

Contents

00 - Technical data	1
1 Engine number/engine data	1
2 Safety precautions	2
2.1 Working on the fuel system	2
2.2 Safety precautions when working on vehicles with start/stop system	2
2.3 Safety precautions when using testers and measuring instruments during a road test	3
2.4 Safety precautions when working on the subframe	3
2.5 Safety precautions when working on the cooling system	3
2.6 Safety precautions when working on the exhaust system	4
3 Repair instructions	5
3.1 Rules for cleanliness	5
3.2 General notes	5
3.3 General repair instructions	6
3.4 Nuts, bolts	7
3.5 Identification plates	7
3.6 Use of impact wrenches	7
3.7 Foreign material in engine	8
3.8 Contact corrosion	8
3.9 Routing and attachment of pipes, hoses and wiring	8
3.10 Installing radiators and condensers	9
10 - Removing and installing engine	10
1 Removing engine	10
2 Securing engine to engine and gearbox support	34
3 Installing engine	36
4 Assembly mountings	42
4.1 Assembly overview - assembly mountings	42
4.2 Removing and installing engine mounting (left-side)	44
4.3 Removing and installing engine mounting (right-side)	49
4.4 Removing and installing torque reaction support and stop for torque reaction support	53
13 - Crankshaft group	55
1 Cylinder block (pulley end)	55
1.1 Assembly overview - poly V-belt drive	55
1.2 Removing and installing poly V-belts	57
1.3 Removing and installing tensioner for poly V-belt	60
1.4 Removing and installing vibration damper	61
1.5 Removing and installing bracket for ancillaries	62
1.6 Assembly overview - sealing flange (pulley end)	66
1.7 Renewing crankshaft oil seal (pulley end)	67
1.8 Removing and installing sealing flange (pulley end)	69
2 Cylinder block (gearbox end)	74
2.1 Assembly overview - dual-mass flywheel and sealing flange (gearbox end)	74
2.2 Removing and installing dual-mass flywheel	75
2.3 Renewing sealing flange (gearbox end)	77
3 Crankshaft	88
3.1 Assembly overview - crankshaft	88
3.2 Extracting and driving in needle bearing for crankshaft	90
3.3 Crankshaft dimensions	91
3.4 Measuring axial clearance of crankshaft	91
3.5 Measuring radial clearance of crankshaft	92
3.6 Pulling spur gear off crankshaft and shrink-fitting new spur gear	92



4	Pistons and conrods	97
4.1	Assembly overview - pistons and conrods	97
4.2	Measuring piston projection at "TDC"	103
4.3	Piston and cylinder dimensions	105
4.4	Measuring radial clearance of conrods	105
15 - Cylinder head, valve gear		106
1	Toothed belt drive	106
1.1	Assembly overview - toothed belt	106
1.2	Removing and installing toothed belt	108
2	Cylinder head	123
2.1	Assembly overview - cylinder head cover	123
2.2	Removing and installing cylinder head cover	124
2.3	Assembly overview - cylinder head	126
2.4	Removing and installing cylinder head	129
2.5	Checking compression	146
3	Valve gear	149
3.1	Assembly overview - valve gear	149
3.2	Measuring axial clearance of camshafts	151
3.3	Measuring radial clearance of camshafts	152
3.4	Removing and installing camshaft oil seal	153
3.5	Removing and installing camshafts	157
3.6	Checking hydraulic compensation elements	166
3.7	Renewing valve stem oil seals with cylinder head installed	167
3.8	Renewing valve stem oil seals with cylinder head removed	171
3.9	Valve dimensions	176
3.10	Reworking valve seats	176
3.11	Checking valve guides	176
3.12	Checking valves	177
17 - Lubrication		178
1	Sump, oil pump, balance shaft module	178
1.1	Assembly overview - sump, oil pump, balance shaft module	178
1.2	Removing and installing oil level and oil temperature sender G266	184
1.3	Removing and installing sump	184
1.4	Removing and installing oil pump	193
1.5	Removing balance shaft module	195
1.6	Installing a new balance shaft module	197
1.7	Re-installing a used balance shaft module	202
2	Oil filter housing, engine oil cooler and oil supply line	205
2.1	Assembly overview - oil filter housing and engine oil cooler	205
2.2	Removing and installing oil filter housing with engine oil cooler	208
2.3	Removing and installing engine oil cooler	210
2.4	Removing and installing oil supply line	212
2.5	Removing and installing oil pressure switch F1	215
2.6	Checking oil pressure	216
2.7	Engine oil	216
2.8	Checking oil level	216
19 - Cooling		217
1	Parts of cooling system (on engine)	217
1.1	General notes	217
1.2	Connection diagram - coolant hoses	217
1.3	Draining and filling cooling system	218
1.4	Checking cooling system for leaks	226

