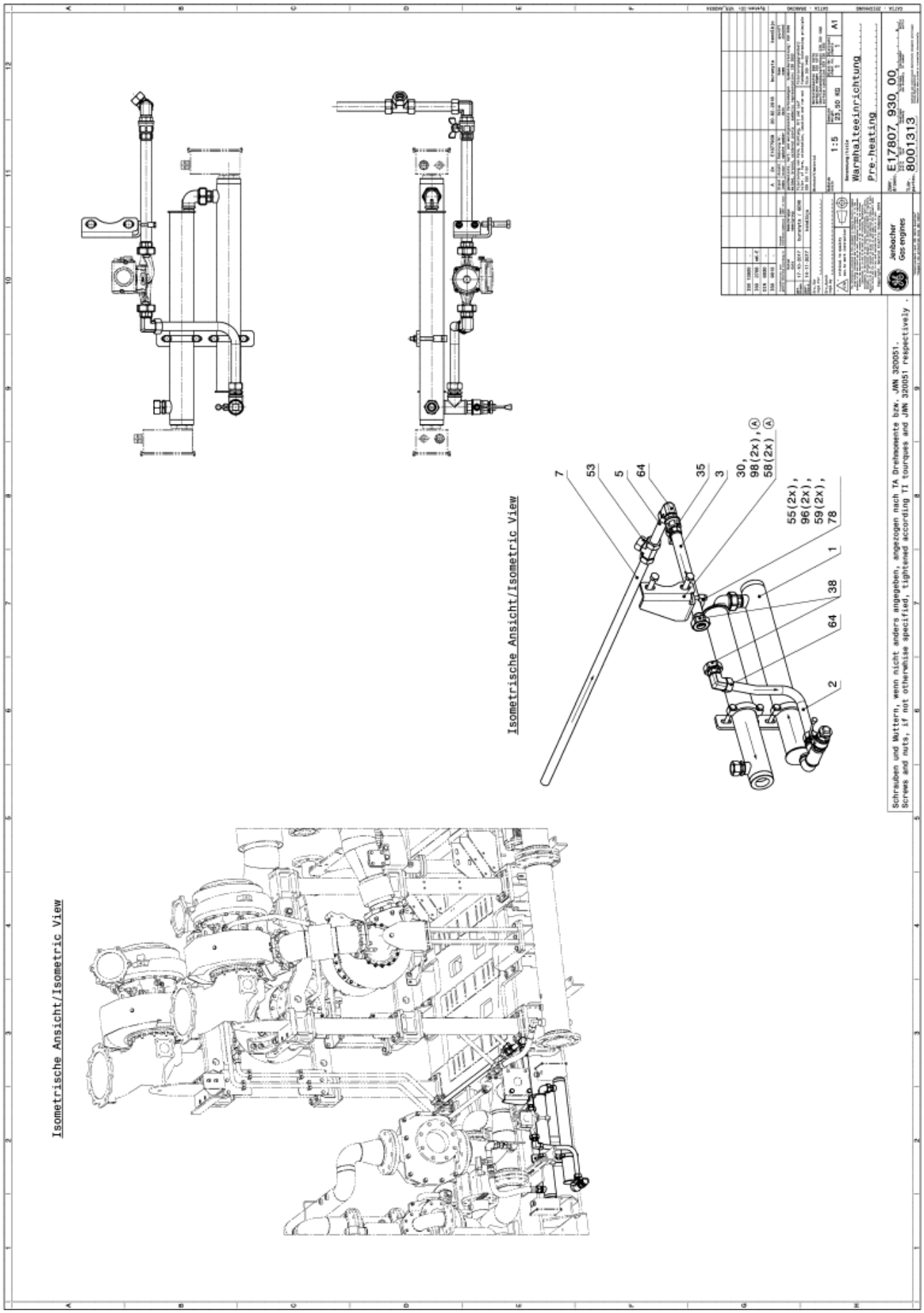


Figure 6: Pre-heating system - drawing - PN8001313

Procedure:

1) **Engine shutdown according to Technical Instruction TA 1100-0105 – Engine shutdown**

2) **Secure engine according to Technical Instruction TA 2300-0010 – Guidelines for using the LOTO kit**

3) **Drain cooling water on the lowest point, see figure below**
Cooling water must be drained using the red marked valve in the figure below. It is the lowest point to drain cooling water in the system.

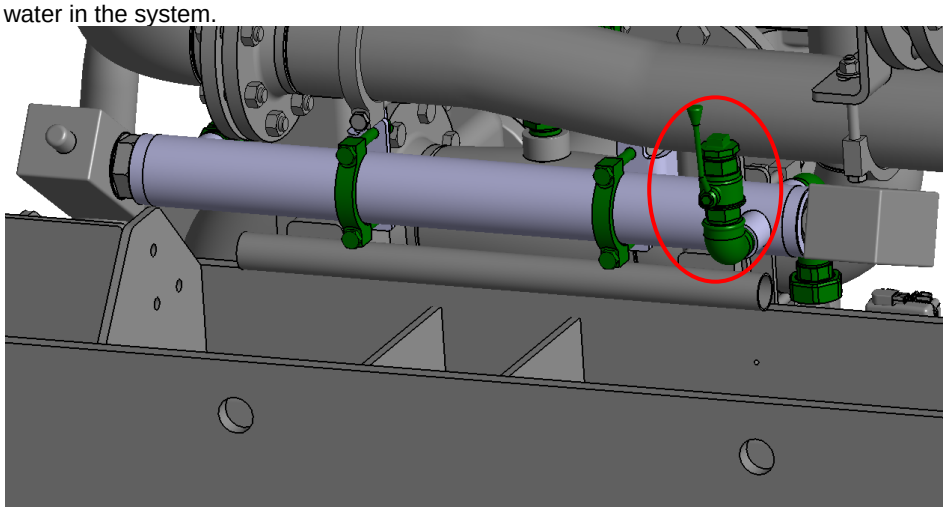


Figure 7: Drain cooling water

4) **Electrical disconnection of the pre-heating elements and the pump**

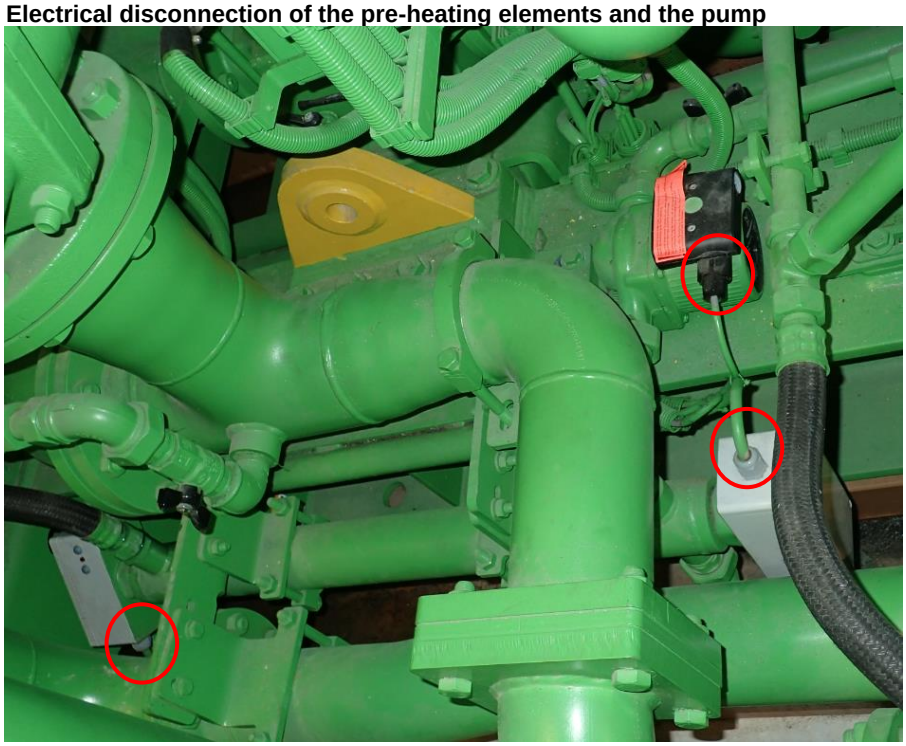


Figure 8: Electrical disconnection

5) Dismounting of mechanical components

- Loosen the straight screw connections, see figure below. Use cleaning wipes to get rid of the draining water when loosening the straight screw connection.

