



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	6
3.1 Rules for cleanliness	6
3.2 Foreign objects in engine	6
3.3 Contact corrosion	6
3.4 Routing and attachment of lines	6
3.5 Fitting radiator and condensers	7
10 - Removing and installing engine	8
1 Removing and installing motor	8
1.1 Removing motor	8
1.2 Separating engine and gearbox	22
1.3 Securing engine on engine and gearbox support	23
1.4 Installing engine	25
2 Assembly mountings	30
2.1 Assembly overview - assembly mountings	30
2.2 Removing and installing engine mounting	34
2.3 Removing and installing gearbox mounting	35
2.4 Removing and installing pendulum support	38
2.5 Supporting engine in installation position	39
2.6 Adjusting assembly mountings	54
2.7 Checking adjustment of assembly mountings (engine and gearbox mountings)	57
13 - Crankshaft group	59
1 Cylinder block (pulley end)	59
1.1 Assembly overview - poly V-belt drive	59
1.2 Assembly overview - sealing flange, belt pulley end	63
1.3 Removing and installing poly-V belt	65
1.4 Removing and installing tensioner for poly V-belt	69
1.5 Removing and installing vibration damper	70
1.6 Removing and installing engine support	72
1.7 Renewing crankshaft oil seal - belt pulley end	76
1.8 Removing and installing sealing flange on pulley end	79
2 Cylinder block, gearbox end	83
2.1 Assembly overview - cylinder block, gearbox end	83
2.2 Removing and installing flywheel	84
2.3 Removing and installing sealing flange on gearbox side	85
3 Crankshaft	97
3.1 Renewing needle bearing in crankshaft	97
3.2 Crankshaft dimensions	99
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	Removing and installing oil spray jets	106
4.4	Checking pistons and cylinder bores	108
4.5	Checking radial clearance of conrods	110
4.6	Setting piston to TDC position	110
15	Cylinder head, valve gear	116
1	Cylinder head	116
1.1	Assembly overview - cylinder head	116
1.2	Assembly overview - camshaft housing	119
1.3	Removing and installing cylinder head	127
1.4	Removing and installing camshaft housing	133
1.5	Checking compression	139
2	Toothed belt drive	141
2.1	Assembly overview - toothed belt cover	141
2.2	Assembly overview - toothed belt	142
2.3	Removing and installing toothed belt guard	146
2.4	Preassembling and installing valve timing tool	147
2.5	Removing and installing toothed belt	158
2.6	Checking valve timing	168
2.7	Adjusting valve timing	170
2.8	Removing toothed belt from camshaft	193
3	Valve gear	203
3.1	Assembly overview - valve gear	203
3.2	Measuring axial play of camshaft	206
3.3	Removing and installing camshaft oil seal	207
3.4	Removing and installing camshaft adjuster	218
3.5	Removing and installing camshaft control valve 1 N205	234
3.6	Removing and installing exhaust camshaft control valve 1 N318	235
3.7	Removing and installing valve stem seals	236
3.8	Removing and installing toothed belt pulley	249
3.9	Removing and installing cam actuators	252
4	Inlet and exhaust valves	255
4.1	Checking valve guides	255
4.2	Checking valves	256
4.3	Valve dimensions	256
17	Lubrication	257
1	Sump, oil pump	257
1.1	Assembly overview - sump/oil pump	257
1.2	Engine oil:	261
1.3	Removing and installing lower part of sump	261
1.4	Removing and installing upper part of sump	268
1.5	Removing and installing oil pump	274
1.6	Removing and installing oil level and oil temperature sender G266	275
2	Engine oil cooler	277
2.1	Assembly overview - engine oil cooler	277
2.2	Removing and installing engine oil cooler	277
3	Crankcase ventilation	279
3.1	Assembly overview - crankcase breather system	279
3.2	Removing and installing oil separator	280
4	Oil filter, oil pressure switch	283
4.1	Assembly overview - oil filter/oil pressure switch	283
4.2	Removing and installing oil pressure switch F1	285
4.3	Removing and installing oil pressure switch for reduced oil pressure F378	287
4.4	Removing and installing oil pressure regulating valve N428	289



