

2014

# A8/A8L /S8

Quick Reference  
Specification Book



# 2014 Audi A8/A8L/S8 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.

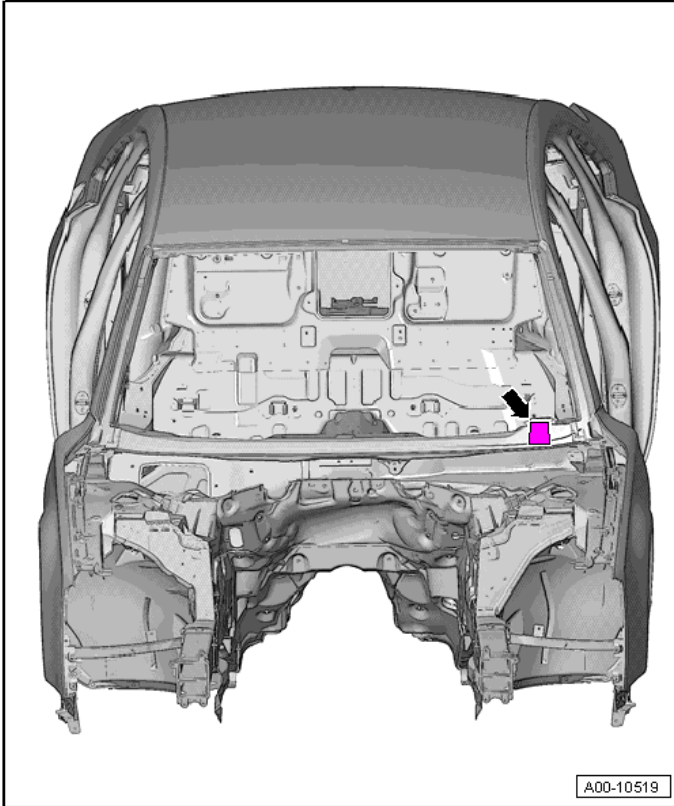
*(CAUTIONS cont'd on next page)*

## **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.

# VIN Decoder

### 2014 Audi VIN Decoder

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
<b>Series:</b> <b>A</b> = A4 Premium AS Cab Premium A8 Sedan RB V8 4.2 Coupe**** RB V10 5.2 Coupe**** <b>B</b> = A4 Premium q S4 Premium q TT/TS/TTFS Cpe Prem = quattro <b>C</b> = A5 Premium q AS Cab Premium q A6 2.0T Premium S5 Premium+ q S5 Cab Premium q Q5 2.0T Premium Q5 Hybrid Prestige Q5 TDI Premium q S25 Premium+ S25 Premium+ Q7 3.0TDTI Prem RS5 Cpe & Cab** <b>D</b> = A4 Manual Prem q S4 Manual Prem A5 2.0T Premium+ S8 Sedan Q5 3.0T Premium+ Q5 TDI Premium+ Q7 3.0T Prest. S-Line RB V8 4.2 Coupe - Manual <b>E</b> = A4 Premium+ q RB V10 5.2 Coupe**** AS Premium+ q S7 RB V8 4.2 Coupe**** <b>G</b> = A5 Manual Prem q S5 Manual Prem q A6 2.0T Premium+ q RB V10 5.2 Coupe - Manual <b>H</b> = A4 Manual Prem+ q AS Prestige q S7 <b>J</b> = A4 Premium+ q A5 2.0T Premium+ q RB V10 5.2 Coupe <b>L</b> = A5 Premium+ q AS Cab Premium+ q Q5 2.0T Premium+ Q7 3.0TDTI Prem RB V10 5.2 Coupe - Manual <b>M</b> = A5 Manual Prestige q AS Cab Premium+ q S-Line RB V8 4.2 Spider*** RB V10 5.2 Spider*** <b>U</b> = Allroad Premium+ q AS Cab Prestige RB V8 4.2 Spider*** RB V10 5.2 Spider*** <b>V</b> = Allroad Prestige q Manual SS Prestige q SS Cab Prestige q Q5 TDI Prestige SQ5 Prestige Q7 TDI Prestige <b>W</b> = A5 Prestige+ q S-Line AS Cab Prestige+ q A7 Premium+ q S7 RS7*** Q5 3.0T Prestige S-Line Q5 TDI Prestige S-Line Q7 TDI Prestige S-Line RB V8 4.2 Spider*** <b>2</b> = A7 Prestige q RB V10 5.2 Plus Coupé - Manual <b>3</b> = S5 Man Prestige q RB V10 5.2 Plus Coupé <b>4</b> = A5 Man Prest q A7 Allroad Premium q <b>9</b> = Allroad Premium q	<b>Mfg. Make (1-3)</b> W U A	<b>Series</b> B	<b>Engine</b> F	<b>Restraint system</b> A	<b>Model (7&amp;8)</b> F L	<b>Check digit</b> 3	<b>Model year</b> E	<b>Assembly plant</b> 1	<b>Sequential production number (position 12 - 17)</b> 0 0 2 0 1 4								
												** 4 cyl 2.0L 220hp (CAED) A4 CVT / A4 q / AS Cpe q / AS Cab / AS CVT (C7) / A6 q F= 4 cyl 2.0L 211hp (CETA) TT Cpe q / TT Rstr q F= 4 cyl 2.0L 220hp (CPN8) A4 q / AS Cpe q / AS Cab q / Allroad / Q5 + G= V6 3.0L 310hp (CTUA) A6 q (C7) / A7 q G= V6 3.0L 333hp (CTUB) S4 / S5 / S5 Cab / A8 / A8L G= V6 3.0L 272hp (CTUC) Q5 G= V6 3.0L 354hp (CTUD) SQ5 G= V6 3.0L 333hp (CTVA) Q7 G= V6 3.0L 280hp (CTWB) Q7 M= V6 3.0L TDI 240hp (CPNA) Q7 M= V6 3.0L TDI 240hp (CPNA) A6 M= V6 3.0L TDI 240hp (CPNB) A6 / A7 Sportback, Q5 N= V10 5.2L 550hp (CTYA) R8 Coupe N= V10 5.2L 520hp (CTYB) R8 Spider U= V8 4.2L 430hp (CND) R8 / R8 Spider U= V10 5.2L 520hp (CNDM) R8 1= 4 cyl 2.0L 260hp (CDMA) TTFS Cpe/Rstr 2= V8 4.0L 420hp (CEUA) A8 / A8L 2= V8 4.0L 420hp (CEUC) S6 / S7 Sportback (C7) 2= V8 4.0L 520hp (CGTA) S8 2= V8 4.0L 560hp (CGTB) RST Sportback (C7) 4= W12 6L 500hp (CEA) A8L (C4) 6= V8 4.2L 400hp (RSS) Cpe/Cab 8 or C= 4 cyl 2.0L 211hp + 40 kW (CHUA) Q5					
												FC (4G) = AB / SE / AT / ST / RS / RS FD (4H) = A8 / S8 FE (4L) = A8L / Q7 FG (4Z) = R8 FH (8F) = A5 / S5 / S5 Cab / R55 Cab FK (8J) = TT / TTS FL (8K) = A4 / S4 FP (8K) = A4L / Q5 FR (8T) = A5 / S5 / S5 Cab					
												A= Inpolstatt D= Bratislava N= Neckarsulm 1= Győr					
												* 7th VIN character is alphabetic for CDN, Mex. and US 2010 and later vehicles. ROW model characters are listed in parenthesis, ( ), for reference only ** All allroad models are identified by WMI code of 'WAU'. All other A4 models are identified by WMI code of 'WAU'. *** RSS Cabriolet, RSS Coupé, RST and R8 models are identified by WMI code of 'WAU'. **** R8 Coupe 4.2 and 5.2 models and R8 Spider 4.2 and 5.2 models may use					

July 15, 2013 (Rev 2)

◆ The following 5.0T models are E85 Flex/Fuel capable: A4 2.0T quattro automatic, allroad 2.0T quattro, A5 5.0T Cabriolet quattro, A5 5.0T Coupé quattro automatic, Q5 5.0T  
 ◆◆ Some early production R8 V10 Coupés with manual transmission vehicles used a 4th and 5th character combination of 'G0' instead of 'GN'.  
 ◆◆◆ Some early production vehicles use the character 'C' instead of 'E'.

### 2014 Restraint System:

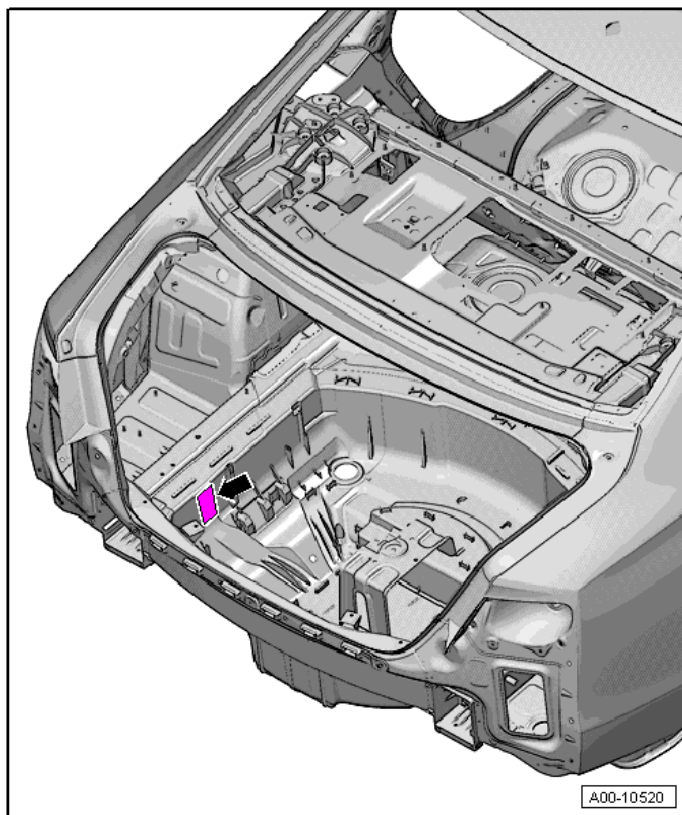
All = Active - Dri/Pass, AirBag - Dri/Pass, Advanced Front AirBag  
 A (A5 / S5 / RSS Cab, TT / TTS, R8) = Side AirBags Front, Knee AirBags Front  
 A (A5 / S5, RSS Coupé) = Side AirBags Front, Side Guard Air Curtain, Knee AirBags Front  
 A (A4 / S4, A6 / S6, Q5, Q7) = Side AirBags Front, Side Guard Air Curtain  
 A (A8 / S8) = Side AirBags Frt. & Rear, Side Guard Air Curtain, Knee AirBag  
 A (R8) = Side AirBags Front, Knee AirBags Front  
 A (A4 / S4 / A6 / S6, A7 / S7 / RST) = Side AirBags Front, Side Guard Air Curtain, Knee AirBag  
 B (A4 / S4, A6 / S6, A7 / S7 / RST) = Side AirBags Front & Rear, Side Guard Air Curtain, Knee AirBag  
 B (Q5, Q7) = Side AirBags Front & Rear, Side Guard Air Curtain

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  
 E = 2014

### 2014 Audi VIN Decoder

1	Mfg. Make (1-3)
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	

## Vehicle Data Label



The vehicle data label (➡) is located in the back of the spare wheel well on the left side.

Vehicle  
Identification

# SALES CODES

## Engine Codes

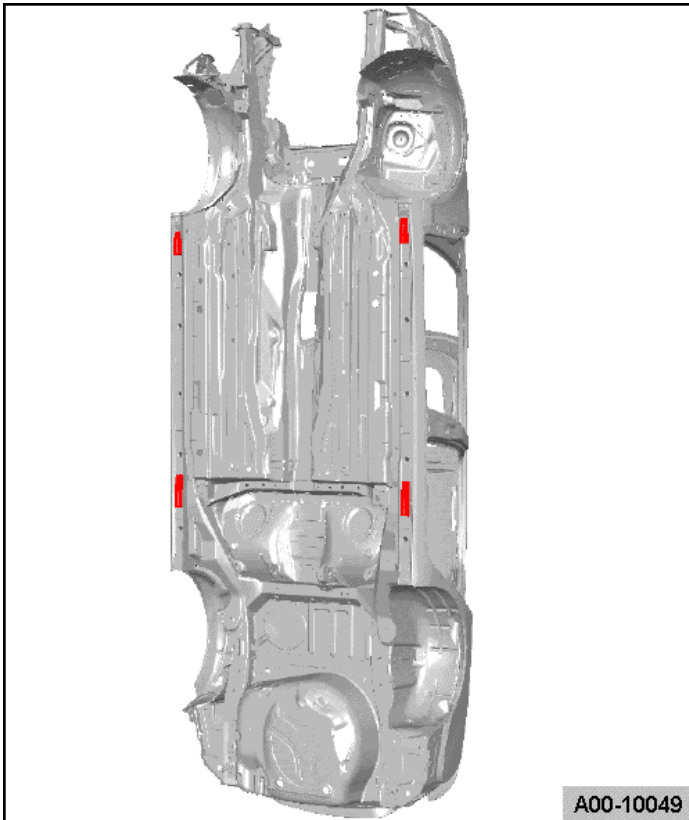
CPNA	3.0L 6-cylinder (TDI)
CTUB	3.0L 6-cylinder
CEUA, CGTA	4.0L 8-cylinder
CEJA	6.3L 12-cylinder

## Transmission Code

0BK	8-speed automatic transmission
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# VEHICLE LIFTING

## Hoist and Floor Jack Lifting Points



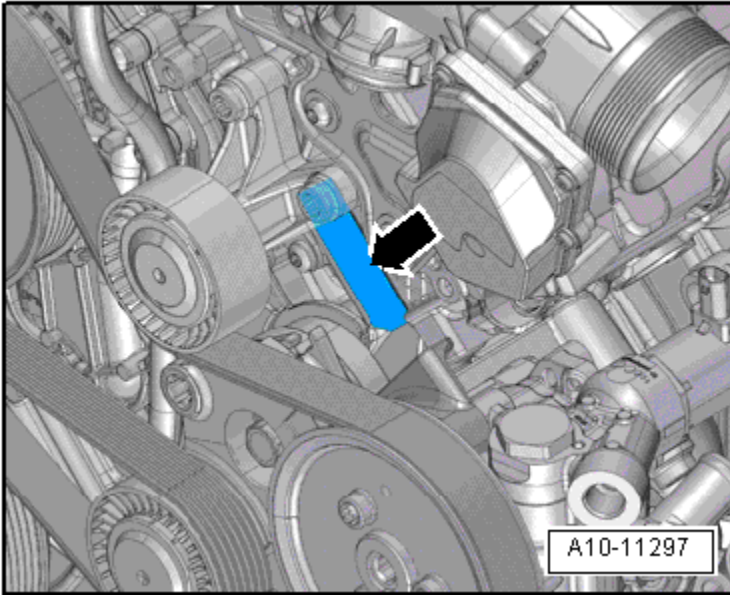
Front and Rear: At the plastic recesses on the vehicle underbody marked in red.



# ENGINE MECHANICAL – 3.0L CPNA (TDI)

## General, Technical Data

### Engine Number Location



The engine number (➡) (engine code and serial number) is located on the left side in the front under the high pressure pump toothed belt.

Sales  
Codes

Vehicle  
Lifting

Engine –  
3.0L CPNA (TDI)

## Engine Data

Code letters		CPNA
Displacement	liter	2.967
Output	kW at RPM	176 @ 4000
Torque	Nm at RPM	550 @ 2200
Bore	diameter mm	83.0
Stroke	mm	91.4
Compression ratio		16.8
RON	at least	51
Fuel injection and ignition system		Bosch Motronic
Ignition sequence		1-4-3-6-2-5
Exhaust Gas Recirculation (EGR)		Yes
Turbocharger, Supercharger		Turbocharger
Charge air cooler		Yes
Oxygen Sensor (O2S) regulation		Heated oxygen sensor (HO2S) 1
Particulate Filter		Yes
Selective Catalytic Reduction (SCR) - catalytic converter		Yes
Valve per cylinder		4

## *Engine Assembly – 3.0L CPNA (TDI)*

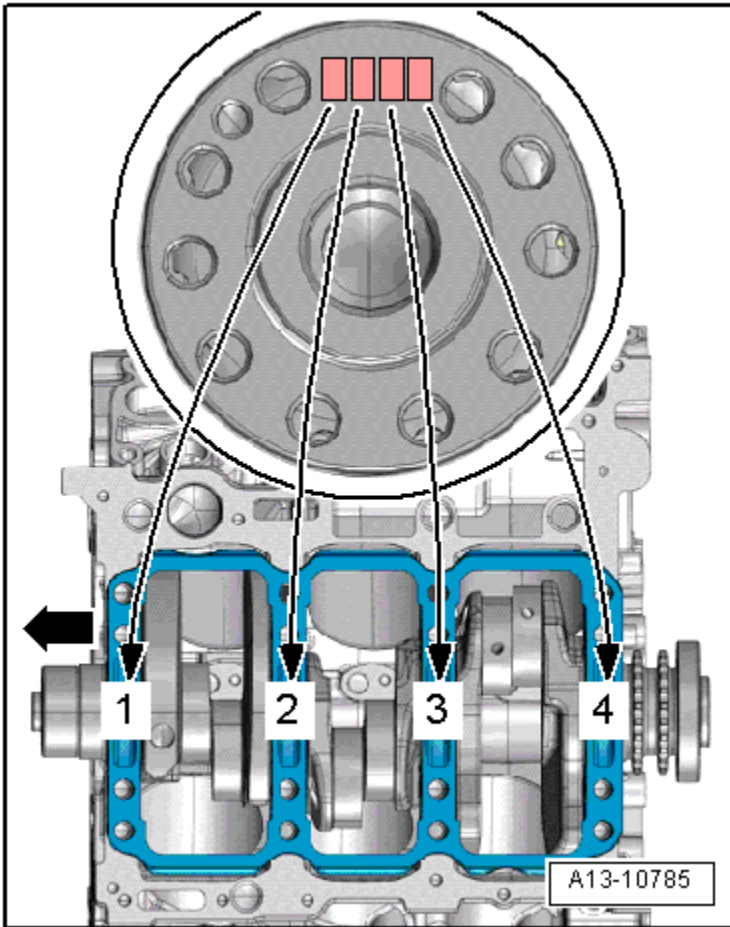
### Fastener Tightening Specifications

Component	Fastener size	Nm
Bolts and nuts	M6	9
	M7	15
	M8	20
	M10	40
	M12	65
Engine mount <sup>1)</sup>	-	90 plus an additional 90° (¼ turn)
Engine support	-	40
Heat shield	-	10
Hydraulic hose mount nut	-	9
Retaining plate for the engine mount bolt	-	20
Subframe bolt-to-retaining plate	-	55

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

# Crankshaft, Cylinder Block – 3.0L CPNA

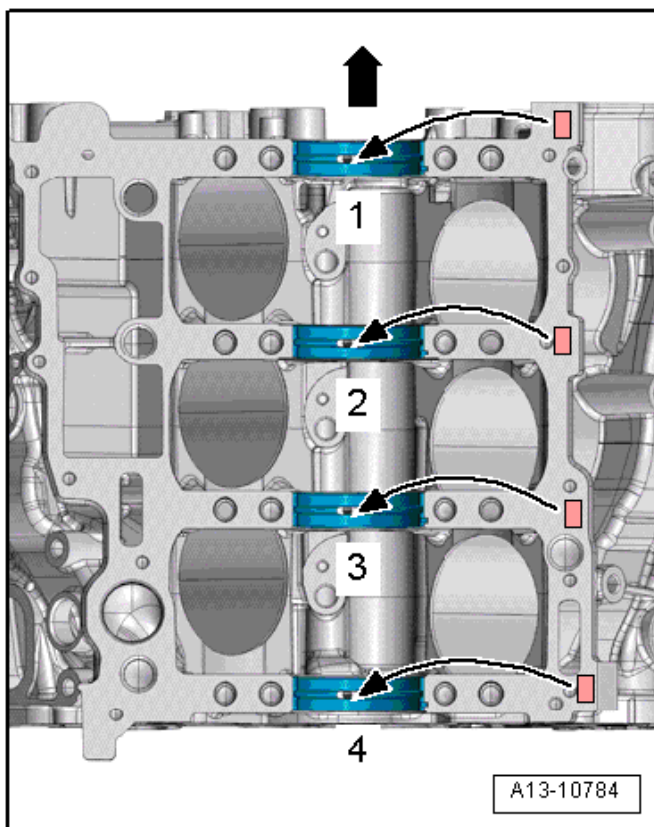
## Allocation of Crankshaft Bearing Shells for Guide Frame



Bearing shells with the correct thickness are allocated to the guide frame in the factory. Colored dots on sides of bearing shells serve for identifying bearing shell thickness. Allocation of bearing shells to guide frame is marked on flywheel flange of crankshaft by a row of letters. The first letter of the row of letters represents bearing 1 the second letter is for bearing 2 etc.

Letter on cylinder block	Color of bearing
R	Red
G	Yellow
B	Blue

## Allocation of Crankshaft Bearing Shells for Cylinder Block



Bearing shells with the correct thickness are allocated to the cylinder block in the factory. Colored dots on bearing shells serve for identifying bearing shell thickness. Arrow: belt pulley side. Allocation of bearing shells to cylinder block is identified with a letter by each bearing.

Letter on cylinder block	Color of bearing
R	Red
G	Yellow
B	Blue

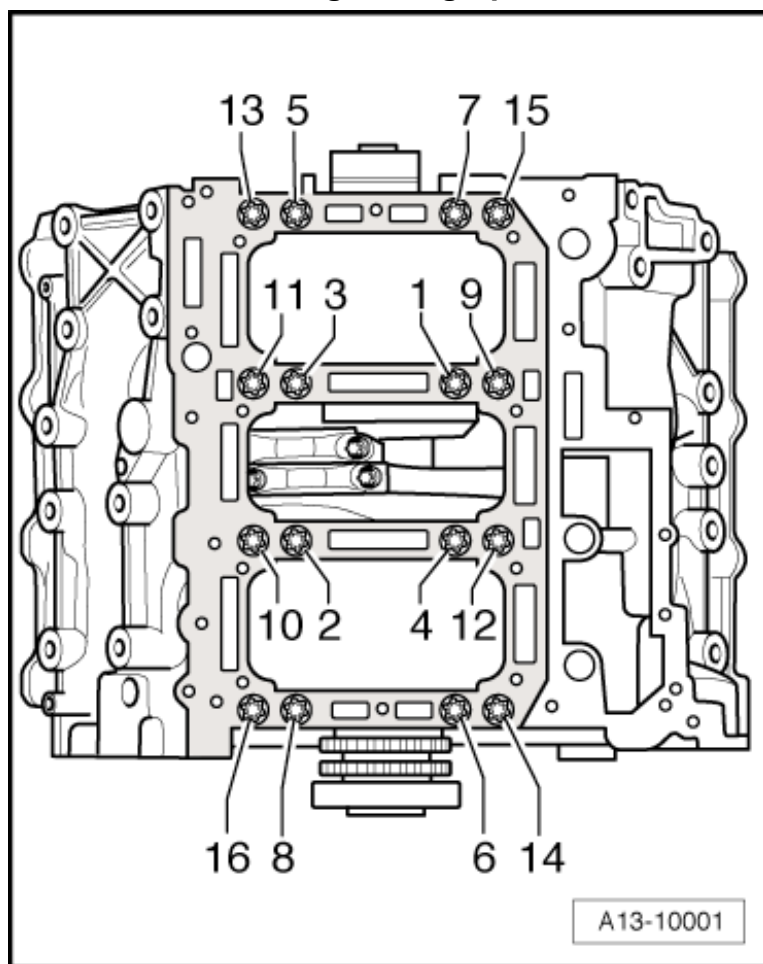
## Fastener Tightening Specifications

Component	Nm
Bracket for assemblies	
Tighten in 2 steps: 5 Nm diagonally 40 Nm diagonally	-
Bracket for the generator	
Tighten in 2 steps: 5 Nm diagonally 40 Nm diagonally	-
Bracket for idler roller	23
Connecting rod bearing cap bolts <sup>1)2)</sup>	35 plus an additional 90° (¼ turn)
Cover to sealing flange bolt	9
Connecting rod bearing cap <sup>1)</sup>	60 plus an additional 90° (¼ turn)
Idler Roller For the ribbed belt	23
Oil dipstick guide tube	9
Piston cooling oil spray jet	9
Tensioner for the ribbed belt <sup>1)</sup>	50 plus an additional 90° (¼ turn)
Vibration damper to crankshaft <sup>1)</sup>	20 plus an additional 90° (¼ turn)

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

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

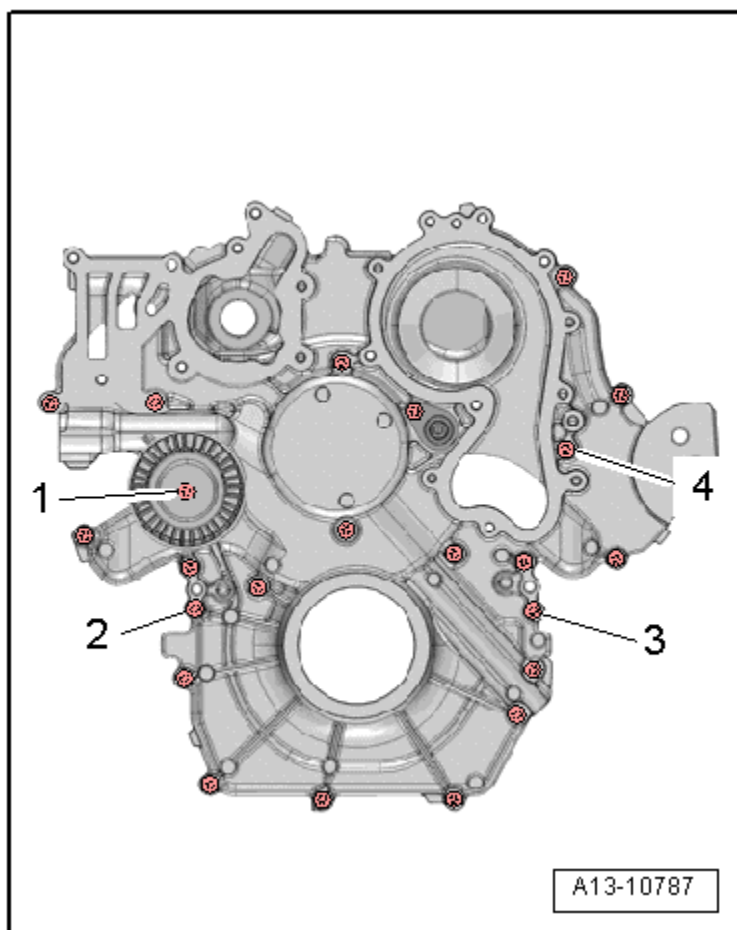
## Guide Frame Tightening Specifications



Replace any bolts that were tightened with an additional turn.

Step	Component	Nm
1	Tighten bolts 1 through 16 in sequence	30
2	Tighten bolts 1 through 16 in sequence	50
3	Tighten bolts 1 through 16 in sequence	an additional 180° (½ turn)

## Ribbed Belt Pulley Side Sealing Flange Tightening Specifications

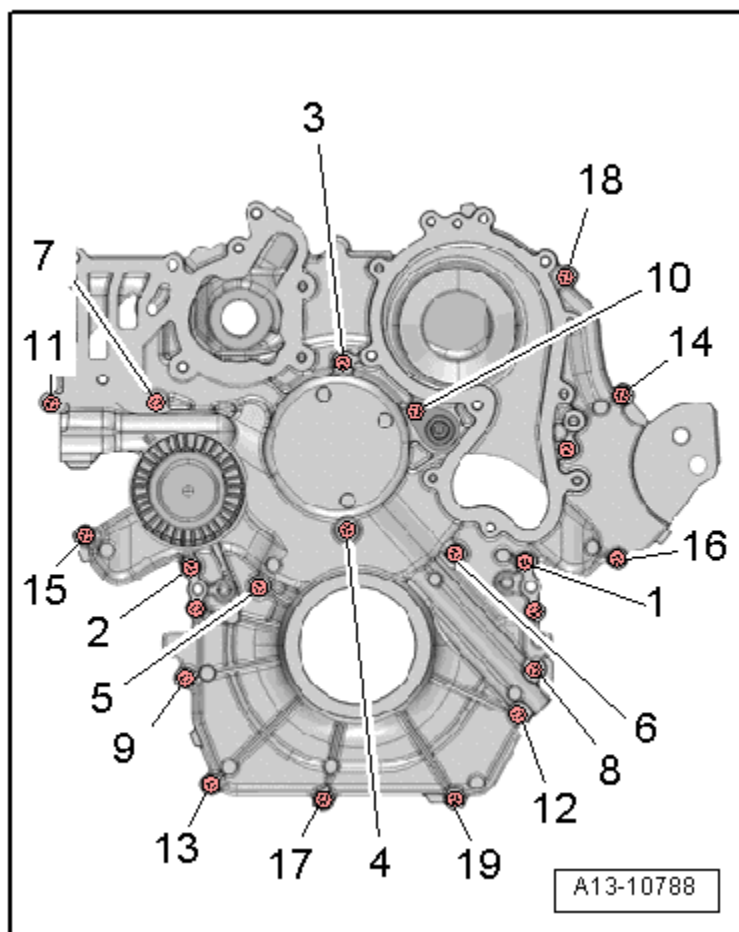


Replace any bolts that were tightened with an additional turn.  
Tighten the bolts in 11 steps in the sequence shown.

### Steps 1 to 3:

Step	Component	Nm
1	Attach the sealing flange with the seal to the cylinder block	
2	Tighten bolt 1	23
3	Tighten bolts 2 through 4 in sequence	Tighten M6x20 to 9 Nm

## Ribbed Belt Pulley Side Sealing Flange Tightening Specifications (cont'd)

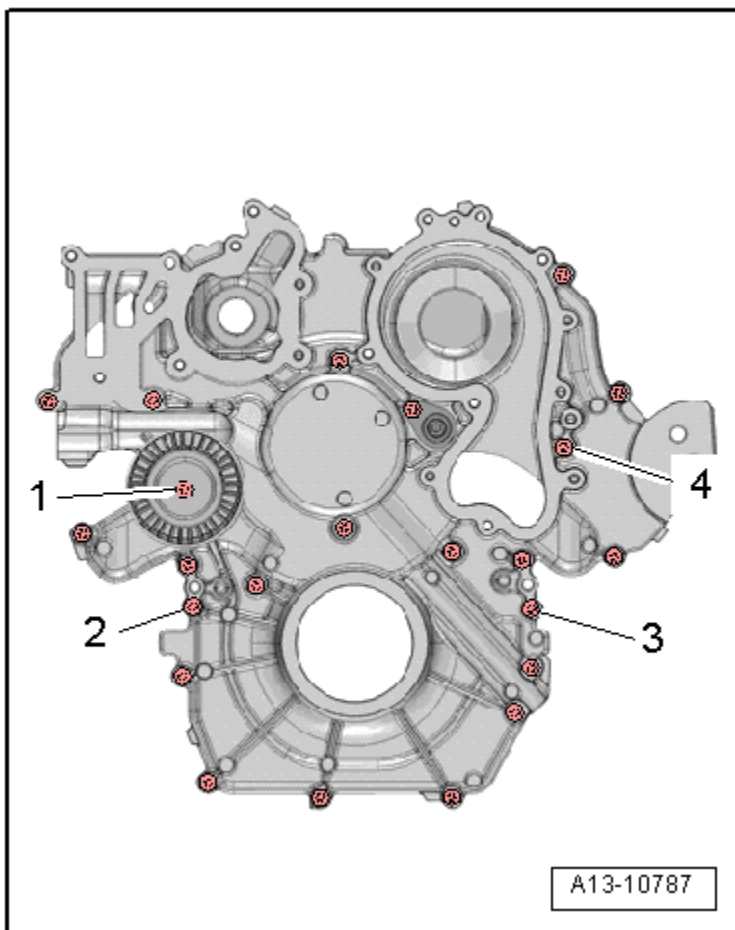


### Steps 4 to 8:

Step	Component	Nm
4	Insert a temperature regulator for the engine oil cooler with the cover	
5	Tighten bolt 10	Hand-tighten
6	Tighten bolts 1 through 19 in sequence	3
7	Tighten bolts 1 through 19 in sequence	3
8	Tighten bolts 1 through 19 in sequence	90 plus an additional 90° (¼ turn)



## Ribbed Belt Pulley Side Sealing Flange Tightening Specifications (cont'd)



### Steps 9 to 11:

Step	Component	Nm
9	Tighten bolts 2 through 4 in sequence	Remove the steel bolts M6x20
10	Tighten bolts 2 through 4 in sequence	Insert the aluminum bolts and tighten to 3 Nm
11	Tighten bolts 2 through 4 in sequence	Turn the aluminum bolts 90 plus an additional 90° (¼ turn)

## Crankshaft Dimensions

Honing dimension in mm	Crankshaft bearing journal diameter		Connecting rod journal diameter	
Basic dimension	65.000	- 0.022	54.000	- 0.022
		- 0.042		- 0.042

## Piston Ring End Gaps

Piston ring end gaps dimensions in mm	New	Wear limit
1 <sup>st</sup> compression ring	0.25 to 0.40	0.60
2 <sup>nd</sup> compression ring	0.70 to 0.90	1.20
Oil scraping ring	0.25 to 0.50	0.70

## Piston Ring Clearance

Piston ring dimensions in mm	New	Wear limit
1 <sup>st</sup> compression ring	0.009 to 0.130	0.160
2 <sup>nd</sup> compression ring	0.05 to 0.09	0.11
Oil scraping ring	0.03 to 0.07	0.10

## Piston and Cylinder Dimensions

	Cylinder bore diameter in mm	Piston diameter in mm
Nominal dimension	83.006 to 83.014 <sup>1)</sup>	82.924 to 82.936 <sup>2)</sup>
Repair stage	83.046 to 83.054 <sup>1)</sup>	82.964 to 82.976 <sup>2)</sup>

<sup>1)</sup> Measure 50 mm inside the cylinder bore..

<sup>2)</sup> Measurement with graphite coating (thickness 0.02 mm). The graphite coating wears away.

# Cylinder Head, Valvetrain – 3.0L CPNA

## Fastener Tightening Specifications

Component	Nm
Balance shaft nut <sup>3)</sup>	30 plus an additional 90° (¼ turn)
Balance weight bolt	60
Bracket to cylinder head bolt	23
Camshaft chain sprocket bolt	23
Chain tensioner for camshaft timing chain bolt <sup>1)</sup>	5 plus an additional 90° (¼ turn)
Chain tensioner with glide track bolt <sup>1)</sup>	5 plus an additional 90° (¼ turn)
Drive chain sprocket for the balance shaft bolt	23
Drive chain sprocket for the oil pump bolt <sup>1)</sup>	30 plus an additional 45° (⅙ turn)
Gear carrier bolt <sup>2)</sup>	9
Glide track bolt <sup>1)</sup>	5 plus an additional 90° (¼ turn)
Glide track guide pin <sup>1)</sup>	5 plus an additional 90° (¼ turn)
Heat shield to cylinder head cover bolt	9
Jump protector bolt	9
Engine lifting eye to cylinder head bolt	23

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

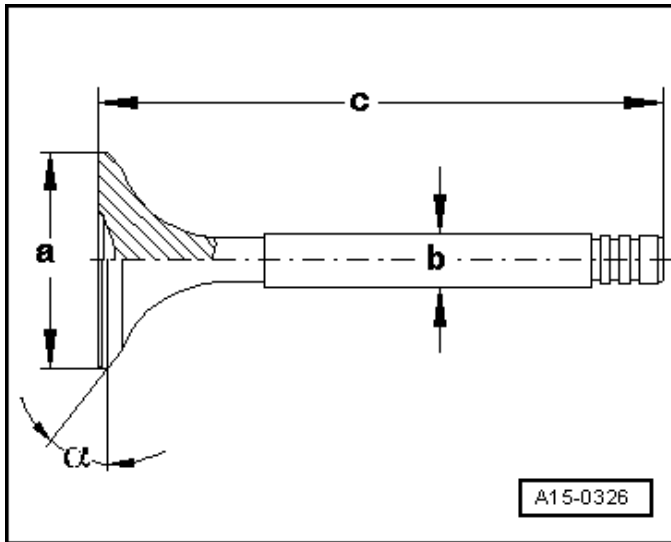
<sup>2)</sup> Insert with locking compound.

<sup>3)</sup> After loosening the nut, the balance shaft must be replaced

## Compression Checking Specifications

Compression pressure	Bar pressure
New	28 to 33
Wear limit	21
Maximum difference between cylinders	5

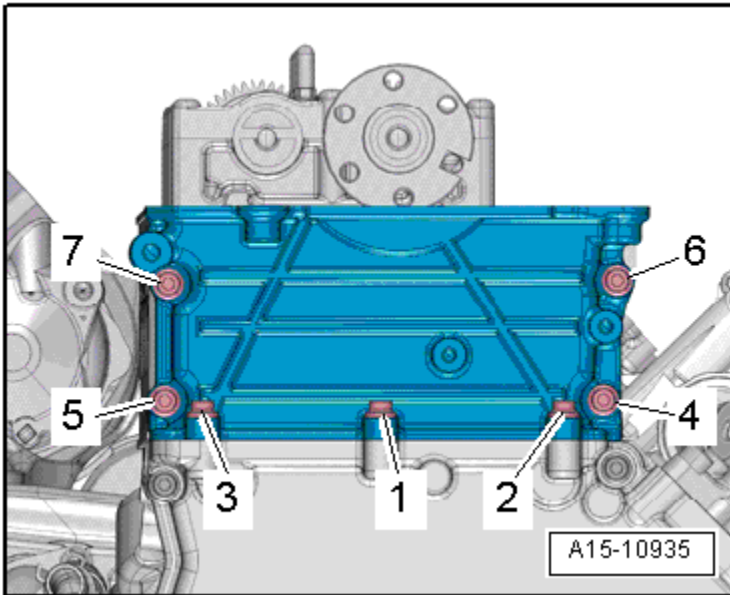
## Valve Dimensions



Dimension		Intake valve	Exhaust valve
Diameter a	mm	28.5 to 28.7	25.9 to 26.1
Diameter b	mm	5.968 to 5.982	5.958 to 5.972
c	mm	97.2 to 97.4	99.0 to 99.2
$\alpha$	$\angle^\circ$	45° 10'	45° 10'

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

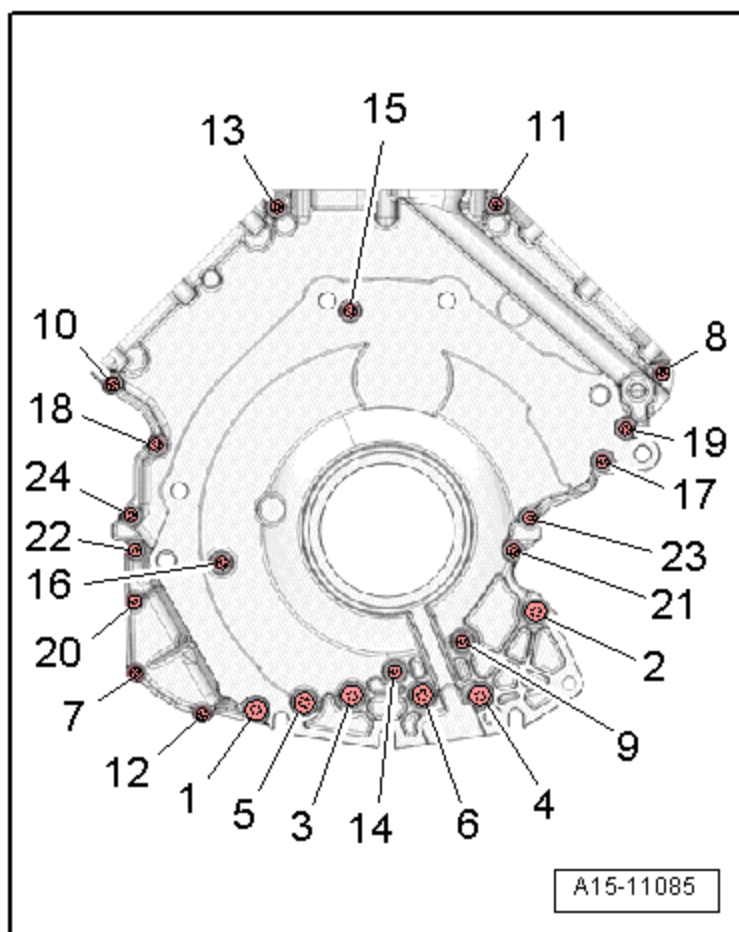
## Upper Timing Chain Cover Tightening Specification



Replace any bolts that were tightened with an additional turn.

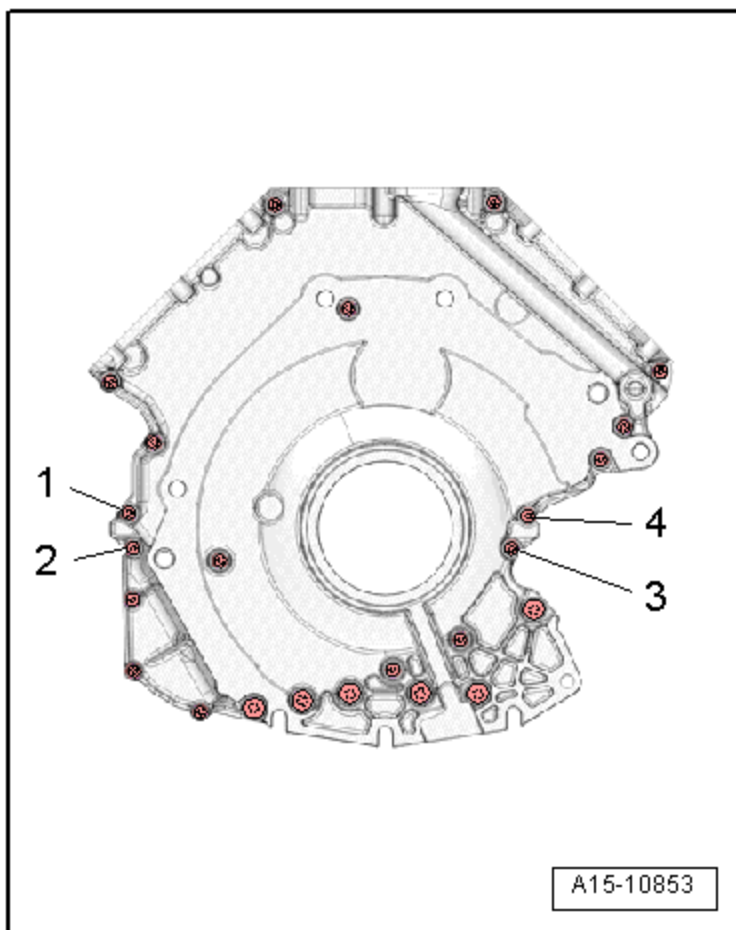
Steps	Component	Nm
1	Tighten bolts 1 through 3 in sequence	Hand-tighten
2	Tighten bolts 4 through 7 in sequence	Hand-tighten
3	Tighten bolts 1 through 7 in sequence	8
4	Tighten bolts 1 through 7 in sequence	8
5	Tighten bolts 1 through 7 in sequence	an additional 90° (¼ turn)

## Lower Timing Chain Cover Removing Sequence



Remove the bolts in the following sequence 24 to 1.

## Lower Timing Chain Cover Tightening Specification

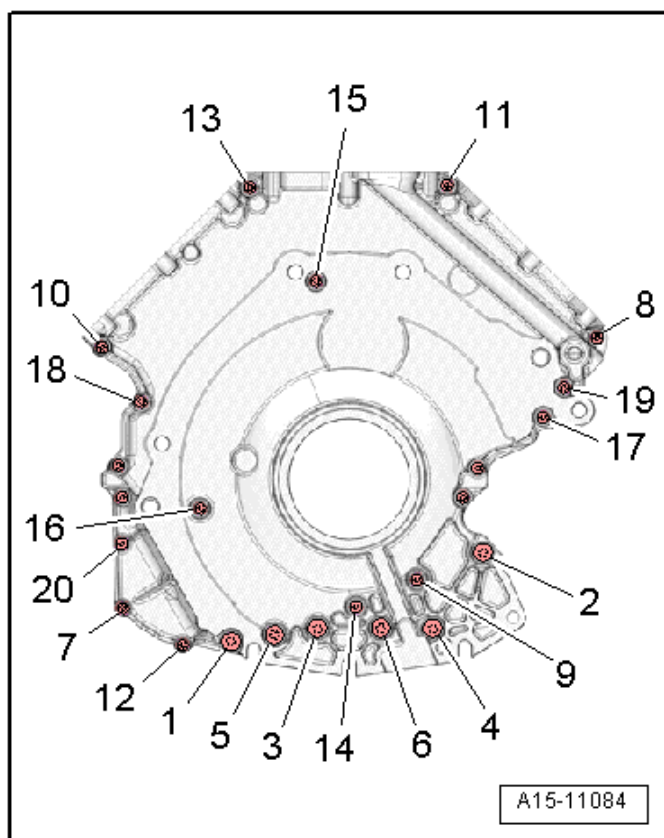


Replace any bolts that were tightened with an additional turn.

### Steps 1 and 2

Steps	Component	Nm
1	Attaching the timing chain guard lower section with the sealant and the sealing pieces to the cylinder block	
2	Tighten bolts 1 through 4 in sequence	9

## Lower Timing Chain Cover Tightening Specification (cont'd)



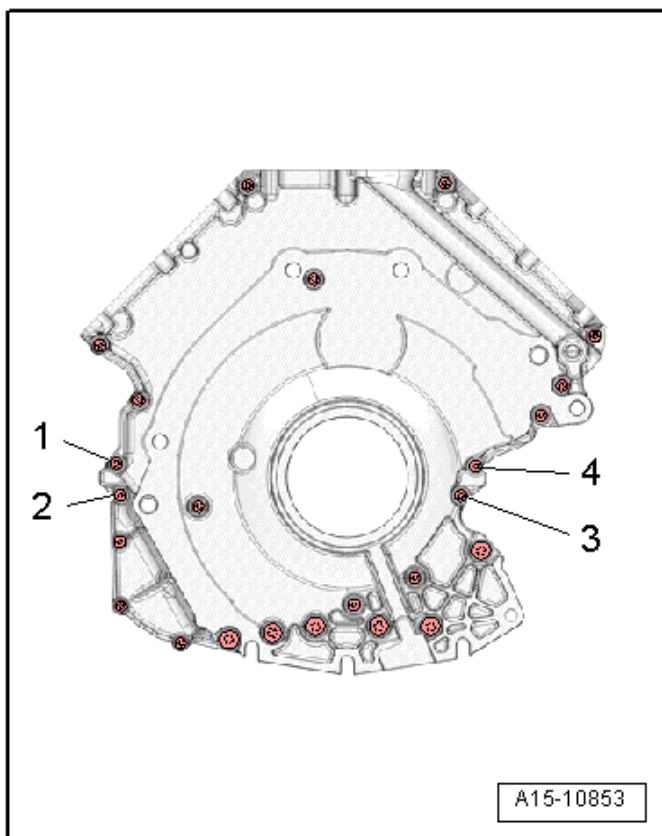
Replace any bolts that were tightened with an additional turn.

### Steps 3 to 6

Steps	Component	Nm
3	Tighten bolts 1 through 20 in sequence	3
4	Tighten bolts 1 through 20 in sequence	3
5	Tighten bolts 1 through 20 in sequence	8
6	Tighten bolts 1 through 20 in sequence	an additional 90° (¼ turn)



## Lower Timing Chain Cover Tightening Specification (*cont'd*)

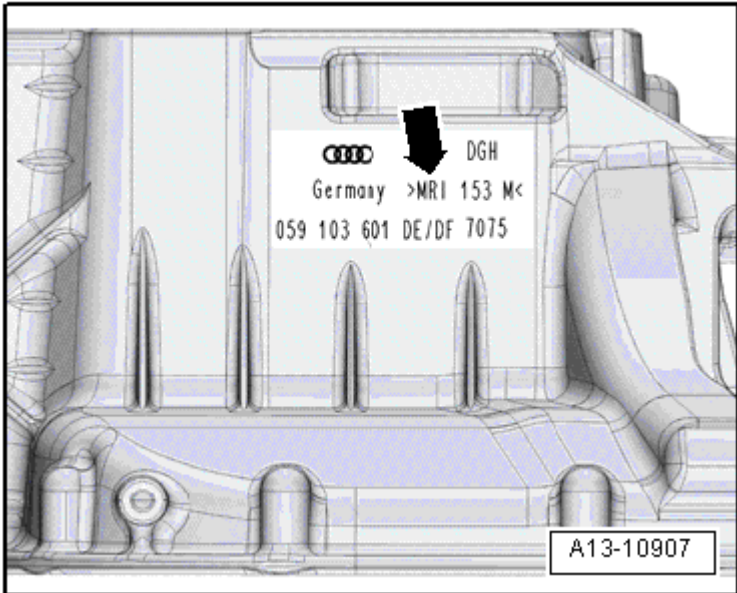


Replace any bolts that were tightened with an additional turn.

### Steps 7 to 9

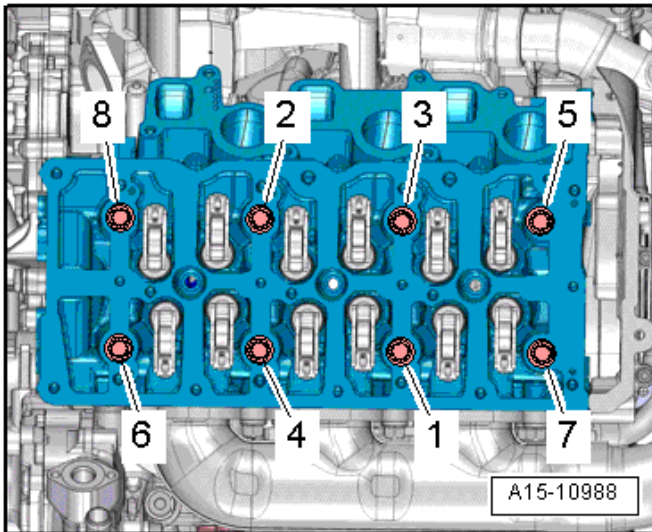
Steps	Component	Nm
7	Tighten bolts 1 through 4 in sequence	Remove the steel bolts M6x20
8	Tighten bolts 1 through 4 in sequence	3
9	Tighten bolts 1 through 4 in sequence	an additional 90° (¼ turn)

## Vehicles with Magnesium Upper Oil Pan



The steel bolts must be replaced with aluminum bolts (steps 6 - 8) after all bolts have been tightened on vehicles with magnesium oil pan upper sections (identifying feature: letter combination MRI (➔) on the oil pan upper section).

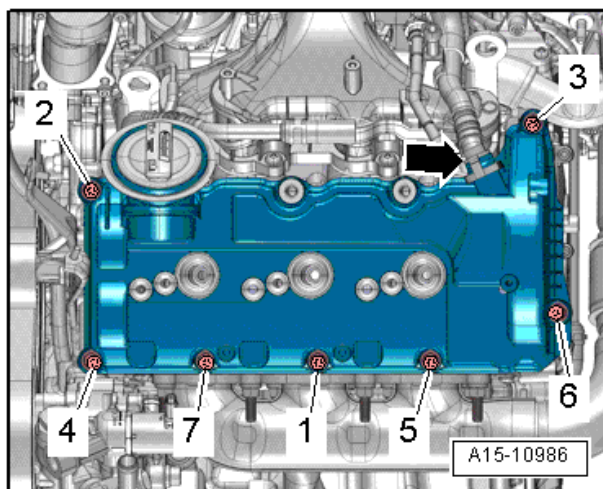
## Cylinder Head Tightening Specifications



Replace any bolts that were tightened with an additional turn.

Step	Component	Nm
1	Tighten bolts 1 through 8 in sequence	Hand-tighten
2	Tighten bolts 1 through 8 in sequence	35
3	Tighten bolts 1 through 8 in sequence	70
4	Tighten bolts 1 through 8 in sequence	an additional 90° (¼ turn)
5	Tighten bolts 1 through 8 in sequence	an additional 90° (¼ turn)

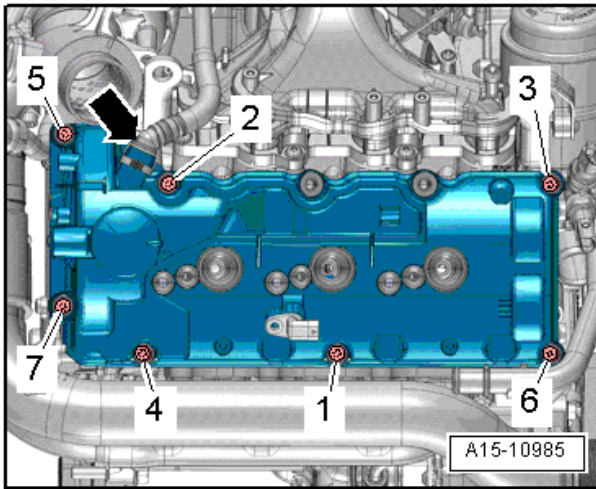
## Left Cylinder Head Cover Tightening Specification



Replace any bolts that were tightened with an additional turn.

Step	Component	Nm
1	Tighten bolts 1 through 7 in sequence	Hand-tighten
2	Tighten bolts 1 through 7 in sequence	8
3	Tighten bolts 1 through 7 in sequence	an additional 90° (¼ turn)

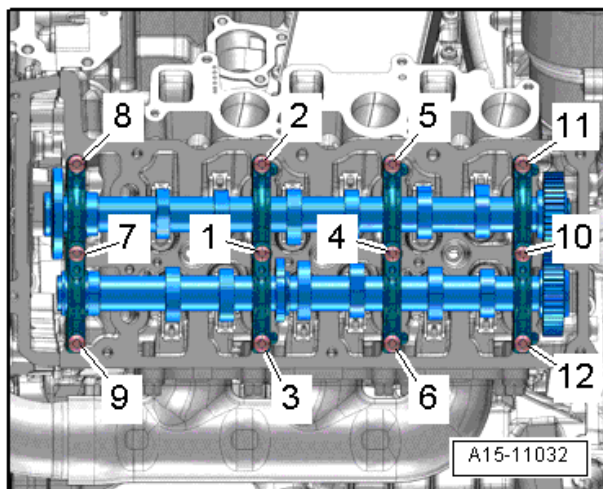
## Right Cylinder Head Cover Tightening Specification



Replace any bolts that were tightened with an additional turn.

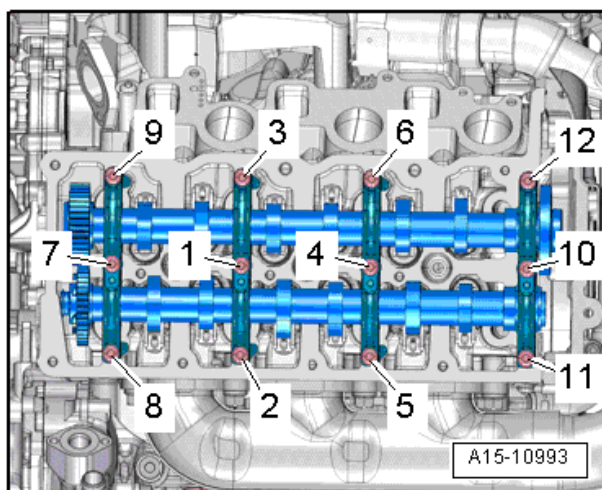
Step	Component	Nm
1	Tighten bolts 1 through 7 in sequence	Hand-tighten
2	Tighten bolts 1 through 7 in sequence	8
3	Tighten bolts 1 through 7 in sequence	an additional 90° (¼ turn)

## Cylinder Bank 1 (Right) Bearing Cap Tightening Specification



Step	Component	Nm
1	Tighten bolts 1 through 12 in sequence	Hand-tighten
2	Tighten bolts 1 through 12 in sequence	9

## Cylinder Bank 2 (Left) Bearing Cap Tightening Specification



Step	Component	Nm
1	Tighten bolts 1 through 12 in sequence	Hand-tighten
2	Tighten bolts 1 through 12 in sequence	9

# Lubrication – 3.0L CPNA

## Fastener Tightening Specifications

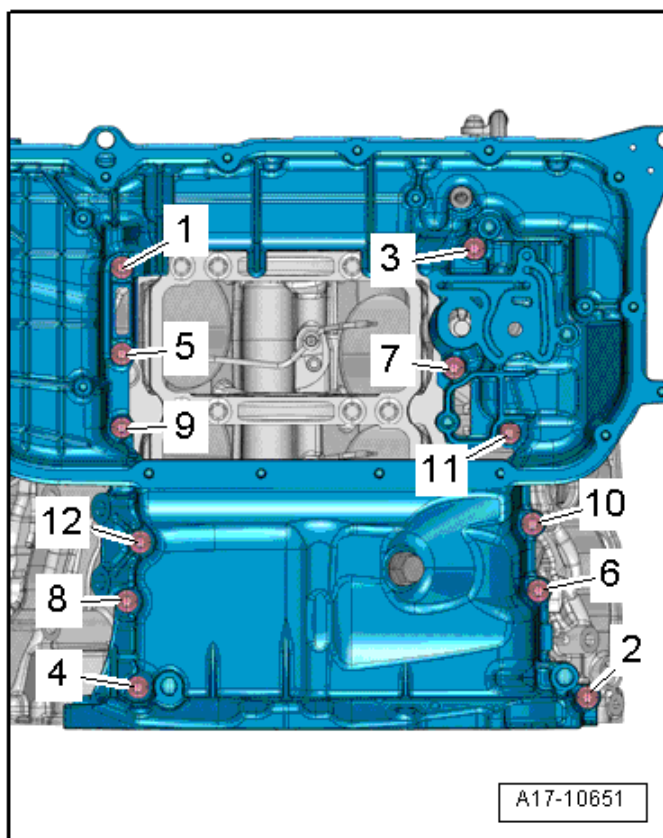
Component	Nm
Cap with oil filter by-pass valve	35
Chain sprocket for the oil pump bolt <sup>1)</sup>	30 plus an additional 45° (1/8 turn)
Engine oil cooler	9
Engine oil cooler thermostat cap <sup>1)</sup>	3 plus an additional 90° (1/4 turn)
Guide tube for the oil dipstick	9
Mounting plate for the engine oil cooler	9
Oil baffle bolt <sup>1)</sup>	3 plus an additional 90° (1/4 turn)
Oil drain plug	30
Oil filter housing bolt	9
Oil level thermal sensor-to-oil pan	9
Oil pressure regulation valve	9
Oil pressure switch	20
Oil return pipe-to-oil pump	9
Reduced oil pressure switch	20
Upper oil pan drain plug	25
<b>Vacuum line from the vacuum pump <sup>2)</sup></b>	
- Bolt <sup>1)</sup>	3 plus an additional 45° (1/8 turn)
- Bolt	9

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

<sup>2)</sup> For bolt tightening clarification, refer to ElsaWeb, *Upper Oil Pan Overview*, items 19 and 21.



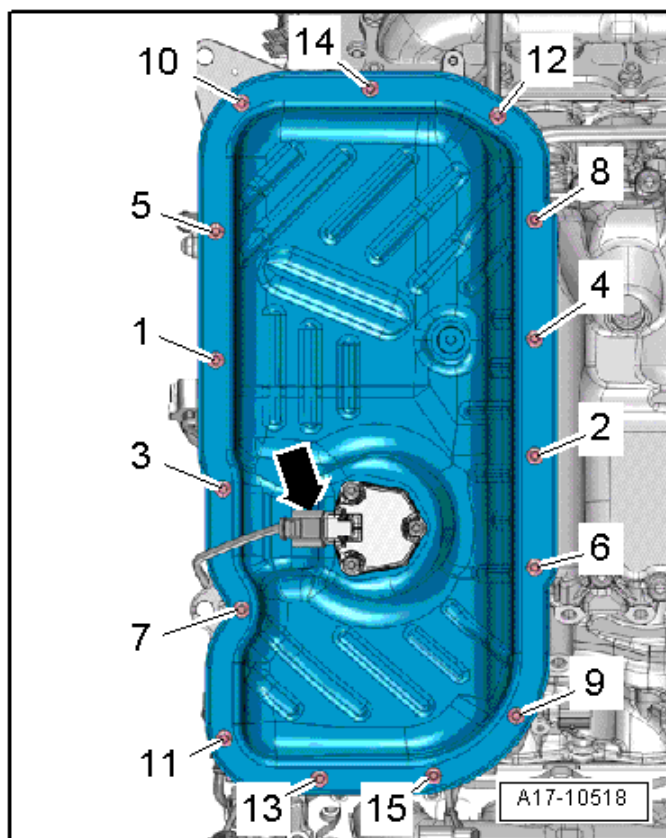
## Upper Oil Pan Tightening Specifications



Replace any bolts that were tightened with an additional turn.

Step	Component	Nm
1	Tighten bolts 1 through 12 in sequence	2
2	Tighten bolts 1 through 12 in sequence	5
3	Tighten bolts 1 through 12 in sequence	an additional 90° (¼ turn)

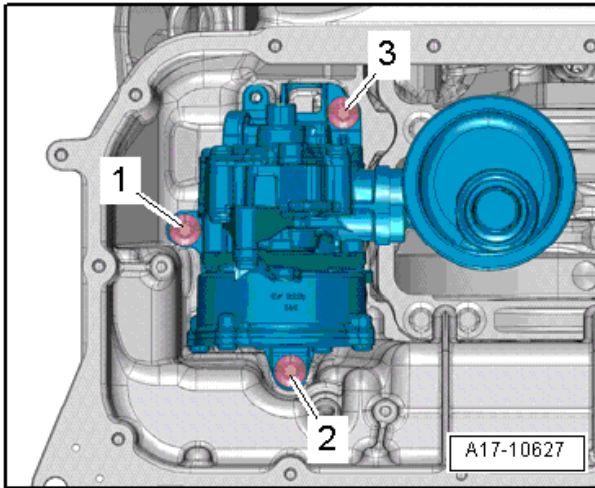
## Oil Pan Tightening Specifications



Replace any bolts that were tightened with an additional turn.

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

## Oil Pump with Vacuum Pump Tightening Specification



Replace any bolts that were tightened with an additional turn.

Step	Component	Nm
1	Tighten bolts 1 to 3 in sequence	Hand-tighten
2	Tighten bolts 1 to 3 in sequence	8
3	Tighten bolts 1 to 3 in sequence	an additional 90° (¼ turn)

# Cooling System – 3.0L CPNA

## Fastener Tightening Specifications

Component	Nm
Check valve bolts	9
Coolant connection bolts	9
Coolant fan bolts	3.5
Coolant lines	
- Banjo bolt	12
- Bolt	9
Coolant pump to engine bolts	9
Coolant pump ribbed belt pulley bolts <sup>1)</sup>	23
Coolant shut-off valve	9
Engine Coolant Temperature (ECT) sensor	9
Fan wheel bolts	5
Front coolant pipe bolts	9
Left coolant pipe bolts	9
Left lower coolant pipe bolts	9
Rubber buffer bolt	3.5
Transmission coolant valve bolts	9
Upper left coolant pipe nut/bolt	9

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

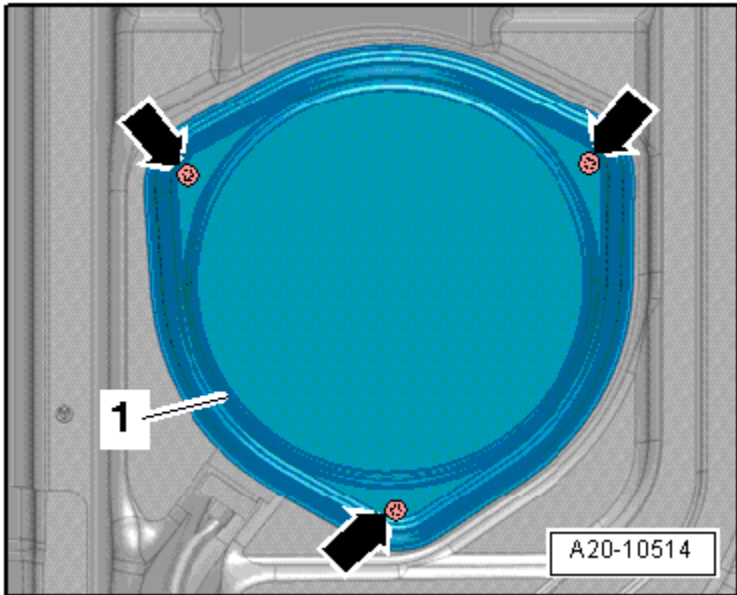
# Fuel Supply – 3.0L CPNA

## Fastener Tightening Specifications

Component	Nm
Accelerator pedal module	8
Air filter housing	23
<b>Bracket for fuel filter <sup>1)</sup></b>	
- Bolt	2.1
- Bolt	5.5
Carrier plate bolt	23
Fuel cooler bolts	1.5
<b>Fuel filler neck</b>	
- Bolt	23
- Nut	2.5
Fuel pump control module to bracket nut	1.6
Fuel tank heat shield to fuel tank bolt	23
Locking flange cover bolt	1.5
Locking ring	120
Mounting strap bolts	23

<sup>1)</sup> For bolt tightening clarification, refer to ElsaWeb, *Fuel Filter Overview*, items 2 and 16.

## Locking Flange Cover Tightening Specification



Step	Component	Nm
1	Tighten bolts (➡) in a diagonal sequence	1.5

# Turbocharger, Supercharger – 3.0L CPNA

## Fastener Tightening Specifications

Component	Nm
Air guide pipe	9
Air guide pipe bracket bolts	8
Bracket for charge air cooler	9
Bracket for connector and engine cover	9
Charge air cooler bolts	3.5
Charge air cooler bolts (Hot Climate version)	9
Charge air pressure sensor/intake air temperature sensor	3.5
Charge air pressure sensor/intake air temperature sensor (Hot Climate version)	9
Connection for air guide hose	9
Coolant supply line bolts <sup>1)</sup>	9
Coolant supply line bolts <sup>2)</sup>	8
Coolant supply line connections	25
Exhaust manifold bolts <sup>3)4)</sup>	30 plus an additional 90° (¼ turn)
Particulate filter nut <sup>3)4)</sup>	23
Rear air guide bolt	1.7
<b>Screw-type clamps</b>	
- 9 mm wide	3.4
- 13 mm wide	5.5

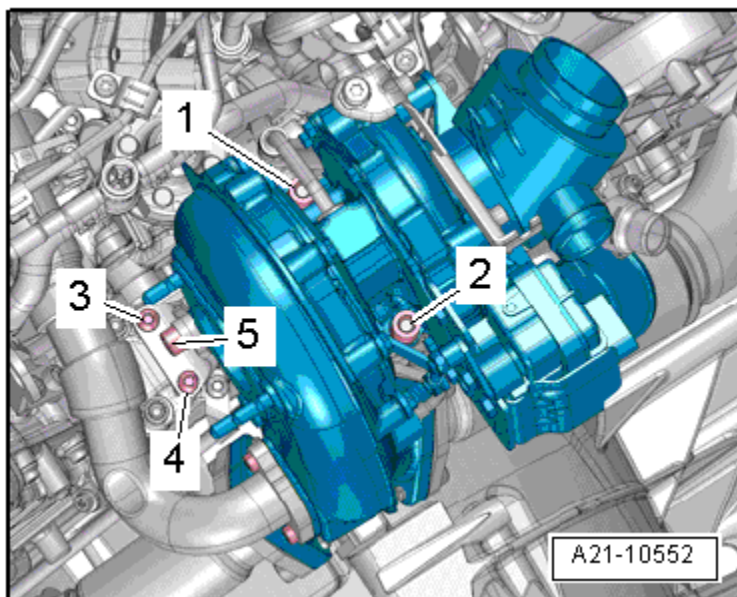
<sup>1)</sup> For bolt tightening clarification, refer to ElsaWeb, *Turbocharger Overview*, item 32.

<sup>2)</sup> For bolt tightening clarification, refer to ElsaWeb, *Turbocharger Overview*, item 8.

<sup>3)</sup> Replace fasteners.

<sup>4)</sup> Coat the thread with hot bolt paste..

## Turbocharger Tightening Specification



Replace the stud bolts and the nuts.

Step	Component	Nm
1	Stud bolts for the nuts 1 and 2	10
2	Tighten bolts and nuts 1 and 2	Hand-tighten
3	Tighten bolts and nuts 1 and 2	9
4	Tighten bolts and nuts 1 and 2	an additional 90° (¼ turn)
5	Tighten bolts 3 to 5 in sequence	Hand-tighten
6	Tighten bolts 3 and 4 in sequence	9
7	Tighten bolt 5	23



# Exhaust System, Emission Controls – 3.0L CPNA

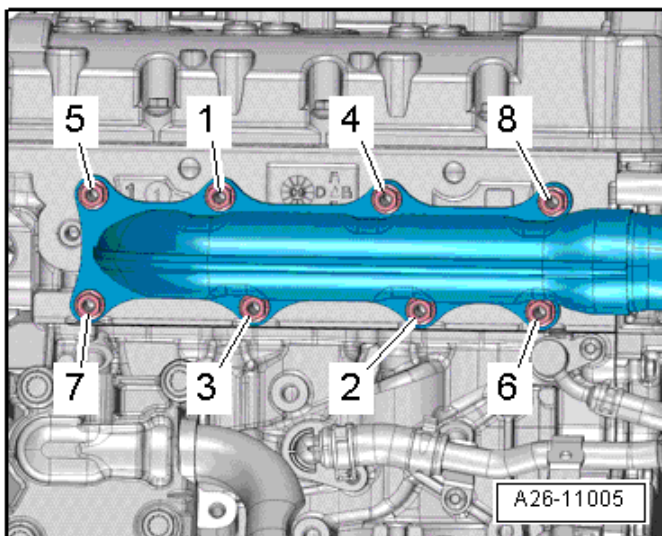
## Fastener Tightening Specifications

Component	Nm
Base place for reducing agent metering system control module	8
Clamp for reducing agent injector	5
Clamping sleeve nut	23
Connection to EGR cooler	9
Coolant connection	9
EGR cooler bolt	9
EGR cooler bleeder screw	8
<b>EGR temperature sensor</b>	
- at the aluminum EGR cooler	35
- at the steel EGR cooler	45
Engine temperature control temperature sensor bolt	9
Exhaust gas recirculation motor bolt	9
Exhaust gas temperature sensor <sup>2)</sup>	45
Exhaust manifold <sup>1) 2)</sup>	
- Bolt	30 an additional 90° (¼ turn)
- Nut	25
Exhaust pressure sensor 1 <sup>2)</sup>	45
Particulate filter with catalytic converter nut <sup>1) 2)</sup>	23
Particle sensor <sup>2)</sup>	50
Pressure pipe for differential pressure sensor	45
Reducing agent tank bolt	20
Screw-type clamp	
- Part number 059 131 548 C	5
- Part number 059 131 548 D	3.5
Selective Catalytic Reduction (SCR) - catalytic converter nut	23
Suspended mount bolt	23
Y-pipe nut	23

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

<sup>2)</sup> Coat the thread with hot bolt paste.

## Exhaust Manifold Tightening Specifications

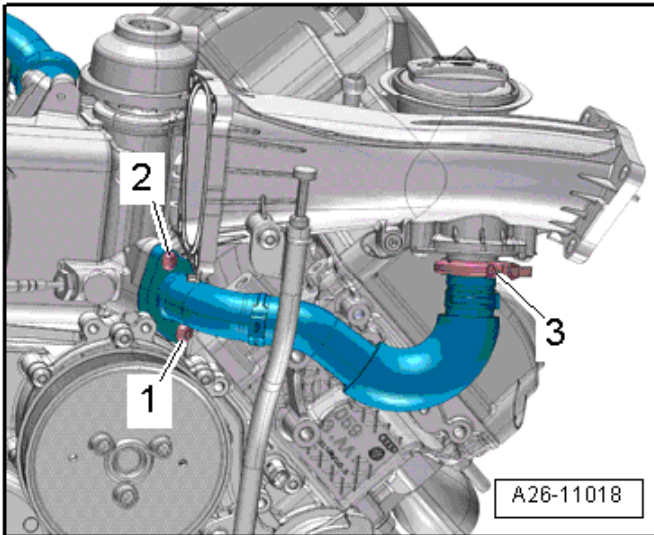


Step	Component	Nm
1	Tighten bolts 1 through 9 in sequence <sup>1) 2)</sup>	Hand-tighten
2	Tighten bolts 1 through 9 in sequence	15
3	Tighten bolts 1 through 9 in sequence	25

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

<sup>2)</sup> Coat the thread on the nut with hot bolt paste. For the correct hot bolt paste, refer to the Electronic Parts Catalog (ETKA).

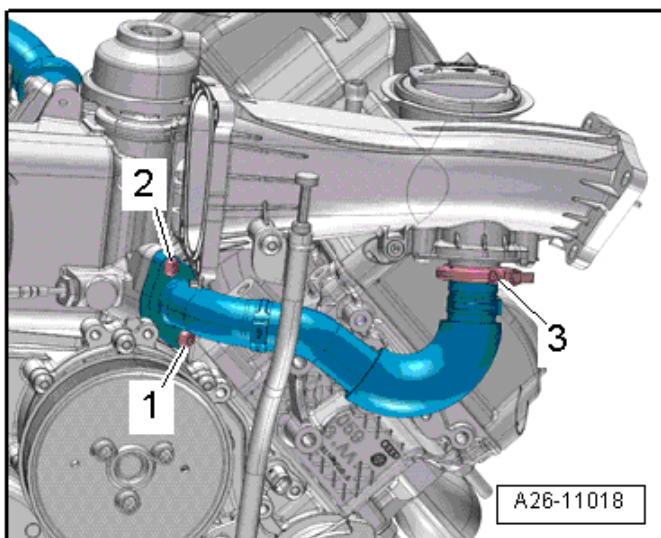
## EGR Pipe at the Intake Manifold Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 and 2 in sequence <sup>1)</sup>	Hand-tighten
2	Tighten bolt 3	2.5
3	Tighten bolts 1 and 2 in sequence	30

<sup>1)</sup> Coat the thread on the nut with hot bolt paste. For the correct hot bolt paste, refer to the Electronic Parts Catalog (ETKA).

## EGR Pipe at the Turbocharger Tightening Specifications



Step	Component	Nm
1	Tighten bolts 2 and 3 in sequence <sup>1)</sup>	Hand-tighten
2	Tighten bolt <sup>1)</sup>	2.5
3	Tighten bolts 2 and 3 in sequence	30
4	Tighten bolts 2 and 3 in sequence	an additional 90° (¼ turn)

<sup>1)</sup> Coat the thread on the nut with hot bolt paste. For the correct hot bolt paste, refer to the Electronic Parts Catalog (ETKA).

# Multiport Fuel Injection – 3.0L CPNA

## Fastener Tightening Specifications

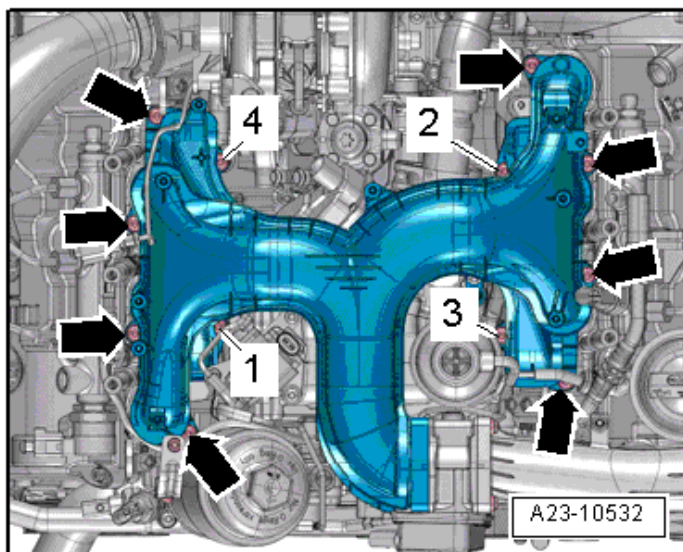
Component	Nm
Air filter mount bolt	3.5
Air filter housing bracket bolt	8
Air guide bolt	2.5
Air guide pipe bolt	9
Bracket for air guide pipe bolt	9
Bracket for connector bolt	4
<b>Bracket for tension clamp</b>	
- on camshaft bearing	2
- on cylinder head	9
Clamp for the high pressure line bolt	9
Differential pressure sensor	45
Differential pressure sensor bolt	4.5
Engine support adapter nut	70
Exhaust gas temperature sensor 3	45
Fuel rail bolt	22
Fuel temperature sensor	2
Heated oxygen sensor	55
High pressure line <sup>1)</sup>	25
High pressure pump bolt	22
Hose connection ring banjo bolt	25
Intake flap motor bolt	9
Lower air filter housing bolt	3.5
Mass air flow sensor bolt	3.5
Mass air flow sensor housing bolt	3.5
Mounting pins for engine cover	5
Particle sensor <sup>3)</sup>	60
Pipe for the exhaust gas recirculation bolt	9
NOx sensor with NOx sensor control module	8
NOx sensor control module 2 with NOx sensor 2	50
NOx sensor control module 2 with NOx sensor 2 bolt	6
<b>Tension clamp bolt <sup>2)</sup></b>	
- First tighten	8
- Second tighten	an additional 90° (¼ turn)
Upper air filter housing bolt	2.5
Wiring guide bolt	4

<sup>1)</sup> Coat the threads on the union nut with clean engine oil.

<sup>2)</sup> Replace fastener

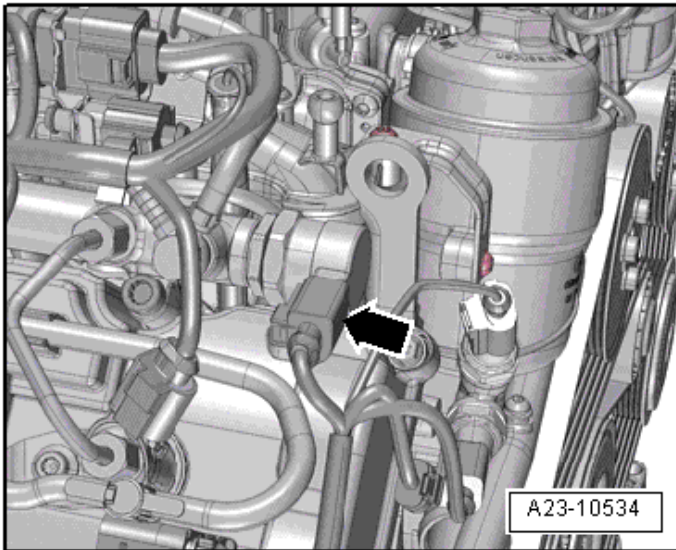
<sup>3)</sup> Coat with hot bolt paste.

