



Contents

00 - Technical data	1
1 Identification	1
2 Safety precautions	2
3 Repair instructions	3
10 - Removing and installing engine	4
1 Removing and installing engine	4
1.1 Removing engine	4
1.2 Separating engine and gearbox	58
1.3 Removing engine from scissor-type assembly platform	70
1.4 Securing engine to engine and gearbox support	72
1.5 Installing engine	75
2 Assembly mountings	79
2.1 Exploded view - assembly mountings	79
2.2 Supporting engine in installation position	81
2.3 Removing and installing engine mountings	82
2.4 Removing and installing gearbox mounting	85
3 Engine cover panel	86
13 - Crankshaft group	87
1 Cylinder block (pulley end)	87
1.1 Exploded view - cylinder block (pulley end)	87
1.2 Exploded view - sealing flange (pulley end)	87
1.3 Removing and installing poly V-belts	87
1.4 Removing and installing poly V-belt tensioner	91
1.5 Removing and installing vibration damper	92
1.6 Removing and installing bracket for ancillaries	93
1.7 Removing and installing engine support	93
1.8 Renewing crankshaft oil seal (pulley end)	94
1.9 Removing and installing sealing flange (pulley end)	94
2 Cylinder block (gearbox end)	97
3 Crankshaft	98
4 Balance shaft	99
5 Pistons and conrods	100
15 - Cylinder head, valve gear	101
1 Timing chain cover	101
2 Chain drive	102
2.1 Exploded view - camshaft timing chains	102
2.2 Exploded view - drive chain for oil pump	102
2.3 Removing camshaft timing chain from camshafts	102
2.4 Removing and installing camshaft timing chain	103
3 Cylinder head	104
3.1 Exploded view - cylinder head	104
3.2 Exploded view - camshaft housing	104
3.3 Removing and installing cylinder head	104
3.4 Removing and installing camshaft housing	104
3.5 Checking compression	105
4 Valve gear	106
4.1 Exploded view - valve gear	106
4.2 Measuring axial clearance of camshaft	106



4.3	Measuring radial clearance of camshaft	106
4.4	Removing and installing camshaft	106
4.5	Removing and installing cam actuators	106
4.6	Removing and installing camshaft control valve 1 N205	107
4.7	Removing and installing valve stem oil seals	108
5	Inlet and exhaust valves	109
17	Lubrication	110
1	Sump/oil pump	110
1.1	Exploded view - sump/oil pump	110
1.2	Engine oil	110
1.3	Removing and installing sump (bottom section)	110
1.4	Removing and installing sump (top section)	110
1.5	Removing and installing oil pump	110
1.6	Removing and installing oil level and oil temperature sender G266	111
2	Engine oil cooler	112
2.1	Exploded view - engine oil cooler	112
2.2	Removing and installing engine oil cooler	112
2.3	Removing and installing spray nozzle valve	113
3	Crankcase breather	114
4	Oil filter/oil pressure switches	115
4.1	Exploded view - oil filter	115
4.2	Exploded view - oil pressure switches/oil pressure control	115
4.3	Removing and installing oil filter housing	115
4.4	Removing and installing oil pressure switch F22	116
4.5	Removing and installing oil temperature sender G8	116
4.6	Removing and installing oil pressure sender G10	116
4.7	Checking oil pressure	117
4.8	Removing and installing valve for oil pressure control N428	117
19	Cooling	119
1	Cooling system/coolant	119
1.1	Connection diagram - coolant hoses	119
1.2	Checking cooling system for leaks	124
1.3	Draining and filling cooling system	124
2	Coolant pump/thermostat assembly	136
2.1	Exploded view - coolant pump/thermostat	136
2.2	Exploded view - electric coolant pump	136
2.3	Exploded view - coolant temperature senders	140
2.4	Removing and installing electric coolant pump	140
2.5	Removing and installing coolant pump	150
2.6	Removing and installing map-controlled engine cooling system thermostat F265	150
2.7	Removing and installing coolant temperature sender G62	151
2.8	Removing and installing engine outlet coolant temperature sender G82	151
2.9	Removing and installing radiator outlet coolant temperature sender G83	152
2.10	Removing and installing temperature sender for engine temperature regulation G694	153
2.11	Removing and installing coolant valves	153
3	Coolant pipes	154
3.1	Exploded view - coolant pipes	154
3.2	Removing and installing coolant pipes	159
4	Radiator/radiator fan(s)	177
4.1	Exploded view - radiator/radiator fans	177
4.2	Exploded view - radiator blind	181
4.3	Exploded view - auxiliary radiator	182
4.4	Removing and installing radiator	183

