



## Contents

<b>00 - Technical data</b>	<b>1</b>
<b>1 Safety information</b>	<b>1</b>
1.1 Safety regulations for working on fuel supply	1
1.2 Safety measures when working on vehicles with 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
<b>2 Identification</b>	<b>3</b>
2.1 Engine number/engine data	3
<b>3 Repair notes</b>	<b>5</b>
3.1 Rules for cleanliness	5
3.2 General information	5
3.3 General repair instructions	5
3.4 Foreign objects in engine	7
3.5 Contact corrosion	7
3.6 Routing and attachment of lines	7
3.7 Fitting radiator and condensers	7
3.8 Checking vacuum system	7
<b>10 - Removing and installing engine</b>	<b>9</b>
<b>1 Removing and installing motor</b>	<b>9</b>
1.1 Removing motor	9
1.2 Separating engine and gearbox	60
1.3 Securing engine on engine and gearbox support	61
1.4 Installing engine	63
<b>2 Assembly mountings</b>	<b>68</b>
2.1 Assembly overview - assembly mountings	68
2.2 Removing and installing engine mounting	80
2.3 Removing and installing gearbox mountings	85
2.4 Removing and installing pendulum support	87
2.5 Supporting engine in installation position	89
2.6 Checking adjustment of assembly mountings (engine and gearbox mountings)	117
2.7 Adjusting assembly mountings	118
<b>13 - Crankshaft group</b>	<b>122</b>
<b>1 Cylinder block (pulley end)</b>	<b>122</b>
1.1 Assembly overview - poly V-belt drive	122
1.2 Assembly overview - sealing flange, belt pulley end	126
1.3 Removing and installing poly-V belt	129
1.4 Removing and installing tensioner for poly V-belt	133
1.5 Removing and installing vibration damper	134
1.6 Removing and installing engine support	136
1.7 Renewing crankshaft oil seal - belt pulley end	139
1.8 Removing and installing sealing flange on pulley end	142
<b>2 Cylinder block, gearbox end</b>	<b>146</b>
2.1 Assembly overview - cylinder block, gearbox end	146
2.2 Removing and installing flywheel	147
2.3 Removing and installing sealing flange on gearbox side	148
<b>3 Crankshaft</b>	<b>160</b>
3.1 Renewing needle bearing in crankshaft	160
3.2 Crankshaft dimensions	163
3.3 Measuring axial clearance of crankshaft	163



<b>4</b>	<b>Pistons and conrods</b>	<b>165</b>
4.1	Assembly overview - pistons and conrods	165
4.2	Removing and installing pistons	168
4.3	Removing and installing oil spray jets	169
4.4	Checking pistons and cylinder bores	170
4.5	Checking radial clearance of conrods	173
4.6	Separating new conrod	173
4.7	Setting piston to TDC position	174
<b>15</b>	<b>Cylinder head, valve gear</b>	<b>179</b>
<b>1</b>	<b>Cylinder head</b>	<b>179</b>
1.1	Assembly overview - cylinder head	179
1.2	Assembly overview - camshaft housing	181
1.3	Removing and installing cylinder head	185
1.4	Removing and installing camshaft housing	190
1.5	Checking compression	196
<b>2</b>	<b>Toothed belt drive</b>	<b>198</b>
2.1	Assembly overview - toothed belt cover	198
2.2	Assembly overview - toothed belt	199
2.3	Removing and installing toothed belt guard	203
2.4	Preassembling and installing valve timing tool	205
2.5	Checking valve timing	213
2.6	Adjusting valve timing	216
2.7	Removing and installing toothed belt	227
2.8	Removing toothed belt from camshaft	234
<b>3</b>	<b>Valve gear</b>	<b>242</b>
3.1	Assembly overview - valve gear	242
3.2	Removing and installing camshaft oil seal	244
3.3	Removing and installing camshaft adjuster	256
3.4	Removing and installing toothed belt pulley	277
3.5	Removing and installing camshaft control valve 1 N205	282
3.6	Removing and installing exhaust camshaft control valve 1 N318	283
3.7	Removing and installing valve stem seals	284
<b>4</b>	<b>Inlet and exhaust valves</b>	<b>296</b>
4.1	Checking valve guides	296
4.2	Checking valves	297
4.3	Valve dimensions	297
<b>17</b>	<b>Lubrication</b>	<b>298</b>
<b>1</b>	<b>Sump, oil pump</b>	<b>298</b>
1.1	Assembly overview - sump/oil pump	298
1.2	Engine oil:	302
1.3	Removing and installing lower part of sump	302
1.4	Removing and installing upper part of sump	308
1.5	Removing and installing oil pump	312
1.6	Removing and installing oil level and oil temperature sender G266	314
<b>2</b>	<b>Engine oil cooler</b>	<b>315</b>
2.1	Assembly overview - engine oil cooler	315
2.2	Removing and installing engine oil cooler	315
<b>3</b>	<b>Crankcase ventilation</b>	<b>317</b>
3.1	Assembly overview - crankcase breather system	317
3.2	Removing and installing oil separator	318
<b>4</b>	<b>Oil filter, oil pressure switch</b>	<b>322</b>
4.1	Assembly overview - oil filter/oil pressure switch	322
4.2	Removing and installing oil pressure switch F1	324



