2013

A7

Quick Reference Specification Book

Audi
Truth in Engineering

2013 Audi A7
Quick Reference Specification Book
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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.

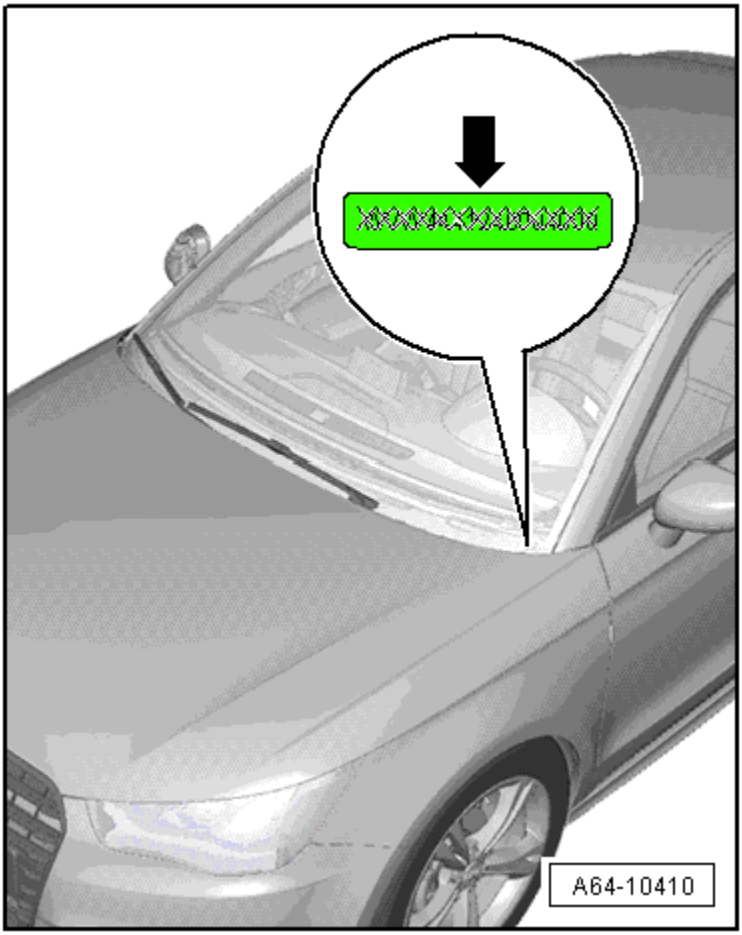
(CAUTIONS cont'd on next page)

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.

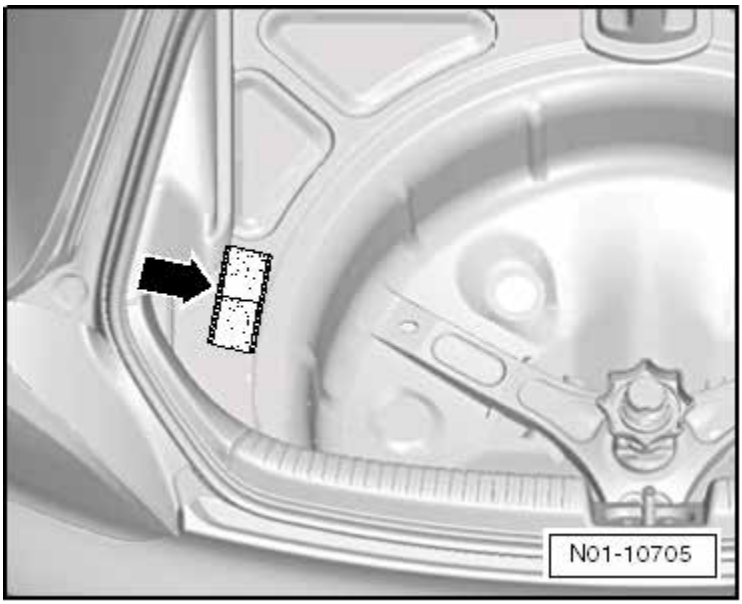
VEHICLE IDENTIFICATION

Vehicle Identification Number (VIN) Location



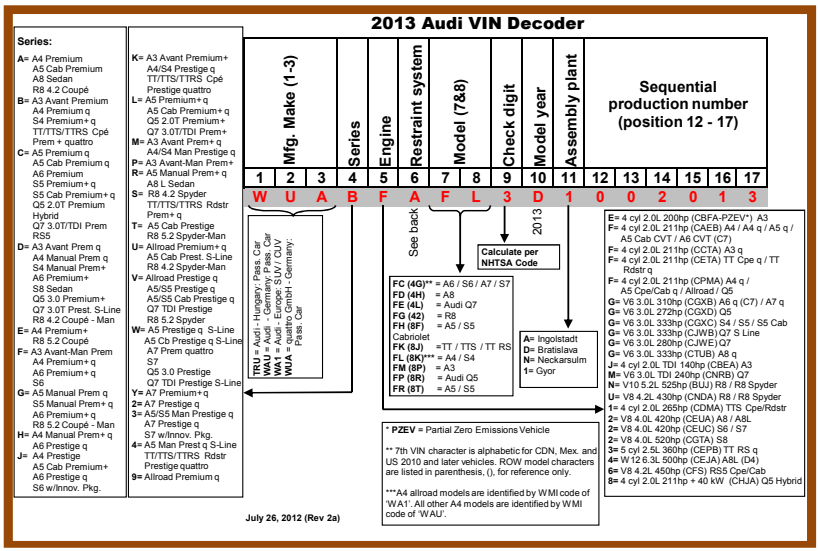
The VIN (➡) is on the left side of the vehicle in the area of the windshield wiper mount. It is visible from the outside.

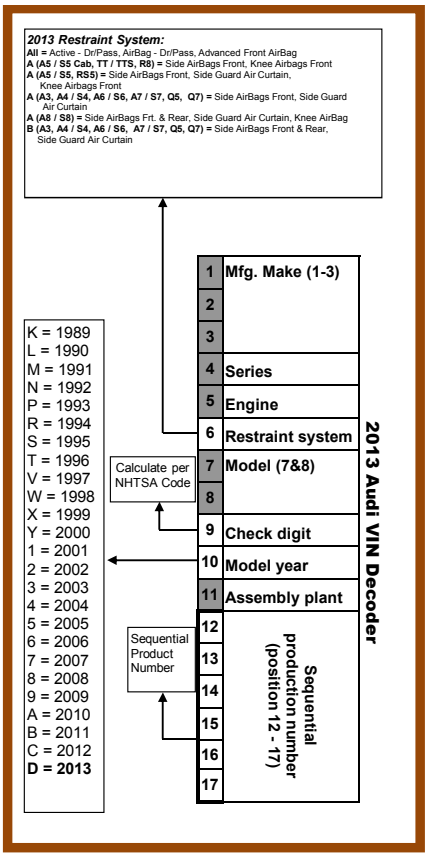
Vehicle Data Label



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


2013 Audi VIN Decoder
Series:
A= A4 Premium
A5 Cab Premium
A8 Sedan
R8 4.2 Coupé
B= A3 Avant Premium
A4 Premium q
S4 Premium+q
TT/TTS/TTRS Cpé
Prem + quattro
C= A5 Premium q
A5 Cab Premium q
A6 Premium
S5 Premium+q
S5 Cab Premium+q
Q5 2.0T Premium
Hybrid
Q7 3.0T/TDI Prem
RS5
D= A3 Avant Prem q
A4 Manual Prem q
S4 Manual Prem+
A6 Premium+
S8 Sedan
Q5 3.0 Premium+
Q7 3.0T Prest. S-Line
R8 4.2 Coupé - Man
E= A4 Premium+
R8 5.2 Coupé
F= A3 Avant-Man Prem
A4 Premium+q
A6 Premium+q
S6
G= A5 Manual Prem q
S5 Manual Prem+q
A6 Premium+q
R8 5.2 Coupé - Man
H= A4 Manual Prem+q
A6 Prestige q
J= A4 Prestige
A5 Cab Premium+
A6 Prestige q
S6 w/Innov. Pkg.
K= A3 Avant Premium+
A4/S4 Prestige q
TT/TTS/TTRS Cpé
Prestige quattro
L= A5 Premium+q
A5 Cab Premium+q
Q5 2.0T Premium+
Q7 3.0T/TDI Prem+
M= A3 Avant Prem+q
A4/S4 Man Prestige q
P= A3 Avant-Man Prem+
R= A5 Manual Prem+ q
A8 L Sedan
S= R8 4.2 Spyder
TT/TTS/TTRS Rdstr
Prem+q
T= A5 Cab Prestige
R8 5.2 Spyder-Man
U= Allroad Premium+q
A5 Cab Prest. S-Line
R8 4.2 Spyder-Man
V= Allroad Prestige q
A5/S5 Prestige q
A5/S5 Cab Prestige q
Q7 TDI Prestige
R8 5.2 Spyder
W= A5 Prestige q S-Line
A5 Cb Prestige q S-Line
A7 Prem quattro
S7
Q5 3.0 Prestige
Q7 TDI Prestige S-Line
Y= A7 Premium+q
2= A7 Prestige q
3= A5/S5 Man Prestige q
A7 Prestige q
S7 w/Innov. Pkg.
4= A5 Man Prest q S-Line
TT/TTS/TTRS Rdstr
Prestige quattro
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 D 1 0 0 2 0 1 3
See back
2013
Calculate per NHTSA Code
TRU = Audi - Hungary: Pass. Car
WAU = Audi - Germany: Pass. Car
WA1 = Audi - Europe: SUV / CUV
WUA = quattro GmbH - Germany: Pass. Car
FC (4G)** = A6 / S6 / A7 / S7
FD (4H) = A8
FE (4L) = Audi Q7
FG (4Z) = R8
FH (8F) = A5 / S5 Cabriolet
FK (8J) =TT / TTS / TT RS
FL (8K)*** = A4 / S4
FM (8P) = A3
FP (8R) = Audi Q5
FR (8T) = A5 / S5
A= Ingolstadt
D= Bratislava
N= Neckarsulm
1= Gyor
E= 4 cyl 2.0L 200hp (CBFA-PZEV*) A3
F= 4 cyl 2.0L 211hp (CAEB) A4 / A4 q / A5 q / A5 Cab CVT / A6 CVT (C7)
F= 4 cyl 2.0L 211hp (CCTA) A3 q
F= 4 cyl 2.0L 211hp (CETA) TT Cpe q / TT Rdstr q
F= 4 cyl 2.0L 211hp (CPMA) A4 q / A5 Cpe/Cab q / Allroad / Q5
G= V6 3.0L 310hp (CGXB) A6 q (C7) / A7 q
G= V6 3.0L 272hp (CGXD) Q5
G= V6 3.0L 333hp (CGXC) S4 / S5 / S5 Cab
G= V6 3.0L 333hp (CJWB) Q7 S Line
G= V6 3.0L 280hp (CJWE) Q7
G= V6 3.0L 333hp (CTUB) A8 q
J= 4 cyl 2.0L TDI 140hp (CBEA) A3
M= V6 3.0L TDI 240hp (CNRB) Q7
N= V10 5.2L 525hp (BUJ) R8 / R8 Spyder
U= V8 4.2L 430hp (CNDA) R8 / R8 Spyder
1= 4 cyl 2.0L 265hp (CDMA) TTS Cpe/Rdstr
2= V8 4.0L 420hp (CEUA) A8 / A8L
2= V8 4.0L 420hp (CEUC) S6 / S7
2= V8 4.0L 520hp (CGTA) S8
3= 5 cyl 2.5L 360hp (CEPB) TT RS q
4= W 12 6.3L 500hp (CEJA) A8L (D4)
6= V8 4.2L 450hp (CFS) RS5 Cpe/Cab
8= 4 cyl 2.0L 211hp + 40 kW (CHJA) Q5 Hybrid
* PZEV = Partial Zero Emissions Vehicle
** 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 identified by WMI code of 'WA1'. All other A4 models are identified by WMI code of 'WAU'.
July 26, 2012 (Rev 2a)


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

SALES CODES

Engine Codes

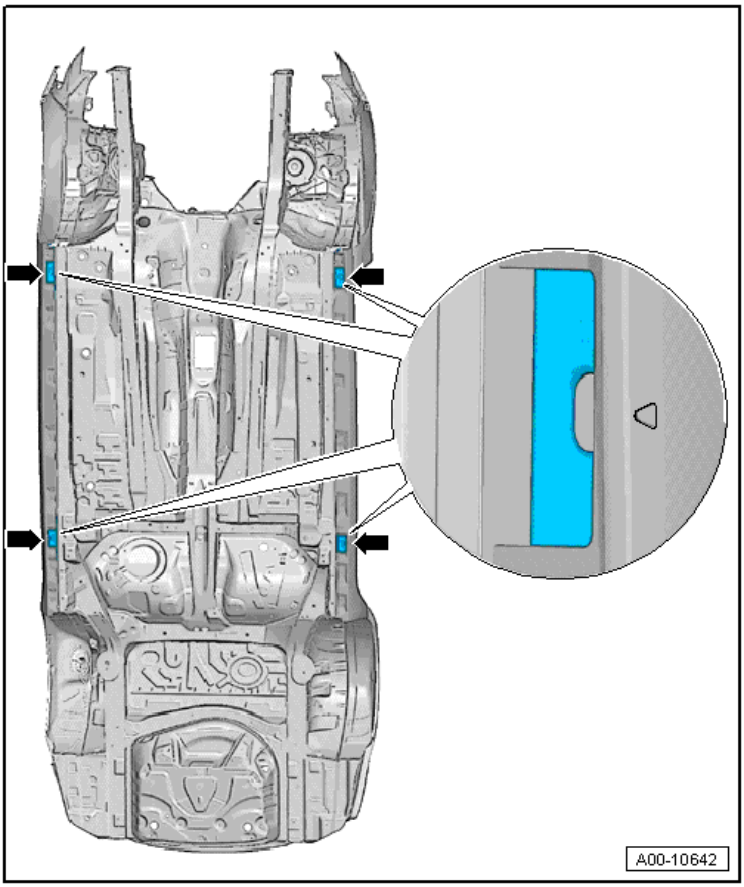
CTUA	3.0L 6-cylinder (TFSI)
CEUC	4.0L 8-cylinder (FSI BIT)

Transmission Codes

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

VEHICLE LIFTING

Hoist and Floor Jack Lifting Points

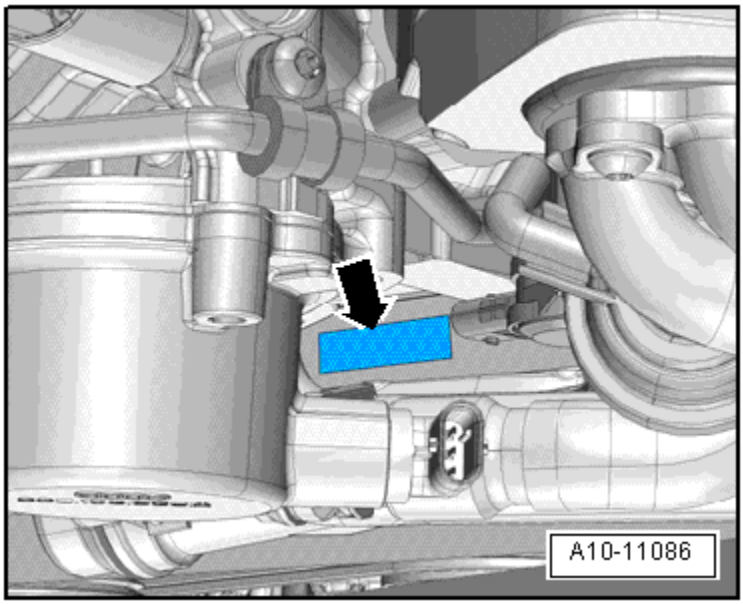


Position the hoist or floor jack on the plastic mounts (➡) found on the underbody.

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.

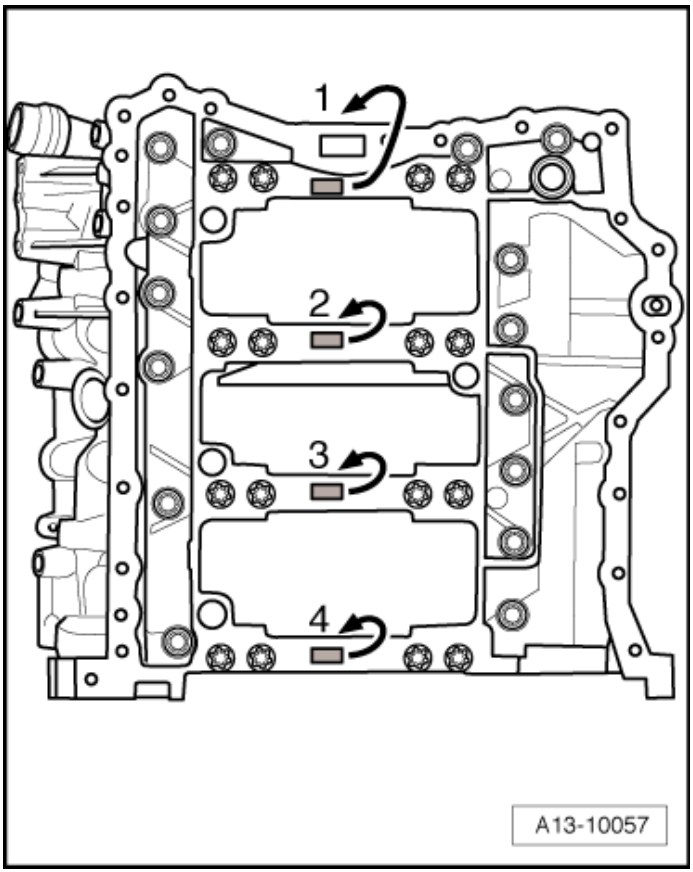
Engine Assembly – 3.0L CTUA

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
Subframe	-	55

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

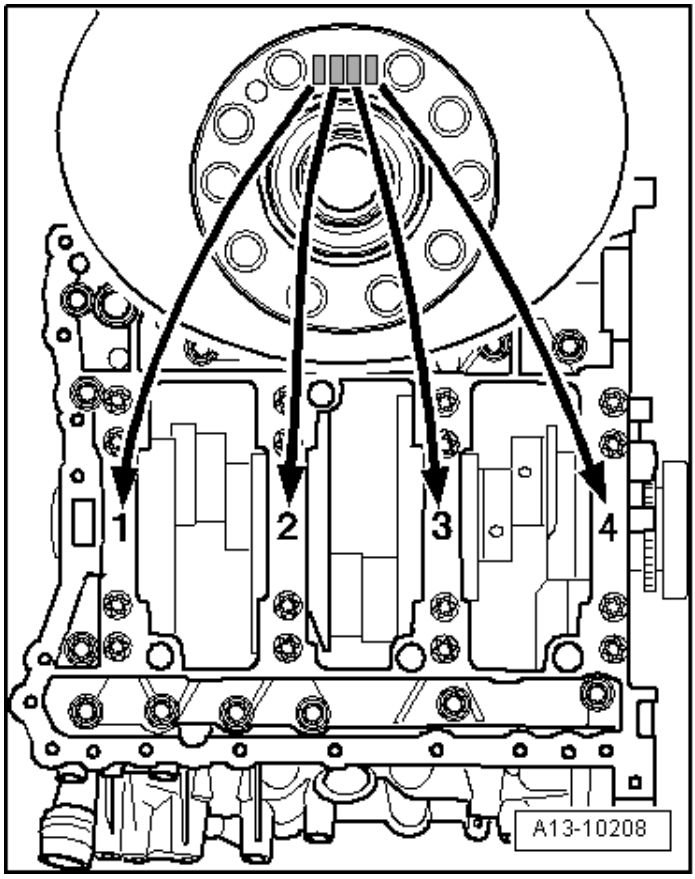
Allocation of Crankshaft Bearing Shells for Cylinder Block



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.

