

2013

# A3

Quick Reference  
Specification Book



# 2013 Audi A3

## Quick Reference Specification Book

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# GENERAL INFORMATION

## *Decimal and Metric Equivalents*

### Distance/Length

To calculate: mm x 0.03937 = in.

mm	in.	mm	in.	mm	in.	mm	in.
0.002	0.00008	0.01	0.0004	0.1	0.004	1	0.04
0.004	0.00016	0.02	0.0008	0.2	0.008	2	0.08
0.006	0.00024	0.03	0.0012	0.3	0.012	3	0.12
0.008	0.00031	0.04	0.0016	0.4	0.016	4	0.16
0.010	0.00039	0.05	0.0020	0.5	0.020	5	0.20
0.020	0.00079	0.06	0.0024	0.6	0.024	6	0.24
0.030	0.00118	0.07	0.0028	0.7	0.028	7	0.28
0.040	0.00157	0.08	0.0031	0.8	0.031	8	0.31
0.050	0.00197	0.09	0.0035	0.9	0.035	9	0.35
0.060	0.00236	0.10	0.0039	1.0	0.039	10	0.39
0.070	0.00276	0.20	0.0079	2.0	0.079	20	0.79
0.080	0.00315	0.30	0.0118	3.0	0.118	30	1.18
0.090	0.00354	0.40	0.0157	4.0	0.157	40	1.57
0.100	0.00394	0.50	0.0197	5.0	0.197	50	1.97
0.200	0.00787	0.60	0.0236	6.0	0.236	60	2.36
0.300	0.01181	0.70	0.0276	7.0	0.276	70	2.76
0.400	0.01575	0.80	0.0315	8.0	0.315	80	3.15
0.500	0.01969	0.90	0.0354	9.0	0.354	90	3.54
0.600	0.02362	1.00	0.0394	10.0	0.394	100	3.94
0.700	0.02756	2.00	0.0787	20.0	0.787		
0.800	0.03150	3.00	0.1181	30.0	1.181		
0.900	0.03543	4.00	0.1575	40.0	1.575		
1.000	0.03937	5.00	0.1969	50.0	1.969		
2.000	0.07874	6.00	0.2362	60.0	2.362		
3.000	0.11811	7.00	0.2756	70.0	2.756		
4.000	0.15748	8.00	0.3150	80.0	3.150		
5.000	0.19685	9.00	0.3543	90.0	3.543		
6.000	0.23622	10.00	0.3937	100.0	3.937		
7.000	0.27559	20.00	0.7874				
8.000	0.31496	30.00	1.1811				
9.000	0.35433	40.00	1.5748				
10.000	0.39370	50.00	1.9685				
20.000	0.78740	60.00	2.3622				
30.000	1.18110	70.00	2.7559				
40.000	1.57480	80.00	3.1496				
50.000	1.96850	90.00	3.5433				
60.000	2.36220	100.00	3.9370				
70.000	2.75591						
80.000	3.14961						
90.000	3.54331						
100.000	3.93701						

# Tightening Torque

## Nm-to-lb·ft (ft·lb)

To calculate: Nm x 0.738 = lb·ft

Nm	lb·ft (ft·lb)	Nm	lb·ft (ft·lb)	Nm	lb·ft (ft·lb)
10	7	55	41	100	74
11	8	56	41	105	77
12	9	57	42	110	81
13	10	58	43	115	85
14	10	59	44	120	89
15	11	60	44	125	92
16	12	61	45	130	96
17	13	62	46	135	100
18	13	63	46	140	103
19	14	64	47	145	107
20	15	65	48	150	111
21	15	66	49	155	114
22	16	67	49	160	118
23	17	68	50	165	122
24	18	69	51	170	125
25	18	70	52	175	129
26	19	71	52	180	133
27	20	72	53	185	136
28	21	73	54	190	140
29	21	74	55	195	144
30	22	75	55	200	148
31	23	76	56	205	151
32	24	77	57	210	155
33	24	78	58	215	159
34	25	79	58	220	162
35	26	80	59	225	166
36	27	81	60	230	170
37	27	82	60	235	173
38	28	83	61	240	177
39	29	84	62	245	181
40	30	85	63	250	184
41	30	86	63	260	192
42	31	87	64	270	199
43	32	88	65	280	207
44	32	89	66	290	214
45	33	90	66	300	221
46	34	91	67	310	229
47	35	92	68	320	236
48	35	93	69	330	243
49	36	94	69	340	251
50	37	95	70	350	258
51	38	96	71	360	266
52	38	97	72	370	273
53	39	98	72	380	280
54	40	99	73	390	288
55	41	100	74	400	295

## Nm-to-lb·in (in·lb), kg·cm

To calculate: Nm x 8.85 = lb·in • Nm x 10.20 = kg·cm

Nm	lb·in (in·lb)	kg·cm	Nm	lb·in (in·lb)	kg·cm
1	9	10	26	230	265
2	18	20	27	239	275
3	27	31	28	248	286
4	35	41	29	257	296
5	44	51	30	266	306
6	53	61	31	274	316
7	62	71	32	283	326
8	71	82	33	292	337
9	80	92	34	301	347
10	89	102	35	310	357
11	97	112	36	319	367
12	106	122	37	327	377
13	115	133	38	336	387
14	124	143	39	345	398
15	133	153	40	354	408
16	142	163	41	363	418
17	150	173	42	372	428
18	159	184	43	381	438
19	168	194	44	389	449
20	177	204	45	398	459
21	186	214	46	407	469
22	195	224	47	416	479
23	204	235	48	425	489
24	212	245	49	434	500
25	221	255	50	443	510

## N·cm-to-lb·in (in·lb), kg·cm

To calculate: N·cm x 0.089 = lb·in • N·cm x 0.102 = kg·cm

N·cm	lb·in (in·lb)	kg·cm	N·cm	lb·in (in·lb)	kg·cm
50	4	5	250	22	25
60	5	6	300	27	31
70	6	7	350	31	36
80	7	8	400	35	41
90	8	9	450	40	46
100	9	10	500	44	51
110	10	11	550	49	56
120	11	12	600	53	61
130	12	13	650	58	66
140	12	14	700	62	71
150	13	15	750	66	76
160	14	16	800	71	82
170	15	17	850	75	87
180	16	18	900	80	92
190	17	19	950	84	97
200	18	20	1000	89	102

## kg·cm-to-lb·in (in·lb), N·cm

To calculate:  $\text{kg}\cdot\text{cm} \times 0.868 = \text{lb}\cdot\text{in}$  •  $\text{kg}\cdot\text{cm} \times 9.81 = \text{N}\cdot\text{cm}$

kg·cm	lb·in (in·lb)	N·cm		kg·cm	lb·in (in·lb)	N·cm
5	4	49		110	95	1079
6	5	59		120	104	1177
7	6	69		130	113	1275
8	7	78		140	122	1373
9	8	88		150	130	1471
10	9	98		160	139	1569
20	17	196		170	148	1667
30	26	294		180	156	1765
40	35	392		190	165	1863
50	43	490		200	174	1961
60	52	588		210	182	2059
70	61	686		220	191	2157
80	69	785		230	200	2256
90	78	883		240	208	2354
100	87	981		250	217	2452

## Warnings and Cautions

### WARNINGS

- Some repairs may be beyond your capability. If you lack the skills, tools and equipment, or a suitable workplace for any procedure described in this manual, we suggest you leave such repairs to an authorized dealer service department or other qualified shop.
- Do not reuse any fasteners that have become worn or deformed during normal use. Many fasteners are designed to be used only once and become unreliable and may fail when used a second time. This includes, but is not limited to, nuts, bolts, washers, self-locking nuts or bolts, circlips and cotter pins. Always replace these fasteners with new parts.
- Never work under a lifted car unless it is solidly supported on stands designed for the purpose. Do not support a car on cinder blocks, hollow tiles or other props that may crumble under continuous load. Never work under a car that is supported solely by a jack. Never work under the car while the engine is running.
- If you are going to work under a car on the ground, make sure the ground is level. Block the wheels to keep the car from rolling. Disconnect the battery negative (-) terminal (ground strap) to prevent others from starting the car while you are under it.

- Never run the engine unless the work area is well ventilated. Carbon monoxide kills.
- Remove rings, bracelets and other jewelry so they cannot cause electrical shorts, get caught in running machinery, or be crushed by heavy parts.
- Tie back long hair. Do not wear a necktie, a scarf, loose clothing, or a necklace when you work near machine tools or running engines. If your hair, clothing, or jewelry were to get caught in the machinery, severe injury could result.
- Do not attempt to work on your car if you do not feel well. You increase the danger of injury to yourself and others if you are tired, upset, or have taken medication or any other substance that may keep you from being fully alert.
- Illuminate your work area adequately but safely. Use a portable safety light for working inside or under the car. Make sure the bulb is enclosed by a wire cage. The hot filament of an accidentally broken bulb can ignite spilled fuel, vapors or oil.
- Use a suitable container to catch draining fuel, oil, or brake fluid. Do not use food or beverage containers that might mislead someone into drinking from them. Store flammable fluids away from fire hazards. Wipe up spills at once, but do not store oily rags which can ignite and burn spontaneously.
- Always observe good workshop practices. Wear goggles when you operate machine tools or work with battery acid. Wear gloves or other protective clothing whenever the job requires working with harmful substances.
- Greases, lubricants and other automotive chemicals contain toxic substances, many of which are absorbed directly through the skin. Read the manufacturer's instructions and warnings carefully. Use hand and eye protection. Avoid direct skin contact
- Disconnect the battery negative (-) terminal (ground strap) whenever you work on the fuel or electrical system. Do not smoke or work near heaters or other fire hazards. Keep an approved fire extinguisher handy.
- Friction materials (such as brake pads or shoes or clutch discs) contain asbestos fibers or other friction materials. Do not create dust by grinding, sanding, or cleaning with compressed air. Avoid breathing dust. Breathing any friction material dust can lead to serious diseases and may result in death.

*(WARNINGS cont'd on next page)*

## **WARNINGS** *(cont'd)*

- Batteries give off explosive hydrogen gas during charging. Keep sparks, lighted matches and open flame away from the top of the battery. If hydrogen gas escaping from the cap vents is ignited, it ignites the gas trapped in the cells and causes the battery to explode.
- Connect and disconnect battery cables, jumper cables or a battery charger only with the ignition off. Do not disconnect the battery while the engine is running.
- Do not quick-charge the battery (for boost starting) for longer than one minute. Wait at least one minute before boosting the battery a second time.
- Do not allow battery charging voltage to exceed 16.5 volts. If the battery begins producing gas or boiling violently, reduce the charging rate. Boosting a sulfated battery at a high charging rate can cause an explosion.
- The A/C system is filled with chemical refrigerant, which is hazardous. The A/C system should be serviced only by trained technicians using approved refrigerant recovery/recycling equipment, trained in related safety precautions, and familiar with regulations governing the discharging and disposal of automotive chemical refrigerants.
- Do not expose any part of the A/C system to high temperatures such as open flame. Excessive heat increases system pressure and may cause the system to burst.
- Some aerosol tire inflators are highly flammable. Be extremely cautious when repairing a tire that may have been inflated using an aerosol tire inflator. Keep sparks, open flame or other sources of ignition away from the tire repair area. Inflate and deflate the tire at least four times before breaking the bead from the rim. Completely remove the tire from the rim before attempting any repair.
- Some cars are equipped with a Supplemental Restraint System (SRS) that automatically deploys airbags and pyrotechnic seat belt tensioners in the event of a frontal or side impact. These are explosive devices. Handled improperly or without adequate safeguards, they can be accidentally activated and cause serious injury.
- The ignition system produces high voltages that can be fatal. Avoid contact with exposed terminals and use extreme care when working on a car with the engine running or the ignition on.



- Place jack stands only at locations specified by manufacturer. The vehicle lifting jack supplied with the vehicle is intended for tire changes only. Use a heavy duty floor jack to lift the vehicle before installing jack stands.
- Battery acid (electrolyte) can cause severe burns. Flush contact area with water, seek medical attention.
- Aerosol cleaners and solvents may contain hazardous or deadly vapors and are highly flammable. Use only in a well ventilated area. Do not use on hot surfaces (such as engines or brakes).
- Do not remove coolant reservoir or radiator cap with the engine hot. Burns and engine damage may occur.

## CAUTIONS

- If you lack the skills, tools and equipment, or a suitable workshop for any procedure described in this manual, we suggest you leave such repairs to an authorized dealer or other qualified shop.
- Before starting a job, make certain that you have all the necessary tools and parts on hand. Read all the instructions thoroughly and do not attempt shortcuts. Use tools appropriate to the work and use only replacement parts meeting original specifications. Makeshift tools, parts and procedures will not make good repairs.
- Use pneumatic and electric tools only to loosen threaded parts and fasteners. Never use these tools to tighten fasteners, especially on light alloy parts. Always use a torque wrench to tighten fasteners to the tightening torque specification listed.
- Be mindful of the environment and ecology. Before you drain the crankcase, find out the proper way to dispose of the oil. Do not pour oil onto the ground, down a drain, or into a stream, pond or lake. Dispose of in accordance with Federal, State and Local laws.
- The control module for the Anti-lock Brake System (ABS) cannot withstand temperatures from a paint-drying booth or a heat lamp in excess of 95°C (203°F) and should not be subjected to temperatures exceeding 85°C (185°F) for more than two hours.
- Before doing any electrical welding on cars equipped with ABS, disconnect the battery negative (-) terminal (ground strap) and the ABS control module connector.
- Always make sure the ignition is off before disconnecting battery.

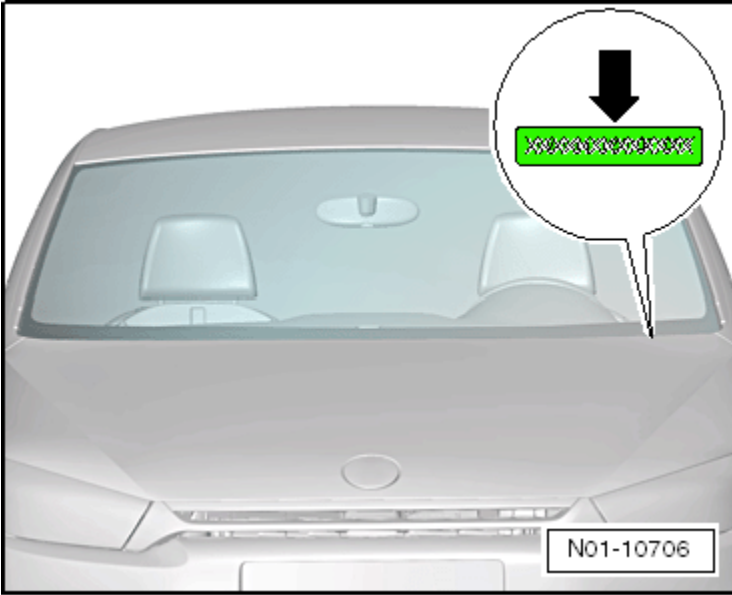
*(CAUTIONS cont'd on next page)*

## **CAUTIONS** *(cont'd)*

- Label battery cables before disconnecting. On some models, battery cables are not color coded.
- Disconnecting the battery may erase fault code(s) stored in control module memory. Check for fault codes prior to disconnecting the battery cables.
- If a normal or rapid charger is used to charge the battery, disconnect the battery and remove it from the vehicle to avoid damaging paint and upholstery.
- Do not quick-charge the battery (for boost starting) for longer than one minute. Wait at least one minute before boosting the battery a second time.
- Connect and disconnect a battery charger only with the battery charger switched off.
- Sealed or “maintenance free” batteries should be slow-charged only, at an amperage rate that is approximately 10% of the battery’s ampere-hour (Ah) rating.
- Do not allow battery charging voltage to exceed 16.5 volts. If the battery begins producing gas or boiling violently, reduce the charging rate. Boosting a sulfated battery at a high charging rate can cause an explosion.

# VEHICLE IDENTIFICATION

## Vehicle Identification Number (VIN) Location



Vehicle  
Identification

The VIN (➡) is on the left side of the vehicle in the area of the windshield wiper mount. It is visible from the outside (typical illustration shown).

# VIN Decoder

### 2013 Audi VIN Decoder

2013 Audi VIN Decoder											Sequential production number (position 12 - 17)							
Series:			Mfg. Make (1-3)			Series	Engine	Restraint system	Model (7&8)	Check digit	Model year	Assembly plant	12	13	14	15	16	17
<b>A</b> = A4 Premium <b>A5</b> Cab Premium <b>A6</b> Sedan <b>R8</b> 4.2 Coupé <b>B</b> = A3 Avant Premium <b>A4</b> Premium q <b>S4</b> Premium+ q <b>T</b> TTTS/ TTRS Cpe <b>Prem</b> = quattro <b>C</b> = A5 Premium q <b>A5</b> Cab Premium q <b>A6</b> Premium <b>S5</b> Premium+ q <b>S5</b> Cab Premium+ q <b>Q5</b> 2.0T Premium Hybrid <b>Q7</b> 3.0T/TDI Prem RS5 <b>D</b> = A3 Avant Prem q <b>A4</b> Manual Prem q <b>S4</b> Manual Prem+ <b>A6</b> Premium+ <b>S6</b> Sedan <b>Q5</b> 3.0 Premium+ <b>Q7</b> 3.0T Prest. S-Line <b>R8</b> 4.2 Coupé - Man <b>E</b> = A4 Premium+ <b>R8</b> 5.2 Coupé <b>F</b> = A3 Avant-Man Prem <b>A4</b> Premium+ q <b>A6</b> Premium+ q <b>S6</b> <b>G</b> = A5 Manual Prem q <b>S5</b> Manual Prem+ q <b>A6</b> Premium+ q <b>H</b> = A4 Manual Prem+ q <b>J</b> = A4 Prestige <b>A5</b> Cab Premium+ <b>A6</b> Prestige q <b>S6</b> w/Inov. Pkg.			<b>K</b> = A3 Avant Premium+ <b>A4/S4</b> Prestige q <b>T</b> TTTS/ TTRS Cpe <b>Prestige</b> quattro <b>L</b> = A5 Premium+ q <b>A5</b> Cab Premium+ q <b>Q5</b> 2.0T Premium+ q <b>Q7</b> 3.0T/TDI Prem+ <b>M</b> = A3 Avant Prem+ q <b>A4/S4</b> Man Prestige q <b>P</b> = A3 Avant-Man Prem+ <b>R</b> = A5 Manual Prem+ q <b>A6</b> L Sedan <b>S</b> = R8 4.2 Spyder <b>T</b> TTTS/ TTRS Rdstz <b>Prem</b> + q <b>T</b> = A5 Cab Prestige <b>R8</b> 5.2 Spyder-Man <b>U</b> = Allroad Premium+ q <b>A5</b> Cab Prest. S-Line <b>R8</b> 4.2 Spyder-Man <b>V</b> = Allroad Prestige q <b>A5/S5</b> Prestige q <b>A5/S5</b> Cab Prestige q <b>Q7</b> TDI Prestige <b>R8</b> 5.2 Spyder <b>W</b> = A5 Prestige q S-Line <b>A5</b> Cq Prestige q S-Line <b>A7</b> Prem quattro <b>S7</b> <b>Q5</b> 3.0 Prestige <b>Q7</b> TDI Prestige S-Line <b>Y</b> = A7 Premium+ q <b>A7</b> Prestige q <b>S7</b> w/Inov. Pkg. <b>Z</b> = A7 Prestige q <b>3</b> = A5/S5 Man Prestige q <b>4</b> = A5 Man Prest q S-Line <b>T</b> TTTS/ TTRS Rdstz <b>Prestige</b> quattro <b>9</b> = Allroad Premium q			<b>W</b> = Audi - Germany, Plus Car <b>U</b> = Audi - Europe, SUV / CUV <b>N</b> = Audi - Germany - <b>V</b> = Audi - Germany - <b>P</b> = Plus Car			<b>W</b> U A B F A F L 3 D 1 0 0 2 0 1 3			See back Calculate per NHTSA Code 2013			<b>E</b> = 4 cyl 2.0L 200hp (C8F-A-PZEV)* A3 <b>F</b> = 4 cyl 2.0L 211hp (C8E-B) A4 / A4 q / A5 q / A5 Cab CVT / A6 CVT (C7) <b>F</b> = 4 cyl 2.0L 211hp (CCTA) A3 q <b>F</b> = 4 cyl 2.0L 211hp (CETA) TT Cpe q / TT Rdstz q <b>F</b> = 4 cyl 2.0L 211hp (CPMA) A4 q / A5 Cpe/Cab q / Allroad / Q5 <b>G</b> = V6 3.0L 310hp (C8X-B) A6 q (C7) / A7 q <b>G</b> = V6 3.0L 272hp (C8X-D) Q5 <b>G</b> = V6 3.0L 333hp (C8X-G) S4 / S5 / S5 Cab <b>G</b> = V6 3.0L 333hp (C1WB) Q7 S Line <b>G</b> = V6 3.0L 280hp (C1WE) Q7 <b>G</b> = V6 3.0L 333hp (C1UB) A6 q <b>J</b> = 4 cyl 2.0L TDI 140hp (C8E-A) A3 <b>M</b> = V6 3.0L TDI 240hp (C8R-B) Q7 <b>N</b> = V10 5.2L 525hp (BUJ) R8 / R8 Spyder <b>U</b> = V8 4.2L 430hp (C8DA) R8 / R8 Spyder <b>1</b> = 4 cyl 2.0L 265hp (C8MA) TTS Cpe/Rdstz <b>2</b> = V8 4.0L 420hp (CEJA) A8 / A8L <b>2</b> = V8 4.0L 420hp (CEUC) S6 / S7 <b>2</b> = V8 4.0L 520hp (C8TA) S8 <b>3</b> = 5 cyl 2.5L 360hp (CEP) TT RS q <b>4</b> = W 12 3L 500hp (CEJA) A8L (D4) <b>6</b> = V8 4.2L 450hp (CFS) R8S Cpe/Cab <b>8</b> = 4 cyl 2.0L 211hp + 40 kW (CHJA) Q5 Hybrid			

July 26, 2012 (Rev 2a)

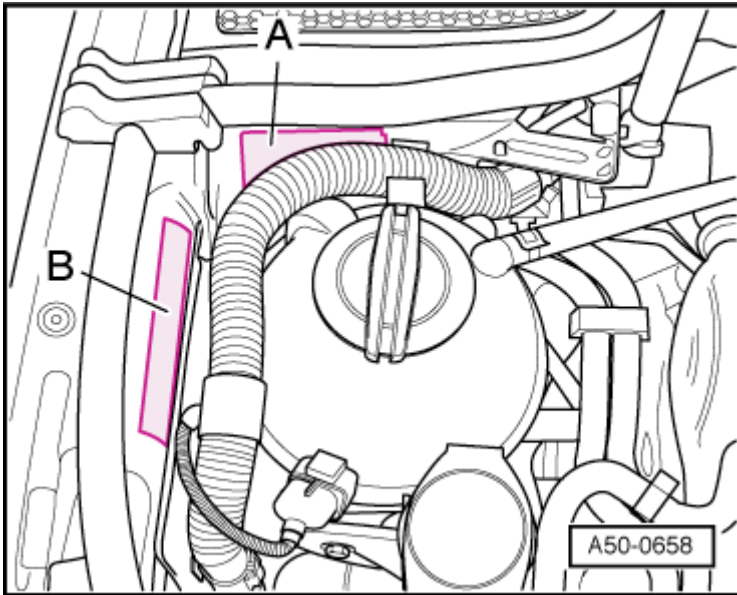
### 2013 Audi VIN Decoder

**2013 Restraint System:**  
 All = Active - Driver, AirBag - Driver, Advanced Front AirBag  
**A** (A6 / S6 Cab, TT / TTS, R8) = Side AirBags Front, Knee AirBags Front  
**A** (A5 / S5, RS5) = Side AirBags Front, Side Guard Air Curtain, Knee AirBags Front  
**A** (A3, A4 / S4, A6 / S6, A7 / S7, Q5, Q7) = Side AirBags Front, Side Guard Air Curtain  
**A** (A8 / S8) = Side AirBags Frt. & Rear, Side Guard Air Curtain, Knee AirBag  
**B** (A3, A4 / S4, A6 / S6, A7 / S7, Q5, Q7) = Side AirBags Front & Rear, Side Guard Air Curtain

1	Mfg. Make (1-3)	<b>2013 Audi VIN Decoder</b>
2		
3		
4	Series	
5	Engine	
6	Restraint system	
7	Model (7&8)	
8		
9	Check digit	
10	Model year	
11	Assembly plant	
12	Sequential production number (position 12 - 17)	
13		
14		
15		
16		
17		

**K** = 1989  
**L** = 1990  
**M** = 1991  
**N** = 1992  
**P** = 1993  
**R** = 1994  
**S** = 1995  
**T** = 1996  
**V** = 1997  
**W** = 1998  
**X** = 1999  
**Y** = 2000  
**1** = 2001  
**2** = 2002  
**3** = 2003  
**4** = 2004  
**5** = 2005  
**6** = 2006  
**7** = 2007  
**8** = 2008  
**9** = 2009  
**A** = 2010  
**B** = 2011  
**C** = 2012  
**D** = 2013

## Type Plate/Vehicle Identification Number (VIN)



The type plate (A) is fastened behind the right strut tower on the plenum chamber.

The VIN (B) (chassis number) is stamped into the upper inner longitudinal member.

Vehicle  
Identification

# SALES CODES

## Engine Codes

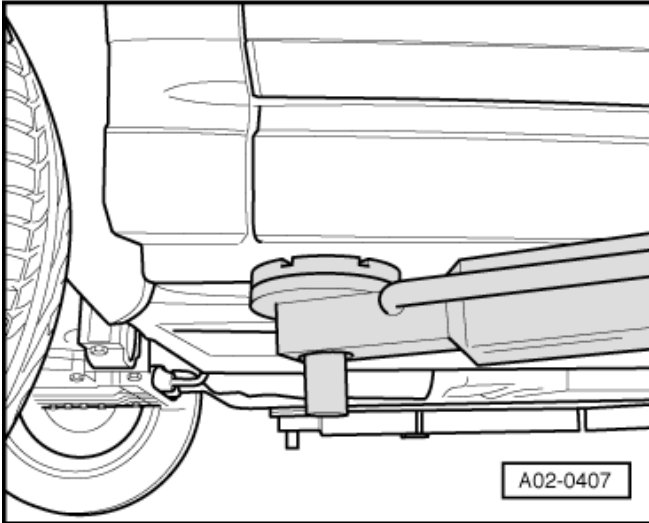
<b>CBEA</b>	2.0L 4-cylinder (TDI)
<b>CBFA, CCTA</b>	2.0L 4-cylinder

## Transmission Codes

<b>02Q</b>	6-speed manual
<b>02E</b>	6-speed Direct Shift Gearbox (DSG)

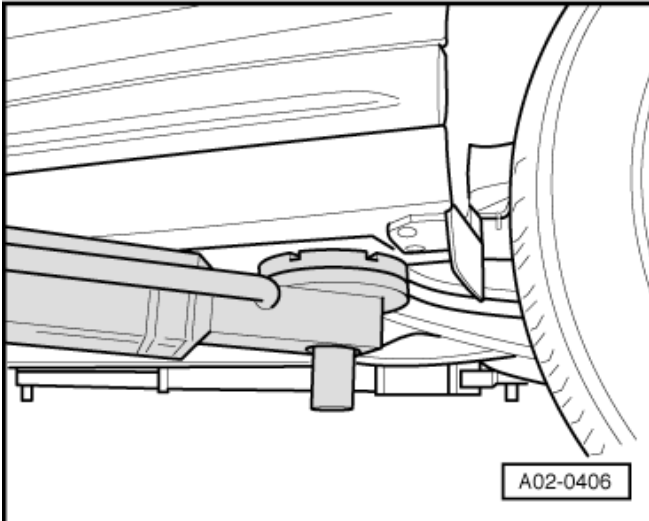
# VEHICLE LIFTING

## Hoist and Jack Mounting Points Front



The lift points are located on the longitudinal reinforcement, in the area of the stamped marking.

## Rear



The lift points are located on the side member reinforcement, in the area of the stamped marking.

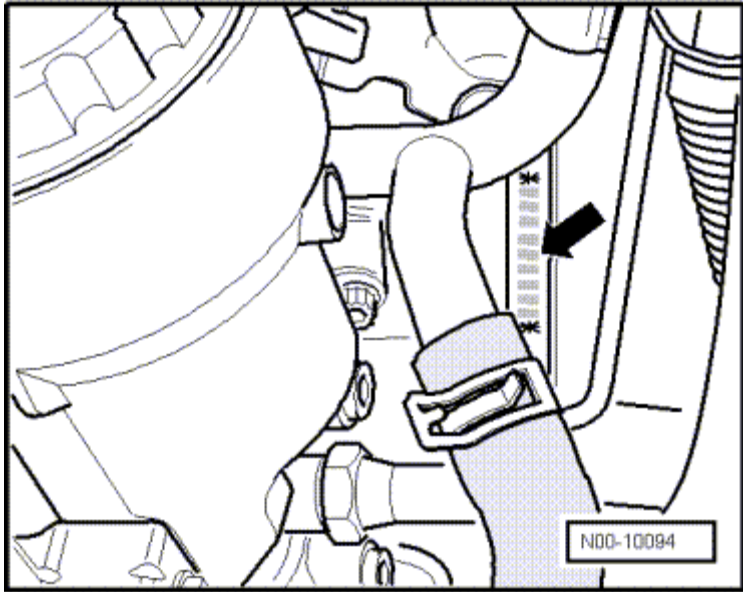
Sales  
Codes

Vehicle  
Lifting

# ENGINE MECHANICAL – 2.0L CBEA (TDI)

## *General, Technical Data*

### Engine Number Location



The engine number (engine code and serial number) (➡) is located at the front of the engine/transmission joint. The engine code and serial number is also on a label found on the toothed belt guard.



## Engine Data

Code letters		CBEA
Displacement	liter	1.968
Output	kW at RPM	103 @ 4200
Torque	Nm at RPM	320 @ 1750 to 2500
Bore	diameter mm	81.0
Stroke	mm	95.5
Compression ratio		16.5
CZ	at least	51
Ignition sequence		1-3-4-2
Exhaust Gas Recirculation (EGR)		Yes
Exhaust temperature control		Yes
Turbocharger		Turbocharger
Glow plugs		Steel glow plugs
Charge Air Cooler (CAC)		Yes
Oxygen Sensor (O2S) regulation		Heated Oxygen Sensor (HO2S) 1
Particulate filter		Yes
Valve per cylinder		4

# Engine Assembly – 2.0L CBEA (TDI)

## Fastener Tightening Specifications

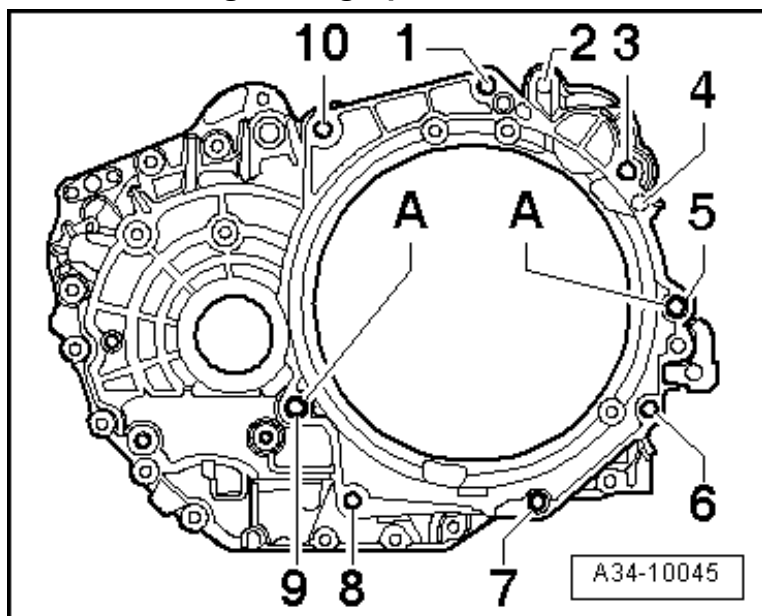
Component	Fastener size	Nm
Bolts and nuts	M6	9
	M7	15
	M8	20
	M10	40
	M12	65
<b>Bracket</b> <sup>1) 3)</sup>		
Bracket-to-engine mount		20 plus an additional 90° (¼ turn)
Bracket-to-body		20 plus an additional 90° (¼ turn)
<b>Engine support</b> <sup>1) 2)</sup>		
Engine mount-to-body		40 plus an additional 90° (¼ turn)
Engine mount-to-engine support		60 plus an additional 90° (¼ turn)

<sup>1)</sup> Replace fastener(s).

<sup>2)</sup> For bolt tightening clarification, refer to ElsaWeb, *Subframe Assembly Overview*, items 6, 10 and 11.

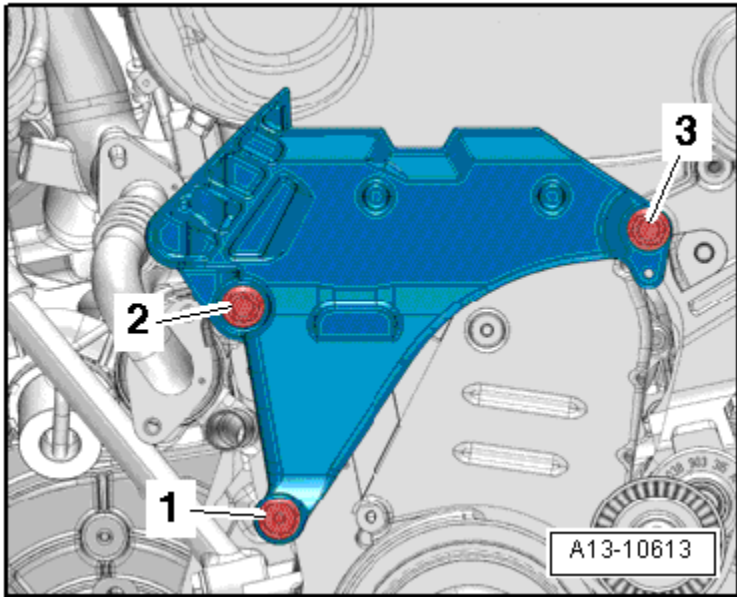
<sup>3)</sup> For bolt tightening clarification, refer to ElsaWeb, *Subframe Assembly Overview*, items 8 and 9.

## S tronic Transmission to Engine Tightening Specifications



Item	Bolt	Nm
1, 3, 10	M12x55	80
5	M12x65	80
6, 7, 8	M10x50	40
9	M12x70	80
2, 4	Starter, securing. Refer to Electrical Equipment; Rep. Gr.27; Removal and Installation	
A	Alignment sleeves for centering	

## Engine Mount Bracket Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 3 in sequence <sup>1)</sup>	7
2	Tighten bolts 1 through 3 in sequence	40
3	Tighten bolts 1 through 3 in sequence	an additional 180° (½ turn)

<sup>1)</sup> Replace fastener(s).

