

Contents

00 - Technical data	1
1 Identification	1
1.1 Engine number/engine data	1
2 Safety information	2
2.1 Safety precautions when working on the high-voltage system	2
2.2 Safety precautions when working in the vicinity of high-voltage components	3
2.3 Safety precautions when working on the fuel supply system	3
2.4 Safety precautions when working on vehicles with start/stop system	4
2.5 Safety precautions when using testers and measuring instruments during a road test	4
2.6 Safety precautions when working on the cooling system	5
2.7 Safety precautions when working on the exhaust system	5
2.8 Safety precautions when working on the ignition system	6
3 Repair instructions	7
3.1 Rules for cleanliness	7
3.2 Rules for cleanliness when working on the high-voltage battery	8
3.3 Performing adaptions after renewing a component	8
3.4 Foreign material in engine	9
3.5 Cleaning engine	9
3.6 Contact corrosion	9
3.7 Routing and attachment of pipes, hoses and wiring	9
3.8 Installing radiators and condensers	10
3.9 Checking vacuum system	10
3.10 Nuts, bolts	10
3.11 Identification plates	11
3.12 Use of impact wrenches	11
3.13 Work on high-voltage components or potential equalisation lines	12
3.14 Painting work on vehicles with high-voltage system	12
4 Assessing high-voltage system risk level	13
4.1 Necessary qualifications	13
4.2 Work that requires high-voltage system to be de-energised	13
10 - Removing and installing engine	16
1 Safety information	16
2 Removing and installing engine	17
2.1 Removing engine	17
2.2 Separating engine and gearbox	104
2.3 Removing engine from scissor-type assembly platform	122
2.4 Securing engine to engine and gearbox support	123
2.5 Installing engine	124
3 Assembly mountings	131
3.1 Assembly overview - assembly mountings	131
3.2 Supporting engine in installation position	140
3.3 Removing and installing engine mountings	147
3.4 Removing and installing power unit mounting senders	166
3.5 Removing and installing power unit mounting control unit J931	167
3.6 Removing and installing gearbox mounting	168
4 Engine cover panel	172
4.1 Removing and installing engine cover panel	172
13 - Crankshaft group	173
1 Safety information	173
2 Cylinder block (pulley end)	174

2.1	Assembly overview - cylinder block (pulley end)	174
2.2	Removing and installing poly V-belt	181
2.3	Removing and installing poly V-belt tensioner	183
2.4	Removing and installing vibration damper	186
2.5	Removing and installing bracket for ancillaries	204
2.6	Removing and installing engine support	208
3	Cylinder block (gearbox end)	215
3.1	Assembly overview - cylinder block (gearbox end)	215
3.2	Removing and installing drive plate	217
3.3	Removing and installing flywheel	218
3.4	Removing and installing sealing flange (gearbox end)	220
3.5	Renewing needle bearing in drive plate	223
4	Crankshaft	225
4.1	Assembly overview - crankshaft	225
4.2	Crankshaft dimensions	228
4.3	Allocation of main bearing shells	228
4.4	Measuring axial clearance of crankshaft	229
4.5	Measuring radial clearance of crankshaft	230
4.6	Removing and installing crankshaft	230
4.7	Removing and installing sender wheel	232
5	Balance shaft	233
5.1	Assembly overview - balance shaft	233
5.2	Removing and installing balance shaft	235
5.3	Renewing oil seal for balance shaft (inlet side)	238
6	Pistons and conrods	241
6.1	Assembly overview - pistons and conrods	241
6.2	Removing and installing pistons	245
6.3	Removing and installing oil spray jets	246
6.4	Checking pistons and cylinder bores	248
6.5	Separating parts of new conrod	249
6.6	Checking radial clearance of conrod bearings	250
15 - Cylinder head, valve gear	251
1	Safety information	251
2	Timing chain cover	252
2.1	Assembly overview - timing chain cover	252
2.2	Removing and installing timing chain cover	255
2.3	Renewing oil seal for vibration damper	259
3	Chain drive	262
3.1	Assembly overview - camshaft timing chains	262
3.2	Assembly overview - drive chain for balance shaft	264
3.3	Removing and installing bearing saddle	266
3.4	Removing and installing camshaft timing chain	270
3.5	Checking chain elongation	280
3.6	Removing and installing drive chain for balance shaft	282
3.7	Checking valve timing	285
4	Cylinder head	289
4.1	Assembly overview - cylinder head	289
4.2	Removing and installing cylinder head	293
4.3	Checking compression	301
5	Valve gear	306
5.1	Assembly overview - valve gear	306
5.2	Removing and installing camshaft	310
5.3	Installing ball for slider	321