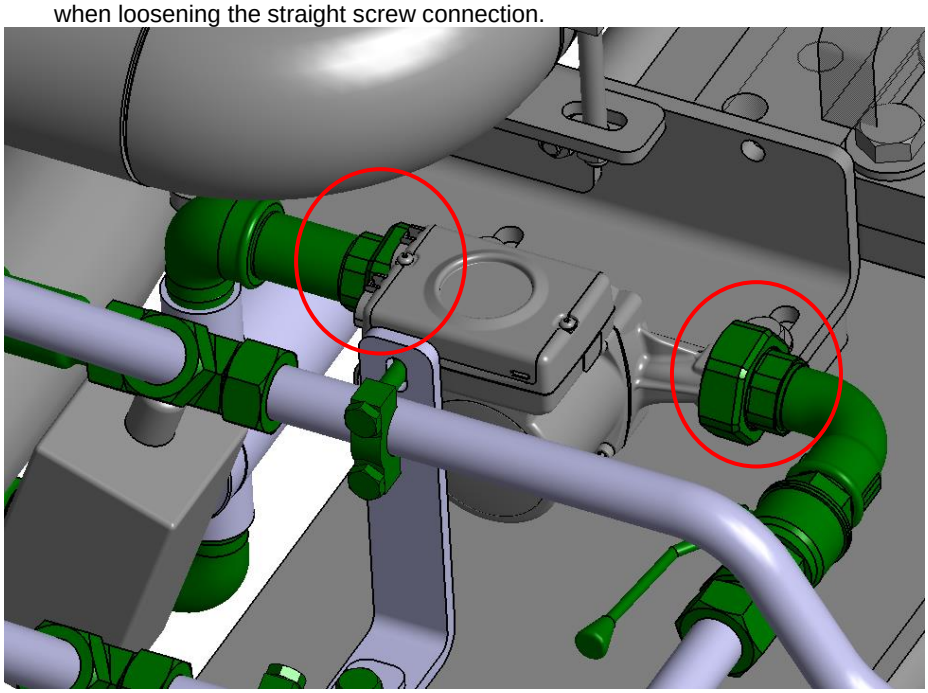


Figure 9: Loosen the straight-screw connection

- Disconnect hose
  Disconnect hose by opening the straight screw connection, see figure below.

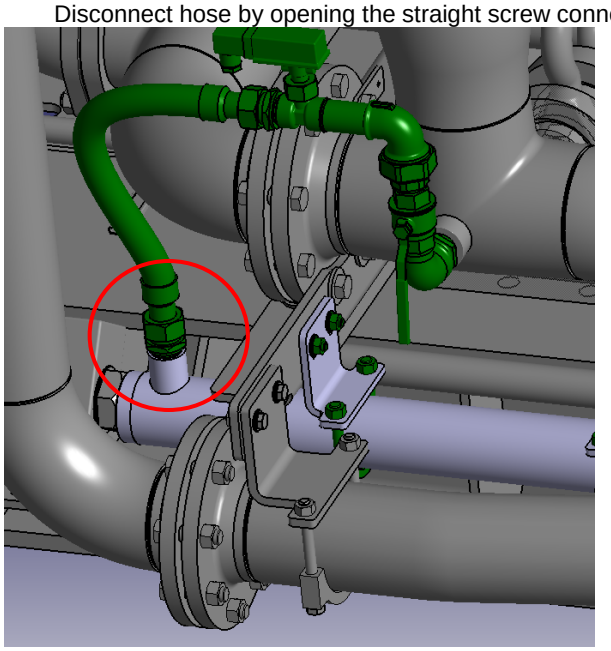


Figure 10: Disconnect hose from container

- Loosen of screw connection, see figure below. Afterwards it is possible to remove the brackets.

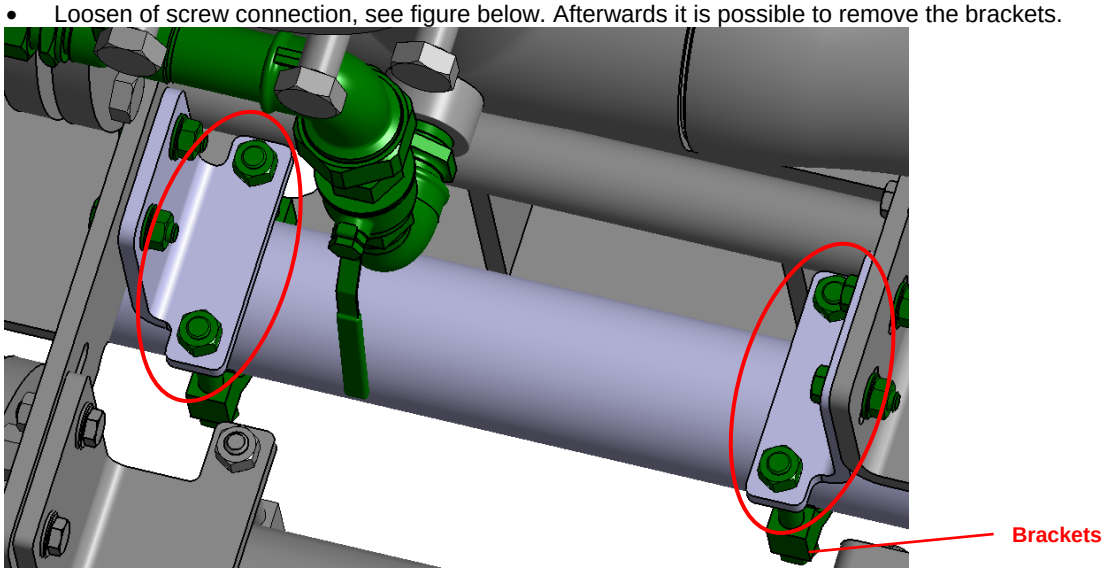


Figure 11: Loosen of screws

6) After all steps in point 5) are executed, the assembly which must be exchanged, can be dismounted.

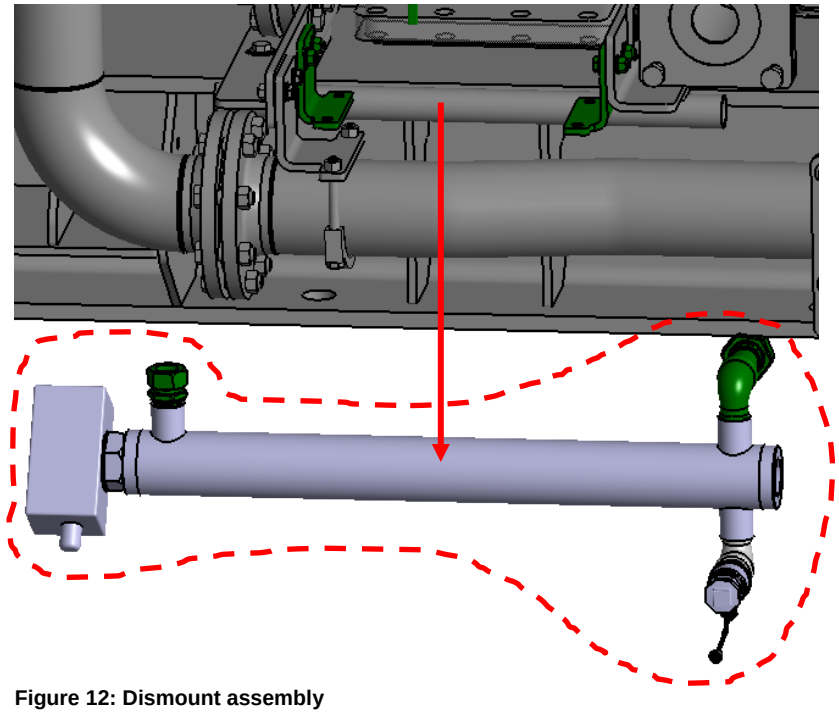


Figure 12: Dismount assembly

7) Screw in the pre-heating elements

Before mounting of the pre-mounted pre-heating assembly, the pre-heating elements must be installed in the containers. The container assembly is part of the retrofit kit. When screwing in the pre-heating elements, attention must be paid to the alignment of these elements.

