



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 the cooling system	2
1.5 Safety precautions when working on ignition system	2
2 Identification	3
2.1 Engine number/engine data	3
3 Repair notes	4
3.1 Rules for cleanliness	4
3.2 Foreign bodies in engine	4
3.3 Contact corrosion	4
3.4 Routing and attachment of lines	4
3.5 Fitting radiator and condensers	5
10 - Removing and installing engine	6
1 Removing and installing engine	6
1.1 Removing engine	6
1.2 Separating engine and gearbox	19
1.3 Securing engine on engine and gearbox support	20
1.4 Installing engine	22
2 Assembly mountings	25
2.1 Assembly overview – assembly mountings	25
2.2 Removing and installing engine mounting	28
2.3 Removing and installing gearbox mounting	30
2.4 Removing and installing pendulum support	32
2.5 Supporting engine in installation position	32
2.6 Adjusting assembly mountings	42
2.7 Checking adjustment of assembly mountings	44
13 - Crankshaft group	45
1 Cylinder block (pulley end)	45
1.1 Assembly overview - poly V-belt drive	45
1.2 Removing and installing poly-V belt	49
1.3 Removing and installing tensioner for poly V-belt	52
1.4 Removing and installing vibration damper	53
1.5 Removing and installing engine support	55
1.6 Renewing crankshaft oil seal - pulley end	57
2 Cylinder block, gearbox end	61
2.1 Assembly overview - cylinder block, gearbox end	61
2.2 Removing and installing flywheel	62
2.3 Removing and installing sealing flange on gearbox side	63
3 Crankshaft	74
3.1 Crankshaft dimensions	74
3.2 Renewing needle bearing in crankshaft	74
3.3 Measuring axial clearance of crankshaft	77
4 Pistons and conrods	79
4.1 Assembly overview - pistons and conrods	79
4.2 Removing and installing pistons	82
4.3 Checking pistons and cylinder bores	83
4.4 Separating new conrod	86



4.5	Checking radial clearance of conrods	86
4.6	Removing and installing oil spray jets	87
15	- Cylinder head, valve gear	89
1	Cylinder head	89
1.1	Assembly overview - cylinder head	89
1.2	Assembly overview - camshaft housing	91
1.3	Removing and installing cylinder head	93
1.4	Removing and installing camshaft housing	98
1.5	Checking compression	102
2	Toothed belt drive	105
2.1	Assembly overview - toothed belt cover	105
2.2	Assembly overview - toothed belt	105
2.3	Removing and installing toothed belt guard	107
2.4	Removing and installing toothed belt	108
2.5	Checking valve timing	114
2.6	Adjusting valve timing	122
2.7	Removing toothed belt from camshaft	129
3	Valve gear	134
3.1	Assembly overview - valve gear	134
3.2	Measuring axial play of camshaft	135
3.3	Removing and installing camshaft oil seal	136
3.4	Removing and installing camshaft adjuster	143
3.5	Removing and installing camshaft control valve 1 N205	146
3.6	Removing and installing valve stem oil seals	147
3.7	Removing and installing toothed belt pulley	155
4	Inlet and exhaust valves	158
4.1	Checking valve guides	158
4.2	Checking valves	159
4.3	Valve dimensions	159
17	- Lubrication	160
1	Sump, oil pump	160
1.1	Assembly overview - sump/oil pump	160
1.2	Engine oil:	164
1.3	Removing and installing oil sump	165
1.4	Removing and installing oil pump	170
1.5	Removing and installing oil level and oil temperature sender G266	173
2	Engine oil cooler	174
2.1	Assembly overview - engine oil cooler	174
2.2	Removing and installing engine oil cooler	174
3	Crankcase ventilation	176
3.1	Assembly overview - crankcase breather system	176
3.2	Removing and installing oil separator	177
4	Oil filter, oil pressure switch	181
4.1	Assembly overview - oil filter/oil pressure switch	181
4.2	Removing and installing oil pressure switch for reduced oil pressure F378	181
4.3	Checking oil pressure and oil pressure switch	182
4.4	Removing and installing oil filter housing	184
19	- Cooling	186
1	Cooling system/coolant	186
1.1	Connection diagram - coolant hoses	186
1.2	Checking cooling system for leaks	188
1.3	Draining and adding coolant	190



