

2013

Q5

Quick Reference
Specification Book

2013 Audi Q5

Quick Reference Specification Book

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GENERAL INFORMATION

Decimal and Metric Equivalents

Distance/Length

To calculate: mm x 0.03937 = in.

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

Tightening Torque

Nm-to-lb·ft (ft·lb)

To calculate: Nm x 0.738 = lb·ft

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

Nm-to-lb-in (in·lb), kg·cm

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

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

N·cm-to-lb-in (in·lb), kg·cm

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

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

kg·cm-to-lb·in (in·lb), N·cm

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

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

Warnings and Cautions

WARNINGS

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

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

(WARNINGS cont'd on next page)

WARNINGS *(cont'd)*

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

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

CAUTIONS

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

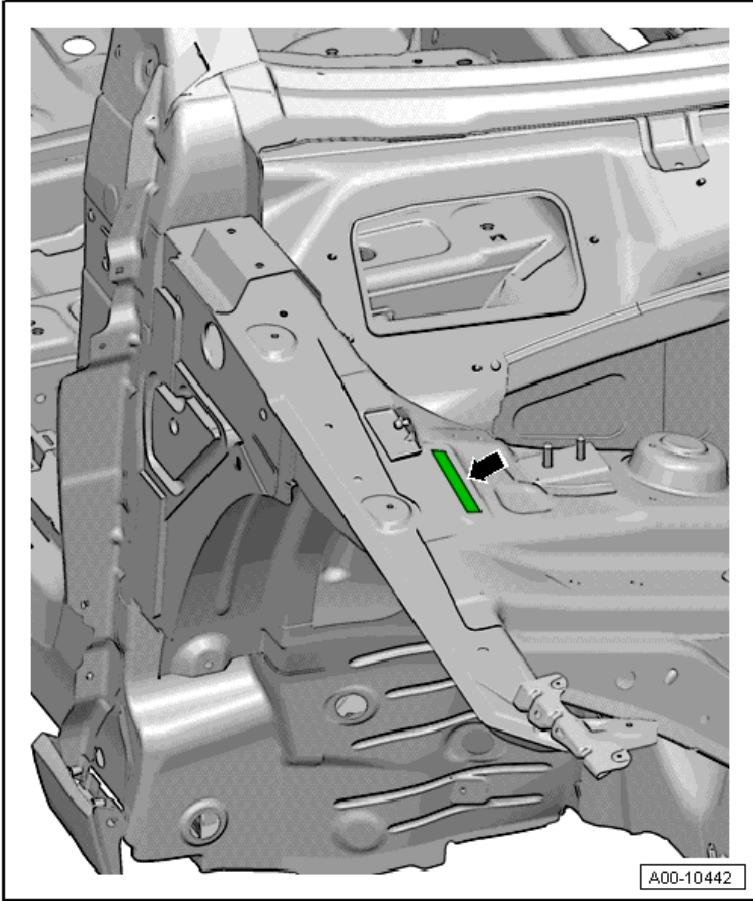
(CAUTIONS cont'd on next page)

CAUTIONS *(cont'd)*

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

VEHICLE IDENTIFICATION

Vehicle Identification Number (VIN) Location



Vehicle
Identification

The Vehicle Identification Number (VIN) is located on the right suspension strut.

VIN Decoder

2013 Audi VIN Decoder

2013 Audi VIN Decoder											Sequential production number (position 12 - 17)									
Series:	Mfg. Make (1-3)	Series	Engine	Restraint system	Model (7&8)	Check digit	Model year	Assembly plant												
	1 2 3	4	5	6	7 8	9	10	11	12	13	14	15	16	17						
A= A4 Premium A5 Cab Premium A3 Sedan R8 4.2 Coupé B= A3 Avant Premium A4 Premium q S4 Premium+ q TT/TTTS/TTRS Cpe Prem+ quattro C= A5 Premium+ q A5 Cab Premium+ q A8 Premium S5 Premium+ q S5 Cab Premium+ q Q5 2.0T Premium Hybrid Q7 3.0T/TTDI Prem RS5 D= A3 Avant Prem q A4 Manual Prem+ q S4 Manual Prem+ q A6 Premium+ q S8 Sedan Q5 3.0 Premium+ q Q7 3.0T Prest. S-Line R8 4.2 Coupé - Man E= A4 Premium+ q S5 5.2 Coupé F= A3 Avant-Man Prem A4 Premium+ q A6 Premium+ q G= A5 Manual Prem q S5 Manual Prem+ q A6 Premium+ q S5 H= A4 Manual Prem+ q A5 Prestige q R8 5.2 Coupé - Man J= A4 Prestige A5 Cab Premium+ q A5 Prestige q S6 w/Innov. Pkg.	K= A3 Avant Premium+ A4/S4 Prestige+ q TT/TTTS/TTRS Cpe Prestige quattro L= A5 Premium+ q A5 Cab Premium+ q Q5 2.0T Premium+ q Q7 3.0T/TTDI 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/TTTS/TTRS Rdstr Prem+ q T= A5 Cab Prestige R9 5.2 Spyder-Man U= Allroad Premium+ q A5 Cab Prest. S-Line R9 4.2 Spyder-Man V= Allroad Prestige+ q A5/S5 Prestige+ q A5/S5 Cab Prestige+ q Q7 TDI Prestige R9 5.2 Spyder W= A5 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/TTTS/TTRS Rdstr Prestige quattro 9= Allroad Premium q	TRU = Audi - Hungary Pass. Car WAU = Audi - Germany Pass. Car WAA = Audi - Czech Rep. - Germany Pass. Car WNA = Audi - Poland - Germany Pass. Car	See back FG (4G)** = A6 / S6 / A7 / S7 FD (4H) = A8 FE (4L) = Audi Q7 FG (4Z) = R8 FH (8F) = A5 / S5 Cabriolet FK (8A) = TT / TTS / TT RS FL (8K)*** = A4 / S4 FM (8P) = A3 FF (8R) = Audi Q5 FR (8T) = A5 / S5	Calculate per NHTSA Code 2013 A= Ingolstadt D= Bratislava N= Neckarsulm 1= Győr	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 (Q7) G= 4 cyl 2.0L 211hp (CCTA) A3 q H= 4 cyl 2.0L 211hp (CETA) TT Cpe q / TT Rdstr q I= 4 cyl 2.0L 211hp (CPMA) A4 q / A6 Cpe/Cab q / Allroad / Q5 J= V6 3.0L 310hp (CXXB) A6 q (C7) / A7 q K= V6 3.0L 272hp (CXXD) Q5 L= V6 3.0L 333hp (CGXC) S4 / S5 / S5 Cab M= V6 3.0L 333hp (CXXB) Q7 S-Line N= V6 3.0L 240hp (CNRB) Q7 O= V6 3.0L 333hp (CTUB) A8 q P= 4 cyl 2.0L TDI 140hp (CBEA) A3 Q= V6 3.0L TDI 240hp (CJUA) A8 / A8L R= V8 4.0L 420hp (CEUA) A8 / A8L S= V8 4.0L 420hp (CEUC) S6 / S7 T= V8 4.0L 520hp (CGTA) S8 U= V6 3.0L 360hp (CEPB) TT RS q V= W12 6.3L 500hp (CEJA) A8L (D4) W= V8 4.0L 450hp (CFS) RS5 Cpe/Cab X= 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)

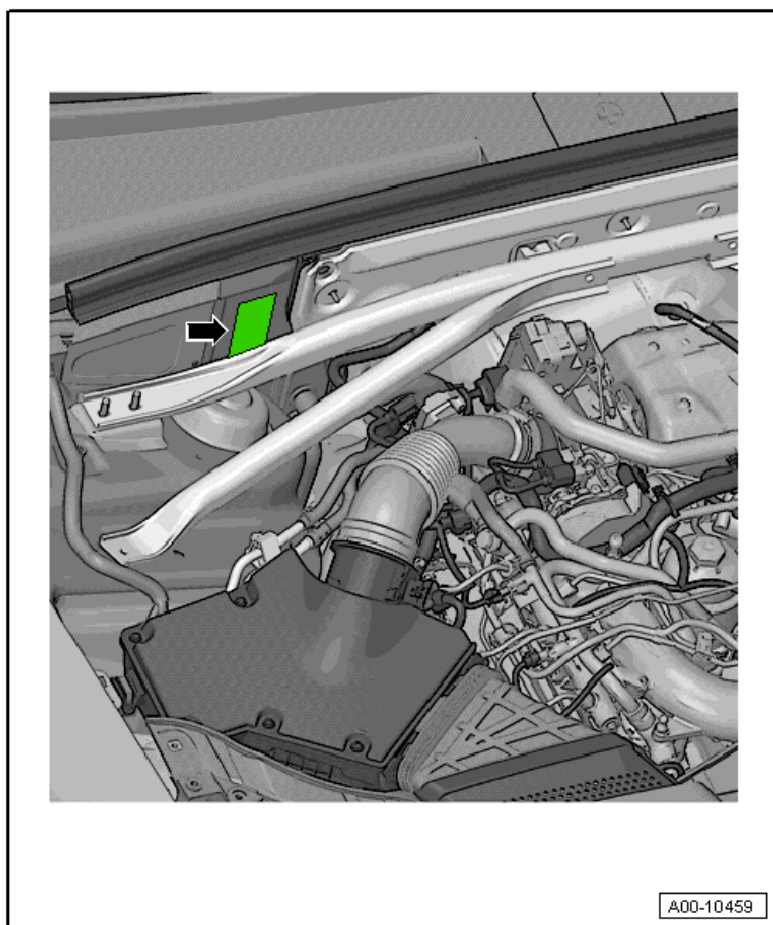
2013 Audi VIN Decoder

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	Mfg. Make (1-3)			Series	Engine	Restraint system	Model (7&8)		Check digit	Model year	Assembly plant	Sequential production number (position 12 - 17)					
K= 1989 L= 1990 M= 1991 N= 1992 P= 1993 R= 1994 S= 1995 T= 1996 V= 1997 W= 1998 X= 1999 Y= 2000 1 = 2001 2 = 2002 3 = 2003 4 = 2004 5 = 2005 6 = 2006 7 = 2007 8 = 2008 9 = 2009 A = 2010 B = 2011 C = 2012 D = 2013	Calculate per NHTSA Code																

2013 Restraint System:

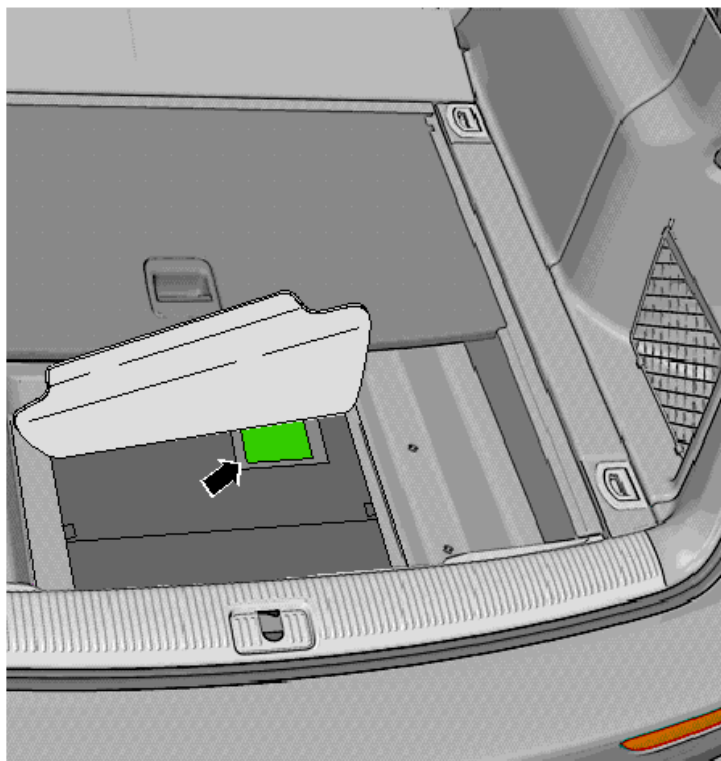
A (Active - Dr/Pass, AirBag - Dr/Pass, Advanced Front AirBag)
A (A5 / S5 Cab, TT / TTS, R8) = Side AirBags Front, Knee AirBags Front
A (A5 / S5, RS5) = Side AirBags Front, Side Guard Air Curtain, Knee AirBag Front
A (A3, A4 / S4, A6 / S6, A7 / S7, Q5, Q7) = Side AirBags Front, Side Guard Air Curtain
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

Vehicle Identification Number Decoder Type Plate Location



The type plate is located on the right side of the engine compartment near the suspension strut.

Vehicle Data Label Location



A00-10443

The vehicle data label is located inside the luggage compartment on the spare wheel well cover.

SALES CODES

Engine Codes

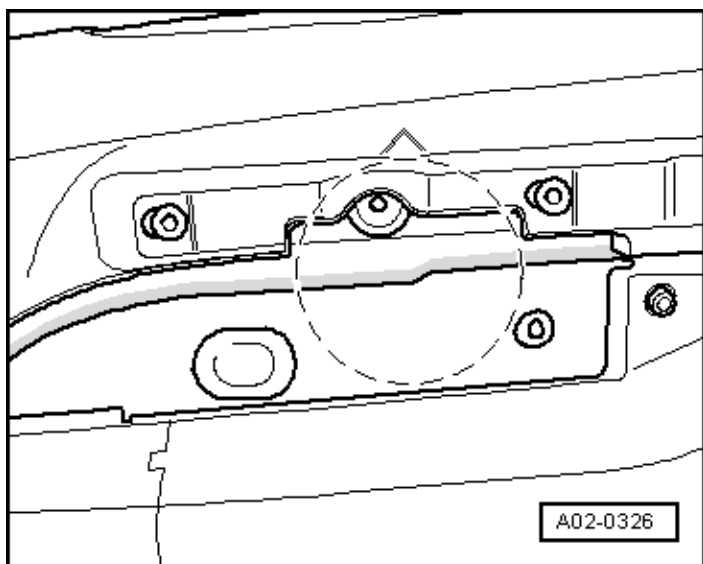
CPMA	2.0L 4-cylinder
CHJA	2.0L 4-cylinder
CTUC	3.0L 6-cylinder

Transmission Codes

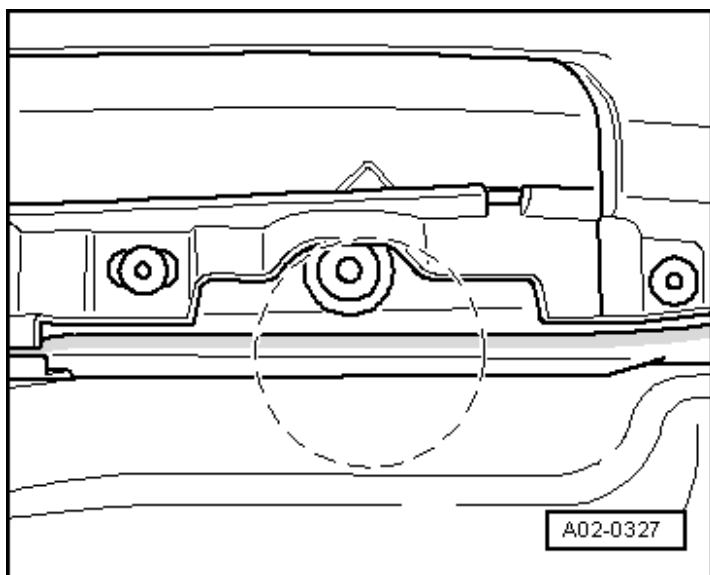
0BW	8-speed automatic
0BK	8-speed automatic

VEHICLE LIFTING

Lifting Points for Lifting Platform and Trolley Jack



Front: At the side member of the vertical reinforcement area.
The marking is for the onboard vehicle jack.

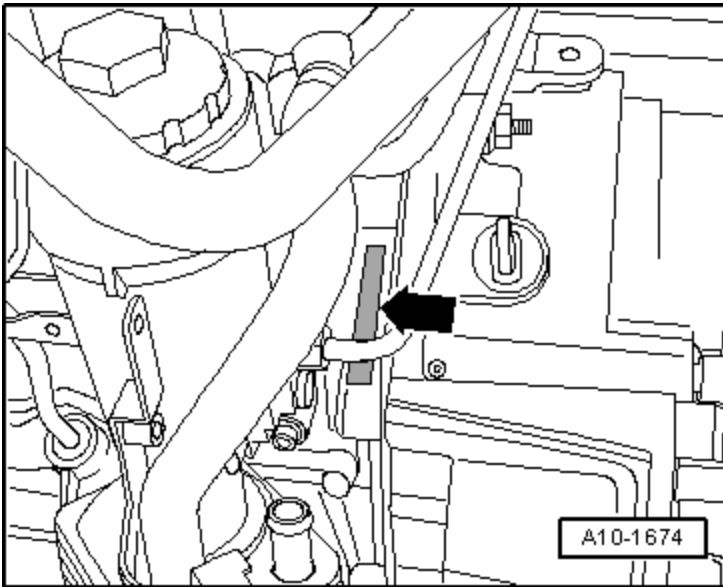


Rear: At the side member vertical reinforcement area.
The marking is for the onboard vehicle jack.

ENGINE MECHANICAL – 2.0L CPMA, CHJA

General, Technical Data – 2.0L CPMA, CHJA

Engine Number Location



The engine number (engine code and serial number) ➔ is located on the left side of the vehicle where the engine/transmission are joined.

Engine Data

Code Letters		CPMA	CHJA
Displacement	liter	1.984	1.984
Output	kW at RPM	155/6000	155/5800
Torque	Nm at RPM	350/1500	350/1500
Bore	Diameter in mm	82.5	82.5
Stroke	mm	92.8	92.8
Compression ratio		9.6	9.6
RON		95 ¹⁾	95 ¹⁾
Injection system/ignition system		FSI	FSI
Ignition sequence		1-3-4-2	1-3-4-2
Knock control		Yes	Yes
Turbocharger, Supercharger		Yes	Yes
Exhaust Gas Recirculation (EGR)		No	No
Variable intake manifold		No	No
Variable valve timing		Yes	Yes
Secondary Air Injection (AIR)		No	No

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

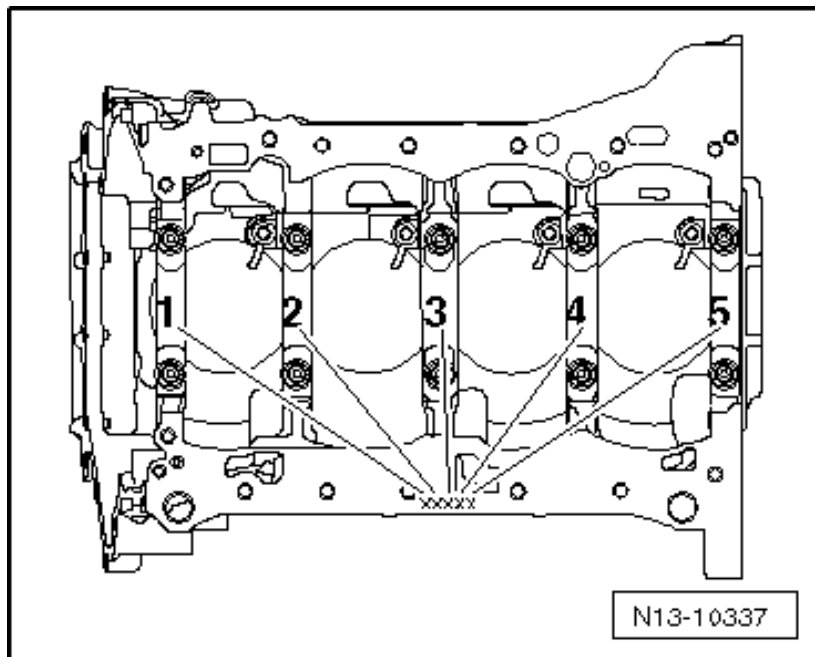
Engine Assembly – 2.0L CPMA, CHJA

Fastener Tightening Specifications

Component	Fastener size	Nm
Bolts and nuts	M6	9
	M7	15
	M8	20
	M10	40
	M12	65
Exceptions:		
Ground (GND) cable nut		9
Hydraulic line bracket nut		9
Engine mount		90 plus an additional 90° (¼ turn)
Engine support		40
Heat shield		10
Retaining plate		20
Subframe		55
Hybrid		
Crossmember-to-subframe		20
Torque bracket-to-engine		50

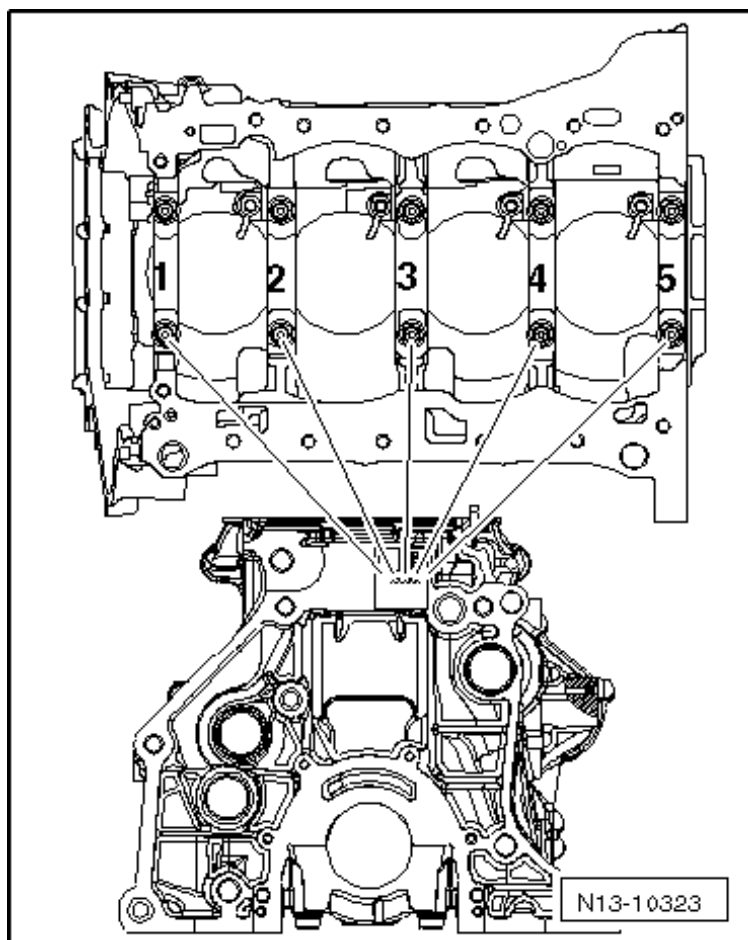
Crankshaft, Cylinder Block – 2.0L CPMA, CHJA

Cylinder Block Bearing Shell Identification



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

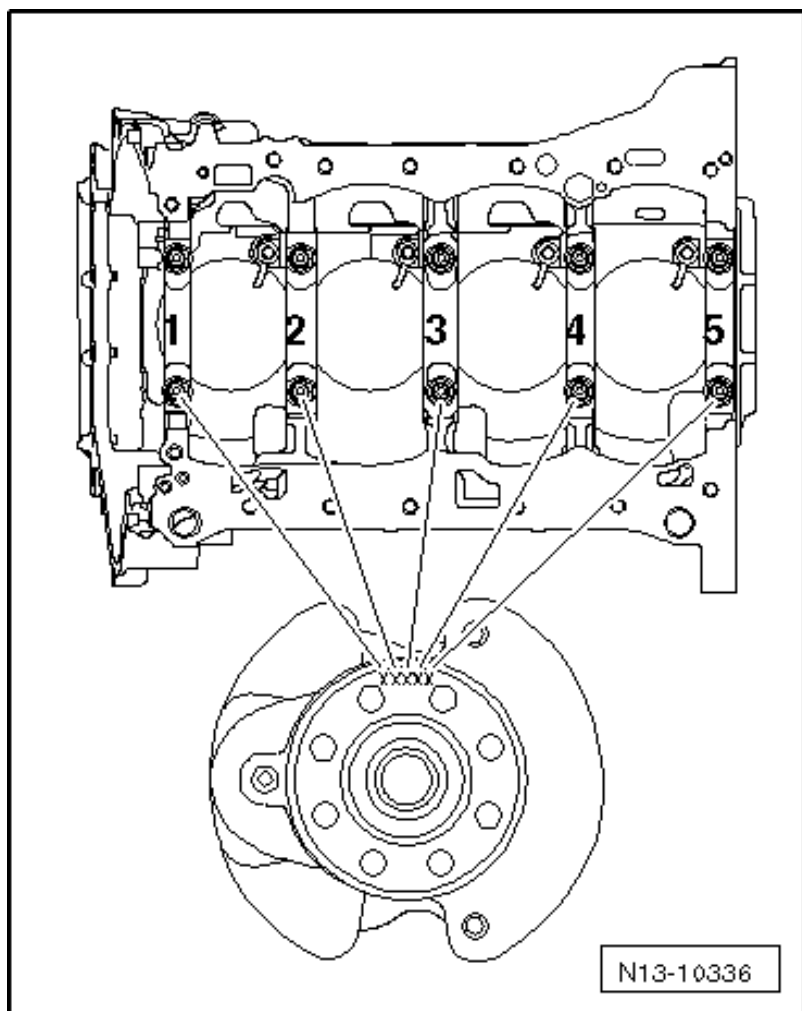
Cylinder Block Bearing Shell Identification



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

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

Bearing Cap Bearing Shell Identification



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

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

Fastener Tightening Specifications

Component	Nm
Connecting rod bearing cap (replace fasteners)	45 plus an additional 90° (¼ turn)
Drive plate (replace fasteners)	60 plus an additional 90° (¼ turn)
Idler roller	20
Pressure relief valve	27
Pressure relief valve-to-oil spray jet	27
Ribbed belt tensioning damper	40
Sensor wheel (replace fasteners)	10 plus an additional 90° (¼ turn)
Vibration damper (replace fasteners)	150 plus an additional 90° (¼ turn)

Crankshaft Dimensions

Reconditioning dimensions in mm ¹⁾	Crankshaft bearing pin diameter	Connecting rod bearing pin diameter
Basic dimension	58.00	47.80

¹⁾ The preparation of worn crankshafts is not provided.

Piston Ring End Gaps

Piston ring dimensions in mm	New	Wear limit
Compression ring	0.20 to 0.40	0.80
Oil scraping ring	0.25 to 0.50	0.80

Piston Ring Clearance

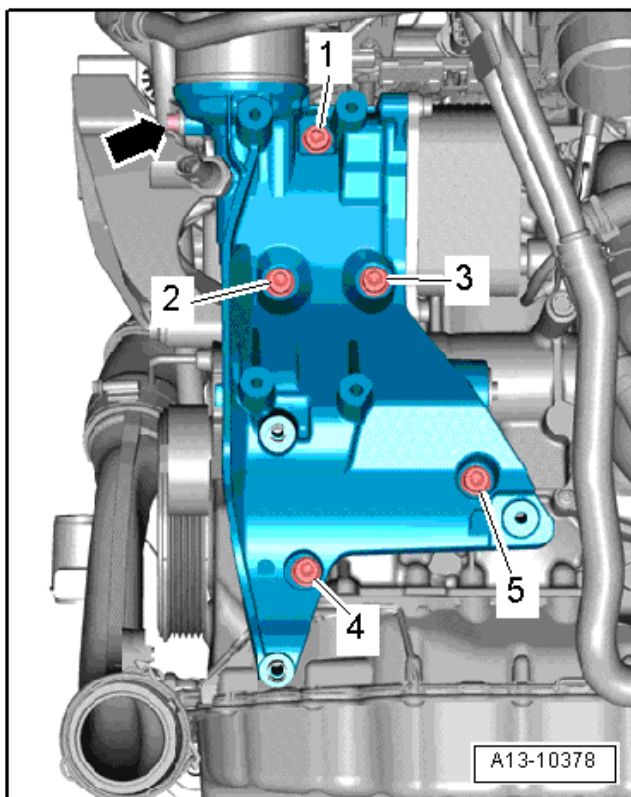
Piston ring dimensions in mm	New	Wear limit
1 st compression ring	0.06 to 0.09	0.20
2 nd compression ring	0.03 to 0.06	0.15
Oil scraping rings	Cannot be measured	

Piston and Cylinder Dimensions

Honing dimension in mm	Piston diameter	Cylinder bore diameter
Basic dimension	82.465 ¹⁾	82.51

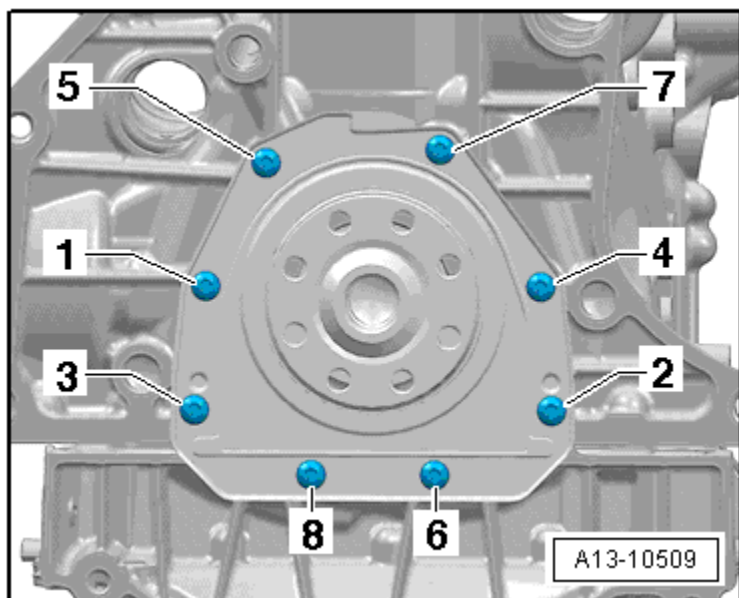
¹⁾ Measurements without graphite coating (thickness = 0.02 mm). The graphite coating wears off.

Accessory Assembly Bracket Tightening Specifications



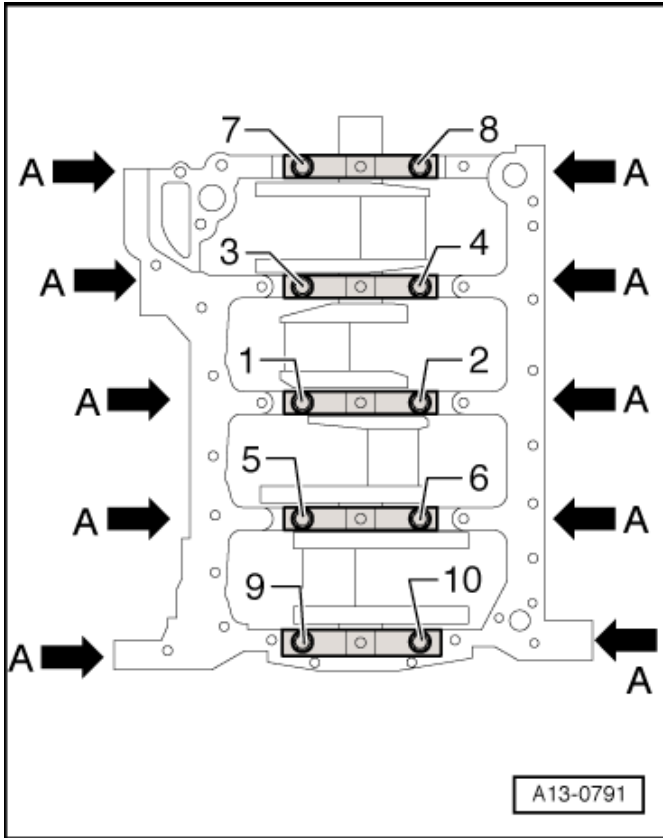
Step	Component	Nm
1	Tighten bolts 1 through 5 in sequence	Hand-tighten
2	Tighten bolts 1 through 5 in sequence	20
3	Tighten bolts 1 through 5 in sequence	an additional 90° (¼ turn)

Sealing Flange Tightening Specifications



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

Crankshaft Assembly Tightening Specifications



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

Cylinder Head, Valvetrain – 2.0L CPMA, CHJA

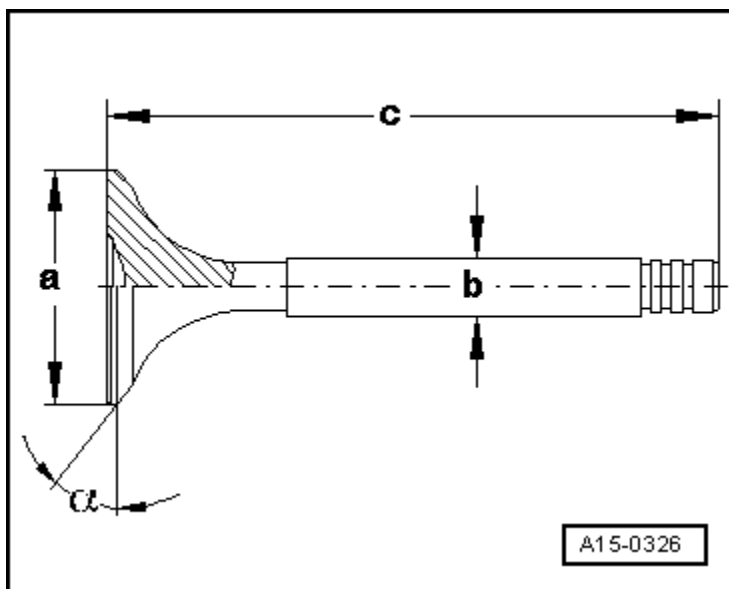
Fastener Tightening Specifications

Component	Nm
Balance shaft (replace fasteners)	9
Balance shaft timing chain guide rail, guide pins	20
Bearing bracket	9
	20 plus an additional 90° (¼ turn) (replace fasteners)
Camshaft adjuster actuator	5
Camshaft Position (CMP) sensor	9
Camshaft timing chain guide rail, guide pins	20
Chain tensioner ²⁾	9
Chain tensioner ¹⁾	65
Control valve	35
Engine cover plug with ball head	5
Heat shield	20
Mounting plate	9
Oil dipstick guide tube	9
Sealing plugs	5
Timing chain tensioning rail, guide pins	20
Transport strap	25

¹⁾ For bolt tightening clarification, refer to ElsaWeb, Balance Shaft Timing Chain Overview, item 4.

²⁾ For bolt tightening clarification, refer to ElsaWeb, Camshaft Timing Chain Overview, and item 3.

Valve Dimensions



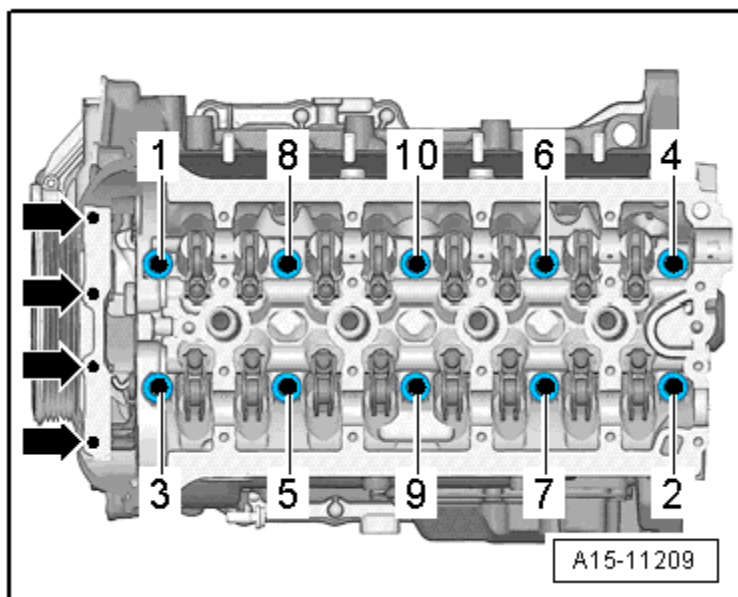
Dimension		Intake valve	Exhaust valve
Diameter a	mm	33.85 ± 0.10	28.0 ± 0.1
Diameter b	mm	5.98 ± 0.01	5.96 ± 0.01
c	mm	104.0 ± 0.2	101.9 ± 0.2
α	∠°	45	45

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

Compression Pressures

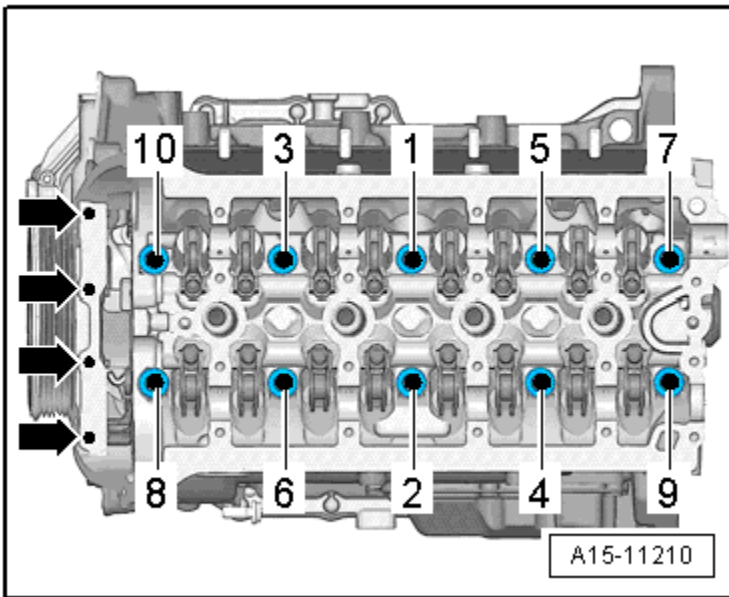
New bar positive pressure	Wear limit bar positive pressure	Difference between cylinders bar positive pressure
11.0 to 14.0	7.0	Max. 3.0

Cylinder Head Removal Specifications



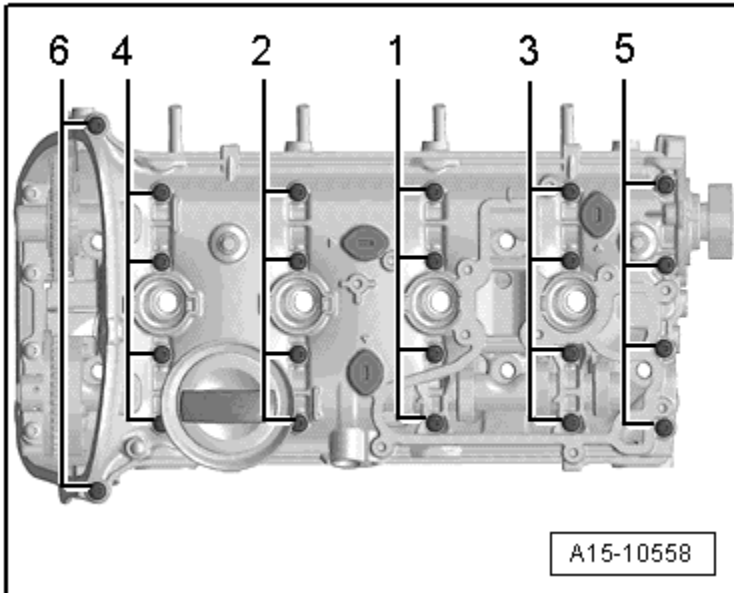
Remove cylinder head bolts 1 to 10 in sequence.