4.3	Removing and installing oil pressure switch for reduced oil pressure F378	325
4.4	Checking oil pressure	326
4.5	Removing and installing oil pressure regulating valve N428	328
<b>19</b>	<b>- Cooling</b>	<b>330</b>
<b>1</b>	<b>Cooling system/coolant</b>	<b>330</b>
1.1	Connection diagram - coolant hoses	330
1.2	Checking cooling system for leaks	332
1.3	Draining and adding coolant	340
<b>2</b>	<b>Coolant pump, regulation of cooling system</b>	<b>348</b>
2.1	Assembly overview - coolant pump, thermostat	348
2.2	Assembly overview - electric coolant pump	351
2.3	Assembly overview - coolant temperature sender	352
2.4	Removing and installing electric coolant pump	354
2.5	Removing and installing coolant pump	356
2.6	Removing and installing thermostat	362
2.7	Removing and installing toothed belt pulley for coolant pump	366
2.8	Removing and installing coolant temperature sender G62	367
2.9	Removing and installing radiator outlet coolant temperature sender G83	370
<b>3</b>	<b>Coolant pipes</b>	<b>374</b>
3.1	Assembly overview - coolant pipes	374
3.2	Removing and installing coolant pipes	374
<b>4</b>	<b>Radiator, radiator fan</b>	<b>379</b>
4.1	Assembly overview - radiator/radiator fan	379
4.2	Assembly overview - radiator cowl and radiator fan	388
4.3	Removing and installing radiator	392
4.4	Removing and installing water radiator for charge air cooling circuit	399
4.5	Removing and installing radiator cowl	407
4.6	Removing and installing radiator fan V7	413
<b>21</b>	<b>- Turbocharging/supercharging</b>	<b>416</b>
<b>1</b>	<b>Turbocharger</b>	<b>416</b>
1.1	Assembly overview - turbocharger	416
1.2	Removing and installing turbocharger	420
1.3	Removing and installing charge pressure positioner V465	426
1.4	Removing and installing connection for turbocharger	429
<b>2</b>	<b>Charge air system</b>	<b>433</b>
2.1	Assembly overview - charge air system	433
2.2	Removing and installing charge air cooler	435
2.3	Removing and installing charge pressure sender GX26	438
2.4	Checking charge air system for leaks	439
2.5	Removing and installing air pipe	441
<b>24</b>	<b>- Mixture preparation - injection</b>	<b>444</b>
<b>1</b>	<b>Injection system</b>	<b>444</b>
1.1	Overview of fitting locations - injection system	444
<b>2</b>	<b>Injectors</b>	<b>449</b>
2.1	Assembly overview - fuel rail with injectors	449
2.2	Removing and installing fuel rail	453
2.3	Removing and installing injectors	454
2.4	Cleaning injectors	468
<b>3</b>	<b>Air filter</b>	<b>470</b>
3.1	Assembly overview - air filter housing	470
3.2	Removing and installing air filter housing	472
3.3	Removing and installing air guide on lock carrier	474



3.4	Removing and installing resonator for intake air	476
<b>4</b>	<b>Intake manifold</b>	<b>478</b>
4.1	Assembly overview - intake manifold	478
4.2	Removing and installing intake manifold	481
4.3	Removing and installing throttle valve module GX3	484
4.4	Cleaning throttle valve module GX3	485
<b>5</b>	<b>Senders and sensors</b>	<b>487</b>
5.1	Removing and installing intake manifold sender GX9	487
5.2	Removing and installing fuel pressure sender G247	487
5.3	Checking fuel pressure sender G247	489
5.4	Removing and installing exhaust gas pressure sensor 1 G450	493
<b>6</b>	<b>Engine control unit</b>	<b>495</b>
6.1	Assembly overview - engine control unit J623	495
6.2	Removing and installing engine control unit J623	496
6.3	Removing and installing engine (motor) control unit J623 with protective housing	502
<b>7</b>	<b>High-pressure pump</b>	<b>519</b>
7.1	Assembly overview - high-pressure pump	519
7.2	Removing and installing high-pressure pump	525
7.3	Removing and installing high-pressure pipe	527
<b>8</b>	<b>Lambda probe</b>	<b>530</b>
8.1	Assembly overview - Lambda probe	530
8.2	Removing and installing Lambda probe	531
<b>26</b>	<b>- Exhaust system</b>	<b>536</b>
<b>1</b>	<b>Exhaust pipes and silencers</b>	<b>536</b>
1.1	Assembly overview - silencers	536
1.2	Separating exhaust pipes from silencers	546
1.3	Removing and installing silencer	550
1.4	Installation position of clamp	559
1.5	Aligning exhaust system free of stress	560
1.6	Checking exhaust system for leaks	567
<b>2</b>	<b>Emission control</b>	<b>568</b>
2.1	Assembly overview - emission control	568
2.2	Removing and installing catalytic converter	570
2.3	Removing and installing particulate filter	577
<b>28</b>	<b>- Ignition system</b>	<b>578</b>
<b>1</b>	<b>Ignition system</b>	<b>578</b>
1.1	Assembly overview - ignition system	578
1.2	Removing and installing ignition coils with output stage	580
1.3	Removing and installing knock sensor 1 G61	583
1.4	Removing and installing Hall sender	584
1.5	Removing and installing engine speed sender G28	585