- The 1st pre-heating element in Figure 13, right must be aligned vertically
- The screw-in process of the 2nd pre-heating element (Figure 13, left) must be stopped ~15° prior to vertical alignment to avoid collision with engine frame
- Use Loctite 55 threat sealing tape

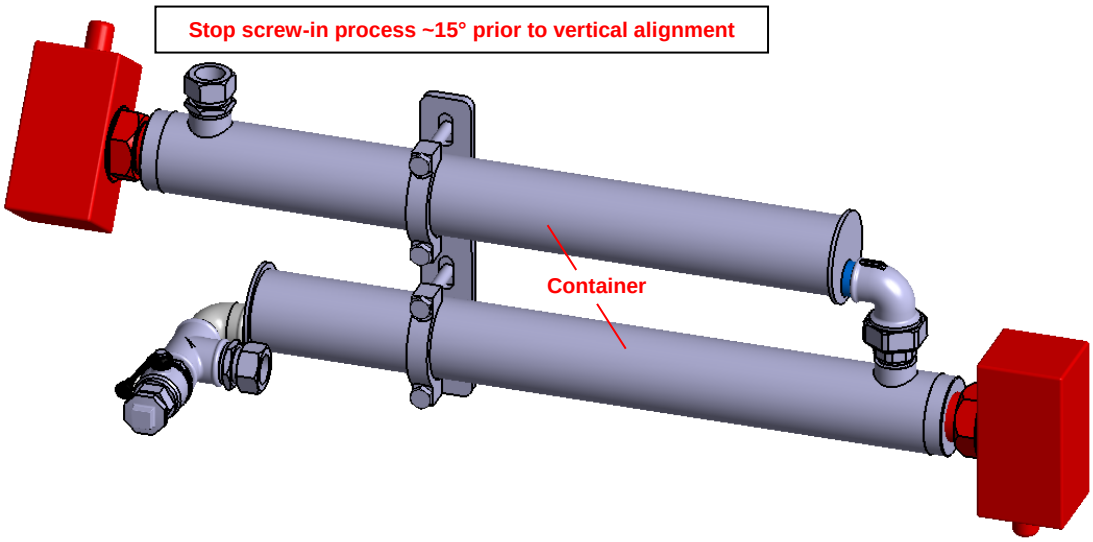


Figure 13: Pre-mounted assembly and alignment of the pre-heating elements

8) Installation of the pre-mounted assembly

Fix the pre-mounted assembly using the holders, clamps, screws and nuts.

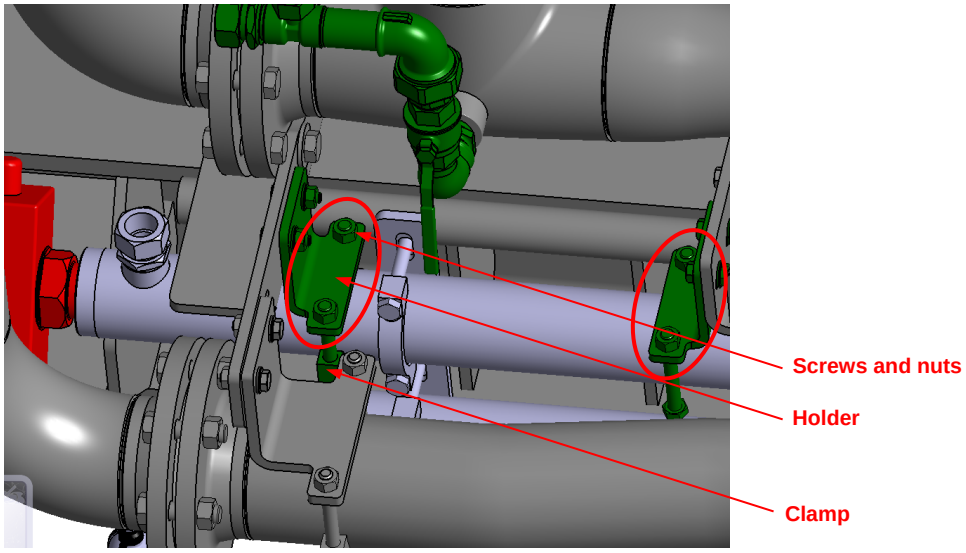


Figure 14: Fixing the pre-mounted assembly

9) Installation of new pipe

- Install the new pipe
- Mount the bracket
- Replace angular fitting by a T-piece

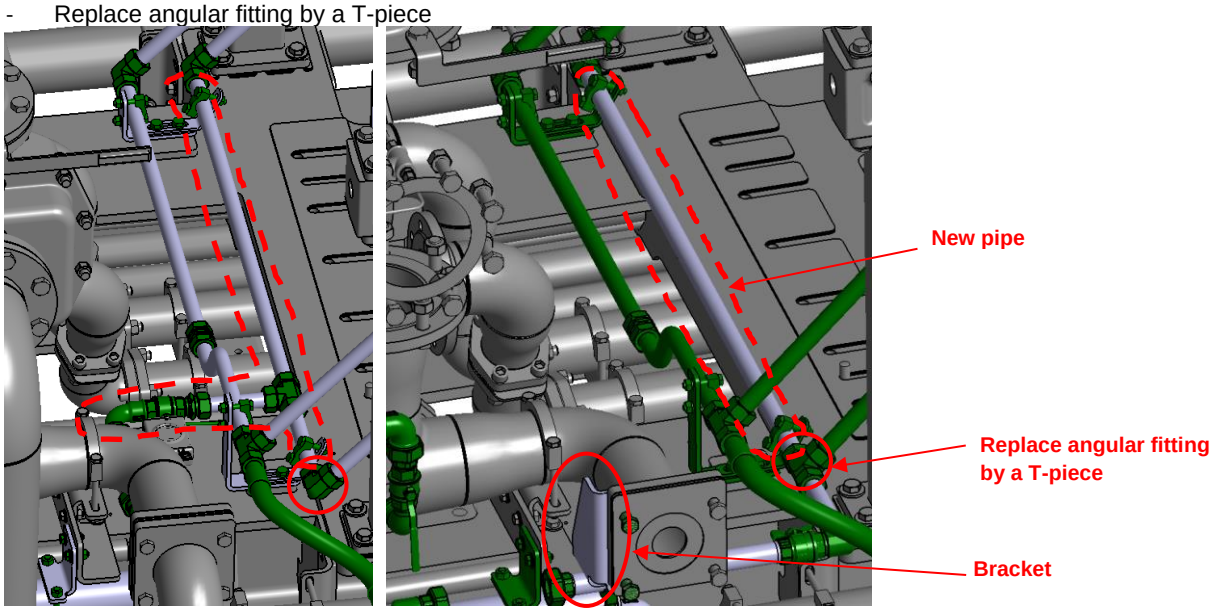


Figure 15: Exchange of pipe

10) Installation of the pump

- Install the pump according the picture below
- Pay attention to the correct flow direction

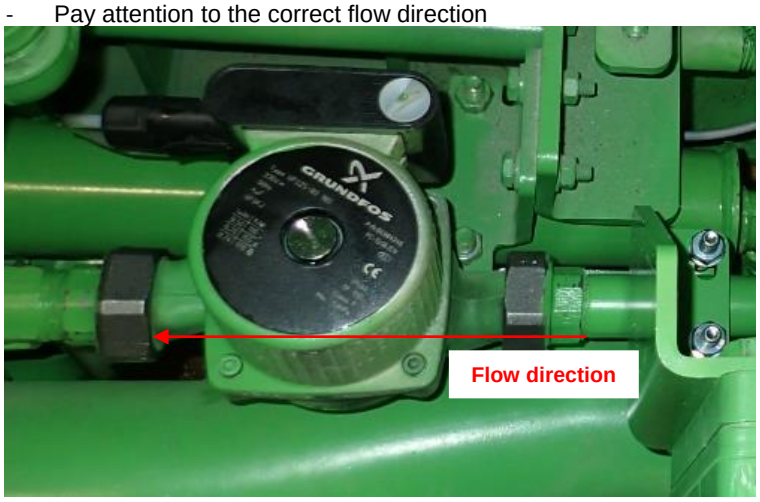


Figure 16: Installed pump

11) Alignment of pipes and components

After mounting the new components, the proper alignment of the parts – especially pipes and the pump – must be checked.

