|  |
| --- |
| **Service procedures** |
| **KSD 1403 Workshop Manual (Rev. 00\_DRAFT\_01)** |



**Registration of modifications to the document**

Any modifications to this document must be registered by the drafting body, by completing the following table.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Released by** | **Code** | **Revision** | **Release Date** | **Revision date** | **Edited by** | **Endorsed** |
|  | KSD1403-WS |  |  |  |  |  |

**Translated from the original manual in Italian language**

Data reported in this issue can be modified at any time by KOHLER.

Sommario

[1. TITOLO 1 2](#_Toc495648770)

[1.1. Asdfsdfsdf 2](#_Toc495648771)

[1.2. Asdfsdfsdfggg 2](#_Toc495648772)

# Service procedures

## Preliminary information

Z_importante.jpg **Important**

* The mark ( operazione_utile.gif ) after the title of a paragraph, indicates that the procedure is not required in order to disassemble the engine, however the procedures are featured in order to illustrate the disassembly of components.
* The operator should prepare all equipment and tools in order to enable him to carry out the operations correctly and safely.
* Before proceeding with operation, carefully read **Chap. 3** .
* In order to operate safely and easily, we recommend positioning the engine on a rotating stand for engine overhauling.
* Seal all injection component unions as illustrated in **Par. xx**  during assembly.
* Protect all disassembled components and coupling surfaces subject to oxidation with lubricant.
* Where necessary, reference to **special tools** to use during disassembly operations is indicated (es. **ST\_05** ).
* Replace all gaskets or rubber components at each disassembly.

## Cooling circuit

|  |  |
| --- | --- |
| Uncscrew the cap  **A1**  of the radiator  **A**  to drain the remaining coolant. | Cap_5_38.png |
| **DISASSEMBLING** | |
| **Radiator NA - TC model** | Cap_5_04.png |
| Loosen the clamps  **B**  and remove the hose  **C** .  Unscrew the nuts **D** and the screw **E** to remove the rods **F1** , **F2** . |
| Loosen the clamps  **B**  and remove the hose  **C** .  Unscrew the nuts  **B**  to remove the radiator  **A** . § | Cap_5_05.png |
| **Radiator TCA** **model** | **TBD** |
|  |  |
| **Oil Cooler hoses** | Cap_5_06.png |
| Loosen the clamps  **B**  and remove the hoses  **C** . |
| **NOTE:**  the oil cooler has various configurations and can be installed also on the intake side.  Unscrew the screws **E1** and clamps **B1** if present. | Cap_5_13.png |
| **Fan and belt** | Cap_5_07.png |
| Unscrew the screws  **G**  and remove the fan  **H** . |
| Remove the belt  **L** using  **ST\_57** tool. | Cap_5_08.png  poly_v_belt_removal.png  DISASSEMBLING |
| **Coolant pump** | Cap_5_09.png |
| Unscrew the screw  **M**  and remove the pulley  **N** . |
| Loosen the clamps  **B**  and remove the hose  **C** . | Cap_5_10.png |
| Do not disassemble the flange  **R** .  **NOTE:**  the flange **R** for pulley **N** can be intalled in various positions based from engine specification, each configuration has a specific belt and pulley.  It is not necessary to remove the flange **R** for pulley **N** to proceed with following operations below.  In case of flange disassembling, take note of its original position to avoid a wrong positioning at the assembling.  + Apply  **Loctite 242**  on the thread of screws  (tightening torque  **10**  **Nm** ). §  Unscrew the screws  **P**  and remove the coolant pump  **Q** . | Cap_5_11-12_Tavola%2520disegno%25201.png |
| **Thermostatic valve** | Cap_5_152.png |
| Unscrew the screws **W1** and remove the cover **W2** . |
| Remove the thermostatic valve  **W3** . | Cap_5_153.png |
| **+ Thermostatic valve specifications**   |  |  |  |  | | --- | --- | --- | --- | | **Opening start** | | **Opening stop** | | | 0.1 mm | @ 80° C | 7 mm | @ 95° C | |
| **Radiator support** | Cap_5_20.png |
| Unscrew the screws  **S**  and remove the radiator support  **T** . |
| **ASSEMBLING** | |
| **Radiator support** | Cap_5_39.png |
| Fix the radiator support **T**  on the crankcase  **V**  using the screws  **S**  and washers  **S1**  (tightening torque  **45** **Nm** ). |
| **Thermostatic valve** | Cap_5_154.png |
| Place the thermostatic valve  **W3**  inside the seat of cylinder head  **W** .  Place the gasket  **W4**  inside the seat of cover  **W2** .  + Apply  **Loctite 270**  on the thread of screw  **W1** . §  Fix the cover  **W2**  with gasket  **W4**  on the cylinder head  **W**  using the screws  **W1**  (tightening torque  **10** **Nm** ).  **NOTE:**  make sure that the gasket  **W4**  stays in its seat during cover  **W2** assembly process. |
| **Coolant pump** | Cap_5_14.png |
| Fix the coolant pump  **Q**  on the crankcase  **V**  with the gasket  **Q1**  using the screws  **P**  (tightening torque  **25** **Nm** ). |
| Install components  **N1** ,  **N2**  inside pulley  **N** .  + Apply  **Loctite 242**  on the thread of screw  **M** . §  Fix the pulley  **N**  on flange  **R**  using the screw  **M**  (tightening torque  **25** **Nm** ). | Cap_5_15.png |
| **Fan and belt** | Cap_5_16.png  poly_v_belt_installation.png  INSTALLING |
| Install the new belt  **A**  on pulleys  **N** ,  **Q2** ,  **Z1** ,  **Z2**  using the  **ST\_57** tool. |
| + Apply  **Loctite 242**  on the thread of screw  **G** . §  Fix the fan **H**  with the plate  **H1**  and the spacer  **H2**  on pulley  **N**  (tightening torque  **10** **Nm** ).  **NOTE:**  the spacer  **H2**  can be different based on engine specification. | Cap_5_17.png |
| **Oil Cooler hoses** | Cap_5_06.png |
| Fix the hoses  **C**  using the clamps  **B** . |
| **NOTE:**  the oil cooler has various configurations and can be installed also on the intake side.  Fix the clamps **B1** using screws **E1** if present. | Cap_5_13.png |
| **Radiator NA - TC model** | Cap_5_18.png |
| Place the radiator **A** on support **T** .  Fix the radiator  **A**  using nuts  **D**  (tightening torque  **25** **Nm** ).  Fix the hoses  **C**  using the clamps  **B** . |
| Place the rods **F1** ,  **F2**  for the radiator fixing  **A** .  Fix the rods  **F1** ,  **F2**  using the nuts  **D**  with washers  **D1**  and screws  **E**  (tightening torque  **10** **Nm** ). | Cap_5_19.png |
| **Radiator TCA model** | **TBD** |
|  |  |