5.4	Removing and installing cam adjustment actuators	321
5.5	Removing and installing camshaft control valves N205 / N318	322
5.6	Removing and installing valve stem oil seals	324
6	Inlet and exhaust valves	334
6.1	Checking valve guides	334
6.2	Checking valves	335
6.3	Valve dimensions	335
17 - Lubrication	336	
1	Safety information	336
2	Sump/oil pump	337
2.1	Assembly overview - sump/oil pump	337
2.2	Engine oil	340
2.3	Removing and installing lower part of sump	341
2.4	Removing and installing oil pump	345
2.5	Removing and installing upper part of sump	345
2.6	Removing and installing oil level and oil temperature sender G266	349
3	Engine oil cooler	351
3.1	Assembly overview - engine oil cooler	351
3.2	Removing and installing engine oil cooler	351
3.3	Removing and installing mechanical switching valve	352
4	Crankcase breather	353
4.1	Assembly overview - crankcase breather system	353
4.2	Removing and installing oil separator	354
4.3	Removing and installing tank breather pressure sensor 1 G950	355
5	Oil filter/oil pressure switches	356
5.1	Assembly overview - oil filter	356
5.2	Assembly overview - oil pressure switches/oil pressure control	357
5.3	Removing and installing oil pressure switch F22	359
5.4	Removing and installing oil pressure switch for reduced oil pressure F378	359
5.5	Removing and installing stage 3 oil pressure switch F447	360
5.6	Removing and installing valve for oil pressure control N428	374
5.7	Removing and installing piston cooling jet control valve N522	375
5.8	Checking oil pressure	375
19 - Cooling	379	
1	Safety information	379
2	Cooling system/coolant	381
2.1	Connection diagram - coolant hoses	381
2.2	Overview of fitting locations - cooling system	395
2.3	Assembly overview - coolant expansion tank	400
2.4	Checking cooling system for leaks	402
2.5	Draining coolant	409
2.6	Draining coolant - high-voltage cooling circuit	412
2.7	Coolant specifications and mixture ratio	415
2.8	Filling cooling system with cooling system charge unit VAS 6096	417
2.9	Filling cooling system with cooling system service device VAS 531 011	418
2.10	Filling cooling system using cooling system charge unit VAS 6096 , high-voltage cooling circuit	419
2.11	Filling cooling system using cooling system service device VAS 531 011 , high-voltage cooling circuit	421
2.12	Bleeding cooling system	423
2.13	Bleeding cooling system - high-voltage cooling circuit	423
2.14	Topping up coolant and bleeding cooling system - high-voltage cooling circuit	425
2.15	Checking coolant level and topping up if necessary	426

