

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	22
1.3 Removing engine from scissor-type assembly platform	31
1.4 Securing engine to engine and gearbox support	33
1.5 Installing engine	35
2 Assembly mountings	39
2.1 Assembly overview - assembly mountings	39
2.2 Supporting engine in installation position	43
2.3 Removing and installing engine mountings	45
2.4 Removing and installing power unit mounting senders	50
2.5 Removing and installing gearbox mountings	51
2.6 Removing and installing power unit mounting control unit J931	54
3 Engine cover panel	56
13 - Crankshaft group	57
1 Cylinder block (pulley end)	57
1.1 Assembly overview - cylinder block (pulley end)	57
1.2 Assembly overview - sealing flange (pulley end)	57
1.3 Removing and installing poly V-belt	57
1.4 Removing and installing poly V-belt tensioner	58
1.5 Removing and installing vibration damper	58
1.6 Removing and installing bracket for ancillaries	58
1.7 Removing and installing engine support	61
1.8 Renewing crankshaft oil seal (pulley end)	62
1.9 Removing and installing sealing flange (pulley end)	62
2 Cylinder block (gearbox end)	63
3 Crankshaft	64
4 Balance shaft	65
5 Pistons and conrods	66
15 - Cylinder head, valve gear	67
1 Timing chain cover	67
2 Chain drive	68
2.1 Assembly overview - camshaft timing chains	68
2.2 Assembly overview - drive chain for high-pressure pump	68
2.3 Assembly overview - drive chain for oil pump	68
2.4 Assembly overview - intermediate drive	68
2.5 Removing camshaft timing chain from camshafts	68
2.6 Removing and installing camshaft timing chain	69
2.7 Removing and installing drive chain for high-pressure pump	69
2.8 Installing intermediate drive	69
3 Cylinder head	70
3.1 Assembly overview - cylinder head	70
3.2 Assembly overview - cylinder head cover	70



3.3	Removing and installing cylinder head	70
3.4	Removing and installing cylinder head cover	70
3.5	Removing and installing seals for injectors	71
3.6	Checking compression	71
4	Valve gear	72
4.1	Assembly overview - valve gear	72
4.2	Measuring axial clearance of camshaft	72
4.3	Measuring radial clearance of camshaft	72
4.4	Removing and installing camshaft	72
4.5	Removing and installing valve stem oil seals	72
5	Inlet and exhaust valves	73
17	Lubrication	74
1	Sump/oil pump	74
1.1	Assembly overview - sump/oil pump	74
1.2	Engine oil	74
1.3	Removing and installing lower part of sump	74
1.4	Removing and installing upper part of sump	76
1.5	Removing and installing oil pump	76
1.6	Removing and installing oil level and oil temperature sender G266	76
2	Engine oil cooler	77
3	Crankcase breather	78
4	Oil filter/oil pressure switches	79
4.1	Assembly overview - oil filter	79
4.2	Assembly overview - oil pressure switches/oil pressure control	79
4.3	Removing and installing oil filter housing	79
4.4	Removing and installing oil pressure switch F22	80
4.5	Removing and installing oil temperature sender G8	80
4.6	Removing and installing oil pressure sender G10	80
4.7	Checking oil pressure	80
4.8	Removing and installing valve for oil pressure control N428	80
4.9	Removing and installing oil temperature sender 2 G664	80
19	Cooling	81
1	Cooling system/coolant	81
1.1	Connection diagram - coolant hoses	81
1.2	Checking cooling system for leaks	85
1.3	Draining and filling cooling system	85
2	Coolant pump/thermostat assembly	92
2.1	Assembly overview - coolant pump	92
2.2	Assembly overview - electric coolant pump	92
2.3	Assembly overview - thermostat	94
2.4	Assembly overview - coolant temperature senders	94
2.5	Assembly overview - coolant valves	94
2.6	Removing and installing electric coolant pump	95
2.7	Removing and installing coolant pump	98
2.8	Removing and installing thermostat	98
2.9	Removing and installing coolant temperature sender G62	98
2.10	Removing and installing temperature sender for engine temperature regulation G694	98
2.11	Removing and installing coolant valves	98
3	Coolant pipes	101
3.1	Assembly overview - coolant pipes	101
3.2	Removing and installing coolant pipes	105
4	Radiator/radiator fans	115

