



## 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 .....	49
1.3 Removing engine from scissor-type assembly platform .....	62
1.4 Securing engine to engine and gearbox support .....	65
1.5 Installing engine .....	67
<b>2 Assembly mountings</b> .....	<b>71</b>
2.1 Exploded view - assembly mountings .....	71
2.2 Supporting engine in installation position .....	74
2.3 Removing and installing engine mountings .....	78
2.4 Removing and installing gearbox mounting .....	83
<b>3 Engine cover panel</b> .....	<b>85</b>
<b>13 - Crankshaft group</b> .....	<b>86</b>
<b>1 Cylinder block (pulley end)</b> .....	<b>86</b>
1.1 Exploded view - cylinder block (pulley end) .....	86
1.2 Exploded view - sealing flange (pulley end) .....	89
1.3 Removing and installing poly V-belts .....	89
1.4 Removing and installing poly V-belt tensioner .....	93
1.5 Removing and installing vibration damper .....	94
1.6 Removing and installing bracket for ancillaries .....	94
1.7 Removing and installing engine support .....	96
1.8 Renewing crankshaft oil seal (pulley end) .....	97
1.9 Removing and installing sealing flange (pulley end) .....	97
<b>2 Cylinder block (gearbox end)</b> .....	<b>98</b>
<b>3 Crankshaft</b> .....	<b>99</b>
<b>4 Balance shaft</b> .....	<b>100</b>
<b>5 Pistons and conrods</b> .....	<b>101</b>
<b>15 - Cylinder head, valve gear</b> .....	<b>102</b>
<b>1 Timing chain cover</b> .....	<b>102</b>
<b>2 Chain drive</b> .....	<b>103</b>
2.1 Exploded view - camshaft timing chains .....	103
2.2 Exploded view - drive chain for oil pump .....	103
2.3 Removing camshaft timing chain from camshafts .....	103
2.4 Removing and installing camshaft timing chain .....	103
<b>3 Cylinder head</b> .....	<b>104</b>
3.1 Exploded view - cylinder head .....	104
3.2 Exploded view - camshaft housing .....	104
3.3 Removing and installing cylinder head .....	104
3.4 Removing and installing camshaft housing .....	104
3.5 Checking compression .....	105
<b>4 Valve gear</b> .....	<b>106</b>
4.1 Exploded view - valve gear .....	106
4.2 Measuring axial clearance of camshaft .....	106



4.3	Measuring radial clearance of camshaft	106
4.4	Removing and installing camshaft	106
4.5	Removing and installing cam actuators	106
4.6	Removing and installing camshaft control valves	107
4.7	Removing and installing valve stem oil seals	107
<b>5</b>	<b>Inlet and exhaust valves</b>	<b>108</b>
<b>17</b>	<b>Lubrication</b>	<b>109</b>
<b>1</b>	<b>Sump/oil pump</b>	<b>109</b>
1.1	Exploded view - sump/oil pump	109
1.2	Engine oil	109
1.3	Removing and installing sump (bottom section)	110
1.4	Removing and installing sump (top section)	110
1.5	Removing and installing oil baffle plate	110
1.6	Removing and installing oil pump	110
1.7	Removing and installing oil level and oil temperature sender G266	110
<b>2</b>	<b>Engine oil cooler</b>	<b>111</b>
2.1	Exploded view - engine oil cooler	111
2.2	Removing and installing engine oil cooler	111
2.3	Removing and installing spray nozzle valve	111
<b>3</b>	<b>Crankcase breather</b>	<b>112</b>
<b>4</b>	<b>Oil filter/oil pressure switches</b>	<b>113</b>
4.1	Exploded view - oil filter	113
4.2	Exploded view - oil pressure switches/oil pressure control	113
4.3	Removing and installing oil filter housing	113
4.4	Removing and installing oil pressure switch F22	114
4.5	Removing and installing oil temperature sender G8	114
4.6	Removing and installing oil pressure sender G10	114
4.7	Checking oil pressure	115
4.8	Removing and installing valve for oil pressure control N428	115
<b>19</b>	<b>Cooling</b>	<b>117</b>
<b>1</b>	<b>Cooling system/coolant</b>	<b>117</b>
1.1	Connection diagram - coolant hoses	117
1.2	Exploded view - coolant expansion tank	124
1.3	Checking cooling system for leaks	125
1.4	Draining and filling cooling system	125
<b>2</b>	<b>Coolant pump/thermostat assembly</b>	<b>132</b>
2.1	Exploded view - coolant pump/thermostat	132
2.2	Exploded view - electric coolant pump	132
2.3	Exploded view - coolant valves	135
2.4	Exploded view - coolant temperature senders	135
2.5	Removing and installing electric coolant pump	136
2.6	Removing and installing coolant pump	140
2.7	Removing and installing map-controlled engine cooling system thermostat F265	140
2.8	Removing and installing coolant temperature sender G62	141
2.9	Removing and installing engine outlet coolant temperature sender G82	141
2.10	Removing and installing radiator outlet coolant temperature sender G83	142
2.11	Removing and installing temperature sender for engine temperature regulation G694	143
2.12	Removing and installing coolant valves	143
<b>3</b>	<b>Coolant pipes</b>	<b>145</b>
3.1	Exploded view - coolant pipes	145
3.2	Removing and installing coolant pipes	151
<b>4</b>	<b>Radiators/radiator fans</b>	<b>172</b>
4.1	Exploded view - radiators/radiator fans	172



