



Contents

00 - Technical data	1
1 Safety information	1
1.1 Safety regulations for working on fuel supply	1
1.2 Safety measures when working on vehicles with a start/stop system	1
1.3 Safety precautions when using testers and measuring instruments during a road test	2
1.4 Safety precautions when working on ignition system	2
1.5 Safety precautions when working on exhaust system	2
1.6 Safety precautions when working on the cooling system	3
2 Identification	4
2.1 Engine number/engine data	4
3 Repair instructions	6
3.1 Rules for cleanliness	6
3.2 General information	6
3.3 General repair notes	6
3.4 Foreign objects in engine	7
3.5 Contact corrosion	7
3.6 Routing and attachment of lines	7
3.7 Fitting radiator and condensers	7
3.8 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	46
1.3 Securing engine on engine and gearbox support	50
1.4 Installing engine	52
2 Assembly mountings	62
2.1 Assembly overview – assembly mountings	62
2.2 Supporting engine in installation position	74
2.3 Removing and installing engine mounting	85
2.4 Removing and installing gearbox mounting	90
2.5 Removing and installing pendulum support	95
2.6 Checking adjustment of assembly mountings	99
2.7 Adjusting assembly mountings	101
13 - Crankshaft group	107
1 Cylinder block (pulley end)	107
1.1 Assembly overview - poly V-belt drive	107
1.2 Removing and installing poly-V belt	114
1.3 Removing and installing tensioner for poly V-belt	122
1.4 Removing and installing vibration damper	123
1.5 Removing and installing engine support	125
1.6 Renewing crankshaft oil seal - belt pulley end	132
2 Cylinder block, gearbox end	135
2.1 Assembly overview - cylinder block, gearbox end	135
2.2 Removing and installing flywheel	139
2.3 Removing and installing drive plate	140
2.4 Removing and installing sealing flange on gearbox side	143
3 Crankshaft	155
3.1 Measuring axial clearance of crankshaft	155
4 Pistons and conrods	157
4.1 Assembly overview - pistons and conrods	157



4.2	Removing and installing pistons	161
4.3	Checking pistons and cylinder bores	162
4.4	Separating new conrod	164
4.5	Checking radial clearance of conrods	165
4.6	Removing and installing oil spray jets	166
4.7	Setting piston to TDC position	167
15	Cylinder head, valve gear	170
1	Cylinder head	170
1.1	Assembly overview - cylinder head	170
1.2	Assembly overview - camshaft housing	172
1.3	Removing and installing cylinder head	174
1.4	Removing and installing camshaft housing	178
1.5	Checking compression	181
2	Toothed belt drive	184
2.1	Assembly overview - toothed belt cover	184
2.2	Assembly overview - toothed belt	184
2.3	Removing and installing toothed belt guard	186
2.4	Removing and installing toothed belt	187
2.5	Preassembling and installing valve timing tool	194
2.6	Checking valve timing	203
2.7	Adjusting valve timing	207
2.8	Removing toothed belt from camshaft	218
3	Valve gear	224
3.1	Assembly overview - valve gear	224
3.2	Removing and installing camshaft adjuster	226
3.3	Removing and installing toothed belt pulley	231
3.4	Measuring axial play of camshaft	236
3.5	Removing and installing camshaft oil seal	237
3.6	Removing and installing camshaft control valve 1 N205	243
3.7	Removing and installing valve stem seals	244
4	Inlet and exhaust valves	254
4.1	Checking valve guides	254
4.2	Checking valves	255
4.3	Valve dimensions	255
17	Lubrication	256
1	Sump, oil pump	256
1.1	Assembly overview - sump/oil pump	256
1.2	Removing and installing lower part of sump	259
1.3	Removing and installing oil pump	265
1.4	Removing and installing upper part of sump	267
1.5	Engine oil:	272
2	Engine oil cooler	273
2.1	Assembly overview - engine oil cooler	273
2.2	Removing and installing engine oil cooler	273
3	Crankcase ventilation	275
3.1	Assembly overview - crankcase breather system	275
3.2	Removing and installing oil separator	276
4	Oil filter, oil pressure switch	279
4.1	Assembly overview - oil filter/oil pressure switch	279
4.2	Removing and installing oil pressure switch F1	279
4.3	Checking oil pressure	281
4.4	Removing and installing oil filter housing	282



19 - Cooling	284
1 Cooling system/coolant	284
1.1 Connection diagram - coolant hoses	284
1.2 Draining and adding coolant	287
1.3 Checking cooling system for leaks	296
2 Coolant pump, regulation of cooling system	300
2.1 Assembly overview - coolant pump, thermostat	300
2.2 Assembly overview - coolant temperature sender	303
2.3 Removing and installing coolant pump	304
2.4 Removing and installing toothed belt pulley for coolant pump	308
2.5 Removing and installing thermostat	309
2.6 Removing and installing coolant temperature sender G62	313
2.7 Removing and installing radiator outlet coolant temperature sender G83	315
3 Coolant pipes	317
3.1 Assembly overview - coolant pipes	317
3.2 Removing and installing coolant pipes	317
4 Radiator, radiator fan	320
4.1 Assembly overview – radiator/radiator fan	320
4.2 Assembly overview – radiator cowl and radiator fan	324
4.3 Removing and installing radiator	326
4.4 Removing and installing radiator cowl	339
4.5 Removing and installing radiator fan V7	342
24 - Mixture preparation - injection	345
1 Injection system	345
1.1 Overview of fitting locations - injection system	345
1.2 Assembly overview - fuel system	351
2 Injectors	354
2.1 Assembly overview - fuel rail with injectors	354
2.2 Removing and installing fuel rail	354
2.3 Removing and installing injectors	357
2.4 Checking injectors	358
2.5 Cleaning injectors	362
3 Air filter	364
3.1 Assembly overview - air filter housing	364
3.2 Removing and installing air filter housing	366
4 Intake manifold	369
4.1 Assembly overview – intake manifold	369
4.2 Removing and installing intake manifold	373
4.3 Removing and installing throttle valve module GX3	376
4.4 Cleaning throttle valve module GX3	376
5 Senders and sensors	378
5.1 Removing and installing intake manifold sender GX9	378
6 Engine control unit	379
6.1 Removing and installing engine control unit J623	379
7 Lambda probe	391
7.1 Assembly overview - Lambda probe	391
7.2 Removing and installing Lambda probe	392
26 - Exhaust system	395
1 Exhaust pipes and silencers	395
1.1 Assembly overview – silencers	395
1.2 Separating exhaust pipes from silencers	405



1.3	Removing and installing silencer	407
1.4	Aligning exhaust system free of stress	414
1.5	Checking exhaust system for leaks	415
2	Emission control	416
2.1	Assembly overview – emission control	416
2.2	Removing and installing catalytic converter	420
28	- Ignition system	424
1	Ignition system	424
1.1	Assembly overview - ignition system	424
1.2	Removing and installing ignition coils with output stage	426
1.3	Removing and installing knock sensor 1 G61	428
1.4	Removing and installing Hall sender	430
1.5	Removing and installing engine speed sender G28	430