WORKSHOP MANUAL

FOR 4.C ENGINES ZETOR

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This is for regular Zetor service network only.
This is for regular Zetor service network only.
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Preface:

This manual is intended for expert engineers, responsible for job performance on engines of ZETOR Proxima and Forterra tractors. It contains all information concerning these engines with force to inspections, revisions and regulating operations, and the most important instructions for dismantling and reassembly.

The service manual is an aid for expert, who participated in training, eventually superstructural courses, being regularly organized in plant training centre. Based on this manual he will be able to perform rationally and properly the necessary interventions to these engines.

The content of this manual is then a footing for worker repairing if he needs to confirm his working procedure. It should be matter of fact that any workshop will have this manual at its disposal in order to find out the desirable information if need required.

The manual is designed for engines of FORTERRA tractor of types 1204, 1004, 1304, 1404, and in introductory chapters 1 and 2 as well as for engine parts with same design, i.e. for engines of PROXIMA tractors type 7204, 1104, and 1204. In conclusion of manual chapters 3 and 4 the differences of PROXIMA 7204, 1104, and 1204 motors are stated.

Our thanks belong to all those who will come up with practical experience to completion of our publications.

Neither text and figures included in this manual, nor their parts have to be reproduced without publisher's approval.

The manufactured engines are gradually innovated. Considering time delays between performed innovations and last edition of service manual the data in this manual can partly differ from actual engine design. In such case contact us, please, for data specification.
IMPORTANT INTRODUCTORY REMARKS

From the reason of close understanding the figures are made without gloves and special descriptions regarding safety measures, which have to be performed. Besides the common precautions and expert procedures it is necessary to follow below mentioned common rules.

- During dismantling and assembly works it is necessary to adopt all safety measures and measures of antiraymatic prevention prescribed by EEC directives; especially no use of any unprepared or worn tools; to pull on the gloves impervious for lubricants and fuels; to maintain clear floor free of lubricant layers; to wear suitable working clothes and antiskid footwear etc.

- If we get dirty by lubricating oil or engine oil it is necessary to change immediately the soiled clothes and rinse the affected body parts thoroughly by water.

- Do not deposit the lubricants or engine fuels, sealing or other substances classified as hazardous waste by relevant regulations of single countries, but dispose the waste as per regulations.

- Dismantling, assembly, and inspection works described in this manual will be carried out on engines dismantled from tractor and placed on working rack.

- Before engine attaching on working rack it is required to ensure all holes (inlet, outlet, holes of turbocharger eventually compressor, holes for fuel and lubricating oil etc.) and to clean the engine properly.

- For this operation steam, hot water under pressure can be used on highly fouled places followed by kerosene or special grease-solvent products. Then dry engine by LP air stream (2 or 3 bars) and treat them by thin film of lubricating oil or antioxidant agent.

- Before engine attaching on working rack dismantle from engine all external parts of accessories, which interfere with fixtures on working rack or unable to be dismantled (starter, fan, alternator).

- Before engine dismantling in order to check the injection pump, nozzles, and cams it is necessary to identify the basic specifications (engine type, serial number, type of injection pump, type of injection nozzle). Here it is important to observe the data stated on the first pages of this manual, follow described procedures.

service network only
INSTRUCTIONS FOR MANUAL APPLICATION

1. Dismantling and Assembly of Complex Assembly Groups

   (1) For dismantling and reassembly of complete structural units the performed works and used methods are described fully in single steps. If the exactly same steps in reverse order are required at reassembly opposite to dismantling these steps are not described.

   (2) Any special method used only for fitting-in are marked with symbol: [ ].

   This symbol is also mentioned at the end of each important dismantling stage in order to show, what part intended for assembly the relevant information is concerned with.

   For example:

   DISMANTLING OF GROUP:

   !: ..............................................................

   Name of procedure

   Safety standards to be followed during execution of described operation.

   1 – Removal of component (1): .........................

   Stage of procedure

   ⋆: ..............................................................

   Technique or important action to be followed during component dismantling.

   2 – Separate before connection (2) [1]: ..............

   It is notified that the applicable technical specifications are at the disposal.

   ⚠️: ..............................................................

   Discharge of oil, liquid or fuel and discharged quantity reporting.

   For example:

   INSTALLATION OF GROUP:

   ⋆: ..............................................................

   Name of procedure

   Technique used during assembly.

   ⋆: ..............................................................

   Technique or important action to be followed during component assembly.

   ⚠️: ..............................................................

   Oil or liquid filling and required quantity.

2. List of Special Tools

   (1) Concerning the descriptions, order number and number of tool pieces, stated in working procedures (T1, T2, etc.) see list of “SERVICE TOOLS”.

3. Tightening Torques

   1 – In working procedures the symbol  \( \frac{\text{Nm}}{} \) is valid for special tightening torque based on examined values and to be essentially followed.

   2 – If no symbol is given the values defined in part STANDARD TIGHTENING TORQUES FOR BOLTS AND NUTS* should be observed for used tightening torques.
APPLICATION AND UPDATING OF MANUAL

1. UPDATE OF MANUAL
   Authorized dealers will be immediately informed about addenda, revisions or alterations. Before
   commencing of revisions it is necessary to refer to the latest updating of information, because it can contain
   the additional data compared with previous edition.

2. ARCHIVING OF UPDATES
   1 – Check number of pages and insert a page in continuing order with respect to the described group and
      page section in manual.

   2 – Additional pages: These will be marked by means of pause (,) and sequence number as per number of
       pages. Example:

       5
       5-1
       5-2
       6

       Additional pages

       INSTRUCTION: The additional pages should be properly numbered in order to prevent a compliance
       with existing pages.

   3 – Pages for edition updating: These pages require to be displayed by sequence number within one
       cycle; the corresponding symbol is located below number of pages. Example:

       5
       5-1  – Original page
       5-1  – Page of updates
       0
       5-2  – Original page

       INSTRUCTION: All additional pages, pages and pages with updates will be given in the list of
       manual that is newly filled with any update and it requires to be included in place of previous list.

3. SYMBOLS USED IN MANUAL
   For easier use of manual the important data for safety of technicians and job quality will be marked by
   symbols given in the following table.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>⚠️ ⚠️</td>
<td>Safety</td>
<td>During job performance the appropriate safety measures should be carried out.</td>
</tr>
<tr>
<td>⚠️ ✓</td>
<td>Attention</td>
<td>During job performance the special methods are used other instructions observed to make provision for standard values</td>
</tr>
<tr>
<td>👍</td>
<td>Weight</td>
<td>Weight of important building groups. Choose lifting ropes as per actual demands; job performance requires suitable protective systems etc.</td>
</tr>
<tr>
<td>🎯</td>
<td>Tightening torque</td>
<td>Keeping of special tightening torques for corresponding parts at installation or assembly.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>🎯</td>
<td>Lubrication</td>
<td>Structural parts of tractor, where adhesives, lubricants should be used.</td>
</tr>
<tr>
<td>🎯</td>
<td>Oil, water</td>
<td>Points of oil, water or other fuel filling with statement of applicable quantities</td>
</tr>
<tr>
<td>🎯</td>
<td>Discharge</td>
<td>Points for oil, coolants or fuel discharge and indication of discharge quantity</td>
</tr>
</tbody>
</table>

This is for regular Zetor service network.
The tractor parts with weight over 25 kg or significantly bigger must be lifted and transported by means of suitable lifting device and steel ropes eventually belts from polyester fibers. In sections with descriptions from dismantling and assembly of groups and parts the lifted load is marked by following symbol:

STEEL ROPES – BELTS

- Use always suitable steel ropes or polyester belts as per weight of lifted parts, while it is necessary to observe the following table:

<table>
<thead>
<tr>
<th>Ø rope (mm)</th>
<th>STEEL ROPES (standard type &quot;S&quot; or &quot;Z&quot;, twisted)</th>
<th>Polyester belts (with slot holes – simple design)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Load capacity (kg)</td>
<td>Width (mm)</td>
</tr>
<tr>
<td>8</td>
<td>650 620 500</td>
<td>25</td>
</tr>
<tr>
<td>10</td>
<td>1000 740 1420</td>
<td>50</td>
</tr>
<tr>
<td>12</td>
<td>1450 2500 2050</td>
<td>62</td>
</tr>
<tr>
<td>14</td>
<td>2000 3460 2820</td>
<td>75</td>
</tr>
<tr>
<td>16</td>
<td>2600 4500 3670</td>
<td>100</td>
</tr>
<tr>
<td>18</td>
<td>3300 5710 4660</td>
<td>150</td>
</tr>
</tbody>
</table>

NOTE: The load capacity was calculated by using of safety factor.

- The ropes and belts require to be slung in the centre of lifting hook. If the connection is shifted to side it is impossible to eliminate the load slipping while lifted.
- In no case lift the heavy load by only one rope. Use always two or more symmetrically spaced ropes.
- If the load hangs only on one rope its rotation, unwinding or slipping down should not be expelled. This can cause serious accidents.
- The weight of permissible loading is reduced if the ropes make together a blunt angle.

The permissible weight (kg) is reduced with raising angle of loading: the following diagram illustrates the change of permissible weight (as per suspension angle) for two ropes with Ø 10 mm and load capacity of 1000 kg.
STANDARD TIGHTENING TORQUES FOR BOLTS AND NUTS

The special tightening torques for important tractor parts and mounting carried out accord. to specified procedures are given in separate sections regarding the assembly of applicable parts.

The given tightening torques are applied to assembly with bolts and nuts free of lubrication, but with eventual anaerobic adhesives on thread.

The given values are considered for mounting on materials from steel or cast iron; at softer materials e.g. aluminium, copper or plastic etc. the tightening torques must be reduced by 50%.