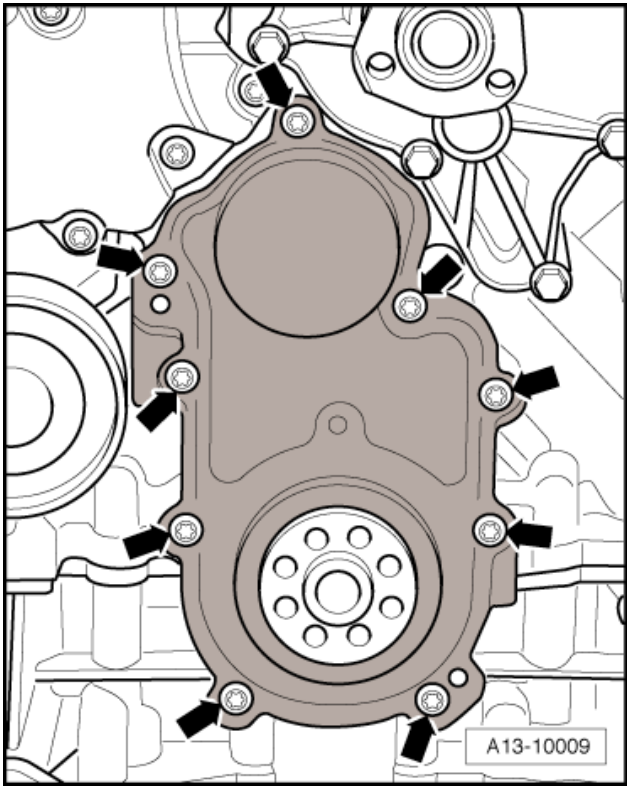
Letter on guide frame	Color of bearing
R	Red
G	Yellow
B	Blue
S	Black

Fastener Tightening Specifications

Component	Nm
Connecting rod [1]	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)

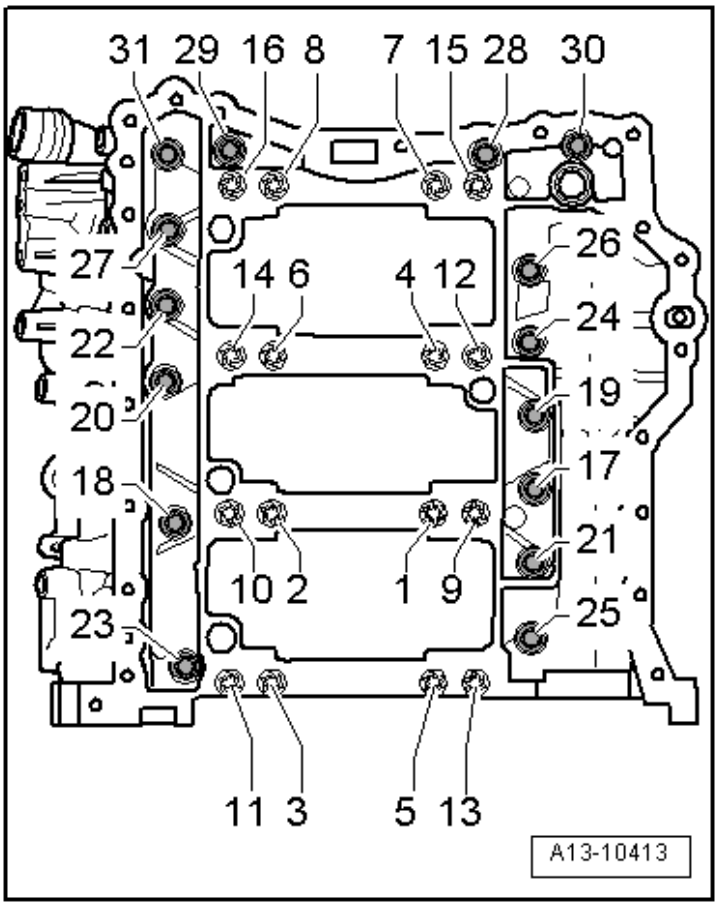
[1] Replace fastener(s).
[2] For bolt tightening clarification, refer to ElsaWeb, *Ribbed Belt Drive Overview*, item 4.
[3] For bolt tightening clarification, refer to ElsaWeb, *Supercharger Ribbed Belt Drive Overview*, item 6.
[4] Insert the bolt with locking compound

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

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

Cylinder Head, Valvetrain – 3.0L CTUA

Fastener Tightening Specifications

Component	Nm
Balance shaft	60
Balance shaft chain sprocket [1]	15 plus an additional 90° (¼ turn)
Bearing end bracket	13
Camshaft adjustment solenoid valve	5
Chain tensioner with glide track [1]	10 plus an additional 45° (⅛ turn)
Drive sprocket bearing plate [1]	8 plus an additional 45° (⅛ turn)
Drive sprocket mounting pin [3]	5 plus an additional 60° (⅙ turn)
Drive train chain tensioner for timing mechanism	9
Exhaust camshaft chain sprocket [1]	80 plus an additional 90° (¼ turn)
Glide track, bolt	10 plus an additional 90° (¼ turn)
Glide track, bolt Guide rail [1]	10 plus an additional 90° (¼ turn)
Intake camshaft adjuster [1]	80 plus an additional 90° (¼ turn)
Left camshaft control chain tensioner	9
Mounting pin for drive sprocket bolt [2]	30 plus an additional 90° (¼ turn)
Oil dipstick guide tube	9
Oil pump drive sprocket [1]	30 plus an additional 90° (¼ turn)

Fastener Tightening Specifications *(cont'd)*

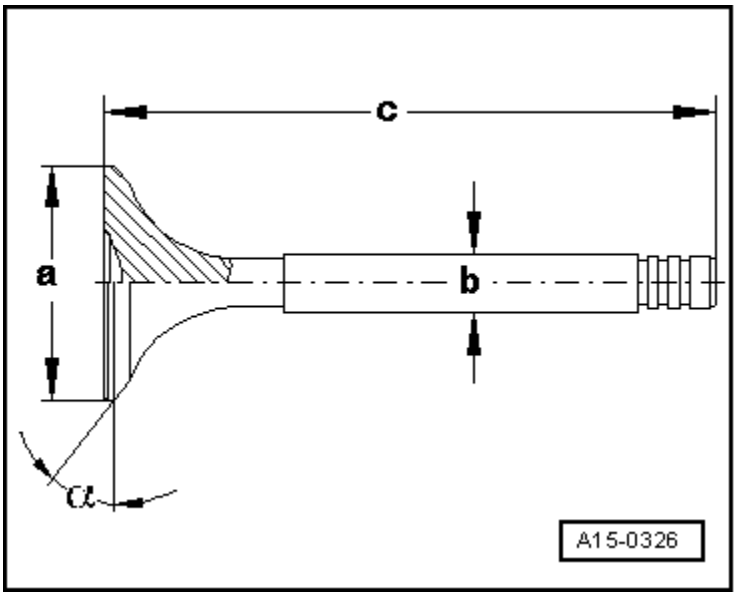
Component	Nm
Right camshaft timing chain drive sprocket bearing plate [1)]	8 plus an additional 45° (⅛ turn)
Right camshaft timing chain tensioner	9
Right timing chain drive sprocket [1)]	30 plus an additional 90° (¼ turn)
Timing mechanism drive train chain tensioner	9

[1)] Replace fastener(s).

Compression Checking Specifications

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

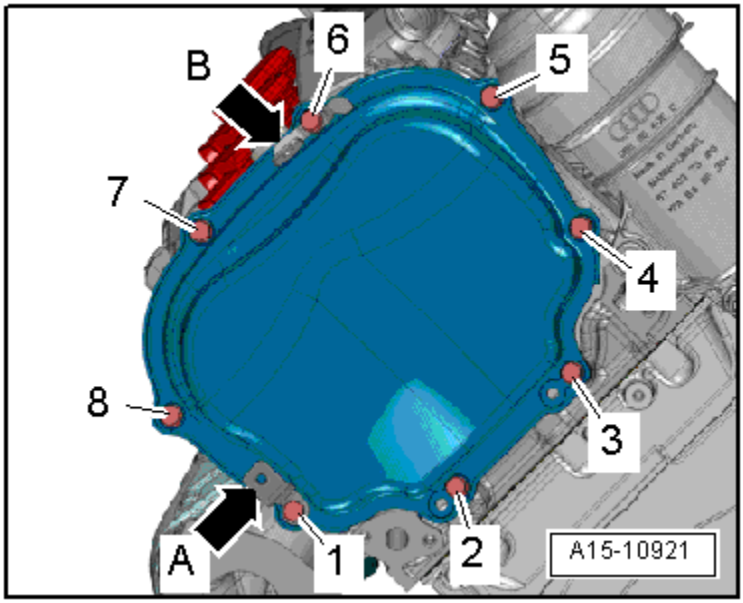
Valve Dimensions



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

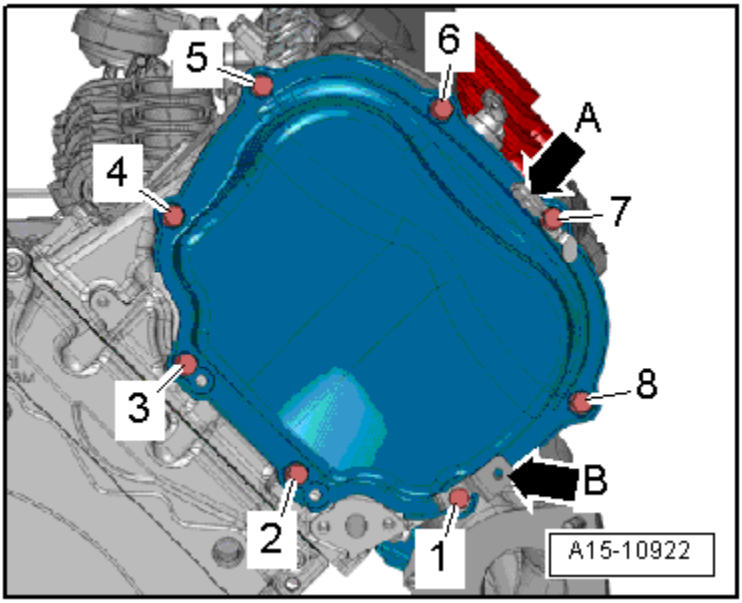


Step	Component	Nm
1	Tighten bolts 1 through 8 in sequence	5
2	Tighten bolts 1 through 8 in sequence	an additional 90° (¼ turn)

[1)]Replace fastener(s).

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

Right Timing Chain Cover Tightening Specifications

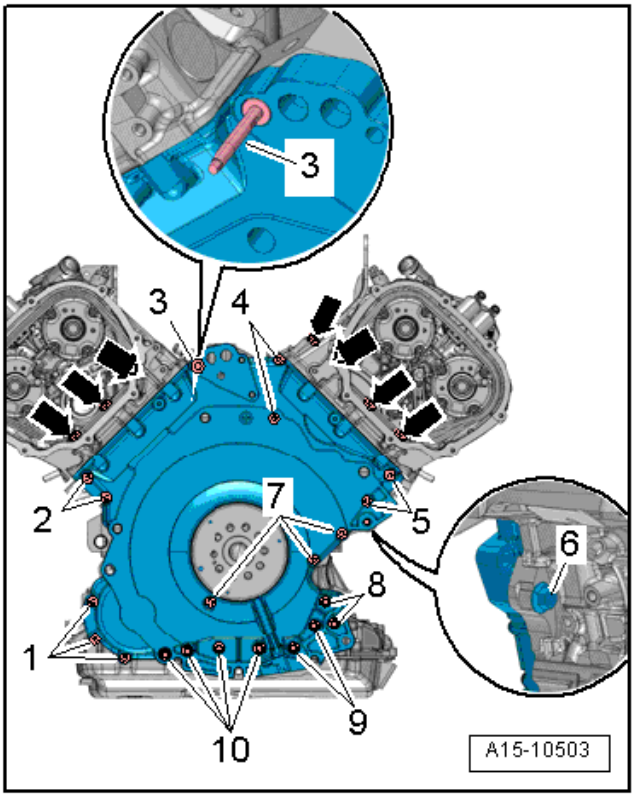


Step	Component	Nm
1	Replace and tighten bolts 1 through 8 in sequence	5
2	Tighten bolts 1 through 8 in sequence	an additional 90° (¼ turn)

[1)]Replace fastener(s).

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

Lower Timing Chain Cover Tightening Specifications

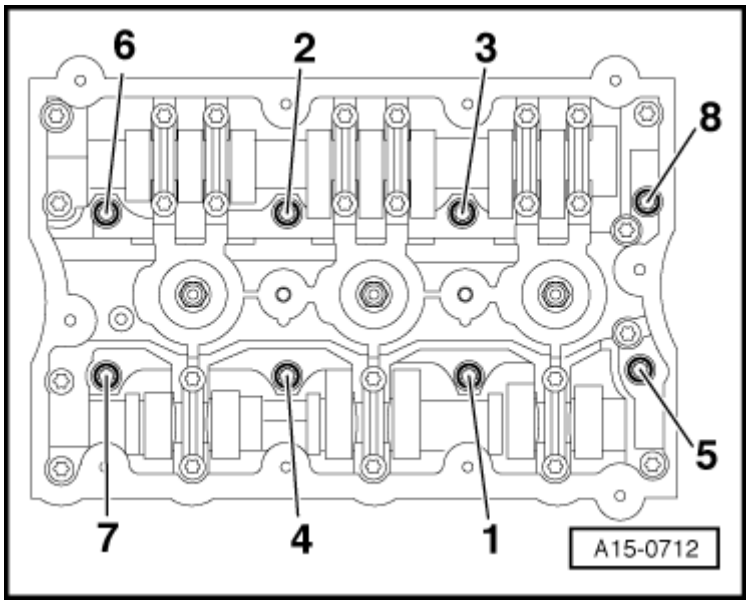


Replace all fasteners except bolt 3.

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, and ➡	an additional 90° (¼ turn)
4	Tighten bolts 8, 9 and 10	8
5	Tighten bolts 8, 9 and 10	an additional 90° (¼ turn)
6	Tighten the bolt 3	16
7	Tighten bolt 6	20
8	Tighten bolt 6	an additional 90° (¼ turn)

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

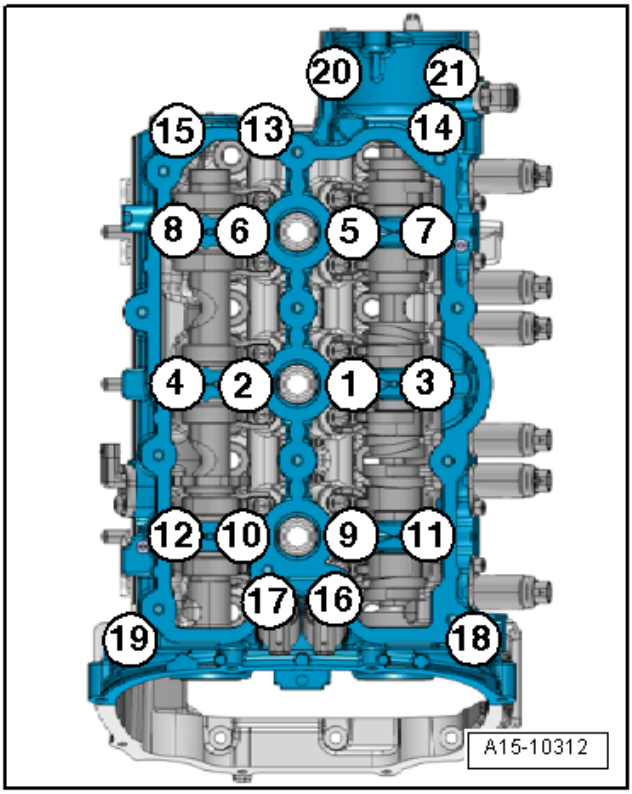
Cylinder Head Tightening Specifications



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

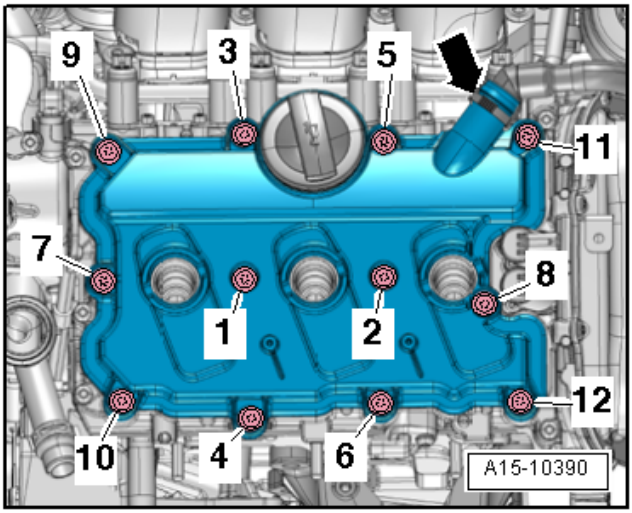


NOTE: The left cylinder head camshaft guide frame is shown.
The right cylinder head camshaft guide frame is identical.

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)

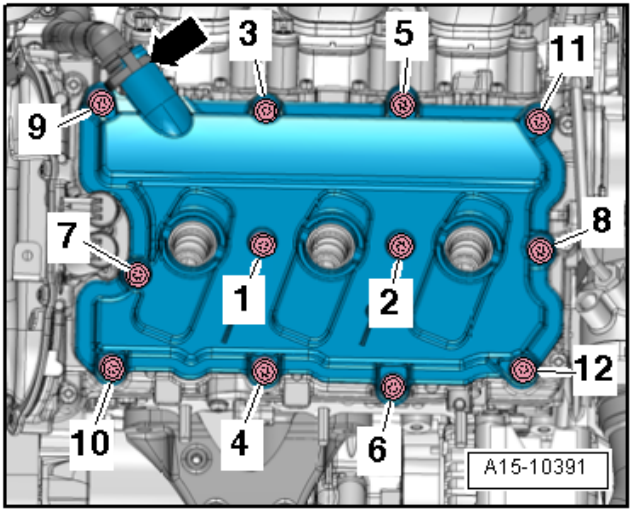
1) Replace fastener(s)
2) The guide frame must be in contact with the entire contact surface of the cylinder head.

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

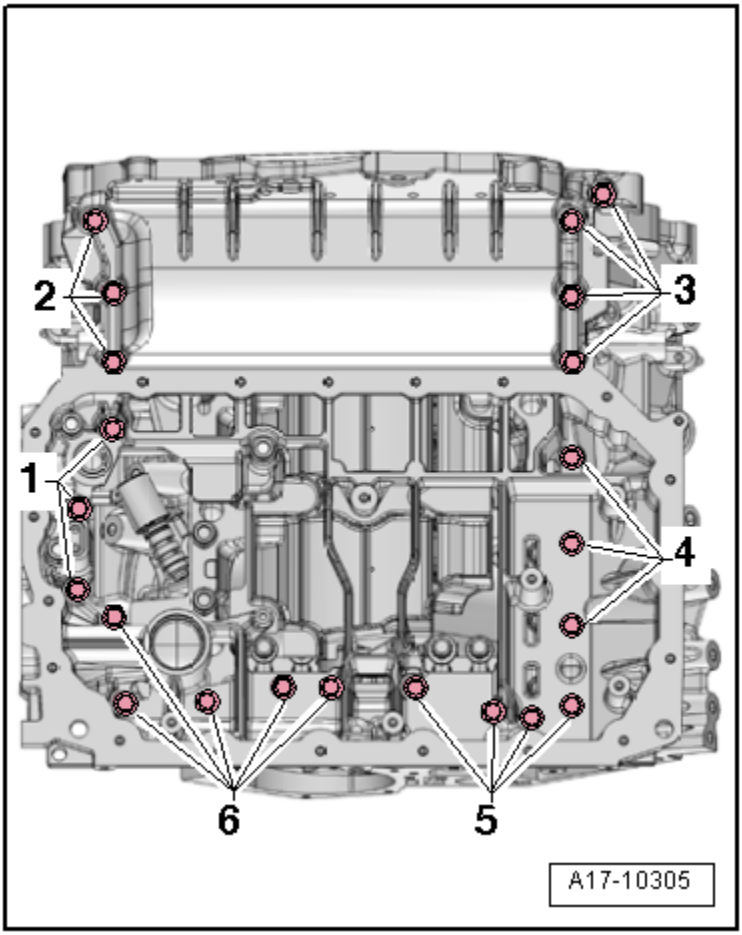
[1] Replace fastener(s).

[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.

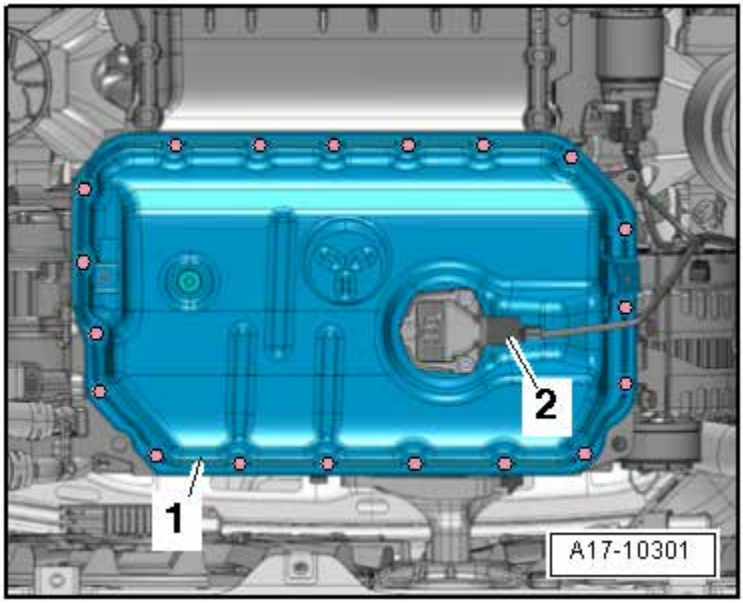
[4] For bolt tightening clarification, refer to ElsaWeb, *Oil Filter Housing and Oil Pressure Switch Overview,* items 1, 4, 5 and 13.

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

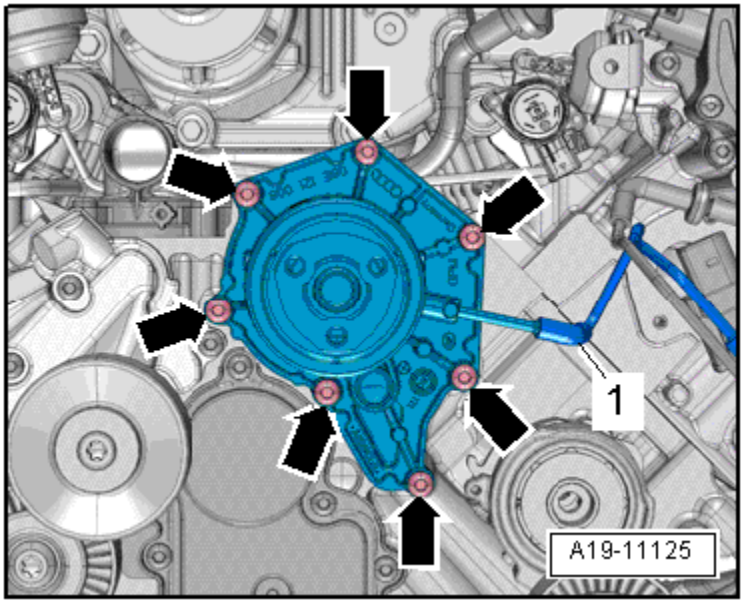
Fastener Tightening Specifications

Component	Nm
Coolant hose connecting piece	9
Coolant pump	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 [1)]	2.5
	9
Left charge air cooling circuit radiator	9
Left charge air cooling circuit radiator bracket [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
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
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 and 9.

