



Contents

00 - Technical data	1
1 — Change history —	1
2 Safety instructions	2
2.1 Safety measures regarding work on the fuel supply	2
2.2 Safety measures for work in vehicles with Start-Stop system	3
2.3 Safety measures in test drives using testing and measurement devices	3
2.4 Safety measures when working on the ignition system	4
2.5 Safety measures when working on the exhaust system	4
2.6 Safety measures when working on the cooling system	5
3 Identification	6
3.1 Engine number/engine characteristics	6
4 Repair instructions	8
4.1 Cleaning rules	8
4.2 General instructions	8
4.3 General repair instructions	9
4.4 Foreign bodies on the engine	9
4.5 Contact corrosion	9
4.6 Connection installation and fastening	10
4.7 Radiator and capacitor installation	10
4.8 Check the vacuum system	10
10 - Removing and installing engine	11
1 Engine - remove and install	11
1.1 Engine - removal	11
1.2 Engine - separate gearbox	24
1.3 Engine - secure to engine and gearbox support	28
1.4 Engine - installation	30
1.5 Engine - remove and install, summarized instructions	33
2 Power-drive unit supports	37
2.1 Power unit brackets - assembly overview	37
2.2 Power unit bracket (engine side) - remove and install	40
2.3 Drive-train mounting (gearbox side) - remove and install	41
2.4 Pendulum support (torque limiter) - remove and install	43
2.5 Support the engine in assembly position	45
2.6 Drive train mountings - adjust	54
2.7 Drive train mounting adjustment - check	56
13 - Crankshaft group	58
1 Cylinder block (pulley side)	58
1.1 Poly-V belt mechanism - assembly overview	58
1.2 Poly-V belt - remove and install	60
1.3 Poly-V belt tensioner - remove and install	61
1.4 Crankshaft pulley (vibration damper) - remove and install	62
1.5 Engine console - remove and install	66
1.6 Crankshaft seal (pulley side) - replace	71
2 Cylinder block (gearbox side)	75
2.1 Cylinder block (gearbox side) - assembly overview	75
2.2 Flywheel - remove and install	79
2.3 Clutch Disk - removal and installation	81
2.4 Crankshaft flange (flywheel side) - replace	83
3 Crankshaft	96
3.1 Crankshaft - dimensions	96



4	Pistons and conrods - remove and install	97
4.1	Pistons and conrods - assembly overview	97
4.2	Pistons - remove and install	100
4.3	Pistons, rings, and cylinders - check	101
4.4	Conrod and cap (new part) - separate	104
4.5	Conrod radial clearance - check	104
4.6	Oil spray jet and valve - remove and install	105
15	Cylinder head, valve gear	107
1	Engine cylinder head	107
1.1	Engine cylinder head - assembly overview	107
1.2	Cylinder head cover with exhaust and inlet camshafts - assembly overview	109
1.3	Cylinder head - remove and install	112
1.4	Cylinder head - remove and install, summarized instructions	116
1.5	Cylinder head cover with exhaust and inlet camshafts - remove and install	118
1.6	Cylinder compression - check	124
2	Toothed belt drive	127
2.1	Console, upper and lower cover of the toothed belt - assembly overview	127
2.2	Toothed belt - assembly overview	127
2.3	Toothed belt - remove and install	129
2.4	Valve timing - check	133
2.5	Valve timing - adjust	139
2.6	Camshaft toothed belt - remove	147
3	Camshaft mechanism	153
3.1	Camshaft mechanism - assembly overview	153
3.2	Crankshaft - check axial clearance	155
3.3	Camshaft gasket (pulley side) - replace	156
3.4	Inlet and exhaust camshaft regulators - remove and install	163
3.5	Camshaft adjustment valve 1 N205 and Exhaust camshaft adjustment valve 1 N318 - remove and install	174
3.6	Valve stem sealant - replace	175
4	Inlet and exhaust valves	188
4.1	Valve guides - check	188
4.2	Valves - check	189
4.3	Valve dimensions	189
17	Lubrication	190
1	Crankcase/oil pump	190
1.1	Crankcase/oil pump - assembly overview	190
1.2	Lower sump - remove and install	195
1.3	Upper crankcase - remove and install	197
1.4	Oil pump - remove and install	201
1.5	Engine oil	203
2	Engine oil cooler	205
2.1	Engine oil cooler - assembly overview	205
2.2	Engine oil cooler - remove and install	205
3	Engine crankcase ventilation	207
3.1	Engine crankcase ventilation - assembly overview	207
3.2	Crankcase ventilation device - remove and install	208
4	Oil filter/Oil pressure switch F378	213
4.1	Oil filter/Oil pressure switch F378 – assembly overview	213
4.2	Oil filter - remove and install	213
4.3	Oil pressure switch F378 – remove and install	214
4.4	Oil pressure and Oil pressure switch F378 – check	216



