

Contents

00 - Technical data	1
1 Identification	1
2 Safety information	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	43
1.3 Securing engine to engine and gearbox support	48
1.4 Installing engine	52
2 Assembly mountings	57
2.1 Assembly overview - assembly mountings	57
2.2 Removing and installing engine mountings	60
2.3 Removing and installing gearbox mounting	65
2.4 Supporting engine in installation position	67
2.5 Removing and installing power unit mounting control unit J931	72
3 Engine cover panel	73
3.1 Removing and installing engine cover panel	73
13 - Crankshaft group	76
1 Cylinder block (pulley end)	76
1.1 Assembly overview - cylinder block (pulley end)	76
1.2 Assembly overview - sealing flange (pulley end)	76
1.3 Removing and installing poly V-belt	76
1.4 Removing and installing poly V-belt tensioner	76
1.5 Removing and installing vibration damper	76
1.6 Removing and installing bracket for ancillaries	77
1.7 Removing and installing engine support	79
1.8 Renewing crankshaft oil seal (pulley end)	80
1.9 Removing and installing sealing flange (pulley end)	80
2 Cylinder block (gearbox end)	82
3 Crankshaft	83
4 Balance shaft	84
5 Pistons and conrods	85
15 - Cylinder head, valve gear	86
1 Timing chain cover	86
1.1 Assembly overview - timing chain cover	86
1.2 Removing and installing timing chain cover	86
2 Chain drive	87
3 Cylinder head	88
3.1 Assembly overview - cylinder head	88
3.2 Assembly overview - cylinder head cover	88
3.3 Removing and installing cylinder head	88
3.4 Removing and installing cylinder head cover	88
3.5 Removing and installing seals for injectors	89
3.6 Checking compression	89
4 Valve gear	90
4.1 Assembly overview - valve gear	90
4.2 Measuring axial clearance of camshaft	90



4.3	Measuring radial clearance of camshaft	90
4.4	Removing and installing camshaft	90
4.5	Removing and installing valve stem oil seals	90
5	Inlet and exhaust valves	91
17	Lubrication	92
1	Sump/oil pump	92
1.1	Assembly overview - sump/oil pump	92
1.2	Engine oil	92
1.3	Removing and installing lower part of sump	92
1.4	Removing and installing upper part of sump	92
1.5	Removing and installing oil pump	93
1.6	Removing and installing oil level and oil temperature sender G266	93
2	Engine oil cooler	94
3	Crankcase breather	95
4	Oil filter/oil pressure switches	96
4.1	Assembly overview - oil filter	96
4.2	Assembly overview - oil pressure switches/oil pressure control	96
4.3	Removing and installing oil filter housing	96
4.4	Removing and installing oil pressure switch F22	97
4.5	Removing and installing oil temperature sender G8	97
4.6	Removing and installing oil pressure sender G10	97
4.7	Checking oil pressure	98
4.8	Removing and installing valve for oil pressure control N428	98
4.9	Removing and installing oil temperature sender 2 G664	98
19	Cooling	100
1	Cooling system/coolant	100
1.1	Connection diagram - coolant hoses	100
1.2	Overview of fitting locations - cooling system	106
1.3	Checking cooling system for leaks	107
1.4	Draining and filling cooling system	107
2	Coolant pump/thermostat assembly	116
2.1	Assembly overview - coolant pump	116
2.2	Assembly overview - electric coolant pump	116
2.3	Assembly overview - thermostat	118
2.4	Exploded view - coolant temperature senders	118
2.5	Removing and installing electric coolant pump	119
2.6	Removing and installing coolant pump	124
2.7	Removing and installing thermostat	124
2.8	Removing and installing coolant temperature sender G62	124
2.9	Removing and installing temperature sender for engine temperature regulation G694	124
2.10	Removing and installing coolant valves	125
3	Coolant pipes	128
3.1	Assembly overview - coolant pipes	128
3.2	Removing and installing coolant pipes	133
4	Radiator/radiator fans	147
4.1	Exploded view - radiator/radiator fans	147
4.2	Exploded view - radiator cowl and radiator fans	150
4.3	Assembly overview - auxiliary radiator	151
4.4	Removing and installing radiator	152
4.5	Removing and installing radiator cowl	158
4.6	Removing and installing radiator fan V7	162
4.7	Removing and installing radiator blind	163
4.8	Removing and installing radiator blind control motor	165

