



Contents

00 - Technical data	1
1 Identification	1
2 Safety precautions	2
3 Repair instructions	3
10 - Removing and installing engine	4
1 Removing and installing engine	4
1.1 Removing engine	4
1.2 Separating engine and gearbox	19
1.3 Securing engine to engine and gearbox support	25
1.4 Installing engine	28
2 Assembly mountings	32
2.1 Exploded view - assembly mountings	32
2.2 Supporting engine in installation position	34
2.3 Removing and installing engine mountings	37
2.4 Removing and installing gearbox mounting	39
3 Engine cover panel	41
13 - Crankshaft group	42
1 Cylinder block (pulley end)	42
1.1 Exploded view - cylinder block (pulley end)	42
1.2 Exploded view - sealing flange (pulley end)	42
1.3 Removing and installing poly V-belt	42
1.4 Removing and installing poly V-belt tensioner	42
1.5 Removing and installing vibration damper	42
1.6 Removing and installing bracket for ancillaries	43
1.7 Removing and installing engine support	43
1.8 Renewing crankshaft oil seal (pulley end)	44
1.9 Removing and installing sealing flange (pulley end)	44
2 Cylinder block (gearbox end)	45
3 Crankshaft	46
4 Balance shaft	47
5 Pistons and conrods	48
15 - Cylinder head, valve gear	49
1 Timing chain cover	49
2 Chain drive	50
3 Cylinder head	51
3.1 Exploded view - cylinder head	51
3.2 Exploded view - cylinder head cover	51
3.3 Removing and installing cylinder head	51
3.4 Removing and installing cylinder head cover	51
3.5 Removing and installing seals for injectors	53
3.6 Checking compression	53
4 Valve gear	54
5 Inlet and exhaust valves	55
17 - Lubrication	56
1 Sump/oil pump	56
1.1 Exploded view - sump/oil pump	56
1.2 Engine oil	56



1.3	Removing and installing sump (bottom section)	56
1.4	Removing and installing sump (top section)	56
1.5	Removing and installing oil pump	56
1.6	Removing and installing oil level and oil temperature sender G266	57
2	Engine oil cooler	58
3	Crankcase breather	59
4	Oil filter/oil pressure switches	60
4.1	Exploded view - oil filter	60
4.2	Exploded view - oil pressure switches/oil pressure control	60
4.3	Removing and installing oil filter housing	60
4.4	Removing and installing oil pressure switch F22	60
4.5	Removing and installing oil temperature sender G8	60
4.6	Removing and installing oil pressure sender G10	60
4.7	Checking oil pressure	61
4.8	Removing and installing valve for oil pressure control N428	61
4.9	Removing and installing oil temperature sender 2 G664	61
19 - Cooling		62
1	Cooling system/coolant	62
1.1	Connection diagram - coolant hoses	62
1.2	Checking cooling system for leaks	65
1.3	Draining and filling cooling system	65
2	Coolant pump/thermostat assembly	72
2.1	Exploded view - coolant pump	72
2.2	Exploded view - electric coolant pump	72
2.3	Exploded view - thermostat	73
2.4	Exploded view - coolant temperature senders	73
2.5	Exploded view - coolant valves	73
2.6	Removing and installing electric coolant pump	74
2.7	Removing and installing coolant pump	75
2.8	Removing and installing thermostat	75
2.9	Removing and installing coolant temperature sender G62	76
2.10	Removing and installing temperature sender for engine temperature regulation G694	76
2.11	Removing and installing coolant temperature sender 2 G802	76
2.12	Removing and installing coolant valves	77
3	Coolant pipes	79
3.1	Exploded view - coolant pipes	79
3.2	Removing and installing coolant pipes	82
4	Radiator/radiator fans	90
4.1	Exploded view - radiator/radiator fans	90
4.2	Removing and installing radiator	92
4.3	Removing and installing radiator cowl	96
4.4	Removing and installing radiator fan V7	99
21 - Turbocharging/supercharging		100
1	Turbocharger	100
1.1	Exploded view - turbocharger	100
1.2	Removing and installing turbocharger	100
2	Charge air system	101
2.1	Exploded view - charge air system	101
2.2	Exploded view - hose connections for charge air system	102
2.3	Removing and installing charge air cooler	102
2.4	Removing and installing charge pressure sender G31	103
2.5	Removing and installing intake air temperature sender G42	103
2.6	Checking charge air system for leaks	104



23 - Mixture preparation - injection	105
1 Injection system	105
1.1 Overview - fuel system	105
1.2 Overview of fitting locations - injection system	106
1.3 Filling and bleeding fuel system	111
1.4 Checking fuel system for leaks	111
2 Vacuum system	112
3 Air cleaner	113
3.1 Exploded view - air cleaner housing	113
3.2 Removing and installing air cleaner housing	114
4 Intake manifold	116
4.1 Exploded view - intake manifold	116
4.2 Removing and installing intake manifold (top section)	116
4.3 Removing and installing intake manifold (bottom section)	117
4.4 Removing and installing intake manifold flap motor V157	117
4.5 Removing and installing throttle valve module J338	117
5 Injectors/high-pressure reservoir (rail)	119
5.1 Exploded view - injectors	119
5.2 Checking injectors	119
5.3 Performing adaption of correction values for injectors	119
5.4 Checking for injectors sticking open	119
5.5 Checking return flow rate of injectors with engine running	120
5.6 Checking return flow rate of injectors at starter cranking speed	120
5.7 Checking pressure retention valve in fuel return line	121
5.8 Removing and installing injectors	121
5.9 Removing and installing high-pressure pipes	123
5.10 Removing and installing high-pressure reservoir (rail)	123
6 Senders and sensors	125
6.1 Removing and installing air mass meter G70	125
6.2 Removing and installing fuel temperature sender G81	126
6.3 Removing and installing fuel pressure sender G247	126
6.4 Removing and installing fuel pressure sender for low pressure G410	126
6.5 Checking fuel pressure regulating valve N276	127
6.6 Removing and installing fuel pressure regulating valve N276	129
6.7 Removing and installing pressure differential sender G505	129
7 High-pressure pump	132
8 Lambda probe	133
9 Engine control unit	134
9.1 Exploded view - engine control unit	134
9.2 Removing and installing engine control unit J623	134
26 - Exhaust system	136
1 Exhaust pipes/silencer	136
1.1 Exploded view - silencer	136
1.2 Removing and installing front exhaust pipe	137
1.3 Removing and installing silencer	138
1.4 Stress-free alignment of exhaust system	140
1.5 Checking exhaust system for leaks	140
2 Emission control system	141
2.1 Exploded view - emission control system	141
2.2 Removing and installing emission control module	142
3 Exhaust gas temperature control	145
3.1 Exploded view - exhaust gas temperature control	145



3.2	Removing and installing parts of exhaust gas temperature control	145
4	Exhaust gas recirculation	147
4.1	Exploded view - exhaust gas recirculation system	147
4.2	Removing and installing exhaust gas recirculation cooler	147
4.3	Removing and installing exhaust gas recirculation temperature sensor G98	147
5	Exhaust manifold	148
5.1	Exploded view - exhaust manifold	148
5.2	Removing and installing exhaust manifold	148
28	Glow plug system	152
1	Glow plug system	152
1.1	Exploded view - glow plug system	152
1.2	Removing and installing glow plug	152
1.3	Removing and installing Hall sender G40	152
1.4	Removing and installing engine speed sender G28	152