

## Contents

<b>00 - Technical data</b>	<b>1</b>
1 <b>Technical data</b>	<b>1</b>
1.1    Engine number	1
1.2    Engine data	2
2 <b>Safety precautions</b>	<b>3</b>
2.1    Working on the fuel system	3
2.2    Procedure before opening high-pressure section of injection system	3
2.3    Working on the cooling system	4
2.4    Using testers and measuring instruments during a road test	4
2.5    Working on the exhaust system	4
3 <b>Contact corrosion!</b>	<b>5</b>
4 <b>General repair instructions</b>	<b>6</b>
4.1    Rules for cleanliness when working on fuel supply system, injection system and turbocharger	6
4.2    Checking fuel system for leaks	6
4.3    Foreign particles in engine	6
4.4    Contact corrosion!	6
4.5    Routing and attachment of pipes, hoses and wiring	7
4.6    Checking vacuum system	7
4.7    Installing radiators and condensers	8
<b>10 - Removing and installing engine</b>	<b>9</b>
1 <b>Removing and installing engine</b>	<b>9</b>
1.1    Removing and installing engine	9
1.2    Removing	10
1.3    Securing engine to engine stand	28
1.4    Installing	28
1.5    Tightening torques	30
<b>13 - Crankshaft group</b>	<b>32</b>
1 <b>Dismantling and assembling engine</b>	<b>32</b>
1.1    Poly V-belt drive - exploded view	32
1.2    Removing and installing poly V-belt	33
1.3    Removing and installing tensioner for poly V-belt	34
1.4    Removing and installing vibration damper	36
2 <b>Removing and installing sealing flanges and dual-mass flywheel/flywheel/drive plate</b>	<b>39</b>
2.1    Sealing flanges and dual-mass flywheel/flywheel/drive plate - exploded view	39
2.2    Renewing crankshaft oil seal (pulley end)	40
2.3    Removing and installing sealing flange (front)	42
2.4    Removing and installing sealing flange (rear)	45
2.5    Removing and installing flywheel	47
3 <b>Removing and installing crankshaft</b>	<b>49</b>
3.1    Crankshaft dimensions	52
3.2    Measuring axial clearance	52
3.3    Measuring radial clearance	52
3.4    Removing and installing drive chain sprocket for oil pump	53
4 <b>Dismantling and assembling pistons and conrods</b>	<b>55</b>
4.1    Piston and cylinder dimensions	58
4.2    Checking radial clearance of conrods	58
<b>15 - Cylinder head, valve gear</b>	<b>59</b>
1 <b>Toothed belt drive</b>	<b>59</b>

