



Contents

00 - Technical data	1
1 Safety information	1
1.1 Safety precautions when working on the cooling system	1
1.2 Safety regulations for working on fuel supply	2
1.3 Releasing high pressure in fuel system	2
1.4 Safety precautions when working on charge air system	3
1.5 Safety precautions when working on ignition system	3
1.6 Safety regulations for working on fuel supply	4
2 Identification	6
2.1 Engine number/engine data	6
3 General information	7
3.1 General notes on injection	7
4 Repair instructions	8
4.1 Rules for cleanliness when working on fuel supply system/injection system	8
10 - Removing and installing engine	9
1 Removing and installing engine	9
1.1 Removing engine	9
1.2 Securing engine on engine and gearbox support	16
1.3 Installing engine	16
2 Assembly mountings	20
2.1 Assembly overview - assembly mountings	20
13 - Crankshaft group	21
1 Cylinder block (pulley end)	21
1.1 Assembly overview - poly V-belt drive	21
1.2 Removing and installing poly V-belt, vehicles with air conditioner	22
1.3 Removing and installing poly V-belt, vehicles without air conditioner	23
1.4 Removing and installing top ancillary bracket	24
1.5 Removing and installing bottom ancillary bracket	25
1.6 Renewing crankshaft oil seal - belt pulley end	26
1.7 Removing and installing belt pulley.	29
2 Cylinder block, gearbox end	33
2.1 Assembly overview - cylinder block, gearbox end	33
2.2 Removing and installing sealing flange on gearbox side	34
3 Crankshaft	43
3.1 Renewing needle bearing in crankshaft	43
3.2 Crankshaft dimensions	44
4 Pistons and conrods	45
4.1 Assembly overview - pistons and conrods	45
4.2 Checking pistons and cylinder bores	46
4.3 Separating new conrod	47
4.4 Piston and cylinder dimensions	48
15 - Cylinder head, valve gear	49
1 Cylinder head	49
1.1 Assembly overview - cylinder head	49
1.2 Removing and installing cylinder head cover with camshaft	51
1.3 Removing and installing cylinder head	60
1.4 Checking compression	66
2 Cover for timing chain	68
2.1 Removing and installing top valve timing housing	68



2.2	Removing and installing bottom valve timing housing	71
3	Chain drive	74
3.1	Assembly overview - timing chain	74
3.2	Checking timing chain	77
3.3	Removing and installing timing chain	80
3.4	Removing and installing timing chain and chain drive for oil pump	87
3.5	Checking valve timing	90
3.6	Adjusting valve timing	93
4	Valve gear	101
4.1	Assembly overview - valve gear	101
4.2	Measuring axial play of camshaft	102
4.3	Removing and installing valve stem seals	103
5	Inlet and exhaust valves	105
5.1	Reworking valve seats	105
5.2	Checking valve guides	106
5.3	Valve dimensions	107
17 - Lubrication		108
1	Sump, oil pump	108
1.1	Assembly overview - sump/oil pump	108
1.2	Engine oil:	111
1.3	Removing and installing oil sump	111
1.4	Removing and installing oil pump	115
2	Engine oil cooler	118
2.1	Removing and installing engine oil cooler	118
3	Crankcase ventilation	120
3.1	Assembly overview - crankcase breather system	120
3.2	Removing and installing oil separator	121
4	Oil filter, oil pressure switch	123
4.1	Checking oil pressure and oil pressure switch	123
4.2	Removing and installing non-return valve	124
19 - Cooling		126
1	Cooling system/coolant	126
1.1	Connection diagram - coolant hoses	126
1.2	Draining and adding coolant	127
1.3	Checking cooling system for leaks	132
2	Coolant pump, regulation of cooling system	134
2.1	Assembly overview - thermostat	134
2.2	Removing and installing coolant pump	134
2.3	Removing and installing coolant circulation pump V50	136
3	Radiator, radiator fan	139
3.1	Assembly overview - radiator/ radiator fan V7	139
3.2	Removing and installing radiator	141
3.3	Removing and installing radiator fan V7	143
21 - Turbocharging/supercharging		145
1	Exhaust turbocharger	145
1.1	Assembly overview - turbocharger	145
1.2	Removing and installing turbocharger	147
1.3	Removing and installing charge pressure positioner V465	150
2	Charge air system	153
2.1	Assembly overview - charge air system	153
2.2	Removing and installing charge air cooler	154



24 - Mixture preparation - injection	157
1 Injectors	157
1.1 Removing and installing injectors	157
1.2 Renewing seals on injectors	159
2 Air filter	163
2.1 Assembly overview - air filter	163
2.2 Removing and installing air filter	163
3 Intake manifold	165
3.1 Assembly overview - intake manifold, part I	165
3.2 Assembly overview - intake manifold, part II	166
3.3 Removing and installing intake manifold	167
3.4 Removing and installing throttle valve module J338	168
3.5 Cleaning throttle valve module J338	171
4 Senders and sensors	172
4.1 Checking fuel pressure sender G247	172
4.2 Checking fuel pressure regulator and holding pressure	174
5 Engine (motor) control unit	178
5.1 Removing and installing engine (motor) control unit J623	178
5.2 Removing and installing anti-theft engine control unit J623	179
6 High-pressure pump	181
6.1 Assembly overview - high-pressure pump	181
6.2 Removing and installing high-pressure pump	182
26 - Exhaust system	185
1 Exhaust pipes and silencers	185
1.1 Assembly overview - silencers	185
1.2 Separating exhaust pipes from silencers	186
1.3 Installation position of clamp	187
2 Exhaust gas cleaning	189
2.1 Assembly overview - emission control	189
2.2 Assembly overview- emission control, vehicles as of week 22/2011	191
28 - Ignition system	193
1 Ignition system	193
1.1 Assembly overview - ignition system	193
1.2 Test data, spark plugs	194
1.3 Removing and installing engine speed sender G28	195