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

Turbocharger, G-Charger – 3.0L CTUA

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

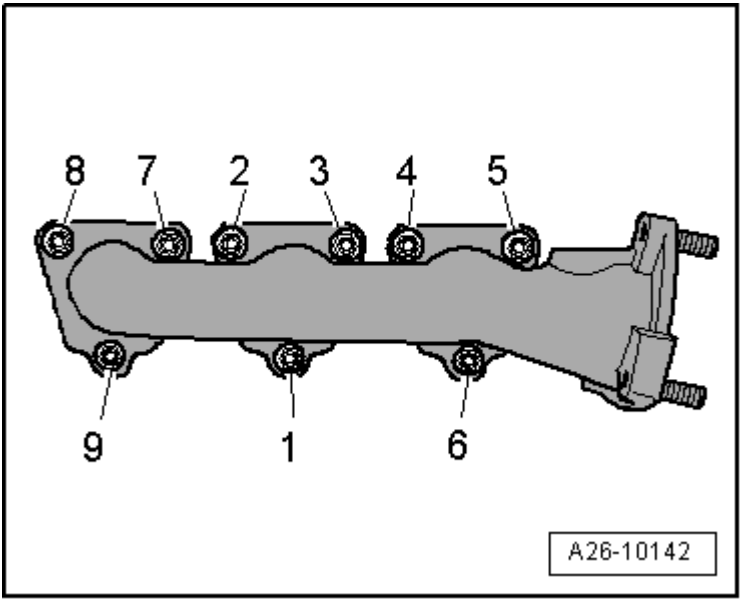
Component	Nm
Bonded rubber bushing nut	9
Catalytic converter nut	23
Catalytic converter to manifold nut [3]	23
Front clamping sleeve nut	23
Heat shield	10
Left Secondary Air Injection (AIR) combination valve	9
Rear clamping sleeve nut	23
Right Secondary Air Injection (AIR) combination valve	9
Secondary 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 -2, 14 and 19-*.

[3] Coat the thread with hot bolt paste.

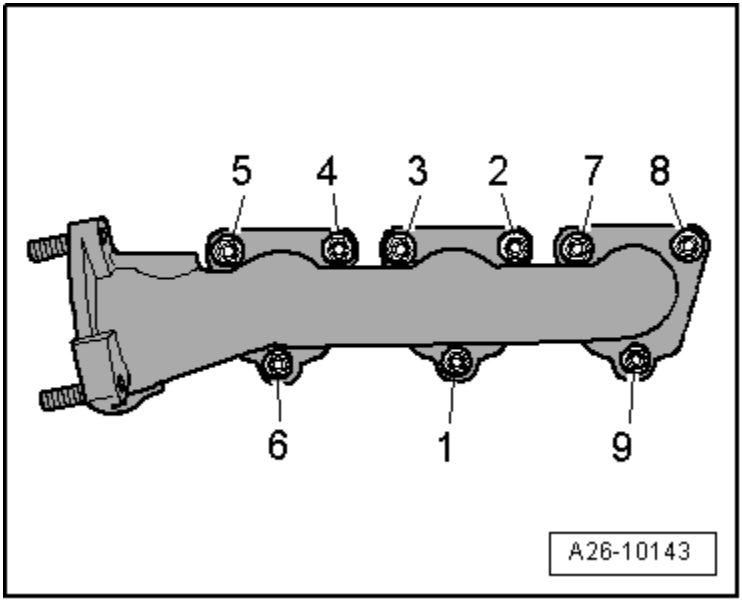
Left Exhaust Manifold Tightening Specifications



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

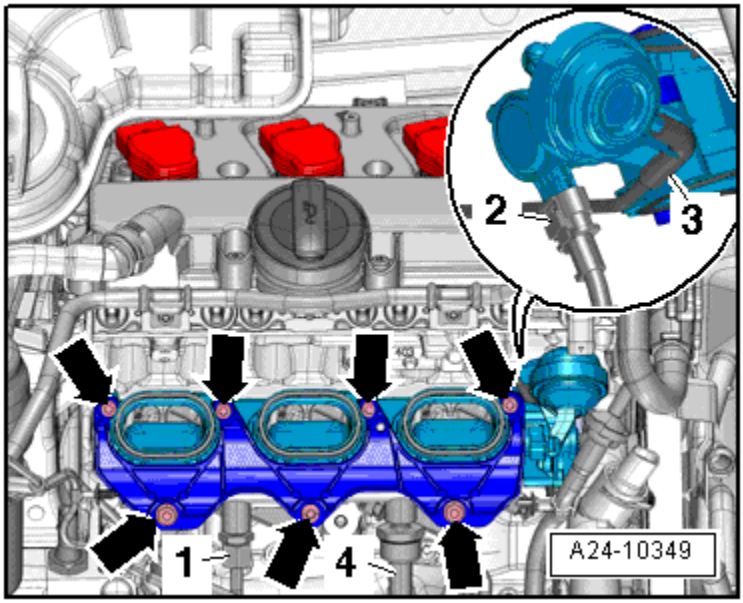
3.0L TFSI Engine	
Engine idle speed	Cannot be adjusted, it is regulated by idle stabilization
Fuel pressure before high pressure pump	3.0 to 6.0 bar pressure
Fuel pressure after high pressure pump	30 to 125 bar pressure

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
Threaded connection-to-high pressure pump	27
Throttle Valve Control Module [4)]	10

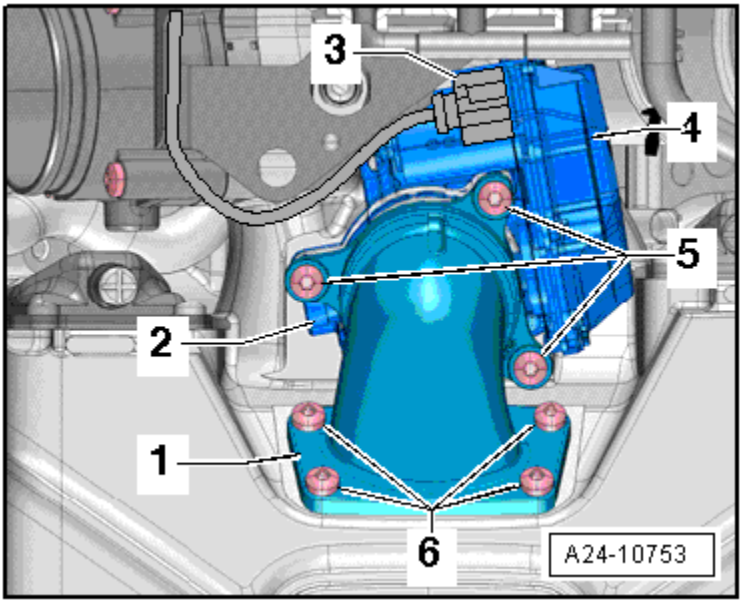
1) Oil the threads.
2) For bolt tightening clarification, ElsaWeb, *Intake Manifold Lower Section, Fuel Rail and Fuel Injector Overview*, items 10, 11 and 12.
3) Coat the threads on the union nut with fuel.
4) In a diagonal sequence

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

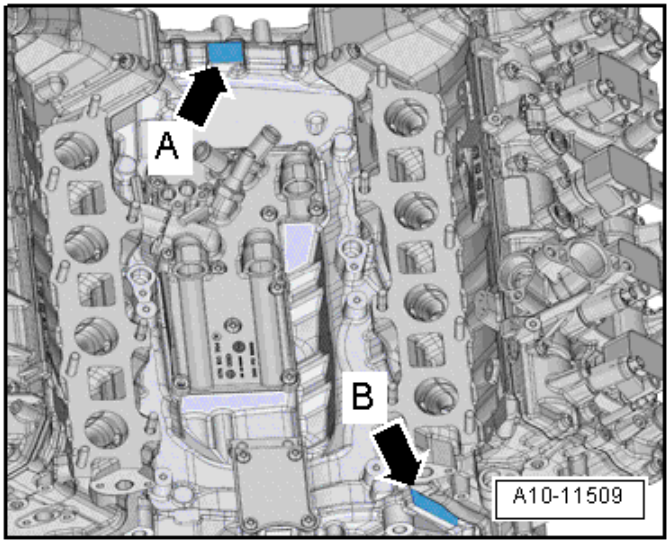
Fastener Tightening Specifications

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

ENGINE MECHANICAL – 4.0L CEUC

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
Displacement	liter	3.999
Output	kW at RPM	309 @ 5000 to 6400
Torque	Nm at RPM	550 @ 1400 to 5200
Bore	diameter mm	84.5
Stroke	mm	89.0
Compression ratio		10.1
RON	at least	98 [1]
Fuel injection and ignition system		Bosch Motronic
Ignition sequence		1-5-4-8-6-3-7-2
Exhaust Gas Recirculation (EGR)		No
Turbocharger, Supercharger		2 turbocharger
Knock control		4 sensors
Charge air cooler		Yes
Oxygen Sensor (O2S) regulation		2 sensors before catalytic converter 2 sensors after catalytic converter
Variable valve timing		Intake / Exhaust
Variable intake manifold		Yes
Secondary Air Injection (AIR) system		Yes
Valve per cylinder		4

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

Engine Assembly – 4.0L CEUC

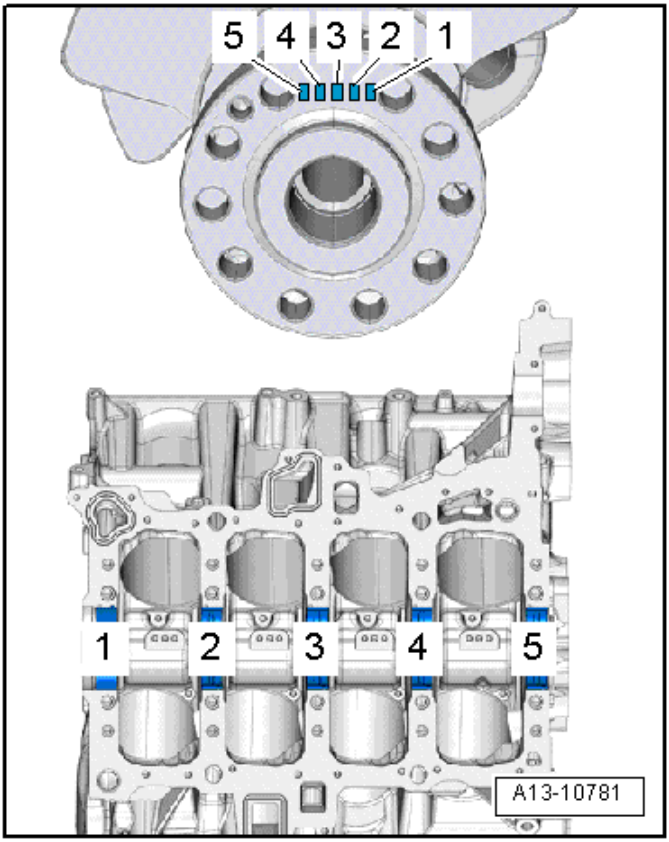
Fastener Tightening Specifications

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	-	40
Subframe-to-engine bracket	-	55

[1] Replace fastener(s).

Crankshaft, Cylinder Block – 4.0L CEUC

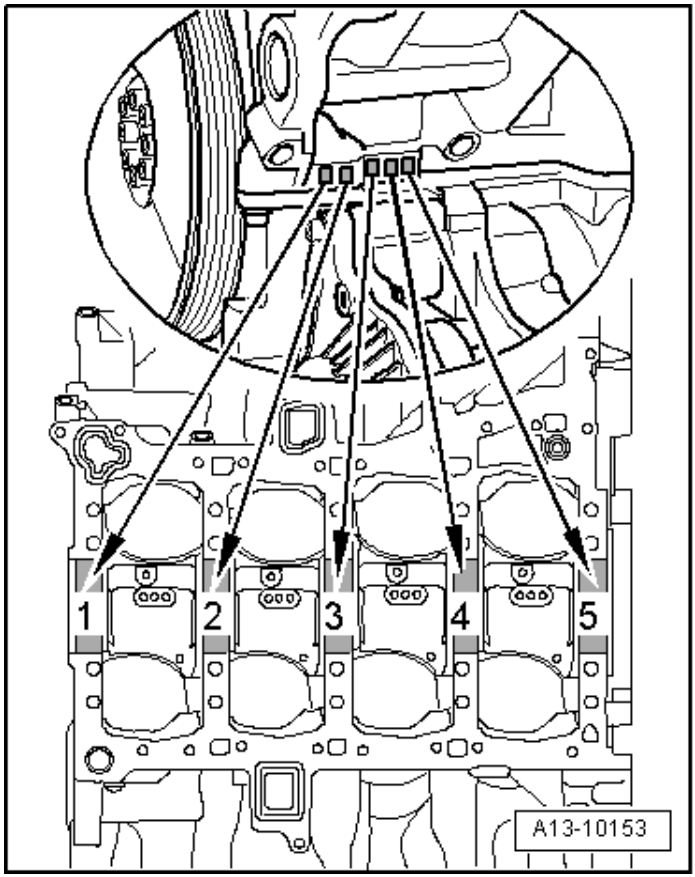
Allocation of Crankshaft Bearing Shells for Guide Frame



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.

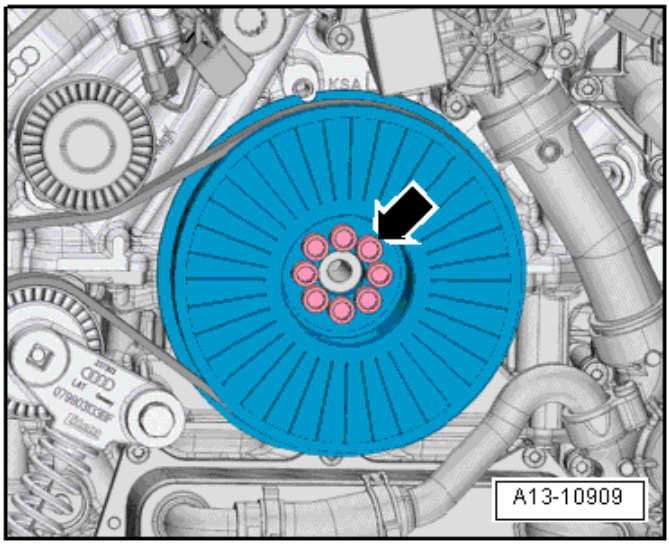
Letter on guide frame	Color of bearing
R	Red
S	Black
G	Yellow
U	Green
B	Blue

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]	
- Bolt	22
- Bolt	55

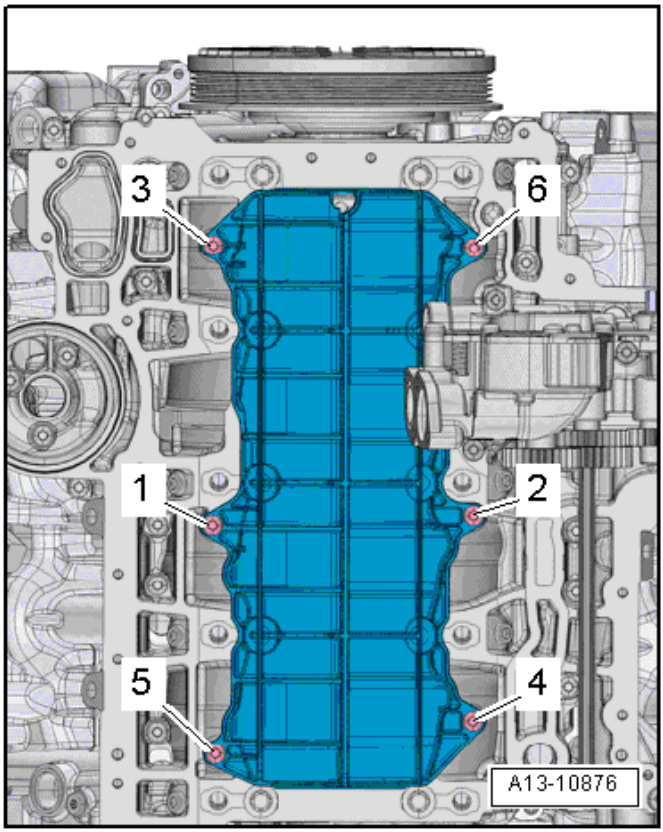
[1] Replace fastener(s).
[2] For bolt tightening clarification, refer to ElsaWeb, *Ribbed Belt Drive Overview*, items 1 and 2.

Vibration Damper, Tightening Specification



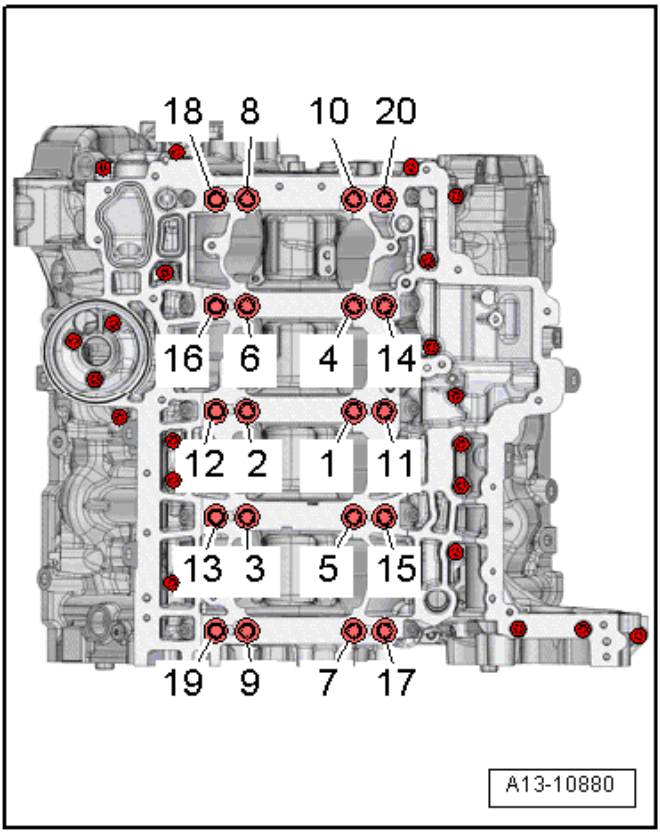
Step	Bolts	Tightening Specification/Additional Turn
1	Arrow	15 Nm in a diagonal sequence
2	Arrow	22 Nm in a diagonal sequence
3	Arrow	In a diagonal sequence, turn an additional 90°

Baffle Plate Tightening Specification



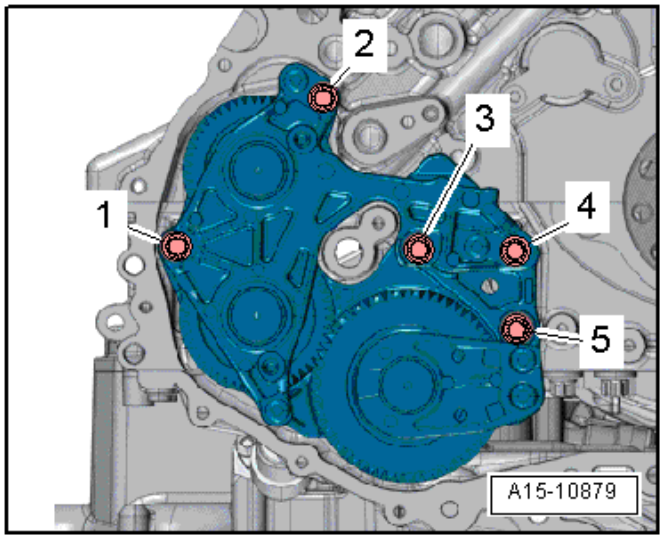
Step	Component	Nm
1	Tighten bolts 1 through 6 in sequence	5
2	Tighten bolts 1 through 6 in sequence	an additional 90° (¼ turn)

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

Honing dimension in mm	Crankshaft bearing pin diameter		Crankshaft connecting rod journal diameter	
Basic dimension	65.000	– 0.022	56.000	– 0.022
		– 0.042		– 0.042
Repair stage	65.750	– 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 0.30	0.80
2nd compression ring	0.50 to 0.70	0.80
Oil scraping ring	0.25 to 0.50	0.80

Piston Ring Clearance

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

Piston and Cylinder Dimensions

Honing dimension in mm	Piston diameter	Cylinder bore diameter
Nominal dimension	84.490 [1)]	84.510 ± 0.005 [2)]
Repair stage	84.590 [1)]	84.610 ± 0.005 [2)]

[1)] Dimension without graphite coating (thickness 0.01 mm). The graphite coating wears away.
[2)] Measure 50 mm inside the cylinder bore.

