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| **Assembly information** |
| **KDI 2504 TM Workshop manual (Rev. 07.6)** |



Sommario

[1. TITOLO 1 2](#_Toc495648770)

[1.1. Asdfsdfsdf 2](#_Toc495648771)

[1.2. Asdfsdfsdfggg 2](#_Toc495648772)

# Assembly information

## Information on engine configuration

* In this chapter, the engine is represented as **"BASE CONFIGURATION"** (refer to [**Par 1.3**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=259&parent=1527) **-** [**Par.** **1.4**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=645&parent=1527) ).
* For the assembly of components not described in this chapter refer to [**Chap. 11**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=704&parent=1527) .
* The following are the components described in [**Chap. 11**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=704&parent=1527) .

**11.1** [**Oil dipstick in cylinder head**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=704&parent=1527)

**11.2** [**Heater (replacement)**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=705&parent=1527)

**11.3** [**Idler gear (for 3 rd / 4 th PTO)**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=706&parent=1527)

**11.4** [**3 rd PTO (replacement)**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=707&parent=1527)

**11.5** [**4 th PTO (replacement)**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=708&parent=1527)

**11.6** [**3 rd + 4 th PTO (configurations)**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=709&parent=1527)

**11.7** [**Air filter (cartridge replacement)**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=710&parent=1527)

**11.8** [**Remote oil filter (disassembly and assembly)**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=711&parent=1527)

**11.9** [**Poly-V alternator belt (replacement and adjustment)**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=720&parent=1527)

**11.10** [**Tightening pulley and alternator for Poly-V belt**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=721&parent=1527)

## Assembly recommendations

* The information is laid out in sequence, the intervention methods have been selected, tested and approved by the manufacturer's technicians.
* This chapter describes the installation procedures for the assemblies and/ or individual components which have already been checked, overhauled or possibly replaced with original spare parts.
* Where necessary, reference to special tools during assembly operations is indicated and identified in [**Tab. 13.1**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=339&parent=1527) , hereinafter in **Tab. 9.1** an example of a special tool ( [**ST\_05**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=339&parent=1527) ).

**Tab. 9.1**

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| **SPECIAL TOOLS** | | | |
| **"ST" Code** | **Picture /draw** | **DESCRIPTION** | **PART NUMBER** |
| **ST\_05** | ST_05.jpg | Six nicks Key SN 8 | ED0014603650-S |

Z_importante.jpg **Important**

* Before proceeding with operations, read  [**Par. 3.3.2**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=437&parent=1527) .
* To easily locate specific topics, the reader should refer to the **analytical index** or **chapter index** .
* The operator must check that:
  + the components, the assemblies, the coupling surfaces of the parts are washed, clean and thoroughly dried;
  + the coupling surfaces are undamaged;
  + the equipment and tools are ready so that all work can be carried out correctly and safely;
  + ensure that the working environment is safe.
* The operator must:
  + carry out the procedures smoothly and safely. It is thus recommended to install the engine on a special rotating stand used when servicing engines to ensure the safety of the operator and the other individuals involved;
  + tighten the assemblies and / or components in a criss-cross or alternating pattern, initially with a value lower than that preset, and then subsequently, with the tightening torque specified in the procedure;
  + replace all seal gaskets after each assembly for all components on which they are provided.

## Engine block assembly

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| **9.3.1 Crankshaft bushings**    Z_importante.jpg **Important**       * Execute the procedure in [**Par. 8.2.1 and 8.2.2**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=681&parent=1527) , before proceeding with assembly. * The crankshaft half-bearings are made of special material. Therefore, they must be replaced every time they are assembled to prevent seizures.  1. Fit the new half-bearings **B** onto the crankcase upper half **E** adhering to the reference notches **C** .     Z_importante.jpg **Important**     * After the half-bearings are fitted, check that the lubrication holes **D** correspond with the crankcase grooves **E** . * The lower and upper half bearings **CANNOT** be singularly replaced, and both halves must be replaced together.  1. Fit the new half-bearings **A** onto the lower crankcase **F** using the reference notches **G** . 2. Lubricate the half-bearings **A and B** with **oil.** | Fig._9.1.jpg **Fig 9.1**Fig._9.2.jpg **Fig 9.2** |
| **9.3.2 Tappets**   1. Lubricate the tappets **G** with oil. 2. Insert the tappets **G** into the housings **H** of the upper crankcase. | Fig._9.3.jpg **Fig 9.3** |
| **9.3.3 Camshaft**   1. Check that the bushing **Q** is correctly fitted. 2. Lubricate the pins **L** , the cams **M** of the camshaft **N** , all the housing **P** ( [**Par. 8.2.4 and Par. 8.2.6**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=681&parent=1527) ) and the bushing **Q** with oil. 3. Insert the camshaft **N** all the way into its housing **P** . 4. Fit the lock ring **R** on to the crankcase **E** to hold the position of the camshaft **N** . 5. Manually rotate the camshaft **N** ensuring that it is free. | Fig._9.4.jpg **Fig 9.4** |
| **9.3.4 Vent compartment closure lid**   1. With the screws **CF** tighten the cover **CG** and the gasket **CH** (tightening torque to **10 Nm** ). | Fig._9.5.jpg **Fig 9.5** |
| **9.3.5 Crankshaft**    Z_importante.jpg **Important**       * Carry out the checks described in [**Par. 8.4.1 and Par. 8.4.2**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=683&parent=1527) .  1. Check that the crankshaft half-bearings are mounted correctly on the upper crankcase **E** . 2. Lubricate the main journal and crankpin **J** , with oil. 3. Insert the crankshaft **W** into its seat on the upper crankcase **E** . 4. Insert the 2 shoulder half-rings **K** , between the crankshaft **W** and the upper crankcase **E** ( **AB** detail). | imm9.6.jpg **Fig 9.6** |
| **9.3.6 Lower crankcase**    Z_importante.jpg **Important**       * Before proceeding to the assembly of the piston and connecting rod, carry out the checks described in [**Par. 8.5.1**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=684&parent=1527) .  1. Check that the crankshaft half-bearings are mounted correctly on the lower crankcase **F** ( **AC** detail). 2. Assemble the 2 shoulder half-rings **AD** onto the lower crankcase **F** applying two drops of oil to keep them in their seat. 3. Check that the coupling surfaces **AE** are free from dirt and grit. | imm9.7.jpg **Fig 9.7** |
| 1. Spread a bead of **Loctite 5660 (rif. AL)** of approx **1 mm** thickness on the surface **AM** of the upper crankshaft half **C** being careful not to block the oil feed grooves **AG** and the return oil sump **AH** . 2. Join the two crankshaft halves **E and F** observing the guide pins **AN** .     Z_importante.jpg **Important**       * Failure to follow the bolting procedures compromises the functionality of the engine and can cause damage to people and property. | imm9.8.jpg **Fig 9.8** |
| 1. Tighten the fastening screws strictly following the sequence and the tightening torque indicated.     Tightening Screws **Torx M12x1,25** (from the **n° 1** to the **n° 10** ): CYCLE 1 - with a torque of **40 Nm** ; CYCLE 2 - with a torque of **70 Nm** ; CYCLE 3 - with a torque of **120 Nm** .    Tightening Screws **Torx M8** (from the **n° 11** to the **n° 27** ): CYCLE 4 - with a torque of **20Nm** ; CYCLE 5 - with a torque of **35** **Nm** ;   1. Perform the operations described in  [**Par. 8.4.2**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=683&parent=1527) . 2. Check that crankshaft **W** rotates smoothly. | Fig._9.10.jpg **Fig 9.9** |
| **9.3.7 Piston rings**   1. Perform the operations described in [**Par. 8.5.3**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=684&parent=1527) . 2. Put the scraper ring **AP** onto the piston **AQ** . 3. Put the 2° seal ring **AR** on the piston **AQ** . 4. Put the 1° seal ring **AS** onto the piston **AQ** . | imm9.11.jpg **Fig 9.10** |
| 1. Perform the operations described in [**Par. 8.5.4**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=684&parent=1527) . 2. Position the segment openings with a 120° angle between them ( **Y** ).   **NOTE:**  do not use the segment opening with the pin hole ( **N** )   1. Lubricate the piston skirt and piston rings with oil. | 9_3_7.png **Fig 9.11** |
| **9.3.8 Piston**    Z_importante.jpg **Important**       * Before proceeding to the assembly of the piston and connecting rod, carry out the checks described in [**Par. 8.5.1**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=684&parent=1527) . * Always replace the bearings **CE** after each assembly. * Mate components respecting references at [**Par. 7.13.5.**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=308&parent=1527)  1. Loosen the screws **AU** and remove the connecting rod cap **AV** . 2. Fit the new bearings **CE** . 3. Insert the connecting rod **AZ** into the piston **AQ** and align the seats **BA** . 4. Insert the gudgeon pin **BB** into the seat **BA** for the assembly of the connecting rod and piston unit. 5. Insert the lock rings **BD** inside the seat **BE** of the piston **AQ** to lock the gudgeon pin **BB** .   imm9.14_9.15.jpg **Fig 9.13** | imm9.13_9.14.jpg **Fig 9.12** |

