



Contents

00 - Technical data	1
1 Safety information	1
1.1 Safety measures when working on fuel supply	1
1.2 Safety measures when working on vehicles with 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 the cooling system	2
1.5 Safety precautions when working on ignition system	2
1.6 Safety precautions when working on exhaust system	3
2 Identification	5
2.1 Engine number/engine data	5
3 Repair instructions	7
3.1 Rules for cleanliness	7
3.2 General information	8
3.3 Foreign objects in engine	8
3.4 Contact corrosion	9
3.5 Routing and attachment of lines	9
3.6 Fitting radiator and condensers	9
3.7 Checking vacuum system	9
10 - Removing and installing engine	11
1 Removing and installing engine	11
1.1 Removing engine	11
1.2 Separating engine and gearbox	18
1.3 Securing engine on engine and gearbox support	22
1.4 Installing engine	24
2 Assembly mountings	29
2.1 Assembly overview - assembly mountings	29
2.2 Removing and installing engine mounting	30
2.3 Removing and installing gearbox mounting	32
2.4 Removing and installing pendulum support	33
2.5 Supporting engine in installation position	34
2.6 Adjusting assembly mountings	36
2.7 Checking adjustment of assembly mountings (engine and gearbox mountings)	38
13 - Crankshaft group	40
1 Cylinder block (pulley end)	40
1.1 Assembly overview - poly V-belt drive	40
1.2 Assembly overview - sealing flange, belt pulley end	44
1.3 Removing and installing poly-V belt	45
1.4 Removing and installing tensioner for poly V-belt	48
1.5 Removing and installing vibration damper	49
1.6 Removing and installing engine support	50
1.7 Renewing crankshaft oil seal - belt pulley end	52
1.8 Removing and installing sealing flange on pulley end	55
2 Cylinder block, gearbox end	58
2.1 Assembly overview - cylinder block, gearbox end	58
2.2 Removing and installing flywheel	59
2.3 Removing and installing sealing flange on gearbox side	60
3 Crankshaft	68
3.1 Crankshaft dimensions	68
3.2 Renewing needle bearing in crankshaft	68
3.3 Measuring axial clearance of crankshaft	70



4	Pistons and conrods	72
4.1	Assembly overview - pistons and conrods	72
4.2	Removing and installing pistons	74
4.3	Checking pistons and cylinder bores	75
4.4	Separating new conrod	76
4.5	Checking radial clearance of conrods	77
4.6	Removing and installing oil spray jets	77
15	Cylinder head, valve gear	79
1	Cylinder head	79
1.1	Assembly overview - cylinder head	79
1.2	Assembly overview - camshaft housing	81
1.3	Removing and installing cylinder head	84
1.4	Removing and installing camshaft housing	88
1.5	Checking compression	91
2	Toothed belt drive	94
2.1	Assembly overview - toothed belt cover	94
2.2	Assembly overview - toothed belt	95
2.3	Removing and installing toothed belt	98
2.4	Checking valve timing	108
2.5	Removing toothed belt from camshaft	113
3	Valve gear	122
3.1	Assembly overview - valve gear	122
3.2	Measuring axial play of camshaft	123
3.3	Removing and installing camshaft oil seal	124
3.4	Removing and installing camshaft adjuster	130
3.5	Removing and installing camshaft control valve 1 N205	137
3.6	Removing and installing exhaust camshaft control valve 1 N318	137
3.7	Removing and installing valve stem seals	138
4	Inlet and exhaust valves	147
4.1	Reworking valve seats	147
4.2	Checking valve guides	148
4.3	Checking valves	149
4.4	Valve dimensions	150
17	Lubrication	151
1	Sump, oil pump	151
1.1	Assembly overview - sump/oil pump	151
1.2	Engine oil:	154
1.3	Removing and installing lower part of sump	154
1.4	Removing and installing upper part of sump	158
1.5	Removing and installing oil pump	162
1.6	Removing and installing oil level and oil temperature sender G266	163
2	Engine oil cooler	164
2.1	Assembly overview - engine oil cooler	164
2.2	Removing and installing engine oil cooler	164
3	Crankcase ventilation	166
3.1	Assembly overview - crankcase breather system	166
3.2	Removing and installing oil separator	167
4	Oil filter, oil pressure switch	169
4.1	Assembly overview - oil filter/oil pressure switch	169
4.2	Removing and installing oil pressure switch F1	170
4.3	Removing and installing oil pressure switch for reduced oil pressure F378	171
4.4	Checking oil pressure and oil pressure switch	172
4.5	Removing and installing oil pressure regulating valve N428	175