2.16	Checking coolant level and topping up if necessary - high-voltage cooling circuit	427
2.17	Removing and installing coolant expansion tank	429
3	Coolant pump/thermostat assembly	436
3.1	Assembly overview - coolant pump/thermostat	437
3.2	Assembly overview - electric coolant pump	440
3.3	Assembly overview - coolant temperature senders	450
3.4	Assembly overview - coolant valves	458
3.5	Removing and installing coolant circulation pump V50	464
3.6	Removing and installing continued coolant circulation pump V51	469
3.7	Removing and installing coolant pump for high-voltage battery V590	477
3.8	Removing and installing thermal management coolant pump V617	481
3.9	Removing and installing thermal management coolant pump 2 V618	484
3.10	Removing and installing thermal management coolant pump 4 V620	487
3.11	Removing and installing coolant pump	493
3.12	Removing and installing toothed belt for coolant pump	504
3.13	Removing and installing actuator for engine temperature regulation N493	506
3.14	Removing and installing coolant temperature sender G62	508
3.15	Removing and installing radiator outlet coolant temperature sender G83	513
3.16	Removing and installing coolant temperature sender 1 for thermal management G902 ..	516
3.17	Removing and installing coolant temperature sender 2 for thermal management G903 ..	519
3.18	Removing and installing coolant temperature sender 3 for thermal management G904 ..	521
3.19	Removing and installing coolant temperature sender 4 for thermal management G905 ..	524
3.20	Removing and installing coolant temperature sender 5 for thermal management G906 ..	525
3.21	Removing and installing coolant temperature sender 6 for thermal management G907 ..	527
3.22	Removing and installing coolant temperature sender 7 for thermal management G908 ..	531
3.23	Removing and installing coolant temperature sender 8 for thermal management G968 ..	532
3.24	Removing and installing coolant temperature sender 1 for high-voltage battery G898 ..	534
3.25	Removing and installing coolant valves	540
3.26	Removing and installing coolant changeover valve 1 N632	545
3.27	Removing and installing coolant changeover valve 2 N633	549
3.28	Removing and installing coolant changeover valve 3 N634	553
3.29	Removing and installing coolant changeover valve 4 N635	558
4	Coolant pipes	563
4.1	Assembly overview - coolant pipes	563
4.2	Removing and installing coolant pipes	573
4.3	Removing and installing coolant pipes for gearbox	601
5	Radiator/radiator fan	616
5.1	Assembly overview - radiator/radiator fan	616
5.2	Assembly overview - radiator cowl and radiator fan	624
5.3	Assembly overview - radiator blind	626
5.4	Removing and installing radiator	629
5.5	Removing and installing radiator blind	652
5.6	Removing and installing radiator blind control motor V544	656
5.7	Removing and installing radiator cowl	660
5.8	Removing and installing radiator fan VX57	676
5.9	Removing and installing radiator fan 2 V177	677
5.10	Removing and installing auxiliary radiator	677
21	- Turbocharging/supercharging	682
1	Safety information	682
2	Turbocharger	683
2.1	Assembly overview - turbocharger	683
2.2	Removing and installing turbocharger	687
2.3	Removing and installing turbocharger air recirculation valve N249	692
2.4	Removing and installing charge pressure control module GX34	693

3	Charge air system	695
3.1	Assembly overview - charge air system	695
3.2	Assembly overview - hose connections for charge air system	699
3.3	Removing and installing charge air cooler	700
3.4	Removing and installing charge pressure sender G31	705
3.5	Checking charge air system for leaks	707
24	- Mixture preparation - injection	714
1	Safety information	714
2	Injection system	715
2.1	Overview of fitting locations - injection system	715
3	Air filter	730
3.1	Assembly overview - air filter housing	730
3.2	Removing and installing air filter housing	740
4	Intake manifold	746
4.1	Assembly overview - intake manifold	746
4.2	Removing and installing intake manifold	748
4.3	Removing and installing throttle valve module GX3	752
4.4	Cleaning throttle valve module GX3	754
4.5	Removing and installing intake manifold flap valve N316	755
4.6	Checking intake manifold change-over function	755
5	Injectors	758
5.1	Assembly overview - fuel rail with injectors	758
5.2	Removing and installing fuel rail	759
5.3	Removing and installing injectors	759
5.4	Cleaning injectors	764
6	Senders and sensors	766
6.1	Removing and installing intake manifold pressure sender G71	766
6.2	Removing and installing fuel pressure sender G247	766
6.3	Checking fuel pressure sender G247	767
6.4	Removing and installing pressure differential sender for particulate filter G1037	769
7	High-pressure pump	771
7.1	Assembly overview - high-pressure pump	771
7.2	Removing and installing high-pressure pump	773
7.3	Removing and installing high-pressure pipe	774
8	Lambda probe	778
8.1	Assembly overview - Lambda probe	778
8.2	Removing and installing Lambda probe	780
9	Engine control unit	782
9.1	Assembly overview - engine control unit	782
9.2	Removing and installing engine control unit J623	786
26	- Exhaust system	788
1	Safety information	788
2	Exhaust pipes/silencers	789
2.1	Assembly overview - silencers	789
2.2	Separating exhaust pipes/silencers	807
2.3	Removing and installing front silencer	812
2.4	Removing and installing silencer	816
2.5	Stress-free alignment of exhaust system	826
2.6	Checking exhaust system for leaks	827
3	Emission control system	828
3.1	Assembly overview - emission control system	828
3.2	Removing and installing catalytic converter	830