Cylinder Head, Valvetrain – 4.0L CEUC

Fastener Tightening Specifications

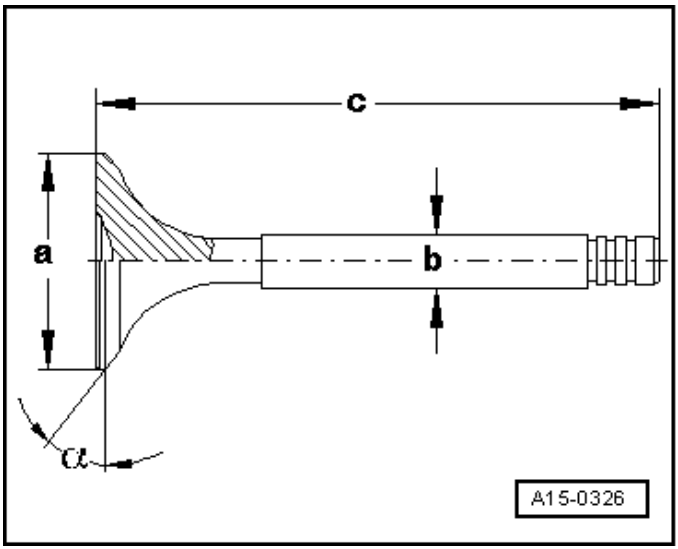
Component	Nm
Balance shaft	9
Bracket for idler sprocket to engine [1)]	5 plus an additional 90° (¼ turn)
Camshaft adjuster for exhaust camshaft to camshaft [1)]	80 plus an additional 90° (¼ turn)
Camshaft adjuster for intake camshaft to camshaft [1)]	80 plus an additional 90° (¼ turn)
Camshaft adjustment 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
Engine lifting eye to engine	22
Glide track to engine [1)]	17 plus an additional 90° (¼ turn)
Intake/exhaust camshaft adjuster to camshaft housing	5
Mounting pin for left camshaft timing chain drive sprocket to bearing plate [1)]	5 plus an additional 90° (¼ turn)
Mounting pin for the right camshaft timing chain drive sprocket to engine [1)]	20 plus an additional 45° (⅛ turn)
Mounting pin for idler sprocket to engine	42

[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

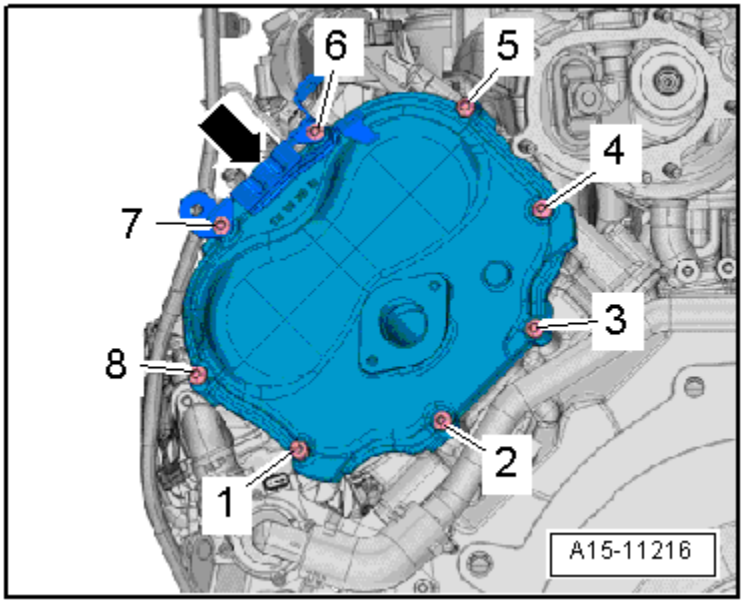
Valve Dimensions



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

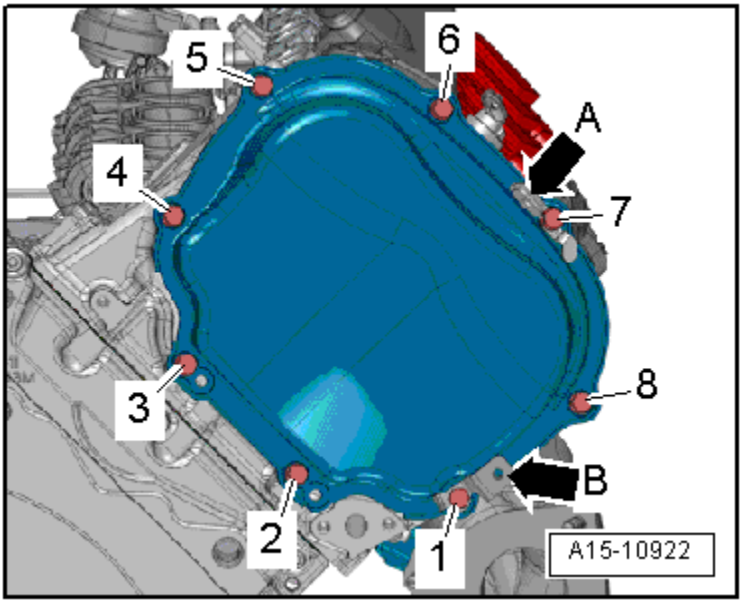


Step	Component	Nm
1	Tighten bolts 1 through 8 in sequence	5
2	Tighten bolts 1 through 8 in sequence [1]	an additional 90° (¼ turn)

[1] Replace fastener(s)

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

Right Timing Chain Cover Tightening Specifications

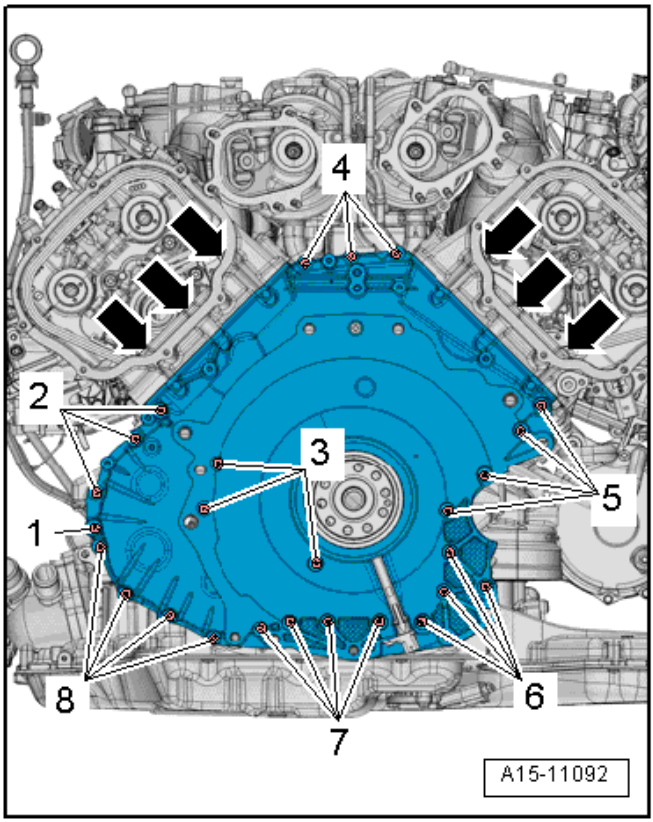


Step	Component	Nm
1	Tighten bolts 1 through 8 in sequence	5
2	Tighten bolts 1 through 8 in sequence [1)]	an additional 90° (¼ turn)

[1)] Replace fastener(s)

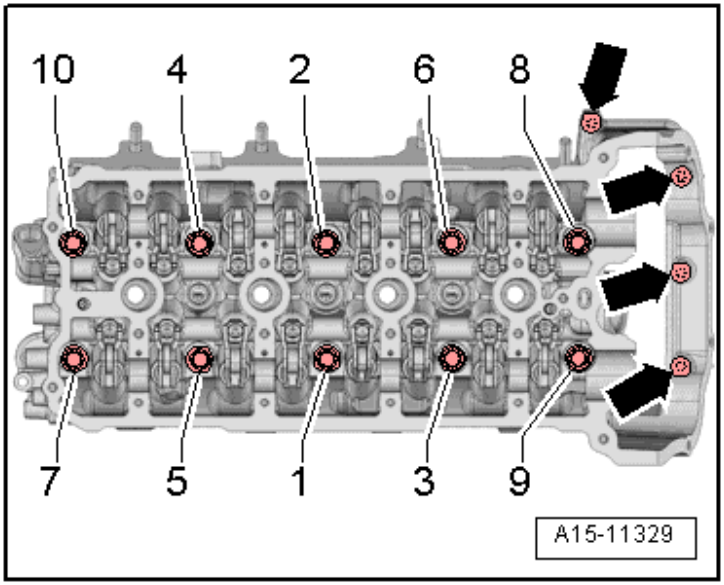
NOTE: Brackets A and B are connected with the timing chain cover.

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*

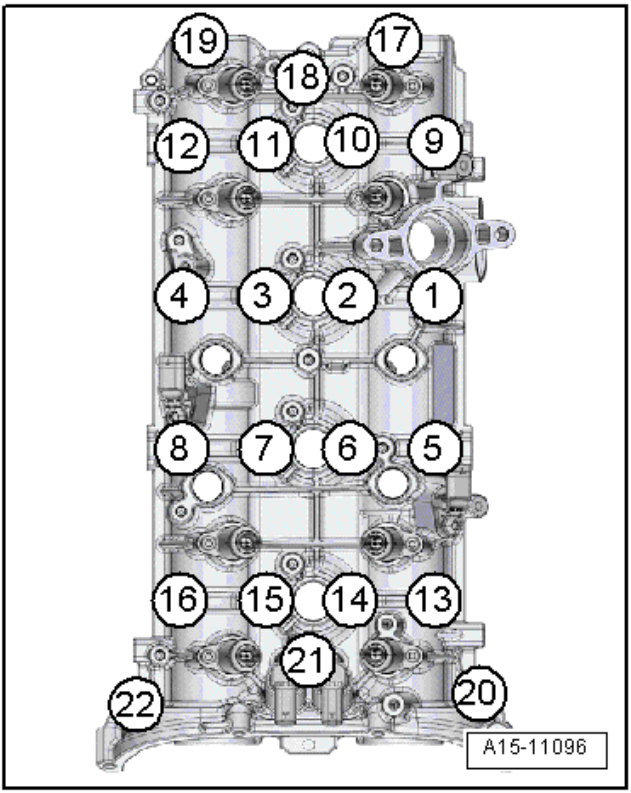
Cylinder Head Tightening Specifications



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

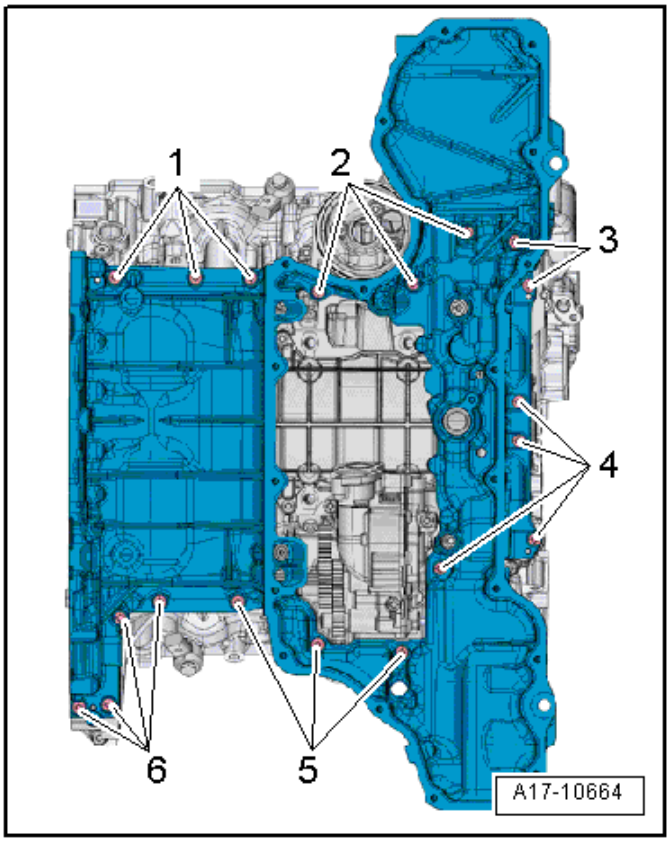
Lubrication – 4.0L CEUC

Fastener Tightening Specifications

Component	Nm
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 pipe-to-oil pump [1)]	8 plus an additional 90° (¼ turn)
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
Reduced oil pressure switch-to-engine	20

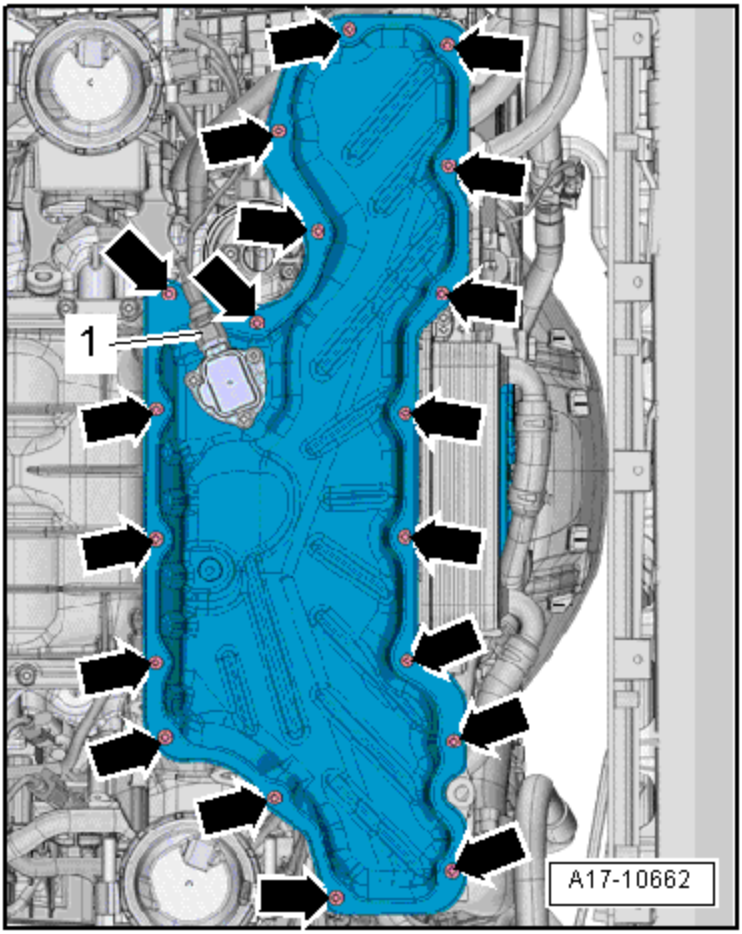
[1)] Replace fastener(s).

Upper Oil Pan Tightening Specifications



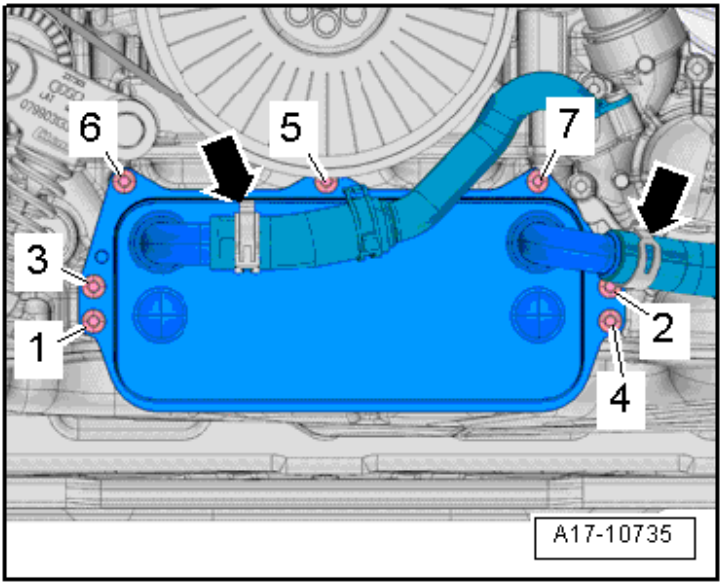
Step	Component	Nm
1	Tighten bolts 1 through 7 in a diagonal sequence	Hand-tighten
2	Tighten bolts 1 through 7 in a diagonal sequence	5
3	Tighten bolts 1 through 7 in a diagonal sequence	an additional 90° (¼ turn)

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

Fastener Tightening Specifications

Component	Nm
Bracket-to-after-run coolant pump bracket	9
Bracket-to-after-run coolant pump	9
Bracket-to-engine coolant circulation pump 2	1.5
Bracket for engine coolant circulation pump 2-to-engine	9
Bracket-to-left cooler for charge air cooling circuit	9
Bracket-to-left cooler for charge air cooling circuit to body	
- Bolt	5
- Nut	22
Bracket-to-radiator	5
Bracket for charge air coolant pump nut-to-bracket	9
Bracket for transmission fluid cooling valve-to-transmission	9
Coolant connection-to-housing for the coolant pump	9
Coolant switch-off valve-to-engine [1]	5 plus an additional 90° (¼ turn)
Engine coolant temperature sensor-to-engine	9
Engine coolant temperature sensor on radiator outlet-to-engine	9
Engine temperature control sensor-to-engine	9
Fan shroud-to-coolant fan	3.5
Fan wheel-to-fan shroud	5
Front charge air cooling circuit radiator-to-radiator	7
Front coolant pipe-to-engine	9
Housing for the coolant pump-to-coolant pump [1]	8 plus an additional 90° (¼ turn)
Lower left coolant pipe-to-engine	9
Lower left coolant pipe-to-subframe	9
Map controlled engine cooling thermostat-to-housing for the coolant pump	9
Radiator bracket-to-radiator [2]	4.5
	5
Right coolant pipe on the right side of the transmission-to-transmission	9
Right coolant pipe-to-engine	9
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, *Radiator, Front Charge Air Cooling Cuircuit Radiator and Condensor Overview*, items 22 and 24.

Fuel Supply – 4.0L CEUC

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.

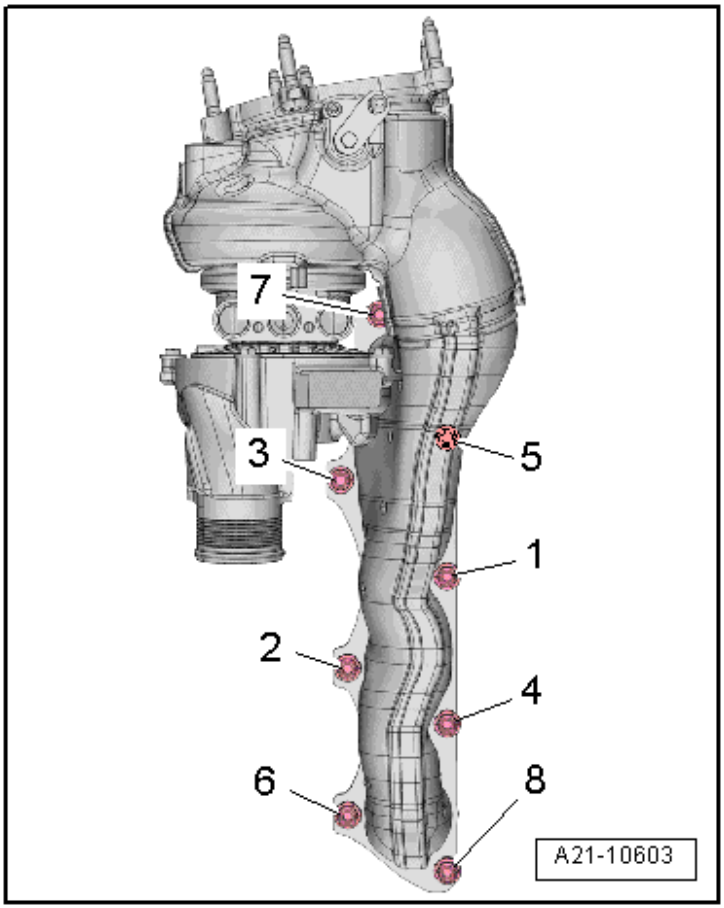
Turbocharger, G-Charger – 4.0L CEUC

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

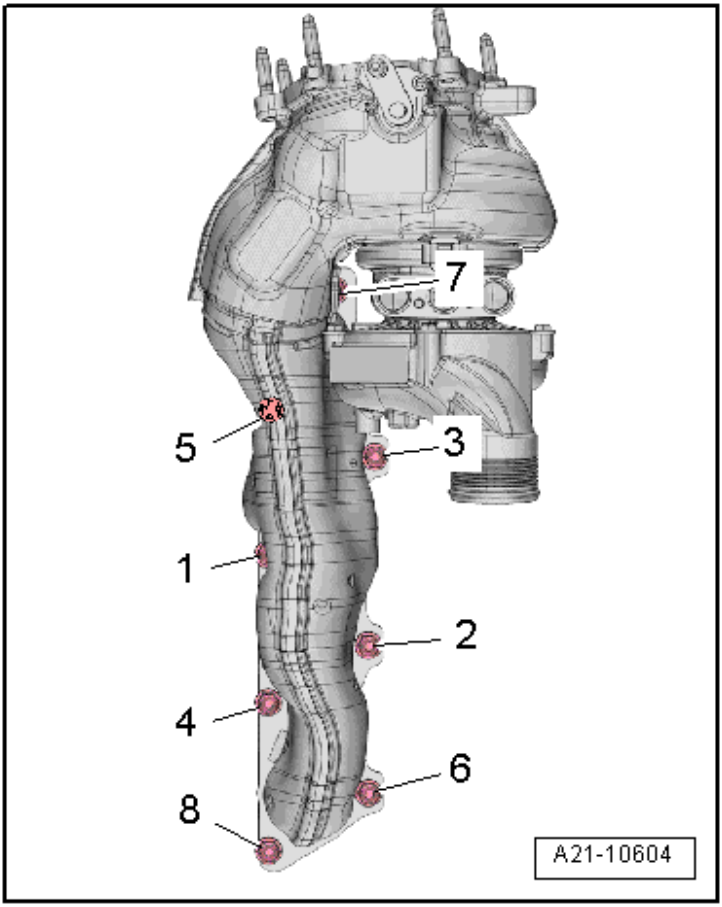
Component	Nm
Turbocharger recirculation valve-to-air guide	9
Vacuum actuator-to-turbocharger	9

Left Turbocharger Tightening Specifications



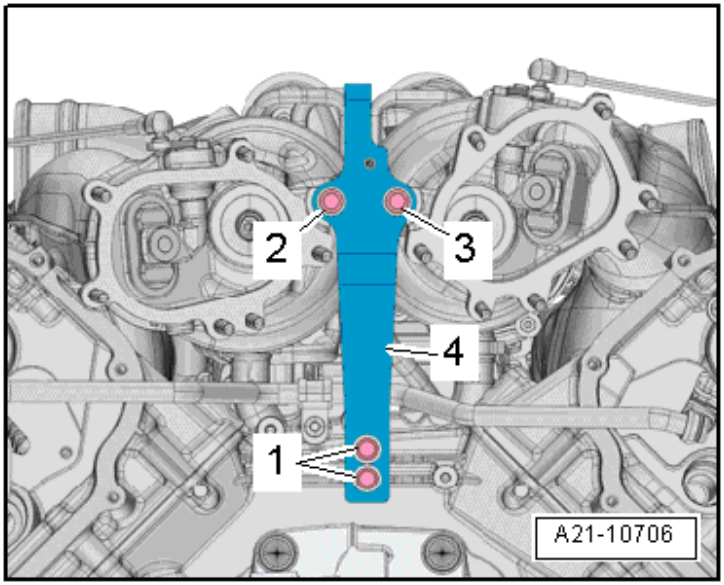
Step	Component	Nm
1	Tighten bolts 1 through 8 in sequence	16
2	Tighten bolts 1 through 8 in sequence	25

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

Fastener Tightening Specifications

Component	Nm
Bracket secondary air injection pump motor-to-body	9
Bonded rubber bushing-to-bracket secondary air injection pump motor nut	9
Catalytic converter-to-exhaust manifold nut [1]	23
Clamping sleeve nut	23
Connection flange-to-left secondary air injection combination valve	9
Connection flange-to-right secondary air injection combination valve	9
Exhaust door control unit	3
Front muffler-to-catalytic converter nut [1]	23
Suspended mount-to-body	20

[1] Coat the thread with hot bolt paste.

