2013

Jetta & GLI

Quick Reference Specification Book

2013 VW Jetta & GLI
Quick Reference Specification Book
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ENGINES

TRANSMISSIONS

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

N·m-to-lb·ft (ft·lb)

To calculate: N·m x 0.738 = lb·ft

N·m	lb·ft (ft·lb)	N·m	lb·ft (ft·lb)	N·m	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

N·m-to-lb·in (in·lb), kg·cm

To calculate: N·m x 8·85 = lb·in • N·m x 10.20 = kg·cm

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

N·cm-to-lb·in (in·lb), kg·cm

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

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

kg·cm-to-lb·in (in·lb), N·cm

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

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

Warnings and Cautions

WARNINGS

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

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

(WARNINGS cont'd on next page)

WARNINGS *(cont'd)*

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

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

CAUTIONS

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

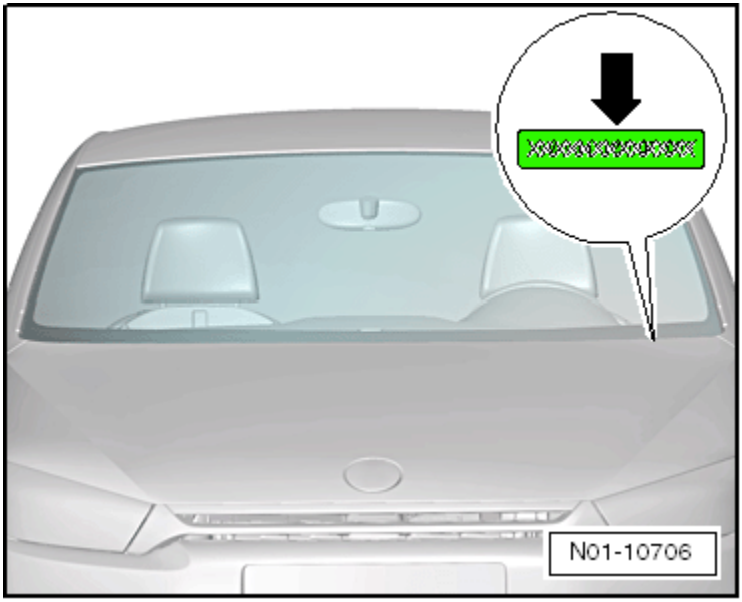
(CAUTIONS cont'd on next page)

CAUTIONS *(cont'd)*

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

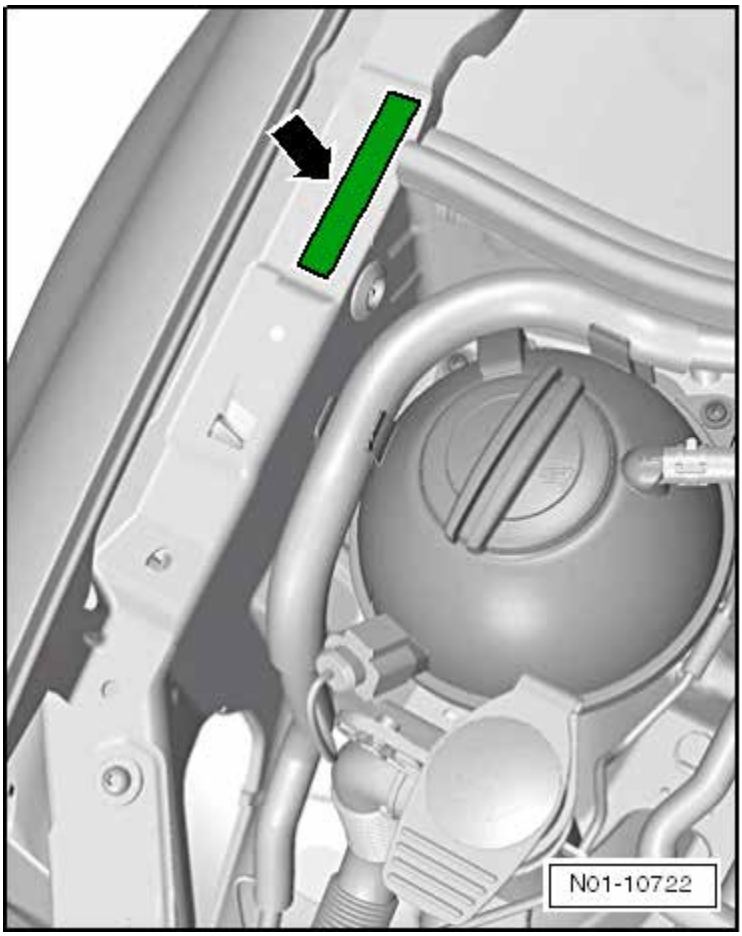
VEHICLE IDENTIFICATION

VIN on Lower Edge of Windshield



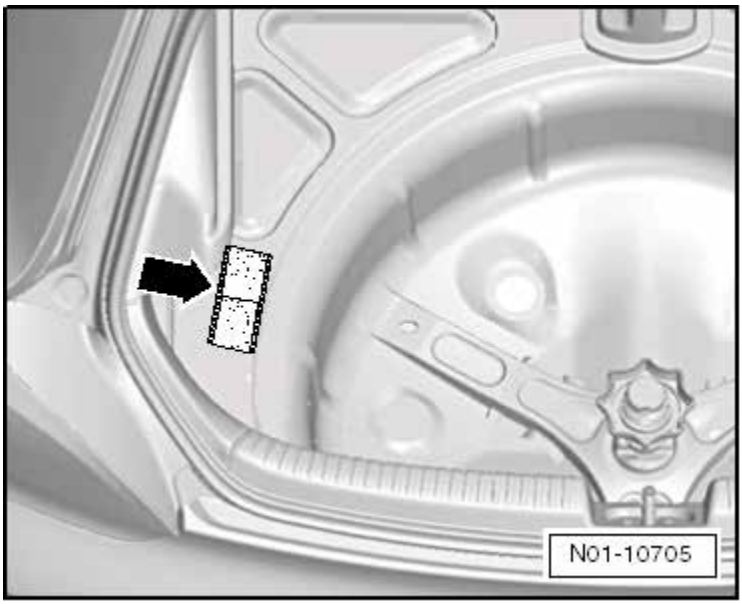
The VIN ➡ is on the left side of the vehicle in the area of the windshield wiper mount. It is visible from outside.

VIN on Longitudinal Member Extension



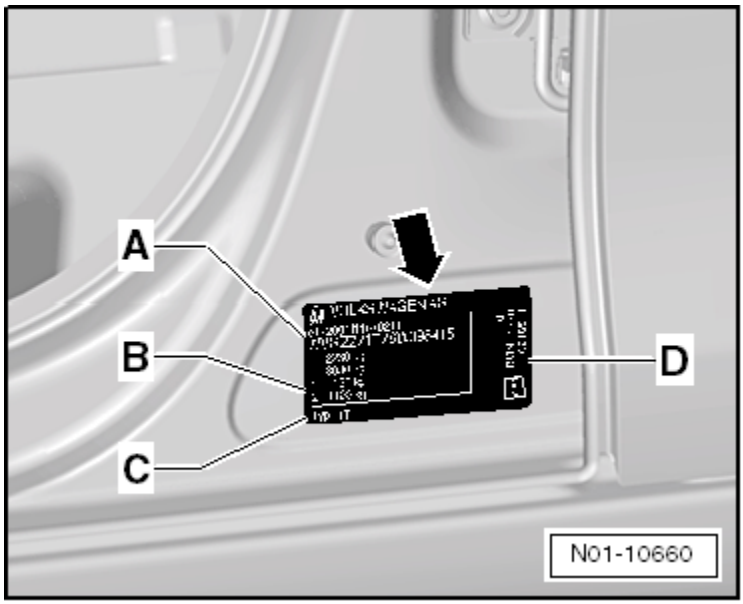
The Vehicle Identification Number (VIN) is located on the extension of the longitudinal member ➡.

Vehicle Data Label



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

Type Plate



The type plate ➡ is visible at the bottom of the B-pillar when the left front door is open.

The type plate contains the following vehicle information:

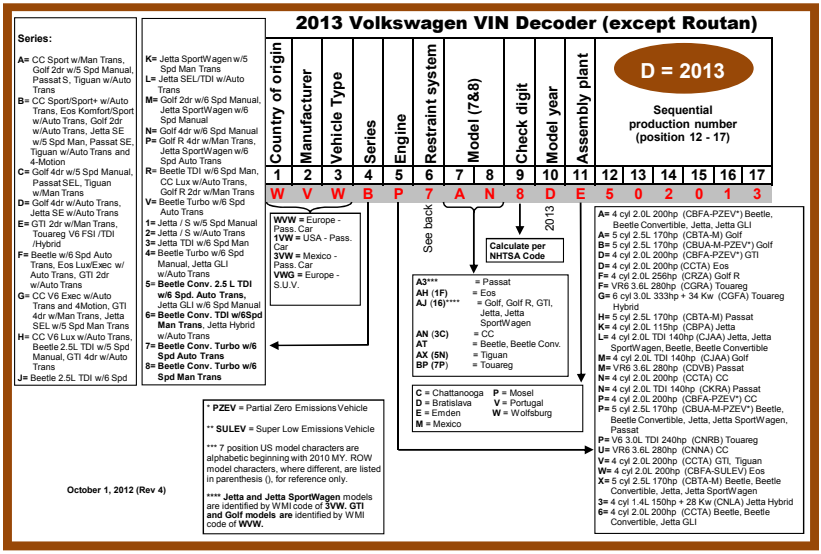
A – Vehicle Identification Number (VIN)

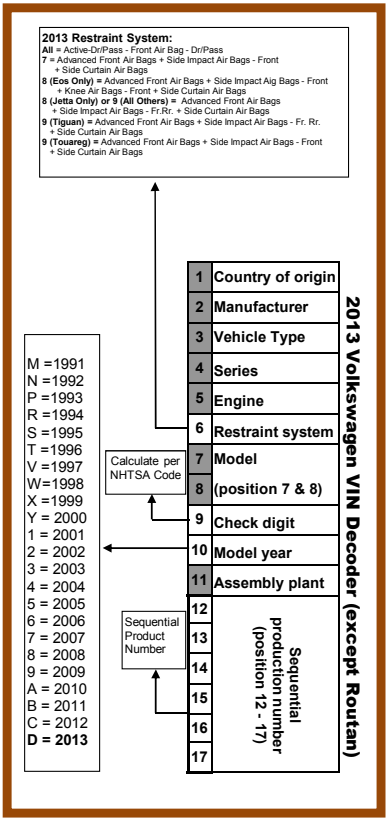
B – Variable specifications (axle loads, total permissible weights, permissible towing weights)

C – Type number

D – Engine code

VIN Decoder


2013 Volkswagen VIN Decoder (except Routan)
Series:
A= CC Sport w/Man Trans, Golf 2dr w/5 Spd Manual, Passat S, Tiguan w/Auto Trans
B= CC Sport/Sport+ w/Auto Trans, Eos Komfort/Sport w/Auto Trans, Golf 2dr w/Auto Trans, Jetta SE w/5 Spd Man, Passat SE, Tiguan w/Auto Trans and 4-Motion
C= Golf 4dr w/5 Spd Manual, Passat SEL, Tiguan w/Man Trans
D= Golf 4dr w/Auto Trans, Jetta SE w/Auto Trans
E= GTI 2dr w/Man Trans, Touareg V6 FSI /TDI /Hybrid
F= Beetle w/6 Spd Auto Trans, Eos Lux/Exec w/ Auto Trans, GTI 2dr w/Auto Trans
G= CC V6 Exec w/Auto Trans and 4Motion, GTI 4dr w/Man Trans, Jetta SEL w/5 Spd Man Trans
H= CC V6 Lux w/Auto Trans, Beetle 2.5L TDI w/5 Spd Manual, GTI 4dr w/Auto Trans
J= Beetle 2.5L TDI w/6 Spd
K= Jetta SportWagen w/5 Spd Man Trans
L= Jetta SEL/TDI w/Auto Trans
M= Golf 2dr w/6 Spd Manual, Jetta SportWagen w/6 Spd Manual
N= Golf 4dr w/6 Spd Manual
P= Golf R 4dr w/Man Trans, Jetta SportWagen w/6 Spd Auto Trans
R= Beetle TDI w/6 Spd Man. CC Lux w/Auto Trans, Golf R 2dr w/Man Trans
V= Beetle Turbo w/6 Spd Auto Trans
1= Jetta / S w/5 Spd Manual
2= Jetta / S w/Auto Trans
3= Jetta TDI w/6 Spd Man
4= Beetle Turbo w/6 Spd Manual, Jetta GLI w/Auto Trans
5= Beetle Conv. 2.5 L TDI w/6 Spd. Auto Trans, Jetta GLI w/6 Spd Manual
6= Beetle Conv. TDI w/6Spd Man Trans, Jetta Hybrid w/Auto Trans
7= Beetle Conv. Turbo w/6 Spd Auto Trans
8= Beetle Conv. Turbo w/6 Spd Man Trans
Country of origin
Manufacturer
Vehicle Type
Series
Engine
Restraint system
Model (7&8)
Check digit
Model year
Assembly plant
D = 2013
Sequential production number (position 12 - 17)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
W V W B P 7 A N 8 D E 5 0 2 0 1 3
WVW = Europe - Pass. Car
1VW = USA - Pass. Car
3VW = Mexico - Pass. Car
VWG = Europe - S.U.V.
See back
Calculate per NHTSA Code
2013
A3*** = Passat
AH (1F) = Eos
AJ (16)**** = Golf, Golf R, GTI, Jetta, Jetta SportWagen
AN (3C) = CC
AT = Beetle, Beetle Conv.
AX (5N) = Tiguan
BP (7P) = Touareg
C = Chattanooga
D = Bratislava
E = Emden
M = Mexico
P = Mosel
V = Portugal
W = Wolfsburg
A= 4 cyl 2.0L 200hp (CBFA-PZEV*) Beetle, Beetle Convertible, Jetta, Jetta GLI
A= 5 cyl 2.5L 170hp (CBTA-M) Golf
B= 5 cyl 2.5L 170hp (CBUA-M-PZEV*) Golf
D= 4 cyl 2.0L 200hp (CBFA-PZEV*) GTI
D= 4 cyl 2.0L 200hp (CCTA) Eos
F= 4 cyl 2.0L 256hp (CRZA) Golf R
F= VR6 3.6L 280hp (CGRA) Touareg
G= 6 cyl 3.0L 333hp + 34 Kw (CGFA) Touareg Hybrid
H= 5 cyl 2.5L 170hp (CBTA-M) Passat
K= 4 cyl 2.0L 115hp (CBPA) Jetta
L= 4 cyl 2.0L TDI 140hp (CJAA) Jetta, Jetta SportWagen, Beetle, Beetle Convertible
M= 4 cyl 2.0L TDI 140hp (CJAA) Golf
M= VR6 3.6L 280hp (CDVB) Passat
N= 4 cyl 2.0L 200hp (CCTA) CC
N= 4 cyl 2.0L TDI 140hp (CKRA) Passat
P= 4 cyl 2.0L 200hp (CBFA-PZEV*) CC
P= 5 cyl 2.5L 170hp (CBUA-M-PZEV*) Beetle, Beetle Convertible, Jetta, Jetta SportWagen, Passat
P= V6 3.0L TDI 240hp (CNRB) Touareg
U= VR6 3.6L 280hp (CNNA) CC
V= 4 cyl 2.0L 200hp (CCTA) GTI, Tiguan
W= 4 cyl 2.0L 200hp (CBFA-SULEV) Eos
X= 5 cyl 2.5L 170hp (CBTA-M) Beetle, Beetle Convertible, Jetta, Jetta SportWagen
3= 4 cyl 1.4L 150hp + 28 Kw (CNLA) Jetta Hybrid
6= 4 cyl 2.0L 200hp (CCTA) Beetle, Beetle Convertible, Jetta GLI
* PZEV = Partial Zero Emissions Vehicle
** SULEV = Super Low Emissions Vehicle
*** 7 position US model characters are alphabetic beginning with 2010 MY. ROW model characters, where different, are listed in parenthesis (), for reference only.
**** Jetta and Jetta SportWagen models are identified by WMI code of 3VW. GTI and Golf models are identified by WMI code of WVW.
October 1, 2012 (Rev 4)


2013 Restraint System:
All = Active-Dr/Pass - Front Air Bag - Dr/Pass
7 = Advanced Front Air Bags + Side Impact Air Bags - Front + Side Curtain Air Bags
8 (Eos Only) = Advanced Front Air Bags + Side Impact Aig Bags - Front + Knee Air Bags - Front + Side Curtain Air Bags
8 (Jetta Only) or 9 (All Others) = Advanced Front Air Bags + Side Impact Air Bags - Fr.Rr. + Side Curtain Air Bags
9 (Tiguan) = Advanced Front Air Bags + Side Impact Air Bags - Fr. Rr. + Side Curtain Air Bags
9 (Touareg) = Advanced Front Air Bags + Side Impact Air Bags - Front + Side Curtain Air Bags
M =1991
N =1992
P =1993
R =1994
S =1995
T =1996
V =1997
W=1998
X =1999
Y = 2000
1 = 2001
2 = 2002
3 = 2003
4 = 2004
5 = 2005
6 = 2006
7 = 2007
8 = 2008
9 = 2009
A = 2010
B = 2011
C = 2012
D = 2013
Calculate per NHTSA Code
Sequential Product Number
1 Country of origin
2 Manufacturer
3 Vehicle Type
4 Series
5 Engine
6 Restraint system
7 Model
8 (position 7 & 8)
9 Check digit
10 Model year
11 Assembly plant
12 13 14 15 16 17
Sequential production number (position 12 - 17)
2013 Volkswagen VIN Decoder (except Routan)

SALES CODES

Engine Codes

CBPA	2.0L 4-cylinder 2V
CBFA/CCTA	2.0L 4-cylinder 4V
CJAA	2.0L TDI 4-cylinder 4V turbo
CBTA/CBUA	2.5L 5-cylinder 4V

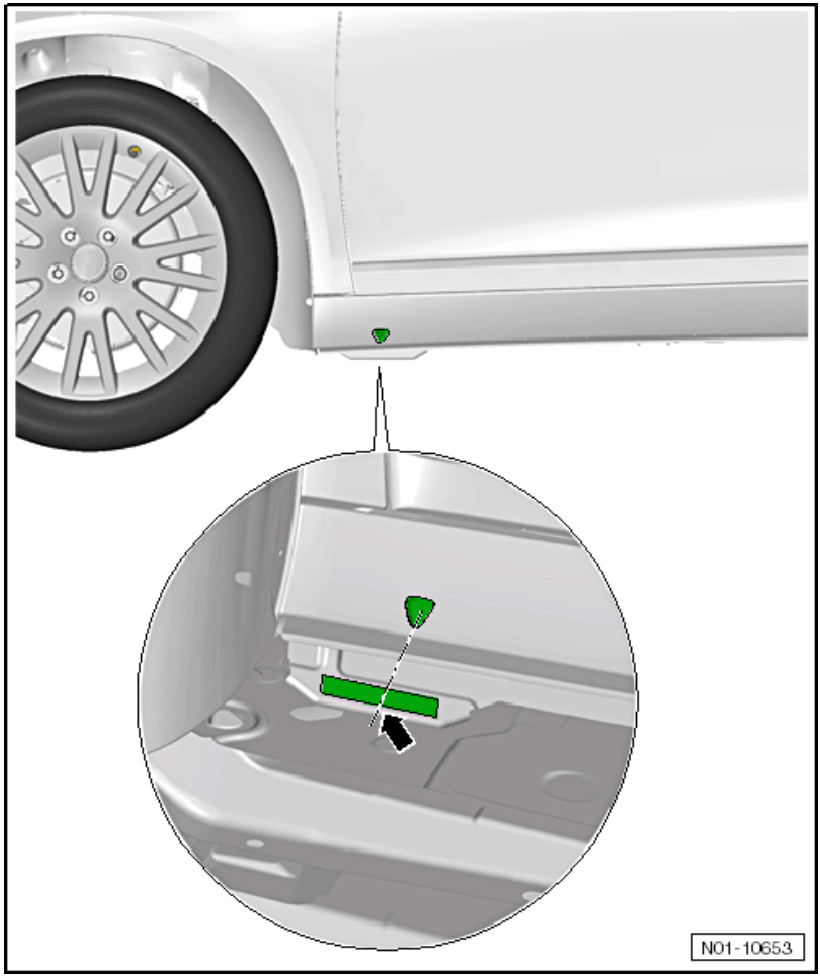
Transmission Codes

0AF	5-speed manual
0A4	5-speed manual
02Q	6-speed manual
02E	6-speed direct shift
09G	6-speed automatic

VEHICLE LIFTING

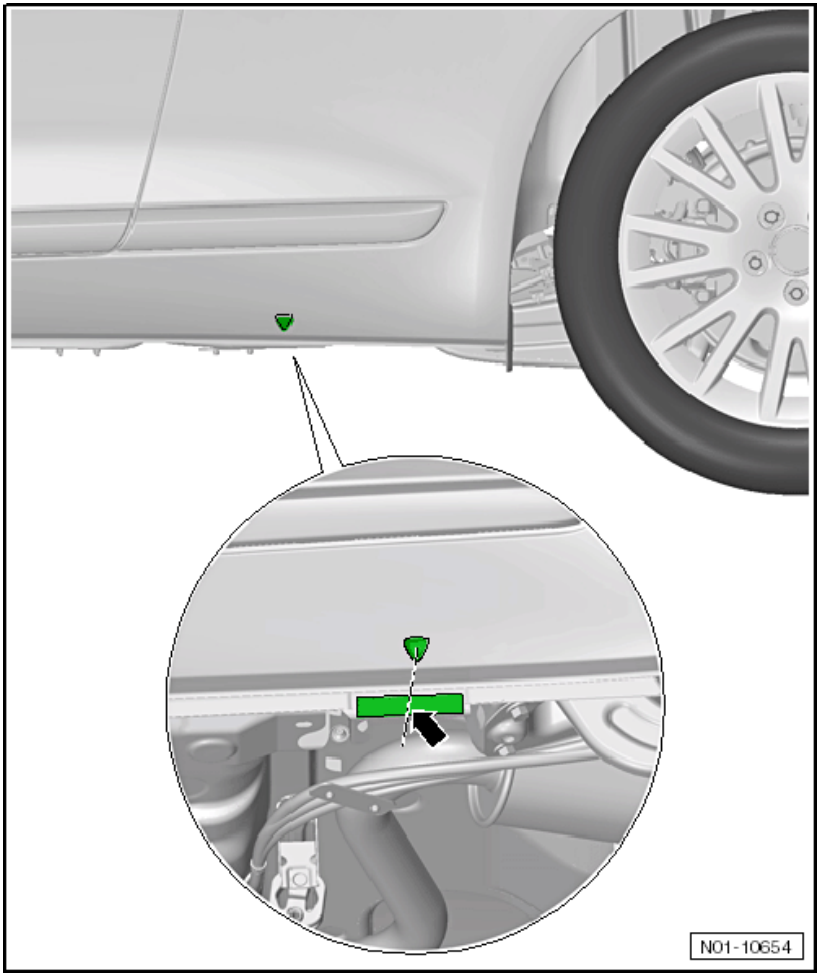
Hoist and Jack Mounting Points

Front



Position the support plate in the side member vertical reinforcement area ➡.

Rear

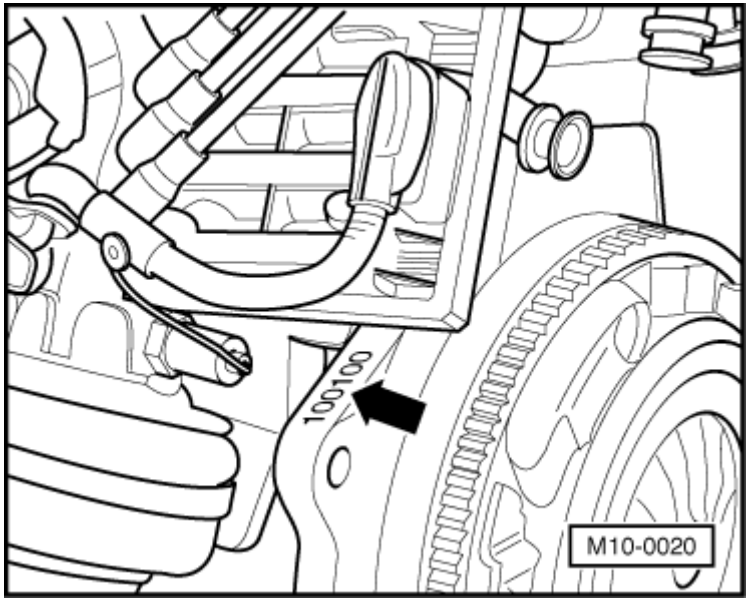


Position the support plate in the side member vertical reinforcement area ➡.

ENGINE – 2.0L CBPA

General Information – 2.0L CBPA

Engine Number



The engine number (engine code and serial number) is located at the front of the engine/transmission joint.

The engine number consists of up to nine alphanumeric characters. The first three letters are the engine code. The next six digits are the engine serial number. If more than 999,999 engines with the same engine code are produced, the first of the six characters is replaced with a letter. There is also a label ➡ on the toothed belt guard that shows the engine code and the engine serial number. The engine code is also included on the vehicle data plates.

Vehicles with a Four Digit Engine Code:

- Four digit engine codes begin with the letter “C”.
- The first three positions describe the engine type and are stamped onto the engine.
- The fourth position describes the engine output and torque.
- The 4 digit engine code is also stored in the ECM and is also found on the type plate and the vehicle data label.

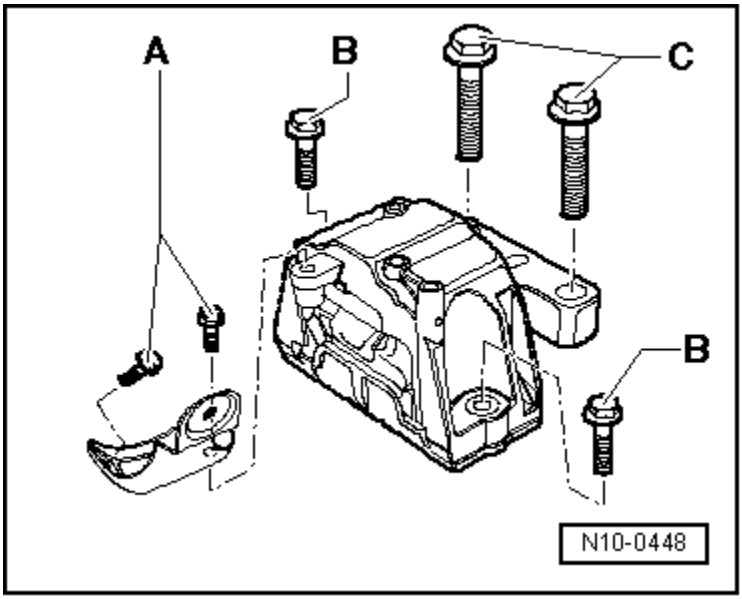
Engine Data

Code Letters		**CBPA**
Manufactured		from 06.10
Emission values in accordance with		ULEV 2 [1]
Displacement	liter	2.0
Output	kW at RPM	85 at 5200
Torque	Nm at RPM	170 at 4000
Bore	Diameter mm	82.5
Stroke	mm	92.8
Compression ratio		10.3:1
Valves per cylinder		2
Research Octane Number (RON)	Minimum	95 RON (or 91 RON unleaded)
Fuel injection		Motronic ME 17
Ignition		Motronic ME 17
Knock control		Knock Sensor (KS) 1
On Board Diagnostic (OBD)		OBD II
Oxygen Sensor (O2S) regulation		2 sensors
Catalytic converter		Yes
Turbocharger, Supercharger		No
Secondary Air Injection (AIR) system		No
Variable intake manifold		No
Variable Valve Timing (VVT)		No

[1] Ultra Low Emission Vehicles 2

Engine Assembly – 2.0L CBPA

Engine Mount Tightening Specifications

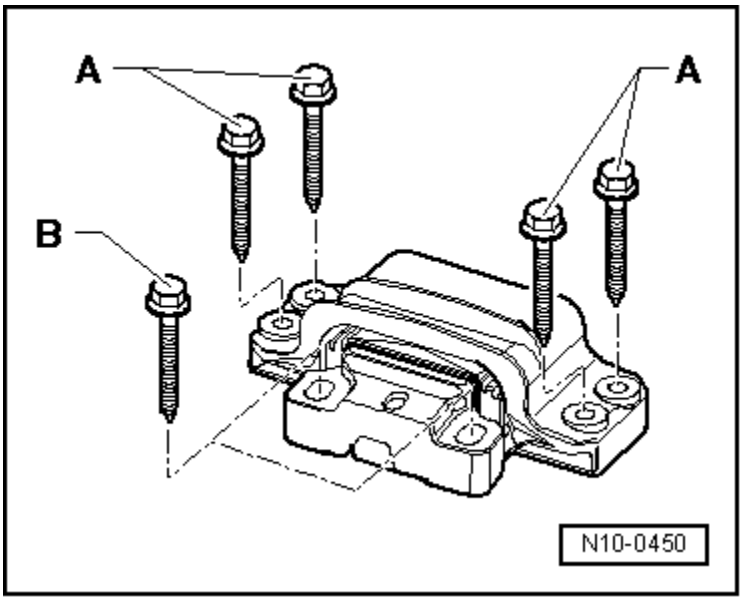


Component	Nm
A (always replace)	20 plus an additional 90° (¼ turn)
B (always replace)	40 plus an additional 90° (¼ turn)
C (always replace)	60 plus an additional 90° (¼ turn)

Fastener Tightening Specifications

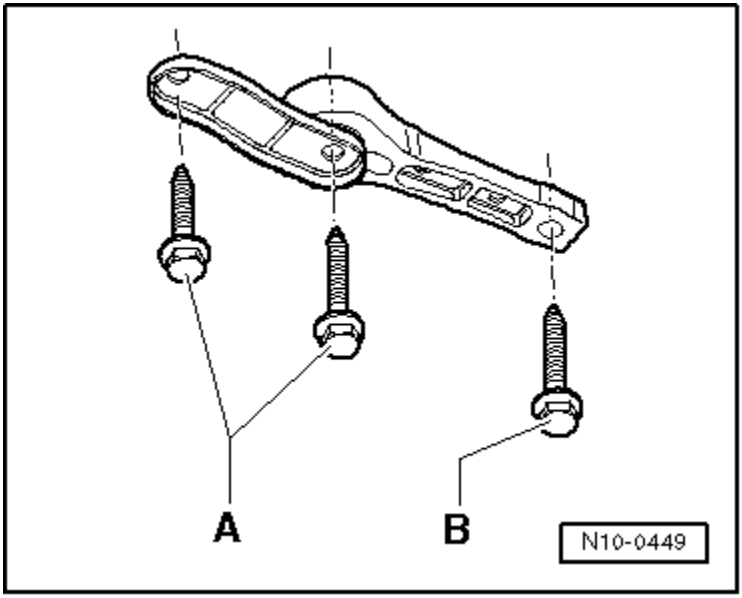
Component	Fastener Size	Nm
Bolts and nuts	M6	9
	M7	15
	M8	23
	M10	40
	M12	60

Transmission Mount Tightening Specifications



Component	Nm
A (always replace)	40 plus an additional 90° (¼ turn)
B (always replace)	60 plus an additional 90° (¼ turn)

Pendulum Support Tightening Specifications



Component	Nm
A (always replace)	40 plus an additional 90° (¼ turn)
B (always replace)	100 plus an additional 90° (¼ turn)

Crankshaft, Cylinder Block – 2.0L CBPA

Fastener Tightening Specifications

Component	Nm
Accessory bracket-to-cylinder block bolt	25
Adapter-to-cylinder block bolt	15
Bracket-to-cylinder block/coolant line bolt/nut	9
Bracket-to-oil filter bracket bolt	9
Center toothed belt guard-to-cylinder block bolt (always replace)	9
Connecting rod bearing cap-to-connecting rod bolt (always replace)	30 plus an additional 90° (¼ turn)
Coolant line-to-cylinder block bolt	25
Coolant pump/rear toothed belt guard-to-cylinder block bolt	15
Crankshaft bearing cap-to-cylinder block bolt (always replace)	65 plus an additional 90° (¼ turn)
Crankshaft toothed belt sprocket-to-crankshaft bolt (always replace)	90 plus an additional 90° (¼ turn)
Engine mount bracket-to-cylinder block bolt	45
Engine oil cooler-to-oil filter bracket nut	25
Flywheel/drive plate-to-crankshaft/sensor wheel bolt (always replace)	60 plus an additional 90° (¼ turn)
Knock sensor-to-cylinder block bolt [1)]	20
Lower toothed belt guard-to-cylinder block bolt (always replace)	9
Oil filter bracket-to-cylinder block bolt (always replace)	15 plus an additional 90° (¼ turn)
Oil pump-to-cylinder block bolt	15
Power steering fluid reservoir bracket-to-cylinder block bolt	23
Pressure relief valve	27
Rear toothed belt guard-to-cylinder block bolt	20
Ribbed belt tensioner-to-cylinder block bolt	23
Sealing flange-to-cylinder block bolt	15
Sensor wheel-to-crankshaft bolt (always replace)	10 plus an additional 90° (¼ turn)
Toothed belt tensioner-to-cylinder block nut	20
Vibration damper-to-crankshaft bolt	25

[1)] Tightening specification affects the function of the Knock Sensor (KS).

Crankshaft Dimensions

Honing dimension in mm	Crankshaft bearing stub axle - diameter		Connecting rod bearing stub axle - diameter	
Basic dimension	54.00	– 0.017	47.80	– 0.022
		– 0.037		– 0.042
1st oversize	53.75	– 0.017	47.55	– 0.022
		– 0.037		– 0.042
2nd oversize	53.50	– 0.017	47.30	– 0.022
		– 0.037		– 0.042
Stage III	53.25	– 0.017	47.05	– 0.022
		– 0.037		– 0.042

Piston and Cylinder Dimensions

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

[1)] Measurements are without the graphite coating (thickness = 0.02 mm). The graphite coating wears off.

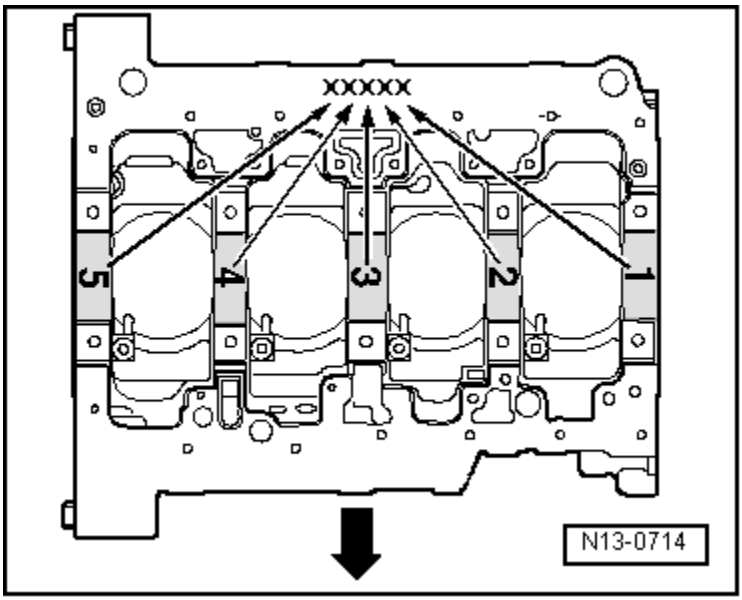
Piston Ring Gap

Piston ring gap Dimensions in mm	New	Wear limit
Compression rings	0.20 to 0.40	0.8
Oil scraping ring	0.25 to 0.50	0.8

Piston Ring Groove Clearance

Piston ring to groove clearance Dimensions in mm	New	Wear limit
Compression rings	0.06 to 0.09	0.20
Oil scraping ring	0.03 to 0.06	0.15

Upper Crankshaft Bearing Identification



The upper bearing shells are allocated to the cylinder block with the correct thickness from the factory. The colored dots identify the bearing shell thickness. The letters (x) marked on the lower sealing surface of the cylinder block identify which bearing thickness must be installed in which location. The ➡ points in the direction of travel.

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

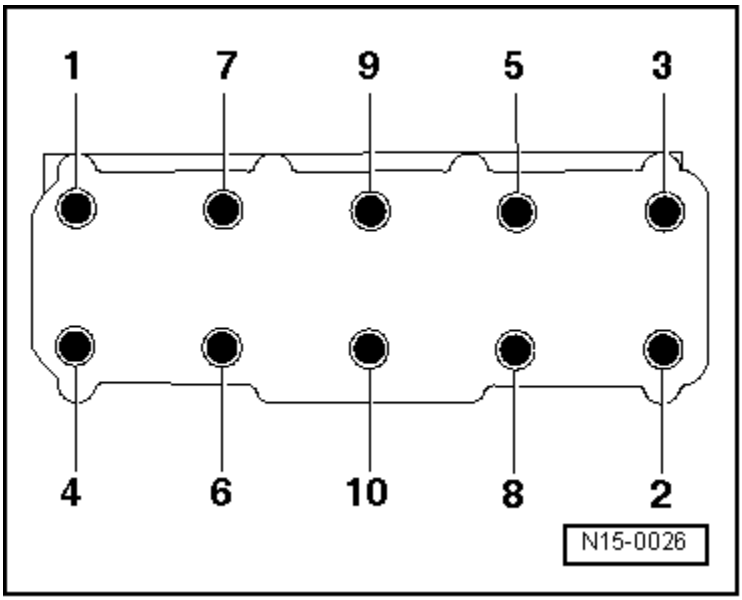
If the colored marks are not yet stamped or are no longer readable, use the center (red) bearing shell. The lower crankshaft bearing shells are shipped as a replacement part with a yellow dot.

Cylinder Head, Valvetrain – 2.0L CBPA

Fastener Tightening Specifications

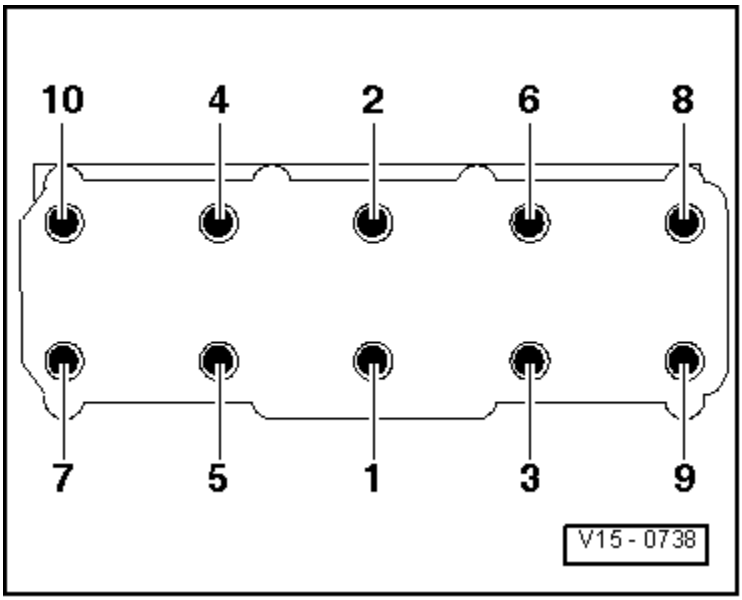
Component	Nm
Camshaft bearing cap-to-cylinder head nut	20
Camshaft sprocket-to-camshaft bolt	100
Coolant distribution housing-to-cylinder head bolt	9
Cylinder head cover-to-cylinder head nut	10
Engine mount bracket-to-cylinder block bolt	45
Lifting eye-to-cylinder head bolt	20
Plug-to-cylinder head (always replace)	15
Rear toothed belt guard-to-cylinder block bolt	15
Rear toothed belt guard/camshaft position sensor-to-cylinder head bolt	20
Ribbed belt tensioner-to-cylinder block bolt	23
Toothed belt tensioner-to-cylinder block nut	20
Vibration damper-to-crankshaft bolt	25

Cylinder Head Removal



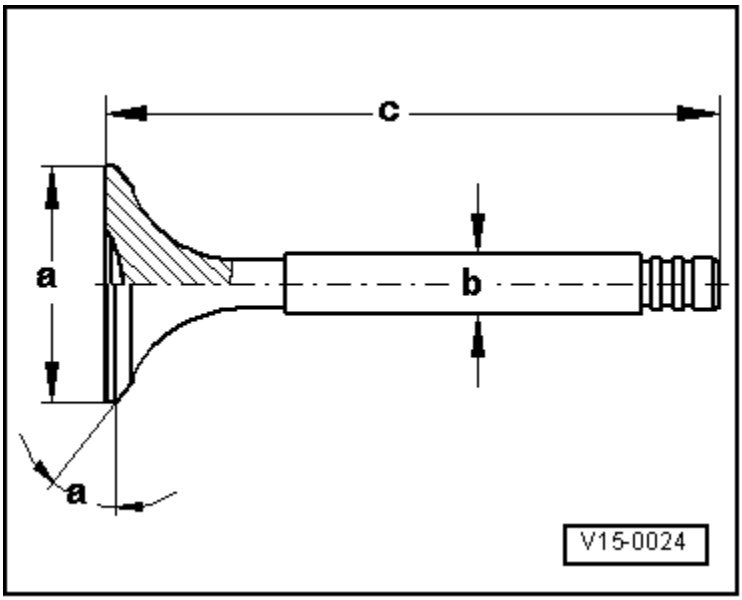
Loosen and remove the cylinder head bolts 1 through 10 in sequence.

Cylinder Head Installing



Step	Tighten	Nm
1	Using a torque wrench, tighten the bolts	40
2	Using a ratchet, tighten the bolts	an additional 90° (¼ turn)
3	Using a ratchet, tighten the bolts	an additional 90° (¼ turn)

Valve Dimensions



Dimension		Intake Valve	Exhaust Valve
Diameter a	mm	39.50 ± 0.15	32.90 ± 0.15
Diameter b	mm	6.92 ± 0.02	6.92 ± 0.02
c	mm	91.85	91.15
α	∠°	45	45

Lubrication – 2.0L CBPA

Fastener Tightening Specifications

Component	Nm
Chain tensioner with tensioning rail-to-cylinder block	15
Check valve-to-oil filter bracket	8
Engine oil cooler-to-oil filter bracket nut	25
Lower oil pan-to-upper oil pan bolt	22
Oil drain plug-to-oil pan	30
Oil filter bracket-to-cylinder block bolt (always replace)	15 plus an additional 90° (¼ turn)
Oil pressure switch-to-oil filter bracket	25
Plug-to-oil filter bracket (always replace) [1)]	40
Plug-to-oil filter bracket [1)]	15
Pressure relief valve-to-cylinder block	27
Sealing flange-to-cylinder block bolt	15
Splash wall-to-cylinder block bolt	10
Sprocket-to-oil pump bolt (always replace)	20 plus an additional 90° (¼ turn)
Suction pipe-to-oil pump bolt	15

1) For bolt tightening clarification, refer to ElsaWeb, Oil Filter Bracket and Attachments Overview, items 1 and 6.

Oil Pan-to-Cylinder Block Tightening Specifications

Step	Tighten	Nm
1	Tighten the oil pan to cylinder block bolts very lightly in a diagonal sequence	
2	Tighten the oil pan to transmission bolts lightly	
3	Tighten the oil pan to cylinder block bolts lightly in a diagonal sequence	
4	Tighten the oil pan to transmission bolts	45
5	Tighten the oil pan to cylinder block bolts in a diagonal sequence	15

Cooling System – 2.0L CBPA

Fastener Tightening Specifications

Component	Nm
Air conditioning condenser-to-radiator bolt	5
Connecting pipe bracket-to-fan shroud bolt	2
Coolant distribution housing-to-cylinder head bolt	9
Coolant expansion tank-to-body bolt	2
Coolant fan control thermal switch-to-lower coolant hose	3
Coolant line bolt	40
Coolant pump/rear toothed belt guard-to-cylinder block bolt	15
Fan-to-fan shroud nut	5
Fan shroud-to-radiator bolt	5
Radiator mount-to-lock carrier bolt	7
Rear toothed belt guard-to-cylinder head bolt	20
Ribbed belt tensioner-to-cylinder block bolt	23
Thermostat housing-to-cylinder block bolt	15

Fuel Supply – 2.0L CBPA

Fastener Tightening Specifications

Component	Fastener Size	Nm
Accelerator Pedal Position (APP) sensor/ Accelerator Pedal Position 2 (APP2) sensor-to-body bolt	-	10
Air filter housing-to-Leak Detection Pump (LDP) bracket nut	-	2
EVAP canister-to-underbody bolt	-	8
Fuel filler tube-to-body bolt	-	10
Fuel filter bracket bolt	-	3
Fuel tank securing strap-to-underbody bolt (always replace)	M8	25
Fuel tank-to-underbody bolt	M6	10
Leak Detection Pump (LDP) bracket-to-body nut	-	6
Leak Detection Pump (LDP) bracket-to-Leak Detection Pump (LDP) bolt	-	3
Lock ring-to-fuel tank	-	110

Multiport Fuel Injection – 2.0L CBPA

Technical Data

Engine Code	CBPA
Idle check Engine idle speed RPM	780 [1]
Engine Control Module (ECM) System designation Part number:	Motronic ME 17 Refer to the Parts Catalog
Engine speed limitation RPM	Approximately 6300

[1] Applies to manual and automatic transmissions. If the voltage supply for the ECM drops below 12 volts, the idle speed gradually increases up to 880 RPM. The idle speed is not adjustable.

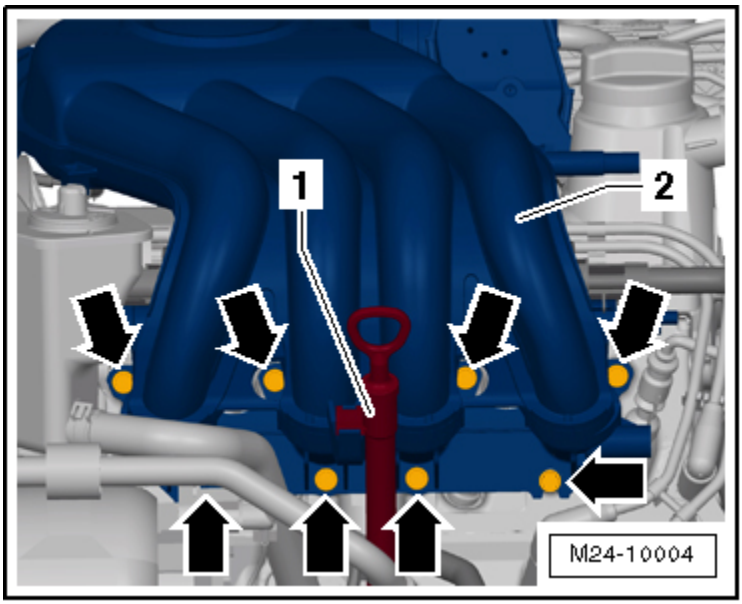
[2] Replace the ECM. Refer to *Chapter "Engine Control Module"*.

Fastener Tightening Specifications

Component	Nm
Air duct-to-lock carrier bolt	2.5
Bracket-to-intake air duct bolt	2
Elbow-to-lower air filter housing bolt	2
Fuel rail-to-intake manifold bolt	9
Intake air duct-to-body nut	20
Intake manifold-to-cylinder head bolt/nut	23
Lower air filter housing-to-battery tray bolt	8
Manifold Absolute Pressure (MAP) sensor-to-intake manifold bolt	2.5
Oxygen Sensor (O2S) [1]	55
Retaining clip-to-lower air filter housing bolt	2
Throttle valve control module-to-intake manifold bolt	9
Upper air filter housing-to-lower air filter housing bolt	2

[1] Lubricate the threads using hot bolt paste G 052 112 A3 only.

Intake Manifold Tightening Specifications



Starting from the inside and working toward the outside, tighten the intake manifold bolts in a diagonal sequence to 23 Nm.

Exhaust System, Emission Controls – 2.0L CBPA

Fastener Tightening Specifications

Component	Nm
Clamping sleeve nut	23
Exhaust manifold-to-cylinder head nut (always replace)	23
Front exhaust pipe with catalytic converter-to-exhaust manifold nut (always replace)	23
Heat shield-to-catalytic converter	
Front bolt	10
Rear bolt	5
Muffler suspended mount-to-underbody bolt	23
Oxygen Sensor (O2S)	55
Rear crossmember-to-underbody nut	20
Suspended mount-to-subframe bolt	23
Suspended mount-to-underbody bolt [2]	26
	23
Warm air collector plate-to-cylinder head bolt [1]	10
	23

[1] For bolt tightening clarification, refer to ElsaWeb, Exhaust Manifold, Front Exhaust Pipe with Catalytic Converter and Attachments Overview, items 3 and 4.

[2] For bolt tightening clarification, refer to ElsaWeb, Muffler and Mounts Overview, items 2 and 4.

Ignition – 2.0L CBPA

Technical Data

Engine Code	CBPA
Ignition sequence	1-3-4-2
Spark plugs	101 100 033 AA
Electrode gap	0.9 1.1 mm
Tightening specification	25 Nm
Change intervals	Refer to Maintenance Intervals Rep. Gr. 03

Fastener Tightening Specifications

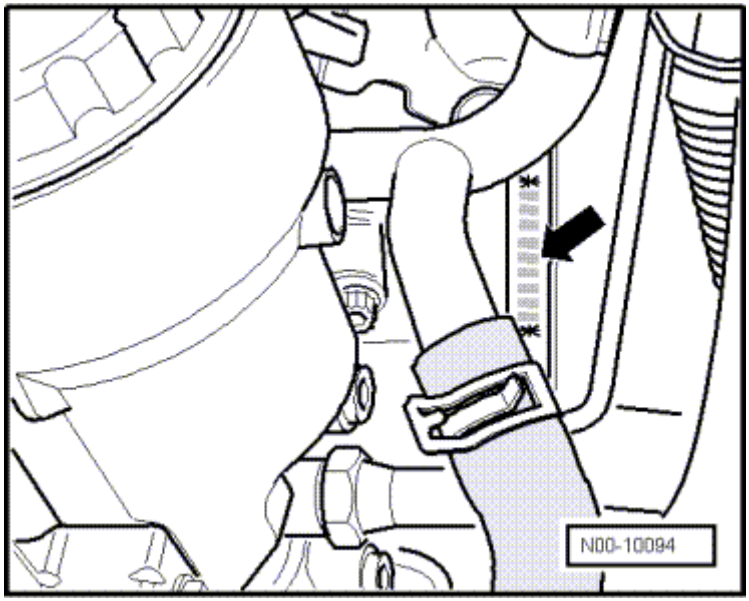
Component	Nm
Ignition coil bolt	10
Knock Sensor (KS) bolt [1]	20
Spark plug	25

[1] Tightening specifications affect the function of the Knock Sensor (KS).

ENGINE – 2.0L CJAA (TDI)

General Information

Engine Number



The engine number (engine code and serial number) ➡ is located at the front of the engine/transmission joint. There is also a label on the toothed belt guard that shows the engine code and serial number. Engine codes beginning with C are four digit. The first 3 digits of the engine code indicate the displacement and the mechanical structure of the engine. They are stamped in the cylinder block, including the serial number. The fourth digit describes the engine output and torque.

