

Contents

00 - Technical data	1
1 Identification	1
1.1 Engine number/engine data	2
2 Safety information	4
2.1 Safety precautions when working on the fuel supply system	4
2.2 Safety precautions when working on vehicles with start/stop system	4
2.3 Safety precautions when using testers and measuring instruments during a road test	5
2.4 Safety precautions when working on the cooling system	5
2.5 Safety precautions when working on the exhaust system	5
2.6 Safety precautions when working on the ignition system	6
3 Repair instructions	7
3.1 Rules for cleanliness	7
3.2 Performing adaptations after renewing a component	7
3.3 General notes	8
3.4 General repair instructions	9
3.5 Foreign material in engine	10
3.6 Cleaning engine	10
3.7 Contact corrosion	10
3.8 Routing and attachment of pipes, hoses and wiring	10
3.9 Nuts, bolts	11
3.10 Identification plates	11
3.11 Use of impact wrenches	11
3.12 Installing radiators and condensers	12
3.13 Checking fuel system for leaks	12
10 - Removing and installing engine	13
1 Removing and installing engine	13
1.1 Removing engine	13
1.2 Separating engine and gearbox	45
1.3 Securing engine to engine and gearbox support	49
1.4 Installing engine	50
2 Assembly mountings	55
2.1 Assembly overview - assembly mountings	55
2.2 Supporting engine in installation position	58
2.3 Removing and installing engine mounting	61
2.4 Removing and installing gearbox mounting	62
2.5 Removing and installing pendulum support	64
2.6 Checking adjustment of assembly mountings	65
2.7 Adjusting assembly mountings	65
13 - Crankshaft group	67
1 Cylinder block (pulley end)	67
1.1 Assembly overview - poly V-belt drive	67
1.2 Removing and installing poly V-belt	73
1.3 Removing and installing poly V-belt tensioner	76
1.4 Removing and installing vibration damper	77
1.5 Removing and installing engine support	79
1.6 Renewing crankshaft oil seal (pulley end)	81
1.7 Removing and installing sealing flange (pulley end)	83
2 Cylinder block (gearbox end)	85
2.1 Assembly overview - cylinder block (gearbox end)	85
2.2 Removing and installing flywheel	87



2.3	Removing and installing sealing flange (gearbox end)	89
3	Crankshaft	98
3.1	Crankshaft dimensions	98
3.2	Renewing needle bearing in crankshaft	98
3.3	Measuring axial clearance of crankshaft	100
4	Pistons and conrods	102
4.1	Assembly overview - pistons and conrods	102
4.2	Removing and installing pistons	105
4.3	Separating parts of new conrod	106
4.4	Removing and installing oil spray jets	107
4.5	Checking pistons and cylinder bores	107
4.6	Checking radial clearance of conrod bearings	108
4.7	Setting pistons to TDC position	109
15	- Cylinder head, valve gear	112
1	Toothed belt drive	112
1.1	Assembly overview - toothed belt guard	112
1.2	Assembly overview - toothed belt	112
1.3	Removing and installing toothed belt guard	114
1.4	Removing and installing toothed belt	115
1.5	Pre-assembling and fitting electronic measuring system for camshaft setting VAS 611 007	117
1.6	Checking valve timing	123
1.7	Adjusting valve timing	124
1.8	Detaching toothed belt from camshaft	133
2	Cylinder head	139
2.1	Assembly overview - cylinder head	139
2.2	Assembly overview - camshaft housing	142
2.3	Removing and installing cylinder head	144
2.4	Removing and installing camshaft housing	148
2.5	Checking compression	151
3	Valve gear	154
3.1	Assembly overview - valve gear	154
3.2	Removing and installing camshaft oil seal	156
3.3	Removing and installing camshaft adjuster	165
3.4	Removing and installing inlet camshaft control valve 1 N727	176
3.5	Removing and installing exhaust camshaft control valve 1 N318	177
3.6	Removing and installing valve stem oil seals	177
3.7	Removing and installing retainer for oil seal	192
4	Inlet and exhaust valves	194
4.1	Checking valve guides	194
4.2	Checking valves	194
4.3	Valve dimensions	195
17	- Lubrication	196
1	Sump/oil pump	196
1.1	Assembly overview - sump/oil pump	196
1.2	Engine oil	199
1.3	Removing and installing sump	200
1.4	Removing and installing oil pump	203
1.5	Removing and installing oil level and oil temperature sender G266	204
2	Engine oil cooler	205
2.1	Assembly overview - engine oil cooler	205
2.2	Removing and installing engine oil cooler	205
3	Crankcase breather	207