2	Coolant pump, regulation of cooling system	200
2.1	Assembly overview - coolant pump, thermostat	200
2.2	Assembly overview - electric coolant pump	203
2.3	Assembly overview - coolant temperature sender	204
2.4	Removing and installing electric coolant pump	205
2.5	Removing and installing coolant pump	207
2.6	Removing and installing thermostat	213
2.7	Removing and installing toothed belt pulley for coolant pump	216
2.8	Removing and installing coolant temperature sender G62	218
2.9	Removing and installing radiator outlet coolant temperature sender G83	220
3	Coolant pipes	221
3.1	Assembly overview - coolant pipes	221
3.2	Removing and installing coolant pipes	221
4	Radiator, radiator fan	225
4.1	Assembly overview - radiator/radiator fan	225
4.2	Assembly overview - radiator cowl and radiator fan	227
4.3	Removing and installing radiator	228
4.4	Removing and installing water radiator for charge air cooling circuit	229
4.5	Removing and installing radiator cowl	232
4.6	Removing and installing radiator fan	234
21	Turbocharging/supercharging	237
1	Turbocharger	237
1.1	Assembly overview - turbocharger	237
1.2	Removing and installing turbocharger	239
1.3	Removing and installing charge pressure positioner V465	243
2	Charge air system	245
2.1	Assembly overview - charge air system	245
2.2	Removing and installing charge air cooler	248
2.3	Removing and installing charge pressure sender GX26	250
2.4	Checking charge air system for leaks	251
2.5	Removing and installing air intake pipe	253
24	Mixture preparation - injection	255
1	Injection system	255
1.1	Overview of fitting locations - injection system	255
2	Injectors	259
2.1	Assembly overview - fuel rail with injectors	259
2.2	Removing and installing fuel rail	261
2.3	Removing and installing injectors	261
2.4	Cleaning injectors	268
3	Air filter	270
3.1	Assembly overview - air filter housing	270
3.2	Removing and installing air filter housing	271
3.3	Removing and installing resonator for intake air	273
4	Intake manifold	275
4.1	Assembly overview - intake manifold	275
4.2	Removing and installing intake manifold	277
4.3	Removing and installing throttle valve module GX3	280
4.4	Cleaning throttle valve module GX3	281
5	Senders and sensors	283
5.1	Removing and installing intake manifold sender GX9	283
5.2	Removing and installing fuel pressure sender G247	283
5.3	Checking fuel pressure sender G247	285



6	Engine/motor control unit	288
6.1	Removing and installing engine control unit J623	288
7	High-pressure pump	292
7.1	Assembly overview - high-pressure pump	292
7.2	Removing and installing high-pressure pump	296
7.3	Removing and installing high-pressure pipe	298
8	Lambda probe	301
8.1	Assembly overview - Lambda probe	301
8.2	Removing and installing lambda probe	302
26 - Exhaust system		306
1	Exhaust pipes and silencers	306
1.1	Assembly overview – silencers	306
1.2	Separating exhaust pipes from silencers	306
1.3	Removing and installing rear silencer	308
1.4	Aligning exhaust system free of stress	309
1.5	Checking exhaust system for leaks	310
1.6	Installation position of clamp	311
2	Emission control	313
2.1	Assembly overview – emission control	313
2.2	Removing and installing catalytic converter	315
28 - Ignition system		320
1	Ignition system	320
1.1	Assembly overview - ignition system	320
1.2	Test data, spark plugs	322
1.3	Removing and installing ignition coils with output stage	322
1.4	Removing and installing knock sensor 1 G61	325
1.5	Removing and installing Hall sender G40	325
1.6	Removing and installing engine speed sender G28	326