



**2013**

# **Passat**

**Quick Reference  
Specification Book**



# 2013 Volkswagen Passat Quick Reference Specification Book

## TABLE OF CONTENTS

<b>General Information .....</b>	<b>1</b>
Decimal and Metric Equivalents .....	1
Tightening Torque .....	2
Warnings and Cautions .....	4
<b>Vehicle Identification.....</b>	<b>9</b>
Vehicle Identification Number (VIN) Location .....	9
VIN Decoder .....	10
VIN on Longitudinal Member Extension .....	11
Vehicle Data Label.....	12
<b>Sales Codes .....</b>	<b>13</b>
Engine Codes .....	13
Transmission Codes .....	13
<b>Vehicle Lifting .....</b>	<b>14</b>
Hoist and Jack Mounting Points .....	14
Front .....	14
Rear.....	15

## ENGINES

<b>Engine Mechanical – 2.0L CKRA (TDI).....</b>	<b>16</b>
General, Technical Data .....	16
Engine Number Location .....	16
Engine Data .....	17
Engine Assembly – 2.0L CKRA (TDI) .....	18
Fastener Tightening Specifications.....	18
Engine Mount Tightening Specifications.....	18
Transmission Mount Tightening Specifications.....	19
Pendulum Support Tightening Specifications .....	20
Engine Mount Bracket Tightening Specifications .....	21
Crankshaft, Cylinder Block – 2.0L CKRA (TDI) .....	22
Fastener Tightening Specifications.....	22
Sealing Flange (Belt Pulley Side) Bolt Tightening Sequence and Specification .....	23
Sealing Flange (Transmission Side) Bolt Tightening Sequence and Specification .....	24
Accessory Bracket Tightening Specifications .....	25

Crankshaft Dimensions .....	25
Piston and Cylinder Dimensions.....	26
Piston Ring End Gaps .....	26
Piston Ring Clearance.....	26
Cylinder Head, Valvetrain – 2.0L CKRA (TDI) .....	27
Fastener Tightening Specifications.....	27
Valve Dimensions .....	28
Compression Pressures .....	28
Cylinder Head Cover Tightening Specification .....	29
Cylinder Head Tightening Specifications .....	30
Bearing Frame Tightening Specifications .....	31
Lubrication – 2.0L CKRA (TDI) .....	32
Fastener Tightening Specifications.....	32
Oil Filter Bracket Bolt Tightening Sequence and Specification.....	33
Oil Pan Bolt Tightening Sequence and Specification .....	34
Balance Shaft Module, with 8 Bolts, Tightening Sequence and Specification.....	35
Balance Shaft Module, with 6 Bolts, Tightening Sequence and Specification.....	36
Cooling System – 2.0L CKRA (TDI).....	37
Fastener Tightening Specifications.....	37
Fuel Supply – 2.0L CKRA (TDI).....	38
Fastener Tightening Specifications.....	38
Turbocharger – 2.0L CKRA (TDI) .....	39
Fastener Tightening Specifications.....	39
Exhaust System – 2.0L CKRA (TDI).....	40
Fastener Tightening Specifications.....	40
Front Exhaust Pipe with Particulate Filter Tightening Specifications .....	41
Ignition/Glow Plug System – 2.0L CKRA (TDI).....	42
Fastener Tightening Specifications.....	42
Diesel Fuel Injection – 2.0L CKRA (TDI) .....	42
Fastener Tightening Specifications.....	42
<b>Engine Mechanical – 2.5L CBTA, CBUA.....</b>	<b>44</b>
General, Technical Data .....	44
Engine Number.....	44
Engine Data .....	45
Engine Assembly – 2.5L CBTA, CBUA.....	46
Fastener Tightening Specifications.....	46
Engine Mount Tightening Specifications.....	46

Transmission Mount Tightening Specifications.....	47
Pendulum Support Tightening Specifications.....	48
<b>Crankshaft, Cylinder Block – 2.5L CBTA, CBUA.....</b>	<b>49</b>
Main Bearing Shell Allocation.....	49
Crankshaft/Upper Bearing Shell Mark.....	49
Fastener Tightening Specifications.....	50
Crankshaft Dimensions.....	51
Piston Ring Gap.....	51
Piston Ring Groove Clearance.....	51
Piston and Cylinder Dimensions.....	51
<b>Cylinder Head, Valvetrain – 2.5L CBTA, CBUA.....</b>	<b>52</b>
Fastener Tightening Specifications.....	52
Valve Dimensions.....	53
Compression Pressures.....	53
Cylinder Head Cover Tightening Specification.....	54
Cylinder Head Tightening Specifications.....	55
Guide Frame Tightening Specifications.....	56
<b>Lubrication – 2.5L CBTA/CBUA.....</b>	<b>57</b>
Fastener Tightening Specifications.....	57
<b>Cooling System – 2.5L CBTA, CBUA.....</b>	<b>57</b>
Fastener Tightening Specifications.....	57
<b>Fuel Supply – 2.5L CBTA, CBUA.....</b>	<b>58</b>
Fastener Tightening Specifications.....	58
<b>Exhaust System, Emission Controls – 2.5L CBTA, CBUA.....</b>	<b>59</b>
Fastener Tightening Specifications.....	59
Secondary Air Injection Pipe Tightening Specifications.....	60
<b>Multiport Fuel Injection – 2.5L CBTA, CBUA.....</b>	<b>61</b>
Fastener Tightening Specifications.....	61
Lower Air Filter Housing Bolt Tightening Sequence.....	62
<b>Ignition – 2.5L CBTA/CBUA.....</b>	<b>62</b>
Fastener Tightening Specifications.....	62
Technical Data.....	62
<b>Engine Mechanical – 3.6L CDVB.....</b>	<b>63</b>
General, Technical Data.....	63
Engine Number Location.....	63
Engine Data.....	64
Cylinder Numbering.....	65
Engine Assembly – 3.6L CDVB.....	66
Fastener Tightening Specifications.....	66

Crankshaft, Cylinder Block – 3.6L CDVB .....	67
Allocation of Crankshaft Bearing Shells for Cylinder Block ...	67
Cylinder Block Identification .....	67
Crankshaft Identification .....	68
Fastener Tightening Specifications.....	70
Accessory Bracket Bolt Tightening Specifications .....	71
Piston Ring End Gaps .....	72
Piston Ring Clearance.....	72
Piston and Cylinder Dimensions.....	72
Crankshaft Dimensions .....	72
Cylinder Head, Valvetrain – 3.6L CDVB .....	73
Fastener Tightening Specifications.....	73
Compression Pressures .....	73
Valve Dimensions .....	74
Dimensions for Intake Valve .....	74
Dimensions for Exhaust Valve .....	74
Cylinder Head Tightening Specifications .....	75
Camshaft Bearing Cap Tightening Specifications .....	76
Cylinder Head Cover Tightening Specification .....	77
Lubrication – 3.6L CDVB .....	78
Fastener Tightening Specifications.....	78
Cooling System – 3.6L CDVB.....	79
Fastener Tightening Specifications.....	79
Fuel Supply – 3.6L CDVB.....	80
Fastener Tightening Specifications.....	80
Exhaust System, Emission Controls – 3.6L CDVB.....	80
Fastener Tightening Specifications.....	80
Multiport Fuel Injection – 3.6L CDVB.....	81
Fastener Tightening Specifications.....	81
Ignition – 3.6L CDVB .....	82
Ignition Technical Data.....	82
Fastener Tightening Specifications.....	82

## **TRANSMISSIONS**

<b>Manual Transmission – 0A4 .....</b>	<b>83</b>
General, Technical Data .....	83
Transmission Identification .....	83
Codes Letters, Transmission Allocation and Capacities .....	85
Clutch – 0A4 .....	85
Fastener Tightening Specifications.....	85

Controls, Housing – 0A4 .....	86
Fastener Tightening Specifications .....	86
Transmission to Engine Tightening Specifications .....	87
Gears, Shafts – 0A4 .....	88
Fastener Tightening Specification .....	88
Determining Shim Thickness .....	88
Adjustment Shim Table .....	89
<b>Manual Transmission – 02Q .....</b>	<b>90</b>
General, Technical Data .....	90
Transmission Identification .....	90
Codes Letters, Transmission Allocation and Capacities .....	92
Clutch – 02Q .....	93
Fastener Tightening Specifications .....	93
Controls, Housing – 02Q .....	94
Fastener Tightening Specifications .....	94
Transmission to Engine Tightening Specifications .....	95
<b>Automatic Transmission – 09G .....</b>	<b>96</b>
General, Technical Data .....	96
Identification on Transmission .....	96
Engine and Transmission Allocation .....	97
Controls, Housing – 09G .....	98
Fastener Tightening Specifications .....	98
Transmission to Engine Tightening Specifications .....	99
Gears, Hydraulic Controls – 09G .....	100
Fastener Tightening Specifications .....	100
<b>Direct Shift Gearbox (DSG) Transmission – 02E ....</b>	<b>101</b>
General, Technical Data .....	101
Identification on Transmission .....	101
Identification on Transmission .....	102
Transmission Allocation Codes .....	103
Controls, Housing (DSG) – 02E .....	104
Fastener Tightening Specifications .....	104
Mechatronic Tightening Specifications .....	105
Oil Pump Tightening Specifications Without Countersunk Bolt .	
106	
Transmission to Engine Tightening Specifications	
Diesel Engine .....	107
Gas Engine .....	108

# CHASSIS

<b>Suspension, Wheels, Steering .....</b>	<b>109</b>
Front Suspension .....	109
Fastener Tightening Specifications.....	109
Rear Suspension .....	111
Fastener Tightening Specifications.....	111
Self-Leveling Suspension .....	112
Fastener Tightening Specification .....	112
Wheels, Tires .....	112
Fastener Tightening Specification .....	112
Wheel Alignment Data .....	113
Wheel Alignment Specified Values .....	113
Steering .....	114
Fastener Tightening Specifications.....	114
<b>Brake System.....</b>	<b>115</b>
General, Technical Data .....	115
Brake PR Number, Allocation .....	115
Front Brakes .....	115
Rear Brakes.....	115
Brake Master Cylinder and Brake Booster .....	115
Front Brakes .....	116
Rear Brakes.....	117
Anti-lock Brake System (ABS).....	118
Fastener Tightening Specifications.....	118
Mechanical Components .....	118
Fastener Tightening Specifications.....	118
Hydraulic Components .....	119
Fastener Tightening Specifications.....	119
<b>Body.....</b>	<b>120</b>
Air Gap Body Dimensions .....	120
Body, Front .....	120
Body, Center .....	121
Body, Rear .....	122
Body Exterior .....	123
Lock Carrier Tightening Specifications .....	123
Front Fender Tightening Specifications .....	123
Trim, Noise Insulation Tightening Specifications .....	123
Front Hood, Plenum Chamber Tightening Specifications....	123
Rear Lid, Fuel Filler Door Tightening Specifications.....	123



Front and Rear Door Tightening Specifications .....	124
Sunroof Tightening Specifications .....	124
Front Bumper Tightening Specifications .....	124
Rear Bumper Tightening Specifications .....	125
Glass, Window Regulators Specifications .....	125
Mirror, Roof Rail Tightening Specifications .....	125
<b>Body Interior .....</b>	<b>125</b>
Storage Compartments, Covers and Trim Tightening Specifications .....	125
Instrument Panel and Crossmember Tightening Specifications .....	126
Passenger Protection Fastener Tightening Specifications ..	126
Interior Trim Fastener Tightening Specifications .....	127
Seat Frames Fastener Tightening Specifications .....	127
<b>General, Technical Data .....</b>	<b>128</b>
Refrigerant Oil Distribution .....	128
Refrigerant R134a Vapor Pressure Table .....	129
<b>Heating, Ventilation.....</b>	<b>130</b>
Fastener Tightening Specifications.....	130
<b>Air Conditioning .....</b>	<b>130</b>
Fastener Tightening Specifications.....	130
<b>Electrical System.....</b>	<b>131</b>
Communication.....	131
Fastener Tightening Specifications.....	131
Electrical Equipment.....	132
Battery, Starter, Generator, Cruise Control Fastener Tightening Specifications .....	132
Windshield Wiper/Washer Tightening Specifications.....	133
Exterior Lights, Switches Tightening Specifications .....	133
E-box in the Engine Compartment Tightening Specifications .....	133
Wiring Tightening Specification .....	133
<b>DTC Chart.....</b>	<b>134</b>
Engine Codes CKRA .....	134
Fuel and Air Mixture, Additional Emissions Regulations .....	134
Ignition System .....	139
Additional Exhaust Regulation.....	141
Speed and Idle Control.....	143
Control Module and Output Signals.....	143
Fuel and Air Ratios Control Module.....	146

Ignition System .....	154
Additional Emissions Regulations .....	155
<b>DTC Chart.....</b>	<b>157</b>
Engine Codes CBTA/CBUA.....	157
Fuel and Air Mixture,	
Additional Emissions Regulations .....	157
Ignition System .....	163
Additional Exhaust Regulation.....	165
Speed and Idle Control.....	166
Control Module and Output Signals.....	167
Fuel and Air Ratios Control Module.....	168
Ignition System .....	170
Additional Emissions Regulations .....	171
<b>DTC Chart.....</b>	<b>173</b>
Engine Code CDVB .....	173
Fuel and Air Mixture,	
Additional Emissions Regulations .....	173
Ignition System .....	181
Additional Exhaust Regulation.....	184
Speed and Idle Control.....	184
Control Module and Output Signals.....	185
Fuel and Air Ratios Control Module.....	187
Additional Emissions Regulations .....	191

# GENERAL INFORMATION

## *Decimal and Metric Equivalents*

### Distance/Length

To calculate: mm x 0.03937 = in.

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

# Tightening Torque

## Nm-to-lb·ft (ft·lb)

To calculate: Nm x 0.738 = lb·ft

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

## Nm-to-lb-in (in·lb), kg·cm

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

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

## N·cm-to-lb-in (in·lb), kg·cm

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

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

## kg·cm-to-lb·in (in·lb), N·cm

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

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

## Warnings and Cautions

### WARNINGS

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

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

*(WARNINGS cont'd on next page)*

## **WARNINGS** *(cont'd)*

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



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

## CAUTIONS

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

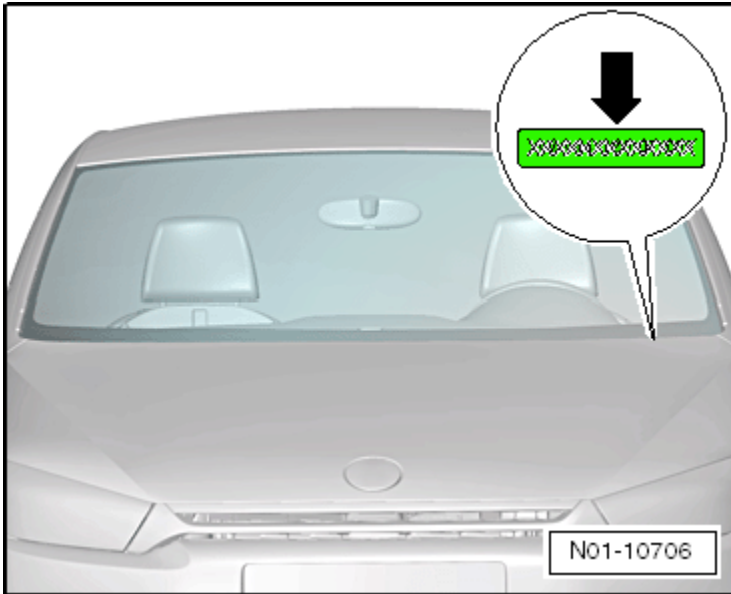
*(CAUTIONS cont'd on next page)*

## **CAUTIONS** *(cont'd)*

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

# VEHICLE IDENTIFICATION

## Vehicle Identification Number (VIN) Location



Vehicle  
Identification

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

# VIN Decoder

## 2013 Volkswagen VIN Decoder (except Routan)

**Series:**

**A=** CC Sport w/Man Trans, Golf Zdr w/5 Spd Manual, Passat S, Tiguan w/Auto Trans

**B=** CC Sport/Sport w/Auto Trans, Eos Kombi/Sport w/Auto Trans, Golf Zdr 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 Zdr w/Man Trans, Touareg V6 FSI/TDI /hybrid

**F=** Beetle w/6 Spd Auto Trans, Eos Lux/Esc w/Auto Trans, GTI Zdr w/Auto Trans

**G=** CC V6 Esc w/Auto Trans and 4Motion, GTI 4dr w/Man Trans, Jetta SEL w/5 Spd Man Trans

Country of origin	Manufacturer	Vehicle Type	Series	Engine	Restraint system	Model (7&8)	Check digit	Model year	Assembly plant	Sequential production number (position 12 - 17)						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
W	V	V	B	P	7	A	N	8	D	E	5	0	2	0	1	3

**WWW** = Europe - Passat, CC, Golf  
**USA** = USA - Passat, Golf  
**M** = Mexico - Passat, Car  
**WVG** = Europe - SUV, V.

**See block**

**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

**Calculate per NHTSA Code** 2013

**C** = Chattanooga  
**D** = Slovakia  
**E** = Emden  
**M** = Mexico  
**P** = Mosel  
**V** = Portugal  
**W** = Wolfsburg

**\*\* 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 **SWV, GTI and Golf** models are identified by WMI code of **WWW**.

**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 (CBTA-M) Golf  
**D=** 4 cyl 2.0L 200hp (CBFA-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 (CGR) Touareg  
**G=** 6 cyl 3.0L 330hp + 34 Kw (CGFA) Touareg Hybrid  
**H=** 5 cyl 2.5L 170hp (CBTA-M) Passat  
**K=** 4 cyl 2.0L 150hp (CBFA) 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 (CGR) 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 (CBFA-M-PZEV\*) Beetle, Beetle Convertible, Jetta, Jetta SportWagen, Passat  
**P=** VR6 3.0L TDI 240hp (CNRB) Touareg  
**P=** VR6 3.6L 280hp (CJAA) 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

August 14, 2012 (Rev 3)

### 2013 Restraint System:

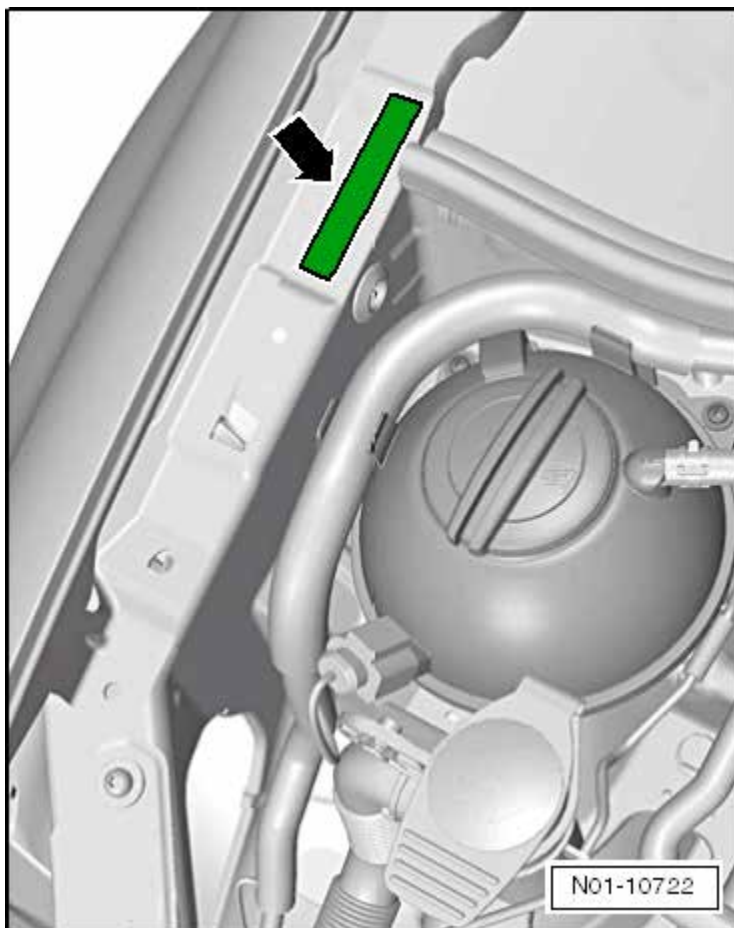
**All** = Active-Dr/Pass - Front Air Bag - Dr/Pass  
**7** = Advanced Front Air Bags + Side Impact Air Bags - Front + Side Curtain Air Bags  
**8 (Eos Only)** = Advanced Front Air Bags + Side Impact Air Bags - Front + Knee Air Bags - Front + Side Curtain Air Bags  
**8 (Jetta Only) or 8 (All Others)** = 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

**2013 Volkswagen VIN Decoder (except Routan)**

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	Sequential production number (position 12 - 17)
13	
14	
15	
16	
17	

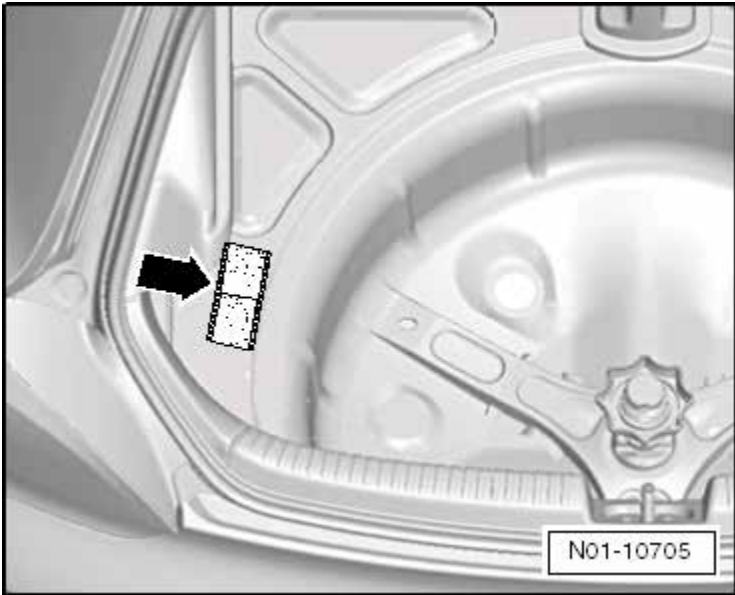
## VIN on Longitudinal Member Extension



Vehicle  
Identification

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

## Vehicle Data Label



The vehicle data label (➡) is located in the left rear of the vehicle in the spare wheel well. The vehicle data label is also in the customer's maintenance booklet.

# SALES CODES

## Engine Codes

<b>CKRA</b>	2.0L 4-cylinder Turbo Diesel (TDI)
<b>CBTA/CBUA</b>	2.5L 5-cylinder
<b>CDVB</b>	3.6L 6-cylinder

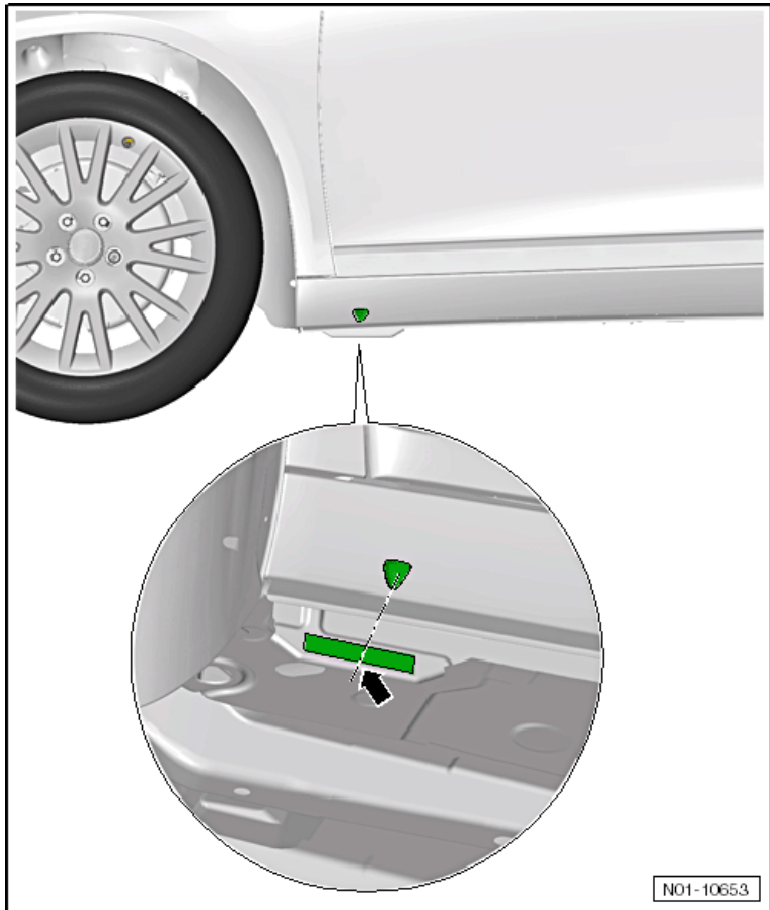
## Transmission Codes

<b>0A4</b>	5-speed manual
<b>02Q</b>	6-speed manual
<b>02E</b>	6-speed Direct Shift Gearbox (DSG)
<b>09G</b>	6-speed automatic

# VEHICLE LIFTING

## *Hoist and Jack Mounting Points*

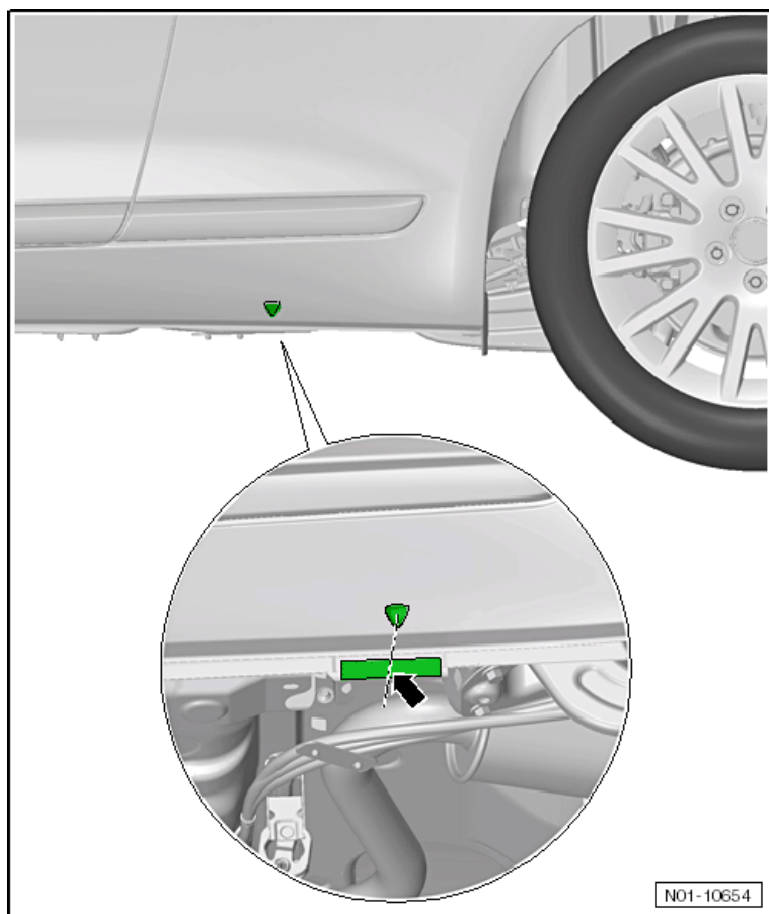
Front



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



## Rear



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



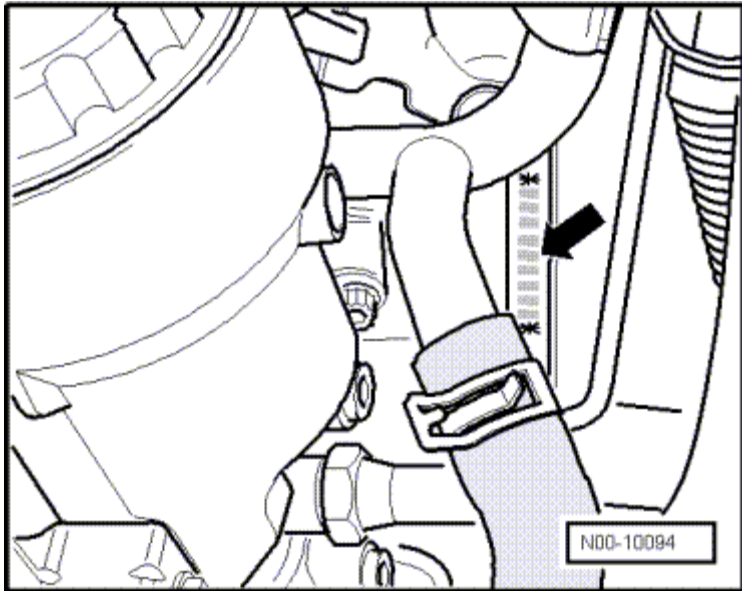
### **WARNING**

Make sure the side member stiffener contacts the support plate of the lifting platform at center.

# ENGINE MECHANICAL – 2.0L CKRA (TDI)

## *General, Technical Data*

### Engine Number Location



The engine number (engine code and serial number) (arrow) 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 digits. 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

Identification code		CKRA
Emission values in accordance with		BIN 5/LEV 2
Displacement	liter	2.0
Output	kW at RPM	103 @ 4000
Torque	Nm at RPM	320 @ 1500 to 2500
Bore	diameter mm	81.0
Stroke	mm	95.5
Valves per cylinder		4
Compression ratio		16.5
Fuel		Diesel
Ignition sequence		1-3-4-2
Balance shaft module		Yes
Catalytic converter		Yes
Exhaust Gas Recirculation (EGR)		Yes
Turbocharger, Supercharger		Yes
Charge Air Cooler (CAC)		Yes
Particulate filter		Yes

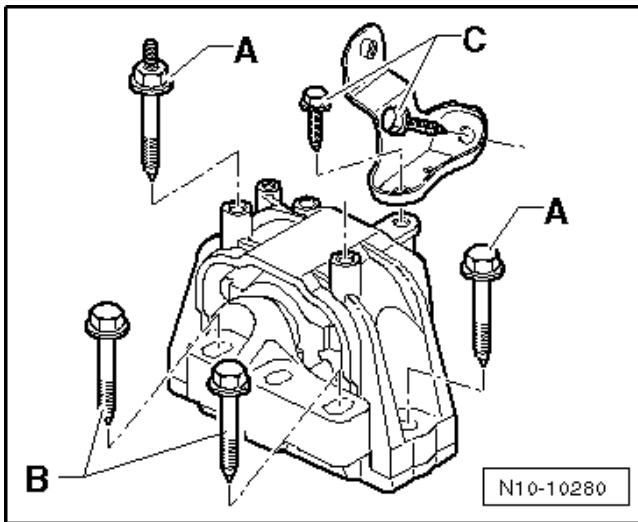
# Engine Assembly – 2.0L CKRA (TDI)

## Fastener Tightening Specifications

Component	Fastener size	Nm
Bolts and nuts	M6	10
	M7	15
	M8	25
	M10	40
	M12 <sup>1)</sup>	65

<sup>1)</sup> Tightening specification for a M12 collar bolt is 75 Nm.

