



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	5
3.1 Rules for cleanliness	5
3.2 Foreign objects in engine	5
3.3 Contact corrosion	5
3.4 Routing and attachment of lines	5
3.5 Fitting radiator and condensers	6
10 - Removing and installing engine	7
1 Removing and installing motor	7
1.1 Removing motor	7
1.2 Separating engine and gearbox	19
1.3 Securing engine on engine and gearbox support	21
1.4 Installing engine	22
2 Assembly mountings	25
2.1 Assembly overview - assembly mountings	25
2.2 Removing and installing engine mounting	31
2.3 Removing and installing gearbox mountings	33
2.4 Removing and installing pendulum support	35
2.5 Supporting engine in installation position	37
13 - Crankshaft group	42
1 Cylinder block (pulley end)	42
1.1 Assembly overview - poly V-belt drive	42
1.2 Assembly overview - sealing flange, belt pulley end	44
1.3 Removing and installing poly-V belt	46
1.4 Removing and installing tensioner for poly V-belt	49
1.5 Removing and installing vibration damper	50
1.6 Removing and installing engine support	52
1.7 Renewing crankshaft oil seal - belt pulley end	56
1.8 Removing and installing sealing flange on pulley end	59
2 Cylinder block, gearbox end	63
2.1 Assembly overview - cylinder block, gearbox end	63
2.2 Removing and installing flywheel	65
2.3 Removing and installing sealing flange on gearbox side	66
3 Crankshaft	77
3.1 Crankshaft dimensions	77
3.2 Renewing needle bearing in crankshaft	77
3.3 Measuring axial clearance of crankshaft	80
4 Pistons and conrods	82
4.1 Assembly overview - pistons and conrods	82
4.2 Removing and installing pistons	85
4.3 Separating new conrod	86
4.4 Removing and installing oil spray jets	87



4.5	Checking pistons and cylinder bores	88
4.6	Checking radial clearance of conrods	91
4.7	Setting piston to TDC position	91
15	Cylinder head, valve gear	96
1	Cylinder head	96
1.1	Assembly overview - cylinder head	96
1.2	Assembly overview - camshaft housing	98
1.3	Removing and installing cylinder head	103
1.4	Removing and installing camshaft housing	108
1.5	Checking compression	112
2	Toothed belt drive	115
2.1	Assembly overview - toothed belt cover	115
2.2	Assembly overview - toothed belt	116
2.3	Removing and installing toothed belt guard	120
2.4	Checking valve timing	121
2.5	Preassembling and installing valve timing tool	128
2.6	Adjusting valve timing	143
2.7	Removing toothed belt from camshaft	165
2.8	Removing and installing toothed belt	172
3	Valve gear	180
3.1	Assembly overview - valve gear	180
3.2	Removing and installing camshaft oil seal	182
3.3	Removing and installing camshaft adjuster	196
3.4	Removing and installing toothed belt pulley	215
3.5	Removing and installing camshaft control valve 1 N205	220
3.6	Removing and installing exhaust camshaft control valve 1 N318	221
3.7	Removing and installing valve stem seals	222
3.8	Removing and installing cam actuators	232
4	Inlet and exhaust valves	239
4.1	Checking valve guides	239
4.2	Checking valves	240
4.3	Valve dimensions	240
17	Lubrication	241
1	Sump, oil pump	241
1.1	Assembly overview - sump/oil pump	241
1.2	Engine oil:	245
1.3	Removing and installing lower part of sump	245
1.4	Removing and installing upper part of sump	251
1.5	Removing and installing oil pump	255
1.6	Removing and installing oil level and oil temperature sender G266	257
2	Engine oil cooler	258
2.1	Assembly overview - engine oil cooler	258
2.2	Removing and installing engine oil cooler	258
3	Crankcase ventilation	260
3.1	Assembly overview - crankcase breather system	260
3.2	Removing and installing oil separator	261
4	Oil filter, oil pressure switch	264
4.1	Assembly overview - oil filter/oil pressure switch	264
4.2	Removing and installing oil pressure switch F1	265
4.3	Removing and installing oil pressure switch for reduced oil pressure F378	267
4.4	Checking oil pressure	267
4.5	Removing and installing oil pressure regulating valve N428	270



