



Contents

00 - Technical data	1
1 Safety information	1
1.1 Safety regulations for working on fuel supply	1
1.2 Safety precautions when working on natural gas system	1
1.3 Safety measures when working on vehicles with a start/stop system	3
1.4 Safety precautions when using testers and measuring instruments during a road test	4
1.5 Safety precautions when working on the cooling system	4
1.6 Safety precautions when working on ignition system	4
2 Identification	5
2.1 Engine number/engine data	5
3 Repair notes	7
3.1 Rules for cleanliness	7
3.2 Foreign objects in engine	7
3.3 Contact corrosion	7
3.4 Routing and attachment of lines	7
3.5 Fitting radiator and condensers	8
10 - Removing and installing engine	9
1 Removing and installing engine	9
1.1 Removing engine	9
1.2 Separating engine and gearbox	18
1.3 Securing engine on engine and gearbox support	20
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 Removing and installing gearbox mounting	27
2.4 Removing and installing pendulum support	28
2.5 Supporting engine in installation position	29
2.6 Adjusting assembly mountings	39
2.7 Checking adjustment of assembly mountings	40
13 - Crankshaft group	41
1 Cylinder block (pulley end)	41
1.1 Assembly overview - poly V-belt drive	41
1.2 Assembly overview - cylinder block (pulley end)	41
1.3 Removing and installing poly-V belt	43
1.4 Renewing crankshaft oil seal - belt pulley end	46
2 Cylinder block, gearbox end	49
2.1 Assembly overview - cylinder block, gearbox end	49
2.2 Removing and installing flywheel	50
2.3 Removing and installing sealing flange on gearbox side	51
3 Crankshaft	63
3.1 Crankshaft dimensions	63
4 Pistons and conrods	64
4.1 Assembly overview - pistons and conrods	64
4.2 Checking pistons and cylinder bores	66
4.3 Separating new conrod	68
4.4 Setting piston to TDC position	69
15 - Cylinder head, valve gear	72
1 Cylinder head	72



1.1	Assembly overview - cylinder head	72
1.2	Removing and installing cylinder head	75
1.3	Removing and installing camshaft housing	84
1.4	Checking compression	89
2	Toothed belt drive	93
2.1	Assembly overview - toothed belt cover	93
2.2	Assembly overview - toothed belt	93
2.3	Removing and installing toothed belt	95
2.4	Preassembling and installing valve timing tool	106
2.5	Checking valve timing	114
2.6	Adjusting valve timing	118
2.7	Removing toothed belt from camshaft	129
3	Valve gear	135
3.1	Assembly overview - valve gear	135
3.2	Measuring axial play of camshaft	136
3.3	Removing and installing camshaft adjuster	137
3.4	Removing and installing toothed belt pulley	143
3.5	Removing and installing camshaft oil seal	147
3.6	Removing and installing valve stem seals	157
4	Inlet and exhaust valves	168
4.1	Checking valve guides	168
17 - Lubrication		169
1	Sump, oil pump	169
1.1	Assembly overview - sump/oil pump	169
1.2	Engine oil:	173
1.3	Removing and installing sump	173
1.4	Removing and installing oil pump	178
2	Crankcase ventilation	181
2.1	Assembly overview - crankcase breather system	181
2.2	Removing and installing oil separator	182
3	Oil filter, oil pressure switch	187
3.1	Removing and installing oil pressure switch F1	187
3.2	Checking oil pressure and oil pressure switch	188
3.3	Removing and installing oil filter housing	190
19 - Cooling		192
1	Cooling system/coolant	192
1.1	Connection diagram - coolant hoses	192
1.2	Checking cooling system for leaks	192
1.3	Draining and adding coolant	196
2	Coolant pump, regulation of cooling system	202
2.1	Assembly overview - coolant pump	202
2.2	Assembly overview - thermostat	205
2.3	Removing and installing coolant pump	208
2.4	Removing and installing thermostat	213
2.5	Removing and installing toothed belt for coolant pump	220
2.6	Removing and installing coolant temperature sender G62	222
2.7	Removing and installing radiator fan thermal switch F18	224
3	Radiator, radiator fan	226
3.1	Assembly overview - radiator, radiator fan	226
3.2	Removing and installing radiator	228
3.3	Removing and installing radiator cowl with radiator fan	232
3.4	Removing and installing radiator fan V7	234



24 - Mixture preparation - injection	238
1 Injection system	238
1.1 Overview of fitting locations - injection system	238
1.2 Assembly overview - fuel system	241
2 Injectors	244
2.1 Assembly overview - fuel rail with injectors	244
2.2 Removing and installing injectors	244
2.3 Checking injectors	248
2.4 Cleaning injectors	253
3 Checking natural gas supply system for leaks	257
3.1 Distinguishing between pressure sections of natural gas supply system	257
3.2 Determining pressure in gas system	261
3.3 Determining operating mode of natural gas vehicles	261
3.4 Activating and deactivating natural gas mode	261
3.5 Checking gas system for leaks	263
4 Gas injectors	268
4.1 Assembly overview - gas rail	268
4.2 Removing and installing gas rail with gas injector N366/N367/N368	270
4.3 Removing and installing gas rail sensor G401	274
5 Air filter	276
5.1 Assembly overview - air filter housing	276
5.2 Removing and installing air filter housing	277
6 Intake manifold	279
6.1 Assembly overview – intake manifold	279
6.2 Removing and installing intake manifold	281
6.3 Removing and installing throttle valve module GX3	287
6.4 Cleaning throttle valve module GX3	289
7 Senders and sensors	291
7.1 Removing and installing intake manifold sender GX9	291
8 Engine control unit	293
8.1 Assembly overview – motor control unit	293
8.2 Removing and installing engine control unit J623	293
8.3 Removing and installing engine (motor) control unit J623 with protective housing	295
9 Lambda probe	297
9.1 Assembly overview - Lambda probe	297
9.2 Removing and installing Lambda probe	302
10 Gas pressure regulator	307
10.1 Assembly overview - gas pressure regulator	307
10.2 Removing and installing gas pressure regulator	309
10.3 Removing and installing tank pressure sensor G400	312
26 - Exhaust system	316
1 Exhaust pipes and silencers	316
1.1 Assembly overview – silencers	316
1.2 Separating exhaust pipes from silencers	317
1.3 Removing and installing silencer	318
1.4 Checking exhaust system for leaks	320
1.5 Installation position of clamp	320
2 Emission control	323
2.1 Assembly overview – emission control	323
2.2 Removing and installing catalytic converter	328
28 - Ignition system	333



1	Ignition system	333
1.1	Assembly overview - ignition system	333
1.2	Removing and installing ignition coils with output stage	335
1.3	Removing and installing knock sensor 1 G61	339
1.4	Removing and installing Hall sender	339
1.5	Removing and installing engine speed sender G28	341