4.2	Exploded view - auxiliary radiator	175
4.3	Removing and installing radiator	175
4.4	Removing and installing water radiator for charge air cooling circuit	185
4.5	Removing and installing radiator cowl	187
4.6	Removing and installing radiator fan V7 / radiator fan 2 V177	194
4.7	Removing and installing auxiliary radiator	195
<b>21</b>	<b>- Turbocharging/supercharging</b>	<b>200</b>
<b>1</b>	<b>Turbochargers</b>	<b>200</b>
1.1	Exploded view - turbocharger	200
1.2	Exploded view - electric compressor with control unit for electric compressor J1123	200
1.3	Removing and installing turbocharger	201
1.4	Removing and installing electric compressor with control unit for electric compressor J1123	203
1.5	Renewing vacuum unit for turbocharger	205
1.6	Removing and installing temperature sender for engine cover panel G765	205
<b>2</b>	<b>Charge air system</b>	<b>206</b>
2.1	Exploded view - charge air system	206
2.2	Exploded view - hose connections for charge air system	209
2.3	Removing and installing air pipe	209
2.4	Removing and installing charge air cooler	219
2.5	Removing and installing charge pressure sender G31	224
2.6	Removing and installing charge pressure sender 2 G447	225
2.7	Removing and installing overrun air recirculation valve	226
2.8	Checking charge air system for leaks	226
<b>24</b>	<b>- Mixture preparation - injection</b>	<b>228</b>
<b>1</b>	<b>Injection system</b>	<b>228</b>
1.1	Overview of fitting locations - injection system	228
1.2	Checking fuel system for leaks	243
<b>2</b>	<b>Vacuum system</b>	<b>244</b>
2.1	Connection diagram - vacuum system	244
2.2	Checking vacuum system	245
<b>3</b>	<b>Air cleaner</b>	<b>246</b>
3.1	Exploded view - air cleaner housing	246
3.2	Removing and installing air cleaner housing	247
<b>4</b>	<b>Intake manifold</b>	<b>248</b>
4.1	Exploded view - intake manifold	248
4.2	Removing and installing intake manifold	248
4.3	Removing and installing throttle valve module GX3	249
4.4	Cleaning throttle valve module GX3	249
<b>5</b>	<b>Injectors</b>	<b>250</b>
5.1	Exploded view - fuel rail with injectors	250
5.2	Removing and installing fuel rail	250
<b>6</b>	<b>Senders and sensors</b>	<b>251</b>
6.1	Exploded view - actuator for structure-borne sound and control unit for structure-borne sound	251
6.2	Exploded view - pressure differential sender	253
6.3	Removing and installing actuator for structure-borne sound R214	253
6.4	Removing and installing control unit for structure-borne sound J869	254
6.5	Removing and installing intake air temperature sender G42 / intake manifold pressure sender G71	255
6.6	Removing and installing fuel pressure sender G247	255
6.7	Removing and installing fuel pressure sender for low pressure G410	255
6.8	Removing and installing pressure differential sender	255



<b>7</b>	<b>High-pressure pump</b> .....	<b>256</b>
7.1	Exploded view - high-pressure pump .....	256
7.2	Removing and installing high-pressure pump .....	256
7.3	Removing and installing high-pressure pipe .....	256
<b>8</b>	<b>Lambda probe</b> .....	<b>257</b>
8.1	Exploded view - Lambda probe .....	257
8.2	Removing and installing Lambda probe .....	257
<b>9</b>	<b>Engine control unit</b> .....	<b>259</b>
9.1	Exploded view - engine control unit .....	259
9.2	Removing and installing engine/motor control unit J623 .....	259
<b>26</b>	<b>- Exhaust system</b> .....	<b>261</b>
<b>1</b>	<b>Exhaust pipes/silencers</b> .....	<b>261</b>
1.1	Exploded view - silencers .....	261
1.2	Removing and installing front silencers .....	263
1.3	Separating exhaust pipes/silencers .....	265
1.4	Removing and installing silencers .....	266
1.5	Stress-free alignment of exhaust system .....	268
1.6	Checking exhaust system for leaks .....	269
<b>2</b>	<b>Emission control system</b> .....	<b>270</b>
2.1	Exploded view - emission control system .....	270
2.2	Removing and installing catalytic converter .....	275
2.3	Removing and installing particulate filter .....	288
<b>3</b>	<b>Exhaust gas temperature control</b> .....	<b>290</b>
<b>28</b>	<b>- Ignition system</b> .....	<b>291</b>
<b>1</b>	<b>Ignition system</b> .....	<b>291</b>
1.1	Exploded view - ignition system .....	291
1.2	Removing and installing ignition coils .....	291
1.3	Removing and installing knock sensor 1 G61 / knock sensor 2 G66 .....	293
1.4	Removing and installing Hall senders .....	293
1.5	Removing and installing engine speed sender G28 .....	293