

2014

R8/Spyder

Quick Reference
Specification Book

2014 Audi R8/Spyder

Quick Reference Specification Book

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GENERAL INFORMATION

Decimal and Metric Equivalents

Distance/Length

To calculate: mm x 0.03937 = in.

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

Tightening Torque

Nm-to-lb·ft (ft·lb)

To calculate: Nm x 0.738 = lb·ft

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

Nm-to-lb-in (in·lb), kg·cm

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

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

N·cm-to-lb-in (in·lb), kg·cm

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

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

kg·cm-to-lb·in (in·lb), N·cm

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

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

Warnings and Cautions

WARNINGS

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

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

(WARNINGS cont'd on next page)

WARNINGS *(cont'd)*

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

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

CAUTIONS

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

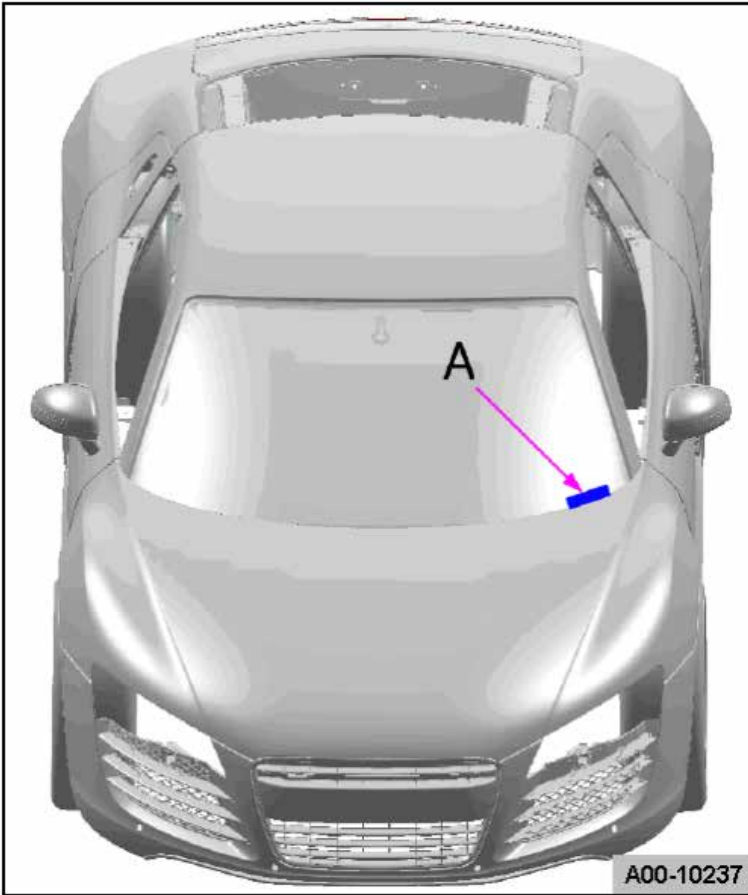
(CAUTIONS cont'd on next page)

CAUTIONS *(cont'd)*

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

VEHICLE IDENTIFICATION

Vehicle Identification Number (VIN) Location



Vehicle
Identification

The VIN (A) is on the left side of the vehicle and is visible from the outside. The vehicle data label is on the inside of the fuse box in the interior.

VIN Decoder

2014 Audi VIN Decoder

Series	Mfg. Make (1-3)			Series	Engine	Restraint system	Model (7&8)	Check digit	Model year	Assembly plant	Sequential production number (position 12 - 17)						
	1	2	3								4	5	6	7	8	9	10
A = A4 Premium AS Cab Premium A6 Sedan RS V8 4.2 Coupe*** RB V10 5.2 Coupe*** B = A4 Premium q S4 Premium+q TT TTS/TTTS Cab Prem - quattro C = A5 Premium q AS Cab Premium q A6 2.0T Premium S5 Premium+q S5 Cab Premium q Q5 2.0T Premium Q5 Hybrid Prestige Q5 TDI Premium+ SQ5 Premium+ Q7 3.0T TDI Prem RS5 Coup 4 Cab*** D = A4 Manual Prem q S4 Manual Prem+ A6 2.0T Premium+ S5 Sedan Q5 3.0T Premium+ Q5 TDI Premium+ Q7 3.0T Prest. S-Line RS V8 4.2 Coupe+ Manual E = A4 Premium+ RB V10 5.2 Coupe*** F = A4 Premium q A6 2.0T Premium q A5 Premium+q S6 RS V8 4.2 Coupe*** G = A5 Manual Prem q S5 Manual Prem+ q A6 2.0T Premium+ q A5 Premium+ q S7 RS V8 4.2 Coupe*** H = A4 Manual Prem+ q A5 Prestige q AS Cab Premium+ A6 S4 Prestige q RB V10 5.2 Coupe	L = A5 Premium+ q AS Cab Premium+ q Q5 2.0T Premium+ Q7 3.0T TDI Prem+ RB V10+ 5.2 Coupe+ Manual M = A4 S4 Man Prestige q A5 Premium+ q S-Line A6 S4 Manual Prem+ A8 L Sedan S = TT TTS/TTTS Rtdr Prem+ q S-Line RS V8 4.2 Spyder+ Manual T = Allroad Premium q RB V10 5.2 Spyder+ Manual U = Allroad Premium+ q AS Cab Prestige RS V8 4.2 Spyder+ Manual V = Allroad Prestige+ q S5 Prestige+ q S5 Cab Prestige q Q7 TDI Prestige SQ5 Prestige Q7 TDI Prestige Manual W = Allroad Prestige+ q RS V10 5.2 Spyder*** Manual X = AS Cab Prestige q A7 Prestige q S7 RS V10 5.2 Spyder*** Manual Y = Allroad Prestige S-Line Q7 TDI Prestige S-Line RS V8 4.2 Spyder+ Manual Z = A7 Prestige RS V10 5.2 Plus Coupe+ Manual 1 = S5 Man Prestige q RB V10 5.2 Plus Coupe+ Manual 2 = A4 Premium q A5 Man Prest q A5 Man Prest q Allroad Premium q	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17	W U A B F A F L 9 E 1 0 0 2 0 0 1 4	FC (4G) = A6 / S6 / AT / ST RST FD (4H) = A6 / S6 FD (4L) = Audi Q7 FG (4E) = RS FH (8F) = A5 / S5 / RS5 Cab FK (8J) = TT / TTS FL (8K) = A4 / S4 FR (8R) = A6 / S6 FR (8T) = A5 / S5 /	See back Calculate per NHTSA Code 2014 An Ingotstadt RS5 Cab N= Neckarsulm T= Gyr	F = 4 cyl 2.0L 220hp (CAE) A4 CVT / A4 q / A5 Cpe q / A5 Cab / A6 CVT (C7) / A6 q F = 4 cyl 2.0L 211hp (CEA) TT Cpe q / TT Rtdr q F = 4 cyl 2.0L 220hp (CPM) A4 q / A5 Cpe q / A5 Cab q / Allroad Q5 + G = V6 3.0L 310hp (CTUA) A6 q (C7) / A7 q G = V6 3.0L 330hp (CTUB) S4 / S5 / S6 Cab / A8 / A8L G = V6 3.0L 272hp (CTUC) Q5 G = V6 3.0L 354hp (CTUD) SQ5 G = V6 3.0L 333hp (CTWA) Q7 G = V6 3.0L 280hp (CTWB) Q7 H = V6 3.0L TDI 240hp (CNR) Q7 I = V6 3.0L TDI 240hp (CPNA) A8 M = V6 3.0L TDI 240hp (CPNB) A6 / A7 Sportback Q5 N = V10 5.2L 550hp (CTPA) RB Coupe N = V10 5.2L 525hp (CTYA) RB / RB Spyder U = V8 4.2L 430hp (CND) RB / RB Spyder U = V10 5.2L 525hp (CTVA) RB 1 = 4 cyl 2.0L 265hp (GDMA) TTS Cpe/Rtdr 2 = V8 4.0L 420hp (GCTA) A8 / A8L 2 = V8 4.0L 420hp (GCU) S5 / S7 Sportback (C7) 2 = V8 4.0L 420hp (GCTA) RS7 2 = V8 4.0L 280hp (CRB) RST Sportback (C7) 4 = V6 3.0L 350hp (CEJA) A6 (D4) 6 = V8 4.2L 450hp (CFS) R55 Cpe/Cab 6 = C-4 cyl 2.0L 211hp + 40 kW (DUA) Q5											

* 7th VIN character is alphabetic for CDN, Mex. and US 2010 and later vehicles. ROW model characters are listed in parenthesis, (), for reference only
 ** A4 Allroad models are identified by WMI code of 'WAF'. All other A4 models are identified by WMI code of 'WAU'.
 *** R55 Cabriolet, R55 Coupe, R57 and R8 models are identified by WMI code of 'WUAA'.
 **** RB Coupe 4.2 and 5.2 models and RB Spyder 4.2 and 5.2 models may use

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♦ The following 2.0T models are E85 Flex-Fuel capable: A4 2.0T quattro automatic, allroad 2.0T quattro, A5 2.0T Cabriolet quattro, A5 2.0T Coupe quattro automatic, Q5 2.0T
 ♦♦ Some early production RB V10 Coupes with manual transmission vehicles used a 4th and 5th character combination of 'GU' instead of 'GN'.
 ♦♦♦ Some early production vehicles use the character 'C' instead of 'B'.

2014 Restraint System:

All = Active - Dr/Pass, AirBag - Dr/Pass, Advanced Front AirBag
 (A) (A5 / S5, R55 Cab, TT / TTS, RB) = Side AirBags Front, Knee AirBags Front
 (A) (A5 / S5, R55 Coupe) = Side AirBags Front, Side Guard Air Curtain, Knee AirBags Front
 (A) (A4 / S4, A6 / S6, Q5, Q7) = Side AirBags Front, Side Guard Air Curtain
 (A) (A8 / S8) = Side AirBags Frt. & Rear, Side Guard Air Curtain, Knee AirBag
 (A) (R8) = Side AirBags Front, Knee AirBags Front
 (A) (A4 / S4 / A6 / S6, A7 / S7 / R57) Side AirBags Front, Side Guard Air Curtain, Knee AirBag
 (B) (A4 / S4, A6 / S6, A7 / S7 / R57) = Side AirBags Front & Rear, Side Guard Air Curtain, Knee AirBag
 Side Guard Air Curtain
 Side Guard Air Curtain
 (B) (Q5, Q7) Side AirBags Front & Rear, Side Guard Air Curtain

K = 1989
L = 1990
M = 1991
N = 1992
P = 1993
R = 1994
S = 1995
T = 1996
V = 1997
W = 1998
X = 1999
Y = 2000
1 = 2001
2 = 2002
3 = 2003
4 = 2004
5 = 2005
6 = 2006
7 = 2007
8 = 2008
9 = 2009
A = 2010
B = 2011
C = 2012
D = 2013
E = 2014

2014 Audi VIN Decoder

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

SALES CODES

Engine Codes

CNDA	4.2L 8-cylinder
CMPA	5.2L 10-cylinder

Transmission Codes

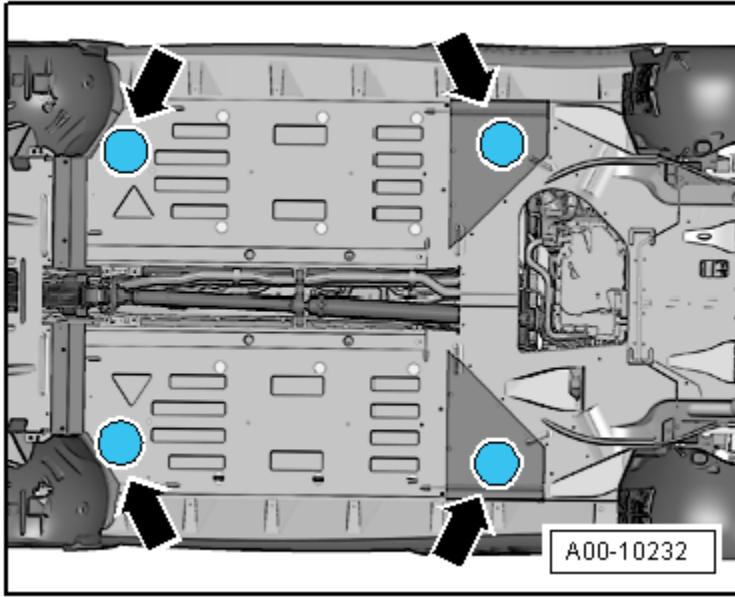
0B6	R tronic 6-speed manual/automatic transmission
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Vehicle
Identification

Sales
Codes

VEHICLE LIFTING

Hoist and Floor Jack Lifting Points

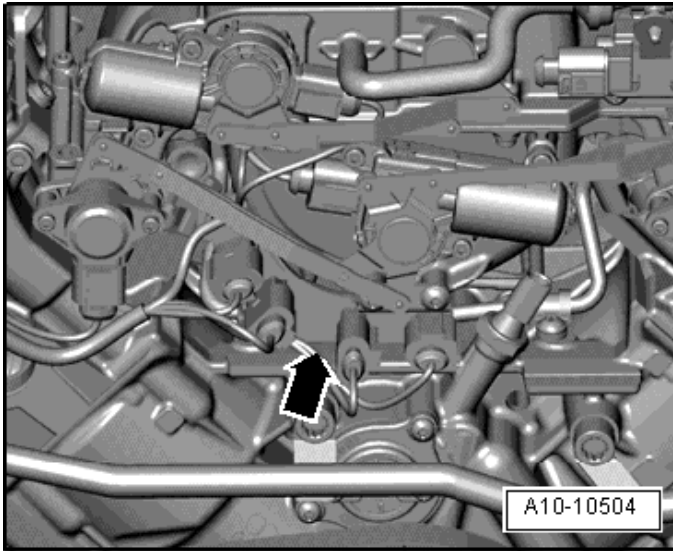


Use a suitable rubber or wooden block between the jack and the vehicle. Position a floor jack only at the points shown in the illustration. Do not lift the vehicle at the engine oil pan, transmission, or on the front or rear axles as serious damage may result.

ENGINE MECHANICAL – 4.2L CNDA

General, Technical Data – 4.2L CNDA

Engine Number Location



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

Engine Data

Code Letters		CNDA
Displacement	liter	4.163
Output	kW at RPM	316 @ 7800
Torque	Nm at RPM	430 @ 4500 to 6000
Bore	diameter in mm	84.5
Stroke	mm	92.8
Compression ratio		12.5
RON	at least	98 ¹⁾
Fuel injection and ignition system		Bosch Motronic
Ignition sequence		1-5-4-8-6-3-7-2
Exhaust Gas Recirculation (EGR)		No
Turbocharger		No
Knock Sensor (KS)		2 sensors
Charge Air Cooler (CAC)		No
Oxygen Sensor (O2S) regulation		2 sensors before catalytic converter 2 sensors after catalytic converter
Variable valve timing		Intake Exhaust
Variable intake manifold		Yes
Secondary Air Injection (AIR) System		Yes
Valve per cylinder		4

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

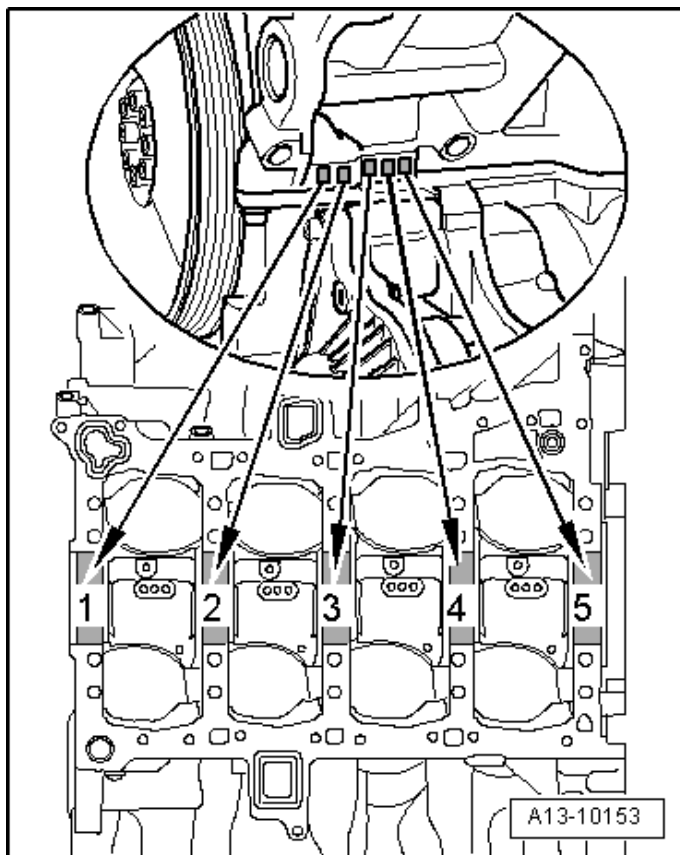
Engine Assembly – 4.2L CNDA

Fastener Tightening Specifications

Component	Fastener size	Nm
Bolts/nuts	M6	9
	M7	15
	M8	20
	M10	40
	M12	65
Heat shield	-	10
Left engine mount	-	20
Left engine support	-	40
Right engine mount	-	20
Right engine support	-	40
Vacuum reservoir bracket	-	8
Exceptions:		
Coolant reservoir bracket-to-frame	-	9
Coolant reservoir-to-frame	-	9
Transmission 086		
Clamp to engine compartment crossmember	-	8
Engine compartment crossmember	-	20
Engine compartment trim bracket to engine compartment crossmember	-	8
Engine cover bracket to engine compartment crossmember	-	8
Oil tank to engine compartment crossmember	-	8
Vacuum reservoir to bracket	-	5
Transmission 0BZ		
Clamp to engine compartment crossmember	-	8
Engine compartment trim bracket to engine compartment crossmember	-	8
Engine compartment crossmember	-	20
Oil tank to engine compartment crossmember	-	8
Spacer plate to engine compartment crossmember	-	20
Vacuum reservoir bracket	-	8

Crankshaft, Cylinder Block – 4.2L CNDA

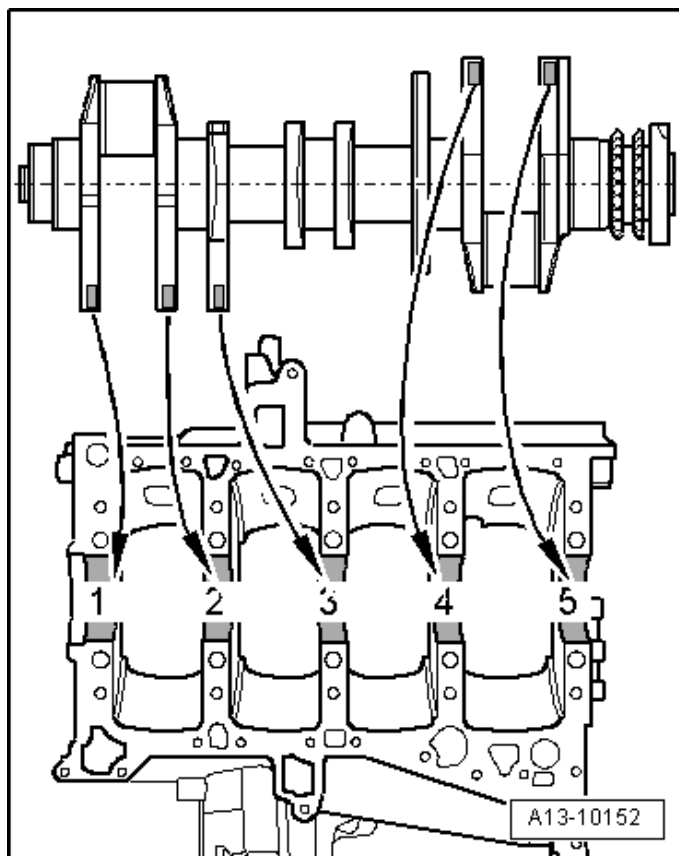
Allocation of Crankshaft Bearing Shells for Cylinder Block



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

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

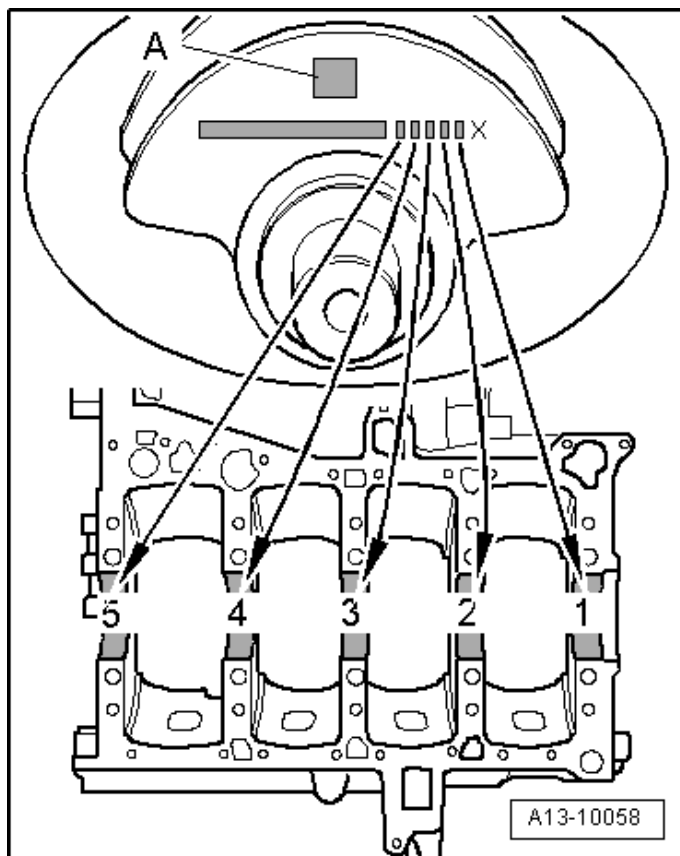
Allocation of Crankshaft Bearing Shells for Guide Frame – Version 1



Bearing shells with the correct thickness are allocated to the guide frame in the factory. Colored dots on the sides of the bearing shells identify the bearing shell thickness. Allocation of the bearing shells to the guide frame is marked by one colored dot each on the crankshaft counterweight as shown in the illustration.

Colored dot on crankshaft	Color of bearing
R	Red
Y	Yellow
B	Blue

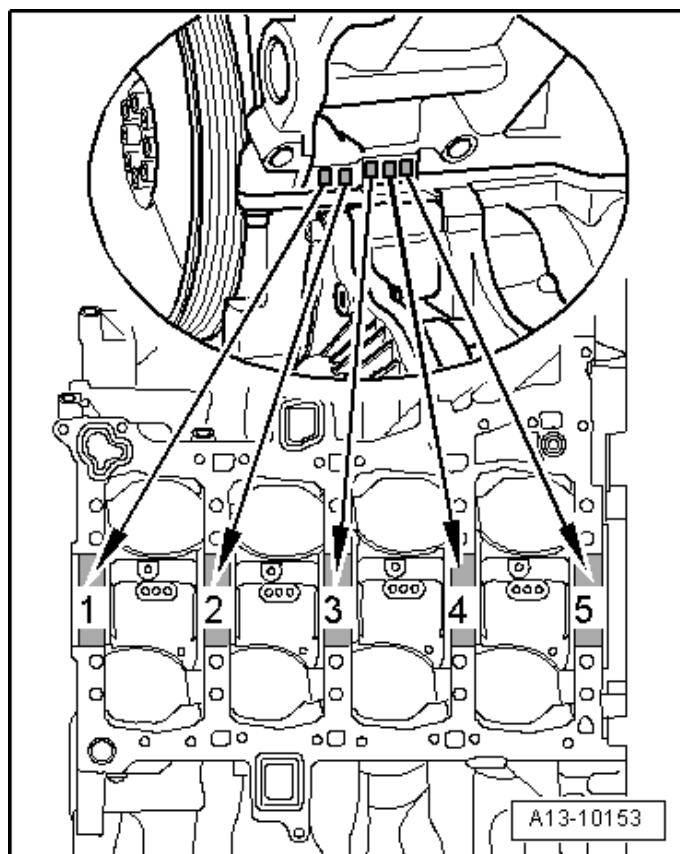
Allocation of Crankshaft Bearing Shells for Guide Frame – Version 2



Bearing shells with the correct thickness are allocated to the guide frame in the factory. Colored dots on the sides of the bearing shells identify the bearing shell thickness. Allocation of the bearing shells to guide frame is identified by a letter on the front crankshaft counterweight, as shown in the illustration. The X marks the end of the letter sequence and is near the bearing (1) color identification on the belt pulley side.

Colored dot on crankshaft	Color of bearing
R	Red
G	Yellow
B	Blue

Allocation of Main Bearing Shells, Used and Refaced Crankshafts



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

Colored dot on crankshaft	Color of bearing
R	Red
G	Yellow
B	Blue

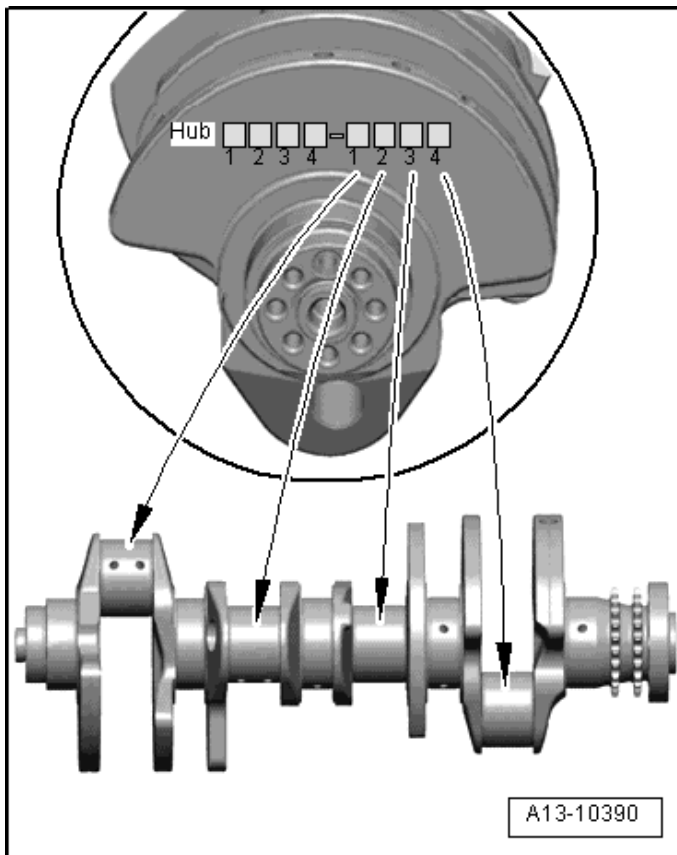
Allocation of Crankshaft Bearing Shells for Guide Frame

- With used and refaced crankshafts, measure the main crankshaft journals to allocate the appropriate bearing shells.
- Any other markings on the crankshaft are invalid when refacing crankshafts.
- Use the following table to allocate the bearing shells to the diameter of the main crankshaft journals.

Crankshaft bearing pin diameter in mm	Color identification of bearing shells for guide frame in mm		
	Red	Yellow	Blue
Basic dimension 65.000	64.976 to 64.972	64.972 to 64.965	64.965 to 64.960
Repair stage 64.750 ¹⁾	64.726 to 64.722	64.722 to 64.715	64.715 to 64.710

- ¹⁾ The same color marking applies to the thicker oversized bearing for refaced crankshafts as for new crankshafts despite the greater bearing thickness.

Connecting Rod, Allocating with Connecting Rod Bearing Shells to Crankshaft

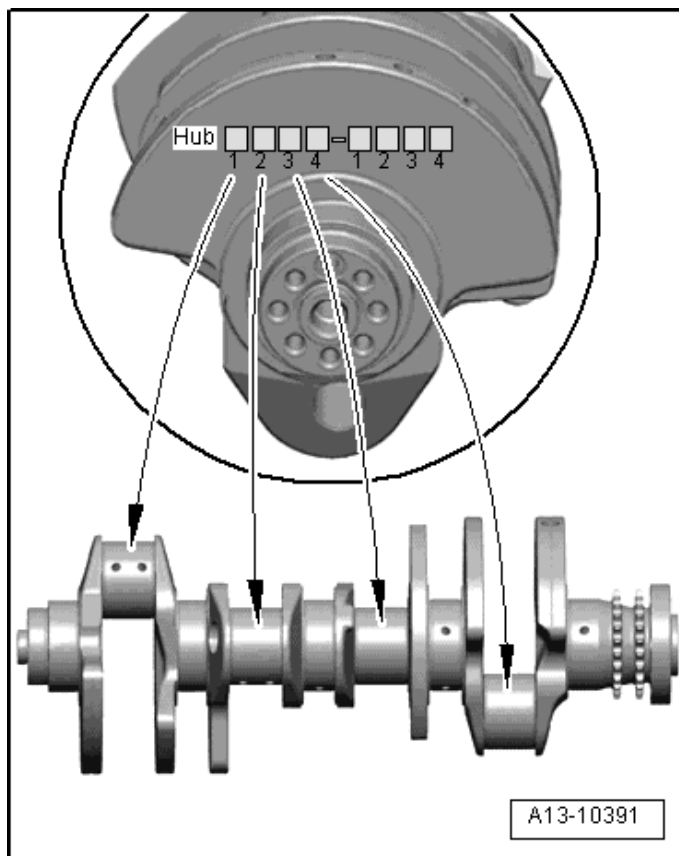


The crankshaft is allocated to a connecting rod of the proper width at the factory. Stamped letters on the narrow side of the base identify the width of the base. The allocation of the connecting rod to the crankshaft is identified by a letter on the front crankshaft counterweight as shown in the illustration.

NOTE: The numbers under the sequence of letters indicate the allocation of the connecting rod pins from front to rear.

Letter on crankshaft	Connecting rod base width in mm
X	Narrow (18.650 to 18.669)
Y	Wide (18.670 to 18.690)

Allocation of Connecting Rod Bearing Shell Thickness to Crankshaft



The crankshaft is allocated to connecting rod bearing shells of the proper thickness at the factory. The colored dots on the sides of the bearing shells identify the bearing shell thickness. The allocation of the bearing shells to the crankshaft is identified by a letter on the front crankshaft counterweight, as shown in the illustration.

NOTE: The numbers under the sequence of letters indicate the allocation of the crankshaft pins from front to rear.

Letter on crankshaft	Bearing color combination (connecting rod/cover alternatively)
R	Red/Yellow
G	Yellow/Blue
B	Blue/Blue

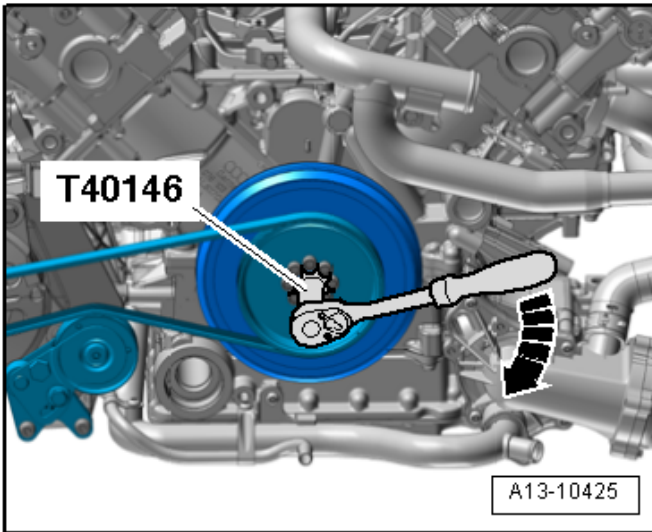
Fastener Tightening Specifications

Component	Fastener size	Nm
Baffle	-	9
Connecting rod ¹⁾	-	40 plus an additional 120° (1/3 turn)
Damper roller	-	22
Flywheel ¹⁾	-	60 plus an additional 90° (1/4 turn)
Generator bracket	M8	22
	M10	46
Damper roller ²⁾	-	9
	-	40
Oil spray jet	-	9
Oil tray-to-guide frame	-	9
Ring gear	-	12
Ribbed belt tensioning element	-	22

¹⁾ Replace fastener(s).

²⁾ For bolt tightening clarification, refer to ElsaWeb, *Ribbed Belt Drive Overview*, items 10 and 12.

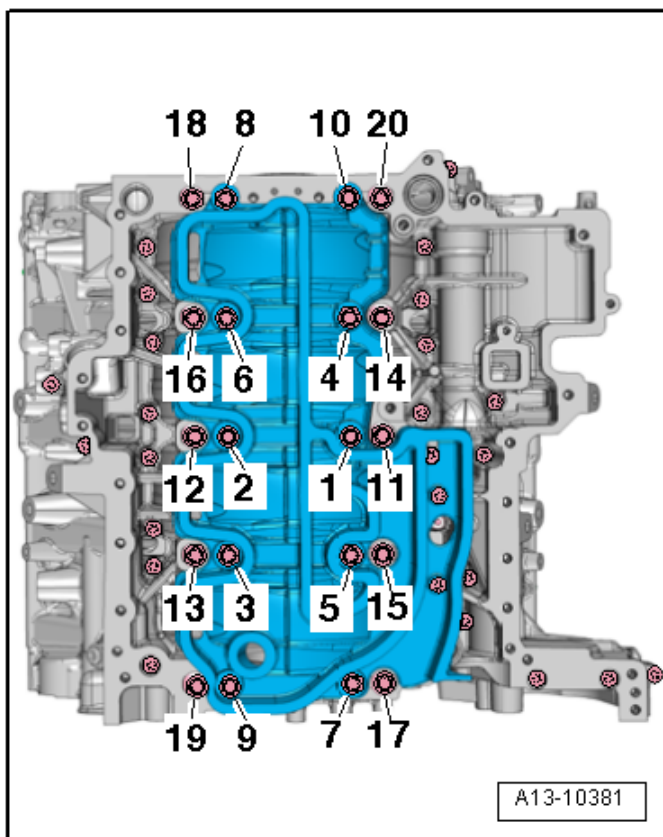
Vibration Damper Tightening Specification



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

¹⁾ Replace fastener(s).

Guide Frame Tightening Specifications



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

¹⁾ Replace fastener(s).

Crankshaft Dimensions

Honing dimension in mm	Crankshaft bearing pin diameter		Connecting rod pin diameter	
Basic dimension	65.000	-0.024	54.000	-0.024
		-0.040		-0.040
Repair stage	64.750	-0.024	53.750	-0.024
		-0.040		-0.040

Piston Ring End Gaps

Piston ring end gaps dimensions in mm	New	Wear limit
1 st compression ring	0.150 to 0.300	0.800
2 nd compression ring	0.005 to 0.045	0.800
Oil scraping ring	0.200 to 0.400	0.800

Piston Ring Clearance

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

Piston and Cylinder Dimensions

Cylinder bore diameter mm	Piston diameter mm
84.510 ± 0.005	84.490 ¹⁾
84.610 ± 0.005	84.590 ¹⁾

¹⁾ Measurement with coating (thickness = 0.01 mm). The graphite coating wears away.