12) Mounting of pipeline

- Pre-mount the pipeline (pipeline, straight screw connections, elbow fitting)
- Connect T-piece and pump with the pre-mounted pipeline

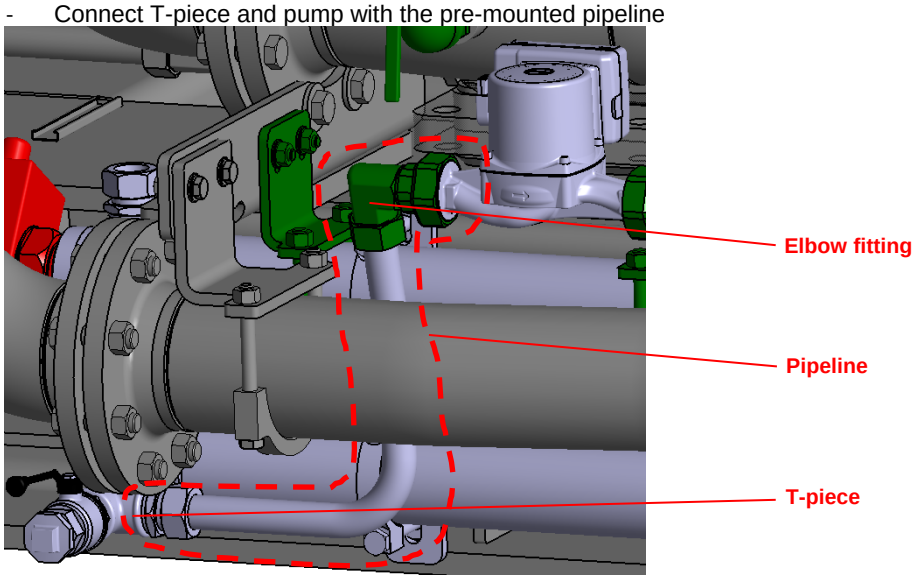


Figure 17: Mounting of the pipe

13) Connection of hoses

14) Electrical cabling of the pump and the pre-heating elements

15) Fill the cooling water according to W 8080 A0

16) Bleed the pump

Use a screwdriver according to the figure below to bleed the pump.

Figure 18: Bleeding of the pump

17) Operational control of the pre-heating elements

For the operational test of the pre-heating elements current-measuring tongs must be used.

Figure 19: Gas analysis using gas analyzing device TESTO 350

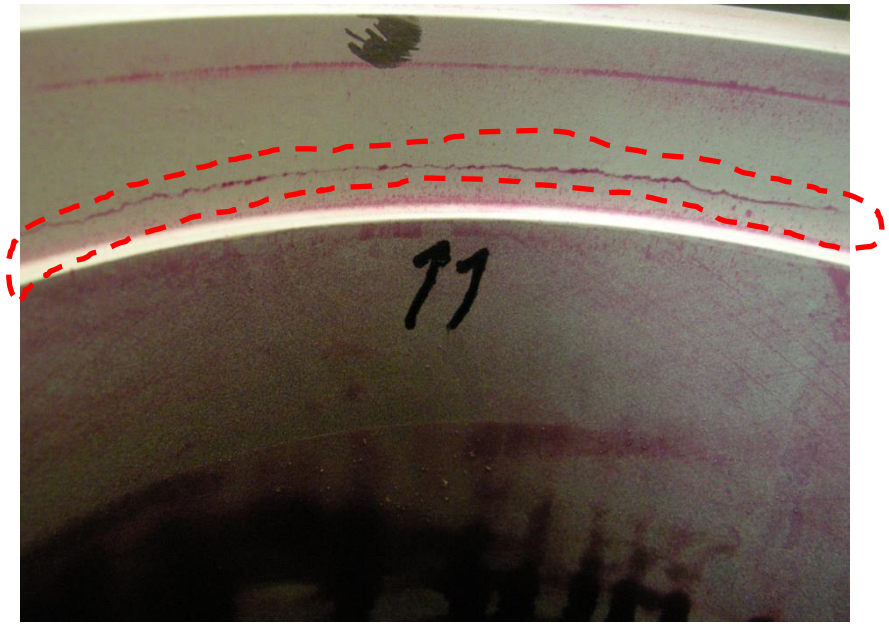


Figure 20: Example of a liner crack

Procedure:

- After the disassembly of the liner, clean it with brake cleaner
- Use crack penetration fluid (red) to coat the surface of the liner where the crack is assumed
- Wait approximately 30 minutes to ensure sufficient penetration
- Clean the surface with a cleaning cloth, **DO NOT USE BREAK CLEANER!**
- Use developer spray (white) to make the cracks visible; after some seconds the crack will become visible

Figure 21: Pre-chamber tip leakage

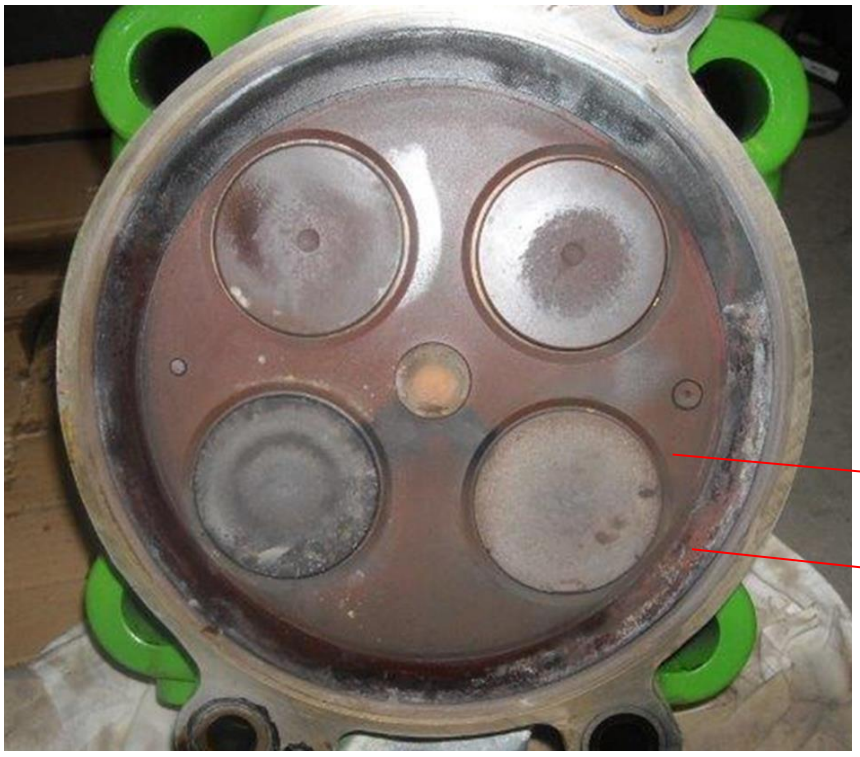


Figure 22: Cylinder head with signs of leakage

Figure 22 shows general corrosion on the flame deck of the cylinder head as well as signs of corrosion in the area of the cylinder head gasket.

4 ADJUSTING OF THE COOLING WATER PRESSURE PARAMETERS

The engine cooling water pressure parameters must also be adjusted **(only relevant for J624-H if the position of the pressure sensor is modified according to chapter 4.1):**

- **Minimum 1 (Parameter Nr. 11917):** Change from **1.90 bar** to **1.70 bar** **(Level 30 necessary)**.
- **Maximum (Parameter Nr. 11916):** Change from **3.00 bar** to **3.10 bar** **(Level 40 necessary).**

The window where the parameters can be set is shown in Figure 23.