## Exhaust line

|  |  |
| --- | --- |
| **NA Model** | **TBD** |
|  |  |
| **TC - TCA** **Model** | Cap_5_21.png |
| **Muffler option A §** |
| **DISASSEMBLING**  Unscrew the nuts  **A** .  Unscrew the screws  **B**  and remove the muffler  **C** . |
| **ASSEMBLING**  Fix the muffler **C** on the bracket **C1** using the screws  **B**  (tightening torque  **xx Nm** ).  Fix the muffler  **C**  on the flange  **D1**  using the nuts  **A**  (tightening torque  **xx Nm** ). | Cap_5_46.png |
| **Turbocharger** | Cap_5_22.png |
| **DISASSEMBLING**  Unscrew the screws  **D3**  and remove the tube  **E2** .  Unscrew the screws  **D2**  and remove the tube  **E1** .  Loosen the clamp **F1**  and disconnect the hose  **E3** .  Loosen the clamp  **F3**  and disconnect the hose  **E4** .  Unscrew the nuts  **D4**  and remove the turbocharger  **D** . |
| **ASSEMBLING**  Place the turbocharger **D**  on the interfacing falnge of exhaust manifold  **H** . | Cap_5_47.png |
| Fix the turbocharger  **D**  on the exhaust manifold  **H**  using the nuts  **D4**  (tightening torque  **25** **Nm** ).  Connect the hose  **E3**  with the turbocharger  **D**  and fix it using the clamp  **F1** .  Place the tube  **E2**  on the turbocharger  **D**  and the crankcase  **G**  with screws  **D3**  and copper washers  **D5** .  Fix the tube  **E2** using the screws  **D3**  (tightening torque  **1** **5** **Nm** ).  Place the tube  **E1**  on the crankcase  **G**  and under the turbocharger  **D**  with screws  **D2**  and gskets  **E5** , **E6** .  Tighten the screws  **D2**  (tightening torque  **10**   **Nm** ). | Cap_5_48.png  Cap_5_50.png |
| **Only for TC model** | Cap_5_23.png |
| **DISASSEMBLING**  Loosen the clamp  **F2**  and remove the hose  **E3** . § |
| **ASSEMBLING**  Connect the hose  **E3**  with the inlet manifold **L** and fix it using the clamp **F2** . | Cap_5_49.png |