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| **9.3.9  Piston and connecting rod assembly**    Z_importante.jpg **Important**       * Before assembling the piston and connecting rod assemblies, execute the controls described in [**Par. 8.5**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=684&parent=1527)  1. Rotate the crankshaft **W** by moving the crankpin **BG** to a **TDC** position of the affected cylinder. 2. Lubricate the piston skirt and rings **AQ** . | 9.14.jpg **Fig 9.14** |
| 1. Check that the half-bearing **AS** is mounted correctly and lubricate it thoroughly.       Z_importante.jpg **Important**       * Make sure you are at the stage described in **Point** **1** . * The piston **AQ** must be mounted with the arrow **BN** (stamped on the piston crown) facing the timing system side.  1. Using the piston ring compression pliers, insert the piston inside the cylinder **BQ** by around 10mm (height **BM** ). | 9.15.jpg **Fig 9.15** |
| 1. Rotate the piston **AQ** by 10° counter-clockwise with respect to its correct assembly position ( **Fig. 9.16** - height **BP** ). | 9.16.jpg  **Fig 9.16** |
| **NOTE** : Doing this prevents the impact between the connecting rod **AZ** and the sprayer **V** . | 9.17.jpg  **Fig 9.17** |
| Z_importante.jpg **Important**     * Leave the ring compressor assembled on the piston        1. Push piston **AQ** downwards without introducing the segments in the cylinder, rotate piston **AQ** by 10° in a clockwise direction (value  **BR** – correct assembly position).   9.18.jpg  **Fig 9.18** | |
| 1. Push the piston **AQ** downwards by centering the crankpin **BG** with the connecting rod **AZ** . 2. Turn the crankcase on support to assemble the con rod capp on cylinder **1** and **4** . 3. Check that the half-bearing **AS** is mounted correctly on the connecting rod cap **AV** . | 9.19.jpg  **Fig 9.19** |
| Z_importante.jpg **Important**     * Check that the break levels of connecting rod cap **AV** coincide perfectly onto connecting rod **AZ** before screwing on and tightening capscrews **AU** .  1. Couple the connecting rod cap **AV** to the connecting rod **AZ** using the marks made at disassembly ( **Par. 7.15.2 e 7.15.5** ). 2. Screw in the screws **AU** . 3. Repeat the operations from 1 to 10 for each cylinder.       Z_importante.jpg **Important**     * Failure to adhere to the assembly procedures may compromise the functionality of the engine, and also cause damage to persons and property.      1. Tighten the screws **AU** , alternately, strictly following the tightening torques indicated.     **Tightening sequence of screws Torx M10x1:**    **1° CYCLE** - with a torque of **40** **Nm** ; **2°** **CYCLE** - with a torque of **85** **Nm** ;     1. Check that the connecting rods have axial play and the crankshaft **W** rotates smoothly.     **NOTE** : After the check carried out at point 14, position the shaft **W** with the first cylinder to TDC. | 9.20.jpg  **Fig 9.20** |

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| **9.3.10 Crankshaft gasket flange**        Z_importante.jpg **Important**       * Check that the contact surface between the flange and the crankcase is free of grit and dirt. * Always replace the gasket **BS** after each assembly.      1. Check that there are bushings **BT** on the crankcase **E** . 2. Lubricate the oil seal lip **BU** . 3. Position the gasket **BS** and flange **BV** on the crankcase **E** in correspondence with the bushings **BT** . 4. Put **Loctite 243** on the **2** screws **BW** matching the bushings **BT** . 5. Screw the fastening screws all the way in **BW** without tightening them. 6. Tighten all the screws **BW** strictly following the tightening sequence indicated (tightening torque to **10 Nm** ). | imm9.24.jpg **Fig 9.21** **a**imm9.25.jpg **Fig 9.21 b** |
| **9.3.11 Cover 3 rd PTO**    Z_importante.jpg **Important**       * Replace capscrews **CA** with each assembly or alternatively apply **Loctite 2701** on the thread.  1. Secure the cover **CB** with the screws **CA** and **CC** inserting the gasket **CD** (tightening torque **25 Nm** ). | imm9.26.jpg **Fig 9.22** |