# Crankshaft, Cylinder Block – 2.0L CBEA (TDI)

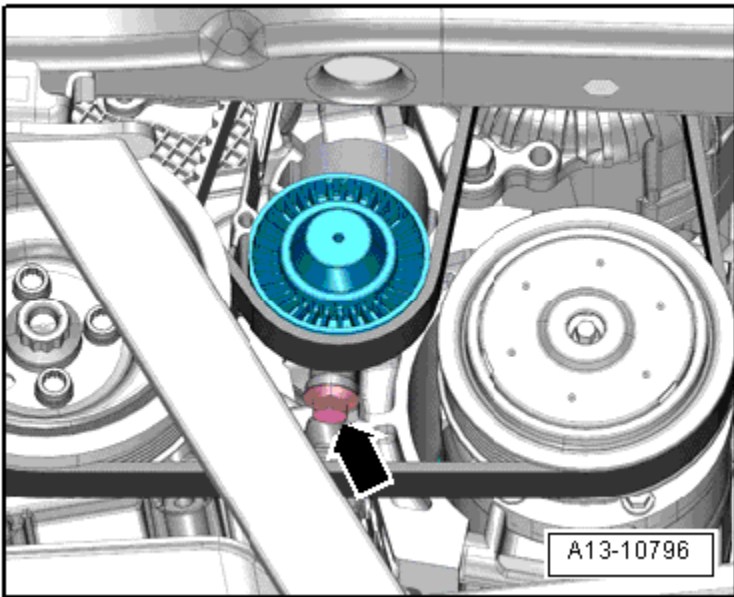
## Fastener Tightening Specifications

Component	Nm
Bearing cap <sup>1)</sup>	65 plus an additional 90° (¼ turn)
Brackets <sup>2)</sup>	23
Connecting rod <sup>1)</sup>	30 plus an additional 90° (¼ turn)
Dual mass flywheel <sup>1)</sup>	60 plus an additional 90° (¼ turn)
Engine Speed (RPM) sensor	4.5
Generator	25
Pressure relief valve	27
Sealing flange (transmission side)	15
Vibration damper <sup>1)</sup>	10 plus an additional 90° (¼ turn)

<sup>1)</sup> Replace fastener(s).

<sup>2)</sup> For bolt tightening clarification, refer to ElsaWeb, *Ribbed Belt Drive with Tensioner and A/C Compressor Assembly Overview*, items 5, 7, 14 and 15.

## Ribbed Belt Tensioning Roller Tightening Specifications



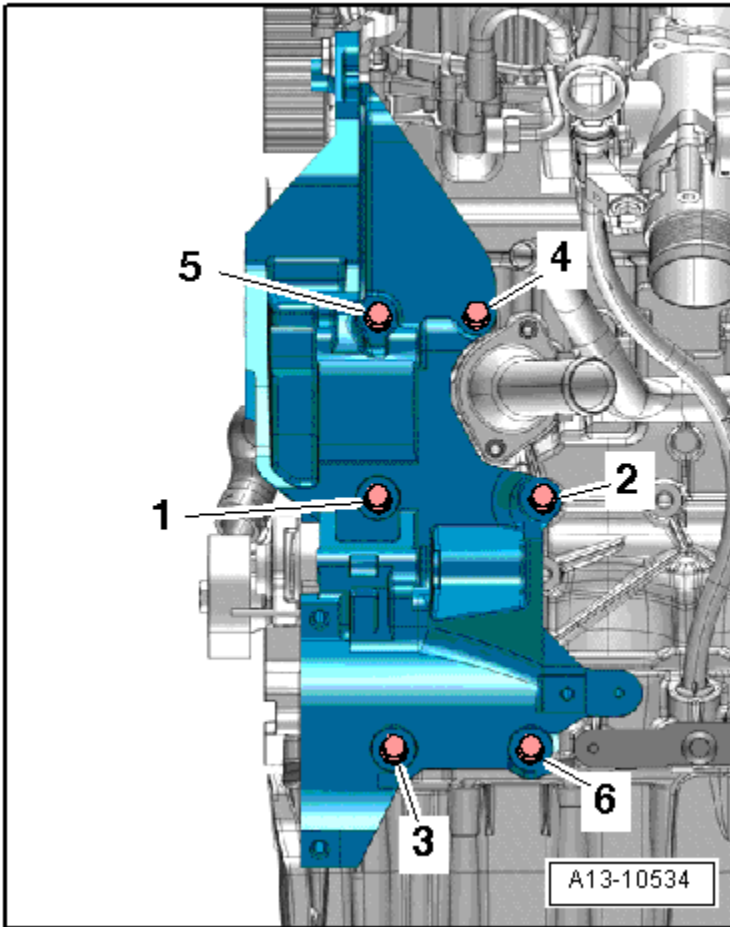
Step	Component	Nm
1	Tighten ➔	Hand-tighten <sup>1)2)</sup>
2	Tighten ➔	until the bolt is all the way in <sup>3)</sup>
3	Loosen ➔	90° (¼ turn)
4	Tighten ➔	30
5	Tighten ➔	an additional 90° (¼ turn)

<sup>1)</sup> Replace fastener(s).

<sup>1)</sup> The ribbed belt will become tensioned.

<sup>2)</sup> The ribbed belt will be tensioned further.

## Accessory Bracket Tightening Specifications

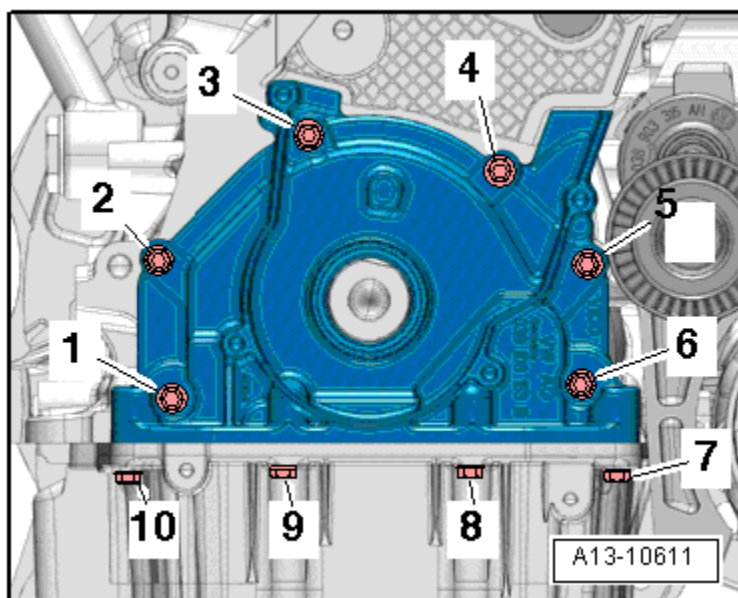


Bolts -1- and -2- M10 x 52. Bolts -3- and -6- M10 x 30. Bolts -4- and -5- M10 x 60.

Step	Component	Nm
1	Tighten bolts 1 through 6 in sequence <sup>1)</sup>	Hand-tighten
2	Tighten bolts 1 through 6 in sequence	40
3	Tighten bolts 3 and 6	an additional 45° (1/8 turn)
4	Tighten bolts 1, 2, 4 and 5 in sequence	an additional 90° (1/4 turn)

<sup>1)</sup> Replace fastener(s).

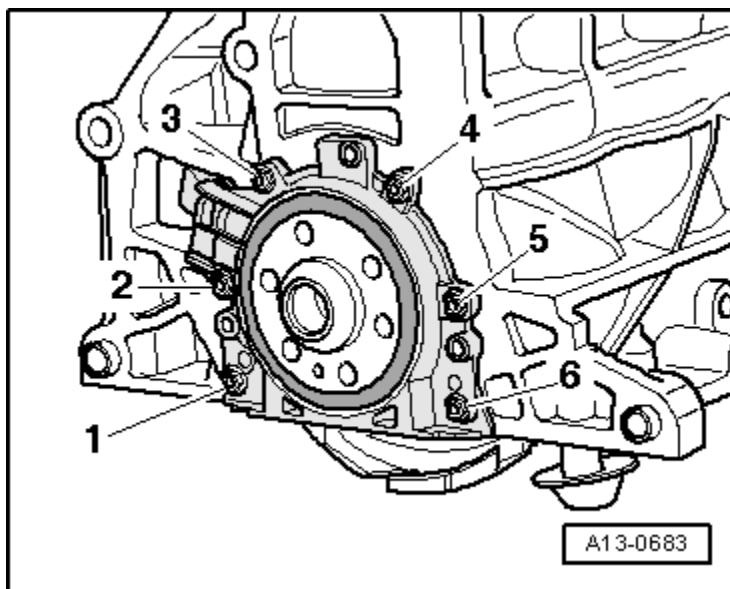
## Ribbed Belt Pulley Side Sealing Flange Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 10 in sequence	Hand-tighten
2	Tighten bolts 1 through 6 in sequence	15
3	Tighten bolts 7 through 10 in sequence	15



## Ribbed Belt Transmission Side Sealing Flange Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 6 in sequence	Hand-tighten
2	Tighten bolts 1 through 6 in sequence	15

## Crankshaft Dimensions

Honing dimension in mm	Crankshaft bearing pin diameter		Connecting rod bearing pin diameter	
Basic dimension	54.000	-0.022	50.900	-0.022
		-0.042		-0.042

## Piston and Cylinder Dimensions

Honing dimension in mm	Piston diameter	Cylinder bore diameter
Basic dimension	80.96 <sup>1)</sup>	81.01

<sup>1)</sup> Measurement with coating (thickness = 0.02 mm). The coating wears off.

## Piston Ring End Gaps

Piston ring gap dimensions in mm	New	Wear limit
1 <sup>st</sup> compression ring	0.25 to 0.40	1.0
2 <sup>nd</sup> compression ring	0.25 to 0.40	1.0
Oil scraping ring	0.25 to 0.50	1.0

## Piston Ring Clearance

Piston ring to groove clearance dimensions in mm	New	Wear limit
1 <sup>st</sup> compression ring	0.06 to 0.09	0.25
2 <sup>nd</sup> compression ring	0.05 to 0.08	0.25
Oil scraping ring	0.03 to 0.06	0.15

# Cylinder Head, Valvetrain – 2.0L CBEA (TDI)

## Fastener Tightening Specifications

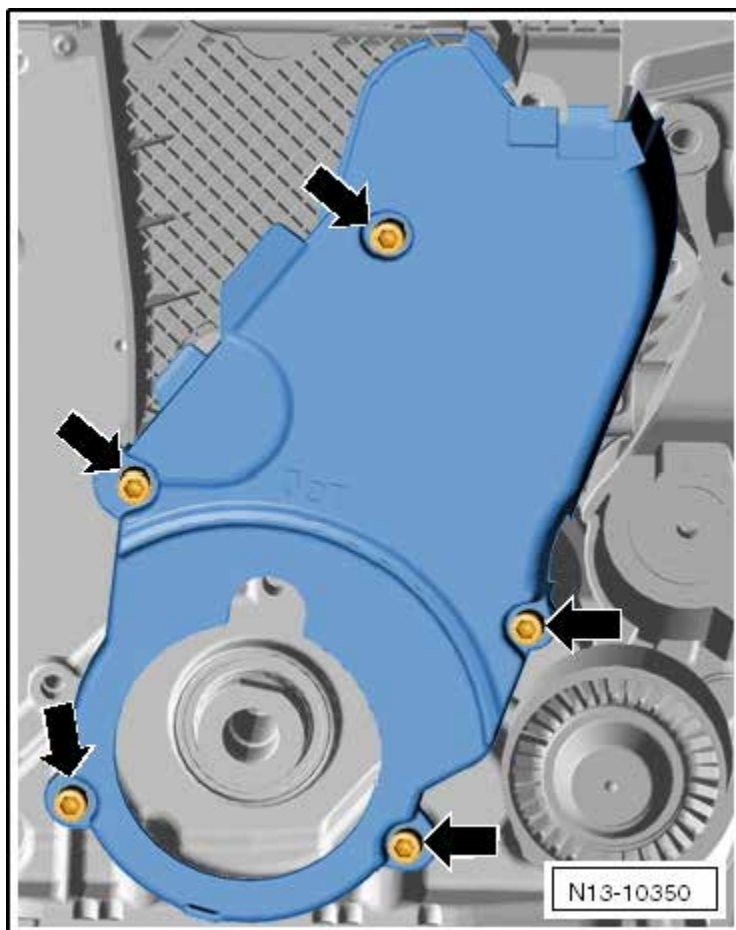
Component	Nm
Camshaft Position (CMP) sensor	10
Camshaft stub	100
Camshaft toothed belt gear	25
Coolant pump	15
Crankshaft toothed belt gear <sup>1)</sup>	120 plus an additional 90° (¼ turn)
Engine lifting eye	20
Heat shield	5
Idler roller <sup>1) 3)</sup>	50 plus an additional 90° (¼ turn)
Idler roller nut/bolt <sup>2)</sup>	20
Rear toothed belt guard	9
Tensioning roller	20 plus an additional 45° (⅛ turn)

<sup>1)</sup> Replace fastener(s).

<sup>2)</sup> For bolt tightening clarification, refer to ElsaWeb, *Toothed Belt Assembly Overview*, items 3 and 6.

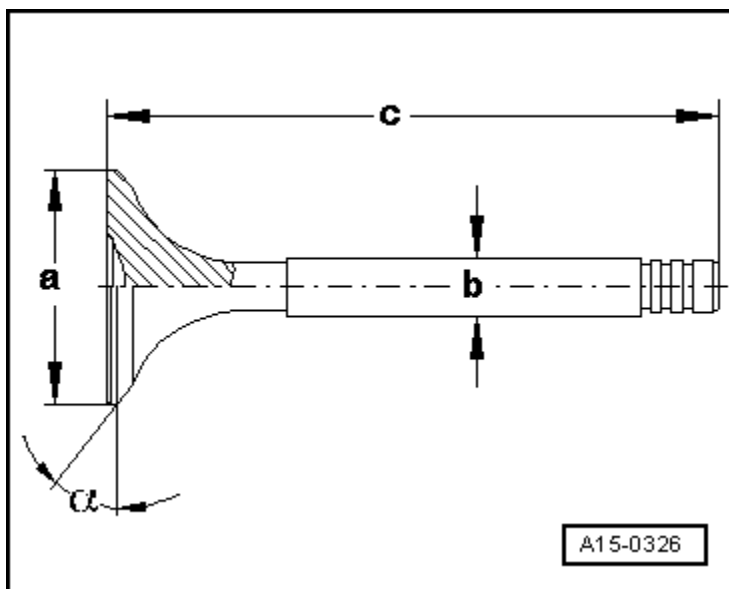
<sup>3)</sup> For bolt tightening clarification, refer to ElsaWeb, *Toothed Belt Assembly Overview*, item 20.

## Lower Toothed Belt Guard Fastener Tightening Specification



Step	Component	Nm
1	Tighten bolts (→) in a diagonal sequence	9

## Valve Dimensions



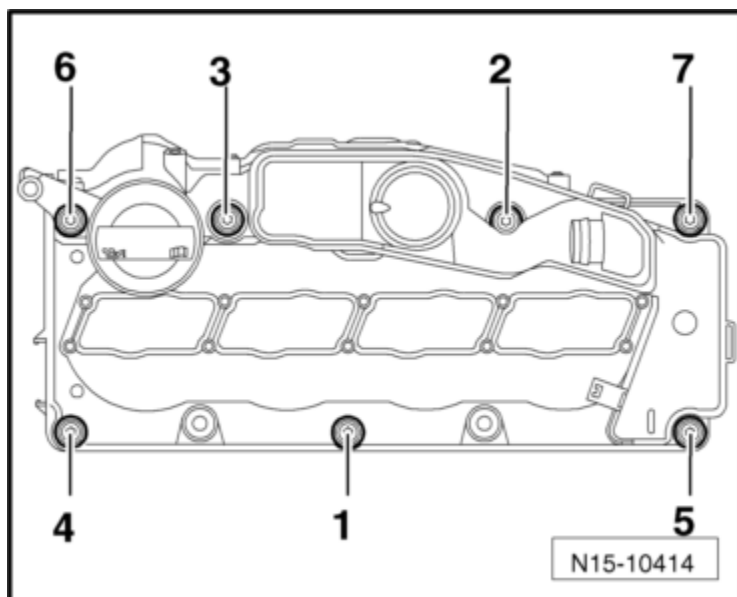
Dimension		Intake valve	Exhaust valve
Diameter a	mm	28.10	26.00
Diameter b	mm	5.975	5.965
c	mm	99.30	99.10
$\alpha$	$\angle^\circ$	45	45

NOTE: Intake and exhaust valves must not be refaced by grinding. Only lapping is permitted.

## Compression Pressures

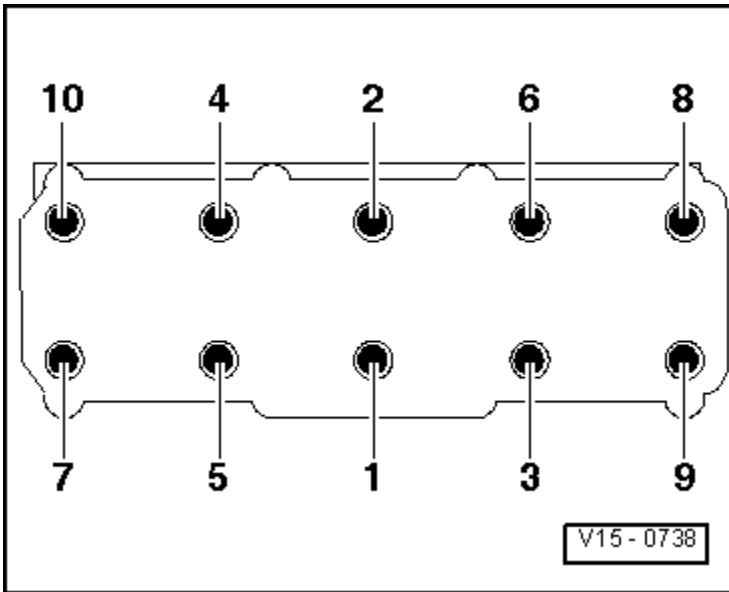
New Bar positive pressure	Wear limit Bar positive pressure	Difference between cylinders Bar positive pressure
25.0 to 31.0	19.0	Maximum 5.0

## Cylinder Head Cover Tightening Specification



Step	Component	Nm
1	Tighten bolts 1 through 7 in sequence	9

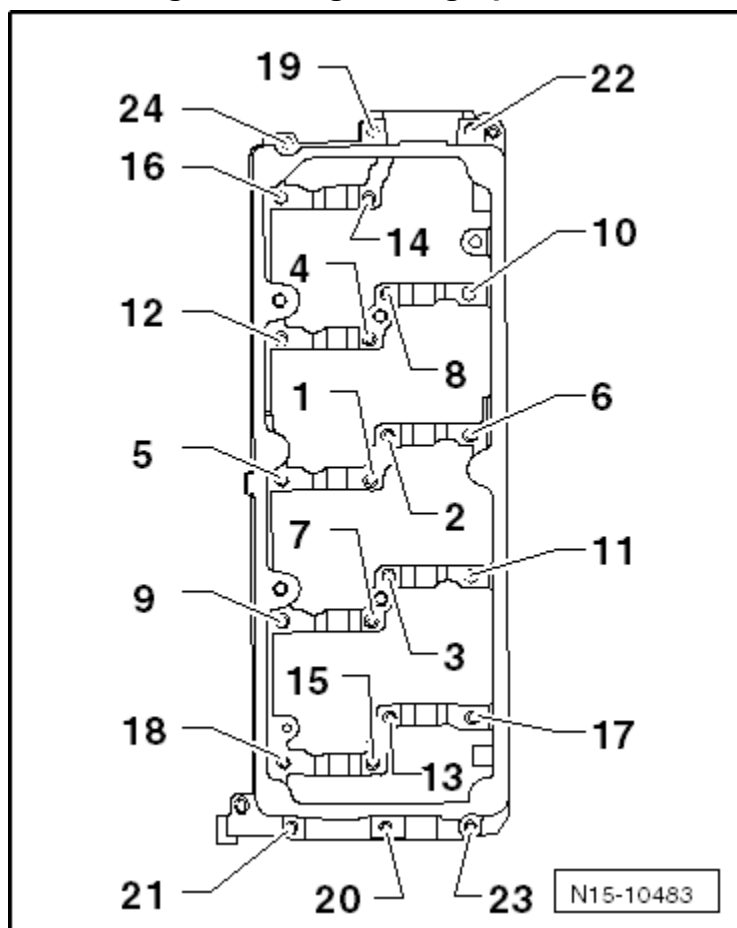
## Cylinder Head Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 10 in sequence <sup>1)</sup>	30
2	Tighten bolts 1 through 10 in sequence	50
3	Tighten bolts 1 through 10 in sequence	an additional 90° (¼ turn)
4	Tighten bolts 1 through 10 in sequence	an additional 90° (¼ turn)

<sup>1)</sup> Replace fastener(s).

## Bearing Frame Tightening Specifications



Step	Component	Nm
1	Tighten bolts and nuts 1 through 24 in sequence <sup>1)</sup>	Hand-tighten
2	Tighten bolts and nuts 1 through 24 in sequence	10

<sup>1)</sup> The guide frame must be in contact with the entire contact surface of the cylinder head.



# Lubrication – 2.0L CBEA (TDI)

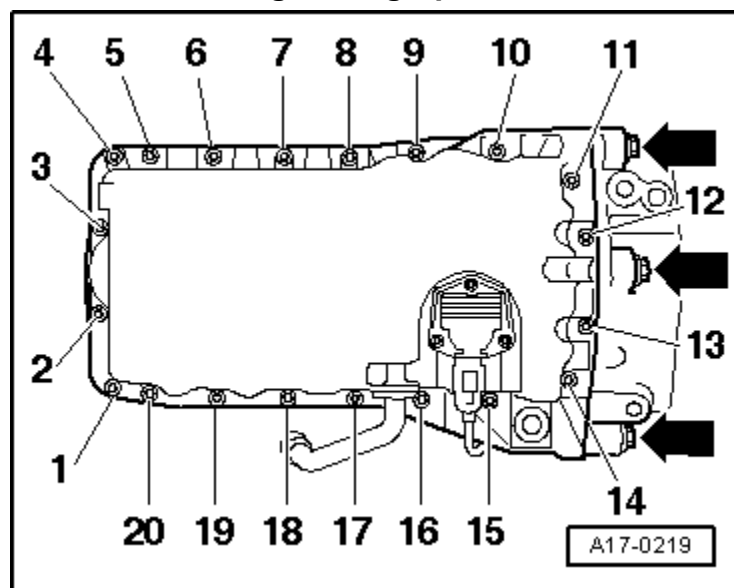
## Fastener Tightening Specifications

Component	Nm
Balance shaft spur gear	20 plus an additional 90° (¼ turn)
Cap	25
Connecting piece	33
Intermediate sprocket hub	90 plus an additional 90° (¼ turn)
Locking bolt	25
Oil dipstick guide tube	9
Oil drain plug	30
Oil level thermal sensor <sup>1)</sup>	9
Oil pressure switch	20
Oil pump	9
Oil suction pipe	9
Oil supply line union nut	22
Suction line <sup>2)</sup>	9
	20
Wiring harness bracket	10

<sup>1)</sup> Replace fastener(s).

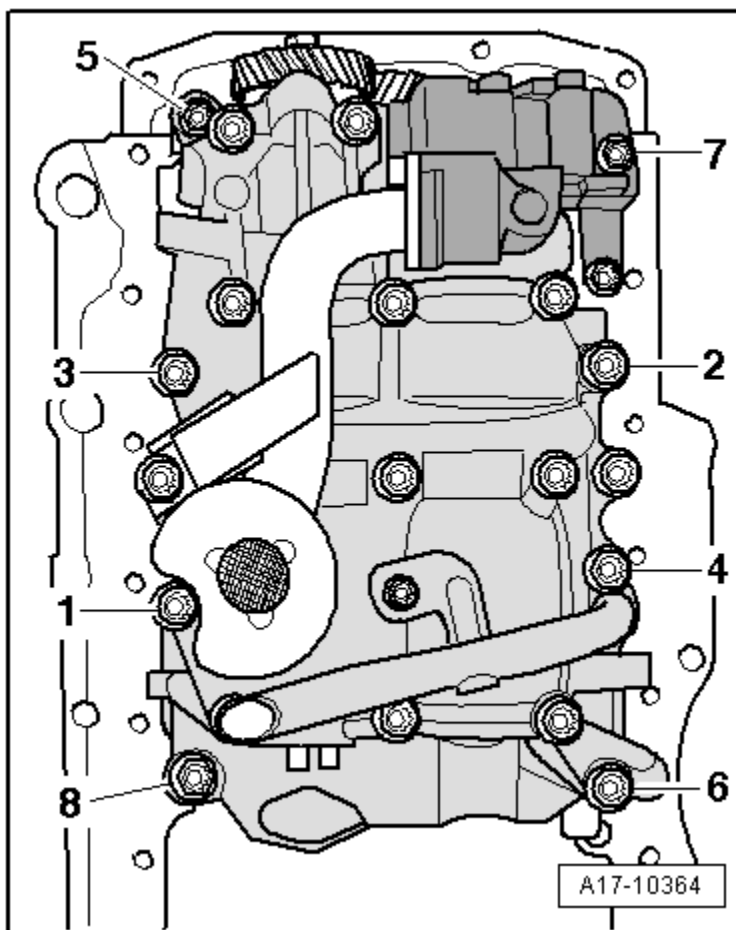
<sup>2)</sup> For bolt tightening clarification, refer to ElsaWeb, *Oil Pump, Oil Pan and Balance Shaft Module Assembly Overview*, items 2 and 4.

## Oil Pan Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 20 in sequence	5
2	Tighten bolts (→)	40
3	Tighten bolts 1 through 20 in sequence	15

## Balance Shaft Assembly Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 8 in sequence <sup>1)</sup>	Hand-tighten
2	Tighten bolts 1 through 8 in sequence	8
3	Tighten bolts 5 and 7	13
4	Tighten bolts 1, 2, 3, 4, 6 and 8	20
5	Tighten bolts 1 through 8 in sequence	an additional 90° (¼ turn)

<sup>1)</sup> Replace fastener(s).

# Cooling System – 2.0L CBEA (TDI)

## Fastener Tightening Specifications

Component	Nm
Connecting piece <sup>3)</sup>	9
Connecting piece <sup>2)</sup>	15
Connecting piece <sup>5)</sup>	15
Coolant fan nut	5
Coolant line	9
Coolant pump	40
Engine pre-warmer clamp secured on the bracket	10
Exhaust Gas Recirculation (EGR) cooler pump bracket <sup>1)</sup>	2.7
	40
Fan rib	5
Front coolant line <sup>4)</sup>	13
	40
Left coolant line	9
Radiator	9
Right coolant line	9
Ventilation pipe	10
4/2-way valve with thermostat	15

<sup>1)</sup> For bolt tightening clarification, refer to ElsaWeb, *Coolant Pipes, Coolant Temperature Sensors and Coolant Pump Assembly Overview*, items 3 and 4.

<sup>2)</sup> For bolt tightening clarification, refer to ElsaWeb, *Connection Diagram, Coolant Hoses*, item 19.

<sup>3)</sup> For bolt tightening clarification, refer to ElsaWeb, *Coolant Pipes, Coolant Temperature Sensors and Coolant Pump Assembly Overview*, item 18.

<sup>4)</sup> For bolt tightening clarification, refer to ElsaWeb, *Coolant Pipes, Coolant Temperature Sensors and Coolant Pump Assembly Overview*, items 27 and 28.

<sup>5)</sup> For bolt tightening clarification, refer to ElsaWeb, *Coolant Pump and Coolant Thermostat Assembly Overview*, item 7.

## Fuel Supply – 2.0L CBEA (TDI)

### Fastener Tightening Specifications

Component	Nm
Accelerator pedal module	9
Brackets <sup>2)</sup>	9
	20
Filter housing cover	5
Fuel filter housing	10
Fuel tank <sup>1)</sup>	11
	26
Heat shield lock washer	2
Locking ring	110

<sup>1)</sup> For bolt tightening clarification, refer to ElsaWeb, *Fuel Tank with Attachments Assembly Overview*, items 10 and 12.

<sup>2)</sup> For bolt tightening clarification, refer to ElsaWeb, *Auxiliary Fuel Pump Assembly Overview*, items 2, 3, 4, 8, and 9.

## Turbocharger – 2.0L CBEA (TDI)

### Fastener Tightening Specifications

Component	Nm
Air guide pipe	9
Charge Air Pressure/Intake Air Temperature (IAT) sensor	5
Clamp <sup>1)</sup>	7
Connecting pipe nut	20
Control pipe <sup>1</sup>	23
Control wire	23
Exhaust Gas Recirculation (EGR) system filter hex stud	20
Exhaust Gas Recirculation (EGR) system filter nut	23
Heat shield	20
Intake scoop	8
Left air guide pipe	9
Mount	5
Oil return line	15
Oil supply line bracket	10
Oil supply line	22
Turbocharger banjo bolt brace <sup>1)</sup>	60
Turbocharger nut <sup>1)</sup>	23
Warm air collector plate	8
Wiring harness bracket	8

<sup>1)</sup> Replace fastener(s).

## Exhaust System – 2.0L CBEA (TDI)

### Fastener Tightening Specifications

Component	Nm
Bracket for the control pipe	9
Clamp <sup>1) 3)</sup>	3.5
	7
Clamping sleeve nut	23
Connecting pipe	23
Control pipe	23
Control pipe bracket nut	23
Exhaust Gas Recirculation (EGR) motor 2	8
Exhaust Gas Recirculation (EGR) system filter	23
Exhaust Gas Recirculation (EGR) system housing	8
Exhaust Gas Recirculation (EGR) temperature sensor	20
Exhaust Gas Recirculation (EGR) vacuum regulator solenoid valve with Exhaust Gas Recirculation (EGR) potentiometer	10
Exhaust Gas Temperature (EGT) sensor	45
Heat shield nut	9
Intake flap motor <sup>2)</sup>	10
Particulate filter lower bracket nut	23
Particulate filter upper bracket	23
Particulate filter with catalytic converter	23
Pipe-to-Exhaust Gas Recirculation (EGR) cooler	20
Radiator	8
Rear cross member nut	23
Suspended mount	23

<sup>1)</sup> Replace fastener(s).

<sup>2)</sup> For bolt tightening clarification, refer to ElsaWeb, *EGR Vacuum Regulator solenoid Valve and EGR Potentiometer Assembly Overview*, items 10 and 11.

<sup>3)</sup> For bolt tightening clarification, refer to ElsaWeb, *Particulate Filter and NOx Absorption Catalytic Converter Assembly Overview*, items 3, 5, and 10.

## Ignition/Glow Plug System – 2.0L CBEA (TDI)

### Fastener Tightening Specification

Component	Nm
Glow plugs	17

# Diesel Fuel Injection – 2.0L CBEA (TDI)

## Fastener Tightening Specifications

Component	Nm
Air filter lower section	8
Air filter upper section	1.5
Bracket for the control wire nut	9
Camshaft Position (CMP) sensor	10
Connecting pipe-to-Exhaust Gas Recirculation (EGR) cooler	20
Control wire attached to the exhaust	45
Differential pressure sensor	8
Differential pressure sensor bracket	9
Engine Speed (RPM) sensor	4.5
Exhaust Gas Recirculation (EGR) motor bolts	10
Exhaust Gas Temperature (EGT) sensor <sup>1)</sup>	45
Exhaust pressure sensor 1	8
Fuel high pressure pump long bolts	20 plus an additional 180° (½ turn)
Fuel high pressure pump short bolts	20 plus an additional 90° (¼ turn)
Fuel pressure regulator valve	80
Fuel pressure sensor	100
Fuel rail	22
Fuel return lines-to-fuel tank	10
Heated Oxygen Sensor (HO2S) with Oxygen Sensor (O2S) heater	50
High pressure lines between the fuel rail and the injectors	25
High pressure line between the high pressure pump and fuel rail	10
High pressure line connections	25
High pressure fuel pump hub nut	95
High pressure pump toothed belt gear	20
Injection unit cover	5
Intake manifold	8
Mass Air Flow (MAF) sensor	1.5
Oxygen Sensor (O2S) behind Three Way Catalytic Converter (TWC)with Oxygen Sensor (O2S) 1 (behind TWC) heater	50
Tensioning bracket nut	10
Throttle valve control module with throttle position sensor	10

<sup>1)</sup> Lubricate with hot bolt paste. Refer to the Electronic Parts Catalog (ETKA).

# ENGINE MECHANICAL – 2.0L CBFA, CCTA

## *General, Technical Data*

### Engine Number Location

The engine number (engine code and serial number) is located at the front of the engine/transmission joint. The engine code and serial number is also on a label found on the toothed belt guard and data plates

### Engine Data

Code letters		CBFA	CCTA
Displacement	liter	1.984	1.984
Output	kW at RPM	147 @ 5000	147 @ 5000
Torque	Nm at RPM	280 @ 1700	280 @ 1700
Bore	diameter mm	82.5	82.5
Stroke	mm	92.8	92.8
Compression ratio		10.3	9.6
RON		98 <sup>1)</sup>	98 <sup>1)</sup>
Fuel injection and ignition system		FSI	FSI
Ignition sequence		1-3-4-2	1-3-4-2
Knock control		Yes	Yes
Turbocharger		Yes	Yes
Exhaust Gas Recirculation (EGR)		No	No
Variable intake manifold		No	No
Variable valve timing		Yes	Yes
Secondary Air Injection (AIR)		Yes	No

<sup>1)</sup> Unleaded RON 95 is also permissible, although with reduced power.



# Engine Assembly – 2.0L CBFA, CCTA

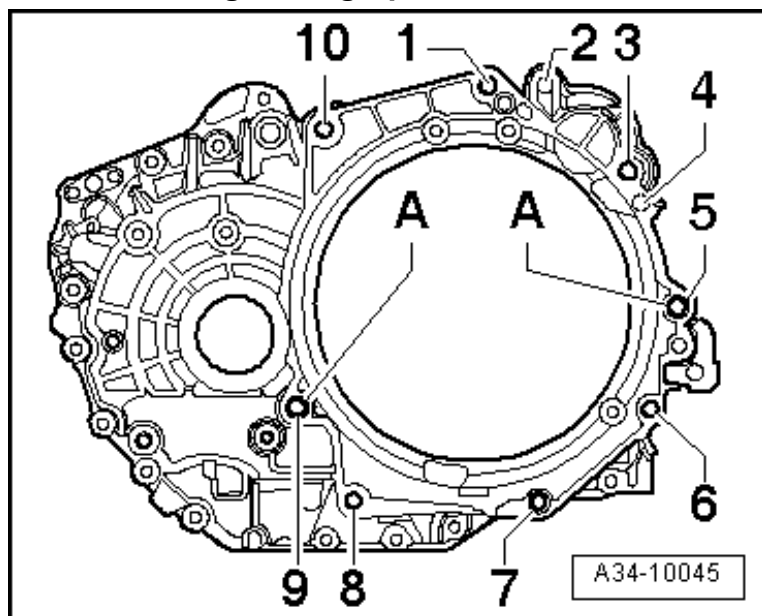
## Fastener Tightening Specifications

Component	Fastener size	Nm
Bolts/nuts	M6	10
	M7	15
	M8	22
	M10	40
	M12	65
Bracket-to-engine mount <sup>1)</sup>	-	20 plus an additional 90° (¼ turn)
Engine mount <sup>1)2)</sup>	-	40 plus an additional 90° (¼ turn)
	-	60 plus an additional 90° (¼ turn)
Engine support <sup>1)</sup>	-	40 plus an additional 180° (½ turn)

<sup>1)</sup> Replace fastener(s).

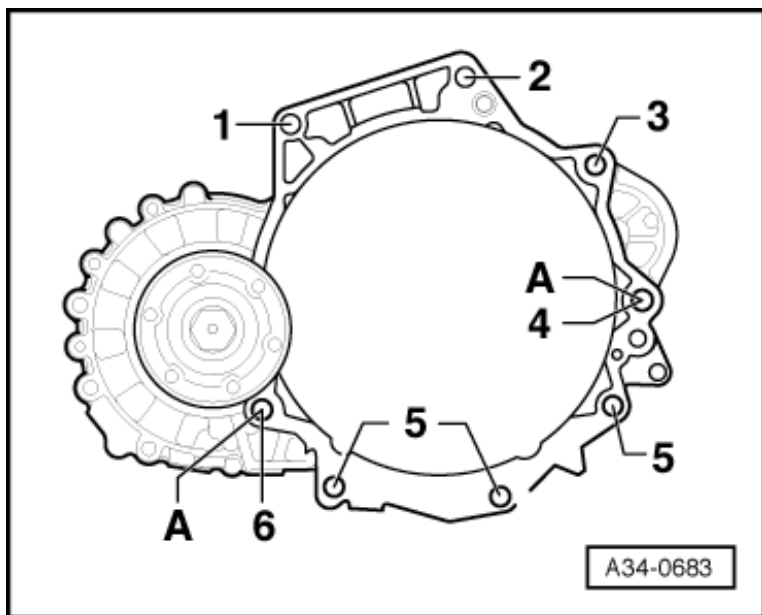
<sup>2)</sup> For bolt tightening clarification, refer to ElsaWeb, *Subframe Assembly Overview*, items 6, 10 and 11.

