

## Contents

<b>00 - Technical data</b>	<b>1</b>
<b>1 Technical data</b>	<b>1</b>
1.1 Engine number	1
1.2 Engine data	1
<b>10 - Removing and installing engine</b>	<b>3</b>
<b>1 Removing and installing engine</b>	<b>3</b>
1.1 Removing engine	3
1.2 Securing engine to assembly stand	11
1.3 Installing engine	12
<b>13 - Crankshaft group</b>	<b>15</b>
<b>1 Servicing belt drive</b>	<b>15</b>
1.1 Poly V-belt drive for power steering pump, alternator and viscous fan	15
1.2 Poly V-belt drive for air conditioner	17
1.3 Removing and installing poly V-belt	17
1.4 Removing and installing vibration damper	21
1.5 Bracket for power steering pump and oil cooler - exploded view of components	21
1.6 Removing and installing bracket for power steering pump and oil cooler	23
1.7 Removing and installing mounting bushes on bracket for power steering pump and oil cooler	25
1.8 Toothed belt drive for camshafts	32
1.9 Toothed belt drive for injection pump	35
1.10 Removing and installing toothed belt	36
1.11 Removing toothed belt from camshaft sprockets	45
<b>2 Sealing flanges and flywheel/drive plate</b>	<b>54</b>
2.1 Sealing flanges and flywheel/drive plate - exploded view of components	54
2.2 Renewing crankshaft oil seal - pulley end	56
2.3 Removing and installing front sealing flange	57
2.4 Removing and installing flywheel/dual-mass flywheel	60
2.5 Extracting and driving in needle bearing for dual-mass flywheel	61
2.6 Removing and installing drive plate	62
<b>3 Crankshaft</b>	<b>65</b>
3.1 Removing and installing crankshaft	65
3.2 Crankshaft dimensions	67
3.3 Measuring axial clearance	67
3.4 Measuring radial clearance	68
3.5 Removing and installing chain sprocket	68
<b>4 Pistons and conrods</b>	<b>70</b>
4.1 Dismantling and assembling pistons and conrods	70
4.2 Checking piston projection at "TDC"	73
4.3 Piston and cylinder dimensions	74
4.4 Checking radial clearance of conrods	74
<b>15 - Cylinder head, valve gear</b>	<b>76</b>
<b>1 Removing and installing cylinder head</b>	<b>76</b>
1.1 Cylinder head - exploded view of components	76
1.2 Removing and installing cylinder head cover (left-side)	78
1.3 Removing and installing cylinder head cover (right-side)	81
1.4 Removing cylinder head (left-side)	84
1.5 Removing cylinder head (right-side)	87
1.6 Installing cylinder head	90
1.7 Checking compression	94



<b>2</b>	<b>Servicing valve gear - engine code letters AFB, AKE, AKN, AYM, BFC</b>	<b>96</b>
2.1	Valve gear - exploded view of components	96
2.2	Checking axial clearance of camshafts	98
2.3	Renewing camshaft oil seal	99
2.4	Removing and installing camshafts	101
2.5	Removing and installing outer camshaft bearing caps	105
2.6	Renewing valve stem oil seals	107
2.7	Checking hydraulic valve compensation elements	111
2.8	Valve dimensions	112
2.9	Checking valve guides	112
2.10	Checking valves	113
<b>3</b>	<b>Servicing valve gear - engine code letters BAU, BCZ, BDG, BDH</b>	<b>114</b>
3.1	Valve gear - exploded view of components	114
3.2	Checking axial clearance of camshafts	116
3.3	Renewing camshaft oil seal	117
3.4	Removing and installing camshafts	119
3.5	Removing and installing outer camshaft bearing caps	123
3.6	Renewing valve stem oil seals	125
3.7	Checking hydraulic valve compensation elements	130
3.8	Valve dimensions	131
3.9	Checking valve guides	131
3.10	Checking valves	132
<b>17 - Lubrication</b>		<b>133</b>
<b>1</b>	<b>Components of lubrication system</b>	<b>133</b>
1.1	Sump, oil pump - exploded view of components	133
1.2	Removing sump (bottom section)	135
1.3	Installing sump (bottom section) - engines with moulded gasket	138
1.4	Installing sump (bottom section) - engines with liquid gasket	138
1.5	Removing and installing oil pump	140
1.6	Removing and installing sump (top section)	146
1.7	Installing sump (top section) - engines with moulded gasket	152
1.8	Installing sump (top section) - engines with liquid gasket	154
1.9	Removing and installing oil cooler	157
1.10	Oil filter bracket, oil filter - exploded view of components	160
1.11	Removing and installing connecting piece with oil separator	162
1.12	Removing and installing oil filter bracket - engine code letters AFB, AKN, AKE, AYM, BAU, BCZ, BFC	165
1.13	Removing and installing oil filter bracket - engine code letters BDG, BDH	166
1.14	Renewing oil retention valves	167
1.15	Checking oil pressure and oil pressure switch	167
1.16	Engine oil	169
1.17	Checking oil level	169
<b>19 - Cooling</b>		<b>171</b>
<b>1</b>	<b>Removing and installing parts of cooling system</b>	<b>171</b>
1.1	Connection diagram for coolant hoses - vehicles with exhaust gas recirculation cooler	171
1.2	Connection diagram for coolant hoses - vehicles with fuel cooling system	173
1.3	Connection diagram for coolant hoses - vehicles with auxiliary heater	174
1.4	Draining and filling cooling system	175
1.5	Coolant pump and thermostat - exploded view of components	181
1.6	Removing and installing coolant pump	182
1.7	Removing, installing and checking coolant thermostat	183
1.8	Coolant pipes on vehicles with engine code letters AFB, AKE, AKN, AYM, BAU, BCZ, BFC - exploded view of components	190