Engine Data

Code Letters		**CJAA**
Manufactured		From 05.09
Emissions values	in accordance with	ULEV2 Standard
Displacement	liter	2.0
Output	kW at RPM	103 at 4000
Torque	Nm at RPM	320 at 1750 - 2500
Bore	Diameter mm	81.0
Stroke	mm	95.5
Valves per cylinder		4
Compression ratio		16.5
Diesel fuel	in accordance with	ASTM D 975 Standard [1)]
Ignition sequence		1-3-4-2
Balance shaft module		No
Nitrogen Oxide (NOx) reduction catalytic converter		Yes
Reduction catalytic converter		Yes
Exhaust Gas Recirculation (EGR)		Yes
Turbocharger, Supercharger		Turbocharger
Charge Air Cooler (CAC)		Yes
Particulate filter		Yes

[1)] With a sulfur content less than 15 mg/kg of diesel fuel.

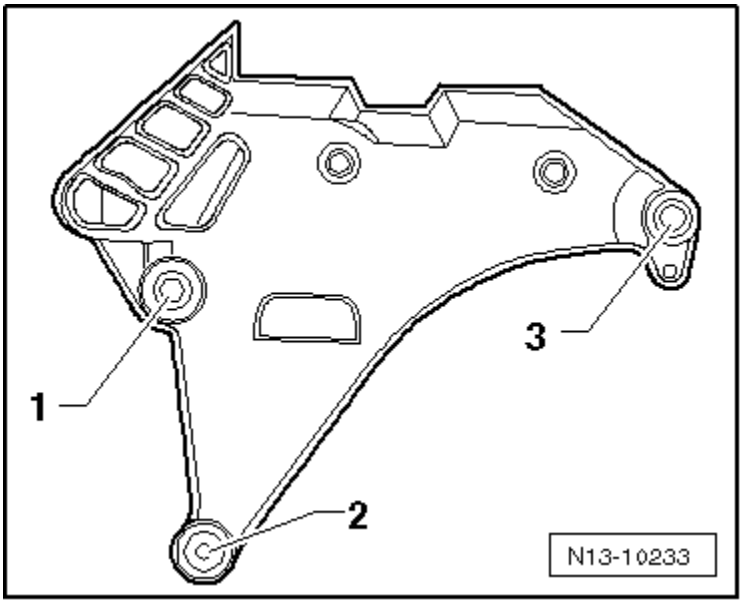
Engine Assembly – 2.0L CJAA (TDI)

Fastener Tightening Specifications

Component	Fastener Size	Nm
Bolts and nuts	M6	10
	M7	15
	M8	20
	M10	40
	M12	65 [1)]
Bracket-to-body bolt (always replace)	-	20 plus an additional 90° (¼ turn)
Bracket-to-engine mount bolt (always replace)	-	20 plus an additional 90° (¼ turn)
Engine mount-to-body bolt (always replace)	-	40 plus an additional 90° (¼ turn)
Engine mount-to-engine mount bracket bolt (always replace)	-	60 plus an additional 90° (¼ turn)
Pendulum support-to-subframe bolt (always replace)	-	100 plus an additional 90° (¼ turn)
Pendulum support-to-transmission bolt (always replace)	-	50 plus an additional 90° (¼ turn)
Transmission mount-to-body bolt (always replace)	-	40 plus an additional 90° (¼ turn)
Transmission mount-to-transmission mount bracket (always replace)	-	60 plus an additional 90° (¼ turn)

[1)] Specification for the M23 collar bolt: 75 Nm

Engine Mount Bracket-to-Cylinder Block Tightening Specifications



WARNING

Always use the correct tightening sequence and specifications for the engine mount bracket bolts. Otherwise tension could develop in the engine mount bracket and break it.

Step	Component	Nm
1	Tighten bolts 1 through 3 in sequence by hand	Hand-tighten
2	Tighten the bolts 1 through 3 in sequence	40 plus an additional 180° (½ turn)

Crankshaft, Cylinder Block – 2.0L CJAA (TDI)

Fastener Tightening Specifications

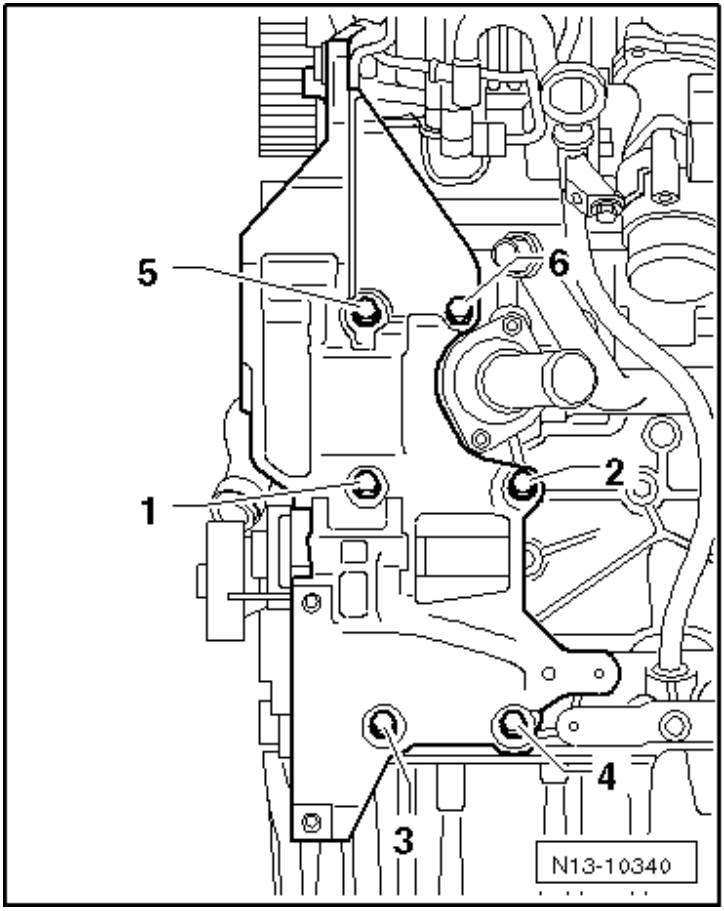
Component	Nm
Accessory bracket-to-belt tensioner bolt (always replace) [1]	20 plus an additional 180° (½ turn)
Air conditioning compressor-to-accessory bracket bolt	45
Camshaft toothed belt gear-to-camshaft bolt (always replace)	20 plus an additional 45° (⅛ turn)
Center toothed belt guard-to-lower toothed belt guard bolt (always replace)	10
Connecting piece-to-cylinder block bolt	15
Connecting rod cap-to-connecting rod bolt (always replace) [6]	30 plus an additional 90° (¼ turn)
Coolant pump-to-cylinder block bolt	15
Crankshaft bearing cap-to-cylinder block bolt (always replace)	65 plus an additional 90° (¼ turn)
Crankshaft toothed belt gear-to-crankshaft bolt (always replace) [2]	120 plus an additional 90° (¼ turn)
Engine mount bracket-to-cylinder block bolt	40 plus an additional 180° (½ turn)
Engine speed sensor-to-cylinder block bolt	5
Flywheel-to-crankshaft bolt (always replace)	60 plus an additional 90° (¼ turn)
Generator-to-accessory bracket bolt	25
High pressure fuel pump toothed belt gear-to-camshaft bolt (always replace)	20 plus an additional 90° (¼ turn)
Hub-to-camshaft bolt	100
Hub-to-high pressure fuel pump nut	95
Oil filter bracket-to-cylinder block bolt (always replace) [4]	15 plus an additional 90° (¼ turn)
Oil pan-to-cylinder block bolt [5]	15
Oil spray jet-to-cylinder block bolt	27
Protective plate-to-rear toothed belt guard bolt	5

Fastener Tightening Specifications *(cont'd)*

Component	Nm
Rear toothed belt guard-to-cylinder block/head bolt (always replace) [2]	10
	20
Sealing flange-to-cylinder block bolt	15
Toothed belt idler roller-to-cylinder block bolt (always replace) [3]	25
	50 plus an additional 90° (¼ turn)
Toothed belt idler roller-to-cylinder block nut	20
Toothed belt tensioner-to-cylinder head stud nut (always replace)	20 plus an additional 45° (⅛ turn)
Vibration damper pulley-to-crankshaft bolt (always replace)	10 plus an additional 90° (¼ turn)
Wiring harness bracket-to-oil filter bracket bolt	10

[1] Do not lubricate or grease the threads or collar.
[2] For bolt tightening clarification, refer to ElsaWeb, Toothed Belt Overview, items 14 and 15.
[3] For bolt tightening clarification, refer to ElsaWeb, Toothed Belt Overview, items 10 and 17.
[4] First, fasten the upper left and lower right bolts, and then tighten all four bolts in a diagonal sequence.
[5] Tighten in a diagonal sequence and in steps.
[6] Lubricate the threads and contact surface.

Accessory Bracket Tightening Specifications



Component	Nm
Tighten new accessory bracket bolts 1 through 6 in sequence	40 plus an additional 90° (¼ turn)

Piston and Cylinder Dimensions

Honing dimension in mm	Piston diameter [1)]	Cylinder bore diameter
Basic dimension	80.960	81.010

[1)] Take the measurement approximately 12 mm in from the lower edge of the piston and offset 90° to the piston axis.

Crankshaft Dimensions

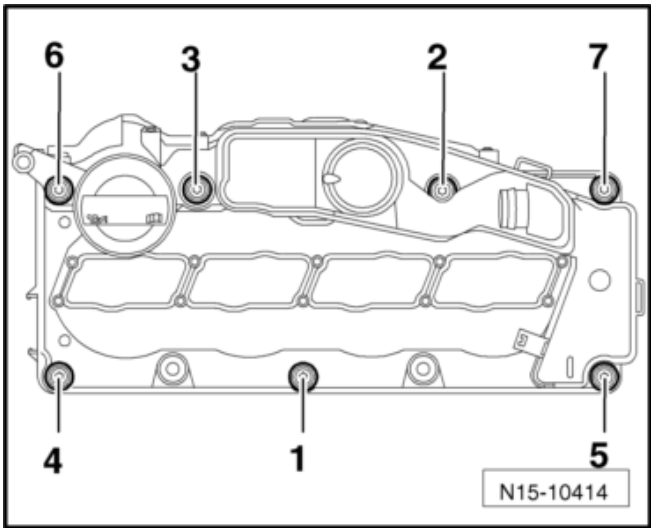
Honing dimension in mm	Crankshaft bearing pins-diameter		Connecting rod bearing pin-diameter	
Basic dimension	54.000	- 0.022	50.900	- 0.022
		-0.042		- 0.042

Cylinder Head, Valvetrain – 2.0L CJAA (TDI)

Fastener Tightening Specifications

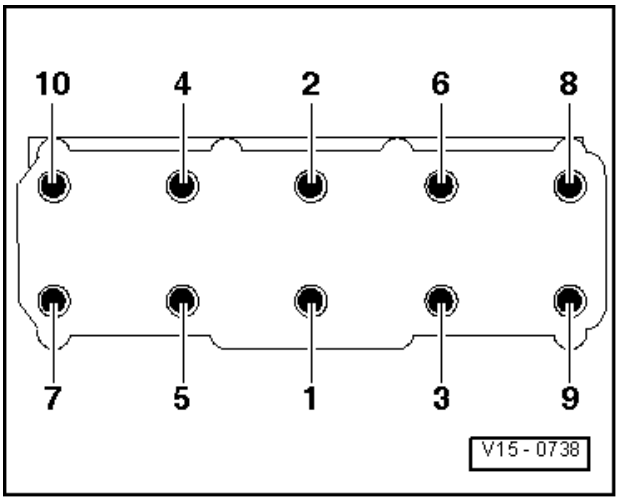
Component	Nm
Camshaft Position (CMP) sensor-to-cylinder head bolt	10
Coolant connection-to-cylinder head bolt	10
Fuel rail-to-cylinder head cover bolt	22
Heat shield-to-cylinder head cover bolt	5
Injection unit cover-to-cylinder head cover bolt	5
Injection unit tensioning bracket-to-cylinder head cover nut	10
Lifting eye-to-cylinder head stud/bolt	25
Vacuum pump-to-cylinder head bolt	10

Cylinder Head Cover Tightening Specifications



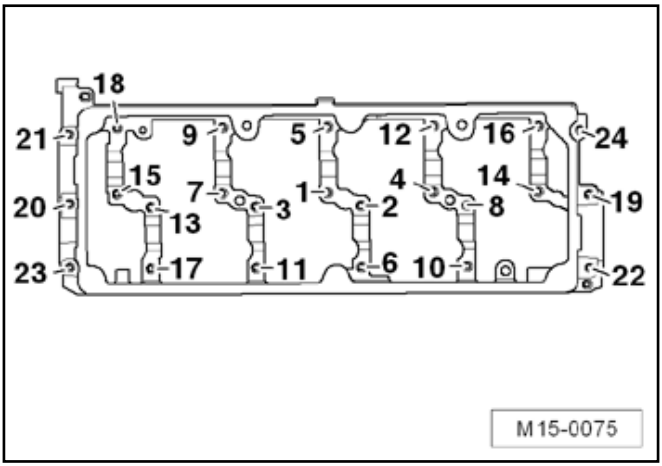
Component	Nm
Tighten the cylinder head cover bolts 1 through 7 in sequence	10

Cylinder Head Tightening Specifications



Step	Component	Nm
1	Tighten bolts using a torque wrench	35
2	Tighten bolts using a torque wrench	60
3	Tighten bolts using a ratchet	an additional 90° (¼ turn)
4	Tighten bolts using a ratchet	an additional 90° (¼ turn)

Bearing Frame Tightening Specifications



Component	Nm
Tighten the bearing frame bolts and nuts 1 through 24 in sequence	10

Lubrication – 2.0L CJAA (TDI)

Fastener Tightening Specifications

Component	Nm
Connection-to-oil filter bracket	30
Cover-to-oil filter bracket	25
Oil cooler-to-oil filter bracket locking bolt	25
Oil filter bracket-to-cylinder block bolt (always replace) [1)]	15 plus an additional 90° (¼ turn)
Oil pressure switch-to-oil filter bracket	22
Oil supply line clamp bolt	10
Oil supply line-to-connection	22
Wiring harness bracket-to-oil filter bracket bolt	10
Chain tensioner with tensioning rail-to-cylinder block bolt	15
Oil level thermal sensor-to-oil pan bolt	10
Oil pan-to-cylinder block bolt	15
Oil pan drain plug (always replace)	30
Oil pan-to-transmission bolt	40
Oil pump sprocket-to-oil pump bolt	20 plus an additional 90° (¼ turn)
Oil spray jet-to-cylinder block bolt	27
Sealing flange-to-cylinder block bolt	15
Splash wall-to-cylinder block bolt	15
Suction line-to-oil pump bolt	15

[1)] For bolt tightening clarification, refer to ElsaWeb, Oil Pump, Pan and Balance Shaft Module Overview, items 21 and 23.

Cooling System – 2.0L CJAA (TDI)

Recommended Mixture Ratios

Frost protection to	Anti-freeze quantity	G 12 Plus-Plus [1)]	Distilled water [1)]
-25°C (-13°F)	40%	3.2L	4.8L
-35°C (-31°F)	50%	4.0L	4.0L

[1)] The quantity of coolant can vary depending upon the vehicle equipment.

Fastener Tightening Specifications

Component	Nm
4/2 way valve with thermostat-to-cylinder block bolt	15
Connecting piece-to-cylinder block bolt	15
Coolant fan-to-fan shroud nut	5
Coolant pump-to-cylinder block bolt	15
Coolant reservoir-to-body stud bolt	3
Engine pre-warmer bracket-to-engine pre-warmer coolant pipe bolt	10
Engine pre-warmer coolant pipe-to-charge air pipe bolt	10
Fan shroud-to-radiator bolt	5
Radiator bolt	5
Ventilation pipe-to-intake manifold bolt	10

Fuel Supply – 2.0L CJAA (TDI)

Fastener Tightening Specifications

Component	Nm
Accelerator Pedal Position (APP) sensor and Accelerator Pedal Position 2 (APP2) sensor-to-body bolt	9
Auxiliary fuel pump bolt	20
Exhaust pressure sensor 1 bracket bolt	8
Fuel filler door unit-to-body bolt	1.5
Fuel filler tube-to-body bolt	11
Fuel filter housing bolt/nut	8
Fuel filter housing cover-to-fuel filter housing bolt	9
Fuel tank securing strap-to-body bolt (always replace)	25
Locking bolt-to-fuel filter housing cover	5
Locking ring-to-fuel tank	110

Turbocharger, G-Charger – 2.0L CJAA (TDI)

Fastener Tightening Specifications

Component	Nm
Brace-to-turbocharger stud bolt	20
Charge Air Cooler (CAC) mount bolt	5
Charge air pipe bolt	8
Charge air pressure sensor-to-charge air pipe bolt	3
Connecting hose-to-charge air pipe clamp	5
Connecting piece-to-turbocharger bolt	8
Connecting pipe-to-exhaust manifold nut [1)]	20
Control line/heat shield-to-exhaust manifold stud nut	23
Damper-to-turbocharger bolt	10
Exhaust Gas Recirculation (EGR) filter-to-stud bolt nut	23
Exhaust gas temperature sensor 1-to-exhaust manifold	45
Intake scoop-to-turbocharger bolt	8
Oil supply line bracket-to-turbocharger bolt	10
Oil supply line-to-oil filter bracket	22
Oil supply line-to-turbocharger	22
Oil return line-to-turbocharger bolt	15
Particulate filter-to-turbocharger clamp (always replace)	7
Turbocharger brace-to-cylinder block banjo bolt (always replace)	60
Turbocharger/exhaust manifold-to-cylinder head nut (always replace) [1)]	23
Vacuum actuator with charge pressure actuator position sensor-to-turbocharger bolt	8
Warm air collector plate bolt	8
Wiring harness bracket bolt	8

[1)] Lubricate the studs for the exhaust manifold with hot bolt paste G 052 112 A3.

Diesel Fuel Injection – 2.0L CJAA (TDI)

Fastener Tightening Specifications

Component	Nm
Connecting pipe-to-Exhaust Gas Recirculation (EGR) vacuum regulator solenoid valve bolt	20
Exhaust Gas Recirculation (EGR) vacuum regulator solenoid valve-to-intake manifold bolt	8
Fuel injection unit sealing cap-to-cylinder head cover bolt	5
Fuel injection unit tensioning plate-to-cylinder head cover nut	10
Fuel pressure regulator valve-to-fuel rail	80

Component	Nm
Fuel pressure sensor-to-fuel rail	100
Fuel return line clamp nut	8
Fuel rail-to-cylinder head cover bolt	22
High pressure fuel pump-to-cylinder block bolt	20
High pressure line fitting	28
High pressure line clamp nut	8
Intake air guide-to-lock carrier screw	5
Intake manifold-to-cylinder head bolt	8
Lower air filter housing-to-body bolt	8
Mass Air Flow (MAF) sensor-to-upper air filter housing screw	3.5
Throttle valve control module-to-Exhaust Gas Recirculation (EGR) vacuum regulator solenoid valve bolt	8
Throttle valve control module-to-oil dipstick tube bolt	8
Upper air filter housing-to-lower air filter housing screw	2

Exhaust System, Emission Controls – 2.0L CJAA (TDI)

Fastener Tightening Specifications

Component	Nm
Connecting pipe-to-Exhaust Gas Recirculation (EGR) housing bolt	23
Control line bracket-to-particulate filter bolt	9
Control line bracket nut	23
Control line-to-Exhaust Gas Recirculation (EGR) housing fitting	23
Control line-to-particulate filter fitting	45
Exhaust Gas Recirculation (EGR) cooler-to-Exhaust Gas Recirculation (EGR) housing bolt	8
Exhaust Gas Recirculation (EGR) filter-to-Exhaust Gas Recirculation (EGR) housing bolt	23
Exhaust Gas Recirculation (EGR) filter-to-particulate filter clamp (always replace)	3.5
Exhaust Gas Recirculation (EGR) filter-to-turbocharger stud bolt nut	23
Exhaust Gas Recirculation (EGR) valve 2-to-Exhaust Gas Recirculation (EGR) housing bolt	8
Exhaust Gas Recirculation (EGR) temperature sensor-to-Exhaust Gas Recirculation (EGR) housing bolt	20

Fastener Tightening Specifications *(cont'd)*

Component	Nm
Exhaust gas temperature sensors 2 and 3-to-particulate filter [2)]	45
Exhaust gas temperature sensor 4-to-particulate filter with NOx reduction catalytic converter [2)]	45
Exhaust pipe suspended mount-to-body bolt (always replace)	23
Exhaust pressure sensor 1-to-auxiliary fuel pump bracket	4
Exhaust pressure sensor 2 bolt [1)]	4
	8
Front muffler-to-rear muffler clamping sleeve nut	23
NOx reduction catalytic converter-to-exhaust flap control module clamp (always replace)	7
NOx reduction catalytic converter-to-front muffler clamping sleeve nut	23
Oxygen Sensor (O2S)	52
Particulate filter bracket-to-cylinder block nut	25
Particulate filter bracket-to-particulate filter/cylinder head bolt/nut	23
Particulate filter-to-NOx reduction catalytic converter clamp (always replace)	7
Particulate filter-to-particulate filter bracket nut	23
Rear muffler suspended mount-to-body bolt	23
Shield-to-particulate filter bolt	10
Suspended mount-to-subframe bolt	25
Tunnel bridge-to-body nut	23
Turbocharger-to-particulate filter clamp (always replace)	7

1) For bolt tightening clarification, refer to ElsaWeb, Particulate Filter with NOx Reduction Catalytic Converter Overview, items 3 and 4.
2) Lubricate the threads with hot bolt paste G 052 112 A3.

Ignition/Glow Plug System – 2.0L CJAA (TDI)

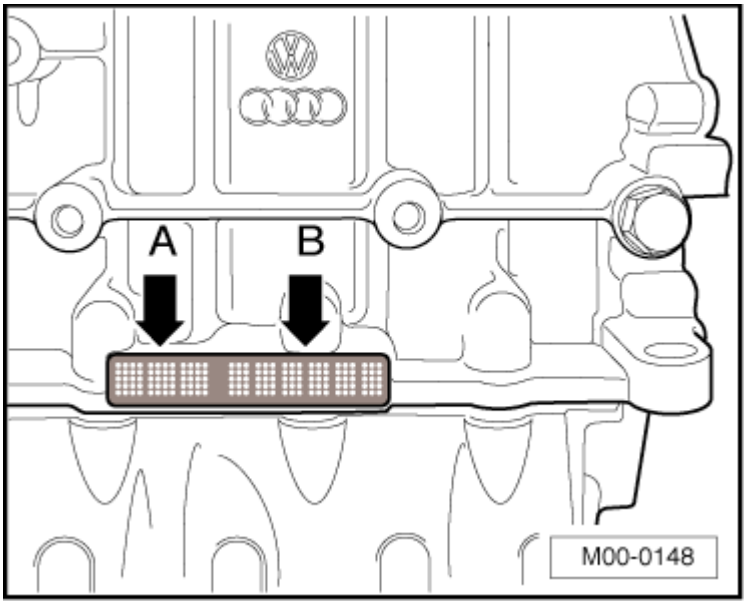
Fastener Tightening Specification

Component	Nm
Glow plug	12

ENGINE – 2.5L CBTA, CBUA

General Information

Engine Number



The engine code (A ➡) and engine number (B ➡) (serial number) are located on the rear side of the engine, above the cylinder block/ upper oil pan partition. The engine number consists of up to nine characters (alphanumeric). The first part (maximum of 3 letters) represents the engine code, the second (six digit) is the serial number. If more than 999,999 engines with the same engine code are produced, the first of the six characters is replaced with a letter. In addition, a sticker with the engine code and engine number is applied to the cylinder head cover. The engine code letters are also located on the vehicle data label. The vehicle data label is located in the customer's service schedule as well as in the spare tire wheel well or on the luggage compartment floor.

When four digit engine codes are used, the first three digits indicate the mechanical structure of the engine and are stamped on the engine. The fourth digit describes the engine output and torque.

Engine Data

Engine Code		CBTA	CBUA
Manufactured		from 07.07	from 07.07
Emission values in accordance with		through MY 2009: ULEV 2 [1] from MY 2010: TIER 2/BIN% (US coalition)	SULEV [2]
Displacement	cm^3	2480	2480
Output	kW at RPM	125 at 5700	125 at 5700
Torque	Nm at RPM	240 at 4250	240 at 4250
Bore	Diameter mm	82.5	82.5
Stroke	mm	92.8	92.8
Compression ratio		9.5	9.5
Valves per cylinder		4	4
RON	Minimum	95 unleaded [3]	95 unleaded [3]
Fuel injection, ignition		through 05.08: Motronic ME 7.1.1 from 06.08: ME 17.5	through 05.08: Motronic ME 7.1.1 from 06.08: ME 17.5
Knock control		2 sensors	2 sensors
Variable valve timing		Yes	Yes
Variable intake manifold		No	No
Oxygen Sensor (O2S) regulation		2 sensors	3 sensors
Catalytic converter		Yes	Yes
Exhaust Gas Recirculation (EGR)		No	No
Turbocharger, Supercharger		No	No
Secondary Air Injection (AIR) system		Through MY 2009: Yes From MY 2010: No	Yes

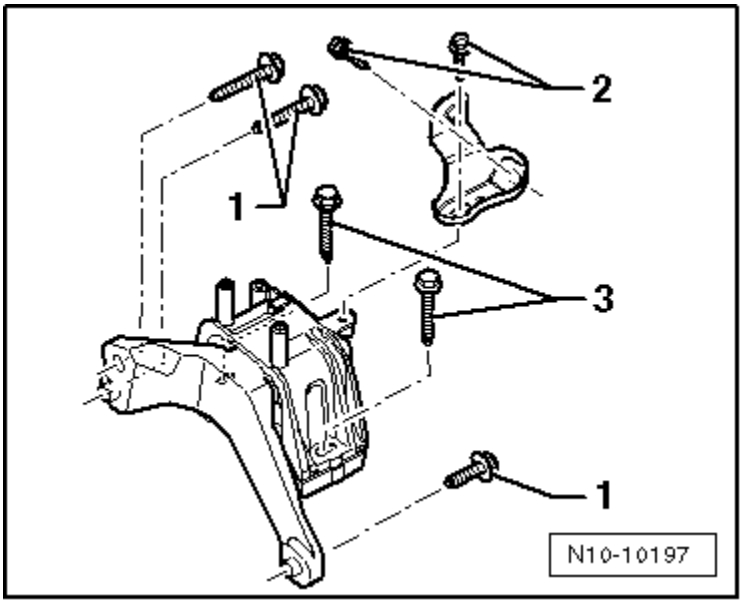
[1] ULEV 2: Ultra Low Emission Vehicle 2
[2] SULEV: Super Ultra Low Emission Vehicle
[3] Unleaded RON 91 is permitted, but performance is reduced.

Engine Assembly – 2.5L CBTA, CBUA

Fastener Tightening Specifications

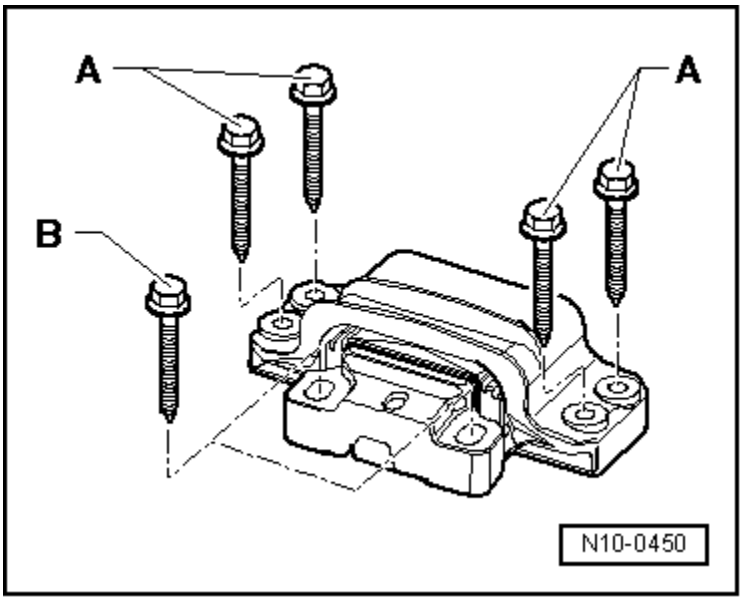
Component	Fastener size	Nm
Bolts, nuts	M6	10
	M7	15
	M8	25
	M10	40
	M12	60

Engine Mount Tightening Specifications



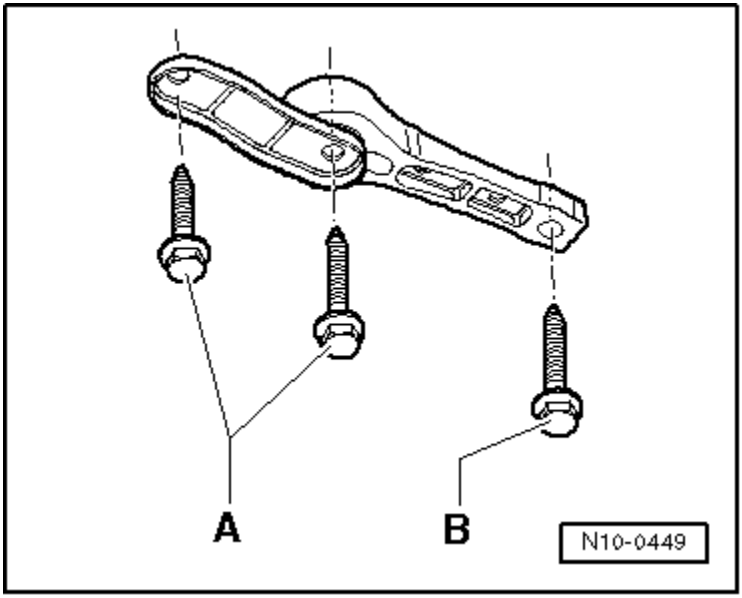
Component	Nm
Bolt 1 (always replace)	40 plus an additional 90° (¼ turn)
Bolt 2 (always replace)	20 plus an additional 90° (¼ turn)
Bolt 3 (always replace)	60 plus an additional 90° (¼ turn)

Transmission Mount Tightening Specifications



Component	Nm
Bolt A (always replace)	40 plus an additional 90° (¼ turn)
Bolt B (always replace)	60 plus an additional 90° (¼ turn)

Pendulum Support Tightening Specifications



Secure the pendulum support to the transmission first and then to the subframe.
To remove, first remove bolt B, then bolts A.
To install, first install bolts A, then bolt B.

Component	Fastener size	Nm
Bolts A (always replace)	8.8	40 plus an additional 90° (¼ turn)
	10.9	50 plus an additional 90° (¼ turn)
Bolt B (always replace)		100 plus an additional 90° (¼ turn)

Crankshaft, Cylinder Block – 2.5L CBTA, CBUA

Fastener Tightening Specifications

Component	Nm
Accessory bracket-to-cylinder block bolt	25
Air conditioning compressor ribbed belt, lower idler pulley with bracket-to-accessory bracket bolt	25
Air conditioning compressor-to-accessory bracket bolt	25
Air conditioning compressor ribbed belt, belt tensioner-to-accessory bracket bolt	35
Brake booster vacuum pump-to-control housing cover bolt	10
Connecting rod bearing cap-to-connecting rod bolt (always replace)	30 plus an additional 90° (¼ turn)
Control housing cover-to-cylinder block bolt	25
Coolant pump-to-cylinder block bolt	10
Cover-to-cylinder block bolt	10
Crankshaft bearing cap-to-cylinder block bolt (always replace)	40 plus an additional 90° (¼ turn)
Double sprocket-to-cylinder block bolt (always replace)	60 plus an additional 90° (¼ turn)
Drive plate/flywheel-to-crankshaft bolt (always replace)	60 plus an additional 90° (¼ turn)
Engine mount-to-accessory bracket bolt (always replace)	40 plus an additional 90° (¼ turn)
Engine speed sensor-to-control housing cover bolt	5
Exhaust camshaft sprocket-to-camshaft bolt (always replace)	60 plus an additional 90° (¼ turn)
Generator-to-accessory bracket bolt	25
Generator, power steering pump and coolant pump ribbed belt, belt tensioner-to-accessory bracket bolt	35
Intake camshaft adjuster-to-camshaft bolt (always replace)	60 plus an additional 90° (¼ turn)
Intake manifold support-to-cylinder block bolt	25
Knock Sensor (KS)-to-cylinder block bolt [1)]	20
Locking bolt-to-cylinder block bolt	30
Mount-to-cylinder block bolt	10

Component	Nm
Oil dipstick guide tube-to-cylinder block bolt	25
Oil filter bracket-to-cylinder block bolt	25
Oil pressure switch-to-cylinder block	20
Oil pump sprocket-to-oil pump bolt (always replace)	20 plus an additional 90° (¼ turn)
Power steering pump-to-accessory bracket bolt	23
Power steering pump pulley-to-power steering pump bolt	23
Pressure relief valve	27
Reduced oil pressure switch-to-cylinder block	20
Sealing flange-to-cylinder block bolt	10
Thermostat housing with coolant pipe-to-cylinder block bolt	10
Threaded pin-to-cylinder block	40
Timing chain tensioner-to-cylinder block bolt	10
Timing chain tensioner-to-cylinder head bolt	10
Transport strap-to-cylinder block bolt	25
Vibration damper-to-crankshaft bolt (always replace)	50 plus an additional 90° (¼ turn)

1) Tightening specifications affect the function of the Knock Sensor (KS).

Crankshaft Dimensions

Honing dimension in mm	Crankshaft bearing pins-diameter		Connecting rod bearing pin-diameter	
Basic dimension	58.00	- 0.022	47.80	- 0.022
		- 0.042		- 0.042
1st oversize	57.75	- 0.022	47.55	- 0.022
		- 0.042		- 0.042
2nd oversize	57.50	- 0.022	47.30	- 0.022
		- 0.042		- 0.042
Stage III	57.25	- 0.022	47.05	- 0.022
		- 0.042		- 0.042

Piston and Cylinder Dimensions

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

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

Piston Ring End Gaps

Piston ring Dimensions in mm	Gap	
	New	Wear limit
Compression rings	0.20 to 0.40	0.8
Oil scraping ring	0.25 to 0.50	0.8

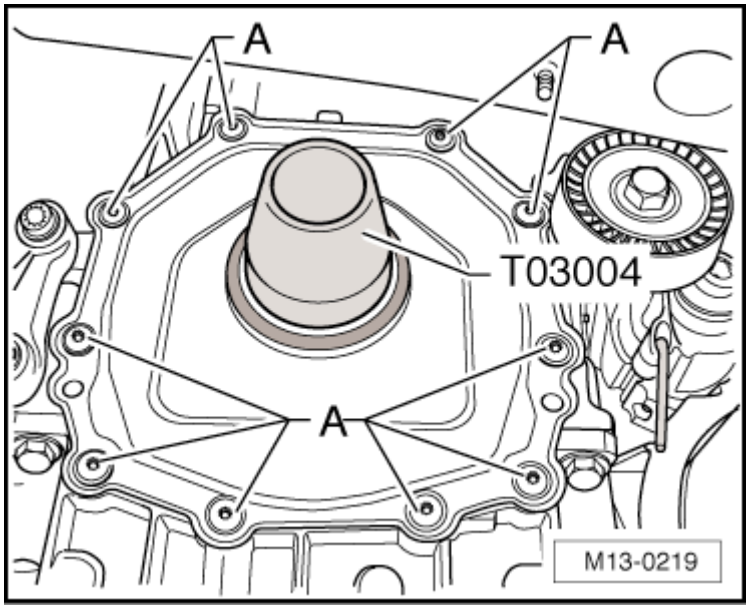
Piston Ring Clearance

Piston ring Dimensions in mm	Ring to groove clearance	
	New	Wear limit
Compression rings	0.06 to 0.09	0.20
Oil scraping ring	0.03 to 0.06	0.15

Brake Booster Vacuum Pump Tightening Specifications

Component	Nm
Vacuum pump-to-control housing cover	10
Coolant pipe-to-bracket	10

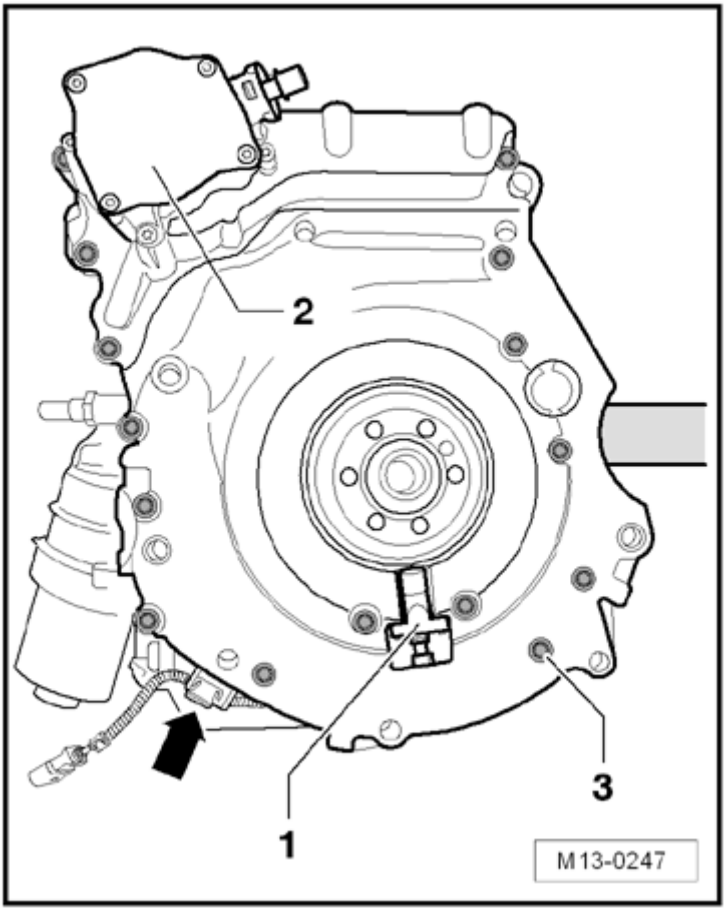
Sealing Flange (Belt Pulley Side) Tightening Specifications



Tighten the sealing flange bolts (A) uniformly in a diagonal sequence to 10 Nm.

Component	Nm
Vibration damper-to-crankshaft (always replace)	50 plus an additional 90° (¼ turn)
Belt tensioner-to-accessory bracket	35
Sealing flange-to-cylinder block	10
Locking bolt-to-cylinder block	30

Control Housing Cover Tightening Specifications



Tighten all the control housing cover bolts (3) to the cylinder block and the upper oil pan to 10 Nm.

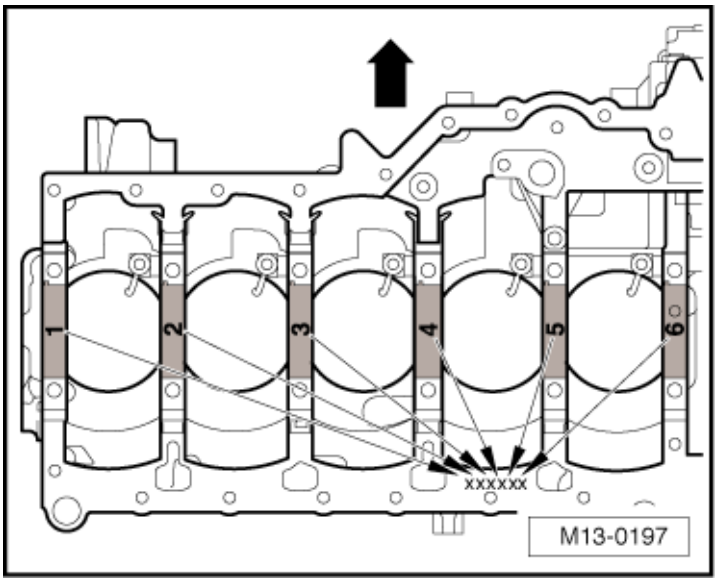
Tighten the bolts to the cylinder block and the upper oil pan to 25 Nm.

Component	Nm
Flywheel/drive plate-to-crankshaft (always replace bolts)	60 plus an additional 90° (¼ turn)
Locking bolt-to-cylinder block	30

Drive Chain Tightening Specifications

Component	Nm
Chain tensioner bolts	40
Intake camshaft adjuster	60 plus an additional 90° (¼ turn)
Exhaust camshaft sprocket	60 plus an additional 90° (¼ turn)
Pin for tensioning track	10

Identification of the Upper Crankshaft Bearing Shells



The upper bearing shells are allocated to the cylinder block with the correct thickness from the factory. Colored dots identify the bearing thicknesses.

The letters marked on the lower sealing surface of the cylinder block identify which bearing thickness must be installed in which location.

Letter on cylinder block	Color of bearing shell
G	Yellow
B	Blue
W	White

The ➡ points in the direction of travel. If the colored dots can no longer be read, use the blue bearing shell. The lower crankshaft bearing shells are always shipped as a replacement part with the yellow colored dot.

Crankshaft Assembly Tightening Specification

Component	Nm
Bearing cap-to-cylinder block bolts	40 plus an additional 90° (¼ turn)

Piston and Connecting Rod Tightening Specifications

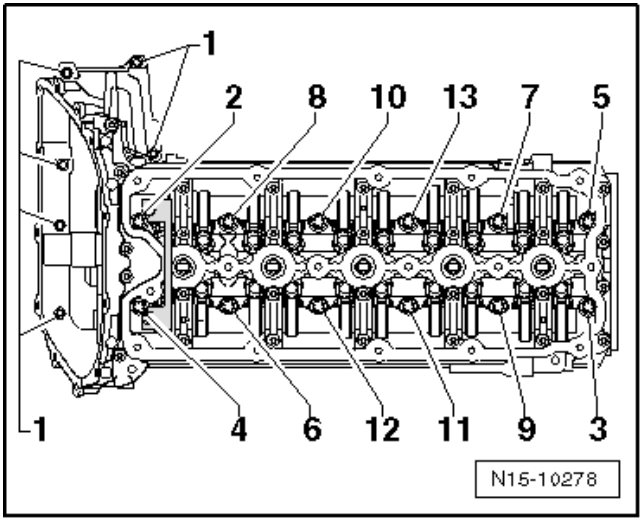
Component	Nm
Connecting rod bearing cap-to-connecting rod bolts	30 plus an additional 90° (¼ turn)
Pressure relief valve-to-oil spray jet	27

Cylinder Head – 2.5L CBTA, CBUA

Fastener Tightening Specifications

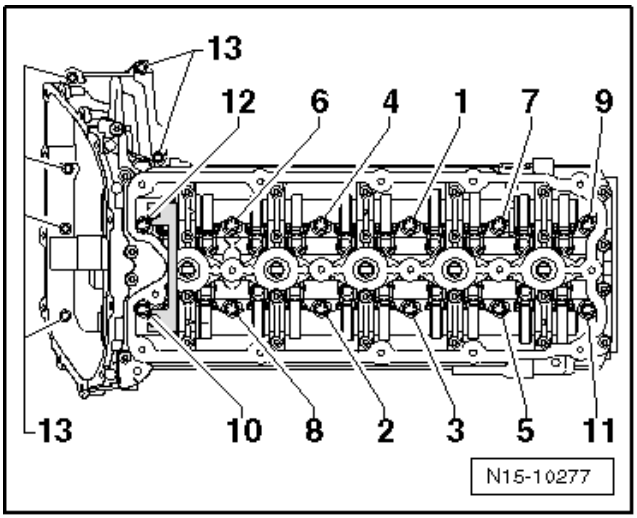
Component	Nm
Camshaft adjustment valve 1-to-cylinder head bolt	2
Camshaft clamp T40070-to-camshaft bolt	20
Camshaft Position (CMP) sensor-to-cylinder head bolt	10
Chain compartment cover-to-cylinder head bolt	10
Coolant thermostat housing-to-chain compartment cover bolt	10
Exhaust camshaft sprocket-to-camshaft bolt (always replace)	60 plus an additional 90° (¼ turn)
Intake camshaft adjuster-to-camshaft bolt (always replace)	60 plus an additional 90° (¼ turn)
Locking bolt-to-cylinder block	30
Secondary Air Injection (AIR) connecting pipe-to-cylinder head bolt	10
Transport strap-to-cylinder block bolt	25
Wire bracket-to-chain compartment cover bolt	10

Cylinder Head Removal Sequence



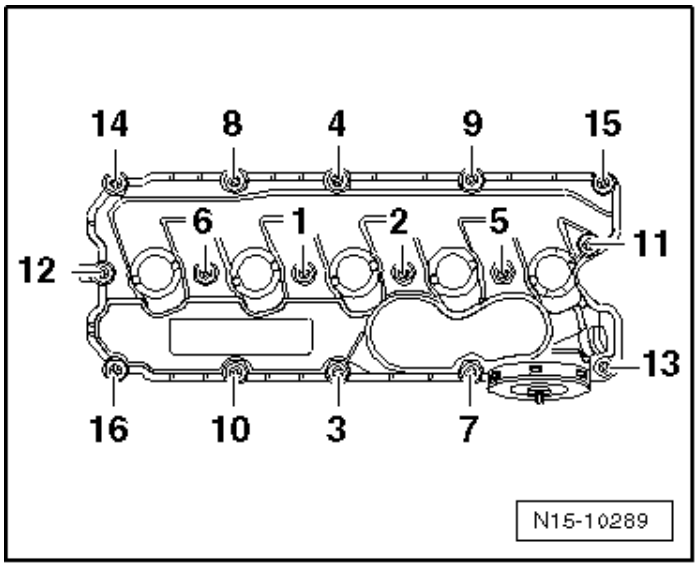
Remove the cylinder head bolts 1 through 13 in sequence.

Cylinder Head Tightening Specifications



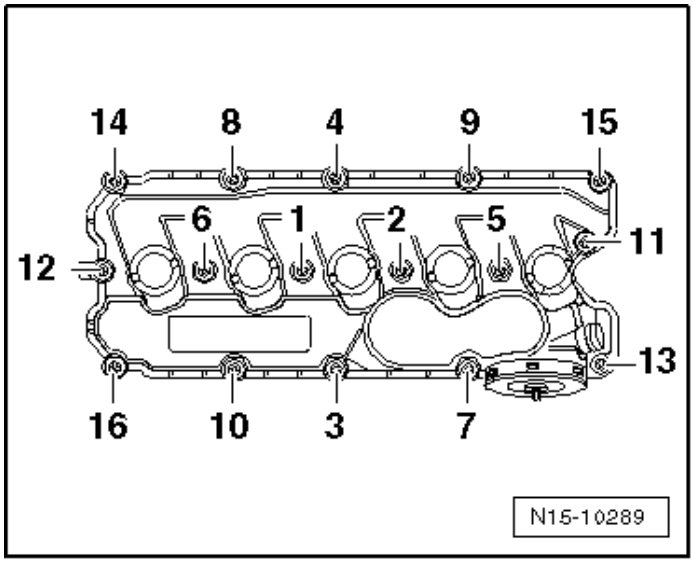
Step	Tighten	Nm
1	Tighten bolts 1 through 12 in sequence	40
2	Tighten bolts 1 through 12 in sequence	an additional 90° (¼ turn)
3	Tighten bolts 1 through 12 in sequence	an additional 90° (¼ turn)
4	Tighten bolt 13	10

Cylinder Head Cover Removal Sequence



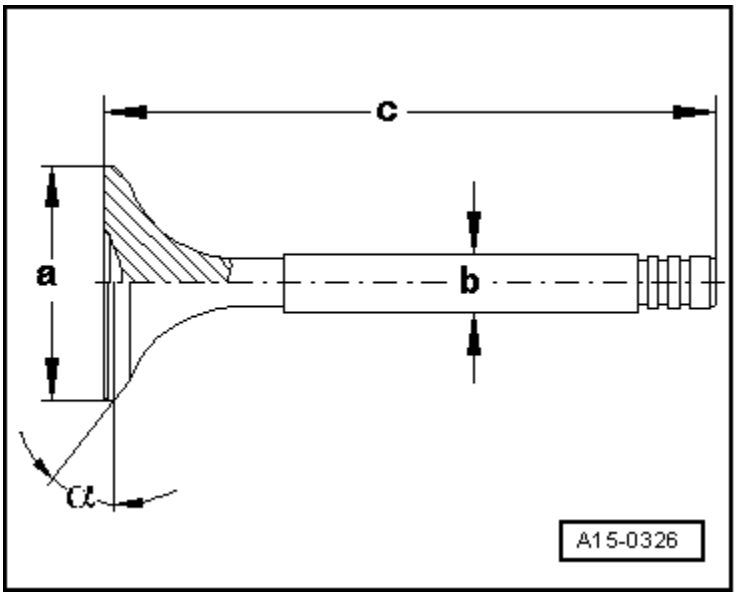
Remove the cylinder head cover bolts 16 through 1 in sequence.

Cylinder Head Cover Tightening Specifications



Component	Nm
Cylinder head cover-to-cylinder head	10
Secondary Air Injection (AIR) connecting pipe at cylinder head	10

Valve Dimensions



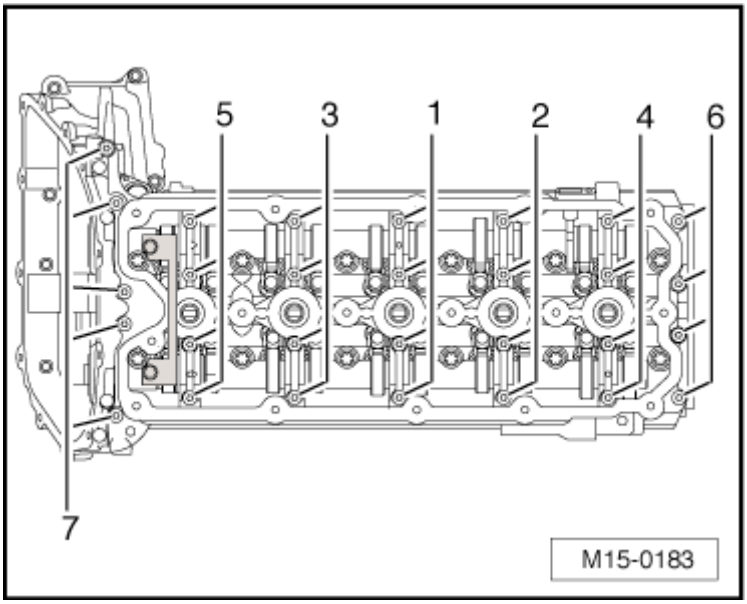
Dimension		Intake valve	Exhaust valve
Diameter a	mm	26.80 to 27.00	29.80 to 30.00
Diameter b	mm	5.95 to 5.97	5.94 to 5.95
c	mm	104.84 to 105.34	103.64 to 104.14
α	∠°	45	45

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

Compression Pressures

New Bar positive pressure	Wear limit Bar positive pressure	Difference between cylinders Bar positive pressure
9.0 to 13.0	8.0	Max. 3.0

Camshaft Tightening Specifications



Component	Nm
Tighten bolts 1 through 7 in sequence	8
Tighten bolts 1 through 7 in sequence	an additional 90° (¼ turn)

Lubrication – 2.5L CBTA, CBUA

Fastener Tightening Specifications

Component	Nm
Guide tube-to-cylinder block bolt [1)]	25
Intake manifold support/guide tube-to-cylinder block bolt [2)]	25
Locking bolt-to-cylinder block	30
Lower oil pan-to-upper oil pan bolt	10
Oil cooler-to-oil filter bracket bolt	25
Oil filter bracket-to-cylinder block bolt	25
Oil filter housing-to-oil filter bracket	25
Oil intake pipe-to-oil pump bolt	10
Oil intake pipe-to-upper oil pan bolt	10
Oil pan drain plug-to-lower oil pan	30
Oil pressure regulation valve-to-cylinder block bolt [1)]	9
Oil pressure switch-to-cylinder block [1)]	20
Oil pressure switch-to-oil filter adapter [2)]	20

Component	Nm
Oil pump align plate T03005-to-crankshaft bolt	30
Oil pump-to-cylinder block bolt	25
Reduced oil pressure sensor-to-cylinder block [1)]	20
Sprocket-to-oil pump bolt (always replace)	20 plus an additional 90° (¼ turn)
Upper oil pan-to-cylinder block bolt	25

1) Jetta from MY 11 only
2) Jetta from MY 05 through 10, Jetta SportWagen (US)/Jetta Wagon (Canada) for MY 09 and Jetta SportWagen (US)/Golf Wagon (Canada) from MY 10 only.

