



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
1.6 Identification	3
2 Repair notes	4
2.1 Rules for cleanliness	4
2.2 Foreign objects in engine	4
2.3 Contact corrosion	4
2.4 Pipe/wire routing and attachment	4
2.5 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	17
1.4 Installing engine	19
2 Assembly mountings	22
2.1 Assembly overview - assembly mountings	22
2.2 Supporting engine in installation position	24
2.3 Removing and installing motor mounting	27
2.4 Removing and installing gearbox mounting	29
2.5 Removing and installing pendulum support	30
13 - Crankshaft group	32
1 Cylinder block (pulley end)	32
1.1 Assembly overview - poly V-belt drive	32
1.2 Removing and installing poly-V belt	36
1.3 Removing and installing tensioner for poly V-belt	39
1.4 Removing and installing vibration damper	39
1.5 Removing and installing engine support	40
1.6 Renewing crankshaft oil seal - belt pulley end	43
2 Cylinder block, gearbox end	46
2.1 Assembly overview - cylinder block, gearbox end	46
2.2 Removing and installing flywheel	47
2.3 Removing and installing sealing flange on gearbox side	48
3 Crankshaft	57
3.1 Crankshaft dimensions	57
3.2 Measuring axial clearance of crankshaft	57
3.3 Renewing needle bearing in crankshaft	58
4 Pistons and conrods	62
4.1 Assembly overview - pistons and conrods	62
4.2 Separating new conrod	64
4.3 Removing and installing pistons	64
4.4 Removing and installing oil spray jets	65
4.5 Checking pistons and cylinder bores	66
4.6 Checking radial clearance of conrods	67



15 - Cylinder head, valve gear	69
1 Cylinder head	69
1.1 Assembly overview - cylinder head	69
1.2 Assembly overview - camshaft housing	70
1.3 Removing and installing cylinder head	72
1.4 Removing and installing camshaft housing	76
1.5 Checking compression	80
2 Toothed belt drive	83
2.1 Assembly overview - toothed belt cover	83
2.2 Assembly overview - toothed belt	84
2.3 Checking valve timing	85
2.4 Removing toothed belt from camshaft	91
2.5 Removing and installing toothed belt	103
3 Valve gear	117
3.1 Assembly overview - valve gear	117
3.2 Measuring axial play of camshaft	119
3.3 Removing and installing camshaft adjuster	120
3.4 Removing and installing toothed belt pulley	123
3.5 Removing and installing camshaft oil seal	125
3.6 Removing and installing camshaft control valve 1 N205	130
3.7 Removing and installing valve stem seals	131
4 Inlet and exhaust valves	139
4.1 Checking valve guides	139
4.2 Checking valves	139
4.3 Valve dimensions	140
17 - Lubrication	141
1 Sump, oil pump	141
1.1 Assembly overview - sump/oil pump	141
1.2 Engine oil:	145
1.3 Removing and installing oil sump	145
1.4 Removing and installing oil pump	149
1.5 Removing and installing oil level and oil temperature sender G266	152
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 for reduced oil pressure F378	160
4.3 Checking oil pressure and oil pressure switch	161
4.4 Removing and installing oil filter housing	162
19 - Cooling	164
1 Cooling system/coolant	164
1.1 Connection diagram - coolant hoses	164
1.2 Draining and adding coolant	166
1.3 Checking cooling system for leaks	171
2 Coolant pump, regulation of cooling system	173
2.1 Assembly overview - coolant pump, thermostat	173
2.2 Assembly overview - electric coolant pump	175
2.3 Assembly overview - coolant temperature sender	177



2.4	Removing and installing coolant pump	178
2.5	Removing and installing toothed belt pulley for coolant pump	182
2.6	Removing and installing thermostat	183
2.7	Removing and installing electric coolant pump	186
2.8	Removing and installing coolant temperature sender G62	188
2.9	Removing and installing radiator fan thermal switch F18	190
3	Coolant pipes	192
3.1	Assembly overview - coolant pipes	192
3.2	Removing and installing coolant pipes	192
4	Radiator, radiator fan	196
4.1	Assembly overview - radiator/radiator fan	196
4.2	Assembly overview - radiator cowl and radiator fan	198
4.3	Removing and installing radiator	199
4.4	Removing and installing water radiator for charge air cooling circuit	202
4.5	Removing and installing radiator cowl	205
4.6	Removing and installing radiator fan V7	207
21	- Turbocharging/supercharging	209
1	Exhaust turbocharger	209
1.1	Assembly overview - turbocharger	209
1.2	Removing and installing turbocharger	211
1.3	Removing and installing charge pressure positioner V465	215
1.4	Removing and installing connection for turbocharger	216
2	Charge air system	220
2.1	Assembly overview - charge air system	220
2.2	Removing and installing air pipe	222
2.3	Removing and installing charge pressure sender GX26	223
2.4	Removing and installing charge air cooler	223
2.5	Checking charge air system for leaks	226
24	- Mixture preparation - injection	229
1	Injection system	229
1.1	Overview of fitting locations - injection system	229
2	Air filter	233
2.1	Assembly overview - air filter housing	233
2.2	Removing and installing air filter housing	234
2.3	Removing and installing resonator for intake air	235
3	Intake manifold	236
3.1	Assembly overview - intake manifold	236
3.2	Removing and installing intake manifold	238
3.3	Removing and installing throttle valve module GX3	240
3.4	Cleaning throttle valve module GX3	241
4	Injectors	243
4.1	Assembly overview - fuel rail with injectors	243
4.2	Removing and installing fuel rail	244
4.3	Removing and installing injectors	245
5	Senders and sensors	250
5.1	Removing and installing intake manifold sender GX9	250
5.2	Removing and installing fuel pressure sender G247	250
5.3	Checking fuel pressure sender G247	251
6	High-pressure pump	254
6.1	Assembly overview - high-pressure pump	254
6.2	Removing and installing high-pressure pump	255
6.3	Removing and installing high-pressure pipe	256



7	Lambda probe	258
7.1	Assembly overview - Lambda probe	258
7.2	Removing and installing Lambda probe	259
8	Engine (motor) control unit	262
8.1	Assembly overview - engine control unit	262
8.2	Removing and installing engine (motor) control unit J623	263
26	- Exhaust system	265
1	Exhaust pipes, silencers	265
1.1	Assembly overview - silencers	265
1.2	Separating exhaust pipes, silencers	266
1.3	Removing and installing silencer	268
1.4	Aligning exhaust system free of tension	270
1.5	Check exhaust system for leaks	270
1.6	Installation position of clamp	271
2	Exhaust gas cleaning	272
2.1	Assembly overview - emission control	272
2.2	Removing and installing catalytic converter	273
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	281
1.5	Removing and installing Hall sender G40	281
1.6	Removing and installing engine speed sender G28	282