

Contents

00 - Technical data	1
1 Technical data	1
1.1 Engine number	1
1.2 Engine data	1
2 Safety precautions	4
2.1 Working on the fuel system	4
2.2 Procedure before opening high-pressure section of injection system	4
2.3 Working on the cooling system	5
2.4 Using testers and measuring instruments during a road test	5
2.5 Working on the exhaust system	5
3 General repair instructions	6
3.1 Rules for cleanliness when working on fuel supply system, injection system and turbocharger	6
3.2 Checking fuel system for leaks	6
3.3 Foreign particles in engine	6
3.4 Contact corrosion	6
3.5 Routing and attachment of pipes, hoses and wiring	7
3.6 Nuts, bolts	7
3.7 Identification plates	7
3.8 Use of impact wrenches	7
3.9 Checking vacuum system	8
3.10 Installing radiators, condensers and charge air coolers	9
10 - Removing and installing engine	10
1 Removing and installing engine	10
1.1 Removing engine	10
1.2 Securing engine to assembly stand	28
1.3 Installing engine	28
1.4 Vacuum connections	34
13 - Crankshaft group	36
1 Servicing work on pulley end	36
1.1 Exploded view - poly V-belt drive	36
1.2 Removing and installing poly V-belt	37
1.3 Removing and installing pulley/vibration damper	39
1.4 Exploded view - toothed belt drive	40
1.5 Removing and installing toothed belt	43
2 Removing and installing sealing flanges and dual-mass flywheel/flywheel/drive plate	48
2.1 Exploded view - sealing flanges and dual-mass flywheel/flywheel/drive plate	48
2.2 Renewing crankshaft oil seal (pulley end)	50
2.3 Removing and installing sealing flange (front)	51
2.4 Removing and installing dual-mass flywheel - vehicles with manual gearbox	57
2.5 Extracting and driving in needle bearing for dual-mass flywheel	59
2.6 Removing and installing flywheel - vehicles with multitronic gearbox 01J	59
2.7 Removing and installing drive plate - vehicles with automatic gearbox 01V	60
3 Removing and installing crankshaft	63
3.1 Exploded view - crankshaft	63
3.2 Crankshaft dimensions	65
3.3 Measuring axial clearance of crankshaft	66
3.4 Measuring radial clearance of crankshaft	67
3.5 Removing and installing drive chain sprocket for oil pump	67
4 Dismantling and assembling pistons and conrods	69



4.1	Different versions of conrods and conrod bolts	69
4.2	Exploded view - sawn conrods	69
4.3	Exploded view - industrially cracked conrods	71
4.4	Piston and cylinder dimensions	74
4.5	Checking radial clearance of conrod bearings	74
15	- Cylinder head, valve gear	76
1	Removing and installing cylinder head	76
1.1	Exploded - cylinder head	76
1.2	Removing and installing cylinder head cover (left-side)	79
1.3	Removing and installing cylinder head cover (right-side)	80
1.4	Removing cylinder head (left-side)	82
1.5	Removing cylinder head (right-side)	85
1.6	Installing cylinder head	88
1.7	Removing and installing intake manifold	92
1.8	Checking compression	95
2	Servicing valve gear	98
2.1	Exploded view - valve gear	98
2.2	Checking axial clearance of camshafts	101
2.3	Renewing camshaft oil seals	102
2.4	Renewing oil seal for Hall sender and sealing cap - cylinder head (left-side)	104
2.5	Renewing oil seal for Hall sender - cylinder head (right-side)	104
2.6	Removing and installing camshafts and camshaft adjuster	107
2.7	Checking hydraulic bucket tappets	111
2.8	Renewing valve stem oil seals	112
2.9	Valve dimensions	117
2.10	Checking valve guides	117
2.11	Machining valve seats	118
2.12	Checking valves	120
3	Checking variable valve timing	121
3.1	Checking function of variable valve timing	121
3.2	Checking camshaft control valves (solenoid valves)	125
17	- Lubrication	130
1	Removing and installing parts of lubrication system	130
1.1	Exploded view - lubrication system	130
1.2	Removing sump (bottom section)	132
1.3	Installing sump (bottom section) - engines with moulded gasket	133
1.4	Installing sump (bottom section) - engines with liquid gasket	134
1.5	Removing and installing sump (top section)	135
1.6	Removing and installing oil pump	146
1.7	Checking chain tensioner	148
1.8	Removing and installing drive chain and chain tensioner for oil pump	148
1.9	Renewing oil retention valves	149
1.10	Checking oil pressure and oil pressure switch	150
1.11	Engine oil	153
1.12	Checking oil level	153
19	- Cooling	155
1	Removing and installing parts of cooling system	155
1.1	Connection diagram - coolant hoses	155
1.2	Draining and filling cooling system	157
1.3	Exploded view - coolant pump and thermostat	163
1.4	Removing and installing coolant pump	163
1.5	Removing, installing and checking thermostat	165
1.6	Exploded view - coolant pipes	168

1.7	Removing and installing coolant pipe (front)	169
1.8	Removing and installing coolant pipe (small)	171
1.9	Removing and installing coolant pipe (rear)	172
1.10	Exploded view - radiator and radiator fan	174
1.11	Removing and installing radiator	176
1.12	Removing and installing viscous fan	179
1.13	Removing and installing pulley for viscous fan	180
1.14	Checking continued coolant circulation pump V51	181
1.15	Removing and installing continued coolant circulation pump V51	181
1.16	Checking radiator fan	182
1.17	Checking cooling system for leaks	183
26	- Exhaust system	185
1	Removing and installing parts of exhaust system	185
1.1	Exploded view - exhaust system, vehicles with front-wheel drive	185
1.2	Exploded view - exhaust system, vehicles with four-wheel drive	191
1.3	Separating centre and rear silencers	195
1.4	Stress-free alignment of exhaust system	196
1.5	Aligning tailpipes - vehicles with concealed tailpipes	197
1.6	Aligning tailpipes - vehicles with visible tailpipes	198
1.7	Checking exhaust system for leaks	198
2	Secondary air system - vehicles with engine code ALF, ALG, ALW, AML, AMM, AMX, AQD, ARJ, ARN, ASM, ATQ, BDV	199
2.1	Principle and function	199
2.2	Exploded view - secondary air system	201
2.3	Checking secondary air inlet valve N112	203
2.4	Checking secondary air pump relay J299 and activation	206
2.5	Checking combination valve for secondary air system for proper operation and leakage	211
2.6	Removing and installing secondary air pump	213
2.7	Removing and installing combination valve for secondary air system (left-side)	214
2.8	Removing and installing combination valve for secondary air system (right-side)	216