4.9	Removing and installing auxiliary radiator	166
21	Turbocharging/supercharging	169
1	Turbocharger	169
1.1	Exploded view - turbocharger	169
1.2	Removing and installing turbocharger	169
2	Charge air system	170
2.1	Assembly overview - charge air system	170
2.2	Assembly overview - hose connections for charge air system	171
2.3	Removing and installing charge air cooler	171
2.4	Removing and installing charge pressure sender G31	174
2.5	Removing and installing charge air temperature sender after charge air cooler G811	174
2.6	Checking charge air system for leaks	174
23	Mixture preparation - injection	175
1	Injection system	175
1.1	Overview - fuel system	175
1.2	Overview of fitting locations - injection system	177
1.3	Filling and bleeding fuel system	187
1.4	Checking fuel system for leaks	187
2	Vacuum system	188
3	Air filter	189
3.1	Assembly overview - air filter housing	189
3.2	Removing and installing air filter housing	191
4	Intake manifold	195
4.1	Exploded view - intake manifold	195
4.2	Removing and installing upper part of intake manifold	195
4.3	Removing and installing lower part of intake manifold	195
4.4	Removing and installing intake manifold flap motor V157	195
4.5	Removing and installing throttle valve module J338	196
5	Injectors/high-pressure reservoir (rail)	197
5.1	Assembly overview - injectors	197
5.2	Checking injectors	197
5.3	Performing adaption of correction values for injectors	197
5.4	Checking for injectors sticking open	197
5.5	Checking return flow rate of injectors with engine running	197
5.6	Checking return flow rate of injectors at starter cranking speed	197
5.7	Checking pressure retention valve in fuel return line	198
5.8	Removing and installing injectors	198
5.9	Removing and installing high-pressure pipes	198
5.10	Removing and installing high-pressure reservoir (rail)	198
6	Senders and sensors	199
6.1	Removing and installing fuel pressure regulating valve N276	199
6.2	Checking fuel pressure regulating valve N276	199
6.3	Removing and installing fuel pressure sender G247	201
6.4	Removing and installing air mass meter G70	202
6.5	Removing and installing pressure differential sender G505	202
6.6	Removing and installing pressure differential sender 2 G524	204
6.7	Removing and installing fuel temperature sender G81	206
6.8	Removing and installing fuel pressure sender for low pressure G410	206
7	High-pressure pump	207
8	Lambda probe	208
8.1	Assembly overview - Lambda probe	208
8.2	Removing and installing Lambda probe	210



8.3	Removing and installing NOx senders	210
8.4	Removing and installing particulate sensor G784	213
9	Engine control unit	216
9.1	Exploded view - engine control unit	216
9.2	Removing and installing engine/motor control unit J623	216
26	- Exhaust system	218
1	Exhaust pipes/silencers	218
1.1	Exploded view - silencer	218
1.2	Removing and installing front exhaust pipe	222
1.3	Removing and installing silencer	227
1.4	Stress-free alignment of exhaust system	229
1.5	Checking exhaust system for leaks	229
2	Emission control system	230
2.1	Assembly overview - emission control system	230
2.2	Removing and installing emission control module	230
2.3	Removing and installing ammonia trap	232
2.4	Removing and installing exhaust flap control unit J883	232
3	SCR (selective catalytic reduction) system	233
3.1	Assembly overview - reducing agent tank	233
3.2	Assembly overview - control unit for reducing agent metering system	235
3.3	Assembly overview - reducing agent supply line	236
3.4	Releasing pressure in SCR system	236
3.5	Draining reducing agent tank	236
3.6	Removing and installing reducing agent tank	238
3.7	Removing and installing injector for reducing agent N474	241
3.8	Removing and installing control unit for reducing agent metering system J880	241
3.9	Removing and installing reducing agent quality sensor G849	242
4	Exhaust gas temperature regulation	243
4.1	Assembly overview - exhaust gas temperature regulation	243
4.2	Removing and installing exhaust gas temperature sender 1 G235	243
4.3	Removing and installing exhaust gas temperature sender 2 G448	243
4.4	Removing and installing exhaust gas temperature sender 3 G495	243
4.5	Removing and installing exhaust gas temperature sender 4 G648	244
5	Exhaust gas recirculation	245
5.1	Assembly overview - exhaust gas recirculation system	245
5.2	Removing and installing exhaust gas recirculation cooler	247
5.3	Removing and installing exhaust gas recirculation valve 2 GX6	251
5.4	Removing and installing exhaust gas recirculation temperature sensor G98	252
5.5	Removing and installing exhaust gas recirculation pipes	253
6	Exhaust manifold	255
6.1	Exploded view - exhaust manifold	255
6.2	Removing and installing exhaust manifold	255
28	- Glow plug system	259
1	Glow plug system	259
1.1	Assembly overview - glow plug system	259
1.2	Removing and installing glow plug	259
1.3	Removing and installing automatic glow period control unit J179	259
1.4	Removing and installing Hall sender G40	259
1.5	Removing and installing engine speed sender G28	260