Cylinder Head, Valvetrain – 4.2L CNDA

Fastener Tightening Specifications

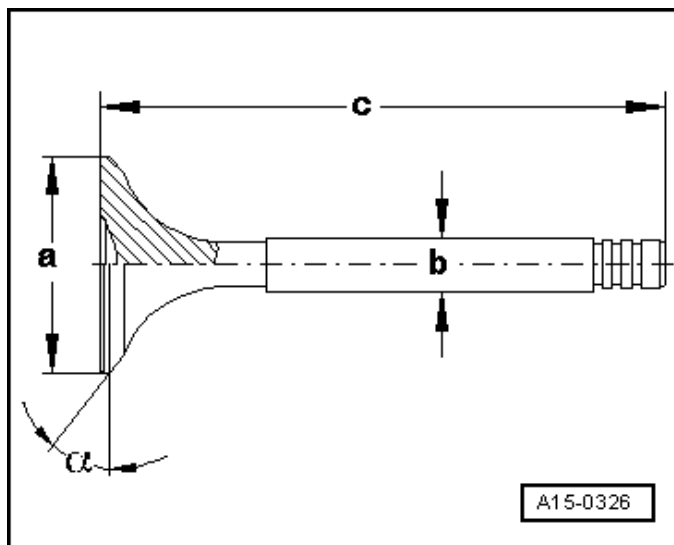
Component	Nm
Camshaft adjustment valve 2 (N208)	2.4
Camshaft adjustment valve 2 (exhaust) (N319)	2.4
Camshaft adjusters ¹⁾	80 plus an additional 90° (¼ turn)
Camshaft Position (CMP) sensor 2 (G163)	9
Camshaft Position (CMP) sensor 4 (G301)	9
Timing mechanism drive chain tensioner ¹⁾	5 plus an additional 90° (¼ turn)
Power take-off drive chain tensioner ¹⁾	5 plus an additional 90° (¼ turn)
Cylinder head locking bolt	35
Power take-off drive sprocket	64
A/C compressor driveshaft	60
Engine lifting eye	22
Gliding piece-to-engine ¹⁾	5 plus an additional 90° (¼ turn)
Timing mechanism drive chain guide rail ¹⁾	17 plus an additional 90° (¼ turn)
Power take-off chain idler sprocket	42
Idler sprocket mounting bracket ¹⁾	5 plus an additional 90° (¼ turn)
Left camshaft timing chain drive sprocket	22
Left camshaft timing chain tensioner ¹⁾	5 plus an additional 90° (¼ turn)
Drive sprocket mounting bracket	9
Right camshaft timing chain drive sprocket	42
Right camshaft timing chain tensioner ¹⁾	5 plus an additional 90° (¼ turn)

¹⁾ Replace fastener(s).

Compression Checking Specifications

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

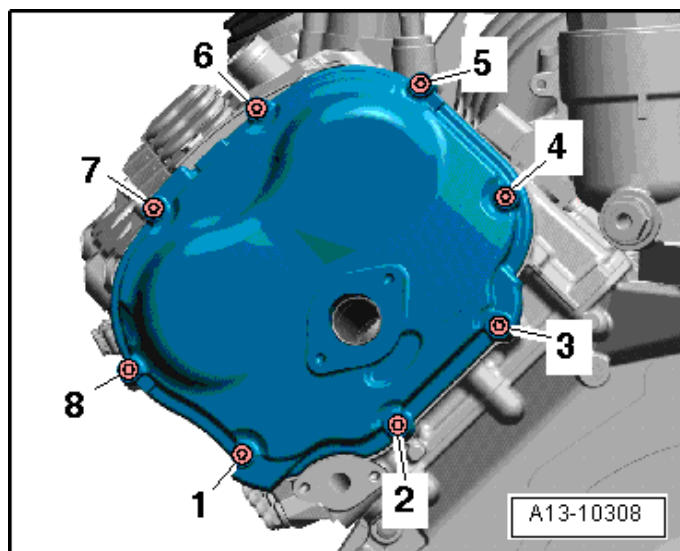
Valve Dimensions



Dimension		Intake valve	Exhaust valve
Diameter a	mm	33.85 ± 0.10	28.0 ± 0.1
Diameter b	mm	5.965 ± 0.005	5.955 ± 0.007
c	mm	103.97 ± 0.20	101.87 ± 0.20
α	∠°	45	45

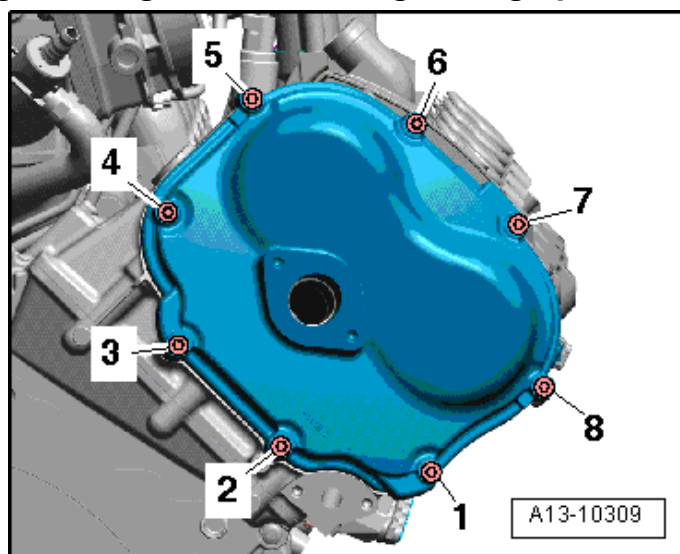
NOTE: Intake and exhaust valves must not be refaced by grinding. Only lapping is permitted.

Left Timing Chain Cover Tightening Specification



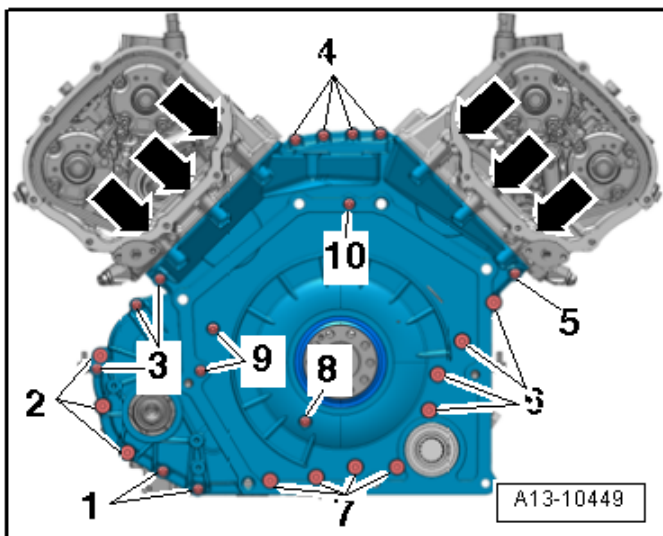
Step	Component	Nm
1	Tighten bolts 1 through 8 in sequence	9

Right Timing Chain Cover Tightening Specification



Step	Component	Nm
1	Tighten bolts 1 through 8 in sequence	9

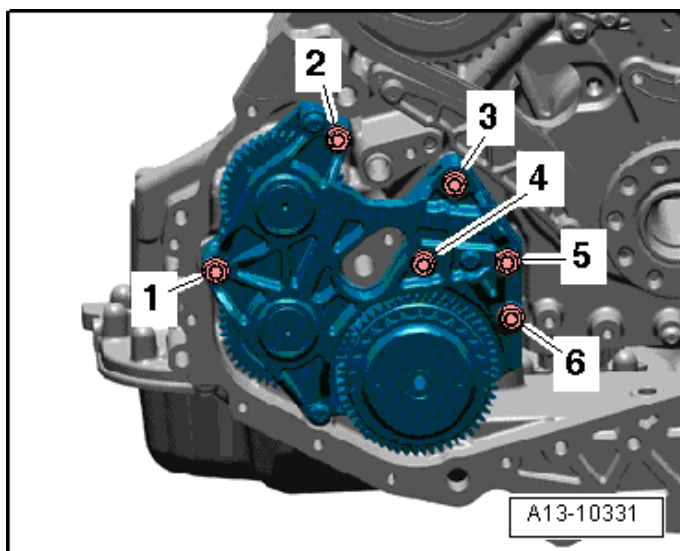
Lower Timing Chain Cover Tightening Specifications



Step	Component	Nm
1	Tighten the bolts (➡) ¹⁾	5
2	Tighten the bolts 1 through 10 in a diagonal sequence ¹⁾	8
3	Tighten bolts (➡)	10
4	Tighten bolts 2, 6 and 7 in a diagonal sequence	22
5	Tighten bolts 1, 3, 4, 5, 8, 9, and 10 in a diagonal sequence	an additional 90° (¼ turn)
6	Tighten bolts (➡)	an additional 90° (¼ turn)

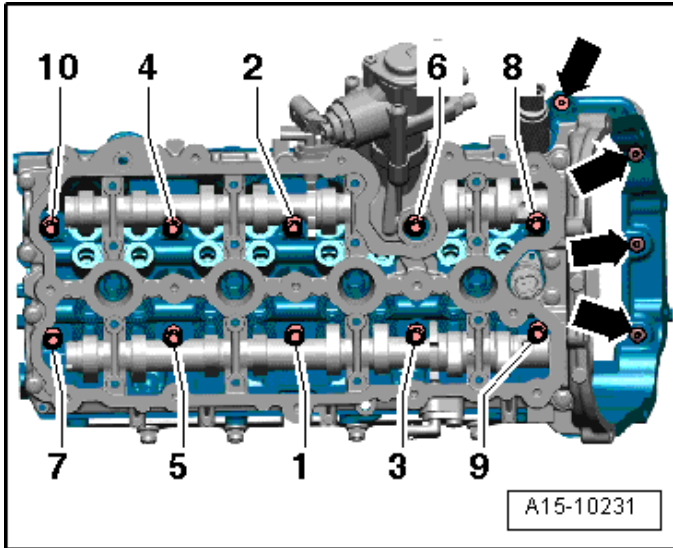
¹⁾ Replace fastener(s).

Spur Gear Unit Tightening Specification



Step	Component	Nm
1	Tighten bolts 1 through 6 in a diagonal sequence	22

Cylinder Head Tightening Specifications

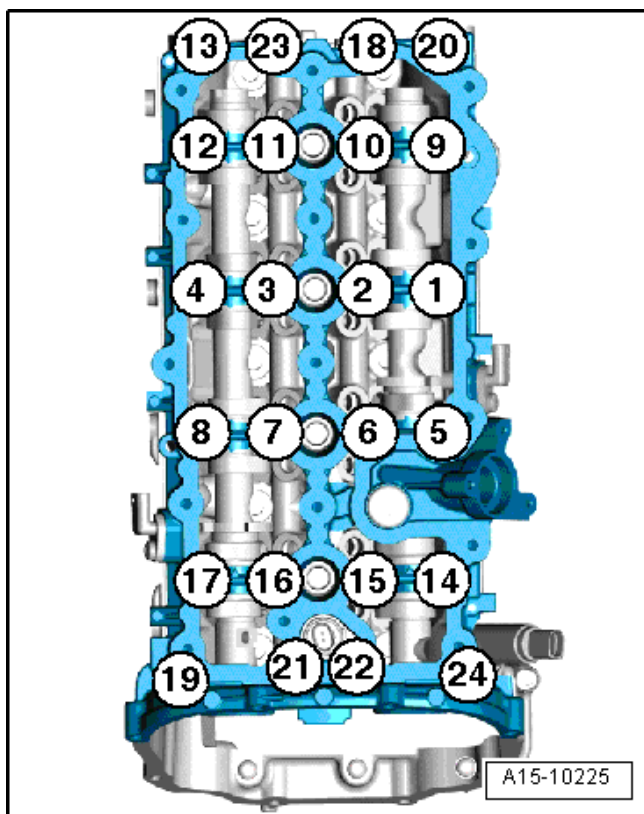


NOTE: Both cylinder heads are identical in tightening.

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

¹⁾ Replace fastener(s).

Camshaft Guide Frame Tightening Specifications



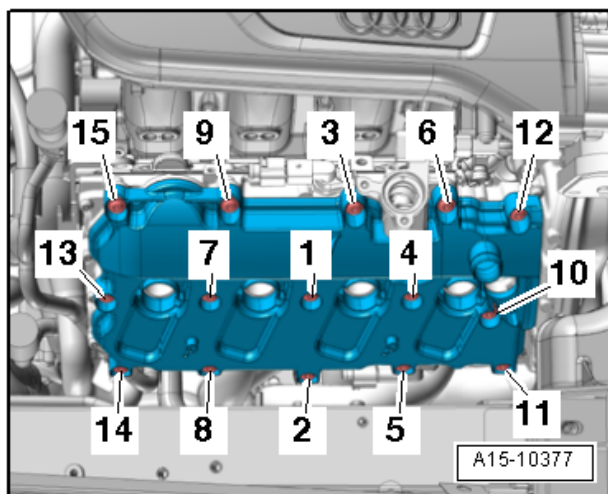
NOTE: Both camshaft guide frames are identical in tightening.

Step	Component	Nm
1	Tighten bolts 1 through 24 in sequence ¹⁾	Hand-tighten ²⁾
2	Tighten bolts 1 through 24 in sequence	8
3	Tighten bolts 1 through 24 in sequence	an additional 90° (¼ turn)

¹⁾ Replace fastener(s).

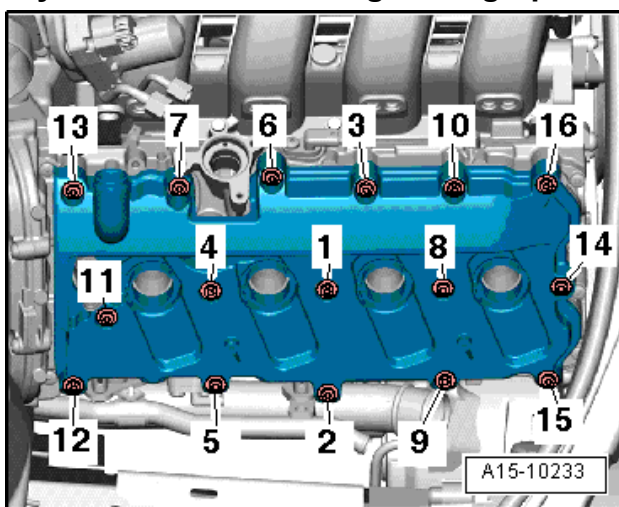
²⁾ The guide frame must be in contact with the entire contact surface of the cylinder head.

Left Cylinder Head Cover Tightening Specification



Step	Component	Nm
1	Tighten bolts 1 through 15 in sequence	9

Right Cylinder Head Cover Tightening Specification



Step	Component	Nm
1	Tighten bolts 1 through 16 in sequence	9

Engine Lubrication – 4.2L CNDA

Fastener Tightening Specifications

Component	Nm
Crankcase ventilation pressure regulator valve bracket ⁴⁾	9
Crankcase ventilation pressure regulator valve bracket ³⁾	22
Secondary Air Injection (AIR) solenoid valve bracket (N112)	5 plus an additional 90° (¼ turn)
Cover ¹⁾	5 plus an additional 90° (¼ turn)
End cover	5
Engine oil cooler	8
Oil container hose/line assembly-to-engine	8
Oil container hose/line assembly	8
Oil pump intake tube	9
Oil lines mounting plate	9
Oil container	8
Oil cooler carrier plate ²⁾	8
	20
Oil drain plug	10
Oil filter housing	9
Oil filter housing cap	25
Oil filter housing locking bolt	50
Oil level thermal sensor (G266)	8
Oil pan lower section	9
Oil pressure switch (F1)	20
Oil pump	9
Oil tank	9
Oil temperature sensor 2-to-oil filter housing	9
Pressure regulator valve for the crankshaft housing ventilation	9
Retaining plate to upper oil pan	9
Spacer piece-to-oil tank	8
Upper oil pan section plug	35

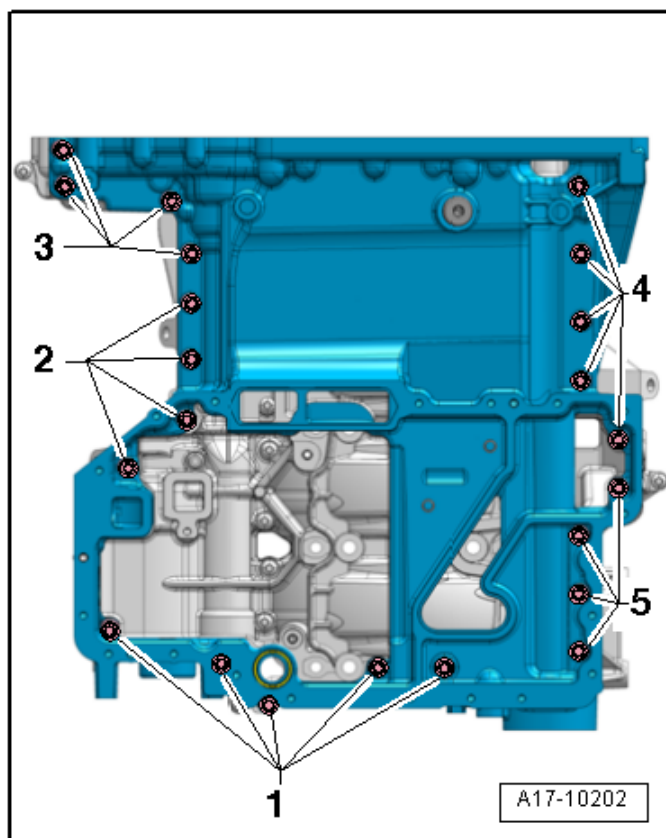
¹⁾ Replace fastener(s).

²⁾ For bolt tightening clarification, refer to ElsaWeb, *Oil Cooler and Oil Container Overview*, items 1, 2 and 30.

³⁾ For bolt tightening clarification, refer to ElsaWeb, *Oil Cooler and Oil Container Overview*, item 5.

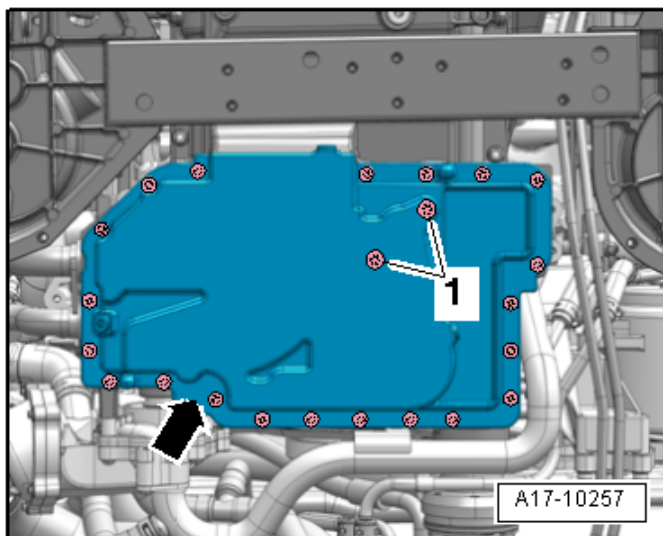
⁴⁾ For bolt tightening clarification, refer to ElsaWeb, *Crankcase Ventilation Overview*, item 8.

Upper Oil Pan Tightening Specifications



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

Oil Pan Tightening Specifications



Step	Component	Nm
1	Tighten bolts in a diagonal sequence	Hand-tighten
2	Tighten bolts in a diagonal sequence	5
3	Tighten bolts in a diagonal sequence	9

Cooling System – 4.2L CNDA

Fastener Tightening Specifications

Component	Nm
After-run coolant pump (V51)	8
Air duct	2.5
Bleeder screw	0.5
Electrical connectors bracket nut	9
Radiator bracket	20
Rear coolant pipe bracket	9
Upper coolant pipe bracket	9
Condenser	5
Connecting piece	8
Coolant fan nut	6
Coolant pipes in the center of the vehicle	20
Coolant pump	9
Coolant pump housing	9
Coolant thermostat with housing	9
Drain plug	4
Fan rib	8
Front air guide	2.5
Front coolant pipe	9
Front coolant return pipe	8
Generator coolant pipe	9
Left coolant supply pipe ¹⁾	8
	20
Left radiator bracket	20
Rear air guide	2.5
Rear coolant pipe	9
Right coolant supply pipe ²⁾	8
	20
Right radiator bracket	20
Rubber clamp	9
Upper coolant pipe	40

¹⁾ For bolt tightening clarification, refer to ElsaWeb, *Coolant Pipes, Front and in Vehicle Center Overview*, items 7 and 15.

²⁾ For bolt tightening clarification, refer to ElsaWeb, *Coolant Pipes, Front and in Vehicle Center Overview*, items 6 and 7.

Fuel Supply – 4.2L CNDA

Fastener Tightening Specifications

Component	Nm
Accelerator pedal module	9
Fuel filter bracket	
- Clamp	3
- Bracket	8
Leak Detection Pump (LDP) bracket ¹⁾	1.5
	8
EVAP canister	8
Fuel filler tube	20
Hose clamp	3
Left tension strap nut	3.2
Locking flange cover	9
Locking flange with locking ring	125
Locking ring	125
Tension strap nut	20

¹⁾ For bolt tightening clarification, refer to ElsaWeb, *EVAP Canister and Leak Detection System Overview*, items 1 and 19.

Exhaust System, Emission Controls – 4.2L CNDA

Fastener Tightening Specifications

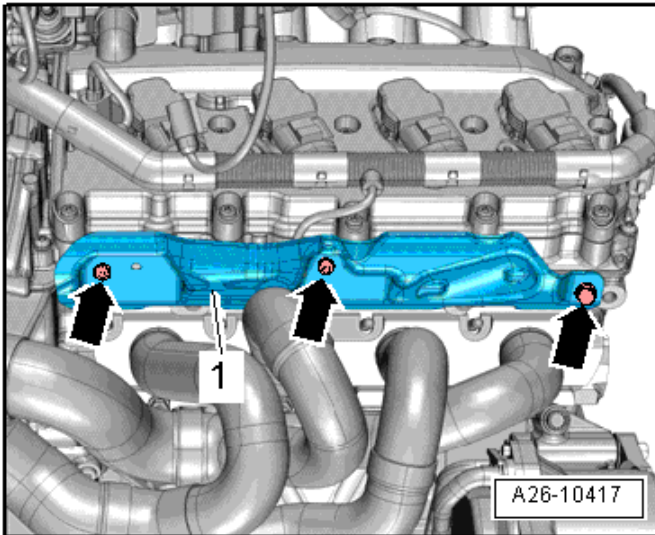
Component	Nm
Muffler bracket ²⁾	25
	45
Secondary Air Injection (AIR) pump motor (V101) bracket nut/bolt	9
Secondary Air Injection (AIR) solenoid valve (N112) bracket	9
Front heat shield	6
Left tail lamp assembly heat shield	
Bolt	1.5
Spring nut	2
Left lower heat shield nut	2
Left rear wheel housing liner heat shield ³⁾	1.5
	4
	6
Rear heat shield	6
Secondary air connecting pipe-to-cylinder head	9
Secondary air pipe	9
Secondary air pipe-to-Secondary Air Injection (AIR) combi-valves	5
Securing strip ¹⁾	25

¹⁾ Replace fastener(s).

²⁾ For bolt tightening clarification, refer to ElsaWeb, *Muffler Overview*.

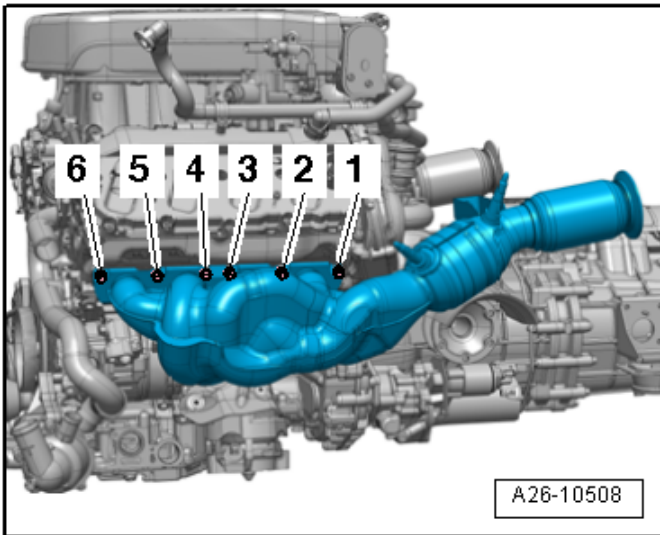
³⁾ For bolt tightening clarification, refer to ElsaWeb, *Heat Shield Overview*, items 1, 2, 22 and 23.

Exhaust Manifold Heat Shield Tightening Specifications



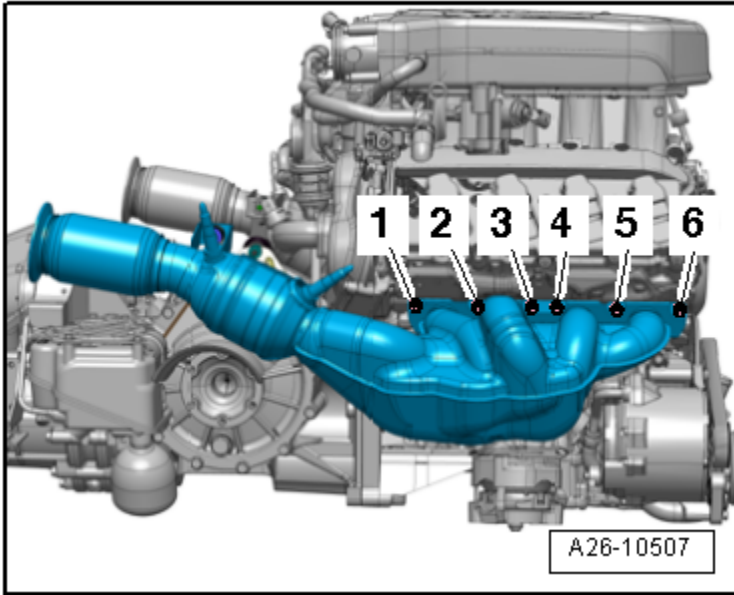
Step	Component	Bolt	Nm
1	Tighten bolts (➔)	M6	9
2	Tighten bolts (➔)	M8	23

Left Exhaust Manifold Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 6 in sequence	Hand-tighten
2	Tighten bolts 1 through 6 in sequence	20
3	Tighten bolts 1 through 6 in sequence	30

Right Exhaust Manifold Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 6 in sequence	Hand-tighten
2	Tighten bolts 1 through 6 in sequence	20
3	Tighten bolts 1 through 6 in sequence	30

Multipoint Fuel Injection – 4.2L CNDA

Technical Data

Engine data		4.2L FSI engine
Idle speed cannot be adjusted, it is regulated by idle stabilization		640 to 840 RPM
Engine speed limitation via fuel injector shut-off		6500 RPM
Fuel pressure	Fuel supply pressure up to high pressure pump (produced by an electric fuel pump in the fuel tank)	3 to 6 bar pressure
	Fuel high pressure (produced by a mechanical single-piston pump) at approximately 85 degree coolant temperature	Between 20 and 40 bar pressure at idle to approximately 125 bar pressure at certain operating points

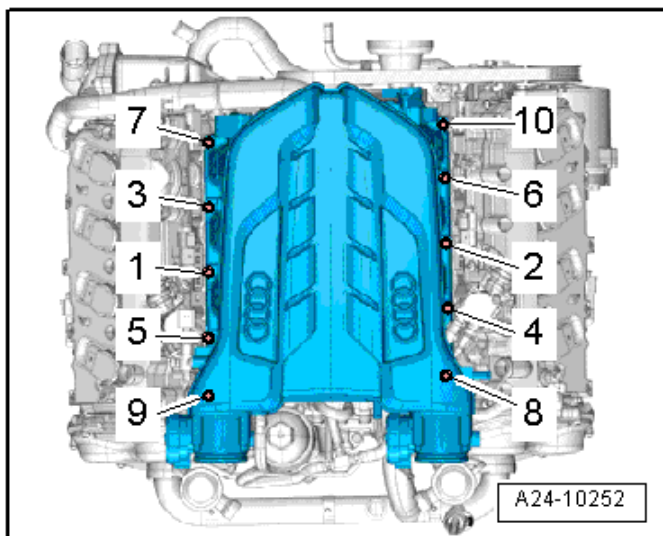
Fastener Tightening Specifications

Component	Nm
Air guide adapter	4
Air duct	8
Air guide	8
Air filter housing upper/lower sections	8
Camshaft Position (CMP) sensor	10
Intake manifold clamp	9
Engine speed sensor	9
Fuel filler tubes	9
Fuel pressure sensor	22
Fuel rail ²⁾	9
Fuel supply line	25
Heat shield	3
High pressure line connection union nut ¹⁾	40
High pressure pumps	10
Hose clamps	5.5
Intake manifold flap vacuum actuator	9
Intake manifold runner position sensor	2.5
Knock Sensor (KS)	20
Locking flange cover	9
Low fuel pressure sensor	15
Mass Air Flow (MAF) sensor	1.5
Oxygen Sensor (O2S)	55
High pressure line pressure relief valve	25
Retaining clip	9
Strainer	1.2
Throttle valve control module	9

¹⁾ Coat the threads on the union nut with fuel.

²⁾ Fasten in diagonal sequence in steps.

Intake Manifold Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 10 in sequence	8
2	Tighten bolts 8 and 9 in sequence	11
3	Tighten bolts 1 through 7 and 10 in sequence	9
4	Tighten bolts 1 through 7 and 10 in sequence	an additional 90° (¼ turn)

Ignition – 4.2L CNDA

Ignition Technical Data

Engine Data		4.2L/4V FSI Engine
Idle speed		Not adjustable
Ignition timing		Not adjustable, regulated by the Engine Control Module (ECM)
Ignition/glow plug system		Single coil ignition system with 8 ignition coils (output stages integrated) that are connected directly to spark plugs via the ignition cables
Spark plugs	Names	Data sheets for exhaust emission test
	Tightening specifications	Maintenance Procedures Rep. Gr. 03
Ignition sequence		1-5-4-8-6-3-7-2

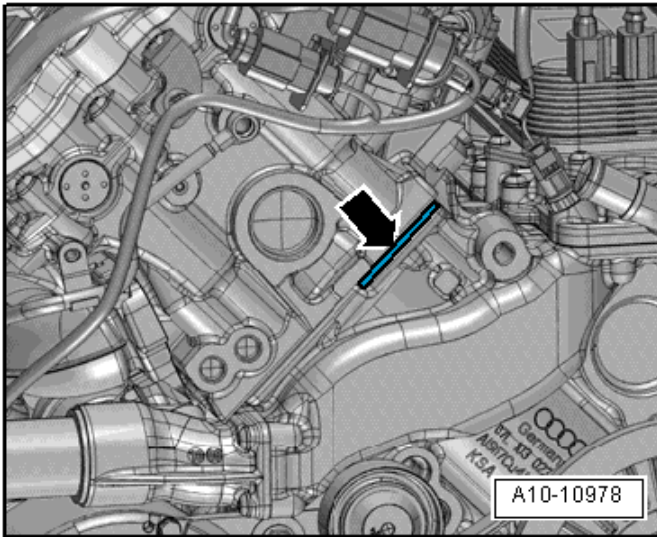
Fastener Tightening Specifications

Component	Nm
Camshaft Position (CMP) sensor	10
Ignition coil electrical wiring-to-cylinder head cover	5
Knock Sensor (KS)	20
Spark plugs	30

ENGINE MECHANICAL – 5.2L CTPA, CTYA

General, Technical Data – 5.2L CTPA, CTYA

Engine Number Location



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

Engine Data

Code Letters		CTPA	CTYA
Displacement	liter	5.204	5.204
Output	kW at RPM	404 @ 8000	386 @ 8000
Torque	Nm at RPM	540 @ 6500	530 @ 6500
Bore	diameter mm	84.5	84.5
Stroke	mm	92.8	92.8
Compression ratio		12.5	12.5
RON	at least	98 ¹⁾	98 ¹⁾
Injection system/ignition system		Bosch Motronic	Bosch Motronic
Ignition sequence		1-6-5-10-2-7-3-8-4-9	1-6-5-10-2-7-3-8-4-9
Turbocharger		No	No
Knock control		4 sensors	4 sensors
Oxygen Sensor (O2S) regulation		2 sensors before catalytic converter 2 sensors after catalytic converter	2 sensors before catalytic converter 2 sensors after catalytic converter
Variable valve timing		Intake Exhaust	Intake Exhaust
Variable intake manifold		Yes	Yes
Secondary Air Injection (AIR) system		Yes	Yes
Valve per cylinder		4	4

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

Engine Assembly – 5.2L CTPA, CTYA

Fastener Tightening Specifications

Component	Fastener size	Nm
Bolts and nuts	M6	9
	M7	15
	M8	20
	M10	40
	M12	65
Bolts to engine compartment crossmember ¹⁾	-	20
		10 plus an additional 45° (1/8 turn)
Bolts to engine compartment crossmember ⁴⁾	-	20
		10 plus an additional 45° (1/8 turn)
Clamp to engine compartment crossmember	-	8
Engine compartment cross member ¹⁾	-	8
		20
Engine compartment trim bracket	-	8
Engine cover bracket to engine compartment crossmember	-	8
Engine cover bracket to engine compartment crossmember	-	8
Heat shield	-	10
Left engine mount	-	20
Left engine support	-	40
Oil pump bracket ³⁾	-	22
		6 plus an additional 45° (1/8 turn)
Right engine mount	-	20
Right engine support ²⁾	-	40
		42
Spacer plate to engine compartment crossmember	-	20

¹⁾ For bolt tightening clarification, refer to ElsaWeb, *Engine Compartment Crossmember Overview*, items 6, 11, 19 and 21

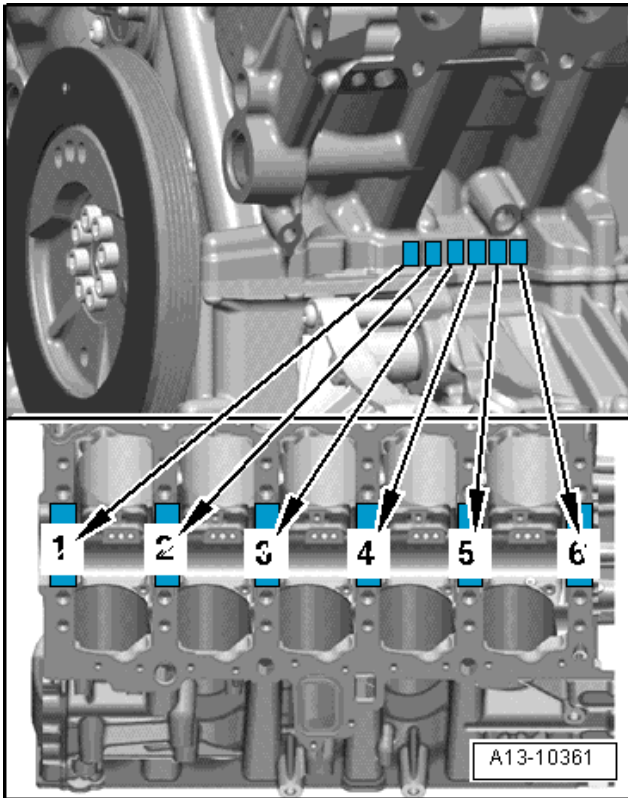
²⁾ For bolt tightening clarification, refer to ElsaWeb, *Subframe Mount Overview*, items 6, 11 and 10.

³⁾ For bolt tightening clarification, refer to ElsaWeb, *Subframe Mount Overview*, items 19 and 20.

⁴⁾ For bolt tightening clarification, refer to ElsaWeb, *Engine Compartment Crossmember Overview*, items 2, 4, 11, 17 and 19.

Crankshaft, Cylinder Block – 5.2L CTPA,CTYA

Allocation of Crankshaft Bearing Shells for Cylinder Block, New Crankshaft

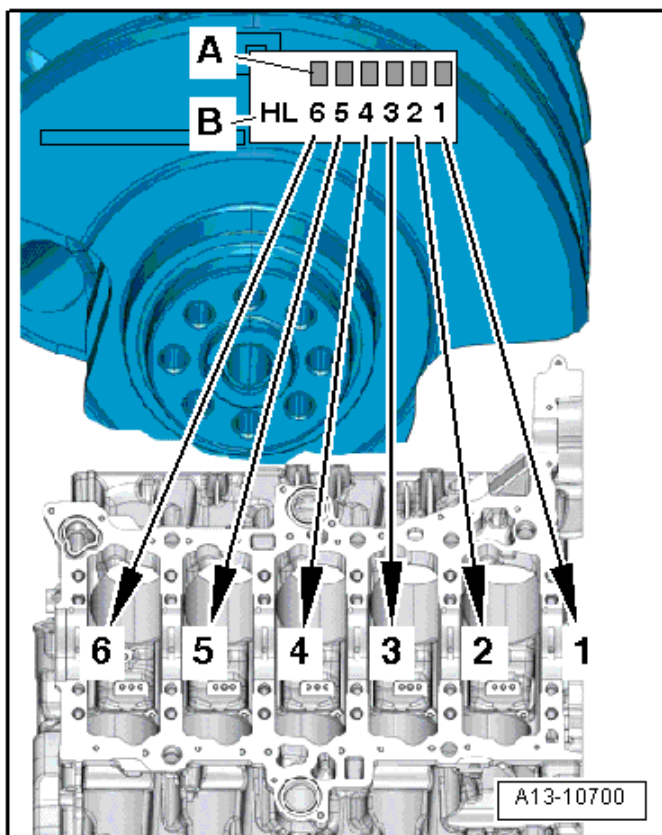


Bearing shells with the correct thickness are allocated to the cylinder block in the factory. Colored dots on the sides of the bearing shells identify the bearing shell thickness. Allocation of the bearing shells to the cylinder block is marked by one letter each at the front left on cylinder block as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

The bearing identification refers to the first installation during production: R = red, G = yellow, B = blue. During a second installation by service, the next thinner bearing shell is installed, for example, black instead of red, as shown in the following table.