## S tronic Transmission to Engine Tightening Specifications



Item	Bolt	Nm
1, 3, 10	M12x55	80
5	M12x65	80
6, 7, 8	M10x50	40
9	M12x70	80
2, 4	Starter, securing. Refer to Electrical Equipment; Rep. Gr.27; Removal and Installation	
A	Alignment sleeves for centering	

## Manual Transmission to Engine Tightening Specifications



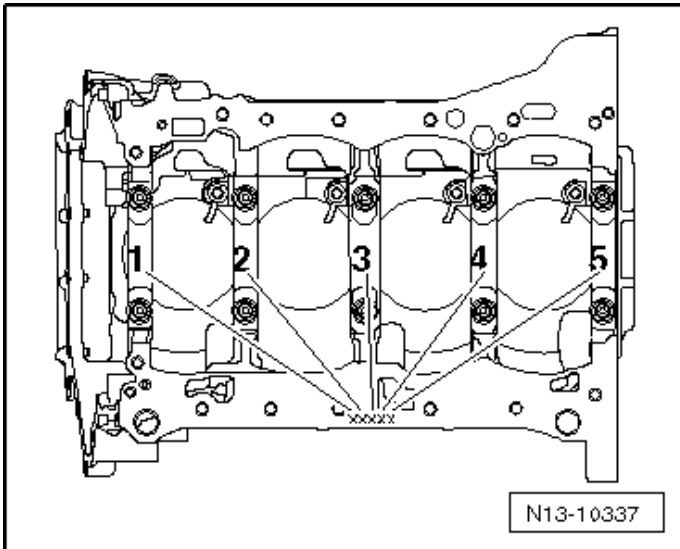
Item	Bolt	Nm
1, 2	M12x65	80
3 <sup>1)2)</sup>	M12x150	80
4 <sup>1)2)</sup>	M12x165	40
5	M10x50	
6	M12x85	80
A	Alignment sleeves for centering	

<sup>1)</sup> Bolt with threaded pin M8.

<sup>2)</sup> Also starter to transmission.

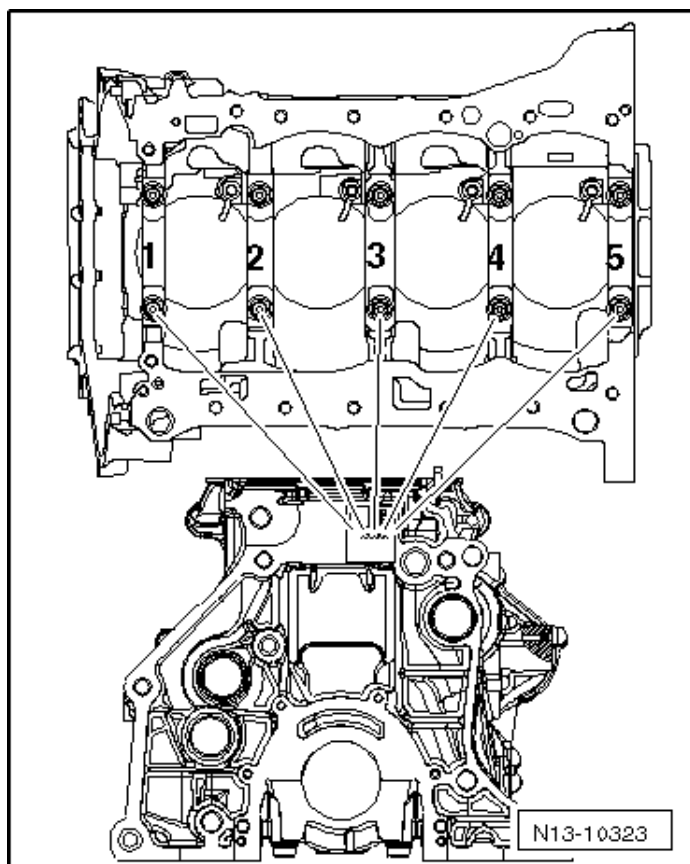
# ***Crankshaft, Cylinder Block – 2.0L CBFA, CCTA***

## **Cylinder Block Bearing Shell Identification**



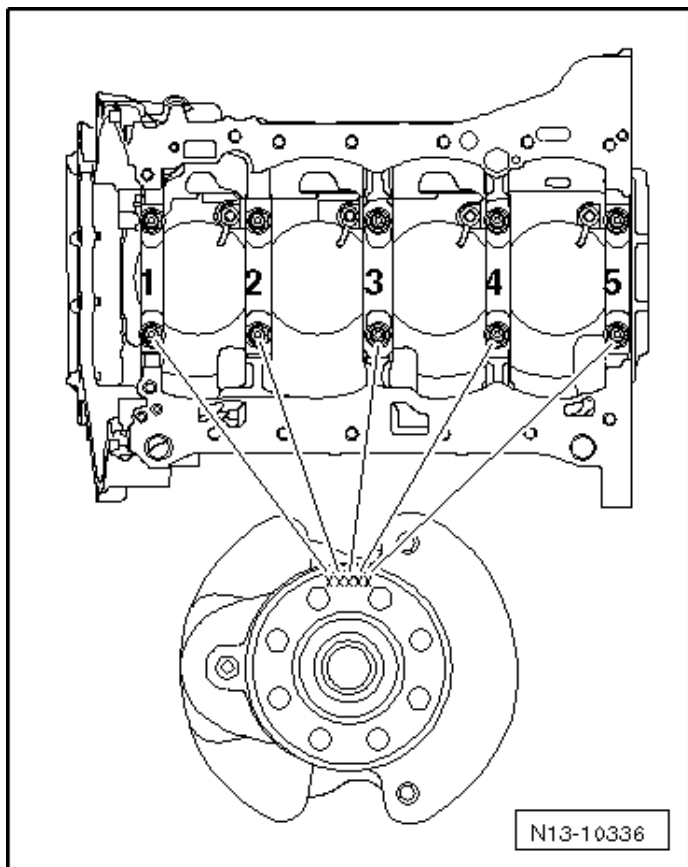
The cylinder block bearing shell identification is located either on the oil pan sealing surface or on the top (transmission side) of the cylinder block.

## Bearing Cap Bearing Shell Identification



The identification on the cylinder block is for the upper bearing shell.  
Note the letter and match it to the color identification in the table.

Letter on cylinder block	Color of bearing
S	Black
R	Red
G	Yellow
B	Blue
W	White



The identification on the crankshaft is for the lower bearing shell.  
 Note the letter and match it to the color identification in the table.

Letter on crankshaft	Color of bearing
S	Black
R	Red
G	Yellow
B	Blue
W	White

## Fastener Tightening Specifications

Component	Nm
A/C compressor	25
Connecting rod bearing cap <sup>1) 2)</sup>	45 plus an additional 90° (¼ turn)
Dual mass flywheel <sup>1)</sup>	60 plus an additional 90° (¼ turn)
Pressure relief valve	27
Sensor wheel <sup>1)</sup>	10 plus an additional 90° (¼ turn)
Vibration damper <sup>1)</sup>	150 plus an additional 90° (¼ turn)

<sup>1)</sup> Replace fastener(s).

<sup>2)</sup> Lubricate the threads and contact surface.

## Crankshaft Dimensions

Reconditioning dimension in mm <sup>1)</sup>	Crankshaft bearing pin diameter	Connecting rod bearing pin diameter
Basic dimension	58.00	47.80

<sup>1)</sup> The preparation of worn crankshafts is not provided.

## Piston Ring End Gaps

Piston ring dimensions in mm	New	Wear limit
Compression ring	0.20 to 0.40	0.8
Oil scraping ring	0.25 to 0.50	0.8

## Piston Ring Clearance

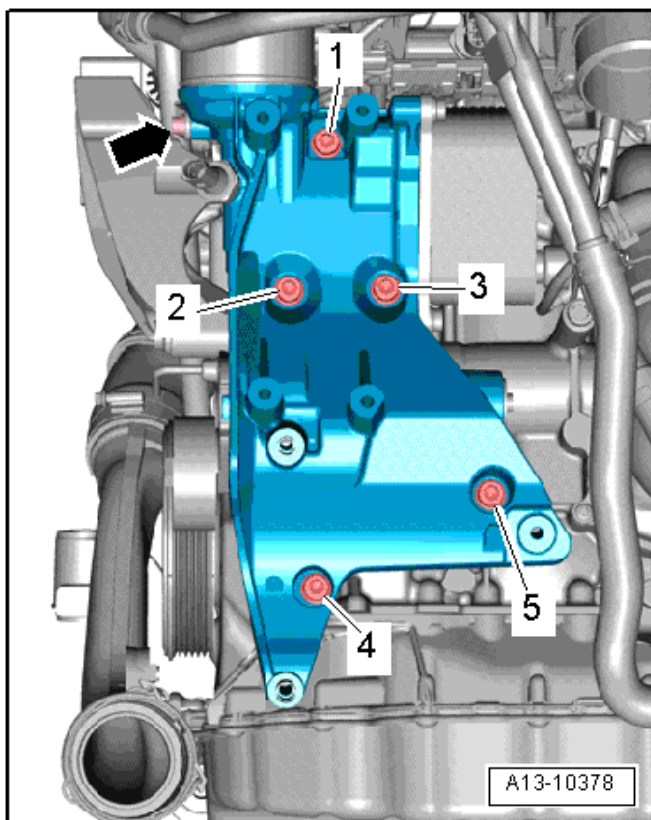
Piston ring dimensions in mm	New	Wear limit
1 <sup>st</sup> compression ring	0.06 to 0.09	0.20
2 <sup>nd</sup> compression ring	0.03 to 0.06	0.15
Oil scraping rings	Cannot be measured	

## Piston and Cylinder Dimensions

Honing dimension in mm	Piston diameter	Cylinder bore diameter
Basic dimension	82.465 <sup>1)</sup>	82.51

<sup>1)</sup> Measurements without graphite coating (thickness = 0.02 mm). The graphite coating wears off.

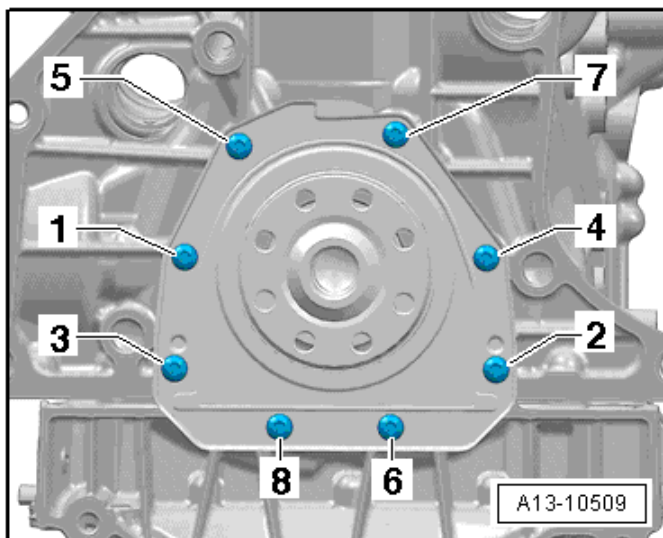
## Accessory Assembly Bracket Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 5 in sequence	Hand-tighten
2	Tighten bolts 1 through 5 in sequence	20
3	Tighten bolts 1 through 5 in sequence	an additional 90° (¼ turn)

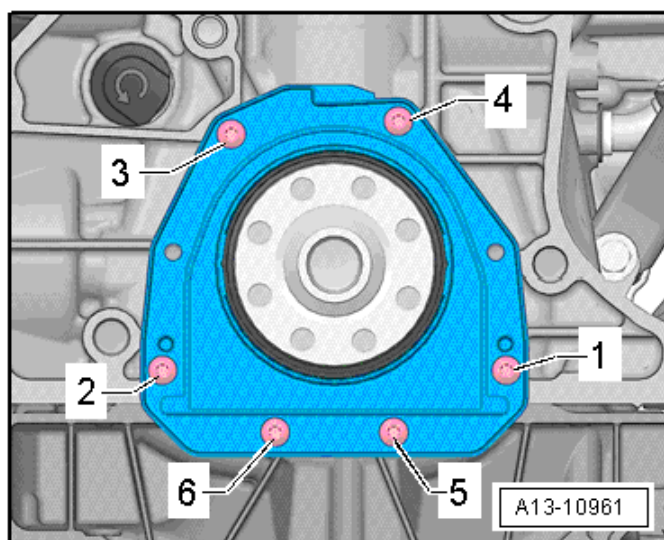


## Sealing Flange Tightening Specifications



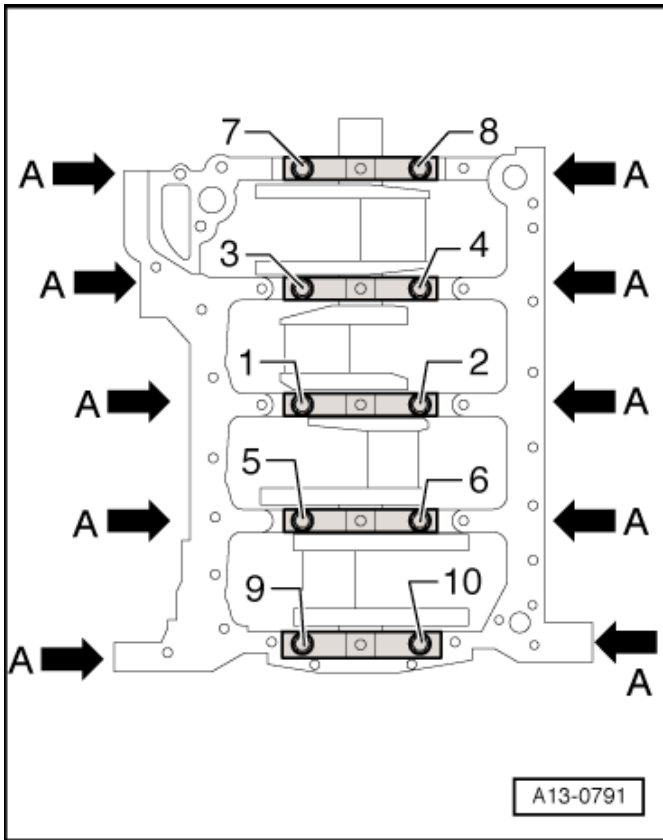
Step	Component	Nm
1	Tighten bolts 1 through 8 in sequence	Hand-tighten
2	Tighten bolts 1 through 8 in sequence	9

## Transmission Side Sealing Flange Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 6 in sequence	Hand-tighten
2	Tighten bolts 1 through 6 in sequence	4 an additional 45° (1/8 turn)

## Crankshaft Assembly Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 10 and A in sequence	Hand-tighten
2	Tighten bolts 1 through 10 in sequence	65
3	Tighten bolts 1 through 10 in sequence	an additional 90° (¼ turn)
4	Tighten bolts A	20
5	Tighten bolts A	an additional 90° (¼ turn)

# Cylinder Head, Valvetrain – 2.0L CBFA, CCTA

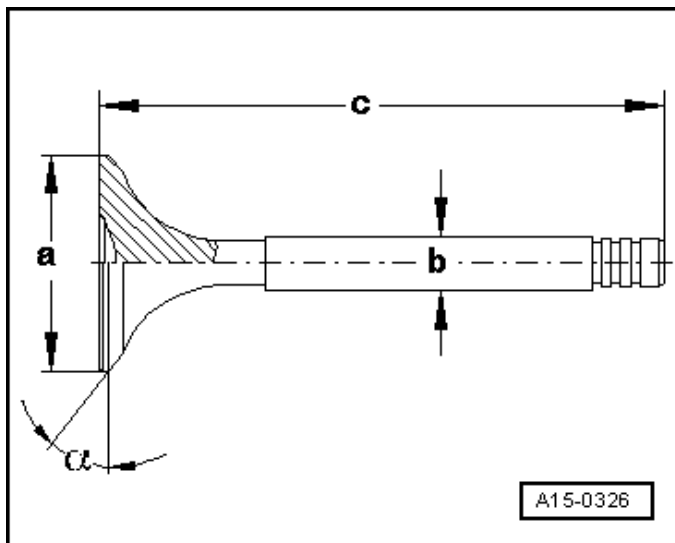
## Fastener Tightening Specifications

Component	Fastener size	Nm
Balance shaft exhaust side <sup>1)</sup>	-	9
Balance shaft intake side <sup>1)</sup>	-	9
Balance shaft timing chain guide rail guide pins	-	20
Bearing bracket <sup>1)2)</sup>	-	9
	M6	8 plus an additional 90° (¼ turn)
	M8	20 plus an additional 90° (¼ turn)
Bracket for heat shield <sup>1)</sup>	-	9
Camshaft Position (CMP) sensor	-	9
Camshaft timing chain guide rail guide pins	-	20
Chain tensioner to tensioning rail for the timing chain	-	85
Control valve	-	35
Guide track for the balance shaft timing chain-to-engine guide bolts	-	20
Guide track for the timing chain-to-engine guide bolts	-	20
Heat shield <sup>1)</sup>	-	20
Mounting plate	-	9
Oil dipstick guide tube	-	9
Sealing plugs	-	5
Secondary air injection solenoid valve-to-engine	-	9
Timing chain tensioning rail guide pins	-	20
Timing chain tensioning rail		
Bolt	-	9
Guide pins	-	20
Transport bracket	-	25

<sup>1)</sup> Replace fastener(s).

<sup>2)</sup> For bolt tightening clarification, refer to ElsaWeb, *Camshaft Timing Chain Assembly Overview*, items 5 and 7.

## Valve Dimensions



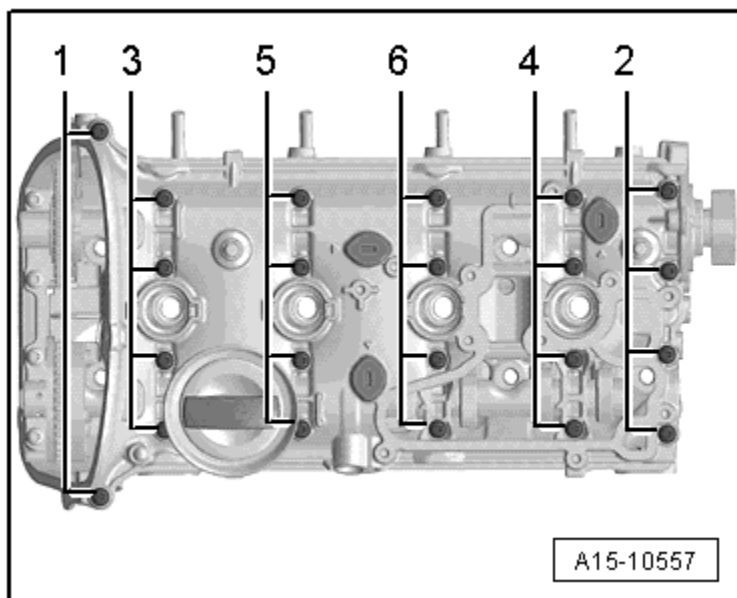
Dimension		Intake valve	Exhaust valve
Diameter a	mm	33.85 ± 0.10	28.0 ± 0.1
Diameter b	mm	5.98 ± 0.007	5.955 ± 0.007
c	mm	103.97	101.87
α	∠°	45	45

NOTE: Intake and exhaust valves must not be refaced by grinding. Only lapping is permitted.

## Compression Pressures

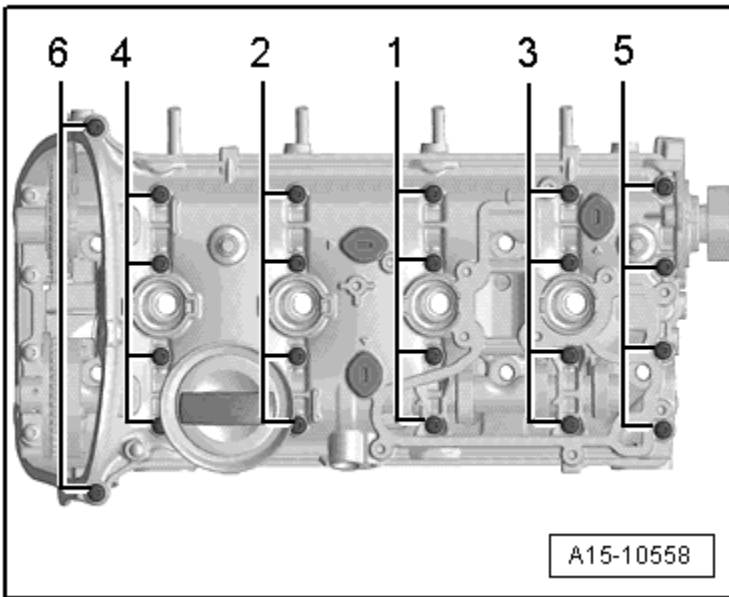
New Bar positive pressure	Wear limit Bar positive pressure	Difference between cylinders Bar positive pressure
11.0 to 14.0	7.0	Max. 3.0

## Cylinder Head Cover Removal Specification



Remove cylinder head cover bolts 1 through 6 in sequence.

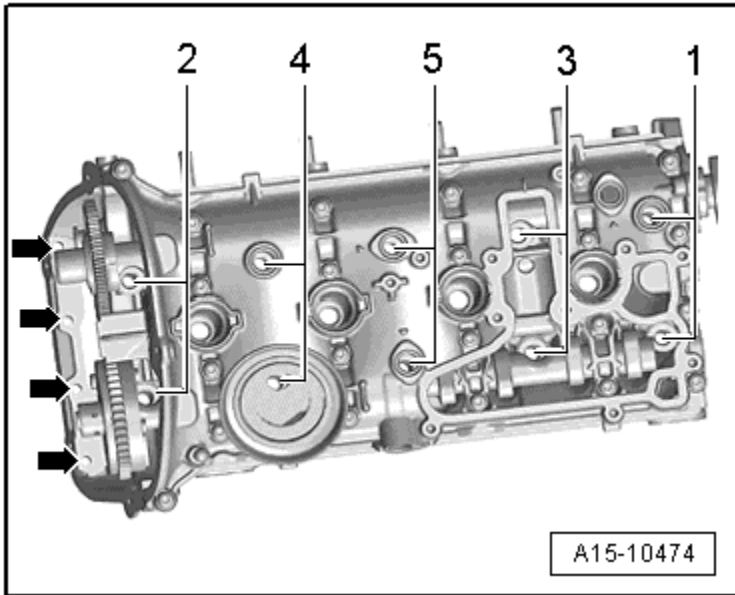
## Cylinder Head Cover Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 6 in sequence in several stages <sup>1)</sup>	Hand-tighten
2	Tighten bolts 1 through 6 in sequence	8
3	Tighten bolts 1 through 6 in sequence	an additional 90° (¼ turn)

<sup>1)</sup> Replace fastener(s).

## Cylinder Head Removal Specifications



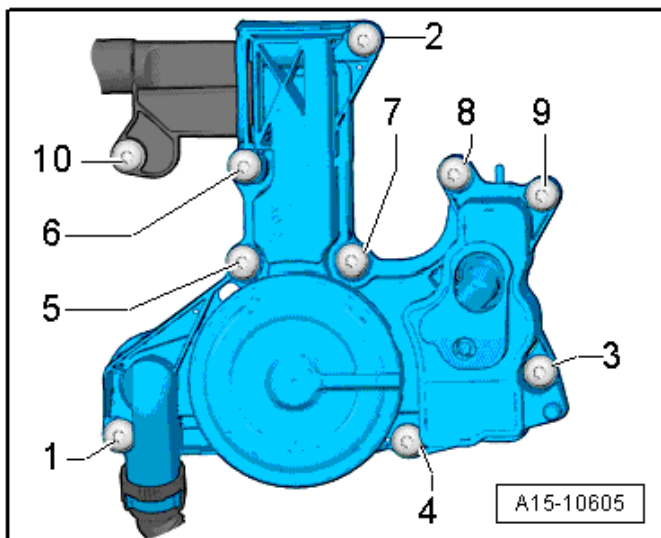
Remove cylinder head bolts (➡) and 1 through 5 in sequence.

## Cylinder Head Tightening Specifications

Step	Component	Nm
1	Tighten bolts 1 through 5 in sequence	40
2	Tighten bolts 1 through 5 in sequence	an additional 90° (¼ turn)
3	Tighten bolts 1 through 5 in sequence	an additional 90° (¼ turn)
4	Tighten bolts (arrows)	8
5	Tighten bolts (arrows)	an additional 90° (¼ turn)



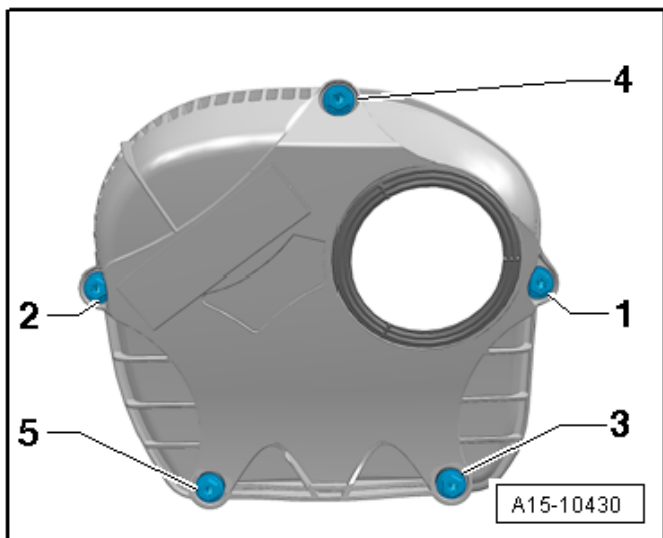
## Crankcase Ventilation Tightening Specification



Step	Component	Nm
1	Tighten bolts 1 through 10 in sequence	11

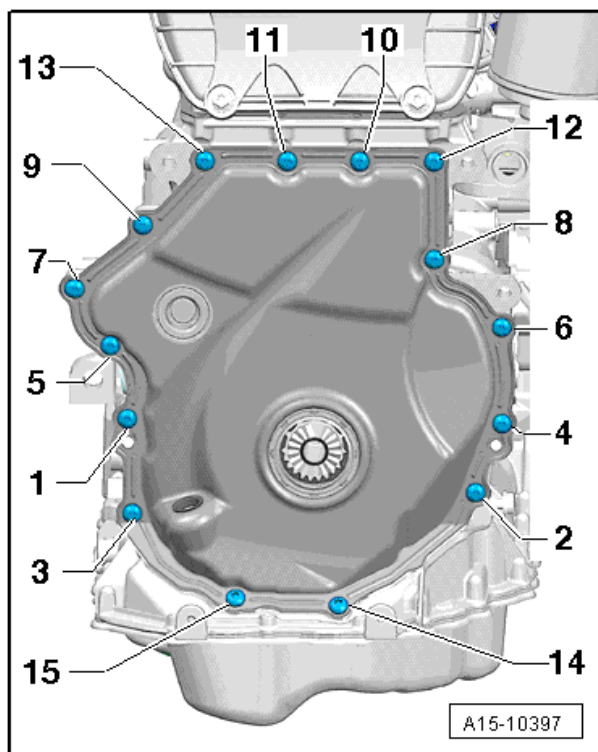
NOTE: The crankcase ventilation bolts are self-tapping. If replacing the cylinder head, only use the original bolts since the cylinder head is delivered without a thread for installing the crankcase ventilation. Do not cut the thread with a thread cutter.

## Upper Timing Chain Cover Tightening Specifications



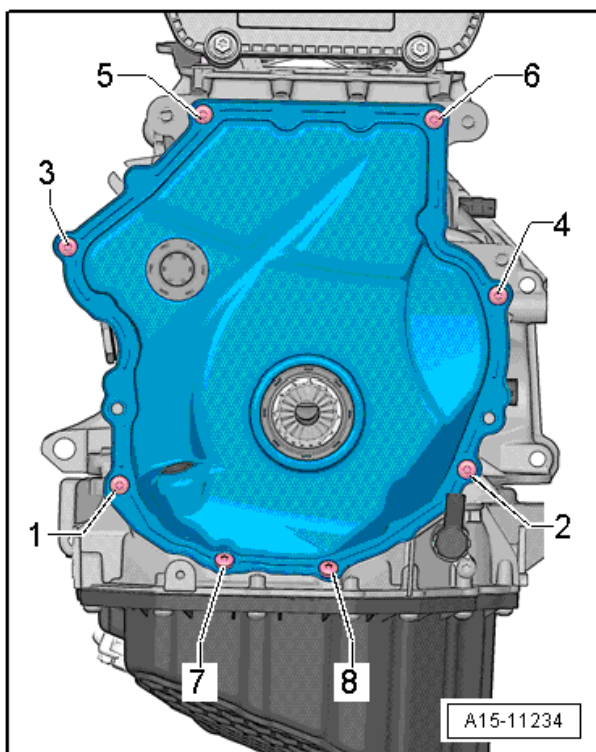
Step	Component	Nm
1	Tighten bolts 1 through 5 in sequence, in several stages	Hand-tighten
2	Tighten bolts 1 through 5 in sequence	9

## Lower Timing Chain Cover for 15 Bolts Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 15 in sequence	8
2	Tighten bolts 1 through 15 in sequence	an additional 45° (1/8 turn)

## Lower Timing Chain Cover for 8 Bolts Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 8 in sequence	4
2	Tighten bolts 1 through 8 in sequence	an additional 45° (1/8 turn)

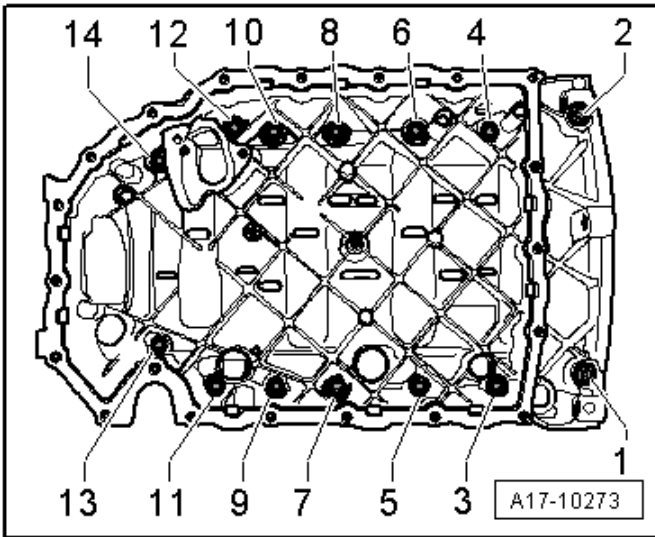
# Lubrication – 2.0L CBFA, CCTA

## Fastener Tightening Specifications

Component	Nm
Chain tensioner	9
Engine oil cooler	23
Oil baffle	9
Oil drain plug <sup>1)</sup>	30
Oil pan (upper section)	9
Oil pressure switch	20
Oil pump	9
	20

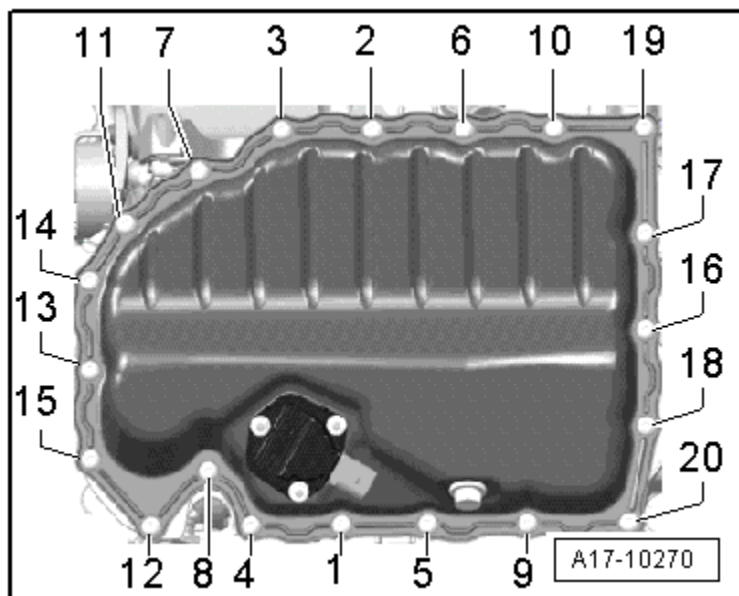
<sup>1)</sup> Replace fastener(s).

## Upper Oil Pan Tightening Specifications



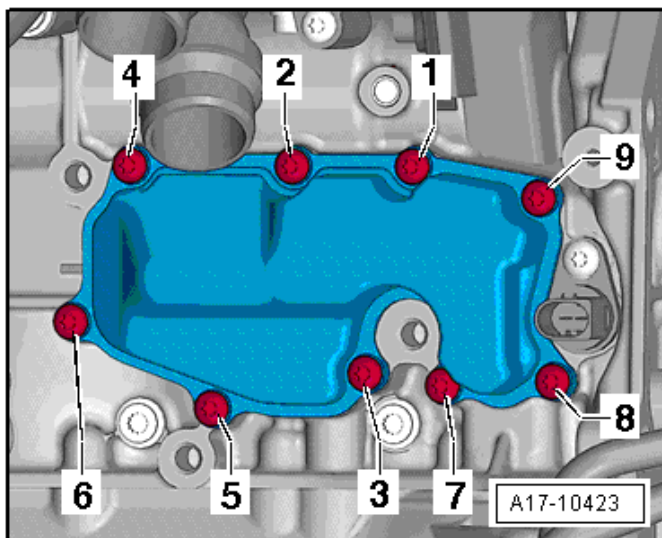
Step	Component	Nm
1	Tighten bolts 1 through 14 in sequence	Hand-tighten
2	Tighten bolts 1 through 14 in sequence	15
3	Tighten bolts 1 through 14 in sequence	an additional 90° (¼ turn)

## Oil Pan Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 20 in sequence	Hand-tighten
2	Tighten bolts 1 through 20 in sequence	8
3	Tighten bolts 1 through 20 in sequence	an additional 45° (1/8 turn)

## Oil Separator Tightening Specification



Step	Component	Nm
1	Tighten bolts 1 through 9 in sequence	9

# Cooling System – 2.0L CBFA, CCTA

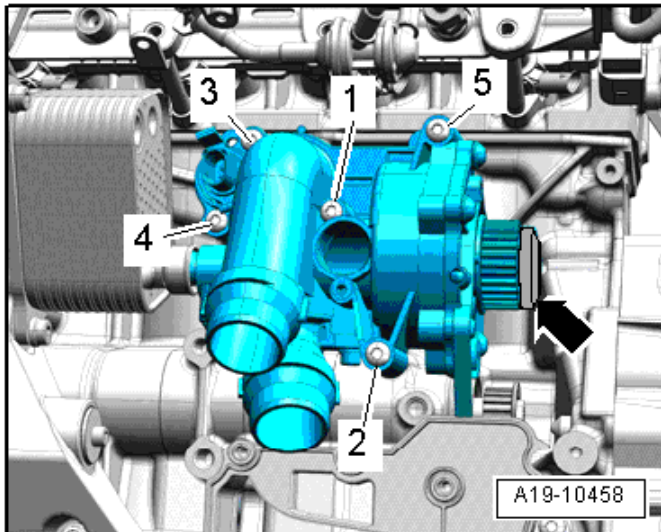
## Fastener Tightening Specifications

Component	Nm
After-Run coolant pump bracket-to-bracket	8
Bracket <sup>2)</sup>	5
Coolant fan-to-fan shroud nut	10
Connecting piece-to-coolant pump	9
Fan shroud-to-radiator	5
Front coolant pipes	5
Radiator-to-charge air cooler	5
Retaining plate-to-coolant pump	4
Small coolant pipe	9
Toothed belt drive gear <sup>1)</sup>	10 plus an additional 90° (¼ turn)
Toothed belt cover-to-coolant pump	9

<sup>1)</sup> Replace fastener.