## Fuel System

|  |  |
| --- | --- |
| **Fuel feed pump** | |
| **Electric fuel feed pump** **§** | Cap_5_40.png |
| **DISASSEMBLING**  Disconnect the junction  **A1**  and remove the tube  **E1**  with the pump **F**  and the pre-filter  **G** . |
| **ASSEMBLING**  Connect the junction  **A1**  on the filter  **D** .  Check the condition of tubes  **F**  and pre-filter  **G** . | Cap_5_45.png |
| **Mechanical fuel feed pump §** | Cap_5_41.png  Cap_5_42.png |
| **DISASSEMBLING**  Unscrew the screw  **B7** .  Unscrew the nuts **B8**  and remove the pump **P** . |
| **ASSEMBLING**  Place the pump **P** with gasket  **P1** on the crankcase  **Q** .  Fix the pump **P**  on the crankcase  **Q**  using the nuts **B8**  (tightening torque  **25** **Nm** ).  Fix the tube  **E3**  on the pump  **P**  using the screw  **B7**  with copper washers  **B9**  (tightening torque  **15** **Nm** ). | Cap_5_43.png  Cap_5_44.png |
| **Fuel filter** | |
| **DISASSEMBLING**  Disconnect the connector  **A1**  from the injection pump  **A** .  Unscrew the screw  **B1** .  Unscrew the screws  **B2**  and remove the fuel filter  **D**  with the tube  **C** . | Cap_5_24.png |
| **ASSEMBLING**  Fix the fuel filter  **D**  using the screws  **B2**  (tightening torque  **25** **Nm** ).  Conect the connector  **A1**  on the injection pump  **A** .  Fix the tube  **C**  using the screw  **B1**  (tightening torque  **25** **Nm** ). | Cap_5_37.png |
| **Rail §** | |
| **DISASSEMBLING**  Unscrew the nuts   **A2** , **A3** and remove the tube  **E2**  from the rail  **H**  and injection pump  **A** . | Cap_5_25.png |
| Remove the lockers  **H2** .  Unscrew the screws  **B2**  and remove the spacers  **H1**  and the rail  **H** . | Cap_5_26.png |
| **ASSEMBLING**  + Apply oil  **EMI-385**  on injector gaskets. §  Place the rail  **H**  on the injectors  **L** . | Cap_5_34.png |
| Install the lockers  **H2**  on the rail  **H** . | Cap_5_35.png |
| Place the spacers  **H1**  under the rail  **H**  and fix the rail  **H**  using the screws  **B2**  (tightening torque  **25** **Nm** ). | Cap_5_36.png |
| Place the tube  **E2**  on the injection pump  **A**  and Rail **H** ,  screw the nuts  **A2** , **A3** .  Tight the nut  **A2**  (tightening torque  **28** **Nm** ).  Tight the nut  **A3**  (tightening torque  **28** **Nm** ). | Cap_5_25.png |
| Electronic injectors | |
| **DISASSEMBLING**  Place the the sockets  **L1**  of the tool  **ST\_48**  on the injectors  **L** .  Fix the nuts  **B3**  on the cylinder head  **N** . | Cap_5_27.png |
| Install the lockers  **L2**  on the sockets  **L1**  to lock the injectors  **L** . | Cap_5_27a_27b.png |
| Unscrew the nuts  **B4**  to extract the injectors  **L**  from the cylinder head  **N** . | Cap_5_28.png |
| **ASSEMBLING**  + In case of injector reinstallation: before the reinstallation, replace all injector gaskets. §  + Apply oil **EMI-385** on injector gaskets. §  Place the injectors  **L**  inside the cylinder head  **N** .  Place the sockets  **L1**  of the tool  **ST\_48**  on the injectors  **L** .  Place the washers  **B6**  under the nuts  **B3**  and fix the nuts  **B3**  on the cylinder head  **N** . | Cap_5_31.png |
| Install the lockers  **L2**  on the sockets  **L1**  to lock the injectors  **L** .  Screw the nuts  **B4**  to install the injectors  **L**  inside the cylinder head  **N** . | Cap_5_32_33.png |
| **Injection pump** | |
| **DISASSEMBLING**  Unscrew the screws  **B5**  and remove the injection pump  **A** . | Cap_5_29.png |
| **ASSEMBLING**  Install the roller tappet  **A4**  inside the crankcase **M**  if not allready present.  Place the injection pump  **A**  on the crackcase  **M** .  + Fix the pump  **A**  using the screws  **B5**   respecting the tightening cycle below listed:   * **cycle 1: 15 Nm** * **cycle 2: 2** **5 Nm** | Cap_5_30.png |

