2014

A7

Quick Reference Specification Book

Audi
Truth in Engineering

2014 Audi A7
Quick Reference Specification Book
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TRANSMISSIONS

CHASSIS

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: kg·cm x 0.868 = lb·in • kg·cm x 9.81 = N·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.

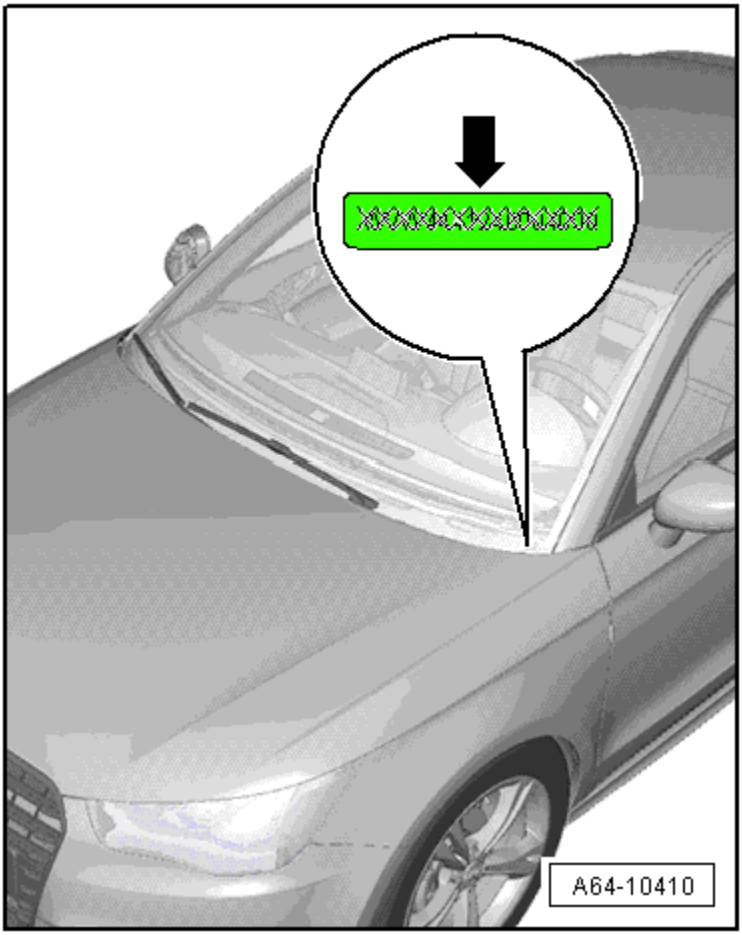
(CAUTIONS cont'd on next page)

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.

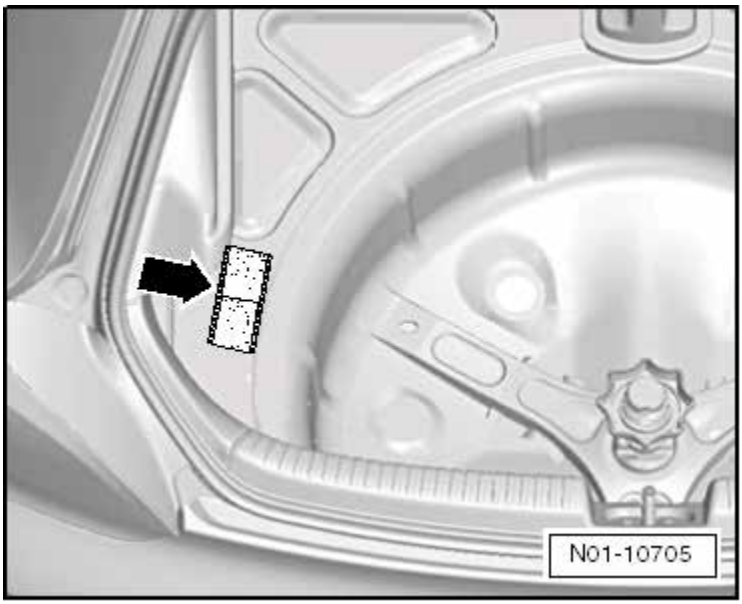
VEHICLE IDENTIFICATION

Vehicle Identification Number (VIN) Location



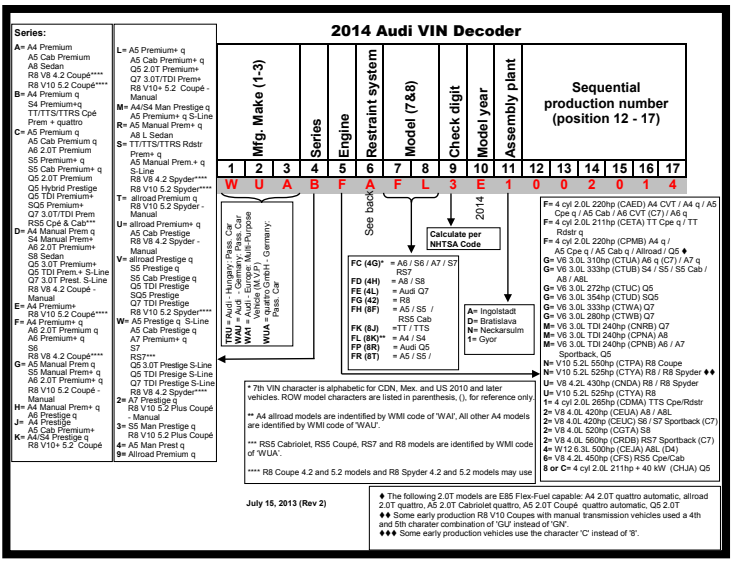
The VIN (➡) is on the left side of the vehicle in the area of the windshield wiper mount. It is visible from the outside.

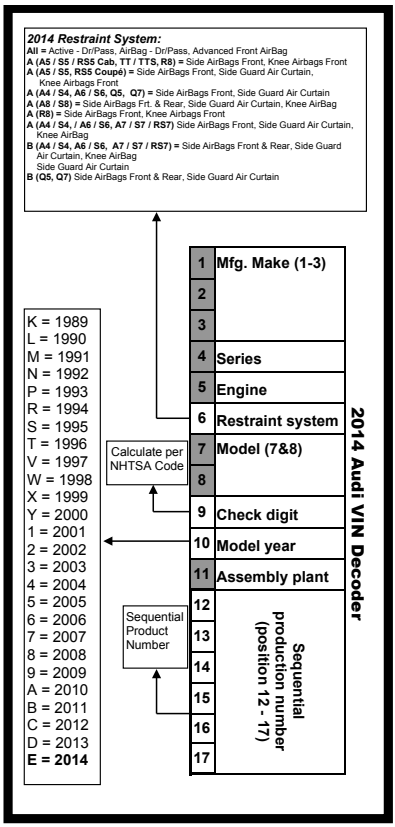
Vehicle Data Label



The vehicle data label (➡) is located in the left rear of the vehicle in the spare wheel well. The vehicle data label can also be found in the customer's service schedule.

VIN Decoder


2014 Audi VIN Decoder
Series:
A= A4 Premium
A5 Cab Premium
A8 Sedan
R8 V8 4.2 Coupé****
R8 V10 5.2 Coupé****
B= A4 Premium q
S4 Premium+q
TT/TTS/TTRS Cpé
Prem + quattro
C= A5 Premium q
A5 Cab Premium q
A6 2.0T Premium
S5 Premium+ q
S5 Cab Premium+ q
Q5 2.0T Premium
Q5 Hybrid Prestige
Q5 TDI Premium+
SQ5 Premium+
Q7 3.0T/TDI Prem
RS6 Cpé & Cab***
D= A4 Manual Prem q
S4 Manual Prem+
A6 2.0T Premium+
S8 Sedan
Q5 3.0T Premium+
Q5 TDI Prem.+ S-Line
Q7 3.0T Prest. S-Line
R8 V8 4.2 Coupé -
Manual
E= A4 Premium+
R8 V10 5.2 Coupé****
F= A4 Premium+ q
A6 2.0T Premium q
A6 Premium+ q
S6
R8 V8 4.2 Coupé****
G= A5 Manual Prem q
S5 Manual Prem+ q
A6 2.0T Premium+ q
R8 V10 5.2 Coupé -
Manual
H= A4 Manual Prem+ q
A6 Prestige q
J= A4 Prestige
A5 Cab Premium+
K= A4/S4 Prestige q
R8 V10+ 5.2 Coupé
L= A5 Premium+ q
A5 Cab Premium+ q
Q5 2.0T Premium+
Q7 3.0T/TDI Prem+
R8 V10+ 5.2 Coupé -
Manual
M= A4/S4 Man Prestige q
A5 Premium+ q S-Line
R= A5 Manual Prem+ q
A8 L Sedan
S= TT/TTS/TTRS Rdstr
Prem+ q
A5 Manual Prem.+ q
S-Line
R8 V8 4.2 Spyder****
R8 V10 5.2 Spyder****
T= allroad Premium q
R8 V10 5.2 Spyder -
Manual
U= allroad Premium+ q
A5 Cab Prestige
R8 V8 4.2 Spyder -
Manual
V= allroad Prestige q
S5 Prestige q
S5 Cab Prestige q
Q5 TDI Prestige
SQ5 Prestige
Q7 TDI Prestige
R8 V10 5.2 Spyder****
W= A5 Prestige q S-Line
A5 Cab Prestige q
A7 Premium+ q
S7
RS7***
Q5 3.0T Prestige S-Line
Q5 TDI Prestige S-Line
Q7 TDI Prestige S-Line
R8 V8 4.2 Spyder****
2= A7 Prestige q
R8 V10 5.2 Plus Coupé
- Manual
3= S5 Man Prestige q
R8 V10 5.2 Plus Coupé
4= A5 Man Prest q
9= Allroad Premium q
Mfg. Make (1-3)
Series
Engine
Restraint system
Model (7&8)
Check digit
Model year
Assembly plant
Sequential production number (position 12 - 17)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
W U A B F A F L 3 E 1 0 0 2 0 1 4
See back
2014
TRU = Audi - Hungary: Pass. Car
WAU = Audi - Germany: Pass. Car
WAI = Audi - Europe: Multi-Purpose Vehicle (MPV)
WUA = quattro GmbH - Germany: Pass. Car
Calculate per NHTSA Code
FC (4G)* = A6 / S6 / A7 / S7 RS7
FD (4H) = A8 / S8
FE (4L) = Audi Q7
FG (42) = R8
FH (8F) = A5 / S5 / RS5 Cab
FK (8J) =TT / TTS
FL (8K)** = A4 / S4
FP (8R) = Audi Q5
FR (8T) = A5 / S5 /
A= Ingolstadt
D= Bratislava
N= Neckarsulm
1= Gyor
F= 4 cyl 2.0L 220hp (CAED) A4 CVT / A4 q / A5 Cpe q / A5 Cab / A6 CVT (C7) / A6 q
F= 4 cyl 2.0L 211hp (CETA) TT Cpe q / TT Rdstr q
F= 4 cyl 2.0L 220hp (CPMB) A4 q / A5 Cpe q / A5 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 (CTWA) Q7
G= V6 3.0L 280hp (CTWB) Q7
M= V6 3.0L TDI 240hp (CNRB) Q7
M= V6 3.0L TDI 240hp (CPNA) A8
M= V6 3.0L TDI 240hp (CPNB) A6 / A7 Sportback, Q5
N= V10 5.2L 550hp (CTPA) R8 Coupe
N= V10 5.2L 525hp (CTYA) R8 / R8 Spyder ♦♦
U= V8 4.2L 430hp (CNDA) R8 / R8 Spyder
U= V10 5.2L 525hp (CTYA) R8
1= 4 cyl 2.0L 265hp (CDMA) TTS Cpe/Rdstr
2= V8 4.0L 420hp (CEUA) A8 / A8L
2= V8 4.0L 420hp (CEUC) S8 / S7 Sportback (C7)
2= V8 4.0L 520hp (CGTA) S8
2= V8 4.0L 560hp (CRDB) RS7 Sportback (C7)
4= W12 6.3L 500hp (CEJA) A8L (D4)
6= V8 4.2L 450hp (CFS) RS5 Cpe/Cab
8 or C= 4 cyl 2.0L 211hp + 40 kW (CHJA) Q5
* 7th VIN character is alphabetic for CDN, Mex. and US 2010 and later vehicles. ROW model characters are listed in parenthesis, (), for reference only.
** A4 allroad models are indentified by WMI code of 'WAI', All other A4 models are identified by WMI code of 'WAU'.
*** RS5 Cabriolet, RS5 Coupé, RS7 and R8 models are identified by WMI code of 'WUA'.
**** R8 Coupe 4.2 and 5.2 models and R8 Spyder 4.2 and 5.2 models may use
July 15, 2013 (Rev 2)
♦ The following 2.0T models are E85 Flex-Fuel capable: A4 2.0T quattro automatic, allroad 2.0T quattro, A5 2.0T Cabriolet quattro, A5 2.0T Coupé quattro automatic, Q5 2.0T
♦♦ Some early production R8 V10 Coupes with manual transmission vehicles used a 4th and 5th character combination of 'GU' instead of 'GN'.
♦♦♦ Some early production vehicles use the character 'C' instead of '8'.


2014 Restraint System:
All = Active - Dr/Pass, AirBag - Dr/Pass, Advanced Front AirBag
A (A5 / S5 / RS5 Cab, TT / TTS, R8) = Side AirBags Front, Knee Airbags Front
A (A5 / S5, RS5 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 / RS7) Side AirBags Front, Side Guard Air Curtain, Knee AirBag
B (A4 / S4, A6 / S6, A7 / S7 / RS7) = Side AirBags Front & Rear, Side Guard Air Curtain, Knee AirBag
Side Guard Air Curtain
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
Calculate per NHTSA Code
Sequential Product Number
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
13
14
15
16
17
Sequential production number (position 12 - 17)
2014 Audi VIN Decoder

SALES CODES

Engine Codes

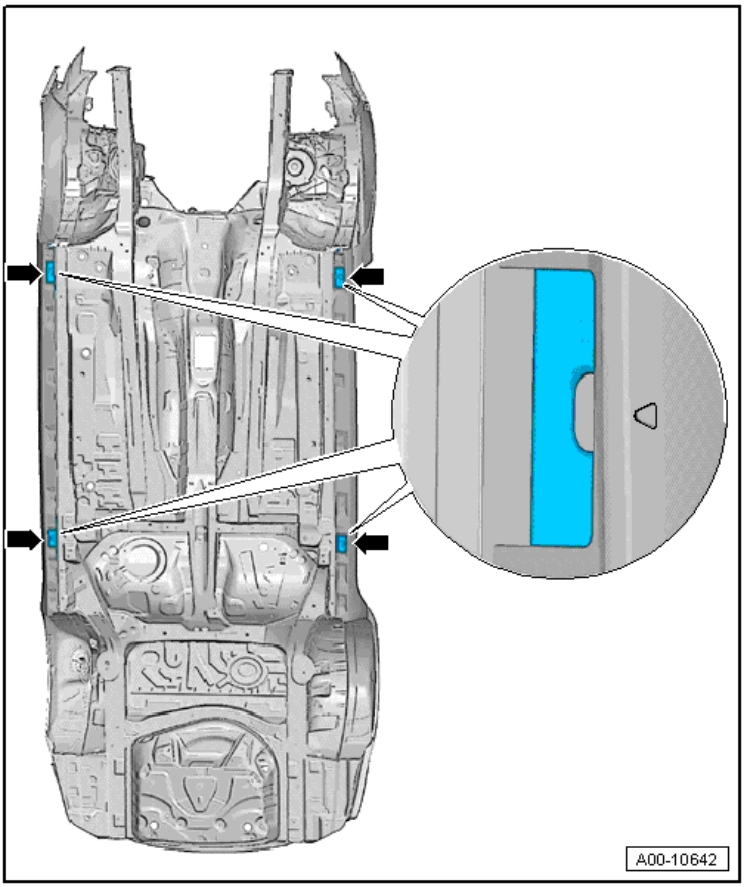
CTUA	3.0L 6-cylinder (TFSI)
CPNB	3.0L 6-cylinder (TDI)
CRDB	4.0L 8-cylinder (FSI BIT)
CEUC	4.0L 8-cylinder (FSI BIT)

Transmission Codes

0B5	7-speed S tronic transmission
0BK	8-speed automatic transmission

VEHICLE LIFTING

Hoist and Floor Jack Lifting Points

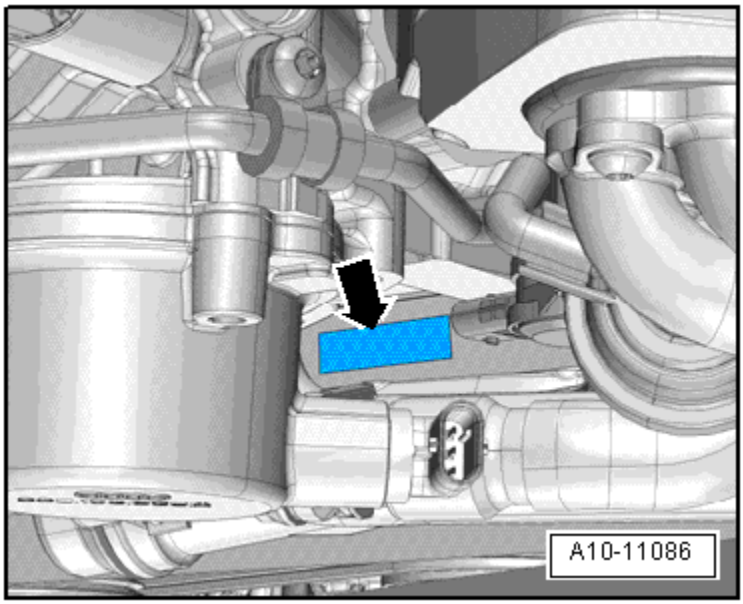


Position the hoist or floor jack on the plastic mounts (➡) found on the underbody.

ENGINE MECHANICAL – 3.0L CTUA

General, Technical Data

Engine Number Location



The engine number (engine code and serial number) is located on the top front of the cylinder block, below the right cylinder head (➡). Engine codes beginning with C are four-digit. The first 3 digits of the engine code indicate the displacement and the mechanical structure of the engine. The fourth digit describes the engine output and torque.

Engine Data

Code letters		**CTUA**
Displacement	liter	2.995
Output	kW at RPM	228 @ 5500 to 6500
Torque	Nm at RPM	440 @ 2900 to 4500
Bore	diameter mm	84.5
Stroke	mm	89.0
Compression ratio		10.5
RON	at least	95 [1)]
Fuel injection and ignition system		Simos
Ignition sequence		1-4-3-6-2-5
Exhaust Gas Recirculation (EGR)		No
Turbocharger, Supercharger		Supercharger
Knock control		2 sensors
Charge air cooler		Yes
Oxygen Sensor (O2S) regulation		2 sensors before catalytic converter 2 sensors after catalytic converter
Variable valve timing		Intake
Variable intake manifold		No
Secondary Air Injection (AIR) system		Yes
Valve per cylinder		4

[1)] Unleaded RON 91 is also permitted but performance is reduced.

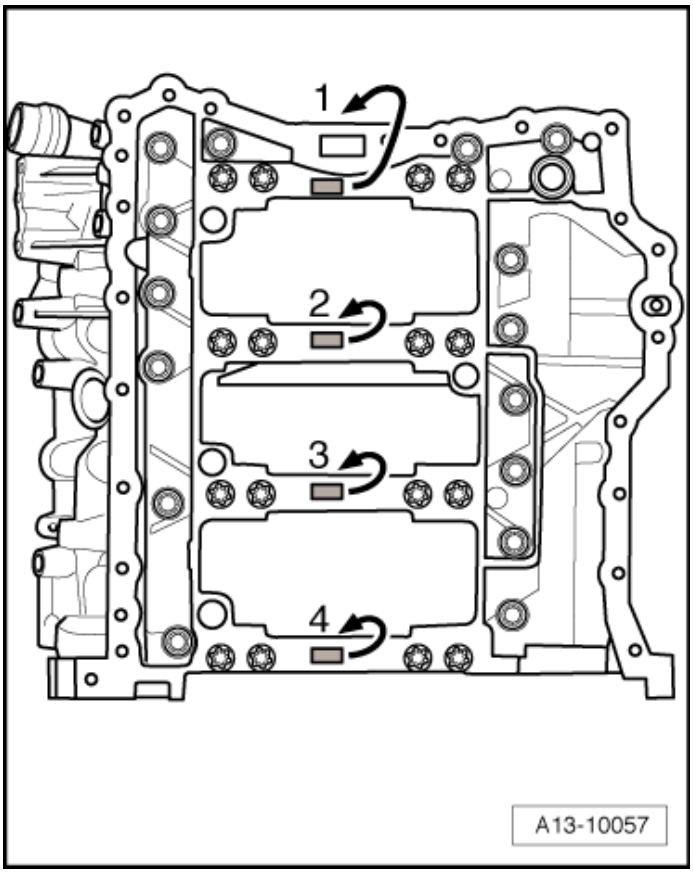
Engine Assembly – 3.0L CTUA

Fastener Tightening Specifications

Component	Fastener size	Nm
Bolts and nuts	M6	9
	M7	15
	M8	20
	M10	40
	M12	65
Engine mount [1)]	-	90 plus an additional 90° (¼ turn)
Engine mount plate	-	20
Engine support [2)]	-	20
	-	40
Heat shield	-	10
Engine mount plate	-	20
Subframe	-	55

1) Replace fastener(s).
2) For bolt tightening clarification, refer to ElsaWeb, *Subframe Mount Overview*, items 4 and 5.

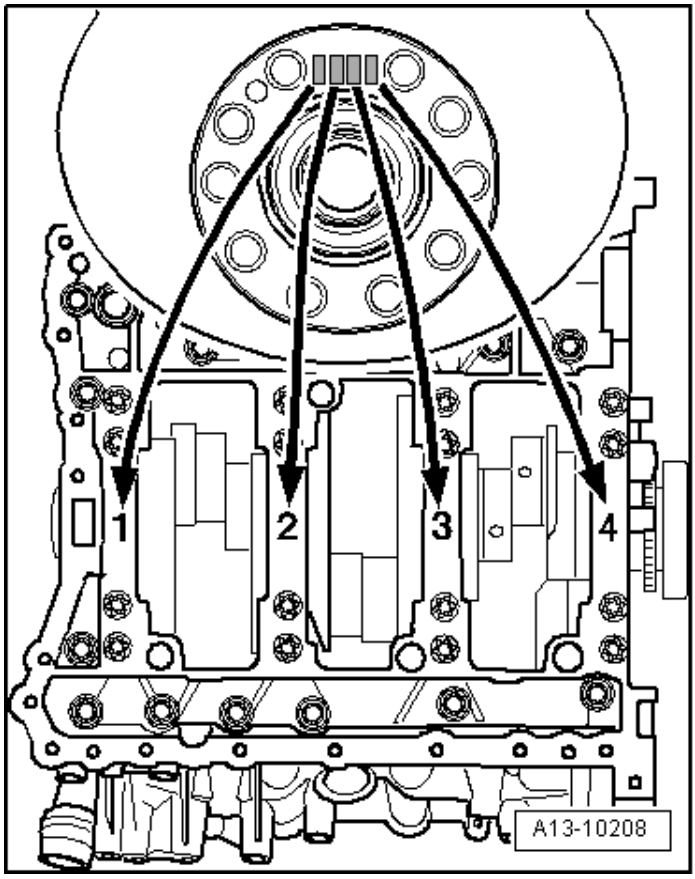
Allocation of Crankshaft Bearing Shells for Cylinder Block



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. Allocation of the bearing shells to the cylinder block is marked by a letter on the respective bearing on the guide frame.

Letter on guide frame	Color of bearing
R	Red
G	Yellow
B	Blue
S	Black

Allocation of Crankshaft Bearing Shells for Guide Frame



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

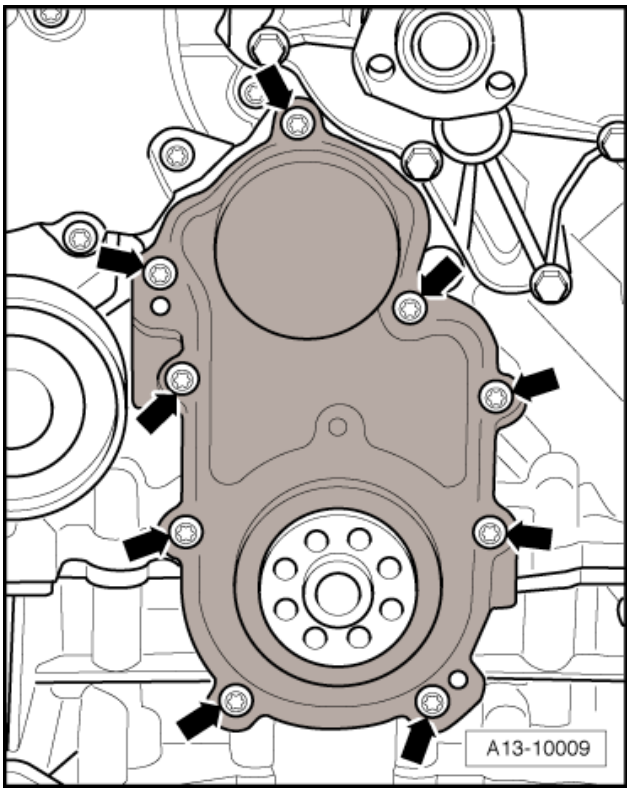
Letter on guide frame	Color of bearing
R	Red
G	Yellow
B	Blue
S	Black

Fastener Tightening Specifications

Component	Nm
Connecting rod [1) 5)]	50 plus an additional 90° (¼ turn)
Drive plate [1)]	60 plus an additional 90° (¼ turn)
Locking bolt	9
Oil pressure regulation valve	9
Piston cooling oil spray jet [4)]	9
Ribbed belt idler roller [3)]	42
Ribbed belt idler roller [2)]	40
Ribbed belt tensioning damper	40
Vibration damper [1)]	20 plus an additional 90° (¼ turn)

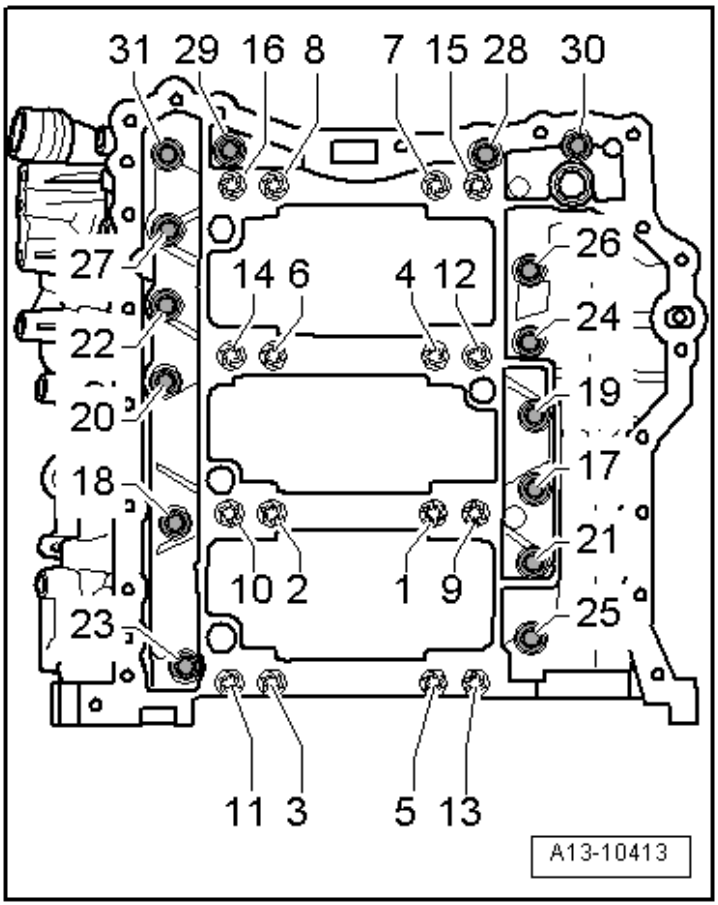
1) Replace fastener(s).
2) For bolt tightening clarification, refer to ElsaWeb, *Ribbed Belt Drive Overview*, item 4.
3) For bolt tightening clarification, refer to ElsaWeb, *Supercharger Ribbed Belt Drive Overview*, item 6.
4) Insert the bolt with locking compound
5) Lubricate the thread and contact surface.

Ribbed Belt Sealing Flange Tightening Specification



Component	Nm
Tighten bolts (➡) in a diagonal sequence	9

Guide Frame Tightening Specifications



Step	Component	Nm
1	Replace and tighten bolts 1 through 16 in sequence	50
2	Tighten bolts 1 through 16 in sequence	an additional 90° (¼ turn)
3	Replace and tighten bolts 17 through 31 in sequence (for guide frame sealing surfaces on cylinder block)	23

Crankshaft Dimensions

Honing dimension in mm	Crankshaft bearing pin diameter		Crankshaft connecting rod journal diameter	
Basic dimension	65.000	-0.022 -0.042	56.000	-0.022 -0.042

Piston Ring End Gaps

Piston ring dimensions in mm	New	Wear limit
1st compression ring	0.20 to 0.30	0.80
2nd compression ring	0.50 to 0.70	0.80
Oil scraping ring	0.25 to 0.50	– [1]

[1] Data not available. Refer to ElsaWeb for the current oil scraping ring wear limit.

Piston Ring Clearance

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

Piston and Cylinder Dimensions

Honing dimension in mm	Piston diameter	Cylinder bore diameter
Basic dimension	84.49 [1]	84.51 [2]

[1] Dimension without graphite coating (thickness 0.02 mm). The graphite coating wears away.

[2] Measure 50 mm inside the cylinder bore.

Cylinder Head, Valvetrain – 3.0L CTUA

Fastener Tightening Specifications

Component	Nm
Balance shaft transmission side to balance shaft	60
Balance shaft belt pulley side to Balance shaft	60
Balance shaft chain sprocket [1)]	15 plus an additional 90° (¼ turn)
Bearing plate for drive sprocket	8 plus an additional 45° (⅛ turn)
Bearing plate for right camshaft timing chain drive sprocket [1)]	8 plus an additional 45° (⅛ turn)
Camshaft adjuster for intake camshaft [1)]	80 plus an additional 90° (¼ turn)
Camshaft adjustment solenoid valve	5
Camshaft chain sprocket for exhaust camshaft [1)]	80 plus an additional 90° (¼ turn)
Chain tensioner with glide track [1)]	10 plus an additional 45° (⅛ turn)
Chain tensioner for left camshaft control chain	9
Chain tensioner for right camshaft timing chain	9
Drive sprocket for oil pump [1)]	30 plus an additional 90° (¼ turn)
Drive sprocket for right timing chain [1)]	30 plus an additional 90° (¼ turn)
Drive train chain tensioner for timing mechanism	9
Gear carrier to balance shaft	13
Glide track, bolt [1)]	10 plus an additional 90° (¼ turn)
Guide rail bolt [1)]	10 plus an additional 90° (¼ turn)
Mounting pin for drive sprocket bolt [2)]	30 plus an additional 90° (¼ turn)

Fastener Tightening Specifications *(cont'd)*

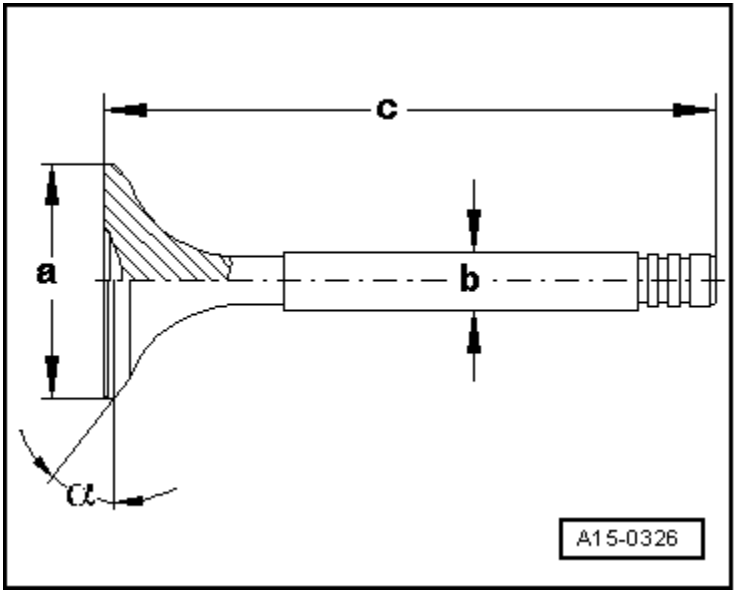
Component	Nm
Mounting pin for drive sprocket bolt [3]	5 plus an additional 60° turn
Oil dipstick guide tube	9

[1] Replace fastener(s).
[2] For bolt tightening clarification, refer to ElsaWeb, *Timing Mechanism Drive Chain Overview*, and see item 15.
[3] For bolt tightening clarification, refer to ElsaWeb, *Timing Mechanism Drive Chain Overview*, and see item 3.

Compression Checking Specifications

Compression pressure	Bar pressure
New	11.0 to 14.0
Wear limit	10.0
Maximum difference between cylinders	30

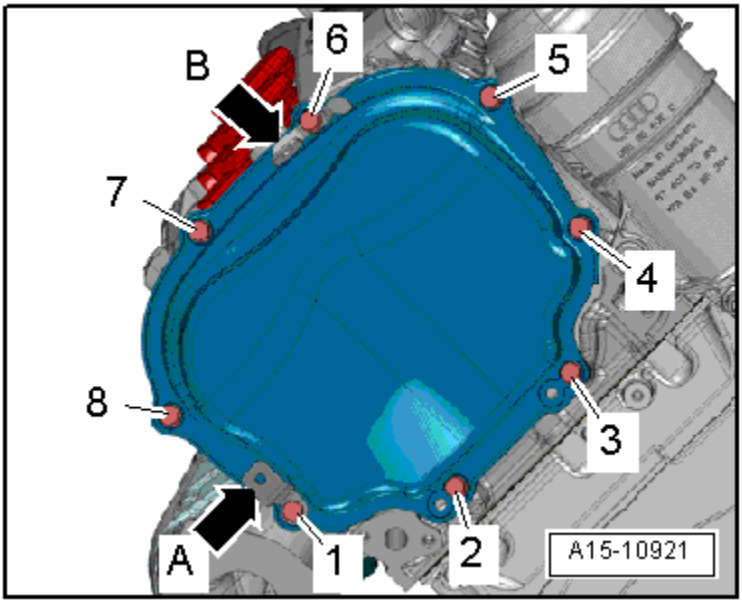
Valve Dimensions



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	104.0 ± 0.2	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 Specifications

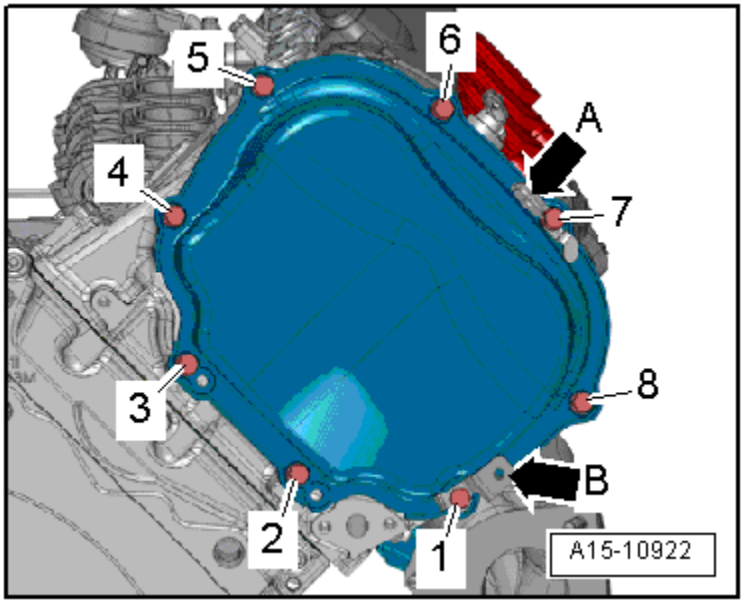


Step	Component	Nm
1	Tighten bolts 1 through 8 in sequence	5
2	Tighten bolts 1 through 8 in sequence	an additional 90° (¼ turn)

[1)]Replace fastener(s).

NOTE: Brackets A and B are connected with the timing chain cover.

Right Timing Chain Cover Tightening Specifications

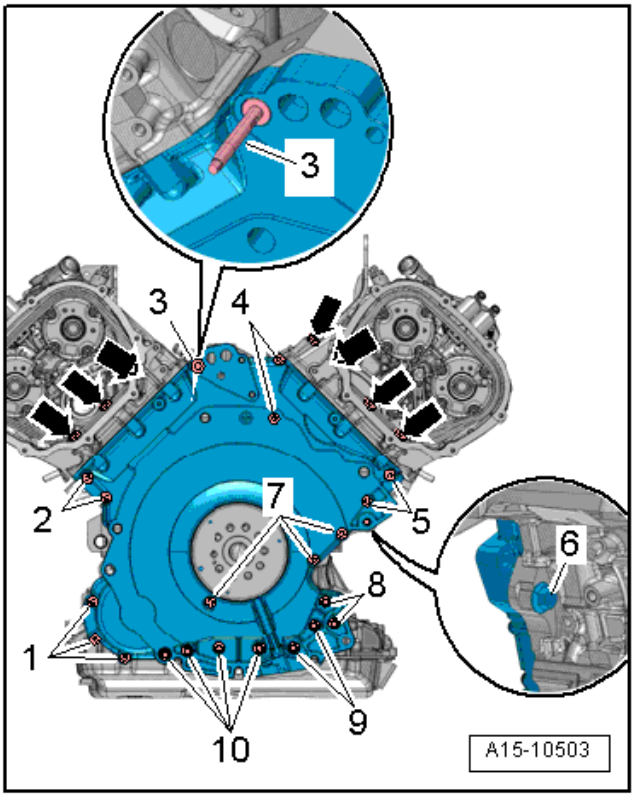


Step	Component	Nm
1	Replace and tighten bolts 1 through 8 in sequence	5
2	Tighten bolts 1 through 8 in sequence	an additional 90° (¼ turn)

[1)]Replace fastener(s).

NOTE: Brackets A and B are connected with the timing chain cover.

Lower Timing Chain Cover Tightening Specifications

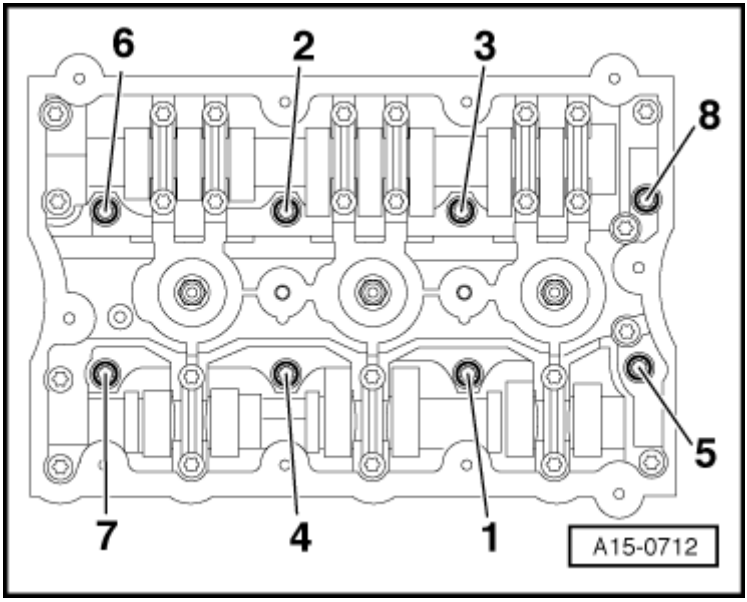


Replace all fasteners except bolt 3.

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

[1] Replace fastener(s) except bolt 3.

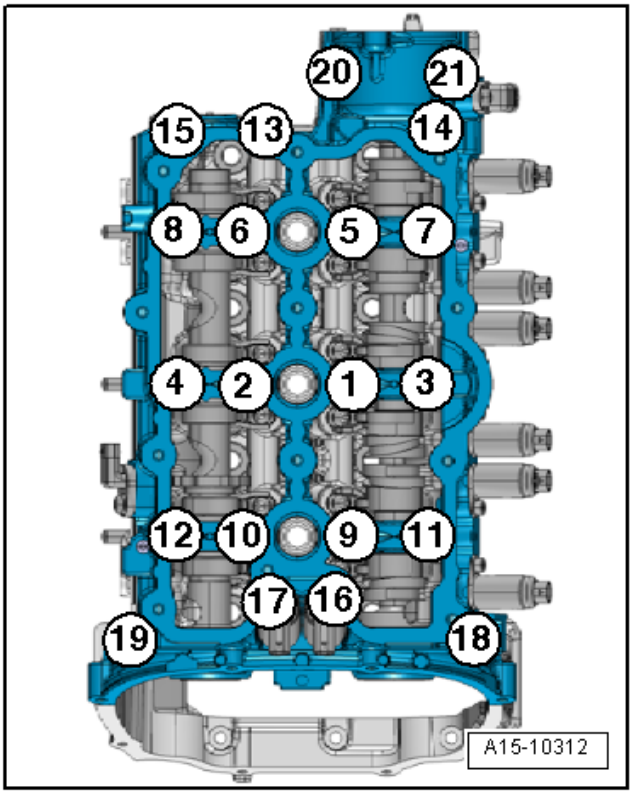
Cylinder Head Tightening Specifications



NOTE: The left cylinder head is shown. The right cylinder head is identical.

Step	Component	Nm
1	Replace and 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

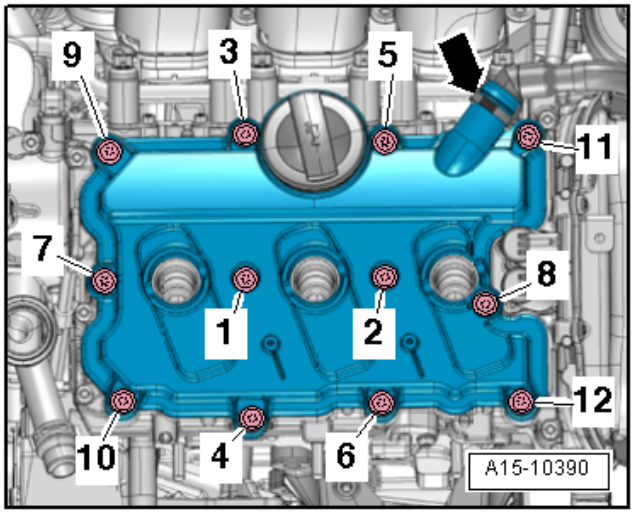


NOTE: The left cylinder head camshaft guide frame is shown.
The right cylinder head camshaft guide frame is identical.

Step	Component	Nm
1	Replace and tighten bolts 1 through 21 in sequence [1) 2)]	Hand-tighten [1)]
2	Tighten bolts 1 through 21 in sequence	8
3	Tighten bolts 1 through 21 in sequence	an additional 90° (¼ turn)

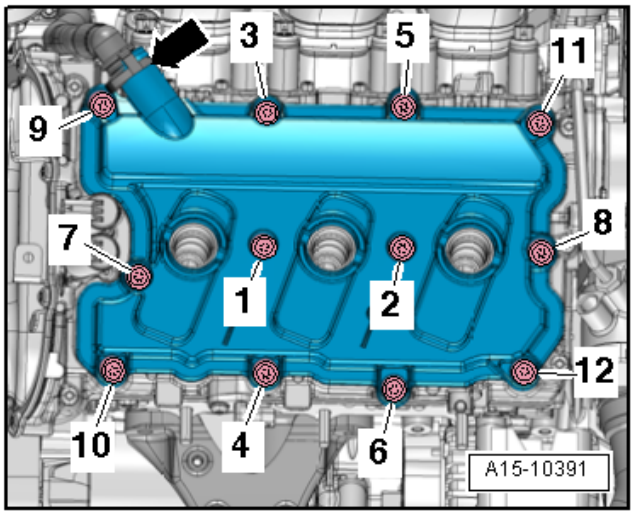
1) Replace fastener(s)
2) The guide frame must be in contact with the entire contact surface of the cylinder head.

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

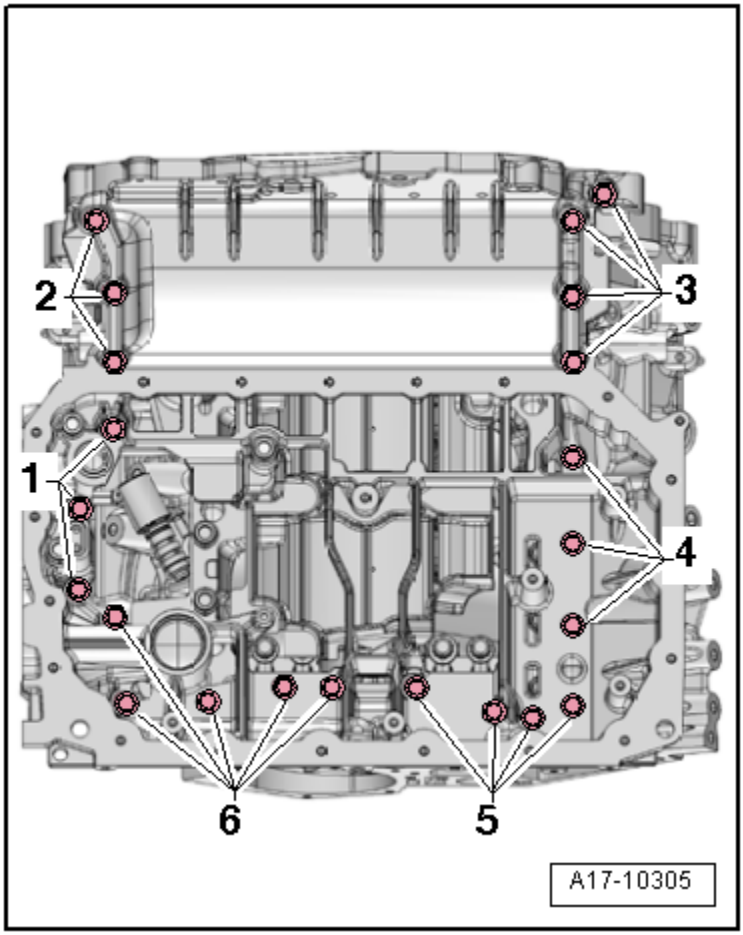
Engine Lubrication – 3.0L CTUA

Fastener Tightening Specifications

Component	Nm
Chain sprocket bracket bolt	9
Chain sprocket bolt [1]	30 plus an additional 90° (¼ turn)
Cover with oil separator bolt	9
Crankcase ventilation hose bolt	2.5
Drain plug on engine	20
Engine oil cooler bolt [1] [2]	9
	3 plus an additional 90° (¼ turn)
Lower oil baffle to upper oil pan bolt [1]	3 plus an additional 90° (¼ turn)
Oil check valve bolt	20
Oil drain plug to lower oil pan bolt	30
Oil filter housing	
Oil filter housing nut and bolts [4]	13
	9
Oil filter housing union bolt	13
Oil filter housing cap	25
Oil level thermal sensor nut	9
Oil pressure switch	20
Oil pump to upper oil pan bolt	20
Reduced oil pressure switch	20
Upper oil baffle to upper oil pan bolt [1] [3]	3 plus an additional 90° (¼ turn)

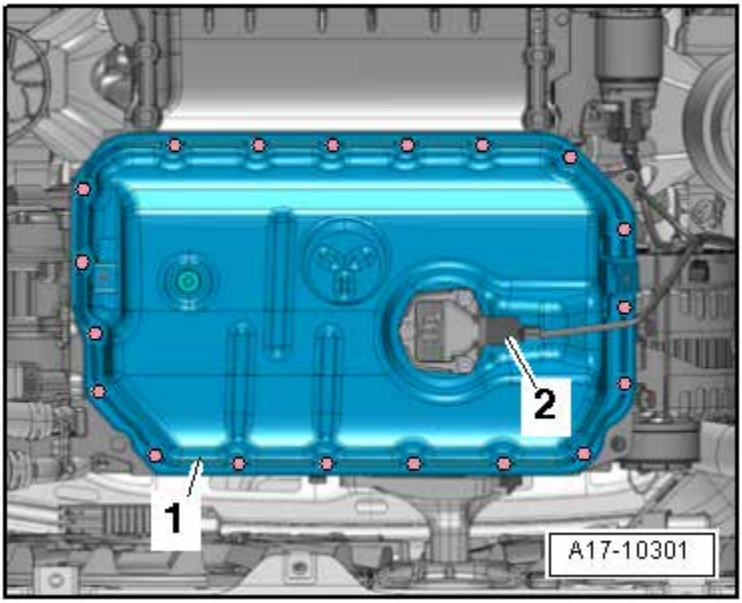
1) Replace fastener(s).
2) For bolt tightening clarification, refer to ElsaWeb, *Oil Pan Upper and Lower Sections, Oil Pump and Oil Cooler Overview,* items 15 and 17.
3) Insert with locking compound.
4) For bolt tightening clarification, refer to ElsaWeb, *Oil Filter Housing and Oil Pressure Switch Overview,* items 1, 5 and 13.

Upper Oil Pan Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 6 in a diagonal sequence instages	20

Oil Pan Tightening Specifications



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

Cooling System – 3.0L CTUA

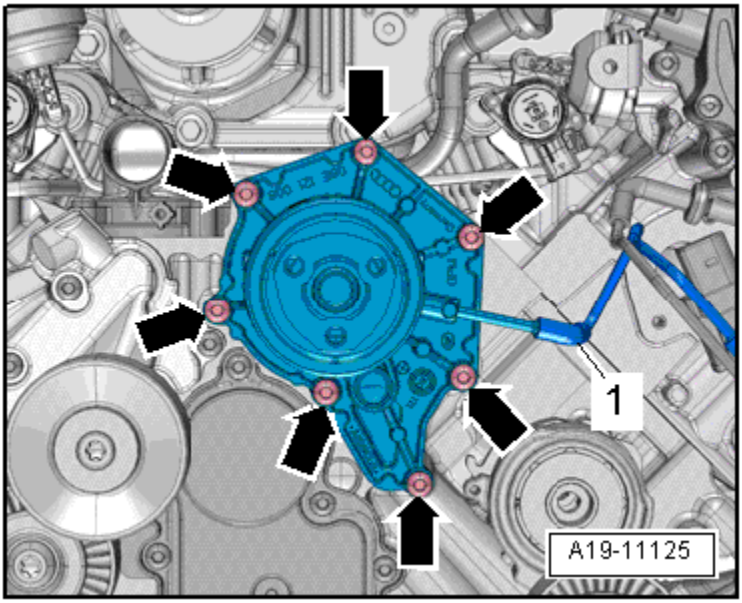
Fastener Tightening Specifications

Component	Nm
Charge air cooling pump	9
Coolant hose connecting piece	9
Coolant pump ribbed belt pulley	20
Coolant thermostat	9
Engine temperature control sensor	3
Fan rib	3.5
Fan wheel	5
Front charge air cooling circuit radiator	4.5
Front coolant pipe bolt [1]	2.5
	9
Left charge air cooling circuit radiator	9
Left charge air cooling circuit radiator bracket bolts/nuts [2]	9
	22
Left coolant pipes	9
Left front coolant pipes	9
Left front coolant pipes bracket	22
Lower coolant pipe on the supercharger	9
Lower left coolant pipe	22
Radiator bracket	5
Ribbed belt pulley for coolant pump	20
Right coolant pipe on the right side of the transmission	9
Rubber buffer	4.5
Transmission coolant valve bracket	9
Transmission coolant valve heat shield	9
Transmission coolant valve-to-lower left coolant pipe	22
Upper coolant pipe	9
Upper coolant pipe on the supercharger	5

[1] For bolt tightening clarification, refer to ElsaWeb, *Coolant Pipes Overview,* items 6, 7 and 27.