<sup>2)</sup> For bolt tightening clarification, refer to “After-Run Coolant Pump -V51- Overview” and see item -1-.

## Coolant Pump Tightening Specification



Step	Component	Nm
1	Tighten bolts 1 through 5 in sequence	9



# Fuel Supply – 2.0L CBFA, CCTA

## Fastener Tightening Specifications

Component	Nm
Accelerator pedal module	9
Air filter housing	4
Evaporative Emission (EVAP) canister	6
Fuel filter bracket	3
Fuel tank	26
Leak Detection Pump (LDP) bracket <sup>1)</sup>	4
	8
Locking ring	110
<b>Protective plate for fuel delivery connection</b>	
- Bolt	8
- Collar bolt	11
- Securing strap	26

<sup>1)</sup> For bolt tightening clarification, refer to ElsaWeb, *EVAP Canister System/Leak Detection System Overview*, items 9 and 12.

# Turbocharger, G-Charger – 2.0L CBFA, CCTA

## Fastener Tightening Specifications

Component	Nm
Air guide pipe-to-bracket	10
Bearings-to-charge air cooler	5
Bracket for turbocharger <sup>5)</sup>	30
Charge air pipe-to-body	10
Charge air pipe-to-charge air hose	10
Charge air pressure sensor-to-charge air pipe	5
Clamping strip, nut <sup>4) 5)</sup>	
Connection-to-turbocharger	9
Coolant return line <sup>4)</sup>	9
	35
Coolant supply line <sup>3)</sup>	9
	35
Fastening strip nut <sup>1)</sup>	30
Oil supply line <sup>2)</sup>	9
	30
Oil return line	9
Right air guide pipe-to-oil pan	10
Turbocharger bracket	30
Turbocharger recirculating valve	7
Turbocharger vacuum diaphragm bolt	10
Turbocharger vacuum diaphragm nut	9
Wastegate bypass regulator valve	3

<sup>1)</sup> Replace fastener(s).

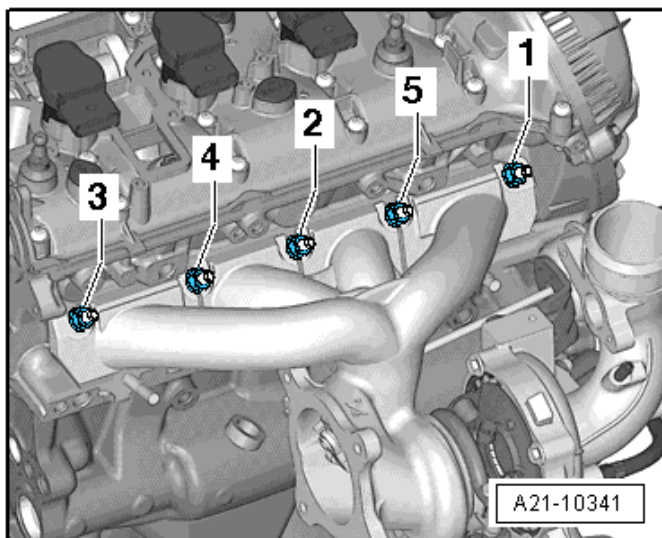
<sup>2)</sup> For bolt tightening clarification, refer to ElsaWeb, *Turbocharger Assembly Overview, Part II*, items 2, 5 and 6.

<sup>3)</sup> For bolt tightening clarification, refer to ElsaWeb, *Turbocharger Assembly Overview, Part II*, items 8, 9 and 10.

<sup>4)</sup> For bolt tightening clarification, refer to ElsaWeb, *Turbocharger Assembly Overview, Part III*, items 3 and 6.

<sup>5)</sup> Coat the bolt with hot bolt paste

## Turbocharger Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 5 in sequence	5
2	Tighten bolts 1 through 5 in sequence	12
3	Tighten bolts 1 through 5 in sequence	16
4	Tighten bolts 1 through 5 in sequence	25

## Exhaust System – 2.0L CBFA, CCTA

### Fastener Tightening Specifications

Component	Nm
Exhaust system bracket bolts	23
Front clamping sleeve nut	25
Front exhaust pipe with catalytic converters nut <sup>1) 3)</sup>	40
Rear clamping sleeve nut	25
Secondary Air Injection (AIR) pump motor bracket nuts <sup>2)</sup>	9
	25
Secondary Air Injection (AIR) solenoid valve bolts	9
Suspended mount-to-body	23

<sup>1)</sup> Replace fastener(s).

<sup>2)</sup> For bolt tightening clarification, refer to ElsaWeb, *Secondary Air Injection System Assembly Overview*, items 3, 9 and 11.

<sup>3)</sup> Lubricate the turbocharger stud bolts with hot bolt paste, refer to the Electronic Parts Catalog (ETKA).

## Multiport Fuel Injection – 2.0L CBFA, CCTA

### Technical Data

Engine data		2.0L/147 kW Turbo FSI Engine
Idle speed cannot be adjusted, it is regulated by idle stabilization		640 to 800 RPM
Engine speed limitation via fuel injector shut-off		6500 RPM
Fuel pressure	Fuel supply pressure up to high pressure pump (is produced by an electric fuel pump in the fuel tank)	Approximately 6.0 Bar positive pressure (same under all operating conditions)
	Fuel high pressure (produced by a mechanical single-piston pump) at approximately 85 degree coolant temperature	Approximately 35 Bar pressure at idle Approximately 150 Bar pressure at certain operating points.

## Fastener Tightening Specifications

Component	Fastener size	Nm
Adapter between connector piece and high pressure fuel line		40
Air filter housing upper section	-	1.5
Connection for the fuel supply line-to-fuel rail <sup>1)</sup>	-	22
Fuel pressure sensor	-	27
Fuel supply line connectors <sup>1)</sup>	-	25
Fuel supply line-to-fuel rail connections <sup>1) 2)</sup>	-	40
Fuel supply line union nut	-	20
High pressure fuel line	-	20
High Pressure Pump <sup>2)</sup>	M8	20
Intake Air Temperature (IAT) sensor	-	11
Intake Air Temperature (IAT) sensor bolt		5
Intake manifold	-	9
Intake manifold support nut	-	10
Intake manifold support bolt	-	23
Knock Sensor (KS) <sup>1)</sup>	-	20
Mass Air Flow (MAF) sensor	-	1.5
Oxygen Sensor (O2S)	-	55
Throttle valve control module	-	5
Throttle valve control module, throttle drive for Electronic Power Control (EPC)	-	7
Turbocharger recirculating valve	-	7
Wastegate bypass regulator valve	-	3

<sup>1)</sup> Replace fastener(s).

<sup>2)</sup> Tighten by hand in a diagonal sequence and then tighten to 5 Nm.

# Ignition – 2.0L CBFA, CCTA

## Technical Data

Engine data	2.0L/147 kW Turbo FSI Engine
Idle speed	640 to 800 RPM Idle speed cannot be adjusted; it is regulated by idle stabilization.
RPM	Approximately 6500 RPM Limited by switching off fuel injectors and closing throttle valve.
Ignition timing	Regulated by the Engine Control Module (ECM). Ignition timing is not adjustable.
Ignition/glow plug system	Single coil ignition system with 4 ignition coils (output stages integrated) that are connected directly to spark plugs via the ignition cables. The ignition coils can be pulled out of the cylinder head using ignition coil puller (T40039).
Ignition sequence	1-3-4-2

## Fastener Tightening Specifications

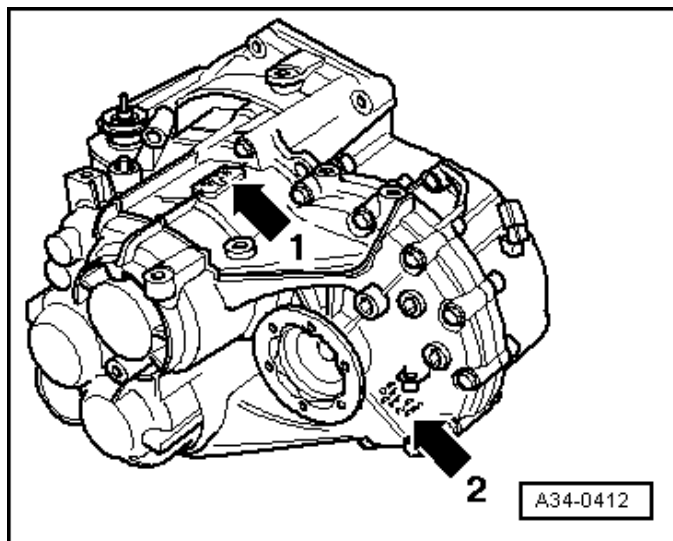
Component	Nm
Camshaft Position (CMP) sensor	10
Knock Sensor (KS) <sup>1)</sup>	20
Spark plug	30

<sup>1)</sup> Replace fastener(s).

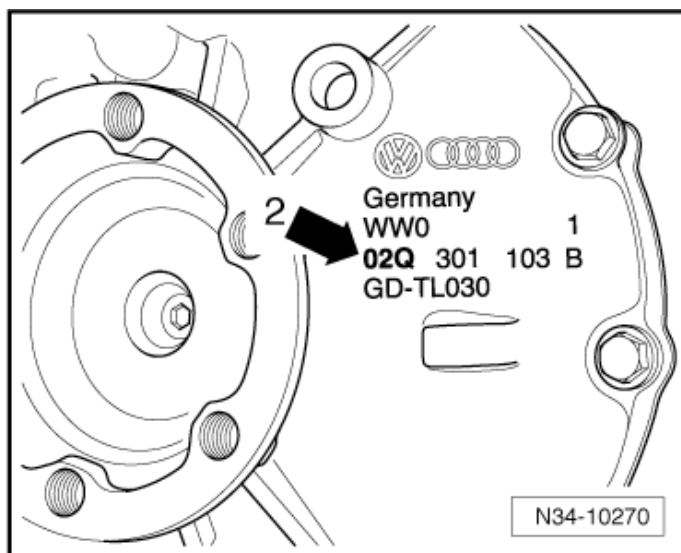
# MANUAL TRANSMISSION – 02Q

## General, Technical Data

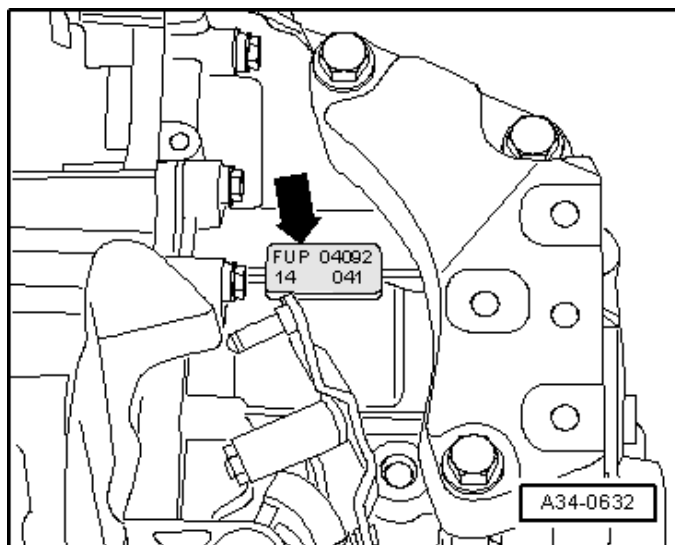
### Transmission Identification



- (1) Transmission code letters and build date.  
(2) Manual transmission 02Q.



- (2) Manual transmission 02Q.



(➡) Transmission code letters and build date.

**Example:**

<b>FUP</b>	<b>04</b>	<b>09</b>	<b>2</b>
Identification codes	Day	Month	Year of production (2002)



## Codes Letters, Transmission Allocation and Capacities

<b>Manual transmission</b>		
Identification codes		KZS
Manufactured	from	05.2009
	to	
Allocation	Model	Audi A3 from MY 2004
	Engine	2.0L - 147 kW Turbo-FSI
Gear ratios	Final drive I for 1 <sup>st</sup> to 4 <sup>th</sup> gear	71:18 = 3.944
$Z_2:Z_1 = i$	Final drive II for 5 <sup>th</sup> /6 <sup>th</sup> and reverse gears	71:23 = 3.087
	1 <sup>st</sup> gear	47:14 = 3.357
	2 <sup>nd</sup> gear	48:23 = 2.087
	3 <sup>rd</sup> gear	47:32 = 1.469
	4 <sup>th</sup> gear	45:41 = 1.098
	5 <sup>th</sup> gear	41:37 = 1.108
	6 <sup>th</sup> gear	38:41 = 0.927
	Reverse gear	34:23 x 14:14 = 3.990
$i_{total}$ in highest gear		2.861
Capacities		Refer to the Fluid Capacity Chart
Hydraulic		Hydraulic

Manual Trans. -  
02Q

The following information can be found in the Electronic Parts Catalog (ETKA):

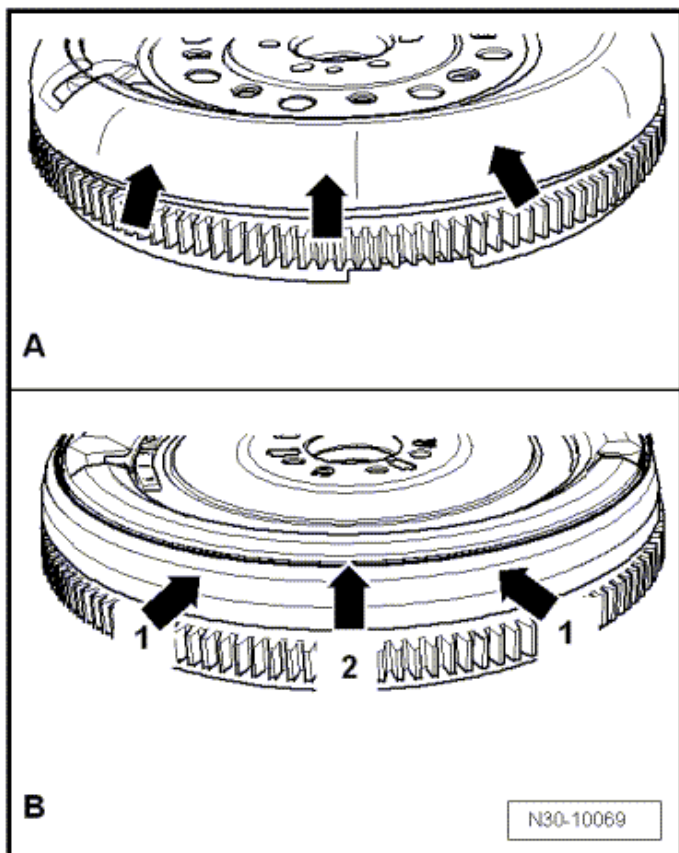
- Gear oil specification
- Driveshaft flange allocation
- Clutch allocation

# Clutch – 02Q

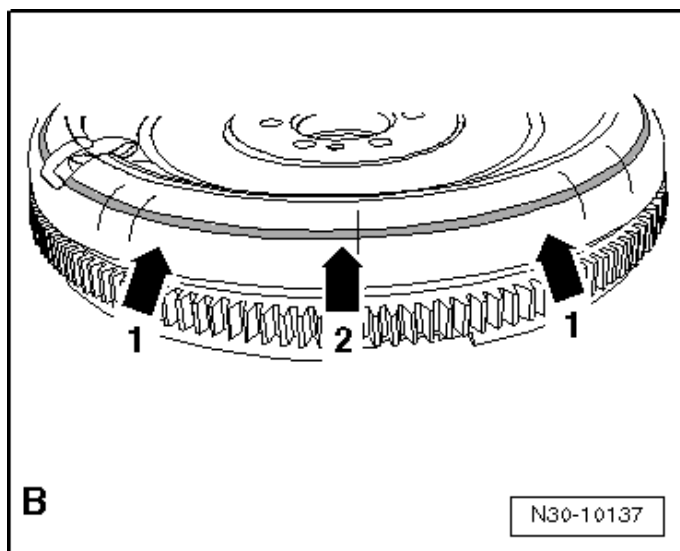
## Fastener Tightening Specifications

Component	Fastener size	Nm
Bulkhead bracket nut	-	20
Clutch pedal bracket nut	-	25
<b>Clutch slave cylinder with release bearing</b>		
Metal clutch slave cylinder	-	12
Plastic clutch slave cylinder	-	15
Pressure plate (Sachs)	M6	13
	M7	20
SAC pressure plate (LuK)	M6	13
	M7	20
Vent screw	-	4.5

## Determining Clutch Manufacturer



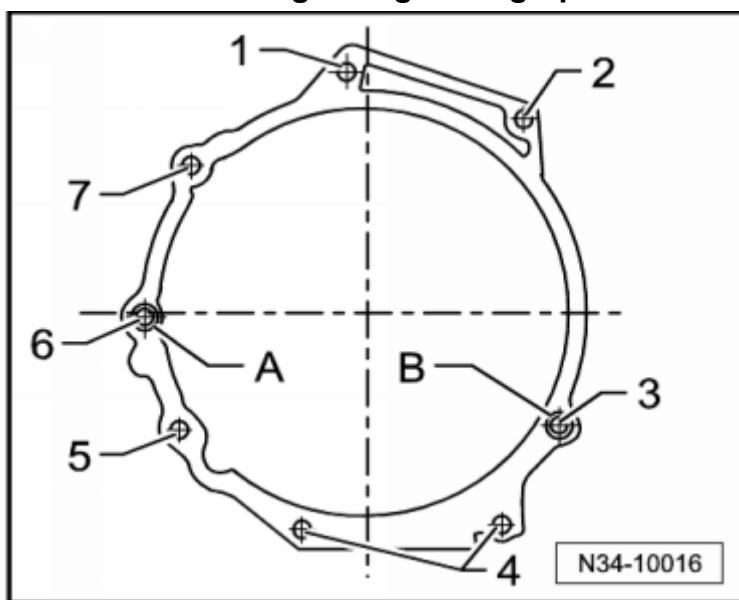
- A) Round outer contour (➡) indicates a clutch manufactured by Sachs.
- B) Squared outer contour (1) and a depression all the way around (2) indicates a clutch manufactured by LuK.



B) Round outer contour (1) and a depression all the way around (2) indicates a clutch manufactured by LuK.

## Controls, Housing – 02Q

### Transmission to Engine Tightening Specifications



Manual Trans. –  
02Q

Item	Fastener	Nm
1 to 2	M12 x 55 <sup>1)</sup> With threaded stud M8	80
3	M12 x 70 <sup>1)</sup> Installed from the engine side	80
4	M10 x 50 <sup>1)</sup>	40
5	M10 x 105 <sup>1)</sup>	40
6 and 7	M12 x 165 - With threaded stud M8 - Also starter to transmission	80
A and B	Alignment sleeves for centering	

<sup>1)</sup> Replace fastener(s).

## Fastener Tightening Specifications

Component	Fastener size	Nm
Back-up light switch	-	20
Bracket for electrical wiring-to-lower starter bolt	-	23
Cable mounting bracket	-	20
Cable mounting bracket-to-transmission	-	20
Clutch housing	-	15 plus an additional 90° (¼ turn)
Cover plate	-	6
Flange shaft	-	33
Ground cable-to-upper bolt on the starter	-	23
Oil drain bolt with internal hex bolt	-	30
Oil drain bolt with internal multi-point bolt	-	45
Right driveshaft heat shield-to-cylinder block	-	25
Selector bracket	-	5
Selector shaft	-	20
Selector shaft locking bolt	-	30
Selector mechanism	-	20
Shift housing nuts	M6	8
	M8	25
Small cover plate for flywheel	-	10
Stub shaft or flange shaft	-	33
Metal slave cylinder with release bearing	-	12
Plastic slave cylinder with release bearing	-	15
Transmission mount	-	60 plus an additional 90° (¼ turn)
Transmission pendulum support (without threaded inserts) <sup>1)</sup>	-	40 plus an additional 90° (¼ turn)
Transmission pendulum support (with threaded inserts) <sup>1)</sup>	-	50 plus an additional 90° (¼ turn)
	-	100 plus an additional 90° (¼ turn)

Component	Fastener size	Nm
Transmission mount <sup>2)</sup>	-	40 plus an additional 90° (¼ turn)
	-	60 plus an additional 90° (¼ turn)
Transmission shift lever nut	-	23

<sup>1)</sup> For bolt tightening clarification, refer to ElsaWeb, *Subframe Mount Assembly Overview*, items 2 and 13.

<sup>2)</sup> For bolt tightening clarification, refer to ElsaWeb, *Subframe Mount Assembly Overview*, items 14 and 15.

## Rear Final Drive – 02Q

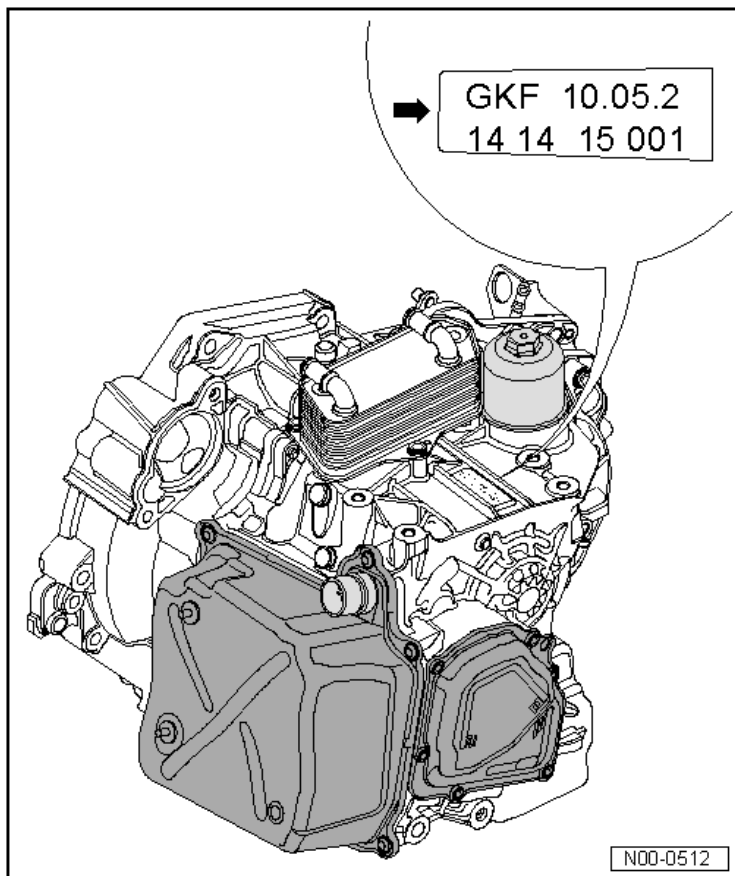
### Fastener Tightening Specifications

Component	Nm
Air duct pipe-to-engine	10
Exhaust system bracket to subframe	23
Right drive axle heat shield	25
Stub shaft	33

# S TRONIC TRANSMISSION – 02E

## General, Technical Data

### Identification on Transmission



The transmission code letters are on top of the transmission near the transmission oil cooler.

Example for above transmission:

- GKF = Transmission code
- 10.05.2 = Production date May 10th, 2002.

The transmission code is also found on the vehicle data plate.



## Code Letters, Transmission Allocations, Ratios and Equipment

<b>S tronic transmission</b>		<b>02E FWD</b>
<b>Transmission</b>	<b>Identification codes</b>	<b>KCZ,KNC,KPV,LQZ,LTL, MMA</b>
Allocation	Type	Audi A3 from MY 2004
	Engine	2.0L TFSI 4V - 147 kW
Gear Ratios	Final drive I for 1 <sup>st</sup> to 4 <sup>th</sup> gear	69:17 = 4.059
Z <sub>2</sub> :Z <sub>1</sub>	Final drive II for 5 <sup>th</sup> /6 <sup>th</sup> gear and reverse gear	69:22 = 3.136
	1 <sup>st</sup> gear	45:13 = 3.461
	2 <sup>nd</sup> gear	43:20 = 2.150
	3 <sup>rd</sup> gear	41:28 = 1.464
	4 <sup>th</sup> gear	41:38 = 1.078
	5 <sup>th</sup> gear	35:32 = 1.094
	6 <sup>th</sup> gear	35:38 = 0.921
	Reverse gear	22:14 x 33:13 = 3.990

**S tronic  
Transmission – 02E**

# Controls, Housing – 02E

## Fastener Tightening Specifications

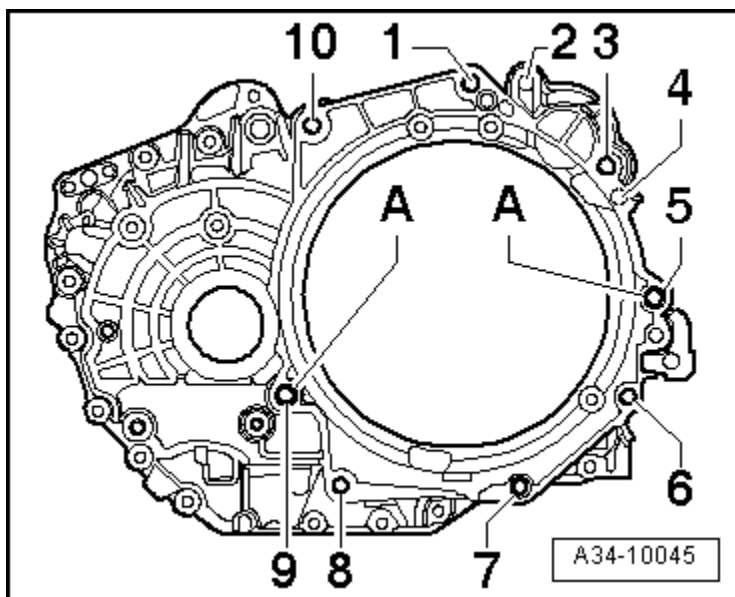
Component	Nm
Selector lever cable bracket nut	13
Selector mechanism function unit cover nut <sup>1)</sup>	9
Final drive support <sup>1)</sup>	40 plus an additional 90° (¼ turn)
Inspection plug	45
Locking plate	3.5
Locking spring	3.5
Mounting bracket for selector lever cable on transmission	23
Oil drain plug	45
Overflow pipe	3
Pendulum support <sup>1)2)</sup>	40 plus an additional 90° (¼ turn)
	100 plus an additional 90° (¼ turn)
Selector mechanism function unit nut	10
Selector mechanism function unit nut (from 11.2009)	8
Transmission fluid cooler <sup>1)</sup>	20 plus an additional 45° (⅙ turn)
Transmission mount <sup>1) 3)</sup>	40 plus an additional 90° (¼ turn)
	60 plus an additional 90° (¼ turn)
Transmission oil filter housing	20

<sup>1)</sup> Replace fastener(s).

<sup>2)</sup> For bolt tightening clarification, refer to ElsaWeb, *Subframe Mount Overview*, items 2 and 13.

<sup>3)</sup> For bolt tightening clarification, refer to ElsaWeb, *Subframe Mount Overview*, items 14 and 15.

## Transmission to Engine Tightening Specifications



### Transmission to 2.0L TFSI Engine

Item	Fastener	Nm
1, 3, 10	M12 x 55	80
5, 9	M12 x 70	80
6, 7, 8	M10 x 50	40
2, 4	For bolt tightening clarification, refer to ElsaWeb, <i>Electrical Equipment, Starter</i> .	
A	Alignment sleeves for centering	

### Transmission to 2.0L TDI CR Engine

Item	Fastener	Nm
1, 3, 10	M12 x 55	80
5	M12 x 65	80
6	M12 x 50	80
7, 8	M10 x 50	40
9	M12 x 70	80
2, 4	For bolt tightening clarification, refer to ElsaWeb, <i>Electrical Equipment, Starter</i> .	
A	Alignment sleeves for centering	

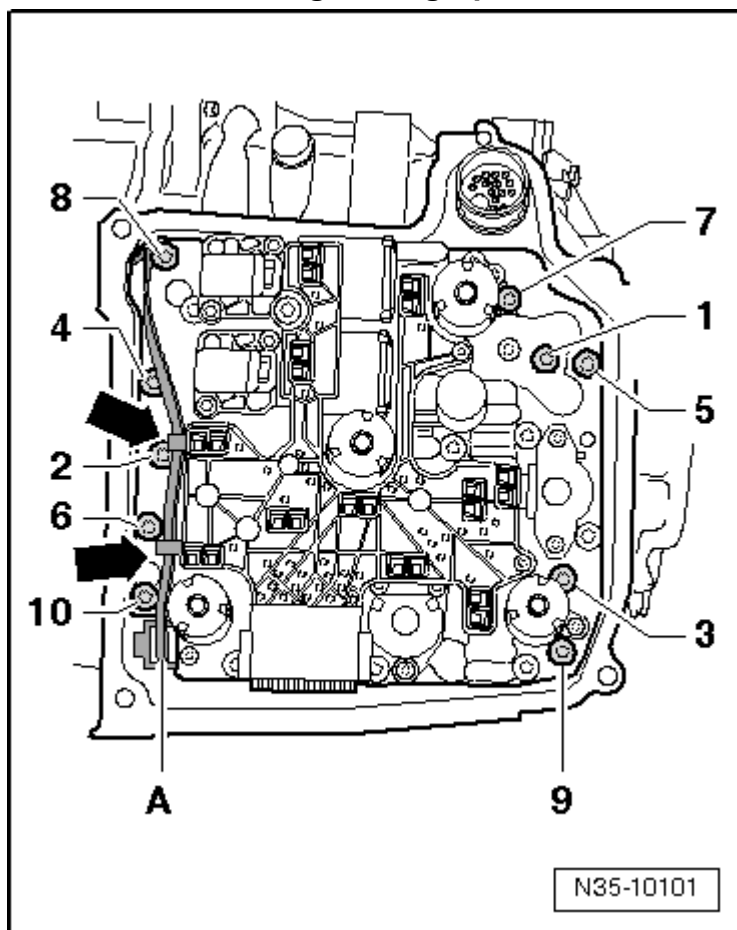
# Gears, Shafts – 02E

## Fastener Tightening Specifications

Component	Nm
Guard plate	32
Oil Pan <sup>1)</sup>	16

<sup>1)</sup> Tighten bolts diagonally in steps.

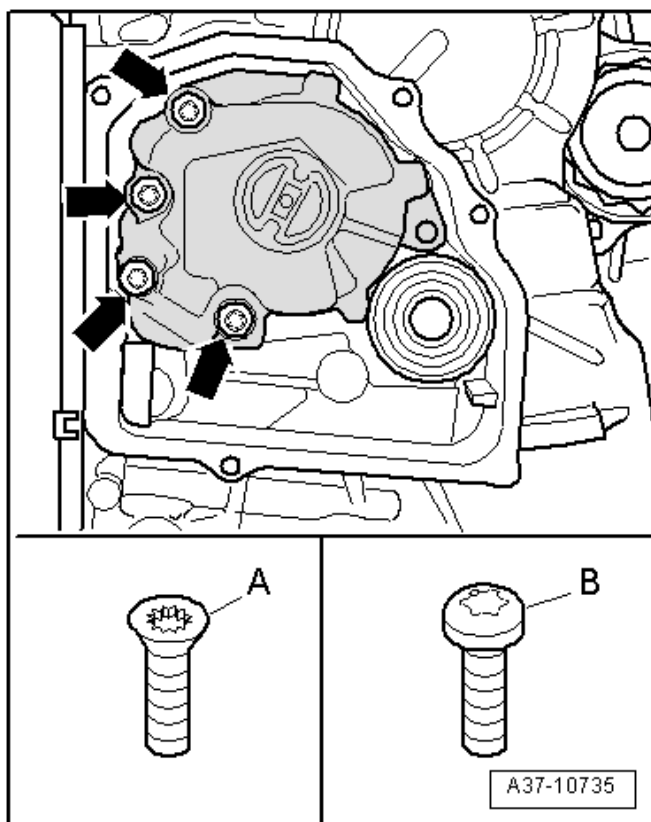
## Mechatronic Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 10 in sequence <sup>1)</sup>	Hand-tighten
2	Tighten bolts 1 through 10 in sequence	5
3	Tighten bolts 1 through 10 in sequence	an additional 90° (¼ turn)

<sup>1)</sup> Replace fastener(s).

## Transmission Oil Pump - Tightening Specification and Sequence



S tronic  
Transmission – 02E

Countersunk bolts -A-: Tighten countersunk bolts to 8 Nm diagonally.

Flat head bolts -B-:

Stage	Component	Nm
1	-B-	5 Nm diagonally
2	-B-	90° additional turn, diagonally

<sup>1)</sup> Replace fastener(s).

## Rear Final Drive, Differential – 02E

Component	Nm
Left Flange Shaft <sup>1)</sup>	30
Lever/Selector Shaft, Nut <sup>1)</sup>	20
Right Flange Shaft <sup>1)</sup>	30

<sup>1)</sup> Replace fastener(s).

# SUSPENSION, WHEELS, STEERING

## Front Suspension

### Fastener Tightening Specifications

Component	Fastener size	Nm
<b>Ball joint to transverse link nut</b>		
- Cast steel or aluminum transverse link	-	60
- Sheet steel transverse link	-	100
Ball joint-to-wheel bearing housing nut <sup>1)</sup>	-	60
Console-to-body bolt <sup>1)</sup>	-	70 plus an additional 90° (¼ turn)
Coupling rod-to-stabilizer bar nut <sup>1)</sup>	-	65
Diagonal brace-to-body bolt (Cabriolet only) <sup>1)</sup>	-	90 plus an additional 45° (⅛ turn)
<b>Constant Velocity (CV) joint boot clamp</b>		
- All except with inner Constant Velocity (CV) joint attached	-	20
- with inner Constant Velocity (CV) joint attached	-	25
Drive axle-to-transmission bolt <sup>1) 4)</sup>	M8	40
	M10	70
<b>Drive axle to wheel hub bolt</b>		
- Hex bolt	-	200 plus an additional 180° (½ turn)
- 12-point bolt with ribs	-	70 plus an additional 90° (¼ turn)
- 12-point bolt without ribs	-	200 plus an additional 180° (½ turn)
Heat shield-to-subframe bolt	-	6
Level control system sensor-to-transverse link nut	-	9
Level control system sensor-to-subframe bolt	-	9

<b>Component</b>	<b>Fastener size</b>	<b>Nm</b>
Pendulum support-to-subframe bolt <sup>1)</sup>	-	100 plus an additional 90° (¼ turn)
Stabilizer bar-to-subframe bolt <sup>1)</sup>	-	20 plus an additional 90° (¼ turn)
Steering gear-to-subframe bolt <sup>1)</sup>	-	50 plus an additional 90° (¼ turn)
Strut-to-body bolt <sup>1)</sup>	-	15 plus an additional 90° (¼ turn)
Strut-to-strut bearing nut <sup>1)</sup>	-	60
Strut-to-wheel bearing housing bolt <sup>1)</sup>	-	70 plus an additional 90° (¼ turn)
Subframe-to-body bolt <sup>1)</sup>	-	70 plus an additional 90° (¼ turn)
<b>Tie rod end to wheel bearing housing nut <sup>1)</sup></b>		
- All except Audi S3 and RS3	-	20 plus an additional 90° (¼ turn)
- Audi S3 <sup>3)</sup>	-	100
- RS3	-	110
Transverse link-to-console bolt <sup>1)2)</sup>	-	70 plus an additional 180° (½ turn)
Transverse link mounting bracket-to-body bolt <sup>1)</sup>	-	70 plus an additional 90° (¼ turn)
Transverse link mounting bracket-to-console bolt <sup>1)</sup>	-	50 plus an additional 90° (¼ turn)
Wheel hub-to-wheel bearing housing bolt <sup>1)</sup>	-	70 plus an additional 90° (¼ turn)

<sup>1)</sup> Replace fastener(s).

<sup>2)</sup> Tighten in curb weight position.

<sup>4)</sup> Tighten to 100 Nm, then loosen by 180° (½ turn) and tighten to 100 Nm again.

<sup>5)</sup> Pre-tighten to 10 Nm.

