



Contents

00 - Technical data	1
1 Safety information	1
1.1 Safety regulations for working on fuel supply	1
1.2 Safety precautions when using testers and measuring instruments during a road test	2
1.3 Safety precautions when working on ignition system	2
1.4 Safety precautions when working on the cooling system	3
2 Identification	4
2.1 Engine number/engine data	4
3 Repair notes	6
3.1 Rules for cleanliness	6
3.2 Foreign bodies in engine	6
3.3 Contact corrosion	6
3.4 Routing and attachment of lines	6
3.5 Fitting radiator and condensers	6
10 - Removing and installing engine	7
1 Removing and installing engine	7
1.1 Removing engine	7
1.2 Securing engine on engine and gearbox support	17
1.3 Installing engine	18
2 Assembly mountings	21
2.1 Assembly overview – assembly mountings	21
2.2 Removing and installing engine mounting	23
2.3 Supporting engine in installation position	32
2.4 Adjusting assembly mountings	39
2.5 Checking adjustment of assembly mountings	41
13 - Crankshaft group	42
1 Cylinder block (pulley end)	42
1.1 Assembly overview - poly V-belt drive	42
1.2 Assembly overview - cylinder block (pulley end)	43
1.3 Removing and installing poly-V belt	46
1.4 Removing and installing vibration damper	46
1.5 Removing and installing bracket for ancillaries	50
1.6 Renewing crankshaft oil seal - pulley end	52
2 Cylinder block, gearbox end	55
2.1 Assembly overview - cylinder block, gearbox end	55
2.2 Removing and installing sealing flange on gearbox side	56
3 Crankshaft	69
3.1 Assembly overview - crankshaft	69
3.2 Crankshaft dimensions	71
3.3 Renewing needle bearing in crankshaft	71
4 Pistons and conrods	74
4.1 Assembly overview - pistons and conrods	74
4.2 Checking pistons and cylinder bores	76
4.3 Separating new conrod	78
15 - Cylinder head, valve gear	80
1 Cylinder head	80
1.1 Assembly overview - cylinder head	80
1.2 Removing and installing cylinder head	83
1.3 Removing and installing camshaft housing	85



1.4	Checking compression	93
2	Cover for timing chain	95
2.1	Removing and installing valve timing housing (timing case)	95
3	Chain drive	100
3.1	Removing and installing timing chain and chain drive for oil pump	100
3.2	Checking timing chain	111
3.3	Checking valve timing	117
3.4	Adjusting valve timing	121
4	Valve gear	132
4.1	Assembly overview - valve gear	132
4.2	Measuring axial play of camshaft	134
4.3	Removing and installing valve stem oil seals	136
5	Inlet and exhaust valves	139
5.1	Reworking valve seats	139
5.2	Checking valve guides	140
17 - Lubrication		142
1	Sump, oil pump	142
1.1	Assembly overview - sump/oil pump	142
1.2	Engine oil:	144
1.3	Removing and installing oil sump	145
1.4	Removing and installing oil pump	148
2	Oil filter, oil pressure switch	151
2.1	Checking oil pressure and oil pressure switch	151
19 - Cooling		154
1	Cooling system/coolant	154
1.1	Connection diagram - coolant hoses	154
1.2	Checking cooling system for leaks	155
1.3	Draining and adding coolant	157
2	Coolant pump, regulation of cooling system	163
2.1	Assembly overview - thermostat	163
2.2	Removing and installing coolant circulation pump V50	165
2.3	Removing and installing coolant pump	166
3	Radiator, radiator fan	170
3.1	Assembly overview - radiator/radiator fan	170
3.2	Removing and installing radiator	172
3.3	Removing and installing water radiator for charge air cooling circuit	174
3.4	Removing and installing radiator cowl	176
3.5	Removing and installing radiator fan V7 and radiator fan 2 V177	177
21 - Turbocharging/supercharging		179
1	Turbocharger	179
1.1	Assembly overview - turbocharger	179
1.2	Assembly overview - turbocharger air recirculation valve N249	181
1.3	Removing and installing turbocharger	182
1.4	Checking vacuum unit for turbocharger	189
1.5	Adjusting vacuum unit for turbocharger	191
1.6	Renewing vacuum unit for turbocharger	199
1.7	Removing and installing compressor housing and turbine housing	203
2	Charge air system	210
2.1	Assembly overview - charge air system	210
24 - Mixture preparation - injection		213
1	Injection system	213



1.1	Releasing high pressure in fuel system	213
2	Injectors	214
2.1	Assembly overview - fuel rail with injectors	214
2.2	Removing and installing injectors	214
2.3	Renewing seals on injectors	217
3	Air filter	223
3.1	Assembly overview - air filter housing	223
3.2	Removing and installing air filter housing	223
4	Intake manifold	225
4.1	Assembly overview – intake manifold	225
4.2	Assembly overview - lower part of intake manifold with fuel rail	227
4.3	Removing and installing intake manifold	229
4.4	Removing and installing throttle valve module J338	230
4.5	Cleaning throttle valve module J338	234
5	Senders and sensors	236
5.1	Checking fuel pressure sender G247	236
6	Engine/motor control unit	240
6.1	Removing and installing engine control unit J623 without protective housing	240
6.2	Removing and installing engine (motor) control unit J623 with protective housing	242
7	High-pressure pump	248
7.1	Assembly overview - high-pressure pump	248
7.2	Removing and installing high-pressure pump	249
26	- Exhaust system	254
1	Exhaust pipes and silencers	254
1.1	Assembly overview – silencers	254
1.2	Separating exhaust pipes from silencers	255
1.3	Installation position of clamp	257
1.4	Aligning exhaust system free of stress	259
2	Emission control	261
2.1	Assembly overview – emission control	261
28	- Ignition system	264
1	Ignition system	264
1.1	Assembly overview - ignition system	264
1.2	Test data, spark plugs	266
1.3	Removing and installing ignition coils with output stage	266
1.4	Removing and installing engine speed sender G28	268