## Sensors and Switches

|  |  |
| --- | --- |
| **T-MAP Sensor (only for model** **TC - TCA)** | |
| **DISASSEMBLY**  Unscrew the screws  **A1**  and remove the sensor  **A** . | Cap_5_51.png |
| **ASSEMBLY**  Place the sensor  **A**  on the intake manifold  **A3** .  Fix the sendor  **A**  using the screws  **A1**  (tightening torque  **10** **Nm** ). | Cap_5_52.png |
| **RPM Sensor** | |
| **DISASSEMBLY**  Unscrew the screw  **B1** and remove the sensor  **B** . | Cap_5_53.png |
| **ASSEMBLY**  Place the sensor **B** on the crackcase  **B3** with the shim  **B2** .  Fix the sensor **A**  using the screw  **B** **1**  (tightening torque  **xx Nm** ). | Cap_5_54.png |
| **Phase Sensor** | |
| **DISASSEMBLY**  Unscrew the screw  **C1** and remove the sensor  **C** . | Cap_5_55.png |
| **ASSEMBLY**  Place the sensor  **C** on the carter  **C4** with the shim **C2** .  + Apply  **Loctite 242**  on the thread of screw  **C1** . §  Fix the sensor  **C**  using the screw  **C1**  (tightening torque  **10** **Nm** ). | Cap_5_56.png |
| **Coolant temperature Sensor** | |
| **DISASSEMBLY**  Unscrew and remove the sensor  **D** . | Cap_5_57.png |
| **ASSEMBLY**  Fix the sensor  **D**  with the gasket  **D1**  on the cylinder head  **D2**  (tightening torque  **12** **Nm** ). | Cap_5_58.png |
| **Oil Pressure Switch** | |
| **DISASSEMBLY**  Unscrew and remove the switch  **E** . | Cap_5_59.png |
| **ASSEMBLY**  Fix the switch  **E**  on the crankcase  **E1**  (tightening torque  **25** **Nm** ). | Cap_5_60.png |

## Electrical components

|  |  |
| --- | --- |
| **Starter Motor** | |
| **DISASSEMBLY**  Unscrew the screws  **A**  and remove the motor  **B** . | Cap_5_61.png |
| **ASSEMBLY**  Fix the motor  **B** to the flanging plate/bell  **C** using the screws  **A**  (tightening torque  **25** **Nm** ). | Cap_5_62.png |
| **Voltage alternator** | |
| **Alternator 45A** | Cap_5_63.png |
| **DISASSEMBLY**  Unscrew the screw **A** . |
| Unscrew the nut **B**  and remove the alternator  **C** . | Cap_5_64.png |
| **ASSEMBLY**  Place the alternator  **C**  on the crankcase  **D** , install the screw  **B4**  inside the fixing hole and install the spacer  **B3** .  Screw the nut  **B**  with the washer  **B1**  on the screw **B4** . | Cap_5_65.png |
| Fix the bracket **C1**  on the cylinder head  **E**  using the screw **A**  (tightening torque  **25** **Nm** ).  Fix the alternator  **C**  using the nut **B**  and the screw  **B4**  (tightening torque  **25** **Nm** ). | Cap_5_66.png |
| **Alternator 80A - 100A §** | Cap_5_124.png |
| **DISASSEMBLY**  Unscrew the screw  **A** . |
| Unscrew the nut  **B**  and remove the alternator  **C** . | Cap_5_125.png |
| **ASSEMBLY**  Place the alternator  **C**  on the crankcase  **D** , install the screw  **B4**  inside the fixing hole and install the spacer  **B3** .  Screw the nut  **B**  with the washer  **B1**  on the screw  **B4** . | Cap_5_126.png |
| Fix the alternator **C**  using the screw  **A** , the nut **A1** with the washer  **A2** on the bracket  **C1**  (tightening torque  **25** **Nm** ).  Fix the alternator  **C**  using the nut  **B**  and the screw  **B4**  (tightening torque  **25** **Nm** ). | Cap_5_127.png |
| **Glow plugs** | |
| **DISASSEMBLY**  Unscrew the nuts  **A**  and remove the cables **B1** , **B2** . | Cap_5_67.png |
| Unscrew and remove the glow plugs  **C** . | Cap_5_68.png |
| **ASSEMBLY**  Install and fix the glow plugs  **C** on cylinder head  **D**  (tightening torque  **15** **Nm** ). | Cap_5_69.png |
| Fix the cables **B1** , **B2**  on the glow plugs **C**  using the nuts  **A**  (tightening torque  **2.5** **Nm** ). | Cap_5_67.png |