[2] For bolt tightening clarification, refer to ElsaWeb, *Radiator Overview* items 5, 6, and 8.

Coolant Pump Tightening Specification



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

Fuel Supply – 3.0L CTUA

Fastener Tightening Specifications

Component	Nm
Accelerator pedal module	8
Air filter housing nut	8
Bolt for securing the fuel filler neck	20
Carrier plate	20
Evaporative Emission (EVAP) canister [2)]	1.5
	20
Exhaust system suspended mount	20
Fuel filler neck bolt	20
Fuel filler tube protective plate [1)]	3.5
	20
Fuel pump control module	1.6
Fuel tank	20
Fuel tank leak detection control module to EVAP canister	1.5
Heat shield lock washer	2
Locking flange cover	1.5
Locking ring	110

1) For bolt tightening clarification, refer to ElsaWeb, *Fuel Tank with Attachments Overview,* items 8, 9.and 13

2) For bolt tightening clarification refer, to ElsaWeb, *EVAP System Overview,* items 2, 3 and 14.

Turbocharger, G-Charger – 3.0L CGXB (TFSI)

Fastener Tightening Specifications

Component	Nm
Bleeder screw	1.5 to 3.0
Changeover valves bracket	9
Charge air cooler to supercharger bolt [1]	10
Charge air pressure sensor (replace)	10
Drive head [1]	25
Engine lifting eye	27
Insulation plate	5
Left Charge Air Cooler (CAC) [1]	10
Right Charge Air Cooler (CAC) [1]	10
Supercharger nut	20
Supercharger threaded pin	17

[1] Replace fastener(s).

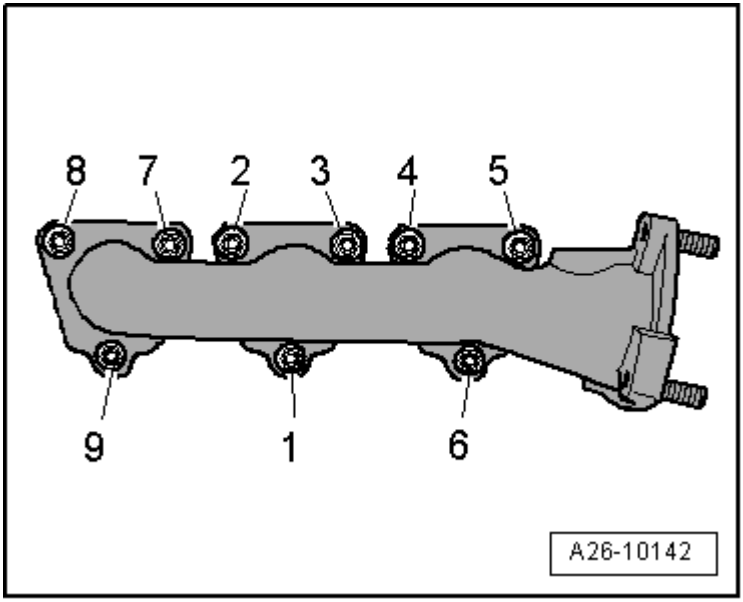
Exhaust System, Emission Controls – 3.0L CTUA

Fastener Tightening Specifications

Component	Nm
Bonded rubber bushing nut	9
Catalytic converter nut	23
Catalytic converter to manifold nut [3]	23
Front clamping sleeve nut	23
Heat shield	9
Left Secondary Air Injection (AIR) combination valve	9
Rear clamping sleeve nut	23
Right Secondary Air Injection (AIR) combination valve	9
Secondary Air Injection (AIR) pump motor hose-to-right Secondary Air Injection (AIR) combination valve	9
Secondary Air Injection (AIR) pump motor bracket	9
Suspended mount [1] [2]	20
	23

[1] Replace fastener(s).
[2] For bolt tightening clarification, refer to ElsaWeb, *Muffler Overview see items -1, 15 and 18-*.
[3] Coat the thread with hot bolt paste.

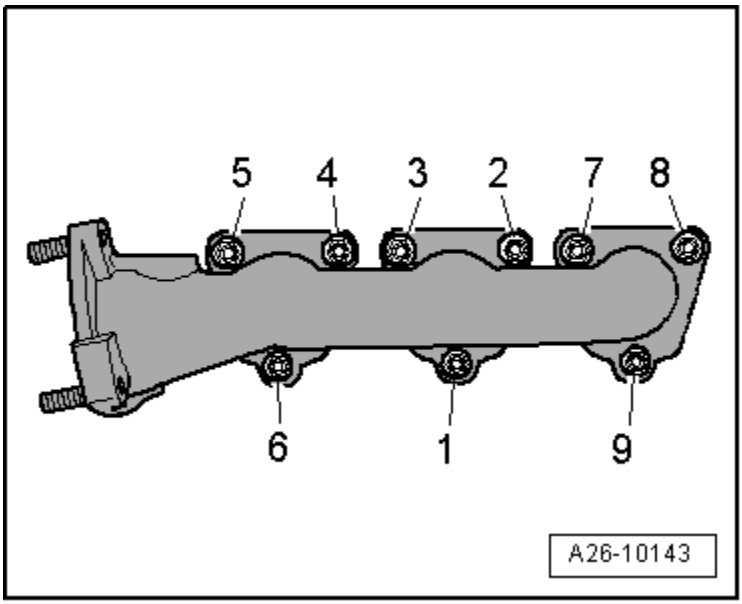
Left Exhaust Manifold Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 9 in sequence [1) 2)]	Hand-tighten
2	Tighten bolts 1 through 9 in sequence	15
3	Tighten bolts 1 through 9 in sequence	25

1) Replace fastener(s).
2) 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 [1) 2)]	Hand-tighten
2	Tighten bolts 1 through 9 in sequence	15
3	Tighten bolts 1 through 9 in sequence	25

1) Replace fastener(s).

2) 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 CTUA

Technical Data

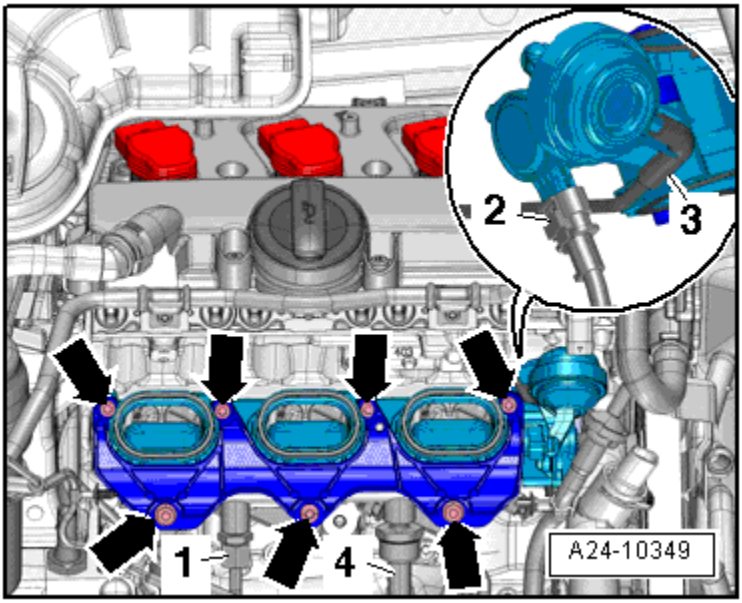
3.0L TFSI Engine	
Engine idle speed	Cannot be adjusted, it is regulated by idle stabilization
Fuel pressure before high pressure pump	3.0 to 6.0 bar pressure
Fuel pressure after high pressure pump	30 to 125 bar pressure

Fastener Tightening Specifications

Component	**Nm**
Air duct	1.5
Camshaft Position (CMP) sensor	9
Fuel pressure sensor [1)]	22
Fuel rail bracket [2)]	2.5
High-pressure line [3)]	25
High Pressure Pump	Hand-tighten
	20
Intake Air Temperature (IAT) sensor (G42)/Manifold Absolute Pressure (MAP) sensor (G71)	10
Intake manifold runner position sensor 2	2.5
Low fuel pressure sensor	15
Oxygen Sensor (O2S)	55
High-pressure line bracket	9
High-pressure line protective plate nut	9
High-pressure line protective plate threaded pin	9
High-pressure line threaded connection	40
Screw-type clamps 9 mm wide	3.4
Screw-type clamps 13 mm wide	5.5
Threaded connection-to-high pressure pump	27
Throttle Valve Control Module [4)]	10

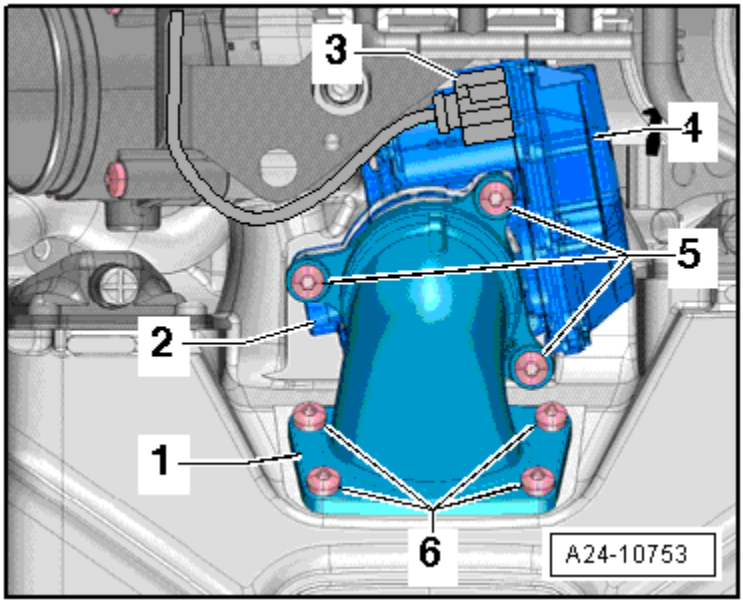
1) Oil the threads.
2) For bolt tightening clarification, ElsaWeb, *Intake Manifold Lower Section, Fuel Rail and Fuel Injector Overview*, items 10, 11 and 12.
3) Coat the threads on the union nut with fuel.
4) In a diagonal sequence

Lower Intake Manifold Tightening Specification



Component	Nm
Tighten bolts and nuts (➡) diagonally in stages	9

Control Valve Control Module
Tightening Specifications



Step	Bolts	Nm
1	5, 6	Hand-tighten
2	6	10
3	5	10

Ignition – 3.0L CTUA

Ignition Technical 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 6 ignition coils (output stages integrated) that are connected directly to spark plugs via the ignition cables.
Spark plugs	Names	Refer to data sheets for exhaust emission test.
	Tightening specifications	Maintenance Procedures Rep. Gr. 03
Ignition sequence		1-4-3-6-2-5

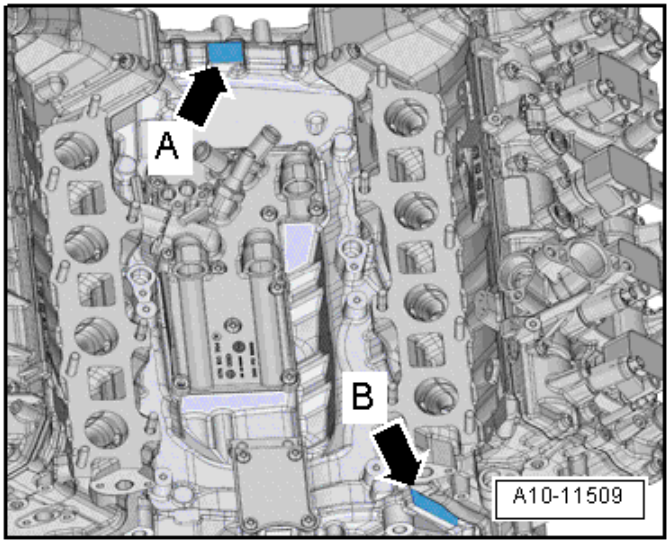
Fastener Tightening Specifications

Component	**Nm**
Camshaft Position (CMP) sensor	9
Engine speed sensor	9
Knock Sensor (KS)	25
Wiring harness	5

ENGINE MECHANICAL – 4.0L CEUC, CRDB

General, Technical Data

Engine Number Location



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 engine serial number (“engine code“ and “serial number“) is located on the front of the cylinder block on the left side -arrow B-. The first 3 digits of the engine code stand for displacement and the mechanical structure of the engine. They are stamped in the cylinder block, including the serial number. The fourth digit describes the engine output and torque and depends on the Engine Control Module (ECM).

Engine Data

Code letters		CEUC	CRDB
Displacement	liter	3.999	3.999
Output	kW at RPM	309 @ 5000 to 6400	412 @ 5700 to 6600
Torque	Nm at RPM	550 @ 1400 to 5200	700 @ 11750 to 5500
Bore	diameter mm	84.5	84.5
Stroke	mm	89.0	89.0
Compression ratio		10.1	9.3
RON	at least	98 [1)]	98 [1)]
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
Exhaust Gas Recirculation (EGR)		No	No
Turbocharger, Supercharger		2 turbocharger	2 turbocharger
Knock control		4 sensors	4 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 / Exhaust	Intake / Exhaust
Variable intake manifold		Yes	Yes
Secondary Air Injection (AIR) system		Yes	Yes
Valve per cylinder		4	4

[1)] Unleaded RON 95 is also permitted but performance is reduced.

Engine Assembly – 4.0L CEUC, CRDB

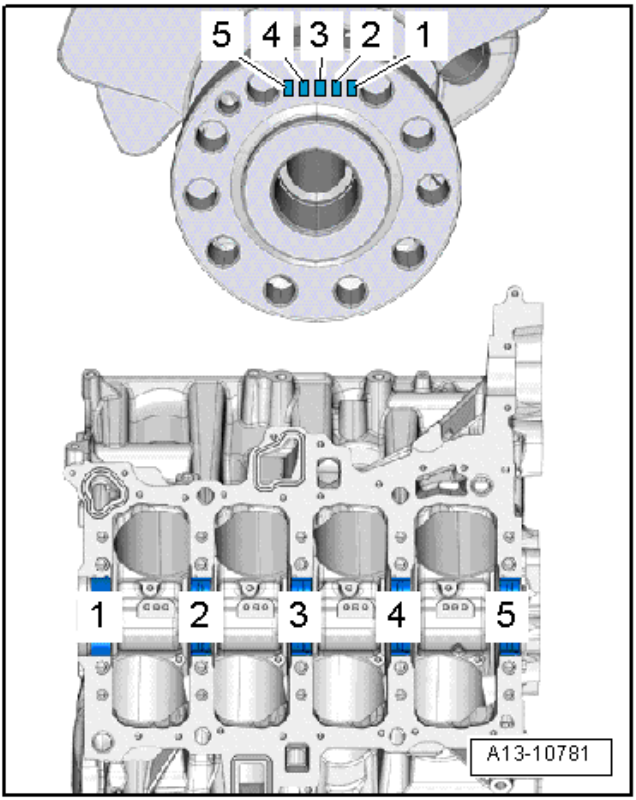
Fastener Tightening Specifications

Component	Fastener size	Nm
Bolts and nuts	M6	9
	M7	15
	M8	20
	M10	40
	M12	65
Engine bracket-to-engine	-	20
Engine mount-to-engine support [1)]	-	90 plus an additional 90° (¼ turn)
Engine support-to-engine	-	60
Subframe mount sensor and subframe mount actuator to engine mount bolt	-	6
Subframe-to-engine bracket	-	55

[1)] Replace fastener(s).

Crankshaft, Cylinder Block – 4.0L CEUC, CRDB

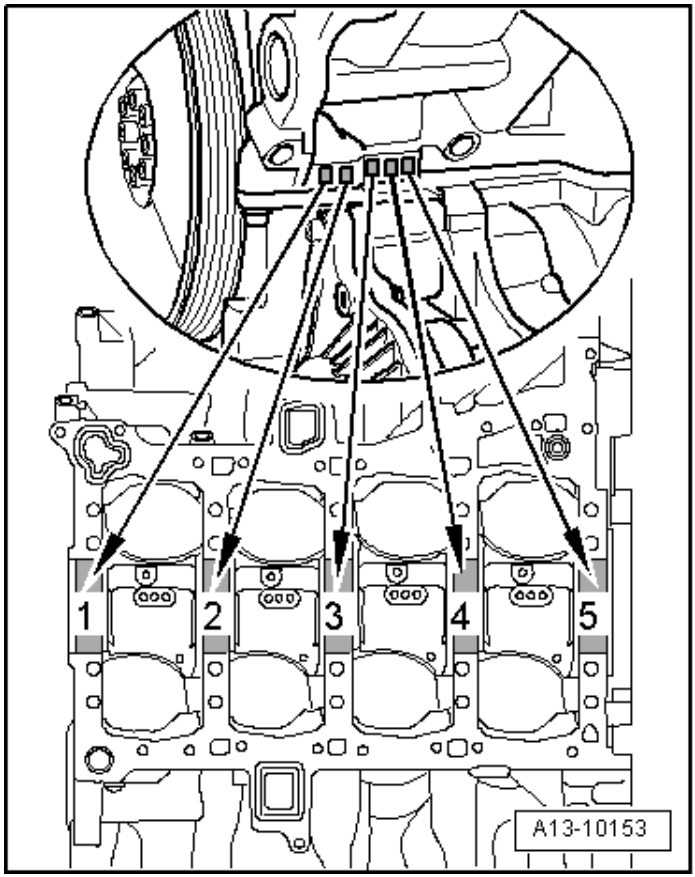
Allocation of Crankshaft Bearing Shells for Guide Frame



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. The allocation of bearing shells to guide frame is identified by a letter on the front crankshaft flange, as shown in the illustration. The letter series begins with crankshaft bearing “5“ (transmission side) and ends with crankshaft bearing “1“ (belt pulley side).

Letter on guide frame	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 cylinder block in the factory. Colored dots on sides of bearing shells serve for identifying bearing shell thickness. Allocation of bearing shells to cylinder block is marked by one letter each at left front on cylinder block (can be read from outside) as shown in the illustration.

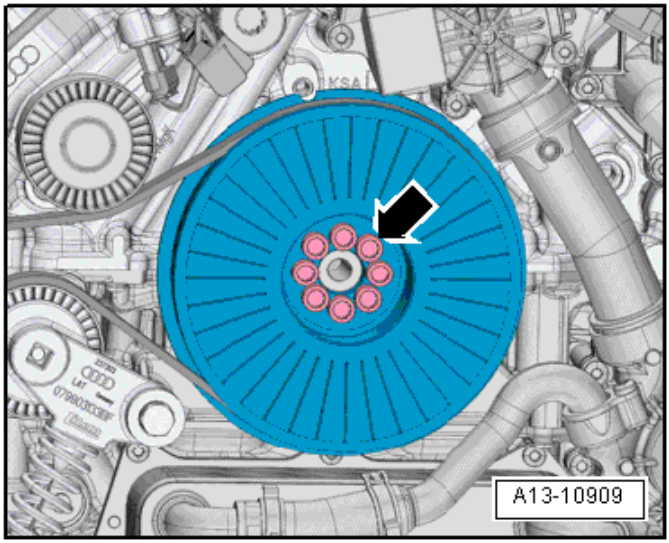
Letter on guide frame	Color of bearing
R	Red
S	Black
G	Yellow
U	Green
B	Blue

Fastener Tightening Specifications

Component	Nm
Connecting rod bearing cap -o-connecting rod [1]	50 plus an additional 90° (¼ turn)
Drive plate crankshaft [1]	60 plus an additional 90° (¼ turn)
Idler roller for the ribbed belt-to-engine	22
Oil spray jet	9
Tensioner for the ribbed belt-to-engine [2]	22
	55

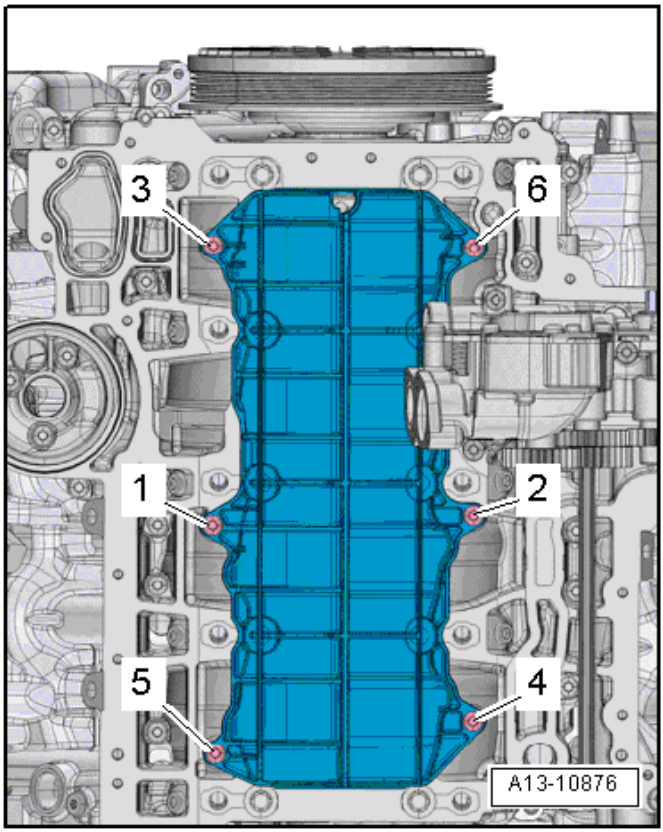
[1] Replace fastener(s).
[2] For bolt tightening clarification, refer to ElsaWeb, *Ribbed Belt Drive Overview*, items 1 and 2.

Vibration Damper, Tightening Specification



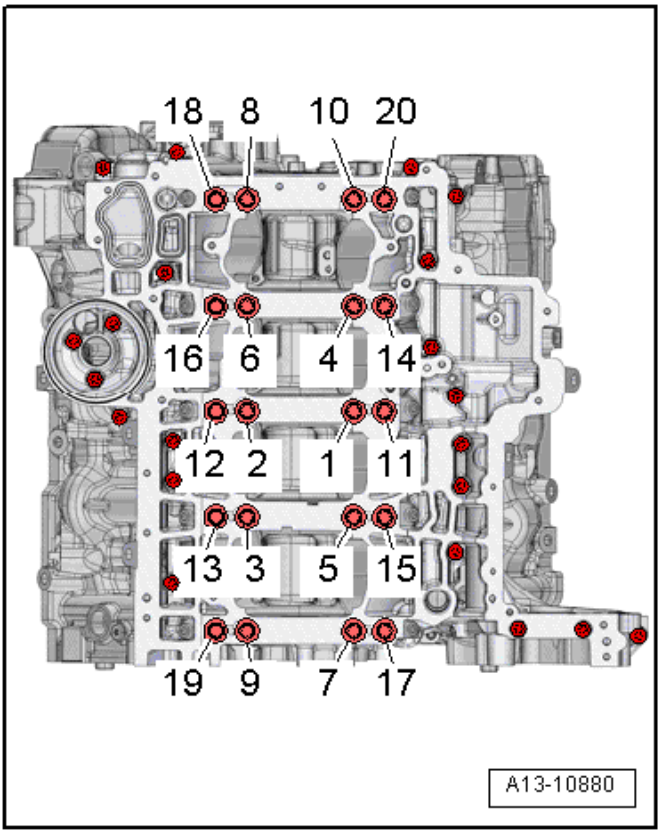
Step	Bolts	Tightening Specification/Additional Turn
1	Arrow	15 Nm in a diagonal sequence
2	Arrow	22 Nm in a diagonal sequence
3	Arrow	In a diagonal sequence, turn an additional 90°

Baffle Plate Tightening Specification



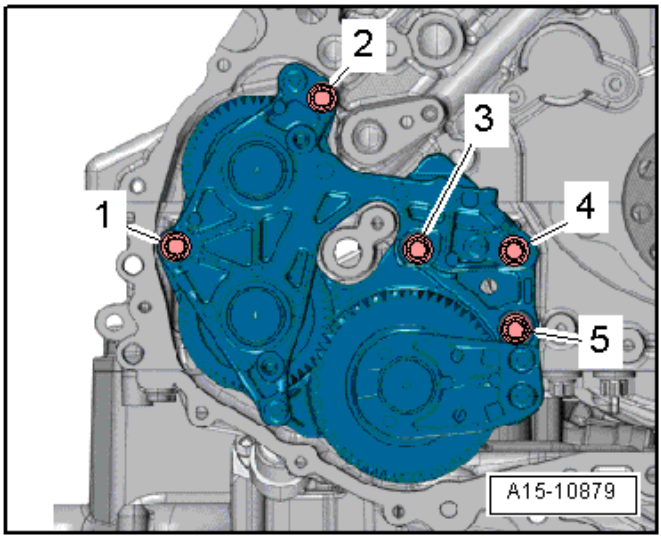
Step	Component	Nm
1	Tighten bolts 1 through 6 in sequence	5
2	Tighten bolts 1 through 6 in sequence	an additional 90° (¼ turn)

Guide Frame Tightening Specifications



Step	Bolts	Nm
1	1 through 10	30
2	11 through 20	30
3	1 through 10	50
4	1 through 10	an additional 90° (¼ turn)
5	11 through 20	50
6	11 through 20	an additional 90° (¼ turn)
7	Without numbering in the illustration	9 Nm in a diagonal sequence

Spur Gear Unit Tightening Specifications



Tighten the bolts diagonally in the sequence -1 to 5- to 22 Nm.

Crankshaft Dimensions

Crankshaft with Crankshaft Bearing Journal Diameter 65 mm

Honing dimension in mm	Crankshaft bearing pin diameter		Crankshaft 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

Crankshaft with Crankshaft Bearing Journal Diameter 67 mm

Honing dimension in mm	Crankshaft bearing pin diameter		Crankshaft connecting rod journal diameter	
Basic dimension	67.000	– 0.022	54.000	– 0.022
		– 0.042		– 0.042
Repair stage	66.750	– 0.022	53.750	– 0.022
		– 0.042		– 0.042

Piston Ring End Gaps

Piston ring dimensions in mm	New	Wear limit
1st compression ring	0.20 to 0.35	0.80
2nd compression ring	0.20 to 0.40	0.80
Oil scraping ring	0.20 to 0.40	0.80

Piston Ring Clearance

Piston ring dimensions in mm	New	Wear limit
1st compression ring	0.035 to 0.085	0.200
2nd compression ring	0.005 to 0.045	0.150
Oil scraping ring	0.020 to 0.055	0.200

Cylinder Dimensions

Honing dimension in mm	Cylinder bore diameter
Nominal dimension	84.510 ± 0.005 2)
Repair stage	84.610 ± 0.005 2)

1) Measure 50 mm inside the cylinder bore.

Piston Dimensions

Piston diameter in mm		
Engine Codes	**CEUC**	**CRDB**
Nominal dimension	84.470 1)	84.490 1)
Repair stage	84.580 1)	84.590 1)

1) Measurement with coating (thickness = 0.018 mm). The coating wears off.

Cylinder Head, Valvetrain – 4.0L CEUC, CRDB

Fastener Tightening Specifications

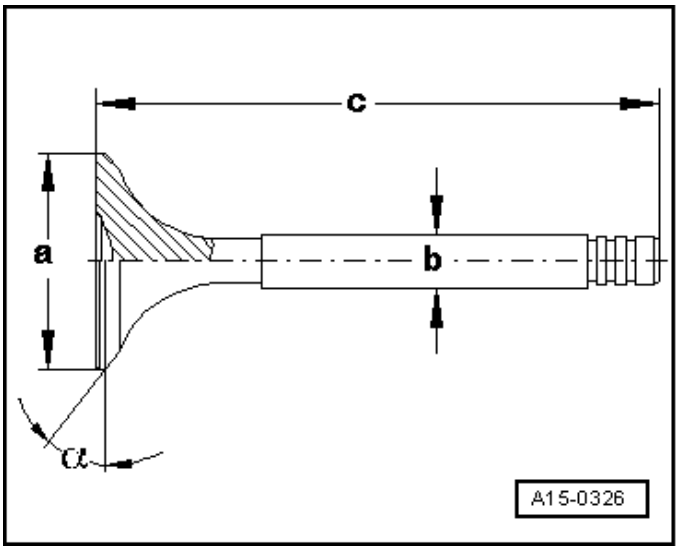
Component	Nm
Bearing plate for drive chain sprocket bolt	9
Bracket for idler sprocket to engine [1)]	5 plus an additional 90° (¼ turn)
Camshaft adjuster for exhaust camshaft to camshaft [1)]	80 plus an additional 90° (¼ turn)
Camshaft adjuster for intake camshaft to camshaft [1)]	80 plus an additional 90° (¼ turn)
Camshaft adjustment valve to camshaft housing	5
Chain tensioner to engine [1)]	5 plus an additional 90° (¼ turn)
Chain tensioner with glide track to engine [1)]	5 plus an additional 90° (¼ turn)
Connection for coolant to right timing chain cover	9
Double bolt nut	9
Engine lifting eye to engine	22
Exhaust camshaft adjustment valve 2	5
Glide track to engine [1)]	17 plus an additional 90° (¼ turn)
Intake/exhaust camshaft adjuster to camshaft housing	5
Mounting pin for idler sprocket to engine	42
Mounting pin for left camshaft timing chain drive sprocket to bearing plate [1)]	5 plus an additional 90° (¼ turn)
Mounting pin for right camshaft timing chain drive sprocket to engine [1)]	20 plus an additional 45° (⅛ turn)

[1)] Replace fastener(s).

Compression Checking Specifications

Compression pressure	Bar pressure
New	10.0 to 15.0
Wear limit	9.0
Maximum difference between cylinders	3.0

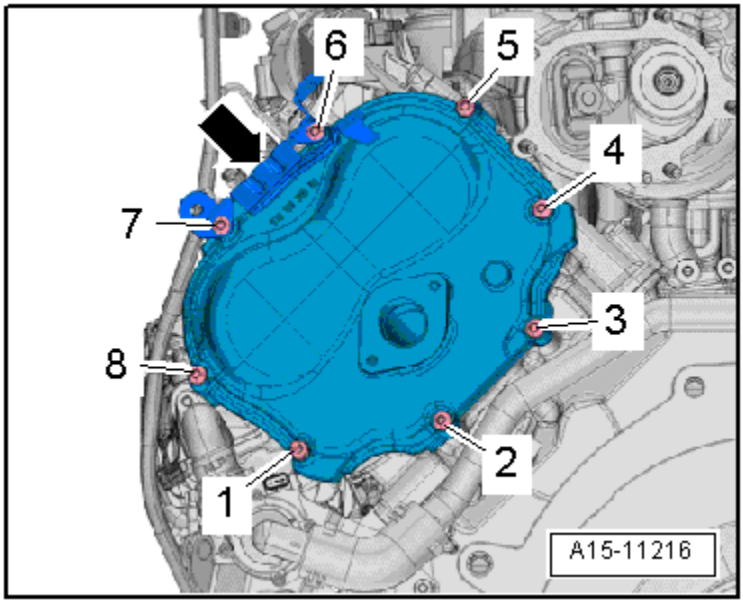
Valve Dimensions



Dimension		Intake valve	Exhaust valve
Diameter a	mm	33.85 ± 0.10	28.0 ± 0.1
Diameter b	mm	5.98 ± 0.007	5.935 ± 0.007
c	mm	103.97 ± 0.20	101.87 ± 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 Specifications

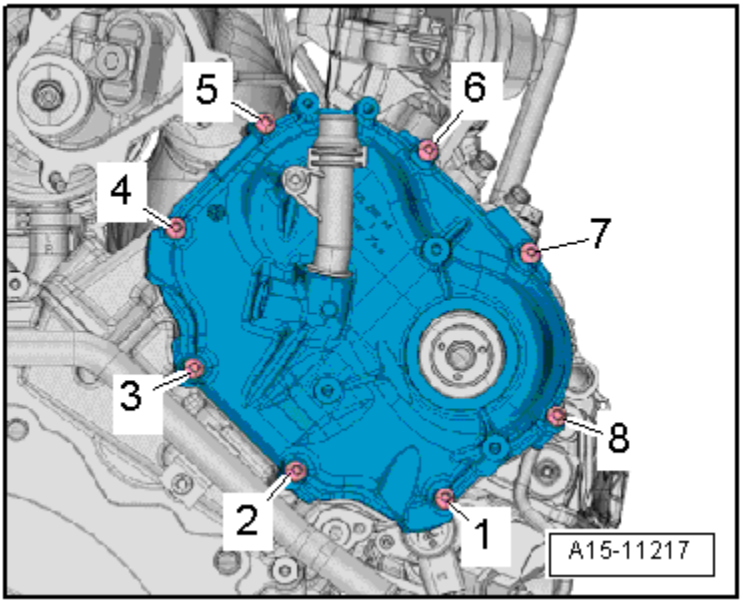


Step	Component	Nm
1	Tighten bolts 1 through 8 in sequence	5
2	Tighten bolts 1 through 8 in sequence [1)]	an additional 90° (¼ turn)

[1)] Replace fastener(s)

NOTE: The mount -arrow- is affixed with the timing chain guard.

Right Timing Chain Cover Tightening Specifications

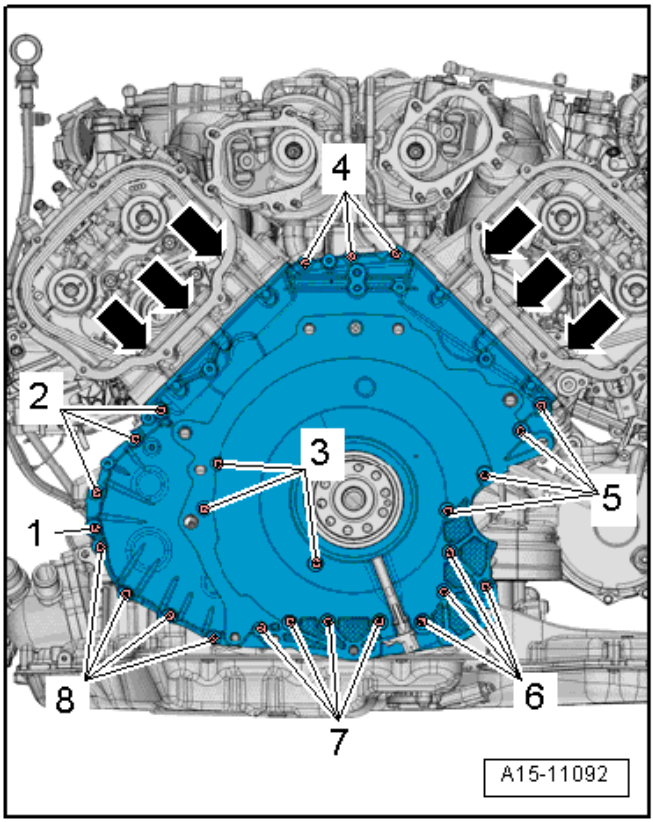


Step	Component	Nm
1	Tighten bolts 1 through 8 in sequence	5
2	Tighten bolts 1 through 8 in sequence [1)]	an additional 90° (¼ turn)

[1)] Replace fastener(s)

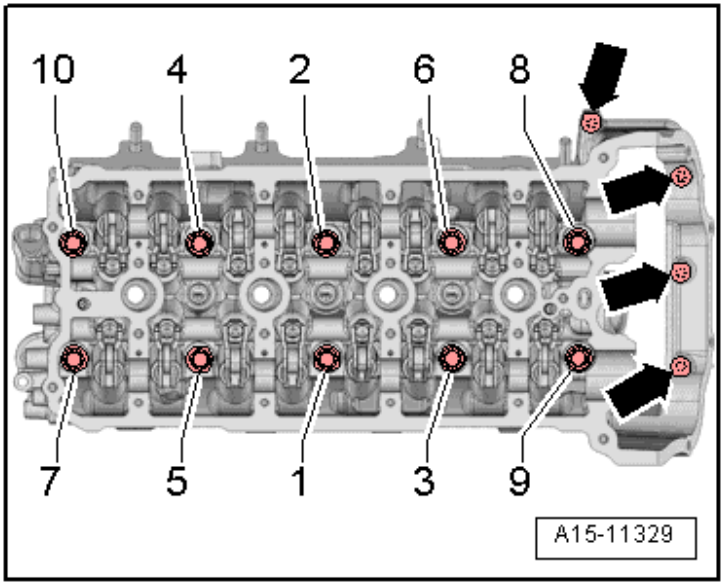
NOTE: Brackets A and B are connected with the timing chain cover.

Lower Timing Chain Cover Tightening Specifications



Step	Component	Nm
1	Tighten the bolts (➡)	5
2	Tighten bolts 2 through 8 in a diagonal sequence	8
3	Tighten the bolts (➡)	8
4	Tighten bolts 2 through 8 in a diagonal sequence	an additional 90° (¼ turn)
5	Tighten the bolts (➡)	an additional 90° (¼ turn)
6	Tighten bolts 1	Tighten for the power steering pump, refer to ElsaWeb, *Suspension Wheels, Steering*

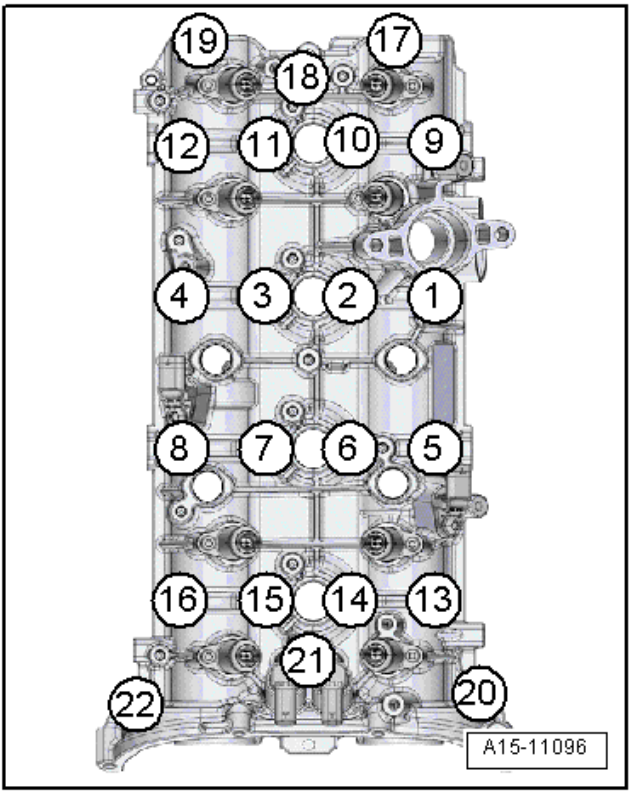
Cylinder Head Tightening Specifications



NOTE: Replace any bolts that were tightened with an additional turn.
The cylinder head for cylinder bank 2 (left) is shown in the illustration.

Step	Component	Nm
1	Tighten bolts 1 through 10 in sequence	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	Arrows	10
7	Arrows	an additional 90° (¼ turn)

Camshaft Guide Frame Tightening Specifications



NOTE: The left cylinder head camshaft guide frame is shown.
The right cylinder head camshaft guide frame is identical.

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

1) Replace fastener(s)
2) The camshaft housing contact surface must lay entirely on top of the cylinder head

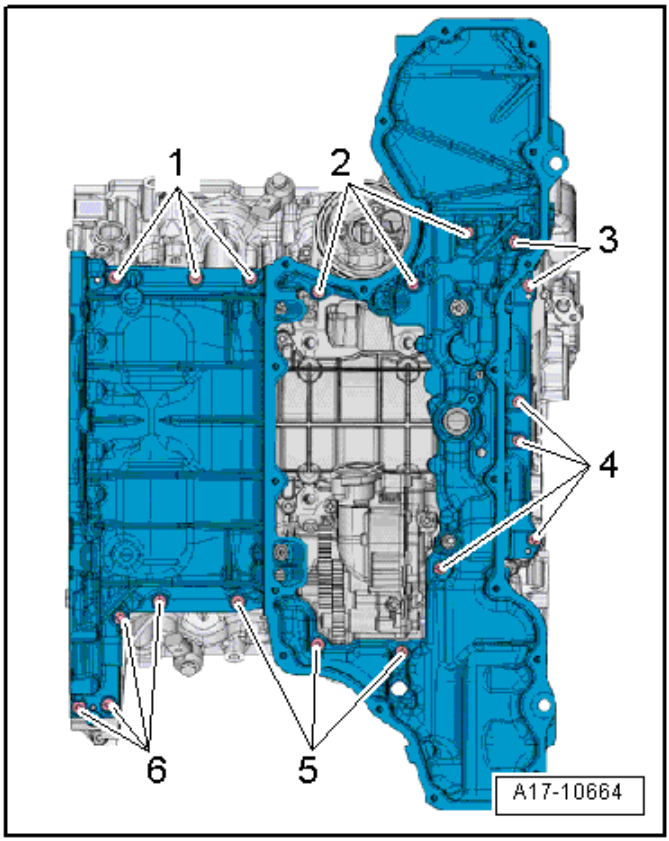
Lubrication – 4.0L CEUC, CRDB

Fastener Tightening Specifications

Component	Nm
Bracket nut	
Bracket for right engine oil cooler	
- Bolt	8
- Nut	20
Charge air cooler housing	9
Cover to upper oil pan	8
Cover in the inner V-to-engine [1)]	5 plus an additional 90° (¼ turn)
Drain plug-to-engine	30
Guide tube for the oil dipstick-to-upper oil pan	9
Intake tube for the oil pump-to-oil pump	9
Oil cap to lower engine	25
Oil drain plug-to-cap	4
Oil drain plug-to-lower oil pan	20
Oil level thermal sensor-to-lower oil pan	9
Oil lines (for Audi RS6/RS7) bolt	9
Oil pipe-to-oil pump [1)]	8 plus an additional 90° (¼ turn)
Oil - pipe - hose line bolt/nut	8
Oil pressure regulation valve-to-engine	9
Oil pressure switch-to-engine	20
Oil pump-to-engine [1)]	8 plus an additional 90° (¼ turn)
Oil separator-to-charge air cooler housing	3.2
Oil temperature sensor 2-to-engine double bolt	9
Pipe for the crankcase ventilation	3.2

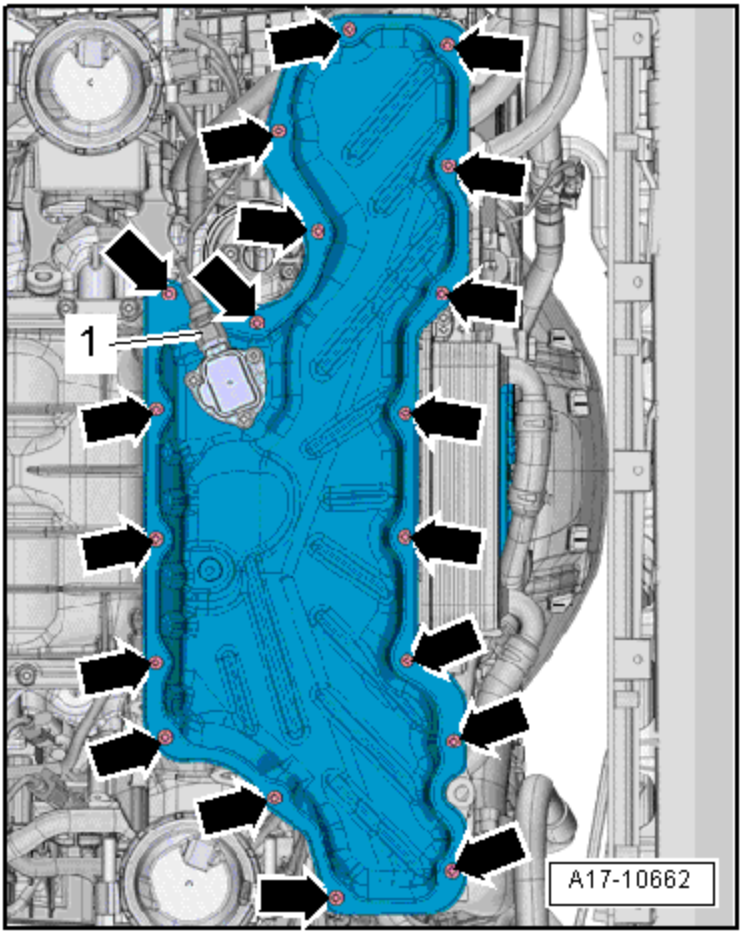
1) Replace fastener(s).
2) For bolt tightening clarification, ElsaWeb, *Oil Pan/Oil Pump Overview*, item 20.
3) For bolt tightening clarification, ElsaWeb, *Oil Filter Overview*, items1
4 For bolt tightening clarification, ElsaWeb, *Spray Nozzle Valve and Hydraulic Adjuster Check Valve Overview* item 12.

Upper Oil Pan Tightening Specifications



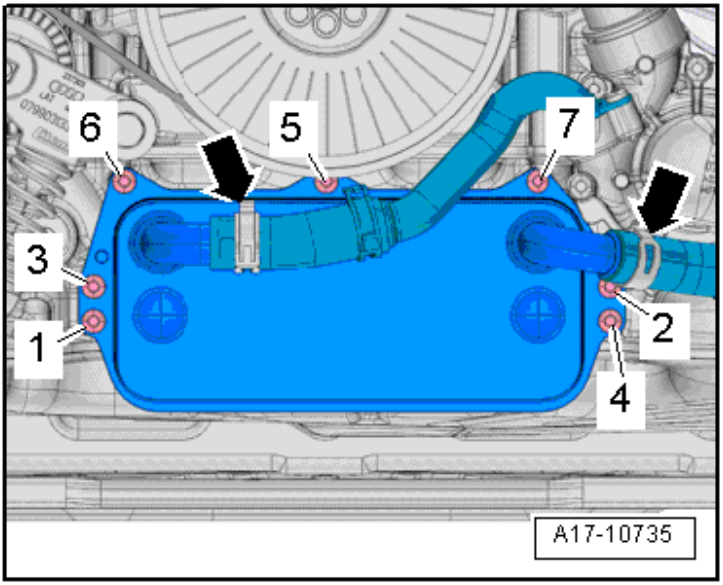
Step	Component	Nm
1	Tighten bolts 1 through 6 in a diagonal sequence	Hand-tighten
2	Tighten bolts 1 through 6 in a diagonal sequence	5
3	Tighten bolts 1 through 6 in a diagonal sequence	an additional 90° (¼ turn)

Lower Oil Pan Tightening Specifications



Step	Component	Nm
1	Bolts arrows in a diagonal sequence	Hand-tighten
2	Bolts arrows in a diagonal sequence	8
3	Bolts arrows in a diagonal sequence	an additional 90° (¼ turn)

Oil Cooler Tightening Specifications



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 CEUC, CRDB

Fastener Tightening Specifications

Component	Nm
After-run coolant pump to bracket bolt	1.5
Air guide bolt/nut (Audi RS6/RS7)	5
Bracket (Audi RS6/RS7) 5	
- Bolt	20
- Nut	9
Bracket bolt/nut	9
Bracket bolt (Audi S6/S7)	5
Bracket bolt (Audi RS6/RS7)	5
Bracket to frame bolt (Automatic Transmission)	9
Bracket to frame bolt (S tronic Transmission)	9
Bracket to front radiator coolant circuit for atf cooling bolt (Audi RS6/RS7)	3.5
Bracket to radiator coolant circuit for ATF cooling (Audi S6/S7) 4	
- Bolt	3.5
- Nut	8
- Bolt	20
Bracket to right engine oil cooler (Audi RS6/RS7) bolt	3.5
	8
Bracket to transmission fluid cooling valve bolt (Automatic Transmission)	9
Bracket to transmission fluid cooling valve bolt (S tronic Transmission)	9
Bracket for charge air cooling pump nut	9
Bracket for engine coolant circulation pump 2 2	1.5
	9
Coolant connection bolt	9
Coolant pipe nut	9
Coolant pump housing bolt 1	8 plus an additional 90° (¼ turn)
Coolant shut-off valve bolt 1	5 plus an additional 90° (¼ turn)
Cooler for charge air cooling circuit bolt (Audi S6/S7)	7
Cooler for charge air cooling circuit bolt (Audi RS6/RS7)	5
Engine coolant temperature sensor-to-engine	9
Engine temperature control sensor-to-engine	9
Fan shroud-to-coolant fan	3.5
Fan wheel-to-fan shroud	5

Fastener Tightening Specifications *(cont'd)*

Component	Nm
Housing for the coolant pump-to-coolant pump [1]	8 plus an additional 90° (¼ turn)
Lower front coolant pipes bolt	23
Lower left coolant pipe bolt (Automatic Transmission)	9
Lower left coolant pipe bolt (S tronic Transmission)	9
Lower rear coolant pipe bolt	9
Map controlled engine cooling thermostat-to-housing for the coolant pump	9
Radiator bracket bolt (Audi S6/S7)	5
Radiator bracket (Audi RS6/RS7) [3]	7
	18
Rear radiator coolant circuit for atf cooling to bracket nut (Audi RS6/RS7)	9
Right coolant pipe bolt/nut	9
Right coolant pipe on the transmission bolt (Automatic Transmission)	9
Right coolant pipe on the transmission bolt (S tronic Transmission)	9
Rubber buffer to radiator bracket bolt (Audi S6/S7)	4.5
Rubber buffer to radiator bracket bolt (Audi RS6/RS7)	8
Rubber bushing to bracket bolt (Audi RS6/RS7)	3.5
Upper left coolant pipe-to-engine nut	9
Upper rear coolant pipe-to-engine	9

1) Replace fastener(s)
2) For bolt tightening clarification, refer to ElsaWeb, *Engine Coolant Circulation Pump 2 -V178- Overview* items 3 and 5.
3) For bolt tightening clarification, refer to ElsaWeb, *Radiator Overview, Audi RS6/RS7* items 21 and 25.
4) For bolt tightening clarification, refer to ElsaWeb, *Radiator, Radiator Coolant Circuit for ATF Cooling Overview, Audi S6/S7*, items 2, 6 and 7.
5) For bolt tightening clarification, refer to ElsaWeb, *Radiator, Radiator Coolant Circuit for ATF Cooling Overview, Audi RS6/RS7*, items 7, 11 and 12.
6) For bolt tightening clarification, refer to ElsaWeb, *Radiator, Right Auxiliary Cooler Overview, Audi RS6/RS7*, items 6 and 8.

Fuel Supply – 4.0L CEUC, CRDB

Fastener Tightening Specifications

Component	Nm
Accelerator pedal module	8
Air filter housing nut	8
Bolt for fecuring the fuel filler neck	20
Carrier plate	20
Evaporative Emission (EVAP) canister [2]	1.5
	20
Fuel tank	20
Fuel tank leak detection control module-to-EVAP canister	1.5
Fuel pump control module	1.6
Heat shield lock washer	2
Locking flange cover	1.5
Locking ring	110
Protective plate for fuel filler tube [1]	3.5
	20
Suspended mount for exhaust system	20

[1] For bolt tightening clarification, refer to ElsaWeb, *Fuel Tank with Attachments Overview*, items 8, 9 and 13.

