



Contents

00 - Technical data	1
1 — Change history —	1
2 Identification	2
2.1 Engine number/engine characteristics	2
3 Safety indications	4
3.1 Safety measures for working on fuel supply system	4
3.2 Safety measures when working on vehicles with Start-Stop system	4
3.3 Safety measures for test drives with testing and measuring equipment	4
3.4 Safety measures when working on the cooling system	5
3.5 Safety measures when working on the ignition system	5
4 Repair instructions	6
4.1 Cleaning rules	6
4.2 Foreign bodies on the engine	6
4.3 Contact corrosion	6
4.4 Cable routing and fastening	6
4.5 Radiators and condensers - assembly	7
10 - Removing and installing engine	8
1 Engine - remove and install	8
1.1 Engine - removal	8
1.2 Engine and gearbox - separate	21
1.3 Engine in the gearbox and engine support - secure	25
1.4 Engine - install	26
2 Assembly carrier	30
2.1 Assembly mountings - assembly overview	30
2.2 Hold the engine in assembly position	35
2.3 Engine bracket - remove and install	40
2.4 Gearbox bracket - remove and install	43
2.5 Pendulum support (torque limiter) - remove and install	45
2.6 Assembly mountings adjustment - check	46
2.7 Assembly mountings - adjust	47
13 - Crankshaft group	50
1 Cylinder block - belt pulley side	50
1.1 Poly-V belt drive - assembly overview	50
1.2 Pulley side sealing flange - assembly overview	52
1.3 Poly-V belt - remove and install	53
1.4 Poly-V belt tensioner - remove and install	55
1.5 Pulley (vibration damper) - remove and install	56
1.6 Engine console - remove and install	57
1.7 Crankshaft seal on the pulley side - replace	66
1.8 Sealing flange on the belt pulley side - remove and install	68
2 Cylinder block, gearbox side	72
2.1 Cylinder block (gearbox side) - assembly overview	72
2.2 Clutch Disk - removal and installation	74
2.3 Sealing flange on the gearbox side - remove and install	77
3 Crankshaft	90
3.1 Crankshaft - dimensions	90
3.2 Crankshaft axial clearance - measure	90
4 Piston and connecting rod	92
4.1 Piston and connecting rod - assembly overview	92
4.2 Pistons - remove and install	96



4.3	Oil injectors - remove and install	97
4.4	Piston and cylinder - test	98
4.5	Conrod radial clearance - check	100
15	- Cylinder head, valve gear	102
1	Toothed belt drive	102
1.1	Toothed belt cover - assembly overview	102
1.2	Toothed belt - assembly overview	103
1.3	Toothed belt guard - remove and install	105
1.4	Valve timing - check	106
1.5	Remove the camshaft toothed belt	112
1.6	Valve timing - adjust	119
1.7	Toothed belt - remove and install	127
2	Engine cylinder head	134
2.1	Engine cylinder head - assembly overview	134
2.2	Cylinder head cover with camshafts - assembly overview	136
2.3	Engine cylinder head - remove and install	139
2.4	Cylinder head cover with camshafts - remove and install	144
2.5	Compression pressure - check	149
3	Valve gear	151
3.1	Valve gear - assembly overview	151
3.2	Camshaft adjustment valve 1 N205 - remove and install	153
3.3	Exhaust camshaft adjustment valve 1 N318 - remove and install	153
3.4	Camshaft control shaft adjuster - remove and install	154
3.5	Camshaft axial clearance - measure	155
3.6	Camshaft seal - remove and install	156
3.7	Valve stem sealant - remove and install	162
4	Inlet and exhaust valves	172
4.1	Valve guides - check	172
4.2	Valves - check	173
4.3	Valve dimensions	173
17	- Lubrication	174
1	Crankcase/oil pump	174
1.1	Crankcase/oil pump - assembly overview	174
1.2	Sump (bottom section) - remove and install	178
1.3	Oil pump - remove and install	183
1.4	Sump (top section) - remove and install	185
1.5	Engine oil	191
2	Engine oil cooler	192
2.1	Engine oil cooler - assembly overview	192
2.2	Engine oil cooler - remove and install	192
3	Crankcase breather	194
3.1	Crankcase breather - assembly overview	194
3.2	Oil separator - remove and install	195
4	Oil filter/Oil pressure switch	199
4.1	Oil filter/Oil pressure switch - assembly overview	199
4.2	Oil pressure switch F1 - remove and install	200
4.3	Oil pressure switch F378 – remove and install	201
4.4	Oil pressure control valve N428 - remove and install	202
4.5	Oil pressure - check	203
19	- Cooling	206
1	Cooling system/coolant	206
1.1	Coolant lines - connection diagram	206