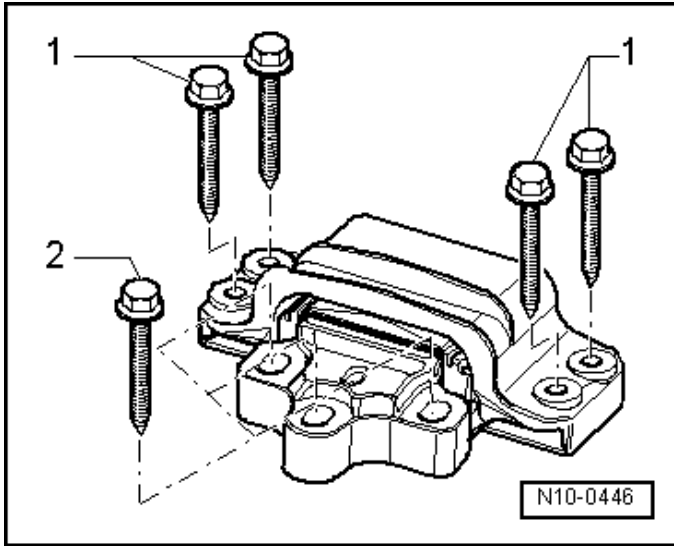
## Engine Mount Tightening Specifications



Step	Component	Nm
1	Tighten bolts A <sup>1)</sup>	40 plus an additional 90° (¼ turn)
2	Tighten bolts B <sup>1)</sup>	60 plus an additional 90° (¼ turn)
3	Tighten bolts C <sup>1)</sup>	20 plus an additional 90° (¼ turn)

<sup>1)</sup> Replace fastener(s).

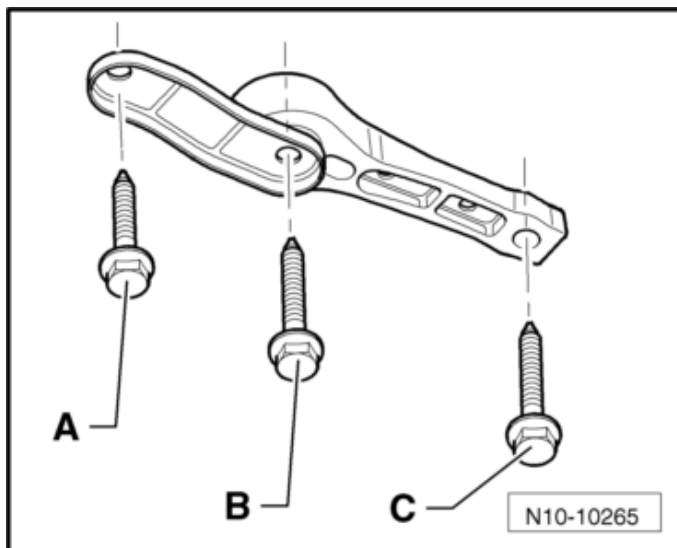
## Transmission Mount Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 <sup>1)</sup>	40 plus an additional 90° (¼ turn)
2	Tighten bolts 2 <sup>1)</sup>	60 plus an additional 90° (¼ turn)

<sup>1)</sup> Replace fastener(s).

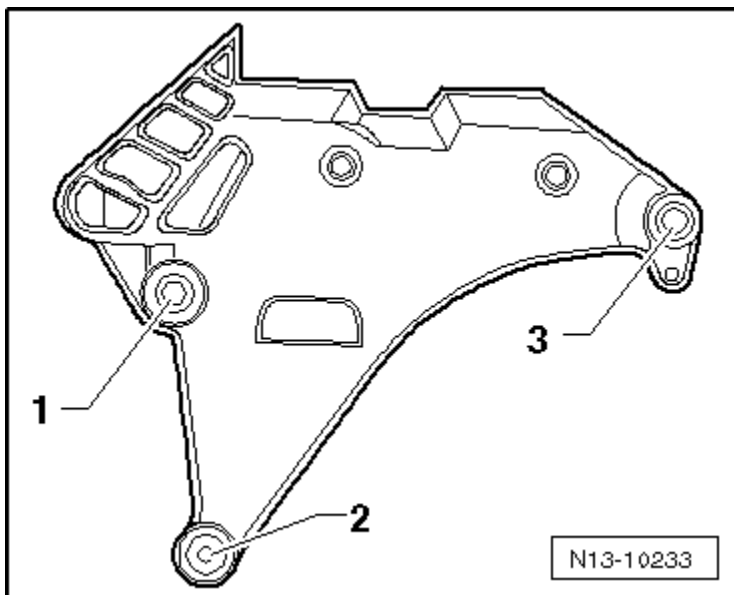
## Pendulum Support Tightening Specifications



Step	Component	Nm
1	Tighten bolts A <sup>1)</sup>	50 plus an additional 90° (¼ turn)
2	Tighten bolts B <sup>1)</sup>	50 plus an additional 90° (¼ turn)
3	Tighten bolts C <sup>1)</sup>	100 plus an additional 90° (¼ turn)

<sup>1)</sup> Replace fastener(s).

## Engine Mount Bracket Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 3 in sequence <sup>1)</sup>	Hand-tighten
2	Tighten bolts 1 through 3 in sequence	40
3	Tighten bolts 1 through 3 in sequence	an additional 180° (½ turn)

<sup>1)</sup> Replace fastener(s).

### **WARNING**

Always use the correct tightening sequence and specifications for the engine mount bracket bolts. Tension could develop in the engine mount bracket and damage to the bracket could occur.

# Crankshaft, Cylinder Block – 2.0L CKRA (TDI)

## Fastener Tightening Specifications

Component	Nm
Accessory bracket-to-belt tensioner bolt <sup>1)</sup>	35
Accessory bracket-to-high pressure fuel pump bolt <sup>1)</sup>	20 plus an additional 90° (¼ turn)
Air conditioning compressor-to-accessory bracket bolt	45
Connecting rod cap-to-connecting rod bolt <sup>1)3)</sup>	30 plus an additional 90° (¼ turn)
Crankshaft bearing cap-to-cylinder block bolt <sup>1)</sup>	65 plus an additional 90° (¼ turn)
Crankshaft toothed belt gear-to-crankshaft bolt <sup>1)2)</sup>	120 plus an additional 90° (¼ turn)
Dual mass flywheel-to-crankshaft bolt <sup>1)</sup>	60 plus an additional 90° (¼ turn)
Engine speed sensor-to-sealing flange bolt	5
Generator-to-accessory bracket bolt	25
Oil spray jet-to-cylinder block bolt	27
Ribbed Belt Tensioner	35
Toothed belt idler pulley-to-cylinder block bolt <sup>1)</sup>	50 plus an additional 90° (¼ turn)
Toothed belt idler roller-to-cylinder block nut	20
Vibration damper-to-crankshaft bolt <sup>1)</sup>	10 plus an additional 90° (¼ turn)

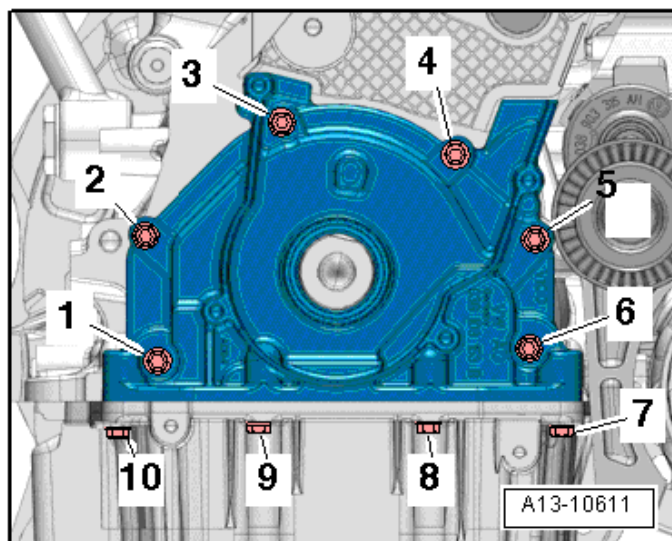
<sup>1)</sup> Replace fastener(s).

<sup>2)</sup> Do not lubricate or grease the threads or collar.

<sup>3)</sup> Lubricate the threads and contact surface.

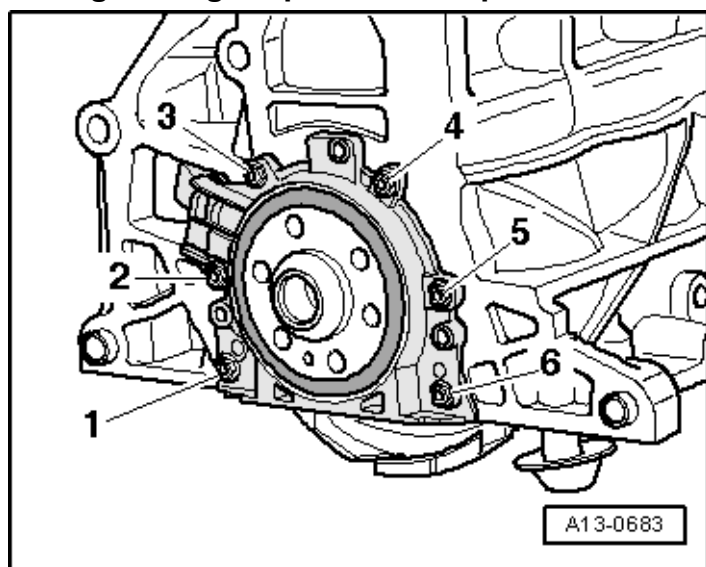


## Sealing Flange (Belt Pulley Side) Bolt Tightening Sequence and Specification



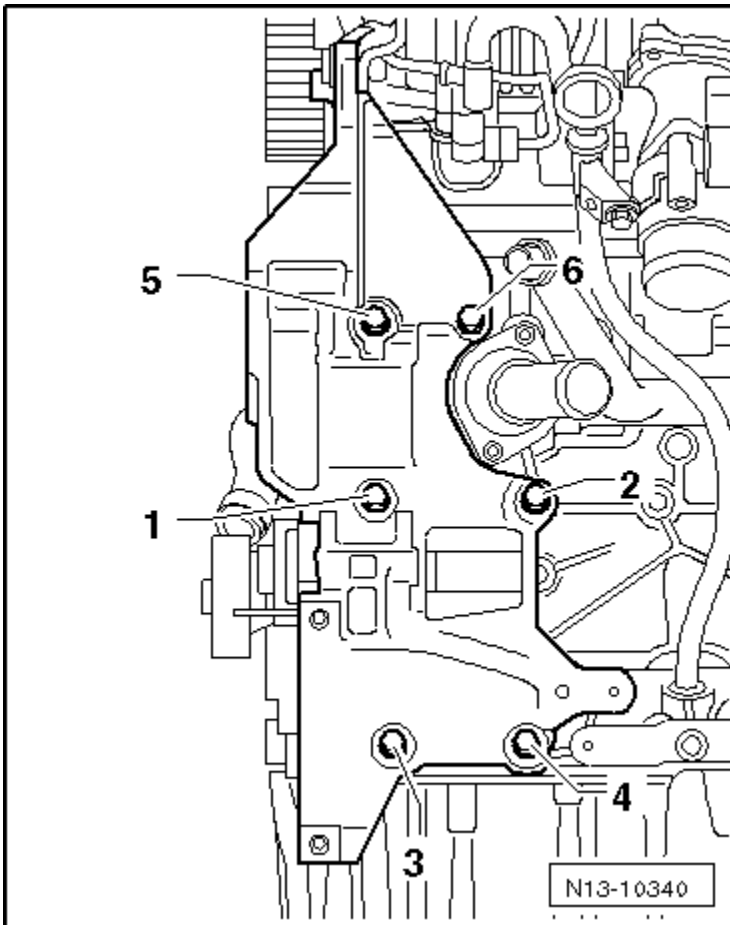
Step	Component	Nm
1	1 through 10	Hand-tighten
2	1 through 6	Tighten diagonally in steps to at least 15 Nm
3	7 through 10	Tighten to 15 Nm

## Sealing Flange (Transmission Side) Bolt Tightening Sequence and Specification



Step	Component	Nm
1	1 through 6	Hand-tighten
2	1 through 6	Tighten diagonally in steps to at least 15 Nm

## Accessory Bracket Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 6 in sequence	Hand-tighten
2	Tighten bolts 1 through 6 in sequence	40
3	Tighten bolts 3 and 4	an additional 45° (1/8 turn)
4	Tighten bolts 1, 2, 5 and 6 in sequence	an additional 90° (1/4 turn)

## Crankshaft Dimensions

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

## Piston and Cylinder Dimensions

Honing dimension in mm	Piston diameter <sup>1)</sup>	Cylinder bore diameter
Basic dimension	80.96	81.0

<sup>1)</sup> Measurement with coating (thickness = 0.02 mm). The coating wears off.

### Piston Ring End Gaps

Piston ring gap dimensions in mm	New	Wear limit
1 <sup>st</sup> compression ring	0.20 to 0.40	1.0
2 <sup>nd</sup> compression ring	0.20 to 0.40	1.0
Oil scraping ring	0.25 to 0.50	1.0

### Piston Ring Clearance

Piston ring to groove clearance dimensions in mm	New	Wear limit
1 <sup>st</sup> compression ring	0.06 to 0.09	0.25
2 <sup>nd</sup> compression ring	0.05 to 0.08	0.25
Oil scraping ring	0.03 to 0.06	0.15

# Cylinder Head, Valvetrain – 2.0L CKRA (TDI)

## Fastener Tightening Specifications

Component	Nm
Camshaft Position (CMP) sensor-to-cylinder head bolt <sup>2)</sup>	10
Camshaft sprocket-to-camshaft bolt	20 plus an additional 45° (1/8 turn)
Center toothed belt guard-to-lower toothed belt guard bolt	10
Connecting Piece-to-Cylinder Head Bolt	10
Coolant pump-to-cylinder block bolt	15
Crankshaft toothed belt gear-to-crankshaft bolt <sup>1)3)</sup>	120 plus an additional 90° (1/4 turn)
Engine lifting eye-to-cylinder head bolt	20
Engine mount bracket-to-cylinder block bolt <sup>1)</sup>	40 plus an additional 180° (1/2 turn)
Fuel rail-to-cylinder head cover bolt	22
High pressure line clamp screw	8
High pressure pump hub nut	95
High pressure pump toothed belt gear-to-hub bolt	20
Hub-to-camshaft bolt	100
Oil pressure switch-to-cylinder head	20
Rear toothed belt guard protective plate bolt	5
Rear toothed belt guard-to-cylinder head bolt <sup>4)</sup>	10 20 <sup>1)</sup>
Tensioning bracket-to-cylinder head cover/cylinder head bolt <sup>1)</sup>	8 plus an additional 180° (1/2 turn)
Toothed belt idler pulley-to-cylinder head bolt <sup>1)</sup>	50 plus an additional 90° (1/4 turn)
Toothed belt idler roller-to-cylinder block nut	20
Toothed belt idler roller-to-cylinder head bolt	20
Toothed belt tensioning roller-to-cylinder head nut	20 plus an additional 45° (1/8 turn)
Vacuum pump-to-cylinder head bolt	10
Vibration damper-to-crankshaft bolt <sup>1)</sup>	10 plus an additional 90° (1/4 turn)

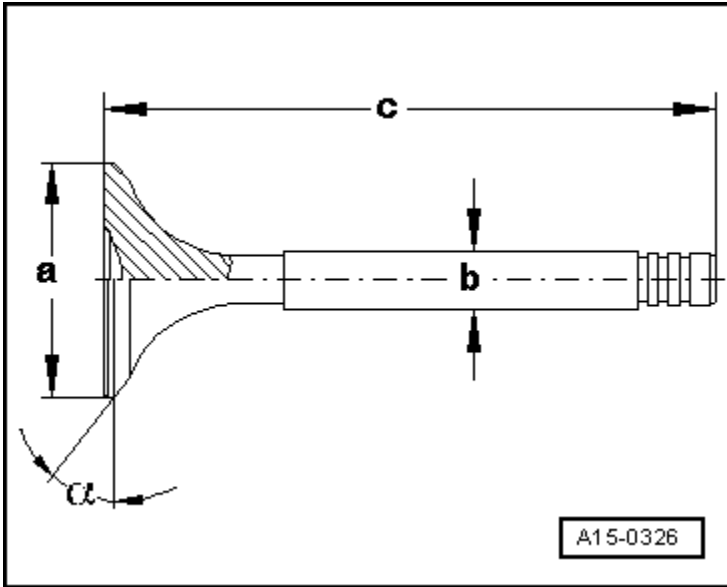
<sup>1)</sup> Replace fastener(s).

<sup>2)</sup> Install using locking compound. Refer to the Electronic Parts Catalog (ETKA).

<sup>3)</sup> Do not lubricate or grease the threads or collar.

<sup>4)</sup> For bolt tightening clarification, refer to ElsaWeb, *Toothed Belt Drive Overview*, items 14 and 15.

## Valve Dimensions



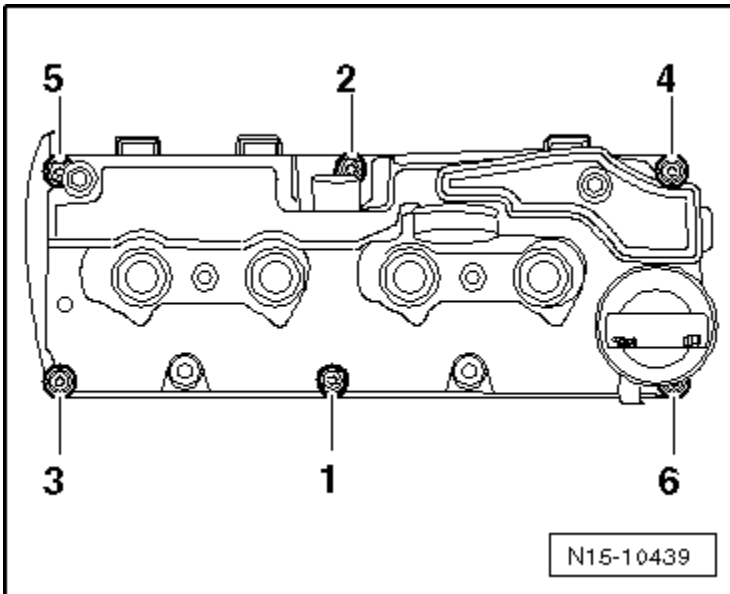
Dimension		Intake valve	Exhaust valve
Diameter a	mm	28.10	26.00
Diameter b	mm	5.975	5.965
c	mm	99.30	99.10
$\alpha$	$^{\circ}$	45	45

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

## Compression Pressures

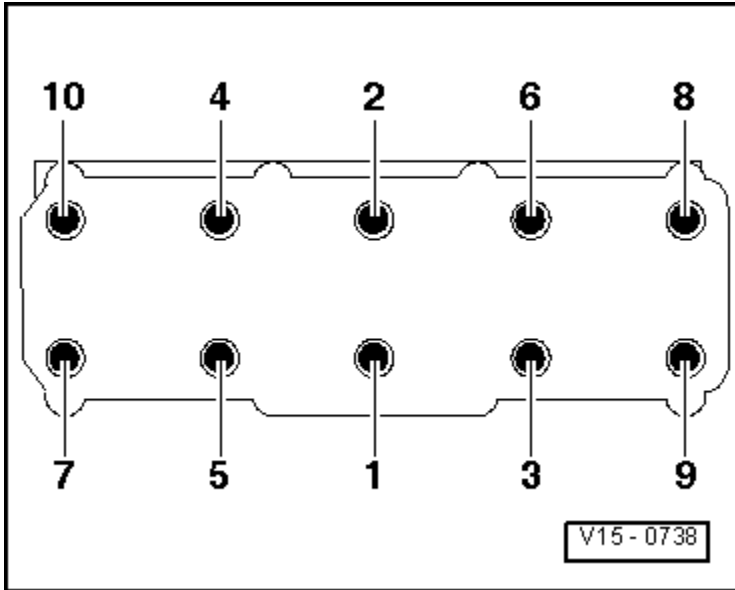
New Bar positive pressure	Wear limit Bar positive pressure	Difference between cylinders Bar positive pressure
25.0 to 31.0	19.0	Maximum 5.0

## Cylinder Head Cover Tightening Specification



Step	Component	Nm
1	Tighten bolts 1 through 6 in sequence	9

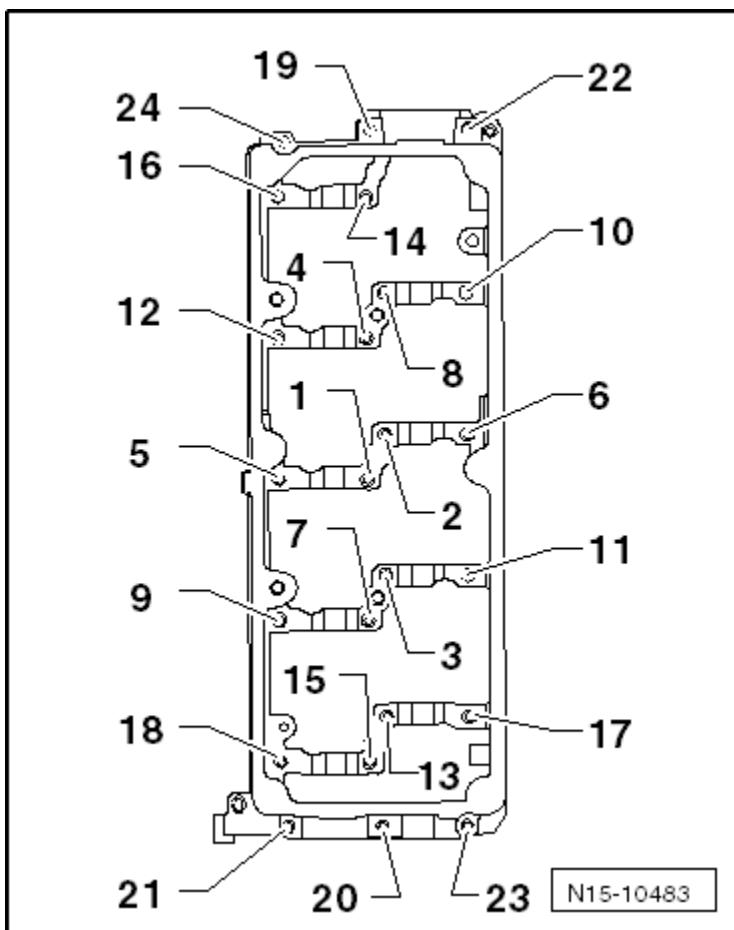
## Cylinder Head Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 10 in sequence	30
2	Tighten bolts 1 through 10 in sequence	50
3	Tighten bolts 1 through 10 in sequence	an additional 90° (¼ turn)
4	Tighten bolts 1 through 10 in sequence	an additional 90° (¼ turn)



## Bearing Frame Tightening Specifications



Step	Component	Nm
1	Tighten bolts and nuts 1 through 24 in sequence <sup>1)</sup>	Hand-tighten
2	Tighten bolts and nuts 1 through 24 in sequence	10

<sup>1)</sup> The guide frame must be in contact with the entire contact surface of the cylinder head.

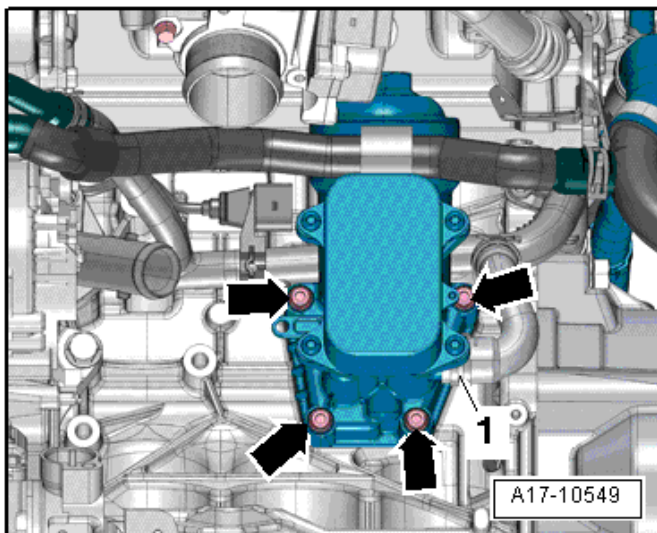
## **Lubrication – 2.0L CKRA (TDI)**

### **Fastener Tightening Specifications**

<b>Component</b>	<b>Nm</b>
Intermediate sprocket/hub-to-balance shaft module bolt <sup>1)</sup>	90 plus an additional 90° (¼ turn)
Oil cooler-to-oil filter bracket bolt	11
Oil filter cap bracket	25
Oil pan drain plug	30
Oil pan-to-transmission bolt	45
Oil pressure switch-to-cylinder block	20
Oil pump-to-balance shaft module bolt	9
Spur gear-to-balance shaft bolt <sup>1)</sup>	20 plus an additional 90° (¼ turn)
Suction pipe-to-balance shaft module bolt	9
Suction pipe-to-oil pump bolt	9

<sup>1)</sup> Replace fastener(s).

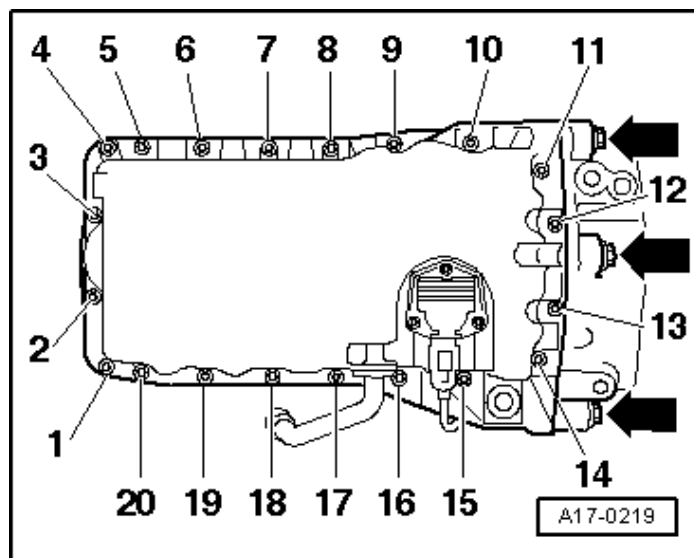
## Oil Filter Bracket Bolt Tightening Sequence and Specification



Note: Replace the oil filter bracket bolts. Install the upper left bolt and the lower right bolt. Tighten the bolts in 2 steps:

Step	Bolts	Nm
1	-Arrows-	Tighten to 14 Nm in a diagonal sequence
2	-Arrows-	Tighten an additional 90° (1/4) turn, in a diagonal sequence

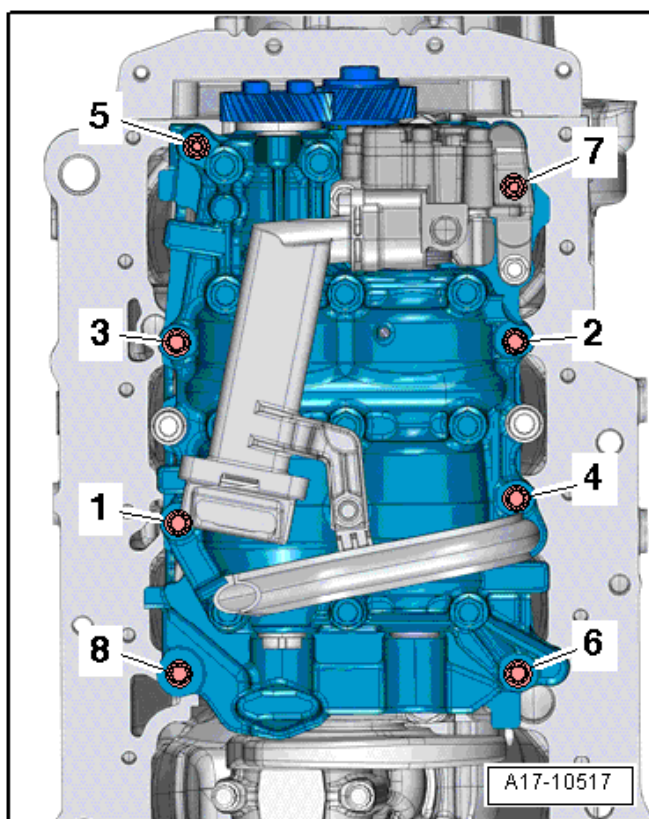
## Oil Pan Bolt Tightening Sequence and Specification



Note: Replace the oil pan bolts. Tighten the bolt in 3 steps:

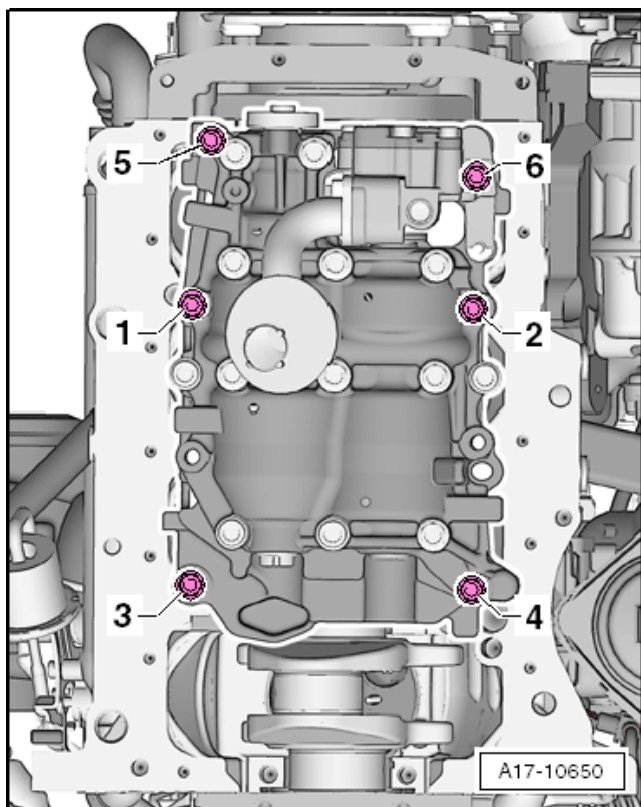
Step	Bolts	Nm
1	-1 through 20-	Tighten to 5 Nm, in a diagonal sequence
2	-Arrows-	Tighten to 40 Nm
3	-1 through 20-	Tighten to 15 Nm, diagonally and in steps

## Balance Shaft Module, with 8 Bolts, Tightening Sequence and Specification



Step	Bolts	Nm
1	-1 through 8-	Hand tighten
2	-1 through 8-	Tighten in sequence to 6 Nm
3	-1 through 4-	Tighten to 20 Nm.
4	-5-	Tighten to 13 Nm.
5	-6-	Tighten to 20 Nm.
6	-7-	Tighten to 13 Nm.
7	-8-	Tighten to 20 Nm.
8	-1 through 8-	Tighten an additional 90° (1/4) turn in sequence using a ratchet

## Balance Shaft Module, with 6 Bolts, Tightening Sequence and Specification



Step	Bolts	Nm
1	-1 through 6-	Hand tighten
2	-1 through 6-	Tighten in sequence to 6 Nm
3	-1 through 4-	Tighten to 20 Nm.
4	-5 and 6-	Tighten to 13 Nm.
5	-1 through 6-	Tighten an additional 90° (1/4) turn in sequence with a ratchet

## Cooling System – 2.0L CKRA (TDI)

### Fastener Tightening Specifications

Component	Fastener size	Nm
4/2 way valve housing cover-to-housing bolt	-	5
4/2 way valve with thermostat-to-cylinder block bolt	-	15
Charged air cooler circuit radiator mount bolt	-	10
Charge air cooling pump-to-bracket bolt	-	1.5
Charge air cooling pump-to-bracket bolt	M6	8
	M10	40
Connecting piece-to-cylinder block bolt	-	9
Coolant expansion tank-to-body bolt	-	5
Coolant fan shroud nut	-	10
Coolant pump-to-cylinder block bolt	-	15
Engine preheating element bracket bolt	-	8
Front coolant pipe bolt/nut	-	9
Intake manifold support-to-engine bolt	-	40
Intake manifold support-to-throttle valve control module bolt	-	8
Left coolant pipe bolt	-	9
Left coolant pipe nut	-	8
Radiator bolt	-	5
Radiator fan shroud bolt	-	5
Rear coolant pipe bolt	-	20
Rear coolant pipe nut	-	25

## **Fuel Supply – 2.0L CKRA (TDI)**

### **Fastener Tightening Specifications**

<b>Component</b>	<b>Nm</b>
Accelerator pedal module-to-body bolt	10
Fuel filler tube-to-body bolt <sup>1)</sup>	8 plus an additional 90° (¼ turn)
Fuel filter cover-to-housing bolt	5
Fuel filter housing-to-chassis bolt/nut	10
Fuel tank heat shield nut	2.5
Fuel tank lock ring	110
Tensioning strap-to-underbody bolt <sup>1)</sup>	20 plus an additional 90° (¼ turn)

<sup>1)</sup> Replace fastener(s).