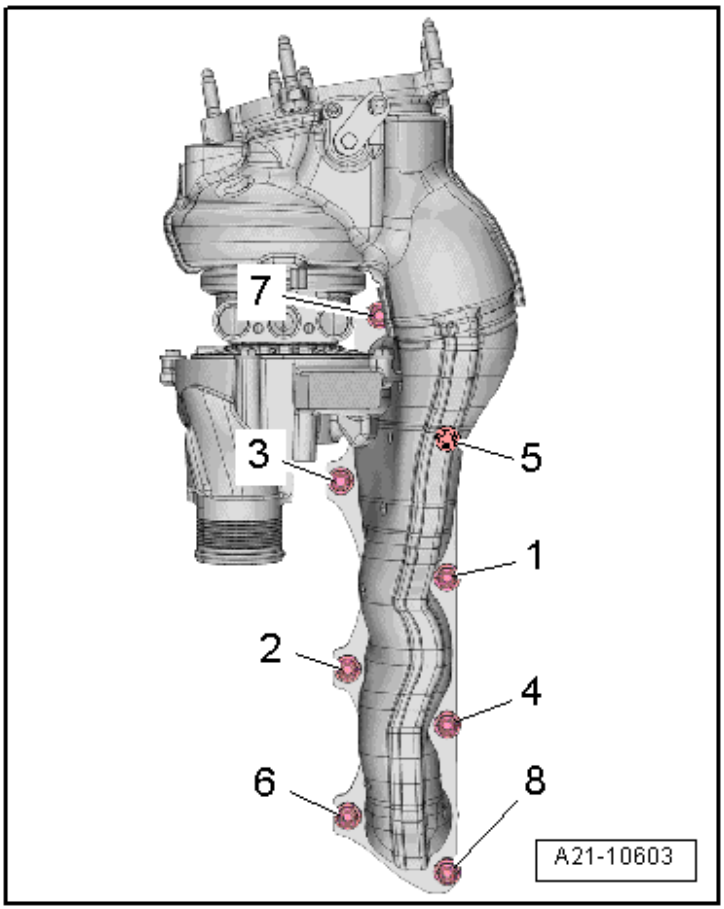
[2] For bolt tightening clarification, refer to ElsaWeb, *EVAP System Overview*, items 2, 3 and 14.

Turbocharger, G-Charger – 4.0L CEUC, CRDB

Fastener Tightening Specifications

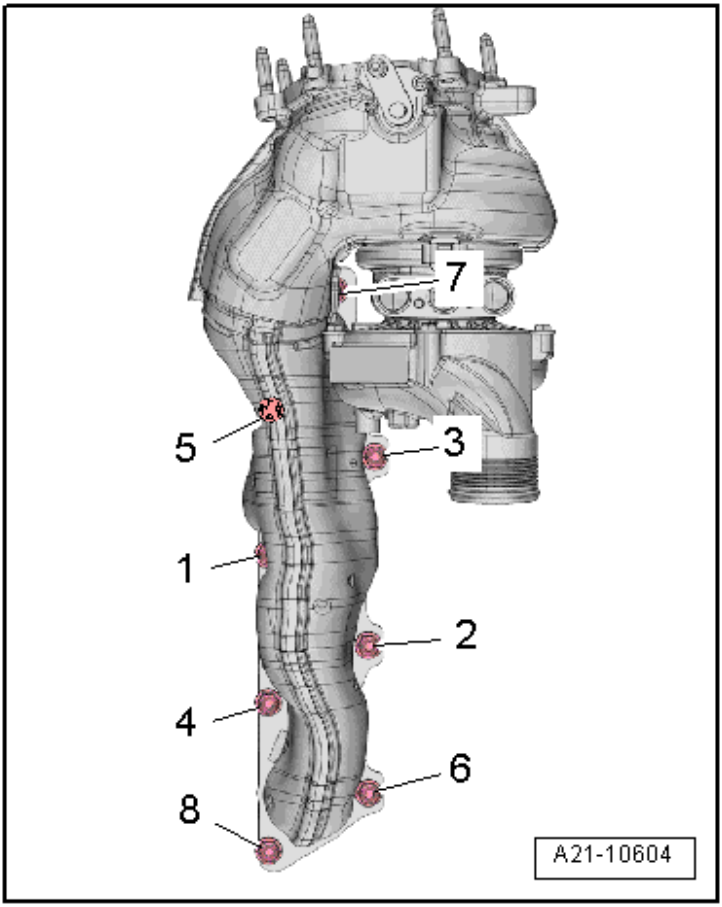
Component	Nm
Air guide-to-throttle valve control module	9
Air guide-to-turbocharger	9
Ball pin for engine cover	2.5
Bank 2 turbocharger recirculation valve-to-air guide	9
Charge air cooler-to-charge air cooler housing	3.2
Charge air cooler housing-to-body	9
Charge air pressure sensor-to-air guide	9
Clamp 9 mm wide	3.4
Clamp 13 mm wide	5.5
Connection for oil return hose-to-turbocharger	9
Coolant supply pipe-to-turbocharger	9
Engine cover temperature sensor	9
Oil supply pipe-to-turbocharger	9
Retaining plate for coolant and oil lines-to-turbocharger	9
Structure-borne sound actuator	9
Turbocharger recirculation valve-to-air guide	9
Vacuum actuator-to-turbocharger	
- Ball pin	2.5
- Bolt	9

Left Turbocharger Tightening Specifications



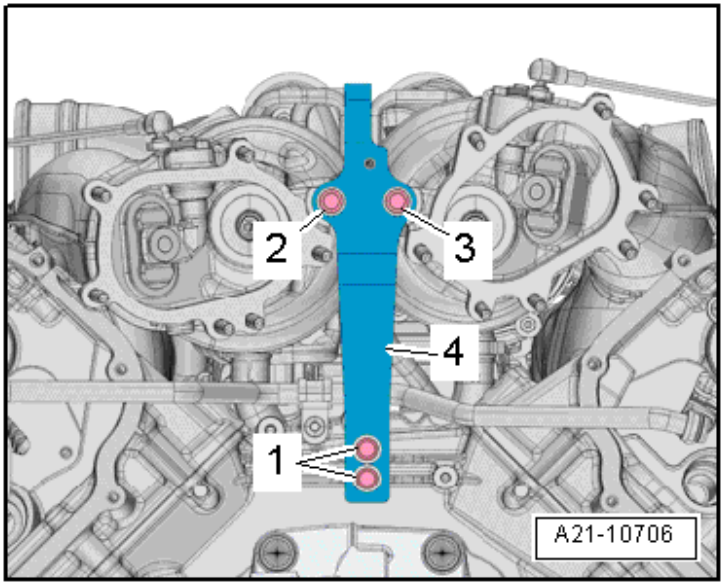
Step	Component	Nm
1	Tighten bolts 1 through 8 in sequence	16
2	Tighten bolts 1 through 8 in sequence	25

Right Turbocharger Tightening Specifications



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

Turbocharger Support Tightening Specifications



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

Exhaust System, Emission Controls – 4.0L CEUC, CRDB

Fastener Tightening Specifications

Component	Nm
Bracket for Secondary Air Injection (AIR) pump motor bolt/nut	9
Catalytic converter to manifold nut [1) 2)]	23
Clamping sleeve nut	23
Connection flange to left air combination valve bolt	9
Connection flange to right Secondary Air Injection (AIR) combination valve bolt	9
Connection flange-to-right secondary air injection combination valve	23
Front muffler to catalytic converter nut [1) 2)]	23
Suspended mount bolt [3)]	20
Suspended mount bolt [4)]	23

1) Replace
2) Coat the thread with hot bolt paste.
3) For bolt tightening clarification, refer to ElsaWeb, *Muffler Overview* and see item 3
4) For bolt tightening clarification, refer to ElsaWeb, *Muffler Overview* and see items 15 and 18

Multiport Fuel Injection – 4.0L CEUC, CRDB

Fastener Tightening Specifications

Component	Nm
Air guide bolt	2.5
Air guide with turbocharger recirculation valve bolt	9
Bracket for the fuel rail bolt	3
Bracket for the low pressure line bolt	9
Charge air cooler temperature sensor bolt	9
Fuel supply hose bolt	9
High pressure line bolt	9
High pressure line union nut	25
High pressure pump bolt 2	20 plus an additional 45° (⅛ turn)
Intake air temperature sensor	2.5
Intake manifold bolt 1	9
Intake manifold runner position sensor 2 bolt	2.5
Low fuel pressure sensor	15
Low pressure line bolt	9
Manifold absolute pressure sensor bolt	3
Oxygen sensor	55
Throttle valve control module bolt	5

1) Tighten diagonally in steps
2) Replace fastener(s)

Ignition – 4.0L CEUC, CRDB

Technical Data

Test Data		4.0L 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 spark plugs via the ignition cables.
Spark plugs	Names	Refer to data sheets for exhaust emission test.
	Tightening specifications	Maintenance Procedures Rep. Gr. 03
Ignition sequence		1-5-4-8-6-3-7-2

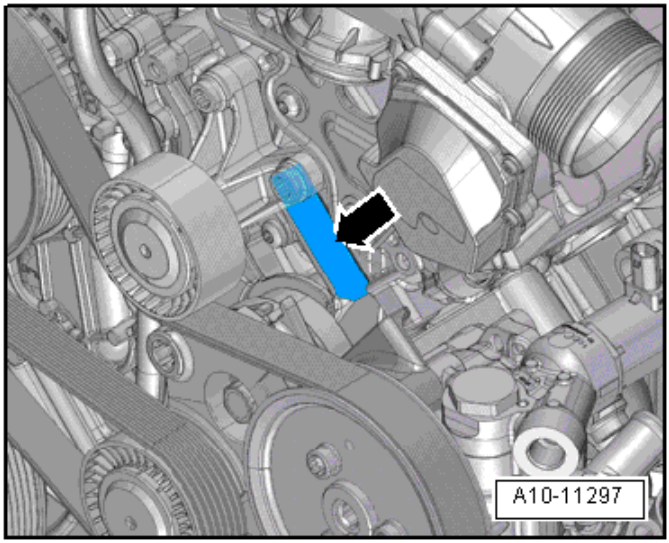
Fastener Tightening Specifications

Component	Nm
Camshaft Position (CMP) sensor-to-engine	9
Engine Speed (RPM) sensor-to-cylinder head	9
Ignition coil-to-cylinder head	9
Knock Sensor (KS)-to-engine	25
Wiring harness-to-cylinder head	5

ENGINE MECHANICAL – 3.0L CPNB (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 (➡). In addition, a sticker with “engine code” and “serial number” is affixed to the intake manifold. Engine codes beginning with C are four-digit. The first 3 digits of the engine code indicate the displacement and the mechanical structure of the engine. The fourth digit describes the engine output and torque. The four digit engine code is on the type plate, vehicle data label and engine control module.

Engine Data

Code letters		**CPNB**
Displacement	liter	2.967
Output	kW at RPM	176 @ 4000 to 4500
Torque	Nm at RPM	580 @ 1700 to 2750
Bore	diameter mm	83.0
Stroke	mm	91.4
Compression ratio		16.8
CZ	at least	51
Ignition sequence		1-4-3-6-2-5
Exhaust Gas Recirculation (EGR)		Yes
Turbocharger		1 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 CPNB (TDI)

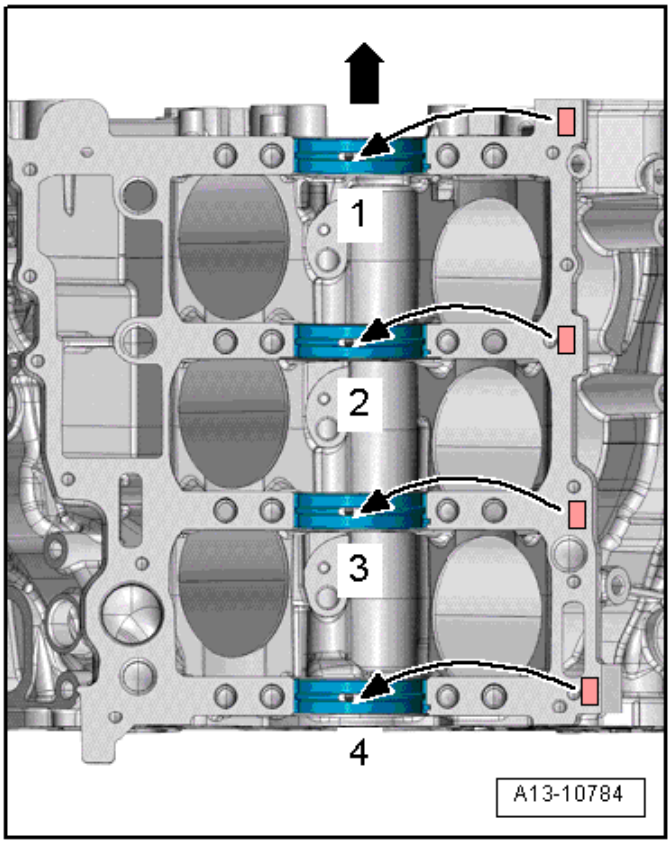
Fastener Tightening Specifications

Component	Fastener size	Nm
Bolts and nuts	M6	9
	M7	15
	M8	20
	M10	40
	M12	65
Engine mount to engine support bolt [1)]	-	90 plus an additional 90° (¼ turn)
Engine support bolt	-	40
Heat shield to engine support bolt	-	10
Retaining plate bolt	-	20
Subframe to retaining plate bolt	-	55
Transverse beam to lock carrier nut	-	40
Stop for torque bracket to transverse beam bolt	-	30
Torque bracket bolt [1)]	-	20 plus an additional 90° (¼ turn)

[1)] Replace fastener(s).

Crankshaft, Cylinder Block – 3.0L CPNB (TDI)

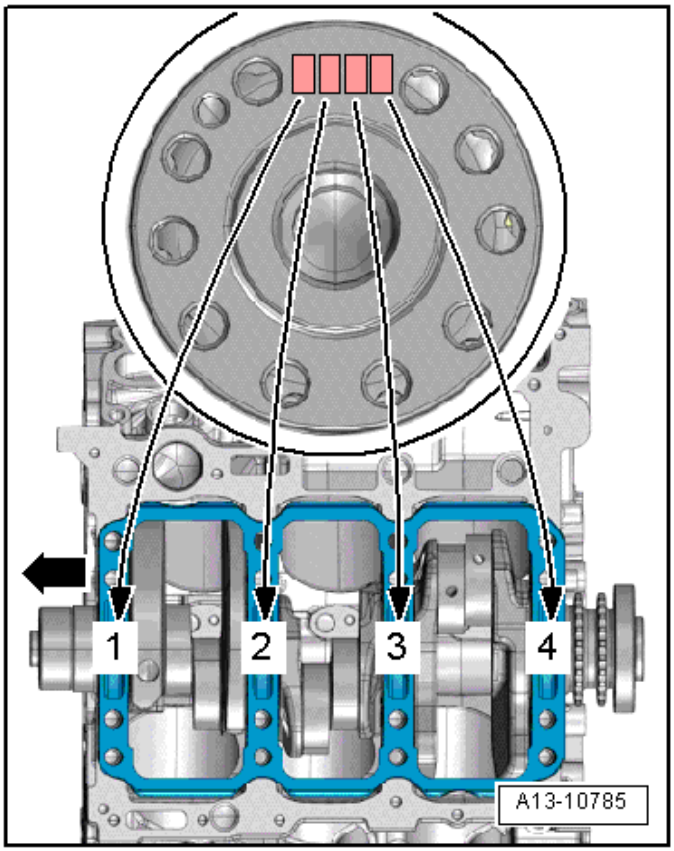
Allocation of Crankshaft Bearing Shells for Cylinder Block



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. Allocation of bearing shells to cylinder block is identified with a letter by each bearing. -Arrow-: belt pulley side.

Letter on guide frame	Color of bearing
R	Red
G	Yellow
B	Blue

Allocation of Crankshaft Bearing Shells for Guide Frame



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

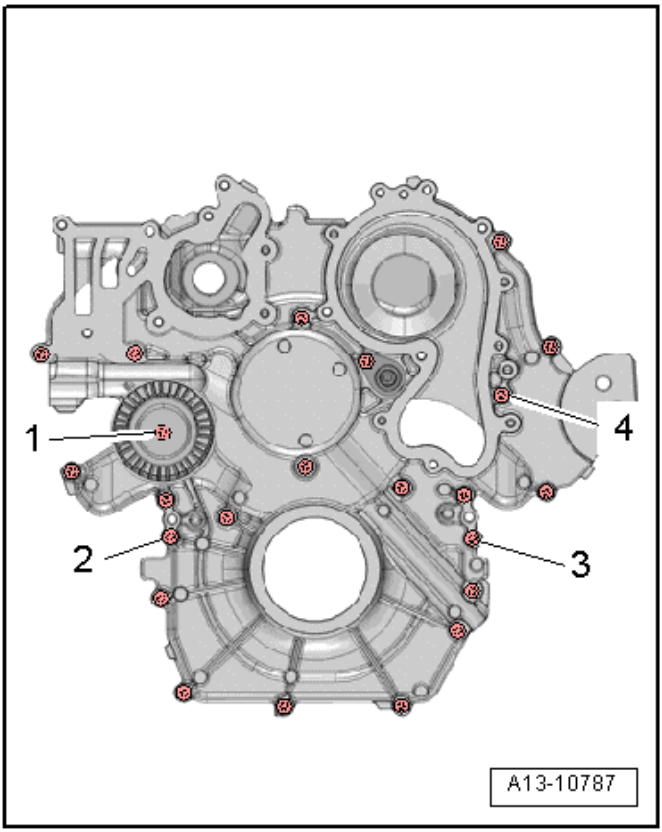
Letter on guide frame	Color of bearing
R	Red
G	Yellow
B	Blue

Fastener Tightening Specifications

Component	Nm
Bracket for A/C compressor tighten in 2 steps:	
- Diagonally	5
- Diagonally	40
Bracket for generator tighten in 2 steps:	
- Diagonally	5
- Diagonally	40
Connecting rod bearing cap to connecting rod bolt [1)]	35 plus an additional 90° (¼ turn)
Cover for the belt pulley side sealing flange bolt	9
Drive plate to crankshaft bolt 1	60 plus an additional 90° (¼ turn)
Idler roller for the ribbed belt to engine bolt	23
Oil temperature sensor 2 bolt	9
Tensioner for the ribbed belt bolt [1)]	50 plus an additional 90° (¼ turn)
Washer to vibration damper bolt [1)]	20 plus an additional 90° (¼ turn)

[1)] Replace fastener(s).

Ribbed Belt Sealing Flange Tightening Specification

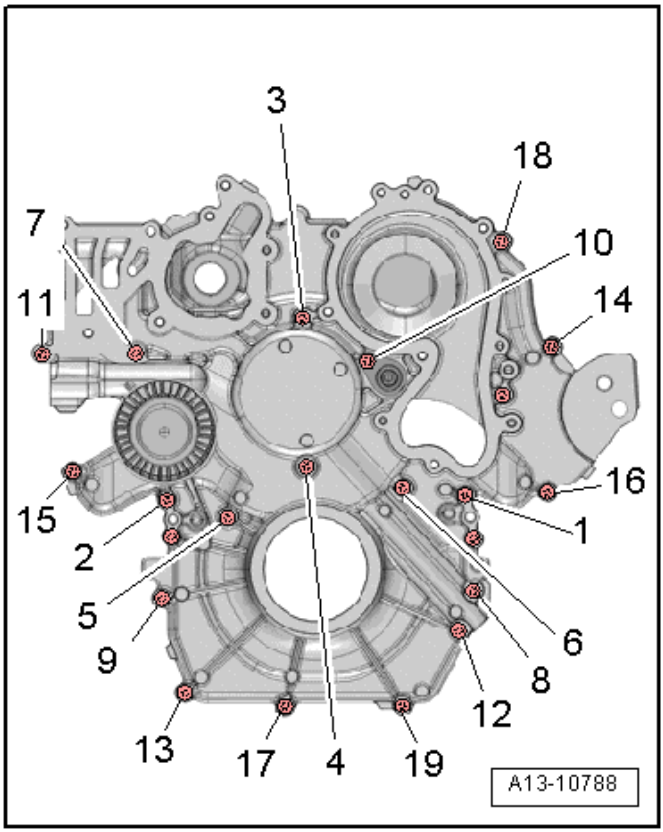


Tighten the bolts in 11 steps in the sequence shown.

Steps 1 … 3:

Steps	Bolts	Tightening Specification
1		Attach the sealing flange with the seal to the cylinder block
2	1	Tighten for the idler roller 23 Nm
3	2, 3, 4	Tighten the M6x20 to 9 Nm

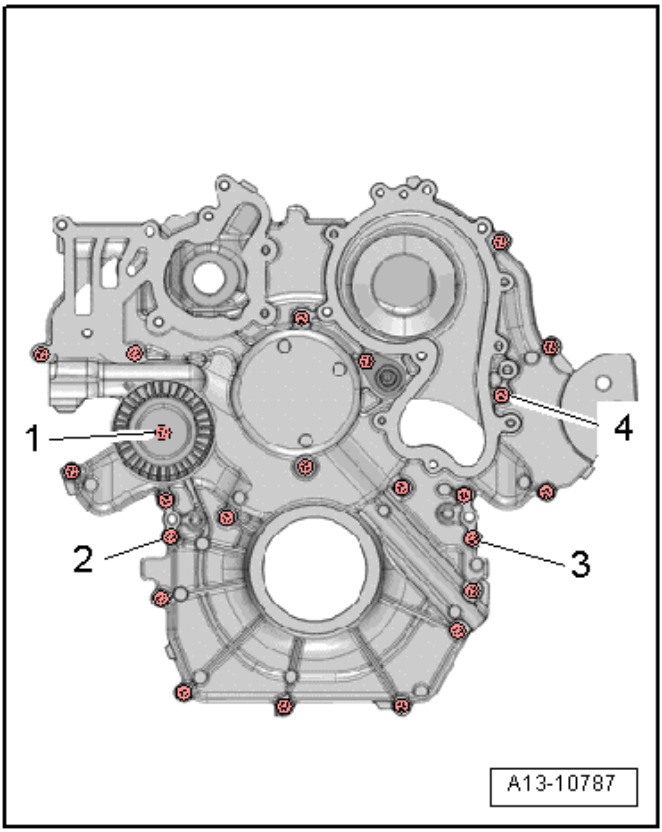
Ribbed Belt Sealing Flange Tightening Specification *(cont'd)*



Steps 4 … 8:

Steps	Bolts	Tightening Specification
4		Insert a temperature regulator for the engine oil cooler with the cover
5	10	Install all the way in by hand.
6	1 to 19	3 Nm
7	1 to 19	3 Nm - this measurement accounts for the seal shrinkage
8	1 to 19	Tighten 90° additional turn

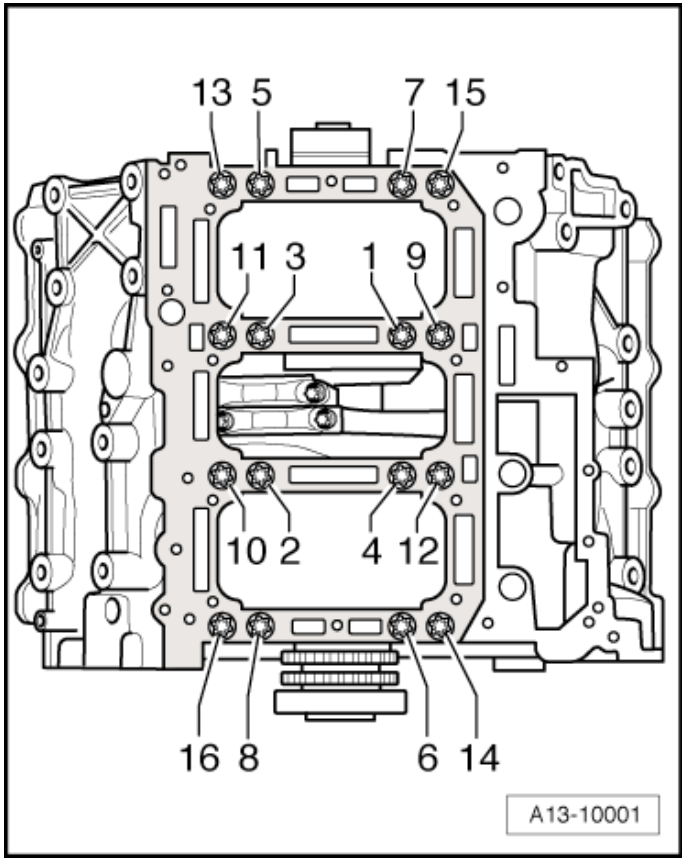
Ribbed Belt Sealing Flange Tightening Specification *(cont'd)*



Steps 9 … 11:

Steps	Bolts	Tightening Specification
9	2, 3, 4	Remove the steel bolts M6x20
10	2, 3, 4	Insert the aluminum bolts and tighten to 3 Nm
11	2, 3, 4	Turn the aluminum bolts 90° further

Guide Frame Tightening Specifications



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

[1] Replace fastener(s).

Crankshaft Dimensions

Honing dimension in mm	Crankshaft bearing pin diameter		Crankshaft connecting rod journal diameter	
Basic dimension	65.000	– 0.022	60.000	– 0.022
		– 0.042		– 0.042

Piston Ring End Gaps

Piston ring dimensions in mm	New	Wear limit
1st compression ring	0.25 to 0.40	0.60
2nd compression ring	0.70 to 0.90	1.20
Oil scraping ring	0.25 to 0.50	0.70

1) Not determined.

Piston Ring Clearance

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

Piston and Cylinder Dimensions

Honing dimension in mm	Piston diameter	Cylinder bore diameter
Nominal dimension	82.924 and 82.936 1)	83.006 and 83.014 1)
Repair stage	82.964 and 82.976 1)	83.046 and 83.054 1)

1) Dimension without graphite coating (thickness 0.02 mm). The graphite coating wears away.

Piston Projection, Measuring at “TDC”

Piston Projection above the Upper Edge of the Cylinder Block	Identification Holes
0.82 to 0.92 mm	1
0.92 to 0.97 mm	2
0.97 to 1.08 mm	3

Cylinder Head, Valvetrain – 3.0L CPNB (TDI)

Fastener Tightening Specifications

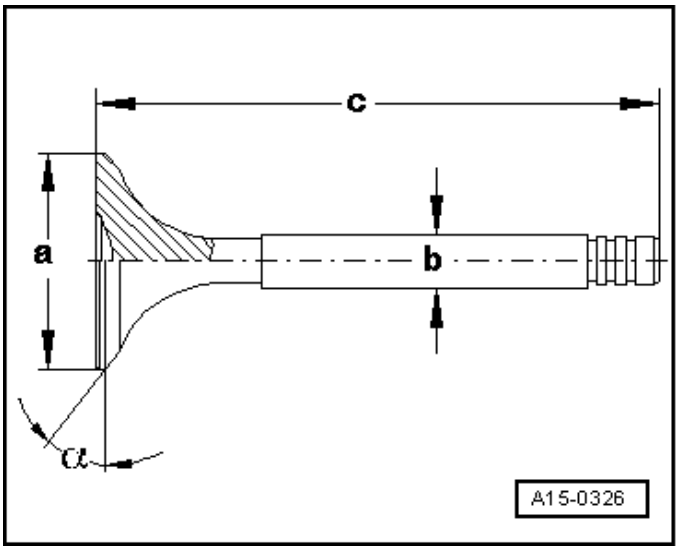
Component	Nm
Balance weight belt pulley side to balance shaft bolt	60
Balance weight transmission side to balance shaft nut [2]	30 plus an additional 90° (¼ turn)
Bracket to cylinder head bolt	23
Camshaft chain sprocket bolt	23
Chain tensioner for the camshaft timing chain bolt [1]	5 plus an additional 90° (¼ turn)
Chain tensioner with glide track bolt [1]	5 plus an additional 90° (¼ turn)
Coolant pipes banjo bolt	12
Drive chain sprocket for the oil pump bolt [1]	30 plus an additional 45° (⅛ turn)
Drive chain sprocket to balance weight bolt	23
Engine lifting eye bolt	23
Gear carrier bolt	9
Guide rail guide pin [1]	5 plus an additional 90° (¼ turn)
Jump protector bolt	9

[1] Replace fastener(s).
[2] 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

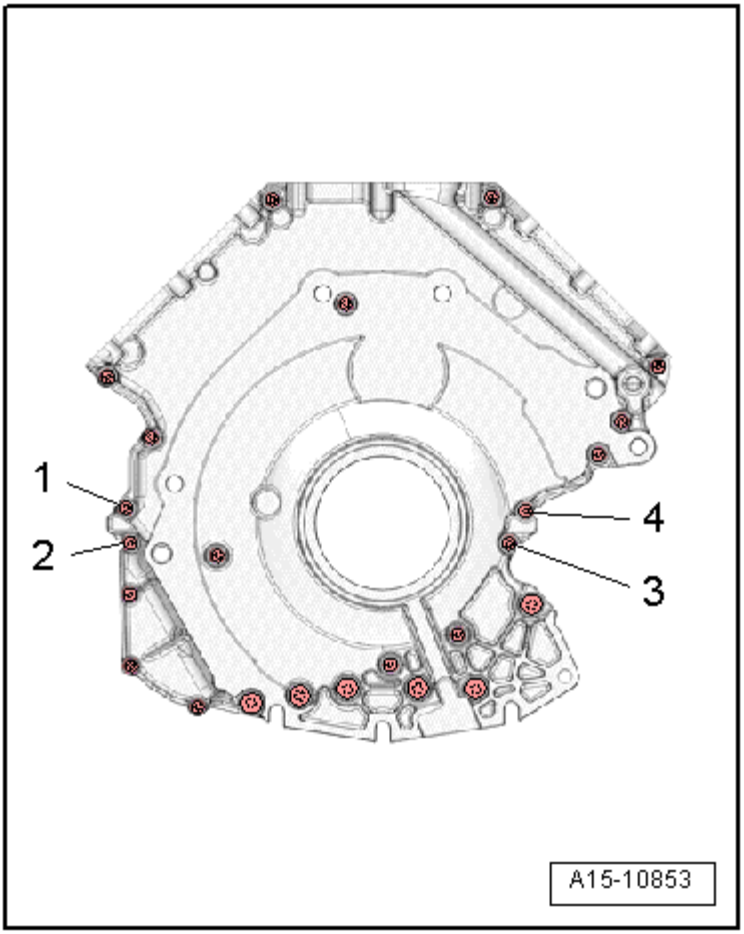
Valve Dimensions



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
α	∠°	45° 10'	45° 10'

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

Lower Timing Chain Cover Tightening Specifications

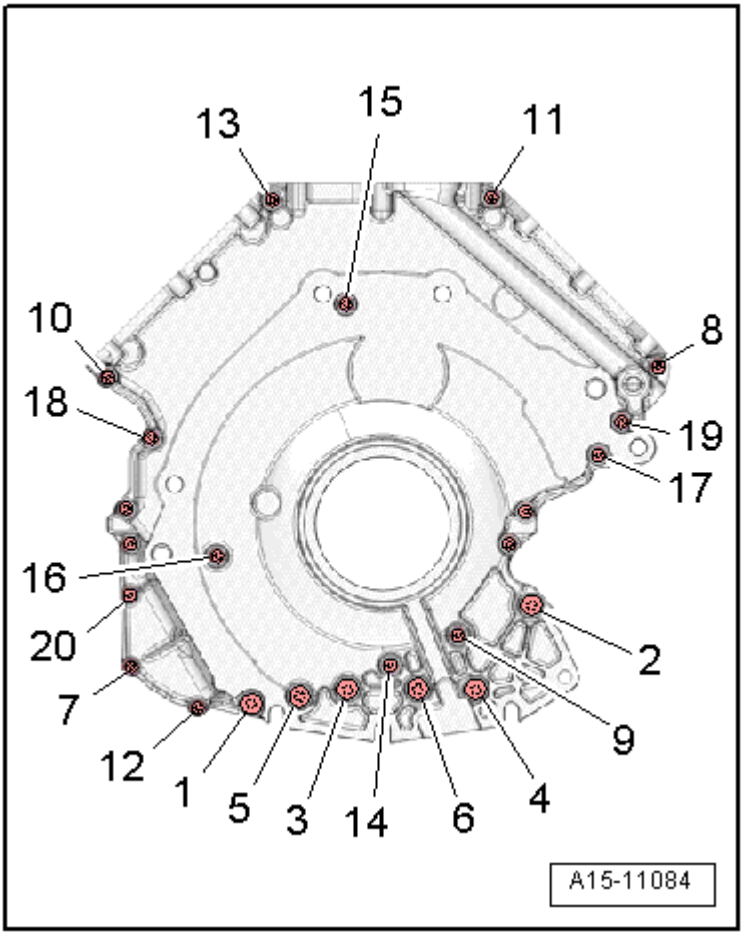


Tighten the bolts in multiple steps in the sequence shown.
Replace any bolts that were tightened with an additional turn.

Steps 1 and 2:

Step	Bolts	Tightening Specification/Additional Turn
1		Attaching the timing chain guard lower section with the sealant and the sealing pieces to the cylinder block
2	1, 2, 3, and 4	Tighten the M6x20 to 9 Nm

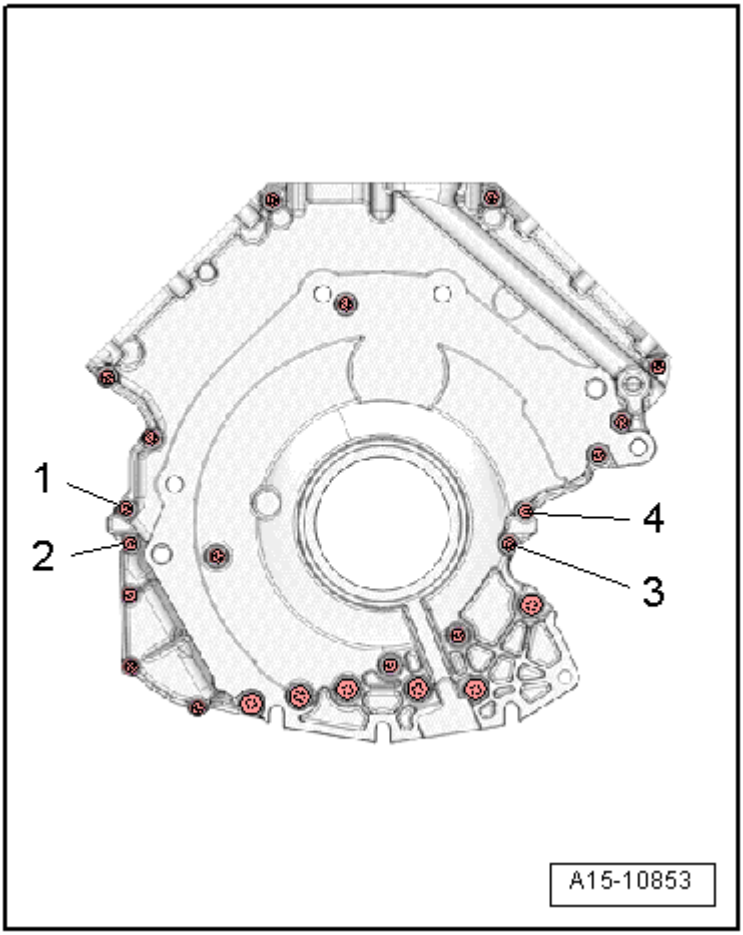
Lower Timing Chain Cover Tightening Specifications *(cont'd)*



Steps 3 to 6:

Step	Bolts	Tightening Specification/Additional Turn
3	1 to 20	3 Nm
4	1 to 20	3 Nm - this measurement takes into account the lower timing chain cover shrinkage.
5	1 to 6	8 Nm
6	1 to 20	Tighten 90° additional turn

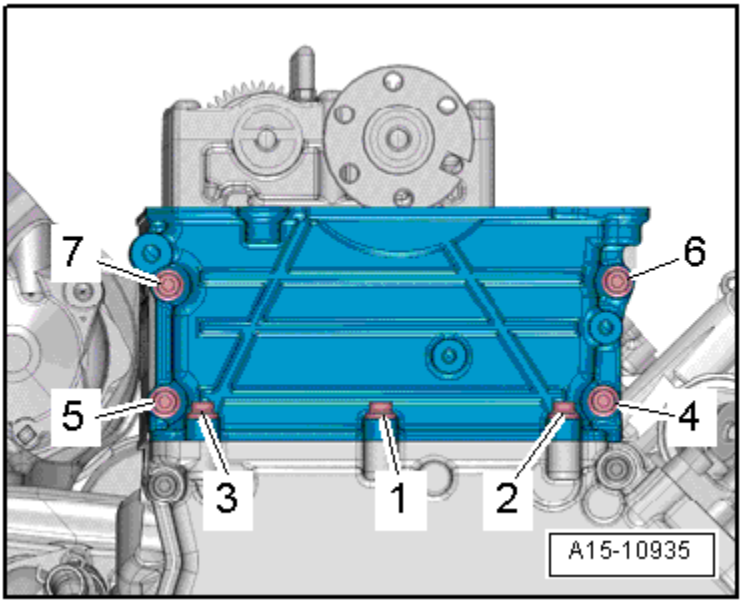
Lower Timing Chain Cover Tightening Specifications *(cont'd)*



Steps 7 to 9:

Step	Bolts	Tightening Specification/Additional Turn
7	1, 2, 3, and 4	Remove the steel bolts M6x20
8	1, 2, 3, and 4	Insert the aluminum bolts and tighten to 3 Nm
9	1, 2, 3, and 4	Turn the aluminum bolts 90° further

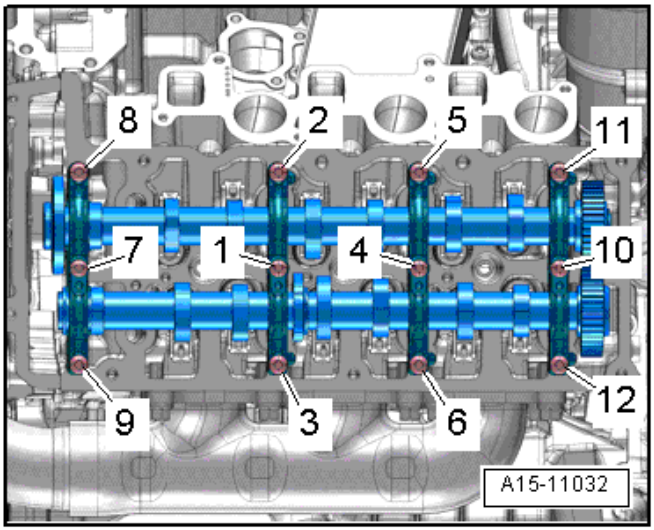
Upper Timing Chain Cover Tightening Specifications



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

Step	Bolts	Tightening Specification/Additional Turn
1	1, 2, and 3	Install all the way in by hand.
2	4 to 7	Install all the way in by hand.
3	1 to 7	8 Nm
4	1 to 7	8 Nm - this measurement takes into account the timing chain guard shrinkage.
5	1 to 7	Tighten 90° additional turn

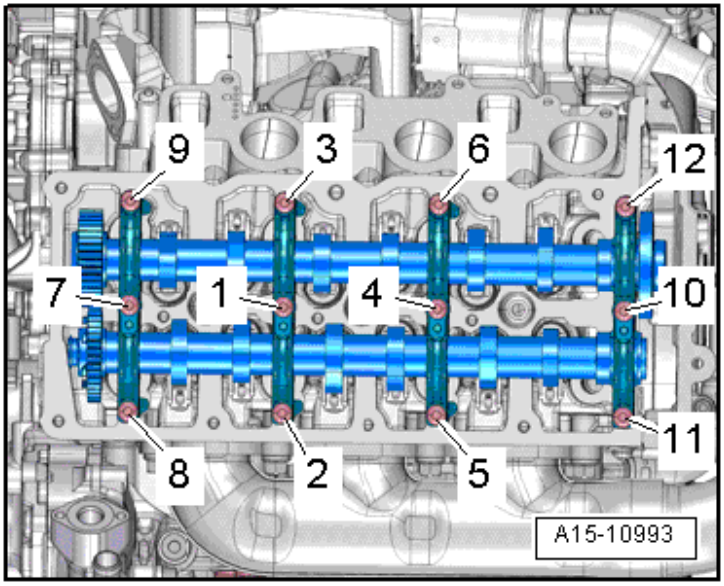
Cylinder Bank 1 (right) Bearing Cap - Tightening Specification and Sequence



Step	Bolts	Tightening Specification/Additional Turn
1	1 to 12	Install all the way in by hand.
2	1 to 12	9 Nm

1) Replace fastener(s) except bolt 3.

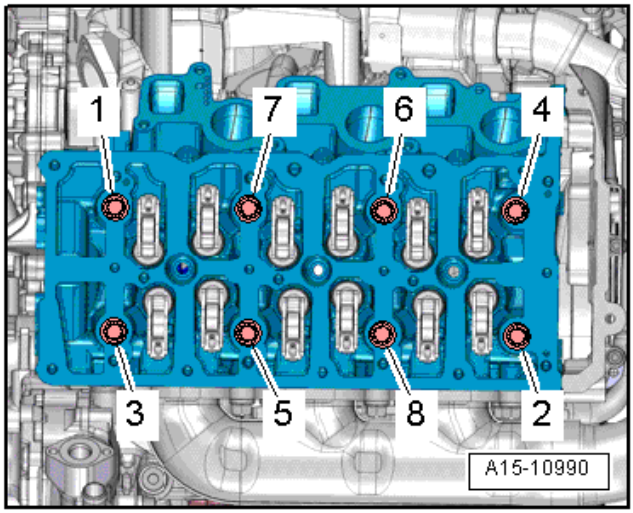
Cylinder Bank 2 (left) Bearing Cap - Tightening Specification and Sequence



NOTE: The left cylinder head is shown.
The right cylinder head is identical.

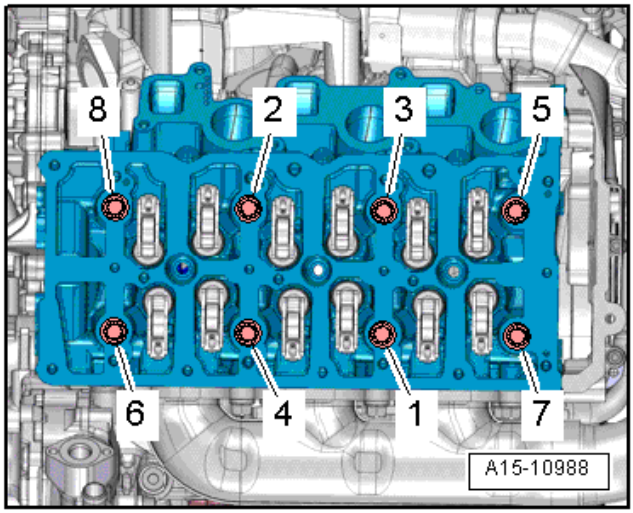
Step	Bolts	Tightening Specification/Additional Turn
1	1 to 12	Install all the way in by hand.
2	1 to 12	9 Nm

Cylinder Head, Loosening Bolts



Loosen the cylinder head bolts in the sequence -1 to 8

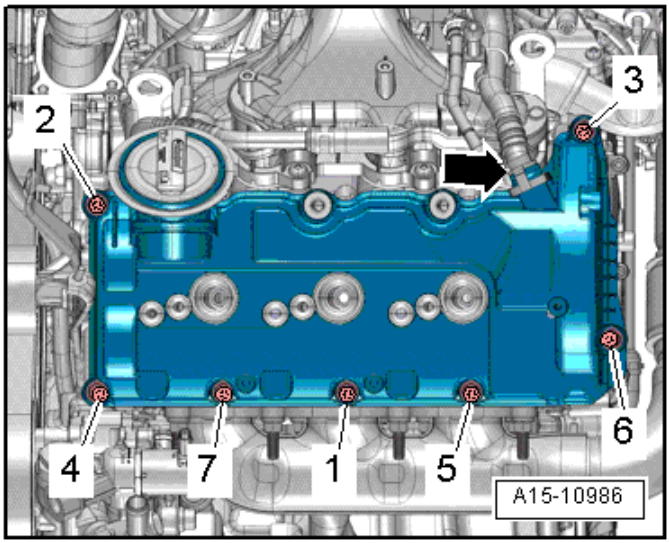
Cylinder Head - Tightening Specification and Sequence



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

Step	Bolts	Tightening Specification/Additional Turn
1	1 to 8	Install all the way in by hand.
2	1 to 8	35 Nm
3	1 to 8	70 Nm
4	1 to 8	an additional 90° (¼ turn)
5	1 to 8	an additional 90° (¼ turn)

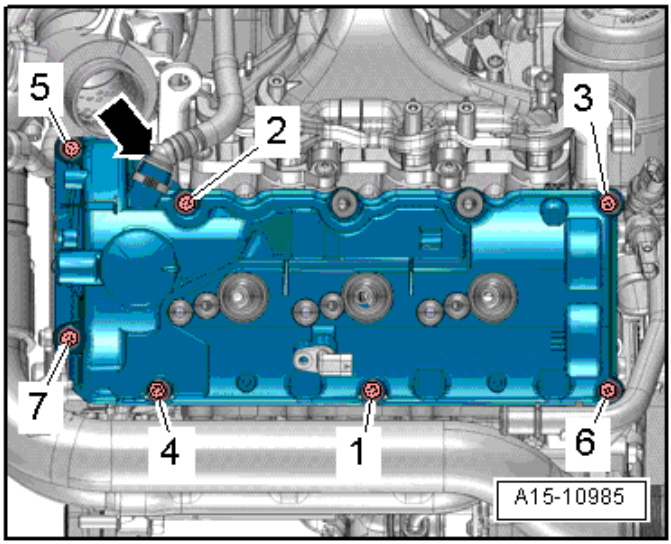
Left Cylinder Head Cover Tightening Specification



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

Step	Bolts	Tightening Specification/Additional Turn
1	1 to 7	Install all the way in by hand.
2	1 to 7	8 Nm
3	1 to 7	Tighten 90° additional turn

Right Cylinder Head Cover Tightening Specification



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

Step	Bolts	Tightening Specification/Additional Turn
1	1 to 7	Install all the way in by hand.
2	1 to 7	8 Nm
3	1 to 7	Tighten 90° additional turn

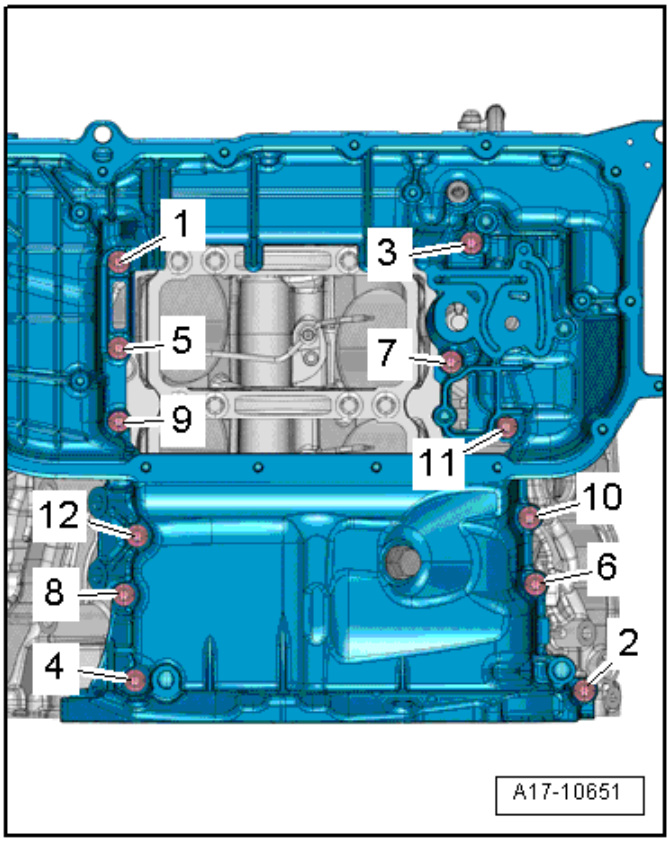
Lubrication – 3.0L CPNB (TDI)

Fastener Tightening Specifications

Component	Nm
Chain sprocket for the oil pump to input shaft bolt [1]	30 plus an additional 45° (⅛ turn)
Coolant shut-off valve to mounting plate bolt	9
Cover to oil filter housing	35
Engine oil cooler to mounting plate	9
Guide tube for the oil dipstick to engine bolt	9
Intake line to oil pump bolt	9
Mounting plate for the engine oil cooler bolt	9
Oil baffle bolt [1]	3 plus an additional 90° (¼ turn)
Oil drain plug	30
Oil filter housing bolt	9
Oil pan upper section drain plug [2]	25
Oil pressure regulation valve to oil pan upper section bolt	9
Oil pressure switch	20
Oil pump to oil return pipe bolt	9
Oil return pipe to oil pump bolt	9
Reduced oil pressure switch	20
Vacuum line from the vacuum pump	
- Bolt	9
- Bolt [1]	3 plus an additional 45° (⅛ turn)

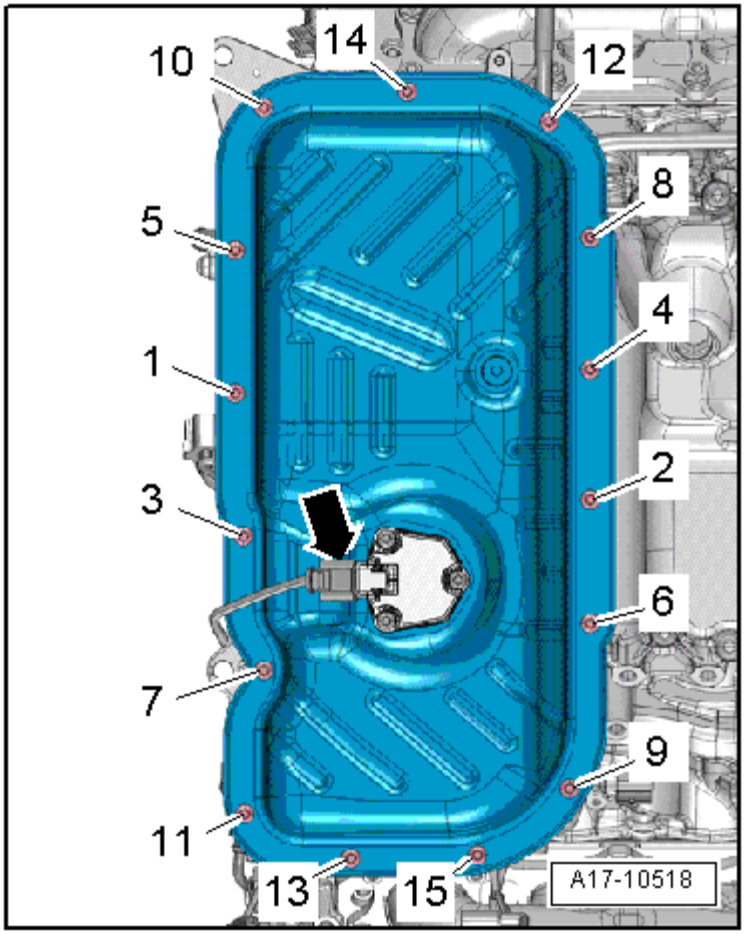
1) Replace fastener(s).
2) For Top Dead Center (TDC) marking
3) For bolt tightening clarification, refer to ElsaWeb, *Oil Pan Upper Section Overview* and see items -19 and 21.

