

Contents

00 - Technical data	1
1 Identification	1
1.1 Engine number/engine data	1
2 Safety precautions	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 working on the subframe	3
2.4 Safety precautions when using testers and measuring instruments during a road test	3
2.5 Safety precautions when working on the ignition system	3
2.6 Safety precautions when working on the cooling system	4
3 Repair instructions	5
3.1 Rules for cleanliness	5
3.2 Foreign particles in engine	5
3.3 Contact corrosion	5
3.4 Routing and attachment of pipes, hoses and wiring	6
3.5 Nuts, bolts	6
3.6 Identification plates	6
3.7 Use of impact wrenches	7
3.8 Installing radiators and condensers	7
3.9 Checking vacuum system	7
10 - Removing and installing engine	9
1 Removing and installing engine	9
1.1 Removing engine	9
1.2 Separating engine and gearbox	26
1.3 Securing engine to engine and gearbox support	29
1.4 Installing engine	32
2 Assembly mountings	35
2.1 Exploded view - assembly mountings	35
2.2 Supporting engine in installation position	37
2.3 Removing and installing engine mountings	40
2.4 Removing and installing gearbox mounting	44
2.5 Removing and installing pendulum support	46
2.6 Checking adjustment of assembly mountings (engine/gearbox mountings)	47
2.7 Adjusting assembly mountings	48
3 Engine cover panel	51
3.1 Removing and installing engine cover panel	51
13 - Crankshaft group	52
1 Cylinder block (pulley end)	52
1.1 Exploded view - cylinder block (pulley end)	52
1.2 Exploded view - sealing flange (pulley end)	55
1.3 Removing and installing poly V-belts	56
1.4 Removing and installing poly V-belt tensioner	59
1.5 Removing and installing vibration damper	60
1.6 Removing and installing bracket for ancillaries	63
1.7 Removing and installing sealing flange (pulley end)	63
2 Cylinder block (gearbox end)	68
2.1 Exploded view - flywheel	68
2.2 Removing and installing flywheel	69
2.3 Checking sender wheel	71
2.4 Renewing crankshaft oil seal (gearbox end)	72



3	Crankshaft	76
3.1	Exploded view - crankshaft	76
3.2	Crankshaft dimensions	79
3.3	Renewing needle bearing in crankshaft	79
3.4	Measuring axial clearance of crankshaft	82
3.5	Measuring radial clearance of crankshaft	83
4	Pistons and conrods	84
4.1	Exploded view - pistons and conrods	84
4.2	Removing and installing pistons	86
4.3	Checking pistons and cylinder bores	88
4.4	Separating parts of new conrod	90
4.5	Checking radial clearance of conrod bearings	90
15	- Cylinder head, valve gear	92
1	Timing chain cover	92
1.1	Exploded view - timing chain cover	92
1.2	Removing and installing timing chain cover	95
2	Chain drive	107
2.1	Exploded view - camshaft timing chains	107
2.2	Exploded view - drive chain for valve gear	107
2.3	Removing and installing camshaft timing chain	108
2.4	Removing and installing drive chain for valve gear	118
3	Cylinder head	121
3.1	Exploded view - cylinder head	121
3.2	Removing and installing cylinder head	125
3.3	Removing and installing cylinder head cover	136
3.4	Checking compression	138
4	Valve gear	140
4.1	Exploded view - valve gear	140
4.2	Measuring axial clearance of camshaft	143
4.3	Measuring radial clearance of camshaft	144
4.4	Removing and installing camshaft	145
4.5	Removing and installing camshaft control valve 1 N205	151
4.6	Removing and installing exhaust camshaft control valve 1 N318	152
4.7	Checking hydraulic compensation elements	153
4.8	Removing and installing valve stem oil seals	155
5	Inlet and exhaust valves	164
5.1	Checking valve guides	164
5.2	Checking valves	165
5.3	Valve dimensions	165
17	- Lubrication	167
1	Sump/oil pump	167
1.1	Exploded view - sump/oil pump	167
1.2	Engine oil	171
1.3	Removing and installing sump (bottom section)	171
1.4	Removing and installing sump (top section)	174
1.5	Removing and installing oil pump	182
1.6	Removing and installing oil level and oil temperature sender G266	189
2	Engine oil cooler	190
2.1	Removing and installing engine oil cooler	190
3	Crankcase breather	191
3.1	Removing and installing pressure control valve for crankcase breather system	191
4	Oil filter/oil pressure switches	194