Cooling System – 2.5L CBTA, CBUA

Recommended Mixture Ratios

Frost protection to	Coolant	G 12 Plus-Plus [1)]	Distilled water [1)]
-25°C (-13°F)	40%	3.6L	5.4L
-35°C (-31°F)	50%	4.5L	4.5L

1) The quantity of coolant can vary depending upon the vehicle equipment.

Fastener Tightening Specifications

Component	Nm
Air conditioning condenser-to-radiator bolt	5
Flange-to-cylinder head nut	10
Coolant fan-to-fan shroud nut	5
Coolant hose bracket-to-accessory bracket bolt	9
Coolant line-to-cylinder block bolt/nut	10
Coolant pump-to-cylinder block bolt	10
Coolant thermostat housing-to-cylinder block bolt	25
Expansion tank-to-body bolt	2
Fan shroud-to-radiator bolt	5
Heated Oxygen Sensor (HO2S) bracket bolt	10
Oil dipstick guide tube-to-cylinder block bolt	25
Oil filter bracket-to-cylinder block bolt	25
Radiator mount-to-lock carrier bolt	7
Thermostat housing cover-to-thermostat housing bolt	5

Fuel Supply – 2.5L CBTA, CBUA

Fastener Tightening Specifications

Component	Fastener Size	Nm
Accelerator pedal module-to-body bolt	-	10
Evaporative emission canister-to-underbody bolt	-	8
Fuel filler pipe-to-body bolt	M6	11
Fuel filter bracket bolt	-	3
Fuel tank tensioning strap-to-body bolt (always replace)	M8	26
Fuel tank-to-underbody bolt (always replace)	M8	26
Leak Detection Pump (LDP) air filter housing-to-bracket nut [2)]	-	2
Leak Detection Pump (LDP) air filter housing-to-bracket bolt [1)]	-	3
Leak Detection Pump (LDP) bracket-to-body nut [2)]	-	6
Leak Detection Pump (LDP) bracket-to-body nut [1)]	-	9
Leak Detection Pump (LDP)-to-bracket bolt [2)]		3
Leak Detection Pump (LDP)-to-bracket bolt [1)]	-	2
Lock ring-to-fuel tank	-	110

[1)] Jetta from MY 05 through 10, Jetta SportWagen (US)/Jetta Wagon (Canada) for MY 09 and Jetta SportWagen (US)/Golf Wagon (Canada) from MY 10 only.

[2)] Jetta from MY 11 only.

Multiport Fuel Injection – 2.5L CBTA, CBUA

Technical Data

Engine codes		CBTA and CBUA
Idle check		
Engine idle speed [1]	RPM	680
Engine Control Module (ECM) [2]		
System designation		Motronic ME 7.1.1 from MY 2009 Motronic ME 17.5
Replacement part number		Refer to parts catalog
Engine speed limitation	RPM	Approximately 6300

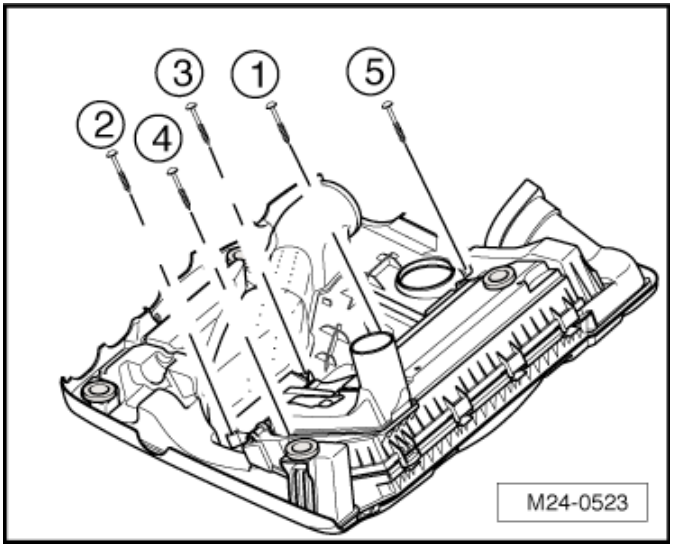
[1] Applies to manual and automatic transmission. If voltage supply of Engine Control Module (ECM) drops below 12 volts, idle speed is raised in stages up to 780 RPM. Idle speed is not adjustable.

[2] Replace the ECM. Refer to ElsaWeb.

Fastener Tightening Specifications

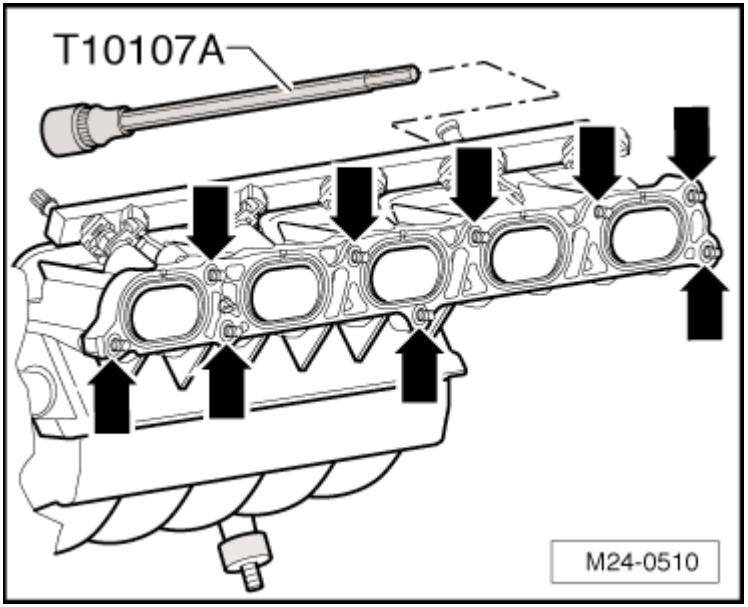
Component	Nm
Fuel rail-to-intake manifold bolt	3.5
Intake air duct-to-air guide bolt	1.5
Intake manifold-to-cylinder head bolt	9
Intake manifold support-to-cylinder block bolt	25
Intake manifold support-to-intake manifold bolt	16
Manifold Absolute Pressure (MAP) sensor-to-intake manifold bolt	3.5
Mass Air Flow (MAF) sensor-to-upper air filter housing/ engine cover bolt	3
Oil dipstick guide tube-to-cylinder block bolt	25
Oxygen Sensor (O2S)	55
Power steering pump intake line and Secondary Air Injection (AIR) pump motor bracket-to-cylinder block bolt	25
Power steering pump intake line and Secondary Air Injection (AIR) pump motor bracket-to-intake manifold bolt	16
Power steering intake line bracket-to-intake manifold bolt	16
Throttle valve control module-to-intake manifold bolt	6.5
Transport strap-to-cylinder head bolt	25

Lower Air Filter Housing to Upper Air Filter Housing/ Engine Cover Tightening Sequence and Specification



Tighten the bolts as shown in sequence -1 through 5- to 2 Nm.

Intake Manifold Tightening Specifications



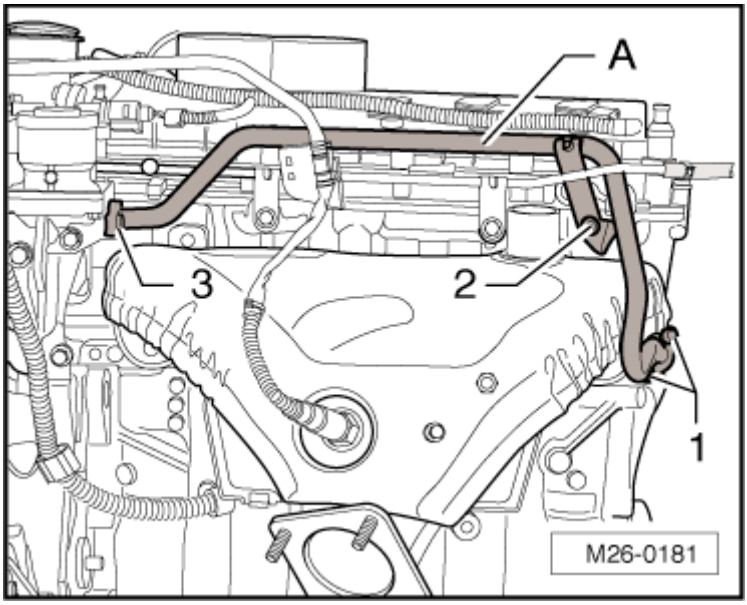
Starting from the inside and working toward the outside, tighten the intake manifold bolts in a diagonal sequence to 9 Nm.

Exhaust System – 2.5L CBTA, CBUA

Fastener Tightening Specifications

Component	Nm
Crossmember-to-underbody nut	20
Exhaust clamp nut	23
Exhaust manifold-to-cylinder head nut (always replace)	25
Front exhaust pipe with catalytic converter-to-exhaust manifold nut (always replace)	23
Front exhaust pipe with catalytic converter suspended mount-to-subframe bolt	23
Heat shield-to-exhaust manifold bolt	10
Intake manifold support-to-cylinder block bolt	25
Muffler suspended mount-to-body/fuel tank bolt	26
Muffler suspended mount-to-body bolt	23
Oxygen Sensor (O2S)	55
Oxygen Sensor (O2S) bracket-to-cylinder block bolt	10
Secondary Air Injection (AIR) pump motor bushing-to-intake manifold support nut	10
Secondary Air Injection (AIR) sensor 1-to-Secondary Air Injection (AIR) pressure pipe bolt	2
Secondary Air Injection (AIR) solenoid valve-to-cylinder head bolt	10

Secondary Air Injection Pipe Tightening Specifications



Replace all seals for the secondary air injection pipe (A).
Install all bolts only hand tight. Tighten bolts 1, 2 and 3 in sequence to 10 Nm.

Ignition System – 2.5L CBTA, CBUA

Technical Data

Engine codes		CBTA and CBUA
Ignition sequence		1-2-4-5-3
Spark plugs		Refer to the Electronic Parts Catalog (ETKA)
	Electrode gap	1.0 to 1.1 mm
	Tightening specification	25 Nm
	Change intervals	Refer to Maintenance Intervals Rep. Gr. 03

Fastener Tightening Specifications

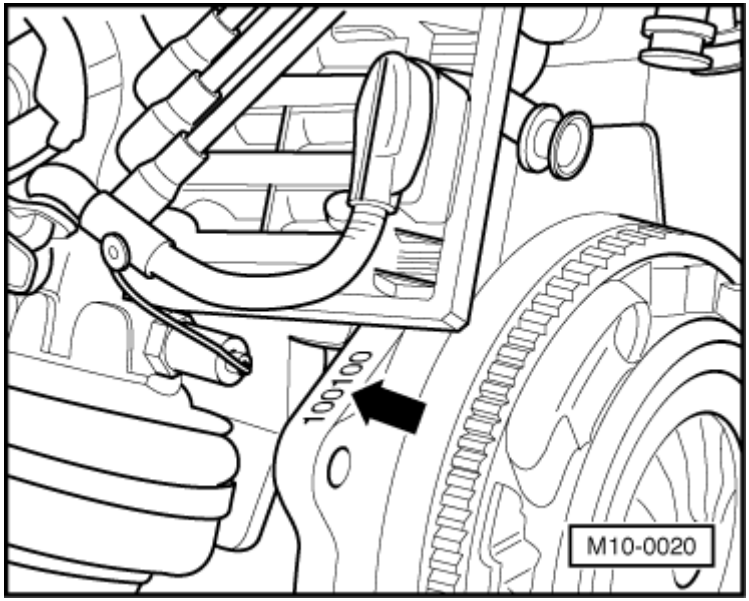
Component	Nm
Camshaft Position (CMP) sensor bolt	10
Knock Sensor (KS) bolt [1)]	20
Spark plug	25

[1)] Tightening specifications affect the function of the Knock Sensor (KS).

ENGINE – 2.0L CBFA, CCTA

General Information – 2.0L CBFA, CCTA

Engine Number



The engine number (engine code and serial number) is located at the front of the engine/transmission joint.

The engine number consists of up to nine alphanumeric characters. The first three letters are the engine code. The next six digits are the engine serial number. If more than 999,999 engines with the same engine code are produced, the first of the six characters is replaced with a letter. There is also a label ➡ on the toothed belt guard that shows the engine code and the engine serial number. The engine code is also included on the vehicle data plates.

Vehicles with a Four Digit Engine Code:

- Four digit engine codes begin with the letter “C”.
- The first three positions describe the engine type and are stamped onto the engine.
- The fourth position describes the engine output and torque.
- The 4 digit engine code is also stored in the ECM and is also found on the type plate and the vehicle data label.

Engine Data

Code Letters		CBFA	CBPA
Manufactured		from 11.07	from 11.07
Emission values in accordance with		SULEV [1]	ULEV 2 [2]
Displacement	liter	2.0	2.0
Output	kW at RPM	147 at 5100	147 at 5100
Torque	Nm at RPM	280 at 1700	280 at 1700
Bore	Diameter mm	82.5	82.5
Stroke	mm	92.8	92.8
Compression ratio		9.6:1	9.6:1
Valves per cylinder		4	4
Research Octane Number (RON)	Minimum	minimum 95	minimum 95
Fuel injection		FSI [3]	FSI [3]
Ignition sequence		1-3-4-2	1-3-4-2
Knock control		Knock Sensor (KS) 1	Knock Sensor (KS) 1
On Board Diagnostic (OBD)		yes	yes
Oxygen Sensor (O2S) regulation		3 sensors	3 sensors
Catalytic converter		Yes	Yes
Exhaust Gas Recirculation (EGR)		No	No
Oil pressure control		No	No
Turbocharger		Yes	Yes
Secondary Air Injection (AIR) system		Yes	No
Valves per cylinder		4	4
Variable intake manifold		Yes	Yes
Variable Valve Timing (VVT)		Yes	Yes

[1] Super Ultra Low Emission Vehicle
[2] Ultra Low Emission Vehicles 2
[3] Fuel Straight Injection

Engine Assembly – 2.0L CBFA, CCTA

Fastener Tightening Specifications

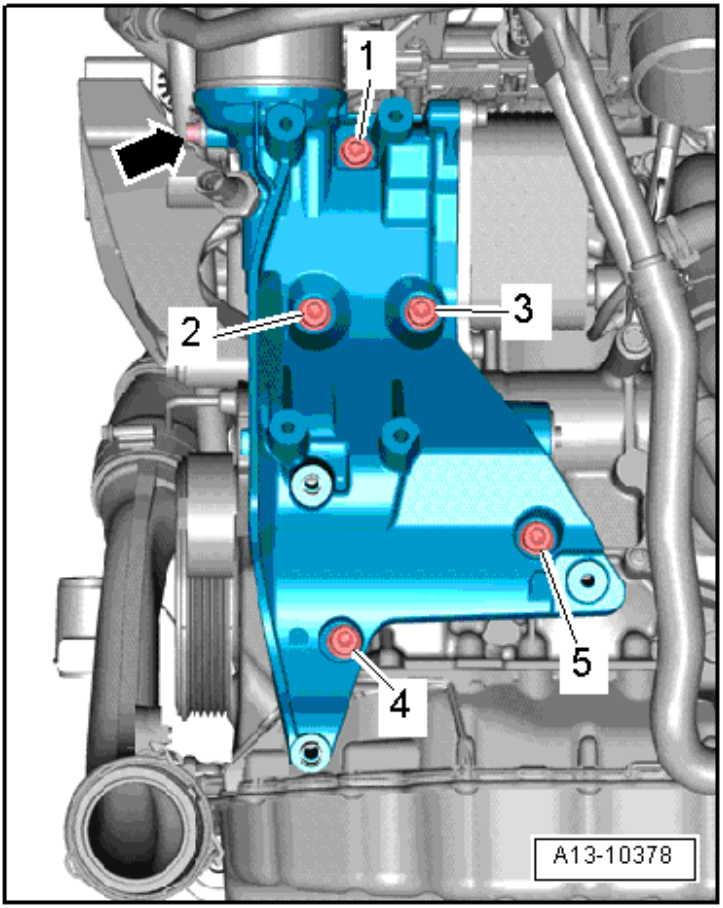
Component	Fastener Size	Nm
Bolts and nuts	M6	10
	M7	15
	M8	20
	M10	40
	M12	60
Bracket-to-body bolt (always replace)	-	20 plus an additional 90° (¼ turn)
Bracket-to-engine mount bolt (always replace)	-	20 plus an additional 90° (¼ turn)
Engine mount-to-body bolt (always replace)	-	40 plus an additional 90° (¼ turn)
Engine Mount Bracket to Engine bolt (always replace)	-	40 plus an additional 180° (½ turn)
Engine mount-to-engine mount bracket bolt (always replace)	-	60 plus an additional 90° (¼ turn)
Pendulum support-to-subframe bolt (always replace)	-	100 plus an additional 90° (¼ turn)
Pendulum support-to-transmission bolt (always replace)	-	50 plus an additional 90° (¼ turn)
Transmission mount-to-body bolt (always replace)	-	40 plus an additional 90° (¼ turn)
Transmission mount-to-transmission mount bracket bolt (always replace)	-	60 plus an additional 90° (¼ turn)

Crankshaft, Cylinder Block – 2.0L CBFA, CCTA

Fastener Tightening Specifications

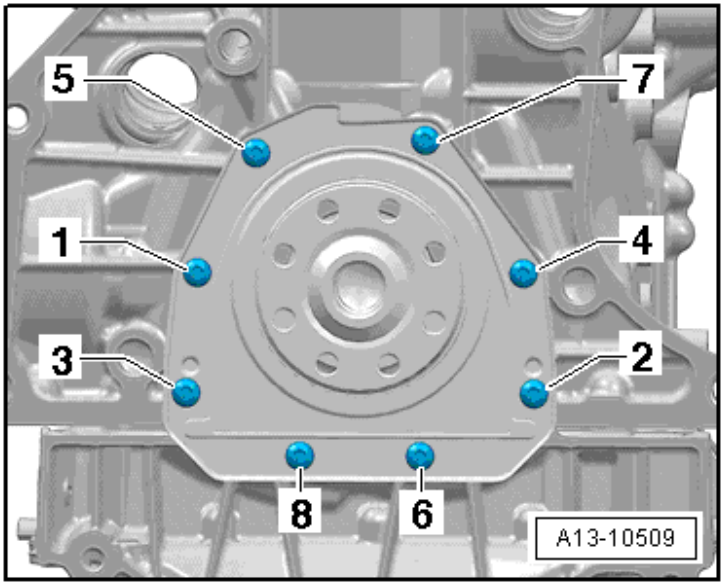
Component	Nm
Air conditioning compressor-to-accessory bracket bolt	25
Connecting rod bolt (always replace)	45 plus an additional 90° (¼ turn)
Dual mass flywheel-to-crankshaft bolt (always replace)	60 plus an additional 90° (¼ turn)
Generator-to-accessory bracket bolt	23
Pressure relief valve	27
Ribbed belt tensioner bolt	10
sensor wheel-to-crankshaft screw (always replace)	10 plus an additional 90° (¼ turn)
Vibration damper-to-crankshaft bolt (always replace)	150 plus an additional 90° (¼ turn)

Accessory Bracket Bolt Tightening Sequence and Specification



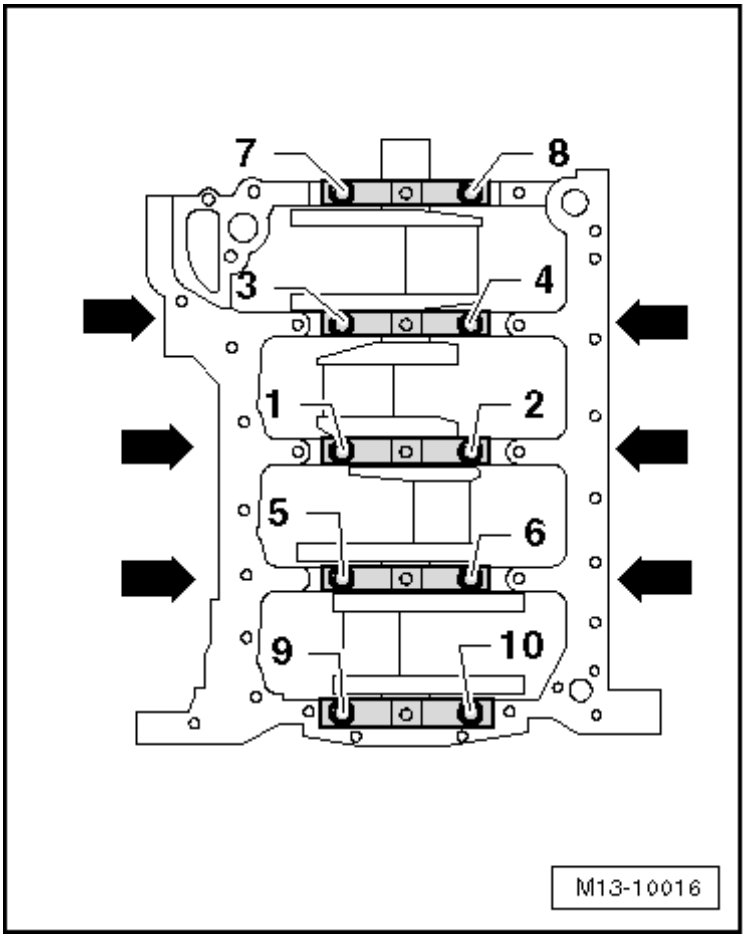
Step	Tighten	Nm
1	Position the accessory bracket and then install bolt -4-. Tighten the bolts in 3 passes in sequence -1 through 5-.	-
2	Tighten bolts by hand.	-
3	Tighten bolts 1 through 5 in sequence	20
4	Tighten bolts 1 through 5 in sequence	an additional 90° (¼ turn)

Transmission Side Sealing Flange Bolt Tightening Sequence and Specification



Step	Tighten	Nm
1	Tighten bolts 1 through 8 in sequence	Hand tight
2	Tighten bolts 1 through 8 in sequence	9

Crankshaft Bearing Cap Bolt Tightening Sequence and Specification



Step	Tighten	Nm
1	Tighten bolts 1 through 10 in sequence	Hand tight
2	Tighten bolts 1 through 10 in sequence	65
3	Tighten bolts 1 through 10 in sequence using a ratchet	an additional 90° (¼ turn)
4	Tighten bolts 1 through 10 in sequence (➡)	20
5	Tighten the bolts (➡) using a ratchet	an additional 90° (¼ turn)

Crankshaft Dimensions

Honing dimension in mm [1]	Crankshaft bearing stub axle - diameter	Connecting rod bearing stub axle - diameter
Basic dimension	58.00	47.80

[1] The preparation of worn crankshafts is not provided.

Piston and Cylinder Dimensions

Honing dimension in mm	Piston - diameter	Cylinder bore - diameter
Basic dimension	82.465 [1]	82.510

[1] Measurements are without the graphite coating (thickness = 0.02 mm). The graphite coating wears off.

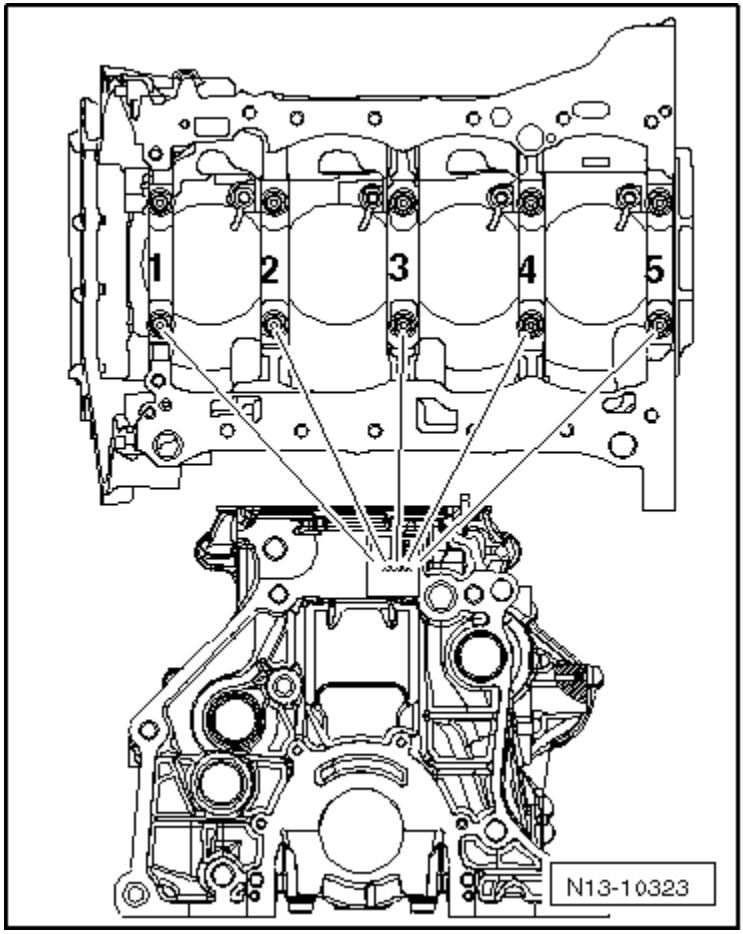
Piston Ring Gap

Piston ring gap Dimensions in mm	New	Wear limit
Compression rings	0.20 to 0.40	0.8
Oil scraping ring	0.25 to 0.50	0.8

Piston Ring Groove Clearance

Piston ring to groove clearance Dimensions in mm	New	Wear limit
Compression rings	0.06 to 0.09	0.20
Oil scraping ring	0.03 to 0.06	0.15

Upper Crankshaft Bearing Identification

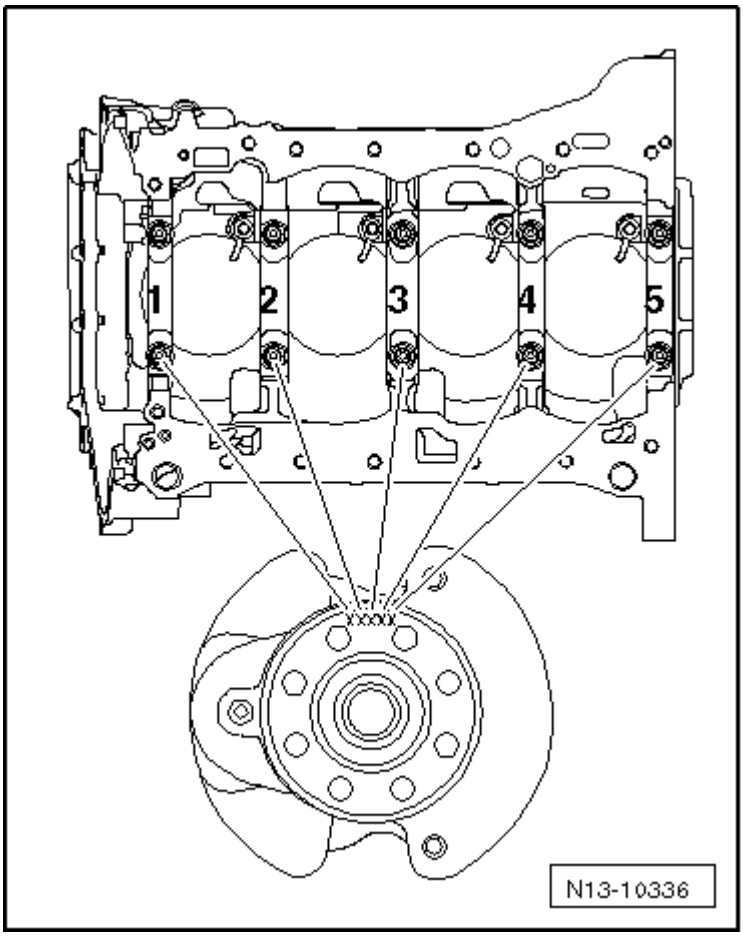


The bearing shells are allocated to the cylinder block with the correct thickness by the factory. Colored dots serve to identify the bearing thicknesses.

The code letters on the lower contact surface or on the top of the cylinder block identify which bearing shell and where it must be installed on the cylinder block (upper bearing shell).

The code letters on the crankshaft identify which bearing shell and where they must be installed in the bearing cap (lower bearing shell).

Lower Crankshaft Bearing Identification



Note the letters and then match them to the color identification in the table:

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

If the colored marks are not yet stamped or are no longer readable, use the center (red) bearing shell. The lower crankshaft bearing shells are shipped as a replacement part with a yellow dot.

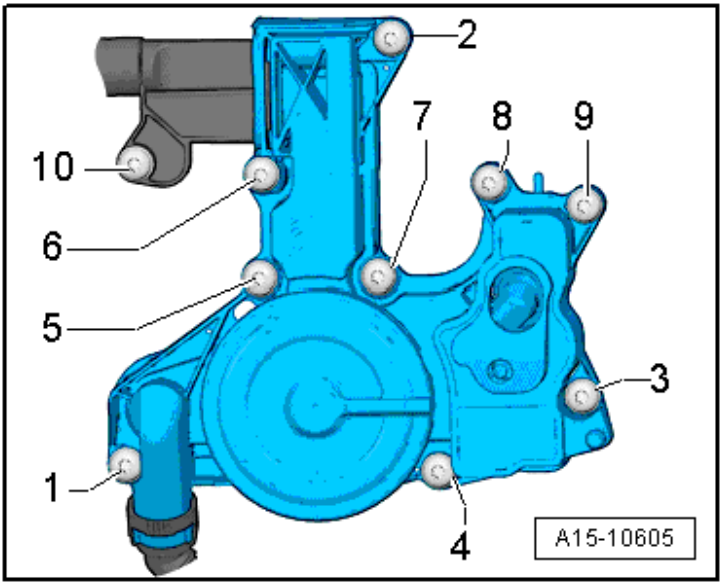
Cylinder Head, Valvetrain – 2.0L CBFA, CCTA

Fastener Tightening Specifications

Component	Fastener Size	9Nm9
Balance shaft-to-cylinder block bolt	-	59
Balance shaft chain tensioner-to-cylinder block [4]	-	65
Balance shaft timing chain guide rail-to-cylinder block guide pin	-	20
Balance shaft timing chain tensioning rail-to-cylinder block guide pin	-	20
Bearing bracket-to-cylinder head bolt	-	9
Bearing bracket-to-exhaust camshaft bolt [1]	M6	8 an additional 90° (¼ turn)
	M8	20 an additional 90° (¼ turn)
Camshaft position sensor-to-cylinder head bolt	-	9
Camshaft timing chain guide rail-to-cylinder block guide pin	-	20
Camshaft timing chain tensioner-to-cylinder block bolt	-	9
Camshaft timing chain tensioning rail-to-cylinder block guide pin	-	20
Control valve-to-intake camshaft [2]	-	35
Heat shield-to-bracket bolt	-	9
Heat shield-to-bracket/cylinder head bolt	-	20
Oil dipstick guide tube/camshaft adjustment valve 1 to cylinder head bolt	-	9
Oil dipstick guide tube-to-cylinder head bolt	-	9
Plug with ball head stud-to-cylinder head cover	-	5
Retaining plate/connecting piece-to-cylinder head bolt	-	9
Secondary air injection solenoid valve-to-cylinder head bolt [3]	-	9
Transport strap-to-cylinder head bolt	-	25

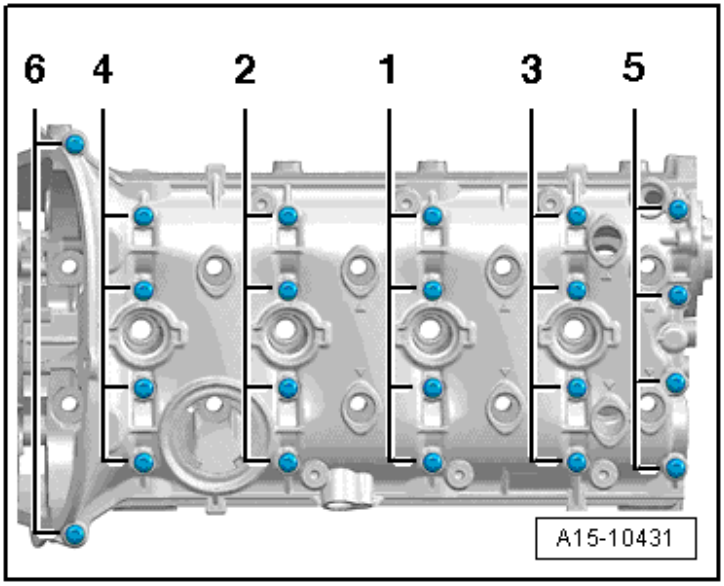
[1] Always replace
[2] Has left hand threads
[3] Engine code CBFA only
[4] Install with locking fluid

Crankcase Ventilation Bolt Tightening Sequence and Specification



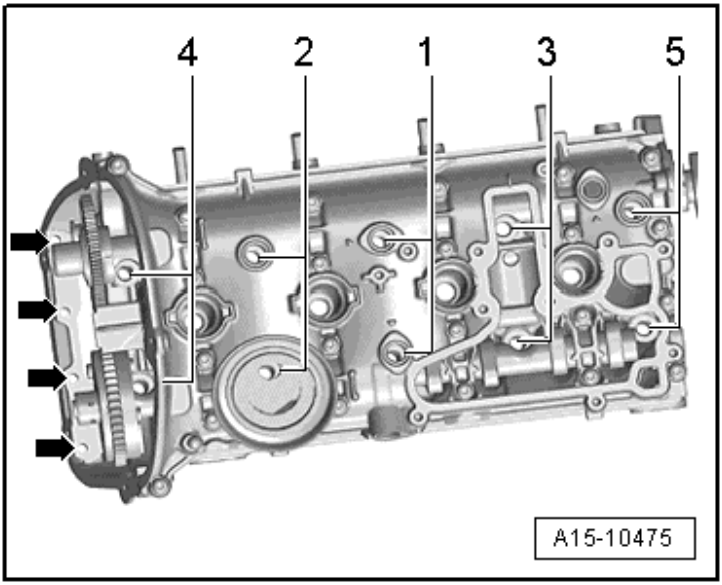
Tighten the crankcase ventilation bolts in sequence -1 through 10- to 11 Nm.

Cylinder Head Cover Bolt Tightening Sequence and Specification



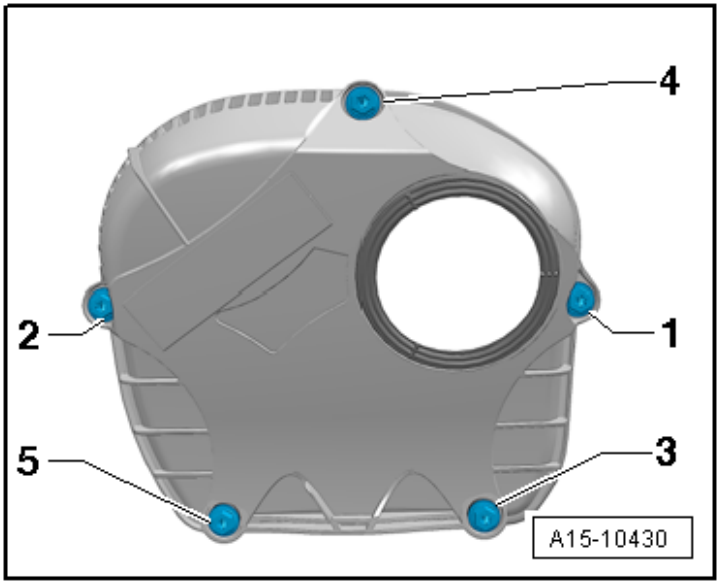
Step	Tighten	Nm
1	Tighten bolts 1 through 6 in sequence	Hand tight
2	Tighten bolts 1 through 6 in sequence	8
3	Tighten bolts 1 through 6 in sequence	an additional 90° (¼ turn)

Cylinder Head Bolt Tightening Sequence and Specification



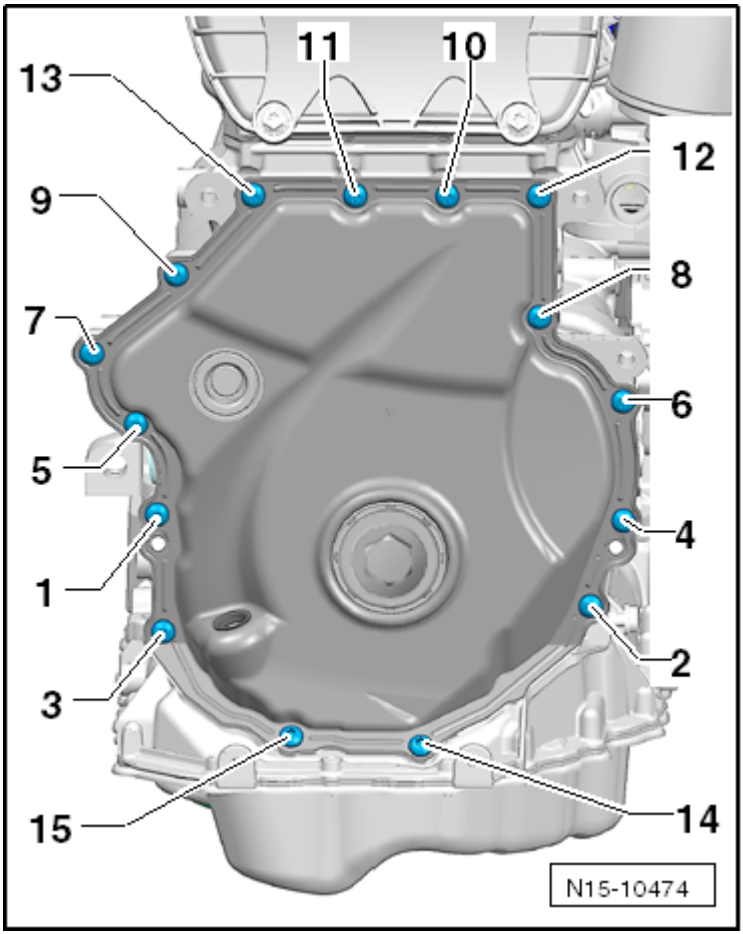
Step	Tighten	Nm
1	Tighten bolts 1 through 5 in sequence	40
2	Tighten bolts 1 through 5 in sequence	an additional 90° (¼ turn)
3	Tighten bolts 1 through 5 in sequence	an additional 90° (¼ turn)
4	Tighten the new bolts (➡) to 8 Nm.	8
5	Tighten the bolts (➡)	an additional 90° (¼ turn)

Upper Timing Chain Cover Bolt Tightening Sequence and Specification



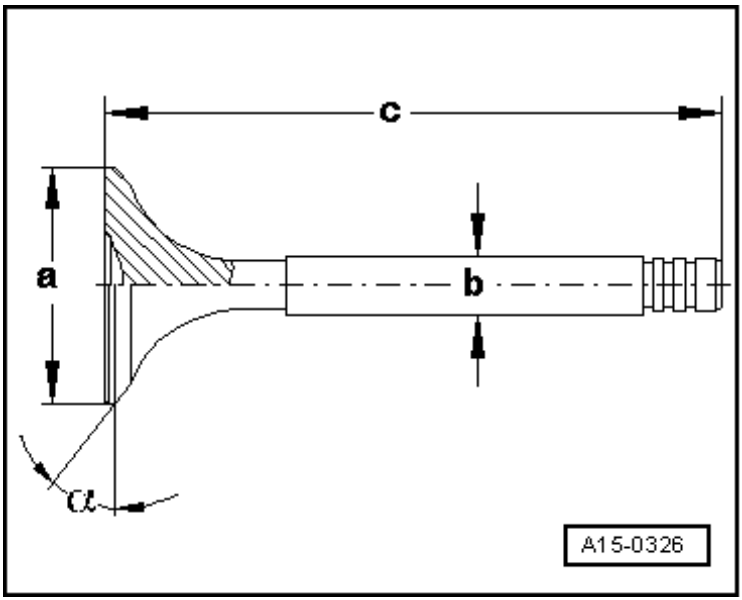
Step	Tighten	Nm
1	Tighten bolts 1 through 5 in sequence	Hand tight
2	Tighten bolts 1 through 5 in sequence	9

Lower Timing Chain Cover Bolt Tightening Sequence and Specification



Step	Tighten	Nm
1	Tighten bolts 1 through 15 in sequence	Hand tight
2	Tighten bolts 1 through 15 in sequence	8
3	Tighten bolts 1 through 15 in sequence	an additional 90° (¼ turn)

Valve Dimensions



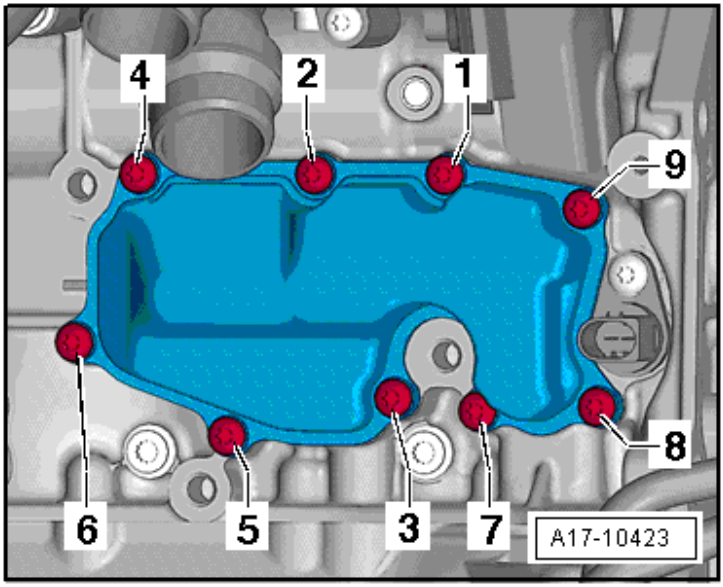
Dimension		Intake Valve	Exhaust Valve
Diameter a	mm	33.85 ± 0.10	28.00 ± 0.1
Diameter b	mm	5.980 ± 0.007	5.955 ± 0.007
c	mm	103.97	101.87
α	∠°	45	45

Lubrication – 2.0L CBFA, CCTA

Fastener Tightening Specifications

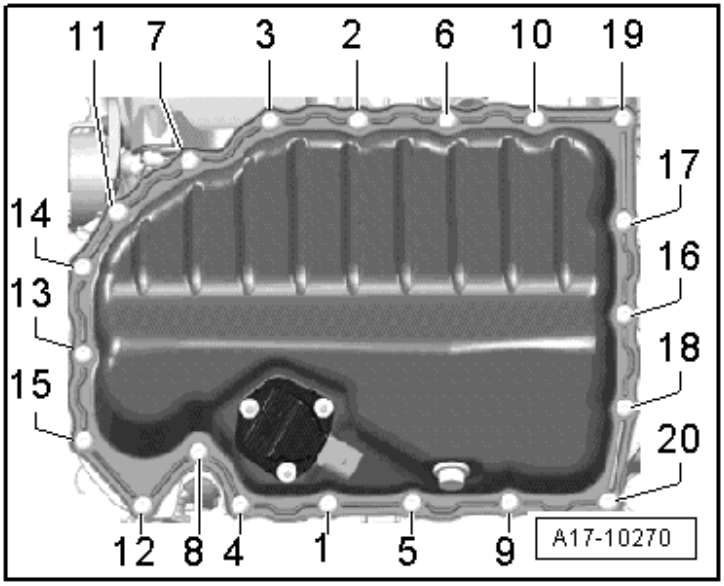
Component	Fastener Size	Nm
Oil baffle-to-upper oil pan bolt	-	9
Oil cooler-to-accessory bracket bolt	-	15
Oil drain plug-to-lower oil pan (always replace)	-	30
Oil filter-to-accessory bracket	-	22
Oil intake pipe-to-oil pump bolt	-	9
Oil pressure switch-to-accessory bracket	-	20
Oil pump drive chain tensioner-to-cylinder block guide pin	-	9
Oil pump-to-upper oil pan bolt	M6	9
	M8	20

Oil Separator Bolt Tightening Sequence and Specification



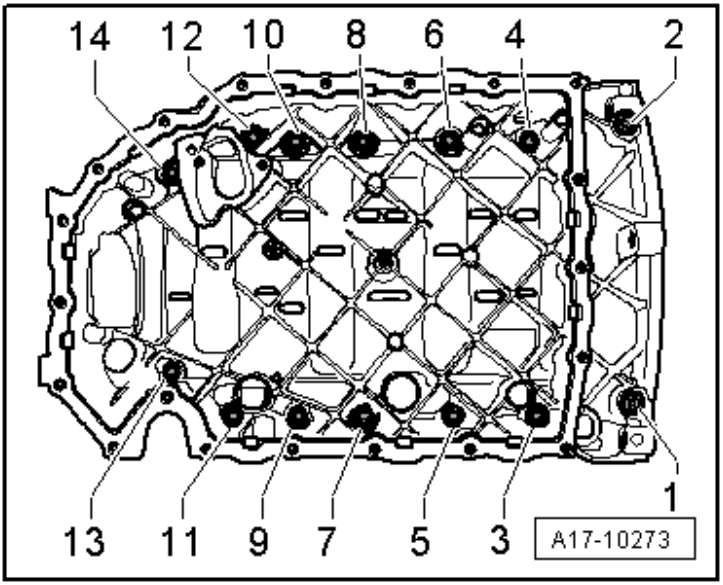
Step	Tighten	Nm
1	Tighten bolts 1 through 9 in sequence	9

Lower Oil Pan Bolt Tightening Sequence and Specification



Step	Tighten	Nm
1	Tighten bolts 1 through 20 in sequence	Hand tight
2	Tighten bolts 1 through 20 in sequence	8
3	Tighten bolts 1 through 20 in sequence	an additional 45° (⅛ turn)

Cylinder Head Cover Bolt Tightening Sequence and Specification



Step	Tighten	Nm
1	Tighten bolts 1 through 14 in sequence	Hand tight
2	Tighten bolts 1 through 14 in sequence	15
3	Tighten bolts 1 through 14 in sequence	an additional 90° (¼ turn)

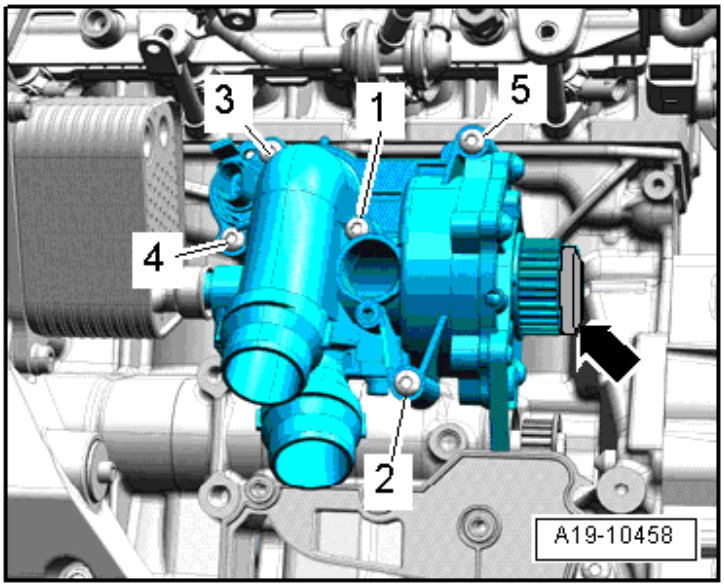
Cooling System – 2.0L CBFA, CCTA

Fastener Tightening Specifications

Component	Nm
After run coolant pump bracket-to-mounting bracket bolt	8
After run coolant pump mounting bracket-to-cylinder block bolt	40
Connecting piece-to-coolant pump bolt	9
Engine coolant temperature sensor retaining plate-to-coolant pump bolt	4
Fan-to-fan shroud nut	10
Fan shroud-to-radiator bolt	5
Front coolant pipe bolt	5
Radiator-to-charge air cooler bolt	5
Small coolant pipe bolt	9
Toothed belt drive gear-to-balance shaft bolt (always replace) [1)]	17
Toothed belt guard-to-coolant pump bolt	9

[1)] Left hand threads

Coolant Pump Bolt Tightening Sequence and Specification



Tighten the coolant pump bolts in the sequence -1 through 5- shown to 9 Nm.

Fuel Supply – 2.0L CBFA, CCTA

Fastener Tightening Specifications

Component	Nm
Accelerator Pedal Module to Body Bolt	10
Evaporative Emission Canister to Body Bolt [3)]	8
Evaporative Emission Canister Cover to Body Bolt [2)]	8
Fuel Filter Bracket Bolt	3
Fuel Filler Tube to Body Bolt	11
Fuel Tank to Body Bolt [1)]	26
Fuel Tank Securing Strap Bolt [1)]	26
Leak Detection Pump Air Filter Housing to Bracket Bolt [2)]	3
Leak Detection Pump Air Filter Housing to Bracket Bolt [3)]	2
Leak Detection Pump Bracket to Body Nut	6
Leak Detection Pump to Bracket Bolt [2)]	2
Leak Detection Pump to Bracket Bolt [3)]	3
Lock ring-to-fuel tank	110

1) Always replace
2) tta/GLI for MY 08 through 10, Jetta SportWagen (US)/Jetta Wagon (Canada) for MY 09
3) GLI from MY 12

Turbocharger – 2.0L CBFA, CCTA

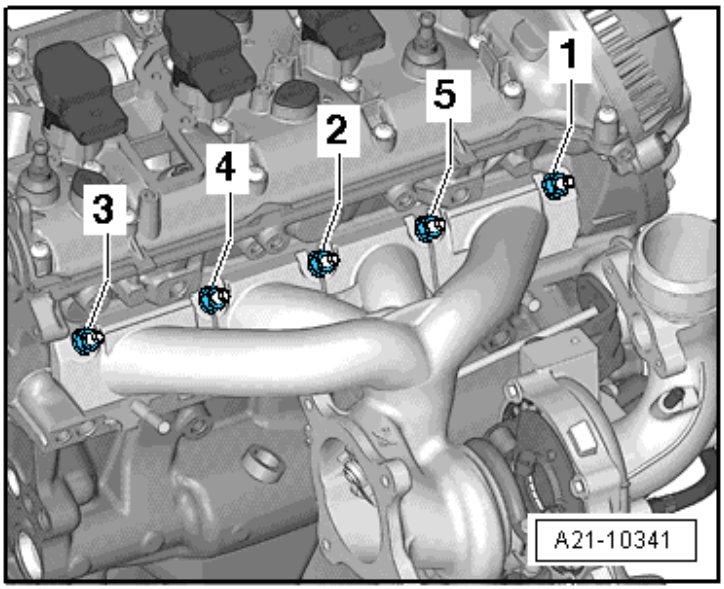
Fastener Tightening Specifications

Component	Nm
Charge air cooler mount bolt	5
Charge air pipe-to-cylinder block	10
Charge air pressure sensor-to-charge air pipe bolt	5
Charge air regulation vacuum diaphragm-to-turbocharger bolt	10
Connection-to-turbocharger bolt	9
Coolant return line bracket-to-turbocharger bolt	9
Coolant return line-to-turbocharger banjo bolt	38
Coolant supply line bracket-to-cylinder block bolt	9
Coolant supply line-to-cylinder block banjo bolt	38
Coolant supply line-to-turbocharger banjo bolt	38
Fastening strip nut [1)]	30
Oil return line-to-cylinder block bolt	9
Oil return line-to-turbocharger bolt	9
Oil supply line bracket-to-turbocharger bolt	9
Oil supply line-to-cylinder block bolt	9
Oil supply line-to-turbocharger banjo bolt	33
Plenum chamber bulkhead bolt	8

Component	Nm
Turbocharger recirculation valve-to-turbocharger bolt	7
Turbocharger support-to-cylinder block bolt [2]	30
Turbocharger support-to-turbocharger bolt [2]	30
Wastegate bypass regulator valve-to-turbocharger bolt	3

[1] Always replace
[2] Lubricate the bolts with hot bolt paste, refer to the Parts Catalog

Turbocharger Nut Tightening Sequence and Specification



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

Multiport Fuel Injection – 2.0L CBFA, CCTA

Fastener Tightening Specifications

Component	Fastener Size	Nm
Connecting piece-to-fuel rail 1	-	22
Connecting piece-to-high pressure pump 1	-	22

Fastener Tightening Specifications *(cont'd)*

Fuel pressure sensor-to-fuel rail	-	22
Fuel pressure sensor-to-vas 6394/1	-	22
High pressure pump-to-cylinder head bolt 1	M6 threads	8 an additional 90° (¼ turn)
	M8 threads	20
High pressure fuel line-to-fuel rail union nut	-	18
High pressure fuel line-to-high pressure pump union nut	-	18
Intake air temperature sensor-to-intake manifold bolt	-	5
Intake manifold bolt		
-Tighten to	-	3
- Then tighten to	-	9
Intake manifold support-to-cylinder block bolt	-	23
Intake manifold support-to-intake manifold nut	-	10
Lower air filter housing-to-body bolt	-	8
Mass airflow sensor-to-upper air filter housing bolt	-	3.5
Throttle valve control module-to-intake manifold bolt	-	5
Upper air filter housing-to-lower air filter housing bolt	-	1.5

1) Lubricate the threads using hot bolt paste G 052 112 A3 only.