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

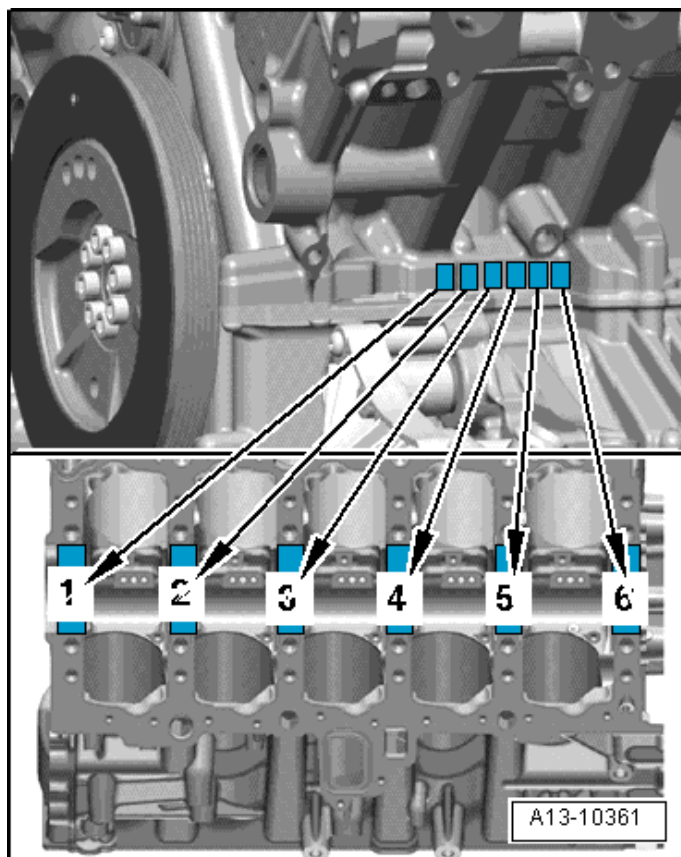
Allocation of Crankshaft Bearing Shells for Guide Frame



Bearing shells with the correct thickness are allocated to the guide frame in the factory. Colored dots on the sides of the bearing shells identify the bearing shell thickness. Allocation of the bearing shells to the guide frame is identified by a letter on the front crankshaft counterweight as shown in the illustration. The lettering sequence (A) is located opposite the bearing number (B) (depending on the version, the numbering sequence begins with HL = main bearing).

Colored dot on crankshaft	Color of bearing
R	Red
Y	Yellow
B	Blue

Allocation of Main Bearing Shells, Used and Refaced Crankshafts



Bearing shells are allocated to cylinder block corresponding to color markings stamped into the cylinder block. With used and refaced crankshafts, measure the main crankshaft journals to allocate the appropriate bearing shells. Thicker oversized bearing shells are available for refaced crankshafts. These have the same color markings as the original-size bearing shells. The bearing identification refers to the first installation during production: R = red, G = yellow, B = blue. During a second installation by service, the next thinner bearing shell is installed, for example, black instead of red, as shown in the following table.

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

Allocation of Crankshaft Bearing Shells for Guide Frame

- With used and refaced crankshafts, measure the main crankshaft journals to allocate the appropriate bearing shells.
- Any other markings on the crankshaft are invalid when refacing crankshafts.
- Use the following table to allocate the bearing shells to the diameter of the main crankshaft.

Crankshaft bearing pin diameter in mm	Color identification of bearing shells for guide frame		
	Red	Yellow	Blue
Basic dimension 67.000	66.978 to 66.972	66.971 to 66.965	66.964 to 66.958
Repair stage 66.750 ¹⁾	66.728 to 66.722	66.721 to 66.715	66.714 to 66.708

¹⁾ The same color marking applies to the thicker oversized bearing for refaced crankshafts as for new crankshafts despite the greater bearing thickness.

Fastener Tightening Specifications

Component	Nm
Connecting rod bearing cap to connecting rod ^{2) 3)}	40 plus an additional 120° ($\frac{1}{3}$ turn)
Cylinder block plug	9
Drain plug	45
Protection tube flange	9
Flywheel ²⁾	60 plus an additional 90° ($\frac{1}{4}$ turn)
Generator bracket	42
Ribbed belt idler roller	22
Oil spray jet ⁴⁾	9
Starter ring gear	12
Suction module plug	45
Ribbed belt tensioning element ¹⁾	28
	55

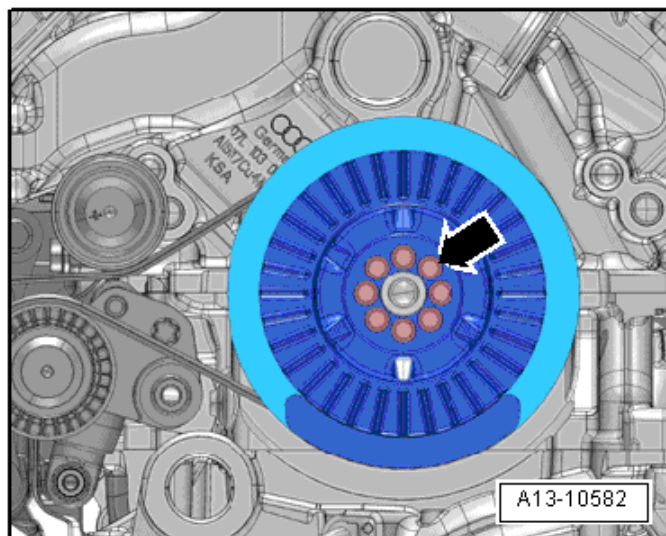
¹⁾ For bolt tightening clarification, refer to ElsaWeb, *Ribbed Belt Drive Overview*, items 1 and 2.

²⁾ Replace fastener(s).

³⁾ Lubricate the threads and contact surface..

⁴⁾ Insert the bolt with locking compound.

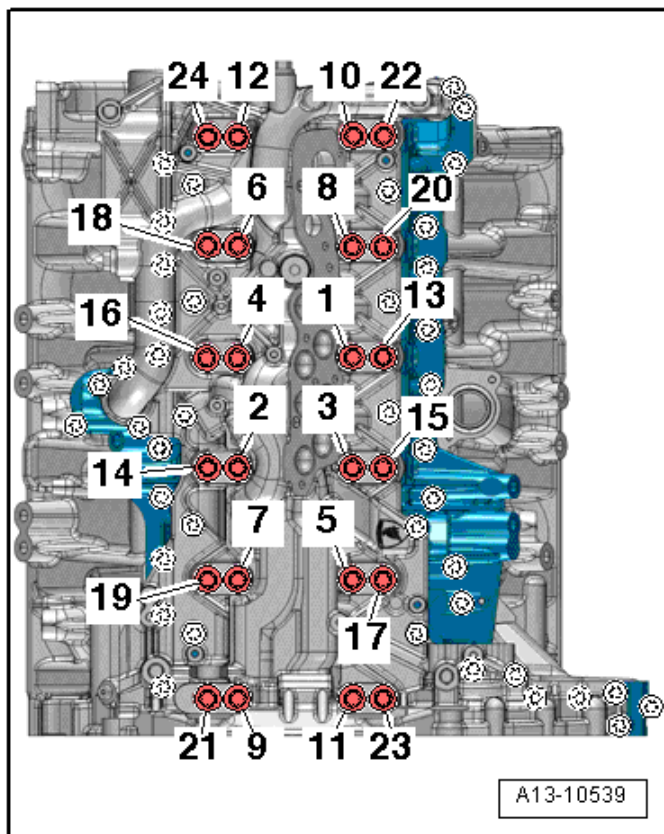
Vibration Damper Tightening Specifications



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

¹⁾ Replace fastener(s).

Guide Frame Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 12 in sequence ¹⁾	30
2	Tighten bolts 13 through 24 in sequence ¹⁾	20
3	Tighten bolts 1 through 12 in sequence	50
4	Tighten bolts 13 through 24 in sequence	40
5	Tighten bolts 1 through 12 in sequence	an additional 180° (½ turn)
6	Tighten bolts 13 through 24 in sequence	an additional 135°
7	Tighten the guide frame-to-cylinder block sealing surface bolts (not numbered) in a diagonal sequence	9

¹⁾ Replace fastener(s).

Crankshaft Dimensions

Honing dimension in mm	Crankshaft bearing journal diameter		Crankshaft connecting rod journal diameter	
	Basic dimension	67.000	-0.022	54.000
	-0.042		-0.040	
Repair stage	66.750	-0.022	53.750	-0.024
		-0.042		-0.040

Piston Ring End Gaps

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

Piston Ring Clearance

Piston ring dimensions in mm	New	Wear limit
1 st compression ring	0.02 to 0.07	0.20
2 nd compression ring	0.005 to 0.045	0.200
Oil scraping ring	0.02 to 0.06	0.15

Piston and Cylinder Dimensions

Matching pistons are allocated to the different manufacturing stages of the cylinder block.

Cylinder bore diameter in mm	Piston diameter in mm
84.510 ± 0.005	84.490 ¹⁾
84.610 ± 0.005	84.590 ¹⁾

¹⁾ Measurement with coating (thickness = 0.01 mm). The graphite coating wears away.

Cylinder Head, Valvetrain – 5.2L CTPA, CTYA

Fastener Tightening Specifications

Component	Nm
Exhaust camshaft adjuster	
Initial tightening specifications	60
Final tightening specifications ¹⁾	80 plus an additional 90° (¼ turn)
Intake camshaft adjuster ¹⁾	
Initial tightening specifications	60
Final tightening specifications	80 plus an additional 90° (¼ turn)
Camshaft adjustment valve	2.4
Cylinder head plug	45
Chain tensioner ¹⁾	5 plus an additional 90° (¼ turn)
Coolant and fuel lines ¹⁾⁴⁾	
Banjo bolts	8 plus an additional 90° (¼ turn)
	7 plus an additional 90° (¼ turn)
Drain plug for cylinder head	45
Drive chain sprocket thrust washer to mounting bracket for drive sprocket	22
Power take-off drive chain sprocket	64
Engine lifting eye	22
Guide rail ¹⁾³⁾	17 plus an additional 90° (¼ turn)
Guide rail ¹⁾²⁾	5 plus an additional 90° (¼ turn)
Idler sprocket mounting bracket ¹⁾	5 plus an additional 90° (¼ turn)
Left camshaft timing chain tensioner ¹⁾	5 plus an additional 90° (¼ turn)
Left camshaft timing chain drive sprocket	22
Locking bolt	45

Fastener Tightening Specifications (*cont'd*)

Component	Nm
Drive sprocket mounting bracket ¹⁾	5 plus an additional 90° (¼ turn)
Oil drain plug	12
Drive sprocket pivot pin	42
Idler sprocket pivot pin	42
Right camshaft timing chain tensioner ¹⁾	5 plus an additional 90° (¼ turn)

¹⁾ Replace fastener(s).

²⁾ For bolt tightening clarification, refer to ElsaWeb, *Power Take-Off Drive Chain Overview*, item 2.

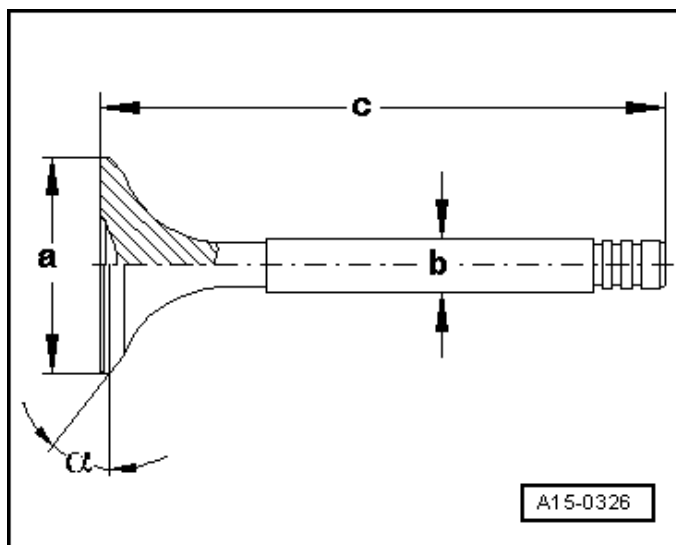
³⁾ For bolt tightening clarification, refer to ElsaWeb, *Timing Mechanism Drive Chain Overview*, items 1 and 8.

⁴⁾ For bolt tightening clarification, refer to ElsaWeb, *Cylinder Head Overview*, items 11 and 15.

Compression Checking Specifications

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

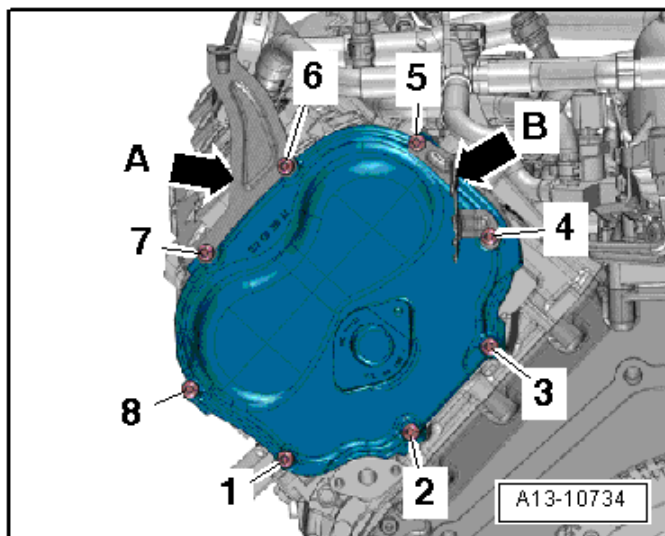
Valve Dimensions



Dimension		Intake valve	Exhaust valve
Diameter a	mm	33.85 ± 0.10	28.0 ± 0.1
Diameter b	mm	5.965 ± 0.005	5.955 ± 0.007
c	mm	103.97 ± 0.20	101.87 ± 0.20
α	\angle°	45	45

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

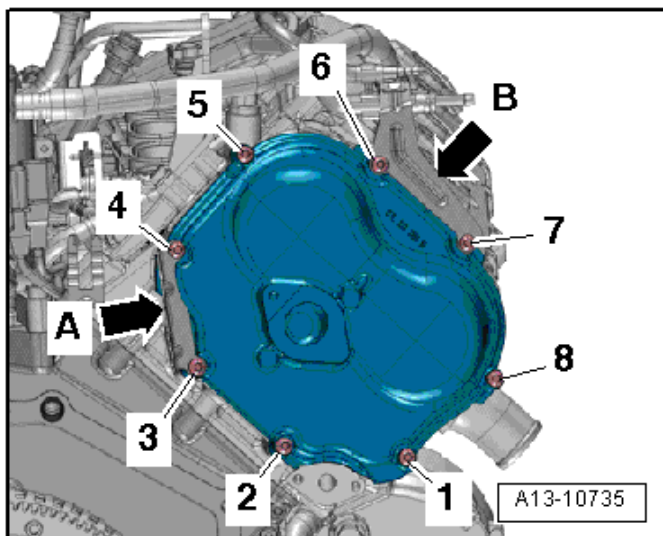
Left Timing Chain Cover Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 8 in sequence	5
2	Tighten bolts 1 through 8 in sequence	9

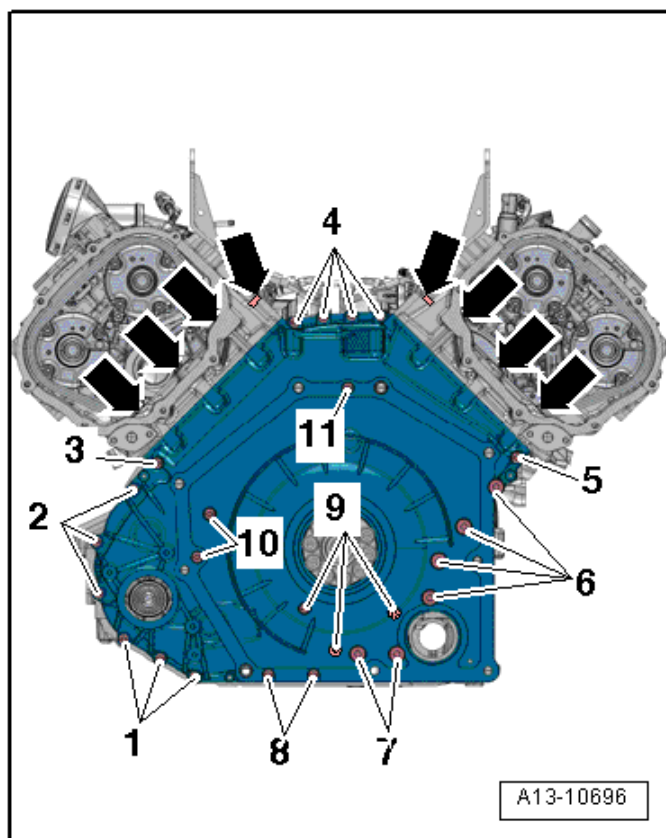
Right Timing Chain Cover Tightening Specifications

Engine –
5.2L CTPA, CTYA



Step	Component	Nm
1	Tighten bolts 1 through 8 in sequence	5
2	Tighten bolts 1 through 8 in sequence	9

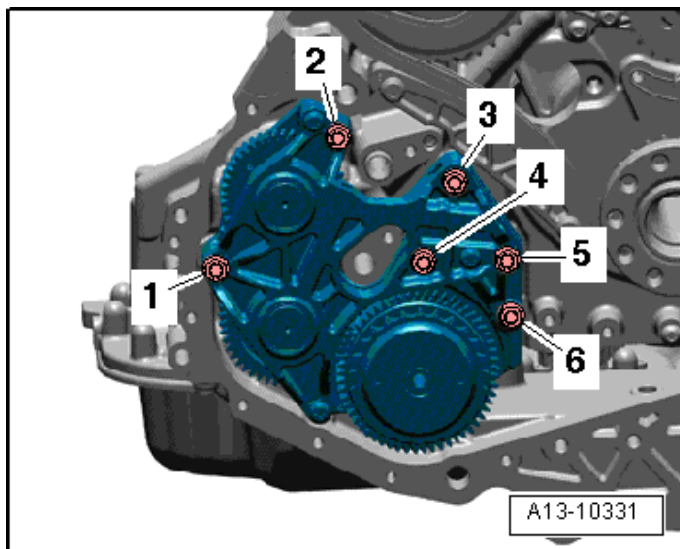
Lower Timing Chain Cover Tightening Specifications



Step	Component	Nm
1	Tighten the bolts (➡) ¹⁾	5
2	Tighten the bolts 1 through 11 in a diagonal sequence ¹⁾	8
3	Tighten bolts (➡)	11
4	Tighten bolts 7 and 8 in a diagonal sequence	22
5	Tighten bolts 1 through 6 and 9 through 11 in a diagonal sequence	an additional 90° (¼ turn)
6	Tighten bolts (➡)	an additional 90° (¼ turn)

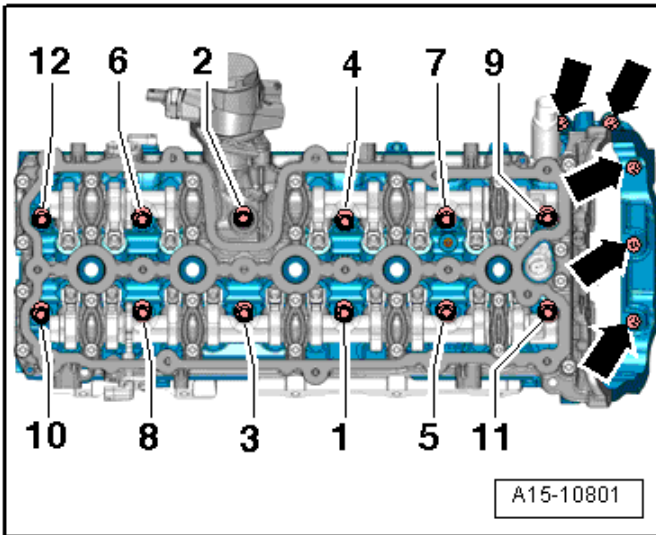
¹⁾ Replace fastener(s).

Spur Gear Unit Tightening Specification



Step	Component	Nm
1	Tighten bolts 1 through 6 in a diagonal sequence	22

Cylinder Head Tightening Specifications

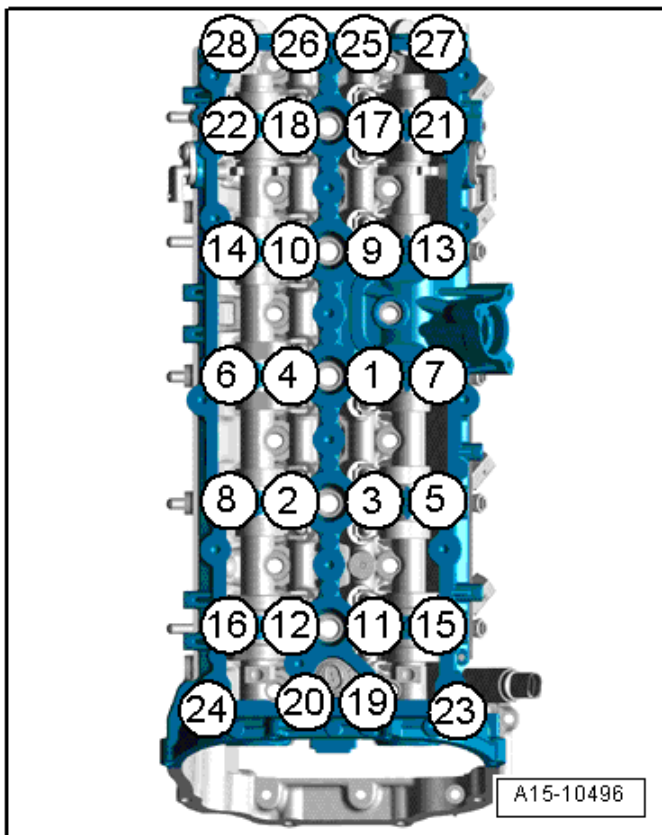


NOTE: Both cylinder heads are identical in tightening.

Step	Component	Nm
1	Tighten bolts 1 through 12 in sequence ¹⁾	Hand-tighten
2	Tighten bolts 1 through 12 in sequence	30
3	Tighten bolts 1 through 12 in sequence	60
4	Tighten bolts 1 through 12 in sequence	an additional 90° (¼ turn)
5	Tighten bolts 1 through 12 in sequence	an additional 90° (¼ turn)
6	Tighten bolts (➡) ¹⁾	11
7	Tighten bolts (➡)	an additional 90° (¼ turn)

¹⁾ Replace fastener(s).

Camshaft Guide Frame Tightening Specifications



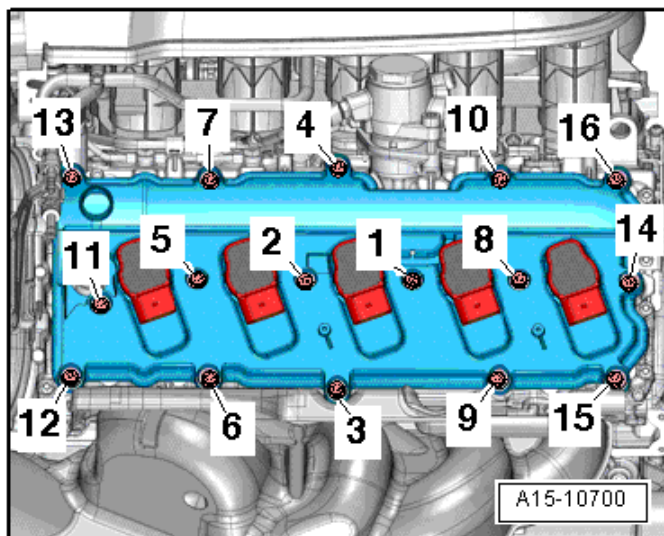
NOTE: The left cylinder head camshaft guide frame is shown.
The right cylinder head camshaft guide frame is identical.

Step	Component	Nm
1	Tighten bolts 1 through 28 in sequence ¹⁾	Hand-tighten ²⁾
2	Tighten bolts 1 through 28 in sequence	8
3	Tighten bolts 1 through 28 in sequence	an additional 90° (¼ turn)

¹⁾ Replace fastener(s).

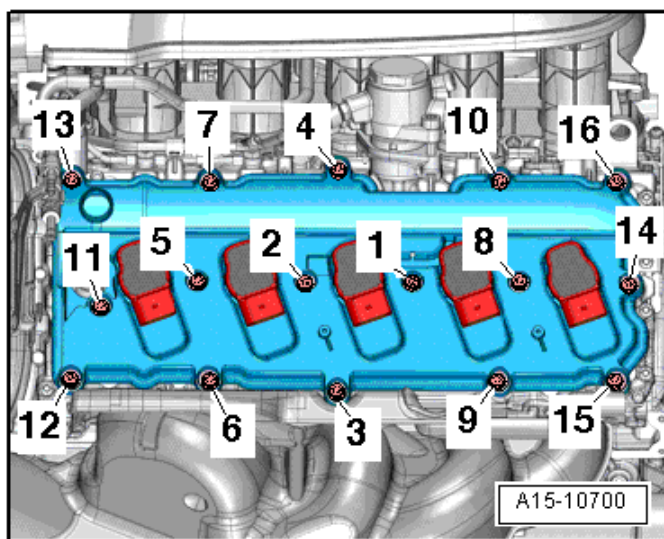
²⁾ The guide frame must be in contact with the entire contact surface of the cylinder head.

Left Cylinder Head Cover Tightening Specification



Step	Component	Nm
1	Tighten bolts 1 through 16 in sequence	9

Right Cylinder Head Cover Tightening Specification



Step	Component	Nm
1	Tighten bolts 1 through 16 in sequence	9

Engine Lubrication – 5.2L CTPA, CTYA

Fastener Tightening Specifications

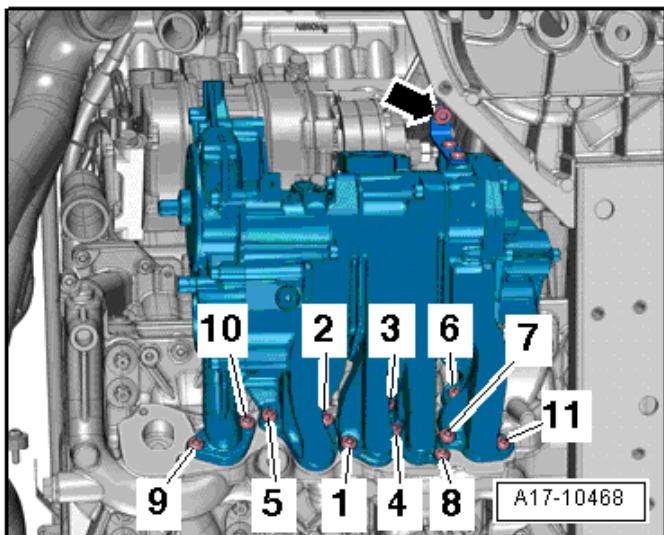
Component	Nm
Electrical connector bracket	9
Oil pump bracket ¹⁾	6 plus an additional 45° (1/8 turn)
Coolant drain plug	25
Coolant temperature sensor	2
Crankcase housing ventilation hose	9
Drain plug for oil filter housing	20
Drain plug for suction module	25
Engine coolant temperature sensor	9
Fuel rail from the oil tank to the engine	8
Heat shield	8
Hose/line assembly drain plug	10
Hose/line assembly from the oil pump	9
Hose/line assembly to the oil tank	8
Hose for crankcase ventilation	9
Left engine oil cooler ³⁾	8
	9
Oil check valve	6
Left engine oil cooler drain plug	22
Oil drain plug	12
Oil filter housing ²⁾	9
	22
	50
Locking bolt	50
Oil filter housing cap	25
Oil level thermal sensor	8
Oil pump oil line-to-thermostat	9
Oil pressure switch	20
Oil tank	8
Oil temperature sensor 2	2
Oil return restrictor	9
Left engine oil cooler spacer bolt	9
Spacer piece for oil tank (Transmission 086)	8
Suction module plug	25

¹⁾ Replace fastener(s).

²⁾ For bolt tightening clarification, refer to ElsaWeb, *Oil Filter Housing Overview*, items 2, 17 and 26.

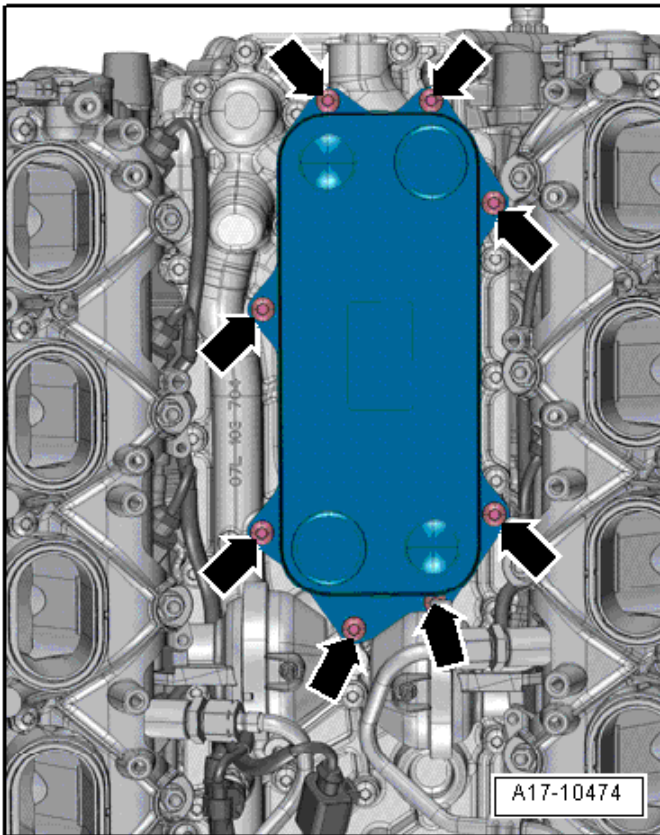
³⁾ For bolt tightening clarification, refer to ElsaWeb, *Left Engine Oil Cooler Assembly Overview*, items 5, 6, 20 and 23.

Oil Pump Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 11 in sequence	8
2	Tighten bolts 1 through 11 in sequence	10

Upper Engine Oil Cooler Tightening Specifications



Step	Component	Nm
1	Tighten bolts (➡) in a diagonal sequence	3
2	Tighten bolts (➡) in a diagonal sequence	9

Cooling System – 5.2L CTPA, CTYA

Fastener Tightening Specifications

Component	Nm
Air duct	2.5
Bleeder screw	0.5
Coolant pump housing bracket ¹⁾	6 plus an additional 45° (1/8 turn)
Radiator bracket	20
Center radiator bracket	8
Coolant thermostat with housing drain plug	5
Coolant fan nut	6
Coolant pipes in the center of the vehicle ²⁾	8
	20
Coolant thermostat with housing	9
Condenser	5
Connecting piece	8
Fan shroud to side radiator bolt	8
Front air guide	2.5
Coolant pump housing ³⁾	9
	10
Large left rear coolant pipe	9
Left coolant supply pipe	8
Left radiator bracket	20
Rear air guide	2.5
Rear coolant return pipe	8
Right coolant supply pipe	8
Right radiator bracket	20
Right Rear Coolant Pipe to the ATF Cooler nut	9
Right rear coolant pipe	9
Rubber bushing to transmission coolant pump	2.7

¹⁾ Replace fastener(s).

²⁾ For bolt tightening clarification, refer to ElsaWeb, *Coolant Pipes Overview*, items 7, 8 and 10.

³⁾ For bolt tightening clarification, refer to ElsaWeb, *Coolant Pump Overview*, items 2 and 3.

⁴⁾ For bolt tightening clarification, refer to ElsaWeb, *Coolant Expansion Tank Overview*, items 1, 4 and 8.

Fuel Supply – 5.2L CTPA, CTYA

Fastener Tightening Specifications

Component	Nm
Coupe and Spyder	
Accelerator pedal module	9
Bracket for Fuel Filter	
- Bracket	8
- Clamp	3
Bracket for Leak detection pump (Coupe) ²⁾	
- Bolt	1.25
- Bolt	8
Bracket for Air Filter (Coupe)	8
Bracket for Leak Detection Pump ¹⁾	
- Bolt	1.5
- Bolt	8
Bushing to EVAP Canister bolt (Coupe)	8
EVAP Canister	8
Fuel Filler Tube	20
Fuel Pump Control Module	2.5
Hose Clamp	3
Left Tension Strap, Nut	3.2
Locking Flange Cover bolts	9
Locking Flange with Locking Ring	125
Locking Ring	125
Tension Strap, Nut/Bolt	20

¹⁾ For bolt tightening clarification, refer to ElsaWeb, *EVAP Canister System and Tank Leak Diagnosis System Overview* and items 8 and 9.

²⁾ For bolt tightening clarification, refer to ElsaWeb, *EVAP Canister System and Tank Leak Diagnosis System Overview*, items 1 and 19.

Exhaust System, Emission Controls – 5.2L CTPA, CTYA

Fastener Tightening Specifications

Component	Nm
Bracket for muffler	25
Bracket for secondary air injection pump motor, bolt/nut	9
Bracket for secondary air injection pump motor 2, nut	9
Bracket for Secondary Air Injection (AIR) solenoid valve	9
Clamp to exhaust manifold	7
Connection for secondary air injection (air) combi-valves	9
Front heat shield ²⁾	1.5
	6
Heat shield for the left tail lamp assembly ³⁾	
- Bolt	1.5
- Spring nut	2
Left tail lamp assembly heat shield ³⁾	1.5
	2
Left lower heat shield nut	2
Left rear wheel housing liner heat shield ⁴⁾	1.5
	4
	6
Rear heat shield	6
Secondary air hose	9
Secondary air connecting pipe-to-cylinder head	9
Securing strip nut ¹⁾	25

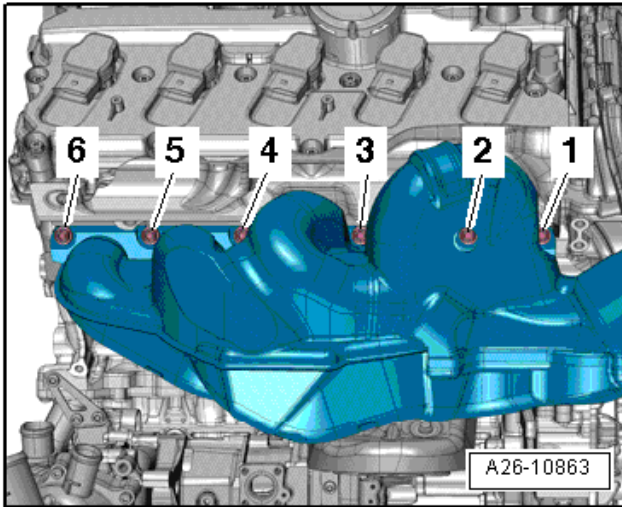
¹⁾ Replace fastener(s).

²⁾ For bolt tightening clarification, refer to ElsaWeb, *Heat Shield Overview*, items 2 and 5.

³⁾ For bolt tightening clarification, refer to ElsaWeb, *Heat Shield Overview*, items 16 and 18.