# Rear Suspension

## Fastener Tightening Specifications

Component	Fastener size	Nm
ABS wheel speed sensor-to-wheel bearing housing bolt	-	8
Brake disc-to-wheel hub bolt	-	4
Coupling rod-to-stabilizer bar nut <sup>1)</sup>	-	45
Coupling rod-to-wheel bearing housing nut <sup>1)</sup>	-	45
<b>Cover plate to wheel bearing housing bolt</b>		
- FWD	-	12
- AWD	-	10
Cross member-to-subframe nut (AWD) <sup>1)</sup>	-	50 plus an additional 180° (½ turn)
<b>Constant Velocity (CV) joint boot clamp</b>		
- with 100 mm inner Constant Velocity (CV) joint	-	20
- with 82 mm outer Constant Velocity (CV) joint	-	25
Diagonal brace bolt (Cabriolet) <sup>1)</sup>	-	90 plus an additional 45° (⅙ turn)
Drive axle-to-transmission bolt <sup>1)4)</sup>	M8	40
	M10	70
<b>Drive axle to wheel hub bolt (AWD) <sup>1)</sup></b>		
- With hex bolt	-	200 plus an additional 180° (½ turn)
- With twelve-point bolt with ribs	-	70 plus an additional 90° (¼ turn)
- With twelve-point bolt without ribs	-	200 plus an additional 180° (½ turn)
Lower transverse link-to-subframe nut <sup>1)2)</sup>	-	95
Lower transverse link-to-wheel bearing housing nut <sup>1)2)</sup>	-	90 plus an additional 90° (¼ turn)
Rear level control system sensor bolt	-	5
Shock absorber-to-body bolt <sup>1)</sup>	-	50 plus an additional 45° (⅙ turn)
Shock absorber-to-mount nut <sup>1)</sup>	-	25



Component	Fastener size	Nm
Shock absorber-to-wheel bearing housing bolt	-	180
Stabilizer bar-to-subframe bolt <sup>1)</sup>	-	25 plus an additional 45° (1/8 turn)
Stone protection plate-to-lower transverse link bolt	-	8
Subframe-to-body bolt <sup>1)</sup>	-	90 plus an additional 90° (1/4 turn)
Tie rod-to-subframe nut <sup>1)2)</sup>	-	90 plus an additional 90° (1/4 turn)
Tie rod-to-wheel bearing housing bolt <sup>1)2)</sup>	-	130 plus an additional 90° (1/4 turn)
Trailing arm mounting bracket-to-body bolt <sup>1)</sup>	-	50 plus an additional 45° (1/8 turn)
Trailing arm-to-mounting bracket bolt <sup>1)</sup>	-	90 plus an additional 90° (1/4 turn)
Trailing arm-to-wheel bearing housing bolt <sup>1)3)</sup>	-	90 plus an additional 45° (1/8 turn)
Upper transverse link-to-subframe nut <sup>1)2)</sup>	-	95
Upper transverse link-to-wheel bearing housing bolt <sup>1)2)</sup>	-	130 plus an additional 90° (1/4 turn)
Wheel hub-to-wheel bearing housing bolt with aluminum wheel bearing housing (FWD) <sup>1)</sup>	-	200 plus an additional 180° (1/2 turn)
Wheel hub-to-wheel bearing housing bolt with steel wheel bearing housing (FWD) <sup>1)</sup>	-	180 plus an additional 180° (1/2 turn)
Wheel hub-to-wheel bearing housing bolt (AWD) <sup>1)</sup>	-	70 plus an additional 90° (1/4 turn)

<sup>1)</sup> Replace fastener(s).

<sup>2)</sup> Always tighten the threaded connection in curb weight position.

<sup>3)</sup> For bolt tightening clarification, refer to ElsaWeb, *Wheel Bearing Housing*.

<sup>4)</sup> Pre-tighten to 10 Nm in a diagonal sequence, and then tighten to specification in a diagonal sequence.

# Wheels, Tires, Wheel Alignment

## Fastener Tightening Specifications

Component	Nm
Decorative trim-to-wheel rim bolt	5
Metal valve-to-wheel rim union nut	8
Tire pressure monitoring sensor union nut	8
Wheel Bolt	120
Wheel electronics-to-metal valve microencapsulated bolt (Beru system)	4

## Wheel Alignment Data

### Wheel Alignment Specified Values

Front suspension	Standard suspension (UA0/UA4)	Sport suspension (UA1/UA5/UA9/UA6)
Individual toe	5' ± 5'	5' ± 5'
Total toe	10' ± 10'	10' ± 10'
Camber (wheels straight ahead) <sup>1)</sup>	-30' ± 30'	-41' ± 30'
Maximum permissible difference between both sides	30'	30'
Toe differential angle at 20° steering angle <sup>2)</sup>	1° 38' ± 20'	1° 40' ± 20'
Caster	7° 34' ± 30'	7° 47' ± 30'
Maximum permissible difference between both sides	30'	30'
Maximum steering angle at inner wheel	41°	40°

<b>Front suspension</b>	<b>Sport suspension (UB5/UA7)</b>	<b>Heavy duty suspension (UA2)</b>	<b>Sport suspension (UA3/UB2/UB3)</b>
Individual toe	5' ± 5'	5' ± 5'	5' ± 5'
Total toe	10' ± 10'	10' ± 10'	10' ± 10'
Camber (wheels straight ahead) <sup>1)</sup>	-46' ± 30'	-14' ± 30'	-46' ± 30'
Maximum permissible difference between both sides	30'	30'	30'
Toe differential angle at 20° steering angle <sup>2)</sup>	2° ± 20'	1° 38' ± 20'	2° ± 20'
Caster	8° 07' ± 30'	7° 17' ± 30'	8° 07' ± 30'
Maximum permissible difference between both sides	30'	30'	30'
Maximum steering angle at inner wheel	39°	41°	39°

<sup>1)</sup> Camber corrections are not possible. It can only be corrected slightly by sliding the subframe with the consoles.

<sup>2)</sup> Depending on the manufacturer, the toe out angle difference can also be indicated negatively in the alignment computer.

<b>Rear suspension</b>	<b>Standard Suspension UA0/UA4</b>	<b>Sport Suspension UA1/UA5/UA9/UA6</b>
Total toe	25' ± 10'	25' ± 10'
Individual toe	12,5' ± 5'	12,5' ± 5'
Maximum permissible deviation from direction of rotation	20'	20'
Camber	-1° 20' ± 30'	-1° 20' ± 30'
Maximum permissible difference between both sides	30'	30'

<b>Rear suspension</b>	<b>Sport suspension (UB5/UA7)</b>	<b>Heavy duty suspension (UA2)</b>	<b>Sport suspension (UA3/UB2/UB3)</b>
Total toe	25' ± 10'	25' ± 10'	25' ± 10'
Individual toe	12,5' ± 5'	12,5' ± 5'	12,5' ± 5'
Maximum permissible deviation from direction of rotation	20'	20'	20'
Camber	-1° 20' ± 30'	-1° 20' ± 30'	-1° 20' ± 30'
Maximum permissible difference between both sides	30'	30'	30'

# Steering

## Fastener Tightening Specifications

Component	Nm
Heat shield-to-steering gear bolt	6
Mounting bracket-to-lateral control arm for steering column bolt	20
Servo motor-to-steering gear housing bolt	35
Steering column-to-mounting bracket bolt	20
Steering column-to-steering gear bolt	20 plus an additional 90° (¼ turn)
Steering gear housing pinion screw plug	65
Steering gear-to-subframe bolt <sup>1)</sup>	50 plus an additional 90° (¼ turn)
Steering pinion-to-steering gear housing nut <sup>1)</sup>	25
Steering pinion cover-to-steering gear housing bolt	15
Steering wheel-to-steering column bolt <sup>1)</sup>	50
Strut-to-lateral control arm for steering column bolt	20
Strut-to-mounting bracket bolt	20
Strut-to-steering column bolt	9
<b>Tie rod end to tie rod nut</b>	
- Generation I	55
- Generation II and III	50
<b>Tie rod end to wheel bearing housing nut <sup>1)</sup></b>	
- All except S3 and RS3	20 plus an additional 90° (¼ turn)
- S3 <sup>2)</sup>	100
- RS3	110
Tie rod-to-steering gear	100

<sup>1)</sup> Replace fastener(s).

<sup>2)</sup> Tighten to 100 Nm, then loosen by 180° (½ turn) and tighten to 100 Nm again.

# BRAKE SYSTEM

## General, Technical Data

### Vehicle Data Sticker PR Number Allocation

WAUZZZ8P x3A000151				
8P1		A7C		1975019
A3FSI				2.0
1	110KW	M6S	08/02	
-----				
LY7W/LY7W			N7A/ MB	
2	EOA 7A2	4UE	6XE	
	1KQ	J1L	1ZE	1AT ← 5
3	3FE	UA1	5MJ	7X1 4R4
	FOA	8GU	0G4	0YZ L10
4	T58	3NZ	8JG	U1A X9X 1N3
	2ZG	8Q3	9Q2	8Z5
	7Q0	CR4	7K0	4X1 6R2
	3L3		3Y6	5D1
	1SA	0GG	QG1	4GH
1335 11.1 11.1 1.1 11.1				
A45-0206				

2 - Rear wheel brake

3 - Front wheel brake

The vehicle data label can be found in the spare wheel well as well as in the Maintenance booklet.

The correct combination of brake caliper/brake rotor/brake pad can be determined using the PR-No. Refer to the Electronic Parts Catalog (ETKA).

## Brake Master Cylinder and Brake Booster

<b>Brake system</b>		
Dual-circuit brake system with diagonal distribution, Anti-lock Brake System (ABS) with Electronic Brake Pressure Distribution (EBD). Depending on equipment and construction, also with Electronic Differential Lock (EDL), Anti-Slip Regulation (ASR), Electronic Stability Program (ESP).		
Brake master cylinder	Diameter in mm	22.2
Brake booster	Diameter in inches	10
	Function	Pneumatic
Assist factor	i =	5

<b>Front axle</b>					
<b>Production Relevant No. (PR. No.)</b>		<b>1ZA</b>	<b>1ZC/1ZM</b>	<b>1ZD/1LJ</b>	
Front brake caliper		FN 3	FN 3	FN 3	
Pistons	Diameter mm	54	54	54	
Front brake disc	Diameter mm	312	312	312	
Brake disc thickness ventilated	mm	25	25	25	
Brake disc wear limit	mm	22	22	22	
Pad thickness, new (not including backing plate)	mm	14.8	14	14	
Brake pad wear limit (not including backing plate)	mm	2	2	2	

<b>Front axle</b>						
<b>Production Relevant No. (PR. No.)</b>		<b>1ZE</b>	<b>1ZF</b>	<b>1ZK/ 1LK</b>	<b>1ZP</b>	
Front brake caliper		FN 3	FS III	FNR- G-57	FN 3	
Pistons	Diameter mm	54	54	57	54	
Front brake disc	Diameter mm	288	280	345	288	
Brake disc thickness ventilated	mm	25	22	30	25	
Brake disc wear limit	mm	22	19	27	22	
Pad thickness, new (not including backing plate)	mm	14	14	14.8	14	
Brake pad wear limit (not including backing plate)	mm	2	2	2	2	

<b>Rear wheel brake (FWD)</b>						
<b>Production Relevant No. (PR. No.)</b>		<b>1KD</b>	<b>1KE, 1KF</b>	<b>1KQ</b>	<b>1KU</b>	<b>1KZ, 1KJ</b>
Rear brake caliper		C 38	CII 41HR	C 38	CII 38HR	CII 38HR
Pistons	Diameter mm	38	41	38	38	38
Rear brake disc	Diameter mm	255	260	255	286	286
Brake disc thickness	mm	10	12	10	12	12
Brake disc wear limit	mm	8	10	8	10	10
Pad thickness, new (not including backing plate)	mm	10.96	10.96	10.96	10.96	10.96
Brake pad wear limit (not including backing plate)	mm	2	2	2	2	2

<b>Rear wheel brake (AWD)</b>						
<b>Production Relevant No. (PR. No.)</b>		<b>1KF</b>	<b>1KJ</b>	<b>1KU</b>	<b>1KW</b>	<b>2EA</b>
Rear brake caliper		CII 41HR	CII 41HR	CII 41HR	CII 41HR	CII 41HR
Pistons	Diameter mm	41	41	41	41	41
Rear brake disc	Diameter mm	260	286	286	310	310
Brake disc thickness not ventilated	mm	12	12	12	22	22
Brake disc wear limit	mm	9	9	9	19	19
Pad thickness, new (not including backing plate)	mm	10.96	10.96	10.96	10.96	10.96
Brake pad wear limit (not including backing plate)	mm	2	2	2	2	2

# Anti-lock Brake System (ABS)

## Fastener Tightening Specifications

Component	Nm
ABS control module (with ESP) <sup>1)</sup>	5.5
ABS hydraulic unit	4
ABS hydraulic unit bracket	8
ABS hydraulic unit bracket nut	20
Brake lamp switch	5
Brake lines-to-hydraulic unit <sup>1)</sup>	14
Control module-to-hydraulic unit <sup>1)</sup>	4
Cover plate	60
Electronic Stability Program (ESP) sensor unit-to-bracket	20
Hydraulic unit-to-bracket	8
Speed sensor-to-stub axle	8
Wheel speed sensor	8

<sup>1)</sup> Replace fastener(s).



# Mechanical Components

## Fastener Tightening Specifications

Component	Fastener size	Nm
<b>Front Brakes</b>		
Brake caliper housing bracket bolt	M8 x 16	25
Brake caliper housing (FS III) <sup>2)</sup>	-	28
	-	30
Brake caliper housing (FN 3)	-	30
Brake carrier	M14 x 1.5 x 38	196
Brake disc	-	4
Brake disc (FNR-G-60)	-	5
Brake hose with banjo fitting and union bolt	-	35
Brake line connector-to-brake hose	-	12
Brake line connection-to-brake caliper	-	19
Cover plate	-	10
Wheel bearing housing	-	190
Wheel speed sensor	-	8
<b>Rear Brakes</b>		
Brake caliper housing <sup>1)</sup>	-	35
Brake caliper-to-brake carrier <sup>1)</sup>	-	35
Brake disc	-	4
Brake hose-to-brake caliper <sup>3)</sup>	-	38
Brake line	-	14
Cover plate	-	10
Wheel bearing housing <sup>1)</sup>	-	90 plus an additional 90° (¼ turn)
Wheel speed sensor	-	8
<b>All</b>		
Brake caliper-to-wheel bearing housing	-	30
Brake caliper with balance weight <sup>1)</sup>	-	10
Brake pedal-to-mounting bracket nuts <sup>1)</sup>	-	25
Compensator bracket adjustment nut	-	8
Parking brake lever nut	-	15
Brake pedal nut	-	25
Mounting bracket nut	-	25
Vibration damper	-	10

<sup>1)</sup> Replace fastener(s).

<sup>2)</sup> For bolt tightening clarification, refer to ElsaWeb, *Brake, FS III Assembly Overview*, items 7 and 10.

<sup>3)</sup> Every time the banjo bolt is loosened, replace the brake hose/brake line with the banjo bolt.

# Hydraulic Components

## Fastener Tightening Specifications

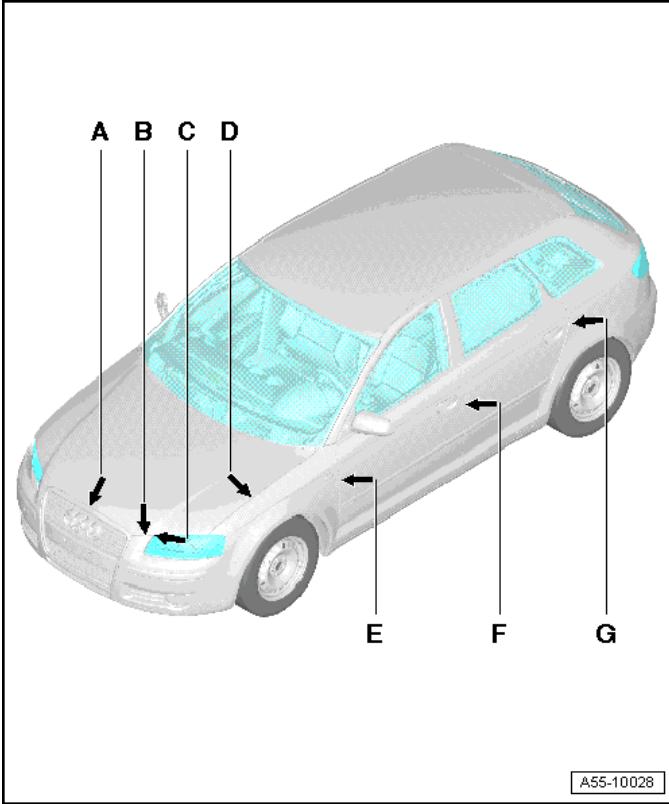
Component	Nm
<b>Front</b>	
Bleeder screw	10
Bleeder screw (FNR-G-57)	15
FN 3 brake caliper housing guide pins	30
FNR-G-57 brake caliper housing guide pins	30
FS III brake caliper housing guide pins	28
<b>Rear</b>	
Bleeder screw	10
Brake caliper housing with parking brake cable lever <sup>1)</sup>	35
<b>All</b>	
Air filter housing	10
Battery carrier-to-body	10
Brake booster/mounting bracket-to-bulkhead	25
Brake line-to-brake master cylinder	14
Heat shield nuts <sup>1)</sup>	20
Master brake cylinder at brake booster	25
Shield-to-bracket	10
Vacuum pump sealing flange	9
Vacuum pump-to-bracket	18
Vacuum pump bracket-to-assembly	18

<sup>1)</sup> Replace fastener(s).

# BODY

## Body Exterior

### Gap Dimensions



	<b>Dimension</b>
Dimension E	3.5 mm +/- 0.5 mm
Dimension F	4.5 mm +/- 0.5 mm
Dimension G	3.5 mm +/- 0.5 mm

Flush dimension to side panel = 0 mm+1 mm with parallel course of gap to body.

## Lock Carrier Tightening Specifications

Component	Nm
Bumper bracket bolts	60
Bumper bracket Torx® bolts	8.5
Lock carrier bolts <sup>1)</sup>	10
	23
	60

<sup>1)</sup> For bolt tightening clarification, refer to ElsaWeb, *Lock Carrier with Attachments*.

## Front Fender Tightening Specification

Component	Nm
Front fender bolts	4.5
	5
	7.5
	10
<b>Noise insulation</b>	
- Combination Screw	6
- Metal Screw	2
Wheel housing liner	2

<sup>1)</sup> For bolt tightening clarification, refer to ElsaWeb, *Fender Overview*.

## Front Hood Tightening Specifications

Component	Nm
Front hood catch nuts	11
Front hood gas filled strut ball head pin	14
Front hood hinge bolts/nuts	21
Hood latch bolts	11
Release lever screws	2

## Rear Lid Tightening Specifications

Component	Nm
Rear lid buffer Torx® bolts	8
Rear lid hinge bolts/nuts	21
Rear lid latch bracket bolts	21
Rear lid lock nuts	21
Rear lid mounting plate Torx® screws	1.7
Rear lid spoiler bolts	2.5 - 4
Rear lid striker nuts	20

## Door Tightening Specifications

Component	Nm
Door frame bolts	32
Door frame collar and Torx® bolts	6
Door hinge bolts	32
Door lock bolts	20
Door striker pin bolts	20
Fuel filler door bolts	1
Window regulator bolts	4
Window regulator motor bolts	3.5

## Front Bumper Tightening Specifications

Component	Nm
Bumper cover bolts <sup>1)</sup>	1.5
	4
	8.5
	23
Radiator grille bolts	8.5

<sup>1)</sup> For bolt tightening clarification, refer to ElsaWeb, *Front Bumper*.

## Rear Bumper and Impact Member Tightening Specifications

Component	Nm
Impact member bolts/nuts <sup>2)</sup>	1.5
	1.7
	2
	2.5
	23
	75
Rear bumper cover bolts <sup>1)</sup>	1.5
	1.7
	1.8
	2
	2.1
	2.3
	2.5
	4
	5
	8.5
	23
	75

<sup>1)</sup> For bolt tightening clarification, refer to ElsaWeb, *Rear Bumper Cover Overview*

<sup>2)</sup> For bolt tightening clarification, refer to ElsaWeb, *Rear Bumper Cover Overview, Rear Impact Member, Lateral Guide, Rear Guide.*

## Exterior Mirror Tightening Specifications

Component	Nm
Mirror adjusting unit mount bolts	10
Mirror base bolts	12
Mirror cover bolts	1

## Sunroof Tightening Specification

Component	Nm
Sunroof bolts/nuts	2 – 3.5

# Body Interior

## Storage Compartment, Center Console Tightening Specifications

Component	Nm
Center console bolts and nuts <sup>1)</sup>	3
	3.5
	14
Center console bracket bolts	1.5
Glove compartment bolts	9
Shift mechanism cover angled bracket nuts	10
Steering column trim bolts	3.5

<sup>1)</sup> For bolt tightening clarification, refer to ElsaWeb, *Center Console Component Overview*.

## Instrument Panel Tightening Specifications

Component	Nm
Instrument panel cover bolts/nuts	1.5 – 3.5
Left and right knee bar bolts	9
Panel trim bolts	1.5 – 3

## Central Tube Tightening Specifications

Component	Nm
Central tube bolts and nuts <sup>1)</sup>	9
	20
	25

<sup>1)</sup> For bolt tightening clarification, refer to ElsaWeb, *Central Tube*.

## Passenger Protection Tightening Specifications

Component	Nm
Airbag control module (J234) nuts	8
Battery interrupt igniter (N253) nuts	15
Belt anchor bolts <sup>1)</sup>	55
Belt guide	8
Belt latch-to-seat (with bucket seat) <sup>1)</sup>	22
Belt latch-to-seat (without bucket seat) <sup>1)</sup>	20
Belt tensioner bolts	55
Driver side airbag unit on steering wheel bolts	7
Electrical wires to main fuses M6	9
Front side airbag bolts	10
Handle to steering column adjustment clamping lever	3.5
LATCH bracket bolts	7
Lower steering column trim to steering column switch module	3.5
Passenger airbag nuts <sup>1)</sup>	9
Rear belt anchor bolts <sup>1)</sup>	55
Rear belt latch bolts <sup>1)</sup>	55
Rear center 3-point seat belt latch hex nut <sup>1)</sup>	55
Rear center belt latch bolts <sup>1)</sup>	55
Rear side airbag bolts	2
Rear side bolt	8
Seat belt height adjust bolt	21
Seat belt relay bolt <sup>1)</sup>	50
Seat belt-to-outer floor assembly anchorage point <sup>1)</sup>	55
Seat Occupied Recognition Control Module -J706-	3.5
Side curtain bolts <sup>1)</sup>	5
Side curtain nuts <sup>1)</sup>	9
Steering Column Electronic Systems Control Module -J527- to steering column switch module	0.4
Steering wheel nut <sup>1)</sup>	50
Three-point seat belt bolts <sup>1)</sup>	50

<sup>1)</sup> Replace fastener(s).



## Interior Trim Tightening Specifications

Component	Nm
A, B, C and D-pillar trim screws	1.2 - 3.5
Front and rear door trim bolts	2 - 4.5
Luggage compartment trim screws	1.8 - 4
Rear lid trim bolts	1.8
Rear shelf bolts	1 - 2
Sunshade bolts	2.5

## Seat Frames Tightening Specifications

Component	Nm
Actuator lever bolts	4.5
Backrest frame bolts	22
Front and rear seat frame bolts <sup>1)</sup>	40
Front backrest adjustment motor bolts	9
Front backrest self-locking bolts <sup>1)</sup>	34
Rear seat center bracket bolt	15
Seat adjustment trim bolts	2 – 3.5
Seat angle adjustment motor bolt <sup>1)</sup>	28
Seat angle adjustment motor screws	10
Seat height adjuster bolts	8
Seat release lever cover screws	2.5
Seat retaining plate bolts	12
Seat storage compartment bolts	0.5 – 3.5
Sill side trim screws	0.5

<sup>1)</sup> Replace fastener(s).

# HEATING, VENTILATION AND AIR CONDITIONING

## *General, Technical Data*

### Refrigerant Oil Distribution

Component	Approximate % of total amount of oil in component
A/C compressor	50
Condenser	10
Suction hose	10
Evaporator	20
Fluid reservoir	10

### Refrigerant R134a Vapor Pressure Table

Temperature in °C	Pressure in Bar (positive pressure) of R134a
-45	-0.61
-40	-0.49
-35	-0.34
-30	-0.16
-25	0.06
-20	0.32
-15	0.63
-10	1.00
-5	1.43
0	1.92
5	2.49
10	3.13
15	3.90
20	4.70
25	5.63
30	6.70
35	7.83
40	9.10
45	10.54
50	12.11
55	13.83
60	15.72
65	17.79
70	20.05
75	22.52
80	25.21
85	28.14
90	31.34

# Air Conditioning

## Fastener Tightening Specifications

Component	Nm
A/C compressor	25
Auxiliary heater heating element	6
Condenser-to-radiator	5
Drive plate (Denso version 1)	20
Drive plate (Denso version 2)	35
Drive plate (Denso version 3)	30
Drive plate-to-shaft (Zexel/Valeo) <sup>1)</sup>	17
Drive plate-to-pulley (Zexel/Valeo) <sup>1)</sup>	7
Drive plate-to-shaft (Sanden)	25
Drive plate-to-pulley (Sanden version 1) <sup>2)</sup>	4.5
Drive plate-to-pulley (Sanden version 2) <sup>2)</sup>	12
Dryer cartridge sealing cap (Denso condenser)	2
Expansion valve	10
Fluid reservoir mounting	10
Heater core clamps	2.5
High pressure sensor	8
Oil drain plug (Denso compressor)	30
Oil drain plug (Sanden compressor)	10
Oil drain plug (Zexel compressor)	10
Oil drain plug (Delphi compressor)	15
Pressure relief valve (Delphi compressor with sealing ring)	15
Pressure relief valve (Sanden compressor)	14.5
Pressure relief valve (Denso compressor)	10
Pressure relief valve (Zexel/Valeo compressor)	10
Refrigerant lines-to-compressor	25
Refrigerant lines-to-condenser	10
Refrigerant line connecting point	10
Refrigerant lines-to-expansion valve	10

<sup>1)</sup> For bolt tightening clarification, refer to ElsaWeb, *A/C Compressor Belt Pulley, Zexel/Valeo Overview*.

<sup>2)</sup> For bolt tightening clarification, refer to ElsaWeb, *A/C Compressor Belt Pulley, Sanden*.

# ELECTRICAL SYSTEM

## *Communication Equipment*

### Fastener Tightening Specifications

<b>Component</b>	<b>Nm</b>
Amplifier screw	4
Amplifier with bass speaker in left luggage compartment nut/screw	5
Antenna amplifier screw	2
Front interior light screw	3
Left antenna module nut/screw	6
Multifunction buttons-to-steering wheel screw (with two blocks of buttons)	1
<b>Speakers</b>	
- Bass speaker nut/screw	5
- Center mid/high range speaker screw	1
- Front mid/low range loudspeaker screw	2
- Rear midrange speaker screw	2
- Rear speaker screw	2
Telephone antenna nut	6
Telephone baseplate in center armrest bolt	1
Telephone baseplate-to-instrument panel bolt	2
Telephone/navigation system/auxiliary heater antenna nut	6

# Electrical Equipment

## Battery, Starter, Generator and Cruise Control Tightening Specifications

### Battery

Component	Nm
Battery bracket bolts	22
Battery cover-to-body	8
Battery terminal-to-battery pole	6
Battery-to-body	6
Ground wire-to-body	20

### Starter

Component	Nm
<b>2.0L TSFI (CBFA, CCTA)</b>	
Electrical wires bracket	23
Ground cable-to-starter	23
Starter-to-manual transmission	80
Terminal B+to-starter	16
<b>2.0L TDI CR (CBEA)</b>	
Starter-to-transmission	40
Terminal B+to-starter	15

### Generator

Component	Nm
<b>2.0L TSFI (CBFA, CCTA)</b>	
Generator-to-accessories bracket	23
Ribbed belt tensioner-to-accessories bracket	23
Terminal 30/B+to-generator	16
<b>2.0L TDI CR (CBEA)</b>	
Generator-to-accessories bracket	23
Terminal 30/B+to-generator	16

### Instruments Tightening Specifications

Component	Nm
Cigarette lighter-to-center console	1.5
Horn-to-bracket	9
Instrument cluster-to-instrument panel	3.5
Lock carrier bracket	8
Longitudinal member bracket	60
Radio frequency controlled clock receiver-to-bumper	2.5
Signal horn and dual tone horn-to-bracket	5

## Windshield Wiper/Washer Tightening Specifications

Component	Nm
Wiper crank-to-wiper motor	18
Wiper frame-to-plenum chamber	8
Wiper motor-to-wiper frame	9
Rear window wiper arm nut	12
Rear window wiper motor-to-rear lid	8
Windshield washer fluid reservoir filler tube-to-wheel housing	8
Windshield washer fluid reservoir-to-longitudinal member nut	8
Windshield washer fluid reservoir-to-longitudinal member screw	8

## Exterior Lights, Switches Tightening Specifications

Component	Nm
Fog lamp housing-to-bumper	6
Gas discharge bulb control module-to-headlamp	1.5
Gas discharge bulb control module-to-headlamp housing	1.4
Headlamp beam adjustment motor-to-headlamp housing	1
Headlamp housing mount-to-lock carrier	4.5
Headlamp housing-to-mount	4.5
Headlamp housing retaining strap	6
Headlamp power output stage-to-headlamp housing	1.4
Headlamp range control module-to-center console	1.3
Headlamp-to-lock carrier	6
High-mounted brake lamp-to-roof spoiler	4.5
Inner tail lamp-to-body	3.5
Steering column electronic systems control module-to-steering column switch module	1.4
Tail lamps-to-body	3.5
Turn signal bulb-to-outside mirror housing	0.9

# DTC CHART

## Engine Code CBEA (TDI)

### Fuel and Air Mixture, Additional Emission Regulations

DTC	Error Message	Malfunction Criteria and Threshold Value
P00AF	Turbocharger Boost Control "A" Module Performance	Boost pressure actuator stuck < 10% when commanded on or > 10% when commanded off.
P0045	Turbocharger Boost Control Solenoid "A" Circuit Open	Open circuit message from output driver
P0047	Turbocharger Boost Control Solenoid "A" Circuit Low	Short to ground message from output driver
P0048	Turbocharger Boost Control Solenoid "A" Circuit High	Short to voltage message from output driver
P0071	Ambient Air Temperature Sensor Circuit Range/ Performance	Temperature difference to at least 3 other temperature sensors at startup > 45 K
P0072	Ambient Air Temperature Sensor Circuit Low	Error signal low sent from Cluster to ECU
P0073	Ambient Air Temperature Sensor Circuit High	Error signal high sent from Cluster to ECU
P0087	Fuel Rail/System Pressure - Too Low	<ul style="list-style-type: none"> <li>• Control deviation &gt; 150 - 200 Bar</li> <li>• Exceeding absolute rail pressure limits &lt; 120 - 125 Bar or &gt; 1950 Bar</li> <li>• Control deviation &lt; -200 to -300 Bar</li> <li>• Exceeding absolute rail pressure limits &gt; 1950 bar.</li> </ul>
P0088	Fuel Rail/System Pressure - Too High	<ul style="list-style-type: none"> <li>• Control deviation &gt; 150 - 200 Bar</li> <li>• Exceeding absolute rail pressure limits &lt; 120 - 125 Bar or &gt; 1950 Bar</li> <li>• Control deviation &lt; -200 to -300 Bar</li> </ul>
P0090	Fuel Pressure Regulator 1 Control Circuit	Open circuit diagnostic signal from output driver
P0091	Fuel Pressure Regulator 1 Control Circuit Low	Grounded circuit diagnostic signal from output driver

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0091	Fuel Pressure Regulator 1 Control Circuit Low	Grounded circuit diagnostic signal from output driver
P0092	Fuel Pressure Regulator 1 Control Circuit High	Over current circuit diagnostic signal from output driver
P0100	Mass Air Flow Circuit	<ul style="list-style-type: none"> <li>• Signal range check high, battery voltage &gt; 17 V</li> <li>or</li> <li>• Signal range check low, battery voltage &lt; 7.5 V</li> </ul>
P0101	Mass Air Flow Circuit Range/ Performance	Deviation between actual mass airflow and modeled air mass > 1.16 or < 0.84
P0102	Mass Air Flow Circuit Low Input	Range check low: <ul style="list-style-type: none"> <li>• Calculated PWM signal period time &gt; 854 kg/h</li> <li>or</li> <li>• Raw value PWM signal period time &gt; 900 kg/h</li> </ul>
P0103	Mass Air Flow Circuit High Input	Range check high: <ul style="list-style-type: none"> <li>• Calculated PWM signal period time &lt; -57 kg/h</li> <li>or</li> <li>• Raw value PWM signal period time &lt; -150 kg/h</li> </ul>
P0111	Intake Air Temperature Circuit Performance	Temperature difference to at least 3 other temperature sensors at startup > 20 K
P0112	Intake Air Temperature Circuit Low Input	Boost temperature sensor voltage < 0.04 V
P0113	Intake Air Temperature Circuit High Input	Boost temperature sensor voltage > 2.88 V
P0116	Engine Coolant Temperature Sensor 1 Circuit Range/ Performance	<ul style="list-style-type: none"> <li>• Time for coolant temp to reach 20° C or increase by 10 K.... &gt; 300 Sec. for start temperature &lt;10° C or &gt; 120 Sec. for start temp &gt; 10° C</li> </ul>
P0117	Engine Coolant Temperature (Sensor 1) Circuit Low	Coolant temperature sensor voltage < 0.15 V
P0118	Engine Coolant Temperature (Sensor 1) Circuit High	Coolant temperature sensor voltage > 3.25 V



DTC	Error Message	Malfunction Criteria and Threshold Value
P0128	Coolant Thermostat Temperature below control range	Measured temperature lower than model temperature < 70° C and modeled temperature > 80° C
P0130	O2 Sensor Circuit (Bank 1, Sensor 1) Malfunction	<ul style="list-style-type: none"> <li>• Short to battery &gt; 3 V</li> <li>• Nernst voltage &gt; 4 V</li> <li>• Adjustment voltage &gt; 1.5 V</li> </ul> or <ul style="list-style-type: none"> <li>• Short to ground &lt; 2 V</li> <li>• Nernst voltage &lt; 1.75 V</li> <li>• Adjustment voltage &lt; 0.3 V</li> </ul>
P0132	O2 Sensor Circuit (Bank 1, Sensor 1) High Voltage	O2 sensor raw signal > 3.2 V
P0135	O2 Sensor Heater Circuit (Bank 1 Sensor 1) Malfunction	Sensor element temperature < 720° or > 840° C
P0136	O2 Sensor Circuit (Bank 1 Sensor 2) Malfunction	<ul style="list-style-type: none"> <li>• Short to battery &gt; 3 V</li> <li>• Nernst voltage &gt; 4 V</li> <li>• Adjustment voltage &gt; 1.5 V</li> </ul> and <ul style="list-style-type: none"> <li>• Short to ground &lt; 2 V</li> <li>• Nernst voltage &lt; 1.75 V</li> <li>• Adjustment voltage &lt; 0.3 V</li> </ul>
P0138	O2 Sensor Circuit (Bank 1 Sensor 2) High Voltage	O2S raw signal > 3.2 V
P0141	O2 Heater Circuit (Bank 1, Sensor 2) Malfunction	<ul style="list-style-type: none"> <li>• Max fault sensor element temp &gt; 840° C</li> <li>• Min fault sensor element temp.&lt; 720</li> <li>• Voltage error signal from output driver.</li> </ul>
P0181	Fuel Temperature Sensor A Circuit Range/Performance	Temperature difference to at least 3 other temperature sensors at startup > 30 K
P0182	Fuel Temperature Sensor A Circuit Low	Fuel temperature sensor voltage < 0.05 V
P0183	Fuel Temperature Sensor A Circuit High	Fuel temperature sensor voltage > 4.7 V
P0191	Fuel Rail Pressure Sensor Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Sensor voltage &lt; 269 mV or &gt; 591 mV</li> <li>• Adaptation value out of limit &lt; 70% or &gt; 130%</li> </ul>