3.3	Removing and installing particulate filter	844
3.4	Removing and installing exhaust flap control unit J883	850
4	Exhaust gas temperature regulation	852
4.1	Assembly overview - exhaust gas temperature regulation	852
4.2	Removing and installing parts of exhaust gas temperature regulation	852
5	Secondary air system	855
5.1	Assembly overview - secondary air system	855
5.2	Removing and installing secondary air pump motor V101	857
5.3	Removing and installing secondary air inlet valve N112	860
5.4	Removing and installing sender 1 for secondary air pressure G609	861
5.5	Removing and installing resonator for secondary air system	862
28	- Ignition system	863
1	Safety information	863
2	Ignition system	864
2.1	Assembly overview - ignition system	864
2.2	Removing and installing ignition coil	866
2.3	Removing and installing knock sensor 1 G61	868
2.4	Removing and installing Hall senders	869
2.5	Removing and installing engine speed sender G28	871
93	- Electric drive systems	878
1	Safety information	878
2	High-voltage components	879
2.1	Overview of fitting locations - high-voltage components	879
3	Warning stickers	884
3.1	Checking warning stickers	884
4	High-voltage battery unit	891
4.1	Assembly overview - high-voltage battery (installed)	891
4.2	Determining mean cell voltage	896
4.3	Charging and discharging battery modules	898
4.4	Checking high-voltage battery for leaks	900
4.5	Inspecting and classifying hybrid battery unit AX1	912
4.6	Removing and installing hybrid battery unit AX1	915
4.7	Removing and installing switching unit for high-voltage battery SX6	931
5	High-voltage battery components	937
5.1	Assembly overview - high-voltage battery	937
5.2	Overview of fitting locations - battery modules	945
5.3	Overview of fitting locations - battery connectors	948
5.4	Marking battery modules - Audi Q5	949
5.5	Removing battery module	949
5.6	Installing battery module	972
5.7	Visually inspecting and classifying battery module	988
5.8	Removing and installing battery regulation control unit J840	989
6	Power and control electronics for electric drive	991
6.1	Overview of fitting locations - power and control electronics for electric drive	991
6.2	Removing and installing power and control electronics for electric drive	998
6.3	Removing and installing bracket for power and control electronics for electric drive JX1	1006
7	Electric drive motor	1010
7.1	Assembly overview - electric drive motor	1010
7.2	Removing and installing three-phase current drive VX54	1012
7.3	Removing and installing drive motor temperature sender G712	1012
7.4	Removing and installing drive motor rotor position sender 1 G713	1013
7.5	Removing and installing oil return connection	1015

7.6	Renewing input shaft oil seal	1016
8	High-voltage wiring	1017
8.1	Overview of fitting locations - high-voltage wiring	1017
8.2	Removing and installing high-voltage wiring harness for high-voltage battery	1029
8.3	Removing and installing high-voltage wiring harness for drive motor	1033
8.4	Removing and installing high-voltage wire leading to switching unit for high-voltage battery	1044
8.5	Removing and installing high-voltage wire for electrical air conditioner compressor and high-voltage heater (PTC)	1047
9	De-energising high-voltage system	1049
10	Re-energising high-voltage system	1051
11	Potential equalisation lines	1052
11.1	General notes - potential equalisation lines	1052
11.2	Overview of fitting locations - potential equalisation lines	1052
11.3	Potential equalisation measurement	1055
11.4	Removing and installing potential equalisation lines	1055
12	Charging socket	1064
12.1	Assembly overview - charging socket	1064
12.2	e-tron charging system	1067
12.3	Diagnosis of e-tron charging system	1067
12.4	Removing and installing high-voltage battery charging socket 1 UX4	1069
12.5	Removing and installing module for battery charge selector buttons EX32	1073
13	Charging unit for high-voltage battery	1076
13.1	Assembly overview - charging unit for high-voltage battery	1076
13.2	Removing and installing charging unit 1 for high-voltage battery AX4	1078
13.3	Removing and installing bracket for charging unit 1 for high-voltage battery AX4	1085
14	Vehicle noise/engine sound	1087
14.1	Overview of fitting locations - vehicle noise/engine sound	1087
14.2	Removing and installing engine sound generator control unit J943	1088
14.3	Removing and installing actuator 1 for engine sound generator R257	1090