4.5	Checking oil pressure	290
19	Cooling	293
1	Cooling system/coolant	293
1.1	Connection diagram - coolant hoses	293
1.2	Checking cooling system for leaks	295
1.3	Draining and adding coolant	300
2	Coolant pump, regulation of cooling system	309
2.1	Assembly overview - coolant pump, thermostat	309
2.2	Assembly overview - electric coolant pump	312
2.3	Assembly overview - engine preheater	313
2.4	Assembly overview - coolant temperature sender	314
2.5	Removing and installing electric coolant pump	315
2.6	Removing and installing coolant pump	317
2.7	Removing and installing thermostat	323
2.8	Removing and installing toothed belt pulley for coolant pump	327
2.9	Removing and installing coolant temperature sender G62	332
2.10	Removing and installing radiator outlet coolant temperature sender G83	334
2.11	Removing and installing engine preheating element Z97	335
3	Coolant pipes	338
3.1	Assembly overview - coolant pipes	338
3.2	Removing and installing coolant pipes	338
4	Radiator, radiator fan	343
4.1	Assembly overview - radiator/radiator fan	343
4.2	Assembly overview - radiator cowl and radiator fan	347
4.3	Removing and installing radiator	349
4.4	Removing and installing water radiator for charge air cooling circuit	359
4.5	Removing and installing radiator cowl with radiator fan	365
4.6	Removing and installing radiator fan	367
21	Turbocharging/supercharging	370
1	Turbocharger	370
1.1	Assembly overview - turbocharger	370
1.2	Removing and installing turbocharger	374
1.3	Removing and installing charge pressure positioner V465	380
1.4	Removing and installing connection for turbocharger	383
2	Charge air system	386
2.1	Assembly overview - charge air system	386
2.2	Removing and installing charge pressure sender GX26	388
2.3	Removing and installing charge air cooler	389
2.4	Checking charge air system for leaks	392
2.5	Removing and installing air pipe	394
24	Mixture preparation - injection	397
1	Injection system	397
1.1	Overview of fitting locations - injection system	397
2	Injectors	402
2.1	Assembly overview - fuel rail with injectors	402
2.2	Removing and installing fuel rail	404
2.3	Removing and installing injectors	405
2.4	Cleaning injectors	411
3	Air filter	413
3.1	Assembly overview - air filter housing	413
3.2	Removing and installing air filter housing	414
3.3	Removing and installing resonator for intake air	415



4	Intake manifold	417
4.1	Assembly overview - intake manifold	417
4.2	Removing and installing intake manifold	420
4.3	Removing and installing throttle valve module GX3	423
4.4	Cleaning throttle valve module GX3	424
5	Senders and sensors	426
5.1	Removing and installing intake manifold sender GX9	426
5.2	Removing and installing fuel pressure sender G247	426
5.3	Checking fuel pressure sender G247	428
5.4	Removing and installing exhaust gas pressure sensor 1 G450	432
6	Engine control unit	434
6.1	Removing and installing engine control unit J623	434
7	High-pressure pump	442
7.1	Assembly overview - high-pressure pump	442
7.2	Removing and installing high-pressure pump	448
7.3	Removing and installing high-pressure pipe	450
8	Lambda probe	452
8.1	Assembly overview - Lambda probe	452
8.2	Removing and installing Lambda probe	453
26	- Exhaust system	455
1	Exhaust pipes and silencers	455
1.1	Assembly overview - silencers	455
1.2	Removing and installing silencer	466
1.3	Separating exhaust pipes from silencers	477
1.4	Aligning exhaust system free of stress	485
1.5	Checking exhaust system for leaks	487
1.6	Installation position of clamp	487
2	Emission control	490
2.1	Assembly overview - emission control	490
2.2	Removing and installing catalytic converter	499
2.3	Removing and installing particulate filter	507
2.4	Removing and installing exhaust flap control unit J883	507
28	- Ignition system	509
1	Ignition system	509
1.1	Assembly overview - ignition system	509
1.2	Removing and installing ignition coils with output stage	511
1.3	Removing and installing knock sensor 1 G61	514
1.4	Removing and installing Hall sender	514
1.5	Removing and installing engine speed sender G28	515