Upper Oil Pan Section Tightening Specifications



Step	Bolts	Tightening specification/additional turn
1	1 to 12	2 Nm
2	1 to 12	5 Nm
3	1 to 12	Tighten 90° additional turn

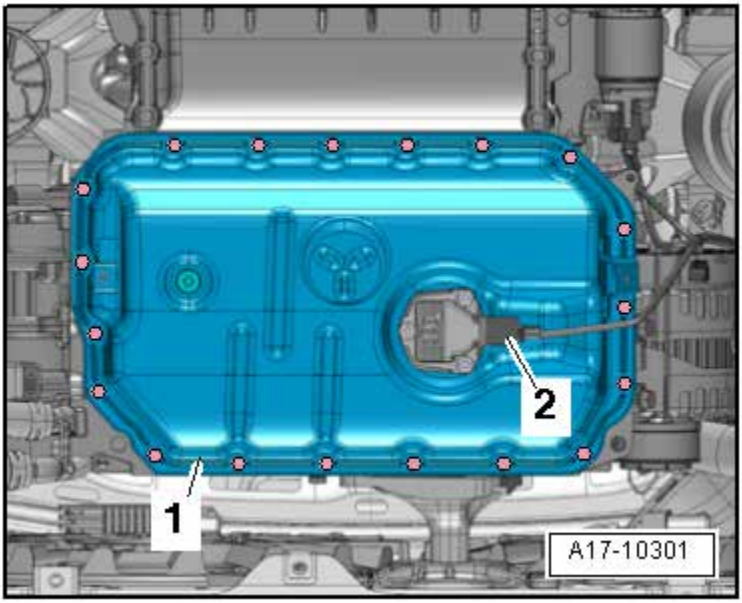
Lower Oil Pan Tightening Specifications



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

Step	Bolts	Tightening specification/additional turn
1	1 to 15	2 Nm
2	1 to 15	5 Nm
3	1 to 15	Tighten 90° additional turn

Oil Pump with Vacuum Pump - Tightening Specification and Sequence



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

Step	Bolts	Tightening specification/additional turn
1	1 to 3	Install all the way in by hand.
2	1 to 3	8 Nm
3	1 to 3	Tighten 90° additional turn

Cooling System – 3.0L CPNB (TDI)

Fastener Tightening Specifications

Component	Nm
Bracket for coolant auxiliary cooler bolt	
- Bolt	20
- Nut	8
Bracket to coolant auxiliary cooler bolt	3.5
Check valve bolt	9
Coolant connection bolt	9
Coolant fan control module to fan shroud bolt	2.5
Coolant pipes [2]	
- Bolt	9
- Banjo Bolt	12
Coolant pump to engine bolt [1]	3 plus an additional 90° (¼ turn)
Coolant pump ribbed belt pulley to coolant pump bolt	23
Coolant shut-off valve to mounting plate bolt	9
Engine coolant temperature sensor bolt	9
Engine temperature control sensor bolt	9
Fan shroud to coolant fan bolt	5
Front coolant pipe bolt	9
Left rear coolant pipe bolt [3]	
- Bolt	9
- Bolt	20
Radiator bracket [4]	
- Bolt	4.5
- Bolt	5
Upper coolant pipe bolt	9

[1] Tighten diagonally in steps

[2] For bolt tightening clarification, refer to ElsaWeb, *Coolant Pipes Overview*, items 13, 15 and 16.

[3] For bolt tightening clarification, refer to ElsaWeb, *Coolant Pipes Overview*, items 22 and 24.

[4] For bolt tightening clarification, refer to ElsaWeb, *Radiator Overview* items 18 and 20.

Fuel Supply – 3.0L CPNB (TDI)

Fastener Tightening Specifications

Component	Nm
Accelerator pedal module to bracket bolt	8
Fuel filter bracket nut	2.1
Fuel filler neck to fender bolt	20
Fuel pump control module bolt	1.6
Heat shield to fuel tank bolt	2
Locking flange cover screw	1.5
Locking ring	110
Mounting strap to body bolt	20
Reducing agent filler tube bolt	2.5

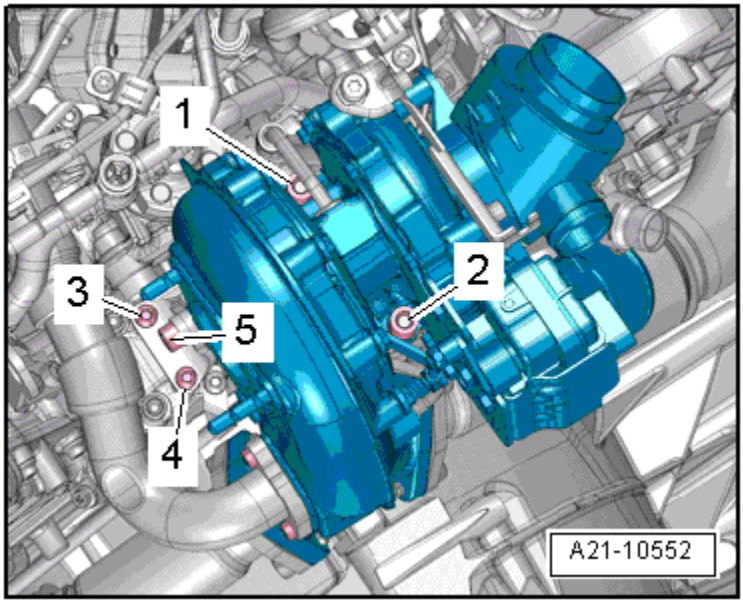
Turbocharger, G-Charger – 3.0L CPNB (TDI)

Fastener Tightening Specifications

Component	Nm
Bracket for connector and engine cover to turbocharger	9
Bracket for turbocharger bolt [1)]	23
Bracket for turbocharger stud bolt [2)]	10
Charge air cooler	7
Charge air pressure sensor/intake air temperature sensor bolt	5
Clamp 13 mm wide	5.5
Clamp 9 mm wide	3.4
Connection to turbocharger bolt	9
Right air guide pipe bolt	9

1) Tighten last to 23 Nm diagonally and in steps.
2) Replace nuts after each time they are loosened.

Turbocharger - Tightening Specification and Sequence



Tighten the bolts and nuts in seven steps in the sequence shown.
Replace the stud bolts and nuts.

Step	Bolts	Tightening specification/additional turn
1	Stud bolts for the nuts -1, and 2-	10 Nm
2	1 and 2	Install all the way in by hand.
3	1 and 2	9 Nm
4	1 and 2	Tighten 90° additional turn
5	3, 4 and 5	Install all the way in by hand.
6	3 and 4	9 Nm
7	56	23 Nm

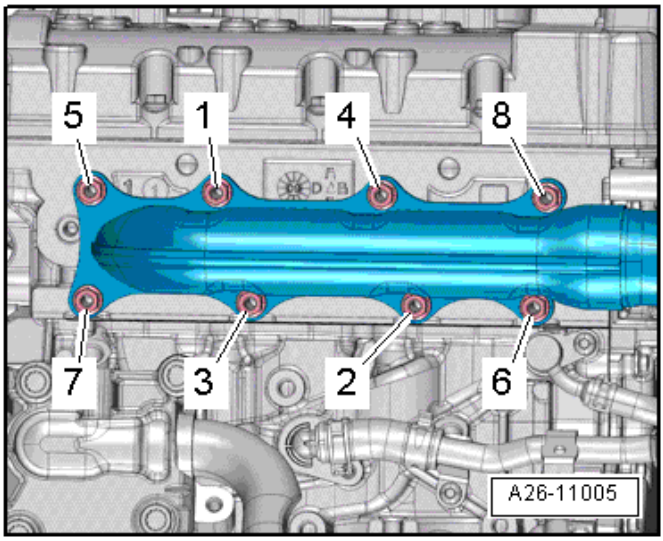
Exhaust System, Emission Controls – 3.0L CPNB (TDI)

Fastener Tightening Specifications

Component	Nm
Clamp for front exhaust pipe to reducing agent injector bolt	5
Clamping sleeve nut	23
Connection to EGR cooler bolt	23
Coolant connection bolt	9
Cover for the reducing agent tank to tank	2
EGR cooler bolt	9
EGR motor to connection bolt	9
EGR temperature sensor	
- Aluminum exhaust gas recirculation radiator bolt	35
- Steel exhaust gas recirculation radiator bolt	45
Engine coolant temperature sensor bolt	9
Exhaust manifold bolt [1) 2)]	30 plus an additional 90° (¼ turn)
NOx sensor control module 2 with NOx sensor 2	
- Bolt	50
- Nut	2
Particulate filter with catalytic converter nut [1) 2)]	23
Particulate sensor	
- Bolt	45
- Nut	2
Pressure line for the differential pressure sensor	45
Pressure pipe for differential pressure sensor	45
Reducing agent metering system control module to base plate bolt	4.5
Suspended mount bolt	23
Selective Catalytic Reduction (SCR) - catalytic converter to front exhaust pipe nut	23
Tank For the reducing agent bolt	20

1) Replace fastener(s).
2) Coat the thread with hot bolt paste.

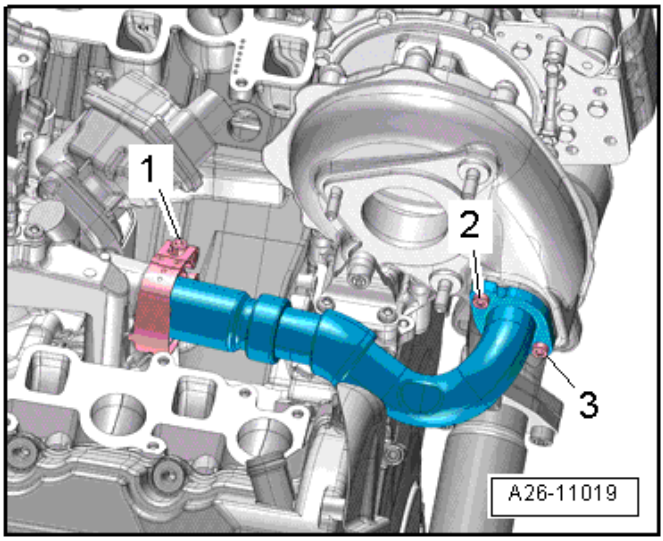
Exhaust Manifold - Tightening Specification and Sequence



Replace the nuts. Coat the thread on the nut with hot bolt paste. Refer to the Parts Catalog. Tighten the nuts in 3 steps according to the tightening sequence:

Step	Bolts	Tightening specification
1	Stud bolts for the nuts -1, and 2-	Install all the way in by hand.
2	1 and 2	15 Nm
3	1 and 2	25 Nm

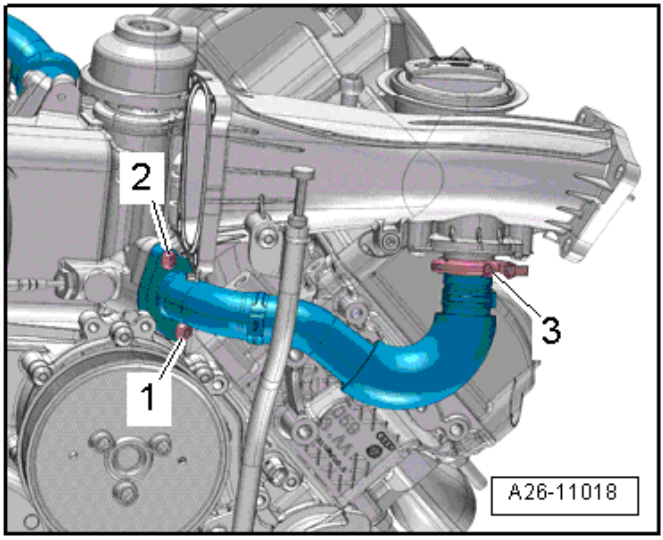
EGR Pipe at the Turbocharger - Tightening Specification and Sequence



Replace the nuts. Coat the thread on the nut with hot bolt paste. Refer to the Parts Catalog. Tighten the nuts in 3 steps according to the tightening sequence:

Step	Bolts	Tightening specification
1	2 and 3	Turn them by hand until the bolt heads are touching
2	1	Position using the tab on the EGR pipe tightening specification. • Part number 059 131 548 C: 5 Nm • Part number 059 131 548 D: 3.5 Nm
3	2 and 3	5 Nm
4	2 and 3	Tighten 90° additional turn

Exhaust Gas Recirculation (EGR) Pipe at the Intake Manifold - Tightening Specification and Sequence



The flange at the EGR pipe must not be wavy or bent. Attach the EGR pipe with the seals and the screw-type clamps. Coat the thread on the bolts with hot bolt paste; for the correct hot bolt paste refer to the Parts Catalog.

Step	Bolts	Tightening specification
1	1 and 2	Turn them by hand until the bolt heads are touching
2	3	Position them as shown in the illustration 2.5 Nm
3	1 and 2	9 Nm

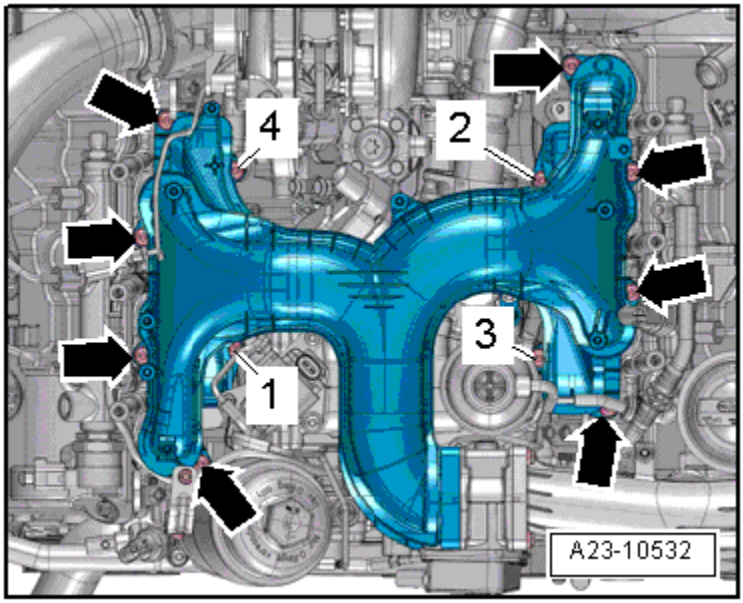
Multiport Fuel Injection – 3.0L CPNB (TDI)

Fastener Tightening Specifications

Component	Nm
Adapter to high pressure pump bolt	70
Air guide bolt	1.5
Air guide pipe to intake flap motor bolt	9
Bracket for the air guide pipe bolt	9
Bracket for the connector to intake manifold bolt	4
Clamp the high pressure line bolt	9
Counter pin	
- On camshaft bearing	2.5
- On cylinder head	9
Differential pressure sensor	4.5
Fuel rail bolt	22
Fuel return hose to fuel rail banjo bolt	25
Fuel temperature sensor	2
High pressure line	25
High pressure pump bolt	22
Intake flap motor to intake manifold bolt	9
Intake manifold mounting pins to cover bolt	5
Mass airflow sensor bolt	3.5
NOx sensor control module with NOx sensor nut	2
Oxygen sensor [2)]	55
Particle sensor nut	2
Pipe for the exhaust gas recirculation to air guide pipe bolt	9
Pressure line for exhaust pressure sensor [1)]	45
Tensioning Claw [1)]	
- First tightening	6
- Second tightening	Tighten 90° additional turn
Wiring guide to intake manifold bolt	4

[1)] Replace
[2)] Coat threads with hot bolt paste

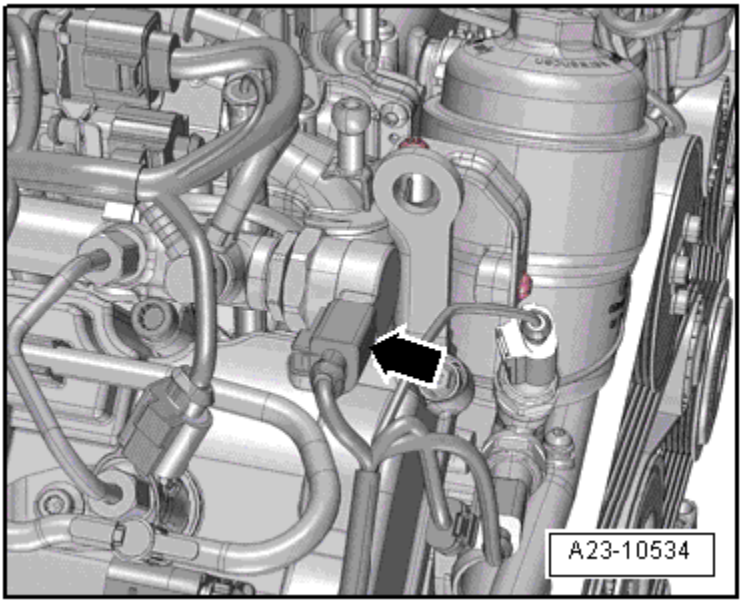
Intake Manifold - Tightening Specification and Sequence



Tighten the bolts in 3 steps as follows:

Step	Bolts	Tightening specification
1	1 through 4, arrows	Install all the way in by hand.
2	1 through 4	5 Nm in sequence shown
3	1 through 4 and arrows	9 Nm in any sequence

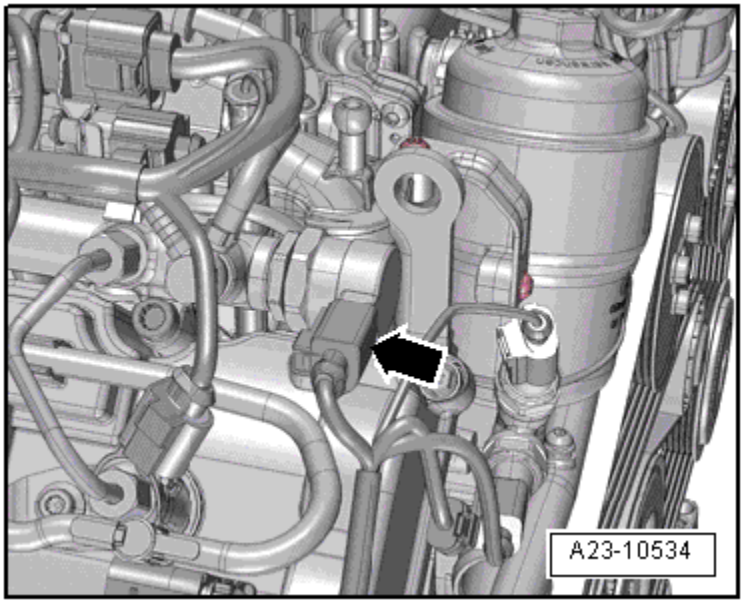
Fuel Pressure Regulator Valve -N276-
- Tightening Specification



Align the Fuel Pressure Regulator Valve -N276- such that connecting the harness connector -arrow- does not cause the electrical wiring to be placed under tension. Counterhold the housing hex bolt to tighten union nut on regulator valve in four stages as follows:

Step	Tightening specification
1	Install all the way in by hand.
2	60 Nm
3	Turn back 90°
4	85 Nm

Fuel Pressure Sensor -G247-
Tightening Specifications



Tighten the Fuel Pressure Sensor -G247- in four steps:

Step	Tightening specification
1	Install all the way in by hand.
2	60 Nm
3	Turn back 180°
4	85 Nm

Ignition – 3.0L CPNB (TDI)

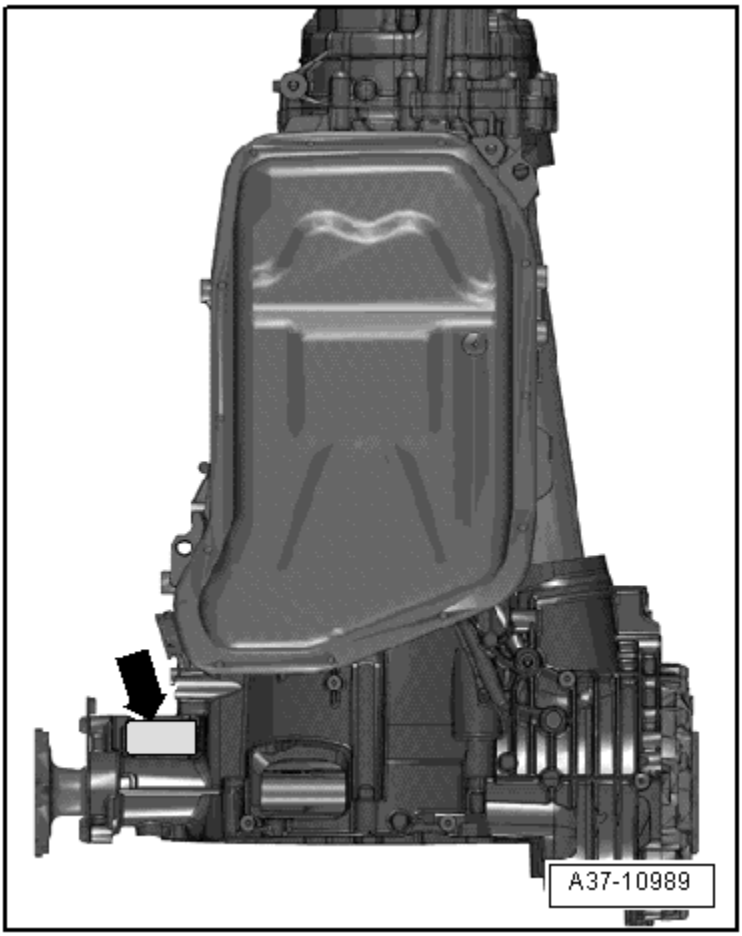
Fastener Tightening Specifications

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

AUTOMATIC TRANSMISSION – 0BK

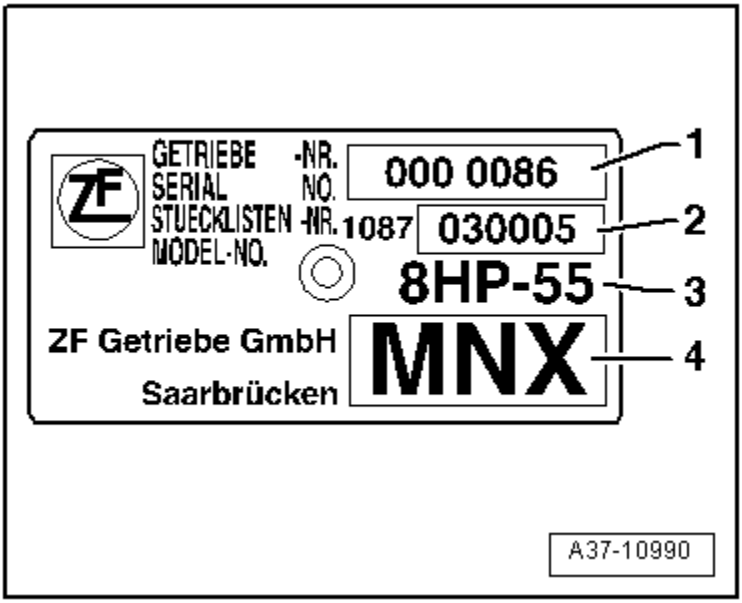
General, Technical Data – 0BK

Transmission Identification



The transmission code letters are located on the data plate under the transmission. Type plate installed location (➡).

Transmission Identification *(cont'd)*



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

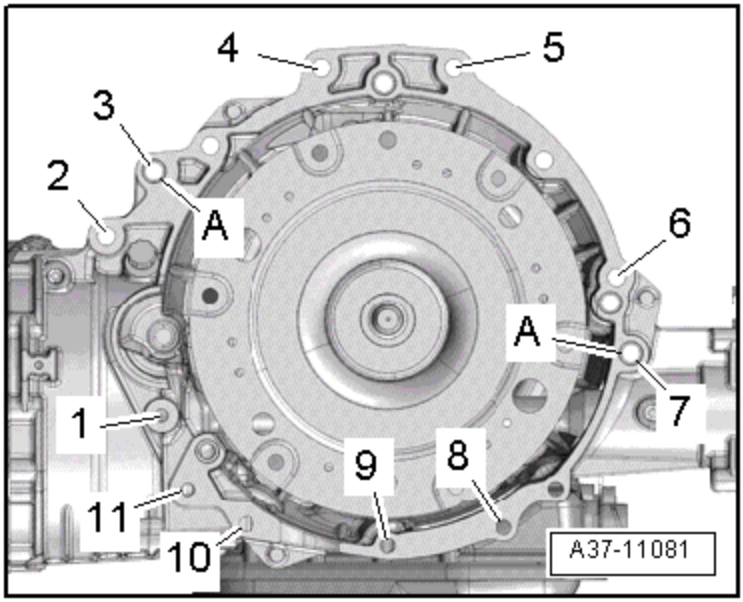
NOTE: The transmission code letters are also included on the vehicle data labels.

Code Letters, Transmission Allocations, Ratios and Equipment

Automatic Transmission		0BK AWD	
Transmission	Identification codes	NEU, NNT, NXT	NPV, PTT
Torque converter	Identification codes	Y137	N140
Allocation	Type	Audi A7 from MY 2011	Audi A6 from MY 2011 RS6
	Engine	3.0L TFSI - 228 kW	4.0L TFSI - 412 kW
Primary drive		25:27 = 0.862	27 : 29 = 0.931
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		2.848	3.076
Rear axle bevel gear		43:13 = 3.308	43 : 13 = 3.308
Complete rear axle ratio = rear axle bevel gear x primary drive		2.851	3.080
Oil system, front final drive/ transfer case		Separated	
Refer to the Parts Catalog for the following information: • Production time period. • Transmission fluid specification • Driveshaft flange allocation			

Automatic Transmission		0BK AWD
Transmission	Identification codes	PDC
Torque converter	Identification codes	F166
Allocation	Type	Audi A7 from MY 2011
	Engine	3.0L TDI - 176 kW
Primary drive		27 : 33 = 0.818
Gear wheel, front axle		30 : 31 = 0.968
Front axle bevel gear		35 : 11 = 3.182
Complete front axle ratio = primary drive x drive wheel x bevel gear		2.519
Rear axle bevel gear		37 : 12 = 3.083
Complete rear axle ratio = rear axle bevel gear x primary drive		2.523
Oil system, front final drive/transfer case		Separated
Refer to the Parts Catalog for the following information: • Production time period. • Transmission fluid specification • Driveshaft flange allocation		

Securing Transmission to Engine



Item	Bolt	Nm
1	M10 x 50 [1)]	65
2 through 6	M12 x 100 [2)]	30 plus an additional 90° (¼ turn)
7	M12 x 125	30 plus an additional 90° (¼ turn)
8, 11	M10 x 60 [2)]	15 plus an additional 90° (¼ turn)
9	M10 x 75 [2)]	15 plus an additional 90° (¼ turn)
10	M10 x 95 [2)]	15 plus an additional 90° (¼ turn)
A	Alignment sleeves for centering	

1) 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 reused.

2) 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.

Fastener Tightening Specifications

Component	Fastener size	Nm
ATF cooler to transmission bolt	-	8
ATF drain plug [2]	-	12
ATF pipe bolt [3]	-	8
	-	20
ATF pipe [4]	-	8
ATF plug for ATF in the transmission	-	30
Bolts and nuts	M6	9
	M7	15
	M8	20
	M10	40
	M12	65
Cable mounting bracket to transmission	-	8
Drive axle heat shields	-	23
Heat shield to transmission		
- Upper bolts	-	9
- Lower bolt	-	20
Nut for securing the shift mechanism to the body	-	8
Selector lever cable adjustment bolt	-	13
Stop to transmission mount [1] [2]	-	20 plus an additional 90° (¼ turn)
Transmission support to transmission	-	40
Transmission support to transmission mount		
- Bolt	-	40
- Nut [1]	-	20
Tunnel cross member		
- Bolt 8.8	M10 x 55	40
- Bolt 10.9	M10 x 40	70
Tunnel crossmember to transmission mount nut	-	20

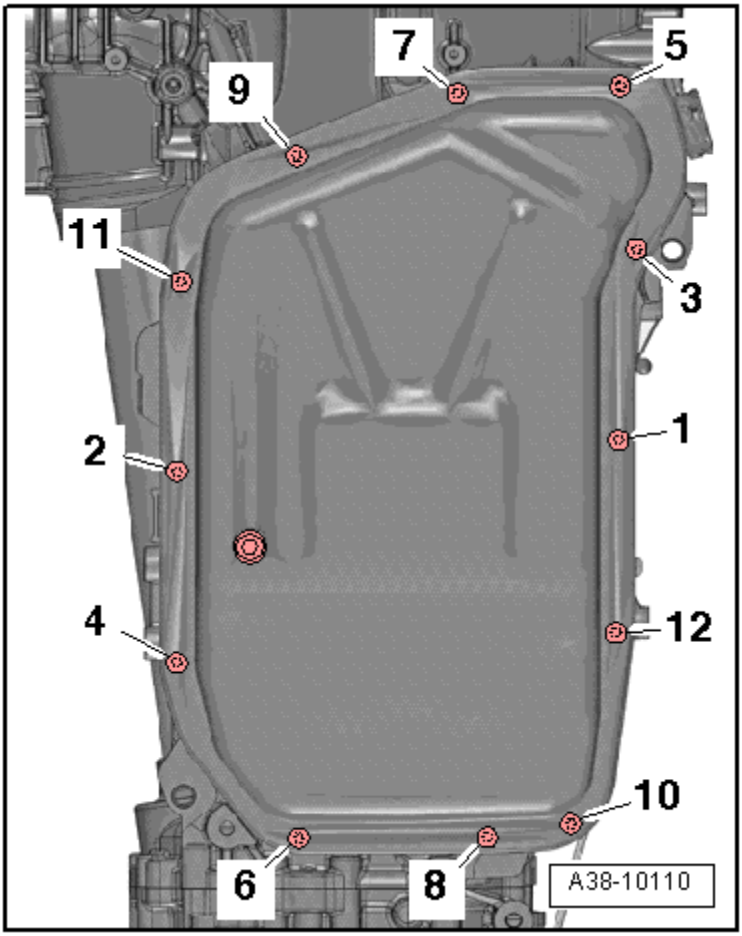
[1] Only remove if the transmission mount must be separated from the transmission support.
[2] Replace fastener(s).
[3] For bolt tightening clarification, refer to ElsaWeb, *Cooler and ATF Pipes Overview,* items 9 and 10.
[4] For bolt tightening clarification, refer to ElsaWeb, *Cooler and ATF Pipes Overview,* item 13

Fastener Tightening Specifications

Component	Nm
Automatic Transmission Fluid (ATF) drain plug [1)]	12
Connector housing	5.5
Mechatronic	10

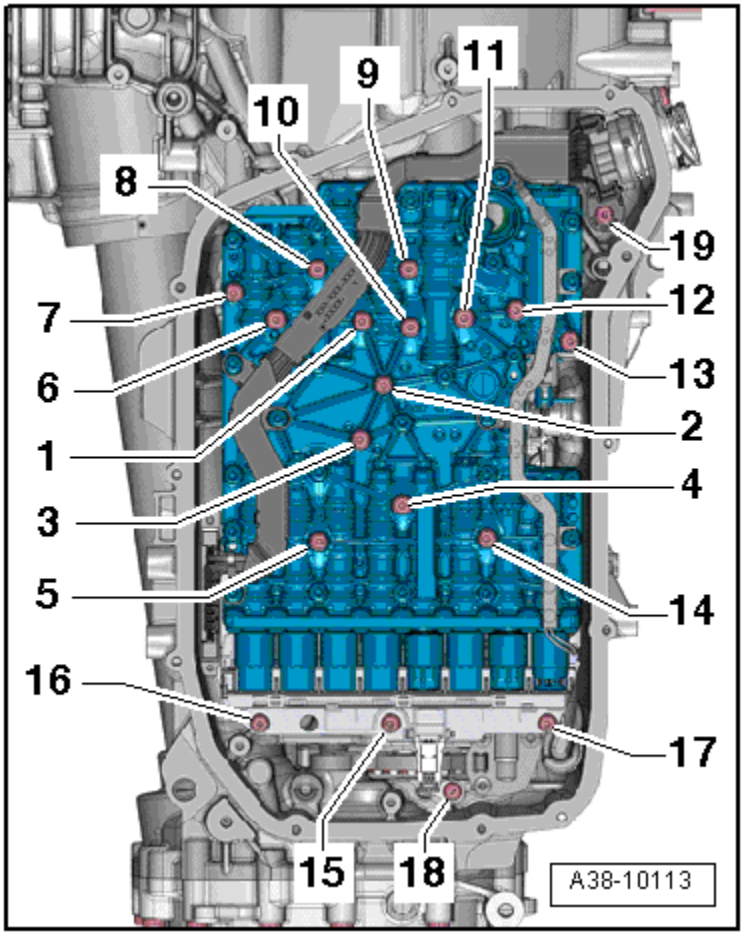
[1)] Replace fastener(s).

Automatic Transmission Fluid (ATF) Oil Pan – Tightening Specification and Sequence



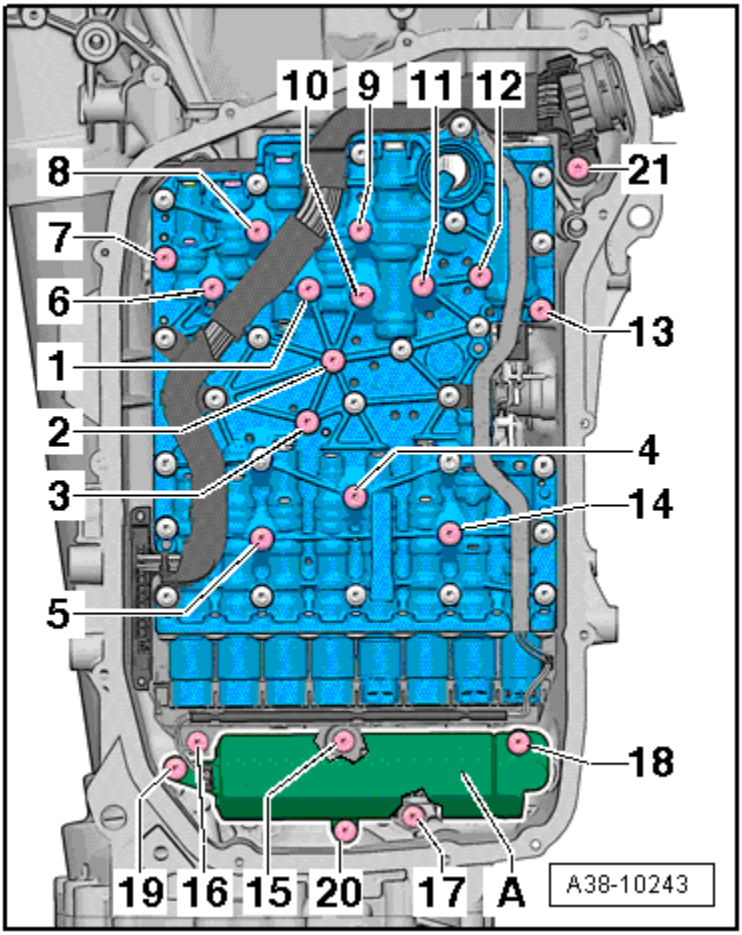
Step	Component	Nm
1	Replace and tighten bolts 1 through 12 in sequence	Hand-tighten
2	Tighten bolts 1 through 12 in sequence	4
3	Tighten bolts 1 through 12 in sequence	an additional 45° (⅛ turn)

Mechatronic without Hydraulic Pulse Memory Tightening Specification



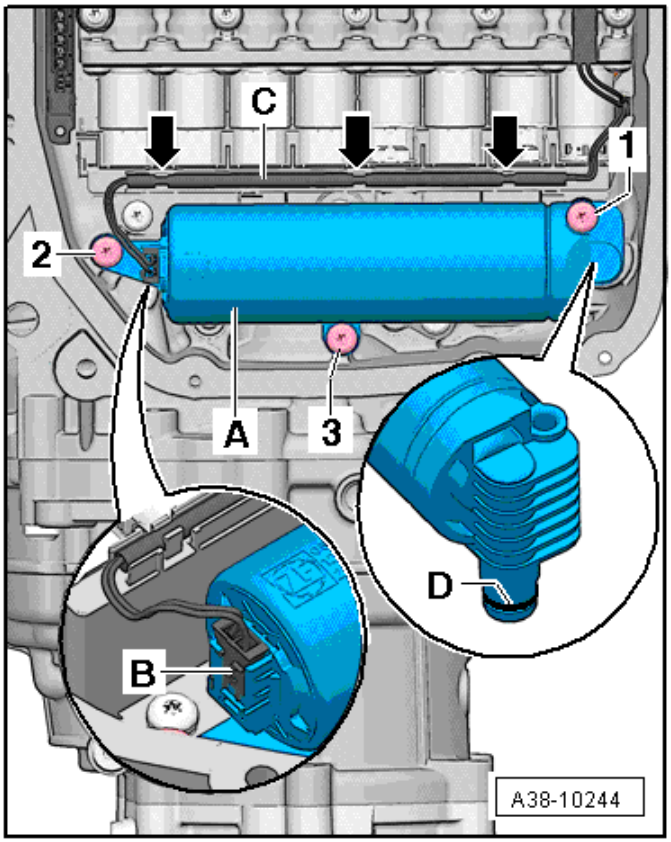
Component	Nm
Tighten bolts 1 through 19 in sequence	10

Mechatronic with Hydraulic Pulse Memory Tightening Specification



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

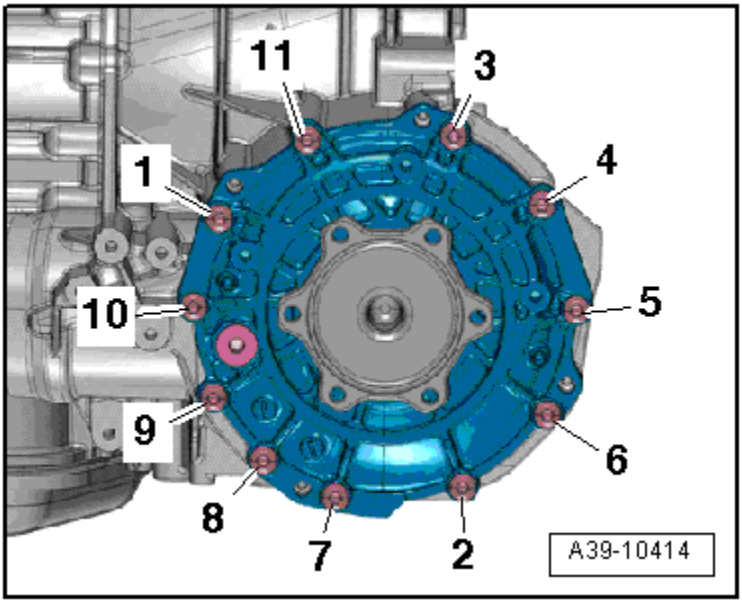
Rear Final Drive, Differential

Fastener Tightening Specifications

Component	Nm
Balance weight [1]	20 plus an additional 90° (¼ turn)
Front final drive cooler bolt	9
Left flange shaft bracket [2]	24
Transfer case transmission fluid drain plug [1]	27
Front final drive transmission fluid oil drain plug [1]	10
Transfer case transmission fluid oil drain plug [1]	12

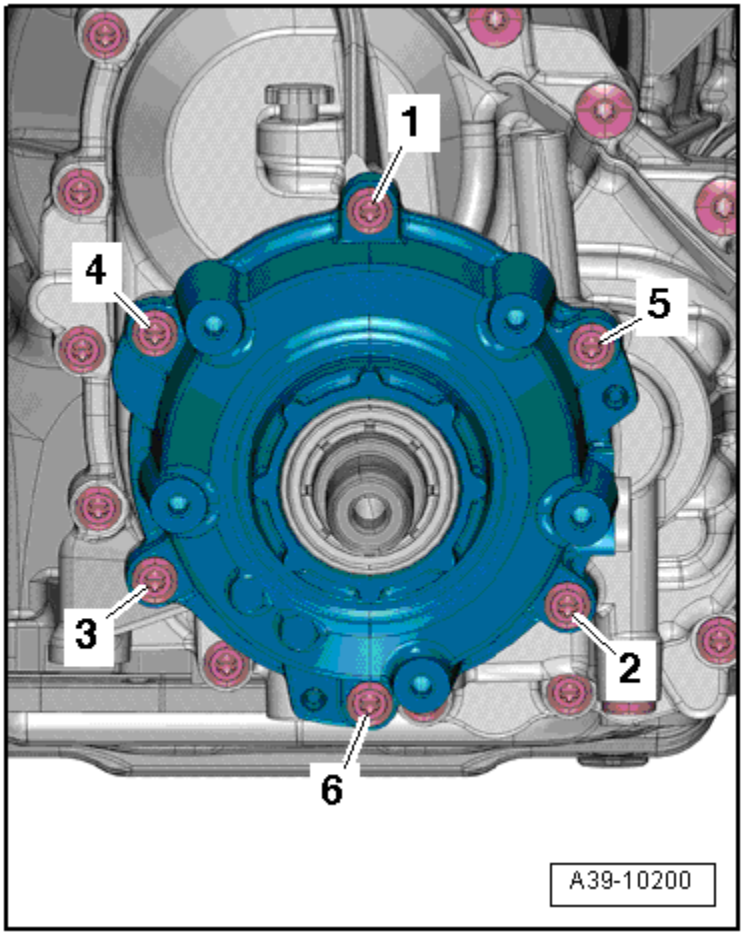
[1] Replace fastener(s).
[2] Steel bolt.

Front Final Drive Cover Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 and 6	3
2	Tighten bolts 1 through 11 in sequence	23

Center Differential Housing Tightening Specifications



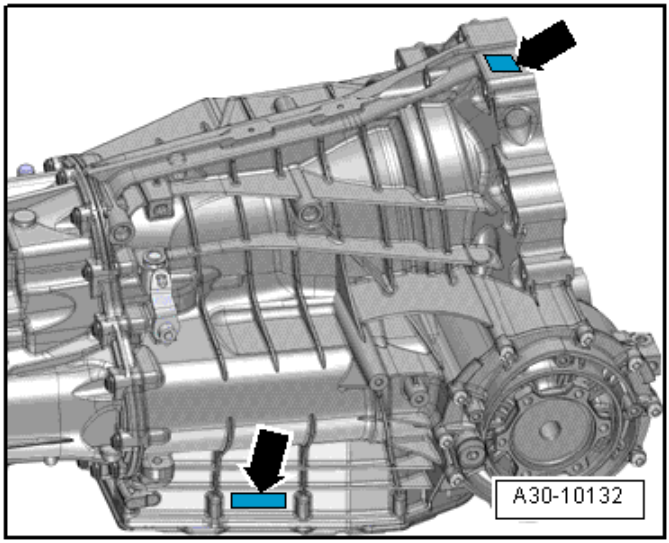
Step	Component	Nm
1	Replace and tighten bolts 1 and 6 [1)]	3
2	Tighten bolts 1 through 6 in sequence	10
3	Tighten bolts 1 through 6 in sequence	an additional 90° (¼ turn)

[1)] Replace fastener(s).

S TRONIC TRANSMISSION – 0B5

General, Technical Data

Transmission Identification



The transmission code letters are located on the transmission housing. The ➡ indicates the location of the type plate.

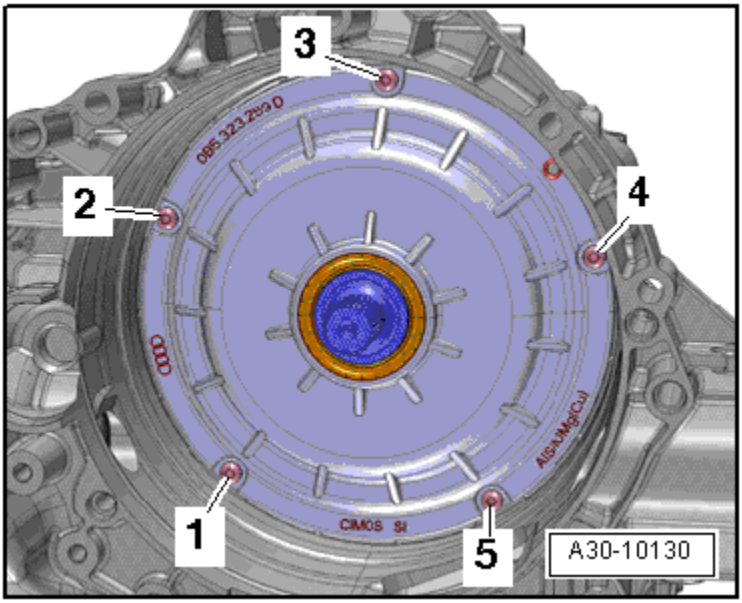
Transmission code:	LHF
Manufacturer key:	D04
Factory: K = Kassel:	K100808
Build date:	100808 = 10.08.2008

Code Letters, Transmission Allocations, Ratios and Equipment

S tronic transmission		0B5 AWD	
Transmission	Identification codes	NHH	NSK
Allocation	Model	A7 from MY 2011	A7 from MY 2011
	Engine	4.0L TFSI 300, 309 kW	4.0L FSI 300, 309 kW
Gear ratios	1st gear	48:13 = 3.692	48:13 = 3.692
	2nd gear	43:20 = 2.150	47:21 = 2.238
	3rd gear	45:32 = 1.406	53:34 = 1.559
	4th gear	41:40 = 1.025	47:40 = 1.175
	5th gear	37:47 = 0.787	43:47 = 0.915
	6th gear	30:48 = 0.625	38:51 = 0.745
	7th gear	27:52 = 0.519	37:60 = 0.617
	Reverse gear	53:18 = 2.944	53:18 = 2.944
Front Axle	Gear wheel	35:31 = 1.129	35:31 = 1.129
	Bevel gear	29:8 = 3.625	29:8 = 3.625
	Translation “i“	4.093	4.093
Rear axle	Bevel gear	37:9 = 4.111	37 : 9 = 4.111
Total ratio “i_{total}“ in the highest gear		2.124	2.124
Spread		7.11	7.11-

S tronic transmission		0B5 AWD	
Transmission	Identification codes	NHH	NSK
Allocation	Model	A7 from MY 2011	A7 from MY 2011
	Engine	4.0L TFSI 300, 309 kW	4.0L FSI 300, 309 kW
Gear ratios	1st gear	48:13 = 3.692	48:13 = 3.692
	2nd gear	43:20 = 2.150	47:21 = 2.238
	3rd gear	45:32 = 1.406	53:34 = 1.559
	4th gear	41:40 = 1.025	47:40 = 1.175
	5th gear	37:47 = 0.787	43:47 = 0.915
	6th gear	30:48 = 0.625	38:51 = 0.745
	7th gear	27:52 = 0.519	37:60 = 0.617
	Reverse gear	53:18 = 2.944	53:18 = 2.944
Front Axle	Gear wheel	35:31 = 1.129	35:31 = 1.129
	Bevel gear	29:8 = 3.625	29:8 = 3.625
	Translation “i“	4.093	4.093
Rear axle	Bevel gear	37:9 = 4.111	37 : 9 = 4.111
Total ratio “i_{total}“ in the highest gear		2.124	2,698
Spread		7.11	7.11

Clutch Cover Tightening Specification and Sequence



Tighten the bolts in three steps in the sequence shown:

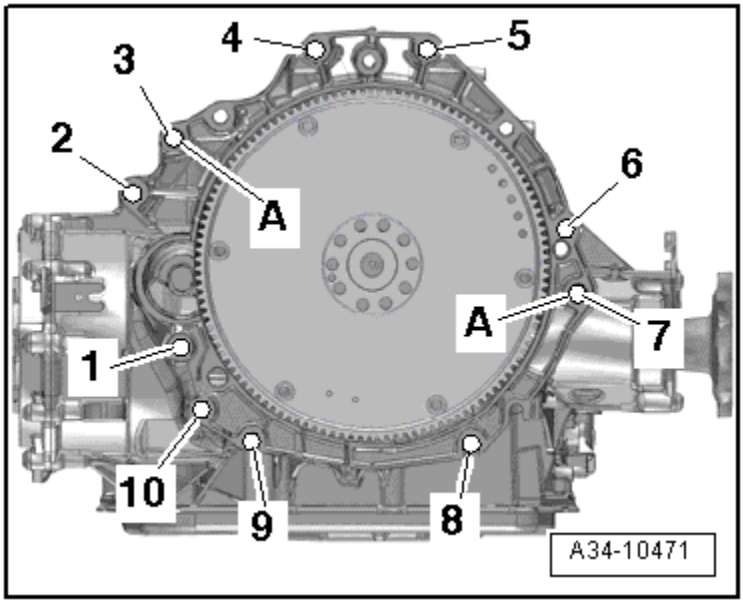
Step	Fastener	Tightening specifications
1	Tighten bolts 1 through 5 in sequence	Install by hand evenly until the bolt head contact the clutch cover.
2	Tighten bolts 1 through 5 in sequence	Tighten one after the other in 90° steps until the clutch cover contact the transmission housing.
3	Tighten bolts 1 through 5 in sequence	8 Nm

Fastener Tightening Specifications

Component	Fastener size	Nm
Flywheel to transmission	-	60

[1] Replace fastener(s).

Securing Transmission to Engine



Item	Fastener	Nm
1	M10 x 50 [2]	65
2 [1], 3 through 6	M12 x 100 [3]	30 plus an additional 90° (¼ turn)
7	M12 x 125 [3]	30 plus an additional 90° (¼ turn)
8	M10 x 60 [3]	15 plus an additional 90° (¼ turn)
9 and 10	M10 x 75 [3]	15 plus an additional 90° (¼ turn)
A	Alignment sleeves for centering	

[1] Mount the auxiliary adapter

[2] Bolt strength rating 10.9. There is no limit to the number of times steel bolts may be used.

[3] 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.

Fastener Tightening Specifications

Component	Fastener size	Nm
ATF drain plug	-	45
ATF fill and check plug	-	45
Air guide to transmission	-	3
Automatic Transmission Fluid (ATF) cooler-to-bracket	-	9
Automatic Transmission Fluid (ATF) cover-to-housing	-	8
Automatic Transmission Fluid (ATF) filter housing-to-transmission	-	10
Automatic Transmission Fluid (ATF) pipe/ hose line-to-ATF filter housing [2)]	-	8
		20
Bolts and nuts	M6	9
	M7	15
	M8	20
	M10	40
	M12	65
Cable mounting bracket-to-transmission	-	8
Cover-to-ATF housing	-	8
Cover-to-transmission		20
Drive axle heat shields	-	23
Heat Shield		
- Upper bolts	-	9
- Lower bolt	-	20
Securing shift mechanism-to-body, nut		8
Selector lever cable adjustment		13
Stop to transmission mount [1)]		20 plus an additional 90° (¼ turn)
Tunnel crossmember-to-transmission	-	70
Tunnel crossmember-to-transmission mount nut	-	20
Transmission Fluid (MTF) fill and check plug	-	45
Transmission Fluid (MTF) drain plug	--	45
Transmission support-to-transmission	-	40
Transmission support-to-transmission mount nut/bolt	-	20

1) Replace fastener(s).