Cylinder Head Tightening Specifications



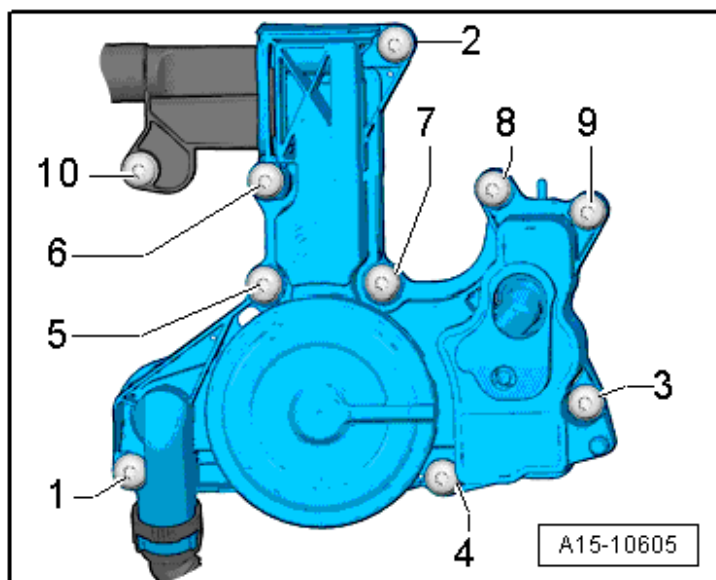
Step	Component	Nm
1	Tighten bolts 1 through 10 in sequence	40
2	Tighten bolts 1 through 10 in sequence	an additional 90° (¼ turn)
3	Tighten bolts 1 through 10 in sequence	an additional 90° (¼ turn)
4	Tighten bolts arrows	8
5	Tighten bolts arrows	an additional 90° (¼ turn)

Cylinder Head Cover Tightening Specifications



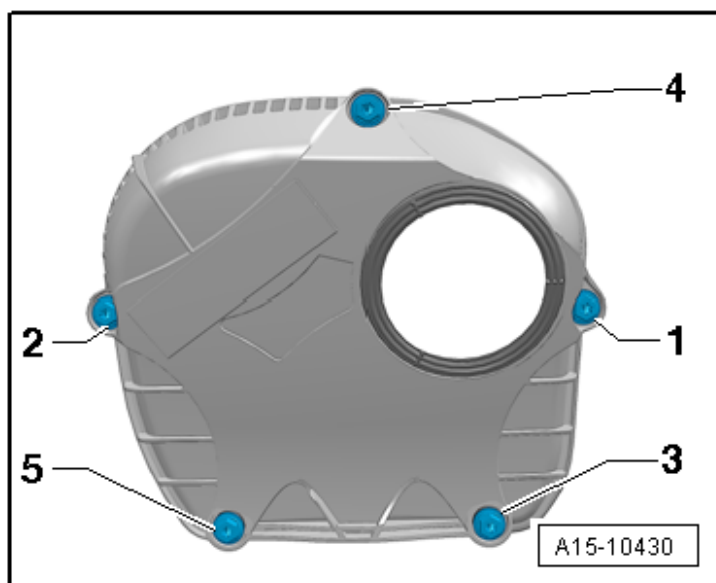
Step	Component	Nm
1	Tighten bolts 1 through 6 in sequence in several stages	Hand-tighten
2	Tighten bolts 1 through 6 in sequence	8
3	Tighten bolts 1 through 6 in sequence	an additional 90° (¼ turn)

Crankcase Ventilation Tightening Specifications



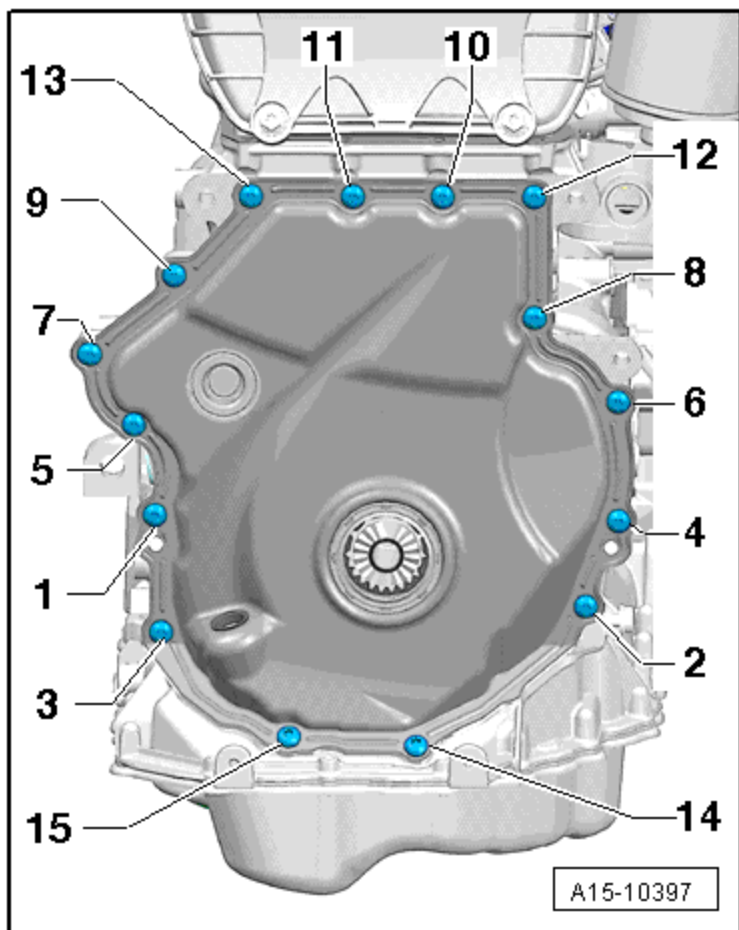
Step	Component	Nm
1	Tighten bolts 1 through 10 in sequence	11

Upper Timing Chain Cover Tightening Specifications



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

Lower Timing Chain Cover Tightening Specifications



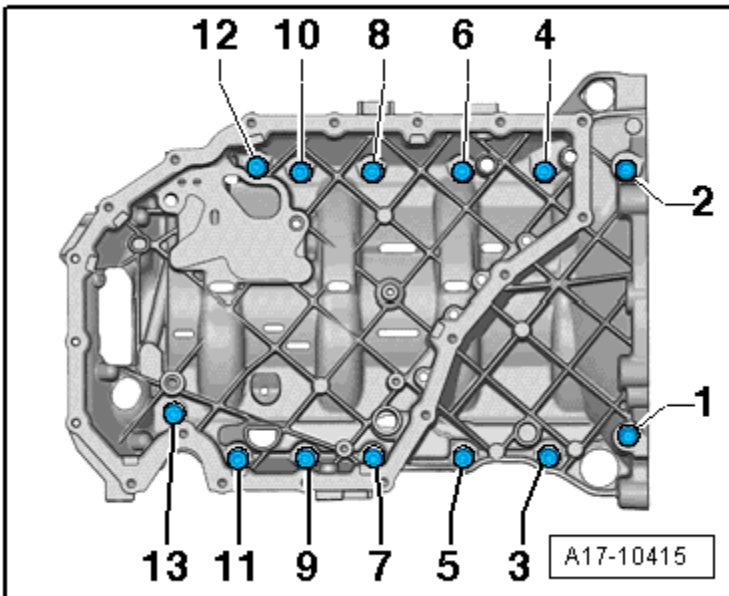
Step	Component	Nm
1	Tighten bolts 1 through 15 in sequence	8
2	Tighten bolts 1 through 15 in sequence	an additional 45° (1/8 turn)

Lubrication – 2.0L CPMA, CHJA

Fastener Tightening Specifications

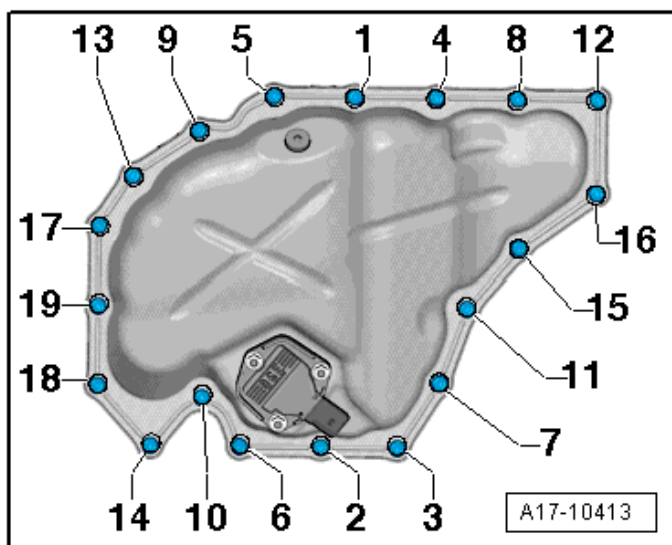
Component	Nm
Chain tensioner bolts	9
Engine oil cooler bolts	23
Oil baffle bolts	9
Oil drain plug (replace)	30
Oil level thermal sensor nut	9
Oil pump bolts	20
Oil pressure regulation valve bolts	9
Oil pressure switch bolt	20
Reduced oil pressure switch bolt	20
Suction line bolts	9

Upper Oil Pan Tightening Specifications



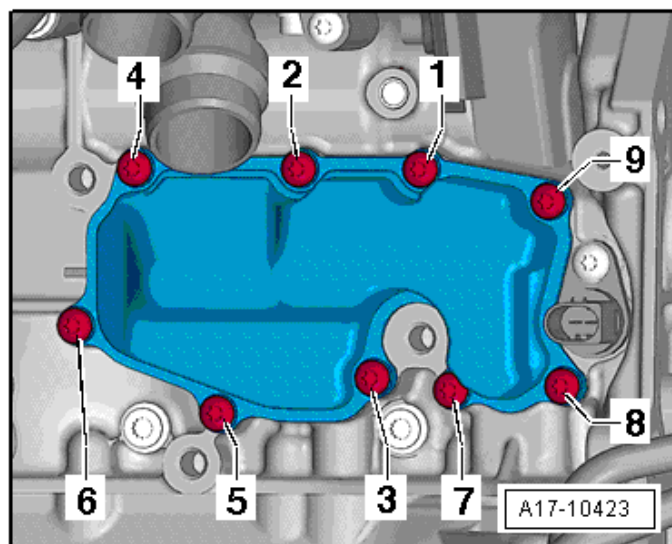
Step	Component	Nm
1	Tighten bolts 1 through 13 in sequence	15
2	Tighten bolts 1 through 13 in sequence	an additional 90° (¼ turn)

Oil Pan Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 19 in sequence	8
2	Tighten bolts 1 through 19 in sequence	an additional 45° (1/8 turn)

Oil Separator Tightening Specifications



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

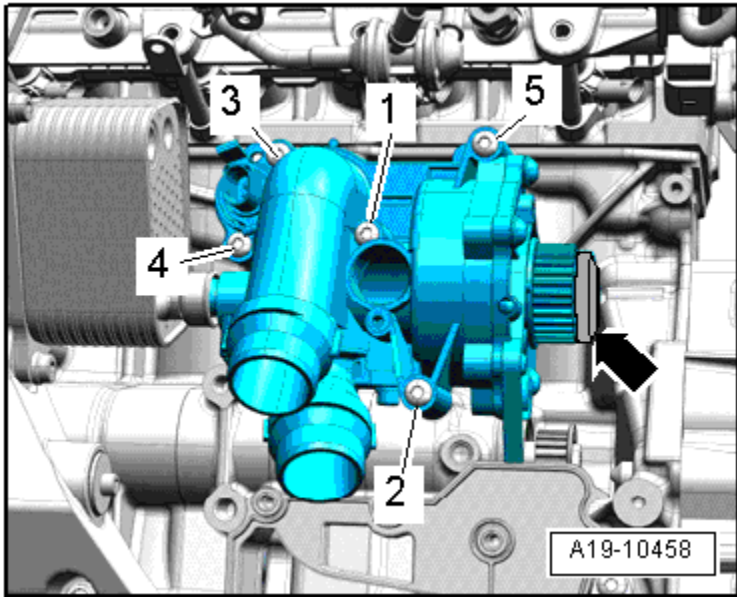
Engine Cooling – 2.0L CPMA, CHJA

Fastener Tightening Specifications

Component	Nm
Connecting piece	9
Coolant connection	9
Coolant fan control module	2.5
Fan rib to coolant fan	5
Front coolant line	6
Radiator bracket ¹⁾	4.5
	5.5
Retaining plate	4
Small coolant pipe	9
Toothed belt drive gear (replace fastener)	10 plus an additional 90° (¼ turn)
Toothed belt guard	9
Hybrid	
Bracket for low temperature circuit coolant pump to low temperature system coolant pump	20
Coolant pipe for electric drive power and control electronics bracket for low temperature circuit coolant pump	9
Coolant pipe to low temperature coolant circuit radiator frame	4.5
Low temperature coolant circuit radiator frame to condenser	8

¹⁾ For bolt tightening clarification, refer to ElsaWeb, Radiator and Coolant Fan Overview, items 17 and 19.

Coolant Pump Tightening Specifications



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

Fuel Supply – 2.0L CPMA, CHJA

Fastener Tightening Specifications

Component	Nm
Accelerator pedal module	8
EVAP canister	16
Fuel pump control module	2.5
Fuel tank nut/bolt	20
Fuel pump control module bolt	2.5
Fuel tank heat shield bolt	4
Leak detection pump air filter nut	5
Leak Detection Pump (LDP)-to-EVAP canister	4
Locking flange cover bolt	1.5
Locking ring	110
Mounting strap to fuel tank bolt	20
Securing strap	20

Turbocharger – 2.0L CPMA, CHJA

Fastener Tightening Specifications

Component	Nm
Air guide pipe nut	9
Brace	30
Bracket	30
Charge Air Cooler (CAC)	7
Clamp for air guide pipe	5.5
Clamping strip-to-engine, nut ⁵⁾	30
Connection	9
Coolant return line ³⁾	9
	35
Coolant supply line ²⁾	9
	35
Crankcase ventilation pipe	9
Fastening strip nut (replace fastener)	30
Hose clamp	5.5
Oil return pipe	9
Oil supply line-to-turbocharger ¹⁾	9
	30
Turbocharger recirculating valve	7
Turbocharger-to-support ⁴⁾	30
Charge air pressure sensor	5
Wastegate bypass regulator valve	3

¹⁾ For bolt tightening clarification, refer to ElsaWeb, Turbocharger Overview Part II, items 6, 8 and 9.

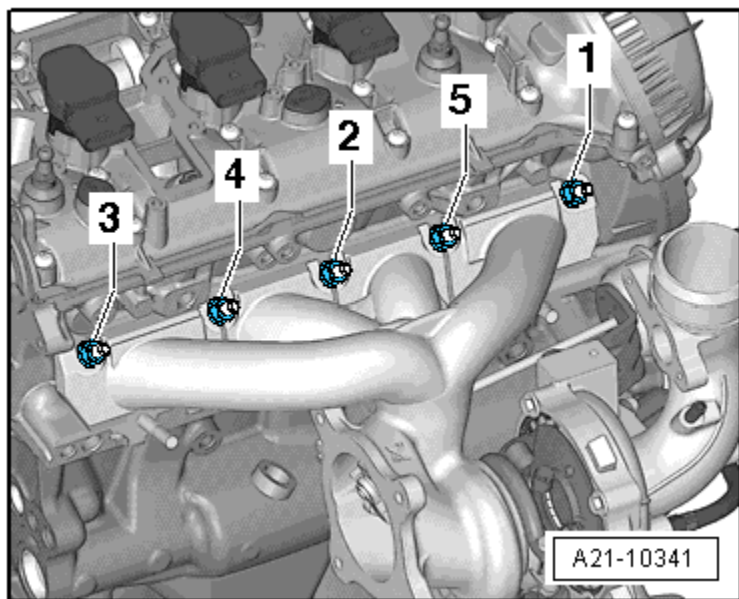
²⁾ For bolt tightening clarification, refer to ElsaWeb, Turbocharger Overview Part II, items 12, 13 and 14.

³⁾ For bolt tightening clarification, refer to ElsaWeb, Turbocharger Overview Part III, items 3 and 6.

⁴⁾ Coat the bolt with hot bolt paste; hot bolt paste, refer to the Parts Catalog.

⁵⁾ Coat the exhaust manifold stud bolts with hot bolt past; hot bolt paste, refer to the Parts Catalog

Turbocharger Tightening Specifications



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

Exhaust System – 2.0L CPMA, CHJA

Fastener Tightening Specifications

Component	Nm
Bracket for rear muffler	23
Bracket to secondary air injection pump motor, nuts ²⁾	8
	9
Catalytic converter nuts ¹⁾ (replace fastener)	25
	40
Clamping sleeve nut	25
Heat shield-to-pipe for secondary air	9
Rear muffler clamp-to-tail pipe	60
Secondary air injection solenoid valve	9
Secondary air heat shield to pipe	20
Suspended mount	23

¹⁾ For bolt tightening clarification, refer to ElsaWeb, *Muffler Overview*, items 10 and 12.

²⁾ For bolt tightening clarification, refer to ElsaWeb, *Secondary Air Injection System Overview*, items 13 and 14.

Fuel Injection and Ignition – 2.0L CPMA, CHJA

Technical Data

Engine data		2.0L Turbo FSI engine
Idle speed Idle speed cannot be adjusted, it is regulated by idle stabilization		640 to 800 RPM
Engine speed limitation via fuel injector shut-off		6500 RPM
Fuel pressure	Fuel supply pressure up to high pressure pump (produced as needed by an electric fuel pump in the fuel tank).	3.0 to 10.5 bar pressure
	Fuel high pressure (produced by a mechanical single piston pump) at approximately 85 degree coolant temperature.	30 to 150 bar pressure
Ignition System		Single coil ignition system with 4 ignition coils (output stages integrated) connected directly to spark plugs via the ignition cables. The ignition coils can be pulled out of the cylinder head using ignition coil puller T40039.
Ignition sequence		1-3-4-2

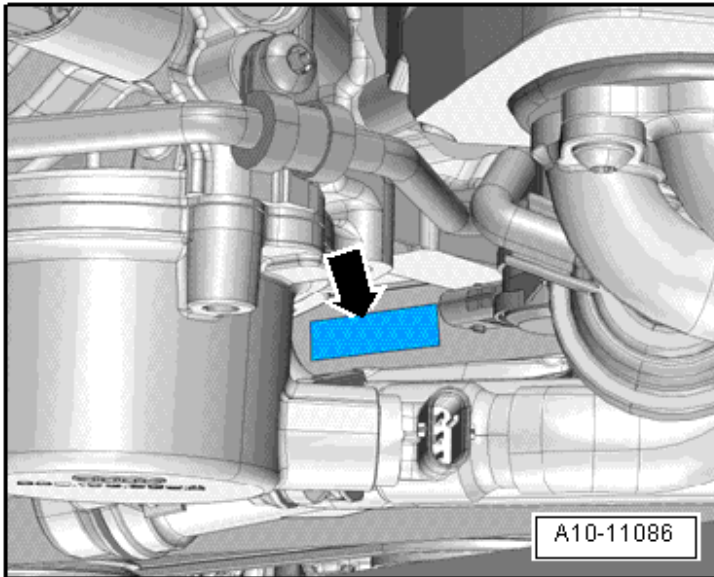
Fastener Tightening Specifications

Component	Nm
Adapter between high pressure fuel line and connecting piece	25
Air duct-to-lock carrier	2
Camshaft Position (CMP) sensor	10
E-Box cover	3.5
Engine speed sensor	4.5
Fuel pressure sensor	27
Fuel supply line connectors (replace fastener)	40
Fuel supply line union nut	27
High pressure fuel line	27
High pressure pump bolts	20
Intake Air Temperature (IAT) sensor	5
Intake manifold	9
Intake manifold support nut	10
Intake manifold support bolt	23
Knock Sensor (KS)	20
Oxygen Sensor (O2S)	55
Spark plug	30
Throttle valve control module	7

ENGINE MECHANICAL – 3.0L CTUC

General, Technical Data – 3.0L CTUC

Engine Number Location



The engine number (engine code and serial number) is located at front on cylinder block, below the right cylinder head (1➡).

Engine codes beginning with “C” are four-digit.

The first 3 digits of the engine code are for displacement and mechanical structure of the engine and are stamped on the cylinder block. The fourth digit describes the engine output and torque.

Engine Data

Identification codes		CTUC
Displacement	liter	2.995
Output	kW at RPM	200/4800 to 6500
Torque	Nm at RPM	400/2250 to 4250
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
Turbocharger		No
Knock control		2 sensors
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 permitted but performance is reduced.

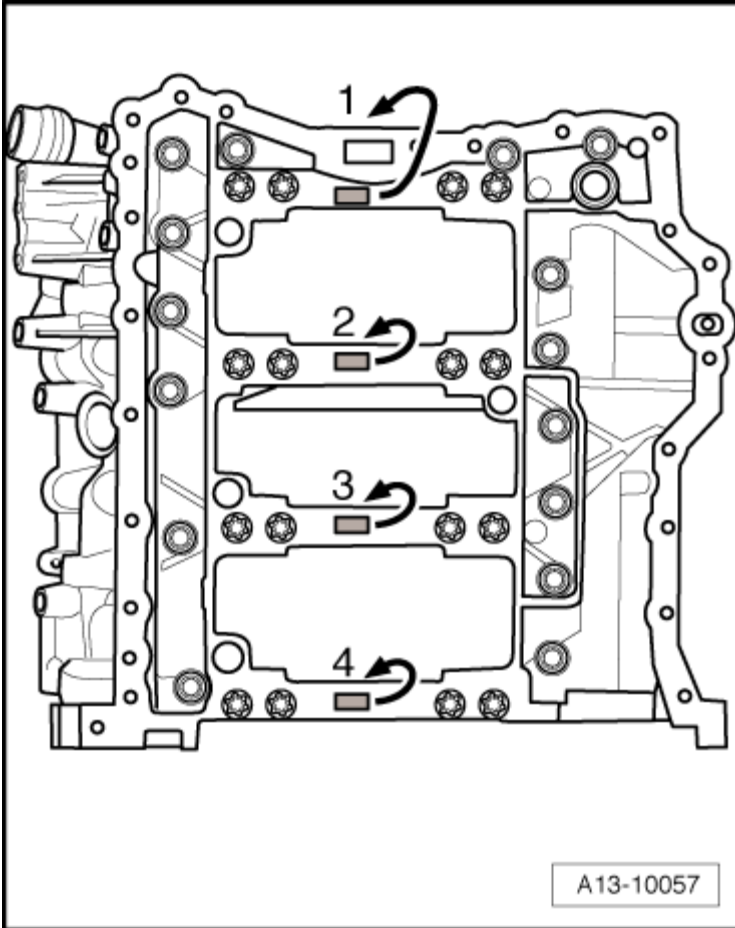
Engine Assembly – 3.0L CTUC

Fastener Tightening Specifications

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

Crankshaft, Cylinder Block – 3.0L CTUC

Allocation of Crankshaft Bearing Shells for Cylinder Block

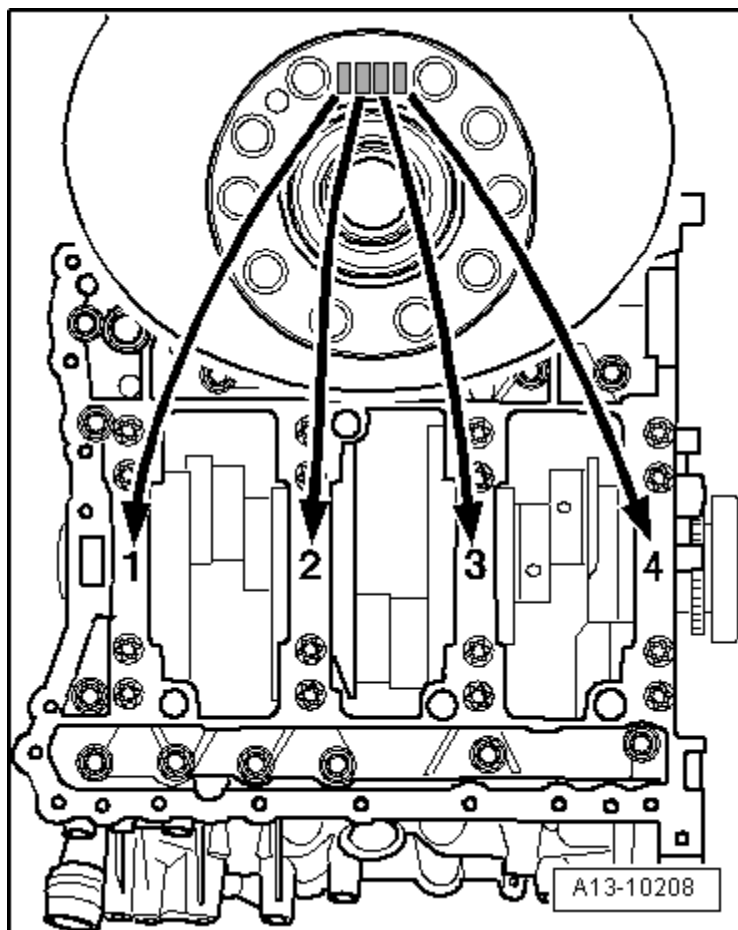


The bearing shells are allocated to the cylinder block with the correct thickness from the factory. Colored dots on the sides of the bearing shells identify the bearing shell thickness.

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



The bearing shells are allocated to the guide frame with the correct thickness from 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.

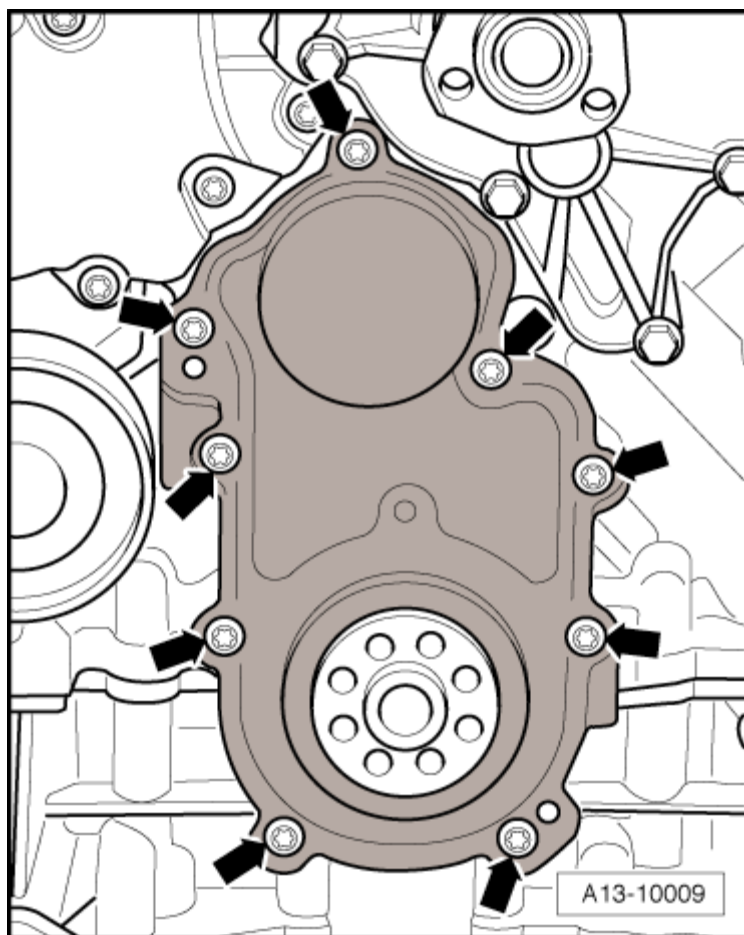
Letter on guide frame	Color of bearing
R	Red
G	Yellow
B	Blue
S	Black

Fastener Tightening Specifications

Component	Nm
Connecting rod bearing cap-to-connecting rod bolt (replace fastener)	50 plus an additional 90° (¼ turn)
Coolant pump-to-engine bolt	9
Drive plate (replace fastener)	60 plus an additional 90° (¼ turn)
Idler roller-to-coolant pump bolt	40
Idler roller-to-supercharger bolt	40
Marking locking bolt	14
Oil pressure regulation valve-to-engine bolt	9
Oil spray jet bolt	9
Tensioner for the ribbed belt-to-engine bolt	40
Vibration damper-to-engine bolt (replace fastener)	20 plus an additional 90° (¼ turn)

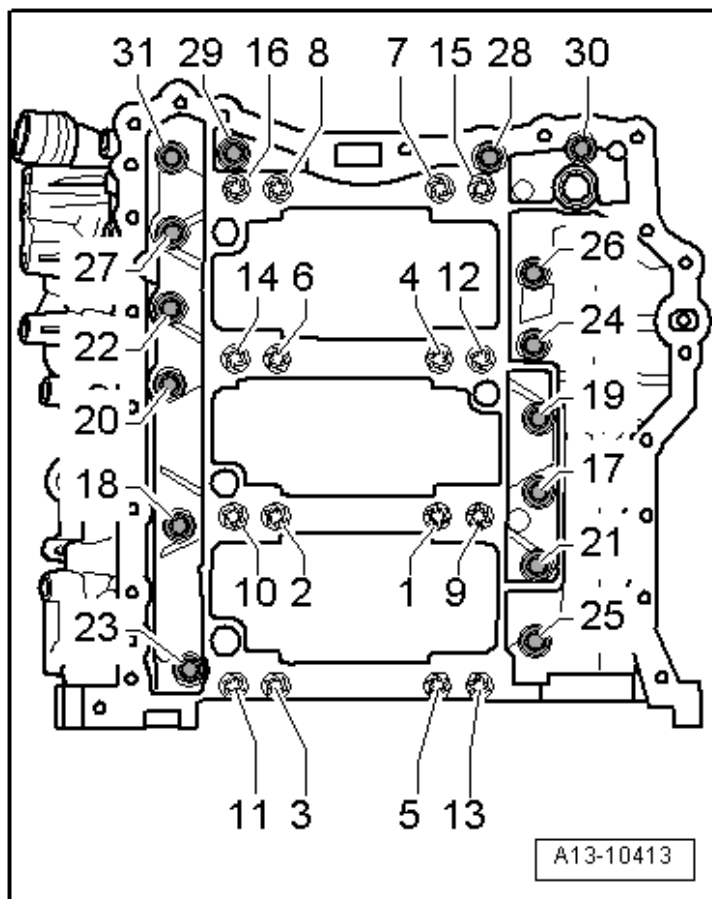
¹⁾ Insert bolt with locking compound.

Ribbed Belt Sealing Flange Tightening Specification



Component	Nm
Tighten the bolts → in a diagonal sequence	9

Guide Frame Tightening Specifications



Replace the guide frame bolts and insert the long bolts in the inner rows of the guide frame.

Step	Component	Nm
1	Tighten bolts 1 through 16 in sequence	50
2	Tighten bolts 1 through 16 in sequence	an additional 90° (¼ turn)
3	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 gap	Wear limit
1 st compression ring	0.20 to 0.30	0.80
2 nd compression rings	0.50 to 0.70	0.80
Oil scraping ring	0.25 to 0.50	Not determined yet

Piston Ring Clearance

Piston ring Dimensions in mm	New	Wear limit
1 st compression ring	0.04 to 0.08	0.20
2 nd compression rings	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.

Compression Checking Specifications

Compression pressure	Bar pressure
New	10.0 to 14.0
Wear limit	9.0
Maximum difference between cylinders	30

Cylinder Head, Valvetrain – 3.0L CTUC

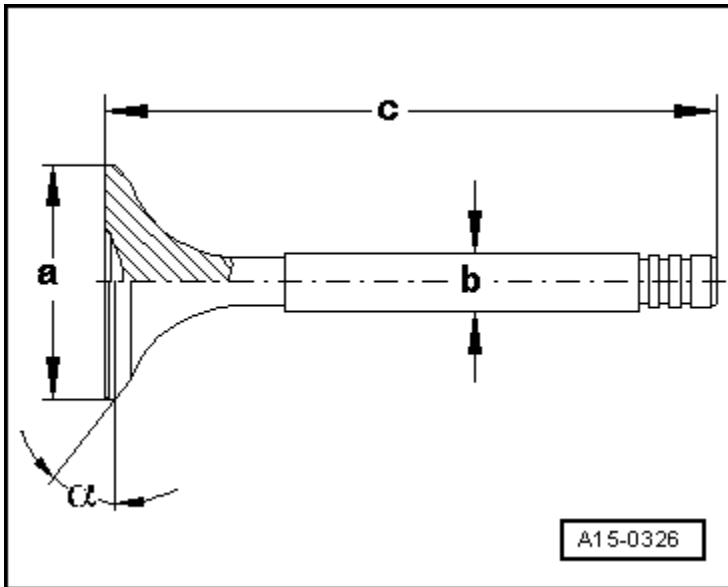
Fastener Tightening Specifications

Component	Nm
Balance shaft belt pulley side-to-balance shaft bolt	60
Balance shaft chain sprocket ²⁾	15 plus an additional 90° (¼ turn)
Balance shaft transmission side-to-balance shaft bolt	60
Bearing plate for the right camshaft timing chain drive sprocket bolt ²⁾	8 plus an additional 45° (⅕ turn)
Camshaft adjustment solenoid valve-to-cylinder head	5
Camshaft chain sprocket bolt ²⁾	80 plus an additional 90° (¼ turn)
Chain tensioner for the left camshaft control chain-to-engine bolt	9
Chain tensioner for the right camshaft timing chain-to-engine bolt	9
Chain tensioner for timing mechanism drive chain-to-engine bolt	9
Chain tensioner with glide track-to-engine bolt	10 plus an additional 45° (⅕ turn)
Drive chain sprocket for the oil pump-to-engine bolt	30 plus an additional 90° (¼ turn)
Gear carrier bolt	13
Glide track-to-engine bolt ²⁾	10 plus an additional 90° (¼ turn)
Mounting pin for the drive chain sprocket bolt-to-engine bolt ^{1) 2)}	5 plus an additional 60° (⅙ turn)
Mounting pin for the drive chain sprocket bolt-to-engine bolt ^{1) 2)}	30 plus an additional 90° (¼ turn)
Oil dipstick guide tube-to-engine bolt	9

¹⁾ For bolt tightening clarification, refer to ElsaWeb, Timing Mechanism Drive Chain Overview, items 1 and 8.

²⁾ Replace fastener

Valve Dimensions

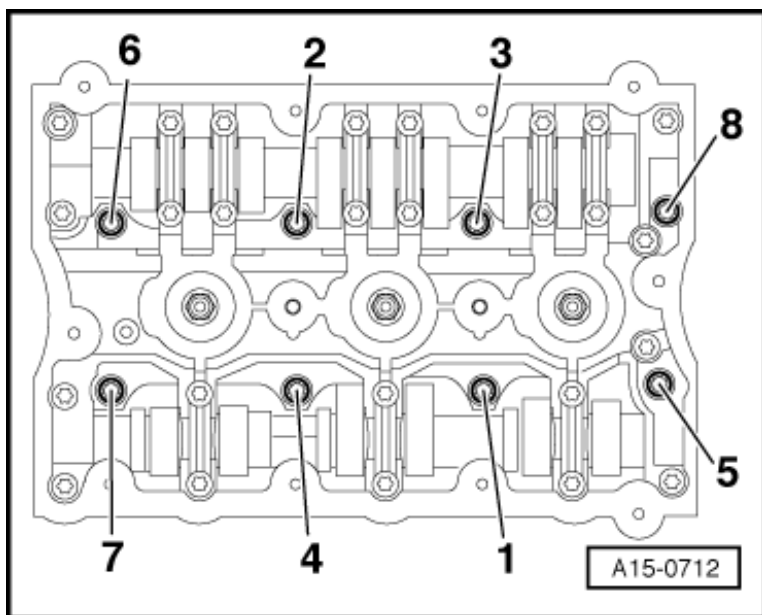


Dimension		Intake valve	Exhaust valve
Diameter a	mm	33.85 ± 0.10	28.0 ± 0.1
Diameter b	mm	5.98 ± 0.01	5.96 ± 0.01
c	mm	104.0 ± 0.2	101.9 ± 0.2
α	$^{\circ}$	45	45

WARNING

- Risk of injury if exhaust valves with sodium filling are disposed of improperly.
- Cut exhaust valve with sodium filling into 2 parts using a metal saw between the shaft center and valve plate. While doing this, do not come into contact with water.
- Throw, at the most, 10 such sawed exhaust valves in a bucket filled with water and step back immediately.
- When there is contact with water, a sudden chemical reaction occurs which burns the sodium filling.
- The treated parts may then be discarded through conventional disposal channels.

Cylinder Head Tightening Specifications

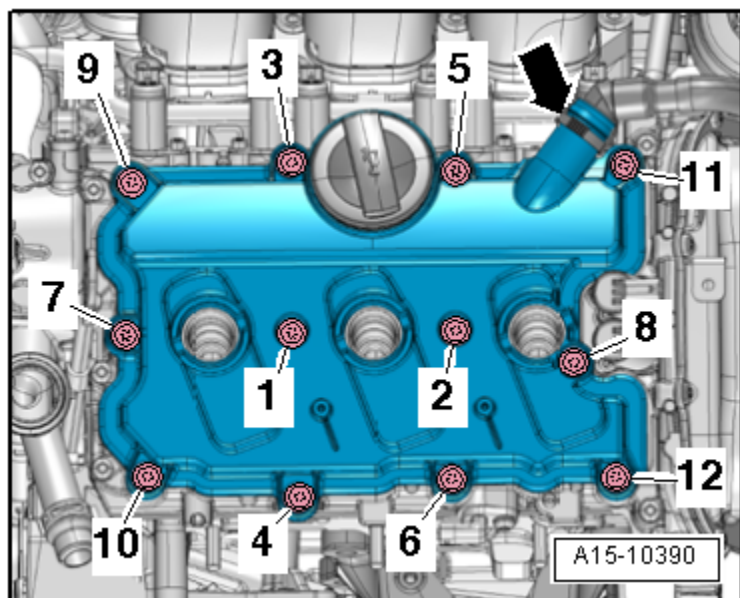


Engine –
3.0L CTUC

Replace any bolts that were tightened with an additional turn.