# Turbocharger – 2.0L CKRA (TDI)

## Fastener Tightening Specifications

Component	Nm
Charge Air Cooler (CAC)-to-cylinder block bolt	8
Charge air hose clamp (9 mm wide)	3
Charge air hose clamp (13 mm wide)	5.5
Charge air pipe-to-cylinder block bolt	8
Charge air pressure sensor/intake air temperature sensor-to-Charge Air Cooler (CAC) bolt	3
Connecting Piece to Turbocharger Bolt	8
Cylinder block support bolt	8
Oil return line-to-turbocharger bolt	15
Oil supply line bracket-to-turbocharger bolt	20
Oil supply line clip bolt	10
Oil supply line-to-cylinder block banjo bolt	30
Oil supply line-to-turbocharger	22
Pulsation damper-to-turbocharger bolt	9
Turbocharger connecting piece bolt	8
Turbocharger heat shield bolt	15
Turbocharger heat shield nut <sup>1)</sup>	24
Turbocharger support-to-cylinder block banjo bolt <sup>1)</sup>	60
Turbocharger support tab bolt	10
Turbocharger/exhaust manifold-to-cylinder head nut <sup>1)</sup>	24
Vacuum actuator with charge pressure actuator position sensor-to-turbocharger bolt	8

<sup>1)</sup> Replace fastener(s).

# Exhaust System – 2.0L CKRA (TDI)

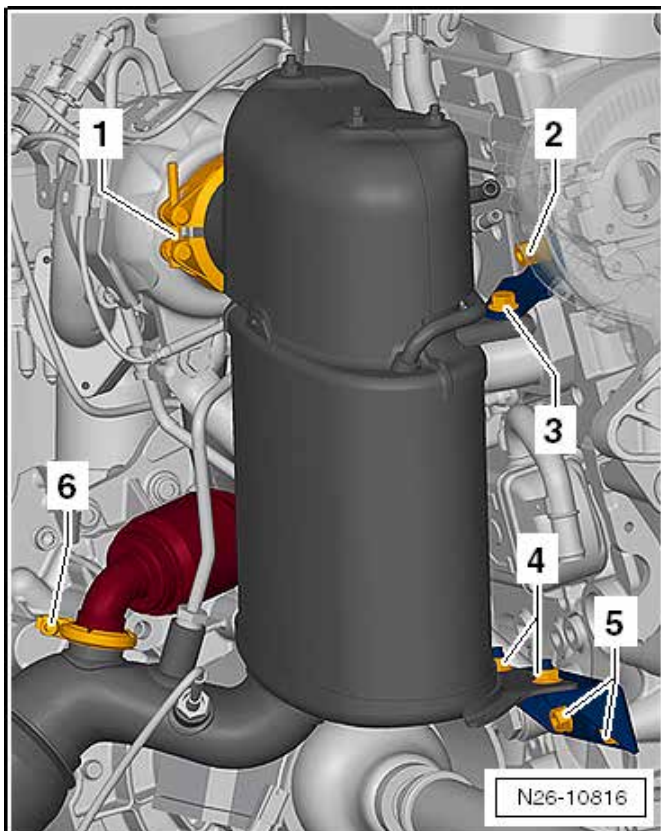
## Fastener Tightening Specifications

Component	Nm
Clamping Sleeve (2 Individual Clamps)	25
Clamping Sleeve (Continuous Clamp)	35
Control Line to Particulate Filter Fitting	45
Exhaust Door Control Unit to Exhaust Pipe Clamp <sup>1)</sup>	7
Exhaust Gas Recirculation Cooler to Cylinder Block Bolt	9
Exhaust Gas Recirculation Pipe to Cylinder Head Bolt	9
Exhaust Gas Recirculation Pipe to Exhaust Gas Recirculation Cooler Bolt	9
Exhaust Gas Recirculation Temperature Sensor to Exhaust Gas Recirculation Pipe	20
Exhaust Gas Temperature Sensor 1 to Turbocharger	45
Exhaust Gas Temperature Sensors 2 and 3 to Particulate Filter	45
Exhaust Gas Temperature Sensor 4 to Front Exhaust Pipe with Particulate Filter	45
Heated Oxygen Sensor to Particulate Filter <sup>2)</sup>	50
NOx Reduction Catalytic Converter Suspended Mount to Subframe Bolt	25
NOx Reduction Catalytic Converter to Exhaust Door Control Unit Clamp <sup>1)</sup>	7
NOx Reduction Catalytic Converter to Front Exhaust Pipe with Particulate Filter Nut	23
NOx Sensor Control Module to Underbody Nut	6
NOx Sensor to NOx Reduction Catalytic Converter	52
Particulate Filter to Particulate Filter Bracket Nut	23
Rear Muffler Suspended Mount to Body Bolt	25
Reducing Agent Delivery Module to Reducing Agent Tank Lock Ring	80
Reducing Agent Injector to NOx Reduction Catalytic Converter Clamp <sup>1)</sup>	5
Reducing Agent Pump to Reducing Agent Delivery Module Bolt	5
Reducing Agent Tank to Underbody Bolt	25
Shield to Particulate Filter	10
Tunnel Bridge to Underbody Bolt	23
Turbocharger to Particulate Filter Clamp <sup>1)</sup>	7

<sup>1)</sup> Replace fastener(s).

<sup>2)</sup> Coat only the threads with hot bolt paste (G 052 112 A3).

## Front Exhaust Pipe with Particulate Filter Tightening Specifications



Step	Component	Nm
1	Position the particulate filter on the turbocharger. Install clamp (1) so it is still loose.	-
2	Install bolts 2 through 5 hand-tight so they are still loose. The particulate filter and bracket must be allowed to slide back and forth.	-
3	Tighten clamp (1)	7
4	Tighten bolts 5, 4, 2, and 3 in order	23
5	Tighten clamp (6)	3.5

## ***Ignition/Glow Plug System – 2.0L CKRA (TDI)***

### **Fastener Tightening Specifications**

<b>Component</b>	<b>Nm</b>
Camshaft Position (CMP) sensor	10
Engine Speed (RPM) sensor	5
Glow plug	18

## ***Diesel Fuel Injection – 2.0L CKRA (TDI)***

### **Fastener Tightening Specifications**

<b>Component</b>	<b>Fastener size</b>	<b>Nm</b>
Adjusting element bolt	-	1.5
Air guide pipe-to-turbocharger bolt	-	8
Connecting hose clamp (9 mm wide)	-	3
Connecting hose clamp (13 mm wide)	-	5.5
Connecting pipe-to-cylinder head bolt	-	20
Connecting pipe-to-Exhaust Gas Recirculation (EGR) vacuum regulator solenoid valve bolt	-	20
Differential pressure sensor bolt	-	4
Exhaust Gas Recirculation (EGR) vacuum regulator solenoid valve-to-intake manifold bolt	-	8
Exhaust pressure sensor 1 bolt	-	4
Fuel pressure regulator valve-to-fuel rail	-	80
Fuel pressure sensor-to-fuel rail	-	100
Fuel rail-to-cylinder head cover bolt	-	22
Fuel return line clamp-to-intake manifold bolt	-	8
Guide tube-to-throttle valve control module bolt	-	10

## Fastener Tightening Specifications (cont'd)

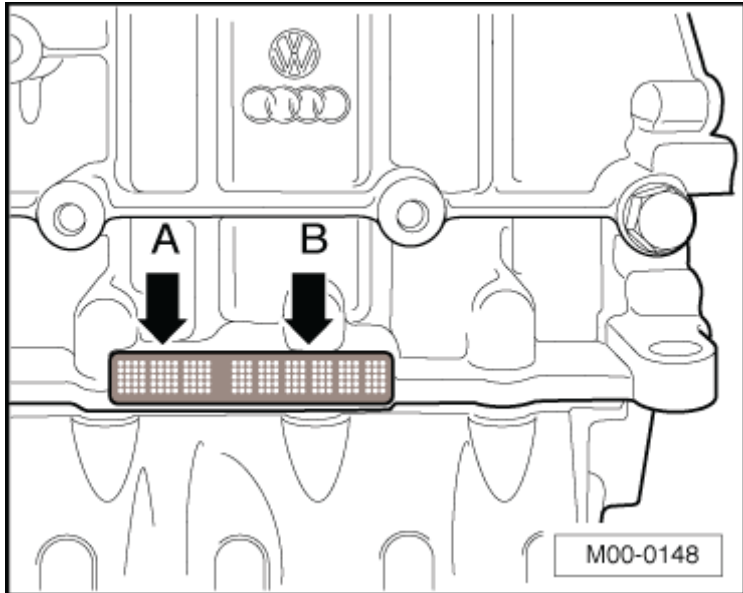
Component	Fastener size	Nm
High pressure fuel pump-to-accessory bracket bolt	M8 x 90	20 plus an additional 180° (½ turn)
	M8 x 28 <sup>1)</sup>	20 plus an additional 45° (⅛ turn)
High pressure line clamp nut	-	8
High pressure line fitting	-	28
High pressure pump hub nut	-	95
High pressure pump support-to-cylinder block bolt	-	23
High pressure pump support-to-high pressure pump bolt	-	23
High pressure pump support stud bolt	-	15
High pressure pump toothed belt gear-to-hub bolt <sup>1)</sup>	-	20
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	-	1.5
Oxygen Sensor (O2S)	-	50
Tensioning bracket-to-cylinder head cover/cylinder head bolt <sup>1)</sup>	-	8 plus an additional 180° (½ turn)
Throttle valve control module support bolt	-	10
Throttle valve control module-to-Exhaust Gas Recirculation (EGR) vacuum regulator solenoid valve bolt	-	10
Upper air filter housing-to-lower air filter housing screw	-	1.5

<sup>1)</sup> Replace fastener(s).

# ENGINE MECHANICAL – 2.5L CBTA, CBUA

## *General, Technical Data*

### 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 digits) 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 codes		CBTA	CBUA
Manufactured		from 07.2007	from 07.2007
Emission values in accordance with		TIER 2/BIN 5 (US coalition)	SULEV <sup>1)</sup>
Displacement	cm <sup>3</sup>	2480	2480
Output	kW at RPM	125 @ 5700	125 @ 5700
Torque	Nm at RPM	240 @ 4250	240 @ 4250
Engine idle speed <sup>3)</sup>	RPM	680	680
Engine speed (RPM) limitation	RPM	approximately 6300	approximately 6300
Bore	diameter mm	82.5	82.5
Stroke	mm	92.8	92.8
Compression ratio		9.5	9.5
Valves per cylinder		4	4
Research Octane Number (RON)	minimum	95 unleaded <sup>2)</sup>	95 unleaded <sup>2)</sup>
Fuel injection, ignition		Motronic ME 17.5	Motronic 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		No	Yes

<sup>1)</sup> SULEV = Super Ultra Low Emission Vehicles.

<sup>2)</sup> Unleaded RON 91 is permitted but performance is reduced.

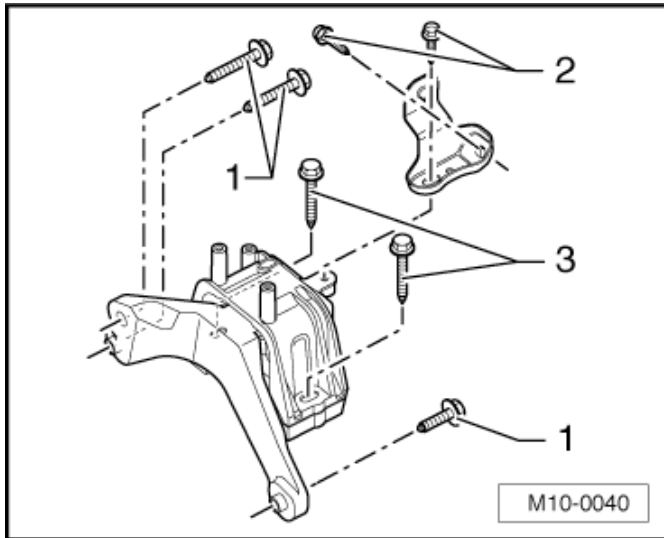
<sup>3)</sup> Applies to manual and automatic transmission. If voltage supply of Engine Control Module (ECM) drops below 12 volts, idle speed is raised in stages up to 780 RPM. Idle speed is not adjustable.

# Engine Assembly – 2.5L CBTA, CBUA

## Fastener Tightening Specifications

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

## Engine Mount Tightening Specifications

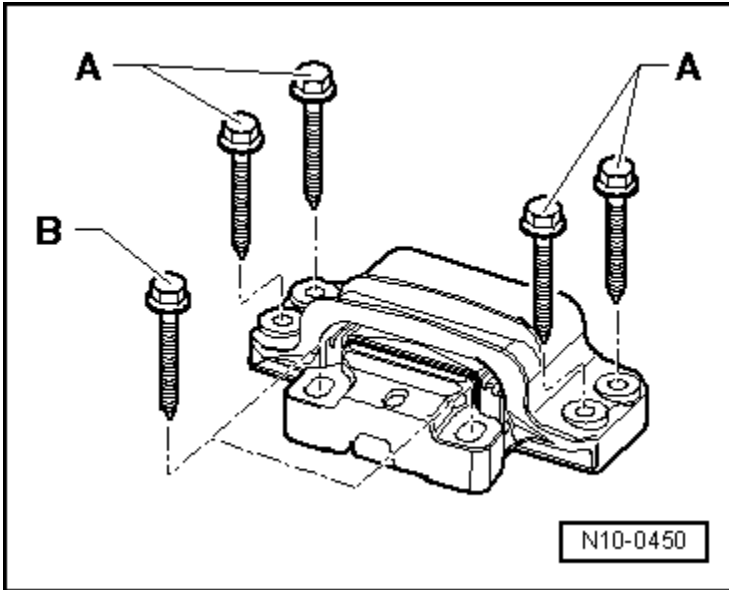


Component	Nm
Bolts 1	40 plus an additional 90° (¼ turn) <sup>1)</sup>
Bolts 2	20 plus an additional 90° (¼ turn) <sup>1)</sup>
Bolts 3	60 plus an additional 90° (¼ turn) <sup>1)</sup>

<sup>1)</sup> Replace fastener(s).



## Transmission Mount Tightening Specifications

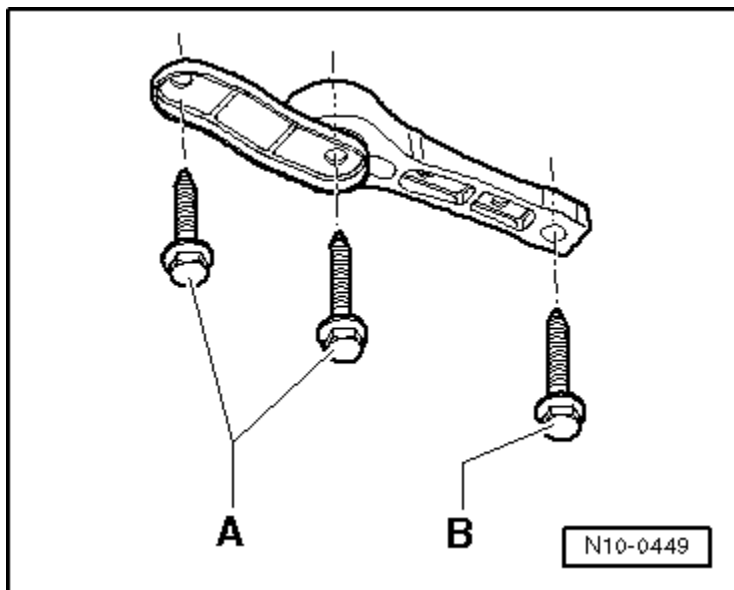


Engine –  
2.5L CBTA, CBUA

Component	Nm
Bolts A <sup>1)</sup>	40 plus an additional 90° (¼ turn)
Bolt B <sup>1)</sup>	60 plus an additional 90° (¼ turn)

<sup>1)</sup> Replace fastener(s).

## 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.

Component	Fastener size	Nm
Bolts A <sup>1)</sup>	10.9	50 plus an additional 90° (¼ turn)
Bolt B <sup>1)</sup>	-	100 plus an additional 90° (¼ turn)

<sup>1)</sup> Replace fastener(s).

# Crankshaft, Cylinder Block – 2.5L CBTA, CBUA

## Main Bearing Shell Allocation

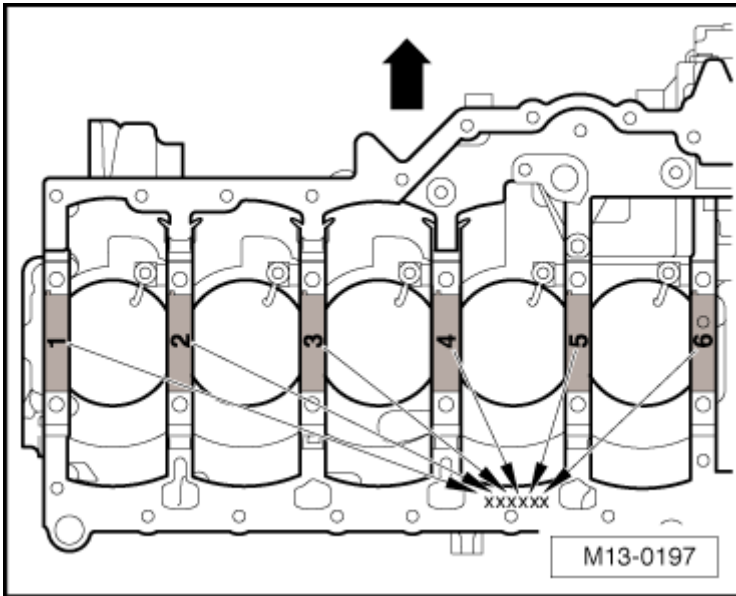
The upper bearing shells are allocated to the cylinder block with the correct thickness from the factory.

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
G	Yellow
B	Blue
W	White

## Crankshaft/Upper Bearing Shell Mark



### NOTE:

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

## Fastener Tightening Specifications

Component	Nm
Accessory bracket-to-cylinder block bolt	25
Air conditioning compressor-to-accessory bracket bolt/ stud bolt	25
Compressor ribbed belt tensioner-to-accessory bracket bolt	35
Connecting rod bearing cap bolt <sup>1)</sup>	30 plus an additional 90° (¼ turn)
Crankshaft bearing cap-to-cylinder block bolt <sup>1)</sup>	40 plus an additional 90° (¼ turn)
Cylinder block plug	30
Drive plate/flywheel-to-crankshaft bolt <sup>1)</sup>	60 plus an additional 90° (¼ turn)
Engine mount-to-accessory bracket bolt <sup>1)</sup>	40 plus an additional 90° (¼ turn)
Engine speed sensor-to-control housing cover bolt	5
Generator-to-accessory bracket bolt	25
Generator, power steering pump and coolant pump ribbed belt, belt tensioner-to-accessory bracket bolt	35
Idler pulley bracket-to-accessory bracket bolt	25
Power steering pump-to-accessory bracket bolt	23
Power steering pump pulley bolt	23
Pressure relief valve	27
Sealing flange-to-cylinder block bolt	10
Timing case-to-cylinder block bolt	25
Vibration damper-to-crankshaft bolt <sup>1) 2)</sup>	50 plus an additional 90° (¼ turn)

<sup>1)</sup> Replace fastener(s).

<sup>2)</sup> Only use a strength category 10.9 bolt.

## Crankshaft Dimensions

Honing dimensions in mm	Crankshaft bearing pin diameter		Connecting rod bearing pin diameter	
Basic dimension	58.00	-0.022	47.80	-0.022
		-0.042		-0.042
1 <sup>st</sup> oversize	57.75	-0.022	47.55	-0.022
		-0.042		-0.042
2 <sup>nd</sup> 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 Ring Gap

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

## Piston Ring Groove Clearance

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

## Piston and Cylinder Dimensions

Honing dimension in mm	Piston diameter	Cylinder bore diameter
Basic dimension	82.465 <sup>1)</sup>	82.51

<sup>1)</sup> Measurement does not include the graphite coating (thickness = 0.02 mm). The graphite coating wears away.

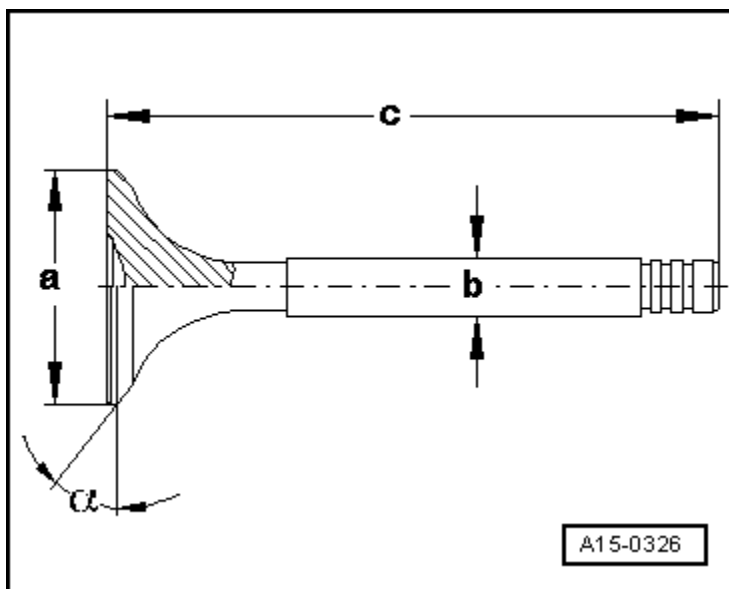
# Cylinder Head, Valvetrain – 2.5L CBTA, CBUA

## 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 pipe-to-bracket bolt	10
Cylinder block threaded pin	40
Double sprocket-to-cylinder block bolt <sup>1)</sup>	60 plus an additional 90° (¼ turn)
Exhaust camshaft sprocket-to-camshaft bolt <sup>1)</sup>	60 plus an additional 90° (¼ turn)
Flange-to-chain compartment cover bolt	10
Intake camshaft adjuster-to-camshaft bolt <sup>1)</sup>	60 plus an additional 90° (¼ turn)
Mount-to-cylinder block bolt	10
Oil pump sprocket to oil pump bolt <sup>1)</sup>	20 plus an additional 90° (¼ turn)
Plug-to-cylinder block	30
Secondary Air Injection (AIR) connecting pipe-to-cylinder head bolt	10
Timing chain tensioner-to-cylinder block bolt	10
Timing chain tensioner-to-cylinder head bolt	10
Transport strap-to-cylinder block bolt	25
Vacuum pump-to-control housing cover bolt	10
Wire bracket-to-chain compartment cover bolt	10

<sup>1)</sup> Replace fastener(s).

## Valve Dimensions

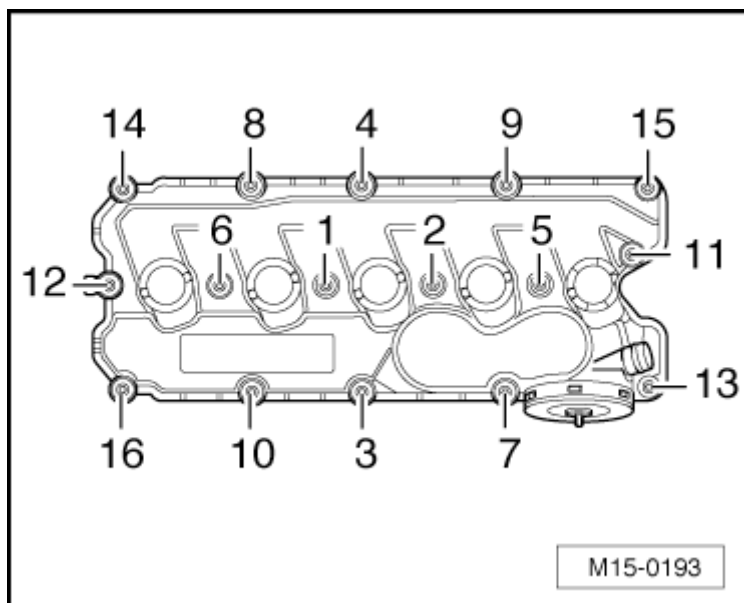


Dimension		Intake valve	Exhaust valve
Diameter a	mm	26.80 to 27.00	29.80 to 30.00
Diameter b	mm	5.95 to 5.97	5.94 to 5.95
c	mm	104.84 to 105.34	103.64 to 104.14
$\alpha$	$\angle^\circ$	45	45

## Compression Pressures

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

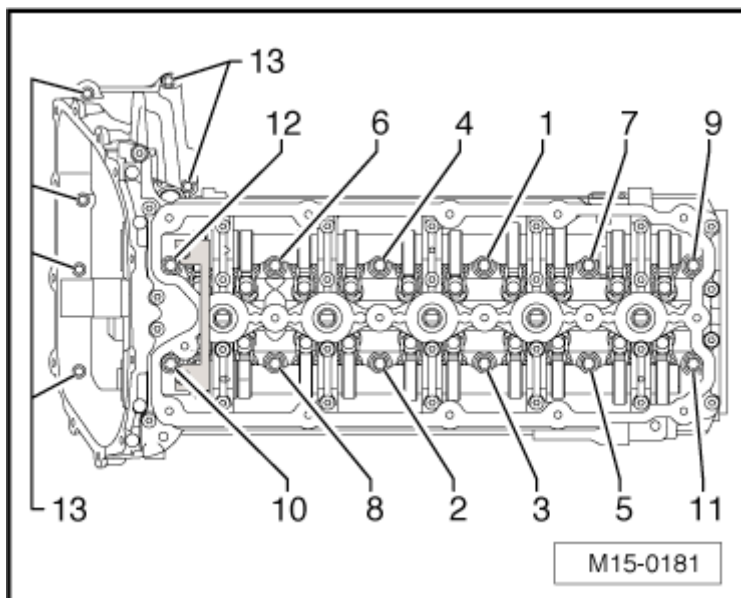
## Cylinder Head Cover Tightening Specification



Step	Component	Nm
1	Tighten bolts 1 through 16 in sequence	10

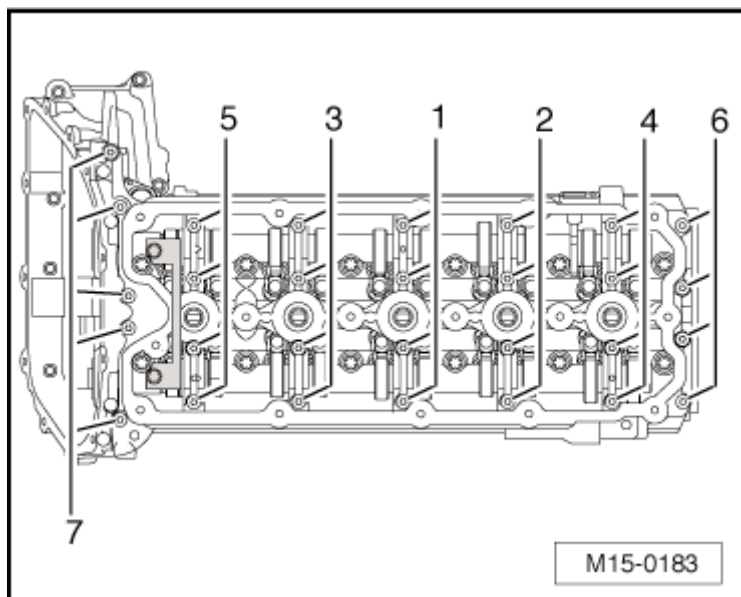


## Cylinder Head Tightening Specifications



Step	Component	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 bolts 13	10

## Guide Frame Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 7 in sequence <sup>1)</sup>	8
2	Tighten bolts 1 through 7 in sequence	an additional 90° (¼ turn)

<sup>1)</sup> Replace fastener(s).

## Lubrication – 2.5L CBTA/CBUA

### Fastener Tightening Specifications

Component	Nm
Cylinder block plug	30
Lower oil pan drain plug	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 pressure regulation valve-to-cylinder block bolt	9
Oil pressure switch-to-cylinder block	20
Oil pump align plate (T03005)-to-crankshaft bolt	30
Oil pump-to-cylinder block bolt	25
Oil pump sprocket bolt <sup>1)</sup>	20 plus an additional 90° (¼ turn)
Reduced oil pressure sensor-to-cylinder block	20
Upper oil pan-to-cylinder block bolt	25

<sup>1)</sup> Replace fastener(s).

## Cooling System – 2.5L CBTA, CBUA

### Fastener Tightening Specifications

Component	Nm
Air conditioning condenser-to-radiator bolt	5
Coolant fan shroud nut	5
Coolant hose bracket-to-accessory bracket bolt	9
Coolant pipe-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
Flange-to-cylinder head nut	10
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 fan shroud bolt	5
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
Air filter-to-Evaporative Emission (EVAP) canister nut	-	1.8
Evaporative Emission (EVAP) canister-to-body nut	-	8
Fuel filler tube-to-body bolt	-	11
Fuel tank heat shield nut	-	2.5
Fuel tank lock ring	-	110
Fuel tank-to-chassis bolt	M6	8 plus an additional 90° (¼ turn)
	M8 <sup>1)</sup>	20 plus an additional 90° (¼ turn)
Leak Detection Pump (LDP)-to-Evaporative Emission (EVAP) canister screw	-	1.8
Tensioning strap-to-underbody bolt <sup>1)</sup>	-	25

<sup>1)</sup> Replace fastener(s).