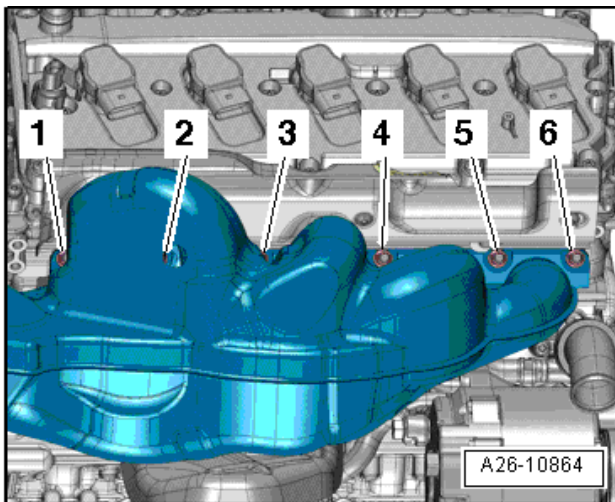
⁴⁾ For bolt tightening clarification, refer to ElsaWeb, *Heat Shield Overview*, items 1, 2, 22 and 23.

Left Exhaust Manifold Tightening Specifications



Step	Component	Nm
1	Tighten nuts 1 through 6 in sequence	Hand-tighten
2	Tighten nuts 1 through 6 in sequence	20
3	Tighten nuts 1 through 6 in sequence	30

Right Exhaust Manifold Tightening Specifications



Step	Component	Nm
1	Tighten nuts 1 through 6 in sequence	Hand-tighten
2	Tighten nuts 1 through 6 in sequence	20
3	Tighten nuts 1 through 6 in sequence	30

Multiport Fuel Injection – 5.2L CTPA, CTYA

Technical Data

Engine Data		5.2L/4V Engine
Idle speed cannot be adjusted. It is regulated by idle stabilization		640 to 840/min
Engine speed limitation via fuel injector shut-off		6500 RPM
Fuel pressure	Fuel supply pressure up to high pressure pump (produced by an electric fuel pump in the fuel tank)	3.0 to 6.0 bar pressure
	Fuel high pressure (produced by a mechanical single-piston pump) at approximately 85 degree coolant temperature	Between 20 and 40 bar pressure at idle to approximately 125 bar pressure at certain operating points

Fastener Tightening Specifications

Component	Nm
Coupe and Spyder	
Air guide ²⁾	
Adapter	4
	8
Air filter housing lower section	8
Air filter housing upper section	8
Heat shield	3
Hose clamps	5.5
Mass Air Flow (MAF) sensor	1.5
Strainer	1.2
GT	
Air filter housing lower section	8
Air filter housing upper section	8
Air guide	3
Heat shield	3
Hose clamps	5.5
Mass Air Flow (MAF) sensor	1.5
Strainer bolt	1.2
All Vehicles	
Bracket	9
Camshaft Position (CMP) sensor 4	10
Cover	5.5
Engine Control Module nut	7
Engine Speed (RPM) sensor	9
Fuel filler tubes	2.5
Fuel pressure sensor	25
High pressure pipe clamp ¹⁾	7 plus an additional 90° (¼ turn)
High pressure pipe-to-fuel rail	25
High pressure pump	22
Intake manifold runner position sensor	2.5
Oxygen Sensor (O2S)	55
Drain plug-to-high pressure pump ^{1) 3)}	15
Threaded connection	40
Throttle valve control module	9
Throttle valve control module 2	9
To vacuum reservoir	5

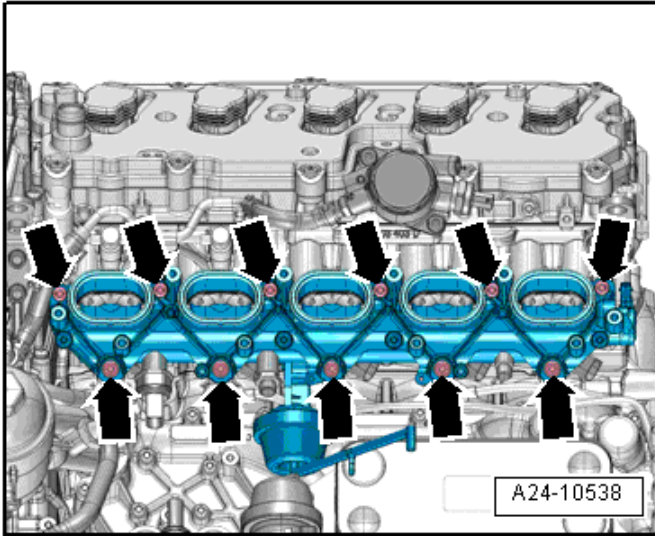
Component	Nm
Fuel supply line union nut ³⁾	25
High pressure line union nut ³⁾	25

¹⁾ Replace fastener(s).

²⁾ For bolt tightening clarification, refer to ElsaWeb, *Air Filter Overview*, items 11, 12 and 17.

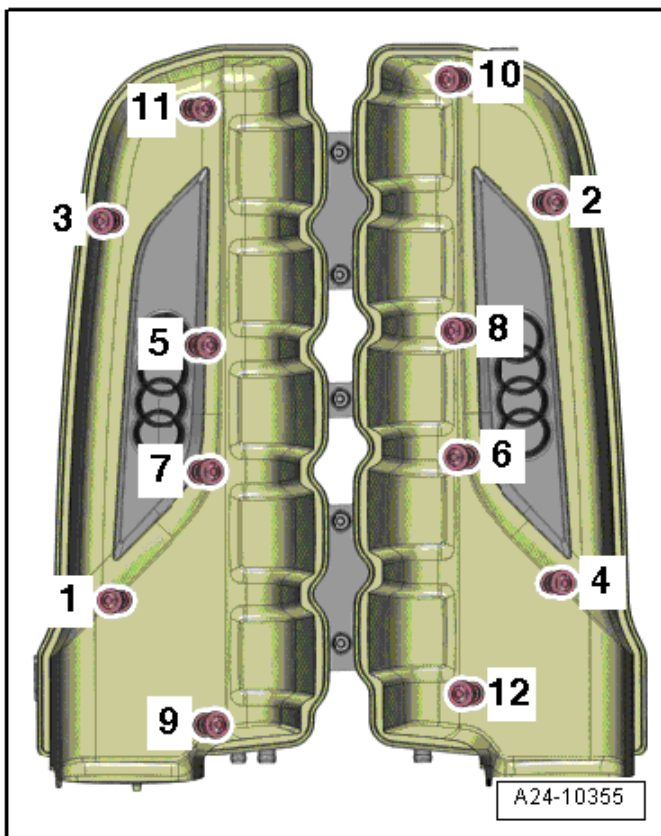
³⁾ Coat the threads with engine oil.

Lower Intake Manifold Tightening Specification



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

Upper Intake Manifold Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 4 in sequence	11
3	Tighten bolts 9 through 12 in sequence	11
4	Tighten bolts 1 through 12 in sequence	11

Ignition – 5.2L CTPA, CTYA

Ignition Technical Data

Engine data		5.2L/4V Engine
Idle speed (not adjustable)		640 to 840/min
Ignition timing		Not adjustable, regulated by the Engine Control Module (ECM)
Ignition/glow plug system		Single coil ignition system with 10 ignition coils (output stages integrated) that are connected directly to spark plugs via the ignition cables.
Spark plugs	Names	Data sheets for exhaust emission test
	Tightening specifications	Refer to the Maintenance Procedures Rep. Gr. 03
Ignition sequence		1-6-5-10-2-7-3-8-4-9

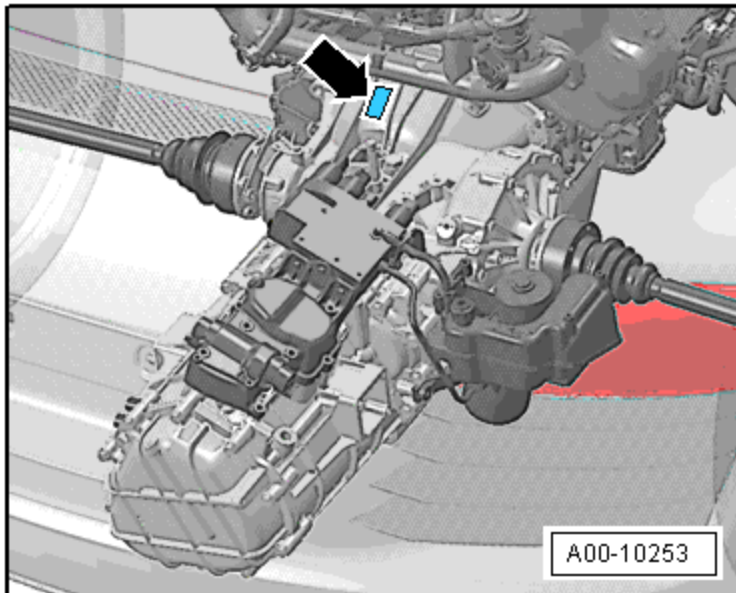
Fastener Tightening Specifications

Component	Nm
Camshaft Position (CMP) sensor	10
Ignition coil electrical wiring-to-cylinder head cover	5
Knock Sensor (KS)	20
Spark plugs	30

MANUAL/AUTOMATIC TRANSMISSION – 086 (R TRONIC)

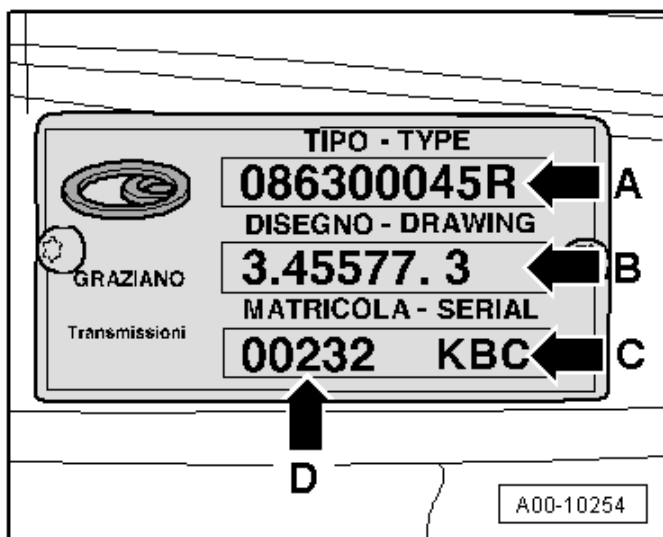
General, Technical Data – 086

Transmission Identification



The transmission data is on the top of the transmission (➔) on the type plate.

Transmission Identification



Manual/Auto Trans. -
086 (R tronic)

A - 086300045R = Basic transmission part number

B - 3.45577.3 = Transmission manufacturer
production-based serial number

C - KBC = Transmission code

D - 00232 = Manufacturer serial number

NOTE: The transmission code letters are also included on the vehicle data label. If the transmission code is not on the type plate, then allocate the transmission using the Electronic Parts Catalog (ETKA).

Code Letters, Transmission Allocations, Ratios and Equipment

6-Speed Manual Transmission

6-Speed manual transmission		086 AWD		
Transmission	Identification codes	KBA	KLA	KVJ
Allocation	Type	Audi R8 from MY 2007	Audi R8 from MY 2007	Audi R8 from MY 2007
	Engine	8-cylinder FSI 4.2L 4V	10-cylinder FSI 5.2L 4V	10-cylinder FSI 5.2L 4V

Manual/Automatic Transmission (R-Tronic)

Manual/Automatic Transmission (R tronic)		086 AWD		
Transmission	Identification codes	KBC	KLB KVK LFS LJM MAZ	LFR MBB
Allocation	Type	Audi R8 from MY 2007	Audi R8 from MY 2007	Audi R8 from MY 2007
	Engine	8-cylinder FSI 4.2L 4V	10-cylinder FSI 5.2L 4V	8-cylinder FSI 4.2L 4V
Note		Transmission without gold contact on the gear recognition sensors (G604, G616)		

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

- Axle and gear ratios
- Clutch allocation
- Front final drive allocation

Clutch – 086

Fastener Tightening Specifications

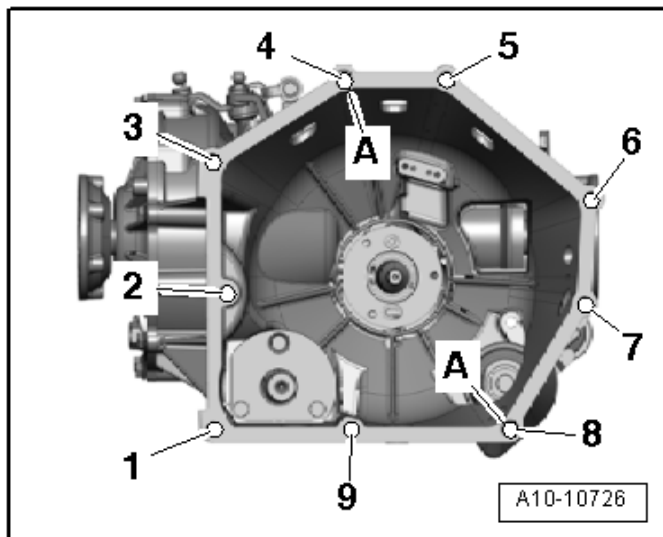
Component	Nm
Bracket bolt	18
Clutch position sensor (G476) bracket	6
Clutch pedal mounting bracket nut ^{1) 2)}	20
	22
Clutch position sensor	6
Clutch slave cylinder with release bearing	10
Hose/line assembly-to-slave cylinder banjo bolt	25
Socket bolt	30
Ring gear ¹⁾	8 plus an additional 180° (½ turn)
Vent bolt	20

¹⁾ Replace fastener(s).

²⁾ For bolt tightening clarification, refer to ElsaWeb, *Clutch Mechanism Overview*, items 10 and 15.

Controls, Housing – 086

Securing Transmission to Engine



Item	Fastener	Nm
1, 2, 7, 8	M10	45
3 to 6	M10	65
9	M10 x 175	45
A	Alignment sleeves for centering	

Fastener Tightening Specifications

Component	Fastener size	Nm
Back-up lamp switch	-	20
Bearing housing	-	30
Hex socket bolt	-	24
Bearing housing grooved nut ⁴⁾	-	100
Center console bracket	-	10
Cover bracket	-	22
R tronic shift actuator bracket on the transmission		
- Upper bolts	-	10
- Lower bolt	-	18
Transmission hydraulic pump (V387) bracket		24
Cable mounting bracket	-	20
Clamp nut	-	5
Clutch actuator valve (N255)	-	3.6
Clutch housing grooved nut ⁴⁾	-	100
Hydraulic oil reservoir cover	-	1.3

Component	Fastener size	Nm
Selector lever transmission range display (Y5) cover		3
Drain plug ³⁾	-	8
End cover	-	35
Front air duct	-	10
Front transmission oil line	-	10
Front transmission oil line bracket	-	20
Front transmission oil line-to-thermostat	-	20
Front transmission oil line-to-transmission oil cooler		25
Gear selection valve 1 (N284)	-	3.6
Gear selection valve 2 (N285)	-	3.6
Gear selection valve 3 (N286)	-	3.6
Gear recognition sensor (G604)	-	3.6
Gear recognition sensor 2 (G616)	-	3.6
Heat shield	-	10
Hydraulic oil reservoir	-	10
Hydraulic pressure line		
- Bolt	-	10
- Union nut	-	24
- Banjo bolt	-	25
Hydraulic pressure sensor (G270)	-	15
Left transmission support		
- Bolt	-	20
- Nut	-	80
Locking plate	-	10
Mechanical hydraulic pump	-	5.5
Mount ⁴⁾	-	15
Selector housing mounting plate	-	20
Oil check plug (only on new transmission versions)	-	50
Oil drain plug	-	50
Oil fill plug	-	50
Pressure reservoir	-	55
R tronic shift actuator	M6	10
	M8	24
Rear transmission oil line (banjo bolt)	-	25
Rear transmission oil line nut	-	10
Retaining clamp		
- Nut	-	8
- Bolt	-	8
Reverse gear wheel nut ¹⁾	-	100
Right transmission support		
- Bolt	-	20
- Upper nut	-	25
- Lower nut	-	80

Fastener Tightening Specifications (cont'd)

Component	Fastener size	Nm
Roller bearing nut ¹⁾	-	160
Securing plate	-	25
Selector gear for reverse gear, nut ¹⁾	-	100
Selector relay lever	-	30
5th and 6th gears shift fork ⁴⁾	-	15
Selector lever handle to the selector lever	-	8
Selector lever sensor system control module (J587)	-	3
Shift housing nut	-	55
Shift lever guide	-	5
Shift mechanism housing	-	18
Shift relay lever	-	30
Shift unit	-	10
Thermostat bracket	-	20
Transmission Control Module (TCM)-to-bracket		9
Transmission housing	-	30
Transmission hydraulic pump (V387)	-	10
Transmission Input Speed (RPM) sensor (G182) ²⁾	-	9
Transmission mounts	-	40
Transmission oil cooler ³⁾	-	10
	-	20
Upper section of the housing	-	3

¹⁾ Replace fastener(s).

²⁾ For bolt tightening clarification, refer to ElsaWeb, *Transmission Fluid Cooler Overview*, items 2, 3, 6 and 8.

³⁾ Install with sealing compound AMV 188 001 02.

⁴⁾ Secure with locking fluid D 197 300 A2.

Rear Final Drive, Differential

Fastener Tightening Specifications

Components	Fastener size	Nm
Driveshaft bracket	-	20
Driveshaft flange nut	-	170
Driveshaft motor nut ¹⁾	-	170
Exhaust manifold with catalytic converter bracket	-	10
Exhaust manifold with catalytic converter bracket (left flange shaft)	-	10
Exhaust manifold with catalytic converter bracket (right flange shaft)	M6	10
	M8	25
Final drive cover	-	35
Flange shaft ⁴⁾	-	25
Oil filler plug	-	30
Front crossmember		
To front final drive	-	55
	-	95
Gear carrier ³⁾	-	26
	-	30
Left drive axle heat shield	-	20
Right drive axle heat shield	-	20
Lock plate	-	30
Rear crossmember		
Bolt	-	20
Nut	-	40
Transmission driveshaft nut ¹⁾²⁾	-	100

¹⁾ Replace fastener(s).

²⁾ Peen after tightening.

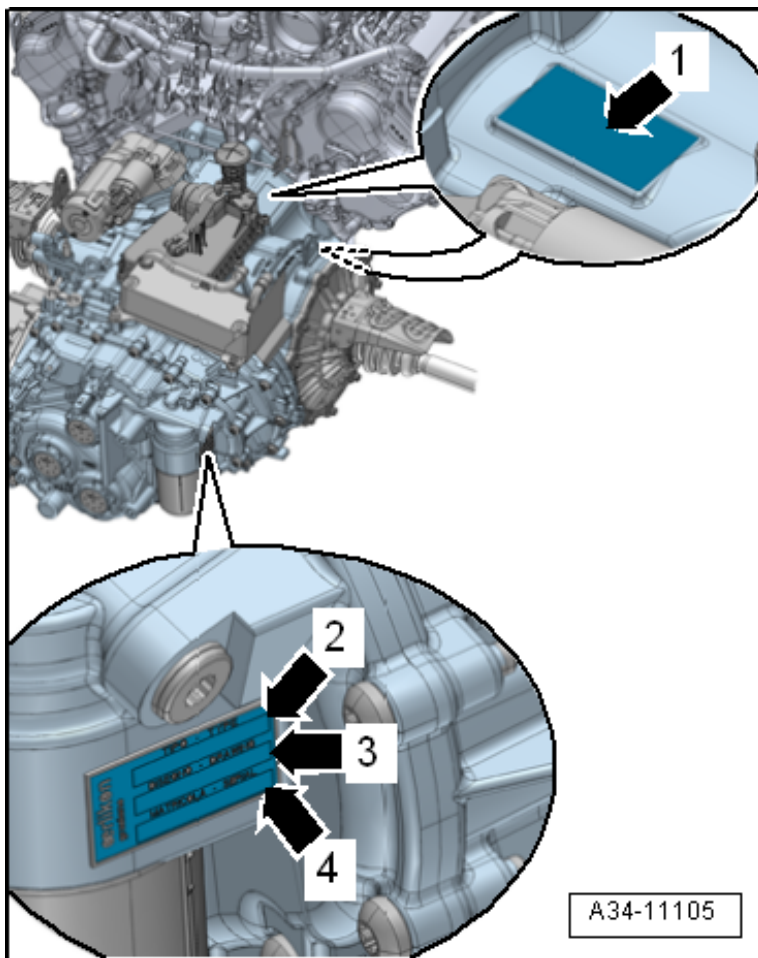
³⁾ For bolt tightening clarification, refer to ElsaWeb, *Transmission Driveshaft Overview*, items 8 and 9.

⁴⁾ Insert with locking fluid AMV 185 101 A1.

MANUAL/AUTOMATIC TRANSMISSION – 0BZA (S TRONIC)

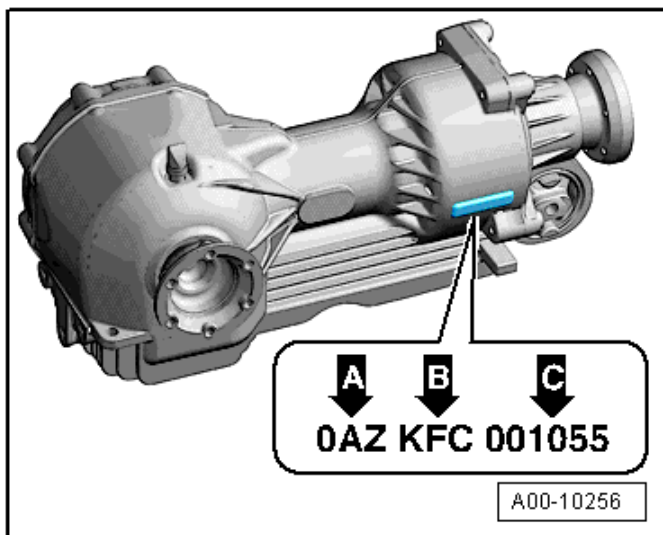
General, Technical Data – 0BZA

Transmission Identification



The transmission characteristics can be found on top of and under the transmission next to the oil pan (➔ 1).

Front Final Drive Identification



Arrow A: 0AZ = transmission type identification

Arrow B: KFC = transmission code

Arrow C: 001055 = serial number

NOTE: The transmission code letters are also included on the vehicle data label. Installed location for the vehicle data label. Refer to the Maintenance Procedures Rep. Gr. 03.

Transmission-Engine Allocation

7-Speed R tronic Transmission

0BZ AWD		
Transmission	Code letters	NXZ
Allocation	Type	Audi R8 from MY 2007
	Engine	4.2L FSI - 316 kW 5.2L FSI - 386 kW 5.2L FSI - 404 kW

Refer to the Parts Catalog for the following information:

- Axle and gear ratios
- Front final drive allocation

Clutch – 0BZA

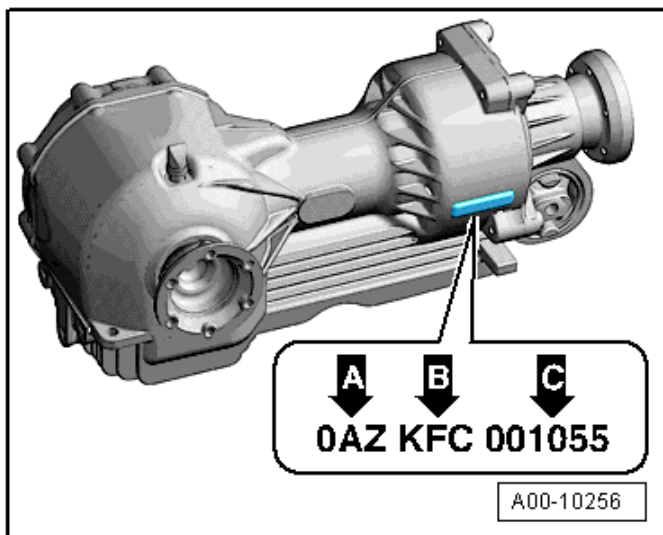
Fastener Tightening Specifications

Component	Nm
Clutch hub-to-transmission housing bolts ¹⁾²⁾	15 plus an additional 60° turn
Mount-to-dual clutch bolt ¹⁾	6 plus an additional 190° (¼ turn)

¹⁾ Replace fastener(s).

²⁾ Tighten in a diagonal sequence.

Clutch Cover Tightening Specifications

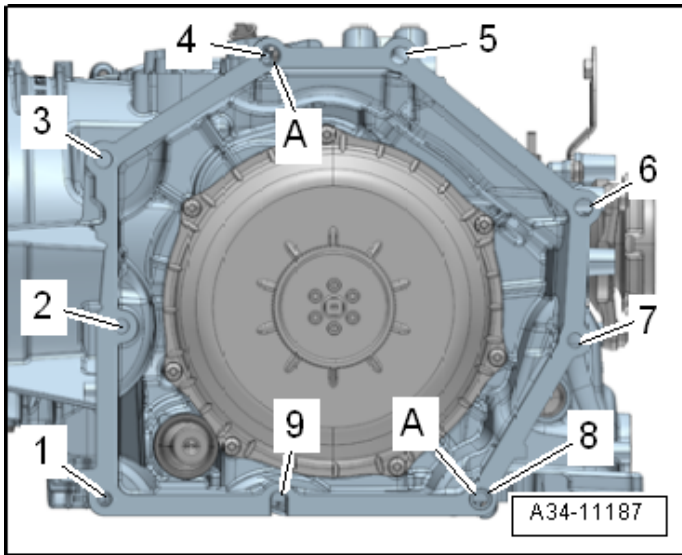


Step	Component	Nm
1	Tighten bolts 1 through 12 in sequence ¹⁾	Hand-tighten
2	Tighten bolts 1 through 12 in sequence	6
3	Tighten bolts 1 through 12 in sequence	an additional 45° (1/8 turn)

¹⁾ Install by hand evenly until the bolt head contact the clutch cover.

Controls, Housing – 0BZA

Securing Transmission to Engine



Item	Fastener	Nm
1, 2, 7, 8	M10 x 60 ¹⁾	45
3 to 6	M12 x 75 ¹⁾	65
9 ²⁾	M10 x 100 ¹⁾	45
A	Alignment sleeves for centering	

¹⁾ Aluminum bolts may be used two times.

²⁾ With anti-twist mechanism.

Fastener Tightening Specifications

Component	Fastener size	Nm
Bolts and nuts		
	M6	9
	M7	15
	M8	20
	M10	40
	M12	65
Anti-Twist mechanism nut	-	10
ATF cooler on the transmission-to-transmission housing ¹⁾	-	10 plus an additional 30° turn
Bracket for the ATF pipe	-	20
Bracket for the electrical wire ¹⁾	-	3 plus an additional 45° (1/8 turn)
Clutch temperature sensor 2 ¹⁾	-	3 plus an additional 45° (1/8 turn)
Crossmember-to-transmission mount	-	60
Drain and check plug in the transmission wheel set	-	32
Engine speed sensor ¹⁾	-	3 plus an additional 45° (1/8 turn)
Filter cover	-	40
Front air duct	-	10
Front ATF pipes-to-ATF cooler		
- Bolt	-	8
- Nut	-	5
Front ATF pipe union nut	-	23
Impact element-to-crossmember	-	40
Oil drain plug for the differential ¹⁾	-	15
Oil drain plug in the oil pan ¹⁾	-	8
Oil drain plug near the gearshift rails	-	15
Oil drain plug near the Mechatronic	-	20
Overflow pipe	-	0.9
Rear ATF pipes ⁴⁾		
- Bolt	-	8
- Bolt	-	20
Rear ATF pipes ³⁾		
- Bolt	-	10
- Bolt	-	20
Selector lever handle attached-to-selector lever	-	8

Fastener Tightening Specifications (cont'd)

Component	Fastener size	Nm
Selector lever transmission range display cover	-	3
Shift mechanism housing	-	18
Transmission input speed sensor/clutch oil temperature sensor 1 ¹⁾	-	3 plus an additional 45° (1/8 turn)
Transmission mount-to-transmission support	-	20
Transmission support 2)		
- Bolt	-	20
- Bolt	-	40
- Nut	-	40

¹⁾ Replace fastener(s).

²⁾ For bolt tightening clarification, refer to ElsaWeb, *Assembly Mounts Overview*" items 10 and 11.

³⁾ For bolt tightening clarification, refer to ElsaWeb, *ATF Circuit Overview*" items 2, 3 and 8.

⁴⁾ For bolt tightening clarification, refer to ElsaWeb, *ATF Circuit Overview*" items 6 and 7.

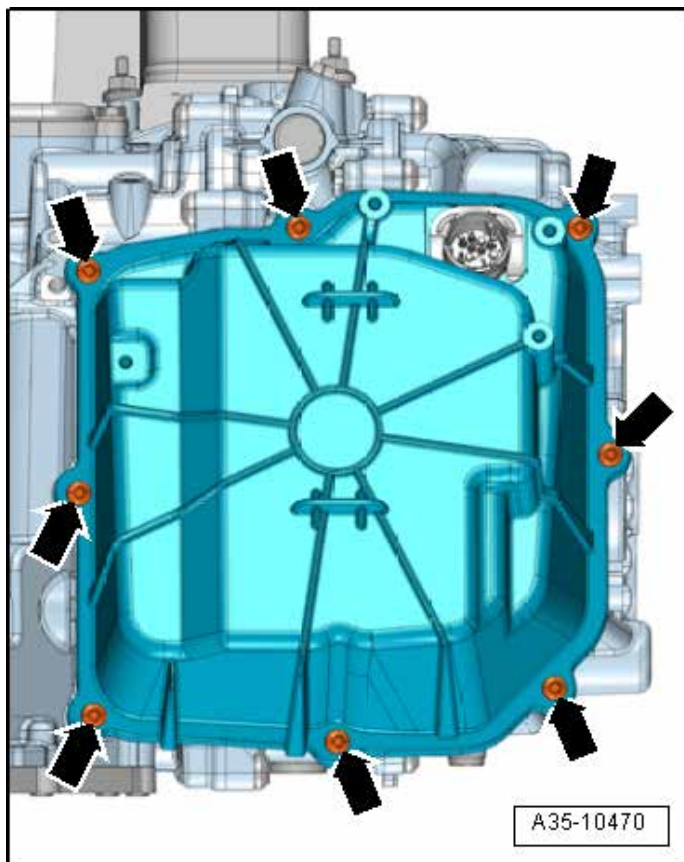
Gears, Shafts– 0BZA

Fastener Tightening Specifications

Component	Fastener size	Nm
Bracket for the oil pipes to auxilliary hydraulics ¹⁾	-	15 plus an additional 90° (1/4 turn)
Coupling rod nut	-	8
Coupling rod transmission housing nut	-	8
Connector housing-to-auxilliary hydraulics ¹⁾	-	3 plus an additional 45° (1/8 turn)
Emergency operation bolt	-	3
Lever for the parking lock nut	-	10
Oil drain plug	-	8

¹⁾ Replace fastener(s).

Mechatronic Cover Tightening Specification

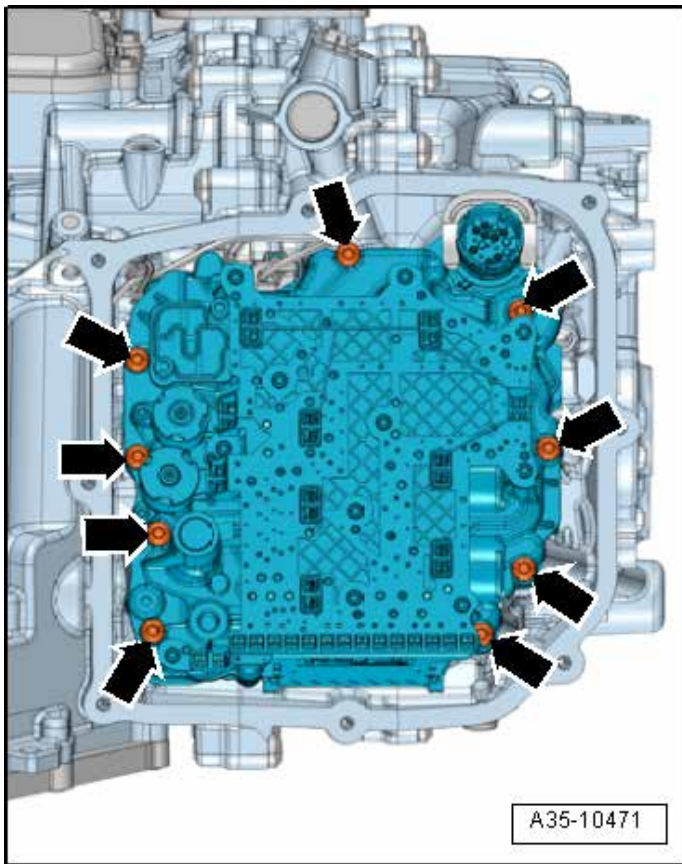


Manual/Auto Trans. –
0BZA (S tronic)

Steps	Component	Nm
1	(➡) ¹⁾	Hand-tighten
2	(➡) ¹⁾	3
3	(➡) ¹⁾	an additional 60° turn

¹⁾ Tighten diagonally.

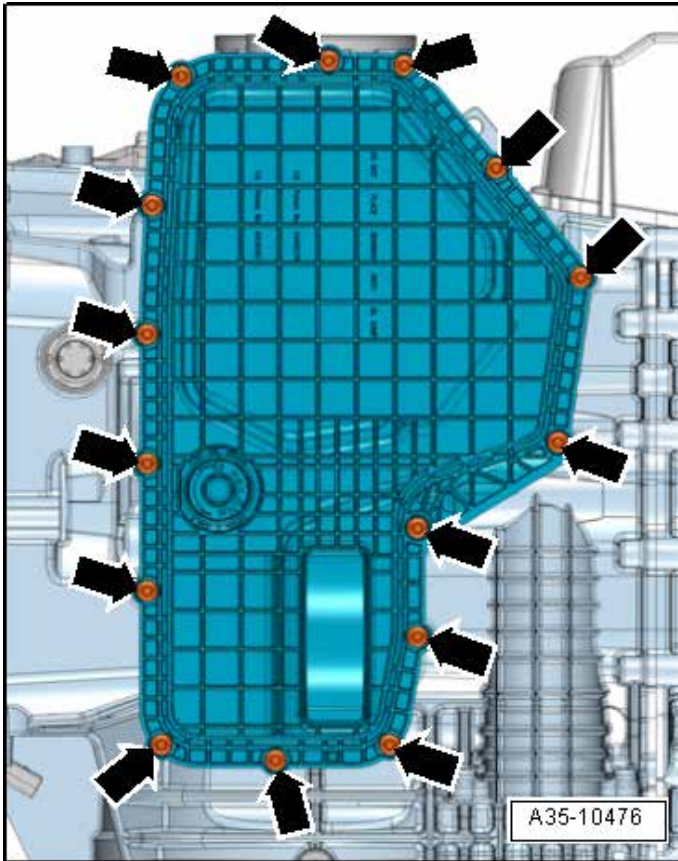
DSG Transmission Mechatronic Tightening Specification



Steps	Component	Nm
1	(➡) ¹⁾	Hand-tighten
2	(➡) ¹⁾	8
3	(➡) ¹⁾	an additional 45° (1/8 turn)

¹⁾ Tighten diagonally. DSG Transmission Mechatronic Tightening Specification

Oil Pan Tightening Specification

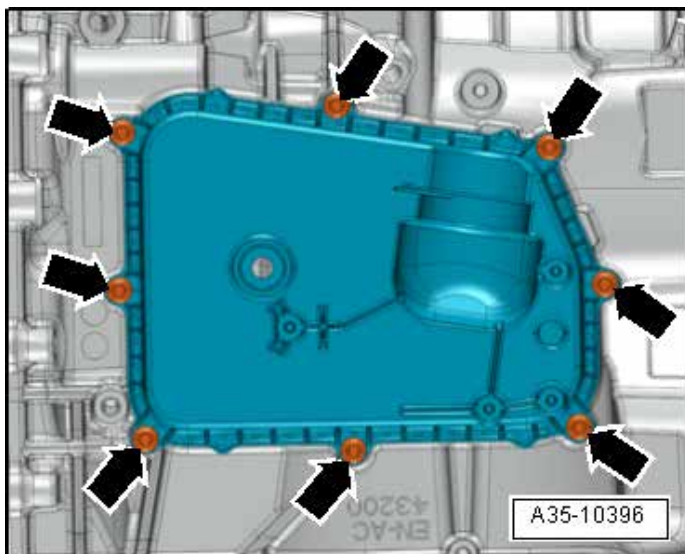


Manual/Auto Trans. –
0BZA (S tronic)

Steps	Component	Nm
1	(➡) ¹⁾	Hand-tighten
2	(➡) ¹⁾	8
3	(➡) ¹⁾	an additional 60° turn

¹⁾ Tighten diagonally.