## Intake Manifold Tightening Specifications



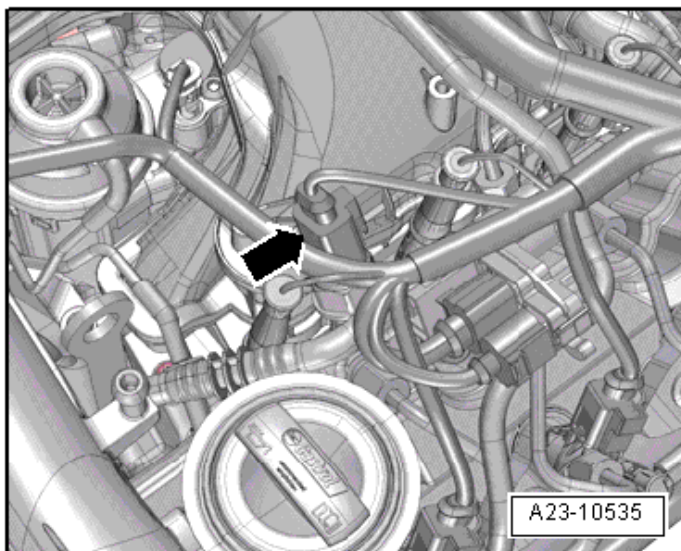
Step	Component	Nm
1	Tighten bolts 1 through 4 and (➔) in sequence	Hand-tighten
2	Tighten bolts 1 through 4 in sequence	5
3	Tighten bolts 1 through 4 and (➔) any sequence	9

## Fuel Pressure Regulator Valve Tightening Specification



Step	Component	Nm
1	Tighten bolt (➡)	Hand-tighten
2	Tighten bolt (➡)	60
3	Tighten bolt (➡)	Turn back 90°
4	Tighten bolt (➡)	85

## Fuel Pressure Sensor Tightening Specification



Step	Component	Nm
1	Tighten bolt (➡)	Hand-tighten
2	Tighten bolt (➡)	60
3	Tighten bolt (➡)	Turn back 180°
4	Tighten bolt (➡)	85

## Ignition System – 3.0L CPNA

### Ignition Tightening Specifications

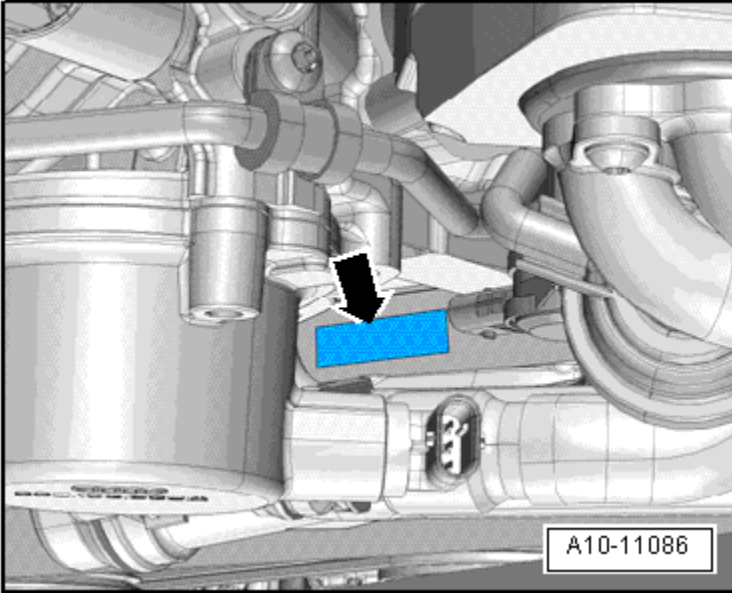
Component	Nm
Camshaft Position (CMP) sensor	9
Engine Speed (RPM) sensor	9
Glow plug	12



# ENGINE MECHANICAL – 3.0L CGXC, CTUB

## General, Technical Data

### Engine Number Location



The engine number (➡) (engine code and serial number) is located at the front of the engine on top of the cylinder block.

## Engine Data

Code letters		CGXC	CTUB
Displacement	liter	2.995	2.995
Output	kW at RPM	245/5500 - 6500	245/5500 - 6500
Torque	Nm at RPM	440@2900-5300	440@2900-5300
Bore	diameter mm	84.5	84.5
Stroke	mm	89.0	89.0
Compression ratio		10.5	10.5
RON	at least	98 <sup>1)</sup>	98 <sup>1)</sup>
Fuel injection and ignition system		Simos	Simos
Ignition sequence		1-4-3-6-2-5	1-4-3-6-2-5
Exhaust Gas Recirculation (EGR)		No	No
Supercharger		Supercharger	Supercharger
Knock Sensors (KS)		2 sensors	2 sensors
Charge air cooler		Yes	Yes
Oxygen Sensor (O2S) regulation		2 sensors before catalytic converter 2 sensors after catalytic converter	2 sensors before catalytic converter 2 sensors after catalytic converter
Variable valve timing		Intake	Intake
Variable intake manifold		No	No
Secondary Air Injection (AIR) system		Yes	Yes
Valve per cylinder		4	4

<sup>1)</sup> Unleaded RON 95 is also permitted but performance is reduced.

# Engine Assembly – 3.0L CGXC, CTUB

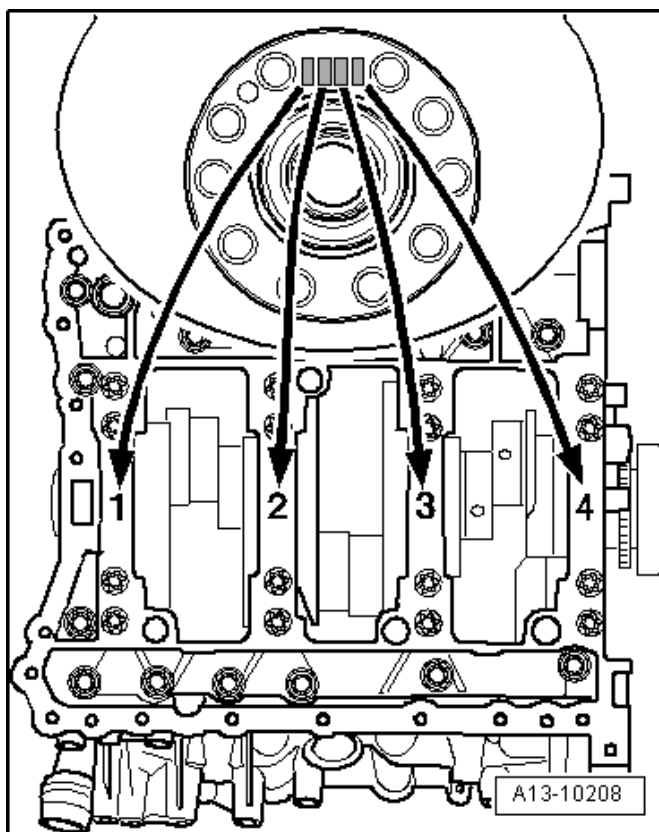
## Fastener Tightening Specifications

Component	Fastener size	Nm
Bolts and nuts	M6	9
	M7	15
	M8	20
	M10	40
	M12	60
Engine bracket	-	20
Engine mount <sup>1)</sup>	-	90 plus an additional 90° (¼ turn)
Engine support	-	40
Heat shield	-	10
Hydraulic hose mount	-	9
Subframe to retaining plate for engine mount	-	55
<b>Exception:</b> Ground pins to the strut tower	-	9

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

# Crankshaft, Cylinder Block – 3.0L CGXC, CTUB

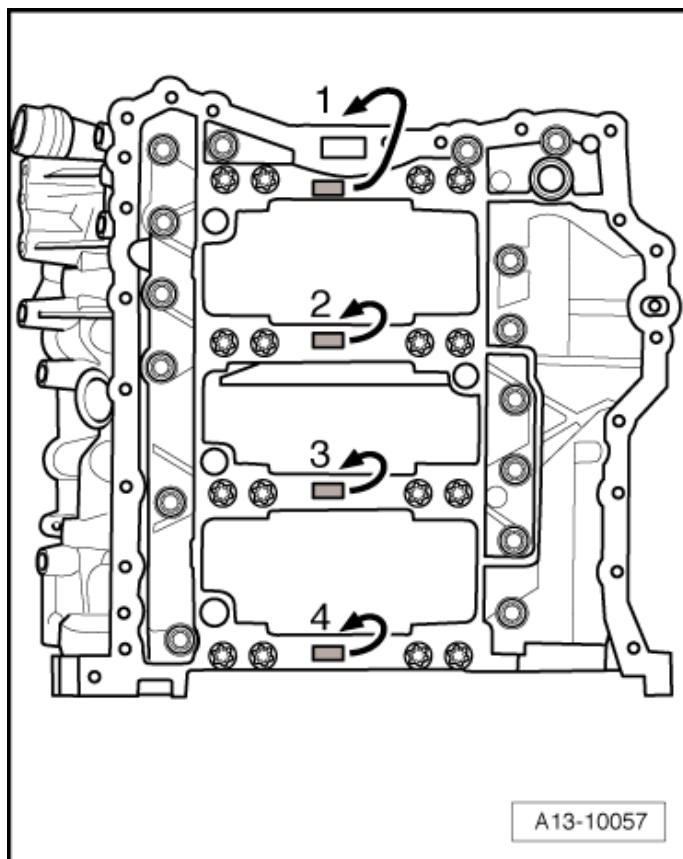
## Allocation of Crankshaft Bearing Shells for Guide Frame



Bearing shells with the correct thickness are allocated to the guide frame in the factory. Colored dots on the sides of the bearing shells serve for identifying bearing shell thickness. Allocation of bearing shells to guide frame is marked on the transmission flange of crankshaft by a row of letters. The first letter of the row of letters represents bearing "1", the second letter is for bearing "2", etc.

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

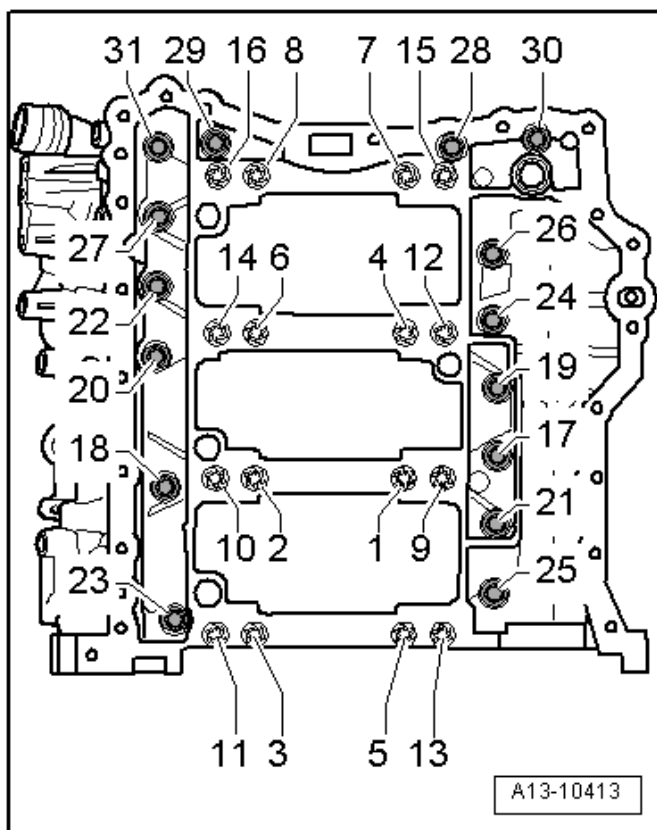
## Allocation of Crankshaft Bearing Shells for Cylinder Block



Bearing shells with the correct thickness are allocated to the cylinder block in the factory. Colored dots on the sides of the bearing shells identify the bearing shell thickness. The allocation of the bearing shells to the cylinder block is marked by one letter each on the respective bearing on guide frame.

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

## Guide Frame Tightening Specifications



Replace any bolts that were tightened with an additional turn.

Step	Bolts	Nm
1	Bolts 1 through 16 in sequence	50
2	Bolts 1 through 16 in sequence	an additional 90° (¼ turn)
3	Bolts 17 through 31 in sequence	Blue

## Fastener Tightening Specifications

Component	Nm
Connecting rod bearing cap to connecting rod <sup>1) 4)</sup>	50 plus an additional 90° (¼ turn)
Coolant pump-to-engine	9
Drive plate to crankshaft <sup>1)</sup>	60 plus an additional 90° (¼ turn)
Generator bracket to engine	20
Idler roller for ribbed belt to engine <sup>2)</sup>	40
Idler roller for ribbed belt to engine <sup>3)</sup>	40
Marking locking bolt to engine	14
Oil pressure regulation valve	9
Oil spray jet <sup>5)</sup>	9
Ribbed belt pulley to coolant pump	20
Tensioner for the ribbed belt to engine	40
Vibration damper to engine <sup>1)</sup>	20 plus an additional 90° (¼ turn)

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

<sup>2)</sup> For bolt tightening clarification, refer to ElsaWeb, Supercharger *Ribbed Belt Drive Overview*, item 6.

<sup>3)</sup> For bolt tightening clarification, refer to ElsaWeb, *Auxiliary Component Bracket Ribbed Belt Drive Overview* item 5.

<sup>4)</sup> Lubricate the thread and contact surface.

<sup>5)</sup> Insert the bolt with locking compound.

## Crankshaft Dimensions

Honing dimension in mm	Crankshaft bearing journal diameter		Connecting rod journal diameter	
Basic dimension	65.000	- 0.022	54.000	- 0.022
		- 0.042		- 0.042

## Piston Ring End Gaps

Piston ring end gaps dimensions in mm	New	Wear limit
1 <sup>st</sup> compression ring	0.20 to 0.30	0.80
2 <sup>nd</sup> compression ring	0.50 to 0.70	0.80
Oil scraping ring	0.25 to 0.50	<sup>1)</sup>

<sup>1)</sup> Not determined yet.

## Piston Ring Clearance

Piston ring dimensions in mm	New	Wear limit
1 <sup>st</sup> compression ring	0.04 to 0.08	0.20
2 <sup>nd</sup> compression ring	0.03 to 0.07	0.15
Oil scraping ring	0.02 to 0.06	0.15

## Piston and Cylinder Dimensions

Cylinder bore diameter in mm	Piston diameter in mm
84.51	84.49 <sup>1)</sup>

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



# Cylinder Head, Valvetrain – 3.0L CGXC, CTUB

## Fastener Tightening Specifications

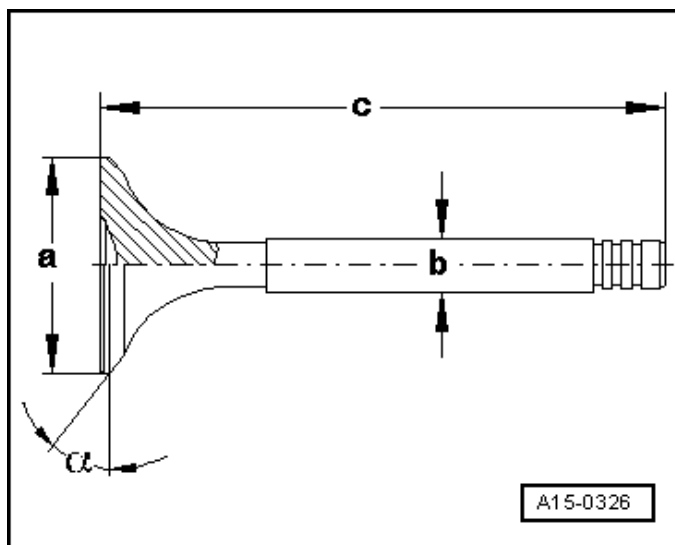
Component	Nm
Bearing plate for drive sprocket to cylinder head <sup>1)</sup>	8 plus an additional 45° ( $\frac{1}{8}$ turn)
Balance weight transmission side to balance shaft	60
Camshaft adjuster for the exhaust camshaft <sup>1)</sup>	80 plus an additional 90° ( $\frac{1}{4}$ turn)
Camshaft adjuster for the intake camshaft <sup>1)</sup>	80 plus an additional 90° ( $\frac{1}{4}$ turn)
Camshaft adjustment solenoid valve to cylinder head	5
Camshaft Chain Sprocket For the exhaust camshaft to camshaft <sup>1)</sup>	80 plus an additional 90° ( $\frac{1}{4}$ turn)
Chain tensioner to engine	9
Chain tensioner with glide track to engine <sup>1)</sup>	10 plus an additional 45° ( $\frac{1}{8}$ turn)
Drive sprocket for Left camshaft timing chain drive sprocket to bearing plate <sup>1)</sup>	30 plus an additional 90° ( $\frac{1}{4}$ turn)
Drive sprocket for oil pump to engine <sup>1)</sup>	30 plus an additional 90° ( $\frac{1}{4}$ turn)
Drive sprocket for right camshaft timing chain <sup>1)</sup>	15 plus an additional 90° ( $\frac{1}{4}$ turn)
Gear carrier to engine	13
Glide track to engine <sup>1)</sup>	10 plus an additional 45° ( $\frac{1}{8}$ turn)
Mounting pin for left camshaft timing chain drive sprocket to bearing plate <sup>1)</sup>	5 plus an additional 60° turn
Mounting pin for right camshaft timing chain drive sprocket <sup>1)</sup>	30 plus an additional 90° ( $\frac{1}{4}$ turn)
Oil dipstick guide tube to engine	9

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

## Compression Checking Specifications

Compression pressure	Bar pressure
New	10.0 to 14.0
Wear limit	9.0
Maximum difference between cylinders	3.0

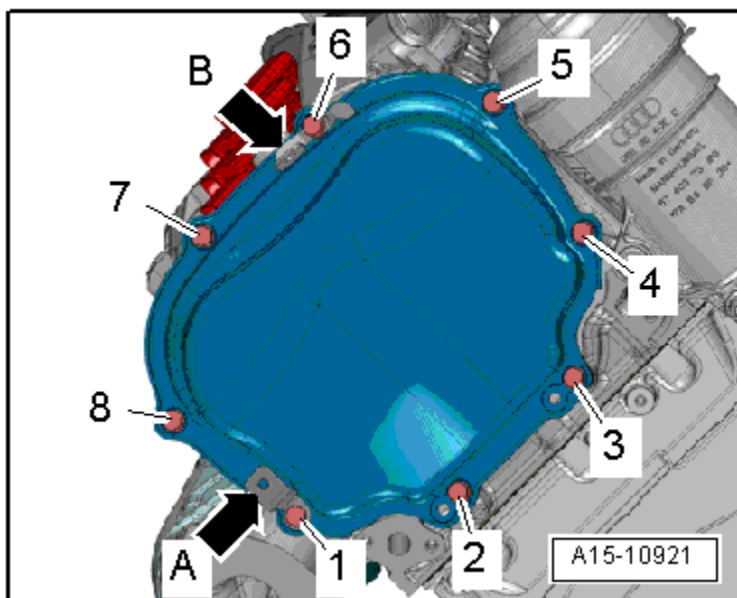
### Valve Dimensions



Dimension		Intake valve	Exhaust valve
Diameter a	mm	$33.85 \pm 0.10$	$28.0 \pm 0.1$
Diameter b	mm	$5.98 \pm 0.01$	$5.96 \pm 0.01$
c	mm	$104.00 \pm 0.20$	$101.9 \pm 0.2$
$\alpha$	$^{\circ}$	45	45

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

## Left Timing Chain Cover Tightening Specification

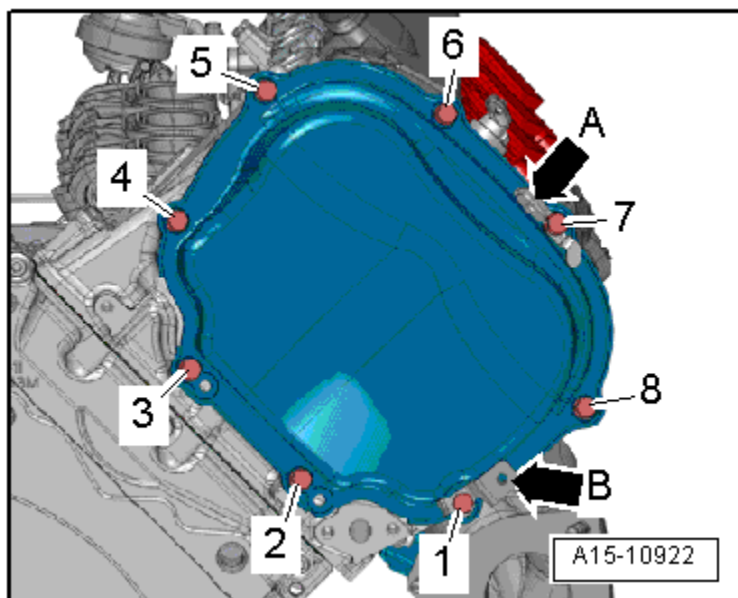


Engine –  
3.0L CGXC, CTUB

Replace any bolts that were tightened with an additional turn. The brackets -arrows A, B- are connected with the left timing chain cover.

Step	Component	Nm
1	1 through 8 in sequence	5
2	1 through 8 in sequence	an additional 90° (¼ turn)

## Right Timing Chain Cover Tightening Specification

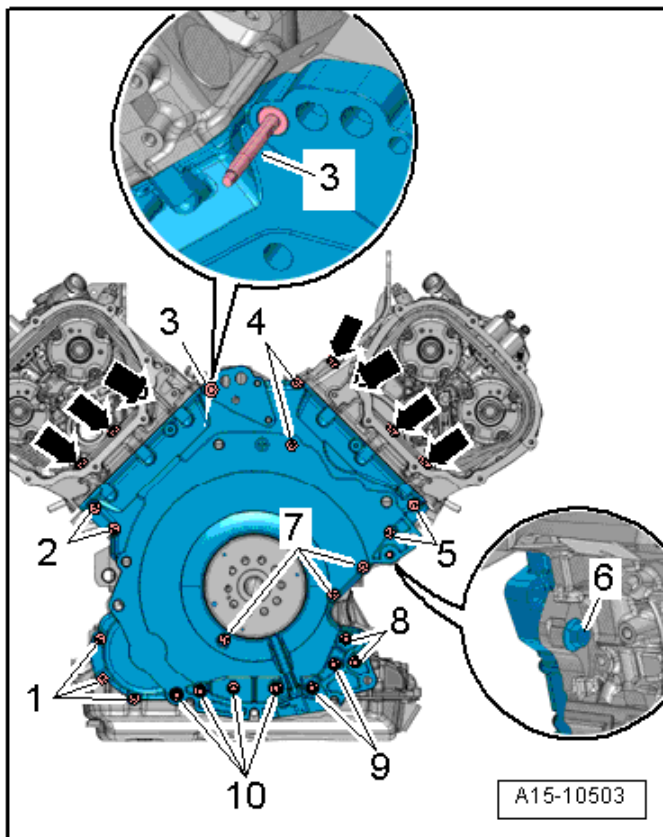


Replace any bolts that were tightened with an additional turn. The brackets -arrows A, B- are connected with the left timing chain cover.

Step	Component	Nm
1	1 through 8 in sequence	5
2	1 through 8 in sequence	an additional 90° (¼ turn)

## Lower Timing Chain Cover Tightening Specifications

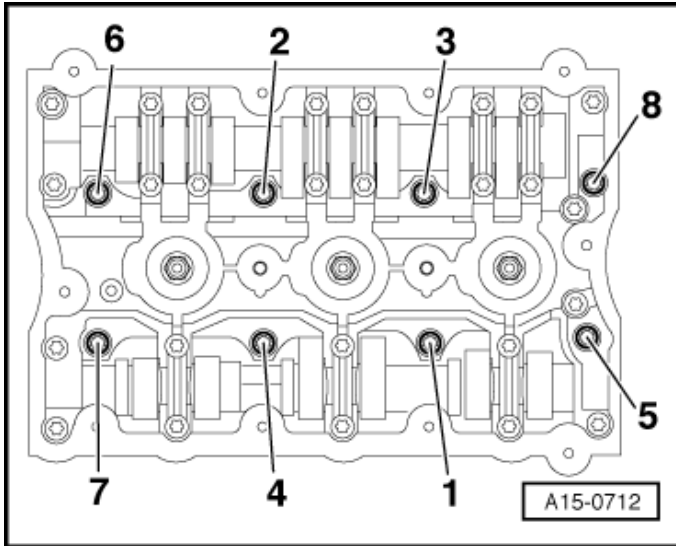
Engine –  
3.0L CGXC, CTUB



Replace any bolts that were tightened with an additional turn.

Step	Component	Nm
1	Tighten bolts (➡)	3
2	Tighten bolts 1 through 10 in a diagonal sequence	3
3	Tighten bolts 1, 2, 4, 5, 7 and (➡)	an additional 90° (¼ turn)
4	Tighten bolts 8, 9 and 10 in sequence	8
5	Tighten bolts 8, 9 and 10 in sequence	an additional 90° (¼ turn)
6	Tighten bolt 3	16
7	Tighten bolt 6	20
8	Tighten bolt 6	an additional 180° (½ turn)

## Cylinder Head Tightening Specifications

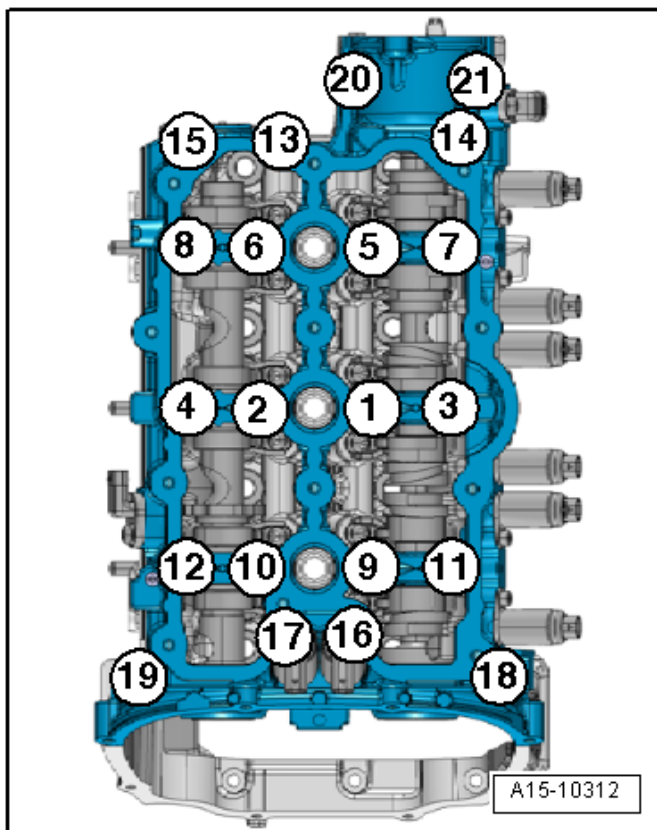


Replace any bolts that were tightened with an additional turn.

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

## Camshaft Guide Frame Tightening Specifications

Engine –  
3.0L CGXC, CTUB



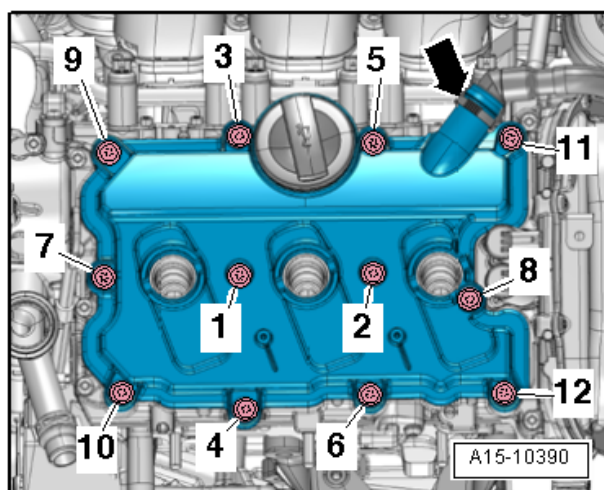
The guide frame for the left cylinder head camshaft is shown in the illustration. The right cylinder head is identical.

Step	Component	Nm
1	Tighten bolts 1 through 21 in sequence <sup>1)</sup>	Hand-tighten <sup>2)</sup>
2	Tighten bolts 1 through 21 in sequence	8
3	Tighten bolts 1 through 21 in sequence	an additional 90° (¼ turn)

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

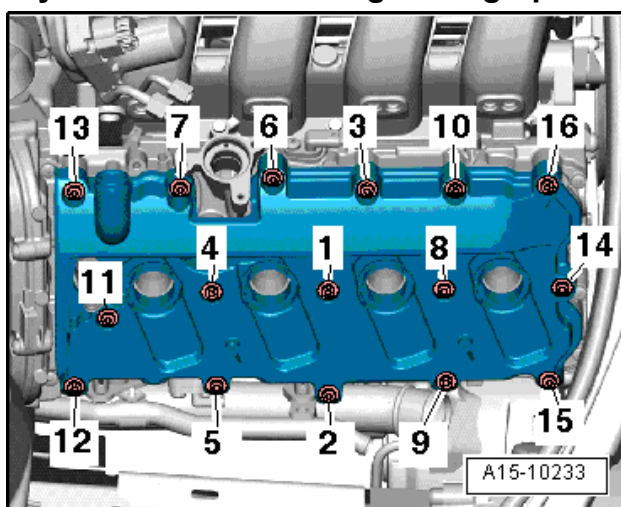
<sup>2)</sup> The guide frame must be in contact with the entire contact surface of the cylinder head.

## Left Cylinder Head Cover Tightening Specification



Step	Component	Nm
1	Tighten bolts 1 through 12 in sequence	9

## Right Cylinder Head Cover Tightening Specification



Step	Component	Nm
1	Tighten bolts 1 through 12 in sequence	9



# Lubrication – 3.0L CGXC, CTUB

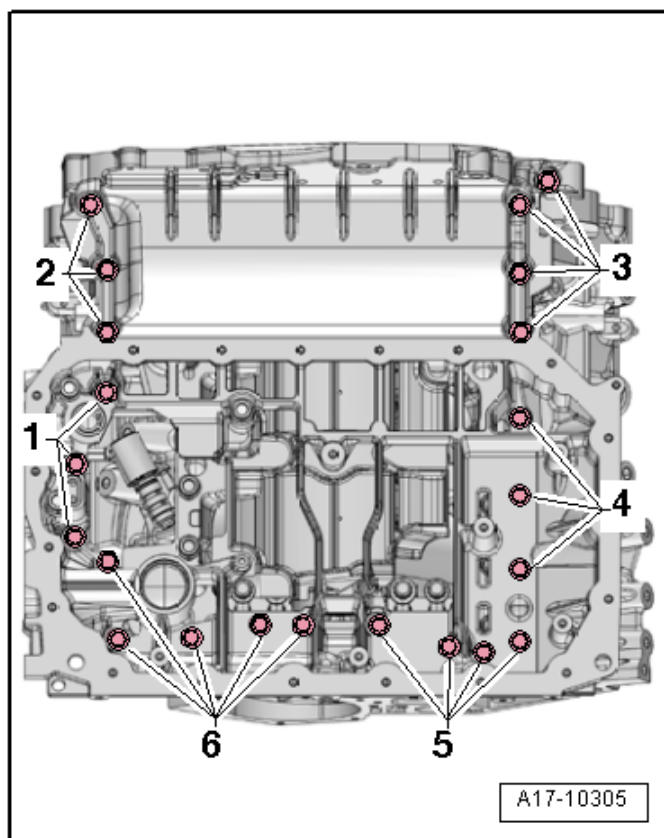
## Fastener Tightening Specifications

Component	Nm
Bracket chain sprocket for oil pump to upper oil pan	9
Cap to oil filter housing	25
Cover with oil separator to engine	9
Engine oil cooler to upper oil pan <sup>1) 2)</sup>	3 plus an additional 90° (¼ turn)
	9
Lower oil baffle to upper oil pan <sup>1)</sup>	3 plus an additional 90° (¼ turn)
Oil check valve to engine	9
Oil drain plug to lower oil pan	20
Oil filter housing to engine	30
Oil filter housing union nut to threaded pin	13
Oil level thermal sensor to lower oil pan nut	13
Oil pressure switch to oil filter housing	9
Oil pump to upper oil pan	20
Oil pump to upper oil pan	20
Oil pump chain sprocket to oil pump input shaft	30 plus an additional 90° (¼ turn)
Upper oil baffle to upper oil pan <sup>1)</sup>	3 plus an additional 90° (¼ turn)

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

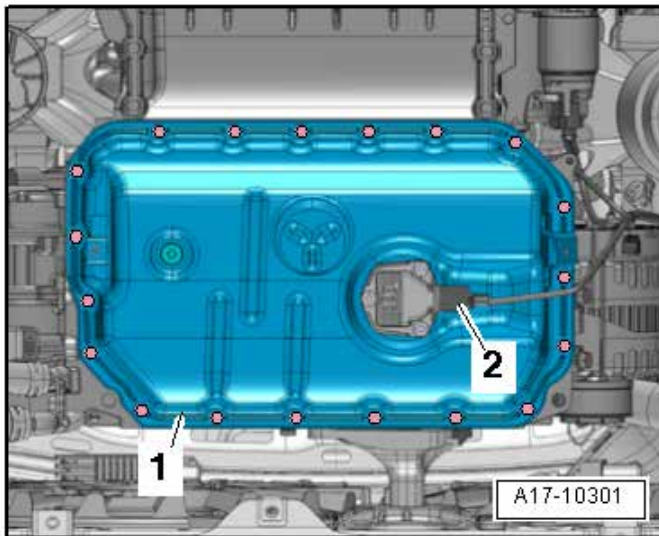
<sup>2)</sup> For bolt tightening clarification, refer to ElsaWeb, *Upper and Lower Oil Pans, Oil Pump and Oil Cooler Overview*, items 15 and 17.

## Upper Oil Pan Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 6 in a diagonal sequence	8
2	Tighten bolts 1 through 6 in a diagonal sequence	an additional 90° (¼ turn)

## Oil Pan Tightening Specifications



Step	Component	Nm
1	Tighten bolts in a diagonal sequence	3
2	Tighten bolts in a diagonal sequence	an additional 90° (¼ turn)

# Cooling System – 3.0L CGXC, CTUB

## Fastener Tightening Specifications

Component	Nm
Bracket for front left coolant pipes-to-engines	22
Bracket for left cooler for charge air cooling circuit-to-left charge air cooling circuit radiator	9
Charge air cooling pump-to-engine	9
Connection for coolant hose-to-engine	9
Coolant pump-to-engine	9
Coolant thermostat-to-engine	9
Engine temperature control sensor-to-engine	3
Fan shroud-to-radiator	3.5
Fan wheel-to-fan shroud	3.5
Front left coolant pipes-to-engine	9
Front coolant pipe-to-engine	2.5
Idler roller for the ribbed belt-to-engine	42
Left coolant pipes-to-engine	3 an additional 90° (¼ turn)
Lower coolant pipe on the compressor-to-engine	5
Lower left coolant pipe-to-transmission	9
Ribbed belt pulley-to-coolant pump	20
Right coolant pipe on the right side of the transmission-to-transmission	9
Rubber buffer-to-radiator	3.5
Upper coolant pipe-to-engine	9
Upper coolant pipe on the compressor-to-engine	5

## ***Fuel Supply – 3.0L CGXC, CTUB***

### **Fastener Tightening Specifications**

<b>Component</b>	<b>Nm</b>
Accelerator pedal module to pedal bracket	8
Air filter housing to bracket	4
Bracket for fuel tank pressure sensor	4
Bracket to the fuel tank	23
Carrier plate	23
Evaporative Emission (EVAP) canister	20
Fuel filler neck bolt	23
Fuel filler neck nut	2.5
Fuel pump control module nut	1.6
Fuel tank	23
Fuel tank leak detection control module nut	1.6
Heat shield for fuel tank	23
Locking flange cover to floor	1.5
Locking ring to fuel tank	120
Securing strap	23

## ***Turbocharger, G-Charger – 3.0L CGXC, CTUB***

### **Fastener Tightening Specifications**

<b>Component</b>	<b>Nm</b>
Bleeder screw for the left charge air cooler	1.5 to 3.0
Bracket for change-over valves-to-supercharger	9
Charge air cooler-to-supercharger housing <sup>1)</sup>	10
Charge air pressure sensor-to-supercharger <sup>1)</sup>	10
Drive head-to-supercharger housing <sup>1)</sup>	25
Engine lifting eye-to-supercharger	27
Insulation plate-to-supercharger	5
Nut-to-threaded pin	20
Threaded pin-to-engine	17

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

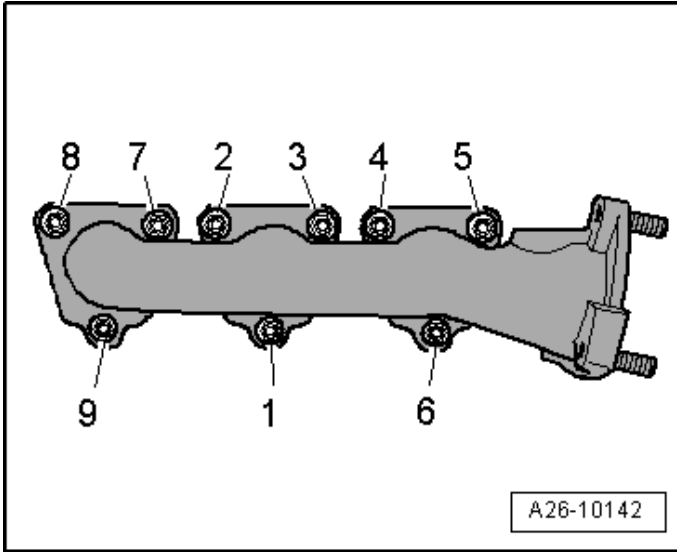
# **Exhaust System, Emission Controls – 3.0L CGXC, CTUB**

## **Fastener Tightening Specifications**

<b>Component</b>	<b>Nm</b>
Bonded rubber bushing bracket for secondary air injection pump motor nut	9
Bracket for secondary air injection pump motor-to-body	9
Catalytic converter-to-manifold nut 1, 2	20
Front clamping sleeve nut	23
Front muffler-to-catalytic converter nut 1, 2	20
Hose from the secondary air injection pump motor-to-right secondary air injection combination valve	9
Right secondary air injection combination valve-to-engine	9
Secondary air combination valve heat shield	9
Suspended mount-to-center muffler	23
Suspended mount-to-front muffle	23
Left secondary air injection combination valve-to-engine	9

- <sup>1)</sup> Replace fastener(s).
- <sup>2)</sup> Coat the thread with hot bolt paste.

## Left Exhaust Manifold Tightening Specifications

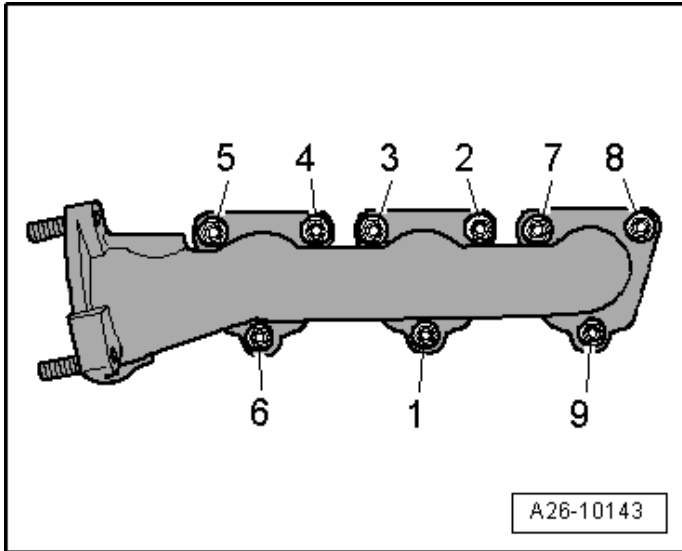


Step	Component	Nm
1	Tighten bolts 1 through 9 in sequence <sup>1) 2)</sup>	Hand-tighten
2	Tighten bolts 1 through 9 in sequence	15
3	Tighten bolts 1 through 9 in sequence	25

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

<sup>2)</sup> Coat the thread on the nut with hot bolt paste. For the correct hot bolt paste, refer to the Electronic Parts Catalog (ETKA).

## Right Exhaust Manifold Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 9 in sequence <sup>1)2)</sup>	Hand-tighten
2	Tighten bolts 1 through 9 in sequence	15
3	Tighten bolts 1 through 9 in sequence	25

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

<sup>2)</sup> Coat the thread on the nut with hot bolt paste. For the correct hot bolt paste, refer to the Electronic Parts Catalog (ETKA).



# ***Multiport Fuel Injection – 3.0L CGXC, CTUB***

## **Technical Data**

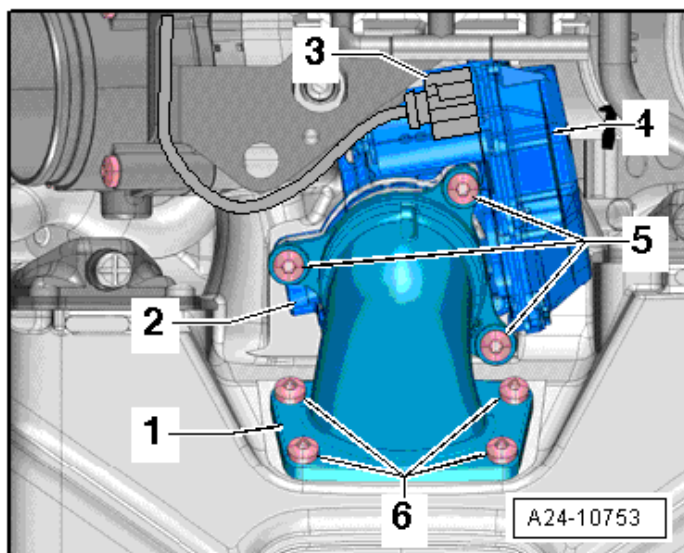
<b>Engine data</b>	<b>4.2L/4V/273 kW-Motor</b>
Idle speed	Cannot be adjusted, it is regulated by idle stabilization
Fuel pressure before high pressure pump	3 to 6 bar pressure
Fuel pressure after high pressure pump	30 to 125 bar pressure

## **Fastener Tightening Specifications**

<b>Component</b>	<b>Nm</b>
Adapter-to-air filter housing upper section	1.5
Air guide-to-air filter housing	1.5
Air filter housing upper section-to-lower section	2.5
Bracket for high pressure line-to-cylinder head	9
Camshaft position sensor-to-housing	9
Fuel line union nut	25
Fuel pressure sensor	22
High pressure line threaded connection-to-fuel rail	40
High pressure line-to-bracket	9
High pressure line-to-high pressure pump	25
<b>Housing-to-protective plate</b>	
- Threaded pin	9
- Nut	9
Intake manifold lower section <sup>1)</sup>	9
Intake manifold runner position sensor 2-to-vacuum actuator	2.5
Low fuel pressure sensor-to-high pressure pump	15
Oxygen sensor	55
Throttle valve control module <sup>1)</sup>	10

<sup>1)</sup> Tighten bolts in a diagonal sequence.

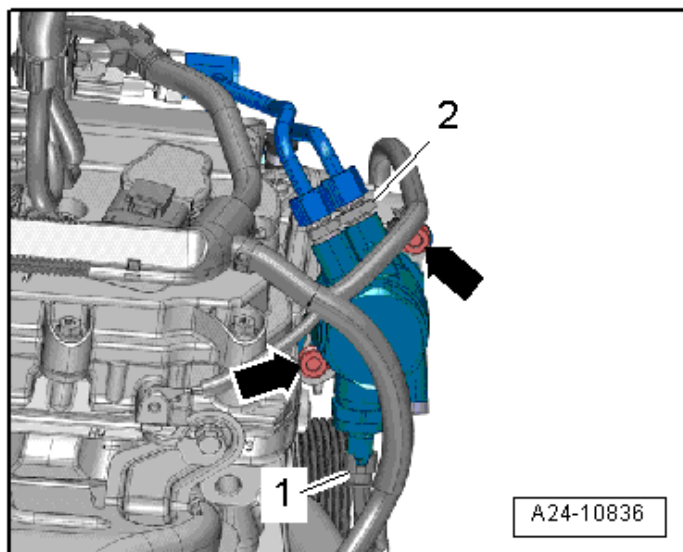
## Control Valve Control Module Tightening Specification



Step	Component	Nm
1	Tighten bolts 5 and 6	Hand-tighten
2	Tighten bolt 6	10
3	Tighten bolt 5	10

## High Pressure Pump Tightening Specifications

Engine –  
3.0L CGXC, CTUB



Step	Component	Nm
1	Tighten bolts (➔)	Hand-tighten
2	Tighten bolts (➔)	In steps to 20 Nm

# Ignition System – 3.0L CGXC, CTUB

## Ignition Tightening Specifications

Component	Nm
Camshaft Position (CMP) sensor	9
Knock Sensors (KS)	25
Wiring for ignition coils at cylinder head cover	5

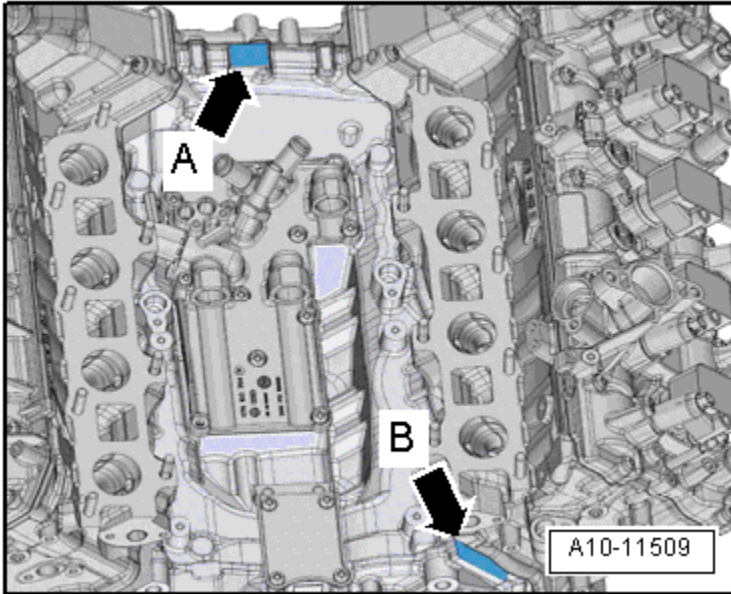
## Technical Data

Test data		3.0L TFSI Engine
Engine idle speed		Cannot be adjusted, it is regulated by idle stabilization
Ignition timing		Not adjustable; regulated by the Engine Control Module (ECM).
Ignition/glow plug system		Single coil ignition system with 8 ignition coils (output stages integrated) that are connected directly to the spark plugs via the ignition cables.
Spark plugs	Names	Refer to Electronic Parts Catalog (ETKA).
	Removing and installing	Maintenance Procedures Rep. Gr.03
Ignition sequence		1-4-3-6-2-5

# ENGINE MECHANICAL – 4.0L CEUA, CGTA

## General, Technical Data

### Engine Number Location



Engine –  
4.0L CEUA, CGTA

The engine number -arrow B- is visible, if the housing for the charge air cooler is removed. The first 3 digits of the engine code -arrow A- are visible, when the engine cover is removed. The 4-digit engine code is on the type plate, vehicle data label and ECM.

## Engine Data

Code letters		CEUA	CGTA
Displacement	liter	3.999	3.999
Output	kW at RPM	309 @ 6000	381 @ 6000
Torque	Nm at RPM	600 @ 1500 to 4500	650 @ 1500 to 4500
Bore	diameter mm	84.5	84.5
Stroke	mm	89.0	89.0
Compression ratio		10.1	10.1
RON	at least	98 <sup>1)</sup>	98 <sup>1)</sup>
Fuel injection and ignition system		Bosch Motronic	Bosch Motronic
Ignition sequence		1-5-4-8-6-3-7-2	1-5-4-8-6-3-7-2
Turbocharger		2 turbocharger	2 turbocharger
Oxygen Sensor (O2S) regulation		2 sensors before catalytic converter 2 sensors after cat. converter	2 sensors before catalytic converter 2 sensors after cat. converter
Variable valve timing		Intake Exhaust	Intake Exhaust
Variable intake manifold		Yes	Yes
Secondary Air Injection (AIR) system		Yes	Yes
Valve per cylinder		4	4

<sup>1)</sup> Unleaded RON 95 is also permitted but performance is reduced.

## Engine Assembly – 4.0L CEUA, CGTA

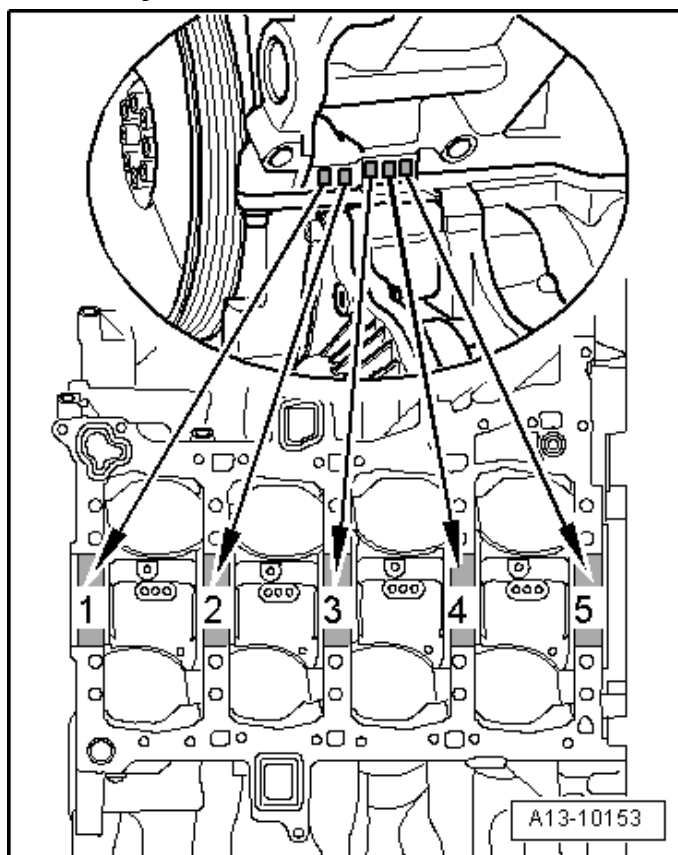
### Fastener Tightening Specifications

Component	Fastener size	Nm
Bolts and nuts	M6	9
	M7	15
	M8	20
	M10	40
	M12	65
Engine bracket	-	20
Engine mount-to-engine support <sup>1)</sup>	-	90 plus an additional 90° (¼ turn)
Engine support	-	40
Heat shield	-	10
Subframe	-	55
Wheel housing bracket bolt		9

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

# Crankshaft, Cylinder Block – 4.0L CEUA, CGTA

## Allocation of Crankshaft Bearing Shells for Cylinder Block – New Crankshaft

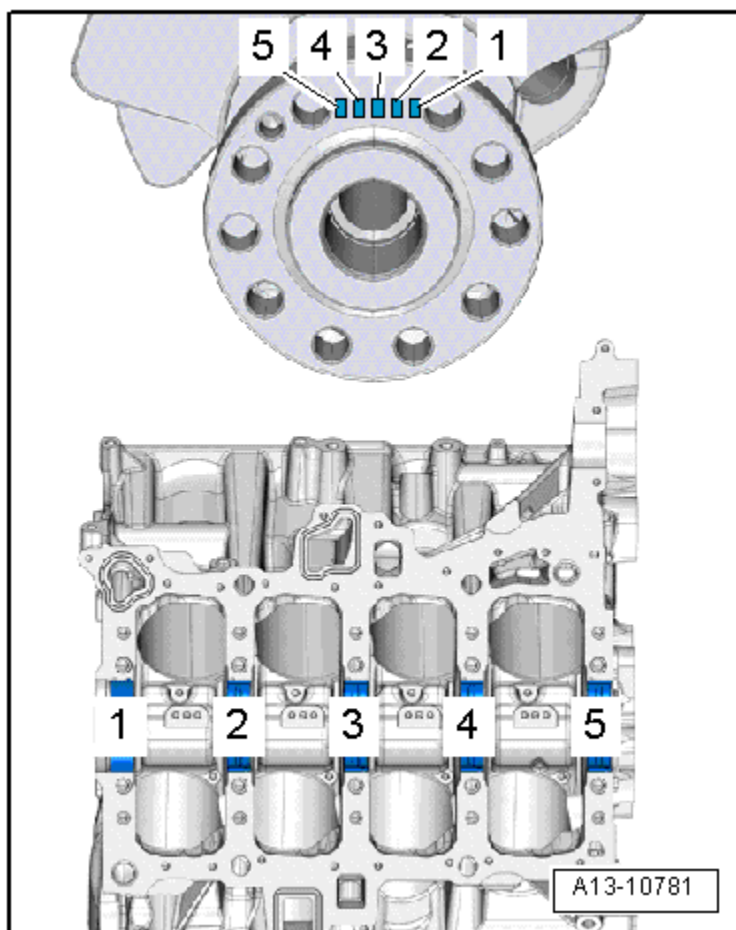


Engine –  
4.0L CEUA, CGTA

Bearing shells with the correct thickness are allocated to the cylinder block in the factory. Colored dots on the sides of the bearing shells identify the bearing shell thickness. The allocation of the bearing shells to the cylinder block is marked by one letter each at the front left on cylinder block as shown in the illustration.

Letter on cylinder block	Color of bearing
R	Red
S	Black
G	Yellow
U	Green
B	Blue

## Allocation of Crankshaft Bearing Shells for Guide Frame

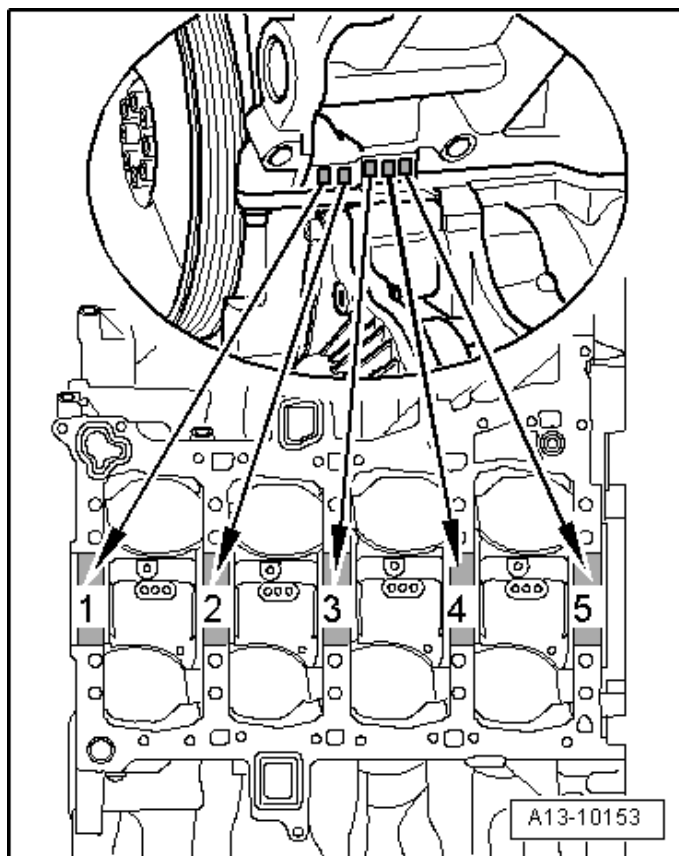


Bearing shells with the correct thickness are allocated to the guide frame in the factory. Colored dots on the sides of the bearing shells identify the bearing shell thickness. The allocation of bearing shells to the guide frame is identified by a letter on the front crankshaft flange as shown in the illustration.

Letter on cylinder block	Color of bearing
R	Red
S	Black
G	Yellow
U	Green
B	Blue



## Allocation of Crankshaft Bearing Shells for Guide Frame – Used and Reworked Crankshafts



Engine –  
4.0L CEUA, CGTA

Bearing shells are allocated to cylinder block corresponding to the color markings stamped into the cylinder block. With used and reworked crankshafts, measure the crankshaft pivot pins to allocate the appropriate bearing shells. Thicker oversized bearing shells are available for a reworked crankshaft. These have the same color markings as the original size bearing shells.

Letter on cylinder block	Color of bearing
R	Red
S	Black
G	Yellow
U	Green
B	Blue

## Fastener Tightening Specifications

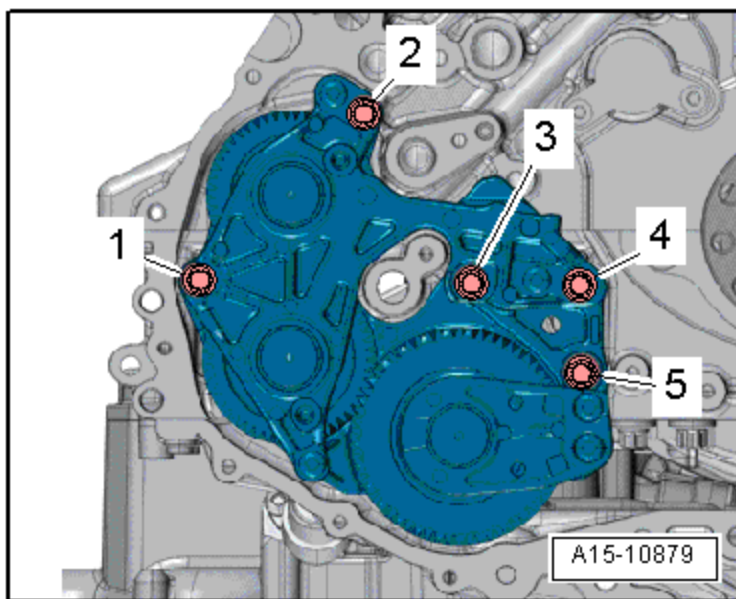
Component	Nm
Drive plate-to-crankshaft <sup>1)</sup>	60 plus an additional 90° (¼ turn)
Connecting rod bearing cap-to-connecting rod <sup>1)</sup>	50 plus an additional 90° (¼ turn)
Idler roller for the ribbed belt	22
Oil spray jet for piston cooling <sup>3)</sup>	9
Ribbed belt tensioning element <sup>2)</sup>	22
	55

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

<sup>2)</sup> For bolt tightening clarification, refer to ElsaWeb, *Ribbed Belt Drive Overview*, items 1 and 2.

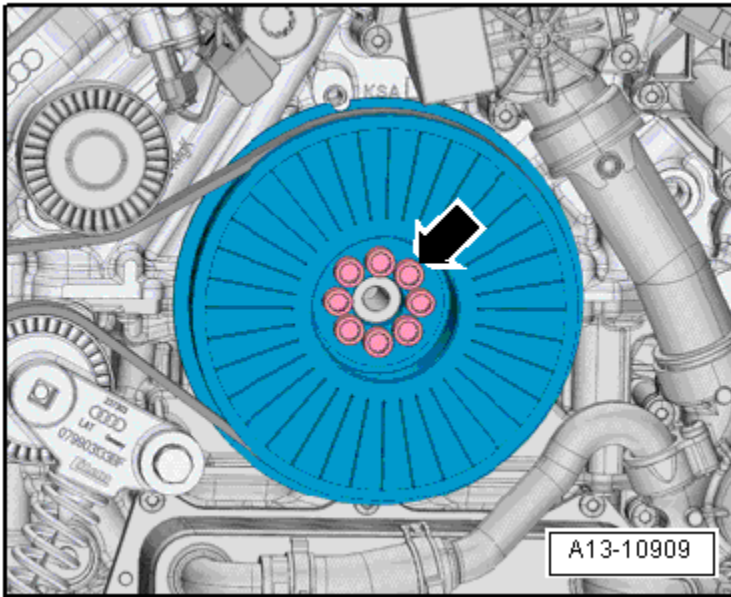
<sup>3)</sup> Insert bolts with locking compound

## Spur Gear Unit Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 to 5 in a diagonal sequence	22

## Vibration Damper Tightening Specifications



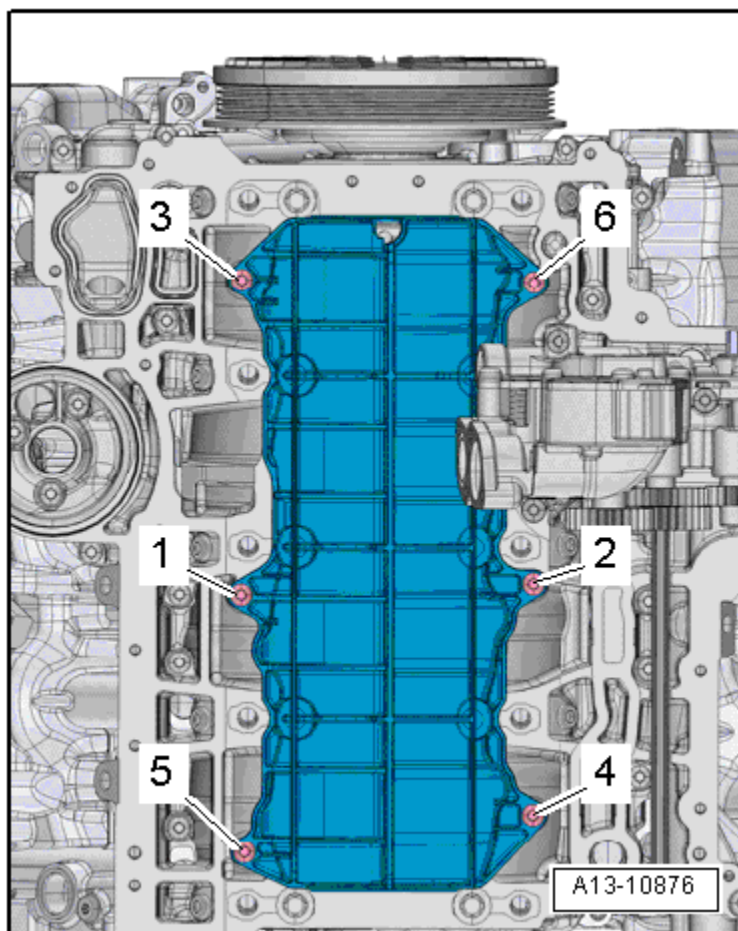
Engine –  
4.0L CEUA, CGTA

Step	Component	Nm
1	Tighten bolts (➡) in a diagonal sequence <sup>1) 2)</sup>	15
2	Tighten bolts (➡) in a diagonal sequence	22
3	Tighten bolts (➡) in a diagonal sequence	an additional 90° (¼ turn)

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

<sup>2)</sup> Install the bolts with a locking compound. Refer to the Electronic Parts Catalog (ETKA).

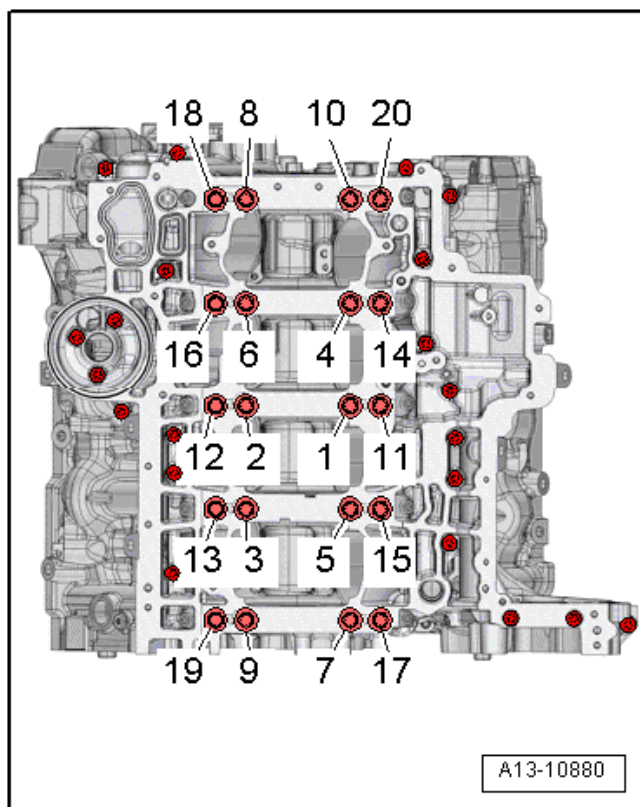
## Baffle Plate Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 6 in sequence <sup>1)</sup>	5
2	Tighten bolts 1 through 6 in sequence	an additional 90° (¼ turn)

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

## Guide Frame Tightening Specifications



Engine –  
4.0L CEUA, CGTA

Step	Component	Nm
1	Tighten bolts 1 through 10 in sequence <sup>1)</sup>	30
2	Tighten bolts 11 through 20 in sequence <sup>1)</sup>	30
3	Tighten bolts 1 through 10 in sequence	50
4	Tighten bolts 1 through 10 in sequence	an additional 90° (¼ turn)
4	Tighten bolts 11 through 20 in sequence	50
5	Tighten bolts 1 through 20 in sequence	an additional 90° (¼ turn)
6	Tighten guide frame to cylinder block sealing surface bolts (not numbered) in a diagonal sequence	9

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

## Crankshaft Dimensions (Engine Code CEUA)

Honing dimension in mm	Crankshaft bearing journal diameter		Connecting rod journal diameter	
Basic dimension	65.000	- 0.022	54.000	- 0.022
		- 0.042		- 0.042
Repair stage	64.750	- 0.022	53.750	- 0.022
		- 0.042		- 0.042

## Crankshaft Dimensions (Engine Code CGTA)

Honing dimension in mm	Crankshaft bearing journal diameter		Connecting rod journal diameter	
Basic dimension	67.000	- 0.010	54.000	- 0.022
		- 0.029		- 0.042
Repair stage	66.750	- 0.010	53.750	- 0.022
		- 0.029		- 0.042

## Piston Ring End Gaps

Piston ring end gaps dimensions in mm	New	Wear limit
1 <sup>st</sup> compression ring	0.20 to 0.35	0.80
2 <sup>nd</sup> compression ring	0.20 to 0.40	0.80
Oil scraping ring	0.20 to 0.40	0.80

## Piston Ring Clearance (Engine Code CEUA)

Piston ring dimensions in mm	New	Wear limit
1 <sup>st</sup> compression ring	0.020 to 0.070	0.200
2 <sup>nd</sup> compression ring	0.005 to 0.045	0.150
Oil scraping ring	0.020 to 0.055	0.200

## Piston Ring Clearance (Engine Code CGTA)

Piston ring dimensions in mm	New	Wear limit
1 <sup>st</sup> compression ring	0.026 to 0.058	not fixed
2 <sup>nd</sup> compression ring	0.020 to 0.045	not fixed
Oil scraping ring	0.011 to 0.028	not fixed

## Piston and Cylinder Dimensions

Cylinder bore diameter in mm	Piston diameter in mm
84.510 ± 0.005	84.490 <sup>1)</sup>
84.610 ± 0.005	84.590 <sup>1)</sup>

<sup>1)</sup> Measurement with graphite coating (thickness 0.01 mm). The graphite coating wears away.

# Cylinder Head, Valvetrain – 4.0L CEUA, CGTA

## Fastener Tightening Specifications

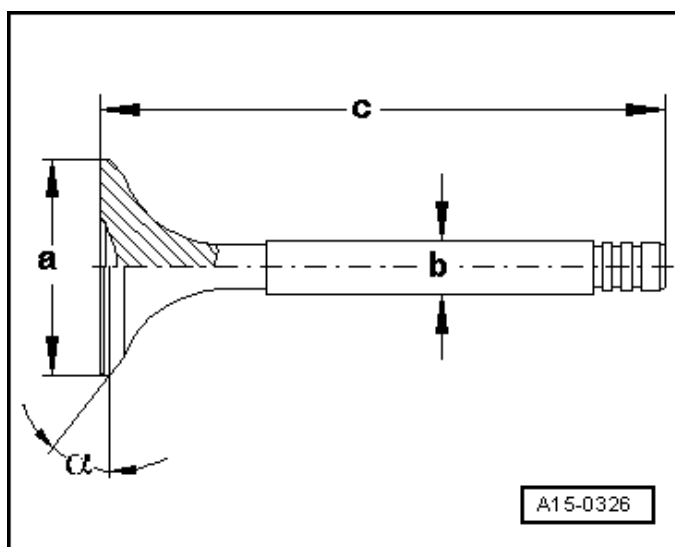
Component	Nm
Bearing plate for drive sprocket	9
Bracket for idler sprocket <sup>1)</sup>	5 plus an additional 90° (¼ turn)
Camshaft adjustment valve 2 to camshaft housing	5
Camshaft adjuster for the exhaust camshaft <sup>1)</sup>	80 plus an additional 90° (¼ turn)
Camshaft adjuster for the intake camshaft <sup>1)</sup>	80 plus an additional 90° (¼ turn)
Chain tensioner for the left camshaft control chain <sup>1)</sup>	5 plus an additional 90° (¼ turn)
Chain Tensioner for the right camshaft timing chain <sup>1)</sup>	5 plus an additional 90° (¼ turn)
Chain tensioner to engine <sup>1)</sup>	5 plus an additional 90° (¼ turn)
Chain tensioner with glide track to engine <sup>1)</sup>	5 plus an additional 90° (¼ turn)
Drive sprocket for the right camshaft timing chain <sup>1)</sup>	20 plus an additional 45° (⅛ turn)
Glide Track <sup>1)</sup>	17 plus an additional 90° (¼ turn)
Gliding piece to engine <sup>1)</sup>	5 plus an additional 90° (¼ turn)
Engine lifting eye to cylinder head	22
Exhaust camshaft adjustment valve 2 to camshaft housing	5
Idler sprocket for the power take-off drive chain to engine	42
Intake/exhaust camshaft to cylinder head	5
Mounting pin to bearing plate <sup>1)</sup>	5 plus an additional 90° (¼ turn)

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

## Compression Checking Specifications

Compression pressure	Bar pressure Engine Code CEUA	Bar pressure Engine Code CGTA
New	10.0 to 15.0	10.0 to 14.0
Wear limit	9.0	8.0
Maximum difference between cylinders	3.0	3.0

## Valve Dimensions

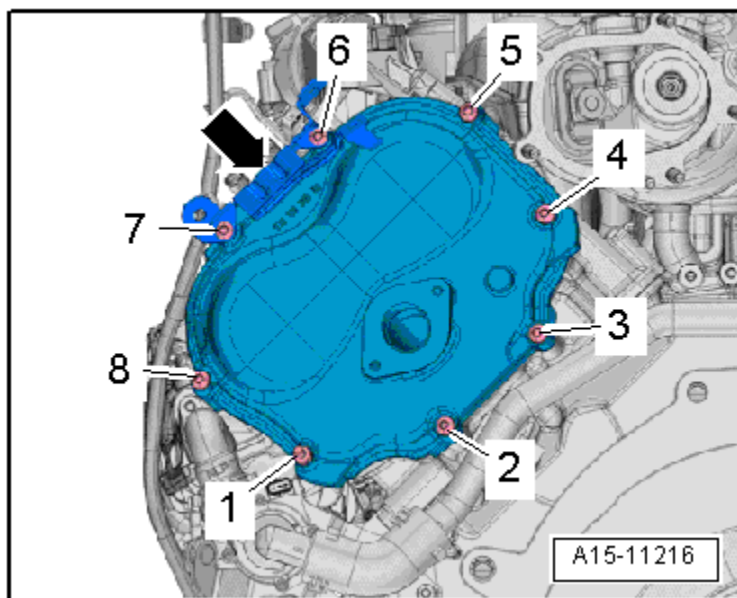


Dimension		Intake valve	Exhaust valve
Diameter a	mm	33.85 ± 0.10	28.0 ± 0.1
Diameter b	mm	5.98 ± 0.01	5.96 ± 0.01
c	mm	103.97 ± 0.20	101.9 ± 0.2
α	∠°	45	45

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



## Left Timing Chain Cover Tightening Specification

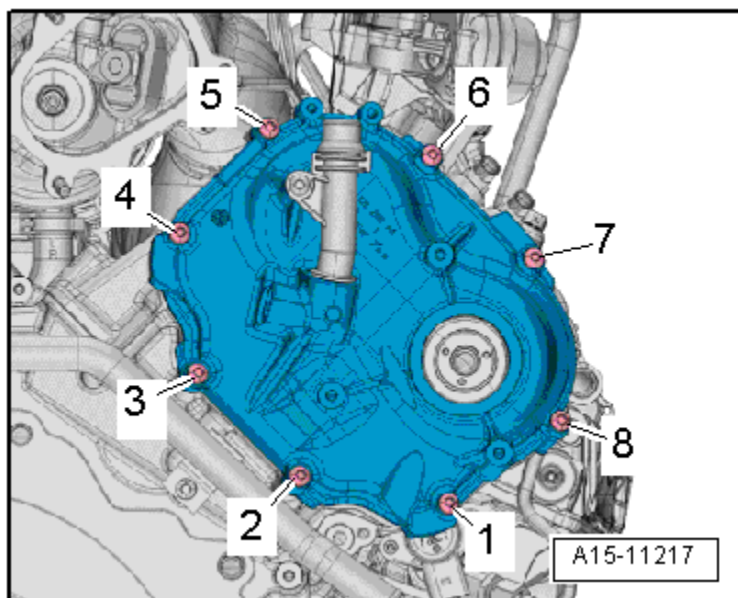


Engine –  
4.0L CEUA, CGTA

Replace any bolts that were tightened with an additional turn.

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

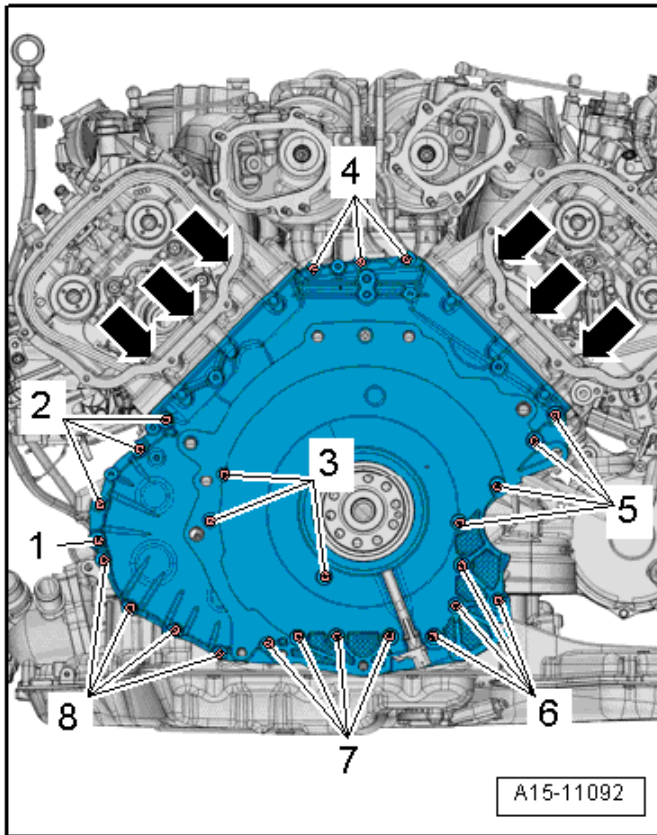
## Right Timing Chain Cover Tightening Specification



Replace any bolts that were tightened with an additional turn.

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

## Lower Timing Chain Cover Tightening Specifications



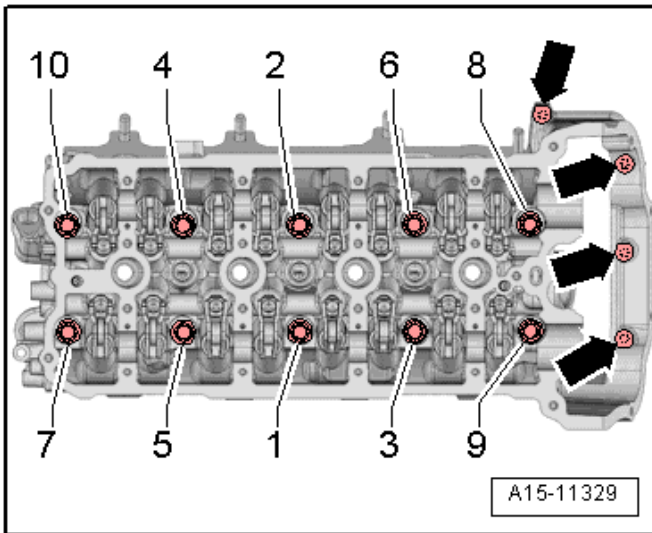
Engine –  
4.0L CEUA, CGTA

Replace any bolts that were tightened with an additional turn.

Step	Component	Nm
1	Tighten bolts (➔)	5
2	Tighten bolts 2 through 8 in a diagonal sequence <sup>1)</sup>	8
3	Tighten bolts (➔)	8
4	Tighten bolts 2 through 8 in a diagonal sequence	an additional 90° (¼ turn)
5	Tighten bolts (➔)	an additional 90° (¼ turn)
6	Tighten bolt <sup>1)</sup>	Tighten for power steering pump

<sup>1)</sup> For bolt tightening clarification, refer to ElsaWeb, *Suspension, Wheels, Steering; Rep. Gr.48; Specifications*

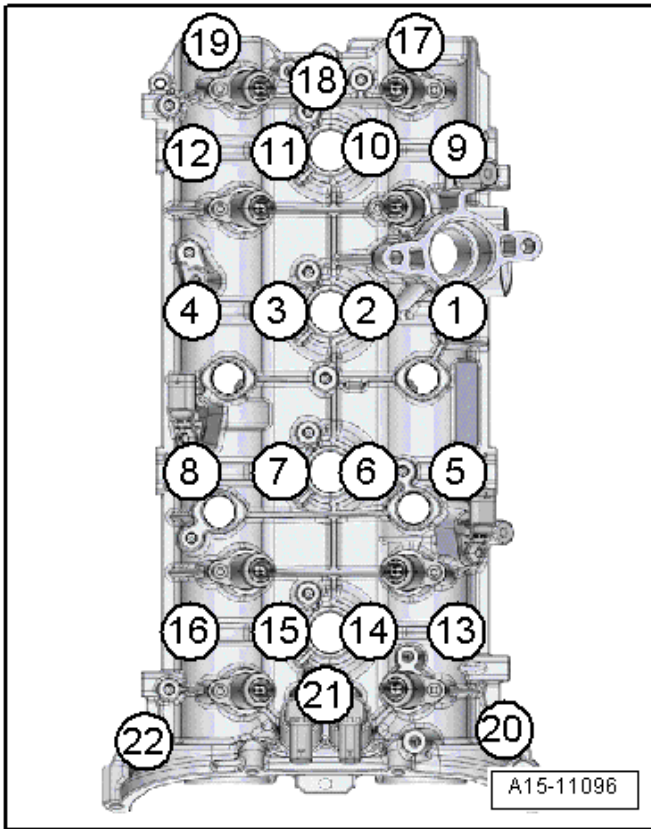
## Cylinder Head Tightening Specifications



Replace any bolts that were tightened with an additional turn.

Step	Component	Nm
1	Tighten bolts 1 through 10 in sequence <sup>1)</sup>	Hand-tighten
2	Tighten bolts 1 through 10 in sequence	30
3	Tighten bolts 1 through 10 in sequence	60
4	Tighten bolts 1 through 10 in sequence	an additional 90° (¼ turn)
5	Tighten bolts 1 through 10 in sequence	an additional 90° (¼ turn)
6	Tighten bolts (➡)	10
7	Tighten bolts (➡)	an additional 90° (¼ turn)

## Camshaft Housing Tightening Specifications



Engine –  
4.0L CEUA, CGTA

Replace any bolts that were tightened with an additional turn.