1.9	Coolant pipes on vehicles with engine code letters BDG, BDH - exploded view of components	192
1.10	Removing and installing coolant pipe (front)	192
1.11	Removing and installing coolant pipe (top left and bottom left) - engine code letters AFB, AKE, AKN, AYM, BAU, BCZ, BFC	194
1.12	Removing and installing coolant pipe (top left) - engine code letters BDG, BDH	198
1.13	Removing and installing coolant pipe (bottom left) - engine code letters BDG, BDH	200
1.14	Removing and installing coolant pipe (right-side)	202
1.15	Removing and installing coolant pipe (rear) - engine code letters BDG, BDH	203
1.16	Removing and installing radiator	204
1.17	Removing and installing viscous fan	206
1.18	Removing and installing radiator fan V7	208
1.19	Checking cooling system for leaks	210
<b>21</b>	<b>Turbocharging/supercharging</b>	<b>212</b>
<b>1</b>	<b>Servicing charge air system with turbocharger</b>	<b>212</b>
1.1	Rules for cleanliness	212
1.2	Hose connection diagram for charge pressure control	212
1.3	Turbocharger - exploded view of components	214
1.4	Removing and installing turbocharger	215
1.5	Removing and installing intermediate flange - engine code letters AFB, AKE, AKN, AYM, BAU, BCZ, BFC	217
1.6	Removing and installing intermediate flange - engine code letters BDG, BDH	219
1.7	Charge air cooler - exploded view of components	221
1.8	Removing and installing intake manifold pressure sender G71	222
1.9	Removing and installing charge air cooler	223
<b>26</b>	<b>Exhaust system</b>	<b>226</b>
<b>1</b>	<b>Removing and installing parts of exhaust system - vehicles with front-wheel drive</b>	<b>226</b>
1.1	Exhaust system - exploded view of components	226
1.2	Separating centre and rear silencers	230
1.3	Removing and installing exhaust elbow for turbocharger - engine code letters AFB AKN	231
1.4	Removing and installing starter catalytic converter - engine code letters AKE, AYM, BAU, BCZ, BDG, BDH, BFC	232
1.5	Removing and installing front exhaust pipe with main catalytic converter - engine code letters AFB AKN	235
1.6	Removing and installing front exhaust pipe with main catalytic converter - engine code letters AKE, AYM, BAU, BCZ, BDG, BDH, BFC	237
1.7	Stress-free alignment of exhaust system	240
1.8	Aligning tailpipes - vehicles with concealed tailpipes	241
1.9	Aligning tailpipes - vehicles with visible tailpipes	242
1.10	Checking exhaust system for leaks	242
<b>2</b>	<b>Removing and installing parts of exhaust system - vehicles with four-wheel drive</b>	<b>243</b>
2.1	Exhaust system - exploded view of components	243
2.2	Separating centre and rear silencers	246
2.3	Removing and installing exhaust elbow for turbocharger - engine code letters AFB AKN	247
2.4	Removing and installing starter catalytic converter - engine code letters AKE, AYM, BAU, BCZ, BDG, BDH, BFC	249
2.5	Removing and installing front exhaust pipe with main catalytic converter - engine code letters AFB AKN	251
2.6	Removing and installing front exhaust pipe with main catalytic converter - engine code letters AKE, AYM, BAU, BCZ, BDG, BDH, BFC	254
2.7	Stress-free alignment of exhaust system	256
2.8	Aligning tailpipes - vehicles with concealed tailpipes	257
2.9	Aligning tailpipes - vehicles with visible tailpipes	258
2.10	Checking exhaust system for leaks	258



<b>3</b>	<b>Removing and installing exhaust manifold</b> .....	<b>259</b>
3.1	Exhaust manifold with intermediate pipe - exploded view of components .....	259
3.2	Removing and installing exhaust manifold (left-side) with intermediate pipe .....	260
3.3	Removing and installing exhaust manifold (right-side) with intermediate pipe .....	261
<b>4</b>	<b>Exhaust gas recirculation system</b> .....	<b>265</b>
4.1	Hose connection diagram for exhaust gas recirculation .....	265
4.2	Exhaust gas recirculation system with engine code letters AFB, AKE, AKN, AYM, BAU, BCZ, BFC - exploded view of components .....	266
4.3	Checking mechanical exhaust gas recirculation valve - engine code letters AFB, AKE, AKN, AYM, BAU, BCZ, BFC .....	266
4.4	Removing and installing mechanical exhaust gas recirculation valve - engine code letters AFB, AKE, AKN, AYM, BAU, BCZ, BFC .....	267
4.5	Exhaust gas recirculation system on vehicles with engine code letters BDG, BDH - exploded view of components .....	269
4.6	Checking mechanical exhaust gas recirculation valve - engine code letters BDG, BDH ..	270
4.7	Removing and installing mechanical exhaust gas recirculation valve - engine code letters BDG, BDH .....	272
4.8	Removing and installing exhaust gas recirculation cooler - engine code letters BDG, BDH .....	272