Exhaust System, Emission Controls – 2.0L CBFA, CCTA

Fastener Tightening Specifications

Component	Nm
Clamping sleeve nut	23
Front exhaust pipe with catalytic converter-to-turbocharger nut 1) 2)	40
Oxygen sensor 2)	55
Secondary air injection pump motor bracket-to-body nut	25
Secondary air injection pump motor-to-bracket nut	9
Secondary air injection solenoid valve bolt	9
Suspended mount-to-subframe/underbody bolt	25
Suspended mount-to-underbody bolt (for attaching the fuel tank) 1)	26

1) Always replace
2) Lubricate with hot bolt paste, refer to the Parts Catalog.

Ignition – 2.0L CBFA, CCTA

Fastener Tightening Specifications

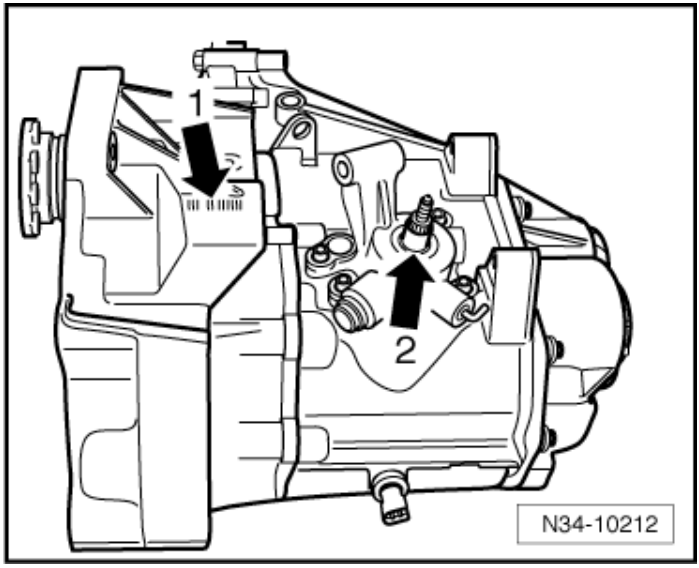
Component	Nm
Camshaft Position Sensor Bolt	9
Engine Speed Sensor Bolt	9
Knock Sensor Bolt [1)]	20
Spark Plug	25

[1)] Tightening specifications affect the function of the Knock Sensor (KS).

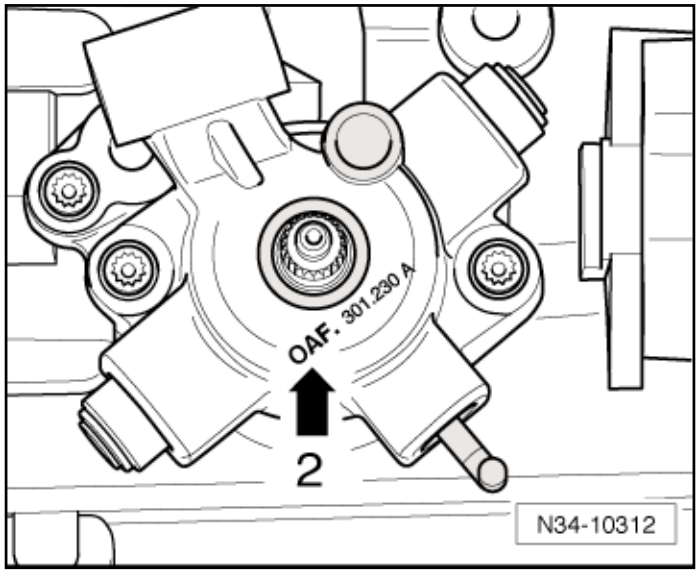
MANUAL TRANSMISSION – 0AF

General Information

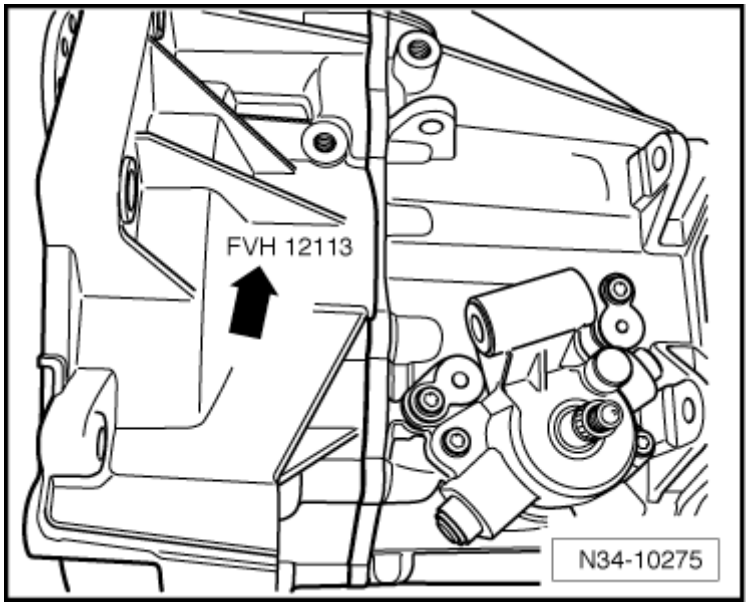
Transmission Identification



Code letters and date of manufacture (1 ➡).
Manual transmission 0AF (2 ➡).



Manual transmission 0AF (2 ➡).



Transmission code letters and build date.

Example:	FVH	12	11	3
	Identification code	Day	Month	Year (2003) of manufacture

The transmission code letters are also included on the vehicle data label.

Codes Letters, Transmission Allocation and Capacities

Transmission		5 Speed Manual Transmission 0AF
Code Letters		LDZ
Manufactured	from	06.10
	through	
Allocation	Type	Jetta from MY 2011
	Engine	2.0L - 85 kW
Ratio $Z_1 : Z_2$	Final drive	59: 15 = 3.933
Capacities for the manual transmission		2.0 liters
Drive axle flange diameter		100 mm

Refer to the Parts Catalog for the following information:
- Individual gear ratios
- Transmission fluid specifications
- Clutch disc and pressure plate allocation

Clutch – 0AF

Fastener Tightening Specifications

Component	Fastener Size	Nm
Ball stud-to-transmission	-	20
Clutch pedal bolt nut (always replace)	-	25
Clutch pedal bracket-to-bulkhead nut (always replace)	-	25
Clutch slave cylinder-to-transmission bolt	-	20
Guide sleeve/clutch release lever-to-transmission bolt (always replace)	-	5 plus an additional 90° (¼ turn)
Impact bolster support-to-steering column bracket		
Secured with two bolts	-	10
Secured with one bolt	-	20
Pressure plate-to-flywheel bolt	M6	13
	M7	20

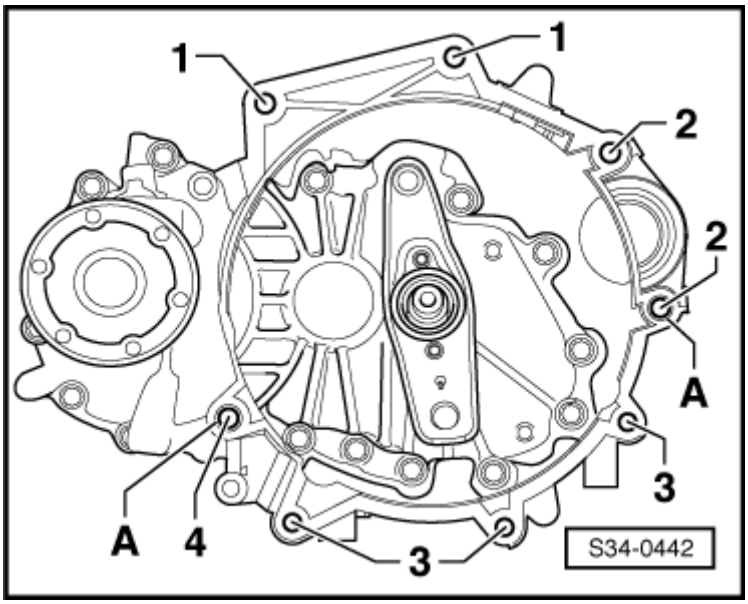
Controls, Housing – 0AF

Fastener Tightening Specifications

Component	Fastener Size	Nm
Backup lamp switch-to-transmission housing	-	20
Ball stud-to-clutch housing	-	20
Cable bracket support-to-transmission bolt	-	20
Clutch housing-to-transmission housing bolt (always replace)	-	5 plus an additional 90° (¼ turn)
Cover-to-transmission housing bolt (always replace)	-	5 plus an additional 90° (¼ turn)
Engine mount-to-engine mount bracket bolt (always replace)	-	60 plus an additional 90° (¼ turn)
Flange shaft bolt	-	25
Oil fill/drain plug		
Multipoint socket head	-	25
Hex socket head	-	30
Pivot pin-to-transmission housing bolt	-	5 plus an additional 90° (¼ turn)

Component	Fastener Size	Nm
Reverse gear axle-to-transmission housing bolt (always replace)	-	25 plus an additional 90° (¼ turn)
Shift lever-to-shift unit nut (always replace)	-	23
Shift unit-to-transmission housing bolt	-	5 plus an additional 90° (¼ turn)
Transmission housing cover-to-transmission housing bolt (always replace)	-	5 plus an additional 90° (¼ turn)
Transmission housing-to-input shaft with output shaft and bearing mount/grooved ball bearing bolt (always replace)	-	5 plus an additional 90° (¼ turn)
Transmission housing-to-shift fork nut (always replace)	-	23
Transmission mount bracket-to-transmission bolt (always replace)	-	40 plus an additional 90° (¼ turn)
Shift housing-to-body nut	M6	8
	M8	25

Transmission to Engine Tightening Specifications



Item	Bolt	Qty.	Nm
1	M12 x 50	2	80
2	M12 x 135 (also starter to transmission)	2	80
3	M10 x 50	3	40
4	M12 x 60	1	80
A	Alignment bushings for centering		

Rear Final Drive, Differential – 0AF

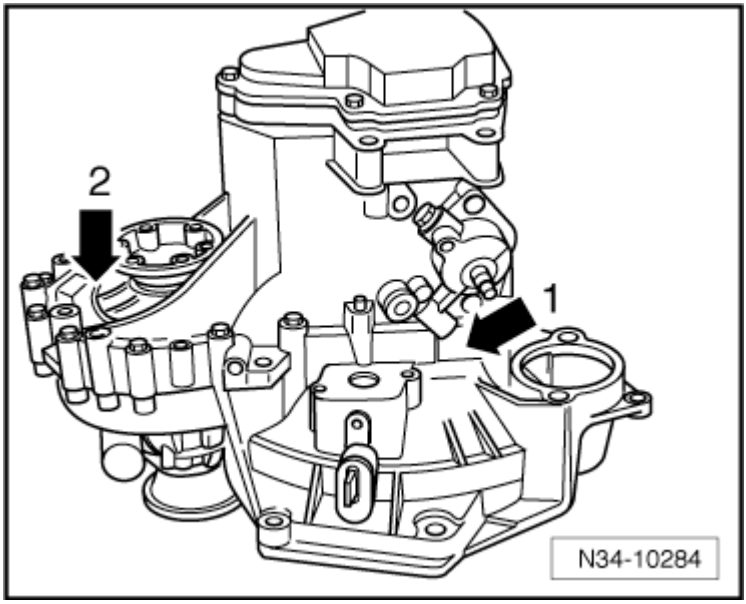
Fastener Tightening Specifications

Component	Fastener Size	Nm
Flange shaft bolt	-	25

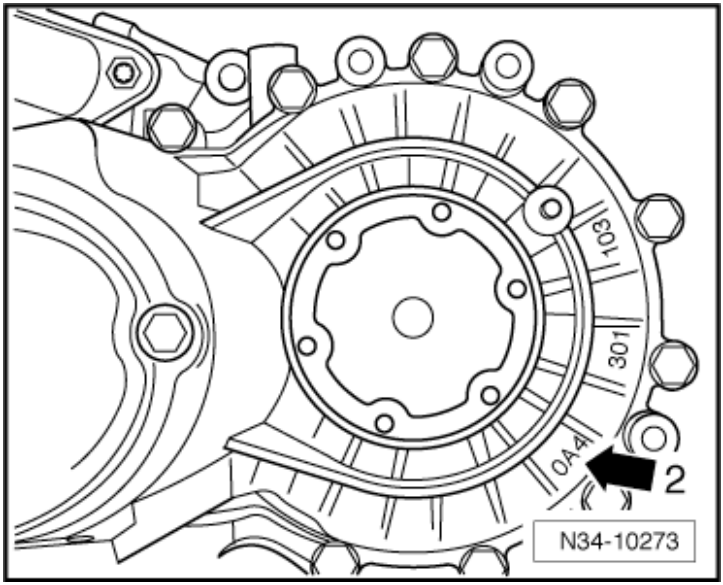
MANUAL TRANSMISSION – 0A4

General Information

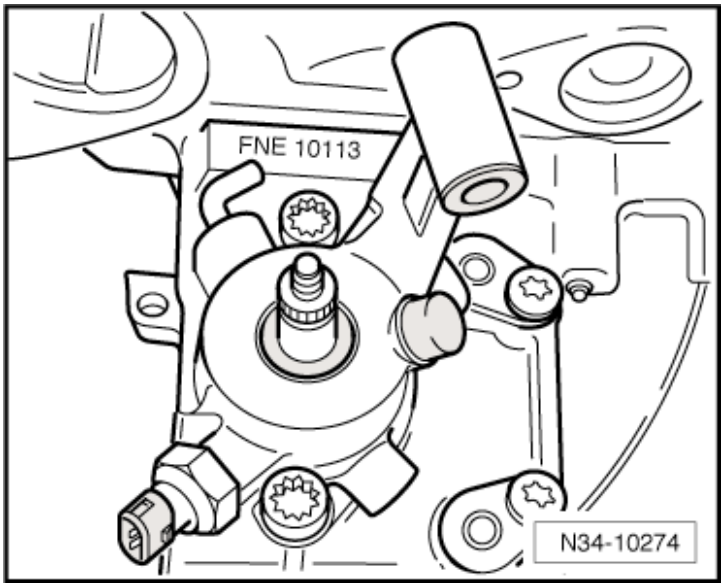
Transmission Identification



Code letters and build date (1 ➡).
Manual transmission 0A4 (2 ➡).



Manual transmission 0A4 (2 ➡).



Transmission code letters and build date.

Example:	FNE	10	11	3
	Identification code	Day	Month	Year (2003) of manufacture

The transmission code letters are also included on the vehicle data label.

Codes Letters, Transmission Allocation and Capacities

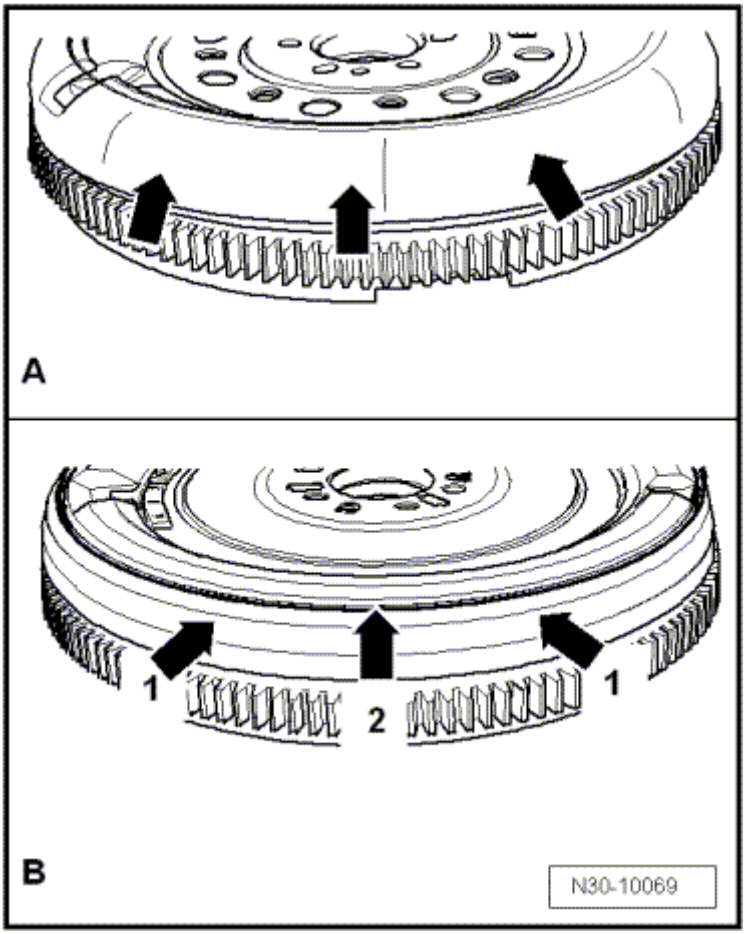
Transmission		**5 Speed Manual Transmission 0A4**
Code Letters		JCR
Manufactured	from	05.06
	through	
Allocation	Type	Jetta from MY 2005
	Engine	1.9L - 74 kW
Ratio $Z_1 : Z_2$	Final drive	61:18 = 3.389
Capacities for the manual transmission		Refer to the Fluid Capacity Tables Rep. Gr. 03
Drive axle flange diameter		108 mm

Refer to the Parts Catalog for the following information:
- Individual gear ratios
- Transmission fluid specifications
- Clutch disc and pressure plate allocation

Transmission		**5 Speed Manual Transmission 0A4**
Code Letters		KPF
Manufactured	from	04.10
	through	
Allocation	Type	Jetta from MY 2005 through 2006, Jetta SportWagen (US)/ Golf Wagon (Canada) from MY 2010, Jetta from MY 2011
	Engine	2.5L - 125 kW
Ratio $Z_1 : Z_2$	Final drive	62:17 = 3.647
Capacities for the manual transmission		Refer to the Fluid Capacity Tables Rep. Gr. 03
Drive axle flange diameter		100 mm

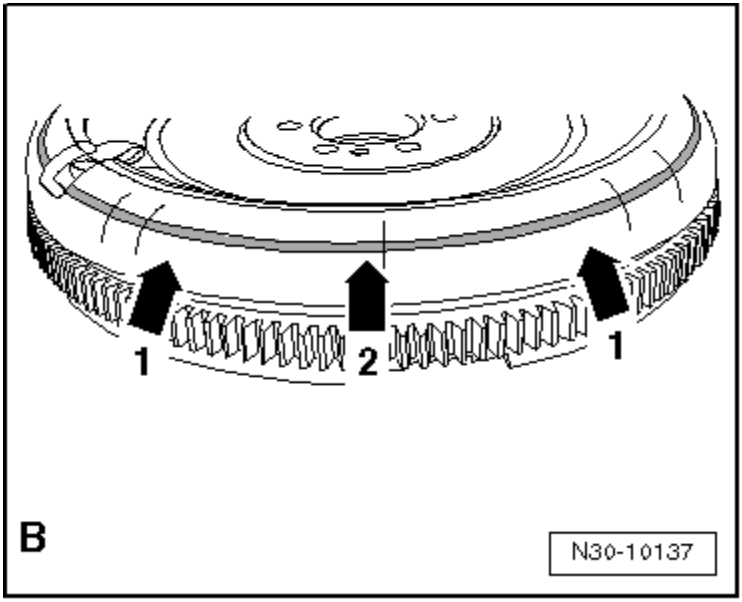
Refer to the Parts Catalog for the following information:
- Individual gear ratios
- Transmission fluid specifications
- Clutch disc and pressure plate allocation

Determining Clutch Manufacturer



A) Round outer contour (➡) indicates a clutch manufactured by Sachs.

B) Squared outer contour (1 ➡) and a depression all the way around (2 ➡) indicates a clutch manufactured by LuK.



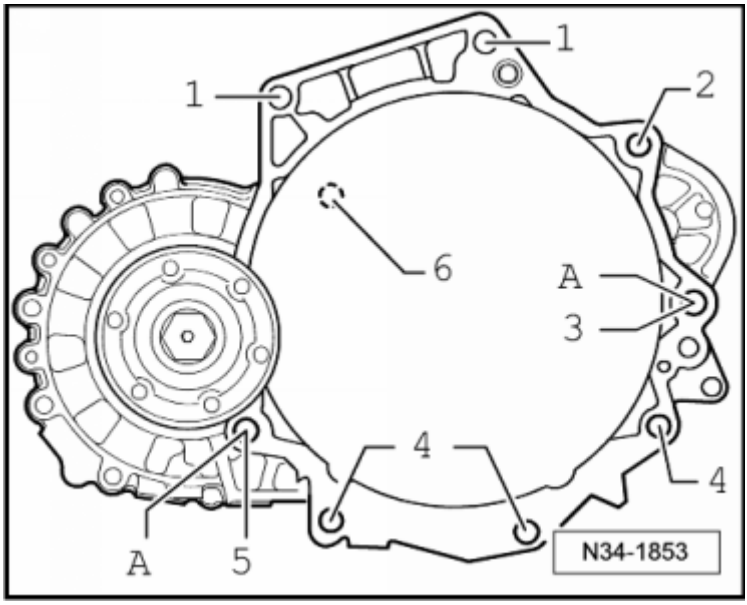
B) Round outer contour (1 ➡) and a depression all the way around (2 ➡) indicates a clutch manufactured by LuK.

Fastener Tightening Specifications

Component	Fastener Size	Nm
Ball stud-to-transmission	-	25
Clutch pedal bolt nut (always replace)	-	25
Clutch pedal bracket-to-bulkhead nut (always replace)	-	25
Clutch slave cylinder-to-transmission bolt	-	20
Guide sleeve-to-transmission bolt	-	20
Hose/line assembly bracket-to-transmission bolt	-	20
Impact bolster support-to-steering column bracket		
Secured with two bolts	-	10
Secured with one bolt	-	20
Pressure plate-to-flywheel bolt	M6	13
	M7	20
Transmission support-to-transmission bracket/transmission bolt (always replace)	-	20 plus an additional 90° (¼ turn)

Controls, Housing – 0A4

Transmission to Engine Tightening Specifications



Item	Bolt	Qty.	Nm
1	M12 x 65	2	80
2	M12 x 170 Also starter to transmission	1	80
3	M12 x 170 Also starter to transmission	1	80
4	M10 x 65	3	40
5	M12 x 95	1	80
6	M6 x 8 Small flywheel cover plate (not pictured)	1	10
A	Alignment pins for centering		

Fastener Tightening Specifications

Component	Fastener size	Nm
5th gear bolt (always replace)	-	80 plus an additional 90° (¼ turn)
5th gear shift jaw bolt	-	25
Backup lamp switch-to-shift unit	-	20
Cable bracket support-to-transmission bolt	-	20

Component	Fastener size	Nm
Clutch housing-to-transmission housing bolt (always replace)	-	25 plus an additional 90° (¼ turn)
Flange shaft bolt	-	25
Guide sleeve-to-clutch housing bolt	-	20
Oil drain plug-to-clutch housing	-	35
Oil fill plug-to-transmission housing	-	35
Output shaft-to-clutch housing nut (always replace)	-	25 plus an additional 90° (¼ turn)
Pivot pin-to-transmission housing bolt	-	25
Reverse gear selector fork-to-clutch housing bolt	-	25
Sealing cap-to-transmission housing bolt	-	25
Shift lever-to-shift unit nut (always replace)	-	23
Shift unit-to-transmission housing bolt	-	25
Synchronizer hub with gear wheel and 5th gear synchronizer ring bolt (always replace)	-	80 plus an additional 90° (¼ turn)
Transmission housing cover-to-transmission housing bolt	-	18
Transmission housing-to-reverse shaft support bolt (always replace)	-	25
Transmission mount-to-body bolt (always replace)	-	60 plus an additional 90° (¼ turn)
Transmission mount bracket-to-transmission bolt (always replace)	-	40 plus an additional 90° (¼ turn)
Transmission neutral position sensor-to-transmission housing bolt	-	5
Transmission support-to-transmission bracket/transmission bolt (always replace)	-	20 plus an additional 90° (¼ turn)
Shift housing-to-body nut	M6	8
	M8	25

Determining Shim Thickness

Example:	Bearing clearance measured value	Adjustment shim thickness according to the table
	1.21 mm	1.175 mm

Adjustment Shim Table

Bearing play	Adjusting shim
Measured value (mm)	**Thickness (mm)**
0.671 to 0.699 0.700 to 0.724 0.725 to 0.749	0.650 0.675 0.700
0.750 to 0.774 0.775 to 0.799 0.800 to 0.824	0.725 0.750 0.775
0.825 to 0.849 0.850 to 0.874 0.875 to 0.899	0.800 0.825 0.850
0.900 to 0.924 0.925 to 0.949 0.950 to 0.974	0.875 0.900 0.925
0.975 to 0.999 1.000 to 1.024 1.025 to 1.049	0.950 0.975 1.000
1.050 to 1.074 1.075 to 1.099 1.100 to 1.124	1.025 1.050 1.075
1.125 to 1.149 1.150 to 1.174 1.175 to 1.199	1.100 1.125 1.150
1.200 to 1.224 1.225 to 1.249 1.250 to 1.274	1.175 1.200 1.225
1.275 to 1.229 1.300 to 1.324 1.325 to 1.349	1.250 1.275 1.300
1.350 to 1.374 1.375 to 1.399 1.400 to 1.424	1.325 1.350 1.375
1.425 to 1.449 1.450 to 1.474 1.475 to 1.499	1.400 1.425 1.450
1.500 to 1.524 1.525 to 1.549 1.550 to 1.574	1.475 1.500 1.525

Bearing play	Adjusting shim
Measured value (mm)	Thickness (mm)
1.575 to 1.599 1.600 to 1.624 1.625 to 1.649	1.550 1.575 1.600
1.650 to 1.674 1.675 to 1.699 1.700 to 1.724	1.625 1.650 1.675

Refer to the Parts Catalog for the correct shims.

Using VW 447 i, remove the input shaft and the outer race/tapered roller bearing from the transmission housing.

Install the shim with the correct thickness, thickest shim first.

If the measured shim thickness is larger than those listed in the table, then install two shims that add up to the necessary thickness.

Using VW 510, press the outer race/tapered roller bearing and the selected shim (1.175 mm in the example) into the transmission housing.

Assemble the transmission housing and tighten the bolts to 25 Nm plus an additional 90° (¼ turn).

Rear Final Drive, Differential – 0A4

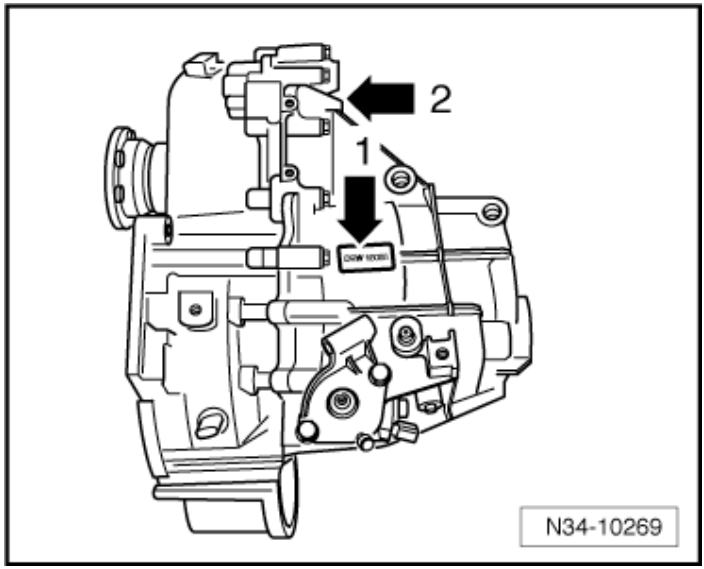
Fastener Tightening Specifications

Component	Fastener Size	Nm
Flange shaft bolt	-	25

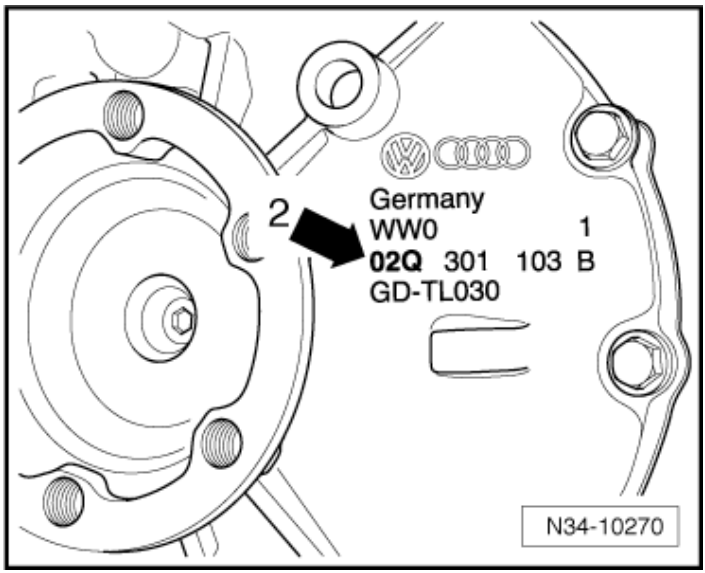
MANUAL TRANSMISSION – 02Q

General Information

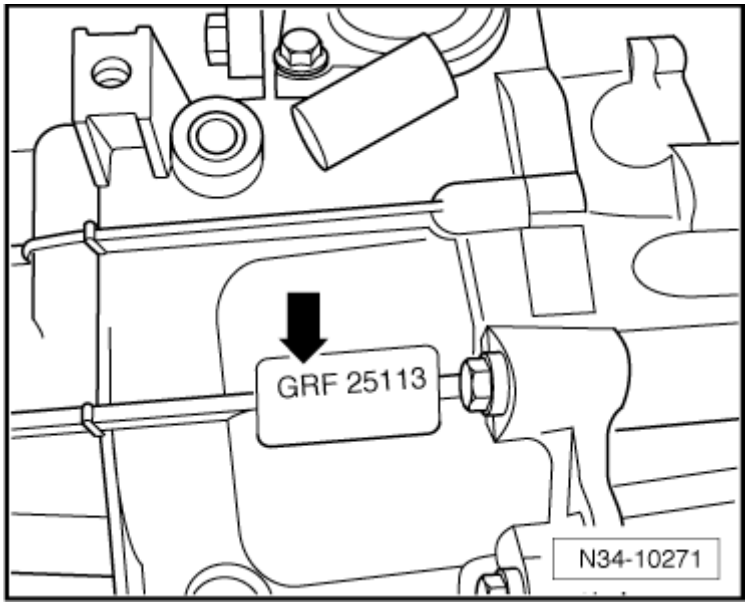
Transmission Identification



Code letters and build date (1➡).
Manual transmission 02Q (2➡).



Manual transmission 02Q (2 ➡).



Transmission code letters and build date (➡).

Example:	GRF	25	11	3
	Identification codes	Day	Month	Year (2003) of manufacture

Codes Letters, Transmission Allocation and Capacities

Transmission		6 Speed 02Q	
Identification Codes		NFP	MDL
Manufactured	from	05.10	11.09
	through		
Allocation	Type	Jetta from MY 2011	Jetta from MY 2011
	Engine	2.0L - 104 kW TDI	2.0L - 147 kW TFSI
Ratio: Z_2: Z_1	Final drive I [1)]	69:20 = 3.450	70:19 = 3.684
	Final drive II [2)]	69:25 = 2.760	70:24 = 2.917
Capacities		Refer to Fluid Capacity Tables Rep. Gr. 03	Refer to Fluid Capacity Tables Rep. Gr. 03
Drive axle flange diameter		107 mm	107 mm

1) Final drive for 1st through 4th gear.
2) Final drive for 5th gear, 6th gear and reverse gear.

Refer to the Parts Catalog for the following information:
- The individual gear ratios
- Transmission fluid specifications
- Clutch disc and pressure plate allocation

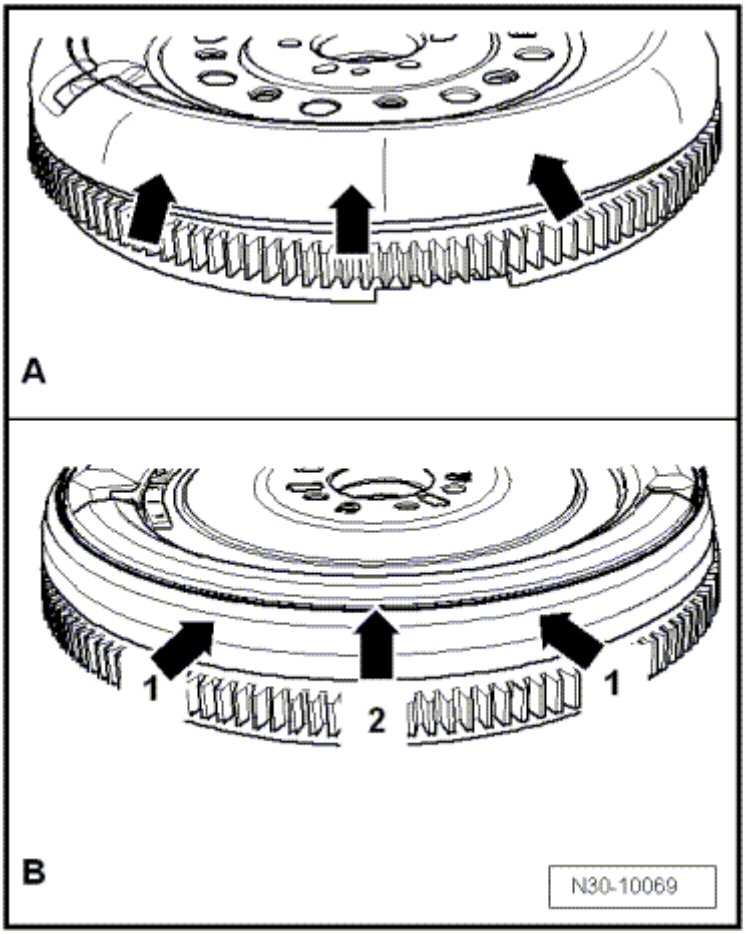
Clutch – 02Q

Fastener Tightening Specifications

Component	Fastener size	Nm
Clutch pedal mounting bracket-to-cross panel nut (always replace)	-	25
Clutch pedal-to-mounting bracket through bolt nut (always replace)	-	25
Impact bolster support-to-steering column mounting bracket bolt		
- Secured with two bolts		10
- Secured with one bolt		20
Pressure plate-to-dual mass flywheel bolt [1)]	(LuK) M6	13
	(Sachs) M7	20
Slave cylinder with release bearing-to-transmission bolt (always replace)		
Slave cylinder with metal housing (without locking fluid)	-	12
Slave cylinder with plastic housing (with locking fluid)	-	15

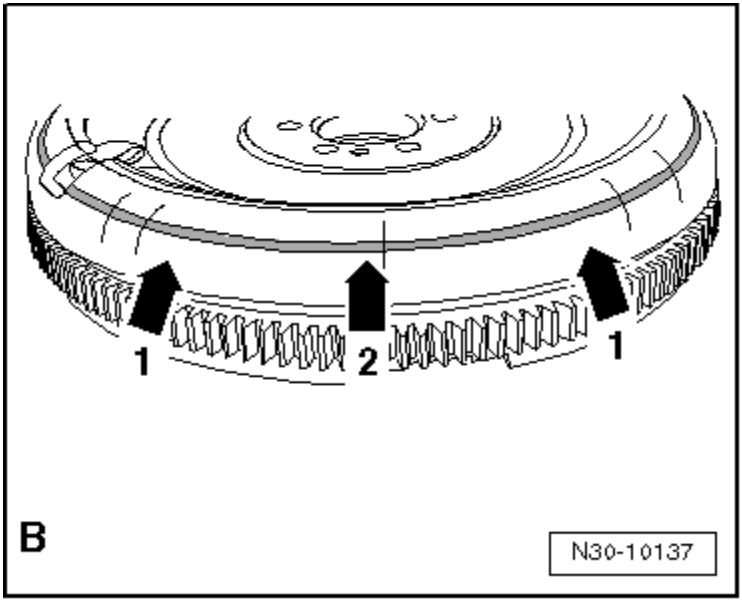
[1)] Loosen and tighten in small steps and in a diagonal sequence.

Determining Clutch Manufacturer



A) Round outer contour (➡) indicates a clutch manufactured by Sachs.

B) Squared outer contour (1 ➡) and a depression all the way around (2 ➡) indicates a clutch manufactured by LuK.



B) Round outer contour (1 ➡) and a depression all the way around (2 ➡) indicates a clutch manufactured by LuK.

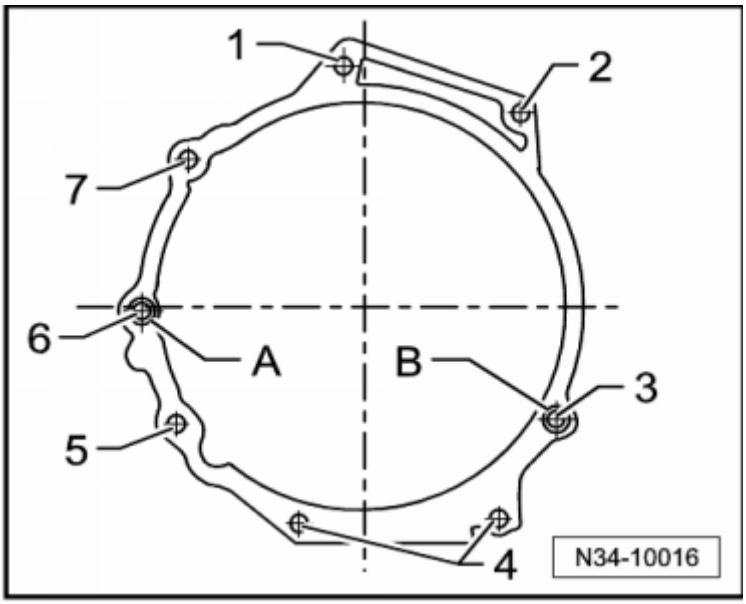
Controls, Housing – 02Q

Fastener Tightening Specifications

Component	Fastener size	Nm
Backup Lamp Switch to Transmission Housing	-	20
Cable Mounting Bracket to Transmission Bolt/Nut	-	20
Flange Shaft Bolt	-	33
Fluid Drain/Fill Plug		
- with a hex socket head	-	30
- with a multipoint socket head	-	45
Gear Shift Unit to Transmission Housing Bolt [1]	-	20
Locking bolt to Transmission Housing	-	45
Slave Cylinder with Release Bearing to Clutch Housing Bolt [1]		
- Slave cylinder with a metal housing (without locking fluid)	-	12
- Slave cylinder with a plastic housing (with locking fluid)	-	15
Transmission Housing to Clutch Housing Bolt [1]		
- With a internal hex round head, “from transmission build date 7 December 2009”	M9	15 + 180°
- With a outer hex head	-	15 + 90°
Transmission Shift Lever to Gear Shift Unit Nut	-	23
Shift Housing to Body Nut	M6	8
	M8	25

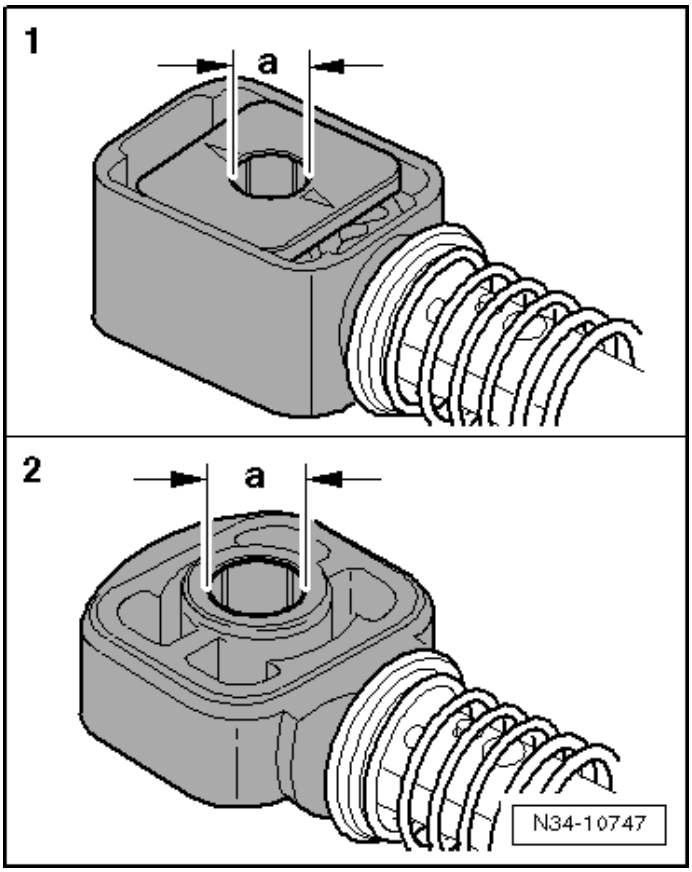
[1] Replace fasteners

Transmission to Engine Tightening Specifications



Item	Bolt	Qty.	Nm
1	M12 x 55 With a short M8 threaded pin or M12 x 50 Without threaded pin	1	80
2	M12 x 55 With long M8 threaded pin	1	80
3	M12 x 70 or M12 x 65	1	80
4	M10 x 50	2	40
5	M10 x 105	1	40
6	M12 x 165 With a short M8 threaded pin Also starter to transmission	1	80
7	M12 x 165 With a short M8 threaded pin Also starter to transmission	1	80
-	M6 x 8 Small flywheel cover plate (not present on all engines)	1	10
A and B: Centering alignment sleeves			

Cable Retainer Allocation



Cable Retainer for	Dimension a
1- Shift cable to transmission shift lever from 06.06	8.5 mm
2- Shift cable to transmission shift lever to 05.06	10 mm
2 - Selector cable to metal relay lever	8 mm
2 - Selector cable to plastic relay lever	10 mm

Gears, Shafts – 02Q

Adjustment Shim Table

Thickness (mm)		
1.45	1.75	2.05
1.50	1.80	2.10
1.55	1.85	2.15
1.60	1.90	2.20
1.65	1.95	2.25
1.70	2.00	

Rear Final Drive, Differential – 02Q

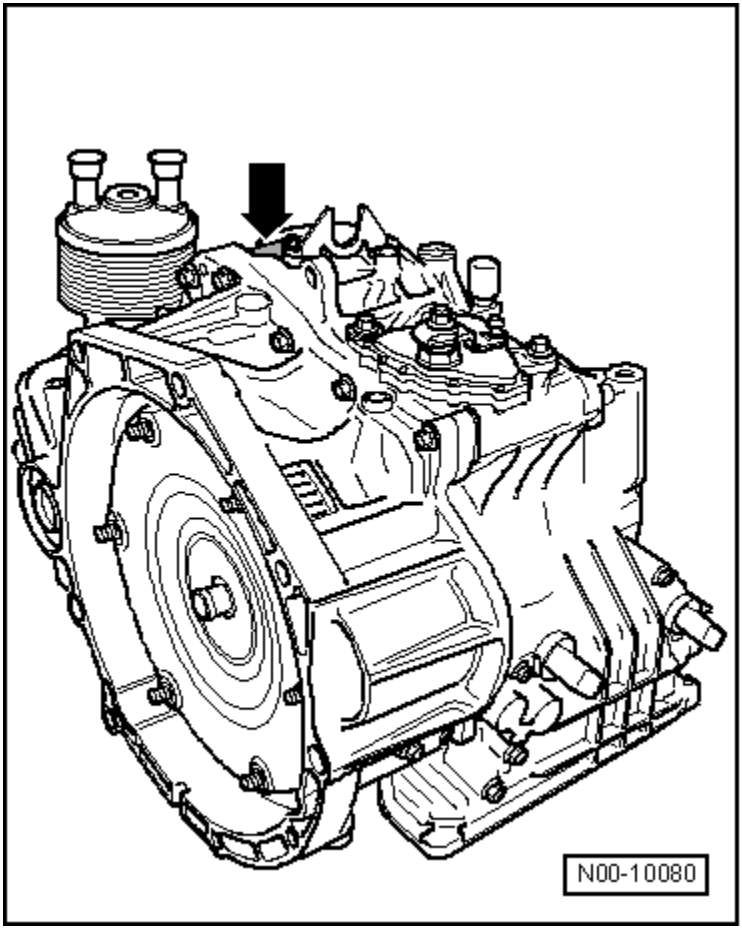
Fastener Tightening Specifications

Component	Fastener Size	Nm
Flange shaft bolt	-	25

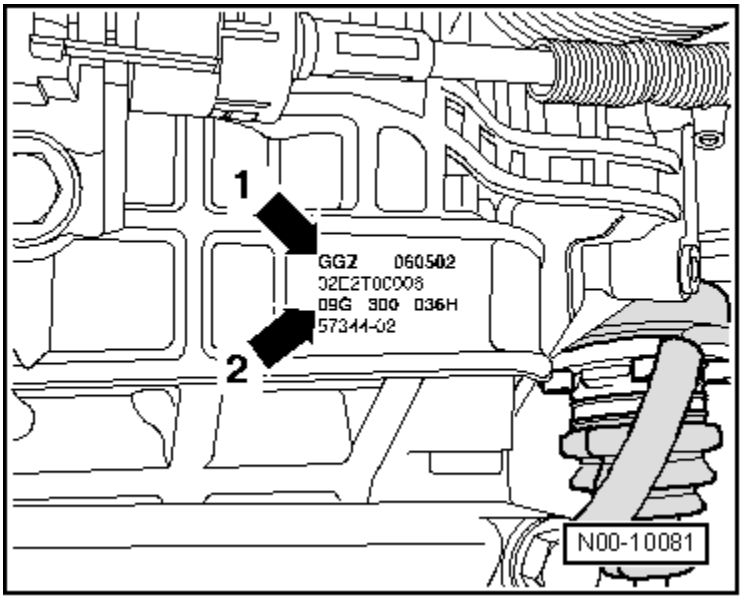
AUTOMATIC TRANSMISSION – 09G

General, Technical Data

Identification on Transmission



Code letters (➡)



Code letter (1 ➡) indicates 6-speed automatic transmission 09G (2 ➡).

Example:	GGZ	08	05	02
	Identification codes	Day	Month	Year (2002) of manufacture

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

Code Letters, Assembly Allocation and Ratios

If original replacement parts are needed for a repair, always pay attention to the transmission codes.