4.5	Removing and installing radiator cowl	191
4.6	Removing and installing radiator fan V7	195
4.7	Removing and installing radiator blind	196
4.8	Removing and installing radiator blind control motor V544	196
4.9	Removing and installing auxiliary radiator	198
21	Turbocharging/supercharging	206
1	Turbochargers	206
1.1	Exploded view - turbochargers	206
1.2	Removing and installing turbocharger	206
1.3	Renewing vacuum unit for turbocharger	208
1.4	Removing and installing temperature sender for engine cover panel G765	208
2	Charge air system	209
2.1	Exploded view - charge air system	209
2.2	Exploded view - hose connections for charge air system	213
2.3	Removing and installing air pipe	213
2.4	Removing and installing charge air cooler	225
2.5	Removing and installing charge pressure sender G31	228
2.6	Removing and installing charge air temperature sender	229
2.7	Removing and installing overrun air recirculation valve	230
2.8	Checking charge air system for leaks	230
24	Mixture preparation - injection	232
1	Injection system	232
1.1	Overview of fitting locations - injection system	232
2	Vacuum system	247
3	Air cleaner	248
3.1	Exploded view - air cleaner housing	248
3.2	Removing and installing air cleaner housing	249
4	Intake manifold	251
4.1	Exploded view - intake manifold	251
4.2	Removing and installing intake manifold	251
4.3	Removing and installing throttle valve module GX3	252
4.4	Cleaning throttle valve module GX3	253
5	Injectors	254
5.1	Exploded view - fuel rail with injectors	254
5.2	Removing and installing fuel rail	254
5.3	Removing and installing injectors	254
5.4	Cleaning injectors	254
6	Senders and sensors	255
6.1	Exploded view - actuator for structure-borne sound and control unit for structure-borne sound	255
6.2	Removing and installing actuator for structure-borne sound R214	256
6.3	Removing and installing control unit for structure-borne sound J869	256
6.4	Removing and installing intake air temperature sender G42 / intake manifold pressure sender G71	257
6.5	Removing and installing fuel pressure sender G247	257
6.6	Removing and installing fuel pressure sender for low pressure G410	257
6.7	Removing and installing pressure differential sender	257
7	High-pressure pump	258
7.1	Exploded view - high-pressure pump	258
7.2	Removing and installing high-pressure pump	258
7.3	Removing and installing high-pressure pipe	258
8	Lambda probe	259
8.1	Exploded view - Lambda probe	259



8.2	Removing and installing Lambda probe	259
9	Engine control unit	261
9.1	Exploded view - engine control unit	261
9.2	Removing and installing engine/motor control unit J623	261
26	- Exhaust system	263
1	Exhaust pipes/silencers	263
1.1	Exploded view - silencers	263
1.2	Removing and installing front silencers	268
1.3	Separating exhaust pipes/silencers	273
1.4	Removing and installing silencers	274
1.5	Stress-free alignment of exhaust system	275
1.6	Checking exhaust system for leaks	276
2	Emission control system	277
2.1	Exploded view - emission control system	277
2.2	Exploded view - exhaust flap control unit	279
2.3	Removing and installing catalytic converter	280
2.4	Removing and installing exhaust flap control unit J883 / J945	290
3	Exhaust gas temperature control	293
28	- Ignition system	294
1	Ignition system	294
1.1	Exploded view - ignition system	294
1.2	Removing and installing ignition coils	294
1.3	Removing and installing knock sensor 1 G61	296
1.4	Removing and installing Hall senders	296
1.5	Removing and installing engine speed sender G28	296