



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 instructions	4
3.1 Rules for cleanliness	4
3.2 Foreign objects 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	16
1.3 Securing engine on engine and gearbox support	18
1.4 Installing engine	19
2 Assembly mountings	22
2.1 Assembly overview - assembly mountings	22
2.2 Removing and installing engine mounting	24
2.3 Removing and installing gearbox mounting	25
2.4 Removing and installing pendulum support	27
2.5 Supporting engine in installation position	27
2.6 Adjusting assembly mountings	34
2.7 Checking adjustment of assembly mountings (engine and gearbox mountings)	36
13 - Crankshaft group	37
1 Cylinder block (pulley end)	37
1.1 Assembly overview - poly V-belt drive	37
1.2 Assembly overview - sealing flange, belt pulley end	41
1.3 Removing and installing poly-V belt	42
1.4 Removing and installing tensioner for poly V-belt	45
1.5 Removing and installing vibration damper	45
1.6 Removing and installing engine support	46
1.7 Renewing crankshaft oil seal - belt pulley end	48
1.8 Removing and installing sealing flange on pulley end	51
2 Cylinder block, gearbox end	54
2.1 Assembly overview - cylinder block, gearbox end	54
2.2 Removing and installing flywheel	55
2.3 Removing and installing sealing flange on gearbox side	56
3 Crankshaft	64
3.1 Crankshaft dimensions	64
3.2 Renewing needle bearing in crankshaft	64
3.3 Measuring axial clearance of crankshaft	67
4 Pistons and conrods	68
4.1 Assembly overview - pistons and conrods	68
4.2 Removing and installing pistons	70



4.3	Checking pistons and cylinder bores	71
4.4	Separating new conrod	72
4.5	Checking radial clearance of conrods	72
4.6	Removing and installing oil spray jets	73
15	- Cylinder head, valve gear	75
1	Cylinder head	75
1.1	Assembly overview - cylinder head	75
1.2	Assembly overview - camshaft housing	77
1.3	Removing and installing cylinder head	78
1.4	Removing and installing camshaft housing	82
1.5	Checking compression	86
2	Toothed belt drive	89
2.1	Assembly overview - toothed belt cover	89
2.2	Assembly overview - toothed belt	90
2.3	Removing and installing toothed belt guard	91
2.4	Removing and installing toothed belt	92
2.5	Checking valve timing	96
2.6	Adjusting valve timing	101
2.7	Removing toothed belt from camshaft	108
3	Valve gear	112
3.1	Assembly overview - valve gear	112
3.2	Measuring axial play of camshaft	113
3.3	Removing and installing camshaft oil seal	114
3.4	Removing and installing camshaft adjuster	119
3.5	Removing and installing camshaft control valve 1 N205	127
3.6	Removing and installing exhaust camshaft control valve 1 N318	128
3.7	Removing and installing valve stem seals	128
4	Inlet and exhaust valves	136
4.1	Checking valve guides	136
4.2	Checking valves	136
4.3	Valve dimensions	137
17	- Lubrication	138
1	Sump, oil pump	138
1.1	Assembly overview - sump/oil pump	138
1.2	Engine oil:	141
1.3	Removing and installing lower part of sump	142
1.4	Removing and installing upper part of sump	146
1.5	Removing and installing oil pump	150
1.6	Removing and installing oil level and oil temperature sender G266	151
2	Engine oil cooler	153
2.1	Assembly overview - engine oil cooler	153
2.2	Removing and installing engine oil cooler	153
3	Crankcase ventilation	155
3.1	Assembly overview - crankcase breather system	155
3.2	Removing and installing oil separator	156
4	Oil filter, oil pressure switch	159
4.1	Assembly overview - oil filter/oil pressure switch	159
4.2	Removing and installing oil pressure switch F1	160
4.3	Removing and installing oil pressure switch for reduced oil pressure F378	161
4.4	Checking oil pressure	161
4.5	Removing and installing oil pressure regulating valve N428	163
19	- Cooling	165