## Oil sump unit assembly

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| **9.4.1 Oil fume pipes**   1. Apply **Loctite 648** on the pipe threads **A** . 2. Screw and tighten the pipes **A** (tightening torque of  **15 Nm** ). | Fig._9.23.jpg **Fig 9.23** |
| **9.4.2** **Oil suction pipe**    Z_importante.jpg **Important**       * It is mandatory to replace the gasket **B** after each assembly. * Always replace capscrews **D** with new ones or alternatively apply **Loctite 2701** .      1. Insert the new gasket **B** in the seat of the oil suction hose flange **D** . 2. Secure the hose **C** on the crankcase **E** with the screws **D** (tightening torque **10 Nm** ). | Fig._9.24.jpg **Fig 9.24** |
| **9.4.3 Oil Sump**   1. Ensure that the contact surfaces **F** of the oil sump **G** and the crankcase **E** are completely clean. 2. Apply a bead of approx. **2.5 mm** of sealant **(Loctite 5660)** on the surface **F** of the oil sump **G** . 3. **Note** : alternatively apply **Loctite 5699** . | imm9.29.jpg **Fig 9.25** |
| Z_importante.jpg **Important**       * Tighten the screws **L** , strictly following the sequence and tightening torque indicated.      1. Tighten the screws **L** following the sequence indicated (tightening torque **25 Nm** ). 2. Remove the two studs [**ST\_18**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=339&parent=1527) with the appropriate screws (tightening torque 25 Nm) 3. After tightening all of the screws, loosen screw **n°1** and retighten it to the torque value specified in step **4** . 4. Check that the oil drain plugs **M** are tight (tightening torque **35 Nm** ). | imm9.30.jpg **Fig 9.26** |

## Flange unit assembly

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| **9.5.1 Bell housing**    Z_Pericolo.jpg **Danger**       * Bell **A** is very heavy; pay special attention during assembly operations to avoid dropping and causing serious risks to the operator.  1. Install the bell housing **A** in accordance with the reference pins **B** on the base **C** . | imm9.31.jpg **Fig 9.27** |
| Z_importante.jpg **Important**       * Failure to adhere to the assembly procedures may compromise the functionality of the engine, and also cause damage to persons and property.  1. Tighten the fastening screws **D** strictly following the tightening sequence indicated (tightening torque **50** **Nm** ). | imm9.32.jpg **Fig 9.28** |
| **9.5.2 Flywheel**    Z_Pericolo.jpg **Danger**       * Flywheel **F** is very heavy; pay special attention during assembly operations to avoid dropping and causing serious risks to the operator.  1. Screw the special tool [**ST\_09**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=339&parent=1527) on the crankshaft **E** instead of the screws **G** positioned higherup ( **Fig.** **9.29** ). 2. Insert the flywheel **F** on the crankshaft **E** using the tool as a guide [**ST\_09**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=339&parent=1527) and manually tighten all the screws **G** (the last screw is fitted in the place of the tool [**ST\_09**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=339&parent=1527) ). 3. Mount the tool [**ST\_34**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=339&parent=1527) in the seat of the starter motor **H** and fit it with the two starter motor fixing screws. 4. Tighten the screws **G** (tightening torque at **140 Nm** ). | 9.5.jpg **Fig 9.29** |

## Timing system gear assembly and injection pump

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| **9.6.1 Timing system gear assembly**   1. Check that the key **A** is correctly fitted on the camshaft **B** . 2. Position the gear **C** on the camshaft **B** adhering to the key reference **A** . 3. Screw capscrew **D** until the end. 4. Tighten the middle gear pin **H** , in the housing **J** of the crankcase, with the screws **K** (tightening torque **25 Nm** ). | Fig._9.30.jpg **Fig 9.30** |
| Z_importante.jpg **Important**       * The fitting of the middle gear pin **H** has only one position, the 4 screw holes **K** are asymmetric. * Always replace the gasket **L** at each assembly.  1. Insert the shoulder ring **M** . 2. Check the integrity of the bushing N into the middle gear **P** , and ensure that it is free from impurities. 3. Thoroughly lubricate the pin **H** and the bushing **N** . 4. Position the gear **P** on the pin **H** observing all the marks **W** of the gears **C** and **S (Fig. 9.30) .** | imm9.35.jpg **Fig 9.31** |
| Z_importante.jpg **Important**       * Failure to comply with the marks **W** on the gears **C, P and S** , causes engine malfunction and serious damage. | imm9.36.jpg **Fig 9.32** |
| 1. Insert the shoulder ring **Q** and the lock ring **R.** 2. Tighten the screw **D** ( **Fig. 9.30** - tightening torque at **100 Nm** ). | imm9.37.jpg **Fig 9.33** |
| **9.6.2 Injection pump**    Z_importante.jpg **Important**       * Always change screws **T** with new ones or alternatively apply **Loctite 270 (Fig. 9.34)** to the threads.  1. Perform the operations described in the warning in [**Par. 6.1.5** .](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=659&parent=1527) 2. Place a dial gauge to detect the TDC on piston N° **1** , then bring the indicator of the dial gauge to **0** .   **NOTE** : During the detection phase of the TDC, check that cylinder N° **1** is in compression phase (align the notches **W** as in **Fig. 9.33** ). | Fig._9.34.jpg **Fig 9.34** |
| 1. By means of the identified pump code, refer to [**Tab. 6.1**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=659&parent=1527) to know the advance degrees and the corresponding value to lower the piston. 2. Mount tool [**ST\_34**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=339&parent=1527) in the seat of starter motor **H (Fig. 9.29)** and fix it with two motor fixing screws. 3. Having identified the value to lower the piston, rotate the crankshaft anti-clockwise by going beyond the value described in [**Tab. 6.1**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=659&parent=1527) , once again, rotate the crankshaft clockwise stopping at the correct advance value by using tool [**ST\_03 - ST\_34**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=339&parent=1527) . 4. Lock the [**ST\_34**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=339&parent=1527) , ensure that the crankshaft does not rotate, which would alter the correct advance value. If this happens, repeat the instructions described in points **4, 5 and 6.** | Fig._9.35.jpg **Fig 9.35** |
| 1. Fix pump **Z** into housing **V** by means of screws **T** ( **Fig. 9.34** - tightening torque at **25 Nm** ). 2. Position the gear **AC** onto shaft **AB** of the pump.   **NOTE:** You are not required to respect the reference **Q** gear **AE** ( **Fig.** **9.36** ).   1. Insert washer **U** and tighten nut **AD** (tightening torque at **70 Nm** ).     Z_importante.jpg **Important**       * In the event of assembling screw **X1** (tightening torque at **10 Nm** ). * In the event of assembling screws **X2 and X3** (tightening torque at **2** **5 Nm** ). | 9.6.jpg **Fig 9.36**  Fig._9.37.jpg  **Fig 9.37** |