# Exhaust System, Emission Controls – 2.5L CBTA, CBUA

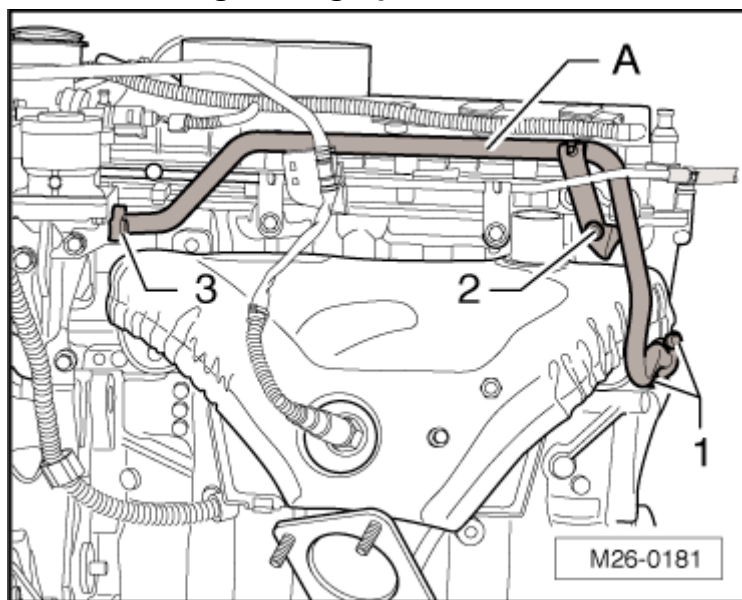
## Fastener Tightening Specifications

Component	Nm
<b>Catalytic converter heat shield bolt <sup>2)</sup></b>	
- Front bolt	10
- Rear bolt	5
Exhaust clamp nut	23
Exhaust manifold-to-cylinder head nut <sup>1)</sup>	23
Exhaust pipe with catalytic converter-to-exhaust manifold nut <sup>1)</sup>	23
Exhaust pipe with catalytic converter suspended mount-to-subframe bolt	23
Exhaust manifold heat shield 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 Pump Motor Bracket to Cylinder Block Bolt	25
Secondary Air Injection (AIR) pump motor bushing-to-intake manifold support nut <sup>2)</sup>	10
Secondary Air Injection (AIR) sensor 1-to-secondary air injection pressure pipe screw <sup>2)</sup>	2
Secondary Air Injection (AIR) solenoid valve-to-cylinder head bolt <sup>2)</sup>	10
Tunnel bridge-to-underbody nut	20

<sup>1)</sup> Replace fastener(s).

<sup>2)</sup> Engine code CBUA only.

## Secondary Air Injection Pipe Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 3 in sequence	Hand-tighten
2	Tighten bolts 1 through 3 in sequence	10

# Multiport Fuel Injection – 2.5L CBTA, CBUA

Engine –  
2.5L CBTA, CBUA

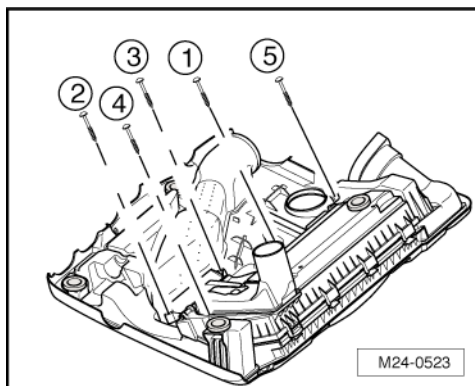
## Fastener Tightening Specifications

Component	Nm
Connecting piece-to-engine cover with air filter housing bolt	3
Cylinder head transport strap bolt	25
Fuel rail-to-intake manifold bolt	3.5
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
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 <sup>2)</sup>	25
Power steering pump intake line and Secondary Air Injection (AIR) pump motor bracket-to-intake manifold bolt <sup>2)</sup>	16
Power steering intake line bracket-to-intake manifold bolt <sup>1)</sup>	16
Throttle valve control module-to-intake manifold bolt	6.5

<sup>1)</sup> Engine code CBTA only.

<sup>2)</sup> Engine code CBUA only.

## Lower Air Filter Housing Bolt Tightening Sequence



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

## Ignition – 2.5L CBTA/CBUA

### Fastener Tightening Specifications

Component	Nm
Camshaft Position (CMP) sensor bolt	10
Cylinder block cover plate bolt	10
Cylinder block plug	30
Knock Sensor (KS) bolt <sup>1)</sup>	20
Spark plug	25

<sup>1)</sup> Tightening specifications affect the function of the Knock Sensor (KS).

### Technical Data

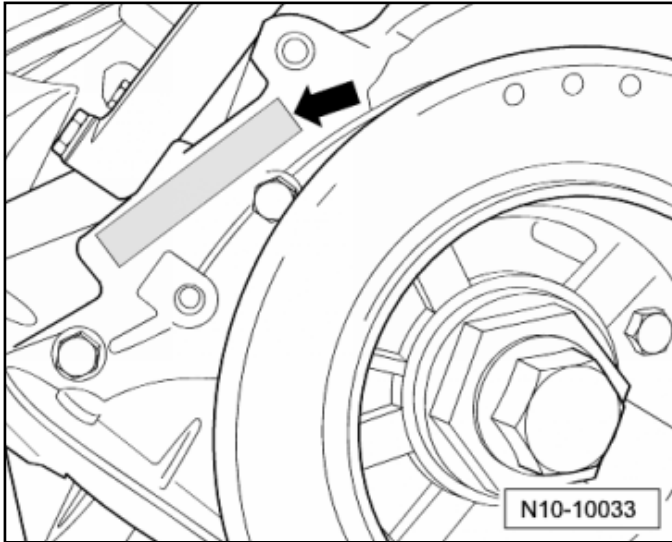
Engine codes	CBTA and CBUA
Ignition sequence	1-2-4-5-3
Spark plugs	Refer to the Parts Catalog
Electrode gap	1.0 to 1.1 mm
Tightening specification	25 Nm
Change intervals	Refer to Maintenance Intervals Rep. Gr. 03



# ENGINE MECHANICAL – 3.6L CDVB

## General, Technical Data

### Engine Number Location



The engine number (engine code and serial number) (➡) is located on the cylinder block next to the vibration damper.

Engine –  
3.6L CDVB

## Engine Data

Engine code		CDVB
Manufactured		From 01.2011
Emission values in accordance with		BIN 5/ULEV 2 <sup>2)</sup>
Displacement	cm <sup>3</sup>	3597
Output	kW at RPM	206 @ 6200
Torque	Nm at RPM	350 @ 2500-5000
Engine idle speed <sup>3)</sup>	RPM	640 to 760
Engine speed (RPM) limitation	RPM	approximately 6700
Bore	diameter mm	89.0
Stroke	mm	96.4
Cylinder angle		10.6°
Compression ratio		11.4
Valves per cylinder		4
Research Octane Number (RON)	minimum	95 unleaded <sup>1)</sup>
Fuel injection, ignition		Motronic MED 17.1.6
Knock control		2 knock sensors
Oxygen Sensor (O2S) regulation		4 sensors
Catalytic converter		Yes
Leak detection system		No
Exhaust Gas Recirculation (EGR)		Internal

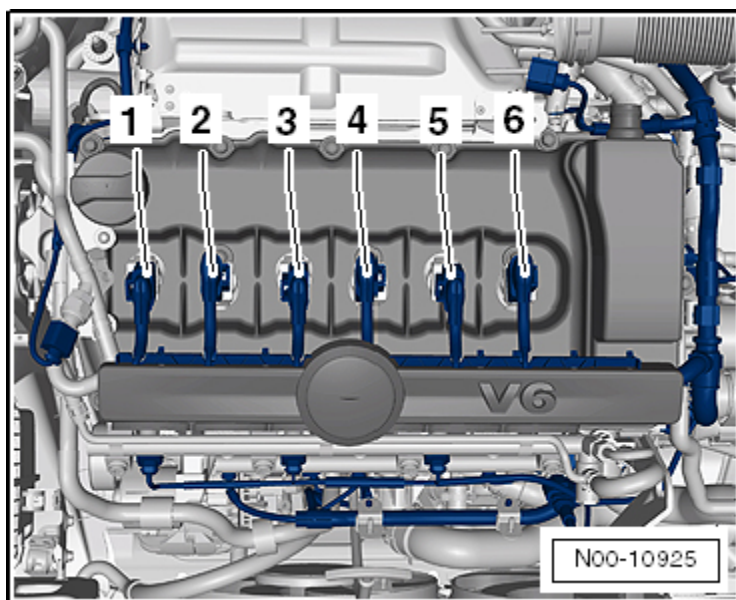
<sup>1)</sup> In exceptional circumstances a minimum 91 RON, however with reduced performance.

<sup>2)</sup> ULEV 2: Ultra Low Emission Vehicles 2.

<sup>3)</sup> Idle speed is not adjustable.

## Cylinder Numbering

NOTE: Cylinder 1 is located opposite the fuel supply side.



Engine –  
3.6L CDVB

Ignition sequence

1-5-3-6-2-4

# Engine Assembly – 3.6L CDVB

## Fastener Tightening Specifications

Component	Fastener size	Nm
Bolts and nuts	M6	10
	M7	15
	M8	25
	M10	40
	M12	60
Engine mount-to-engine mount bracket bolt <sup>1)</sup>	-	60 plus an additional 90° (¼ turn)
Engine mount-to-body bolt <sup>1)</sup>	-	40 plus an additional 90° (¼ turn)
Engine mount bracket-to-cylinder block bolt <sup>1)</sup>	-	40 plus an additional 180° (½ turn)
Pendulum support-to-subframe bolt <sup>1)</sup>	-	100 plus an additional 90° (¼ turn)
Pendulum support-to-transmission bolt <sup>1)</sup>	-	50 plus an additional 90° (¼ turn)
Support-to-engine mount/body bolt <sup>1)</sup>	-	20 plus an additional 90° (¼ turn)
Transmission mount-to-body bolt <sup>1)</sup>	-	40 plus an additional 90° (¼ turn)
Transmission mount-to-transmission mount bracket bolt <sup>1)</sup>	-	60 plus an additional 90° (¼ turn)

<sup>1)</sup> Replace fastener(s).

# Crankshaft, Cylinder Block – 3.6L CDVB

## Allocation of Crankshaft Bearing Shells for Cylinder Block

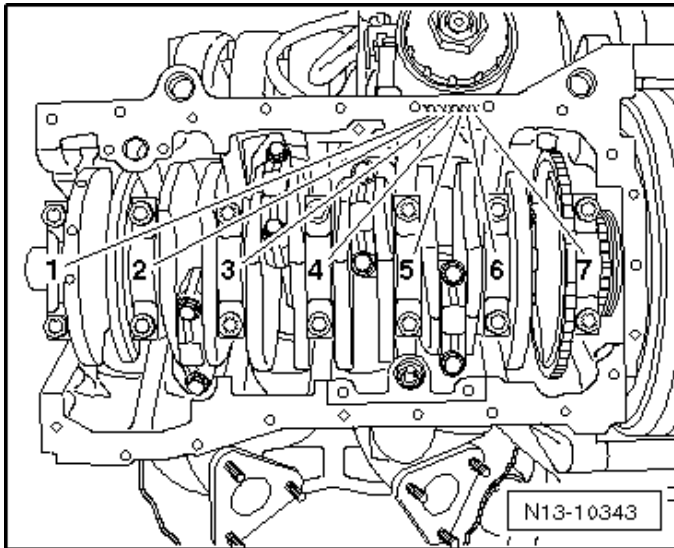
The main bearing shells with the correct thickness are allocated to the cylinder block and crankshaft in the factory. Colored dots identify the bearing thickness.

Allocate the bearing shells if the cylinder block or crankshaft are being replaced.

The bearing shell for the cylinder block (upper bearing shell) is always marked with a yellow dot.

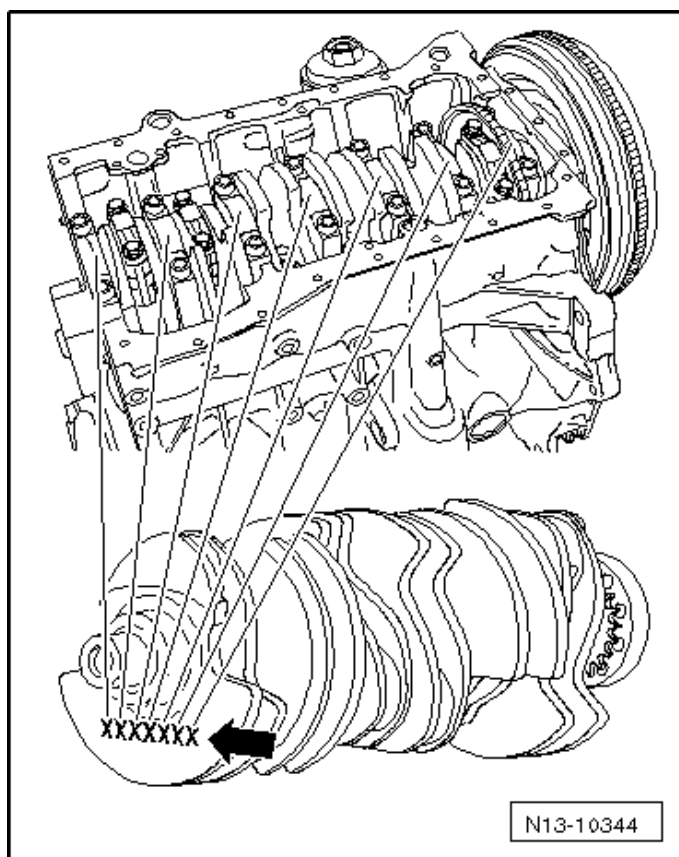
Using the letters on the cylinder block and crankshaft, determine the correct color identification for the bearing shell in the bearing cap (lower bearing shell). The first letter is for bearing cap 1, the second for bearing cap 2, etc.

## Cylinder Block Identification



The letters are located on the oil pan sealing surface.

## Crankshaft Identification



The letters are located on the outer crankshaft counterweight for cylinder 1.

Note the letters and then match it to the color identification in the table.

Letter on the cylinder block	Letter on the crankshaft counterweight	Bearing shell color identification for the bearing cap	Bearing shell color identification for the cylinder block
A, B, C, D, E	R	Red	Yellow
A, B, C, D, E	G	Red	Yellow
A, B, C, D, E	B	Yellow	Yellow
A, B, C, D, E	V	Blue	Yellow
G, H, I	R	Red	Yellow
G, H, I	G	Red	Yellow
G, H, I	B	Yellow	Yellow

Letter on the cylinder block	Letter on the crankshaft counterweight	Bearing shell color identification for the bearing cap	Bearing shell color identification for the cylinder block
G, H, I	V	Blue	Yellow
K, L, M	R	Red	Yellow
K, L, M	G	Yellow	Yellow
K, L, M	B	Blue	Yellow
K, L, M	V	Purple	Yellow

**Example:**

Bearing Cap	1	2	3	4	5	6	7
Letter on the cylinder block	G	H	H	H	G	E	G
Letter on the crankshaft counterweight	G	B	B	V	B	B	G
Bearing shell color identification for the bearing cap	Red	Yellow	Yellow	Blue	Yellow	Yellow	Red

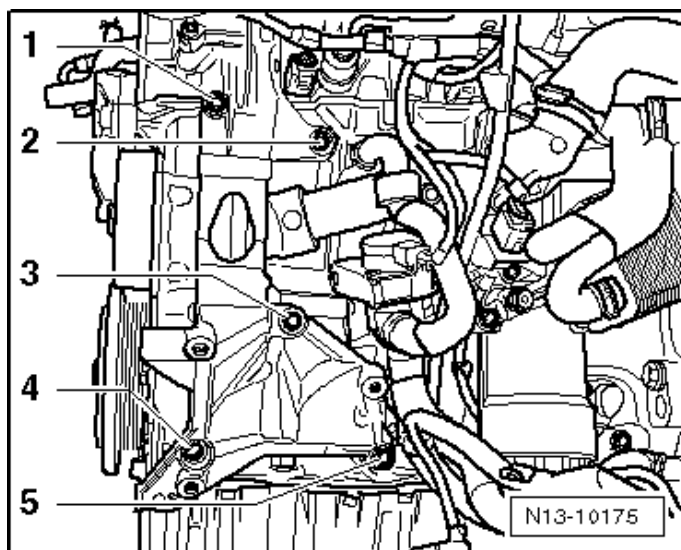
## Fastener Tightening Specifications

Component	Fastener size	Nm
A/C compressor-to-accessory bracket bolt	M8 x 100	23
Connecting rod bearing cap-to-connecting rod bolt <sup>1)</sup>	-	40 plus an additional 90° (¼ turn)
Coolant pump pulley-to-coolant pump bolt	-	20
Coolant pump-to-cylinder block bolt	-	8
Crankshaft bearing cap-to-cylinder block bolt <sup>1)</sup>	-	30 plus an additional 180° (½ turn)
Flywheel-to-crankshaft bolt <sup>1)</sup>	-	60 plus an additional 90° (¼ turn)
Generator-to-accessory bracket bolt	-	25
Idler roller-to-accessory bracket bolt	-	40
Ribbed belt tensioner-to-accessory bracket bolt	-	50
Sealing flange-to-cylinder block bolt	-	10
Sensor wheel-to-crankshaft screw <sup>1)</sup>	-	10 plus an additional 90° (¼ turn)
Vibration damper-to-crankshaft bolt <sup>1)</sup>	-	60 plus an additional 180° (½ turn)

<sup>1)</sup> Replace fastener(s).



## Accessory Bracket Bolt Tightening Specifications



Engine –  
3.6L CDVB

Step	Component	Nm
1	Tighten bolts 2 and 4	Hand-tighten
2	Tighten bolts 1, 3 and 5	Hand-tighten
3	Tighten bolts 1 through 5 in a diagonal sequence	25

## Piston Ring End Gaps

Piston ring dimensions in mm	Gap	
	New	Wear limit
Compression ring	0.30 to 0.45	1.0
Stepped compression ring	0.30 to 0.50	1.0
Oil scraping ring	0.20 to 0.90	1.2

## Piston Ring Clearance

Piston ring dimensions in mm	Ring to groove clearance	
	New	Wear limit
Compression ring	0.04 to 0.06	0.12
Stepped compression ring	0.03 to 0.06	0.15
Oil scraping ring	0.02 to 0.06	0.15

## Piston and Cylinder Dimensions

Honing dimension in mm	Piston diameter	Cylinder bore diameter
Basic dimension	88.945	89.010

## Crankshaft Dimensions

Reconditioning dimension in mm	Crankshaft bearing pin diameter	Connecting rod bearing pin diameter
Basic dimension	59.958 to 59.978	53.958 to 53.978

# Cylinder Head, Valvetrain – 3.6L CDVB

## Fastener Tightening Specifications

Component	Nm
Camshaft adjuster bolt <sup>1)</sup>	60 plus an additional 90° (¼ turn)
Camshaft adjustment valve-to-cylinder head bolt	3.8
Camshaft Position (CMP) sensor-to-cover bolt	8
Chain tensioner-to-cylinder block	50
Chain tensioner with tensioning rail-to-cylinder block bolt	10
Control housing-to-cylinder head bolt <sup>2)</sup>	8 plus an additional 90° (¼ turn)
Coolant pipe-to-timing chain cover bolt	8
Cylinder block guide rail bolt	23
Cylinder block guide rail pin	10
Cylinder flange-to-cylinder block bolt	10
Cylinder head connecting piece bolt	10
Cylinder head cover bolt	8
Cylinder head lifting eye bolt	23
Fuel hose bracket-to-cylinder head cover bolt	10
Intake manifold support-to-cylinder head bolt	23
Oil pump-to-cylinder block bolt <sup>2)</sup>	8
Oil pump sprocket bolt <sup>1)</sup>	60 plus an additional 90° (¼ turn)
Sealing flange-to-cover bolt	23
Tensioning rail-to-cylinder block pin	10
Vacuum pump cover bolt	8
Water connection-to-cylinder head bolt <sup>3)</sup>	10
	23 <sup>2)</sup>

<sup>1)</sup> Replace fastener(s).

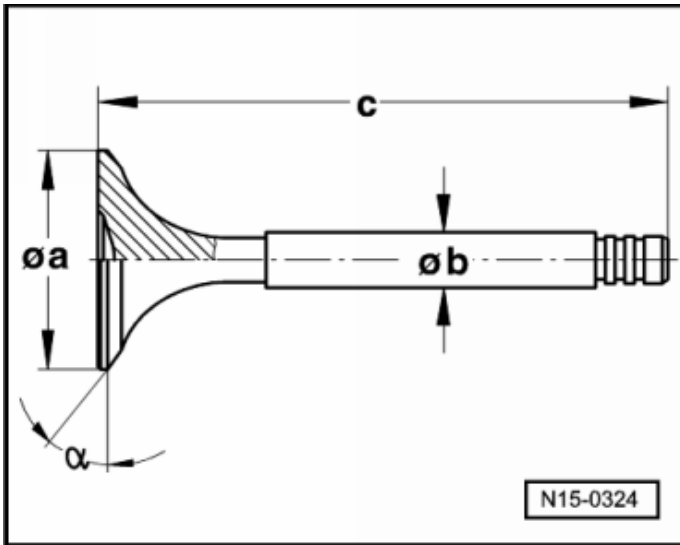
<sup>2)</sup> Install the bolts using liquid locking fluid (D 000 600 A2).

<sup>3)</sup> For bolt clarification, see -items 12 and 23- in the → Chapter „Cylinder Head and Cover Overview“.

## Compression Pressures

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

## Valve Dimensions



### Dimensions for Intake Valve

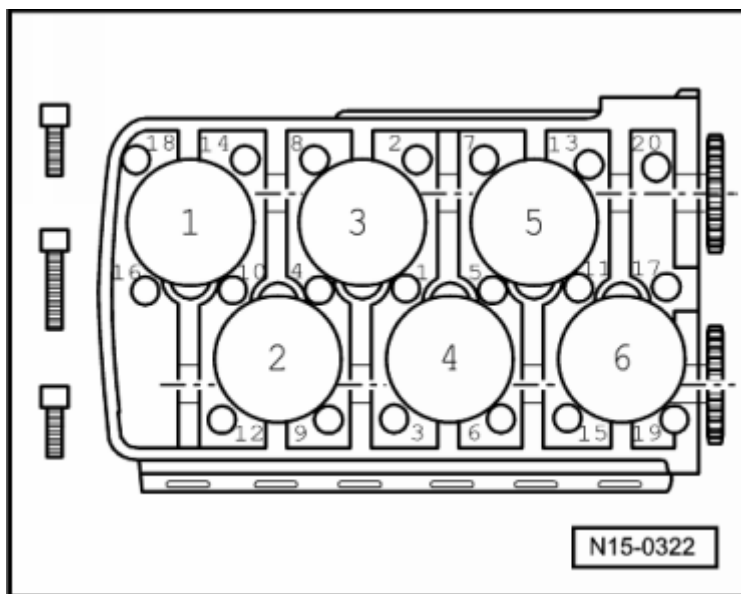
Dimension		Short valve	Long valve
Diameter a	mm	33.20	33.20
Diameter b	mm	5.98	5.98
c	mm	102.46	136.36
$\alpha$	$^{\circ}$	$44^{\circ} 40'$	$44^{\circ} 40'$

### Dimensions for Exhaust Valve

Dimension		Short valve	Long valve
Diameter a	mm	30.20	30.20
Diameter b	mm	5.97	5.97
c	mm	102.20	136.20
$\alpha$	$^{\circ}$	$44^{\circ} 40'$	$44^{\circ} 40'$

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

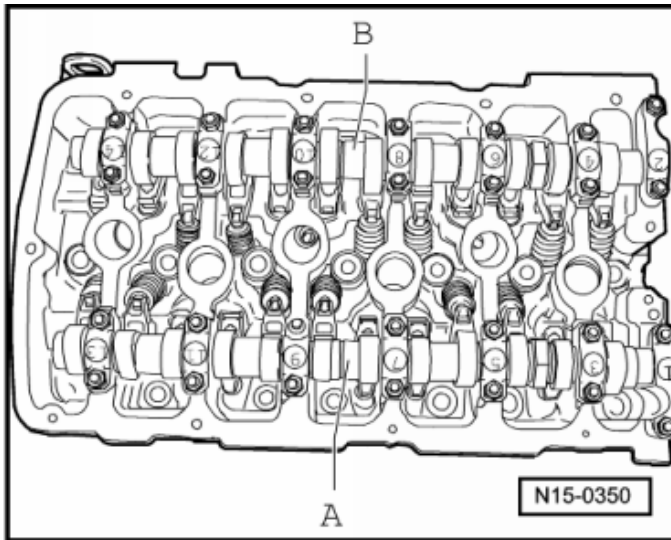
## Cylinder Head Tightening Specifications



Engine –  
3.6L CDVB

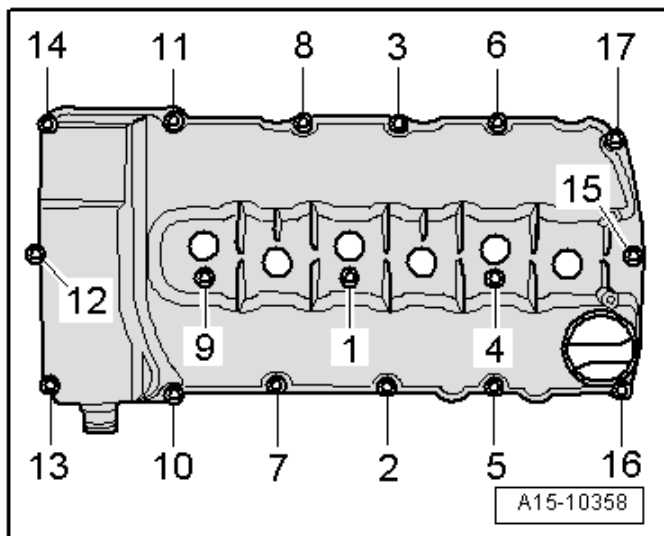
Step	Component	Nm
1	Tighten bolts 1 through 20 in sequence	15
2	Tighten bolts 1 through 20 in sequence	30
3	Tighten bolts 1 through 20 in sequence	an additional 90° (¼ turn)
4	Tighten bolts 1 through 20 in sequence	an additional 90° (¼ turn)

## Camshaft Bearing Cap Tightening Specifications



Step	Component	Nm
<b>A - Intake Camshaft</b>		
1	Alternately tighten bearing caps 5 and 9 and in a diagonal sequence	5 plus an additional 45° (1/8 turn)
2	Alternately tighten bearing caps 1 and 13 in a diagonal sequence	5 plus an additional 45° (1/8 turn)
3	Tighten bearing cap 7	5 plus an additional 45° (1/8 turn)
4	Alternately tighten bearing caps 3 and 11 and in a diagonal sequence	5 plus an additional 45° (1/8 turn)
<b>B - Exhaust Camshaft</b>		
1	Alternately tighten bearing caps 6 and 10 and in a diagonal sequence	5 plus an additional 45° (1/8 turn)
2	Alternately tighten bearing caps 2 and 14 and in a diagonal sequence	5 plus an additional 45° (1/8 turn)
3	Tighten bearing cap 8	5 plus an additional 45° (1/8 turn)
4	Alternately tighten bearing caps 4 and 12 and in a diagonal sequence	5 plus an additional 45° (1/8 turn)

## Cylinder Head Cover Tightening Specification



Engine –  
3.6L CDVB

Step	Component	Nm
1	Tighten bolts 1 through 17 in sequence	10

# Lubrication – 3.6L CDVB

## Fastener Tightening Specifications

Component	Nm
Baffle plate-to-oil pan bolt	10
Engine oil cooler-to-oil filter housing bolt	8
Oil dipstick guide tube-to-intake manifold bolt	6
Oil drain plug cap	10
Oil filter housing cap	25
Oil filter housing-to-cylinder block bolt	23
Oil level thermal sensor-to-oil pan bolt	10
Oil pan drain plug <sup>1)</sup>	30
Oil pan-to-cylinder block bolt	12
Oil pan-to-transmission bolt	45
Oil pipe-to-cylinder block bolt <sup>1)2)</sup>	8
Oil pressure switch-to-oil filter housing	20
Oil pump control piston plug	35
Oil pump-to-cylinder block bolt <sup>1)2)</sup>	8
Oil pump sprocket bolt <sup>1)</sup>	60 plus an additional 90° (¼ turn)
Suction pipe-to-cylinder block bolt <sup>1) 2)</sup>	8

<sup>1)</sup> Replace fastener(s).

<sup>2)</sup> Install using locking compound. Refer to the Electronic Parts Catalog (ETKA).



# Cooling System – 3.6L CDVB

## Fastener Tightening Specifications

Component	Nm
Adapter-to-cylinder block bolt	10
A/C condenser-to-radiator bolt	5
Coolant expansion tank-to-body bolt	2
Coolant pipe-to-timing chain cover bolt	10
Coolant pipe-to-cylinder head bolt	10
Coolant pipe (side, bottom)-to-cylinder block bolt	25
Coolant pipe (side, top)-to-cylinder head bolt	10
Coolant pump-to-cylinder block bolt	8
Coolant pump pulley-to-coolant pump bolt	20
Cylinder head connecting piece bolt	10
Fan shroud nut	10
Engine mount-to-engine mount bracket bolt <sup>1)</sup>	60 plus an additional 90° (¼ turn)
Radiator fan shroud bolt	5
Radiator bracket bolt	5
Rear coolant pipe-to-cylinder head nut	20
Thermostat housing cover bolt	8

<sup>1)</sup> Replace fastener(s).

## Fuel Supply – 3.6L CDVB

### Fastener Tightening Specifications

Component	Fastener size	Nm
Accelerator pedal module-to-body bolt	-	10
Air filter-to-Evaporative Emission (EVAP) canister nut	-	1.8
Evaporative Emission (EVAP) canister-to-body nut	-	8
Fuel filler tube-to-body bolt	-	11
Fuel tank-to-chassis bolt	M6	8 plus an additional 90° (¼ turn)
	M8 <sup>1)</sup>	20 plus an additional 90° (¼ turn)
Fuel tank heat shield nut	-	2.5
Fuel tank locking ring	-	110
Leak Detection Pump (LDP)-to-Evaporative Emission (EVAP) canister screw	-	1.8
Tensioning strap-to-underbody bolt <sup>1)</sup>	-	25

<sup>1)</sup> Replace fastener(s).