1	Cooling system/coolant	165
1.1	Connection diagram - coolant hoses	165
1.2	Assembly overview - engine preheater	166
1.3	Checking cooling system for leaks	166
1.4	Draining and adding coolant	169
1.5	Removing and installing engine preheating element Z97	175
2	Coolant pump, regulation of cooling system	178
2.1	Assembly overview - coolant pump, thermostat	178
2.2	Assembly overview - electric coolant pump	180
2.3	Assembly overview - coolant temperature sender	182
2.4	Removing and installing electric coolant pump	182
2.5	Removing and installing coolant pump	184
2.6	Removing and installing thermostat	188
2.7	Removing and installing toothed belt pulley for coolant pump	191
2.8	Removing and installing coolant temperature sender G62	192
2.9	Removing and installing radiator outlet coolant temperature sender G83	193
3	Coolant pipes	195
3.1	Assembly overview - coolant pipes	195
3.2	Removing and installing coolant pipes	195
4	Radiator, radiator fan	199
4.1	Assembly overview - radiator/radiator fan	199
4.2	Assembly overview - radiator cowl and radiator fan	201
4.3	Removing and installing radiator	201
4.4	Removing and installing water radiator for charge air cooling circuit	203
4.5	Removing and installing radiator cowl	205
4.6	Removing and installing radiator fan V7	207
4.7	Removing and installing radiator fan 2 V177	207
21	Turbocharging/supercharging	208
1	Exhaust turbocharger	208
1.1	Assembly overview - turbocharger	208
1.2	Removing and installing turbocharger	211
1.3	Removing and installing charge pressure positioner V465	217
2	Charge air system	221
2.1	Assembly overview - charge air system	221
2.2	Removing and installing charge air cooler	223
2.3	Removing and installing charge pressure sender GX26	225
2.4	Checking charge air system for leaks	226
2.5	Removing and installing air intake pipe	227
24	Mixture preparation - injection	229
1	Injectors	229
1.1	Assembly overview - fuel rail with injectors	229
1.2	Removing and installing fuel rail	230
1.3	Removing and installing injectors	230
1.4	Cleaning injectors	234
2	Air filter	236
2.1	Assembly overview - air filter housing	236
2.2	Removing and installing air filter housing	237
2.3	Removing and installing resonator for intake air	238
3	Intake manifold	239
3.1	Assembly overview - intake manifold	239
3.2	Removing and installing intake manifold	240
3.3	Removing and installing throttle valve module GX3	243
3.4	Cleaning throttle valve module GX3	244



4	Senders and sensors	246
4.1	Removing and installing fuel pressure sender G247	246
4.2	Checking fuel pressure sender G247	247
4.3	Removing and installing intake manifold sender GX9	249
5	Engine (motor) control unit	251
5.1	Removing and installing engine (motor) control unit J623	251
6	High-pressure pump	255
6.1	Assembly overview - high-pressure pump	255
6.2	Removing and installing high-pressure pump	258
6.3	Removing and installing high-pressure pipe	260
7	Lambda probe	262
7.1	Assembly overview - Lambda probe	262
7.2	Removing and installing Lambda probe	263
26 - Exhaust system	266	
1	Exhaust pipes and silencers	266
1.1	Assembly overview - silencers	266
1.2	Separating exhaust pipes from silencers	268
1.3	Removing and installing rear silencer	270
1.4	Aligning exhaust system free of stress	270
1.5	Check exhaust system for leaks	271
1.6	Installation position of clamp	272
2	Exhaust gas cleaning	273
2.1	Assembly overview - emission control	273
2.2	Removing and installing catalytic converter	274
28 - Ignition system	278	
1	Ignition system	278
1.1	Assembly overview - ignition system	278
1.2	Test data, spark plugs	279
1.3	Removing and installing ignition coils with output stage	279
1.4	Removing and installing knock sensor 1 G61	282
1.5	Removing and installing Hall sender	282
1.6	Removing and installing engine speed sender G28	283