

## Contents

<b>00 - Technical data</b> .....	<b>1</b>
<b>1 Engine number</b> .....	<b>1</b>
<b>2 Engine data</b> .....	<b>2</b>
<b>3 Safety precautions</b> .....	<b>3</b>
3.1 Procedure before opening high-pressure section of injection system .....	4
<b>4 General repair instructions</b> .....	<b>5</b>
4.1 Rules for cleanliness when working on fuel supply system and injection system .....	5
4.2 Checking for leaks in the fuel system .....	5
4.3 Foreign particles in engine .....	5
4.4 Contact corrosion! .....	5
4.5 Routing and attachment of pipes, hoses and wiring .....	6
4.6 Installing radiators and condensers .....	6
4.7 Checking vacuum system .....	6
<b>10 - Removing and installing engine</b> .....	<b>7</b>
<b>1 Removing engine</b> .....	<b>7</b>
<b>2 Separating engine and gearbox</b> .....	<b>30</b>
<b>3 Securing engine to engine and gearbox support</b> .....	<b>34</b>
<b>4 Installing engine</b> .....	<b>38</b>
<b>5 Assembly mountings</b> .....	<b>44</b>
5.1 Assembly mountings - exploded view .....	44
5.2 Removing and installing engine mountings .....	45
5.3 Removing and installing mounting for torque reaction support .....	49
<b>13 - Crankshaft group</b> .....	<b>58</b>
<b>1 Cylinder block (pulley end)</b> .....	<b>58</b>
1.1 Poly V-belt drive for alternator - exploded view .....	58
1.2 Removing and installing poly V-belt .....	59
1.3 Removing and installing vibration damper .....	60
1.4 Renewing crankshaft oil seal (pulley end) .....	61
<b>2 Cylinder block (gearbox end)</b> .....	<b>64</b>
2.1 Dual-mass flywheel - exploded view .....	64
2.2 Removing and installing dual-mass flywheel .....	64
2.3 Extracting and driving in needle bearing for dual-mass flywheel .....	66
2.4 Renewing crankshaft oil seal (gearbox end) .....	68
<b>3 Crankshaft</b> .....	<b>71</b>
3.1 Crankshaft - exploded view .....	71
3.2 Allocation of main bearing shells for new crankshafts .....	74
3.3 Allocation of main bearing shells on used and machined crankshafts .....	75
3.4 Crankshaft dimensions .....	76
3.5 Measuring axial clearance .....	76
3.6 Measuring radial clearance .....	77
<b>4 Pistons and conrods</b> .....	<b>78</b>
4.1 Pistons and conrods - exploded view .....	78
4.2 Allocation of conrods and conrod bearing shells to crankshaft .....	81
4.3 Piston and cylinder dimensions .....	82
4.4 Measuring radial clearance of conrods .....	82
<b>15 - Cylinder head, valve gear</b> .....	<b>83</b>
<b>1 Chain drive</b> .....	<b>83</b>
1.1 Timing chain covers - exploded view .....	83