<table>
<thead>
<tr>
<th>THREAD SIZE</th>
<th>CLASS OF BOLT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8.8</td>
</tr>
<tr>
<td></td>
<td>Nm</td>
</tr>
<tr>
<td>M6x1</td>
<td>8.0 – 8.8</td>
</tr>
<tr>
<td>M8x1.25</td>
<td>19.4 – 21.4</td>
</tr>
<tr>
<td>M10x1.5</td>
<td>38.4 – 42.4</td>
</tr>
<tr>
<td>M12x1.75</td>
<td>66.5 – 73.5</td>
</tr>
<tr>
<td>M14x2</td>
<td>106 – 117</td>
</tr>
<tr>
<td>M16x2</td>
<td>154 – 182</td>
</tr>
<tr>
<td>M18x2.5</td>
<td>228 – 252</td>
</tr>
<tr>
<td>M20x2.5</td>
<td>321 – 355</td>
</tr>
<tr>
<td>M22x2.5</td>
<td>441 – 487</td>
</tr>
<tr>
<td>M24x3</td>
<td>553 – 611</td>
</tr>
<tr>
<td>M27x3</td>
<td>816 – 902</td>
</tr>
<tr>
<td>M8x1</td>
<td>20.8 – 23.0</td>
</tr>
<tr>
<td>M10x1.25</td>
<td>40.6 – 44.8</td>
</tr>
<tr>
<td>M12x1.25</td>
<td>72.2 – 79.8</td>
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<tr>
<td>M12x1.5</td>
<td>69.4 – 76.7</td>
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<td>M14x1.5</td>
<td>114 – 126</td>
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<td>M16x1.5</td>
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<td>M18x1.5</td>
<td>256 – 282</td>
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<td>M20x1.5</td>
<td>355 – 393</td>
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<td>M22x1.5</td>
<td>482 – 532</td>
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<td>M24x2</td>
<td>602 – 666</td>
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<td>Bottom cover</td>
<td>11</td>
</tr>
<tr>
<td>Rear cover</td>
<td>11</td>
</tr>
<tr>
<td>Front cover</td>
<td>11</td>
</tr>
<tr>
<td>Connecting rod</td>
<td>110 - 120</td>
</tr>
<tr>
<td>Flywheel</td>
<td>70 - 80</td>
</tr>
<tr>
<td>Pulley – no power consumption</td>
<td>150 - 170</td>
</tr>
<tr>
<td>Pulley – no power consumption</td>
<td>240 - 260</td>
</tr>
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<td>PROXIMA suction pipe</td>
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<td>Head of cylinders</td>
<td>160 - 180</td>
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<td>Ignitors</td>
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<td>Fuel filter</td>
<td>22</td>
</tr>
<tr>
<td>Compressor</td>
<td>15</td>
</tr>
<tr>
<td>Compressor wheel</td>
<td>180 - 200</td>
</tr>
<tr>
<td>Water pump</td>
<td>15</td>
</tr>
<tr>
<td>Balancer</td>
<td>23 - 26</td>
</tr>
<tr>
<td>Turbocharger M10</td>
<td>45 - 50</td>
</tr>
<tr>
<td>Turbocharger M8</td>
<td>20 - 25</td>
</tr>
<tr>
<td>Exhaust bend</td>
<td>50 - 60</td>
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<tr>
<td>Exhaust manifold</td>
<td>50</td>
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<tr>
<td>Suction manifold</td>
<td>26</td>
</tr>
<tr>
<td>Charging line</td>
<td>15</td>
</tr>
<tr>
<td>Coupling LUK M8</td>
<td>23 - 26</td>
</tr>
<tr>
<td>Coupling LUK M10</td>
<td>46 - 51</td>
</tr>
</tbody>
</table>
SERVICE TOOLS

78.942.001
Universal puller

78.942.002
Jig for pressing-on of front crankshaft Gufero gasket

78.942.003
Jig for pressing-on of rear crankshaft Gufero gasket

78.942.004
Podger for clutch disks centering - universal

78.942.005
Podger for clutch disk centering
78.942.008
Puller of insertion cylinders

78.942.010
Jig for compression of valve springs

78.942.011
Wrench for flange of injection pump

78.942.012
Holder of injection pump nuts

78.942.014
Puller of clutch bearing
78.942.020
Guide ring to piston 105

78.942.030
Pusher of balancing shaft bearings

78.942.035
Jig for pressing on of rear crankshaft Gufero gasket

*Note: with dismantled rear cap*

78.942.952
Wrench for nut of injection pump flange

*Note: for EKO engines – use with tool 78.942.011*
ENGINE PARAMETERS AND LOCATION OF SERIAL NUMBER

NOTE: The indications RIGHT and LEFT apply to engine in front view – from pulley (i.e. from cylinder 1).

The engine type and corresponding serial number (between ★ symbols) are indicated on engine block left side close to injection pump.

In addition to manufacturer's trademark the parameters include the following indications:

1 – Engine type
2 – Serial number

The serial number is also placed on plate in tractor cabin.
**MAIN TECHNICAL SPECIFICATIONS**

**TECHNICAL SPECIFICATIONS OF FORTEZRA Z 11741.4C TRACTOR ENGINES**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
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<tbody>
<tr>
<td>Tractor type</td>
<td>Z 11741.4C</td>
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<tr>
<td>Engine type</td>
<td>1504</td>
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<tr>
<td>Kind of engine</td>
<td>diesel, four-stroke with direct fuel injection, supercharged engine</td>
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<tr>
<td>Engine design</td>
<td>cylinder in-line vertical water-cooled engine</td>
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<tr>
<td>Number of cylinders</td>
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</tr>
<tr>
<td>Cylinder capacity</td>
<td>cm³</td>
</tr>
<tr>
<td>Bore x stroke</td>
<td>mm</td>
</tr>
<tr>
<td>Rated speed</td>
<td>min⁻¹</td>
</tr>
<tr>
<td>Injection order</td>
<td></td>
</tr>
<tr>
<td>Compression ratio</td>
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</tr>
<tr>
<td>Max. overrun speed</td>
<td>min⁻¹</td>
</tr>
<tr>
<td>Idle speed</td>
<td>min⁻¹</td>
</tr>
<tr>
<td>Net engine power at rated speed measured as per ISO 2288</td>
<td>kW</td>
</tr>
<tr>
<td>Specific fuel consumption at given engine power</td>
<td>g.kW⁻¹.h⁻¹</td>
</tr>
<tr>
<td>Max. torque (Ml)</td>
<td>Nm</td>
</tr>
<tr>
<td>Elevation Mt</td>
<td>%</td>
</tr>
<tr>
<td>Engine lubrication</td>
<td>forced with Gerotor pump</td>
</tr>
<tr>
<td>Maximum oil consumption after 10---0 Mh of engine run</td>
<td>g.kW⁻¹.h⁻¹</td>
</tr>
<tr>
<td>Oil pressure at rated engine speed and oil temperature 80°C</td>
<td>MPa</td>
</tr>
<tr>
<td>Minimum oil pressure at engine speed 750 min⁻¹ and oil temperature 80°C</td>
<td>MPa</td>
</tr>
<tr>
<td>Maximum temperature of coolant</td>
<td>°C</td>
</tr>
<tr>
<td>Kind of overhead valves</td>
<td>OHV</td>
</tr>
<tr>
<td>Oil filter</td>
<td>full-flow and single-use</td>
</tr>
<tr>
<td>Fuel filter</td>
<td>one-stage with removable cartridge</td>
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<tr>
<td>Type of injection pump</td>
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<tr>
<td>Injection valve</td>
<td>VA 76S 180-3030</td>
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<tr>
<td>Nozzle type</td>
<td>DOP150x526-4150</td>
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<tr>
<td>Opening pressure of injectors</td>
<td>MPa</td>
</tr>
<tr>
<td>Advance angle of shots</td>
<td>°</td>
</tr>
<tr>
<td>Valve clearance at cold engine suction</td>
<td>mm</td>
</tr>
<tr>
<td>- exhaust</td>
<td>mm</td>
</tr>
</tbody>
</table>
### MAIN TECHNICAL PARAMETERS

| TECHNICAL SPECIFICATION OF FORterra Z 8641, Z 9641, Z 10641, Z 11441 TRACTOR ENGINES |
|-----------------------------------------------|-----------------|----------------|----------------|----------------|
| Tractor type | Z 8641 | Z 9641 | Z 10641 | Z 11441 |
| Engine type | 1204 | 1004 | 1304 | 1404 |
| Kind of engine | diesel, four-stroke with direct fuel injection, supercharged engine | | | |
| Engine design | cylinder in-line vertical water-cooled engine | | | |
| Number of cylinders | 4 | 4 | 4 | 4 |
| Cylinder capacity \( cm^3 \) | 4156 | 4156 | 4156 | 4156 |
| Bore x stroke \( mm \) | 105x120 | 105x120 | 105x120 | 105x120 |
| Rated speed \( min^{-1} \) | 2200 | 2200 | 2200 | 2200 |
| Injection order | 1-3-4-2 | 1-3-4-2 | 1-3-4-2 | 1-3-4-2 |
| Compression ratio | 17 | 17 | 17 | 17 |
| Max. overrev speed \( min^{-1} \) | 2460 | 2460 | 2460 | 2460 |
| Idle speed \( min^{-1} \) | 750±25 | 750±25 | 750±25 | 750±25 |
| Net engine power at rated speed measured as per ISO 2288 \( kw \) | 60 | 66 | 74 | 81 |
| Specific fuel consumption at given engine power \( g.kW^{-1}.h^{-1} \) | 253 | 254 | 252 | 257 |
| Max. torque (Mk) \( Nm \) | 351 | 391 | 440 | 480 |
| Elevation Mt \( \% \) | 35 | 36 | 37 | 36 |
| Engine lubrication | forced with Gear oil pump | | | |
| Maximum oil consumption after 100 Mh of engine run \( g.kW^{-1}.h^{-1} \) | 0.7 | 0.7 | 0.7 | 0.7 |
| Oil pressure at rated engine speed and oil temperature 80°C \( MPa \) | 0.2 | 0.5 | 0.2 | 0.5 |
| Minimum oil pressure at engine speed 750 min^{-1} and oil temperature 80°C \( MPa \) | 0.05 | 0.05 | 0.05 | 0.05 |
| Max. temperature of coolant \( ^o C \) | 106 | | | |
| Kind of overhead valves | OHV | | | |
| Oil filter | full-flow and single-use | | | |
| Fuel filter | one-stage with removable cartridge | | | |
| Type of injection pump | PP4M10P1T3423 | PP4M10P1T3735 | PP4M10P1T3734 | PP4M10P1T3733 |
| Injection valve | VA 76S 160-3026 | VA 76S 160-3026 | VA 76S 160-3026 | VA 76S 160-3026 |
| Nozzle type | DOP 150 S 428-4104 | DOP 150 S 428-4104 | DOP 150 S 428-4104 | DOP 150 S 428-4104 |
| Opening pressure of injectors \( MPa \) | | 22-0.8 | | |
| Advance angle of shots | | 12 | | 9 |
| Valve clearance at cold engine - suction \( mm \) | 0.25±0.05 | 0.25±0.05 | 0.25±0.05 | 0.25±0.05 |
| - exhaust \( mm \) | 0.25±0.05 | 0.25±0.05 | 0.25±0.05 | 0.25±0.05 |
### MAIN TECHNICAL PARAMETERS