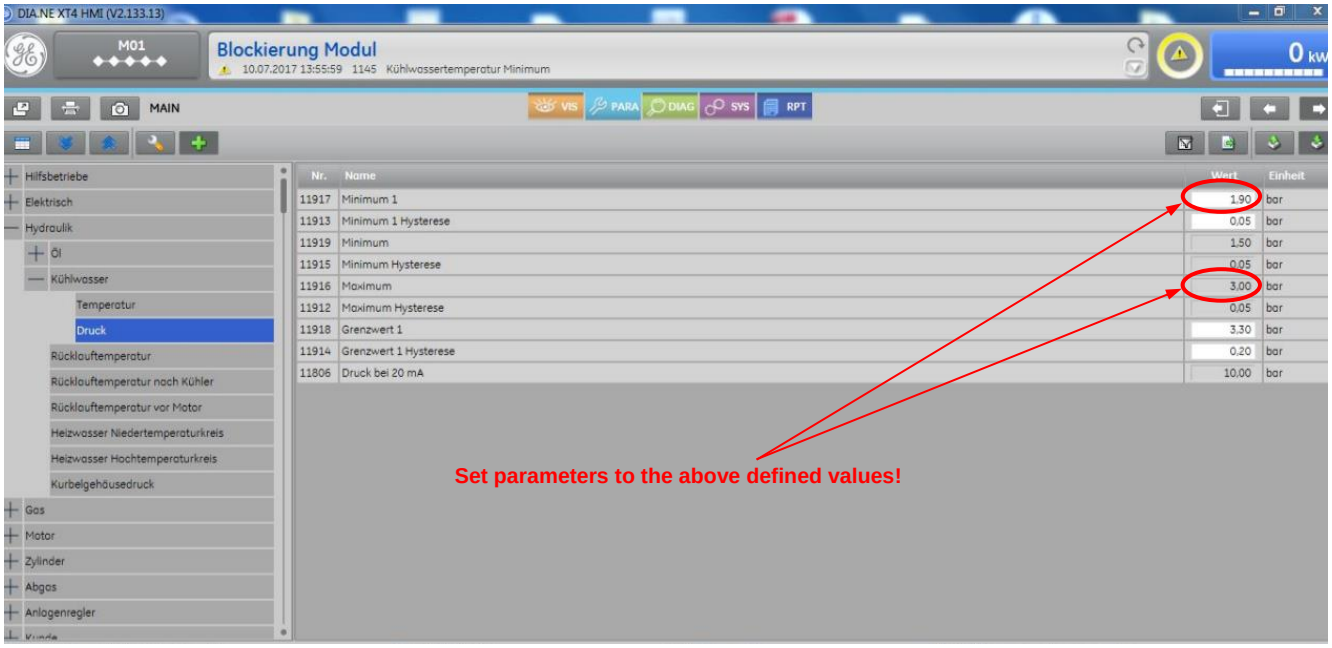


Figure 23: Changing the parameters

4.1 Modify the pressure sensor position (J624-H)

We recommended moving the pressure sensor on a J624-H engine, as shown in Figure 24 and Figure 25.

Procedure:

- ✓ Drain cooling water
- ✓ Remove the pressure sensor at position ①
- ✓ Fit the pressure sensor at position ②, close off the nipple at ① with a screw plug and renew the sealing ring
- ✓ Route the pressure sensor cabling so that no kinks or chafing against adjacent components can occur
- ✓ Fill with cooling water according to chapter 2

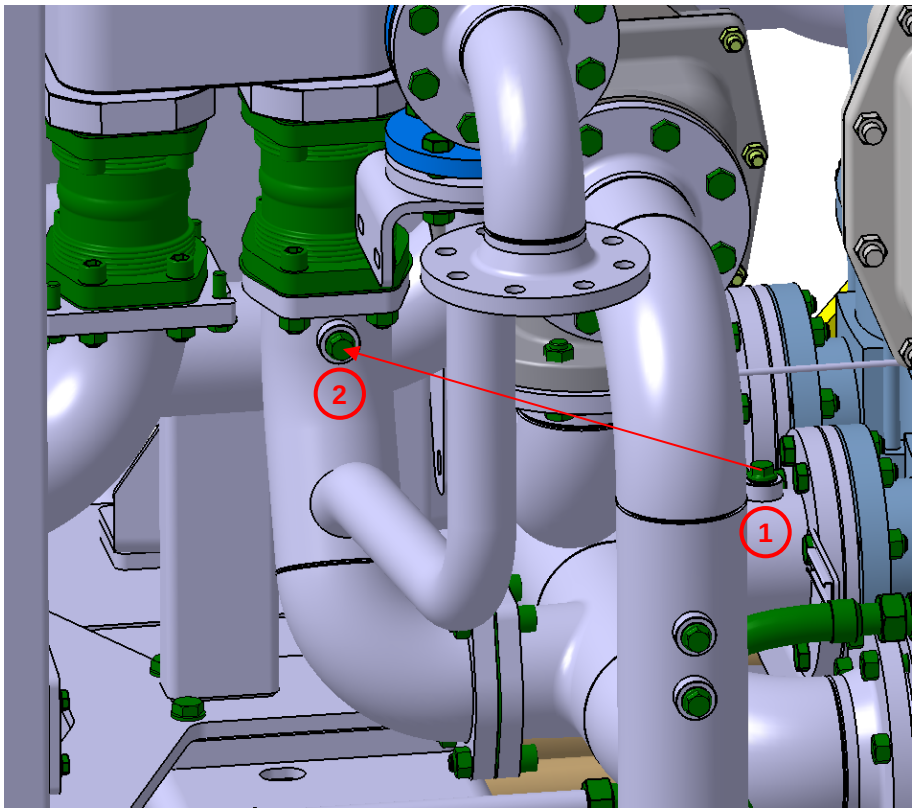


Figure 24: Moving the pressure sensor (1) – J624

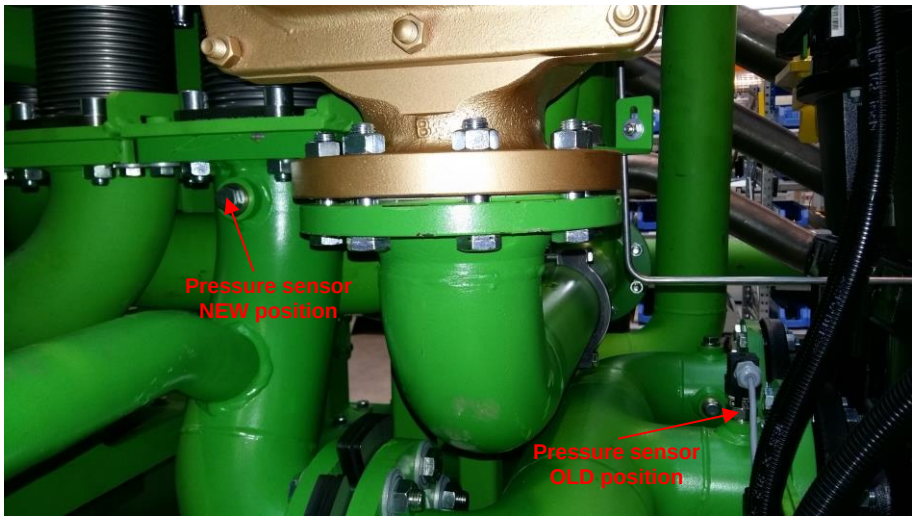


Figure 25: Moving the pressure sensor (2) - J624

5 FINE GRINDING OF PRE-CHAMBER SEALING SEAT

If leakage is detected on the pre-chamber, it is necessary to fine-grind the pre-chamber sealing seat in the cylinder head to achieve a high surface quality and to remove possible deposits. The grinding tool is available for "F" and "H" cylinder heads. It is designed in a way to grind the sealing surface of the pre-chamber to a defined hard stop. Therefore, it is possible to use a drilling machine instead of a hand wheel.