Step	Component	Nm
1	Insert 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)

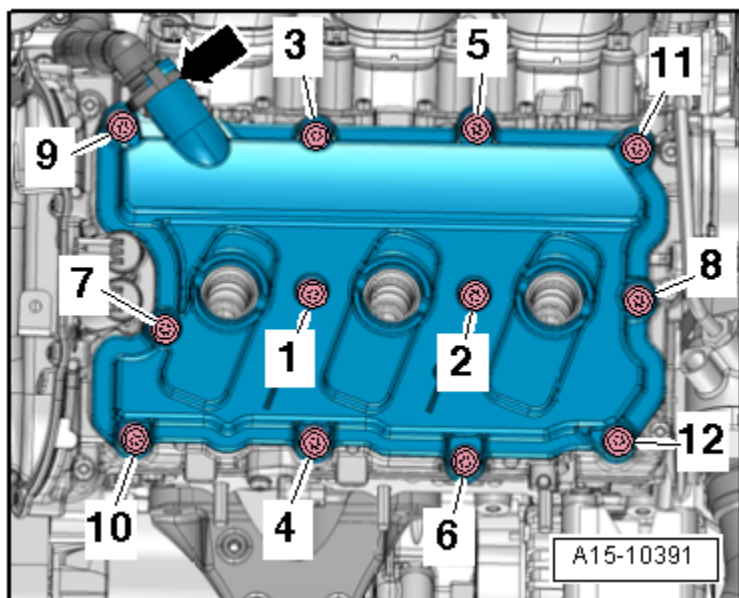
Left Cylinder Head Cover Tightening Specification



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

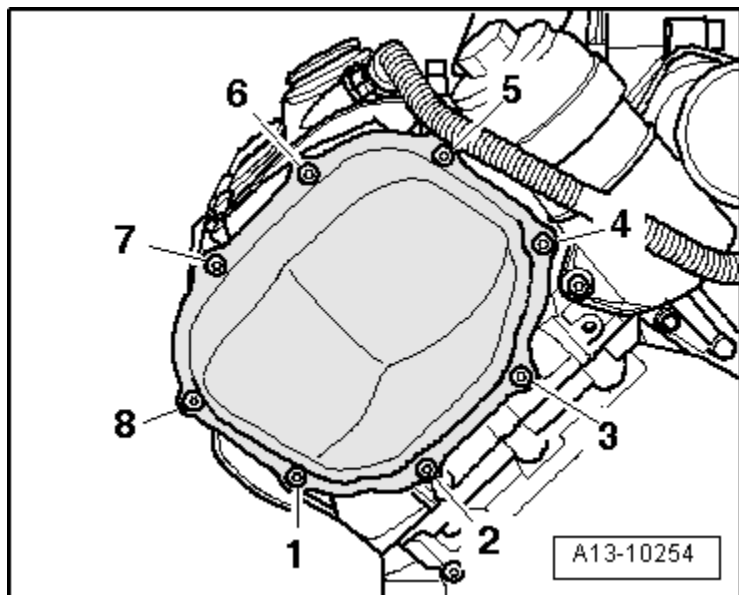
Right Cylinder Head Cover Tightening Specification

Engine –
3.0L CTUC



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

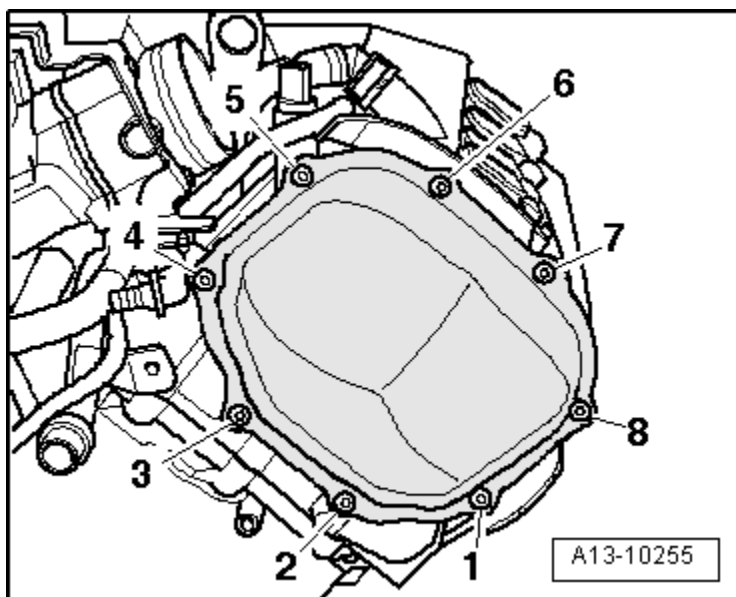
Left Timing Chain Cover Tightening Specifications



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

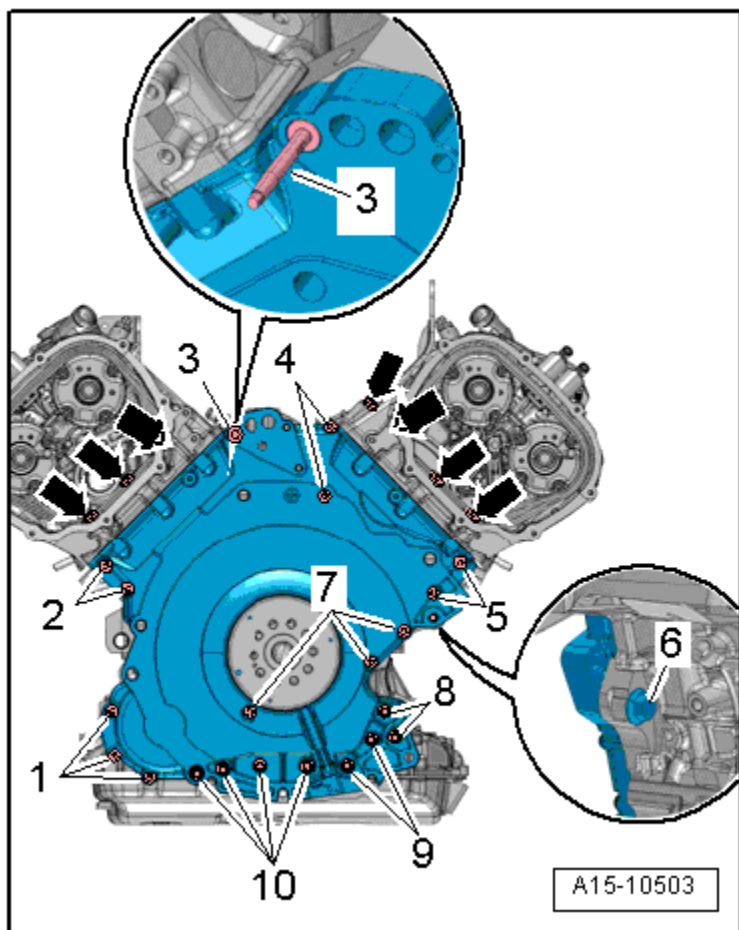
Right Timing Chain Cover Tightening Specifications

Engine –
3.0L CTUC



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

Lower Timing Chain Cover Tightening Specifications

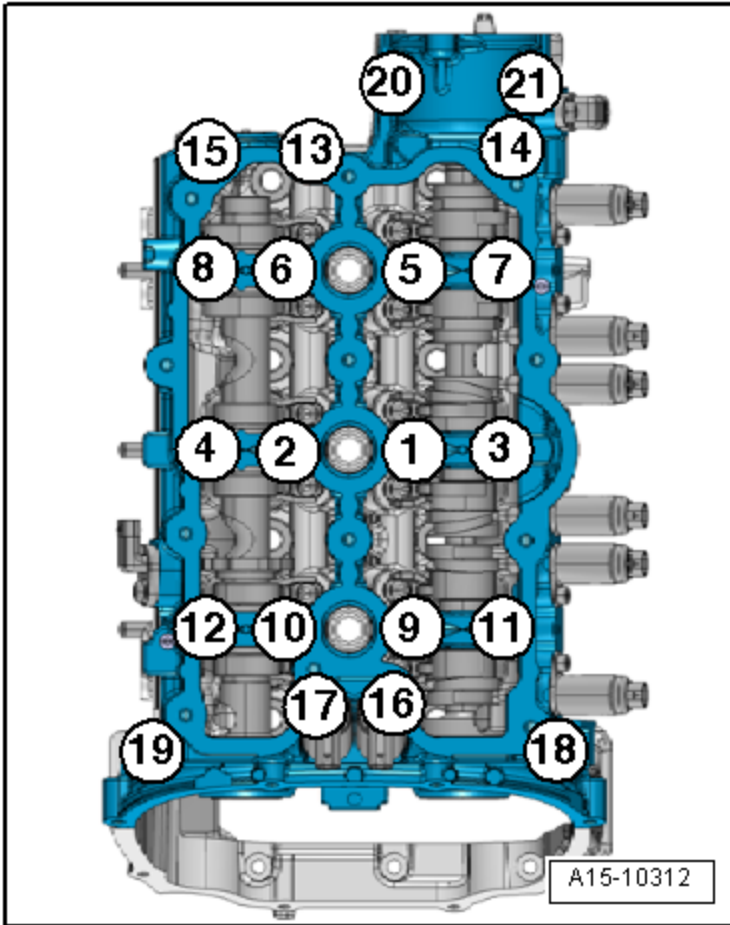


Replace any bolts that were tightened with an additional turn.

Step	Component	Nm
1	Insert the bolts (➔) and tighten	3
2	Tighten bolts 1 through 10 in sequence diagonally	3
3	Tighten bolts 1, 2, 4, 5, 7	an additional 90° turn
4	Tighten bolts 8, 9 and 10	9
5	Tighten bolt 3	8
6	Tighten bolt 6	an additional 90° turn

Step	Component	Nm
7	Tighten bolt 3	16
8	Tighten bolt 6	20
9	Tighten bolt 6	an additional 180° turn

Camshaft Guide Frame Tightening Specifications



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

Engine Lubrication – 3.0L CTUC

Fastener Tightening Specifications

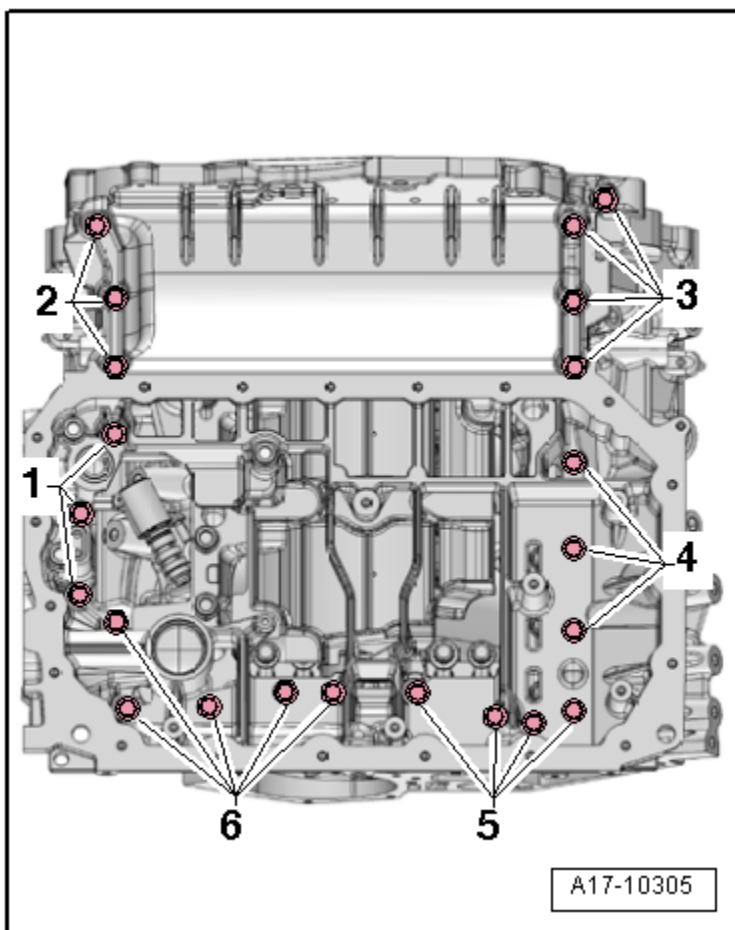
Component	Nm
Bracket-to-upper oil pan bolt	9
Chain sprocket for the oil pump bolt (replace fastener)	30 plus an additional 90° (¼ turn)
Chain sprocket for the oil pump bolt	2.5
	9
Chain sprocket for the oil pump bolt	9
Drain plug-to-engine	20
Engine oil cooler bolt (replace fastener)	3 plus an additional 90° (¼ turn)
	9
Lower oil baffle-to-upper oil pan bolt	9
Oil drain plug	30
Oil filter housing cap	25
Oil filter housing	
- Bolt	13
- Collar Nut	13
- Bolt	9
Oil level thermal sensor-to-lower oil pan nut	9
Oil pressure switch	20
Oil pump-to-upper oil pan	20
Upper oil baffle to upper oil pan bolt (replace fastener)	30 plus an additional 90° (¼ turn)

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

²⁾ For bolt tightening clarification, refer to ElsaWeb, *Oil Separator, Crankcase Ventilation Overview*, items 4 and 8.

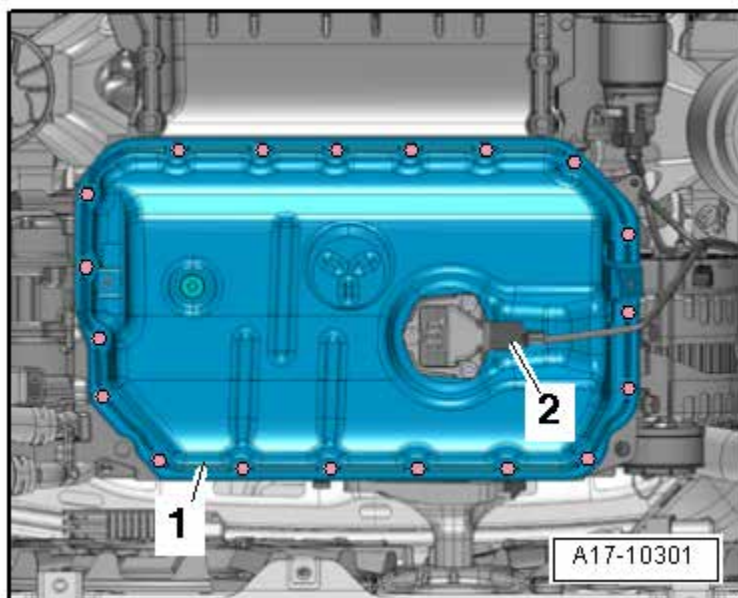
Upper Oil Pan Tightening Specifications

Engine –
3.0L CTUC



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

Oil Pan Tightening Specifications



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

Cooling System – 3.0L CTUC

Fastener Tightening Specifications

Component	Nm
Bracket for left front coolant pipes	22
Bracket for left cooler for charge air cooling circuit ³⁾	
- Bolt	6
- Nuts	9
- Bolt	23
Connection for coolant hose to engine	9
Coolant pump to engine	9
Coolant thermostat-to-engine	9
Engine temperature control temperature sensor	3
Fan shroud-to-radiator	3.5
Fan wheel-to-coolant fan	5
Front charge air cooling circuit radiator	4.5
Front coolant pipe bolts ¹⁾	2.5
	9
Idler roller for the ribbed belt	40
Left coolant pipes ²⁾	3 plus an additional 90° (¼ turn)
Left front coolant pipes-to-engine	9
Lower coolant pipe on the supercharger	5
Radiator bracket	5
Ribbed belt pulley-to-coolant pump	20
Rubber buffer	4.5
Upper coolant pipe on the supercharger	5
Upper coolant pipe-to-engine	5

¹⁾ For bolt tightening clarification, refer to ElsaWeb, *Coolant Pipes Overview*, item 7 and 27.

²⁾ Replace fasteners.

³⁾ For bolt tightening clarification, refer to ElsaWeb, *Left Charge Air Cooling Circuit Radiator, Charge Air Cooling Pump Overview*, items 1, 9 and 10.

Turbocharger, Supercharger – 3.0L CTUC

Fastener Tightening Specifications

Component	Nm
Bleeder screw for the left charge air cooler bolt	1.5 to 3.0
Bracket for change-over valves-to-supercharger bolt	9
Charge air pressure sensor bolt ¹⁾	10
Drive head-to-supercharger housing bolt ¹⁾	25
Engine lifting eye-to-supercharger bolt	27
Insulation plate-to-supercharger bolt	5
Left charge air cooler bolt ¹⁾	10
Right charge air cooler bolt ¹⁾	10
Threaded pin nut	20
Threaded pin-to-engine bolt	17

¹⁾ Replace fasteners.

Exhaust System, Emission Controls – 3.0L CTUC

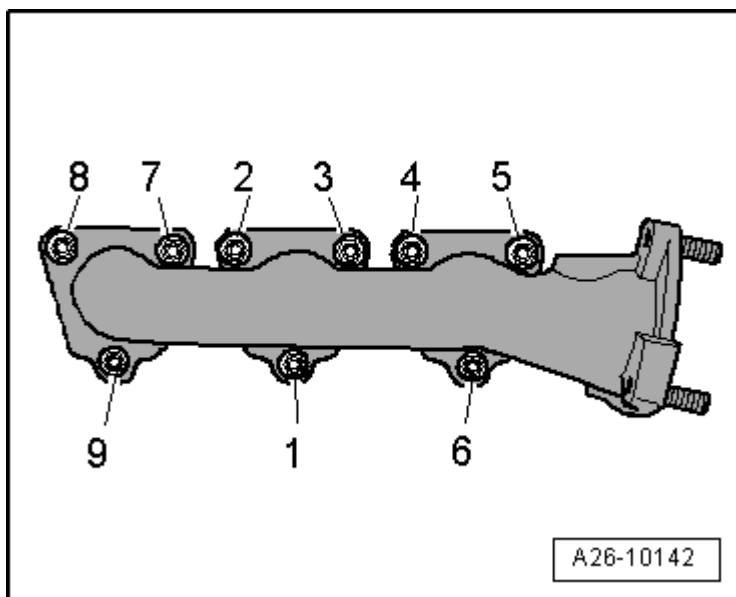
Fastener Tightening Specifications

Component	Nm
Bracket for Secondary Air Injection (AIR) hose	9
Bracket for Secondary Air Injection (AIR pump motor	9
Bonded rubber bushing to bracket nut	9
Catalytic converter to exhaust manifold nut ¹⁾²⁾	23
Catalytic converter to front muffler nut	23
Center muffler nut ¹⁾	20
Exhaust door control unit to muffler nut	3
Heat shield	9
Left Secondary Air Injection (AIR combination valve	9
Right Secondary Air Injection (AIR combination valve	9
Secondary air combination valve heat shield	9
Secondary air hose bolt	9
Suspended mount bolt	23

¹⁾ Replace fasteners.

²⁾ Coat the thread with hot bolt paste.

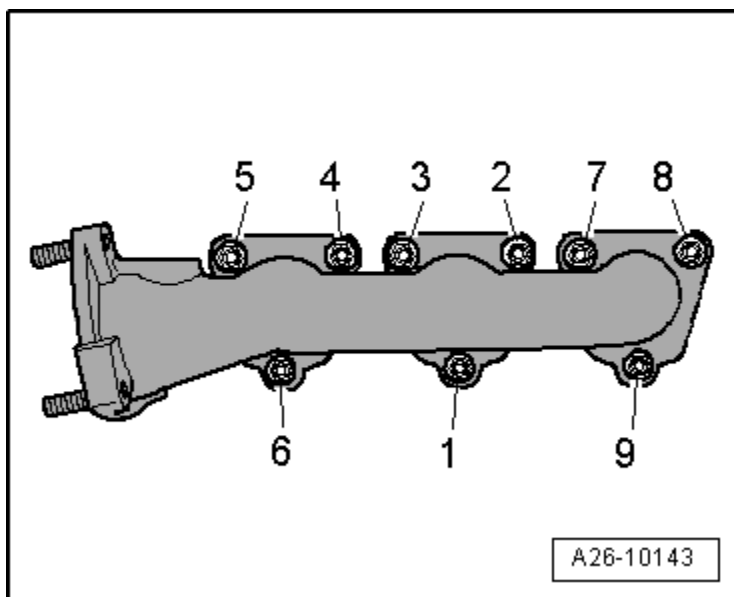
Left Exhaust Manifold Tightening Specifications



Engine –
3.0L CTUC

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

Right Exhaust Manifold Tightening Specifications



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

Fuel Supply – 3.0L CTUC

Fastener Tightening Specifications

Component	Nm
Accelerator pedal module-to-pedal bracket bolt	8
EVAP canister-to-bracket bolt	16
Fuel tank nut/bolt	20
Fuel pump control module bolt	2.5
Fuel tank heat shield bolt	4
Leak detection pump air filter nut	5
Leak detection pump-to-Evaporative Emission (EVAP) canister bolt	4
Locking flange cover bolt	1.5
Locking ring bolt	110
Mounting strap to fuel tank bolt	20
Securing fuel filler tube and the ground connection bolt	20

Fuel Injection and Ignition – 3.0L CTUC

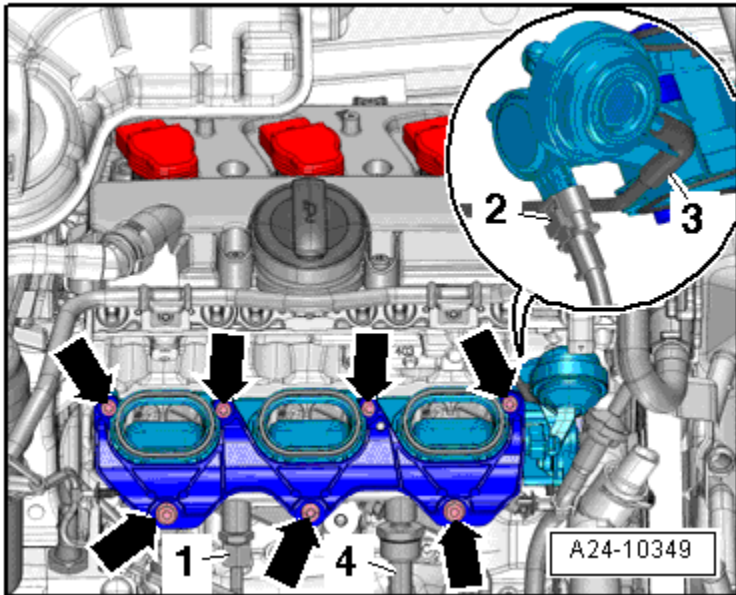
Ignition Technical Data

Engine data	3.0L TFSI
Idle speed	Cannot be adjusted, it is regulated by idle stabilization
Ignition timing	Not adjustable, regulated by Engine Control Module (ECM)
Ignition/glow plug system	Single coil ignition system with 6 ignition coils (output stages integrated) connected directly to the spark plugs via the ignition cables.
Ignition sequence	1-5-3-6-2-4

Fastener Tightening Specifications

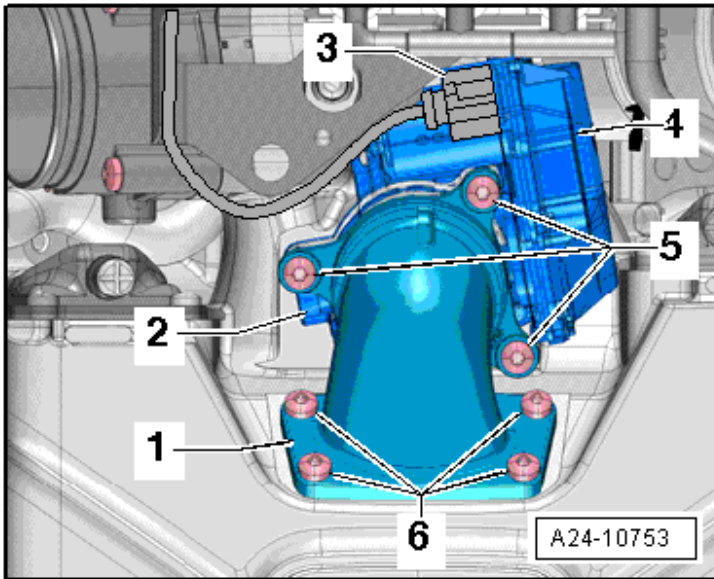
Component	Nm
Air Filter Housing Upper Section Bolt	1.5
Air Guide to Lock Carrier Bolt	2
Camshaft Position Sensor Bolt	9
Engine Speed Sensor Bolt	9
Fuel Line Bracket Bolt	9
Fuel Line to Fuel Rail Threaded Connection	40
Fuel Pressure Sensor	22
Fuel Rail Bracket Bolt	2.5
Fuel Supply Hose to High Pressure Pump Threaded Connection	27
Heat Shield Double Stud to High Pressure Pump	9
High Pressure Line	25
Ignition Coil Harness Retainer Bolt	5
Intake Air Temperature Sensor/Manifold Absolute Pressure Sensor	10
Intake Manifold Runner Position Sensor Bolts	2.5
Knock Sensor Bolt	25
Low Fuel Pressure Sensor	15
Oxygen Sensor	55
Throttle Valve Control Module (diagonal sequence)	10

Lower Intake Manifold Tightening Specifications



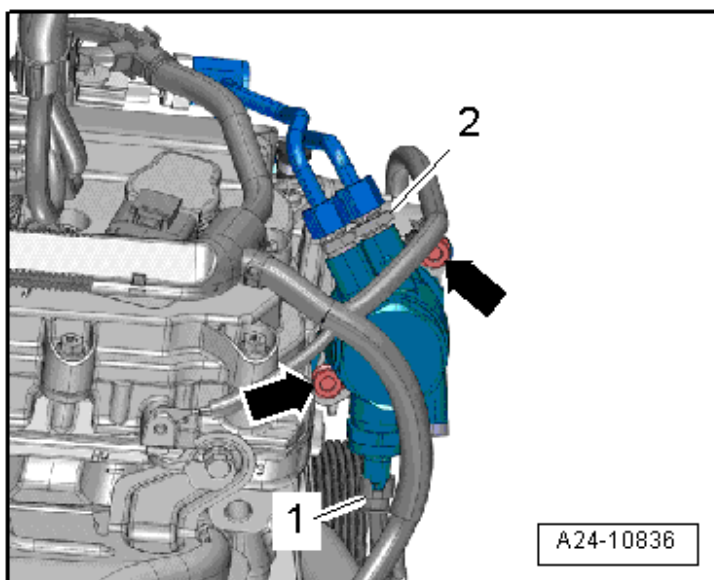
Component	Nm
Lower intake manifold-to-cylinder head (➔) (tighten diagonally)	9

Control Valve Control Module Tightening Specification



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

Control Valve Control Module Tightening Specification

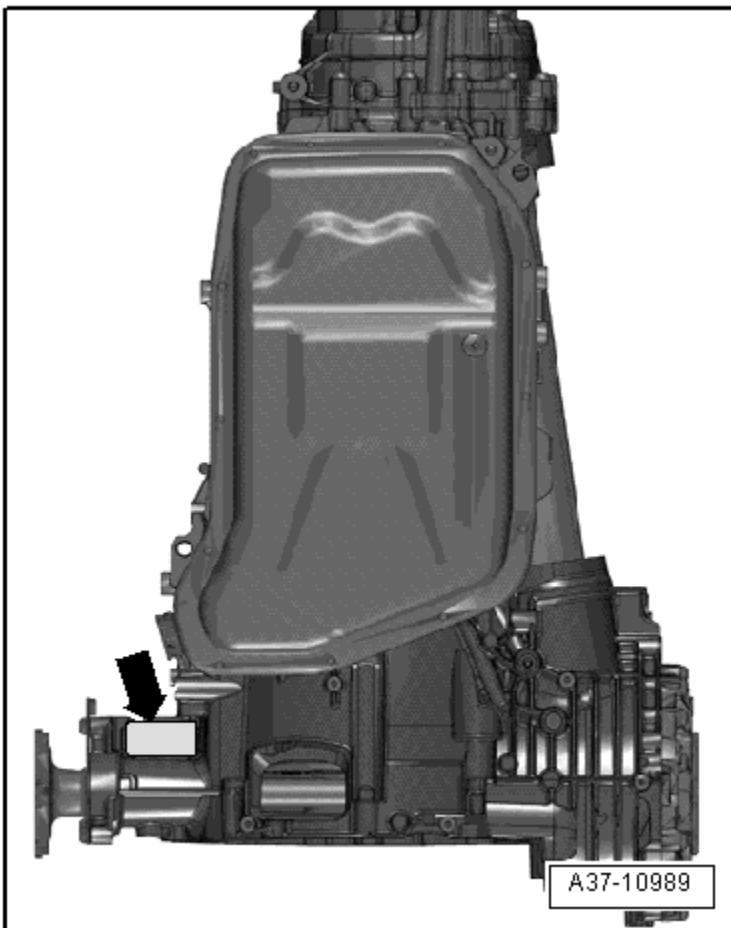


Step	Component	Nm
1	Tighten (➡)	Hand-tighten
2	Tighten (➡) in steps	9

AUTOMATIC TRANSMISSION – 0BK

General, Technical Data – 0BK

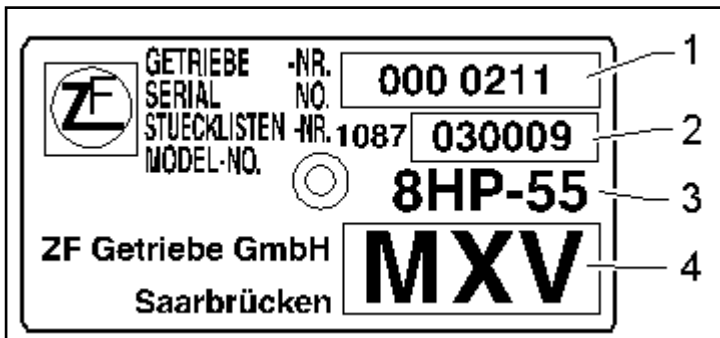
Transmission Identification



Automatic Trans. –
0BK

Transmission code letters are located on the data plate under the transmission. Type plate installed location ➔.

Transmission Code and Transmission Serial Number



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

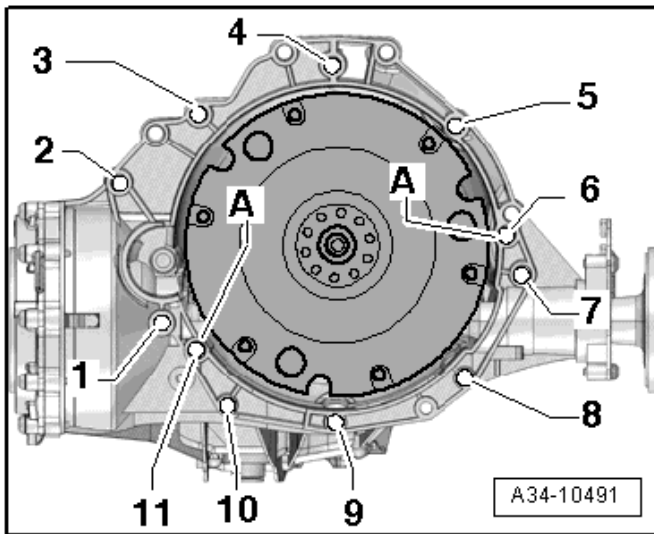
Note: The transmission code letters are also included on the vehicle data labels.

Code Letters, Transmission Allocations, Ratios and Equipment

Automatic Transmission			0BK AWD	
Transmission	Identification codes		MXV	NEV
	Month of manufacture	from through	06.2010 07.2010	07.2010
Torque converter	Identification codes		NW235	NW235
Allocation	Type		Audi Q5 from MY 08	Audi Q5 from MY 08
	Engine		2.0L TFSI - 155 kW	2.0L TFSI - 155 kW
Primary drive			33:29 = 1.138	33:29 = 1.138
Gear wheel front axle			31:29 = 1.069	31:29 = 1.069
Front axle bevel gear			34:11 = 3.091	34:11 = 3.091
Complete front axle ratio = primary drive x drive wheel x bevel gear			3.760	3.760
Rear axle bevel gear			43:13 = 3.308	43:13 = 3.308
Complete rear axle ratio = rear axle bevel gear x primary drive			3.764	3.764
Oil system, front final drive/ transfer case			Separated	Separated

Controls, Housing – 0BK

Securing Transmission to Engine



Automatic Trans. –
0BK

Item	Bolt	Nm
1 ¹⁾	M10 x 50 ²⁾	65
2 ¹⁾ , 7	M12 x 100 ³⁾	30 plus an additional 90° (¼ turn)
3 ⁴⁾ , 6	M12 x 75 ³⁾	30 plus an additional 90° (¼ turn)
4, 5 ⁴⁾	M12 x 120 ³⁾	15 plus an additional 90° (¼ turn)
8, 10	M10 x 75 ³⁾	15 plus an additional 90° (¼ turn)
9	M10 x 60 ³⁾	15 plus an additional 90° (¼ turn)
11 ⁵⁾	M12 x 50 ³⁾	30 plus an additional 90° (¼ turn)
A	Alignment sleeves for centering	

¹⁾ Also secures the starter.

²⁾ Bolt strength rating 10.9, there is no limit to the number of times steel bolts can be used.

³⁾ The aluminum bolts can be used twice.

⁴⁾ With a bracket for the wires.

⁵⁾ Installed from the engine side.

Securing Transmission to Engine (*cont'd*)

Aluminum bolts 2 through 11 can only be used twice. After using the bolts once, use a chisel and mark the bolts with two notches (X).

To prevent damaging the bolts when marking them, do not clamp them in a vise. Use a ½" drive 14 mm socket and extension clamped into a vice. Do not use bolts that have been marked with an X.

Fastener Tightening Specifications

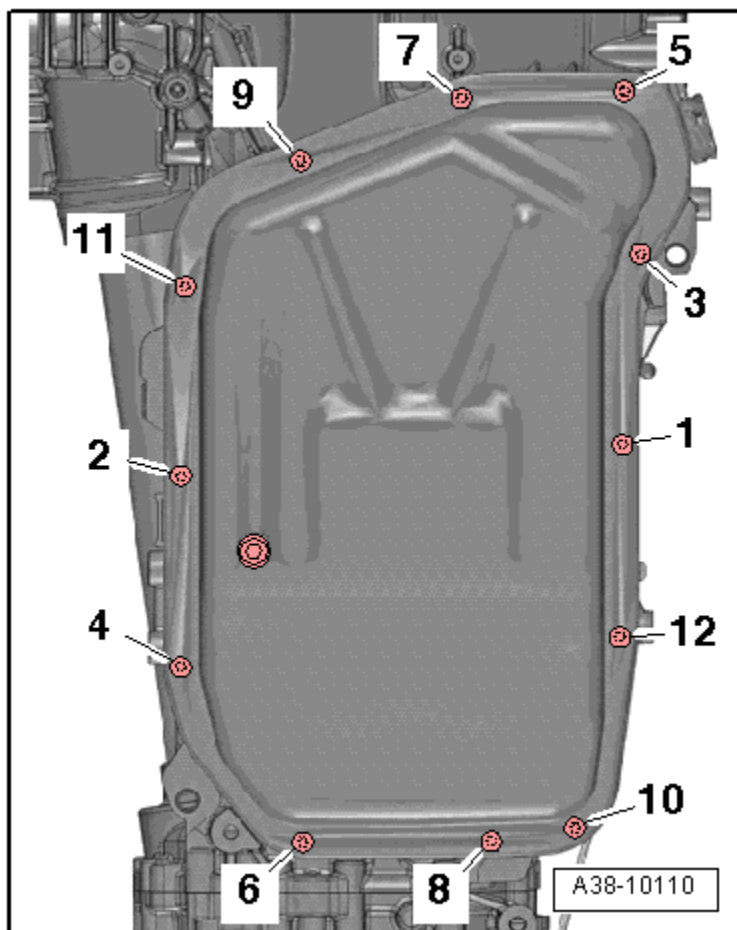
Component	Fastener size	Nm
ATF drain plug (replace fastener)		12
ATF plug for the hole for checking and filling (replace fastener)		30
Bolts and nuts	M6	9
	M7	15
	M8	20
	M10	40
	M12	65
Drain plug for the hole for checking and filling the transmission fluid inside the transfer case		12
Drain plug for the hole for checking and filling the transmission fluid inside the front final drive		30
Drive axle heat shield		23
Oil drain plug for the transmission fluid inside the transfer case		30
Oil drain plug for the transmission fluid inside the front final drive		12
Selector mechanism function unit to the body nut		10

Gears, Hydraulic Controls – 0BK

Fastener Tightening Specifications

Component	Nm
Connector housing	5.5
Mechatronic connector-to-transmission housing	10
Transmission output speed sensor-to-transmission housing	10

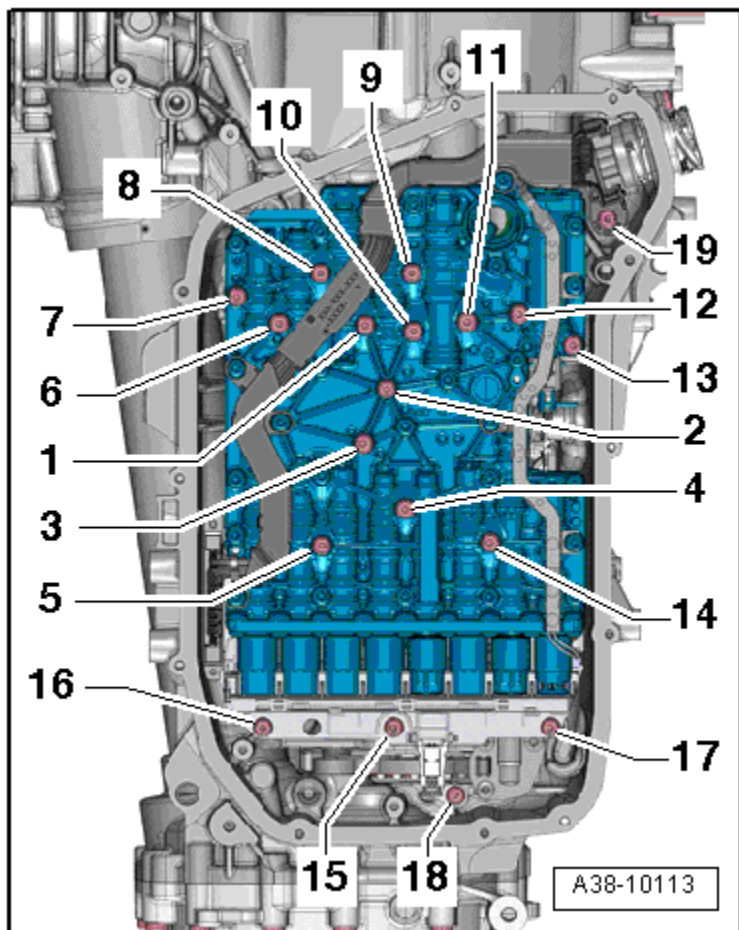
ATF Oil Pan Tightening Specifications and Sequence



Automatic Trans. –
0BK

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° (1/8 turn)

Mechatronic Tightening Specification

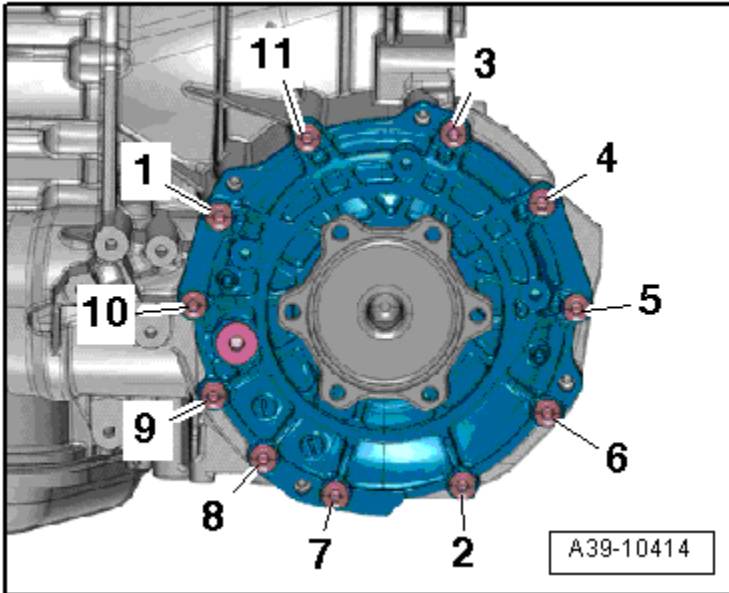


Bolts -18- and -19- are shorter. Bolt -18- attaches the transmission output speed sensor -G195- to the transmission housing. Bolt -19- attaches the Mechatronic connector to the transmission housing.

Component	Nm
Tighten bolts 1 through 19 in sequence	10

Rear Final Drive, Differential – 0BK

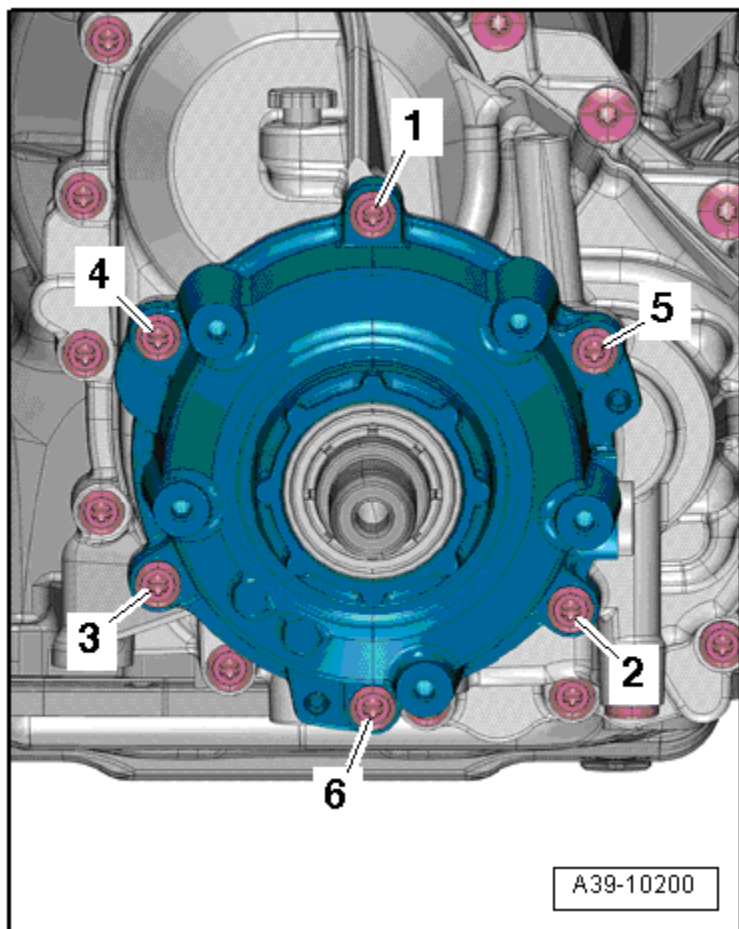
Front Final Drive Cover Tightening Specifications



Automatic Trans. –
0BK

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

Center Differential Housing Tightening Specifications



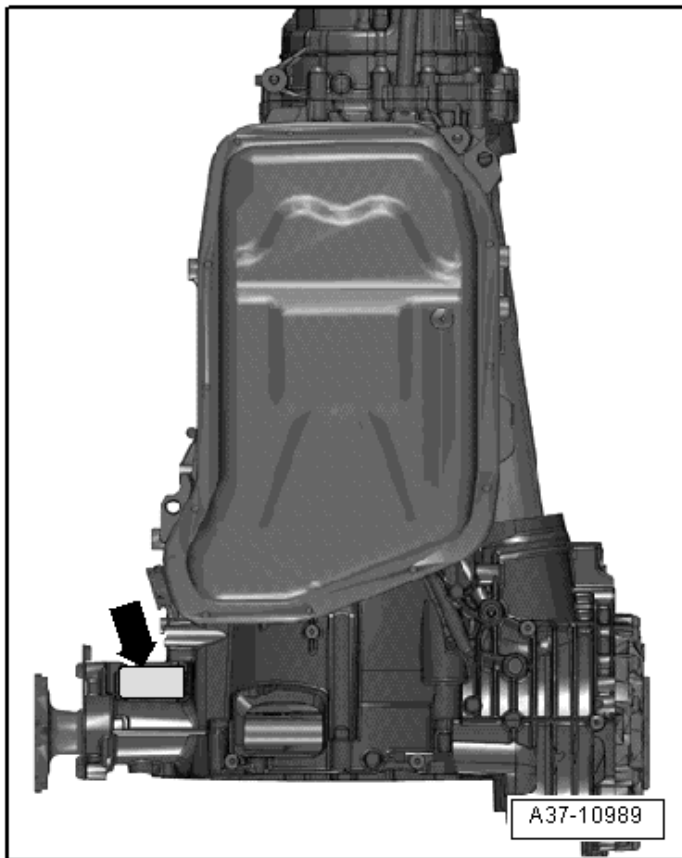
Replace the center differential housing bolts.