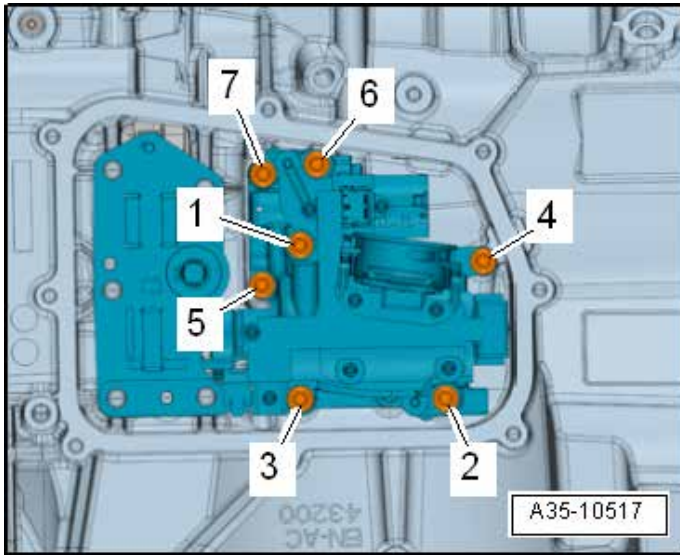
Parking Lock Cover Tightening Specification



Steps	Component	Nm
1	(➡) ¹⁾	Hand-tighten
2	(➡) ¹⁾	3
3	(➡) ¹⁾	an additional 45° (1/8 turn)

¹⁾ Tighten diagonally.

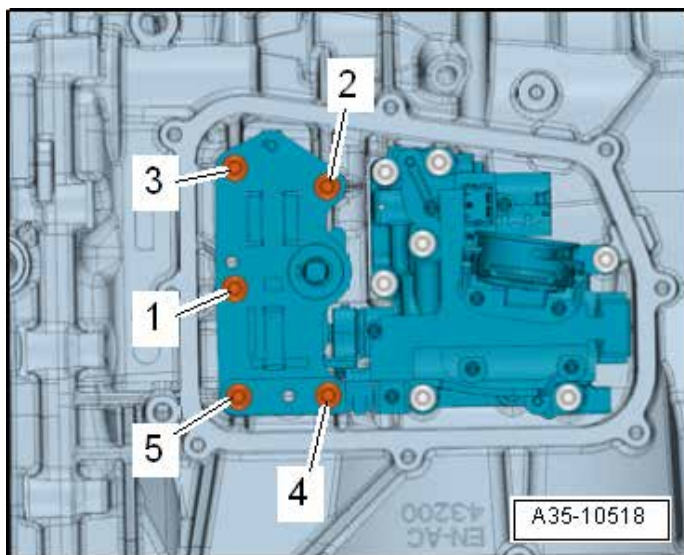
Tighten the Bolts on the Electrical/Hydraulic Parking Lock Component in the Sequence Shown:



Steps	Component	Nm
1	1 through 7	3
2	1 through 7	an additional 45° (1/8 turn)

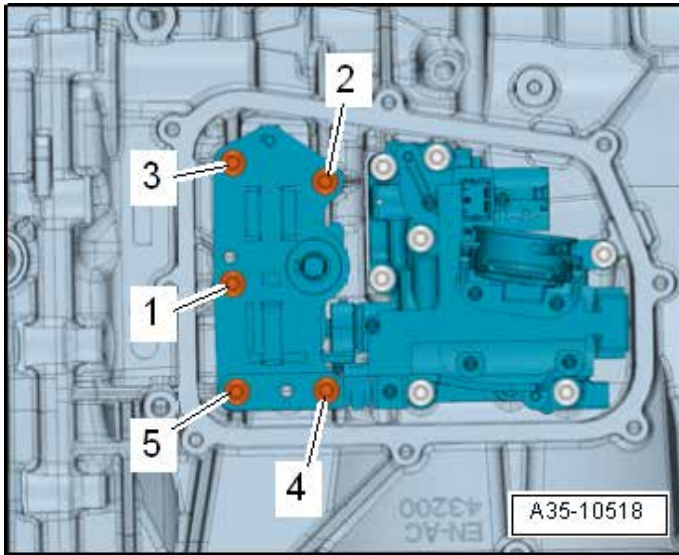
**Manual/Auto Trans. –
0BZA (S tronic)**

Tighten the Bolts on the Electrical/Hydraulic Parking Lock Component in the Sequence Shown:



Steps	Component	Nm
3	1 to 3	15
4	1 to 3	an additional 60° turn

Tighten the Bolts on the Electrical/Hydraulic Parking Lock Component in the Sequence Shown:



Steps	Component	Nm
1	4 and 5	15
2	4 and 5	an additional 60° turn

**Manual/Auto Trans. –
0BZA (S tronic)**

Rear Final Drive, Differential

Fastener Tightening Specifications

Components	Fastener size	Nm
Bracket for driveshaft bolt	-	20
Driveshaft flange bolt to front final drive nut ¹⁾	-	170
Driveshaft motor to engine nut ¹⁾	-	170
Final drive cover to transmission bolt	-	65
Flange to transmission bolt ¹⁾	-	8 + 90°
Flange shaft bolt ²⁾	-	25
Front crossmember ³⁾	-	55
	-	95
Heat shield for drive axle	-	23
Lock plate to driveshaft	-	30
Rear crossmember to front final drive ⁴⁾		
- Bolt	-	20
- Nut	-	40
Transmission fluid filler plug	-	30

¹⁾ Replace fastener(s).

²⁾ Insert with locking fluid AMV 185 101 A1

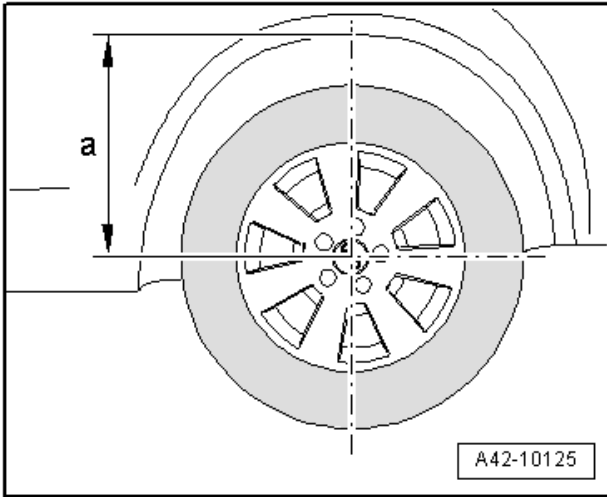
³⁾ For bolt tightening clarification, refer to ElsaWeb, *Front Final Drive Overview* items 1 and 2.

⁴⁾ For bolt tightening clarification, refer to ElsaWeb, *Front Final Drive Overview* items 6, 7 and 8..

SUSPENSION, WHEELS, STEERING

Front Suspension – General, Technical Data

Wheel Bearing, Lifting to Curb Weight Position



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

Chassis

AWD		
Front suspension		Double wishbone axle with tubular stabilizer
Rear suspension		Double wishbone axle with tubular stabilizer
Wheelbase	mm	2650
Front track ¹⁾	mm	1633
Rear track ²⁾	mm	1595

¹⁾ Front track width only applicable with 235/40/R18 tires on 8.5Jx18 ET42 rims.

²⁾ Rear track width only applicable with 285/35/R18 tires on 10.5Jx18 ET50 rims.

Steering

AWD	
Steering gear	Servo assisted, maintenance-free rack-and-pinion steering
Maximum steering lock angle on inside wheel	36° 24'
Turning diameter	Approximately 11.50 meters

Front Suspension

Fastener Tightening Specifications

Component	Nm
Brake cooling air guide-to-lower transverse link bolt	8
Coupling rod-to-lower transverse link bolt ³⁾	60
Coupling rod-to-stabilizer bar bolt ³⁾	60
Constant Velocity (CV) joint clamp	20
Drive axle-to-transmission bolt	40
Drive axle-to-wheel hub bolt ¹⁾	200 plus an additional 180° (½ turn)
Level control system sensor bolt	8
Level control system sensor ball pins-to-lower transverse link	8
Lower transverse link retaining bracket bolt	30
Lower transverse link-to-retaining bracket nut ¹⁾²⁾	110
Lower transverse link-to-wheel bearing housing nut ¹⁾	110
Stabilizer bar-to-subframe bolt	30
Suspension strut-to-body nut ¹⁾	110
Suspension strut-to-upper control arm nut ¹⁾³⁾	110
Tie rod end-to-wheel bearing housing nut ¹⁾	110
Upper control arm retaining bracket bolt	30
Upper control arm-to-retaining bracket nut ¹⁾²⁾	110
Upper control arm-to-wheel bearing housing nut ¹⁾	110
Wheel hub-to-wheel bearing housing bolt ¹⁾	80 plus an additional 90° (¼ turn)

¹⁾ Replace fastener(s).

²⁾ Pre-tighten with 8 Nm and tighten with final tightening torque in curb weight position.

³⁾ Must be tightened in the curb weight position. Refer to ElsaWeb, *Wheel Bearing, Lifting to Curb Weight Position*.

Rear Suspension

Fastener Tightening Specifications

Component	Nm
ABS wheel speed sensor-to-wheel bearing housing bolt	9
Brake cooling air guide-to-lower transverse link nut	6
Brake disc cover plate-to-wheel bearing housing bolt	9
Brake disc-to-wheel hub mounting bolt	9
Coupling rod-to-stabilizer bar bolt ³⁾	60
Constant Velocity (CV) joint boot clamp	25
Drive axle-to-rear final drive bolt ¹⁾	70
Drive axle-to-wheel bearing unit ¹⁾	
- Bolt (V8 engine)	200 plus an additional 180° (½ turn)
- Nut (V10 engine)	500
Electronically controlled shock absorber connector bolt	0.5
Level control system sensor bolt	8
Lower transverse link retaining bracket bolt	30
Lower transverse link and tie rod-to-retaining bracket nut ^{1) 2) 3)}	120
Lower transverse link-to-wheel bearing housing nut ¹⁾	110
Stabilizer bar-to-body bolt ³⁾	30
Suspension strut-to-body nut ^{1) 3)}	110
Suspension strut and coupling rod-to-wheel bearing housing nut ^{1) 3)}	110
Tie rod-to-wheel bearing housing bolt/nut ¹⁾	110
Upper transverse link retaining bracket bolt	30
Upper transverse link-to-retaining bracket nut ^{1) 2) 3)}	110
Upper transverse link-to-wheel bearing housing nut ¹⁾	110
Wheel bearing unit-to-wheel bearing housing bolt ¹⁾	80 plus an additional 90° (¼ turn)

¹⁾ Replace fastener(s).

²⁾ Pre-tighten with 8 Nm and tighten with final tightening torque in curb weight position.

³⁾ Must be tightened in the curb weight position. Refer to ElsaWeb, *Wheel Bearing, Lifting to Curb Weight Position*.

Wheels, Tires, Wheel Alignment

Fastener Tightening Specifications

Component	Nm
Metal valve body-to-rim union nut	6
Tire pressure monitoring sensor micro-encapsulated bolt ¹⁾	4

Vehicle Alignment Specified Values, All Wheel Drive

These target values are valid for the coupe
and Spyder with a V8 gasoline engine

Front Suspension	Standard suspension (1BA)	Sport suspension Audi Magnetic Ride (AMR) (1BL)
Toe per wheel (adjustment value)	10' ± 2'	10' ± 2'
Toe per wheel (control value)	10' ± 4'	10' ± 4'
Camber	-60' ± 10'	-60' ± 10'
Maximum permissible difference between both sides	20'	20'
Toe differential angle at 20° steering angle ¹⁾	56' ± 10'	56' ± 10'
Maximum steering angle at inner wheel	36° 24'	36° 24'

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

Rear Suspension	Standard suspension (1BA)	Sport suspension Audi Magnetic Ride (AMR) (1BL)
Toe per wheel (adjustment value)	10' ± 3'	10' ± 3'
Toe per wheel (control value)	10' ± 5'	10' ± 5'
Camber	-60' ± 15'	-60' ± 15'
Maximum permissible difference between both sides	30'	30'

Rear Suspension	Standard suspension (1BA)	Sport suspension Audi Magnetic Ride (AMR) (1BL)
Maximum permissible deviation from direction of rotation	10'	10'

These target values are valid for the coupe and Spyder with a V10 gasoline engine

Front Suspension	Standard suspension (1BE)	Sport suspension Audi Magnetic Ride (AMR) (2MN)
Toe per wheel (adjustment value)	10' ± 2'	10' ± 2'
Toe per wheel (control value)	10' ± 4'	10' ± 4'
Camber	-60' ± 10'	-60' ± 10'
Maximum permissible difference between both sides	20'	20'
Toe differential angle at 20° steering angle ¹⁾	56' ± 10'	56' ± 10'
Maximum steering angle at inner wheel	36° 24'	36° 24'

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

Rear Suspension	Standard suspension (1BE)	Sport suspension Audi Magnetic Ride (AMR) (2MN)
Toe per wheel (adjustment value)	10' ± 3'	10' ± 3'
Toe per wheel (control value)	10' ± 5'	10' ± 5'
Camber	-60' ± 15'	-60' ± 15'
Maximum permissible difference between both sides	30'	30'
Maximum permissible deviation from direction of rotation	10'	10'

**Suspension,
Wheels, Steering**

Steering

Fastener Tightening Specifications

Component	Nm
Air duct mounting bolt	2.5
Hydraulic oil cooler mounting bolt	8
Knee airbag mount-to-steering column bolt	23
Knee airbag mount-to-steering column mounting bracket bolt	23
Line clamp mounting bolts	8
Line union nut	40
Power steering pump pressurized line banjo bolt ¹⁾	50
Steering gear pressurized line banjo bolt ¹⁾	35
Reservoir mounting bolt	8
Return line-to-steering gear banjo bolt ¹⁾	47
Centering steering screw plug	22
Steering column adjusting handle bolt	3
Steering column mounting bolt	23
Steering column cover bolt	8
Steering column-to-steering gear bolt	33
Steering gear mounting bolt ¹⁾	47
Steering wheel-to-steering column bolt ¹⁾	50
Steering column support bolt	9
Steering column mounting bracket support bolt	23
Tie rod end-to-tie rod lock nut	50
Tie rod-to-steering gear	100

¹⁾ Replace fastener(s).

BRAKE SYSTEM

General, Technical Data

Front Wheel Brakes – Technical Data

Front wheel brake		
Brake disc ventilated	diameter in mm	365
Brake disc thickness	mm	34
Brake disc wear limit	mm	32.4
8-piston brake caliper, Brembo	diameter in mm	32/28
Brake pad thickness with backing plate and dampening sheet	mm	17
Brake pad wear limit with backing plate and dampening sheet	mm	9.6
Backing plate	mm	5.0
Dampening sheet	mm	1.6

Ceramic – front brakes C/SiC		
Brake caliper		Brembo M6 Al
Production Relevant No. (PR. No.)		1LW
Brake disc ventilated	diameter in mm	380
Brake disc thickness	mm	38
Brake disc wear limit		The wear value is the minimum brake disc thickness and the new weight of the brake disc. It is stamped into the brake disc cup.
Brake caliper, 6 piston monoblock	diameter in mm	2 x 32/36/38
Minimum pad thickness with backing plate and dampening sheet	mm	9.5

Rear Wheel Brakes – Technical Data

Rear wheel brake		
Brake disc ventilated	diameter in mm	356
Brake disc thickness	mm	32
Brake disc wear limit	mm	30.4
4-piston brake caliper, Brembo	diameter in mm	42/38
Brake pad thickness with backing plate and dampening sheet	mm	18.2
Brake pad, wear limit with backing plate and dampening sheet	mm	8.8
Backing plate	mm	5.0
Dampening sheet	mm	0.8

Ceramic - rear brakes		
Brake caliper		TRW CII45 HE - DK
Production Relevant No. (PR. No.)		1KU
Brake disc ventilated	diameter in mm	356
Brake disc thickness	mm	28
Brake disc wear limit		The wear value is the minimum brake disc thickness and the new weight of the brake disc. It is stamped into the brake disc cup.
Brake caliper, 1 piston	diameter in mm	45
Remaining pad strength with backing plate and dampening sheet		9.0

Parking Brake – Technical Data

Parking brake/mechanical		
Brake disc ventilated	diameter in mm	356
Brake disc thickness	mm	32
Brake disc wear limit	mm	30.4
One piston brake caliper, mechanical	diameter in mm	35
Brake pad thickness with backing plate	mm	9.0
Brake pad wear limit with backing plate	mm	5.5
Backing plate	mm	3.5

Anti-lock Brake System (ABS)

Fastener Tightening Specifications

Component	Nm
ABS hydraulic unit-to-bracket nut	8
ABS wheel speed sensor-to-wheel bearing housing bolt	8
Brake lines-to-hydraulic unit (5 mm diameter brake lines)	12
Brake lines-to-hydraulic unit (8 mm diameter brake lines)	16
ESP sensor unit bolt	9

Mechanical Components

Fastener Tightening Specifications

Component	Nm
Brake disc-to-wheel hub bolt	9
Brake pedal mounting bracket-to-bulkhead bolt	15
	25
Brake shield-to-wheel bearing housing bolt	9
Front brake caliper bolt ¹⁾	110
Front brake caliper guide pins bolt (ceramic brakes) ¹⁾	30
Front brake hose bracket-to-front brake caliper	25
Front brake hose bracket-to-cross member support and suspension	9
Front brake hose in front brake caliper	16
Front brake line connection-to-brake hose (ceramic brakes)	12
Front brake pressure line-to-brake hose	16
Parking brake caliper bolt ¹⁾	55
Parking brake lever nut	15
Rear brake caliper bolt ¹⁾	110
Rear brake hose in brake caliper	12
Rear brake hose bracket-to-brake caliper and suspension (ceramic brakes)	9
Rear brake pressure line-to-brake hose	16

¹⁾ Replace fastener(s).

Hydraulic Components

Fastener Tightening Specifications

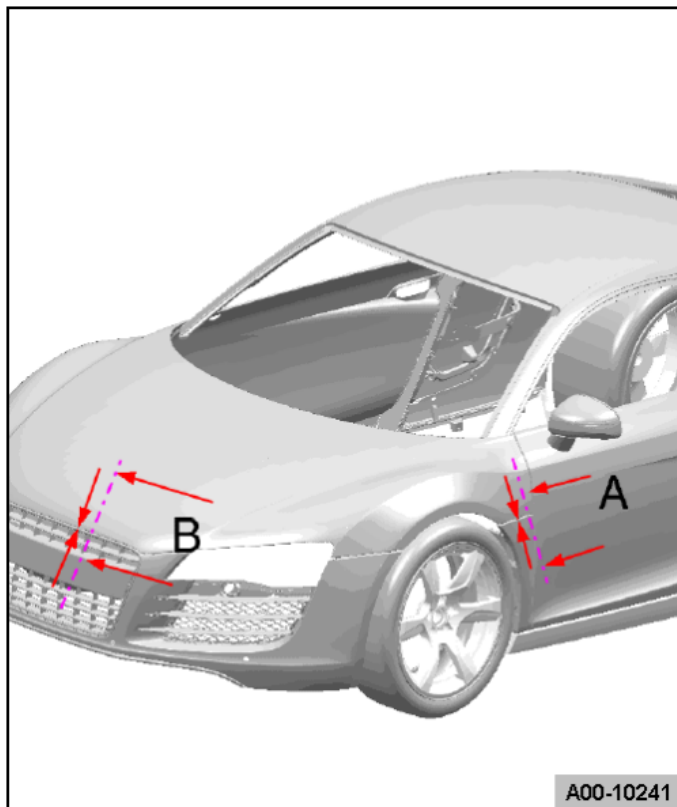
Component	Nm
Brake booster bolts	49
Brake disc-to-wheel hub bolt	9
Brake line-to-brake master cylinder	14
Brake line-to-hydraulic assembly	12
Brake line-to-rear axle	14
Brake shield-to-wheel bearing housing bolt	9
Front brake caliper bolt ¹⁾	110
Front brake caliper guide pins bolt (ceramic brakes) ¹⁾	30
Front brake hose bracket-to-front brake caliper	25
Front brake hose bracket-to-cross member support and suspension	9
Front brake hose in front brake caliper	16
Front brake line connection-to-brake hose (ceramic brakes)	12
Front brake pressure line-to-brake hose	16
Parking brake caliper bolt ¹⁾	55
Parking brake lever nut	15
Rear brake caliper bolt ¹⁾	110
Rear brake hose in brake caliper	12
Rear brake hose bracket-to- brake caliper and suspension (ceramic brakes)	9
Rear brake pressure line-to-brake hose	16

¹⁾ Replace fastener(s).

BODY

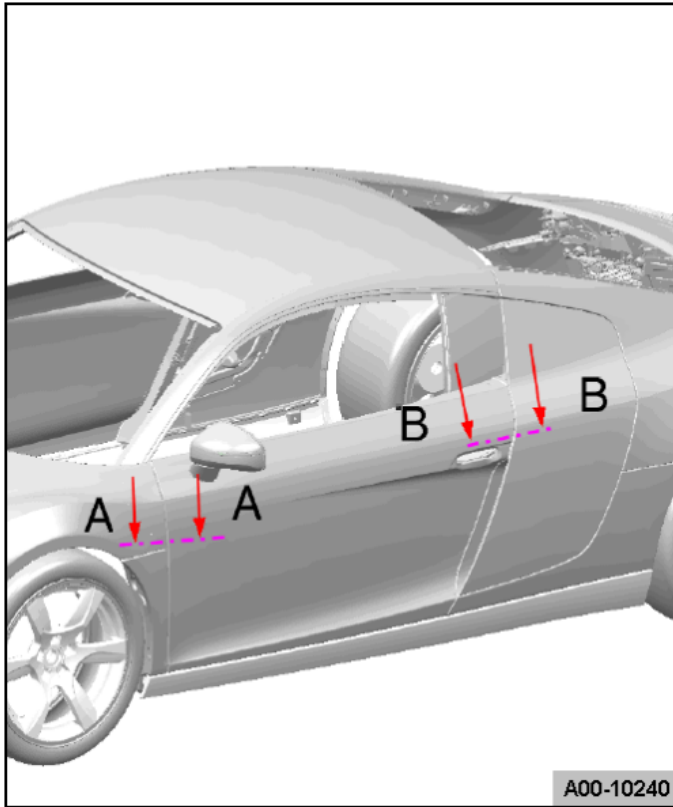
Air Gap Body Dimensions

Front Gap Dimensions



Component	mm
A	3.5 ± 0.5
B	3.5 ± 0.5

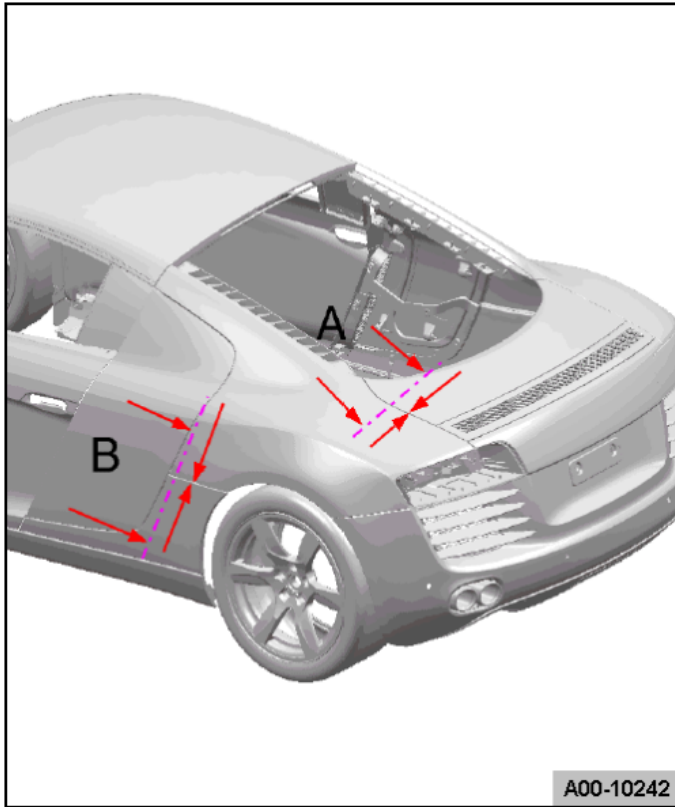
Center Gap Dimensions



Body

Component	mm
A	3.5 ± 0.5
B	4.0 ± 0.5

Rear Gap Dimensions



Component	mm
A	4.5 ± 0.5
B	3.5 ± 0.5

Body Exterior

Lock Carrier Tightening Specifications

Component	Nm
Lock carrier bolts	9
Front lid lock bolts	9
Frame-to-lock carrier bolts	23
Hood lock-to-frame	9

Headlamp, Wheel Housing Liner and Radiator Brackets Tightening Specifications

Component	Nm
Center headlamp bracket bolts	10
Outer radiator bracket and upper wheel housing liner bracket bolts ¹⁾	10
	23

¹⁾ For bolt tightening clarification, refer to ElsaWeb, *Headlamp, Wheel Housing Liner and Radiator Brackets Overview*.

Front Fender Tightening Specifications

Component	Nm
Buffer for hood stop bolt	18
Front fender upper bolts	6
Front fender buffer bolts	8
Front fender lower bolts	10
Front fender end plate bolts	10

Engine Compartment Trim, Lid and Side Panel Cover Tightening Specifications

Component	Nm
B-pillar trim nuts	18
Bracket for the power steering line-to-upper left longitudinal member	8
Cover for side panel ²⁾	5
	7
Bracket for the upper rear side panel	10
Engine compartment trim bolts/nuts	18
Front engine compartment trim in the center	8
Hinge trim nuts	18
Angle bracket bolts	2.5
Hinge bolts	22
Ball head pin	10
Left side engine compartment trim	8
Lower rear side panel bolts	5

Engine Compartment Trim, Lid and Side Panel Cover Tightening Specifications (*cont'd*)

Component	Nm
Mount for the tail lamp bolts	10
Mount for the upper cover	
- Nut	1.2
- Double bolt	1.2
- Bolt	10
Rear crossmember bolts	12
Striker pin	2
Side panel cover bolts	4
	7
	10
Upper left longitudinal member bolts	20
Upper rear side panel bolts	10
Upper right longitudinal member bolts	20

- ¹⁾ For bolt tightening clarification, refer to ElsaWeb, *Lower, Upper and Side panel cover Overview*.
- ²⁾ For bolt tightening clarification, refer to ElsaWeb, *Side Panel Cover and Upper Cover Assembly Overview* items 2, 13, 14 and 15.

Front Lid Tightening Specifications

Component	Nm
Ball head pin	14
Striker pin with catch nut	9
Striker pin bolt	2
Anti-twist mechanism bolt	2
Lid stop nut	8
Buffer bolt	8
Lid hinge bolts	25

Upper Longitudinal Member and Rear Crossmember Tightening Specifications

Component	Nm
Adjusting buffer bolts	7
Longitudinal member bolts	20

Door Tightening Specifications

Component	Nm
Upper door hinge bolts	37
Lower door hinge bolts	37
Door lock bolts	19
Striker pin bolts	25

Component	Nm
Cover bolts	2.5
Cover "I" and "II" for the anti-theft protection	2.2

Front Bumper Tightening Specifications

Component	Nm
Bumper cover bolts	3 to 5
Bumper cover mount bolts	5
Impact member bolts	21
Bumper cover mount bolts	10

Rear Bumper Tightening Specifications

Component	Nm
Rear bumper cover bolts	2.5
Rear bumper cover upper mount bolts	2
Rear bumper cover center bolts	1 to 4
Rear bumper cover side mount bolts	2
Rear bumper lower section bolts	5
Exhaust pipe trim bolts	4
Intake air grill bolts and nuts	5
Rear impact member bolts ¹⁾	6
	8
	9
	21

¹⁾ For bolt tightening clarification, refer to ElsaWeb, *Bumpers, Impact Member Overview*.

Door Door Window and Guide Tightening Specifications

Component	Nm
Left retainer for rear window frame bolts	22.5
Rear window motor bolt	5.5
Window regulator bolts	9
Window guide nuts	4.5
Window guide bolts	8

Rear Spoiler Tightening Specifications

Component	Nm
Rear spoiler bolts	8
Rear spoiler nuts	10
Rear spoiler heat shield bolts	6

Front Wheel Housing Liner Tightening Specification

Component	Nm
Wheel housing liner bolts	1 to 4

Rear View Mirror Tightening Specifications

Component	Nm
Mirror carrier plate bolts	6.5
Mirror adjusting unit bolts	2
Mirror base cover bolts	6.5

Strips and Trim Tightening Specifications

Component	Nm
Sill panel trim bolts	1.5
Retaining strip-to-sill panel bolts	1.5
Heat shield nuts	2
Heat shield bolts	6

Convertible Top Tightening Specifications

Component	Nm
Center air intake grille	2
Convertible top compartment cover	1.4
Convertible top operation control module	3
Convertible top flap bolts	9
Convertible top hinge guide bolts	9
Convertible top main bearing bolts	22.5
Convertible top locks bolt	9
End plates for convertible top bolts	12
Front trim bolt	5.5
Hinge for the convertible top compartment cover bolt	22.5
Hydraulic pump bracket	9
	22.5
Hydraulic fluid reservoir	4
Hydraulic line	6
Mounting bracket for the convertible top compartment cover bolts	22.5
Retaining strip-to-convertible top fins	5.5
Rubber cable for the convertible top headliner bolts	2
	5.5
Seal for water drain	9

Body Interior

Storage Compartment and Armrest Tightening Specifications

Component	Nm
Center console bolts and nuts	1 to 4.5
Center console mounting bracket bolts	3
Driver side footwell cover	2.5
Driver side instrument panel cover	3
Lower steering column switch trim	2.5
Storage compartment bolts	3
Steering column adjustment handle	3
Steering column trim bolts	2.5

Instrument Panel Tightening Specifications

Component	Nm
Impact absorber bolts ³⁾	3
	8
Central tube bolts and nuts ²⁾	9
	21
	23
Instrument panel bolts/nuts ¹⁾	.3
	.5
	.7
	2
	3
	5

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

²⁾ For bolt tightening clarification, refer to ElsaWeb, *Central Tube Assembly Overview*.

³⁾ For bolt tightening clarification, refer to ElsaWeb, *Impact Absorber Component Overview*.

Passenger Protection Tightening Specifications

Component	Nm
Belt guide ring	55
Three-point seat belt	55
Belt anchor bolts	55
Seat frame bolts ¹⁾	55
Belt latch bolts	34
Belt latch bolts (racing seat)	40
Four-point seat belt anchor bolt	40
Four-point seat belt anchor nut	55
Four-point seat belt eye bolt	55
Belt guide ring mount bolts	23
Bottom seat belt guide bolts	4.5
Automatic belt retractor bolts	55
LATCH child seat anchor seat pan bolts	12
Airbag control module (J234) bolts	9
Battery interrupt igniter (N253) nuts	15
Side airbag bolts	10
Airbag bolts	7
Driver side knee airbag bracket bolts	9
Passenger knee airbag bolts	3
Passenger knee airbag nuts	7
Crash sensor bolts	9

¹⁾ Replace fastener(s).

Interior Trim Tightening Specifications

Component	Nm
Door trim bolts	0.6 to 2.8
Parking brake trim bolts	2.5
Door mirror triangle cover bolts	2
Door trim stop bolt	2.5
Lower A-pillar trim bolts	2
Footrest cover bolts	3.5 to 7
Footrest bracket nut/bolt	3.5
Passenger footrest bolts	8
Passenger footrest nuts	3.5
C-pillar trim ball stud	2.5
Rear shelf ball stud	2.5
Rear shelf storage bracket bolt	3.5
Rear shelf storage ball pin for mount	8
Belt extraction panel bolts	0.7
Side trim bolts	2.5
Sun visor bolts	3.5
Roof frame trim bolts	2.5

Seat Frames Tightening Specifications

Component	Nm
Seat frame bolts	40
Seat trim bolts	2.5
Seat height adjuster bolts	8
Seat bracket and operation lever bolts	3.5
Backrest self-locking screws	36
Seat pan self-locking screws	29
Drawer assembly bolts	3.5
Seat inclination adjustment motor self-locking bolt	14
Seat inclination adjustment motor self-locking screws	22
Backrest frame mount bolt	22
Seat forward/back adjuster bolts	30

HEATING, VENTILATION AND AIR CONDITIONING

General, Technical Data

Refrigerant Oil Distribution

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

Refrigerant R134a Vapor Pressure Table

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

Temperature in °C	Pressure in bar (positive pressure) of R134a
80	25.21
85	28.14
90	31.34

Air Conditioning

Fastener Tightening Specifications

Component	Nm
Air intake unit-to-plenum chamber	9
A/C pressure/temperature sensor	5
Compressor driveshaft	60
Compressor oil drain plug	30
Condenser-to-radiator	5
Coolant pump	8
Drive plate	30
Drive plate with overload protection-to-drive plate	10
High pressure side service connection	22
Pressure relief valve	10
Refrigerant lines-to-compressor	25
Refrigerant lines-to-condenser	9
Refrigerant lines-to-evaporator	9
Evaporator-to-reservoir refrigerant line	9
Refrigerant line in-line connection	9
Refrigerant line threaded connection (on the evaporator) hex head bolt	25
High pressure side service connection refrigerant line retaining clamp	22
Reservoir bracket-to-body	6
Restrictor	15
Service line (V10)	9
Union in refrigerant pipe (with restrictor)	15

ELECTRICAL SYSTEM

Communication Equipment

Communication Tightening Specifications

Component	Nm
Antenna amplifier, rear	8
Antenna amplifier 2	2
Antenna amplifier 3	2
Antenna amplifier 4	8
Center speaker	5
Center mid/high range speaker	1
Front bass speakers	3
Front mid-range speakers	3
Fuse carrier	9
Multifunction buttons	3
Radio, telephone, navigation system antenna	4
Rear mid-bass speakers	6
Rear view camera	2
Rear view camera system control module nuts	9
Satellite radio	6
Seat belt microphone control module	9
Sound system control module	6
Telephone base plate	2

Electrical Equipment

Battery, Starter, Generator, Cruise Control Tightening Specifications

Component	Nm
Battery bracket screw	16
Battery Cut-Out Relay 2 Nut ¹⁾	15
Battery Retainer Nut ¹⁾	9
Generator Mounting Bolt	23
Generator 30/B+ Terminal Nut	15
Generator Coolant Pipe Retaining Plate Screw	9
Ground Wire Nut	6
Positive Battery Cable Terminal Nut	6
Positive Battery Cable Nut ¹⁾	15
Starter B+ Terminal Nut	15
Starter Mounting Bolt (Including Wiring Harness Bracket)	65
Transmission Temperature Limit Switch 2 Nut ¹⁾	5

¹⁾ For GT.

Instruments Tightening Specifications

Component	Nm
12V socket 2 nut	2
Instrument cluster screw	2.5
Radio frequency controlled clock receiver screw	2.5
Signal horn nuts (with bracket)	9

Windshield Wiper/Washer Tightening Specifications

Component	Nm
Headlamp spray nozzle screws	2.5
Windshield wiper motor mounting bolts	8
Windshield wiper motor bolt-to-windshield wiper arm	8
Windshield wiper motor nut-to-windshield wiper arm	17
Washer fluid reservoir ¹⁾	8
	10

¹⁾ For bolt tightening clarification, refer to ElsaWeb, *Washer Fluid Reservoir Tightening Specifications*.