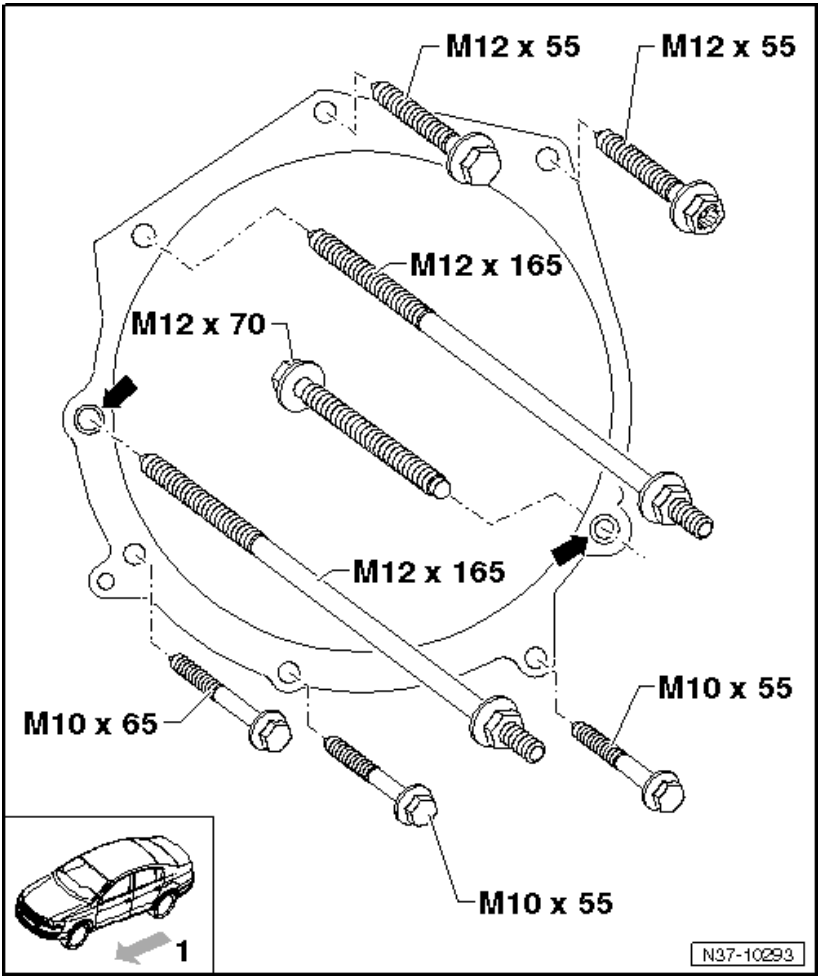
Automatic Transmission 09G			
Identification codes	MAM	HDN, HFU, HRM, JUJ	KBV, KGL, MAN, PDW
Engine	2.0L - 85 kW	2.5L - 110 kW	2.5L - 125 kW

Controls, Housing – 09G

Fastener Tightening Specifications

Component	Nm
Automatic transmission fluid cooler-to-transmission bolt	36
Inspection plug-to-transmission oil pan	27
Multifunction transmission range switch-to-transmission bolt	6
Multifunction transmission range switch-to-transmission nut	7
Selector lever cable bracket-to-transmission nut	8
Selector lever-to-selector shaft nut	13
Selector lever and selector mechanism with selector lever cable-to-body screw	8
Shift housing-to-body nut	4

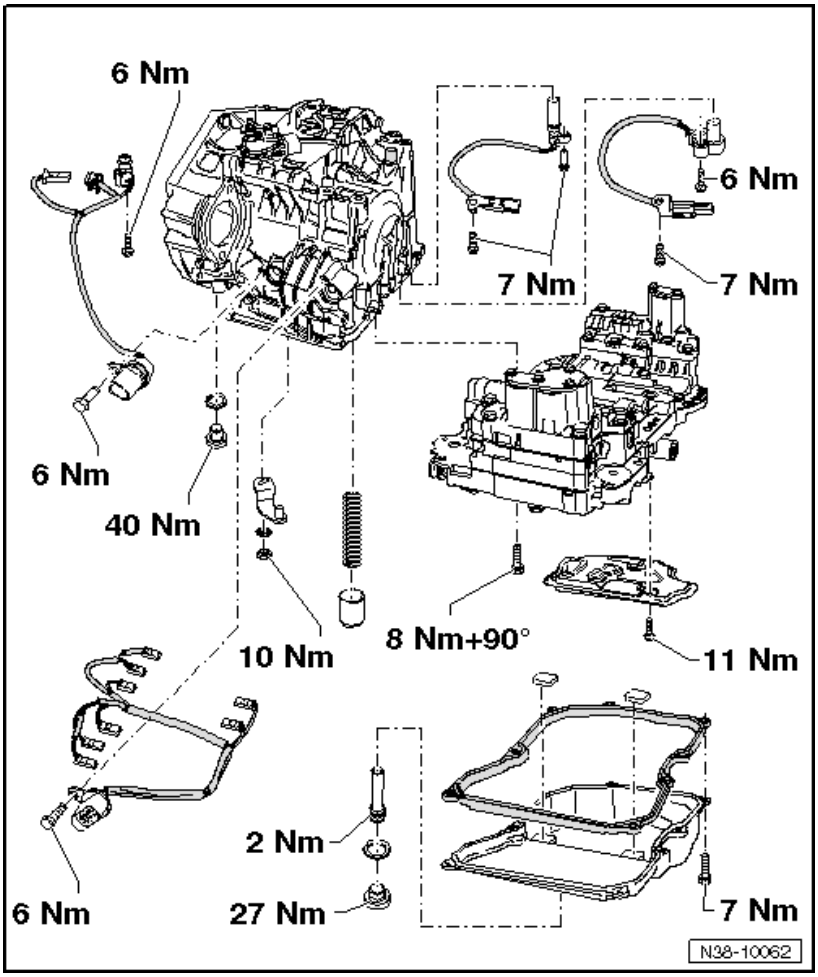
Transmission to Engine Tightening Specifications



Component	Fastener size	Nm
Drive plate-to-converter	-	60
Bolts	M12	80 or 65, if using T10179
Bolts located in the lower flange	M10	40
Alignment pins ➡ for centering		

Gears, Hydraulic Controls – 09G

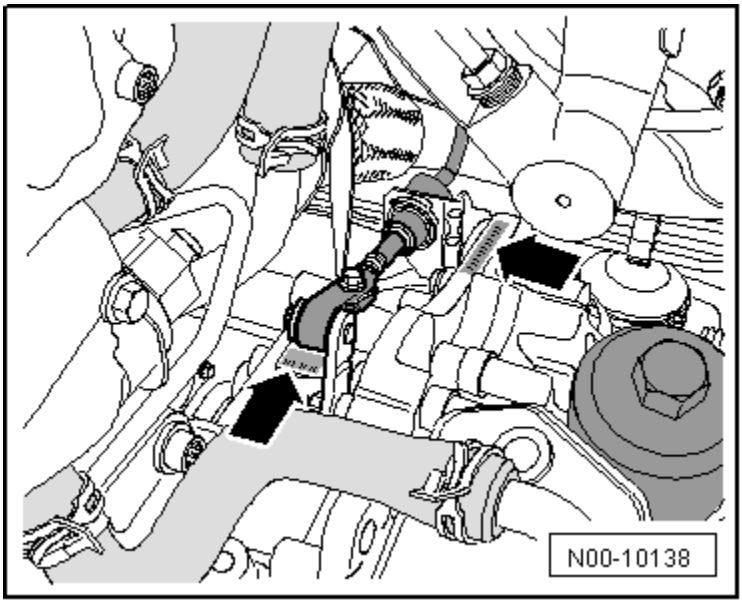
Fastener Tightening Specifications



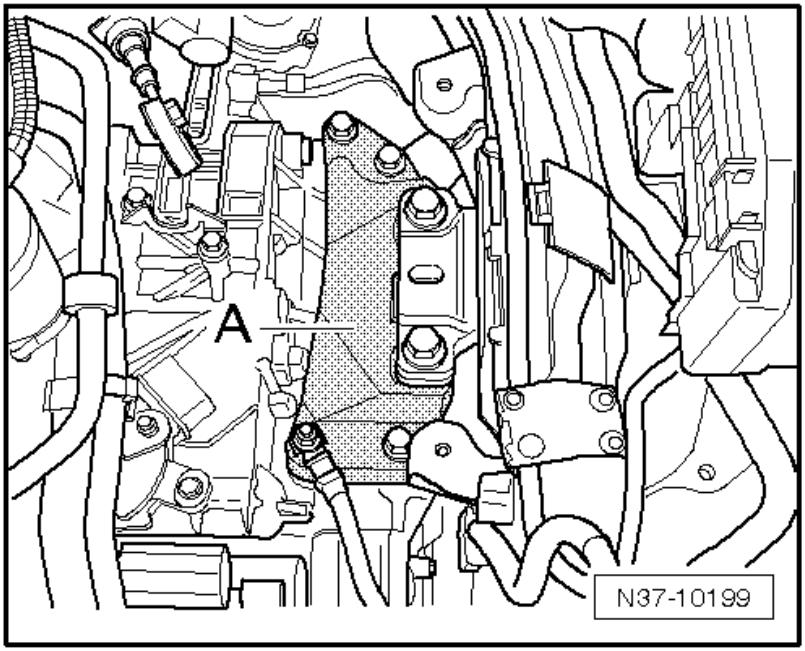
DIRECT SHIFT GEARBOX (DSG) TRANSMISSION – 02E

General Information

Transmission Code Letters, Reading



The transmission code letters can be found on the transmission near the selector lever cable (➡) or under the transmission mount bracket.



To read the transmission code letters under the transmission mount bracket, the engine and transmission must be supported and the transmission mount bracket (A) removed. Refer to ElsaWeb for the transmission mount bracket (A) removal procedure.

Transmission Allocation Codes

Direct Shift Gearbox (DSG) 02E		
HLH, HQN, HQH, HXU and JPL	KCU, KMX, KQC, LQV, LTE, MFL, MSV, NJK, MSV and NLP	HBQ, HUT, HXW, JPP, KCZ, KNC, KPV, LQZ, LTL, MSX, NJM and NLQ
1.9L -77 kW TDI	2.0L - 103 kW TDI	2.0L - 147 kW TFSI
Installed in: Jetta from MY 2005 through 2010, Jetta SportWagen (US)/Jetta Wagon (Canada) for MY 2009, Jetta SportWagen (US)/Golf Wagon (Canada) for MY 2010, Jetta from MY 2011 and GLI from MY 2012		

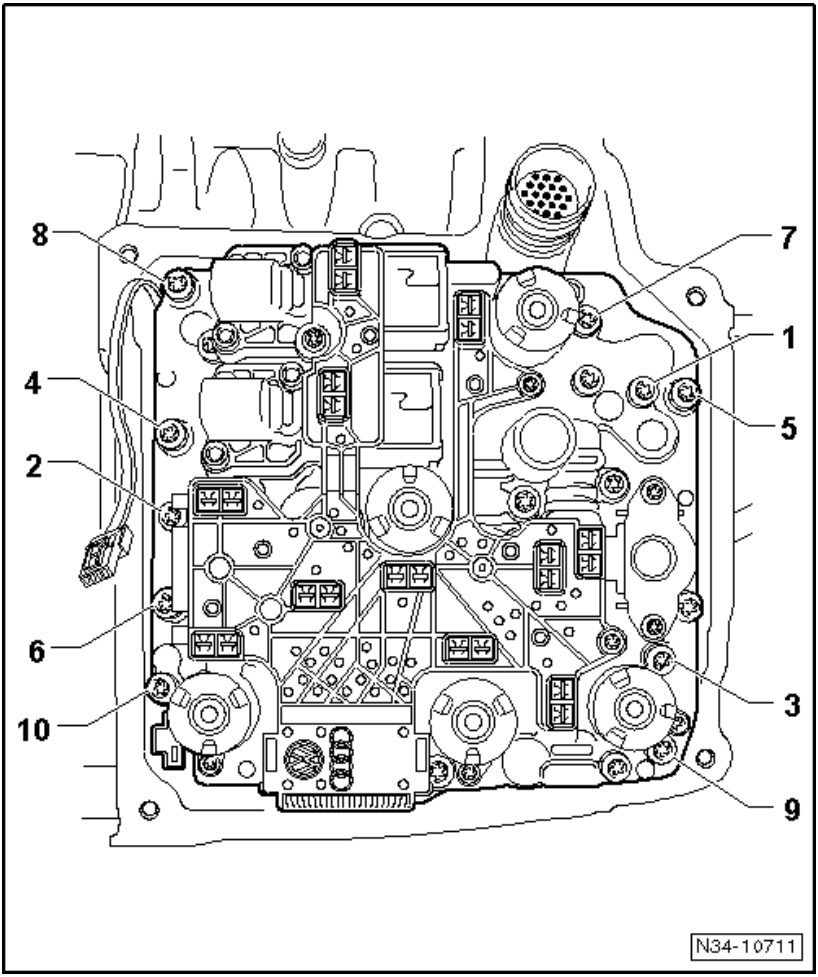
Controls, Housing (DSG) – 02E

Fastener Tightening Specifications

Component	Nm
Drain plug to transmission	45
Mechatronic (large) cover bolt [1)]	10
Oil filter housing	20
Oil pump (small) cover bolt [1)]	8
Overflow tube to transmission	3
Selector housing to body nut	8
Selector lever cable adjusting bolt	13
Selector mechanism with selector lever and selector lever cable to body bolt	8
Selector shaft lever nut	20
Transmission fluid cooler to transmission bolt	20 plus an additional 90° (¼ turn)
Transmission input speed and clutch oil temperature sensor bolt	10
Wire bracket to mechatronic (large) cover nut	10

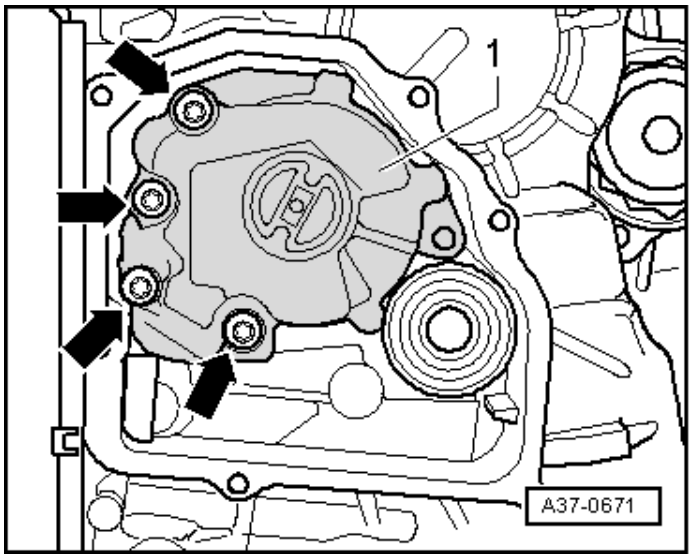
[1)] Tighten the bolts diagonally in multiple stages.

Mechatronic Tightening Specifications



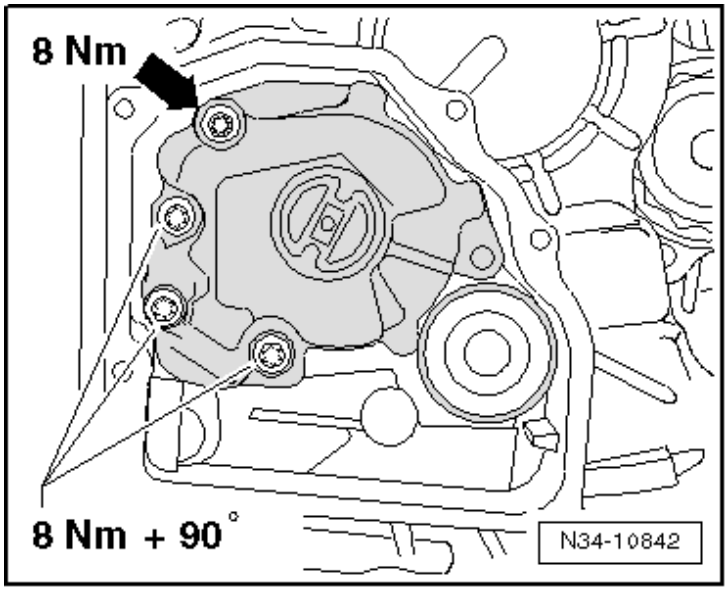
Stage	Bolts	Tightening specification
1	Tighten bolts 1 through 10 in sequence	Install all the way in by hand.
2	Tighten bolts 1 through 10 in sequence	5 Nm
3	Tighten bolts 1 through 10 in sequence	Then tighten them an addition 90° (1/4) turn

Oil Pump Tightening Specifications



Without countersunk bolt

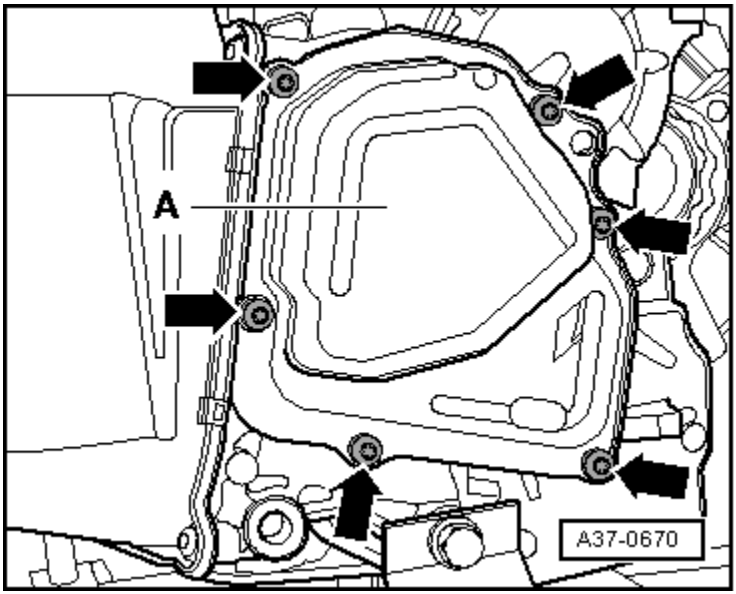
Component	Nm
Oil pump bolts ➡ with flat heads	5 plus an additional 90° (¼ turn)



With countersunk bolt

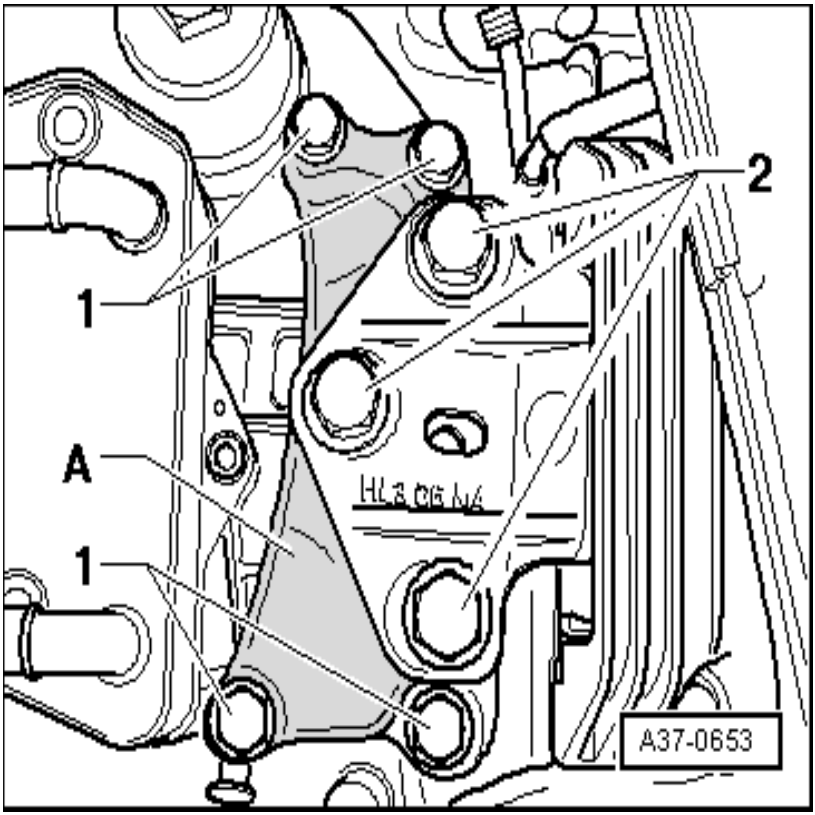
Component	Nm
Oil pump countersunk bolt	8
3 remaining oil pump bolts	8 plus an additional 90° (¼ turn)

Oil Pump Cover Tightening Specifications



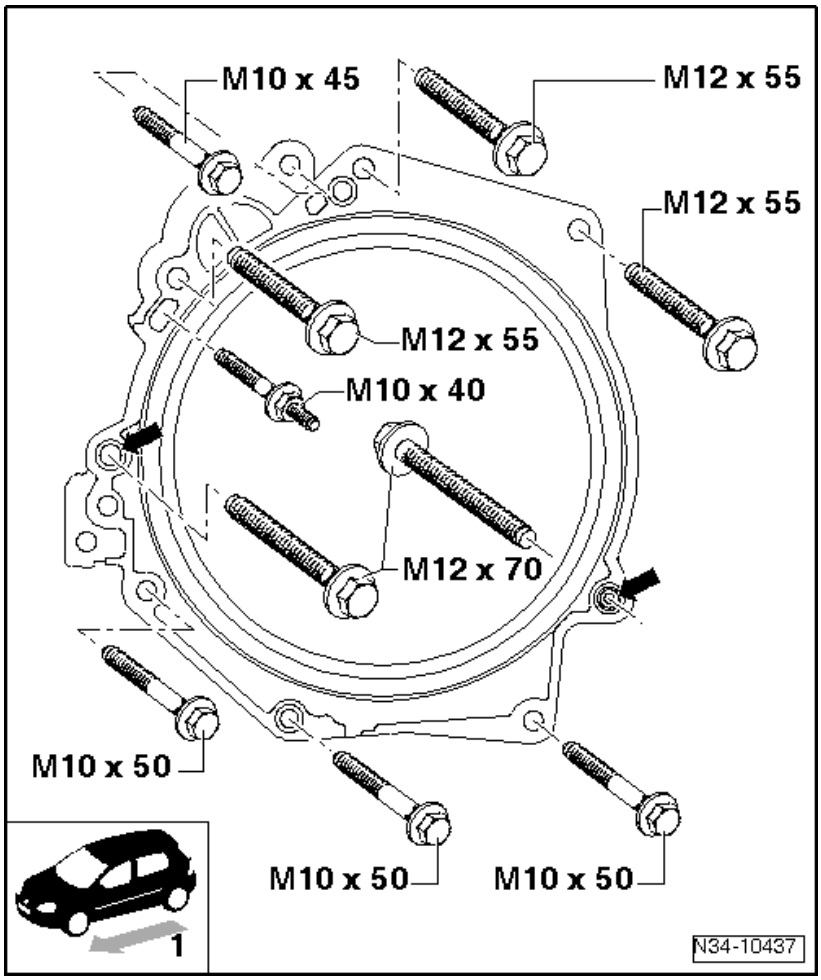
Component	Nm
Tighten bolts ➡ in a diagonal sequence in several steps (replace bolts)	8

Transmission Mount Tightening Specifications



Bolt	Component	Nm
1 and 2	Install all new bolts and tighten	Hand-tighten
1	Transmission mount-to-body	40 plus an additional 90° (¼ turn)
2	Transmission mount-to-transmission support	60 plus an additional 90° (¼ turn)

Transmission to Engine Tightening Specifications



Component	Fastener Size	Nm
Bolts	M12	80 or 65 if using T10179
Bolts	M10	40
Alignment pins ➡ for centering		

BRAKE SYSTEM

General Information

Front Brakes

Engine Version	PR number	Front Wheel Brake
1.4l 110 kW	1ZA/1ZB/1LV	FN 3 (16)
2.0L 85 kW	1ZM/1ZQ	FS III (15”)
2.5L 125 kW	1ZP/1ZE	FN 3 (15”)
2.0L 103 kW TDI	1ZP/1ZE	FN 3 (15”)
2.0L 147 kW	1ZA/1ZB/1LV	FN 3 (16”)

Rear Brakes, Torsion Beam Rear Suspension

Engine Version	PR number	Rear Wheel Brake
2.5L 125 kW	1KS/1KT	Bosch
2.0 103 kW TDI		
2.5l 125 kW [1)]	1KG	TB 230 x 32
2.0L 85 kW	1KG	TB 230 x 32

[1)] SE version only

Rear Brakes, Multi-link Rear Axle

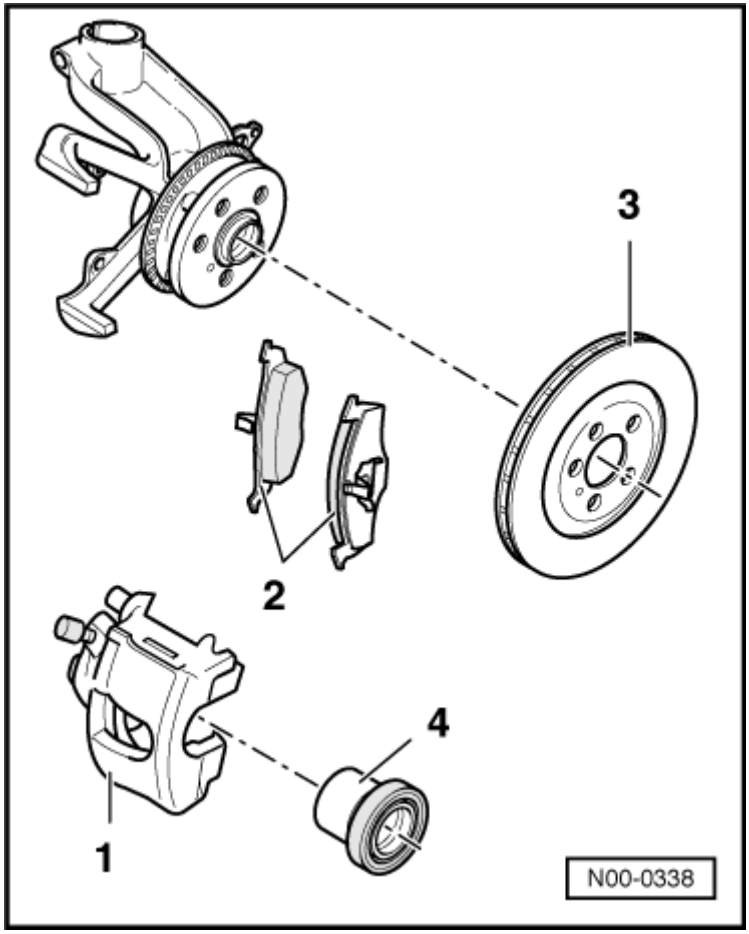
Engine Version	PR number	Rear Wheel Brake
1.4l 110 kW	1KS/1KT	Bosch
2.0L 147 kW	1KS/1KT	Bosch

Master Cylinder and Brake Booster

Brake master cylinder [1)]	Diameter in mm	22.2
Brake master cylinder [1)]	Diameter in mm	23.81
Brake booster	Diameter in inches	10

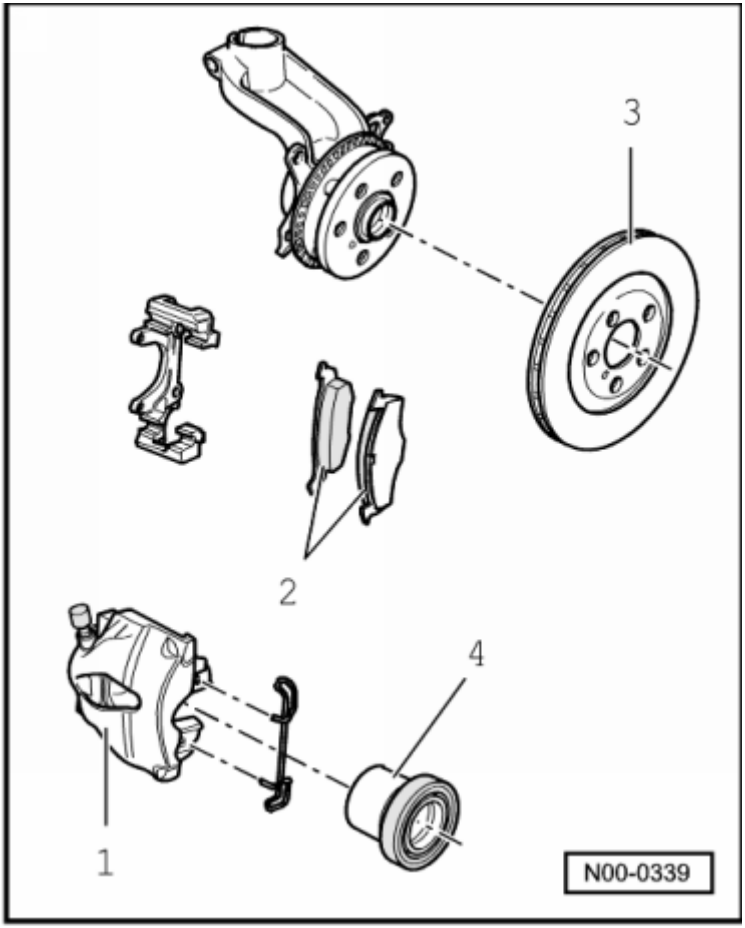
[1)] Allocation, refer to Electronic Parts Catalog (ETKA).

Front Brakes, FS III



Item	PR Number		1ZM/1ZQ
1	Brake caliper		FS III (15”)
2	Brake pad, thickness without backing plate	mm	14
3	Brake rotor	Diameter in mm	280
	Brake rotor, thickness	mm	22
4	Brake caliper, piston	Diameter in mm	54

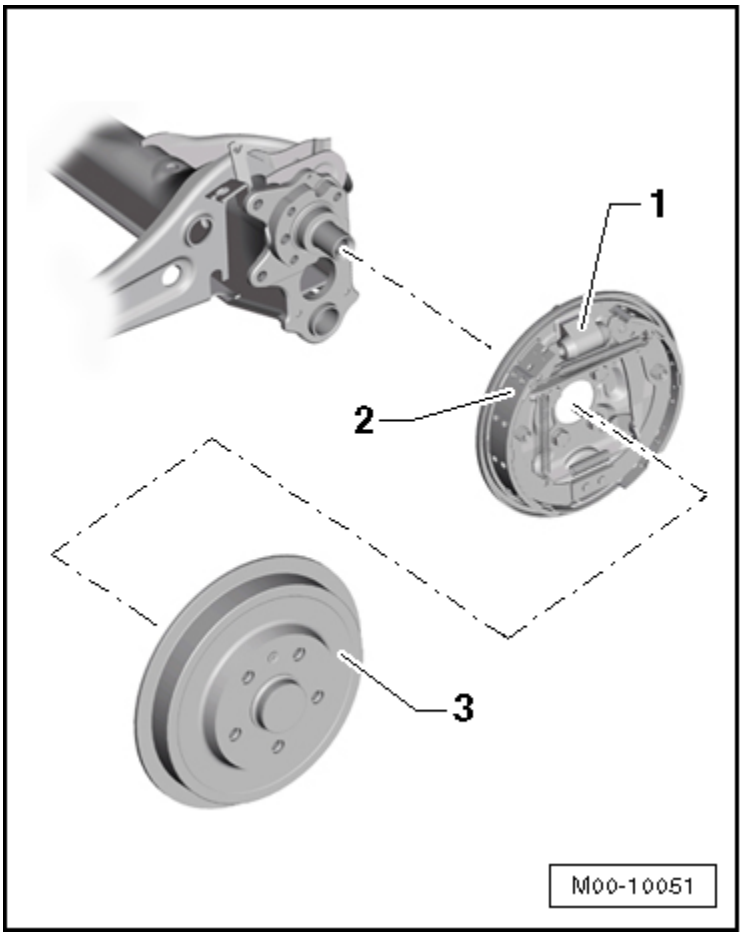
Front Brakes, FN 3



Item	PR number		1ZE/1ZP
1	Brake caliper		FN 3 (15”)
2	Brake pad, thickness without backing plate	mm	14
3	Brake rotor	Diameter in mm	288
	Brake rotor, thickness	mm	25
4	Brake caliper, piston	Diameter in mm	54

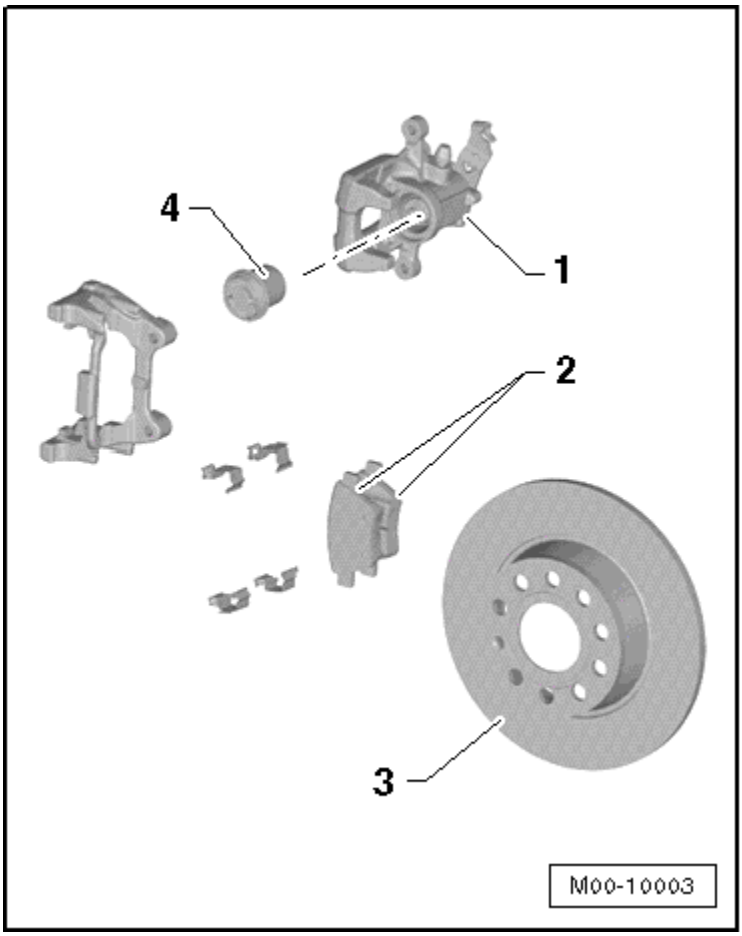
Item	PR number		1LV/1ZA/1ZB
1	Brake caliper		FN 3 (16”)
2	Brake pad, thickness	mm	14
	Brake pad, wear limit without back plate	mm	2
3	Brake rotor	Diameter in mm	312
	Brake rotor thickness	mm	25
	Brake rotor, wear limit	mm	22
4	Brake caliper, piston	Diameter in mm	54

Rear Drum Brakes



Item	PR number		1KG
1	Wheel brake cylinder	mm	20
2	Brake pad, width	mm	32
	Brake pad, thickness	mm	5
	Brake pad, minimum thickness	mm	2.5
3	Brake drum	Diameter in mm	230
	Brake drum, wear limit	Diameter in mm	231.5

Rear Disc Brakes



Item	PR number		1KS/1KT
1	Brake caliper		Bosch
2	Brake pad, thickness without backing plate	mm	12
3	Brake rotor	Diameter in mm	272
	Brake rotor, thickness	mm	10
4	Brake caliper, piston	Diameter in mm	38

Anti-lock Brake System (ABS)

Fastener Tightening Specifications

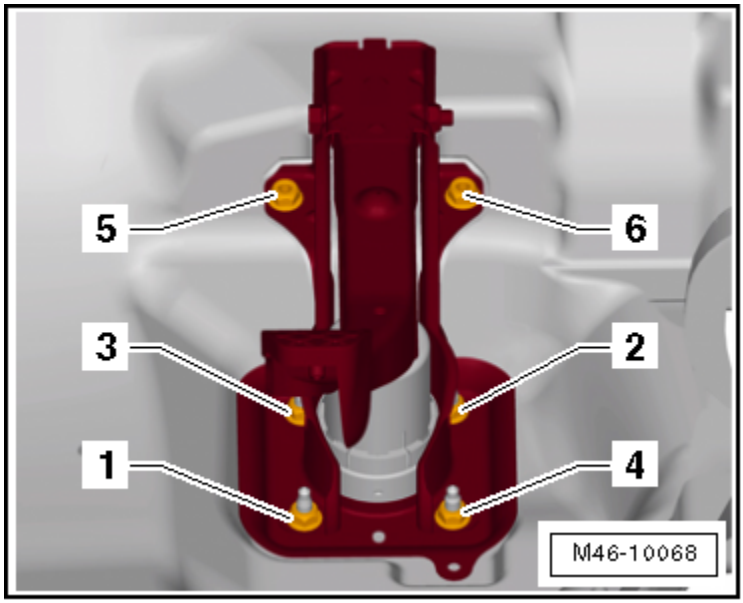
Component	Nm
ABS control module-to-ABS hydraulic unit bolt (always replace)	
ABS Mark 70 (ABS/ASR)	5.5
ABS Mark 60 EC (ABS/EDL/ASR/ESP) (always replace)	2+/- 0.8
ABS hydraulic unit bracket bolt/nut	8
Brake line	14
Steering angle sensor-to-steering column bolt	1.5
Steering wheel-to-steering column bolt (always replace)	30 plus an additional 90° (¼ turn)
Wheel speed sensor bolt	8

Mechanical Components

Fastener Tightening Specifications

Component	Fastener size	Nm
Brake booster and mounting bracket nut (always replace)		25
Brake disc-to-wheel hub bolt		
FS III		5
FN 3		4
Brake hose-to-brake caliper		35
Brake pedal-to-mounting bracket nut (always replace)		25
Front brake carrier-to-wheel bearing housing bolt, FN 3		124
Front cover plate-to-wheel bearing housing bolt		12
Front brake caliper guide pin		30
Front wheel bearing unit-to-wheel bearing housing bolt (always replace)		70 plus an additional 90° (¼ turn)
Parking brake lever nut		20
Rear brake caliper-to-guide pin bolt (always replace)		35
Rear brake carrier-to-wheel bearing housing bolt, disc brakes (always replace)		90 plus an additional 90° (¼ turn)
Rear drum brake carrier/disc brake cover plate (torsion beam) and stub axle-to-axle beam bolt (always replace)		30 plus an additional 90° (¼ turn)
Rear disc brake cover plate (multi-link)-to-axle beam bolt	M6 x 12	12
Rear brake disc/drum-to-wheel hub bolt		8
Rear wheel bearing unit-to-stub axle bolt (drum brake) (always replace)		180 plus an additional 180° (1/2 turn)
Rear wheel bearing unit-to-stub axle bolt (disc brake) (always replace)		180 plus an additional 90° (¼ turn)
Rear wheel brake cylinder-to-brake carrier bolt, drum brakes		8
Wheel speed sensor bolt		8

Brake Pedal Mounting Bracket Tightening Specifications



Component	Nm
Install all new bolts and tighten 1 through 6 in sequence	25

Hydraulic Components

Fastener Tightening Specifications

Component	Nm
Brake caliper bleeder valve	10
Brake lamp switch-to-brake master cylinder nut	5
Brake line-to-master cylinder	14
Brake master cylinder-to-brake booster nut (always replace)	25
Front brake caliper guide pin	30
Pedal assembly mounting nut (always replace)	25
Rear brake caliper-to-guide pin bolt (always replace)	35

SUSPENSION, WHEELS, STEERING

Front Suspension

Fastener Tightening Specifications

Component	Fastener size	Nm
ABS wheel speed sensor-to-wheel bearing housing bolt	-	8
Ball joint to control arm nut	-	100
Ball joint-to-wheel bearing housing nut	-	60
Control arm-to-Subframe Bolt (always replace)	M12 x 1.5 x 80	70 plus an additional 90° (¼ turn)
Coupling rod-to-stabilizer bar nut	-	65
Coupling rod-to-strut nut	-	65
Cover plate-to-wheel bearing housing bolt	-	12
CV joint boot clamp	-	25
Drive axle heat shield bolt	-	25
Drive axle-to-transmission bolt (always replace) [2]		
- CV joint VL 100	M8	40
- CV joint VL 100	M10	70
- CV joint VL 107	M10 x 52	70
- Triple roller joint AAR3300i	M10 x 23	70
Drive axle to wheel hub bolt (always replace)		
- Twelve-point bolt with ribs	-	70 plus an additional 90° (¼ turn)
- Twelve-point bolt without ribs	-	200 plus an additional 180° (½ turn)
Pendulum support to subframe bolt (always replace) [1]	M14 x 1.5 x 70	100 plus an additional 90° (¼ turn)
Pendulum support to transmission bolt (always replace)	-	50 plus an additional 90° (¼ turn)
Shock absorber to suspension strut bearing nut (always replace)	-	60
Subframe to body bolt (always replace)	-	70 plus an additional 90° (¼ turn)

Fastener Tightening Specifications *(cont'd)*

Component	Fastener size	Nm
Stabilizer bar to subframe bolt	-	20 plus an additional 90° (¼ turn)
Strut to body bolt (always replace)	-	15 plus an additional 90° (¼ turn)
Strut to wheel bearing housing nut (always replace)	-	70 plus an additional 90° (¼ turn)
Wheel hub-to-wheel bearing housing bolt (always replace) 3)	-	70 plus an additional 90° (¼ turn)

1) Tighten only when the pendulum support is bolted to the transmission..
2) First tighten diagonally to 10 Nm, then tighten diagonally again to the tightening specification.

Rear Suspension

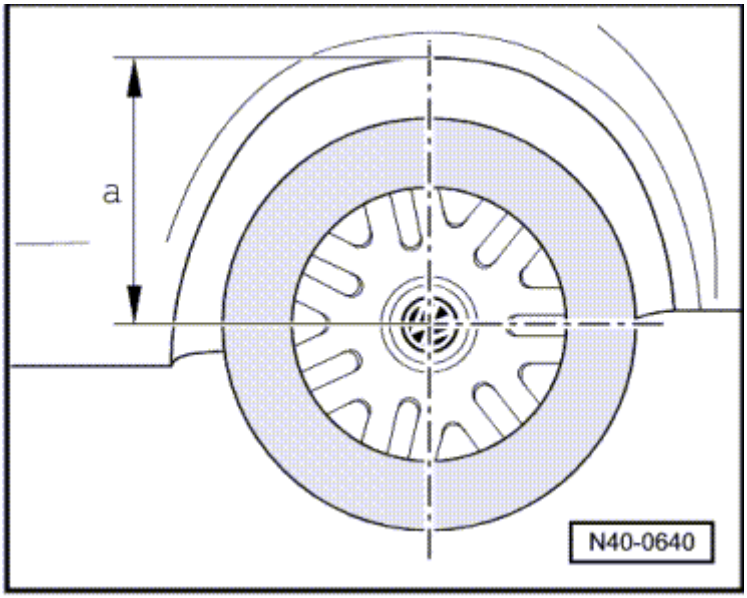
Fastener Tightening Specifications

Component	Fastener Size	Nm
ABS wheel speed sensor to wheel bearing housing bolt	-	8
Brake disc to wheel hub bolt	-	4
Coupling rod to stabilizer bar nut 1)	-	45
Coupling rod to wheel bearing housing nut 1)	-	45
Cover Plate to wheel bearing housing bolt	-	12
Left rear level control system sensor bolt	M5 x 20	5
Lower transverse link to subframe nut 1) 2)	-	95
Lower transverse link to wheel bearing housing nut 1) 2)	-	90 plus an additional 90° (¼ turn)
Shock absorber to body bolt 1)	-	50 plus an additional 90° (¼ turn)
Shock absorber to shock absorber mounting nut 1	-	25
Shock absorber to wheel bearing housing bolt	-	180

Component	Fastener Size	Nm
Stabilizer bar to subframe bolt [1) 2) 5)]	-	25 plus an additional 90° (¼ turn)
Stone protection plate to lower transverse link bolt	-	8
Subframe to body bolt [1) 3)]	-	90 plus an additional 90° (¼ turn)
Tie rod to subframe nut [1) 2)]	-	90 plus an additional 90° (¼ turn)
Tie rod to wheel bearing housing nut [1) 2)]	-	130 plus an additional 90° (¼ turn)
Trailing arm mounting bracket to body bolt [1)]	-	50 plus an additional 90° (¼ turn)
Trailing arm to mounting bracket bolt [1)]	-	90 plus an additional 90° (¼ turn)
Trailing arm to wheel bearing housing bolt [1) 4)]	-	90 plus an additional 90° (¼ turn)
Upper transverse link to subframe nut [1) 2)]	-	95
Upper transverse link to wheel bearing housing nut [1) 2)]	-	130 plus an additional 90° (¼ turn)
Wheel hub to wheel bearing housing bolt [1)]	-	180 plus an additional 90° (¼ turn)

1) Tighten in the curb weight position, refer to ElsaWeb, Wheel Bearing Housing, Lifting to Curb Weight Position.
2) Always tighten threaded connections in curb weight position. Refer to → Chapter „Rear Axle, Lifting to Curb Weight Position“.
3) Tighten in the following sequence: Tighten to 90 + 90° turn, loosen one full turn (360°), then tighten to 90 + 90° turn..
4) Observe tightening sequence.
5) Tighten uniformly.

Alignment Specifications with Torsion Beam Rear Suspension



Front Suspension	Basic	Sport
PR numbers	2UA	2UC
Total toe (wheels not pressed)	10’ ± 10′	10’ ± 10′
Camber (wheels in straight ahead position)	-30′ ± 30′	-40′ ± 30′
Maximum permissible difference between both sides	Maximum 30’	Maximum 30’
Toe out angle [1)] with steering wheel turned 20° to left and right	1°19′ ± 20′	1°31′ ± 20′
Caster	7° 37′ ± 30′	7° 53′ ± 30′
Maximum permissible difference between both sides	Maximum 30’	Maximum 30’
Standing height	379 ± 10 mm	364 ± 10 mm

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

Front Suspension	Comfort	Heavy Duty
PR numbers	2UD	2UB
Total toe (wheels not pressed)	10’ ± 10′	10’ ± 10′

Front Suspension	Comfort	Heavy Duty
Camber (wheels in straight ahead position)	-22′ ± 30′	-13′ ± 30′
Maximum permissible difference between both sides	Maximum 30’	Maximum 30’
Toe out angle [1] with steering wheel turned 20° to left and right	1°12′ ± 20′	1°7′ ± 20′
Caster	7° 27′ ± 30′	7° 18′ ± 30′
Maximum permissible difference between both sides	Maximum 30’	Maximum 30’
Standing height	389 ± 10 mm	399 ± 10 mm

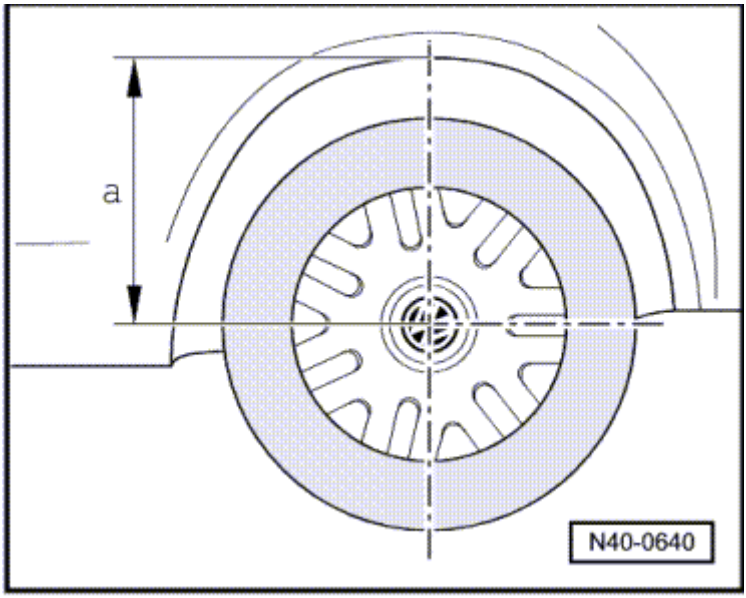
[1] Depending on the manufacturer, the toe out angle difference can also be indicated negatively in the alignment computer.

Specified values valid for all engine versions

Rear Suspension	Basic	Sport
Camber	-1° ± 30′	-1° ± 30′
Maximum permissible difference between both sides	Maximum 30’	Maximum 30’
Total toe (at prescribed camber)	+20′ ± 10′	+20′ ± 10′
Maximum permissible deviation from direction of rotation	Maximum 20’	Maximum 20’
Standing height	379 ± 10 mm	364 ± 10 mm

Rear Suspension	Comfort	Heavy Duty
Camber	-1° ± 30′	-1° ± 30′
Maximum permissible difference between both sides	Maximum 30’	Maximum 30’
Total toe (at prescribed camber)	+20′ ± 10′	+20′ ± 10′
Maximum permissible deviation from direction of rotation	Maximum 20’	Maximum 20’
Standing height	389 ± 10 mm	399 ± 10 mm

Alignment Specifications, Multi-Link Rear Suspension



Front Suspension	Basic
PR numbers	2UA
Total toe (wheels not pressed)	10’ ± 10′
Camber (wheels in straight ahead position)	-30′ ± 30′
Maximum permissible difference between both sides	Maximum 30’
Toe out angle [1] with steering wheel turned 20° to left and right	1°19′ ± 20′
Caster	7° 37′ ± 30′
Maximum permissible difference between both sides	Maximum 30’
Standing height	379 ± 10 mm

[1] Depending on the manufacturer, the toe out angle difference can also be indicated negatively in the alignment computer.

Front Suspension	Sport	Comfort	Heavy Duty
PR numbers	2UC	2UD	2UB

Front Suspension	Sport	Comfort	Heavy Duty
Total toe (wheels not pressed)	10’ ± 10′	10’ ± 10′	10’ ± 10′
Camber (wheels in straight ahead position)	-40′ ± 30′	-22′ ± 30′	-13′ ± 30′
Maximum permissible difference between both sides	Maximum 30’	Maximum 30’	Maximum 30’
Toe out angle [1] with steering wheel turned 20° to left and right	1°31′ ± 20′	1°12′ ± 20′	1°7′ ± 20′
Caster	7° 53′ ± 30′	7° 27′ ± 30′	7° 18′ ± 30′
Maximum permissible difference between both sides	Maximum 30’	Maximum 30’	Maximum 30’
Standing height	364 ± 10 mm	389 ± 10 mm	399 ± 10 mm

[1] Depending on the manufacturer, the toe out angle difference can also be indicated negatively in the alignment computer.

Specified values valid for all engine versions

Rear Suspension	Basic
Camber	-1° ± 30′
Maximum permissible difference between both sides	maximum 30’
Total toe (at prescribed camber)	+20′ ± 10′
Maximum permissible deviation from direction of rotation	Maximum 20’
Standing height	379 ± 10 mm

Rear Suspension	Sport	Comfort	Heavy Duty
Camber	-1° ± 30′	-1° ± 30′	-1° ± 30′
Maximum permissible difference between both sides	Maximum 30’	Maximum 30’	Maximum 30’
Total toe (at prescribed camber)	+20′ ± 10′	+20′ ± 10′	+20′ ± 10′
Maximum permissible deviation from direction of rotation	Maximum 20’	Maximum 20’	Maximum 20’
Standing height	364 ± 10 mm	389 ± 10 mm	399 ± 10 mm

Fastener Tightening Specifications

Component	Nm
Tire pressure sensor union nut	8
Front subframe to body bolt [1]	70 plus an additional 180° (½ turn)
Front tie rod end to tie rod nut	70
Lower transverse link to rear subframe nut [1] [2]	8

Fastener Tightening Specifications *(Cont'd)*

Component	Nm
Upper transverse link to rear subframe nut [1) 2)]	95

1) Always replace after removal.
2) Always tighten threaded connections in curb weight position. Refer to Chapter *"Rear Axle, Lifting to Curb Weight Position"* (all except GLI) or to Chapter *"Rear Axle, Lifting to Curb Weight Position"* (GLI only).

Steering

Fastener Tightening Specifications

Component	Fastener size	Nm
Ball joint to control arm [1)]	-	100
Belt pulley-to-power steering pump bolt	-	22
Heat shield-to-steering gear bolt, hydraulic power steering	-	23
Pendulum support-to-transmission	M10 x 35	50 plus an additional 90° (¼ turn)
	M10 x 75	
Power steering pump-to-bracket bolt	-	22
Pressure line-to-power steering pump bolt	-	32
Shield-to-steering gear bolt/nut	-	6
Stabilizer bar to coupling rod nut [1) 2)]	-	65
Steering column-to-assembly carrier bolt	-	20
Steering column-to-steering gear bolt [1)]	M8 x 35	30
Steering gear-to-subframe bolt [1)]	-	50 plus an additional 90° (¼ turn)
Steering wheel-to-steering column bolt [1)]	-	30 plus an additional 90° (¼ turn)
Subframe to body	-	70 plus an additional 90° (¼ turn)
Tie rod-to-steering gear	-	100
Tie rod end-to-tie rod nut	-	70
Tie rod end-to-wheel bearing housing nut [1)]	-	20 plus an additional 90° (¼ turn)
Universal joint to steering gear bolt [1)]	-	30

1) Always replace after removal.
2) Counterhold at joint pin inner multi-point fitting.

ELECTRICAL SYSTEM

Communication

Fastener Tightening Specifications

Component	Nm
Amplifier-to-body nut	6
Antenna amplifier-to-C-pillar screw	2
FM frequency filter in positive wire-to-C-pillar	2
Frequency crossover	1.5
Front mid-range speaker	1.5
Radio-to-center console screw	1.5
Roof antenna-to-body nut	7
Satellite radio-to-rear shelf	4
Satellite tuner antenna-to-body nut	7
Subwoofer in rear shelf	4

Battery, Starter, Generator, Cruise Control

Fastener Tightening Specifications

Component	Fastener size	Nm
Subassembly bracket, collar bolts [1]	-	52
Subassembly bracket, collar bolts [2]	-	25
Subassembly bracket, collar bolts [3]	-	45
Air filter housing-to-body screw	-	10
Battery hold down screw	-	20
Battery terminal clamp nut	-	6
Battery tray bolts	-	9
B+ wire-to-starter	-	20
B+ wire nut-to-generator	-	20
Generator cap, Phillips head screw	-	4.5
Generator cap, nut	-	15
Generator cap, nut	-	20
Generator bolts [1]	-	23
Generator bolts [2]	-	25
Generator bolts [3] [4]	-	20
Hex bolt with washer and threaded piece for voltage regulator	-	2
Ribbed belt pulley without freewheel	-	65
Ribbed belt pulley with freewheel	-	80
Ribbed belt tensioner, collar bolts [1] [3]	-	23

Fastener Tightening Specifications *(cont'd)*

Component	Fastener size	Nm
Starter mounting bolt	M10	40
	M12	75
Voltage regulator, Phillips head screw	-	2
Voltage Stabilizer J532	-	1.5
Wire clamp nut-to-the back of the generator	-	3.2
Wiring bracket nut at starter, manual transmission	-	20

1) Applies to 1.4L and 2.0L FSI
2) Applies to 2.5L
3) Applies to 2.0L TFSI
4) Applies to 2.0L TDI

Instruments

Fastener Tightening Specification

Component	Nm
Horn-to-bracket nut	10
Horn bracket-to-body bolt	20
Instrument cluster	1.5

Windshield Wiper/Washer System

Fastener Tightening Specifications

Component	Nm
Windshield wiper arm attaching nut	20
Windshield wiper frame-to-body 1)	5
Windshield wiper frame-to-body 2)	8
Windshield wiper motor-to-wiper frame bolts	8
Windshield wiper motor crank-to-windshield wiper motor shaft	18
Windshield/headlamp washer fluid reservoir-to-the body	8

1) For bolt tightening clarification, refer to Chapter *"Windshield Wiper System Overview"* and see item -4-
2) For bolt tightening clarification, refer to Chapter *"Windshield Wiper System Overview"* and see item -5-.