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

AUTOMATIC TRANSMISSION – 0BW

General, Technical Data – 0BW

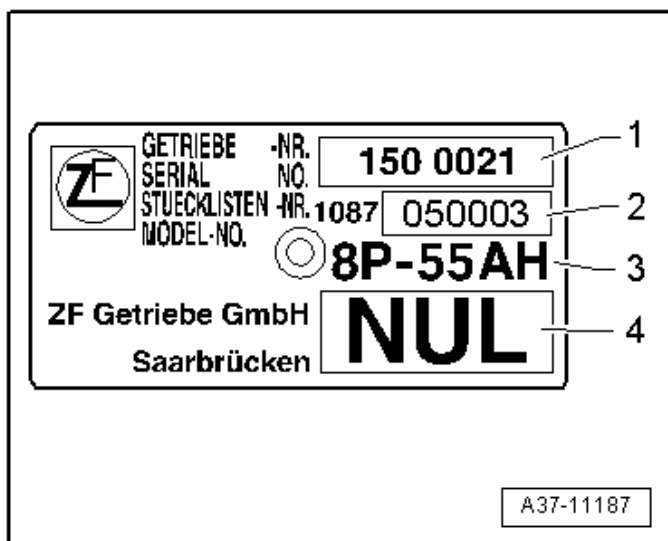
Transmission Identification



Transmission code letters are located on the data plate under the transmission. The data plate is installed at ➔

Automatic Trans. –
0BW

Transmission Code Letters and Serial Numbers



Example:	
1	Transmission serial number
2	Parts list number
3	Manufacturer transmission identification: 8P55AH
4	Transmission code letters, for example: KRL

Note: The transmission code is also listed on the vehicle data plate.

Specifications – Engine Codes, Allocation, Ratios and Capacities

Automatic Transmission			8 Speed Automatic 0BW Hybrid AWD
Transmission	Identification code		KGE
	Month of production	from to	06.2011
Allocation	Model		Audi Q5 from MY 08
	Engine		2.0L TFSI - 155 kW
Primary drive			33:29 = 1.138
Front axle helical gear			31:29 = 1.069
Front axle bevel gear			34:11 = 3.091
Complete front axle ratio = primary drive x helical gear drive x bevel gear drive			3.760
Rear axle bevel gear			43:13 = 3.308
Complete rear axle ratio = Rear axle bevel gear x primary drive			4.220
Oil system, front final drive/transfer case			Separated

Controls, Housing – 0BW

Fastener Tightening Specifications

Component	Fastener size	Nm
ATF Drain Plug ²⁾	-	12
ATF Pipe, Nut	-	29
ATF Pipe, Return ¹⁾	-	9
	-	20
ATF Pipe, Supply for Attaching the ATF Pipe to the Engine	-	9
ATF Pipe, Supply from the Transmission to the ATF Cooler	-	9
ATF Plug for the Hole for Checking and Filling for the ATF in the Transmission ²⁾	-	30
Bolts and nuts	M6	9
	M7	15
	M8	20
	M10	40
	M12	65
Drain Plug for the Hole for Checking and Filling for the Transmission Fluid Inside the Transfer Case ²⁾	-	27

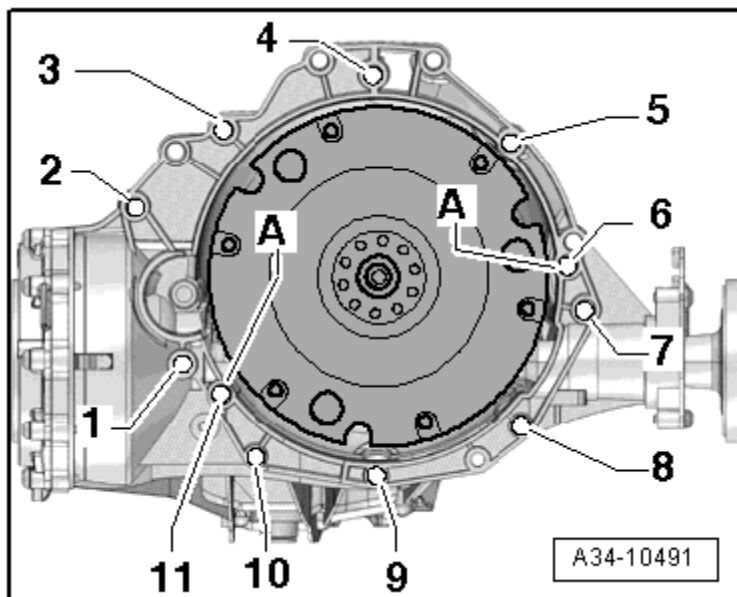
Fastener Tightening Specifications (cont'd)

Drain Plug for the Hole for Checking and Filling for the Transmission Fluid Inside the Front Final Drive ²⁾	-	27
Lower Stop for the Transmission Mount ²⁾	-	20 plus an additional 90° (¼ turn)
Oil Drain Plug for the Transmission Fluid Inside the Front Final Drive ²⁾	-	8
Oil Drain Plug for the Transmission Fluid Inside the Transfer Case ²⁾	-	12
Selector Lever Cable, Nut	-	13
Selector Lever Cable Adjustment Secured on the Shift Mechanism Function Unit	-	13
Selector Lever Cable Bracket	-	8
Selector Mechanism Function Unit, Nut	-	10
Tunnel Crossmember	-	70
Transmission Mount	-	20
Transmission Support BOLT	-	40
Transmission Support nut	-	20

¹⁾ For bolt tightening clarification, refer to ElsaWeb, *ATF Cooler and ATF Pipes Overview* items 10, 12 and 13.

²⁾ Replace

Transmission to Engine Tightening Specifications



Item	Bolt	Nm
1 ¹⁾	M10 x 50 ²⁾	65
2 ¹⁾ , 7	M12 x 100 ³⁾	30 plus an additional 90° (¼ turn)
3 ⁴⁾ , 6	M12 x 75 ³⁾	30 plus an additional 90° (¼ turn)
4, 5 ⁴⁾	M12 x 120 ³⁾	15 plus an additional 90° (¼ turn)
8, 10	M10 x 75 ³⁾	15 plus an additional 90° (¼ turn)
9	M10 x 60 ³⁾	15 plus an additional 90° (¼ turn)
11 ⁵⁾	M12 x 50 ³⁾	30 plus an additional 90° (¼ turn)
A	Alignment pins for centering	

¹⁾ Also secures the starter.

²⁾ Bolt strength rating 10.9, there is no limit to the number of times steel bolts can be used.

³⁾ The aluminum bolts can be used 2 times

⁴⁾ With a bracket for the wires.

⁵⁾ Installed from the engine side

Gears, Hydraulic Controls – 0BW

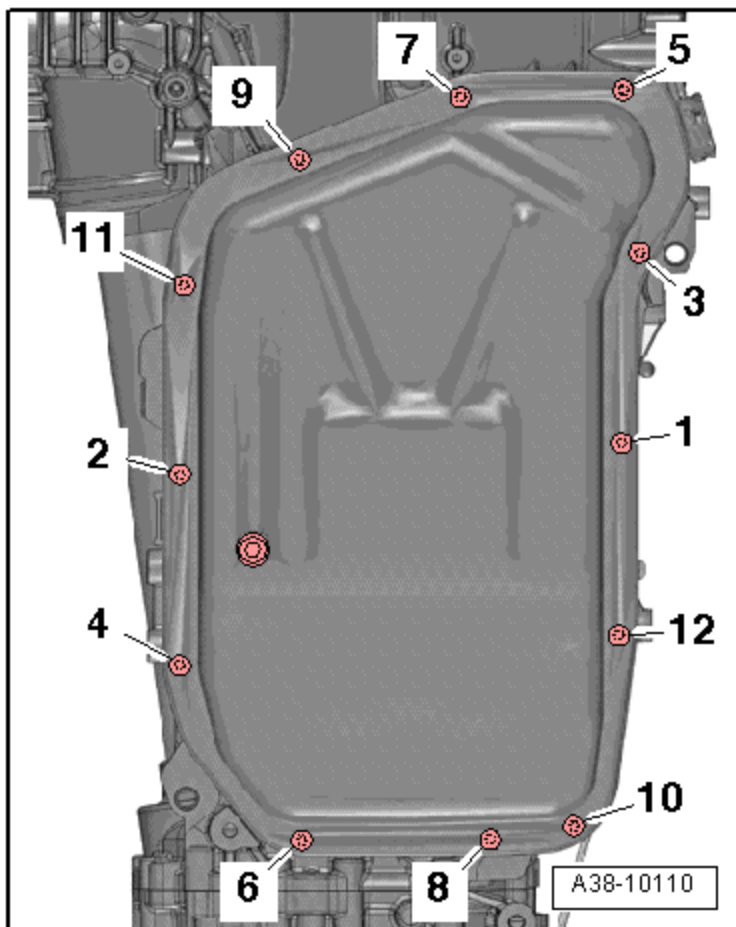
Fastener Tightening Specifications

Component	Fastener size	Nm
ATF Drain Plug	-	10
ATF Pipe, Nut	-	5.5
Electro-Drive Drive Motor ²⁾	-	10
	-	10 plus an additional 75°
	-	60 ¹⁾
Electro-Drive Drive Motor coolant line connections	-	20
High Voltage Connection Box Housing	-	20
Oil Drain Plug for the ATF in the Transmission	-	12
Transmission Fluid Auxiliary Hydraulic Pump 1	-	10

¹⁾ Replace

²⁾ For bolt tightening clarification, refer to ElsaWeb, *Electro-Drive Drive Motor -V141-Overview* items 10, 11 and 12

ATF Oil Pan Tightening Specifications

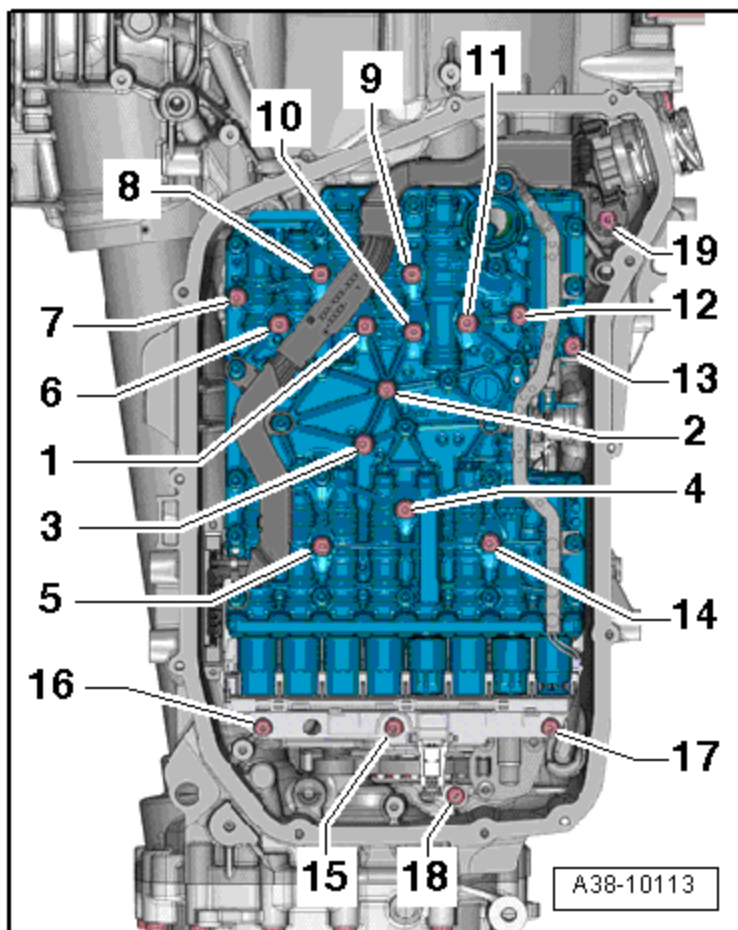


Replace the oil pan bolts.

Step	Bolts	Tightening Specification/Additional Turn
1	1 through 12	Hand-tighten
2	1 through 12	4 Nm
3	1 through 12	Plus an additional 45° (1/8 turn)

Automatic Trans. -
0BW

Mechatronic Tightening Specifications



Bolts -18- and -19- are shorter. Bolt -18- attaches the transmission output speed sensor -G195- to the transmission housing. Bolt -19- attaches the Mechatronic connector to the transmission housing.

Component	Nm
Tighten bolts 1 through 19 in sequence	10

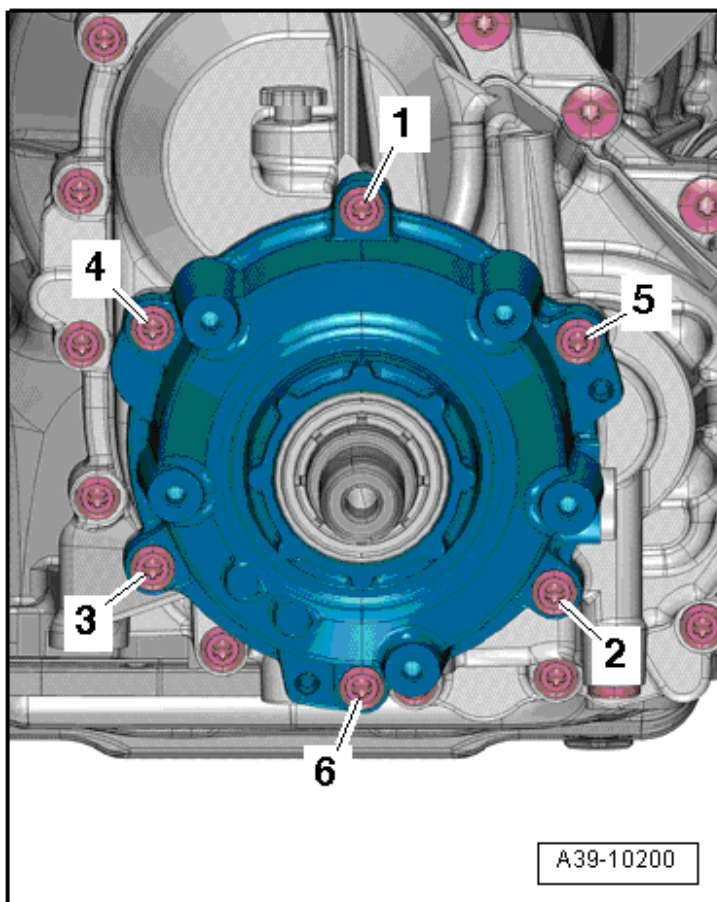
Rear Final Drive, Differential – 0BW

Fastener Tightening Specifications

Component	Fastener size	Nm
Balance Weight ¹⁾	-	20 plus an additional 90° (¼ turn)
Drain Plug for the Transmission Fluid Inside the Front Final Drive ¹⁾	-	27
Drain Plug for the Transmission Fluid Inside the Transfer Case ¹⁾	-	27
Left Flange Shaft Mounting Bracket ¹⁾	-	9 plus an additional 60°
Oil Drain Plug for the Transmission Fluid inside the Front Final Drive ¹⁾	-	8
Oil Drain Plug for the Transmission Fluid Inside the Transfer Case ¹⁾	-	12

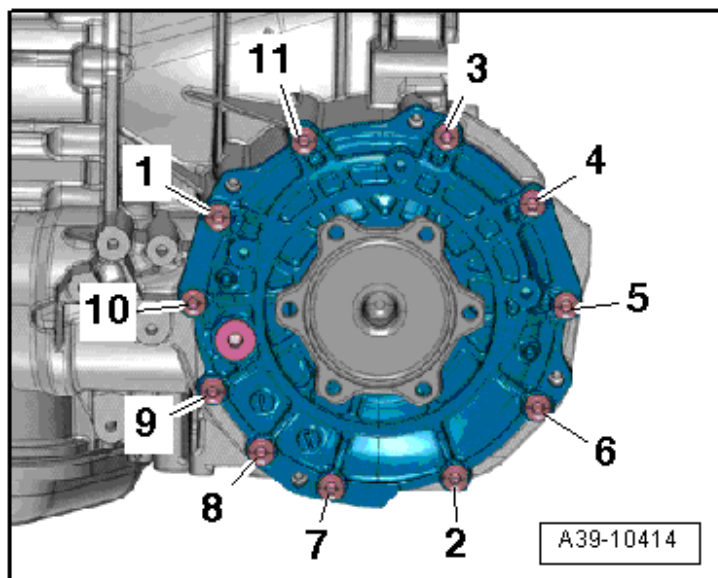
¹⁾ Replace

Center Differential Housing Tightening Specifications



Step	Bolts	Tightening Specification/Additional Turn
1	1 through 6	3 Nm
2	1 through 6	4 Nm
3	1 through 6	Plus an additional 90° (¼ turn)

Front Final Drive Cover Tightening Specifications



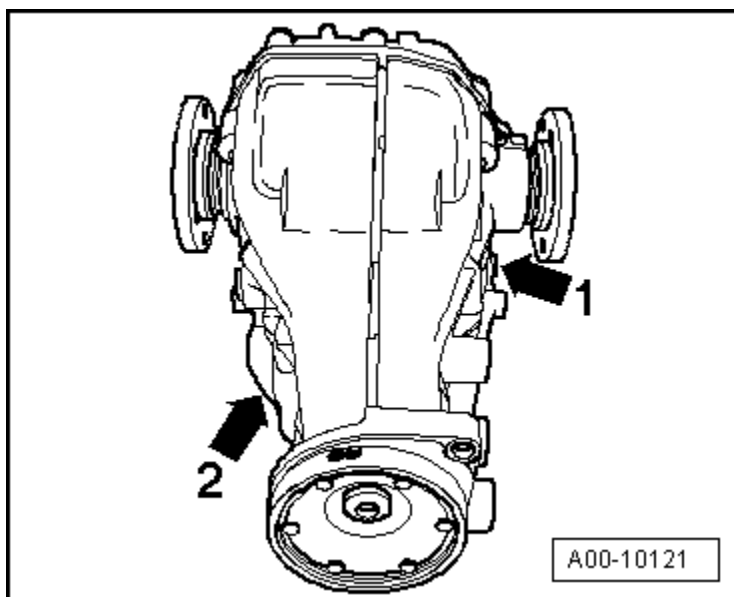
Step	Bolts	Tightening Specification/Additional Turn
1	1 and 6	3 Nm
2	1 through 11	27 Nm

Automatic Trans. -
0BW

REAR FINAL DRIVE – 0BC

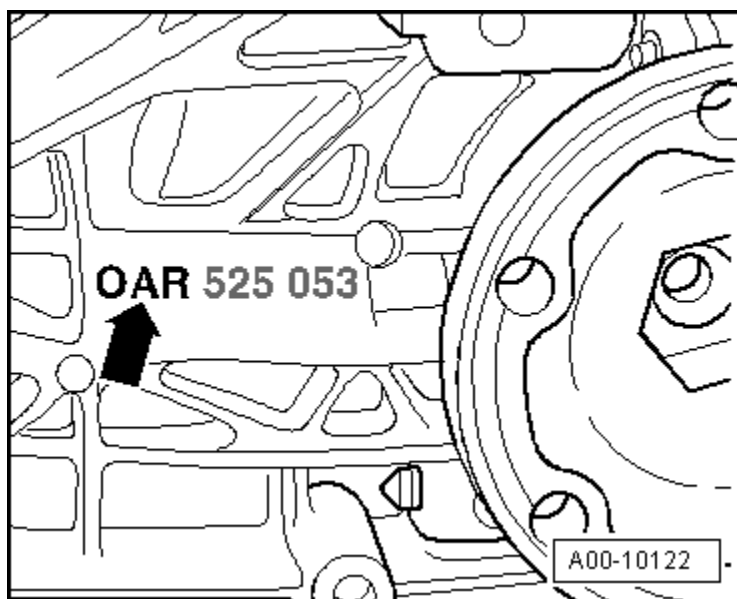
General, Technical Data – 0BC

Rear Final Drive Identification



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

Final Drive Identification

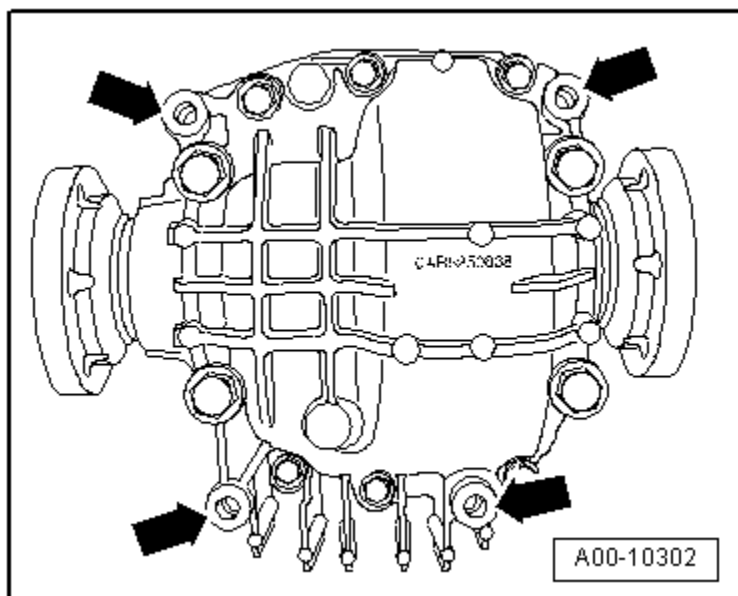


Final Drive 0BC (➡) and 0AR

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

Rear Final Drive –
0BC

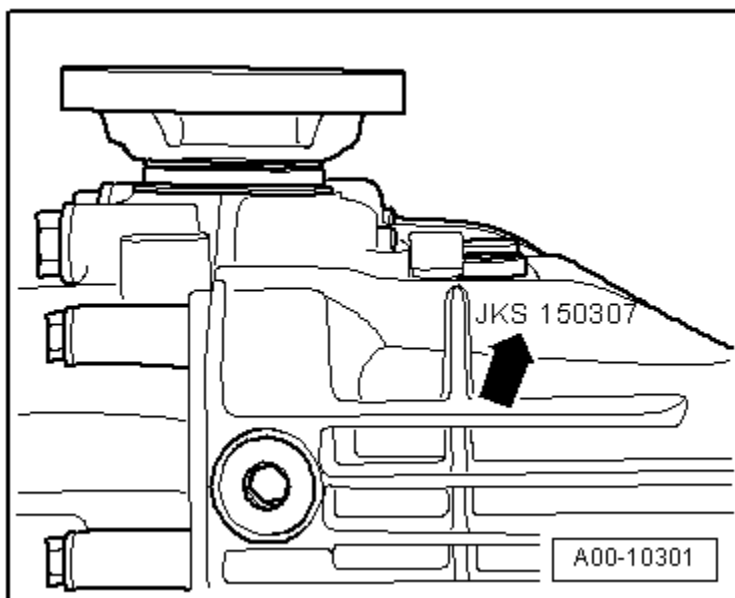
Final Drive Identification (cont'd)



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

The 0BC final drive has 4 threaded holes (➡) in its housing, used for attaching the cross member. In addition to this, there is an additional threaded hole under the flange/driveshaft used for attaching the final drive to the subframe.

Rear Final Drive Code and Date of Manufacture



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

Rear Final Drive Transmission Allocations, Ratios, Capacities

Rear Final Drive		0BC		
Code letters		KCC	KLL	KLM
Ratio	Final drive $Z_2:Z_1$	43:13 = 3.308	35:8 = 4.375	35:8 = 4.375
Driveshaft flange diameter		75.5 mm	70.7 mm	75.5 mm
Gear oil capacity		See 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.

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

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

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

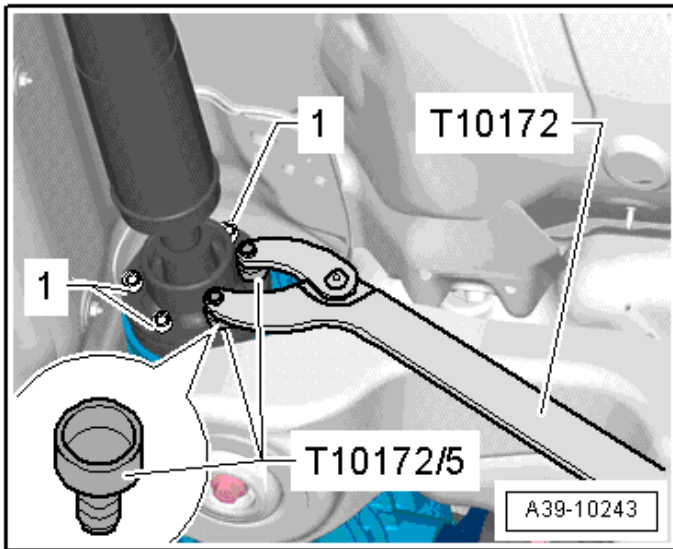
- Date of manufacture
- Gear oil specification
- Engine, manual transmission and automatic transmission allocation using code letters and PR numbers.

Fastener Tightening Specifications

Component	Nm
Backing plate-to-driveshaft ¹⁾	30 plus an additional 90° (¼ turn)
Balance weight-to-rear final drive	22
Check plug for rear final drive	30
Crossmember-to-rear final drive	55
Driveshaft heat shield	24
Heat Shield-to-crossmember	20
Intermediate bearing bracket	20
Subframe-to-frame	55
Subframe-to-rear final drive	95

¹⁾ Always replace

Driveshaft to Rear Final Drive Tightening Specification



Always replace the driveshaft bolts 1.

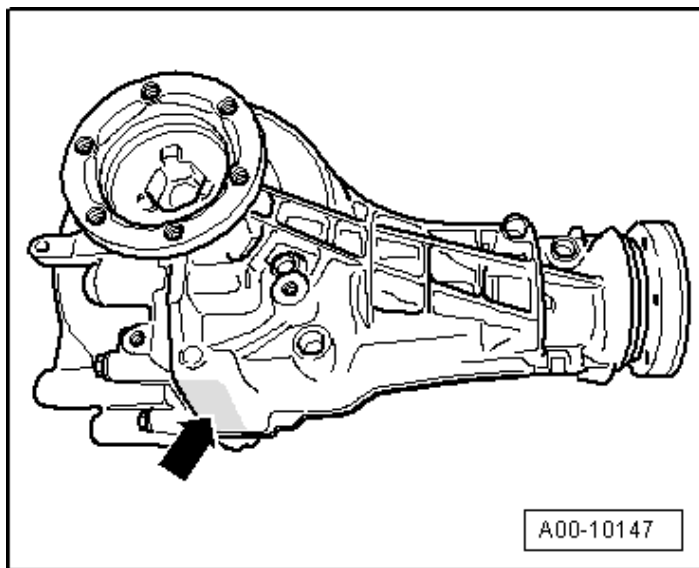
Step	Bolts	Tightening Specification/Additional Turn
1	1	Next to the color dot 30 Nm ¹⁾
2	1	30 Nm
3	1	Plus an additional 90° (¼ turn)

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

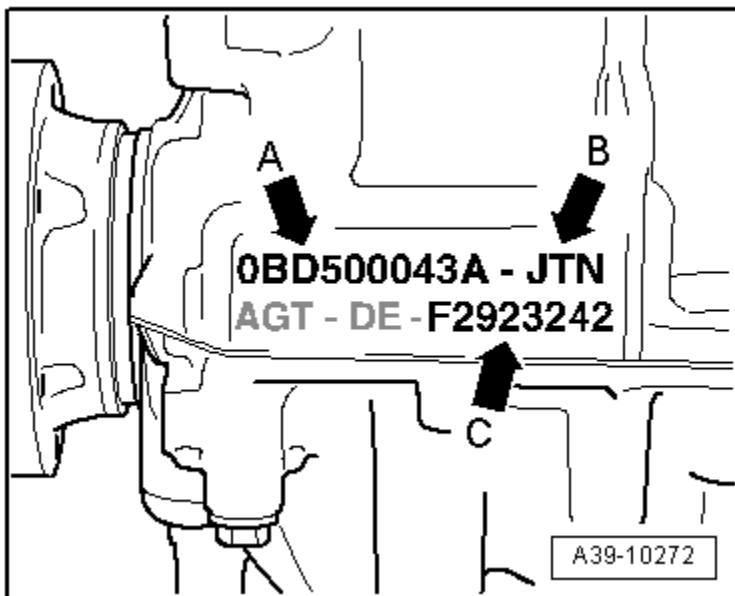
REAR FINAL DRIVE – 0BD

General, Technical Data – 0BD

Rear Final Drive Identification



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



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

B ➔ code letters JTN

C ➔ Rear final drive manufacture date

Example

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

Rear Final Drive Allocations, Ratios, Capacities

Rear Final Drive		OBD		
Code letters		KBB	KHR	LLU
Ratio	Final drive Z ₂ :Z ₁	35:8 = 4.375	43:13 = 3.308	42:9 = 4.667
Driveshaft flange diameter		75.5 mm	75.5 mm	75.5 mm
Capacity		1.0 liters		

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

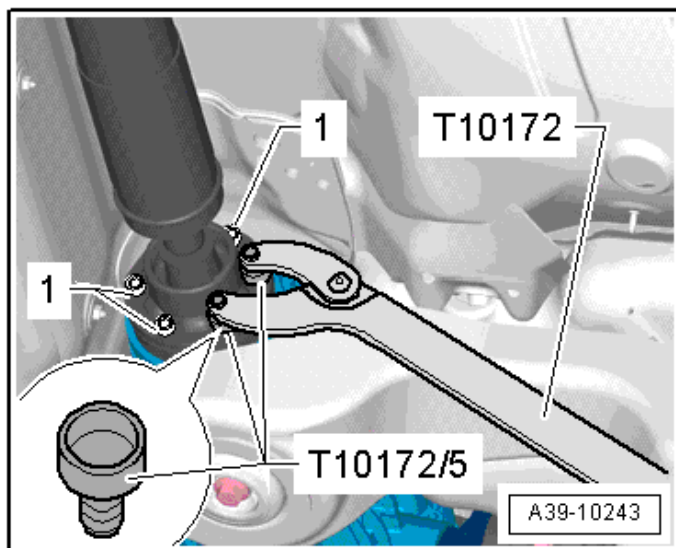
- Date of manufacture
- Gear oil specification
- Engine, manual transmission and automatic transmission allocation using code letters and PR numbers.

Fastener Tightening Specifications

Component	Nm
Driveshaft backing plate (replace fasteners)	30 plus an additional 90° (¼ turn)
Crossmember	55
Heat shield	20
Intermediate bearing bracket	20
Screw plug	45
Subframe ¹⁾	55
	95

¹⁾ For bolt tightening clarification, refer to ElsaWeb, *Rear Final Drive Assembly Overview*, items 2 and 3.

Driveshaft to Rear Final Drive Tightening Specification



Always replace the driveshaft bolts 1.

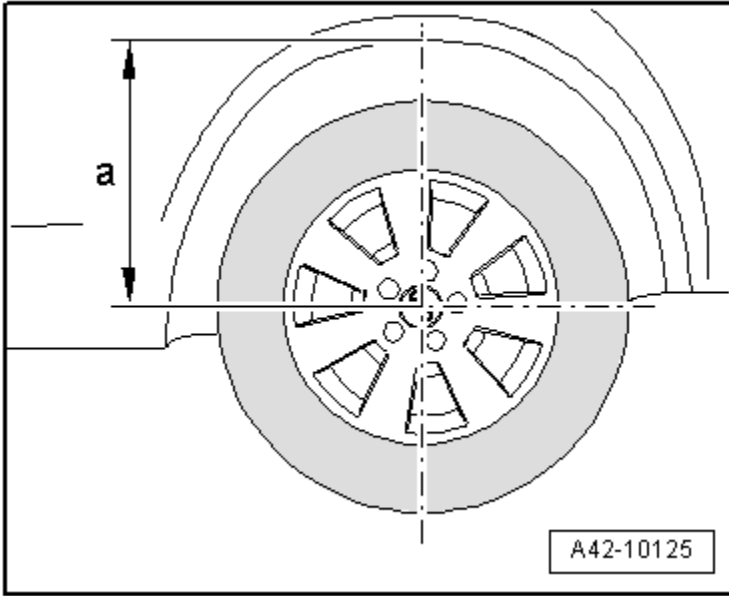
Step	Bolts	Tightening Specification/Additional Turn
1	1	Next to the color dot 30 Nm ¹⁾
2	1	30 Nm
3	1	Plus an additional 90° (¼ turn)

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

SUSPENSION, WHEELS, STEERING

Front Suspension

Front Axle – Curb Weight Data



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

Front Axle – Curb Weight Data (cont'd)

AWD				
		Standard Suspension (1BA)	Sport Suspension (1BV)	Suspension with Electronic Damping (1BL)
Wheelbase	mm	Approximately 2807	Approximately 2807	Approximately 2807
Front track; refer to Note	mm	Approximately 1617	Approximately 1617	Approximately 1617
Rear track; refer to Note	mm	Approximately 1613	Approximately 1613	Approximately 1613
Maximum steering angle at curved inner wheel	Degree	39° 54'	39° 54'	39° 54'

Note:

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

Change in track width:

- ET 27 “+ 22 mm”
- ET 33 “+ 12 mm”
- ET 37 “+ 4 mm”

Front Suspension Tightening Specifications

Component	Nm
Ball joint-to-wheel bearing housing bolt (replace fastener)	40
Brake shield-to-wheel bearing housing bolt	10
Coupling rod-to-stabilizer bar bolt ¹⁾ (replace fastener)	40 plus an additional 90° (¼ turn)
Coupling rod-to-shock absorber fork bolt ¹⁾²⁾	40 plus an additional 90° (¼ turn)
Constant Velocity (CV) joint boot clamp	20
Drive axle-to-transmission bolt ¹⁾	70
Drive axle-to-wheel hub bolt ¹⁾	200 plus an additional 180° (½ turn)
Guide link-to-subframe nut ¹⁾²⁾	70 plus an additional 180° (½ turn)
Guide link-to-wheel bearing housing nut ¹⁾	
- Hex collar nut M12 special wrench 21 mm	145
- Hex combination nut M12 special wrench 18 mm	110
- Hex combination nut M12 special wrench 21 mm	120
- Hex combination nut M12 special wrench 21 mm	140
Level control system sensor bolt	20
Level control system sensor nut	9
Shock absorber-to-shock absorber fork bolt ¹⁾	40 plus an additional 180° (½ turn)
Shock absorber mounting bracket-to-body bolt ³⁾ (replace fastener)	40 plus an additional 90° (¼ turn)
Stabilizer bar-to-subframe nut ¹⁾ (replace fastener)	25
Subframe-to-body bolt (replace fastener)	115 plus an additional 90° (¼ turn)
Subframe crossbrace-to-subframe bolt (replace fastener)	90 plus an additional 90° (¼ turn)
Subframe shield-to-subframe bolt	9 20
Tie rod end-to-wheel bearing housing nut	
- Hex collar nut	20 plus an additional 90° (¼ turn)
- 12-point combi-nut	100

Fastener Tightening Specifications (cont'd)

Component	Nm
- Hex combi-nut	110
Tower brace-to-body nut	2
	20
Tower brace reinforcement bolt	20
Track control arm-to-ball joint nut (replace fastener)	
- Hex collar nut M12 special wrench 21 mm	145
- Hex combination nut M12 special wrench 18 mm	110
- Hex combination nut M12 special wrench 21 mm	120
- Hex combination nut M12 special wrench 21 mm	140
Track control arm-to-shock absorber fork bolt ¹⁾ (replace fastener)	90 plus an additional 90° (¼ turn)
Track control arm-to-wheel bearing housing nut ¹⁾ (replace fastener)	70 plus an additional 180° (½ turn)
Upper control arm-to-mounting bracket nut ¹⁾²⁾ (replace fastener)	50 plus an additional 90° (¼ turn)
Upper control arm-to-wheel bearing housing nut (replace fastener)	40
Wheel bearing-to-wheel bearing housing bolt (replace fastener)	80 plus an additional 90° (¼ turn)
Wheel speed sensor-to-wheel bearing housing bolt	9

¹⁾ Must be tightened in the curb weight position. Refer to ElsaWeb, Wheel Bearing, Lifting to Curb Weight Position.

²⁾ Push toward the inside of the vehicle when tightening the control arm.

³⁾ Follow tightening sequence. Refer to ElsaWeb, Suspension Strut with Mounting Bracket.

Rear Suspension Tightening Specifications

Component	Fastener size	Nm
ABS wheel speed sensor-to-wheel bearing housing bolt	-	9
Brake disc-to-wheel hub bolt	-	5
Brake shield-to-wheel bearing housing bolt	-	10
Coupling rod-to-stabilizer bar bolt ¹⁾ (replace fastener)	-	40 plus an additional 90° (¼ turn)
Drive axle-to-rear final drive bolt (replace fastener)		
- with 89 mm diameter outer Constant Velocity (CV) joint and 100 mm diameter inner Constant Velocity (CV) joint	M8	20 plus an additional 90° (¼ turn)
- with 94 mm diameter outer Constant Velocity (CV) joint and 107 mm diameter inner Constant Velocity (CV) joint	M10	70
Drive axle-to-wheel hub bolt (replace fastener)	-	200 plus an additional 180° (½ turn)
Level control system sensor bolt	-	5
	-	9
Lower transverse link-to-subframe bolt ¹⁾ (replace fastener)	-	70 plus an additional 180° (½ turn)
Lower transverse link-to-wheel bearing housing bolt ¹⁾ (replace fastener)	-	120 plus an additional 360° (full turn)
Shock absorber-to-shock absorber mount nut (replace fastener)	-	35
Shock absorber-to-wheel bearing housing bolt 1) (replace fastener)	-	150 plus an additional 180° (½ turn)
Shock absorber mount-to-body bolt (replace fastener)	-	50 plus an additional 45° (¼ turn)
Stabilizer bar-to-subframe bolt ²⁾ (replace fastener)	-	25 plus an additional 90° (¼ turn)
Subframe-to-body bolt (replace fastener)	-	115 plus an additional 90° (¼ turn)
Tie rod-to-subframe nut ¹⁾ (replace fastener)	-	95
Tie rod-to-wheel bearing housing bolt ¹⁾ (replace fastener)	-	90 plus an additional 90° (¼ turn)

Rear Suspension Tightening Specifications *(cont'd)*

Component	Fastener size	Nm
Upper transverse link-to-subframe bolt ¹⁾ (replace fastener)	-	70 plus an additional 180° (½ turn)
Upper transverse link-to-wheel bearing housing nut ¹⁾ (replace fastener)	-	95
Wheel bearing-to-wheel bearing housing bolt	-	80 plus an additional 90° (¼ turn)

¹⁾ Must be tightened in the curb weight position. Refer to ElsaWeb, Wheel Bearing, with Coil Spring, Lifting to Curb Weight Position.

²⁾ Tighten evenly.