Exterior Lights, Switches Tightening Specifications

Component	Nm
Daytime running lamp and parking lamp LED module screws	2
Exterior mirror housing screw	6.5
Fog light cover grille screws	1.2
Fog light mounting screws	1.2
Headlamp housing screws	4.5
HID headlamp control module screws	2
LED turn signal screw to exterior mirror housing	0.4
Low beam housing cover screws	2
Mirror mount screw to exterior mirror housing	2
Parking aid control module nuts	4.5
Power output stage 1 for LED headlamp screws	2
Power output stage 2 for LED headlamp screws	2
Power output stage 3 for LED headlamp screws	2
Power output stage 4 for LED headlamp screws	2
Steering column electronic systems control module screw	0.4
Tail lamp adjusting element screws	4.5
Tail lamp nut	4.5
Turn signal housing cover screw	2
Rear parking aid warning buzzer screws	1

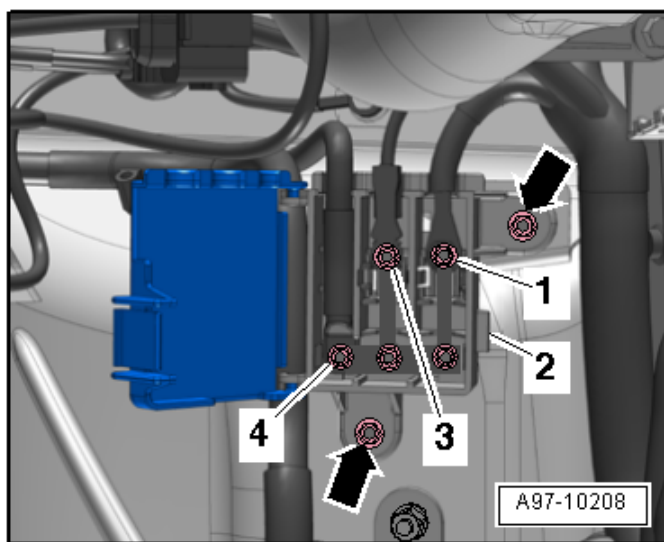
Interior Lights, Switches Tightening Specifications

Component	Nm
Alarm horn nut	9
Garage door opener control module screws	4.5
Frame-to-trim with switch screws	0.5

Wiring Tightening Specifications

Component	Nm
Right central tube connector station nut	4.5
Passenger footwell relay carrier and fuse panel	4.5
Right A-pillar fuse panel nut	4.5
Right A-pillar main fuse box nut	4.5
Right rear connector station nut	4.5
Right rear fuse panel base plate screws	4.5
Right rear relay carrier screws	4.5
Vehicle positioning system interface control module nut	4.5

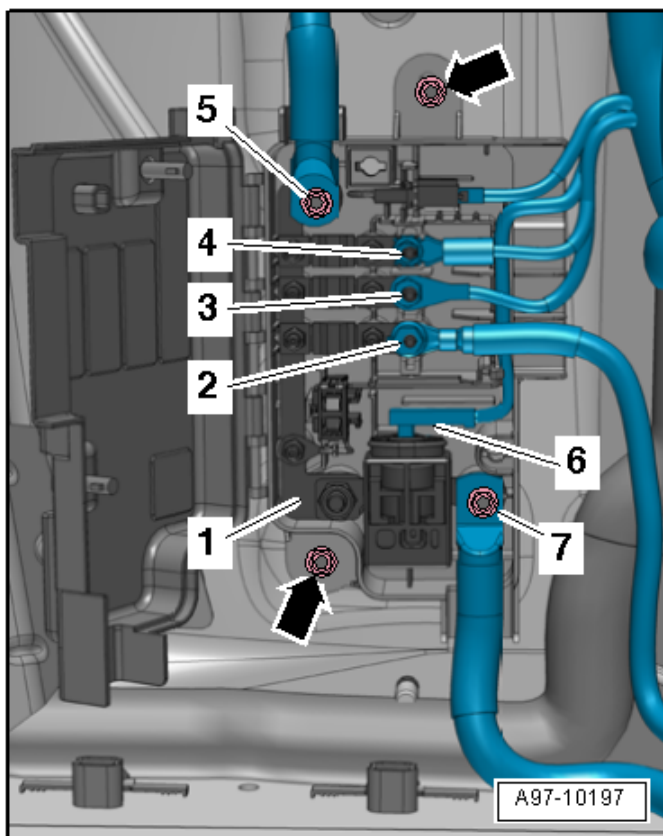
Right A-Pillar Fuse Panel Tightening Specifications



Item	Component	Nm
1	Nut	7.5
2	Right A-pillar fuse panel	-
3	Nut	7.5
4	Engine compartment battery wire nut	15

NOTE: Disregard the ➡.

Right A-Pillar Main Fuse Box Tightening Specifications

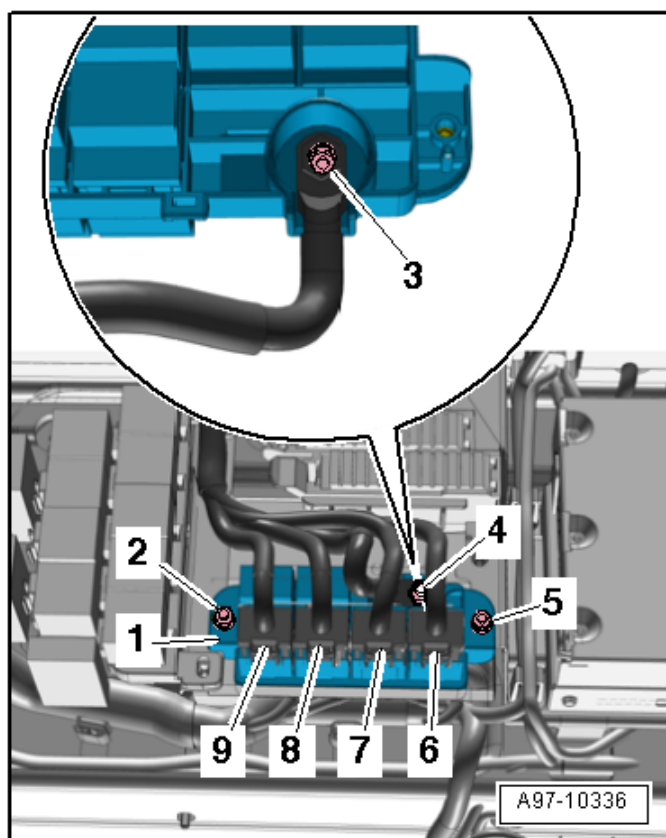


Electrical Equip./
Communication

Item	Component	Nm
1	Right A-pillar main fuse box	-
2	Nut	9
3	Nut	9
4	Nut	9
5	Nut	15
7	Interior battery wire nut	15

NOTE: Disregard the ➡.

Right Rear Connector Station Tightening Specifications



Item	Component	Nm
1	Right rear connector station	-
2	Lower positive wire nut	9
3	Upper positive wire nut	9

NOTE: Disregard the other items.

DTC CHART

Engine Code - CTPA, CTYA

Fuel and Air Mixture, Additional Emissions Regulations

DTC	Error Message	Malfunction Criteria and Threshold Value
P000A	Intake Camshaft Adjustment Valve 1 Response Check	Adjustment angle difference < 6 °CA/s
P000B	Exhaust Camshaft Adjustment Valve 1 Response Check	Adjustment angle difference < 6 °CA/s
P000C	Intake Camshaft Adjustment Valve 2 Response Check	Adjustment angle difference < 6 °CA/s
P000D	Exhaust Camshaft Adjustment Valve 2 Response Check	Adjustment angle difference < 6 °CA/s
P0010	Intake Camshaft Adjustment Valve 1 Circuit Open	Signal voltage 4.4-5.6 V
P0011	Intake Camshaft Adjustment Valve 1 Stuck Check	Adjustment angle difference > 10 °CA
P0013	Exhaust Camshaft Adjustment Valve 1 Circuit Open	Signal voltage 4.4 - 5.6 V
P0014	Exhaust Camshaft Adjustment Valve 1 Stuck Check	Adjustment angle difference > 10 °CA
P0016	Intake Camshaft Adjustment Valve 1 Crankshaft Position -Camshaft Position Correlation	<ul style="list-style-type: none"> • Adaptive value at limit > 11° CA or • Adaptive value at limit < -11° CA
P0017	Exhaust Camshaft Adjustment Valve 1 Crankshaft Position - Camshaft Position Correlation	<ul style="list-style-type: none"> • Adaptive value at limit > 11° CA or • Adaptive value at limit < -11° CA
P0018	Intake Camshaft Adjustment Valve 2 Crankshaft Position - Camshaft Position Correlation	<ul style="list-style-type: none"> • Adaptive value at limit > 11° CA or • Adaptive value at limit < -11° CA

DTC	Error Message	Malfunction Criteria and Threshold Value
P0019	Exhaust Camshaft Adjustment Valve 2 Crankshaft Position - Camshaft Position Correlation	<ul style="list-style-type: none"> • Adaptive value at limit > 11° CA or • Adaptive value at limit < -11° CA
P0020	Intake Camshaft Adjustment Valve 2 Circuit Open	Signal voltage 4.4 - 5.6 V
P0021	Intake Camshaft Adjustment Valve 2 Stuck Check	Adjustment angle difference > 10 °CA
P0023	Exhaust Camshaft Adjustment Valve 2 Circuit Open	Signal voltage 4.4 - 5.6 V
P0024	Exhaust Camshaft Adjustment Valve 2 Stuck Check	Adjustment angle difference > 10 °CA/s
P0030	HO2S Heater Circuit Open (Bank 1, Sensor 1)	Signal voltage > 4.4 - 5.6 V
P0031	HO2S Heater Circuit Short to Ground (Bank 1, Sensor 1)	Signal voltage < 2.15 - 2.25 V
P0032	HO2S Heater Circuit Short to Battery Voltage (Bank 1, Sensor 1)	Heater current, > 3 A
P0036	HO2S Heater Circuit Open (Bank 1, Sensor 2)	Signal voltage, 4.4 - 5.6 V
P0037	HO2S Heater Circuit Short to Ground (Bank 1, Sensor 2)	Signal voltage, < 2.15 - 2.25 V
P0038	HO2S Heater Circuit Short to Battery Voltage (Bank 1, Sensor 2)	Heater current, > 3 A
P0050	HO2S Heater Circuit Open (Bank 2, Sensor 1)	Signal voltage > 4.4 - 5.6 V
P0051	HO2S Heater Circuit Short to Ground (Bank 2, Sensor 1)	Signal voltage < 2.15 - 2.25 V
P0052	HO2S Heater Circuit Short to Battery Voltage (Bank 2, Sensor 1)	Heater current, > 3 A
P0056	HO2S Heater Circuit Open (Bank 2, Sensor 2)	Signal voltage > 4.4 - 5.6 V
P0057	HO2S Heater Circuit Short to Ground (Bank 2, Sensor 2)	Signal voltage < 2.15 - 2.25 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P0058	HO2S Heater Circuit Short to Battery Voltage (Bank 2, Sensor 2)	Heater current > 3 A
P0070	Ambient Air Temperature Sensor Circuit Open or Short to Battery Voltage	Ambient air temp < -50° C
P0071	Ambient Air Temperature Sensor Circuit Rationality Check	Ambient temperature minus engine temperature @ engine start > 40 - 25 K
P0072	Ambient Air Temperature Sensor Circuit Short to Ground	Ambient air temp > 87.0° C
P008A	Low Fuel Pressure Sensor Circuit Pressure Out of Range Low	Actual pressure, < 0.08 MPa
P008B	Low Fuel Pressure Sensor Circuit Pressure Out of Range High	Actual pressure, > 0.08 MPa
P0087	Fuel Metering Valve 1 & 2 Circuit Functional Check Stuck Open	<ul style="list-style-type: none"> • Pressure control activity > 0.28 MPa • Fuel trim activity, 0.9 - 1.15[-] • Difference between actual pressure - Target pressure < -1.2 MPa
P0089	Low Fuel Pressure Sensor Circuit Functionality Check	<ul style="list-style-type: none"> • Difference between actual pressure - Target pressure < -0.2 MPa or > 0.15 MPa • Pressure control activity > 0.450 or < -0.250 MPa
P0100	MAF Sensor Circuit Open	PWM time length 0 uSec
P0101	MAF Sensor Circuit Rationality Check	<ul style="list-style-type: none"> • Mass air flow 1 - mass air flow 2 and mass air flow 1 < mass air flow 2 or mass air flow 1 > mass air flow 2 < 30% or • Mass air flow 1 - mass air flow 2 and mass air flow 1 < mass air flow 2 or mass air flow 1 > mass air flow 2 > 30%
P0102	MAF Sensor Circuit Short to Ground	PWM time length < 83 uSec
P0103	MAF Sensor Circuit Short to Battery	PWM time length > 4500 uSec

DTC	Error Message	Malfunction Criteria and Threshold Value
P0108	2 MAF Sensors MAF 2	<ul style="list-style-type: none"> • Mass air flow HFM2 vs. lower threshold map $HFM2 < 0 - 450$ kg/h or • Mass air flow HFM2 vs. upper threshold map $> 55 - 1082$
P010B	MAF Sensor 2 Circuit Rationality Check	<ul style="list-style-type: none"> • Mass air flow 1 - mass air flow 2 and mass air flow 1 $<$ mass air flow 2 or mass air flow 1 $>$ mass air flow 2 $<$ 30% or • Mass air flow 1 - mass air flow 2 and mass air flow 1 $<$ mass air flow 2 or mass air flow 1 $>$ mass air flow 2 $>$ 30%
P010C	MAF Sensor 2 Circuit Open or Short to Ground	PWM time length < 83 [us]
P010D	MAF Sensor 2 Circuit Short to Battery Voltage	PWM time length > 4500 [us]
P010E	2 MAF Sensors MAF 1 MAF 2	PWM time length 0 uSec
P0111	Intake Air Temperature Sensor 1 Circuit Rationality Check	IAT minus engine temperture @ engine start and IAT minus ambient air temperature @ engine start $> 40 - 25$ K
P0112	Intake Air Temperature Sensor Short to Ground	IAT $> 125.0^{\circ}$ C
P0113	Intake Air Temperature Sensor Circuit Open or Short to Battery Voltage	IAT $< - 36^{\circ}$ C
P0116	Engine Coolant Temperature Sensor Circuit Stuck / Rationality Check	<ul style="list-style-type: none"> •Delta ECT < 3K • Engine temperature minus ambient air temperature @ engine start and engine temperature minus IAT @ engine start $> 40 - 25$ [K]
P0117	Engine Coolant Temperature Sensor Circuit Short to Ground	Short to ground-ECT $> 141^{\circ}$ C
P0118	Engine Coolant Temperature Sensor Circuit Open or Short to Battery Voltage	Short to battery positive or open circuit-ECT $< - 45.75^{\circ}$ C

DTC	Error Message	Malfunction Criteria and Threshold Value
P0121	Throttle Position Sensor Circuit (Bank 1, Sensor 1) Rationality Check	<ul style="list-style-type: none"> • TPS1 - TPS 2 > 6.3% and • Actual TPS 1 - calc. value > actual TPS 2 - calc. value 1% • Actual TPS 1 - calc. value > 9%
P0122	Throttle Position Sensor Circuit (Bank 1, Sensor 1) Short to Ground	Signal voltage < 0.175 V
P0123	Throttle Position Sensor Circuit (Bank 1, Sensor 1) Open or Short to Battery Voltage	Signal voltage > 4.63 V
P0130	HO2S Heater Circuit Out of Range (Bank 1, Sensor 1)	<ul style="list-style-type: none"> • Sensor element temperature < 640° C or • Heater resistance > 950 Ω
P0131	HO2S Circuit Short to Ground Voltage (Bank 1, Sensor 1)	Virtual mass < 2.00 V
		Nernst voltage < 1.75 V
		Adjustment voltage (IA) < 0.3 V
		Adjustment voltage (IP) < 0.3 V
P0132	O2 Sensor Circuit High Voltage (Bank 1 Sensor 1)	Virtual mass > 3 V
		Nernst voltage > 4 V
		Adjustment voltage (IA) > 1.5 V
		Adjustment voltage (IP) > 1.5 V
P0133	O2S Circuit response rate monitoring, area ratio (Bank 1, Sensor 1)	<ul style="list-style-type: none"> • Lower value of both area ratios R2L and L2L in case of symmetric fault < 0.3[-] • Lower value of both counters for area ratio R2L and L2R ≥ 5[-]
P0135	HO2S Heater Circuit Out of Range (Bank 1, Sensor 1)	Sensor element temperature < 720° C
P0136	HO2S Circuit Heater Coupling Check (Bank 1, Sensor 2)	<ul style="list-style-type: none"> • Delta O2S signal rear > 2 V • Number of heater coupling faults > 4[-]
P0137	HO2S Circuit Signal Check (Bank 1, Sensor 2)	Signal voltage < 60 mV
P0138	HO2S Circuit Short to Battery Voltage (Bank 1, Sensor 2)	Signal voltage > 1.08 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P0139	HO2S Circuit Response and Performance (Bank 1, Sensor 2)	<ul style="list-style-type: none"> • Transient Time > 0.4 s • Response Time > 1.5 s
P0140	HO2S Circuit Signal Activity Checking (Bank 2, Sensor 1)	<ul style="list-style-type: none"> • Signal voltage 401 - 499 mV • Exhaust gas temp. > 600° C and • HO2S rear internal resistance > 20K Ω
P0141	HO2S Heater Circuit Out of Range (Bank 1, Sensor 2)	Heater resistance 0.48 - 23K Ω (This depends on catalyst temp.)
P0150	HO2S Heater Circuit Out of Range (Bank 2, Sensor 1)	<ul style="list-style-type: none"> • Sensor element temperature < 640° C or • Heater resistance > 950 Ω
P0151	HO2S Circuit Short to Ground Voltage (Bank 2, Sensor 1)	Virtual mass (VM) voltage < 2 V
		Nernst voltage (UN) < 1.75 V
		Adjustment voltage (IA) < 0.3 V
		Adjustment voltage (IP) < 0.3 V
P0152	HO2S Circuit Short to Battery Voltage (Bank 2, Sensor 1)	Virtual mass (VM) voltage > 3 V
		Nernst voltage (UN) > 4 V
		Adjustment voltage (IA) > 1.5 V
		Adjustment voltage (IP) > 1.5 V
P0153	O2S Circuit response rate monitoring, area ratio (Bank 2, Sensor 1)	<ul style="list-style-type: none"> • Lower value of both area ratios R2L and L2L in case of symmetric fault < 0.3[-] • Lower value of both counters for area ratio R2L and L2R $\geq 5[-]$
P0155	HO2S Heater Circuit Out of Range (Bank 2, Sensor 1)	Sensor element temperature < 720° C
P0156	HO2S Circuit Heater Coupling Check (Bank 2, Sensor 2)	<ul style="list-style-type: none"> • Delta O2S signal rear > 2 V • Number of heater coupling faults > 4
P0157	HO2S Circuit Signal Check (Bank 2, Sensor 2)	Signal voltage < 60 mV
P0158	HO2S Circuit Short to Battery Voltage (Bank 1, Sensor 2)	Signal voltage > 1.08 V
P0159	HO2S Circuit Response and Performance (Bank 2, Sensor 2)	<ul style="list-style-type: none"> • Transient Time > 0.4 s • Response Time > 1.5 s

DTC	Error Message	Malfunction Criteria and Threshold Value
P0160	HO2S Circuit Signal Activity Checking (Bank 2, Sensor 2)	<ul style="list-style-type: none"> • Signal voltage 401 - 499 mV • Exhaust gas temp. > 600° C • HO2S rear internal resistance > 20KΩ
P0161	HO2S Heater Circuit Out of Range (Bank 2, Sensor 2)	Heater resistance 0.48 - 23K Ω (This depends on catalyst temp.)
P0171	Fuel Trim System to Lean (Bank 1)	Additive: <ul style="list-style-type: none"> • Adaptive value < 5% Multiplicative: <ul style="list-style-type: none"> • Adaptive value > 20 [%]
P0172	Fuel Trim System to Rich (Bank 1)	Additive: <ul style="list-style-type: none"> • Adaptive value < 5% Multiplicative: <ul style="list-style-type: none"> • Adaptive value < -20 [%]
P0174	Fuel Trim System to Lean (Bank 2)	Additive: <ul style="list-style-type: none"> • Adaptive value < 5% Multiplicative: <ul style="list-style-type: none"> • Adaptive value > 20 [%]
P0175	Fuel Trim System to Rich (Bank 2)	Additive: <ul style="list-style-type: none"> • Adaptive value < 5% Multiplicative: <ul style="list-style-type: none"> • Adaptive value < -20 [%]
P018A	Fuel Pressure Sensor 2 Circuit Short to Battery Voltage or Open	Signal voltage > 4.8 V
P018B	Fuel Pressure Sensor 2 Signal Range	Rail pressure > 13.5 MPa
P018C	Fuel Pressure Sensor 2 Circuit Short to Ground	Signal voltage < 0.2 V
P0190	Fuel Pressure Sensor Circuit Short to Battery Voltage or Open	Signal voltage > 4.8 V
P0191	Fuel Pressure Sensor Signal Range	Rail pressure > 13.5 mPa
P0192	Fuel Rail Pressure Sensor Circuit Short to Ground	Signal voltage < 0.2 V
P0201	Fuel Injector Circuit - Low Side Cylinder #1 Open	<ul style="list-style-type: none"> • Signal current < 2.1 A Booster Timer Check • Low side signal current < 4 A • Booster time > 6 ms

DTC	Error Message	Malfunction Criteria and Threshold Value
P0202	Fuel Injector Circuit - Low Side Cylinder #2 Open	<ul style="list-style-type: none"> • Signal current < 2.1 A Booster Timer Check • Low side signal current < 4 A • Booster time > 6 ms
P0203	Fuel Injector Circuit - Low Side Cylinder #3 Open	<ul style="list-style-type: none"> • Signal current < 2.1 A Booster Timer Check • Low side signal current < 4 A • Booster time > 6 ms
P0204	Fuel Injector Circuit - Low Side Cylinder #4 Open	<ul style="list-style-type: none"> • Signal current < 2.1 A Booster Timer Check • Low side signal current < 4 A • Booster time > 6 ms
P0205	Fuel Injector Circuit - Low Side Cylinder #5 Open	<ul style="list-style-type: none"> • Signal current < 2.1 A Booster Timer Check • Low side signal current < 4 A • Booster time > 6 ms
P0206	Fuel Injector Circuit - Low Side Cylinder #6 Open	<ul style="list-style-type: none"> • Signal current < 2.1 A Booster Timer Check • Low side signal current < 4 A • Booster time > 6 ms
P0207	Fuel Injector Circuit - Low Side Cylinder #7 Open	<ul style="list-style-type: none"> • Signal current < 2.1 A Booster Timer Check • Low side signal current < 4 A • Booster time > 6 ms
P0208	Fuel Injector Circuit - Low Side Cylinder #8 Open	<ul style="list-style-type: none"> • Signal current < 2.1 A Booster Timer Check • Low side signal current < 4 A • Booster time > 6 ms
P0209	Fuel Injector Circuit - Low Side Cylinder #9 Open	<ul style="list-style-type: none"> • Signal current < 2.1 A Booster Timer Check • Low side signal current < 4 A • Booster time > 6 ms
P0210	Fuel Injector Circuit - Low Side Cylinder #10 Open	<ul style="list-style-type: none"> • Signal current < 2.1 A Booster Timer Check • Low side signal current < 4 A • Booster time > 6 ms
P0221	Throttle Position Sensor Circuit (Bank 1, Sensor 2) Rationality Check	<ul style="list-style-type: none"> • TPS - TPS 2 > 6.3% • Actual TPS 1 - calc. value > actual TPS 2 - calc. value 1 % • Actual TPS 1 - calc. value > 9%

DTC	Error Message	Malfunction Criteria and Threshold Value
P0222	TThrottle Position Sensor Circuit (Bank 1, Sensor 2) Short to Ground	Signal voltage < 0.175 V
P0223	Throttle Position Sensor Circuit (Bank 1, Sensor 2) Open or Short to Battery Voltage	Signal voltage > 4.63 V
P025A	Fuel Pump Control Module / Fuel Transfer Pump Circuit Open	Signal voltage > 4.4 - 5.6 V
P025C	Fuel Pump Control Module / Fuel Transfer Pump Circuit Short to Ground	Signal voltage < 2.15 - 3.25 V
P025D	Fuel Pump Control Module / Fuel Transfer Pump Circuit Short to Battery Voltage	Signal current > 1.1 A
P0261	Fuel Injector Circuit - low side Cylinder #1 Short to Ground	Signal current < 2.1 A
P0262	Fuel Injector Circuit - low side Cylinder #1 Short to Battery Voltage	Signal current > 14.70 A
P0264	Fuel Injector Circuit - low side Cylinder #2 Short to Ground	Signal current < 2.1 A
P0265	Fuel Injector Circuit - low side Cylinder #2 Short to Battery Voltage	Signal current > 14.70 A
P0267	Fuel Injector Circuit - low side Cylinder #3 Short to Ground	Signal current < 2.1 A
P0268	Fuel Injector Circuit - low side Cylinder #3 Short to Battery Voltage	Signal current > 14.70 A
P0270	Fuel Injector Circuit - low side Cylinder #4 Short to Ground	Low side signal current < 2.1 A
P0271	Fuel Injector Circuit - low side Cylinder #4 Short to Battery Voltage	Signal current > 14.70 A
P0273	Fuel Injector Circuit - low side Cylinder #5 Short to Ground	Low side signal current < 2.1 A
P0274	Fuel Injector Circuit - low side Cylinder #5 Short to Battery Voltage	Signal current > 14.70 A

DTC	Error Message	Malfunction Criteria and Threshold Value
P0276	Fuel Injector Circuit - low side Cylinder #6 Short to Ground	Low side signal current < 2.1 A
P0277	Fuel Injector Circuit - low side Cylinder #6 Short to Battery Voltage	Signal current > 14.70 A
P0279	Fuel Injector Circuit - low side Cylinder #7 Short to Ground	Low side signal current < 2.1 A
P0280	Fuel Injector Circuit - low side Cylinder #7 Short to Battery Voltage	Signal current > 14.70 A
P0282	Fuel Injector Circuit - low side Cylinder #8 Short to Ground	Low side signal current < 2.1 A
P0283	Fuel Injector Circuit - low side Cylinder #8 Short to Battery Voltage	Signal current > 14.70 A
P0285	Fuel Injector Circuit - low side Cylinder #9 Short to Ground	Low side signal current < 2.1 A
P0286	Fuel Injector Circuit - low side Cylinder #9 Short to Battery Voltage	Signal current > 14.70 A
P0288	Fuel Injector Circuit - low side Cylinder #10 Short to Ground	Low side signal current < 2.1 A
P0289	Fuel Injector Circuit - low side Cylinder #10 Short to Battery Voltage	Signal current > 14.70 A
P2004	Intake Manifold Runner Position Sensor Checking Stuck Open	Deviation runner flaps position vs. calculated position > 30%
P2005	Intake Manifold Runner Position Sensor 2 Checking Stuck Open	Deviation runner flaps position vs. calculated position > 30%
P2006	Intake Manifold Runner Position Sensor Checking Stuck Closed	Deviation runner flaps position vs calculated position > 30%
P2007	Intake Manifold Runner Position Sensor 2 Checking Stuck Closed	Deviation runner flaps position vs. calculated position > 30%
P2008	Intake Manifold Runner Control Circuit Open	Signal voltage 4.4 - 5.6 V
P2009	Intake Manifold Runner Control Circuit Short to Ground	Signal voltage < 2.15 - 3.25 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P2010	Intake Manifold Runner Control Circuit Short to Battery Voltage	Signal current > 2.20 A
P2014	Intake Manifold Runner Position Sensor Circuit Short to Ground	Signal voltage, < 0.20 V
P2017	Intake Manifold Runner Position Sensor Circuit Open or Short to Battery Voltage	Signal voltage, > 4.8 V
P2019	Intake Manifold Runner Position Sensor 2 Circuit Short to Ground	Signal voltage, < 0.2 V
P2022	Intake Manifold Runner Position Sensor 2 Circuit Open or Short to Battery Voltage	Signal voltage, > 4.8 V
P2088	Intake Camshaft Adjustment Valve 1 Circuit Short to Ground	Signal voltage, < 2.15 - 3.25 V
P2089	Intake Camshaft Adjustment Valve 1 Circuit Short to Battery Voltage	Signal current > 2.2 A
P2090	Exhaust Camshaft Adjustment Valve 1 Circuit Short to Ground	Signal voltage, < 2.15 - 3.25 V
P2091	Exhaust Camshaft Adjustment Valve 1 Circuit Short to Battery Voltage	Signal current > 2.2 A
P2092	Intake Camshaft Adjustment Valve 2 Circuit Short to Ground	Signal voltage, < 2.15 - 3.25 V
P2093	Intake Camshaft Adjustment Valve 2 Circuit Short to Battery Voltage	Signal current > 2.2 A
P2094	Exhaust Camshaft Adjustment Valve 2 Circuit Short to Ground	Signal voltage, < 2.15 - 3.25 V
P2095	Exhaust Camshaft Adjustment Valve 2 Circuit Short to Battery Voltage	Signal current > 2.2 A
P2096	Fuel Trim Post Catalyst (Bank 1) Out of Range Low	Deviation lambda control < -0.03%

DTC Chart

DTC	Error Message	Malfunction Criteria and Threshold Value
P2097	Fuel Trim Post Catalyst (Bank 1) Out of Range High	Deviation lambda control > -0.03%
P2098	Fuel Trim Post Catalyst (Bank 2) Out of Range Low	Deviation lambda control < -0.03%
P2099	Fuel Trim Post Catalyst (Bank 2) Out of Range High	Deviation lambda control > -0.03%
P3025	Angle Sensor 1 (on throttle drive 2 power accelerator actuation)	<ul style="list-style-type: none"> • TPS 1-TPS 2, > 6.3% • TPS 2 - calc value > TPS 1 calc. value or <ul style="list-style-type: none"> • TPS 2 calc. value, > 9%
P3026	Angle Sensor 1 (on throttle drive 2 power accelerator actuation)	Signal voltage, < 0.176 V
P3027	Angle Sensor 1 (on throttle drive 2 power accelerator actuation)	Signal voltage, > 4.63 V
P3028	Angle Sensor 2 (on throttle drive 2 power accelerator actuation)	<ul style="list-style-type: none"> • TPS 1-TPS 2, > 6.3% • TPS 2 - calc value > TPS 1 calc. value or <ul style="list-style-type: none"> • TPS 2 calc. value, > 9%
P3029	Angle Sensor 2 (on throttle drive 2 power accelerator actuation)	Signal voltage, <0.21 V
P3030	Angle Sensor 2 (on throttle drive 2 power accelerator actuation)	Signal voltage, > 4.78 V
P3031	Throttle Drive 2 (power accelerator actuation) Electrical malfunction in circuit	<ul style="list-style-type: none"> • Duty cycle >80% and <ul style="list-style-type: none"> • ECM power stage Failure
P3032	Throttle Actuator Basic Setting (Bank 1 Bank 2)	<ul style="list-style-type: none"> • TPS 1 signal voltage < 0.21 or > 0.87 V • TPS 2 signal voltage < 4.14 or > 4.84 V
P3035	Throttle Valve Control Module 2 Mechanical Malfunction	<ul style="list-style-type: none"> • Time to open over reference point + 12%, > 0.14 Sec. • Time to close below reference point, + 3%, > 0.56 Sec. • Time to close below reference point + 3% > 0.56 Sec
P3081	Engine Temperature Too Low	Modeled ECT, Minus ECT > 9.75 K

DTC	Error Message	Malfunction Criteria and Threshold Value
P3298	Warm Up Catalyst Efficiency Below Threshold (Bank 3)	<1.0 -
P3299	Warm Up Catalyst Efficiency Below Threshold (Bank 4)	<1.0 -

Ignition System

DTC	Error Message	Malfunction Criteria and Threshold Value
P0300	Random Misfire Detected	<ul style="list-style-type: none"> • Emission threshold 1st interval % (MR), > 1.96% • Calibrated threshold 1st interval misfire rate (MR) > 1.5% • Catalyst damage misfire rate (MR), > 5%
P0301	Cylinder 1 Misfire Detected	<ul style="list-style-type: none"> • Emission threshold 1st interval % (MR), > 1.96% • Calibrated threshold 1st interval misfire rate (MR) > 1.5% • Catalyst damage misfire rate (MR), > 5%
P0302	Cylinder 2 Misfire Detected	<ul style="list-style-type: none"> • Emission threshold 1st interval % (MR), > 1.96% • Calibrated threshold 1st interval misfire rate (MR) > 1.5% • Catalyst damage misfire rate (MR), > 5%
P0303	Cylinder 3 Misfire Detected	<ul style="list-style-type: none"> • Emission threshold 1st interval % (MR), > 1.96% • Calibrated threshold 1st interval misfire rate (MR) > 1.5% • Catalyst damage misfire rate (MR), > 5%
P0304	Cylinder 4 Misfire Detected	<ul style="list-style-type: none"> • Emission threshold 1st interval % (MR), > 1.96% • Calibrated threshold 1st interval misfire rate (MR) > 1.5% • Catalyst damage misfire rate (MR), > 5%

DTC	Error Message	Malfunction Criteria and Threshold Value
P0305	Cylinder 5 Misfire Detected	<ul style="list-style-type: none"> • Emission threshold 1st interval % (MR), > 1.96% • Calibrated threshold 1st interval misfire rate (MR) > 1.5% • Catalyst damage misfire rate (MR), > 5%
P0306	Cylinder 6 Misfire Detected	<ul style="list-style-type: none"> • Emission threshold 1st interval % (MR), > 1.96% • Calibrated threshold 1st interval misfire rate (MR) > 1.5% • Catalyst damage misfire rate (MR), > 5%
P0307	Cylinder 7 Misfire Detected	<ul style="list-style-type: none"> • Emission threshold 1st interval % (MR), > 1.96% • Calibrated threshold 1st interval misfire rate (MR) > 1.5% • Catalyst damage misfire rate (MR), > 5%
P0308	Cylinder 8 Misfire Detected	<ul style="list-style-type: none"> • Emission threshold 1st interval % (MR), > 1.96% • Calibrated threshold 1st interval misfire rate (MR) > 1.5% • Catalyst damage misfire rate (MR), > 5%
P0309	Cylinder 9 Misfire Detected	<ul style="list-style-type: none"> • Emission threshold 1st interval % (MR), > 1.96% • Calibrated threshold 1st interval misfire rate (MR) > 1.5% • Catalyst damage misfire rate (MR), > 5%
P0310	Cylinder 10 Misfire Detected	<ul style="list-style-type: none"> • Emission threshold 1st interval % (MR), > 1.96% • Calibrated threshold 1st interval misfire rate (MR) > 1.5% • Catalyst damage misfire rate (MR), > 5%

DTC	Error Message	Malfunction Criteria and Threshold Value
P0321	Engine Speed Circuit Performance Check	<ul style="list-style-type: none"> • Counted versus referenced teeth, > 1 • Reference gap during engine start, not detected • Teeth during engine start, detected • Reference gap at normal operation, lost
P0322	Engine Speed Circuit No Signal	<ul style="list-style-type: none"> • Engine speed, No signal • Phase signal, O.K.
P0341	Camshaft Position Sensor Circuit Rationality Check	Phase changes last 10 revs < 11 or > [-]
P0342	Camshaft Position Sensor Circuit Rationality Check Low	Signal voltage low, 10 Rev.
P0343	Camshaft Position Sensor Circuit Rationality Check High	Signal voltage high, 10 rev.
P0346	Camshaft Position Sensor 3 Circuit Rationality Check	Phase changes last 10 revs: < 11 or > 13 [-]
P0347	Camshaft Position Sensor 3 Circuit Rationality Check Low	Signal low voltage, 10 Rev.
P0348	Camshaft Position Sensor 3 Circuit Rationality Check High	Signal voltage high, 10 rev.
P0351	Ignition Coil Cylinder 1 Control Circuit Open	Signal current, < 4.95 - 8.82 mA
P0352	Ignition Coil Cylinder 2 Control Circuit Open	Signal current, < 4.95 - 8.82 mA
P0353	Ignition Coil Cylinder 3 Control Circuit Open	Signal current, < 4.95 - 8.82 mA
P0354	Ignition Coil Cylinder 4 Control Circuit Open	Signal current, < 4.95 - 8.82 mA
P0355	Ignition Coil Cylinder 5 Control Circuit Open	Signal current, < 4.95 - 8.82 mA
P0356	Ignition Coil Cylinder 6 Control Circuit Open	Signal current, < 4.95 - 8.82 mA
P0357	Ignition Coil Cylinder 7 Control Circuit Open	Signal current, < 4.95 - 8.82 mA
P0358	Ignition Coil Cylinder 8 Control Circuit Open	Signal current, < 4.95 - 8.82 mA
P0359	Ignition Coil Cylinder 9 Control Circuit Open	Signal current, < 4.95 - 8.82 mA

DTC	Error Message	Malfunction Criteria and Threshold Value
P0360	Ignition Coil Cylinder 10 Control Circuit Open	Signal current, < 4.95 - 8.82 mA
P0366	Camshaft Position Sensor 2 Circuit Rationality Check	Phase changes last 10 revs < 11 or > 13
P0367	Camshaft Position Sensor 2 Circuit Rationality Check Low	Signal voltage low 10 rev.
P0368	Camshaft Position Sensor 2 Circuit Rationality Check High	Signal voltage high, 10 rev.
P0391	Camshaft Position Sensor 4 Circuit Rationality Check	Phase changes last 10 revs < 11 or > 13
P0392	Camshaft Position Sensor 4 Circuit Rationality Check Low	Signal voltage low, 10 Rev.
P0393	Camshaft Position Sensor 4 Circuit Rationality Check High	Signal voltage high, 10 rev.