## Cylinder head unit assembly

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| **9.7.1 Valve stem gasket**    Z_importante.jpg **Important**       * Carry out the checks described in [**Par. 8.6.4**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=316&parent=1527) before proceeding with the following operations. * Always replace gasket **A** with every assembly * Lubricate the gaskets **A** on the inside.  1. Fit the oil seals **A** on the valve guides **B** using the tool [**ST\_08**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=339&parent=1527) . | Fig._9.38.jpg **Fig 9.38** |
| **9.7.2 Injector sleeves** ( operazione_utile.gif **)**   1. Insert the seals **C** in the seats of the sleeve **D** . 2. Insert the seal **E** with the convex side facing upward at the base of the sleeve **D** . 3. Lubricate the gaskets **C** . 4. Insert and carefully screw the sleeve **D** into the seat of the head **F** .     **NOTE:** The sleeve **D** must not protrude above the surface of the head **BF** .     1. Clamp the sleeve **D** (tightening torque at **30 Nm** ). | imm9.42.jpg **Fig 9.39** |
| **9.7.3 Injectors projection**   1. Insert the injector **G** inside the sleeve **H** . 2. Mount the injector fixing bracket **M** and secure it with the screw **N** , without performing the calibration. 3. Check protrusion of injectors by means of the tool [**ST\_03**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=339&parent=1527) **(Fig. 9.44)** , check the projection of the injector, which must range between 1.68 ÷ 2.42 mm.     **NOTE** : if the value detected does not correspond, replace gasket **Q** with a different thickness. | Fig._9.40.jpg **Fig 9.40**Fig._9.41.jpg **Fig 9.41** |
| **9.7.4 Valves**   1. Pre-lubricate and insert the valves **X** into the head **F** taking care to fit them in the original positions as per the reference marks made in [**Par. 7.11.3.1**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=676&parent=1527) . 2. Position the spring **Y** on the seat of the head **F** . 3. Position the disk **S** on the spring **Y** centering the valve **X** . 4. Mount the tool [**ST\_07**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=339&parent=1527) on the head **F** fixing it on one of the holes for securing the rocker arm cover.     **NOTE:** Change the fixing hole according to the position of the valves to be fitted.     1. Position the tool [**ST\_07**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=339&parent=1527) on the valve as shown in the figure. 2. Push the lever of the tool [**ST\_07**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=339&parent=1527) downwards, in order to lower the valve disks **S** in the direction of the arrow **AK** , and insert the valve cotters **AJ** inside the disk **S** . 3. Check that the valve cotters **AJ** are properly mounted on the valve seats **X** and release the tool [**ST\_07**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=339&parent=1527) .     **NOTE:** repeat all the steps for the relevant valves and remove the tool [**ST\_07**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=339&parent=1527) . | imm9.45.jpg **Fig 9.42** |
| imm9.46.jpg **Fig 9.43** |
| imm9.47.jpg **Fig 9.44** |
| **9.7.5 Cylinder head**   1. Fix the eyebolts **AW** with the screws **AX** onto the head **F** (tightening torque of **25 Nm** ). 2. Position the piston **P** at the TDC. 3. Position the tool [**ST\_03**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=339&parent=1527) on the crankcase surface of the head and measure the piston protrusion **P** from head level **K** in 4 diametrically opposed points **R.** Repeat the operation for all pistons **P** and take note of the highest average value, determining valu **e S (Tab. 9.2)** .     **Tab. 9.2**   |  |  | | --- | --- | | **S (mm)** | **Hole number** | | 0.030 - 0.126 | 1 1foro.jpg | | 0.127 - 0.250 | 2 2fori.jpg | | 0.251 - 0.375 | 3 3fori.jpg |  1. Based on the value detected at point **3** , select the relevant gasket **T** as shown in the **Tab. 9.2 (Fig. 9.47** detail **U** ). 2. Check that the crankcase surface **K** and the gasket **T** are completely free of dirt and grit.       Z_importante.jpg **Important**       * The head gasket must be replaced for each assembly.  1. Position the gasket **T** on the surface **K** with reference to the centering bushings **J** . | imm9.48.jpg **Fig 9.45**imm9.49.jpg **Fig 9.46**Fig._9.47.jpg **Fig 9.47** |
| 1. Check that the surface head **W** is free from impurities. 2. Position the head **F** on the crankcase **Z** with reference to the centering bushings **J** .       Z_importante.jpg **Important**       * The fastening bolts **V** must be replaced every time they are assembled. * Failure to adhere to the bolt fixing procedures may compromise the functionality of the engine, and also may cause damage to persons and property. * Tighten capscrews **V** observing the cycles, tightening, and subsequent rotation as indicated in **Tab. 9.3** .  1. Secure the head **F** by tightening the screws **V** strictly following the sequence indicated in the **Fig. 9.50** and the tightening torque indicated in the **Tab. 9.3** . | Fig._9.48.jpg  **Fig 9.48** |
| **Tab. 9.3**   |  |  | | --- | --- | | **CYCLE** | **TORQUE** | | 1 | 40 Nm | | 2 | 70 Nm | | 3 | 100 Nm | | 4 | 90° | | 5 | 90° | | 6 | 90° | | Fig._9.50.jpg  **Fig 9.50** |
| **9.7.6 Rods and valve bridges**   1. Insert the rocker control rods **AA** into the niches of the head **F** .     Z_importante.jpg **Important**       * Properly centre the rods **AA** into the spherical housing of the camshaft tappets **AB** .  1. Mount the valve bridge **AC** on to the pairs of discharge and suction valves. | imm9.54.jpg **Fig 9.51** |
| imm9.55.jpg **Fig 9.52** |
| **9.7.7 Rocker arms**    Z_importante.jpg **Important**       * To correctly position the rocker arms, turn the rocker arm pin **AH** with the lower height **AL** towards the timing system side as in **Fig.9.54** . * The discharge rocker arm **AT** is shorter than the suction arm **AR** .      1. Fit the lock ring **AM** into the seat **AN** of the rocker arm pin **AH** . 2. Position the pin **AH** with the screw support surface **AP** facing upwards and insert the 2 shoulder rings **AQ** . 3. Insert in sequence the suction rocker arm **AR** , the holder **AS** and the discharge rocker arm **AT** in the pin **AH .** 4. Insert the spring **AU** in the pin **AH** . 5. Repeat points **3, 4** for all the rocker arms. **NOTE:** The holder **AV** must be fitted with the last pair of rocker arms towards the flywheel. 6. Insert 2 shoulder rings **AQ** and the lock ring **AN** to lock all the components inserted in the pin **AH** . **NOTE** : The spring **AU** ensures that the supports **AS** and **AV** are kept in place. | imm9.57.jpg **Fig 9.54**imm9.58.jpg **Fig 9.55** |
| **9.7.8 Rocker arm pin assembly**    Z_importante.jpg **Important**       * Position the rocker arm pin assembly **BB** on a level to align all the support surfaces. * Check that the pistons are positioned half way between the TDC and BDC. Rotate the crankshaft 90° counterclockwise with regard to the 1st cylinder TDC, positioning the crankshaft pin **BP** as shown in Fig **9.58a** . If the crankshaft pulley and the timing gear cover have not been removed, rotate the crankshaft positioning the reference **BQ** located on the target wheel in correspondence of the speed sensor, as shown in **Fig. 9.58b** .      1. Position the rocker arm pin assembly **BB** on the head **F** , respecting the plug **BC** on the head using the holder indicated **AV** . 2. Check the correct positioning of all the rocker arms and the u-bolt control valves (detail **BD** ). House the tappet in the seat of the rocker arms control rod. 3. Secure the rocker arm pin **BB** tightening the screws **BE** (tightening torque to **25 Nm** ). Adhere to the screw tightening sequence **BE** as shown in **Fig. 9.60** . | imm9.59.jpg **Fig 9.56**imm9.60.jpg **Fig 9.57** |
| imm9.60A.jpg **Fig 9.58a** | imm9.60B.jpg **Fig 9.58b** |