## Exhaust System, Emission Controls – 3.6L CDVB

### Fastener Tightening Specifications

Component	Fastener size	Nm
Center muffler bracket-to-underbody bolt	-	23
Clamping sleeve nut	M8	25
	M10	40
Exhaust manifold-to-cylinder head nut <sup>1)</sup>	-	25
Front exhaust pipe-to-exhaust manifold nut	-	40
Heat shield bracket-to-cylinder head bolt	-	20
Heat shield bracket-to-heat shield bolt	-	20
Intake manifold support/heat shield-to-exhaust manifold bolt	-	20
Oxygen Sensor (O2S)	-	50
Suspended mount-to-subframe bolt	-	25
Suspended mount-to-underbody bolt	-	23
Tunnel bridge-to-underbody bolt	-	25

<sup>1)</sup> Replace fastener(s).

# Multiport Fuel Injection – 3.6L CDVB

## Fastener Tightening Specifications

Component	Nm
Air duct-to-lock carrier bolt	5
Air filter housing bracket-to-body bolt	10
Fuel (connecting) pipe-to-fuel rail union nut	28
Fuel pressure sensor-to-fuel rail	22
Fuel pressure sensor-to-pressure sensor tester (VAS 6394)	22
Fuel rail-to-cylinder head bolt <sup>1)</sup>	30 plus an additional 90° (¼ turn)
Fuel supply hose bracket bolt	8
High pressure fuel pipe-to-fuel rail union nut	28
High pressure fuel pipe-to-high pressure fuel pump union nut	28
<b>High pressure fuel pump connection</b>	
- For the low pressure hose	28
- For the high pressure line	40
High pressure fuel pump-to-cylinder head bolt	10
Intake manifold rear support-to-upper intake manifold bolt	20
Low fuel pressure sensor-to-fuel supply line	15
Lower air filter housing nut	8
Lower intake manifold-to-cylinder head bolt	8
Mass Air Flow (MAF) sensor-to-upper air filter housing bolt	2
Pressure relief valve cap-to-fuel rail	22
Pressure sensor tester (VAS 6394)-to-fuel rail	22
Regulator flap-to-lower air filter housing bolt	2
Throttle valve control module-to-upper intake manifold bolt	7
Upper air filter housing-to-lower air filter housing bolt	2
Upper intake manifold-to-intake manifold front support bolt	10
Upper intake manifold-to-lower intake manifold bolt	10
Vent hose-to-upper intake manifold bolt	3.5

<sup>1)</sup> Replace fastener(s).

Engine –  
3.6L CDVB

## Ignition – 3.6L CDVB

### Ignition Technical Data

<b>Engine code</b>	<b>CDVB</b>
Ignition sequence	1-5-3-6-2-4
<b>Spark plugs <sup>1)</sup></b>	
VW/Audi	101 905 622 A
Electrode gap	0.8 to 0.9 mm
Tightening specification	18 Nm
Change intervals	Refer to Maintenance Procedures Rep. Gr. 03 Maintenance Procedures

<sup>1)</sup> Use the spark plug removal tool (3122B) to remove or install spark plugs.

### Fastener Tightening Specifications

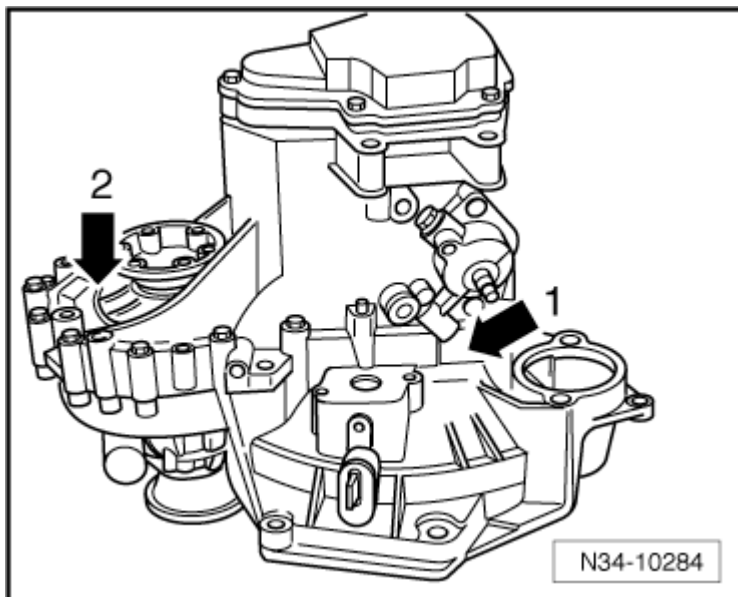
<b>Component</b>	<b>Nm</b>
Camshaft Position (CMP) sensor	10
Harness connector bracket bolt	20
Knock Sensor (KS) <sup>1)</sup>	20
Knock Sensor (KS) bracket bolt	20
Spark plug	18

<sup>1)</sup> Tightening specification affects the function of the Knock Sensor (KS).

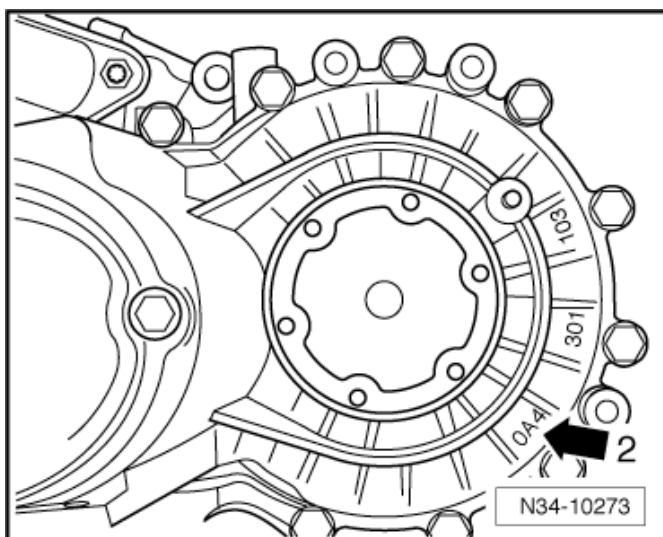
# MANUAL TRANSMISSION – 0A4

## General, Technical Data

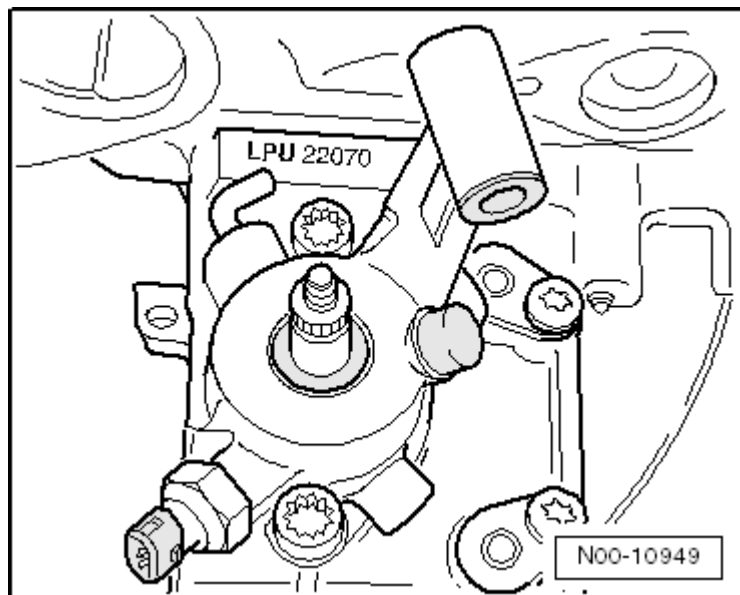
### Transmission Identification



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



Manual transmission 0A4 (2).



Transmission code letters and build date.

**Example:**

<b>LPU</b>	<b>22</b>	<b>07</b>	<b>0</b>
Identification code	Day	Month	Year (2010) of manufacture

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

## Codes Letters, Transmission Allocation and Capacities

Manual transmission		5 Speed Manual Transmission 0A4
Identification code		LPU
Manufactured	from through	from 06.2011
Allocation	Type	Passat from MY 2012
	Engine	2.5 L - 125 kW
Ratio: $Z_2: Z_1$	Final drive	62:17 = 3.647
Manual transmission capacity (transmission completely disassembled)		Refer to the Fluid Capacity Tables Rep. Gr. 03

Refer to the Electronic Parts Catalog (ETKA) for the following information:

- Individual gear ratios
- Transmission fluid specifications
- Clutch disc and pressure plate allocation

## Clutch – 0A4

### Fastener Tightening Specifications

Component	Fastener size	Nm
Ball stud-to-transmission	-	25
Clutch pedal-to-mounting bracket through bolt nut <sup>1)</sup>	-	25
Clutch pedal mounting bracket-to-bulkhead nut <sup>1)</sup>	-	25
Clutch slave cylinder-to-transmission bolt	-	20
Impact bolster support-to-steering column bracket bolt <sup>1)</sup>	-	20
Pressure plate-to-flywheel bolt <sup>2)</sup>	M6	13
	M7	20
Transmission guide sleeve bolt	-	20
Transmission hose/line assembly bracket bolt	-	20
Transmission support-to-transmission bracket/transmission bolt <sup>1)</sup>	-	20 plus an additional 90° (¼ turn)

<sup>1)</sup> Replace fastener(s).

<sup>2)</sup> Loosen and tighten in small steps and in a diagonal sequence.

# Controls, Housing – 0A4

## Fastener Tightening Specifications

Component	Nm
5 <sup>th</sup> gear drive gear-to-output shaft bolt <sup>1)</sup>	80 plus an additional 90° (¼ turn)
5 <sup>th</sup> gear plate spring synchronizer hub with drive gear and synchronizer ring-to-input shaft bolt <sup>1)</sup>	80 plus an additional 90° (¼ turn)
5 <sup>th</sup> gear selector fork base-to-transmission housing bolt	25
5 <sup>th</sup> gearshift jaw-to-selector fork with rail bolt	25
Backup lamp switch-to-shift unit	20
Clutch housing drain plug	35
Flange shaft bolt	25
Gearshift unit with selector cover-to-transmission housing bolt	25
Ground cable-to-upper starter stud bolt	20
Guide sleeve-to-clutch housing bolt	20
Lower starter wires mount	20
Output shaft bearing support-to-clutch housing nut <sup>1)</sup>	25 plus an additional 90° (¼ turn)
Reverse gear selector fork-to-clutch housing bolt	25
Reverse gear shaft support bolt <sup>1)2)</sup>	25 30
Sealing cap-to-transmission housing bolt	25
Shift housing-to-body nut	8
Transmission cable bracket bolt	20
Transmission housing fill plug	35
Transmission housing support pin	25
Transmission housing-to-clutch housing bolt <sup>1)</sup>	25 plus an additional 90° (¼ turn)
Transmission housing cover-to-transmission housing bolt	18
Transmission mount bracket-to-transmission bolt <sup>1)</sup>	40 plus an additional 90° (¼ turn)
Transmission mount-to-transmission mount bracket bolt <sup>1)</sup>	60 plus an additional 90° (¼ turn)
Transmission shift lever-to-shift unit nut <sup>1)</sup>	23
Transmission support-to-transmission bolt <sup>1)</sup>	20 plus an additional 90° (¼ turn)



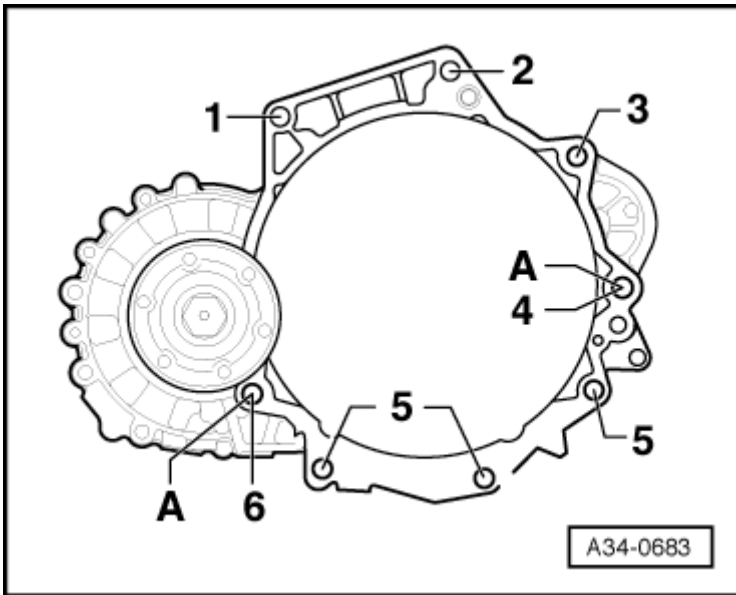
## Fastener Tightening Specifications (cont'd)

Component	Nm
Transmission support-to-transmission mount bracket bolt <sup>1)</sup>	20 plus an additional 90° (¼ turn)
Wire bracket to starter stud bolt nut	20

<sup>1)</sup> Replace fastener(s).

<sup>2)</sup> For bolt clarification, see -items 3, 4 and 10- in the → Chapter „Transmission Housing and Gear Shift Unit Overview“

## Transmission to Engine Tightening Specifications



Manual Trans. –  
0A4

Item	Fastener	Quantity	Nm
1	M 12 x 65	1	80
2	M 12 x 65	1	80
3	M 12 x 170 <sup>1)</sup>	1	80
4	M 12 x 170 <sup>1)</sup>	1	80
5	M 10 x 65	3	40
6	M 12 x 95	1	80
A	Alignment bushings for centering		

<sup>1)</sup> Also starter to transmission

# Gears, Shafts – 0A4

## Fastener Tightening Specification

Component	Nm
Output shaft bearing support-to-clutch housing nut <sup>1)</sup>	25 plus an additional 90° (¼ turn)

<sup>1)</sup> Replace fastener(s).

## Determining Shim Thickness

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

## Adjustment Shim Table

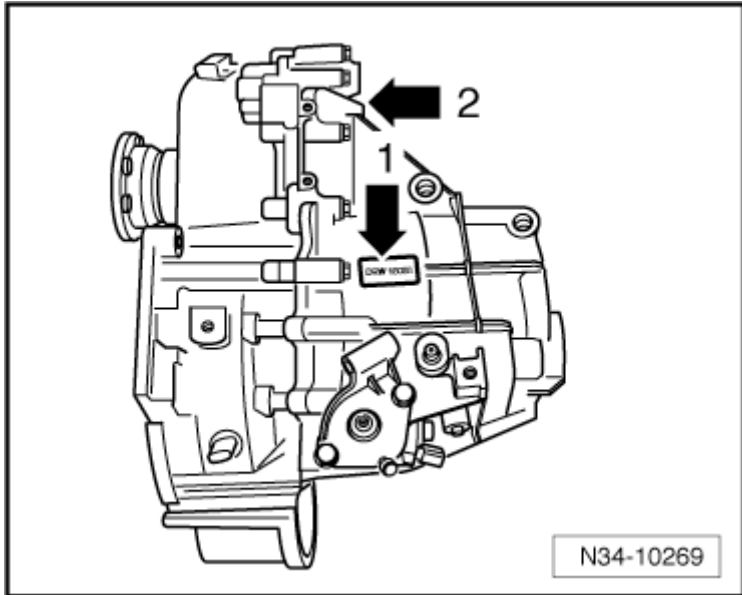
Bearing play	Adjusting shim
Measured value (mm)	Thickness (mm)
0.671 to 0.699	0.650
0.700 to 0.724	0.675
0.725 to 0.749	0.700
0.750 to 0.774	0.725
0.775 to 0.799	0.750
0.800 to 0.824	0.775
0.825 to 0.849	0.800
0.850 to 0.874	0.825
0.875 to 0.899	0.850
0.900 to 0.924	0.875
0.925 to 0.949	0.900
0.950 to 0.974	0.925
0.975 to 0.999	0.950
1.000 to 1.024	0.975
1.025 to 1.049	1.000
1.050 to 1.074	1.025
1.075 to 1.099	1.050
1.100 to 1.124	1.075
1.125 to 1.149	1.100
1.150 to 1.174	1.125
1.175 to 1.199	1.150
1.200 to 1.224	1.175
1.225 to 1.249	1.200
1.250 to 1.274	1.225
1.275 to 1.299	1.250
1.300 to 1.324	1.275
1.325 to 1.349	1.300
1.350 to 1.374	1.325
1.375 to 1.399	1.350
1.400 to 1.424	1.375
1.425 to 1.449	1.400
1.450 to 1.474	1.425
1.475 to 1.499	1.450
1.500 to 1.524	1.475
1.525 to 1.549	1.500
1.550 to 1.574	1.525
1.575 to 1.599	1.550
1.600 to 1.624	1.575
1.625 to 1.649	1.600
1.650 to 1.674	1.625
1.675 to 1.699	1.650
1.700 to 1.724	1.675

NOTE: Refer to the Electronic Parts Catalog  
(ETKA) for the correct shims.

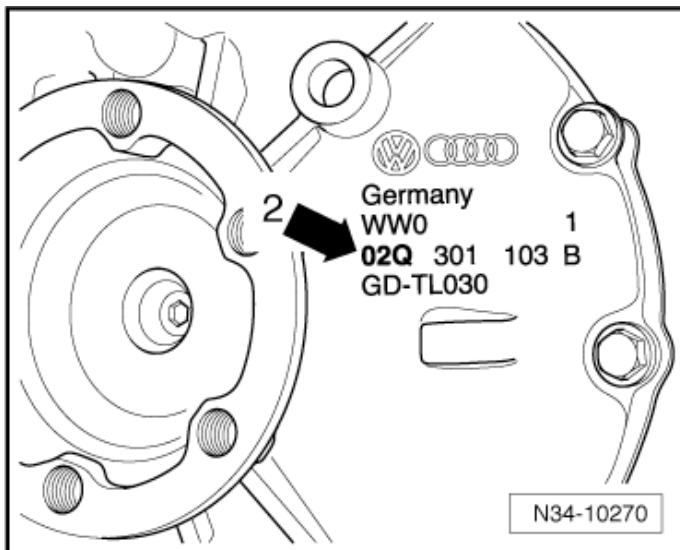
# MANUAL TRANSMISSION – 02Q

## General, Technical Data

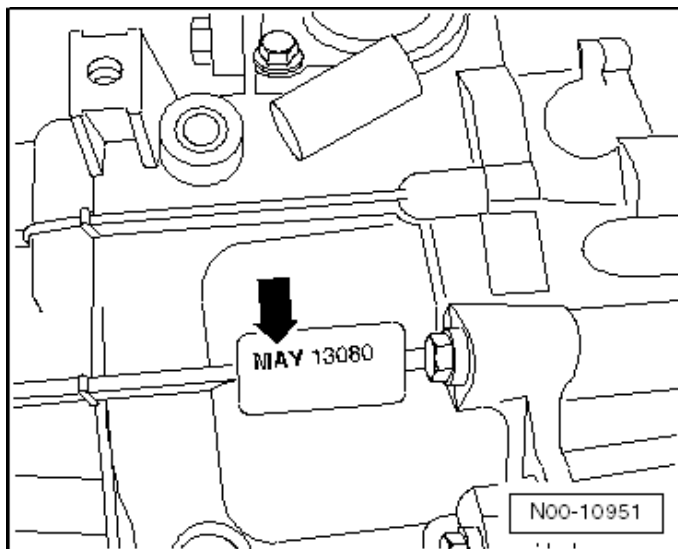
### Transmission Identification



Code letters and build date (1) for the manual transmission 02Q (2).



Manual transmission 02Q (2).



Transmission code letters and build date (➡).

**Example:**

<b>MAY</b>	<b>13</b>	<b>08</b>	<b>0</b>
Identification codes	Day	Month	Year (2010) of manufacture

## Codes Letters, Transmission Allocation and Capacities

Manual Transmission		6-speed 02Q	
Identification codes		MAY	NGB
Manufactured	from through	06.2011	06.2011
Allocation	Type	Passat from MY 2012	Passat from MY 2012
	Engine	2.0L - 103 kW turbo diesel	2.0L - 103 kW turbo diesel
Ratio: $Z_2 : Z_1$	Final drive I <sup>1)</sup>	70:19 = 3.684	70:19 = 3.684
	Final drive II <sup>2)</sup>	70:24 = 2.917	70:24 = 2.917
Drive axle flange diameter		107 mm	107 mm
Capacities for the manual transmission		Refer to the Fluid Capacity Tables Rep. Gr. 03	

<sup>1)</sup> Final drive for 1<sup>st</sup> through 4<sup>th</sup> gear.

<sup>2)</sup> Final drive for 5<sup>th</sup>, 6<sup>th</sup> and reverse gears.

Refer to the Electronic Parts Catalog (ETKA) for the following:

- Individual gear ratios
- Transmission fluid specifications
- Clutch disc and pressure plate allocation

# Clutch – 02Q

## Fastener Tightening Specifications

Component	Fastener size	Nm
Clutch pedal-to-mounting bracket through bolt nut <sup>1)</sup>	-	25
Impact bolster support-to-steering column bracket bolt <sup>1)</sup>	-	20
Mounting bracket-to-bulkhead nut <sup>1)</sup>	-	25
Pressure plate-to-dual mass flywheel bolt <sup>3)</sup>	M6	13
	M7	20
<b>Slave cylinder with release bearing-to-transmission bolt <sup>1) 2)</sup></b>		
- Slave cylinder with metal housing (without locking fluid)	-	12
- Slave cylinder with plastic housing (with locking fluid)	-	15

<sup>1)</sup> Replace fastener(s).

<sup>2)</sup> Carefully tighten diagonally and in small stages so that the slave cylinder bolt tabs do not break off.

<sup>3)</sup> Loosen and tighten in small steps and in a diagonal sequence.

# Controls, Housing – 02Q

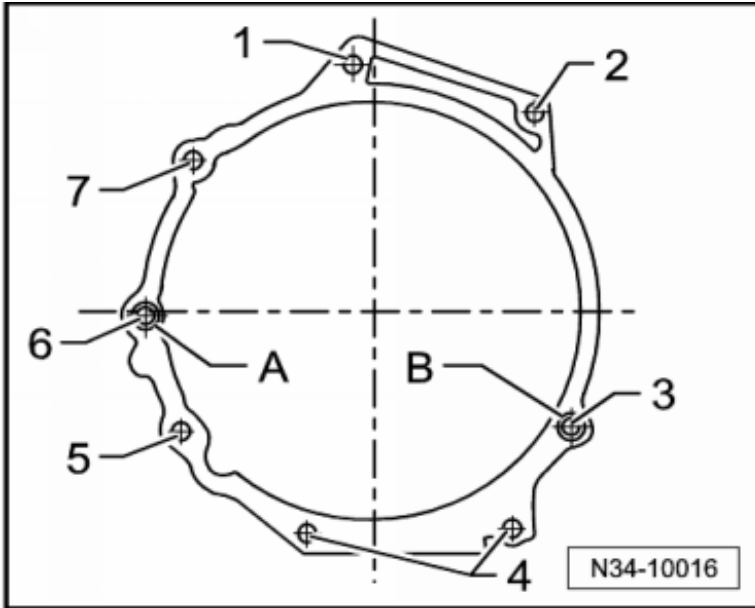
## Fastener Tightening Specifications

Component	Fastener size	Nm
Backup lamp switch-to-transmission housing	-	20
Cable mounting bracket-to-transmission bolt/nut	-	20
Flange shaft countersunk bolt	-	33
Gearshift unit-to-transmission housing bolt <sup>1)</sup>	-	20
Ground cable-to-upper starter bolt		20
Lower starter plug wires mount		20
<b>Oil fill or drain plug</b>		
- Multi-point socket head	-	45
- Hex socket head	-	30
Shift housing-to-body nut	M6	8
	M8	25
<b>Transmission housing locking screw</b>		
- Made of plastic		45
- Made of metal		30
Transmission housing-to-clutch housing bolt	M9	15 plus an additional 180° (½ turn)
Transmission mount bracket-to-transmission bolt <sup>1)</sup>	-	60 plus an additional 90° (¼ turn)
Transmission mount-to-transmission mount bracket bolt <sup>1)</sup>	-	60 plus an additional 90° (¼ turn)
Transmission shift lever-to-shift unit nut <sup>1)</sup>	-	23

<sup>1)</sup> Replace fastener(s).



## Transmission to Engine Tightening Specifications



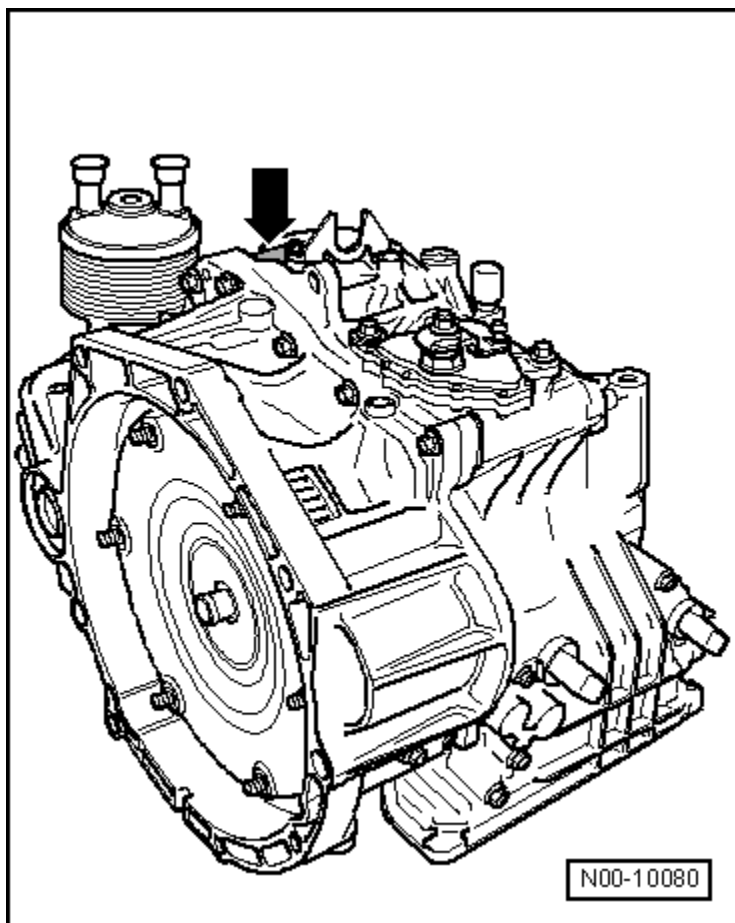
Item	Fastener	Quantity	Nm
1	M12 x 55 (with a short M8 threaded pin) or M12 x 50 (without threaded pin)	1	80
2	M12 x 55 (with a long M8 threaded pin)	1	80
3	M12 x 70 or M12 x 65	1	80
4	M10 x 50	2	40
5	M10 x 105	1	40
6	M12 x 165 (with a short M8 threaded pin) <sup>1)</sup>	1	80
7	M12 x 165 (with a short M8 threaded pin) <sup>1)</sup>	1	80
A	Alignment sleeves for centering		

<sup>1)</sup> Also starter to transmission.

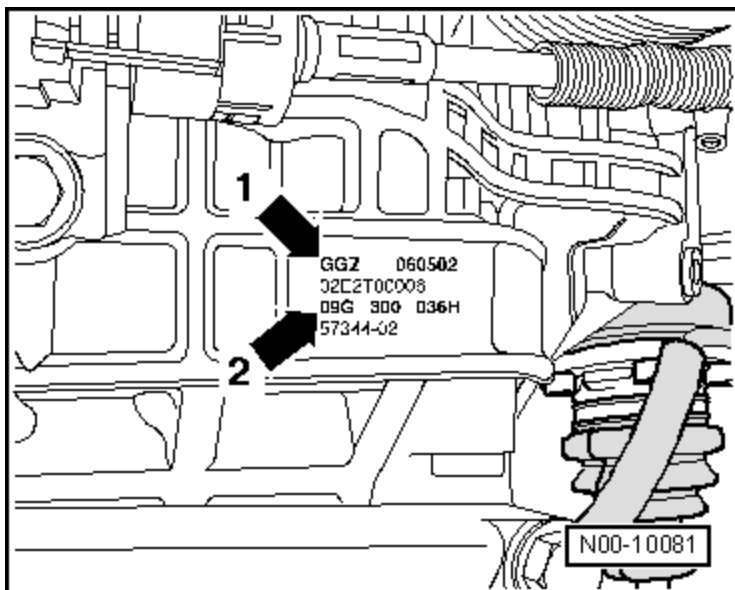
# AUTOMATIC TRANSMISSION – 09G

## *General, Technical Data*

### Identification on Transmission



Code letters (➡).