Step	Component	Nm
1	Tighten bolts 1 through 22 in sequence <sup>1)</sup>	Hand-tighten <sup>2)</sup>
2	Tighten bolts 1 through 22 in sequence	8
3	Tighten bolts 1 through 22 in sequence	an additional 90° (¼ turn)

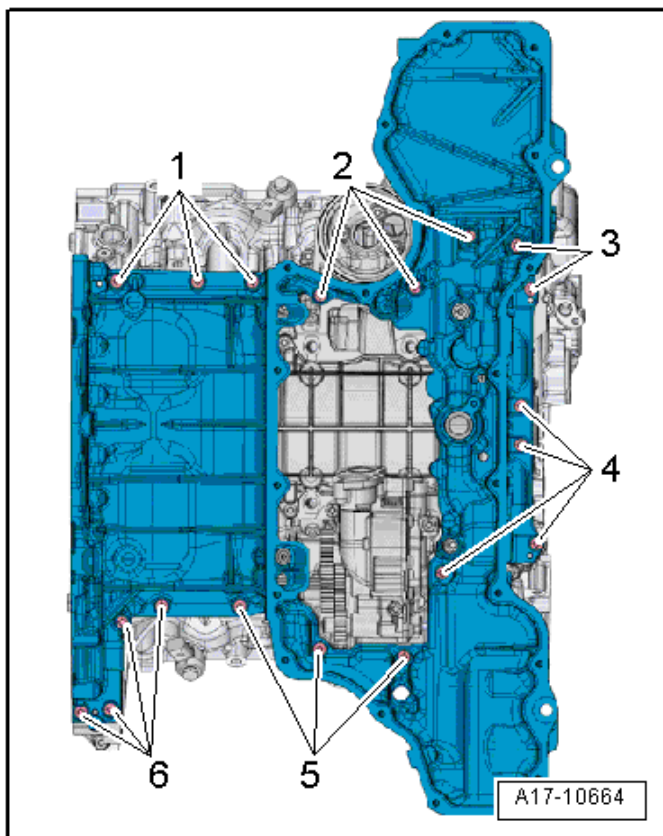
# Lubrication – 4.0L CEUA, CGTA

## Fastener Tightening Specifications

Component	Nm
Cover in the inner V-to-engine <sup>1)</sup>	5 plus an additional 90° (¼ turn)
Cover-to-upper oil pan	8
Drain plug-to-engine	30
Guide tube-to-upper oil pan	9
Intake tube for oil pump	9
Oil drain plug-to-lower oil pan	20
Oil drain plug-to-oil filter cap	4
Oil filter cap	25
Oil level thermal sensor-to-lower oil pan	9
Oil pipe to oil pump <sup>1)</sup>	8 plus an additional 90° (¼ turn)
Oil pipes-to-upper oil pan (for vehicles with engine code CGTA)	9
Oil pressure regulation valve-to-engine	9
Oil pressure switch	20
Oil pressure switch, level 3	20
Oil return line-to-right engine oil cooler	9
Oil separator	3.2
Oil supply line-to-right engine oil cooler	9
Oil temperature sensor-to-engine 2 double bolt	9
Pipe for the crankcase ventilation	3.2
Rear air guide-to-right engine oil cooler	9
Reduced oil pressure switch	20
Right engine oil cooler (Engine Code CGTA)	9

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

## Upper Oil Pan Tightening Specifications

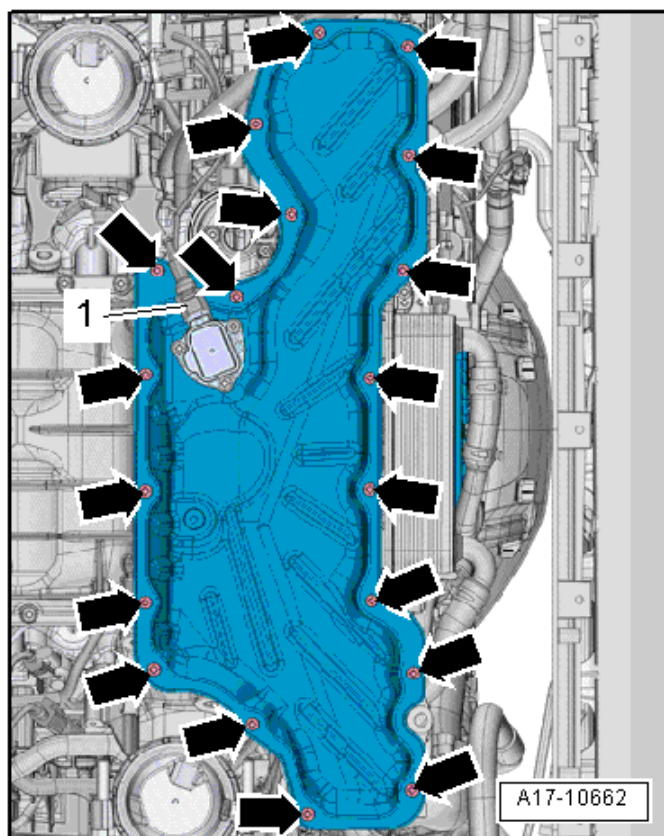


Engine –  
4.0L CEUA, CGTA

Replace any bolts that were tightened with an additional turn.

Step	Component	Nm
1	Tighten bolts 1 through 6 in a diagonal sequence	Hand-tighten
2	Tighten bolts 1 through 6 in a diagonal sequence	5
3	Tighten bolts 1 through 6 in a diagonal sequence	an additional 90° (¼ turn)

## Oil Pan Tightening Specifications

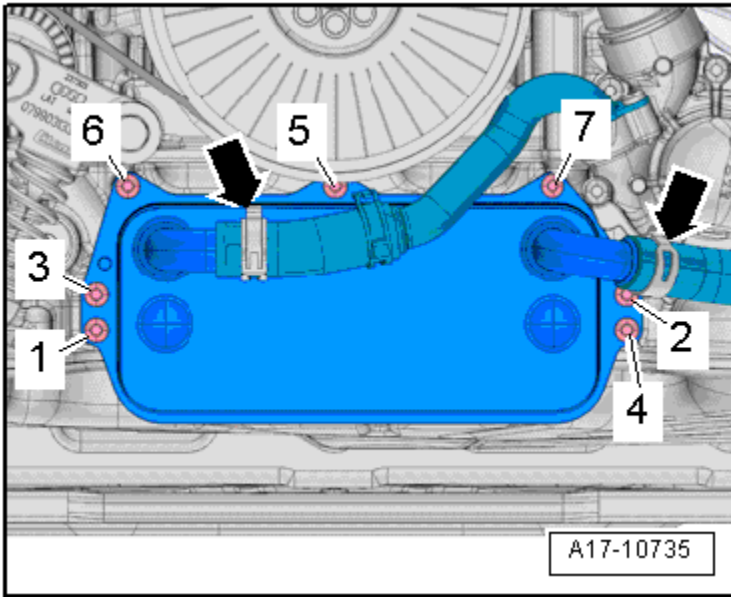


Replace any bolts that were tightened with an additional turn.

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



## Front Engine Oil Cooler Tightening Specification



Engine –  
4.0L CEUA, CGTA

Step	Component	Nm
1	Tighten bolts 1 through 7 in sequence	3
2	Tighten bolts 1 through 7 in sequence	9

# Cooling System – 4.0L CEUA, CGTA

## Fastener Tightening Specifications

Component	Nm
Bracket for after-run coolant pump <sup>2)</sup>	
- Bolt	1.5
- Bolt	9
- Nut	9
Bracket for charge air cooling pump-to-bracket for after-run coolant pump	9
Bracket for engine coolant circulation pump 2-to-engine coolant circulation pump 2	1.5
Bracket for engine coolant circulation pump 2-to-engine	9
Bracket for left cooler for charge air cooling circuit	9
Coolant connection-to-housing for the coolant pump	9
Coolant switch-off valve <sup>1)</sup>	5 plus an additional 90° (¼ turn)
Engine coolant temperature sensor-to-engine	9
Engine temperature control sensor-to-engine	9
Fan shroud-to-fan	3.5
Fan wheel-to-fan shroud	5
Front charge air cooling circuit radiator-to-radiator	5
Front coolant pipe to engine nut/bolt	9
Housing for the coolant pump-to-coolant pump <sup>1)</sup>	8 plus an additional 90° (¼ turn)
Hydraulic oil cooler-to-condenser	5
Lower left coolant pipe	9
Map controlled engine cooling thermostat-to-housing for the coolant pump	9
Right coolant pipe on the right side of the transmission-to-engine	9
Transmission coolant valve bracket for engine coolant circulation pump 2 to engine (vehicles with engine codes CEUA)	9
Transmission fluid cooling valve-to-abracket for after-run coolant pump	9
Upper left coolant pipe-to-aengine nut	9
Upper rear coolant pipe-to-aengine	9

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

<sup>2)</sup> For bolt tightening clarification, refer to ElsaWeb, *After-Run Coolant Pump -V51-, Charge Air Cooling Pump -V188-, Transmission Coolant Valve -N488- Overview* items 2, 5, 6 and 9

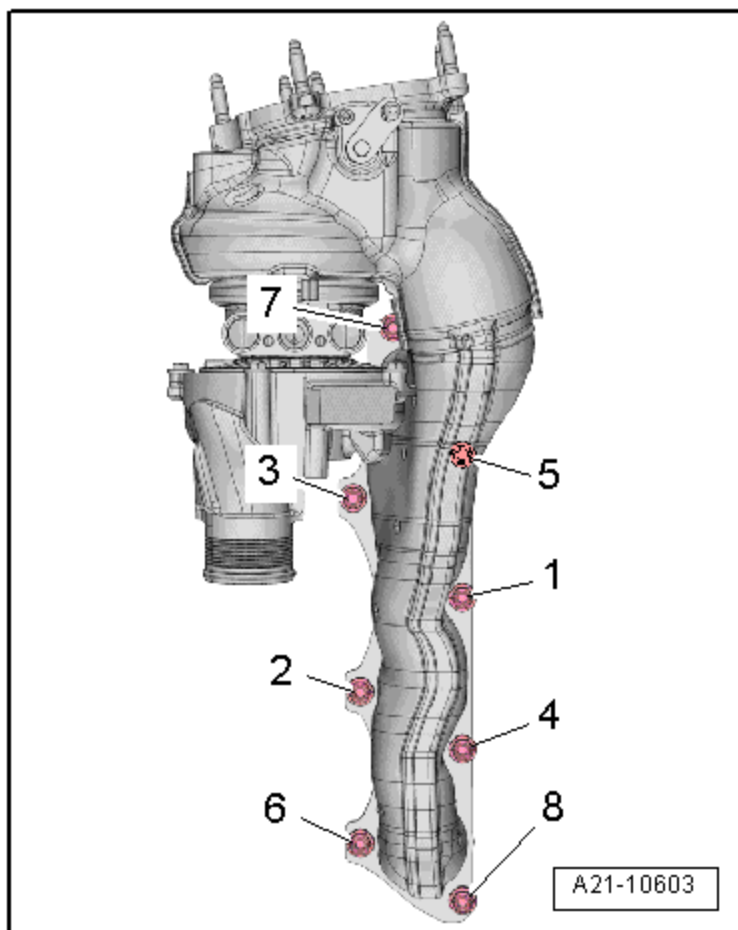
# Turbocharger – 4.0L CEUA, CGTA

## Fastener Tightening Specifications

Component	Nm
Air guide-to-throttle valve control module	9
Air guide pipe-to-turbocharger	9
Charge air cooler-to-charge air cooler housing	3.2
Charge air cooler housing-to-body	9
Charge air pressure sensor-to-air guide	9
Connection for oil return hose-to-turbocharger	9
Coolant supply pipe-to-turbocharger	9
Engine cover temperature sensor	9
Oil supply line-to-turbocharger	9
Retaining plate for coolant and oil lines-to-turbocharger	9
Turbocharger recirculation valve-to-air guide	9
<b>Vacuum actuator for the turbocharger</b>	
- Ball pin	2.5
- Bolt	9

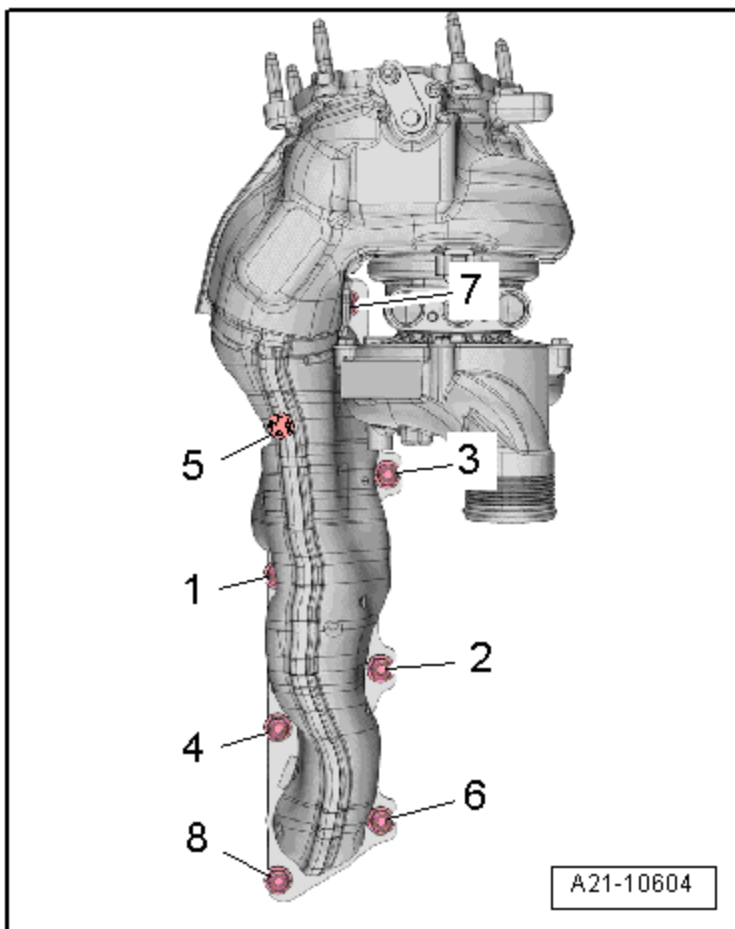
Engine –  
4.0L CEUA, CGTA

## Left Turbocharger Tightening Specification



Step	Component	Nm
1	Tighten bolts 1 through 8 in sequence	16
2	Tighten bolts 1 through 8 in sequence	25

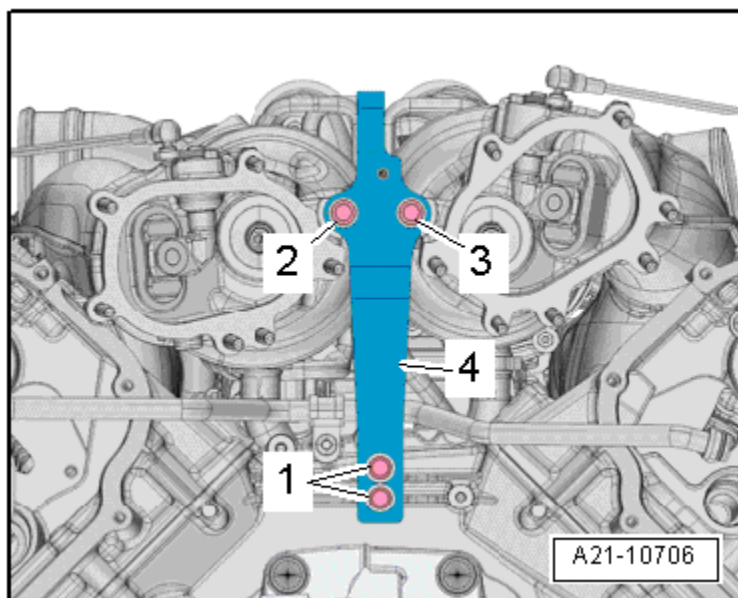
## Right Turbocharger Tightening Specification



Engine –  
4.0L CEUA, CGTA

Step	Component	Nm
1	Tighten bolts 1 through 8 in sequence	16
2	Tighten bolts 1 through 8 in sequence	25

## Turbocharger Support Tightening Specification



Step	Component	Nm
1	Tighten bolts 1 to 3 in sequence	5
2	Tighten bolts 1 to 3 in sequence	25

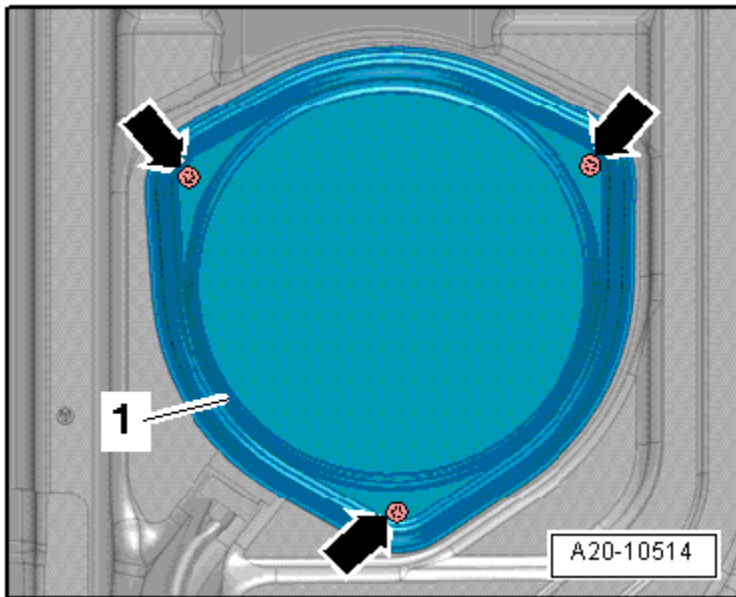
# Fuel Supply – 4.0L CEUA, CGTA

## Fastener Tightening Specifications

Component	Nm
Accelerator pedal module to pedal bracket	8
Air filter housing to bracket	4
Bracket for fuel tank pressure sensor	4
Bracket to the fuel tank	23
Carrier plate	23
EVAP canister	20
Fuel filler neck nut	2.5
Fuel filler neck bolt	23
Fuel tank	23
Fuel tank leak detection control module, nut	1.6
Fuel pump control module to bracket nut	1.6
Heat shield for fuel tank	23
Locking flange cover to floor	1.5
Locking ring to fuel tank	120
Securing strap	23

Engine –  
4.0L CEUA, CGTA

## Locking Flange Cover Tightening Specification



Step	Component	Nm
1	Tighten bolts (➔) in a diagonal sequence	1.5

## Exhaust System, Emission Controls – 4.0L CEUA, CGTA

### Fastener Tightening Specifications

Component	Nm
Catalytic converter-to-manifold nut <sup>1) 2)</sup>	23
Clamping sleeve	23
Front muffler-to-catalytic converter nut <sup>1) 2)</sup>	23
Secondary Air Injection (AIR) pump motor bracket-to-air pump motor <sup>3)</sup>	
- Bolt	5
- Bolt	8
- Nut	9
Suspended mount-to-body	23

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

<sup>2)</sup> Coat the threads with hot bolt paste.

<sup>3)</sup> For bolt tightening clarification, refer to ElsaWeb, *Secondary Air Injection System Overview* items 1, 3 and 31.



# Multiport Fuel Injection – 4.0L CEUA, CGTA

## Technical Data

Engine data	4.0L TFSI Engine
Idle speed	Cannot be adjusted, it is regulated by idle stabilization
Fuel pressure after high pressure pump	25 to 140 bar pressure
Fuel pressure before high pressure pump	4.0 to 7.0 bar pressure

<sup>1)</sup> Depending on Engine Control Module (ECM) requirements.

## Fastener Tightening Specifications

Component	Nm
Air guide <sup>1)</sup>	2.5
Air guide <sup>2)</sup>	3.5
Air guide with turbocharger recirculation valve -N249- to throttle valve control module	9
Bracket for the fuel rail	3
Charge air cooler temperature sensor to throttle valve control module	9
<b>High pressure line</b>	
- Union nuts	25
- Connections	40
Fuel pressure sensor 2 to fuel rail <sup>3)</sup>	25
High pressure pump to camshaft housing <sup>5)</sup>	22
Intake manifold runner position sensor 2	2.5
Intake manifold to Bracket for the fuel rail <sup>4)</sup>	9
Intake air temperature sensor to Intake manifold	2.5
Low fuel pressure sensor to high pressure pump	15
Manifold absolute pressure sensor to charge air cooler housing	3
Threaded connection between high pressure line and fuel rail	40
Throttle valve control module to charge air cooler housing	5
Upper air filter housing to lower air filter housing	2.5

<sup>1)</sup> For bolt tightening clarification, refer to ElsaWeb, *Air Filter Overview*, items 1,2, 4 and 5.

<sup>2)</sup> For bolt tightening clarification, refer to ElsaWeb, *Air Filter Overview*, items 9 and 11.

<sup>3)</sup> Coat the threads with clean engine oil.

<sup>4)</sup> Fasten in diagonal sequence in steps

<sup>5)</sup> Replace

# Ignition System – 4.0L CEUA, CGTA

## Ignition Tightening Specifications

Component	Nm
Camshaft Position (CMP) sensor-to-engine	9
Engine Speed (RPM) sensor-to-engine	9
Knock Sensors (KS)-to-engine	9
Spark plug-to-engine	25
Wiring router-to-engine	5

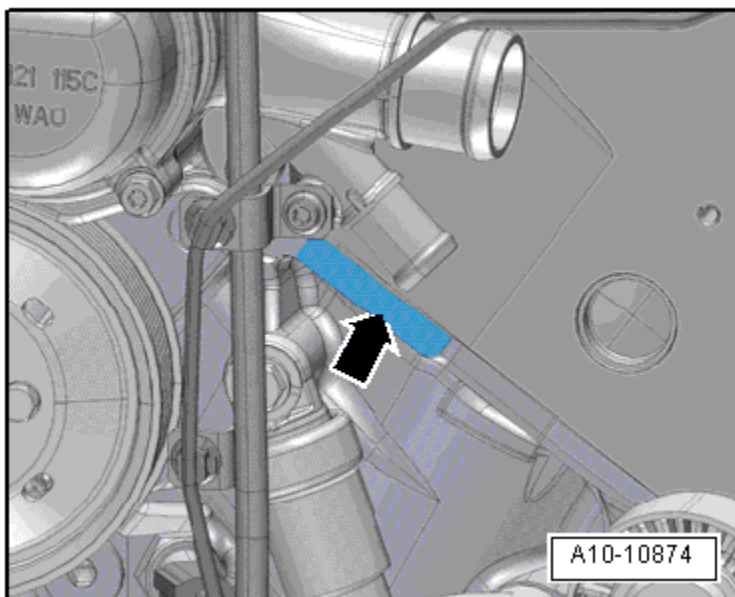
## Technical Data

Test data		4.0L TFSI Engine
Idle speed		Cannot be adjusted, it is regulated by idle stabilization
Ignition timing		Not adjustable; regulated by the Engine Control Module (ECM).
Ignition System		Single coil ignition system with 8 ignition coils (output stages integrated) that are connected directly to spark plugs via the ignition cables.
Spark plugs	Names	Refer to the Parts Catalog
	Removing and installing	Refer to the Maintenance Procedures Rep. Gr. 03
Ignition sequence		1-5-4-8-6-3-7-2

# ENGINE MECHANICAL – 6.3L CEJA

## General, Technical Data

### Engine Number Location



The engine number (➔) (engine code and serial number) is located at the front of the engine on the left side.

Engine –  
6.3L CEJA

## Engine Data

Identification codes		CEJA
Displacement	liter	6.299
Output	kW at RPM	368 @ 6400
Torque	Nm at RPM	550 @ 3250
Bore	diameter mm	86.0
Stroke	mm	90.368
Compression ratio		11.4
RON	at least	98 <sup>1)</sup>
Fuel injection and ignition system		Bosch Motronic
Ignition sequence		1-7-5-11-3-9-6-12-2-8-4-10
Turbocharger		No
Knock control		4 sensors
Oxygen Sensor (O2S) regulation		4 sensors before catalytic converter 4 sensors after catalytic converter
Variable valve timing		Intake Exhaust
Variable intake manifold		No
Secondary Air Injection (AIR) system		Yes
Valve per cylinder		4

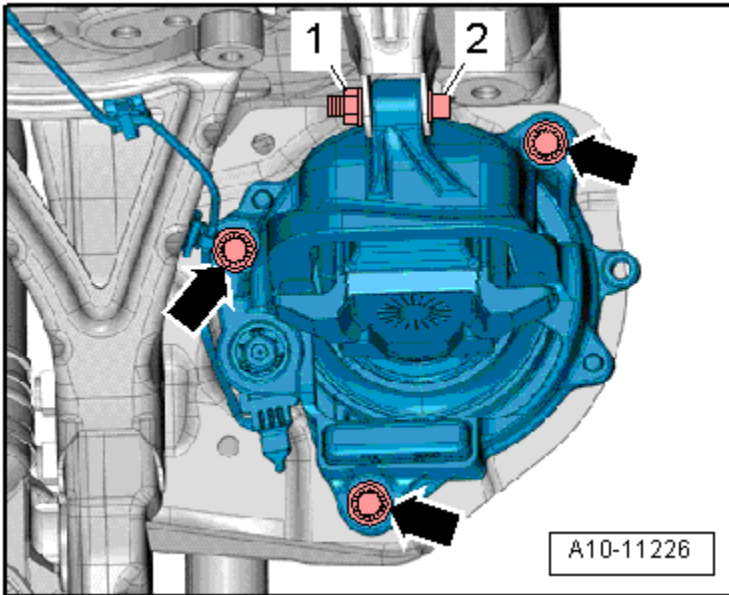
<sup>1)</sup> Unleaded RON 95 is also permitted but performance is reduced.

## Engine Assembly – 6.3L CEJA

### Fastener Tightening Specifications

Component	Fastener size	Nm
Bolts and nuts	M6	9
	M7	15
	M8	20
	M10	40
	M12	65
Engine support	-	40
Subframe nut	-	20

## Locking Flange Cover Tightening Specification



Step	Component	Nm
1	Tighten bolts (➔) and 2	Hand-tighten
2	Tighten bolts (➔) and 2	20

Engine –  
6.3L CEJA

## ***Crankshaft, Cylinder Block – 6.3L CEJA***

### **Fastener Tightening Specifications**

<b>Component</b>	<b>Nm</b>
Drive plate	60 plus an additional 90° (¼ turn)
Power steering pump bracket	40
Ribbed belt idler roller	32
Tensioning element with relay lever <sup>1)</sup>	32 plus an additional 90° (¼ turn)
Tensioning roller tension spring	23
Vibration damper <sup>1)</sup>	40 plus an additional 90° (¼ turn)

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

## ***Cylinder Head, Valvetrain – 6.3L CEJA***

### **Fastener Tightening Specifications**

<b>Component</b>	<b>Nm</b>
Camshaft adjustment valve in the exhaust	2.4
Camshaft drive chain sprocket <sup>1)</sup>	90 plus an additional 135°
Chain tensioner with tensioning rail for the drive chain	9
Camshaft adjustment control housing <sup>1)</sup>	4 plus an additional 90° (¼ turn)
Engine lifting eye	23
Guide rail mounting pin	15
<b>Cylinder bank 1 (right)</b>	
Camshaft adjuser <sup>1)</sup>	60 plus an additional 90° (¼ turn)
Camshaft timing chain guide rail	8 plus an additional 90° (¼ turn)
Camshaft timing chain tensioner <sup>1)</sup>	4 plus an additional 90° (¼ turn)
Guide rail mounting pin	20
Tensioning element mounting pin	42

<b>Component</b>	<b>Nm</b>
Timing chain tensioning element	8
<b>Cylinder bank 2 (left)</b>	
Camshaft adjuster <sup>1)</sup>	60 plus an additional 90° (¼ turn)
Camshaft timing chain tensioner <sup>3)</sup>	4 plus an additional 90° (¼ turn)
	8 plus an additional 90° (¼ turn)
Tensioning element mounting pin	42
Timing chain tensioning element <sup>2)</sup>	8

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

<sup>2)</sup> Install the bolts with a locking compound. Refer to the Electronic Parts Catalog (ETKA).

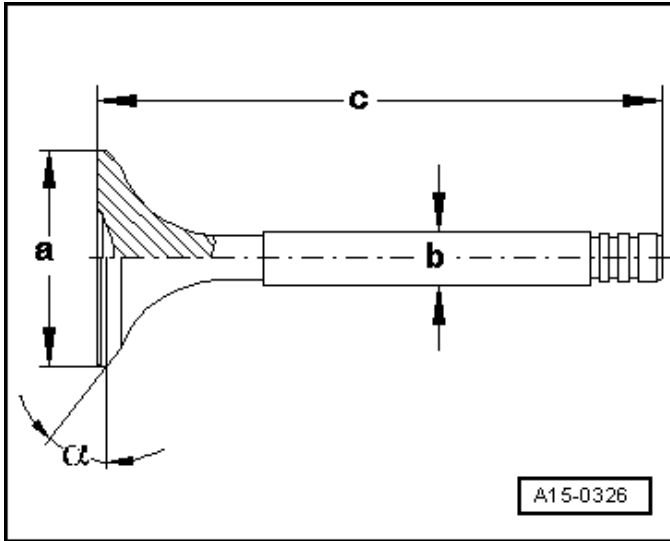
<sup>3)</sup> For bolt tightening clarification, refer to ElsaWeb, *Camshaft Timing Chains Overview, Cylinder Bank 2 (left)*, items 1 and 7.

## Compression Checking Specifications

<b>Compression pressure</b>	<b>Bar pressure</b>
New	11.0 to 13.0
Wear limit	10.0
Maximum difference between cylinders	3.0

**Engine –  
6.3L CEJA**

## Valve Dimensions

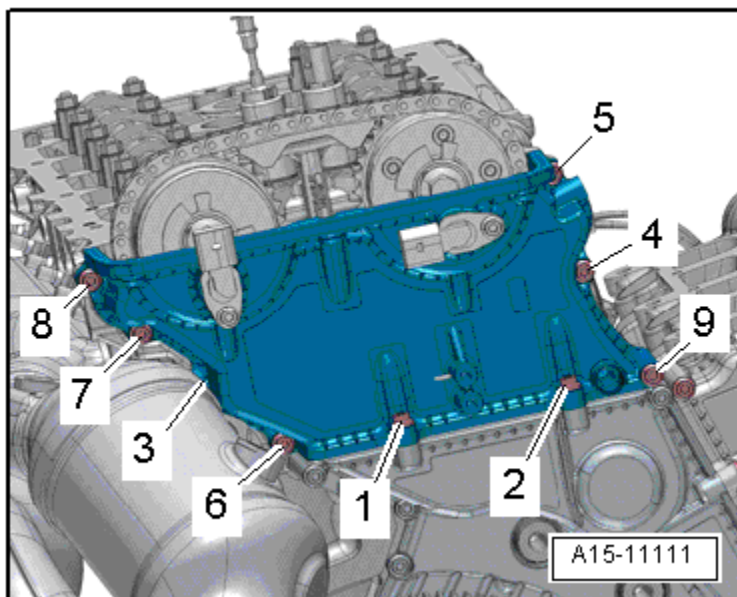


Dimension		Short intake valve	Long intake valve	Short exhaust valve	Long exhaust valve
Diameter a	mm	33.2	33.2	30.2	30.2
Diameter b	mm	5.96	5.96	5.94	5.94
c	mm	102.2	136.4	102.2	136.1
$\alpha$	$^{\circ}$	45	45	45	45

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



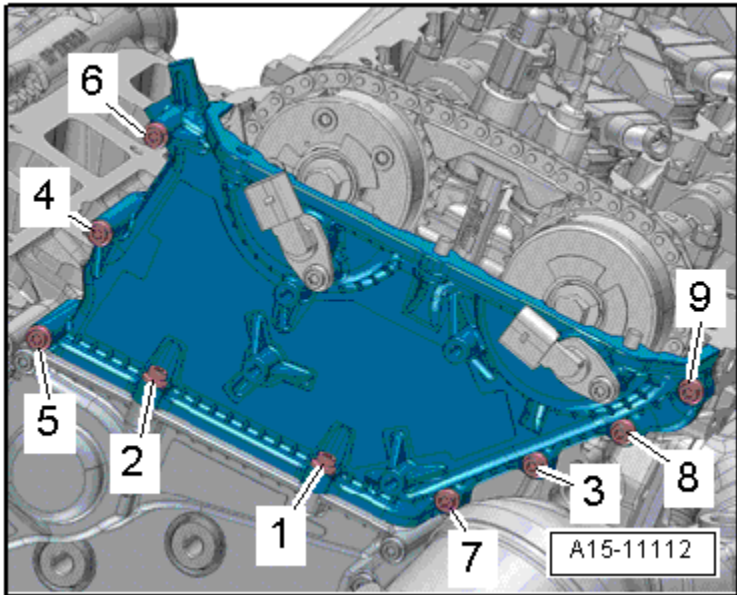
## Left Timing Chain Cover Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 9 in sequence	4
2	Tighten bolts 1 through 8 in sequence	an additional 45° (1/8 turn)
3	Tighten bolt 9	an additional 180° (1/2 turn)

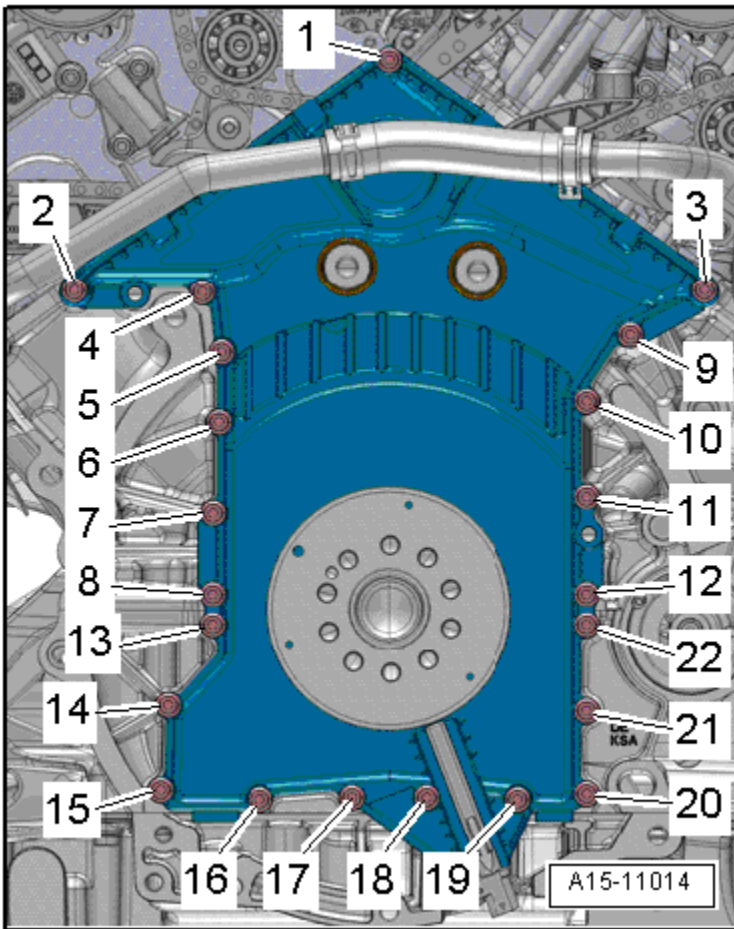
Engine –  
6.3L CEJA

## Right Timing Chain Cover Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 9 in sequence	4
2	Tighten bolts 1 through 3 and 7 through 9 in sequence	an additional 45° (1/8 turn)
3	Tighten bolts 4 through 6	an additional 180° (1/2 turn)

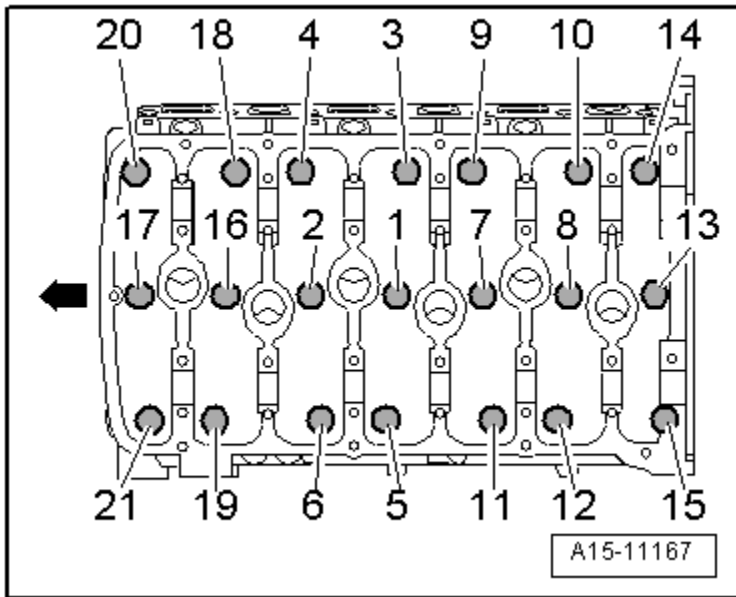
## Lower Timing Chain Cover Tightening Specifications



Engine –  
6.3L CEJA

Step	Component	Nm
1	Tighten bolts 1 through 22	4
2	Tighten bolts 1 through 3	an additional 180° (½ turn)
3	Tighten bolts 4 through 22	an additional 45° (⅛ turn)

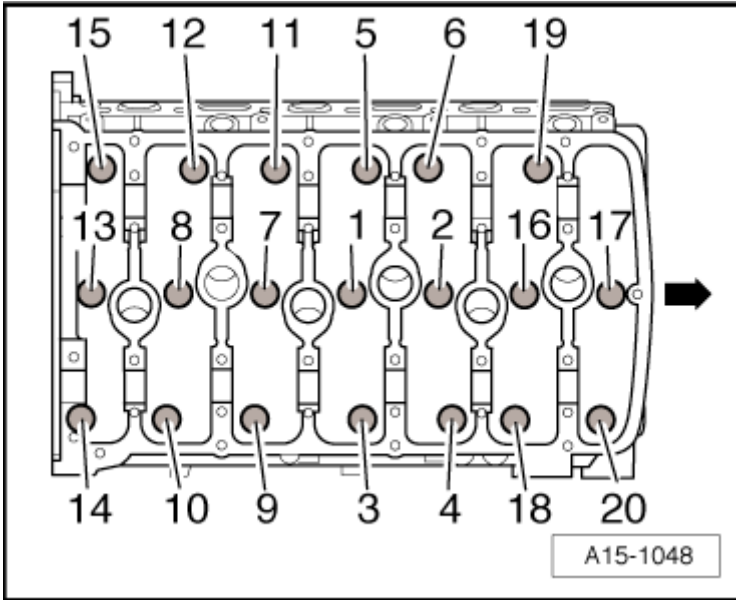
## Left Cylinder Head Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 21 in sequence <sup>1)</sup>	23
2	Tighten bolts 1 through 21 in sequence	37
3	Tighten bolts 1 through 21 in sequence	an additional 90° (¼ turn)
4	Tighten bolts 1 through 21 in sequence	an additional 90° (¼ turn)

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

## Right Cylinder Head Tightening Specifications

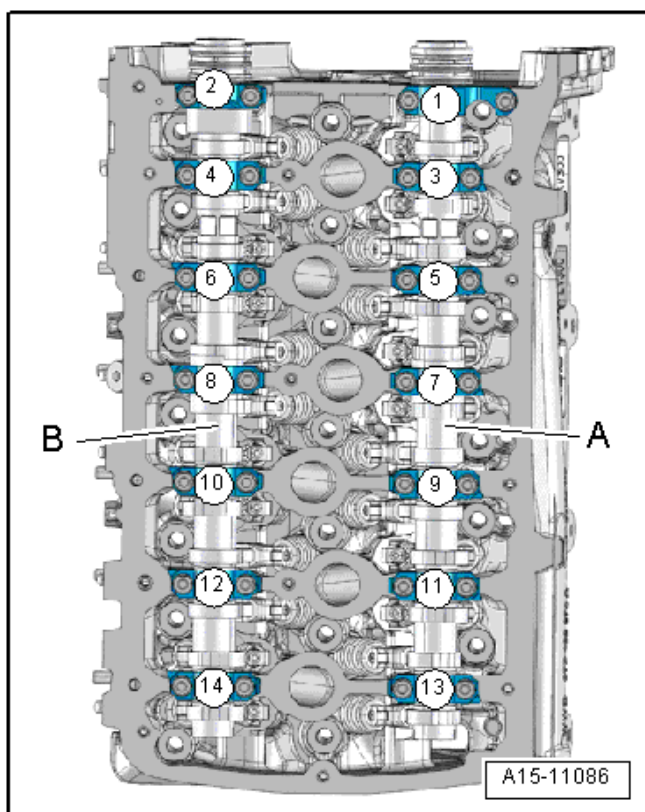


Step	Component	Nm
1	Tighten bolts 1 through 20 in sequence <sup>1)</sup>	23
2	Tighten bolts 1 through 20 in sequence	37
3	Tighten bolts 1 through 20 in sequence	an additional 90° (¼ turn)
4	Tighten bolts 1 through 20 in sequence	an additional 90° (¼ turn)

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

Engine –  
6.3L CEJA

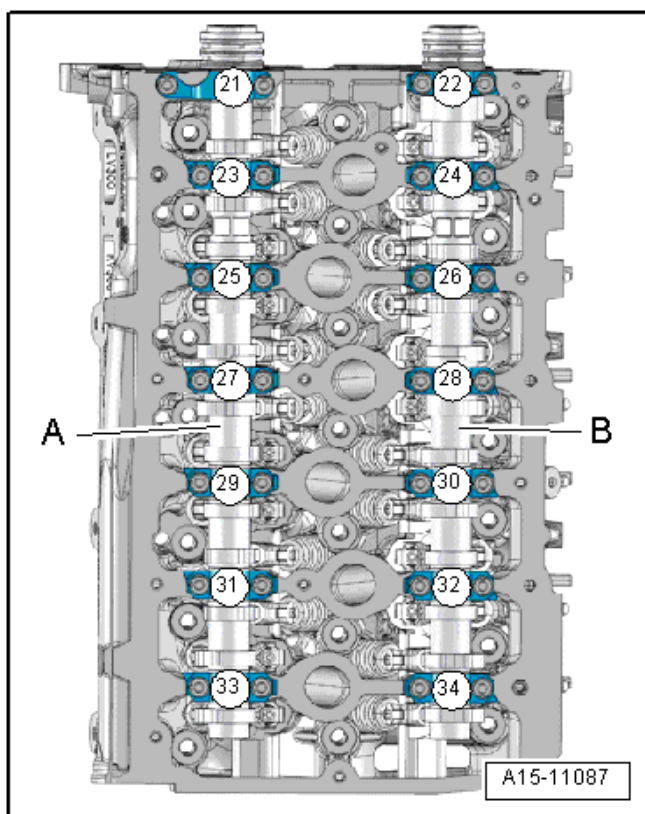
## Cylinder Bank 1 (Right) Bearing Cap Tightening Specifications



Step	Component	Nm
<b>Intake camshaft A</b>		
1	Tighten bolts 3 and 11	Hand-tighten
2	Tighten bolts 3 and 11	5 plus an additional 45° (1/8 turn)
3	Tighten bolt 7	5 plus an additional 45° (1/8 turn)
4	Tighten bolts 5 and 9	5 plus an additional 45° (1/8 turn)
5	Tighten bolts 1 and 13	5 plus an additional 45° (1/8 turn)

Step	Component	Nm
<b>Intake camshaft B</b>		
1	Tighten bolts 4 and 12	Hand-tighten
2	Tighten bolts 4 and 12	5 plus an additional 45° (1/8 turn)
3	Tighten bolt 8	5 plus an additional 45° (1/8 turn)
4	Tighten bolts 6 and 10	5 plus an additional 45° (1/8 turn)
5	Tighten bolts 2 and 14	5 plus an additional 45° (1/8 turn)

## Cylinder Bank 2 (Left) Bearing Cap Tightening Specifications

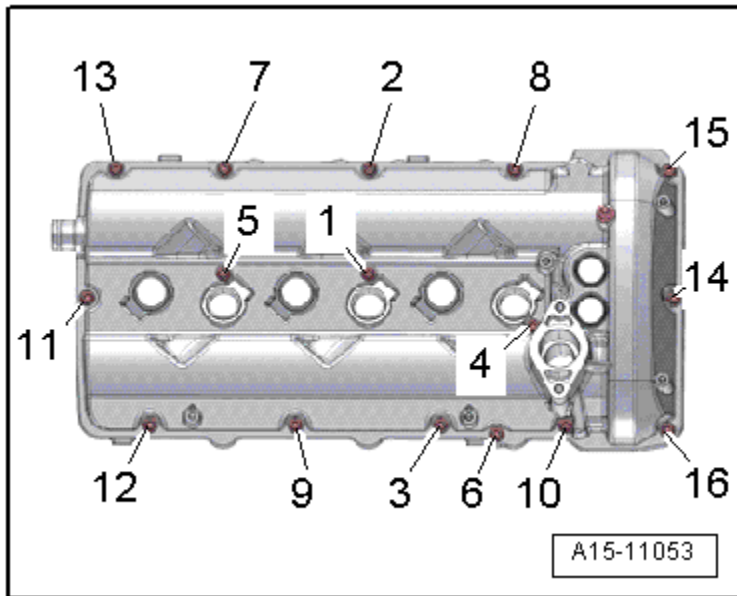


Step	Component	Nm
<b>Intake camshaft A</b>		
1	Tighten bolts 23 and 31	Hand-tighten
2	Tighten bolts 23 and 31	5 plus an additional 45° (1/8 turn)
3	Tighten bolt 27	5 plus an additional 45° (1/8 turn)
4	Tighten bolts 25 and 29	5 plus an additional 45° (1/8 turn)
5	Tighten bolts 21 and 33	5 plus an additional 45° (1/8 turn)



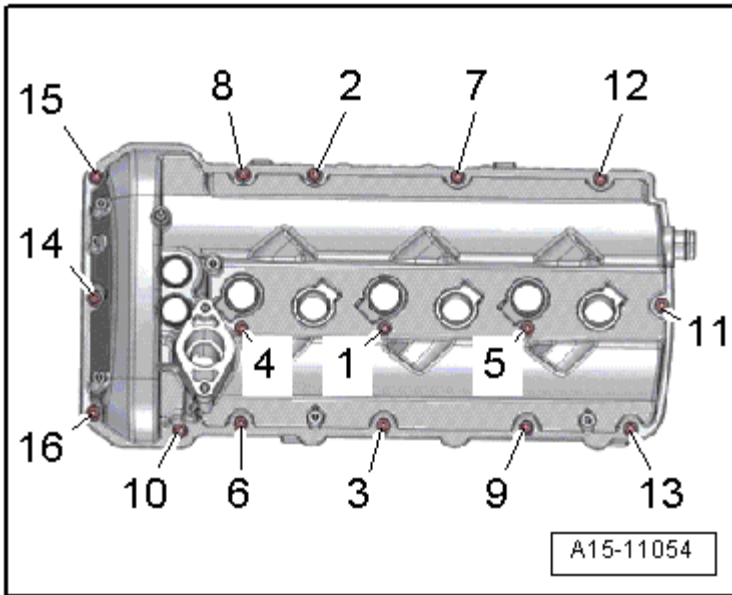
Step	Component	Nm
<b>Intake camshaft B</b>		
1	Tighten bolts 24 and 32	Hand-tighten
2	Tighten bolts 24 and 32	5 plus an additional 45° (1/8 turn)
3	Tighten bolt 28	5 plus an additional 45° (1/8 turn)
4	Tighten bolts 26 and 30	5 plus an additional 45° (1/8 turn)
5	Tighten bolts 22 and 34	5 plus an additional 45° (1/8 turn)

## Left Cylinder Head Cover Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 13 in sequence	8
2	Tighten bolts 14 through 16 in sequence	4
3	Tighten bolts 14 through 16 in sequence	an additional 90° (¼ turn)

## Right Cylinder Head Cover Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 13 in sequence	8
2	Tighten bolts 14 through 16 in sequence	4
3	Tighten bolts 14 through 16 in sequence	an additional 90° (¼ turn)

**Engine –  
6.3L CEJA**

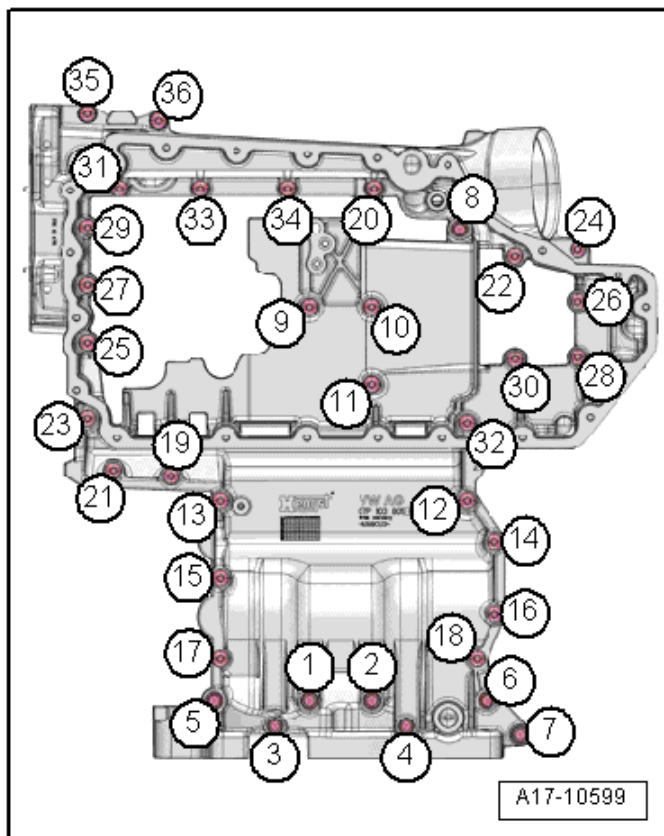
# Lubrication – 6.3L CEJA

## Fastener Tightening Specifications

Component	Fastener size	Nm
Ball Pin for Engine Cover	-	8
Cap for Oil Filter Element	-	25
Chain tensioner	M6	8
	M8	20
Crankcase ventilation hose	-	8
Engine cover ball pin	-	8
Engine oil cooler	-	9
Oil dipstick guide tube <sup>1)</sup>	-	4 plus an additional 45° (1/8 turn)
Oil drain plug	-	30
Oil filler tube and crankcase ventilation pressure control valve housing	-	8
Oil filter element cap	-	25
Oil level thermal sensor	-	8
Oil pipe banjo bolt	-	20
Oil pressure switch	-	20
Oil pump	-	20
Oil pump intake tube	-	8
Reduced oil pressure switch	-	20

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

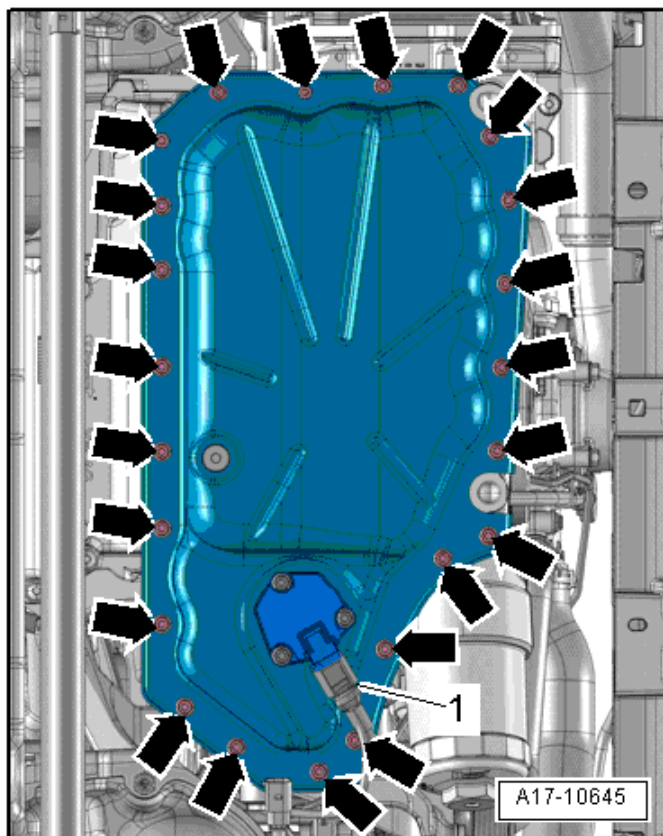
## Upper Oil Pan Tightening Specifications



Engine –  
6.3L CEJA

Step	Component	Nm
1	Tighten bolts 1 through 36 in sequence	Hand-tighten
2	Tighten bolts 1 through 36 in sequence	8
3	Tighten bolts 1 through 8 in sequence	20

## Oil Pan Tightening Specifications



Step	Component	Nm
1	Tighten bolts (➡) in a diagonal sequence	Hand-tighten
2	Tighten bolts (➡) in a diagonal sequence	4
3	Tighten bolts (➡) in a diagonal sequence	an additional 45° (1/8 turn)

# Cooling System – 6.3L CEJA

## Fastener Tightening Specifications

Component	Nm
After-run coolant pump	9
Coolant auxiliary cooler bracket	9
Coolant pump	10
Coolant temperature sensor <sup>1)</sup>	4 plus an additional 45° (1/8 turn)
Engine cover mounting pins	4.5
Fan rib	3.5
Fan wheel	5
Left rear coolant pipe	9
Lower left coolant pipe	9
Radiator	3.5
Ribbed belt pulley	8
Right coolant pipes <sup>2)</sup>	9
	20
Right front coolant pipe	9
Right rear coolant pipe	9
Right Coolant Pipe on the Right Side of the Transmission <sup>3)</sup>	9
	23
Thermostat housing <sup>1)</sup>	20
Thermostat housing cover	9
Upper left coolant pipe	9

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

<sup>2)</sup> For bolt tightening clarification, refer to ElsaWeb, *Coolant Pipes Overview*, items 8 and 9.

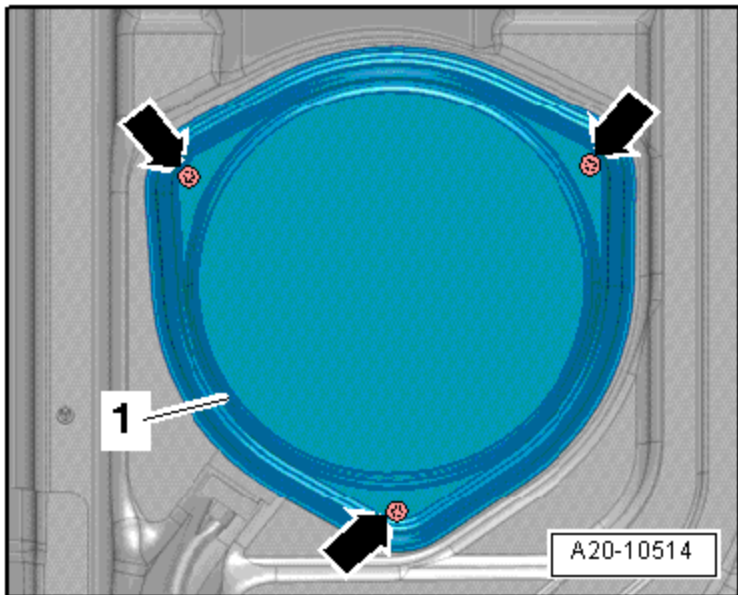
<sup>3)</sup> For bolt tightening clarification, refer to ElsaWeb, *Coolant Pipes Overview*, items 10 through 11.

# Fuel Supply – 6.3L CEJA

## Fastener Tightening Specifications

Component	Nm
Accelerator pedal module	8
Air filter housing	4
Bracket for fuel tank pressure sensor	4
Bracket to the fuel tank	23
Carrier plate	23
Evaporative Emission (EVAP) canister	20
Fuel filler neck nut	2.5
Fuel filler neck bolt	23
Fuel tank	23
Fuel tank leak detection control module, nut	1.6
Fuel pump control module to bracket nut	1.6
Heat shield for fuel tank	23
Locking flange cover to floor	1.5
Locking ring	120
Securing strap	23

## Locking Flange Cover Tightening Specification



Step	Component	Nm
1	Tighten bolts (➔) in a diagonal sequence	1.5



# Exhaust System, Emission Controls – 6.3L CEJA

## Fastener Tightening Specifications

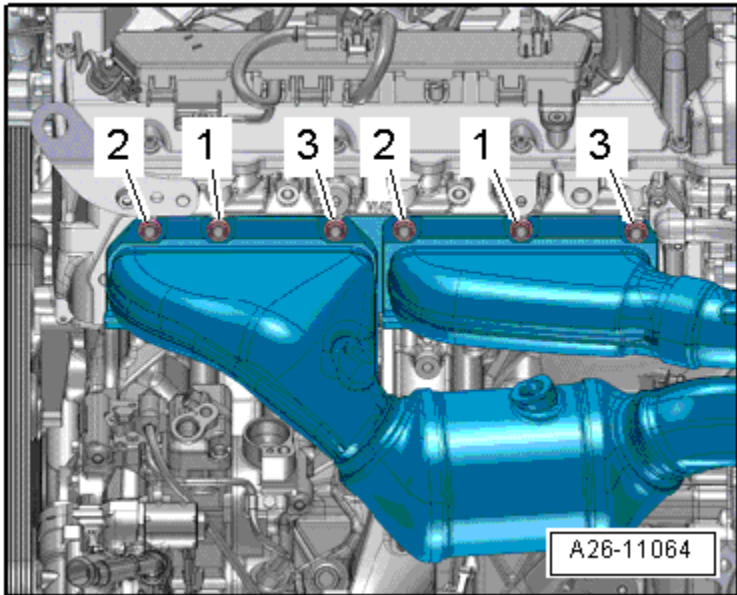
Component	Nm
Air filter bracket	9
Air filter housing bracket	9
Bonded rubber bushing nut	9
Front clamping sleeve nut	23
Front muffler nut <sup>1)</sup>	20
Heat shield	9
Rear clamping sleeve nut	23
Secondary Air Injection (AIR) pump motor bracket	20
Secondary Air Injection (AIR) system air filter housing	9
Secondary air pipe	8
Secondary air pipe <sup>3)</sup>	4 plus an additional 45° ( $\frac{1}{8}$ turn)
	8
Securing strip nut <sup>1) 2)</sup>	23
Suspended mount	23

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

<sup>2)</sup> Lubricate the thread with hot bolt paste. Refer to the Electronic Parts Catalog (ETKA).

<sup>3)</sup> For bolt tightening clarification, refer to ElsaWeb, *Secondary Air Injection System Overview*, items 1, 3, 5, 19, 21 and 23.

## Left Exhaust Manifold Tightening Specifications

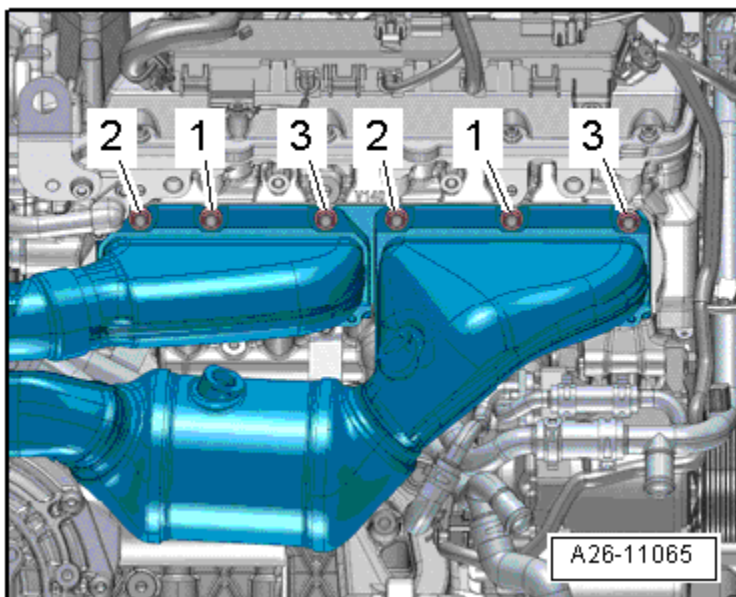


Step	Component	Nm
1	Tighten nuts 1 through 3 in sequence <sup>1) 2)</sup>	Hand-tighten
2	Tighten nuts 1 through 3 in sequence	15
3	Tighten nuts 1 through 3 in sequence	23

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

<sup>2)</sup> Lubricate the threads with hot bolt paste. For the correct hot bolt paste, refer to the Electronic Parts Catalog (ETKA).

## Right Exhaust Manifold Tightening Specifications



Step	Component	Nm
1	Tighten nuts 1 through 3 in sequence <sup>1) 2)</sup>	Hand-tighten
2	Tighten nuts 1 through 3 in sequence	15
3	Tighten nuts 1 through 3 in sequence	23

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

<sup>2)</sup> Lubricate the threads with hot bolt paste. For the correct hot bolt paste, refer to the Electronic Parts Catalog (ETKA).

Engine –  
6.3L CEJA

# Multiport Fuel Injection – 6.3L CEJA

## Technical Data

6.3L FSI engine	
Engine idle speed	Cannot be adjusted, it is regulated by idle stabilization.
Fuel pressure before high pressure pump	6.0 to 7.0 bar pressure
Fuel pressure after high pressure pump	15 to 135 bar pressure

## Fastener Tightening Specifications

Component	Nm
Air filter upper section	2.5
Air guide	1.5
Air guide pipe	2.5
Clamp nut	9
Connecting piece	40
Fuel pressure sensor	27
Fuel rail <sup>1)</sup>	30 plus an additional 90° (¼ turn)
High pressure pipe	27
High pressure pump	20
Housing	1.5
Intake manifold	9
Low fuel pressure sensor	15
Mass Air Flow (MAF)/Intake Air Temperature (IAT) sensor	1.5
Throttle valve control module <sup>1)</sup>	7
Union nut-to-high pressure pump <sup>2)</sup>	22
	27

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

<sup>2)</sup> For bolt tightening clarification, refer to ElsaWeb, *High Pressure Pump Overview*, items 1 and 3.

## Ignition System Tightening Specifications

Component	Nm
Camshaft Position (CMP) sensor	9
Electrical harness connector	5
Engine Speed (RPM) sensor <sup>1)</sup>	4 plus an additional 45° ( $\frac{1}{8}$ turn)
Knock Sensor (KS)	20

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

### Technical Data

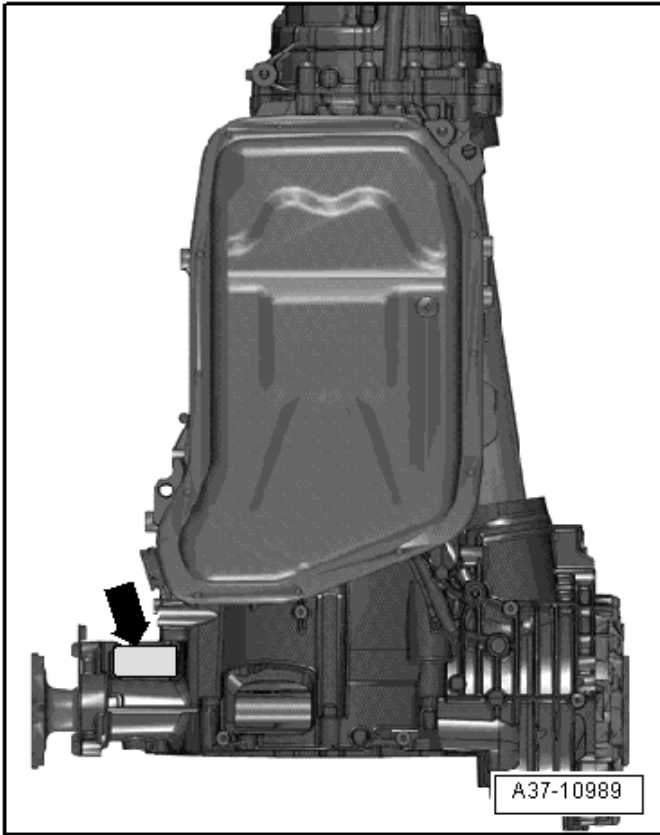
Test data		6.3L/4V engine
Engine idle speed		Cannot be adjusted, it is regulated by idle stabilization.
Ignition timing		Not adjustable; regulated by the Engine Control Module (ECM).
Ignition system		Single coil ignition system with 12 ignition coils (output stages integrated) that are connected directly to spark plugs via the ignition cables.
Spark plugs	Names	Refer to the Electronic Parts Catalog
	Tightening specifications	Maintenance Procedures Rep. Gr. 03
Ignition sequence		1-12-5-8-3-10-6-7-2-11-4-9

**Engine –  
6.3L CEJA**

# AUTOMATIC TRANSMISSION – 0BK

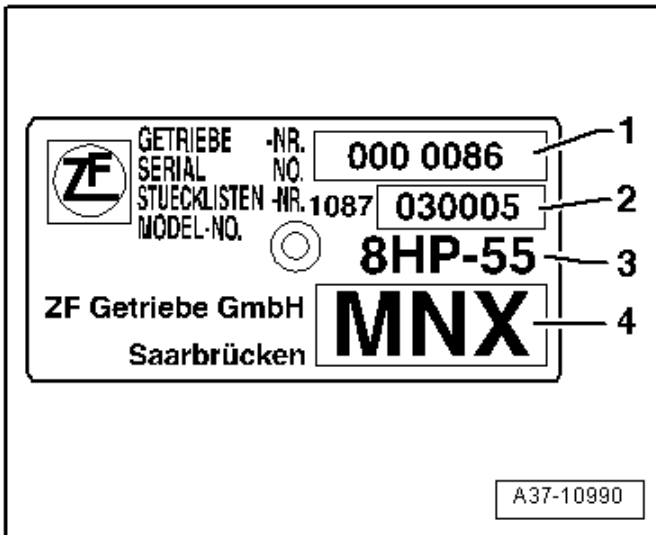
## *General, Technical Data*

### Transmission Identification



The transmission code letters are located on the type plate under the transmission. The (➡) indicates the location of the type plate.

## Transmission Type Plate



- 1 - Transmission serial number
- 2 - Parts list number
- 3 - Manufacturer transmission identification: 8HP-55
- 4 - Example of a transmission code: MNX

NOTE: The transmission code letters are also included on the vehicle data labels.

## Code Letters, Transmission Allocations, Ratios and Equipment

<b>Automatic transmission</b>		<b>0BK AWD</b>	
Transmission	Identification codes	MEE	NDE
Torque converter	Identification codes	N140	N140
Allocation	Type	Audi A8 from MY 2010	Audi A8 from MY 2010
	Engine	4.0L TFSI - 309 kW	4.0L TFSI - 309 kW
Primary drive		32:33 = 0.970	32:33 = 0.970
Gear wheel (front axle)		31:29 = 1.069	31:29 = 1.069
Front axle bevel gear		34:11 = 3.091	34:11 = 3.091
Complete front axle ratio = primary drive x drive wheel x bevel gear		3.204	3.203
Rear axle bevel gear		43:13 = 3.308	43:13 = 3.308
Complete rear axle ratio = rear axle bevel gear x primary drive		3.207	3.207
Oil system, front final drive/transfer case		Shared	Separated
Start/Stop System		Yes	No

<b>Automatic transmission</b>		<b>0BK AWD</b>	
Transmission	Identification codes	MXS	MXT
Torque converter	Identification codes	T139	Y137
Allocation	Type	Audi A8 from MY 2010	Audi A8 from MY 2010
	Engine	6.3L FSI - 368 kW	3.0L FSI - 273 kW
Primary drive		27:29 = 0.931	32:33 = 0.970
Gear wheel (front axle)		31:29 = 1.069	31:29 = 1.069
Front axle bevel gear		34:11 = 3.091	34:11 = 3.091
Complete front axle ratio = primary drive x drive wheel x bevel gear		3.076	3.203
Rear axle bevel gear		43:13 = 3.308	43:13 = 3.308
Complete rear axle ratio = rear axle bevel gear x primary drive		3.080	3.207
Oil system, front final drive/transfer case		Shared	Separated
Start/Stop System		No	No



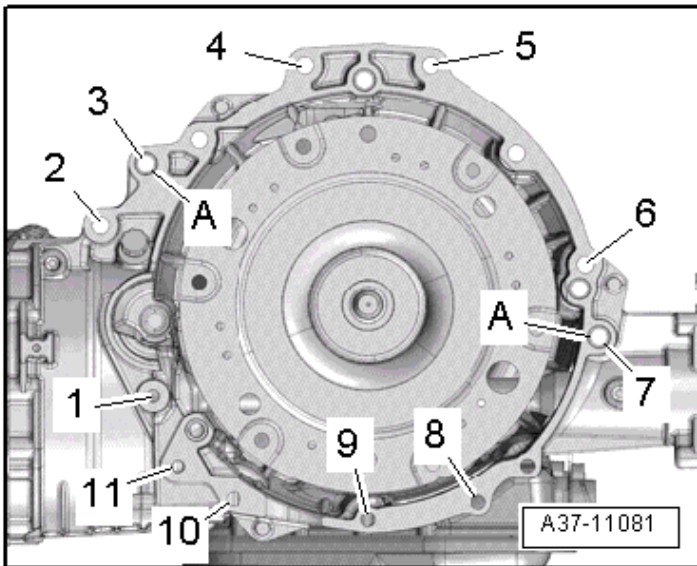
<b>Automatic transmission</b>		<b>0BK AWD</b>	
Transmission	Identification codes	NCK	NPQ
Torque converter	Identification codes	T138	P140
Allocation	Type	Audi A8 from MY 2010	Audi A8 from MY 2010
	Engine	6.3L FSI - 368 kW	3.0L TDI - 176kW
Primary drive		27:29 = 0.931	27:34 = 0.794
Gear wheel (front axle)		31:29 = 1.069	31:29 = 1.069
Front axle bevel gear		34:11 = 3.091	34:11 = 3.091
Complete front axle ratio = primary drive x drive wheel x bevel gear		3.076	2.624
Rear axle bevel gear		43:13 = 3.308	43:13 = 3.308
Complete rear axle ratio = rear axle bevel gear x primary drive		3.080	2.627
Oil system, front final drive/transfer case		Shared	Separated
Start/Stop System		Yes	Yes

<b>Automatic transmission</b>		<b>0BK AWD</b>	
Transmission	Identification codes	MEF	
Torque converter	Identification codes	N140	
Allocation	Type	Audi A8 from MY 2010	
	Engine	4.0L TFSI - 382 kW	
Primary drive		32:33 = 0.970	
Gear wheel (front axle)		31:29 = 1.069	
Front axle bevel gear		34:11 = 3.091	
Complete front axle ratio = primary drive x drive wheel x bevel gear		3.204	
Rear axle bevel gear		43:13 = 3.308	
Complete rear axle ratio = rear axle bevel gear x primary drive		3.207	
Oil system, front final drive/transfer case		Shared	
Start/Stop System		Yes	

**Automatic Trans. –  
0BK**

## Controls, Housing – 0BK

### Securing Transmission to 3.0L TDI Engine

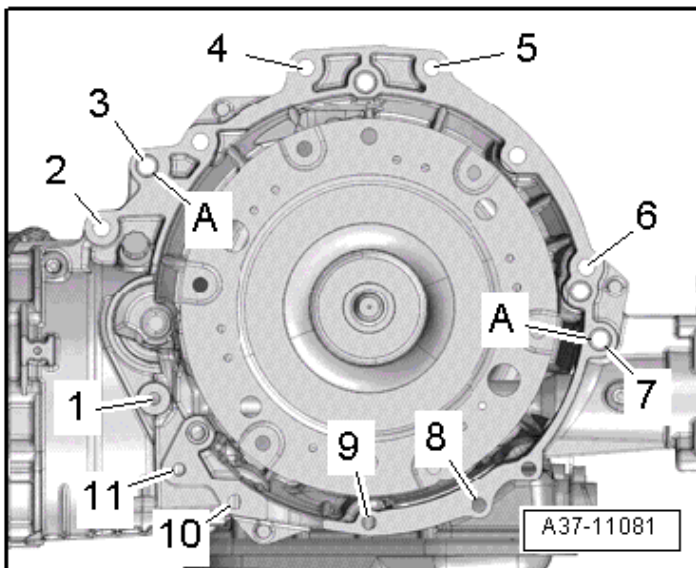


Item	Fastener	Nm
1	M10 x 50 <sup>1)</sup>	65
2 to 6	M12 x 100 <sup>2)</sup>	30 plus an additional 90° (¼ turn)
7	M12 x 125	30 plus an additional 90° (¼ turn)
8, 11	M10 x 60 <sup>2)</sup>	15 plus an additional 90° (¼ turn)
9	M10 x 75 <sup>2)</sup>	15 plus an additional 90° (¼ turn)
10	M10 x 95 <sup>2)</sup>	15 plus an additional 90° (¼ turn)
A	Alignment sleeves for centering	

<sup>1)</sup> Attaches the starter to the transmission. Bolt strength rating 10.9. There is no limit to the number of times the steel bolt can be used again.

<sup>2)</sup> Aluminum bolts can only be used twice. Mark the bolts by making two notches (X) with a chisel after they have been used the first time. To prevent damaging the bolts when marking them, do not clamp them in a vise. Insert the bolts in a ½" drive 14 mm socket clamped into a vise. Do not use bolts that have been marked with an X.

## Securing Transmission to 3.0L TFSI Engine

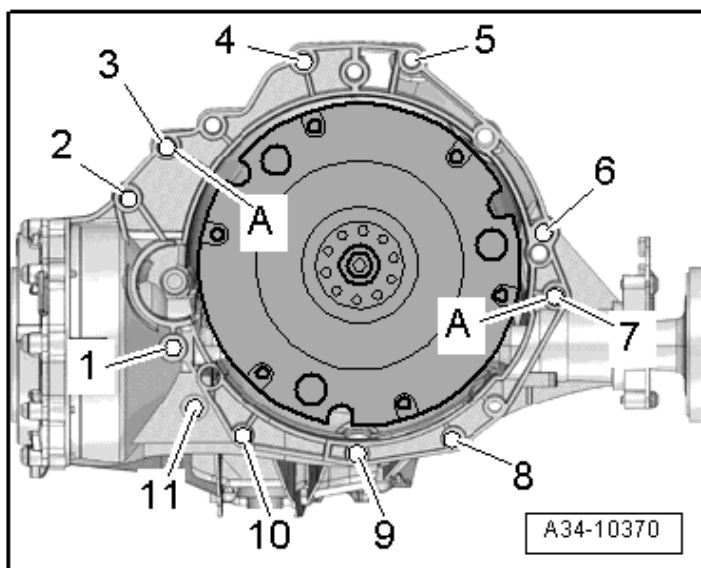


Item	Fastener	Nm
1	M10 x 50 <sup>1)</sup>	65
2 to 6	M12 x 100 <sup>2)</sup>	30 plus an additional 90° (¼ turn)
7	M12 x 125 <sup>1)</sup>	30 plus an additional 90° (¼ turn)
8, 11	M10 x 60 <sup>2)</sup>	15 plus an additional 90° (¼ turn)
9	M10 x 75 <sup>2)</sup>	15 plus an additional 90° (¼ turn)
10	M10 x 95 <sup>2)</sup>	15 plus an additional 90° (¼ turn)
A	Alignment sleeves for centering	

<sup>1)</sup> Bolt strength rating 10.9. There is no limit to the number of times steel bolts may be used.

<sup>2)</sup> Aluminum bolts can only be used twice. Mark the bolts by making two notches (X) with a chisel after they have been used the first time. To prevent damaging the bolts when marking them, do not clamp them in a vise. Insert the bolts in a ½" drive 14 mm socket clamped into a vise. Do not use bolts that have been marked with an X.

## Securing Transmission to 4.0L Engine



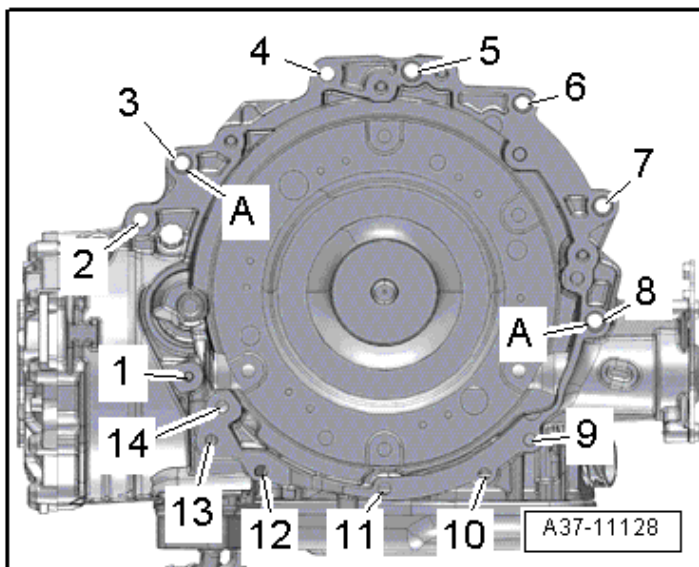
Item	Fastener	Nm
1	M10 x 50 <sup>1)</sup>	65
2 to 6	M12 x 100 <sup>2)</sup>	30 plus an additional 90° (¼ turn)
7	M12 x 175 <sup>3)</sup>	30 plus an additional 90° (¼ turn)
8, 11	M10 x 60 <sup>2)</sup>	15 plus an additional 90° (¼ turn)
9	M10 x 75 <sup>2)</sup>	15 plus an additional 90° (¼ turn)
10	M10 x 95 <sup>2)</sup>	15 plus an additional 90° (¼ turn)
A	Alignment sleeves for centering	

<sup>1)</sup> Bolt strength rating 10.9. There is no limit to the number of times steel bolts may be used.

<sup>2)</sup> Aluminum bolts can only be used twice. Mark the bolts by making two notches (X) with a chisel after they have been used the first time. To prevent damaging the bolts when marking them, do not clamp them in a vise. Insert the bolts in a ½" drive 14 mm socket clamped into a vise. Do not use bolts that have been marked with an X.

<sup>3)</sup> Also attaches the power steering pump. Replace the bolt each time it is removed.

## Securing Transmission to 6.3L Engine



Item	Fastener	Nm
1	M10 x 50 <sup>1)</sup>	65
2, 8	M12 x 100 <sup>2)</sup>	30 plus an additional 90° (¼ turn)
3, 4, 5, 6, 7, 14	M12 x 75 <sup>2)</sup>	30 plus an additional 90° (¼ turn)
9, 12, 13	M10 x 75 <sup>2)</sup>	15 plus an additional 90° (¼ turn)
10	M10 x 40 <sup>2)</sup>	15 plus an additional 90° (¼ turn)
11	M10 x 60 <sup>2)</sup>	15 plus an additional 90° (¼ turn)
A	Alignment sleeves for centering	

<sup>1)</sup> Bolt strength rating 10.9. There is no limit to the number of times steel bolts may be used.

<sup>2)</sup> Aluminum bolts can only be used twice. Mark the bolts by making two notches (X) with a chisel after they have been used the first time. To prevent damaging the bolts when marking them, do not clamp them in a vise. Insert the bolts in a ½" drive 14 mm socket clamped into a vise. Do not use bolts that have been marked with an X.

Automatic Trans. –  
0BK

## Fastener Tightening Specifications

Component	Fastener size	Nm
Automatic Transmission Fluid (ATF) cooler	-	8
Automatic Transmission Fluid (ATF) drain plug <sup>2)</sup>		12
Automatic Transmission Fluid (ATF) pipes <sup>3)</sup>	-	8
	-	20
ATF pipes <sup>4)</sup>		8
Bolts and nuts	M6	9
	M7	15
	M8	20
	M10	40
	M12	65
Brace for left transmission mount	-	20
Brace for right transmission mount	-	20
Emergency release lever, nut	-	2.5
Drain plug for the transmission fluid inside the transfer case	-	12
Drain plug for the hole for checking and filling	-	30
Drain plug for the hole for checking and filling for the transmission fluid inside the front final drive	-	10
Drain plug for the hole for checking and filling, for the transmission fluid inside the transfer case <sup>2)</sup>	-	27
Front emergency release cable	-	9
Heat shield	-	10
Left transmission support <sup>1)</sup>	-	20
	-	40
Left transmission mount	-	20
Lower stop for the rear transmission mount <sup>2)</sup>	-	20 plus an additional 90° (¼ turn)
Oil drain plug for the ATF in the transmission	-	12
Oil drain plug for the ATF in the transmission for the transmission fluid inside the transfer case <sup>2)</sup>	-	12
Rear transmission support		
- Nut	-	20
- Bolt	-	40
Right transmission mount	-	20
Right transmission support	-	20

Component	Fastener size	Nm
Selector lever handle lower section	-	7
Selector mechanism function unit	-	8
Selector Lever Release Button -E681- and Selector Lever Transmission Range Position Display Unit -Y26-	-	0.25
Transmission support <sup>5)</sup>		
- Bolt	-	40
- Nut	-	20
Tunnel crossmember	M10 x 55 8.8	40
	M10 x 40 10.9	70
Tunnel crossmember nut	-	20

<sup>1)</sup> For bolt tightening clarification, refer to ElsaWeb, *Tunnel Crossmember, Transmission Mount and Transmission Supports Overview*, items 20 and 28.