Multiport Fuel Injection – 4.0L CEUC

Technical Data

3.0L TFSI engine	
Engine idle speed	Cannot be adjusted, it is regulated by idle stabilization
Fuel pressure before high pressure pump	4.0 to 7.0 Bar pressure
Fuel pressure after high pressure pump	25 to 120 Bar pressure

Fastener Tightening Specifications

Component	Nm
Air guide-to-air guide	2.5
Air guide with turbocharger recirculation valve-to-throttle valve control module	9
Bracket for the fuel rail-to-Intake manifold	3
Charge air cooler temperature sensor-to-throttle valve control module	9
Fuel pressure sensor 2-to-fuel rail [1)]	25
High pressure pump-to-camshaft housing [2)]	22
Intake air temperature sensor-to-Intake manifold	2.5
Intake manifold runner position sensor-to-Intake manifold	2.5
Intake manifold-to-bracket for the fuel rail	9
Low Fuel Pressure Sensor-to-High Pressure Pump	15
Manifold Absolute Pressure (MAP) sensor-to-charge air cooler housing	3
Threaded connection-to-fuel rail and high pressure line [1)]	40
Throttle valve control module-to-charge air cooler housing	5
Union nut-to-high pressure pump [1)]	25

1) Coat the union nut threads with clean engine oil.
2) Replace fastener(s)

Ignition – 4.0L CEUC

Technical 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

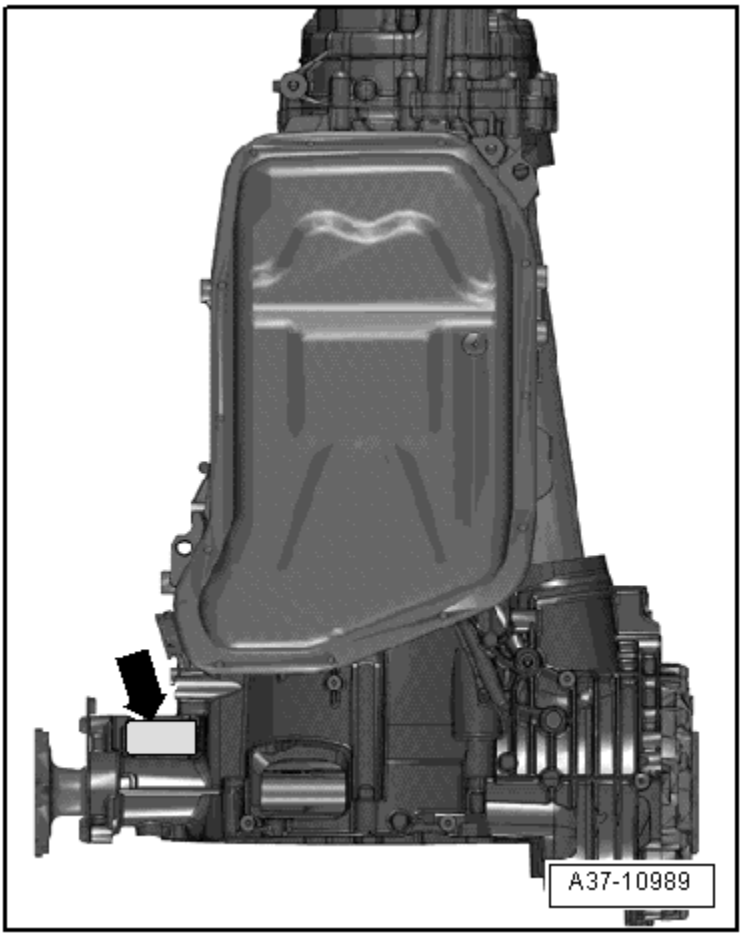
Fastener Tightening Specifications

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

AUTOMATIC TRANSMISSION – 0BK

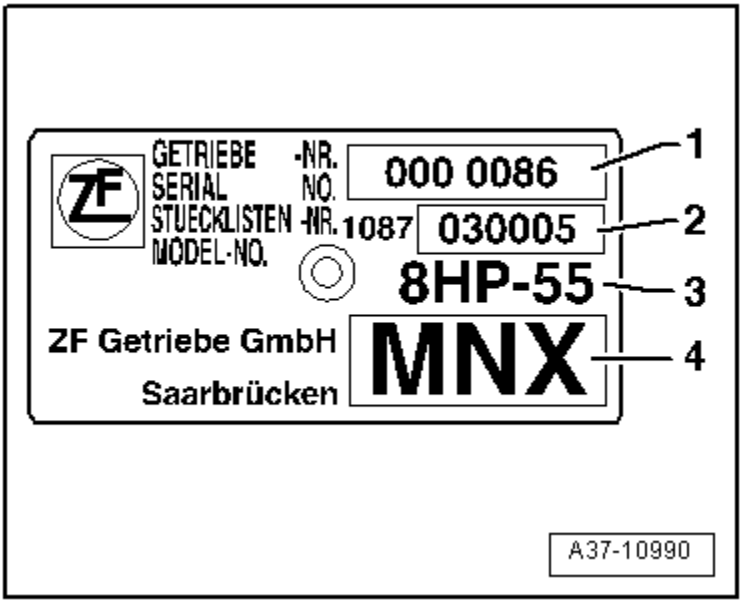
General, Technical Data – 0BK

Transmission Identification



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

Transmission Identification



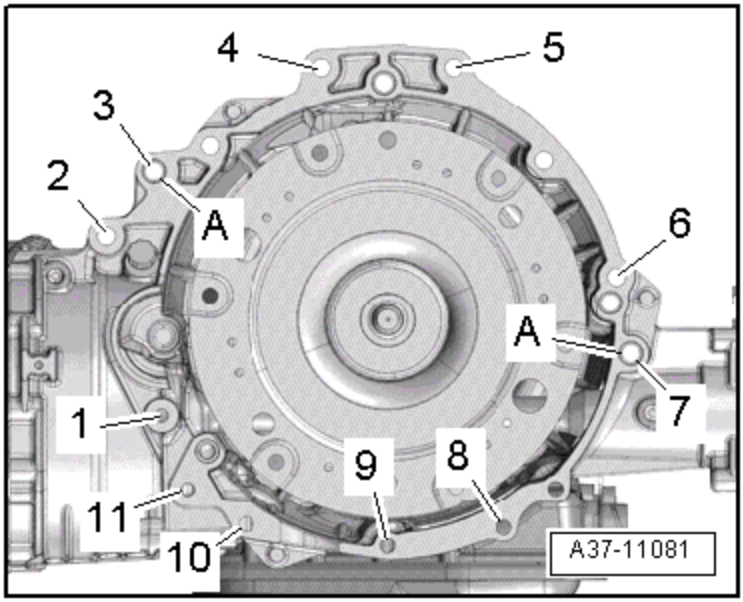
1 - Transmission serial number
2 - Parts list number
3 - Manufacturer transmission identification: 8HP-55
4 - Example of a transmission code: MNX

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 / NXT
	Month of manufacture	from through	01.11
Torque converter	Identification codes		Y137
Allocation	Type		Audi A7 from MY 2011
	Engine		3.0L TFSI - 228 kW
Primary drive			25:27 = 0.862
Gear wheel, front axle			31:29 = 1.069
Front axle bevel gear			34:11 = 3.091
Complete front axle ratio = primary drive x drive wheel x bevel gear			2.848
Rear axle bevel gear			43:13 = 3.308
Complete rear axle ratio = rear axle bevel gear x primary drive			2.851
Oil system, front final drive/transfer case			Separated

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
Automatic Transmission Fluid (ATF) check and fill plug [1]	-	30
Automatic Transmission Fluid (ATF) cooler	-	8
Automatic Transmission Fluid (ATF) drain plug [1]	-	12
Automatic Transmission Fluid (ATF) pipe-to-Automatic Transmission Fluid (ATF) cooler	-	8
Automatic Transmission Fluid (ATF) pipe [2]	-	8
	-	20
Bolts and nuts	M6	9
	M7	15
	M8	20
	M10	40
	M12	65
Cable mounting bracket	-	8
Drive axle heat shields	-	23
Heat shield upper bolts	-	9
Heat shield lower bolt	-	20
Selector lever cable	-	13
Selector mechanism function unit cover nut	-	10
Selector mechanism function unit nut	-	8
Transmission fluid check and fill drain plug (inside the transfer case) [1]	-	27
Transmission fluid check and fill drain plug (inside the front final drive) [1]	-	27
Transmission fluid oil drain plug (inside the transfer case) [1]	-	12
Transmission fluid oil drain plug (inside the front final drive) [1]	-	10
Transmission mount stop [1]	-	20 plus an additional 90° (¼ turn)
Transmission support bolt	-	40
Transmission support nut	-	20
Tunnel cross member bolt 8.8	M10 x 55	40
Tunnel cross member bolt 10.9	M10 x 40	70
-Nut to transmission mount	-	20

[1] Replace fastener(s).

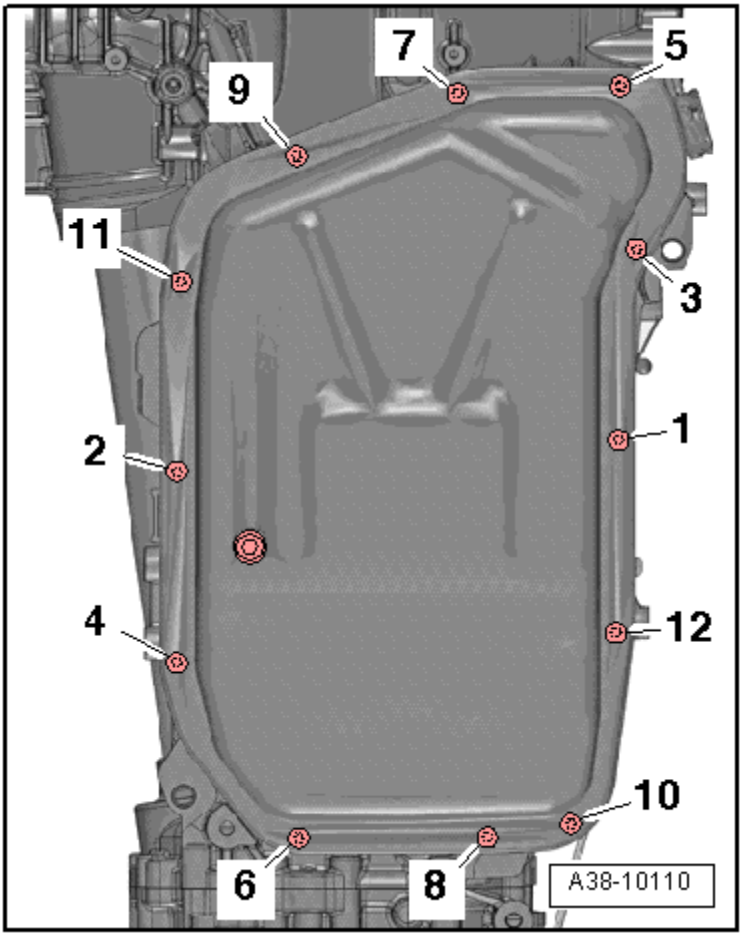
[2] For bolt tightening clarification, refer to ElsaWeb, *Cooler and ATF Pipes Overview,* items 9 and 10.

Fastener Tightening Specifications

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

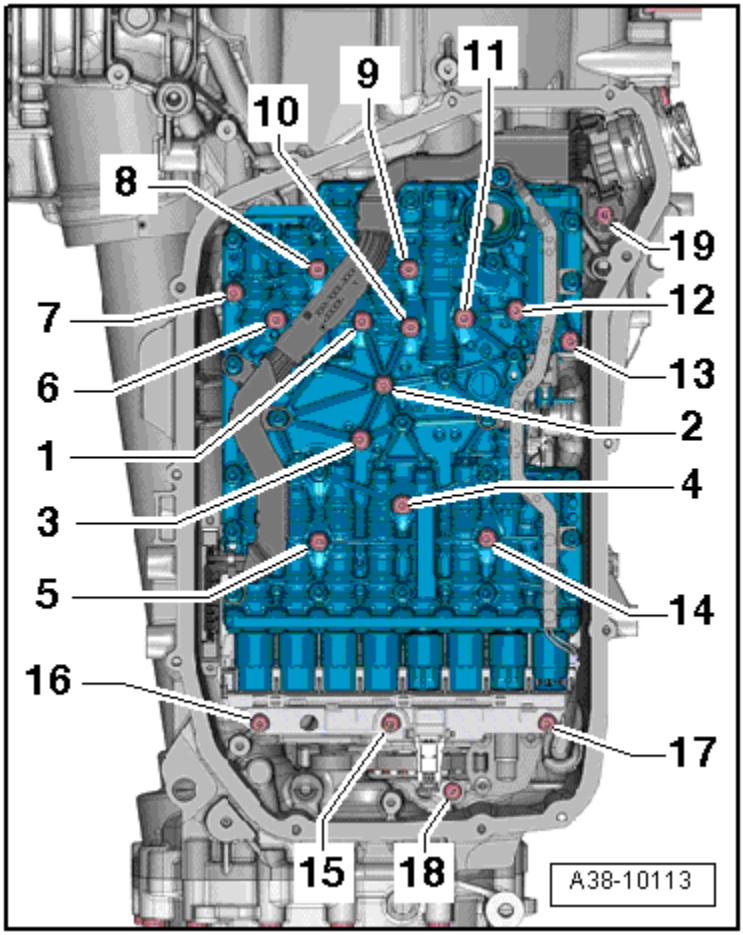
[1)] Replace fastener(s).

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



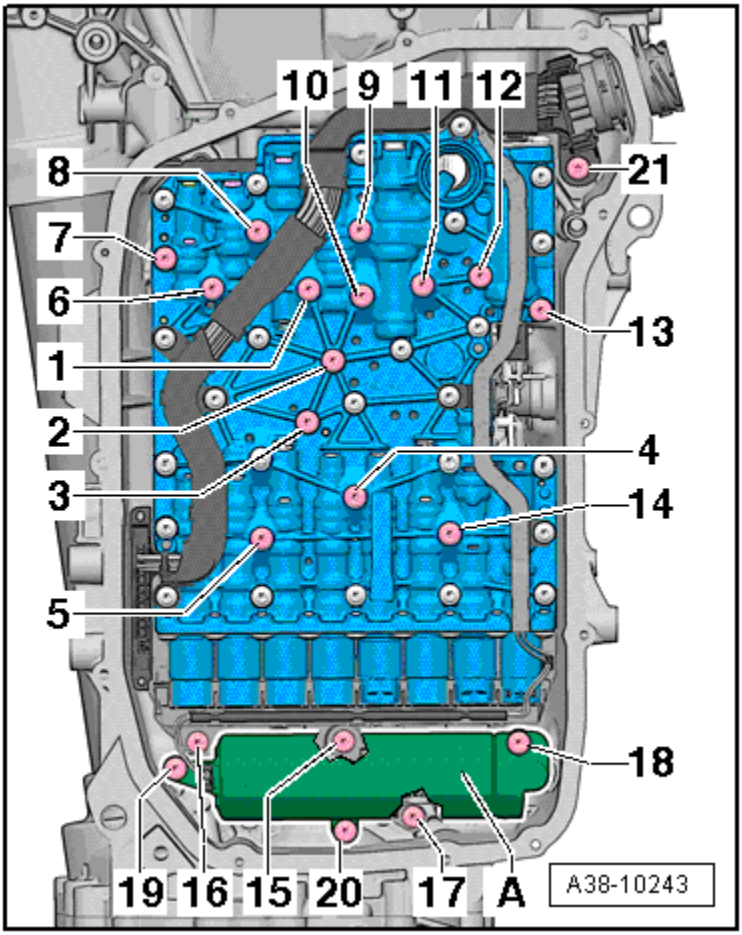
Step	Component	Nm
1	Replace and tighten bolts 1 through 12 in sequence	Hand-tighten
2	Tighten bolts 1 through 12 in sequence	4
3	Tighten bolts 1 through 12 in sequence	an additional 45° (⅛ turn)

Mechatronic without Hydraulic Pulse Memory Tightening Specification



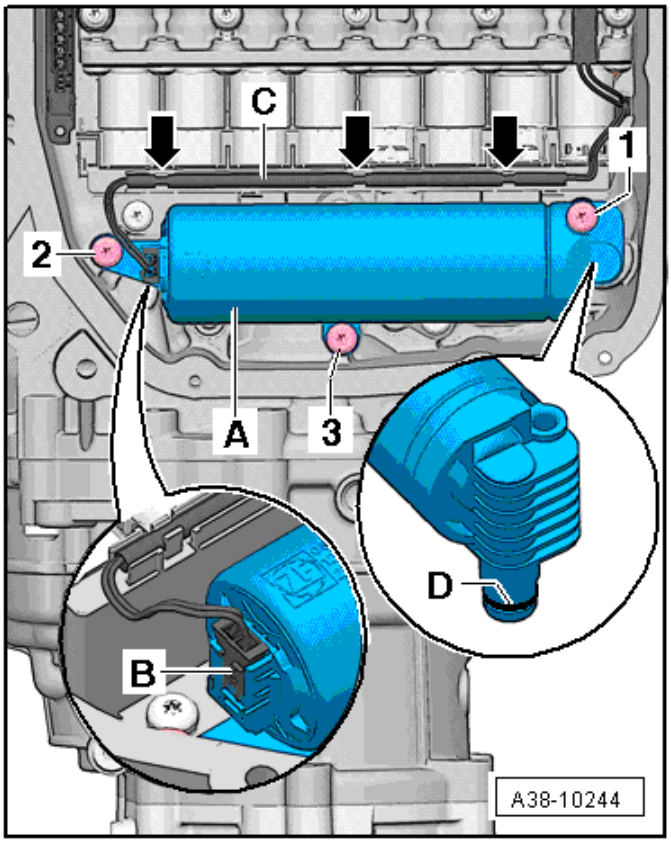
Component	Nm
Tighten bolts 1 through 19 in sequence	10

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

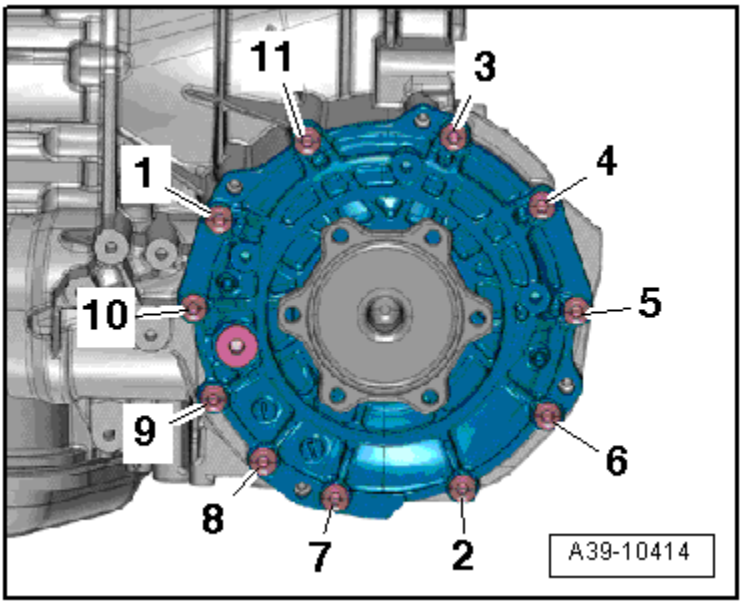
Rear Final Drive, Differential

Fastener Tightening Specifications

Component	Nm
Balance weight [1]	20 plus an additional 90° (¼ turn)
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

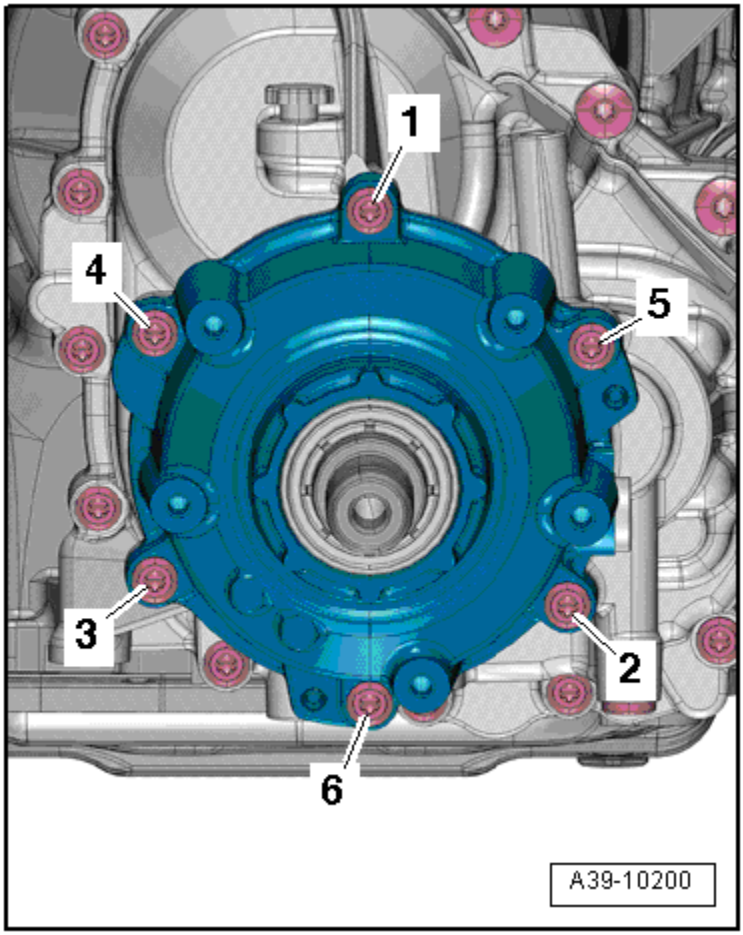
[1] Replace fastener(s).
[2] Steel bolt.