## Intake manifold

|  |  |
| --- | --- |
| **DISASSEMBLY**  Unscrew the screws **A**  and remove the manifold  **B** . | Cap_5_70.png |
| **ASSEMBLY**  Place the manifold  **B** on the cylinder head  **C** using the tool  **ST\_18** .  Fix the manifold  **B** and the gasket  **B1**  on the cylinder head  **C**  using the screws **A** (tightening torque  **25** **Nm** ). | Cap_5_71.png |

## Exhaust manifold

|  |  |
| --- | --- |
| **DISASSEMBLY**  Unscrew the nuts  **A** and remove the manifold   **B** . | Cap_5_72.png |
| **ASSEMBLY**  Place the gaskets  **B1**  and the manifold  **B** on the cylinder head  **C** using the studs  **B2** .  Fix the manifold **B**  on the cylinder head **C**  using the nuts  **A** (tightening torque  **25** **Nm** ). | Cap_5_73.png |

## PTOs

|  |  |
| --- | --- |
| **1st PTO** | |
| **Flywheel** | |
| **DISASSEMBLY**  Install the tool  **ST\_16** on pulley **C** .  **Install the component T3  on the crankcase  D  using the screws  T2  entering the component  T4  inside the groove of the component  T3** .  **Fix the screws  T5  to lock the pulley  C** to the tool   **ST\_16** .  **NOTE:**  in this way the crankshaft is locked. | Cap_5_160.png |
| Unscrew the screw **A**  and remove the flywheel  **B** . | Cap_5_74.png |
| **ASSEMBLY**  Place the flywheel **B** on the crankshaft  **C** using the  **ST\_46** .  Fix the flywheel **B**  on the crankshaft  **C**  using the screws  **A**  (tightening torque  **140** **Nm** ). | Cap_5_77.png |
| **Flanging plate** | |
| **DISASSEMBLY**  Unscrew the screws **A** and remove the plate   **B** . | Cap_5_75.png |
| **ASSEMBLY**  **Place the plate  B  on the crankcase  C .**  **NOTE:  use the proper reference pins.**  **Fix the plate B  on the crankcase  C  using the screws A**  (tightening torque  **45** **Nm** ). | Cap_5_76.png |
| **Flanging bell (TBD)** | |
| **DISASSEMBLY**  **Unscrew the screws  A** and remove the bell  **B** . | **TBD** |
| **ASSEMBLY**  **Place the bell   B   on the crankcase   C .**  **NOTE:  use the proper reference pins.**  **Fix the bell   B** **on the  crankcase  C  using the screws  A**  (tightening torque  **xx Nm** ). |  |
| **2nd PTO** | |
| **DISASSEMBLY**  Unscrew the screw  **A**  and remove the pulley  **B**  with the tool  **ST\_16** .  Remove the component **T3**  from the crankcase  **D** . | Cap_5_78.png |
| **ASSEMBLY**  Install the pulley **B**  on the crankshaft  **C**  using the screw  **A** .  **NOTE:**  do not fix the screw  **A** .  Install the tool  **ST\_16** on pulley **B** .  **Install the component  T3  on the crankcase  D  using the screws  T2  entering the component  T4  inside the groove of the component  T3** .  **Fix the screws  T5  to lock the pulley  C** to the tool  **ST\_16** .  **Fix the screws  A**  (tightening torque  **360** **Nm** ). | Cap_5_79.png  Cap_5_161.png |
| **3rd PTO** | |
| **DISASSEMBLY**  Unscrew the nuts  **A** and remove the 3rd PTO  **B** . | Cap_5_80.png |
| **ASSEMBLY**  Place the 3rd PTO  **B**  on the crankcase  **C**  with the gasket  **B1** .  Fix the 3rd PTO **B**  using the nuts  **A**  (tightening torque  **xx Nm** ). | Cap_5_81.png |