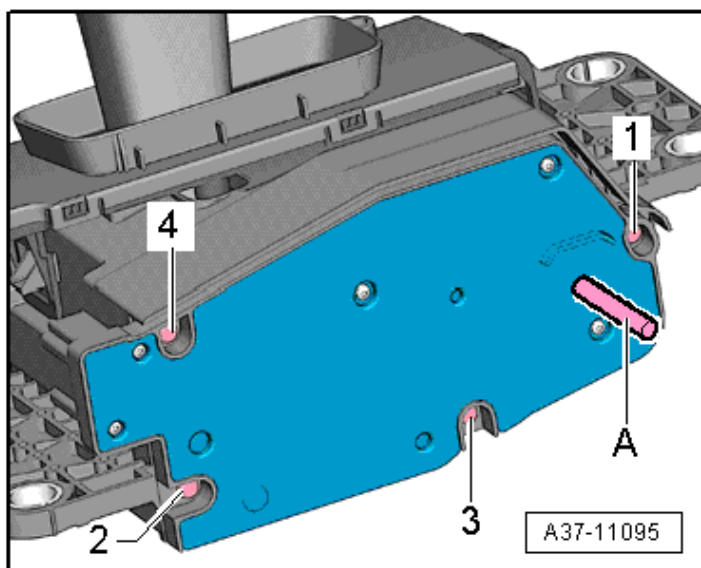
<sup>2)</sup> Replace fastener(s).

<sup>3)</sup> For bolt tightening clarification, refer to ElsaWeb, *ATF Cooler and ATF Pipes Overview*, items 7 and 8.

<sup>4)</sup> For bolt tightening clarification, refer to ElsaWeb, *ATF Cooler and ATF Pipes Overview*, item 11.

<sup>5)</sup> For bolt tightening clarification, refer to 3.0L TFSI and 3.0L TDI ElsaWeb, *Tunnel Crossmember, Transmission Mount and Transmission Supports Overview*, items 5, 6, 7 and 8.

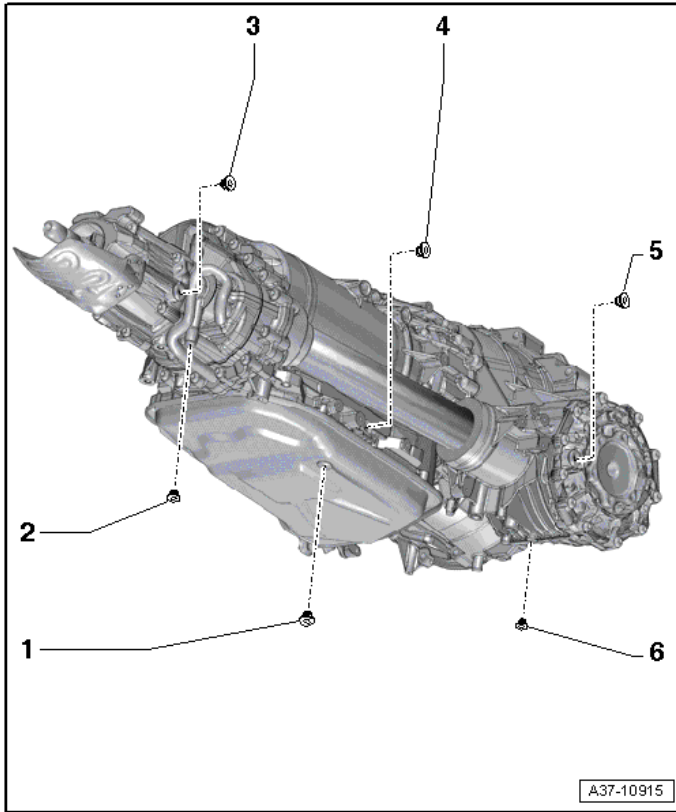
## Selector Lever Sensor System Control Module Tightening Specifications



Step	Bolts	Nm
1	Tighten bolts 1 to 4 in sequence	1.1



## Drain and Fill Plugs Tightening Specifications



Item	Fastener	Nm
1	Automatic Transmission Fluid (ATF) drain plug <sup>1)</sup>	12
2	Transmission fluid oil drain plug (inside the transfer case) <sup>1)</sup>	12
3	Transmission fluid drain plug (inside the transfer case) <sup>1)</sup>	27
4	Automatic Transmission Fluid (ATF) check and fill hole drain plug <sup>1)</sup>	30
5	Transmission fluid drain plug (inside the front final drive)	27
6	Transmission fluid oil drain plug (inside the front final drive)	10

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

Automatic Trans. –  
0BK

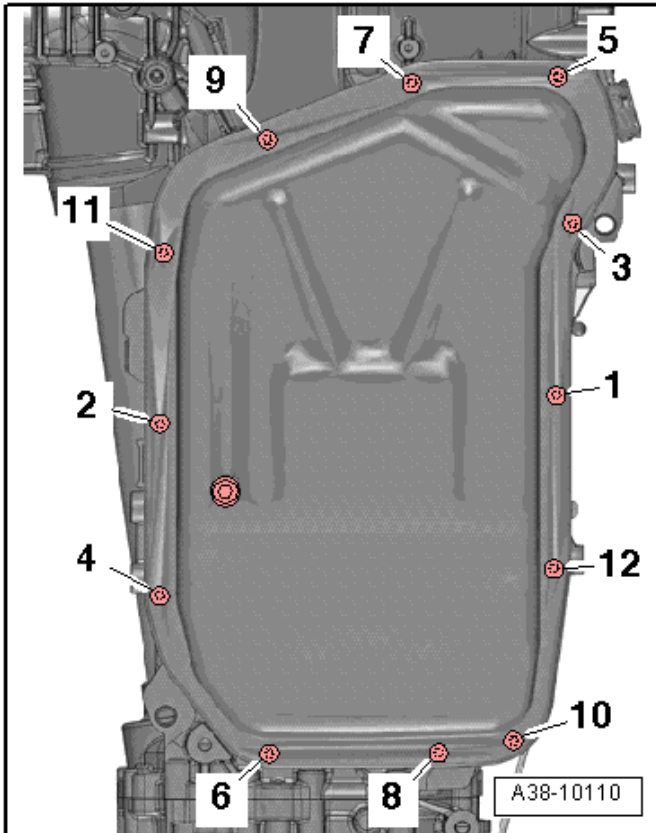
# Gears, Hydraulic Controls – 0BK

## Fastener Tightening Specification

Component	Nm
Connector housing	5.5
Mechatronic <sup>1)</sup>	10
Oil drain plug	12

<sup>1)</sup> For bolt tightening clarification, refer to ElsaWeb, ATF Pan, ATF Screen, Mechatronic and Hydraulic Pulse Memory with Accumulator Solenoid -N485-Overview, items 5 and 13.

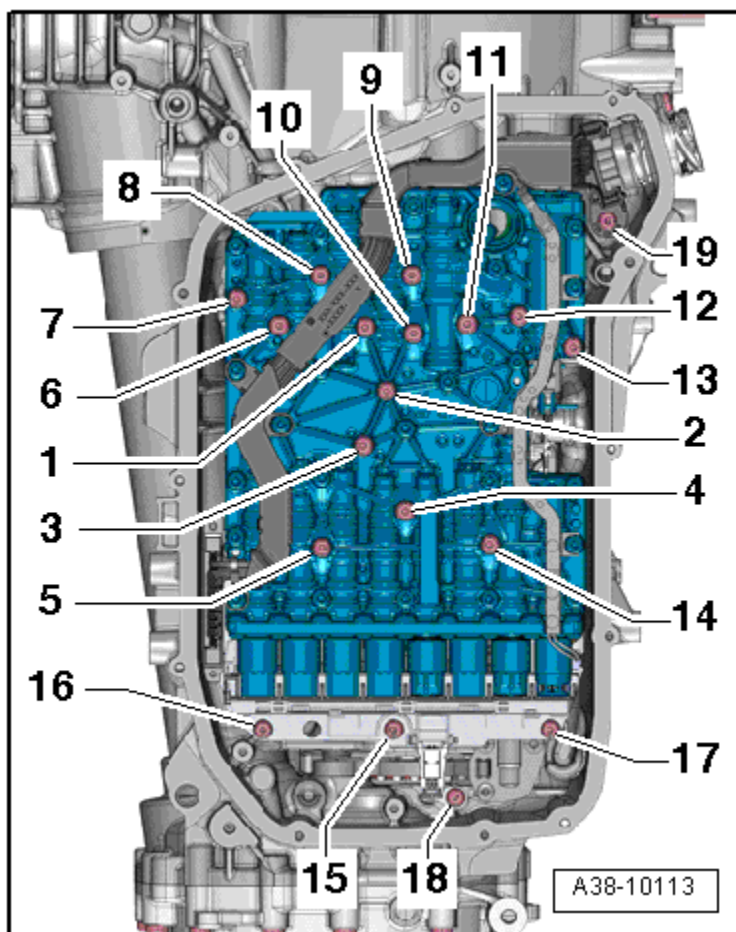
## Oil Pan Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 12 in sequence <sup>1)</sup>	Hand-tighten
2	Tighten bolts 1 through 12 in sequence	4
3	Tighten bolts 1 through 12 in sequence	an additional 45° (1/8 turn)

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

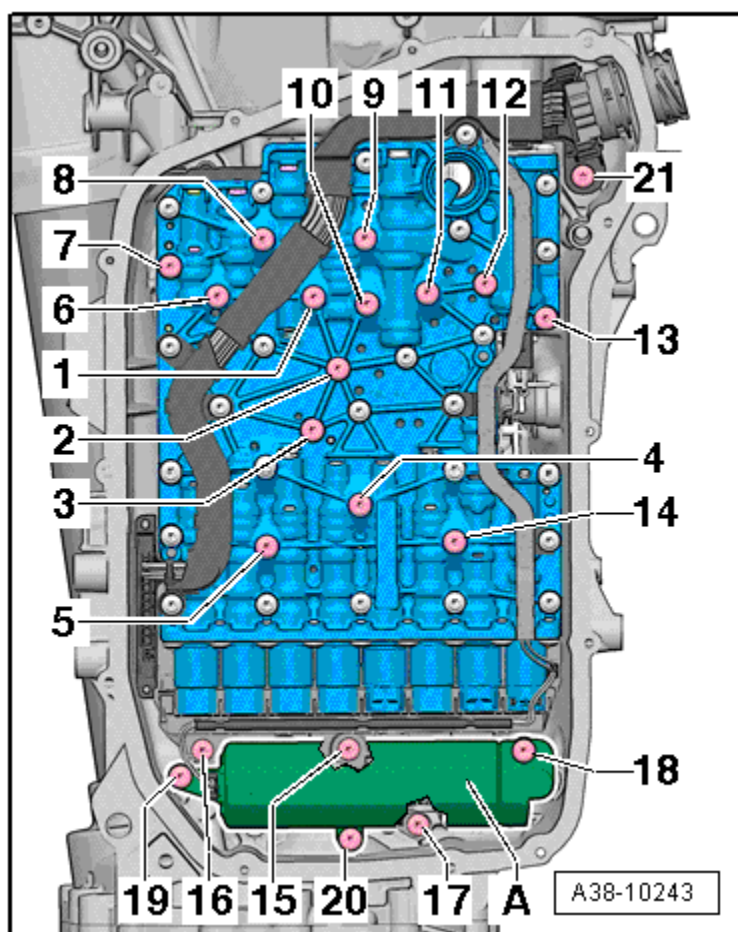
## Mechatronic Tightening Specification without Hydraulic Pulse Memory



Component	Nm
Tighten bolts 1 through 19 in sequence	10

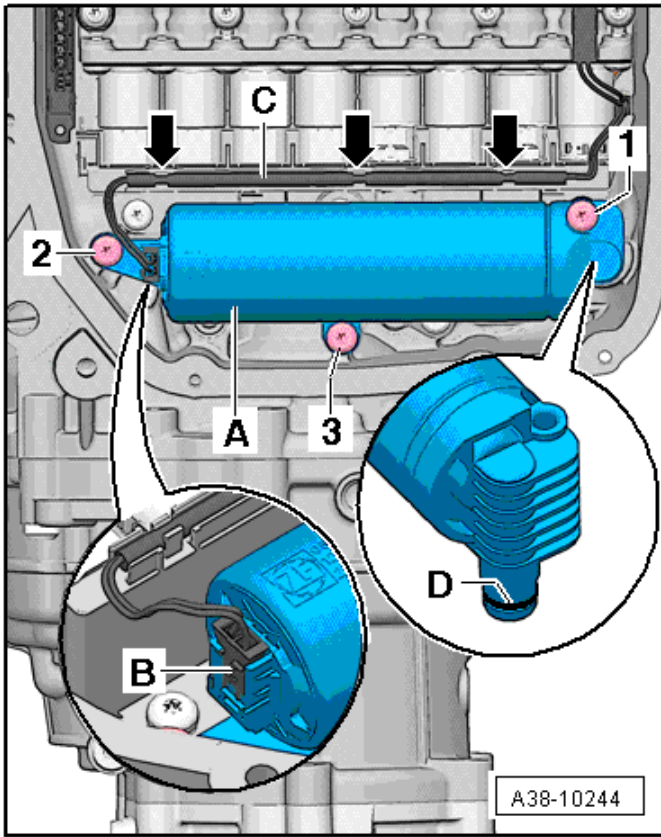
Automatic Trans. –  
0BK

## Mechatronic Tightening Specifications with Hydraulic Pulse Memory



Component	Nm
Tighten bolts 1 through 17 in sequence	10
Tighten bolts 18 through 21 in sequence	10

# Hydraulic Pulse Memory Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 to 3 in sequence	10

Automatic Trans. –  
0BK

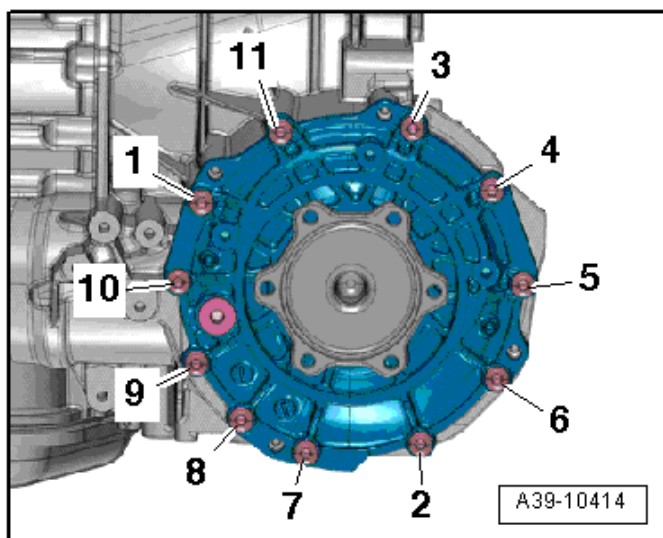
## Rear Final Drive, Differential – 0BK

### Fastener Tightening Specifications

Component	Nm
Automatic Transmission Fluid (ATF) drain plug (in the transmission)	30
Automatic Transmission Fluid (ATF) oil drain plug (in the transmission)	12
Gear carrier <sup>1)</sup>	9 plus an additional 60° (1/6 turn)
Transmission fluid drain plug (inside the front final drive)	27
Transmission fluid drain plug (inside the transfer case)	27
Transmission fluid oil drain plug (inside the front final drive)	10
Transmission fluid oil drain plug (inside the transfer case)	12

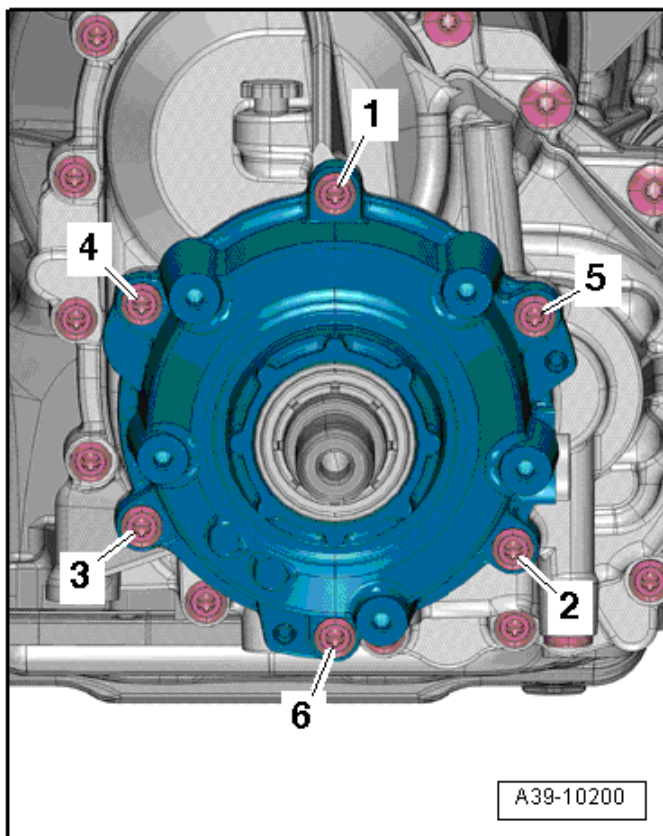
<sup>1)</sup> Replace fastener(s).

### Front Final Drive Cover Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 and 6	3
2	Tighten bolts 1 through 11 in sequence	27

## Center Differential Housing Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 and 6 <sup>1)</sup>	3
2	Tighten bolts 1 through 6 in sequence <sup>1)</sup>	10
3	Tighten bolts 1 through 6 in sequence	an additional 90° (¼ turn)

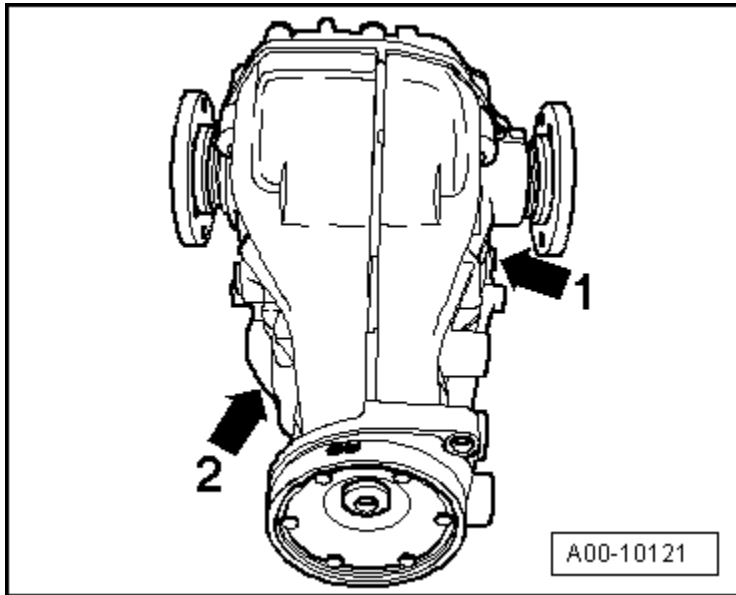
<sup>1)</sup> Replace fastener(s).

Automatic Trans. –  
0BK

# REAR FINAL DRIVE – 0BC, 0BD, 0BE, 0BF

## *General, Technical Data – 0BC*

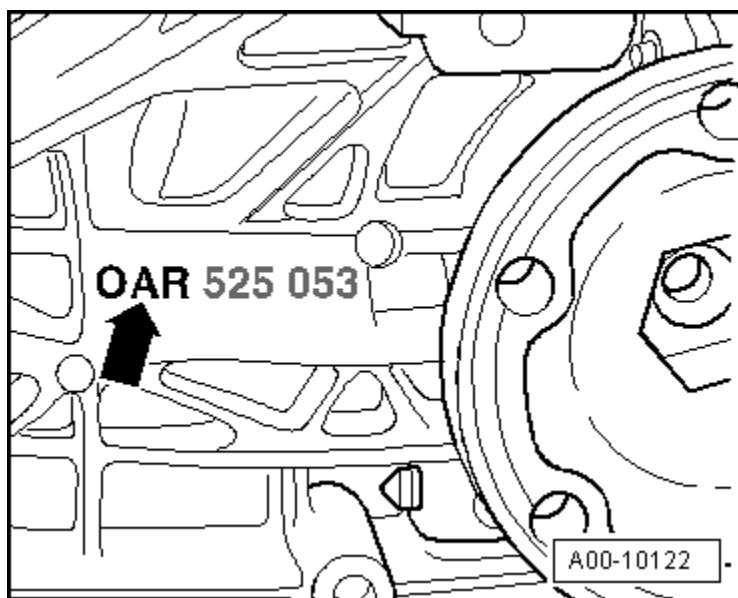
### Rear Final Drive Identification



0BC final drive and 0AR (1➡). Code and build date (2➡).



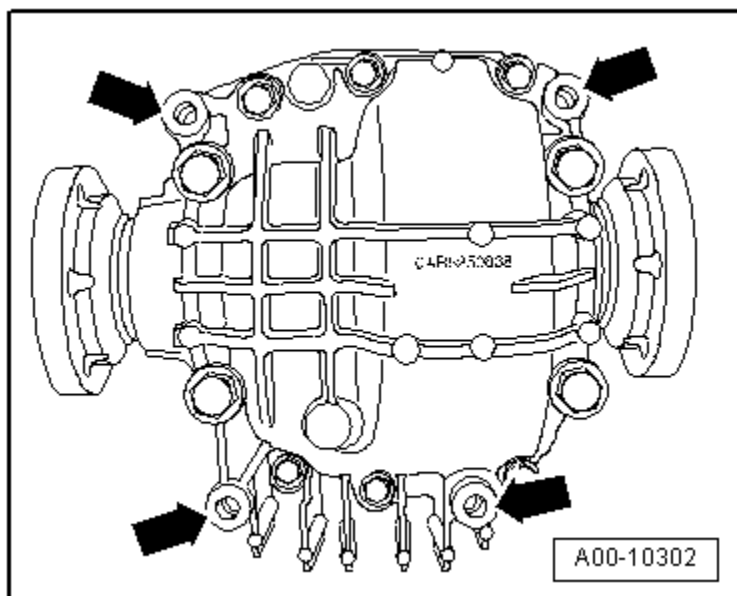
## Final Drive Identification



Final Drive OBC (➡) and OAR

Note: OAR is always on the rear final drive housing.  
The changes to the housing are what differentiate  
the OBC final drive from the OAR final drive.

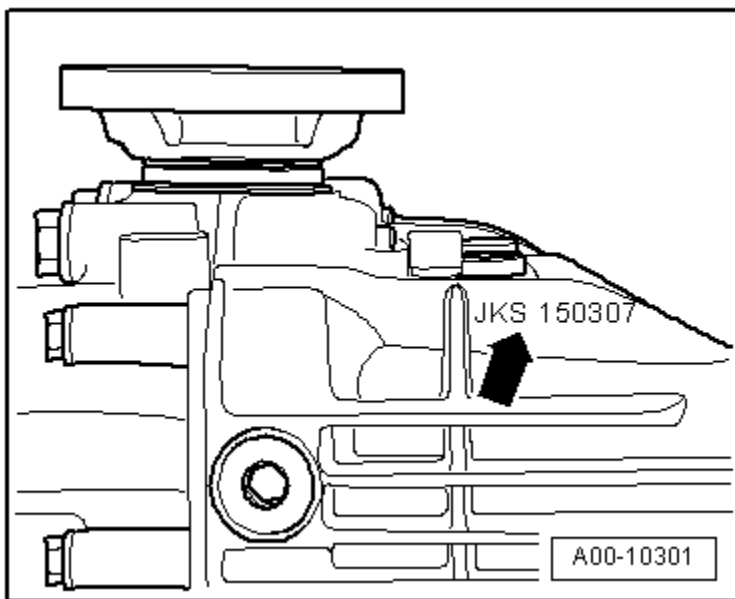
## Final Drive Identification (cont'd)



The locations of the threaded holes (➡) for attaching the cross member to the rear final drive are also different.

The OBC final drive has 4 threaded holes (➡) in its housing, used for attaching the cross member. In addition to this, there is an additional threaded hole under the flange/driveshaft used for attaching the final drive to the subframe.

## Rear Final Drive Code and Date of Manufacture

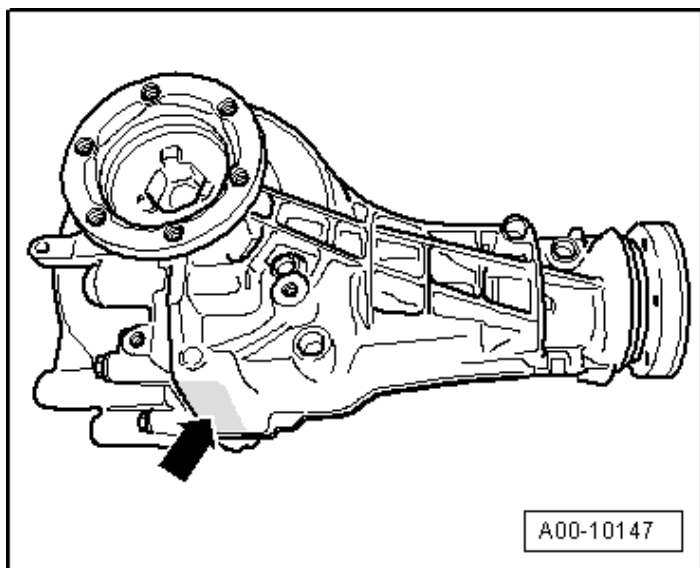


<b>Example:</b>	<b>JKS</b>	<b>15</b>	<b>03</b>	<b>07</b>
	Code letters	Day	Month	Year of manufacture 2007

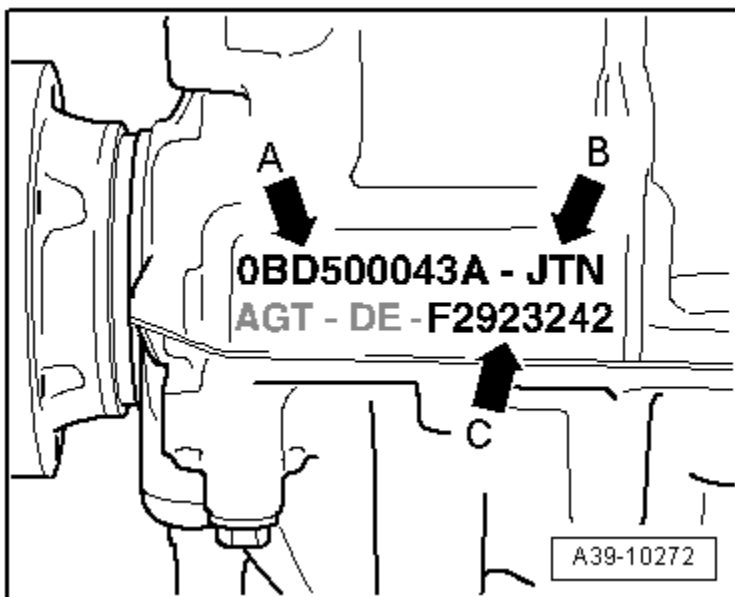
When installing a new rear final drive unit, the final drive code, the PR number and the vehicle engine code must be verified in the Parts Catalog. This is the only to assure the correct allocation.

## **General, Technical Data – 0BD**

### **Rear Final Drive Identification**



Final drive OBD, code letters and manufacture date (➡).



A ➔ front final drive OBD with replacement part number (example: 0BD 500 043A)

B ➔ code letters JTN

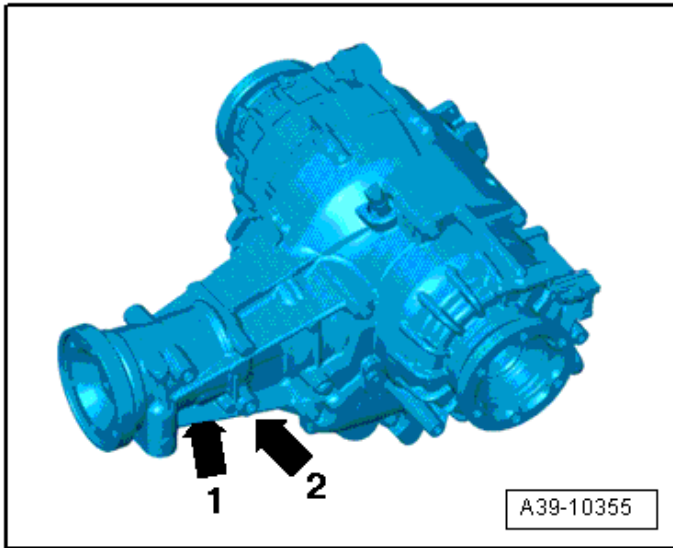
C ➔ Rear final drive manufacture date

### Example

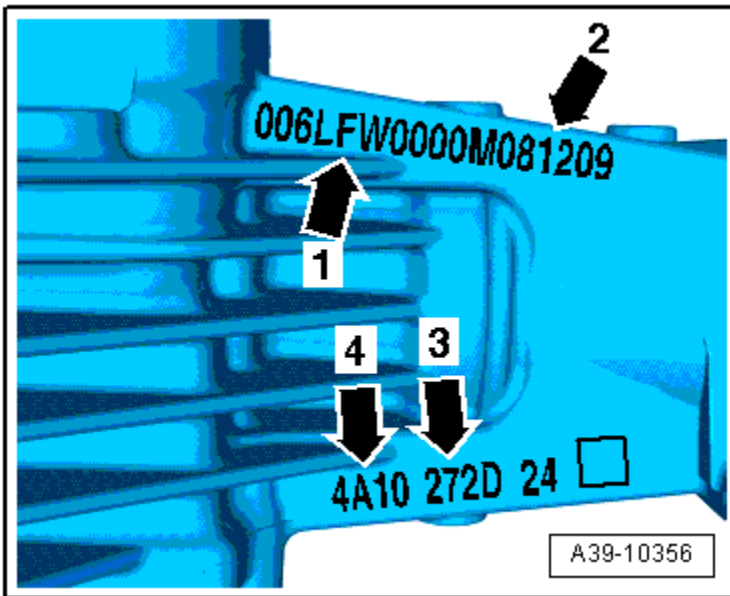
F	292	3242
Production year 2006 F = 2006, G = 2007, H = 2008, etc.	Production date 292 <sup>nd</sup> calendar day (always given in three-digit format)	Day of manufacture serial number

## **General, Technical Data – 0BE, 0BF**

### **Rear Final Drive Identification**



Clutch class -arrow 1-. Engine code and build date-arrow 2-. The way to recognize the rear final drive “0BF and 0BE” is the hydraulic control unit with the side chambers.



- 1 ➔ Code LFW
- 2 ➔ Rear final drive build dates
- 3 ➔ Classification (classification of the clutch wear values) for the right clutch. Example: -272D-
- 4 ➔ Classification (classification of the clutch wear values) for the left clutch. Example: -4A10-

### Example

<b>08</b>	<b>12</b>	<b>09</b>
Production year 2008	Month	Day

### Rear Final Drive Transmission Allocations, Ratios, Capacities

Rear Final Drive		0BC		
		KCC	NPR	PFR
Code letters				
Ratio	Final drive $Z_2:Z_1$	43:13 = 3.308	43:13 = 3.308	43:13 = 3.308
Driveshaft flange diameter		75.5 mm	75.5 mm	75.5 mm
Gear oil capacity		See the Fluid Capacity Tables; Rep. Gr.03;		

**Rear Final Drive –  
0BC, 0BD, 0BE, 0BF**

## Rear Final Drive Transmission Allocations, Ratios, Capacities (cont'd)

Rear Final Drive		0BF	
Code letters		MKV	
Ratio	Final drive $Z_2:Z_1$	43 : 13 = 3.308	
Driveshaft flange diameter		75.5 mm	
Gear oil - capacity • For rear final drive (differential and pinion) • No replacement interval		See the Fluid Capacity Tables; Rep. Gr.03;	
Gear oil specification		Refer to the Parts Catalog.	
ATF capacity • For the hydraulic control unit and chambers • No replacement interval			
ATF specification		Refer to the Parts Catalog.	

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

- Date of manufacture
- Gear oil specification
- Engine, manual transmission and automatic transmission allocation using code letters and PR numbers.

## Fastener Tightening Specifications

Component	-Fastener Size	Nm
Driveshaft heat shield	-	24
Intermediate bearing bracket	-	20
Lock plate to driveshaft <sup>1)</sup>	-	30 plus an additional 90° (¼ turn)
Final Drive 0BC, 0BD		
Balance weight to rear final drive bolt <sup>3)</sup>	-	22
Balance weight to rear final drive bolt <sup>4)</sup>	-	55
Crossmember to rear final drive bolt	-	55
Heat shield to crossmember bolt	-	20
Subframe <sup>2)</sup>		
- Bolt	-	55
- Bolt	-	95
Gear Oil Drain and Inspection Plugs 0BE, 0BF		
Drain plug for gear oil <sup>1)</sup>	-	15
Inspection plug for gear oil <sup>1)</sup>	-	15
Final Drive 0BE, 0BF		



Component	-Fastener Size	Nm
All Wheel Drive Clutch Valve 2 -N446- to hydraulic control unit housing bolt	-	2.5
All Wheel Drive Pump -V415- to hydraulic control unit housing bolt	-	5
ATF check plug <sup>1)</sup>	-	15
ATF drain plug <sup>1)</sup>	-	15
Bracket for wiring harness to rear final drive bolt	-	9
Gear oil drain plug <sup>1)</sup>		15
Gear oil inspection plug <sup>1)</sup>		15
Gear oil checking plug 0BC		30
Gear oil checking plug 0BD		45
Hydraulic control unit <sup>6)</sup>		
- Bolt <sup>5)</sup>	M8 x 50	20
- Bolt	M8 x 30	see tightening sequence → Hydraulic Control Module, 0BE, 0BF
Left line to Hydraulic Control Unit Housing nut		30
Oil Pressure/Temperature Sensor		10
Right Flange Shaft to Final Drive bolt <sup>1)</sup>		50 + 90°
Right line to Hydraulic Control Unit Housing nut		30
Shuttle valve		8
Gear Oil Drain and Inspection Plugs, 0BE, 0BF		
ATF drain plug <sup>1)</sup>		15
ATF inspection plug <sup>1)</sup>		15

<sup>1)</sup> Replace

<sup>2)</sup> For bolt tightening clarification, refer to ElsaWeb, *Final Drive 0BC, 0BD Overview* items 2 and 3

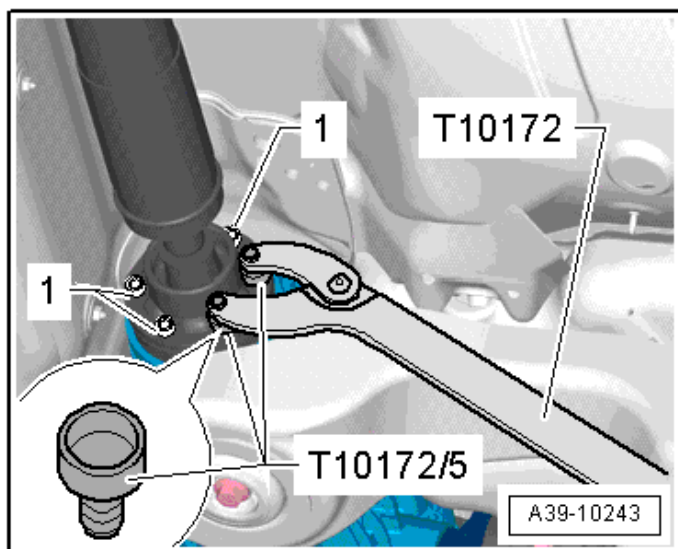
<sup>3)</sup> For bolt tightening clarification, refer to ElsaWeb, *Final Drive 0BC, 0BD Overview* item 1

<sup>4)</sup> For bolt tightening clarification, refer to ElsaWeb, *Final Drive 0BC, 0BD Overview* item 9

<sup>5)</sup> Coat the thread with Sealing Compound -D 176 501 A1-

<sup>6)</sup> For bolt tightening clarification, refer to ElsaWeb, *Final Drive 0BE, 0BF Overview* items 7, 8 and 9

## Driveshaft to Rear Final Drive Tightening Specification



Always replace the driveshaft bolts 1.

Step	Bolts	Tightening Specification/Additional Turn
1	1	Next to the color dot 30 Nm <sup>1)</sup>
2	1	30 Nm
3	1	Plus an additional 90° (¼ turn)

<sup>1)</sup> By doing this, the CV joint is pushed slightly to the opposite side and imbalance is avoided.

# SUSPENSION, WHEELS, STEERING

## General, Technical Data

### Chassis

Front axle	Five-link front axle, transverse stabilizer, air spring damper with variable levels and damping characteristics, guide links with hydraulic damping mounts
Rear axle	Track-controlled axle, upper and lower transverse link, transverse stabilizer, independent suspension, air spring damper with variable levels and damping characteristics

FWD/AWD		Standard suspension (1BK) <sup>1)</sup>	Sport suspension (2MA/2MB) <sup>2)</sup>	Heavy duty suspension (1BY) <sup>3)</sup>
Wheelbase	mm	2992	2994	2991
Front track	mm	1644	1632	1643
Rear track	mm	1635	1623	1634
Maximum steering angle at inner wheel	Degree	39.8	39.8	39.8

<sup>1)</sup> Suspension in the "Comfort" level.

<sup>2)</sup> Suspension in the "Sport" level.

<sup>3)</sup> Suspension in the "heavy duty suspension" level.

NOTE: The specified values apply to all engine versions.  
Tracks change with use of wheels with different offset.

### Steering

Steering gear	Maintenance-free rack and pinion steering with speed-dependent servo assist
Turning diameter	Approximately 12.30 meters

# Front Suspension

## Fastener Tightening Specifications

Component	Fastener size	Nm
Adapter-to-subframe bolt	-	20
Air spring shock absorber-to-shock absorber fork bolt <sup>1)</sup>	-	40 plus an additional 180° (½ turn)
Air spring shock absorber-to-suspension strut dome nut <sup>1) 5)</sup>	-	30
Ball joint-to-track control arm nut <sup>1)</sup>	-	120
Ball joint-to-wheel bearing housing bolt <sup>1)</sup>	-	40
Air line connecting piece with the residual pressure retaining valve	-	3
Constant Velocity (CV) joint boot clamp	-	20
Control arm-to-wheel bearing housing nut <sup>1)</sup>	-	120
Coupling rod-to-shock absorber fork bolt <sup>1) 3)</sup>	-	40 plus an additional 90° (¼ turn)
Coupling rod-to-stabilizer bar bolt <sup>1) 3)</sup>	-	40 plus an additional 90° (¼ turn)
Drive axle-to-transmission bolt <sup>1)</sup>	M10	70
	M12	90 plus an additional 90° (¼ turn)
Drive axle-to-wheel hub bolt <sup>1)</sup>	-	200 plus an additional 180° (½ turn)
Guide link-to-subframe nut <sup>1) 3)</sup>	-	70 plus an additional 180° (½ turn)

Component	Fastener size	Nm
Guide link-to-wheel bearing housing nut <sup>1)</sup>	-	120
Heat shield-to-subframe bolt	-	9
Level control system sensor bolt	-	9
Outer Constant Velocity (CV) joint	-	200 plus an additional 180° (½ turn)
Power steering hose-to-subframe bolt	-	9
Protection bracket-to-subframe bolt	-	23
Shock absorber fork-to-track control arm nut <sup>1)3)</sup>	-	90 plus an additional 90° (¼ turn)
Stabilizer bar-to-subframe nut <sup>1)4)</sup>	-	35
Subframe crossbrace-to-subframe bolt <sup>1)</sup>	-	90 plus an additional 180° (½ turn)
Subframe-to-body bolt <sup>1)2)</sup>	-	115 plus an additional 90° (¼ turn)
Tie rod end-to-wheel bearing housing nut <sup>1)</sup>	-	130
Tower brace mounting bolt <sup>6)</sup>	-	10
	-	25
	-	50
Track control arm-to-subframe nut <sup>1)3)</sup>	-	70 plus an additional 180° (½ turn)
Upper control arm-to-suspension strut dome bolt <sup>1)3)</sup>	-	50 plus an additional 90° (¼ turn)
Upper control arm-to-wheel bearing housing nut <sup>1)</sup>	-	40
Wheel bearing-to-wheel bearing housing bolt <sup>1)</sup>	-	80 plus an additional 90° (¼ turn)

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

<sup>2)</sup> Remove and tighten diagonally and in steps.

<sup>3)</sup> For bolt tightening clarification, refer to ElsaWeb, *Wheel Bearing, Raising to Control Position to Tighten Bolts*.

<sup>4)</sup> Remove and install the nuts alternating from side to side.

<sup>5)</sup> Tighten in the curb weight position.

<sup>6)</sup> For bolt tightening clarification, refer to ElsaWeb, *Air Spring Damper, Shock Absorber Fork, Upper Control Arm and Tower Brace Overview*, items 3, 4 and 6.

# Rear Suspension

## Fastener Tightening Specifications

Component	Fastener size	Nm
Air spring damper boot clamp	-	8
Air spring damper-to-body nut <sup>1) 4)</sup>	-	30
Air spring shock absorber-to-wheel bearing housing bolt <sup>1)</sup>	-	100 plus an additional 180° (½ turn)
Brace-to-subframe bolt	-	17
Brake disc cover plate-to-wheel bearing housing bolt	-	10
Brake disc-to-wheel hub bolt	-	5
Constant Velocity (CV) joint boot clamp	-	20
Coupling rod-to-lower transverse link bolt <sup>1) 2)</sup>	-	40 plus an additional 90° (¼ turn)
Coupling rod-to-stabilizer bar bolt <sup>1) 2)</sup>	-	40 plus an additional 90° (¼ turn)
Drive axle-to-rear final drive bolt	M10	70
Drive axle-to-wheel hub collar bolt <sup>1)</sup>	-	200 plus an additional 180° (½ turn)
Level control system sensor bolt	-	9
Lower transverse link-to-subframe bolt <sup>1) 2)</sup>	-	70 plus an additional 180° (½ turn)
Lower transverse link-to-wheel bearing housing bolt <sup>1) 2)</sup>	-	120 plus an additional 360° (1 full turn)
Stabilizer bar-to-subframe bolt <sup>1) 3)</sup>	-	25 plus an additional 90° (¼ turn)
Subframe-to-body bolt <sup>1)</sup>	-	115 plus an additional 90° (¼ turn)
Tie rod-to-subframe nut <sup>1) 2)</sup>	-	95
Tie rod-to-wheel bearing housing bolt <sup>1) 2)</sup>	-	90 plus an additional 90° (¼ turn)
Upper transverse link-to-subframe bolt <sup>1) 2)</sup>	-	70 plus an additional 180° (½ turn)

Component	Fastener size	Nm
Upper transverse link-to-wheel bearing housing nut <sup>1) 2)</sup>	-	95
Wheel bearing-to-wheel bearing housing bolt <sup>1)</sup>	-	80 plus an additional 90° (¼ turn)

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

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

<sup>3)</sup> Tighten evenly.

<sup>3)</sup> Tighten diagonally.

## Self-Leveling Suspension

### Fastener Tightening Specifications

Component	Fastener size	Nm
Air spring damper connecting piece	-	3
Air supply unit connecting piece	-	3
Air supply unit-to-bracket threaded sleeve	-	7.5
Air supply unit-to-retainer bolt	-	9
Bracket to spare wheel well nut	-	9
Muffler nut	-	5
Pressure reservoir bolt	-	9
Pressure reservoir connecting piece	-	5
Solenoid valve block-to-bracket bolt	-	3.5
Solenoid valve connecting piece	10 mm	2
	12 mm	3
Spare wheel well bracket nut	-	9
Spare wheel well cover nut	-	2.5
Stone chip protective molding nut	-	9
Wiring connector connecting piece	-	5

# Wheels, Tires

## Fastener Tightening Specifications

Component	Fastener size	Nm
Active steering control module bracket nut	-	2.5
Active steering control module to bracket bolt	-	8
Distance regulation control module bracket bolt	-	2.5
Night vision camera-to-retaining plate bolt	-	5
Night vision camera retaining plate-to-bumper bolt	-	6

## Wheel Alignment Data

### Wheel Alignment Specified Values

The specified values are for all vehicles except those equipped with an 8-cylinder TDI or 12-cylinder FSI engine

Front Axle	Standard suspension (1BK)	Sport suspension (2MA/2MB)	Heavy duty suspension (1BY)
Camber	- 56' ± 23'	- 1°7' ± 23'	- 48' ± 23'
Maximum permissible difference between both sides	30'	30'	30'
Toe per wheel (adjustment value)	+ 10' ± 5'	+ 10' ± 5'	+ 10' ± 5'
Toe per wheel (control value)	+ 10' ± 6'	+ 10' ± 6'	+ 10' ± 6'
Toe differential angle at 20° <sup>1)</sup>	1° 49' ± 30'	1° 49' ± 30'	1° 49' ± 30'
Outer wheel steering angle at maximum steering angle	33° 24' + 1° 30' - 2°	33° 24' + 1° 30' - 2°	33° 24' + 1° 30' - 2°
Inner wheel steering angle at maximum steering angle	39° 48' + 1° 30' - 2°	39° 48' + 1° 30' - 2°	39° 48' + 1° 30' - 2°

<sup>1)</sup> The wheel stop on the outer wheel is reduced by this amount. Depending on the computer manufacturer, the toe-out angle difference can be indicated negatively in the alignment computer.



Rear Axle	Standard suspension (1BK)	Sport suspension (2MA/2MB)	Heavy duty suspension (1BY)
Camber	- 1°15' ± 25'	- 1°20' ± 25'	- 1°15' ± 25'
Maximum permissible difference between both sides	30'	30'	30'
Toe for each wheel	+ 12' ± 5'	+ 12' ± 5'	+ 12' ± 5'
Total toe	+ 24' ± 10'	+ 24' ± 10'	+ 24' ± 10'
Maximum permissible deviation in direction of travel relative to vehicle longitudinal axis	10'	10'	10'

The specified values are for vehicles equipped with a 12-cylinder FSI engine.

Front Axle	Standard suspension (1BK)	Sport suspension (2MA/2MB)	Heavy duty suspension (1BY)
Camber	- 56' ± 23'	- 1°7' ± 23'	- 48' ± 23'
Maximum permissible difference between both sides	30'	30'	30'
Toe per wheel (adjustment value)	+ 12' ± 5'	+ 12' ± 5'	+ 12' ± 5'
Toe per wheel (control value)	+ 12' ± 6'	+ 12' ± 6'	+ 12' ± 6'
Toe differential angle at 20° <sup>1)</sup>	1° 49' ± 30'	1° 49' ± 30'	1° 49' ± 30'
Outer wheel steering angle at maximum steering angle	33° 24' + 1° 30' -2°	33° 24' + 1° 30' -2°	33° 24' + 1° 30' -2°
Inner wheel steering angle at maximum steering angle	39° 48' + 1° 30' -2°	39° 48' + 1° 30' -2°	39° 48' + 1° 30' -2°

<sup>1)</sup> The wheel stop on the outer wheel is reduced by this amount. Depending on the computer manufacturer, the toe-out angle difference can be indicated negatively in the alignment computer.

## Wheel Alignment Specified Values (cont'd)

Rear Axle	Standard suspension (1BK)	Sport suspension (2MA/2MB)	Heavy duty suspension (1BY)
Camber	- 1°15' ± 25'	- 1°20' ± 25'	- 1°15' ± 25'
Maximum permissible difference between both sides	30'	30'	30'
Toe for each wheel	+ 12' ± 5'	+ 12' ± 5'	+ 12' ± 5'
Total toe	+ 24' ± 10'	+ 24' ± 10'	+ 24' ± 10'
Maximum permissible deviation in direction of travel relative to vehicle longitudinal axis	10'	10'	10'

## Steering

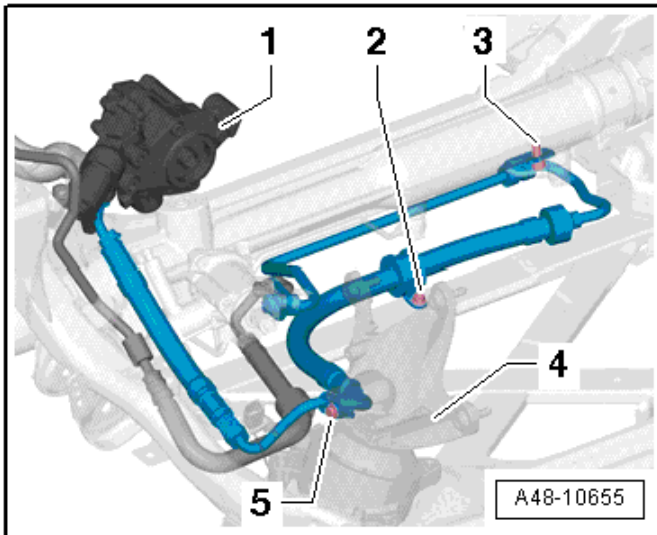
### Fastener Tightening Specifications

Component	Nm
Belt Pulley to Power Steering Pump Bolt (6-Cylinder)	22
Belt pulley-to-power steering pump bolt (12-cylinder)	23
Electro-Mechanical Steering Gear with Tie Rods <sup>1)</sup>	
- Bolt to subframe	80 plus an additional 180° (½ turn)
- Nut to wheel bearing housing	100
Electronic steering column lock control module-to-steering column bolt	5
Hose and line-to-body mounting bolt	9
Hydraulic fluid cooler bolt	4.5
	5
Lower reservoir-to-body bolt	9
Power adjustable steering column control module-to-steering column bolt	5
Power assisted steering gear with tie rods-to-wheel bearing housing nut <sup>1)</sup>	130
<b>Power steering pressure line-to-pump bolt (without dynamic steering)</b>	
- 8-cylinder	20
-12-cylinder	9

Component	Nm
Power steering pressure line-to-pump union nut (with dynamic steering)	40
Power steering pressure line-to-steering gear bolt	20
Power steering pressure line bracket-to-steering gear bolt	20
Power steering pressure line union bolt	40
Power steering pump bracket-to-engine bolt (12-cylinder)	23
Power steering pump-to-bracket bolt (12-cylinder)	23
Power steering pump-to-engine bolt (8-cylinder)	25
Pressurized line union nut (8-cylinder)	40
Power Steering Pump to Bracket Bolt, 6-Cylinder	25
Pressurized Line, 6-Cylinder (Without Dynamic Steering)	9
Pressurized Line Union Nut, 6-Cylinder	40
Pressurized Line Union Nut, 6-Cylinder FSI	38
Protective boot bolt	4
Upper reservoir-to-body bolt	4.5
	9
Servotronic solenoid valve	3
Steering column-to-central tube bolt	20
Steering gear-to-subframe bolt <sup>1)</sup>	80 plus an additional 180° (½ turn)
Steering intermediate shaft-to-steering column bolt <sup>1)</sup>	30
Steering intermediate shaft-to-steering gear bolt <sup>1)</sup>	30
Steering wheel-to-steering column bolt <sup>1)</sup>	30 plus an additional 90° (¼ turn)
Tie rod-to-steering gear	105
Tie rod end-to-tie rod nut	60
Tie Rod End to Steering Gear ((Electro-Mechanical Steering Gear)	100
Tie Rod End to Tie Rod Nut (Electro-Mechanical Steering Gear)	80
Tie rod end-to-wheel bearing housing nut <sup>1)</sup>	130

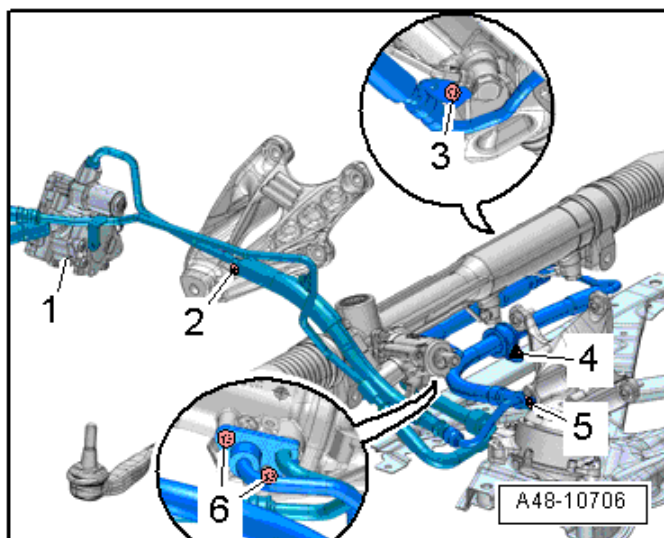
<sup>1)</sup> Replace fastener(s).

## Pressure Line from the Power Steering Pump to the Power Steering Gear (8-Cylinder)



Step	Component	Nm
1	Tighten bolts 3 and 5 in sequence	9
2	Tighten nut 2	9

## Pressure Line from the Power Steering Pump to the Power Steering Gear (12-Cylinder)




Step	Component	Nm
1	Tighten bolts 2 and 5 in sequence	9
2	Tighten bolts 3 and 6 in sequence	20
3	Tighten nut 4	9

# BRAKE SYSTEM

## General, Technical Data

### Vehicle Data Label

---- 45-7-3574 926 96						
FAHRZG.-IDENT-NR. VEHICLE-IDENT-NO.	WAUZZZ 4H9AN000386					
TYR/TYPER	4H2 0AA					
	A8 Lim. 273 kW	quat. 4,2	V8 A8			
MOTORKB./GETR.KB. ENG.CODE/TRANS.CODE	CDRA --- ---					
LACKNR./INNENAUSST. PAINT NO./INTERIOR	LY9C/LY9C N5D/FZ					
M.-AUSST./OPTIONS						
	EQA	7MG	AUF	6XL	5SL	5RU
	<b>1KW</b>	JOP	<b>1LL</b>			1BK
	3FE			5MG	7X8	
	FQA				0YZ	0JZ
	T8T		8BP	U1A	X9X	1N7
	2ZD		8Q3		8Z5	D79
	7T6	CP5	7K6		2K1	
	3PN	SOR	4KC	3Y8	4F2	5D7
	1SA	5ZO		Q1A		4GQ
		11.1	11.1	11.1		111
						A00-10566

The brake system installed in a vehicle is indicated (➡) on the vehicle data label by the Production Relevant No. (PR No.).

## Technical Data

<b>Brake system</b>	
Dual-circuit brake system with diagonal distribution and ABS, EBV, EDL, ASR, ESP, ECD and electromechanical parking brake	

<b>Front wheel brake</b>				
<b>Brake</b>		<b>(17")</b>	<b>(18")</b>	<b>(19")</b>
Production Relevant No. (PR. No.)		1LL	1LJ	1LW/ F4S
Brake disc ventilated	Dia. mm	356	380	400
Brake disc thickness	mm	34	36	38
Brake disc wear limit	mm	32	34	36
Brake pad thickness with backing plate and dampening sheet	mm	20.2	20.2	20.2
Brake pad wear limit with backing plate and dampening sheet	mm	9	9	9

<b>Rear wheel brake</b>				
<b>Brake</b>		<b>(17")</b>	<b>(18")</b>	<b>(19")</b>
Production Relevant No. (PR. No.)		1KW	1KY/1KZ	F4S
Brake disc ventilated	Dia. mm	330	356	380
Brake disc thickness	mm	22	22	30
Brake disc wear limit	mm	20	20	28
Brake pad thickness with backing plate and dampening sheet	mm	17.45	17.45	17.45
Brake pad wear limit with backing plate and dampening sheet	mm	8	8	8

<b>Ceramic Front Brakes</b>		
Production Relevant No. (PR. No.)		1LW
Brake disc ventilated	Dia. mm	400
Brake disc thickness	mm	38
Brake disc wear limit		The minimum dimension for the brake rotor thickness is stamped on the brake rotor cup. Use this when checking for wear.
Brake caliper, 6 piston monoblock	Dia. mm	2 x 32/ 36/ 38

**Brake System**

# Anti-lock Brake System (ABS)

## Fastener Tightening Specifications

Component	Nm
ABS control module-to-ABS hydraulic unit bolt <sup>1)</sup>	4.5
ABS wheel speed sensor-to-wheel bearing housing bolt	9
<b>Brake line-to-hydraulic unit</b>	
- 5 mm brake lines	12
- 8 mm brake lines	20
Sensor electronics control module nut	9

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

## Mechanical Components

### Fastener Tightening Specifications

Component	Nm
Brake disc cover plate-to-wheel bearing housing bolt (PR-1LN and 1LP)	10
<b>Brake disc-to-wheel hub bolt</b>	
- Front, PR-1LL and 1LM	9
- Front, PR-1LN and 1LP	5
- Rear	5
Brake pedal mounting pin bolt	8
Electromechanical parking brake control module nut	10
Electromechanical parking brake motor-to-rear caliper bolt	12
<b>Front brake line</b>	
- To brake hose	12
- To brake caliper	19
Front brake caliper guide pin (PR-1LL and 1LM)	55
Front brake caliper-to-wheel bearing housing bolt (PR-1LN and 1LP)	196
Front brake carrier bolt (PR-1LL and 1LM) <sup>1)</sup>	196
Gas pedal module-to-mounting bracket bolt	8
Mounting bracket nut	8
Mounting bracket-to-steering bolt	20
Rear brake caliper-to-guide pin bolt <sup>1)</sup>	35
Rear brake carrier bolt <sup>1)</sup>	100 plus an additional 90° (¼ turn)
<b>Rear brake hose</b>	
- To brake pipe	12
- To brake caliper	19
Rear brake hose bracket bolt	10



<b>Component</b>	<b>Nm</b>
Trim and balance spring-to-front brake caliper bolt (PR-1LL and 1LM)	22

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

## **Hydraulic Components**

### **Hydraulic Tightening Specifications**

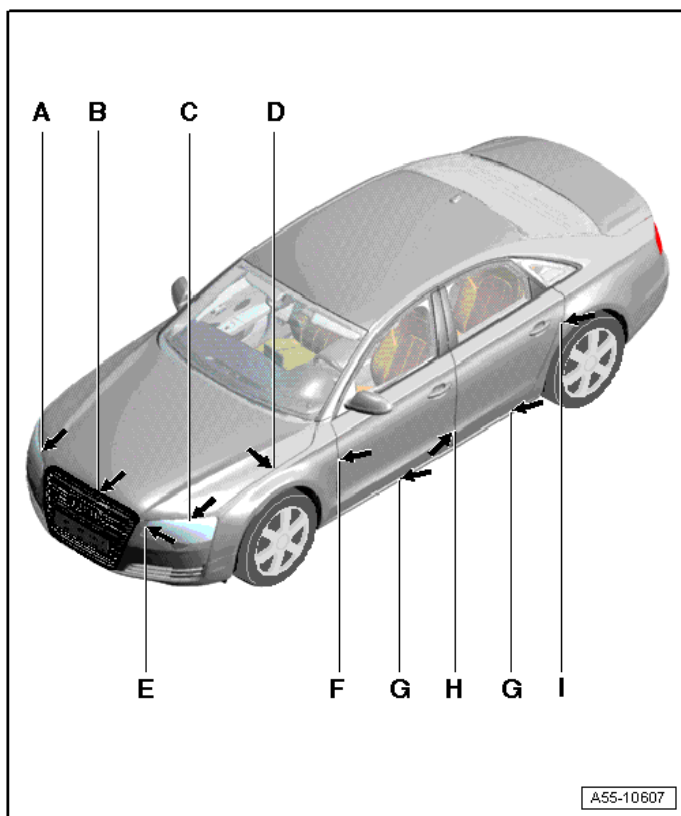
<b>Component</b>	<b>Nm</b>
Ball head-to-brake booster	30
Brake booster-to-mounting bracket bolt	23
<b>Brake line</b>	
- To brake master cylinder	24
- To hydraulic unit (Ø 5 mm brake lines)	12
- To hydraulic unit (Ø 8 mm brake lines)	20
- To the brake hose	12
- To the brake caliper	19
Brake master cylinder-to-booster nut	49
Brake system vacuum pump bracket nut	9
Mounting bracket-to-steering bolt	20
Rear brake caliper-to-guide pin bolt <sup>1)</sup>	35

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

# BODY

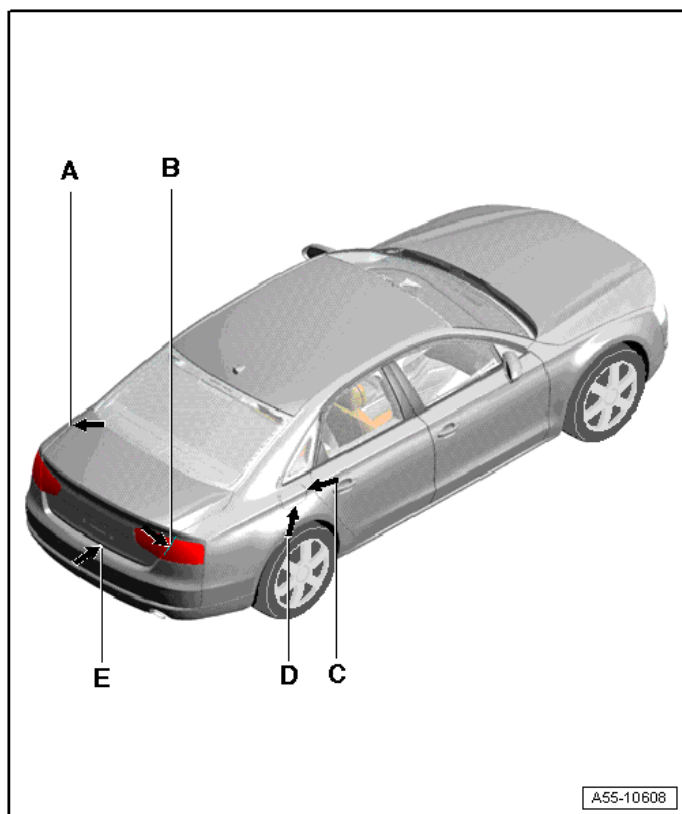
## *Air Gap Body Dimensions – Coupe*

### Front Gap Dimensions



Component	mm
A	5.5
B	4.5
C	4.5
D	3.0
E	2.5
F	3.5
G	5.0
H	4.5
I	3.5

## Rear Gap Dimensions



Component	mm
A	3.5
B	3.5
C	2.5
D	2.5
E	5.0

Body

# Body Exterior

## Body Front Tightening Specifications

Component	Nm
Brace to body bolt	23
End plate to fender mount bolt	12
Fender to body bolt	12
Fender mount to fender flange bolt	24
Front fender bracket to fender bolt	12
Impact bar to lock carrier	30
Lock carrier to body bolt <sup>1)</sup>	9
	23
	24
Lower fender bracket to fender bolt	12
Lower fender mount to fender bolt	12
Lower longitudinal member to bracket bolt	23
Plenum chamber cover bolt <sup>3)</sup>	3
	5
Plenum chamber - bulkhead to plenum chamber bolt	10
Tower brace bolt <sup>2)</sup>	10
	25
	50
Underbody impact guard to bracket bolt	23
Upper longitudinal member to brace bolt	24
Upper longitudinal member to lock carrier cover bolt	24

<sup>1)</sup> For bolt tightening clarification, refer to ElsaWeb, *Lock Carrier with Attachments Assembly Overview*, items 3, 5, 6 and 9.

<sup>2)</sup> For bolt tightening clarification, refer to ElsaWeb, *Tower Brace Overview*, items 2, 3 and 4.

<sup>3)</sup> For bolt tightening clarification, refer to ElsaWeb, *Plenum Chamber Overview*, items 3 and 6.

## Hood, Lids Tightening Specifications

Component	Nm
<b>Hood</b>	
Catch to hood bolt	11
Catch to hood bolt (with pedestrian protection)	11
Front cover to fender bolt	3
Hood catch to hood bolt (with pedestrian protection)	11
Hood catch bolt (pedestrian protection catch)	11
Hood catch bracket bolt	11
Hood hinge to hood nut (without pedestrian protection)	32
Hood hinge to hood nut (with pedestrian protection)	32
Left plenum chamber cover to fender bolt	6

<b>Component</b>	<b>Nm</b>
Lock carrier to body bolt	10
Operating lever mounting bracket screw	2
Outer plenum chamber cover to fender bolt	6
Rear lid latch bolt	10
Pedestrian protection trigger 1 bolt/nut (with pedestrian protection)	18
<b>Rear Lid</b>	
Bracket to handle nut	6
Cover to handle bolt	8
Cover to right water drain channel bolt	14
Handle to rear lid nut	6
Hood hinge bolt	34
Rear fender to lamp assembly screw	2.5
Rear lid catch to body nut	23
Rear lid hinge to rear lid bolt/nut	34
Rear lid latch to rear lid nut	23
<b>Rear lid motor to body</b>	
- Bolt	23
- Nut	20
Rear lid motor to rear fender nut	20
<b>Fuel Filler Door</b>	
Cover to fuel filler door nut	1.5
Fuel filler door to fender screw	2
Fuel filler door unlock motor to fender screw	2

### **Front Doors, Central Locking System Tightening Specifications**

<b>Component</b>	<b>Nm</b>
<b>Front Doors</b>	
Bottom door hinge to body bolt	32
Bottom door hinge to door bolt	45
Door arrester to body bolt	33
Door arrester to door bolt	8
Door arrester to door bolt	25
Stud bolt to bottom door hinge bolt	30
Stud bolt to upper door hinge bolt	30
Upper door hinge to door bolt	45
Upper door hinge to body bolt	32
<b>Door Components</b>	
Door lock to door bolt	19
Door lock cover bolt	3.5
Driver door closing assist motor to door bolt	4

## Front Doors, Central Locking System Tightening Specifications (cont'd)

Component	Nm
Front backing to door bolt	2.5
Fuel filler door to fender bolt	1.7
Hood catch bolt	25
Window regulator to door nut	6
Window regulator motor to door bolt	3.5

## Rear Doors Tightening Specifications

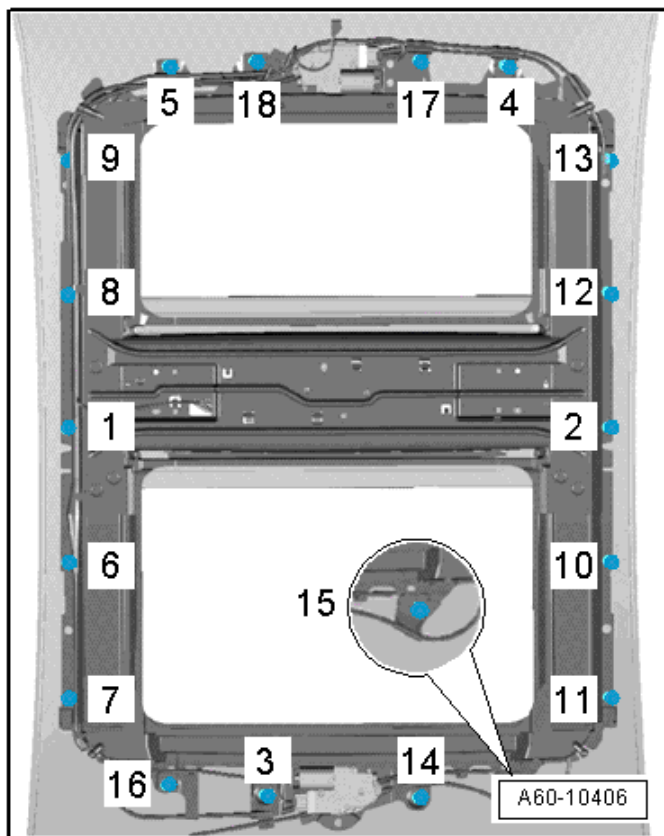
Component	Nm
Rear Door	
Bottom door hinge to body bolt	32
Bottom door hinge to door bolt	45
Door arrester bolt	8
Stud bolt to bottom door hinge bolt	30
Stud bolt to upper door hinge bolt	30
Upper door hinge to body bolt	32
Upper door hinge to door bolt	45
Door Components	
Door lock to door	19
Door lock cover bolt	3.5
Front backing to door bolt	2.5
Hood catch bolt	25
Left rear closing assist motor to door bolt	3
Left rear window regulator motor to door bolt	3.5
Lower window regulator mount to door bolt	6
Window regulator to door nut	6

## Sunroof Tightening Specifications

Component	Nm
Sunroof	
Front guide to frame	1
Slider to sliding headliner bolt	1.5
Sunroof frame to roof bolt/nut	8
Sunroof frame to sunroof control module bolt	3
Wind deflector motor to sunroof frame bolt	1.5
Panorama Sunroof	
Front glass panel to slotted guide rail bolt	5.5
Left lifter to sunroof frame bolt	1
Rear glass panel to lifter bolt	5.5
Right lifter to sunroof frame bolt	1

Component	Nm
Roof shade control module to sunroof shade frame bolt	3
Slotted guide rail with tilting mechanism to panorama roof frame bolt	1
Sunroof control module bolt	3
Sunroof shade bolt	1
Sunroof shade frame to sunroof frame bolt	3
Wind deflector bolt	1

## Assembly Frame to Roof Tightening Sequence



Body

Step	Component	Nm
1	Tighten bolts 1 and 18 in sequence	8

## Bumpers Tightening Specifications

Component	Nm
Front Bumper	
Bracket for connecting the bumper cover/lock carrier bolt	3
Bumper cover bottom plate bolt	3
Bumper cover	
- Bolt	3
- Nut	4
Connecting brace <sup>1)</sup>	
- Bolt	9
- Bolt	23
Mount for the bumper cover bolt	1.5
Reinforcement brace bolt	3
Side impact bar bolt	30
Spacer for the bumper cover bolt	7
Rear Bumper	
Bumper cover lower section bolt	2
Center mount for the bumper cover bolt	2.5
Rear bumper cover nut	4
Side mount for bumper cover bolt	1.5
Upper mount for the bumper cover bolt	2.5

<sup>1)</sup> For bolt tightening clarification, refer to ElsaWeb, *Impact Member Overview*, items 8 and 10.

## Glass, Window Regulators Tightening Specifications

Component	Nm
Heated windshield control module nut	7.5

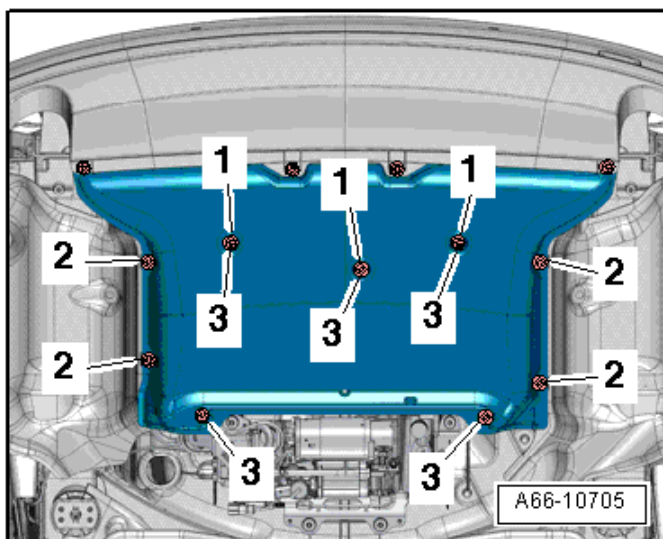
## Exterior Equipment Tightening Specifications

Component	Nm
Trim	
B-pillar trim bolt	2.5
C-pillar triangle trim bolt	2.5
Rear bracket fitting screw	1.5
Sill panel cover bolt	8
Exterior Rearview Mirror	
Front exterior rearview mirror housing	1
Mirror adjusting unit bolt	1
Seal bolt	10
Radiator Grille	
Mount for night vision system camera	6
Spoiler	
Front outer wheel spoiler	2.5



Component	Nm
Inner front wheel spoiler	2.5
Rear wheel spoiler	2.5
Underbody Trim Panels	
Front cover for the spare wheel well nut	2.5
Rear cover for the spare wheel well	2
Heat Shields and Crossbraces	
Crossbrace bolt	24
Heat shield nut	2.5
Tunnel brace bolt	24
Wheel housing liners	
Front section of front wheel housing liner bolt/nut	2.5
Rear section of front wheel housing liner bolt/nut	2.5
Rear wheel housing liner bolt	2.5

## Assembly Frame to Roof Tightening Sequence



Body

Step	Component	Nm
1	Tighten bolts 1	hand tighten
2	Tighten bolts 2	2.5
3	Tighten bolts 3	2.5

# Body Interior

## Interior Equipment Tightening Specifications

Component	Nm
Armrest	
Front center armrest bolt	4.5
Rear center armrest bolt	4.5
Storage compartment bolt	4
Front Center Console	
Bracket for front center console to carrier bolt	4.3
Bracket for storage compartment bolt	4.5
Center console	4.5
Center console to trim strip bolt	1.6
Cupholder bolt	4.5
Rear Center Console - Vehicles with Long Wheel Base	
Bracket for folding table bolt	4.3
Bracket for center console to support nut	3
Center console	4.5
Cover to support bolt	2.5
Cover for vehicles without folding table to support bolt	2.5
Cupholder bolt	2.5
Folding table to bracket bolt	7
Folding table to trim bolt	1.2
Mount for socket to side trim bolt	2.5
Mount for cigarette lighter bolt	2.5
Side trim for center armrest to center console bolt	1.6
Storage compartment bolt	4
Storage compartment to support bolt	2.5
Support for center console bolt	2.5
Storage Compartments and Covers	
Driver side instrument panel cover bolt	3
Glove compartment bolt	3
Glove compartment cover to glove compartment bolt	1.5
Lower trim to upper trim for steering column bolt	1.5
Support to folding table bolt	4.3

## Passenger Protection, Airbags, Seat Belts Tightening Specifications

Component	Nm
Airbag control module nut	9
Automatic belt retractor with driver seat belt tensioner igniter 1 left front seat belt tensioner control module and driver belt force limiter to pillar <sup>1)2)</sup>	2 35
Battery Interrupt Igniter to fuse panel A nut	15
Belt guide ring bolt <sup>1)</sup>	45
Belt guide ring nut <sup>1)</sup>	30
Belt height adjustment <sup>4)</sup>	
- Bolt	2
- Bolt <sup>1)</sup>	23
Connector For driver side curtain airbag igniter bolt <sup>3)</sup>	6
Driver front airbag crash sensor bolt	10
Driver side airbag crash sensor bolt	6
Driver side pedestrian protection crash sensor bolt	10
Front passenger airbags with front passenger airbag igniter 1 / front passenger airbag drain valve igniter bolt <sup>3)</sup>	9
Front passenger side pedestrian protection crash sensor bolt	10
Front side airbag with driver thorax airbag igniter bolt <sup>3) 5)</sup>	8
Driver seat position sensor bolt	1.2
Front seat belt guide to pillar nut <sup>3)</sup>	2
Front seat belt latch with driver seat belt switch bolt <sup>1)</sup>	33
Ground wire to glove compartment bolt <sup>3)</sup>	9
Left retainer bolt <sup>3)</sup>	9
Left retainer to driver side knee airbag nut <sup>3)</sup>	8
Passenger side knee airbag to support nut <sup>3)</sup>	8
Passenger front airbag crash sensor bolt	10
Passenger-side side airbag crash sensor bolt	6
Pedestrian protection center crash sensor bolt	10
Rear automatic belt retractor bolt <sup>1)</sup>	35
Rear center automatic belt retractor nut <sup>1)</sup>	35
Rear center belt anchor nut <sup>3)</sup>	45
Rear seat belt latch nut <sup>3)</sup>	45
Rear side airbag crash sensor (driver side) nut	9
Rear outer belt anchor bolt <sup>1)</sup>	35
Rear outer belt latch (individual power rear seat) bolt <sup>3)</sup>	34.5
Right retainer bolt <sup>3)</sup>	9
Right rear side airbag crash sensor nut	9
Right retainer to driver side knee airbag nut <sup>3)</sup>	8
Seat occupied recognition control module bolt	3.5

## Passenger Protection, Airbags, Seat Belts Tightening Specifications (cont'd)

Component	Nm
Side airbag in the rear with left rear thorax airbag igniter bolt <sup>3) 5)</sup>	8
Supports to glove compartment nut <sup>3)</sup>	8
Rear center belt latch nut <sup>3)</sup>	45
Threaded pin for rear center belt anchor (individual power rear seat)	6
Threaded pin for rear center belt latch (individual power rear seat)	6

- 1) If it was removed because of an accident, replace the bolt/nut
- 2) For bolt tightening clarification, refer to ElsaWeb, *Front Three-Point Seat Belt Overview*, items 1 and 3.
- 3) Always replace if removed.
- 4) For bolt tightening clarification, refer to ElsaWeb, *Front Three-Point Seat Belt Overview*, items 9 and 11.
- 5) Install with locking compound

## Interior Trim Tightening Specifications

Component	Nm
Air ducts to front door trim panel bolt	1.2
Bracket for glove compartment to central tube	3
Bracket for instrument panel cover to central tube bolt	3
Bracket glove compartment/A/C unit to central tube	3
Bracket to central tube bolt	20
Bracket to central tube threaded pin to nut	20
Left rear window shade motor bolt/nut	3.3
Pull handle/armrest to front door trim panel bolt	1.2
Pull handle/armrest to front door trim panel bolt (passenger side)	2.8
Pull handle/armrest to rear door trim panel bolt	1.2
Rear window shade to rear door bolt	3.3
Trim with interior door mechanism to front door trim panel <sup>1)</sup>	1.2
	2.8
Top front defroster vent to instrument panel bolt	3
Top rear defroster vent to instrument panel bolt	3
Trim strip to upper cover bolt	3
Upper cover to instrument panel bolt	3
<b>Passenger Compartment Trim</b>	
A-pillar upper trim to A-pillar bolt	4.5
D-pillar trim to D-pillar bolt	3
Front roof grab handle to A-pillar upper trim bolt	4.5
Front sill panel trim to floor bolt	4.5
Rear roof grab handle D-pillar bolt	4.5

Component	Nm
Rear shelf to body bolt	2
Trim for the rear window shade guide to body bolt	3
Upper B-pillar trim to B-pillar nut	4.5
Luggage Compartment Trim Panel	
Mount For vehicle jack to Spare wheel well trim bolt	4.5
Retaining hook to Upper luggage compartment trim panel bolt	1.5
Tie-down eye bolt	4.5
Roof Trim	
Sun visor to roof	3.5

<sup>1)</sup> For bolt tightening clarification, refer to ElsaWeb, *Rear Door Trim Overview*, items 8 and 17.