#### TECHNICAL SPECIFICATION OF PROXIMA Z 6421, 7421, Z 8441 TRACTOR ENGINES

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Z 6421/Z 6441</th>
<th>Z 7421/Z 7441</th>
<th>Z 8421/Z 8441</th>
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<td>Z 7421/Z 7441</td>
<td>Z 8421/Z 8441</td>
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<td>1204</td>
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<tr>
<td>Engine design</td>
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<tr>
<td>Number of cylinders</td>
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<td>4</td>
<td>4</td>
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<td>Cylinder capacity</td>
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<td>105x120</td>
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<td>2200</td>
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<tr>
<td>Compression ratio</td>
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<td>17</td>
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<tr>
<td>Max. overrun speed</td>
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<td>Net engine power at rated speed measured as per ISO 2288</td>
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<td>Specific fuel consumption at given power</td>
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<td>Engine lubrication</td>
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<td>Maximum oil consumption after 100 Mh of engine run</td>
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<td>0.7</td>
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<td>Oil pressure at rated engine speed and oil temperature 80°C</td>
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<td>0.2 - 0.5</td>
<td>0.2 - 0.5</td>
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<tr>
<td>Minimum oil pressure at engine speed 750 mm⁻¹ and oil temperature 80°C</td>
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<tr>
<td>Max. temperature of coolant °C</td>
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<td>Kind of overhead valves</td>
<td>OHV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil filter</td>
<td>full flow and single-use</td>
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</tr>
<tr>
<td>Fuel filter</td>
<td>one-stage with removable cartridge</td>
<td></td>
<td></td>
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<tr>
<td>Type of injection pump</td>
<td>PP4M10P1F 3420</td>
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<tr>
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<td>11</td>
<td>12</td>
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<td>Valve clearance at cold engine</td>
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<td></td>
<td></td>
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<td>- suction mm</td>
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<td>0.25±0.05</td>
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<tr>
<td>- exhaust mm</td>
<td>0.25±0.05</td>
<td>0.25±0.05</td>
<td>0.25±0.05</td>
</tr>
</tbody>
</table>
This is for regular Zetor service network only.

1. DISMANTLING OF ENGINE
1.1 PREPARATORY Dismantling Operations
(valid for engines FORterra 1204, 1004, 1304, 1404, 1504 only)

1. Remove before engine dismantling:
   - Starter
   - Radiator fan and drive belts
   - Alternator
   - A/C compressor

2. Hook up the motor to lifting device and place on suitable rack for servicing for fixing and rotating.

3. Fix the podger for "A" (78.942.005) clutch centering to the centre hole of crankshaft.

4. Unscrew the bolts (1) along shield periphery and remove clutch shield (2).
   - Release the bolts gradually crosswise and evenly.

5. Pull out the disk (3) by podger for "A" clutch centering, "A".

---

Zetor

22
6. At first hook up the flywheel to lifting device. Unscrew the bolts (5) attaching the flywheel (4) to the crankshaft.

7. Release the flywheel by means of levers and pull it out from crankshaft.
   ★ To release the flywheel use the levers on both sides.

8. Discharge oil from crankcase by discharge hole. Release five nuts of sump bolts. Unscrew the nuts as well as peripheral sump bolts and remove the sump (6).

9. Unscrew nine bolts (7) of crankshaft cover.
10 - Release the cover from pins in case by tapping of copper mallet to cover edge.

11 - Dismantle the cover together with gasket by means of two levers.
1.2 Dismantling of Suction and Exhaust Manifolds (valid for engines FORTELLA 1204, 1004, 1304, 1404, 1504 only)

1 - Unscrew nuts (1) fixing the ejector (2) of air inlet from intercooler.

2 - Remove the ejector (2) with gasket from suction manifold (1).

3 - Unscrew and remove the bolts (3) of suction manifold.

4 - Disconnect a supply to overpressure corrector (1).

5 - Remove suction manifold and gasket.

★ Use new gasket when reassembling.

6 - Unscrew two bolts (4) of pipe supplying oil from cooler to turbocharger.
7 - Release and unscrew the cap nut (5) of oil line (6) and dismantle the line.

8 - Unscrew three bolts (7) attaching the exhaust bend (8) to the exhaust manifold.

9 - Release clips (9) and remove the rubber hose (10) from oil line.

10 - By light swinging disconnect an elbow from turbocharger and remove the sealings (12). When four nuts (13) on exhaust manifold are released, remove the turbocharger (14) and dismantle the exhaust manifold (15).
1.3 DISMANTLING OF FUEL LINE, INJECTORS AND IGNITERS  
(valid for all types of PROXIMA and FORTERRA engines)

1 - Release and unscrew the bolts (1) fixing the cover of cylinder head (2).

2 - Remove the cover of cylinder head together with cover gasket (3).

3 - Release and unscrew the cap nut (4) of injection pipes on injectors (5).
4 - Release and unscrew the bolts (6) of holders (7) of injection pipes.

5 - Release and unscrew the cap nut (8) of injection pipes on injection pump and remove them.

6 - Unscrew hollow screws (9) of fuel waste from injectors and remove all fuel waste hoses (10).

7 - Release and unscrew nuts (11) of calipers of injectors (12) and remove injectors (13) with gaskets.
   ★ Protect inlet fuel holes and injector nozzle by plugs to prevent impurities from getting inside.

8 - Release nuts (14) on igniters and remove the cables (15) of igniters.
9. Remove carefully the igniters (16) from cylinder head.

This is for regular Zetor service network only.
1.4 REMOVAL AND DISMANTLING OF CYLINDER HEAD
(valid for all types of PROXIMA and FORTERRA engines)

1 - Release and unscrew the bolts (1) of rocker arm support (2).

2 - Remove the assembly of arms (3) from cylinder head (4).

3 - Remove the push rods (5) from cylinder head (6).
4. Unscrew and remove the nuts (7) and washers (8) from bolts of cylinder head.

5. Remove cylinder head and its gasket. Set aside the cylinder head out of engine base.

6. Release and unscrew the bolts (9) of thermostat body cover (9).

7. Remove gasket (10) and dismantle the thermostat (11).

8. Release and unscrew the bolts (12) attaching thermostat body (13) to the cylinder head.
9 - Remove thermostat body (13) and gasket on cylinder head (14).

10 - Before dismantling of valves measure the size of valve depth to the plane of cylinder head.

★ At suction and exhaust valve the distance is "A" 0.6 to 0.8mm. The pressing force of springs will be reduced by higher values.

11 - Check the valve tightness by liquid. It should not diffuse through valve.

★ Replace the valve seat and valve in case of higher "A" value or liquid diffusion.

12 - Compress gradually the springs (16) of suction and exhaust valves by means of jig (78.942.010) for dismantling of valve springs (15).

13 - Remove split valve plug (17).
14 - Remove the internal valve plate (18), valve spring plate (19), external valve spring (20), internal valve spring (21), and valve (22).

15 - Remove gasket (23) from line of suction valve.
1.5 DISMANTLING OF VALVE CONTROL GEAR
(valid for all types of PROXIMA and FORTERRA engines)

1 - Remove the circlip (1) from rocker arm pin (2) and spring washer (3).

2 - Remove the arm of suction valve (4), bracket (5) and arm of exhaust valve (6).

3 - Remove expansion spring (7) and proceed in the same way up to last rocker arm bracket (8).

4 - Press the positioning pin on the last bracket (9) and pull out the bracket (8).

⚠️ ATTENTION!! Pin (9) closes lubricating channel as well!!
1.6 REMOVAL AND DISMANTLING OF WATER PUMP (valid for all types of PROXIMA and FORTERRA engines)

1. Remove rubber gasket (1) staying in pump body (2) after dismantling of thermostat housing.

2. Release and unscrew the nuts (3) fixing pump to the crankcase.

3. Remove pump (2) together with gasket (4). Replace the gasket for new one after disassembly.
4 - Release and unscrew the bolts (5) fixing bearing body (6) to the pump body (2).

5 - By means of puller (70.942.001) remove the pulley of (7) cooling pump.

6 - Dismantle then the circlip (3).

7 - Press out the bearing with shaft from pump bearing body and remove an impeller (8).
8. After removal of impeller press out the shaft thrust plain seal (4).

⚠️ After any dismantling the shaft seal should be replaced by a new one!
1.7 REMOVAL OF FRONT COVER
(valid only for FORTERRA 1204, 1004, 1304, 1404, 1504 engines)

1 - Release and unscrew the bolt (1) fixing pulley to the crankshaft.

2 - Pull out the pulley from crankshaft by puller (78.942.001) fixed in threads (2).

3 - Rotate the engine and remove a suction basket (8) and its spring from suction pipe.

4 - Unscrew bolts (9) of suction (10) and discharge tubes (11). Remove both pipes from engine.
5 - Release and unscrew all bolts along circumference of the front cover (11). Release the front cover from register pins by slight hammering. Remove the cover.