## Fuel system assembly

|  |  |
| --- | --- |
| Z_importante.jpg **Important**       * Replace the high pressure pipes after two disassemblies. * Remove the protective caps from all the components of the fuel circuit just before assembly [**(Par. 2.9.7).**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=269&parent=1527) * When repaired, **RSN-A** injectors must be certified by a Stanadyne centre to check their correct operation - check the type of engine mounted injectors on the spare parts list ( **RSN-A** is specified in the description). | Fig._9.59.jpg **Fig 9.59** |
| **9.8.1 Injector**     1. Lubricate the gaskets **U, T, S** , and fit them on the injector **Z.** | Fig._9.60.jpg  **Fig 9.60** |
| 2 .  Fit the injector **Z** in the sleeve **V** . | Fig._9.61.jpg  **Fig 9.61** |
| 1. Assemble parts **P, Q, R** . 2. Fit the parts so assembled on the injector **Z** . | Fig._9.62.jpg  **Fig 9.62** |
| 5. Insert tool [**ST\_51**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=339&parent=1527) on the injectors junctions **Z** (detail **X1** ).  6. Tighten the screw **P** (tightening torque to **20 Nm** ) | INIETTORI.jpg  **Fig 9.63** |
| **9.8.2 Fuel injector ricicle pipe**     1. Position the tube **N** on the injectors **Z** , and tighten screws **M** (coppia di serraggio a **14 Nm** ) and insert the gasket **T** . | Fig._9.64.jpg  **Fig 9.64** |
| **9.8.3 Rocker arm cover**  image8814635265d37b495  **Important**   * Always replace the gaskets **AK** after each disassembly ( [**ST\_36**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=339&parent=1527) ).  1. Position tool [**ST\_17**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=339&parent=1527) onto the head in correspondence with the two fastening holes **5 and 6** ( **Fig. 9.67)** . 2. Position the gasket **AM** on the head **AL** using tool [**ST\_17**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=339&parent=1527) as a guide. 3. Fit the rocker arm cap **C** on the head **AL** via the screws L observing the clamping sequence illustrated in **Fig. 9.67.** 4. With vaseline lubricate the gaskets **AK.** | Fig._9.65.jpg  **Fig 9.65**  Fig._9.67b.jpg  **Fig. 9.67** |
| **9.8.4 Installation of the fuel injector pipes (injection pump/injectors)**    Z_importante.jpg **Important**     * Replace the high pressure pipes after two disassemblies.        1. Position pipes **D** on the injectors and on the injector pump and tighten the nuts **E** **and** **F** manually, without clamping them. 2. Clamp the nuts **E and F** (tightening torque at **25 Nm** ). 3. Mount the retainers **C** of the hoses **D.** | Fig._9.68.jpg **Fig 9.68** |
| **9.8.5 Fuel filter**   1. Secure the fuel filter holder **J** with the screws **K** on the crankcase **W** (tightening torque of **25 Nm** ).     **NOTE:** For the assembly of the fuel cartridge, refer to operation 2 of [**Par. 6.7.2**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=666&parent=1527) . | Fig._9.69.jpg **Fig 9.69** |

## Intake manifold assembly

|  |  |
| --- | --- |
| Z_importante.jpg **Important**       * Check that the contact surfaces between the collector **C** and the head **D** are free from impurities.  1. Insert [**ST\_18**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=339&parent=1527) special tool into market point. 2. Mount the gasket **A** on the head **D** . 3. Mount the manifold **C** on the head **D** . 4. Fit the manifold **C** using the screws **B** (tightening torque of **25 Nm** ). | Fig._9.70.jpg **Fig 9.70** |

## Exhaust manifold assembly

|  |  |
| --- | --- |
| Z_importante.jpg **Important**       * Replace the self-locking nuts **B** and the metal gaskets **D** between the manifold and the cylinder head every time they are assembly. * In the event of mounting the studs **C** , fix ( **25** **Nm** tightening torque) with **Loctite 2701** on the thread.      1. Check that the contact surfaces **F** are free from impurities. 2. Insert the gaskets **D** and **E** on the studs **C** . 3. Position the manifold **A** on the studs **C** . 4. Fix the manifold **A** on the cylinder head by tightening the self-locking nuts **B** (tightening torque of **25 Nm** ). | Fig._9.71.jpg **Fig 9.71** |

## Lubrication circuit assembly

|  |  |
| --- | --- |
| **9.** **11 .1 Assembly oil mist separator unit**   1. Follow operations [**1, 3, 4, 6, 7 and 8** of **Par. 6.8.2.**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=661&parent=1527) | |
| **9.** **11 .2 Oil Cooler and oil filter Unit Assembly**     1. Follow operations of [**Par. 6.6.2 - 6.6.3**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=660&parent=1527) . | |
| **9.** **11 .3 Oil pump**  **NOTE:** Carry out the checks described in [**Par. 8.7**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=685&parent=1527) before proceeding with the following operations.     1. Check that all contact surfaces between **AL, AH, AF, AG and AN** are free of impurities – scratches - dents. 2. When assembling, do not use any type of gasket between  **AG and AN.** 3. Thoroughly lubricate the seat of the rotors **AF** on the oil pump crankcase **AG** and the two rotors **AH** and **AL** . 4. Insert, inside the seat **AF** , the 2 rotors (in sequence) **AH** and **AL** , respecting the reference **BP** as the picture. (or refer to [**Par. 2.10.2**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=719&parent=1527) **)** . | Fig._9.73.jpg **Fig 9.73** |
| 1. Check that the 2 pins **AM** are inserted properly in the crankcase timing system **AN** . 2. Position the oil pump assembly **AG** using the pin marks **AM** . 3. Fasten the oil pump cover **AG** with the screws **AH** (tightening torque **10 Nm** ). | Fig._9.74.jpg **Fig 9.74** |
| **9.** **11 .4 Timing system crankcase**    Z_importante.jpg **Important**       * Always replace the oil seal **J** after each assembly ( [**ST\_14**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=339&parent=1527) ). * Always replace the gasket **P** after each assembly. * To prepare the surface of the **K** plane for the new application of the sealant, it must be cleaned through the use of: - initially **Loctite SF 7200** - subsequently **Loctite SF 7063** Avoid any contact with the **K** plane and be careful not to compromise the cleaning performed.  1. Distribute a bead of **Loctite 5188** , of about 1mm thickness, on the surfaces **K** of the crankcase **C** . 2. Make sure that the key **M** ( **Fig. 9.76** ) is inserted properly on the crankshaft and that it is facing upwards. 3. Lubricate and insert the gasket **P** in the seat of oil pump **Q** . | Fig._9.75.jpg **Fig 9.75** |
| 1. Tighten the tool [**ST\_10**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=339&parent=1527) on the crankshaft. 2. Check that the 2 pins **N** are properly inserted in the timing system crankcase **C** . 3. Lubricate the gasket **J** with oil and position the crankcase **C** on the crankcase **E** , using the pins **N** , inserting the oil pump **Q** on the crankshaft. | Fig._9.76.jpg **Fig 9.76** |
| 1. Fasten the screws **R** (tightening torque of **25** **Nm** ). | imm9.89.jpg **Fig 9.77** |
| **9.** **11 .5 Crankcase oil filler flange Timing System**    Z_importante.jpg **Important**       * Always replace the gasket **BA** after each assembly.  1. Position the gasket **BA** in the seat on the flange **BB** . 2. Clamp the flange **BB** on the crankcase **BC** with the screws **BD** (tightening torque of **10 Nm -** [**ST\_06**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=339&parent=1527) ). | Fig._9.78.jpg **Fig 9.78** |
| **9.** **11 .6 Oil pressure relief valve**   1. Lubricate the piston **BE** and fully insert it in the seat **BF** . 2. Insert the spring **BG** in the piston.       Z_importante.jpg **Important**       * Always replace the gasket **BH** after each assembly.  1. Mount the gasket **BH** on cap **BL** . 2. Tighten the cap **BL** on the crankcase **BC** (tightening torque of **50 Nm** ). | Fig._9.79.jpg **Fig 9.79** |