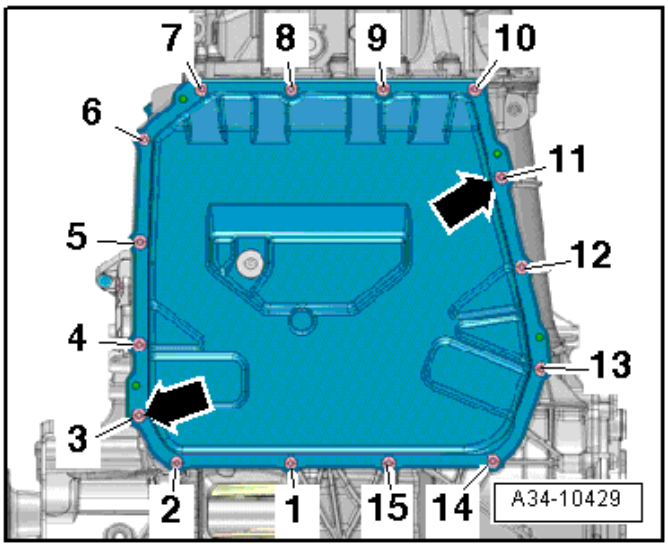
2) For bolt tightening clarification, refer to ElsaWeb, *ATF Pipe/Hose Lines Replaceable ATF Filter Overview,* items 15 and 17.

Fastener Tightening Specifications

Component	Fastener size	Nm
ATF filter cover-to-ATF filter housing	-	8
ATF filter housing-to-transmission housing	-	10
ATF pipe connection-to-transmission housing	-	10
Cable guide for the RPM sensors-to-transmission housing	-	8
Connector housing-to-transmission housing	-	8
Retaining plate to atf pressure pipes	-	10
Sensor module-to-transmission intermediate housing	-	8
Side shaft-to-transmission intermediate housing 1	-	150 plus an additional 90° (¼ turn)
Suction jet pump-to-transmission housing	-	4.5

1) Replace fastener(s).

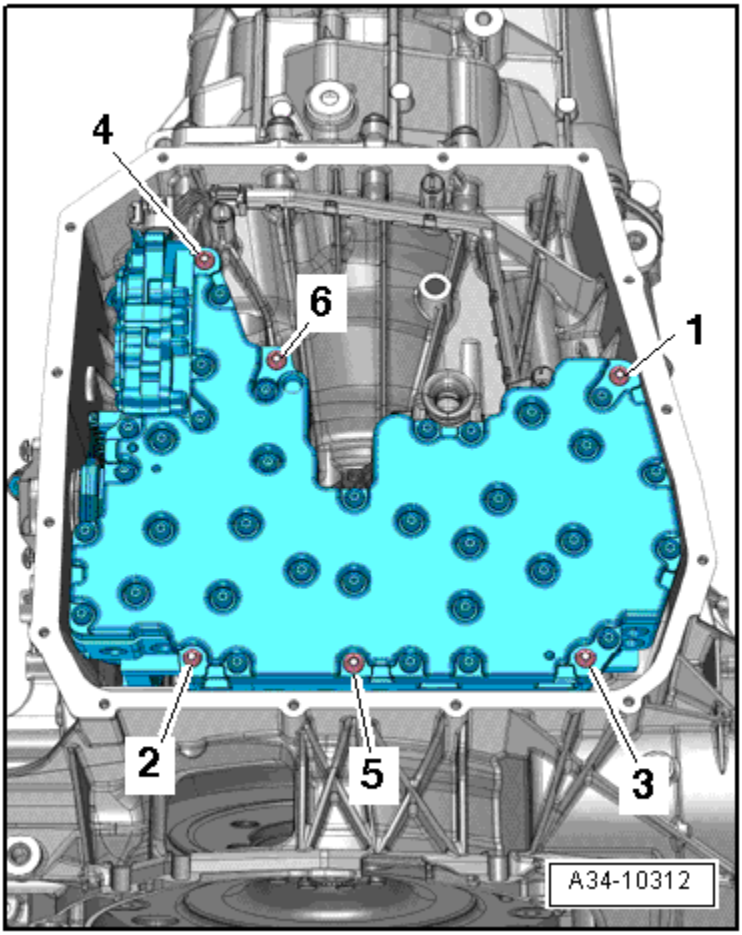
Oil Pan Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 15 in sequence 1)	Hand-tighten
2	Tighten bolts 1 through 15 in sequence	10

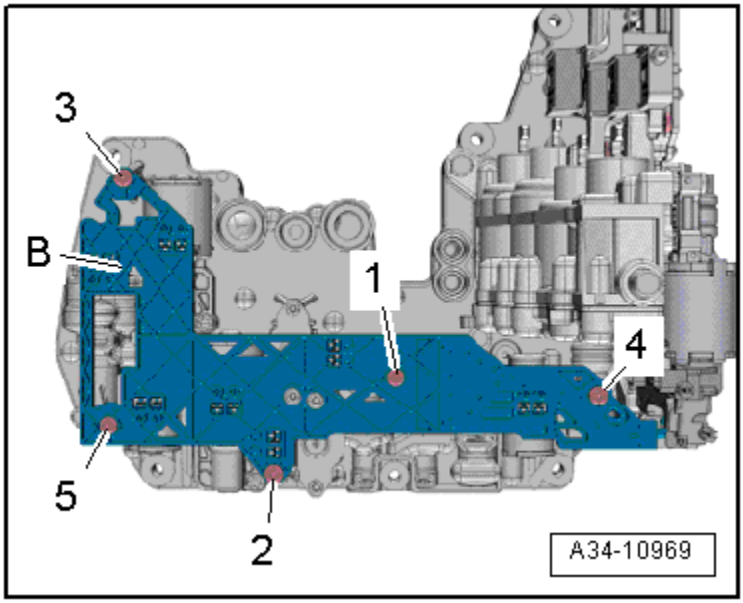
1) Replace fastener(s).

Mechatronic Tightening Specification



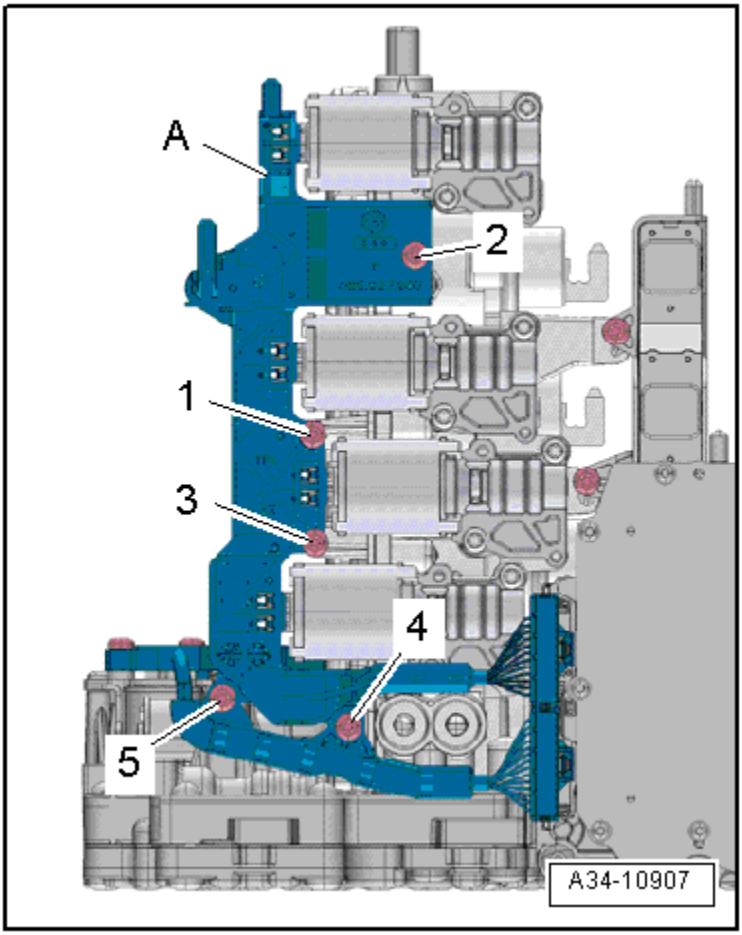
Component	Nm
Tighten bolts 1 through 6 in sequence	10

Circuit Board 1 Tightening Specifications



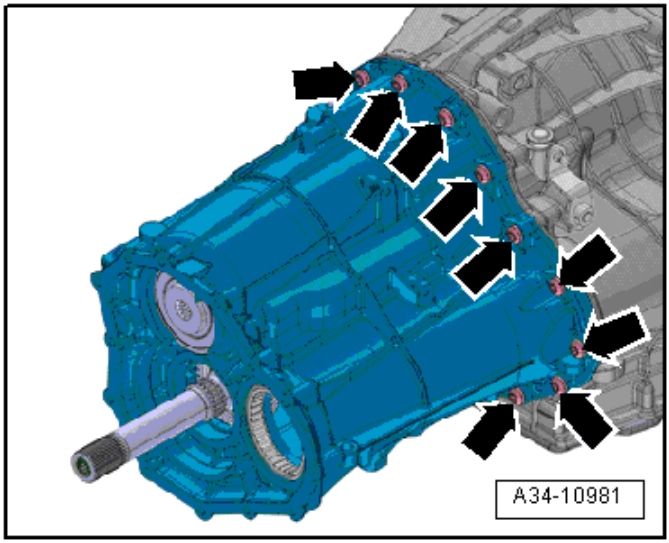
Component	Nm
Tighten bolts 1 through 5 in sequence	3

Circuit Board 2 Tightening Specifications



Component	Nm
Tighten bolts 1 through 5 in sequence	3

Transmission Intermediate Housing Tightening Specifications



Step	Component	Nm
1	Bolts arrows diagonally	8
2	Bolts arrows diagonally	plus an additional 120° turn

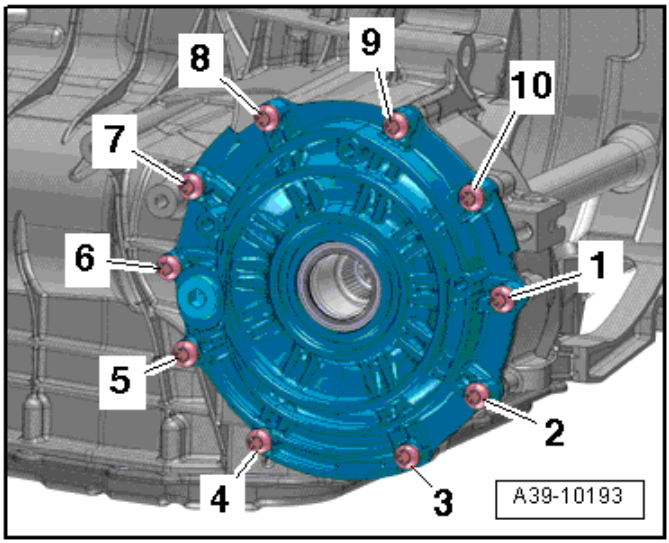
Rear Final Drive, Differential – 0B5

Fastener Tightening Specifications

Component	Nm
Balance weight to center differential housing bolt [1]	20 plus an additional 90° (¼ turn)
Bracket to the left flange shaft with the bearing	10 plus an additional 45° (⅛ turn)
Transmission fluid (MTF) drain plug	45
Transmission fluid (MTF) fill and check plug	45

[1] Replace fastener(s).

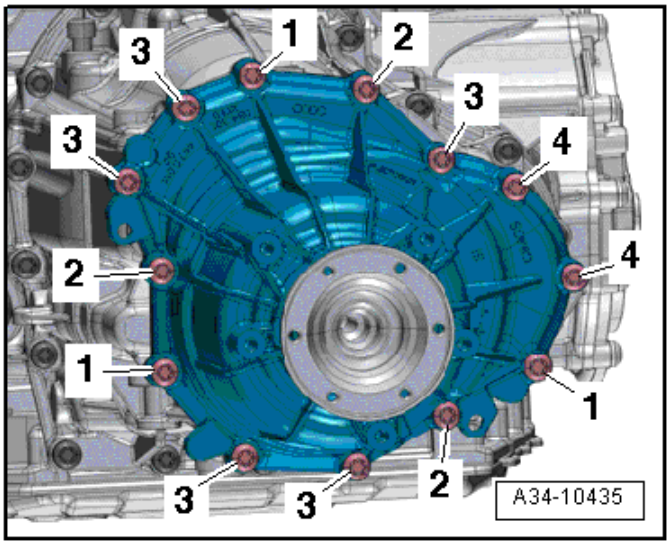
Front Final Drive Cover Tightening Specifications



Replace bolts that are tightened to the specification.

Step	Component	Nm
1	Tighten bolts [1] 1 through 10 in sequence	3
2	Tighten bolts 1 through 10 in sequence	20
3	Tighten bolts 1 through 10 in sequence	Tighten 90°

Center Differential Housing Tightening Specifications

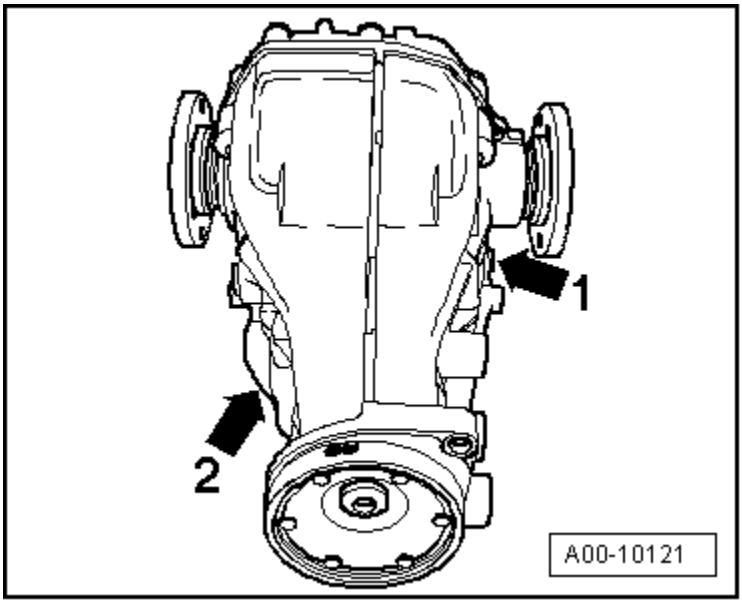


Step	Component	Nm
1	Aluminum bolts -1-	8
2	Aluminum bolts -2-	Hand-tighten
3	Aluminum bolts -1-	Loosen again and then install all the way hand-tight
4	Aluminum bolts -3-	Hand-tighten
5	Steel bolts -4-	Hand-tighten
6	-1, 2, 3, 4- diagonally	10
7	Steel bolts -4-	15
8	-1, 2, 3, 4- diagonally	90° additional turn

REAR FINAL DRIVE – 0BC, 0BD, 0BE, 0BF

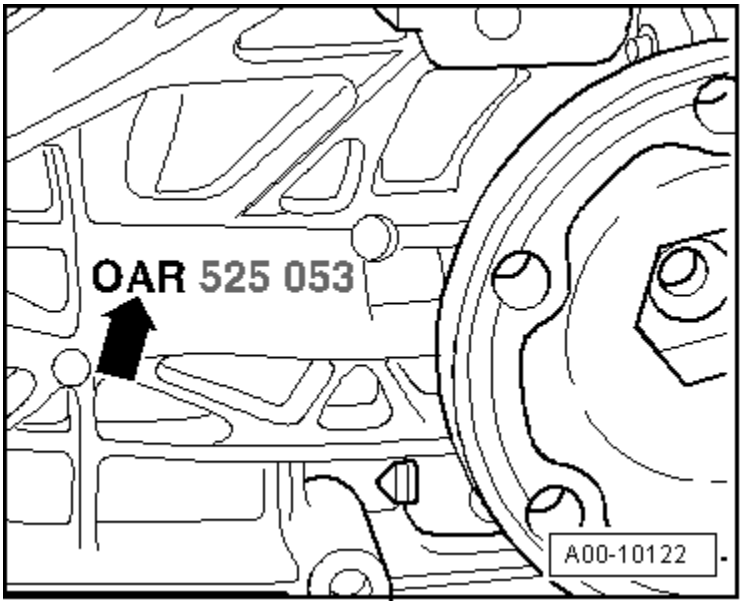
General, Technical Data – 0BC

Rear Final Drive Identification



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

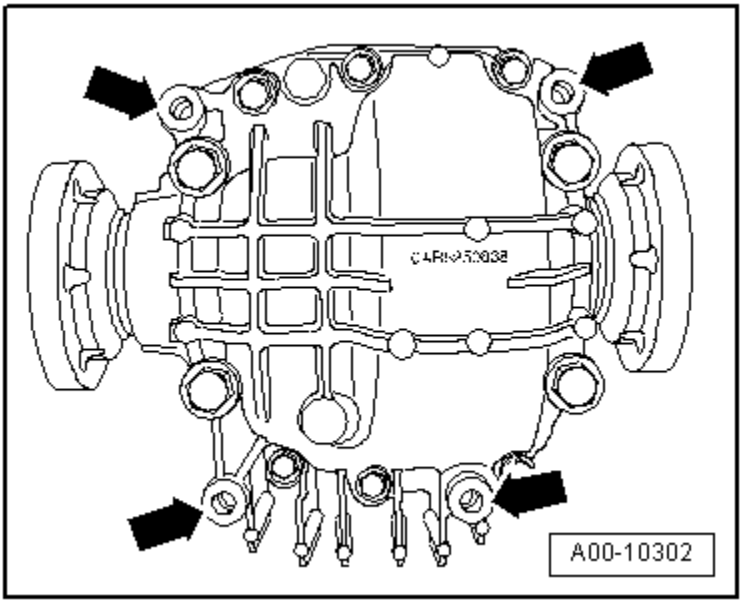
Final Drive Identification



Final Drive 0BC (➡) and 0AR

Note: 0AR is always on the rear final drive housing. The changes to the housing are what differentiate the 0BC final drive from the 0AR final drive.

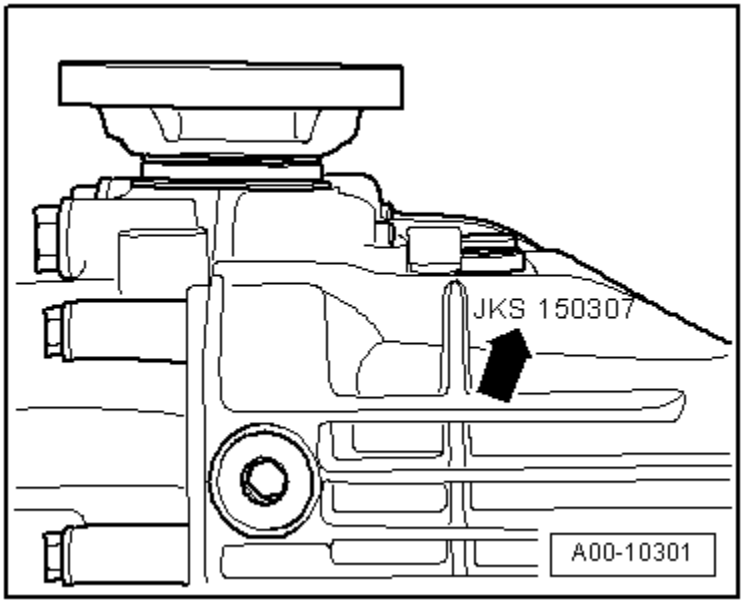
Final Drive Identification *(cont'd)*



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

The 0BC 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.

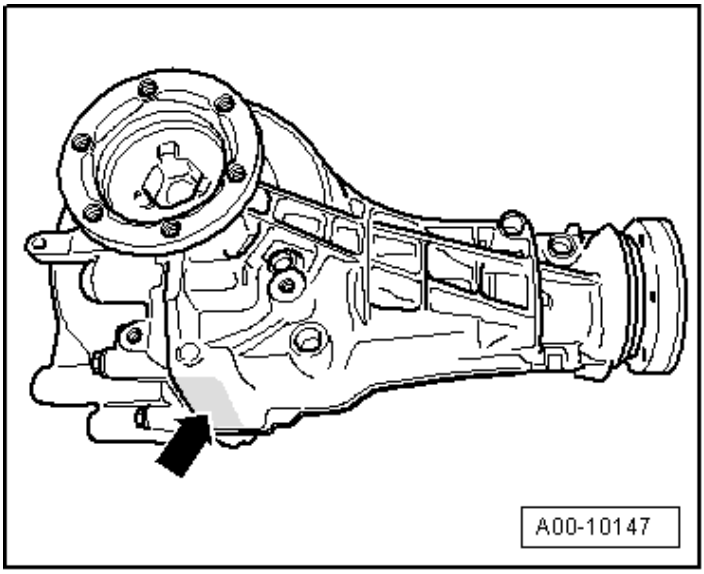
Rear Final Drive Code and Date of Manufacture



Example:	JKS	15	03	07
	Code letters	Day	Month	Year of manufacture 2007

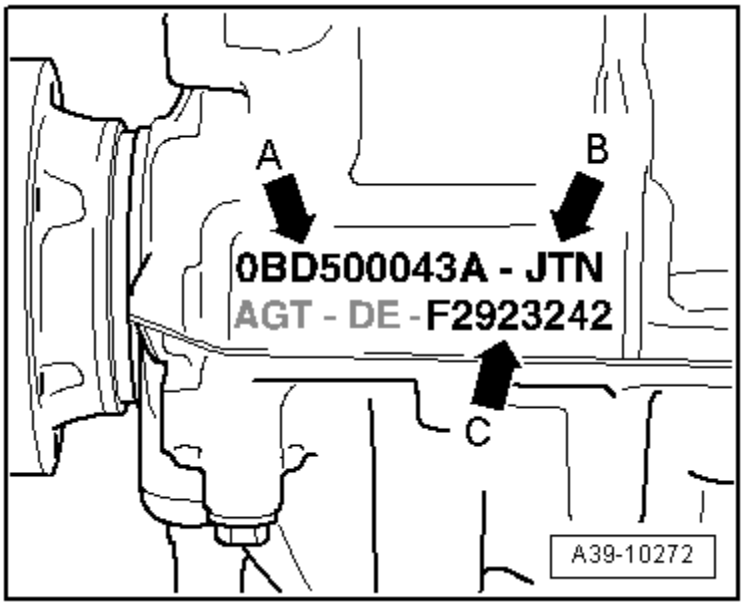
When installing a new rear final drive unit, the final drive code, the PR number and the vehicle engine code must be verified in the Parts Catalog. This is the only to assure the correct allocation.

Rear Final Drive Identification



Final drive 0BD, code letters and manufacture date (➡).

Rear Final Drive Identification *(cont'd)*



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

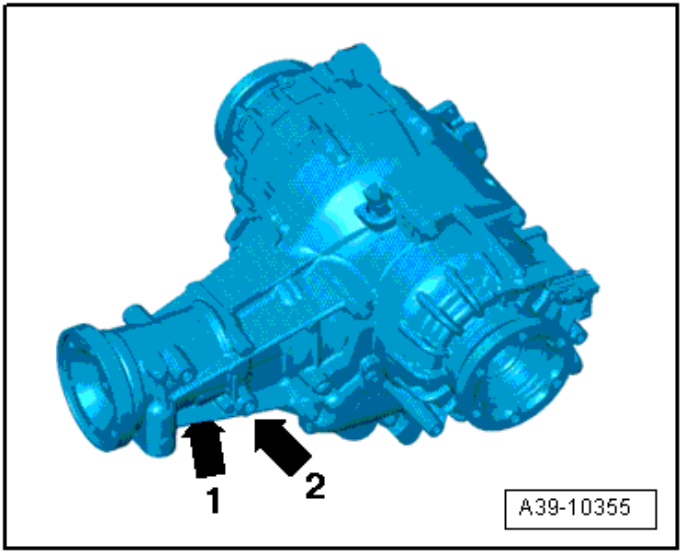
B➡ code letters JTN

C➡ Rear final drive manufacture date

Example

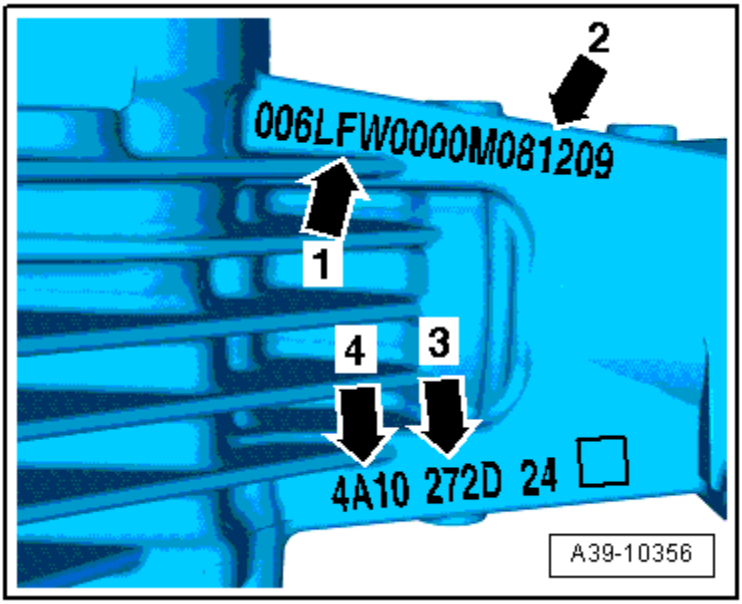
F	292	3242
Production year 2006 F = 2006, G = 2007, H = 2008, etc.	Production date 292nd calendar day (always given in three-digit format)	Day of manufacture serial number

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.

Rear Final Drive Identification *(cont'd)*



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

08	12	09
Production year 2008	Month	Day

Rear Final Drive Transmission Allocations, Ratios, Capacities

Rear Final Drive		0BC		
Code letters		JKS	KCC	KLM
Ratio	Final drive Z_2:Z_1	35:9 = 3.889	43:13 = 3.308	35:8 = 4.375
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	
Code letters		LAW	LWV
Ratio	Final drive $Z_2:Z_1$	42:9 = 4.666	37:12 = 3.083
Driveshaft flange diameter		75.5 mm	75.5 mm
Gear oil capacity		See the Fluid Capacity Tables; Rep. Gr.03;	

Rear Final Drive		0BC	
Code letters		MNB	NPR
Ratio	Final drive $Z_2:Z_1$	37:9 = 3.083	43:13 = 3.308
Driveshaft flange diameter		75.5 mm	70.7 mm
Gear oil capacity		See the Fluid Capacity Tables; Rep. Gr.03;	

Rear Final Drive 0BF Transmission Allocations, Ratios, Capacities

Rear Final Drive		0BF	
Code letters		MKU	
Ratio	Final drive $Z_2:Z_1$	37:9 = 4.111	
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.

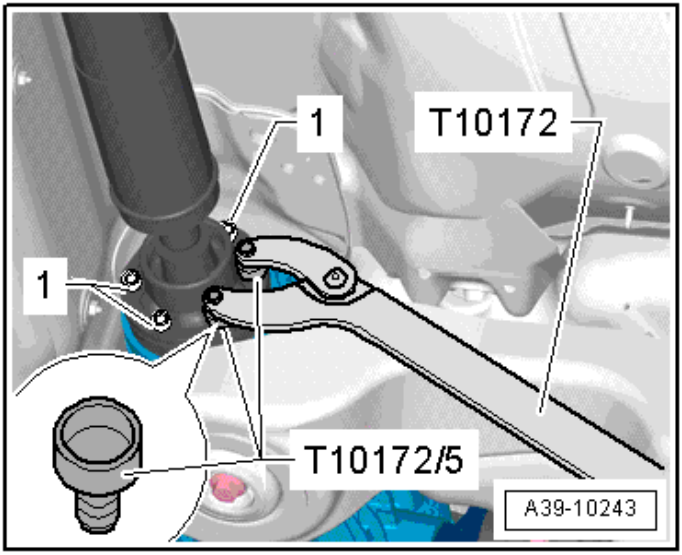
Fastener Tightening Specifications

Component	-Fastener Size	Nm
Driveshaft heat shield	-	24
Intermediate bearing bracket	-	20
Lock plate to driveshaft [1]	-	30 plus an additional 90° (¼ turn)
Final Drive 0BC, 0BD		
Balance weight to rear final drive bolt [3]	-	22
Balance weight to rear final drive bolt [4]	-	55
Crossmember to rear final drive bolt	-	55
Heat shield to crossmember bolt	-	20
Subframe [2]		
- Bolt	-	55
- Bolt	-	95
Gear Oil Drain and Inspection Plugs 0BE, 0BF		
Drain plug for gear oil [1]	-	15
Inspection plug for gear oil [1]	-	15
Final Drive 0BE, 0BF		
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 [1]	-	15
ATF drain plug [1]	-	15
Bracket for wiring harness to rear final drive bolt	-	9
Gear oil drain plug [1]		15
Gear oil inspection plug [1]		15
Gear oil checking plug 0BC		30
Gear oil checking plug 0BD		45
Hydraulic control unit [6]		
- Bolt [5]	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 [1]		50 + 90°

Component	-Fastener Size	Nm
Right line to Hydraulic Control Unit Housing nut		30
Shuttle valve		8
Gear Oil Drain and Inspection Plugs, 0BE, 0BF		
ATF drain plug [1]		15
ATF inspection plug [1]		15

1) Replace
2) For bolt tightening clarification, refer to ElsaWeb, *Final Drive 0BC, 0BD Overview* items 2 and 3
3) For bolt tightening clarification, refer to ElsaWeb, *Final Drive 0BC, 0BD Overview* item 1
4) For bolt tightening clarification, refer to ElsaWeb, *Final Drive 0BC, 0BD Overview* item 9
5) Coat the thread with Sealing Compound -D 176 501 A1-
6) 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 [1)]
2	1	30 Nm
3	1	Plus an additional 90° (¼ turn)

[1)] 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 Suspension	Five link front axle, upper and lower transverse link, transverse stabilizer, twin gas-filled strut coil spring or optional air spring damper with variable level and damping characteristics.
Rear Suspension	Track controlled axle, upper and lower transverse link, transverse stabilizer, independent suspension, twin gas-filled struts with coil spring or air spring with variable level and damping characteristics.

FWD/AWD	**Sportback**		
	Standard suspension 1BA [1)]	Heavy duty suspension 1BB [1)]	Sport suspension 1BE [1)]
Wheelbase	2917	2916	2918
Front track	1645	1641	1646
Rear track	1639	1638	1639
Maximum steering angle at inner wheel	39°36’		

FWD/AWD	**Sportback**	
	Air suspension standard suspension 1BK in “Comfort” setting [1)]	Heavy duty suspension air suspension 1BS in “Comfort” setting [1)]
Wheelbase	2915	2915
Front track	1645	1635
Rear track	1636	1644
Maximum steering angle at inner wheel	39°36’	

[1)] Front/rear track width, applies only to 235/55 R 17 (ET30)..

Chassis *(cont'd)*

FWD/AWD	Sportback	
	Sport suspension 1BV [1]	Sport suspension air suspension on RS models 2MA [2]
Wheelbase	2918	2916
Front track	1646	1635
Rear track	1639	1626
Maximum steering angle at inner wheel	39°36'	

FWD/AWD	Sportback	
	Sport suspension air suspension 2MB in "Sport" setting [3]	Sport suspension on RS models 2MC [1]
Wheelbase	2916	2917
Front track	1641	1635
Rear track	1632	1628
Maximum steering angle at inner wheel	39°36'	

[1] Front/rear track width, applies only to 235/55 R 17 (ET30).
[2] Front/rear track width, applies only to 275/35 R 20 (ET35).
[3] Front/rear track width, applies only to 255/40 R 19 (ET32).

Front Suspension

Front Suspension Tightening Specifications

Component	Fastener size	Nm
Air line connecting piece	-	3
Air spring boot clamp	-	8
Air spring shock absorber-to-shock absorber fork bolt [1]	-	40 plus an additional 180° (½ turn)
Air spring shock absorber-to-suspension strut dome nut [1] [5]	-	30
Ball joint-to-wheel bearing housing bolt [1]	-	40
Coil spring shock absorber-to-shock absorber mounting nut [1]	-	50
Coupling rod-to-shock absorber fork bolt [1] [3]	-	40 plus an additional 90° (¼ turn)

Component	Fastener size	Nm
Coupling rod-to-stabilizer bar bolt [1) 3)]	-	40 plus an additional 90° (¼ turn)
Constant Velocity (CV) joint boot clamp	-	20
Drive axle-to-transmission bolt	M10	70
Drive axle-to-wheel hub bolt [1)]	-	200 plus an additional 180° (½ turn)
Front lower longitudinal member-to-subframe bolt	-	20
Guide link-to-subframe bolt [1) 3)]	-	70 plus an additional 180° (½ turn)
Guide link-to-wheel bearing housing nut [1)]	-	140
Level control system sensor bolt/nut	-	9
Shock absorber fork-to-track control arm nut [1) 3)]	-	90 plus an additional 90° (¼ turn)
Stabilizer bar-to-subframe nut [1) 4)]	-	25
Subframe-to-body bolt [1) 2)]	-	115 plus an additional 90° (¼ turn)
Subframe crossbrace-to-subframe bolt [1)]	-	90 plus an additional 180° (½ turn)
Subframe heat shield-to-subframe bolt/nut	-	9
Tower brace-to-body bolt	-	20
Track control arm-to-ball joint nut [1)]	M12	120
	M14	140
Track control arm-to-subframe nut [1) 3)]	-	70 plus an additional 180° (½ turn)
Upper control arm-to-subframe bolt [1) 3)]	-	50 plus an additional 90° (¼ turn)
Upper control arm-to-wheel bearing housing nut [1)]	-	40
Wheel hub-to-wheel bearing housing bolt [1)]	-	80 plus an additional 90° (¼ turn)

1) Replace fastener(s).
2) Tighten diagonally and in steps.
3) Tighten in the curb weight position.
4) Remove and install the nuts alternating from side-to-side.
5) Loosen and tighten diagonally.

Rear Suspension

Fastener Tightening Specifications

Component	Fastener size	Nm
ABS wheel speed sensor-to-wheel bearing housing bolt	-	9
Coupling rod-to-stabilizer bar bolt [1) 2)]	-	40 plus an additional 90° (¼ turn)
Coupling rod-to-subframe bolt [1) 2)]	-	40 plus an additional 90° (¼ turn)
Cover plate-to-wheel bearing housing bolt	-	10
Constant Velocity (CV) joint boot clamp	-	20
Drive axle-to-final drive bolt [1)]	M10	70
Drive axle-to-wheel hub bolt [1)]	-	200 plus an additional 180° (½ turn)
Lower transverse link-to-subframe bolt [1) 2)]	-	70 plus an additional 180° (½ turn)
Lower transverse link-to-wheel bearing housing bolt [1) 2)]	-	120 plus an additional 360° (full turn)
Shock absorber-to-mount nut - conventional [1)]	-	35
Shock absorber-to-mount nut - electronic damping [1)]	-	50
Shock absorber-to-wheel bearing housing bolt [1) 2)]	-	150 plus an additional 180° (½ turn)
Shock absorber mount-to-body bolt [1)]	-	50 plus an additional 90° (¼ turn)
Stabilizer bar-to-subframe bolt [1)]	-	25 plus an additional 90° (¼ turn)
Subframe-to-body bolt [1)]	-	115 plus an additional 90° (¼ turn)
Tie rod-to-subframe nut [1)]	-	95
Tie rod-to-wheel bearing housing bolt [1) 2)]	-	90 plus an additional 90° (¼ turn)

Component	Fastener size	Nm
Upper transverse link-to-subframe bolt [1) 2)]	-	70 plus an additional 180° (½ turn)
Upper transverse link-to-wheel bearing housing nut [1) 2)]	-	95
Wheel Hub to Wheel Bearing Housing Bolt [1)]		
- FWD		200 plus an additional 180° (½ turn)
- AWD		80 plus an additional 90° (¼ turn)

1) Replace fastener(s).
2) Tighten in the curb weight or control position.

Self-Leveling Suspension

Fastener Tightening Specifications

Component	Fastener size	Nm
Air supply unit bracket bolt/nut	-	9
Air supply unit bracket threaded sleeve	-	7.5
Air supply unit connecting piece	-	3
Air supply unit-to-retainer bolt	-	9
Front air spring damper connecting piece	-	3
Front vehicle level sensor-to-bracket bolt	-	9
Front vehicle level sensor track control arm nut	-	9
Level control system solenoid-to-air supply unit bolt	-	5
Pressure reservoir connecting piece	-	5
Rear air spring connecting piece	-	2.5
Rear level control system sensor-to-bracket bolt	-	5
Rear level control system sensor-to-lower transverse link bolt	-	9
Solenoid valve connecting pieces	10 mm	2
	12 mm	3
Stone chip protection nut	-	9

Wheels, Tires

Fastener Tightening Specifications

Component	Nm
Image processing control module bracket nut	2.5
Image processing control module-to-bracket bolt	8
Level control system control module bracket nut	2.5
Level control system control module-to-bracket bolt	8
Night vision system camera-to-retaining plate bolt	6
Night vision system camera retaining plate bolt	6
Night vision system camera retaining plate-to-night vision system camera bolt	5

Wheel Alignment Data

Wheel Alignment Specified Values

Front suspension	Standard suspension 1BA)	Heavy duty suspension 1BB	Sport suspension 1BE/1BV
Camber	- 53′± 23′	- 43′± 23′	- 1°5′± 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′ ± 7′	+ 10′ ± 7′	+ 10′ ± 7′
Toe differential angle at 20° [1)]	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° 36′ + 1° 30’- 2°	39° 36′ + 1° 30’- 2°	39° 36′ + 1° 30’- 2°

[1)] 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.

Front suspension	Standard suspension air suspension 1BK	Heavy duty suspension air suspension 1BS	RS suspension air suspension 2MA
Camber	1°5′± 23″	- 53′± 23′	-1°8′± 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′ ± 7′	+ 10′ ± 7′	+ 10′ ± 7′
Toe differential angle at 20° [1)]	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° 36′ + 1° 30’- 2°	39° 36′ + 1° 30’- 2°	39° 36′ + 1° 30’- 2°

[1)] 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.

Front suspension	Sport suspension air suspension 2MB	Heavy duty suspension air suspension 1BS
Camber	1°5′± 23″	1°2′± 23″
Maximum permissible difference between both sides	30′	30′
Toe per wheel (adjustment value)	+ 10′ ± 5′	+ 10′ ± 5′
Toe per wheel (control value)	+ 10′ ± 7′	+ 10′ ± 7′
Toe differential angle at 20° [1)]	1° 49′ ± 30′	1° 49′ ± 30′
Outer wheel steering angle at maximum steering angle	33° 24′ + 1° 30’- 2°	33° 24′ + 1° 30’- 2°
Inner wheel steering angle at maximum steering angle	39° 36′ + 1° 30’- 2°	39° 36′ + 1° 30’- 2°

[1)] 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 suspension	Steel suspension, all vehicles	Air suspension, all vehicles
Camber	- 1°20′ ± 25′	- 1°20′ ± 25′
Maximum permissible difference between both sides	30′	30′
Toe for each wheel	+ 10 ± 5′	+ 10 ± 5′
Total toe	+ 20′ ± 10′	+ 20′ ± 10′
Maximum permissible deviation in direction of travel relative to vehicle longitudinal axis	10′	10′

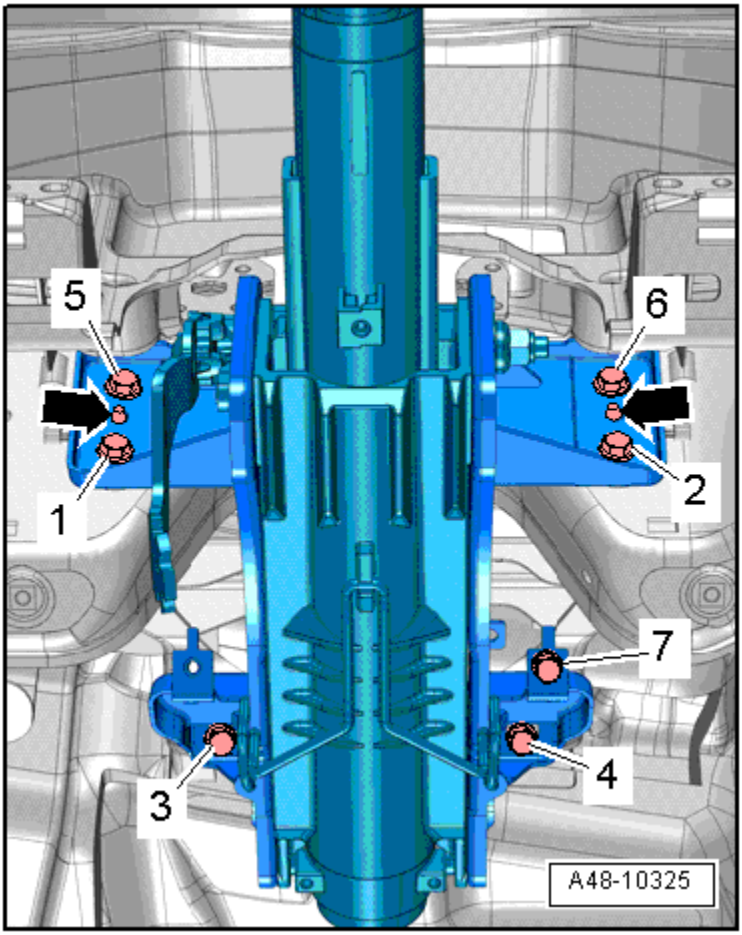
Steering

Fastener Tightening Specifications

Component	Nm
Electronic steering column lock control module-to-steering column bolt	5
Handle-to-steering column bolt (manual adjustable steering column)	5
Safety lock for active steering (locking magnet)-to-steering column bolt [1) 3)]	8 + 2
Steering column-to-central tube bolt [2)]	20
Steering gear boot clamp	[4)]
Steering gear-to-subframe bolt [1)]	80 plus an additional 180° (½ turn)
Steering intermediate shaft-to-body nut	3
Steering intermediate shaft-to-steering column bolt [1)]	30
Steering intermediate shaft-to-steering gear bolt [1)]	30
Steering wheel-to-steering column bolt [1)]	50
Tie rod-to-steering gear	100
Tie rod end-to-tie rod nut	80
Tie rod end-to-wheel bearing housing nut [1)]	100

1) Replace fastener(s).
2) For bolt tightening clarification, refer to ElsaWeb, *Manual and Power Adjustable Steering Column*.
3) For bolt tightening clarification, refer to ElsaWeb, *Active Steering Safety Lock Actuator -F437-, Dynamic Steering*.
4) For clamp tightening clarification, refer to ElsaWeb, *Electromechanical Steering Gear Overview, Tensioning the Inner Clamp.*

Steering Column Tightening Specifications

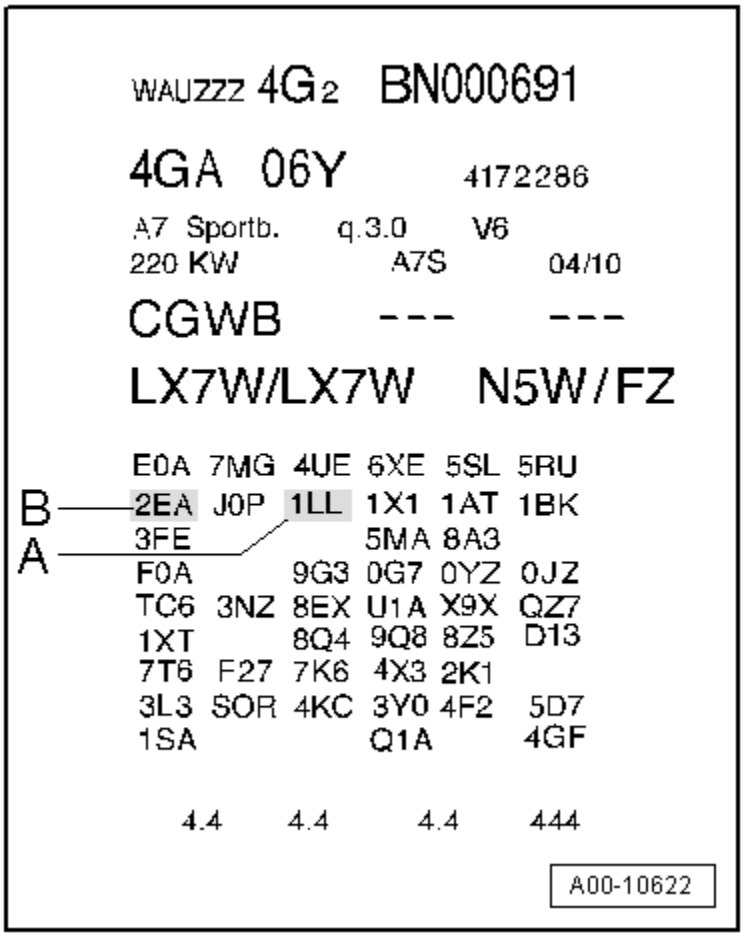


Step	Component	Nm
1	Position the steering column with the positioning pins (➡) in the central tube positioning holes	
2	Loosely install all bolts	
3	Tighten bolts 1 through 7 in sequence	20

BRAKE SYSTEM

General, Technical Data

Technical Data



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

Front Wheel Brakes – Technical Data

Front Wheel Brake				
Type		FBC- 60	FBC- 60	2 FNR-AL 42
Production Relevant No. (PR. No.)		1LA	1LJ/FM0	1LL/FM0
Brake disc ventilated	diameter mm	320	345	356
Brake disc thickness	mm	30	30	34
Brake disc wear limit	mm	28	28	32
Brake pad wear limit with backing plate and dampening sheet		9	9	9

Front Wheel Brake			
Type		Brembo	Brembo Wave-Design
Production Relevant No. (PR. No.)		1LU	1LM+1LX
Brake disc ventilated	diameter mm	400	390x245
Brake disc thickness	mm	38	36
Brake disc wear limit	mm	36	34
Brake pad wear limit with backing plate and dampening sheet		9	9

Front Wheel Brake Ceramic			
Type		Brembo	Brembo
Production Relevant No. (PR. No.)		1LW	1LN
Brake disc ventilated	diameter mm	400	420
Brake disc thickness	mm	38	38
Brake disc wear limit	mm	-	-
Brake pad wear limit with backing plate and dampening sheet		9	9

Rear Wheel Brakes – Technical Data

Rear Wheel Brake				
Production Relevant No. (PR. No.)		1KW	2EA	1KY
Brake disc ventilated	diameter mm	300	330	356
Brake disc thickness	mm	12	22	22
Brake disc wear limit	mm	10	20	20
Brake pad wear limit with backing plate and dampening sheet		8	8	8

Rear Wheel Brake				
Type		Wave-Design (Steel)	Ceramic	Ceramic
Production Relevant No. (PR. No.)		1KJ + 1KQ	1KU	1KK
Brake disc ventilated	diameter mm	356x243	370	370
Brake disc thickness	mm	22	30	30
Brake disc wear limit	mm	20	1)	1)
Brake pad wear limit with backing plate and dampening sheet		8	8	8

1) For determing wear, refer to ElsaWeb, *Ceramic Brake Rotor, Determining Wear*.

Anti-lock Brake System (ABS)

Fastener Tightening Specifications

Component	Nm
ABS control module-to-ABS hydraulic unit bolt	4.5
ABS wheel speed sensor bolt	9
Brake Lines to the Hydraulic Unit	
Hydraulic unit brake lines on 4 brake caliper	14
Hydraulic unit brake lines to master brake cylinder	16
Sensor electronics control module nut	9

Mechanical Components

Fastener Tightening Specifications

Component	Nm
Attaching pedal bracket to steering column bolt	20
Brake pedal bracket to body nut	8
Brake pedal mounting pin to bracket bolt	8
Gas pedal module to brake pedal bracket bolt	8
Ceramic Front Brakes PR-1LN/1LW	
Bleeder screw	13
Bracket for brake hose and electrical wire bolt	9
Brake line to brake hose bolt	14
Brake rotor to stub axle carrier bolt	10
Cover plate to stub axle carrier bolt	10
Stub axle carrier to brake caliper bolt	196
Front Brakes, PR- 1LA/ 1LJ	
Brake caliper to the brake carrier bolt	30
Brake carrier to wheel bearing housing bolt	196
Brake line connection to brake caliper bolt	20
Brake pad bolt	5
Front Brakes, PR- 1LL/ FM0	
Trim to brake caliper bolt	22
Brake carrier to wheel bearing housing	196
Guide pins	55
Brake pad bolt	9
Front Brakes, PR-1LU	
Brake line connection to brake hose	14
Brake line connection to brake caliper	20
Brake pad bolt	5
Brake rotor cover plate to stub axle carrier bolt	10
Stub axle carrier to brake caliper bolt	196
Front Brakes, RS-6/RS-7, Steel Brakes, PR-1LM+1LX	

Fastener Tightening Specifications *(cont'd)*

Bleeder screw	13
Bracket for brake hose and electrical wire to stub axle carrier bolt	9
Brake rotor to stub axle carrier bolt	10
Cover plate to stub axle carrier bolt	10
Stub axle carrier to brake caliper bolt	196
Tension strut bolt [1)]	30
Front Brakes, PR-1KW/2EA + 1KY	
Bracket to electric connection bolt	10
Brake caliper to brake carrier with guide pins and cap bolt [1)]	35
Brake carrier to brake caliper bolt [1)]	100
Brake hose in brake caliper	20
Brake hose to brake pipe line	14
Brake pad bolt	5
Motor to brake caliper bolt	12
Rear Brakes, RS-6/RS-7, Steel Brakes, PR-1KJ + 1KQ	
Bleeder screw	13
Bracket for the connector to brake caliper bolt [1)]	35
Brake rotor to stub axle carrier bolt	10
Cover plate to stub axle carrier bolt	10
Electro-mechanical parking brake motor to brake caliper bolt	12
Stub axle carrier to brake caliper bolt [1)]	100 plus an additional 90° (¼ turn)
Rear Ceramic Brakes, PR-1KU + PR-1KK	
Bleeder screw	13
Bracket for connector to brake caliper bolt [1)]	35
Brake rotor to stub axle carrier bolt	10
Cover plate to stub axle carrier bolt	10
Electro-mechanical parking brake motor to brake caliper bolt	12
Stub axle carrier to brake carrier bolt [1)]	100 plus an additional 90° (¼ turn)

[1)] Replace fastener(s).