6 - Remove the centring pin (12) from crankshaft if used. Unscrew the nut (13) fixing gear wheel (14) of injection pump drive. Rotate the nut and pull out the wheel from injection pump shaft (15) by nut screwing.

7 - In case of low lubricating pressure or failure of oil pump dismantle the pump.

8 - Release and unscrew the nut (17) fixing gear wheel (18) to the compressor drive and remove the wheel.

★ In case of no compressor repair it is not necessary to dismantle the geared wheel (18).

9 - Release and unscrew the bolts (19) and remove the compressor (20) from crankcase.
1.8 DISMANTLING OF COMPRESSOR
(valid for all types of PROXIMA and FORTERRA engines)

1 - Release and unscrew the nuts (1) fixing compressor cylinder head (2).

2 - Remove gasket under head (3), lip valve (4) and gasket under valve.

3 - Remove compressor cylinder (5) and cylinder liner gasket (6).
4. Dismantle plug (7) in compressor housing and cap on housing. Then release connecting rod bolts.

5. Remove the connecting rod assembly (9) with piston (10) and piston pin (29) from compressor housing.

6. Press out the crankshaft (12) together with bearing (13) from crankcase. After removal of circlip (14) press out also the bearing (15).
1.9 REMOVAL OF PISTONS AND CYLINDER LINER
(valid for all types of PROXIMA and FORTERRA engines)

1 - Release and unscrew the bolts (1) of connecting rod cover (2) of the first and fourth cylinders.

2 - Release the connecting rod cover from centering pins by light hammering and remove it.
   ★ Scrape off the layer of hard carbon from top parts of cylinder liners.

3 - Rotate by crankshaft by 180° and press out the connecting rod with pistons from cylinder liner by suitable tool (3). Remove bearing shell from connecting rods and their covers.
4. After removal of connecting rods (4), take care that connecting rod cover (2) would be always joined to the proper connecting rod. Both parts are of the same marking.

5. Dismantle the connecting rods with pistons of the second and third cylinders in the same procedure.

2. Press out all cylinder liner by the same tool (78.942.008).
1.10 REMOVAL OF CRANKSHAFT
(valid for all types of PROXIMA and FORTERRA engines)

1. Before dismantling of crankshaft measure an end clearance of crankshaft bearing by means of indicator (1). Make the axial motion of crankshaft by lever (2).

* The maximum permissible end clearance is 0.10 mm to 0.24 mm.

2. Unscrew the bolts (3) of main bearing cap and release the cap by slight hammering. Remove them from centring sleeves.

* The caps are marked. Observe the correct order for next reassembly. If the caps are not marked do it for reassembly.
3. Release the cap of rear bearing and remove it. Remove the bottom thrust plain bearing.

4. Attach the lifting device to crankshaft and remove it carefully from crankcase.

5. Remove top thrust bearing and upper brasses (6) from crankshaft bearings.
   - Mark out the positions of slide bearings for subsequent check and reassembly.
1.11 REMOVAL OF CAMSHAFT AND BALANCERS (valid for all types of PROXIMA and FORTERRA engines)

1. Unscrew two bolts (4) of camshaft locking washer.

2. Push out the camshaft (3) assembly from crankcase. Check all surfaces (2) in crankcase, where the cam shaft is placed.

3. Remove the cam followers (7) from engine block.
   ★ Check the surface of followers touching the cams. This surface should be fully smooth, otherwise the followers are to be replaced.
4. Unscrew two bolts (1) of mounting adapters (2) at each balancer.
   ★ Dismantle both balancers together with gear wheels and adapters.

5. Take out the left balancer (3) a right balancer from case.
   ★ The left gear wheel has marked tooth 56° from feather groove.
   ★ The right gear wheel has marked tooth 19° from feather groove.
6. Pull out the gear wheels (4) from shafts by means of puller and push out the feather keys.

7. The needle bearings (5) are to be pressed out from case only if damaged.
1.12 REMOVAL OF INJECTION PUMP
(valid for all types of PROXIMA and FORTERRA engines)

1 - Disconnect the lever rod (1) of fuel control.
   Disconnect the hoses of fuel feed and discharge.

2 - Disconnect the gear wheel (3) of injection pump
   drive by pushing out from cone on pump shaft.
   Unscrew a mounting nut (4), turn it and push out
   the wheel (3) from pump shaft by back screwing.

⚠ The given procedure is valid also in case of
   engine mounted in tractor.

3 - Unscrew hex nuts (5) attaching the pump body to
   crankcase.

4 - Release and unscrew pentagonal nut (6) beyond
   injection pump by means of special wrench
   (78.942.011 +78.942.952).
## 2. ENGINE ASSEMBLY

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
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<tr>
<td><strong>1.</strong></td>
<td>All works during engine assembly must be done on clean mounting table in clean environment.</td>
</tr>
<tr>
<td><strong>2.</strong></td>
<td>Before starting of assembly remove all carbon accretions, old sealing cement etc. from parts to be used again. Blow out all oil line by compressed air.</td>
</tr>
<tr>
<td><strong>3.</strong></td>
<td>Before assembly, lubricate slightly all parts by engine oil except of bolts, if not specified otherwise.</td>
</tr>
<tr>
<td><strong>4.</strong></td>
<td>This rule is not valid for cylinder liners and appropriate o-rings and seal seats. The cylinder liners are to be inserted to block in accordance with mounting instructions.</td>
</tr>
<tr>
<td><strong>5.</strong></td>
<td>When assembling the bushings of main bearing, connecting rod bearings for crankshaft pin make sure that lubricating holes are properly oriented.</td>
</tr>
<tr>
<td><strong>6.</strong></td>
<td>Remove always excess sealants.</td>
</tr>
</tbody>
</table>
2.1 ASSEMBLY OF COOLING PISTON NOZZLES (valid for all types of PROXIMA and FORterra engines)

1 - Screw in the plug (1) to oil channel at the second clamp and top oil channel. Ensure the plug by hammering out.

2 - Knock the nozzles (2) to the oil channel at the second and fourth clamps and ensure by hammering out.

This is for regular Zetor service network only
2.2 ASSEMBLY OF LINERS
(valid for all types of PROXIMA and FORTERRA engines)

1 - Clear fully the contact surface of a cylinder liner as well as surface for its seating in crankcase and for o-rings.

 Sealant: CURIL K2.

2 - The cylinder liners are made in three dimensional groups marked as "A", "B", and "C" on face cylinder collar.

The point of measurement is 110 mm from top cylinder edge.

Marking "A" = Ø105 ±0.012
Marking "B" = Ø105 ±0.012 ±0.024
Marking "C" = Ø105 ±0.012 ±0.024 ±0.036

The conic shape and ovality of inner diameter is max. 0.02 mm. The pistons of same marking should be mounted to cylinders.

3 - Push the cylinder liners without rubber o-rings to the case and position towards camshaft by classifying mark (Ex.: B).
4 - Measure the overlap of collars of liners against head surface of crankcase by dial gauge (indicator). The measured value should range from 0.05 to 0.10 mm.

⚠️ Within measuring the cylinders must be properly creeped to the crankcase e.g. by means of bolts and clamps fitted to the threads in crankcase.

5 - Remove the cylinder liners from crankcase, place o-rings to grooves. Grease the rings and push the cylinder liners in crankcase by slight pressure so that the classifying mark must head towards camshaft.
2.3. ASSEMBLY OF BALANCERS
(valid for all types of PROXIMA and FORTERRA engines)

1. Before assembling of balancers check the correct hammering of plugs to crankshaft.

⚠️ Before assembling of needle bearings of balancers knock all metal plugs in the rear side of crankcase. Clear off all surfaces of bearing and shaft from excess sealant.

🔍 Before knocking the plug grease the hole surfaces by LOCTITE 648 sealant.

2. Knock the needle bearings (1) for two balancers in crankshaft.

3. Press the needle bearings (1) of balancers to case by means of pusher (2) in this way that you firstly press the rear bearing, and then middle and the front one after all.

★ The needle bearing should be marked towards pin.
4 - The correct layout of needle bearings is visualized by scheme.

5 - Grease the needle bearings and insert the balancers. The left balancer (4) (left wheel has marked tooth ca. 56° from feather groove) and left balancer (right gear wheel has marked tooth 19° from feather groove).

6 - Tighten the bolts (5) of balancer adapters by tightening torque 23Nm to 26Nm.

Bolts: 23Nm to 26Nm.
2.4 ASSEMBLY OF CAMSHAFT
(valid for all types of PROXIMA and FORTERRA engines)

1. Lubricate the seating of cam lifters (1) and insert the lifters to case.
   ![Seating of lifters: engine oil.]

2. Lubricate the holes (2) for seating of camshaft and insert the camshaft assembly (3) to the crankcase.
   ![Lubricate the seating of camshaft by engine oil.]
   **Warning:** Even when inserting the gear wheel of camshaft make sure that the marks on gear wheels of balancer and camshaft are properly adjusted.

3. Mount the thrust plate and fix it by bolts (4).
   ![Bolts: 23Nm to 26Nm.]
2.5 ASSEMBLY OF CRANKSHAFT
(valid for FORTERRA 1204, 1004, 1304, 1404, 1504 engines)

1 - Prepare bearing for mounting to crankshaft and rotate it by marking towards outside of crankshaft.

2 - Bump the bearing (1) to the crankshaft.

3 - Fit a feather (3) to crankshaft.

4 - Prepare crankshaft gear and drive wheel for crankshaft of 1004, 1304, 1404, 1504 engines. Warm up the crankshaft gear (4) and drive wheel (5) to temperature 210°C and press into front part of crankshaft. Apply cube (shop gauge) with thickness of 25 mm and press the drive wheel (5) of oil pump to the crankshaft. Then remove the cube.

★ The distance of drive wheel from crankshaft gear is: 25 mm.
5 - Clear fully the surfaces for crankshaft bearing shells (6); mount the shells of main head bearing so that they perfectly seat in locks. Lubricate the functional surfaces with oil.

6 - Fit the crankshaft to shells and slide on the top axial bearing to rear bearing.