19 - Cooling	177
1 Cooling system/coolant	177
1.1 Connection diagram - coolant hoses	177
1.2 Checking cooling system for leaks	178
1.3 Draining and adding coolant	180
2 Coolant pump, regulation of cooling system	187
2.1 Assembly overview - coolant pump, thermostat	187
2.2 Assembly overview - electric coolant pump	189
2.3 Assembly overview - coolant temperature sender	191
2.4 Removing and installing electric coolant pump	191
2.5 Removing and installing coolant pump	193
2.6 Removing and installing thermostat	197
2.7 Removing and installing toothed belt pulley for coolant pump	200
2.8 Removing and installing coolant temperature sender G62	201
2.9 Removing and installing radiator outlet coolant temperature sender G83	202
3 Coolant pipes	205
3.1 Assembly overview - coolant pipes	205
3.2 Removing and installing coolant pipes	205
4 Radiator, radiator fan	209
4.1 Assembly overview - radiator/radiator fan	209
4.2 Assembly overview - radiator cowl and radiator fan	211
4.3 Removing and installing radiator	211
4.4 Removing and installing radiator cowl with radiator fan	214
4.5 Removing and installing radiator fan	215
21 - Turbocharging/supercharging	217
1 Turbocharger	217
1.1 Assembly overview - turbocharger	217
1.2 Removing and installing turbocharger	218
1.3 Removing and installing charge pressure positioner V465	221
2 Charge air system	223
2.1 Assembly overview - charge air system	223
2.2 Removing and installing charge air cooler	225
2.3 Removing and installing charge air pressure sender G31 / intake air temperature sender G42	227
2.4 Checking charge air system for leaks	228
2.5 Removing and installing air pipe	230
24 - Mixture preparation - injection	233
1 Injection system	233
1.1 Overview of fitting locations - injection system	233
2 Injectors	237
2.1 Assembly overview - fuel rail with injectors	237
2.2 Removing and installing fuel rail	238
2.3 Removing and installing injectors	238
2.4 Renewing seals on injectors	242
2.5 Cleaning injectors	245
3 Air filter	247
3.1 Assembly overview - air filter housing	247
3.2 Removing and installing air filter housing	248
4 Intake manifold	249
4.1 Assembly overview - intake manifold	249
4.2 Removing and installing intake manifold	250
4.3 Removing and installing throttle valve module GX3	252



4.4	Cleaning throttle valve module	252
5	Senders and sensors	254
5.1	Removing and installing fuel pressure sender G247	254
5.2	Checking fuel pressure sender G247	255
6	Engine control unit	257
6.1	Removing and installing engine (motor) control unit J623 with protective housing	257
7	High-pressure pump	259
7.1	Assembly overview - high-pressure pump	259
7.2	Removing and installing high-pressure pump	260
7.3	Removing and installing high-pressure pipe	261
8	Lambda probe	263
8.1	Assembly overview - Lambda probe	263
8.2	Removing and installing Lambda probe	264
26	- Exhaust system	266
1	Exhaust pipes and silencers	266
1.1	Assembly overview - silencers	266
1.2	Separating exhaust pipes from silencers	267
1.3	Aligning exhaust system free of stress	268
1.4	Checking exhaust system for leaks	269
1.5	Installation position of clamp	269
2	Emission control	272
2.1	Assembly overview - emission control	272
2.2	Removing and installing catalytic converter	273
28	- Ignition system	277
1	Ignition system	277
1.1	Assembly overview - ignition system	277
1.2	Removing and installing ignition coils with output stage	278
1.3	Removing and installing knock sensor 1 G61	280
1.4	Removing and installing Hall sender	281
1.5	Removing and installing engine speed sender G28	282