## Cylinder head

|  |  |
| --- | --- |
| **DISASSEMBLY**  Unscrew the screws **A1**  and remove the cover  **A** . | Cap_5_140.png |
| Unscrew the screws  **B1**  and remove the rocker arms  **B** . | Cap_5_141.png |
| Remove the rods  **C** . | Cap_5_142.png |
| Unscrew the screws  **D1**  and remove the cylinder head **D** . | Cap_5_143.png |
| **ASSEMBLY**  **ENTER THE PISTON PROTUSION VALUES TO CHOOSE THE CORRECT HEAD GASKET**  Check the tappets **E1**  are correctly installed inside the crackcase  **E** .  Place the gasket **D2**  on the crankcase **E**  using the reference pins **E2** .  Place the head **D**  on the gasket  **D2**  using the reference pins  **E2** . | Cap_5_150.png  Cap_5_144.png |
| Apply **MOLY GREASE** on the screw **D1 (20 mm from the head  bottom** **)**  Tighten the screws  **D1**  respecting the tightening order as per illustration indication at each cycle below listed:   * **cycle 1: 10 Nm** * **cycle 2: 35 Nm** * **cycle 3: 90°** * **cycle 4: 90°** * **cycle 5:** **90°** * **cycle 6:** **90°** | Cap_5_145.png |
| Install the rods **C**  inside the proper niches inside the cylinder head  **D** . | Cap_5_146.png |
| Place the spacers  **B2**  correctly on the valves **B3** .  Place the rocker arms  **B**  on the head  **D**  using the proper reference pins.  Check all spacers **B2**  are correctly installed on the valves  **B3** .  + Apply  **Loctite 242**  on the thread of screw  **B1** . §  Fix the rocker arms **B**  using the screws **B1** (tightening torque  **25** **Nm** ). | Cap_5_147.png |
| Check the gasket **A2**  is correctly installed insde its seat inside the cover  **A** .  Place the cover  **A**  on the head  **D** using the tool   **ST\_17** .  Place the screws  **A1**  inside the fixing holes. | Cap_5_148.png |
| Tighten the screws  **A** **1**  respecting the tightening order as per illustration indication ( tightening torque  **10** **Nm** ). | Cap_5_149.png |

## Oil circuit

|  |  |
| --- | --- |
| **Oil Cooler** | |
| **DISASSEMBLY**  Unscrew and remove the filter  **A** . | Cap_5_82.png |
| Unscrew the joint  **C**  and remove the oil cooler  **D** . | Cap_5_83.png |
| Unscrew th screw  **E**  and remove the support **F** . | Cap_5_84.png |
| **ASSEMBLY**  Install the gasket **E1**  in the proper seat on the screw **E** .  Install the gasket **F1**  on the support **F** .  Fix the support **F**  on the crankcase **G**  using the screw  **E**  with the gasket **E2** (tightening torque  **25** **Nm** ). | Cap_5_85.png |
| Check the oil cooler gasket is correctly installed.  Fix the oil cooler **D**  on the support  **F**  using the joint **C**  (tightening torque  **30** **Nm** ). | Cap_5_86.png |
| Check the gasket **D1**  is correctly installed inside the proper seat of the oil filter  **D** .  Tifgten the filter **D**  on the support **F**  (tightening torque  **20** **Nm** ). | Cap_5_87.png |
| **Oil Pressure valve** | |
| **DISASSEMBLY**  Unscrew the plug **A**  and remove the gasket **A1** , the spring  **A2** , the piston  **A3** from the carter  **B** . | Cap_5_88-89.png |
| **ASSEMBLY**  Install the piston **A3** , the spring  **A2**  inside the carter **B** .  Tighten the plug **A**  with the cooper washer **A1** on the carter  **B**  (tightening torque  **17.5** **Nm** ). | Cap_5_90.png |
| **Oil sump** | |
| **DISASSEMBLY**  Unscrew the screws **A1**  and remove the oil sump  **A** .  **NOTE:**  Use a metal sheet/spatula between the crankcase and oil sump to detach them. | Cap_5_91.png |
| Unscrew the screw  **B1** .  Unscrew the screw  **B2**  and remove the tube  **B** .  Unscrew the screws  **C1**  and remove the plate  **C** . | Cap_5_92.png |
| **ASSEMBLY**  Install the gaskets  **B3**  inside the proper seat of the tube  **B** .  Place the tube **B**  installing it inside the oil inlet hole of the crankcase  **D** .  + Apply  **Loctite 242**  on the thread of screw  **B** **1, B2** . §  Fix the tube  **B**  using the screws  **B2**  (tightening torque  **25** **Nm** ).  Fix the tube  **B**  using the screws  **B1**  (tightening torque  **10** **Nm** ). | Cap_5_93.png |
| + Apply  **Loctite 242**  on the thread of screw  **C1** . §  Fix the plate  **C**  using the screws  **C1**  (tightening torque  **25** **Nm** ). | Cap_5_94.png |
| Apply about **2.5 mm** cord of sealant  **S** ( **Loctite 5699** ) on the oil sump **A** as per illustration.  Cap_5_95_Tavola%2520disegno%25201.png | |
| Place the oil sump **A** on the crankcase sulbasamento **D** using the tool   **ST\_18** .  + Apply  **Loctite 242**  on the thread of screw  **A1** . §  Fix the oil sump **A**  on the crankcase  **D**  using the screws  **A1**  (tightening torque  **25** **Nm** ). | Cap_5_96.png |
| **Timing gear cover (oil pump)** | |
| **DISASSEMBLY**  Unscrew the screws  **A1**  and remove the carter  **A** . | Cap_5_97.png |
| **ASSEMBLY**  Apply about  **2.5 mm**  cord of sealant  **S**  ( **Loctite 5699** ) on the carter  **A** as per illustration.  Cap_5_98.png | |
| Place the gasket **A3**  in the proper seat of the carter **A** .  Install the gasket **A2**  on the carter **A**  using the tool  **ST\_58** .  Place the carter  **A**  on the crankcase  **B**  using the tool  **ST\_18** . | Cap_5_99.png |
| + Apply  **Loctite 242**  on the thread of screw  **A1** . §  Fix the carter  **A**  on the crankcase **B**  using the screws **A1** respecting the fixing order as per illustration indication (tightening torque  **25** **Nm** ).  Cap_5_128.png | |