19 - Cooling	271
1 Cooling system/coolant	271
1.1 Connection diagram - coolant hoses	271
1.2 Checking cooling system for leaks	275
1.3 Draining and adding coolant	278
2 Coolant pump, regulation of cooling system	287
2.1 Assembly overview - coolant pump, thermostat	287
2.2 Assembly overview - electric coolant pump	290
2.3 Assembly overview - coolant temperature sender	291
2.4 Removing and installing electric coolant pump	292
2.5 Removing and installing coolant pump	294
2.6 Removing and installing thermostat	300
2.7 Removing and installing toothed belt pulley for coolant pump	303
2.8 Removing and installing coolant temperature sender G62	307
2.9 Removing and installing radiator outlet coolant temperature sender G83	309
3 Coolant pipes	312
3.1 Assembly overview - coolant pipes	312
3.2 Removing and installing coolant pipes	312
4 Radiator, radiator fan	317
4.1 Assembly overview - radiator/radiator fan	317
4.2 Assembly overview - radiator cowl and radiator fan	319
4.3 Removing and installing radiator	320
4.4 Removing and installing water radiator for charge air cooling circuit	325
4.5 Removing and installing radiator cowl with radiator fan	329
4.6 Removing and installing radiator fan V7	330
21 - Turbocharging/supercharging	333
1 Turbocharger	333
1.1 Assembly overview - turbocharger	333
1.2 Removing and installing turbocharger	337
1.3 Removing and installing charge pressure positioner V465	343
1.4 Removing and installing connection for turbocharger	345
2 Charge air system	349
2.1 Assembly overview - charge air system	349
2.2 Removing and installing charge air cooler	351
2.3 Removing and installing charge pressure sender GX26	354
2.4 Checking charge air system for leaks	355
2.5 Removing and installing air pipe	357
24 - Mixture preparation - injection	360
1 Injection system	360
1.1 Overview of fitting locations - injection system	360
2 Injectors	368
2.1 Assembly overview - fuel rail with injectors	368
2.2 Removing and installing fuel rail	370
2.3 Removing and installing injectors	371
2.4 Cleaning injectors	377
3 Air filter	379
3.1 Assembly overview - air filter housing	379
3.2 Removing and installing air filter housing	379
3.3 Removing and installing resonator for intake air	381
4 Intake manifold	382
4.1 Assembly overview - intake manifold	382
4.2 Removing and installing intake manifold	384



4.3	Removing and installing throttle valve module GX3	388
4.4	Cleaning throttle valve module GX3	390
5	Senders and sensors	392
5.1	Removing and installing fuel pressure sender G247	392
5.2	Checking fuel pressure sender G247	393
5.3	Removing and installing intake manifold sender GX9	397
6	Engine control unit	399
6.1	Removing and installing engine control unit J623	399
6.2	Removing and installing engine (motor) control unit J623 with protective housing	401
7	High-pressure pump	404
7.1	Assembly overview - high-pressure pump	404
7.2	Removing and installing high-pressure pump	409
7.3	Removing and installing high-pressure pipe	411
8	Lambda probe	412
8.1	Assembly overview - Lambda probe	412
8.2	Removing and installing Lambda probe	413
26 - Exhaust system		417
1	Exhaust pipes and silencers	417
1.1	Assembly overview - silencers	417
1.2	Separating exhaust pipes from silencers	420
1.3	Removing and installing silencer	421
1.4	Aligning exhaust system free of stress	424
1.5	Checking exhaust system for leaks	425
2	Emission control	426
2.1	Assembly overview - emission control	426
2.2	Removing and installing catalytic converter	428
28 - Ignition system		433
1	Ignition system	433
1.1	Assembly overview - ignition system	433
1.2	Removing and installing ignition coils with output stage	435
1.3	Removing and installing knock sensor 1 G61	438
1.4	Removing and installing Hall sender	439
1.5	Removing and installing engine speed sender G28	440