



## Contents

<b>00 - Technical data</b>	<b>1</b>
<b>1 Identification</b>	<b>1</b>
<b>2 Safety precautions</b>	<b>2</b>
<b>3 Repair instructions</b>	<b>3</b>
<b>10 - Removing and installing engine</b>	<b>4</b>
<b>1 Removing and installing engine</b>	<b>4</b>
1.1 Removing engine	4
1.2 Separating engine and gearbox	20
1.3 Securing engine to engine and gearbox support	25
1.4 Installing engine	28
<b>2 Assembly mountings</b>	<b>35</b>
2.1 Exploded view - assembly mountings	35
2.2 Supporting engine in installation position	37
2.3 Removing and installing engine mountings	39
2.4 Removing and installing support mountings	42
2.5 Removing and installing gearbox mounting	43
<b>3 Engine cover panel</b>	<b>45</b>
3.1 Removing and installing engine cover panel	45
<b>13 - Crankshaft group</b>	<b>46</b>
<b>1 Cylinder block (pulley end)</b>	<b>46</b>
1.1 Exploded view - cylinder block (pulley end)	46
1.2 Exploded view - sealing flange (pulley end)	48
1.3 Removing and installing poly V-belt	49
1.4 Removing and installing poly V-belt tensioner	49
1.5 Removing and installing vibration damper	49
1.6 Removing and installing bracket for ancillaries	50
1.7 Removing and installing engine support	50
1.8 Renewing crankshaft oil seal (pulley end)	51
1.9 Removing and installing sealing flange (pulley end)	51
<b>2 Cylinder block (gearbox end)</b>	<b>52</b>
<b>3 Crankshaft</b>	<b>53</b>
<b>4 Balance shaft</b>	<b>54</b>
<b>5 Pistons and conrods</b>	<b>55</b>
<b>15 - Cylinder head, valve gear</b>	<b>56</b>
<b>1 Timing chain cover</b>	<b>56</b>
1.1 Exploded view - timing chain cover	56
1.2 Removing and installing timing chain cover	58
<b>2 Chain drive</b>	<b>60</b>
<b>3 Cylinder head</b>	<b>61</b>
3.1 Exploded view - cylinder head	61
3.2 Exploded view - cylinder head cover	63
3.3 Removing and installing cylinder head	65
3.4 Removing and installing cylinder head cover	65
3.5 Removing and installing seals for injectors	67
3.6 Checking compression	68
<b>4 Valve gear</b>	<b>69</b>
<b>5 Inlet and exhaust valves</b>	<b>70</b>



<b>17 - Lubrication</b> .....	<b>71</b>
<b>1 Sump/oil pump</b> .....	<b>71</b>
1.1 Exploded view - sump/oil pump .....	71
1.2 Engine oil .....	74
1.3 Removing and installing sump (bottom section) .....	75
1.4 Removing and installing sump (top section) .....	75
1.5 Removing and installing oil pump .....	75
1.6 Removing and installing oil level and oil temperature sender G266 .....	75
<b>2 Engine oil cooler</b> .....	<b>76</b>
<b>3 Oil filter/oil pressure switches</b> .....	<b>77</b>
3.1 Exploded view - oil filter .....	77
3.2 Removing and installing oil pressure sender G10 .....	78
3.3 Checking oil pressure .....	78
3.4 Removing and installing oil filter housing .....	78
3.5 Removing and installing valve for oil pressure control N428 .....	79
3.6 Removing and installing oil temperature sender 2 G664 .....	79
<b>19 - Cooling</b> .....	<b>80</b>
<b>1 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 Coolant pump/thermostat assembly</b> .....	<b>88</b>
2.1 Exploded view - coolant pump .....	88
2.2 Exploded view - electric coolant pump .....	90
2.3 Exploded view - thermostat .....	91
2.4 Exploded view - coolant temperature senders .....	93
2.5 Removing and installing electric coolant pump .....	94
2.6 Removing and installing coolant pump .....	95
2.7 Removing and installing thermostat housing .....	95
2.8 Removing and installing map-controlled engine cooling system thermostat F265 .....	95
2.9 Removing and installing coolant temperature sender G62 .....	95
2.10 Removing and installing temperature sender for engine temperature regulation G694 ..	95
2.11 Removing and installing coolant temperature sender 2 G802 .....	96
2.12 Removing and installing coolant valves .....	96
<b>3 Coolant pipes</b> .....	<b>97</b>
3.1 Exploded view - coolant pipes .....	97
3.2 Removing and installing coolant pipes .....	100
3.3 Removing and installing coolant pipes for gearbox .....	108
<b>4 Radiator/radiator fan</b> .....	<b>110</b>
4.1 Exploded view - radiator/radiator fan .....	110
4.2 Removing and installing radiator .....	112
4.3 Removing and installing radiator cowl .....	116
4.4 Removing and installing radiator fan V7 .....	118
<b>21 - Turbocharging/supercharging</b> .....	<b>120</b>
<b>1 Turbocharger</b> .....	<b>120</b>
1.1 Exploded view - turbocharger .....	120
1.2 Removing and installing turbocharger .....	122
<b>2 Charge air system</b> .....	<b>123</b>
2.1 Exploded view - charge air system .....	123
2.2 Exploded view - hose connections for charge air system .....	124
2.3 Removing and installing charge air cooler .....	124
2.4 Removing and installing charge pressure sender G31 .....	125