## Crankcase

|  |  |
| --- | --- |
| **Timing gear (camshafts)** | |
| **DISASSEMBLY**  Remove the tappets **D1**  from the crankcase  **D** . | Cap_5_151.png |
| Unscrews the screws  **A1**  and remove the gear  **A** . | Cap_5_101.png |
| Unscrews the screws  **B1**  and remove the shaft **B** .  Unscrews the screws  **C1**  and remove the shaft  **C** . | Cap_5_102.png |
| **ASSEMBLY**  Install the shaft **C**  inside the crankcase **D** .  + Apply **Loctite 242** on the thread of screw **C1** . §  Fix the shaft **C**  using the screws  **C1** (tightening torque  **10** **Nm** ). | Cap_5_108.png |
| Install the shaft  **B** inside the crankcase  **D** .  + Apply  **Loctite 242**  on the thread of screw  **B1** . §  Fix the shaft  **B** using the screws  **B1**  (tightening torque  **10** **Nm** ). | Cap_5_107.png |
| Install the gear **A2** on the support  **A** .  Install the washer **A3**  on the support **A** . | Cap_5_129.png |
| Place the gear **A2** on the crankcase  **D**  aligning the references as per illustration.  + Apply  **Loctite 242**  on the thread of screw  **A1** . §  Fix the support  **A**  on the crankcase  **D**  using the screws **A1**  (tightening torque  **10** **Nm** ).  Cap_5_100.png | |
| **Crankshaft seal support - flywheel side** | |
| **DISASSEMBLY**  Unscrew the screws **A1**  and remove the flange  **A** . | Cap_5_103.png |
| **ASSEMBLY**  Install the gasket **A2**  inside the flange **A** using the tool  **ST\_42** .  Place the flange **A**  on the crankcase  **B** . | Cap_5_109.png |
| + Apply  **Loctite 242**  on the thread of screw  **A1** . §  Fix the flange  **A**  using the screws **A1**  respecting the fixing order as per illustration (tightening torque  **10** **Nm** ). | Cap_5_159.png |
| **Conrod and piston** | |
| **DISASSEMBLY**  Unscrew the screws **B4**  and remove the conrod caps **B1a** , **B2a** , **B3a** . | Cap_5_104.png |
| Extract the conrod and piston **P**  from the crankcase **C** . | Cap_5_105.png |
| Replace the bearings  **D**  on  **B1a** ,  **B2a** ,  **B3a,** **B1b** ,  **B2b** ,  **B3b** .  **NOTE:**  the bearing position  **D**  on  **B1a** ,  **B2a** ,  **B3a,** **B1b** ,  **B2b** ,  **B3b**  must be centered as per illustration.  Install  **B1a** ,  **B2a** ,  **B3a**  su  **B1b** ,  **B2b** ,  **B3b**  using the screws  **B4** .  **NOTE:**  do not tighten the screws  **B4** . | Cap_5_134-137.png |
| Check the conrod and piston groups  **P** , weight difference must not exceed  **10** **gr** .  Unscrew the screws **B4**  and remove **B1a** ,  **B2a** ,  **B3a** da  **B1b** ,  **B2b** ,  **B3b** . § | Cap_5_135.png |
| **ASSEMBLY**  Rotate the crankshaft **D**  moving the crankpin **D1**  at **BDC** . | Cap_5_111.png |
| The combustion chamber **H** of the piston must be oriented towards the inlet manifold. | Cap_5_136.png |
| + Lubricate the piston mantle, segments, conrod bearings and cylinder surface with engine oil **15W-40** .  Install the conrod and piston groups **P** about **10 mm** of the piston skirt. | Cap_5_113.png |
| Align the gudgeon pin axle with engine center axle.  Rotate the piston **P** about **15°** anticlockwise. | Cap_5_112.png |
| This operation avoid the conrod impact against the oil sprayer **E**  during the conrod and piston installation inside the cylinder  **C** .  Gently push the piston in the cylinder  **C**  paying attention to the sprayer  **E** . | Cap_5_110.png |