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



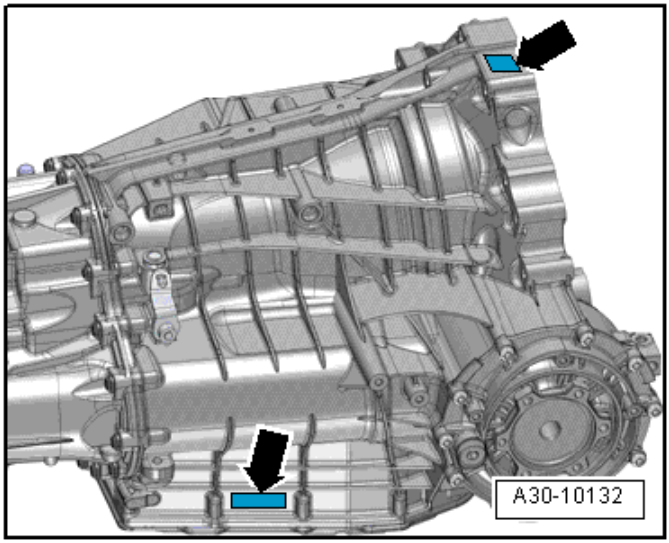
Step	Component	Nm
1	Replace and tighten bolts 1 and 6 [1)]	3
2	Tighten bolts 1 through 6 in sequence	10
3	Tighten bolts 1 through 6 in sequence	an additional 90° (¼ turn)

[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.

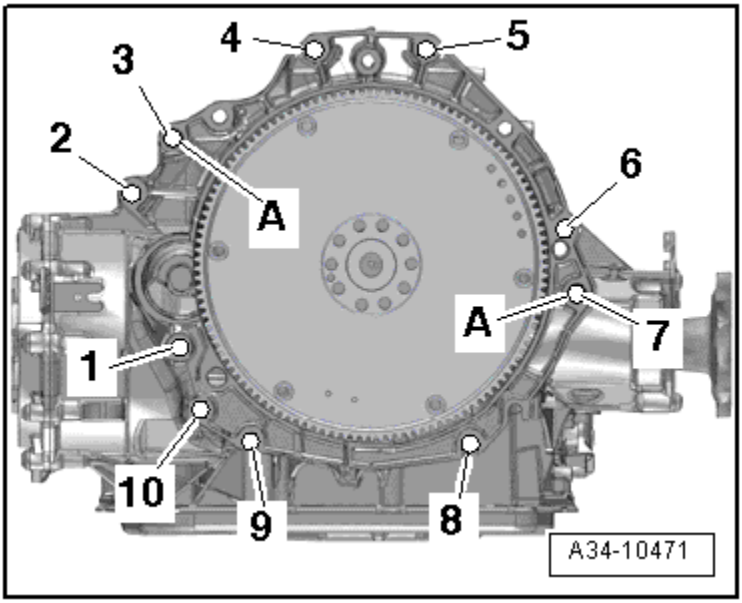
Code Letters, Transmission Allocations, Ratios and Equipment

S tronic transmission		0B5 AWD	
Transmission	Identification codes	NHH	NSK
Allocation	Model	A7 from MY 2011	A7 from MY 2011
	Engine	4.0L TFSI 309 kW	4.0L FSI 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		-	-

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

Controls, Housing – 0B5

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
Air guide to transmission	-	3
Automatic Transmission Fluid (ATF) cooler-to-bracket	-	9
Automatic Transmission Fluid (ATF) cover-to-housing	-	8
ATF Drain Plug	-	45
ATF Fill and Check Plug	-	45
Automatic Transmission Fluid (ATF) housing-to-transmission	-	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
Selector lever cable adjustment		13
Securing shift mechanism-to-body, nut		8
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) drain plug	-	45
Transmission Fluid (MTF) fill and check 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.

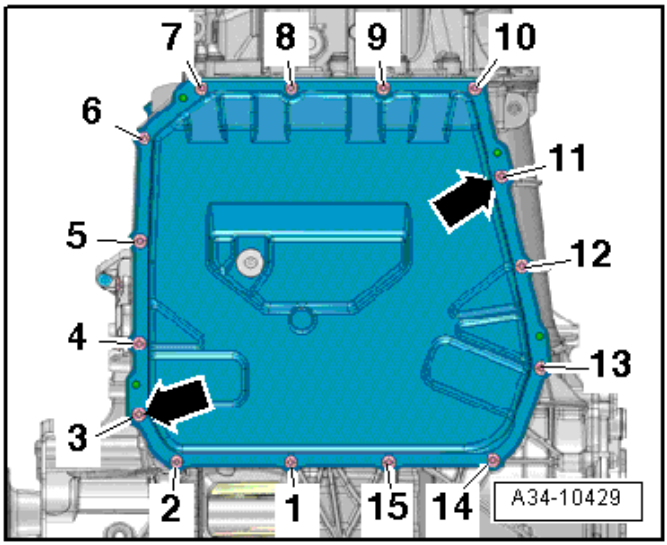
Gears, Shafts – 0B5

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
Oil pump-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	-	1500 plus an additional 90° (¼ turn)
Suction jet pump-to-transmission housing	-	4.5

[1] Replace fastener(s).

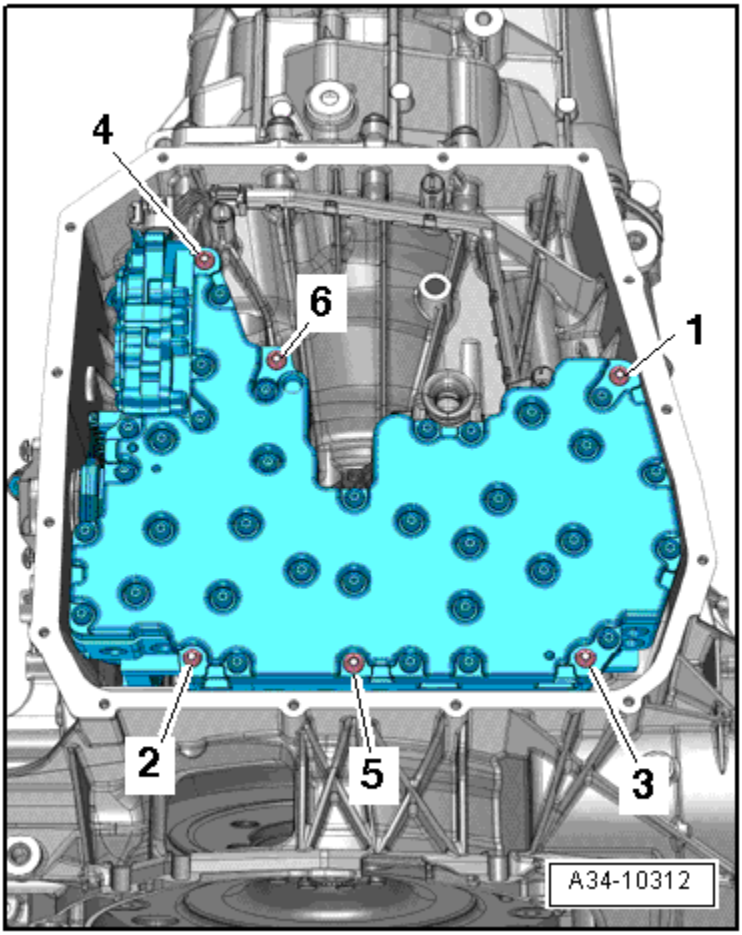
Oil Pan Tightening Specifications



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

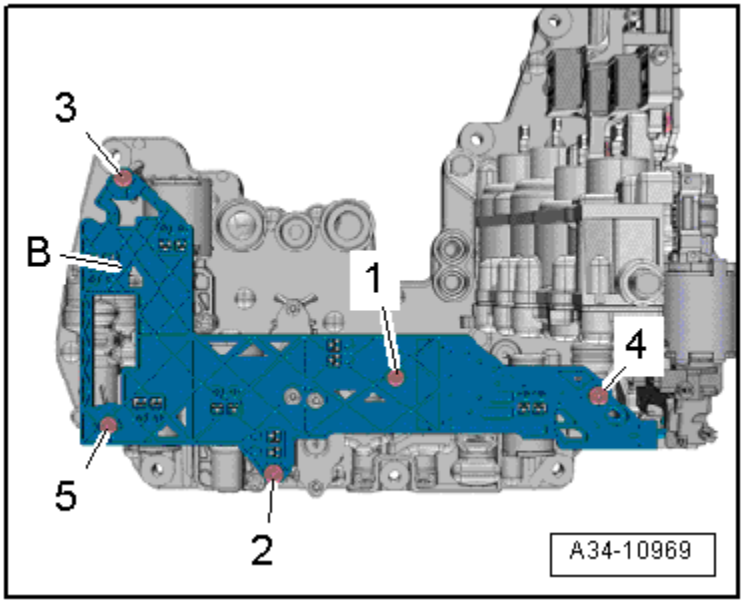
[1)] Replace fastener(s).

Mechatronic Tightening Specification



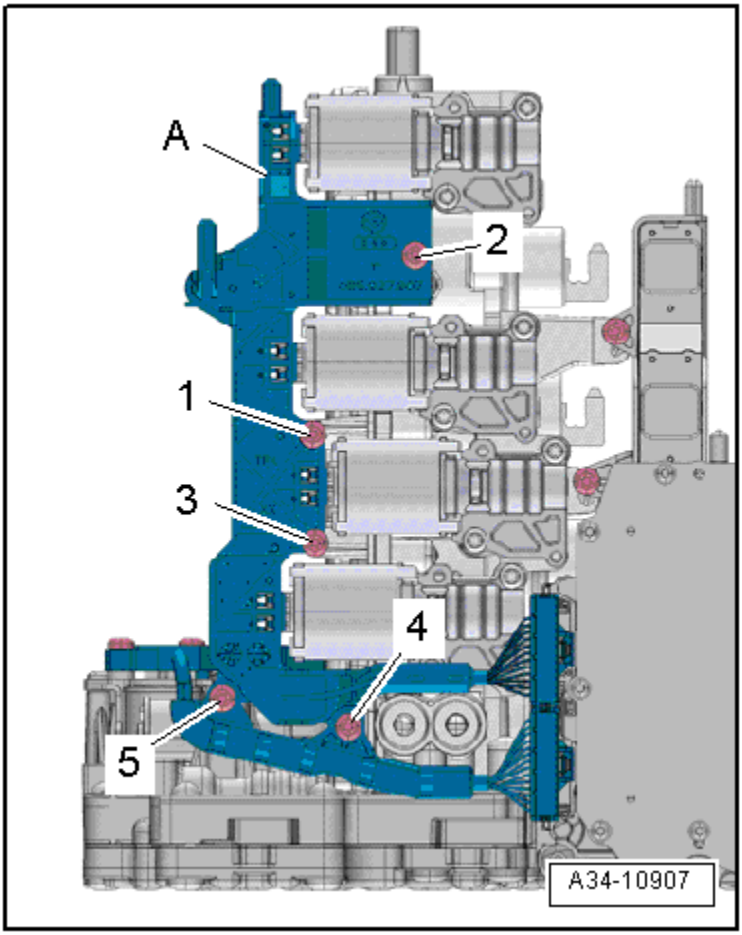
Component	Nm
Tighten bolts 1 through 6 in sequence	10

Circuit Board 1 Tightening Specifications



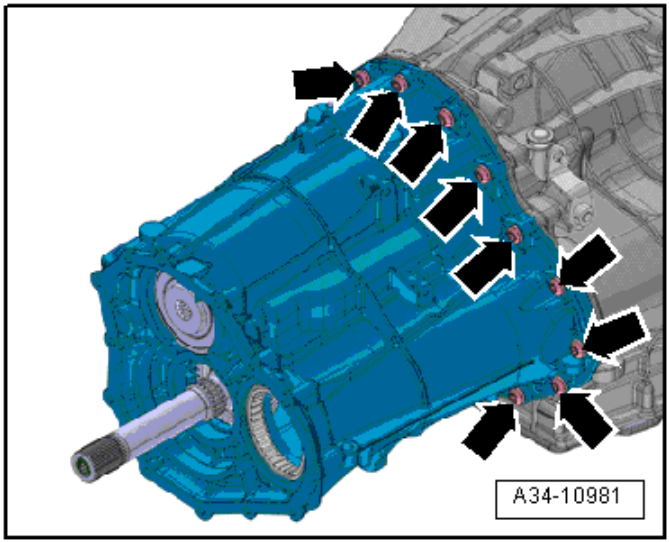
Component	Nm
Tighten bolts 1 through 5 in sequence	3

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

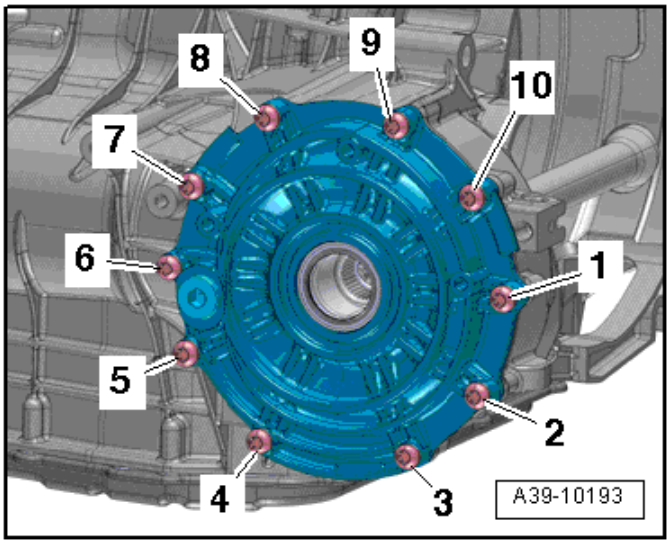
Rear Final Drive, Differential – 0B5

Fastener Tightening Specifications

Component	Nm
Balance weight [1]	20 plus an additional 90° (¼ turn)
Left flange shaft bracket [2]	24
Transmission fluid drain plug (inside the transfer case) [1]	27
Transmission fluid oil drain plug (inside the front final drive) [1]	10
Transmission fluid oil drain plug (inside the transfer case) [1]	12

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

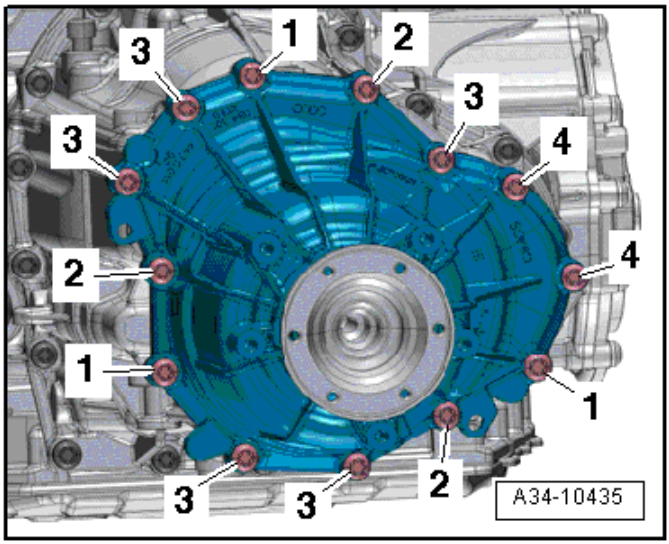
Front Final Drive Cover Tightening Specifications



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

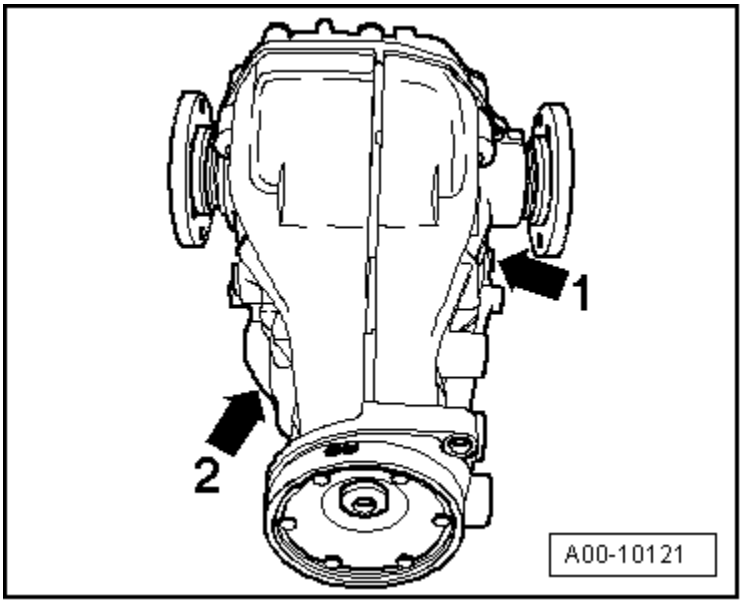


Step	Component	Nm
1	Aluminum bolts -1-	8
2	Aluminum bolts -2-	Hand-tighten
3	Aluminum bolts -1-	Loosen again and then install all the way hand-tight
4	Aluminum bolts -3-	Hand-tighten
5	Steel bolts -4-	Hand-tighten
6	-1, 2, 3, 4- diagonally	10
7	Steel bolts -4-	15
8	-1, 2, 3, 4- diagonally	90° additional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

REAR FINAL DRIVE – 0BC

General, Technical Data – 0BC

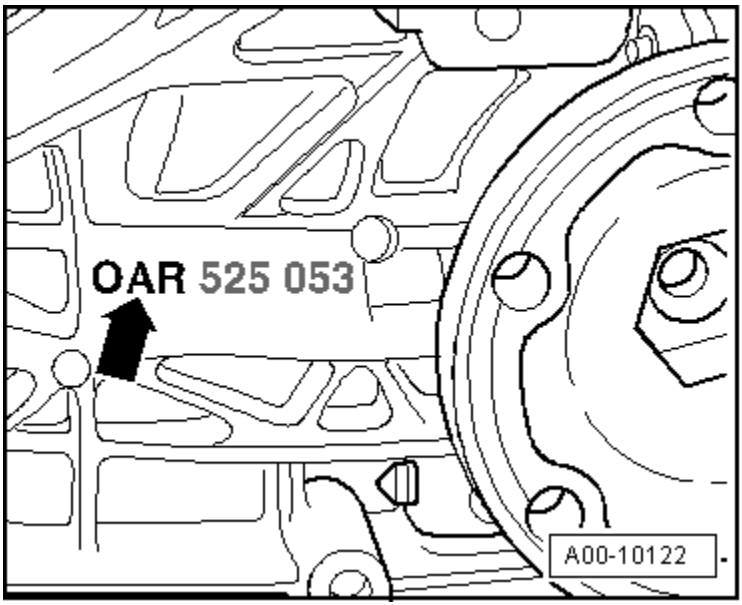
Rear Final Drive Identification



0BC final drive and 0AR (1).

Code and build date (2).

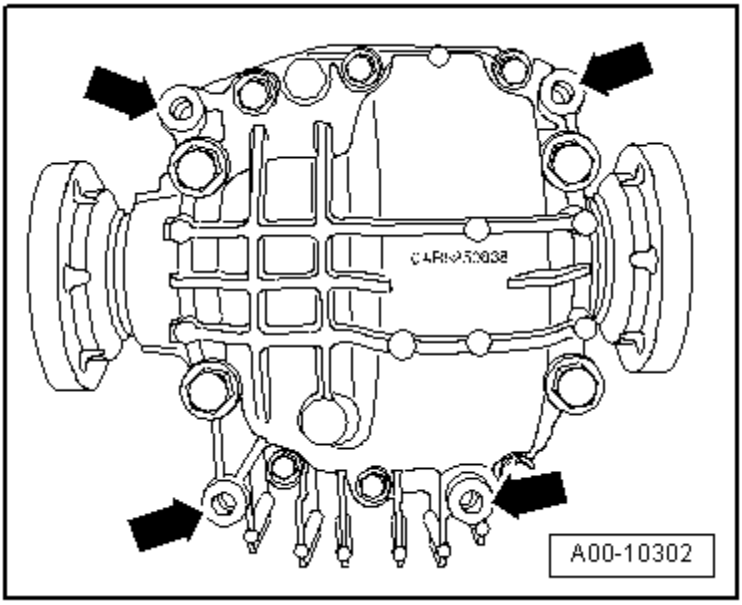
Rear Final Drive Identification *(cont'd)*



Final drive 0BC and 0AR (➡). OAR shown.

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.

