



Contents

00 - Technical data	1
1 Identification	1
1.1 Engine number, engine data	1
2 Safety instructions	2
2.1 Safety precautions when working on fuel supply system	2
2.2 Safety precautions when working on vehicles with a Start/Stop system	2
2.3 Safety precautions during road tests in which test and measuring equipment is used	3
2.4 Safety precautions when working on cooling system	3
2.5 Safety precautions when working on ignition system	3
3 Repair instructions	4
3.1 Rules for cleanliness	4
3.2 Foreign objects in engine	4
3.3 Contact corrosion	4
3.4 Routing and securing lines	4
3.5 Installing coolers, condensers and radiators	5
10 - Removing and installing engine	6
1 Removing and installing engine	6
1.1 Removing engine	6
1.2 Separating engine and gearbox	16
1.3 Securing engine on engine and gearbox support	18
1.4 Installing engine	19
2 Assembly mountings	23
2.1 Assembly overview - assembly mountings	23
2.2 Supporting engine in installation position	25
2.3 Removing and installing engine mountings	27
2.4 Removing and installing gearbox mounting	28
2.5 Removing and installing pendulum support	30
2.6 Checking adjustment of assembly mountings (engine and gearbox mountings)	30
2.7 Adjusting assembly mountings	30
13 - Crankshaft group	33
1 Cylinder block (pulley end)	33
1.1 Assembly overview - poly V-belt drive	33
1.2 Assembly overview - sealing flange, belt pulley end	37
1.3 Removing and installing poly V-belt	38
1.4 Removing and installing tensioner for poly V-belt	42
1.5 Removing and installing vibration damper	42
1.6 Removing and installing engine support	43
1.7 Renewing crankshaft oil seal - belt pulley end	46
1.8 Removing and installing sealing flange on pulley end	48
2 Cylinder block, gearbox end	51
2.1 Assembly overview - cylinder block, gearbox end	51
2.2 Removing and installing flywheel	52
2.3 Removing and installing sealing flange on gearbox side	53
3 Crankshaft	63
3.1 Renewing needle bearing in crankshaft	63
3.2 Crankshaft dimensions	64
3.3 Measuring axial clearance of crankshaft	64
4 Pistons and conrods	66
4.1 Assembly overview - pistons and conrods	66
4.2 Removing and installing pistons	68



4.3	Removing and installing oil spray jets	69
4.4	Checking pistons and cylinder bores	70
4.5	Checking radial clearance of conrods	71
15 - Cylinder head, valve gear	73
1	Toothed belt drive	73
1.1	Assembly overview - toothed belt cover	73
1.2	Assembly overview - toothed belt	74
1.3	Checking valve timing	75
1.4	Removing toothed belt from camshaft	80
1.5	Removing and installing toothed belt	91
2	Cylinder head	104
2.1	Assembly overview - cylinder head	104
2.2	Assembly overview - camshaft housing	106
2.3	Removing and installing cylinder head	107
2.4	Removing and installing camshaft housing	111
2.5	Checking compression	115
3	Valve gear	118
3.1	Assembly overview - valve gear	118
3.2	Removing and installing inlet camshaft control valve 1 N205	119
3.3	Removing and installing camshaft adjuster	119
3.4	Measuring axial play of camshaft	120
3.5	Removing and installing camshaft oil seal	121
3.6	Removing and installing valve stem seal	126
4	Inlet and exhaust valves	134
4.1	Checking valve guides	134
4.2	Checking valves	134
4.3	Valve dimensions	135
17 - Lubrication	136
1	Sump, oil pump	136
1.1	Assembly overview - sump and oil pump	136
1.2	Removing and installing oil level and oil temperature sender G266	139
1.3	Removing and installing lower part of sump	139
1.4	Removing and installing oil pump	142
1.5	Removing and installing upper part of sump	143
1.6	Engine oil	146
2	Engine oil cooler	147
2.1	Assembly overview - engine oil cooler	147
2.2	Removing and installing engine oil cooler	147
3	Crankcase breather	149
3.1	Assembly overview - crankcase breather system	149
3.2	Removing and installing oil separator	150
4	Oil filter, oil pressure switch	153
4.1	Assembly overview - oil filter/oil pressure switch	153
4.2	Removing and installing oil pressure switch F1	154
4.3	Removing and installing oil pressure switch for reduced oil pressure F378	155
4.4	Removing and installing oil pressure regulating valve N428	156
4.5	Checking oil pressure	157
19 - Cooling	160
1	Cooling system, coolant	160
1.1	Coolant hose schematic diagram	160
1.2	Draining and filling coolant	161
1.3	Checking cooling system for leaks	166



