



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	5
3.1 Rules for cleanliness	5
3.2 General information	5
3.3 General repair instructions	6
3.4 Foreign objects in engine	6
3.5 Contact corrosion	6
3.6 Routing and attachment of lines	7
3.7 Fitting radiator and condensers	7
3.8 Checking vacuum system	7
10 - Removing and installing engine	8
1 Removing and installing engine	8
1.1 Removing engine	8
1.2 Separating engine and gearbox	31
1.3 Securing engine on engine and gearbox support	34
1.4 Installing engine	36
2 Assembly mountings	44
2.1 Assembly overview - assembly mountings	44
2.2 Removing and installing motor mounting	49
2.3 Removing and installing gearbox mounting	52
2.4 Removing and installing pendulum support	56
2.5 Supporting engine in installation position	58
2.6 Adjusting assembly mountings	66
2.7 Checking adjustment of assembly mountings (engine and gearbox mountings)	69
13 - Crankshaft group	70
1 Cylinder block (pulley end)	70
1.1 Assembly overview - poly V-belt drive	70
1.2 Removing and installing poly-V belt	74
1.3 Removing and installing tensioner for poly V-belt	78
1.4 Removing and installing vibration damper	79
1.5 Removing and installing engine support	82
1.6 Renewing crankshaft oil seal - belt pulley end	86
2 Cylinder block, gearbox end	90
2.1 Assembly overview - cylinder block, gearbox end	90
2.2 Removing and installing flywheel	92
2.3 Removing and installing sealing flange on gearbox side	94
3 Crankshaft	104
3.1 Crankshaft dimensions	104
3.2 Renewing needle bearing in crankshaft	104
4 Pistons and conrods	107
4.1 Assembly overview - pistons and conrods	107
4.2 Removing and installing pistons	110



4.3	Checking pistons and cylinder bores	111
4.4	Separating new conrod	113
4.5	Checking radial clearance of conrods	114
4.6	Removing and installing oil spray jets	114
4.7	Setting piston to TDC position	115
15	Cylinder head, valve gear	119
1	Cylinder head	119
1.1	Assembly overview - cylinder head	119
1.2	Assembly overview - camshaft housing	121
1.3	Removing and installing cylinder head	123
1.4	Removing and installing camshaft housing	127
1.5	Checking compression	131
2	Toothed belt drive	133
2.1	Assembly overview - toothed belt cover	133
2.2	Assembly overview - toothed belt	133
2.3	Removing and installing toothed belt	135
2.4	Preassembling and installing test tool VAS 611 007	141
2.5	Checking valve timing	149
2.6	Adjusting valve timing	152
2.7	Removing toothed belt from camshaft	161
3	Valve gear	169
3.1	Assembly overview - valve gear	169
3.2	Measuring axial play of camshaft	171
3.3	Removing and installing camshaft oil seal	172
3.4	Removing and installing camshaft adjuster	180
3.5	Removing and installing camshaft control valve 1 N205	191
3.6	Removing and installing exhaust camshaft control valve 1 N318	192
3.7	Removing and installing valve stem seals	194
4	Inlet and exhaust valves	205
4.1	Checking valve guides	205
4.2	Checking valves	206
4.3	Valve dimensions	206
17	Lubrication	207
1	Sump, oil pump	207
1.1	Assembly overview - sump/oil pump	207
1.2	Engine oil:	211
1.3	Removing and installing sump	211
1.4	Removing and installing oil pump	217
1.5	Removing and installing oil level and oil temperature sender G266	218
2	Engine oil cooler	220
2.1	Assembly overview - engine oil cooler	220
2.2	Removing and installing engine oil cooler	220
3	Crankcase ventilation	222
3.1	Assembly overview - crankcase breather system	222
3.2	Removing and installing oil separator	223
4	Oil filter, oil pressure switch	227
4.1	Assembly overview - oil filter/oil pressure switch	227
4.2	Removing and installing oil pressure sender G10	228
4.3	Checking oil pressure and oil pressure switch	229
4.4	Removing and installing oil filter housing	229
4.5	Removing and installing oil pressure regulating valve N428	230
19	Cooling	233