Hydraulic Components

Fastener Tightening Specifications

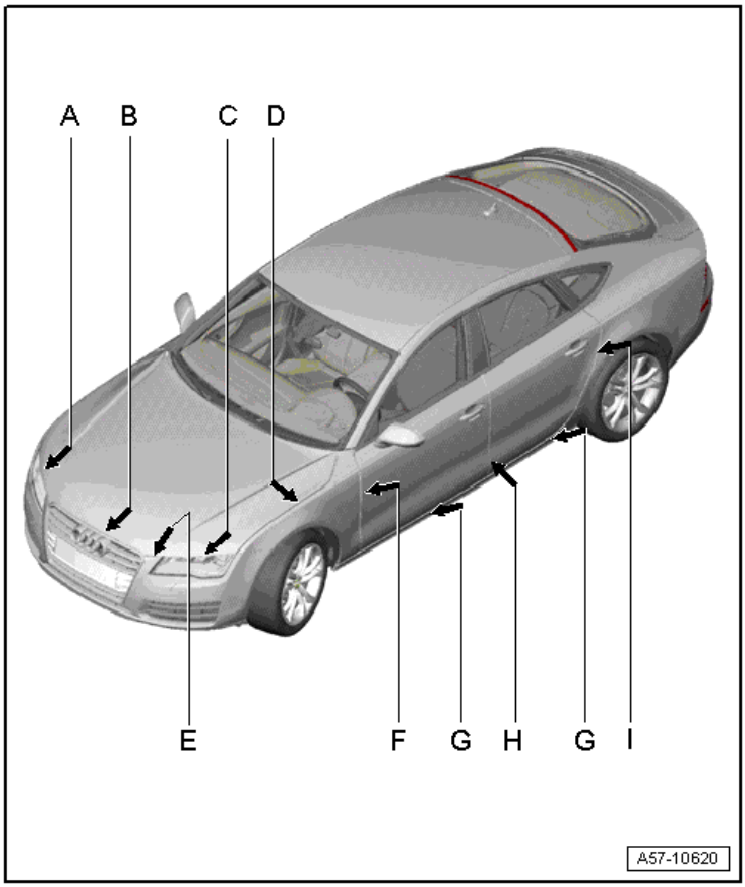
Component	Nm
Ball head-to-brake booster	30
Brake booster-to-bracket bolt	23
Brake caliper housing	30
Brake fluid reservoir cap	5
Brake line-to-master cylinder	24
Brake line-to-hydraulic unit	
- 5 mm brake lines	12
- 8 mm brake lines	20
Brake line connection-to-brake hose	12
Brake line connection-to-brake caliper	19
Brake line connection to brake master cylinder	16
Brake master cylinder nut	49
Brake pedal mounting bracket bolt	20
Brake system vacuum pump bracket nut	9
Front bleeder valve	15
Front brake caliper-to-brake carrier bolt (PR. No. 1LA/1LJ)	30
Front brake carrier-to-wheel bearing housing bolt	196
Rear brake caliper to brake carrier bolt [1)]	35

[1)] Replace fastener(s).

BODY

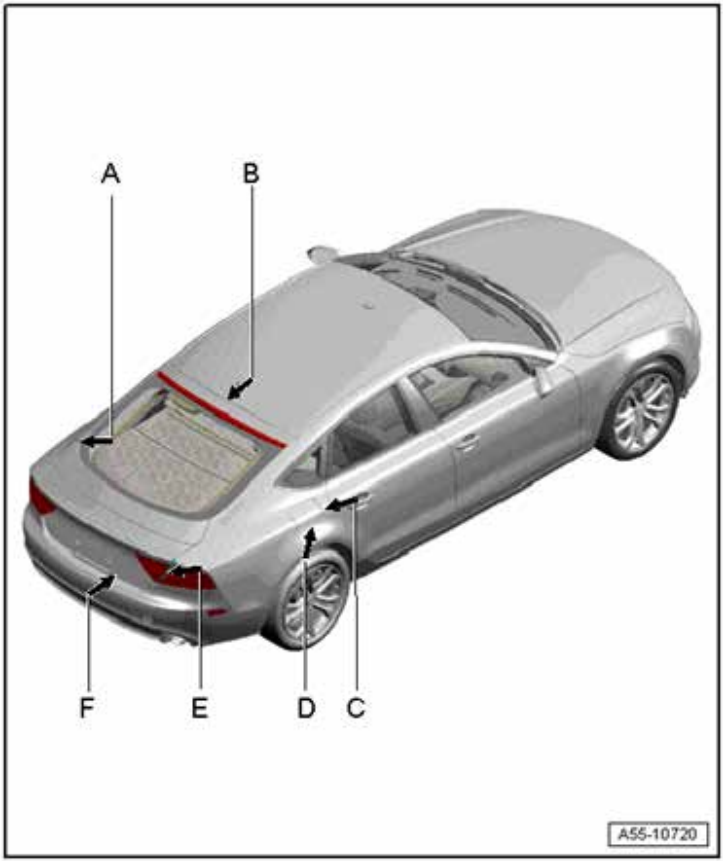
Air Gap Body Dimensions

Front Gap Dimensions



Component	mm
A	6.5 ± 0.5
B	4.5 ± 0.5
C	6.5 ± 0.5
D	3.0 ± 0.5
E	3.0 ± 0.5
F	3.5 ± 0.5
G	5.0 ± 0.5
H	4.5 ± 0.5
I	3.5 ± 0.5

Rear Gap Dimensions



Component	mm
A	3.7 ± 0.5
B	5.0 ± 0.5
C	2.3 ± 0.5
D	2.3 ± 0.5
E	5.3 ± 0.5
F	5.5 ± 0.5

Body Front

Fastener Tightening Specifications

Component	Nm
Cable bracket bolt	2
Center cover for tower brace bolt	2
Fender bolts	10
Fender to lower bracket bolt	10
Heat shield nut	4
Left cover bolt	2
Lock carrier [1]	
- Bolt	8
- Bolt	10
Lock carrier brace bolt	20
Lower bracket bolt	10
Mount for the front bumper cover bolt	8
Right cover nut	2
Tower brace bolt	20
Upper bracket for fender bolt	10

[1] For bolt tightening clarification, refer to ElsaWeb, *Lock Carrier with Attachments Assembly Overview* items 5 and 9.

Hood, Lids

Fastener Tightening Specifications

Component	Nm
Adjusting buffer body side bolt	8
Ball stud for gas-filled strut to body	21
Catch bracket to hood nut	8
Fuel filler door unlock motor bolt	1.5
Hood hinge to body bolt/nut	21
Hood release lever bracket bolt	2
Hood latch to lock carrier bolt	11
Rear lid drive motor tilting mechanism bolt	21
Read lid hinge bolt	21
Rear lid lock nut	21
Rear lid motor bolt	21
Read lid striker nut	21
Stop for rear lid side bolt	6

Front Doors, Central Locking System

Fastener Tightening Specifications

Component	Nm
Bottom door hinge to body bolt	32
Bottom door hinge to door bolt	32
Catch bolt	19
Door arrester to body bolt	33
Door arrester to door bolt	8
Door lock bolt	25
Fuel filler door bolt	1.5
Front backing to door bolt	2.5
Guide for lock cylinder bolt	1.5
Nut for adjusting bolt	9
Stud bolt to upper door hinge	23
Upper door hinge to body bolt	32
Upper door hinge to door bolt	45
Window regulator bolts	9
Window regulator motor bolts	3.5

Rear Doors

Fastener Tightening Specifications

Component	Nm
Bottom door hinge to body bolt	34
Bottom door hinge to door bolt	34
Catch bolt	19
Door arrester to body bolt	33
Door arrester to door bolt	8
Door lock bolt	25
Front backing to door bolt	2.5
Nut for adjusting bolt	12
Stud bolt to upper door hinge	23
Upper door hinge to body bolt	34
Upper door hinge to door bolt	34
Window regulator motor bolts	3.5
Window regulator bolts	9

Sunroof

Fastener Tightening Specifications

Component	Nm
Frame bolts	8
Motor	4
Sunroof spring to headliner bolts	1.5
Wind Deflector to frame nuts	8

Bumpers

Fastener Tightening Specifications

Component	Nm
Front Bumper Cover Audi A7/S7	
Bumper cover upper side bolt	1.5
Front bumper cover mount bolt (Qty. 2)	4
Lower front bumper cover bolt (Qty. 6)	2
Lower part of spoiler bolt	2
Night vision camera mount bolt (Qty. 4)	6
Reinforcement brace bolt (Qty. 6)	1.5
Upper reinformacement brace bolts (Qty. 4)	4
Front Bumper Cover Audi RS 7	
Bumper cover upper side bolt	1.5
Center Reinforcement brace bolt (Qty. 6)	1.5
Front bumper cover mount bolt	4
Lower part of spoiler bolt	2
Molded foam part bolt (Qty. 4)	2
Night vision camera mount bolt (Qty. 4)	6
Side reinforcement brace bolt	1.5
All vehicles	
Bumper cover end plate bolt (rear middle (Qty. 4)	5
Bumper cover end plate bolt (ends (Qty. 2)	2.1
Connecting brace bolt	4.5
Impact member mount bolt (Qty. 3)	55
Impact member mount bolt (Upper) (Qty. 4)	10
Impact member to impact member mount nut	20
Lower front longitudinal bolt	20
Rear Bumper Cover Audi A7/S7	
Rear bumper cover lower section bolt	1.7
Rear bumper cover side end bolt	2
Rear bumper cover side mount bolt	1.5
Rear Bumper Cover Audi RS 7	
Rear bumper cover inside nut	2
Rear bumper cover lower section bolt	1.7

Component	Nm
Tail pipe trim bolt	2
Tail pipe trim mount bolt	2

Glass, Window Regulators

Fastener Tightening Specifications

Component	Nm
Window regulator bolt/nut	9
Window regulator motor	3.5

Exterior Equipment

Fastener Tightening Specifications

Component	Fastener	Nm
B-pillar trim bolt	-	2
Center vehicle underbody cover	-	2.1
Crossbrace bolt	-	55
Driveshaft cover nut	-	2
Front cover for the spare wheel well nut	-	2.1
Front vehicle underbody cover nut	-	2.1
Front wheel housing liner		
- Bolt	-	2.1
- Nut	-	2
Heat shield nut	-	2.1
Mirror adjusting unit bolt	-	1
Mount for B-pillar bolt	-	3
Mount with drive unit bolt	-	9
Noise insulation, front		
- Bolt	M6	3.5
- Bolt	M8	20
Parking aid sensor mount bolt	-	1.5
Radiator Grille bolt Audi A7/S7	-	1.5
Radiator Grille bolt Audi RS 7	-	1.5
Rear spoiler nuts	-	2
Rear vehicle underbody cover		
- Bolt	-	2.1
- Bolt	-	3.5
Rear wheel housing liner nut	-	2
Stop for spoiler nut	-	8
Upper seal bolt	-	1
Wheel spoiler bolt Audi A7/S7	-	2
Wheel spoiler bolt Audi RS 7	-	2.1

Interior Equipment

Fastener Tightening Specifications

Component	Nm
Storage Compartments and Covers	
Driver side instrument panel cover bolt	3
Glove compartment	3
Knee airbag: glove compartment handle with additional threaded connection	1.8
Instrument cluster gap cover	3
Instrument panel lower cover	3
Steering column switch module lower trim	1.5
Front Center Console	
Center console nut	4
Center console bracket bolt	3
Center console to Trim panel	1.4
Cupholder to Center console bolt	1.4
Front ashtray/storage compartment cover	3
Mount to Rear cover bolt	1.4
Rear bracket to center console	3
Rear cover to rear vent bolt	3
Storage compartment to center console	1.4
Front Center Armrest	
Cigarette lighter and socket mount	1.4
Rear cover to rear vent bolt	3
Interior Rearview Mirror	
Clip to interior rearview mirror	1.5

Passenger Protection, Airbags, Seat Belts

Fastener Tightening Specifications

Component	Nm
Airbag Control Module -J234- to floor nut	9
Automatic belt retractor to body bolt [2)]	45
Automatic belt retractor to pillar [2)]	45
Automatic belt retractor to pillar [2)]	5
Automatic belt retractor (only for if equipped with an electric seat belt tensioner) bolt	2
Automatic belt retractor to split rear seat backrest, 2/3 right nut [2)]	45
Battery Interrupt Igniter -N253- to Positive terminal clamp nut	15
Belt height adjustment to pillar [2)]	27

Component	Nm
Belt latch with driver side rear seat belt switch -E258- nut [1]	45
Belt latch with front passenger side rear seat belt switch -E259- nut [1]	45
Connector to control module bracket bolt	1.5
Driver front airbag crash sensor -G283- bolt	9
driver knee airbag bracket bolt [1] [4]	9
Driver seat position sensor -G553- to seat bolt	1.5
Driver side airbag crash sensor -G179- bolt	5
Driver side knee airbag ground cable nut	9
Driver side knee airbag to bracket nut [1]	8
Front belt anchor to pillar [2]	45
Front passenger airbags with front passenger airbag igniter 1 -N131-/front passenger airbag drain valve igniter -N491- nut [1]	9
Front seat belt to seat [3]	33
Glove compartment to passenger side knee airbag bolt [1]	8
Front side airbag to body bolt [1] [3]	10
Head curtain airbag to roof bolt [1]	5
LATCH child seat anchor to seat bolt [1]	8
Passenger front airbag crash sensor -G284- bolt	9
Passenger-side side airbag crash sensor -G180- bolt	5
Rear belt anchor to floor bolt [2]	45
Rear side airbag to side upholstery bolt	10
Right rear side airbag crash sensor -G257- bolt	9
Rear side airbag crash sensor (driver side) -G256- bolt	9
Seat belt latch with driver side rear seat belt switch -E258- nut [1]	45
Seat belt latch with front passenger side rear seat belt switch -E259- nut [1]	45
Side upholstery to body bolt	9
Supports to passenger side knee airbag nut [1]	8

[1] Replace fastener(s).
[2] If it was removed because of an accident, replace the bolt
[3] Install with locking compound; locking compound refer to the Parts Catalog
[4] For bolt tightening clarification, refer to ElsaWeb, *Driver Knee Airbag Igniter N295 items 3 and 4.*.

Interior Trim

Fastener Tightening Specifications

Component	Nm
A/C unit bracket to instrument panel central tube bolt	3.6
	9
Center instrument panel vent to Front information display control head -J685-	3
Central tube	
- Bolt	20
- Bolt	3.6
- Bolt	25
- Nut [2)]	20
Coat hook bracket to body bolt	2.5
Cover to Rear lid bolt	2
Decorative trim strip to per instrument panel cover bolt	1.5
Defroster vent in the center to Instrument Panel bolt	1.5
door trim bolt	2.5
door trim stop bolt	4.5
Driver side trim to Instrument Panel bolt	3
Front passenger side trim to Instrument panel Tube bolt	3
Front sill panel trim to body (driver's side only) bolt	2.5
glove compartment bracket to instrument panel central tube bolt	9
glove compartment/knee airbag to instrument panel central tube bolt	9
inside door release mechanism bolt	1.2
Information electronics control module 1 -J794- to trim bolt	1
Instrument Panel bolt	3
instrument panel cover to instrument panel central tube bolt	3.6
	9
Instrument panel vent to Instrument Panel bolt	3
Mounting bracket to instrument panel central tube bolt	20
pull handle/armrest bolt	1.2
Pull handle clip bolt	4.5
Retainer For knee airbag to instrument panel central tube bolt	9
Side defroster vent to Instrument Panel bolt	3
Tie-down eye to body bolt	6
Upper instrument panel cover to Instrument Panel bolt	3
Vehicle jack/break-down kit (If equipped) to Spare wheel well trim nut	8

Component	Nm
windshield projection head up display control module -J898- bracket to Instrument Panel Central Tube bolt	9
	20

1) For bolt tightening clarification, refer to ElsaWeb, *Instrument Panel Central Tube Assembly Overviewitems, items* 1, 8, 9 18, 22 and 23
2) Replace fastener(s).
1) For bolt tightening clarification, refer to ElsaWeb, *Instrument Panel Central Tube Assembly Overviewitems, items* 5 and 6

Seat Frames

Fastener Tightening Specifications

Component	Nm
Front Seat, Standard Seat/Sport Seat, Manual	
Backrest to seat pan bolt 1)	34.5
Bracket for sill side trim to seat	3.5
Bracket to backrest frame bolt	3.8
Driver seat lumbar support adjustment switch -E176- to sill-side trim bolt	0.8
Seat angle adjustment	
- Bolt	6.5
- Shoulder pin	6
Seat height adjuster 2)	
- Bolt	6.5
- Bolt	10
Seat height adjustment handle lever to seat pan bolt	8
Seat to floor bolt	50
Front Seat, Power Standard Seat/Sport Seat/Super Sport Seat	
Adjusting spindle to seat bolt 1)	22
Backrest to seat pan bolt 1)	34.5
Bracket for sill-side trim to front seat bolt	8
Bracket to seat pan bolt 1)	10
Bracket to driver backrest adjustment motor -V45- 3)	
- Bolt 1)	3.7
- Nut 1)	6
Cover grille to front seat screw	1.5
Driver seat adjustment control head -E470- to sill-side trim bolt	0.8
Driver seat adjustment control head -E470-to sill-side trim bolt	0.8
Driver seat height adjustment motor -V245- to seat bolt 1)	20
Driver seat angle adjustment motor -V243- to Seat pan bolt	
- Bolt 1)	10
- Bolt 1)	20

Fastener Tightening Specifications *(cont'd)*

Component	Nm
Seat depth adjuster to sport seat with a seat depth adjuster 3)	4
Seat to floor bolt	50
Storage compartment to front seat bolt	8
Upper seat pan frame to Lower seat pan frame bolt 1)	22
Front Seat - Multicontour Seat	
Belt guide to seat pan bolt	10
Bracket for front trim, compressor and multicontour seat control module to front seat bolt 3)	3.5
Bracket for sill side trim to seat bolt	8
Brackrest to seat pan bolt 1)	34.5
Driver seat cushion fan -V390- to seat pan bolt	2.4
Driver seat switch module 2 -E667- to sill-side trim bolt	0.8
Driver seat switch module -E663- to sill-side trim bolt	0.8
Multicontour seat to driver seat depth adjustment motor -V256- bolt	3.5
Retaining plate to upper seat pan frame bolt	28
Seat to floor bolt	50
Tunnel side trim boly bolt 3)	6.5
Upper seat pan frame to lower seat pan frame bolt 1)	22
Grille to Seat pan bolt	2.4
Multi-Contour Seat Pneumatic Components	
Backrest bolster inflation adjuster to multicontour seat bolt	1.1
Driver seat multicontour seat compressor -V439- to Rubber metal mount nut	3.5
Module carrier to backrest frame bolt	6.5
Rear Seat Bench	
Standard Seat/Sport Seat	
Center bracket to body bolt	20
Center storage compartment to rear seat bench - super sport seat bolt	2.8
Inner mounting pin	13.5
Locking tab to rear seat backrest frame bolt	25
Securing bracket the center bracket bolt	9
Side upholstery bolt	3
Standard seat/sport seat	
Center bracket to body bolt	20
Rear seat backrest Inner mounting pin	13.5
Securing bracket for the center bracket bolt	9
Side upholstery bolt	3

Component	Nm
Rear Center Armrest	
Basis	
Center armrest bracket to rear seat backrest, 2/3 right [1]	
- Nut	8
- Bolt [1]	11
Trim for center armrest bolt [4]	4
	0.9
Vehicles with Storage Compartment	
Center armrest bracket to rear seat backrest, 2/3 right bolt	11
Storage compartment bolts	4
Vehicles with Pass-Through Door	
Bracket for center armrest to rear seat backrest, 2/3 right bolt	8
Hood for the pass-through opening to rear center armrest bolt [1]	11

1) Replace.
2) For bolt tightening clarification, refer to ElsaWeb, *Seat Height Adjuster Assembly Overview* items 2 and 4.
3) Use locking fluid when installing the bolt.
4) For bolt tightening clarification, refer to ElsaWeb, *Rear Center Armrest Assembly Overview* items *5, 6, 7, 9 and 10*

HEATING AND AIR CONDITIONING

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

Fastener Tightening Specifications

Component	Fastener size	Nm
A/C pressure/temperature sensor	-	5
Coolant recirculation pump/coolant shut-off valve bracket	-	6
Compressor drive plate [1]	-	30
Compressor drive plate bolt [1]	-	10
Compressor belt pulley drive plate [2]	-	30
Compressor belt pulley drive plate bolt [2]	-	20
Compressor Input Shaft	-	30
Compressor mounting bolt	-	25
Control motors	-	1
Coolant recirculating pump	-	1.5
Coolant shut-off valve	-	8
Dryer cartridge screw plug	-	2
Expansion valve	-	10
Fluid reservoir-to-condenser	-	10
Fresh air blower	-	1
Front air guides	-	1.5
Heat exchanger hose clamps	-	2
Oil drain plug	-	30
Pressure relief valve	-	10
Refrigerant lines-to-condenser	M6	9
Refrigerant line-to-compressor	M8	25
Refrigerant line from compressor	M6	9
Refrigerant pipe-to-evaporator retaining plate	-	5
Evaporator housing upper section	-	2

[1] 8-Cylinder
[2] 4 and 6-Cylinders

ELECTRICAL EQUIPMENT

Communication Fastener Tightening Specifications

Component	Nm
Antenna amplifiers	2
Center Speakers	1.5
Digital sound system control module nut (Standard/Bose)	3.5
Digital sound system control module screw (Standard/ Bose)	6
Digital sound system control module nut (Bang & Olfusen)	5
Digital sound system control module screw (Standard/ Bose)	3.5
Effects speakers	1.5
Front information display control head	3
Front mid-range speaker	3
Front and rear mid-bass speakers	3
Front treble speakers	1.5
Information electronics control module 1	3
Information electronics control module 1-to-divider	1
Peripheral camera, front, left and right	2
Peripheral camera, rear	3
Roof mounted antenna	6
Rearview camera	6
Rearview camera system control module rack	3
Subwoofer	4.5
Telephone baseplate	1
Tiptronic switch	1.2

Battery, Starter, Generator, Cruise Control Tightening Specifications

Component	Nm
Battery hold-down	18
Battery jump start terminal mount	4
Battery jump start pin	9
Generator bolts [2]	20
Generator Bolts [3]	23
Generator Coolant Pipe Clamp Bolt [3]	9
Generator threaded pin	10
Generator threaded pin nut	20
Generator B+ terminal nut	16
Main fuse panel at battery	5
Negative battery terminal	5
Starter B+ terminal	20
Tool kit retainer	18
Wiring harness bracket [1]	40

[1] For bolt tightening clarification, refer to ElsaWeb, *Battery Jump Start Terminal and Positive Terminal Grip Overview,* item 2.

[2] 3.0L

[3] 4.0L

Instruments Tightening Specifications

Component	Nm
12V socket 3 nut	2
Data bus On Board Diagnostic (OBD) interface	2
Horns	11
Horn bracket	8
Instrument cluster	3
Windshield projection head up display control module	5.5

Windshield Wiper/Washer Tightening Specifications

Component	Nm
Headlamp washer nozzle	2.5
Washer fluid hose-to-night vision camera	2.5
Washer fluid filler tube	8
Washer fluid reservoir	7
Windshield wiper motor	8
Wiper arm nut	22

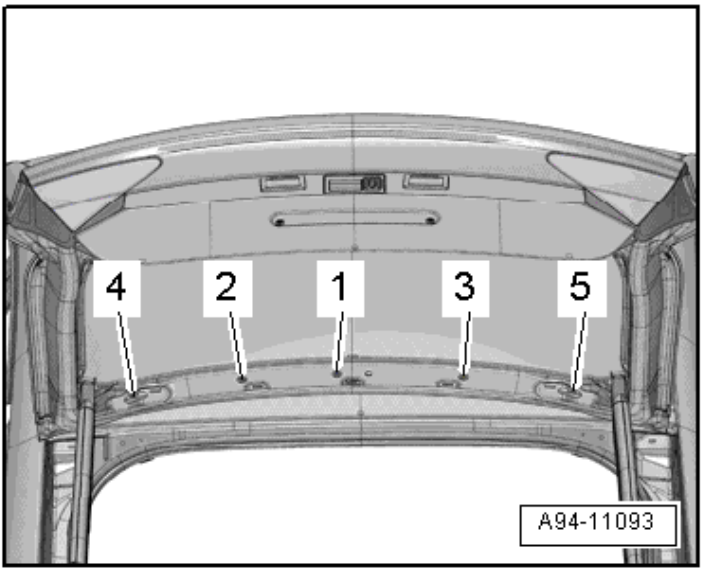
Exterior Lights, Switches Tightening Specifications

Component	Nm
Anti-theft immobilizer reading coil mount	3
Headlamp housing mount	4.5
HID headlamps	
Power output stages	1.5
Housing [1)]	4.5
Housing [2)]	6
Range control positioning motor	2
Range control positioning motor housing cover	2
LED headlamps	
Power output stages	1.5
Housing	4.5
Housing	6
Headlamp fan	1.5
Headlamp fan 2	2
Headlamp fan housing cover	2
LED Inner tail lamp	
Inner tail lamp housing nut	2
Inner tail lamp housing screw	4
Inner tail lamp housing cover	2
LED Outer tail lamp	
Back-up lamp	2
Back-up lamp cover	2
Housing	3.5

[1)] For bolt tightening clarification, refer to ElsaWeb, *HID Headlamps Overview,* items 7 and 12.

[2)] For bolt tightening clarification, refer to ElsaWeb, *HID Headlamps Overview,* item 15.

Tightening Specification and Sequence: High-Mounted Brake Lamp Bulb



Tighten the nut to 2.5 Nm in the following sequence: 1 to 5.

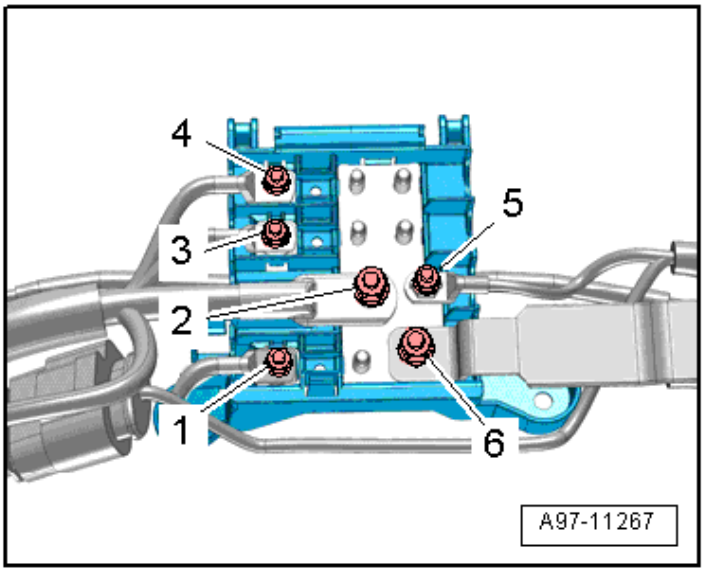
Interior Lights, Switches Tightening Specifications

Component	Nm
Access/start authorization antennas	2
Alarm horn and bracket	3
Front interior lamps/reading lamps	2
Lane change assistance control modules	2
Steering column adjustment switch -E167-/Steering wheel heating button -E522-	1.5
Sunroof button -E325-	0.65

Wiring Tightening Specifications

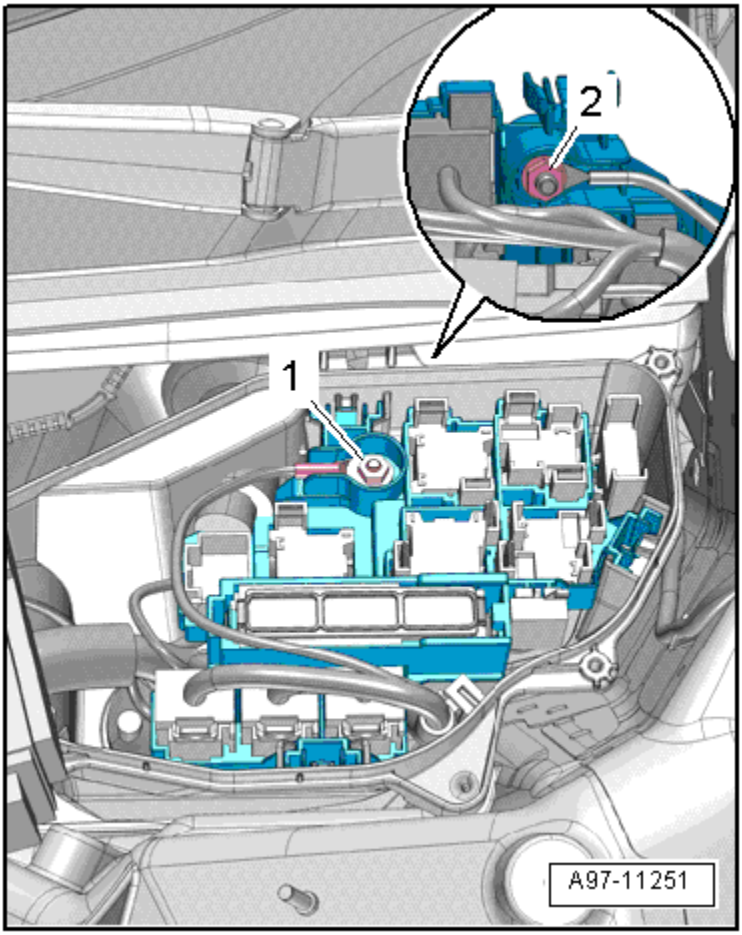
Component	Nm
Comfort system central control module retaining frame	3
Plenum chamber E-box	3
Plenum chamber E-box cover	3
Luggage compartment control module upper frame	3
Luggage compartment control module lower frame	3
Luggage compartment relay and fuse panel	3
Terminal 30 wire junction	3
Vehicle electrical system control module mount	3

Terminal 30 Wire Junction (TV2) Fastener Tightening Specifications



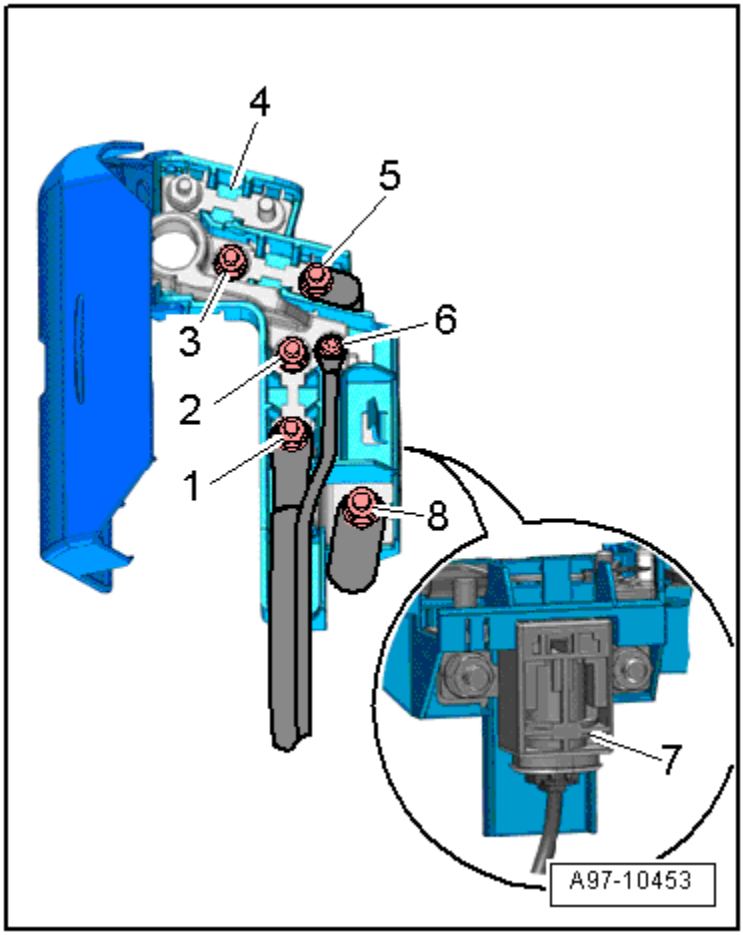
No.	Description	Nm
1	PTC line	18
2	Battery jump start terminal (U6)	20
3	Nut	7.5
4	Nut	7.5
5	E-Box positive wire	7.5
6	Battery wire	18

Relay Panel and Fuse Panel Inside Plenum Chamber E-Box Fastener Tightening Specifications



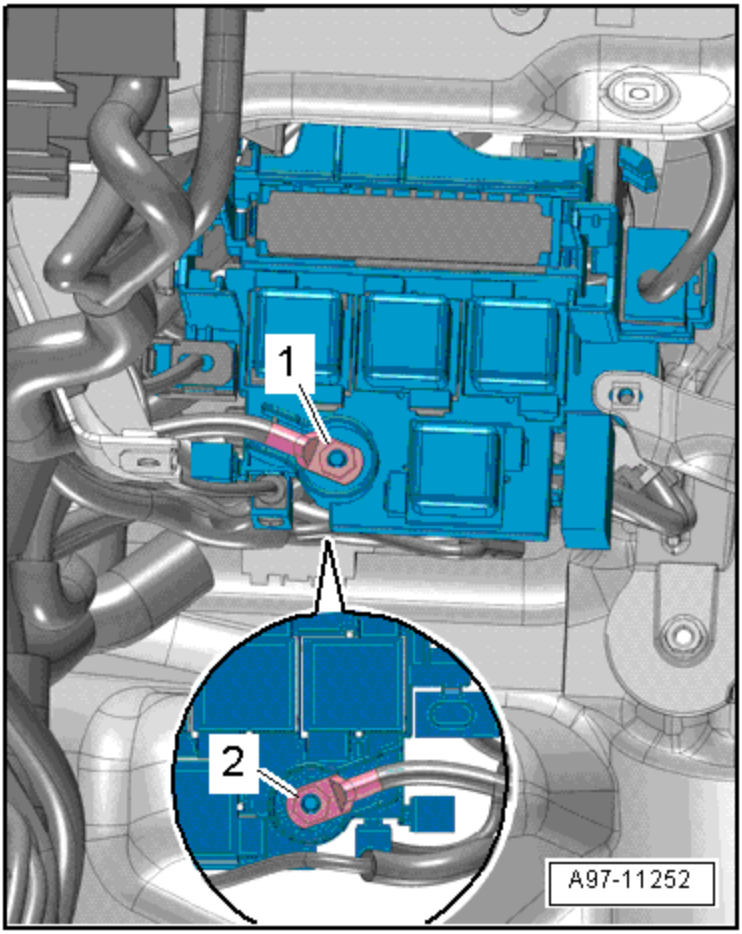
No.	Description	Nm
1	Positive wire	9
2	Electrical wire on the back	9

Main Fuse Panel Tightening Specifications



No.	Description	Nm
1	Electrical wire	7.5
2	Nut	9
3	Nut	9
4	Main fuse panel inside the luggage compartment	-
5	Positive wire-to-engine	7.5
6	Bolt	3.5
7	Battery interrupt igniter (N253)	15
8	Electrical wire	18

Relay Panel Under Instrument Panel On Left Side With A Threaded Connection Tightening Specifications



No.	Description	Nm
1	Electrical wire	9
2	Electrical wire on the back	9

DTC CHART

Engine Code CTUA

Fuel and Air Mixture, Additional Emissions Regulations

DTC	Error Message	Malfunction Criteria and Threshold Value
P000A	Intake (A) Camshaft Position Slow Response (Bank 1)	Adjustment angle difference < 5° CA
P000C	Intake (A) Camshaft Position Slow Response (Bank 2)	Adjustment angle difference < 5° CA
P007C	Intake Air Temperature Sensor after Intercooler 1	Intake Air Temperature > 129 °C
P007D	Intake Air Temperature Sensor after Intercooler 1	Intake Air Temperature < -40 °C
P00A2	Intake Air Temperature Sensor after Intercooler 2 Short to Ground	Intake Air Temperature > 129 °C
P00A3	Intake Air Temperature Sensor after Intercooler 2 Open Circuit	Intake Air Temperature < -40 °C
P00A6	Intake Air Temperature Sensor after intercooler 2 Open Circuit S4 Only	• Difference AAT vs. ECT vs. CHDT at engine start < 26.5 °C and • Difference IAT vs. CHDT at engine start > 26.5 °C and • Difference IAT vs. AAT at engine start < 26.5 °C and • Difference IAT vs. ECT at engine start > 26.5 °C
P008A	Low Pressure Fuel System Pressure - Too Low	Actual pressure < 0.08 MPa
P008B	High Pressure Fuel System Pressure - Too High	Actual pressure > 1.1 MPa
P0010	Intake (A) Camshaft Position Actuator Circuit/Open (Bank 1)	Signal current > 0.8 mA
P0011	Intake (A) Camshaft Position Timing - Over-Advanced (Bank 1)	Adjustment angle difference > 10° CA

DTC	Error Message	Malfunction Criteria and Threshold Value
P0016	Crankshaft Position - Camshaft Position Correlation (Bank 1)	Actual value > 146° CA
P0018	Crankshaft Position - Camshaft Position Correlation (Bank 2)	Actual value < 84° CA
P0020	Intake (A) Camshaft Position Actuator Circuit/Open (Bank 2)	Signal current > 0.8 mA
P0021	Intake (A) Camshaft Position Timing - Over-Advanced (Bank 2)	Actual value > 10° CA
P0030	HO2S Heater Control Circuit (Bank 1, Sensor 1) Open Circuit	Heater current < 8 - < 40 mA
P0031	HO2S Heater Control Circuit Low (Bank 1, Sensor 1) Short to Ground	Heater voltage < 1.9 - < 2.22 V
P0032	HO2S Heater Control Circuit High (Bank 1, Sensor 1) Short to B+	Heater current > 8 - > 11 A
P0036	HO2S Heater Control Circuit (Bank 1, Sensor 2) Open Circuit	Heater current < 8 - < 40 mA
P0037	HO2S Heater Control Circuit Low (Bank 1, Sensor 2) Short to Ground	Heater voltage < 1.9 - < 2.22
P0038	HO2S Heater Control Circuit High (Bank 1, Sensor 2) Short to B+	Heater current > 3 - > 5 A
P0050	HO2S Heater Control Circuit High (Bank 2, Sensor 1) Short to Battery Voltage	Heater current < 8 - < 40 mA
P0051	HO2S Heater Control Circuit Low (Bank 1, Sensor 1) Short to Ground	Heater voltage < 1.9 - < 2.22 V
P0052	HO2S Heater Control Circuit High (Bank 2, Sensor 1) Short to Battery Voltage	Heater current > 8 - > 11 A
P0056	HO2S Heater Control Circuit (Bank 1, Sensor 2) Open Circuit	Heater current < 8 - < 40 mA

DTC	Error Message	Malfunction Criteria and Threshold Value
P0057	HO2S Heater Control Circuit Low (Bank 1, Sensor 2) short to Ground	Heater voltage < 1.9 - < 2.22 V
P0058	HO2S Heater Control Circuit High (Bank 1, Sensor 2) Short to Battery Voltage	Heater current > 3 - > 5 A
P0068	MAP/MAF – Throttle Position Correlation	• Plausibility with fuel system load calculation < -43% • Plausibility with fuel system load calculation > 43%
P0071	Ambient Air Temperature Sensor Circuit Range/ Performance	• Difference AAT vs. ECT vs. CHDT at engine start < 26.5 °C and • Difference IAT vs. CHDT at engine start > 26.5 °C and • Difference IAT vs. AAT at engine start < 26.5 °C and • Difference IAT vs. ECT at engine start > 26.5 °C
P0072	Ambient Air Temperature Sensor Circuit Low	Failure
P0073	CAN Communication with Ambient Air Temperature Sensor	Failure
P007C	Intake Air Temperature Sensor after Intercooler 1	Intake Air Temperature > 129 °C
P007D	Intake Air Temperature Sensor after Intercooler 1	Intake Air Temperature < -40 °C
P0087	Fuel Rail/System Pressure - Too Low	• Deviation fuel rail pressure control > 3.5 MPa and • Lambda controller output (no map, just bottom and top limit) -15 - 15%
P0089	Fuel Pressure Sensor 1 Performance	• Deviation fuel pressure control (LP) < -28% • Target pressure-actual pressure > 0.17 MPa • Target pressure-actual pressure < -0.17 MPa

DTC	Error Message	Malfunction Criteria and Threshold Value
P0090	Fuel Rail Pressure Control Valve, Open Circuit	Signal current < 0.8 mA
P0091	Fuel Rail Pressure Control Valve, Short to Ground	Signal Voltage < 2.0 V
P0092	Fuel Rail Pressure Control Valve, Open Circuit	Signal current > 11 A
P0096	Intake Air Temperature Sensor 2 Circuit Bank 1 Range/ Performance	• Difference AAT vs. ECT vs. CHDT at engine start < 26.5 °C and • Difference IAT vs. CHDT at engine start > 26.5 °C and • Difference IAT vs. AAT at engine start < 26.5 °C and • Difference IAT vs. ECT at engine start > 26.5 °C
P0111	Intake Air Temperature Sensor 1 Rationality Check S4 Only	• Difference in value between AAT vs. ECT vs. CHDT at engine start (depending on engine off time) < 26.5 °C and • Difference in value between IAT vs. CHDT at engine start (depending on engine off time) > 26.5 °C and • Difference in value between IAT vs. ECT at engine start (depending on engine off time) > 26.5 °C
P0112	Intake Air Temperature Sensor 1 Circuit Low Input	Intake air temperature > 129 °C
P0113	Intake Air Temperature Sensor 1 Circuit High Input	Intake air temperature < -40 °C

DTC	Error Message	Malfunction Criteria and Threshold Value
P0116	Engine Coolant Temperature Sensor 1 Circuit Range/ Performance. (Stuck)	• Difference in value between ECT vs. AAT vs. IAT at engine start (depending on engine off time) < 26.5 °C and • Difference in value between ECT vs. CHDT at engine start (depending on engine off time) > 26.5 °C and • Difference in value between ECT vs. IAT at engine start (depending on engine off time) > 26.5 °C
P0117	Engine Coolant Temperature Sensor 1 Circuit Low Input	Engine coolant temperature > 141 °C
P0118	Engine Coolant Temperature Sensor 1 Circuit Open	Engine coolant temperature < -45.8 °C
P0121	Throttle/Pedal Position Sensor A Circuit Range/Performance	• TPS 1 - TPS 2 > 5.79% and • Relative mass air integral > 100 at 0.45 s
P0122	Throttle/Pedal Position Sensor A Circuit Low Input	Signal voltage < 0.117 V
P0123	Throttle/Pedal Position Sensor A Circuit High Input	Signal voltage > 4.6 V
P012B	Turbocharger/Supercharger Inlet Pressure Sensor Circuit Range/Performance	Pressure difference in cross check between boost pressure sensor 1/2; inlet charger pressure and ambient pressure sensor > 7 kPa
P012C	Turbocharger/Supercharger Inlet Pressure Sensor Circuit Low	Signal voltage < 0.2 V
P012D	Turbocharger/Supercharger Inlet Pressure Sensor Circuit High	Signal voltage > 4.8 V
P0130	O2 Sensor Circuit (Bank 1, Sensor 1)	O2S ceramic temperature < 640°C
P0131	O2 Sensor Circuit (Bank 1, Sensor 1) Low Voltage	Virtual mass < 0.13 V
P0132	O2 Sensor Circuit (Bank 1, Sensor 1) High Voltage	Signal voltage > 5.5 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P0133	O2 Circuit Slow Response (Bank 1, Sensor 1)	Lambda value > 0.9004
P0135	O2 Heater Circuit (Bank 1, Sensor 1)	UEGO ceramic temperature < 680 or > 965 °C
P0136	O2 Circuit (Bank 1, Sensor 2)	Oscillation check • O2S signal rear not oscillating at reference +/- 10 mV Signal range check • Signal voltage > 0.15 V
P0137	O2 Circuit Low Voltage (Bank 1, Sensor 2)	• Signal voltage < 20 mV and • Internal resistance < 10 Ohm
P0138	O2 Circuit High Voltage (Bank 1, Sensor 2)	Signal voltage > 1.2 V
P0139	O2 Circuit Slow Response (Bank 1 Sensor 2)	Average ratio between measured and maximum allowed rich to lean switching time ratio > 1
P013A	O2 Sensor (Bank 1 Sensor 2) Slow Response - Rich to Lean	Arithmetic filtered max differential transient time at rich to lean transition ≤ 800 mV/s and number of checks ≥ 3
P013B	O2 Sensor (Bank 1 Sensor 2) Slow Response - Lean to Rich	Arithmetic filtered max differential transient time at rich to lean transition ≤ 800 mV/s and number of checks ≥ 3
P013C	O2 Sensor (Bank 2 Sensor 2) Slow Response - Rich to Lean	Arithmetic filtered max differential transient time at rich to lean transition ≤ 800 mV/s and number of checks ≥ 3
P013D	O2 Sensor (Bank 2 Sensor 2) Slow Response - Lean to Rich	Arithmetic filtered max differential transient time at rich to lean transition ≤ 800 mV/s and number of checks ≥ 3
P013E	O2 Sensor (Bank 1 Sensor 2) Delayed Response - Lean to Rich	Arithmetic filtered max differential transient time at rich to lean transition ≥ 0.800 s and number of checks ≥ 4
P013F	O2 Sensor (Bank 1 Sensor 2) Delayed Response - Lean to Rich	Arithmetic filtered max differential transient time at rich to lean transition ≥ 0.800 s and number of checks ≥ 4

DTC	Error Message	Malfunction Criteria and Threshold Value
P0140	O2 Circuit No Activity Detected (Bank 1, Sensor 2)	• Signal voltage 0.376 - 0.474 V
P0141	O2 Heater Circuit (Bank 1, Sensor 2) Out of Range	Heater resistance > 10 Ω
P014A	O2 Sensor (Bank 2 Sensor 2) Delayed Response - Rich to Lean	Arithmetic filtered max differential transient time at rich to lean transition ≥ 0.800 s and number of checks ≥ 4
P014B	O2 Sensor (Bank 1 Sensor 2) Delayed Response - Lean to Rich	Arithmetic filtered max differential transient time at rich to lean transition ≥ 0.800 s and number of checks ≥ 4
P0151	O2 Sensor Circuit, (Bank 2 Bank 1) Low Voltage	Virtual mass < 0.13 V
P0152	O2 Sensor Circuit, (Bank 2 Sensor 1) High Voltage	Signal voltage > 5.5 V
P0153	O2 Circuit Slow Response (Bank 2, Sensor 1)	Lambda value > 0.9004
P0155	O2 Heater Circuit (Bank 2, Sensor 1)	UEGO ceramic temperature < 680 or > 965 °C
P0156	O2 Circuit (Bank 1, Sensor 2)	Oscillation check • O2S signal rear not oscillating at reference +/- 10 mV Signal range check • Signal voltage > 0.15 V
P0157	O2 Circuit Low Voltage (Bank 1, Sensor 2)	• Signal voltage < 20 mV and • Internal resistance < 10 Ohm
P0158	O2 Circuit High Voltage (Bank 1, Sensor 2)	Signal voltage > 1.2 V
P0159	O2 Circuit Slow Response (Bank 1, Sensor 2)	Average ratio between measured and maximum allowed rich to lean switching time ratio > 1
P0160	O2 Circuit No Activity Detected (Bank 1, Sensor 2)	Internal resistance > 60,000 Ohm
P0161	O2 Heater Circuit (Bank 1, Sensor 2) Out of Range	Heater resistance > 10 Ω
P0169	Incorrect Fuel Composition	Plausibility check failed
P0171	Fuel System Too Lean, Additive (Bank 1, Bank 2)	Adaptive value > 25%

DTC	Error Message	Malfunction Criteria and Threshold Value
P0172	Fuel System Too Rich-Multiplicative (Bank 1, Bank 2)	Adaptive value < -25%
P0174	Fuel System Too Lean, Additive (Bank 1, Bank 2)	Adaptive value > 25%
P0175	System Too Rich-Additive (Bank 1, Bank 2)	Adaptive value < -25%
P017B	Cylinder Head Temperature Sensor Circuit Range/ Performance	• Difference in value between ECT vs. AAT vs. IAT at engine start (depending on engine off time) < 26.5 °C and • Difference in value between CHDT vs. ECT at engine start (depending on engine off time) > 26.5 °C and • Difference in value between CHDT vs. AAT at engine start (depending on engine off time) > 26.5 °C
P017C	Cylinder Head Temperature Sensor Circuit Low	• Cylinder head temperature short to ground > 215 °C • Cylinder head temperature short to battery plus < -60 °C
P017D	Cylinder Head Temperature Sensor Circuit High	• Cylinder head temperature short to ground > 215 °C • Cylinder head temperature short to battery plus < -60 °C
P0190	Fuel Rail Pressure Sensor A Circuit	Signal voltage > 4.6 V
P0191	Fuel Rail Control Valve, High Pressure Side	Actual pressure > 16.85 MPa
P0192	Fuel Rail Pressure Sensor A Circuit Low Input	Signal voltage < 0.2 V
P0201	Injector Circuit/Open - Cylinder 1	• Signal current < 10 A and • Signal voltage > 3.5 V
P0202	Injector Circuit/Open - Cylinder 2	• Signal current < 10 A and • Signal voltage > 3.5 V
P0203	Injector Circuit/Open - Cylinder 3	• Signal current < 10 A and • Signal voltage > 3.5 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P0204	Injector Circuit/Open - Cylinder 4	• Signal current < 10 A and • Signal voltage > 3.5 V
P0205	Injector Circuit/Open - Cylinder 5	• Signal current < 10 A and • Signal voltage > 3.5 V
P0206	Injector Circuit/Open - Cylinder 6	• Signal current < 10 A and • Signal voltage > 3.5 V
P0221	Throttle/Pedal Position Sensor/Switch B Circuit Range/Performance	• TPS 1 - TPS 2 > 5.79% and • Relative mass air integral > 100 at 0.45 s
P0222	Throttle/Pedal Position Sensor/Switch B Circuit Low Input	Signal voltage < 0.117 V
P0223	Throttle/Pedal Position Sensor/Switch B Circuit High Input	Signal voltage > 4.6 V
P0235	Boost Pressure Control Functional Check	Difference between actual measured charge pressure quotient and target charge pressure quotient (1) 0.25 - 0.35
P0236	Turbocharger/Supercharger Boost Sensor A Plausibility Check	• Pressure difference in cross check between boost pressure sensor 1/2; inlet charger pressure and ambient pressure sensor > 7 kPa • Pressure difference in cross check between boost pressure sensor 1/2 and inlet charger pressure (1) > 12 -27 kPa • Pressure difference in cross check between boost pressure sensor 1 and 2 > 12.5 kPa and • Fuel trim activity (bank with deviation is considered to be defective) > 15%
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 Rationality Check	• Pressure difference in cross check between boost pressure sensor 1/2; inlet charger pressure and ambient pressure sensor > 7 kPa • Pressure difference in cross check between boost pressure sensor 1/2 and inlet charger pressure (1) > 12 -27 kPa • Pressure difference in cross check between boost pressure sensor 1 and 2 > 12.5 kPa and • Fuel trim activity (bank with deviation is considered to be defective) > 15%
P0241	Turbocharger/Supercharger Boost Sensor -Short to Ground	Signal voltage < 0.2 V
P0242	Turbocharger/Supercharger Boost Sensor short to Battery Voltage	Signal voltage > 4.8 V
P025A	Fuel Pump Module -Open Control Circuit	Signal current < 0.8 mA
P025C	Fuel Pump Module -Short to Ground	Signal voltage < 2.0 V
P025D	Fuel Pump Module -Short to Battery Voltage	Signal current > 1.0 A
P0261	Cylinder 1 Injector Circuit Short to Ground	• Signal current < 10 A and • Signal voltage > 3.5 V
P0262	Cylinder 1 Injector Circuit Short to Battery Voltage	Signal current > 16 A
P0264	Cylinder 2 Injector Circuit Short to Ground	• Signal current < 10 A and • Signal voltage > 3.5 V
P0265	Cylinder 2 Injector Circuit Short to Battery Voltage	Signal current > 16 A
P0267	Cylinder 3 Injector Circuit Short to Ground	• Signal current < 10 A and • Signal voltage > 3.5 V
P0268	Cylinder 3 Injector Circuit Short to Battery Voltage	Signal current > 16 A

