

Contents

00 - Technical data	1
1 Identification	1
1.1 Engine number/engine data	1
2 Safety precautions	2
2.1 Safety precautions when working on the fuel supply system	2
2.2 Safety precautions when working on vehicles with start/stop system	2
2.3 Safety precautions when using testers and measuring instruments during a road test	3
2.4 Safety precautions when working on the cooling system	3
2.5 Safety precautions when working on the ignition system	3
2.6 Safety precautions when working on the subframe	4
2.7 Safety precautions when working on the exhaust system	4
3 Repair instructions	5
3.1 Rules for cleanliness	5
3.2 Foreign particles in engine	5
3.3 Contact corrosion	5
3.4 Routing and attachment of pipes, hoses and wiring	6
3.5 Installing radiators and condensers	6
3.6 Nuts, bolts	6
3.7 Identification plates	6
3.8 Use of impact wrenches	7
3.9 Checking vacuum system	7
10 - Removing and installing engine	9
1 Removing and installing engine	9
1.1 Removing engine	9
1.2 Separating engine and gearbox	26
1.3 Securing engine to engine and gearbox support	32
1.4 Installing engine	34
2 Assembly mountings	42
2.1 Exploded view - assembly mountings	42
2.2 Supporting engine in installation position	43
2.3 Removing and installing engine mountings	44
2.4 Removing and installing gearbox mounting	47
3 Engine cover panel	49
3.1 Removing and installing engine cover panel	49
13 - Crankshaft group	50
1 Cylinder block (pulley end)	50
1.1 Exploded view - poly V-belt drive	50
1.2 Removing and installing poly V-belts	52
1.3 Removing and installing poly V-belt tensioner	56
1.4 Removing and installing vibration damper	58
1.5 Removing and installing sealing flange (pulley end)	59
2 Cylinder block (gearbox end)	63
2.1 Exploded view - cylinder block (gearbox end)	63
2.2 Removing and installing drive plate	63
2.3 Renewing crankshaft oil seal (gearbox end)	64
3 Crankshaft	67
3.1 Exploded view - crankshaft	67
3.2 Crankshaft dimensions	71
3.3 Measuring axial clearance of crankshaft	71
3.4 Measuring radial clearance of crankshaft	71



3.5	Removing and installing sender wheel	72
3.6	Checking sender wheel	72
4	Balance shaft	74
4.1	Exploded view - balance shaft	74
4.2	Removing and installing balance shaft	74
5	Pistons and conrods	77
5.1	Exploded view - pistons and conrods	77
5.2	Removing and installing pistons	79
5.3	Checking pistons and cylinder bores	80
5.4	Checking radial clearance of conrod bearings	81
15	- Cylinder head, valve gear	82
1	Timing chain cover	82
1.1	Exploded view - timing chain cover	82
1.2	Removing and installing timing chain cover	85
2	Chain drive	98
2.1	Exploded view - camshaft timing chains	98
2.2	Exploded view - drive chain for valve gear	101
2.3	Exploded view - drive chain for oil pump	103
2.4	Removing camshaft timing chain from camshafts	103
2.5	Removing and installing camshaft timing chain	113
2.6	Removing and installing drive chain for valve gear	115
2.7	Removing and installing drive chain for oil pump	118
3	Cylinder head	120
3.1	Exploded view - cylinder head	120
3.2	Removing and installing cylinder head	122
3.3	Removing and installing cylinder head cover	130
3.4	Checking compression	131
4	Valve gear	134
4.1	Exploded view - valve gear	134
4.2	Measuring axial clearance of camshaft	137
4.3	Measuring radial clearance of camshaft	138
4.4	Removing and installing camshaft	139
4.5	Removing and installing camshaft control valves	145
4.6	Checking hydraulic compensation elements	146
4.7	Removing and installing valve stem oil seals	148
5	Inlet and exhaust valves	157
5.1	Checking valve guides	157
5.2	Checking valves	158
5.3	Valve dimensions	158
17	- Lubrication	159
1	Sump/oil pump	159
1.1	Exploded view - sump/oil pump	159
1.2	Engine oil	162
1.3	Removing and installing sump (bottom section)	162
1.4	Removing and installing sump (top section)	164
1.5	Removing and installing oil pump	167
1.6	Removing and installing oil level and oil temperature sender G266	168
2	Engine oil cooler	169
2.1	Exploded view - engine oil cooler	169
2.2	Removing and installing engine oil cooler	169
3	Crankcase breather	172
3.1	Exploded view - crankcase breather system	172