1.5	Assembly overview - coolant pump, thermostat, 4/2-way valve with thermostat	228
1.6	Removing and installing coolant pump	229
1.7	Removing and installing thermostat	230
1.8	Removing and installing 4/2-way valve with thermostat	232
1.9	Checking thermostat	234
1.10	Assembly overview - coolant pipes, coolant temperature senders, coolant circulation pump	234
1.11	Removing and installing coolant pipe (top)	236
1.12	Removing and installing coolant pipe (rear)	238
1.13	Removing and installing coolant pipe (bottom)	239
1.14	Removing and installing pump for exhaust gas recirculation cooler V400	241
1.15	Removing and installing coolant temperature sender G62	243
1.16	Removing and installing radiator outlet coolant temperature sender G83	244
2	Parts of cooling system (on body)	246
2.1	General notes	246
2.2	Assembly overview - radiator and radiator fans	246
2.3	Removing and installing radiator	248
2.4	Removing and installing radiator cowl	254
2.5	Removing and installing radiator fan V7 and radiator fan 2 V177	257
21	- Turbocharging/supercharging	258
1	Turbocharger	258
1.1	Assembly overview - turbocharger	258
1.2	Removing and installing turbocharger	260
2	Charge air cooling	268
2.1	Assembly overview - charge air cooling	268
2.2	Removing and installing charge air cooler	270
2.3	Removing and installing charge pressure sender G31 - vehicles without auxiliary heater ..	272
2.4	Removing and installing charge pressure sender G31 - vehicles with auxiliary heater ..	273
2.5	Checking charge air system for leaks	274
26	- Exhaust system	278
1	Silencers	278
1.1	Assembly overview - silencers	278
1.2	Removing and installing particulate filter - vehicles with manual gearbox	282
1.3	Removing and installing particulate filter - vehicles with multitronic gearbox	286
1.4	Removing and installing front exhaust pipe - vehicles with manual gearbox	291
1.5	Removing and installing front exhaust pipe - vehicles with multitronic gearbox	294
1.6	Separating Y-pipe and rear silencers	296
1.7	Renewing tailpipes	298
1.8	Stress-free alignment of exhaust system	298
1.9	Aligning tailpipes	300
1.10	Checking exhaust system for leaks	301
2	Exhaust manifold	302
2.1	Assembly overview - exhaust manifold	302
2.2	Removing and installing exhaust manifold	303
3	Exhaust gas temperature regulation	304
3.1	Assembly overview - exhaust gas temperature senders	304
3.2	Removing and installing exhaust gas temperature sender 1 G235	305
3.3	Removing and installing exhaust gas temperature sender 3 G495	308
3.4	Removing and installing exhaust gas temperature sender 4 G648	310
4	Exhaust gas recirculation	313
4.1	Assembly overview - exhaust gas recirculation cooler	313
4.2	Removing and installing exhaust gas recirculation cooler	315
4.3	Removing and installing vacuum unit for exhaust gas recirculation cooler	317

4.4	Assembly overview - exhaust gas recirculation valve G212 with exhaust gas recirculation potentiometer N18	320
4.5	Removing and installing exhaust gas recirculation valve N18 with exhaust gas recirculation potentiometer G212	321
4.6	Cleaning exhaust gas recirculation system	321