## Seat Frames Tightening Specifications

Component	Nm
Front Seat - Standard Seat	
Bracket bolted with the seat pan bolt <sup>1)</sup>	10
Bracket to backrest frame bolt <sup>1)</sup>	3.7
Backrest to seat pan bolt <sup>1)</sup>	33
Belt guide to seat pan bolt	10
Bushing to backrest frame bolt	5
Driver seat adjustment control head to sill-side trim bolt	0.8
Driver seat angle adjustment motor to seat pan bolt <sup>1) 2)</sup>	10
	20
Driver seat height adjustment motor to frame bolt <sup>1)</sup>	22
Driver seat lumbar support adjustment switch to sill-side trim bolt	0.8
Driver seat switch module to Sill-side trim bolt	0.8
Front seat to bracket bolt	3.5
Mount to cover for connector station bolt	25
Retaining plate to lower seat pan frame bolt	28
Seat pan to driver seat height adjustment motor bolt <sup>1)</sup>	20
Shaft through driver backrest adjustment motor nut <sup>1)</sup>	6
Side bolster/sill-side trim bracket to front seat bolt	3.5
Standard seat to floor bolt	50
Trim on the tunnel-side to front seat bolt	6.5
Upper seat pan frame to lower seat frame with driver seat forward/back adjustment motor bolt <sup>1)</sup>	22
Front Seat - Reclining Seat	
Backrest cover to bracket bolt	6.5
Backrest frame to front passenger footrest adjustment motor bolt <sup>1)</sup>	5

## Seat Frames Tightening Specifications (cont'd)

Component	Nm
Backrest frame to front passenger headrest adjustment motor bolt/nut	10
Backrest frame to lumbar support bolt	6.5
Backrest to lower seat frame bolt <sup>1)</sup>	33
Footrest to outer cover bolt	2.5
Front passenger headrest adjustment motor to Pressure distribution plate bolt	10
Mount only in rear on the tunnel side to floor bolt	25
Pressure distribution plate to backrest frame bolt	2.5
Seat rail to support channels bolt	50
Support channels to floor bolt	50
Seat belt guide to lower seat frame bolt <sup>1)</sup>	10
<b>Front Seat - Multicontour Seat</b>	
Belt guide to seat pan bolt	10
Backrest to seat pan bolt <sup>1)</sup>	33
Bracket to backrest cover bolt	6.5
Backrest cover to backrest bolt	6.5
Bracket to front seat bolt	3.5
Driver seat depth adjustment motor to front seat bolt	3.5
<b>Headrest frame to Backrest Frame</b>	
- Bolt	4
- Nut	10
Mount for rear seat entertainment to front seat bolt	6.5
Mount to connector station bolt	25
Seat rail to floor bolt	50
Side bolster/sill-side trim bracket to front seat bolt	3.5
<b>Rear Bench Seat</b>	
Mount for rear seat bench to floor bolt	45
Rear seat backrest to floor	45
Retaining bracket for the rear seat backrest to body nut	20
<b>Individual Power Rear Seats</b>	
Bracket to left rear seat forward/back adjustment motor bolt	8
Cover to lower seat frame/rear seat backrest bolt	8
Hook to seat cushion in the center nut	8
Lower seat frame/rear seat backrest to body bolt/nut	45
Retaining bracket to body nut	20
<b>Pneumatic Components on Individual Power Rear Seat</b>	
Bracket rubber metal mount bolt to nut	2.5
Bracket rubber metal mount nut	1.5
Left rear multi-contour seat compressor nut	1.5

Component	Nm
Seat frame to module carrier with air cushions for lumbar support bolt	2.5
Center Rear Armrest	
Rear center armrest to side trim bolt	1.8
Rear center armrest to body bolt/nut	8
Storage compartment for rear seat backrest bolt (short wheel base)	3
Cover for the DVD changer bolt <sup>3)</sup>	3
	4.5
Storage compartment for rear seat backrest <sup>4)</sup>	
- Bolt	1
- Bolt	8
- Nut	1
Multi-Contour Seat Pneumatic Components	
Backrest frame to module carrier bolt	6.5
Backrest bolster inflation adjuster to backrest bolt	1.1
Driver seat multicontour seat compressor to bracket nut	3.5

<sup>1)</sup> Replace.

<sup>2)</sup> For bolt tightening clarification, refer to ElsaWeb, *Seat Angle Adjustment Motor Overview*, items 2 and 3.

<sup>3)</sup> For bolt tightening clarification, refer to ElsaWeb, *Rear Center Armrest Storage Compartement - Vehicles with Long Wheel Base*, items 2 and 5.

<sup>4)</sup> For bolt tightening clarification, refer to ElsaWeb, *Rear Center Armrest Storage Compartement - Vehicles with Long Wheel Base*, items 7, 8, 9 and 10.

## Camper Cabinets, Shelves, Water Tank Tightening Specifications

Component	Nm
Cover for cooler bolt	3
Left retainer to cooler bolt/nut	3
Positive cable cover bolt	3
Right retainer to cooler bolt/nut	3

# HEATING, VENTILATION & 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	Fastener size	Nm
A/C pressure/temperature sensor	-	5
Bracket for (V50) and (N82/N279)	-	8
Compressor driveshaft	-	60
Compressor drive plate	-	30
Compressor drive plate socket head bolt	-	10
Compressor mounting bolts	-	25
Compressor pulley drive plate bolt	-	20
Compressor refrigerant lines	M6	9
	M8	25
Condenser refrigerant lines	M6	10
	M8	20
Condenser refrigerant line bracket	-	5
Denso oil drain plug	-	30
Denso pressure relief valve	-	10
Dryer cartridge retaining bolt	-	2
Evaporator line connector	-	5
Front expansion valve retaining plate bolts	-	10
Rear expansion valve retaining plate bolts	M6	10
Rear refrigerant line bracket-to-center tunnel	M8	10
Refrigerant line connection points	M6	10
	M8	20
Refrigerant lines-to-rear expansion valve	M6	10
	M8	20
Windshield defogger control module	-	6

# ELECTRICAL SYSTEM

## Communication Equipment

### Communication Tightening Specifications

Component	Nm
Antenna amplifier-to-D-pillar screw	2
Center speaker-to-instrument panel screw	1.5
Digital sound system control module bracket nut <sup>2)</sup>	4
Digital sound system control module bracket-to-rear panel nut <sup>1)</sup>	4
Digital sound system control module bracket-to-rear panel screw <sup>1)</sup>	3
Digital sound system control module bracket-to-rear panel screw <sup>2)</sup>	4
Digital sound system control module 2 bracket-to-rear panel nut <sup>2)</sup>	4
Display mount-to-instrument panel screw	3
DVD changer bracket screw	4
Effects speaker-to-rear panel screw <sup>1)</sup>	2.5
Effects speaker-to-rear panel screw <sup>2)</sup>	3
Front bass speaker-to-front door screw	3
Front information display control head-to-display mount screw	1.3
Front mid-range speaker-to-front door screw	3
Front treble speaker-to-instrument panel screw	1.5
Multifunction button-to-steering wheel screw	1.2
Multimedia display unit-to-bracket screw	4
Peripheral cameras, front, left and right	2
Peripheral camera, rear	3
Radio bracket-to-rear panel nut	4
Rear bass speaker-to-rear door screw <sup>2)</sup>	3
Rear mid-bass speaker-to-rear door screw <sup>1)</sup>	3
Rear mid-range speaker-to-rear door screw <sup>2)</sup>	3
Rearview camera-to-handle button nut	8
Roof antenna-to-roof screw	6
Subwoofer-to-rear panel screw <sup>1)</sup>	2.5
Subwoofer-to-rear panel screw <sup>2)</sup>	3
Telephone baseplate-to-center armrest storage compartment screw	1
Tiptronic downshift button-to-steering wheel screw	1.2

<sup>1)</sup> BOSE® system only

<sup>2)</sup> Bang & Olufsen® system only

# Electrical Equipment

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

Component	Nm
Battery jump start terminal mount	4
Battery positive cable-to-jump start terminal nut	8
Battery positive cable from battery-to-jump start terminal nut	20
Battery terminal clamp nut	6
Generator coolant pipes retaining plate	9
Generator mounting bolt	23
Wiring harness mount <sup>1)</sup>	10
Terminal 30/B+ generator nut	16
Terminal 30/B+ starter nut	18
Tool kit cover retainer bolts	18
Voltage stabilizer nut	3

<sup>1)</sup> For bolt tightening clarification, refer to ElsaWeb, *Battery Jump Start Terminal and Positive Terminal Overview*, items 1, 2, 3 and 18.

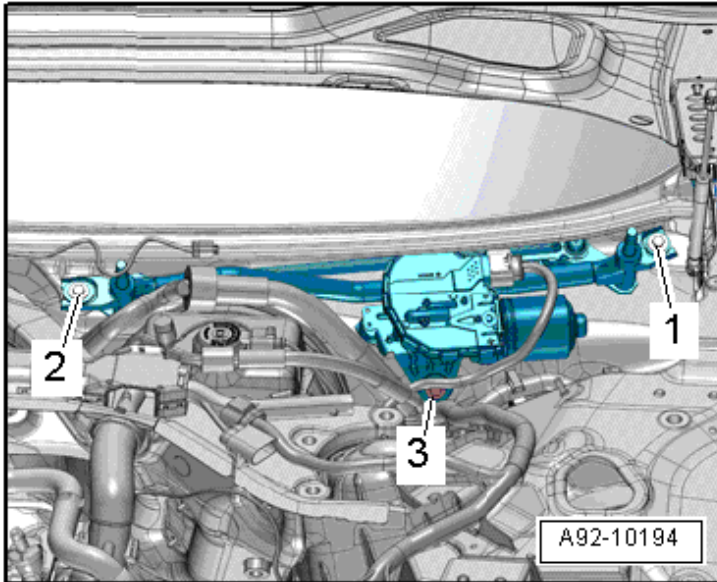
## Instruments Tightening Specifications

Component	Nm
Converter with socket (12V, 110V) screws	1.2
Instrument cluster-to-instrument panel	3
Luggage compartment 12 V outlet trim panel nut	2
Signal horn bracket-to-body	11
Signal horns-to-bracket	11

## Windshield Wiper/Washer Tightening Specifications

Component	Nm
Washer fluid hose-to-left spray nozzle and night vision camera	4
Washer fluid reservoir-to-body	7
Wiper arm-to-wiper axle nut	21

## Windshield Wiper Motor Tightening Sequence

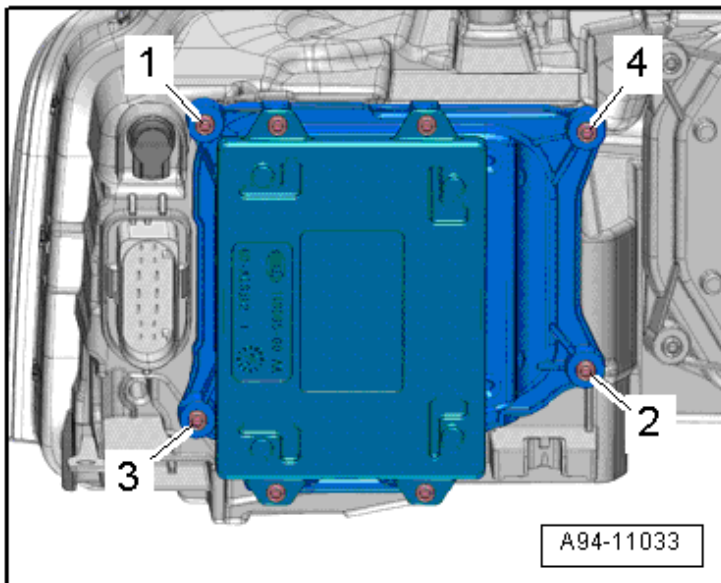


Step	Component	Nm
1	Tighten bolts 1 through 3 in sequence	Hand-tighten
2	Tighten bolts 1 through 3 in sequence	8

## Exterior Lights, Switches Tightening Specifications

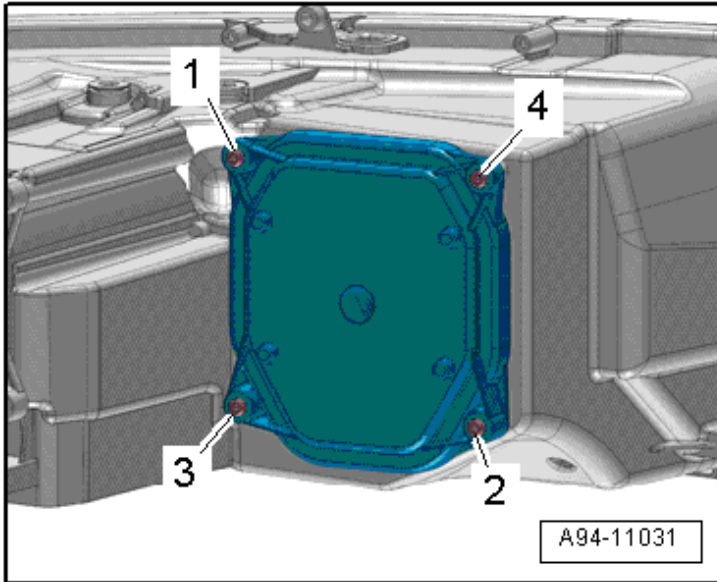
Component	Nm
Adjusting element for adjusting the headlamp housing-to-the bumper contour screw	4.5
Clamping Ring for Steering Column Screw	4
Exterior rear view mirror turn signal bulb screw	0.9
Headlamp housing bracket	4.5
Headlamp housing bracket screw	4.5
Headlamp housing cover	1.2
HID headlamp control module	1.2
HID headlamp power output stages screw	1.4
Inner tail lamp nut	6
Lamp Socket for Back-Up Light Screw	2
LED power output stages screw	1.5
LED retaining frame	1.5
License plate light screw	1
Mount for Access/Start Authorization Switch	3
Outer tail lamp	3.5
Steering column electronic systems control module screw	0.5

## Housing Cover With Power Output Stage 1 for Led Headlamps Tightening Sequence



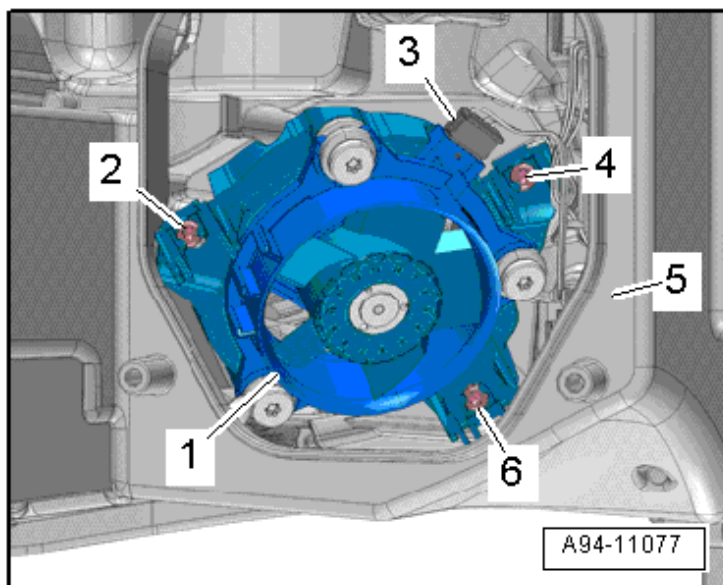
Step	Component	Nm
1	Tighten bolts 1 through 4 in sequence	1.5

## Housing Cover Tightening Sequence



Step	Component	Nm
1	Tighten bolts 1 through 4 in sequence	1.5

## Headlamp Fan - Tightening Tightening Sequence



Step	Component	Nm
1	Tighten bolts 2, 4 and 6 in sequence	1

## Interior Lights, Switches Tightening Specifications

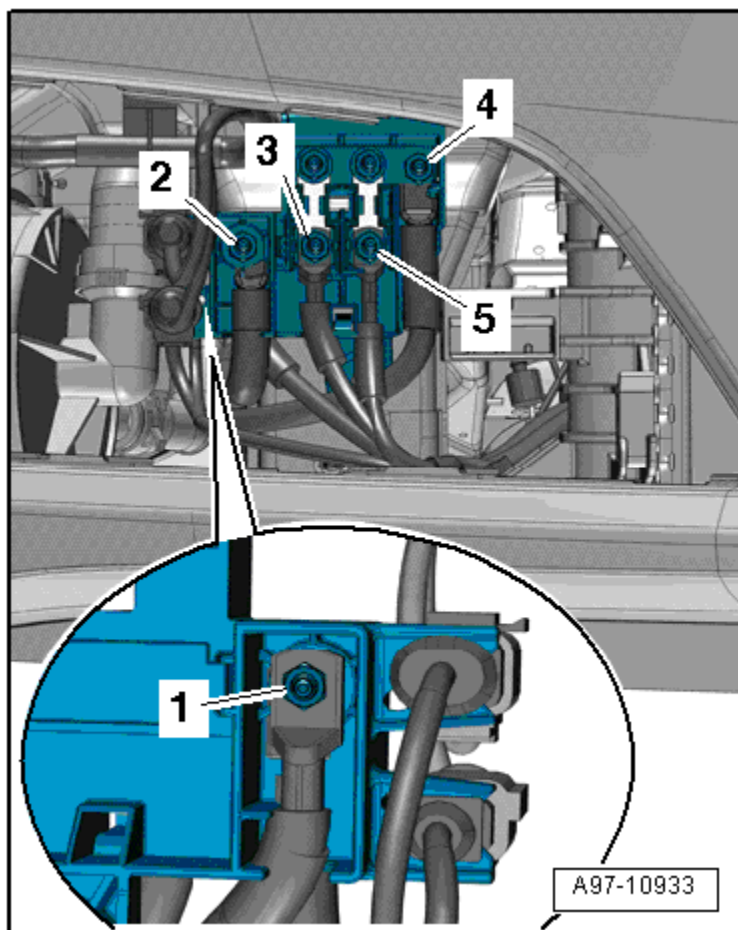
Component	Nm
Alarm horn nut	7
Driver memory seat control head	2
Electromechanical parking brake button -AUTO HOLD-button	2.5
Front interior lamps/reading lamps	4.5
Interior access/start authorization antenna 2 nut	2
Lane change assistance control module screw	3.5
Lane change assistance control module 2 screw	3.5
Left access/start authorization antenna screw	1
Luggage compartment access/start authorization antenna nut	2
Rear seat adjustment control head assembly	2
Roof Electronics Control Module -J528	0.8
Selector Lever Transmission Range Position Display Unit -Y26- with Selector Lever Illumination Bulb -L101-	0.2
Steering column adjustment switch/steering wheel heating button	1
Sunroof button	0.8



## Wiring Tightening Specifications

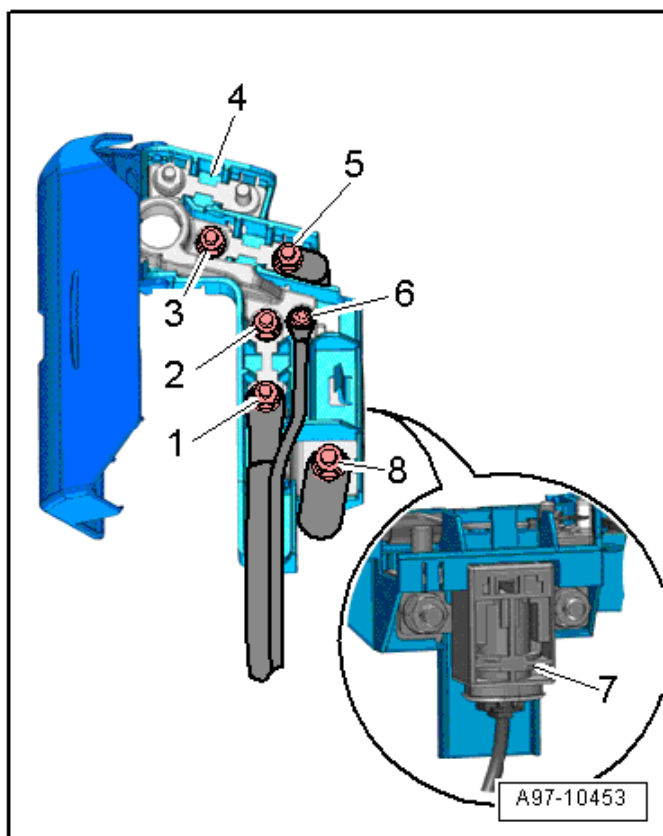
Component	Nm
2-pin relay/fuse panel, right A-pillar screw	4
Battery jump start pin for negative terminal clamp	20
Control modules retaining frame nut	4
Data bus OBD interface nut	4
E-Box cover screw (in plenum chamber, right side)	3.5
E-Box nut (in plenum chamber, right side)	3
Fuse panel F nut	4
Fuse panel screw	3
Vehicle electrical system control module mount nut	3

## Fuse Panel Tightening Specifications



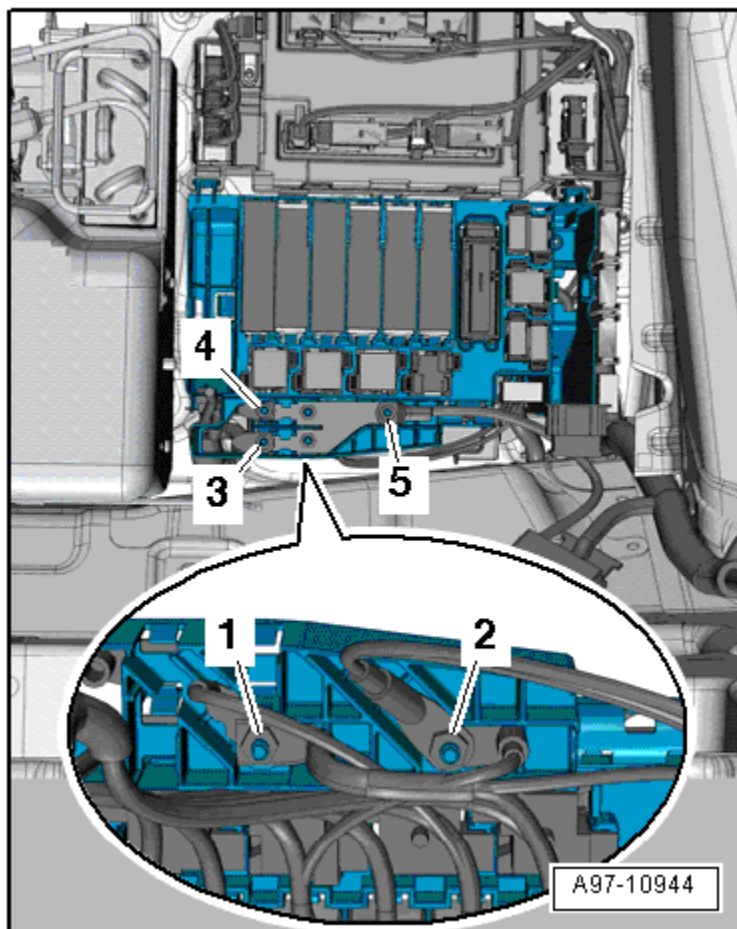
Item	Component	Nm
1	Ground wires	7.5
2	Ground connection for the ground wire on the longitudinal member	9
3	Coolant fan fuse (S42)	7.5
4	Terminal 30 wire Junction 2 (TV22)	7.5
5	Coolant fan second speed fuse (S104)	7.5

## Fuse Panel D Tightening Specifications



Item	Component	Nm
1	Electrical wire	7.5
2	Nut	9
3	Nut	9
4	Fuse panel D (SD) inside the luggage compartment	-
5	Positive wire-to-engine	7.5
6	Bolt	2.5
7	Battery interrupt igniter (N253)	15
8	Electrical wire	18

## Fuse Panel F Tightening Specifications



Item	Component	Nm
1	Positive cable to fuse panel 5 (ST5), fuse panel 6 (ST6)	7.5
2	Positive cable to fuse panel 3 (ST3), fuse panel 4 (ST4), terminal 15 power supply relay (J329), sockets relay (J807), auxiliary fuses	7.5
3	Positive cable from the wiring harness on the right side of the vehicle	7.5
4	Positive cable from the wiring harness on the left side of the vehicle	7.5
5	Electrical wire	7.5

# DTC CHART

## Engine Codes - 3.0L CTUB

### Fuel and Air Mixture, Additional Emissions Regulations

DTC	Error Message	Malfunction Criteria and Threshold Value
P000A	A Camshaft Position Slow Response Bank 1	<ul style="list-style-type: none"><li>• Adjustment angle difference &lt; 5° CA</li><li>• Number of checks 10 times</li></ul>
P000C	Camshaft Position Slow Response Bank 2	<ul style="list-style-type: none"><li>• Adjustment angle difference &lt; 5° CA</li><li>• Number of checks 10 times</li></ul>
P0010	A Camshaft Position Actuator Circuit / Open Bank 1	Signal current > 0.8 mA
P0011	A Camshaft Position - Timing Over-Advanced or System Performance Bank 1	<ul style="list-style-type: none"><li>• Adjustment angle difference &gt; 10° CA</li><li>• Number of checks 3 times</li></ul>
P0016	Crankshaft Position – Camshaft Position Correlation Bank 1 Sensor A	Ap tive value > 146° CA
P0018	Crankshaft Position – Camshaft Position Correlation Bank 2 Sensor A	Actual value < 84° CA
P0020	A Camshaft Position Actuator Circuit / Open Bank 2	Signal current < 0.8 mA
P0021	A Camshaft Position - Timing Over-Advanced or System Performance Bank 2	<ul style="list-style-type: none"><li>• Adjustment angle difference &gt; 10° CA</li><li>• Number of checks 3 times</li></ul>
P0030	HO2S Heater Control Circuit Bank 1 Sensor 1	Heater current (hardware values) < 40 mA
P0031	HO2S Heater Control Circuit Low Bank 1 Sensor 1	Heater voltage (hardware values) < 1.9 to 2.22 V
P0032	HO2S Heater Control Circuit High Bank 1, Sensor 1	Heater current (hardware values) > 8 to 11 A
P0036	HO2S Heater Control Circuit Bank 1 Sensor 2	Heater current (hardware values) < 8 to 40 mA
P0037	HO2S Heater Control Circuit Low Bank 1 Sensor 2	Heater voltage < 1.9 to 2.22 V
P0038	HO2S Heater Control Circuit High Bank 1 Sensor 2	Heater current (hardware values) > 3 to 5 A

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
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 Battery voltage	Heater current, > 2.70 - 5.50 A
P0050	HO2S Heater Control Circuit Bank 2, Sensor 1	Heater current (hardware values) < 8 to 40 mA
P0051	HO2S Heater Control Circuit Low Bank 2 Sensor 1	Heater voltage (hardware values) < 1.9 to 2.22 V
P0052	HO2S Heater Control Circuit High Bank 2 Sensor 1	Heater current (hardware values) > 8 to 11A
P0056	HO2S Heater Control Circuit (Bank 2 Sensor 2)	Heater current (hardware values) < 8 to 40 mA
P0057	HO2S Heater Control Circuit Low Bank 2 Sensor 2	Heater voltage < 1.9 to 2.22 V
P0058	HO2S Heater Control Circuit High Bank 2 Sensor 2	Heater current (hardware values) > 3 to 5 A
P0068	MAP/MAF – Throttle Position Correlation	<ul style="list-style-type: none"> <li>• Deviation throttle controller &lt; 43 or &gt; 43%</li> <li>• Difference actual pressure downstream throttle to set-point value &gt;30 kPa</li> </ul>
P0071	Ambient Air Temperature Sensor Circuit Range/ Performance	<ul style="list-style-type: none"> <li>• Difference ECT vs. CHDT vs. IAT at engine start &lt; 26.5° C (depending on engine off time) map (1)</li> <li>• Difference AAT vs. IAT at engine start &gt; 26.5° C (depending on engine off time) map (1)</li> <li>• Difference AAT vs. ECT at engine start &gt; 26.5° C (depending on engine off time) map (1)</li> <li>• Difference AAT vs. CHDT at engine start &gt; 26.5° C (depending on engine off time) map (1)</li> </ul>
P0072	Ambient Air Temperature Sensor Circuit Low	Failure

DTC	Error Message	Malfunction Criteria and Threshold Value
P0073	Ambient Air Temperature Sensor Circuit High	Failure
P007C	Charge Air Cooler Temperature Sensor Circuit Low Bank 1	Intake Air Temperature > 129° C
P007D	Charge Air Cooler Temperature Sensor Circuit High Bank 1	Intake Air Temperature < -40° C
P0087	Fuel Rail/System Pressure - Too Low	<ul style="list-style-type: none"> <li>• Deviation fuel rail pressure control &gt; 0.105 g/Rev and</li> <li>• Deviation HO2S control -15 - 15%</li> <li>• Actual pressure 3.5 MPa</li> <li>• Target pressure-actual pressure &gt;2 MP and</li> <li>• Deviation HO2S control -15 - 15%</li> </ul>
P0088	Fuel Rail/System Pressure - Too High	Fuel rail pressure > 13.9 MPa
P0089	Fuel Pressure Regulator 1 Performance	<ul style="list-style-type: none"> <li>• Deviation fuel press control (LP) &lt; -28% or &gt; 35%</li> <li>• Target press minus actual press &gt; 0.17 MPa</li> <li>• Target press minus actual press &lt; 0.17 MPa</li> </ul>
P008A	Low Pressure Fuel System Pressure - Too Low	Actual pressure < 0.08 MPa
P008B	Low Pressure Fuel System Pressure - Too High	Actual pressure >1.1 MPa
P0090	Fuel Pressure Regulator 1 Control Circuit	Signal voltage < 2.9 .. 3.2 [V]
P0091	Fuel Pressure Regulator 1 Control Circuit Low	Signal voltage 1.95 .. 2.2 [V]
P0092	Fuel Pressure Regulator 1 Control Circuit High	Short to battery plus signal current > 8 to 11 A

DTC	Error Message	Malfunction Criteria and Threshold Value
P0096	Intake Air Temperature Sensor 2 Circuit Range/Performance Bank 1	<ul style="list-style-type: none"> <li>• Difference AAT vs. ECT vs. CHDT at engine start &lt; 26.5° C (depending on engine off time) map (1)</li> <li>• Difference IAT vs. CHDT at engine start &gt; 26.5° C (depending on engine off time) map (1)</li> <li>• Difference IAT vs. AAT at engine start &gt; 26.5° C (depending on engine off time) map (1)</li> <li>• Difference IAT vs. ECT at engine start &gt; 26.5° C (depending on engine off time) map (1)</li> </ul>
P00A2	Charge Air Cooler Temperature Sensor Circuit Low Bank 2	IAT > 129 [° C]
P00A3	Charge Air Cooler Temperature Sensor Circuit High Bank 2	IAT < -40 [°C]
P00A6	Intake Air Temperature Sensor 2 Circuit Range/Performance Bank 2	<ul style="list-style-type: none"> <li>• Difference AAT vs. ECT vs. CHDT at engine start &lt; 26.5° C (depending on engine off time) map (1)</li> <li>• Difference IAT vs. CHDT at engine start &gt; 26.5° C (depending on engine off time) map (1)</li> <li>• Difference IAT vs. AAT at engine start &gt; 26.5° C (depending on engine off time) map (1)</li> <li>• Difference IAT vs. ECT at engine start &gt; 26.5° C (depending on engine off time) map (1)</li> </ul>



DTC	Error Message	Malfunction Criteria and Threshold Value
P0111	Intake Air Temperature Sensor 1 Circuit Range/Performance Bank 1	<ul style="list-style-type: none"> <li>• Difference AAT vs. ECT vs. CHDT at engine start &lt; 26.5° C (depending on engine off time) map (1)</li> <li>• Difference IAT vs. CHDT at engine start &gt; 26.5° C (depending on engine off time) map (1)</li> <li>• Difference IAT vs. AAT at engine start &gt; 26.5° C (depending on engine off time) map (1)</li> <li>• Difference IAT vs. ECT at engine start &gt; 26.5° C (depending on engine off time) map (1)</li> </ul>
P0112	Intake Air Temperature Sensor 1 Circuit Low Bank 1	Intake air temperature > 129° C
P0113	Intake Air Temperature Sensor 1 Circuit High Bank 1	Intake air temperature < -40° C
P0116	Engine Coolant Temperature Sensor 1 Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Difference AAT vs. ECT vs. CHDT at engine start &lt; 26.5° C (depending on engine off time) map (1)</li> <li>• Difference IAT vs. CHDT at engine start &gt; 26.5° C (depending on engine off time) map (1)</li> <li>• Difference IAT vs. AAT at engine start &gt; 26.5° C (depending on engine off time) map (1)</li> <li>• Difference IAT vs. ECT at engine start &gt; 26.5° C (depending on engine off time) map (1)</li> </ul>
P0117	Engine Coolant Temperature Sensor 1 Circuit Low	Engine coolant temperature < - 45.8° C
P0118	Engine Coolant Temperature Sensor 1 Circuit High	Engine coolant temperature > 141° C
P0121	Throttle/Pedal Position Sensor/Switch "A" Circuit Range/Performance	<ul style="list-style-type: none"> <li>• TPS 1 - TPS 2 &gt; 5.79% and</li> <li>• Relative mass air integral &gt; 100 at 0.45 s</li> </ul>

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0122	Throttle/Pedal Position Sensor/Switch "A" Circuit Low	Signal voltage < 0.117 V
P0123	Throttle/Pedal Position Sensor/Switch "A" Circuit High	Signal signal voltage > 4.6 [V]
P012B	Turbocharger/Supercharger Inlet Pressure Sensor Circuit Range/Performance Downstream of Throttle Valve	<ul style="list-style-type: none"> <li>• Pressure difference in cross check between boost pressure sensor 1/2; inlet charger pressure and ambient pressure sensor &gt; 7 kPa</li> <li>• Pressure difference in cross check between boost pressure sensor 1/2 and inlet charger pressure (1) &gt; 12 - 27 kPa</li> <li>• Depending on engine speed</li> </ul>
P012C	Turbocharger/Supercharger Inlet Pressure Sensor Circuit High Downstream of Throttle Valve	Signal voltage < 0.2 V
P012D	Turbocharger/Supercharger Inlet Pressure Sensor Circuit High Downstream of Throttle Valve	Signal voltage > 4.8 V
P0130	O2 Sensor Circuit Bank 1, Sensor 1	O2S ceramic temperature < 640° C
P0131	O2 Sensor Circuit Low Voltage Bank 1 Sensor 1	Signal voltage < 0.13 V
P0132	O2 Sensor Circuit High Voltage Bank 1 Sensor 1	Signal voltage > 5.5 V
P0133	O2 Circuit Slow Response Bank 1 Sensor 1	Response check- HO2S value vs modeled HO2S value > 0.9004
P0135	O2 Sensor Heater Circuit Bank 1 Sensor 1	UEGO ceramic temperature < 680 or > 965° C
P0136	O2 Sensor Circuit Bank 1 Sensor 2	Oscillation check <ul style="list-style-type: none"> <li>• O2S signal rear not oscillating at reference +/- 10 mV</li> </ul> Signal range check <ul style="list-style-type: none"> <li>• Signal voltage &gt; 0.15 V</li> </ul>
P0137	O2 Sensor Circuit Low Voltage Bank 1 Sensor 2	<ul style="list-style-type: none"> <li>• Signal voltage &lt; 20 mV and</li> <li>• Internal resistance &lt; 10 Ohm</li> </ul>
P0138	O2 Sensor Circuit High Voltage Bank 1 Sensor 1	Signal voltage > 1.2 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P0139	O2 Circuit Slow Response Bank 1 Sensor 2	O2S signal rear- signal too slow- 1
P013A	HO2 Sensor Slow Response - Rich to Lean Bank 1 Sensor 2	<ul style="list-style-type: none"> <li>• Arithmetic filtered max differential transient time at rich to lean transition <math>\leq 800</math> mV/s</li> <li>• Number of checks <math>\geq 3</math></li> </ul>
P013B	HO2 Sensor Slow Response - Lean to Rich Bank 1, Sensor 2	<ul style="list-style-type: none"> <li>• Arithmetic filtered max differential transient time at rich to lean transition <math>\leq 800</math> mV/s</li> <li>• Number of checks <math>\geq 3</math></li> </ul>
P013C	HO2 Sensor Slow Response - Rich to Lean Bank 2 Sensor 2	<ul style="list-style-type: none"> <li>• Arithmetic filtered max differential transient time at rich to lean transition <math>\leq 800</math> mV/s</li> <li>• Number of checks <math>\geq 3</math></li> </ul>
P013D	Oxygen Sensors Slow Response - Lean to Rich Bank 2, Sensor 2	<ul style="list-style-type: none"> <li>• Arithmetic filtered max differential transient time at rich to lean transition <math>\leq 800</math> mV/s</li> <li>• Number of checks <math>\geq 3</math></li> </ul>
P013E	Oxygen Sensors Delayed Response - Rich to Lean Bank 1, Sensor 2	<ul style="list-style-type: none"> <li>• Arithmetic filtered max differential transient time at rich to lean transition <math>\leq 800</math> mV/s</li> <li>• Number of checks <math>\geq 3</math></li> </ul>
P013F	HO2 Sensor Delayed Response - Lean to Rich Bank 1, Sensor 2	<ul style="list-style-type: none"> <li>• Arithmetic filtered max differential transient time at rich to lean transition <math>\leq 800</math> mV/s</li> <li>• Number of checks <math>\geq 3</math></li> </ul>
P0140	HO2 Sensor Circuit No Activity Detected Bank 1 Sensor 2	<ul style="list-style-type: none"> <li>• Signal voltage, 0.376 - 0.474 V</li> <li>• O2S rear internal resistance <math>&gt; 60</math> K<math>\Omega</math></li> </ul>
P0141	O2 Sensor Heater Circuit Bank 1 Sensor 2	Heater resistance $> 10$ K $\Omega$
P014A	HO2 Sensor Circuit Delayed Response - Lean to Rich Bank 2, Sensor 2	<ul style="list-style-type: none"> <li>• Arithmetic filtered max differential transient time at rich to lean transition <math>\leq 800</math> mV/s</li> <li>• Number of checks <math>\geq 3</math></li> </ul>

DTC	Error Message	Malfunction Criteria and Threshold Value
P014B	HO2 Sensor Circuit Delayed Response - Lean to Rich Bank 2 Sensor 2	<ul style="list-style-type: none"> <li>• Arithmetic filtered max differential transient time at rich to lean transition <math>\leq 800</math> mV/s</li> <li>• Number of checks <math>\geq 3</math></li> </ul>
P0151	HO2 Sensor Circuit Low Voltage Bank 2 Sensor 1	Signal voltage $< 0.13$ V
P0152	O2 Sensor Circuit High Voltage (Bank 2 Sensor 1)	Signal voltage $> 5.5$ V
P0153	HO2 Sensor Circuit Slow Response Bank 2 Sensor 1	Response check- HO2S value vs modeled HO2S value $> 0.7998$
P0155	HO2 Sensor Heater Circuit Bank 2, Sensor 1	UEGO ceramic temperature $< 680$ or $> 965^\circ$ C
P0156	HO2 Sensor Circuit Bank 2 Sensor 2	Oscillation check <ul style="list-style-type: none"> <li>• O2S signal rear not oscillating at reference <math>\pm 10</math> mV</li> </ul> Signal range check <ul style="list-style-type: none"> <li>• Signal voltage <math>&gt; 0.2</math> V</li> </ul>
P0157	HO2 Sensor Circuit Low Voltage Bank 2 Sensor 2	<ul style="list-style-type: none"> <li>• Signal voltage <math>&lt; 20</math> mV and</li> <li>• Internal resistance <math>&lt; 10</math> Ohm</li> </ul>
P0158	HO2 Sensor Circuit High Voltage Bank 2 Sensor 2	Signal voltage $> 1.2$ V
P0159	HO2 Sensor Circuit Slow Response Bank 2 Sensor 2	<ul style="list-style-type: none"> <li>• O2S signal rear- signal too slow- 1</li> <li>• Maximum allowed rich to lean switching time</li> </ul>
P0160	HO2 Sensor Circuit No Activity Detected Bank 2 Sensor 2	<ul style="list-style-type: none"> <li>• Signal voltage, <math>0.376 - 0.474</math> V</li> <li>• O2S rear internal resistance <math>&gt; 60</math> K<math>\Omega</math></li> </ul>
P0161	HO2 Sensor Heater Circuit Bank 1, Sensor 2	Heater resistance $> 10K$ $\Omega$
P0169	Incorrect Fuel Composition	Plausibility check failed
P0171	System Too Lean Bank 1	System too lean adaptive value $> 0.0075$ [g/rev]
P0172	System Too Rich Bank 1	System too rich adaptive value $< -0.0075$ [g/rev]
P0174	System Too Lean Bank 2	System too lean adaptive value $> 0.0075$ [g/rev]
P0175	System Too Rich Bank 2	System too rich adaptive value $< -0.0075$ [g/rev]

DTC	Error Message	Malfunction Criteria and Threshold Value
P017B	Cylinder Head Temperature Sensor Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Measured cylinder head temperature below modeled temperature</li> <li>• Difference ETC vs AAT vs IAT at engine start &lt; 26.5° C (depending on engine off time) map (1)</li> <li>• Difference CHDT vs ECT at engine start &gt; 26.5° C (depending on engine off time) map (1)</li> <li>• Difference CHDT vs IAT at engine start &gt; 26.5° C (depending on engine off time) map (1)</li> <li>• Difference CHDT vs AAT at engine start &gt; 26.5° C (depending on engine off time) map (1)</li> </ul>
P017C	Cylinder Head Temperature Sensor Circuit Low	Cylinder head temperature > 215 °C
P017D	Cylinder Head Temperature Sensor Circuit High	Cylinder head temperature < -60 °C
P0190	Fuel Rail Pressure Sensor "A" Circuit	Signal voltage > 4.6 V
P0191	Fuel Rail Pressure Sensor "A" Circuit Range/Performance	Actual pressure > 16.85 MPa
P0192	Fuel Rail Pressure Sensor "A" Circuit Low	Signal voltage < 0.2 V
P0201	Injector Circuit/Open - Cylinder 1	<ul style="list-style-type: none"> <li>• Signal current &lt; 10 A and</li> <li>• Signal voltage &gt; 3.5 V</li> </ul>
P0202	Injector Circuit/Open - Cylinder 2	<ul style="list-style-type: none"> <li>• Signal current &lt; 10 A and</li> <li>• Signal voltage &gt; 3.5 V</li> </ul>
P0203	Injector Circuit/Open - Cylinder 3	<ul style="list-style-type: none"> <li>• Signal current &lt; 10 A and</li> <li>• Signal voltage &gt; 3.5 V</li> </ul>
P0204	Injector Circuit/Open - Cylinder 4	<ul style="list-style-type: none"> <li>• Signal current &lt; 10 A and</li> <li>• Signal voltage &gt; 3.5 V</li> </ul>

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0205	Injector Circuit/Open - Cylinder 5	<ul style="list-style-type: none"> <li>• Signal current &lt; 10 A</li> <li>and</li> <li>• Signal voltage &gt; 3.5 V</li> </ul>
P0206	Injector Circuit/Open - Cylinder 6	<ul style="list-style-type: none"> <li>• Signal current &lt; 10 A</li> <li>and</li> <li>• Signal voltage &gt; 3.5 V</li> </ul>
P0221	Throttle/Pedal Position Sensor/Switch "B" Circuit Range/Performance	<ul style="list-style-type: none"> <li>• TPS 1 - TPS 2 &gt; 5.79%</li> <li>and</li> <li>• Relative mass air integral &gt; 100 at 0.45 s</li> </ul>
P0222	Throttle/Pedal Position Sensor/Switch "B" Circuit Low	Signal voltage < 0.117 V
P0223	Throttle/Pedal Position Sensor/Switch "B" Circuit High	Signal voltage > 4.6 V
P0234	Turbocharger / Supercharger Over-boost Condition Rationality Check High	Difference set value boost pressure vs actual boost pressure value, 200 - 1275 hPa
P0235	Turbo/Super Charger Boost Sensor "A" Circuit	Difference between actual measured charge pressure quotient and target charge pressure quotient (1) > 0.25.....35 [-] depending on altitude
P0236	Turbocharger/Supercharger Boost Sensor "A" Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Pressure difference in cross check between boost pressure sensor 1/2; inlet charger pressure and ambient pressure sensor &gt; 7 kPa</li> <li>• Pressure difference in cross check between boost pressure sensor 1/2 and inlet charger pressure (1) &gt; 12 -27 kPa</li> <li>• Pressure difference in cross check between boost pressure sensor 1 and 2 &gt; 12.5 kPa</li> <li>• Fuel trim activity (bank with deviation is considered to be defective) &gt; 15%</li> </ul>
P0237	Turbocharger/Supercharger Boost Sensor "A" Circuit Low	Signal voltage < 0.2 V
P0238	Turbocharger/Supercharger Boost Sensor "A" Circuit High	Signal voltage > 4.8 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P0240	Turbocharger/Supercharger Boost Sensor "B" Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Pressure difference in cross check between boost pressure sensor 1/2; inlet charger pressure and ambient pressure sensor &gt; 7 kPa</li> <li>• Pressure difference in cross check between boost pressure sensor 1/2 and inlet charger pressure (1) &gt; 12 -27 kPa</li> <li>• Pressure difference in cross check between boost pressure sensor 1 and 2 &gt; 12.5 kPa</li> <li>• Fuel trim activity (bank with deviation is considered to be defective) &gt; 15%</li> </ul>
P0241	Turbocharger/Supercharger Boost Sensor "B" Circuit Low	Signal voltage < 0.2 V
P0242	Turbocharger/Supercharger Boost Sensor "B" Circuit High	Signal voltage > 4.8 V
P025A	Fuel Pump Module Control Circuit/Open	Signal voltage < 2.9 to 3.2 [V]
P025C	Fuel Pump Module Control Circuit Low	Signal voltage < 1.95 to 2.2 V
P025D	Fuel Pump Module Control Circuit High	Signal current > 1 to 2 A
P0261	Cylinder 1 Injector Circuit Low	<ul style="list-style-type: none"> <li>• Signal current &lt; 10 A and</li> <li>• Signal voltage &gt; 3.5 V</li> </ul>
P0262	Cylinder 1 Injector Circuit High	Signal current > 16 A
P0264	Cylinder 2 Injector Circuit Low	<ul style="list-style-type: none"> <li>• Signal current &lt; 10 A and</li> <li>• Signal voltage &gt; 3.5 V</li> </ul>
P0265	Cylinder 2 Injector Circuit High	Signal current > 16 A
P0267	Cylinder 3 Injector Circuit Low	<ul style="list-style-type: none"> <li>• Signal current &lt; 10 A and</li> <li>• Signal voltage &gt; 3.5 V</li> </ul>
P0268	Cylinder 3 Injector Circuit High	Signal current > 16 A
P0270	Cylinder 4 Injector Circuit Low	<ul style="list-style-type: none"> <li>• Signal current &lt; 10 A and</li> <li>• Signal voltage &gt; 3.5 V</li> </ul>
P0271	Cylinder 4 Injector Circuit High	Signal current > 16 A

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0273	Cylinder 5 Injector Circuit Low	<ul style="list-style-type: none"> <li>• Signal current &lt; 10 A</li> <li>and</li> <li>• Signal voltage &gt; 3.5 V</li> </ul>
P0274	Cylinder 5 Injector Circuit High	Signal current > 16 A
P0276	Cylinder 6 Injector Circuit Low	<ul style="list-style-type: none"> <li>• Signal current &lt; 10 A</li> <li>and</li> <li>• Signal voltage &gt; 3.5 V</li> </ul>
P0277	Cylinder 6 Injector Circuit High	Signal current > 16 A
P0299	Turbocharger / Supercharger Under-boost Rationality check	Difference set value boost pressure vs actual boost pressure value, >150 hPa
P2004	Intake Manifold Runner Control Stuck Open Bank 1	Signal voltage > 2.5V
P2005	Intake Manifold Runner Control Stuck Open Bank 2	Signal voltage < 2.5 V
P2006	Intake Manifold Runner Control Stuck Closed Bank 1	Signal voltage < 2.9 V
P2007	Intake Manifold Runner Control Stuck Closed Bank 2	Signal voltage > 2.9 V
P2008	Intake Manifold Runner Control Circuit/Open	Signal voltage 2.9 to 3.2 V
P2009	Intake Manifold Runner Control Circuit Low	Signal voltage < 1.95 to 2.2 V
P2010	Intake Manifold Runner Control Circuit High	Signal current 1.2 A
P2014	Intake Manifold Runner Position Sensor/Switch Circuit (Bank 1)	Signal voltage < 0.2 V
P2017	Intake Manifold Runner Position Sensor/Switch Circuit High Bank 1	Signal voltage > 4.8 V
P2019	Intake Manifold Runner Position Sensor/Switch Circuit Bank 2	Signal voltage < 0.2 V
P2022	Intake Manifold Runner Position Sensor/Switch Circuit High Bank 2	Signal voltage > 4.8 V
P2024	Evaporative Emissions (EVAP) Fuel Vapor Temperature Sensor Circuit	Signal current < 0.8 mA



DTC	Error Message	Malfunction Criteria and Threshold Value
P2025	Evaporative Emissions (EVAP) Fuel Vapor Temperature Sensor Performance	<ul style="list-style-type: none"> <li>• Response time &gt; 1000 ms and number of checks &gt; 3.00</li> <li>• Security bit incorrect and number of checks &gt; 3.00</li> <li>• Resetcounter &gt; 3.00</li> <li>• Time difference between ECU and EVAP Fuel Tank Temp Sensor &gt; 3.0 s</li> </ul> Case 1: <ul style="list-style-type: none"> <li>• EVAP Fuel Tank Temp Sensor &gt; 119 °C</li> <li>• EVAP Fuel Tank Temp Sensor &lt; -39 °C</li> <li>• Difference between EVAP Fuel Tank Temp Sensor and ECT <math>\geq 20.3</math> K and difference between EVAP Fuel Tank Temp Sensor and IAT <math>\geq 20.3</math> K gradient EVAP Fuel Tank Temp Sensor &gt; 20 [K/10min]</li> </ul>
P2026	Evaporative Emissions (EVAP) Fuel Vapor Temperature Sensor Circuit Low Voltage	Signal voltage < 2.0 V
P2027	Evaporative Emissions (EVAP) Fuel Vapor Temperature Sensor Circuit High Voltage	Signal current > 1.0 A
P2088	A Camshaft Position Actuator Control Circuit Low Bank 1	Signal voltage, < 1.95 to 2.20 V
P2089	A Camshaft Position Actuator Control Circuit High Bank 1	Signal current, > 3 to 5 A
P2092	A Camshaft Position Actuator Control Circuit Low Bank 2	Signal voltage, < 1.95 to 2.20 V
P2093	A Camshaft Position Actuator Control Circuit High Bank 2	Signal current, > 3 to 5 A
P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	Integral part of trim control post cat. > 10%
P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	Integral part of trim control post cat. < 10%
P2098	Post Catalyst Fuel Trim System Too Lean Bank 2	Integral part of trim control post cat. > 10%
P2099	Post Catalyst Fuel Trim System Too Rich Bank 2	Integral part of trim control post cat. < 10%

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P3081	Engine Temperature Too Low	Step 1 <ul style="list-style-type: none"> <li>• Modeled ECT &gt; 30° C</li> <li>and</li> <li>• ECT &lt; 30° C</li> </ul>

## Ignition System

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0300	Random/Multiple Cylinder Misfire Detected	<ul style="list-style-type: none"> <li>• Emission threshold misfire rate (MR) 1st interval &gt; 1.5%</li> <li>• Emission threshold misfire rate (MR) &gt; 1.5%</li> <li>• Catalyst damage, misfire rate (MR) &gt; 1.5 - 15%</li> </ul>
P0301	Cylinder 1 Misfire Detected	<ul style="list-style-type: none"> <li>• Emission threshold misfire rate (MR) 1st interval &gt; 1.5%</li> <li>• Emission threshold misfire rate (MR) &gt; 1.5%</li> <li>• Catalyst damage, misfire rate (MR) &gt; 1.5 - 15%</li> </ul>
P0302	Cylinder 2 Misfire Detected	<ul style="list-style-type: none"> <li>• Emission threshold misfire rate (MR) 1st interval &gt; 1.5%</li> <li>• Emission threshold misfire rate (MR) &gt; 1.5%</li> <li>• Catalyst damage, misfire rate (MR) &gt; 1.5 - 15%</li> </ul>
P0303	Cylinder 3 Misfire Detected	<ul style="list-style-type: none"> <li>• Emission threshold misfire rate (MR) 1st interval &gt; 1.5%</li> <li>• Emission threshold misfire rate (MR) &gt; 1.5%</li> <li>• Catalyst damage, misfire rate (MR) &gt; 1.5 - 15%</li> </ul>
P0304	Cylinder 4 Misfire Detected	<ul style="list-style-type: none"> <li>• Emission threshold misfire rate (MR) 1st interval &gt; 1.5%</li> <li>• Emission threshold misfire rate (MR) &gt; 1.5%</li> <li>• Catalyst damage, misfire rate (MR) &gt; 1.5 - 15%</li> </ul>
P0305	Cylinder 5 Misfire Detected	<ul style="list-style-type: none"> <li>• Emission threshold misfire rate (MR) 1st interval &gt; 1.5%</li> <li>• Emission threshold misfire rate (MR) &gt; 1.5%</li> <li>• Catalyst damage, misfire rate (MR) &gt; 1.5 - 15%</li> </ul>

DTC	Error Message	Malfunction Criteria and Threshold Value
P0306	Cylinder 6 Misfire Detected	<ul style="list-style-type: none"> <li>Emission threshold misfire rate (MR) 1st interval &gt; 1.5%</li> <li>Emission threshold misfire rate (MR) &gt; 1.5%</li> <li>Catalyst damage, misfire rate (MR) &gt; 1.5 - 15%</li> </ul>
P0326	Knock Sensor 1 Circuit Range/Performance Bank 1 or Single Sensor	<ul style="list-style-type: none"> <li>Lower threshold &lt; 0.029 V</li> <li>Upper threshold &gt; 1.992 V</li> </ul>
P0327	Knock Sensor 1 Circuit Low Bank 1 or Single Sensor	<ul style="list-style-type: none"> <li>Lower threshold &lt; 0.18 V</li> </ul>
P0328	Knock Sensor 1 Circuit High Bank 1 or Single Sensor	<ul style="list-style-type: none"> <li>Upper threshold &gt; 14.8 V</li> </ul>
P0331	Knock Sensor 2 Circuit Range/Performance Bank 2	<ul style="list-style-type: none"> <li>Lower threshold &lt; 0.029 V</li> <li>Upper threshold &gt; 1.992 V</li> </ul>
P0332	Knock Sensor 2 Circuit Low Bank 2	<ul style="list-style-type: none"> <li>Lower threshold &lt; 0.18 V</li> </ul>
P0335	Engine Speed Sensor	<ul style="list-style-type: none"> <li>Open circuit &gt; 1 V</li> <li>Short to grnd &lt; 1.5 V</li> <li>Short to Battery voltage &gt; 3.5 V</li> <li>Signal check no signal</li> </ul>
P0336	Crankshaft Position Sensor "A" Circuit Range/Performance	<ul style="list-style-type: none"> <li>RPM Signal comparison with phase sensor not synchronous</li> <li>Counted versus reference teeth &gt; 1</li> <li>Actual time value vs modeled time value &gt; 1.375</li> </ul>
P0340	Camshaft Position Sensor "A" Circuit Bank 1 or Single Sensor	Signal activity check <ul style="list-style-type: none"> <li>Signal voltage no altering @ 4 Rev</li> </ul>
P0341	Camshaft Position Sensor "A" Circuit Range/Performance Bank 1 or Single Sensor	<ul style="list-style-type: none"> <li>Actual time value vs. min. time value &lt; 1</li> <li>Adaptive value vs. target value &gt; 12.4 °CA</li> <li>Actual time value vs. modeled time value &gt; 3.5</li> </ul>
P0345	Camshaft Position Sensor "A" Circuit Bank 2	Signal activity check <ul style="list-style-type: none"> <li>Signal voltage no altering @ 4 Rev</li> </ul>

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0346	Camshaft Position Sensor "A" Circuit Range/Performance Bank 2	<ul style="list-style-type: none"> <li>• Actual time value vs. min. time value &lt; 1</li> <li>• Adaptive value vs. target value &gt; 12.4° CA</li> <li>• Actual time value vs. modeled time value &gt; 3.5</li> </ul>
P0351	Ignition Coil "A" Primary/ Secondary Circuit	Open circuit <ul style="list-style-type: none"> <li>• Signal current &lt; -0.05 - 0.2 mA</li> <li>• Hardware value from final stage &gt; 0.04 - 0.2 mA</li> </ul>
P0352	Ignition Coil "B" Primary/ Secondary Circuit	Short to ground <ul style="list-style-type: none"> <li>• Signal current &lt; -0.05 - 0.2 mA</li> <li>• Hardware value from final stage &gt; 0.04 - 0.2 mA</li> </ul>
P0353	Ignition Coil "C" Primary/ Secondary Circuit	Short to battery <ul style="list-style-type: none"> <li>• Signal current &lt; -0.05 - 0.2 mA</li> <li>• Hardware value from final stage &gt; 0.04 - 0.2 mA</li> </ul>
P0354	Ignition Coil "D" Primary/ Secondary Circuit	<ul style="list-style-type: none"> <li>• Signal current &lt; -0.05 - 0.2 mA</li> <li>• Hardware value from final stage &gt; 0.04 - 0.2 mA</li> </ul>
P0355	Ignition Coil E Primary/ Secondary Circuit	<ul style="list-style-type: none"> <li>• Signal current &lt; -0.05 - 0.2 mA</li> <li>• Hardware value from final stage &gt; 0.04 - 0.2 mA</li> </ul>
P0356	Ignition Coil F Primary/ Secondary Circuit	<ul style="list-style-type: none"> <li>• Signal current &lt; -0.05 - 0.2 mA</li> <li>• Hardware value from final stage &gt; 0.04 - 0.2 mA</li> </ul>
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

DTC	Error Message	Malfunction Criteria and Threshold Value
P2307	Ignition Coil "C" Primary Control Circuit High	Signal current > 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 current > 5.1 - 7.0 mA

### Additional Exhaust Regulation

DTC	Error Message	Malfunction Criteria and Threshold Value
P0413	Secondary Air Injection System Switching Valve "A" Circuit Open	<ul style="list-style-type: none"> <li>Signal voltage &lt; 0.8 mA</li> <li>Signal Voltage 2.9 to 3.2 V</li> </ul>
P0414	Secondary Air Injection System Switching Valve "A" Circuit Shorted	Short to Battery Voltage: <ul style="list-style-type: none"> <li>Current 3 to 5 A</li> </ul>
P0416	Secondary Air Solenoid Valve 2 Circuit Open Circuit	Signal voltage < 0.8 mA
P0417	Secondary Air Solenoid Valve 2 Circuit Short to Ground or Battery Voltage	Signal voltage < 2.00 V
P0418	Secondary Air Injection System Control "A" Circuit	<ul style="list-style-type: none"> <li>Signal current &lt; 1 mA</li> <li>Signal Voltage 2.9 to 3.2 [ V ]</li> </ul>
P0420	Catalyst System Efficiency Below Threshold Bank 1	Amplitude ratio O2S > 1.5
P0430	Catalyst System Efficiency Below Threshold Bank 2	Amplitude ratio O2S > 1.5
P0441	Evaporative Emission System Incorrect Purge Flow	Deviation HO2S control < 4% <ul style="list-style-type: none"> <li>Purge valve quality &lt; 0,05 [-]</li> </ul>
P0442	EVAP System Leak Detected LDP (Small Leak)	Time for pressure drop < 1.06 - 1.3 Sec.
P0444	Evaporative Emission System Purge Control Valve Circuit Open	Signal current < 0.8mA
P0445	Evaporative Emission System Purge Control Valve Circuit Shorted	Signal voltage < 2.0 V or Signal current > 5 A
P0450	Evaporative Emission System Pressure Sensor/Switch	<ul style="list-style-type: none"> <li>Signal Voltage 2.9 to 3.2 V</li> <li>or</li> <li>Signal Current 0.8 to 4 mA</li> </ul>

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0451	Evaporative Emission System Pressure Sensor/Switch Range/Performance	VLD Pressure Sensor / Switch = Closed
P0452	Fuel Tank Leak Detection System (NVLD) Short to Battery Voltage	Signal voltage > 3.0 V
P0453	Evaporative Emission System Pressure Sensor/Switch	<ul style="list-style-type: none"> <li>• Signal Current 1 to 2 A</li> <li>or</li> <li>• Signal Voltage 2 V</li> </ul>
P0455	EVAP System Leak Detected LDP (Large Leak Detected)	Time for pressure drop < 0.65 - 0.7 s.
P0456	Evaporative Emission System Leak Detected (very small leak)	NVLD switch position open
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 > 2.2 A
P0491	Secondary Air Injection System Insufficient Flow Bank 1	Diference between reference AIR mass flow and calculated AIR mass flow > 18 to 21 [kg/h]
P0492	Secondary Air Injection System Insufficient Flow (Bank 2)	Diference between reference AIR mass flow and calculated AIR mass flow > 18 to 21 [kg/h]

## Speed and Idle Control

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0501	Vehicle Speed Sensor "A" Range/Performance	Communication check • Sensor signal failure
P0502	Vehicle Speed Sensor "A" Circuit Low	Communication check • Sensor signal failure
P0503	Vehicle Speed Sensor Range/Performance	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

DTC	Error Message	Malfunction Criteria and Threshold Value
P050A	Cold Start Idle Air Control System Performance	<ul style="list-style-type: none"> <li>• Out of range low</li> <li>• Engine speed deviation &lt; 80 - 250 rpm</li> <li>• Out of range high</li> <li>• Engine speed deviation &gt; 80 - 250 rpm</li> </ul>
P050B	Cold Start Ignition Timing Performance	Idle difference between commanded spark timing vs. actual value > 20%
P052A	Cold Start "A" Camshaft Position Timing Over-Advanced Bank 1	<ul style="list-style-type: none"> <li>• Adjustment angle difference &gt; 10° CA</li> <li>• Number of checks 2</li> </ul>
P052C	Cold Start "A" Camshaft Position Timing Over-Advanced Bank 2	<ul style="list-style-type: none"> <li>• Adjustment angle difference &gt; 10° CA</li> <li>• Number of checks 2</li> </ul>
P053F	Cold Start Fuel Pressure Performance	Target pressure-actual pressure > 1.5 MPa

### 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
P0603	Internal Hardware Check	SPI Communication lost
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	Control Module Processor ECM fault	EEPROM check failed
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>

DTC	Error Message	Malfunction Criteria and Threshold Value
P0638	Throttle Actuator Control Range/Performance Bank 1	Functional check: close movement <ul style="list-style-type: none"> <li>• Open to 15° &gt; 1.275 s</li> <li>• Then close to ref. point &gt; 1.28 s</li> <li>• Gradient &lt; 7° per second</li> </ul> Functional check open movement <ul style="list-style-type: none"> <li>• Close to 1.99° &gt; 1.275 s</li> <li>• Then open to ref. point &gt; 1.28 s</li> <li>• Gradient &lt; 7° per second</li> </ul> Signal range check @ mechanical stop low <ul style="list-style-type: none"> <li>• TPS 1 signal voltage out-off range 0.208 - 0.852 V</li> </ul> or <ul style="list-style-type: none"> <li>• TPS 2 signal voltage out off range 4.158 - 4.802 V</li> </ul>
P0641	Sensor Reference Voltage "A" Circuit/Open	Signal voltage, deviation +/- 0.3 V
P0642	Sensor Reference Voltage "A" Circuit Low	Signal voltage < 4.62 V
P0643	Sensor Reference Voltage "A" Circuit High	5 V supply voltage > 5.44 V
P0651	Sensor Reference Voltage "B" Circuit/Open	Signal voltage, deviation +/- 0.3 V
P0652	Sensor Reference Voltage "B" Circuit Low	Signal voltage < 4.62 V
P0653	Sensor Reference Voltage "B" Circuit High	5 V supply voltage > 5.44 V
P0657	Actuator Supply Voltage "A" Circuit/Open	Signal voltage, < 2.9 to 3.2 V
P0658	Actuator Supply Voltage "A" Circuit Low	Signal voltage, < 1.95 to 2.2 V
P0659	Actuator Supply Voltage "A" Circuit High	Signal current > 1.2 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	Sense circuit voltage > 6.0 V
P0687	ECM/PCM Power Relay Control Circuit High	Sense circuit voltage < 5.0 V



DTC	Error Message	Malfunction Criteria and Threshold Value
P0688	ECM/PCM Power Relay Sense Circuit /Open	<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 +/- 0.3 V
P0698	Sensor Reference Voltage "C" Circuit Low	Signal voltage, < 4.6-5 V
P0699	Sensor Reference Voltage "C" Circuit High	5 V supply voltage > 4.99 - 5.41 V
U0001	High Speed CAN Communication Bus	CAN message, no feedback
U0002	High Speed CAN Communication Bus Performance	Global time out...receiving no messages
U0100	Lost Communication With ECM/PCM "A"	<ul style="list-style-type: none"> <li>• Failure of all CAN engine messages, Time out more than 490 mSec</li> <li>• Failure of all CAN engine messages but not all CAN messages, Time out more than 1010 mSec</li> </ul>
U0101	Lost Communication with TCM	No message received from TCM
U0121	CAN ABS Brake Unit	No CAN communication with TCU, time-out
U0140	CAN Communication with BCM 1	CAN message no message
U0146	CAN Gateway A	CAN communication with gateway, implausible message
U0155	Communication with ICL	No CAN communication with ICL, time-out
U0302	Software Incompatibility with Transmission Control Module	MT vehicle ECM coded as AT vehicle
U0322	Communication with Body Control Module	Ambient temperature value module not encoded for ambient temp sensor, 00h
U0323	CAN: Instrument Cluster Audi Only	Ambient temp value module not encoded for ambient temp sensor, 00h
U0402	CAN communication with TCM	Invalid data received from TCM <ul style="list-style-type: none"> <li>• Implausible message</li> </ul>

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
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	<ul style="list-style-type: none"> <li>• Out of range: receiving fault value 203.5 mph</li> <li>• Out of range: receiving fault value &gt; 202.81 mph</li> <li>• Out of range: receiving fault value &lt; 1.24 mph</li> </ul>
U0422	CAN: Instrument cluster	Aambient temp. value (initialization), Audi, 01h
U0423	communication with ICL	Invalid data received from ICL implausible message
U0447	Lost Communication With Gateway "B"	Received data from Gateway implausible message
U1103	vehicle in production mode	Proiduction mode = active

## Transmission

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0705	Transmission Range Sensor "A" Circuit Malfunction (PRNDL Input)	-
P0706	Transmission Range Sensor "A" Circuit Range/ Performance	4 bit position code, incorrect
P0707	Transmission Range Sensor Circuit Low	-
P0708	Transmission Range Sensor Circuit High	-
P0710	Transmission Fluid Temperature Sensor "A" Circuit	Sensor short circuit: <ul style="list-style-type: none"> <li>• U_sensor (+), and U_sensor (-) diagnosis by ASIC</li> </ul>

DTC	Error Message	Malfunction Criteria and Threshold Value
P0711	Transmission Fluid Temperature Sensor "A" Circuit Range/Performance	Discontinual temperature: <ul style="list-style-type: none"> <li>• ATF temperature delta T between 2 measurements, &gt; 20° C</li> </ul> Sensor stuck: <ul style="list-style-type: none"> <li>• Comparison ATF vs. chip temperature, ATF temp. must follow chip temp. in certain ranges, 25-40° C</li> </ul>
P0712	Transmission Fluid Temperature Sensor "A" Circuit Low	Circuit low: <ul style="list-style-type: none"> <li>• U_sensor (+), and U_sensor (-) diagnosis by ASIC</li> </ul>
P0713	Transmission Fluid Temperature Sensor "A" Circuit High	Circuit high: <ul style="list-style-type: none"> <li>• U_sensor (+), and U_sensor (-) diagnosis by ASIC</li> </ul>
P0714	Transmission Fluid Temperature Sensor "A" Circuit Intermittent	Circuit high: <ul style="list-style-type: none"> <li>• U_sensor (+), and U_sensor (-) diagnosis by ASIC</li> </ul>
P0716	Input/Turbine Speed Sensor "A" Circuit Range/Performance	Signal higher or lower than threshold <ul style="list-style-type: none"> <li>• Higher, &gt; + 8000 RPM</li> <li>• Lower, &lt; 20 RPM</li> </ul>
P0717	Input/Turbine Speed Sensor "A" Circuit No Signal	Hardware detection
P0721	Output Speed Sensor Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Signal &gt; threshold, &gt; 10000 RPM</li> <li>• Difference between last and actual value &gt; threshold, -1000 RPM</li> <li>• Difference to wheel speeds, &gt; 500 RPM and input speed, &gt; 200 RPM</li> </ul>
P0722	Output Speed Sensor Circuit No Signal	Hardware detection
P0727	Engine Speed Input Circuit No Signal	CAN message signal error flag, =1
P0741	Torque Converter Clutch Circuit Performance or Stuck Off	Rate of (setting of nominal value) - actual value, > 50 RPM
P0746	Pressure Control Solenoid "A" Performance or Stuck Off	PWM hardware detection, 0 or 100%
P0747	Pressure Control Solenoid "A" Stuck On	PWM hardware detection, 0 or 100%

DTC	Error Message	Malfunction Criteria and Threshold Value
P0748	Pressure Control Solenoid "A" Electrical	<ul style="list-style-type: none"> <li>• Current higher or lower than threshold, &gt; 220 mA</li> <li>• EDS output voltage at short to ground or open circuit ~ 0.5 V smaller than EDS supply voltage</li> <li>• Static leakage current flow</li> </ul>
P0751	Shift Solenoid "A" Performance or Stuck Off	<ul style="list-style-type: none"> <li>• If PWM = 0%, diagnosis by ASIC</li> <li>• If <math>0\% \leq \text{PWM}</math>, 7.6% voltage return lead (low), &lt; 0.75 V</li> <li>• If <math>7.6\% \leq \text{PWM}</math>, 92.4% voltage return lead (high), &lt; 0.75 V</li> <li>• If <math>7.6\% \leq \text{PWM}</math>, 92.4% voltage return lead (low), &lt; 0.75 V</li> </ul>
P0752	Shift Solenoid "A" Stuck On	<ul style="list-style-type: none"> <li>• If PWM = 100%, diagnosis by ASIC</li> <li>• If <math>7.6\% \leq \text{PWM} \leq 100\%</math> voltage return lead (high), &gt; 0.3 V</li> </ul>
P0754	Shift Solenoid "A" Intermittent	<ul style="list-style-type: none"> <li>• If PWM = 0%, diagnosis by ASIC</li> <li>• If <math>0\% \leq \text{PWM}</math>, 7.6% voltage return lead (low), &lt; 0.75 V</li> <li>• If <math>7.6\% \leq \text{PWM}</math>, 92.4% voltage return lead (high), &lt; 0.75 V</li> <li>• If <math>7.6\% \leq \text{PWM}</math>, 92.4% voltage return lead (low), &lt; 0.75 V</li> </ul>
P0776	Pressure Control Solenoid "B" Performance or Stuck Off	PWM hardware detection, 0 or 100%
P0777	Pressure Control Solenoid "B" Stuck On	PWM hardware detection, 0 or 100%
P0778	Pressure Control Solenoid "B" Electrical	<ul style="list-style-type: none"> <li>• Current higher or lower than threshold, &lt; 730 mA</li> <li>• EDS output voltage at short to ground or open circuit ~ 0.5 V smaller than EDS supply voltage</li> <li>• Static leakage current flow</li> </ul>
P0796	Pressure Control Solenoid "C" Performance or Stuck Off	PWM hardware detection, 0 or 100%
P0797	Pressure Control Solenoid "C" Stuck On	PWM hardware detection, 0 or 100%

DTC	Error Message	Malfunction Criteria and Threshold Value
P0798	Pressure Control Solenoid "C" Electrical	<ul style="list-style-type: none"> <li>• Current higher or lower than threshold, &gt; 220 mA</li> <li>• EDS output voltage at short to ground or open circuit ~ 0.5 V smaller than EDS supply voltage</li> <li>• Static leakage current flow</li> </ul>
P0889	TCM Power Relay Sense Circuit Range/Performance	FET drive, not possible
P0890	TCM Power Relay Sense Circuit Low	<ul style="list-style-type: none"> <li>• Solenoid power supply voltage, &lt; 1.4 V</li> <li>• Drop voltage over high side FET, &gt; 1 V</li> </ul>
P0891	TCM Power Relay Sense Circuit High	Hardware detection
P0892	TCM Power Relay Sense Circuit Intermittent	Hardware detection
P2637	Torque Management Feedback Signal "A"	CAN message signal error flag, = 1
P2714	Pressure Control Solenoid "D" Performance or Stuck Off	PWM hardware detection, 0 or 100%
P2715	Pressure Control Solenoid "D" Stuck On	PWM hardware detection, 0 or 100%
P2716	Pressure Control Solenoid "D" Electrical	<ul style="list-style-type: none"> <li>• Current higher or lower than threshold, &lt; 730 mA</li> <li>• EDS output voltage at short to ground or open circuit ~ 0.5 V smaller than EDS supply voltage</li> <li>• Static leakage current flow</li> </ul>
P2723	Pressure Control Solenoid "E" Performance or Stuck Off	PWM hardware detection, 0 or 100%
P2725	Pressure Control Solenoid "E" Electrical	<ul style="list-style-type: none"> <li>• Current higher or lower than threshold, &lt; 730 mA</li> <li>• EDS output voltage at short to ground or open circuit ~ 0.5 V smaller than EDS supply voltage</li> <li>• Static leakage current flow</li> </ul>
P2732	Pressure Control Solenoid "F" Performance or Stuck Off	PWM hardware detection, 0 or 100%
P2733	Pressure Control Solenoid "F" Stuck On	PWM hardware detection, 0 or 100%

DTC	Error Message	Malfunction Criteria and Threshold Value
P2734	Pressure Control Solenoid "F" Electrical	<ul style="list-style-type: none"> <li>• EDS output voltage at short to ground or open circuit ~ 0.5 V smaller than EDS supply voltage</li> <li>• Static leakage current flow</li> </ul>
P2735	Pressure Control Solenoid "F" Intermittent	PWM hardware detection, 0 or 100%

### Fuel and Air Ratios Control Module

DTC	Error Message	Malfunction Criteria and Threshold Value
P10A0	Actuation Regulating Flap for Intake Air Electrical Error	<ul style="list-style-type: none"> <li>• Duty cycle &gt; 95% and/or duty cycle &lt;-95 [%]</li> <li>• Duty cycle &gt; 0.3 s at &gt; 98 %</li> </ul>
P10A4	Regulating Flap for Intake Air Mechanical Malfunction	<ul style="list-style-type: none"> <li>• Difference adapted value vs. actual value &gt; 6.5 [%]</li> <li>• Absolute value of maximum deviation between predicted and real value: &gt; 8%</li> <li>• Adaptive value &lt; 60 [%] and/or adaptive value &gt; 88 [%]</li> </ul>
P10A5	Potentiometer Regulating Flap for Intake Air Signal Too High	Signal voltage > 4.9 V
P10A6	Potentiometer Regulating Flap for Intake Air Signal Too Low	Signal voltage < 0.1 V
P10A7	Adaptation Regulating Flap for Intake Air Soiled	Difference actual signal voltage to learned signal voltage > 0.05 V
P10A8	Adaptation Regulating Flap for Intake Air Lower Limit Not Reached	RFP Signal Voltage in closed position ≤ 0.35 - ≥ 0.65 V
P1114	Internal Resistance Too Large Bank 1, Sensor 2	Heater resistance, (128-648)*(8-40)1.02-25.9 k Ω (dep. on mod. exhaust temp. and heater power)
P12A1	Fuel Rail Pressure Sensor Inappropriately Low	<ul style="list-style-type: none"> <li>• Deviation fuel rail pressure control &gt; 0.060 g/Rev and</li> <li>• Deviation HO2S control &lt; -22.5%</li> </ul>

DTC	Error Message	Malfunction Criteria and Threshold Value
P12A2	Fuel Rail Pressure Sensor Inappropriately High	<ul style="list-style-type: none"> <li>• Deviation fuel rail pressure control &lt; 0.051 g/Rev</li> <li>• Deviation HO2S control &gt; 30%</li> </ul>
P12A4	Fuel Rail Pump Control Valve Stuck Closed	<ul style="list-style-type: none"> <li>• Deviation fuel rail pressure control &lt; -0.120 g/rev</li> <li>• Lambda controller output (no map, just bottom and top limit) -15 - 15%</li> <li>• Actual pressure - target pressure &gt;3.5 MPa</li> <li>• Lambda controller output (no map, just bottom and top limit) -15 - 15%</li> </ul>
P13EA	Cold Start Ignition Timing Performance Off Idle	Part Load Difference between commanded spark timing vs. actual value > 15%
P150A	Engine Off Timer Performance	<ul style="list-style-type: none"> <li>• Difference between engine-off-time &lt; -12.0 Sec. and</li> <li>• ECM after run-time &gt; 12.0 Sec.</li> </ul>
P169A	Loading Mode Active	Transport mode active
P2101	Throttle Actuator "A" Control Motor Circuit Range/ Performance	<ul style="list-style-type: none"> <li>• Duty cycle &gt; 0.4 s at &gt; 98% and</li> <li>• Actual TPS - ref. point &gt; 1.5° or</li> <li>• Actual TPS - calc. value &gt; 0.4 s at &gt; 8°</li> </ul>
P2106	Throttle Actuator Control System - Forced Limited Power	ECM power stage = failure
P2122	Throttle/Pedal Position Sensor/Switch "D" Circuit Low	Signal voltage < 0.4 V
P2123	Throttle/Pedal Position Sensor/Switch "D" Circuit High	Signal voltage > 4.82 V
P2127	Throttle/Pedal Position Sensor/Switch "E" Circuit Low	Signal voltage < 0.2 V
P2128	Throttle/Pedal Position Sensor/Switch "E" Circuit High	Signal voltage > 2.8 V
P2138	Throttle/Pedal Position Sensor/Switch "D"/"E" Voltage Correlation	Signal voltage sensor 1 vs 2, > 0.24 V
P2147	Fuel Injector Group "A" Supply Voltage Circuit Low	Signal current > 12 A

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P2148	Fuel Injector Group "A" Supply Voltage Circuit High	Signal current > 33 A
P2150	Fuel Injector Group "B" Supply Voltage Circuit Low	Signal current > 12 A
P2151	Fuel Injector Group "B" Supply Voltage Circuit High	Signal current > 33 A
P2153	Fuel Injector Group "C" Supply Voltage Circuit Low	Signal current > 12 A
P2154	Fuel Injector Group "C" Supply Voltage Circuit High	Signal current > 33 A
P2181	Cooling System Performance	<ul style="list-style-type: none"> <li>• ECT &lt; 75 °C</li> <li>• Mass air integral 3.5 - 26.0 kg</li> </ul>
P2195	HO2 Sensor Signal Biased/ Stuck Lean Bank 1 Sensor 1	HO2S value > 1.1 V
P2196	HO2 Sensor Signal Biased/ Stuck Rich Bank 1 Sensor 1	HO2S value < 0.9 V
P2197	HO2 Sensor Signal Biased/ Stuck Lean Bank 2 Sensor 1	HO2S value > 1.1 V
P2198	HO2 Sensor Signal Biased/ Stuck Rich Bank 2 Sensor 1	HO2S value < 0.9 V
P219C	Cylinder 1 Air-Fuel Ratio Imbalance	<ul style="list-style-type: none"> <li>• Adaptive value &lt; -10%</li> <li>or</li> <li>• &gt; 10%</li> </ul>
P219D	Cylinder 2 Air-Fuel Ratio Imbalance	<ul style="list-style-type: none"> <li>• Adaptive value &lt; -10%</li> <li>or</li> <li>• &gt; 10%</li> </ul>
P219E	Cylinder 3 Air-Fuel Ratio Imbalance	<ul style="list-style-type: none"> <li>• Adaptive value &lt; -10%</li> <li>or</li> <li>• &gt; 10%</li> </ul>
P219F	Cylinder 4 Air-Fuel Ratio Imbalance	<ul style="list-style-type: none"> <li>• Adaptive value &lt; -10%</li> <li>or</li> <li>• &gt; 10%</li> </ul>
P21A0	Cylinder 5 Air-Fuel Ratio Imbalance	<ul style="list-style-type: none"> <li>• Adaptive value &lt; -10%</li> <li>or</li> <li>• &gt; 10%</li> </ul>
P21A1	Cylinder 6 Air-Fuel Ratio Imbalance	<ul style="list-style-type: none"> <li>• Adaptive value &lt; -10%</li> <li>or</li> <li>• &gt; 10%</li> </ul>



