

Contents

| | |
|--|-----------|
| 00 - Technical data | 1 |
| 1 Technical data | 1 |
| 1.1 Engine number | 1 |
| 1.2 Engine data | 1 |
| 2 Safety precautions | 3 |
| 2.1 Working on the fuel system | 3 |
| 2.2 Procedure before opening high-pressure section of injection system | 3 |
| 2.3 Working on the cooling system | 4 |
| 2.4 Using testers and measuring instruments during a road test | 4 |
| 2.5 Working on the exhaust system | 4 |
| 3 Repair instructions | 5 |
| 3.1 Rules for cleanliness when working on fuel supply system, injection system and turbocharger | 5 |
| 3.2 Checking fuel system for leaks | 5 |
| 3.3 Foreign particles in engine | 6 |
| 3.4 Contact corrosion | 6 |
| 3.5 Routing and attachment of pipes, hoses and wiring | 6 |
| 3.6 Nuts, bolts | 6 |
| 3.7 Identification plates | 7 |
| 3.8 Use of impact wrenches | 7 |
| 3.9 Checking vacuum system | 7 |
| 3.10 Installing radiators, condensers and charge air coolers | 8 |
| 10 - Removing and installing engine | 9 |
| 1 Removing and installing engine | 9 |
| 1.1 Removing engine | 9 |
| 1.2 Securing engine to assembly stand | 29 |
| 1.3 Installing engine | 30 |
| 1.4 Vacuum connections | 33 |
| 13 - Crankshaft group | 35 |
| 1 Dismantling and assembling engine | 35 |
| 1.1 Lock carrier - exploded view | 35 |
| 1.2 Moving lock carrier into service position | 35 |
| 1.3 Poly V-belt drive for power steering pump, alternator and air conditioner compressor - exploded view | 38 |
| 1.4 Removing and installing poly V-belt | 39 |
| 1.5 Removing and installing crankshaft pulley | 41 |
| 1.6 Toothed belt drive - exploded view | 41 |
| 1.7 Removing and installing toothed belt | 44 |
| 2 Removing and installing sealing flange and flywheel/drive plate | 49 |
| 2.1 Sealing flange and flywheel/drive plate - exploded view | 49 |
| 2.2 Renewing crankshaft oil seal (pulley end) | 50 |
| 2.3 Removing and installing sealing flange (front) | 52 |
| 2.4 Removing dual-mass flywheel or flywheel for automatic gearbox 01J | 57 |
| 2.5 Extracting and driving in needle bearing for dual-mass flywheel | 58 |
| 3 Removing and installing crankshaft | 60 |
| 3.1 Crankshaft - exploded view | 60 |
| 3.2 Crankshaft dimensions | 62 |
| 3.3 Measuring axial clearance of crankshaft | 62 |
| 3.4 Measuring radial clearance of crankshaft | 63 |
| 3.5 Removing and installing chain sprocket | 64 |
| 4 Dismantling and assembling pistons and conrods | 65 |