Wheels, Tires

Fastener Tightening Specifications

Component	Nm
Adaptive cruise control sensor bracket bolt	8
Level control system control module bracket nut	6
Level control system control module to bracket bolt	8
Tire pressure monitoring control module nut	2
Tire pressure monitoring sensor to rim union nut	8
Wheel bolts (tighten the wheel bolts in a diagonal sequence to the following specified torque)	140

Wheel Alignment Data

Wheel Alignment Specified Values – AWD

Specifications valid for all engine versions

Front Suspension	Standard suspension (1BA)	Sport suspension (1BV)	Suspension with electronic damping (1BL)
Camber ¹⁾	- 25' ± 23'	- 25' ± 23'	- 25' ± 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-out angle at 20 degrees ²⁾	1° 49' ± 30'	1° 49' ± 30'	1° 49' ± 30'
Outer wheel steering angle at maximum steering angle	33° 30' + 1° 30' - 2°	33° 30' + 1° 30' - 2°	33° 30' + 1° 30' - 2°
Inner wheel steering angle at maximum steering angle	39° 54' + 1° 30' - 2°	39° 54' + 1° 30' - 2°	39° 54' + 1° 30' - 2°

¹⁾ A camber value of -20' applies to the front axle for the Australian market.

²⁾ Depending on the computer manufacturer, the toe-out angle difference can be indicated negatively in the alignment computer.

Rear Suspension	Standard suspension (1BA)	Sport suspension (1BV)	Suspension with electronic damping (1BL)
Camber	- 1°20' ± 25'	- 1°20' ± 25'	- 1°20' ± 25'
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' ± 5'	+ 10' ± 5'	+ 10' ± 5'
Maximum permissible deviation in direction of travel relative to vehicle longitudinal axis	10'	10'	10'

Wheel Alignment Specified Values – FWD

Specifications valid for all engine versions

Front Suspension	Standard suspension (2MF)	Sport suspension (1BV)
Camber	- 49 ± 23'	- 49 ± 23'
Maximum permissible difference between both sides	30'	30'
Toe per wheel (adjustment value)	+ 10' ± 5'	+ 10' ± 5'
Toe per wheel (control value)	+ 10' ± 7'	+ 10' ± 7'
Toe-out angle at 20 degrees ¹⁾	1° 49' ± 30'	1° 49' ± 30'
Outer wheel steering angle at maximum steering angle	33° 30' + 1° 30' - 2°	33° 30' + 1° 30' - 2°
Inner wheel steering angle at maximum steering angle	39° 54' + 1° 30' - 2°	39° 54' + 1° 30' - 2°

¹⁾ Depending on the computer manufacturer, the toe-out angle difference can be indicated negatively in the alignment computer.

Rear Suspension	Standard suspension (2MF)	Sport suspension (1BV)	Standard suspension (1BA)
Camber	- 1°20' ± 25'	- 1°20' ± 25'	- 1°20' ± 25'
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' ± 5'	+ 10' ± 5'	+ 10' ± 5'
Maximum permissible deviation in direction of travel relative to vehicle longitudinal axis	10'	10'	10'

Wheel Alignment Specified Values – Hybrid

Front Suspension	Standard suspension (1BA) ¹⁾	Sport suspension (2MF) ²⁾
Camber	- 27 ± 23'	- 49 ± 23'
Maximum permissible difference between both sides	30'	30'
Toe per wheel (adjustment value)	+ 10' ± 5'	+ 10' ± 5'
Toe per wheel (control value)	+ 10' ± 7'	+ 10' ± 7'
Toe-out angle at 20 degrees ³⁾	1° 49' ± 30'	1° 49' ± 30'
Outer wheel steering angle at maximum steering angle	33° 30' + 1° 30' - 2°	33° 30' + 1° 30' - 2°
Inner wheel steering angle at maximum steering angle	39° 54' + 1° 30' - 2°	39° 54' + 1° 30' - 2°

¹⁾ NAR, China and Russia

²⁾ ECE without Russia

³⁾ Angle of outer wheel is less by this amount. It can also be indicated negatively in alignment computer, depending on manufacturer.

Rear Suspension	Standard suspension (1BA)	Sport suspension (2MF)
Camber	- 1°20' ± 25'	- 1°20' ± 25'
Maximum permissible difference between both sides	30'	30'
Toe per wheel (adjustment value)	+ 10' ± 5'	+ 10' ± 5'
Toe per wheel (control value)	+ 10' ± 5'	+ 10' ± 5'
Maximum permissible deviation in direction of travel relative to vehicle longitudinal axis	10'	10'

Steering

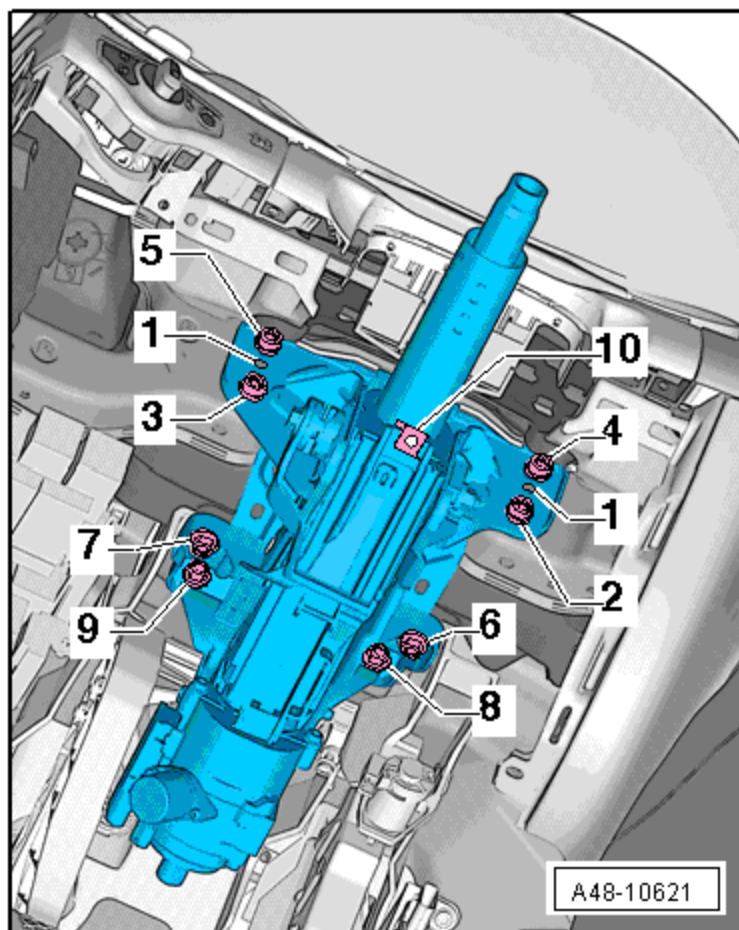
Fastener Tightening Specifications

Component	Nm
Airbag-to-steering wheel bolt	7
Belt pulley-to-power steering pump bolt	
- 4-cylinder	20
- 6-cylinder	22
Electronic steering column lock control module-to-steering column bolt	5
Handle-to-steering column bolt	3
Power steering pump bolt	20
Pressure line-to-steering gear bolt	20
Pressure line rubber bushing-to-steering gear	6
Pressure line-to-rubber bushing nut	6
Pressure line union nut	40
Pressure line to power steering pump	
- Union nut, with dynamic steering	38
- Bolt, without dynamic steering	9
Reservoir-to-bracket bolt	9
Reservoir bracket-to-body bolt	9
Return line-to-body bolt	9
Servotronic solenoid valve-to-steering gear bolt ²⁾	3
Steering column-to mounting bracket and central tube bolt ¹⁾	20
Steering gear-to-subframe bolt (replace fastener)	80 plus an additional 180° (½ turn)
Steering intermediate shaft-to-steering column bolt (replace fastener)	30 plus an additional 90° (¼ turn)
Steering intermediate shaft-to-steering gear bolt (replace fastener)	30 plus an additional 90° (¼ turn)
Steering wheel-to-steering column bolt (replace fastener)	30 plus an additional 90° (¼ turn)
Tie rod-to-steering gear	
- Electromechanical steering	100
- Hydraulic steering	90
Tie rod end-to-tie rod nut	
- Electromechanical steering	80
- Hydraulic steering	60

Component	Nm
Tie rod end-to-wheel bearing housing nut (electromechanical steering gear) (replace fastener)	100
Tie rod end-to-wheel bearing housing nut (hydraulic steering gear) (replace fastener)	
- Hex collar nut	20 plus an additional 90° (¼ turn)
- 12-point combi-nut	100
- Hex combi-nut	110

- ¹⁾ Always follow bolt tightening sequence. Refer to ElsaWeb, Steering Column Tightening Specifications.
- ²⁾ Always follow bolt tightening sequence. Refer to ElsaWeb, *Servotronic Solenoid Valve*.

Steering Column Tightening Specifications



Step	Component	Nm
1	Position the steering column with the positioning pins (1) in the central tube positioning holes	
2	Loosely install all bolts	
3	Tighten bolts 2 through 5 in sequence	20
4	If equipped, install the right driver side knee bar	
5	Tighten bolts 6 through 9 in sequence	20
6	Replace the spring nut (10) if the steering column was replaced	

BRAKE SYSTEM

General Information

Brake System – Technical Data

---- 21-7-0928 926 96
WAUZZZ 8R₁ 8A101698
8RB 0HY S0R

Q5 quat. TDI 3.0 V6
176 KW A7S

CCWA --- ---

LX7W/LX7W N3Q/CA

	E0A	701	4UE	6XC	5SL	6TS
A —	1KE	J0Z	1LJ		1AT	1BA
	3FU			5MA	7X	
B —	F0A		8GR	0G7	0YD	0JJ
	T41	5KA	8BP	U2A	X9X	1N3
	1XX		803	904	8Z5	D50
	7T6	C2T	7K0	4X3	2K1	
	3L3		4KC	3Y0	4K4	5D7
			7MG	01A		4GF

88.8 8.8 88.8 888

A00-10419

Brake System

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 Brakes			
Production Relevant No. (PR. No.)		1LA	1LJ
Brake caliper		FBC- 60 - 16"	FBC- 60 - 17"
Brake disc ventilated	Diameter mm	320	345
Brake disc, thickness	mm	30	30
Brake disc, wear limit	mm	28	28
Brake caliper, piston	Diameter mm	60	60
Pad thickness with backing plate and dampening sheet	mm	20.3	20.3
Brake pad wear limit with backing plate and dampening sheet	mm	10	10

Rear Wheel Brakes – Technical Data

Rear Brakes			
Production Relevant No. (PR. No.)		1KW	1KE
Brake caliper		CII-43 EPB - 16"	CII-43 EPB - 17"
Brake disc	Diameter mm	300	330
Unvented brake disc thickness	mm	12	-
Internally vented brake disc thickness		-	22
Brake disc, wear limit	mm	10	20
Brake caliper, piston	Diameter mm	43	43
Pad thickness with backing plate and dampening sheet	mm	17.5	17.5
Brake pad wear limit with backing plate and dampening sheet	mm	7	7

Antilock Brake System (ABS)

Fastener Tightening Specifications

Component	Nm
ABS wheel speed sensor-to-wheel bearing housing bolt	9
All brake lines at hydraulic unit	14

Mechanical Components

Brake Pedal Tightening Specifications

Component	Nm
Front Brakes	
Brake caliper-to-brake carrier bolt	30
Brake carrier-to-wheel bearing housing bolt ¹⁾	196
Brake line-to-brake caliper	20
Brake rotor-to-wheel bearing housing	5
Rear Brakes	
Brake carrier-to-wheel bearing housing bolt -1-	100 plus an additional 90° (¼ turn)
Brake caliper-to-brake carrier bolt -1-	35
Brake hose-to-brake caliper bolt	20
Brake rotor-to-wheel bearing bolt	5
Brake shield-to-wheel bearing housing bolt	10
Electromechanical parking brake actuator-to-brake caliper bolt	12
Brake booster-to-mounting bracket for pedal assembly nut	8
Gas pedal module-to-mounting bracket for pedal assembly bolt	8
Mounting pin bolt	8
Pedal support-to-bracket bolt	20
Wheel bolts	140

¹⁾ Always replace if removed

Hydraulic Components

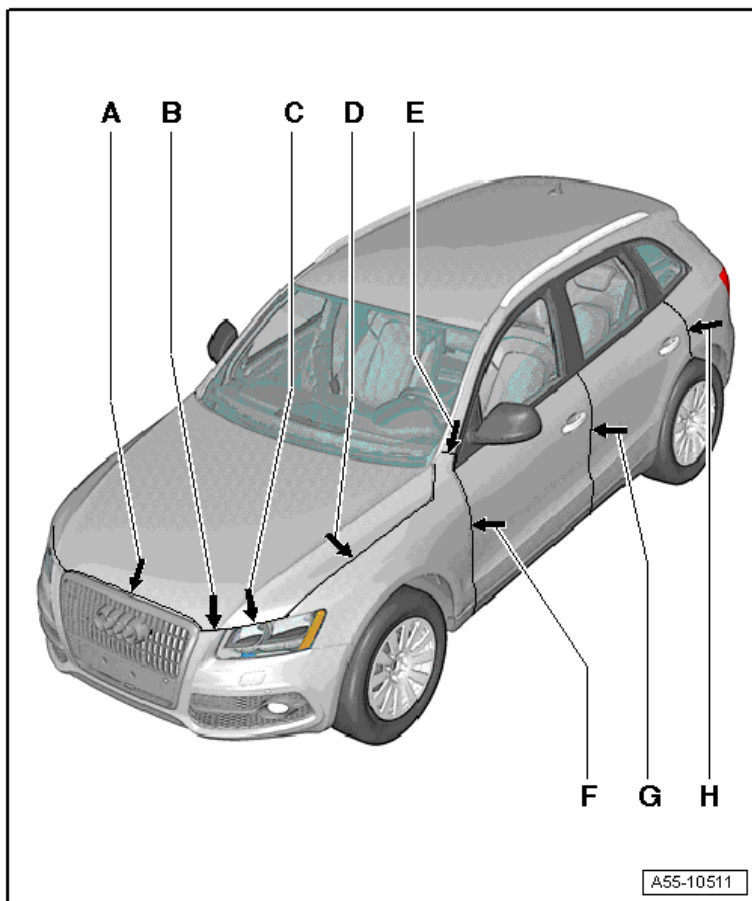
Hydraulic Tightening Specifications

Component	Nm
Bleeder valve	15
Brake caliper housing bolts	30
Brake caliper to brake carrier bolt	30
Brake carrier to wheel bearing housing bolt ¹⁾	196
Brake line to brake caliper	20
Brake rotor to wheel bearing housing	5
Bleeder valve	15
Brake caliper housing with actuator to brake caliper ¹⁾	35
Brake carrier to wheel bearing housing ¹⁾	100 plus an additional 90° (¼ turn)
Brake system vacuum pump bracket to body bolt	9
Brake system vacuum pump bracket to body nut	8
Brake system vacuum pump to bracket nut	9
Brake booster to mounting bracket bolt	25
Brake fluid reservoir to brake master cylinder bolt	5
Brake line to brake master cylinder	14
Brake master cylinder to hydraulic unit nut	49
Brake system vacuum pump bracket bolts	9
Brake system vacuum pump bracket nut	8
Brake system vacuum pump buffer nut-to-bracket	9
Electronic parking brake rear caliper ¹⁾	35
Pedal support to bracket bolt	20
Vacuum pump hose-to-pump	5
Vacuum pump to engine bolt (Torx® 30)	9
Wheel bolts	140

¹⁾ Always replace if removed

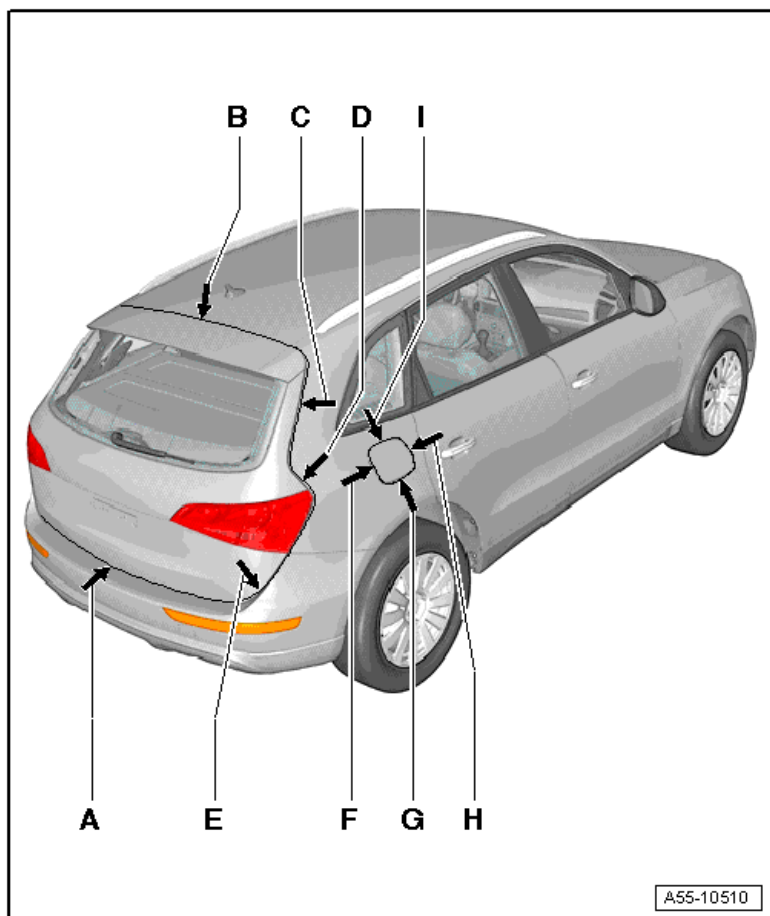
BODY

Air Gap Body Dimensions



Component	mm
A	4.5 ± 1.0
B	4.5 ± 1.0
C	4.5 ± 1.0
D	3.0 ± 0.5
E	2.0 ± 0.5
F	3.5 ± 0.5
G	4.5 ± 0.5
H	3.5 ± 0.5

Body



Component	mm
A	5.0 ± 1.0
B	4.5 ± 0.5
C	4.5 ± 0.5
D	4.5 ± 0.5
E	4.5 ± 0.5
F	$2.0 + 0.5$
G	2.5 ± 0.5
H	$2.0 + 0.5$
I	$2.0 + 0.5$

Body Exterior

Lock Carrier, Plenum Chamber Tightening Specifications

Component	Nm
Left and right reinforcementbolts/nut	20
Lock carrier bolts, upper	5
Lock carrier bolts, lower	1.5
	55
Side impact bar	55
Underbody cover hex nuts	2
Rear underbody bolts	2
Plenum chamber nut	4
Plenum chamber bolt	7
Rear lid bolts	21
Rear lid gas filled strut ball studs	21
Rear lid hinge hex head nut	21
Rear lid latch bracket bolts	21
Rear lid lock bolts	21

¹⁾ For bolt tightening clarification. Refer to ElsaWeb, *Lock Carrier with Attachments Assembly Overview, items 1 and 7.*

Front Fender Tightening Specifications

Component	Nm
Front fender bolts	8
Front fender mount nut	4
Front fender brace bolts	10
Front fender brace nuts	4
Front fender end plate screws	1.5

Front Hood Tightening Specifications

Component	Nm
Front hood hex nut	21
Front hood gas filled strut ball studs	21
Front hood hinge bolts	21
Front hood catch bolts	8

Rear Lid Tightening Specifications

Component	Nm
Adjusting buffer bolt	8
Rear lid bolts	21
Rear lid gas filled strut ball studs	21
Rear lid hinge hex head nut	21
Rear lid latch bracket bolts ¹⁾	8
	21
Rear lid lock bolts	21

¹⁾ For bolt tightening clarification. Refer to ElsaWeb, *Rear Lid Motor Assembly Overview items 3 and 5*.

Front and Rear Door Tightening Specifications

Component	Nm
Cover for the door lock bolt	3.5
Door upper hinge stud bolt	30
Door upper hinge bolt	32
Door Lower hinge bolt	32
Door Lower hinge fitting bolt	45
Door lock to inner door part bolt	20
Front backing-to-door	2.5
Side impact protection bolts	20
Side impact protection nuts	20
Door arrester bolts	8
Door striker pin bolts	25
Door lock bolts	19
Window regulator motor-to-door bolts	3.5

Sunroof Tightening Specifications

Component	Nm
Front and rear glass panel bolts	4.5
Sunroof motor bolts	2
Sunshade bolts	3.5

Front and Rear Door Window Tightening Specifications

Component	Nm
Window regulator bolts	6
Window regulator nuts	6
Speaker bolts	1.5

Front Bumper Tightening Specifications

Component	Nm
Bumper cover bolts	2.5 - 5
Distance regulation control module bolt	8
Vent grille bolt	2.5
Noise insulation bolts	2.5
Cover mount nuts	4
Side impact bar-to-body bolts	1.5
Side impact bar-to-bracket-to-lock carrier bolts	4
Spoiler (special equipment)	1.5
Locating bolt	5

Rear Bumper Tightening Specifications

Component	Nm
Rear bumper cover bolts	1.5
Rear bumper guide piece	1.5
Side impact bar bolts	8
Side impact bar nuts	4
Left and right console impact member mount bolts	40
Cross member bolts	60
Trailer hitch bolts	20
Hand actuator bracket bolts	8

Front Wheel Housing Liner Tightening Specification

Component	Nm
Aerodynamic trim nuts	2
Front noise Insulation	2.5
Wheel housing liner bolts	2.5

Rear View Mirror Tightening Specifications

Component	Nm
Mirror adjusting unit mount	10
Mirror adjusting unit bolts	1.5

Strips and Trim Tightening Specifications

Component	Nm
Sill panel extension bolts	2
Retaining strip-to-sill panel bolts	2

Body Interior

Storage Compartment and Armrest Tightening Specifications

Component	Nm
Bracket for center console-to-center console	
- Nut	8
- Bolt	3
Center console mounting bracket bolts	8
Cupholder-to-center console	1.4
Front ashtray-to-center console	2.5
Front center console bolts	2
Heated cupholder-to-center console	1.4
Storage compartment/ashtray unit bolts	1.4
Steering column trim bolts	1.5
Trim panel for center console	1.4

Instrument Panel and Central Tube Tightening Specifications

Component	Nm
Front sill panel trim (Driver side only) bolt	2.5
Instrument panel vent bolts	3
Top center defrost vent	1.5
Panel trim bolts	3
Speaker trim bolts	1.5
Central tube mounting bracket bolts	20
Driver's side trim bolts	3
Threaded pin	20
Instrument panel cover bracket bolt	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	1.4

Passenger Protection Tightening Specifications

Component	Nm
Airbag control module J234 nuts	9
Automatic belt retractor bolt	45
Battery Interrupt Igniter-to-fuse panel A nuts	15
Belt latch to seat	34
Belt guide ring bolt	45
Belt anchor bolt	45
Driver side airbag crash sensor bolt	5
Driver side rear side airbag crash sensor nut	9
Front door crash sensor bolts	2.5
Front seat belt B-pillar bolt	45
Front seat belt height adjuster bolt	23
Front seat belt-to-window anchor rail bolt	45
Front Side Airbag	10
Head curtain airbag	
- Bolt	3.5
- Nut	9
latch child seat anchorage	8
Passenger airbag nut	8
Passenger front airbag crash sensor	9
Passenger side airbag crash sensor bolts	5
Passenger occupant detection system control module bolt	1.5
Rear center 3-point seat belt latch hex nut	45
Rear center lap belt bolt	45
Rear double belt latch bolt	45
Rear side airbag	4.5
Rear sill panel trim	4.5
Rear wheel housing crash sensor bolts	9
Reinforcement (on power seats) nut/bolt	18
Right rear side airbag crash sensor nut	9
Seat belt height adjuster	27
Side airbag bolts	9
Side curtain airbag cap nuts	9

Interior Trim Tightening Specifications

Component	Nm
Instrument panel bolts	3
Instrument panel above tunnel bolts	8
Instrument panel aligning bolts	2
Footwell trim bolts	2

Interior Trim Tightening Specifications (*cont'd*)

Component	Nm
Instrument panel below heating or A/C mechanism (2 bolts)	9
Instrument panel tunnel area bolts	20
Instrument panel tunnel area nuts	20
Front/rear brackets for gap cover (luggage compartment)	20
Fuse holder bolts	2
Fuse holder nuts	8
Door trim handle molding area bolts	2
Door trim handle molding area (4 surrounding bolts)	2
Door mirror triangle cover bolt	2
Upper A-pillar and B-pillar trim airbag emblem bolt	4
B-pillar trim bolts	4
C-pillar trim nut	2
Side trim bolts	2
Rear lid trim handle recess bolts	2
Luggage compartment cover side storage compartment bolts	2
Luggage compartment side trim bolts	8
Molded headliner bolts	2
Tie-Down Eye	6

Seat Frames Tightening Specifications

Component	Nm
Backrest to seat pan bol	33
Front seat frame bolts	50
Lever For seat height adjustment handle.	19.5
Seat trim bolts	2
Seat drawer mount bolts	3.5
Seat bracket and operation lever bolts	3.5
Front seat backrest bolts	20
Rear seat center backrest bolt	16
Rear seat center bracket	16
Rear seat belt buckle-to-floor bolt	30
Rear seat side upholstery bolt	16
Rear seat side upholstery nut	55
Rear seat storage unit with center armrest bolts	9
Retaining Bracket For sill side trim	8
Seat Height Adjuster	6
Sill-Side Trim-to-seat bolt	8

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
Compressor Driveshaft	-	60
Denso A/C compressor oil drain plug	-	30
Denso A/C compressor pressure relief valve	-	10
A/C compressor-to-engine bracket bolt	-	25
A/C pressure/temperature sensor-to-refrigerant line	-	5
Coolant pipe bracket-to-heat exchanger connector flange bolt	-	2.5
Dryer cartridge retaining screw (with filter)	-	2
Evaporator connector-to-evaporator bolt	-	5
Expansion valve-to-evaporator refrigerant line bolt	-	10
Fluid reservoir-to-condenser	-	10
Fresh air intake-to-plenum bolt	-	3
Hybrid Battery Refrigerant Shut-Off Valve 1 Union	-	16.5
Pressure Relief Valve (Denso)	-	10
Refrigerant line-to-condenser bolt	-	9
Refrigerant line-to-compressor bolt	M6	9
Refrigerant line-to-compressor bolt	M8	25
Refrigerant line with inner heat exchanger-to-expansion valve bolt	-	10

ELECTRICAL EQUIPMENT

Communication Fastener Tightening Specifications

Component	Nm
Front information display control head screw	2
Radio screw	3
Roof antenna nut	6
Antenna systems	
Antenna amplifier (R24)/Antenna Amplifier 4 (R113) screw	6
Antenna amplifier 3 (R112) screw	2
Left antenna module (R108) screw	2
Roof antenna (R216) nut	6
Rearview camera system	
Rearview camera (R189) nut	6
Multifunction steering wheel	
Multifunction buttons screw	3
Sound system	
Center mid/high range loudspeaker (R158)	1
Digital sound system control module (J525) nut	3.5
Left front treble speaker (R20)/left front mid-range speaker (R103)/right front treble speaker (R22)/right front mid-range speaker (R104) screw	1
Left front treble speaker (R20)/right front treble speaker (R22) screw	2
Left front mid-bass speaker (R101)/right effects speaker (R21)/right front mid-bass speaker (R102)/right front bass speaker (R23) screw	3
Left rear mid-range speaker (R105)/right rear mid-range speaker (R106) nut	3
Left rear mid/low range loudspeaker (R159)/right rear mid/low range loudspeaker (R160) screw	3
Rear shelf subwoofer (R157) screw	2
TV system	
Bracket with radio (R) nut	3
TV tuner (R78) nut	3

Battery, Starter, Generator, Cruise Control Tightening Specifications

Component	Nm
Auxiliary battery bracket screws	9
Battery retaining bracket screw	18
Fuse panel a nut	5
Generator screws/bolts	23
Ground wire with battery monitoring control module nut	5
Ground wire with battery monitoring control module to screw for battery terminal nut	5
Ground wire with battery monitoring control module 2 nut	18
Negative pole to auxiliary battery screw	4.5
Terminal 30/b+ to generator nut	16
Terminal 30/b+ to starter nut	15

Instruments Tightening Specifications

Component	Nm
12V socket 3 right luggage compartment side trim nut	2
Data bus onboard diagnostic interface screw	3
Instrument cluster screw	2.5
Low and high tone horn-to-impact member nuts	9
Radio frequency controlled clock receiver screw	2.5

Windshield Wiper/Washer System Tightening Specifications

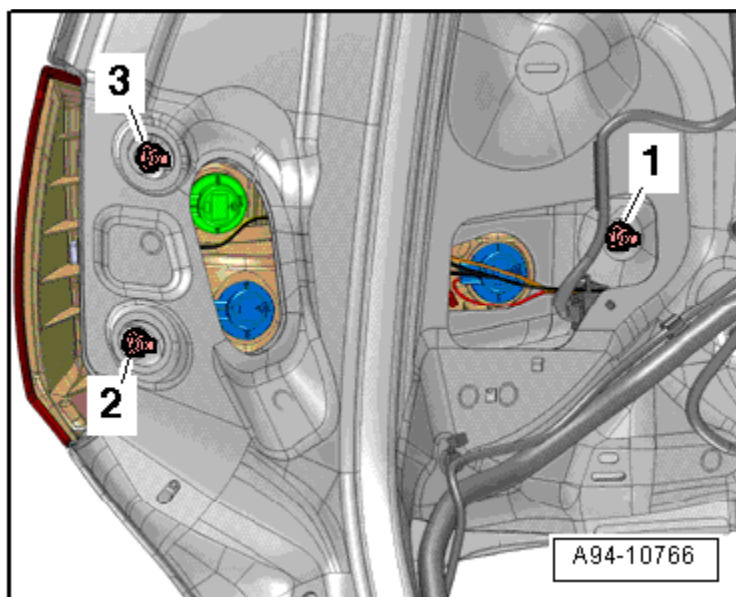
Component	Nm
Fuel filler tube nut	7
Fluid Filler Tube to Washer Fluid Reservoir Nut	7
Rear wiper arm-to-rear window wiper motor nut	12
Rear Window Wiper Motor Nut	8
Washer Fluid Reservoir to Vehicle Tighten in sequence	7 ¹⁾
Windshield wiper arm-to-windshield wiper motor nut	17
Windshield Wiper Motor to Vehicle	8

¹⁾ Tighten bolt 3 then 4.

Exterior Lights, Switches Tightening Specifications

Component	Nm
Bolt on the Access/Start Authorization Switch	3
Nuts to Parking Aid Control Module	3
Retaining Strap on the Headlamp Housing	6
Screw for Bi-Xenon Headlamp Retaining Plate	1.4
Screw for Clamping Ring to Steering Column	4
Screw for Daytime Running Lamp and Parking Lamp LED Module	1.4
Screw for Exterior Rearview Mirror Turn Signal Bulb	0.9
Screw for Fog Lamps	4.5
Screws for Headlamp Housing	4.5
Screws for Headlamp Housing Bracket	8
Screws for Headlamp Housing Bracket (Bi-Xenon Headlamps)	4.5
Screws for Headlamp Mount	4.5
Screw for Headlamp Range Control Positioning Motor Housing Cover	2
Screws for High Mounted Brake Light	2.5
Screw for Steering Column Electronic Systems Control Module	0.5

Taillamps Tightening Specification



Component	Nm
Tighten the rear light housing nuts 1 through 3 in sequence	3.5

Interior Lights, Switches Tightening Specifications

Component	Nm
Front interior lamps/reading lamps bolt	1.6
Interior access/start authorization antenna 1 mount bolt	2
Left and Right Access/Start Authorization Antenna Bolts	2
Luggage Compartment Access/Start Authorization Antenna Bolts	2
Sunroof regulator bolt	1
Alarm horn bracket nuts	7
	8.5
Headlamp assistant screw	2.4
Lane change assistance control module screws	2.5
Lane change assistance control module 2 screws	2.5

Wiring Tightening Specifications

Component	Nm
4-pin relay/fuse panel electrical wire	9
Engine compartment E-Box cover bolt	3.5
Engine compartment E-Box cover nut	9
Electrical wire on back of fuse panel B	9
Engine compartment E-Box screws	4.5
Fuse panel A bolt	3.5
Fuse panel A nut	9
Fuse panel A electrical wire	7.5
Fuse panel A positive wire-to-engine	18
Relay/fuse panel mount nut	3
Positive wire-to-fuse panel B	9
Terminal 30 nut	7.5
Terminal 30 battery wire	18
Terminal 30 battery jump start terminal	20
Terminal 30 E-Box positive wire	7.5
Terminal 30 fan wire	7.5
Terminal 30 PTC line	7.5
Terminal 30 starter wire	18

DTC CHART

Engines - CPMA

Fuel and Air Mixture, Additional Emission Regulations

DTC	Error Message	Malfunction Criteria and Threshold Value
P000A	Intake (A) Camshaft Position Slow Response Bank 1	Signal change < 1.9 - 4.2°CRK/s
P0010	Intake (A) Camshaft Position Actuator Circuit/Open (Bank 1)	Signal voltage > 4.40 - 5.60 V
P0011	Intake (A) Camshaft Position Timing - Over-Advanced (Bank 1)	Target error (stuck position) > 6.8 - 8°CRK
P0016	Crankshaft Position - Camshaft Position Correlation (Bank 1, Sensor A)	<ul style="list-style-type: none"> • Permissible deviation < 11° Rev or • Permissible deviation > 11° Rev
P025A	Fuel Pump Open Circuit	Signal voltage > 4.40 - 5.60 V
P025C	Fuel Pump Short to Ground	Signal voltage < 2.15 - 3.25 V
P025D	Fuel Pump Short to B+	Signal current > 1.10 A
P0030	HO2S Heater Control Circuit (Bank 1, Sensor 1) Open Circuit	Heater voltage 2.34 - 3.59 V
P0031	HO2S Heater Control Circuit Low (Bank 1, Sensor 1) Short to Ground	Heater voltage < 2.34 V
P0032	HO2S Heater Control Circuit High (Bank 1, Sensor 1) Short to B+	Heater voltage > 3.59 V
P0036	HO2S Heater Control Circuit (Bank 1, Sensor 2) Open Circuit	SULEV heater voltage 4.50 - 5.50 V
P0037	HO2S Heater Control Circuit Low (Bank 1, Sensor 2) Short to Ground	Heater voltage < 3.00 V
P0038	HO2S Heater Control Circuit High (Bank 1, Sensor 2) Short to B+	Heater current 2.70 - 5.50 A

DTC	Error Message	Malfunction Criteria and Threshold Value
P0043	HO2S Heater Control Circuit Low (Bank 1, Sensor 2) Short to Ground	<ul style="list-style-type: none"> • 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
P050A	Idle Air Control System RPM Lower or Higher Than Expected	Out of range - Low <ul style="list-style-type: none"> • Engine speed deviation < 80 RPM and <ul style="list-style-type: none"> • RPM controller torque value \geq calculated max. value Out of range - High <ul style="list-style-type: none"> • Engine speed deviation > 80 RPM and <ul style="list-style-type: none"> • RPM controller torque value \leq calculated min. value Plausibility check <ul style="list-style-type: none"> • Integrated deviation of engine speed low and integrated deviation of engine speed high > 2000 RPM
P0068	MAP/MAF – Throttle Position Correlation	<ul style="list-style-type: none"> • Plausibility with fuel system load calculation < -50% • Plausibility with fuel system load calculation > 50%
P0087	Fuel Rail/System Pressure - Too Low	<ul style="list-style-type: none"> • Pressure control activity > 5.00 mPa and <ul style="list-style-type: none"> • Fuel trim activity 0.90 - 120
P0088	Fuel Rail/System Pressure - Too High	Fuel rail pressure > 13.9 MPa
P0089	Fuel Pressure Regulator 1 Performance	Actual pressure deviation <ul style="list-style-type: none"> • < 100 kPa • > 100 kPa
P0100	Mass or Volume Air Flow A Circuit	MAF sensor signal 0 μ s

DTC	Error Message	Malfunction Criteria and Threshold Value
P0101	Mass or Volume Air Flow A Circuit Range/Performance	<ul style="list-style-type: none"> • Mass air flow vs. lower threshold model < 0 - 396 kg/h • Mass air flow vs. upper threshold > 34 - 907 kg/h • Load calculation > 19% and • Fuel system (mult.) < -21% • Load calculation < -19% and • Fuel system (mult.) > 21 %
P0102	Mass or Volume Air Flow A Circuit Low Input	MAF sensor signal < 66 µs
P0103	Mass or Volume Air Flow A Circuit High Input	MAF sensor signal > 4500 µs
P0106	Manifold Absolute Pressure/ BARO Sensor Range/ Performance	Boost pressure signal <ul style="list-style-type: none"> • Altitude sensor < -210 hPa • Altitude sensor > 230 hPa
P0111	Intake Air Temperature Sensor 1 Rationality Check (ULEV)	<ul style="list-style-type: none"> • Difference in value between IAT and ECT at engine start (depending on engine off time) > 25 - 40 K and • Difference in value between IAT and AAT at engine start (depending on engine off time) > 25 - 40 K
P0112	Intake Air Temperature Sensor 1 Circuit Low Input	Intake air temperature > 141°C
P0113	Intake Air Temperature Sensor 1 Circuit High Input	Intake air temperature < 46°C
P0116	Engine Coolant Temperature Sensor 1 Circuit Range/ Performance	Stuck high <ul style="list-style-type: none"> • Difference in value between ECT and AAT at engine start (depending on engine off time) > 25 - 40°C and • Difference in value between IAT and AAT at engine start (depending on engine off time) < 25 - 40°C and • Difference in value between AAT and ECT at engine start (depending on engine off time) > 25 - 40°C

DTC	Error Message	Malfunction Criteria and Threshold Value
P0116	Engine Coolant Temperature Sensor 1 Circuit Range/Performance (ULEV)	<ul style="list-style-type: none"> • Signal in range 109.6 - 140.3°C and no change on signal < 1.5 K • Signal in range 50.3 - 88.4°C and no change on signal < 1.5 K • Signal in range 88.5 - 109.5°C and no change on signal < 1.5 K
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	<ul style="list-style-type: none"> • TPS 1 - TPS 2 > 6.30% and • Actual TPS 1 calculated value > actual TPS 2 calculated value or • TPS 1 calculated value > 9.00%
P0122	Throttle/Pedal Position Sensor A Circuit Low Input	Signal voltage < 0.20 V
P0123	Throttle/Pedal Position Sensor A Circuit High Input	Signal voltage > 4.81 V
P0130	O2 Sensor Circuit (Bank 1, Sensor 1)	O2S ceramic temperature < 640°C
P0131	O2 Sensor Circuit (Bank 1, Sensor 1) Low Voltage	Virtual mass < 2.0 V
		Nernst voltage < 1.50 V
		Adjustment voltage < 0.30 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: <ul style="list-style-type: none"> • Lower value of both area ratios R2L and L2R < 0.30 and <ul style="list-style-type: none"> • Difference of R2L area ratio vs. L2R area ratio -0.400 - 0.400 Asymmetric fault: <ul style="list-style-type: none"> • Lower value of both area ratios R2L and L2R < 0.30 and <ul style="list-style-type: none"> • Difference of R2L area ratio vs. L2R area ratio NOT (-0.400 - 0.400) General: <ul style="list-style-type: none"> • Lower value of both counters for area ratio R2L and L2R ≥ 5 times
P0135	O2 Heater Circuit (Bank 1, Sensor 1)	<ul style="list-style-type: none"> • O2S ceramic temperature < 715°C and <ul style="list-style-type: none"> • Heater duty cycle 100% <ul style="list-style-type: none"> • O2S ceramic temperature < 715°C and <ul style="list-style-type: none"> • Time after O2S heater on 40 Sec.
P0136	O2 Circuit (Bank 1, Sensor 2)	<ul style="list-style-type: none"> • Delta voltage one step at heater switching > 2.00 V and <ul style="list-style-type: none"> • Number of heater coupling ≥ 6 times
P0137	O2 Circuit Low Voltage (Bank 1, Sensor 2)	<ul style="list-style-type: none"> • Signal voltage < 0.06 V for time > 3 Sec. and <ul style="list-style-type: none"> • 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 > 1.26 V for > 5 Sec.