## Crankshaft pulley assembly

|  |  |
| --- | --- |
| 1. Check that the pin **U** is mounted properly on the crankshaft **V** . 2. Position the pulley **T** on the crankshaft V using the pin mark **U** . 3. Apply **Molyslip** grease on the screw thread **Z** . 4. Clamp the pulley **T** with the screw **Z** (tightening torque of **360 Nm** ) and remove special tool [**ST\_34**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=339&parent=1527) ( **Fig. 9.29)** | Fig._9.80.jpg  **Fig 9.80** |

## Turbocharger Assembly

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| --- | --- |
| Z_importante.jpg **Important**       * Before proceeding, perform the operation described in [**Par. 2.18**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=717&parent=1527) . * Ensure that tube **B** is not clogged.  1. Fasten the connecting sleeve **A** to the pipe **B** with the clamp **C** onto the flange fitting **D** .       Z_importante.jpg **Important**       * Always replace the gasket **F** after each assembly.  1. Lubricate and insert the gasket **F** into the seat of the pipe **G** .       Z_importante.jpg **Important**       * Remove the plastic or foam caps from the turbo compressor before assembling. * Replace nuts **M** with each assembly.  1. Check that the contact surfaces **E** are free from impurities deformations or cracks, otherwise replace exhaust manifold **L** . 2. Position the turbo-compressor **H** on the bolts on the manifold **L** . 3. Fasten the turbo-compressor **H** with the nuts **M** (tightening torque of **25 Nm** ). 4. Insert the sleeve **T** on the turbo-compressor **H** and secure it with the clamp **U** . 5. Fasten the pipe **G** with the screws **N** to the turbo-compressor **H** .     Z_importante.jpg **Important**       * Always replace the gasket **P** after each assembly. * Before assembly of the tube **Q** , perform the operation described in [**Par. 2.18.2 - point 2**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=717&parent=1527) . * Ensure that tube **Q** is not clogged.  1. Insert the gaskets **P** between: - **Q** and **R** ; - **Q** and **S** ; - **Q** and **H** . Fasten the fuel outlet pipe **Q** with the fittings **R** on the turbo-compressor **H** and on the crankcase **S** (tightening torque of **15** **Nm** ).      1. Follow operations **4 and 5** of **Par. 6.1.9** . | 9.80.jpg **Fig 9.81**9.81.jpg **Fig 9.82**9.82.jpg **Fig 9.83** |

## Coolant circuit assembly

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| --- | --- |
| **9.14.1 Thermostatic valve**    Z_importante.jpg **Important**       * Always replace the gasket **A** after each assembly.      1. Check the condition of the seal gasket **A** and fit it on the thermostatic valve **B** . 2. Position the thermostatic valve **B** in the seat on the head **C** (detail **D** ). 3. Secure the cover **E** with the screws **F** on the head **C** (tightening torque of **10 Nm** ). | 9.83.jpg **Fig 9.84** |
| **9.14.2 Coolant pump**    Z_importante.jpg **Important**       * Always replace the gasket **L** every time it is assembled.      1. Fit the pump **G** with the screws **H** interposing the gasket **L** (tightening torque of **25 Nm** ). | Fig._9.82.jpg **Fig 9.85** |
| **9.14.3 Oil Cooler hoses**   1. Fit hose **Q1** onto coolant pump **G** and Oil Cooler **M** . 2. Fit hose **Q2** onto crankcase **R** and Oil Cooler **M** . 3. Secure the sleeve **Q** on Oil Cooler **M** and to the pump **G** with the clamps **K** . 4. Fasten the clamp **Y** with the screw **S** (tightening torque of **22 Nm - ST\_05** ).   9.85.jpg  **Fig 9.86** | |

## Electric component assembly

|  |  |
| --- | --- |
| **9.15.1 Sensors and switches** | |
| **9.15.1.1 Coolant temperature sensor**   1. Secure the sensor **D** onto the head **E** (tightening torque of **20 Nm** ). | 9.85.jpg **Fig 9.87** |
| **9.15.1.2 Oil pressure switch**   1. Clamp the oil pressure switch **F** on the crankcase **G** (tightening torque at **35 Nm** ). | 9.86.jpg **Fig 9.88** |
| **9.15.1.3 Fuel filter water detection sensor**   1. Lubricate and insert the gasket **AA** on the fitting **AB** . 2. Fix the sensor **AB** onto the cartridge **AC** (tightening torque of **5 Nm** ). | 9.87.jpg  **Fig 9.89** |

|  |  |
| --- | --- |
| **9.15.2 Alternator**   1. Mount the bracket **M**  on the head **N** using the screw **H** and relative washer, without clamping it. 2. Fit the alternator with the screw **A** with the relative washer and spacer **B** . 3. Mount the alternator **C** on the crankcase **Q**  tightening the nut **R**  up to the stop without clamping it. 4. Mount the screw **L** and relative washer on the alternator **C** , without clamping it. 5. Clamp screw **H** (tightening torque of **25** **Nm** ). | 9.88.jpg  **Fig 9.90** |

|  |  |
| --- | --- |
| image4748635265d9e99ab Important   * The belt **S** must always be replaced every time it is assembled, even if it has not reached the scheduled hours for replacement.  1. Insert the belt **E** on the pulleys **T** . 2. Push the alternator **C** in the direction of the arrow **J** . 3. While tensioning the alternator **C** , first clamp screw **A** (tightening torque at **25 Nm** ) and then screw  **D**  (tightening torque at **69 Nm [thread M10] - 40 Nm** **[thread M8]** ). 4. Check the tension of the belt **S**  with the instrument ( **DENSO BTG-2** ), positioning it in point **P** (the tension must be between **200** and **230 N** ). 5. If the tension values do not correspond, tighten screws **A** and D, then repeat operations **7** , **8** , **9** and **10** . | 9.89.jpg  **Fig 9.91** |