Exterior Lights, Switches

Fastener Tightening Specifications

Component	Nm
Carrier, front end [1]	5
Carrier, front end [2]	8
Fog Lamp Housing Screws	2
Headlamp	5
Headlamp Power Output Stage	1.4
HID Headlamp Control Module	1.4
High-mounted brake lamp	2
License plate lamp	2
Rear lid taillamps bulb holder	3.5
Steering column electronic systems control module	1.5
Taillamp in side panel bulb holder	2.5

[1] For bolt tightening clarification, refer to ElsaWeb, *Headlamp Overview,* see item 7.

[2] For bolt tightening clarification, refer to ElsaWeb, *Headlamp Overview,* see item 6.

Interior Lights, Switches

Fastener Tightening Specifications

Component	Nm
Alarm horn nut	10
Front interior lamp	2

Wiring

Left E-box in the Engine Compartment Tightening Specifications

Fasteners	Nm
Nuts (wire connections to the E-box)	9
Nuts	6

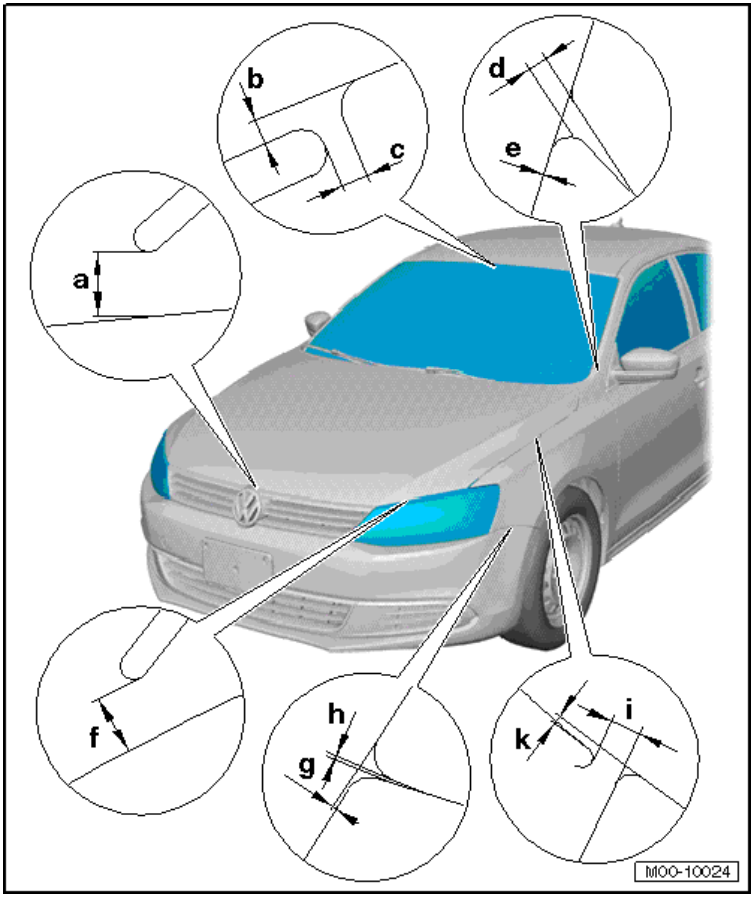
Fastener Tightening Specification

Component	Nm
Driver footwell fuse panel	1.5
Fuse Panel Behind the Instrument Panel on the Driver Side	2.5

BODY

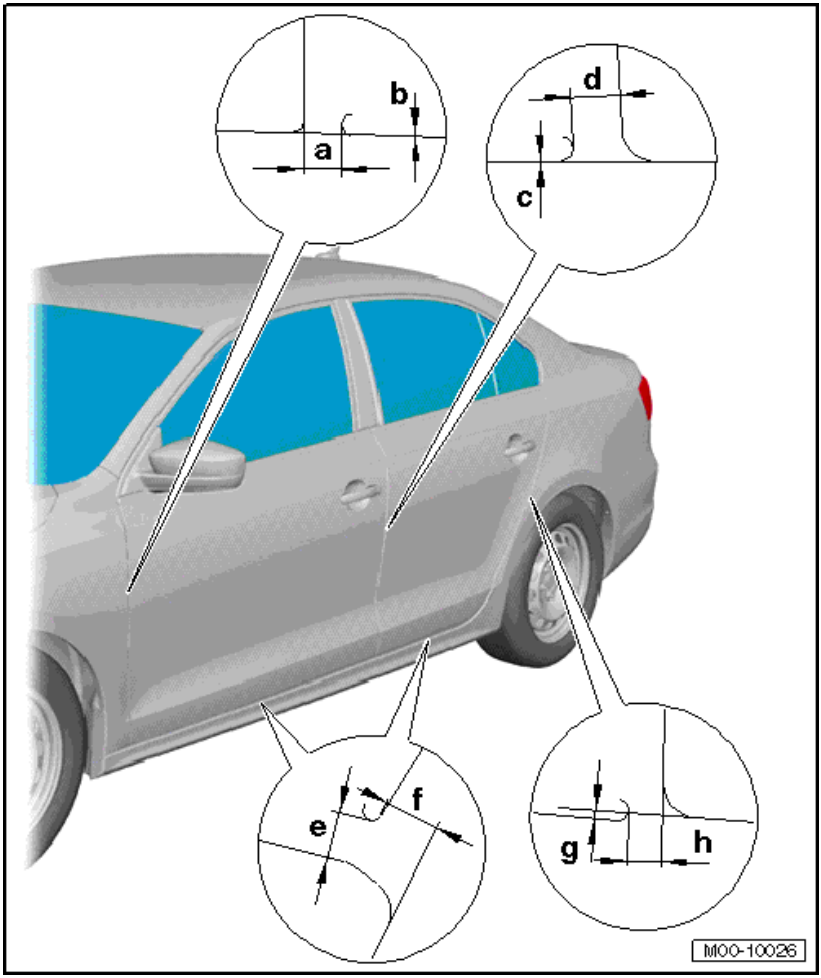
Body Dimensions

Body, Front



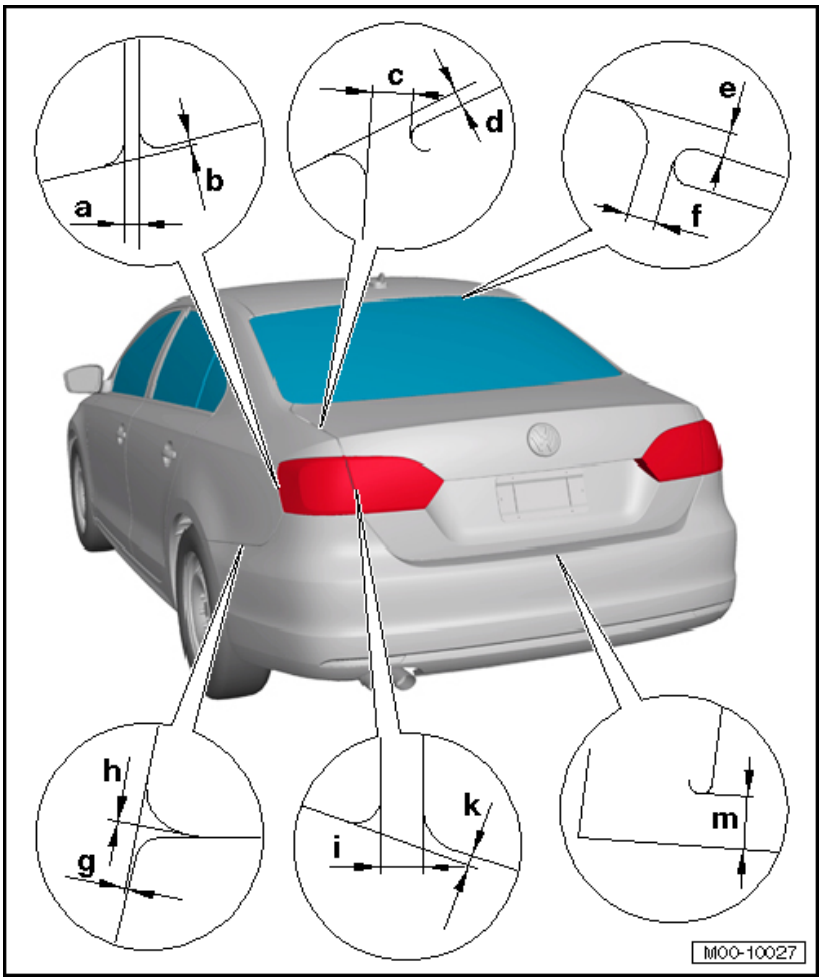
Component	mm
a	5.0 ± 0.5
b	1.9 ± 0.5
c	2.5 ± 0.5
d	2.0 ± 1.0
e	0.0 ± 0.5
f	4.9 ± 0.5
g	0.5 ± 0.5
h	0.5 ± 0.5
i	3.2 ± 1.5
k	0.5 – 1.6 ± 0.5

Body, Center



Component	mm
a	3.5 ± 0.5
b	0.0 ± 0.8
c	0.0 ± 1.0
d	4.2 ± 0.5
e	4.5 ± 0.5
f	5.1 ± 0.5
g	0.8 ± 1.0
h	3.5 ± 0.5

Body, Rear



Component	mm
a	1.0 ± 0.5
b	0.5 ± 0.5
c	3.7 ± 0.5
d	0.0 – 0.5 ± 0.5
e	2.0 ± 0.5
f	2.5 ± 0.5
g	0.5 ± 0.5
h	0.0 ± 0.5
i	3.5 ± 0.5
k	0.8 + 0.5
m	5.0 ± 0.5

Body Exterior

Lock Carrier Tightening Specifications

Component	Nm
Air guide channel bolts	2
Angle bracket bolts	8
Bumper carrier-to-the lock carrier bolts	8
Lock carrier bolts	60
Lock carrier support-to-bumper carrier nut	18
Front bumper enter guide bolts	8
Lock carrier support-to-lock carrier and hood latch bolts	12

Front Fender and Underbody Trim Tightening Specifications

Component	Nm
Cross panel	25
Front fender bolts	6
Fender brace bolts	6
Right rear underbody trim panel bolt	2.7
Tunnel bridge	20
Underbody trim panel	2

Front Hood and Rear Lid Tightening Specifications

Component	Nm
Hood hex nut-to-hood	22
Hood hinge bolts-to-body	22
Hood latch bolts	12
Hood release lever bracket bolts	1.5
Hood stricker nuts	10
Rear lid adjusting bolts	9
Rear lid handle bolts	6
Rear lid latch bolts	23
Rear license plate holder bolts	4
Rear lid striker bolts	18

Front and Rear Door Tightening Specifications

Component	Nm
Door hinge bolts (always replace)	40
Door hinge bolts (upper section to lower section)	23
Striker pin bolts	20
Door lock-to-inner door part bolt	18
Door strap (pillar side) bolt	30

Front and Rear Door Tightening Specifications *(Cont'd)*

Component	Nm
Door strap (door side) bolts	9
Lock cylinder bolts	4
Fuel fill door	1.5

Sunroof Tightening Specifications

Component	Nm
Glass panel bolts	7
Sunshade bolts	1
Assembly unit bolts	8
Sunroof motor bolts	4
Joining piece bolts	1.5

Front Bumper Tightening Specifications

Component	Nm
Bumper cover bolts	2
Slide guide bolts	2
Center guide bolts	8
Carrier assembly bolts (2 on each side)	8
Carrier assembly nuts	8
Carrier assembly (3 on left, 4 on right)	60

Rear Bumper Tightening Specifications

Component	Nm
Bumper cover bolts	2.7
Bumper cover guide bolts	4
Bumper carrier bolts	20

Front and Rear Door Window Tightening Specifications

Component	Nm
Window regulator motor nuts	8
Window regulator motor bolts	4
Fixed door window bolts	5.5

Front and Rear Wheel Housing Liner Tightening Specification

Component	Nm
Front and rear wheel housing liner bolts	2

Rear View Mirror Tightening Specifications

Component	Nm
Mirror base plate bolts	8
Adjusting unit with exterior rearview mirror motor bolts	2
Sill panel cover	2

Sill Panel Cover Tightening Specification

Component	Nm
Sill panel cover bolts	2

Body Interior

Passenger Protection Tightening Specifications

Component	Nm
Seat belt-to-outer floor assembly anchor point	40
Belt anchor bolt	40
Front seat belt height adjuster bolt	40
Belt latch-to-seat bolt	20
Automatic belt retractor bolt	40
Rear center 3-point seat belt belt latch hex nut	40
Rear center lap belt bolt	40
Rear double belt latch bolt	40
Airbag control module J234 nuts	9
Passenger occupant detection system control module J706	1.5
Passenger side airbag unit bolts	9
Seat frame to floor bolts	40
Side airbag bolts	9
Side curtain airbag cap nuts	9
Side curtain airbag cap bolts	4.5
Front crash sensor bolts	9
Rear wheel housing crash sensor bolts	9

Interior Trim Tightening Specifications

Component	Nm
Center console trim screw	1.5
Instrument panel bolts	1.5
Instrument panel screws	9
Deformation element screws	1.5
Instrument panel cross member bolts	20
Headliner bolts	2
Door trim panel bracket bolts	4
Door trim panel bolts	4
Door trim panel screws	2
Door mirror triangle cover bolt	2
Seat trim screw	3
Upper A-pillar and B-pillar trim airbag emblem bolt	4
B-pillar trim bolts	4

HEATING, VENTILATION & AIR CONDITIONING

General Information

Refrigerant Oil Distribution

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

Refrigerant R134a Vapor Pressure Table

Temperature in °C	Pressure in bar (positive pressure) of R134a
-45	-0.61
-40	-0.49
-35	-0.34
-30	-0.16
-25	0.06
-20	0.32
-15	0.63
-10	1.00
-5	1.43
0	1.92
5	2.49
10	3.13
15	3.90
20	4.70
25	5.63
30	6.70
35	7.83
40	9.10
45	10.54
50	12.11
55	13.83
60	15.72
65	17.79
70	20.05
75	22.52
80	25.21
85	28.14
90	31.34

Heating, Ventilation

Fastener Tightening Specifications

Component	Nm
Auxiliary heater heating element screw	1.4
Auxiliary heater heating element connector strip [1)]	9 ±1
Auxiliary heater heating element voltage supply nuts [2)]	6 ±1
Fresh air blower bolt	1

[1)] From 1K-7M 119 727
[2)] Through 1K-7M 119 726

Air Conditioning

Fastener Tightening Specifications

Component	Nm
A/C compressor bolts	25
Climatic	
Heating and A/C unit bracket (item 3) screws	4
Heating and A/C unit bracket (items 5, 11) screws	8
Climatronic	
Heating and A/C unit bracket (item 3) screws	4
Heating and A/C unit bracket (items 5, 11) screws	8
Climatronic control module	1.5 ± 0.2
Condenser attaching screws	5
Expansion valve bolts	5
Fluid reservoir	4.2 ± 0.7
Refrigerant line bolts	12
Refrigerant line at compressor bolts	22 ± 1

DTC CHART

Engine Code 2.0L CBPA

Fuel and Air Mixture, Additional Emission Regulations

DTC	Error Message	Malfunction Criteria and Threshold Value
P0016	Crankshaft Position-Camshaft Position Correlation Bank 1 Sensor A	• Permissible deviation < -12° Rev or • Permissible deviation > 12° Rev
P0030	HO2S Heater Control Circuit (Bank 1, Sensor 1)	Heater voltage 4.70 - 5.40 V
P0031	O2 Sensor Heater Control Circuit (Bank 1 (1) Sensor 1) Low	Heater voltage 0 to 3.26 V
P0032	O2 Sensor Heater Control Circuit (Bank 1 (1) Sensor 1) High	Heater current > 5.50 A
P0036	Sensor Heater Control Circuit (Bank 1 (1) Sensor 2)	Heater voltage 2.34 - 3.59 V
P0037	O2 Sensor Heater Control Circuit (Bank 1 (1) Sensor 2) Low	Heater voltage < 2.34 V
P0038	O2 Sensor Heater Control Circuit (Bank 1 (1) Sensor 2) High	Heater voltage > 3.59 V
P0070	Ambient Air Temperature Sensor Circuit	Ambient air temperature < -50 °C
P0071	Ambient Air Temperature Sensor Circuit Range/ Performance	• Difference in value IAT vs. ECT @ engine start (depending on engine off time) < 25 °K • Difference in value IAT vs AAT @ engine start > 25 °K (depending on engine off time) • Difference in value ECT vs AAT @ engine start > 25 °K (depending on engine off time)
P0072	Ambient Air Temperature Sensor Circuit Low	Ambient air temperature > 87 °C

DTC	Error Message	Malfunction Criteria and Threshold Value
P0106	Manifold ABS. Pressure or BARO Pressure Range/ Performance	• Difference of actual manifold pressure lower threshold < 0 hPa • Modeled range 45 to 845 hPa or • Difference of actual manifold pressure upper threshold > 0 hPa • Modeled range 640 to 1055 hPa or • Difference between BARO sensor and MAP sensor at engine start > 60 hPa
P0107	Manifold ABS Pressure or BARO Pressure Low Input	Signal voltage < 0.20 V
P0108	Manifold Abs.Pressure or BARO Pressure High Input	Signal voltage > 4.88 V
P0111	Intake Air Temperature (Sensor 1 Bank 1) Circuit Range/Performance	• Difference in value IAT vs. ECT @ engine start (depending on engine off time) > 25 °K • Difference in value IAT - AAT @ engine start < 25 °K (depending on engine off time) • Difference in value ECT vs AAT @ engine start > 25 °K (depending on engine off time)
P0112	Intake Air Temperature (Sensor 1 Bank 1) Circuit Low	Intake air temperature > 130°C
P0113	Intake Air Temperature (Sensor 1 Bank 1) Circuit High	Intake air temperature < -46°C
P0116	Engine Coolant Temperature Sensor 1 Circuit Range/ Performance	•Difference in value IAT vs. ECT @ engine start (depending on engine off time) > 24.75 °C • Difference in value IAT - AAT @ engine start < 24.75 °C (depending on engine off time)
P0117	Engine Coolant Temperature Sensor 1 Circuit Low	Engine coolant temperature > 140°C
P0118	Engine Coolant Temperature Sensor 1 Circuit High	Engine coolant temperature < -40°C

DTC	Error Message	Malfunction Criteria and Threshold Value
P0121	Throttle/Pedal Position Sensor A Circuit Range/Performance	• TPS 1 - TPS 2 > 5.10 6.30% • Actual TPS 1 calculated value > TPS 2 calculated value • TPS 1 calc. value > 9.00%
P0122	Throttle/Pedal PositionSensor A Circuit Low Input	Signal voltage < 0.20 V
P0123	Throttle/Pedal PositionSensor A Circuit High Input	Signal voltage > 4.81 V
P013A	O2 Sensor (Bank 1 Sensor 2) Slow Response - Rich to Lean	• EWMA filtered max differential transient time at fuel cutoff ≥ 0.5 Sec. • Number of checks ≥ 3
P0130	O2 Sensor Circuit (Bank 1 Sensor 1) Malfunction	O2S ceramic temperature < 640°C
P0131	O2 Sensor Circuit (Bank 1, Sensor 1) Low Voltage	Virtual mass > 1.75 V
		Nernst voltage > 1.50 V
		Adjustment voltage > 0.30 V
P0132	O2 Sensor Circuit (Bank 1, Sensor 1) High Voltage	Virtual mass > 3.25 V
		Nernst voltage > 4.40 V
		Adjustment voltage > 7 V
P0133	O2 Sensor Circuit (Bank 1 Sensor 1) Slow Response	Signal dynamic slope check • O2S signal front vs. modeled O2S signal ratio < 0.35 and > 0.01 • Cycles completed > 40 Oscillation check • Lambda amplitude signal > 20% • Cycles > 8 • Time lambda > lambda amplitude 400 m sec. Delay check • Delay modeled lambda signal minus measured signal > 460 m sec. • Cycles > 12
P0135	O2 Sensor Heater Circuit (Bank 1 Sensor 1) Malfunction	• Heater duty cycle, > 90% • O2S ceramic temperature, < 715 °C • Time after O2S heater on 36 Sec.

DTC	Error Message	Malfunction Criteria and Threshold Value
P0137	O2 Sensor Circuit (Bank 1 Sensor 2) Low Voltage	Cold condition • Signal voltage < 0.06 V for time > 3 Sec. and • Difference of sensor voltage with load pulse vs. no load pulse < 0.01 V
P0138	O2 Sensor Circuit (Bank 1 Sensor 2) High Voltage	Signal voltage > 1.08 V for > 5 Sec.
P0140	O2 Sensor Circuit (Bank 1 Sensor 2) No Activity Detected	Signal voltage • Signal voltage .40 - .60 mV for > 3 Sec • Internal resistance > 40000 ohm and exhaust temperature > 600 °C
P0141	O2 Sensor Heater Circuit (Bank 1 Sensor 2) Malfunction	Heater resistance 1200 to 32400 Ω
P0169	Incorrect Fuel Composition	• Fuel quantity incorrect • Fuel correction factor incorrect • Difference between predicted and real air mass > 3.80%
P0201	Cylinder 1- Injector Circuit	• Signal voltage 4.5 to 5.5 V • Internal logic failure
P0202	Cylinder 2- Injector Circuit	• Signal voltage 4.5 to 5.5 V • Internal logic failure
P0203	Cylinder 3- Injector Circuit	• Signal voltage 4.5 to 5.5 V • Internal logic failure
P0204	Cylinder 4- Injector Circuit	• Signal voltage 4.5 to 5.5 V • Internal logic failure
P0221	Throttle/Pedal Position Sensor/Switch B Range/ Performance	• TPS 1 - TPS 2 > 5.10 to 6.30% • Actual TPS 2 calculated value > TPS 1 calculated value • TPS 2 – calc. value > 9.00%
P0222	Throttle/Pedal Position Sensor/Switch B Low Input	Signal voltage < 0.20 V
P0223	Throttle/Pedal Position Sensor/Switch B High Input	Signal voltage > 4.81 V
P0261	Cylinder 1- Injector Circuit Low	Signal voltage < 3.0 V
P0262	Cylinder 1- Injector Circuit High	Signal current > 2.20 to 4.0 A

DTC	Error Message	Malfunction Criteria and Threshold Value
P0264	Cylinder 2- Injector Circuit Low	Signal voltage < 3.0 V
P0265	Cylinder 2- Injector Circuit High	Signal current > 2.20 to 4.0 A
P0267	Cylinder 3- Injector Circuit Low	Signal voltage < 3.0 V
P0268	Cylinder 3- Injector Circuit High	Signal current > 2.20 to 4.0 A
P0270	Cylinder 4- Injector Circuit Low	Signal voltage < 3.0 V
P0271	Cylinder 4- Injector Circuit High	Signal current > 2.20 to 4.0 A
P2096	Post Catalyst Fuel Trim System (Bank 1) Too Lean	Deviation lambda control < -0.03
P2097	Post-Catalyst Fuel Trim System Too Rich (Bank 1)	Integral part of lambda control > 0.03%
P3081	Post Catalyst Fuel Trim System (Bank 1) Too Rich	Difference between ECT and modeled ECT > 10.5 K

Ignition System

DTC	Error Message	Malfunction Criteria and Threshold Value
P0300	Random/Multiple Cylinder Misfire Detected	• Emission threshold misfire rate (MR) > 1.6% • Catalyst damage misfire rate (MR) > 1.6% - 24%
P0301	Cylinder 1 Misfire Detected	• Emission threshold misfire rate (MR) > 1.6% • Catalyst damage misfire rate (MR) > 1.6% - 24%
P0302	Cylinder 2 Misfire Detected	• Emission threshold misfire rate (MR) > 1.6% • Catalyst damage misfire rate (MR) > 1.6% - 24%
P0303	Cylinder 3 Misfire Detected	• Emission threshold misfire rate (MR) > 1.6% • Catalyst damage misfire rate (MR) > 1.6% - 24%

DTC	Error Message	Malfunction Criteria and Threshold Value
P0304	Cylinder 4 Misfire Detected	• Emission threshold misfire rate (MR) > 1.6% • Catalyst damage misfire rate (MR) > 1.6% - 24%
P0321	Ign./Distributor Eng.Speed Inp.Circ. Range/Performance	• Comparison of counted teeth vs reference = incorrect • Monitoring reference gap failure
P0322	Ign./Distributor Eng.Speed Inp.Circ. No Signal	• Camshaft signal > 5 • Engine speed no signal
P0324	Knock Control System Error	• Signal fault counter (combustion) > 24 or • Signal fault counter (measuring window) > 2.00
P0327	Knock Sensor 1 Circuit Low Input	• Lower threshold < 70 V or for signal range check • Lower threshold < 1.05 to 5.49 V
P0328	Knock Sensor 1 Circuit High Input	• Upper threshold > 32.99 to 99.99 V
P0341	Camshaft Position Sensor Circuit Range/Performance	• Signal pattern incorrect • Defect counter = 8
P0342	Camshaft Position Sensor Circuit Low Input	• Signal voltage permanently low • Crankshaft signals = 8
P0343	Camshaft Pos.Sensor Circuit High Input	• Signal voltage permanently high • Crankshaft signals = 8
P0351	Ignition Coil A Primary/ Secondary Circuit	• Signal current < 0.25 to -2.0 mA • Internal check failed
P0353	Ignition Coil C Primary/ Secondary Circuit	• Signal current < 0.25 to -2.0 mA • Internal check failed

Additional Exhaust Regulation

DTC	Error Message	Malfunction Criteria and Threshold Value
P0420	Catalyst System (Bank 1) Efficiency Below Threshold	• Oxygen storage capacity (OSC) vs OSC of borderline catalyst < 1.00

DTC	Error Message	Malfunction Criteria and Threshold Value
P043E	Evaporative Emission System Leak Detection Reference Orifice Low Flow	EVAP pump current during reference measurement > 40 mA
P043F	Evaporative Emission System Leak Detection Reference Orifice High Flow	EVAP pump current during reference measurement < 15 mA
P0441	EVAP Emission Contr. Sys. Incorrect Purge Flow	Difference of actual vs. reference EVAP pump current > 1.70 or drop of EVAP pump current < 1 mA within 12 Sec.
P0442	EVAP Emission Contr. Sys. (Small Leak) Leak Detected	Modeled pressure from pump current < 9 hPa
P0444	Evaporative Emission System Purge Control Valve Circuit Open	Signal voltage > 4.70 - 5.40 V
P0447	Evaporative Emission System Vent Control Circuit Open	Signal voltage > 4.7 to 5.4 V
P0448	Evaporative Emission System Vent Control Circuit Shorted	Signal voltage < 2.74 to 3.26 V or signal current > 2.2 to 4.0 A
P0456	EVAP Emission Control System (very small Leak) Leak Detected	EVAP system leakage area calculated from pump current curve > 0.17 mm squared.
P0458	Evaporative Emission System Purge Control Valve Circuit Low	Signal voltage 0.00 - 3.26 V
P0459	Evaporative Emission System Purge Control Valve Circuit High	Signal current > 2.2 A

Speed and Idle Control

DTC	Error Message	Malfunction Criteria and Threshold Value
P050A	Cold Start Idle Air Control System Performance	Out of range low: • Engine speed deviation > 200 RPM • RPM controller torque value ≥ calculated min. value Out of range high: • Engine speed deviation < -100 RPM • RPM controller torque value ≤ calculated min. value

DTC	Error Message	Malfunction Criteria and Threshold Value
P050B	Cold Start Ignition Timing Performance	Difference between commanded and actual spark timing > 20%
P0501	Vehicle Speed Sensor “A” Range/Performance	VSS signal < 4 km/h
P0506	Idle Control System RPM Lower than Expected	• Idle speed Deviation > 100 RPM and RPM controller torque value ≥ calculated max. value
P0507	Idle Control System RPM Higher than Expected	• Idle speed Deviation < -100 RPM and RPM controller torque value ≤ calculated min. value

Control Module and Output Signals

DTC	Error Message	Malfunction Criteria and Threshold Value
P0606	ECM Processor Fault	ECM internal check failure, signal voltage driver out of range or plausibility check failed
P0627	Fuel Pump “A” Control Circuit/ Open	Open circuit • Signal voltage 4.50 to 5.50 V Short to ground • Signal voltage < 3.0 V
P0629	Fuel Pump “A” Control Circuit High	Signal current 0.60 to 1.20 A
P0638	Throttle Actuator Control (Bank 1) Range/Performance	• Time to close to reference point > 0.6 Sec. • Reference point 2.88% or • TPS 1 signal voltage is NOT 0.40 to 0.80 V • TPS 2 signal voltage is NOT 4.20 to 4.60 V • TPS 1 and TPS 2 signal voltage is NOT 4.82 to 5.18 V
P0641	Sensor Reference Voltage “A” Circuit Open	Signal voltage deviation > ± 0.3 V
P0651	Sensor Reference Voltage “B” Circuit Open	Signal voltage deviation > ± 0.3 V
P0697	Sensor Reference Voltage “C” Circuit Open	Signal voltage deviation > ± 0.3 V

DTC	Error Message	Malfunction Criteria and Threshold Value
U0001	High Speed CAN Communication Bus	Bus Off failure or CAN message = no feedback
U0002	High Speed CAN Communication Bus Performance	Global Time Out failure or receiving no messages
U0101	Lost Communication with TCM	Time Out failure. No message received by ECM
U0121	Lost Communication With Anti-Lock Brake System (ABS) Control Module	No CAN communication with ABS.
U0146	Lost Communication With Gateway “A”	CAN communication with gateway no messages received.
U0155	Lost Communication With Instrument Panel Cluster (IPC) Control Module	No IPC CAN messages received
U0302	Software Incompatibility with Transmission Control Module	Manual transmission coded ECM software. ECM received AT messages from TCM
U0402	Software Incompatibility with Transmission Control Module	Transmission Data Length Code incorrect or implausible messages received.
U0415	Invalid Data Received From Anti-Lock Brake System Control Module	• Speed sensor initialization failed • Speed sensor low voltage error failed • Speed sensor error out of range • Implausible messages sent from ABS
U0423	Invalid Data Received From Instrument Panel Cluster Control Module	• Implausible CAN messages received. • Implausible ambient temperature value

Fuel and Air Ratios Control Module

DTC	Error Message	Malfunction Criteria and Threshold Value
P150A	Engine Off Time Performance	Difference between engine off time and ECM after run time < -12 Sec. or > 12 Sec.

DTC	Error Message	Malfunction Criteria and Threshold Value
P2101	Throttle Actuator Control Motor Circuit Range/ Performance	• Duty cycle >80% • Deviation throttle value angles vs. calculated value 4 - 50% • ECM power stage no failure
P2106	Throttle Actuator Control System Forced Limited Power	Internal check failed
P2122	Throttle/Pedal Pos. Sens./ Switch D Circuit Low Input	Signal voltage < 0.61 V
P2123	Throttle/Pedal Pos. Sens./ Switch D Circuit High Input	Signal voltage > 4.79 V
P2127	Throttle/Pedal Pos. Sens./ Switch E Circuit Low Input	Signal voltage < 0.27 V
P2128	Throttle/Pedal Pos. Sens./ Switch E Circuit High Input	Signal voltage > 2.43 V
P2138	Throttle/Pedal Position Sensor/Switch D/E Voltage Correlation	Signal voltage sensor 1 vs. sensor 2 is > 0.17 - 0.70 V
P2177	System too lean off idle, (Bank 1)	Adaptive value > 28%
P2178	System too rich off idle, (Bank 1)	Adaptive value < -20%
P2181	Cooling System Performance	Cooling system temperature too low after a sufficient mass air flow integral 65 to 75 °C
P2184	Engine Coolant Temperature (Sensor 2) Circuit Low	ECT outlet > 140 °C
P2185	Engine Coolant Temperature (Sensor 2) Circuit High	ECT outlet < -40 °C
P2187	System too lean at idle, (Bank 1)	Adaptive value > 5.02%
P2188	System too rich at idle, (Bank 1)	Adaptive value < -5.02%
P2195	O2 Sensor Signal Stuck Lean (Bank 1 Sensor 1)	Delta lambda of 2nd lambda control loop > 0.07
P2196	O2 Sensor Signal Stuck Rich (Bank 1 Sensor 1)	Delta lambda of 2nd lambda control loop < -0.07
P2237	O2 Sensor Positive Current Control Circuit (Bank 1 Sensor 1) Open	• O2S signal front 1.49 - 1.51 V • Delta lambda controller > 0.10

DTC	Error Message	Malfunction Criteria and Threshold Value
P2243	O2 Sensor Reference Voltage Circuit (Bank 1 Sensor 1) Open	• O2S signal front < 0.20 V and Internal resistance > 950 Ohm • O2S signal front > 4.70 V and Internal resistance > 950 Ohm
P2251	O2 Sensor Negative Current Control Circuit (Bank 1 Sensor 1) open	• O2S signal front 1.47 to 1.53 V • Internal resistance > 950 Ohm
P2270	O2 Sensor Signal Stuck Lean; (Bank 1 Sensor 2)	• O2S signal rear not oscillating at reference < 0.62 to 0.63 V • Enrichment after stuck lean 20%
P2271	O2 Sensor Signal Stuck Rich; (Bank 1 Sensor 2)	• O2S signal rear not oscillating at reference > 0.62 to 0.63 V • Enrichment after stuck lean 20% or Fuel Cutoff • Sensor voltage >= 0.15 V • Mass flow after fuel cutoff > 2000 to 3500 mg • 1 or more checks
P2279	Intake Air System Leak	• Offset value throttle mass flow > 13kg/h

Ignition System

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

Additional Emissions Regulations

DTC	Error Message	Malfunction Criteria and Threshold Value
P240A	Evaporative Emission System Leak Detection Pump Heater Control Circuit/Open	Signal voltage > 4.7 to 5.4 V
P240B	Evaporative Emission System Leak Detection Pump Heater Control Circuit Low	Signal voltage < 2.74 to 3.26 V
P240C	Evaporative Emission System Leak Detection Pump Heater Control Circuit High	Signal current > 2.2 to 4.0 A
P2400	Evaporative Emission System Leak Detection Pump Control Circuit/Open	Signal voltage > 4.7 - 5.4 V
P2401	Evaporative Emission System Leak Detection Pump Control Circuit Low	Signal voltage > 2.74 - 3.26 V
P2402	Evaporative Emission System Leak Detection Pump Control Circuit High	Signal voltage at EVAP pump current measuring resistor > 1.80 to 4.0 V
P2407	Evaporative Emission System Leak Detection Pump Sense Circuit Intermittent/Erratic	• ECT at start < 60 °C and > 60 °C running • AAT < 35 °C and > 4 °C • Time since engine start 600 Sec. • Integrated purge flow since last purge stop > 2 g • Integrated purge flow since last monitoring run > 0 g • Intake manifold vacuum > 100 hPa • Vehicle speed 0 to 120 km/h • Fuel volume flow ≤ 5 ml/Sec. • Engine speed > 30 RPM and not idle. • Front O2S ready • Altitude ≤ 2700 m
P2414	02 Sensor Exhaust Sample Error, (Bank 1 Sensor 1)	• Threshold 1 - Signal voltage 3.10 - 4.77 V • Threshold 2 - Signal voltage 2.5 to 3.06 V
P2431	Secondary Air Injection System Air Flow/Pressure Bank 1 Sensor Circuit Range/ Performance	Difference between SAI pressure and ambient pressure ≠ -25.0 - 25.0 hPa

DTC	Error Message	Malfunction Criteria and Threshold Value
P2450	Evaporative Emission System Switching Valve Performance/ Stuck Open	EVAP pump current difference between reference measurement to idle < 3 mA
P2539	Low Pressure Fuel System Sensor Circuit	Signal voltage > 4.9 V
P2540	Low Pressure Fuel System Sensor Circuit Range/ Performance	Actual pressure deviation < 800 kPa < 80 kPa
P2541	Low Pressure Fuel System Sensor Circuit Low Input	Signal voltage < 0.2 V
P2626	O2 Sensor Pumping Current Trim Circuit/Open (Bank 1 Sensor 1(	O2S signal front > 4.81 V

DTC CHART

Engine Code 2.0L CJAA

Fuel and Air Mixture, Additional Emission Regulations

DTC	Error Message	Malfunction Criteria and Threshold Value
P000E	Fuel Volume Regulator Control Exceeded Learning Limit	• Number of learning points at adaptation limits ≥ 8 of 64 • Upper limit > 1.2
P00AF	Turbocharger/Supercharger Boost Control “A” Module Performance	Boost pressure actuator stuck < 17% when commanded on or > 17% when commanded off.
P00C6	Fuel Rail Pressure Too Low - Engine Cranking	Fuel rail pressure < 120 to 180 bar
P00D1	O2 (Sensor 1 Bank 1) Heater Performance	Sensor temperature < 720 °C
P00D2	O2 (Sensor 2 Bank 1) Heater Performance	Sensor temperature < 720 °C
P00D5	O2 (Sensor 1 Bank 1) or O2 Sensor 2 Bank 1 correlation	Offset air fuel ratio > 0.05
P0045	Turbocharger/Supercharger Boost Control Solenoid “A” Circuit/Open	Open circuit message from output driver
P0047	Turbocharger/Supercharger Boost Control Solenoid “A” Circuit Low	Short to ground message from output driver
P0048	Turbocharger/Supercharger Boost Control Solenoid “A” Circuit High	Short to voltage message from output driver
P0071	Ambient Air Temperature Sensor Circuit Range/ Performance	Temperature difference to at least 2 other temperature sensors at startup > 45 °Kelvin
P0072	Ambient Air Temperature Sensor Circuit Low	Error signal low sent from Cluster to ECM
P0073	Ambient Air Temperature Sensor Circuit High	Error signal high sent from Cluster to ECM

DTC	Error Message	Malfunction Criteria and Threshold Value
P0087	Fuel Rail/System Pressure - Too Low	• Control deviation > 150 - 200 Bar • Exceeding absolute rail pressure limits < 120 - 125 Bar or > 1950 Bar • Control deviation < -200 to -300 Bar
P0088	Fuel Rail/System Pressure - Too High	• Control deviation > 150 - 200 Bar • Exceeding absolute rail pressure limits < 120 - 125 Bar or > 1950 Bar • Control deviation < -200 to -300 Bar
P0090	Fuel Pressure Regulator 1 Control Circuit	Open circuit diagnostic signal from output driver
P0091	Fuel Pressure Regulator 1 Control Circuit Low	Grounded circuit diagnostic signal from output driver
P0092	Fuel Pressure Regulator 1 Control Circuit High	Over current circuit diagnostic signal from output driver
P0100	Mass or Volume Air Flow Circuit	• Battery voltage < 7.5 V or • Signal range check low, battery voltage < 7.5 V
P0101	Mass or Volume Air Flow Circ. Range/Performance	Ratio of actual mass airflow and modeled air mass > 1.80 or < 0.84
P0102	Mass or Volume Air Flow Circ. Low Input	Range check low: • Calculated PWM signal period time > 666.6 µs (-57 kg/h) or • Raw value PWM signal period time > 900 kg/h
P0103	Mass or Volume Air Flow Circ. High Input	Range check high: • Calculated PWM signal period time > 666.6 µs (-57 kg/h) or Calculated PWM signal period time > 833.35 µs (-157 kg/h)
P0111	Intake Air Temperature (Sensor 1 Bank 1) Circuit Range/Performance	Temperature difference to at least 3 other temperature sensors at startup > 30 °K

DTC	Error Message	Malfunction Criteria and Threshold Value
P0112	Intake Air Temperature Sensor 1 Bank 1 Circuit Low	Boost temperature sensor voltage < 0.04 V
P0113	Intake Air Temperature Sensor 1 Bank 1 Circuit High	Boost temperature sensor voltage > 2.88 V
P0116	Engine Coolant Temperature Sensor 1 Circuit Range/ Performance	• Time for coolant temp to reach 19.96 °C or increase by 10 °K > 300 Sec. for start temperature <10 °C >120 Sec. for start temp > 10 °C • Temperature difference to at least 3 other temperature sensors at startup > 30 °K
P0117	Engine Coolant Temperature (Sensor 1) Circuit Low	Coolant temperature sensor voltage < 0.15 V
P0118	Engine Coolant Temperature Sensor 1 Circuit High	Coolant temperature sensor voltage > 3.25 V
P0128	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)	Measured temperature lower than model temperature < 70 °C and modeled temperature > 80 °C
P013B	O2 Sensor (Bank 1 Sensor 2) Slow Response - Lean to Rich	Time delay between oxygen signals pre and post NOx trap > 0.45 Sec.
P0130	O2 Sensor Circuit (Bank 1 Sensor 1) Malfunction	• Short to battery > 3 V • Nernst voltage > 4 V • Adjustment voltage > 1.5 V or • Short to ground < 2 V • Nernst voltage < 1.75 V • Adjustment voltage < 0.3 V
P0132	O2 Sensor Circuit (Bank 1 Sensor 1) High Voltage	O2 sensor raw signal > 3.2 V
P0133	O2 Sensor Circuit (Bank 1 Sensor 1) Slow Response	• Time to 30% of expected concentration increase > 2.8 Sec or • Time to 60% of expected concentration increase > 4.1 Sec. or • Time to 60% minus time to 30% > 1.3 Sec.

DTC	Error Message	Malfunction Criteria and Threshold Value
P0135	O2 Sensor Heater Circuit (Bank 1 Sensor 1) Malfunction	• Diagnostic signal from output driver sent or • Sensor element temperature < 720 or > 840 °C
P0136	O2 Sensor Circuit (Bank 1 Sensor 2) Malfunction	• LSU internal resistance > 1104 ohms • LSU raw voltage < 1.4 or > 1,6 V • Virtual ground > 3 V • Nernst voltage > 4 V • Adjustment voltage > 1.5 V or • LSU raw voltage < 0.2 or > 3 V • Short to ground < 2 V • Nernst voltage < 1.75 V • Adjustment voltage < 0.3 V
P0138	O2 Sensor Circuit (Bank 1 Sensor 2) High Voltage	O2S raw signal > 3.2 V
P0139	O2 Sensor Circuit (Bank 1 Sensor 2) Slow Response	• Time to 30% of expected concentration increase > 2.8 Sec. or • Time to 60% of expected concentration increase > 4.1 Sec. or • Time to 60% minus time to 30% > 1.3 Sec.
P014D	O2 Sensor (Bank 1 Sensor 1) Slow Response - Lean to Rich	Time delay between oxygen signals pre and post NOx trap > 1.5 Sec.
P0141	O2 Sensor Heater Circuit (Bank 1 Sensor 2) Malfunction	• Sensor element temp < 720 and > 840 °C • Voltage error signal from output driver.
P0181	Fuel Temperature Sensor A Circuit Range/Performance	Temperature difference to at least 2 other temperature sensors at startup > 30 °K
P0182	Fuel Temperature Sensor A Circuit Low Input	Fuel temperature sensor voltage < 0.05 V
P0183	Fuel Temperature Sensor A Circuit High Input	Fuel temperature sensor voltage > 4.70 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P0191	Fuel Rail Pressure Sensor “A” Circuit Range/Performance	• Sensor voltage < 428 mV or > 613 mV • Adaptation value out of limit < 83% or > 130%
P0192	Fuel Rail Pressure Sensor “A” Circuit Low Input	Sensor voltage < 200 mV or > 591 mV
P0193	Fuel Rail Pressure Sensor “A” Circuit High Input	Sensor voltage > 4800 mV
P020A	Cylinder 1 Injection Timing	• Control error < limit from MAP f (engine speed and desired torque) -8 °CA to -4 °CA or • Control error < limit from MAP f (engine speed and desired torque) +8 °CA to +4 °CA
P020B	Cylinder 2 Injection Timing	• Control error < limit from MAP f (engine speed and desired torque) -8 °CA to -4 °CA or • Control error < limit from MAP f (engine speed and desired torque) +8 °CA to +4 °CA
P020C	Cylinder 3 Injection Timing	• Control error < limit from MAP f (engine speed and desired torque) -8 °CA to -4 °CA or • Control error < limit from MAP f (engine speed and desired torque) +8 °CA to +4 °CA
P020D	Cylinder 4 Injection Timing	• Control error < limit from MAP f (engine speed and desired torque) -8 °CA to -4 °CA or • Control error < limit from MAP f (engine speed and desired torque) +8 °CA to +4 °CA
P0201	Cylinder 1- Injector Circuit	Open circuit diagnostic signal from output driver
P0202	Cylinder 2- Injector Circuit	Open circuit diagnostic signal from output driver
P0203	Cylinder 3- Injector Circuit	Open circuit diagnostic signal from output driver
P0204	Cylinder 4- Injector Circuit	Open circuit diagnostic signal from output driver

DTC	Error Message	Malfunction Criteria and Threshold Value
P0234	Turbo/Super Charger Overboost Condition	Control deviation > -300 - -800 hPa @ delta engine speed/ injection quantity
P0236	Turbocharger Boost Sensor (A) Circ. Range/Performance	Difference between barometric and boost pressure signal > 150 hPa
P0237	Turbocharger Boost Sensor (A) Circ. Low Input	Boost Pressure Sensor < 0.68 V
P0238	Turbocharger Boost Sensor (A) Circ. High Input	Boost Pressure Sensor > 4.88 V
P026A	Charge Air Cooler Efficiency Below Threshold	Charge air intercooler efficiency < 0.4
P0263	Cylinder 1 Contribution/ Balance	Calibration value of injector energizing time > 217 µs (depending on rail pressure) or < 117 µs
P0266	Cylinder 2 Contribution/ Balance	Calibration value of injector energizing time > 217 - 426 µs (depending on rail pressure) or < 117 - 157 µs
P0269	Cylinder 3 Contribution/ Balance	Calibration value of injector energizing time > 217 - 426 µs (depending on rail pressure) or < 117 - 157 µs
P026A	Charge Air Cooler Efficiency Below Threshold	Efficiency < 0.40
P0272	Cylinder 4 Contribution/ Balance	Calibration value of injector energizing time > 217 - 426 µs (depending on rail pressure) or < 117 - 157 µs
P0299	Turbo/Super Charger Underboost	Deviation of actual and desired boost pressure > 400 - 800 hPa @ delta engine speed/injection quantity
P20D8	Exhaust After Treatment Fuel Supply Control Performance	Control deviation > limit from Map f or < limit from Map f (engine speed, torque)
P2000	NOx Absorber Efficiency Bank 1 Below Threshold	• Oxygen signals post NOx trap < 0.97 • Oxygen signals pre NOx trap < 0.045 • Mass of reductant consumption < 0.40 g

DTC	Error Message	Malfunction Criteria and Threshold Value
P2002	Particulate Trap (Bank 1) Efficiency Below Threshold	• Differential pressure signal < f (exhaust gas volume flow) or • Ratio of filtered temperature dynamic upstream and downstream of the PM trap < 1.2
P2004	Intake Manifold Runner Control (Bank 1) Stuck Open	Flap valve stuck open > 12%
P2006	Intake Manifold Runner Control (Bank 1) Stuck Closed	Flap valve stuck closed < 12%
P2008	Intake Manifold Runner (Bank 1) Control Circuit/Open	Open load diagnostic signal from output driver
P2009	Intake Manifold Runner (Bank 1) Control Circuit Low	Short to ground on output 1 or 2 signal from output driver
P2010	Intake Manifold Runner (Bank 1) Control Circuit High	Short to voltage on output 1 or 2 signal from output driver
P2015	Intake Manifold Runner Position Sensor/Switch Circuit Range/Performance	• Position sensor signal > 4.61 or < 0.39 V • Closed learning position > 4.61 or < 3.79 V • Open learning position > 1.21 or < 0.39 V
P2016	Intake Manifold Runner Position Sensor/Switch Circuit Low	Position sensor signal < 0.25 V
P2017	Intake Manifold Runner Position Sensor/Switch Circuit High	Position sensor signal > 4.75 V
P2031	Exhaust Gas Temperature (Sensor 2), Bank 1 Circuit	Sensor 2 voltage > 1.72 V
P2032	Exhaust Gas Temperature (Sensor 2), Bank 1 Circuit Low	Sensor 2 voltage < 0.45 V
P2080	Exhaust Gas Temperature Sensor Circuit (Bank 1) Range/Performance	• Comparison of upstream turbine exhaust gas temp vs modeled temperature < 85 °C or • Temperature difference to other temp sensors during cold start < 45 °K

DTC	Error Message	Malfunction Criteria and Threshold Value
P2084	Exhaust Gas Temperature Sensor 2 Circuit Range/ Performance	• Comparison of upstream turbine exhaust gas temp vs modeled temperature < 85 °C or • Temperature difference to other temp sensors during cold start < 45 °K
P3081	Engine Temperature Too Low	Difference between ECT and modeled ECT > 10° K

Ignition System

DTC	Error Message	Malfunction Criteria and Threshold Value
P0300	Random/Multiple Cylinder Misfire Detected	• No rise in engine speed after fuel injection Calculated based on values from last two engine revolutions • Error threshold 82% misfire over 440 crankshaft revolutions
P0301	Cylinder 1 Misfire Detected	• No rise in engine speed after fuel injection Calculated based on values from last two engine revolutions • Error threshold 82% misfire over 440 crankshaft revolutions
P0302	Cylinder 2 Misfire Detected	• No rise in engine speed after fuel injection Calculated based on values from last two engine revolutions • Error threshold 82% misfire over 440 crankshaft revolutions
P0303	Cylinder 3 Misfire Detected	• No rise in engine speed after fuel injection Calculated based on values from last two engine revolutions • Error threshold 82% misfire over 440 crankshaft revolutions

DTC	Error Message	Malfunction Criteria and Threshold Value
P0304	Cylinder 4 Misfire Detected	• No rise in engine speed after fuel injection Calculated based on values from last two engine revolutions • Error threshold 82% misfire over 440 crankshaft revolutions
P0321	Ign./Distributor Engine Speed Inp. Circ. Range/Performance	• Consecutive not plausible signals > 15 • Cam phase signals without plausible engine speed signal > 4 cam rotations.
P0322	Ign./Distributor Eng.Speed Inp.Circ. No Signal	No incremental signal. Internal self test failed.
P0381	Glow Plug/Heater Indicator Circuit	Receipt bit for lamp request not equal with lamp request bit.
P0383	Glow Plug Control Module Control Circuit Low	Diagnostic error signal sent from output driver = 0 V.