DTC	Error Message	Malfunction Criteria and Threshold Value
P0270	Cylinder 4 Injector Circuit Short to Ground	• Signal current < 10 A and • Signal voltage > 3.5 V
P0271	Cylinder 4 Injector Circuit Short to Battery Voltage	Signal current > 16 A
P0273	Cylinder 5 Injector Circuit Short to Ground	• Signal current < 10 A and • Signal voltage > 3.5 V
P0274	Cylinder 5 Injector Circuit Short to Battery Voltage	Signal current > 16 A
P0276	Cylinder 6 Injector Circuit Short to Ground	• Signal current < 10 A and • Signal voltage > 3.5 V
P0277	Cylinder 6 Injector Circuit Short to Battery Voltage	Signal current > 16 A
P2004	Intake Manifold Runner Control Stuck Open (Bank 1)	Signal voltage > 2.5V
P2005	Intake Manifold Runner Control Stuck Closed (Bank 2)	Signal voltage < 2.9 V
P2006	Intake Manifold Runner Control Stuck Closed (Bank 1)	Signal voltage < 2.9 V
P2007	Intake Manifold Runner Control Stuck Open (Bank 2)	Signal voltage > 2.5 V
P2008	Intake Manifold Runner Control Circuit/Open (Bank 1)	Signal voltage < 2.9 - 3.2 V
P2009	Intake Manifold Runner Control Circuit Shorted (Bank 1)	Signal voltage < 1.95 - 2.2 V
P2010	Intake Manifold Runner Control Circuit Shorted to B+ (Bank 1)	Signal current 1 - 2 A
P2014	Intake Manifold Runner Position Sensor/Switch Circuit Short to Ground (Bank 1)	Signal voltage < 0.2 V
P2017	Intake Manifold Runner Position Sensor/Switch Circuit Short to Battery Voltage (Bank 1)	Signal voltage > 4.8 V
P2019	Intake Manifold Runner Position Sensor Circuit Open circuit (Bank 2)	Signal voltage < 0.2 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P2022	Intake Manifold Runner Position Sensor Circuit Short to Battery voltage (Bank 2)	Signal voltage > 4.8 V
P2024	Evaporative Emissions (EVAP) Fuel Vapor Temperature Sensor Circuit	Signal current < 0.8 A
P2025	Evaporative Emissions (EVAP) Fuel Vapor Temperature Sensor Performance	• Response time > 1000 ms and • Numbers of checks > 3.00 or • Security bit incorrect and • Numbers of checks > 3.00
P2026	Evaporative Emissions (EVAP) Fuel Vapor Temperature Sensor Circuit Low Voltage	Signal voltage < 2 V
P2027	Evaporative Emissions (EVAP) Fuel Vapor Temperature Sensor Circuit High Voltage	Signal current > 1 A
P2088	A Camshaft Position Actuator Control Circuit Low short to Ground (Bank 1)	Signal voltage < 2 V
P2089	A Camshaft Position Actuator Control Circuit High Short to Battery Voltage (Bank 1)	Signal current > 3 A
P2092	A Camshaft Position Actuator Control Circuit Low Short to Ground (Bank 2)	Signal voltage < 2 V
P2093	A Camshaft Position Actuator Control Circuit High short to Battery voltage (Bank 2)	Signal current > 3 A
P2096	Post Catalyst Fuel Trim System Out of Range High (Bank 1)	Integral part of trim control post cat. > 10%
P2097	Post Catalyst Fuel Trim System Out of Range Low (Bank 1)	Integral part of trim control post cat. < -10%
P2098	Post Catalyst Fuel Trim System Out of Range High (Bank 2)	Integral part of trim control post cat. > 10%
P2099	Post Catalyst Fuel Trim System Out of Range Low (Bank 2)	Integral part of trim control post cat. < -10%

Ignition System

DTC	Error Message	Malfunction Criteria and Threshold Value
P0300	Random, Multiple Misfire Detected	• Emission threshold misfire rate (MR) > 1.5%
P0301	Cylinder 1 Misfire Detected	• Emission threshold misfire rate (MR) > 1.5% • Catalyst damage misfire rate (MR) > 1.5 - 15%
P0302	Cylinder 2 Misfire Detected	• Emission threshold misfire rate (MR) > 1.5% • Catalyst damage misfire rate (MR) > 1.5 - 15%
P0303	Cylinder 3 Misfire Detected	• Emission threshold misfire rate (MR) > 1.5% • Catalyst damage misfire rate (MR) > 1.5 - 15%
P0304	Cylinder 4 Misfire Detected	• Emission threshold misfire rate (MR) > 1.5% • Catalyst damage misfire rate (MR) > 1.5 - 15%
P0305	Cylinder 5 Misfire Detected	• Emission threshold misfire rate (MR) > 1.5% • Catalyst damage misfire rate (MR) > 1.5 - 15%
P0306	Cylinder 6 Misfire Detected	• Emission threshold misfire rate (MR) > 1.5% • Catalyst damage misfire rate (MR) > 1.5 - 15%
P0326	Knock Sensor 1 Signal Activity Check	• Lower threshold < 0.029 V • Upper threshold > 1.992 V
P0327	Knock Sensor 1 Circuit Low Input (Bank 1) Short to Ground	• Lower threshold < 0.18 V
P0328	Knock Sensor 1 Circuit Short to Battery Voltage	• Upper threshold > 14.8 V
P0331	Knock Sensor 2 Signal Activity Check	• Lower threshold < 0.029 V • Upper threshold > 1.992 V
P0332	Knock Sensor 2 Circuit Short to Ground/Open	• Lower threshold < 0.18 V
P0335	Engine Speed Sensor	RPM signal no activity

DTC	Error Message	Malfunction Criteria and Threshold Value
P0336	Engine Speed Sensor	• RPM Signal comparison with phase sensor not synchronous • Counted versus reference teeth > 1 • Ratio between old tooth period vs. actual tooth period > 1.375
P0340	Camshaft Position (Sensor 1) A Circuit	No signal change during 4 rev.
P0341	Camshaft Position (Sensor 1) Circuit Range/Performance	• Actual time value vs. min. time value < 1 • Adaptive value vs. target value > 12.4 °CA • Actual time value vs. modeled time value > 3.5
P0345	Camshaft Position (Sensor 1) Circuit	No signal change during 4 rev.
P0346	Camshaft Position (Sensor 2) Circuit Range/Performance	• Actual time value vs. min. time value < 1 • Adaptive value vs. target value > 12.4 °CA • Actual time value vs. modeled time value > 3.5
P0351	Ignition Coil A Primary/ Secondary Circuit	• Signal current < -0.05 - 2.0 mA • Signal current > 0.04 - 2.0 mA
P0352	Ignition Coil B Primary/ Secondary Circuit	• Signal current < -0.05 - 2.0 mA • Signal current > 0.04 - 2.0 mA
P0353	Ignition Coil C Primary/ Secondary Circuit	• Signal current < -0.05 - 2.0 mA • Signal current > 0.04 - 2.0 mA
P0354	Ignition Coil D Primary/ Secondary Circuit	• Signal current < -0.05 - 2.0 mA • Signal current > 0.04 - 2.0 mA
P0355	Ignition Coil E Primary/ Secondary Circuit	• Signal current < -0.05 - 2.0 mA • Signal current > 0.04 - 2.0 mA

DTC	Error Message	Malfunction Criteria and Threshold Value
P0356	Ignition Coil F Primary/ Secondary Circuit	• Signal current < -0.05 - 2.0 mA • Signal current > 0.04 - 2.0 mA

Additional Exhaust Regulation

DTC	Error Message	Malfunction Criteria and Threshold Value
P0410	Rationality Check	Deviation SAI pressure > 20.0 hPa
P0413	Open Circuit	Signal current < 0.8 mA
P0414	Air Valve Short to Ground	Signal voltage < 2 V
P0416	Open Circuit	Signal current < 0.8 mA
P0417	Air Valve Short to Ground	Signal voltage < 2 V
P0418	Air Pump Relay. Open Circuit	Signal current < 1 mA
P0420	Catalyst System (Bank 1)	Normalized catalyst efficiency mean value (visible in SCAN-Tool) > 1.8 and number of checks 4
P0430	Catalyst System (Bank 2)	Normalized catalyst efficiency mean value (visible in SCAN-Tool) > 1.8 and number of checks 4
P0441	Evaporative Emission System Incorrect Purge Flow	Purge valve quality < 0.05
P0442	Evaporative Emission System Leak Detected (Small Leak)	Time for pressure drop < 1.06 - 1.3 Sec.
P0444	Evaporative Emission System Purge Control Valve Circuit Open	Signal voltage < 2.9 - 3.2 V
P0445	Evaporative Emission System Purge Control Valve Short to Ground	Signal voltage < 1.95 - 2.2 V Signal current > 5 A
P0450	Evaporative Emission System Pressure Sensor/Switch	Signal voltage 0.39 - 0.55 V
P0451	Evaporative Emission System Pressure Sensor/Switch Range/Performance	NVLD switch position closed

DTC	Error Message	Malfunction Criteria and Threshold Value
P0452	EVAP Emission Control System Pressure Sensor Low Input	Signal voltage < 0.24 V
P0453	EVAP Emission Control System Pressure Sensor High Input	Signal voltage > 3.0 V
P0455	Evaporative Emission System Purge Control Valve, Short to Ground or Short to Battery Plus	Time for pressure drop (3) < 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 System Insufficient Flow (Bank 1)	Difference between reference AIR mass flow and calculated AIR mass flow > 18 - 21 kg/h
P0492	Secondary Air System Insufficient Flow (Bank 2)	Difference between reference AIR mass flow and calculated AIR mass flow > 18 - 21 kg/h

Speed and Idle Control

DTC	Error Message	Malfunction Criteria and Threshold Value
P0501	Vehicle Speed Sensor A Range/Performance	Vehicle speed signal < 1.24 mph
P0502	Vehicle Speed Sensor A Circuit Low Input	Sensor signal failure
P0503	Vehicle Speed Sensor A Out of Range/High	Vehicle speed signal > 203.5 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	Idle Control System RPM Out of Range	• Out of range low < -80 - -250 RPM • Out of range high > 80 - 250 RPM
P050B	Cold Start Ignition Timing Performance	Difference between commanded spark timing vs. actual timing (mean value during catalyst heating) > 15%
P052A	Intake (A) Camshaft Position Actuator Circuit / (Bank 1)	Adjustment angle difference > 10 °CA
P052C	Intake (A) Camshaft Position Actuator Circuit / (Bank 2)	Adjustment angle difference > 10 °CA
P053F	Fuel Rail Pressure Control Valve	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
P0606	ECM Processor	SPI Communication lost
P0627	Fuel Pump A Control Circuit/ Open	• Internal error fuel pump control unit • Feedback from fuel pump control unit pump blocked short circuit to battery +, ground or open circuit
P0638	Throttle Actuator Control Range/Performance (Bank 1)	• Actual TPS - calc. value and > 8° duty cycle > 0.4 s at 98% and • Actual TPS - ref. point < 1.5° • Open to 15° > 1.275s then close to ref. point > 1.28s gradient < 7°/s or • Close to 1.99° > 1.275s then open to ref. point >1.28s gradient < 7°/s • TPS 1 signal voltage 0.208 - 0.852 V or TPS 2 signal voltage 4.158 - 4.802 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P0642	Sensor Reference Voltage A Circuit Low	Signal voltage < 4.615 V
P0643	Sensor Reference Voltage A Circuit High	Signal voltage > 5.434 V
P0652	Sensor Reference Voltage B Circuit Low	Signal voltage < 4.615 V
P0653	Sensor Reference Voltage B Circuit High	Signal voltage > 5.434 V
P0657	Actuator Supply Voltage A Circuit/Open	Signal voltage < 2.9 - 3.2 V
P0658	Actuator Supply Voltage A Circuit Low	Signal voltage < 1.95 - 2.2 V
P0659	Actuator Supply Voltage A Circuit High	Signal current > 1 - 2 A
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
U0001	High Speed CAN Communication Bus	CAN message, no feedback
U0002	High Speed CAN Communication Bus	Global time out
U0101	Lost Communication with TCM	CAN communication with TCM, time out. No message received by ECM
U0121	CAN ABS Brake Unit	CAN communication with ABS, no message
U0140	CAN communication with Body Control Module 1	CAN message - no message
U0146	CAN Gateway A	CAN communication with gateway, time out
U0155	CAN Instrument Cluster	Received CAN message - no message
U0302	Software Incompatibility with Transmission Control Module	Manual transmission vehicle, TCM coded as automatic transmission vehicle
U0322	Software Incompatibility with Body Control Module	Ambient temperature value (module not encoded for ambient temperature sensor)

DTC	Error Message	Malfunction Criteria and Threshold Value
U0402	CAN Communication with TCM	Received data from TCM implausible message
U0404	Invalid Data Received From Gear Shift Control Module	• If the value of message counter is permanent, constant, or change exceeds a threshold, increment an event counter • Maximum change of message counter > 5
U0415	CAN Link to Speed Sensor	Vehicle speed via CAN out of range = 655.35 km/h
U0422	CAN: Vehicle Speed Sensor	• Speed sensor signal: initialization error 655.34km/h • Speed sensor signal: low voltage error 655.33km/h • Speed sensor signal: sensor error 655.35 km/h • Vehicle speed >/= 325 km/h
U0422	CAN: Instrument cluster	Ambient temperature value initialization
U0423	Communication with Instrument Cluster	Received CAN message, implausible message
U0447	CAN Gateway	Received data from Gateway implausible message
U1103	(Bank 1 Sensor 1) Heater Circuit Performance too low	Proiduction mode active

Fuel and Air Ratios Control Module

DTC	Error Message	Malfunction Criteria and Threshold Value
P10A0	RFP Power stage, Signal Range Check	• Duty cycle > 95% or • Adaptive value < -95%
P10A4	RFP Actuator, Functional Check	• Adaptive value < 60% or • Adaptive value > 88%
P10A5	RFP Sensor, Short to B +	Signal voltage > 4.9 V
P10A6	RFP Sensor, Short to Ground / Open Circuit	Signal voltage < 0.1 V
P10A7	RFP Sensor, Signal Range Check @ Mechanical Stop High	Difference actual signal voltage to learned signal voltage > 0.05 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P10A8	RFP Sensor, Signal Range Check @ Mechanical Stop Low	RFP Signal Voltage in closed position ≤ 0.35 - ≥ 0.65 V
P12A1	Fuel Rail Pressure Sensor Inappropriately Low	• Deviation fuel rail pressure control > -0.051 g/rev and • Deviation lambda control > 30%
P12A2	Fuel Rail Pressure Sensor Inappropriately High	• Deviation fuel rail pressure control < -0.060 g/rev and • Deviation lambda control < -22.5%
P12A4	Fuel Rail Pump Control Valve Stuck Closed	• Deviation fuel rail pressure control < -0.120 g/rev and • Lambda controller output (no map, just bottom and top limit) -15 - 15%
P13EA	Cold Start Ignition Timing Performance Off Idle	Difference between commanded spark timing vs. actual timing (mean value during catalyst heating) > 15%
P150A	Comparing Engine Off Time From Instrument Cluster Control Unit With Engine after Run Time	• Difference between engine-off-time < -12.0 Sec. and • ECM keep alive time > 12.0 Sec.
P169A	Loading Mode Active	Transport mode active
P2101	Throttle Actuator A Control Motor Circuit Range/ Performance	• Duty cycle > 0.4 s at > 98% and • Actual TPS - ref. point > 1.5° or • Actual TPS - calc. value > 0.4 s at > 8°
P2106	Throttle Actuator Control System - short to Battery voltage or ground	ECM power stage failure
P2122	Throttle/Pedal Position Sensor Circuit Low Input	Signal voltage < 0.4 V
P2123	Throttle/Accelerator Pedal Position Sensor 1 Circuit High Input	Signal voltage > 4.82 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P2127	Throttle/Accelerator Pedal Position Sensor 2 Circuit Low Input	Signal voltage < 0.2 V
P2128	Throttle/Accelerator Pedal Position Sensor 2 Circuit High Input	Signal voltage > 2.8 V
P2138	Throttle/Accelerator Pedal Position Sensor 1/2 Rationality Check	Signal voltage: Difference between signal sensor 1 and 2 > 0.24 V
P2147	Injector Circuit short to ground	Signal current > 12 A
P2148	Injector Circuit short to Battery voltage	Signal current > 33 A
P2150	Injector Circuit Short to Ground	Signal current > 12 A
P2151	Injector Circuit Short to Battery Voltage	Signal current > 33 A
P2153	Injector Circuit short to Battery Voltage	Signal current > 12 A
P2154	Injector Circuit short to Battery Voltage	Signal current > 33 A
P2181	Cooling System Performance	Engine coolant temperature < 75 °C
P2195	O2 Sensor rationality check high (Bank 1)	Lambda value > 1.1
P2196	O2 Sensor Signal Biased/ Stuck Rich (Bank 1)	Lambda value < 0.9
P2197	O2 Sensor rationality check high (Bank 2)	Lambda value > 0.96
P2198	O2 Sensor rationality check Low (Bank 2)	Lambda value < 1.04
P219C	Cylinder Imbalance	• Adaptive value < -10% or • > 10%
P219D	Cylinder Imbalance	• Adaptive value < -10% or • > 10%
P219E	Cylinder Imbalance	• Adaptive value < -10% or • > 10%

DTC	Error Message	Malfunction Criteria and Threshold Value
P219F	Cylinder Imbalance	• Adaptive value < -10% or • > 10%
P21A0	Cylinder Imbalance	• Adaptive value < -10% or • > 10%
P21A1	Cylinder Imbalance	• Adaptive value < -10% or • > 10%
P2227	Barometric Pressure Circuit Range/Performance	Pressure difference in cross check between boost pressure sensor 1/2; inlet charger pressure and ambient pressure sensor > 7 kPa
P2237	O2 Sensor Positive Current Control Circuit/Open (Bank 1, Sensor 1)	Signal activity check failed
P2240	O2 Sensor Positive Current Control Circuit / Open (Bank 2, Sensor 1)	Signal activity check failed
P2243	O2 Sensor Reference Voltage Circuit / Open (Bank 1, Sensor 1)	Functional check failed
P2247	O2 Sensor Nernst Voltage Open (Bank 2, Sensor 1)	Intrusive check failed
P2251	O2 Sensor Signal open circuit (Bank 1, Sensor 1)	• Functional check heater failed and • Signal activity check failed
P2254	O2 Sensor Signal Open Circuit (Bank 2, Sensor 1)	• Functional check heater failed and • Signal activity check failed
P2257	Air Pump Relay Short to Ground	Signal voltage < 2.00 V
P2258	Air Pump Relay Short to B+	Signal current > 3 A
P2270	O2 Circuit Slow Response (Bank 1, Sensor 2) SULEV	Signal voltage < 0.800 V and number of checks ≥ 3
P2271	O2 Circuit (Bank 1, Sensor 2) SULEV	Signal voltage > 0.2 V and number of checks ≥ 3
P2272	O2 Sensor Signal Stuck Lean (Bank 2 Sensor 2)	Signal voltage < 0.800 V and number of checks ≥ 3
P2273	O2 Sensor Signal Stuck Rich (Bank 2 Sensor 2)	Signal voltage > 0.2 V and number of checks ≥ 3

Additional Emissions Regulations

DTC	Error Message	Malfunction Criteria and Threshold Value
P2400	Evaporative Emission System Leak Detection Pump Control Circuit/Open	Signal current < 0.8 mA
P2401	Evaporative Emission System Leak Detection Pump Control Circuit Low	Signal voltage < 2 V
P2402	Evaporative Emission System Leak Detection Pump Control Circuit High	Signal current = 1 A
P2403	Evaporative Emission System Leak Detection Pump Sense Circuit/Open	Low signal voltage > 1 Sec.
P2404	Evaporative Emission System Leak Detection Pump Sense Circuit Range/Performance	• Switch closed for > 0.36 Sec. • Number of checks 26.
P2414	O2 Sensor Signal Range Check (Bank 1, Sensor 1)	O2S signal front > 3.1 V
P2415	O2 Sensor Signal Range Check (Bank 2, Sensor 1)	O2S signal front > 3.1 V
P2440	Secondary Air System Valve (Bank 1) Stuck Open	Deviation of lambda controller > 15.00%
P2442	Secondary Air System Valve (Bank 2) Stuck Open	Deviation of lambda controller > 15.00%
P2539	Low Pressure Fuel System Sensor Circuit Short to B +	Signal voltage > 4.8 V
P2541	Low Pressure Fuel System Sensor Circuit Low	Signal voltage < 0.2 V
P2626	O2 Sensor Pumping Current Trim Circuit/Open (Bank 1 Sensor 1)	O2S signal front > 4.7 V
P2629	O2 Sensor Pumping Current Trim Circuit/Open (Bank 2, Sensor 1)	O2S signal front > 4.7 V

DTC CHART

Engine Code CEUC

Fuel and Air Mixture, Additional Emissions Regulations

DTC	Error Message	Malfunction Criteria and Threshold Value
P000A	Intake Camshaft Position Slow Response (Bank 1)	• Difference between target position vs. actual position > 8.00 - 63.75 °CRK for time > 1.5 - 3.0 s and • Adjustment angle ≥ 3.00 °CRK
P000B	Exhaust Camshaft Position Slow Response, (Bank 1)	• Difference between target position vs. actual position > 8.00 - 63.75 °CRK for time > 1.5 - 3.0 s and • Adjustment angle ≥ 3.00 °CRK
P000C	Intake Camshaft Position Slow Response (Bank 2)	• Difference between target position vs. actual position > 8.00 - 63.75 °CRK for time > 1.5 - 3.0 s and • Adjustment angle ≥ 3.00 °CRK
P000D	Exhaust Camshaft Position Slow Response, (Bank 2)	• Difference between target position vs. actual position > 8.00 - 63.75 °CRK for time > 1.5 - 3.0 s and • Adjustment angle ≥ 3.00 °CRK
P0010	Intake (A) Camshaft Position Actuator Circuit/Open (Bank 1)	Signal voltage 4.70 - 5.40 V
P0011	Intake (A) Camshaft Position Target Error (Bank 1)	• Difference between target position vs. actual position > 8.00 - 63.75 °CRK for time > 1.5 - 3.0 s and • Adjustment angle < 3.00 °CRK
P0013	Exhaust (A) Camshaft Position Response Check (Bank 1 Bank 2)	Signal voltage 4.70 - 5.40 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P0014	Exhaust (A) Camshaft Position Target Error (Bank 1)	• Difference between target position vs. actual position > 8.00 - 63.75 °CRK for time > 1.5 - 3.0 s and • Adjustment angle < 3.00 °CRK
P0016	Crankshaft Position - Camshaft Position Correlation (Bank 1, Sensor 2)	• Permissible deviation < -11.01° CRK and • Engine speed no signal
P0017	Crankshaft Position - Camshaft Position Correlation Exhaust (Bank 1 Bank 2)	• Permissible deviation < -11.01° CRK or • Permissible deviation > 11.01° CRK
P0018	Crankshaft Position - Camshaft Position Correlation Intake (Bank 1 Bank 2)	• Permissible deviation < -11.01° CRK and • Engine speed no signal
P0019	Crankshaft Position - Camshaft Position Correlation Exhaust (Bank 1 Bank 2)	• Permissible deviation < -11.01° CRK or • Permissible deviation > 11.01° CR
P0020	Intake (A) Camshaft Position Actuator Circuit / Open (Bank 1)	Signal voltage, signal voltage 4.70 - 5.40 V
P0021	Intake (A) Camshaft Position target Error (Bank 2)	• Difference between target position vs. actual position > 8.00 - 63.75 °CRK for time > 1.5 - 3.0 s and • Adjustment angle <3.00 °CRK
P0023	Exhaust (A) Camshaft Position Response Check (Bank 1 Bank 2)	Signal voltage 4.70 - 5.40 V
P0024	Exhaust (A) Camshaft Position Target Error (Bank 2)	• Difference between target position vs. actual position > 8.00 - 63.75 °CRK for time > 1.5 - 3.0 s and • Adjustment angle <3.00 °CRK

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	HO2S 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) Short to B+	Signal current > 3.59 A
P0040	Oxygen Sensors Front	Lambda controllers exceed thresholds in opposite directions • Case 1: lambda control value bank 1 < 0.80 and • Lambda control value bank 2 > 1.20 • Case 2: lambda control value bank 1 > 1.20 and • Lambda control value bank 2 < 0.80
P0043	HO2S Heater Control Circuit Low (Bank 1, Sensor 2) Short to Ground	• SULEV Heater voltage < 3 V • ULEV Heater voltage < 3 V
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 1, Sensor 1) Open Circuit	Signal voltage > 4.70 - 5.40 V
P0051	HO2S Heater Control Circuit Low (Bank 1, Sensor 1) Short to Ground	Signal voltage 0.0 - 3.26 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P0052	HO2S Heater Control Circuit High (Bank 1, Sensor 1) Short to B+	Heater current > 5.50 A
P0056	HO2S Heater Control Circuit (Bank 1, Sensor 2) Open Circuit	Signal voltage 2.34 - 3.59 V
P0057	HO2S Heater Control Circuit Low (Bank 1, Sensor 2) Short to Ground	Heater voltage < 2.34 V
P0058	HO2S Heater Control Circuit High (Bank 1, Sensor 2) Short to B+	Signal current > 3.59 A
P0068	MAP/MAF – Throttle Position Correlation	• Deviation throttle controller < 43 or > 43%
P0070	Ambient air temp sensor short to B+	Ambient air temp <50.0°C
P0071	Rationality check	• Difference ECT vs. IAT at engine start < 24.8 - 39.8 K and • Difference IAT vs. AAT at engine start > 24.8 - 39.8 K and • Difference AAT vs. ECT at engine start > 24.8 - 39.8 K (depending on engine off time)
P0072	Ambient Air Temperature Sensor Short to Ground	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	• Pressure control activity > 1.0 mPa and • Fuel trim activity 0.90 - 120 and • Difference between target pressure vs. actual pressure > 0.40 mPa
P0088	Fuel Rail/System Pressure - Too High	Fuel rail pressure > 13.9 MPa

DTC	Error Message	Malfunction Criteria and Threshold Value
P0089	Fuel Pressure Regulator 1 Performance	• Difference between actual pressure - target pressure >200 kPa • Pressure control activity < -350 kPa or >350 kPa
P008A	Fuel Pressure Out of Range Low	< 80.0 kPa
P008B	Fuel Pressure Out of Range High	Actual press > 850 MPa
P0096	Charge Air Cooler Temperature (Sensor 1) Cross Checking	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	Charge Air Cooler Temperature (Sensor 1) Short to Ground	Signal voltage < 0.10 V
P0098	Charge Air Cooler Temperature (Sensor 1) Short to Battery Voltage / Open Circuit	Signal voltage > 4.62 V
P00A6	Charge Air Cooler Temperature (Sensor 2) Cross Checking	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	Charge Air Cooler Temperature (Sensor 2) Short to Ground	Signal Voltage < 0.10 V
P00A8	Charge Air Cooler Temperature (Sensor 2) Short to Battery Voltage / Open Circuit	Signal Voltage > 4.62 V
P0100	Mass or Volume Air Flow A Circuit	MAF sensor signal 0 µs

DTC	Error Message	Malfunction Criteria and Threshold Value
P0101	Mass or Volume Air Flow A Circuit Range/Performance	• Mass air flow vs. lower threshold model < 11 - 192% • Mass air flow vs upper threshold > 120 - 168% • Load calculation >20%. and • Fuel system (mult) < 15% and • Mass air flow vs. calculated mass air flow < 20%
P0102	Mass or Volume Air Flow A Circuit Low Input	MAF sensor signal, < 0.2 V
P0103	Mass or Volume Air Flow A Circuit High Input	MAF sensor signal > 4.8 V
P0106	Manifold Pressure Sensor Range/Performance	Boost pressure signal • Manifold pressure signal: variation between state 1 and 2 < 50.00 [hPa]
P0107	Manifold Pressure Sensor	• Signal voltage > 0.20 V Range check: • Manifold pressure signal < 80.00 hPa
P0108	Manifold Pressure Sensor	• Signal voltage < 4.80 V Range check: • Manifold pressure signal > 1170.00 hPa
P0111	Intake Air Temperature Sensor 1 Cross Check	• 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 Input	Signal voltage < 0.15 V
P0113	Intake Air Temperature Sensor 1 Circuit High Input	Signal voltage > 4.50 V
P0116	Engine Coolant Temperature Sensor 1 Circuit Range/ Performance	•Difference ECT vs. IAT at engine start > 24.8 - 39.8 K and • Difference IAT vs. AAT at engine start < 24.8 - 39.8 K and • Difference AAT vs. ECT at engine start < 24.8 - 39.8 K (depending on engine off time)

DTC	Error Message	Malfunction Criteria and Threshold Value
P0117	Engine Coolant Temperature Sensor 1 Circuit Low Input	Engine coolant temperature > 140°C
P0118	Engine Coolant Temperature Sensor 1 Circuit Open	Engine coolant temperature < 40°C
P0121	Throttle/Pedal Position Sensor A Circuit Range/Performance	• TPS 1 - TPS 2 > 6.30% and • TPS 1 calculated value > 9.00%
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
P0130	O2 Sensor Circuit (Bank 1, Sensor 1)	O2S ceramic temperature < 640°C
P012B	Charger Inlet Pressure Rationality Check	• Pressure difference in cross check between boost pressure sensor 1/2; IM pressure, ambient pressure sensor • Pressure difference in cross check between boost pressure sensor 1/2; IM pressure
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 < 1.75 V
		Nernst voltage < 1.50 V
		Adjustment voltage < 3.0 V
P0132	O2 Sensor Circuit (Bank 1, Sensor 1) High Voltage	Virtual mass > 3.25 V
		Nernst voltage > 4.40 V
		Adjustment voltage > 7 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P0133	O2 Circuit Slow Response (Bank 1, Sensor 1)	Symmetric fault: • Difference of R2L area ratio vs. L2R area ratio -0.50 - 1.00 • Lower value of both counters for area ratio R2L and L2R ≥ 5 times Delay Time: • Gradient ratio ≥ 0.30 • Lower value of both area ratios R2L and L2R < 0.30 Transient Time: • Gradient ratio ≥ 0.30 • Gradient ratio ≤ 0.60 • Lower value of both area ratios R2L and L2R < 0.30 or • Lower value of both gradient ratios R2L and L2R < 0.30 Asymmetric fault: • Difference of R2L area ratio vs. L2R area ratio NOT (-0.50 - 1.00) • Values of both counters for area ratio R2L and L2R ≥ 5 times Delay Time: • Gradient ratio ≥ 0.30 • Lower value of both area ratios R2L and L2R < 0.30 Transient Time: • Gradient ratio ≥ 0.30) • Gradient ratio ≤ 0.60 • Lower value of both area ratios R2L and L2R < 0.30 or • Lower value of both gradient ratios R2L and L2R < 0.30

DTC	Error Message	Malfunction Criteria and Threshold Value
P0135	O2 Heater Circuit (Bank 1, Sensor 1)	Out of range high • O2S ceramic temperature < 725°C and • Heater duty cycle 90.00% Rationality check (sensor heating up) • O2S ceramic temperature < 725°C and • Time after O2S heater on 40 Sec.
P0136	O2 Circuit (Bank 1, Sensor 2)	Delta O2S signal rear > 2 V
P0137	O2 Circuit Low Voltage (Bank 1, Sensor 2)	• Signal voltage < 0.06 V for time > 3 Sec. and • Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3 measurements) < 0.01 V
P0138	O2 Circuit High Voltage (Bank 1, Sensor 2)	Signal voltage > 1.08 V for > 5 Sec.
P0139	O2 Circuit Slow Response (Bank 1 Sensor 2)	O2S rear signal 640 - 645 mV
P013A	Oxygen Sensors Rear (binary LSF)	• EWMA filtered max differential transient time at fuel cut off ≥ 0.5 Sec and • Number of checks ≥ 3.00 (initial phase and step function)
P013C	Oxygen Sensors Rear (binary LSF)	• EWMA filtered max differential transient time at fuel cut off ≥ 0.5 Sec and • Number of checks ≥ 3.00 (initial phase and step function)

DTC	Error Message	Malfunction Criteria and Threshold Value
P0140	O2 Circuit No Activity Detected (Bank 1, Sensor 2)	• Signal voltage .40 - .60 mV for > 3 Sec and • Difference in sensor voltage with load pulse and voltage without load pulse (mean value of 3 measurements) ≥ 2.80 V
P0140	O2S Signal Check - Circuit Continuity (sensor ground line open circuit)	• Internal resistance > 80,000Ω and • Exhaust temperature > 700° C
P0141	O2 Heater Circuit (Bank 1, Sensor 2) Out of Range	Heater resistance 500 - 10000 Ω
P0145	O2 Circuit Slow Response (Bank 1, Sensor 2)	• EWMA filtered transient time at fuel cut off > 0.4 Sec. • In voltage range 401.4 - 201.2 mV • Number of checks (initial phase) > 3 • Number of checks (step function) > 3
P0150	O2 Sensor Circuit (Bank 1, Sensor 1)	Sensor element temperature < 690° C
P0151	O2 Sensor Circuit, (Bank 1 Bank 2) Low Voltage	Virtual mass < 1.75 V
		Nernst voltage < 1.50 V
		Adjustment voltage < 3.0 V
P0152	O2 Sensor Circuit (Bank 1, Sensor 1) High Voltage	Virtual mass > 3.25 V
		Nernst voltage > 4.40 V
		Adjustment voltage > 7 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P0153	O2 Circuit Slow Response (Sensor 1, Bank 2)	Symmetric fault: • Difference of R2L area ratio vs. L2R area ratio -0.50 - 1.00 • Lower value of both counters for area ratio R2L and L2R ≥ 5 times Delay Time: • Gradient ratio ≥ 0.30 • Lower value of both area ratios R2L and L2R < 0.30 Transient Time: • Gradient ratio ≥ 0.30 • Gradient ratio ≤ 0.60 • Lower value of both area ratios R2L and L2R < 0.30 or • Lower value of both gradient ratios R2L and L2R < 0.30 Asymmetric fault: • Difference of R2L area ratio vs. L2R area ratio NOT (-0.50 - 1.00) • Values of both counters for area ratio R2L and L2R ≥ 5 times Delay Time: • Gradient ratio ≥ 0.30 • Lower value of both area ratios R2L and L2R < 0.30 Transient Time: • Gradient ratio ≥ 0.30) • Gradient ratio ≤ 0.60 • Lower value of both area ratios R2L and L2R < 0.30 or • Lower value of both gradient ratios R2L and L2R < 0.30

DTC	Error Message	Malfunction Criteria and Threshold Value
P0155	O2 Heater Circuit (Bank 1, Sensor 1)	Out of range high • O2S ceramic temperature < 725° C and • Heater duty cycle > 90.00% Rationality check (sensor heating up) • O2S ceramic temperature < 725° C and • Time after O2S heater on 40.0 Sec
P0156	O2 Circuit (Bank 1, Sensor 2)	Delta O2S signal rear > 2 V
P0157	O2 Circuit Low Voltage (Bank 1, Sensor 2)	• Signal voltage < 0.06 V for time > 3.0 Sec and • Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3 measurements) < 0.01 V
P0158	O2 Circuit High Voltage (Bank 1, 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)	• Internal resistance > 80,000Ω and • Exhaust temperature > 700° C
P0169	Function Monitoring: Injection Time	Comparison with fuel quantity incorrect
P0171	Fuel System Too Lean, Additive (Bank 1, Bank 2)	Adaptive value > 5.30%
P0172	System Too Rich (Bank 1)	Adaptive value < -5.30%
P0174	Fuel System Too Lean, Additive (Bank 1, Bank 2)	Adaptive value > 5.30%
P0175	System Too Rich-Additive (Bank 1, Bank 2)	Adaptive value < -5.30%

DTC	Error Message	Malfunction Criteria and Threshold Value
P017B	Cylinder Head Temperature Sensor	• Difference between modelled and measured cylinder head temperature > 9.8 K • Difference CHDT (Cylinder Head Temperature) vs. ECT at engine start ≥ 24.8 - 39.8 K or • Difference CHDT (Cylinder Head Temperature) vs. IAT at engine start ≥ 24.8 - 39.8 K • Difference CHDT (Cylinder Head Temperature) vs. ECT at engine start ≤ -(24.8 - 39.8) K or • Difference CHDT (Cylinder Head Temperature) vs. IAT at engine start ≤ -(24.8 - 39.8) K
P017C	Cylinder Head Temperature Sensor	Signal voltage < 0.11 V
P017D	Cylinder Head Temperature Sensor	Signal voltage > 3.10 V
P0190	Fuel Rail Pressure Sensor A Circuit	Signal voltage > 4.8 V
P0191	Fuel Rail Control Valve, High Pressure Side	Actual pressure > 10 MPa
P0192	Fuel Rail Pressure Sensor A Circuit Low Input	Signal voltage < 0.2 V
P0201	Injector Circuit/Open - Cylinder 1	• Low side signal current < 2.1 A
P0202	Injector Circuit/Open - Cylinder 2	• Low side signal current < 2.1 A
P0203	Injector Circuit/Open - Cylinder 3	• Low side signal current < 2.1 A
P0204	Injector Circuit/Open - Cylinder 4	• Low side signal current < 2.1 A
P0205	Injector Circuit/Open - Cylinder 5	• Low side signal current < 2.1 A
P0206	Injector Circuit/Open - Cylinder 6	• Low side signal current < 2.1 A
P0207	Injector Circuit/Open - Cylinder 7	• Low side signal current < 2.1 A

DTC	Error Message	Malfunction Criteria and Threshold Value
P0208	Injector Circuit/Open - Cylinder 8	• Low side signal current < 2.1 A
P0221	Throttle/Pedal Position Sensor/Switch B Circuit Range/Performance	• TPS 1 - TPS 2 > 6.30% or • TPS 2 calculated value > 9.00%
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	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 • > 27 - 50 kPa, depending on altitude
P0236	Turbocharger/Supercharger Boost (Sensor 1) Plausability Check	• Pressure difference in cross check between boost pressure sensor 1/2; IM pressurel > 7 kPa • Pressure difference in cross check between . boost pressure sensor 1/2 and IM > 12 - 27 kPa
P0237	Turbocharger/Supercharger Boost (Sensor 1) Circuit Low	Signal voltage < 0.2 V
P0238	Turbocharger/Supercharger Boost (Sensor 1) Circuit High	Signal voltage > 4.8 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P0240	Turbocharger/Supercharger Boost Sensor 2 Rationality Check	• Pressure difference in cross check between boost pressure sensor 1/2; IM pressure, ambient pressure > 7 kPa • Pressure difference in cross check between boost pressure sensor 1/2; IM pressure > 12 - 27 kPa • Pressure difference in cross check between pressure sensor 1 and 2 > 12.51 kPa and fuel trim activity (bank with deviation is considered to be defective > 151%
P0241	Turbocharger/Supercharger Boost Sensor 2 Short to Ground	Signal voltage < 0.2 V
P0242	Turbocharger/Supercharger Boost Sensor 2 Short to Battery Voltage	Signal voltage > 4.8 V
P0243	Turbocharger/Supercharger Wastegate Solenoid A	Signal voltage > 4.4 - 5.6 V
P0245	Turbocharger/Supercharger Wastegate Solenoid A Low	Signal voltage < 2.15 - 3.25 V
P0246	Turbocharger/Supercharger Wastegate Solenoid A High	Signal current > 2.2 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 B+	Signal current > .6 mA
P0261	Cylinder 1 Injector Circuit Short to Ground	Signal current < 2.1 A
P0262	Cylinder 1 Injector Circuit Short to B+	Signal current > 14.70 A
P0264	Cylinder 2 Injector Circuit Short to Ground	Signal current < 2.1 A
P0265	Cylinder 2 Injector Circuit Short to B+	Signal current > 14.70 A
P0267	Cylinder 3 Injector Circuit Short to Ground	Signal current < 2.1 A
P0268	Cylinder 3 Injector Circuit Short to B+	Signal current > 14.70 A

DTC	Error Message	Malfunction Criteria and Threshold Value
P0270	Cylinder 4 Injector Circuit Short to Ground	Low side signal current < 2.1 A
P0271	Cylinder 4 Injector Circuit Short to B+	Signal current > 14.70 A
P0273	Cylinder 5 Injector Circuit Short to Ground	Low side signal current < 2.1 A
P0274	Cylinder 5 Injector Circuit Short to B+	Signal current > 14.70 A
P0276	Cylinder 6 Injector Circuit Short to Ground	Low side signal current < 2.1 A
P0277	Cylinder 6 Injector Circuit Short to B+	Signal current > 14.70 A
P0279	Cylinder 7 Injector Circuit Short to Ground	Low side signal current < 2.1 A
P0280	Cylinder 7 Injector Circuit Short to B+	Signal current > 14.70 A
P0282	Cylinder 8 Injector Circuit Short to Ground	Low side signal current < 2.1 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
P200A	Intake Manifold Runner Control Out of Range	Signal voltage < 0.7 V
P200B	Intake Manifold Runner Control overtravel	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 Closed (Bank 2)	Difference between target position vs. actual position > 30%
P2006	Intake Manifold Runner Control Stuck Open (Bank 1)	Difference between target position vs. actual position > 30%
P2007	Intake Manifold Runner Control Stuck Open (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

DTC	Error Message	Malfunction Criteria and Threshold Value
P2009	Intake Manifold Runner Control Circuit Shorted (Bank 1)	Signal voltage 0.0 - 3.26 V
P2010	Intake Manifold Runner Control Circuit Shorted to B+ (Bank 1)	Signal current > 2.20 A
P2014	Intake Manifold Runner Position Sensor/Switch Circuit (Bank 1)	Signal voltage, < 0.20 V
P2015	Intake Manifold Runner Position Sensor/Switch Circuit Range/Performance (Bank 1)	Deviation runner flap position vs. actual position > 25%
P2016	Intake Manifold Runner Position Sensor/Switch Circuit Low (Bank 1)	Signal voltage < 0.25 V
P2017	Intake Manifold Runner Position Sensor/Switch Circuit (Bank 1) Short to B+	Signal voltage, > 4.80 V
P2019	Intake Manifold Runner Position Sensor/Switch Circuit Bank 1 Open Circuit	Signal voltage, < 0.20 V
P2022	Intake Manifold Runner Position Sensor/Switch Circuit Bank 1 Short to B+	Signal voltage, > 4.80 V
P2024	Evaporative Emissions (EVAP) Fuel Vapor Temperature / Pressure Sensor Circuit	Signal voltage 4.70 - 5.40 V
P2025	Evaporative Emissions (EVAP) Fuel Vapor Temperature / Pressure Sensor Performance	• Response time > 1000 ms • Number of checks > 3.00 • Security bit incorrect • Number of checks > 3.00 [-] • Time difference between ECM and Smart Module > 3.0 s • Smart Module Temp High > 119 °C • Smart Module Temp Low < -39 °C
P2026	Evaporative Emissions (EVAP) Fuel Vapor Temperature / Pressure Sensor Short to Ground	Signal voltage 0.0 - 3.25 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P2027	Evaporative Emissions (EVAP) Fuel Vapor Temperature / Pressure Sensor Short to Battery 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 B+	Signal current > 2.2 A
P2090	A Camshaft Position Actuator Control Circuit Low Bank 1 Short to Ground	Signal voltage 0.0 - 3.25 V
P2091	VVT actuator exhaust (Bank 1 Bank 2)	Short to battery plus signal current > 2.20 A
P2092	A Camshaft Position Actuator Control Circuit Low Bank 1 Short to Ground	Signal voltage 0.0 - 3.25
P2093	A Camshaft Position Actuator Control Circuit High (Bank 1) Short to B+	Signal current, > 2.20 A
P2094	A Camshaft Position Actuator Control Circuit Low (Bank 1) Short to Ground	Signal voltage 0.0 - 3.25 V
P2095	VVT actuator exhaust (Bank 1 Bank 2)	Short to battery plus signal current > 2.20 A
P2096	Post Catalyst Fuel Trim System Out of Range High (Bank 1 Bank 2)	Out of range I-portion of 2nd lambda control loop < -0.030
P2097	Post Catalyst Fuel Trim System out of range low (Bank 1 Bank 2)	I-portion of 2nd lambda control loop > 0.030
P2098	Post Catalyst Fuel Trim System out of range high (Bank 1 Bank 2)	Out of range I-portion of 2nd lambda control loop < -0.030
P2099	Post Catalyst Fuel Trim System out of range low (Bank 1 Bank 2)	I-portion of 2nd lambda control loop > 0.030
P3081	Engine Temperature Too Low	Reference model temperature - measured engine coolant temperature > 9.8 K

Ignition System

DTC	Error Message	Malfunction Criteria and Threshold Value
P0300	Random Misfire Detected	• Emission threshold misfire rate (MR) > 2.5% • Catalyst damage misfire rate (MR) > 2.5 - 24%
P0301	Cylinder 1 Misfire Detected	• Emission threshold misfire rate (MR) > 2.5% • Catalyst damage misfire rate (MR) > 2.5 - 24%
P0302	Cylinder 2 Misfire Detected	• Emission threshold misfire rate (MR) > 2.5% • Catalyst damage misfire rate (MR) > 2.5 - 24%
P0303	Cylinder 3 Misfire Detected	• Emission threshold misfire rate (MR) > 2.5% • Catalyst damage misfire rate (MR) > 2.5 - 24%
P0304	Cylinder 4 Misfire Detected	• Emission threshold misfire rate (MR) > 2.5% • Catalyst damage misfire rate (MR) > 2.5 - 24%
P0305	Cylinder 5 Misfire Detected	• Emission threshold misfire rate (MR) > 2.5% • Catalyst damage misfire rate (MR) > 2.5 - 24%
P0306	Cylinder 6 Misfire Detected	• Emission threshold misfire rate (MR) > 2.5% • Catalyst damage misfire rate (MR) > 2.5 - 24%
P0307	Cylinder 7 Misfire Detected	• Emission threshold misfire rate (MR) > 2.5% • Catalyst damage misfire rate (MR) > 2.5 - 24%
P0308	Cylinder 8 Misfire Detected	• Emission threshold misfire rate (MR) > 2.5% • Catalyst damage misfire rate (MR) > 2.5 - 24%
P0321	Ignition/Distributor Engine Speed Input Circuit Range/ Performance	• Comparison of counted teeth vs. reference incorrect or • Monitoring reference gap failure

DTC	Error Message	Malfunction Criteria and Threshold Value
P0322	Ignition/Distributor Engine Speed Input Circuit No Signal	• Camshaft signal > 3 and • Engine speed no signal
P0324	Knock Control System Error	• Signal fault counter (combustion) > 24 or • Signal fault counter (measuring window) > 2.00 • Communication errors • SPI communication > 25
P0326	Knock Control System	• Lower threshold < 0.029 V • Upper threshold > 1.992 V
P0327	Knock Sensor 1 Circuit Low Input (Bank 1) Short to Ground	Lower threshold 0.18 V
P0328	Knock Sensor 1 Circuit Short to B+	Upper threshold > 1.00 V
P0331	Knock Control System	• Lower threshold < 0.029 V • Upper threshold > 1.992 V
P0332	Knock Sensor 1 Circuit Low Input (Bank 1) Short to Ground	Lower threshold 0.18 V
P0333	Knock Sensor 1 Circuit short to B+	Upper threshold > 1.00 V
P0335	Engine Speed Sensor	• Open circuit > 1 V • Short to grnd < 1.5 V • Short to B+ > 3.5 V • Signal check no signal
P0336	Engine Speed Sensor	• RPM signal comparison with phase sensor not synchronous • Counted versus reference teeth > 1 • Actual time value vs modeled time value > 1.375
P0340	Camshaft Position Sensor A Circuit (Bank 1 or Single Sensor)	Signal activity check • Signal voltage no altering @ 4 Rev
P0341	Camshaft Position Sensor A Circuit Range/Performance (Bank 1 or Single Sensor)	• Signal pattern incorrect • defect counter 6.00
P0342	Camshaft Position Sensor A Circuit Low Input (Bank 1 or Single Sensor)	• Signal voltage permanently low and • Crankshaft signals 4.00

DTC	Error Message	Malfunction Criteria and Threshold Value
P0343	Camshaft Position Sensor A Circuit High Input (Bank 1 or Single Sensor)	• Signal voltage permanently high • Crankshaft signals 4
P0345	Camshaft Position Sensor A Circuit (Bank 1 or single sensor)	Signal activity check • Signal signal activity check
P0346	Camshaft Position Sensor A Circuit Range/Performance (Bank 2 or Single Sensor)	• Signal pattern incorrect • Defect counter 6.00
P0347	Camshaft Position Sensor A Circuit Low (Bank 2 or Single Sensor)	• Signal voltage permanently low and • Crankshaft signals 4.00
P0348	Sensor A Circuit High (Bank 2 or Single Sensor)	• Signal voltage permanently high and • Crankshaft signals 4
P0351	Ignition Coil A Primary/ Secondary Circuit	Open circuit • Signal current < 0.25 to 2.0 mA or • Internal check failed
P0352	Ignition Coil B Primary/ Secondary Circuit	Open circuit • Signal current < 0.25 to 2.0 mA or • Internal check failed
P0353	Ignition Coil C Primary/ Secondary Circuit	Open circuit • Signal current < 0.25 to 2.0 mA or • Internal check failed
P0354	Ignition Coil D Primary/ Secondary Circuit	Open circuit • Signal current < 0.25 to 2.0 mA or • Internal check failed
P0355	Ignition Coil E Primary/ Secondary Circuit	Open circuit • Signal current < 0.25 to 2.0 mA or • Internal check failed

DTC	Error Message	Malfunction Criteria and Threshold Value
P0356	Ignition Coil F Primary/ Secondary Circuit	Open circuit • Signal current < 0.25 to 2.0 mA or • Internal check failed
P0357	Ignition Coil G Primary/ Secondary Circuit	Open circuit • Signal current < 0.25 to 2.0 mA or • Internal check failed
P0358	Ignition Coil H Primary/ Secondary Circuit	Open circuit • Signal current < 0.25 to 2.0 mA or • Internal check failed
P0366	Camshaft Position Sensor A Circuit Range/Performance (Bank 1 or Single Sensor)	• Signal pattern incorrect • Defect counter 6
P0367	Camshaft Position Sensor A Circuit Low (Bank 1 or Single Sensor)	• Signal voltage permanently low and • Crankshaft signals 4.00
P0368	Camshaft Position Sensor A Circuit High (Bank 1 or Single Sensor)	• Signal voltage permanently high and • Crankshaft signals 4.00
P0391	Camshaft Position Sensor A Circuit Range/Performance (Bank 2 or Single Sensor)	• Signal pattern incorrect • Defect counter 6
P0392	Camshaft Position Sensor A Circuit Low (Bank 2 or Single Sensor)	• Signal voltage permanently low and • Crankshaft signals 4.00
P0393	Camshaft Position Sensor A Circuit High (Bank 2 or Single Sensor)	• Signal voltage permanently high and • Crankshaft signals 4.00

