



Contents

00 - Technical data	1
1 Safety information	1
1.1 Safety regulations for working on fuel supply	1
1.2 Safety measures when working on vehicles with a start/stop system	1
1.3 Safety precautions when using testers and measuring instruments during a road test	2
1.4 Safety precautions when working on ignition system	2
1.5 Safety precautions when working on the cooling system	2
2 Identification	3
2.1 Engine number/engine data	3
2.2 Numbering of cylinders	4
3 Repair instructions	5
3.1 Rules for cleanliness	5
3.2 Foreign objects in engine	5
3.3 Contact corrosion	5
3.4 Routing and attachment of lines	5
3.5 Fitting radiator and condensers	6
10 - Removing and installing engine	7
1 Removing and installing engine	7
1.1 Removing engine	7
1.2 Separating engine and gearbox	19
1.3 Securing engine on engine support	21
1.4 Installing engine	22
1.5 Supporting engine in installation position	24
2 Assembly mountings	27
2.1 Assembly overview - assembly mountings	27
2.2 Removing and installing engine mounting	27
13 - Crankshaft group	29
1 Dismantling and assembling engine	29
1.1 Part I	30
1.2 Part II	32
1.3 Removing and installing poly-V belt	34
1.4 Removing and installing vibration damper	35
2 Sealing flanges and drive plate	36
2.1 Assembly overview - sealing flanges and drive plate	36
2.2 Assembly overview - timing chain covers	37
2.3 Removing and installing seal on gearbox side	38
2.4 Removing and installing sealing flange on gearbox side	40
2.5 Renewing crankshaft sealing flange, vibration damper side	43
2.6 Removing and installing drive plate	45
2.7 Removing and installing bracket for ancillaries	47
3 Crankshaft	49
3.1 Assembly overview - crankshaft	49
3.2 Fitting sender wheel to crankshaft	50
3.3 Allocation of main bearing shells	51
4 Pistons and conrods	56
4.1 Assembly overview - pistons and conrods	56
4.2 Checking piston and cylinder	57
4.3 Piston and cylinder dimensions	61
15 - Cylinder head, valve gear	62



1	Chain drive	62
1.1	Checking valve timing	62
1.2	Removing and installing camshaft adjuster	64
1.3	Removing and installing camshaft timing chain	71
1.4	Removing and installing oil pump drive timing chain	74
1.5	Removing and installing chain drive sprocket for high-pressure pump	78
2	Cylinder head	80
2.1	Assembly overview - cylinder head	80
2.2	Removing and installing cylinder head	82
2.3	Removing and installing cylinder head cover	90
2.4	Assembly overview - mechanical vacuum pump	92
2.5	Removing and installing mechanical vacuum pump	93
2.6	Installing cover oil seals	94
2.7	Checking compression	95
3	Valve gear	99
3.1	Assembly overview - valve gear	99
3.2	Camshafts, checking axial clearance	101
3.3	Assembly overview - timing housing	102
3.4	Removing and installing camshaft control valves	103
3.5	Removing and installing camshaft	105
3.6	Camshaft identification	110
4	Inlet and exhaust valves	111
4.1	Renewing valve stem seals	111
4.2	Valve dimensions	113
4.3	Checking valve guides	113
4.4	Reworking valve seats	114
17	Lubrication	116
1	Sump, oil pump	116
1.1	Assembly overview - sump/oil pump	116
1.2	Engine oil:	118
1.3	Removing and installing oil pan	119
1.4	Removing and installing oil pump	122
2	Oil filter, oil pressure switch	128
2.1	Removing and installing oil spray jet	128
2.2	Assembly overview - oil filter housing	128
2.3	Removing and installing oil filter housing, engine support	130
2.4	Removing and installing oil pressure switch F1	131
2.5	Checking oil pressure and oil pressure switch	131
19	Cooling	135
1	Cooling system (engine code CGRA)	135
1.1	Coolant hose connection diagram	135
1.2	Vacuum hose connection diagram	137
1.3	Assembly overview - vacuum hoses	138
1.4	Assembly overviews - cooling system	138
2	Cooling system (engine code CMTA)	142
2.1	Coolant hose connection diagram	142
2.2	Assembly overview - cooling system, engine side, front and rear	142
2.3	Assembly overview - cooling system, engine side, left	143
3	Coolant pump and thermostat	145
3.1	Assembly overview - coolant pump and thermostat	146
3.2	Removing and installing coolant pump	148
3.3	Removing and installing coolant circulation pump 2 V178	149
3.4	Removing and installing, checking thermostat	150