2.5	Checking charge air system for leaks	126
<b>23</b>	<b>Mixture preparation - injection</b>	<b>127</b>
<b>1</b>	<b>Injection system</b>	<b>127</b>
1.1	Overview - fuel system	127
1.2	Overview of fitting locations - injection system	128
1.3	Filling and bleeding fuel system	133
1.4	Checking fuel system for leaks	133
<b>2</b>	<b>Vacuum system</b>	<b>134</b>
2.1	Connection diagram - vacuum system	134
2.2	Checking vacuum system	134
<b>3</b>	<b>Air cleaner</b>	<b>135</b>
3.1	Exploded view - air cleaner housing	135
3.2	Removing and installing air cleaner housing	136
<b>4</b>	<b>Intake manifold</b>	<b>139</b>
4.1	Exploded view - intake manifold	139
4.2	Removing and installing intake manifold (top section)	141
4.3	Removing and installing intake manifold (bottom section)	142
4.4	Removing and installing intake manifold flap motor V157	142
4.5	Removing and installing throttle valve module J338	142
<b>5</b>	<b>Injectors/high-pressure reservoir (rail)</b>	<b>143</b>
5.1	Exploded view - injectors	143
5.2	Checking injectors	145
5.3	Performing adaption of correction values for injectors	145
5.4	Checking for injectors sticking open	145
5.5	Checking return flow rate of injectors with engine running	145
5.6	Checking return flow rate of injectors at starter cranking speed	145
5.7	Checking restrictor in fuel return line	145
5.8	Removing and installing injectors	146
5.9	Removing and installing high-pressure pipes	147
5.10	Removing and installing high-pressure reservoir (rail)	147
<b>6</b>	<b>Senders and sensors</b>	<b>149</b>
6.1	Removing and installing intake air temperature sender G42	149
6.2	Removing and installing air mass meter G70	149
6.3	Removing and installing fuel temperature sender G81	150
6.4	Removing and installing fuel pressure sender G247	150
6.5	Removing and installing fuel pressure sender for low pressure G410	150
6.6	Checking fuel pressure regulating valve N276	151
6.7	Removing and installing fuel pressure regulating valve N276	153
6.8	Removing and installing pressure differential sender G505	153
<b>7</b>	<b>High-pressure pump</b>	<b>156</b>
<b>8</b>	<b>Lambda probe</b>	<b>157</b>
8.1	Exploded view - Lambda probe	157
8.2	Removing and installing Lambda probe	158
8.3	Removing and installing NOx senders	158
<b>9</b>	<b>Engine control unit</b>	<b>161</b>
9.1	Exploded view - engine control unit	161
9.2	Removing and installing engine/motor control unit J623	162
<b>26</b>	<b>Exhaust system</b>	<b>163</b>
<b>1</b>	<b>Exhaust pipes/silencers</b>	<b>163</b>
1.1	Exploded view - silencers	163
1.2	Removing and installing front exhaust pipe	167
1.3	Separating exhaust pipes/silencers	169



1.4	Removing and installing silencers	171
1.5	Stress-free alignment of exhaust system	172
1.6	Checking exhaust system for leaks	172
<b>2</b>	<b>Emission control system</b>	<b>173</b>
2.1	Exploded view - emission control system	173
2.2	Removing and installing emission control module	175
<b>3</b>	<b>SCR (selective catalytic reduction) system</b>	<b>179</b>
3.1	Exploded view - reducing agent tank	179
3.2	Exploded view - reducing agent supply line	180
3.3	Draining reducing agent tank	180
3.4	Removing and installing reducing agent tank	181
3.5	Removing and installing injector for reducing agent N474	183
3.6	Removing and installing control unit for reducing agent metering system J880	183
<b>4</b>	<b>Exhaust gas temperature control</b>	<b>185</b>
4.1	Exploded view - exhaust gas temperature control	185
4.2	Removing and installing exhaust gas temperature sender 1 G235	186
4.3	Removing and installing exhaust gas temperature sender 2 G448	187
4.4	Removing and installing exhaust gas temperature sender 3 G495	187
4.5	Removing and installing exhaust gas temperature sender 4 G648	187
<b>5</b>	<b>Exhaust gas recirculation</b>	<b>189</b>
5.1	Exploded view - exhaust gas recirculation system	189
5.2	Removing and installing exhaust gas recirculation cooler	190
5.3	Removing and installing exhaust gas recirculation temperature sensor G98	190
<b>6</b>	<b>Exhaust manifolds</b>	<b>191</b>
6.1	Exploded view - exhaust manifold	191
6.2	Removing and installing exhaust manifolds	192
<b>28</b>	<b>Glow plug system</b>	<b>196</b>
<b>1</b>	<b>Glow plug system</b>	<b>196</b>
1.1	Exploded view - glow plug system	196
1.2	Removing and installing glow plug	197
1.3	Removing and installing automatic glow period control unit J179	197
1.4	Removing and installing Hall sender G40	198
1.5	Removing and installing engine speed sender G28	198