1.2	Removing and installing timing chain covers (left and right)	84
1.3	Removing and installing timing chain cover (bottom)	88
1.4	Camshaft timing chains for vehicles up to 03.2007 - exploded view	92
1.5	Removing timing chains from camshafts - vehicles up to 03.2007	95
1.6	Removing and installing camshaft timing chains - vehicles up to 03.2007	102
1.7	Camshaft timing chains for vehicles from 03.2007 onwards - exploded view	105
1.8	Removing timing chains from camshafts - vehicles from 03.2007 onwards	109
1.9	Removing and installing camshaft timing chains - vehicles from 03.2007 onwards	116
1.10	Drive chain for valve gear for vehicles up to 03.2007 - exploded view	118
1.11	Removing and installing drive chain for valve gear - vehicles up to 03.2007	120
1.12	Drive chain for valve gear for vehicles from 03.2007 onwards - exploded view	122
1.13	Removing and installing drive chain for valve gear - vehicles from 03.2007 onwards	123
1.14	Drive chain for auxiliary drives - exploded view	124
1.15	Removing and installing drive chain for auxiliary drives	125
1.16	Auxiliary drives - exploded view	127
1.17	Renewing oil seal for AC compressor drive	128
1.18	Renewing oil seal for power steering pump drive	130
1.19	Removing and installing spur gear drive	131
<b>2</b>	<b>Cylinder head</b>	<b>135</b>
2.1	Cylinder head - exploded view	135
2.2	Removing and installing cylinder head cover (left-side)	136
2.3	Removing and installing cylinder head cover (right-side)	138
2.4	Removing and installing cylinder head	141
2.5	Checking compression	149
<b>3</b>	<b>Valve gear</b>	<b>153</b>
3.1	Valve gear - exploded view	153
3.2	Measuring axial clearance of camshafts	155
3.3	Measuring radial clearance of camshafts	156
3.4	Removing and installing camshafts	157
3.5	Renewing valve stem oil seals with cylinder head installed	164
3.6	Renewing valve stem oil seals with cylinder head removed	168
3.7	Checking hydraulic valve compensation elements	172
3.8	Valve dimensions	173
3.9	Checking valve guides	173
3.10	Checking valves	174
<b>17</b>	<b>Lubrication</b>	<b>175</b>
<b>1</b>	<b>Lubrication system</b>	<b>175</b>
1.1	Oil pump, sump (bottom section) - exploded view	175
1.2	Removing and installing oil level and oil temperature sender G266	177
1.3	Removing and installing sump (bottom section)	177
1.4	Removing and installing oil pump	180
1.5	Sump (top section) - exploded view	184
1.6	Removing and installing sump (top section)	185
1.7	Oil retention valve and spray nozzle valve - exploded view	190
1.8	Removing and installing oil retention valve and spray nozzle valve	191
1.9	Removing and installing hose for crankcase breather system	193
1.10	Oil filter housing - exploded view	193
1.11	Removing and installing oil filter housing	195
1.12	Removing and installing engine oil cooler on engine	195
1.13	Removing and installing engine oil cooler on lock carrier	196
1.14	Removing and installing oil pressure switch F1	199
1.15	Checking oil pressure and oil pressure switch F1	199
1.16	Engine oil	200
1.17	Checking oil level	200

<b>19 - Cooling</b>	<b>201</b>
<b>1 Cooling system</b>	<b>201</b>
1.1 Diagram of coolant hose connections	201
1.2 Draining and filling cooling system	203
1.3 Coolant pump and thermostat - exploded view	208
1.4 Removing and installing coolant pump	209
1.5 Removing and installing thermostat with housing	211
1.6 Checking thermostat	211
1.7 Removing and installing continued coolant circulation pump V51	212
1.8 Coolant pipes - exploded view	213
1.9 Removing and installing coolant pipe (front)	215
1.10 Removing and installing coolant pipe (rear)	215
1.11 Removing and installing coolant pipe (left-side)	221
1.12 Removing and installing coolant pipe (right-side)	221
1.13 Removing and installing radiator	224
1.14 Removing and installing auxiliary radiator (left-side)	229
1.15 Removing and installing auxiliary radiator (right-side)	230
1.16 Removing and installing radiator fan control unit J293	232
1.17 Removing and installing radiator fan V7 (left side)	232
1.18 Removing and installing radiator fan 2 V177 (right side)	233
1.19 Checking cooling system for leaks	234
<b>26 - Exhaust system</b>	<b>236</b>
<b>1 Exhaust system</b>	<b>236</b>
1.1 Exhaust system - exploded view	236
1.2 Separating centre and rear silencers	239
1.3 Removing and installing front exhaust pipe (left-side) with starter catalytic converter and main catalytic converter	240
1.4 Removing and installing front exhaust pipe (right-side) with starter catalytic converter and main catalytic converter	242
1.5 Exhaust manifold - exploded view	245
1.6 Removing and installing exhaust manifold (left-side)	246
1.7 Removing and installing exhaust manifold (right-side)	248
1.8 Stress-free alignment of exhaust system	250
1.9 Checking exhaust system for leaks	251
<b>2 Secondary air system</b>	<b>253</b>
2.1 Principle and function	253
2.2 Secondary air system - exploded view	253
2.3 Removing and installing secondary air pump	255
2.4 Checking combination valves for secondary air system for correct operation and leakage	257
2.5 Removing and installing combination valve for secondary air system (left-side)	258
2.6 Removing and installing combination valve for secondary air system (right-side)	261
<b>3 Exhaust flap</b>	<b>263</b>
3.1 Checking exhaust flap	263
3.2 Checking vacuum unit for exhaust flap	264