Additional Exhaust Regulation

DTC	Error Message	Malfunction Criteria and Threshold Value
P040B	Exhaust Gas Recirculation Temperature Sensor “A” Circuit Range/Performance	• Sensor temperature < 55 °C or • Temperature difference to other temp sensors during cold start < 45 °K
P040C	Exhaust Gas Recirculation Temperature Sensor “A” Circuit Low	Signal sensor voltage < 0.06 V
P040D	Exhaust Gas Recirculation Temperature Sensor “A” Circuit High	Signal sensor voltage > 3.24 V
P0401	Exhaust Gas Recirc. Flow Insufficient Detected	Control deviation < limit from map f (engine speed, desired airflow)
P0402	Exhaust Gas Recirc. Flow Excessive Detected	Control deviation > limit from map (engine speed, desired airflow)
P0403	Exhaust Gas Recirculation Circuit	Valve stuck open > 17% or stuck closed < 17%

DTC	Error Message	Malfunction Criteria and Threshold Value
P0405	Exhaust Gas Recirculating Sensor A Circuit Low	Position sensor signal range check low.
P0406	Exhaust Gas Recirculating Sensor A Circuit High	Position sensor signal range check high.
P0420	Catalyst System, (Bank 1) Efficiency Below Threshold	HC conversion rate < 0.3
P045A	Exhaust Gas Recirculation “B” Control Circuit	Diagnostic signal from output driver
P045B	Exhaust Gas Recirculation “B” Control Circuit Range/ Performance	Position sensor signal > 1 V or < 0.4 V
P045C	Exhaust Gas Recirculation “B” Control Circuit Low	Diagnostic signal from output driver
P045D	Exhaust Gas Recirculation “B” Control Circuit High	Diagnostic signal from output driver
P045E	Exhaust Gas Recirculation Valve 2 Control Stuck Open	Comparison of actual and desired position signal • Control deviation > 12%
P045F	Exhaust Gas Recirculation “B” Control Stuck Closed	Comparison of actual and desired position signal • Control deviation < -12%
P046C	Exhaust Gas Recirculation Sensor “A” Circuit Range/ Performance	Position sensor signal > 1 V or < 0.4 V
P047C	Exhaust Pressure Sensor “B” Low	Pressure sensor voltage < 0.2 V
P047D	Exhaust Pressure Sensor “B” High	Pressure sensor voltage > 4.9 V
P047F	Exhaust Pressure Control Valve “A” Stuck Open	Control valve stuck open - position sensor < 10% when commanded closed
P0470	Exhaust Pressure Sensor “A”	Sensor voltage > 4.9
P0471	Exhaust Pressure Sensor "A" Range/Performance	Differential of pressure signal < -27 or > 47 hPa
P0472	Exhaust Pressure Sensor “A”Low	Sensor voltage < 0.2 V
P0473	Exhaust Pressure Sensor “A” High	Sensor voltage > 4.9 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P0474	Exhaust Pressure Sensor “A” Circuit Intermittent/Erratic	Difference between modeled and actual pressure differential across low pressure EGR > 40 hPa
P0475	Exhaust Pressure Control Valve “A”	Diagnostic signal from output driver
P0477	Exhaust Pressure Control Valve “A” Low	Diagnostic signal from output driver.
P0478	Exhaust Pressure Control Valve “A” High	Short to voltage on Out 1 or Out 2 signal from output driver.
P048A	Exhaust Pressure Control Valve “A” Stuck Closed	Control valve stuck closed - position sensor > 10% when commanded open
P048B	Exhaust Pressure Control Valve Position Sensor/Switch Circuit	Position sensor signal < 0.25 V
P048C	Exhaust Pressure Control Valve Pos. Sensor/Switch Circuit Range/Performance	Position sensor signal in desired range during closed position learning > 1.1 V or < 0.5 V
P048E	Exhaust Pressure Control Valve Pos. Sensor/Switch Circuit High	Position sensor signal > 4.85 V
P0486	Exhaust Gas Recirculation Sensor “B” Circuit	Position sensor signal > 4890 or < 210 mV

Speed and Idle Control

DTC	Error Message	Malfunction Criteria and Threshold Value
P0501	Vehicle Speed Sensor “A” Range/Performance	VSS signal < 6 km/h
P0502	Vehicle Speed Sensor “A” Circuit Low Input	Brake control unit error message sent
P0503	Vehicle Speed Sensor “A” Intermittent/Erratic/High	Vehicle speed > 320 km/h
P0506	Idle Control System RPM Lower than Expected	Control deviation < 10%
P0507	Idle Control System RPM Higher than Expected	Control deviation > 10%
P0534	Vehicle Speed Sensor Intermittent	-

DTC	Error Message	Malfunction Criteria and Threshold Value
P0544	Exhaust Gas Temperature Sensor Circuit (Bank 1)	Signal voltage > 1.72 V
P0545	Exhaust Gas Temperature Sensor Circuit (Bank 1) Low	Signal voltage < 0.45 V
P054E	Idle Control System Fuel Quantity Lower Than Expected	Actual fuel mass < limit from map f(engine speed , engine temperature)
P054F	Idle Control System Fuel Quantity Higher Than Expected	Actual fuel mass > limit from map f(engine speed , engine temperature)
P0562	System Voltage Low Voltage	Internal check failure of voltage supply for ECM off timer

Control Module and Output Signals

DTC	Error Message	Malfunction Criteria and Threshold Value
P06A3	Sensor Reference Voltage “D” Circuit/Open	Sensor supply voltage < 2.97 V or > 3.63 V
P06B9	Cylinder 1 Glow Plug Circuit Range/Performance	• Message from Glow Control Unit = error message • 4 - 14 Sec. after glow start = 1.2 ohm or less
P06BA	Cylinder 2 Glow Plug Circuit Range/Performance	• Message from Glow Control Unit = error message • 4 - 14 Sec. after glow start = 1.2 ohm or less
P06BB	Cylinder 3 Glow Plug Circuit Range/Performance	• Message from Glow Control Unit = error message • 4 - 14 Sec. after glow start = 1.2 ohm or less
P06BC	Cylinder 4 Glow Plug Circuit Range/Performance	• Message from Glow Control Unit = error message • 4 - 14 Sec. after glow start = 1.2 ohm or less
P06C5	Cylinder 1 Glow Plug Incorrect	Message from Glow Control Unit = error message (wrong current slope).
P06C6	Cylinder 2 Glow Plug Incorrect	Message from Glow Control Unit = error message (wrong current slope).

DTC	Error Message	Malfunction Criteria and Threshold Value
P06C7	Cylinder 3 Glow Plug Incorrect	Message from Glow Control Unit = error message (wrong current slope).
P06C8	Cylinder 4 Glow Plug Incorrect	Message from Glow Control Unit = error message (wrong current slope).
P0604	Internal Control Module Random Access Memory (RAM) Error	• Write EEPROM not possible • Checksum error in 3 or more locations
P0605	Internal Control Module ROM Test Error	ECM internal ROM self test failed
P0606	ECM/PCM Processor	ECM internal self test failed
P0607	Control Module Performance	• Low/high supply voltage diagnostic signal from output driver or • Failed signal range check with barometer pressure sensor (located on ECM circuit board)
P0627	Fuel Pump “A” Control Circuit/ Open	Open circuit signal from output driver
P0628	Fuel Pump “A” Control Circuit Low	Grounded circuit signal from output driver
P0629	Fuel Pump “A” Control Circuit High	Over Current signal from output driver
P0634	PCM/ECM/TCM Internal Temperature Too High	Current Over-Temperature diagnostic signal from output driver > 150 °C
P0638	Throttle Actuator Control (Bank 1) Range/Performance	Diagnostic signal from actuator module = defective state
P064C	Glow Plug Control Module	Wrong GCU build = error message
P0641	Sensor Reference Voltage “A” Circuit Open	Sensor supply voltage < 4.8 V or > 5.2 V
P0651	Sensor Reference Voltage “B” Circuit Open	Sensor supply voltage < 4.8 V or > 5.2 V
P066A	Cylinder 1 Glow Plug Control Circuit Low	Over current on circuit > 70 A
P066C	Cylinder 2 Glow Plug Control Circuit Low	Over current on circuit > 70 A

DTC	Error Message	Malfunction Criteria and Threshold Value
P066E	Cylinder 3 Glow Plug Control Circuit Low	Over current on circuit > 70 A
P067A	Cylinder 4 Glow Plug Control Circuit Low	Message from glow control unit = 3.44 V
P0670	Glow Plug Module Control Circuit	Message from glow control unit = 3.44 V
P0671	Cylinder 1 Glow Plug Circuit	Message from Glow Control Unit, (glow current < 2.2 A)
P0672	Cylinder 2 Glow Plug Circuit	Message from Glow Control Unit, (glow current < 2.2 A)
P0673	Cylinder 3 Glow Plug Circuit	Message from Glow Control Unit, (glow current < 2.2 A)
P0674	Cylinder 4 Glow Plug Circuit	Message from Glow Control Unit, (glow current < 2.2 A)
P068A	ECM/PCM Power Relay De-Energized Performance - Too Early	Relay stuck, no change in circuit voltage
P068B	ECM/PCM Power Relay De-Energized Performance - Too Late	Relay stuck, no change in circuit voltage
P0684	Glow Plug Control Module to PCM Comm. Circuit Range/ Performance	Message from glow relay-missing info from Glow Control Unit
P0697	Sensor Reference Voltage “C” Circuit Open	Sensor supply voltage < 3.168 V or > 3.432 V
U0001	High Speed CAN Communication Bus	CAN driver A status Bus Off.
U0002	High Speed CAN Communication Bus Performance	CAN driver A status no communication
U0101	Lost Communication with TCM	No TCM messages received.
U0121	Lost Communication With Anti-Lock Brake System (ABS) Control Module	No messages received from ABS module
U0155	Lost Communication With Instrument Panel Cluster (IPC) Control Module	No messages received from Instrument cluster
U0302	Software Incompatibility with Transmission Control Module	Wrong TCM messages received.
U0402	Invalid Data Received From Transmission Control Module	Data length code transmitted, incorrect

DTC	Error Message	Malfunction Criteria and Threshold Value
U0404	Invalid Data Received From Gear Shift Control Module	Wrong TCM messages received.
U0415	Invalid Data Received From Anti-Lock Brake System Control Module	Implausible ABS messages sent. Veh speed > 320 km/h or missing vehicle speed data.
U0423	Invalid Data Received From Instrument Panel Cluster Control Module	Error message sent from Instrument Panel Cluster to ECU
U1024	Instrument cluster control module Read out DTC	Error message sent from instrument cluster to ECU

Fuel and Air Ratios Control Module

DTC	Error Message	Malfunction Criteria and Threshold Value
P1004	Torque difference cylinder 1 Limiting value exceeded	• Control error < limit from MAP f (engine speed and desired torque) -50 to -30 Nm or • +50 to +30 Nm
P1005	Torque difference cylinder 2 Limiting value exceeded	• Control error < limit from MAP f (engine speed and desired torque) -50 to -30 Nm or • +50 to +30 Nm
P1006	Torque difference cylinder 3 Limiting value exceeded	• Control error < limit from MAP f (engine speed and desired torque) -50 to -30 Nm or • +50 to +30 Nm
P1007	Torque difference cylinder 4 Limiting value exceeded	• Control error < limit from MAP f (engine speed and desired torque) -50 to -30 Nm or • +50 to +30 Nm
P13CE	Sensor for internal pressure of cylinder 1 Electrical errorn	Cylinder pressure sensor voltage > 3.17 V
P13CF	Sensor for internal pressure of cylinder 1 Short circuit to ground	Cylinder pressure sensor voltage < 0.13 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P13D0	Sensor for internal pressure of cylinder 1 Implausible signal	• Cylinder pressure sensor voltage < 0.33 V or > 3.09 V or • Deviation between min and max cylinder pressure # 1 < 20 bar • Offset out of range < -7 or > 7 bar or • Pressure based measured TDC position sensor out of range or • Difference of calculated cylinder pressure vs. actual measured cylinder pressure out of range < -10 or > 10 Bar
P13D1	Sensor for internal pressure of cylinder 2 Electrical error	Cylinder pressure sensor voltage > 3.17 V
P13D2	Sensor for internal pressure of cylinder 2 Short circuit to ground	Cylinder pressure sensor voltage < 0.13 V
P13D3	Sensor for internal pressure of cylinder 2 Implausible signal	• Cylinder pressure sensor voltage < 0.33 V or > 3.09 V or • Deviation between min and max cylinder pressure # 2 < 20 bar • Offset out of range < -7 or > 7 bar or • Pressure based measured TDC position sensor out of range or • Difference of calculated cylinder pressure vs. actual measured cylinder pressure out of range < -10 or > 10 Bar
P13D4	Sensor for internal pressure of cylinder 3 Electrical error	Cylinder pressure sensor voltage > 3.17 V
P13D5	Sensor for internal pressure of cylinder 3 Short circuit to ground	Cylinder pressure sensor voltage < 0.13 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P13D6	Sensor for internal pressure of cylinder 3 Implausible signal	• Cylinder pressure sensor voltage < 0.33 V or > 3.09 V or • Deviation between min and max cylinder pressure # 3 < 20 bar • Offset out of range < -7 or > 7 bar or • Pressure based measured TDC position sensor out of range or • Difference of calculated cylinder pressure vs. actual measured cylinder pressure out of range < -10 or > 10 Bar
P13D7	Sensor for internal pressure of cylinder 4 Electrical error	Cylinder pressure sensor voltage > 3.17 V
P13D8	Sensor for internal pressure of cylinder 4 Short circuit to ground	Cylinder pressure sensor voltage < 0.13 V
P13D9	Sensor for internal pressure of cylinder 4 Implausible signal	• Cylinder pressure sensor voltage < 0.33 V or > 3.09 V or • Deviation between min and max cylinder pressure # 4 < 20 bar • Offset out of range < -7 or > 7 bar or • Pressure based measured TDC position sensor out of range or • Difference of calculated cylinder pressure vs. actual measured cylinder pressure out of range < -10 or > 10 Bar
P13E0	Sensor for internal pressure of cylinder 1 Malfunction	Pressure based measured TDC vs. crank position sensor for cyl. 1 out of range < 1.8 CA or > 1.8 CA

DTC	Error Message	Malfunction Criteria and Threshold Value
P13E1	Sensor for internal pressure of cylinder 2 Malfunction	Pressure based measured TDC vs. crank position sensor for cyl. 2 out of range < 1.8 CA or > 1.8 CA
P13E2	Sensor for internal pressure of cylinder 3 Malfunction	Pressure based measured TDC vs. crank position sensor for cyl. 3 out of range < 1.8 CA or > 1.8 CA
P13E3	Sensor for internal pressure of cylinder 4 Malfunction	Pressure based measured TDC vs. crank position sensor for cyl. 4 out of range < 1.8 CA or > 1.8 CA
P140C	EGR (Sensor 2 Bank 1) Signal too low	Position sensor signal > 4850 mV
P140E	EGR sensor 2 bank 1 Signal too high	Position sensor signal < 150 mV
P169A	Loading mode active	Transport mode active
P2100	Throttle Actuator Control Motor Circuit/Open	Open circuit diagnostic signal sent from output driver
P2101	Throttle Actuator A Control Motor Circuit Range/ Performance	Missing diagnostic signal from actuator module
P2102	Throttle Actuator Control Motor Circuit Low	Grounded circuit diagnostic signal sent from output driver
P2103	Throttle Actuator “A” Control Motor Circuit High	Circuit short to voltage diagnostic signal sent from output driver
P2122	Throttle/Pedal Pos. Sens./ Switch D Circuit Low Input	Sensor 1 voltage < 0.61 V
P2123	Throttle/Pedal Pos. Sens./ Switch D Circuit High Input	Sensor 1 voltage > 4.79 V
P2127	Throttle/Pedal Pos. Sens./ Switch E Circuit Low Input	Sensor 2 voltage < 0.27 V
P2128	Throttle/Pedal Pos. Sens./ Switch E Circuit High Input	Sensor 2 voltage > 2.43 V
P2138	Throttle/Pedal Position Sensor/Switch D/E Voltage Correlation	Voltage drift monitoring: • Throttle Position Sensor 1 voltage and APP Sensor 2 voltage = 13 - 20%
P2146	Fuel Injector Group “A” Supply Voltage Circuit Open	Diagnostic signal from output driver = error pattern

DTC	Error Message	Malfunction Criteria and Threshold Value
P2149	Fuel Injector Group “B” Supply Voltage Circuit Open	Diagnostic signal from output driver = error pattern
P2183	Engine Coolant Temperature (Sensor 2) Circuit Range/ Performance	Temperature difference to at least 2 other temperature sensors at startup > 20 °K
P2184	Engine Coolant Temperature (Sensor 2) Circuit Low	ECT signal voltage < 0.15 V
P2185	Engine Coolant Temperature (Sensor 2) Circuit High	Deviation to oxygen concentration > 0.046
P2195	O2 Sensor Signal Stuck Lean (Bank 1 Sensor 1)	Deviation to oxygen concentration > 0.046
P2196	O2 Sensor Signal Stuck Rich (Bank 1 Sensor 1)	Deviation to oxygen concentration < 0.063
P2237	O2 Sensor Positive Current Control Circuit (Bank 1 Sensor 1) Open	• Measured oxygen concentration < 0.005
P2243	O2 Sensor Reference Voltage Circuit (Bank 1 Sensor 1) Open	• O2S internal resistance > 1104Ω • Oxygen sensor raw signal > 3 V
P2251	O2 Sensor Negative Current Control Circuit (Bank 1 Sensor 1) open	• O2S internal resistance > 1104 Ω • Oxygen sensor raw signal < 1.4 V or > 1.6 V
P2270	O2 Sensor Signal Stuck Lean; (Bank 1 Sensor 2)	Deviation to oxygen concentration during fuel cutoff > 0.046 OR deviation between measured and modeled oxygen concentration > 4.8% vol.
P2271	O2 Sensor Signal Stuck Rich; (Bank 1 Sensor 2)	Deviation to oxygen concentration during fuel cutoff < -0.063
P2279	Intake Air System Leak	Deviation between actual airflow and modeled mass air flow < 0.7
P2294	Fuel Pressure Regulator 2 Control Circuit	Open circuit diagnostic signal from output driver
P2295	Fuel Pressure Regulator 2 Control Circuit Low	Grounded circuit diagnostic signal from output driver
P2296	Fuel Pressure Regulator 2 Control Circuit High	Over current circuit diagnostic signal from output driver

DTC	Error Message	Malfunction Criteria and Threshold Value
P320B	O2 (Sensor 2 Bank 1) Heater Performance Masking	Sensor temperature < 720 °C
P320C	O2 (Sensor 1/2 Bank 1) lean correlation	Offset air fuel ratio > 0.5

Additional Emissions Regulations

DTC	Error Message	Malfunction Criteria and Threshold Value
P240F	Exhaust Gas Recirculation Slow Response	Calculated characteristic value > 20 at positive or negative air mass change
P2413	Exhaust Gas Recirculation System Performance	• Number of learning points at fuel mass adaptation limit > or = to 4 • At upper limit = 6 mg/stroke • At lower limit = -6 mg/stroke
P242A	Exhaust Gas Temperature Sensor Circuit (Bank 1 Sensor 3)	Sensor signal voltage > 1.72 V
P242B	Exhaust Gas Temperature Sensor Circuit (Bank 1 Sensor 3) Range/Performance	• Comparison of upstream turbine exhaust gas temp vs modeled temperature < 250 °C or • Temperature difference to other temp sensors during cold start < 45 °K
P242C	Exhaust Gas Temperature Sensor Circuit Low (Bank 1 Sensor 3)	Sensor signal voltage < 0.45 V
P244C	Exhaust Temperature Too Low For Particulate Filter Regeneration (Bank 1)	Time to activate control loop > 45 to 60 Sec.
P2452	Diesel Particulate Filter Differential Pressure Sensor Circuit	Sensor voltage > 4.9 V
P2453	Diesel Particulate Filter Differential Pressure Sensor Circuit Range/Performance	Differential pressure signal < -83 hPa to > 80 hPa
P2454	Diesel Particulate Filter Differential Pressure Sensor Circuit Low	Sensor voltage < 0.2

DTC	Error Message	Malfunction Criteria and Threshold Value
P2456	Diesel Particulate Filter Pressure Sensor “A” Circuit Intermittent/Erratic	Inverse change of differential pressure per time > 10 hPa or < 10 hPa
P2457	Exhaust Gas Recirculation Cooler Efficiency Below Threshold	Sensor temperature above threshold 40 °K
P2458	Diesel Particulate Filter Regeneration Duration	Regeneration time > 5400 Sec.
P2459	Diesel Particulate Filter Regeneration Frequency	PM trap loading > dynamically rising threshold f(simulated engine emissions)
P246E	Exhaust Gas Temperature Sensor Circuit (Bank 1 Sensor 4)	Sensor signal voltage > 1.72 V
P246F	Exhaust Gas Temperature Sensor Circuit (Bank 1 Sensor 4) Range/Performance	• Sensor temperature < 230 °C or • Temperature difference to other temp sensors during cold start < 45 °K
P2463	Diesel Particulate Filter - Soot Accumulation	Calculated particulate matter trap loading > 40 g
P247A	Exhaust Gas Temperature Out of Range (Bank 1 Sensor 3)	Control deviation > limit from Map f or < limit from Map f (engine speed, torque)
P2470	Exhaust Gas Temperature Sensor Circuit Low (Bank 1 Sensor 4)	Sensor signal voltage < 0.45 V
P2478	Exhaust Gas Temperature Out of Range (Bank 1 Sensor 1)	Control deviation > limit from Map f or < limit from Map f (engine speed, torque)
P2563	Turbocharger Boost Control Position Sensor Circuit Range/Performance	• Position sensor signal voltage < 0.3 or > 4.5 V or • Position sensor signal > 1.72 or < 0.3 V
P2564	Turbocharger Boost Control Position Sensor Circuit Low	Position sensor signal voltage < 0.15 V
P2565	Turbocharger Boost Control Position Sensor Circuit High	Sensor signal voltage > 4.85 V
P2610	ECM/PCM Internal Engine Off Timer Performance	Quantity time over threshold < 7.52 or > 8.48 Sec.

DTC	Error Message	Malfunction Criteria and Threshold Value
P2632	Fuel Pump “B” Control Circuit Open	Open circuit diagnostic signal from output driver
P2633	Fuel Pump “B” Control Circuit Low	Grounded circuit diagnostic signal from output driver
P2634	Fuel Pump “B” Control Circuit High	Over current circuit diagnostic signal from output driver
P268A	Fuel Injector Calibration Not Learned/Programmed	Accumulated global release time of zero fuel calibration but disabled by rail pressure deviation.

DTC CHART

Engine Codes 2.5L CBTA, CBUA

Fuel and Air Mixture, Additional Emission Regulations

DTC	Error Message	Malfunction Criteria and Threshold Value
P000A	“A” Camshaft Position Slow Response (Bank 1)	• Difference between target and actual > 8° CRK for > 1.8 to 2.5 Sec. • Adjustment angle < 3° CRK rotation
P0010	“A” Camshaft Position Actuator Circuit/Open (Bank 1)	Signal voltage > 4.70 - 5.40 V
P0011	Camshaft Position (Bank 1) Timing over-advanced or System Performance	• Difference between target and actual > 8° CRK rotation • Adjustment angle < 3° CRK rotation
P0016	Crankshaft Position-Camshaft Position Correlation (Bank 1 Sensor A)	Permissible deviation < -13.49 or >13.49 CRK deg.
P0030	O2 Sensor Heater Control Circuit (Bank 1 (1) Sensor 1)	• O2S signal rear not oscillating at reference < 598 mV and enrichment after stuck lean 20% or • Heater voltage 4.70 to 5.40 V
P0031	O2 Sensor Heater Control Circuit (Bank 1 (1) Sensor 1) Low	• O2S signal rear not oscillating at reference < 598 mV and enrichment after stuck lean 20% or • Heater voltage 0 to 3.26 V
P0032	O2 Sensor Heater Control Circuit (Bank 1 (1) Sensor 1) High	Heater current > 5.50 A
P0036	HO2S Heater Control Circuit (Bank 1, Sensor 2) Open Circuit	Heater voltage 2.34 to 3.59 V
P0037	O2 Sensor Heater Control Circuit(Bank 1 (1) Sensor 2) Low	Heater voltage < 2.34 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P0038	O2 Sensor Heater Control Circuit (Bank 1 (1) Sensor 2) High	Heater voltage > 3.59 A
P0042	O2 Sensor Heater Control Circuit (Bank 1 (1) Sensor 3)	Heater voltage 2.34 to 3.59 V
P0043	O2 Sensor Heater Control Circuit (Bank 1 (1) Sensor 3) Low	Heater voltage < 2.34 V
P0044	O2 Sensor Heater Control Circuit (Bank 1 (1) Sensor 3) High	Heater voltage > 3.59 V
P0070	Ambient Air Temperature Sensor Circuit	Ambient air temp < -50 °C
P0071	Ambient Air Temperature Sensor Circuit Range/ Performance	Difference of ECT vs. IAT or IAT vs. AAT at start > 25 K (kelvin) or AAT vs. ECT at start < 25 K
P0072	Ambient Air Temperature Sensor Circuit Low	Ambient air temp > 87 °C
P0106	Manifold Absolute Pressure/ BARO Pressure Range/ Performance	• Difference manifold pressure - lower threshold model < 0. Model range 45 to 845 hPa • Difference manifold pressure - upper threshold model > 0. Model range 640 - 1055 • Difference altitude sensor signal vs. manifold pressure signal at engine start > 60 hPa
P0107	Manifold Absolute Pressure or BARO Pressure Low Input	Signal voltage < 0.20 V
P0108	Manifold Absolute Pressure or BARO Pressure High Input	Signal voltage > 4.86 V
P0111	Intake Air Temperature Sensor 1 Bank 1 Circuit Range/ Performance	• Difference of ECT vs. IAT or IAT vs. AAT at start > 25 K (kelvin) or AAT vs. ECT at start < 25 K
P0112	Intake Air Temperature (Sensor 1 Bank 1) Circuit Low	IAT > 130.0 °C
P0113	Intake Air Temperature (Sensor 1 Bank 1) Circuit High	IAT < -46 °C

DTC	Error Message	Malfunction Criteria and Threshold Value
P0116	Engine Coolant Temperature (Sensor 1) Circuit Range/ Performance	• No change on signal 2 °K • ECT signal stuck in range 75 - 105 °C and no change in signal 2 °K
P0117	Engine Coolant Temperature (Sensor 1) Circuit Low	Engine coolant temperature > 140°C
P0118	Engine Coolant Temperature (Sensor 1) Circuit High	Engine coolant temperature < -40°C
P0121	Throttle/Pedal Position Sensor A Circuit Range/Performance	• TPS 1 - TPS 2 > 5.10 to 6.30% • TPS 1 calc. value > 9.00%
P0122	Throttle/Pedal Position Sensor A Circuit Low Input	Signal voltage < 0.20 V
P0123	Throttle/Pedal Position Sensor A Circuit High Input	Signal voltage > 4.81 V
P013A	O2 Sensor (Bank 1 Sensor 2) Slow Response - Rich to Lean	EWMA filtered max differential transient time at fuel cutoff >= 0.5 Sec. and number of checks >= 3
P0130	O2 Sensor Circuit Bank 1 Sensor 1) Malfunction	O2S ceramic temperature < 640°C
P0131	O2 Sensor Circuit (Bank 1, Sensor 1) Low Voltage	Virtual mass < 1.75V
		Nernst voltage < 1.50 V
		Adjustment voltage < 0.30 V
P0132	O2 Sensor Circuit (Bank 1, Sensor 1) High Voltage	Virtual mass > 3.25 V
		Nernst voltage > 4.40 V
		Adjustment voltage > 7 V
P0133	O2 Sensor Circuit (Bank 1 Sensor 1) Slow Response	• Difference between R2L and L2R area ratio -0.40 to 0.40 • Counter cycles completed >/= 4 times • Gradient ratio >= 0.25 or <= 0.40 and lower value of both ratios < 0.25
P0135	O2 Sensor Heater Circuit (Bank 1 Sensor 1) Malfunction	• Heater duty cycle > 90% • O2S ceramic temperature, < 720 °C or • O2S ceramic temp < 715 °C • Time after O2 heater on, 35 Sec.

DTC	Error Message	Malfunction Criteria and Threshold Value
P0136	O2 Sensor Circuit (Bank 1 Sensor 2) Malfunction	• Delta O2S rear signal > 2.00 V • Number of checks = 6
P0137	O2 Sensor Circuit (Bank 1 Sensor 2) Low Voltage	• Cold condition: Signal voltage < 0.06 V for > 3 Sec • Difference of sensor voltage with and without load pulse < 0.01 V
P0138	O2 Sensor Circuit (Bank 1 Sensor 2) High Voltage	Signal voltage > 1.08 V for > 5 Sec.
P0139	O2 Sensor Circuit (Bank 1, Sensor 2) Slow Response	• EWMA filtered transient time at fuel cut off > 0.6 Sec. • O2 voltage between 201 - 401 mV • O2S rear signal > 0.16 V during fuel cut off active
P0140	O2 Sensor Circuit (Bank 1, Sensor 2) No Activity Detected	• Signal voltage .40 to .60 V for > 3 Sec. • Voltage difference between load pulse and no load pulse >= 2.80 V • Internal resistance > 40 k and exhaust temp > 670 °C
P0141	O2 Sensor Heater Circuit (Bank 1, Sensor 2) Malfunction	• Difference of sensor voltage with and without load pulse < 0.01 V • Internal heater resistance 1200 - 32400 Ω
P0142	O2 Sensor Circuit (Bank 1 Sensor 3)	• Delta voltage 1 step at heater switching > 2.00 V • Heater coupling >= 6 times
P0143	O2 Sensor Circuit (Bank 1 Sensor 3) Low Voltage	• Signal voltage .40 to .60 V for > 3 Sec. • Voltage difference between load pulse and no load pulse >= 2.80 V • Internal resistance > 40 k and exhaust temp > 670 °C
P0144	O2 Sensor Circuit (Bank 1 Sensor 3) High Voltage	Signal voltage > 1.08 V for > 5 Sec.
P0145	O2 Sensor Circuit (Bank 1 Sensor 3) Slow Response	• EWMA filtered transient time at fuel cut off > 1.5 Sec. • O2 voltage between 201 - 401 mV

DTC	Error Message	Malfunction Criteria and Threshold Value
P0146	O2 Sensor Circuit (Bank 1 Sensor 3) No Activity Detected	• Signal voltage .40 to .60 V for > 3 Sec. • Voltage difference between load pulse and no load pulse >= 2.80 V • Internal resistance > 40 k and exhaust temp > 670 °C
P0147	O2 Sensor Heater Circuit (Bank 1 Sensor 3)	Internal heater resistance 1200 - 32400 Ω
P0169	Incorrect Fuel Composition	Fuel quantity out of limit or incorrect
P0201	Cylinder 1 - Injector Circuit	Low side signal voltage 4.50 - 5.50 V
P0202	Cylinder 2 - Injector Circuit	Low side signal voltage 4.50 - 5.50 V
P0203	Cylinder 3 - Injector Circuit	Low side signal voltage 4.50 - 5.50 V
P0204	Cylinder 4 - Injector Circuit	Low side signal voltage 4.50 - 5.50 V
P0205	Cylinder 5 - Injector Circuit	Low side signal voltage 4.50 - 5.50 V
P0221	Throttle/Pedal Position Sensor/Switch B Range/ Performance	• TPS 1 to TPS 2, > 5.10 to 6.3% • TPS 2 – calc position > 9 %
P0222	Throttle/Pedal Position Sensor/Switch B Circuit Low Input	Signal voltage < 0.20 V
P0223	Throttle/Pedal Position Sensor/Switch B Circuit High Input	Signal voltage > 4.81 V
P0261	Cylinder 1 Injector Circuit Low	Signal voltage < 3.00 V
P0262	Cylinder 1 Injector Circuit High	Signal current < 2.20 - 4.00 A
P0264	Cylinder 2 Injector Circuit Low	Signal voltage < 3.00 V
P0265	Cylinder 2 Injector Circuit High	Signal current < 2.20 - 4.00 A
P0267	Cylinder 3 Injector Circuit Low	Signal voltage < 3.00 V
P0268	Cylinder 3 Injector Circuit High	Signal current < 2.20 - 4.00 A
P0270	Cylinder 4 Injector Circuit Low	Signal voltage < 3.00 V
P0271	Cylinder 4 Injector Circuit High	Signal current < 2.20 - 4.00 A
P0273	Cylinder 5 Injector Circuit Low	Signal voltage < 3.00 V
P0274	Cylinder 5 Injector Circuit High	Signal current < 2.20 - 4.00 A

DTC	Error Message	Malfunction Criteria and Threshold Value
P2088	"A" Camshaft Position Actuator Control Circuit Low (Bank 1)	Signal voltage 0.0 to 3.25 V
P2089	"A" Camshaft Position Actuator Control Circuit High (Bank 1)	Signal current, > 2.2 A
P2096	Post Catalyst Fuel Trim System (Bank 1) Too Lean	Deviation lambda control < -0.03%
P2097	Post Catalyst Fuel Trim System (Bank 1) Too Rich	Deviation lambda control > 0.03%
P3081	Engine temperature too low	Difference between ECT and modeled ECT > 11 K

Ignition System

DTC	Error Message	Malfunction Criteria and Threshold Value
P0300	Random/Multiple Cylinder Misfire Detected	• Emission threshold 1st interval misfire rate (200 rev Misfire Rate) > 2.5% • Emission threshold misfire rate (1000 rev Misfire Rate), > 2.5 to 24%
P0301	Cylinder 1 Misfire Detected	• Emission threshold 1st interval misfire rate (200 rev Misfire Rate) > 2.5% • Emission threshold misfire rate (1000 rev Misfire Rate), > 2.5 to 24%
P0302	Cylinder 2 Misfire Detected	• Emission threshold 1st interval misfire rate (200 rev Misfire Rate) > 2.5% • Emission threshold misfire rate (1000 rev Misfire Rate), > 2.5 to 24%
P0303	Cylinder 3 Misfire Detected	• Emission threshold 1st interval misfire rate (200 rev Misfire Rate) > 2.5% • Emission threshold misfire rate (1000 rev Misfire Rate), > 2.5 to 24%

DTC	Error Message	Malfunction Criteria and Threshold Value
P0304	Cylinder 4 Misfire Detected	• Emission threshold 1st interval misfire rate (200 rev Misfire Rate) > 2.5% • Emission threshold misfire rate (1000 rev Misfire Rate), > 2.5 to 24%
P0305	Cylinder 5 Misfire Detected	• Emission threshold 1st interval misfire rate (200 rev Misfire Rate) > 2.5% • Emission threshold misfire rate (1000 rev Misfire Rate), > 2.5 to 24%
P0321	Ignition/Distributor Engine Speed Input Circuit Range/ Performance	• Comparison of counted teeth and number of teeth +/- 1 tooth • Loss of reference gap during normal operation • No reference gap during engine start
P0322	Ignition/Distributor Engine Speed Input Circuit No Signal	• No engine speed signal but CMP signals > 5 cam shaft revs • Engine speed = no signal
P0324	Knock Control System Error	• Signal fault counter (combustion) > 30 or Signal fault counter measuring window > 2
P0327	Knock Sensor 1 Circuit Low Input	• Lower threshold < - 0.70 V • Signal range check < 0.55 to 5.60 V
P0328	Knock Sensor 1 Circuit High Input	• Upper threshold > 1.00 V • Signal range check > 16.50 to 92 V
P0332	Knock Sensor 2 Circuit Low Input	• Lower threshold < - 0.70 V • Signal range check < 0.55 to 5.60 V
P0333	Knock Sensor 2 Circuit High Input	• Upper threshold > 1 V • Signal range check > 16.50 to 92 V
P0341	Camshaft Position Sensor Circuit Range/Performance	• Signal pattern incorrect • Defect counter = 8
P0342	Camshaft Position Sensor Circuit Low Input	• Signal voltage permanently low • Crankshaft signals = 8

DTC	Error Message	Malfunction Criteria and Threshold Value
P0343	Camshaft Position Sensor Circuit High Input	• Signal voltage permanently high • Crankshaft signals = 8
P0351	Ignition Coil A Primary/ Secondary Circuit	• Signal current < 0.25 to -2.0 mA • Internal check failed
P0352	Ignition Coil B Primary/ Secondary Circuit	• Signal current < 0.25 to -2.0 mA • Internal check failed
P0353	Ignition Coil C Primary/ Secondary Circuit	• Signal current < 0.25 to -2.0 mA • Internal check failed
P0354	Ignition Coil D Primary/ Secondary Circuit	• Signal current < -0.25 to 2.0 mA • Internal check failed
P0355	Ignition Coil E Primary/ Secondary Circuit	• Signal current < 0.25 to -2.0 mA • Internal check failed

Additional Exhaust Regulation

DTC	Error Message	Malfunction Criteria and Threshold Value
P0410	Secondary Air Injection System Malfunction	Deviation SAI pressure > 50 hPa
P0413	Secondary Air Injection System Switching Valve A Circuit Open	Signal voltage 4.70 to 5.40 V
P0414	Secondary Air Injection System Switching Valve A Circuit Shorted	• Signal voltage 0 to 3.25 V or • Signal current > 2.20 A
P0418	Secondary Air Injection System Relay A Circuit	Signal voltage 4.70 to 5.40 V
P0420	Catalyst System (Bank 1) Efficiency Below Threshold	Oxygen storage capacity (OSC) vs OSC value of borderline catalyst < 1.00
P043E	Evaporative Emission System Leak Detection Reference Orifice Low Flow	EVAP pump current during reference measurement > 40 mA
P043F	Evaporative Emission System Leak Detection Reference Orifice High Flow	EVAP pump current during reference measurement < 15 mA

DTC	Error Message	Malfunction Criteria and Threshold Value
P0441	EVAP Emission Control System Incorrect Purge Flow	Actual EVAP pump current vs. difference from last reading > 1.70
P0442	EVAP Emission Control System (Small Leak) Leak Detected	Current pump pressure vs. modeled pump pressure < 9 hPa.
P0444	Evaporative Emission System Purge Control Valve Circuit Open	Signal voltage 4.70 - 5.40 V
P0447	Evaporative Emission System Vent Control Circuit Open	Signal voltage > 4.70 - 5.40 V
P0448	Evaporative Emission System Vent Control Circuit Shorted	• Signal current > 2.2 to 4 A or • Signal voltage < 2.74 to 3.26 V
P0455	EVAP Emission Control System (Gross Leak) Leak Detected	Time for pressure drop < 0.95 Sec.
P0456	EVAP Emission Control System (very small Leak) Leak Detected	EVAP system leakage area calculated from pump current curve > 0.17 mm squared.
P0458	Evaporative Emission System Purge Control Valve Circuit Low	Signal voltage 0 to 3.26 V
P0459	Evaporative Emission System Purge Control Valve Circuit High	Signal current, > 2.2 A
P0491	Secondary Air Injection System (Bank 1) insufficient flow	• SAI pressure vs. modeled SAI < 50 - 72% or • Absolute deviation of raw pressure signal from filtered signal mean value < 8.98 hPa

Speed and Idle Control

DTC	Error Message	Malfunction Criteria and Threshold Value
P0501	Vehicle Speed Sensor “A” Range/Performance	Vehicle speed < 4 km/h
P0503	Vehicle Speed Sensor “A” Intermittend/Erratic/High	Vehicle speed > 325 km/h

DTC	Error Message	Malfunction Criteria and Threshold Value
P0506	Idle Control System RPM Lower than Expected	• Engine speed deviation > 100 RPM • RPM controller torque value ≥ calculated max value.
P0507	Idle Control System RPM Higher than Expected	• Engine speed deviation < -100 RPM • RPM controller torque value ≤ calculated min. value.
P050A	Cold Start Idle Air Control System Performance	• Engine speed deviation > 100 RPM • RPM controller torque value >= calculated max. value or • Engine speed deviation < -100 RPM • RPM controller torque value <= calculated min. value.
P050B	Cold Start Ignition Timing Performance	Difference between commanded spark timing vs. actual value > 20%
P052A	Cold Start “A” Camshaft Position Timing Over-Advanced	Difference between actual and target position > 10° CRK rev.

Control Module and Output Signals

DTC	Error Message	Malfunction Criteria and Threshold Value
P0606	ECM/PCM Processor	• Internal hardware/voltage check - failed • Communication CPU - Sensor IC - failed • EEPROM Check failed
P0627	Fuel Pump “A” Control Circuit/ Open	• Signal voltage 4.50 to 5.50 V (open circuit) • Signal voltage < 3.00 V (grounded circuit)
P0629	Fuel Pump “A” Control Circuit High	Signal current 0.60 to 1.20 A

DTC	Error Message	Malfunction Criteria and Threshold Value
P0638	Throttle Actuator Control (Bank 1) Range/Performance	• Time to close to reference point > 0.6 Sec. and reference point = 2.88% or • TPS 1 signal voltage, not 0.40 - 0.80 V • TPS 2 signal voltage, not (4.20 - 4.60) V
P0641	Sensor Reference Voltage “A” Circuit Open	Signal voltage deviation > +/- 0.3 V
P0651	Sensor Reference Voltage “B” Circuit Open	Signal voltage deviation > ± 0.3 V
P0697	Sensor Reference Voltage “C” Circuit Open	Signal voltage deviation > +/- 0.3 V
U0001	High Speed CAN Communication Bus	CAN message = no feedback
U0002	High Speed CAN Communication Bus Performance	Global time out, no messages received
U0101	Lost Communication with TCM	Time out, no message received
U0121	Lost Communication With Anti-Lock Brake System (ABS) Control Module	No CAN messages received
U0146	Lost Communication With Gateway “A”	No CAN messages received
U0155	Lost Communication With Instrument Panel Cluster (IPC) Control Module	No CAN messages received
U0302	Software Incompatibility with Transmission Control Module	Manual transmission coded ECM but automatic transmission messages received from TCM
U0402	Invalid Data Received From Transmission Control Module	Implausible data message received
U0415	Invalid Data Received From Anti-Lock Brake System Control Module	• Sensor signal failure • None, or implausible information • CAN 1 VSS signal incorrect > 327.08 km/h
U0422	Invalid Data Received From Body Control Module	Ambient temperature value initialization = 00h

DTC	Error Message	Malfunction Criteria and Threshold Value
U0423	Invalid Data Received From Instrument Panel Cluster Control Module	AAT sensor reading from cluster to ECM implausible or no message
U0447	Invalid Data Received From Gateway “A”	CAN message incorrect

Fuel and Air Ratios Control Module

DTC	Error Message	Malfunction Criteria and Threshold Value
P117A	Bank 1, oxygen sensor correction center sensor Control limit reached	I - portion of 3rd lambda control loop > 0.03)
P150A	Engine Off Timer Performance	Comparison of engine off time from Instrument Cluster control unit with ECM engine after run timer < -12 or > 12 Sec.
P1609	Crash shut-off was triggered	Airbags activated
P12A1	Fuel Rail Pressure Sensor Inappropriately Low	• Pressure control activity > 0.25 MPa and • Fuel trim activity < 0.85
P12A2	Fuel Rail Pressure Sensor Inappropriately High	• Pressure control activity > 0.25 MPa and • Fuel trim activity < 0.85
P12A4	Fuel Rail Pump Control Valve Stuck Closed	• Fuel trim activity 0.85 to 1.15 and • Pressure control activity < 6.0 mPa
P13EA	Ignition Timing Monitor	Difference between commanded spark timing and actual value > 0.60%
P2101	Throttle Actuator A Control Motor Circuit Range/ Performance	• Duty cycle >80% • Deviation throttle value angles vs calculated value 4 to 50% • ECM driver = no fault
P2106	Throttle Actuator Control System Forced Limited Power	Internal check failure
P2122	Throttle/Pedal Position Sensor/Switch D Circuit Low Input	Signal voltage < 0.61 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P2123	Throttle/Pedal Position Sensor/Switch D Circuit High Input	Signal voltage > 4.79 V
P2127	Throttle/Pedal Position Sensor/Switch E Circuit Low Input	Signal voltage < 0.27 V
P2128	Throttle/Pedal Position Sensor/Switch E Circuit High Input	Signal voltage > 2.43 V
P2138	Throttle/Pedal Position Sensor/Switch D/E Voltage Correlation	Signal voltage sensor 1 vs. 2 > 0.17 to 0.70 V
P2177	System too lean off idle, (Bank 1)	• Adaptive value > 28%
P2178	System too rich off idle, (Bank 1)	• Adaptive value < 20%
P2181	Cooling System Performance	ECT too low after sufficient mass air flow interval = 75 °C
P2184	Engine Coolant Temperature (Sensor 2) Circuit Low	ECT outlet > 140 °C
P2185	Engine Coolant Temperature (Sensor 2) Circuit High	ECT outlet < -40 °C
P2187	System too lean at idle, (Bank 1)	• Adaptive value > 5.02%
P2188	System too rich at idle, (Bank 1)	• Adaptive value < -5.02%
P2195	O2 Sensor Signal Stuck Lean (Bank 1 Sensor 1)	Delta lambda of 2nd lambda control loop > 0.07
P2196	O2 Sensor Signal Stuck Rich (Bank 1 Sensor 1)	Delta lambda of 2nd lambda control loop < -0.07
P2237	O2 Sensor Positive Current Control Circuit (Bank 1 Sensor 1) Open	• O2S signal front 1.49 to 1.51 V • Fuel cutoff > 3 Sec. • Delta lambda controller > 0.10
P2243	O2 Sensor Reference Voltage Circuit (Bank 1 Sensor 1) Open	• O2S signal front > 4.70 V and Internal resistance > 950 Ω • O2S signal front < 0.20 V And Internal resistance > 950 Ω
P2251	O2 Sensor Negative Current Control Circuit (Bank 1 Sensor 1) open	O2S signal front 1.47 to 1.53 V and > 950 Ω
P2257	Secondary Air Injection System Control “A” Circuit low	Signal voltage 0 to 3.26 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P2258	Secondary air injection System Control “A” Circuit High	Signal current .60 to 2.40 A
P2270	O2 Sensor Signal Stuck Lean (Bank 1 Sensor 2)	O2S signal rear not oscillating at reference < 598 mV and enrichment after stuck lean 20%
P2271	O2 Sensor Signal Stuck Rich (Bank 1 Sensor 2)	O2S signal rear not oscillating at reference > 598 mV and enrichment after stuck rich 15%
P2274	O2 Sensor Signal Stuck Lean; (Bank 1 Sensor 3)	O2S rear not oscillating at reference < 0.64 to 0.65 V and enrichment after stuck lean 20%
P2275	O2 Sensor Signal Stuck Rich; (Bank 1 Sensor 3)	• O2S rear not oscillating at reference > 0.64 to 0.65 V and enrichment after stuck rich 15% or • Sensor voltage of >= 0.15 V after oxygen mass flow (after fuel cutoff) > 3500 mg with >= 1 check
P2279	Intake Air System Leak	Offset value throttle mass flow > 13 kg/h

Ignition System

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

DTC	Error Message	Malfunction Criteria and Threshold Value
P2310	Ignition Coil D Primary Control Circuit High	Signal voltage > 5.1 - 7.0 mA
P2312	Ignition Coil E Primary Control Circuit Low	Signal current > 24.0 mA
P2313	Ignition Coil E Primary Control Circuit High	Signal voltage > 5.1 - 7.0 mA

Additional Emissions Regulations

DTC	Error Message	Malfunction Criteria and Threshold Value
P240A	Evaporative Emission System Leak Detection Pump Heater Control Circuit/Open	Signal voltage > 4.7 to 5.4 V
P240B	Evaporative Emission System Leak Detection Pump Heater Control Circuit Low	Signal voltage < 2.74 to 3.26 V
P240C	Evaporative Emission System Leak Detection Pump Heater Control Circuit High	Signal current > 2.2 to 4 A
P2400	Evaporative Emission System Leak Detection Pump Control Circuit/Open	Signal voltage > 4.70 to 5.40 V
P2401	Evaporative Emission System Leak Detection Pump Control Circuit Low	Signal voltage < 2.74 to 3.26 V
P2402	Evaporative Emission System Leak Detection Pump Control Circuit High	Signal voltage > 4.00 or >1.80 V
P2403	Evaporative Emission System Leak Detection Pump Sense Circuit/Open	Low signal voltage > .5 Sec.
P2404	Evaporative Emission System Leak Detection Pump Sense Circuit Range/Performance	• High signal voltage > 12 Sec. • Number of checks = 30 • Cumulative time of high signal voltage during pumping > 10 Sec.
P2407	Evaporative Emission System Leak Detection Pump Sense Circuit Intermittent/Erratic	• Fluctuation of EVAP pump current during reference measurement > 1 mA • Fluctuation of EVAP pump current during reference measurement > 1 mA

DTC	Error Message	Malfunction Criteria and Threshold Value
P2414	02 Sensor Exhaust Sample Error, (Bank 1 Sensor 1)	• Threshold 1 - Signal voltage 3.1 - 4.81 V • Threshold 2 - Signal voltage 2.5 to 3.10 V
P2431	Secondary Air Injection System Air Flow/Pressure (Bank 1 Sensor) Circuit Range/Performance	Difference between SAI pressure and ambient pressure NOT -60 to 60 hPa
P2432	Secondary Air Injection System Air Flow/Pressure Bank 1 Sensor Circuit Low	Signal voltage < 0.5 V
P2433	Secondary Air Injection System Air Flow/Pressure Bank 1 Sensor Circuit High	Signal voltage > 4.5 V
P2440	Secondary Air Injection System Switching Valve Stuck Open (Bank 1)	SAI pressure sensor measured with SAI pressure vs. modeled while SAI valve closed < 64.8%
P2450	Evaporative Emission System Switching Valve Performance/ Stuck Open	EVAP pump current difference between reference measurement to idle < 3 mA
P2626	O2 Sensor Pumping Current Trim Circuit/Open (Bank 1 Sensor 1)	O2S signal front > 4.77 V (lean)

DTC CHART

Engine Code 2.0L CBFA

Fuel and Air Mixture, Additional Emission Regulations

DTC	Error Message	Malfunction Criteria and Threshold Value
P000A	“A” Camshaft Position Slow Response (Bank 1)	Signal change > 8 CRK ° for > 2.9 Sec. and adjustment angle >= 2.50 CRK rev.
P0010	“A” Camshaft Position Actuator Circuit/Open (Bank 1)	Signal voltage, > 4.7 - 5.4 V
P0011	A Camshaft Position (Bank 1) Timing over-advanced or System Performance	Signal change > 8 CRK ° for > 2.9 Sec. and adjustment angle < 2.50 CRK rev.
P0016	Crankshaft Position-Camshaft Position Correlation (Bank 1, Sensor A)	• Permissible deviation < -11 CRK ° or • Permissible deviation > 11 rev
P0030	O2 Sensor Heater Control Circuit (Bank 1 (1) Sensor 1)	Heater voltage 4.70 - 5.40 V
P0031	O2 Sensor Heater Control Circuit (Bank 1 (1) Sensor 1) Low	Heater voltage < 0 to 3.26 V
P0032	O2 Sensor Heater Control Circuit (Bank 1 (1) Sensor 1)	Signal current > 5.50 A
P0036	O2 Sensor Heater Control Circuit (Bank 1 (1) Sensor 2)	Heater voltage, 4.50 - 5.50 V
P0037	O2 Sensor Heater Control Circuit (Bank 1 (1) Sensor 2) Low	Heater voltage < 3.00 V
P0038	O2 Sensor Heater Control Circuit (Bank 1 (1) Sensor 2) High	Heater current 2.70 - 5.50 A
P0042	O2 Sensor Heater Control Circuit (Bank1 (1) Sensor 3)	Heater voltage 2.34 to 3.59 V
P0043	O2 Sensor Heater Control Circuit(Bank1(1)Sensor 3) Low	Heater voltage < 2.34 V
P0044	O2 Sensor Heater Control Circuit (Bank 1 (1) Sensor 3) High	Heater voltage > 3.59 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P0068	MAP/MAF - Throttle Position Correlation	Plausibility with fuel system • Load calculation < -22% Plausibility with fuel system • Load calculation > 22%
P0070	Ambient Air Temperature Sensor Circuit	Ambient air temperature < -50 °C
P0071	Ambient Air Temperature Sensor Circuit Range/ Performance	• Difference in value between ECT and AAT at engine start (depending on engine off time) > 25 K and • Difference in value between AAT and IAT at engine start (depending on engine off time) > 25 K
P0072	Ambient Air Temperature Sensor Circuit Low	Ambient air temperature > 77 °C
P0087	Fuel Rail/System Pressure - Too Low	• Fuel trim activity 0.90 - 1.15 • Pressure controller activity > 2 MPa • Difference between target and actual pressure > -16.4
P0100	Mass or Volume Air Flow A Circuit	MAF sensor signal 0 µs
P0101	Mass or Volume Air Flow A Circuit Range/Performance	Mass air flow vs. • upper threshold model > 60 to 800 kg/h • lower threshold model < 0 to 400 kg/h • Load calculation > 18% • Fuel system < -18%
P0102	Mass or Volume Air Flow Circuit Low Input	MAF sensor signal < 66 µs
P0103	Mass or Volume Air Flow Circuit High Input	MAF sensor signal > 4500 µs
P0106	Manifold Absolute Pressure or BARO Sensor Range/ Performance	• Difference of boost pressure signal vs altitude sensor signal > 230 hPa or • Difference of boost pressure signal vs altitude sensor signal < -130 hPa