3.2	Removing and installing oil separator	173
3.3	Removing and installing hose for crankcase breather system	175
3.4	Removing and installing pressure control valve	176
3.5	Removing and installing oil drain valve	177
3.6	Removing and installing crankcase breather shut-off valve N548	178
4	Oil filter/oil pressure switches	180
4.1	Exploded view - oil filter	180
4.2	Exploded view - oil pressure switches/oil pressure control	181
4.3	Removing and installing oil pressure switch F22	181
4.4	Removing and installing oil pressure switch for reduced oil pressure F378	182
4.5	Checking oil pressure	183
4.6	Removing and installing valve for oil pressure control N428	184
19	Cooling	186
1	Cooling system/coolant	186
1.1	Connection diagram - coolant hoses	186
1.2	Checking cooling system for leaks	190
1.3	Draining and filling cooling system	191
2	Coolant pump/thermostat assembly	199
2.1	Exploded view - coolant pump/thermostat	199
2.2	Exploded view - electric coolant pump	200
2.3	Exploded view - coolant temperature senders	201
2.4	Removing and installing electric coolant pump	201
2.5	Removing and installing coolant pump	204
2.6	Removing and installing thermostat	206
2.7	Removing and installing coolant temperature sender G62	207
2.8	Removing and installing temperature sender for engine temperature regulation G694	208
3	Coolant pipes	210
3.1	Exploded view - coolant pipes	210
3.2	Removing and installing coolant pipes	211
4	Radiator/radiator fans	221
4.1	Exploded view - radiator/radiator fans	221
4.2	Removing and installing radiator	223
4.3	Removing and installing water radiator for charge air cooling circuit	227
4.4	Removing and installing radiator cowl	229
4.5	Removing and installing radiator fan V7	234
21	Turbocharging/supercharging	236
1	Supercharger	236
1.1	Exploded view - supercharger	236
1.2	Exploded view - magnetic clutch	239
1.3	Exploded view - rotor assembly	240
1.4	Removing and installing supercharger	241
1.5	Checking supercharger for leaks	247
1.6	Removing and installing magnetic clutch	249
1.7	Removing and installing pulley for supercharger	256
1.8	Removing and installing drive unit	257
1.9	Removing and installing rotor assembly	260
1.10	Renewing input shaft oil seal	264
1.11	Securing supercharger to engine and gearbox support	266
1.12	Removing and installing sender 1 for turbocharger speed G688	270
2	Charge air system	271
2.1	Exploded view - charge air system	271
2.2	Exploded view - hose connections for charge air system	272
2.3	Removing and installing charge air cooler	272



2.4	Removing and installing charge pressure sender G31 / G447	277
24	Mixture preparation - injection	278
1	Injection system	278
1.1	Overview of fitting locations - injection system	278
1.2	Checking fuel system for leaks	285
2	Vacuum system	286
2.1	Connection diagram - vacuum system	286
2.2	Checking vacuum system	287
3	Air cleaner	289
3.1	Exploded view - air cleaner housing	289
3.2	Removing and installing air cleaner housing	290
4	Intake manifold	292
4.1	Exploded view - intake manifold (bottom section) with fuel rail	292
4.2	Removing and installing intake manifold (bottom section) with fuel rail	294
4.3	Removing and installing throttle valve module J338	298
4.4	Removing and installing regulating flap control unit J808	300
4.5	Removing and installing fuel line	300
5	Injectors	302
5.1	Exploded view - fuel rail with injectors	302
5.2	Removing and installing fuel rail	305
5.3	Removing and installing injectors	307
5.4	Cleaning FSI injectors - vehicles with FSI engine	313
6	Senders and sensors	315
6.1	Removing and installing intake air temperature sender G42 / intake manifold pressure sender G71	315
6.2	Removing and installing fuel pressure sender G247	315
6.3	Removing and installing fuel pressure sender for low pressure G410	316
7	High-pressure pump	318
7.1	Exploded view - high-pressure pump	318
7.2	Removing and installing high-pressure pump	319
7.3	Removing and installing high-pressure pipe	323
8	Lambda probe	326
8.1	Exploded view - Lambda probe	326
8.2	Removing and installing Lambda probe	327
9	Engine control unit	331
9.1	Removing and installing engine/motor control unit J623	331
26	Exhaust system	336
1	Exhaust pipes/silencers	336
1.1	Exploded view - silencers	336
1.2	Separating exhaust pipes/silencers	338
1.3	Removing and installing front silencers	339
1.4	Removing and installing silencers	341
1.5	Stress-free alignment of exhaust system	341
1.6	Checking exhaust system for leaks	342
2	Emission control system	344
2.1	Exploded view - emission control system	344
2.2	Removing and installing catalytic converter	345
3	Secondary air system	347
3.1	Exploded view - secondary air system	347
3.2	Removing and installing secondary air pump motor V101	349
3.3	Checking combination valve	349
3.4	Removing and installing combination valve	351

4	Exhaust manifolds	355
4.1	Exploded view - exhaust manifold	355
4.2	Removing and installing exhaust manifolds	356
28	Ignition system	362
1	Ignition system	362
1.1	Exploded view - ignition system	362
1.2	Test data - spark plugs	363
1.3	Removing and installing ignition coils with output stages	363
1.4	Removing and installing knock sensor	365
1.5	Removing and installing Hall senders	366
1.6	Removing and installing engine speed sender G28	367