

## Contents

<b>00 - Technical data</b>	<b>1</b>
1     Identification	1
2     Safety precautions	2
3     Repair instructions	3
<b>10 - Removing and installing engine</b>	<b>4</b>
1     Removing and installing engine	4
1.1    Removing engine	4
1.2    Separating engine and gearbox	23
1.3    Securing engine to engine and gearbox support	33
1.4    Installing engine	36
2     Assembly mountings	41
2.1    Exploded view - assembly mountings	41
2.2    Supporting engine in installation position	43
2.3    Removing and installing engine mountings	47
2.4    Removing and installing gearbox mounting	51
3     Engine cover panel	53
<b>13 - Crankshaft group</b>	<b>54</b>
1     Cylinder block (pulley end)	54
1.1    Exploded view - cylinder block (pulley end)	54
1.2    Exploded view - sealing flange (pulley end)	54
1.3    Removing and installing poly V-belt	54
1.4    Removing and installing poly V-belt tensioner	54
1.5    Removing and installing vibration damper	54
1.6    Removing and installing bracket for ancillaries	55
1.7    Removing and installing engine support	55
1.8    Renewing crankshaft oil seal (pulley end)	57
1.9    Removing and installing sealing flange (pulley end)	57
2     Cylinder block (gearbox end)	59
3     Crankshaft	60
4     Balance shaft	61
5     Pistons and conrods	62
<b>15 - Cylinder head, valve gear</b>	<b>63</b>
1     Timing chain cover	63
1.1    Exploded view - timing chain cover	63
1.2    Removing and installing timing chain cover	63
2     Chain drive	65
3     Cylinder head	66
3.1    Exploded view - cylinder head	66
3.2    Exploded view - cylinder head cover	66
3.3    Removing and installing cylinder head	66
3.4    Removing and installing cylinder head cover	66
3.5    Removing and installing seals for injectors	68
3.6    Checking compression	69
4     Valve gear	70
5     Inlet and exhaust valves	71
<b>17 - Lubrication</b>	<b>72</b>
1     Sump/oil pump	72



1.1	Exploded view - sump/oil pump .....	72
1.2	Engine oil .....	72
1.3	Removing and installing sump (bottom section) .....	72
1.4	Removing and installing sump (top section) .....	72
1.5	Removing and installing oil pump .....	73
1.6	Removing and installing oil level and oil temperature sender G266 .....	73
<b>2</b>	<b>Engine oil cooler .....</b>	<b>74</b>
<b>3</b>	<b>Crankcase breather .....</b>	<b>75</b>
<b>4</b>	<b>Oil filter/oil pressure switches .....</b>	<b>76</b>
4.1	Exploded view - oil filter .....	76
4.2	Exploded view - oil pressure switches/oil pressure control .....	76
4.3	Removing and installing oil filter housing .....	76
4.4	Removing and installing oil pressure switch F22 .....	77
4.5	Removing and installing oil temperature sender G8 .....	77
4.6	Removing and installing oil pressure sender G10 .....	77
4.7	Checking oil pressure .....	78
4.8	Removing and installing valve for oil pressure control N428 .....	78
4.9	Removing and installing oil temperature sender 2 G664 .....	78
<b>19 - Cooling .....</b>	<b>80</b>	
<b>1</b>	<b>Cooling system/coolant .....</b>	<b>80</b>
1.1	Connection diagram - coolant hoses .....	80
1.2	Checking cooling system for leaks .....	84
1.3	Draining and filling cooling system .....	84
<b>2</b>	<b>Coolant pump/thermostat assembly .....</b>	<b>92</b>
2.1	Exploded view - coolant pump .....	92
2.2	Exploded view - electric coolant pump .....	92
2.3	Exploded view - thermostat .....	94
2.4	Exploded view - coolant temperature senders .....	94
2.5	Removing and installing electric coolant pump .....	95
2.6	Removing and installing coolant pump .....	98
2.7	Removing and installing thermostat .....	98
2.8	Removing and installing coolant temperature sender G62 .....	98
2.9	Removing and installing temperature sender for engine temperature regulation G694 .....	98
2.10	Removing and installing coolant valves .....	99
<b>3</b>	<b>Coolant pipes .....</b>	<b>100</b>
3.1	Exploded view - coolant pipes .....	100
3.2	Removing and installing coolant pipes .....	104
<b>4</b>	<b>Radiator/radiator fans .....</b>	<b>117</b>
4.1	Exploded view - radiator/radiator fans .....	117
4.2	Removing and installing radiator .....	120
4.3	Removing and installing radiator cowl .....	125
4.4	Removing and installing radiator fan V7 .....	128
<b>21 - Turbocharging/supercharging .....</b>	<b>130</b>	
<b>1</b>	<b>Turbocharger .....</b>	<b>130</b>
1.1	Exploded view - turbocharger .....	130
1.2	Removing and installing turbocharger .....	130
<b>2</b>	<b>Charge air system .....</b>	<b>132</b>
2.1	Exploded view - charge air system .....	132
2.2	Exploded view - hose connections for charge air system .....	133
2.3	Removing and installing charge air cooler .....	134
2.4	Removing and installing charge pressure sender G31 .....	135
2.5	Removing and installing charge air temperature sender after charge air cooler G811 .....	135
2.6	Checking charge air system for leaks .....	136