3.5	Removing and installing temperature sender for engine temperature regulation G694 . . .	151
4	Coolant	154
4.1	Draining coolant	154
4.2	Draining cooling system (vehicles with one heat exchanger)	155
4.3	Draining cooling system (vehicles with two heat exchangers)	156
4.4	Filling with coolant	158
4.5	Checking filling quality	161
4.6	Checking cooling system for leaks	162
5	Radiator and radiator fans	164
5.1	Assembly overview - radiator and radiator fan	164
5.2	Removing and installing radiator module	165
5.3	Removing and installing radiator cowl	170
5.4	Dismantling cooler module	171
20	Fuel supply system	173
1	Safety precautions	173
1.1	Safety regulations for working on fuel supply	173
2	Parts of fuel supply system	174
2.1	Rules for cleanliness	175
2.2	Assembly overview - fuel tank with attachments	175
2.3	Assembly overview - fuel delivery unit, fuel gauge sender and suction jet pumps	177
2.4	Removing, installing and renewing fuel filter	179
2.5	Emptying fuel tank	181
2.6	Removing and installing fuel gauge sender 2 G169 and suction-jet pump	184
2.7	Removing and installing fuel delivery unit and fuel gauge sender G	188
2.8	Removing and installing fuel tank with attached components	191
3	Checking fuel pump	196
3.1	Checking fuel pressure	196
3.2	Checking holding pressure	200
4	Electronic power control (EPC)	202
4.1	Assembly overview - accelerator	202
5	Activated charcoal filter system	203
5.1	Assembly overview - activated charcoal filter system	203
5.2	Checking fuel system for leaks	203
6	Activated charcoal filter system (vehicles for USA and Canada)	206
6.1	Assembly overview - activated charcoal filter system	207
6.2	Checking fuel system for leaks	208
24	Mixture preparation - injection	215
1	Injection system	215
1.1	General notes on the injection system	215
1.2	Rules for cleanliness	215
1.3	Technical data	216
2	Injectors	217
2.1	Assembly overview - fuel rail with high-pressure pump and injectors	217
2.2	Removing and installing injectors	221
2.3	Renewing seals on injectors	225
3	Air filter	229
3.1	Assembly overview - air filter	229
3.2	Removing and installing air filter housing	229
3.3	Removing and installing air filter element	231
4	Intake manifold	233
4.1	Assembly overview - intake manifold	233
4.2	Checking vacuum unit for intake manifold flap	234



4.3	Removing and installing intake manifold upper part	236
4.4	Removing and installing lower part of intake manifold with fuel rail	239
4.5	Removing and installing throttle valve module J338	242
5	Senders and sensors	243
5.1	Checking fuel pressure sender G247	243
6	Engine control unit	246
6.1	Removing and installing engine control unit J623	246
7	High-pressure pump	248
7.1	Assembly overview - high-pressure pump	248
7.2	Removing and installing high-pressure pump	249
26	- Exhaust system	253
1	Exhaust manifold	253
1.1	Assembly overview - exhaust manifold	253
1.2	Removing and installing exhaust manifold	253
2	Silencers and catalytic converters	256
2.1	Assembly overview - catalytic converter	256
2.2	Assembly overview - silencers	258
2.3	Separating centre and rear silencers	259
2.4	Replacing tail pipes	260
2.5	Removing and installing catalytic converters	260
2.6	Aligning exhaust system free of stress	265
2.7	Checking exhaust system for leaks	266
3		267
28	- Ignition system	269
1	Ignition system	269
1.1	General notes on ignition system	269
1.2	Assembly overview - ignition system	269
1.3	Safety precautions	271
1.4	Test data, spark plugs	272
1.5	Removing and installing ignition coils with output stage	272
1.6	Removing and installing engine speed sender G28	274