| | | |
|-----------|---|------------|
| 4.1 | Pistons and conrods - exploded view | 65 |
| 4.2 | Piston and cylinder dimensions | 68 |
| 4.3 | Checking radial clearance of conrod bearings | 68 |
| 15 | Cylinder head, valve gear | 70 |
| 1 | Removing and installing cylinder head | 70 |
| 1.1 | Cylinder head - exploded view | 70 |
| 1.2 | Removing and installing cylinder head cover (left-side) | 73 |
| 1.3 | Removing and installing cylinder head cover (right-side) | 76 |
| 1.4 | Removing cylinder head (left-side) | 79 |
| 1.5 | Removing cylinder head (right-side) | 81 |
| 1.6 | Installing cylinder head | 83 |
| 1.7 | Removing and installing intake manifold | 86 |
| 1.8 | Checking compression | 89 |
| 2 | Servicing valve gear | 94 |
| 2.1 | Valve gear - exploded view | 94 |
| 2.2 | Checking axial clearance of camshafts | 97 |
| 2.3 | Renewing camshaft oil seals | 98 |
| 2.4 | Renewing oil seal for Hall sender and sealing cap - cylinder head (left-side) | 100 |
| 2.5 | Renewing oil seal for Hall sender - cylinder head (right-side) | 101 |
| 2.6 | Removing and installing camshafts and camshaft adjuster | 104 |
| 2.7 | Checking hydraulic bucket tappets | 108 |
| 2.8 | Renewing valve stem oil seals | 109 |
| 2.9 | Checking valve guides | 113 |
| 2.10 | Checking valves | 114 |
| 2.11 | Machining valve seats | 114 |
| 3 | Checking variable valve timing | 116 |
| 3.1 | Testing the system | 116 |
| 3.2 | Checking camshaft control valves (solenoid valves) | 119 |
| 17 | Lubrication | 123 |
| 1 | Removing and installing parts of lubrication system | 123 |
| 1.1 | Lubrication system - exploded view | 123 |
| 1.2 | Removing and installing sump (bottom section) | 124 |
| 1.3 | Removing and installing oil pump | 127 |
| 1.4 | Checking chain tensioner | 128 |
| 1.5 | Removing and installing drive chain and chain tensioner for oil pump | 129 |
| 1.6 | Removing and installing sump (top section) | 130 |
| 1.7 | Renewing oil retention valves | 141 |
| 1.8 | Checking oil pressure and oil pressure switch | 142 |
| 1.9 | Engine oil | 145 |
| 1.10 | Checking oil level | 145 |
| 19 | Cooling | 146 |
| 1 | Removing and installing parts of cooling system | 146 |
| 1.1 | Parts of cooling system | 146 |
| 1.2 | Draining and filling cooling system | 148 |
| 1.3 | Coolant pump and thermostat - exploded view | 153 |
| 1.4 | Removing and installing coolant pump | 154 |
| 1.5 | Removing, installing and checking thermostat | 155 |
| 1.6 | Coolant pipes - exploded view | 158 |
| 1.7 | Removing and installing coolant pipe (front) | 159 |
| 1.8 | Removing and installing coolant pipe (small) | 161 |
| 1.9 | Removing and installing coolant pipe (rear) | 162 |
| 1.10 | Removing and installing radiator | 164 |
| 1.11 | Renewing radiator fan motor | 168 |

| | | |
|-----------|---|------------|
| 1.12 | Checking cooling system for leaks | 169 |
| 26 | - Exhaust system | 171 |
| 1 | Removing and installing parts of exhaust system | 171 |
| 1.1 | Exhaust system - exploded view | 171 |
| 1.2 | Separating centre and rear silencers | 175 |
| 1.3 | Removing and installing front exhaust pipe (left-side) with starter catalytic converter and main catalytic converter | 176 |
| 1.4 | Removing and installing front exhaust pipe (right-side) with starter catalytic converter and main catalytic converter | 180 |
| 1.5 | Removing and installing exhaust manifold (left-side) | 184 |
| 1.6 | Removing and installing exhaust manifold (right-side) | 186 |
| 1.7 | Stress-free alignment of exhaust system | 188 |
| 1.8 | Checking exhaust system for leaks | 190 |
| 2 | Secondary air system | 191 |
| 2.1 | Principle and function | 191 |
| 2.2 | Checking secondary air inlet valve N112 | 193 |
| 2.3 | Checking secondary air pump relay J299 and activation | 197 |
| 2.4 | Removing and installing secondary air pump motor V101 | 204 |
| 2.5 | Checking combination valve for secondary air system for proper operation and leakage .. | 206 |
| 2.6 | Removing and installing combination valve for secondary air system (left-side) | 208 |
| 2.7 | Removing and installing combination valve for secondary air system (right-side) | 210 |