7 - Clean the surfaces for shells in bearing caps (11). Slide on the bottom liners so that they perfectly seat in locks.

   Lubricate the functional surfaces with oil.

8 - Mount the caps in order of their dismantling.
9 - Mount the lower axial bearing to cut of rear bearing.

10 - Fix the caps by light hammering and tighten slightly the bolts of bearing caps.

11 - Tighten the bolts (3) of main bearing caps by torque 180Nm to 200Nm.

Note: Bolts of caps: 180Nm to 200Nm.

12 - Make sure whether the crankshaft rotates easily.
2.6 ASSEMBLY OF PISTONS AND CONNECTING RODS (valid for all types of PROXIMA and FORTERRA engines)

1. Three types of piston rings are mounted on piston. Two upper ones are o-rings and the bottom ring is scrape ring.

2. Check the clearance in locks of piston rings. Insert the piston ring to cylinder, in which it will be fixed. Push in to cal. 20 mm. The clearance of lock of piston ring is to be 0.3 to 0.5 mm at new engine. It is max. 1.5 mm by repaired engine.

3. Mount the pistons of the same mark as the cylinders in engine are. The pistons are manufactured in one weight group with weight tolerance ±8.5g.

   The classifying size is marked:
   
   \[ A^* = \odot 104.880^{+0.012} \]
   \[ B^* = \odot 104.892^{-0.012} \]
   \[ C^* = \odot 104.904^{-0.012} \]
4 - Mount the piston rings (4) and (5) to piston (3) by means of pliers.

⚠️ The piston rings should be mounted in such way that the TOP mark is directed to piston head and the locks of piston rings have not to be under each other. Turn the ring locks mutually through 120 degrees.

5 - Before assembly of piston to connecting rods set up correctly the relative position of piston and connecting rod as per figure!

⚠️ Compensating boss of con rod eye is on the offset side of combustion chamber in piston.

6 - Two types of piston pins are mounted to engines. The piston pin marked "A" is designed for more heavy-duty engines; its inner hole \( \phi \) is 21 mm and catalogue number 13.003.012.

The piston pin marked "B" is designed for low-efficiency engines; its inner hole \( \phi \) is 23 mm and catalogue number 78.003.012.

⚠️ The piston pins used in one engine must have an identical catalogue number.

7 - Warm up the piston slightly over 40°C and insert the connecting rod (6) and piston pin (7) to piston.
2.6 ASSEMBLY OF PISTONS AND CONNECTING RODS (valid for all types of PROXIMA and FORTERRA engines)

⚠️ The piston pins used in one engine must have the same weight marking. The connecting rods with ("L") marking are lighter ones; heavier without marking.

8. Ensure the piston pin from both sides by piston pin circlip.

9. Slide partly the connecting rod with piston in cylinder by means of guide ring No. 78.942.020 (8) serving to compression of piston rings.

⚠️ Mount the misalignment of combustion chamber in piston and compensating boss of con rod on side of injection pump.

10. Press the piston fully to cylinder by pusher from soft material.
11 - There are numbers stamped on side of big eye and cap. The connecting rod caps should be mounted in such way that number on cap will be identical with connecting rod and located on the same side of connecting rod.

12 - Lubricate the split shell of connecting rods (10) and mount them on connecting rod ends (11).

⚠️ Check if the lobes of split shells are placed in grooves of connecting rod ends and if the numerical marking of connecting rod end corresponds with shell.

🔍 Split shell: Engine oil.

13 - Tighten the bolts (12) of connecting rod caps to torque 110Nm to 120Nm by means of torque spanner.

🛠️ Bolts of caps: 110Nm to 120Nm.

14 - Check if the crankshaft rotates smoothly and freely.

⚠️ Before checking of crankshaft motion do not forget to ensure the cylinder liners against release.
2.7 ASSEMBLY OF REAR COVER
(valid for all type of PROXIMA and FORTERRA engines)

1. Before assembly of rear cover check if two pins (1) for cover centring are located on crankcase
and if the plugs are on holes at the rear ends of
camshaft (2) and balancers (3). If not, push them
in.

![Lubricate the hole surfaces by LOCTITE 648 sealant before plug pushing in.]

2. Press the Gufero gasket in rear cover by means
of jig No. 78.942.635 Gufero (5). Lubricate the
sealing surfaces by CURIL K2 sealant and insert
the gasket (4).

![Sealant: CURIL K2.]

3. Position the rear cover to pins (6) and on gasket.
Screw all nine bolts (7) and tighten them by
torque 11 Nm.

![Bolts: 11 Nm.]

This is
for regular
Zetor
service network
only.
1. Before mounting the piston on connecting rod determine if the dimensional classification and piston are identical. The pistons and cylinders are again classified into three groups: A, B, C.

2. Warm up the piston (10) slightly over 40 °C and insert the connecting rod (9) and piston pin (29) to the piston. Ensure the piston pin both-sided by circlip (34).

4. Insert the crankshaft (12) to the compressor case and press in the bearing to the shaft end and case. Apply the gasket on case and screw down the cap (13). Press in the bearing (15) on the other side of crankshaft (15) and apply the circlip (14).

⚠️ Use the bearings 6306/C3 ČSN 02 4630 and 6305/C3 ČSN 02 4630 during assembly.
5 - Firstly insert the connecting rod end with line to the compressor housing. Then insert the connecting rod with piston (9,10) and screw down the connecting rod end through the hole in bottom part of casing.

6 - Close the hole by plug (7).

7 - Put the gasket (6) and cylinder (5) on compressor housing. While slipping the cylinder on piston take care that the locks of piston rings were turned to one another by 120° angle.

8 - Check the correct technical condition of lip valve. The plotting tongue (9) should fit close to bottom supporting plate (8). Insert undamaged gasket (10) between both supporting plates, which are to be similar.
9 - Then screw both plates together.

10 - Put the gasket (3) to lip valve (4).

11 - Fix the compressor head (2) by four nuts (1).
2.9 ASSEMBLY OF FRONT COVER AND OIL PUMP
(valid for FORTERRA 1004, 1304, 1404, 1504 engines)

1 - Mount the compressor before assembly of front cover 15Nm (if dismantled). Tighten the bolts by torque 15 Nm.
   <br>Νote: Bolts: 15Nm.

2 - Mount the compressor gear wheel and nut fixing the wheel. Tighten the nut by torque 180 to 200 Nm.
   <br>Note: Nuts: 180Nm to 200Nm.

3 - Mount the injection pump to the crankshaft and fix it by nuts (5). Slide on the gear wheel (3) and fix it freely by nut (4). Do not tighten the nuts!
4. Prepare the idle wheel for assembly to the front part of crankshaft. Lubricate the contact surfaces by oil. Check the wheel position on pin (2) and insert three bolts (3).

5. Insert wheel between gear wheel of camshaft (4) and drive wheel of injection pump (5). While inserting take care about correct position of gear wheel as per marks. Tighten them properly three bolts (3) fixing the idle wheel on pin.

   \[\text{Bolts: 23Nm to 26Nm.}\]

6. Check the correct mutual position of drive wheels (A) (B) (C) (D) (E) as per marking.
7 - Check and hammer the jig pins (6) to the front part of crankcase. Lubricate the sealing surfaces by plastic filler.

Sealing surfaces: plastic filler.

8 - Fit the jig for mounting of front cover (7).

9 - Before mounting of oil pump check its maintenance condition.

The operating oil pressure at rated speed and oil temperature 80° is to be 0.2 to 0.5 Mpa (2 to 5 bars). The minimum pressure at 600 rpm' is allowed to 0.05 Mpa. If these values are not reached check then the oil pump together with filter:

- The spring of relief valve (7) has 12 mm diameter; the length without load is 67 mm.
- The piston of reduction valve (8) has 168 mm diameter.

10 - Toothing between outer and inner gears should have clearance of 0.22 mm and axial clearance of max. 0.1 mm.

11 - Lubricate the crankshaft in front part by oil for Guforo mounting. Slip the front cover (8) over pins and jig for cover positioning. With cover in proper position turn over the crankshaft.

Bolts: 11Nm.
12 - Place gasket on oil pump (9) and neck in crankshaft (10). Screw in slightly the suction (11) and discharge (12) pipes. Tighten the bolts to torque 14 Nm to 20 Nm.

Bolts: 14Nm to 20 Nm.

⚠ Before pipe assembly check the correct operation of relief valve. The piston of reduction valve must move freely.

13 - Slip the suction basket (13) over suction pipe including spring (14).

14 - Slip the pulley (15) over crankshaft; insert the fixing bolt (16) with washer.

⚠ Before slipping over the pulley clear properly the conical part of crankshaft and pulley. Lubricate a thread and conical part by sealant.

Bolt: Loctite 243.

Cone: Loctite 638.

15 - Ensure the crankshaft against rotating by lever at rear part of crankshaft.
16 - Lubricate the fixing bolt for pulley without power consumption (it has only two threads for bolts) by Loctite 243 sealant and tighten with torque 150 Nm – 170 Nm.

![Bolt: Loctite 243.](image)

17 - Lubricate the fixing bolt for pulley with power consumption (it has four threads for bolts) by Loctite 243 sealant and tighten with torque 240 Nm – 260 Nm.

![Bolt: 240Nm - 260Nm.](image)

Bolt: Loctite 243.

This is for regular Zetor service network only.
2.10. ASSEMBLY OF CRANKCASE SUMP AND FLYWHEEL (valid for FORterra 1204, 1004, 1304, 1404, 1504 engines)

1 - Scrape to plane a seal overlap at front and rear covers.

2 - Screw in five studs (1) of the bottom cover. Lubricate the plastic filler to the sealing surface of bottom cover and crankcase surface and apply the sealing (2).

3 - Screw the nuts M8 (3) in studs freely and tighten slightly the bottom cover by means of twenty bolts (4) with washers. Then tighten all nuts and bolts crosswise by torque spanner.

   - Bolts and nuts: 10 Nm.

4 - Screw the drain plug with gasket in the drain hole (5).
5. For 1204 engine prepare the flywheel with hole distance of 33.3 mm, i.e. 12° for ignition timing of shots.