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| **9.15.3 Starter Motor**    Z_importante.jpg **Important**       * Remove the tool if still there [**ST\_34**](https://iservice.lombardini.it/jsp/Template2/manuale.jsp?id=339&parent=1527) .  1. Fit the starter **Q** with the screws **R** on to the flange bell **S** (tightening torque of **45 Nm** ). | 9.14.jpg **Fig 9.92** |

## Tightening torques and the use of sealants

**Tab. 9.4** - \* Alternatively to the capscrew replacements, with "Dri-loc"

|  |  |  |  |
| --- | --- | --- | --- |
| **BASE CONFIGURATION** | | | |
| **SHORT BLOCK** | | | |
| **Component** | **Thread (mm)** | **Torque (Nm)** | **Sealer** |
| Breather room closing cover fastening capscrew (EXHAUST SIDE) | M6x1 | 10 |  |
| **Lower crankcase fastening capscrew** | **M12x1.25** | **3 Torque cycles** |  |
| 1st Cycle |  | 40 |  |
| 2nd Cycle |  | 70 |  |
| 3rd Cycle |  | 120 |  |
| **Lower crankcase fastening capscrew** | **M8x1.25** | **2 Torque cycles** |  |
| 1st Cycle |  | 20 |  |
| 2nd Cycle |  | 35 |  |
| **Connecting rod screw** | **M8x1** | **2 Torque cycles** |  |
| 1st Cycle |  | 40 |  |
| 2nd Cycle |  | 85 |  |
| Crankshaft gasket flange fastening capscrew | M6x1 | 10 |  |
| Closing cover fastening capscrew 3 rd PTO | M8x1.25 | 25 | Loctite 2701\* |
| Idle gear lubr. hole cap closure | M14x1.5 | 30 | Loctite 2701\* |
| Coolant drain hole closing cap | M16x1.5 | 50 |  |
| **OIL SUMP ASSEMBLY** | | | |
| **Component** | **Thread (mm)** | **Torque (Nm)** | **Sealer** |
| Oil fumes tube | M12x1,5 | 15 | Loctite 648 |
| Oil suction hose fastening capscrew | M6x1 | 10 | Loctite 2701\* |
| Oil sump fastening capscrew | M8x1.25 | 25 |  |
| Oil drain cap | M18x1.5 | 35 |  |
| **FLANGE ASSEMBLY (1st PTO)** | | | |
| **Component** | **Thread (mm)** | **Torque (Nm)** | **Sealer** |
| Flange bell fastening capscrew | M10x1,5 | 50 |  |
| Flywheel fastening capscrew | M12x1,25 | 140 |  |
| **GEAR DISTRIBUTION** | | | |
| **Component** | **Thread (mm)** | **Torque (Nm)** | **Sealer** |
| Intermediate gear gudgeon fastening screw | M8x1.25 | 25 |  |
| Camshaft gear control fastening capscrew | M10x1 | 100 |  |
| Fastening nut on fuel injection pump gear | M14x1.5 | 65 |  |
| **ENGINE CYLINDER HEAD ASSEMBLY** | | | |
| **Component** | **Thread (mm)** | **Torque (Nm)** | **Sealer** |
| Air bleeding cap | M6x1 | 8 |  |
| Lifting brace fastening capscrew | M8x1.25 | 25 |  |
| Injector manifold | M12x1 | 30 |  |
| **Cylinder head fastening capscrew** | **M12x1.25** | **6 Torque cycles** |  |
| 1st Cycle |  | 40 |  |
| 2nd Cycle |  | 70 |  |
| 3rd Cycle |  | 100 |  |
| 4th Cycle |  | 90° |  |
| 5th Cycle |  | 90° |  |
| 6th Cycle |  | 90° |  |
| Rocker arm gudgeon fastening capscrew | M8x1,25 | 25 |  |
| Rocker arm cover fastening capscrew | M6x1 | 10 |  |
| **INJECTION SYSTEM** | | | |
| **Component** | **Thread (mm)** | **Torque (Nm)** | **Sealer** |
| Injector brace fastening capscrew | M8x1.25 | 20 |  |
| Waste line fastening drilled capscrew/nipple on Cyl. head | M6x1 | 14 |  |
| Waste line fastening drilled capscrew on injectors | M10x1 | 15 |  |
| Injector side injection tube nuts | M12x1.5 | 25 |  |
| Injection pump side injection tubes nuts | M12x1.5 | 25 |  |
| Injection pump fastening capscrew | M8x1.25 | 25 | Loctite 2701\* |
| Fuel injection pump locking screw | ... |  |  |
| Fuel delivery fastening drilled capscrew (on injection pump) | M10x1 | 25 |  |
| Waste line fastening drilled capscrew (on injection pump) | M10x1 | 25 |  |
| Bleeding screw injection pump (on waste line fastening drilled capscrew) | M6x1 | 22 |  |
| Fuel filter fastening capscrew | M8x1.25 | 22 |  |
| **INTAKE MANIFOLD** | | | |
| **Component** | **Thread (mm)** | **Torque (Nm)** | **Sealer** |
| Fastening screw intake manifold | M8x1.25 | 25 |  |
| Intake flange fastening capscrew | M8x1.25 | 25 |  |
| **EXHAUST MANIFOLD** | | | |
| **Component** | **Thread (mm)** | **Torque (Nm)** | **Sealer** |
| Exhaust manifold fixing stud | M8x1.25 | 25 |  |
| Exhaust manifold fixing nut | M8x1.25 | 25 |  |
| Exhaust flange/muffler fixing nut | M8x1.25 | 25 |  |
| **LUBRICATION CIRCUIT** | | | |
| **Component** | **Thread (mm)** | **Torque (Nm)** | **Sealer** |
| Oil filter fastening union | M20x1.5 | 15 | Loctite 2701\* |
| Oil filter | M20x1.5 | 15 |  |
| Oil pump carter fastening capscrew | TG6 | 10 |  |
| Carter distribution fastening capscrew | M8x1.25 | 25 |  |
| Fastening capscrew for plug on timing system cover | TG6 | 10 |  |
| Side oil load flange fastening capscrew (onto carter distribution) | TG6 | 10 |  |
| Pressure relief valve cap | M16x1.5 | 50 |  |
| Breather system cover fastening capscrew (on rocker arms cover) | M8x1.25 | 25 |  |
| **CRANKSHAFT PULLEY** | | | |
| **Component** | **Thread (mm)** | **Torque (Nm)** | **Sealer** |
| Crankshaft pulley fastening screw | M16x1.5 | 360 | Molyslip |
| **COOLANT CIRCUIT** | | | |
| **Component** | **Thread (mm)** | **Torque (Nm)** | **Sealer** |
| Thermostatic valve cover fastening capscrew | M6x1 | 10 |  |
| Coolant pump fastening capscrew | M8x1.25 | 25 |  |
| **ELECTRICAL COMPONENTS** | | | |
| **Component** | **Thread (mm)** | **Torque (Nm)** | **Sealer** |
| Coolant temperature sensor | M12x1.5 | 20 max. |  |
| Oil pressure switch | M12x1.5 | 35 |  |
| Sensor for water presence in fuel |  | 5 |  |
| Alternator bracket fastening capscrew | M8x1.25 | 25 |  |
| Alternator fastening capscrew | M8x1.25 | 40 |  |
| Alternator fastening capscrew | M10x1.5 | 69 |  |
| Starter motor fastening capscrew | M10x1.5 | 45 |  |
| Supply cable fastening nut (starter motor) | M8x1.25 | 10 |  |
| **CONTROLS** | | | |
| **Component** | **Thread (mm)** | **Torque (Nm)** | **Sealer** |
| Accelerator bracket fastening capscrew | M6x1 | 10 |  |