DTC	Error Message	Malfunction Criteria and Threshold Value
P2227	Barometric Pressure Sensor "A" Circuit Range/Performance	Pressure difference in cross-check between boost press. sensor 1/2; Intake Manifold press., ambient press. >7 kPa
P2237	HO2 Sensor Positive Current Control Circuit Open Bank 1, Sensor 1	<ul style="list-style-type: none"> <li>• Signal activity check-failed</li> <li>• Open Circuit pump Current (IP)</li> </ul>
P2240	HO2 Sensor Positive Current Control Circuit Open Bank 2, Sensor 1	<ul style="list-style-type: none"> <li>• Signal activity check-failed</li> <li>• Open Circuit pump Current (IP)</li> </ul>
P2243	HO2 Sensor Reference Voltage Circuit/Open Bank 1 Sensor 1	<ul style="list-style-type: none"> <li>• Signal activity check-failed</li> <li>• Open Circuit Nernst Voltage (UN)</li> </ul>
P2247	HO2 Sensor Reference Voltage Circuit/Open Bank 2 Sensor 1	<ul style="list-style-type: none"> <li>• Signal activity check-failed</li> <li>• Open Circuit Nernst Voltage (UN)</li> </ul>
P2251	HO2 Sensor Negative Current Control Circuit Open Bank 1, Sensor 1	<ul style="list-style-type: none"> <li>• Signal activity check-failed</li> <li>• Open Circuit Virtual Mass (VM)</li> </ul>
P2254	HO2 Sensor Negative Current Control Circuit Open Bank 2, Sensor 1	<ul style="list-style-type: none"> <li>• Signal activity check-failed</li> <li>• Open Circuit Virtual Mass (VM)</li> </ul>
P2257	Secondary Air Injection System Control "A" Circuit Low	Signal voltage < 2.00 V
P2258	Secondary Air Injection System Control "A" Circuit High	Signal current > 3 A
P2270	HO2 Sensor Signal Biased/Stuck Lean Bank 1 Sensor 2	Signal voltage < 0.750 V and number of checks = 2
P2271	HO2 Sensor Signal Biased/Stuck Rich Bank 1 Sensor 2	Signal voltage > 0.15 V and number of checks ≥ 2
P2272	HO2 Sensor Signal Biased/Stuck Lean Bank 2 Sensor 2	Signal voltage < 0.750 V and number of checks = 2
P2273	HO2 Sensor Signal Biased/Stuck Rich Bank 2 Sensor 2	Signal voltage > 0.15 V and number of checks ≥ 2
P2293	Fuel Pressure Regulator 2 Performance	<ul style="list-style-type: none"> <li>• Difference between target pressure vs. actual pressure, &gt; 1.50mPa</li> <li>• Difference between target pressure vs. actual pressure, &lt; -1.50 mPa</li> </ul>

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P2294	Fuel Pressure Regulator 2 Control Circuit	Signal current < 0.8 mA
P2295	Fuel Pressure Regulator 2 Control Circuit Low	< 2.0 V
P2296	Fuel Pressure Regulator 2 Control Circuit High	Signal current > 8 A

### **Additional Emissions Regulations**

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P2414	HO2 Sensor Exhaust Sample Error Bank 1, Sensor 1	O2S signal front > 3.1 V
P2415	HO2 Sensor Exhaust Sample Error Bank 2, Sensor 1	O2S signal front > 3.1 V
P2440	Secondary Air Injection System Switching Valve Stuck Open Bank 1	Deviation of lambda controller > 15.00%
P2442	Secondary Air Injection System Switching Valve Stuck Open Bank 2	Deviation of lambda controller > 15.00%
P2539	Low Pressure Fuel System Sensor Circuit	Signal voltage > 4.8 V
P2541	Low Pressure Fuel System Sensor Circuit Low	Signal voltage < 0.2 V
P2626	HO2 Sensor Pumping Current Trim Circuit Open Bank 1 Sensor 1	<ul style="list-style-type: none"> <li>• O2S signal front &gt; 4.7 V</li> <li>• Open Circuit Adjustment Voltage (IA)</li> </ul>
P2629	HO2 Sensor Pumping Current Trim Circuit Open Bank 2 Sensor 1	<ul style="list-style-type: none"> <li>• O2S signal front &gt; 4.7 V</li> <li>• Open Circuit Adjustment Voltage (IA)</li> </ul>

# DTC CHART

## Engine Codes - 4.0L CEUA, CGTA

### Fuel and Air Mixture, Additional Emissions Regulations

DTC	Error Message	Malfunction Criteria and Threshold Value
P000A	Intake Camshaft Position Slow Response, Bank 1	<ul style="list-style-type: none"> <li>• Difference between target position vs. actual position &gt; 8.00 - 63.75 °CRK for time &gt; 1.5 - 3.0 s</li> <li>and</li> <li>• Adjustment angle <math>\geq</math> 3.00 °CRK</li> </ul>
P000B	"B" Camshaft Position Slow Response Bank 1	<ul style="list-style-type: none"> <li>• Difference between target position vs. actual position &gt; 8.00 - 63.75 °CRK for time &gt; 1.5 - 3.0 s</li> <li>and</li> <li>• Adjustment angle <math>\geq</math> 3.00 °CRK</li> </ul>
P000C	"A" Camshaft Position Slow Response (Bank 2	<ul style="list-style-type: none"> <li>• Difference between target position vs. actual position &gt; 8.00 - 63.75 °CRK for time &gt; 1.5 - 3.0 s</li> <li>and</li> <li>• Adjustment angle <math>\geq</math> 3.00 °CRK</li> </ul>
P000D	"B" Camshaft Position Slow Response Bank 2	<ul style="list-style-type: none"> <li>• Difference between target position vs. actual position &gt; 8.00 - 63.75 °CRK for time &gt; 1.5 - 3.0 s</li> <li>and</li> <li>• Adjustment angle <math>\geq</math> 3.00 °CRK</li> </ul>
P0010	"A" Camshaft Position Actuator Control Circuit/Open Bank 1	Signal voltage 4.70 - 5.40 V
P0011	"A" Camshaft Position - Timing Over-Advanced or System Performance Bank 1	<ul style="list-style-type: none"> <li>• Difference between target position vs. actual position &gt; 8.00 - 63.75 °CRK for time &gt; 1.5 - 3.0 s</li> <li>and</li> <li>• Adjustment angle &lt; 3.00 °CRK</li> </ul>
P0013	"B" Camshaft Position Actuator Control Circuit/Open Bank 1	Signal voltage 4.70 - 5.40 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P0014	"B" Camshaft Position - Timing Over-Advanced or System Performance Bank 1	<ul style="list-style-type: none"> <li>• Difference between target position vs. actual position &gt; 8.00 - 63.75 °CRK for time &gt; 1.5 - 3.0 s</li> <li>and</li> <li>• Adjustment angle &lt; 3.00 °CRK</li> </ul>
P0016	Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor A	<ul style="list-style-type: none"> <li>• Permissible deviation &lt; -11.01° CRK</li> <li>and</li> <li>• Engine speed no signal</li> </ul>
P0017	Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor B	<ul style="list-style-type: none"> <li>• Permissible deviation &lt; -11.01° CRK</li> <li>or</li> <li>• Permissible deviation &gt; 11.01° CRK</li> </ul>
P0018	Crankshaft Position - Camshaft Position Correlation Bank 2 Sensor A	<ul style="list-style-type: none"> <li>• Permissible deviation &lt; -11.01° CRK</li> <li>and</li> <li>• Engine speed no signal</li> </ul>
P0019	Crankshaft Position - Camshaft Position Correlation Bank 2 Sensor B	<ul style="list-style-type: none"> <li>• Permissible deviation &lt; -11.01° CRK</li> <li>or</li> <li>• Permissible deviation &gt; 11.01° CRK</li> </ul>
P0020	"A" Camshaft Position Actuator Control Circuit/Open Bank 2	Signal voltage 4.70 - 5.40 V
P0021	"A" Camshaft Position - Timing Over-Advanced or System Performance Bank 2	<ul style="list-style-type: none"> <li>• Difference between target position vs. actual position &gt; 8.00 - 63.75 °CRK for time &gt; 1.5 - 3.0 s</li> <li>and</li> <li>• Adjustment angle &lt; 3.00 °CRK</li> </ul>
P0023	"B" Camshaft Position Actuator Control Circuit/Open Bank 2	Signal voltage 4.70 - 5.40 V
P0024	"B" Camshaft Position - Timing Over-Advanced or System Performance Bank 2	<ul style="list-style-type: none"> <li>• Difference between target position vs. actual position &gt; 8.00 - 63.75 °CRK for time &gt; 1.5 - 3.0 s</li> <li>and</li> <li>• Adjustment angle &lt; 3.00 °CRK</li> </ul>

DTC	Error Message	Malfunction Criteria and Threshold Value
P0030	HO2S Heater Control Circuit (Bank 1, Sensor 1) Open Circuit	Signal voltage > 4.70 - 5.40 V
P0031	HO2S Heater Control Circuit Low (Bank 1, Sensor 1) Short to Ground	Signal voltage < 0.0 - 3.26 V
P0032	O2S Heater Control Circuit High (Bank 1, Sensor 1) Short to B+	Heater current > 5.50 A
P0036	HO2S Heater Control Circuit (Bank 1, Sensor 2) Open Circuit	Signal voltage 2.34 - 3.59 V
P0037	HO2S Heater Control Circuit Low (Bank 1, Sensor 2) short to ground	Signal voltage < 2.34 V
P0038	HO2S Heater Control Circuit High Bank 1 Sensor 2	Signal current > 3.59 A
P0040	O2 Sensor Signals Swapped Bank 1 Sensor 1/ Bank 2 Sensor 1	Lambda controllers exceed thresholds in opposite directions <ul style="list-style-type: none"> <li>• Case 1: lambda control value bank 1 &lt; 0.80</li> </ul> and <ul style="list-style-type: none"> <li>• Lambda control value bank 2 &gt; 1.20</li> </ul> <ul style="list-style-type: none"> <li>• Case 2: lambda control value bank 1 &gt; 1.20</li> </ul> and <ul style="list-style-type: none"> <li>• Lambda control value bank 2 &lt; 0.80</li> </ul>
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
P0050	HO2S Heater Control Circuit Bank 2 Sensor 1	Signal voltage > 4.70 - 5.40 V
P0051	HO2S Heater Control Circuit Low Bank 2 Sensor 1	Signal voltage 0.0 - 3.26 V
P0052	HO2S Heater Control Circuit High Bank 2 Sensor 1	Heater current > 5.50 A
P0056	HO2S Heater Control Circuit Bank 2 Sensor 2	Signal voltage 2.34 - 3.59 V

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0057	HO2S Heater Control Circuit Low Bank 2 Sensor 2	Heater voltage < 2.34 V
P0058	HO2S Heater Control Circuit High Bank 2 Sensor 2	Signal current > 3.59 A
P0070	Ambient Air Temperature Sensor Circuit "A"	Ambient air temp < 50.0° C
P0071	Ambient Air Temperature Sensor Circuit "A" Range/Performance	<ul style="list-style-type: none"> <li>• Difference ECT vs. IAT at engine start &lt; 24.8 - 39.8 K and</li> <li>• Difference IAT vs. AAT at engine start &gt; 24.8 - 39.8 K and</li> <li>• Difference AAT vs. ECT at engine start &gt; 24.8 - 39.8 K (depending on engine off time)</li> </ul>
P0072	Ambient Air Temperature Sensor Circuit "A" Low	Ambient air temp > 87.0° C
P007C	Intake Air Temperature Sensor After Intercooler 1	Intake air temperature < 0.099 V
P007D	Intake Air Temperature Sensor After Intercooler 1	Intake air temperature > 3.20 V
P0087	Fuel Rail/System Pressure - Too Low	<ul style="list-style-type: none"> <li>• Pressure control activity &gt; 1.0 mPa and</li> <li>• Fuel trim activity 0.90 - 20 and</li> <li>• Difference between target pressure vs. actual pressure &gt; 0.40 mPa</li> </ul>
P0088	Fuel Rail/System Pressure - Too High	Fuel rail pressure > 13.9 MPa
P0089	Fuel Pressure Regulator 1 Performance	<ul style="list-style-type: none"> <li>• Difference between actual pressure - target pressure &gt; 200 kPa</li> <li>• Pressure control activity &lt; -350 kPa or &gt; 350 kPa</li> </ul>
P008A	Low Pressure Fuel System Pressure - Too Low	< 80.0 kPa
P008B	Low Pressure Fuel System Pressure - Too High	Actual press > 850 MPa

DTC	Error Message	Malfunction Criteria and Threshold Value
P0096	Intake Air Temperature Too High	Difference charge air cooler temp. sensor 1 vs. median between (ECT, IAT, Charge air cooler temp. sensor 1, Charge air cooler temp. sensor 2) > 9.8 K
P0097	Intake Air Temperature Sensor 2 Circuit Low Bank 1	Signal voltage < 0.10 V
P0098	Intake Air Temperature Sensor 2 Circuit High Bank 1	Signal voltage > 4.62 V
P00A6	Intake Air Temperature Sensor 2 Circuit Range/Performance Bank 2	Difference charge air cooler temp. sensor 2 vs. median between (ECT, IAT, Charge air cooler temp. sensor 2, Charge air cooler temp. sensor 1) > 9.8 K
P00A7	Intake Air Temperature Sensor 2 Circuit Low Bank 2	Signal Voltage < 0.10 V
P00A8	Intake Air Temperature Sensor 2 Circuit High Bank 2	Signal Voltage > 4.62 V
P0106	Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance	Boost pressure signal • Manifold pressure signal: variation between state 1 and 2 < 50.00 [hPa]
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low	• Signal voltage < 0.20 V Range check: • Manifold pressure signal < 80.00 hPa
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High	• Signal voltage > 4.80 V Range check: • Manifold pressure signal > 1170.00 hPa
P0111	Intake Air Temperature Sensor 1 Circuit Range/Performance	• Difference IAT vs. ECT at engine start > 24.8 - 39.8 K • (Depending on engine off time) and difference IAT vs. AAT at engine start > 24.8 - 39.8 K
P0112	Intake Air Temperature Sensor 1 Circuit Low Bank 1	Signal voltage < 0.15 V
P0113	Intake Air Temperature Sensor 1 Circuit High Bank 1	Signal voltage > 4.50 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P0116	Engine Coolant Temperature Sensor 1 Circuit Range/Performance.	<ul style="list-style-type: none"> <li>• Difference ECT vs. IAT at engine start &gt; 24.8 - 39.8 K and</li> <li>• Difference IAT vs. AAT at engine start &lt; 24.8 - 39.8 K and</li> <li>• Difference AAT vs. ECT at engine start &lt; 24.8 - 39.8 K (depending on engine off time)</li> </ul>
P0117	Engine Coolant Temperature Sensor 1 Circuit Low	Engine coolant temperature > 140° C
P0118	Engine Coolant Temperature Sensor 1 Circuit High	Engine coolant temperature < -40° 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>• TPS 1 calculated value &gt; 9.00%</li> </ul>
P0122	Throttle/Pedal Position Sensor A Circuit Low Input	Signal voltage < 0.18 V
P0123	Throttle/Pedal Position Sensor A Circuit High Input	Signal voltage > 4.63 V
P012B	Charger Inlet Pressure Rationality Check	<ul style="list-style-type: none"> <li>• Pressure difference in cross check between boost pressure sensor 1/2; IM pressure, ambient pressure sensor</li> <li>• Pressure difference in cross check between boost pressure sensor 1/2; IM pressure</li> </ul>
P012C	Charger Inlet Pressure Short To Ground	Signal voltage < 0.2 V
P012D	Charger Inlet Pressure Short To B+	Signal voltage > 4.8 V
P0130	O2 Sensor Circuit (Bank 1, Sensor 1)	Sensor element temperature < 690° C
P0131	O2 Sensor Circuit, Bank 1, Sensor 1 Low Voltage	Virtual mass (VM) voltage < 1.75 V
		Nernst voltage (UN) < 1.50 V
		Adjustment voltage (IP) < 3.0 V
P0132	O2 Sensor Circuit, Bank 1, Sensor 1 High Voltage	Virtual mass (VM) voltage > 3.25 V
		Nernst voltage (UN) > 4.40 V
		Adjustment voltage (IP) > 7.00 V



DTC	Error Message	Malfunction Criteria and Threshold Value
P0133	O2 Circuit Slow Response (Bank 1, Bank 2)	<p>Symmetric fault:</p> <ul style="list-style-type: none"> <li>• Difference of R2L area ratio vs. L2R area ratio -0.50 - 1.00</li> <li>• Lower value of both counters for area ratio R2L and L2R <math>\geq 5</math> times</li> </ul> <p>Delay Time:</p> <ul style="list-style-type: none"> <li>• Gradient ratio <math>\geq 0.30</math></li> <li>• Lower value of both area ratios R2L and L2R <math>&lt; 0.30</math></li> </ul> <p>Transient Time:</p> <ul style="list-style-type: none"> <li>• Gradient ratio <math>\geq 0.30</math></li> <li>• Gradient ratio <math>\leq 0.60</math></li> <li>• Lower value of both area ratios R2L and L2R <math>&lt; 0.30</math></li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>• Lower value of both gradient ratios R2L and L2R <math>&lt; 0.30</math></li> </ul> <p>Asymmetric fault:</p> <ul style="list-style-type: none"> <li>• Difference of R2L area ratio vs. L2R area ratio NOT (-0.50 - 1.00)</li> <li>• Values of both counters for area ratio R2L and L2R <math>\geq 5</math> times</li> </ul> <p>Delay Time:</p> <ul style="list-style-type: none"> <li>• Gradient ratio <math>\geq 0.30</math></li> <li>• Lower value of both area ratios R2L and L2R <math>&lt; 0.30</math></li> </ul> <p>Transient Time:</p> <ul style="list-style-type: none"> <li>• Gradient ratio <math>\geq 0.30</math>)</li> <li>• Gradient ratio <math>\leq 0.60</math></li> <li>• Lower value of both area ratios R2L and L2R <math>&lt; 0.30</math></li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>• Lower value of both gradient ratios R2L and L2R <math>&lt; 0.30</math></li> </ul>

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0135	O2 Sensor Heater Circuit (Bank 1, Sensor 1)	Out of range high <ul style="list-style-type: none"> <li>• O2S ceramic temperature &lt; 725° C</li> </ul> and <ul style="list-style-type: none"> <li>• Heater duty cycle 90.00%</li> </ul> Rationality check (sensor heating up) <ul style="list-style-type: none"> <li>• O2S ceramic temperature &lt; 725° C</li> </ul> and <ul style="list-style-type: none"> <li>• Time after O2S heater on 40 Sec.</li> </ul>
P0136	O2 Sensor Circuit Bank 1, Sensor 2	Delta O2S signal rear > 2 V
P0137	O2 Sensor Circuit Low Voltage Bank 1, Sensor 2	<ul style="list-style-type: none"> <li>• Signal voltage &lt; 0.06 V for time &gt; 3 Sec.</li> </ul> and <ul style="list-style-type: none"> <li>• Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3 measurements) &lt; 0.01 V</li> </ul>
P0138	O2 Sensor Circuit High Voltage (Bank 1, Sensor 2)	Signal voltage > 1.08 V for > 5 Sec.
P0139	O2 Sensor Circuit Slow Response (Bank 1 Sensor 2)	O2S rear signal 640 - 645 mV
P013A	O2 Sensor Slow Response - Rich to Lean Bank 1 Sensor 2	<ul style="list-style-type: none"> <li>• EWMA filtered max differential transient time at fuel cut off <math>\geq 0.5</math> Sec</li> </ul> and <ul style="list-style-type: none"> <li>• Number of checks <math>\geq 3.00</math> (initial phase and step function)</li> </ul>
P013C	O2 Sensor Bank 2 Sensor 2 Slow Response - Rich to Lean	<ul style="list-style-type: none"> <li>• EWMA filtered max differential transient time at fuel cut off <math>\geq 0.5</math> Sec</li> </ul> and <ul style="list-style-type: none"> <li>• Number of checks <math>\geq 3.00</math> (initial phase and step function)</li> </ul>

DTC	Error Message	Malfunction Criteria and Threshold Value
P013D	O2 Sensor Slow Response - Lean to Rich Bank 2 Sensor 2	<ul style="list-style-type: none"> <li>EWMA filtered max differential transient time at fuel cut off <math>\geq 0.5</math> Sec</li> <li>and</li> <li>Number of checks <math>\geq 3.00</math> (initial phase and step function)</li> </ul>
P013E	O2 Sensor Delayed Response - Rich to Lean Bank 1 Sensor 2	<ul style="list-style-type: none"> <li>EWMA filtered max differential transient time at fuel cut off <math>\geq 0.5</math> Sec</li> <li>and</li> <li>Number of checks <math>\geq 3.00</math> (initial phase and step function)</li> </ul>
P013F	O2 Sensor Delayed Response - Lean to Rich Bank 1 Sensor 2	<ul style="list-style-type: none"> <li>EWMA filtered max differential transient time at fuel cut off <math>\geq 0.5</math> Sec</li> <li>and</li> <li>Number of checks <math>\geq 3.00</math> (initial phase and step function)</li> </ul>
P0140	O2 Sensor Circuit No Activity Detected Bank 1 Sensor 2	<ul style="list-style-type: none"> <li>Signal voltage .40 - .60 mV for <math>&gt; 3</math> Sec</li> <li>and</li> <li>Difference in sensor voltage with load pulse and voltage without load pulse (mean value of 3 measurements) <math>\geq 2.80</math> V</li> </ul>
P0140	O2S Signal Check - Circuit Continuity (sensor ground line open circuit)	<ul style="list-style-type: none"> <li>Internal resistance <math>&gt; 80,000\Omega</math></li> <li>and exhaust temperature <math>&gt; 700^\circ\text{C}</math></li> </ul>
P0141	O2 Heater Circuit (Bank 1, Sensor 2) Out of Range	Heater resistance $> 500 - 10000\Omega$
P0145	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</math> Sec.</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
P014A	O2 Sensor Delayed Response - Rich to Lean Bank 2 Sensor 2	<ul style="list-style-type: none"> <li>• EWMA filtered max differential transient time at fuel cut off <math>\geq 0.5</math> s</li> <li>• and number of checks <math>\geq 3.00</math> (initial phase and step function)</li> </ul>
P014B	O2 Sensor Delayed Response - Lean to Rich Bank 2 Sensor 2	<ul style="list-style-type: none"> <li>• EWMA filtered max differential transient time at fuel cut off <math>\geq 0.5</math> s</li> <li>• and number of checks <math>\geq 3.00</math> (initial phase and step function)</li> </ul>
P0150	O2 Sensor Circuit (Bank 1, Sensor 1)	Sensor element temperature $< 690^{\circ}$ C
P0151	O2 Sensor Circuit, Bank 2 Sensor 1 Low Voltage	Virtual mass (VM) voltage $< 1.75$ V
		Nernst voltage (UN) $< 1.50$ V
		Adjustment voltage (IP) $< 3.0$ V
P0152	O2 Sensor Circuit Bank 2 Sensor 1 High Voltage	Virtual mass (VM) voltage $> 3.25$ V
		Nernst voltage (UN) $> 4.40$ V
		Adjustment voltage (IP) $> 7.00$ V

DTC	Error Message	Malfunction Criteria and Threshold Value
P0153	O2 Circuit Slow Response (Sensor 1, Bank 2)	<p>Symmetric fault:</p> <ul style="list-style-type: none"> <li>• Difference of R2L area ratio vs. L2R area ratio -0.50 - 1.00</li> <li>• Lower value of both counters for area ratio R2L and L2R <math>\geq 5</math> times</li> </ul> <p>Delay Time:</p> <ul style="list-style-type: none"> <li>• Gradient ratio <math>\geq 0.30</math></li> <li>• Lower value of both area ratios R2L and L2R <math>&lt; 0.30</math></li> </ul> <p>Transient Time:</p> <ul style="list-style-type: none"> <li>• Gradient ratio <math>\geq 0.30</math></li> <li>• Gradient ratio <math>\leq 0.60</math></li> <li>• Lower value of both area ratios R2L and L2R <math>&lt; 0.30</math></li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>• Lower value of both gradient ratios R2L and L2R <math>&lt; 0.30</math></li> </ul> <p>Asymmetric fault:</p> <ul style="list-style-type: none"> <li>• Difference of R2L area ratio vs. L2R area ratio NOT (-0.50 - 1.00)</li> <li>• Values of both counters for area ratio R2L and L2R <math>\geq 5</math> times</li> </ul> <p>Delay Time:</p> <ul style="list-style-type: none"> <li>• Gradient ratio <math>\geq 0.30</math></li> <li>• Lower value of both area ratios R2L and L2R <math>&lt; 0.30</math></li> </ul> <p>Transient Time:</p> <ul style="list-style-type: none"> <li>• Gradient ratio <math>\geq 0.30</math>)</li> <li>• Gradient ratio <math>\leq 0.60</math></li> <li>• Lower value of both area ratios R2L and L2R <math>&lt; 0.30</math></li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>• Lower value of both gradient ratios R2L and L2R <math>&lt; 0.30</math></li> </ul>

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0155	O2 Sensor Heater Circuit Bank 2 Sensor 1	Out of range high <ul style="list-style-type: none"> <li>• O2S ceramic temperature &lt; 725 °C</li> <li>and</li> <li>• Heater duty cycle &gt; 90.00%</li> </ul> Rationality check (sensor heating up) <ul style="list-style-type: none"> <li>• O2S ceramic temperature &lt; 725 °C</li> <li>and</li> <li>• Time after O2S heater on 40.0 Sec</li> </ul>
P0156	O2 Circuit (Bank 1, Sensor 2)	Delta O2S signal rear > 2 V
P0157	O2 Sensor Circuit Low Voltage (Bank 2 Sensor 2)	<ul style="list-style-type: none"> <li>• Signal voltage &lt; 0.06 V for time &gt; 3.0 Sec</li> <li>and</li> <li>• Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3 measurements) &lt; 0.01 V</li> </ul>
P0158	O2 Sensor Circuit High Voltage Bank 2 Sensor 2	Signal voltage > 1.08 V for time > 5.0 Sec
P0159	O2 Circuit Slow Response (Bank 1, Sensor 2)	O2S rear signal 640 - 645 mV
P0160	O2S signal Check - Circuit Continuity (sensor ground line open circuit)	<ul style="list-style-type: none"> <li>• Internal resistance &gt; 80,000Ω</li> <li>and</li> <li>• Exhaust temperature &gt; 700° C</li> </ul>
P0161	O2 Sensor Heater Circuit Bank 2 Sensor 2	Heater resistance > 500 - 10000 Ω
P0169	Incorrect Fuel Composition	Comparison with fuel quantity incorrect
P0171	Fuel Trim, Bank 1 System Too Lean	<ul style="list-style-type: none"> <li>• Adaptive value &gt; 5.30%</li> <li>• Too rich at idle Adaptive value &gt; 25%</li> </ul>
P0172	Fuel Trim, Bank 1 System Too Rich	<ul style="list-style-type: none"> <li>• Adaptive value &lt; -5.30%</li> <li>• Adaptive value &lt; -20%</li> </ul>
P0174	Fuel Trim, Bank 2 System Too Lean	<ul style="list-style-type: none"> <li>• System too lean adaptive value &gt; 20</li> <li>• Signal Adaptive value &gt; 5.30%</li> </ul>
P0175	Fuel Trim, Bank 2 System Too Rich	<ul style="list-style-type: none"> <li>• Too rich at idle Adaptive value &lt; 20%</li> <li>• Adaptive value &lt; -5.30%</li> </ul>

DTC	Error Message	Malfunction Criteria and Threshold Value
P017B	Cylinder Head Temperature Sensor	<ul style="list-style-type: none"> <li>• Difference between modelled and measured cylinder head temperature &gt; 9.8 K</li> <li>• Difference CHDT (Cylinder Head Temperature) vs. ECT at engine start <math>\geq 24.8 - 39.8</math> K</li> <li>or</li> <li>• Difference CHDT (Cylinder Head Temperature) vs. IAT at engine start <math>\geq 24.8 - 39.8</math> K</li> <li>• Difference CHDT (Cylinder Head Temperature) vs. ECT at engine start <math>\leq -(24.8 - 39.8)</math> K</li> <li>or</li> <li>• Difference CHDT (Cylinder Head Temperature) vs. IAT at engine start <math>\leq -(24.8 - 39.8)</math> K</li> </ul>
P017C	Cylinder Head Temperature Sensor	Signal voltage < 0.11 V
P017D	Cylinder Head Temperature Sensor Circuit High	Signal voltage > 3.10 V
P018B	Fuel Pressure Sensor "B" Circuit Range/Performance	Actual pressure >19 mPa
P0190	Fuel Rail Pressure Sensor A Circuit	Signal voltage > 4.80 V
P0191	Fuel Rail Pressure Sensor Circuit Range/Performance Bank 1	Actual pressure >19 mPa
P0192	Fuel Rail Pressure Sensor A Circuit Low Input	Signal voltage < 0.20 V
P01C8	Fuel Rail/System Pressure Bank 2 Too Low	Actual pressure < 0.80 mPa
P01C9	Fuel Rail/System Pressure Bank 2 Too High	Actual pressure >13.50 mPa
P0201	Injector Circuit/Open - Cylinder 1	Signal current < 2.10 A
P0202	Injector Circuit/Open - Cylinder 2	Signal current < 2.10 A
P0203	Injector Circuit/Open - Cylinder 3	Signal current < 2.10 A
P0204	Injector Circuit/Open - Cylinder 4	Signal current < 2.10 A

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0205	Injector Circuit/Open - Cylinder 5	Signal current < 2.10 A
P0206	Injector Circuit/Open - Cylinder 6	Signal current < 2.10 A
P0207	Injector Circuit/Open - Cylinder 7	Signal current < 2.10 A
P0208	Injector Circuit/Open - Cylinder 8	Signal current < 2.10 A
P021A	Fuel Rail/System Pressure Bank 2 Too Low	Actual pressure < -3.00 mPa
P021F	Fuel Rail/System Pressure Bank 2 Too High	Actual pressure >1.30 mPa
P0221	Throttle/Pedal Position Sensor/Switch B Circuit Range/Performance	<ul style="list-style-type: none"> <li>• TPS 1 - TPS 2 &gt; 6.30°</li> <li>or</li> <li>• TPS 2 calculated value &gt; 9.00</li> </ul>
P0222	Throttle/Pedal Position Sensor/Switch B Circuit Low Input	Signal voltage < 0.16 V
P0223	Throttle/Pedal Position Sensor/Switch B Circuit High Input	Signal voltage > 4.88 V
P0234	Turbocharger/Supercharger Overboost Condition Rationality Check High	Difference of set value boost pressure vs. actual boost pressure value > 200 - 1275 hPa
P0235	Boost Pressure Control	Boost pressure sensor signal vs target value <ul style="list-style-type: none"> <li>• &gt; 27 - 50 kPa, depending on altitude</li> </ul>
P0236	Turbocharger/Supercharger Boost Sensor "A" Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Pressure difference in cross check between boost pressure sensor 1/2; IM pressure &gt; 7 kPa</li> <li>• Pressure difference in cross check between boost pressure sensor 1/2 and IM &gt; 12 - 27 kPa</li> </ul>
P0237	Turbocharger/Supercharger Boost Sensor "A" Circuit Low	Signal voltage < 0.2 V
P0238	Turbocharger/Supercharger Boost Sensor "A" Circuit High	Signal voltage > 4.8 V



DTC	Error Message	Malfunction Criteria and Threshold Value
P0240	Turbocharger/Supercharger Boost Sensor "B" Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Pressure difference in cross check between boost pressure sensor 1/2; IM pressure, ambient pressure &gt; 7 kPa</li> <li>• Pressure difference in cross check between boost pressure sensor 1/2; IM pressure &gt; 12 - 27 kPa</li> <li>• Pressure difference in cross check between pressure sensor 1 and 2 &gt; 12.51 kPa and fuel trim activity (bank with deviation is considered to be defective &gt; 151%)</li> </ul>
P0241	Turbocharger/Supercharger Boost Sensor "B" Circuit Low	Signal voltage < 0.2 V
P0242	Turbocharger/Supercharger Boost Sensor "B" Circuit High	Signal voltage > 4.8 V
P0243	Turbocharger Wastegate Solenoid A	Signal voltage > 4.4 - 5.6 V
P0245	Turbocharger Wastegate Solenoid A Low	Signal voltage < 2.15 - 3.25 V
P0246	Turbocharger Wastegate Solenoid A High	Signal current > 2.20 A
P025A	Fuel Pump Open Circuit	Signal voltage > 4.8 .. 5.3 V
P025C	Fuel Pump Short to Ground	Signal voltage < 2.7 .. 3.25 V
P025D	Fuel Pump Short to Battery Plus	Signal current > .6 mA
P0261	Cylinder 1 Injector Circuit Short to Ground	Signal current < 2.10 A
P0262	Cylinder 1 Injector Circuit Short to B+	Signal current > 14.70 A
P0264	Cylinder 2 Injector Circuit Short to Ground	Signal current < 2.10 A
P0265	Cylinder 2 Injector Circuit Short to B+	Signal current > 14.70 A
P0267	Cylinder 3 Injector Circuit Short to Ground	Signal current < 2.10 A
P0268	Cylinder 3 Injector Circuit Short to B+	Signal current > 14.70 A
P0270	Cylinder 4 Injector Circuit Short to Ground	Signal current < 2.10 A

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0271	Cylinder 4 Injector Circuit Short to B+	Signal current > 14.70 A
P0273	Cylinder 5 Injector Circuit Short to Ground	Signal current < 2.10 A
P0274	Cylinder 5 Injector Circuit Short to B+	Signal current > 14.70 A
P0276	Cylinder 6 Injector Circuit Short to Ground	Signal current < 2.10 A
P0277	Cylinder 6 Injector Circuit Short to B+	Signal current > 14.70 A
P0279	Cylinder 7 Injector Circuit Short to Ground	Signal current < 2.10 A
P0280	Cylinder 7 Injector Circuit Short to B+	Signal current > 14.70 A
P0282	Cylinder 8 Injector Circuit Short to Ground	Signal current < 2.10 A
P0283	Cylinder 8 Injector Circuit Short to B+	Signal current > 14.70 A
P0299	Turbocharger/Supercharger Underboost Rationality Check Low	Difference set value boost pressure vs actual boost pressure value, >150 hPa
P209D	Cylinder 1- Injector Leaking	<ul style="list-style-type: none"> <li>• Rail pressure controller valve &gt; 0.40 - 2.0 MPa</li> <li>and</li> <li>• Misfire &gt; 30.0</li> </ul>
P02AD	Cylinder 2- Injector Leaking	<ul style="list-style-type: none"> <li>• Rail pressure controller valve &gt; 0.40 - 2.0 MPa</li> <li>and</li> <li>• Misfire &gt; 30.0</li> </ul>
P02A9	Cylinder 3- Injector Leaking	<ul style="list-style-type: none"> <li>• Rail pressure controller valve &gt; 0.40 - 2.0 MPa</li> <li>and</li> <li>• Misfire &gt; 30.0</li> </ul>
P02B9	Cylinder 4- Injector Leaking	<ul style="list-style-type: none"> <li>• Rail pressure controller valve &gt; 0.40 - 2.0 MPa</li> <li>and</li> <li>• Misfire &gt; 30.0</li> </ul>
P02B1	Cylinder 5- Injector Leaking	<ul style="list-style-type: none"> <li>• Rail pressure controller valve &gt; 0.40 - 2.0 MPa</li> <li>and</li> <li>• Misfire &gt; 30.0</li> </ul>

DTC	Error Message	Malfunction Criteria and Threshold Value
P02A5	Cylinder 6- Injector Leaking	<ul style="list-style-type: none"> <li>• Rail pressure controller valve &gt; 0.40 - 2.0 MPa</li> <li>and</li> <li>• Misfire &gt; 30.0</li> </ul>
P02B5	Cylinder 7- Injector Leaking	<ul style="list-style-type: none"> <li>• Rail pressure controller valve &gt; 0.40 - 2.0 MPa</li> <li>and</li> <li>• Misfire &gt; 30.0</li> </ul>
P02A1	Cylinder 8- Injector Leaking	<ul style="list-style-type: none"> <li>• Rail pressure controller valve &gt; 0.40 - 2.0 MPa</li> <li>and</li> <li>• Misfire &gt; 30.0</li> </ul>
P200A	Intake Manifold Runner Control Out of Range	Signal voltage < 0.7 V
P200B	Intake Manifold Runner Performance Bank 1	Signal voltage < 0.7 V
P2004	Intake Manifold Runner Control Stuck Open Bank 1	Difference between target position vs. actual position > 30%
P2005	Intake Manifold Runner Control Stuck Open Bank 2	Difference between target position vs. actual position > 30%
P2006	Intake Manifold Runner Control Stuck Closed Bank 1	Difference between target position vs. actual position > 30%
P2007	Intake Manifold Runner Control Stuck Closed Bank 2	Deviation runner flaps position > 30 vs. calculated position > 30%
P2008	Intake Manifold Runner Control Circuit/Open Bank 1	Signal voltage 4.70 - 5.40 V
P2009	Intake Manifold Runner Control Circuit Low Bank 1	Signal voltage 0.0 - 3.26 V
P2010	Intake Manifold Runner Control Circuit High Bank 1	Signal current > 2.20 A
P2014	Intake Manifold Runner Position Sensor/Switch Circuit Bank 1	Signal voltage, < 0.20 V
P2015	Intake Manifold Runner Position Sensor/Switch Circuit Range/Performance Bank 1	Deviation runner flap position vs. actual position > 25%

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P2016	Intake Manifold Runner Position Sensor/Switch Circuit Low Bank 1	Signal voltage < 0.25 V
P2017	Intake Manifold Runner Position Sensor/Switch Circuit High Bank 1	Signal voltage, > 4.80 V
P2019	Intake Manifold Runner Position Sensor/Switch Circuit Bank 2	Signal voltage, < 0.20 V
P2022	Intake Manifold Runner Position Sensor/Switch Circuit High Bank 2	Signal voltage, > 4.80 V
P2024	Evaporative Emissions (EVAP) Fuel Vapor Temperature Sensor Circuit	Signal voltage 4.70 - 5.40 V
P2025	Evaporative Emissions (EVAP) Fuel Vapor Temperature Sensor Performance	<ul style="list-style-type: none"> <li>• Response time &gt; 1000 ms</li> <li>• Number of checks &gt; 3.00</li> <li>• Security bit = incorrect</li> <li>• Number of checks &gt; 3.00 [-]</li> <li>• Time difference between ECM and Smart Module &gt; 3.0 s</li> <li>• Smart Module Temp High &gt; 119° C</li> <li>• Smart Module Temp Low &lt; -39° C</li> </ul>
P2026	Evaporative Emissions (EVAP) Fuel Vapor Temperature / Pressure Sensor Short to Ground	Signal voltage 0.0 - 3.25 V
P2027	Evaporative Emissions (EVAP) Fuel Vapor Temperature / Pressure Sensor Short to Battery Voltage	Signal current > 2.20 A
P2068	Fuel Level Sensor "B" Circuit High	Instrument cluster module signal open
P2088	"A" Camshaft Position Actuator Control Circuit Low Bank 1	Signal voltage 0.0 - 3.25
P2089	"A" Camshaft Position Actuator Control Circuit High Bank 1	Signal current > 2.2 A

DTC	Error Message	Malfunction Criteria and Threshold Value
P2090	"B" Camshaft Position Actuator Control Circuit Low Bank 1	Signal voltage 0.0 - 3.25 V
P2091	"B" Camshaft Position Actuator Control Circuit High Bank 1	Short to battery plus signal current > 2.20 A
P2092	A Camshaft Position Actuator Control Circuit Bank 2 Low	Signal voltage 0.0 - 3.25
P2093	A Camshaft Position Actuator Control Circuit Bank 2 High	Signal current, > 2.20 A
P2094	"B" Camshaft Position Actuator Control Circuit Low Bank 2	Signal voltage 0.0 - 3.25 V
P2095	"B" Camshaft Position Actuator Control Circuit High Bank 2	Short to battery plus signal current > 2.20 A
P2096	Post Catalyst Fuel Trim System Bank 1 Too Lean	Out of range I-portion of 2nd lambda control loop < -0.030
P2097	Post Catalyst Fuel Trim System Bank 1 Too Rich	I-portion of 2nd lambda control loop > 0.030
P2098	Post Catalyst Fuel Trim System Bank 2 Too Lean	Out of range I-portion of 2nd lambda control loop < -0.030
P2099	Post Catalyst Fuel Trim System Bank 2 Too Rich	I-portion of 2nd lambda control loop > 0.030
P3081	Engine Temperature Too Low	Reference model temperature - measured engine coolant temperature > 9.8 K
P31A2	Camshaft Actuator "B" Cylinder 2 Circuit Low	Signal voltage < 2.8 - 3.2 V
P31A3	Camshaft Actuator "B" Cylinder 3 Circuit Low	Signal voltage < 2.8 - 3.2 V
P31A5	Camshaft Actuator "B" Cylinder 5 Circuit Low	Signal voltage < 2.8 - 3.2 V
P31A8	Cam Shaft Actuator "B" Cylinder 8 Circuit Low	Signal voltage < 2.8 - 3.2 V
P31AA	Camshaft Actuator Outlet "B" Cylinder 2 Circuit Low	Signal voltage < 2.8 - 3.2 V
P31AB	Camshaft Actuator Outlet "B" Cylinder 3 Circuit Low	Signal voltage < 2.8 - 3.2 V
P31AD	Camshaft Actuator Outlet "B" Cylinder 5 Circuit Low	Signal voltage < 2.8 - 3.2 V

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P31B0	Camshaft Actuator Outlet "B" Cylinder 8 Circuit Low	Signal voltage < 2.8 - 3.2 V
P31B2	Camshaft Actuator "A" Cylinder 2 Circuit Low	Signal voltage < 2.8 - 3.2 V
P31B3	Camshaft Actuator "A" Cylinder 3 Circuit Low	Signal voltage < 2.8 - 3.2 V
P31B5	Camshaft Actuator "A" Cylinder 5 Circuit Low	Signal voltage < 2.8 - 3.2 V
P31B8	Camshaft Actuator "A" Cylinder 8 Circuit Low	Signal voltage < 2.8 - 3.2 V
P31BA	Camshaft Actuator Outlet "A" Cylinder 2 Circuit Low	Signal voltage < 2.8 - 3.2 V
P31BB	Camshaft Actuator Outlet "A" Cylinder 3 Circuit Low	Signal voltage < 2.8 - 3.2 V
P31BD	Camshaft Actuator Outlet "A" Cylinder 5 Circuit Low	Signal voltage < 2.8 - 3.2 V
P31C0	Camshaft Actuator Outlet "A" Cylinder 8 Circuit Low	Signal voltage < 2.8 - 3.2 V

## Ignition System

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0300	Random Misfire Detected	<ul style="list-style-type: none"> <li>• Emission threshold misfire rate (MR) &gt; 2.5%</li> <li>• Catalyst damage misfire rate (MR) &gt; 2.5 - 24%</li> </ul>
P0301	Cylinder 1 Misfire Detected	<ul style="list-style-type: none"> <li>• Emission threshold misfire rate (MR) &gt; 2.5%</li> <li>• Catalyst damage misfire rate (MR) &gt; 2.5 - 24%</li> </ul>
P0302	Cylinder 2 Misfire Detected	<ul style="list-style-type: none"> <li>• Emission threshold misfire rate (MR) &gt; 2.5%</li> <li>• Catalyst damage misfire rate (MR) &gt; 2.5 - 24%</li> </ul>
P0303	Cylinder 3 Misfire Detected	<ul style="list-style-type: none"> <li>• Emission threshold misfire rate (MR) &gt; 2.5%</li> <li>• Catalyst damage misfire rate (MR) &gt; 2.5 - 24%</li> </ul>

DTC	Error Message	Malfunction Criteria and Threshold Value
P0304	Cylinder 4 Misfire Detected	<ul style="list-style-type: none"> <li>• Emission threshold misfire rate (MR) &gt; 2.5%</li> <li>• Catalyst damage misfire rate (MR) &gt; 2.5 - 24%</li> </ul>
P0305	Cylinder 5 Misfire Detected	<ul style="list-style-type: none"> <li>• Emission threshold misfire rate (MR) &gt; 2.5%</li> <li>• Catalyst damage misfire rate (MR) &gt; 2.5 - 24%</li> </ul>
P0306	Cylinder 6 Misfire Detected	<ul style="list-style-type: none"> <li>• Emission threshold misfire rate (MR) &gt; 2.5%</li> <li>• Catalyst damage misfire rate (MR) &gt; 2.5 - 24%</li> </ul>
P0307	Cylinder 7 Misfire Detected	<ul style="list-style-type: none"> <li>• Emission threshold misfire rate (MR) &gt; 2.5%</li> <li>• Catalyst damage misfire rate (MR) &gt; 2.5 - 24%</li> </ul>
P0308	Cylinder 8 Misfire Detected	<ul style="list-style-type: none"> <li>• Emission threshold misfire rate (MR) &gt; 2.5%</li> <li>• Catalyst damage misfire rate (MR) &gt; 2.5 - 24%</li> </ul>
P0321	Ignition/Distributor Engine Speed Input Circuit Range/ Performance	<ul style="list-style-type: none"> <li>• Counted teeth vs. reference incorrect</li> </ul> or <ul style="list-style-type: none"> <li>• Monitoring reference gap failure</li> </ul>
P0322	Ignition Engine Speed Input Circuit No Signal	<ul style="list-style-type: none"> <li>• Camshaft signal &gt; 3 and</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> </ul> or <ul style="list-style-type: none"> <li>• Signal fault counter (measuring window) &gt; 2.00</li> <li>• Communication errors</li> <li>• SPI communication &gt; 25</li> </ul>
P0326	Knock Sensor System	<ul style="list-style-type: none"> <li>• Lower threshold &lt; 0.029 V</li> <li>• Upper threshold &gt; 1.992 V</li> </ul>
P0327	Knock/Combustion Vibration Sensor 1 Circuit Low Bank 1 or Single Sensor	Lower threshold 0.18 V
P0328	Knock/Combustion Vibration Sensor 1 Circuit High Bank 1 or Single Sensor	Upper threshold > 1.00 V

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0331	Knock Control System	<ul style="list-style-type: none"> <li>• Lower threshold &lt; 0.029 V</li> <li>• Upper threshold &gt; 1.992 V</li> </ul>
P0332	Knock/Combustion Vibration Sensor 2 Circuit Low Bank 2	Lower threshold 0.18 V
P0333	Knock/Combustion Vibration Sensor 2 Circuit High Bank 2	Upper threshold > 1.00 V
P0335	Engine Speed Sensor	<ul style="list-style-type: none"> <li>• Open circuit &gt; 1 V</li> <li>• Short to grd &lt; 1.5 V</li> <li>• Short to B+ &gt; 3.5 V</li> <li>• Signal check no signal</li> </ul>
P0336	Engine Speed Sensor	<ul style="list-style-type: none"> <li>• RPM signal comparison with phase sensor not synchronous</li> <li>• Counted versus reference teeth &gt; 1</li> <li>• Actual time value vs modeled time value &gt; 1.375</li> </ul>
P0340	Camshaft Position Sensor Circuit (Bank 1 or single sensor)	Signal activity check <ul style="list-style-type: none"> <li>• Signal voltage no altering @ 4 Rev</li> </ul>
P0341	Camshaft Position Sensor A Circuit Range/Performance (Bank 1 or single sensor)	<ul style="list-style-type: none"> <li>• Signal pattern incorrect</li> <li>• Defect counter 6.00</li> </ul>
P0342	Camshaft Position Sensor A Circuit Low Input (Bank 1 or single sensor)	<ul style="list-style-type: none"> <li>• Signal voltage permanently low and</li> <li>• Crankshaft signals 4.00</li> </ul>
P0343	Camshaft Position Sensor A Circuit High Input (Bank 1 or single sensor)	<ul style="list-style-type: none"> <li>• Signal voltage permanently high</li> <li>• Crankshaft signals 4</li> </ul>
P0345	Camshaft Position Sensor A Circuit (Bank 1 or single sensor)	Signal activity check <ul style="list-style-type: none"> <li>• Signal voltage no altering @ 4 Rev</li> </ul>
P0346	Camshaft Position Sensor "A" Circuit Range/Performance Bank 2	<ul style="list-style-type: none"> <li>• Signal pattern incorrect</li> <li>• Defect counter 6.00</li> </ul>
P0347	Camshaft Position Sensor "A" Circuit Low Bank 2	<ul style="list-style-type: none"> <li>• Signal voltage permanently low and</li> <li>• Crankshaft signals 4.00</li> </ul>
P0348	Camshaft Position Sensor "A" Circuit High Bank 2	<ul style="list-style-type: none"> <li>• Signal voltage permanently high and</li> <li>• Crankshaft signals 4</li> </ul>



DTC	Error Message	Malfunction Criteria and Threshold Value
P0351	Ignition Coil "A" Primary Control Circuit/Open	Open circuit • Signal current < 0.25 to 2.0 mA or • Internal check failed
P0352	Ignition Coil "B" Primary Control Circuit/Open	Open circuit • Signal current < 0.25 to 2.0 mA or • Internal check failed
P0353	Ignition Coil "C" Primary Control Circuit/Open	Open circuit • Signal current < 0.25 to 2.0 mA or • Internal check failed
P0354	Ignition Coil "D" Primary Control Circuit/Open	Open circuit • Signal current < 0.25 to 2.0 mA or • Internal check failed
P0355	Ignition Coil "E" Primary Control Circuit/Open	Open circuit • Signal current < 0.25 to 2.0 mA or • Internal check failed
P0356	Ignition Coil "F" Primary Control Circuit/Open	Open circuit • Signal current < 0.25 to 2.0 mA or • Internal check failed
P0357	Ignition Coil "G" Primary Control Circuit/Open	Open circuit • Signal current < 0.25 to 2.0 mA or • Internal check failed
P0358	Ignition Coil "H" Primary Control Circuit/Open	Open circuit • Signal current < 0.25 to 2.0 mA or • Internal check failed
P0366	Camshaft Position Sensor "B" Circuit Range/Performance Bank 1	• Signal pattern incorrect • Defect counter 6

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0367	Camshaft Position Sensor "B" Circuit Low Bank 1	<ul style="list-style-type: none"> <li>• Signal voltage permanently low and</li> <li>• Crankshaft signals 4.00</li> </ul>
P0368	Camshaft Position Sensor "B" Circuit High Bank 1	<ul style="list-style-type: none"> <li>• Signal voltage permanently high and</li> <li>• Crankshaft signals 4.00</li> </ul>
P0391	Camshaft Position Sensor "B" Circuit Range/Performance Bank 2	<ul style="list-style-type: none"> <li>• Signal pattern incorrect</li> <li>• Defect counter 6</li> </ul>
P0392	Camshaft Position Sensor "B" Circuit Low Bank 2	<ul style="list-style-type: none"> <li>• Signal voltage permanently low and</li> <li>• Crankshaft signals 4.00</li> </ul>
P0393	Camshaft Position Sensor "B" Circuit High Bank 2	<ul style="list-style-type: none"> <li>• Signal voltage permanently high and</li> <li>• Crankshaft signals 4.00</li> </ul>

### **Additional Exhaust Regulation**

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0410	Secondary Air Injection System Malfunction	Difference ambient pressure vs. AIR pressure measured with AIR pressure sensor > 3.00 kPa
P0413	Secondary Air Injection System Switching Valve Open	Signal voltage 4.70 - 5.40 V
P0414	AIR System Switching Valve "A" Circuit Shorted	Signal current > 2.20 A or signal voltage 0.0 - 3.25 V
P0415	Secondary Air Injection System Switching Valve Shorted to B+	Signal current 2.20 - 4.20 A
P0416	Secondary Air Injection System Switching Valve Open	Signal voltage 4.70 - 5.40 V
P0417	AIR System Switching Valve "B" Circuit Shorted	Signal voltage 0.0 - 3.25 V or signal current > 2.20 A
P0418	Secondary Air Injection System Relay A Circuit	Signal voltage 4.70 - 5.40 V
P0420	Catalyst System Efficiency Below Threshold	Measured OSC / OSC of borderline catalystr. EWMA filter value for catalystr , < 1.0

DTC	Error Message	Malfunction Criteria and Threshold Value
P0421	Catalyst Bank 1	EWMA filter value for catalyst < 0.2
P0430	Catalyst System, Bank2 Efficiency Below Threshold	Amplitude ratio O2S > 1.5
P0431	Catalyst Bank 2	EWMA filter value for catalyst < 0.2
P0441	Evaporative Emission System functional check Valve Stuck (Purge Flow)	<ul style="list-style-type: none"> <li>• Deviation lambda control &lt; 2.50% and</li> <li>• Deviation idle control &lt; 20%</li> </ul>
P0442	Evaporative Emission System Leak Detected (Small Leak)	Time for pressure drop < 1.7 - 2.2 s.
P0444	Evaporative Emission System Purge Control Valve Circuit Open	Signal voltage > 4.70 - 5.40 V
P0445	Evaporative Emission System Purge Control Valve Short to Ground Evaporative Emission System Purge Control Valve Short to battery Plus	<ul style="list-style-type: none"> <li>• Signal voltage &lt; 2.0 V</li> <li>• Signal current &gt;1.0 A</li> </ul>
P0450	NVLD switch	Open Circuit signal voltage 0.39 - 0.55 V
P0451	NVLD switch	Natural vacuum leak detection (NVLD) switch position stuck closed
P0452	NVLD switch	Short to ground signal voltage < 0.24 V
P0453	NVLD switch	Short to battery voltage signal voltage > 3.0 V
P0455	Evaporative Emission System Leak Detected (gross leak/no flow)	Time for pressure drop < 0.95 - 1.1 Sec.
P0456	Evaporative Emission System Leak Detected (very small leak)	<ul style="list-style-type: none"> <li>• Natural vacuum leak detection (NVLD) switch position</li> <li>• Switch Open</li> </ul>
P0458	Evaporative Emission System Purge Control Valve Circuit Low or Short to Ground	Signal voltage, < 0.0 - 3.26 V
P0459	Evaporative Emission System Purge Control Valve Circuit High or Short to Voltage	Signal current > 2.2 A

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0461	Fuel Level Sensor Circuit Range/Performance	Difference between fuel consumption and fuel level changes, < -12.00 - > 12.00
P0462	Fuel Level Sensor "A" Circuit Low	Instrument cluster module signal short
P0463	Fuel Level Sensor "A" Circuit High	Instrument cluster module signal open

DTC	Error Message	Malfunction Criteria and Threshold Value
P0491	Secondary Air Injection System Insufficient Flow Bank 1	<ul style="list-style-type: none"> <li>• Blockage: relative AIR pressure measured with AIR pressure sensor vs. modeled &lt; 0.10 [-]</li> <li>• Leakage: relative AIR pressure measured with AIR pressure sensor vs. modeled &lt; 0.10 [-]</li> </ul> <p>and</p> <ul style="list-style-type: none"> <li>• Relative AIR pressure measured <math>\leq</math> 3.00 kPa</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>• Blockage: relative AIR pressure measured with AIR pressure sensor vs. modeled &lt; 0.45 [-]</li> <li>• Leakage: relative AIR pressure measured with AIR pressure sensor vs. modeled &lt; 0.45 [-]</li> </ul> <p>and</p> <ul style="list-style-type: none"> <li>• Relative AIR pressure measured <math>\leq</math> 3.00 kPa</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>• Blockage: relative AIR pressure measured with AIR pressure sensor vs. modeled while valve bank 2 commanded closed &lt; 0.70[-]</li> <li>• Leakage: relative AIR pressure measured with AIR pressure sensor vs. modeled while valve bank 2 commanded closed &lt; 0.70 [-]</li> </ul> <p>and</p> <ul style="list-style-type: none"> <li>• Relative AIR pressure measured <math>\leq</math> 3.00 kPa</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>• Average pressure difference between absolute value and filtered value while valve bank 2 commanded closed &lt; 0.14 - 1.22 kPa</li> </ul> <p>and</p> <ul style="list-style-type: none"> <li>• Relative AIR pressure measured <math>\leq</math> 3.00 kPa</li> </ul>

DTC	Error Message	Malfunction Criteria and Threshold Value
P0492	Secondary Air System Insufficient Flow Bank 2	<ul style="list-style-type: none"> <li>• Blockage: relative AIR pressure measured with AIR pressure sensor vs. modeled &lt; 0.10 [-]</li> <li>• Leakage: relative AIR pressure measured with AIR pressure sensor vs. modeled &lt; 0.10 [-]</li> </ul> <p>and</p> <ul style="list-style-type: none"> <li>• Relative AIR pressure measured <math>\leq</math> 3.00 kPa</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>• Blockage: relative AIR pressure measured with AIR pressure sensor vs. modeled &lt; 0.45 [-]</li> <li>• Leakage: relative AIR pressure measured with AIR pressure sensor vs. modeled &lt; 0.45 [-]</li> </ul> <p>and</p> <ul style="list-style-type: none"> <li>• Relative AIR pressure measured <math>\leq</math> 3.00 kPa</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>• Blockage: relative AIR pressure measured with AIR pressure sensor vs. modeled while valve bank 2 commanded closed &lt; 0.70[-]</li> <li>• Leakage: relative AIR pressure measured with AIR pressure sensor vs. modeled while valve bank 2 commanded closed &lt; 0.70 [-]</li> </ul> <p>and</p> <ul style="list-style-type: none"> <li>• Relative AIR pressure measured <math>\leq</math> 3.00 kPa</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>• Average pressure difference between absolute value and filtered value while valve bank 2 commanded closed &lt; 0.14 - 1.22 kPa</li> </ul> <p>and</p> <ul style="list-style-type: none"> <li>• Relative AIR pressure measured <math>\leq</math> 3.00 kPa</li> </ul>

## Speed and Idle Control

DTC	Error Message	Malfunction Criteria and Threshold Value
P0501	Vehicle Speed Sensor "A" Circuit Range/Performance	Speed sensor signal: plausibility error failure
P0502	Vehicle Speed Sensor "A" Circuit Low	Speed sensor signal: electrical error failure
P0503	Vehicle Speed Sensor A Out of Range High	Vehicle speed > 200 km/h
P0506	Idle Air Control System RPM Lower Than Expected	<ul style="list-style-type: none"> <li>• Engine speed deviation &lt; -80 RPM</li> <li>and</li> <li>• RPM controller torque value <math>\geq</math> calculated max value</li> </ul>
P0507	Idle Air Control System RPM Higher Than Expected	<ul style="list-style-type: none"> <li>• Engine speed deviation &gt; -80 RPM</li> <li>and</li> <li>• RPM controller torque value <math>\leq</math> calculated max. value</li> </ul>
P0597	Thermostat Heater Control Circuit Open	Signal voltage 4.70 - 5.40 V
P0598	Thermostat Heater Control Circuit Low	Signal voltage 0.0 - 3.25 V
P0599	Thermostat Heater Control Circuit High	Signal current > 2.20 A
P050A	Cold Start Idle Air Control System Performance	RPM lower: <ul style="list-style-type: none"> <li>• Engine speed deviation &gt; 200 RPM</li> <li>and</li> <li>• RPM controller torque value <math>\geq</math> calculated max. value</li> </ul> RPM Higher: <ul style="list-style-type: none"> <li>• Engine speed deviation &lt; -200 RPM</li> <li>and</li> <li>• RPM controller torque value <math>\leq</math> calculated min. value</li> </ul>
P050B	Idle Ignition timing monitor	Difference between commanded spark timing vs. actual value > 16.50% - 30.00%
P052A	Cold Start "A" Camshaft Position Timing Over-Advanced Bank 1	Difference between target position vs. actual position > 8°C

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P052C	Cold Start "A" Camshaft Position Timing Over-Advanced Bank 2	Difference between target position vs. actual position > 8° CA
P053F	Fuel Rail Pressure Control Valve	<ul style="list-style-type: none"> <li>• Target pressure-actual pressure &gt; 1.30 MPa</li> <li>• Difference between target pressure vs. actual pressure &lt; -3.00 mPa</li> </ul>
P054A	Cold Start "B" Camshaft Position Timing Over-Advanced Bank 1	Difference between target position vs. actual position > 8° CA
P054C	Cold Start "B" Camshaft Position Timing Over-Advanced Bank 2	Difference between target position vs. actual position > 8° CA

### **Control Module and Output Signals**

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0601	Internal Control Module Memory Check Sum Error	Internal check sum, incorrect
P0603	Internal Hardware Check	SPI communication lost
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 Faults	<ul style="list-style-type: none"> <li>• Drive by wire module check check failed</li> <li>• EEPROM-check check failed</li> </ul>
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>
P0634	Control Module Internal Temperature "A" Too High	Signal range check over temperature > 150° C



DTC	Error Message	Malfunction Criteria and Threshold Value
P0638	Throttle Actuator Control Range/Performance Bank 1	<ul style="list-style-type: none"> <li>• Time to open over reference point &gt; 0.6 Sec</li> <li>and</li> <li>• Reference point -1.5%</li> <li>• Time to close below reference point &gt; 0.3 Sec</li> <li>and</li> <li>• Reference point 1.0%</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 < 4.606 - 4.998 V
P0643	Sensor Reference Voltage "A" Circuit High	5 V supply voltage: > supply voltage > 4.998 - 5.406 V
P0651	Sensor Reference Voltage "B" Circuit/Open	Signal voltage deviation > $\pm$ 0.3 V
P0652	Sensor Reference Voltage "B" Circuit Low	Signal voltage < 4.606 - 4.998 V
P0653	Sensor Reference Voltage "B" Circuit High	> 5 V supply voltage: supply voltage > 4.998 - 5.406 V
P0657	Actuator Supply Voltage "A" Circuit/Open	Signal voltage > 4.4 - 5.6 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; 0.7 - 1.4 A</li> <li>• Sense circuit voltage &lt; 5.0 V</li> </ul>
P0688	ECM/PCM Power Relay Sense Circuit	Sense voltage < 4.0 V
P0697	Sensor Reference Voltage "C" Circuit/Open	Signal voltage deviation > $\pm$ 0.3 V
P0698	Sensor Reference Voltage "C" Circuit Low	Signal voltage < 4.606 - 4.998 V
P0699	Sensor Reference Voltage "C" Circuit High	5V supply voltage > 4.998 - 5.406 V

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P062B	Internal Control Module Fuel Injector Control Performance	SPI communications check identifier failure
U0001	High Speed CAN Communication Bus	CAN message, no feedback
U0002	High Speed CAN Communication Bus Performance	Global time out, receiving no messages
U0100	Lost Communication with ECM/PCM A	<ul style="list-style-type: none"> <li>• Failure of all CAN engine messages, Time out more than 490 mSec</li> <li>• Failure of all CAN engine messages but not all CAN messages, Time out more than 1010 mSec</li> </ul>
U0101	Lost Communication with TCM	No CAN message received from TCM
U0121	Lost Communication with Anti-Lock Brake System (ABS) Control Module	Received CAN message no message
U0140	Lost Communication with Body Control Module	Time out no message
U0146	Lost Communication with Gateway "A"	Received CAN message no message
U0155	Lost Communication with Instrument Panel Cluster (IPC) Control Module	Received CAN message no message
U0302	Software Incompatibility with Transmission Control Module	MT vehicle ECM coded as AT vehicle
U0323	Software Incompatibility with Instrument Panel Control Module	Ambient temperature value module not encoded for ambient temperature sensor, 00h
U0402	CAN communication with TCM	Invalid data received from TCM <ul style="list-style-type: none"> <li>• Implausible message</li> </ul>
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	Invalid Data Received from Anti-Lock Brake System (ABS) Control Module	Received data implausible message
U0422	Invalid Data Received from Body Control Module	Ambient temperature value initialization, 01 h
U0423	Invalid Data Received from Instrument Panel Control Module	Received data implausible message
U0447	Invalid Data Received from Gateway "A"	Received data from Gateway implausible message
U1103	Production Mode Active	

### Fuel and Air Ratios Control Module

DTC	Error Message	Malfunction Criteria and Threshold Value
P100F	Fuel injector mechanical malfunction	<ul style="list-style-type: none"> <li>• Rail pressure controller value &gt; 60.00 - 327.67 mm<sup>3</sup></li> <li>• Misfire failure</li> </ul>
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 temp. and heater power)
P11A5	Camshaft Actuator "A" Cylinder 2 Circuit/Open	<ul style="list-style-type: none"> <li>• Signal Voltage = 4.8 - 5.3 V or</li> <li>• Signal Current = 3 - 6 A</li> </ul>
P11A6	Camshaft Actuator "A" Cylinder 2 Range/Performance	<ul style="list-style-type: none"> <li>• Difference of feedback signal vs. battery voltage &lt; 1.00 [V] and</li> <li>• Correction switch (self-contained switching in opposite lift) = successful or fail</li> </ul>
P11A7	Camshaft Actuator "B" Cylinder 2 Circuit/Open	<ul style="list-style-type: none"> <li>• Signal Voltage = 4.8 - 5.3 V or</li> <li>• Signal Current = 3 - 6 A</li> </ul>
P11A8	Camshaft Actuator "B" Cylinder 2 Range/Performance	<ul style="list-style-type: none"> <li>• Difference of feedback signal vs. battery voltage &lt; 1.00 [V] and</li> <li>• Correction switch (self-contained switching in opposite lift) = successful or fail</li> </ul>

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P11A9	Camshaft Actuator "A" Cylinder 3 Circuit/Open	<ul style="list-style-type: none"> <li>• Signal Voltage = 4.8 - 5.3 V</li> <li>or</li> <li>• Signal Current = 3 - 6 A</li> </ul>
P11AA	Camshaft Actuator "A" Cylinder 3 Range/Performance	<ul style="list-style-type: none"> <li>• Difference of feedback signal vs. battery voltage &lt; 1.00 [V] and</li> <li>• Correction switch (self-contained switching in opposite lift) = successful or fail</li> </ul>
P11AB	Camshaft Actuator "B" Cylinder 3 Circuit/Open	<ul style="list-style-type: none"> <li>• Signal Voltage = 4.8 - 5.3 V</li> <li>or</li> <li>• Signal Current = 3.74 - 6.8 A</li> </ul>
P11AC	Camshaft Actuator "B" Cylinder 3 Range/Performance	<ul style="list-style-type: none"> <li>• Difference of feedback signal vs. battery voltage &lt; 1.00 [V] and</li> <li>• Correction switch (self-contained switching in opposite lift) = successful or fail</li> </ul>
P11B1	Camshaft Actuator "A" Cylinder 5 Circuit/Open	<ul style="list-style-type: none"> <li>• Signal Voltage = 4.8 - 5.3 V</li> <li>or</li> <li>• Signal Current = 3 - 6 A</li> </ul>
P11B2	Camshaft Actuator "A" Cylinder 5 Range/Performance	<ul style="list-style-type: none"> <li>• Difference of feedback signal vs. battery voltage &lt; 1.00 [V] and</li> <li>• Correction switch (self-contained switching in opposite lift) = successful or fail</li> </ul>
P11B3	Camshaft Actuator "B" Cylinder 5 Circuit/Open	<ul style="list-style-type: none"> <li>• Signal Voltage = 4.8 - 5.3 V</li> <li>or</li> <li>• Signal Current = 3.74 - 6.8 A</li> </ul>
P11B4	Camshaft Actuator "B" Cylinder 5 Range/Performance	<ul style="list-style-type: none"> <li>• Difference of feedback signal vs. battery voltage &lt; 1.00 [V] and</li> <li>• Correction switch (self-contained switching in opposite lift) = successful or fail</li> </ul>
P11BD	Camshaft Actuator "A" Cylinder 8 Range/Performance	<ul style="list-style-type: none"> <li>• Signal Voltage = 4.8 - 5.3 V</li> <li>or</li> <li>• Signal Current = 5.5 - 10.0 A</li> </ul>

DTC	Error Message	Malfunction Criteria and Threshold Value
P11BE	Camshaft Actuator "B" Cylinder 8 Circuit/Open	<ul style="list-style-type: none"> <li>• Signal Voltage = 4.8 - 5.3 V or</li> <li>• Signal Current = 3.74 - 6.8 A</li> </ul>
P11C1	Camshaft Actuator Outlet "A" Cylinder 2 Range/Performance	<ul style="list-style-type: none"> <li>• Signal Voltage = 4.8 - 5.3 V or</li> <li>• Signal Current = 3.74 - 6.8 A</li> </ul>
P11C2	Camshaft Actuator Outlet "B" Cylinder 2 Circuit/Open	<ul style="list-style-type: none"> <li>• Signal Voltage = 4.8 - 5.3 V or</li> <li>• Signal Current = 3.74 - 6.8 A</li> </ul>
P11C3	Camshaft Actuator Outlet "A" Cylinder 3 Range/Performance	<ul style="list-style-type: none"> <li>• Signal Voltage = 4.8 - 5.3 V or</li> <li>• Signal Current = 3.74 - 6.8 A</li> </ul>
P11C4	Camshaft Actuator Outlet "B" Cylinder 3 Circuit/Open	<ul style="list-style-type: none"> <li>• Signal Voltage = 4.8 - 5.3 V or</li> <li>• Signal Current = 3.74 - 6.8 A</li> </ul>
P11C7	Camshaft Actuator Outlet "A" Cylinder 5 Range/Performance	<ul style="list-style-type: none"> <li>• Signal Voltage = 4.8 - 5.3 V or</li> <li>• Signal Current = 3.74 - 6.8 A</li> </ul>
P11C8	Camshaft Actuator Outlet "B" Cylinder 5 Circuit/Open	<ul style="list-style-type: none"> <li>• Signal Voltage = 4.8 - 5.3 V or</li> <li>• Signal Current = 3.74 - 6.8 A</li> </ul>
P11CD	Camshaft Actuator Outlet "A" Cylinder 8 Range/Performance	<ul style="list-style-type: none"> <li>• Signal Voltage = 4.8 - 5.3 V or</li> <li>• Signal Current = 5.5 - 10.0 A</li> </ul>
P11CE	Camshaft Actuator Outlet "B" Cylinder 8 Circuit/Open	<ul style="list-style-type: none"> <li>• Signal Voltage = 4.8 - 5.3 V or</li> <li>• Signal Current = 5.5 - 10.0 A</li> </ul>
P11D1	Camshaft Actuator "A" Cylinder 8 Range/Performance	<ul style="list-style-type: none"> <li>• Difference of feedback signal vs. battery voltage &lt; 1.00 [V] and</li> <li>• Correction switch (self-contained switching in opposite lift) = successful or fail</li> </ul>
P11D2	Camshaft Actuator "B" Cylinder 8 Range/Performance	<ul style="list-style-type: none"> <li>• Difference of feedback signal vs. battery voltage &lt; 1.00 [V] and</li> <li>• Correction switch (self-contained switching in opposite lift) = successful or fail</li> </ul>

DTC	Error Message	Malfunction Criteria and Threshold Value
P11D5	Camshaft Actuator Outlet "A" Cylinder 2 Range/ Performance	<ul style="list-style-type: none"> <li>• Difference of feedback signal vs. battery voltage &lt; 1.00 [V] and</li> <li>• Correction switch (self-contained switching in opposite lift) = successful or fail</li> </ul>
P11D6	Camshaft Actuator Outlet "B" Cylinder 2 Range/ Performance	<ul style="list-style-type: none"> <li>• Difference of feedback signal vs. battery voltage &lt; 1.00 [V] and</li> <li>• Correction switch (self-contained switching in opposite lift) = successful or fail</li> </ul>
P11D7	Camshaft Actuator Outlet "A" Cylinder 3 Range/ Performance	<ul style="list-style-type: none"> <li>• Difference of feedback signal vs. battery voltage &lt; 1.00 [V] and</li> <li>• Correction switch (self-contained switching in opposite lift) = successful or fail</li> </ul>
P11D8	Camshaft Actuator Outlet "B" Cylinder 3 Range/ Performance	<ul style="list-style-type: none"> <li>• Difference of feedback signal vs. battery voltage &lt; 1.00 [V] and</li> <li>• Correction switch (self-contained switching in opposite lift) = successful or fail</li> </ul>
P11DB	Camshaft Actuator Outlet "A" Cylinder 5 Range/ Performance	<ul style="list-style-type: none"> <li>• Difference of feedback signal vs. battery voltage &lt; 1.00 [V] and</li> <li>• Correction switch (self-contained switching in opposite lift) = successful or fail</li> </ul>
P11DC	Camshaft Actuator Outlet "B" Cylinder 5 Range/ Performance	<ul style="list-style-type: none"> <li>• Difference of feedback signal vs. battery voltage &lt; 1.00 [V] and</li> <li>• Correction switch (self-contained switching in opposite lift) = successful or fail</li> </ul>

DTC	Error Message	Malfunction Criteria and Threshold Value
P11E1	Camshaft Actuator Outlet "A" Cylinder 8 Range/ Performance	<ul style="list-style-type: none"> <li>• Difference of feedback signal vs. battery voltage &lt; 1.00 [V] and</li> <li>• Correction switch (self-contained switching in opposite lift) = successful or fail</li> </ul>
P11E2	Camshaft Actuator Outlet "B" Cylinder 8 Range/ Performance	<ul style="list-style-type: none"> <li>• Difference of feedback signal vs. battery voltage &lt; 1.00 [V] and</li> <li>• Correction switch (self-contained switching in opposite lift) = successful or fail</li> </ul>
P12A1	Fuel Rail Pressure Sensor Inappropriately Low	<ul style="list-style-type: none"> <li>• Rail pressure bank 1 @ engine start &lt; 0.10 mPa</li> <li>• Fuel system too rich @ part load <math>\leq -15.00\%</math></li> <li>• Fuel system too rich @ idle <math>\leq 3.00\%</math></li> <li>• Rail pressure bank 2 @ engine start <math>\geq 0.50</math> mPa</li> </ul>
P12A2	Fuel Rail Pressure Sensor Inappropriately High	<ul style="list-style-type: none"> <li>• Rail pressure bank 1 @ engine start &gt; 1.50 mPa</li> <li>• Fuel system too lean @ part load <math>\geq -15.00\%</math></li> <li>• Fuel system too lean @ idle <math>\geq 3\%</math></li> <li>• Rail pressure bank 2 @ engine start <math>\leq 1.00</math> mPa</li> </ul>
P12A4	Fuel Rail Pump Control Valve Stuck Closed	<ul style="list-style-type: none"> <li>• Pressure control activity &lt; -3.0</li> <li>• Fuel trim activity 0.90 - 1.30 mPa</li> </ul> and <ul style="list-style-type: none"> <li>• Difference between target pressure vs. actual pressure &lt; -8.00 mPa</li> </ul>
P12A5	Fuel Rail Pressure Bank 2 Sensor Inappropriately Low	<ul style="list-style-type: none"> <li>• Rail Pressure Bank 1 @ Engine Start &lt; 0.10 mPa</li> <li>• Fuel system too rich @ part load <math>\leq -15.00\%</math></li> <li>• Fuel system too rich @ idle <math>\leq 3.00\%</math></li> <li>• Rail pressure bank 2 @ engine start <math>\geq 0.50</math> mPa</li> </ul>

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P12A6	Fuel Rail Pressure Sensor Bank 2 Inappropriately High	<ul style="list-style-type: none"> <li>• Rail Pressure Bank 1 @ Engine Start &gt; 1.50 mPa</li> <li>• Fuel system too lean @ part load <math>\geq -15.00\%</math></li> <li>• Fuel system too lean @ idle <math>\geq 3.0\%</math></li> <li>• Rail pressure bank 2 @ engine start <math>\leq 1.00</math> mPa</li> </ul>
P129B	Fuel Rail Pressure Control Valve	<ul style="list-style-type: none"> <li>• Open circuit signal voltage 1.40 - 3.20 V</li> <li>• Rationality check signal pattern incorrect</li> </ul>
P129C	Fuel Rail Pressure Control Valve	Signal voltage 1.40 - 3.20 V
P129D	Fuel Rail Pressure Control Valve	Short to battery plus signal voltage > 3.20 V
P1321	Knock Sensor 3 Signal Too Low	Lower threshold, 0.18 V
P1322	Knock Sensor 3 Signal Too High	Upper threshold >1.00 V
P1323	Knock Sensor 4 Signal Too Low	Lower threshold, 0.18 V
P1324	Knock Sensor 3 Signal Too High	Upper threshold >1.00 V
P13EA	Ignition Timing Monitor	Difference between commanded spark timing vs. actual value > 10.00% - 19.00%
P150A	Engine Off Time	<ul style="list-style-type: none"> <li>• Difference between engine off time and ECM after run time &lt; -12.0 Sec.</li> <li>• Difference between engine off time and ECM after run time &gt; 12.0 Sec.</li> </ul>
P166F	Partial Engine Operation Deactivated	Ignition On
P169A	Loading Mode Active	-



DTC	Error Message	Malfunction Criteria and Threshold Value
P2101	Throttle Actuator "A" Control Motor Circuit Range/ Performance	Signal range check <ul style="list-style-type: none"> <li>• Duty cycle &gt; 80%</li> </ul> and <ul style="list-style-type: none"> <li>• ECM power stage, no failure</li> </ul> Rationality check <ul style="list-style-type: none"> <li>• Deviation throttle valve angles vs. calculated value 4.0 - 50.0%</li> </ul>
P2106	Throttle Actuator Control System - Forced Limited Power	Short to battery plus/ short to ground <ul style="list-style-type: none"> <li>• Internal check failed</li> </ul> Open circuit <ul style="list-style-type: none"> <li>• Internal check failed</li> </ul> Temperature / current monitoring <ul style="list-style-type: none"> <li>• Internal check failed</li> </ul> Functional check <ul style="list-style-type: none"> <li>• Internal check failed</li> </ul>
P2119	Throttle Actuator Control Throttle Body Range/ Performance - Bank 1	<ul style="list-style-type: none"> <li>• TPS 1 signal voltage NOT (0.21 - 0.87) V</li> </ul> or <ul style="list-style-type: none"> <li>• TPS 2 signal voltage NOT (4.14 - 4.84) V</li> </ul>
P2122	Throttle/Pedal Position Sensor/Switch D Circuit Low Input	Signal voltage < 0.65 V
P2123	Throttle/Pedal Position Sensor/Switch D Circuit High Input	Signal voltage > 4.79 V
P2127	Throttle/Pedal Position Sensor/Switch E Circuit Low Input	Signal voltage < 0.28 V
P2128	Throttle/Pedal Position Sensor/Switch "E" Circuit High Input	Signal voltage > 2.43 V
P2138	Throttle/Pedal Position Sensor/Switch "D" / "E" Voltage Correlation	Signal voltage sensor 1 vs. 2 > 0.14 - 0.70 V
P2146	Fuel Injector Group A Supply Voltage Circuit / Short to Ground	Short to ground (high side) <ul style="list-style-type: none"> <li>• Signal current &gt; 14.90 A</li> </ul> Short to battery plus (high side) <ul style="list-style-type: none"> <li>• Signal current &lt; 2.60 A</li> </ul>
P2147	Injector Circuit Short to Ground	Signal current > 12 A

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P2148	Injector Circuit short to B+	Signal current > 33 A
P2149	Fuel Injector Group B Supply Voltage Circuit / Short to Ground	Short to ground (high side) • Signal current > 14.90 A Short to battery plus (high side) • Signal current < 2.60 A
P2150	Injector Circuit Short to Ground	Signal current > 12 A
P2151	Injector Circuit Short to b+	Signal current > 33 A
P2152	Fuel Injector Group B Supply Voltage Circuit / Short to Ground	Short to ground (high side) • Signal current, > 14.90 A Short to battery plus (high side) • Signal current < 2.60 A
P2153	Injector Circuit Short to Ground	Signal current > 12 A
P2154	Injector Circuit Short to B+	Signal current > 33 A
P2155	Fuel Injector Group B Supply Voltage Circuit / Short to Ground	Short to ground (high side) • Signal current, > 14.90 A Short to battery plus (high side) • Signal current < 2.60 A
P2181	Cooling System Performance	Cooling system temperature to low after a sufficient air mass flow interval < 60 - 75° C
P2184	Engine Coolant Temperature Sensor 2 Circuit Low	Signal voltage < 0.22 V
P2185	Engine Coolant Temperature Sensor 2 Circuit High	Signal voltage > 4.88 V
P2195	O2 Sensor Signal Stuck Lean Bank 1 Sensor 1	Delta lambda of 2nd lambda control loop > 0.070
P2196	O2 Sensor Signal Stuck Rich Bank 1 Sensor 1	Delta lambda of 2nd lambda control loop < 0.070
P2197	O2 Sensor Signal Stuck Lean Bank 2 Sensor 1	Delta lambda of 2nd lambda control loop > 0.070
P2198	O2 Sensor Signal Stuck Rich Bank 2 Sensor 1	Delta lambda of 2nd lambda control loop < 0.070
P2227	Barometric Sensor Rationality Check	Pressure difference in cross check between boost pressure sensor 1/2; inlet charger pressure and ambient pressure sensor >7 kPa