DTC	Error Message	Malfunction Criteria and Threshold Value
P0139	O2 Circuit Slow Response (Bank 1, Sensor 2)	<ul style="list-style-type: none"> • EWMA filtered transient time at fuel cut off > 0.7 Sec. • In voltage range 201 - 347.7 mV • Number of checks (initial phase) > 3 • Number of checks (step function) > 3
P0140	O2 Circuit No Activity Detected (Bank 1, Sensor 2)	<ul style="list-style-type: none"> • Signal voltage .40 - .60 mV for > 3 Sec or • Difference in sensor voltage with load pulse and voltage without load pulse (mean value of 3 measurements) \geq 2.80 V
P0141	O2 Heater Circuit (Bank 1, Sensor 2) Out of Range	Heater resistance 810 - 4560 Ω
P0145	O2 Circuit Slow Response (Bank 1, Sensor 2)	<ul style="list-style-type: none"> • 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
P0169	Incorrect Fuel Composition	Comparison with fuel quantity incorrect
P0171	System Too Lean (Bank 1)	At idle <ul style="list-style-type: none"> • Adaptive value > 21% At part-load <ul style="list-style-type: none"> • Adaptive value 26% (only B8 ULEVVII)
P0172	System Too Rich (Bank 1)	At idle <ul style="list-style-type: none"> • Adaptive value < 5.02% (< 6.0% only B8 ULEV) At part-load <ul style="list-style-type: none"> • Adaptive value < 21% (< -26% only B8 ULEVVII)
P0190	Fuel Rail Pressure Sensor A Circuit	Signal voltage > 4.8 V
P0191	Fuel Rail Control Valve, High Pressure Side	Actual pressure > 20.6 MPa

DTC	Error Message	Malfunction Criteria and Threshold Value
P0192	Fuel Rail Pressure Sensor A Circuit Low Input	Signal voltage < 0.2 V
P0201	Injector Circuit/Open - Cylinder 1	<ul style="list-style-type: none"> • Low side signal current < 2.1 A • Internal logic failure
P0202	Injector Circuit/Open - Cylinder 2	<ul style="list-style-type: none"> • Low side signal current < 2.1 A • Internal logic failure
P0203	Injector Circuit/Open - Cylinder 3	<ul style="list-style-type: none"> • Low side signal current < 2.1 A • Internal logic failure
P0204	Injector Circuit/Open - Cylinder 4	<ul style="list-style-type: none"> • Low side signal current < 2.1 A • Internal logic failure
P0221	Throttle/Pedal Position Sensor/Switch B Circuit Range/Performance	<ul style="list-style-type: none"> • TPS 1 - TPS 2 > 6.30% and • Actual TPS 2 calculated value > actual TPS 1 calculated value or <ul style="list-style-type: none"> • TPS 2 calculated value > 9.00%
P0222	Throttle/Pedal Position Sensor/Switch B Circuit Low Input	Signal voltage < 0.20 V
P0223	Throttle/Pedal Position Sensor/Switch B Circuit High Input	Signal voltage > 4.81 V
P0234	Turbocharger/Supercharger Overboost Condition Rationality Check High	Difference of set value boost pressure vs. actual boost pressure value > 200 - 1280 hPa
P0236	Turbocharger Boost Sensor A Plausability Check	Difference in boost pressure signal vs. altitude sensor signal > 220 hPa or < 120 hPa
P0237	Turbocharger/Supercharger Boost Sensor A Circuit Low	Signal voltage < 0.2 V
P0238	Turbocharger/Supercharger Boost Sensor A Circuit High	Signal voltage > 4.88 V
P0243	Turbocharger/Supercharger Wastegate Solenoid A	Signal voltage > 4.40 - 5.60 V
P0245	Turbocharger/Supercharger Wastegate Solenoid A Low	Signal voltage < 2.15 - 3.25 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P0246	Turbocharger/Supercharger Wastegate Solenoid A High	Signal current > 2.20 A
P0261	Cylinder 1 Injector Circuit Low	Signal current < 2.10 A
P0262	Cylinder 1 Injector Circuit High	Signal current > 14.70 A
P0264	Cylinder 2 Injector Circuit Low	Signal current < 2.10 A
P0265	Cylinder 2 Injector Circuit High	Signal current > 14.70 A
P0267	Cylinder 3 Injector Circuit Low	Signal current < 2.10 A
P0268	Cylinder 3 Injector Circuit High	Signal current > 14.70 A
P0270	Cylinder 4 Injector Circuit Low	Low side signal current < 2.10 A
P0271	Cylinder 4 Injector Circuit High	Signal current > 14.70 A
P0299	Turbocharger/Supercharger Underboost Rationality Check Low	Difference of set boost pressure vs. actual boost pressure value > 150 hPa
P2004	Intake Manifold Runner Control Stuck Open Bank 1	<ul style="list-style-type: none"> • Normal closed position, unable to reach signal voltage < 2.62 or > 4.65 V or • Normal open position, unable to reach signal voltage < 0.35 or > 2.38 V
P2008	Intake Manifold Runner Control Circuit/Open (Bank 1)	Signal voltage 4.40 - 5.60 V
P2009	Intake Manifold Runner Control Circuit Shorted (Bank 1)	Signal voltage 2.15 - 3.25 V
P2010	Intake Manifold Runner Control Circuit Shorted to B+ (Bank 1)	Signal current > 2.20 A
P2014	Intake Manifold Runner Position Sensor/Switch Circuit (Bank 1)	Signal voltage > 4.75 V
P2015	Intake Manifold Runner Position Sensor/Switch Circuit Range/Performance (Bank 1)	Deviation runner flap position vs. actual position > 25%
P2016	Intake Manifold Runner Position Sensor/Switch Circuit Low (Bank 1)	Signal voltage < 0.25 V
P2088	Camshaft Position A Actuator Control Circuit Low (Bank 1) Short to Ground	Signal voltage < 2.15 - 3.25 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P2089	Camshaft Position A Actuator Control Circuit High (Bank 1) Short to B+	Signal current > 2.2 A
P2096	Post-Catalyst Fuel Trim System Too Lean (Bank 1)	l-portion of 2nd lambda control loop < 0.030
P2097	Post-Catalyst Fuel Trim System Too Rich (Bank 1)	l-portion of 2nd lambda control loop > 0.030
P3081	Engine Temperature Too Low	Reference model temperature - measured engine coolant temp. > 10 [K]

Ignition System

DTC	Error Message	Malfunction Criteria and Threshold Value
P0300	Crankshaft Speed Fluctuation (Single or Multiple)	<ul style="list-style-type: none"> • Emission threshold misfire rate (MR) > 1.7% • Catalyst damage misfire rate (MR) > 5.0 - 20.0%
P0301	Crankshaft Speed Fluctuation (Single or Multiple)	<ul style="list-style-type: none"> • Emission threshold misfire rate (MR) > 1.7% • Catalyst damage misfire rate (MR) > 5.0 - 20.0%
P0302	Crankshaft Speed Fluctuation (Single or Multiple)	<ul style="list-style-type: none"> • Emission threshold misfire rate (MR) > 1.7% • Catalyst damage misfire rate (MR) > 5.0 - 20.0%
P0303	Crankshaft Speed Fluctuation (Single or Multiple)	<ul style="list-style-type: none"> • Emission threshold misfire rate (MR) > 1.7% • Catalyst damage misfire rate (MR) > 5.0 - 20.0%
P0304	Crankshaft Speed Fluctuation (Single or Multiple)	<ul style="list-style-type: none"> • Emission threshold misfire rate (MR) > 1.7% • Catalyst damage misfire rate (MR) > 5.0 - 20.0%
P0321	Ignition/Distributor Engine Speed Input Circuit Range/ Performance	<ul style="list-style-type: none"> • Comparison of counted teeth vs. reference incorrect or • Monitoring reference gap failure
P0322	Ignition/Distributor Engine Speed Input Circuit No Signal	<ul style="list-style-type: none"> • Camshaft signal > 3 • Engine speed no signal

DTC	Error Message	Malfunction Criteria and Threshold Value
P0324	Knock Control System Error	<ul style="list-style-type: none"> • Signal fault counter (combustion) > 24 or <ul style="list-style-type: none"> • Signal fault counter (measuring window) > 2.00
P0327	Knock Sensor 1 Circuit Low Input (Bank 1) Short to ground, Port B	Lower threshold, < 0.70 V
P0327	Knock (Sensor 1) Circuit Short to Ground, Port A	Lower threshold, < 0.70 V
P0327	Knock Sensor 1 Circuit Signal Range Check	Lower threshold, < 0.70 V
P0328	Knock Sensor 1 Circuit signal range check (Bank 1)	Upper threshold > 18.0 - 50.0 V
P0328	Knock Sensor 1 Circuit short to B+ Port B (Bank 1)	Upper threshold > 1.00 V
P0328	Knock Sensor 1 Circuit short to B+ Port A (Bank 1)	Upper threshold > 1.00 V
P0340	Camshaft Position Sensor A Circuit (Bank 1 or Single Sensor)	Cam adaption values out of range <ul style="list-style-type: none"> • > 20° KW • < -20° KW • Difference of adapted and actual values > 9° KW
P0341	Camshaft Position Sensor A Circuit Range/Performance (Bank 1 or Single Sensor)	Signal pattern incorrect
P0342	Camshaft Position Sensor A Circuit Low Input (Bank 1 or Single Sensor)	<ul style="list-style-type: none"> • Signal voltage low • Crankshaft signals = 8
P0343	Camshaft Position Sensor A Circuit High Input (Bank 1 or Single Sensor)	<ul style="list-style-type: none"> • Signal voltage high • Crankshaft signals = 8
P0351	Ignition Coil A Primary/ Secondary Circuit	<ul style="list-style-type: none"> • Signal current < -0.25 to 2.0 mA • Internal check failed
P0352	Ignition Coil B Primary/ Secondary Circuit	<ul style="list-style-type: none"> • Signal current < -0.25 to 2.0 mA • Internal check failed
P0353	Ignition Coil C Primary/ Secondary Circuit	<ul style="list-style-type: none"> • Signal current < -0.25 to 2.0 mA • Internal check failed

DTC	Error Message	Malfunction Criteria and Threshold Value
P0354	Ignition Coil D Primary/ Secondary Circuit	<ul style="list-style-type: none"> • Signal current < -0.25 to 2.0 mA • Internal check failed

Additional Exhaust Regulation

DTC	Error Message	Malfunction Criteria and Threshold Value
P0410	System Check After SAI (PZEV)	Deviation SAI pressure > 20.0 hPa
P0413	Open Circuit (PZEV)	Signal voltage 9.25 - 11.25 V
P0414	Short to Ground (PZEV)	Signal voltage < 6.00 V
P0415	Short to B+ (PZEV)	Signal current 2.20 - 4.20 A
P0418	Air Pump Relay Open Circuit (PZEV)	Signal voltage 4.50 - 5.50 V
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<ul style="list-style-type: none"> • Measured OSC / OSC of borderline catalyst value for front catalyst , < 0.40 or • Value for front catalyst, <1.30 and • Value for main catalyst, <1.20
P0420	Catalyst System (Only Bin 5, ULEV) Efficiency Below Threshold (Bank 1)	<ul style="list-style-type: none"> • Measured OSC / OSC of borderline catalyst value for main catalyst , < 0.90 While • Value for front catalyst, < 2.00
P0420	Catalyst System (only bin 5, ULEV) Efficiency Below Threshold (Bank 1)	Measured OSC/OSC of borderline catalyst. EWMA filter value for catalyst < .20
P0441	Evaporative Emission System Incorrect Purge Flow	Reaction of idle controller or lambda controller Deviation less than .079% lambda controller and < 35% idle controller deviation.
P0442	Evaporative Emission System Leak Detected (Small Leak)	Time for pressure drop < 1.55 - 1.75 Sec.
P0444	Evaporative Emission System Purge Control Valve Circuit Open	Signal voltage > 4.40 - 5.40 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P0455	Evaporative Emission System Leak Detected (Gross Leak/ No Flow)	Time for pressure drop < 0.95 Sec.
P0456	Evaporative Emission System Leak Detected (Very Small Leak)	< 5.0 - 6.5 Sec.
P0458	Evaporative Emission System Purge Control Valve Circuit Low	Signal voltage < 2.15 - 3.25 V
P0459	Evaporative Emission System Purge Control Valve Circuit High	Signal current > 2.20 A
P0491	Secondary Air System Insufficient Flow. Flow Check During Catalyst Heating. (PZEV)	SAI pressure measured with SAI pressure sensor vs modeled < 0.6 (0.62) %

Speed and Idle Control

DTC	Error Message	Malfunction Criteria and Threshold Value
P0501	Vehicle Speed Sensor A Range/Performance	VSS signal < 4 km/h
P0503	Vehicle Speed Sensor A Out of Range/High	Vehicle speed > 200 km/h
P0506	Idle Air Control System - RPM Lower Than Expected	<ul style="list-style-type: none"> • Engine speed deviation < -80 RPM and • RPM controller torque value ≥ calculated max value • Integrated deviation of engine speed low and integrated deviation of engine speed high > 2000 RPM
P0507	Idle Air Control System - RPM Higher Than Expected	<ul style="list-style-type: none"> • Engine speed deviation > -80 RPM and • RPM controller torque value ≤ calculated min. value
P050B	Cold Start Idle Air Control System Performance	Difference between commanded spark timing vs. actual value > 0.25%

DTC	Error Message	Malfunction Criteria and Threshold Value
P052A	VVT Actuator Intake	Difference between target position and actual position > 12.0°CRK
P053F	Fuel Rail Control Valve High Pressure Side	

Control Module and Output Signals

DTC	Error Message	Malfunction Criteria and Threshold Value
P0601	Internal Control Module Memory Check Sum Error	Internal check sum, incorrect
P0604	Internal Control Module Random Access Memory (RAM) Error	Write ability check, failed
P0605	Internal Control Module Read Only Memory (ROM) Error	Checksum incorrect
P0606	CAN: Internal Fault	RAM error memory checksum error
P0606	ECM Processor	<ul style="list-style-type: none"> • Function monitoring: WDA general cause failure • Function monitoring: WDA internal check failure • Function monitoring: WDA overvoltage detection failure • EEPROM check failed • Internal hardware check (electrical adjustment communication, voltage supply) check
P0606	ECM: 5V Supply Voltage	Internal hardware check under-/over-voltage detection
P0606	ECM: A/D Converter	<ul style="list-style-type: none"> • Power-up calibration check failed • A/D-channel conversion check failed
P0606	ECM: A/D Converter 2	<ul style="list-style-type: none"> • Power-up calibration check failed • A/D-channel conversion check failed

DTC	Error Message	Malfunction Criteria and Threshold Value
P0627	Fuel Pump A Control Circuit/ Open	<ul style="list-style-type: none"> • Internal error fuel pump control unit • Feedback from fuel pump control unit pump blocked short circuit to battery +, ground or open circuit
P0638	Throttle Actuator Control Range/Performance (Bank 1)	Rationality check: <ul style="list-style-type: none"> • Time to close to reference point > 0.6 Sec. and <ul style="list-style-type: none"> • Reference point 2.88% Rationality check: <ul style="list-style-type: none"> • Time to open over reference point > 0.1 Sec or <ul style="list-style-type: none"> • Time to close below reference point > 0.6 Sec Signal range check at mechanical stop low <ul style="list-style-type: none"> • TPS 1 signal voltage \neq 0.40 - 0.80 V or <ul style="list-style-type: none"> • TPS 2 signal voltage \neq 4.20 - 4.60 V
P0641	Sensor Reference Voltage A Circuit/Open	Signal voltage deviation > \pm 0.3 V
P0642	Sensor Reference Voltage A Circuit Low	Signal voltage < 4.6 - 5.0 V
P0643	Sensor Reference Voltage A Circuit High	5V supply voltage > 4.99 - 5.41 V
P0651	Sensor Reference Voltage B Circuit/Open	Signal voltage deviation > \pm 0.3 V
P0652	Sensor Reference Voltage B Circuit Low	Signal voltage < 4.6 - 5.0 V
P0653	Sensor Reference Voltage B Circuit High	5V supply voltage > 4.99 - 5.41 V
P0657	Actuator Supply Voltage A Circuit/Open	Signal voltage > 4.40 - 5.60 V
P0658	Actuator Supply Voltage A Circuit Low	Signal voltage < 2.15 - 3.25 V
P0659	Actuator Supply Voltage A Circuit High	Signal current > 1.10 A

DTC	Error Message	Malfunction Criteria and Threshold Value
P0685	ECM/PCM Power Relay Control Circuit/Open	<ul style="list-style-type: none"> • Signal voltage 2.6 - 3.7 V • Sense circuit voltage > 6 V
P0686	ECM/PCM Power Relay Control Circuit Low	<ul style="list-style-type: none"> • Signal voltage 2.6 - 3.7 V • Sense circuit voltage > 6 V
P0687	ECM/PCM Power Relay Control Circuit High	<ul style="list-style-type: none"> • Signal current > 1.4 - 0.7 A • Sense circuit voltage < 6 V
P0688	ECM/PCM Power Relay Sense Circuit	<ul style="list-style-type: none"> • Sense voltage < 3.0 V • Difference sense circuit voltage with camshaft actuator commanded off and on > 2.5 V • Battery voltage > 3 V
P0697	Sensor Reference Voltage C Circuit/Open	Signal voltage deviation > ± 0.3 V
P0698	Sensor Reference Voltage C Circuit Low	Signal voltage < 4.6 - 5.0 V
P0699	Sensor Reference Voltage C Circuit High	5V supply voltage > 4.99 - 5.41 V
P062B	Injection Valves Communication	Internal logic 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	<ul style="list-style-type: none"> • 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	CAN communication with TCM, time out. check No message received by ECM
U0121	CAN ABS Brake Unit	CAN communication with ABS, time out
U0140	CAN communication with Body Control Module	Received CAN message - no message
U0146	CAN Gateway A	CAN communication with gateway, time out
U0155	CAN Instrument Cluster	Received CAN message - no message

DTC	Error Message	Malfunction Criteria and Threshold Value
U0302	Software Incompatibility with Transmission Control Module	AT vehicle ECM coded as MT vehicle
U0323	CAN: Instrument cluster Audi only	Ambient temperature value module not encoded for ambient temp sensor, 00h
U0402	CAN Communication with TCM	Data length code transmitted, incorrect
U0404	Invalid Data Received From Gear Shift Control Module	<ul style="list-style-type: none"> • 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 > 325 km/h
U0415	CAN: Vehicle Speed Sensor	<ul style="list-style-type: none"> • 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, Audi 01 h
U0423	CAN: Instrument cluster	Received CAN message, implausible message
U0447	CAN Gateway	CAN message incorrect

Fuel and Air Ratios Control Module

DTC	Error Message	Malfunction Criteria and Threshold Value
P11A1	Cylinder 1 Exhaust Cam Low Lift Electrical Fault	
P11A2	Cylinder 1 Functional Test, Fault Switching to Low Exhaust Cam Lift	0.00147 s
P11A3	Cylinder 2 Exhaust Cam Low Lift Electrical Fault	
P11A4	Cylinder 2 Functional Test, Fault Switching to Low Exhaust Cam Lift	0.00147 s

DTC	Error Message	Malfunction Criteria and Threshold Value
P11A5	Cylinder 3 Exhaust Cam Low Lift Electrical Fault	
P11A6	Cylinder 3 Functional Test, Fault Switching to Low Exhaust Cam Lift	0.00147 s
P11A7	Cylinder 4 Exhaust Cam Low Lift Electrical Fault	
P11A8	Cylinder 4 Functional Test, Fault Switching to Low Exhaust Cam Lift	0.00147 s
P1114	Internal Resistance Too Large (Bank 1, Sensor 2)	Heater resistance, (128-648)*(8-40)1.02-25.9 k Ω (dep. on mod. exhaust temp. and heater power)
P12A1	Fuel Rail Pressure Sensor Inappropriately Low	<ul style="list-style-type: none"> • Pressure control activity > 0.25 MPa and • Fuel trim activity < 0.85
P12A2	Fuel Rail Pressure Sensor Inappropriately High	<ul style="list-style-type: none"> • Pressure control activity > 0.25 MPa and • Fuel trim activity < 0.85
P12A4	Fuel Rail Pump Control Valve Stuck Closed	<ul style="list-style-type: none"> • Fuel trim activity 0.85 to 1.15 and • Pressure control activity < 6.0 mPa
P13EA	Ignition Timing Monitor	Difference between commanded spark timing and actual value > 0.60%
P150A	Engine Off Time Performance	<p>Comparison of engine off time from instrument cluster control unit with engine after run time.</p> <ul style="list-style-type: none"> • Difference between engine off time and ECM after run time < -12.0 Sec. <p>Comparison of engine off time from instrument cluster control unit with engine after run time</p> <ul style="list-style-type: none"> • Difference between engine off time and ECM after run time > 12.0 Sec.

DTC	Error Message	Malfunction Criteria and Threshold Value
P2101	Throttle Actuator A Control Motor Circuit Range/Performance	<ul style="list-style-type: none"> • Duty cycle >80% and • ECM power stage, no failure • Deviation throttle valve angles vs. calculated value 4.0 - 50.0%
P2106	Throttle Actuator Control System - Short to B+ or Ground	Internal check failed
P2106	Throttle Actuator Control System Open Circuit	Internal check failed
P2106	Throttle Actuator Control System Temp./Current Monitoring	Internal check failed
P2106	Throttle Actuator Control System Functional Check	Internal check failed
P2110	Throttle Actuator Control System - Forced Limited RPM	Engine load out of range
P2122	Throttle/Pedal Position Sensor/Switch D Circuit Low Input	Signal voltage < 0.646 V
P2123	Throttle/Pedal Position Sensor/Switch D Circuit High Input	Signal voltage > 4.794 V
P2127	Throttle/Pedal Position Sensor/Switch E Circuit Low Input	Signal voltage < 0.276 V
P2128	Throttle/Pedal Position Sensor/Switch E Circuit High Input	Signal voltage > 2.431 V
P2138	Throttle/Pedal Position Sensor/Switch D/E Voltage Correlation	Signal voltage: Difference between signal sensor 1 vs 2 > 0.143 - 0.703 V
P2146	Fuel Injector Group A Supply Voltage Circuit/Open	<ul style="list-style-type: none"> • Short to ground (high side) • Signal current > 14.90 A • Short to battery plus (high side) • Signal current < 2.60 A
P2149	Fuel Injector Group B Supply Voltage Circuit/Open	<ul style="list-style-type: none"> • Short to ground (high side) • Signal current > 14.90 A • Short to battery plus (high side) • Signal current < 2.60 A

DTC	Error Message	Malfunction Criteria and Threshold Value
P2177	Fuel System	<ul style="list-style-type: none"> • System too lean at part load • Adaptive value > 26%
P2178	Fuel System	<ul style="list-style-type: none"> • System too rich at part load • Adaptive value < 26%
P2181	Cooling System Performance	Cooling system temp too low after a sufficient air mass flow interval 55 - 80°C
P2187	Fuel System	<ul style="list-style-type: none"> • System too lean at idle • Adaptive value > 5.02%
P2188	Fuel System	<ul style="list-style-type: none"> • System too rich at idle • Adaptive value < 6.0%
P2195	O2 Sensor Signal Biased/ Stuck Lean (Bank 1, Sensor 1)	Delta lambda of 2nd lambda control loop > 0.07
P2196	O2 Sensor Signal Biased/ Stuck Rich (Bank 1, Sensor 1)	Delta lambda of 2nd lambda control loop < 0.07
P2231	O2 Sensor Signal Circuit Shorted to Heater Circuit	Delta O2S signal front > 190 uA
P2237	O2 Sensor Positive Current Control Circuit/Open (Bank 1, Sensor 1)	<ul style="list-style-type: none"> • Lambda set value < 0.97 or • O2S signal front 1.49 - 1.51 and lambda set value > 1.03 V • O2S signal front < 1.70 V and fuel cut off > 3.00 Sec. • O2S signal front 1.49 - 1.51 V and delta lambda controller > 0.10
P2243	O2 Sensor Reference Voltage Circuit/Open (Bank 1, Sensor 1)	<ul style="list-style-type: none"> • O2S signal front < 0.30 V and Internal resistance > 1000 Ohms • O2S signal front > 3.25 V and Internal resistance > 1000 Ohms
P2257	Air Pump Relay Short to Ground (PZEV)	Signal voltage < 3.00 V
P2258	Air Pump Relay Short to B+ (PZEV)	Signal current 0.60 - 1.20 A
P2270	O2 Circuit Slow Response (Bank 1, Sensor 2)	O2S signal rear < 0.603 - 0.649 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P2279	Intake Air System Leak	<ul style="list-style-type: none"> • Threshold to detect a defective system > 1.45 and • Ratio of the tie system defective during the measurement window to the whole duration of the measurement window > 0.60
P2293	Fuel Pressure Regulator 2 Performance	<ul style="list-style-type: none"> • Difference between target pressure vs. actual pressure: > 1.50 mPa or • < -1.50 mPa
P2294	Fuel Pressure Regulator 2 Control Circuit Open Circuit	• Signal voltage 1.40 - 3.20 V
P2294	Fuel Pressure Regulator 2 Control Circuit Rationality Check	• Signal pattern incorrect
P2295	Fuel Pressure Regulator 2 Control Circuit Low Short to Ground	Signal voltage < 1.40 - 3.20 V
P2296	Fuel Pressure Regulator 2 Control Circuit High	Signal voltage > 3.20 V

Ignition System

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

DTC	Error Message	Malfunction Criteria and Threshold Value
P2310	Ignition Coil D Primary Control Circuit High	Signal voltage > 5.1 - 7.0 mA

Additional Emissions Regulations

DTC	Error Message	Malfunction Criteria and Threshold Value
P2400	Evaporative Emission System Leak Detection Pump Control Circuit/Open	Signal voltage > 4.40 - 5.60 V
P2401	Evaporative Emission System Leak Detection Pump Control Circuit Low	Signal voltage < 2.15 to 3.25 V
P2402	Evaporative Emission System Leak Detection Pump Control Circuit High	Signal current > 3.0 A
P2403	Evaporative Emission System Leak Detection Pump Sense Circuit/Open	Low signal voltage > 0.5 Sec.
P2404	Evaporative Emission System Leak Detection Pump Sense Circuit Range/Performance	<ul style="list-style-type: none"> • High signal voltage > 12 Sec. and • Number of checks 30 and • Cumulative time of high signal voltage during pumping > 50 Sec.
P2414	O2 Sensor Exhaust Sample Error (Bank 1, Sensor 1)	<ul style="list-style-type: none"> • Threshold 1 - Signal voltage 3.1 - 4.81 V • Threshold 2 - Signal voltage 2.5 to 3.10 V
P2431	Rationality check	Difference between SAI pressure and ambient pressure ≠ -25.0 - 25.0 hPa
P2432	Signal Range Check	Signal voltage < 0.40 V
P2433	Signal Range Check	Signal voltage > 4.65 V
P2440	System Check After SAI (PZEV)	SAI pressure measured with SAI pressure sensor vs. modeled while SAI valve closed < 0.55%
P2539	Low Pressure Fuel System Sensor Circuit	Signal voltage > 4.9 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P2540	Low Pressure Fuel System Sensor Circuit Range/Performance	Actual pressure deviation < 800 kPa < 80 kPa
P2541	Low Pressure Fuel System Sensor Circuit Low	Signal voltage < 0.2 V
P2626	O2 Sensor Pumping Current Trim Circuit/Open (Bank 1 Sensor 1)	O2S signal front > 4.81 V

Transmission

DTC	Error Message	Malfunction Criteria and Threshold Value
P2637	Torque management Feedback Signal "A"	CAN message signal error flag, = 1
P2714	Pressure Control Solenoid "D" Performance or Stuck Off	PWM hardware detection, 0 or 100%
P2715	Pressure Control Solenoid "D" Stuck On	PWM hardware detection, 0 or 100%
P2716	Pressure Control Solenoid "D" Electrical	<ul style="list-style-type: none"> • Current higher or lower than threshold, < 730 mA • EDS output voltage at short to ground or open circuit ~ 0.5 V smaller than EDS supply voltage • Static leakage current flow
P2723	Pressure Control Solenoid "E" Performance or Stuck off	PWM hardware detection, 0 or 100%
P2725	Pressure Control Solenoid "E" Electrical	<ul style="list-style-type: none"> • Current higher or lower than threshold, < 730 mA • EDS output voltage at short to ground or open circuit ~ 0.5 V smaller than EDS supply voltage • Static leakage current flow
P2732	Pressure Control Solenoid "F" Performance or Stuck off	PWM hardware detection, 0 or 100%
P2733	Pressure Control Solenoid "F" Stuck On	PWM hardware detection, 0 or 100%

DTC	Error Message	Malfunction Criteria and Threshold Value
P2734	Pressure Control Solenoid "F" Electrical	<ul style="list-style-type: none"> • EDS output voltage at short to ground or open circuit ~ 0,5 V smaller than EDS supply voltage • Static leakage current flow
P2735	Pressure Control Solenoid "F" Intermittent	PWM hardware detection, 0 or 100%

DTC CHART

Engine Code CHJA

Fuel and Air Mixture, Additional Emission Regulations

DTC	Error Message	Malfunction Criteria and Threshold Value
P000A	Intake (A) Camshaft Position Slow Response Bank 1	<ul style="list-style-type: none">• Difference between target position vs. actual position > 8.00° CRK• For time > 1.3 - 2.9 Sec• Adjustment angle \geq 2.50° CRK
P0010	Intake (A) Camshaft Position Actuator Circuit/Open (Bank 1)	Signal voltage > 4.70 - 5.40 V
P0011	Intake (A) Camshaft Position Timing - Over-Advanced (Bank 1)	<ul style="list-style-type: none">• Difference between target position vs. actual position > 8.00° CRK• For time > 1.3 - 2.9 Sec• Adjustment angle \geq 2.50° CRK
P0016	Crankshaft Position - Camshaft Position Correlation (Bank 1, Sensor A)	<ul style="list-style-type: none">• Permissible deviation < 11.01 Revor• Permissible deviation > 11.01 Rev
P0030	HO2S Heater Control Circuit (Bank 1, Sensor 1) Open Circuit	Heater voltage 4.70 - 5.40 V
P0031	HO2S Heater Control Circuit Low (Bank 1, Sensor 1) Short to Ground	Heater voltage 0.0 - 3.26 V
P0032	HO2S Heater Control Circuit High (Bank 1, Sensor 1) Short to B+	Heater voltage > 5.50 V
P0036	HO2S Heater Control Circuit (Bank 1, Sensor 2) Open Circuit	Heater voltage 2.34 - 3.59 V
P0037	HO2S Heater Control Circuit Low (Bank 1, Sensor 2) Short to Ground	Heater voltage < 2.34 V
P0038	HO2S Heater Control Circuit High (Bank 1, Sensor 2) Short to B+	Heater current 3.59 A

DTC	Error Message	Malfunction Criteria and Threshold Value
P0043	HO2S Heater Control Circuit Low (Bank 1, Sensor 2) Short to Ground	<ul style="list-style-type: none"> • 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
P0068	MAP/MAF – Throttle Position Correlation	<ul style="list-style-type: none"> • Plausibility with fuel system load calculation < -50% • Plausibility with fuel system load calculation > 50%
P0070	Ambient Air Temperature Sensor	Ambient air temp < 50.0° C
P0071	Ambient Air Temperature Sensor	<ul style="list-style-type: none"> • Difference value: IAT-ECT @ engine start (depending on engine-off time, < 24.8 K and • Difference value: IAT-AAT @ engine start (depending on engine-off time), > 24.8 K and • Difference AAT vs. ECT at engine start > 24.8 (depending on engine off time) K
P0072	Ambient Air Temperature Sensor	Ambient air temp > 87.0° C
P0087	Fuel Rail/System Pressure - Too Low	<ul style="list-style-type: none"> • Pressure control activity > 5.00 mPa and • Fuel trim activity 0.90 - 120 and • Difference between target pressure vs. actual pressure > -16.38 mPa
P0088	Fuel Rail/System Pressure - Too High	Fuel rail pressure > 13.9 MPa
P0089	Fuel Pressure Regulator 1 Performance	Actual pressure deviation <ul style="list-style-type: none"> • < 100 kPa • > 100 kPa
P0100	Mass or Volume Air Flow A Circuit	MAF sensor signal 0 μs

DTC	Error Message	Malfunction Criteria and Threshold Value
P0101	Mass or Volume Air Flow A Circuit Range/Performance	<ul style="list-style-type: none"> • Mass air flow vs. lower threshold model < 0 - 417 kg/h • Mass air flow vs. upper threshold > 34 - 873 kg/h • Load calculation > 23% and • Fuel system (mult.) < -23% • Load calculation < -19% and • Fuel system (mult.) > 23%
P0102	Mass or Volume Air Flow A Circuit Low Input	MAF sensor signal < 66 μ s
P0103	Mass or Volume Air Flow A Circuit High Input	MAF sensor signal > 4500 μ s
P0106	Manifold Absolute Pressure/ BARO Sensor Range/ Performance	Boost pressure signal <ul style="list-style-type: none"> • Altitude sensor < -210 hPa • Altitude sensor > 230 hPa
P0111	Intake Air Temperature Sensor 1 Rationality Check (ULEV)	<ul style="list-style-type: none"> • Difference in value between IAT vs. ECT at engine start (depending on engine off time) > 24.8 K and • Difference in value between IAT vs. AAT at engine start (depending on engine off time) > 24.8 K and • Difference in value between AAT vs. ECT at engine start (depending on engine off time) < 24.8 K
P0112	Intake Air Temperature Sensor 1 Circuit Low Input	Signal voltage < 0.16° C
P0113	Intake Air Temperature Sensor 1 Circuit High Input	Signal voltage > 4.48° C

DTC	Error Message	Malfunction Criteria and Threshold Value
P0116	Engine Coolant Temperature Sensor 1 Circuit Range/Performance	<ul style="list-style-type: none"> • Difference in value between IAT vs. ECT at engine start (depending on engine off time) > 24.8 K and • Difference in value between IAT vs. AAT at engine start (depending on engine off time) > 24.8 K and • Difference in value between AAT vs. ECT at engine start (depending on engine off time) < 24.8 K
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	<ul style="list-style-type: none"> • TPS 1 - TPS 2 > 5.1 - 6.3% and • Actual TPS 1 calculated value > actual TPS 2 calculated value or • TPS 1 calculated value > 9.00%
P0122	Throttle/Pedal Position Sensor A Circuit Low Input	Signal voltage < 0.20 V
P0123	Throttle/Pedal Position Sensor A Circuit High Input	Signal voltage > 4.81 V
P0130	O2 Sensor Circuit (Bank 1, Sensor 1)	O2S ceramic temperature < 690°C
P0131	O2 Sensor Circuit (Bank 1, Sensor 1) Low Voltage	Nernst voltage < 1.50 V
		Adjustment voltage < 0.30 V
P0132	O2 Sensor Circuit (Bank 1, Sensor 1) High Voltage	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)	<p>Symmetric fault:</p> <ul style="list-style-type: none"> • Difference of R2L area ratio vs. L2R area ratio -0.40 - 0.40 • Lower value of both counters for area ratio R2L and L2R ≥ 4 times <p>Delay Time:</p> <ul style="list-style-type: none"> • Gradient ratio ≥ 0.00 • Lower value of both area ratios R2L and L2R < 0.30 <p>Transient Time:</p> <ul style="list-style-type: none"> • Gradient ratio ≥ 0.00 • Gradient ratio ≤ 0.45 • Lower value of both area ratios R2L and L2R < 0.30 <p>or</p> <ul style="list-style-type: none"> • Lower value of both gradient ratios R2L and L2R < 0.00 <p>ASYMMETRIC FAULT:</p> <ul style="list-style-type: none"> • Difference of R2L area ratio vs. L2R area ratio NOT -0.40 - 0.40 • Lower value of both counters for area ratio R2L and L2R ≥ 4 times <p>Delay Time:</p> <ul style="list-style-type: none"> • Gradient ratio ≥ 0.00 • Lower value of both area ratios R2L and L2R < 0.30 <p>Transient Time:</p> <ul style="list-style-type: none"> • Gradient ratio ≥ 0.00 • Gradient ratio ≤ 0.45 • Lower value of both area ratios R2L and L2R < 0.30 <p>or</p> <ul style="list-style-type: none"> • Lower value of both gradient ratios R2L and L2R < 0.00
P0135	O2 Heater Circuit (Bank 1, Sensor 1)	<ul style="list-style-type: none"> • O2S ceramic temperature $< 725^{\circ}\text{C}$ <p>and</p> <ul style="list-style-type: none"> • Heater duty cycle $> 90\%$ <ul style="list-style-type: none"> • O2S ceramic temperature $< 725^{\circ}\text{C}$ <p>and</p> <ul style="list-style-type: none"> • Time after O2S heater on 40 Sec.