Additional Exhaust Regulation

DTC	Error Message	Malfunction Criteria and Threshold Value
P0410	Secondary Air Injection System Bank 1 or 2	"Difference of secondary air pressure during phase 3 to secondary air pressure before secondary air injection > 30
P0413	Secondary Air Injection Solenoid Valve Open	Signal voltage > 4.4 V
P0414	Secondary Air Injection Solenoid Valve Short to Battery Voltage or Short to Ground	<ul style="list-style-type: none"> • Signal current > 2.2 A or • Signal Voltage < 3.25 V
P0418	Secondary Air Injection System Control Circuit (Bank 1) Open	Signal voltage > 4.4 V
P0419	Secondary Air Injection System Control Circuit (Bank 2) Open	Signal voltage > 4.4 V
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<1.0 -
P0421	Catalyst System Efficiency (Bank 1)	EWMA filter value for catalyst < 0.2 [-]
P0430	Warm Up Catalyst Efficiency Below Threshold Bank 2	<1.0 -

DTC	Error Message	Malfunction Criteria and Threshold Value
P0431	Catalyst System Efficiency (Bank 2)	EWMA filter value for catalyst < 0.2 [-]
P0441	EVAP Purge Regulator Valve 2 Circuit Functional Check	<ul style="list-style-type: none"> • Deviation lambda control < 6% • Deviation idle control < 20%
P0442	Evaporative Emission System Leak Detected (small leak)	Time for pressure drop < 1.7 - 2.2 Sec.
P0444	EVAP Purge Regulator Valve 1 Circuit Open	Signal voltage > 4.4 - 5.6 V
P0449	Evaporative Emission System Vent Valve/Solenoid Circuit	Signal voltage > 4.4- 5.5 V
P0455	Evaporative Emission System Leak Detected (gross leak/no flow)	Time for pressure drop < 0.95 - 1.1 Sec.
P0456	EVAP System Leak Detected (very small leak)	Time for pressure drop < 4 - 5.5 Sec
P0458	EVAP Purge Regulator Valve 1 Circuit Short to Ground	Signal voltage, 3.25 - 2.15 V
P0459	EVAP Purge Regulator Valve 1 Circuit Short to Battery Voltage	Signal current > 2.2 A
P0491	Secondary Air Injection System Insufficient Flow Bank 1	<ul style="list-style-type: none"> • Blockage: relative secondary air mass flow (phase 1) < 0.027 [-] • Leakage: relative secondary air mass flow (phase 1) , < 0.05 [-] • “Average pressure difference between absolute value and filtered value (phase 1))” < 1.6 - 13.1 hPa
P0492	Secondary Air Injection System Insufficient Flow Bank 2	<ul style="list-style-type: none"> • Blockage: relative secondary air mass flow (phase 1) < 0.027 [-] • Leakage: relative secondary air mass flow (phase 1) , < 0.05 [-] • “Average pressure difference between absolute value and filtered value (phase 1))” < 1.6 - 13.1 hPa
P0498	Evaporative Emission System Vent Valve Control Circuit Low	Signal Voltage, < 3.01 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P0499	Evaporative Emission System Vent Valve Control Circuit High	Signal current, 2.7-5.5 A

Speed and Idle Control

DTC	Error Message	Malfunction Criteria and Threshold Value
P0501	Vehicle Speed Sensor Range / Performance	VSS signal, < 2.5 MPH
P0506	Idle Control RPM Lower Than Expected	<ul style="list-style-type: none"> • Engine speed deviation < -80 RPM and/or < -200 RPM • Idle controller at max. value 0 - 10%
P0507	Idle Control RPM Higher Than Expected	<ul style="list-style-type: none"> • Engine speed deviation > 80 RPM and • Idle controller at lower limit -7%
P050A	Idle Control RPM Lower or Higher Than Expected	<ul style="list-style-type: none"> • Engine speed deviation < - 200 RPM and • Idle controller at max. value 0 - 4.8%
P050B	Cold Start Monitoring Idle: Ignition Timing Monitor	Difference between commanded spark timing vs. actual value > 22.00 [%]
P052A	Intake Camshaft Adjustment Valve 1 Circuit Cold Start Monitoring (Target Error Camshaft)	Difference between target position vs. actual position > 8° CA
P052C	Intake Camshaft Adjustment Valve 2 Circuit Cold Start Monitoring (Target Error Camshaft)	Difference between target position vs. actual position > 8° CA
P053F	Fuel Rail Pressure Sensor Functional Check Cold Start	Difference between target pressure - actual pressure > 1.30 [MPa] or < - 5.00 [MPa]
P054A	Exhaust Camshaft Adjustment Valve 1 Circuit Cold Start Monitoring (Target Error Camshaft)	Difference between target position vs. actual position > 6° CA

DTC	Error Message	Malfunction Criteria and Threshold Value
P054C	Exhaust Camshaft Adjustment Valve 2 Circuit Cold Start Monitoring (Target Error Camshaft)	Difference between target position vs. actual position > 6° CA

Control Module and Output Signals

DTC	Error Message	Malfunction Criteria and Threshold Value
P0601	Internal Control Module Memory Check Sum Error	Internal check sum, incorrect
P0602	Control Module Programming Error	Reprogramming not completed
P0604	Internal Control Module Random Access Memory (RAM) Error	Write ability check, failed
P0605	ECM Checksum ROM	Check failed
P0606	ECM/PCM Processor	RAM error memory checksum error
P0613	TCM Processor	Check-calculation of 1st CPU failed, Single reset does not cover problem
P0614	ECM / TCM Incompatible	Detection of error signal
P062B	Injector Valves Communication CPU	SPI communications check Identifier not active / correct
P0638	Throttle Valve Control Module Mechanical Malfunction	<ul style="list-style-type: none"> • Time > 0.14 s to open over reference point + 12% • Time > 0.56 s to close below reference point, + 3% Signal Range Check <ul style="list-style-type: none"> • TPS 1 signal voltage < 0.21 V or > 0.87 V • TPS 2 signal voltage < 4.14 V or > 4.84 V
P0639	Throttle Valve Control Module 2 Range / Performance	<ul style="list-style-type: none"> • Duty cycle > 80% • ECM power stage No Failure Rationality Check • Deviation throttle valve angles vs. calculated values > 4-50%
P0641	Sensor Reference Voltage A Circuit/Open	Internal Fault

DTC	Error Message	Malfunction Criteria and Threshold Value
P0642	Sensor Reference Voltage A Circuit Low	Signal voltage < 4.606 - 4.998 V
P0643	Sensor Reference Voltage A Circuit High	Signal voltage > 4.998 - 5.406 V
P0651	Sensor Reference Voltage B Circuit/Open	Internal Fault
P0652	Sensor Reference Voltage B Circuit Low	Signal voltage < 4.606 - 4.998 V
P0653	Sensor Reference Voltage B Circuit High	Signal voltage, >4.998 - 5.406 V
P0657	Actuator Supply Voltage A Circuit/Open	Signal voltage, > 4.4 - 5.6 V
P0658	Actuator Supply Voltage A Circuit Low	Signal voltage, < 2.15 - 3.25 V
P0659	Actuator Supply Voltage A Circuit High	Signal current > 1.1 A
P0685	(ECM) Power Supply Relay Control Circuit Open	<ul style="list-style-type: none"> • Signal voltage 2.6 - 3.7 V • Sense circuit voltage < 6 V
P0686	(ECM) Power Supply Relay Control Circuit Short to Ground	<ul style="list-style-type: none"> • Signal voltage 2.6 - 3.7 V • Sense circuit voltage < 6 V
P0687	(ECM) Power Supply Relay Control Circuit Short to Battery Voltage	<ul style="list-style-type: none"> • Signal current > 0.7 - 1.4 A • Sense circuit voltage < 6.0 V
P0688	ECM/PCM Power Relay Sense Circuit	Sense voltage < 4.0 V
P0697	Sensor Reference Voltage C Circuit/Open	Internal Fault
P0698	Sensor Reference Voltage C Circuit Low	Signal voltage < 4.606 - 4.998 V
P0699	Sensor Reference Voltage C Circuit High	5V supply voltage > 4.998 - 5.406 V
Stopped here		
U0001	High Speed CAN Communication Bus	CAN message, no feedback
U0002	High Speed CAN Communication Bus Performance	Global timeout receiving no message

DTC	Error Message	Malfunction Criteria and Threshold Value
U0037	Vehicle Communication Bus B	<ul style="list-style-type: none"> • “CAN message on Master/ Slave-CAN” • “No feedback on Master/Slave-CAN”
U0100	Lost Communication With ECM/PCM “A”	No time triggered CAN message received from Master. no feedback
U0101	Lost Communication with TCM	No CAN message received from TCM no feedback
U0115	Lost Communication With ECM/PCM “B”	No time triggered CAN message received from Slave; no feedback
U0155	Lost Communication With Instrument Panel Cluster (IPC) Control Module	No time triggered CAN message received from Instrument Cluster Module. no feedback
U0302	Software Incompatibility with Transmission Control Module	OBDD relevant Gear-ECU wrong coded
U0322	Software Incompatibility with Body Control Module	Temperature received from CAN ≤ -50
U0401	Invalid Data Received From ECM/PCM	Communication on private CAN failed
U0402	Invalid Data Received From Transmission Control Module	Invalid data received from TCM
U0415	Invalid Data Received From Anti-Lock Brake System Control Module	Receiving fault value 206 MPH
U0423	Invalid Data Received From Instrument Panel Control Module	Temperature received from CAN ≤ -49.5

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

DTC	Error Message	Malfunction Criteria and Threshold Value
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
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	Input/Turbine Speed Sensor "A" 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

DTC	Error Message	Malfunction Criteria and Threshold Value
P0727	Engine Speed Input Circuit No Signal	CAN message signal error flag, = 1
P0741	Torque Converter Clutch Circuit Performance or Stuck Off	Rate of (setting of nominal value) - actual value, > 50 RPM
P0746	Pressure Control Solenoid "A" Performance or Stuck Off	PWM hardware detection, 0 or 100%
P0747	Pressure Control Solenoid "A" Stuck On	PWM hardware detection, 0 or 100%
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 $92.4\% \leq \text{PWM} < 100\%$ voltage return lead (low), < 0.75 V
P0752	Shift Solenoid Stuck On	<ul style="list-style-type: none"> • If PWM = 100%, diagnosis by ASIC • If $7.6\% \leq \text{PWM} < 100\%$ 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 $92.4\% \leq \text{PWM} < 100\%$ 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%

DTC	Error Message	Malfunction Criteria and Threshold Value
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 supply voltage • Static leakage current flow
P0796	Pressure Control Solenoid "C" Performance or Stuck Off	PWM hardware detection, 0 or 100%
P0797	Pressure Control Solenoid "C" Stuck On	PWM hardware detection, 0 or 100%
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 Sense Circuit Range/Performance	FET drive, not possible
P0890	TCM Power Relay Sense 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 Sense Circuit High	Hardware detection
P0892	TCM Power Relay Sense Circuit Intermittent	Hardware detection
P1702	Impossible Combination of Substitute Functions or Not Allowed Actuating of Valves	SW functions: actuating solenoid valves colliding with 2 substitute functions with same priority as driven solenoid valves that have short circuit to supply or interruption
P2637	Torque management Feedback Signal "A"	CAN message signal error flag, = 1
P2714	Pressure Control Solenoid "D" Performance or Stuck Off	PWM hardware detection, 0 or 100%
P2715	Pressure Control Solenoid "D" Stuck On	PWM hardware detection, 0 or 100%

DTC	Error Message	Malfunction Criteria and Threshold Value
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%
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
P100F	Fuel Rail Injection Valves	<ul style="list-style-type: none"> • Volume part of rail pressure controller > 20 mm • Misfire failure
P1009	Air Mass Meter 1/2 Implausible Signal From Load Detection (Via throttle position and engine speed map)	<ul style="list-style-type: none"> • Mass air flow HFM2 vs. lower threshold map HFM2 < 0 - 450 kg/h • Mass air flow HFM2 vs. upper threshold map > 55 - 1082
P1491	Evaporative Emission System Purge Control Valve CircuitOpen	Signal voltage > 4.4 - 5.6 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P1647	Checking Coding/Versions of Control Modules in CAN-bus	-
P117C	Post Catalyst Fuel Trim System Too Lean (Bank 3)	Deviation lambda control > -0.03%
P117D	Post Catalyst Fuel Trim System Too Rich (Bank 3)	Deviation lambda control > -0.03%
P117E	Post Catalyst Fuel Trim System Too Lean Bank 4	Deviation lambda control > -0.03%
P117F	Post Catalyst Fuel Trim System Too Rich Bank 4	Deviation lambda control > -0.03%
P12A1	Fuel Rail Pressure Sensor High Pressure System	<ul style="list-style-type: none"> • Pressure control activity > 0.07 mPa • Fuel trim activity < 0.85 • Difference between target pressure - actual pressure -1 - 1
P12A2	Fuel Rail Pressure Sensor High Pressure System	<ul style="list-style-type: none"> • Pressure control activity < -0.0035 MPa • Fuel trim activity > 1.25 • Difference between target pressure - actual pressure -1 - 1
P12A4	Fuel Rail Pressure Control valve	<ul style="list-style-type: none"> • Pressure control activity < -7.0 MPa • Fuel trim activity 0.9 - 1.3 • Difference between target pressure - actual pressure < -8.0 mPa
P12A5	Fuel Rail Pressure Sensor High Pressure System	<ul style="list-style-type: none"> • Pressure control activity > 0.07 mPa • Fuel trim activity < 0.85 • Difference between target pressure - actual pressure -1 - 1
P12A6	Fuel Rail Pressure Sensor High Pressure System	<ul style="list-style-type: none"> • Pressure control activity < -0.0035 MPa • Fuel trim activity > 1.25 • Difference between target pressure - actual pressure -1 - 1

DTC	Error Message	Malfunction Criteria and Threshold Value
P12A7	Fuel Rail Pressure Control Valve	<ul style="list-style-type: none"> • Pressure control activity < -7.0 MPa • Fuel trim activity 0.9 - 1.3 • Difference between target pressure - actual pressure < -8.0 mPa
P129B	Fuel Pressure Regulator 2 Control Circuit	Signal voltage 1.8 - 4.5 V
P129C	Fuel Pressure Regulator 2 Control Circuit Low	Signal voltage < 1.8 V
P129D	Fuel Pressure Regulator 2 Control Circuit High	Signal voltage > 4.5 V
P1489	Evaporative Emission System Purge Control Valve Circuit High	Signal current > 2.2 A
P1490	Evaporative Emission System Purge Control Valve Circuit Low	Signal voltage, 3.25 - 2.15 V
P1494	Evaporative Emission System Incorrect Purge Flow	<ul style="list-style-type: none"> • Deviation lambda control < 6% • Deviation idle control < 20%
P1497	Secondary Air Injection System Insufficient Flow (Bank 3)	<ul style="list-style-type: none"> • Relative secondary air mass flow < 0.047 • Relative secondary sir mass flow, < 0.05
P1498	Secondary Air Injection System Insufficient Flow (Bank 4)	<ul style="list-style-type: none"> • Relative secondary air mass flow < 0.047 • Relative secondary sir mass flow < 0.05
P150A	Engine-Off-Time	<ul style="list-style-type: none"> • Difference between engine-off-time and ECM after run-time < - 12 Sec • Difference between engine-off-time and ECM after run-time > 12 Sec
P2101	Throttle Actuator Control Motor Circuit Range/ Performance	<ul style="list-style-type: none"> • Duty cycle > 80% • ECM power stage, no failure Rationality Check • Deviation throttle valve angles vs. calculated value 4.0 - 50.0%
P2106	Throttle Valve Control Module Forced Limited Power	<ul style="list-style-type: none"> • Duty cycle > 80% and • ECM power stage Failure

DTC	Error Message	Malfunction Criteria and Threshold Value
P2122	Accelerator Pedal Position Sensor Circuit Short to Ground	Signal voltage < 0.625 V
P2123	Accelerator Pedal Position Sensor Circuit Open or Short to Battery Voltage	Signal voltage > 4.81 V
P2127	Accelerator Pedal Position Sensor 2 Circuit Short to Ground	Signal voltage < 0.625 V
P2128	Accelerator Pedal Position Sensor 2 Circuit Open or Short to Battery Voltage	Signal voltage > 4.81 V
P2138	Accelerator Pedal Position Sensors Circuit Rationality Check	Signal voltage, sensor 1 vs. sensor 2 > 0.117 - 0.703 V
P2146	Fuel Injector Cylinders 1 & 3 Supply Voltage Circuit Short to Battery Voltage	<ul style="list-style-type: none"> • Signal current, < 2.6 A Short to Ground • Signal current > 14.9 A Short circuit on coil monitoring booster-time • Internal logic = failure
P2149	Fuel Injector Cylinders 4 & 5 Supply Voltage Circuit Short to Battery Voltage	<ul style="list-style-type: none"> • Signal current, < 2.6 A Short to Ground • Signal current > 14.9 A Short circuit on coil monitoring booster-time • Internal logic = failure
P2152	Fuel Injector Cylinder 2 Supply Voltage Circuit Short to Battery Voltage	<ul style="list-style-type: none"> • Signal current, < 2.6 A Short to Ground • Signal current > 14.9 A Short circuit on coil monitoring booster-time • Internal logic = failure
P2155	Fuel Injector Cylinders 6 & 8 Supply Voltage Circuit Short to Battery Voltage	<ul style="list-style-type: none"> • Signal current, < 2.6 A Short to Ground • Signal current > 14.9 A Short circuit on coil monitoring booster-time • Internal logic = failure

DTC	Error Message	Malfunction Criteria and Threshold Value
P216A	Fuel Injector Cylinders 9 & 10 Supply Voltage Circuit Short to Battery Voltage	<ul style="list-style-type: none"> • Signal current, < 2.6 A Short to Ground • Signal current > 14.9 A Short circuit on coil monitoring booster-time • Internal logic = failure
P216D	Fuel Injector Cylinder 7 Supply Voltage Circuit Short to Battery Voltage	<ul style="list-style-type: none"> • Signal current, < 2.6 A Short to Ground • Signal current > 14.9 A Short circuit on coil monitoring booster-time • Internal logic = failure
P2181	Cooling System Rationality Check	• ECT < 75° C Mass air integral 4 - 12 Kg
P2195	O2S Signal Out of Range Check (Bank 1, Sensor 1)	Trim control post catalyst > 0.06
P2196	O2S Signal Out of Range Check (Bank 1, Sensor 1)	Trim control post catalyst < -0.06
P2197	O2S Signal Out of Range Check (Bank 2, Sensor 1)	Trim control post catalyst > 0.06
P2198	O2S Signal Out of Range Check (Bank 2, Sensor 1)	Trim control post catalyst < -0.06
P2231	O2 Sensor Signal Circuit Shorted to Heater Circuit Bank 1 Sensor 1	<ul style="list-style-type: none"> • Delta O2S signal front > 0.2 - 0.498 V • Elapsed time since last O2S < 0.05 Sec • Heater switch on
P2234	O2 Sensor Signal Circuit Shorted to Heater Circuit Bank 2 Sensor 1	<ul style="list-style-type: none"> • Delta O2S signal front > 0.2 - 0.498 V • Elapsed time since last O2S < 0.05 Sec • Heater switch on
P2237	O2S Circuit Open Pump Current (IP) (Bank 1, Sensor 1)	<ul style="list-style-type: none"> • Mass air integral in exhaust gas > 0.2 kg • Fuel cut off active > 3 Sec. • O2S signal front < 1.7 V • Enrichment or lean out Active • O2S signal front 1.49 - 1.5 V • Delta lambda value setting > 0.15

DTC	Error Message	Malfunction Criteria and Threshold Value
P2240	O2S Circuit Open Pump Current (IP) (Bank 1, Sensor 2)	<ul style="list-style-type: none"> • Mass air integral in exhaust gas > 0.2 kg • Fuel cut off active > 3 Sec. • O2S signal front < 1.7 V • Enrichment or lean out Active • O2S signal front 1.49 - 1.5 V • Delta lambda value setting > 0.15
P2243	O2S Circuit open Nernst voltage (UN) (Bank 1, Sensor 1)	<ul style="list-style-type: none"> • Signal > 4.7 V or • Signal < 0.2 V
P2247	O2S Circuit Open Nernst Voltage (UN) (Bank 2, Sensor 1)	<ul style="list-style-type: none"> • Signal > 4.7 V or • Signal < 0.2 V
P2251	O2S Circuit Open Virtual Mass (VM) (Bank 1, Sensor 1)	<ul style="list-style-type: none"> • Signal 1.47 - 1.53 V • Internal resistance > 1500Ω
P2254	O2S Circuit Open Virtual Mass (VM) (Bank 2, Sensor 1)	<ul style="list-style-type: none"> • Signal 1.47 - 1.53 V • Internal resistance > 1500Ω
P2257	Secondary Air Injection System Control Circuit (Bank 1) Short to Ground	Signal voltage < 2.15 - 3.25 V
P2258	Secondary Air Injection System Control Circuit (Bank 1) Short to Battery Voltage	Signal current > 1.1 A
P2259	Secondary Air Injection System Control Circuit (Bank 2) Short to Ground	Signal voltage < 2.15 V
P2260	Secondary Air Injection System Control Circuit (Bank 2) Short to Battery Voltage	Signal current > 1.1 A
P2293	Fuel Rail Pressure Sensor Functional Check	Difference between actual pressure - Target pressure > 1.30 or < -5.00 MPa
P2294	Fuel Metering Valve Circuit Open	Signal voltage 2.3 - 2.7 V
P2295	Fuel Metering Valve Circuit Short to Ground	Signal voltage < 1.8 - 2.25 V
P2296	Fuel Metering Valve Circuit Short to Battery Voltage	Signal voltage > 4.98 V

Ignition System

DTC	Error Message	Malfunction Criteria and Threshold Value
P2300	Ignition Coil Cylinder 1 Control Circuit Short to Ground	Signal voltage < 0.5 - 1.0 V
P2301	Ignition Coil Cylinder 1 Control Circuit Short to Battery Voltage	Signal voltage > 5.2 - 6.0 V
P2303	Ignition Coil Cylinder 2 Control Circuit Short to Ground	Signal voltage < 0.5 - 1.0 V
P2304	Ignition Coil Cylinder 2 Control Circuit Short to Battery Voltage	Signal voltage > 5.2 - 6.0 V
P2306	Ignition Coil Cylinder 3 Control Circuit Short to Ground	Signal voltage < 0.5 - 1.0 V
P2307	Ignition Coil Cylinder 3 Control Circuit Short to Battery Voltage	Signal voltage > 5.2 - 6.0 V
P2309	Ignition Coil Cylinder 4 Control Circuit Short to Ground	Signal voltage < 0.5 - 1.0 V
P2310	Ignition Coil Cylinder 4 Control Circuit Short to Battery Voltage	Signal voltage > 5.2 - 6.0 V
P2312	Ignition Coil Cylinder 5 Control Circuit Short to Ground	Signal voltage < 0.5 - 1.0 V
P2313	Ignition Coil Cylinder 5 Control Circuit Short to Battery Voltage	Signal voltage > 5.2 - 6.0 V
P2315	Ignition Coil Cylinder 6 Control Circuit Short to Ground	Signal voltage < 0.5 - 1.0 V
P2316	Ignition Coil Cylinder 6 Control Circuit Short to Battery Voltage	Signal voltage > 5.2 - 6.0 V
P2318	Ignition Coil Cylinder 7 Control Circuit Short to Ground	Signal voltage < 0.5 - 1.0 V
P2319	Ignition Coil Cylinder 7 Control Circuit Short to Battery Voltage	Signal voltage > 5.2 - 6.0 V
P2321	Ignition Coil Cylinder 8 Control Circuit Short to Ground	Signal voltage < 0.5 - 1.0 V
P2322	Ignition Coil Cylinder 8 Control Circuit Short to Battery Voltage	Signal voltage > 5.2 - 6.0 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P2324	Ignition Coil Cylinder 9 Control Circuit Short to Ground	Signal voltage < 0.5 - 1.0 V
P2325	Ignition Coil Cylinder 9 Control Circuit Short to Battery Voltage	Signal voltage > 5.2 - 6.0 V
P2327	Ignition Coil Cylinder 10 Control Circuit Short to Ground	Signal voltage < 0.5 - 1.0 V
P2328	Ignition Coil Cylinder 10 Control Circuit Short to Battery Voltage	Signal voltage > 5.2 - 6.0 V
P2400	EVAP System Leak Detection Pump Control Circuit Open	Signal voltage > 4.4 - 5.5 V
P2401	Evaporative Emission System Leak Detection Pump Control Circuit Low	Signal voltage < 3 -2.15 V
P2402	Evaporative Emission System Leak Detection Pump Control Circuit High	Signal current > 2.7 - 5.5 A
P2403	EVAP System Leak Detection Pump Rationality Check Unable to Close	Low signal voltage for > 10.4 s
P2404	EVAP System Leak Detection Pump Rationality Check Unable to Open	High signal voltage > 10.4 Sec.
P2414	O2S Circuit Signal Range Check (Bank 1, Sensor 1)	Internal voltage 3.7-4.8 V
P2415	O2S Circuit Signal Range Check (Bank 2, Sensor 1)	Internal voltage 2.5 - 3.0 V
P2422	Evaporative Emission System Vent Valve Stuck Closed	Time for pressure drop during 2nd leak check < 1.45 Sec.
P2431	SAIR System pressure Sensor Rationality Check	Difference between SAI pressure and ambient pressure NOT(-60 - 60 hPa)
P2432	SAIR System pressure Sensor Short to Ground	Signal voltage < 0.4 V
P2433	SAIR System pressure Sensor Short to battery Voltage or Open	Signal voltage > 4.6 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P2436	SAIR System pressure Sensor 2 Rationality Check	Difference between SAI pressure and ambient pressure NOT(-60 - 60 hPa)
P2437	SAIR System pressure Sensor 2 Short to Ground	Signal voltage < 0.4 V
P2438	SAIR System pressure Sensor 2 Short to Battery Voltage or Open	Signal voltage > 4.6 V
P2440	Secondary Air Injection System Stuck Open Bank 1	<ul style="list-style-type: none"> • Blockage: relative secondary air mass flow (phase 1) ≥ 0.27 [-] • Leakage: relative secondary air mass flow (phase 1) ≥ 0.27 [-] • Relative secondary air mass flow (phase 2)] < 0.75 [-]
P2442	Secondary Air Injection System Stuck Open Bank 2	<ul style="list-style-type: none"> • Blockage: relative secondary air mass flow (phase 1) ≥ 0.27 [-] • Leakage: relative secondary air mass flow (phase 1) ≥ 0.27 [-] • Relative secondary air mass flow (phase 2)] < 0.75 [-]
P2539	Low Fuel Pressure Sensor Circuit Short to Battery Voltage	Signal voltage > 4.8 V
P2541	Low Fuel Pressure Sensor Circuit Short to Ground	Signal voltage, < 2.0 V
P2626	O2S Circuit Open Adjustment Voltage (IA) (Bank 1, Sensor 1)	Signal > 4.8 V
P2629	O2S Circuit Open Adjustment Voltage (IA) (Bank 2, Sensor 1)	Signal > 4.8 V

DTC CHART

Engine Code - CNDA

Fuel and Air Mixture, Additional Emissions Regulations

DTC	Error Message	Malfunction Criteria and Threshold Value
P000A	Intake "A" Camshaft Position Slow Response (Bank 1)	Adjustment angle difference, <math><6^{\circ}</math> CA/s
P000B	Exhaust "B" Camshaft Position Slow Response (Bank 1)	Adjustment angle difference <math><6^{\circ}</math> CA/s
P000C	Intake "A" Camshaft Position Slow Response (Bank 2)	Adjustment angle difference <math><6^{\circ}</math> CA/s
P000D	Exhaust "B" Camshaft Position Slow Response (Bank 2)	Adjustment angle difference <math><6^{\circ}</math> CA/s
P0010	Intake "A" Camshaft Position Actuator Circuit / Open (Bank 1)	Signal voltage, <math><4.4-5.6</math> V
P0011	Intake "A" Camshaft Position - Timing Over-Advanced or System Performance (Bank 1)	Adjustment angle difference $>10^{\circ}$ CA/s
P0013	Exhaust "B" Camshaft Position - Actuator Circuit / Open (Bank 1)	Signal voltage 4.4–5.6 V
P0014	Exhaust "B" Camshaft Position - Timing Over-Advanced or System Performance (Bank 1)	Adjustment angle difference $>10^{\circ}$ CA/s
P0016	Crankshaft Position – Camshaft Position Correlation (Bank 1 Sensor A)	Adaptive value at limit, 11° CA
P0017	Crankshaft Position – Camshaft Position Correlation (Bank 1 Sensor B)	Adaptive value at limit, 11° CA
P0018	Crankshaft Position – Camshaft Position Correlation (Bank 2 Sensor A)	Adaptive value at limit, 11° CA
P0019	Crankshaft Position – Camshaft Position Correlation (Bank 2 Sensor B)	Adaptive value at limit, 11° CA
P0020	Intake "A" Camshaft Position Actuator Circuit / Open (Bank 2)	Signal voltage, <math><4.4-5.6</math> V

DTC	Error Message	Malfunction Criteria and Threshold Value
P0021	Intake "A" Camshaft Position - Timing Over-Advanced or System Performance (Bank 2)	Adjustment angle difference >10 °CA/s
P0023	Exhaust "B" Camshaft Position - Actuator Circuit / Open (Bank 2)	Signal voltage 4.4 - 5.6 V
P0024	Exhaust "B" Camshaft Position - Timing Over-Advanced or System Performance (Bank 2)	Adjustment angle difference >10° CA/s
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	Signal voltage, 4.4 - 5.6 V
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	Heater voltage < 2.15 - 2.25 V
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	Signal current > 2,2 A
P0036	HO2S Heater Control Circuit (Bank 1 Sensor 2)	Heater voltage, 4.4 - 5.6 V
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	Heater voltage, < 2.15 - 3.25 V
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	Signal current, > 3 A
P0050	HO2S Heater Control Circuit (Bank 2 Sensor 1)	Signal voltage, 4.4 - 5.6 V
P0051	HO2S Heater Control Circuit Low (Bank 2 Sensor 1)	Heater voltage < 2.15 - 2.25 V
P0052	HO2S Heater Control Circuit High (Bank 2 Sensor 1)	Signal current > 2,2 A
P0056	HO2S Heater Control Circuit (Bank 2 Sensor 2)	Heater voltage, 4.4 - 5.6 V
P0057	HO2S Heater Control Circuit Low (Bank 2 Sensor 2)	Heater voltage < 2.34 V
P0058	HO2S Heater Control Circuit High (Bank 2 Sensor 2)	Signal current > 3.59 A
P0087	Fuel Rail/System Pressure - Too Low	

DTC	Error Message	Malfunction Criteria and Threshold Value
P0089	Fuel Pressure Regulator 1 Performance	<ul style="list-style-type: none"> • Difference between actual pressure - Target pressure < -0.2 MPa • Difference between actual pressure - Target pressure >0.15 MPa • Pressure control activity > 0.350 < -0.250 MPa
P008A	Fuel System Pressure Sensor Low Pressure System	Actual pressure < 0.08 MPa
P008B	Fuel System Pressure Sensor Low Pressure System	Actual pressure > 0.8 MPa
P010C	Mass or Volume Air Flow "B" Circuit Low	MAF Sensor signal, < 0.2 V
P0101	Mass or Volume Air Flow Circuit Range/Performance	<ul style="list-style-type: none"> • Mass air flow 1 - Mass air flow 2 < 30% • Mass air flow 1 - Mass air flow 2 > 30% and <ul style="list-style-type: none"> • Mass air flow 1 < Mass air flow 2 or <ul style="list-style-type: none"> • Mass air flow 1 > Mass air flow 2
P0102	Mass or Volume Air Flow Circuit Low Input	MAF Sensor signal, < 0.2 V
P0103	Mass or Volume Air Flow Circuit High Input	MAF Sensor signal, > 4.8 V
P0106	Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance	<ul style="list-style-type: none"> • Altitude sensor, < -21 kPa • Boost pressure signal, > 23 kPa • Altitude sensor signal vs. modeled altitude > 20 kPa
P0112	Intake Air Temperature Sensor 1 Circuit Low	IAT, > 125.0° C
P0113	Intake Air Temperature Sensor 1 Circuit High	IAT, <-36° C
P0116	Engine Coolant Temperature Circuit Range/Performance	Delta ECT, < 3 K
P0117	Engine Coolant Temperature Circuit Low	Engine coolant temperature > 141 °C
P0118	Engine Coolant Temperature Circuit High	Engine coolant temperature < -45.75 °C

DTC	Error Message	Malfunction Criteria and Threshold Value
P0121	Throttle/Pedal Position Sensor/Switch "A" Circuit Range/Performance	<ul style="list-style-type: none"> • TPS 1 - TPS 2 > 6.3% and • TPS 2 - calc value > TPS 1 calc. value or • TPS 2 calc. value, > 9%
P0122	Throttle/Pedal Position Sensor/Switch "A" Circuit Low	Signal voltage < 0.176 V
P0123	Throttle/Pedal Position Sensor/Switch "A" Circuit High	Signal voltage > 4.63 V
P0130	O2 Sensor Circuit (Bank 1, Sensor 1)	<ul style="list-style-type: none"> • Sensor element temperature < 600 °C or • Heater resistance > 570 Ohm
P0131	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)	Virtual mass > 2 V
		Nernst voltage >1.75 V
		Adjustment voltage > 0.3 V
P0132	O2 Sensor Circuit High Voltage (Bank 1 Sensor 1)	Virtual mass > 3 V
		Nernst voltage > 4 V
		Adjustment voltage > 1.5 V
P0133	O2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	<ul style="list-style-type: none"> • O2S signal front vs. modeled O2s signal, signal ratio < 0.32 • Cycles completed, > 40
P0135	O2 Sensor Heater Circuit (Bank 1 Sensor 1)	Sensor element temperature, < 685° C
P0136	O2 Sensor Circuit (Bank 1 Sensor 2)	<ul style="list-style-type: none"> • Delta O2S signal rear > 2 V • Number of heater coupling faults > 5
P0137	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	Signal voltage, < 0.06 V
P0138	O2 Sensor Circuit High Voltage (Bank 1 Sensor 1)	Signal voltage 1.3 V
P0139	O2 Sensor Circuit Slow Response (Bank 1 Sensor 2)	<ul style="list-style-type: none"> • O2S rear signal 610 mV, Not oscillating at reference • O2S signal rear during fuel cut off, > 200 mV