4.1	Assembly overview - radiator/radiator fans	115
4.2	Removing and installing radiator	118
4.3	Removing and installing radiator cowl	122
4.4	Removing and installing radiator fan V7	125
21	Turbocharging/supercharging	126
1	Turbocharger	126
1.1	Assembly overview - turbocharger	126
1.2	Removing and installing turbocharger	126
2	Charge air system	127
2.1	Assembly overview - charge air system	127
2.2	Assembly overview - hose connections for charge air system	129
2.3	Removing and installing charge air cooler	129
2.4	Removing and installing charge pressure sender G31	131
2.5	Removing and installing charge air temperature sender after charge air cooler G811	131
2.6	Checking charge air system for leaks	131
23	Mixture preparation - injection	132
1	Injection system	132
1.1	Overview - fuel system	132
1.2	Overview of fitting locations - injection system	132
1.3	Filling and bleeding fuel system	142
1.4	Checking fuel system for leaks	142
2	Vacuum system	143
3	Air filter	144
3.1	Assembly overview - air filter housing	144
3.2	Removing and installing air filter housing	146
4	Intake manifold	148
4.1	Assembly overview - intake manifold	148
4.2	Removing and installing upper part of intake manifold	148
4.3	Removing and installing lower part of intake manifold	149
4.4	Removing and installing intake manifold flap motor V157	149
4.5	Removing and installing throttle valve module J338	149
5	Injectors/high-pressure reservoir (rail)	151
5.1	Assembly overview - injectors	151
5.2	Checking injectors	151
5.3	Performing adaption of correction values for injectors	151
5.4	Checking for injectors sticking open	151
5.5	Checking return flow rate of injectors with engine running	153
5.6	Checking return flow rate of injectors at starter cranking speed	154
5.7	Checking pressure retention valve in fuel return line	155
5.8	Removing and installing injectors	155
5.9	Removing and installing high-pressure pipes	157
5.10	Removing and installing high-pressure reservoir (rail)	157
6	Senders and sensors	160
6.1	Removing and installing air mass meter G70	160
6.2	Removing and installing fuel temperature sender G81	161
6.3	Removing and installing fuel pressure sender G247	161
6.4	Removing and installing fuel pressure sender for low pressure G410	161
6.5	Checking fuel pressure regulating valve N276	161
6.6	Removing and installing fuel pressure regulating valve N276	163
6.7	Removing and installing pressure differential sender 2 G524	164
6.8	Removing and installing pressure differential sender G505	165
7	High-pressure pump	166



8	Lambda probe	167
8.1	Assembly overview - Lambda probe	167
8.2	Removing and installing Lambda probe	167
8.3	Removing and installing NOx senders	168
8.4	Removing and installing particulate sensor G784	170
9	Engine control unit	173
9.1	Assembly overview - engine control unit	173
9.2	Removing and installing engine/motor control unit J623	173
26 - Exhaust system		175
1	Exhaust pipes/silencers	175
1.1	Assembly overview - silencers	175
1.2	Removing and installing front exhaust pipe	177
1.3	Separating exhaust pipes/silencers	180
1.4	Removing and installing silencers	181
1.5	Stress-free alignment of exhaust system	182
1.6	Checking exhaust system for leaks	183
2	Emission control system	184
2.1	Assembly overview - emission control system	184
2.2	Removing and installing emission control module	184
2.3	Removing and installing ammonia trap	187
2.4	Removing and installing exhaust flap control unit J883	188
3	SCR (selective catalytic reduction) system	189
3.1	Assembly overview - reducing agent tank	189
3.2	Assembly overview - reducing agent supply line	191
3.3	Releasing pressure in SCR system	191
3.4	Draining reducing agent tank	191
3.5	Removing and installing reducing agent tank	192
3.6	Removing and installing injector for reducing agent N474	194
3.7	Removing and installing control unit for reducing agent metering system J880	194
4	Exhaust gas temperature regulation	196
5	Exhaust gas recirculation	197
5.1	Assembly overview - exhaust gas recirculation system	197
5.2	Removing and installing exhaust gas recirculation cooler	199
5.3	Removing and installing exhaust gas recirculation valve 2 GX6	204
5.4	Removing and installing exhaust gas recirculation temperature sensor G98	205
6	Exhaust manifolds	206
6.1	Assembly overview - exhaust manifolds	206
6.2	Removing and installing exhaust manifolds	206
28 - Glow plug system		210
1	Glow plug system	210