- Part number of the grinding tool for "F" cylinder head: 1241846
- Part number of the grinding tool for "H" cylinder head: 1242554

Procedure:

➢ **Dismounting the pre-chamber**

➢ **Prepare pre-chamber grinding tool**
- Mounting of grinding disc on the grinding surface of the tool by using a screw

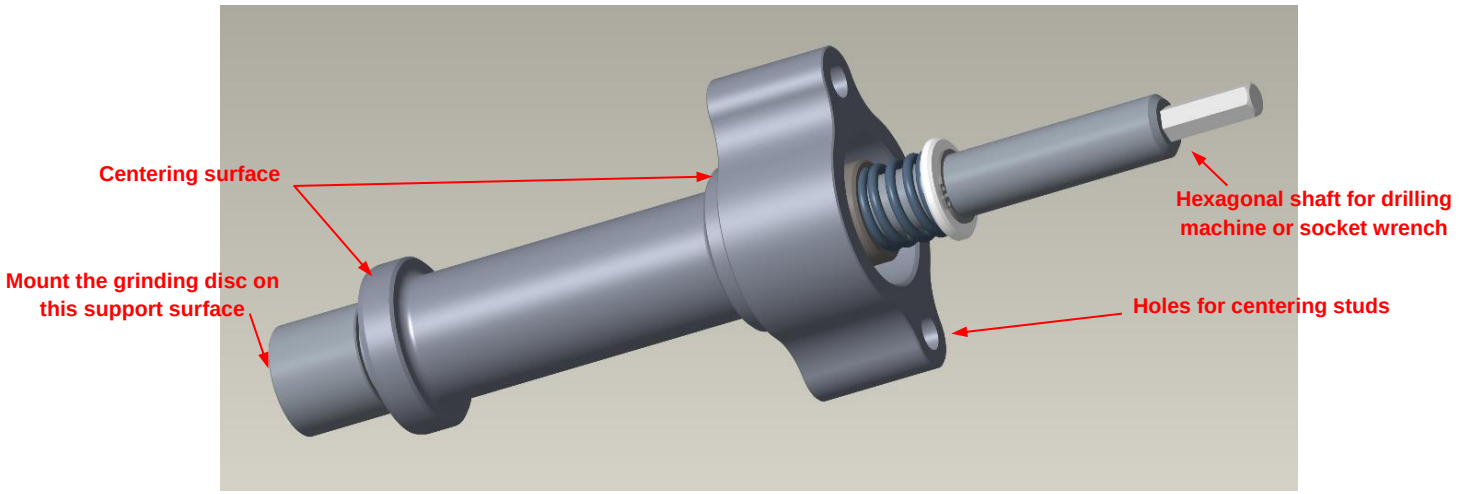


Figure 26: Grinding Tool

Figure 27: Grinding disc

Specification of the grinding disc recommended to be used:

Part number:	1244135
Product:	Klingspor CS310X
Outer diameter:	35 mm
Hole diameter:	7 mm
Thickness:	approx. 0.7 mm
Grain size:	P100

➢ **Mounting of pre-chamber grinding tool**

The grinding tool is mounted using the stud bolts. It is not necessary to secure the grinding tool with distance pieces and hexagonal nuts, see Figure 29.

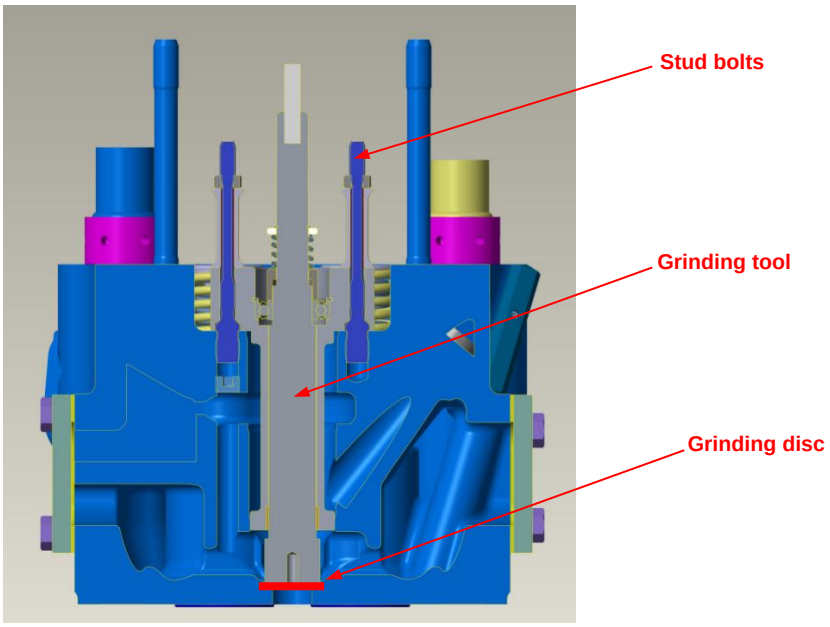


Figure 28: Mounting of grinding tool in cylinder head

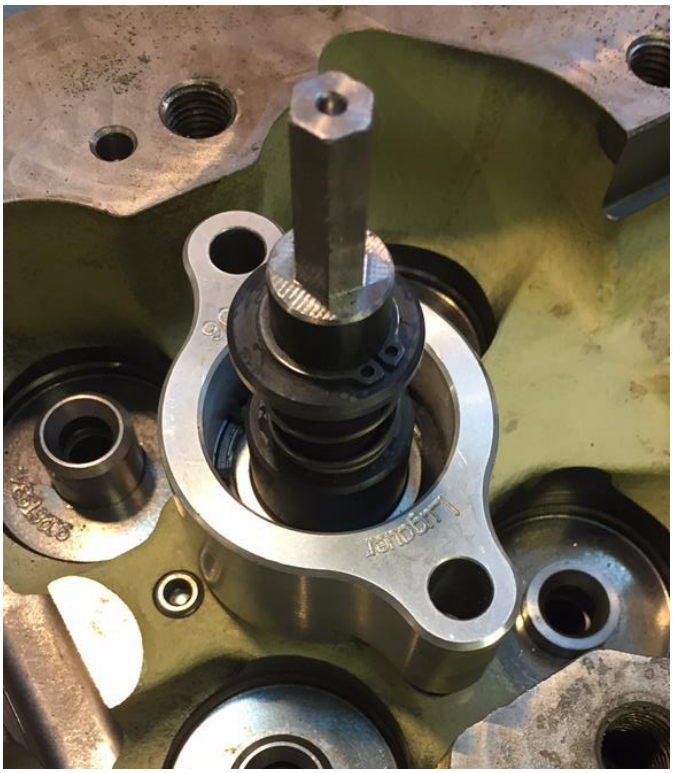


Figure 29: Position of the mounted grinding tool

➢ **Grinding process**

The grinding tool is used by using a drilling machine and a proper chuck. Start the drilling machine and press the shaft of the grinding tool towards the pre-chamber sealing seat. After a few seconds of grinding dismount the tool and check the surface. In Table 5 examples of an insufficient and sufficient surface quality are shown. Through the grinding process, the grinding disc chokes. To extend the lifetime of the grinding disc a brake cleaner could be used.

- **No-Go/Go Condition of the sealing surface**

The table below shows criterions for different surface qualities.

No-Go Condition	Go Condition
Remark: Visible chatter marks to the center of the hole	Remark: No visible radial chatter marks Slight grinding marks are allowed
	

Table 5: Go/No-Go conditions of the sealing surface

- **Dismounting the grinding tool & cleaning of pre-chamber sealing seat**
  After dismounting the grinding tool, clean the pre-chamber sealing seat by using a vacuum cleaner.

6 MOUNTING AND USAGE OF THE PRE-CHAMBER MOUNTING TOOL

The pre-chamber mounting tool is designed in a way that it is possible to use it for "F" and "H" cylinder heads. With this device it is possible to press the sleeve more centric and support to reduce leakage opportunities.