Additional Exhaust Regulation

DTC	Error Message	Malfunction Criteria and Threshold Value
P0410	Rationality Check Directly after Catalyst Heating	Difference ambient pressure vs. AIR pressure measured with AIR pressure sensor > 3.00 kPa

DTC	Error Message	Malfunction Criteria and Threshold Value
P0413	Open Circuit	Signal voltage 4.70 - 5.40 V
P0414	Short to Ground or Short to Battery Voltage	Signal voltage 0.0 - 3.25 V Signal current > 2.20 A
P0417	Short to Ground or Short to Battery Voltage	Signal voltage 0.0 - 3.25 V Signal current > 2.20 A
P0418	Air Pump Relay Open Circuit	Signal voltage 4.70 - 5.40 V
P0420	Catalyst System Efficiency Below Threshold	Measured OSC / OSC of borderline catalyst. EWMA filter value for catalyst , < 1.0
P0421	Catalyst Bank 1	EWMA filter value for catalyst < 0.2
P0430	Catalyst System Bank 2	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)	Deviation lambda control < 2.50% and deviation idle control < 20%
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
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)	• Natural vacuum leak detection (NVLD) switch position • Switch Open
P0458	Evaporative Emission System Purge Control Valve Circuit Low or Short to Ground	Signal voltage, < 0.0 - 3.26 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P0459	Evaporative Emission System Purge Control Valve Circuit High or Short to Voltage	Signal current > 2.2 A
P0491	Secondary Air System Insufficient Flow (Bank 1)	• Blockage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.10 [-] • Leakage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.10 [-] and • Relative AIR pressure measured ≤ 3.00 kPa or • Blockage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.45 [-] • Leakage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.45 [-] and • Relative AIR pressure measured ≤ 3.00 kPa or • Blockage: relative AIR pressure measured with AIR pressure sensor vs. modeled while valve bank 2 commanded closed < 0.70[-] • Leakage: relative AIR pressure measured with AIR pressure sensor vs. modeled while valve bank 2 commanded closed < 0.70 [-] and • Relative AIR pressure measured ≤ 3.00 kPa or • Average pressure difference between absolute value and filtered value while valve bank 2 commanded closed < 0.14 - 1.22 kPa and • Relative AIR pressure measured ≤ 3.00 kPa

DTC	Error Message	Malfunction Criteria and Threshold Value
P0492	Secondary Air System Insufficient Flow (Bank 2)	• Blockage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.10 [-] • Leakage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.10 [-] and • Relative AIR pressure measured ≤ 3.00 kPa or • Blockage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.45 [-] • Leakage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.45 [-] and • Relative AIR pressure measured ≤ 3.00 kPa or • Blockage: relative AIR pressure measured with AIR pressure sensor vs. modeled while valve bank 2 commanded closed < 0.70[-] • Leakage: relative AIR pressure measured with AIR pressure sensor vs. modeled while valve bank 2 commanded closed < 0.70 [-] and • Relative AIR pressure measured ≤ 3.00 kPa or • Average pressure difference between absolute value and filtered value while valve bank 2 commanded closed < 0.14 - 1.22 kPa and • Relative AIR pressure measured ≤ 3.00 kPa

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 Electrical check	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	• Engine speed deviation < -80 RPM and • RPM controller torque value ≥ calculated max value
P0507	Idle Air Control System - RPM Higher Than Expected	• Engine speed deviation > -80 RPM and • RPM controller torque value ≤ calculated max. value
P0597	Map Controlled Engine Cooling Thermostat Sensor, Open Circuit	Signal voltage 4.70 - 5.40 V
P0598	Map Controlled Engine Cooling Thermostat Sensor, Short to Ground	Signal voltage 0.0 - 3.25 V
P0599	Map Controlled Engine Cooling Thermostat Sensor, Short to Battery Voltage	Signal current > 2.20 A
P050A	Idle Air Control System RPM Higher or Lower Than Expected	RPM lower: • Engine speed deviation > 200 RPM and • RPM controller torque value ≥ calculated max. value RPM Higher: • Engine speed deviation < -200 RPM and • RPM controller torque value ≤ calculated min. value
P050B	Ignition Timing Monitor	Difference between commanded spark timing vs. actual value> 18.00%

DTC	Error Message	Malfunction Criteria and Threshold Value
P052A	Cold Start Monitoring VVT intake (Bank 1 Bank 2)	Difference between target position and actual position > 8°CA
P052C	Cold Start Monitoring VVT intake (Bank 1 Bank 2)	Difference between target position and actual position > 8°CA
P053F	Rail Pressure Control Valve	• Target pressure-actual pressure >1.30 MPa • Difference between target pressure vs. actual pressure < -3.00 mPa
P054A	Cold Start Monitoring VVT exhaust (Bank 1 Bank 2)	Difference between target position vs. actual position > 8°CA
P054C	Cold Start Monitoring VVT exhaust (Bank 1 Bank 2)	Difference between target position vs. actual position > 8°CA

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	ECM Interal fault	• Drive by wire module check check failed • EEPROM-check check failed
P0627	Fuel Pump A Control Circuit/ Open	• Internal error fuel pump control unit • Feedback from fuel pump control unit pump blocked short circuit to battery +, ground or open circuit
P0634	Map Controlled Engine Cooling Thermostat Sensor, Signal Range Check	Signal range check over temperature > 150° C

DTC	Error Message	Malfunction Criteria and Threshold Value
P0638	Throttle Actuator Control Range/Performance (Bank 1)	• Time to open over reference point > 0.6 Sec and • Reference point -1.5% • Time to close below reference point > 0.3 Sec and • Reference point 1.0%
P0641	Sensor Reference Voltage A Circuit/Open	Signal voltage deviation > ± 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 > ± 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 > 1.1 A
P0685	ECM/PCM Power Relay Control Circuit/Open	• Signal voltage 2.6 - 3.7 V • Sense circuit voltage > 6 V
P0686	ECM/PCM Power Relay Control Circuit Low	• Signal voltage 2.6 - 3.7 V • Sense circuit voltage > 6 V
P0687	ECM/PCM Power Relay Control Circuit High	• Signal current > 0.7 - 1.4 A • Sense circuit voltage < 5.0 V
P0688	ECM/PCM Power Relay Sense Circuit	Sense voltage < 4.0 V
P0697	Sensor Reference Voltage C Circuit/Open	Signal voltage deviation > ± 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

DTC	Error Message	Malfunction Criteria and Threshold Value
P062B	Communication Check	SPI communications check identifier failure
U0001	High Speed CAN Communication Bus	CAN message, no feedback
U0002	High Speed CAN Communication Bus	Global time out
U0100	Lost Communication with ECM/PCM A	• Failure of all CAN engine messages, time out > 490 mSec. • Failure of all CAN engine messages, but not all CAN messages, time out > 1010 mSec.
U0101	Lost Communication with TCM	No CAN message received from TCM
U0121	CAN ABS Brake Unit	Received CAN message no message
U0140	CAN communication with Body Control Module	Time out no message
U0146	CAN Gateway A	Received CAN message no message
U0155 CAN ICL (only S4)	CAN communication with Instument Cluster Module	Received CAN message no message
U0302	Software Incompatibility with Transmission Control Module	MT vehicle ECM coded as AT vehicle
U0323	CAN: Instrument cluster only	Ambient temperature value module not encoded for ambient temperature sensor, 00h
U0402	CAN Communication with TCM	Invalid data received from TCM • Implausible message
U0404	Invalid Data Received From Gear Shift Control Module	• If the value of message counter is permanent, constant, or change exceeds a threshold, increment an event counter • Maximum change of message counter > 5
U0415	CAN link to speed sensor	Received data implausible message

DTC	Error Message	Malfunction Criteria and Threshold Value
U0422	CAN: Instrument cluster	Ambient temperature value initialization, 01 h
U0423 CAN ICL (only S4)	CAN communication with Instument Cluster Module	Received data implausible message
U0447	CAN Gateway	Received data from Gateway implausible message

Fuel and Air Ratios Control Module

DTC	Error Message	Malfunction Criteria and Threshold Value
P10A0	RFP Powerstage, Signal Range Check	Signal range check • ECM power stage failure or • Duty cycle < 95% or • Duty cycle < 95%
P10A4	RFP Actuator, Functional Check	Absolute value of maximum deviation between predicted and real value: > 8%
P10A5	RFP Sensor, Short to B +	Signal voltage > 4.9 V
P10A6	RFP sensor, Short to Ground / Open Circuit	Signal voltage < 0.1 V
P100F	Functional Check Stuck Open	• Rail pressure controller value > 60.00 - 327.67 mm³ • Misfire failure
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	• Rail Pressure Bank 1 @ Engine Start < 0.10 mPa • Fuel system too rich @ part load ≤ -15.00% • Fuel system too rich @ idle ≤ 3.00% • Fuel pressure bank 2 @ engine start ≥ 0.50 mPa

DTC	Error Message	Malfunction Criteria and Threshold Value
P12A2	Fuel Rail Pressure Sensor Inappropriately High	• Rail pressure bank 1 @ engine start > 1.50 mPa • Fuel system too lean @ part load ≥ -15.00% • Fuel system too lean @ idle ≥ 3.% • Fuel pressure bank 2 @ engine start ≤ 1.00 mPa
P12A4	Fuel Rail Pump Control Valve Stuck Closed	• Pressure control activity < -3.0 • Fuel trim activity 0.90 - 1.30 mPa and • Difference between target pressure vs. actual pressure < -8.00 mPa
P129B	Fuel Rail Pressure Control Valve	• Open circuit signal voltage 1.40 - 3.20 V • Rationality check signal pattern incorrect
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
P13EA	Ignition Timing Monitor	Difference between commanded spark timing and actual value > 0.60%
P150A	Engine Off Time Performance	• Difference between engine off time and ECM after run time < -12.0 Sec. • Difference between engine off time and ECM after run time > 12.0 Sec.
P2101	Throttle Actuator A Control Motor Circuit Range/ Performance	Signal range check • Duty cycle >80% and • ECM power stage, no failure Rationality check • Deviation throttle valve angles vs. calculated value 4.0 - 50.0%

DTC	Error Message	Malfunction Criteria and Threshold Value
P2106	Throttle Actuator Control System - Short to B+ or Ground	Short to battery plus/ short to ground • Internal check failed Open circuit • Internal check failed Temperature / current monitoring • Internal check failed Functional check • Internal check failed
P2119	Throttle Actuator Control Range/Performance (Bank 1)	• TPS 1 signal voltage NOT (0.21 - 0.87) V or • TPS 2 signal voltage NOT (4.14 - 4.84) V
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) • Signal current > 14.90 A Short to battery plus (high side) • Signal current < 2.60 A
P2147	Injector Circuit Short to Ground	Signal current > 12 A
P2148	Injector Circuit Short to B+	Signal current > 33 A
P2149	Fuel Injector Group B Supply Voltage Circuit/Open	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

DTC	Error Message	Malfunction Criteria and Threshold Value
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
P2195	O2 Sensor Rationality Check High (Bank 1, Bank 2)	Delta lambda of 2nd lambda control loop > 0.07
P2196	O2 Sensor Rationality Check Low (Bank 1, Sensor 1)	Delta lambda of 2nd lambda control loop < 0.07
P2197	O2 Sensor Rationality Check High (Bank 1, Bank 2)	Delta lambda of 2nd lambda control loop > 0.070
P2198	O2 Sensor rationality check Low- Bank 1, Bank 2	Delta lambda of 2nd lambda control loop < 0.070
P2227	Turbocharger/Supercharger Boost Sensor A Plausibility Check	Pressure difference in cross check between boost pressure sensor 1/2; IM pressure, ambient pressure >7 kPa
P2231	O2 Sensor Signal Circuit Shorted to Heater Circuit	• Delta O2S signal front > 0.2 - 0.498 V • Elapsed time since last O2S < 0.05 Sec
P2234	O2 Sensor Signal Circuit Shorted to Heater Circuit	• Delta O2S signal front > 0.2 - 0.498 V • Elapsed time since last O2S < 0.05 Sec
P2237	O2 Sensor Positive Current Control Circuit/Open (Bank 1, Sensor 1)	• O2S signal front 1.46 - 1.52 V and • Delta lambda controller > | 0.10 |
P2240	O2 Sensor Positive Current Control Circuit / Open (Bank 1, Bank 2)	• O2S signal front 1.46 - 1.52 V and • Delta lambda controller > | 0.10 |

DTC	Error Message	Malfunction Criteria and Threshold Value
P2243	O2 Sensor Reference Voltage Circuit/Open (Bank 1, Sensor 1)	• O2S signal front < 0.30 V and internal resistance > 950 Ohms • O2S signal front > 0.20 V and Internal resistance > 950 Ohms
P2247	O2 Sensor Nernst Voltage Open - Bank 1, Bank 2	• O2S signal front > 3.25 V and • Internal resistance > 950Ω • O2S signal front < 0.20 V and • Internal resistance > 950Ω
P2251	O2 Sensor Signal Open Circuit (Bank 1, Bank 2)	• O2S signal front 1.44 - 1.53 V and • Internal resistance > 950 Ω
P2254	O2 Sensor Signal Open Circuit (Bank 1, Sensor 1)	• O2S signal front 1.44 - 1.53 V and • Internal resistance > 950 Ω
P2257	Air Pump Relay Short to Ground	Signal voltage 0.00 - 3.26 V
P2258	Air Pump Relay Short to B+	Signal current 0.60 - 2.40 A
P2270	O2 Circuit Slow Response (Bank 1, Sensor 2) SULEV	• O2S signal rear not oscillating at reference < 0.62 - 0.68 V and • Enrichment after stuck lean 25.00%
P2271	O2 Circuit (Bank 1, Sensor 2)	• Sensor voltage of ≥ 0.18 V • After oxygen mass > 3300 - 400 mg • (after fuel cut off) and number of checks ≥1.0
P2272	O2 Circuit Slow Response (Bank 1, Sensor 2)	• O2S signal rear not oscillating at reference < and • Enrichment after stuck lean 25.00%
P2273	O2 Circuit Slow Response (Bank 1, Sensor 2)	• Sensor voltage of ≥ 0.18 V • After oxygen mass > 3300 - 400 mg • (after fuel cut off) and number of checks ≥1.0

DTC	Error Message	Malfunction Criteria and Threshold Value
P2279	Intake Air System Leak	• Offset value throttle mass flow > 17.00 kg/h and • Correction factor > 0.97
P2293	Fuel Pressure Regulator 2 Performance	• Difference between target pressure - actual pressure > 1.30 mPa
P2294	Fuel Pressure Regulator 2 Control Circuit Open Circuit	Open circuit • Signal voltage 1.40 - 3.20 V Rationality check • Signal pattern incorrect
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

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

DTC	Error Message	Malfunction Criteria and Threshold Value
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
P2400	Evaporative Emission System Leak Detection Pump Control Circuit/Open	Signal voltage > 4.4 - 5.5 V
P2401	Evaporative Emission System Leak Detection Pump Control Circuit Low	Signal voltage < 3V
P2402	Evaporative Emission System Leak Detection Pump Control Circuit High	Signal current 2.7 - 5.5 A
P2403	Evaporative Emission System Leak Detection Pump Sense Circuit/Open	Low signal voltage > 10.4 Sec.
P2404	Evaporative Emission System Leak Detection Pump Sense Circuit Range/Performance	High signal voltage > 10.4 Sec.
P2414	O2 Sensor Signal Range Check (Bank 1, Bank 2)	• Threshold 1 - Signal voltage 2.71 - 6.00 V • Threshold 2 - Depending on gain factor, that actual is used for sensor characteristic, the threshold is signal voltage 2.05 - 3.06 V
P2431	Rationality check	Difference between SAI pressure and ambient pressure ≠ -25.0 - 25.0 hPa

DTC	Error Message	Malfunction Criteria and Threshold Value
P2415	O2 Sensor Signal Range Check (Bank 1, Bank 2)	• Threshold 1 - Signal voltage 2.71 - 6.00 V • Threshold 2 - Depending on gain factor, that actual is used for sensor characteristic, the threshold is signal voltage 2.05 - 3.06 V
P2431	Rationality Check	Difference between AIR pressure, AMP, and MAP -6.0 - 6.00 kPa
P2432	Signal Range Check	Signal voltage < 0.40 V
P2433	Signal Range Check	Signal voltage > 4.60 V
P2440	Air Valve Stuck Open	• Relative AIR pressure measured ≤ 3.00 kPa • 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) >1.50 [-] • 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) >1.50 [-] • Difference of average pressure between absolute value and filtered value while both valves commanded closed ≥ 0.30 - 1.00 kPa

DTC	Error Message	Malfunction Criteria and Threshold Value
P2442	Air Valve Bank 2	• Relative AIR pressure measured ≤ 3.00 kPa • 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) >1.50 [-] • 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) >1.50 [-] • Difference of average pressure between absolute value and filtered value while both valves commanded closed ≥ 0.30 - 1.00 kPa
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 > 4.81 V
P2629	O2 Sensor Pumping Current Trim Circuit/Open (Bank 1 Sensor 1)	O2S signal front > 4.8 V
P31A8	Variable Valve Lift (VVL) Actuator, Inlet Open for Cylinder 8 Short to Ground	Signal voltage < 2.8 - 3.2 V
P31A2	Variable Valve Lift (VVL) Actuator, Inlet Open for Cylinder 2 Short to Ground	Signal voltage < 2.8 - 3.2 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P31A5	Variable Valve Lift (VVL) Actuator, Inlet Open for Cylinder 5 Short to Ground	Signal voltage < 2.8 - 3.2 V
P31A3	Variable Valve Lift (VVL) Actuator, Inlet Open for Cylinder 3 Short to Ground	Signal voltage < 2.8 - 3.2 V
P11BE	Variable Valve Lift (VVL) Actuator,Cylinde 8, Inlet Open, Open or Short to Battery Voltage	• Signal voltage 4.8 - 5.3 V or • Signal current 3.74 - 6.8 A
P11A7	Variable Valve Lift (VVL) Actuator, Inlet Open for Cylinder 2, Inlet Open, Open or Short to Battery Voltage	• Signal voltage 4.8 - 5.3 V or • Signal current 3.74 - 6.8 A
P11B3	Variable Valve Lift (VVL) Actuator, Inlet Open for Cylinder 5, Inlet Open, Open or Short to Battery Voltage	• Signal voltage 4.8 - 5.3 V or • Signal current 3.74 - 6.8 A
P11AB	Variable Valve Lift (VVL) Actuator, Inlet Open for Cylinder 3, Inlet Open, Open or Short to Battery Voltage	• Signal voltage 4.8 - 5.3 V or • Signal current 3.74 - 6.8 A
P31B8	Variable Valve Lift (VVL) Actuator, Inlet Close for Cylinder 8 Short to Ground	Signal voltage < 2.8 - 3.2 V
P31B2	Variable Valve Lift (VVL) Actuator, Inlet Closed for Cylinder 2 Short to Ground	Signal voltage < 2.8 - 3.2 V
P31B5	Variable Valve Lift (VVL) Actuator, Inlet Close for Cylinder 5 Short to Ground	Signal voltage < 2.8 - 3.2 V
P31B3	Variable Valve Lift (VVL) Actuator, Inlet Close for Cylinder 3 Short to Ground	Signal voltage < 2.8 - 3.2 V
P11BD	Variable Valve Lift (VVL) Actuator, Inlet Close for Cylinder 8, Open or Short to Battery Voltage	• Signal voltage 4.8 - 5.3 V or • Signal current 5.5 - 10 A
P11A5	Variable Valve Lift (VVL) Actuator, Inlet Close for Cylinder 2, Open or Short to Battery Voltage	• Signal voltage 4.8 - 5.3 V or • Signal current 3 - 6 A

DTC	Error Message	Malfunction Criteria and Threshold Value
P11B1	Variable Valve Lift (VVL) Actuator, Inlet Close for Cylinder 5, Open or Short to Battery Voltage	• Signal voltage 4.8 - 5.3 V or • Signal current 3 - 6 A
P11A9	Variable Valve Lift (VVL) Actuator, Inlet Close for Cylinder 3, Open or Short to Battery Voltage	• Signal voltage 4.8 - 5.3 V or • Signal current 3 - 6 A
P31B0	Variable Valve Lift (VVL) Actuator, Outlet Open for Cylinder 8 Short to Ground	Signal voltage < 2.8 - 3.2 V
P31AA	Variable Valve Lift (VVL) Actuator, Outlet Open for Cylinder 8 Short to Ground	Signal voltage < 2.8 - 3.2 V
P31AD	Variable Valve Lift (VVL) Actuator, Outlet Open for Cylinder 8 Short to Ground	Signal voltage < 2.8 - 3.2 V
P31AB	Variable Valve Lift (VVL) Actuator, Outlet Open for Cylinder 8 Short to Ground	Signal voltage < 2.8 - 3.2 V
P11CE	Variable Valve Lift (VVL) Actuator, Outlet Open for Cylinder 8, Open or Short to Battery Voltage	• Signal voltage 4.8 - 5.3 V or • Signal current 5.5 - 10 A
P11C2	Variable Valve Lift (VVL) Actuator, Outlet Open for Cylinder 2, Open or Short to Battery Voltage	• Signal voltage 4.8 - 5.3 V or • Signal current 3.74 - 6.8
P11C8	Variable Valve Lift (VVL) Actuator, Outlet Open for Cylinder 5, Open or Short to Battery Voltage	• Signal voltage 4.8 - 5.3 V or • Signal current 3.74 - 6.8
P11C4	Variable Valve Lift (VVL) Actuator, Outlet Open for Cylinder 3, Open or Short to Battery Voltage	• Signal voltage 4.8 - 5.3 V or • Signal current 3.74 - 6.8
P31C0	Variable Valve Lift (VVL) Actuator, Outlet Closed for Cylinder 8 Short to Ground	Signal voltage < 2.8 - 3.2 V
P31BA	Variable Valve Lift (VVL) Actuator, Outlet Closed for Cylinder 2 Short to Ground	Signal voltage < 2.8 - 3.2 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P31BD	Variable Valve Lift (VVL) Actuator, Outlet Closed for Cylinder 5 Short to Ground	Signal voltage < 2.8 - 3.2 V
P31BB	Variable Valve Lift (VVL) Actuator, Outlet Closed for Cylinder 3 Short to Ground	Signal voltage < 2.8 - 3.2 V
P11CD	Variable Valve Lift (VVL) Actuator, Outlet Closed for Cylinder 8, Open or Short to Battery Voltage	• Signal voltage 4.8 - 5.3 V or • Signal current 5.5 - 10 A
P11C1	Variable Valve Lift (VVL) Actuator, Outlet Closed for Cylinder 2, Open or Short to Battery Voltage	• Signal voltage 4.8 - 5.3 V or • Signal current 3.74 - 6.8 A
P11C7	Variable Valve Lift (VVL) Actuator, Outlet Closed for Cylinder 5, Open or Short to Battery Voltage	• Signal voltage 4.8 - 5.3 V or • Signal current 3.74 - 6.8 A
P11C3	Variable Valve Lift (VVL) Actuator, Outlet Closed for Cylinder 3, Open or Short to Battery Voltage	• Signal voltage 4.8 - 5.3 V or • Signal current 3.74 - 6.8 A
P11E2	Variable Valve Lift (VVL) Actuator, Outlet Open for Cylinder 8, Rationality Check	< 1.00 V
P11D6	Variable Valve Lift (VVL) Actuator, Outlet Open for Cylinder 2, Rationality Check	< 1.00 V
P11DC	Variable Valve Lift (VVL) Actuator, Outlet Open for Cylinder 5, Rationality Check	< 1.00 V
P11D8	Variable Valve Lift (VVL) Actuator, Outlet Open for Cylinder 3, Rationality Check	< 1.00 V
P11D2	Variable Valve Lift (VVL) Actuator, Inlet Open for Cylinder 3, Rationality Check	< 1.00 V
P11A8	Variable Valve Lift (VVL) Actuator, Inlet Open for Cylinder 3, Rationality Check	< 1.00 V
P11B4	Variable Valve Lift (VVL) Actuator, Inlet Open for Cylinder 3, Rationality Check	< 1.00 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P11AC	Variable Valve Lift (VVL) Actuator, Inlet Open for Cylinder 3, Rationality Check	< 1.00 V
P11E1	Variable Valve Lift (VVL) Actuator, Outlet Closed for Cylinder 8, Rationality Check	< 1.00 V
P11D5	Variable Valve Lift (VVL) Actuator, Outlet Closed for Cylinder 2, Rationality Check	< 1.00 V
P11DB	Variable Valve Lift (VVL) Actuator, Outlet Closed for Cylinder 5, Rationality Check	< 1.00 V
P11D7	Variable Valve Lift (VVL) Actuator, Outlet Closed for Cylinder 3, Rationality Check	< 1.00 V

DTC CHART

Engine Code CPNB

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	• Turbocharger boost control solenoid circuit high
P0071	Ambient Air Temperature Sensor Circuit Range/ Performance	• Temperature difference to ECT, ECT 2> 40 °K • Temperature difference to T2, and FTS > 45 °K • Error bit = set
P0072	Ambient Air Temperature Sensor Circuit Low	AAT < -40 °C
P0087	Fuel Rail/System Pressure - Too Low	• Positive control deviation step 1 > 17000 - 50000 kPa • Positive control deviation step 2 > 15000 kPa • Minimum fuel rail pressure < 0.00 - 12500 kPa
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	Turbocharger Boost Pressure Actuator Control Functional Check	Signal current > 3.0 A
P00AF	Crankshaft Position - Camshaft Position Correlation Intake (Bank 1 Bank 2)	Stuck open • Control deviation > 8.00 [% or • Control deviation < -8.00 [%] • Actual position ≤ 30.00 [%]

DTC	Error Message	Malfunction Criteria and Threshold Value
P00C6	Fuel Rail Pressure System	Fuel rail, high pressure value < 12000 - 23000 kPa
P0101	Mass Air Flow Circuit Range/ Performance	Ratio of modeled and measured air mass flow > 1.15 or < 0.85
P0102	HO2S Heater Control Circuit Low (Bank 1, Sensor 1) Short to Ground	MAF sensor signal (< 0.083 mSec.) > 900 kg/hr
P0103	Mass Air Flow Circuit High Input	MAF sensor signal (> 4.5 mSec.) ≤ 0 kg/hr
P0104	Mass Air Flow Circuit Intermittent	MAF sensor signal period = not measurable
P0111	Intake Air Temperature Circuit Performance	• Temperature difference to ECT, ECT 2 > 35 °K • Temperature difference to FTS > 40 °K • Temperature difference to T1 > 45 °K
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	• ECT increase < f(ECT @ start) °K and • Engine running time > f(ECT @ start) Sec. or • Temperature difference to ECT 2 > 30 °K • Temperature difference to T2, FTS > 35 °K • Temperature difference to T1 > 40 °K
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

DTC	Error Message	Malfunction Criteria and Threshold Value
P0123	Throttle Position Sensor Circuit High Input	Position sensor signal < 0.15 V
P0128	Engine Coolant Temperature Sensor Rationality Check	ECT @ cylinder head < 66 [°C]
P0130	O2 Sensor Circuit Bank 1 Sensor 1 Malfunction	Short to Battery Voltage: • Virtual Mass (VM) > 3.0 V • Nernst voltage (UN) > 4.0 V • Adjustment Voltage IA/IP > 1.5 V Shorted to Ground: • Virtual Mass (VM) < 2.0 V • Nernst voltage (UN) < 1.75 V • Adjustment IA/IP < 0.3 V
P0132	O2 Sensor Circuit Bank 1 Sensor 1 High Voltage	O2 signal > 3.2 V
P0133	O2 Sensor 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	• Integrated oxygen sensor temperature > 330000 - 1117476 K • Oxygen sensor heating = not active
P0135	O2 Sensor Heater Circuit Bank 1 Sensor 1 Malfunction	• Sensor element temperature < 720 or > 840 °C • Power stage active and signal current = -100 to 10000 uA • Power stage not active and signal current = -1000 to -350 uA • Power stage not active and signal current = -100 to 100 uA
P016A	Fuel Trim, Feedback Check	Control Intervention = 0 %
P0171	Fuel Trim, System Lean	Fuel Mass Correction Value = < -0.01 [g/rev]
P0172	Fuel Trim, System Rich	Fuel Mass Correction Value = > 0.01 [g/rev]

DTC	Error Message	Malfunction Criteria and Threshold Value
P0181	Fuel Temperature Sensor Circuit Range/Performance	• Number of Dected Faults ≥ 6.00[-] Cross checks for fault detection: • FTS vs. ECT @ cylinder head > 35 K • FTS vs. IAT > 35K • FTS vs. EOT > 35 K • FTS vs. AAT > 35K • FTS vs. ECT @ radiator outlet > 35 K • FTS vs. ECT @ cylinder block > 35 K • FTS vs. TEGR > 35 K
P0182	Fuel Temperature Sensor Circuit Grounded	Signal Voltage < 0.10 V
P0183	Fuel Temperature Sensor Circuit Shorted to Battery Voltage / Open	Signal Voltage > 4.9 V
P0191	Fuel Rail Pressure Sensor Circuit Range/Performance	Signal voltage < 0.428 V or > 0.613 V
P0192	Fuel Rail Pressure Sensor Circuit Low Input	Signal voltage < 0.2 V
P0193	Fuel Rail Pressure Sensor Circuit High Input	Signal voltage > 4.8 V
P01BA	Engine Oil Temperature Sensor 2 Performance	• EOT cross checks for fault detection: ≥ 6 detected faults • EOT vs. ECT 3, IAT, FTS, AAT or ECT 2 > 30 Kelvin
P01BB	Engine Oil Temperature Sensor 2 Circuit Low	Signal voltage < 0.20 V for ≥ 5 Sec.
P01BC	Engine Oil Temperature Sensor 2 Circuit Intermittent/ Erratic	Signal voltage > 4.85 V for ≥ 5 Sec.
P01BD	Engine Oil Temperature Sensor 2 Circuit Intermittent/ Erratic	• Oil temperature increase < 3.0 K • Oil temperature < 66 °C • Evaluation timer > 59 - 251 s
P01E3	Engine Temperature Control Sensor Circuit Shorted to Battery Voltage	Signal voltage > 4.92 V
P01E4	Engine Temperature Control Sensor Circuit Range/ Performance	ETC vs IAT or AAT or FTS at start up > 35 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	• Open circuit signal voltage > 60 V • Short to battery voltage (low side) signal voltage = failure • Short circuit over load signal voltage > 30 v Short circuit low side: • Deviation between set and actual signal voltage after charging, Injector voltage > 30% of nominal voltage • Deviation between set and actual signal voltage before charging, Injector voltage > 45% of nominal voltage
P0202	Cylinder 2 Injector Circuit Malfunction	• Open circuit signal voltage > 60 V • Short to battery voltage (low side) signal voltage = failure • Short circuit over load signal voltage > 30 V Short circuit low side: • Deviation between set and actual signal voltage after charging, Injector voltage > 30% of nominal voltage • Deviation between set and actual signal voltage before charging, Injector voltage > 45% of nominal voltage

DTC	Error Message	Malfunction Criteria and Threshold Value
P0203	Cylinder 3 Injector Circuit Malfunction	• Open circuit signal voltage > 60 V • Short to battery voltage (low side) signal voltage = failure • Short circuit over load signal voltage > 30 V Short circuit low side: • Deviation between set and actual signal voltage after charging, Injector voltage > 30% of nominal voltage • Deviation between set and actual signal voltage before charging, Injector voltage > 45% of nominal voltage
P0204	Cylinder 4 Injector Circuit	• Open circuit signal voltage > 60 V • Short to battery voltage (low side) signal voltage = failure • Short circuit over load signal voltage > 30 V Short circuit low side: • Deviation between set and actual signal voltage after charging, Injector voltage > 30% of nominal voltage • Deviation between set and actual signal voltage before charging, Injector voltage > 45% of nominal voltage
P0205	Cylinder 5 Injector Circuit	• Open circuit signal voltage > 60 V • Short to battery voltage (low side) signal voltage = failure • Short circuit over load signal voltage > 30 V Short circuit low side: • Deviation between set and actual signal voltage after charging, Injector voltage > 30% of nominal voltage • Deviation between set and actual signal voltage before charging, Injector voltage > 45% of nominal voltage

DTC	Error Message	Malfunction Criteria and Threshold Value
P0206	Cylinder 6 Injector Circuit	• Open circuit signal voltage > 60 V • Short to battery voltage (low side) signal voltage = failure • Short circuit over load signal voltage > 30 V Short circuit low side: • Deviation between set and actual signal voltage after charging, Injector voltage > 30% of nominal voltage • Deviation between set and actual signal voltage before charging, Injector voltage > 45% of nominal voltage
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 Below Efficiency	Filtered chare air cooler efficiency < 7[-]
P0263	Cylinder 1 Contribution / Balance Internal Check	Diagnostic signal from power stage = Failure
P0266	Cylinder 2 Contribution / Balance Internal Check	• Diagnostic signal from power stage = Failure • Adaptive Value Limit High > 213 - 412 [µs] • Adaptive Value Limit Low < 213 - 412 [µs]
P0269	Cylinder 3 Contribution / Balance Internal Check	• Diagnostic signal from power stage = Failure • Adaptive Value Limit High > 213 - 412 [µs] • Adaptive Value Limit Low < 213 - 412 [µs]

DTC	Error Message	Malfunction Criteria and Threshold Value
P0272	Cylinder 4 Contribution / Balance Internal Check	• Diagnostic signal from power stage = Failure • Adaptive Value Limit High > 213 - 412 [µs] • Adaptive Value Limit Low < 213 - 412 [µs]
P0275	Cylinder 5 Contribution / Balance Internal Check	• Diagnostic signal from power stage = Failure • Adaptive Value Limit High > 213 - 412 [µs] • Adaptive Value Limit Low < 213 - 412 [µs]
P0278	Cylinder 6 Contribution / Balance Internal Check	• Diagnostic signal from power stage = Failure • Adaptive Value Limit High > 213 - 412 [µs] • Adaptive Value Limit Low < 213 - 412 [µs]
P0299	Turbo Boost Pressure Control rationality check High	• Differential set value boost pressure vs. actual boost pressure value: depending on ECT > 30 - 100 [kPa] • Differential set value boost pressure vs. actual boost pressure value: depending on engine speed and fuel quantity > 35 - 100 [kPa] • Boost pressure < 0 - 85 [kPa]
P2002	Particulate Trap Efficiency Below Threshold	• Differential pressure < f (volumetric flow rate, soot load) or • Differential pressure < f (volumetric flow rate)
P2004	Intake Manifold Runner Control (Bank 1) Stuck Open	• Control deviation > 10% • Actual position ≤ 40%
P2005	Intake Manifold Runner Control (Bank 2) Stuck Open	• Control deviation > 10% • Actual position ≤ 40%
P2006	Intake Manifold Runner Control (Bank 1) Stuck Closed	• Control deviation > 10% • Actual position ≤ 40%
P2007	Intake Manifold Runner Control (Bank 2) Stuck Closed	• Control deviation > 10% • Actual position ≤ 40%

DTC	Error Message	Malfunction Criteria and Threshold Value
P2008	Intake Manifold Runner Control (Bank 1) Stuck Open	• Diagnostic signal from power stage > 0.8 V (output 1) and < 2 V (output 2) or • Diagnostic signal from power stage = 8 to 18 A or • Diagnostic signal from power stage > 5 V or < 3.4 V
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	• Diagnostic signal from power stage > 0.8 V (output 1) and < 2 V (output 2) or • Diagnostic signal from power stage = 8 to 18 A or • Diagnostic signal from power stage > 5 V or < 3.4 V
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
P2015	Intake Manifold Runner Position Sensor Circuit Range/Performance	• Position sensor signal < 3550 mV • Position sensor signal > 1450 mV or • Position sensor signal > 550 mV and < 250 mV or • Position sensor signal > 4450 mV and < 4750 mV
P2016	Intake Manifold Runner Position Sensor Circuit Low	Position sensor signal ≤ 250 mV
P2017	Intake Manifold Runner Position Sensor Circuit High	Position sensor signal ≥ 4750 mV
P202A	Reducing Agent Tank Heater Control Circuit/Open	Conductance @ start of heating ≤ 0.10 1/Ohm

DTC	Error Message	Malfunction Criteria and Threshold Value
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	• Position sensor signal < 3550 mV • Position sensor signal > 1450 mV or • Position sensor signal > 550 mV and < 250 mV or • Position sensor signal > 4450 mV and < 4750 mV
P2021	Intake Manifold Runner Position Sensor Circuit (Bank 2) Low	Position sensor signal ≤ 250 mV
P2022	Intake Manifold Runner Position Sensor Circuit (Bank 2) High	Position sensor signal ≥ 4750 mV
P203B	Reducing Agent Level Sensor Circuit Range / Performance	• Signal voltage not equal full level < 1.76 V or > 2.02 V or • Signal voltage not equal half full level, 2.03 V or > 2.31 V or • Signal voltage not equal empty level < 1.32 V or > 1.53 V or • Signal voltage not equal SCR values < 0.25 V > 2.35 V
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

DTC	Error Message	Malfunction Criteria and Threshold Value
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	• Signal Voltage < 2.97 V or • Signal Current > 1.6 A
P2049	Reducing Agent Injection Valve Circuit Short to Battery Voltage	• Signal Current > 1.8 A or • Analog measure < 200 mA
P205A	Reducing Agent Tank Temperature Sensor Circuit Short to Battery Voltage or Open	Signal voltage > 4.63 V
P205B	Reducing Agent Tank Temperature Sensor Circuit Range/Performance	Case 1: • AAT > 25 °C • Difference between reducing agent (AdBlue®) to ECT < -30 °K Case 2: • AAT < 25 °C • Difference between reducing agent (AdBlue®) to ECT < -30 °K • Reducing agent temperature increase while heating tank < 1.5 K • For time < 1500.0 s
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	• Rotation < 400 RPM • > 5 Seconds
P208C	Reducing Agent Pump Control Circuit Grounded	Signal Voltage < 2.74 V

DTC	Error Message	Malfunction Criteria and Threshold Value
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	• Temperature difference to temp EGR T3, T4, T5, T6 > 40 °K or • Mean value of modeled to measured T4 > 100 °K
P2084	Exhaust Gas Temperature Sensor 2 Circuit Range/ Performance	• Temperature difference to temp EGR T3, T4, T5, T6 > 40 °K or • Mean value of modeled to measured T3 > 100 °K
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 ≤ 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[-]

DTC	Error Message	Malfunction Criteria and Threshold Value
P20E8	Reducing Agent Pressure Too Low / Functional check	• Actual pressure < 300.00 kPa for 55 s or • Actual pressure < 350.00 kPa for 60 s or • Pressure built up for 21.00[-] Attempts > 450 kPa
P20FE	Reducing Agent Quality Performance	Average Efficiency > 2.50 [-]
P20E9	Reducing Agent Pressure Too High	• Actual pressure > 790.00 kPa for 0.0 s or • Actual pressure > 650.00 kPa for 10 s or • Pressure @ Dosing end > 50 kPa
P20FF	Reducing Agent Metering System Control Module -J880- Detects Internal Hardware Defects	Internal fault
P20F4	Reducing Agent Consumption Too High	SCR adaptive value ≥ 2.50
P20F5	Reducing Agent Consumption Too Low	SCR adaptive value ≤ 0.51
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

DTC	Error Message	Malfunction Criteria and Threshold Value
P2100	Throttle Actuator Control Motor Circuit/Open	Signal from power stage > 3.26 V and < 5.40 V
P2101	Throttle Actuator Control Motor Circuit Range/ Performance	Signal = no change
P2102	Throttle Actuator Control Motor Circuit Low	Signal from power stage ≤ 3.26 V
P2103	Throttle Actuator Control Motor Circuit High	Signal from power stage > 1.50 V and > 50 mA
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 °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 °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 < - 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 on Radiator Outlet Circuit Grounded	Signal voltage < 162 mV

DTC	Error Message	Malfunction Criteria and Threshold Value
P2185	Engine Coolant Temperature Sensor On Radiator Outlet Circuit Short to Battery Voltage	Signal voltage > 3255 mV
P2195	O2 Sensor Signal Stuck Lean (Bank 1 Sensor 1)	• Measured oxygen concentration @ fuel cutoff > 25.6% or • Measured oxygen concentration @ part load > (calculated) 11%
P2196	2 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	Ox 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	• NOx 40 - 70%, time > 5 Sec. or 40% value not reached within 7 Sec. • Ratio > 3 or < -0.75 • Average NOx Offset value > 50 or < -30 ppm
P2202	NOx Sensor Front Circuit Low	NOx Sensor Front Circuit Low
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	• O2S internal resistance > 3 V • Oxygen signal < -1.3 V or > 1.5 V
P2251	O2 Sensor Negative Current Control Circuit Bank 1 Sensor 1 Open	O2S internal resistance voltage > 3 V
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 mass air flow = 0.45 - 0.80[-]

DTC	Error Message	Malfunction Criteria and Threshold Value
P229E	Ox Sensor Rear Circuit Short or Open	• Message From NOx Sensor = Failure or • NOx sensor status ratio of validity ≥ 0.5[-]
P229F	NOx Sensor Rear Circuit Range /Performance	• Average NOx Offset Value > 50 ppm • Number of checks = 2[-] or • Average NOx Offset Value < - 30 ppm • Number of checks = 2[-] or • Measured oxygen concentration compared with calculated oxygen concentration deviation @ part load > 5.3%
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	Ox Sensor Rear Rationality Check	NOx control active time since dew point exceeded >180 s

Ignition System

DTC	Error Message	Malfunction Criteria and Threshold Value
P0300	Random Misfire Detected	• Rise in engine speed after fuel injection calculated based on values from last two engine revolutions • Error threshold 82% misfire over 440 crankshaft revolutions

DTC	Error Message	Malfunction Criteria and Threshold Value
P0301	Cylinder 1 Misfire Detected	• Rise in engine speed after fuel injection calculated based on values from last two engine revolutions • Error threshold 82% misfire over 440 crankshaft revolutions
P0302	Cylinder 2 Misfire Detected	• Rise in engine speed after fuel injection calculated based on values from last two engine revolutions • Error threshold 82% misfire over 440 crankshaft revolutions
P0303	Cylinder 3 Misfire Detected	• Rise in engine speed after fuel injection calculated based on values from last two engine revolutions • Error threshold 82% misfire over 440 crankshaft revolutions
P0304	Cylinder 4 Misfire Detected	• Rise in engine speed after fuel injection calculated based on values from last two engine revolutions • Error threshold 82% misfire over 440 crankshaft revolutions
P0305	Cylinder 5 Misfire Detected	• Rise in engine speed after fuel injection calculated based on values from last two engine revolutions • Error threshold 82% misfire over 440 crankshaft revolutions
P0306	Cylinder 6 Misfire Detected	• Rise in engine speed after fuel injection calculated based on values from last two engine revolutions • Error threshold 82% misfire over 440 crankshaft revolutions

DTC	Error Message	Malfunction Criteria and Threshold Value
P0321	Engine Speed Input Circuit Range/Performance	• Counted teeth vs. reference > 200 • Monitoring reference gap failure
P0322	Engine Speed Input Circuit No Signal	• Camshaft signal > 10 • Engine speed = no signal

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 Insufficient Flow 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	• Control deviation > 10.00 [%] or • Control deviation < -10.00 [%] or • Actual position ≤17.00 [%] • Control deviation > 10.00 [%] or • Control deviation < -10.00 [%] • Actual position > 17.00 [%] Open circuit: • Control deviation < -10.00 [%] Short to ground: • Signal current > 8 - 18 [A] Short to battery voltage • Signal current > 8 - 18 [A]
P0404	Exhaust Gas Recirculation Control Circuit Range/ Performance	• Control deviation > 10% • Actual position > 17%
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 < 0.3
P046C	Exhaust Gas Recirculation Sensor Circuit Range/ Performance	Position sensor signal > 1.05 V
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

DTC	Error Message	Malfunction Criteria and Threshold Value
P240F	EGR Slow Response	• Calculated characteristically value: Negative gradients of target air mass flow > 35 [-] or • Calculated characteristically value: Positive gradients of Target air mass flow ≥ 30 [-]
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	• Temperature difference to EGR temp, T3, T4, T5, T6 > 40 °K or • Mean value of modeled - measured T5 > 100 °K
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 < 2.97 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	• Positive difference between measured and target temperature too high = 10.0 - 70.0 [K] or • Negative difference between measured and target temperature too low = -12.0 -7.0 [K]
P2452	Diesel Particulate Filter Differential Pressure Sensor Circuit	Sensor voltage > 4.9 V

DTC	Error Message	Malfunction Criteria and Threshold Value
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	• Temperature difference to EGR temp, T3, T4, T5, T6 > 40 °K or • Mean value of modeled - measured T5 > 100 °K
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	• Current (IDE) @ measurement 1 < 2 µA • Difference between current (IDE) measurement 1 and 2 or • Signal voltage positive connection (IDE) > 4.7 [V] • Signal voltage positive connection (IDE) < 0.3 [V]
P24AF	PM Sensor Monitoring, Rationality Check	• Signal current (IDE) > 5 µA or •Accumulated change in heater voltage < = 0.40 V
P24B1	PM Sensor Circuit Shorted or open	• Signal voltage negative connection (IDE) > 4.1 [V] • Signal voltage negative connection (IDE) = 0.0 [V]

DTC	Error Message	Malfunction Criteria and Threshold Value
P24B3	PM Sensor Heater functional check	• Heater Coil resistance > 1.06 - 2.31 Ω • eater Coil resistance < 2.94 - 5.13 Ω
P24B5	PM Sensor Heater Short to Ground	• Heating Current < 1.0 A or • Heating Current > 15.0 A
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	Signal range check low: difference between measured PM Sensor supply wire voltage and battery voltage (ECM): • Value > 1.90 [V] or • Value > 2.60 [V] or • Value > 3.00 [V] Signal Range Check High: difference between measured battery voltage (ECM) and Sensor supply wire voltage: • Value > 3.00 [V] or • Value > 2.10 [V] or • Value > 1.10 [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

DTC	Error Message	Malfunction Criteria and Threshold Value
P0506	Idle Control System RPM Lower than Expected	Control deviation < 10%
P0507	Idle 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	• Glow plug resistance (between 4 - 9 Sec.) < 0.3 ohm • Glow plug resistance (between 9 - 14 Sec.) < 0.4 ohm • Glow plug resistance (after 14 Sec.) < 0.5 ohm • Glow plug resistance anytime > 1.2 ohm
P06BB	Cylinder 3 Glow Plug Circuit Range/Performance	• Glow plug resistance (between 4 - 9 Sec.) < 0.3 ohm • Glow plug resistance (between 9 - 14 Sec.) < 0.4 ohm • Glow plug resistance (after 14 Sec.) < 0.5 ohm • Glow plug resistance anytime > 1.2 ohm

DTC	Error Message	Malfunction Criteria and Threshold Value
P06BC	Cylinder 4 Glow Plug Circuit Range/Performance	• Glow plug resistance (between 4 - 9 Sec.) < 0.3 ohm • Glow plug resistance (between 9 - 14 Sec.) < 0.4 ohm • Glow plug resistance (after 14 Sec.) < 0.5 ohm • Glow plug resistance anytime > 1.2 ohm
P06BD	Cylinder 5 Glow Plug Circuit Range/Performance	• Glow plug resistance (between 4 - 9 Sec.) < 0.3 ohm • Glow plug resistance (between 9 - 14 Sec.) < 0.4 ohm • Glow plug resistance (after 14 Sec.) < 0.5 ohm • Glow plug resistance anytime > 1.2 ohm
P06BE	Cylinder 6 Glow Plug Circuit Range/Performance	• Glow plug resistance (between 4 - 9 Sec.) < 0.3 ohm • Glow plug resistance (between 9 - 14 Sec.) < 0.4 ohm • Glow plug resistance (after 14 Sec.) < 0.5 ohm • Glow plug resistance anytime > 1.2 ohm
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	• Glow plug resistance (between 4 - 9 Sec.) < 0.3 ohm • Glow plug resistance (between 9 - 14 Sec.) < 0.4 ohm • Glow plug resistance (after 14 Sec.) < 0.5 ohm • Glow plug resistance anytime > 1.2 ohm

DTC	Error Message	Malfunction Criteria and Threshold Value
P06E5	Glow Plug Control Module Performance	Calculated ground offset ≥ 1.75 V or ≤ -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
P0606	Internal Control Module Memory Check Sum Error	• ECM internal self test failed • RAM error in memory
P0607	Control Module Performance	• Oxygen sensor adaptation > 0.2 V or < -0.2 V • Internal communication failed • Supply voltage for IC < 9 V or • Sensor voltage < 0.265 V or > 3.9 V
P0634	ECM Internal Temperature Too High	Current over-temperature diagnostic signal from output driver • Power stage temperature > 150 °C
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

DTC	Error Message	Malfunction Criteria and Threshold Value
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
P0671	Cylinder 1 Glow Plug Circuit	Glow current ≤ 2.20 A
P0672	Cylinder 2 Glow Plug Circuit	Glow current ≤ 2.20 A
P0673	Cylinder 3 Glow Plug Circuit	Glow current ≤ 2.20 A
P0674	Cylinder 4 Glow Plug Circuit	Glow current ≤ 2.20 A
P0675	Cylinder 5 Glow Plug Circuit	Glow current ≤ 2.20 A
P0676	Cylinder 6 Glow Plug Circuit	Glow current ≤ 2.20 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 messages.
U0028	Vehicle Communication Bus A	CAN message = no feedback
U0029	Vehicle Communication Bus A Performance	Global time out. Receiving no messages.
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	Lost Communication With Body Control Module	No CAN messages from BCM

DTC	Error Message	Malfunction Criteria and Threshold Value
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
U0302	Software Incompatibility with Transmission Control Module	Auto trans messages received from ECM.
U0307	CAN: Instrument cluster only	Error bit = set
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	• Error bit = set • Implausible data from ABS or • Speed sensor signal = 655.35 km/h
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	Ox 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	Reducing Agent Control Module Supply Voltage Too Low	Supply voltage < 8.5 V

DTC	Error Message	Malfunction Criteria and Threshold Value
U140D	Reducing Agent Control Module Supply Voltage Too High	Supply voltage > 16.5 V
U140E	Reducing Agent Control Module Function Restriction Due to Insufficient Voltage	Supply voltage < 9 V
U140F	Reducing Agent Control Module Function restriction due to excessive voltage	Supply voltage > 16 V

Fuel and Air Ratios Control Module

DTC	Error Message	Malfunction Criteria and Threshold Value
P1103	ECM: Production Mode	production mode = Active
P150A	Engine Off Timer Performance	ECM time - IPC time > 12 Sec.

Additional Emissions Regulations

DTC	Error Message	Malfunction Criteria and Threshold Value
P2564	Turbocharger Boost Control Position Sensor Circuit Low	Sensor signal voltage < 0.15 V
P2565	Turbocharger Boost Control Position Sensor Circuit High	Sensor signal voltage > 4.85 V
P261A	Coolant Pump "B" Control Circuit/Open	• Open circuit Signal voltage < 5 V • Functional voltage = 3.2 - 3.5 V
P261C	Coolant Pump "B" Control Circuit Low	Signal voltage < 3 V
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

DTC	Error Message	Malfunction Criteria and Threshold Value
P3348	Turbocharger Control Module Circuit Malfunction	• Diagnostic signal from power stage > 8 - 18 A or • Diagnostic signal from power stage > 5 V or < 3.4 V

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