DTC	Error Message	Malfunction Criteria and Threshold Value
P2231	O2 Sensor Signal Circuit Shorted to Heater Circuit	<ul style="list-style-type: none"> <li>• Delta O2S signal front &gt; 0.2 - 0.498 V</li> <li>• Elapsed time since last O2S &lt; 0.05 Sec</li> </ul>
P2234	O2 Sensor Signal Circuit Shorted to Heater Circuit	<ul style="list-style-type: none"> <li>• Delta O2S signal front &gt; 0.2 - 0.498 V</li> <li>• Elapsed time since last O2S &lt; 0.05 Sec</li> </ul>
P2237	O2 Sensor Positive Current Control Circuit Bank 1 Sensor 1 Open	<ul style="list-style-type: none"> <li>• O2S signal front 1.46 - 1.52 V and</li> <li>• Delta lambda controller &gt;   0.10  </li> </ul>
P2240	O2 Sensor Positive Current Control Circuit Bank 2 Sensor 1 Open	<ul style="list-style-type: none"> <li>• O2S signal front 1.46 - 1.52 V and</li> <li>• Delta lambda controller &gt;   0.10  </li> </ul>
P2243	O2 Sensor Reference Voltage Circuit Bank 1 Sensor 1 Open	<ul style="list-style-type: none"> <li>• O2S signal front &gt; 3.25 V</li> <li>• and</li> <li>• Internal resistance &gt; 950Ω</li> <li>• O2S signal front &lt; 0.20 V and</li> <li>• Internal resistance &gt; 950Ω</li> </ul>
P2247	O2 Sensor Reference Voltage Circuit Bank 2 Sensor 1 Open	<ul style="list-style-type: none"> <li>• O2S signal front &gt; 3.25 V and</li> <li>• Internal resistance &gt; 950Ω</li> <li>• O2S signal front &lt; 0.20 V and</li> <li>• Internal resistance &gt; 950Ω</li> </ul>
P2251	O2 Sensor Signal Open Circuit - Bank 1, Sensor 1	<ul style="list-style-type: none"> <li>• O2S signal front 1.44 - 1.53 V and</li> <li>• Internal resistance &gt; 950 Ω</li> </ul>
P2254	O2 Sensor Negative Current Control Circuit Bank 2 Sensor 1 Open	<ul style="list-style-type: none"> <li>• O2S signal front 1.44 - 1.53 V and</li> <li>• Internal resistance &gt; 950 Ω</li> </ul>
P2257	Secondary air Injection System Control "A" Circuit Low	Signal voltage 0.00 - 3.26 V
P2258	Secondary Air Injection System Control "A" Circuit High	Signal current 0.60 - 2.40 A

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P2270	O2 Sensor Signal Stuck Lean Bank 1 Sensor 2	<ul style="list-style-type: none"> <li>• O2S signal rear not oscillating at reference &lt; 0.62 - 0.68 V and</li> <li>• Enrichment after stuck lean 25.00%</li> </ul>
P2271	O2 Sensor Signal Stuck Rich Bank 1 Sensor 2	<ul style="list-style-type: none"> <li>• Sensor voltage of <math>\geq 0.18</math> V</li> <li>• After oxygen mass &gt; 3300 - 400 mg</li> <li>• (after fuel cut off) and number of checks <math>\geq 1.0</math></li> </ul>
P2272	O2 Sensor Signal Stuck Lean Bank 2 Sensor 2	<ul style="list-style-type: none"> <li>• O2S signal rear not oscillating at reference &lt; 0.62 - 0.68 V and</li> <li>• Enrichment after stuck lean 25.00%</li> </ul>
P2273	O2 Sensor Signal Stuck Rich Bank 2 Sensor 2	<ul style="list-style-type: none"> <li>• Sensor voltage of <math>\geq 0.18</math> V</li> <li>• After oxygen mass &gt; 3300 - 400 mg</li> <li>• (after fuel cut off) and number of checks <math>\geq 1.0</math></li> </ul>
P2279	MAP/MAF - Throttle Position Correlation	<ul style="list-style-type: none"> <li>• Offset value throttle mass flow &gt; 17.00 kg/h and</li> <li>• Correction factor &gt; 0.97</li> </ul>
P2293	Fuel Pressure Regulator 2 Performance	<ul style="list-style-type: none"> <li>• Difference between target pressure - actual pressure &gt; 1.30 mPa</li> </ul>
P2294	Fuel Pressure Regulator 2 Control Circuit	<ul style="list-style-type: none"> <li>Open circuit</li> <li>• Signal voltage 1.40 - 3.20 V</li> <li>Rationality check</li> <li>• Signal pattern incorrect</li> </ul>
P2295	Fuel Pressure Regulator 2 Control Circuit Low Short to Ground	Signal voltage < 1.40 - 3.20 V
P2296	Fuel Pressure Regulator 2 Control Circuit High	Short to battery plus signal voltage > 3.20 V

## Ignition System

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P2300	Ignition Coil "A" Primary Control Circuit Low	Short to ground signal current > 24.0 mA

DTC	Error Message	Malfunction Criteria and Threshold Value
P2301	Ignition Coil "A" Primary Control Circuit High	Short to battery plus signal voltage > 5.1 - 7.0 V
P2303	Ignition Coil "B" Primary Control Circuit Low	Short to ground signal current > 24.0 mA
P2304	Ignition Coil "B" Primary Control Circuit High	Short to battery plus signal voltage > 5.1 - 7.0 V
P2306	Ignition Coil "C" Primary Control Circuit Low	Short to ground signal current > 24.0 mA
P2307	Ignition Coil "C" Primary Control Circuit High	Short to battery plus signal voltage > 5.1 - 7.0 V
P2309	Ignition Coil "D" Primary Control Circuit Low	Short to ground signal current > 24.0 mA
P2310	Ignition Coil "D" Primary Control Circuit High	Short to battery plus signal voltage > 5.1 - 7.0 V
P2312	Ignition Coil "E" Primary Control Circuit Low	Short to ground signal current > 24.0 mA
P2313	Ignition Coil "E" Primary Control Circuit High	Short to battery plus signal voltage > 5.1 - 7.0 V
P2315	Ignition Coil "F" Primary Control Circuit Low	Short to ground signal current > 24.0 mA
P2316	Ignition Coil "F" Primary Control Circuit High	Short to battery plus signal voltage > 5.1 - 7.0 V
P2318	Ignition Coil "G" Primary Control Circuit Low	Short to ground signal current > 24.0 mA
P2319	Ignition Coil "G" Primary Control Circuit High	Short to battery plus signal voltage > 5.1 - 7.0 V
P2321	Ignition Coil "H" Primary Control Circuit Low	Short to ground signal current > 24.0 mA
P2322	Ignition Coil "H" Primary Control Circuit High	Short to battery plus signal voltage > 5.1 - 7.0 V

## Additional Emissions Regulations

DTC	Error Message	Malfunction Criteria and Threshold Value
P2414	O2 Sensor signal range check - Bank 1, Bank 2	<ul style="list-style-type: none"> <li>• Threshold 1 - Signal voltage 2.71 - 6.00 V</li> <li>• Threshold 2 - Depending on gain factor, that actual is used for sensor characteristic, the threshold is signal voltage 2.05 - 3.06 V</li> </ul>
P2415	O2 Sensor Exhaust Sample Error, Bank 2 Sensor 1	<ul style="list-style-type: none"> <li>• Threshold 1 - Signal voltage 2.71 - 6.00 V</li> <li>• Threshold 2 - Depending on gain factor, that actual is used for sensor characteristic, the threshold is signal voltage 2.05 - 3.06 V</li> </ul>
P2431	Secondary Air Injection System Air Flow/Pressure Bank 1 Sensor Circuit Range/Performance	Difference between AIR pressure, AMP, and MAP -6.0 - 6.00 kPa
P2432	Secondary Air Injection System Air Flow/Pressure Bank 1 Sensor Circuit Low	Signal voltage < 0.40 V
P2433	Secondary Air Injection System Air Flow/Pressure Bank 1 Sensor Circuit High	Signal voltage > 4.60 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P2440	Secondary Air Injection System Switching Valve Stuck Open Bank 1	<ul style="list-style-type: none"> <li>• Relative AIR pressure measured <math>\leq 3.00</math> kPa</li> <li>• Relative AIR pressure (measured with AIR pressure sensor vs. modeled) vs. relative AIR pressure (measured with AIR pressure sensor vs. modeled while both AIR valves closed) <math>&gt; 1.50</math> [-]</li> <li>• Relative AIR pressure (measured with AIR pressure sensor vs. modeled while valve bank 2 commanded closed) vs. relative AIR pressure (measured with AIR pressure sensor vs. modeled while valve bank 1 commanded closed) <math>&gt; 1.50</math> [-]</li> <li>• Difference of average pressure between absolute value and filtered value while both valves commanded closed <math>\geq 0.30 - 1.00</math> kPa</li> </ul>
P2442	Secondary Air Injection System Switching Valve Stuck Open Bank 2	<ul style="list-style-type: none"> <li>• Relative AIR pressure measured <math>\leq 3.00</math> kPa</li> <li>• Relative AIR pressure (measured with AIR pressure sensor vs. modeled) vs. relative AIR pressure (measured with AIR pressure sensor vs. modeled while both AIR valves closed) <math>&gt; 1.50</math> [-]</li> <li>• Relative AIR pressure (measured with AIR pressure sensor vs. modeled while valve bank 2 commanded closed) vs. relative AIR pressure (measured with AIR pressure sensor vs. modeled while valve bank 1 commanded closed) <math>&gt; 1.50</math> [-]</li> <li>• Difference of average pressure between absolute value and filtered value while both valves commanded closed <math>\geq 0.30 - 1.00</math> kPa</li> </ul>

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P2539	Low Pressure Fuel System Sensor Circuit	Signal voltage > 4.80 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 < 0.20 V
P2626	O2 Sensor Pumping Current Trim Circuit/Open Bank 1 Sensor 1	O2S signal front > 4.8 V
P2629	O2 Sensor Pumping Current Trim Circuit/Open Bank 1 Sensor 1	O2S signal front > 4.8 V



# DTC CHART

## Engine Codes - 6.3L CEJA

### Fuel and Air Mixture, Additional Emissions Regulations

DTC	Error Message	Malfunction Criteria and Threshold Value
P000A	"A" Camshaft Position Slow Response (Bank 1)	<ul style="list-style-type: none"> <li>• Difference between target position vs. actual position &gt; 6.00 - 50.00° CRK</li> <li>• for time &gt; 1.3 - 5.0 Sec and</li> <li>• Adjustment angle <math>\geq</math> 3.00° CRK</li> </ul>
P000B	"B" Camshaft Position Slow Response (Bank 1)	<ul style="list-style-type: none"> <li>• Slow response</li> <li>• Difference between target position vs. actual position &gt; 6.00 - 20.0° CRK</li> <li>• for time &gt; 1.3 - 7.5 Sec and</li> <li>• Adjustment angle <math>\geq</math> 3.00° CRK</li> </ul>
P000C	"A" Camshaft Position Slow Response (Bank 2)	<ul style="list-style-type: none"> <li>• Difference between target position vs. actual position &gt; 6.00 - 50.00° CRK</li> <li>• for time &gt; 1.3 - 5.0 Sec and</li> <li>• Adjustment angle <math>\geq</math> 3.00° CRK</li> </ul>
P000D	"B" Camshaft Position Slow Response (Bank 2)	<ul style="list-style-type: none"> <li>• Slow response</li> <li>• Difference between target position vs. actual position &gt; 6.00 - 20.0° CRK</li> <li>• for time &gt; 1.3 - 7.5 Sec and</li> <li>• Adjustment angle <math>\geq</math> 3.00 °CRK</li> </ul>
P00AB	Intake Air Temperature Sensor 1 Bank 1 Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Difference ECT vs. IAT at engine start &gt; 24.8 K (depending on engine off time) and</li> <li>• Difference IAT vs. AAT at engine start &gt; 24.8 K (depending on engine off time) and</li> <li>• Difference AAT vs. ECT at engine start &lt; 24.8 K to (depending on engine off time)</li> </ul>

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P00AC	Intake Air Temperature Sensor 1 Bank 2 Circuit Low	IAT > 138.0° C
P00AD	Intake Air Temperature Sensor 1 Bank 2 Circuit High	IAT < -45° C
P008A	Low Pressure Fuel System Pressure - Too Low	Actual pressure, < 40.0 kPa
P008B	Low Pressure Fuel System Pressure - Too High	Actual pressure, > 900 kPa
P0010	"A" Camshaft Position Actuator Circuit/Open (Bank1)	Open circuit • Signal voltage 4.70 to 5.40 V
P0011	A Camshaft Position (Bank1) Timing over-advanced or System Performance	Target error • Difference between target position vs. actual position > 6.00 - 50.00° CRK • for time > 1.3 - 5.0 Sec • Adjustment angle < 3.00° CRK
P0013	B Camshaft Position Actuator Circuit/Open (Bank1)	Open circuit • Signal voltage 4.70 to 5.40 V
P0014	B Camshaft Position (Bank1) Timing Over-Advanced or System Performance	• Difference between target position vs. actual position > 6.00 to 20.0° CRK • for time > 1.3 to 7.5 Sec and • Adjustment angle < 3.00° CRK
P0016	Crankshaft Position-Camshaft Position Correlation Bank 1 Sensor A	• Permissible deviation < -12.00 °CRK or • Permissible deviation > 12.00 °CRK
P0017	Crankshaft Position-Camshaft Position Correlation Bank 1 Sensor B	• Permissible deviation < -12.00 °CRK or • Permissible deviation > 12.00 °CRK
P0018	Crankshaft Position-Camshaft Position Correlation Bank 2 Sensor A	• Permissible deviation < -12.00 °CRK or • Permissible deviation > 12.00 °CRK

DTC	Error Message	Malfunction Criteria and Threshold Value
P0019	Crankshaft Position-Camshaft Position Correlation Bank 2 Sensor B	<ul style="list-style-type: none"> <li>• Permissible deviation &lt; -12.00 °CRK</li> <li>or</li> <li>• Permissible deviation &gt; 12.00 °CRK</li> </ul>
P0020	A Camshaft Position Actuator Circuit (Bank 2)	<ul style="list-style-type: none"> <li>• Open circuit</li> <li>• Signal voltage 4.70 to 5.40 V</li> </ul>
P0021	A Camshaft Position (Bank 2) Timing over-advanced or System Performance	<ul style="list-style-type: none"> <li>• Difference between target position vs. actual position &gt; 6.00 to 50.00° CRK</li> <li>• for time &gt; 1.3 to 5.0 Sec</li> <li>and</li> <li>• Adjustment angle &lt; 3.00° CRK</li> </ul>
P0023	B Camshaft Position Actuator Circuit (Bank 2)	<ul style="list-style-type: none"> <li>• Open circuit</li> <li>• Signal voltage 0.0 to 3.25</li> </ul>
P0024	B Camshaft Position (Bank 2) Timing Over-Advanced or System Performance	<ul style="list-style-type: none"> <li>• Short to ground</li> <li>• Difference between target position vs. actual position &gt; 6.00 - 20.0° CRK</li> <li>• for time &gt; 1.3 - 7.5 Sec</li> <li>and</li> <li>• Adjustment angle &lt; 3.00° CRK</li> </ul>
P0030	2 Sensor Heater Contr. Circ. (Bank 1 (1) Sensor 1)	Heater voltage 4.70 to 5.40 V
P0031	O2 Sensor Heater Contr. Circ. (Bank 1 (1) Sensor 1) Low	Heater voltage 0.0 to 3.26 V
P0032	O2 Sensor Heater Contr. Circ. (Bank 1 (1) Sensor 1) High	Signal current > 5.50 A
P0036	O2 Sensor Heater Contr. Circ. (Bank 1 (1) Sensor 2)	Heater voltage 2.34 - 3.59 V
P0037	O2 Sensor Heater Contr. Circ. (Bank 1 (1) Sensor 2) Low	Heater voltage < 2.34 V
P0038	O2 Sensor Heater Contr. Circ. (Bank 1 (1) Sensor 2) High	Heater current > 3.59 A
P0040	O2 Sensor Signals Swapped Bank 1 Sensor 1/ Bank 2 Sensor 1	Signal range check (detection of exchange lambda sensors upstream catalyst)
P0050	O2 Sensor Heater Contr. Circ. (Bank 2 Sensor 1)	Heater voltage 4.70 to 5.40 V
P0051	O2 Sensor Heater Contr. Circ. (Bank 2 Sensor 1) Low	Heater voltage 0.0 to 3.26 V

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0052	O2 Sensor Heater Contr. Circ. (Bank 2 Sensor 1) High	Signal current > 5.50 A
P0056	O2 Sensor Heater Contr. Circ. (Bank 2 Sensor 2)	Heater voltage 2.34 - 3.59 V
P0057	O2 Sensor Heater Contr. Circ. (Bank 2 Sensor 2) Low	Heater voltage < 2.34 V
P0058	O2 Sensor Heater Contr. Circ. (Bank 2 Sensor 2) High	Heater voltage > 3.59 A
P0068	MAP/MAF – Throttle Position Correlation	Plausibility with fuel system - load survey below threshold <ul style="list-style-type: none"> <li>• Load calculation &lt; -35% and</li> </ul> Plausibility with fuel system - load survey above threshold <ul style="list-style-type: none"> <li>• Load calculation &gt; -35%</li> </ul>
P0070	Ambient Air Temperature Sensor	Ambient air temperature signal: short to battery / open circuit failure
P0071	Ambient Air Temperature Sensor Range/Performance	<ul style="list-style-type: none"> <li>• Difference ECT vs. IAT at engine start &lt; 24.8 K (depending on engine off time) and</li> <li>• Difference IAT vs. AAT at engine start &gt; 24.8 K (depending on engine off time) and</li> <li>• (Depending on engine off time) and diff. AAT vs. ECT at engine start &gt; 24.8 K] (depending on engine off time)</li> </ul>
P0072	Ambient Air Temperature Sensor	Ambient air temperature signal: short to ground failure
P0087	Fuel Rail/System Pressure - Too Low	<ul style="list-style-type: none"> <li>• Pressure control activity, &gt; 2.20 MPa</li> <li>• Fuel trim activity, 0.90 to 16</li> <li>• Difference between actual pressure - Target pressure &gt; 2.20 MPa</li> </ul>

DTC	Error Message	Malfunction Criteria and Threshold Value
P0089	Fuel Pressure Regulator 1 Performance	<ul style="list-style-type: none"> <li>• Difference between actual pressure vs. target pressure &gt; 200.00 kPa</li> <li>or</li> <li>• Difference between actual pressure - Target pressure &gt;150 kPa</li> <li>or</li> <li>• Pressure control activity &gt; 280 kPa</li> <li>or</li> <li>• Pressure control activity &lt; -300.00 kPa</li> </ul>
P0100	2 MAF Sensors MAF 1 MAF 2	MAF sensor signal 0 $\mu$ s
P0101	Mass or Volume Air Flow Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Air mass too low &lt; -10.00 kg/h</li> <li>• Air mass too high &gt; 1100.00 kg/h</li> <li>• Mass air flow vs. lower threshold model &lt; 0 - 500 kg/h</li> <li>• Mass air flow vs. upper threshold model &gt; 25 - 1100 kg/h</li> <li>• Load calculation &gt; 25%</li> <li>• and fuel system (mult.) &lt; -16%</li> <li>• Load calculation &lt; -20%</li> <li>• and fuel system (mult.) &gt; 25%</li> </ul>
P0102	Mass or Volume Air Flow A Circuit Low Input	<ul style="list-style-type: none"> <li>• MAF sensor signal &lt; 66 uSec</li> <li>or</li> <li>• MAF sensor signal temp correction &lt; 40 mSec</li> </ul>
P0103	Mass or Volume Air Flow A Circuit High Input	<ul style="list-style-type: none"> <li>• MAF sensor signal &gt; 1100 uSec</li> <li>or</li> <li>• MAF sensor signal temp correction &lt; 65 mSec</li> </ul>
P010A	2 MAF Sensors MAF 1 MAF 2	MAF sensor signal 0 $\mu$ s
P010C	Mass or Volume Air Flow "B" Circuit Low Input	MAF sensor signal < 40 mSec
P010D	2 MAF Sensors MAF 1 MAF 2	MAF Sensor signal temp.- correction > 65

DTC	Error Message	Malfunction Criteria and Threshold Value
P0111	Intake Air Temperature Sensor 1 Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Difference ECT vs. IAT at engine start &gt; 24.8 K (depending on engine off time) and</li> <li>• Difference IAT vs. AAT at engine start &gt; 24.8 K (depending on engine off time) and</li> <li>• Difference AAT vs. ECT at engine start &lt; 24.8 K to (depending on engine off time)</li> </ul>
P0112	Intake Air Temperature Sensor 1 Circuit Low	IAT > 138.0° C
P0113	Intake Air Temperature Sensor 1 Circuit High	IAT < -45° C
P0116	Engine Coolant Temperature Sensor 1 Circuit Range/Performance	<p>Stuck high</p> <ul style="list-style-type: none"> <li>• No change on signal &lt; 0.0 - 1.5 K</li> </ul> <p>and</p> <ul style="list-style-type: none"> <li>• Signal in range 140° C</li> </ul> <p>Stuck low</p> <ul style="list-style-type: none"> <li>• No change on signal &lt; 0.0 to 1.5K</li> </ul> <p>and</p> <ul style="list-style-type: none"> <li>• Signal in range (lower threshold &gt; -44° C</li> <li>• Signal in range (upper threshold &lt; 88° C</li> </ul> <p>Stuck in range</p> <ul style="list-style-type: none"> <li>• No change on signal &lt; 0.0 to 1.5K</li> </ul> <p>and</p> <ul style="list-style-type: none"> <li>• Signal in range (lower threshold &gt; 89° C</li> <li>• Signal in range (upper threshold &lt; 140° C</li> </ul>
P0117	Engine Coolant Temperature Sensor 1 Circuit Low	Short to ground-ECT > 140° C
P0118	Engine Coolant Temperature Sensor 1 Circuit High	Short to battery positive or open circuit-ECT < -41° C

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0121	Throttle Position Sensor 1 Bank 1 Bank 2	<ul style="list-style-type: none"> <li>• TPS 1 - TPS 2 &gt; 6.3% and</li> <li>• Actual TPS 1 - calc. value &gt; actual TPS 2 - calc. value 1%</li> </ul> or <ul style="list-style-type: none"> <li>• TPS 1 - calc. value &gt; 9%</li> </ul>
P0122	Throttle Position Sensor 1 Bank 1 Bank 2	Signal voltage < 0.20 V
P0123	Throttle Position Sensor 1 Bank 1 Bank 2	Signal voltage > 4.81 V
P0130	O2 Sensor Circ.,Bank1- Sensor1 Malfunction	O2S ceramic temperature < 690° C
P0132	O2 Sensor Circ.,Bank1- Sensor1 Low Voltage	Short to ground
		Virtual mass (VM) < 1.75 V
		Nernst voltage (UN) < 1.50 V
		Adjustment voltage (IP) < 0.30 V

**DTC Chart**

DTC	Error Message	Malfunction Criteria and Threshold Value
P0133	O2 Sensor Circ.,Bank1-Sensor1 Slow Response	<p>Symmetric fault:</p> <ul style="list-style-type: none"> <li>• Difference of R2L area ratio vs. L2R area ratio -0.40 - 0.40</li> <li>• Lower value of both counters for area ratio R2L and L2R <math>\geq</math> 5 times</li> </ul> <p>Delay Time:</p> <ul style="list-style-type: none"> <li>• Gradient ratio <math>\geq</math> 0.50</li> <li>• Lower value of both area ratios R2L and L2R <math>&lt;</math> 0.30</li> </ul> <p>Transient Time:</p> <ul style="list-style-type: none"> <li>• Gradient ratio <math>\geq</math> 0.50</li> <li>• Gradient ratio <math>\leq</math> 0.55</li> <li>• Lower value of both area ratios R2L and L2R <math>&lt;</math> 0.30</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>• Lower value of both gradient ratios R2L and L2R <math>&lt;</math> 0.50</li> </ul> <p>Asymmetric fault:</p> <ul style="list-style-type: none"> <li>• Difference of R2L area ratio vs. L2R area ratio NOT (-0.40 - 0.40)</li> <li>• Values of both counters for area ratio R2L and L2R <math>\geq</math> 5 times</li> </ul> <p>Delay Time:</p> <ul style="list-style-type: none"> <li>• Gradient ratio <math>\geq</math> 0.50</li> <li>• Lower value of both area ratios R2L and L2R <math>&lt;</math> 0.30</li> </ul> <p>Transient Time:</p> <ul style="list-style-type: none"> <li>• Gradient ratio <math>\geq</math> 0.50)</li> <li>• Gradient ratio <math>\leq</math> 0.55</li> <li>• Lower value of both area ratios R2L and L2R <math>&lt;</math> 0.30</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>• Lower value of both gradient ratios R2L and L2R <math>&lt;</math> 0.50</li> </ul>
P0135	O2 Sensor Heater Circ., Bank 1-Sensor 1 Malfunction	<ul style="list-style-type: none"> <li>• O2S ceramic temperature <math>&lt;</math> 725°C</li> </ul> <p>and</p> <ul style="list-style-type: none"> <li>• Heater duty cycle 90.00%</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>• O2S ceramic temp. <math>&lt;</math> 725° C</li> </ul> <p>and</p> <ul style="list-style-type: none"> <li>• Time after O2S heater on 55.0 Sec</li> </ul>



DTC	Error Message	Malfunction Criteria and Threshold Value
P0136	O2 Sensor Circ., Bank 1-Sensor 2 Malfunction	<ul style="list-style-type: none"> <li>• Delta O2S signal rear &gt; 2 V</li> <li>• Number of heater coupling faults &gt; 4</li> </ul>
P0137	O2 Sensor Circ., Bank 1-Sensor 2 Low Voltage	<ul style="list-style-type: none"> <li>• Signal voltage &lt; 0.06 V for time &gt; 3 Sec.</li> </ul> and <ul style="list-style-type: none"> <li>• Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3 measurements) &lt; 0.01 V</li> </ul>
P0138	O2 Sensor Circ., Bank 1-Sensor 2 High Voltage	Signal voltage > 1.08 V for > 5 Sec.
P0139	O2 Sensor Circ., Bank 1-Sensor 2 Slow Response	<ul style="list-style-type: none"> <li>• O2S rear signal not oscillating at reference 635 to 659 mV</li> <li>• O2S signal rear during fuel cut off &gt; 200 mV</li> </ul>
P013A	O2 Sensor Bank 1 Sensor 2 Slow Response - Rich to Lean	<ul style="list-style-type: none"> <li>• Arithmetic filtered max differential transient time at fuel cut off <math>\geq</math> 0.5 Sec</li> </ul> and <ul style="list-style-type: none"> <li>• Number of checks <math>\geq</math> 3.00</li> </ul>
P013C	O2 Sensor Bank 2 Sensor 2 Slow Response - Rich to Lean	<ul style="list-style-type: none"> <li>• Arithmetic filtered max differential transient time at fuel cut off <math>\geq</math> 0.5 Sec</li> </ul> and <ul style="list-style-type: none"> <li>• Number of checks <math>\geq</math> 3.00</li> </ul>
P0140	O2 Sensor Circ., Bank 1 -Sensor 2 No Activity Detected	<ul style="list-style-type: none"> <li>• Signal voltage 0.40 to 0.60 V</li> <li>• for time &gt; 3.0 Sec</li> </ul> and <ul style="list-style-type: none"> <li>• Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3 measurements) <math>\geq</math> 2.80 V</li> </ul> or <ul style="list-style-type: none"> <li>• internal resistance &gt; 40000 <math>\Omega</math></li> <li>and</li> <li>• Exhaust temperature &gt; 700° C</li> </ul>
P0141	O2 Sensor Heater Circ., Bank 1-Sensor 2 Malfunction	Heater resistance 500 - 10000 $\Omega$
P0150	O2 Sensor Circ., Bank 2-Sensor 1 Malfunction	O2S ceramic temperature < 690° C

DTC	Error Message	Malfunction Criteria and Threshold Value
P0151	O2 Sensor Circ., Bank 2-Sensor 1 Low Voltage	Short to ground
		Virtual mass (VM) < 1.75 V
		Nernst voltage (UN) < 1.50 V
		Adjustment voltage (IP) < 0.30 V
P0152	O2 Sensor Circ., Bank 2-Sensor 1 High Voltage	Short to battery
		Virtual mass (VM) > 3.25 V
		Nernst voltage (UN) > 4.40 V
		Adjustment voltage (IP) > 7.00 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P0153	O2 Sensor Circ., Bank 2-Sensor 1 Slow Response	<p>Symmetric fault:</p> <ul style="list-style-type: none"> <li>• Difference of R2L area ratio vs. L2R area ratio <math>-0.40 - 0.40</math></li> <li>• Lower value of both counters for area ratio R2L and L2R <math>\geq 5</math> times</li> </ul> <p>Delay Time:</p> <ul style="list-style-type: none"> <li>• Gradient ratio <math>\geq 0.50</math></li> <li>• Lower value of both area ratios R2L and L2R <math>&lt; 0.30</math></li> </ul> <p>Transient Time:</p> <ul style="list-style-type: none"> <li>• Gradient ratio <math>\geq 0.50</math></li> <li>• Gradient ratio <math>\leq 0.55</math></li> <li>• Lower value of both area ratios R2L and L2R <math>&lt; 0.30</math></li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>• Lower value of both gradient ratios R2L and L2R <math>&lt; 0.50</math></li> </ul> <p>Asymmetric fault:</p> <ul style="list-style-type: none"> <li>• Difference of R2L area ratio vs. L2R area ratio NOT <math>(-0.40 - 0.40)</math></li> <li>• Values of both counters for area ratio R2L and L2R <math>\geq 5</math> times</li> </ul> <p>Delay Time:</p> <ul style="list-style-type: none"> <li>• Gradient ratio <math>\geq 0.50</math></li> <li>• Lower value of both area ratios R2L and L2R <math>&lt; 0.30</math></li> </ul> <p>Transient Time:</p> <ul style="list-style-type: none"> <li>• Gradient ratio <math>\geq 0.50</math>)</li> <li>• Gradient ratio <math>\leq 0.55</math></li> <li>• Lower value of both area ratios R2L and L2R <math>&lt; 0.30</math></li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>• Lower value of both gradient ratios R2L and L2R <math>&lt; 0.50</math></li> </ul>
P0155	O2 Sensor Heater Circ., Bank 2-Sensor 1 Malfunction	<ul style="list-style-type: none"> <li>• O2S ceramic temperature <math>&lt; 725</math> °C</li> </ul> <p>and</p> <ul style="list-style-type: none"> <li>• Heater duty cycle <math>&gt; 90.00\%</math></li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>• O2S ceramic temperature <math>&lt; 725</math> °C and</li> <li>• Time after O2S heater on 55.0 Sec</li> </ul>

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0156	O2 Sensor Circ., Bank 2-Sensor 2 Malfunction	<ul style="list-style-type: none"> <li>• Delta O2S signal rear &gt; 2 V</li> <li>• Number of heater coupling faults &gt; 4</li> </ul>
P0157	O2 Sensor Circ., Bank 2-Sensor 2 Low Voltage	<ul style="list-style-type: none"> <li>• Signal voltage &lt; 0.06 V for time &gt; 3.0 Sec</li> <li>and</li> <li>• Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3 measurements) &lt; 0.01 V</li> </ul>
P0158	O2 Sensor Circ., Bank 2-Sensor 2 High Voltage	Signal voltage > 1.08 V for time > 5.0 Sec
P0159	O2 Sensor Circ., Bank 2-Sensor 2 Slow Response	<ul style="list-style-type: none"> <li>• O2S rear signal not oscillating at reference 635 to 659 mV</li> <li>• O2S signal rear during fuel cut off &gt; 200 mV</li> </ul>
P0160	O2 Sensor Circ., Bank 2-Sensor 2 No Activity Detected	<ul style="list-style-type: none"> <li>• Signal voltage 0.40 - 0.60 V for time &gt; 3.0 Sec</li> <li>and</li> <li>• Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3 measurements) <math>\geq</math> 2.80 V</li> <li>or</li> <li>• Internal resistance &gt; 40000 <math>\Omega</math></li> <li>and</li> <li>• Exhaust temperature &gt; 700° C</li> </ul>
P0161	O2 Sensor Heater Circ., Bank 2-Sensor 2 Malfunction	Heater resistance > 500 - 10000 $\Omega$
P0169	Electronic Throttle Control Module	<ul style="list-style-type: none"> <li>• Comparison with fuel quantity incorrect</li> <li>• Internal check failed</li> <li>• Correction factor incorrect</li> <li>• Fuel quantity incorrect</li> </ul>
P0171	Fuel System Additive Bank 1 Bank 2 Fuel System Multiplicative Bank 1 Bank 2	Adaptive value > 5% Adaptive value > -20%
P0172	Fuel System additive Bank 1 Bank 2 Fuel System multiplicative Bank 1 Bank 2	Adaptive value < 5% Adaptive value < -20%

DTC	Error Message	Malfunction Criteria and Threshold Value
P0174	Fuel System Additive Bank 1 Bank 2 Fuel System multiplicative Bank 1 Bank 2	Adaptive value > 5% Adaptive value > -20%
P0175	Fuel System additive Bank 1 Bank 2 Fuel System Multiplicative Bank 1 Bank 2	Adaptive value < 5% Adaptive value < -20%
P0190	Fuel Rail Pressure Sensor "A" Circuit	Signal voltage > 4.8 V
P0191	Fuel Rail Pressure Sensor	Rail pressure > 13.5 mPa
P0192	Fuel Rail Pressure Sensor "A" Circuit Low Input	Signal voltage < 0.20 V
P0201	Injector Circuit/Open - Cylinder 1	Internal logic failure
P0202	Injector Circuit/Open - Cylinder 2	Internal logic failure
P0203	Injector Circuit/Open - Cylinder 3	Internal logic failure
P0204	Injector Circuit/Open - Cylinder 4	• Internal logic failure
P0205	Injector Circuit/Open - Cylinder 5	• Internal logic failure
P0206	Injector Circuit/Open - Cylinder 6	• Internal logic failure
P0207	Injector Circuit/Open - Cylinder 7	• Internal logic failure
P0208	Injector Circuit/Open - Cylinder 8	• Internal logic failure
P0209	Injector Circuit/Open - Cylinder 9	Internal logic failure
P0210	Injector Circuit/Open - Cylinder 10	Internal logic failure
P0211	Injector Circuit/Open - Cylinder 11	Internal logic failure
P0212	Injector Circuit/Open - Cylinder 12	Internal logic failure

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0221	Throttle Position Sensor 2 Bank 1 Bank 2	<ul style="list-style-type: none"> <li>• TPS 1 - TPS 2 &gt; 6.30%</li> <li>• Actual TPS 2 - calc. value &gt; actual TPS 1 - calc. value</li> </ul> or <ul style="list-style-type: none"> <li>• Actual TPS 2 - calc. value &gt; 9%</li> </ul>
P0222	Throttle Position Sensor 2 Bank 1 Bank 2	Signal voltage < 0.215 V
P0223	Throttle/Pedal Position Sensor/Switch "B" Circuit High	Signal voltage > 4.81 V
P0261	Injection Valves - Low Side Cylinder #1	Signal current < 2.10 A
P0262	Injection Valves - High Side Cylinder #1	Short to battery plus (low side) • Signal current > 14.70 A
P0264	Injection Valves - Low Side Cylinder #2	Signal current < 2.10 A
P0265	Injection Valves - High Side Cylinder #2	Short to battery plus (low side) • Signal current > 14.70 A
P0267	Injection Valves - Low Side Cylinder #3	Signal current < 2.10 A
P0268	Injection Valves - High Side Cylinder #3	Short to battery plus (low side) • Signal current > 14.70 A
P0270	Injection Valves - Low Side Cylinder #4	Signal current < 2.10 A
P0271	Injection Valves - High Side Cylinder #4	Short to battery plus (low side) • Signal current > 14.70 A
P0273	Injection Valves - Low Side Cylinder #5	Signal current < 2.10 A
P0274	Injection Valves - High Side Cylinder #5	Short to battery plus (low side) • Signal current > 14.70 A
P0276	Injection Valves - Low Side Cylinder #6	Signal current < 2.10 A
P0277	Injection Valves - High Side Cylinder #6	Short to battery plus (low side) • Signal current > 14.70 A
P0279	Injection Valves - Low Side Cylinder #7	Signal current < 2.10 A
P0280	Injection Valves - High Side Cylinder #7	Short to battery plus (low side) • Signal current > 14.70 A
P0282	Injection Valves - Low Side Cylinder #8	Signal current < 2.10 A

DTC	Error Message	Malfunction Criteria and Threshold Value
P0283	Injection Valves - High Side Cylinder #8	Short to battery plus (low side) • Signal current > 14.70 A
P0285	Injection Valves - Low Side Cylinder #9	Signal current < 2.10 A
P0286	Injection Valves - High Side Cylinder #9	Short to battery plus (low side) • Signal current > 14.70 A
P0288	Injection Valves - Low Side Cylinder #10	Signal current < 2.10 A
P0289	Injection Valves - High Side Cylinder #10	Short to battery plus (low side) • Signal current > 14.70 A
P0291	Injection Valves - Low Side Cylinder #11	Signal current < 2.10 A
P0292	Injection Valves - High Side Cylinder #11	Short to battery plus (low side) • Signal current > 14.70 A
P0294	Injection Valves - Low Side Cylinder #12	Signal current < 2.10 A
P0295	Injection Valves - High Side Cylinder #12	Short to battery plus (low side) • Signal current > 14.70 A
P010B	Mass or Volume Air Flow "B" Circuit Range/Performance	• Mass air flow HFM2 vs. lower threshold map HFM2 < 0 - 450 kg/h • Mass air flow HFM2 vs. upper threshold map > 55 - 1082
P010C	Mass or Volume Air Flow "B" Circuit Low Input	PWM time length < 40 mSec
P010D	2 MAF Sensors MAF 1 MAF 2	PWM time length > 65 mSec
P010E	2 MAF Sensors MAF 1 MAF 2	PWM time length 0 uSec
P018A	Fuel Pressure Sensor "B" Circuit	Signal voltage > 4.80 V
P018B	Fuel Rail Pressure Sensor	Rail pressure > 13.5 mPa
P018C	Fuel Pressure Sensor "B" Circuit Low	Signal voltage < 0.20 V
P025A	Fuel Pump Module Control Open circuit	Signal voltage > 4.8 to 5.3 V
P025C	Fuel Pump short to ground	Signal voltage < 2.7 to 3.25 V
P025D	Fuel Pump short to B+	Signal current > 0.6 A
P2026	Evaporative Emissions (EVAP) Fuel Vapor Temperature Sensor Circuit Low Voltage	Signal voltage 0.0 - 3.25 V

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P2027	Evaporative Emissions (EVAP) Fuel Vapor Temperature Sensor Circuit High Voltage	• Signal current > 2.20 A
P2088	A Camshaft Position Actuator Control Circuit Low Bank 1	Short to ground • Signal voltage 0.0 - 3.25
P2089	A Camshaft Position Actuator Control Circuit High Bank 1	Short to battery plus • Signal current > 2.2 A
P2090	B Camshaft Position Actuator Control Circuit(Bank1) Low	Short to ground • Signal voltage 0.0 - 3.25
P2091	B Camshaft Position Actuator Control Circuit High (Bank 1)	Short to battery plus • Signal current > 2.20 A
P2092	A Camshaft Position Actuator Control Circuit (Bank 2) Low	Short to ground • Signal voltage 0.0 - 3.25
P2093	A Camshaft Position Actuator Control Circuit (Bank 2) High	Short to battery plus • Signal current > 2.20 A
P2094	B Camshaft Position Actuator Control Circuit (Bank 2) Low	Short to ground • Signal voltage 0.0 - 3.25
P2095	B Camshaft Position Actuator Control Circuit (Bank 2) High	Short to battery plus • Signal current > 2.20 A
P2096	Post Catalyst Fuel Trim System Bank 1 Too Lean	I-portion of 2nd lambda control loop < -0.045
P2097	Post Catalyst Fuel Trim System Bank 1 Too Rich	I-portion of 2nd lambda control loop > -0.045
P2098	Post Catalyst Fuel Trim System Bank 2 Too Lean	I-portion of 2nd lambda control loop < -0.045
P2099	Post Catalyst Fuel Trim System Bank2 Too Rich	I-portion of 2nd lambda control loop > -0.045
P3025	Angle Sensor 1 (on throttle drive 2 power accelerator actuation)	• TPS 1-TPS 2, > 6.3% • TPS 2 - calc value > TPS 1 calc. value or • TPS 2 calc. value, > 9%
P3026	Angle Sensor 1 (on throttle drive 2 power accelerator actuation)	Signal voltage < 0.20 V
P3027	Angle Sensor 1 (on throttle drive 2 power accelerator actuation)	Signal voltage, > 4.81V



DTC	Error Message	Malfunction Criteria and Threshold Value
P3028	Angle Sensor 2 (on throttle drive 2 power accelerator actuation)	<ul style="list-style-type: none"> <li>• TPS 1-TPS 2, &gt; 6.3%</li> <li>• TPS 2 - calc value &gt; TPS 1 calc. value</li> </ul> or <ul style="list-style-type: none"> <li>• TPS 2 calc. value, &gt; 9%</li> </ul>
P3029	Angle Sensor 2 (on throttle drive 2 power accelerator actuation)	Signal voltage, < 0.20 V
P3030	Angle Sensor 2 (on throttle drive 2 power accelerator actuation)	Signal voltage, > 4.81 V
P3031	Throttle Drive 2 (power accelerator actuation) Electrical Malfunction in Circuit	Internal check Failed
P3032	Throttle Actuator Basic Setting Bank 1 Bank 2	<ul style="list-style-type: none"> <li>• TPS 1 signal voltage &lt; 0.21 or &gt; 0.87 V</li> <li>• TPS 2 signal voltage &lt; 4.14 or &gt; 4.84 V</li> </ul>
P3035	Throttle Valve Control Module 2 Mechanical malfunction	<ul style="list-style-type: none"> <li>• Time to open over reference point + 12%, &gt; 0.14 Sec.</li> <li>• Time to close below reference point, + 3%, &gt; 0.56 Sec.</li> <li>• Time to close below reference point + 3% &gt; 0.56 Sec.</li> </ul>
P3081	Engine Temperature Too Low	Difference reference model temperature vs. ECT > 9.8 K
P3144	Exhaust-Bank 3, Sensor 1, Oxygen Sensor Signal Implausible Lean	Delta lambda of 2nd lambda control loop > 0.070
P3145	Exhaust-Bank 3, Sensor 1, Oxygen Sensor Signal Implausible Rich	Delta lambda of 2nd lambda control loop < -0.070
P3146	Exhaust-Bank 4, Sensor1, Oxygen Sensor Signal Implausible Lean	Delta lambda of 2nd lambda control loop > 0.070
P3147	Exhaust-Bank 4, Sensor 1, Oxygen Sensor Signal Implausible Rich	Delta lambda of 2nd lambda control loop < -0.070
P3148	Exhaust Bank 3, O2 Sensor Before Cat. Conv., Heater Circuit Regulation at Upper Limit	<ul style="list-style-type: none"> <li>• O2S ceramic temp. &lt; 725 °C and</li> <li>• Heater duty cycle &gt; 90.00%</li> </ul>

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P3150	Exhaust bank 4, O2 sensor before cat. conv., heater circuit Regulation at upper limit	<ul style="list-style-type: none"> <li>• O2S ceramic temp. &lt; 725 °C and</li> <li>• Heater duty cycle &gt; 90.00%</li> </ul>
P3152	Exhaust Gas Bank 3, Sensor 1 Internal Resistance Implausible	<ul style="list-style-type: none"> <li>• O2S ceramic temp. &lt; 725 °C and</li> <li>• Time after O2S heater on 55.0 Sec</li> </ul>
P3153	Exhaust Gas Bank 4, Sensor 1 Internal Resistance Implausible	<ul style="list-style-type: none"> <li>• O2S ceramic temp. &lt; 725 °C and</li> <li>• Time after O2S heater on 55.0 Sec</li> </ul>
P3200	Exhaust-Bank3 -Sensor1, Heating Circuit Short Circuit To Ground	<ul style="list-style-type: none"> <li>• Signal voltage 0.0 - 3.26 V</li> </ul>
P3201	Exhaust-Bank 3 -Sensor 1, Heating Circuit Short Circuit To B+	Signal current > 5.50 A
P3202	Exhaust-Bank 3 -Sensor1 , Heating Circuit Open Circuit	Heater voltage 4.70 to 5.40 V
P3205	Exhaust-Bank 3-Sensor 1 Voltage Too Low	<ul style="list-style-type: none"> <li>Short to ground</li> <li>• Virtual mass (VM) voltage &lt; 1.75 V</li> <li>• Nernst voltage (UN) &lt; 1.50 V</li> <li>• Adjustment voltage (IP) &lt; 0.30 V</li> </ul>
P3206	Exhaust-Bank 3-Sensor 1 Voltage Too High	<ul style="list-style-type: none"> <li>Short to battery</li> <li>• Virtual mass (VM) voltage &gt; 3.25 V</li> <li>• Nernst voltage (UN) &gt; 4.40 V</li> <li>• Adjustment voltage (IP) &gt; 7.00 V</li> </ul>
P3207	Exhaust-Bank 3-Sensor 1 Electrical Error In Circuit	O2S ceramic temp. < 690 °C

DTC	Error Message	Malfunction Criteria and Threshold Value
P3209	Exhaust-Bank 3-Sensor 1 Signal Too Slow	<p>SYMMETRIC FAULT:</p> <ul style="list-style-type: none"> <li>• Difference of R2L area ratio vs. L2R area ratio -0.40 - 0.40</li> <li>• Lower value of both counters for area ratio R2L and L2R <math>\geq 5</math> times</li> </ul> <p>Delay Time:</p> <ul style="list-style-type: none"> <li>• Gradient ratio <math>\geq 0.50</math></li> <li>• Lower value of both area ratios R2L and L2R <math>&lt; 0.30</math></li> </ul> <p>Transient Time:</p> <ul style="list-style-type: none"> <li>• Gradient ratio <math>\geq 0.50</math></li> <li>• Gradient ratio <math>\leq 0.55</math></li> <li>• Lower value of both area ratios R2L and L2R <math>&lt; 0.30</math></li> <li>• or lower value of both gradient ratios R2L and L2R <math>&lt; 0.50</math></li> </ul> <p>ASYMMETRIC FAULT:</p> <ul style="list-style-type: none"> <li>• Difference of R2L area ratio vs. L2R area ratio NOT (-0.40 - 0.40)</li> <li>• Values of both counters for area ratio R2L and L2R <math>\geq 5</math></li> </ul> <p>Delay Time:</p> <ul style="list-style-type: none"> <li>• Gradient ratio <math>\geq 0.50</math></li> <li>• Lower value of both area ratios R2L and L2R <math>&lt; 0.30</math></li> </ul> <p>Transient Time:</p> <ul style="list-style-type: none"> <li>• Gradient ratio <math>\geq 0.50</math></li> <li>• Gradient ratio <math>\leq 0.55</math></li> <li>• Lower value of both area ratios R2L and L2R <math>&lt; 0.30</math></li> <li>• or lower value of both gradient ratios R2L and L2R <math>&lt; 0.50</math></li> </ul>
P3215	Exhaust-Bank3-Sensor2, Heater Circuit Short Circuit to Ground	Heater voltage, $< 2.34$ V
P3216	Exhaust-Bank 3-Sensor 2, Heater Circuit Short Circuit to B+	Heater voltage $> 3.59$ V
P3217	Exhaust-Bank 3-Sensor 2, Heater Circuit Open Circuit	Heater voltage, $2.34 - 3.59$ V
P3218	Exhaust-Bank 3-Sensor 2, Heater Circuit Electrical Malfunction	Heater resistance $> 500 - 10000\Omega$

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P3220	Exhaust-Bank 3-Sensor 2 Voltage Too Low	<ul style="list-style-type: none"> <li>• Signal voltage &lt; 0.06 V for time &gt; 3.0 Sec</li> <li>and</li> <li>• Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3 measurements) &lt; 0.01 V</li> </ul>
P3221	Exhaust-Bank 3-Sensor 2 Voltage Too High	<ul style="list-style-type: none"> <li>• Signal voltage &gt; 1.08 V</li> <li>• for time &gt; 5.0 Sec</li> </ul>
P3223	Exhaust-Bank 3-Sensor 2 No Activity Detected	<ul style="list-style-type: none"> <li>• Signal voltage 0.40 - 0.60 V for time &gt; 3.0 Sec</li> <li>and</li> <li>• Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3 measurements) <math>\geq</math> 2.80 V</li> <li>or</li> <li>• Internal resistance &gt; 40000<math>\Omega</math></li> <li>and</li> <li>• Exhaust temperature &gt; 700° C</li> </ul>
P3224	Exhaust-Bank 3-Sensor 2 Signal Too Slow	<ul style="list-style-type: none"> <li>• Arithmetic filtered max differential transient time at fuel cut off <math>\geq</math> 0.5 Sec</li> <li>and</li> <li>• Number of checks <math>\geq</math> 3.00</li> </ul>
P3230	Exhaust-Bank 4 -Sensor 1, Heating Circuit Short Circuit to Ground	Signal voltage 0.0 - 3.26 V
P3231	Exhaust-Bank 4 -Sensor1 , Heating Circuit Short Circuit to B+	Signal current > 5.50 A
P3232	Exhaust-Bank 4 -Sensor 1, Heating Circuit Open Circuit	Signal voltage > 4.70 - 5.40 V
P3235	Exhaust-Bank 4-Sensor 1 Voltage Too Low	<ul style="list-style-type: none"> <li>Short to ground</li> <li>• Virtual mass (VM) voltage &lt; 1.75 V</li> <li>• Nernst voltage (UN) &lt; 1.50 V</li> <li>• Adjustment voltage (IP) &lt; 0.30 V</li> </ul>

DTC	Error Message	Malfunction Criteria and Threshold Value
P3236	Exhaust-Bank 4-Sensor 1 Voltage Too High	Short to battery <ul style="list-style-type: none"> <li>• Virtual mass (VM) voltage &gt; 3.25 V</li> <li>• Nernst voltage (UN) &gt; 4.40 V</li> <li>• Adjustment voltage (IP) &gt; 7.00 V</li> </ul>
P3237	Exhaust-Bank 4-Sensor 1 Electrical Error In Circuit	O2S ceramic temp. < 690° C
P3239	Exhaust-Bank 4-Sensor 1 Signal Too Slow	<p>SYMMETRIC FAULT:</p> <ul style="list-style-type: none"> <li>• Difference of R2L area ratio vs. L2R area ratio -0.40 - 0.40</li> <li>• Lower value of both counters for area ratio R2L and L2R <math>\geq</math> 5 times</li> </ul> <p>Delay Time:</p> <ul style="list-style-type: none"> <li>• Gradient ratio <math>\geq</math> 0.50</li> <li>• Lower value of both area ratios R2L and L2R &lt; 0.30</li> </ul> <p>Transient Time:</p> <ul style="list-style-type: none"> <li>• Gradient ratio <math>\geq</math> 0.50</li> <li>• Gradient ratio <math>\leq</math> 0.55</li> <li>• Lower value of both area ratios R2L and L2R &lt; 0.30</li> <li>• or lower value of both gradient ratios R2L and L2R &lt; 0.50</li> </ul> <p>ASYMMETRIC FAULT:</p> <ul style="list-style-type: none"> <li>• Difference of R2L area ratio vs. L2R area ratio NOT (-0.40 - 0.40)</li> <li>• Values of both counters for area ratio R2L and L2R <math>\geq</math> 5</li> </ul> <p>Delay Time:</p> <ul style="list-style-type: none"> <li>• Gradient ratio <math>\geq</math> 0.50</li> <li>• Lower value of both area ratios R2L and L2R &lt; 0.30</li> </ul> <p>Transient Time:</p> <ul style="list-style-type: none"> <li>• Gradient ratio <math>\geq</math> 0.50</li> <li>• Gradient ratio <math>\leq</math> 0.55</li> <li>• Lower value of both area ratios R2L and L2R &lt; 0.30</li> <li>• or lower value of both gradient ratios R2L and L2R &lt; 0.50</li> </ul>
P3245	Exhaust-Bank 4-Sensor 2,Heater Circuit Short Circuit to Ground	Heater voltage, < 2.34 V

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P3246	Exhaust-Bank 4-Sensor 2, Heater Circuit Short Circuit to B+	Heater voltage > 3.59 V
P3248	Exhaust-Bank 4-Sensor 2, Heater Circuit Electrical Malfunction	Heater resistance > 500 - 10000Ω
P3250	Exhaust-Bank 4-Sensor 2 Voltage Too Low	<ul style="list-style-type: none"> <li>• Signal voltage &lt; 0.06 V for time &gt; 3.0 Sec</li> <li>and</li> <li>• Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3 measurements) &lt; 0.01 V</li> </ul>
P3251	Exhaust-Bank 4-Sensor 2 Voltage Too High	<ul style="list-style-type: none"> <li>• Signal voltage &gt; 1.08 V for time &gt; 5.0 Sec</li> </ul>
P3253	Exhaust-Bank 4-Sensor 2 No Activity Detected	<ul style="list-style-type: none"> <li>• Signal voltage 0.40 - 0.60 V for time &gt; 3.0 Sec</li> <li>and</li> <li>• Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3 measurements) ≥ 2.80 V</li> <li>or</li> <li>• Internal resistance &gt; 40000Ω</li> <li>and</li> <li>• Exhaust temperature &gt; 700° C</li> </ul>
P3254	Exhaust-Bank 4-Sensor 2 Signal Too Slow	<ul style="list-style-type: none"> <li>• Arithmetic filtered max differential transient time at fuel cut off ≥ 0.5 Sec</li> <li>and</li> <li>• Number of checks ≥ 3.00</li> </ul>
P3261	Exhaust Bank 3/4 Oxygen Sensors Before Catalytic Converter Swapped	Signal range check (detection of exchange lambda sensors upstream catalyst)
P3278	Linear O2 Sensor, Exhaust Gas Bank 3 / Pump Current Open Circuit	<ul style="list-style-type: none"> <li>• O2S signal front 1.46 - 1.54 V</li> <li>• Delta lambda controller &gt; .10</li> </ul>
P3281	Linear O2 Sensor, Exhaust Gas Bank 3 / Reference Voltage Open Circuit	<ul style="list-style-type: none"> <li>• O2S signal front &lt; 0.20 V</li> <li>• Internal resistance &gt; 950Ω</li> </ul>
P3285	Linear O2 Sensor, Exhaust Bank 3 / Common Ground (Gnd) Wire Open Circuit	<ul style="list-style-type: none"> <li>• O2S signal front 1.44 - 1.53 V</li> <li>and</li> <li>• Internal resistance &gt; 950 Ω</li> </ul>

DTC	Error Message	Malfunction Criteria and Threshold Value
P3288	Linear O2 Sensor, Exhaust Gas Bank 4 / Pump Current Open Circuit	<ul style="list-style-type: none"> <li>• O2S signal front 1.46 - 1.54 V and</li> <li>• Delta lambda controller &gt; .10</li> </ul>
P3291	Linear O2 Sensor, Exhaust Gas Bank 4 / Reference Voltage Open Circuit	<ul style="list-style-type: none"> <li>• O2S signal front &gt; 4.70</li> <li>• Delta lambda controller &gt; .10</li> </ul>
P3295	Linear O2 Sensor, Exhaust Bank 4 / Common Ground (GND) Wire Open Circuit	<ul style="list-style-type: none"> <li>• O2S signal front 1.44 - 1.53 V and</li> <li>• Internal resistance &gt; 950 Ω</li> </ul>
P3298	Catalytic Converter System, Exhaust-Bank 3 Efficiency Below Threshold	<1.0 -
P3299	Catalytic Converter System, Exhaust-Bank 4 Efficiency Below Threshold	<1.0 -

### Ignition System

DTC	Error Message	Malfunction Criteria and Threshold Value
P0300	Random/Multiple Cylinder Misfire Detected	Catalyst damage misfire rate (MR), > 0.75% - 6.25%
P0301	Cylinder 1 Misfire Detected	Catalyst damage misfire rate (MR), > 0.75% to 6.25%
P0302	Cylinder 2 Misfire Detected	Catalyst damage misfire rate (MR), > 0.75% to 6.25%
P0303	Cylinder 3 Misfire Detected	Catalyst damage misfire rate (MR), > 0.75% to 6.25%
P0304	Cylinder 4 Misfire Detected	Catalyst damage misfire rate (MR), > 0.75% to 6.25%
P0305	Cylinder 5 Misfire Detected	Catalyst damage misfire rate (MR), > 0.75% to 6.25%
P0306	Cylinder 6 Misfire Detected	Catalyst damage misfire rate (MR), > 0.75% to 6.25%
P0307	Cylinder 7 Misfire Detected	Catalyst damage misfire rate (MR), > 0.75% to 6.25%
P0308	Cylinder 8 Misfire Detected	Catalyst damage misfire rate (MR), > 0.75% to 6.25%
P0309	Cylinder 9 Misfire Detected	Catalyst damage misfire rate (MR), > 0.75% to 6.25%
P0310	Cylinder 10 Misfire Detected	Catalyst damage misfire rate (MR), > 0.75% to 6.25%

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0311	Cylinder 11 Misfire Detected	Catalyst damage misfire rate (MR), > 0.75% to 6.25%
P0312	Cylinder 12 Misfire Detected	Catalyst damage misfire rate (MR), > 0.75% to 6.25%
P0321	Ignition/Distributor Engine Speed Input Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Counted versus referenced teeth, incorrect</li> <li>or</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 and</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; 28.00</li> <li>or</li> <li>• Signal fault counter (measuring window) &gt; 5.00</li> </ul>
P0327	Knock Sensor 1 Circuit Low Input Knock Sensor 1 Circuit Low Input	<ul style="list-style-type: none"> <li>Short to ground Port B lower threshold &lt; -0.70 V</li> <li>• Short to ground Port B lower threshold &lt; -0.70 V</li> <li>Short to ground Port A lower threshold &lt; -0.70 V</li> <li>• Short to ground Port A lower threshold &lt; -0.70 V</li> <li>Signal range check</li> <li>• Signal range check lower threshold &lt; 0.7 to 3.0 V</li> </ul>
P0328	Knock Sensor Signal Too High	<ul style="list-style-type: none"> <li>• Short to battery plus Port A upper threshold &gt; 1.00 V</li> <li>• Signal range check upper threshold &gt; 44 to 116 V</li> <li>• Short to battery plus Port B upper threshold &gt; 1.00 V</li> <li>• Short to battery plus Port A upper threshold &gt; 1.00 V</li> <li>• Signal range check upper threshold &gt; 69.00 to 116.16 V</li> </ul>



DTC	Error Message	Malfunction Criteria and Threshold Value
P0332	Knock Sensor 2 Circuit Low Input	Short to ground Port B lower threshold < -0.70 V • Short to ground Port B lower threshold < -0.70 V Short to ground Port A lower threshold < -0.70 V • Short to ground Port A lower threshold < -0.70 V Signal range check • Signal range check lower threshold < 0.7 to 3.0 V
P0333	Knock Control System Error	• Short to battery plus Port A upper threshold > 1.00 V • Signal range check upper threshold > 44 to 116 V • Short to battery plus Port B upper threshold > 1.00 V V • Short to battery plus Port A upper threshold > 1.00 V • Signal range check upper threshold > 69.00 to 116.16 V
P0341	Camshaft Position Sensor Circuit Range/Performance	• Signal pattern incorrect and • Defect counter 12.00
P0342	Camshaft Position Sensor Circuit Low Input	• Signal voltage permanently low and • Crankshaft signals 8
P0343	Camshaft Position Sensor "A" Circuit High (Bank 1 or Single Sensor)	• Signal voltage permanently high and • Crankshaft signals 8
P0346	Camshaft Position Sensor Circuit (Bank 2) Range/Performance	• Signal pattern incorrect • Defect counter 12.00
P0347	Camshaft Position Sensor "A" Circuit (Bank 2) Low	• Signal voltage permanently low and • Crankshaft signals 8
P0348	Camshaft Position Sensor "A" Circuit (Bank 2) High	• Signal voltage permanently high and • Crankshaft signals 8

<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>
P0355	Ignition Coil "E" 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>
P0356	Ignition Coil "F" 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>
P0357	Ignition Coil "G" 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>
P0358	Ignition Coil "H" 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>
P0359	Ignition Coil "I" 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>
P0360	Ignition Coil "J" 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>

DTC	Error Message	Malfunction Criteria and Threshold Value
P0361	Ignition Coil "K" 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>
P0362	Ignition Coil "L" 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>
P0366	Camshaft Position Sensor "B" Circuit (Bank 1) Range/ Performance	<ul style="list-style-type: none"> <li>• Signal pattern incorrect</li> <li>• Defect counter 12</li> </ul>
P0367	Camshaft Position Sensor "B" Circuit (Bank 1) Low Input	<ul style="list-style-type: none"> <li>• Signal voltage permanently low</li> <li>• Crankshaft signals 8.00</li> </ul>
P0368	Camshaft Position Sensor "B" Circuit (Bank 1) High Input	<ul style="list-style-type: none"> <li>• Signal voltage permanently high</li> <li>• Crankshaft signals 8.00</li> </ul>
P0391	Camshaft Position Sensor "B" Circuit (Bank 2) Range/ Performance	<ul style="list-style-type: none"> <li>• Signal pattern incorrect</li> <li>• Defect counter 12</li> </ul>
P0392	Camshaft Position Sensor "B" Circuit (Bank 2) Low Input	<ul style="list-style-type: none"> <li>• Signal voltage permanently low and</li> <li>• Crankshaft signals 8.00</li> </ul>
P0393	Camshaft Position Sensor "B" Circuit (Bank 2) High Input	<ul style="list-style-type: none"> <li>• Signal voltage permanently high and</li> <li>• Crankshaft signals 8.00</li> </ul>

### Additional Exhaust Regulation

DTC	Error Message	Malfunction Criteria and Threshold Value
P0410	Secondary Air Injection System Malfunction	Difference ambient pressure vs. AIR pressure measured with AIR pressure sensor > 5.00 hPa
P0418	Secondary Air Injection System Relay A Circuit	Signal voltage 4.70 - 5.40 V
P0419	Secondary Air Injection System Relay B Circuit	Signal voltage 4.70 - 5.40 V
P0420	Catalyst System, Bank1 Efficiency Below Threshold	< 1.0
P0421	Catalyst System Efficiency (Bank 1)	EWMA filter value for catalyst < 0.2

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0430	Catalyst System, Bank 2 Efficiency Below Threshold	< 1.0
P0431	Catalyst System, Bank 2 Efficiency Below Threshold	EWMA filter value for catalyst < 0.2
P0441	Evaporative Emission System Incorrect Purge Flow	<ul style="list-style-type: none"> <li>• Deviation lambda control &lt; 3.7 - 4.9%</li> <li>and</li> <li>• Deviation idle control &lt; 30%</li> </ul>
P0442	Evaporative Emission System Leak Detected (small leak)	Time for pressure drop < 1.7 - 2.2 Sec.
P0444	Evaporative Emission System Purge Control Valve Circuit Open	Signal voltage > 4.70 - 5.40 V
P0449	Evaporative Emission System Vent Valve/Solenoid Circuit	Signal voltage > 4.4 - 5.5 V
P0450	Evaporative Emission System Open Circuit	Signal voltage 0.39 - 0.55 V
P0451	Evaporative Emission System Pressure Sensor/Switch Range/Performance	NVLD switch position stuck closed
P0452	EVAP Emission Control System Pressure Sensor Low Input	Signal voltage < 0.24 V
P0453	Evaporative Emission System Short to Battery +	Signal voltage > 3.0 V
P0455	Evaporative Emission System Leak Detected (gross leak/no flow)	Time for pressure drop < 0.95 - 1.1 Sec.
P0456	EVAP Emission Control System (very small Leak) Leak Detected	NVLD switch position open
P0458	Evaporative Emission System Purge Control Valve Circuit Low	Signal voltage, < 0.0 - 3.26 V
P0459	Evaporative Emission System Purge Control Valve Circuit High	Signal current > 2.20 A

DTC	Error Message	Malfunction Criteria and Threshold Value
P0491	Secondary Air Injection System (Bank 1) Insufficient Flow	<ul style="list-style-type: none"> <li>• AIR pressure measured with AIR pressure sensor vs. modeled &lt; 74 - 75%</li> </ul> or <ul style="list-style-type: none"> <li>• Absolute deviation of raw pressure signal from filtered signal: mean value &lt; 1.21 hPa</li> </ul>
P0492	Secondary Air Injection System (Bank 2)	<ul style="list-style-type: none"> <li>• AIR pressure measured with AIR pressure sensor vs. modeled &lt; 74 - 75%</li> </ul> or <ul style="list-style-type: none"> <li>• Absolute deviation of raw pressure signal from filtered signal: mean value &lt; 1.21 hPa</li> </ul>

### Speed and Idle Control

DTC	Error Message	Malfunction Criteria and Threshold Value
P0501	Vehicle Speed Sensor "A" Range/Performance	Speed sensor signal: plausibility error failure
P0502	Vehicle Speed Sensor "A" Range/Performance	Speed sensor signal: electrical error failure
P0506	Idle Air Control System - RPM Lower Than Expected	<ul style="list-style-type: none"> <li>• Engine speed deviation, &gt; 100 RPM</li> </ul> and <ul style="list-style-type: none"> <li>• RPM controller torque value <math>\geq</math> calculated max value</li> </ul>
P0507	Idle Air Control System RPM Higher Than Expected	<ul style="list-style-type: none"> <li>• Engine speed deviation &lt; 100 RPM</li> </ul> and <ul style="list-style-type: none"> <li>• RPM controller torque value <math>\leq</math> calculated min. value</li> </ul> or <ul style="list-style-type: none"> <li>• Integrated number of fuel cut off transitions <math>\geq</math> n.a.</li> </ul>

DTC	Error Message	Malfunction Criteria and Threshold Value
P050A	Idle Air Control System RPM Lower or Higher Than Expected	Out of range low • Engine speed deviation > 150 RPM and • RPM controller torque value $\geq$ calculated max. value Out of range high • Engine speed deviation < -200 RPM and • RPM controller torque value $\leq$ calculated min. value or • Integrated number of fuel cut off transitions $\geq$ n.a.
P050B	Cold Start Idle Air Control System Performance	Difference between commanded spark timing vs. actual value > 18.00%
P052A	Cold Start "A" Camshaft Position Timing Over-Advanced	Target error • Difference between target position vs. actual position > 10.00 - 40.00° CA
P052C	Cold Start "A" Camshaft Position Timing Over-Advanced	Target error • Difference between target position vs. actual position > 10.00 - 40.00° CA
P053A	Positive Crankcase Ventilation Heater Control Circuit /Open	Open circuit-signal voltage failure
P053B	Positive Crankcase Ventilation Heater Control Circuit Low	Short to ground-signal voltage failure
P053C	Positive Crankcase Ventilation Heater Control Circuit High	Short to battery plus-signal current failure
P053F	Cold Start Fuel Pressure Performance	• Difference between target pressure vs. actual pressure < -1.50 or • Difference between target pressure vs. actual pressure > 1.50
P054A	Cold Start "B" Camshaft Position Timing Over-Advanced	Target error • Difference between target position vs. actual position > 10.00 to 22.00° CRK

DTC	Error Message	Malfunction Criteria and Threshold Value
P054C	Cold Start "B" Camshaft Position Timing Over-Advanced	Target error • Difference between target position vs. actual position > 10.00 to 22.00° CRK

### 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
P0602	Control Module Programming Error	Reprogramming not completed
P0604	Internal Control Module Random Access Memory (RAM) Error	Write ability check, failed
P0605	Internal Control Module Read Only Memory (ROM) Error	Check failed
P0606	ECM/PCM Processor	• Internal check failure • SPI communications check Identifier failure
P06D1	CM/PCM Processor	• Internal check failure • SPI communications check Identifier failure
P0613	TCM Processor	Check-calculation of 1st CPU failed, Single reset does not cover problem
P0614	ECM / TCM Incompatible	Detection of error signal
P062B	Injector Valves Communication CPU	SPI communications check Identifier not active / correct
P0638	Throttle Actuator Control Range/Performance Bank 1	Rationality check close movement • Time to close reference point > 0.6 Sec. and • Reference point 2.88%. Signal range check @ mechanical stop low • TPS 1 signal voltage < 0.40 ; > 0.8V or • TPS 2 signal voltage < 4.20; > 4.6V

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0639	Throttle Actuator Control Range/Performance Bank 2	<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 values &gt; 4-50%</li> </ul>
P0641	Sensor Reference Voltage "A" Circuit/Open	Internal Fault <ul style="list-style-type: none"> <li>• Signal voltage deviation &gt; <math>\pm 0.3</math> V</li> </ul>
P0642	Sensor Reference Voltage "A" Circuit Low	Signal voltage < 4.606 - 4.998 V
P0643	Sensor Reference Voltage "A" Circuit High	Signal voltage, > 4.998 to 5.406 V
P0651	Sensor Reference Voltage "B" Circuit/Open	Internal Fault <ul style="list-style-type: none"> <li>• Signal voltage deviation &gt; <math>\pm 0.3</math> V</li> </ul>
P0652	Sensor Reference Voltage "B" Circuit Low	Signal voltage < 4.606 - 4.998 V
P0653	Sensor Reference Voltage "B" Circuit High	Signal voltage > 4.998 - 5.406 V
P0657	Actuator Supply Voltage "A" Circuit/Open	Signal voltage > 4.4 - 5.6 V
P0658	Actuator Supply Voltage "A" Circuit Low	Signal voltage < 2.15 - 3.25 V
P0659	Actuator Supply Voltage "A" Circuit High	Signal current > 1.1 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 &lt; 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 &lt; 6 V</li> </ul>
P0687	ECM/PCM Power Relay Control Circuit High	<ul style="list-style-type: none"> <li>• Signal current &gt; 0.7 - 1.4 A</li> <li>• Sense circuit voltage &lt; 6.0 V</li> </ul>
P0688	ECM/PCM Power Relay Sense Circuit /Open	Sense voltage < 4.0 V
P0697	Sensor Reference Voltage C Circuit/Open	Internal Fault <ul style="list-style-type: none"> <li>• Signal voltage deviation &gt; +/- 0.3 V</li> </ul>
P0698	Sensor Reference Voltage "C" Circuit Low	Signal voltage < 4.606 - 4.998 V
P0699	Sensor Reference Voltage "C" Circuit High	5V supply voltage > 4.998 - 5.406 V



DTC	Error Message	Malfunction Criteria and Threshold Value
U0001	High Speed CAN Communication Bus	CAN message, no feedback
U0002	High Speed CAN Communication Bus Performance	Global timeout receiving no message
U0037	Vehicle Communication Bus B	Internal CAN failure
U0100	Lost Communication With ECM/PCM "A"	CAN communication check (Master-/Slave-BUS) CAN message triggered received no feedback
U0101	Lost Communication with TCM	No CAN message received from TCM no feedback
U0115	Lost Communication With ECM/PCM "B"	CAN communication check (Master-/Slave-BUS) CAN message triggered received no feedback
U0121	CAN ABS Brake Unit	Lost Communication With Anti-Lock Brake System (ABS) Control, time-out
U0140	CAN Communication with Body Control Module	CAN communication with Body Control Module time out, no message
U0146	Lost Communication With Gateway "A"	Received CAN message no message
U0155	Lost Communication With Instrument Panel Cluster (IPC) Control Module	Received CAN message no message
U0301	CAN: Master/Slave-Communication	Software Incompatibility With ECM/PCM implausible message
U0302	Software Incompatibility with Transmission Control Module	Software Incompatibility With TMC implausible message
U0322	Software Incompatibility with Body Control Module	Temperature received from CAN $\leq -50$
U0323	Communication with Body Control Module	Ambient temperature value (module not encoded for ambient temperature sensor) = FDh
U0401	CAN (only slave)	Communication on private CAN failed

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
U0402	Invalid Data Received From Transmission Control Module	Invalid data received from TCM
U0415	Vehicle Speed	<ul style="list-style-type: none"> <li>• Out of range high</li> <li>• Speed sensor signal: initialization error</li> <li>• Speed sensor signal: low voltage error</li> <li>• Speed sensor signal: sensor error</li> <li>• CAN communication with BSCM implausible message</li> </ul>
U0422	CAN: Ambient Air Temperature Sensor	Ambient temperature value (initialization) = FEh
U0423	CAN: Instrument cluster	Received data implausible message
U0447	Invalid Data Received From Gateway "A"	Received data from Gateway implausible message
U1103	Production mode active	Vehicle in production mode

## Transmission

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0705	Transmission Range Sensor "A" Circuit Malfunction (PRNDL Input)	-
P0706	Transmission Range Sensor "A" Circuit Range/ Performance	4 bit position code, incorrect
P0707	Transmission Range Sensor Circuit Low	-
P0708	Transmission Range Sensor Circuit High	-
P0710	Transmission Fluid Temperature Sensor Circuit	Sensor short circuit: <ul style="list-style-type: none"> <li>• U_sensor (+), and U_sensor (-) diagnosis by ASIC</li> </ul>

DTC	Error Message	Malfunction Criteria and Threshold Value
P0711	Transmission Fluid Temperature Sensor "A" Circuit Range/Performance	Discontinual temperature: <ul style="list-style-type: none"> <li>• ATF temperature delta T between 2 measurements, &gt;20° C</li> </ul> Sensor stuck: <ul style="list-style-type: none"> <li>• Comparison ATF vs. chip temperature, ATF temp. must follow chip temp. in certain ranges, 25 - 40° C</li> </ul>
P0712	Transmission Fluid Temperature Sensor "A" Circuit Low	Circuit low: <ul style="list-style-type: none"> <li>• U_sensor (+), and U_sensor (-) diagnosis by ASIC</li> </ul>
P0713	Transmission Fluid Temperature Sensor "A" Circuit High	Circuit high: <ul style="list-style-type: none"> <li>• U_sensor (+), and U_sensor (-) diagnosis by ASIC</li> </ul>
P0714	Transmission Fluid Temperature Sensor "A" Circuit Intermittent	Circuit high: <ul style="list-style-type: none"> <li>• U_sensor (+), and U_sensor (-) diagnosis by ASIC</li> </ul>
P0716	Input/Turbine Speed Sensor "A" Circuit Range/Performance	Signal higher or lower than threshold <ul style="list-style-type: none"> <li>• Higher, &gt; + 8000 RPM</li> <li>• Lower, &lt; 20 RPM</li> </ul>
P0717	Input/Turbine Speed Sensor "A" Circuit No Signal	Hardware detection
P0721	Output Speed Sensor Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Signal &gt; threshold, &gt; 10000 RPM</li> <li>• Difference between last and actual value &gt; threshold, -1000 RPM</li> <li>• Difference to wheel speeds, &gt; 500 RPM and input speed, &gt; 200 RPM</li> </ul>
P0722	Output Speed Sensor Circuit No Signal	Hardware detection
P0727	Engine Speed Input Circuit No Signal	CAN message signal error flag, = 1
P0741	Torque Converter Clutch Circuit Performance or Stuck Off	Rate of (setting of nominal value) - actual value, > 50 RPM
P0746	Pressure Control Solenoid "A" Performance or Stuck Off	PWM hardware detection, 0 or 100%
P0747	Pressure Control Solenoid "A" Stuck On	PWM hardware detection, 0 or 100%

DTC	Error Message	Malfunction Criteria and Threshold Value
P0748	Pressure Control Solenoid "A" Electrical	<ul style="list-style-type: none"> <li>• Current higher or lower than threshold, &gt; 220 mA</li> <li>• EDS output voltage at short to ground or open circuit ~ 0.5 V smaller than EDS supply voltage</li> <li>• Static leakage current flow</li> </ul>
P0751	Shift Solenoid "A" Performance or Stuck Off	<ul style="list-style-type: none"> <li>• If PWM = 0%, diagnosis by ASIC</li> <li>• If <math>0\% \leq \text{PWM}</math>, 7.6% voltage return lead (low), &lt; 0.75 V</li> <li>• If <math>7.6\% \leq \text{PWM}</math>, 92.4% voltage return lead (high), &lt; 0.75 V</li> <li>• If <math>7.6\% \leq \text{PWM}</math>, 92.4% voltage return lead (low), &lt; 0.75 V</li> </ul>
P0752	Shift Solenoid Stuck On	<ul style="list-style-type: none"> <li>• If PWM = 100%, diagnosis by ASIC</li> <li>• If <math>7.6\% \leq \text{PWM} \leq 100\%</math> voltage return lead (high), &gt; 0.3 V</li> </ul>
P0754	Shift Solenoid "A" Intermittent	<ul style="list-style-type: none"> <li>• If PWM = 0%, diagnosis by ASIC</li> <li>• If <math>0\% \leq \text{PWM}</math>, 7.6% voltage return lead (low), &lt; 0.75 V</li> <li>• If <math>7.6\% \leq \text{PWM}</math>, 92.4% voltage return lead (high), &lt; 0.75 V</li> <li>• If <math>7.6\% \leq \text{PWM}</math>, 92.4% voltage return lead (low), &lt; 0.75 V</li> </ul>
P0776	Pressure Control Solenoid "B" Performance or Stuck off	PWM hardware detection, 0 or 100%
P0777	Pressure Control Solenoid "B" Stuck On	PWM hardware detection, 0 or 100%
P0778	Pressure Control Solenoid "B" Electrical	<ul style="list-style-type: none"> <li>• Current higher or lower than threshold, &lt; 730 mA</li> <li>• EDS output voltage at short to ground or open circuit ~ 0.5 V smaller than EDS supply voltage</li> <li>• Static leakage current flow</li> </ul>
P0796	Pressure Control Solenoid "C" Performance or Stuck off	PWM hardware detection, 0 or 100%
P0797	Pressure Control Solenoid "C" Stuck On	PWM hardware detection, 0 or 100%

DTC	Error Message	Malfunction Criteria and Threshold Value
P0798	Pressure Control Solenoid "C" Electrical	<ul style="list-style-type: none"> <li>• Current higher or lower than threshold, &gt; 220 mA</li> <li>• DS output voltage at short to ground or open circuit ~ 0.5 V smaller than EDS supply voltage</li> <li>• Static leakage current flow</li> </ul>
P0889	TCM Power Relay Sense Circuit Range/Performance	FET drive, not possible
P0890	TCM Power Relay Sense Circuit Low	<ul style="list-style-type: none"> <li>• Solenoid power supply voltage, &lt; 1.4 V</li> <li>• Drop voltage over high side FET, &gt; 1 V</li> </ul>
P0891	TCM Power Relay Sense Circuit High	Hardware detection
P0892	TCM Power Relay Sense Circuit Intermittent	Hardware detection
P1702	Impossible Combination of Substitute Functions or Not Allowed Actuating of Valves	SW functions: actuating solenoid valves colliding with 2 substitute functions with same priority as driven solenoid valves that have short circuit to supply or interruption
P2637	Torque Management Feedback Signal "A"	CAN message signal error flag, = 1
P2714	Pressure Control Solenoid "D" Performance or Stuck Off	PWM hardware detection, 0 or 100%
P2715	Pressure Control Solenoid "D" Stuck On	PWM hardware detection, 0 or 100%
P2716	Pressure Control Solenoid "D" Electrical	<ul style="list-style-type: none"> <li>• Current higher or lower than threshold, &lt; 730 mA</li> <li>• EDS output voltage at short to ground or open circuit ~ 0,5 V smaller than EDS supply voltage</li> <li>• Static leakage current flow</li> </ul>
P2723	Pressure Control Solenoid "E" Performance or Stuck Off	PWM hardware detection, 0 or 100%