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

**Example:**

<b>MAN</b>	<b>24</b>	<b>06</b>	<b>10</b>
Identification codes	Day	Month	Year (2010) of manufacture

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

**Engine and Transmission Allocation**

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

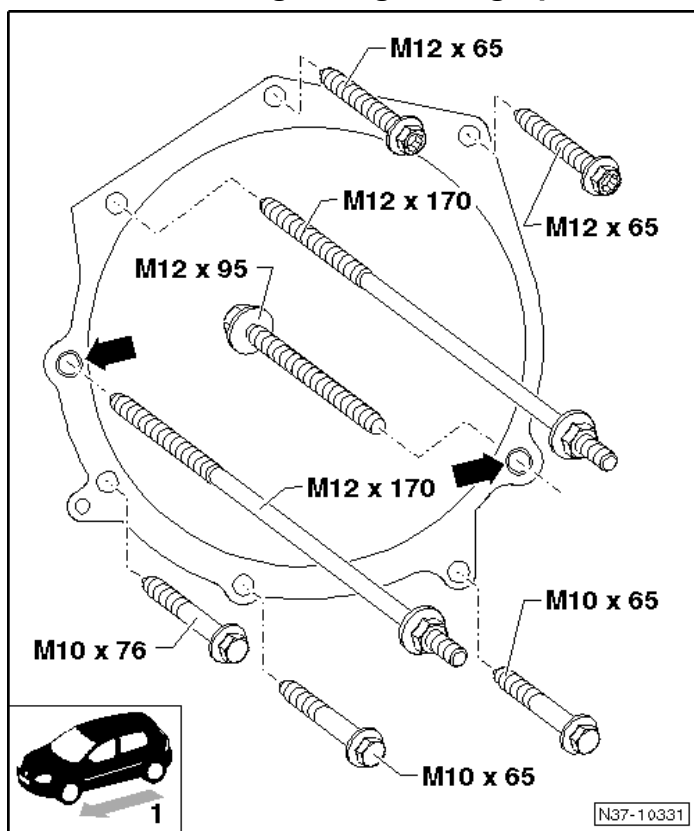
<b>6-Speed automatic transmission 09G</b>	
Transmission code	MAN
Engine	2.5L -125 kW

# **Controls, Housing – 09G**

## **Fastener Tightening Specifications**

<b>Component</b>	<b>Nm</b>
Automatic transmission fluid cooler-to-transmission bolt	36
Multifunction transmission range switch-to-transmission bolt	6
Multifunction transmission range switch-to-transmission nut	7
Selector lever cable adjustment bolt	13
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
Transmission oil pan inspection plug	27

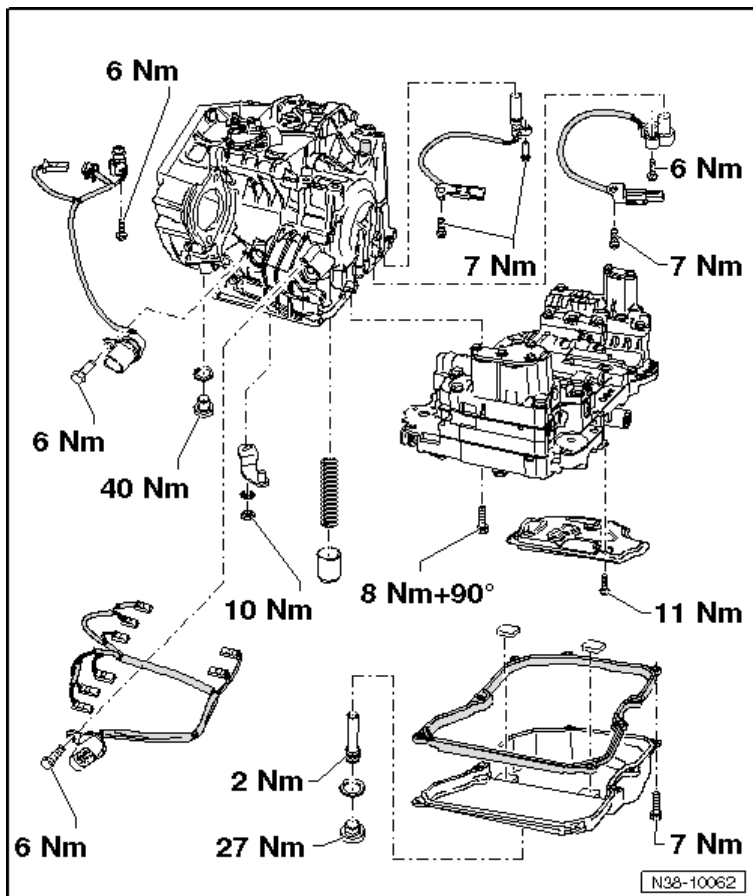
## Transmission to Engine Tightening Specifications



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 (arrow) pins for centering		

# Gears, Hydraulic Controls – 09G

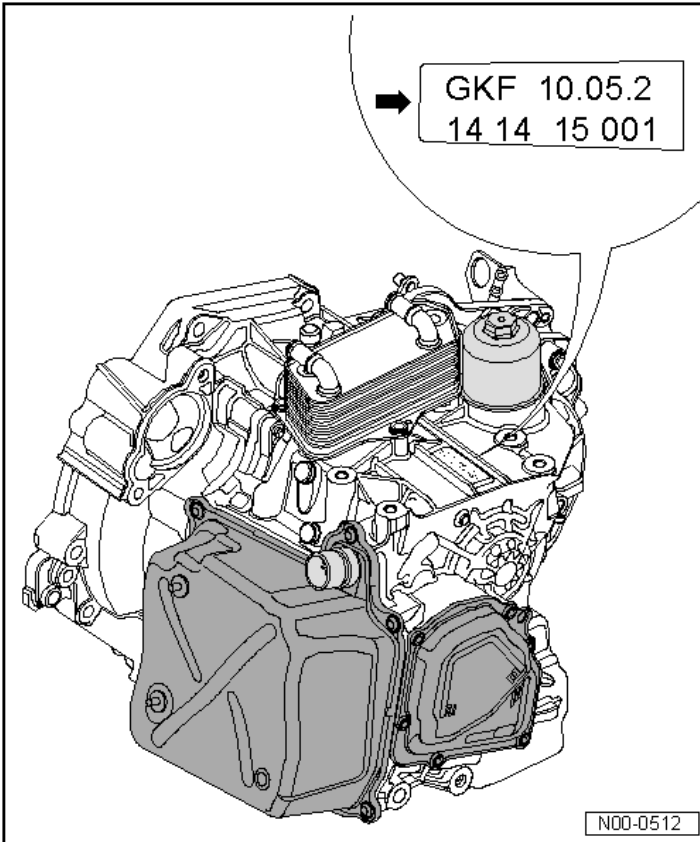
## Fastener Tightening Specifications



# DIRECT SHIFT GEARBOX (DSG) TRANSMISSION – 02E

## General, Technical Data

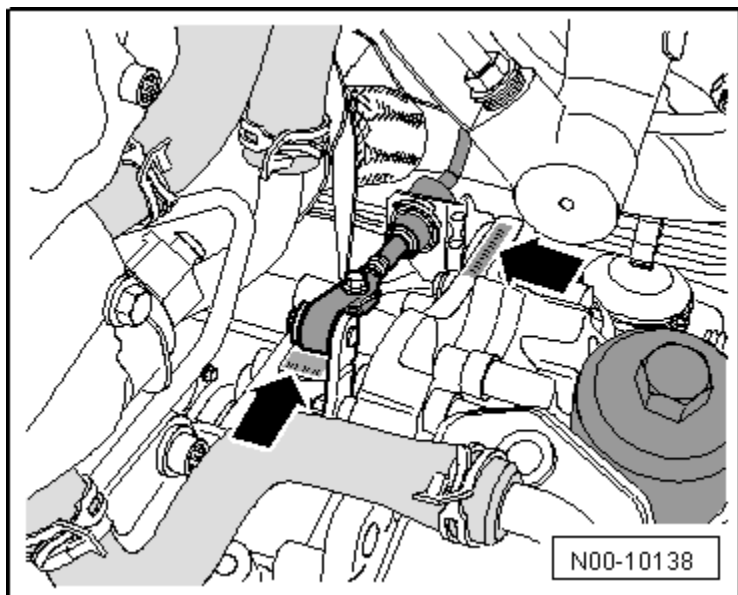
### Identification on Transmission



### Example:

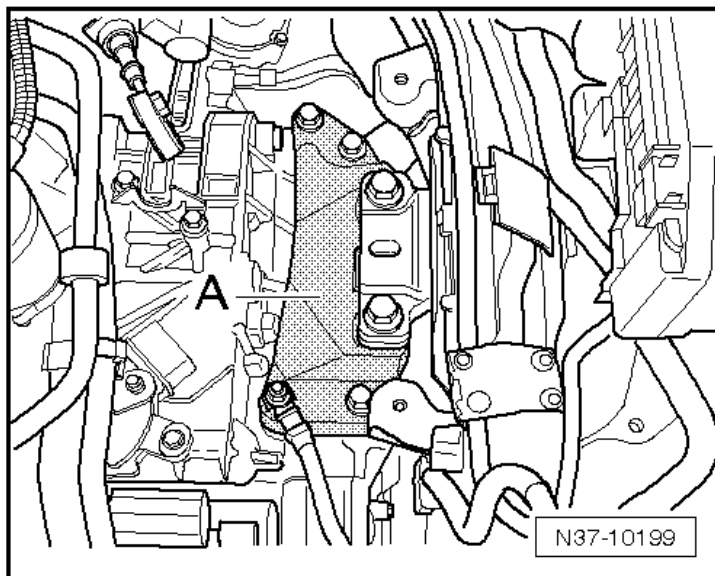
<b>GKF</b>	<b>10</b>	<b>05</b>	<b>10</b>
Identification codes	Day	Month	Year (2002) of manufacture

## Identification on Transmission



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, support the engine and transmission and remove the transmission mount bracket (A). Refer to ElsaWeb for the transmission mount bracket removal procedure.

### Transmission Allocation Codes

<b>Direct Shift Gearbox (DSG®) 02E</b>		
Identification codes	MTA, NJH, NLW	MSV, NJK, NLP
Engine	3.6L - 206 kW FSI	2.0L - 103 kW TDI Common Rail

# Controls, Housing (DSG) – 02E

## Fastener Tightening Specifications

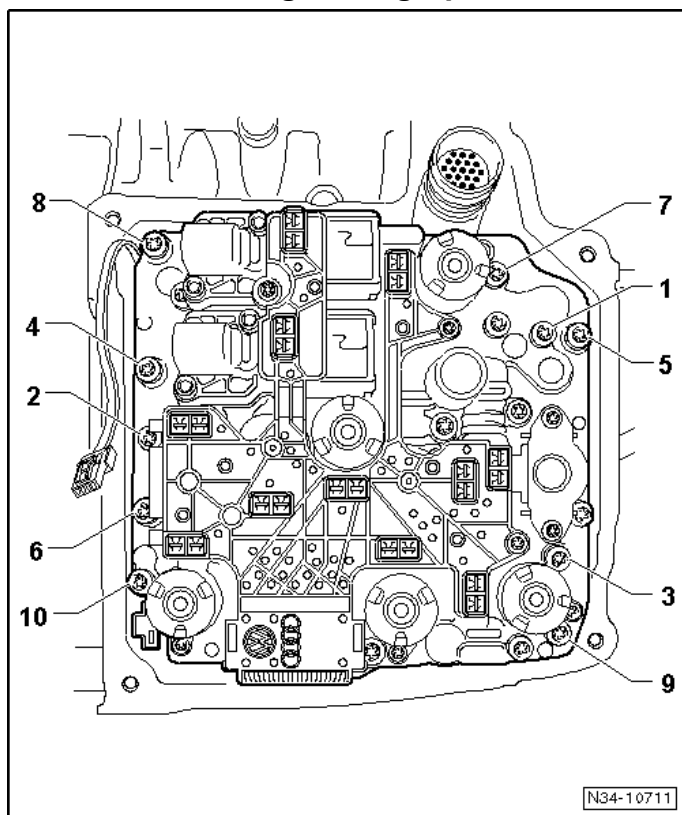
Component	Nm
Cable bracket-to-transmission bolt <sup>1)</sup>	20 plus an additional 90° (¼ turn)
Mechatronic (large) cover bolt <sup>2)</sup>	10
Oil filter housing	20
Oil pump (small) cover bolt <sup>2)</sup>	8
Selector housing-to-body nut	8
Selector mechanism with selector lever and selector lever cable-to-body bolt	8
Selector shaft lever nut	20
Transmission fluid cooler-to-transmission bolt	20 plus an additional 90° (¼ turn)
Transmission fluid drain and check plug-to-transmission	45
Transmission front cover-to-transmission bolt <sup>1)</sup>	16
Transmission input speed and clutch oil temperature sensor bolt	10
Transmission mount bracket -to-transmission bolt <sup>1)</sup>	40 plus an additional 90° (¼ turn)
Transmission mount-to-transmission mount bracket bolt <sup>2)</sup>	60 plus an additional 90° (¼ turn)
Transmission overflow tube	3
Wire bracket-to-Mechatronic (large) cover nut	10

<sup>1)</sup> Replace fastener(s).

<sup>2)</sup> Tighten the bolts diagonally in multiple stages.

## Mechatronic Tightening Specifications

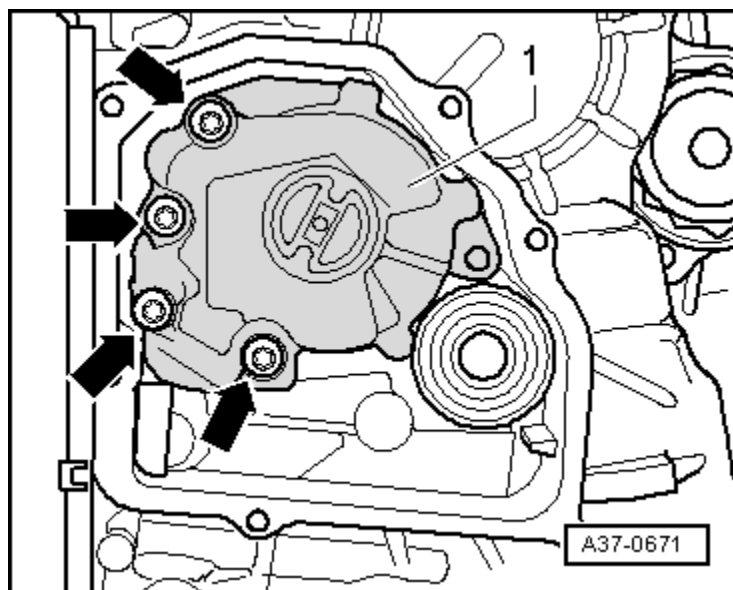
DSG Trans. –  
02E



Step	Component	Nm
1	Tighten bolts 1 through 10 in sequence <sup>1)</sup>	Hand-tighten
2	Tighten bolts 1 through 10 in sequence	5
3	Tighten bolts 1 through 10 in sequence	an additional 90° (¼ turn)

<sup>1)</sup> Replace fastener(s).

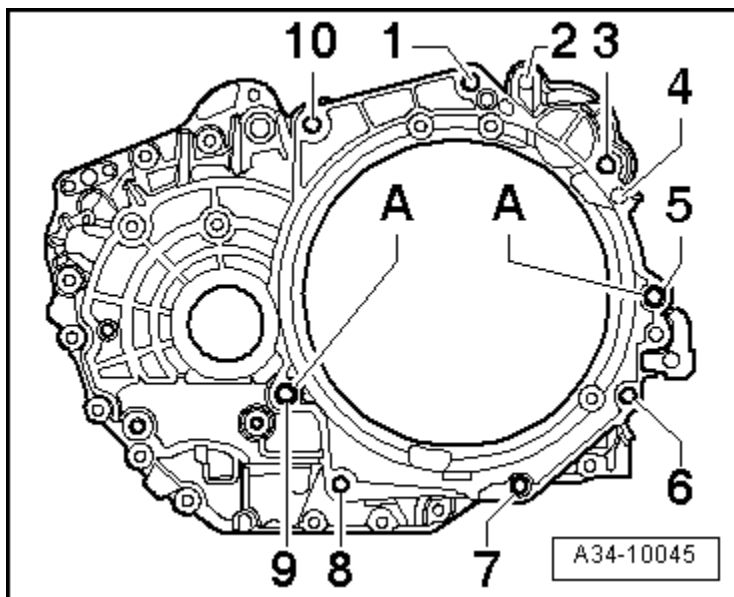
## Oil Pump Tightening Specifications Without Countersunk Bolt



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

## Transmission to Engine Tightening Specifications Diesel Engine

DSG Trans. -  
02E

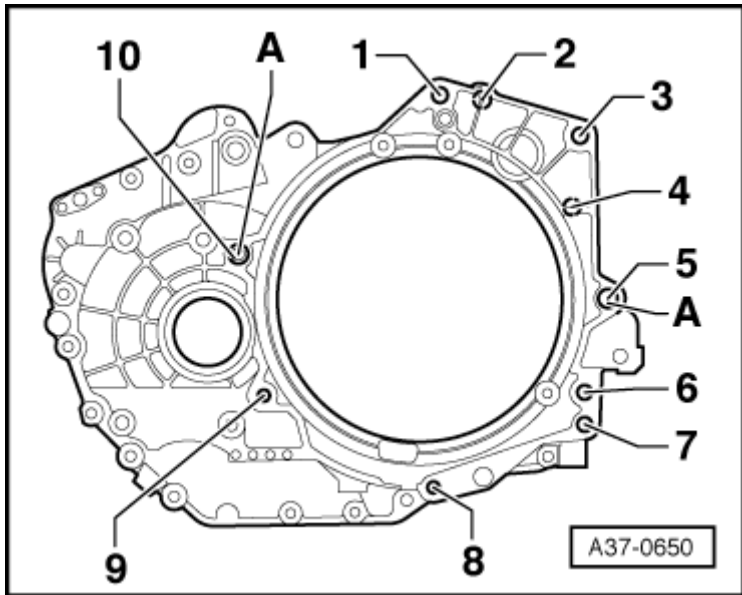


Item	Fastener	Nm
1	M12 x 55	80
2	M10 x 45 <sup>1)</sup>	40
3	M12 x 55 <sup>2)</sup>	80
4	M10 x 45 or M10 x 40 <sup>1)</sup>	40
5	M12 x 65 or M12 x 70	80
6	M10 x 50	40
7	M10 x 50	40
8	M10 x 50	40
9	M12 x 65 or M12 x 70	80
10	M12 x 55	80
A	Alignment sleeves for centering	

<sup>1)</sup> Also starter to transmission.

<sup>2)</sup> Is accessible only through the opening for the starter.

## Gas Engine



Item	Fastener	Nm
1	M12 x 55	80
2	M10 x 45 <sup>1)</sup>	40
3	M12 x 55	80
4	M10 x 45 <sup>1)</sup>	40
5	M12 x 55 <sup>2)</sup>	80
6	M12 x 55	80
7	M10 x 50	40
8	M10 x 50	40
9	M10 x 45 <sup>2)</sup>	40
10	M12 x 65 <sup>2)</sup>	80
A	Alignment sleeves for centering	

<sup>1)</sup> Also starter to transmission.

<sup>2)</sup> Installed from the engine side.

# 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
Connecting link-to-stabilizer bar nut <sup>1)</sup>	-	65
Connecting link-to-suspension strut nut <sup>1)</sup>	-	65
Constant Velocity (CV) joint boot clamp	-	25
Control arm-to-subframe bolt <sup>1)</sup>	M12 x 1.5 x 80	70 plus an additional 90° (¼ turn)
Drive axle heat shield bolt	-	25
<b>Drive axle-to-transmission bolt <sup>1)</sup></b>		
- With Constant Velocity (CV) joint (VL100)	M8	40
- With Constant Velocity (CV) joint (VL100)	M10	70
- With Constant Velocity (CV) joint (VL107) <sup>3)</sup>	M10 x 52	70
- With triple roller joint (AAR3300i) <sup>3)</sup>	M10 x 23	70
<b>Drive axle-to-wheel hub bolt <sup>1)</sup></b>		
- Grade 10.9 bolt		70 plus an additional 90° (¼ turn)
- Grade 8.8 bolt		200 plus an additional 180° (½ turn)
Pendulum support-to-subframe bolt <sup>1) 2)</sup>	M14 x 1.5 x 70	100 plus an additional 90° (¼ turn)
Pendulum support-to-transmission bolt <sup>1)</sup>	-	50 plus an additional 90° (¼ turn)
Shock absorber-to-suspension strut bearing nut <sup>1)</sup>	-	60
Stabilizer bar-to-subframe bolt <sup>1)</sup>	-	20 plus an additional 90° (¼ turn)

## Fastener Tightening Specifications (cont'd)

Component	Fastener size	Nm
Subframe-to-body bolt <sup>1)</sup>	-	70 plus an additional 180° (½ turn)
Suspension strut-to-body bolt <sup>1)</sup>	-	15 plus an additional 90° (¼ turn)
Suspension strut-to-wheel bearing housing nut <sup>1)</sup>	-	70 plus an additional 90° (¼ turn)
Wheel bearing housing cover plate bolt	-	12
Wheel hub-to-wheel bearing housing bolt <sup>1)</sup>	-	70 plus an additional 90° (¼ turn)

<sup>1)</sup> Replace fastener(s).

<sup>2)</sup> Tighten only when the pendulum support is bolted to the transmission.

<sup>3)</sup> First tighten diagonally to 10 Nm, then tighten diagonally again to the tightening specification.



# Rear Suspension

## Fastener Tightening Specifications

Component	Nm
ABS wheel speed sensor-to-wheel bearing housing bolt	8
Brake disc-to-wheel hub bolt	4
Coupling rod-to-stabilizer bar nut <sup>1)</sup>	45
Coupling rod-to-wheel bearing housing nut <sup>1)</sup>	45
Left rear level control system sensor bolt (M5 x 20)	5
Lower transverse link-to-subframe nut <sup>1)2)</sup>	120
Lower transverse link-to-wheel bearing housing nut <sup>1)2)</sup>	70 plus an additional 180° (½ turn)
Shock absorber-to-body bolt <sup>1)</sup>	50 plus an additional 45° (½ turn)
Shock absorber-to-shock absorber mounting nut <sup>1)</sup>	25
Shock absorber-to-wheel bearing housing bolt	180
Stabilizer bar-to-subframe bolt <sup>1), 2)</sup>	25 plus an additional 90° (¼ turn)
Stone protection plate-to-lower transverse link bolt	8
Subframe-to-body bolt <sup>1)</sup>	90 plus an additional 180° (½ turn)
Tie rod-to-subframe nut <sup>1), 2)</sup>	70 plus an additional 180° (½ turn)
Tie rod-to-wheel bearing housing bolt <sup>1)2)</sup>	130 plus an additional 180° (½ turn)
Trailing arm mounting bracket-to-body bolt <sup>1)</sup>	50 plus an additional 45° (½ turn)
Trailing arm-to-mounting bracket bolt <sup>1)</sup>	90 plus an additional 90° (¼ turn)
Trailing arm-to-wheel bearing housing bolt <sup>1)3)</sup>	90 plus an additional 90° (¼ turn)
Upper transverse link-to-subframe nut <sup>1)2)</sup>	120
Upper transverse link-to-wheel bearing housing bolt <sup>1)2)</sup>	130 plus an additional 180° (½ turn)
Wheel bearing housing cover plate bolt	12

## Fastener Tightening Specifications (cont'd)

Component	Nm
Wheel hub-to-wheel bearing housing bolt <sup>1)</sup>	180 plus an additional 180° (½ turn)

<sup>1)</sup> Replace fastener(s).

<sup>2)</sup> Always tighten threaded connections in curb weight position. Refer to ElsaWeb, *Rear Axle, Lifting to Curb Weight Position*.

<sup>3)</sup> For bolt tightening clarification, refer to ElsaWeb, *Trailing Arm with Mounting Bracket*.

## Self-Leveling Suspension

### Fastener Tightening Specification

Component	Fastener Size	Nm
Left Rear Level Control System Sensor - G76- to lower transverse link and subframe	-	5

## Wheels, Tires

### Fastener Tightening Specification

Component	Nm
Wheel bolts-to-wheel hub for all vehicles	140

# Wheel Alignment Data

## Wheel Alignment Specified Values

Specified values valid for all engine versions

Front suspension	Basic suspension	Comfort suspension
Production Relevant No. (PR. No.)	G02; G11	G05
Total toe (wheels not pressed)	10' ± 10'	10' ± 10'
Camber (wheels in straight ahead position)	-30' ± 30'	-21' ± 30'
Maximum permissible difference between both sides	30'	30'
Toe-out angle <sup>1)</sup> with steering wheel turned 20° to left and right	1°33' ± 20'	1°14' ± 20'
Caster	7° 55' ± 30'	7° 27' ± 30'
Maximum permissible difference between both sides	30'	30'
Standing height (mm)	397 ± 10	407 ± 10

<sup>1)</sup> Depending on the manufacturer, the toe out angle difference can also be indicated negatively in the alignment computer.

Rear suspension	Basic suspension	Comfort suspension
Camber	-1° 20' ± 30'	-1° 20' ± 30'
Maximum permissible difference between both sides	30'	30'
Total toe (at prescribed camber)	+10' ± 10'	+10' ± 10'
Maximum permissible deviation from direction of rotation	20'	20'
Standing height (mm)	396 ± 10	406 ± 10

Suspension,  
Wheels, Steering

# Steering

## Fastener Tightening Specifications

Component	Fastener size	Nm
Belt pulley-to-power steering pump bolt (5-cylinder engine)	-	22
Power steering pump bracket bolt (5-cylinder engine)	-	22
Pressure line-to-power steering pump (5-cylinder engine)	-	32
Steering gear-to-subframe bolt <sup>1)</sup>	-	50 plus an additional 90° (¼ turn)
<b>Steering gear heat shield bolt</b>		
- Electromechanical or hydraulic power steering	-	6
- Hydraulic power steering	-	23
Steering column-to-assembly carrier with bracket bolt <sup>1) 2)</sup>	-	20
Steering column-to-steering gear bolt <sup>1)</sup>	M8 x 35	30
Steering wheel-to-steering column bolt <sup>1)</sup>	-	30 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 <sup>1)</sup>	M12 x 1.5	20 plus an additional 90° (¼ turn)

<sup>1)</sup> Replace fastener(s).

<sup>2)</sup> For bolt tightening clarification, refer to ElsaWeb, *Steering Column*.

# BRAKE SYSTEM

## General, Technical Data

### Brake PR Number, Allocation

NOTE: The following tables show the PR number code key. This is important in order to know the brake caliper/brake disc and brake pad combination.

#### Front Brakes

Engine version	PR Number	Front wheel brake
2.0 103 kW TDI	1ZA/1ZB/1LV	FN 3 (16")
2.5L 125 kW		
3.6L 206 kW		

#### Rear Brakes

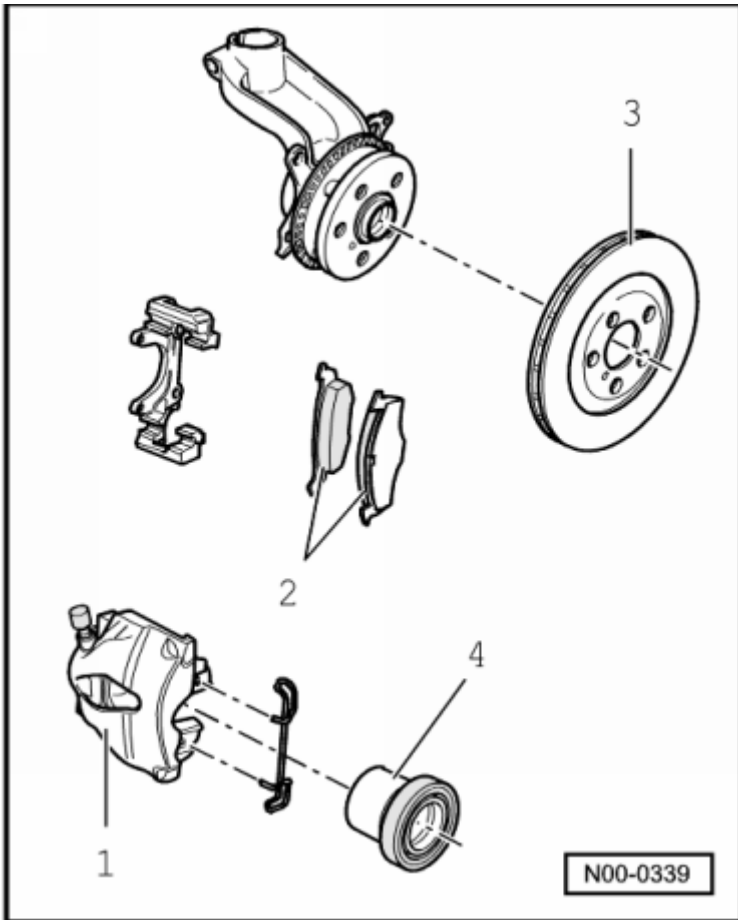
Engine version	PR Number	Rear wheel brake
2.0 103 kW TDI	1KS/1KT	Bosch
2.5L 125 kW		
3.6L 206 kW		

#### Brake Master Cylinder and Brake Booster

Master brake cylinder <sup>1)</sup>	Diameter in mm	22.2
Master brake cylinder <sup>1)</sup>	Diameter in mm	23.81
Brake booster (left hand drive)	Diameter in inches	10

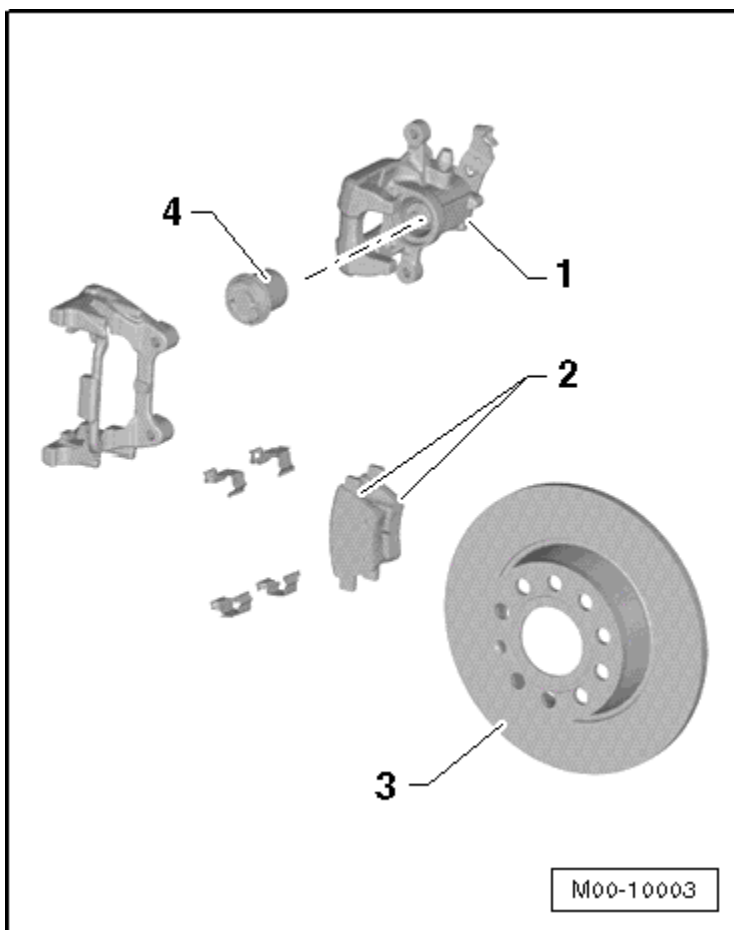
<sup>1)</sup> Allocation, refer to the Electronic Parts Catalog (ETKA).

## Front Brakes



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 disc	Diameter in mm	312
	Brake disc thickness	mm	25
	Brake disc wear limit	mm	22
4	Brake caliper piston	Diameter in mm	54

## Rear Brakes



Brake System

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 disc thickness	mm	10
	Brake disc, lateral runout	mm	0.05
4	Brake caliper piston	Diameter in mm	38

# Anti-lock Brake System (ABS)

## Fastener Tightening Specifications

Component	Nm
ABS control module (w/EDL)-to-ABS hydraulic unit	2 ± 0.8
ABS hydraulic unit bracket bolt	8
ABS hydraulic unit bracket-to-body nut	8
ABS wheel speed sensor-to-wheel bearing housing bolt	8
Brake line-to-ABS hydraulic unit	14
Steering angle sensor-to-steering column bolt	1.5
Steering wheel-to-steering column bolt <sup>1)</sup>	30 plus an additional 90° (¼ turn)

<sup>1)</sup> Replace fastener(s).

# Mechanical Components

## Fastener Tightening Specifications

Component	Nm
ABS wheel speed sensor-to-wheel bearing housing bolt	8
Brake disc-to-wheel hub bolt	4
Brake hose-to-brake caliper	35
Brake pedal-to-mounting bracket nut <sup>1)</sup>	25
Brake pedal mounting bracket-to-body bolt <sup>1), 2)</sup>	25
Cover plate with stub axle on the twist beam rear suspension bolt	30 plus an additional 90° (¼ turn)
Crash bolster	20
Front brake caliper guide pin	30
Front brake carrier-to-wheel bearing housing bolt	200
Parking brake lever adjustment bolt	25
Parking brake lever-to-body nut	25
Parking brake quick adjustor bolt	25
Rear brake caliper-to-brake carrier bolt	35
Rear brake carrier-to-wheel bearing housing bolt <sup>1)</sup>	90 plus an additional 90° (¼ turn)
Wheel bearing housing cover plate bolt	12

<sup>1)</sup> Replace fastener(s).