2	Coolant pump, regulation of cooling system	168
2.1	Assembly overview - coolant pump, thermostat	168
2.2	Assembly overview - electric coolant pump	170
2.3	Assembly overview - coolant temperature sender	172
2.4	Removing and installing coolant pump	173
2.5	Removing and installing toothed belt pulley for coolant pump	176
2.6	Removing and installing thermostat	177
2.7	Removing and installing electric coolant pump	180
2.8	Removing and installing coolant temperature sender G62	182
2.9	Removing and installing coolant temperature sender at radiator outlet G83	183
3	Coolant pipes	185
3.1	Assembly overview - coolant pipes	185
3.2	Removing and installing coolant pipes	185
4	Radiator and radiator fan	189
4.1	Assembly overview - radiator and radiator fan	189
4.2	Assembly overview - radiator cowl and radiator fan	191
4.3	Removing and installing radiator	192
4.4	Removing and installing radiator cowling	193
4.5	Removing and installing radiator fan V7 and radiator fan 2 V177	194
21	- Turbocharging/supercharging	196
1	Turbocharger	196
1.1	Assembly overview - turbocharger	196
1.2	Removing and installing turbocharger	198
1.3	Removing and installing charge pressure positioner V465	202
2	Charge air system	206
2.1	Assembly overview - charge air system	206
2.2	Removing and installing charge pressure sender GX26	208
2.3	Removing and installing charge air cooler	208
2.4	Checking charge air system for leaks	211
24	- Mixture preparation - injection	214
1	Injection system	214
1.1	Overview of fitting locations - injection system	214
1.2	Releasing high pressure in fuel system	217
2	Air filter	219
2.1	Assembly overview - air filter housing	219
2.2	Removing and installing air filter housing	220
3	Intake manifold	221
3.1	Assembly overview - intake manifold	221
3.2	Removing and installing intake manifold	222
3.3	Removing and installing throttle valve module GX3	225
3.4	Cleaning throttle valve module GX3	226
4	Injectors	228
4.1	Assembly overview - fuel rail with injectors	228
4.2	Removing and installing fuel rail	229
4.3	Removing and installing injectors	230
4.4	Cleaning injectors	234
5	Senders and sensors	236
5.1	Removing and installing intake manifold sender GX9	236
5.2	Removing and installing fuel pressure sender G247	236
5.3	Checking fuel pressure sender G247	237
6	High-pressure pump	240
6.1	Assembly overview - high-pressure pump	240



6.2	Removing and installing high-pressure pump	241
6.3	Removing and installing high-pressure pipe	242
7	Lambda probe	244
7.1	Assembly overview - Lambda probe	244
7.2	Removing and installing lambda probe 1 before catalytic converter GX10 / lambda probe 1 after catalytic converter GX7	245
8	Engine control unit	247
8.1	Removing and installing engine control unit J623	247
26	- Exhaust system	251
1	Exhaust pipes, silencers	251
1.1	Assembly overview - silencers	251
1.2	Removing and installing silencer	252
1.3	Separating exhaust pipes, silencers	253
1.4	Aligning exhaust system free of tension	253
1.5	Checking exhaust system for leaks	254
2	Emission control	255
2.1	Assembly overview - emission control	255
2.2	Removing and installing catalytic converter	256
28	- Ignition system	260
1	Ignition system	260
1.1	Assembly overview - ignition system	260
1.2	Test data, spark plugs	261
1.3	Removing and installing ignition coils with output stage	261
1.4	Removing and installing knock sensor 1 G61	263
1.5	Removing and installing Hall sender G40	264
1.6	Removing and installing engine speed sender G28	264