| + Lubricate the crankpins  with engine oil   **15W-40** .  + Apply **BRB100**   **MOLY GREASE**  under the screw head  **P1c** .  Place the conrod **P1a**  on crankpin  **D1** .  Install the cap  **P1b**  using the screws  **P1c** .  **NOTE:**  the caps **P1b** have the mating plan fractured, each cap can be mate with its origin conrod  **P1a** , pay attention to the right mating.  + Tighten the screws  **P1c**  respecting the tightening cycle below listed:   * **cycle 1: 5 Nm** * **cycle 2: 20 Nm** * **cycle 3: 33°** * **cycle 4: 33°** | Cap_5_138.png |
| **Piston** | |
| **DISASSEMBLY**  Remove the lock ring **R** and extract the gudgeon pin **G** from the piston **P** . | Cap_5_155.png |
| Remove the rings **S1** , **S2** , **S3** from the piston **P** . | Cap_5_156.png |
| **ASSEMBLY**  Install the rings  **S1** ,  **S2** ,  **S3**  on the piston  **P** . | Cap_5_157.png |
| + Apply  **MOLYSLIP**  on  gudgeon pin   **G** .    Mate the conrod **P1a** with the piston **P** and install the gudgeon pin **G** .  Install the lock rings **R** to lock the gudgeon pin **G** . | Cap_5_158.png |
| **Crankshaft** | |
| **DISASSEMBLY**  Take note of caps **A1** , **A2** , **A3** marking their position on the crankcase.  Unscrew the screws **A** and remove the caps  **A1** ,  **A2** ,  **A3** , **A4** .  Remove the crankshaft **B** . | Cap_5_106.png |
| Unscrew the screws **C1** and remove the sprayers **C2** . | Cap_5_115.png |
| Remove the bearings **C3** , **C4** . | Cap_5_131-117.png |
| Remove the bearings  **C5** ,  **C4** from the caps  **A1** ,  **A2** ,  **A3** , **A4** . | Cap_5_133.png |
| **ASSEMBLY**  Fix the sprayers **C2** on the crankcase **C** using the screws **C1** (tightening torque  **8** **Nm** ). | Cap_5_130.png |
| Install the bearings **C3** on crankcase **C**  seats respecting the notches  **C3a** and make sure the oil delivery holes  **C3b** is matching with the crankcase ones. | Cap_5_116_132.png |
| Install the bearings **C4** on the crankcase **C** seats. | Cap_5_118.png  Cap_5_162.png |
| Install the crankshaft **B** on the bearings **C3** . | Cap_5_114.png |
| Install the bearings  **C5**  on caps  **A1** ,  **A2** ,  **A3**  seats respecting the notches  **C5a** . | Cap_5_123.png |
| Install the caps  **A1** ,  **A2** ,  **A3** on the crankcase **C** respecting their original position using the screws **A** .  + Apply  **MOLYSLIP**  under the screw head  **A**    + Tighten the screws  **A** respecting the tightening cycle below listed:   * **cycle 1: 15 Nm** * **cycle 2:** **45°** * **cycle 3: 45°** | Cap_5_119.png |
| Install the bearing  **C5**  on cap  **A4**  seat respecting the notch  **C5a** . | Cap_5_122.png |
| Install the bearings  **C4**  on the cap  **A4**  seat. | Cap_5_139.png |
| Install the gaskets **A4a** inside the proper seat on cap **A4** and keep in position using the tool **ST\_49** .  Install the cap **A4** inside the crankcase **C** paying attention to not cut the gasket **A4a** during installation.  Install the cap **A4** using the screws **A** .  + Apply  **MOLYSLIP**  under the screw head  **A**    + Tighten the screws  **A** respecting the tightening cycle below listed:   * **cycle 1: 15 Nm** * **cycle 2:** **45°** * **cycle 3: 45°** | Cap_5_120-121.png |