<sup>2)</sup> For bolt tightening clarification, refer to ElsaWeb, *Mounting Bracket*.



# Hydraulic Components

## Fastener Tightening Specifications

Component	Nm
Battery tray to the body	20
Brake booster-to-pedal assembly nut <sup>1)</sup>	25
Brake caliper bleeder valve	10
Brake light switch bolt	5
Brake line-to-master cylinder	14
Front brake caliper guide pin	30
Master cylinder-to-brake booster nut <sup>1)2)</sup>	25
Rear brake caliper bolt <sup>1)</sup>	35

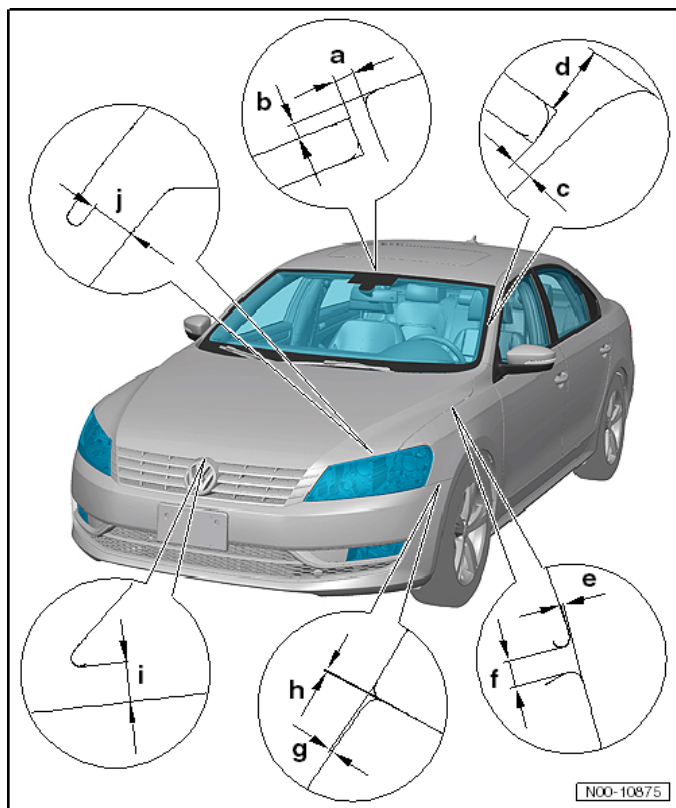
<sup>1)</sup> Replace fastener(s).

<sup>2)</sup> Follow the tightening sequence. Refer to the brake booster installation procedure.

# BODY

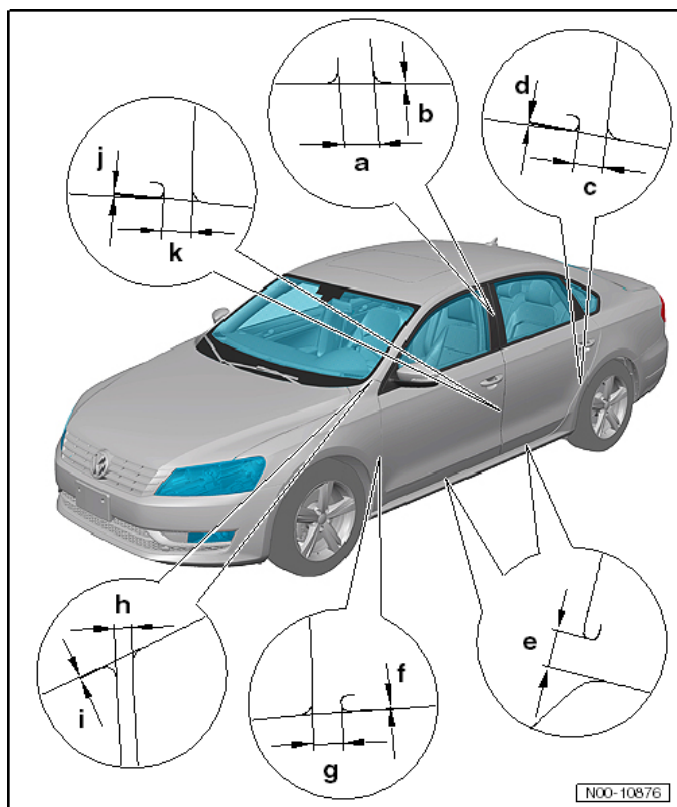
## Air Gap Body Dimensions

### Body, Front



Component	Gap (mm)
a	$2.5 \pm 0.5$
b	$2.0 \pm 1.0$
c	$2.5 \pm 1.0$
d	$8.5 \pm 0.5$
e	$0.0 \pm 0.5$
f	$3.0 \pm 0.5$
g	$0.5 \pm 0.5$
h	$0.0 + 0.5$
i	$5.0 \pm 0.5$
j	$6.0 \pm 0.5$

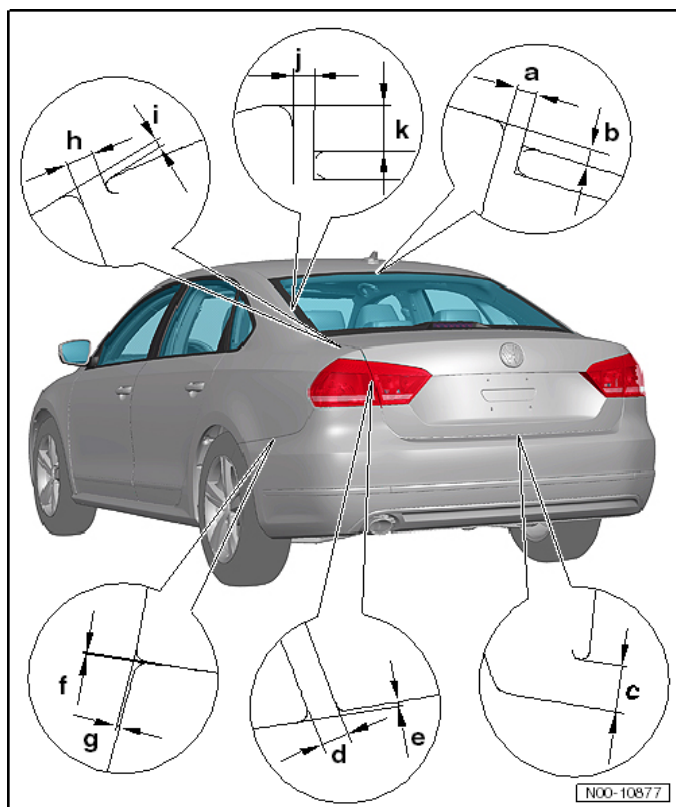
## Body, Center



Component	Gap (mm)
a	4.5 ± 1.0
b	0.0 +1.0
c	3.5 ± 0.5
d	0.0 + 1.0
e	4.5 ± 1.0
f	0.0 - 1.0
g	3.5 ± 0.5
h	2.0 ± 1.0
i	0.1 ± 0.5
j	0.0 + 1.0
k	3.5 ± 0.5

Body

## Body, Rear



Component	Gap (mm)
a	$2.5 \pm 0.5$
b	$2.0 \pm 0.5$
c	$5.5 \pm 0.5$
d	$3.5 \pm 1.0$
e	$0.5 \pm 0.5$
f	$0.0 + 0.5$
g	$3.5 \pm 0.5$
h	$3.5 \pm 0.5$
i	$1.0 \pm 0.5$
j	$2.5 \pm 0.5$
k	$5.5 \pm 0.5$

# Body Exterior

## Lock Carrier Tightening Specifications

Component	Nm
Air guide channel bolts	2 ± 0.3
Bumper carrier bolts <sup>1)</sup>	8 ± 0.8
	12 ± 1.2
	60 ± 6
Carrier piece bolts	8 ± 0.8
Lock carrier support bolts	12

<sup>1)</sup> For bolt tightening clarification, refer to ElsaWeb, *Lock Carrier Attachments Assembly Overview*.

## Front Fender Tightening Specifications

Component	Nm
Front fender bolts	7.5
Front fender brace bolts	7.5

## Trim, Noise Insulation Tightening Specifications

Component	Nm
Battery tray nuts	2
Noise insulation (rear) bolt	6 ± 1.0
Noise insulation (side) bolt	2 ± 0.4
Sill panel cover bolts	2
Tunnel bridge bolts	20
Underbody cover nuts	2
Wheel housing liner bolts	2

## Front Hood, Plenum Chamber Tightening Specifications

Component	Nm
Hood hinge bolts	22
Hood latch bolts	12
Hood release bolts	1.5
Striker pin bolts	18

## Rear Lid, Fuel Filler Door Tightening Specifications

Component	Nm
Fuel filler door unit bolts	1.5
Rear lid handle release button nuts	6
Rear lid hinge-to-lid bolts	12
Rear lid hinge-to-body bolts	22
Rear lid latch striker bolts	18

## Rear Lid, Fuel Filler Door Tightening Specifications (cont'd)

Component	Nm
Rear lid latch nuts	12
Rear lid striker bolts	18

## Front and Rear Door Tightening Specifications

Component	Nm
Door bracket bolt	1.5 – 3.0
Door hinge bolts <sup>2)</sup>	9
	20 plus an additional 90° (¼ turn) <sup>1)</sup>
	23
	30
	40
Door lock bolts	18
Door lock cylinder bolt	3 ± 0.5
Door strap bolt (body side)	9
Door striker pin bolts	20
Rear door handle bracket bolt	1
Window regulator motor bolts	3
Window regulator nuts	8

<sup>1)</sup> Replace fastener(s).

<sup>2)</sup> For bolt tightening clarification, refer to ElsaWeb, *Front or Rear Door Hinge Assembly Overview*.

## Sunroof Tightening Specifications

Component	Nm
Assembly unit bolts	8
Glide piece	1
Panel seal bolts	7
Sunroof drive bolts	4
Sunroof motor bolt	4
Sunshade bolts	1.0

## Front Bumper Tightening Specifications

Component	Nm
Bumper carrier bolts <sup>1)</sup>	8 ± 0.8
	12 ± 1.2
	60 ± 6
Bumper cover bolts	2 ± 0.2
Guide bolts	8 ± 0.8

<sup>1)</sup> For bolt tightening clarification, refer to ElsaWeb, *Front Bumper Cover Assembly Overview*, items 2, 3, and 4.

## Rear Bumper Tightening Specifications

Component	Nm
Rear bumper carrier bolts	20 ± 0.3
Rear bumper cover bolts	2 ± 0.2
Rear bumper nuts	3 ± 0.3

## Glass, Window Regulators Specifications

Component	Nm
Front door window regulator motor bolt	3
Front door window regulator	8
Rear door window regulator motor bolt	3
Rear door window regulator	8

## Mirror, Roof Rail Tightening Specifications

Component	Nm
Adjusting motor screws	2
Exterior rearview mirror housing bolt	8
Roof rail bolts	20

## *Body Interior*

### Storage Compartments, Covers and Trim Tightening Specifications

Component	Nm
Armrest	1.5
Center console mounting bracket nuts	8
Footwell trim bolts	1.5
Front console mounting bracket bolts	2
Glove compartment bolts	1.5
Multimedia box bracket bolts	1.5
Roof grab handle bracket bolts	4.5
Sill panel trim bolts	2
Steering column trim bolts	2.5
Storage compartment /ashtray bolts	1.5
Storage compartment in roof trim panel bolts	1.2
Trim screws	1.5

## Instrument Panel and Crossmember Tightening Specifications

Component	Nm
Instrument panel cross member bolts <sup>1)</sup>	1.5
	4.5
	9
	20

<sup>1)</sup> For bolt tightening clarification, refer to ElsaWeb, *Instrument Panel Crossmember Assembly Overview*.

## Passenger Protection Fastener Tightening Specifications

Component	Nm
Airbag control module nuts	1.5
Airbag crash sensor	9
Belt anchor bolt	40
Belt end fitting bolt	8
Front belt height adjustment bolt	40
Front belt latch bolt <sup>1)</sup>	20
Front passenger airbag bolts	8
Front seat belt relay bolt	40
Passenger occupant detection system control module bolts	1.5
Rear belt latch	40
Rear center belt latch bolt	40
Rear dual seat belt latch bolt	40
Rear seat belt end fitting bolt	40
Seat belt height adjuster	20
Side airbag bolts	9
Three-point seat belt	40

<sup>1)</sup> Replace fastener(s).



## Interior Trim Fastener Tightening Specifications

Component	Nm
A-pillar trim bolts	4.5
B-pillar trim bolts	4.5
C-pillar trim screws	2
Front door trim bolts	2
Rear lid trim screws	1.5
Roof grab handle bracket	4.5

## Seat Frames Fastener Tightening Specifications

Component	Nm
Front seat backrest bolts	35
Front seat frame bolts	40
Height adjustment trim piece	3
Seat bracket bolts	8
Seat drawer mount bolts	8
Trim screws	2 - 3

# HEATING, VENTILATION and AIR CONDITIONING

## *General, Technical Data*

### Refrigerant Oil Distribution

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

## Refrigerant R134a Vapor Pressure Table

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

## Heating, Ventilation

### Fastener Tightening Specifications

Component	Nm
Auxiliary heater heating element connector nut	9 ± 1
Heater core cover	1.5
Heater core hose clamps	2

## Air Conditioning

### Fastener Tightening Specifications

Component	Nm
A/C compressor mounting bolts	23
Condenser-to-radiator bolts	5
Defroster door motor	1.5
Evacuating and charging valve insert	2
Expansion valve bolts	5
Fresh air blower control module	2
Fresh air/recirculating air/back pressure door motor	1.5
Fluid reservoir with dryer cartridge	4.2 ± 0.7
Front A/C display control head	1.5
Front air distribution door motor	1.5
Heater and A/C unit-to-instrument panel cross member nuts	9
Heater and A/C unit-to-retaining bracket bolts	9
Left temperature door motor	1.5
Refrigerant lines-to-A/C compressor bolts	22
Refrigerant lines-to-condenser bolts	12
Refrigerant lines-to-expansion valve	12
Right temperature door motor	1.5
Schrader valve insert	2.4 ± 0.2
Upper to lower heat and A/C unit housing bolts	1.5
Valve With M12 x 1.5 mm External Threads and Groove for O-ring	7 ± 1

# ELECTRICAL SYSTEM

## *Communication*

### Fastener Tightening Specifications

Component	Nm
Amplifier module carrier-to-tunnel screws	1.2
Amplifier module carrier-to-bracket screws	6
Amplifier module carrier bracket nuts	6
Antenna module-to-pillar	2
Radio/RNS	1.5
Roof antenna	7 +1
Subwoofer	2
Treble speaker	2

# Electrical Equipment

## Battery, Starter, Generator, Cruise Control Fastener Tightening Specifications

Component	Fastener size	Nm
Air filter housing-to-body bolt	-	10
B+ wire connection-to-generator	-	20
B+ wire and pyrotechnic battery isolator nut	-	15
B+ wire-to-starter <sup>3)</sup>	M8	20
B+ wire-to-starter <sup>4) 5)</sup>	M8	15
Battery hold down clamp bolt <sup>1)</sup>	M8	20
Battery hold down clamp bolt <sup>2)</sup>	M8 x 35	35
Battery terminal clamp	M6	6
Generator collar bolts	-	20
Generator wire holder nut	-	3.2
Hex bolt with washer and threaded piece	-	2
Pyrotechnic battery isolator mounting nut	-	15
Ribbed belt pulley (with free-running hub)	-	80
Ribbed belt pulley (without free-running hub)	-	65
Starter wiring bracket nut <sup>3)</sup>	M8	20
Starter wiring bracket nut <sup>4)</sup>	M8	23
Starter bolt	M12	75
	M10	40
Suppressor mounting bolt	-	9
Suppressor mounting nut for terminal 30 wire-to-starter	-	15
Suppressor mounting nut for terminal 30 wire from battery interrupt igniter	-	15
Voltage regulator bolts	-	2

<sup>1)</sup> Battery in engine compartment.

<sup>2)</sup> Battery in luggage compartment.

<sup>3)</sup> 2.5L

<sup>4)</sup> TDI

<sup>5)</sup> 3.6L

## Windshield Wiper/Washer Tightening Specifications

Component	Nm
Spray nozzle lift cylinder on the front bumper cover	2
Windshield and headlamp washer fluid reservoir-to-body	8
Windshield wiper motor crank-to-windshield wiper motor shaft	18
Wiper arm-to-shaft nut	20
Wiper linkage-to-body	8

## Exterior Lights, Switches Tightening Specifications

Component	Nm
Fog lamp housing screw	2
Front end carrier	8
Headlamp housing	5
High mounted brake lamp bulb	2
Rear lid tail lamp screws	3.5
Signal horn and dual tone horn	20
Steering column electronic systems control module	1.5
Subwoofer	2
Tail lamp housing bolt	2

## E-box in the Engine Compartment Tightening Specifications

Fasteners	Fastener size	Nm
Nuts	M5	4
Nuts	M6	6

## Wiring Tightening Specification

Component	Nm
Driver footwell fuse panel	1.5

# DTC CHART

## Engine Codes CKRA

### Fuel and Air Mixture, Additional Emissions Regulations

DTC	Error Message	Malfunction Criteria and Threshold Value
P00AF	Turbocharger Boost Control Module Performance	Boost pressure actuator stuck < 17% when commanded on or > 17% when commanded off.
P00D1	O2S Bank 1 Sensor 1 Heater Output Warm Up Time Exceeded	Sensor temperature < 720 °C
P0045	Turbocharger Boost Control Solenoid Circuit Open	Open circuit message from output driver
P0047	Turbocharger Boost Control Solenoid Circuit Low	Short to ground message from output driver
P0048	Turbocharger Boost Control Solenoid 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 °K
P0072	Ambient Air Temperature Sensor Circuit Low	Error signal low sent from Cluster to ECU
P0073	Ambient Air Temperature Sensor Circuit High	Error signal high sent from Cluster to ECU
P0087	Fuel Rail/System Pressure - Too Low	<ul style="list-style-type: none"> <li>• Control deviation &gt; 170 - 200 Bar</li> <li>• Exceeding absolute rail pressure limits &lt; 120 - 125 Bar or &gt; 1950 Bar</li> <li>• Control deviation &lt; -200 to -300 Bar</li> </ul>
P0088	Fuel Rail/System Pressure - Too High	<ul style="list-style-type: none"> <li>• Control deviation &gt; 170 - 200 Bar</li> <li>• Exceeding absolute rail pressure limits &lt; 120 - 125 Bar or &gt; 1950 Bar</li> <li>• Control deviation &lt; -200 to -300 Bar</li> </ul>
P0090	Fuel Pressure Regulator 1 Control Circuit	Open circuit diagnostic signal from output driver



DTC	Error Message	Malfunction Criteria and Threshold Value
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
P0101	Mass Air Flow Circuit Range/ Performance	PWM signal period time > 60 or < 40 m Sec.
P0102	Mass Air Flow Circuit Low Input	PWM signal period time < 71.4 $\mu$ s ( 900kg/h)
P0103	Mass Air Flow Circuit High Input	Range check high: <ul style="list-style-type: none"> <li>• Calculated PWM signal period time &gt; 833.35 <math>\mu</math>s (-150 kg/h)</li> <li>or</li> <li>• Calculated PWM signal period time &gt; 833.35 <math>\mu</math>s (-157 kg/h)</li> </ul>
P0104	Mass Air Flow Circuit Intermittent	Internal test
P0111	Intake Air Temperature Circuit Performance	Temperature difference to at least 3 other temperature sensors at startup > 30 °K
P0112	Intake Air Temperature Circuit Low Input	Boost temperature sensor voltage < 0.04 V
P0113	Intake Air Temperature Circuit High Input	Boost temperature sensor voltage > 2.88 V
P0116	Engine Coolant Temperature Sensor 1 Circuit Range/ Performance	<ul style="list-style-type: none"> <li>• Time for coolant temp to reach 19.96 °C or increase by 10 °K &gt; 300 Sec. for start temperature &lt;10 °C &gt;120 Sec. for start temp &gt; 10 °C</li> <li>• Temperature difference to at least 3 other temperature sensors at startup &gt; 20 °K</li> </ul>
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
P0121	Accelerator Pedal Position Sensor Circuit Range/ Performance	Accelerator pedal position sensor signal > 1.00 V
P0122	Accelerator Pedal Position Sensor Circuit Low	Accelerator pedal position sensor signal > 4.85 V

**DTC Chart**

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0123	Accelerator Pedal Position Sensor Circuit High	Accelerator pedal position sensor signal < .150 V
P0128	Coolant Thermostat Temperature below control range	Measured temperature lower than model temperature < 70 °C and modeled temperature > 80 °C
P0130	O2 Sensor Circuit (Bank 1 Sensor 1) Malfunction	<ul style="list-style-type: none"> <li>• Short to battery &gt; 3 V</li> <li>• Nernst voltage &gt; 4 V</li> <li>• Adjustment voltage &gt; 1.5 V</li> </ul> or <ul style="list-style-type: none"> <li>• Short to ground &lt; 2 V</li> <li>• Nernst voltage &lt; 1.75 V</li> <li>• Adjustment voltage &lt; 0.3 V</li> </ul>
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	<ul style="list-style-type: none"> <li>• Time to 30% of expected concentration increase &gt; 2.6 Sec.</li> </ul> or <ul style="list-style-type: none"> <li>• Time to 60% of expected concentration increase &gt; 4.1 Sec.</li> </ul> or <ul style="list-style-type: none"> <li>• Time to 60% minus time to 30% &gt; 1.5 Sec.</li> </ul>
P0135	O2 Sensor Heater Circuit (Bank 1 Sensor 1) Malfunction	<ul style="list-style-type: none"> <li>• Diagnostic signal from output driver sent</li> </ul> or <ul style="list-style-type: none"> <li>• Sensor element temperature &lt; 720 or &gt; 840 °C</li> </ul>
P0181	Fuel Temperature Sensor Circuit Range/Performance	Temperature difference to at least 2 other temperature sensors at startup > 30 °K
P0182	Fuel Temperature Sensor Circuit Low	Fuel temperature sensor voltage < 0.05 V
P0183	Fuel Temperature Sensor Circuit High	Fuel temperature sensor voltage > 4.70 V
P0192	Fuel Rail Pressure Sensor Circuit Low Input	Sensor voltage < 189 mV
P0193	Fuel Rail Pressure Sensor Circuit High Input	Sensor voltage > 4810 mV

DTC	Error Message	Malfunction Criteria and Threshold Value
P020A	Cylinder 1 Injection Timing	<ul style="list-style-type: none"> <li>Control error &lt; limit from MAP f (engine speed and desired torque) -8 °CA to -4 °CA</li> <li>or</li> <li>Control error &lt; limit from MAP f (engine speed and desired torque) +8 °CA to +4 °CA</li> </ul>
P020B	Cylinder 2 Injection Timing	<ul style="list-style-type: none"> <li>Control error &lt; limit from MAP f (engine speed and desired torque) -8 °CA to -4 °CA</li> <li>or</li> <li>Control error &lt; limit from MAP f (engine speed and desired torque) +8 °CA to +4 °CA</li> </ul>
P020C	Cylinder 3 Injection Timing	<ul style="list-style-type: none"> <li>Control error &lt; limit from MAP f (engine speed and desired torque) -8 °CA to -4 °CA</li> <li>or</li> <li>Control error &lt; limit from MAP f (engine speed and desired torque) +8 °CA to +4 °CA</li> </ul>
P020D	Cylinder 4 Injection Timing	<ul style="list-style-type: none"> <li>Control error &lt; limit from MAP f (engine speed and desired torque) -8 °CA to -4 °CA</li> <li>or</li> <li>Control error &lt; limit from MAP f (engine speed and desired torque) +8 °CA to +4 °CA</li> </ul>
P0201	Cylinder 1 Injector Circuit	Open circuit diagnostic signal from output driver• Low side signal current < 2.1 A
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
P023A	Charge Air Cooler Coolant Pump Control Circuit/Open	Diagnostic signal from output driver
P023B	Charge Air Cooler Coolant Pump Control Circuit Low	Diagnostic signal from output driver
P023C	Charge Air Cooler Coolant Pump Control Circuit High	Diagnostic signal from output driver

**DTC Chart**

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0234	Turbo Charger Overboost Condition limit exceeded	Control deviation > -300 - -800 hPa @ delta engine speed/ injection quantity
P0236	Turbocharger Boost Sensor Circuit Performance	Difference between barometric and boost pressure signal > 150 hPa
P0237	Turbocharger Boost Sensor Circuit Low Input	Boost Pressure Sensor < 0.214 V
P0238	Turbocharger Boost Sensor Circuit High Input	Boost Pressure Sensor > 4.88 V
P026A	Charge Air Cooler Efficiency Too Low	Control error out of range > or < limit set.
P0263	Cylinder 1 Contribution/ Balance	<ul style="list-style-type: none"> <li>• Calibration value of injector energizing time &gt; 322 <math>\mu</math>s (at 1100 bar rail pressure) or &lt; 162 <math>\mu</math>s</li> </ul>
P0266	Cylinder 2 Contribution/ Balance	<ul style="list-style-type: none"> <li>• Calibration value of injector energizing time &gt; 322 <math>\mu</math>s (at 1100 bar rail pressure) or &lt; 162 <math>\mu</math>s</li> </ul>
P0269	Cylinder 3 Contribution/ Balance	<ul style="list-style-type: none"> <li>• Calibration value of injector energizing time &gt; 322 <math>\mu</math>s (at 1100 bar rail pressure) or &lt; 162 <math>\mu</math>s</li> </ul>
P0272	Cylinder 4 Contribution/ Balance	<ul style="list-style-type: none"> <li>• Calibration value of injector energizing time &gt; 322 <math>\mu</math>s (at 1100 bar rail pressure) or &lt; 162 <math>\mu</math>s</li> </ul>
P0299	Turbo Charger Underboost	Deviation of actual and desired boost pressure > 400 - 800 hPa @ delta engine speed/injection quantity
P2004	Intake Manifold Runner Control Stuck Open Bank 1	<ul style="list-style-type: none"> <li>• Normal closed position, unable to reach signal voltage &lt; 2.62 or &gt; 4.65 V</li> <li>or</li> <li>• Normal open position, unable to reach signal voltage &lt; 0.35 or &gt; 2.38 V</li> </ul>
P2008	Intake Manifold Runner Control Circuit/Open (Bank 1)	Signal voltage 4.40 - 5.60 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P2009	Intake Manifold Runner Control Circuit Shorted (Bank 1)	Signal voltage 2.15 - 3.25 V
P2010	Intake Manifold Runner Control Circuit Shorted to B+ (Bank 1)	Signal current > 2.20 A
P2014	Intake Manifold Runner Position Sensor/Switch Circuit (Bank 1)	Signal voltage > 4.75 V
P2015	Intake Manifold Runner Position Sensor/Switch Circuit Range/Performance (Bank 1)	Deviation runner flap position vs. actual position > 25%
P2016	Intake Manifold Runner Position Sensor/Switch Circuit Low (Bank 1)	Signal voltage < 0.25 V
P2088	Camshaft Position A Actuator Control Circuit Low (Bank 1) Short to Ground	Signal voltage < 2.15 - 3.25 V
P2089	Camshaft Position A Actuator Control Circuit High (Bank 1) Short to B+	Signal current > 2.2 A
P2096	Post-Catalyst Fuel Trim System Too Lean (Bank 1)	I-portion of 2nd lambda control loop < 0.030
P2097	Post-Catalyst Fuel Trim System Too Rich (Bank 1)	I-portion of 2nd lambda control loop > 0.030
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	<ul style="list-style-type: none"> <li>• No rise in engine speed after fuel injection Calculated based on values from last two engine revolutions</li> <li>• Error threshold 82% misfire over 440 crankshaft revolutions</li> </ul>

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0301	Cylinder 1 Misfire Detected	<ul style="list-style-type: none"> <li>• No rise in engine speed after fuel injection Calculated based on values from last two engine revolutions</li> <li>• Error threshold 82% misfire over 440 crankshaft revolutions</li> </ul>
P0302	Cylinder 2 Misfire Detected	<ul style="list-style-type: none"> <li>• No rise in engine speed after fuel injection Calculated based on values from last two engine revolutions</li> <li>• Error threshold 82% misfire over 440 crankshaft revolutions</li> </ul>
P0303	Cylinder 3 Misfire Detected	<ul style="list-style-type: none"> <li>• No rise in engine speed after fuel injection Calculated based on values from last two engine revolutions</li> <li>• Error threshold 82% misfire over 440 crankshaft revolutions</li> </ul>
P0304	Cylinder 4 Misfire Detected	<ul style="list-style-type: none"> <li>• No rise in engine speed after fuel injection Calculated based on values from last two engine revolutions</li> <li>• Error threshold 82% misfire over 440 crankshaft revolutions</li> </ul>
P0321	Engine Speed Input Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Consecutive not plausible signals &gt; 15</li> <li>• Cam phase signals without plausible signal &gt; 4 cam rotations.</li> </ul>
P0322	Engine Speed Input Circuit 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
P04DD	Cold Start EGR "A" Flow Insufficient Detected	Control deviation < limit from map f (engine speed, desired airflow)
P04DE	Cold Start EGR "A" Flow Excessive Detected	Control deviation > limit from map (engine speed, desired airflow)
P040B	Exhaust Gas Recirculation Temperature Sensor Circuit Range/Performance	Sensor temperature < 55 °C
P040C	Exhaust Gas Recirculation Temperature Sensor Circuit Low	Signal sensor voltage < 0.06 V
P040D	Exhaust Gas Recirculation Temperature Sensor Circuit High	Signal sensor voltage > 3.24 V
P0401	Exhaust Gas Recirculation Insufficient Flow Detected	Control deviation < limit from map f (engine speed, desired airflow)
P0402	Exhaust Gas Recirculation Excessive Flow Detected	Control deviation > limit from map (engine speed, desired airflow)
P0403	High Pressure Exhaust Gas Recirculation Actuator Circuit	Diagnostic signal from output driver.
P0404	High Pressure Exhaust Gas Recirculation Circuit Range/ Performance	Valve stuck closed - position < 12%
P0405	High Pressure Exhaust Gas Recirculation Position Sensor Circuit Low	Position sensor signal range check low.
P0406	High Pressure Exhaust Gas Recirculation Position Sensor Circuit High	Position sensor signal range check high.
P0420	Catalyst System (Bank 1) Efficiency Below Threshold	HC conversion rate < 0.3
P045A	Low Pressure Exhaust Gas Recirculation Actuator Circuit	Diagnostic signal from output driver
P045B	Low Pressure Exhaust Gas Recirculation Actuator Circuit Range/Performance	Position sensor signal > 1 V or < 0.4 V