6. For 1004, 1304, 1404, and 1504 engines prepare the flywheel with hole distance of 25 mm, i.e. 9° for ignition timing of shots.

7. Before mounting the flywheel check the values given on figure of flywheel and thrust plate valid for new components.

   During renovation of surfaces "A" and "C" it is necessary to take the total of values from surface "B" e.g. A - 0.2 mm, C - 0.3 mm then take away from surface B = (A + C) = 0.5 mm and value B = 3.5 mm.

★ Up to max. 1.0 mm can be taken away from A and C surfaces.

8. Slip the flywheel on crankshaft and fix it by new bolts.

★ Bolts: 70Nm to 80Nm.
2.11 ASSEMBLY OF WATER PUMP
(valid for all types of PROXIMA and FORTERRA engines)

1 - Press the bearing (2) in bearing (1) and insert the circlip (3).

2 - Put the bearing body to the press in such way that the shaft is bore against washer. Press the pulley to position in which the pulley and shaft can be freely turned around.

3 - Put the shaft thrust plain seal (4) on bearing shaft.
4 - Press the shaft thrust plain seal (4) on bearing body by means of special pusher (5).

⚠️ During pressing process the shaft must be supported by washer, not pulley.

5 - Press on the shaft seal MACCANOTECNICA UMBRA SP_619, so that the "IH" dimension = 12,30 ± 0,13 mm was observed.

6 - Press the impeller (6) on shaft bearing so that the clearance between impeller and bearing body would make 0.5 mm. Lubricate the contact surfaces by Loctite 638 sealant. Fix then the bearing body to the body of water pump.

⚠️ Warm the impeller and pulley up to 80° to 90°C before pressing in.

⚠️ Contact surfaces: Loctite 638.
2.12 ASSEMBLY OF CYLINDER HEAD
(valid for all types of PROXIMA and FORterra engines)

2.12.1 ASSEMBLY OF VALVES AND THERMOSTAT

1 - Place the head on workbench by means of lifting device.

2 - The cylinder heads marked on casting by last figure 1 are designed for engines 7204,1104,1204. The heads with last figure 2, are designed for engines 1004,1304,1404,1504.

3 - Before mounting of seals of suction valve stems lubricate the guides of suction valve by oil.

- Stem of suction valve: engine oil.
4 - Slide the gasket (2) of stems of suction valves on guides of suction valves (1).

5 - Hammer the gasket of stem of suction valves by means of pusher.

6 - Before mounting the valves to heads check the surface and damage of valve seats and valves. Slide gradually the suction (3) and exhaust (4) valves to cylinder head.

7 - After installation of valves check if the seats and valves are worn by measuring of countersinking depth of valve head to the plane of valve head. The permissible value is 0.6 to 0.9 mm.

⚠️ Countersinking of valves: 0.6 to 0.9 mm.
8 - Valve springs
   Check the perpendicularity of springs (1).
   Check the diameter and free length of springs:
   - Inner spring has specified Ø 25.65±0.25 mm and length = 50 mm.
   - Outer spring has specified Ø 35.75±0.4 mm and length = 52.33 mm.

9 - Leakage test of valves
   It carries out after installation of valve springs by means of kerosene oil dropped to suction and exhaust channels. The light leakage at new seats and valves is allowed.

10 - After turning of valve head by valve seat downward slide the inner (20) and outer (21) springs on stems of valves (22).

   Specified spring length: inner 50 mm, outer 52 mm.

11 - Place gradually the outer plate (19), then inner plate (18) on valve stem.

12 - Compress springs (16) and valve plates by means of jig 78.942.010.
13 - Mount the split valve plug (17).

14 - Check the tightness of valves in seats by means of kerosene oil.

⚠️ Kerosene oil must not leak.

15 - Fit the lifting lug (18) to face side of cylinder head and tighten the bolts to torque 48 Nm to 51 Nm.

Roboto	Bolts: 48 Nm to 51 Nm.

16 - Insert gasket (19) between head and body of thermostat.

17 - Test the thermostat just before its mounting.

1. – Submerge the thermostat fully to "A" axial containing the liquid.

2. – Warm up liquid and check the temperature by "B" thermometer.

3. – Check if the slot of thermostatic valve is 0.1 mm, when mixture temperature makes 79± 2°C and the slot is 7 mm, when temperature reaches 94°C.

⚠️ If the thermostat does not work as per specified above, replace it.

Do not attempt to alter the thermostat setting!!

18 - Insert thermostat (21) to body and place the gasket (22) on its top part.
19 - Fit the thermostat neck (9) into body by means of four bolts (8).
2.12 ASSEMBLY OF CYLINDER HEAD
(valid for all types of PROXIMA and FORTERRA engines)

2.12.2 ASSEMBLY OF CYLINDER HEAD ON ENGINE HOUSING

1. Turn the crankcase down by crankcase sump. Screw the stud bolts M8x95 (1), M8x80 (2) and M8x35 (3) for fitting of water pump to the front part of crankcase.

   Before screwing on lubricate the stud part of bolts by oil sealant.

2. Place the gasket (4) of water pump to the stud bolts.

3. Mount the body of water pump on three stud bolts and tighten the nuts.

   Nuts: 15Nm.

5. Before seating the head on engine casing measure the piston overlap in crankshaft axis over contact area of crankshaft. If the measured value by some cylinder is 0.35 mm and higher mount the gasket under cylinder head with 0.35 mm thickness and higher. If the value of all cylinders is lower than 0.35 mm then mount the gasket with 1.2 mm thickness.

6. Screw manually 18 bolts of cylinder head (5) to the crankcase and then tighten them by torque 106Nm - 117Nm.

   Bolts: 106Nm - 117Nm.

7. Insert the rubber gasket (6) into water pump.

   Use always new rubber gasket and clean properly the gasket seat.

2. Place the head assembly to crankcase by means of lifting device. Position it carefully to the stud bolts and rubber coupling of water pump.
8 - Mount the washers and nuts to the head bolts. Firstly tighten all nuts (7) gradually by torque 50 Nm as per scheme. Then tighten the nuts gradually to 100 Nm to 120 Nm and finally all nuts up to 160 Nm – 180 Nm.

⚠️ Nuts: 160Nm to 180Nm.

⚠️ Keep the procedure of nut tightening given on figure.

9 - Insert the pushrods (8) to the cylinder head.

⚠️ Take care about correct position into pushrod seat.

10 - Mount the device for valve control. Tighten the bolts (9) by torque 23 Nm to 26 Nm.

⚠️ Bolts: 23Nm to 26Nm.
See to it that bracket with bored hole (10) will be mounted above lubrication opening in cylinder head.

ATTENTION!!! Close the bored hole (10) by locking pin, which closes the lubrication opening.

11. Adjust the clearance between arm and valve stem of all valves to value 0.25 + 0.05 mm.
   ★ Valve clearance: 0.25 + 0.05 mm.
   Insert the feeler gauge 0.25 mm (11) between valve stem and arm and adjust the specified clearance by means of adjusting screw and locking nut.

Pulling constantly turn over the crankshaft clockwise by means of torque wrench. The torque value should not exceed 50 Nm. Repeat the procedure with other cylinders. The order of cylinder duty is: 1 – 3 – 4 – 2. Carry out the adjustment only if both valves of one cylinder are closed.
2.13 CHECK OF INJECTION ADVANCE OF INJECTION PUMP (valid for all PROXIMA and FORTERRA engines)

1 - Move around by crankshaft clockwise and search for point of pin insertion to "A" hole in crankcase and flywheel.

⚠️ There are two holes in flywheel. The first one indicates injection advance and the second one the top dead centre of the first cylinder. Make sure that the first cylinder is in firing cycle e.g. within cover dismantling of cylinder head.

2 - Unscrew the plug on body side of injection pump and remove the pin (5) with spring (6). Remove the spring from pin and put it away.

3 - Insert the locking pin (7) free of spring to the pump body. If the pin can be inserted into camshaft then the adjustment is correct. Reassemble the spring to locking pin and screw the plug into injection pump.

⚠️ If the pins are unable to be inserted simultaneously then the adjustment of injection advance by tilting of injection pump is required.
2.14 CHECK OF INJECTION ADVANCE OF INJECTION PUMP
(valid for 1004, 1304, 1404, 1504 engines)

1. After unsed result of check of injection advance make an adjustment by means of injection pump tilting. If the pin was not pushed in the flywheel hole find out the hole for injection advance. Push the pin in "A" hole of the crankcase and flywheel.

2. Before adjustment of injection advance remove the nuts (2) fixing the injection pump to the crankcase.

3. Unscrew the plug on body side of injection pump and remove the pin (5) with spring (6). Remove the spring from pin and put it away.
4 - Insert the locking pin (7) free of spring to the pump body. Tilt slightly the injection pump towards engine block or from engine block. The injection advance is correctly adjusted if both pins are pushed in.

5 - Tighten slightly the nuts (8) fixing pump to the crankcase. Push out both pins from holes and turn a little the crankshaft counterclockwise. Now push the locking pin into injection pump by reverse rotary movement of crankshaft clockwise. After its insertion the pin should be also pushed in flywheel. This way a correct adjustment is proved. Tighten then all nuts (8) and remove the pins.

Nut of injection pump 50Nm to 60Nm.

If the adjustment cannot be made by this procedure then release the timing gear of injection pump drive and carry out the full adjustment.

6 - Unscrew the plug on body side of injection pump and remove the pin (5) with spring (6). Remove the spring from pin and put it away.

7 - Insert the locking pin (7) free of spring to the pump body. Turn slightly by crankshaft as long as you will push the pin (7) into mountse in camshaft of injection pump.
8 - Dismantle the front nut cover of timing gear of injection pump (1) as well as valve cover.

9 - First ensure the crankshaft against rotating. Then remove the locking pin from injection pump. Unscrew the nut (3) of timing gear and remove spring washer (4). Turn the nut (3) and screw it again. Thus you will release the drive of timing gear to the injection pump.