**DTC Chart**

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0192	Fuel Rail Pressure Sensor Circuit Low Input	<ul style="list-style-type: none"> <li>• Sensor voltage &lt; 200 mV or &gt; 4800 mV</li> <li>• Adaptation value out of limit &lt; 70% or &gt; 130%</li> </ul>
P0193	Fuel Rail Pressure Sensor Circuit High Input	<ul style="list-style-type: none"> <li>• Sensor voltage &lt; 269 mV or &gt; 591 mV</li> <li>• Adaptation value out of limit &lt; 70% or &gt; 130%</li> </ul>
P020A	Cylinder 1 Injection Timing	<ul style="list-style-type: none"> <li>• Control error &lt; limit from MAP f (engine speed and desired torque) -8 °CA to -4 °CA</li> <li>or</li> <li>• Control error &lt; limit from MAP f (engine speed and desired torque) +8 °CA to +4 °CA</li> </ul>
P020B	Cylinder 2 Injection Timing	<ul style="list-style-type: none"> <li>• Control error &lt; limit from MAP f (engine speed and desired torque) -8 °CA to -4 °CA</li> <li>or</li> <li>• Control error &lt; limit from MAP f (engine speed and desired torque) +8 °CA to +4 °CA</li> </ul>
P020C	Cylinder 3 Injection Timing	<ul style="list-style-type: none"> <li>• Control error &lt; limit from MAP f (engine speed and desired torque) -8 °CA to -4 °CA</li> <li>or</li> <li>• Control error &lt; limit from MAP f (engine speed and desired torque) +8 °CA to +4 °CA</li> </ul>
P020D	Cylinder 4 Injection Timing	<ul style="list-style-type: none"> <li>• Control error &lt; limit from MAP f (engine speed and desired torque) -8 °CA to -4 °CA</li> <li>or</li> <li>• Control error &lt; limit from MAP f (engine speed and desired torque) +8 °CA to +4 °CA</li> </ul>
P0201	Cylinder 1 Injector Circuit	Open circuit diagnostic signal from output driver
P0202	Cylinder 2 Injector Circuit	Open circuit diagnostic signal from output driver
P0203	Cylinder 3 Injector Circuit	Open circuit diagnostic signal from output driver
P0204	Cylinder 4 Injector Circuit	Open circuit diagnostic signal from output driver

DTC	Error Message	Malfunction Criteria and Threshold Value
P0234	Turbo Charger Overboost Condition limit exceeded	Control deviation >400 hPa or < -300 hPa
P0236	Turbocharger Boost Sensor (A) Circuit Performance	Boost Pressure Sensor > 150 hPa
P0237	Turbocharger Boost Sensor (A) Circuit Low Input	Boost Pressure Sensor < 0.68 V
P0238	Turbocharger Boost Sensor (A) Circuit High Input	Boost Pressure Sensor > 4.88 V
P0263	Cylinder 1 Contribution/ Balance	Calibration value of injector energizing time > 217 - 426 $\mu$ s (depending on rail pressure) or < 117 - 157 $\mu$ s
P0266	Cylinder 2 Contribution/ Balance	Calibration value of injector energizing time > 217 - 426 $\mu$ s (depending on rail pressure) or < 117 - 157 $\mu$ s
P0269	Cylinder 3 Contribution/ Balance	Calibration value of injector energizing time > 217 - 426 $\mu$ s (depending on rail pressure) or < 117 - 157 $\mu$ s
P0272	Cylinder 4 Contribution/ Balance	Calibration value of injector energizing time > 217 - 426 $\mu$ s (depending on rail pressure) or < 117 - 157 $\mu$ s
P0299	Turbo Charger Underboost	Control deviation >400 hPa or < -300 hPa
P20D8	Exhaust After Treatment Fuel Supply Control Performance	Control deviation < limit from Map f or > limit from Map f (engine speed, torque)
P2000	NOx Adsorber Efficiency Bank 1 Below Threshold	<ul style="list-style-type: none"> <li>• Oxygen signals post NOx trap &lt; 0.95</li> <li>• Oxygen signals pre NOx trap &lt; 0.045</li> <li>• Mass of reductant consumption &lt; 0.9 g</li> </ul>
P2002	Particulate Trap Bank 1 Efficiency Below Threshold	<ul style="list-style-type: none"> <li>• Differential pressure f (exhaust gas volume flow)</li> <li>or</li> <li>• Accumulated loading increment from differential pressure &lt; 1 g</li> </ul>
P2004	Intake Manifold Runner (Bank 1) Control Circuit/Open	Flap valve stuck open or closed < 10% or > 10%

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P2008	Intake Manifold Runner Control Circuit/Open (Bank 1)	Open load diagnostic signal from output driver
P2009	Intake Manifold Runner (Bank 1) Control Circuit Low	Short to ground on output 1 or 2 signal from output driver
P2010	Intake Manifold Runner Control Circuit High (Bank 1)	Short to voltage on output 1 or 2 signal from output driver
P2015	Intake Manifold Runner Position Sensor Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Position sensor signal out of desired range during closed position learning &lt; 3.79 V or &gt; 4.61 V</li> <li>• Position sensor signal out of desired range during open position learning &lt; 0.39 V or &gt; 1.21 V</li> </ul>
P2016	Intake Manifold Runner Position Sensor Circuit Low	Position sensor signal < 0.25 V
P2017	Intake Manifold Runner Position Sensor Circuit High	Position sensor signal > 4.75 V
P2031	Exhaust Gas Temperature Sensor 2 Circuit	Sensor 2 voltage > 1.72 V
P2032	Exhaust Gas Temperature Sensor 2 Circuit Low	Sensor 2 voltage < 0.45 V
P2080	Exhaust Gas Temperature Sensor Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Comparison of upstream turbine exhaust gas temp vs modeled temperature &lt; 85° C</li> <li>or</li> <li>• Temperature difference to other temperature sensors during cold start &lt; 45° K</li> </ul>
P2084	Exhaust Gas Temperature Sensor 2 Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Comparison of upstream turbine exhaust gas temp vs modeled temperature &lt; 85° C</li> <li>or</li> <li>• Temperature difference to other temperature sensors during cold start &lt; 45° K</li> </ul>

## Ignition System

DTC	Error Message	Malfunction Criteria and Threshold Value
P0300	Random/Multiple Cylinder. Misfire Detected	<ul style="list-style-type: none"> <li>• Rise in engine speed after fuel injection Calculated based on values from last two engine revolutions</li> <li>• Error threshold 82% misfire over 440 crankshaft revolutions</li> </ul>
P0301	Cylinder 1 Misfire Detected	<ul style="list-style-type: none"> <li>• Rise in engine speed after fuel injection Calculated based on values from last two engine revolutions</li> <li>• Error threshold 82% misfire over 440 crankshaft revolutions</li> </ul>
P0302	Cylinder 2 Misfire Detected	<ul style="list-style-type: none"> <li>• Rise in engine speed after fuel injection Calculated based on values from last two engine revolutions</li> <li>• Error threshold 82% misfire over 440 crankshaft revolutions</li> </ul>
P0303	Cylinder 3 Misfire Detected	<ul style="list-style-type: none"> <li>• Rise in engine speed after fuel injection Calculated based on values from last two engine revolutions</li> <li>• Error threshold 82% misfire over 440 crankshaft revolutions</li> </ul>
P0304	Cylinder 4 Misfire Detected	<ul style="list-style-type: none"> <li>• Rise in engine speed after fuel injection Calculated based on values from last two engine revolutions</li> <li>• Error threshold 82% misfire over 440 crankshaft revolutions</li> </ul>
P0321	Engine Speed Input Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Consecutive not plausible signals &gt; 15</li> <li>• Cam phase signals without plausible signal &gt; 4 cam rotations.</li> </ul>
P0322	Engine Speed Input Circuit No Signal	No incremental signal. Internal self test failed.

DTC	Error Message	Malfunction Criteria and Threshold Value
P0381	Glow Plug/Heater Indicator Circuit	Receipt bit for lamp request not equal with lamp request bit.
P0383	Glow Plug Control Module Control Circuit Low	Diagnostic error signal sent from output driver

### Additional Exhaust Regulation

DTC	Error Message	Malfunction Criteria and Threshold Value
P040B	Exhaust Gas Recirculation Temperature Sensor Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Sensor temperature &lt; 55° C or</li> <li>• Temperature difference to other temperature sensors during cold start &lt; 45 °K</li> </ul>
P040C	Exhaust Gas Recirculation Temperature Sensor Circuit Low	Signal sensor voltage < 0.06 V
P040D	Exhaust Gas Recirculation Temperature Sensor Circuit High	Signal sensor voltage > 3.24 V
P0401	Exhaust Gas Recirculation Insufficient Flow Detected	Control deviation < limit from map f (engine speed, desired airflow)
P0402	Exhaust Gas Recirculation Excessive Flow Detected	Control deviation > limit from map (engine speed, desired airflow)
P0403	Exhaust Gas Recirculation Circuit	Open load circuit, short to ground or voltage on Out 1 or Out 2, or low voltage supply, short circuit overload
P0405	Exhaust Gas Recirculation Sensor Circuit Low	Position sensor signal range check low.
P0406	Exhaust Gas Recirculation Sensor Circuit High	Position sensor signal range check high.
P0420	Catalyst System Bank1 Efficiency Below Threshold	HC conversion rate < 0.3
P045A	Exhaust Gas Recirculation "B" Control Circuit	Circuit open load or short to voltage
P045C	Exhaust Gas Recirculation "B" Control Circuit Low	Check EGR Valve 2 and Position Sensor -N213-.
P045D	Exhaust Gas Recirculation "B" Control Circuit High	Circuit short to voltage on Out 1 or Out 2

DTC	Error Message	Malfunction Criteria and Threshold Value
P045E	Exhaust Gas Recirculation "B" Control Stuck Open	Comparison of actual and desired position signal • Control deviation > 15%
P045F	Exhaust Gas Recirculation "B" Control Stuck Closed	Comparison of actual and desired position signal • Control deviation < -15%
P047C	Exhaust Pressure Sensor "B" Low	Pressure sensor voltage < 0.2 V
P047D	Exhaust Pressure Sensor "B" High	Pressure sensor voltage > 4.9 V
P047F	Exhaust Pressure Control Valve "A" Stuck Open	Control valve stuck open - position sensor > 10% when commanded closed
P0471	Exhaust Pressure Sensor "A" Range/Performance	Differential of pressure signal < -27 hPa or > 80 hPa
P0472	Exhaust Pressure Sensor A Low	Sensor voltage < 0.2 V
P0473	Exhaust Pressure Sensor A High	Sensor voltage >4.9 V
P0475	Exhaust Pressure Control Valve "A"	Open load or short circuit overload diagnostic signal from output driver
P0477	Exhaust Pressure Control Valve "A" High	Short to voltage on Out 1 or Out 2 signal from output driver.
P048A	Exhaust Pressure Control Valve "A" Stuck Closed	Control valve stuck closed - position sensor < 10% when commanded open
P048B	Exhaust Pressure Control Valve Position Sensor Circuit Low	Position sensor signal < 0.25 V
P048C	Exhaust Pressure Control Valve Position Sensor Circuit Range/Performance	Position sensor signal in desired range during closed position learning > 1.1 V or < 0.5 V
P048E	Exhaust Pressure Control Valve Position Sensor Circuit High	Position sensor signal > 4.75 V

## Speed and Idle Control

DTC	Error Message	Malfunction Criteria and Threshold Value
P0501	Vehicle Speed Sensor Performance	Vehicle speed < 6 km/h
P0503	Vehicle Speed Sensor Intermittent High Signal	Vehicle speed > 320 km/h
P0506	Idle Control System RPM Lower than Expected	Deviation between actual and desired RPM < 30%
P0507	Idle Control System RPM Higher than Expected	Deviation between actual and desired RPM > 30%
P0534	Vehicle Speed Sensor "A" Intermittent/Erratic/High	
P0544	Exhaust Gas Temperature Sensor Circuit (Bank 1)	Signal voltage > 1.72 V
P0545	Exhaust Gas Temperature Sensor Circuit (Bank 1) Low	Signal voltage < 0.45 V
P0562	System Voltage Low Voltage	Internal check failure of voltage supply for ECM off timer

## Control Module and Output Signals

DTC	Error Message	Malfunction Criteria and Threshold Value
P06A3	Sensor Reference Voltage "D" Circuit/Open	Sensor supply voltage < 2.97 V or > 3.63 V
P0604	Internal Control Module Random Access Memory (RAM) Error	<ul style="list-style-type: none"> <li>• Write EEPROM not possible</li> <li>• Checksum error in 3 or more locations</li> </ul>
P0606	Internal Control Module Memory Check Sum Error	<ul style="list-style-type: none"> <li>• ECM internal self test failed</li> </ul>
P0607	Control Module Performance	LSU adaption value < -0.2 V > 0.2 V
P0627	Fuel Pump "A" Control Circuit/ Open	Open circuit signal from output driver
P0628	Fuel Pump "A" Control Circuit Low	Grounded circuit signal from output driver
P0629	Fuel Pump "A" Control Circuit High	Over Current signal from output driver
P0634	ECM Internal Temperature Too High	Current Over-Temperature diagnostic signal from output driver



DTC	Error Message	Malfunction Criteria and Threshold Value
P0638	Throttle Actuator Control Range/Performance (Bank 1)	Diagnostic signal from actuator module = defective state
P0641	Sensor Reference Voltage "A" Circuit Open	Sensor supply voltage < 4.8 V or > 5.2 V
P0651	Sensor Reference Voltage "B" Circuit Open	Sensor supply voltage < 4.8 V or > 5.2 V
P066A	Cylinder 1 Glow Plug Control Circuit Low	Over current on circuit > 75 A
P066C	Cylinder 2 Glow Plug Control Circuit Low	Over current on circuit > 75 A
P066E	Cylinder 3 Glow Plug Control Circuit Low	Over current on circuit > 75 A
P067A	Cylinder 4 Glow Plug Control Circuit Low	Over current on circuit > 75 A
P0670	Glow Plug Module 1 Control Circuit electrical malfunction electrical circuit	Output driver = OFF state
P0671	Cylinder 1 Glow Plug Circuit Q10 Electrical Fault	Message from Glow Control Unit ( I < 2.5 A)
P0672	Cylinder 2 Glow Plug Circuit Q11 Electrical Fault	Message from Glow Control Unit ( I < 2.5 A)
P0673	Cylinder 3 Glow Plug Circuit Q12 Electrical Fault	Message from Glow Control Unit ( I < 2.5 A)
P0674	Cylinder 4 Glow Plug Circuit Q13 Electrical Fault	Message from Glow Control Unit ( I < 2.5 A)
P068A	ECM Power Relay Performance - De-Energized Too Early	Relay opens too early.
P068B	ECM Power Relay Performance - De-Energized Too Late	Relay stuck, no change in circuit voltage
P0684	Glow Plug Control Module to PCM Communication Circuit Range/Performance	Message from glow relay-missing info from Glow Control Unit
P0697	Sensor Reference Voltage "C" Circuit Open	Sensor supply voltage < 3.168 V or > 3.432 V
U0001	High Speed CAN Communication Bus	CAN driver A status Bus Off.
U0002	High Speed CAN Communication Bus Performance	CAN driver A status

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
U0029	Vehicle Communication Bus A Performance	CAN driver B status no communication
U0101	Lost Communication with TCM	No TCM messages received.
U102C	Lost Communication With Anti-Lock Brake System (ABS) Control Module	Value from brake control unit = error state
U0121	Lost Communication With Anti-Lock Brake System (ABS) Control Module	No messages received from ABS module
U0155	Lost Communication With Instrument Panel Cluster (IPC) Control Module	No messages received from Instrument cluster
U0302	Software Incompatibility with Transmission Control Module	Wrong TCM messages received.
U0402	Invalid Data Received From Transmission Control Module	Wrong TCM messages received.
U0415	Invalid Data Received From Anti-Lock Brake System Control Module	Invalid ABS messages sent.
U0423	Invalid Data Received From Instrument Panel Cluster Control Module	Error message sent from instrument cluster to ECU
U1024	Control module for instrument panel insert please read DTC	Error message sent from instrument cluster to ECU

### **Fuel and Air Ratios Control Module**

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P1004	Torque difference cylinder 1 Limiting value exceeded	Control error < limit from MAP f (engine speed and desired torque) -50 to -30 Nm OR +50 to +30 Nm
P1005	Torque difference cylinder 2 Limiting value exceeded	Control error < limit from MAP f (engine speed and desired torque) -50 to -30 Nm OR +50 to +30 Nm
P1006	Torque difference cylinder 3 Limiting value exceeded	Control error < limit from MAP f (engine speed and desired torque) -50 to -30 Nm OR +50 to +30 Nm

DTC	Error Message	Malfunction Criteria and Threshold Value
P1007	Torque difference cylinder 4 Limiting value exceeded	Control error < limit from MAP f (engine speed and desired torque) -50 to -30 Nm OR +50 to +30 Nm
P13CE	Sensor for internal pressure of cylinder 1 Electrical malfunction	Cylinder pressure sensor voltage > 3.17 V
P13CF	Sensor for internal pressure of cylinder 1 Short circuit to ground	Cylinder pressure sensor voltage < 0.13 V
P13D0	Sensor for internal pressure of cylinder 1 Implausible signal	<ul style="list-style-type: none"> <li>• Cylinder pressure sensor voltage &lt; 0.33 V or &gt; 3.09 V or</li> <li>• Deviation between min and max cylinder pressure # 1 &lt; 20 bar</li> <li>• Offset out of range &lt; -5 or &gt; 5 bar</li> <li>or</li> <li>• Pressure based measured TDC position sensor out of range</li> <li>or</li> <li>• Difference of TDC values calculated by 2 different methods out of range &lt; -2.5 ° CRK rev or &gt; 2.5 ° CRK rev.</li> </ul>
P13D1	Sensor for internal pressure of cylinder 2 Electrical malfunction	Cylinder pressure sensor voltage > 3.17 V
P13D2	Sensor for internal pressure of cylinder 2 Short circuit to ground	Cylinder pressure sensor voltage < 0.13 V
P13D3	Sensor for internal pressure of cylinder 2 Implausible signal	<ul style="list-style-type: none"> <li>• Cylinder pressure sensor voltage &lt; 0.33 V or &gt; 3.09 V or</li> <li>• Difference of TDC values calculated by 2 different methods out of range &lt; -2.5 ° CRK rev or &gt; 2.5 ° CRK rev.</li> </ul>
P13D4	Sensor for internal pressure of cylinder 3 Electrical malfunction	Cylinder pressure sensor voltage > 3.17 V

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P13D5	Sensor for internal pressure of cylinder 3 Short circuit to ground	Cylinder pressure sensor voltage < 0.13 V
P13D6	Sensor for internal pressure of cylinder 3 Implausible signal	<ul style="list-style-type: none"> <li>• Cylinder pressure sensor voltage &lt; 0.33 V or &gt; 3.09 V</li> <li>or</li> <li>• Difference of TDC values calculated by 2 different methods out of range &lt; -2.5 ° CRK rev or &gt; 2.5 ° CRK rev.</li> </ul>
P13D7	Sensor for internal pressure of cylinder 4 Electrical malfunction	Cylinder pressure sensor voltage > 3.17 V
P13D8	Sensor for internal pressure of cylinder 4 Short circuit to ground	Cylinder pressure sensor voltage < 0.13 V
P13D9	Sensor for internal pressure of cylinder 4 Implausible signal	<ul style="list-style-type: none"> <li>• Cylinder pressure sensor voltage &lt; 0.33 V or &gt; 3.09 V</li> <li>or</li> <li>• Difference of TDC values calculated by 2 different methods out of range &lt; -2.5 ° CRK rev or &gt; 2.5 ° CRK rev.</li> </ul>
P140C	Low Pressure EGR Sensor Position circuit high	Position sensor signal < 150 mV
P140E	Low Pressure EGR Sensor Position circuit Low	Position sensor signal < 4850 mV
P2100	Throttle Actuator Control Motor Circuit/Open	Open circuit diagnostic signal sent from output driver
P2101	Throttle Actuator A Control Motor Circuit Range/Performance	Missing diagnostic signal from actuator module
P2102	Throttle Actuator Control Motor Circuit Low	Grounded circuit diagnostic signal sent from output driver
P2103	Throttle Actuator "A" Control Motor Circuit High	Circuit short to voltage diagnostic signal sent from output driver
P2122	Throttle/Pedal Position Sensor D Circuit Low Input	Sensor 1 voltage < 0.61 V
P2123	Throttle/Pedal Position Sensor D Circuit High Input	Sensor 1 voltage > 4.79 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P2127	Throttle/Pedal Position Sensor E Circuit Low Input	Sensor 2 voltage < 0.27 V
P2128	Throttle/Pedal Position Sensor E Circuit High Input	Sensor 2 voltage > 2.43 V
P2138	Throttle/Pedal Position Sensor D/E Voltage Correlation	Voltage drift monitoring: <ul style="list-style-type: none"> <li>• Throttle Position Sensor 1 voltage &gt; 1.02 V and APP Sensor 2 &lt; 0.46 V</li> </ul> or <ul style="list-style-type: none"> <li>• Throttle Position Sensor 1 voltage &lt; 0.92 V and APP Sensor 2 &gt; 0.51 V</li> </ul>
P2183	Engine Coolant Temperature Sensor 2 Circuit Range/ Performance	Temperature difference to at least 3 other temperature sensors at startup > 30 K
P2184	Engine Coolant Temperature Sensor 2 Circuit Low	Coolant signal range check low < 0.15 V
P2185	Engine Coolant Temperature Sensor 2 Circuit High	Coolant signal range check high > 3.25 V
P2195	O2 Sensor Signal Stuck Lean (Bank 1 Sensor 1)	Deviation to oxygen concentration > 0.046
P2196	O2 Sensor Signal Stuck Rich (Bank 1 Sensor 1)	Deviation to oxygen concentration < 0.063
P2237	O2 Sensor Positive Current Control Circuit (Bank 1 Sensor 1 Open)	Measured oxygen concentration < 0.005
P2243	O2 Sensor Reference Voltage Circuit (Bank 1 Sensor 1 Open)	<ul style="list-style-type: none"> <li>• O2S internal resistance &gt; 1104Ω</li> <li>• Oxygen sensor raw signal &gt; 3 V</li> </ul>
P2251	O2 Sensor Negative Current Control Circuit (Bank 1 Sensor 1) open	<ul style="list-style-type: none"> <li>• O2S internal resistance &gt; 1104 Ω</li> <li>• Oxygen sensor raw signal &lt; 1.4 V or &gt; 1.6 V</li> </ul>
P2270	O2 Sensor Signal Stuck Lean (Bank 1, Sensor 2)	Deviation to oxygen concentration during fuel cutoff > 0.046
P2271	O2 Sensor Signal Stuck Rich (Bank 1, Sensor 2)	Deviation to oxygen concentration during fuel cutoff < -0.063
P2279	Intake Air System Leak	Deviation between actual airflow and modeled mass air flow < 0.7

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P2294	Fuel Pressure Regulator 2 Control Circuit	Open circuit diagnostic signal from output driver
P2295	Fuel Pressure Regulator 2 Control Circuit Low	Grounded circuit diagnostic signal from output driver
P2296	Fuel Pressure Regulator 2 Control Circuit High	Over current circuit diagnostic signal from output driver

## Ignition System

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P2300	Ignition Coil A Primary Control Circuit Low	Signal current > 24.0 mA
P2301	Ignition Coil A Primary Control Circuit High	Signal current > 5.1 - 7.0 mA
P2303	Ignition Coil B Primary Control Circuit Low	Signal current > 24.0 mA
P2304	Ignition Coil B Primary Control Circuit High	Signal current > 5.1 - 7.0 mA
P2306	Ignition Coil C Primary Control Circuit Low	Signal current > 24.0 mA
P2307	Ignition Coil C Primary Control Circuit High	Signal voltage > 5.1 - 7.0 mA
P2309	Ignition Coil D Primary Control Circuit Low	Signal current > 24.0 mA
P2310	Ignition Coil D Primary Control Circuit High	Signal voltage > 5.1 - 7.0 mA

## Additional Emissions Regulations

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P242A	Exhaust Gas Temperature Sensor Circuit Bank 1 Sensor 3	Sensor signal voltage > 1.72 V
P242B	Exhaust Gas Temperature Sensor Circuit Bank 1 Sensor 3 Range/Performance	Comparison of upstream turbine exhaust gas temp vs modeled temperature < 45K
P242C	Exhaust Gas Temperature Sensor Circuit Low Bank 1 Sensor 3	Sensor signal voltage < 0.45 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P2413	Exhaust Gas Recirculation System Performance	<ul style="list-style-type: none"> <li>• Number of learning points at fuel mass adaptation limit &gt; or = to 4</li> <li>• At upper limit = 6</li> <li>• At lower limit = -6 mg/stroke</li> </ul>
P2453	Diesel Particulate Filter Differential Pressure Sensor Circuit Range/Performance	Differential pressure signal < -30 hPa
P2457	Exhaust Gas Recirculation Cooling System Performance	Sensor temperature above threshold 50° K
P246E	Exhaust Gas Temperature Sensor Circuit Bank 1 Sensor 4	Sensor signal voltage > 1.72 V
P246F	Exhaust Gas Temperature Sensor Circuit Bank 1 Sensor 4 Range/Performance	<ul style="list-style-type: none"> <li>• Sensor temperature &lt; 45K or</li> <li>• Temperature difference to other temperature sensors during cold start &lt; 45° K</li> </ul>
P2463	Diesel Particulate Filter - Soot Accumulation	Calculated particulate matter trap loading > 40 g
P247A	Exhaust Gas Temperature Out of Range (Bank 1 Sensor 3)	Control deviation > limit from Map f or < limit from Map f (engine speed, torque)
P2470	Exhaust Gas Temperature Sensor Circuit Low Bank 1 Sensor 4	Sensor signal voltage < 0.45 V
P2478	Exhaust Gas Temperature Out of Range Bank 1 Sensor 1	Control deviation > limit from Map f or < limit from Map f (engine speed, torque)
P2564	Turbocharger Boost Control Position Sensor Circuit Low	Sensor signal voltage < 0.15 V
P2565	Turbocharger Boost Control Position Sensor Circuit High	Sensor signal voltage > 4.85 V
P2610	ECM/PCM Internal Engine Off Timer Performance	Quantity count over time threshold < 7.52 or > 8.48 Sec.
P2632	Fuel Pump "B" Control Circuit Open	Open circuit diagnostic signal from output driver
P2633	Fuel Pump "B" Control Circuit Low	Grounded circuit diagnostic signal from output driver
P2634	Fuel Pump "B" Control Circuit High	Over current circuit diagnostic signal from output driver

# DTC CHART

## Engine Code CBFA

### Fuel and Air Mixture, Additional Emission Regulations

DTC	Error Message	Malfunction Criteria and Threshold Value
P000A	Intake (A) Camshaft Position Slow Response (Bank 1)	Signal change < 1.9 - 4.2°CRK/s
P0010	Intake (A) Camshaft Position Actuator Circuit/Open (Bank 1)	Signal voltage > 4.40 - 5.60 V
P0011	Intake (A) Camshaft Position Timing - Over-Advanced (Bank 1)	Target error (stuck position) > 6.8 - 8°CRK
P0016	Crankshaft Position - Camshaft Position Correlation (Bank 1, Sensor A)	<ul style="list-style-type: none"> <li>• Permissible deviation &lt; 11° Rev</li> <li>or</li> <li>• Permissible deviation &gt; 11° Rev</li> </ul>
P025A	Fuel Pump Open Circuit	Signal voltage > 4.40 - 5.60 V
P025C	Fuel Pump Short to Ground	Signal voltage < 2.15 - 3.25 V
P025D	Fuel Pump Short to B+	Signal current > 1.10 A
P0030	HO2S Heater Control Circuit (Bank 1, Sensor 1) Open Circuit	Heater voltage 2.34 - 3.59 V
P0031	HO2S Heater Control Circuit Low (Bank 1, Sensor 1) Short to Ground	Heater voltage < 2.34 V
P0032	HO2S Heater Control Circuit High (Bank 1, Sensor 1) Short to B+	Heater voltage > 3.59 V
P0036	HO2S Heater Control Circuit, Bank 1, Sensor 2, Open circuit	SULEV Heater voltage, 4.50 - 5.50 V
P0036	HO2S Heater Control Circuit (Bank 1, Sensor 2) Open Circuit SULEV	Heater voltage 4.50 - 5.50 V
P0037	HO2S Heater Control Circuit Low (Bank 1, Sensor 2) Short to Ground	<ul style="list-style-type: none"> <li>• SULEV Heater voltage &lt; 3 V</li> <li>• ULEV Heater voltage &lt; 3 V</li> </ul>



DTC	Error Message	Malfunction Criteria and Threshold Value
P0038	HO2S Heater Control Circuit High (Bank 1, Sensor 2) Short to B+	Heater current 2.70 - 5.50 A
P0042	HO2S Heater Circuit, Bank 1, Sensor 3, Open circuit (SULEV)	Heater voltage 4.50...5.50 V
P0043	HO2S Heater Control Circuit Low Bank 1, Sensor 2, Short to ground	<ul style="list-style-type: none"> <li>• SULEV Heater voltage &lt; 3 V</li> <li>• ULEV Heater voltage &lt; 3 V</li> </ul>
P0044	HO2S Heater Control Circuit High Bank 1, Sensor 2, Short to B+	Heater current, > 2.70 - 5.50 A
P050A	Idle Air Control System RPM Lower or Higher Than Expected	Out of range - Low <ul style="list-style-type: none"> <li>• Engine speed deviation &lt; 80 RPM</li> </ul> Out of range - High <ul style="list-style-type: none"> <li>• Engine speed deviation &gt; 80 RPM</li> </ul>
P0068	MAP/MAF – Throttle Position Correlation	<ul style="list-style-type: none"> <li>• Plausibility with fuel system load calculation &lt; 50%</li> <li>• Plausibility with fuel system load calculation &gt; 50%</li> </ul>
P0070	Ambient air temp sensor short to B+	Ambient air temp <45.0° C
P0071	Rationality check	<ul style="list-style-type: none"> <li>• Difference value AAT - ECT @ engine start (depending on engine-off time) &gt; 25K - 40K and</li> <li>• Difference value AAT - IAT engine start (depending on engine-off time) &gt; 25K - 40K</li> </ul>
P0072	Ambient air temp sensor short to ground	Ambient air temp >87.0° C
P0087	Fuel Rail/System Pressure - Too Low	<ul style="list-style-type: none"> <li>• Pressure control activity, &gt; 4.00 mPa and</li> <li>• Fuel trim activity, 1.30 - 16.00 and</li> <li>• Difference between target pressure vs. actual pressure, &gt; -16.38 mPa</li> </ul>
P0088	Fuel Rail/System Pressure - Too High	Fuel rail pressure > 13.9 MPa

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0089	Fuel Pressure Regulator 1 Performance	Actual pressure deviation <ul style="list-style-type: none"> <li>• &lt; 100 kPa</li> <li>• &gt; 100 kPa</li> </ul>
P0100	Mass or Volume Air Flow A Circuit	MAF sensor signal 0 $\mu$ s
P0101	Mass or Volume Air Flow A Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Mass air flow vs lower threshold model &lt;12%</li> <li>• Mass air flow vs upper threshold &lt;12%</li> <li>• Load calculation &gt;21%. 23 for ULEV only</li> </ul> and <ul style="list-style-type: none"> <li>• Fuel system (mult) &lt;-19%. -23 ULEV only</li> <li>• Load calculation &lt; 21%. -23 for ULEV only</li> </ul> and <ul style="list-style-type: none"> <li>• Fuel system (mult) &gt;19%. 23 ULEV only</li> </ul>
P0102	Mass or Volume Air Flow A Circuit Low Input	MAF sensor signal < 66 $\mu$ s
P0103	Mass or Volume Air Flow A Circuit High Input	MAF sensor signal > 4500 $\mu$ s
P0106	Manifold Absolute Pressure/ BARO Sensor Range/ Performance	Boost pressure signal <ul style="list-style-type: none"> <li>• &lt; Altitude sensor -210 hPa</li> <li>• &gt; Altitude sensor 230 hPa</li> </ul>
P0111	Intake Air Temperature Sensor 1 Rationality Check (ULEV) Only	<ul style="list-style-type: none"> <li>• Difference in value between IAT and ECT at engine start (depending on engine off time) &gt; 25 - 40 K</li> </ul> and <ul style="list-style-type: none"> <li>• Difference in value between IAT and AAT at engine start (depending on engine off time) &gt; 25 - 40 K</li> </ul>
P0112	Intake Air Temperature (Sensor 1) Circuit Low Input	Intake air temperature > 141.0°C
P0113	Intake Air Temperature Sensor 1 Circuit High Input	Intake air temperature < 45.80°C

DTC	Error Message	Malfunction Criteria and Threshold Value
P0116	Engine Coolant Temperature Sensor 1 Circuit Range/Performance. Only SULEV	Stuck high (140° C): • No change of signal, <1.5K Stuck low (-40° C): • No change of signal, <1.5K Stuck in range: • 88.5 - 109.5° C and • No change on signal, 1.5 K • Difference value: ECT - AAT @ engine start (depending on engine off time) >25...40 K and • Difference value: ECT - IAT @ engine start (depending on engine off time) >25...40 K
P0117	Engine Coolant Temperature (Sensor 1) Circuit Low Input	Engine coolant temperature > 140.30°C
P0118	Engine Coolant Temperature (Sensor 1) Circuit Open	Engine coolant temperature < 39.80°C
P0121	Throttle/Pedal Position Sensor A Circuit Range/Performance	• TPS 1 - TPS 2 > 6.30% and • Actual TPS 1 calculated value > actual TPS 2 calculated value or • TPS 1 calculated value > 9.00%
P0122	Throttle/Pedal Position Sensor A Circuit Low Input	Signal voltage < 0.20 V
P0123	Throttle/Pedal Position Sensor A Circuit High Input	Signal voltage > 4.81 V
P0130	O2 Sensor Circuit (Bank 1, Sensor 1)	O2S ceramic temperature < 640°C
P0131	O2 Sensor Circuit (Bank 1, Sensor 1) Low Voltage	Virtual mass < 2.0 V
		Nernst voltage < 1.75 V
		Adjustment voltage < 0.30 V
P0132	O2 Sensor Circuit (Bank 1, Sensor 1) High Voltage	Virtual mass > 3 V
		Nernst voltage > 4 V
		Adjustment voltage > 1.5 V

**DTC Chart**

DTC	Error Message	Malfunction Criteria and Threshold Value
P0133	O2 Circuit Slow Response (Bank 1, Sensor 1)	<ul style="list-style-type: none"> <li>• O2S signal front vs. modeled O2S signal ratio <math>\leq 0.35</math> and <math>&gt; 0.01</math></li> <li>• Cycles completed, <math>&gt; 12</math></li> <li>• B8 ULEV II cycles completed <math>&gt; 40</math></li> </ul>
P0135	O2 Heater Circuit (Bank 1, Sensor 1)	<ul style="list-style-type: none"> <li>• Out of range-high</li> <li>• O2S ceramic temperature, <math>&lt; 715^{\circ} \text{C}</math></li> <li>and</li> <li>• Heater duty cycle, 100%</li> <li>• Rationality check:</li> <li>• O2S ceramic temperature, <math>&lt; 715^{\circ} \text{C}</math></li> <li>and</li> <li>• Time after O2S heater on 40 s</li> <li>• Difference between measured calibration resistance in ECM and set value, <math>&gt; 45 \Omega</math></li> </ul>
P0136	O2 Circuit (Bank 1, Sensor 2)	<ul style="list-style-type: none"> <li>• Delta voltage one step at heater switching <math>&gt; 2.0020 \text{ V}</math></li> <li>• Number of checks 10</li> </ul>
P0137	O2S Circuit (Bank 1, Sensor 2) Low Voltage	<ul style="list-style-type: none"> <li>• Cold condition, Signal voltage, <math>&lt; 59.6 \text{ mV}</math></li> <li>• Warm condition, signal voltage <math>&lt; 59.6 \text{ mV}</math></li> <li>• Reaction at closed loop enrichment, no reaction</li> </ul>
P0138	O2S Circuit (Bank 1, Sensor 2) High Voltage	Signal voltage $> 1.26 \text{ V}$
P0139	O2 Circuit (Bank 1 Sensor 2) Slow Response	<ul style="list-style-type: none"> <li>• EWMA filtered transient time at fuel cut off <math>&gt; 0.4 \text{ Sec.}</math></li> <li>• In voltage range 401.4 - 201.2 mV</li> <li>• Number of checks (initial phase) <math>&gt; 3</math></li> <li>• Number of checks (step function) <math>&gt; 3</math></li> </ul>