DTC	Error Message	Malfunction Criteria and Threshold Value
P0140	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 2)	<ul style="list-style-type: none"> • Signal voltage, 401 - 499 mV • Modeled exhaust gas temp > 600 °C and <ul style="list-style-type: none"> • O2S rear internal resistance > 20 kOhm
P0141	O2 Sensor Heater Circuit (Bank 1 Sensor 2)	Heater resistance, 1.02 - 25.9 k Ohm depends on catalyst temperature
P0150	O2 Sensor Circuit (Bank 2 Sensor 1)	<ul style="list-style-type: none"> • Sensor element temperature < 600 °C or <ul style="list-style-type: none"> • Heater resistance > 570 Ohm
P0151	O2 Sensor Circuit Low Voltage (Bank 2 Sensor 1)	Virtual mass < 2 V
		Nernst voltage < 1.75 V
		Adjustment voltage < 0.3 V
P0152	O2 Sensor Circuit High Voltage (Bank 2 Sensor 1)	Virtual mass > 3V
		Nernst voltage > 4 V
		Adjustment voltage > 1.5 V
P0153	O2 Sensor Circuit Slow Response (Bank 2 Sensor 1)	Symmetric fault: <ul style="list-style-type: none"> • Difference of R2L area ratio vs. L2R area ratio -0.50 - 1.00 • Lower value of both counters for area ratio R2L and L2R \geq 5 times
P0155	O2 Sensor Heater Circuit (Bank 2 Sensor 1)	Sensor element temperature, < 685° C
P0156	O2 Sensor Circuit (Bank 2 Sensor 2)	<ul style="list-style-type: none"> • Delta O2S signal rear > 2 V • Number of heater coupling faults > 5
P0157	O2 Sensor Circuit Low Voltage (Bank 2 Sensor 2)	Signal voltage, < 0.06 V
P0158	O2 Sensor Circuit High Voltage (Bank 2 Sensor 2)	Signal voltage 1.3 V
P0159	O2 Sensor Circuit Slow Response (Bank 2 Sensor 2)	<ul style="list-style-type: none"> • O2S rear signal 610 mV, Not oscillating at reference • O2S signal rear during fuel cut off, > 200 mV

DTC	Error Message	Malfunction Criteria and Threshold Value
P0160	O2 Sensor Circuit No Activity Detected (Bank 2 Sensor 2)	<ul style="list-style-type: none"> • Signal voltage, 401 - 499 mV • Modeled exhaust gas temp > 600 °C and <ul style="list-style-type: none"> • O2S rear internal resistance > 20 kOhm
P0161	O2 Sensor Heater Circuit (Bank 2 Sensor 2)	Heater resistance, 1.02 - 25.9 k Ohm depends on catalyst temperature
P0171	System Too Lean (Bank 1)	(Multiplicative) Adaptive value > 5% (Additive) Adaptive value > 15%
P0172	System Too Rich (Bank 1)	(Multiplicative) Adaptive value < -5% (Additive) Adaptive value < -15%
P0174	System Too Lean (Bank 2)	(Multiplicative) Adaptive value < -5% (Additive) Adaptive value < -15%
P0175	System Too Rich (Bank 2)	(Multiplicative) Adaptive value < -5% (Additive) Adaptive value < -15%
P0190	Fuel Rail Pressure Sensor A Circuit	Signal voltage > 4.8 V
P0192	Fuel Rail Pressure Sensor A Circuit Low Input	Signal voltage < 0.2 V
P0201	Injector Circuit/Open – Cylinder 1	Signal current < 2.1 A
P0202	Injector Circuit/Open – Cylinder 2	Signal current < 2.1 A
P0203	Injector Circuit/Open – Cylinder 3	Signal current < 2.1 A
P0204	Injector Circuit/Open – Cylinder 4	Signal current < 2.1 A
P0205	Injector Circuit/Open – Cylinder 5	Signal current < 2.1 A
P0206	Injector Circuit/Open – Cylinder 6	Signal current < 2.1 A
P0207	Injector Circuit/Open – Cylinder 7	Signal current < 2.1 A
P0208	Injector Circuit/Open – Cylinder 8	Signal current < 2.1 A

DTC	Error Message	Malfunction Criteria and Threshold Value
P0221	Throttle/Pedal Position Sensor/Switch "B" Circuit Range/Performance	<ul style="list-style-type: none"> • TPS 1-TPS 2, > 6.3% • TPS 2 - calc value > TPS 1 calc. value or <ul style="list-style-type: none"> • TPS 2 calc. value, > 9%
P0222	Throttle/Pedal Position Sensor/Switch "B" Circuit Low	Signal voltage, < 0.156 V
P0223	Throttle/Pedal Position Sensor/Switch "B" Circuit High	Signal voltage, > 4.88 V
P025A	Fuel Pump Module Control Circuit/Open	Signal voltage, >4.4 - 5.6 V
P025C	Fuel Pump Module Control Circuit Low	Signal voltage, < 2.15 - 3.25 V
P025D	Fuel Pump Module Control Circuit High	Signal current, >1.1 A
P0261	Cylinder 1 Injector Circuit Low	Signal current < 2.1 A
P0262	Cylinder 1 Injector Circuit High	Signal current > 14.70 A
P0264	Cylinder 2 Injector Circuit Low	Signal current < 2.1 A
P0265	Cylinder 2 Injector Circuit High	Signal current > 14.70 A
P0267	Cylinder 3 Injector Circuit Low	Signal current < 2.1 A
P0268	Cylinder 3 Injector Circuit High	Signal current > 14.70 A
P0270	Cylinder 4 Injector Circuit Low	Low side signal current < 2.1 A
P0271	Cylinder 4 Injector Circuit High	Signal current > 14.70 A
P0273	Cylinder 5 Injector Circuit Low	Low side signal current < 2.1 A
P0274	Cylinder 5 Injector Circuit High	Signal current > 14.70 A
P0276	Cylinder 6 Injector Circuit Low	Low side signal current < 2.1 A
P0277	Cylinder 6 Injector Circuit High	Signal current > 14.70 A
P0279	Cylinder 7 Injector Circuit Low	Low side signal current < 2.1 A
P0280	Cylinder 7 Injector Circuit High	Signal current > 14.70 A
P0282	Cylinder 8 Injector Circuit Low	Low side signal current < 2.1 A
P0283	Cylinder 8 Injector Circuit High	Signal current > 14.70 A
P2008	Intake Manifold Runner Control Circuit/Open (Bank 1)	Signal voltage, > 4.4 - 5.6 V
P2009	Intake Manifold Runner Control Circuit Low (Bank 1)	Signal voltage, < 2.15 - 3.25 V
P2010	Intake Manifold Runner Control Circuit High (Bank 1)	Signal current, > 2.2 A

DTC	Error Message	Malfunction Criteria and Threshold Value
P2014	Intake Manifold Runner Position Sensor/Switch Circuit Bank 1)	Signal voltage, < 0.2 V
P2015	Intake Manifold Runner Position Sensor/Switch Circuit Range/Performance (Bank 1)	Runner flaps position vs. calculated position, > 20%
P2016	Intake Manifold Runner Position Sensor/Switch Circuit Low (Bank 1)	Signal voltage, < 0.35 V
P2017	Intake Manifold Runner Position Sensor/Switch Circuit High (Bank 1)	Signal voltage > 4.8 V
P2019	Intake Manifold Runner Position Sensor/Switch Circuit (Bank 2)	Signal voltage, < 0.2 V
P2020	Intake Manifold Runner Position Sensor/Switch Circuit Range/Performance (Bank 2)	Runner flaps position vs. calculated position, > 20%
P2022	Intake Manifold Runner Position Sensor/Switch Circuit High (Bank 2)	Signal voltage, > 4.80 V
P2088	A Camshaft Position Actuator Control Circuit Low (Bank 1)	Signal voltage, < 2.15 - 3.25 V
P2089	A Camshaft Position Actuator Control Circuit High (Bank 1)	Signal current, > 2.2 A
P2090	B Camshaft Position Actuator Control Circuit Low (Bank 1)	Signal voltage < 2.15 - 3.25
P2091	B Camshaft Position Actuator Control Circuit High (Bank 1)	Signal current, > 2.2 A
P2092	A Camshaft Position Actuator Control Circuit Low (Bank 2)	Signal voltage, < 2.15 - 3.25 V
P2093	A Camshaft Position Actuator Control Circuit High (Bank 2)	Signal current, > 2.20 A
P2094	B Camshaft Position Actuator Control Circuit Low (Bank 2)	Signal voltage < 2.15 - 3.25
P2095	B Camshaft Position Actuator Control Circuit High (Bank 2)	Signal current, > 2.2 A
P2096	Post Catalyst Fuel Trim System Too Lean (Bank 1)	Lambda control > -3%
P2097	Post Catalyst Fuel Trim System Too Rich (Bank 1)	Lambda control > 3%

DTC	Error Message	Malfunction Criteria and Threshold Value
P2098	Post Catalyst Fuel Trim System Too Lean (Bank 2)	Lambda control > 0.03
P2099	Post Catalyst Fuel Trim System Too Rich (Bank 2)	Lambda control < -0.03
P3081	Engine Temperature Too Low	Modeled ECT, Minus ECT > 9.75 K

Ignition System

DTC	Error Message	Malfunction Criteria and Threshold Value
P0300	Random/Multiple Cylinder Misfire Detected	<ul style="list-style-type: none"> • Emission threshold 1st interval % (MR), > .0% • Emission threshold misfire rate (MR), > 2.0% • Catalyst damage misfire rate (MR), > 5 - 10%
P0301	Cylinder 1 Misfire Detected	<ul style="list-style-type: none"> • Emission threshold 1st interval % (MR), > .0% • Emission threshold misfire rate (MR), > 2.0% • Catalyst damage misfire rate (MR), > 5 - 10%
P0302	Cylinder 2 Misfire Detected	<ul style="list-style-type: none"> • Emission threshold 1st interval % (MR), > .0% • Emission threshold misfire rate (MR), > 2.0% • Catalyst damage misfire rate (MR), > 5 - 10%
P0303	Cylinder 3 Misfire Detected	<ul style="list-style-type: none"> • Emission threshold 1st interval % (MR), > .0% • Emission threshold misfire rate (MR), > 2.0% • Catalyst damage misfire rate (MR), > 5 - 10%
P0304	Cylinder 4 Misfire Detected	<ul style="list-style-type: none"> • Emission threshold 1st interval % (MR), > .0% • Emission threshold misfire rate (MR), > 2.0% • Catalyst damage misfire rate (MR), > 5 - 10%

DTC	Error Message	Malfunction Criteria and Threshold Value
P0305	Cylinder 5 Misfire Detected	<ul style="list-style-type: none"> • Emission threshold 1st interval % (MR), > .0% • Emission threshold misfire rate (MR), > 2.0% • Catalyst damage misfire rate (MR), > 5 - 10%
P0306	Cylinder 6 Misfire Detected	<ul style="list-style-type: none"> • Emission threshold 1st interval % (MR), > .0% • Emission threshold misfire rate (MR), > 2.0% • Catalyst damage misfire rate (MR), > 5 - 10%
P0307	Cylinder 7 Misfire Detected	<ul style="list-style-type: none"> • Emission threshold 1st interval % (MR), > .0% • Emission threshold misfire rate (MR), > 2.0% • Catalyst damage misfire rate (MR), > 5 - 10%
P0308	Cylinder 8 Misfire Detected	<ul style="list-style-type: none"> • Emission threshold 1st interval % (MR), > .0% • Emission threshold misfire rate (MR), > 2.0% • Catalyst damage misfire rate (MR), > 5 - 10%
P0321	Ignition/Distributor Engine Speed Input Circuit Range/Performance	<ul style="list-style-type: none"> • Counted versus referenced teeth, > 1 • Reference gap during engine start, not detected • Teeth during engine start detected • Reverence gap at normal operation, lost
P0322	Ignition/Distributor Engine Speed Input Circuit No Signal	<ul style="list-style-type: none"> • Engine speed, No signal • Phase signal, OK
P0341	Camshaft Position Sensor "A" Circuit Range/Performance (Bank 1 or Single Sensor)	Phase changes last 10 revs, < 11 or > 13
P0342	Camshaft Position Sensor "A" Circuit Low (Bank 1 or Single Sensor)	Signal voltage low, 10 Rev.
P0343	Camshaft Position Sensor "A" Circuit High (Bank 1 or Single Sensor)	Signal voltage high, 10 rev.

DTC	Error Message	Malfunction Criteria and Threshold Value
P0346	Camshaft Position Sensor "A" Circuit Range/Performance (Bank 2)	Phase changes last 10 revs, < 11 or > 13
P0347	Camshaft Position Sensor "A" Circuit Low (Bank 2)	Signal voltage low, 10 Rev.
P0348	Camshaft Position Sensor "A" Circuit High (Bank 2)	Signal voltage high, 10 rev.
P0351	Ignition Coil "A" Primary/ Secondary Circuit	Signal current, < 4.95 - 8.82 mA
P0352	Ignition Coil "B" Primary/ Secondary Circuit	Signal current, < 4.95 - 8.82 mA
P0353	Ignition Coil "C" Primary/ Secondary Circuit	Signal current, < 4.95 - 8.82 mA
P0354	Ignition Coil "D" Primary/ Secondary Circuit	Signal current, < 4.95 - 8.82 mA
P0355	Ignition Coil "E" Primary/ Secondary Circuit	Signal current, < 4.95 - 8.82 mA
P0356	Ignition Coil "F" Primary/ Secondary Circuit	Signal current, < 4.95 - 8.82 mA
P0357	Ignition Coil "G" Primary/ Secondary Circuit	Signal current, < 4.95 - 8.82 mA
P0358	Ignition Coil "H" Primary/ Secondary Circuit	Signal current, < 4.95 - 8.82 mA
P0366	Camshaft Position Sensor "B" Circuit Range/Performance (Bank 1)	Phase changes last 10 revs <11 or >13
P0367	Camshaft Position Sensor "B" Circuit Low (Bank 1)	Signal voltage low, 10 Rev.
P0368	Camshaft Position Sensor "B" Circuit High (Bank 1)	Signal voltage high, 10 rev.
P0391	Camshaft Position Sensor "B" Circuit Range/Performance (Bank 2)	Phase changes last 10 revs, < 11 or > 13
P0392	Camshaft Position Sensor "B" Circuit Low (Bank 2)	Signal voltage low, 10 Rev.
P0393	Camshaft Position Sensor "B" Circuit High (Bank 2)	Signal voltage high, 10 rev.

Additional Exhaust Regulation

DTC	Error Message	Malfunction Criteria and Threshold Value
P0421	Warm Up Catalyst Efficiency Below Threshold (Bank 1)	Amplitude ratio O2S < 1-
P0431	Warm Up Catalyst Efficiency Below Threshold (Bank 2)	Amplitude ratio O2S < 1-
P0441	Evaporative Emission System Incorrect Purge Flow	<ul style="list-style-type: none"> • Lambda control < 5% • Lambda control < 5%
P0442	Evaporative Emission System Leak Detected (small leak)	Time for pressure drop < 4 - 5 Seconds
P0444	Evaporative Emission System Purge Control Valve Circuit Open	Signal voltage > 4.4 - 5.6 V
P0455	Evaporative Emission System Leak Detected (large leak)	Time for pressure drop < 1.0 - 1.1 Sec.
P0456	Evaporative Emission System Leak Detected (very small leak)	Time for pressure drop, 1.7-2.2 Seconds
P0458	Evaporative Emission System Purge Control Valve Circuit Low	Signal voltage, < 3.25 - 2.15 V
P0459	Evaporative Emission System Purge Control Valve Circuit High	Signal current, > 2.2 A
P0491	Secondary Air Injection System Insufficient Flow (Bank 1)	<ul style="list-style-type: none"> • Relative secondary air mass flow < 0.047 • Relative secondary sir mass flow, < 0.05
P0492	Secondary Air Injection System Insufficient Flow (Bank 2)	<ul style="list-style-type: none"> • Relative secondary air mass flow < 0.047 • Relative secondary sir mass flow, < 0.05

Speed and Idle Control

DTC	Error Message	Malfunction Criteria and Threshold Value
P0501	Vehicle Speed Sensor "A" Range/Performance	VSS signal, < 2.5 MPH
P0506	Idle Air Control System RPM Lower Than Expected	<ul style="list-style-type: none"> • Engine speed, < -80 RPM and • Idle controller at upper limit 4.98%

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, > 80 RPM and • Idle controller at lower limit -4%

Control Module and Output Signals

DTC	Error Message	Malfunction Criteria and Threshold Value
P0601	Internal Control Module Memory Check Sum Error	Internal check sum, incorrect
P0602	Control Module Programming Error	Reprogramming not completed
P0604	Internal Control Module Random Access Memory (RAM) Error	Write ability check, failed
P0606	ECM/PCM Processor	<ul style="list-style-type: none"> • Sensor offset correction >0.1 V • Sensor IC power supply voltage <9 V • Communication CPU sensor IC Failed • Delta resistance measured vs. modeled >15 Ohm • Signal voltage <0.2 V • Signal voltage >4.88 V • Drive by wire module check failed • EEPROM check failed • Engine torque out of range • Engine operation condition out of range
P0608	Control Module VSS Output "A"	Voltage, <4->5 V
P062B	Injector Valves Communication CPU	-

DTC	Error Message	Malfunction Criteria and Threshold Value
P0638	Throttle Actuator Control Range/Performance (Bank 1)	<ul style="list-style-type: none"> • Time to open over reference point +12%, > 0.14 Sec. • Time to close below reference point, +3%, > 0.56 Sec. • Time to close below reference point +1%, > 0.14 Sec. • Time to close over reference point, -1.5%, > 0.56 Sec. • TPS 1 signal voltage, < 0.21 V or > 0.87 V • TPS 2 signal voltage, < 4.14 V or > 4.84 V
P0641	Sensor Reference Voltage "A" Circuit/Open	Internal Fault
P0642	Sensor Reference Voltage "A" Circuit Low	Signal voltage, < 4.606-4.998 V
P0643	Sensor Reference Voltage "A" Circuit High	Signal voltage, > 4.998-5.406 V
P0651	Sensor Reference Voltage "B" Circuit/Open	Internal Fault
P0652	Sensor Reference Voltage "B" Circuit Low	Signal voltage, < 4.606-4.998 V
P0653	Sensor Reference Voltage "B" Circuit High	Signal voltage, > 4.998-5.406 V
P0657	Actuator Supply Voltage "A" Circuit/Open	Signal voltage, > 4.4 - 5.6 V
P0658	Actuator Supply Voltage "A" Circuit Low	Signal voltage, < 2.15 - 3.25 V
P0659	Actuator Supply Voltage "A" Circuit High	Signal current > 1.1 A
P0685	ECM/PCM Power Relay Control Circuit /Open	<ul style="list-style-type: none"> • 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, > 0.7 - 1.4 A • Sense circuit voltage, < 6 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P0688	ECM/PCM Power Relay Sense Circuit /Open	Open circuit <ul style="list-style-type: none"> • Sense circuit voltage, < 4.0 V Rationality Check <ul style="list-style-type: none"> • Sense circuit voltage vs. on board voltage, > 1V • Sense circuit voltage, > 16 V • Sense circuit voltage vs. on board voltage, > 2.5 V
P0697	Sensor Reference Voltage "C" Circuit/Open	Internal Fault
P0698	Sensor Reference Voltage "C" Circuit Low	Signal voltage, < 4.606 - 4.998 V
P0699	Sensor Reference Voltage "C" Circuit High	Signal voltage, > 4.998 - 5.406 V
U0001	High Speed CAN Communication Bus	CAN message, no feedback
U0001	High Speed CAN Communication Bus	Signal check <ul style="list-style-type: none"> • Bus off signal is present.
U0002	High Speed CAN Communication Bus Performance	Short to Ground (GND) <ul style="list-style-type: none"> • Check of acknowledge bit set by other ECU's in the emission frame.
U0100	Lost Communication With ECM/PCM "A"	Signal check <ul style="list-style-type: none"> • Signal message, not received
U0101	Lost Communication with TCM	CAN message, No feedback
U0121	Lost Communication With Anti-Lock Brake System (ABS) Control Module	Signal check <ul style="list-style-type: none"> • Message brake 1 or 3, not received
U0155	Lost Communication With Instrument Panel Cluster (IPC) Control Module	Signal check <ul style="list-style-type: none"> • Message Kombi 1 or 2, not received
U0401	Invalid Data Received From ECM/PCM	Signal check <ul style="list-style-type: none"> • Accelerator position no signal, ≥ 102% • DLC message, not correct
U0402	Invalid Data Received From Transmission Control Module	-
U0416	Invalid Data Rec(eived From Vehicle Dynamics Control Module	Signal check <ul style="list-style-type: none"> • Message brake 1 or 3, not correct

DTC	Error Message	Malfunction Criteria and Threshold Value
U0418	Invalid Data Received From Brake System Control Module	Signal check <ul style="list-style-type: none"> • Vehicle speed, 0 RPM • Clutch position, closed • Gear position, engaged • Clutch speed, >1300 RPM Rationality check <ul style="list-style-type: none"> • Driveline speed and engine speed, > 500 RPM • Driveline speed and clutch speed, > 500 RPM
U0423	Invalid Data Received From Instrument Panel Control Module	Signal check <ul style="list-style-type: none"> • Ambient temperature, No signal $\geq 77^{\circ}$ C Signal check <ul style="list-style-type: none"> • Message Kombi 1 or 2, not correct

Transmission

DTC	Error Message	Malfunction Criteria and Threshold Value
P0805	Clutch Position Sensor Circuit	Signal check <ul style="list-style-type: none"> • Vehicle speed, 5 Km/h • Signal reference, 2000 • Time out 1, 100 ms • Time out 2, 50 ms
P0807	Clutch Position Sensor Circuit Low	Short to Ground (GND) Signal Low, < 0.49 V
P0808	Clutch Position Sensor Circuit High	Short to Battery (+) Signal High, > 4.5 V
P0810	Clutch Position Control Error	Functional check clutch opening time, > 2 seconds
P0841	Transmission Fluid Pressure Sensor/Switch "A" Circuit Range/Performance	Rationality check <ul style="list-style-type: none"> • Pressure, 3 bar • Oil volume, 20 cm³ • Pressure, 1.5 bar
P0842	Transmission Fluid Pressure Sensor/Switch "A" Circuit Low	Short to Ground (GND) sensor output voltage, < 0.39 V
P0843	Transmission Fluid Pressure Sensor/Switch "A" Circuit High	Short to Battery (+) sensor output voltage, > 4.79 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P0944	Hydraulic Pressure Unit Loss of Pressure	Flow check <ul style="list-style-type: none"> Leakage if clutch commanded open, > 120 cm³ Functional check <ul style="list-style-type: none"> Pressure increase rate, > 0.8 bar/ms Level check <ul style="list-style-type: none"> Pressure, < 30 bar for a time of 150 ms
P0945	Hydraulic Pump Relay Circuit/ Open	Open circuit <ul style="list-style-type: none"> Driver output voltage, > 2.2 V Driver output voltage during valve Off phase, < 3.2 V Signal check <ul style="list-style-type: none"> Short to supply voltage or open circuit. Driver output current during valve Off phase, < 300 mA Level check <ul style="list-style-type: none"> Hydraulic pressure, > 65 bar
P0947	Hydraulic Pump Relay Circuit Low	Short to Ground (GND) <ul style="list-style-type: none"> Driver output current during valve Off phase, > 3.7 A
P0948	Hydraulic Pump Relay Circuit High	Short to Battery (+) <ul style="list-style-type: none"> Short to supply voltage. Output voltage during valve on phase, > 3.2 V
P17AA	Shift Valve	Short to supply voltage <ul style="list-style-type: none"> Output voltage during valve Off phase, > 3.2 V
P17AB	Shift Valve	Short to supply voltage or open circuit <ul style="list-style-type: none"> Driver output current during valve Off phase, < 300 mA
P17AC	Gear Valve 1	Open Circuit <ul style="list-style-type: none"> Driver output voltage, > 2.2 V Driver output voltage during valve Off phase, < 3.2 V
P17AD	Gear Valve 1	Short to Ground (GND) <ul style="list-style-type: none"> Driver output current during valve On phase, < 3.7 mA

DTC	Error Message	Malfunction Criteria and Threshold Value
P17AE	Gear Valve 1	Short to supply voltage • Output voltage during valve Off phase, > 3.2 V
P17AF	Gear Valve 1	Short to supply voltage or open circuit • Driver output current during valve Off phase, < 300 mA
P17A8	Shift Valve	Open Circuit • Driver output voltage, > 2.2 V • Driver output voltage during valve Off phase, < 3.2 V
P17A9	Shift Valve	Short to Ground (GND) • Driver output current during valve On phase, < 3.7 mA
P17BA	Clutch Position Sensor	Short to Battery (+) • Sensor output Voltage high, > 4.5 V
P17BB	Shift Position Sensor	Rationality check • Shift position timeout, > 245 mV for > 3 seconds
P17BC	Shift Position Sensor	Short to Ground (GND) • Sensor output Voltage low, < 0.5 V
P17BD	Shift Position Sensor	Short to Battery (+) • Sensor output Voltage high, > 4.5 V
P17BE	Hydraulic Pump	Level check • Pump temperature, > 120° C
P17B0	Gear Valve 2	Open Circuit • Driver output voltage, > 2.2 V • Driver output voltage during valve Off phase, < 3.2 V
P17B1	Gear Valve 2	Short to Ground (GND) • Driver output current during valve On phase, < 3.7 mA
P17B2	Gear Valve 2	Short to supply voltage • Output voltage during valve Off phase, > 3.2 V
P17B3	Gear Valve 2	Short to supply voltage or open circuit • Driver output current during valve Off phase, < 300 mA

DTC	Error Message	Malfunction Criteria and Threshold Value
P17B8	Clutch Position Sensor	Rationality Check • Threshold, 3%
P17B9	Clutch Position Sensor	Short to Ground • Sensor output Voltage low, < 0.5 V
P172E	Gear Box	Functional check • Gear not engaged after 1 second for 3 times or • Gear not disengaged after 1 second for 3 times
P1750	Power Supply (Clamp 30)	Signal range check voltage, < 9 V
P1757	Power Supply (Clamp 30)	Open circuit voltage, < 3 V

Fuel and Air Ratios Control Module

DTC	Error Message	Malfunction Criteria and Threshold Value
P1009	Air Mass Meter 1/2 Implausible Signal From Load Detection	• Total mass air flow vs. calculated mass air flow > 20% and • Fuel system (mult) < -15% or • Total mass air flow vs. calculated mass air flow < -20% and • Fuel system (mult) > 15%
P12A1	Fuel Rail Pressure Sensor, High Pressure System	• Pressure control activity > 0.15 MPa • Fuel trim activity < 0.85
P12A2	Fuel Rail Pressure Sensor High Pressure System	• Pressure control activity < -0.25 MPa • Fuel trim activity > 1.3
P12A4	Fuel Rail Pressure Control Valve	• Pressure control activity < -8.0 MPa • Fuel trim activity 0.5 - 1.15
P129B	Fuel Pressure Regulator 2 Control Circuit	Signal voltage 2.3 - 2.7 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P129C	Fuel Pressure Regulator 2 Control Circuit Low	Signal voltage 1.8 - 2.25 V
P129D	Fuel Pressure Regulator 2 Control Circuit High	Signal voltage > 3.91 V
P2101	Throttle Actuator Control Motor Circuit Range/ Performance	<ul style="list-style-type: none"> • Duty cycle > 80% and • ECM power stage, no failure • Throttle valve angles vs. calculated values, > 4-50%
P2106	Throttle Actuator Control System - Forced Limited Power	<ul style="list-style-type: none"> • Duty cycle, > 80% and • ECM power stage, failure
P2122	Throttle/Pedal Position Sensor/Switch "D" Circuit Low Input	Signal voltage, < 0.625 V
P2123	Throttle/Pedal Position Sensor/Switch "D" Circuit High Input	Signal voltage > 4.82 V
P2127	Throttle/Pedal Position Sensor/Switch "E" Circuit Low Input	Signal voltage, < 0.43 V
P2128	Throttle/Pedal Position Sensor/Switch "E" Circuit High Input	Signal voltage, > 4.92 V
P2138	Throttle/Pedal Position Sensor/Switch "D" / "E" Voltage Correlation	Signal voltage, sensor 1 vs. sensor 2, > 0.195 - 1.13 V
P2146	Fuel Injector Group "A" Supply Voltage Circuit/Open	Battery (+) <ul style="list-style-type: none"> • Signal current, < 2.6 A Ground (GND) • Signal current > 14.9 A
P2149	Fuel Injector Group "B" Supply Voltage Circuit/Open	Battery (+) <ul style="list-style-type: none"> • Signal current, < 2.6 A Ground (GND) • Signal current > 14.9 A
P2152	Fuel Injector Group "C" Supply Voltage Circuit/Open	Battery (+) <ul style="list-style-type: none"> • Signal current, < 2.6 A Ground (GND) • Signal current > 14.9 A

DTC	Error Message	Malfunction Criteria and Threshold Value
P2155	Fuel Injector Group "D" Supply Voltage Circuit/Open	Battery (+) <ul style="list-style-type: none"> • Signal current, < 2.6 A Ground (GND) • Signal current > 14.9 A
P2181	Cooling System Performance	<ul style="list-style-type: none"> • ECT < 76.5° C • Mass air integral 5-15 Kg
P2195	O2 Sensor Signal Stuck Lean (Bank 1 Sensor 1)	Trim control post catalyst > 0.06
P2196	O2 Sensor Signal Stuck Rich (Bank 1 Sensor 1)	Trim control post catalyst < -0.06
P2197	O2 Sensor Signal Stuck Lean (Bank 2 Sensor 1)	Trim control post catalyst > 0.06
P2198	O2 Sensor Signal Stuck Rich (Bank 2 Sensor 1)	Trim control post catalyst < -0.06
P2231	O2 Sensor Signal Circuit Shorted to Heater Circuit (Bank 1 Sensor 1)	<ul style="list-style-type: none"> • Delta O2S signal front > 0.2-0.0498 V • Elapsed time since last O2S < 0.05 Sec. • Heater switch on
P2234	O2 Sensor Signal Circuit Shorted to Heater Circuit (Bank 2 Sensor 1)	<ul style="list-style-type: none"> • Delta O2S signal front > 0.2-0.0498 V • Elapsed time since last O2S < 0.05 Sec. • Heater switch on
P2237	O2 Sensor Positive Current Control Circuit/Open (Bank 1 Sensor 1)	<ul style="list-style-type: none"> • Mass air integral in exhaust gas > 0.2 kg • Fuel cut off active > 3 Sec. • O2S signal front < 1.7 V • Enrichment or lean out Active • O2S signal front 1.49 - 1.5 V • Delta lambda value setting > 0.1
P2240	O2 Sensor Positive Current Control Circuit/Open (Bank 2 Sensor 1)	<ul style="list-style-type: none"> • Mass air integral in exhaust gas > 0.2 kg • Fuel cut off active > 3 Sec. • O2S signal front < 1.7 V • Enrichment or lean out Active • O2S signal front 1.49 - 1.5 V • Delta lambda value setting > 0.1
P2243	O2 Sensor Reference Voltage Circuit/Open (Bank 1 Sensor 1)	<ul style="list-style-type: none"> • O2S signal front > 4.7 V and • Delta O2S signal front < 0.2 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P2247	O2 Sensor Reference Voltage Circuit/Open (Bank 2 Sensor 1)	<ul style="list-style-type: none"> • O2S signal front > 4.7 V and • Delta O2S signal front < 0.2 V
P2251	O2 Sensor Negative Current Control Circuit/Open (Bank 1 Sensor 1)	<ul style="list-style-type: none"> • O2S signal front 1.44 - 1.53 V and • Delta O2S signal front 0.03 V
P2254	O2 Sensor Negative Current Control Circuit/Open (Bank 2 Sensor 1)	<ul style="list-style-type: none"> • O2S signal front 1.44 - 1.53 V and • Delta O2S signal front 0.03 V
P2293	Fuel Pressure Regulator 2 Performance	Difference between actual pressure - Target pressure > 1.5 MPa
P2294	Fuel Pressure Regulator 2 Control Circuit	Signal voltage 2.3 - 2.7 V
P2295	Fuel Pressure Regulator 2 Control Circuit Low	Signal voltage 1.8 - 2.25 V
P2296	Fuel Pressure Regulator 2 Control Circuit High	Signal voltage > 3.91 V

Ignition System

DTC	Error Message	Malfunction Criteria and Threshold Value
P2300	Ignition Coil "A" Primary Control Circuit Low	Signal voltage < 0.5 - 1.0 V
P2301	Ignition Coil "A" Primary Control Circuit High	Signal voltage > 5.2 - 6.0 V
P2303	Ignition Coil "B" Primary Control Circuit Low	Signal voltage < 0.5 - 1.0 V
P2304	Ignition Coil "B" Primary Control Circuit High	Signal voltage > 5.2 - 6.0 V
P2306	Ignition Coil "C" Primary Control Circuit Low	Signal voltage < 0.5 - 1.0 V
P2307	Ignition Coil "C" Primary Control Circuit High	Signal voltage > 5.2 - 6.0 V
P2309	Ignition Coil "D" Primary Control Circuit Low	Signal voltage < 0.5 - 1.0 V
P2310	Ignition Coil "D" Primary Control Circuit High	Signal voltage > 5.2 - 6.0 V
P2312	Ignition Coil "E" Primary Control Circuit Low	Signal voltage < 0.5 - 1.0 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P2313	Ignition Coil "E" Primary Control Circuit High	Signal voltage > 5.2 - 6.0 V
P2315	Ignition Coil "F" Primary Control Circuit Low	Signal voltage < 0.5 - 1.0 V
P2316	Ignition Coil "F" Primary Control Circuit High	Signal voltage > 5.2 - 6.0 V
P2318	Ignition Coil "G" Primary Control Circuit Low	Signal voltage < 0.5 - 1.0 V
P2319	Ignition Coil "G" Primary Control Circuit High	Signal voltage > 5.2 - 6.0 V
P2321	Ignition Coil "H" Primary Control Circuit Low	Short to ground signal current > 24.0 mA
P2322	Ignition Coil "H" Primary Control Circuit High	Short to battery plus signal voltage > 5.1 - 7.0 V

Additional Emissions Regulations

DTC	Error Message	Malfunction Criteria and Threshold Value
P2400	Evaporative Emission System Leak Detection Pump Control Circuit/Open	Signal voltage > 4.4 - 5.5 V
P2401	Evaporative Emission System Leak Detection Pump Control Circuit Low	Signal voltage < 3V
P2402	Evaporative Emission System Leak Detection Pump Control Circuit High	Signal current 2.7 - 5.5 A
P2403	Evaporative Emission System Leak Detection Pump Sense Circuit/Open	Low signal voltage > 10.4 Sec.
P2404	Evaporative Emission System Leak Detection Pump Sense Circuit Range/Performance	High signal voltage > 10.4 Sec.
P2414	O2 Sensor Exhaust Sample Error (Bank 1 Sensor 1)	Internal voltage 3.7 - 4.8 V
P2415	O2 Sensor Exhaust Sample Error (Bank 2 Sensor 1)	Internal voltage 2.5–3.06 V
P2539	Low Pressure Fuel System Sensor Circuit	Signal voltage > 4.80 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P2541	Low Pressure Fuel System Sensor Circuit Low	Signal voltage < 2.0 V
P2626	O2 Sensor Pumping Current Trim Circuit/Open (Bank 1 Sensor 1)	O2S signal front > 4.8 V
P2629	O2 Sensor Pumping Current Trim Circuit/Open (Bank 2 Sensor 1)	O2S signal front > 4.8 V

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