



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 in test drives using testing and measurement devices	3
2.3 Safety measures when working on the ignition system	4
2.4 Safety measures when working on the exhaust system	4
2.5 Safety measures when working on the cooling system	4
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	23
1.3 Engine - secure to engine and gearbox support	25
1.4 Engine - installation	27
1.5 Engine - remove and install, summarized instructions	30
2 Power-drive unit supports	33
2.1 Power unit brackets - assembly overview	33
2.2 Power unit bracket (engine side) - remove and install	36
2.3 Drive-train mounting (gearbox side) - remove and install	37
2.4 Pendulum support (torque limiter) - remove and install	39
2.5 Support the engine in assembly position	41
2.6 Drive train mountings - adjust	46
2.7 Drive train mounting adjustment - check	48
13 - Crankshaft group	50
1 Cylinder block (pulley side)	50
1.1 Poly-V belt mechanism - assembly overview	50
1.2 Poly-V belt - remove and install	52
1.3 Poly-V belt tensioner - remove and install	53
1.4 Crankshaft pulley (vibration damper) - remove and install	54
1.5 Engine console - remove and install	58
1.6 Crankshaft seal (pulley side) - replace	63
2 Cylinder block (gearbox side)	66
2.1 Cylinder block (gearbox side) - assembly overview	66
2.2 Flywheel - remove and install	68
2.3 Crankshaft flange (flywheel side) - replace	70
3 Crankshaft	83
3.1 Crankshaft - dimensions	83
4 Pistons and conrods - remove and install	84
4.1 Pistons and conrods - assembly overview	84



4.2	Pistons - remove and install	87
4.3	Pistons, rings, and cylinders - check	88
4.4	Conrod and cap (new part) - separate	91
4.5	Conrod radial clearance - check	91
4.6	Oil spray jet and valve - remove and install	92
15	Cylinder head, valve gear	94
1	Engine cylinder head	94
1.1	Engine cylinder head - assembly overview	94
1.2	Cylinder head cover with exhaust and inlet camshafts - assembly overview	96
1.3	Cylinder head - remove and install	98
1.4	Cylinder head - remove and install, summarized instructions	104
1.5	Cylinder head cover with exhaust and inlet camshafts - remove and install	106
1.6	Cylinder compression - check	112
2	Toothed belt drive	115
2.1	Console, upper and lower cover of the toothed belt - assembly overview	115
2.2	Toothed belt - assembly overview	115
2.3	Toothed belt - remove and install	119
2.4	Valve timing - check	124
2.5	Valve timing - adjust	134
2.6	Camshaft toothed belt - remove	150
3	Camshaft mechanism	161
3.1	Camshaft mechanism - assembly overview	161
3.2	Crankshaft - check axial clearance	163
3.3	Camshaft gasket (pulley side) - replace	164
3.4	Intake and exhaust valve camshaft regulator/gear - remove and install	176
3.5	Camshaft adjustment valve 1 N205 - remove and install	197
3.6	Valve stem sealant - replace	198
4	Inlet and exhaust valves	211
4.1	Valve guides - check	211
4.2	Valves - check	212
4.3	Valve dimensions	212
17	Lubrication	213
1	Crankcase/oil pump	213
1.1	Crankcase/oil pump - assembly overview	213
1.2	Lower sump - remove and install	218
1.3	Upper crankcase - remove and install	220
1.4	Oil pump - remove and install	224
1.5	Engine oil	226
2	Engine oil cooler	228
2.1	Engine oil cooler - assembly overview	228
2.2	Engine oil cooler - remove and install	228
3	Engine crankcase ventilation	230
3.1	Engine crankcase ventilation - assembly overview	230
3.2	Crankcase ventilation device - remove and install	231
4	Oil filter/Oil pressure switch F378	235
4.1	Oil filter/Oil pressure switch F378 – assembly overview	235
4.2	Oil filter - remove and install	235
4.3	Oil pressure switch F378 – remove and install	236
4.4	Oil pressure and Oil pressure switch F378 – check	238
19	Cooling	241
1	Cooling system/coolant	241
1.1	Hose connection diagram for cooling system	241