10 - Now push again the locking pin into the injection pump and release the crankshaft. Turn around by crankshaft clockwise and search for place in flywheel where the pin can be inserted into “A” hole in crankshaft.

⚠️ Make sure that the first cylinder is in firing cycle e.g. within cover dismantling of cylinder head.

11 - The injection advance adjustment is correct after inserting of both pins.
12 - Remove the "A" pin from flywheel. Take out the pin (7) from injection pump.

13 - Ensure the engine crankshaft against rotary movement e.g. by lever interlocked in flywheel ring gear. Tighten the locking nut of timing gear of the injection pump to torque 170 Nm to 190 Nm.

⚠️ The pin "A" pushed in flywheel is not designed for ensuring of crankshaft against angular displacement.

⚠️ Fixing nuts: 170Nm to 190Nm.

14 - Make the consequent check of adjustment in such way that you turn the crankshaft clockwise and push the A pin again into hole in flywheel. If the pin can be pushed in camshaft of injection pump the correct adjustment is proved. Otherwise all adjustment procedure must be repeated.

⚠️ In case the adjustment is not completed in this way the damage of auxiliary disc in injection pump can be considered. Deliver the pump to technical workshop.

15 - Slip the spring over pin. Insert the pin with spring into pump and screw the plug.
16 - If the difficult engine start-up is observed during operation dismantle the solenoid (1) of engine primer.

17 - Check the movability of cold start mechanism by means of shank. In case of detected failure dismantle the pump and deliver it to authorized dealer.
2.15 ASSEMBLY OF IGNITERS AND INJECTORS
(valid for all types of PROXIMA and FORTERRA engines)

1 - Screw the igniters to the holes for igniters (1) in cylinder head.

⚠ When mounting use only the original igniters.

3 - Tighten the igniters (2) by torque 30 Nm.

⚠ Igniters: 30Nm.

4 - Fix three igniter cables (3) on igniters and a supply cable. Put the washers (5) and nuts (6) on igniters and tighten to torque 4 Nm.

⚠ Nuts: 4Nm.
5 - Injector

The injectors are not adjusted by common car repair shop. If checked that the injection pressure is different from specified one (the specified injection pressure makes 25-0.8 Mpa at engine 1504 and for engines 1404, 1304, 1004, and 1204 the specified pressure makes 22-0.8 Mpa) it is necessary to replace the washer of position 3. Only one washer, stated in catalogue, can be used in injectors. The catalogue contains a set of washers graded after 0.2 mm from minimum size of 1 mm to 1.98 mm.

6 - Prepare specified new or tested injectors. Slide new gasket (7) on injector.

- Specified injectors, nozzles, and injection pressure for single engines are the part of main technical parameters in introduction to this manual.
- The mounted injection valve in cylinder head has nozzle overlap of 1.4 to 1.7 mm over plane of cylinder head plane.

7 - Clean the holes in cylinder head (9) and slide on the injectors.
8 - Position the injectors so that the hole for pipe connection is directed to the ignitor. The exact installation is ensured by fixing yoke (9).

9 - Tighten the nuts of fixing yokes (10) by torque 24 Nm to 26 Nm and fix the hoses of fuel overflow by means of hollow screw (11).

- **Injector nuts: 24Nm to 26Nm.**

10 - Connect the fuel overflow from nozzles to injection pump and fuel tank by hollow screw (12).

11 - Place gradually and fix freely the injection pipes (13) to all injectors and injection pipe by means of nuts.

- **The injection pipes for engines 7204.1104,1204 has an inner diameter of 2 mm. For engines 1004,1304,1404,1504 the inner diameter is 1.8 mm.**
2.15 ASSEMBLY OF IGNITERS AND INJECTORS (valid for all types of PROXIMA and FORTERRA engines)

12 - Fix the injection pipes to each other by metal brackets (14) with bolts (15) and nuts.

13 - Place the brackets as per figure.

14 - Firstly tighten the screw caps (16) on injectors with torque 36 Nm by means of torque wrench.

- Screw caps: 36 Nm.

15 - Tighten then the screw caps on injection pump (17) by means of torque wrench.

- Screw caps: 36 Nm.
16 - Lubricate the contact surfaces of cylinder head and valve cover by sealant and put the gasket (18) and cover of cylinder head on head.

17 - Fix the cover of cylinder head by bolts (19).
2.16 ASSEMBLY OF HEAT EXCHANGER AND OIL FILTER (valid for all types of PROXIMA and FORTERRA engines)

1 - Clean and lubricate the surface for cover mounting by sealant.

2 - Check if the o-rings (3) are found at inlet cover holes (2).

3 - Tighten properly the fixing bolts (4) to torque 24Nm to 26Nm.
4 - Screw the neck (hollow screw) to the hole (5) of exchanger cover. Lubricate the thread by sealant Loctite 243.

 Neck thread: Loctite 243.

5 - Push on the piping (8) of oil feed to the turbocharger into neck (6) and fix it by screw cap (7).

6 - Screw the oil filter vessel (9) into heat exchanger.
2.17 ASSEMBLY OF SUCTION AND EXHAUST MANIFOLDS WITH TURBOCHARGER (valid for FORTERRA 1204, 1004, 1304, 1404, 1504 engines)

1 - Clean the contact surface of suction manifold and cylinder head. Lubricate the contact surfaces by Loctite 5923 sealant. Insert the gasket below suction manifold. Fix the suction manifold by bolts (1) with torque 26 Nm.

- Bolts: 26Nm.
- Contact surfaces: Loctite 5923.

2 - Mount the ejector (2) of air intake from intercooler and fix it by means of nuts (3) with washers.

3 - Clean the contact surfaces of exhaust manifold and cylinder head. Insert the gasket and tighten the manifold by through bolts (8). Tighten the bolts by torque 50 Nm.

- Bolts: 50Nm.
4 - Before mounting of used turbocharger measure the bearing clearance. After 2,400 to 3,000 operating hours the maximum allowable clearance is: axial clearance: 0.16 mm.

5 - Maximum allowable clearance: radial: 0.46 mm.

6 - If the measured values do not exceed the allowable tolerances, clean only the blade wheel and compressor spiral. Use only brush with solvent.

⚠️ In case of exceeding the allowable clearance in bearings deliver the turbocharger to a specialized repair shop.

7 - Place the seal of turbine housing on exhaust manifold (8) and mount the turbocharger (9) on exhaust manifold by four nuts (7). Tighten the nuts by torque 40 Nm to 50 Nm.

⚠️ Nuts: 40Nm to 50Nm.
The following table shows the types of used turbochargers at ZETOR tractors.

### ENGINES WITH TURBOCHARGERS

<table>
<thead>
<tr>
<th>Type of tractor</th>
<th>Type of engine</th>
<th>Design (Cylinder number x bore x stroke)</th>
<th>Type of turbocharger</th>
<th>Catalogue No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6421/41</td>
<td>Z 7204</td>
<td>4X105X120</td>
<td>C 14 - 109</td>
<td>13.029.544</td>
</tr>
<tr>
<td>7421/41</td>
<td>Z 1104</td>
<td>4X105X120</td>
<td>C 14 - 109</td>
<td>13.029.544</td>
</tr>
<tr>
<td>8421/41</td>
<td>Z 1204</td>
<td>4X105X120</td>
<td>C 14 - 109</td>
<td>13.029.544</td>
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<tr>
<td>8641</td>
<td>Z 1204</td>
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<td>C 14 - 109</td>
<td>13.029.544</td>
</tr>
<tr>
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<td>4X105X120</td>
<td>C 14 - 109</td>
<td>13.029.544</td>
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<td>Z 1304</td>
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</tr>
<tr>
<td>11441</td>
<td>Z 1404</td>
<td>4X105X120</td>
<td>C 14 - 63</td>
<td>13.029.544</td>
</tr>
<tr>
<td>11741.4C</td>
<td>Z 1504</td>
<td>4X105X120</td>
<td>C 14 - 176</td>
<td>19.029.024</td>
</tr>
</tbody>
</table>
2.18 ASSEMBLY OF CLUTCH
(valid for FORTERRA 1204, 1004, 1304, 1404, 1504 engines)

1. Check also the dimensions of LUK clutch disc.
   The minimum facing thickness is 2 mm.
   The maximum thickness of free disk "B" max. = 12.0 mm.
   
   The thickness of disk pressured by force 10 kN is B = 10.4 to 11.0 mm.

2. Push the disk (3) on flywheel by means of guiding pin "A".

3. Place the clutch disk hub with bigger shoulder (4) towards flywheel.
4. Place the clutch cover (5) on flywheel so that it will click into mortise in flywheel (6).

5. Mount the clutch cover freely on flywheel by bolts.

6. Mount three bolts M10 (7) by torque Mk=45Nm to 51Nm.
   - Bolts 45Nm to 51Nm.
7. Mount six bolts M8 (8) by torque Mk=23Nm to 26Nm.
   - Bolts 23Nm to 26Nm.
   - Tighten the bolts gradually and crosswise.

8. After fixing the clutch cover remove the guiding pin "A".
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This is for regular Zetor service network only
3.1 ELEMENTARY DISMANTLING OPERATIONS PROXIMA (valid for PROXIMA 7204, 1104, 1204 engines)

Proceed as per chapter 1.1 steps 1 and 2

1. Insert the erection pads (1) under disengaging levers of travel for easier release clutch cover bolts.

2. Unscrew the bolts (2) around the cover circumference and remove the complete clutch cover (3).
   * Release the bolts gradually and crosswise and insert the erection pads.

3. Firstly hang the flywheel on lifting device. Unscrew the bolts (5) fixing the flywheel (4) to the crankshaft.
4 - Release the flywheel by means of levers and pull it down of crankshaft.

★ To release the flywheel use levers on both sides.