<b>23 - Mixture preparation - injection</b>	<b>137</b>
<b>1 Injection system</b>	<b>137</b>
1.1 Overview - fuel system	137
1.2 Overview of fitting locations - injection system	138
1.3 Filling and bleeding fuel system	145
1.4 Checking fuel system for leaks	145
<b>2 Vacuum system</b>	<b>146</b>
<b>3 Air cleaner</b>	<b>147</b>
3.1 Exploded view - air cleaner housing	147
3.2 Removing and installing air cleaner housing	149
<b>4 Intake manifold</b>	<b>151</b>
4.1 Exploded view - intake manifold	151
4.2 Removing and installing intake manifold (top section)	151
4.3 Removing and installing intake manifold (bottom section)	152
4.4 Removing and installing intake manifold flap motor V157	152
4.5 Removing and installing throttle valve module J338	152
<b>5 Injectors/high-pressure reservoir (rail)</b>	<b>154</b>
5.1 Exploded view - injectors	154
5.2 Checking injectors	154
5.3 Performing adaption of correction values for injectors	154
5.4 Checking for injectors sticking open	154
5.5 Checking return flow rate of injectors with engine running	154
5.6 Checking return flow rate of injectors at starter cranking speed	154
5.7 Checking restrictor in fuel return line	154
5.8 Removing and installing injectors	155
5.9 Removing and installing high-pressure pipes	156
5.10 Removing and installing high-pressure reservoir (rail)	156
<b>6 Senders and sensors</b>	<b>158</b>
6.1 Removing and installing air mass meter G70	158
6.2 Removing and installing fuel temperature sender G81	159
6.3 Removing and installing fuel pressure sender G247	159
6.4 Removing and installing fuel pressure sender for low pressure G410	159
6.5 Checking fuel pressure regulating valve N276	160
6.6 Removing and installing fuel pressure regulating valve N276	162
6.7 Removing and installing pressure differential sender G505/pressure differential sender 2 G524	162
<b>7 High-pressure pump</b>	<b>166</b>
<b>8 Lambda probe</b>	<b>167</b>
8.1 Exploded view - Lambda probe	167
8.2 Removing and installing Lambda probe	169
8.3 Removing and installing NOx senders	170
8.4 Removing and installing particulate sensor G784	173
<b>9 Engine control unit</b>	<b>176</b>
9.1 Exploded view - engine control unit	176
9.2 Removing and installing engine/motor control unit J623	176
<b>26 - Exhaust system</b>	<b>179</b>
<b>1 Exhaust pipes/silencers</b>	<b>179</b>
1.1 Exploded view - silencers	179
1.2 Removing and installing front exhaust pipe	181
1.3 Separating exhaust pipes/silencers	184
1.4 Removing and installing silencers	185
1.5 Stress-free alignment of exhaust system	187
1.6 Checking exhaust system for leaks	188



<b>2</b>	<b>Emission control system</b>	<b>189</b>
2.1	Exploded view - emission control system	189
2.2	Removing and installing emission control module	189
2.3	Removing and installing trap catalytic converter	192
2.4	Removing and installing exhaust flap control unit J883	192
<b>3</b>	<b>SCR (selective catalytic reduction) system</b>	<b>193</b>
3.1	Exploded view - reducing agent tank	193
3.2	Exploded view - reducing agent supply line	195
3.3	Draining reducing agent tank	195
3.4	Removing and installing reducing agent tank	199
3.5	Removing and installing injector for reducing agent N474	202
3.6	Removing and installing reducing agent quality sensor G849	202
3.7	Removing and installing control unit for reducing agent metering system J880	202
<b>4</b>	<b>Exhaust gas temperature control</b>	<b>204</b>
4.1	Exploded view - exhaust gas temperature control	204
4.2	Removing and installing parts of exhaust gas temperature control	204
<b>5</b>	<b>Exhaust gas recirculation</b>	<b>207</b>
5.1	Exploded view - exhaust gas recirculation system	207
5.2	Removing and installing exhaust gas recirculation cooler	211
5.3	Removing and installing exhaust gas recirculation valve 2 GX6	215
5.4	Removing and installing exhaust gas recirculation temperature sensor G98	215
<b>6</b>	<b>Exhaust manifold</b>	<b>216</b>
6.1	Exploded view - exhaust manifold	216
6.2	Removing and installing exhaust manifold	217
<b>28 - Glow plug system</b>		<b>221</b>
<b>1</b>	<b>Glow plug system</b>	<b>221</b>