DTC	Error Message	Malfunction Criteria and Threshold Value
P0136	O2 Circuit (Bank 1, Sensor 2)	<ul style="list-style-type: none"> • Delta voltage one step at heater switching > 2.00 V and • Number of heater coupling ≥ 6 times
P0137	O2 Circuit Low Voltage (Bank 1, Sensor 2)	<ul style="list-style-type: none"> • 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 > 1.26 V for > 5 Sec.
P0139	O2 Circuit Slow Response (Bank 1, Sensor 2)	<ul style="list-style-type: none"> • EWMA filtered transient time at fuel cut off > 0.7 Sec. • In voltage range 201 - 347.7 mV • Number of checks (initial phase) > 3 • Number of checks (step function) > 3
P013A	Check of Differential Transient Time at Fuel Cut Off	<ul style="list-style-type: none"> • EWMA filtered max differential transient time at fuel cut off > 0.7 Sec. and • Number of checks ≥ 3.00 (initial phase and step function)
P013B	Oxygen Sensors Rear Check of Differential Transient Time at Fuel Feed Restart	<ul style="list-style-type: none"> • Arithmetic filtered max differential transient time at fuel feed restart = n.a or • EWMA filtered max differential transient time at fuel feed restart ≥ 2.5 [s] • Number of checks ≥ 3.00 [-]
P013E	Oxygen Sensors Rear Check of Differential Delay Time at Rich to Lean Transition	<ul style="list-style-type: none"> • Arithmetic filtered max differential delay time at lean to rich transition = n.a. or • EWMA filtered max differential delay time at lean to rich transition > 1.0 [s] and number of checks ≥ 3.00 [-]

DTC	Error Message	Malfunction Criteria and Threshold Value
P013F	Oxygen Sensors Rear Check of Differential Delay Time at Lean to Rich Transition	<ul style="list-style-type: none"> • Arithmetic filtered max differential delay time at lean to rich transition = n.a. or • EWMA filtered max differential delay time at lean to rich transition > 1.5 [s] and number of checks ≥ 3.00 [-]
P0140	O2 Circuit No Activity Detected (Bank 1, Sensor 2)	<ul style="list-style-type: none"> • 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 • Internal resistance > 40000Ω • Exhaust temperature > 600° C
P0141	O2 Heater Circuit (Bank 1, Sensor 2) Out of Range	Heater resistance 810 - 4560 Ω
P0145	O2 Circuit Slow Response (Bank 1, Sensor 2)	<ul style="list-style-type: none"> • 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
P0169	Incorrect Fuel Composition	<ul style="list-style-type: none"> • Interventions on injection path incorrect • Injection cut off incorrect • Internal check failed • correction factor incorrect • Fuel quantity incorrect • ABS difference between predicted and real air mass > 11.30%
P0171	System Too Lean (Bank 1)	<p>At idle</p> <ul style="list-style-type: none"> • Adaptive value > 21% <p>At part-load</p> <ul style="list-style-type: none"> • Adaptive value 26% (only B8 ULEVVII)

DTC	Error Message	Malfunction Criteria and Threshold Value
P0172	System Too Rich (Bank 1)	At idle <ul style="list-style-type: none"> • Adaptive value < 5.02% (< 6.0% only B8 ULEV) At part-load <ul style="list-style-type: none"> • Adaptive value < 21% (< -26% only B8 ULEVVII)
P0190	Fuel Rail Pressure Sensor A Circuit	Signal voltage > 4.90 V
P0191	Fuel Rail Control Valve, High Pressure Side	Actual pressure > 21.3 MPa
P0192	Fuel Rail Pressure Sensor A Circuit Low Input	Signal voltage < 0.2 V
P0201	Injector Circuit/Open - Cylinder 1	<ul style="list-style-type: none"> • Low side signal current < 2.1 A • Internal logic failure
P0202	Injector Circuit/Open - Cylinder 2	<ul style="list-style-type: none"> • Low side signal current < 2.1 A • Internal logic failure
P0203	Injector Circuit/Open - Cylinder 3	<ul style="list-style-type: none"> • Low side signal current < 2.1 A • Internal logic failure
P0204	Injector Circuit/Open - Cylinder 4	<ul style="list-style-type: none"> • Low side signal current < 2.1 A • Internal logic failure
P0221	Throttle/Pedal Position Sensor/Switch B Circuit Range/Performance	<ul style="list-style-type: none"> • TPS 1 - TPS 2 > 5.1 - 6.30% and • Actual TPS 2 calculated value > actual TPS 1 calculated value or <ul style="list-style-type: none"> • TPS 2 calculated value > 9.00%
P0222	Throttle/Pedal Position Sensor/Switch B Circuit Low Input	Signal voltage < 0.20 V
P0223	Throttle/Pedal Position Sensor/Switch B Circuit High Input	Signal voltage > 4.81 V
P0234	Turbocharger/Supercharger Overboost Condition Rationality Check High	Difference of set value boost pressure vs. actual boost pressure value > 200 - 1279.96 hPa

DTC	Error Message	Malfunction Criteria and Threshold Value
P0236	Turbocharger Boost Sensor A Plausability Check	<ul style="list-style-type: none"> • Difference boost pressure signal vs altitude sensor signal, > 242.03 hPa • Difference boost pressure signal vs altitude sensor signal, < 142.03 hPa
P0237	Turbocharger/Supercharger Boost Sensor A Circuit Low	Signal voltage < 0.2 V
P0238	Turbocharger/Supercharger Boost Sensor A Circuit High	Signal voltage > 4.88 V
P0243	Turbocharger/Supercharger Wastegate Solenoid A	Signal voltage > 4.40 - 5.60 V
P0245	Turbocharger/Supercharger Wastegate Solenoid A Low	Signal voltage < 2.15 - 3.25 V
P0246	Turbocharger/Supercharger Wastegate Solenoid A High	Signal current > 2.20 - 4.0 A
P025A	Fuel Pump Open circuit	Signal voltage > 4.80 - 5.30 V
P025C	Fuel Pump Short to ground	Signal voltage < 2.7 - 3.25 V
P025D	Fuel Pump Short to Battery Voltage	Signal current > 0.6 mA
P0261	Cylinder 1 Injector Circuit Low	Signal current < 2.10 A
P0262	Cylinder 1 Injector Circuit High	Signal current > 14.70 A
P0264	Cylinder 2 Injector Circuit Low	Signal current < 2.10 A
P0265	Cylinder 2 Injector Circuit High	Signal current > 14.70 A
P0267	Cylinder 3 Injector Circuit Low	Signal current < 2.10 A
P0268	Cylinder 3 Injector Circuit High	Signal current > 14.70 A
P0270	Cylinder 4 Injector Circuit Low	Low side signal current < 2.10 A
P0271	Cylinder 4 Injector Circuit High	Signal current > 14.70 A
P0299	Turbocharger/Supercharger Underboost Rationality Check Low	Difference of set boost pressure vs. actual boost pressure value > 150 hPa
P2004	Intake Manifold Runner Control Stuck Open (Bank 1)	<ul style="list-style-type: none"> • Normal closed position, unable to reach signal voltage < 2.62 or > 4.65 V or • Normal open position, unable to reach signal voltage < 0.35 or > 2.38 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P2005	Intake Manifold Runner Control Stuck Closed (Bank 2)	<ul style="list-style-type: none"> • AAT > -10 °C • ECT > -10 °C • Engine speed > 400 RPM • Target position < 50% • Number of checks 3 • Difference between ambient pressure and manifold pressure > -200.00 kPa
P2006	Intake Manifold Runner Control Stuck Open (Bank 1)	<ul style="list-style-type: none"> • AAT > -10 °C • ECT > -10 °C • Engine speed > 400 RPM • Target position < 50% • Number of checks 3 • Difference between ambient pressure and manifold pressure > -200.00 kPa
P2007	Intake Manifold Runner Control Stuck Open (Bank 2)	<ul style="list-style-type: none"> • Engine speed > 400 RPM • ECT > -10 °C • IAT > -10 °C • Target position < 50% • Difference between ambient pressure and manifold pressure > 300.00 kPa • Number of checks 1
P2008	Intake Manifold Runner Control Circuit/Open (Bank 1)	Signal voltage 4.75 - 5.40 V
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 > 4.75 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P2015	Intake Manifold Runner Position Sensor/Switch Circuit Range/Performance (Bank 1)	Rationality check high • Difference between target position vs. actual position > 25.00% and • Actual position 0 - 100% Rationality check low • Difference between target position vs. actual position > 25.00% and • Actual position 0 - 100% rationality check • Difference between target position vs. actual position > 25.00% and • Actual position NOT (0 - 100%)
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 2) Short to B+	Signal voltage > 4.80 V
P2024	Evaporative Emissions (EVAP) Fuel Vapor Temperature / Pressure Sensor Circuit Open	Signal voltage 4.70 - 5.40 V
P2025	Evaporative Emissions (EVAP) Fuel Vapor Temperature / Pressure Sensor Circuit 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

DTC	Error Message	Malfunction Criteria and Threshold Value
P2026	Evaporative Emissions (EVAP) Fuel Vapor Temperature / Pressure Sensor Short to Ground	Signal voltage 0.0 - 3.25 V
P2027	Evaporative Emissions (EVAP) Fuel Vapor Temperature / Pressure Sensor Short to Battery Voltage	Signal current > 2.20 A
P2088	A Camshaft Position Actuator Control Circuit Low Bank 1 short to ground	Signal voltage, < 0.0 - 3.25 V
P2089	Camshaft Position A Actuator Control Circuit High (Bank 1) Short to B+	Signal current > 2.2 A
P2096	Post-Catalyst Fuel Trim System Too Lean (Bank 1)	I-portion of 2nd lambda control loop < 0.030
P2097	Post-Catalyst Fuel Trim System Too Rich (Bank 1)	I-portion of 2nd lambda control loop > 0.045
P3081	Engine Temperature Too Low	Difference reference model temperature vs. ECT > 9.8 K
P30A2	Brake Pedal Position Sensor	<ul style="list-style-type: none"> • Brake light switch not active and • Brake pedal position > 47.50% and • Brake pedal position < 10.00%

Ignition System

DTC	Error Message	Malfunction Criteria and Threshold Value
P0300	Crankshaft Speed Fluctuation (Single or Multiple)	<ul style="list-style-type: none"> • Emission threshold misfire rate (MR) > 1.7% • Catalyst damage misfire rate (MR) > 5.0 - 20.0%
P0301	Crankshaft Speed Fluctuation (Single or Multiple)	<ul style="list-style-type: none"> • Emission threshold misfire rate (MR) > 1.7% • Catalyst damage misfire rate (MR) > 5.0 - 20.0%
P0302	Crankshaft Speed Fluctuation (Single or Multiple)	<ul style="list-style-type: none"> • Emission threshold misfire rate (MR) > 1.7% • Catalyst damage misfire rate (MR) > 5.0 - 20.0%

DTC	Error Message	Malfunction Criteria and Threshold Value
P0303	Crankshaft Speed Fluctuation (Single or Multiple)	<ul style="list-style-type: none"> Emission threshold misfire rate (MR) > 1.7% Catalyst damage misfire rate (MR) > 5.0 - 20.0%
P0304	Crankshaft Speed Fluctuation (Single or Multiple)	<ul style="list-style-type: none"> Emission threshold misfire rate (MR) > 1.7% Catalyst damage misfire rate (MR) > 5.0 - 20.0%
P0321	Ignition/Distributor Engine Speed Input Circuit Range/Performance	<ul style="list-style-type: none"> Comparison of counted teeth vs. reference incorrect or <ul style="list-style-type: none"> Monitoring reference gap failure
P0322	Ignition/Distributor Engine Speed Input Circuit No Signal	<ul style="list-style-type: none"> Camshaft signal > 3 Engine speed no signal
P0324	Knock Control System Error	<ul style="list-style-type: none"> Signal fault counter (combustion) > 24 or <ul style="list-style-type: none"> Signal fault counter (measuring window) > 2.00
P0327	Knock Sensor 1 Circuit Low Input (Bank 1) Short to ground, Port B	<ul style="list-style-type: none"> Lower threshold, < 0.70 V or <ul style="list-style-type: none"> Lower threshold, < 0.58 - 1.60 V
P0328	Knock Sensor 1 Circuit, Short to Battery Voltage and/or signal range check	<ul style="list-style-type: none"> Upper threshold > 1.0 V or <ul style="list-style-type: none"> Upper threshold > 18.0 - 150.0 V
P0340	Camshaft Position Sensor A Circuit (Bank 1 or Single Sensor)	Cam adaption values out of range <ul style="list-style-type: none"> > 20° KW < -20° KW Difference of adapted and actual values > 9° KW
P0341	Camshaft Position Sensor A Circuit Range/Performance (Bank 1 or Single Sensor)	<ul style="list-style-type: none"> Signal pattern, incorrect Defect counter 12.00
P0342	Camshaft Position Sensor A Circuit Low Input (Bank 1 or Single Sensor)	<ul style="list-style-type: none"> Signal voltage permanently low Crankshaft signals = 8
P0343	Camshaft Position Sensor A Circuit High Input (Bank 1 or Single Sensor)	<ul style="list-style-type: none"> Signal voltage permanently high Crankshaft signals = 8

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

Additional Exhaust Regulation

DTC	Error Message	Malfunction Criteria and Threshold Value
P0410	System Check After SA	Deviation SAI pressure > 20.0 hPa
P0413	Secondary Air Valve	Signal voltage 4.70- 5.40 V
P0414	Secondary Air Valve	<ul style="list-style-type: none"> • Open circuit • Signal voltage 0.00 - 3.25 V • Short to B+ • Short to battery plus signal current > 2.20 A
P0415	Short to B+ (PZEV)	Signal current 2.20 - 4.20 A
P0418	Air Pump Relay Open Circuit	Signal voltage 4.50 - 5.50 V
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<ul style="list-style-type: none"> • Measured OSC / OSC of borderline catalyst value for front catalyst , < 0.40 or • Value for front catalyst, <1.30 and • Value for main catalyst, <1.20
P0420	Catalyst System (main) Efficiency Below Threshold	Measured OSC / OSC of borderline catalyst measured OSC (HC and Nox-correlated) EWMA filter value for catalyst < 1.00
P0441	Evaporative Emission System Incorrect Purge Flow	Deviation lambda controller less than < 5.00 - 7.01% and < 30% idle controller deviation

DTC	Error Message	Malfunction Criteria and Threshold Value
P0442	Evaporative Emission System Leak Detected (Small Leak)	Time for pressure drop < 1.55 - 1.75 Sec.
P0444	Evaporative Emission System Purge Control Valve Circuit Open	Signal voltage > 4.70 - 5.40 V
P0450	NVLD switch	Signal voltage 0.39 - 0.55 V
P0451	NVLD switch	Natural vacuum leak detection (NVLD) switch position closed
P0452	NVLD switch	
P0453	NVLD switch	
P0455	Evaporative Emission System Leak Detected (Gross Leak/ No Flow)	Time for pressure drop < 0.95 Sec.
P0456	Evaporative Emission System Leak Detected (Very Small Leak)	Natural vacuum leak detection (NVLD) switch position open
P0458	Evaporative Emission System Purge Control Valve Circuit Low	Signal voltage < 0.00 - 3.26 V
P0459	Evaporative Emission System Purge Control Valve Circuit High	Signal current > 2.20 A

DTC	Error Message	Malfunction Criteria and Threshold Value
P0491	Secondary Air System Insufficient Flow. Flow Check During Catalyst Heating.	<ul style="list-style-type: none"> • 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 \leq 20.00 hPa • or blockage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.60 • Leakage: relative AIR pressure measured with AIR pressure sensor vs. modeled < 0.62 • and relative AIR pressure measured \leq 20.00 hPa • or average pressure difference between absolute value and filtered n.a • and relative AIR pressure measured \leq 20.00 hPa

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	<ul style="list-style-type: none"> • Engine speed deviation < 80 RPM and • RPM controller torque value \geq calculated max value • Integrated deviation of engine speed low and integrated deviation of engine speed high > 2000 RPM

DTC	Error Message	Malfunction Criteria and Threshold Value
P0507	Idle Air Control System - RPM Higher Than Expected	<ul style="list-style-type: none"> • Engine speed deviation > 80 RPM and <ul style="list-style-type: none"> • RPM controller torque value \leq calculated min. value
P050A	Cold Start Monitoring. Idle Air Control System Out of Range High / Low	Out of range-low <ul style="list-style-type: none"> • Engine speed deviation < 80 RPM and <ul style="list-style-type: none"> • RPM controller torque value \geq calculated max. value Out of range-high <ul style="list-style-type: none"> • Engine speed deviation > 80 RPM and <ul style="list-style-type: none"> • RPM controller torque value \leq calculated min. value Plausibility check <ul style="list-style-type: none"> • Integrated deviation of engine speed low and integrated deviation of engine speed high > 2000 RPM
P050B	Cold Start Idle Air Control System Performance	Difference between commanded spark timing vs. actual value > 20.0 - 40.0%
P052A	VVT Actuator Intake	Difference between target position and actual position > 12.0°CRK
P053F	Fuel Rail Control Valve High Pressure Side	<ul style="list-style-type: none"> • Difference between target pressure vs. actual pressure < -1.50 MPa • Difference between target pressure vs. actual pressure > 1.50 MPa
P0555	Brake Booster Pressure Sensor Circuit	Sensor voltage > 4.88 V
P0556	Brake Booster Electrical Vacuum Pump Performance	<ul style="list-style-type: none"> • Brake booster pressure < 0.5 - 3.5 [kPa] • For time = 0.5 [s]
P0557	Brake Booster Pressure Sensor Circuit Low	Sensor voltage < 0.2 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P0571	Brake Light Switch	<ul style="list-style-type: none"> • Brake light switch active • “driver brakes” via CAN from BSCM not active • Accelerator pedal > 0.31% • Brake light switch not active • “Driver brakes” via CAN from BSCM active

DTC	Error Message	Malfunction Criteria and Threshold Value
P057B	Brake Pedal Position Sensor	<ul style="list-style-type: none"> • Plausibility check for the two PWM brake sensor raw values duty cycle > 125.00% • Synchronization check for the two PWM brake sensor raw values duty cycle > 8.00% • Check of duty cycle (channel 1) duty cycle > 95.00% • Check of duty cycle (channel 2) duty cycle > 95.00% • Check of duty cycle (channel 1) duty cycle < 5.00% • Check of duty cycle (channel 2) duty cycle < 5.00% • Check of period of time (channel 1) period of time > 6 mSec • Check of period of time (channel 2) period of time > 6 mSec • Check of period of time (channel 1) period of time < 6 mSec • Check of period of time (channel 2) period of time < 6 mSec • Signal activity check (channel 1) position sensor signal no signal • Signal activity check (channel 2) position sensor signal no signal • Rationality check high offset adaption value > 45.00% • Rationality check low offset adaption value < 12.00%

Control Module and Output Signals

DTC	Error Message	Malfunction Criteria and Threshold Value
P0601	Internal Control Module Memory Check Sum Error	Internal check sum, incorrect
P0604	Internal Control Module Random Access Memory (RAM) Error	Write ability check, failed

DTC	Error Message	Malfunction Criteria and Threshold Value
P0605	Internal Control Module Read Only Memory (ROM) Error	Checksum incorrect
P0606	ECM Processor ECM: EEPROM	<ul style="list-style-type: none"> • SPI communications check Identifier failure • Communication check; internal check failure • Internal hardware check under / over voltage detection
P0627	Fuel Pump A Control Circuit/ Open	Signal voltage 4.8 - 5.3 V
P062B	Internal Control Module Fuel Injector Control Performance	<ul style="list-style-type: none"> • SPI communications check Identifier = failure • Internal logic = failure
P0634	ECM: Over - Temperature Power Stage	Power stage temperature > 150 [°C]
P0638	Throttle Actuator Control Range/Performance (Bank 1)	Rationality check: <ul style="list-style-type: none"> • Time to open to reference point > 0.6 Sec. and • Time to close to reference point < 1.5 Sec. • Time to close below reference point > 0.3 Sec. and • Reference point, 1% • Time to close to reference point > 0.6 Sec. and • Reference point, 2.88% • TPS 1 signal voltage ≠ 0.40 - 0.80 V or • TPS 2 signal voltage ≠ 4.20 - 4.60 V
P0641	Sensor Reference Voltage A Circuit/Open	Signal voltage deviation > ± 0.3 V
P0642	Sensor Reference Voltage A Circuit Low	Signal voltage < 4.6 - 5.0 V
P0643	Sensor Reference Voltage A Circuit High	5V supply voltage > 4.99 - 5.41 V
P0651	Sensor Reference Voltage B Circuit/Open	Signal voltage deviation > ± 0.3 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P0652	Sensor Reference Voltage B Circuit Low	Signal voltage < 4.6 - 5.0 V
P0653	Sensor Reference Voltage B Circuit High	5V supply voltage > 4.99 - 5.41 V
P0657	Actuator Supply Voltage A Circuit/Open	Signal voltage > 4.40 - 5.60 V
P0658	Actuator Supply Voltage A Circuit Low	Signal voltage < 2.15 - 3.25 V
P0659	Actuator Supply Voltage A Circuit High	Signal current > 1.10 A
P0685	ECM/PCM Power Relay Control Circuit/Open	<ul style="list-style-type: none"> • Signal voltage 2.6 - 3.7 V • Sense circuit voltage > 6 V
P0686	ECM/PCM Power Relay Control Circuit Low	<ul style="list-style-type: none"> • Signal voltage 2.6 - 3.7 V • Sense circuit voltage > 6 V
P0687	ECM/PCM Power Relay Control Circuit High	<ul style="list-style-type: none"> • Signal current > 1.4 - 0.7 A • Sense circuit voltage < 6 V
P0688	ECM/PCM Power Relay Sense Circuit	<ul style="list-style-type: none"> • Sense voltage < 3.0 V • Difference sense circuit voltage with camshaft actuator commanded off and on > 2.5 V • Battery voltage > 3 V
P0697	Sensor Reference Voltage C Circuit/Open	Signal voltage deviation > ± 0.3 V
P0698	Sensor Reference Voltage C Circuit Low	Signal voltage < 4.6 - 5.0 V
P0699	Sensor Reference Voltage C Circuit High	5V supply voltage > 4.99 - 5.41 V
P0A1B	Drive Motor	Deviation between set and actual value (the actual operation mode is different to the one required) incorrect
P0A7D	High Voltage Battery Pack	Charge state < 25.00%
P0A1F	High Voltage Battery Pack	Deviation between set and actual value (the actual operation mode is different to the one required) incorrect
U0001	High Speed CAN Communication Bus	CAN message, no feedback
U0002	High Speed CAN Communication Bus	Global time out
U0028	CAN: Sensor- or Hybrid-CAN	CAN message no feedback

DTC	Error Message	Malfunction Criteria and Threshold Value
U0029	CAN: Sensor- or Hybrid-CAN	Global time out receiving no message
U0037	Internal CAN Bus (master / slave) no communication, No Feedback Message	No Feedback
U0038	Internal CAN Bus (master / slave) no communication, Communication Check	Global time out = receiving no message
U0100	Lost Communication with ECM/PCM A	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • CAN communication with TCM • Time out check No message received by ECM
U0110	CAN: DMCM (Drive Motor Control Module)	Received CAN message no message
U0112	CAN: BECM (Battery Energy Control Module)	Received CAN message no message
U0121	CAN ABS Brake Unit	Received CAN message- no message
U0140	CAN communication with Body Control Module	Received CAN message - no message
U0146	CAN Gateway A	CAN communication with gateway, time out
U0155	CAN Instrument Cluster	Received CAN message - no message
U0164	CAN: Climate Control Unit	Received CAN message no message
U0302	Software Incompatibility with Transmission Control Module	AT vehicle ECM coded as MT vehicle
U0322	CAN Communication with BCM	Ambient temperature value (module not encoded for ambient temperature sensor) = FDh [-]
U0323	CAN: Instrument cluster Audi only	Ambient temperature value module not encoded for ambient temp sensor, 00h

DTC	Error Message	Malfunction Criteria and Threshold Value
U0402	CAN Communication with TCM	Received data implausible message
U0404	Invalid Data Received From Gear Shift Control Module	<ul style="list-style-type: none"> • If the value of message counter is permanent, constant, or change exceeds a threshold, increment an event counter • Maximum change of message counter > 5
U0411	CAN: DMCM (Drive Motor Control Module)	Received CAN message no message
U0413	CAN: BECM (Battery Energy Control Module)	Received data implausible message
U0415	CAN: Vehicle Speed Sensor	Received data implausible message
U0422	CAN: Instrument cluster	Ambient temperature value initialization, Audi 01 h
U0423	CAN: Instrument cluster	Received CAN message, implausible message
U0424	CAN: Climate Control Unit	Received data implausible message
U0447	CAN Gateway	CAN message incorrect
U102A	Internal CAN Bus (master / slave) no communication, No Feedback Message	No Feedback
U102B	Internal CAN Bus (master / slave) no communication, Communication Check	Global time out = receiving no message
U10EB	CAN: DMCM (Drive Motor Control Module)	Received data implausible message
U10E5	CAN: TCM Hybrid	Received CAN message: no message
U10E6	CAN: TCM Hybrid	Received data: implausible message
U1103	ECM: Production Mode	Production mode active
U1106	ECM: HEV Service Mode	Vehicle in service mode; HEV service mode

Fuel and Air Ratios Control Module

DTC	Error Message	Malfunction Criteria and Threshold Value
P1114	Internal Resistance Too Large (Bank 1, Sensor 2)	Heater resistance, (128-648)*(8-40)1.02-25.9 k Ω (dep. on mod. exhaust temp. and heater power)
P12A1	Fuel Rail Pressure Sensor Inappropriately Low	<ul style="list-style-type: none"> • Pressure control activity > 0.25 MPa and • Fuel trim activity < 0.85 and • Difference between target pressure vs. actual pressure -16.38 - 16.38 MPa
P12A2	Fuel Rail Pressure Sensor Inappropriately High	<ul style="list-style-type: none"> • Pressure control activity > 0.25 MPa and • Fuel trim activity > 1.64 and • Difference between target pressure vs. actual pressure -16.38 - 16.38 MPa
P12A4	Fuel Rail Pump Control Valve Stuck Closed	<ul style="list-style-type: none"> • Pressure control activity < 6.0 mPa and • Fuel trim activity 0.85 to 1.15 and • Difference between target pressure vs. actual pressure < 16.38 MPa
P13EA	Ignition Timing Monitor	Difference between commanded spark timing and actual value > 20.0 - 40.0%
P1427	Electrical Vacuum Pump	Short to battery plus; signal current > 2.2 A
P1428	Electrical Vacuum Pump	Short to ground; signal voltage < 2.15 V
P1429	Electrical Vacuum Pump	Open circuit signal voltage 4.4...5.6 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P150A	Engine Off Time Performance	Comparison of engine off time from instrument cluster control unit with engine after run time. <ul style="list-style-type: none"> • Difference between engine off time and ECM after run time < -12.0 Sec. Comparison of engine off time from instrument cluster control unit with engine after run time <ul style="list-style-type: none"> • Difference between engine off time and ECM after run time > 12.0 Sec.
P169A	ECM: Transport Mode	transport mode active
P1912	Brake Booster Pressure Sensor Signal Range Check	Sensor voltage > 4.88 V
P1913	Brake Booster Pressure Sensor Signal Range Check	Brake booster pressure sensor signal: electrical error -failure
P2101	Throttle Actuator A Control Motor Circuit Range/ Performance	<ul style="list-style-type: none"> • Duty cycle >80% and • ECM power stage, no failure • Deviation throttle valve angles vs. calculated value 4.0 - 50.0%
P2106	Throttle Actuator Control System - Forced Limited Power	Internal check failed
P2110	Throttle Actuator Control System - Forced Limited RPM	Engine load out of range
P2122	Throttle/Pedal Position Sensor/Switch D Circuit Low Input	Signal voltage < 0.55 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: Difference between signal sensor 1 vs 2 > 0.143 - 0.70 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P2146	Fuel Injector Group A Supply Voltage Circuit/Open	Short to ground (high side) • Signal current > 14.90 A Short to battery plus (high side) • Signal current < 2.60 A Core connection (high side - low side) • Signal current < 2.60 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
P2177	Fuel System	• System too lean at part load • Adaptive value > 26%
P2178	Fuel System	• System too rich at part load • Adaptive value < 26%
P2181	Cooling System Performance	Cooling system temp too low after a sufficient air mass flow integral < 55 - 80°C
P2187	Fuel System	• System too lean at idle • Adaptive value > 5.02%
P2188	Fuel System	• System too rich at idle • Adaptive value < 6.0%
P2195	O2 Sensor Signal Biased/ Stuck Lean (Bank 1, Sensor 1)	Delta lambda of 2nd lambda control loop > 0.070
P2196	O2 Sensor Signal Biased/ Stuck Rich (Bank 1, Sensor 1)	Delta lambda of 2nd lambda control loop < 0.07
P2231	O2 Sensor Signal Circuit Shorted to Heater Circuit	Delta O2S signal front > 190 uA
P2237	O2 Sensor Positive Current Control Circuit/Open (Bank 1, Sensor 1)	• O2S signal front 1.46 - 1.54 and delta lambda controller > 10.10 V • O2S signal front < 1.70 V and fuel cut off > 3.00 Sec • O2S signal front 1.49 - 1.51 V and delta lambda controller > 0.10
P2243	O2 Sensor Reference Voltage Circuit/Open (Bank 1, Sensor 1)	• O2S signal front > 4.70 V and Internal resistance > 950 Ω • O2S signal front < 0.30 V and internal resistance > 950 Ω

DTC	Error Message	Malfunction Criteria and Threshold Value
P2251	O2 Sensor Front, Open circuit	<ul style="list-style-type: none"> • O2S voltage signal front 1.42 - 1.50 [V] • Internal resistance > 950 [Ohm]
P2257	Air Pump Relay Short to Ground	Signal voltage 0.0 - 3.25 V
P2258	Air Pump Relay Short to B+	Signal current 0.60 - 2.40 A
P2270	O2 Circuit Slow Response (Bank 1, Sensor 2)	O2S signal rear not oscillating at reference < 0.63 - 0.65 V
P2271	O2 Circuit Slow Response (Bank 1, Sensor 2)	<ul style="list-style-type: none"> • Sensor voltage of ≥ 0.18 V • After oxygen mass > 3400 - 7000 mg (after fuel cut off) and • Number of checks ≥ 1.0
P2279	Intake Air System Leak	<ul style="list-style-type: none"> • Threshold to detect a defective system > 1.45 and • Ratio of the tie system defective during the measurement window to the whole duration of the measurement window > 0.60
P2293	Fuel Pressure Regulator 2 Performance	<ul style="list-style-type: none"> • Difference between target pressure vs. actual pressure: > 1.50 mPa • Difference between target pressure vs. actual pressure, < -1.50 mPa
P2294	Fuel Pressure Regulator 2 Control Circuit Open Circuit	• Signal voltage 1.40 - 3.20 V
P2294	Fuel Pressure Regulator 2 Control Circuit Rationality Check	• Signal pattern incorrect
P2295	Fuel Pressure Regulator 2 Control Circuit Low Short to Ground	Signal voltage < 1.40 - 3.20 V
P2296	Fuel Pressure Regulator 2 Control Circuit High	Signal voltage > 3.20 V

Ignition System

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

Additional Emissions Regulations

DTC	Error Message	Malfunction Criteria and Threshold Value
P2400	Evaporative Emission System Leak Detection Pump Control Circuit/Open	Signal voltage > 4.40 - 5.60 V
P2401	Evaporative Emission System Leak Detection Pump Control Circuit Low	Signal voltage < 2.15 to 3.25 V
P2402	Evaporative Emission System Leak Detection Pump Control Circuit High	Signal current > 3.0 A
P2403	Evaporative Emission System Leak Detection Pump Sense Circuit/Open	Low signal voltage > 0.5 Sec.
P2404	Evaporative Emission System Leak Detection Pump Sense Circuit Range/Performance	<ul style="list-style-type: none"> • High signal voltage > 12 Sec. and • Number of checks 30 and • Cumulative time of high signal voltage during pumping > 50 Sec.

DTC	Error Message	Malfunction Criteria and Threshold Value
P2414	O2 Sensor Exhaust Sample Error (Bank 1, Sensor 1)	Threshold 1 • Signal voltage 2.71 - 6.00 V Threshold 2 • Signal voltage 2.05 to 3.06 V
P2431	Rationality check	Difference between SAI pressure and ambient pressure \neq -25.0 - 25.0 hPa
P2432	Signal Range Check	Signal voltage < 0.40 V
P2433	Signal Range Check	Signal voltage > 4.65 V
P2440	System Check After SAI (PZEV)	SAI pressure measured with SAI pressure sensor vs. modeled while SAI valve closed < 0.55%
P24D5	EVAP Pressure Sensor Open / Shorted to Battery Voltage	> 4.88 V
P24D6	EVAP Pressure Sensor Out of Range High / Low	• Pressure > 149.00 [kPa] or • Pressure < 11.00 [kPa]
P24D7	EVAP Pressure Sensor Short to Ground	< 0.20 V
P2539	Low Pressure Fuel System Sensor Circuit	Signal voltage > 4.9 V
P2540	Low Pressure Fuel System Sensor Circuit Range/ Performance	Actual pressure deviation < 800 kPa < 80 kPa
P2541	Low Pressure Fuel System Sensor Circuit Low	Signal voltage < 0.2 V
P2626	O2 Sensor Pumping Current Trim Circuit/Open (Bank 1 Sensor 1)	O2S signal front > 4.81 V
P2681	Drive Motor Coolant Bypass-Valve	Open circuit signal voltage 4.8 - 5.3 V
P2682	Drive Motor Coolant Bypass-Valve	Short to battery plus signal current > 2.2 - 4.0 A
P2683	Drive Motor Coolant Bypass-Valve	Short to ground signal voltage < 2.8 - 3.2 V
P2705	ECM: Electronic Throttle Control Module	De-coupler status incorrect

DTC CHART

Engine Code CTUC

Fuel and Air Mixture, Additional Emission Regulations

DTC	Error Message	Malfunction Criteria and Threshold Value
P000A	Intake (A) Camshaft Position Response check (Bank 1 or Bank 2)	<ul style="list-style-type: none"> • Adjustment angle difference < 5° CA • Number of checks 10 times
P000B	Exhaust (B) Camshaft Position - Slow Response (Bank 1)	<ul style="list-style-type: none"> • Difference between target and actual position > 10° - 22° CRK for 2 - 3 s • Adjustment angle ≥ 3° CRK
P000C	Intake (A) Camshaft Position Response check (Bank 1 or Bank 2)	<ul style="list-style-type: none"> • Adjustment angle difference < 5° CRK • Number of checks 10 times
P000D	Exhaust (B) Camshaft Position - Slow Response (Bank 2)	<ul style="list-style-type: none"> • Difference between target and actual position > 10° - 22° CRK for 2 - 3 s • Adjustment angle ≥ 3° CRK
P00A2	Intake Air Temperature Sensor after Intercooler 2 Short to Ground	Intake air temperature < 0.099 V
P00A3	Intake Air Temperature Sensor after Intercooler 2 Open Circuit	Intake air temperature > 3.20 V
P00A6	Intake Air Temperature Sensor after intercooler 2 open circuit S4 only	<ul style="list-style-type: none"> • Difference value: IAT-ECT @ engine start (depending on engine-off time, > 26.5° C and • Difference value: IAT- AAT @ engine start (depending on engine-off time), > 26.5° C and • Difference AAT vs. ECT at engine start < 26.5° C (depending on engine off time)
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

DTC	Error Message	Malfunction Criteria and Threshold Value
P008A	Low Pressure Fuel System Pressure - Too Low	Actual pressure • < 0.08 MPa
P008B	High Pressure Fuel System Pressure - Too High	Actual pressure for Q7 • Actual press > 146 psi Actual pressure for A6 • > 116 psi
P0010	Intake (A) Camshaft Position Actuator Circuit/Open (Bank 1)	Signal voltage > 4.4 - 5.6 V
P0011	Intake (A) Camshaft Position Timing - Over-Advanced (Bank 1)	• Adjustment angle difference >8° - 10° CA • Number of checks 3 times
P0013	Camshaft Position Actuator Circuit / Open (Bank 1)	Signal current < 0.8 mA
P0014	Exhaust (B) Camshaft Position - Timing Over - Advanced (Bank 1)	• Difference between target and actual position > 10° - 22° CRK for 2 - 3 s • Adjustment angle ≥ 3° CRK
P0016	Crankshaft Position - Camshaft Position Correlation (Bank 1 Bank 2)	Adaptive value > 139° CRK
P0017	Crankshaft Position - Camshaft Position Correlation (Bank 1 Sensor A) Exhaust	Camshaft/crankshaft • Adaptive value > 70° CA
P0018	Crankshaft Position - Camshaft Position Correlation (Bank 1 Bank 2)	Adaptive value < 75° CRK
P0019	Crankshaft Position - Camshaft Position Correlation (Bank 2 Sensor A) Exhaust	Misalignment • Adaptive value < 142° CA
P0020	Intake (A) Camshaft Position Actuator Circuit / Open (Bank 1)	Signal current < 0.8 mA
P0021	Intake (A) Camshaft Position Timing - Over-Advanced (Bank 1)	• Adjustment angle difference > 10° CRK • Number of checks 3 times
P0023	Camshaft Position Actuator Circuit / Open (Bank 2)	Signal current < 0.8 mA
P0024	Exhaust (B) Camshaft Position - Timing Over - Advanced (Bank 2)	• Difference between target and actual position > 10° - 22° CRK for 2 - 3 s • Adjustment angle ≥ 3° CRK

DTC	Error Message	Malfunction Criteria and Threshold Value
P025A	Fuel Pump Open Circuit	Signal current < 0.8 mA
P025C	Fuel Pump Short to Ground	Signal voltage < 2.0 V
P025D	Fuel Pump Short to B+	Signal current > 1.10 A
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 V
P0038	HO2S Heater Control Circuit High (Bank 1, Sensor 2) Short to B+	Heater current bank 1, > 3 - 5 A
P0042	HO2S Heater Circuit (Bank 1, Sensor 3) open circuit SULEV	Heater voltage 4.50 - 5.50 V
P0043	HO2S Heater Control Circuit Low (Bank 1, Sensor 2) Short to Ground	<ul style="list-style-type: none"> • 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	Heater current < 8 - 40 mA
P050A	Idle Air Control System RPM Lower or Higher Than Expected	Out of range - Low <ul style="list-style-type: none"> • Engine speed deviation < 80 RPM Out of range - High <ul style="list-style-type: none"> • Engine speed deviation > 80 RPM
P0051	HO2S Heater Control Circuit Low (Bank 1, Sensor 1) Short to Ground	Heater voltage < 1.9 - 2.22 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P0052	HO2S Heater Control Circuit High (Bank 1, 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
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 bank 2, > 3 - 5 A
P0068	MAP/MAF – Throttle Position Correlation	Deviation throttle controller < 43 or > 43%
P0070	Ambient air temp sensor short to Battery voltage	Ambient air temp < 50.0° C
P0071	Rationality check	Difference value AAT - IAT engine start (depending on engine-off time) > 26.5° C
P0072	Ambient air temp sensor short to ground	Ambient air temp > 87.0° C
P0073	Ambient air temp sensor open circuit	Ambient air temp < 50.0° C
P0087	Fuel Rail/System Pressure - Too Low	<ul style="list-style-type: none"> • Deviation fuel rail pressure control > 0.105 g/Rev and • Deviation HO2S control -15 - 15% • Actual pressure 3.5 MPa • Target pressure-actual pressure > 2 MP and • Deviation HO2S control -15 - 15%
P0088	Fuel Rail/System Pressure - Too High	Fuel rail pressure > 13.9 MPa
P0089	Fuel Pressure Regulator 1 Performance	<ul style="list-style-type: none"> Actual pressure deviation • Deviation fuel press control < -28% > 35% • Target press minus actual press > 0.17 MPa • Target press minus actual press < 0.17 MPa

DTC	Error Message	Malfunction Criteria and Threshold Value
P008A	Low Pressure Fuel System Pressure - Too Low	Delta fuel press low < 0.80 BAR
P008B	Low Pressure Fuel System Pressure - Too High	Delta fuel press low > 8.5 BAR
P0090	Fuel Rail Pressure Control Valve	Short to ground signal voltage < 2.0 V
P0091	Fuel Rail Pressure Control Valve	Short to ground signal voltage < 2.0 V
P0092	Mass or Volume Air Flow A Circuit	MAF sensor signal, out of range low.
P0100	Mass or Volume Air Flow A Circuit	MAF sensor signal 0 μ s <ul style="list-style-type: none"> • > 25 RPM • < 40 ms
P0101	Mass or Volume Air Flow A Circuit Range/Performance	<ul style="list-style-type: none"> • Mass air flow vs. lower threshold model 12% • Load calculation > 21% and • Fuel system (mult) < -19%. -23 ULEV only • Load calculation < 21%. -23 for ULEV only
P0102	Mass or Volume Air Flow A Circuit Low Input	MAF sensor signal, volume air flow low for < 66 μ s
P0103	Mass or Volume Air Flow A Circuit High Input	MAF sensor signal > 4500 μ s
P0106	Manifold Absolute Pressure/ BARO Sensor Range/ Performance	Boost pressure signal <ul style="list-style-type: none"> • Altitude sensor < -210 hPa • Altitude sensor > 230 hPa
P0107	Manifold Absolute Pressure/ BARO Sensor Range/ Performance Short to Ground-Open Circuit	Signal voltage < 0.2 V
P0108	Manifold Absolute Pressure/ BARO Sensor Range/ Performance Short to Battery Voltage	Signal voltage > 4.8 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P0111	Intake Air Temperature Sensor 1 Rationality Check S4 Only	<ul style="list-style-type: none"> • Difference in value: IAT-ECT at engine start (depending on engine-off time, > 26.5° C and • Difference in value: IAT-AAT at engine start (depending on engine-off time), > 26.5° C and • Difference AAT vs. ECT at engine start < 26.5° C (depending on engine off time)
P0112	Intake Air Temperature Sensor 1 Circuit Low Input	Intake air temperature < 0.099 V
P0113	Intake Air Temperature Sensor 1 Circuit High Input	Intake air temperature > 3.2 V
P0116	Engine Coolant Temperature Sensor 1 Circuit Range/Performance. (Stuck)	<ul style="list-style-type: none"> • Difference in value: IAT-ECT at engine start (depending on engine-off time, >26.5 °C and • Difference in value: IAT-AAT at engine start (depending on engine-off time), >26.5 °C and • Difference in AAT vs. ECT at engine start < 26.5 °C (depending on engine off time)
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 > 3.20 V
P0121	Throttle/Pedal Position Sensor A Circuit Range/Performance	<ul style="list-style-type: none"> • TPS 1 - TPS 2 > 5.90° 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

DTC	Error Message	Malfunction Criteria and Threshold Value
P012B	Charger Inlet Pressure Rationality Check	<ul style="list-style-type: none"> • Pressure difference in cross check between boost pressure sensor 1/2; IM pressure, ambient pressure sensor > 7 kPa • Pressure difference in cross check between boost press. sensor 1/2; IM pressure > 12.27 kPa
P012C	Charger Inlet Pressure Short to Ground	Signal voltage < 0.2 V
P012D	Charger Inlet Pressure Short to Battery Voltage	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	Signal voltage < 0.13 V
P0132	O2 Sensor Circuit (Bank 1, Sensor 1) High Voltage	Signal voltage > 5.5 V
P0133	O2 Circuit Slow Response (Bank 1, Sensor 1)	Response check- HO2S value vs modeled HO2S value > 0.9004
P0135	O2 Heater Circuit (Bank 1, Sensor 1)	UEGO ceramic temperature < 680 or > 965° C
P0136	O2 Circuit (Bank 1, Sensor 2)	Oscillation check <ul style="list-style-type: none"> • O2S signal rear not oscillating at reference +/- 10 mV Signal range check <ul style="list-style-type: none"> • Signal voltage > 0.2 V
P0137	O2 Circuit Low Voltage (Bank 1, Sensor 2)	<ul style="list-style-type: none"> • Signal voltage < 20 mV and • Internal resistance < 10 Ω
P0138	O2 Circuit High Voltage (Bank 1, Sensor 2)	Signal voltage > 1.26 V
P0139	O2 Circuit Slow Response (Bank 1, Sensor 2)	Signal voltage > 1.2 V
P0140	O2 Circuit No Activity Detected (Bank 1, Sensor 2)	<ul style="list-style-type: none"> • Signal voltage .0376 - 0.474 V or • O2S rear internal resistance > 60 KΩ