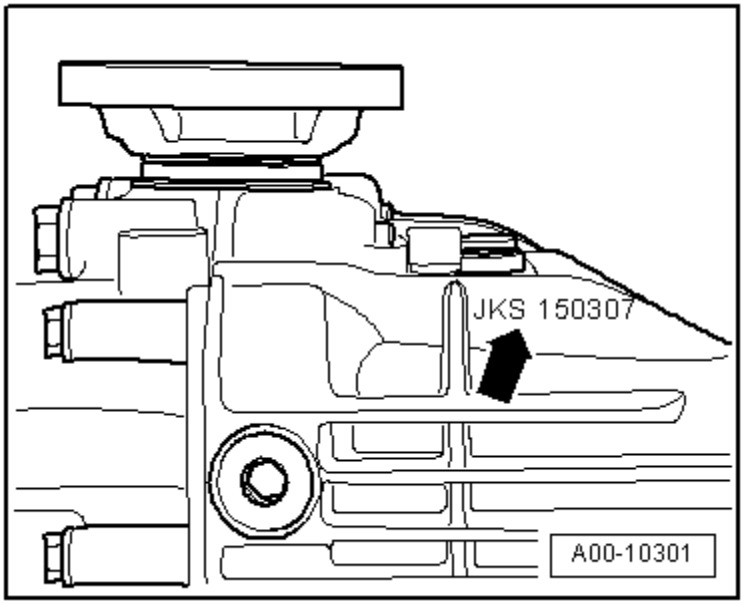
Rear Final Drive Identification *(cont'd)*



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

The 0BC final drive housing has four threaded holes (➡) 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 Identification *(cont'd)*



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

Rear Final Drive Transmission Allocations, Ratios, Capacities

Rear Final Drive		0BC	
Code letters		KCC	LAW
Ratio	Final drive Z_2:Z_1	43:13 = 3.308	42:9 = 4.666
Driveshaft flange diameter		75.5 mm	75.5 mm
Gear oil capacity		Refer to the Fluid Capacity Tables; Rep. Gr.03	

Rear Final Drive		0BC	
Code letters		LWV	MNB
Ratio	Final drive Z_2:Z_1	37:12 = 3.083	37:9 = 4.111
Driveshaft flange diameter		75.5 mm	75.5 mm
Gear oil capacity		Refer to the Fluid Capacity Tables; Rep. Gr.03;	

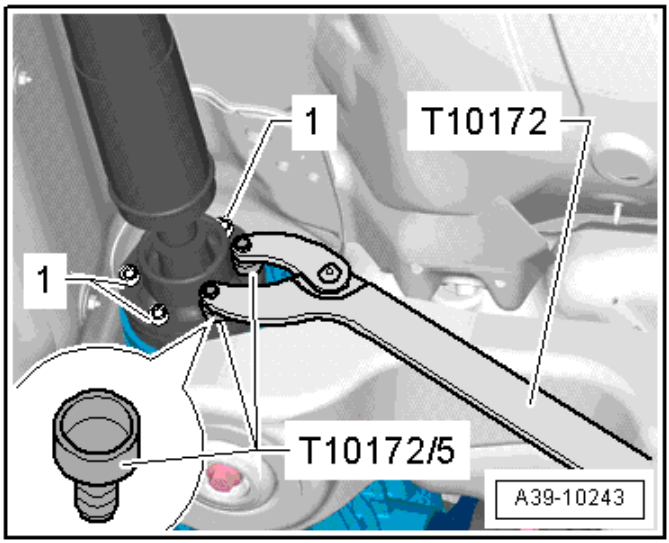
The following information can be found in the Electronic Parts Catalog (ETKA):
- Date of manufacture
- Gear oil specification
- Engine, manual transmission and automatic transmission allocation using code letters and PR numbers.

Fastener Tightening Specifications

Component	Nm
Backing plate [1]	30 plus an additional 90° (¼ turn)
Rear final drive check plug	30
Cross member	55
Heat shield	20
Intermediate bearing bracket	20
Subframe [2]	55
	95

[1] Replace fastener(s).
[2] For bolt tightening clarification, refer to ElsaWeb, *Rear Final Drive Overview,* items 2 and 3.

Driveshaft Tightening Specifications



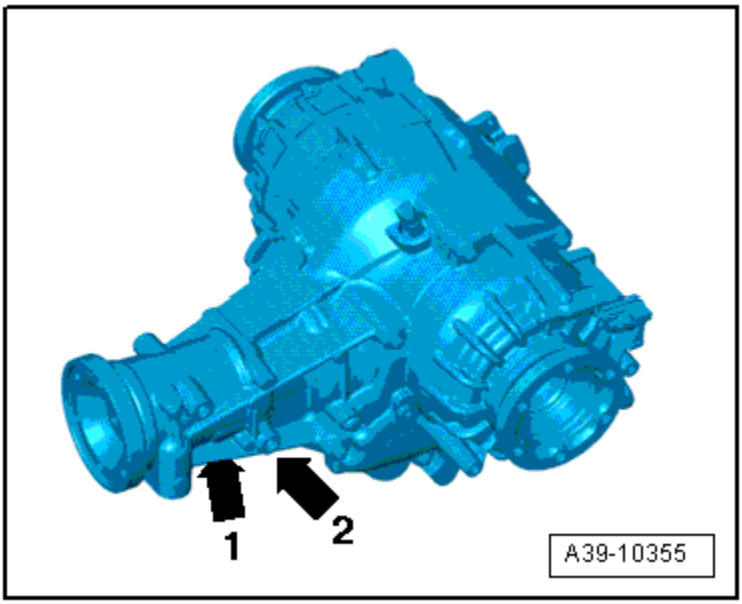
Step	Bolts	Nm
1	-1-	Next to the color dot 30 Nm [1]
2	-1-	Next 30 Nm
3	-1-	All round 90° additional turn

[1] By doing this, the CV joint is pushed slightly to the opposite side and imbalance is avoided.

REAR FINAL DRIVE – 0BE, 0BF

General, Technical Data – 0BE, 0BF

Rear Final Drive Identification

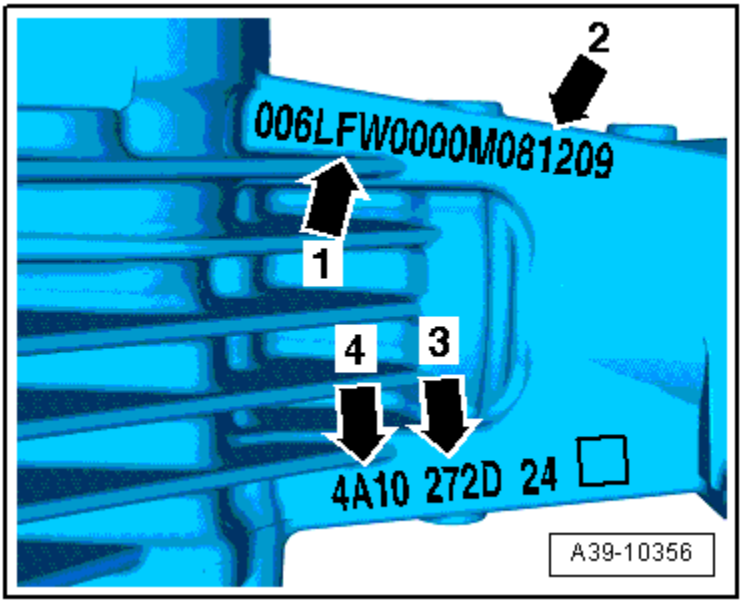


Clutch classification (1).

Code and build date (2).

NOTE: The rear final drive 0BE and 0BF have a hydraulic control unit with the side chambers.

Rear Final Drive Identification *(cont'd)*



1 - Code letters LFW (example: 0BD 500 043A)
2 - Rear final drive date of manufacture (example below)
3 - Right clutch classification (classification of the clutch friction values) Example: 272D
4 - Left clutch classification (classification of the clutch friction values) Example: 4A10

Example:

08	12	09
Year of manufacture 2008	Month	Day

NOTE: When replacing a rear final drive, pay close attention to the final drive code, the PR number and the engine code. Refer to the Electronic Parts Catalog (ETKA). This is the only way to make sure the allocation is correct.

Rear Final Drive Allocations, Ratios, Capacities

Rear Final Drive		0BF	
Code letters		MKU	MKV
Ratio	Final drive Z_2:Z_1	37:9 = 4.111	43:13 = 3.308
Driveshaft flange diameter		75.5 mm	75.5 mm
Gear oil capacity for the final drive (differential and pinion) No change interval		0.95 liter	
Gear oil specification		Refer to the Electronic Parts Catalog (ETKA)	
Automatic Transmission Fluid (ATF) capacity for the hydraulic control unit and chambers No change interval		Refer to the Fluid Capacity Tables Rep. Gr. 03	
Automatic Transmission Fluid (ATF) specification		Refer to the Electronic Parts Catalog (ETKA)	

Rear Final Drive, Differential – 0BE, 0BF

Fastener Tightening Specifications

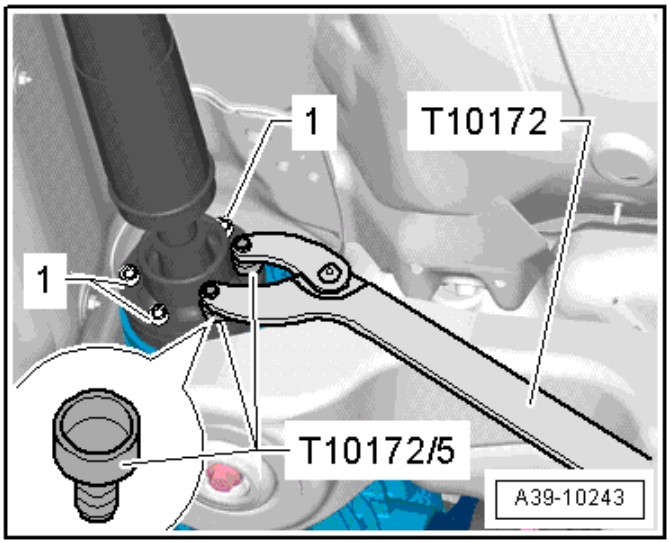
Component	Fastener size	Nm
All wheel drive clutch valve-to-hydraulic control unit housing bolt	-	2.5
All wheel drive pump-to-hydraulic control unit housing bolt	-	5
Automatic Transmission Fluid (ATF) drain plug-to-final drive housing	-	15
Automatic Transmission Fluid (ATF) inspection plug-to-left chamber	-	15
Wiring harness bracket		9
Center bearing	-	20
Drive axle heat shield-to-rear final drive bolt	-	20
Driveshaft center bearing-to-body bolt	-	20
Driveshaft-to-rear final drive flange bolt [1)]	-	30 plus an additional 90° (¼ turn)
Driveshaft-to-transmission flange bolt [1)]	-	30 plus an additional 90° (¼ turn)

Fastener Tightening Specifications *(cont'd)*

Component	Fastener size	Nm
Flange shaft-to-rear final drive bolt [1]	-	50 plus an additional 180° (½ turn)
Gear oil inspection plug-to-final drive housing	-	15
Hydraulic control module-to-final drive housing bolt	M8 [2]	20
	M8 [3]	20
	M8 [4]	30
Left pipe installed between the hydraulic control unit and the left chamber nuts	-	30
Left/right chamber-to-final drive housing bolt	-	24
Oil pressure/temperature sensor-to-hydraulic control unit housing	-	10
Right pipe installed between the hydraulic control unit and the right chamber nuts	-	30
Shuttle valve-to-hydraulic control unit housing	-	8
Subframe-to-rear final drive lower bolt	-	55
Subframe-to-rear final drive rear bolt	-	95
Wiring harness bracket-to-right chamber bolt	-	5
Wiring harness bracket-to-the rear final drive	-	9

[1] Replace fastener(s).
[2] 50 mm long.
[3] 50 mm long with a permanent seal under the bolt head.
[4] 30 mm long.

Driveshaft Tightening Specifications



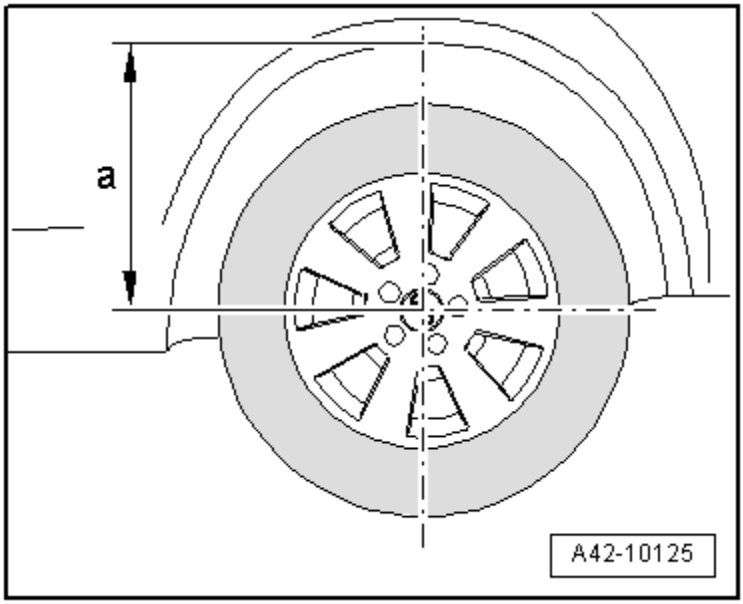
Step	Bolts	Nm
1	-1-	Next to the color dot 30 Nm [1]
2	-1-	Next 30 Nm
3	-1-	All round 90° additional turn

[1] By doing this, the CV joint is pushed slightly to the opposite side and imbalance is avoided.

SUSPENSION, WHEELS, STEERING

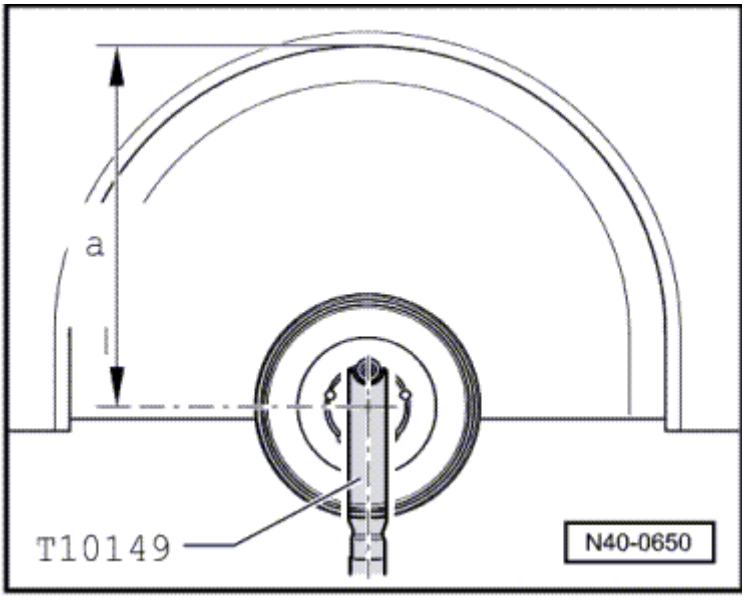
Front Suspension

Wheel Bearing, with Coil Spring, Lifting to Curb Weight Position



Before starting work, use a tape measure to measure dimension (a) from wheel center to lower edge of wheel housing. Take this measurement in the curb weight position (unloaded condition).

Wheel Bearing, with Air Suspension, Lifting to Curb Weight Position



Dimension (a) is dependent on the standing height of the installed suspension.

Sportback

Chassis [1]	Dimension (a) in mm
Standard suspension (1BK)	386 ± 10
Heavy duty suspension (1BS)	391 ± 10
Sport suspension (2MB)	386 ± 10

[1] The suspension the vehicle is equipped with is indicated on the vehicle data plate. The suspension is indicated by a PR number. For the correct PR numbers and assigned suspensions, refer to ElsaWeb, *PR Number Explanations.*

Sedan/Avant

Chassis [1]	Dimension (a) in mm
Standard suspension (1BK)	384 ± 10
Heavy duty suspension (1BS)	389 ± 10
Sport suspension (2MB)	384 ± 10

[1] The suspension the vehicle is equipped with is indicated on the vehicle data plate. The suspension is indicated by a PR number. For the correct PR numbers and assigned suspensions, refer to ElsaWeb, *PR Number Explanations.*

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.

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)
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

Component	Fastener size	Nm
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)

Component	Fastener size	Nm
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)
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

[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	Heavy duty suspension air suspension (1BS)	Standard suspension air suspension (1BK)	Sport suspension air suspension (2MB)
Camber	- 59′± 23′	- 1°5′± 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 (1BA)	Sport suspension (1BE/1BV)	Heavy duty suspension (1BB)
Camber	- 53′± 23′	- 1°5′± 23′	- 43′± 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.

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

Wheel Alignment Specified Values *(cont'd)*

Rear suspension	Standard suspension (1BA)	Sport suspension (1BE/1BV)	Heavy duty suspension (1BB)
Camber	- 1°20′ ± 25′	- 1°20′ ± 25′	- 1°20′ ± 25′
Maximum permissible difference between both sides	30′	30′	30′
Toe for each wheel	+ 10 ± 5′	+ 10 ± 5′	+ 10 ± 5′
Total toe	+ 20′ ± 10′	+ 20′ ± 10′	+ 20′ ± 10′
Maximum permissible deviation in direction of travel relative to vehicle longitudinal axis	10′	10′	10′

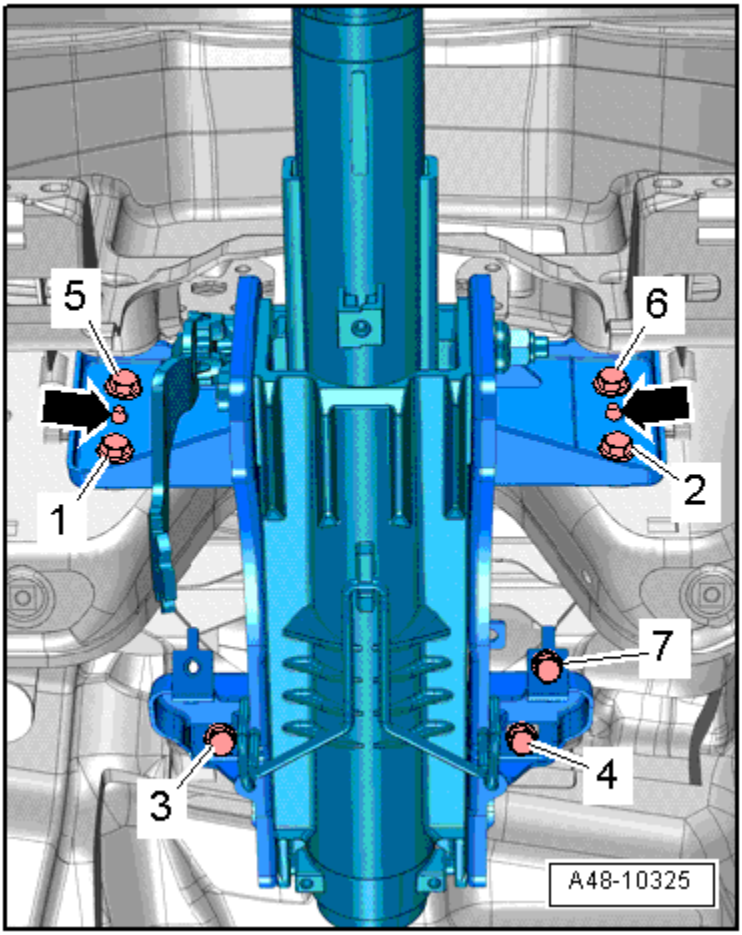
Steering

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, *Steering Column Assembly Overview*.
3) For bolt tightening clarification, refer to ElsaWeb, *Safety Lock for Active Steering (Locking Magnet)*.
4) For clamp tightening clarification, refer to ElsaWeb, *Electromechanical Steering Gear Assembly Overview, Tensioning the Inner Clamp.*

Steering Column Tightening Specifications

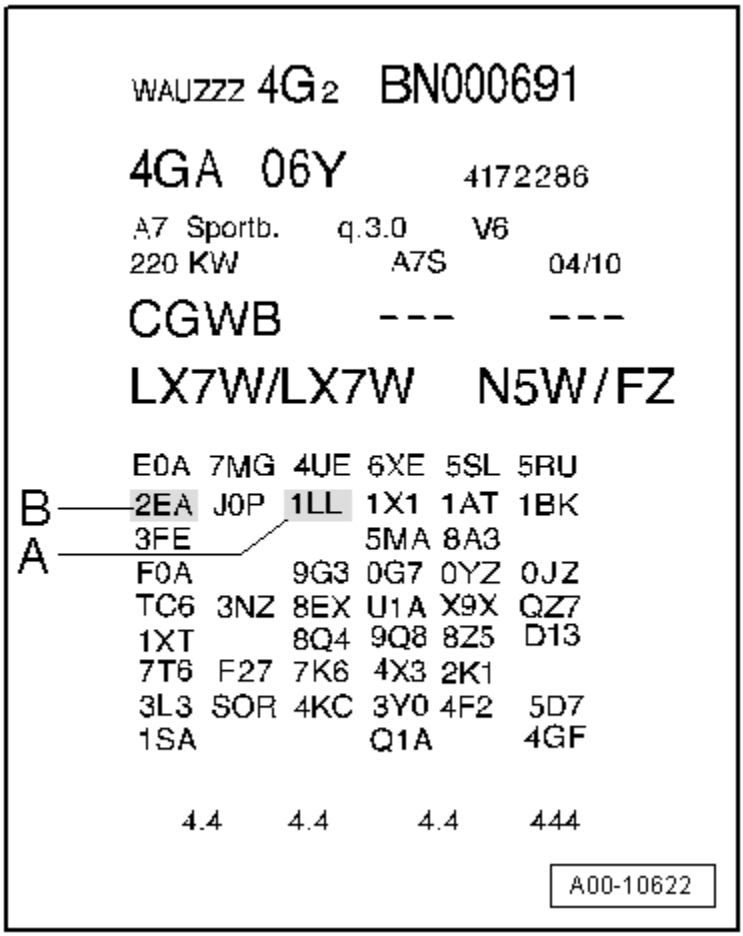


Step	Component	Nm
1	Position the steering column with the positioning pins (➡) in the central tube positioning holes	
2	Loosely install all bolts	
3	Tighten bolts 1 through 7 in sequence	20

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				
Brake		(16”)	(17”)	(17”)
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	365
Brake disc thickness	mm	30	30	34
Brake disc wear limit	mm	28	28	32
Brake pad thickness with backing plate and dampening sheet	mm	19.2	19,.	20.2
Brake pad wear limit with backing plate and dampening sheet		9	9	9

Rear Wheel Brakes – Technical Data

Rear Wheel Brake			
Brake		(16”)	(17”)
Production Relevant No. (PR. No.)		1KW	2EA
Brake disc ventilated	diameter mm	300	330
Brake disc thickness	mm	12	22
Brake disc wear limit	mm	10	20
Brake pad thickness with backing plate and dampening sheet	mm	17.45	17.45
Brake pad wear limit with backing plate and dampening sheet		8	8

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-hydraulic unit	
- 5 mm brake lines	12
- 8 mm brake lines	20
Sensor electronics control module nut	9

Mechanical Tightening Specifications

Component	Nm
Brake pedal bracket-to-body nut	8
Brake pedal mounting pin-to-bracket bolt	8
Electromechanical parking brake control module nut	3
Electromechanical parking brake motor-to-rear brake caliper bolt	12
Front brake caliper-to-brake carrier guide pin (PR. No. 1LL/ FM0)	55
Front brake caliper-to-brake carrier bolt (PR. No. 1LA/1LJ)	30
Front brake carrier-to-wheel bearing housing bolt [1)]	196
Front brake line connection-to-brake hose (PR. No. 1LL/ FM0)	12
Front brake line connection-to-brake caliper (PR. No. 1LL/FM0)	19
Front brake line connection-to-brake caliper (PR. No. 1LA/1LJ)	20
Front brake pad bolt	
- PR. No. 1LL/FM0	9
- PR. No. 1LA/1LJ	5
Front cover plate bolt	10
Gas pedal module-to-brake pedal bracket bolt	8
Rear brake caliper-to-brake carrier bolt [1)]	35
Rear brake carrier-to-wheel bearing housing bolt	100 plus an additional 90° (¼ turn)
Rear brake hose in brake caliper	19
Rear brake hose-to-brake pipe line	12
Rear brake pad bolt	5
Trim and balance spring-to-caliper bolt (PR. No. 1LL/ FM0)	22

[1)] Replace fastener(s).