1	Cooling system/coolant	233
1.1	Connection diagram - coolant hoses	233
1.2	Checking cooling system for leaks	234
1.3	Draining and adding coolant	239
2	Coolant pump, regulation of cooling system	254
2.1	Assembly overview - coolant pump, thermostat	254
2.2	Assembly overview - electric coolant pump	257
2.3	Assembly overview - coolant temperature sender	258
2.4	Removing and installing electric coolant pump	259
2.5	Removing and installing coolant pump	262
2.6	Removing and installing thermostat	267
2.7	Removing and installing toothed belt pulley for coolant pump	271
2.8	Removing and installing coolant temperature sender G62	272
2.9	Removing and installing radiator outlet coolant temperature sender G83	275
3	Coolant pipes	279
3.1	Assembly overview - coolant pipes	279
3.2	Removing and installing coolant pipes	279
4	Radiator, radiator fan	282
4.1	Assembly overview - radiator/radiator fan	282
4.2	Assembly overview - radiator cowl and radiator fan	285
4.3	Assembly overview - radiator blind	287
4.4	Removing and installing radiator	290
4.5	Removing and installing water radiator for charge air cooling circuit	296
4.6	Removing and installing radiator cowl	301
4.7	Removing and installing radiator fan V7	304
4.8	Removing and installing radiator blind	306
4.9	Removing and installing radiator blind control motor V544	308
20	Fuel supply system	314
1	Safety information	314
1.1	Safety regulations for working on fuel supply	314
1.2	Safety precautions when using testers and measuring instruments during a road test	314
1.3	Safety measures when working on vehicles with a start/stop system	315
2	Identification	316
2.1	Engine number/engine data	316
3	General information	317
3.1	Rules for cleanliness when working on auxiliary/supplementary heater and fuel system	317
4	Fuel	318
4.1	Assembly overview - fuel tank	318
4.2	Emptying fuel tank	325
4.3	Removing and installing fuel tank	336
5	Fuel delivery unit, fuel gauge sender	348
5.1	Assembly overview - fuel delivery unit/fuel gauge sender	348
5.2	Removing and installing fuel delivery unit, fuel gauge sender	352
5.3	Removing and installing fuel gauge sender G	365
6	Plug-in connectors	369
6.1	Separating plug-in connectors	369
7	Fuel filter	375
7.1	Assembly overview - fuel filter	375
7.2	Removing and installing fuel filter	375
8	Activated charcoal filter system	378
8.1	Assembly overview - activated charcoal filter system	378
8.2	Removing and installing activated charcoal filter	379
8.3	Checking fuel tank breather	381



9	Accelerator pedal	387
9.1	Assembly overview - accelerator module	387
10	Fuel pump	388
10.1	Checking fuel system pressurisation pump G6	388
21 - Turbocharging/supercharging		450
1	Exhaust turbocharger	450
1.1	Assembly overview - turbocharger	450
1.2	Removing and installing turbocharger	453
1.3	Removing and installing charge pressure positioner V465	459
1.4	Removing and installing connection for turbocharger	460
2	Charge air system	464
2.1	Assembly overview - charge air system	464
2.2	Removing and installing charge air cooler	466
2.3	Removing and installing charge pressure sender GX26	468
2.4	Checking charge air system for leaks	469
2.5	Removing and installing air pipe	471
24 - Mixture preparation - injection		473
1	Injection system	473
1.1	Overview of fitting locations - injection system	473
2	Injectors	484
2.1	Assembly overview - fuel rail with injectors	484
2.2	Removing and installing fuel rail	485
2.3	Removing and installing injectors	486
2.4	Cleaning injectors	493
3	Air filter	495
3.1	Assembly overview - air filter housing	495
3.2	Removing and installing air filter housing	498
4	Intake manifold	500
4.1	Assembly overview - intake manifold	500
4.2	Removing and installing intake manifold	502
4.3	Removing and installing throttle valve module GX3	505
4.4	Cleaning throttle valve module GX3	507
5	Senders and sensors	509
5.1	Removing and installing fuel pressure sender G247	509
5.2	Checking fuel pressure sender G247	510
5.3	Removing and installing intake manifold sender GX9	513
6	Engine (motor) control unit	514
6.1	Assembly overview - engine control unit	514
6.2	Removing and installing engine (motor) control unit J623	515
7	High-pressure pump	521
7.1	Assembly overview - high-pressure pump	521
7.2	Removing and installing high-pressure pump	522
7.3	Removing and installing high-pressure pipe	524
8	Lambda probe	526
8.1	Assembly overview - Lambda probe	526
8.2	Removing and installing Lambda probe	527
26 - Exhaust system		530
1	Exhaust pipes, silencers	530
1.1	Assembly overview - silencers	530
1.2	Separating exhaust pipes/silencers	532
1.3	Removing and installing silencer	534



1.4	Aligning exhaust system free of stress	540
1.5	Check exhaust system for leaks	541
1.6	Installation position of clamp	542
2	Exhaust gas cleaning	544
2.1	Assembly overview - emission control	544
2.2	Removing and installing catalytic converter	549
28	Ignition system	553
1	Ignition system	553
1.1	Assembly overview - ignition system	553
1.2	Removing and installing ignition coils with output stage	555
1.3	Removing and installing knock sensor 1 G61	558
1.4	Removing and installing Hall sender	559
1.5	Removing and installing engine speed sender G28	560