3.1	Assembly overview - crankcase breather system	207
3.2	Removing and installing oil separator	208
4	Oil filter/oil pressure switch	211
4.1	Assembly overview - oil filter/oil pressure switch	211
4.2	Removing and installing oil pressure sender G10	213
4.3	Checking oil pressure and oil pressure switch	214
4.4	Removing and installing valve for oil pressure control N428	214
4.5	Removing and installing piston cooling jet control valve N522	214
19	Cooling	216
1	Cooling system/coolant	216
1.1	Connection diagram - coolant hoses	216
1.2	Checking cooling system for leaks	217
1.3	Draining and filling cooling system	219
2	Coolant pump/thermostat assembly	226
2.1	Assembly overview - coolant pump/thermostat	226
2.2	Assembly overview - electric coolant pump	228
2.3	Assembly overview - coolant temperature senders	229
2.4	Removing and installing electric coolant pump	230
2.5	Removing and installing coolant pump	232
2.6	Removing and installing toothed belt pulley for coolant pump	235
2.7	Removing and installing coolant temperature sender G62	237
2.8	Removing and installing engine outlet coolant temperature sender G82	238
2.9	Removing and installing radiator outlet coolant temperature sender G83	240
2.10	Removing and installing engine temperature regulation module GX33	240
2.11	Checking coolant pump	242
3	Coolant pipes	247
3.1	Assembly overview - coolant pipes	247
3.2	Removing and installing coolant pipes	248
4	Radiators/radiator fan	251
4.1	Assembly overview - radiators/radiator fan	251
4.2	Assembly overview - radiator cowl and radiator fan	253
4.3	Assembly overview - radiator blind	254
4.4	Removing and installing radiator	255
4.5	Removing and installing water radiator for charge air cooling circuit	258
4.6	Removing and installing radiator cowl	262
4.7	Removing and installing radiator fan V7	266
4.8	Removing and installing radiator blind	266
4.9	Removing and installing radiator blind control motor V544	266
21	Turbocharging/supercharging	268
1	Turbocharger	268
1.1	Assembly overview - turbocharger	268
1.2	Removing and installing turbocharger	271
1.3	Removing and installing charge pressure control module GX34	275
1.4	Removing and installing connection for turbocharger	275
2	Charge air system	278
2.1	Assembly overview - charge air system	278
2.2	Assembly overview - hose connections for charge air system	280
2.3	Removing and installing charge air cooler	280
2.4	Removing and installing charge pressure sender GX26	281
2.5	Checking charge air system for leaks	282
2.6	Removing and installing air intake pipe	285
24	Mixture preparation - injection	287



1	Injection system	287
1.1	Overview of fitting locations - injection system	287
2	Air filter	293
2.1	Assembly overview - air filter housing	293
2.2	Removing and installing air filter housing	296
2.3	Removing and installing air duct at lock carrier	297
3	Intake manifold	299
3.1	Assembly overview - intake manifold	299
3.2	Removing and installing intake manifold	301
3.3	Removing and installing throttle valve module GX3	303
3.4	Cleaning throttle valve module GX3	303
4	Injectors	305
4.1	Assembly overview - fuel rail with injectors	305
4.2	Removing and installing fuel rail	307
4.3	Removing and installing injectors	308
4.4	Cleaning injectors	313
5	Senders and sensors	315
5.1	Assembly overview - actuator for structure-borne sound and control unit for structure-borne sound	315
5.2	Removing and installing control unit for structure-borne sound J869 and actuator for structure-borne sound R214	316
5.3	Removing and installing fuel pressure sender G247	316
5.4	Checking fuel pressure sender G247	317
5.5	Removing and installing intake manifold sender GX9	319
5.6	Removing and installing exhaust gas pressure sensor 1 G450	319
6	High-pressure pump	320
6.1	Assembly overview - high-pressure pump	320
6.2	Removing and installing high-pressure pump	320
6.3	Removing and installing high-pressure pipe	322
7	Lambda probe	324
7.1	Assembly overview - Lambda probe	324
7.2	Removing and installing Lambda probe	324
8	Engine control unit	326
8.1	Assembly overview - engine control unit	326
8.2	Removing and installing engine control unit J623	327
26	Exhaust system	334
1	Exhaust pipes/silencers	334
1.1	Assembly overview - silencers	334
1.2	Removing and installing front exhaust pipe	338
1.3	Separating exhaust pipes/silencers	339
1.4	Removing and installing silencers	340
1.5	Stress-free alignment of exhaust system	344
1.6	Checking exhaust system for leaks	345
1.7	Installation position of clamp	345
2	Emission control system	347
2.1	Assembly overview - emission control system	347
2.2	Removing and installing catalytic converter	349
2.3	Removing and installing particulate filter	351
28	Ignition system	352
1	Ignition system	352
1.1	Assembly overview - ignition system	352
1.2	Removing and installing ignition coils	354
1.3	Removing and installing knock sensor 1 G61	356

1.4	Removing and installing engine speed sender G28	357
1.5	Removing and installing inlet camshaft position sender G1002	359
1.6	Removing and installing exhaust camshaft position sender G1003	359