\* Alternatively to the capscrew replacements, with "Dri-loc"

|  |  |  |  |
| --- | --- | --- | --- |
| **OPTIONAL COMPONENTS (CHAP. 11)** | | | |
| **OIL DIPSTICK ON CYLINDER HEAD** | | | |
| **Component** | **Thread (mm)** | **Torque (Nm)** | **Sealer** |
| Oil dipstick tube fastening capscrew | M6x1 | 10 |  |
| **HEATER** | | | |
| **Component** | **Thread (mm)** | **Torque (Nm)** | **Sealer** |
| Flange intake with heater fastening capscrew | M8x1.25 | 22 |  |
| **ALTERNATOR WITH POLY-V BELT** | | | |
| **Component** | **Thread (mm)** | **Torque (Nm)** | **Sealer** |
| Pulley fastening capscrew | M10x1.5 | 48 |  |
| Pulley positioning blocking nut capscrew | M10x1.5 | 45 |  |
| Alternator brace fastening capscrew | M8x1.25 | 25 |  |
| Alternator fastening capscrew (upper) | M8x1.25 | 25 |  |
| Alternator fastening capscrew (lower) | M8x1.25 | 40 |  |
| Pulley sliding plate fastening capscrew | M8x1.25 | 25 |  |
| **IDLE GEAR (FOR 3TH /4TH PTO)** | | | |
| **Component** | **Thread (mm)** | **Torque (Nm)** | **Sealer** |
| Gear drilled fastening capscrew | M14x1.5 | Consultare il Par. >> | Molyslip |
| **3 TH PTO** | | | |
| **Component** | **Thread (mm)** | **Torque (Nm)** | **Sealer** |
| Pump support fastening capscrew | M8x1.25 | 25 | Loctite 2701\* |
| Pump fastening capscrew | M8x1.25 | 25 |  |
| **4 TH PTO** | | | |
| **Component** | **Thread (mm)** | **Torque (Nm)** | **Sealer** |
| Grooved crankshaft support fastening capscrew | M8x1.25 | 25 | Loctite 2701\* |
| Cover fastening capscrew (3 rd PTO side) | M8x1.25 | 25 |  |
| Sump support fastening capscrew | TG6 | 10 |  |
| Pump fastening capscrew | M8x1.25 | 25 |  |
| **BALANCE DEVICE (4 CYLINDERS)** | | | |
| **Component** | **Thread (mm)** | **Torque (Nm)** | **Sealer** |
| Housing closing panel fastening capscrew | M6x1 | 8 |  |
| Shafts support fastening capscrew | M10x1.5 | 50 |  |
| **REMOTE OIL FILTER** | | | |
| **Component** | **Thread (mm)** | **Torque (Nm)** | **Sealer** |
| Head fastening and Oil Cooler union on crankcase | M20x1.5 | 25 | Loctite 2701\* |
| Crankcase head nipple and oil filter support | M14x1.5 | 40 |  |
| Tube union on crankcase head | G3/8 | 30 |  |
| Tube union on filter support | G3/8 | 35 |  |
| Oil filter | M20x1.5 | 20 |  |
| Filter support head air bleeding cap | M8x1.25 | 25 |  |
| **INTAKE CIRCUIT** | | | |
| **Component** | **Thread (mm)** | **Torque (Nm)** | **Sealer** |
| Air filter support plate fastening capscrew (on flange bell) | M8x1.25 | 25 |  |
| Air filter support fastening capscrew | M8x1.25 | 25 |  |
| **EXHAUST CIRCUIT** | | | |
| **Component** | **Thread (mm)** | **Torque (Nm)** | **Sealer** |
| Muffler brace support fastening capscrew | M8x1.25 | 25 |  |
| Muffler fastening capscrew on muffler | M8x1.25 | 25 |  |
| Muffler fastening nut | M8x1.25 | 25 |  |
| **COOLING CIRCUIT** | | | |
| **Component** | **Thread (mm)** | **Torque (Nm)** | **Sealer** |
| Blower fastening capscrew | M6x1 | 10 |  |
| Radiator support fastening capscrew | M16x1.5 | 150 |  |
| Shroud radiator fastening capscrew | M6x1 | 10 |  |
| Radiator lower brace fastening capscrew | M8x1.25 | 25 |  |
| Radiator on anti-vibrating | M8x1.25 | 25 |  |
| Anti-vibrating radiator fastening nut (on lower brace) | M8x1.25 | 25 |  |
| Anti-vibrating and brace fastening capscrew (upper) | M6x1 | 10 |  |
| Upper brace fastening capscrew (on engine cylinder head) | M8x1.25 | 25 |  |
| Side bulkheads fastening capscrew | M6x1 | 10 |  |
| **ENGINE SUPPORT** | | | |
| **Component** | **Thread (mm)** | **Torque (Nm)** | **Sealer** |
| Side feet fastening capscrew (on flange bell or crankcase) | M12x1.75 | 50 |  |
| Rear feet fastening capscrew | M16x1.5 | 200 |  |
| **OIL SUMP WITH SUPPORTING STRUCTURE** | | | |
| **Component** | **Thread (mm)** | **Torque (Nm)** | **Sealer** |
| Flange bell fastening capscrew | M10x1.5 | 85 |  |
| Flange bell fastening capscrew | M16x2 | 270 |  |
| Oil sump fastening capscrew | M8x1.25 | 47 |  |
| By-pass tube fastening capscrew | M6x1 | 10 |  |