1.2	Coolant - drain and fill	208
1.3	Cooling system - check tightness	215
2	Coolant pump/coolant thermostat	218
2.1	Coolant pump/coolant thermostat - assembly overview	218
2.2	Air intake cooling pump - assembly overview	221
2.3	Coolant temperature sensor - assembly overview	222
2.4	Coolant pump - remove and install	223
2.5	Coolant pump toothed belt roller - remove and install	229
2.6	Coolant thermostat - remove and install	230
2.7	Air intake cooling pump - remove and install	234
2.8	Coolant temperature sensor G62 - remove and install	236
2.9	radiator outlet coolant temperature sender G83 remove and install	237
3	Coolant lines	239
3.1	Coolant lines - assembly overview	239
3.2	Coolant lines - remove and install	239
4	Radiator/Radiator fan	244
4.1	Radiator - assembly overview	244
4.2	Fan cowl and radiator fan - assembly overview	246
4.3	Radiator - remove and install	247
4.4	Fan housing - remove and install	249
4.5	Radiator fan V7 - remove and install	250
4.6	Charge air cooling system radiator - remove and install	251
20 - Fuel supply system	255	
1	Fuel tank	255
1.1	Fuel tank - assembly overview	255
1.2	Fuel tank - remove and install	257
1.3	Fuel tank - drain	265
2	Fuel supply unit/Fuel level sensor	275
2.1	Fuel pump (pre-supply pump) G6/Fuel gauge sensor G - assembly overview	275
2.2	Fuel pump (pre-supply pump) G6/Fuel gauge sensor G - remove and install	277
2.3	Fuel gauge sensor G - remove and install	282
2.4	Installation opening cover - remove and install	283
3	Plug-in connectors	285
3.1	Plug-in connectors - disconnect	285
4	Fuel filter	291
4.1	Fuel filter - remove and install	291
5	Activated charcoal system	293
5.1	Activated charcoal tank system wiring diagram	293
5.2	Activated charcoal tank system - assembly overview	295
5.3	Activated charcoal tank - remove and install	297
5.4	Fuel tank ventilation - check	298
6	Accelerator activation	307
6.1	Accelerator pedal module - assembly overview	307
6.2	Accelerator pedal module GX2 - remove and install	307
7	Fuel system pressurisation pump G6	309
7.1	Fuel system pressurisation pump G6 - check	309
7.2	Fuel pump control unit J538 - remove and install	343
8	Fuel lines	345
8.1	Fuel lines - remove and install	345
21 - Turbocharging/supercharging	350	
1	Turbocharger	350
1.1	Turbocharger - assembly overview	350



1.2	Turbocharger - remove and install	354
1.3	Load pressure control V465 - remove and install	358
1.4	Turbocharger inlet nozzle - remove and install	360
2	Supercharging air system	365
2.1	Supercharging air system - assembly overview	365
2.2	Load pressure sensor GX26 - remove and install	368
2.3	Intercooler - remove and install	369
2.4	Charge air system - check air-tightness	372
2.5	Air duct - remove and install	374
24	Mixture preparation - injection	379
1	Injection system	379
1.1	Injection system - assembly overview	379
1.2	High fuel pressure - relieve	383
2	Air cleaner	385
2.1	Air filter - assembly overview	385
2.2	Air filter - remove and install	387
2.3	Air duct - remove and install	388
2.4	Front panel air filter lead - remove and install	389
3	Intake manifold	391
3.1	Intake manifold - assembly overview	391
3.2	Intake manifold - remove and install	394
3.3	Throttle butterfly valve control unit GX3 - remove and install	396
3.4	Throttle valve control unit GX3 - clean	397
4	Injection valves	399
4.1	Fuel rail with injection valves - assembly overview	399
4.2	Fuel distributor - removal and installation	401
4.3	Injection valves - remove and install	402
4.4	Injectors - clean	408
5	Transmitters and sensors	410
5.1	Intake manifold sensor GX9 - remove and install	410
5.2	Fuel pressure sensor G247 - remove and install	411
5.3	Fuel pressure sensor G247 - check	412
5.4	Ethanol concentration sensor G708, vehicles up to the year of manufacture 2021 - assembly overview	414
5.5	Ethanol concentration sensor G708 - remove and install	416
5.6	Control unit and actuator for structure-borne sound – assembly overview	420
6	High pressure pump	421
6.1	High pressure pump - assembly overview	421
6.2	High pressure pump - remove and install	422
6.3	Rigid high pressure line - remove and install	423
7	Lambda probe	426
7.1	Lambda probe - assembly overview	426
7.2	Lambda probe - remove and install	427
8	Engine control unit	431
8.1	Engine control unit J623 - remove and install	431
26	Exhaust system	433
1	Silencer/exhaust pipes	433
1.1	Silencer - assembly overview	433
1.2	Silencer/exhaust pipes - detach	435
1.3	Centre silencer with rear silencer - remove and install	437
1.4	Centre silencer - remove and install	441
1.5	Rear silencer - remove and install	443
1.6	Exhaust system - tension free alignment	444



1.7	Exhaust tail pipe - align	445
1.8	Exhaust system - check tightness	445
1.9	Pipe clamp installation position	445
2	Emission control	447
2.1	Emission control - assembly overview	447
2.2	Catalytic converter - remove and install	450
28 - Ignition system	455	
1	Ignition system	455
1.1	Ignition system - assembly overview	455
1.2	Test data, spark plugs	457
1.3	Ignition coil with final power stage - remove and install	457
1.4	Knock sensor 1 G61 - remove and install	461
1.5	Hall Sensor - remove and install	461
1.6	Engine speed sensor G28 - remove and install	462