19 - Cooling	219
1 Cooling system/coolant	219
1.1 Hose connection diagram for cooling system	219
1.2 Cooling system - check air-tightness	221
1.3 Coolant tank flap - check safety valve	224
1.4 Cooling system - drainage and replenishment	226
2 Water pump/coolant adjustment	235
2.1 Water pump/thermostatic valves - assembly overview	235
2.2 Air intake cooling pump V188 - assembly overview	238
2.3 Coolant temperature sensor - assembly overview	239
2.4 Air intake cooling pump V188 - remove and install	240
2.5 Water pump - remove and install	242
2.6 Thermostats - remove and install	247
2.7 Water pump toothed belt - remove and install	253
2.8 Water pump sprocket - remove and install	256
2.9 Coolant temperature sensor G62 - remove and install	257
2.10 Coolant temperature sensor on the radiator outlet G83 - remove and install	259
3 Cooling system pipes	261
3.1 Coolant system line - assembly overview	261
3.2 Cooling system line - remove and install	261
4 Radiator/Radiator fan	264
4.1 Radiator - assembly overview	264
4.2 Fan cowl and radiator fan - assembly overview	266
4.3 Radiator - remove and install	267
4.4 Fan housing - remove and install	269
4.5 Radiator fan V7 - remove and install	270
4.6 Charge air cooling system radiator - remove and install	271
20 - Fuel supply system	275
1 Fuel tank	275
1.1 Fuel tank - assembly overview	275
1.2 Fuel tank - remove and install	277
1.3 Fuel tank - drain	285
2 Fuel supply unit/Fuel level sensor	295
2.1 Fuel pump (pre-supply pump) G6/Fuel gauge sensor G - assembly overview	295
2.2 Fuel pump (pre-supply pump) G6/Fuel gauge sensor G - remove and install	297
2.3 Fuel gauge sensor G - remove and install	303
2.4 Installation opening cover - remove and install	303
3 Plug-in connectors	305
3.1 Plug-in connectors - disconnect	305
4 Fuel filter	311
4.1 Fuel filter - remove and install	311
5 Activated charcoal system	313
5.1 Wiring diagram - Activated carbon filter system	313
5.2 Activated charcoal tank system - assembly overview	315
5.3 Activated charcoal tank - remove and install	317
5.4 Fuel tank ventilation - check	318
6 Accelerator activation	327
6.1 Accelerator pedal module - assembly overview	327
6.2 Accelerator pedal module GX2 - remove and install	327
7 Fuel system pressurisation pump G6	329
7.1 Fuel system pressurisation pump G6 - check	329
7.2 Fuel pump control unit J538 - remove and install	363



8	Fuel lines	365
8.1	Fuel lines - remove and install	365
21	Turbocharging/supercharging	370
1	Exhaust gas turbocharger	370
1.1	Exhaust gas turbocharger - Assembly overview	370
1.2	Exhaust gas turbocharger - remove and install	374
1.3	Exhaust gas turbocharger - remove and install, summarized instructions	379
1.4	Load pressure control V465 - remove and install	380
1.5	Turbocharger nozzle - remove and install	381
2	Supercharging air system	387
2.1	Supercharging air system - Assembly overview	387
2.2	Air duct - remove and install	390
2.3	Supercharging air intercooler - remove and install	392
2.4	Load pressure sensor GX26 - remove and install	394
2.5	Charge air system - check air-tightness	395
24	Mixture preparation - injection	398
1	Injection system	398
1.1	Injection system - assembly overview	398
1.2	Fuel system - relieve pressure	404
2	Air cleaner	406
2.1	Air filter - assembly overview	406
2.2	Air filter - remove and install	408
2.3	Front panel air filter lead - remove and install	410
3	Intake manifold	412
3.1	Intake manifold - assembly overview	412
3.2	Intake manifold - remove and install	414
3.3	Throttle butterfly valve control unit GX3 - remove and install	418
3.4	Throttle valve control unit GX3 - clean	419
4	Injection valves	421
4.1	Fuel rail with injection valves - assembly overview	421
4.2	Fuel distributor - removal and installation	423
4.3	Injection valves - remove and install	424
4.4	Injectors - remove and install, summarized instructions	431
4.5	Injection valves - clean	433
5	Transmitters and sensors	435
5.1	Intake manifold sensor GX9 - remove and install	435
5.2	Fuel pressure sensor G247 - remove and install	436
5.3	Fuel pressure sensor G247 - check	437
5.4	Ethanol concentration sensor G708 - remove and install	440
6	High pressure pump	442
6.1	High pressure pump - assembly overview	442
6.2	High pressure pump - remove and install	444
6.3	High pressure line - remove and install	446
7	Lambda probe	449
7.1	Lambda probe - assembly overview	449
7.2	Lambda probe 1 before the catalytic converter GX10/Lambda probe 1 after the catalytic converter GX7 - remove and install	450
8	Engine control unit J623	453
8.1	Engine control unit J623 - remove and install	453
26	Exhaust system	455
1	Silencer/exhaust pipes	455



1.1	Silencer - assembly overview	455
1.2	Silencer/exhaust pipes - detach	456
1.3	Centre silencer with rear silencer - remove and install	458
1.4	Centre silencer - remove and install	462
1.5	Rear silencer - remove and install	464
1.6	Exhaust system - tension free alignment	465
1.7	Exhaust system - check tightness	466
1.8	Pipe clamp installation position	466
2	Exhaust system	468
2.1	Emission control - assembly overview	468
2.2	Catalytic converter - remove and install	471
28	Ignition system	475
1	Ignition system	475
1.1	Ignition system - assembly overview	475
1.2	Ignition coils with final power stage - assembly overview	477
1.3	Spark plugs Q - technical data	478
1.4	Ignition coil with final power stage - remove and install	478
1.5	Knock sensor 1 G61 - remove and install	481
1.6	Hall Sensor G40 - remove and install	483
1.7	Engine speed sensor G28 - remove and install	484