1.2	Cooling system - check air-tightness	242
1.3	Coolant tank flap - check safety valve	245
1.4	Cooling system - drainage and replenishment	246
2	Water pump/coolant adjustment	255
2.1	Water pump/thermostatic valves - assembly overview	255
2.2	Air intake cooling pump V188 - assembly overview	258
2.3	Coolant temperature sensor - assembly overview	259
2.4	Air intake cooling pump V188 - remove and install	260
2.5	Water pump - remove and install	262
2.6	Thermostats - remove and install	267
2.7	Water pump toothed belt - remove and install	273
2.8	Water pump sprocket - remove and install	276
2.9	Coolant temperature sensor G62 - remove and install	277
2.10	Coolant temperature sensor on the radiator outlet G83 - remove and install	279
3	Cooling system pipes	281
3.1	Coolant system line - assembly overview	281
3.2	Cooling system line - remove and install	281
4	Radiator/Radiator fan	284
4.1	Radiator - assembly overview	284
4.2	Fan cowl and radiator fan - assembly overview	286
4.3	Radiator - remove and install	287
4.4	Fan housing - remove and install	289
4.5	Radiator fan V7 - remove and install	290
4.6	Charge air cooling system radiator - remove and install	291
20	Fuel supply system	295
1	Fuel tank	295
1.1	Fuel tank - assembly overview	295
1.2	Fuel tank - remove and install	297
1.3	Fuel tank - drain	304
2	Fuel supply unit/Fuel level sensor	315
2.1	Fuel pump (pre-supply pump) G6/Fuel gauge sensor G - assembly overview	315
2.2	Fuel pump (pre-supply pump) G6/Fuel gauge sensor G - remove and install	317
2.3	Fuel gauge sensor G - remove and install	322
2.4	Installation opening cover - remove and install	323
3	Plug-in connectors	325
3.1	Plug-in connectors - disconnect	325
4	Fuel filter	331
4.1	Fuel filter - remove and install	331
5	Activated charcoal system	333
5.1	Activated charcoal filter system - assembly overview	333
5.2	Activated charcoal filter - remove and install	335
5.3	Fuel tank ventilation - check	336
6	Accelerator activation	343
6.1	Accelerator pedal module - assembly overview	343
6.2	Accelerator pedal module GX2 - remove and install	343
7	Fuel system pressurisation pump G6	345
7.1	Fuel system pressurisation pump G6 - check	345
7.2	Fuel pump control unit J538 - remove and install	379
8	Fuel lines	381
8.1	Fuel lines - remove and install	381
21	Turbocharging/supercharging	386
1	Exhaust gas turbocharger	386



1.1	Exhaust gas turbocharger - Assembly overview	386
1.2	Exhaust gas turbocharger - remove and install	390
1.3	Exhaust gas turbocharger - remove and install, summarized instructions	395
1.4	Load pressure control V465 - remove and install	396
1.5	Turbocharger nozzle - remove and install	397
2	Supercharging air system	401
2.1	Supercharging air system - Assembly overview	401
2.2	Air duct - remove and install	404
2.3	Supercharging air intercooler - remove and install	405
2.4	Load pressure sensor GX26 - remove and install	406
2.5	Charge air system - check air-tightness	407
24	Mixture preparation - injection	410
1	Injection system	410
1.1	Injection system - assembly overview	410
1.2	Fuel system - relieve pressure	416
2	Air cleaner	418
2.1	Air filter - assembly overview	418
2.2	Air filter - remove and install	420
3	Intake manifold	423
3.1	Intake manifold - assembly overview	423
3.2	Intake manifold - remove and install	425
3.3	Throttle butterfly valve control unit GX3 - remove and install	429
3.4	Throttle valve control unit GX3 - clean	430
4	Injection valves	432
4.1	Fuel rail with injection valves - assembly overview	432
4.2	Fuel distributor - removal and installation	434
4.3	Injection valves - remove and install	435
4.4	Injectors - remove and install, summarized instructions	442
4.5	Injection valves - clean	443
5	Transmitters and sensors	445
5.1	Intake manifold sensor GX9 - remove and install	445
5.2	Fuel pressure sensor G247 - remove and install	446
5.3	Fuel pressure sensor G247 - check	447
6	High pressure pump	451
6.1	High pressure pump - assembly overview	451
6.2	High pressure pump - remove and install	453
6.3	High pressure line - remove and install	455
7	Lambda probe	458
7.1	Lambda probe - assembly overview	458
7.2	Lambda probe 1 before the catalytic converter GX10/Lambda probe 1 after the catalytic converter GX7 - remove and install	459
8	Engine control unit J623	462
8.1	Engine control unit J623 - remove and install	462
26	Exhaust system	464
1	Silencer/exhaust pipes	464
1.1	Silencer - assembly overview	464
1.2	Silencer/exhaust pipes - detach	465
1.3	Centre silencer with rear silencer - remove and install	467
1.4	Centre silencer - remove and install	471
1.5	Rear silencer - remove and install	473
1.6	Exhaust system - tension free alignment	474
1.7	Exhaust system - check tightness	474
1.8	Pipe clamp installation position	475



2	Exhaust system	476
2.1	Emission control - assembly overview	476
2.2	Catalytic converter - remove and install	479
28	Ignition system	483
1	Ignition system	483
1.1	Ignition system - assembly overview	483
1.2	Ignition coils with final power stage - assembly overview	485
1.3	Spark plugs Q - technical data	486
1.4	Ignition coil with final power stage - remove and install	486
1.5	Knock sensor 1 G61 - remove and install	489
1.6	Hall Sensor G40 - remove and install	491
1.7	Engine speed sensor G28 - remove and install	491