

Contents

00 - Technical data	1
1 Identification	1
1.1 Engine number/engine data	1
2 Safety information	2
2.1 Safety precautions when working on the fuel supply 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 cooling system	3
2.5 Safety precautions when working on the exhaust system	3
2.6 Safety precautions when working on the ignition system	4
3 Repair instructions	5
3.1 Identification plates	5
3.2 Use of impact wrenches	5
3.3 Rules for cleanliness	6
3.4 Foreign material in engine	6
3.5 Cleaning engine	6
3.6 Nuts, bolts	7
3.7 Contact corrosion	7
3.8 Routing and attachment of pipes, hoses and wiring	8
3.9 Installing radiators and condensers	8
3.10 Checking vacuum system	8
10 - Removing and installing engine	10
1 Removing and installing engine	10
1.1 Removing engine	10
1.2 Separating engine and gearbox	10
1.3 Securing engine to engine and gearbox support	13
1.4 Installing engine	15
2 Assembly mountings	16
3 Engine cover panel	17
3.1 Removing and installing engine cover panel	17
13 - Crankshaft group	18
1 Cylinder block (pulley end)	18
1.1 Assembly overview - poly V-belt drive	18
1.2 Assembly overview - sealing flange (pulley end)	20
1.3 Removing and installing poly V-belt	22
1.4 Removing and installing poly V-belt tensioner	22
1.5 Removing and installing vibration damper	22
1.6 Removing and installing bracket for ancillaries	24
1.7 Removing and installing sealing flange (pulley end)	25
2 Cylinder block (gearbox end)	29
2.1 Assembly overview - flywheel	29
2.2 Removing and installing flywheel	30
2.3 Renewing crankshaft oil seal (gearbox end)	33
3 Crankshaft	36
3.1 Assembly overview - crankshaft	36
3.2 Crankshaft dimensions	39
3.3 Renewing needle bearing in crankshaft	39
3.4 Measuring axial clearance of crankshaft	41
3.5 Measuring radial clearance of crankshaft	42
3.6 Removing and installing sender wheel	42

3.7	Checking sender wheel	43
4	Pistons and conrods	45
4.1	Assembly overview - pistons and conrods	45
4.2	Removing and installing pistons	48
4.3	Removing and installing oil spray jets	50
4.4	Checking pistons and cylinder bores	51
4.5	Checking radial clearance of conrod bearings	52
15	- Cylinder head, valve gear	54
1	Timing chain cover	54
1.1	Assembly overview - timing chain cover	54
1.2	Removing and installing timing chain cover	57
2	Chain drive	67
2.1	Assembly overview - camshaft timing chains	67
2.2	Assembly overview - drive chain for valve gear	68
2.3	Removing camshaft timing chain from camshafts	70
2.4	Removing and installing camshaft timing chain	79
2.5	Removing and installing drive chain for valve gear	80
3	Cylinder head	83
3.1	Assembly overview - cylinder head	83
3.2	Assembly overview - camshaft housing	86
3.3	Removing and installing cylinder head	89
3.4	Removing and installing camshaft housing	97
3.5	Checking compression	102
4	Valve gear	106
4.1	Assembly overview - valve gear	106
4.2	Measuring axial clearance of camshaft	108
4.3	Measuring radial clearance of camshaft	109
4.4	Removing and installing camshaft	110
4.5	Installing ball for slider	112
4.6	Removing and installing cam actuators	113
4.7	Removing and installing camshaft control valve 1 N205 / N318	113
4.8	Removing and installing valve stem oil seals	114
5	Inlet and exhaust valves	125
5.1	Checking valve guides	125
5.2	Checking valves	126
5.3	Valve dimensions	126
17	- Lubrication	127
1	Sump/oil pump	127
1.1	Assembly overview - sump/oil pump	127
1.2	Engine oil	130
1.3	Removing and installing lower part of sump	130
1.4	Removing and installing upper part of sump	132
1.5	Removing and installing oil pump	139
1.6	Removing and installing oil level and oil temperature sender G266	147
2	Engine oil cooler	148
2.1	Assembly overview - engine oil cooler	148
2.2	Removing and installing engine oil cooler	150
3	Oil filter/oil pressure switch	155
3.1	Removing and installing oil pressure sender G10	155
3.2	Checking oil pressure	155
3.3	Removing and installing valve for oil pressure control N428	156
4	Crankcase breather	157

