

Contents

00 - Technical data	1
1 Engine number	1
2 Engine data	2
3 Safety precautions	3
3.1 Procedure before opening high-pressure section of injection system	4
4 General repair instructions	7
4.1 Rules for cleanliness	7
4.2 Contact corrosion!	7
4.3 Routing and attachment of pipes, hoses and wiring	7
10 - Removing and installing engine	8
1 Removing and installing engine - vehicles with manual gearbox	8
1.1 Removing engine	8
1.2 Separating engine from manual gearbox	23
1.3 Installing engine	28
2 Removing and installing engine - vehicles with multitronic gearbox	36
2.1 Removing engine	36
2.2 Separating engine from multitronic gearbox	52
2.3 Installing engine	57
3 Removing and installing engine - vehicles with automatic gearbox 09L	64
3.1 Removing engine	64
3.2 Separating engine from automatic gearbox 09L	81
3.3 Installing engine	87
4 Securing engine to engine and gearbox support	95
13 - Crankshaft group	97
1 Cylinder block (pulley end)	97
1.1 Poly V-belt drive - exploded view of components	97
1.2 Removing and installing poly V-belt	98
1.3 Removing and installing vibration damper	100
1.4 Renewing sealing flange (pulley end) with crankshaft oil seal	102
2 Cylinder block (gearbox end)	106
2.1 Dual-mass flywheel on vehicles with manual gearbox - exploded view of components ..	106
2.2 Removing and installing dual-mass flywheel - vehicles with manual gearbox	106
2.3 Extracting and driving in needle bearing for dual-mass flywheel - vehicles with manual gearbox	108
2.4 Flywheel for vehicles with multitronic gearbox - exploded view	110
2.5 Removing and installing damper unit - vehicles with multitronic gearbox	111
2.6 Removing and installing flywheel - vehicles with multitronic gearbox	112
2.7 Drive plate on vehicles with automatic gearbox - exploded view	113
2.8 Removing and installing drive plate - vehicles with automatic gearbox	114
2.9 Renewing crankshaft oil seal (timing chain end)	115
3 Pistons and conrods	118
3.1 Pistons and conrods - exploded view of components	118
3.2 Piston and cylinder dimensions	121
3.3 Checking radial clearance of conrod bearings	121
15 - Cylinder head, valve gear	122
1 Chain drive	122
1.1 Timing chain covers - exploded view of components	122
1.2 Removing and installing timing chain covers (left and right)	122
1.3 Removing and installing timing chain cover (bottom)	128



1.4	Camshaft timing chains - exploded view of components	135
1.5	Detaching timing chains from camshafts, removing and installing chain tensioners	138
1.6	Drive chain for valve gear - exploded view of components	147
1.7	Removing and installing drive chain for valve gear	150
1.8	Drive chain for auxiliary drives on vehicles up to 04.2006 - exploded view	152
1.9	Removing and installing drive chain for auxiliary drives on vehicles up to 04.2006	154
1.10	Drive chain for auxiliary drives on vehicles from 04.2006 - exploded view	157
1.11	Removing and installing drive chain for auxiliary drives on vehicles from 04.2006	158
1.12	Balance shaft - exploded view of components	162
1.13	Removing and installing balance shaft	163
2	Crankshaft	166
2.1	Crankshaft - exploded view of components	166
2.2	Crankshaft dimensions	170
2.3	Measuring axial clearance	170
2.4	Measuring radial clearance	171
3	Cylinder head	172
3.1	Cylinder head - exploded view of components	172
3.2	Removing and installing cylinder head cover (left-side)	174
3.3	Removing and installing cylinder head cover (left-side) - USA vehicles	176
3.4	Removing and installing cylinder head cover (right-side)	178
3.5	Removing and installing cylinder head cover (right-side) - USA vehicles	181
3.6	Removing and installing cylinder head	184
3.7	Removing and installing exhauster pump for brake servo	192
3.8	Checking compression	192
4	Valve gear	197
4.1	Valve gear - exploded view of components	197
4.2	Checking axial clearance of camshafts	198
4.3	Removing and installing camshafts	199
4.4	Renewing valve stem oil seals (cylinder head installed)	204
4.5	Renewing valve stem oil seals (cylinder head removed)	208
4.6	Checking hydraulic valve compensation elements	211
4.7	Valve dimensions	213
4.8	Checking valve guides	213
4.9	Checking valves	214
17	Lubrication	215
1	Lubrication system	215
1.1	Sump (bottom section), sump (top section), oil pump, oil cooler - exploded view of components	215
1.2	Removing and installing oil cooler	218
1.3	Removing and installing sump (bottom section)	219
1.4	Removing and installing oil pump	223
1.5	Removing and installing sump (top section)	223
1.6	Oil filter housing - exploded view of components	227
1.7	Removing and installing oil filter housing	230
1.8	Removing and installing oil filter housing - USA vehicles	232
1.9	Oil retention valves, oil separator - exploded view of components	234
1.10	Removing and installing crankcase breather hoses - not applicable for USA vehicles	236
1.11	Removing and installing oil pressure switch F1	236
1.12	Checking oil pressure	237
1.13	Engine oil	239
1.14	Checking oil level	239
19	Cooling	240
1	Cooling system	240
1.1	Diagram of coolant hose connections	240

1.2	Draining and filling cooling system	242
1.3	Thermostat, coolant pump, hose connection - overview of components	247
1.4	Removing and installing coolant pump	248
1.5	Removing and installing thermostat	250
1.6	Checking thermostat	251
1.7	Coolant pipes - exploded view of components	251
1.8	Removing and installing coolant temperature sender G62	252
1.9	Removing and installing coolant pipe (front)	253
1.10	Removing and installing coolant pipes (left-side)	255
1.11	Removing and installing coolant pipe (top) - not applicable for USA vehicles	258
1.12	Removing and installing radiator	261
1.13	Removing and installing radiator cowl	266
1.14	Removing and installing radiator fan	268
1.15	Renewing radiator fan motor	268
1.16	Checking cooling system for leaks	268
 26 - Exhaust system		 271
1	Exhaust system	271
1.1	Exhaust system - exploded view of components	271
1.2	Separating centre and rear silencers	278
1.3	Renewing tailpipe	279
1.4	Removing and installing front exhaust pipe (left-side) with catalytic converter - vehicles with manual gearbox	280
1.5	Removing and installing front exhaust pipe (right-side) with catalytic converter - vehicles with manual gearbox	283
1.6	Removing and installing front exhaust pipe (left-side) with catalytic converter - vehicles with multitronic gearbox	286
1.7	Removing and installing front exhaust pipe (right-side) with catalytic converter - vehicles with multitronic gearbox	291
1.8	Removing and installing front exhaust pipe (left-side) with catalytic converter - vehicles with automatic gearbox 09L	297
1.9	Removing and installing front exhaust pipe (right-side) with catalytic converter - vehicles with automatic gearbox 09L	301
1.10	Exhaust manifold - exploded view of components	304
1.11	Removing and installing exhaust manifold (left-side)	306
1.12	Removing and installing exhaust manifold (right-side)	311
1.13	Stress-free alignment of exhaust system	314
1.14	Checking exhaust system for leaks	316