DTC	Error Message	Malfunction Criteria and Threshold Value
P0111	Intake Air Temperature (Sensor 1 Bank 1) Circuit	• Difference in value IAT - ECT @ engine start (depending on engine off time) > 25 °C and • Difference in value IAT - AAT @ engine start > 25 °C (depending on engine off time)
P0112	Intake Air Temperature (Sensor 1 Bank 1) Circuit Low	Intake air temperature > 141°C
P0113	Intake Air Temperature (Sensor 1 Bank 1) Circuit High	Intake air temperature < -46°C
P0116	Engine Coolant Temperature Sensor 1 Circuit Range/ Performance	• No change on signal < 2 K or • Signal in range > 89 °C with no change on signal 1.5 °K
P0117	Engine Coolant Temperature Sensor 1 Circuit Low	Engine coolant temperature > 140°C
P0118	Engine Coolant Temperature Sensor 1 Circuit High	Engine coolant temperature < -40°C
P0121	Throttle/Pedal Position Sensor A Circuit Range/Performance	• TPS 1 - TPS 2 > 6.30% • Actual TPS 1 calculated value > TPS 2 calculated value • TPS 1 calc. value > 9.00%
P0122	Throttle/Pedal Pos.Sensor A Circuit Low Input	Signal voltage < 0.20 V
P0123	Throttle/Pedal Position Sensor A Circuit High Input	Signal voltage > 4.81 V
P0130	O2 Sensor Circuit (Bank 1, Sensor 1) Malfunction	O2S ceramic temperature < 640°C
P0131	O2 Sensor Circuit (Bank 1, Sensor 1) Low Voltage	Virtual mass > 1.75 V
		Nernst voltage > 1.50 V
		Adjustment voltage > 0.30 V
P0132	O2 Sensor Circuit (Bank 1, Sensor 1) High Voltage	Virtual mass > 3.25 V
		Nernst voltage > 4.40 V
		Adjustment voltage > 7 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P0133	O2 Sensor Circuit (Bank 1, Sensor 1) Slow Response	Signal dynamic slope check • O2S signal front vs. modeled O2S signal ratio < 0.35 and > 0.01 • Lower value of both counters for area ratios L to R and R to L > = 5 times Oscillation check • Lambda amplitude signal > 20% • Cycles > 8 • Time lambda > lambda amplitude 400 m sec. Delay check • Delay modeled lambda signal minus measured signal > 460 m sec. • Cycles > 12
P0135	O2 Sensor Heater Circuit (Bank 1, Sensor 1) Malfunction	• Heater duty cycle, >100% • O2S ceramic temperature, < 715 °C • Time after O2S heater on 40 Sec.
P0136	O2 Sensor Circuit (Bank 1, Sensor 2) Malfunction	• Delta voltage one step at heater switching > 2.00 V • Number of checks ≥ 4
P0137	O2 Circuit (Bank 1, Sensor 2) Low Voltage	Cold condition • Signal voltage, < 0.06 V for 3 Sec. Warm condition • Signal voltage < 0.01 V • Reaction at closed loop enrichment - no reaction
P0138	O2 Circuit (Bank 1, Sensor 2) High Voltage	Signal voltage > 1.08 V for > 5 Sec.
P0139	O2 Circuit (Bank 1 Sensor 2) Slow Response	• EWMA filtered transient time at fuel cutoff > 0.0 Sec. • In voltage range of 201 - 401 mV • Number of checks, ≥ 3
P013A	O2 Sensor (Bank 1 Sensor 2) Slow Response - Rich to Lean	• EWMA filtered max differential transient time at fuel cutoff ≥ 0.5 Sec. • Number of checks ≥ 3

DTC	Error Message	Malfunction Criteria and Threshold Value
P0140	O2 Circuit (Bank 1, Sensor 2) No Activity Detected	Signal voltage • Signal voltage, 0.40 - 0.60 V for > 3 Sec Internal resistance • > 40000 ohm
P0141	O2 Heater Circuit (Bank 1, Sensor 2) Malfunction	Heater resistance, 702 - 5250 Ohm
P0142	O2 Sensor Circuit (Bank 1 Sensor 3)	• Delta voltage one step at heater > 2.0 V • Number of checks, 4
P0143	O2 Sensor Circuit (Bank 1 Sensor 3) Low Voltage	Cold/Warm condition • Signal voltage < 0.06 V for > 3 Sec.
P0144	O2 Sensor Circuit (Bank 1 Sensor 3) High Voltage	Signal voltage > 1.08 V for > 5 Sec.
P0145	O2 Sensor Circuit (Bank 1, Sensor 3) Slow Response	• EWMA filtered transient time at fuel cutoff > 1.2 Sec. • In voltage range 401.4 - 201.2 mV • Number of checks > 3
P0146	O2 Sensor Circuit (Bank 1, Sensor 3) No Activity Detected	• Signal voltage 0.40 - 0.60 V for > 3 Sec. • Internal resistance > 40000 Ohm
P0147	O2 Sensor Heater Circuit (Bank 1, Sensor 3)	Heater (ECM internal) resistance 792 - 4560 ohm
P0169	Incorrect Fuel Composition	Comparison with fuel quantity incorrect
P0171	Fuel Trim, (Bank1) System too Lean	At idle • Adaptive value > 5.02% At part-load • Adaptive value > 21%
P0172	Fuel Trim, (Bank 1) System too Rich	At idle • Adaptive value < -5.02% At part-load • Adaptive value < -21%
P0190	Fuel Rail Pressure Sensor “A” Circuit	Signal voltage > 4.8 V
P0191	Fuel Rail Pressure Sensor “A” Circuit Range/Performance	Actual pressure > 20.6 MPa

DTC	Error Message	Malfunction Criteria and Threshold Value
P0192	Fuel Rail Pressure Sensor “A” Circuit Low Input	Signal voltage < 0.2 V
P0201	Cylinder 1 - Injector Circuit	• Low side signal current < 2.1 A • Internal logic failure
P0202	Cylinder 2 - Injector Circuit	• Low side signal current < 2.1 A • Internal logic failure
P0203	Cylinder 3 - Injector Circuit	• Low side signal current < 2.1 A • Internal logic failure
P0204	Cylinder 4 - Injector Circuit	• Low side signal current < 2.1 A • Internal logic failure
P0221	Throttle/Pedal Position Sensor/Switch B Circuit Range/Performance	• TPS 1 - TPS 2 > 6.30% • Actual TPS 2 calculated value > TPS 1 calculated value • TPS 2 – calc. value > 9.00%
P0222	Throttle/Pedal Position Sensor/Switch B Low Input	Signal voltage < 0.20 V
P0223	Throttle/Pedal Position Sensor/Switch B High Input	Signal voltage > 4.81 V
P0234	Turbocharger/Supercharger Overboost Condition	Difference of set value boost pressure vs altitude sensor signal > 260 - 1275 hPa
P0236	Turbocharger Boost Sensor (A) Circuit Range/ Performance	Difference of boost pressure signal vs. altitude sensor signal > 230 hPa or < -130 hPa
P0237	Turbocharger Boost Sensor (A) Circuit Low Input	Signal voltage < 0.2 V
P0238	Turbocharger Boost Sensor (A) Circuit High Input	Signal voltage > 4.88 V
P0243	Turbo/Super Charger Wastegate Solonoid A	Signal voltage > 4.4 - 5.6 V
P0245	Turbo/Super Charger Wastegate Solonoid A Low	Signal voltage < 3.25 - 2.15 V
P0246	Turbo/Sup.Charger Wastegate Solonoid A High	Signal current > 2.2 to 4 A
P025A	Fuel Pump Module Control Circuit/Open	Signal voltage 4.40 - 5.60 V
P025C	Fuel Pump Module Control Circuit Low	Signal voltage 2.15 - 3.25 V
P025D	Fuel Pump Module Control Circuit High	Signal current > 1.10 A

DTC	Error Message	Malfunction Criteria and Threshold Value
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
P0299	Turbo/Super Charger Underboost	Difference of set boost pressure vs. actual boost pressure value > 150 hPa
P2008	Intake Manifold Runner (Bank 1) Control Circuit/Open	Signal voltage 4.70 - 5.40 V
P2009	Intake Manifold Runner (Bank 1) Control Circuit Low	Signal voltage 0 to 3.26 V
P2010	Intake Manifold Runner (Bank 1) Control Circuit High	Signal current > 2.20 A
P2014	Intake Manifold Runner Position Sensor/Switch Circuit (Bank 1)	Signal voltage > 4.75 V
P2015	Intake Manifold Runner Position Sensor/Switch Circuit Range/Performance	• Deviation runner flap target position vs actual position > 25% • Actual position 0 to 100%
P2016	Intake Manifold Runner Position Sensor/Switch Circuit Low	Signal voltage < 0.25 V
P2088	“A” Camshaft Position Actuator Control Circuit Low (Bank 1)	Signal voltage 0 - 3.25 V
P2089	“A” Camshaft Position Actuator Control Circuit High (Bank 1)	Signal current > 2.2 A
P2096	Post-Catalyst Fuel Trim System (Bank 1) Too Lean	Deviation lambda control < -0.03
P2097	Post Catalyst Fuel Trim System (Bank 1) Too Rich	Integral part of lambda control > 0.03%
P3081	Engine Temperature Too Low	Difference between ECT and modeled ECT > 10 °K

Ignition System

DTC	Error Message	Malfunction Criteria and Threshold Value
P0300	Random/Multiple Cylinder Misfire Detected	• Emission threshold 1st interval Misfire Rate (MR), > 2.65% • Catalyst damage misfire rate (MR), > 3% - 20%
P0301	Cylinder 1 Misfire Detected	• Emission threshold 1st interval Misfire Rate (MR), > 2.65% • Catalyst damage misfire rate (MR), > 3% - 20%
P0302	Cylinder 2 Misfire Detected	• Emission threshold 1st interval Misfire Rate (MR), > 2.65% • Catalyst damage misfire rate (MR), > 3% - 20%
P0303	Cylinder 3 Misfire Detected	• Emission threshold 1st interval Misfire Rate (MR), > 2.65% • Catalyst damage misfire rate (MR), > 3% - 20%
P0304	Cylinder 4 Misfire Detected	• Emission threshold 1st interval Misfire Rate (MR), > 2.65% • Catalyst damage misfire rate (MR), > 3% - 20%
P0321	Ign./Distributor Eng.Speed Inp.Circ. Range/Performance	• Comparison of counted teeth vs. reference = incorrect • Monitoring reference gap failure
P0322	Ignition/Distributor Engine Speed Input Circuit No Signal	• Camshaft signal > 3 • Engine speed, no signal
P0324	Knock Control System Error	• Signal fault counter (combustion) > 24 or • Signal fault counter (measuring window) > 2.00
P0327	Knock Sensor 1 Circuit Low Input	• Lower threshold < -0.70 V for signal range check • Lower threshold < 0 - 1.60 V
P0328	Knock Sensor 1 Circuit High Input	• Upper threshold > 1.00 V or for signal range check • > 15 - 115.87 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P0340	Camshaft Position Sensor Circuit	Cam adaption values out of range • > 20° KW • < -20° KW • Difference of adapted and actual values > 9° KW
P0341	Camshaft Position Sensor Circuit Range/Performance	• Signal pattern incorrect • Defect counter 12
P0342	Camshaft Position Sensor Circuit Low Input	• Signal voltage low • Crankshaft signals = 8
P0343	Camshaft Position Sensor Circuit High	• Signal voltage high • Crankshaft signals = 8
P0351	Ignition Coil A Primary/ Secondary Circuit	• Signal current 0.25 to -2.0 mA • Internal check failed
P0352	Ignition Coil B Primary/ Secondary Circuit	• Signal current 0.25 to -2.0 mA • Internal check failed
P0353	Ignition Coil C Primary/ Secondary Circuit	• Signal current 0.25 to -2.0 mA • Internal check failed
P0354	Ignition Coil D Primary/ Secondary Circuit	• Signal current 0.25 to -2.0 mA • Internal check failed

Additional Exhaust Regulation

DTC	Error Message	Malfunction Criteria and Threshold Value
P0410	Secondary Air Injection System Malfunction	Deviation SAI pressure > 50.0 hPa
P0413	Secondary Air Injection System Switching Valve A Circuit Open	Signal voltage 4.70 - 5.40 V
P0414	Secondary Air Injection System Switching Valve A Circuit Shorted	• Signal voltage 0 to 3.25 V or • Signal current > 2.20 A
P0418	Secondary Air Injection System Relay A Circuit	Signal voltage 4.70 - 5.40 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P0420	Catalyst System, (Bank 1) Efficiency Below Threshold	Front: • Oxygen storage capacity (OSC) vs OSC of borderline catalyst < 1.00 • Front catalyst < 1.50 • Main catalyst < 1.00 Main: • Oxygen storage capacity (OSC) vs OSC of borderline catalyst < 0.40 • Front catalyst< .90 • While value for front catalyst < 2.00
P0441	Evaporative Emission Control System Incorrect Purge Flow	Deviation < 8% lambda controller and 35% idle controller
P0442	EVAP Emission Control System (Small Leak) Leak Detected	Time for pressure drop < 1.6 - 1.8 Sec.
P0444	EVAP Emission Control System Purge Control Valve Circuit Open	Signal voltage > 4.70 - 5.40 V
P0455	EVAP Emission Control System (Gross Leak) Leak Detected	Time for pressure drop < 1 Sec.
P0456	EVAP Emission Control System (very small Leak) Leak Detected	Time for pressure drop, < 4.5 - 6.0 Sec.
P0458	Evaporative Emission System Purge Control Valve Circuit Low	Signal voltage 0 - 3.26 V
P0459	Evaporative Emission System Purge Control Valve Circuit High	Signal current > 2.2 A
P0491	Secondary Air System Insufficient Flow. Flow Check During Catalyst Heating. (PZEV)	SAI pressure sensor vs modeled pressure < 60 to 75%

Speed and Idle Control

DTC	Error Message	Malfunction Criteria and Threshold Value
P050A	Cold Start Idle Air Control System Performance	Out of range low: • Engine speed deviation < -80 RPM • Engine speed deviation > 80 RPM
P050B	Cold Start Ignition Timing Performance	Difference between commanded spark timing vs. actual value > 20%
P0501	Vehicle Speed Sensor “A” Range/Performance	VSS signal < 6 km/h
P0503	Vehicle Speed Sensor “A” Intermittend/Erratic/High	Vehicle speed > 290 km/h
P0506	Idle Control System RPM Lower than Expected	Integrated engine speed deviation > 2000 RPM or engine speed deviation > 80 RPM
P0507	Idle Control System RPM Higher than Expected	Idle speed Deviation < -80 RPM
P052A	Cold Start “A” Camshaft Position Timing Over-Advanced	Difference between target and actual position > 6 CRK °
P053F	Cold Start Fuel Pressure Performance	• Difference between target pressure vs actual pressure: > 1.50 MPa or • < -1.50 MPa

Control Module and Output Signals

DTC	Error Message	Malfunction Criteria and Threshold Value
P0606	ECM/PCM Processor	ECM internal check failure or BARO failure (located in the ECM).
P062B	Internal Control Module Fuel Injector Control Performance	Internal logic failure
P0634	PCM/ECM/TCM Internal Temperature Too High	Power stage temperature > 150 °C

DTC	Error Message	Malfunction Criteria and Threshold Value
P0638	Throttle Actuator Control (Bank1) Range/Performance	• Time to close to reference point > 0.6 Sec and • Reference point 2.88% • TPS 1 signal 0.40 - 0.60 V • TPS 2 signal 4.20 - 4.60 V • TPS 1 and TPS 2 4.82 - 5.18 V
P0641	Sensor Reference Voltage “A” Circuit Open	Signal voltage deviation > ± 0.3 V
P0651	Sensor Reference Voltage B Circuit/Open	Signal voltage deviation > ± 0.3 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
P0697	Sensor Reference Voltage C Circuit/Open	Signal voltage deviation > ± 0.3 V
U0001	High Speed CAN Communication Bus	CAN message, no feedback
U0002	High Speed CAN Communication Bus Performance	Global Time Out failure
U0101	Lost Communication with TCM	Time Out failure. No message received by ECM
U0121	Lost Communication With Anti-Lock Brake System (ABS) Control Module	CAN communication with ABS Time Out - no message
U0146	Lost Communication With Gateway “A”	CAN communication with gateway Time Out - no message
U0155	Lost Communication With Instrument Panel Cluster (IPC) Control Module	No CAN messages received
U0302	Software Incompatibility with Transmission Control Module	AT vehicle ECM coded as MT vehicle
U0402	Invalid Data Received From Transmission Control Module	Transmission Data implausible message
U0415	CAN Link to Speed Sensor	Vehicle speed > 325 km/h

DTC	Error Message	Malfunction Criteria and Threshold Value
U0415	Invalid Data Received From Anti-Lock Brake System Control Module	• Speed sensor initialization failed • Speed sensor low voltage error failed • Implausible message received
U0422	Invalid Data Received From Body Control Module	Ambient temperature value initialization failure.
U0423	Invalid Data Received From Instrument Panel Cluster Control Module	Implausible CAN message received OR ambient temperature value = 00
U0447	Invalid Data Received From Gateway “A”	CAN message incorrect

Fuel and Air Ratios Control Module

DTC	Error Message	Malfunction Criteria and Threshold Value
P117A	(Bank 1), oxygen sensor correction center sensor Control limit reached	I portion of 3rd lambda control loop > 0.030
P12A1	Fuel Rail Pressure Sensor Inappropriately Low	• Pressure control activity > 0.20 MPa • Fuel trim activity < 0.80 • Difference between actual pressure vs target pressure -16.38 to 16.38 MPa
P12A2	Fuel Rail Pressure Sensor Inappropriately High	• Pressure control activity < -0.05 MPa • Fuel trim activity > 1.65 • Difference between target pressure and actual pressure -16.38 to 16.38 MPa
P12A4	Fuel Rail Pump Control Valve Stuck Closed	• Fuel trim activity .90 to 1.15 • Pressure control activity < -6 MPa • System Deviation < 16.38 MPa
P13EA	Cold Start Ignition Timing Performance Off Idle	Difference between commanded spark timing vs. actual value > 40%
P150A	Engine Off Time Performance	Difference between engine off time and ECM after run time < -12 Sec. or > 12 Sec.
P1609	Crash shut-off was triggered	Airbag was activated

DTC	Error Message	Malfunction Criteria and Threshold Value
P2101	Throttle Actuator Control Motor Circuit Range/ performance	• Duty cycle >80% • Deviation throttle value angles vs. calculated value 4 - 50% • ECM power stage no failure
P2106	Throttle Actuator Control System Forced Limited Power	Internal check failed
P2122	Throttle/Pedal Pos. Sens./ Switch D Circuit Low Input	Signal voltage < 0.61 V
P2123	Throttle/Pedal Pos. Sens./ Switch D Circuit High Input	Signal voltage > 4.79 V
P2127	Throttle/Pedal Pos. Sens./ Switch E Circuit Low Input	Signal voltage < 0.27 V
P2128	Throttle/Pedal Pos. Sens./ Switch E Circuit High Input	Signal voltage > 2.43 V
P2138	Throttle/Pedal Position Sensor/Switch D/E Voltage Correlation	Signal voltage: Difference between signal APP1 and APP2 > 0.17 - 0.70 V
P2146	Fuel Injector Group “A” Supply Voltage Circuit Open	• Signal current, < 2.6 A or • Signal current > 14.90 A
P2149	Fuel Injector Group “B” Supply Voltage Circuit Open	• Signal current, < 2.6 A or • Signal current > 14.90 A
P2177	System too lean off idle, (Bank 1)	• Adaptive value > 28%
P2178	System too rich off idle, (Bank 1)	• Adaptive value < -21%
P2181	Cooling System Performance	Cooling system temperature too low after a sufficient mass air flow integral 74 - 84 °C
P2184	Engine Coolant Temperature Sensor 2 Circuit Low	ECT outlet > 141 °C
P2185	Engine Coolant Temperature Sensor 2 Circuit High	ECT outlet < -43 °C
P2187	System too lean at idle, (Bank 1)	• Adaptive value > 5.02%
P2188	System too rich at idle, (Bank 1)	• Adaptive value < -5.02%
P2195	O2 Sensor Signal Stuck Lean (Bank 1 Sensor 1)	Delta lambda of 2nd lambda control loop > 0.07

DTC	Error Message	Malfunction Criteria and Threshold Value
P2196	O2 Sensor Signal Stuck Rich (Bank 1 Sensor 1)	Delta lambda of 2nd lambda control loop < -0.07
P2231	O2 Sensor (Bank 1 Sensor 1) Signal Circuit Shorted to Heater Circuit	Delta O2S signal front > 190 uA
P2237	O2 Sensor Positive Current Control Circuit (Bank 1 Sensor 1) Open	• O2S signal front 1.49 - 1.51 V • Delta lambda controller > 0.10
P2243	O2 Sensor Reference Voltage Circuit (Bank 1 Sensor 1) Open	• O2S signal front > 3.25 V and Internal resistance > 1000 Ohm • O2S signal front < 0.30 V and Internal resistance > 1000 Ohm
P2251	O2 Sensor Negative Current Control Circuit Bank 1 Sensor 1 open	O2S signal front 1.47 to 1.53 V and internal resistance > 1000 Ohm
P2257	Secondary Air Injection System Control “A” Circuit Low	Signal voltage 0 to 3.26 V
P2258	Secondary air injection System Control “A” Circuit High	Signal current .60 - 2.40 A
P2270	O2 Sensor Signal Stuck Lean (Bank 1 Sensor 2)	• O2S signal rear < -2.00 mV • Enrichment after stuck lean 27.9%
P2271	O2 Sensor Signal Stuck Rich (Bank 1 Sensor 2)	• Sensor voltage of ≥ 0.15 V • After oxygen mass flow > 3000 mg • Number of checks ≥ 1
P2274	O2 Sensor Signal Stuck Lean (Bank 1 Sensor 3)	• O2S rear signal not oscillating at reference < 0.62 to 0.65 V • Enrichment after stuck lean 27.9%
P2275	O2 Sensor Signal Stuck Rich (Bank 1 Sensor 3)	• O2S sensor voltage >= 0.15 V • After oxygen mass flow (fuel cutoff) > 4500 mg • Number of checks >= 1
P2279	Intake Air System Leak	Threshold to detect a defective system > 1.33 - 1.60

DTC	Error Message	Malfunction Criteria and Threshold Value
P2293	Fuel Pressure Regulator 2 Performance	• Difference between target pressure vs. actual pressure: > 1.50 mPa or • < -1.50 mPa
P2294	Fuel Pressure Regulator 2 Control Circuit	• Signal voltage 1.40 - 3.20 V or • Signal pattern incorrect
P2295	Fuel Pressure Regulator 2 Control Circuit Low	Signal voltage < 1.40 - 3.20 V
P2296	Fuel Pressure Regulator 2 Control Circuit High	Signal voltage > 3.20 V

Ignition System

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

Additional Emissions Regulations

DTC	Error Message	Malfunction Criteria and Threshold Value
P2400	Evaporative Emission System Leak Detection Pump Control Circuit/Open	Signal voltage > 4.4 - 5.6 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P2401	Evaporative Emission System Leak Detection Pump Control Circuit Low	Signal voltage < 2.15 to 3.25 V
P2402	Evaporative Emission System Leak Detection Pump Control Circuit High	Signal current > 3.0 A
P2403	Evaporative Emission System Leak Detection Pump Sense Circuit/Open	Low signal voltage > 0.5 Sec.
P2404	Evaporative Emission System Leak Detection Pump Sense Circuit Range/Performance	• High signal voltage > 12 Sec. • Number of checks = 30
P2414	O2 Sensor Exhaust Sample Error (Bank 1, Sensor 1)	• Threshold 1 - Signal voltage 3.1 - 4.81 V • Threshold 2 - Signal voltage 2.5 to 3.10 V
P2431	Secondary Air Injection System Air Flow/Pressure (Bank 1) Sensor Circuit Range/Perfor	Difference between SAI pressure sensor and ambient pressure NOT -60.0 to 60.0 hPa
P2432	Secondary Air Injection System Air Flow/Pressure Bank 1 Sensor Circuit Low	Signal voltage < 0.40 V
P2433	Secondary Air Injection System Air Flow/Pressure (Bank 1) Sensor Circuit High	Signal voltage > 4.65 V
P2440	Secondary Air Injection System Switching Valve Stuck Open (Bank1)	SAI pressure sensor vs modeled while SAI valve is closed < 71.1%
P2626	O2 Sensor Pumping Current Trim Circuit/Open (Bank 1 Sensor 1)	O2S signal front > 4.81 V

DTC CHART

Engine Code 2.0L CCTA

Fuel and Air Mixture, Additional Emission Regulations

DTC	Error Message	Malfunction Criteria and Threshold Value
P000A	"A" Camshaft Position Slow Response (Bank 1)	Difference between target and actual position > 8 °CRK for > 1.3 to 2.9 Sec. and adjustment angle >= 2.50 °CRK
P0010	Intake (A) Camshaft Position Actuator Circuit/Open (Bank 1)	Signal voltage > 4.70 - 5.40 V
P0011	A Camshaft Position (Bank 1) Timing over-advanced or System Performance	• Difference between target and actual position > 8 CRK ° • Adjustment angle < 2.50 CRK °
P0016	Crankshaft Position-Camshaft Position Correlation (Bank 1 Sensor A)	• Permissible deviation < 11° Rev or • Permissible deviation > 11° Rev
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
P0030	O2S Heater Control Circuit (Bank 1 (1) Sensor 1)	Heater voltage 4.70 to 5.40 V
P0031	O2 Sensor Heater Control Circuit (Bank1 (1) Sensor 1) Low	Heater voltage 0 to 3.26 V
P0032	O2 Sensor Heater Control Circuit (Bank1 (1) Sensor 1) High	Heater current > 5.50 A
P0036	O2 Sensor Heater Control Circuit Bank1 (1) Sensor 2)	Heater voltage 2.34 to 3.59 V
P0037	O2 Sensor Heater Control Circuit (Bank1 (1) Sensor 2) Low	Heater voltage < 2.34 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P0038	O2 Sensor Heater Control Circuit (Bank 1 (1) Sensor 2) High	Heater voltage > 3.59 V
P0068	MAP/MAF – Throttle Position Correlation	Plausibility with fuel system • Load calculation < -22% Plausibility with fuel system • Load calculation > 22%
P0070	Ambient Air Temperature Sensor Circuit	Ambient air temperature < -50 °C
P0071	Ambient Air Temperature Sensor Circuit Range/ Performance	• Difference in value between ECT and AAT at engine start (depending on engine off time) > 24.8 °K and • Difference in value between AAT and IAT at engine start (depending on engine off time) > 24.8 °K
P0072	Ambient Air Temperature Sensor Circuit Low	Ambient air temperature > 87 °C
P0087	Fuel Rail/System Pressure - Too Low	• Fuel trim activity 0.90 - 1.15 • Output value rail pressure controller > 2 MPa • Difference between target and actual pressure > -16.38
P0100	Mass or Volume Air Flow A Circuit	MAF sensor signal 0 µs
P0101	Mass or Volume Air Flow Circuit Range/Performance	• Mass air flow vs. • Upper threshold model < 12% • Lower threshold model < 0.400 kg/h • Load calculation > 21% and • Fuel system < -19%
P0102	Mass or Volume Air Flow Circuit Low Input	MAF sensor signal < 66 µs
P0103	Mass or Volume Air Flow Circuit High Input	MAF sensor signal > 4500 µs

DTC	Error Message	Malfunction Criteria and Threshold Value
P0106	Manifold Absolute Pressure or BARO Sensor Range/ Performance	• Difference of boost pressure signal vs altitude sensor signal > 230 hPa or • Difference of boost pressure signal vs altitude sensor signal < -130 hPa
P0111	Intake Air Temperature (Sensor 1 Bank 1) Circuit Range/Performance	• Difference in value IAT - ECT @ engine start (depending on engine off time) > 24.8 °K • Difference in value IAT - AAT @ engine start < 24.8 °K (depending on engine off time)
P0112	Intake Air Temperature (Sensor 1 Bank 1) Circuit Low	Intake air temperature > 141°C
P0113	Intake Air Temperature (Sensor 1 Bank 1) Circuit High	Intake air temperature < -46°C
P0116	Engine Coolant Temperature Sensor 1 Circuit Range/ Performance	• No change on signal < 1.5 °K and • Signal in range 88.5 - 109.5 °C with no change on signal < 1.5 °K
P0117	Engine Coolant Temperature Sensor 1 Circuit Low	Engine coolant temperature > 140°C
P0118	Engine Coolant Temperature Sensor 1 Circuit Open	Engine coolant temperature < -40°C
P0121	Throttle/Pedal Position Sensor A Circuit Range/Performance	• TPS 1 - TPS 2 > 6.30% and • Actual TPS 1 calculated value > actual TPS 2 calculated value or • TPS 1 calculated value > 9.00%
P0122	Throttle/Pedal Position Sensor A Circuit Low Input	Signal voltage < 0.20 V
P0123	Throttle/Pedal Position Sensor A Circuit High Input	Signal voltage > 4.81 V
P013A	O2 Sensor (Bank 1 Sensor 2) Slow Response - Rich to Lean	EWMA filtered max differential transient time at fuel cutoff ≥ 0.5 Sec. for 3 function checks
P0130	O2 Sensor Circuit (Bank 1 Sensor 1) Malfunction	O2S ceramic temperature < 640°C

DTC	Error Message	Malfunction Criteria and Threshold Value
P0131	O2 Sensor Circuit (Bank 1, Sensor 1) Low Voltage	Virtual mass < 1.75 V
		Nernst voltage < 1.50 V
		Adjustment voltage < 0.30 V
P0132	O2 Sensor Circuit (Bank 1, Sensor 1) High Voltage	Virtual mass > 3.25 V
		Nernst voltage > 4.40 V
		Adjustment voltage > 7 V
P0133	O2 Circuit (Bank 1, Sensor 1) Slow Response	Signal dynamic slope check • O2S signal front vs. modeled O2S signal ratio < 0.40 and > 0.01 • Cycles completed > 40 Oscillation check • Lambda amplitude signal > 20% • Cycles > 8 • Time lambda > lambda amplitude 400 m sec. Delay check • Delay modeled lambda signal minus measured signal > 460 m sec. • Cycles > 12
P0135	O2 Sensor Heater Circuit (Bank 1 Sensor 1) Malfunction	• Heater duty cycle 90% • O2S ceramic temperature < 720°C and • Time after O2S heater on 40 Sec.
P0136	O2 Sensor Circuit (Bank 1 Sensor 2) Malfunction	• Delta voltage one step at heater switching > 2.0020 V and • Number of checks 10
P0137	O2 Sensor Circuit (Bank 1, Sensor 2) Low Voltage	• Signal voltage < 0.06 V for > 3 Sec. • Difference with/without load pulse < 0.01 V
P0138	O2 Sensor Circuit (Bank 1, Sensor 2) High Voltage	Signal voltage 1.08 V for > 5 Sec.
P0139	O2 Sensor Circuit (Bank 1 Sensor 2) Slow Response	• EWMA filtered transient time at fuel cutoff > 0.4 Sec. • In voltage range of 201.2 - 401.4 mV • Number of checks > 3

DTC	Error Message	Malfunction Criteria and Threshold Value
P0140	O2 Sensor Circuit (Bank 1, Sensor 2) No Activity Detected	Signal voltage • Signal voltage 0.40 - 0.60 V for > 3 Sec. Internal resistance • > 40000 ohm • Exhaust temperature > 600 °C
P0141	O2 Sensor Heater Circuit (Bank1 Sensor 2) Malfunction	Heater resistance > 792 to 4560 Ohm
P0169	Incorrect Fuel Composition	• Fuel quantity incorrect • Fuel correction factor incorrect • Internal check failed
P0171	Fuel Trim (Bank 1) System too Lean	At idle • Adaptive value > 5.02% At part-load • Adaptive value > 21%
P0172	Fuel Trim (Bank 1) System too Rich	At idle • Adaptive value < -5.02% At part-load • Adaptive value < 21%
P0190	Fuel Rail Pressure Sensor “A” Circuit	Signal voltage > 4.8 V
P0191	Fuel Rail Pressure Sensor “A” Circuit Range/Performance	Actual pressure > 20.6 MPa
P0192	Fuel Rail Pressure Sensor “A” Circuit Low Input	Signal voltage < 0.2 V
P0201	Cylinder 1- Injector Circuit	• Low side signal current < 2.1 A • Internal logic failure
P0202	Cylinder 2- Injector Circuit	• Low side signal current < 2.1 A • Internal logic failure
P0203	Cylinder 3- Injector Circuit	• Low side signal current < 2.1 A • Internal logic failure
P0204	Cylinder 4- Injector Circuit	• Low side signal current < 2.1 A • Internal logic failure
P0221	Throttle/Pedal Position Sensor/Switch B Range/ Performance	• TPS 1 - TPS 2 > 6.30% • Actual TPS 2 calculated value > actual TPS 1 calculated value • TPS 2 calculated value > 9.00%
P0222	Throttle/Pedal Position Sensor/Switch B Low Input	Signal voltage < 0.20 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P0223	Throttle/Pedal Position Sensor/Switch B High Input	Signal voltage > 4.81 V
P0234	Turbo/Super Charger Overboost Condition	Difference of set value boost pressure vs altitude sensor signal > 260 - 1275 hPa
P0236	Turbocharger Boost Sensor (A) Circuit Range/ Performance	Difference of boost pressure signal vs altitude sensor signal > 230 or < -130 hPa
P0237	Turbocharger Boost Sensor (A) Circuit Low Input	Signal voltage < 0.2 V
P0238	Turbocharger Boost Sensor (A) Circuit High Input	Signal voltage > 4.88 V
P0243	Turbo/Super Charger Wastegate Solonoid A	Signal voltage > 5.6 - 4.4 V
P0245	Turbo/Super Charger Wastegate Solonoid A Low	Signal voltage < 3.25 - 2.15 V
P0246	Turbo/Sup.Charger Wastegate Solonoid A High	Signal current > 2.2 to 4 A
P025A	Fuel Pump Module Control Circuit/Open	Signal voltage 4.80 - 5.30 V
P025C	Fuel Pump Module Control Circuit Low	Signal voltage 2.70 - 3.25 V
P025D	Fuel Pump Module Control Circuit High	Signal current > 0.6 mA
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
P0299	Turbo/Super Charger Underboost	Difference of set boost pressure vs. actual boost pressure value > 150 hPa
P2008	Intake Manifold Runner Bank 1 Control Circuit/Open	Signal voltage 4.70 - 5.40 V
P2009	Intake Manifold Runner Bank 1 Control Circuit Low	Signal voltage 0.0 to 3.26 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P2010	Intake Manifold Runner Bank 1 Control Circuit High	Signal current > 2.20 A
P2014	Intake Manifold Runner Position Sensor/Switch Circuit	Signal voltage > 4.75 V
P2015	Intake Manifold Runner Position Sensor/Switch Circuit Range/Performance	Deviation runner flap target position vs actual position > 25% and actual position within 0 to 100%
P2016	Intake Manifold Runner Position Sensor/Switch Circuit Low	Signal voltage < 0.25 V
P2088	"A" Camshaft Position Actuator Control Circuit Low (Bank 1)	Signal voltage < 0.00 - 3.25 V
P2089	"A" Camshaft Position Actuator Control Circuit High - Bank 1	Signal current > 2.2 A
P2096	Post Catalyst Fuel Trim System Bank1 Too Lean	Deviation lambda control < -0.04
P2097	Post Catalyst Fuel Trim System Bank 1 Too Rich	Integral part of lambda control > 0.04
P3081	Engine Temperature Too Low	Difference between ECT and modeled ECT > 9.80 °K

Ignition System

DTC	Error Message	Malfunction Criteria and Threshold Value
P0300	Random/Multiple Cylinder Misfire Detected	• Emission threshold 1st interval Misfire Rate (MR), > 3% • Catalyst damage misfire rate (MR), > 2% - 15%
P0301	Cylinder 1 Misfire Detected	• Emission threshold misfire rate (MR) > 1.7% • Catalyst damage misfire rate (MR) > 5.0 - 20.0%
P0302	Cylinder 2 Misfire Detected	• Emission threshold misfire rate (MR) > 1.7% • Catalyst damage misfire rate (MR) > 5.0 - 20.0%

DTC	Error Message	Malfunction Criteria and Threshold Value
P0303	Cylinder 3 Misfire Detected	• Emission threshold misfire rate (MR) > 1.7% • Catalyst damage misfire rate (MR) > 5.0 - 20.0%
P0304	Cylinder 4 Misfire Detected	• Emission threshold misfire rate (MR) > 1.7% • Catalyst damage misfire rate (MR) > 5.0 - 20.0%
P0321	Ignition/Distributor Engine Speed Input Circuit Range/ Performance	• Comparison of counted teeth vs. reference = incorrect • Monitoring reference gap failure
P0322	Ignition/Distributor Engine Speed Input Circuit No Signal	• Camshaft signal > 3 • Engine speed no signal
P0324	Knock Control System Error	• Signal fault counter (combustion) > 24 or • Signal fault counter (measuring window) > 2.00
P0327	Knock Sensor 1 Circuit Low Input	• Lower threshold < -70 V or for signal range check • Lower threshold < 0.60 - 1.60 V
P0328	Knock Sensor 1 Circuit High Input	• Upper threshold > 1.00 V or for signal range check • > 21.75 - 115.87 V
P0340	Camshaft Position Sensor Circuit	Cam adaption values out of range • > 20° KW • < -20° KW • Difference of adapted and actual values > 9° KW
P0341	Camshaft Position Sensor Circuit Range/Performance	• Signal pattern incorrect • Defect counter 12
P0342	Camshaft Position Sensor A Circuit Low Input	• Signal voltage low • Crankshaft signals = 8
P0343	Camshaft Position Sensor A Circuit High Input	• Signal voltage high • Crankshaft signals = 8
P0351	Ignition Coil A Primary/ Secondary Circuit	• Signal current 0.25 to -2.0 mA • Internal check failed
P0352	Ignition Coil B Primary/ Secondary Circuit	• Signal current 0.25 to -2.0 mA • Internal check failed

DTC	Error Message	Malfunction Criteria and Threshold Value
P0353	Ignition Coil C Primary/ Secondary Circuit	• Signal current 0.25 to -2.0 mA • Internal check failed
P0354	Ignition Coil D Primary/ Secondary Circuit	• Signal current 0.25 to -2.0 mA • Internal check failed

Additional Exhaust Regulation

DTC	Error Message	Malfunction Criteria and Threshold Value
P0420	Catalyst System Efficiency Below Threshold	Front: • Oxygen Storage Capacity (OSC) vs. OSC of borderline catalyst < 0.40 • Front catalyst < 1.30 • Main catalyst < 1.20 Main: • Oxygen Storage Capacity (OSC) vs. OSC of borderline catalyst < 0.40 • While value for front catalyst < 2.00
P043E	Evaporative Emission System Leak Detection Reference Orifice Low Flow	EVAP pump current during reference measurement > 40 mA
P043F	Evaporative Emission System Leak Detection Reference Orifice High Flow	EVAP pump current during reference measurement < 15 mA
P0441	Evaporative Emission Control System Incorrect Purge Flow	Actual EVAP pump current difference between reference measurement to idle divided by pump current difference from the last leak detection phase during engine off > 1.40 mA
P0442	Evaporative Emission Control System Leak Detected (Small Leak)	Modeled pressure from pump current < 9 hPa
P0444	Evaporative Emission System Purge Control Valve Circuit Open	Signal voltage > 4.70 - 5.40 V
P0447	Evaporative Emission System Vent Control Circuit Open	Signal voltage > 4.7 to 5.4 V
P0448	Evaporative Emission System Vent Control Circuit Shorted	Signal voltage < 2.74 to 3.26 V or signal current > 2.2 to 4 A

DTC	Error Message	Malfunction Criteria and Threshold Value
P0455	Evaporative Emission Control System (Gross Leak) Leak Detected	Time for pressure drop < 0.95 Sec.
P0456	EVAP Emission Control System (Very Small Leak) Leak Detected	EVAP leakage area calculated from pump current curve > 0.17 mm 2
P0458	Evaporative Emission System Purge Control Valve Circuit Low	Signal voltage 0.00 - 3.25 V
P0459	Evaporative Emission System Purge Control Valve Circuit High	Signal current > 2.2 A

Speed and Idle Control

DTC	Error Message	Malfunction Criteria and Threshold Value
P050A	Cold Start Idle Air Control System Performance	Out of range low: • Engine speed deviation < -80 RPM Out of range high: • Engine speed deviation > 80 RPM
P050B	Cold Start Ignition Timing Performance	Difference between commanded spark timing and actual spark timing > 20 to 50%
P0501	Vehicle Speed Sensor “A” Range/Performance	VSS signal < 4 km/h
P0503	Vehicle Speed Sensor “A” Intermittend/Erratic/High	Vehicle speed > 290 km/h
P0506	Idle Control System RPM Lower than Expected	Idle speed Deviation > 80 RPM
P0507	Idle Control System RPM Higher than Expected	Idle speed Deviation < -80 RPM
P052A	Cold Start “A” Camshaft Position Timing Over-Advanced	Difference between target position vs actual position: > 6 °CRK
P053F	Cold Start Fuel Pressure Performance	Difference between target pressure vs actual pressure: > 1.50 MPa OR < -1.50 MPa

Control Module and Output Signals

DTC	Error Message	Malfunction Criteria and Threshold Value
P0606	ECM/PCM Processor	ECM internal check failure
P062B	Internal Control Module Fuel Injector Control Performance	Internal logic failure
P0638	Throttle Actuator Control (Bank1) Range/Performance	• Time to close to reference point > 0.6 Sec. and • Reference point 2.88% • Time to close below reference point, + 2.49%, > 0.56 Sec. • Duty cycle > 80% • ECM power stage no failure
P0641	Sensor Reference Voltage “A” Circuit Open	Signal voltage deviation > ± 0.3 V
P0651	Sensor Reference Voltage “B” Circuit Open	Signal voltage deviation > ± 0.3 V
P0657	Actuator Supply Voltage “A” Circuit/Open	Signal voltage > 4.4 - 5.7 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
P0697	Sensor Reference Voltage “C” Circuit Open	Signal voltage deviation > ± 0.3 V
U0001	High Speed CAN Communication Bus	High Speed CAN Communication Bus
U0002	High Speed CAN Communication Bus Performance	Global time out failure
U0101	Lost Communication with TCM	Time Out failure. No message received by ECM
U0121	Lost Communication With Anti-Lock Brake System (ABS) Control Module	CAN communication with ABS Time Out.
U0146	CAN Gateway A	CAN communication with gateway, time out
U0155	Lost Communication With Instrument Panel Cluster (IPC) Control Module	CAN messages not received.
U0302	Software Incompatibility with Transmission Control Module	AT vehicle. ECM coded as MT vehicle

DTC	Error Message	Malfunction Criteria and Threshold Value
U0402	Invalid Data Received From Transmission Control Module	Transmission Data Length Code incorrect
U0415	Invalid Data Received From Anti-Lock Brake System Control Module	• Speed sensor initialization failed • Speed sensor low voltage error failed • Speed > 326 km/h
U0422	Invalid Data Received From Body Control Module	Ambient temperature value initialization failure.
U0423	Invalid Data Received From Instrument Panel Cluster Control Module	Implausible Ambient Air Temperature Sensor value message received from IPC
U0447	Invalid Data Received From Gateway “A”	CAN message incorrect

Fuel and Air Ratios Control Module

DTC	Error Message	Malfunction Criteria and Threshold Value
P12A1	Fuel Rail Pressure Sensor Inappropriately Low	• Pressure control activity > 0.20 MPa • Fuel trim activity < 0.80 • Difference between actual pressure vs target pressure -16.38 to 16.38 MPa
P12A2	Fuel Rail Pressure Sensor Inappropriately High	• Pressure control activity < -0.05 MPa • Fuel trim activity > 1.65 • Difference between target pressure and actual pressure -16.38 to 16.38 MPa
P12A4	Fuel Rail Pump Control Valve Stuck Closed	• Fuel trim activity .90 to 1.15 • Pressure control activity < -6 MPa • System Deviation < 16.38 MPa
P150A	Engine Off Timer Performance	Difference between engine off time and ECM after run time < -12 Sec. or > 12 Sec.
P1609	Crash shut-off was triggered	Airbag activated
P2101	Throttle Actuator A Control Motor Circuit Range/ Performance	• Duty cycle >80% • Deviation throttle value angles vs. calculated value 4 - 50% • ECM power stage no failure

DTC	Error Message	Malfunction Criteria and Threshold Value
P2106	Throttle Actuator Control System Forced Limited Power	Internal check failed
P2122	Throttle/Pedal Position Sensor/Switch D Circuit Low Input	Signal voltage < 0.61 V
P2123	Throttle/Pedal Position Sensor/Switch D Circuit High Input	Signal voltage > 4.79 V
P2127	Throttle/Pedal Position Sensor/Switch E Circuit Low Input	Signal voltage < 0.27 V
P2128	Throttle/Pedal Position Sensor/Switch E Circuit High Input	Signal voltage > 2.43 V
P2138	Throttle/Pedal Position Sensor/Switch D/E Voltage Correlation	Signal voltage: Difference between signal APP1 and APP2 > 0.17 - 0.70 V
P2146	Fuel Injector Group “A” Supply Voltage Circuit Open	• Signal current > 2.6 A or • Signal current < 14.90 A
P2149	Fuel Injector Group “B” Supply Voltage Circuit Open	• Signal current > 2.6 A or • Signal current < 14.70 A
P2177	System too lean off idle, (Bank 1)	• Adaptive value > 28%
P2178	System too rich off idle, (Bank 1)	Adaptive value < -21%
P2181	Cooling System Performance	Cooling system temperature too low after a sufficient mass air flow integral 74 - 84 °C
P2184	Engine Coolant Temperature Sensor 2 Circuit Low	ECT outlet > 141 °C
P2185	Engine Coolant Temperature Sensor 2 Circuit High	ECT outlet < -43 °C
P2187	System too lean at idle, Bank 1	• Adaptive value > 5.02%
P2188	System too rich at idle, Bank 1	• Adaptive value < -5.02%
P2195	O2 Sensor Signal Stuck Lean (Bank 1 Sensor 1)	Delta lambda of 2nd lambda control loop > 0.06
P2196	O2 Sensor Signal Stuck Rich (Bank 1 Sensor 1)	Delta lambda of 2nd lambda control loop < -0.06

DTC	Error Message	Malfunction Criteria and Threshold Value
P2231	O2 Sensor Bank 1 Sensor 1 Signal Circuit Shorted to Heater Circuit	Delta O2S signal front > 190 uA
P2237	O2 Sensor Positive Current Control Circuit Bank 1 Sensor 1 Open	O2S signal front 1.493 - 1.507 V and delta lambda controller > 0.10
P2243	O2 Sensor Reference Voltage Circuit/Open (Bank 1, Sensor 1)	• O2S signal front < 0.30 V and Internal resistance > 1000 Ohms • O2S signal front > 3.25 V and Internal resistance > 1000 Ohms
P2251	O2 Sensor Negative Current Control Circuit (Bank 1 Sensor 1) Open	Front O2S signal 1.47 to 1.53 V and internal resistance > 1000 ohms
P2270	O2 Sensor Signal Stuck Lean; (Bank 1 Sensor 2)	• O2S signal rear < 0.63 - 0.64 V • Enrichment after stuck lean 27.90%
P2271	O2 Sensor Signal Stuck Rich; (Bank 1 Sensor 2)	• O2S signal rear > 0.63 - 0.64 V • Enleanment after stuck rich 14.99%
P2279	Intake Air System Leak	Threshold to detect a defective system > 1.33 - 1.60
P2293	Fuel Pressure Regulator 2 Performance	• Difference between target pressure vs. actual pressure: > 1.50 mPa or • < -1.50 mPa
P2294	Fuel Pressure Regulator 2 Control Circuit	• Signal voltage 1.40 - 3.20 V or • Signal pattern incorrect
P2295	Fuel Pressure Regulator 2 Control Circuit Low	Signal voltage < 1.40 - 3.20 V
P2296	Fuel Pressure Regulator 2 Control Circuit High	Signal voltage > 3.20 V

Ignition System

DTC	Error Message	Malfunction Criteria and Threshold Value
P2300	Ignition Coil “A” Primary Control Circuit Low	Signal current > 24.0 mA

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

Additional Emissions Regulations

DTC	Error Message	Malfunction Criteria and Threshold Value
P2400	Evaporative Emission System Leak Detection Pump Control Circuit/Open	Signal voltage > 4.7 - 5.4 V
P2401	Evaporative Emission System Leak Detection Pump Control Circuit Low	Signal voltage > 2.74 - 3.26 V
P2402	Evaporative Emission System Leak Detection Pump Control Circuit High	Signal voltage at LDP current measuring resistor > 4.00 to 1.80 V
P2403	Evaporative Emission System Leak Detection Pump Sense Circuit/Open	Low signal voltage > .5 Sec.
P2404	Evaporative Emission System Leak Detection Pump Sense Circuit Range/Performance	High signal voltage > 30.4 Sec.
P2407	Evaporative Emission System Leak Detection Pump Sense Circuit Intermittent/Erratic	Fluctuation of EVAP pump current during reference measurement > 2 mA or drop of EVAP pump current during pump phase for >= 3 Sec.

DTC	Error Message	Malfunction Criteria and Threshold Value
P240A	Evaporative Emission System Leak Detection Pump Heater Control Circuit/Open	Signal voltage > 4.7 to 5.4 V
P240B	Evaporative Emission System Leak Detection Pump Heater Control Circuit Low	Signal voltage < 2.74 to 3.26 V
P240C	Evaporative Emission System Leak Detection Pump Heater Control Circuit High	Signal current 2.2 to 4 A
P2414	O2 Sensor Exhaust Sample Error (Bank 1, Sensor 1)	Threshold 1 • Signal voltage 3.1 - 4.81 V • O2S signal 2.5 - 3.2 V Threshold 2 • Signal voltage 2.5 V • O2S signal 2.5 - 3.1 V
P2450	Evaporative Emission System Switching Valve Performance/ Stuck Open	EVAP pump current difference between reference measurement to idle <= 3 mA
P2626	O2 Sensor Pumping Current Trim Circuit/Open (Bank 1, Sensor 1)	O2S signal front > 4.81 V

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