- Part number: 9028131

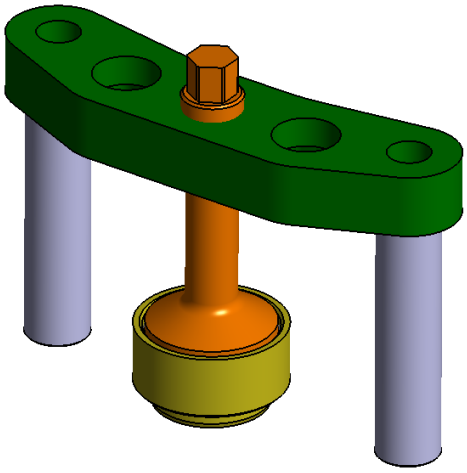


Figure 30: Pre-chamber mounting tool

Procedure:

1) Slide the distance pieces over the stud bolts on the cylinder head

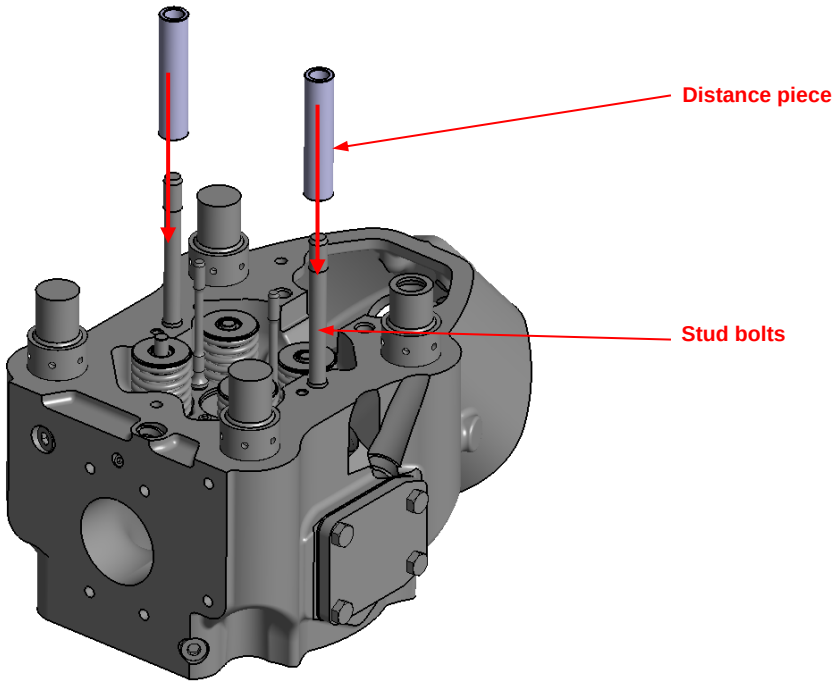


Figure 31: Mounting of distance pieces

2) Pre-mount the plate with pressure bolt and pressure piece

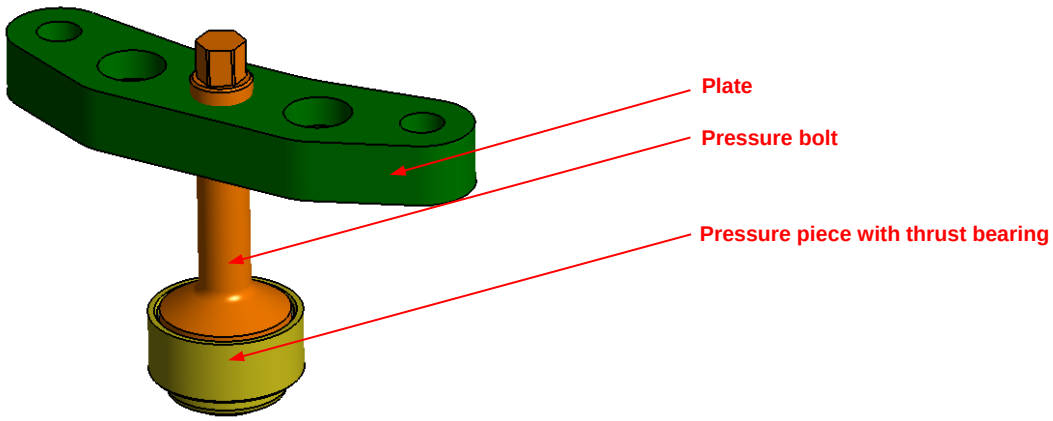


Figure 32: Pre-mounting of plate, pressure bolt and pressure piece

3) Pre-assemble spectacle flange, spring dowels and spark plug socket

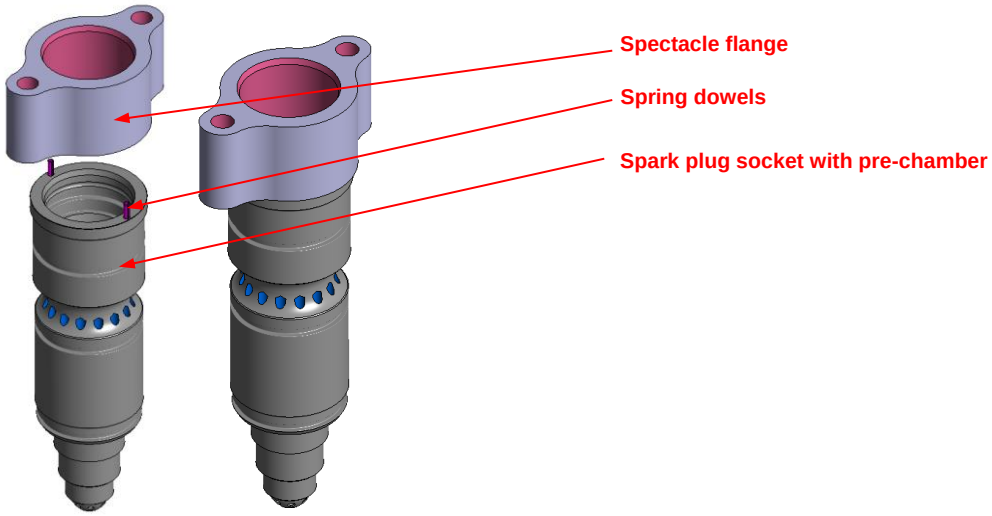


Figure 33: Pre-assembly of spectacle flange, spring dowels and spark plug socket with pre-chamber

4) Slide in pre-mounted assembly

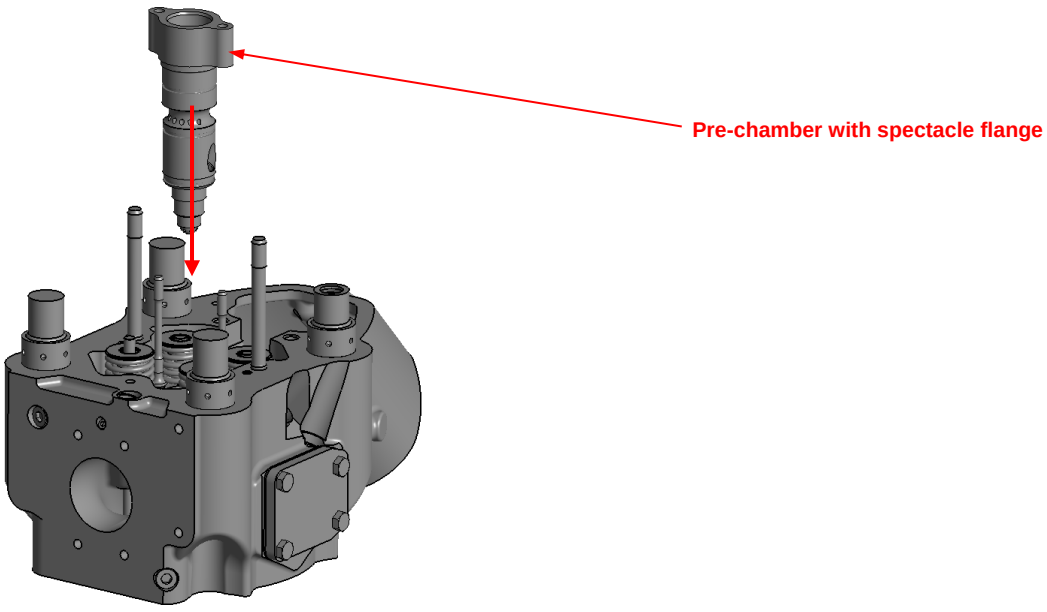


Figure 34: Slide in pre-mounted pre-chamber assembly

5) Position the pre-mounted mounting tool according to Figure 35 on the distance pieces and stud bolts and secure it with 2 x M16 hexagonal nuts