DTC	Error Message	Malfunction Criteria and Threshold Value
P013A	O2S Circuit (Bank 1, Sensor 2) ULEV (Bank 1, Sensor 3) Slow Response, Rich to Lean	<ul style="list-style-type: none"> <li>• EWMA filtered transient time at fuel cut-off, &gt;0.4s</li> <li>• In voltage range, 401.4...201.2 mV</li> <li>• Number of checks (initial phase), &gt;3</li> <li>• Number of checks (step function), &gt;3</li> </ul>
P0140	O2S Circuit (Bank 1, Sensor 2) No Activity Detected	<ul style="list-style-type: none"> <li>• Signal voltage 401 - 499 mV</li> <li>• O2S rear internal resistance &gt;40 KΩ</li> </ul>
P0141	O2 Heater Circuit (Bank 1, Sensor 2) Out of Range (ULEV)	Heater resistance 810 - 4560 Ω
P0142	O2S Circuit (Bank 1, Sensor 3) Heater check	<ul style="list-style-type: none"> <li>• Delta voltage one step at heater switching, &gt;2.0 V</li> <li>• Number of checks, 10</li> </ul>
P0143	O2S Circuit (Bank 1, Sensor) Short to ground	<ul style="list-style-type: none"> <li>• Cold condition, Signal voltage, &lt; 59.6 mV</li> <li>• Warm condition, signal voltage &lt;59.6 mV</li> <li>• Short to B+, voltage &gt;1.26 V</li> </ul>
P0144	O2S Circuit (Bank 1, Sensor 3) Short to B +	Signal voltage >1.26 V
P0145	O2 Circuit (Bank 1, Sensor 2) Slow Response	<ul style="list-style-type: none"> <li>• EWMA filtered transient time at fuel cutoff &gt; 0.4 Sec.</li> <li>• In voltage range 401.4 - 201.2 mV</li> <li>• Number of checks (initial phase) &gt; 3</li> <li>• Number of checks (step function) &gt; 3</li> </ul>
P0146	O2S Circuit Bank 1, Sensor 3, Open circuit	<ul style="list-style-type: none"> <li>• Signal voltage, 401.4 - 499 mV</li> <li>• Internal resistance, 40 KΩ</li> </ul>
P0147	O2S Circuit (Bank 1, Sensor 3) Heater check (SULEV)	Heater resistance 1056 - 11656 Ω
P0171	System (Bank 1) Too Lean	<ul style="list-style-type: none"> <li>• Lean @ idle Adaptive value &gt;21%</li> <li>• Lean @ part-load Adaptive value 26(only B8 ULEVVII)</li> </ul>

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0172	System (Bank 1) Too Rich	<ul style="list-style-type: none"> <li>• Too rich at idle Adaptive value &lt;5.02% (&lt;6.0 only B8 ULEV)</li> <li>• Too rich at part-load Adaptive value &lt;21% (-26(only B8 ULEVVII))</li> </ul>
P0190	Fuel Rail Pressure Sensor A Circuit	Signal voltage > 4.8 V
P0191	Fuel Rail Control Valve, High Pressure Side	Actual pressure > 20.6 MPa
P0192	Fuel Rail Pressure (Sensor A) Circuit Low Input	Signal voltage < 0.2 V
P0201	Injector Circuit/Open - Cylinder 1	• Low side signal current < 2.1 A
P0202	Injector Circuit/Open - Cylinder 2	• Low side signal current < 2.1 A
P0203	Injector Circuit/Open - Cylinder 3	• Low side signal current < 2.1 A
P0204	Injector Circuit/Open - Cylinder 4	• Low side signal current < 2.1 A
P0221	Throttle/Pedal Position Sensor/Switch B Circuit Range/Performance	<ul style="list-style-type: none"> <li>• TPS 1 - TPS 2 &gt; 6.30% and</li> <li>• Actual TPS 2 calculated value &gt; actual TPS 1 calculated value</li> </ul> or <ul style="list-style-type: none"> <li>• TPS 2 calculated value &gt; 9.00%</li> </ul>
P0222	Throttle/Pedal Position Sensor/Switch B Circuit Low Input	Signal voltage < 0.20 V
P0223	Throttle/Pedal Position Sensor/Switch B Circuit High Input	Signal voltage > 4.81 V
P0234	Turbocharger/Supercharger Overboost Condition Rationality Check High	Difference set value boost pressure vs actual boost pressure value, >200...1275 hPa
P0236	Turbocharger Boost Sensor A Plausability Check (ULEV)	<ul style="list-style-type: none"> <li>• Difference boost pressure signal vs altitude sensor signal, &gt;230 hPa</li> <li>• Difference boost pressure signal vs altitude sensor signal, &lt;130 hPa</li> </ul>

DTC	Error Message	Malfunction Criteria and Threshold Value
P0237	Turbocharger/Supercharger Boost Sensor A Circuit Low	Signal voltage < 0.2 V
P0238	Turbocharger/Supercharger Boost Sensor A Circuit High	Signal voltage > 4.88 V
P0243	Turbocharger/Supercharger Wastegate Solenoid A	Signal voltage > 4.40 - 5.60 V
P0245	Turbocharger/Supercharger Wastegate Solenoid A Low	Signal voltage < 2.15 - 3.25 V
P0246	Turbocharger/Supercharger Wastegate Solenoid A High	Signal current > 2.20 A
P0261	Cylinder 1 Injector Circuit Low	Signal current < 2.1 A
P0262	Cylinder 1 Injector Circuit High	Signal current > 14.70 A
P0264	Cylinder 2 Injector Circuit Low	Signal current < 2.1 A
P0265	Cylinder 2 Injector Circuit High	Signal current > 14.70 A
P0267	Cylinder 3 Injector Circuit Low	Signal current < 2.1 A
P0268	Cylinder 3 Injector Circuit High	Signal current > 14.70 A
P0270	Cylinder 4 Injector Circuit Low	Low side signal current < 2.1 A
P0271	Cylinder 4 Injector Circuit High	Signal current > 14.70 A
P0299	Turbocharger/Supercharger Underboost Rationality Check Low	Difference of set boost pressure vs. actual boost pressure value > 150 hPa
P2004	Intake Manifold Runner Control Stuck Open (Bank 1)	<ul style="list-style-type: none"> <li>• Normal closed position, unable to reach</li> <li>• Signal voltage, &lt;2.62 or &gt;4.65 V</li> <li>or</li> <li>• Normal open position, unable to reach</li> <li>• Signal voltage, &lt;0.35 or &gt;2.38 V</li> </ul>
P2008	Intake Manifold Runner Control Circuit/Open (Bank 1)	Signal voltage 4.40 - 5.60 V
P2009	Intake Manifold Runner Control Circuit Shorted (Bank 1)	Signal voltage 2.15 - 3.25 V
P2010	Intake Manifold Runner Control Circuit Shorted to B+ (Bank 1)	Signal current > 2.20 A

DTC	Error Message	Malfunction Criteria and Threshold Value
P2014	Intake Manifold Runner Position Sensor/Switch Circuit (Bank 1)	Signal voltage > 4.75 V
P2015	Intake Manifold Runner Position Sensor/Switch Circuit Range/Performance (Bank 1)	Deviation runner flap position vs. actual position > 25%
P2016	Intake Manifold Runner Position Sensor/Switch Circuit Low (Bank 1)	Signal voltage < 0.25 V
P2088	Camshaft Position A Actuator Control Circuit Low (Bank 1) Short to Ground	Signal voltage < 2.15 - 3.25 V
P2089	Camshaft Position A Actuator Control Circuit High (Bank 1) Short to B+	Signal current > 2.2 A
P2096	Post-Catalyst Fuel Trim System Too Lean (Bank 1)	I-portion of 2nd lambda control loop < 0.03
P2097	Post-Catalyst Fuel Trim System Too Rich (Bank 1)	I-portion of 2nd lambda control loop > 0.03
P3081	Engine Temperature Too Low	Difference between ECT and modeled ECT > 9.80 K

## Ignition System

DTC	Error Message	Malfunction Criteria and Threshold Value
P0300	Random Misfire Detected	"> 2.1 (PZEV) > 1.9 (Bin 5 / B8 ULEV II)"
P0301	Cylinder 1 Misfire Detected	<ul style="list-style-type: none"> <li>• Catalyst damage misfire rate (MR) &gt;2.9 - 20.0 % PZEV &gt;</li> <li>• C&gt; 3.2 - 20.0 Bin 5</li> </ul>
P0302	Cylinder 2 Misfire Detected	<ul style="list-style-type: none"> <li>• Catalyst damage misfire rate (MR) &gt;2.9 - 20.0 % PZEV &gt;</li> <li>• C&gt; 3.2 - 20.0 Bin 5</li> </ul>
P0303	Cylinder 3 Misfire Detected	<ul style="list-style-type: none"> <li>• Catalyst damage misfire rate (MR) &gt;2.9 - 20.0 % PZEV &gt;</li> <li>• C&gt; 3.2 - 20.0 Bin 5</li> </ul>
P0304	Cylinder 4 Misfire Detected	<ul style="list-style-type: none"> <li>• Catalyst damage misfire rate (MR) &gt;2.9 - 20.0 % PZEV &gt;</li> <li>• C&gt; 3.2 - 20.0 Bin 5</li> </ul>



DTC	Error Message	Malfunction Criteria and Threshold Value
P0321	Ignition/Distributor Engine Speed Input Circuit Range/ Performance	<ul style="list-style-type: none"> <li>Counted teeth versus reference, incorrect and</li> <li>Monitoring reference gap, failure</li> </ul>
P0322	Ignition/Distributor Engine Speed Input Circuit No Signal	<ul style="list-style-type: none"> <li>Camshaft signal &gt; 3</li> <li>Engine speed no signal</li> </ul>
P0324	Knock Control System Error	<ul style="list-style-type: none"> <li>Signal fault counter (combustion), &gt;24.0</li> <li>or</li> <li>Signal fault counter (measuring window), &gt;2.00</li> <li>Communication errors</li> <li>SPI communication &gt; 25</li> </ul>
P0327	Knock Sensor 1 Circuit Low Input (Bank 1) Short to Ground, Port B	<ul style="list-style-type: none"> <li>Lower threshold &lt; 70 V</li> </ul>
P0327	Knock Sensor 1 Circuit Short to Ground, Port A	<ul style="list-style-type: none"> <li>Lower threshold &lt; 70 V</li> </ul>
P0327	Knock Sensor 1 Circuit Signal Range Check	<ul style="list-style-type: none"> <li>Lower threshold &lt;0.0 - 2.1582 V</li> </ul>
P0328	Knock Sensor 1 Circuit Low Input (Bank 1) Short to Ground, Port B	<ul style="list-style-type: none"> <li>Upper threshold 29.0674 - 114.9023 V</li> </ul>
P0328	Knock (Sensor 1 Bank 1) Circuit short to B+ Port B	<ul style="list-style-type: none"> <li>Upper threshold &gt;1.00 V</li> </ul>
P0328	Knock (Sensor 1 Bank 1) Circuit short to B+ Port A	<ul style="list-style-type: none"> <li>Upper threshold &gt;1.00 V</li> </ul>
P0340	Camshaft Position Sensor A Circuit (Bank 1 or single sensor)	<ul style="list-style-type: none"> <li>Cam adaption values out of range</li> <li>&gt; 20° KW</li> <li>&lt; -20° KW</li> <li>Difference of adapted and actual values &gt;9° KW</li> </ul>
P0341	Camshaft Position Sensor A Circuit Range / Performance (Bank 1 or single sensor)	Signal pattern, incorrect
P0342	Camshaft Position Sensor A Circuit Low Input (Bank 1 or Single Sensor)	<ul style="list-style-type: none"> <li>Signal voltage low and crankshaft signals, 8.0</li> </ul>
P0343	Camshaft Position Sensor A Circuit High Input (Bank 1 or Single Sensor)	<ul style="list-style-type: none"> <li>Signal voltage low and crankshaft signals, 8.0</li> </ul>

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0351	Ignition Coil A Primary/ Secondary Circuit	<ul style="list-style-type: none"> <li>• Signal current &lt; -0.25 to 2.0 mA</li> <li>or</li> <li>• Internal check failed</li> </ul>
P0352	Ignition Coil B Primary/ Secondary Circuit	<ul style="list-style-type: none"> <li>• Signal current &lt; -0.25 to 2.0 mA</li> <li>or</li> <li>• Internal check failed</li> </ul>
P0353	Ignition Coil C Primary/ Secondary Circuit	<ul style="list-style-type: none"> <li>• Signal current &lt; -0.25 to 2.0 mA</li> <li>or</li> <li>• Internal check failed</li> </ul>
P0354	Ignition Coil D Primary/ Secondary Circuit	<ul style="list-style-type: none"> <li>• Signal current &lt; -0.25 to 2.0 mA</li> <li>or</li> <li>• Internal check failed</li> </ul>

### **Additional Exhaust Regulation**

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0410	System Check After SAI PZEV only	Deviation SAI pressure > 20.0 hPa
P0413	Open Circuit PZEV Only	Signal voltage 9.25 - 11.25 V
P0414	Short to Ground PZEV Only	Signal voltage < 6.00 V
P0415	Short to B+ PZEV Only	Signal current 2.20 - 4.20 A
P0418	Air Pump Relay Open Circuit PZEV Only	Signal voltage 4.50 - 5.50 V
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<ul style="list-style-type: none"> <li>• Measured OSC / OSC of borderline catalyst value for front catalyst , &lt;0.40</li> <li>or</li> <li>• Value for front catalyst, &lt;1.30 and</li> <li>• Value for main catalyst, &lt;1.20</li> </ul>
P0420	Catalyst System (main) Efficiency Below Threshold (Bank 1) PZEV only	<ul style="list-style-type: none"> <li>• Measured OSC / OSC of borderline catalyst value for main catalyst , &lt;0.90 while</li> <li>• Value for front catalyst, &lt;2.00</li> </ul>

DTC	Error Message	Malfunction Criteria and Threshold Value
P0420	Catalyst System (only bin 5, ULEV) Efficiency Below Threshold (Bank 1)	Measured OSC / OSC of borderline catalyst. EWMA filter value for catalyst , <.20
P0441	Evaporative Emission System Incorrect Purge Flow	Reaction of idle controller or lambda controller. Deviation less than 7% lambda controller and 35% idle controller deviation.
P0442	Evaporative Emission System Leak Detected (Small Leak)	Time for pressure drop < 1.55 - 1.75 Sec.
P0444	Evaporative Emission System Purge Control Valve Circuit Open	Signal voltage > 4.40 - 5.40 V
P0455	Evaporative Emission System Leak Detected (Gross Leak/ No Flow)	Time for pressure drop < 0.95 Sec.
P0456	Evaporative Emission System Leak Detected (Very Small Leak)	Time for pressure drop < 4.5 - 6.0 Sec.
P0458	Evaporative Emission System Purge Control Valve Circuit Low	Signal voltage < 2.15 - 3.25 V
P0459	Evaporative Emission System Purge Control Valve Circuit High	Signal current > 2.20 A
P0491	Secondary Air System Insufficient Flow. Flow Check During Catalyst Heating. PZEV only	SAI pressure measured with SAI pressure sensor vs modeled < 0.6 (0.62) %

### Speed and Idle Control

DTC	Error Message	Malfunction Criteria and Threshold Value
P0501	Vehicle Speed Sensor A Range/Performance	VSS signal < 4 km/h
P0501	Vehicle Speed Sensor A Range / Performance Only (ULEV)	VSS signal < 4 km/h
P0503	Vehicle Speed Sensor A Out of Range/High	Vehicle speed > 200 km/h
P0506	Idle Air Control System - RPM Lower Than Expected	• Engine speed deviation < -80 RPM

DTC	Error Message	Malfunction Criteria and Threshold Value
P0507	Idle Air Control System - RPM Higher Than Expected	• Engine speed deviation > -80 RPM

## Control Module and Output Signals

DTC	Error Message	Malfunction Criteria and Threshold Value
P0601	Internal Control Module Memory Check Sum Error	Internal check sum, incorrect
P0604	Internal Control Module Random Access Memory (RAM) Error	Write ability check, failed
P0605	Internal Control Module Read Only Memory (ROM) Error	Checksum incorrect
P0606	ECM Processor	Powerup calibration • EEPROM check, failed A/D channel conversion • Check failed
P0627	Fuel Pump A Control Circuit/ Open	• Internal error fuel pump control unit • Feedback from fuel pump control unit pump blocked short circuit to battery +, ground or open circuit
P0638	Throttle Actuator Control Range/Performance (Bank 1)	Rationality check: • Time to close to reference point > 0.56 Sec. and • Reference point 2.88% Signal range check: • duty cycle >80%V and • ECM power stage, no failure
P0641	Sensor Reference Voltage A Circuit/Open	Signal voltage deviation > $\pm 0.3$ V
P0642	Sensor Reference Voltage A Circuit Low	Signal voltage < 4.6 - 5.0 V
P0643	Sensor Reference Voltage A Circuit High	5V supply voltage > 4.99 - 5.41 V
P0651	Sensor Reference Voltage B Circuit/Open	Signal voltage deviation > $\pm 0.3$ V
P0652	Sensor Reference Voltage B Circuit Low	Signal voltage < 4.6 - 5.0 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P0653	Sensor Reference Voltage B Circuit High	5V supply voltage > 4.99 - 5.41 V
P0657	Actuator Supply Voltage A Circuit/Open	Signal voltage > 4.40 - 5.60 V
P0658	Actuator Supply Voltage A Circuit Low	Signal voltage < 2.15 - 3.25 V
P0659	Actuator Supply Voltage A Circuit High	Signal current > 1.10 A
P0685	ECM/PCM Power Relay Control Circuit/Open	<ul style="list-style-type: none"> <li>• Signal voltage 2.6 - 3.7 V</li> <li>• Sense circuit voltage &gt; 6 V</li> </ul>
P0686	ECM/PCM Power Relay Control Circuit Low	<ul style="list-style-type: none"> <li>• Signal voltage 2.6 - 3.7 V</li> <li>• Sense circuit voltage &gt; 6 V</li> </ul>
P0687	ECM/PCM Power Relay Control Circuit High	<ul style="list-style-type: none"> <li>• Signal current &gt; 1.4 - 0.7 A</li> <li>• Sense circuit voltage &lt; 6 V</li> </ul>
P0688	ECM/PCM Power Relay Sense Circuit	<ul style="list-style-type: none"> <li>• Sense voltage &lt; 3.0 V</li> <li>• Difference sense circuit voltage with camshaft actuator commanded off and on &gt; 2.5 V</li> <li>• Battery voltage &gt; 3 V</li> </ul>
P0697	Sensor Reference Voltage C Circuit/Open	Signal voltage deviation $\pm$ 0.3 V
P0698	Sensor Reference Voltage C Circuit Low	Signal voltage < 4.6 - 5.0 V
P0699	Sensor Reference Voltage C Circuit High	5V supply voltage > 4.99 - 5.41 V
U0001	High Speed CAN Communication Bus	CAN message, no feedback
U0002	High Speed CAN Communication Bus	Global time out
U0100	Lost Communication with ECM/PCM A	<ul style="list-style-type: none"> <li>• Failure of all CAN engine messages, time out &gt; 490 mSec.</li> <li>• Failure of all CAN engine messages, but not all CAN messages, time out &gt; 1010 mSec.</li> </ul>
U0101	Lost Communication with TCM	CAN communication with TCM, time out. No message received by ECM
U0121	CAN ABS Brake Unit	CAN communication with brake unit, time-out

DTC	Error Message	Malfunction Criteria and Threshold Value
U0146	CAN Gateway A	CAN communication with gateway, time out
U0302	Software Incompatibility with Transmission Control Module	AT vehicle ECM coded as MT vehicle
U0323	CAN: Instrument cluster Audi only	Ambient temperature value module not encoded for ambient temp sensor, 00h
U0402	CAN Communication with TCM	Data length code transmitted, incorrect
U0404	Invalid Data Received From Gear Shift Control Module	<ul style="list-style-type: none"> <li>• If the value of message counter is permanent, constant, or change exceeds a threshold, increment an event counter</li> <li>• Maximum change of message counter &gt; 5</li> </ul>
U0415	CAN link to speed sensor	Speed sensor initialization failure
U0422	CAN: Instrument cluster	Ambient temperature value initialization, Audi 01 h
U0423	CAN: Instrument cluster	Received CAN message, implausible message
U0447	CAN Gateway	CAN message incorrect
U1030	LIN Communication	Not active
U102F	LIN Communication	Time out
U102E	LIN Communication	LIN message, incorrect

### Fuel and Air Ratios Control Module

DTC	Error Message	Malfunction Criteria and Threshold Value
P1114	Internal Resistance Too Large (Bank 1, Sensor 2)	Heater resistance, $(128-648) \cdot (8-40) 1.02-25.9 \text{ k } \Omega$ (dep. on mod. exhaust temp. and heater power)
P12A1	Fuel Rail Pressure Sensor Inappropriately Low	<ul style="list-style-type: none"> <li>• Pressure control activity &gt; 0.25 MPa</li> <li>and</li> <li>• Fuel trim activity &lt; 0.80</li> <li>and</li> <li>• Difference between target pressure vs. actual pressure, -16.38...16.38 mPa</li> </ul>

DTC	Error Message	Malfunction Criteria and Threshold Value
P12A2	Fuel Rail Pressure Sensor Inappropriately High	<ul style="list-style-type: none"> <li>• Pressure control activity, &lt;0.05 mPa</li> <li>and</li> <li>• Fuel trim activity &gt; 1.30</li> <li>and</li> <li>• Difference between target pressure vs. actual pressure, -16.38...16.38 mPa</li> </ul>
P12A4	Fuel Rail Pump Control Valve Stuck Closed	<ul style="list-style-type: none"> <li>• Pressure control activity, &lt;6.00 mPa5</li> <li>and</li> <li>• Fuel trim activity, &gt;.90...1.15</li> <li>and</li> <li>• Difference between target pressure vs. actual pressure, &lt;-16.38 mPa</li> </ul>
P2101	Throttle Actuator Control Motor Circuit Range/ Performance	<ul style="list-style-type: none"> <li>• Duty cycle &gt;80%</li> <li>and</li> <li>• ECM power stage, no failure</li> <li>• Deviation throttle valve angles vs. calculated value 4.0 - 50.0%</li> </ul>
P2106	Throttle Actuator Control System - Short to B+ or Ground	Internal check
P2106	Throttle Actuator Control System Open circuit	Internal check
P2106	Throttle Actuator Control System temp. current monitoring	Internal check failed
P2106	Throttle Actuator Control System Functional check	Internal check failed
P2110	Throttle Actuator Control System - Forced Limited RPM	Engine load out of range
P2122	Throttle/Pedal Position Sensor/Switch D Circuit Low Input	Signal voltage < 0.606 V
P2123	Throttle/Pedal Position Sensor/Switch D Circuit High Input	Signal voltage > 4.794 V
P2127	Throttle/Pedal Position Sensor/Switch E Circuit Low Input	Signal voltage < 0.268 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P2128	Throttle/Pedal Position Sensor/Switch E Circuit High Input	Signal voltage > 2.431 V
P2138	Throttle/Pedal Position Sensor/Switch D/E Voltage Correlation	Signal voltage sensor 1 vs. 2 > 0.167 - 0.703 V
P2146	Fuel Injector Group A Supply Voltage Circuit / Short to Ground	Signal current, > 14.90 A
P2149	Fuel Injector Group B Supply Voltage Circuit / Short to Ground	Signal current > 14.90 A
P2181	Cooling System Performance	<ul style="list-style-type: none"> <li>• Cooling system temp too low after a sufficient air mass flow interval, &lt; 74 - 84 °C (SULEV)</li> <li>• &lt; 60 - 84 °C (ULEV)</li> </ul>
P2195	O2 Sensor Signal Biased/ Stuck Lean (Bank 1, Sensor 1)	Delta lambda of 2nd lambda control loop > 0.07
P2196	O2 Sensor Signal Biased/ Stuck Rich (Bank 1, Sensor 1)	Delta lambda of 2nd lambda control loop < 0.07
P2231	O2 Sensor Signal Circuit Shorted to Heater Circuit	Delta O2S signal front > 190 uA
P2237	O2 Sensor Positive Current Control Circuit/Open (Bank 1, Sensor 1)	<ul style="list-style-type: none"> <li>• O2S signal front 1.493...1.507 V</li> <li>• O2S signal front &lt; 1.70020 V and</li> <li>• Fuel cutoff &gt;3.00 s</li> <li>• O2S signal front 1.50...1.51 V</li> <li>• Delta lambda controller, &gt; 0.10</li> </ul>
P2243	O2 Sensor Reference Voltage Circuit/Open (Bank 1, Sensor 1)	<ul style="list-style-type: none"> <li>• O2S signal front &gt;4.70 V and Internal resistance &gt; 1000 Ω</li> <li>• O2S signal front &lt; 0.30 V And Internal resistance &gt; 1000 Ω</li> </ul>
P2257	Air Pump Relay Short to Ground PZEV only	Signal voltage < 3.00 V
P2258	Air Pump Relay Short to B+ PZEV only	Signal current 0.60 - 1.20 A
P2270	O2 Circuit Slow Response (Bank 1, Sensor 2) (ULEV)	Rationality check, O2S signal rear, < 0.620 - 0.654 mV
P2270	O2S Circuit Slow Response (Bank 1, Sensor 2) (SULEV)	Rationality check, O2S signal rear, <0.557 - 0.630 mV



DTC	Error Message	Malfunction Criteria and Threshold Value
P2271	O2S Circuit (Bank 1 Sensor 2) (ULEV)	<ul style="list-style-type: none"> <li>• Measurement range from fuel cutoff to voltage threshold, <math>\leq 152.3</math> mV</li> <li>• Number of checks (initial phase), <math>\geq 1</math></li> </ul>
P2271	O2S Circuit (Bank 1 Sensor 2) (SULEV)	Rationality check, O2S signal rear, $<0.557 - 0.630$ mV
P2274	O2S Circuit Slow Response (Bank 1, Sensor 3) (SULEV)	Rationality check, O2S signal rear, $<0.620 - 0.654$ mV
P2275	O2S Circuit Slow Response (Bank 1, Sensor 3) (SULEV)	<ul style="list-style-type: none"> <li>• Measurement range from fuel cutoff to voltage threshold, <math>\leq 152.3</math> mV</li> <li>• Number of checks (initial phase), <math>\geq 1</math></li> <li>• ULEV</li> <li>• O2S signal rear, <math>&gt;0.620 - 0.654</math> mV</li> </ul>
P2279	Intake Air System Leak	<ul style="list-style-type: none"> <li>• Threshold to detect a defective system <math>&gt; 1.33 - 1.6</math> and</li> <li>• Ratio of the tie system defective during the measurement window to the whole duration of the measurement window <math>&gt; 0.6000</math></li> </ul>
P2293	Fuel Pressure Regulator 2 Performance	<ul style="list-style-type: none"> <li>• Difference between target pressure vs. actual pressure: <math>&gt; 1.50</math> mPa</li> <li>or</li> <li>• Difference between target pressure vs. actual pressure, <math>&lt; -1.50</math> mPa</li> </ul>
P2294	Fuel Pressure Regulator 2 Control Circuit Open Circuit	• Signal voltage $2.30 - 2.70$ V
P2294	Fuel Pressure Regulator 2 Control Circuit Rationality Check	Signal pattern incorrect
P2295	Fuel Pressure Regulator 2 Control Circuit Low Short to Ground	Signal voltage $< 1.80 - 2.20$ V
P2296	Fuel Pressure Regulator 2 Control Circuit High	Signal voltage $> 3.9$ V

## Ignition System

DTC	Error Message	Malfunction Criteria and Threshold Value
P2300	Ignition Coil A Primary Control Circuit Low	Signal current > 24.0 mA
P2301	Ignition Coil A Primary Control Circuit High	Signal current > 5.1 - 7.0 mA
P2303	Ignition Coil B Primary Control Circuit Low	Signal current > 24.0 mA
P2304	Ignition Coil B Primary Control Circuit High	Signal current > 5.1 - 7.0 mA
P2306	Ignition Coil C Primary Control Circuit Low	Signal current > 24.0 mA
P2307	Ignition Coil C Primary Control Circuit High	Signal voltage > 5.1 - 7.0 mA
P2309	Ignition Coil D Primary Control Circuit Low	Signal current > 24.0 mA
P2310	Ignition Coil D Primary Control Circuit High	Signal voltage > 5.1 - 7.0 mA

## Additional Emissions Regulations

DTC	Error Message	Malfunction Criteria and Threshold Value
P2400	Evaporative Emission System Leak Detection Pump Control Circuit/Open	Signal voltage > 4.40 - 5.60 V
P2401	Evaporative Emission System Leak Detection Pump Control Circuit Low	Signal voltage < 2.15 to 3.25 V
P2402	Evaporative Emission System Leak Detection Pump Control Circuit High	Signal current > 3.0 A
P2403	Evaporative Emission System Leak Detection Pump Sense Circuit/Open	Low signal voltage > 0.5 Sec.
P2404	Evaporative Emission System Leak Detection Pump Sense Circuit Range/Performance	<ul style="list-style-type: none"> <li>• High signal voltage &gt; 30.4 V and</li> <li>• Number of checks, 30.0 .</li> </ul>
P2414	O2 Sensor Exhaust Sample Error (Bank 1, Sensor 1)	<ul style="list-style-type: none"> <li>• Signal voltage 3.10...4.81 V</li> <li>• O2S signal, 2.5 - 3.2</li> <li>• Signal Voltage 2.5 V</li> <li>• O2S signal 2.5...3.1 V</li> </ul>

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P2431	Rationality check	Difference between SAI pressure and ambient pressure, NOT -25.0 - 25.00 hPa
P2432	Signal Range Check	Signal voltage < 0.40 V
P2433	Signal Range Check	Signal voltage > 4.65 V
P2440	System Check After SAI PZEV only	SAI pressure measured with SAI pressure sensor vs. modeled while SAI valve closed < 0.55%
P2539	Low Pressure Fuel System Sensor Circuit	Signal voltage > 4.9 V
P2540	Low Pressure Fuel System Sensor Circuit Range/ Performance	Actual pressure deviation < 800 kPa < 80 kPa
P2541	Low Pressure Fuel System Sensor Circuit Low	Signal voltage < 0.2 V
P2568	RIS Sensor wrong signal PZEV only	<ul style="list-style-type: none"> <li>• Signal of sensor mismatched with radiator</li> <li>or</li> <li>• Measured temp. gradients during 3 meadure windows always, &lt;0.25 K/2s</li> </ul>
P2569	RIS Sensor signal low PZEV only	Signal voltage < 0.2 V
P2570	RIS Sensor signal always high PZEV only	Signal voltage >5.0 V
P2626	O2 Sensor Pumping Current Trim Circuit/Open (Bank 1 Sensor 1)	O2S signal front > 4.81 V

# DTC CHART

## Engine Code CCTA

### Fuel and Air Mixture, Additional Emission Regulations

DTC	Error Message	Malfunction Criteria and Threshold Value
P000A	Intake (A) Camshaft Position Slow Response Bank 1	Signal change < 1.9 - 4.2°CRK/s
P0010	Intake (A) Camshaft Position Actuator Circuit/Open (Bank 1)	Signal voltage > 4.4 - 5.6 V
P0011	Intake (A) Camshaft Position Timing - Over-Advanced (Bank 1)	Target error (stuck position) > 6.8 - 8°CRK
P0016	Crankshaft Position - Camshaft Position Correlation (Bank 1, Sensor A)	<ul style="list-style-type: none"> <li>• Permissible deviation &lt; 11° Rev</li> <li>or</li> <li>• Permissible deviation &gt; 11° Rev</li> </ul>
P025A	Fuel Pump Open Circuit	Signal voltage > 4.40 - 5.60 V
P025C	Fuel Pump Short to Ground	Signal voltage < 2.15 - 3.25 V
P025D	Fuel Pump Short to B+	Signal current > 1.1 A
P0030	HO2S Heater Control Circuit (Bank 1, Sensor 1) Open Circuit	Heater voltage 2.34 - 3.59 V
P0031	HO2S Heater Control Circuit Low (Bank 1, Sensor 1) Short to Ground	Heater voltage < 2.34 V
P0032	HO2S Heater Control Circuit High (Bank 1, Sensor 1) Short to B+	Heater voltage > 3.59 V
P0036	HO2S Heater Control Circuit (Bank 1, Sensor 2) Open Circuit SULEV	SULEV heater voltage 4.50 - 5.50 V
P0037	HO2S Heater Control Circuit Low (Bank 1, Sensor 2) Short to Ground	<ul style="list-style-type: none"> <li>• SULEV Heater voltage &lt; 3 V</li> <li>• ULEV Heater voltage &lt; 3 V</li> </ul>
P0038	HO2S Heater Control Circuit High (Bank 1, Sensor 2) Short to B+	Heater current 2.70 - 5.50 A

DTC	Error Message	Malfunction Criteria and Threshold Value
P0043	HO2S Heater Control Circuit Low (Bank 1, Sensor 2) Short to Ground	<ul style="list-style-type: none"> <li>• SULEV Heater voltage &lt; 3 V</li> <li>• ULEV Heater voltage &lt; 3 V</li> </ul>
P0044	HO2S Heater Control Circuit High (Bank 1, Sensor 2) Short to B+	Heater current > 2.70 - 5.50 A
P050A	Idle Air Control System RPM Lower or Higher Than Expected	Out of range - Low <ul style="list-style-type: none"> <li>• Engine speed deviation &lt; 80 RPM</li> </ul> Out of range - High <ul style="list-style-type: none"> <li>• Engine speed deviation &gt; 80 RPM</li> </ul>
P0068	MAP/MAF – Throttle Position Correlation	<ul style="list-style-type: none"> <li>• Plausibility with fuel system load calculation &lt; 50%</li> <li>• Plausibility with fuel system load calculation &gt; 50%</li> </ul>
P0070	Ambient Air Temp Sensor Short to B+	Ambient air temp <45.0 °C
P0071	Rationality Check	<ul style="list-style-type: none"> <li>• Difference value AAT-ECT @ engine start (depending on engine-off time) &gt;  25...40K and</li> <li>• Difference value AAT-IAT engine start (depending on engine-off time) &gt; 25....40K</li> </ul>
P0072	Ambient Air Temp Sensor Short to Ground	Ambient air temp >87.0° C
P0087	Fuel Rail/System Pressure - Too Low	<ul style="list-style-type: none"> <li>• Pressure control activity &gt; 4.00 mPa and</li> <li>• Fuel trim activity 1.30 - 16.00 and</li> <li>• Difference between target pressure vs. actual pressure, &gt; -16.38 mPa</li> </ul>
P0088	Fuel Rail/System Pressure - Too High	Fuel rail pressure > 13.9 MPa
P0089	Fuel Pressure Regulator 1 Performance	Actual pressure deviation <ul style="list-style-type: none"> <li>• &lt; 100 kPa</li> <li>• &gt; 100 kPa</li> </ul>
P0100	Mass or Volume Air Flow A Circuit	MAF sensor signal 0 µs