Further proceed as per chapter 1.1. Steps 8 to 11

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3.2 DISMANTLING OF SUCTION AND EXHAUST MANIFOLDS PROXIMA (valid for PROXIMA 7204, 1104, 1204 engines)

1. Unscrew the bolts (1) fixing the charging line (2) of air inlet to the intercooler body at engine 1204.

2. Dismantle the hose (4) and remove the charging line with gasket from intercooler body (3).

3. Release the circlips (5) and pull down the inlet hoses of coolant (6).

4. Unscrew and remove the bolts (7) of suction manifold.

5. Remove the assembly of intercooler body with seal (8).
   - When reassembling use new seals.

6. Unscrew the bolts (3) fixing the line (4) of air intake to suction body.

7. Release the circlips (5) and remove manifold (4) with seal.

8. Unscrew and remove the bolts (2) of suction manifold (1) and push it down.

Further proceed as per chapter 1.2. Steps 6 to 10
3.7 REMOVAL OF BOTTOM ENGINE HALF AND FRONT COVER (valid for PROXIMA 7204, 1104, 1204 engines)

Proceed as per chapter 1.7. Steps 1 to 4

1 - Release the nuts (9) of suction pipe and the nuts (10) of outlet pipe and bolts (11). Remove both pipes from engine.

2 - Release and unscrew all bolts around the front cover circumference (12). Release the front cover from centring pins by slight hammering and remove it.

3 - Release the bolts (13) on oil filter and dismantle the pump.

Further proceed as per chapter 1.7. Steps 7 to 10
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4.4 ASSEMBLY OF CRANKSHAFT
(valid for PROXIMA 7204, 1104, 1204 engines)

Proceed as per chapter 2.4. Steps 1 to 3

1 - Prepare the crankshaft gear and o-ring for engine crankshaft. Warm the crankshaft gear and o-ring up to temperature 210°C and press them to the front part of crankshaft. Apply cube (shop gauge) with thickness of 9 mm on the crankshaft gear and press an o-ring to the crankshaft. Then remove the cube.

* Distance of o-ring: 9 mm.

Further proceed as per chapter 2.4. Steps 5 to 12.
4.8 ASSEMBLY OF FRONT COVER AND OIL PUMP (valid for PROXIMA 7204, 1104, 1204 and FORTERRA 1204 engines)

Proceed as per chapter 2.8. Steps 1 and 2

1. Mount the oil pump on the cap of the first crankshaft bearing by two bolts (1).

2. Prepare the intermediate gear for assembly to the front part of crankshaft. Check the wheel seating on pin (2) and insert three bolts (3).

3. Mount the injection pump to the crankcase and fix it by nuts (5). Push in the gear wheel (3). The wheel has feather groove and mark “4E3” on face side. Position it by figure 4 against mark on intermediate gear. Tighten the nut (4) by torque 85 to 100 Nm.

   * Nuts: 85Nm to 100Nm
4. Insert the intermediate wheel between gear wheel of camshaft (4) and drive wheel of injection pump (5). Then tighten properly three bolts (3) fixing the intermediate wheel on pin.

Bolts: 23Nm to 26Nm.

5. Check the correct mutual position of drive wheels (A) (B) (C) (D) (E) (F) as per marking.

6. Check or strike the jig pins to the front part of crankcase. Lubricate the sealing surfaces by plastic sealant.

Sealing surfaces: plastic sealant.

7. Place gasket (6) on cover. Check the bearing of oil pump (7) and seating of gear wheels (8).
8 - Lubricate the front side of crankshaft for Gulero mounting. Push the front cover (8) on pins and jig for cover mounting. After cover mounted turn over the crankshaft. Place washer to fifteen bolts and tighten them. Check the rotary function of crankshaft.

Bolts 11Nm.

9 - Seat a seal on crankcase neck. Screw slightly the suction (9) and discharge (10) pipes. Tighten the bolts to torque 14 Nm to 20 Nm.

Bolts: 14Nm ± 20Nm.

⚠️ Before mounting of pipes check the correct work of relief valve.

Further proceed as per chapter 2.8. Steps 11 to 15
4.9 ASSEMBLY OF BOTTOM COVER
(valid for PROXIMA 7204, 1104, 1204 engines)

1 - Scrape to level the seal overlap at front and rear covers.

2 - Screw five hold-down bolts (1) of bottom cover. Lubricate the sealing surface of bottom cover and crankshaft by plastic sealant and apply the seal (2).

3 - Screw freely the nuts M8 (3) to the hold-down bolts and tighten slightly the bottom cover by means of twenty bolts (4) with gaskets. Then tighten crosswise all nuts and bolts by torque wrench.

Bolts and nuts: 10Nm.

4 - Screw slightly the drain plug with gasket into the drain hole.
4.11 AJUSTMENT OF INJECTION ADVANCE OF INJECTION PUMP  
(valid for 7204, 1104, 1204 and Forterra 1204 engines)

1. Turn by engine crankshaft while the pin can be pushed into hole "A" in crankcase, which will fit into flywheel.

⚠️ There are two holes in flywheel. The first one indicates injection advance and the second one the top dead centre of the first cylinder. Make sure that the first cylinder is in firing cycle.

2. Remove nuts fixing the pump to the crankcase in this crankshaft position.

3. Unscrew the plug on body side of injection pump and take out the pin (5) with spring (6). Remove the spring from pin and put it away.
4. Insert the blocking pin (7) without spring to the pump body.

⚠️ If impossible to insert simultaneously the blocking pin it is necessary to adjust the injection advance by tilting of injection pump.

⚠️ By deflecting the pump from engine the injection advance is increased and reduced by inclination of the injection advance.

5. By moving with pump find the position, where the blocking pin can be pushed into camshaft of the injection pump. Then the adjustment is correct.

⚠️ In case when no adjustment can be reached in this way, the damage of auxiliary disc in injection pump should be considered. Then deliver the pump to the authorized dealer.

6. In this position the pump is correctly adjusted and the fixing nuts (5) can be tightened.

⚠️ Nut of injection pump: 50Nm to 60Nm.

7. At the end of adjustment of injection advance check the fluid control of cold start. Release the screw cap of pressure oil inlet to overpressure corrector and deflect the pipe.
8 Check the movability of cold start mechanism by means of shank (2). In case of detected failure dismantle the pump and deliver it to authorized dealer.
4.14 ASSEMBLY OF SUCTION AND EXHAUST MANIFOLDS WITH TURBOCHARGER
(valid for PROXIMA 7204, 1104, 1204 engines)

1 - The suction chamber without intercooler is used for 7204 and 1104 engines. Before assembly clean the contact surface of suction chamber (1) and cylinder head. Put the gasket on contact surfaces and fix the chamber by bolts (2) and tighten by torque 26 Nm.

2 - Mount the charging line (4) to the suction chamber by nuts (3). Put the gasket under flange of charging line. Connect the charging piping to the turbocharger by means of hose (5) and circlips.
   - Bolts: 26Nm.
   - Contact surfaces: Loctite 5923.

3 - The turbocharger body is used at 1204 engine. Before assembly clean the contact surface of intercooler body (1) and cylinder head. Lubricate the contact surfaces by Loctite 5923 sealant. Put the gasket under body. Mount the intercooler body by bolts and tighten with torque 26 Nm.
   - Bolts: 26Nm.
   - Contact surfaces: Loctite 5923.

4 - Mount the charging line (7) to the intercooler (8) by means of bolts (6). Insert the gasket under flange. Lubricate the gasket by Loctite 5923 paste. Connect the charging line to the turbocharger by means of hose (9) and circlips. Finally connect the hose (10) for coolant.
   - Contact surfaces: Loctite 5923.
5 - Clean the contact surfaces of exhaust manifold and cylinder head. Insert gasket and fix the piping by bolts (2). Tighten the bolts by torque 50 Nm.

\[\text{Bolts: 50Nm.}\]

6 - Place the gasket of turbine housing (4) on exhaust manifold (3) and fix the turbocharger to exhaust manifold by means of four nuts (5). Tighten the nuts by torque 40 Nm to 50 Nm.

\[\text{Nuts: 40Nm to 50Nm.}\]
4.15 ASSEMBLY OF FLYWHEEL AND CLUTCH (valid for PROXIMA 7204, 1104, 1204 engines)

1 - Prepare the flywheel with marking 11 for 7204 and 1104 engines. Prepare the flywheel with marking 12 for 1204 engine.
   ★ This number marks size of angle of injection advance.

2 - If you mount the repaired flywheel into crankshaft check the dimensions of flywheel as per figure.
   ★ The dimension 141 mm means that it includes new flywheel. In case you find the dimension 140 mm and less the flywheel requires to be replaced by another one!

3 - Push the flywheel (1) on crankshaft and fix it by new bolts (2).

Bolts: 70Nm to 80Nm.
4 - LUK clutch

The minimum facing thickness is 2 mm.
The maximum thickness of free disk "B" max. = 12.0 mm.

⚠ The thickness of disk pressured by force 10 kN is B = 10.4 to 11.0 mm.

5 - Insert the disk of travel clutch. Place the clutch disk hub with bigger shoulder (3) towards flywheel.

6 - Adjust the disengaging levers of PTO clutch to 38 mm value between clutch cover and upper side of disengaging lever on completed LUK clutch assembly. After adjustment ensure the bolt (1) by safety nut (2). Afterwards paint the bolt (1) and nut (2). To facilitate the clutch mounting to flywheel support the disengaging levers of travel clutch by joists (3) with dimensions 6 x 6 x 40 mm.
7 - Make the adjustment of disengaging levers by means of depth gauge leaned by rule laid across all clutch diameter.

8 - The assembly of double clutch put into flywheel in such way to fit into the slot in flywheel. Centre both disks by means of centring pin 78.942.004.

9 - After disk centring by means of centring pin (4) mount freely the clutch cover to flywheel by wrench (5).

10 - Mount the clutch cover (6) by means of twelve bolts M8 (7) with torque 23Nm to 26Nm.

   ⚠️ Bolts: 23Nm to 26Nm.

   ⚠️ Tighten the bolts gradually and crosswise.
11 - Remove joints 6 x 6 x 40 mm (3). Set the distance between surface of clutch cover and top side of disengaging lever of travel clutch to value 25 mm by means of adjusting screw (4). After adjustment of nut (4) lock nut (5). Paint subsequently both nuts.

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