4.1	Assembly overview - crankcase breather system	157
4.2	Removing and installing crankcase breather module	161
4.3	Removing and installing tank breather pressure sensor 1 G950	162
19	- Cooling	163
1	Cooling system/coolant	163
1.1	Connection diagram - coolant hoses	163
1.2	Checking cooling system for leaks	163
1.3	Draining and filling cooling system	165
2	Coolant pump/thermostat assembly	166
2.1	Assembly overview - coolant pump/thermostat	166
2.2	Assembly overview - electric coolant pump	167
2.3	Assembly overview - coolant temperature senders	168
2.4	Removing and installing electric coolant pump	169
2.5	Removing and installing coolant pump	170
2.6	Checking thermostat	171
2.7	Removing and installing coolant distributor housing	173
2.8	Removing and installing coolant temperature sender G62	176
2.9	Removing and installing temperature sender for engine temperature regulation G694	177
2.10	Removing and installing coolant valves	178
3	Coolant pipes	180
3.1	Assembly overview - coolant pipes	180
3.2	Removing and installing coolant pipes	182
3.3	Removing and installing coolant pipes for gearbox	188
4	Radiator/radiator fans	192
21	- Turbocharging/supercharging	193
1	Turbocharger	193
1.1	Assembly overview - turbocharger	193
1.2	Removing and installing turbocharger	198
1.3	Renewing turbocharger gasket	206
1.4	Renewing vacuum unit for turbocharger	212
1.5	Removing and installing turbocharger air recirculation valve N249	217
2	Charge air system	218
2.1	Assembly overview - charge air system	218
2.2	Assembly overview - hose connections for charge air system	218
2.3	Removing and installing charge air cooler	218
2.4	Removing and installing charge pressure sender G31	218
2.5	Checking charge air system for leaks	220
24	- Mixture preparation - injection	222
1	Injection system	222
2	Air filter	223
3	Intake manifold	224
3.1	Assembly overview - intake manifold	224
3.2	Removing and installing upper part of intake manifold	230
3.3	Removing and installing lower part of intake manifold	232
3.4	Removing and installing intake manifold flap potentiometer G336	233
3.5	Removing and installing throttle valve module GX3	234
4	Injectors	235
4.1	Assembly overview - fuel rail with injectors	235
4.2	Removing and installing fuel rail	237
4.3	Removing and installing injectors	241
4.4	Cleaning injectors	246



5	Senders and sensors	248
5.1	Assembly overview - actuator for structure-borne sound and control unit for structure-borne sound	248
5.2	Removing and installing control unit for structure-borne sound J869 and actuator for structure-borne sound R214	249
5.3	Removing and installing intake air temperature sender G42 / intake manifold pressure sender G71	249
5.4	Removing and installing fuel pressure sender G247	250
5.5	Removing and installing fuel pressure sender for low pressure G410	251
5.6	Removing and installing pressure differential senders	251
6	High-pressure pump	259
6.1	Assembly overview - high-pressure pump	259
6.2	Removing and installing high-pressure pump	261
7	Lambda probe	264
7.1	Assembly overview - Lambda probe	264
7.2	Removing and installing Lambda probe	264
8	Motor control unit	267
26	- Exhaust system	268
1	Exhaust pipes/silencers	268
1.1	Assembly overview - silencers	268
1.2	Stress-free alignment of exhaust system	268
1.3	Checking exhaust system for leaks	268
2	Emission control system	269
2.1	Assembly overview - emission control system	269
2.2	Removing and installing catalytic converter	273
2.3	Workshop regeneration for particulate filter	277
2.4	Removing and installing secondary catalytic converters/exhaust pipes	278
2.5	Removing and installing exhaust flap control unit J883	278
3	Exhaust gas temperature regulation	279
3.1	Assembly overview - exhaust gas temperature regulation	279
3.2	Removing and installing exhaust gas temperature senders	279
28	- Ignition system	282
1	Ignition system	282
1.1	Assembly overview - ignition system	282
1.2	Removing and installing ignition coils	284
1.3	Removing and installing knock sensor 1 G61	287
1.4	Removing and installing Hall senders	289
1.5	Removing and installing engine speed sender G28	289
1.6	Removing and installing intermediate shaft speed sender G265	290