DTC	Error Message	Malfunction Criteria and Threshold Value
P0141	O2 Heater Circuit (Bank 1, Sensor 2) Out of Range	Heater resistance > 10K Ω
P0142	O2 circuit Bank 1 Sensor 3 Heater Check	<ul style="list-style-type: none"> • Delta voltage one step at heater switching, > 2.0 V • Number of checks, 10
P0143	O2 circuit Bank 1 Sensor 3 Short to Ground	<ul style="list-style-type: none"> • Cold condition, Signal voltage, < 59.6 mV • Warm condition, signal voltage <59.6 mV • Short to Battery voltage, voltage > 1.26 V
P0144	O2 circuit Bank 1 Sensor 3 Short to Battery Voltage	Short to Battery voltage, voltage >1.26 V
P0145	O2 Circuit Slow Response (Bank 1, Sensor 2)	<ul style="list-style-type: none"> • 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
P0146	O2 circuit (Bank 1 Sensor 3) Open circuit	<ul style="list-style-type: none"> • Signal voltage, 401.4 - 499 mV • Internal resistance, 40 KΩ
P0147	O2 circuit (Bank 1 Sensor 3) Heater check SULEV	Heater resistance 1056 - 11656 Ω
P0150	O2 Circuit No Activity Detected (Bank 1, Sensor 2)	<ul style="list-style-type: none"> • Signal voltage, 0.376 - 0.474 V • O2S rear internal resistance > 7 KΩ
P0151	O2 Sensor Circuit (Bank 1 Bank 2) Low Voltage	Signal voltage < 0.13 V
P0152	O2 Sensor Circuit (Bank 1 Bank 2) High Voltage	Signal voltage > 5.5 V
P0153	O2 Circuit Slow Response (Bank 1, Bank 2)	Response check- HO2S value vs modeled HO2S value > 0.7998
P0155	O2 Heater Circuit (Bank 1, Sensor 1)	UEGO ceramic temperature < 680 or > 965 $^{\circ}$ C
P0156	O2 Circuit (Bank 1, Sensor 2)	Oscillation check <ul style="list-style-type: none"> • O2S signal rear not oscillating at reference +/- 10 mV Signal range check <ul style="list-style-type: none"> • Signal voltage > 0.2 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P0157	O2 Circuit Low Voltage (Bank 1, Sensor 2)	<ul style="list-style-type: none"> • Signal voltage, < 20 mV and • Internal resistance < 10Ω
P0158	O2 Circuit High Voltage (Bank 1, Sensor 2)	Signal voltage > 1.2 V
P0159	O2 Circuit Slow Response (Bank 1, Sensor 2)	O2S signal rear- signal too slow - 1
P0160	O2 Circuit No Activity Detected (Bank 1, Sensor 2)	<ul style="list-style-type: none"> • Signal voltage, 0.376 - 0.474 V • O2S rear internal resistance > 60 KΩ
P0161	O2 Heater Circuit (Bank 1, Sensor 2) Out of Range	Heater resistance, > 10K Ω
P0169	Incorrect Fuel Composition	Plausability check - failed
P0171	Fuel System Too Lean, Additive (Bank 1, Bank 2)	At idle <ul style="list-style-type: none"> • Adaptive value > 0.0063 g/Rev
P0172	Fuel System Too Rich-Multiplicative (Bank 1, Bank 2)	Too rich at idle Adaptive value < 25%
P0174	Fuel System Too Lean, Additive (Bank 1, Bank 2)	Lean at idle Adaptive value > 0.0063 g/Rev
P0175	System Too Rich-Additive (Bank 1, Bank 2)	Too rich at idle Adaptive value >25%
P0190	Fuel Rail Pressure Sensor A Circuit	Signal voltage > 4.6 V
P0191	Fuel Rail Control Valve, High Pressure Side	Actual pressure > 216.85 mPa
P0192	Fuel Rail Pressure Sensor A Circuit Low Input	Signal voltage < 0.2 V
P0201	Injector Circuit/Open - Cylinder 1	<ul style="list-style-type: none"> • Signal current < 10 A and • Signal voltage > 3.5 V
P0202	Injector Circuit/Open - Cylinder 2	<ul style="list-style-type: none"> • Signal current < 10 A and • Signal voltage > 3.5 V
P0203	Injector Circuit/Open - Cylinder 3	<ul style="list-style-type: none"> • Signal current < 10 A and • Signal voltage > 3.5 V
P0204	Injector Circuit/Open - Cylinder 4	<ul style="list-style-type: none"> • Signal current < 10 A and • Signal voltage > 3.5 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P0205	Injector Circuit/Open - Cylinder 5	<ul style="list-style-type: none"> • Signal current < 10 A and • Signal voltage > 3.5 V
P0206	Injector Circuit/Open - Cylinder 6	<ul style="list-style-type: none"> • Signal current < 10 A and • Signal voltage > 3.5 V
P0221	Throttle/Pedal Position Sensor/Switch B Circuit Range/Performance	<ul style="list-style-type: none"> • 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
P025A	Fuel Pump Module -Open Control Circuit	Signal voltage, > 4.4 V - 5.6 V
P025C	Fuel Pump Module -Short to Ground (GND)	Signal voltage, < 2.15 V - 3.25 V
P025D	Fuel Pump Module -Short to Battery Voltage	Signal current, > 1.1 A
P0234	Turbocharger/Supercharger Overboost Condition Rationality Check High	Difference of set value boost pressure vs. actual boost pressure value > 200 - 1275 hPa
P0235	Boost pressure control	Boost pressure sensor signal vs target value <ul style="list-style-type: none"> • > 0.25 - -35 kPa, depending on altitude
P0236	Turbocharger/Supercharger Boost Sensor A Plausibility check.	<ul style="list-style-type: none"> • Pressure difference in cross check between boost pressure sensor 1/2; IM pressure! > 7 kPai • Pressure difference in cross check between . boost pressure sensor 1/2 and IM > 12 - 27 kPa• Si and • Fuel trim activity (bank with deviation is considered to be defective) > 15%

DTC	Error Message	Malfunction Criteria and Threshold Value
P0237	Turbocharger/Supercharger Boost Sensor A Circuit Low	Signal voltage < 0.2 V
P0238	Turbocharger/Supercharger Boost Sensor A Circuit High	Signal voltage > 4.8 V
P0240	Turbocharger/Supercharger Boost Sensor rationality check	<ul style="list-style-type: none"> • 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 -Short to Ground	Signal voltage < 0.2 V
P0242	Turbocharger/Supercharger Boost Sensor Short to Battery Voltage	Signal voltage > 4.8 V
P0243	Turbocharger/Supercharger Wastegate Solenoid A	Signal voltage > 4.40 - 5.60 V
P0245	Turbocharger/Supercharger Wastegate Solenoid A Low	Signal voltage < 2.15 - 3.25 V
P0246	Turbocharger/Supercharger Wastegate Solenoid A High	Signal current > 2.20 A
P0261	Cylinder 1 Injector Circuit Low	<ul style="list-style-type: none"> • Signal current < 10 A and • Signal voltage < 3.5 V
P0262	Cylinder 1 Injector Circuit High	Signal current > 16 A
P0264	Cylinder 2 Injector Circuit Low	<ul style="list-style-type: none"> • Signal current < 10 A and • Signal voltage < 3.5 V
P0265	Cylinder 2 Injector Circuit High	Signal current > 16 A
P0267	Cylinder 3 Injector Circuit Low	<ul style="list-style-type: none"> • Signal current < 10 A and • Signal voltage < 3.5 V
P0268	Cylinder 3 Injector Circuit High	Signal current > 16 A

DTC	Error Message	Malfunction Criteria and Threshold Value
P0270	Cylinder 4 Injector Circuit Low	<ul style="list-style-type: none"> • Signal current < 10 A and • Signal voltage < 3.5 V
P0271	Cylinder 4 Injector Circuit High	Signal current > 16 A
P0273	Cylinder 5 Injector Circuit Low	<ul style="list-style-type: none"> • Signal current < 10 A and • Signal voltage < 3.5 V
P0274	Cylinder 5 Injector Circuit High	Signal current > 16 A
P0276	Cylinder 6 Injector Circuit Low	<ul style="list-style-type: none"> • Signal current < 10 A and • Signal voltage < 3.5 V
P0277	Cylinder 6 Injector Circuit High	Signal current > 16 A
P0299	Turbocharger/Supercharger Underboost Rationality Check Low	Difference of set 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 over travel	Signal voltage < 0.7 V
P2004	Intake Manifold Runner Control Stuck Open (Bank 1)	Signal voltage, < 2.9 V
P2005	Intake Manifold Runner Control Stuck Closed (Bank 1)	Signal voltage, < 2.9 V
P2006	Intake Manifold Runner Control Stuck Open (Bank 1)	Signal voltage, > 2.5 V
P2007	Intake Manifold Runner Control Stuck Open (Bank 1)	Signal voltage, > 2.5 V
P2008	Intake Manifold Runner Control Circuit/Open (Bank 1)	Signal current < 0.8 mA
P2009	Intake Manifold Runner Control Circuit Shorted (Bank 1)	Signal voltage >2.0 V
P2010	Intake Manifold Runner Control Circuit Shorted to B+ (Bank 1)	Signal current > 2 A
P2014	Intake Manifold Runner Position Sensor Circuit Short to Ground (Bank 1)	Signal voltage, < 0.2 V
P2015	Intake Manifold Runner Position Sensor/Switch Circuit Range/Performance (Bank 1)	Deviation runner flap position vs. actual position > 25%

DTC	Error Message	Malfunction Criteria and Threshold Value
P2016	Intake Manifold Runner Position Sensor/Switch Circuit Low (Bank 1)	Signal voltage < 0.25 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 1)	Signal voltage, < 0.2 V
P2022	Intake Manifold Runner Position Sensor Circuit Short to Battery Voltage (Bank 1)	Signal voltage, > 4.8 V
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 1	Signal voltage, < 2 V
P2093	A Camshaft Position Actuator Control Circuit High short to Battery voltage Bank 1	Signal current, > 3 A
P2096	Post Catalyst Fuel Trim System Out of Range High (Bank 1 Bank 2)	Integral part of trim control, post cat > 10%
P2097	Post Catalyst Fuel Trim System out of range low (Bank 1 Bank 2)	Integral part of trim control, post cat < 10%
P2098	Post Catalyst Fuel Trim System Out of Range High (Bank 1 Bank 2)	Integral part of trim control, post cat > 10%
P2099	Post Catalyst Fuel Trim System Out of range Low (Bank 1 Bank 2)	Integral part of trim control, post cat < 10%

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

Ignition System

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

DTC	Error Message	Malfunction Criteria and Threshold Value
P0306	Cylinder 6 Misfire Detected	<ul style="list-style-type: none"> • Emission threshold misfire rate (MR) 1st internal > 1.5% • Emission threshold misfire rate (MR) > 1.5% • Catalyst damage misfire rate (MR) > 1.5 - 15%
P0321	Ignition/Distributor Engine Speed Input Circuit Range/Performance	<ul style="list-style-type: none"> • Counted teeth vs. reference incorrect or <ul style="list-style-type: none"> • Monitoring reference gap failure
P0322	Ignition/Distributor Engine Speed Input Circuit No Signal	<ul style="list-style-type: none"> • Camshaft signal > 3 • Engine speed no signal
P0324	Knock Control System Error	<ul style="list-style-type: none"> • Signal fault counter (combustion) > 24 or <ul style="list-style-type: none"> • Signal fault counter (measuring window) > 2.00 • Communication errors • SPI communication > 25
P0326	Knock Control System	<ul style="list-style-type: none"> • 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 > 4.8 V
P0331	Knock Control System	<ul style="list-style-type: none"> • 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 Battery Voltage	Upper threshold >1.00 V
P0335	Engine Speed Sensor	<ul style="list-style-type: none"> • Open circuit > 1 V • Short to grd < 1.5 V • Short to Battery voltage > 3.5 V • Signal check no signal

DTC	Error Message	Malfunction Criteria and Threshold Value
P0336	Engine Speed Sensor	<ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • Signal voltage no altering at 4 Rev
P0341	Camshaft Position Sensor A Circuit Range/Performance (Bank 1 or Single Sensor)	<ul style="list-style-type: none"> • 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
P0342	Camshaft Position Sensor A Circuit Low Input (Bank 1 or Single Sensor)	<ul style="list-style-type: none"> • Signal voltage low and • Crankshaft signals 8.0
P0343	Camshaft Position Sensor A Circuit High Input (Bank 1 or Single Sensor)	<ul style="list-style-type: none"> • Signal voltage high and • Crankshaft signals 8.0
P0345	Camshaft Position Sensor A Circuit (Bank 1 or single sensor)	Signal activity check <ul style="list-style-type: none"> • Signal voltage no altering at 4 Rev
P0346	Camshaft Position Sensor A Circuit Range/Performance (Bank 1 or single sensor)	<ul style="list-style-type: none"> • 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
P0347	Camshaft Position Sensor A Circuit Low Input (Bank 1 or single sensor)	Signal activity check <ul style="list-style-type: none"> • Signal voltage low at 10 Rev
P0348	Camshaft Position Sensor A Circuit High Input (Bank 1 or single sensor)	Signal activity check <ul style="list-style-type: none"> • Signal voltage low at 10 Rev
P0351	Ignition Coil A Primary/ Secondary Circuit	Open circuit <ul style="list-style-type: none"> • Signal current < -0.05 - 0.2 mA • Hardware value from final stage > 0.04 - 0.2 mA

DTC	Error Message	Malfunction Criteria and Threshold Value
P0352	Ignition Coil B Primary/ Secondary Circuit	Short to ground <ul style="list-style-type: none"> • Signal current < -0.05 - 0.2 mA • Hardware value from final stage > 0.04 - 0.2 mA
P0353	Ignition Coil C Primary/ Secondary Circuit	Short to Battery voltage <ul style="list-style-type: none"> • Signal current < -0.05 - 0.2 mA • Hardware value from final stage > 0.04 - 0.2 mA
P0354	Ignition Coil D Primary/ Secondary Circuit	<ul style="list-style-type: none"> • Signal current < -0.05 - 0.2 mA • Hardware value from final stage > 0.04 - 0.2 mA
P0355	Ignition Coil E Primary/ Secondary Circuit	<ul style="list-style-type: none"> • Signal current < -0.05 - 0.2 mA • Hardware value from final stage > 0.04 - 0.2 mA
P0356	Ignition Coil F Primary/ Secondary Circuit	<ul style="list-style-type: none"> • Signal current < -0.05 - 0.2 mA • Hardware value from final stage > 0.04 - 0.2 mA

Additional Exhaust Regulation

DTC	Error Message	Malfunction Criteria and Threshold Value
P0410	Rationality Check	Difference of SAIR pressure during phase 3 to SAIR pressure before SAIR injection > 30 hPa
P0413	Open Circuit	Signal voltage < 8 mA
P0414	Air Valve Short to Ground	Signal voltage < 2.00 V
P0415	Short to Battery Voltage	Signal current > 5.0 A
P0416	Open Circuit	Signal voltage < 8 mA
P0417	Air Valve Short to Ground	Signal voltage < 2.00 V
P0418	Air Pump Relay Open Circuit	Signal voltage < 8 mA
P0420	Catalyst System (Bank 1)	Amplitude ratio O2S > 1.5
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	Amplitude ratio O2S > 1.5
P0430	Catalyst System (Bank 2)	Amplitude ratio O2S > 1.5

DTC	Error Message	Malfunction Criteria and Threshold Value
P0441	Evaporative Emission System Incorrect Purge Flow	<ul style="list-style-type: none"> • Deviation HO2S control < 4% or • Deviation throttle controller < 8.0% • Deviation pressure control < 4 kpa
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 current < 0.8mA
P0445	Evaporative Emission System Purge Control Valve Short to Ground	Signal voltage < 2.0 V
P0445	Evaporative Emission System Purge Control Valve Short to Battery Plus	Signal current > 5.0 A
P0455	Evaporative Emission System Leak Detected (Gross Leak/ No Flow)	Time for pressure drop < 0.65 - 0.7 Sec.
P0456	Evaporative Emission System Leak Detected (Very Small Leak)	Time for pressure drop < 5.0-6.5 Sec.
P0458	Evaporative Emission System Purge Control Valve Circuit Low	Signal voltage < 2.15 - 3.25 V
P0459	Evaporative Emission System Purge Control Valve Circuit High	Signal current > 2.20 A

DTC	Error Message	Malfunction Criteria and Threshold Value
P0491	Secondary Air System Insufficient Flow. (Bank 1)	<ul style="list-style-type: none"> • Blockage: relative SAIR pressure (phase 1) - no flow < 0.102 • Leakage: relative SAIR pressure (phase 1) - no flow < 0.102 • Blockage: relative SAIR pressure (phase 1) < 0.5 - 0.648 [-] • Leakage: relative SAIR pressure (phase 1) < 0.602 • Blockage: relative SAIR pressure (phase 21) < 0.5 - 0.648 • Leakage: relative SAIR pressure (phase 21) < 0.727 • Relative SAIR pressure (phase 2) < 0.75 • Average pressure difference between absolute value and filtered value (phase 21) < 2.422 - 4.84 hPa • Relative SAIR pressure (phase 2) < 0.75

DTC	Error Message	Malfunction Criteria and Threshold Value
P0492	Secondary Air System Insufficient Flow. (Bank 2)	<ul style="list-style-type: none"> • Blockage: relative SAIR pressure (phase 1) - no flow < 0.102 • Leakage: relative SAIR pressure (phase 1) - no flow < 0.102 • Blockage: relative SAIR pressure (phase 1) < 0.5 - 0.648 [-] • Leakage: relative SAIR pressure (phase 1) < 0.602 • Blockage: relative SAIR pressure (phase 21) < 0.5 - 0.648 • Leakage: relative SAIR pressure (phase 21) < 0.727 • Relative SAIR pressure (phase 2) < 0.75 • Average pressure difference between absolute value and filtered value (phase 21) < 2.422 - 4.84 hPa • Relative SAIR pressure (phase 2) < 0.75

Speed and Idle Control

DTC	Error Message	Malfunction Criteria and Threshold Value
P0501	Vehicle Speed Sensor A Range/Performance	VSS signal < 4 km/h
P0503	Vehicle Speed Sensor A Out of Range/High	Vehicle speed > 200 km/h
P0506	Idle Air Control System - RPM Lower Than Expected	• Engine speed deviation < -80 RPM
P0507	Idle Air Control System - RPM Higher Than Expected	• Engine speed deviation > 80 RPM
P050A	Air Control System RPM Higher Or Lower Than Expected	<ul style="list-style-type: none"> • Out of range low • Engine speed deviation < 80 - 250 RPM • Out of range high • Engine speed deviation > 80 - 250 RPM

DTC	Error Message	Malfunction Criteria and Threshold Value
P052A	Intake (A) Camshaft Position Actuator Circuit / (Bank 1)	Difference between target position and actual position > 12.0°CRK
P052C	Intake (A) Camshaft Position Actuator Circuit / (Bank 1)	<ul style="list-style-type: none"> • Adjustment angle difference > 10° CA • Number of checks 2
P053F	Fuel Rail Control Valve High Pressure Side	<ul style="list-style-type: none"> • Adjustment angle difference > 10° CA • Number of checks 2

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 fault	EEPROM check..failed
P0627	Fuel Pump A Control Circuit/ Open	<ul style="list-style-type: none"> • Internal error fuel pump control unit • Feedback from fuel pump control unit pump blocked short circuit to battery +, ground or open circuit

DTC	Error Message	Malfunction Criteria and Threshold Value
P0638	Throttle Actuator Control Range/Performance (Bank 1)	Functional check:close movement <ul style="list-style-type: none"> • Open to 15° > 1.275 s • Then close to ref. point > 1.28 s • Gradient < 7° per second Functional check open movement <ul style="list-style-type: none"> • Close to 1.99° > 1.275 s • Then open to ref. point > 1.28 s • Gradient < 7° per second Signal range check at mechanical stop low <ul style="list-style-type: none"> • TPS 1 signal voltage out-off range 0.208 - 0.852 V or <ul style="list-style-type: none"> • TPS 2 signal voltage out off range 4.158 - 4.802 V
P0641	Sensor Reference Voltage A Circuit/Open	Signal voltage deviation > ± 0.3 V
P0642	Sensor Reference Voltage A Circuit Low	Signal voltage < 4.62 V
P0643	Sensor Reference Voltage A Circuit High	5V supply voltage > 5.44 V
P0651	Sensor Reference Voltage B Circuit/Open	Signal voltage deviation > ± 0.3 V
P0652	Sensor Reference Voltage B Circuit Low	Signal voltage < 4.62 V
P0653	Sensor Reference Voltage B Circuit High	5V supply voltage > 5.44 V
P0657	Actuator Supply Voltage A Circuit/Open	Signal current < 0.8 mA
P0658	Actuator Supply Voltage A Circuit Low	Signal voltage > 2.0 V
P0659	Actuator Supply Voltage A Circuit High	Signal current > 1.10 A
P0685	ECM/PCM Power Relay Control Circuit/Open	<ul style="list-style-type: none"> • Signal voltage 2.6 - 3.7 V • Sense circuit voltage > 6 V
P0686	ECM/PCM Power Relay Control Circuit Low	Sense circuit voltage, > 6.0 V
P0687	ECM/PCM Power Relay Control Circuit High	Sense circuit voltage, < 5.0 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P0688	ECM/PCM Power Relay Sense Circuit	<ul style="list-style-type: none"> • Sense voltage < 3.0 V • Difference sense circuit voltage with camshaft actuator commanded off and on > 2.5 V • Battery voltage > 3 V
P0697	Sensor Reference Voltage C Circuit/Open	Signal voltage deviation > ± 0.3 V
P0698	Sensor Reference Voltage C Circuit Low	Signal voltage < 4.6 - 5.0 V
P0699	Sensor Reference Voltage C Circuit High	5V supply voltage > 4.99 - 5.41 V
U0001	High Speed CAN Communication Bus	CAN message, no feedback
U0002	High Speed CAN Communication Bus	Global time out...receiving no messages
U0100	Lost Communication with ECM/PCM A	<ul style="list-style-type: none"> • 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 message received from TCM
U0121	CAN ABS Brake Unit	No CAN communication with TCU, time-out
U0140	CAN communication with Body Control Module	Received CAN message - no message
U0146	CAN Gateway A	CAN communication with gateway,implausible message
U0155	Communication with ICL	No CAN communication with ICL, time-out
U0302	Software Incompatibility with Transmission Control Module	MT vehicle ECM coded as AT vehicle
U0323	CAN: Instrument cluster Audi only	Ambient temperature value module not encoded for ambient temp sensor, 00h
U0402	CAN Communication with TCM	Invalid data received from TCM <ul style="list-style-type: none"> • Implausible message

DTC	Error Message	Malfunction Criteria and Threshold Value
U0404	Invalid Data Received From Gear Shift Control Module	<ul style="list-style-type: none"> 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 only S4	<ul style="list-style-type: none"> Out of range: receiving fault value 203.5 mph Out of range: receiving fault value > 202.81 mph Out of range: receiving fault value < 1.24 mph
U0415	CAN: Vehicle Speed Sensor	<ul style="list-style-type: none"> Out of range: receiving fault value 407.22 mph Out of range: receiving fault value > 202.81 mph Out of range: receiving fault value < 1.24 mph
U0422	CAN: Instrument cluster	Ambient temperature value initialization, Audi 01 h
U0423	CAN: Instrument cluster	Invalid data received from ICL implausible message
U0447	CAN Gateway	Received data from Gateway implausible message

Transmission

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

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

DTC	Error Message	Malfunction Criteria and Threshold Value
P0747	Pressure Control Solenoid "A" Stuck On	PWM hardware detection, 0 or 100%
P0748	Pressure Control Solenoid "A" Electrical	<ul style="list-style-type: none"> • Current higher or lower than threshold, > 220 mA • EDS output voltage at short to ground or open circuit ~ 0.5 V smaller than EDS supply voltage • Static leakage current flow
P0751	Shift Solenoid "A" Performance or Stuck Off	<ul style="list-style-type: none"> • If PWM = 0%, diagnosis by ASIC • If $0\% \leq \text{PWM}$, 7.6% voltage return lead (low), < 0.75 V • If $7.6\% \leq \text{PWM}$, 92.4% voltage return lead (high), < 0.75 V • If $7.6\% \leq \text{PWM}$, 92.4% voltage return lead (low), < 0.75 V
P0752	Shift Solenoid "A" Stuck On	<ul style="list-style-type: none"> • If PWM = 100%, diagnosis by ASIC • If $7.6\% \leq \text{PWM} \leq 100\%$ voltage return lead (high), >0.3 V
P0754	Shift Solenoid "A" Intermittent	<ul style="list-style-type: none"> • If PWM = 0%, diagnosis by ASIC • If $0\% \leq \text{PWM}$, 7.6% voltage return lead (low), < 0.75 V • If $7.6\% \leq \text{PWM}$, 92.4% voltage return lead (high), < 0.75 V • If $7.6\% \leq \text{PWM}$, 92.4% voltage return lead (low), < 0.75 V
P0776	Pressure Control Solenoid "B" Performance or Stuck Off	PWM hardware detection, 0 or 100%
P0777	Pressure Control Solenoid "B" Stuck On	PWM hardware detection, 0 or 100%
P0778	Pressure Control Solenoid "B" Electrical	<ul style="list-style-type: none"> • Current higher or lower than threshold, <730 mA • EDS output voltage at short to ground or open circuit ~ 0,5 V smaller than EDS • Static leakage current flow
P0796	Pressure Control Solenoid "C" Performance or Stuck Off	PWM hardware detection, 0 or 100%

DTC	Error Message	Malfunction Criteria and Threshold Value
P0797	Pressure Control Solenoid "C" Stuck On	PWM hardware detection, 0 or 100%
P0798	Pressure Control Solenoid "C" Electrical	<ul style="list-style-type: none"> • Current higher or lower than threshold, >220 mA • EDS output voltage at short to ground or open circuit ~ 0,5 V smaller than EDS supply voltage • Static leakage current flow
P0889	TCM Power Relay Circuit Range / Performance	FET drive, not possible
P0890	TCM Power Relay Circuit Low	<ul style="list-style-type: none"> • Solenoid power supply voltage, < 1.4 V • Drop voltage over high side FET, > 1 V
P0891	TCM Power Relay Circuit High	Hardware detection
P0892	TCM Power Relay Circuit Intermittent	Hardware detection
P2637	Torque management Feedback Signal "A"	CAN message signal error flag, = 1
P2714	Pressure Control Solenoid "D" Performance or Stuck Off	PWM hardware detection, 0 or 100%
P2715	Pressure Control Solenoid "D" Stuck On	PWM hardware detection, 0 or 100%
P2716	Pressure Control Solenoid "D" Electrical	<ul style="list-style-type: none"> • Current higher or lower than threshold, < 730 mA • EDS output voltage at short to ground or open circuit ~ 0,5 V smaller than EDS supply voltage • Static leakage current flow
P2723	Pressure Control Solenoid "E" Performance or Stuck off	PWM hardware detection, 0 or 100%

DTC	Error Message	Malfunction Criteria and Threshold Value
P2725	Pressure Control Solenoid "E" Electrical	<ul style="list-style-type: none"> • Current higher or lower than threshold, < 730 mA • EDS output voltage at short to ground or open circuit ~ 0,5 V smaller than EDS supply voltage • Static leakage current flow
P2732	Pressure Control Solenoid "F" Performance or Stuck Off	PWM hardware detection, 0 or 100%
P2733	Pressure Control Solenoid "F" Stuck On	PWM hardware detection, 0 or 100%
P2734	Pressure Control Solenoid "F" Electrical	<ul style="list-style-type: none"> • EDS output voltage at short to ground or open circuit ~ 0,5 V smaller than EDS supply voltage • Static leakage current flow
P2735	Pressure Control Solenoid "F" Intermittent	PWM hardware detection, 0 or 100%

Fuel and Air Ratios Control Module

DTC	Error Message	Malfunction Criteria and Threshold Value
P10A0	RFP Powerstage, signal range check	Signal range check <ul style="list-style-type: none"> • 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
P10A7	RFP sensor, signal range check @ mechanical stop high	Difference actual signal voltage to learned signal voltage > 0.05 V
P10A8	RFP sensor, signal range check @ mechanical stop low	RFP Signal Voltage in closed position $\leq 0.35 \dots \geq 0.65$ V
P1114	Internal Resistance Too Large (Bank 1, Sensor 2)	Heater resistance, $(128-648) \cdot (8-40) 1.02-25.9$ k Ω (dep. on mod. exhaust temp. and heater power)

DTC	Error Message	Malfunction Criteria and Threshold Value
P12A1	Fuel Rail Pressure Sensor Inappropriately Low	<ul style="list-style-type: none"> • Deviation fuel rail pressure control > 0.060 g/Rev and • Deviation HO2S control < 22.5%
P12A2	Fuel Rail Pressure Sensor Inappropriately High	<ul style="list-style-type: none"> • Deviation fuel rail pressure control < 0.051 g/Rev and • Deviation HO2S control > 30%
P12A4	Fuel Rail Pump Control Valve Stuck Closed	<ul style="list-style-type: none"> • Deviation fuel rail pressure control < 0.120 g/Rev and • Actual pressure above target pressure -15 - 15%
P150A	Comparing engine off time from instrument cluster control unit with engine after run time	<ul style="list-style-type: none"> • Difference between engine-off-time < - 12 s. and • ECM after run-time > 12 s
P2101	Throttle Actuator A Control Motor Circuit Range/ Performance	<ul style="list-style-type: none"> • Duty cycle >80% and • ECM power stage, no failure • Deviation throttle valve angles vs. calculated value 4.0 - 50.0%
P2106	Throttle Actuator Control System - Short to B+ or Ground	ECM power stage..failure
P2122	Throttle/Pedal Position Sensor/Switch D Circuit Low Input	Signal voltage < 0.646 V
P2123	Throttle/Pedal Position Sensor/Switch D Circuit High Input	Signal voltage > 4.794 V
P2127	Throttle/Pedal Position Sensor/Switch E Circuit Low Input	Signal voltage < 0.276 V
P2128	Throttle/Pedal Position Sensor/Switch E Circuit High Input	Signal voltage > 2.431 V
P2138	Throttle/Pedal Position Sensor/Switch D/E Voltage Correlation	Signal voltage: Difference between signal sensor 1 and 2 > 0.143 - 0.703 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P2146	Fuel Injector Group A 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
P2147	Injector Circuit Short to Ground	Signal current > 12 A
P2148	Injector Circuit Short to Battery Voltage	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 Battery voltage	Signal current > 33 A
P2153	Injector Circuit Short to Ground	Signal current > 12 A
P2154	Injector Circuit Short to Battery Voltage	Signal current > 33 A
P2181	Cooling System Performance	Cooling system temp too low after a sufficient air mass flow interval 55 - 80°C
P2195	O2 Sensor Signal Biased/ Stuck Lean (Bank 1, Sensor 1)	Delta lambda of 2nd lambda control loop > 0.07
P2196	O2 Sensor Signal Biased/ Stuck Rich (Bank 1, Sensor 1)	Delta lambda of 2nd lambda control loop < 0.07
P2197	O2 Sensor Rationality Check High (Bank 1, Bank 2)	HO2S value > 1.1 V
P2198	O2 Sensor Rationality Check Low (Bank 1, Bank 2)	HO2S value < 0.9 V
P2227	Turbocharger/Supercharger Boost Sensor A Plausibility check.	Pressure difference in cross-check between boost press. sensor 1/2; IM pressure ambient pressure >7 kPa
P219C	Cylinder Imbalance	• Adaptive value < -10% or • > 10%
P219D	Cylinder Imbalance	• Adaptive value < -10% or • > 10%

DTC	Error Message	Malfunction Criteria and Threshold Value
P219E	Cylinder Imbalance	<ul style="list-style-type: none"> • Adaptive value < -10% or • > 10%
P219F	Cylinder Imbalance	<ul style="list-style-type: none"> • Adaptive value < -10% or • > 10%
P21A0	Cylinder Imbalance	<ul style="list-style-type: none"> • Adaptive value < -10% or • > 10%
P21A1	Cylinder Imbalance	<ul style="list-style-type: none"> • Adaptive value < -10% or • > 10%
P2231	O2 Sensor Signal Circuit Shorted to Heater Circuit	Delta O2S signal front > 190 uA
P2237	O2 Sensor Positive Current Control Circuit/Open (Bank 1, Sensor 1)	<ul style="list-style-type: none"> • Lambda set value < 0.97 or • O2S signal front 1.49 - 1.51 and lambda set value > 1.03 V • O2S signal front < 1.70 V and fuel cut off > 3.00 Sec. • O2S signal front 1.49 - 1.51 V and delta lambda controller > 0.10
P2240	O2 Sensor Positive Current Control Circuit / Open (Bank 1, Bank 2)	Signal activity check-failed
P2243	O2 Sensor Reference Voltage Circuit/Open (Bank 1, Sensor 1)	<ul style="list-style-type: none"> • O2S signal front < 0.30 V and Internal resistance > 1000 Ohms • O2S signal front > 3.25 V and Internal resistance > 1000 Ohms
P2247	O2 Sensor Nernst Voltage Open (Bank 1, Bank 2)	<ul style="list-style-type: none"> • Functional check heater failed and • Intrusive check temperature measurement failed
P2251	O2 Sensor Signal Open Circuit (Bank 1, Bank 2)	<ul style="list-style-type: none"> • Functional check heater failed and • Signal activity check failed
P2254	O2 Sensor Signal Open Circuit (Bank 1, Sensor 1)	<ul style="list-style-type: none"> • Functional check heater failed and • Signal activity check failed

DTC	Error Message	Malfunction Criteria and Threshold Value
P2257	Air Pump Relay Short to Ground (PZEV)	Signal voltage < 3.00 V
P2258	Air Pump Relay Short to B+ (PZEV)	Signal current 0.60 - 1.20 A
P2270	O2 Circuit Slow Response (Bank 1, Sensor 2)	O2S signal rear < 0.603 - 0.649 V
P2279	Intake Air System Leak	<ul style="list-style-type: none"> • Threshold to detect a defective system > 1.45 and • Ratio of the tie system defective during the measurement window to the whole duration of the measurement window > 0.60
P2293	Fuel Pressure Regulator 2 Performance	<ul style="list-style-type: none"> • Difference between target pressure vs. actual pressure: > 1.50 mPa or • < -1.50 mPa
P2294	Fuel Pressure Regulator 2 Control Circuit Open Circuit	• Signal current < 0.8 mA
P2295	Fuel Pressure Regulator 2 Control Circuit Low Short to Ground	< 2.0 V
P2296	Fuel Pressure Regulator 2 Control Circuit High	Signal current > 8 A

Ignition System

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

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

Additional Emissions Regulations

DTC	Error Message	Malfunction Criteria and Threshold Value
P2400	Evaporative Emission System Leak Detection Pump Control Circuit/Open	Signal voltage > 4.40 - 5.60 V
P2401	Evaporative Emission System Leak Detection Pump Control Circuit Low	Signal voltage < 2.15 to 3.25 V
P2402	Evaporative Emission System Leak Detection Pump Control Circuit High	Signal current > 3.0 A
P2403	Evaporative Emission System Leak Detection Pump Sense Circuit/Open	Low signal voltage > 0.5 Sec.
P2404	Evaporative Emission System Leak Detection Pump Sense Circuit Range/Performance	<ul style="list-style-type: none"> • High signal voltage > 12 Sec. and • Number of checks 30 and • Cumulative time of high signal voltage during pumping > 50 Sec.
P2414	O2 Sensor Exhaust Sample Error (Bank 1, Sensor 1)	<ul style="list-style-type: none"> • Threshold 1 - Signal voltage 3.1 - 4.81 V • Threshold 2 - Signal voltage 2.5 to 3.10 V
P2415	O2 Sensor Signal Range Check (Bank 1, Bank 2)	O2S signal front > 3.1 V
P2431	Rationality check	Difference between SAI pressure and ambient pressure ≠ -25.0 - 25.0 hPa
P2432	Signal Range Check	Signal voltage < 0.40 V
P2433	Signal Range Check	Signal voltage > 4.65 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P2440	Secondary Air System Valve (Bank 1) Stuck Open	<ul style="list-style-type: none"> • Quotient of relative SAI pressure @ phase 1 and relative SAI pressure @ phase 2 > 1.2 • and quotient of relative SAI pressure @ phase 21 > 1.23 and relative SAI pressure @ phase 22 • Quotient of relative SAI pressure @ phase 22 > 1.23 and relative SAI pressure @ phase 21 • or quotient of relative SAI pressure @ phase 1 and relative SAI pressure @ phase 2 > 1.2 • and quotient of relative SAI pressure @ phase 21 ≤ 1.23 and relative SAI pressure @ phase 22 • “ quotient of relative SAI pressure @ phase 22” ≤ 1.23 and relative SAI pressure @ phase 21 • or quotient of relative SAI pressure @ phase 1 and relative SAI pressure @ phase 2 ≤ 1.2 • and quotient of relative SAI pressure @ phase 21 > 1.23 and relative SAI pressure @ phase 22 • “ quotient of relative SAI pressure @ phase 22” > 1.23 and relative SAI pressure @ phase 21 • and average pressure difference between absolute value and filtered while both valves commanded closed (1) > 3 hPa

DTC	Error Message	Malfunction Criteria and Threshold Value
P2440	Secondary Air System Valve (Bank 1) Stuck Open	<ul style="list-style-type: none"> • or quotient of relative SAI pressure @ phase 1 and relative SAI pressure @ phase 2 ≤ 1.2 • and quotient of relative SAI pressure @ phase 21 ≤ 1.23 and relative SAI pressure @ phase 22 • “ quotient of relative SAI pressure @ phase 22” ≤ 1.23 and relative SAI pressure @ phase 21 • and average pressure difference between absolute value and filtered while both valves commanded closed (1) > 3 hPa

DTC	Error Message	Malfunction Criteria and Threshold Value
P2442	Secondary Air System Valve (Bank 2) Stuck Open	<ul style="list-style-type: none"> • Quotient of relative SAI pressure @ phase 1 and relative SAI pressure @ phase 2 > 1.2 • and quotient of relative SAI pressure @ phase 21 > 1.23 and relative SAI pressure @ phase 22 • Quotient of relative SAI pressure @ phase 22 > 1.23 and relative SAI pressure @ phase 21 • or quotient of relative SAI pressure @ phase 1 and relative SAI pressure @ phase 2 > 1.2 • and quotient of relative SAI pressure @ phase 21 ≤ 1.23 and relative SAI pressure @ phase 22 • “ quotient of relative SAI pressure @ phase 22” ≤ 1.23 and relative SAI pressure @ phase 21 • or quotient of relative SAI pressure @ phase 1 and relative SAI pressure @ phase 2 ≤ 1.2 • and quotient of relative SAI pressure @ phase 21 > 1.23 and relative SAI pressure @ phase 22 • “ quotient of relative SAI pressure @ phase 22” > 1.23 and relative SAI pressure @ phase 21 • and average pressure difference between absolute value and filtered while both valves commanded closed (1) > 3 hPa

DTC	Error Message	Malfunction Criteria and Threshold Value
P2442	Secondary Air System Valve (Bank 2) Stuck Open	<ul style="list-style-type: none"> • or quotient of relative SAI pressure @ phase 1 and relative SAI pressure @ phase 2 ≤ 1.2 • and quotient of relative SAI pressure @ phase 21 ≤ 1.23 and relative SAI pressure @ phase 22 • “ quotient of relative SAI pressure @ phase 22” ≤ 1.23 and relative SAI pressure @ phase 21 • and average pressure difference between absolute value and filtered while both valves commanded closed (1) > 3 hPa
P2539	Low Pressure Fuel System Sensor Circuit Short to B +	Signal voltage > 4.8 V
P2540	Low Pressure Fuel System Sensor Circuit Range/ Performance	Actual pressure Deviation < 800 kPa < 80 kPa
P2541	Low Pressure Fuel System Sensor Circuit Low	Signal voltage < 0.2 V
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 1 Sensor 1)	O2S signal front > 4.7 V
P2539	Low Pressure Fuel System Sensor Circuit	Signal voltage > 4.9 V
P2540	Low Pressure Fuel System Sensor Circuit Range/ Performance	Actual pressure deviation < 800 kPa < 80 kPa
P2541	Low Pressure Fuel System Sensor Circuit Low	Signal voltage < 0.2 V
P2626	O2 Sensor Pumping Current Trim Circuit/Open (Bank 1 Sensor 1)	O2S signal front > 4.81 V

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**Printed in the United States
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