1.1	Toothed belt covers - exploded view .....	59
1.2	Toothed belt drive - exploded view .....	60
1.3	Removing and installing toothed belt .....	62
<b>2</b>	<b>Removing and installing cylinder head .....</b>	<b>72</b>
2.1	Cylinder head - exploded view of components .....	72
2.2	Removing and installing cylinder head cover (left-side) .....	74
2.3	Removing and installing cylinder head cover (right-side) .....	76
2.4	Removing cylinder head (left-side) .....	79
2.5	Removing cylinder head (right-side) .....	83
2.6	Installing cylinder head .....	88
2.7	Checking compression .....	91
<b>3</b>	<b>Intake manifold .....</b>	<b>94</b>
3.1	Intake manifold - exploded view of components .....	94
3.2	Removing and installing intake manifold .....	94
<b>4</b>	<b>Servicing valve gear .....</b>	<b>99</b>
4.1	Valve gear - exploded view of components .....	99
4.2	Camshaft adjustment - exploded view of components .....	102
4.3	Checking axial clearance of camshafts .....	103
4.4	Renewing camshaft oil seals .....	103
4.5	Removing and installing camshafts and camshaft adjuster .....	105
4.6	Checking hydraulic bucket tappets .....	113
4.7	Renewing valve stem oil seals with cylinder head installed .....	114
4.8	Renewing valve stem oil seals with cylinder head removed .....	118
4.9	Checking valve guides .....	122
4.10	Checking valves .....	123
4.11	Machining valve seats .....	123
<b>5</b>	<b>Checking camshaft adjustment .....</b>	<b>125</b>
5.1	Testing the system .....	125
5.2	Testing camshaft adjustment (exhaust) .....	127
5.3	Checking camshaft adjustment (inlet) .....	128
5.4	Checking solenoid valves for camshaft adjustment .....	129
5.5	Electrical test of solenoid valves for camshaft adjustment .....	131
5.6	Checking internal resistance .....	132
5.7	Checking voltage supply .....	132
5.8	Checking activation .....	133
<b>17 - Lubrication</b>	<b>.....</b>	<b>134</b>
<b>1</b>	<b>Removing and installing parts of the lubrication system .....</b>	<b>134</b>
1.1	Sump (bottom section), oil pump - exploded view of components .....	134
1.2	Removing and installing sump (bottom section) .....	135
1.3	Removing and installing oil pump .....	138
1.4	Sump (top section), oil filter - exploded view of components .....	143
1.5	Removing and installing sump (top section) .....	145
1.6	Removing and installing drive chain and chain tensioner for oil pump .....	156
1.7	Oil retention valve and spray nozzle valve - exploded view of components .....	157
1.8	Checking oil pressure and oil pressure switch .....	159
1.9	Engine oil .....	161
1.10	Checking oil level .....	161
<b>19 - Cooling</b>	<b>.....</b>	<b>162</b>
<b>1</b>	<b>Cooling system - on engine .....</b>	<b>162</b>
1.1	Draining and filling cooling system .....	162
1.2	Coolant pump and thermostat - exploded view .....	168
1.3	Removing and installing coolant pump .....	169
1.4	Removing and installing thermostat .....	170

1.5	Checking thermostat .....	173
1.6	Coolant pipes - exploded view of components .....	173
1.7	Removing and installing coolant pipe (front) .....	175
1.8	Removing and installing coolant pipe (left-side) .....	176
1.9	Removing and installing coolant pipe (right-side) .....	179
1.10	Removing and installing coolant pipe (rear) .....	180
1.11	Removing and installing coolant pipe leading to alternator .....	182
<b>2</b>	<b>Cooling system - on body .....</b>	<b>185</b>
2.1	Radiator and radiator fan - exploded view of components .....	185
2.2	Removing and installing radiator .....	185
2.3	Removing and installing radiator cowl .....	189
2.4	Removing and installing radiator fan .....	190
2.5	Checking cooling system for leaks .....	190
<b>26 - Exhaust system .....</b>	<b>193</b>	
1	<b>Removing and installing parts of exhaust system .....</b>	<b>193</b>
1.1	Exhaust system - exploded view of components .....	193
1.2	Separating front exhaust pipe and front silencer .....	197
1.3	Separating centre and rear silencers .....	198
1.4	Removing and installing front exhaust pipe (left-side) with catalytic converter .....	199
1.5	Removing and installing front exhaust pipe (right-side) with catalytic converter .....	205
1.6	Removing and installing exhaust manifold (left-side) .....	212
1.7	Removing and installing exhaust manifold (right-side) .....	213
1.8	Stress-free alignment of exhaust system .....	215
1.9	Checking exhaust system for leaks .....	217
<b>2</b>	<b>Servicing secondary air system .....</b>	<b>218</b>
2.1	Principle and function .....	218
2.2	Checking secondary air inlet valve N112 .....	220
2.3	Checking secondary air pump relay J299 and activation .....	224
2.4	Checking voltage supply of secondary air pump relay J299 .....	226
2.5	Checking activation of secondary air pump relay .....	228
2.6	Checking voltage supply of secondary air pump motor V101 .....	229
2.7	Removing and installing secondary air pump motor V101 .....	231
2.8	Checking combination valve for secondary air system for proper operation and leakage ..	232
2.9	Removing and installing combination valve for secondary air system (left-side) .....	235
2.10	Removing and installing combination valve for secondary air system (right-side) .....	236