DTC	Error Message	Malfunction Criteria and Threshold Value
P2725	Pressure Control Solenoid "E" Electrical	<ul style="list-style-type: none"> <li>• Current higher or lower than threshold, &lt;7 30 mA</li> <li>• EDS output voltage at short to ground or open circuit ~ 0,5 V smaller than EDS supply voltage</li> <li>• Static leakage current flow</li> </ul>
P2732	Pressure Control Solenoid "F" Performance or Stuck Off	PWM hardware detection, 0 or 100%
P2733	Pressure Control Solenoid "F" Stuck On	PWM hardware detection, 0 or 100%
P2734	Pressure Control Solenoid "F" Electrical	<ul style="list-style-type: none"> <li>• EDS output voltage at short to ground or open circuit ~ 0.5 V smaller than EDS supply voltage</li> <li>• Static leakage current flow</li> </ul>
P2735	Pressure Control Solenoid "F" Intermittent	PWM hardware detection, 0 or 100%

### Fuel and Air Ratios Control Module

DTC	Error Message	Malfunction Criteria and Threshold Value
P100F	Fuel Rail Injection Valves	<ul style="list-style-type: none"> <li>• Volume part of rail pressure controller &gt; 20 mm</li> <li>• Misfire failure</li> </ul>
P1009	Air Mass Meter 1/2 Implausible Signal From Load Detection (Via throttle position and engine speed map)	<ul style="list-style-type: none"> <li>• Mass air flow HFM2 vs. lower threshold map HFM2 &lt; 0 - 450 kg/h</li> <li>• Mass air flow HFM2 vs. upper threshold map &gt; 55 - 1082</li> </ul>
P106A	Bank 2 Intake Manifold Pressure/Air Mass <-> Throttle Valve Angle Deviation	<ul style="list-style-type: none"> <li>• Plausibility with fuel system - load survey below threshold</li> <li>• Load calculation &lt; -35%</li> </ul>
P1073	2 MAF Sensors MAF 1 MAF 2	MAF sensor signal < 66 uSec
P1074	2 MAF Sensors MAF 1 MAF 2	<ul style="list-style-type: none"> <li>• MAF sensor signal &gt; 1100 uSec</li> <li>or</li> <li>• MAF sensor signal temp correction &lt; 65 mSec</li> </ul>
P1081	Exhaust Bank 3, Mixture Adaptation Range 1 Lean Limit Not Reached	Adaptive value > 6.00%

DTC	Error Message	Malfunction Criteria and Threshold Value
P1082	Exhaust Bank 3, Mixture Adaptation Range 2 Lean Limit Not Reached	Adaptive value > 30%
P1083	Exhaust Bank 3, Mixture Adaptation Range 1 Rich Limit Exceeded	Adaptive value < -6.00%
P1084	Exhaust Bank 3, Mixture Adaptation Range 2 Rich Limit Exceeded	Adaptive value < -30%
P1085	Exhaust Bank4, Mixture Adaptation Range 1 Lean Limit Not Reached	Adaptive value > 6.00%
P1086	Exhaust Bank4, Mixture Adaptation Range 2 Lean Limit Not Reached	Adaptive value > 30%
P1087	Exhaust Bank 4, Mixture Adaptation Range 1 Rich Limit Exceeded	Adaptive value < -6.00%
P1088	Exhaust Bank 4, Mixture Adaptation Range 2 Rich Limit Exceeded	Adaptive value < -30%
P1094	Incorrect Fuel Composition or Electronic Throttle Control Module	<ul style="list-style-type: none"> <li>• Comparison with fuel quantity incorrect</li> <li>or</li> <li>• Internal check failed</li> <li>or</li> <li>• Correction factor incorrect</li> <li>or</li> <li>• Fuel quantity incorrect</li> </ul>
P1167	Mass Air Flow (MAF) Sensor 2 Implausible Signal	<ul style="list-style-type: none"> <li>• Air mass too low &lt; -10.00 kg/h</li> <li>• Air mass too high &gt; 1100.00 kg/h</li> <li>• Mass air flow vs. lower threshold model &lt; 0 to 500 kg/h</li> <li>• Mass air flow vs. upper threshold model &gt; 25 to 1100 kg/h</li> <li>• Load calculation &gt; 25% and</li> <li>• Fuel system (mult.) &lt; -16%</li> <li>• Load calculation &lt; -20% and</li> <li>• Fuel system (mult.) &gt; 25%</li> </ul>

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P13EA	Ignition Timing Monitor	Difference between commanded spark timing and actual value > 10%
P1491	Evaporative Emission System Purge Control Valve Circuit Open	Signal voltage > 4.4- 5.6 V
P1647	Checking Coding/Versions of Control Modules In Can-Bus	-
P117C	Bank3,Oxygen Sensor Correction Behind Cat Lean Control Limit Exceeded	l-portion of 2nd lambda control loop < -0.045
P117D	Bank 3,Oxygen Sensor Correction Behind Cat Rich Control Limit Exceeded	l-portion of 2nd lambda control loop > -0.045
P117E	Bank 4,Oxygen Sensor Correction Behind Cat Lean Control Limit Exceeded	l-portion of 2nd lambda control loop < -0.045
P117F	Bank 4,Oxygen Sensor Correction Behind Cat Rich Control Limit Exceeded	l-portion of 2nd lambda control loop > -0.045
P118A	Bank 3 Sensor 1 Voltage Too Low/Air Leak	Threshold 1: • Signal voltage 2.71 to 6.00 V Threshold 2: • Signal voltage 2.05 to 3.06 V
P118B	Bank4 Sensor 1 Voltage Too Low/Air Leak	Threshold 1: • Signal voltage 2.71 to 6.00 V Threshold 2: • Signal voltage 2.05 to 3.06 V
P118C	Oxygen Sensor 2 Bank 3 Signal Too Lean	• O2S signal rear not oscillating at reference < 0.64 V and • Enrichment after stuck lean 28%
P118D	Oxygen Sensor 2 Bank 3 Signal Too Rich	• O2S signal rear not oscillating at reference > 0.64 V and • Enrichment after stuck rich 15% or • Sensor voltage (after fuel cut off) ≥ 0.15V and • Number of checks ≥ 1.0



DTC	Error Message	Malfunction Criteria and Threshold Value
P118E	Oxygen Sensor 2 Bank 4 Signal Too Lean	<ul style="list-style-type: none"> <li>• O2S signal rear not oscillating at reference &lt; 0.64 V</li> <li>and</li> <li>• Enrichment after stuck lean 28%</li> </ul>
P118F	Oxygen Sensor 2 Bank 4 Signal Too Rich	<ul style="list-style-type: none"> <li>• O2S signal rear not oscillating at reference &gt; 0.64 V</li> <li>and</li> <li>• Enrichment after stuck rich 15%</li> <li>or</li> <li>• Sensor voltage (after fuel cut off) <math>\geq 0.15V</math></li> <li>and</li> <li>• Number of checks <math>\geq 1.0</math></li> </ul>
P12A1	Fuel Rail Pressure Sensor High Pressure System	<ul style="list-style-type: none"> <li>• Pressure control activity &lt; -0.06 MPa</li> <li>and</li> <li>• Fuel trim activity &gt; 1.33</li> <li>and</li> <li>• Difference between target pressure - actual pressure -16.38 to 16.38 MPa</li> </ul>
P12A2	Fuel Rail Pressure Sensor High Pressure System	<ul style="list-style-type: none"> <li>• Pressure control activity &gt; 0.02 MPa</li> <li>and</li> <li>• Fuel trim activity &lt; 0.60</li> <li>and</li> <li>• Difference between target pressure - actual pressure -16.38 to 16.38 MPa</li> </ul>
P12A4	Fuel Volume Regulator Control	<ul style="list-style-type: none"> <li>• Pressure control activity &lt; -4.0 MPa</li> <li>• Fuel trim activity 0.75-1.25</li> <li>• Difference between target pressure - actual pressure &lt; -4.0 mPa</li> </ul>
P12A5	Fuel Rail Pressure Sensor High Pressure System	<ul style="list-style-type: none"> <li>• Pressure control activity &gt; 0.02 MPa</li> <li>and</li> <li>• Fuel trim activity &lt; 0.60</li> <li>and</li> <li>• Difference between target pressure - actual pressure -16.38 to 16.38 MPa</li> </ul>

DTC	Error Message	Malfunction Criteria and Threshold Value
P12A6	Fuel Rail Pressure Sensor High Pressure System	<ul style="list-style-type: none"> <li>• Pressure control activity &lt; -0.06 MPa</li> <li>and</li> <li>• Fuel trim activity &gt; 1.33</li> <li>and</li> <li>• Difference between target pressure - actual pressure -16.38 to 16.38 MPa</li> </ul>
P12A7	Fuel Volume Regulator Control	<ul style="list-style-type: none"> <li>• Pressure control activity &lt; -4.0 MPa</li> <li>• Fuel trim activity 0.75-1.25</li> <li>• Difference between target pressure - actual pressure &lt; -4.0 mPa</li> </ul>
P129B	Fuel Pressure Regulator Valve Bank 2 Open Circuit	<ul style="list-style-type: none"> <li>• Signal voltage 1.40 to 3.20 V</li> <li>or</li> <li>• Signal pattern incorrect</li> </ul>
P129C	Fuel Pressure Regulator Valve Bank 2 Short Circuit To Ground	Signal voltage 1.40 to 3.20 V
P129D	Fuel Pressure Regulator Valve Bank 2 Short Circuit To B+	Signal voltage > 3.20 V
P1321	Knock Control System Error	<ul style="list-style-type: none"> <li>Short to ground Port B lower threshold &lt; -0.70 V</li> <li>• Short to ground Port B lower threshold &lt; -0.70 V</li> <li>Short to ground Port A lower threshold &lt; -0.70 V</li> <li>• Si short to ground Port A lower threshold &lt; -0.70 V</li> <li>Signal range check</li> <li>• Signal range check lower threshold &lt; 0.7 to 3.0 V</li> </ul>
P1322	Knock Control System Error	<ul style="list-style-type: none"> <li>• Short to battery plus Port A upper threshold &gt; 1.00 V</li> <li>• Signal range check upper threshold &gt; 44 to 116 V</li> <li>• Short to battery plus Port B upper threshold &gt; 1.00 V</li> <li>• Short to battery plus Port A upper threshold &gt; 1.00 V</li> <li>• Signal range check upper threshold &gt; 69.00 to 116.16 V</li> </ul>

DTC	Error Message	Malfunction Criteria and Threshold Value
P1323	Knock Control System Error	Short to ground Port B lower threshold < -0.70 V • Short to ground Port B lower threshold < -0.70 V Short to ground Port A lower threshold < -0.70 V • Short to ground Port A lower threshold < -0.70 V Signal range check • Signal range check lower threshold < 0.7 to 3.02V
P1324	Knock Sensor 4 - Signal Too High	• Short to battery plus Port A upper threshold > 1.00 V • Signal range check upper threshold > 44 to 116 V • Short to battery plus Port B upper threshold > 1.00 V • Short to battery plus Port A upper threshold > 1.00 V • Signal range check upper threshold > 69.00 to 116.16 V
P1489	Evaporative Emission System Purge Control Valve Circuit High	Signal current > 2.2 A
P1497	Secondary Air Injection System Insufficient Flow Bank 3	• Relative secondary air mass flow <0.047 • Relative secondary air mass flow, <0.05
P1498	Secondary Air Injection System Insufficient Flow Bank 4	• Relative secondary air mass flow < 0.047 • Relative secondary sir mass flow, < 0.05
P150A	Engine-Off-Time	• Difference between engine-off-time and ECM after run-time < -12 Sec • Difference between engine-off-time and ECM after run-time > 12 Sec
P169A	Vehicle In Transport Mode	Transport mode active

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P210B	Throttle Actuator Control Motor Circuit Range/ Performance	Signal range check <ul style="list-style-type: none"> <li>• Duty cycle &gt; 80 %</li> </ul> and <ul style="list-style-type: none"> <li>• ECM power stage no failure</li> </ul> Rationality check <ul style="list-style-type: none"> <li>• Deviation throttle value angles vs. calculated value &gt; 4.00 - 50.00%</li> </ul>
P2101	Throttle Actuator A Control Motor Circuit Range/ Performance	Signal range check <ul style="list-style-type: none"> <li>• Duty cycle &gt; 80%</li> </ul> and <ul style="list-style-type: none"> <li>• ECM power stage, no failure</li> </ul> Rationality check <ul style="list-style-type: none"> <li>• Deviation throttle valve angles vs. calculated value 4.0 - 50.0%</li> </ul>
P2106	Throttle Actuator Control System - Forced Limited Power	Internal check Failed
P2108	Throttle Actuator Control System -Basic settings	Signal range check @ mechanical stop low <ul style="list-style-type: none"> <li>• TPS 1 signal voltage &lt; 0.40; &gt; 0.8V</li> </ul> or <ul style="list-style-type: none"> <li>• TPS 2 signal voltage &lt; 4.20; &gt; 4.6V</li> </ul>
P2122	Throttle/Pedal Position Sensor/Switch "D" Circuit Low Input	Signal voltage < 0.65 V
P2123	Throttle/Pedal Position Sensor/Switch "D" Circuit High Input	Signal voltage > 4.79 V
P2127	Throttle/Pedal Position Sensor/Switch "E" Circuit Low Input	Signal voltage < 0.28 V
P2128	Throttle/Pedal Position Sensor/Switch "E" Circuit High Input	Signal voltage > 2.43 V
P2138	Throttle/Pedal Position Sensor/Switch "D" / "E" Voltage Correlation	Signal voltage sensor 1 vs. sensor 2 > 0.14 - 0.70 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P2146	Fuel Injector Group "A" Supply Voltage Circuit/Open	Short to ground (high side) <ul style="list-style-type: none"> <li>• Signal current &gt; 14.90 A</li> <li>• Short to battery plus (high side) signal current &lt; 2.60 A</li> <li>• Core connection (high side - low side) signal current &lt; 2.60 A</li> </ul>
P2149	Fuel Injector Group "B" Supply Voltage Circuit/Open	Short to ground (high side) <ul style="list-style-type: none"> <li>• Signal current &gt; 14.90 A</li> <li>• Short to battery plus (high side) signal current &lt; 2.60 A</li> <li>• Core connection (high side - low side) signal current &lt; 2.60 A</li> </ul>
P2152	Fuel Injector Group "C" Supply Voltage Circuit/Open	Short to ground (high side) <ul style="list-style-type: none"> <li>• Signal current &gt; 14.90 A</li> <li>• Short to battery plus (high side) signal current &lt; 2.60 A</li> <li>• Core connection (high side - low side) signal current &lt; 2.60 A</li> </ul>
P2155	Fuel Injector Group "D" Supply Voltage Circuit/Open	Short to ground (high side) <ul style="list-style-type: none"> <li>• Signal current &gt; 14.90 A</li> <li>• Short to battery plus (high side) signal current &lt; 2.60 A</li> <li>• Core connection (high side - low side) signal current &lt; 2.60 A</li> </ul>
P216A	Fuel Injector Group "E" Supply Voltage Circuit/Open	Short to ground (high side) <ul style="list-style-type: none"> <li>• Signal current &gt; 14.90 A</li> <li>• Short to battery plus (high side) signal current &lt; 2.60 A</li> <li>• Core connection (high side - low side) signal current &lt; 2.60 A</li> </ul>
P216D	Fuel Injector Group "F" Supply Voltage Circuit/Open	Short to ground (high side) <ul style="list-style-type: none"> <li>• Signal current &gt; 14.90 A</li> <li>• Short to battery plus (high side) signal current &lt; 2.60 A</li> <li>• Core connection (high side - low side) signal current &lt; 2.60 A</li> </ul>
P2177	System Too Lean Off Idle Bank 1	Adaptive value > 30%

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P2178	System Too Rich Off Idle Bank 1	Adaptive value < -30%
P2179	System Too Lean Off Idle Bank 2	Adaptive value > 30%
P217A	Fuel Injector Group "C" Supply Voltage Circuit/Open	Short to ground (high side) <ul style="list-style-type: none"> <li>• Signal current &gt; 14.90 A</li> <li>• Short to battery plus (high side) signal current &lt; 2.60 A</li> <li>• Core connection (high side - low side) signal current &lt; 2.60 A</li> </ul>
P217D	Fuel Injector Group "D" Supply Voltage Circuit/Open	Short to ground (high side) <ul style="list-style-type: none"> <li>• Signal current &gt; 14.90 A</li> <li>• Short to battery plus (high side) signal current &lt; 2.60 A</li> <li>• Core connection (high side - low side) signal current &lt; 2.60 A</li> </ul>
P2180	System Too Rich Off Idle Bank 2	Adaptive value < -30%
P2181	Cooling System Performance	Cooling system temperature too low after a sufficient air mass flow integral < 75° C
P2187	System Too Lean at Idle, Bank 1	Adaptive value > 6.00%
P2188	System Too Rich at Idle, Bank 1	Adaptive value < -6.00%
P2189	System Too Lean at Idle, Bank 2	Adaptive value > 6.00 %
P2190	System Too Rich at Idle, Bank 2	Adaptive value < -6.00%
P2195	O2 Sensor Signal Stuck Lean Bank 1 Sensor 1	Delta lambda of 2nd lambda control loop > 0.070
P2196	O2 Sensor Signal Stuck Rich Bank 1 Sensor 1	Delta lambda of 2nd lambda control loop < -0.070
P2197	O2 Sensor Signal Stuck Lean Bank 2 Sensor 1	Delta lambda of 2nd lambda control loop > 0.070
P2198	O2 Sensor Signal Stuck Rich Bank 2 Sensor 1	Delta lambda of 2nd lambda control loop < -0.070

DTC	Error Message	Malfunction Criteria and Threshold Value
P2231	O2 Sensor Signal Circuit Shorted to Heater Circuit Bank 1 Sensor 1	<ul style="list-style-type: none"> <li>• Delta O2S signal front &gt; 0.2 - 0.498 V</li> <li>• Elapsed time since last O2S &lt; 0.05 Sec</li> <li>• Heater switch on</li> </ul>
P2234	O2 Sensor Signal Circuit Shorted to Heater Circuit Bank 2 Sensor 1	<ul style="list-style-type: none"> <li>• Delta O2S signal front &gt; 0.2 - 0.498 V</li> <li>• Elapsed time since last O2S &lt; 0.05 Sec</li> <li>• Heater switch on</li> </ul>
P2237	O2 Sensor Positive Current Control Circuit Bank 1 Sensor 1 Open	<ul style="list-style-type: none"> <li>• O2S signal front 1.46 - 1.54 V and</li> <li>• Delta lambda controller &gt; 0.10</li> </ul>
P2240	O2 Sensor Positive Current Control Circuit Bank 2 Sensor 1 Open	<ul style="list-style-type: none"> <li>• O2S signal front 1.46 - 1.54 V and</li> <li>• Delta lambda controller &gt; 0.10</li> </ul>
P2243	O2 Sensor Reference Voltage Circuit Bank 1 Sensor 1 Open	<ul style="list-style-type: none"> <li>• O2S signal front &lt; 0.20 V and</li> <li>• Internal resistance &gt; 950Ω</li> </ul>
P2247	O2 Sensor Reference Voltage Circuit Bank 2 Sensor 1 Open	<ul style="list-style-type: none"> <li>• O2S signal front &gt; 4.70 and</li> <li>• Internal resistance &gt; 950 Ω</li> </ul>
P2251	O2 Sensor Negative Current Control Circuit/Open Bank 1 Sensor 1	<ul style="list-style-type: none"> <li>• O2S signal front 1.44 - 1.53 V and</li> <li>• Internal resistance &gt; 950 Ω</li> </ul>
P2254	O2 Sensor Negative Current Control Circuit/Open Bank 2 Sensor 1	<ul style="list-style-type: none"> <li>• O2S signal front 1.44 - 1.53 V and</li> <li>• Internal resistance &gt; 950 Ω</li> </ul>
P2257	Secondary air injection System Control "A" Circuit Low	Signal voltage 0.00 - 3.26 V
P2258	Secondary air injection System Control "A" Circuit High	Signal current 0.60 - 2.40 A
P2259	Secondary Air Injection System Control "B" Circuit Low	Signal voltage 0.0 - 3.26 V
P2260	Secondary Air Injection System Control "B" Circuit High	Signal current 0.60 - 2.40 A

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P2270	O2 Sensor Signal Stuck Lean; Bank 1 Sensor 2	<ul style="list-style-type: none"> <li>• O2S signal rear not oscillating at reference &lt; 0.64 V</li> <li>and</li> <li>• Enrichment after stuck lean 28%</li> </ul>
P2271	O2 Sensor Signal Stuck Rich; Bank 1 Sensor 2	<ul style="list-style-type: none"> <li>• O2S signal rear not oscillating at reference &gt; 0.64 V</li> <li>and</li> <li>• Enrichment after stuck rich 15%</li> <li>or</li> <li>• Sensor voltage (after fuel cut off) <math>\geq 0.15V</math></li> <li>and</li> <li>• Number of checks <math>\geq 1.0</math></li> </ul>
P2272	O2 Sensor Signal Stuck Lean; Bank 2 Sensor 2	<ul style="list-style-type: none"> <li>• O2S signal rear not oscillating at reference &lt; 0.64 V</li> <li>and</li> <li>• Enrichment after stuck lean 28%</li> </ul>
P2273	O2 Sensor Signal Stuck Rich; Bank 2 Sensor 2	<ul style="list-style-type: none"> <li>• O2S signal rear not oscillating at reference &gt; 0.64 V</li> <li>and</li> <li>• Enrichment after stuck rich 15%</li> <li>or</li> <li>• Sensor voltage (after fuel cut off) <math>\geq 0.15V</math></li> <li>and</li> <li>• Number of checks <math>\geq 1.0</math></li> </ul>
P2279	Intake Air System Leak	<ul style="list-style-type: none"> <li>• Threshold to detect a defective system &gt; 1.70</li> <li>and</li> <li>• Ratio of the tie "System defective" during the measur. window to the whole duration of the measur. window &gt; 0.80</li> </ul>
P2293	Fuel Pressure Regulator 2 Performance	Difference between actual pressure - Target pressure < 1.50 & > 1.50 MPa
P2294	Fuel Pressure Regulator 2 Control Circuit	<ul style="list-style-type: none"> <li>• Signal voltage 1.40 - 3.20 V</li> <li>or</li> <li>• Signal pattern incorrect</li> </ul>



DTC	Error Message	Malfunction Criteria and Threshold Value
P2295	Fuel Pressure Regulator 2 Control Circuit Low	Signal voltage 1.40 - 3.40 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 voltage > 5.1 - 7.0 V
P2303	Ignition Coil "B" Primary Control Circuit Low	Signal current > 24.0 mA
P2304	Ignition Coil "B" Primary Control Circuit High	Signal voltage > 5.1 - 7.0 V
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 V
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 V
P2312	Ignition Coil "E" Primary Control Circuit Low	Signal current > 24.0 mA
P2313	Ignition Coil "E" Primary Control Circuit High	Signal voltage > 5.1 - 7.0 V
P2315	Ignition Coil "F" Primary Control Circuit Low	Signal current > 24.0 mA
P2316	Ignition Coil "F" Primary Control Circuit High	Signal voltage > 5.1 - 7.0 V
P2318	Ignition Coil "G" Primary Control Circuit Low	Signal current > 24.0 mA
P2319	Ignition Coil "G" Primary Control Circuit High	Signal voltage > 5.1 - 7.0 V
P2321	Ignition Coil "H" Primary Control Circuit Low	Signal current > 24.0 mA

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P2322	Ignition Coil "H" Primary Control Circuit High	Signal voltage > 5.1 - 7.0 V
P2324	Ignition Coil "I" Primary Control Circuit Low	Signal current > 24.0 mA
P2325	Ignition Coil "I" Primary Control Circuit High	Signal voltage > 5.1 - 7.0 V
P2327	Ignition Coil "J" Primary Control Circuit Low	Signal current > 24.0 mA
P2328	Ignition Coil "J" Primary Control Circuit High	Signal voltage > 5.1 - 7.0 V
P2330	Ignition Coil "K" Primary Control Circuit Low	Signal current > 24.0 mA
P2331	Ignition Coil "K" Primary Control Circuit High	Signal voltage > 5.1 - 7.0 V
P2333	Ignition Coil "L" Primary Control Circuit Low	Signal current > 24.0 mA
P2334	Ignition Coil "L" Primary Control Circuit High	Signal voltage > 5.1 - 7.0 V

### **Additional Emissions Regulations**

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P2414	O2 Sensor Exhaust Sample Error Bank 1, Sensor 1	<ul style="list-style-type: none"> <li>• Threshold 1 - Signal voltage 2.71 - 6.00 V</li> <li>• Threshold 2 - Signal voltage 2.05 - 3.06 V</li> </ul>
P2415	O2 Sensor Exhaust Sample Error, Bank 2 Sensor 1	<ul style="list-style-type: none"> <li>• Threshold 1 - Signal voltage 2.71 - 6.00 V</li> <li>• Threshold 2 - Signal voltage 2.05 - 3.06 V</li> </ul>
P2422	Evaporative Emission System Vent Valve Stuck Closed	Time for pressure drop during 2nd leak check < 1.45 Sec.
P2431	Secondary Air Injection System Air Flow/Pressure Sensor Circuit Range/Performance	Difference between AIR pressure and ambient pressure < -6.0; > 6.0 kPa)
P2432	Secondary Air Injection System Air Flow/Pressure Bank 1 Sensor Circuit Low	Signal voltage < 0.50 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P2433	Secondary Air Injection System Air Flow/Pressure Sensor Circuit High	Signal voltage > 4.50 V
P2436	Secondary Air Injection System Air Flow/Pressure Bank 2 Sensor Circuit Range/Performance	Difference between AIR pressure and ambient pressure < -6.0; > 6.0 kPa)
P2437	Secondary Air Injection System Air Flow/Pressure Bank 2 Sensor Circuit Low	Signal voltage < 0.50 V
P2438	Secondary Air Injection System Air Flow/Pressure Bank 2 Sensor Circuit High	Signal voltage > 4.50 V
P2440	Secondary Air Injection System Switching Valve Stuck Open Bank 1	Deviation of raw pressure signal from filter signal: <ul style="list-style-type: none"> <li>• Maximum value &gt; 0.38 kPa</li> <li>• Minimum value &lt; -2.5 kPa</li> <li>• Mean value &gt; 0.15 kPa</li> </ul>
P2442	Secondary Air Injection System Switching Valve Stuck Open Bank 2	Deviation of raw pressure signal from filter signal: <ul style="list-style-type: none"> <li>• Maximum value &gt; 0.38 kPa</li> <li>• Minimum value &lt; -2.5 kPa</li> <li>• Mean value &gt; 0.15 kPa</li> </ul>
P2539	Low Pressure Fuel System Sensor Circuit	Signal voltage > 4.90 V
P2541	Low Pressure Fuel System Sensor Circuit Low Input	Signal voltage < 0.10 V
P2626	O2 Sensor Pumping Current - Trim Circuit/Open Bank 1 - Sensor 1	O2S signal front > 4.8 V
P2629	O2 Sensor Pumping Current Trim Circuit/Open Bank 2 Sensor 1	O2S signal front > 4.8 V

# DTC CHART

## Engine Codes - 3.0L TDI CPNA

### Fuel and Air Mixture, Additional Emissions Regulations

DTC	Error Message	Malfunction Criteria and Threshold Value
P0045	Turbocharger Boost Control Solenoid Circuit Open	Diagnostic signal from power stage > 0.8 V (Out 1) and < 2 V (Out 2)
P0047	Turbocharger Boost Control Solenoid Circuit Grounded	Diagnostic signal from power stage > 8 - 18 A
P0048	Turbocharger Boost Control Solenoid Circuit High	Diagnostic signal from power stage > 8 - 18 A
P0071	Ambient Air Temperature Sensor Circuit Range/ Performance	<ul style="list-style-type: none"> <li>• Temperature difference to ECT, ECT 2&gt; 40° K</li> <li>• Temperature difference to T2, and FTS &gt; 45° K</li> <li>• Error bit = set</li> </ul>
P0072	Ambient Air Temperature Sensor Circuit Low	AAT < -40° C
P0087	Fuel Rail/System Pressure - Too Low	<ul style="list-style-type: none"> <li>• Positive control deviation step 1 &gt; 17000.00 - 50000.00 kPa</li> <li>• Positive control deviation step 2 &gt; 15000.00 kPa</li> <li>• Minimum rail pressure &lt; 0.00 - 12500.00 kPa</li> </ul>
P0088	Fuel Rail/System Pressure - Too High	Max Rail Pressure > 215000 kPa
P0090	Fuel Pressure Regulator Control Circuit Open	Signal Voltage < 4.7 V
P0091	Fuel Pressure Regulator Control Circuit Grounded	Signal Voltage < 2.97 V
P0092	Fuel Pressure Regulator Control Circuit Shorted to Battery Voltage	Signal current > 3.0 A
P00AF	Turbocharger Boost Pressure Actuator Control functional check	Stuck open <ul style="list-style-type: none"> <li>• Control deviation &gt; 8.00 [%]</li> <li>or</li> <li>• Control deviation &gt; 8.00 [%]</li> <li>• Actual position ≤ 30.00 [%]</li> </ul>

DTC	Error Message	Malfunction Criteria and Threshold Value
P00C6	Fuel Rail Pressure System	Fuel Rail, high pressure value < 12000 - 23000 kPa
P0101	Mass or Volume Air Flow Circuit Range/Performance	Ratio of modeled and measured air mass flow > 1.15 or < 0.85
P0102	Mass or Volume Air Flow Circuit Low Input	MAF sensor signal (< 0.083 mSec.) > 900 kg/hr
P0103	Mass or Volume Air Flow Circuit High Input	MAF sensor signal (> 4.5 mSec.) ≤ 0 kg/hr
P0104	Mass or Volume Air Flow Circuit Intermittent	MAF sensor signal period = not measurable
P0111	Intake Air Temperature Circuit Performance	<ul style="list-style-type: none"> <li>• Temperature difference to ECT, ECT 2 &gt; 35 °K</li> <li>• Temperature difference to FTS &gt; 40 °K</li> <li>• Temperature difference to T1 &gt; 45 °K</li> </ul>
P0112	Intake Air Temperature Circuit Low Input	Signal voltage < 162 mV
P0113	Intake Air Temperature Circuit High Input	Signal voltage > 3255 mV
P0116	Engine Coolant Temperature Sensor @1 Circuit Range/Performance	<ul style="list-style-type: none"> <li>• ECT increase &lt; f(ECT @ start) ° K</li> <li>and</li> <li>• Engine running time &gt; f(ECT @ start) Sec.</li> </ul> or <ul style="list-style-type: none"> <li>• Temperature difference to ECT 2 &gt; 30° K</li> <li>• Temperature difference to T2, FTS &gt; 35° K</li> <li>• Temperature difference to T1 &gt; 40° K</li> </ul>
P0117	Engine Coolant Temperature Sensor 1 Circuit Low	Signal voltage < 162 mV
P0118	Engine Coolant Temperature Sensor 1 Circuit High	Signal voltage > 3255 mV
P0121	Throttle Position Sensor Circuit Performance	Position sensor signal > 1 V or 0.15 to 0.30 V
P0122	Throttle Position Sensor Circuit Low Input	Position sensor signal < 0.15 V

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0123	Throttle Position Sensor Circuit High Input	Position sensor signal $\geq 4.85$ V
P0128	Engine Coolant Temperature Sensor Rationality Check	ECT @ cylinder head $< 66^{\circ}$ C
P0130	O2 Sensor Circuit Bank 1 Sensor 1 Malfunction	Short to battery voltage: <ul style="list-style-type: none"> <li>• Virtual mass (VM) <math>&gt; 3.0</math> V</li> <li>• Nernst voltage (UN) <math>&gt; 4.0</math> V</li> <li>• Adjustment voltage (IA/IP) <math>&gt; 1.5</math> V</li> </ul> Short to ground <ul style="list-style-type: none"> <li>• Virtual mass (VM) <math>&lt; 2.0</math> V</li> <li>• Nernst voltage (UN) <math>&lt; 1.75</math> V</li> <li>• Adjustment voltage (IA/IP) <math>&lt; 0.3</math> V</li> </ul>
P0132	O2 Sensor Circuit Bank 1, Sensor 1 High Voltage	Signal voltage $> 3.20$ V
P0133	O2 Circuit Bank 1, Sensor 1 Slow Response	Time to reach 60% oxygen $> 4$ Sec.
P0134	O2 Sensor Heated Circuit, Bank 1, Sensor 1 No Activity Detected / Feedback Check	<ul style="list-style-type: none"> <li>• Integrated oxygen sensor temperature <math>&gt; 330000 - 1117476</math> K</li> <li>• Oxygen sensor heating = not active</li> </ul>
P0135	O2 Sensor Heater Circuit Bank 1 Sensor 1 Malfunction	<ul style="list-style-type: none"> <li>• Sensor element temperature <math>&lt; 720</math> or <math>&gt; 840^{\circ}</math> C</li> <li>• Power stage active and signal current = <math>-100</math> to <math>10000</math> <math>\mu</math>A</li> <li>• Power stage not active and signal current = <math>-1000</math> to <math>-350</math> <math>\mu</math>A</li> <li>• Power stage not active and signal current = <math>-100</math> to <math>100</math> <math>\mu</math>A</li> </ul>
P016A	Fuel Trim, Feedback Check	Control intervention 0%
P0171	Fuel Trim, System Lean	Fuel mass correction value $\leq -0.01$ [g/rev]
P0172	Fuel Trim, System Rich	Fuel mass correction value $\geq 0.01$ [g/rev]

DTC	Error Message	Malfunction Criteria and Threshold Value
P0181	Fuel Temperature Sensor Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Number of detected faults <math>\geq 6.00</math></li> <li>Cross checks for fault detection:</li> <li>• FTS vs. ECT @ cylinder head <math>&gt; 35\text{ K}</math></li> <li>• FTS vs. IAT <math>&gt; 35\text{K}</math></li> <li>• FTS vs. EOT <math>&gt; 35\text{ K}</math></li> <li>• FTS vs. AAT <math>&gt; 35\text{K}</math></li> <li>• FTS vs. ECT @ cylinder block <math>&gt; 35\text{ K}</math></li> <li>• FTS vs. ECT @ cylinder block <math>&gt; 35\text{ K}</math></li> <li>• FTS vs. TEGR <math>&gt; 35\text{ K}</math></li> </ul>
P0182	Fuel Temperature Sensor Circuit Grounded	Signal Voltage $< 0.10\text{ V}$
P0183	Fuel Temperature Sensor Circuit Shorted to Battery Voltage / Open	Signal voltage $> 4.90\text{ V}$
P0191	Fuel Rail Pressure Sensor Circuit Range/Performance	Signal voltage $< 0.428\text{ V}$ or $> 0.613\text{ V}$
P0192	Fuel Rail Pressure Sensor Circuit Low Input	Signal voltage $< 0.2\text{ V}$
P0193	Fuel Rail Pressure Sensor Circuit High Input	Signal voltage $> 4.8\text{ mV}$
P01BA	Engine Oil Temperature Sensor 2 Performance	<ul style="list-style-type: none"> <li>• EOT cross checks for fault detection: <math>\geq 6</math> detected faults</li> <li>• EOT vs. ECT 3, IAT, FTS, AAT or ECT 2 <math>&gt; 30\text{ Kelvin}</math></li> </ul>
P01BB	Engine Oil Temperature Sensor 2 Circuit Low	Signal voltage $< 0.20\text{ V}$ for $\geq 5\text{ Sec.}$
P01BC	Engine Oil Temperature Sensor 2 Circuit High	Signal voltage $> 4.85\text{ V}$ for $\geq 5\text{ Sec.}$
P01BD	Engine Oil Temperature Sensor 2 Circuit Intermittent/ Erratic	<ul style="list-style-type: none"> <li>• Oil temperature increase <math>&lt; 3.0\text{ K}</math></li> <li>• Oil temperature <math>&lt; 66^\circ\text{ C}</math></li> <li>• Evaluation timer <math>&gt; 59 - 251\text{ s}</math></li> </ul>
P01E3	Engine Temperature Control Sensor Circuit Shorted to Battery Voltage	Signal voltage $> 4.92\text{ V}$
P01E4	Engine Temperature Control Sensor Circuit Range/ Performance	ETC vs IAT or AAT or FTS at start up $> 35\text{ K}$

DTC	Error Message	Malfunction Criteria and Threshold Value
P01E5	Engine Temperature Control Sensor Circuit Grounded	Signal voltage < 0.22 V
P0201	Cylinder 1 Injector Circuit Malfunction	<ul style="list-style-type: none"> <li>• Open circuit signal voltage &gt; 60 V</li> <li>• Short to battery voltage (low side) signal voltage = failure</li> <li>• Short circuit over load signal voltage &gt; 30 V</li> </ul> Short Circuit Low Side: <ul style="list-style-type: none"> <li>• Deviation between set and actual signal voltage after charging, Injector voltage &gt; 30% of nominal voltage</li> <li>• Deviation between set and actual signal voltage before charging, Injector voltage &gt; 45% of nominal voltage)</li> </ul>
P0202	Cylinder 2 Injector Circuit Malfunction	<ul style="list-style-type: none"> <li>• Open circuit signal voltage &gt; 60 V</li> <li>• Short to battery voltage (low side) signal voltage = failure</li> <li>• Short circuit over load signal voltage &gt; 30 V</li> </ul> Short Circuit Low Side: <ul style="list-style-type: none"> <li>• Deviation between set and actual signal voltage after charging, Injector voltage &gt; 30% of nominal voltage</li> <li>• Deviation between set and actual signal voltage before charging, Injector voltage &gt; 45% of nominal voltage)</li> </ul>



DTC	Error Message	Malfunction Criteria and Threshold Value
P0203	Cylinder 3 Injector Circuit Malfunction	<ul style="list-style-type: none"> <li>• Open circuit signal voltage &gt; 60 V</li> <li>• Short to battery voltage (low side) signal voltage = failure</li> <li>• Short circuit over load signal voltage &gt; 30 V</li> </ul> Short Circuit Low Side: <ul style="list-style-type: none"> <li>• Deviation between set and actual signal voltage after charging, Injector voltage &gt; 30% of nominal voltage</li> <li>• Deviation between set and actual signal voltage before charging, Injector voltage &gt; 45% of nominal voltage)</li> </ul>
P0204	Cylinder 4- Injector Circuit Malfunction	<ul style="list-style-type: none"> <li>• Open circuit signal voltage &gt; 60 V</li> <li>• Short to battery voltage (low side) signal voltage = failure</li> <li>• Short circuit over load signal voltage &gt; 30 V</li> </ul> Short Circuit Low Side: <ul style="list-style-type: none"> <li>• Deviation between set and actual signal voltage after charging, Injector voltage &gt; 30% of nominal voltage</li> <li>• Deviation between set and actual signal voltage before charging, Injector voltage &gt; 45% of nominal voltage)</li> </ul>

DTC	Error Message	Malfunction Criteria and Threshold Value
P0205	Cylinder 5- Injector Circuit Malfunction	<ul style="list-style-type: none"> <li>• Open circuit signal voltage &gt; 60 V</li> <li>• Short to battery voltage (low side) signal voltage = failure</li> <li>• Short circuit over load signal voltage &gt; 30 V</li> </ul> Short Circuit Low Side: <ul style="list-style-type: none"> <li>• Deviation between set and actual signal voltage after charging, Injector voltage &gt; 30% of nominal voltage</li> <li>• Deviation between set and actual signal voltage before charging, Injector voltage &gt; 45% of nominal voltage)</li> </ul>
P0206	Cylinder 6- Injector Circuit Malfunction	<ul style="list-style-type: none"> <li>• Open circuit signal voltage &gt; 60 V</li> <li>• Short to battery voltage (low side) signal voltage = failure</li> <li>• Short circuit over load signal voltage &gt; 30 V</li> </ul> Short Circuit Low Side: <ul style="list-style-type: none"> <li>• Deviation between set and actual signal voltage after charging, Injector voltage &gt; 30% of nominal voltage</li> <li>• Deviation between set and actual signal voltage before charging, Injector voltage &gt; 45% of nominal voltage)</li> </ul>
P0234	Turbo Charger Overboost Condition limit exceeded	Control deviation < -22 kPa
P0236	Turbocharger Boost Pressure Sensor Circuit Performance	Absolute value of pressure difference > 14 kPa
P0237	Turbocharger Boost Pressure Sensor Circuit Low Input	Sensor voltage < 0.40 V
P0238	Turbocharger Boost Pressure Sensor Circuit High Input	Sensor voltage > 4.90 V
P026A	Charge Air Cooler Efficiency Below	Filtered charge air cooler efficiency < 7[-]
P0263	Cylinder 1 Contribution / Balance Internal Check	Diagnostic signal from power stage = Failure

DTC	Error Message	Malfunction Criteria and Threshold Value
P0266	Cylinder 2 Contribution / Balance Internal Check	<ul style="list-style-type: none"> <li>• Diagnostic signal from power stage = Failure</li> <li>• Adaptive value limit high &gt; 213 - 412 [<math>\mu</math>s]</li> <li>• Adaptive value limit low &lt; 213 - 412 [<math>\mu</math>s]</li> </ul>
P0269	Cylinder 3 Contribution / Balance Internal Check	<ul style="list-style-type: none"> <li>• Diagnostic signal from power stage = Failure</li> <li>• Adaptive value limit high &gt; 213 - 412 [<math>\mu</math>s]</li> <li>• Adaptive value limit low &lt; 213 - 412 [<math>\mu</math>s]</li> </ul>
P0272	Cylinder 4 Contribution / Balance Internal Check	<ul style="list-style-type: none"> <li>• Diagnostic signal from power stage = Failure</li> <li>• Adaptive value limit high &gt; 213 - 412 [<math>\mu</math>s]</li> <li>• Adaptive value limit low &lt; 213 - 412 [<math>\mu</math>s]</li> </ul>
P0275	Cylinder 5 Contribution/ Balance	<ul style="list-style-type: none"> <li>• Diagnostic signal from power stage = Failure</li> <li>• Adaptive value limit high &gt; 213 - 412 [<math>\mu</math>s]</li> <li>• Adaptive value limit low &lt; 213 - 412 [<math>\mu</math>s]</li> </ul>
P0278	Cylinder 6 Contribution/ Balance	<ul style="list-style-type: none"> <li>• Diagnostic signal from power stage = Failure</li> <li>• Adaptive value limit high &gt; 213 - 412 [<math>\mu</math>s]</li> <li>• Adaptive value limit low &lt; 213 - 412 [<math>\mu</math>s]</li> </ul>
P0299	Turbo Boost Pressure Control Rationality Check High	<ul style="list-style-type: none"> <li>• Difference set value boost pressure vs. actual boost pressure value: depending on ECT &gt; 30 - 100 [kPa]</li> <li>• Difference set value boost pressure vs. actual boost pressure value: depending on engine speed and fuel quantity &gt; 35 - 100 [kPa]</li> <li>• Boost pressure &lt; 0.00 - 85.00 kPa</li> </ul>

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P2002	Particulate Trap Bank 1 Efficiency Below Threshold	<ul style="list-style-type: none"> <li>• Differential pressure &lt; f (volumetric flow rate, soot load)</li> <li>• Differential pressure &lt; f (volumetric flow rate)</li> </ul>
P2004	Intake Manifold Runner Control Bank 1 Stuck Open	<ul style="list-style-type: none"> <li>• Control deviation &gt; 10%</li> <li>• Actual position ≤ 40%</li> </ul>
P2005	Intake Manifold Runner Control Bank 2 Stuck Open	<ul style="list-style-type: none"> <li>• Control deviation &gt; 10%</li> <li>• Actual position ≤ 40%</li> </ul>
P2006	Intake Manifold Runner Control Bank 1 Stuck Closed	<ul style="list-style-type: none"> <li>• Control deviation &gt; 10%</li> <li>• Actual position ≤ 40%</li> </ul>
P2007	Intake Manifold Runner Control Bank 2 Stuck Closed	<ul style="list-style-type: none"> <li>• Control deviation &gt; 10%</li> <li>• Actual position ≤ 40%</li> </ul>
P2008	Intake Manifold Runner Control Bank 1 Stuck Open	<ul style="list-style-type: none"> <li>• Diagnostic signal from power stage &gt; 0.8 V (output 1) and &lt; 2 V (output 2)</li> <li>or</li> <li>• Diagnostic signal from power stage = 8 to 18 A</li> <li>or</li> <li>• Diagnostic signal from power stage &gt; 5 V or &lt; 3.4 V</li> </ul>
P2009	Intake Manifold Runner Bank 1 Control Circuit Low	Diagnostic signal from power stage 8 to 18 A
P2010	Intake Manifold Runner Control Circuit High, Bank 1	Diagnostic signal from power stage = 8 to 18 A
P2011	Intake Manifold Runner Bank 2 Control Circuit Stuck Open	<ul style="list-style-type: none"> <li>• Diagnostic signal from power stage &gt; 0.8 V (output 1) and &lt; 2 V (output 2)</li> <li>or</li> <li>• Diagnostic signal from power stage = 8 to 18 A</li> <li>or</li> <li>• Diagnostic signal from power stage &gt; 5 V or &lt; 3.4 V</li> </ul>
P2012	Intake Manifold Runner Bank 2 Control Circuit Low	Diagnostic signal from power stage 8 to 18 A
P2013	Intake Manifold Runner Bank 2 Control Circuit High	Diagnostic signal from power stage = 8 to 18 A

DTC	Error Message	Malfunction Criteria and Threshold Value
P2015	Intake Manifold Runner Position Sensor Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Position sensor signal &lt; 3550 mV</li> <li>• Position sensor signal &gt; 1450 mV</li> </ul> or <ul style="list-style-type: none"> <li>• Position sensor signal &gt; 550 mV and &lt; 250 mV</li> </ul> or <ul style="list-style-type: none"> <li>• Position sensor signal &gt; 4450 mV and &lt; 4750 mV</li> </ul>
P2016	Intake Manifold Runner Position Sensor Circuit Low	Position sensor signal $\leq$ 250 mV
P2017	Intake Manifold Runner Position Sensor Circuit High	Position sensor signal $\geq$ 4750 mV
P202A	Reducing Agent Tank Heater Control Circuit/Open	Conductance @ start of heating $\leq$ 0.10 1/Ohm
P202B	Reducing Agent Tank Heater Control Circuit Low	Conductance @ start of heating < 0.20 Ohm
P202C	Reducing Agent Tank Heater Control Circuit High	Conductance @ start of heating > 1 Ohm
P2020	Intake Manifold Runner Position Sensor Circuit Bank 2 Range/Performance	<ul style="list-style-type: none"> <li>• Position sensor signal &lt; 3550 mV</li> <li>• Position sensor signal &gt; 1450 mV</li> </ul> or <ul style="list-style-type: none"> <li>• Position sensor signal &gt; 550 mV and &lt; 250 mV</li> </ul> or <ul style="list-style-type: none"> <li>• Position sensor signal &gt; 4450 mV and &lt; 4750 mV</li> </ul>
P2021	Intake Manifold Runner Position Sensor Circuit Bank 2 Low	Position sensor signal $\leq$ 250 mV
P2022	Intake Manifold Runner Position Sensor Circuit Bank 2 High	Position sensor signal $\geq$ 4750 mV

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P203B	Reducing Agent Level Sensor Circuit Range / Performance	<ul style="list-style-type: none"> <li>• Signal voltage not equal full level &lt; 1.76 V or &gt; 2.02 V</li> <li>or</li> <li>• Signal voltage not equal half full level , 2.03 V or &gt; 2.31 V</li> <li>or</li> <li>• Signal voltage not equal empty level &lt; 1.32 V or &gt; 1.53 V</li> <li>or</li> <li>• Signal voltage not equal SCR values &lt; 0.25 V &gt; 2.35 V</li> </ul>
P203C	Reducing Agent Level Sensor Circuit Open or Grounded	Signal Voltage < 0.1 V
P203D	Reducing Agent Level Sensor Circuit Short to Battery Voltage	Signal Voltage > 4.8 V
P2031	Exhaust Gas Temperature Sensor 2 Circuit	Signal voltage > 2.61 V
P2032	Exhaust Gas Temperature Sensor 2 Circuit Low	Signal voltage < 0.68 V
P204A	Reducing Agent Pressure Sensor Circuit Open / Short Ground	Signal voltage < 0.1 V
P204B	Reducing Agent Pressure Sensor Circuit Range / Performance	Actual pressure Reduction Agent delivery system > 50.00 kPa or < 50.00 kPa
P204D	Reducing Agent Pressure Sensor Circuit High	Signal voltage > 4.90 V
P2047	Reducing Agent Injection Valve Circuit Open	Signal Voltage < 4.7 V
P2048	Reducing Agent Injection Valve Circuit Grounded	<ul style="list-style-type: none"> <li>• Signal Voltage &lt; 2.97 V</li> <li>or</li> <li>• Signal Current &gt; 1.6 A</li> </ul>
P2049	Reducing Agent Injection Valve Circuit Short to Battery Voltage	<ul style="list-style-type: none"> <li>• Signal Current &gt; 1.8 A</li> <li>or</li> <li>• Analog measure &lt; 200 mA</li> </ul>
P205A	Reducing Agent Tank Temperature Sensor Circuit Short to Battery Voltage or Open	Signal voltage > 4.63 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P205B	Reducing Agent Tank Temperature Sensor Circuit Range/Performance	Case 1: <ul style="list-style-type: none"> <li>• AAT &gt; 25° C</li> <li>• difference between reducing agent (AdBlue®) to ECT &lt; -30° K</li> </ul> Case 2: <ul style="list-style-type: none"> <li>• AAT &lt; 25° C</li> <li>• difference between reducing agent (AdBlue®) to ECT &lt; -30° K</li> <li>• Reducing agent temperature increase while heating tank &lt; 1.5 K</li> <li>• For time &lt; 1500.0 s</li> </ul>
P205C	Reducing Agent Tank Temperature Sensor Circuit Grounded	Signal voltage < 0.18 V
P207F	Reducing Agent Quality Performance	Average Efficiency > 2.50 [-]
P208A	Reducing Agent Pump Control Circuit Open	Signal Voltage > 4.7 V
P208B	Reducing Agent Pump Does Not Rotate At Expected Speeds	<ul style="list-style-type: none"> <li>• Rotation &lt; 400 RPM</li> <li>• &gt; 5 Seconds</li> </ul>
P208C	Reducing Agent Pump Control Circuit Grounded	Signal Voltage < 2.74 V
P208D	Reducing Agent Pump Control Circuit High	Signal Current > 4.0 A
P208E	Reducing Agent Injection Valve Stuck Closed Bank 1 Unit 1	Missing number of signal peaks > 200
P2080	Exhaust Gas Temperature Sensor Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Temperature difference to temp EGR T3, T4, T5, T6 &gt; 40° K</li> </ul> or <ul style="list-style-type: none"> <li>• Mean value of modeled to measured T4 &gt; 100° K</li> </ul>
P2084	Exhaust Gas Temperature Sensor 2 Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Temperature difference to temp EGR T3, T4, T5, T6 &gt; 40° K</li> </ul> or <ul style="list-style-type: none"> <li>• Mean value of modeled to measured T4 &gt; 100° K</li> </ul>

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P20BB	Reducing Agent Tank Heater Control Circuit Shorted to Ground	Diagnostic signal from power stage > 14A
P20BB	Reducing Agent Tank Heater Control Circuit Shorted to Ground	Diagnostic signal from power stage > 14A
P20BC	Reducing Agent Tank Heater Control Circuit Shorted to Battery Voltage	Diagnostic signal from power stage > 1 A
P20BD	Reducing Agent Heater 2 Control Circuit/Open	Diagnostic signal from power stage < 1 A
P20BF	Reducing Agent Heater 2 Control Circuit/Low	Diagnostic signal from power stage < 14 A
P20B5	Reducing Agent Metering Unit Heater Control Circuit/Open	Conductance during heating $\leq 0.10$ 1/Ohm
P20B7	Reducing Agent Metering Unit Heater Control Circuit Low	Conductance @ start heating < 0.30 1/Ohm
P20B8	Reducing Agent Metering Unit Heater Control Circuit High	Conductance @ start heating > 1.00 1/Ohm
P20B9	Reducing Agent Tank Heater Control Circuit Open	Diagnostic signal from power stage < 1A
P20C0	Reducing Agent Heater 2 Control Circuit High	Diagnostic signal from power stage < 1 A
P20EE	SCR NOx Catalyst Efficiency Below Threshold	Difference between calculated and measured efficiency < 0.4[-]
P20E8	Reducing Agent Pressure Too Low / Functional Check	<ul style="list-style-type: none"> <li>• Actual pressure &lt; 300.00 kPa for 55 s</li> <li>or</li> <li>• Actual pressure &lt; 350.00 kPa for 60 s</li> <li>or</li> <li>• Pressure built up for 21.00[-] Attempts &gt; 450 kPa</li> </ul>
P20FE	Reducing Agent Quality Performance	Average Efficiency > 2.50 [-]



DTC	Error Message	Malfunction Criteria and Threshold Value
P20E9	Reducing Agent Pressure Too High	<ul style="list-style-type: none"> <li>• Actual pressure &gt; 790.00 kPa for 0.0 s</li> <li>or</li> <li>• Actual pressure &gt; 650.00 kPa for 10 s</li> <li>or</li> <li>• Pressure @ Dosing end &gt; 50 kPa</li> </ul>
P20FF	Reducing Agent Metering System Control Module -J880- Detects Internal Hardware Defects	Internal fault
P20F4	Reducing Agent Consumption Too High	SCR adaptive value $\geq 2.50$
P20F5	Reducing Agent Consumption Too Low	SCR adaptive value $\leq 0.51$
P3081	Engine Temperature Too Low	Difference between ECT and modeled ECT > 10° K
P3348	Activation turbocharger control module 1 -J724 Electrical error in circuit	Signal current > 8 - 18 A

## 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>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>

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
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>
P0305	Cylinder 5 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>
P0306	Cylinder 6 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>• Counted teeth vs. reference &gt; 200</li> <li>• Monitoring reference gap failure</li> </ul>
P0322	Engine Speed Input Circuit No Signal	<ul style="list-style-type: none"> <li>• Camshaft signal &gt; 10 and</li> <li>• Engine speed = no signal</li> </ul>

DTC	Error Message	Malfunction Criteria and Threshold Value
P0381	Glow Plug/Heater Indicator Circuit	Glow plug indicator control (sent message) vs. glow plug indicator (received message) status not equal

### Additional Exhaust Regulation

DTC	Error Message	Malfunction Criteria and Threshold Value
P04DD	Cold Start EGR Insufficient Flow Detected	Control deviation < f(engine speed, injection quantity, target air mass flow)
P04DE	Cold Start EGR Excessive Flow Detected	Ratio of modeled and measured air mass flow > f(turbo charger position)
P040B	Exhaust Gas Recirculation Temperature Sensor Circuit Range/Performance	Measured sensor temperature - mean value of modelled temperature
P040C	Exhaust Gas Recirculation Temperature Sensor Circuit Low	Signal voltage < 0.68 V
P040D	Exhaust Gas Recirculation Temperature Sensor Circuit High	Signal voltage > 2.61 V
P0401	Exhaust Gas Recirculation Flow Insufficient Detected	Control deviation < f (engine speed, injection quantity, target air mass flow)
P0402	Exhaust Gas Recirculation Excessive Flow Detected	Ratio of modeled and measured air mass flow > 1.3[-]

DTC	Error Message	Malfunction Criteria and Threshold Value
P0403	Exhaust Gas Recirculation Actuator Circuit Functional Check	<ul style="list-style-type: none"> <li>• Control deviation &gt; 10.00 [%]</li> <li>or</li> <li>• Control deviation &lt; -10.00 [%]</li> <li>or</li> <li>• Actual position ≤ 17.00 [%]</li> <li>• Control deviation &gt; 10.00 [%]</li> <li>or</li> <li>• Control deviation &lt; -10.00 [%]</li> <li>• Actual position &gt; 17.00 [%]</li> </ul> Open circuit: <ul style="list-style-type: none"> <li>• Signal voltage &gt; 0.8; &lt; 2.0 [V]</li> </ul> Short to ground: <ul style="list-style-type: none"> <li>• Signal current &gt; 8 - 18 [A]</li> </ul> Short to battery voltage: <ul style="list-style-type: none"> <li>• Signal current &gt; 8 - 18 [A]</li> </ul>
P0404	Exhaust Gas Recirculation Control Circuit Range/ Performance	<ul style="list-style-type: none"> <li>• Control deviation &gt; 10%</li> <li>• Actual position &gt; 17%</li> </ul>
P0405	Exhaust Gas Recirculation Sensor Circuit Low	Position sensor signal < 0.25 V
P0406	Exhaust Gas Recirculation Sensor Circuit High	Position sensor signal ≥ 4.75 V
P0420	Catalyst System Bank 1 Efficiency Below Threshold	Ratio of measured and modeled heat quantity < 0.30
P046C	Exhaust Gas Recirculation Sensor Circuit Range/ Performance	• Position sensor signal > 1.05 V

## Speed and Idle Control

DTC	Error Message	Malfunction Criteria and Threshold Value
P050A	Cold Start Idle Air Control System Performance	Idle speed control deviation more than 10% under or 10% above desired idle speed
P050E	SCR Catalyst, Temperature, Plausibility Check	Exhaust gas temperature < 150° C
P0501	Vehicle Speed Sensor Performance	Vehicle speed < 4 km/h
P0502	Vehicle Speed Sensor Circuit Low	Sensor signal failure
P0506	Idle Control System RPM Lower than Expected	Control deviation < 10%

DTC	Error Message	Malfunction Criteria and Threshold Value
P0507	Idle Air Control System - RPM Higher Than Expected	Control deviation > 10%
P052F	Glow Plug Control Module System Voltage	Error message from Glow Control Unit.
P0544	Exhaust Gas Temperature Sensor Circuit Short to Battery Voltage or Open	Signal voltage > 2.61 V
P0545	Exhaust Gas Temperature Sensor Circuit Low	Signal voltage < 0.68 V

### Control Module and Output Signals

DTC	Error Message	Malfunction Criteria and Threshold Value
P06BA	Cylinder 2 Glow Plug Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Glow plug resistance (between 4 - 9 Sec.) &lt; 0.3 ohm</li> <li>• Glow plug resistance (between 9 - 14 Sec.) &lt; 0.4 ohm</li> <li>• Glow plug resistance (after 14 Sec.) &lt; 0.5 ohm</li> <li>• Glow plug resistance anytime &gt; 1.2 ohm</li> </ul>
P06BB	Cylinder 3 Glow Plug Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Glow plug resistance (between 4 - 9 Sec.) &lt; 0.3 ohm</li> <li>• Glow plug resistance (between 9 - 14 Sec.) &lt; 0.4 ohm</li> <li>• Glow plug resistance (after 14 Sec.) &lt; 0.5 ohm</li> <li>• Glow plug resistance anytime &gt; 1.2 ohm</li> </ul>
P06BC	Cylinder 4 Glow Plug Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Glow plug resistance (between 4 - 9 Sec.) &lt; 0.3 ohm</li> <li>• Glow plug resistance (between 9 - 14 Sec.) &lt; 0.4 ohm</li> <li>• Glow plug resistance (after 14 Sec.) &lt; 0.5 ohm</li> <li>• Glow plug resistance anytime &gt; 1.2 ohm</li> </ul>

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P06BD	Cylinder 5 Glow Plug Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Glow plug resistance (between 4 - 9 Sec.) &lt; 0.3 ohm</li> <li>• Glow plug resistance (between 9 - 14 Sec.) &lt; 0.4 ohm</li> <li>• Glow plug resistance (after 14 Sec.) &lt; 0.5 ohm</li> <li>• Glow plug resistance anytime &gt; 1.2 ohm</li> </ul>
P06BE	Cylinder 6 Glow Plug Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Glow plug resistance (between 4 - 9 Sec.) &lt; 0.3 ohm</li> <li>• Glow plug resistance (between 9 - 14 Sec.) &lt; 0.4 ohm</li> <li>• Glow plug resistance (after 14 Sec.) &lt; 0.5 ohm</li> <li>• Glow plug resistance anytime &gt; 1.2 ohm</li> </ul>
P06B0	Reducing Agent Metering System Control Module -J880- Detects Short Circuit of Supply Voltage	Sensor supply voltage < 0.2 >... 5.3 V
P06B9	Cylinder 1 Glow Plug Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Glow plug resistance (between 4 - 9 Sec.) &lt; 0.3 ohm</li> <li>• Glow plug resistance (between 9 - 14 Sec.) &lt; 0.4 ohm</li> <li>• Glow plug resistance (after 14 Sec.) &lt; 0.5 ohm</li> <li>• Glow plug resistance anytime &gt; 1.2 ohm</li> </ul>
P06E5	Glow Plug Control Module Performance	Calculated ground offset $\geq 1.75$ V or $\leq -1.75$ V
P06FE	Cold Start Diesel Intake Air Flow Control Performance	Signal low
P0604	Internal Control Module Random Access Memory (RAM) Error	Read/write error bit set
P0605	Internal Control Module Read Only Memory (ROM) Error	Internal self test failed

DTC	Error Message	Malfunction Criteria and Threshold Value
P0606	Internal Control Module Memory Check Sum Error	<ul style="list-style-type: none"> <li>ECM internal self test failed</li> <li>RAM error in memory</li> </ul>
P0607	Control Module Performance	<ul style="list-style-type: none"> <li>Oxygen sensor adaptation &gt; 0.2 V or &lt; -0.2 V</li> <li>Internal communication failed</li> <li>Supply voltage for IC &lt; 9 V or</li> <li>Sensor voltage &lt; 0.265 V or &gt; 3.9 V</li> </ul>
P0634	ECM Internal Temperature Too High	<p>Current Over-Temperature diagnostic signal from output driver</p> <ul style="list-style-type: none"> <li>Power stage temperature &gt; 150° C</li> </ul>
P0638	Throttle Actuator Control Bank 1 Range/Performance	Diagnostic signal = low state
P064C	Glow Plug Control Module	Received incorrect number of cylinders or glow plug type is unequal to ECU application = error bit
P0641	Sensor Reference Voltage "A" Circuit Open	Voltage supply < 4.7 V or > 5.3 V
P0651	Sensor Reference Voltage "B" Circuit Open	Voltage supply < 4.7 V or > 5.3 V
P066A	Cylinder 1 Glow Plug Control Circuit Low	• Glow current ≥ 70 A
P066C	Cylinder 2 Glow Plug Control Circuit Low	• Glow current ≥ 70 A
P066E	Cylinder 3 Glow Plug Control Circuit Low	• Glow current ≥ 70 A
P067A	Cylinder 4 Glow Plug Control Circuit Low	• Glow current ≥ 70 A
P067B	Cylinder 4 Glow Plug Control Circuit High	Error message from Glow Control Unit
P067C	Cylinder 5 Glow Plug Control Circuit Low	• Glow current ≥ 70 A
P067D	Cylinder 5 Glow Plug Control Circuit High	Error message from Glow Control Unit
P067E	Cylinder 6 Glow Plug Control Circuit Low	• Glow current ≥ 70 A
P067F	Cylinder 6 Glow Plug Control Circuit High	Error message from Glow Control Unit

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0671	Cylinder 1 Glow Plug Circuit	Glow current $\leq$ 2.19 A
P0672	Cylinder 2 Glow Plug Circuit	Glow current $\leq$ 2.19 A
P0673	Cylinder 3 Glow Plug Circuit	Glow current $\leq$ 2.19 A
P0674	Cylinder 4 Glow Plug Circuit	Glow current $\leq$ 2.19 A
P0675	Cylinder 5 Glow Plug Circuit	Glow current $\leq$ 2.19 A
P0676	Cylinder 6 Glow Plug Circuit	Glow current $\leq$ 2.19 A
P0683	Glow Plug Control Module to PCM Communication Circuit	LIN message no feedback
P0697	Sensor Reference Voltage "C" Circuit Open	Voltage supply $<$ 4.7 V or $>$ 5.3 V
U0001	High Speed CAN Communication Bus	CAN message = no feedback
U0002	High Speed CAN Communication Bus Performance	Global time out receiving no message
U0028	Vehicle Communication Bus A	CAN message = no feedback
U0029	Vehicle Communication Bus A Performance	Global time out receiving no message
U010E	CAN Communication Error	No Reducing Agent Metering System Control Module -J880-messages received.
U0101	Lost Communication with TCM	No TCM messages received.
U0106	Lost Communication with Glow Plug Control Module	No message received
U0121	Lost Communication with Anti-Lock Brake System (ABS) Control Module	No CAN messages received from ABS module
U0140	CAN communication with Body Control Module	No CAN messages from BCM
U0146	Lost Communication with Gateway "A"	CAN messages from Gateway = no message.
U0155	Lost Communication With Instrument Panel Cluster (IPC) Control Module	No CAN messages received from Instrument cluster
U02A3	CAN Communication with PM Sensor	No CAN Message [-]
U0302	Software Incompatibility with Transmission Control Module	Auto trans messages received from ECM



DTC	Error Message	Malfunction Criteria and Threshold Value
U0307	Software Incompatibility With Glow Plug Control Module	Error bit = set
U0323	CAN: Instrument cluster Audi only	Ambient temperature value module not encoded for ambient temp sensor, 00h
U040F	Invalid Data Received From Reducing Agent Control Module	Error bit = set
U0402	Invalid Data Received From Transmission Control Module	Wrong TCM messages received
U0407	Invalid Data Received From Glow Plug Control Module	Implausible messages received
U0415	Invalid Data Received From Anti-Lock Brake System Control Module	<ul style="list-style-type: none"> <li>• Error bit = set</li> <li>• Implausible data from ABS or</li> <li>• Speed sensor signal = 655.35 km/h</li> </ul>
U0423	Invalid Data Received From Instrument Panel Cluster Control Module	Error message sent from instrument cluster = invalid data
U0447	Invalid Data Received From Gateway "A"	Implausible message from gateway
U04A4	NOx Sensor Communication Check / Signal Range Check	Communication error
U1006	NOx Sensor 1 (Front) No Communication	No messages from NOx sensor 1 module
U1024	Communications Bus Fault	Error bit set
U1034	NOx Sensor 1 (Front) Implausible signal	Data from NOx sensor 1 module implausible
U10C1	NOx Sensor 2 (Rear) Implausible Signal	Data from NOx sensor 2 module implausible
U10C2	NOx Sensor 2 (Rear) No Communication	No messages from NOx sensor 2 module
U140C	Reductant Control Module Supply Voltage Too Low	Supply voltage < 8.5 V
U140D	Reductant Control Module Supply Voltage Too High	Supply voltage > 16.5 V
U140E	Reductant Control Module Function Restriction Due to Insufficient Voltage	Supply voltage < 9 V

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
U140F	Reductant Control Module Function Restriction Due to Excessive Voltage	Supply voltage > 16 V

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

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P1103	ECM: Production Mode	Production mode = Active
P1419	Exhaust Gas Recirculation Cooler Switch-over Valve 2 Short circuit to Voltage	Diagnostic signal from power stage > 1.5 A
P146D	Reducing Agent Tank Heater Short Circuit to Voltage	Signal voltage > 3.27 V
P146F	Heater 2 for Reducing Agent Short Circuit to Voltage	Signal voltage > 4.70 V
P148F	Exhaust Gas Recirculation Cooler Switch-Over Valve 2 Electrical Malfunction	Diagnostic signal from power stage < 2.97 V
P1499	Exhaust Gas Recirculation Cooler Switch-Over Valve 2 Open Circuit/Short Circuit to Ground	Diagnostic signal from power stage > 4.5 V
P150A	Engine Off Time Performance	ECM time - IPC time > 12 Sec.
P21CA	Reducing Agent Metering System Control Module -J880- detects short circuit of heater supply voltage to B+	Sensor supply voltage < 1 V
P21CC	Reducing Agent Metering System Control Module -J880- detects short circuit of heater supply voltage to ground	Sensor supply voltage > 7 V
P21C7	Reducing Agent Metering System Control Module -J880- detects short circuit to ground on main relay	Supply voltage during activation > 7 V
P21C9	Reducing Agent Metering System Control Module -J880- detects short circuit to B+ on main relay	Supply voltage during activation < 1 V
P2100	Throttle Actuator Control Motor Circuit/Open	Signal from power stage > 3.26 V and < 5.40 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P2101	Throttle Actuator Control Motor Circuit Range/ Performance	Signal = no change
P2102	Throttle Actuator Control Motor Circuit Low	Signal from power stage $\leq 3.26$ V
P2122	Pedal Position Sensor D Circuit Low Input	Signal voltage $< 0.646$ V
P2123	Pedal Position Sensor D Circuit High Input	Signal voltage $> 4.889$ V
P2127	Pedal Position Sensor E Circuit Low Input	Signal voltage $< 0.276$ V
P2128	Pedal Position Sensor E Circuit High Input	Signal voltage $> 2.644$ V
P2138	Pedal Position Sensor D/E Circuit Voltage Correlation	Signal voltage sensor 1 vs. sensor 2 $> 143 - 260$ mV
P214E	Reducing Agent Metering System Control Module -J880- Internal Temperature Too High	Current Over-Temperature diagnostic signal from output driver • Power stage temperature $> 140^{\circ}$ C
P214F	Reducing Agent Metering System Control Module -J880- Internal Pump Temperature Too High	Current Over-Temperature diagnostic signal from output driver • Power stage temperature $> 140^{\circ}$ C
P2146	Fuel Injector Group "A" Supply Voltage Circuit Open	Diagnostic signal from power stage = internal signal
P2149/ P2152	Fuel Injector Group "C" Supply Voltage Circuit/Open	Diagnostic signal from power stage = internal signal
P2181	Engine Coolant Temperature Sensor On Radiator Outlet Circuit Rationality Check	Deviation between target and measured ECT value $< -7.5$ K
P2183	Engine Coolant Temperature Sensor On Radiator Outlet Circuit Cross Check	ECT on radiator outlet vs IAT or AAT or FTS at start up $> 35$ K
P2184	Engine Coolant Temperature Sensor 2 Circuit Low	Signal voltage $< 162$ mV
P2185	Engine Coolant Temperature Sensor 2 Circuit High	Signal voltage $> 3255$ mV

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P2195	O2 Sensor Signal Stuck Lean Bank 1 Sensor 1	<ul style="list-style-type: none"> <li>• Measured oxygen concentration @ fuel cutoff &gt; 25.6%</li> <li>or</li> <li>• Measured oxygen concentration @ part load &gt; (calculated) 11%</li> </ul>
P2196	O2 Sensor Signal Stuck Rich Bank 1 Sensor 1	Measured oxygen concentration @ fuel cutoff > 14.7%
P220A	NOx Sensor Front Circuit Supply Voltage	Sensor supply voltage > 1.5 or < 12 V
P220B	NOx Sensor Rear Supply Voltage Circuit	Sensor supply voltage > 1.5
P2200	NOx Sensor Front Circuit Failure	NOx sensor signal ratio of validity > = 0.50 [-]
P2201	NOx Sensor Front Circuit Range / Performance	<ul style="list-style-type: none"> <li>• NOx 40 - 70%, time &gt; 5 Sec. or 40% value not reached within 7 Sec.</li> <li>• Ratio &gt; 3 or &lt; -0.75</li> <li>• Average NOx offset value &gt; 50 or &lt; -30 ppm</li> </ul>
P2202	NOx Sensor Front Circuit Low	NOx value < -105 ppm
P2203	NOx Sensor Front Circuit High	NOx value > 1655 ppm
P2209	NOx Sensor Front Rationality Check	NOx control active time since dew point exceeded > 180
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; 3 V</li> <li>• Oxygen signal &lt; -1.3 V or &gt; 1.5 V</li> </ul>
P2251	O2 Sensor Negative Current Control Circuit Bank 1 Sensor 1 open	O2S internal resistance voltage > 3 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P226C	Turbocharger Boost Control "A" Slow Response	Boost difference between target and measured < -6976[J]
P2279	Turbocharger Boost Pressure Intake Air System Leak	Ratio of measured and modeled air mass flow 0.45 - 0.80
P229E	NOx Sensor Rear Circuit Short or Open	<ul style="list-style-type: none"> <li>• Message From NOx Sensor = Failure</li> <li>or</li> <li>• NOx sensor status ratio of validity <math>\geq 0.5[-]</math></li> </ul>
P229F	NOx Sensor Rear Circuit Range /Performance	<ul style="list-style-type: none"> <li>• Average NOx offset value &gt; 50 ppm</li> <li>• Number of checks = 2[-]</li> <li>or</li> <li>• Average NOx offset value &lt; - 30 ppm</li> <li>• Number of checks = 2[-]</li> <li>or</li> <li>• Measured oxygen concentration compared with calculated oxygen concentration deviation @ part load &gt; 5.3%</li> </ul>
P2294	Fuel Pressure Metering Valve Control Circuit Open	Signal voltage < 4.7 V
P2295	Fuel Pressure Metering Valve Control Circuit Grounded	Signal voltage < 2.97 V
P2296	Fuel Pressure Metering Valve Control Circuit Short to Battery Voltage	Signal current > 3.0 A
P22A0	NOx Sensor Rear Circuit Low	NOx value < -105 ppm
P22A1	NOx Sensor Rear Circuit High	NOx value > 1655 ppm
P22A7	NOx Sensor rear Rationality check	NOx control active time since dew point exceeded >180 s

## Additional Emissions Regulations

DTC	Error Message	Malfunction Criteria and Threshold Value
P240F	EGR Slow Response	<ul style="list-style-type: none"> <li>• Calculated characteristically value: Negative gradients of target air mass flow &gt; 35 [-]</li> <li>or</li> <li>• Calculated characteristically value: Positive gradients of Target air mass flow &gt; = 30 [-]</li> </ul>
P242A	Exhaust Gas Temperature Sensor Circuit Bank 1 Sensor 3	Signal voltage > 2.61 V
P242B	Exhaust Gas Temperature Sensor Circuit Bank 1 Sensor 3 Range/Performance	<ul style="list-style-type: none"> <li>• Temperature difference to EGR temp, T3, T4, T5, T6 &gt; 40° K</li> <li>or</li> <li>• Mean value of modeled - measured T5 &gt; 100° K</li> </ul>
P242C	Exhaust Gas Temperature Sensor Circuit Low Bank 1 Sensor 3	Signal voltage < 0.68 V
P2425	Exhaust Gas Recirculation Cooling Valve Control Circuit Open	Diagnostic signal from power stage < 4.7 V
P2426	Exhaust Gas Recirculation Cooling Valve Control Circuit Grounded	Diagnostic signal from power stage < 2.97 V
P2427	Exhaust Gas Recirculation Cooling Valve Control Circuit Shorted Battery Voltage	Diagnostic signal from power stage > 2.2 A
P244C	Exhaust Temperature Too Low For Particulate Filter Regeneration Bank 1	Time to closed loop 120 - 300 Sec.
P245B	Exhaust Gas Recirculation Cooler Bypass Control Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Positive difference between measured and target temperature too high = 10.0 - 70.0 [K]</li> <li>or</li> <li>• Negative difference between measured and target temperature too low = -12.0 -7.0 [K]</li> </ul>

DTC	Error Message	Malfunction Criteria and Threshold Value
P2452	Diesel Particulate Filter Differential Pressure Sensor Circuit	Sensor voltage > 4.9 V
P2453	Diesel Particulate Filter Differential Pressure Sensor Circuit Range/Performance	Pressure drop > 3 kPa or < -3 kPa
P2454	Diesel Particulate Filter Differential Pressure Sensor Circuit Low	Sensor voltage < 0.2 V
P2458	Diesel Particulate Filter Regeneration Duration	Time of regen duration > 3600 Sec.
P2459	Diesel Particulate Filter Regeneration Frequency	Measured soot mass > f (volumetric flow rate) grams
P246E	Exhaust Gas Temperature Sensor Circuit Bank 1 Sensor 4	Signal voltage > 1652 mV
P246F	Exhaust Gas Temperature Sensor Circuit Bank 1 Sensor 4 Range/Performance	<ul style="list-style-type: none"> <li>• Temperature difference to EGR temp, T3, T4, T5, T6 &gt; 40° K</li> <li>or</li> <li>• Mean value of modeled - measured T5 &gt; 100° 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 (T5) > 200 K or < -100 K
P2470	Exhaust Gas Temperature Sensor Circuit Low Bank 1 Sensor 4	Signal voltage < 330 mV
P24AE	PM Sensor Functional check / Shorted or Open	<ul style="list-style-type: none"> <li>• Current (IDE) @ measurement 1 &lt; 2 <math>\mu</math>A</li> <li>• Difference between current (IDE) measurement 1 and 2</li> <li>or</li> <li>• Signal voltage positive connection (IDE) &gt; 4.7 [V]</li> <li>• Signal voltage positive connection (IDE) &lt; 0.3 [V]</li> </ul>
P24AF	PM Sensor Monitoring, Rationality Check	<ul style="list-style-type: none"> <li>• Signal current (IDE) &gt; 5 <math>\mu</math>A</li> <li>or</li> <li>• Accumulated change in heater voltage <math>\leq</math> 0.40 V</li> </ul>

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P24B1	PM Sensor Circuit Shorted or Open	<ul style="list-style-type: none"> <li>• Signal voltage negative connection (IDE) &gt; 4.1 [V]</li> <li>• Signal voltage negative connection (IDE) = 0.0 [V]</li> </ul>
P24B3	PM Sensor Heater functional check	<ul style="list-style-type: none"> <li>• Heater Coil resistance &gt; 1.06 - 2.31 Ω</li> <li>• Heater Coil resistance &lt; 2.94 - 5.13 Ω</li> </ul>
P24B5	PM Sensor Heater Short to ground	<ul style="list-style-type: none"> <li>• Heating Current &lt; 1.0 A</li> <li>or</li> <li>• Heating Current &gt; 15.0 A</li> </ul>
P24B6	PM Sensor Heater Short to Battery Voltage	Heating Current ≥ 0.2 A
P24C7	PM Sensor Plausibility Check	Measured sensor temperature - mean value of modelled temperature < - 100 °K
P24D0	PM Sensor Monitoring, Range / Performance Check	<p>Signal range check low: Difference between measured PM Sensor supply wire voltage and battery voltage (ECM):</p> <ul style="list-style-type: none"> <li>• Value &gt; 1.90 [V]</li> <li>or</li> <li>• Value &gt; 2.60 [V]</li> <li>or</li> <li>• Value &gt; 3.00 [V]</li> </ul> <p>Signal Range Check High: difference between measured battery voltage (ECM) and Sensor supply wire voltage:</p> <ul style="list-style-type: none"> <li>• Value &gt; 3.00 [V]</li> <li>or</li> <li>• Value &gt; 2.10 [V]</li> <li>or</li> <li>• Value &gt; 1.10 [V]</li> </ul>
P2564	Turbocharger Boost Control Position Sensor Circuit Low	Sensor signal voltage < 0.15 V
P2565	Turbocharger Boost Control Position Sensor Circuit High	Position sensor signal ≥ 4.85 V
P261A	Coolant Pump "B" Control Circuit/Open	<ul style="list-style-type: none"> <li>• Open circuit Signal voltage &lt; 5 V</li> <li>• Functional voltage = 3.2 - 3.5 V</li> </ul>
P261C	Coolant Pump "B" Control Circuit Low	Signal voltage < 3 V



DTC	Error Message	Malfunction Criteria and Threshold Value
P261D	Coolant Pump "B" Control Circuit High	Signal voltage > 1.8 V
P268A	Fuel Injector Calibration Not Accumulated / Programmed	Accumulated global release time of zero fuel calibration but disabled by rail pressure deviation
P310E	Exhaust gas recirculation cooler bypass valve 2 Implausible signal	Measured temperature < 0.8
P3348	Turbocharger Control Module Circuit Malfunction	<ul style="list-style-type: none"> <li>• Diagnostic signal from power stage &gt; 8 - 18 A</li> <li>or</li> <li>• Diagnostic signal from power stage &gt; 5 V or &lt; 3.4 V</li> </ul>

**DTC Chart**

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