



Contents

00 - Technical data	1
1 Identification	1
1.1 Engine number/engine data	1
2 General information	3
2.1 Numbering of cylinders	3
3 Safety information	4
3.1 Safety precautions during work on fuel system	4
3.2 Safety precautions when using testers and measuring instruments during a road test	4
3.3 Safety precautions when working on the cooling system	5
3.4 Safety precautions when working on ignition system	5
4 Repair notes	6
4.1 Rules for cleanliness	6
4.2 Foreign objects in engine	6
10 - Removing and installing engine	7
1 Removing and installing engine	7
1.1 Removing engine	7
1.2 Separating engine and gearbox	17
1.3 Securing engine on engine and gearbox support	19
1.4 Installing engine	21
2 Assembly mountings	24
2.1 Assembly overview - assembly mountings	24
2.2 Removing and installing engine mounting	26
2.3 Adjusting assembly mountings	28
2.4 Checking adjustment of assembly mountings (engine and gearbox mountings)	33
13 - Crankshaft group	34
1 Cylinder block (pulley end)	34
1.1 Assembly overview - cylinder block (pulley end)	34
1.2 Assembly overview - poly V-belt drive	36
1.3 Removing and installing poly-V belt	38
1.4 Removing and installing tensioner for poly V-belt	39
1.5 Removing and installing vibration damper	40
1.6 Removing and installing bracket for ancillaries	41
1.7 Removing and installing sealing flange on pulley end	42
2 Cylinder block, gearbox end	45
2.1 Assembly overview - cylinder block, gearbox end	45
2.2 Removing and installing flywheel	45
2.3 Renewing crankshaft oil seal (gearbox end)	47
3 Crankshaft	50
3.1 Assembly overview - crankshaft	50
3.2 Renewing needle bearing in crankshaft	52
3.3 Crankshaft dimensions	54
3.4 Measuring axial clearance of crankshaft	54
3.5 Measuring radial clearance of crankshaft	55
3.6 Allocation of main bearing shells	56
3.7 Removing and installing sender wheel	60
4 Pistons and conrods	62
4.1 Assembly overview - pistons and conrods	62
4.2 Removing and installing pistons	64
4.3 Checking pistons and cylinder bores	68
4.4 Separating new conrod	70



15 - Cylinder head, valve gear	71
1 Cylinder head	71
1.1 Assembly overview - cylinder head	71
1.2 Removing and installing cylinder head	73
1.3 Removing and installing cylinder head cover	84
1.4 Assembly overview - vacuum pump	86
1.5 Removing and installing vacuum pump	86
1.6 Checking compression	88
2 Cover for timing chain	92
2.1 Assembly overview - cover for timing chain	92
2.2 Removing and installing timing chain cover	93
2.3 Removing and installing the camshaft control valve seal	98
2.4 Assembly overview - valve timing housing	99
3 Chain drive	101
3.1 Assembly overview - camshaft timing chains	101
3.2 Removing and installing camshaft timing chain	104
3.3 Removing and installing chain drive sprocket for high-pressure pump	108
3.4 Removing and installing timing chain and chain drive for oil pump	110
3.5 Checking valve timing	115
3.6 Adjusting valve timing	118
4 Valve gear	124
4.1 Assembly overview - valve gear	124
4.2 Measuring axial play of camshaft	127
4.3 Removing and installing camshaft	127
4.4 Removing and installing camshaft adjuster	133
4.5 Removing and installing camshaft control valve	142
4.6 Removing and installing valve stem seals	147
5 Inlet and exhaust valves	151
5.1 Checking valve guides	151
5.2 Reworking valve seats	151
5.3 Valve dimensions	153
17 - Lubrication	155
1 Sump, oil pump	155
1.1 Assembly overview - sump/oil pump	155
1.2 Removing and installing oil spray jet	157
1.3 Removing and installing oil pan	158
1.4 Removing and installing oil pump	161
1.5 Engine oil:	167
2 Oil filter, oil pressure switch	169
2.1 Assembly overview - oil filter housing, oil pressure switch	169
2.2 Checking oil pressure and oil pressure switch	171
19 - Cooling	175
1 Cooling system/coolant	175
1.1 Connection diagram - coolant hoses	175
1.2 Checking cooling system for leaks	176
1.3 Draining and adding coolant	180
2 Coolant pump, regulation of cooling system	186
2.1 Assembly overview - coolant pump, thermostat	186
2.2 Removing and installing coolant pump	188
2.3 Removing and installing thermostat	192
2.4 Checking thermostat	193
2.5 Removing and installing continued coolant circulation pump V51	193



3	Radiator, radiator fan	195
3.1	Assembly overview - radiator/radiator fan	195
3.2	Removing and installing radiator	197
3.3	Removing and installing radiator cowl with radiator fan	200
3.4	Removing and installing radiator fan	201
24	Mixture preparation - injection	202
1	Injection system	202
1.1	Overview of fitting locations - injection system	202
2	Injectors	205
2.1	Assembly overview - fuel rail with injectors	205
2.2	Removing and installing injectors	209
2.3	Renewing seals on injectors	213
3	Air filter	218
3.1	Assembly overview - air filter housing	218
3.2	Removing and installing air filter housing	219
3.3	Checking intake air preheating	219
4	Intake manifold	221
4.1	Assembly overview - intake manifold	221
4.2	Removing and installing lower part of intake manifold with fuel rail	223
4.3	Removing and installing intake manifold upper part	226
4.4	Removing and installing throttle valve module J338	230
5	Senders and sensors	232
5.1	Checking fuel pressure sender G247	232
6	Engine control unit	236
6.1	Removing and installing engine control unit J623	236
6.2	Removing and installing engine (motor) control unit J623 with protective housing	237
7	High-pressure pump	241
7.1	Assembly overview - high-pressure pump	241
7.2	Removing and installing high-pressure pump	242
8	Lambda probe	248
8.1	Removing and installing lambda probe G39	248
8.2	Removing and installing Lambda probe G108	249
8.3	Removing and installing lambda probe after catalytic converter G130 and lambda probe 2 after catalytic converter G131	250
26	Exhaust system	253
1	Exhaust pipes and silencers	253
1.1	Assembly overview - silencers	253
1.2	Separating exhaust pipes from silencers	255
1.3	Installation position of clamp	257
2	Emission control	259
2.1	Assembly overview - emission control	259
2.2	Removing and installing catalytic converter	261
3	Exhaust manifold	265
3.1	Assembly overview - exhaust manifold	265
3.2	Removing and installing exhaust manifold	266
28	Ignition system	269
1	Ignition system	269
1.1	Assembly overview - ignition system	269
1.2	Removing and installing ignition coils with output stage	271
1.3	Removing and installing engine speed sender G28	273
1.4	Test data, spark plugs	273