4.1	Exploded view - oil filter housing/oil pressure switches	194
4.2	Removing and installing oil pressure switch F22	197
4.3	Removing and installing oil pressure switch for reduced oil pressure F378	199
4.4	Checking oil pressure	199
4.5	Removing and installing oil filter housing	200
4.6	Removing and installing valve for oil pressure control N428	203
19	Cooling	207
1	Cooling system/coolant	207
1.1	Connection diagram - coolant hoses	207
1.2	Checking cooling system for leaks	208
1.3	Draining and filling cooling system	210
2	Coolant pump/thermostat assembly	219
2.1	Exploded view - coolant pump/thermostat	219
2.2	Removing and installing electric coolant pump	220
2.3	Removing and installing coolant pump	222
2.4	Checking thermostat	225
2.5	Removing and installing thermostat	228
2.6	Removing and installing coolant distributor housing	231
2.7	Removing and installing coolant temperature sender G62	233
2.8	Removing and installing coolant valves	234
3	Coolant pipes	236
3.1	Exploded view - coolant pipes	236
3.2	Removing and installing coolant pipes	238
4	Radiator/radiator fans	249
4.1	Exploded view - radiator/radiator fans	249
4.2	Removing and installing radiator	252
4.3	Removing and installing radiator cowl	257
4.4	Removing and installing radiator fans	261
4.5	Removing and installing auxiliary radiator	263
21	Turbocharging/supercharging	266
1	Turbocharger	266
1.1	Exploded view - turbocharger	266
1.2	Removing and installing turbocharger	271
2	Charge air system	278
2.1	Exploded view - charge air system	278
2.2	Removing and installing charge air cooler	281
2.3	Removing and installing charge pressure sender G31 / intake air temperature sender 2 G299	282
2.4	Removing and installing turbocharger air recirculation valve N249	283
2.5	Checking charge air system for leaks	284
24	Mixture preparation - injection	288
1	Injection system	288
1.1	Overview of fitting locations - injection system	288
2	Air cleaner	296
2.1	Exploded view - air cleaner housing	296
2.2	Removing and installing air cleaner housing	298
3	Intake manifold	300
3.1	Exploded view - intake manifold	300
3.2	Removing and installing intake manifold (top section)	306
3.3	Removing and installing intake manifold (bottom section) with fuel rail	309
3.4	Removing and installing throttle valve module J338	312
4	Injectors	316



4.1	Exploded view - fuel rail with injectors	316
4.2	Removing and installing injectors	318
4.3	Cleaning injectors	324
5	Senders and sensors	326
5.1	Removing and installing fuel pressure sender G247	326
5.2	Removing and installing fuel pressure sender for low pressure G410	327
5.3	Removing and installing intake air temperature sender G42/intake manifold pressure sender G71	328
6	High-pressure pump	330
6.1	Exploded view - high-pressure pump	330
6.2	Removing and installing high-pressure pump	331
6.3	Removing and installing high-pressure pipe	333
7	Lambda probe	336
7.1	Exploded view - Lambda probe	336
7.2	Removing and installing Lambda probe	337
8	Engine control unit	342
8.1	Exploded view - engine control unit	342
8.2	Removing and installing engine control unit J623	343
26 - Exhaust system		347
1	Exhaust pipes/silencers	347
1.1	Exploded view - silencers	347
1.2	Removing and installing silencers	347
1.3	Stress-free alignment of exhaust system	349
1.4	Checking exhaust system for leaks	350
2	Emission control system	351
2.1	Exploded view - emission control system	351
2.2	Removing and installing catalytic converter	353
2.3	Removing and installing starter catalytic converter	354
2.4	Removing and installing exhaust flap control unit J883	356
28 - Ignition system		358
1	Ignition system	358
1.1	Exploded view - ignition system	358
1.2	Test data - spark plugs	360
1.3	Removing and installing ignition coils with output stages	360
1.4	Removing and installing knock sensor	362
1.5	Removing and installing Hall senders	364
1.6	Removing and installing engine speed sender G28	365