DTC	Error Message	Malfunction Criteria and Threshold Value
P0101	Mass or Volume Air Flow A Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Mass air flow vs. lower threshold model &lt; 12%</li> <li>• Mass air flow vs. upper threshold &lt; 12%</li> <li>• Load calculation &gt; 21%. 23 for ULEV only and</li> <li>• Fuel system (mult) &lt; -19%. -23 ULEV only</li> <li>• Load calculation &lt; 21%. -23 for ULEV only and</li> <li>• Fuel system (mult) &gt; 19%. 23 ULEV only</li> </ul>
P0102	Mass or Volume Air Flow A Circuit Low Input	MAF sensor signal < 66 $\mu$ Sec.
P0103	Mass or Volume Air Flow A Circuit High Input	MAF sensor signal > 4500 $\mu$ Sec.
P0106	Manifold Absolute Pressure/ BARO Sensor Range/ Performance	Boost pressure signal <ul style="list-style-type: none"> <li>• Altitude sensor &lt; -210 hPa</li> <li>• Altitude sensor &gt; 230 hPa</li> </ul>
P0111	Intake Air Temperature (Sensor 1) Rationality Check (ULEV)	<ul style="list-style-type: none"> <li>• Difference in value between IAT and ECT at engine start (depending on engine off time) &gt; 25 - 40 K and</li> <li>• Difference in value between IAT and AAT at engine start (depending on engine off time) &gt; 25 - 40 K</li> </ul>
P0112	Intake Air Temperature (Sensor 1) Circuit Low Input	Intake air temperature > 141°C
P0113	Intake Air Temperature (Sensor 1) Circuit High Input	Intake air temperature < 45.80 °C

DTC	Error Message	Malfunction Criteria and Threshold Value
P0116	Engine Coolant Temperature Sensor 1 Circuit Range/Performance. Only SULEV	Stuck low <ul style="list-style-type: none"> <li>• No change of signal, &lt;1.5K</li> <li>• Signal in range 88.5 - 109.5°C and</li> <li>• No change on signal 1.5 K</li> <li>• Difference value: ECT-AAT @ engine start (depending on engine off time) &gt;25...40 K and</li> <li>• Difference value: ECT-IAT @ engine start (depending on engine off time) &gt;25...40 K</li> </ul>
P0117	Engine Coolant Temperature (Sensor 1) Circuit Low Input	Engine coolant temperature > 140.30°C
P0118	Engine Coolant Temperature (Sensor 1) Circuit Open	Engine coolant temperature < 39.80°C
P0121	Throttle/Pedal Position Sensor A Circuit Range/Performance	<ul style="list-style-type: none"> <li>• TPS 1 - TPS 2 &gt; 6.30% and</li> <li>• Actual TPS 1 calculated value &gt; actual TPS 2 calculated value</li> </ul> or <ul style="list-style-type: none"> <li>• TPS 1 calculated value &gt; 9.00%</li> </ul>
P0122	Throttle/Pedal Position Sensor A Circuit Low Input	Signal voltage < 0.20 V
P0123	Throttle/Pedal Position Sensor A Circuit High Input	Signal voltage > 4.81 V
P0130	O2 Sensor Circuit (Bank 1, Sensor 1)	O2S ceramic temperature < 640°C
P0131	O2 Sensor Circuit (Bank 1, Sensor 1) Low Voltage	Virtual mass < 2.0 V
		Nernst voltage < 1.75 V
		IA > 0.30 V
		IP < 0.30 V
P0132	O2 Sensor Circuit (Bank 1, Sensor 1) High Voltage	Virtual mass > 3 V
		Nernst voltage > 4 V
		IA 1.5 V
		IP > 7 V

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0133	O2 Circuit Slow Response (Bank 1, Sensor 1)	<ul style="list-style-type: none"> <li>• O2S signal front vs. modeled O2S signal ratio <math>\leq 0.35</math> and <math>&gt; 0.01</math></li> <li>• Cycles completed, <math>&gt; 12</math></li> <li>• B8 ULEVII cycles completed <math>&gt; 40</math></li> </ul>
P0135	O2 Heater Circuit (Bank 1, Sensor 1)	<ul style="list-style-type: none"> <li>• Out of range-high</li> <li>• O2S ceramic temperature, <math>&lt; 715^{\circ} \text{C}</math></li> <li>and</li> <li>• Heater duty cycle 100%</li> <li>• Rationality check:</li> <li>• O2S ceramic temperature, <math>&lt; 715^{\circ} \text{C}</math></li> <li>and</li> <li>• Time after O2S heater on 40 Sec</li> <li>• Out of range low:</li> <li>• Difference between measured calibration resistance in ECM and set value, <math>&gt; 45 \Omega</math></li> </ul>
P0136	O2 Circuit (Bank 1, Sensor 2)	<ul style="list-style-type: none"> <li>• Delta voltage one step at heater switching <math>&gt; 2.0020 \text{ V}</math></li> <li>and</li> <li>• Number of checks 10</li> </ul>
P0137	O2 Circuit Low Voltage (Bank 1, Sensor 2)	<ul style="list-style-type: none"> <li>• Cold condition, Signal voltage, <math>&lt; 59.6 \text{ mV}</math></li> <li>• Warm condition, signal voltage</li> <li>• Reaction at closed loop enrichment, no reaction</li> </ul>
P0138	O2 Circuit High Voltage (Bank 1, Sensor 2)	Signal voltage $> 1.26 \text{ V}$
P0139	O2 Circuit Slow Response (Bank 1 Sensor 2)	<ul style="list-style-type: none"> <li>• EWMA filtered transient time at fuel cut off <math>&gt; 0.4 \text{ Sec.}</math></li> <li>• In voltage range <math>401.4 - 201.2 \text{ mV}</math></li> <li>• Number of checks (initial phase) <math>&gt; 3</math></li> <li>• Number of checks (step function) <math>&gt; 3</math></li> </ul>
P0140	O2 Circuit No Activity Detected (Bank 1 Sensor 2)	<ul style="list-style-type: none"> <li>• Signal voltage <math>401 - 499 \text{ mV}</math></li> <li>• O2S rear internal resistance <math>&gt; 40 \text{ K}\Omega</math></li> </ul>



DTC	Error Message	Malfunction Criteria and Threshold Value
P0141	O2 Heater Circuit (Bank 1 Sensor 2) Out of Range ULEV	Heater resistance 810 - 4560 $\Omega$
P0142	O2 circuit (Bank 1 Sensor 3) heater check	<ul style="list-style-type: none"> <li>• Delta voltage one step at heater switching, &gt;2.0 V</li> <li>• Number of checks, 10</li> </ul>
P0143	O2 circuit (Bank 1 Sensor 3) Short to ground	<ul style="list-style-type: none"> <li>• Cold condition, signal voltage, &lt; 59.6 mV</li> <li>• Warm condition, signal voltage &lt;59.6 mV</li> <li>• Short to B+, voltage &gt; 1.26 V</li> </ul>
P0144	O2 circuit Bank 1 Sensor 3 Short to Batt. +	Signal voltage > 1.26 V
P0145	O2 Circuit Slow Response (Bank 1, Sensor 2)	<ul style="list-style-type: none"> <li>• EWMA filtered transient time at fuel cut off &gt; 0.4 Sec.</li> <li>• In voltage range 401.4 - 201.2 mV</li> <li>• Number of checks (initial phase) &gt; 3</li> <li>• Number of checks (step function) &gt; 3</li> </ul>
P0146	O2 circuit (Bank 1 Sensor 3) Open circuit	<ul style="list-style-type: none"> <li>• Signal voltage, 401.4 - 499 mV</li> <li>• Internal resistance, 40 K<math>\Omega</math></li> </ul>
P0147	O2 circuit (Bank 1 Sensor 3) heater check SULEV	Heater resistance 1056...11656 $\Omega$
P0171	System Too Lean (Bank 1)	<p>At idle</p> <ul style="list-style-type: none"> <li>• Adaptive value &gt; 21%</li> </ul> <p>At part-load</p> <ul style="list-style-type: none"> <li>• Adaptive value 26% (only B8 ULEVVII)</li> </ul>
P0172	System Too Rich (Bank 1)	<p>At idle</p> <ul style="list-style-type: none"> <li>• Adaptive value &lt; 5.02% (&lt; 6.0% only B8 ULEV)</li> </ul> <p>At part-load</p> <ul style="list-style-type: none"> <li>• Adaptive value &lt; 21% (&lt; -26% only B8 ULEVVII)</li> </ul>
P0190	Fuel Rail Pressure Sensor A Circuit	Signal voltage > 4.8 V
P0191	Fuel Rail Control Valve, High Pressure Side	Actual pressure > 20.6 MPa
P0192	Fuel Rail Pressure Sensor A Circuit Low Input	Signal voltage < 0.2 V
P0201	Injector Circuit/Open - Cylinder 1	<ul style="list-style-type: none"> <li>• Low side signal current &lt; 2.1 A</li> </ul>

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0202	Injector Circuit/Open - Cylinder 2	• Low side signal current < 2.1 A
P0203	Injector Circuit/Open - Cylinder 3	• Low side signal current < 2.1 A
P0204	Injector Circuit/Open - Cylinder 4	• Low side signal current < 2.1 A
P0221	Throttle/Pedal Position Sensor/Switch B Circuit Range/Performance	<ul style="list-style-type: none"> <li>• TPS 1 - TPS 2 &gt; 6.30% and</li> <li>• Actual TPS 1 - calculated value, &gt; actual TPS2 - calculated value</li> </ul> or <ul style="list-style-type: none"> <li>• TPS 1 calculated value &gt; 9.00%</li> </ul>
P0222	Throttle/Pedal Position Sensor/Switch B Circuit Low Input	Signal voltage < 0.20 V
P0223	Throttle/Pedal Position Sensor/Switch B Circuit High Input	Signal voltage > 4.81 V
P0234	Turbocharger/Supercharger Overboost Condition Rationality Check	Difference of set value boost pressure vs. actual boost pressure value > 200 - 1280 hPa
P0236	Turbocharger/Supercharger Boost Sensor A Plausibility Check ULEV	<ul style="list-style-type: none"> <li>• Difference in boost pressure signal vs. altitude sensor signal &gt; 230 hPa</li> <li>• Difference in boost pressure signal vs altitude sensor signal, &lt;130 hPa</li> </ul>
P0237	Turbocharger/Supercharger Boost Sensor A Circuit Low	Signal voltage < 0.20 V
P0238	Turbocharger/Supercharger Boost Sensor A Circuit High	Signal voltage > 4.88 V
P0243	Turbocharger/Supercharger Wastegate Solenoid A	Signal voltage > 4.40 - 5.60 V
P0245	Turbocharger/Supercharger Wastegate Solenoid A Low	Signal voltage < 2.15 - 3.25 V
P0246	Turbocharger/Supercharger Wastegate Solenoid A High	Signal current > 2.20 A
P0261	Cylinder 1 Injector Circuit Low	Signal current < 2.10 A
P0262	Cylinder 1 Injector Circuit High	Signal current > 14.70 A

DTC	Error Message	Malfunction Criteria and Threshold Value
P0264	Cylinder 2 Injector Circuit Low	Signal current < 2.10 A
P0265	Cylinder 2 Injector Circuit High	Signal current > 14.70 A
P0267	Cylinder 3 Injector Circuit Low	Signal current < 2.10A
P0268	Cylinder 3 Injector Circuit High	Signal current > 14.70 A
P0270	Cylinder 4 Injector Circuit Low	Low side signal current < 2.10 A
P0271	Cylinder 4 Injector Circuit High	Signal current > 14.70 A
P0299	Turbocharger/Supercharger Underboost Rationality Check Low	Difference of set boost pressure vs. actual boost pressure value > 150 hPa
P2004	Intake Manifold Runner Control Stuck Open (Bank 1)	<ul style="list-style-type: none"> <li>• Normal closed position, unable to reach signal voltage &lt; 2.62 or &gt; 4.65 V</li> <li>or</li> <li>• Normal open position, unable to reach signal voltage &lt; 0.35 or &gt; 2.38 V</li> </ul>
P2008	Intake Manifold Runner Control Circuit/Open (Bank 1)	Signal voltage 4.40 - 5.60 V
P2009	Intake Manifold Runner Control Circuit Shorted (Bank 1)	Signal voltage 2.15 - 3.25 V
P2010	Intake Manifold Runner Control Circuit Shorted to B+ (Bank 1)	Signal current > 2.20 A
P2014	Intake Manifold Runner Position Sensor/Switch Circuit (Bank 1)	Signal voltage > 4.75 V
P2015	Intake Manifold Runner Position Sensor/Switch Circuit Range/Performance (Bank 1)	Deviation runner flap position vs. actual position > 25%
P2016	Intake Manifold Runner Position Sensor/Switch Circuit Low (Bank 1)	Signal voltage < 0.25 V
P2088	A Camshaft Position Actuator Control Circuit Low (Bank 1) short to ground	Signal voltage < 2.15 - 3.25 V
P2089	A Camshaft Position Actuator Control Circuit High (Bank 1) short to B+	Signal current > 2.20 A
P2096	Post Catalyst Fuel Trim System Too Lean (Bank 1)	I-portion of 2nd lambda control loop < 0.030

DTC	Error Message	Malfunction Criteria and Threshold Value
P2097	Post Catalyst Fuel Trim System Too Rich (Bank 1)	I-portion of 2nd lambda control loop > 0.030
P3081	Engine Temperature Too Low	Difference between ECT and modeled ECT > 9.80° K

## Ignition System

DTC	Error Message	Malfunction Criteria and Threshold Value
P0300	Random Misfire Detected	"> 2.1 (PZEV) > 1.9 (Bin 5 / B8 ULEV II)"
P0301	Cylinder 1 Misfire Detected	<ul style="list-style-type: none"> <li>• Catalyst damage misfire rate (MR) &gt;2.9 - 20.0 % PZEV &gt;</li> <li>• &gt; 3.2 - 20.0 Bin 5</li> </ul>
P0302	Cylinder 2 Misfire Detected	<ul style="list-style-type: none"> <li>• Catalyst damage misfire rate (MR) &gt;2.9 - 20.0 % PZEV &gt;</li> <li>• &gt; 3.2 - 20.0 Bin 5</li> </ul>
P0303	Cylinder 3 Misfire Detected	<ul style="list-style-type: none"> <li>• Catalyst damage misfire rate (MR) &gt;2.9 - 20.0 % PZEV &gt;</li> <li>• &gt; 3.2 - 20.0 Bin 5</li> </ul>
P0304	Cylinder 4 Misfire Detected	<ul style="list-style-type: none"> <li>• Catalyst damage misfire rate (MR) &gt;2.9 - 20.0 % PZEV &gt;</li> <li>• &gt; 3.2 - 20.0 Bin 5</li> </ul>
P0321	Ignition/Distributor Engine Speed Input Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Counted teeth vs. reference incorrect</li> <li>• Monitoring reference gap failure</li> </ul>
P0322	Ignition/Distributor Engine Speed Input Circuit No Signal	<ul style="list-style-type: none"> <li>• Camshaft signals &gt; 3</li> <li>• Engine speed no signal</li> </ul>
P0324	Knock Control System Error	<ul style="list-style-type: none"> <li>• Signal fault counter (combustion) &gt; 24.0</li> <li>or</li> <li>• Signal fault counter (measuring window) &gt; 2.00</li> <li>• Communication errors</li> <li>• SPI communication &gt; 25</li> </ul>
P0327	Knock Sensor 1 Circuit Low Input (Bank 1) Short to Ground, Port B	<ul style="list-style-type: none"> <li>• Lower threshold &lt; 70 V</li> </ul>
P0327	Knock Sensor 1 Circuit Short to Ground, Port A	<ul style="list-style-type: none"> <li>• Lower threshold &lt; 70 V</li> </ul>
P0327	Knock Sensor 1 Circuit Signal Range Check	Lower threshold, < 0.0 - 2.1582 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P0328	Knock Sensor 1 Circuit Signal Range Check (Bank 1)	Upper threshold 29.0674 - 114.9023 V
P0328	Knock Sensor 1 Circuit Short to B+ Port B (Bank 1)	Upper threshold >1.00 V
P0328	Knock Sensor 1 Circuit Short to B+ Port A (Bank 1)	Upper threshold >1.00 V
P0340	Camshaft Position Sensor A Circuit (Bank 1 or Single Sensor)	Cam adaption values out of range <ul style="list-style-type: none"> <li>• &gt; 20° KW</li> <li>• &lt; -20° KW</li> <li>• Difference of adapted and actual values &gt; 9° KW</li> </ul>
P0341	Camshaft Position Sensor A Circuit Range/Performance (Bank 1 or Single Sensor)	Signal pattern incorrect
P0342	Camshaft Position Sensor A Circuit Low Input (Bank 1 or Single Sensor)	<ul style="list-style-type: none"> <li>• Signal voltage low</li> <li>• Crankshaft signals 8</li> </ul>
P0343	Camshaft Position Sensor A Circuit High Input (Bank 1 or Single Sensor)	<ul style="list-style-type: none"> <li>• Signal voltage high</li> <li>• Crankshaft signals 8</li> </ul>
P0351	Ignition Coil A Primary/ Secondary Circuit	<ul style="list-style-type: none"> <li>• Signal current &lt; -0.25 to 2.0 mA</li> </ul> or <ul style="list-style-type: none"> <li>• Internal check failed</li> </ul>
P0352	Ignition Coil B Primary/ Secondary Circuit	<ul style="list-style-type: none"> <li>• Signal current &lt; -0.25 to 2.0 mA</li> </ul> or <ul style="list-style-type: none"> <li>• Internal check failed</li> </ul>
P0353	Ignition Coil C Primary/ Secondary Circuit	<ul style="list-style-type: none"> <li>• Signal current &lt; -0.25 to 2.0 mA</li> </ul> or <ul style="list-style-type: none"> <li>• Internal check failed</li> </ul>
P0354	Ignition Coil D Primary/ Secondary Circuit	<ul style="list-style-type: none"> <li>• Signal current &lt; -0.25 to 2.0 mA</li> </ul> or <ul style="list-style-type: none"> <li>• Internal check failed</li> </ul>

## Additional Exhaust Regulation

DTC	Error Message	Malfunction Criteria and Threshold Value
P0410	System Check After SAI PZEV only	Deviation SAI pressure > 20.0 hPa
P0413	Open Circuit PZEV only	Signal voltage 9.25 - 11.25 V
P0414	Short to Ground PZEV only	Signal voltage < 6.00 V
P0415	Short to B+ PZEV only	Signal current 2.20 - 4.20 A
P0418	Air Pump Relay Open Circuit PZEV only	Signal voltage 4.50 - 5.50 V
P0420	Catalyst System (front) Efficiency Below Threshold (Bank 1) PZEV only	<ul style="list-style-type: none"> <li>• Measured OSC / OSC of borderline catalyst value for front catalyst, &lt; 0.40</li> <li>or</li> <li>• Value for front catalyst, &lt; 1.30 and</li> <li>• Value for main catalyst, &lt; 1.20</li> </ul>
P0420	Catalyst System (main) Efficiency Below Threshold (Bank 1) PZEV only	<ul style="list-style-type: none"> <li>• Measured OSC / OSC of borderline catalyst value for main catalyst, &lt; 0.90</li> <li>While</li> <li>• Value for front catalyst, &lt; 2.00</li> </ul>
P0420	Catalyst System (only bin 5, ULEV) Efficiency Below Threshold (Bank 1)	Measured OSC/OSC of borderline catalyst. EWMA filter value for catalyst < .20
P0441	Evaporative Emission System Incorrect Purge Flow	Reaction of idle controller or lambda controller. Deviation less than 7% lambda controller and 35% idle controller deviation.
P0442	Evaporative Emission System Leak Detected (Small Leak)	Time for pressure drop < 1.55 - 1.75 Sec.
P0444	Evaporative Emission System Purge Control Valve Circuit Open	Signal voltage > 4.40 - 5.40 V
P0455	Evaporative Emission System Leak Detected (Gross Leak/ No Flow)	Time for pressure drop < 0.95 Sec.
P0456	Evaporative Emission System Leak Detected (Very Small Leak)	Time for pressure drop < 4.5 - 6.0 Sec.

DTC	Error Message	Malfunction Criteria and Threshold Value
P0458	Evaporative Emission System Purge Control Valve Circuit Low	Signal voltage < 2.15 - 3.25 V
P0459	Evaporative Emission System Purge Control Valve Circuit High	Signal current > 2.20 A
P0491	Secondary Air System Insufficient Flow. Flow Check During Catalyst Heating. PZEV Only	SAI pressure measured with SAI pressure sensor vs modeled < 0.6 (0.62) %

### Speed and Idle Control

DTC	Error Message	Malfunction Criteria and Threshold Value
P0501	Vehicle Speed Sensor A Range/Performance	VSS signal < 4 km/h
P0501	Vehicle Speed Sensor A Range/Performance Only ULEV	VSS signal < 4 km/h
P0503	Vehicle Speed Sensor A Out of Range High	Vehicle speed > 200 km/h
P0506	Idle Air Control System - RPM Lower Than Expected	• Engine speed deviation < -80 RPM
P0507	Idle Air Control System - RPM Higher Than Expected	• Engine speed deviation > -80 RPM

### Control Module and Output Signals

DTC	Error Message	Malfunction Criteria and Threshold Value
P0601	Internal Control Module Memory Check Sum Error	Internal check sum, incorrect
P0604	Internal Control Module Random Access Memory (RAM) Error	Write ability check, failed
P0605	Internal Control Module Read Only Memory (ROM) Error	Checksum incorrect
P0606	ECM Processor	Powerup calibration • EEPROM check, failed A/D channel conversion • Check failed

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0627	Fuel Pump "A" Control Circuit /Open	<ul style="list-style-type: none"> <li>• Internal error fuel pump control unit</li> <li>• Feedback from fuel pump control unit pump blocked short circuit to battery +, ground or open circuit</li> </ul>
P0638	Throttle Actuator Control Range/Performance (Bank 1)	Rationality check: <ul style="list-style-type: none"> <li>• Time to close to reference point &gt; 0.56 Sec.</li> <li>and</li> <li>• Reference point 2.88%</li> <li>Signal range check</li> <li>• Duty cycle &gt;80%</li> <li>and</li> <li>• ECM power stage, no failure</li> </ul>
P0641	Sensor Reference Voltage A Circuit/Open	Signal voltage deviation > $\pm 0.3$ V
P0642	Sensor Reference Voltage A Circuit Low	Signal voltage < 4.6 - 5.0 V
P0643	Sensor Reference Voltage A Circuit High	5V supply voltage > 4.99 - 5.41 V
P0651	Sensor Reference Voltage B Circuit/Open	Signal voltage deviation $\pm 0.3$ V
P0652	Sensor Reference Voltage B Circuit Low	Signal voltage < 4.6 - 5.0 V
P0653	Sensor Reference Voltage B Circuit High	5V supply voltage > 4.99 - 5.41 V
P0657	Actuator Supply Voltage A Circuit/Open	Signal voltage > 4.40 - 5.60 V
P0658	Actuator Supply Voltage A Circuit Low	Signal voltage < 2.15 - 3.25 V
P0659	Actuator Supply Voltage A Circuit High	Signal current > 1.10 A
P0685	ECM/PCM Power Relay Control Circuit/Open	<ul style="list-style-type: none"> <li>• Signal voltage 2.6 - 3.7 V</li> <li>• Sense circuit voltage &gt; 6 V</li> </ul>
P0686	ECM/PCM Power Relay Control Circuit Low	<ul style="list-style-type: none"> <li>• Signal voltage 2.6 - 3.7 V</li> <li>• Sense circuit voltage &gt; 6 V</li> </ul>
P0687	ECM/PCM Power Relay Control Circuit High	<ul style="list-style-type: none"> <li>• Signal current &gt; 1.4 - 0.7 A</li> <li>• Sense circuit voltage &lt; 6 V</li> </ul>



DTC	Error Message	Malfunction Criteria and Threshold Value
P0688	ECM/PCM Power Relay Sense Circuit	<ul style="list-style-type: none"> <li>• Sense voltage &lt; 3.0 V</li> <li>• Difference sense circuit voltage with camshaft actuator commanded off and on &gt; 2.5 V</li> <li>• Battery voltage &gt; 3 V</li> </ul>
P0697	Sensor Reference Voltage C Circuit/Open	Signal voltage deviation $\pm$ 0.3 V
P0698	Sensor Reference Voltage C Circuit Low	Signal voltage < 4.6 - 5.0 V
P0699	Sensor Reference Voltage C Circuit High	5V supply voltage > 4.99 - 5.41 V
U0001	High Speed CAN Communication Bus	CAN message, no feedback
U0002	High Speed CAN Communication Bus	Global time out
U0100	Lost Communication with ECM/PCM A	<ul style="list-style-type: none"> <li>• Failure of all CAN engine messages, time out &gt; 490 mSec.</li> <li>• Failure of all CAN engine messages, but not all CAN messages, time out &gt; 1010 mSec.</li> </ul>
U0101	Lost Communication with TCM	<ul style="list-style-type: none"> <li>• Checksum check Failed</li> <li>• Message counter check failed</li> <li>• Time out check No message received by ECM</li> </ul>
U0121	CAN ABS Brake Unit	CAN communication with brake unit, time-out
U0146	CAN Gateway A	CAN communication with gateway, time out
U0302	Software Incompatibility with Transmission Control Module	AT vehicle ECM coded as MT vehicle
U0323	CAN: Instrument cluster Audi only	Ambient temperature value module not encoded for ambient temp sensor, 00h
U0402	CAN Communication with TCM	Data length code transmitted, incorrect
U0404	Invalid Data Received From Gear Shift Control Module	<ul style="list-style-type: none"> <li>• If the value of message counter is permanent, constant, or change exceeds a threshold, increment an event counter</li> <li>• Maximum change of message counter &gt; 5</li> </ul>

DTC	Error Message	Malfunction Criteria and Threshold Value
U0415	CAN Link to Speed Sensor	Speed sensor initialization failure
U0422	CAN: Instrument Cluster	Ambient temperature value initialization, Audi 01 h
U0447	CAN Gateway	CAN message incorrect
U1030	LIN Communication	Not active
U102F	LIN Communication	Time out
U102E	LIN Communication	LIN message, incorrect

### Fuel and Air Ratios Control Module

DTC	Error Message	Malfunction Criteria and Threshold Value
P1114	Internal Resistance Too Large (Bank 1, Sensor 2)	Heater resistance, (128-648)*(8-40) 1.02-25.9 k $\Omega$ (dep. on mod. exhaust temperature and heater power)
P12A1	Fuel Rail Pressure Sensor Inappropriately Low	<ul style="list-style-type: none"> <li>• Pressure control activity &gt; 0.25 MPa</li> <li>and</li> <li>• Fuel trim activity &lt; 0.80</li> <li>and</li> <li>• Difference between target pressure vs. actual pressure, -16.38 - 16.38 mPa</li> </ul>
P12A2	Fuel Rail Pressure Sensor Inappropriately High	<ul style="list-style-type: none"> <li>• Pressure control activity, &lt; 0.05 mPa</li> <li>and</li> <li>• Fuel trim activity &lt; 0.85</li> <li>and</li> <li>• Difference between target pressure vs. actual pressure, -16.38...16.38 mPa</li> </ul>
P12A4	Fuel Rail Pump Control Valve Stuck Closed	<ul style="list-style-type: none"> <li>• Pressure control activity, &lt;6.00 mPa</li> <li>and</li> <li>• Fuel trim activity, &gt; .90...1.15</li> <li>and</li> <li>• Difference between target pressure vs. actual pressure, - &lt; 16.38 mPa</li> </ul>

DTC	Error Message	Malfunction Criteria and Threshold Value
P2101	Throttle Actuator A Control Motor Circuit Range/ Performance	<ul style="list-style-type: none"> <li>• Duty cycle &gt;80% and</li> <li>• ECM power stage, no failure</li> <li>• Deviation throttle valve angles vs. calculated value 4.0 - 50.0%</li> </ul>
P2106	Throttle Actuator Control System - Short to B+ or Ground	Internal check
P2106	Throttle Actuator Control System Open Circuit	Internal check
P2106	Throttle Actuator Control System Temperature Current Monitoring	Internal check failed
P2106	Throttle Actuator Control System Functional Check	Internal check failed
P2110	Throttle Actuator Control System - Forced Limited RPM	Engine load out of range
P2122	Throttle/Pedal Position Sensor/Switch D Circuit Low Input	Signal voltage < 0.606 V
P2123	Throttle/Pedal Position Sensor/Switch D Circuit High Input	Signal voltage > 4.794 V
P2127	Throttle/Pedal Position Sensor/Switch E Circuit Low Input	Signal voltage < 0.268 V
P2128	Throttle/Pedal Position Sensor/Switch E Circuit High Input	Signal voltage > 2.431 V
P2138	Throttle/Pedal Position Sensor/Switch D/E Voltage Correlation	Signal voltage: Difference between signal sensor 1 vs. 2 > 0.167 - 0.703 V
P2146	Fuel Injector Group A Supply Voltage Circuit / Short to Ground	Signal current > 14.90 A
P2149	Fuel Injector Group B Supply Voltage Circuit / Short to Ground	Signal current >14.90 A

DTC	Error Message	Malfunction Criteria and Threshold Value
P2181	Cooling System Performance	<ul style="list-style-type: none"> <li>Cooling system temp too low after a sufficient air mass flow interval, &lt; 74 - 84° C (SULEV)</li> <li>&lt; 60 - 84° C (ULEV)</li> </ul>
P2195	O2 Sensor Signal Biased/ Stuck Lean (Bank 1, Sensor 1)	Delta lambda of 2nd lambda control loop > 0.07
P2196	O2 Sensor Signal Biased/ Stuck Rich (Bank 1, Sensor 1)	Delta lambda of 2nd lambda control loop < 0.07
P2231	O2 Sensor Signal Circuit Shorted to Heater Circuit	Delta O2S signal front > 190 uA
P2237	O2 Sensor Positive Current Control Circuit/Open (Bank 1, Sensor 1)	<ul style="list-style-type: none"> <li>O2S signal front 1.493 - 1.507 V</li> <li>O2S signal front &lt; 1.70020 V and</li> <li>Fuel cut-off &gt; 3.00 Sec</li> <li>O2S signal front 1.50 - 1.51 V</li> <li>Delta lambda controller, &gt; 0.10</li> </ul>
P2243	O2 Sensor Reference Voltage Circuit/Open (Bank 1, Sensor 1)	<ul style="list-style-type: none"> <li>O2S signal front &gt;4.70 V and Internal resistance &gt; 1000 Ω</li> <li>O2S signal front &lt; 0.30 V and Internal resistance &gt; 1000 Ω</li> </ul>
P2257	Air Pump Relay Short to Ground PZEV only	Signal voltage < 3.00 V
P2258	Air Pump Relay Short to B+ PZEV only	Signal current 0.60 - 1.20 A
P2270	O2 Circuit Slow Response (Bank 1, Sensor 2) ULEV	Rationality check, O2S signal rear, < 0.620 - 0.654 mV
P2270	O2 Circuit Slow Response (Bank 1, Sensor 2) SULEV	Rationality check, O2S signal rear, < 0.557 - 0.630 mV
P2271	O2 Circuit (Bank 1, Sensor 2) ULEV	<ul style="list-style-type: none"> <li>Measurement range from fuel cut-off to voltage threshold, ≤ 152.3 mV</li> <li>Number of checks (initial phase), ≥ 1</li> </ul>
P2271	O2 Circuit (Bank 1, Sensor 2) SULEV	Rationality check, O2S signal rear, < 0.557 - 0.630 mV
P2274	O2 Circuit Slow Response (Bank 1, Sensor 3) SULEV	Rationality check, O2S signal rear, <0.620...0.654 mV

DTC	Error Message	Malfunction Criteria and Threshold Value
P2275	O2 Circuit Slow Response (Bank 1, Sensor 3) SULEV	<ul style="list-style-type: none"> <li>• Measurement range from fuel cut-off to voltage threshold, <math>\leq 152.3</math> mV</li> <li>• Number of checks (initial phase), <math>\geq 1</math></li> <li>• ULEV</li> <li>• O2S signal rear, <math>&gt; 0.620 - 0.654</math> mV</li> </ul>
P2279	Intake Air System Leak	<ul style="list-style-type: none"> <li>• Threshold to detect a defective system <math>&gt; 1.33 - 1.6</math> and</li> <li>• Ratio of the tie system defective during the measurement window to the whole duration of the measurement window <math>&gt; 0.60000</math></li> </ul>
P2293	Fuel Pressure Regulator 2 Performance	<ul style="list-style-type: none"> <li>• Difference between target pressure vs. actual pressure: <math>&gt; 1.50</math> mPa</li> <li>• Difference between target pressure vs. actual pressure, <math>&lt; -1.50</math> mPa</li> </ul>
P2294	Fuel Pressure Regulator 2 Control Circuit Open circuit	Signal voltage 2.30 - 2.70 V
P2294	Fuel Pressure Regulator 2 Control Circuit Rationality Check	Signal pattern incorrect
P2295	Fuel Pressure Regulator 2 Control Circuit Low Short to Ground	Signal voltage $< 1.80 - 2.20$ V
P2296	Fuel Pressure Regulator 2 Control Circuit High	Signal voltage $> 3.20$ V

### Ignition System

DTC	Error Message	Malfunction Criteria and Threshold Value
P2300	Ignition Coil A Primary Control Circuit Low	Signal current $> 24.0$ mA
P2301	Ignition Coil A Primary Control Circuit High	Signal current $> 5.1 - 7.0$ mA

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P2303	Ignition Coil B Primary Control Circuit Low	Signal current > 24.0 mA
P2304	Ignition Coil B Primary Control Circuit High	Signal current > 5.1 - 7.0 mA
P2306	Ignition Coil C Primary Control Circuit Low	Signal current > 24.0 mA
P2307	Ignition Coil C Primary Control Circuit High	Signal voltage > 5.1 - 7.0 mA
P2309	Ignition Coil D Primary Control Circuit Low	Signal current > 24.0 mA
P2310	Ignition Coil D Primary Control Circuit High	Signal voltage > 5.1 - 7.0 mA

### **Additional Emissions Regulations**

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P2400	Evaporative Emission System Leak Detection Pump Control Circuit/Open	Signal voltage > 4.40 - 5.60 V
P2401	Evaporative Emission System Leak Detection Pump Control Circuit Low	Signal voltage < 2.15 to 3.25 V
P2402	Evaporative Emission System Leak Detection Pump Control Circuit High	Signal current > 3.0 A
P2403	Evaporative Emission System Leak Detection Pump Sense Circuit/Open	Low signal voltage > 0.5 Sec.
P2404	Evaporative Emission System Leak Detection Pump Sense Circuit Range/Performance	<ul style="list-style-type: none"> <li>• High signal voltage &gt; 30.4 V and</li> <li>• Number of checks, 30</li> </ul>
P2414	O2 Sensor Exhaust Sample Error (Bank 1, Sensor 1)	<ul style="list-style-type: none"> <li>• Signal voltage 3.10 - 4.81 V</li> <li>• Signal voltage 2.5 to 3.2 V</li> <li>• O2S signal 2.5 - 3.1 V</li> </ul>
P2431	Rationality check	Difference between SAI pressure and ambient pressure NOT -25.0 - 25.0 hPa
P2432	Signal Range Check	Signal voltage < 0.40 V
P2433	Signal Range Check	Signal voltage > 4.65 V

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P2440	System Check After SAI PZEV only	SAI pressure measured with SAI pressure sensor vs. modeled while SAI valve closed < 0.55%
P2539	Low Pressure Fuel System Sensor Circuit	Signal voltage > 4.9 V
P2540	Low Pressure Fuel System Sensor Circuit Range/ Performance	Actual pressure deviation < 800 kPa < 80 kPa
P2541	Low Pressure Fuel System Sensor Circuit Low	Signal voltage < 0.2 V
P2568	RIS Sensor wrong signal PZEV only	<ul style="list-style-type: none"> <li>• Signal of sensor mismatched with radiator</li> <li>or</li> <li>• Measured temp. gradients during 3 measure windows always, &lt;0.25 K/2s</li> </ul>
P2569	RIS Sensor signal low PZEV only	Signal voltage < 0.2 V
P2570	RIS Sensor signal always high PZEV only	Signal voltage >5.0 V
P2626	O2 Sensor Pumping Current Trim Circuit/Open (Bank 1 Sensor 1)	O2S signal front > 4.81 V

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