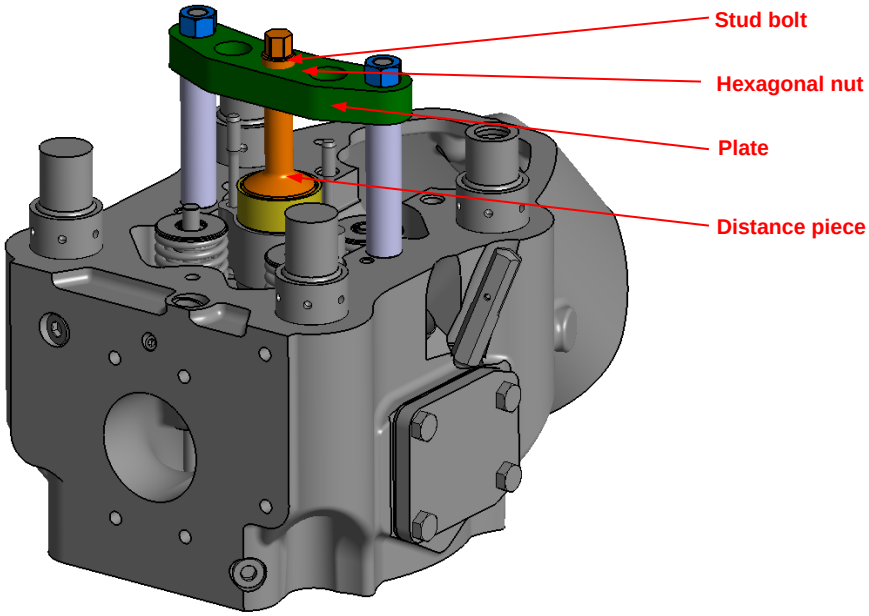


Figure 35: Mounting of pre-chamber mounting tool on "F" cylinder head

6) Position distance pieces and nuts

Tighten the nuts also according to Table 6 or use **Technical Instruction TA 1902-0228**. Use the existing holes on the plate for positioning the nut of the torque wrench on the hexagonal nuts.

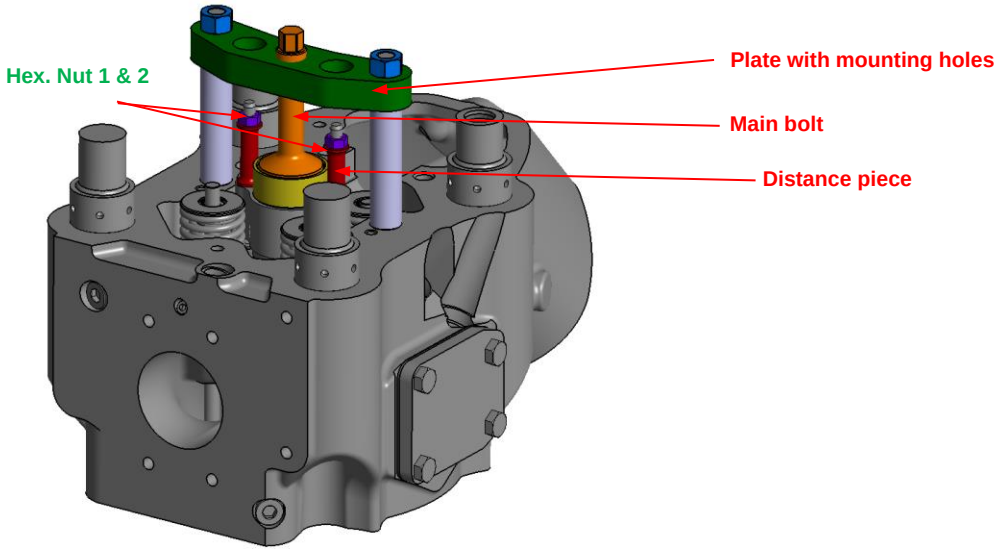


Figure 36: Mounting the distance pieces and nuts for the spectacle flange

i) Once the two nuts on the plate are fixed, apply 40 Nm of torque to the main bolt
ii) Then apply 40 Nm of torque to hexagonal nuts 1&2. Use the table below to ensure equally tightening
iii) After the tightening procedure the mounting tool can be removed

Step	Hex.Nut	Tightening torque [Nm]
1	1	10
2	2	10
3	1	20
4	2	20
5	1	40
6	2	40

Table 6: Tightening torques

7) By applying a torque on the pressure bolt, an axial force is generated which then pushes the spectacle flange with the spark plug socket to a defined hard stop. The thrust bearing ensures an almost frictionless movement.

The tool is applicable for "F" and "H" cylinder heads. The difference between the two variants is the fitting position on the spectacle flange. In case of "F" cylinder heads the situation looks like the left picture below. In case of a "H" cylinder head the right picture below shows the fitting position accordingly.

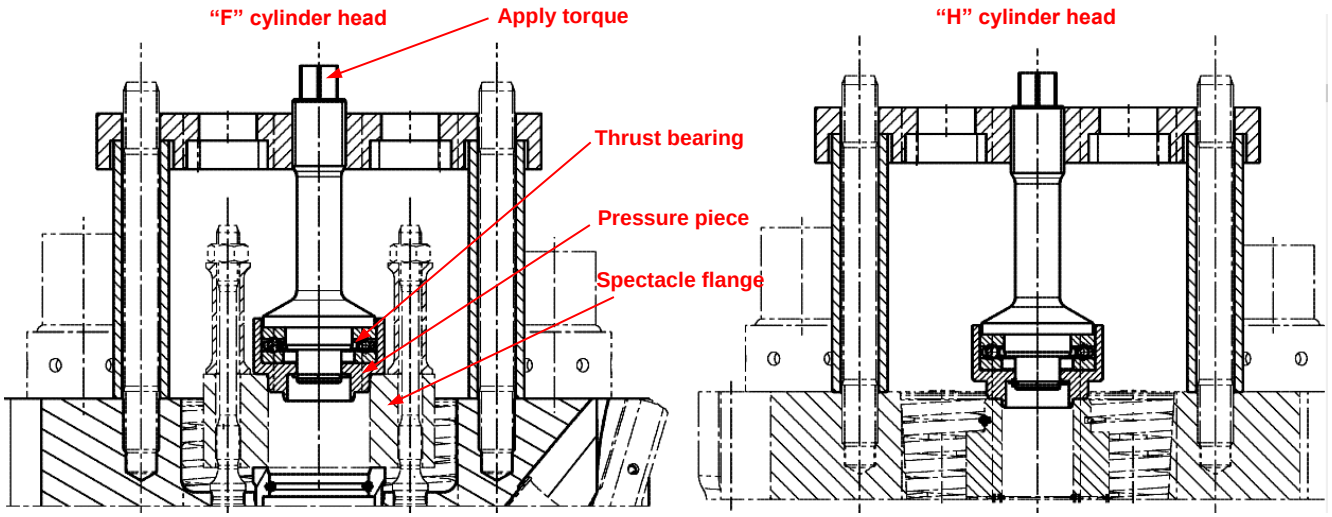


Figure 37: Positioning of the pressure piece on the spectacle flange, "F" and "H" cylinder head

7 MISCELLANEOUS

7.1 Relevant documents

When working on Jenbacher modules, all applicable local regulations must of course be observed in addition to our documentation. We would like to draw particular attention in relation to this Service Technician Instruction to the fact that the following documents must also be observed:

- Technical Instruction TA 1000-0200: Cooling water quality
- Technical Instruction TA 1100-0105: Engine shutdown
- Technical Instruction TA 1100-0111: General conditions - Operation & maintenance
- Technical Instruction TA 1400-0100: Running-in procedure for Distributed Power engines
- Technical Instruction TA 1400-0182: Reconditioning Type 6 engine cylinder heads
- Technical Instruction TA 1902-0228: Tightening torques for J6xx/J624
- Technical Instruction TA 2300-0001: Employee protection
- Technical Instruction TA 2300-0005: Safety regulations
- Technical Instruction TA 2300-0010: Guidelines for using the LOTO kit
- Service Technician Instruction ST-177 – "F" cylinder heads – Cylinder head cracks and corrective action
- Maintenance Instruction W 8080 A0: Cooling water system / mixture circulating water
- Technical Drawing PN 7004914, sheet 1&2
- Technical Drawing PN 8001313

7.2 Revision history

INDEX	DATE	DESCRIPTION / REVISION SUMMARY
06	26/09/19	Specification of the grinding disc recommended to be used for the fine grinding of the pre-chamber sealing seat updated
05	12/03/19	Specification of the grinding disc recommended to be used for the fine grinding of the pre-chamber sealing seat added
04	30/10/18	Drawing 8001313 for the new pre-heating implemented
03	12/07/18	User level to adjust the engine cooling water pressure parameters corrected
02	27/06/18	Fundamental revision
01	25/01/18	First version of this document

Table 7: Revision history

8 LIST OF FIGURES