Hydraulic Tightening Specifications

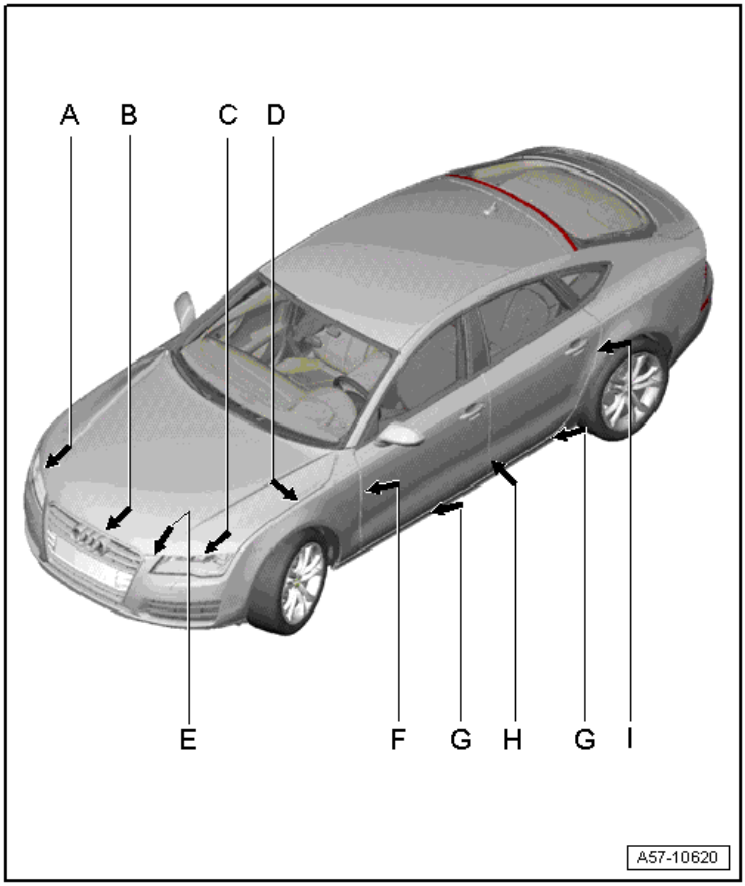
Component	Nm
Ball head-to-brake booster	30
Brake booster-to-bracket bolt	23
Brake fluid reservoir cap	5
Brake line-to-master cylinder	24
Brake line-to-hydraulic unit	
- 5 mm brake lines	12
- 8 mm brake lines	20
Brake line connection-to-brake hose	12
Brake line connection-to-brake caliper	19
Brake master 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

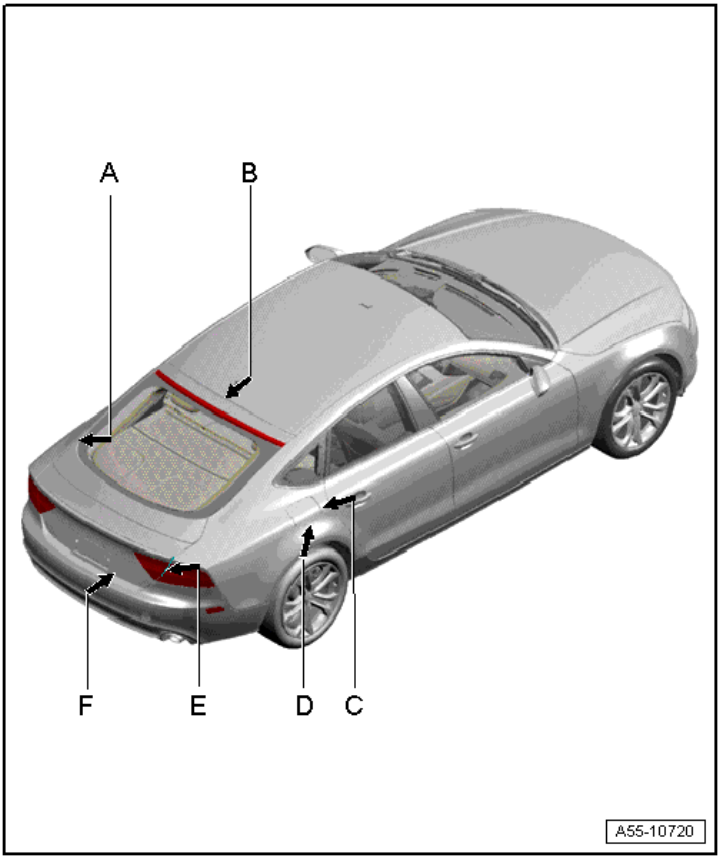
Air Gap Body Dimensions

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 Exterior

Lock Carrier, Tower Brace, and Plenum Chamber Tightening Specifications

Component	Nm
Lock carrier bolts	10
Lock carrier brace bolts	20
Lock carrier mount bolt	8
Tower brace center cover bolts	2
Tower brace bolts	20
Plenum chamber nut	4

Front Fender Tightening Specifications

Component	Nm
Front fender bolts	10
Front fender upper bracket bolts	10
Front fender lower bracket bolts	10
Front fender end plate bolts	10

Front Hood Tightening Specifications

Component	Nm
Front hood gas filled strut ball studs	21
Front hood hinge bolts	21
Front hood catch bolts	8
Front hood catch bracket bolts	8
Lock carrier bolt	11

Rear Lid Tightening Specifications

Component	Nm
Adjusting buffer bolt	11
Fuel filler door unlock motor bolts	1.5
Rear lid lock nuts	21
Rear lid striker nuts	21
Rear lid hinge bolt	21
Rear lid latch bracket bolts	21
Rear lid stop bolt	8

Front and Rear Door Tightening Specifications

Component	Nm
Bottom door hinge bolts	32
Catch	19
Door arrester bolts	8
	33
Door handle bolts	2.5
Door lock	25
Door striker pin bolts	19
Lower door hinge stud bolts	23
Lower door hinge bolts (Front)	32
Lower door hinge bolts (Rear)	34
Upper door hinge stud bolts	23
Upper door hinge bolts (Front)	32
Upper door hinge bolts (Rear)	34
Window regulator motor	3.5

Front Bumper Tightening Specifications

Component	Nm
Bumper cover bolts	2.5 - 4
Bumper cover end plate bolts	2.5 - 5
Bumper cover mount bolts	4
Bumper spoiler bolts	1.5
Reinforcement brace bolts	1.5 - 4
Infrared camera mount bolts	6
Front impact member bar-to-bracket	55
Side impact bar bolt and nut	20
Side impact bar connecting brace bolt	4.5
Side impact bar member mount bolt	10
Lower front longitudinal member bolts	20
Lower part of spoiler	2
Power outlet bolt	3.5
Radiator grill bolts	1.5

Rear Bumper Tightening Specifications

Component	Nm
Rear bumper cover bolts	2
Rear bumper cover upper mount bolts	2
Rear bumper cover center mount bolts	1.5
Rear bumper cover side mount bolts	2
Rear bumper lower section bolts	1.7
Side impact bar bolts	30
Side impact bar nuts	30
Socket	3.5
Impact member-to-trailer hitch bolts	60

Rear Spoiler Tightening Specifications

Component	Nm
Rear spoiler bolts	9
Rear spoiler nuts	2
Rear spoiler stop bolts	8

Front and Rear Door Window Tightening Specifications

Component	Nm
Window regulator motor bolts	3.5
Window regulator bolts	9
Window regulator nuts	6
Window cover nut	12

Front Wheel Housing Liner Tightening Specification

Component	Nm
Wheel housing liner nuts and bolts	2

Rear View Mirror Tightening Specifications

Component	Nm
Mirror adjusting unit mount bolts	8
Mirror adjusting unit bolts	1

Sunroof Tightening Specifications

Component	Nm
Sunroof motor bolts	4
Sunroof frame bolts	8
Sunroof frame nuts	8
Sunroof sliding headliner bolts	1.5

Strips and Trim Tightening Specifications

Component	Nm
Sill panel trim bolts	8
Retaining strip-to-sill panel bolts	2
B-pillar trim bolts	2
Heat shield	2.1
Noise insulation M8 bolts	20
Noise insulation M6 bolts	3.5
Stone chip, front, center and rear underbody cover bolts	2.1
Wheel housing liners	2-2.1

Storage Compartment and Armrest Tightening Specifications

Component	Nm
Bracket for the center console bolts	3
Center armrest bracket bolts and nuts	20
Center armrest trim bolts	1
Center console mounting bracket bolts	3
Cover for the front ashtray/storage compartment	3
Front center console bolts and nuts	1.4 - 3
Gap cover bolts	3
Glove compartment	3
Storage compartment bolts	3
Steering column trim bolts	1.5

Instrument Panel and Central Tube Tightening Specifications

Component	Nm
Instrument panel vent bolts	3
Panel trim bolts	3
Central tube mounting bracket bolts	20
Central tube threaded pin	20
Central tube bolts [1)]	3.6
	9
	20
Driver’s side trim bolts	3
Threaded pin	20
Instrument panel cover bracket bolts	9
Glove compartment bracket bolts	9
Glove compartment right retainer bolts	9
Glove compartment left retainer bolts	9
Left shock absorber bolts	9
Support base nuts	20
Support base bolts center armrest	8

[1)] For bolt tightening clarification, refer to ElsaWeb, *Instrument Panel Central Tube Assembly Overview.*

Passenger Protection Tightening Specifications

Component	Nm
Belt latch-to-seat	33
Belt anchor bolts	45
Front seat belt B-pillar bolts	45
Front seat belt height adjuster bolts	23
Belt latch bolts	45
Front seat belt guide bolts	5
Automatic belt retractor bolts	45
Rear center 3-point seat belt latch hex nut	45
Rear center lap belt bolts	45
Rear belt latch nuts [1]	45
LATCH child seat anchor seat pan bolts	8
Airbag control module (J234) nuts	9
Battery interrupt igniter (N253) nuts	15
Ground wire for front passenger airbag igniter	9
Passenger side airbag unit nuts	9
Side airbag bolts [1]	9
Rear side airbag cap bolts [1]	10
Head curtain airbag bolts [1]	5
Driver side knee airbag bracket bolts [1]	9
Driver side knee airbag nuts [1]	8
Driver side knee airbag ground cable bolt [1]	9
Passenger knee airbag bolts and nuts [1]	8
Passenger side airbag crash sensor bolts	5
Crash sensor bolts	9
Seat position sensor bolt	1.2
Seat occupant sensor bolts	1.5

[1] Replace fastener(s).

Interior Trim Tightening Specifications

Component	Nm
Door trim handle molding area bolts	2
Door trim handle bolts	2
Door mirror triangle cover bolts	2
Door trim stop bolt	2.5
Front sill panel trim	2.5
Stop for door trim	4.5

Seat Frames Tightening Specifications

Component	Nm
Backrest	34.5
Backrest frame bolts	6.5
Bracket for rear seat entertainment	3.8
Center armrest bracket screws	11
Front seat frame bolts	50
Seat angle adjustment	
- Bolt	6.5
- Shoulder pin	6
Seat height adjuster bolts	6.5
Seat trim bolts	2
Seat drawer mount bolts	3.5
Seat bracket and operation lever bolts	3.5
Front seat backrest bolts	20
Locking tab bolt	25
Rear seat center backrest bolts	16
Rear seat center bracket	16
Rear seat belt buckle-to-floor bolts	30
Rear seat side upholstery bolts	16
Rear seat side upholstery nut	55
Rear seat storage unit with center armrest bolts	9

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]	
Generator Coolant Pipe Clamp Bolt3	
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	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.

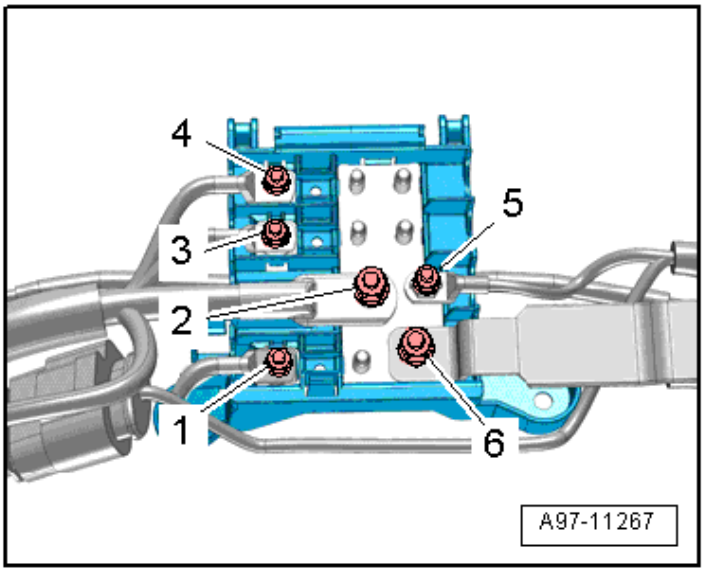
Interior Lights, Switches Tightening Specifications

Component	Nm
Access/start authorization antennas	2
Alarm horn and bracket	3
Lane change assistance control modules	2

Wiring Tightening Specifications

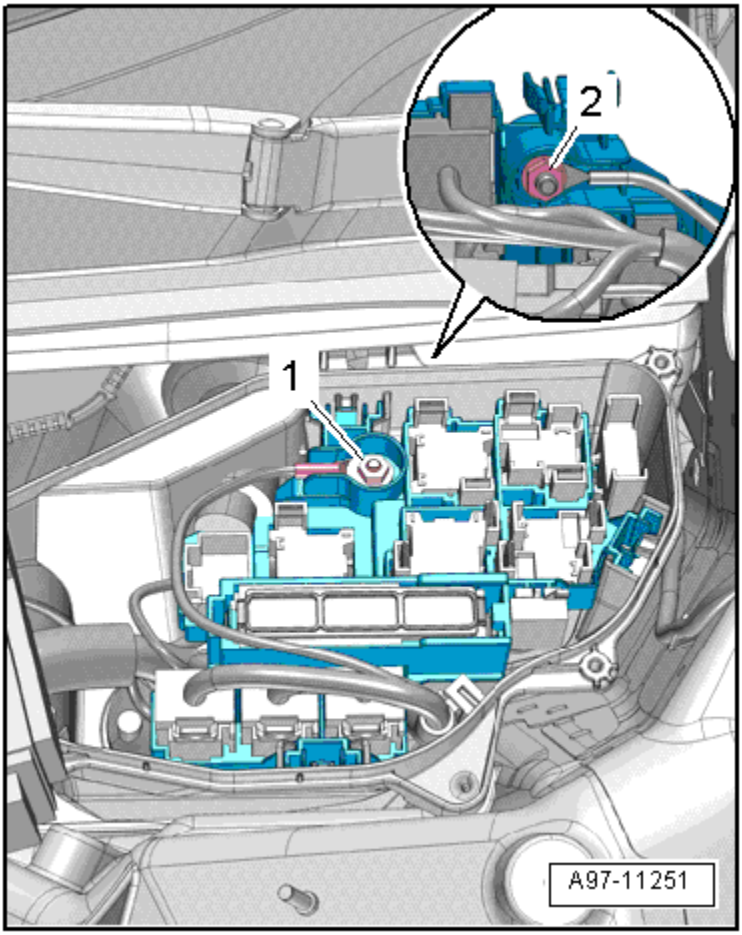
Component	Nm
Comfort system central control module retaining frame	3
Plenum chamber E-box	3
Plenum chamber E-box cover	3
Luggage compartment control module upper frame	3
Luggage compartment control module lower frame	3
Luggage compartment relay and fuse panel	3
Terminal 30 wire junction	3
Vehicle electrical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

Terminal 30 Wire Junction (TV2) Fastener Tightening Specifications



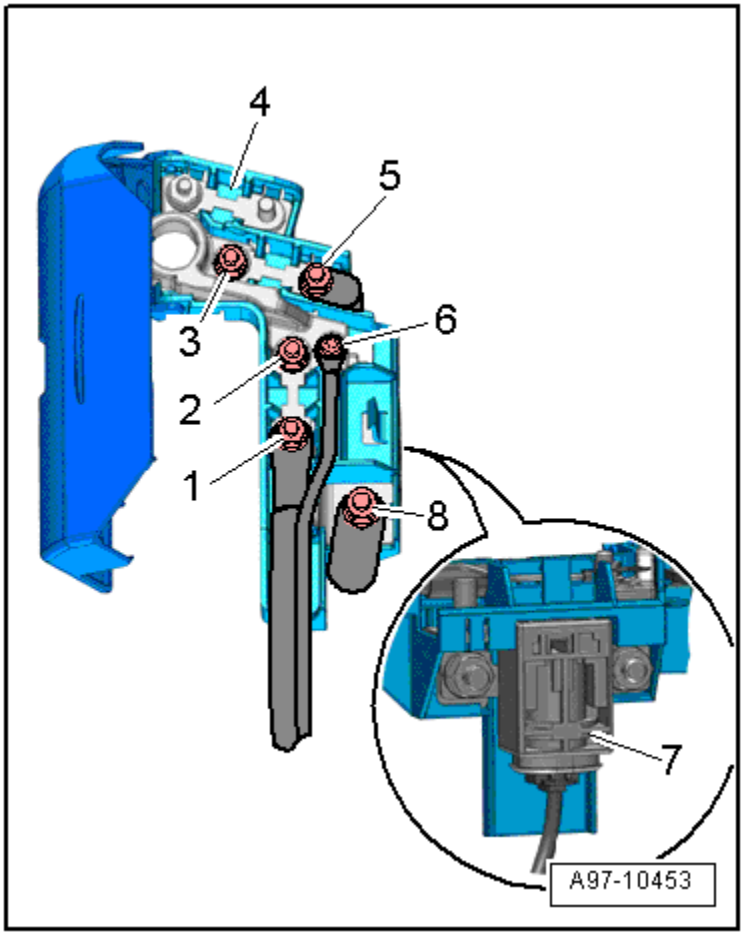
No.	Description	Nm
1	PTC line	18
2	Battery jump start terminal (U6)	20
3	Nut	7.5
4	Nut	7.5
5	E-Box positive wire	7.5
6	Battery wire	18

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



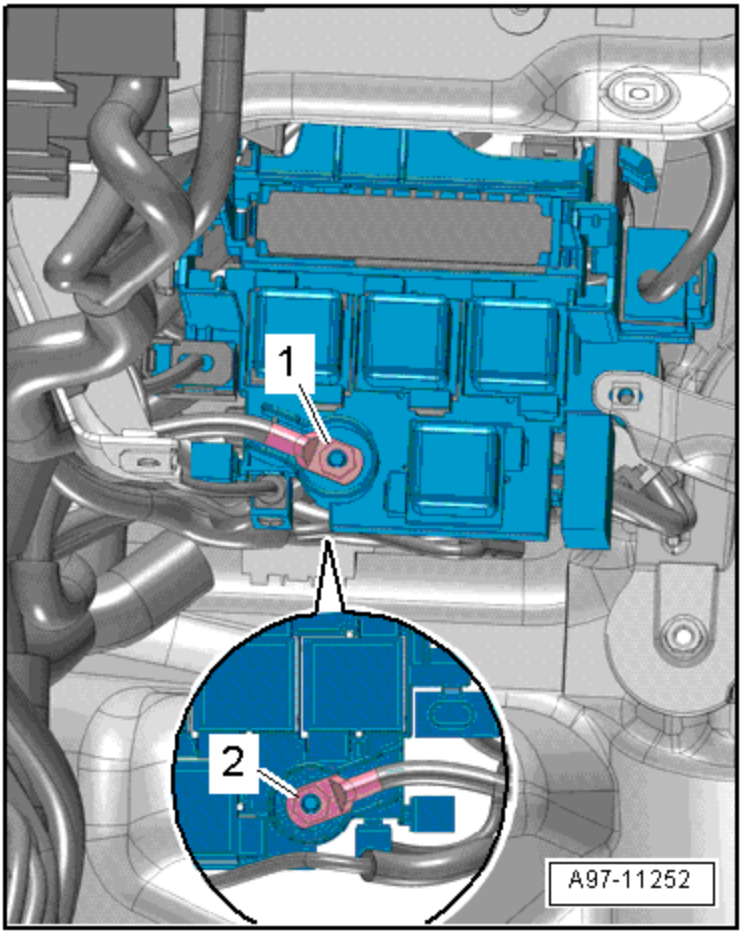
No.	Description	Nm
1	Positive wire	9
2	Electrical wire on the back	9

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

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