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P045C	Low Pressure Exhaust Gas Recirculation Actuator Circuit Low	Diagnostic signal from output driver
P045D	Low Pressure Exhaust Gas Recirculation Actuator Circuit High	Diagnostic signal from output driver
P045E	Low Pressure Exhaust Gas Recirculation Position Stuck Open	Comparison of actual and desired position signal • Valve stuck open > 12%
P045F	Low Pressure Exhaust Gas Recirculation Position Stuck Closed	Comparison of actual and desired position signal • Valve stuck closed < 12%
P046C	High Pressure Exhaust Gas Recirculation Sensor Circuit Range/Performance	Position sensor signal > 1 V or < 0.4 V
P047F	Exhaust Pressure Control Valve A Stuck Open	Control valve stuck closed - position sensor > 10% or < -10%
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
P0475	Exhaust Pressure Control Valve	Diagnostic signal from output driver
P0477	Exhaust Pressure Control Valve 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% or < -10%
P048B	Exhaust Pressure Control Valve Position Sensor Circuit Low	Position sensor signal < 0.25 V
P048C	Exhaust Pressure Control Valve Position Sensor Circuit Range/Performance	Position sensor signal in desired range during closed position learning > 1.15 V or < 0.45 V



DTC	Error Message	Malfunction Criteria and Threshold Value
P048E	Exhaust Pressure Control Valve Position Sensor Circuit High	Position sensor signal > 4.85 V
P0486	Low Pressure Exhaust Gas Recirculation Sensor Circuit	Position sensor signal > 4690 or < 210 mV

### Speed and Idle Control

DTC	Error Message	Malfunction Criteria and Threshold Value
P050E	Cold Start Engine Exhaust Temperature Too Low	Control deviation > limit from MAP f(engine speed, torque)
P0501	Vehicle Speed Sensor Performance	Vehicle speed < 6 km/h
P0502	Vehicle Speed Sensor Circuit Low Input	ABS code set, no vehicle speed signal sent
P0506	Idle Control System RPM Lower than Expected	Control deviation < 10%
P0507	Idle Air Control System - RPM Higher Than Expected	Control deviation > 10%
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
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
P06B9	Cylinder 1 Glow Plug Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Message from Glow Control Unit = error message</li> <li>• 4 - 14 Sec. after glow start = 1.2 ohm or less</li> </ul>
P06BA	Cylinder 2 Glow Plug Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Message from Glow Control Unit = error message</li> <li>• 4 - 14 Sec. after glow start = 1.2 ohm or less</li> </ul>
P06BB	Cylinder 3 Glow Plug Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Message from Glow Control Unit = error message</li> <li>• 4 - 14 Sec. after glow start = 1.2 ohm or less</li> </ul>

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P06BC	Cylinder 4 Glow Plug Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Message from Glow Control Unit = error message</li> <li>• 4 - 14 Sec. after glow start = 1.2 ohm or less</li> </ul>
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).
P06C7	Cylinder 3 Glow Plug Incorrect	Cylinder 3 Glow Plug Incorrect
P06C8	Cylinder 4 Glow Plug Incorrect	Message from Glow Control Unit = error message (wrong current slope).
P06FE	Cold Start Diesel Intake Air Flow Control Performance	Valve stuck open > 12%
P0604	Internal Control Module Random Access Memory (RAM) Error	<ul style="list-style-type: none"> <li>• Write EEPROM not possible</li> <li>• Check sum error in 3 or more locations</li> </ul>
P0605	Internal Control Module Read Only Memory (ROM) Error	ECM internal ROM self test failed
P0606	Internal Control Module Memory Check Sum Error	ECM internal self test failed
P0607	Control Module Performance	<ul style="list-style-type: none"> <li>• Low/high supply voltage diagnostic signal from output driver</li> <li>or</li> <li>• Failed signal range check with barometer pressure sensor (located internally on ECM circuit board)</li> </ul>
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	ECM 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 Control Unit Module Error	Wrong GCU build = error message

DTC	Error Message	Malfunction Criteria and Threshold Value
P0641	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
P066E	Cylinder 3 Glow Plug Control Circuit Low	Over current on circuit > 70 A
P067A	Cylinder 4 Glow Plug Control Circuit Low	Over current on circuit > 70 A
P0670	Glow Plug Module 1 Control Circuit electrical malfunction electrical circuit	Message from glow control unit = 3.44 V
P0671	Cylinder 1 Glow Plug Circuit Q10 Electrical Fault	Message from Glow Control Unit, (glow current < 2.2 A)
P0672	Cylinder 2 Glow Plug Circuit Q11 Electrical Fault	Message from Glow Control Unit, (glow current < 2.2 A)
P0673	Cylinder 3 Glow Plug Circuit Q12 Electrical Fault	Message from Glow Control Unit, (glow current < 2.2 A)
P0674	Cylinder 4 Glow Plug Circuit Q13 Electrical Fault	Message from Glow Control Unit, (glow current < 2.2 A)
P068A	ECM Power Relay Performance - De-Energized Too Early	Relay stuck, no change in circuit voltage
P068B	ECM Power Relay Performance - De-Energized Too Late	Relay stuck, no change in circuit voltage
P0684	Glow Plug Control Module to PCM Communication 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

**DTC Chart**

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
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	Implausible 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.
U0422	CAN: Instrument cluster	Ambient temperature value initialization, Audi 01 h
U0423	Invalid Data Received From Instrument Panel Cluster Control Module	Error message sent from Instrument Panel Cluster to ECU, invalid data
U1006	NOx Sensor 1 No Communication	NOx sensor messages not received.
U1024	Communications Bus Fault, IPC to ECU	Error message sent from instrument cluster to ECU, invalid data
U1034	NOx Sensor 1 Implausible Signal	Time out fault message from NOx sensor

### **Fuel and Air Ratios Control Module**

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
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

DTC	Error Message	Malfunction Criteria and Threshold Value
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 malfunction	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
P13DO	Sensor for internal pressure of cylinder 1 Implausible signal	<ul style="list-style-type: none"> <li>• Cylinder pressure sensor voltage &lt; 0.33 V or &gt; 3.09 V</li> <li>or</li> <li>• Deviation between min and max cylinder pressure # 1 &lt; 20 bar</li> <li>• Offset out of range &lt; -7 or &gt; 7 bar</li> <li>or</li> <li>• Pressure based measured TDC position sensor out of range</li> <li>or</li> <li>• Difference of calculated cylinder pressure vs. actual measured cylinder pressure out of range &lt; -10 or &gt; 10 Bar</li> </ul>
P13D1	Sensor for internal pressure of cylinder 2 Electrical malfunction	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

**DTC Chart**

DTC	Error Message	Malfunction Criteria and Threshold Value
P13D3	Sensor for internal pressure of cylinder 2 Implausible signal	<ul style="list-style-type: none"> <li>• Cylinder pressure sensor voltage &lt; 0.33 V or &gt; 3.09 V</li> <li>or</li> <li>• Deviation between min and max cylinder pressure # 2 &lt; 20 bar</li> <li>• Offset out of range &lt; -7 or &gt; 7 bar</li> <li>or</li> <li>• Pressure based measured TDC position sensor out of range</li> <li>or</li> <li>• Difference of calculated cylinder pressure vs. actual measured cylinder pressure out of range &lt; -10 or &gt; 10 Bar</li> </ul>
P13D4	Sensor for internal pressure of cylinder 3 Electrical malfunction	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
P13D6	Sensor for internal pressure of cylinder 3 Implausible signal	<ul style="list-style-type: none"> <li>• Cylinder pressure sensor voltage &lt; 0.33 V or &gt; 3.09 V</li> <li>or</li> <li>• Deviation between min and max cylinder pressure # 3 &lt; 20 bar</li> <li>• Offset out of range &lt; -7 or &gt; 7 bar</li> <li>or</li> <li>• Pressure based measured TDC position sensor out of range</li> <li>or</li> <li>• Difference of calculated cylinder pressure vs. actual measured cylinder pressure out of range &lt; -10 or &gt; 10 Bar</li> </ul>
P13D7	Sensor for internal pressure of cylinder 4 Electrical malfunction	Cylinder pressure sensor voltage > 3.17 V

DTC	Error Message	Malfunction Criteria and Threshold Value
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	<ul style="list-style-type: none"> <li>• Cylinder pressure sensor voltage &lt; 0.33 V or &gt; 3.09 V</li> <li>or</li> <li>• Deviation between min and max cylinder pressure # 4 &lt; 20 bar</li> <li>• Offset out of range &lt; -7 or &gt; 7 bar</li> <li>or</li> <li>• Pressure based measured TDC position sensor out of range</li> <li>or</li> <li>• Difference of calculated cylinder pressure vs. actual measured cylinder pressure out of range &lt; -10 or &gt; 10 Bar</li> </ul>
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
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
P146D	Reducing Agent Heating 1 Circuit Short Circuit To Voltage	Reducing Agent Heating 1 Circuit Short Circuit To Voltage
P146F	Reducing Agent Heating 2 Circuit Short Circuit To Voltage	Signal voltage > 3.2 V
P148B	Reductant Agent Heating Faulty	Heating active when switched off > 200 µA

**DTC Chart**

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P20A0	Reductant Purge Control Valve Circuit Open	Diagnostic signal from power stage > 2.99 V
P20A2	Reductant Purge Control Valve Circuit Low	Diagnostic signal from power stage < 2.04 V
P20A3	Reductant Purge Control Valve Circuit High	Diagnostic signal from power stage > 2.2 A
P20A5	Reductant Purge Control Valve Stuck Closed	Pressure drop after switching valve < 3000 hPa
P20BB	Reductant Heater A Control Circuit Low	Diagnostic signal from power stage < 2.97 V
P20BC	Reductant Heater A Control Circuit High	Diagnostic signal from power stage > 2.2 A
P20BD	Reductant Heater B Control Circuit Open	Diagnostic signal from power stage > 4.5 V
P20BF	Reductant Heater B Control Circuit Low	Diagnostic signal from power stage < 2.97 V
P20B5	Reductant Metering Unit Heater Control Circuit Open	Current during heating < 2 A
P20B7	Reductant Metering Unit Heater Control Circuit Low	Max. power at engagement < 5 A
P20B8	Reductant Metering Unit Heater Control Circuit High	Max conductance at engaging dosing unit > 0.89 Sec.
P20B9	Reductant Heater A Control Circuit/Open	Diagnostic signal from power stage > 4.5 V
P20C0	Reductant Heater B Control Circuit High	Diagnostic signal from power stage > 2.2 A
P20EE	SCR NOx Catalyst Efficiency Below Threshold Bank 1	Difference between simulated efficiency of a non defective system under the current operating conditions and the measured actual efficiency > 40%
P20E8	Reductant Pressure Too Low	Urea system pressure < 3750 hPa
P20E9	Reductant Pressure Too High	Urea system pressure > 6500 hPa



DTC	Error Message	Malfunction Criteria and Threshold Value
P2002	Particulate Trap Efficiency Below Threshold	<ul style="list-style-type: none"> <li>Differential pressure signal &lt; f (exhaust gas volume flow)</li> </ul> or <ul style="list-style-type: none"> <li>Ratio of filtered temperature dynamic upstream and downstream of the PM trap &lt; 1.2</li> </ul>
P202A	Reducing Agent Tank Heater Control Circuit/Open	Conductance during heating <= 0.1 S
P202B	Reducing Agent Tank Heater Control Circuit Low	Max. power at engagement < 0.159 S
P202C	Reducing Agent Tank Heater Control Circuit High	Max. power at engagement > 0.85 S
P203A	Reductant Level Sensor Circuit	<ul style="list-style-type: none"> <li>Level signal &lt; 25% PWM or &gt; 85% PWM</li> <li>Interval between watch dog pulses &lt; 80 Sec.</li> </ul>
P203B	Reductant Level Sensor Circuit Range/Performance	<ul style="list-style-type: none"> <li>PWM signal &lt; 34%</li> </ul> or <ul style="list-style-type: none"> <li>PWM signal = 34 - 44%</li> </ul>
P2031	Exhaust Gas Temperature Sensor 2 Circuit	Sensor 2 voltage > 1.72 V
P2032	Exhaust Gas Temperature Sensor 2 Circuit Low	Sensor 2 voltage < 0.45 V
P204A	Reductant Pressure Sensor Circuit	Signal voltage < 0.38 V
P204B	Reductant Pressure Sensor Circuit Range/Performance	Signal voltage > 4.80 V or > 500 hPa reading
P204D	Reductant Pressure Sensor Circuit High	Actual pressure before pressure build up > 500 hPa
P2047	Reductant Injection Valve Circuit Open	Diagnostic signal from output driver > 2.99 V
P2048	Reductant Injection Valve Circuit Low	Diagnostic signal from output driver < 2.04 V
P2049	Reductant Injection Valve Circuit High	Diagnostic signal from output driver > 0.25 V
P205A	Reductant Tank Temperature Sensor Circuit	Signal voltage > 3.12 V
P205B	Reductant Tank Temperature Sensor Circuit Range/Performance	Absolute value of temperature difference to ECT > 30 Kelvin and < -52 Kelvin

**DTC Chart**

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P205C	Reductant Tank Temperature Sensor Circuit Low	Signal voltage < 0.16 V
P208A	Reductant Pump Control Circuit Open	Diagnostic signal of output driver > 2.99 V
P208B	Reductant Pump Control Range/Performance	Engine speed > 300 RPM
P208C	Reductant Pump Control Circuit Low	Diagnostic signal of output driver < 2.04 V
P208D	Reductant Pump Control Circuit High	Diagnostic signal of output driver > 6 A
P208E	Reductant Injection Valve Stuck Closed	Number of consecutive failed attempts to open valve > 40
P2080	Exhaust Gas Temperature Sensor Circuit Range/ Performance	<ul style="list-style-type: none"> <li>• Comparison of upstream turbine exhaust gas temp vs modeled temperature &lt; 85 °C</li> <li>or</li> <li>• Temperature difference to other temp sensors during cold start &lt; 45 °K</li> </ul>
P2084	Exhaust Gas Temperature Sensor 2 Circuit Range/ Performance	<ul style="list-style-type: none"> <li>• Comparison of upstream turbine exhaust gas temp vs modeled temperature &lt; 85 °C</li> <li>or</li> <li>• Temperature difference to other temp sensors during cold start &lt; 45 °K</li> </ul>
P2100	Throttle Actuator Control Motor Circuit Open	Open circuit diagnostic signal sent from output driver
P2101	Throttle Actuator 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 Control Motor Circuit High	Circuit short to voltage diagnostic signal sent from output driver
P2111	Throttle Actuator Control System - Stuck Open	Valve stuck open > 12%
P2122	Throttle/Pedal Position Sensor/Switch D Circuit Low Input	Sensor 1 voltage < 0.61 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P2123	Throttle/Pedal Position Sensor/Switch D Circuit High Input	Sensor 1 voltage > 4.79 V
P2127	Throttle/Pedal Position Sensor/Switch E Circuit Low Input	Sensor 2 voltage < 0.27 V
P2128	Throttle/Pedal Position Sensor/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%
P2183	Engine Coolant Temperature Sensor 2 Circuit Range/ Performance	Temperature difference to at least 2 other temperature sensors at startup > 30 °K
P2184	Engine Coolant Temperature Sensor 2 Circuit Low	ECT signal voltage < 0.15 V
P2185	Engine Coolant Temperature Sensor 2 Circuit High	ECT signal voltage > 3.25 V
P2195	O2 Sensor Signal Biased/ Stuck Lean (Bank 1, Sensor 1)	Deviation to oxygen concentration > 0.048%
P220A	NOx Sensor Supply Voltage Bank 1 Sensor 1 Circuit	Difference between battery and sensor supply voltage > 1.5 V or < -16V
P2200	NOx Sensor Circuit Range/ Performance Bank 1 Sensor 1	• Average NOx offset during fuel cutoff < -30 ppm or > 50 ppm • NOx signal < -40 ppm
P2201	NOx Sensor Circuit Range/ Performance Bank 1 Sensor 1	• Average NOx offset during fuel cutoff < -30 ppm or > 50 ppm or • NOx signal < -40 ppm
P2202	NOx Sensor Bank 1 Sensor 1 Circuit Low	NOx sensor reading < -105 ppm
P2203	NOx Sensor Bank 1 Sensor 1 Circuit High	NOx sensor reading > 1655 ppm
P2209	NOx Sensor Heater Bank 1 Sensor 1 Circuit Range/ Performance	NOx control not active for > 180 Sec.

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
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	Signal voltage < 3.00 V
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

## Ignition System

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
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
P240F	Exhaust Gas Recirculation Slow Response	Calculated characteristic value > 20 at positive or negative air mass change
P2413	Exhaust Gas Recirculation System Performance	<ul style="list-style-type: none"> <li>• Number of learning points at fuel mass adaptation limit &gt; or = to 4</li> <li>• At upper limit = 6 mg/stroke</li> <li>• At lower limit = -6 mg/stroke</li> </ul>
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	<ul style="list-style-type: none"> <li>• Comparison of upstream turbine exhaust gas temp vs modeled temperature &lt; 250 °C or temperature difference to other temp sensors at cold startup &lt; 45 Kelvin</li> </ul>
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 < -80 hPa to > 80 hPa and offset corrected differential pressure signal > 10 hPa to < -10 hPa
P2454	Diesel Particulate Filter Differential Pressure Sensor Circuit Low	Sensor voltage < 0.2
P2456	Diesel Particulate Filter Pressure Sensor A Circuit Intermittent	Inverse change of differential pressure per time > 10 hPa/Sec or < -10 hPa/Sec
P2457	Exhaust Gas Recirculation Cooling System Performance	Sensor temperature above threshold 40 °K
P2458	Diesel Particulate Filter Regeneration Duration	Regeneration time > 5400 Sec.

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
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	<ul style="list-style-type: none"> <li>• Sensor temperature &lt; 230 °C</li> <li>or</li> <li>• Temperature difference to other temp sensors during cold start &lt; 45 °K</li> </ul>
P2463	Diesel Particulate Filter - Soot Accumulation	Calculated particulate matter trap loading > 40 g
P2470	Exhaust Gas Temperature Sensor Circuit Low (Bank 1 Sensor 4)	Sensor signal voltage < 0.45 V
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)
P2478	Exhaust Gas Temperature Out of Range Bank 1 Sensor 1	Control deviation > limit from MAP f(engine speed, torque)
P2563	Turbocharger Boost Control Position Sensor Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Position sensor signal voltage &lt; 0.3 or &gt; 4.5 V</li> <li>or</li> <li>• Position sensor signal &gt; 1.72 or &lt; 0.3 V</li> </ul>
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 Internal Engine Off Timer Performance	Quantity time over threshold < 7.52 or > 8.48 Sec

# DTC CHART

## Engine Codes CBTA/CBUA

### Fuel and Air Mixture, Additional Emissions Regulations

DTC	Error Message	Malfunction Criteria and Threshold Value
P000A	Intake Camshaft Position Slow Response (Bank 1)	<ul style="list-style-type: none"> <li>• Difference between target and actual &gt; 8° CRK for &gt; 1.8 to 2.5 Sec.</li> <li>• Adjustment angle &lt; 3° CRK rotation</li> </ul>
P0010	Intake Camshaft Position Actuator Circuit Open (Bank 1)	Signal voltage > 4.70 - 5.40 V
P0011	Intake Camshaft Position Timing - Over-Advanced (Bank 1)	<ul style="list-style-type: none"> <li>• Difference between target and actual &gt; 8° CRK rotation</li> <li>• Adjustment angle &lt; 3° CRK rotation</li> </ul>
P0016	Camshaft Position Sensor Angular Offset Check	Permissible deviation < -13.49 or >13.49 CRK deg.
P0030	HO2S Heater Control Circuit (Bank 1, Sensor 1)	<ul style="list-style-type: none"> <li>• O2S signal rear not oscillating at reference &lt; 598 mV and enrichment after stuck lean 20%</li> <li>or</li> <li>• Heater voltage 4.70 to 5.40 V</li> </ul>
P0031	HO2S Heater Control Circuit Low (Bank 1, Sensor 1)	<ul style="list-style-type: none"> <li>• O2S signal rear not oscillating at reference &lt; 598 mV and enrichment after stuck lean 20%</li> <li>or</li> <li>• Heater voltage 0 to 3.26 V</li> </ul>
P0032	HO2S Heater Control Circuit High (Bank 1, Sensor 1)	Heater current > 5.50 A
P0036	HO2S Heater Control Circuit (Bank 1, Sensor 2)	Heater voltage 2.34 to 3.59 V
P0037	HO2S Heater Control Circuit Low (Bank 1, Sensor 2)	Heater voltage < 2.34 V
P0038	HO2S Heater Control Circuit High (Bank 1, Sensor 2)	Heater voltage > 3.59 A

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0042	O2 Sensor Heater Control Circuit (Bank 1 Sensor 3) (CBA ONLY)	Heater voltage 2.34 to 3.59 V
P0043	O2 Sensor Heater Control Circuit (Bank 1 Sensor 3) Low (CBA ONLY)	Heater voltage < 2.34 V
P0044	O2 Sensor Heater Control Circuit (Bank 1 Sensor 3) High (CBA ONLY)	Heater current > 3.59 A
P0070	Ambient Air Temperature	Ambient air temp < -50 °C
P0071	Ambient Air Temperature Sensor 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 to Barometric Pressure Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Difference manifold pressure - lower threshold model &lt; 0. Model range 45 to 845 hPa</li> <li>• Difference manifold pressure - upper threshold model &gt; 0. Model range 640 - 1055</li> <li>• Difference. altitude sensor signal vs. manifold pressure signal at engine start &gt; 60 hPa</li> </ul>
P0107	Manifold Absolute Pressure Circuit Low Input	Signal voltage < 0.20 V
P0108	Manifold Absolute Pressure Circuit High Input	Signal voltage > 4.86 V
P0111	Intake Air Temperature 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 Circuit Low Input	IAT > 130.0 °C
P0113	Intake Air Temperature Sensor 1 Circuit High Input	IAT < -46 °C
P0116	Engine Coolant Temperature Sensor 1 Circuit Range/Performance	<ul style="list-style-type: none"> <li>• No change on signal 2 °K</li> <li>• ECT signal stuck in range 75 - 105 °C and no change in signal 2 °K</li> </ul>



DTC	Error Message	Malfunction Criteria and Threshold Value
P0117	Engine Coolant Temperature Sensor 1 Circuit Low Input	ECT >140 °C
P0118	Engine Coolant Temperature Sensor 1 Circuit High Input	ECT < -40 °C
P0121	Accelerator Pedal Position Sensor A Circuit Range/ Performance	<ul style="list-style-type: none"> <li>• TPS 1 - TPS 2 &gt; 6.30%</li> <li>• TPS 1 calculated value &gt; 9.00%</li> </ul>
P0122	Accelerator 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 Slow Response - Rich to Lean (Bank 1 Sensor 2)	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)	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
		IA, < 0.30 V
P0132	O2 Sensor Circuit (Bank 1, Sensor 1) High Voltage	Virtual mass > 3.25 V
		Nernst voltage > 4.40 V
		IA, > 7.0 V
P0133	O2 Circuit Slow Response (Bank 1, Sensor 1)	<ul style="list-style-type: none"> <li>• Difference between R2L and L2R area ratio -0.40 to 0.40</li> <li>• Counter cycles completed &gt;/= 4 times</li> <li>• Gradient ratio &gt;= 0.25 or &lt;= 0.40 and lower value of both ratios &lt; 0.25</li> </ul>
P0135	O2 Heater Circuit (Bank 1, Sensor 1)	<ul style="list-style-type: none"> <li>• Heater duty cycle &gt; 90%</li> <li>• O2S ceramic temperature, &lt; 720 °C</li> </ul> or <ul style="list-style-type: none"> <li>• O2S ceramic temp &lt; 715 °C</li> <li>• Time after O2 heater on, 35 Sec.</li> </ul>
P0136	O2 Circuit (Bank 1, Sensor 2)	<ul style="list-style-type: none"> <li>• Delta O2S rear signal &gt; 2.00 V</li> <li>• Number of checks = 6</li> </ul>

**DTC Chart**

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0137	O2 Circuit Low Voltage (Bank 1, Sensor 2)	<ul style="list-style-type: none"> <li>• Cold condition: Signal voltage &lt; 0.06 V for &gt; 3 Sec</li> <li>• Difference of sensor voltage with and without load pulse &lt; 0.01 V</li> </ul>
P0138	O2 Circuit High Voltage (Bank 1, Sensor 2)	Signal voltage > 1.08 V for > 5 Sec.
P0139	O2 Circuit Slow Response (Bank 1 Sensor 2)	<ul style="list-style-type: none"> <li>• EWMA filtered transient time at fuel cut off &gt; 0.6 Sec.</li> <li>• O2 voltage between 201 - 401 mV</li> <li>• O2S rear signal &gt; 0.16 V during fuel cut off active</li> </ul>
P0140	O2 Circuit No Activity Detected (Bank 1, Sensor 2)	<ul style="list-style-type: none"> <li>• Signal voltage .40 to .60 V for &gt; 3 Sec.</li> <li>• Voltage difference between load pulse and no load pulse &gt;= 2.80 V</li> <li>• Internal resistance &gt; 40 k and exhaust temp &gt; 670 °C</li> </ul>
P0141	O2 Heater Circuit (Bank 1, Sensor 2)	<ul style="list-style-type: none"> <li>• Difference of sensor voltage with and without load pulse &lt; 0.01 V</li> <li>• Internal heater resistance 1200 - 32400 Ω</li> </ul>
P0142	O2 Sensor Circuit (Bank 1 Sensor 3)	<ul style="list-style-type: none"> <li>• Delta voltage 1 step at heater switching &gt; 2.00 V</li> <li>• Heater coupling &gt;= 6 times</li> </ul>
P0143	O2 Sensor Circuit Low Voltage Bank 1 Sensor 3	<ul style="list-style-type: none"> <li>• Signal voltage .40 to .60 V for &gt; 3 Sec.</li> <li>• Voltage difference between load pulse and no load pulse &gt;= 2.80 V</li> <li>• Internal resistance &gt; 40 k and exhaust temp &gt; 670 °C</li> </ul>
P0144	O2 Sensor Circuit High Voltage Bank 1 Sensor 3	Signal voltage > 1.08 V for > 5 Sec.
P0145	O2 Sensor Circuit Slow Response (Bank 1 Sensor 3)	<ul style="list-style-type: none"> <li>• EWMA filtered transient time at fuel cut off &gt; 1.5 Sec.</li> <li>• O2 voltage between 201 - 401 mV</li> </ul>

DTC	Error Message	Malfunction Criteria and Threshold Value
P0146	O2 Sensor Circuit No Activity Detected Bank 1 Sensor 3	<ul style="list-style-type: none"> <li>• Signal voltage .40 to .60 V for &gt; 3 Sec.</li> <li>• Voltage difference between load pulse and no load pulse <math>\geq 2.80</math> V</li> <li>• Internal resistance &gt; 40 k and exhaust temp &gt; 670 °C</li> </ul>
P0147	O2 Sensor Heater Circuit Bank 1 Sensor 3	Internal heater resistance 1200 - 32400 $\Omega$
P0169	Incorrect Fuel Composition	Fuel quantity out of limit or incorrect
P0201	Injector Circuit Open Cylinder 1	• Low side signal voltage 4.50 - 5.50 V
P0202	Injector Circuit Open Cylinder 2	• Low side signal voltage 4.50 - 5.50 V
P0203	Injector Circuit Open Cylinder 3	• Low side signal voltage 4.50 - 5.50 V
P0204	Injector Circuit Open Cylinder 4	• Low side signal voltage 4.50 - 5.50 V
P0205	Injector Circuit Open Cylinder 5	Low side signal voltage 4.50 - 5.50 V
P0221	Accelerator Pedal Position Sensor B Circuit Range/ Performance	<ul style="list-style-type: none"> <li>• TPS 1 to TPS 2, &gt; 5.10 to 6.3%</li> <li>• TPS 2 – calc position &gt; 9 %</li> </ul>
P0222	Accelerator Pedal Position Sensor B Circuit Low Input	Signal voltage < 0.20 V
P0223	Accelerator Pedal Position Sensor 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 Chart**

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P2004	Intake Manifold Runner Control Stuck Open Bank 1	<ul style="list-style-type: none"> <li>• Normal closed position, unable to reach signal voltage &lt; 2.62 or &gt; 4.65 V</li> <li>or</li> <li>• Normal open position, unable to reach signal voltage &lt; 0.35 or &gt; 2.38 V</li> </ul>
P2008	Intake Manifold Runner Control Circuit/Open (Bank 1)	Signal voltage 4.40 - 5.60 V
P2009	Intake Manifold Runner Control Circuit Shorted (Bank 1)	Signal voltage 2.15 - 3.25 V
P2010	Intake Manifold Runner Control Circuit Shorted to B+ (Bank 1)	Signal current > 2.20 A
P2014	Intake Manifold Runner Position Sensor/Switch Circuit (Bank 1)	Signal voltage > 4.75 V
P2015	Intake Manifold Runner Position Sensor/Switch Circuit Range/Performance (Bank 1)	Deviation runner flap position vs. actual position > 25%
P2016	Intake Manifold Runner Position Sensor/Switch Circuit Low (Bank 1)	Signal voltage < 0.25 V
P2088	Camshaft Position A Actuator Control Circuit Low (Bank 1)	Signal voltage 0.0 to 3.25 V
P2089	Camshaft Position A Actuator Control Circuit High (Bank 1)	Signal current, > 2.2 A
P2096	Post-Catalyst Fuel Trim System Too Lean (Bank 1)	Deviation lambda control < -0.03%
P2097	Post-Catalyst Fuel Trim System Too Rich (Bank 1)	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 Misfire Detected	<ul style="list-style-type: none"> <li>• Emission threshold 1st interval misfire rate (200 rev Misfire Rate) &gt; 2.5%</li> <li>• Emission threshold misfire rate (1000 rev Misfire Rate), &gt; 2.5 to 24%</li> </ul>
P0301	Cylinder 1 Misfire Detected	<ul style="list-style-type: none"> <li>• Emission threshold 1st interval misfire rate (200 rev Misfire Rate) &gt; 2.5%</li> <li>• Emission threshold misfire rate (1000 rev Misfire Rate), &gt; 2.5 to 24%</li> </ul>
P0302	Cylinder 2 Misfire Detected	<ul style="list-style-type: none"> <li>• Emission threshold 1st interval misfire rate (200 rev Misfire Rate) &gt; 2.5%</li> <li>• Emission threshold misfire rate (1000 rev Misfire Rate), &gt; 2.5 to 24%</li> </ul>
P0303	Cylinder 3 Misfire Detected	<ul style="list-style-type: none"> <li>• Emission threshold 1st interval misfire rate (200 rev Misfire Rate) &gt; 2.5%</li> <li>• Emission threshold misfire rate (1000 rev Misfire Rate), &gt; 2.5 to 24%</li> </ul>
P0304	Cylinder 4 Misfire Detected	<ul style="list-style-type: none"> <li>• Emission threshold 1st interval misfire rate (200 rev Misfire Rate) &gt; 2.5%</li> <li>• Emission threshold misfire rate (1000 rev Misfire Rate), &gt; 2.5 to 24%</li> </ul>
P0305	Cylinder 5 Misfire Detected	<ul style="list-style-type: none"> <li>• Emission threshold 1st interval misfire rate (200 rev Misfire Rate) &gt; 2.5%</li> <li>• Emission threshold misfire rate (1000 rev Misfire Rate), &gt; 2.5 to 24%</li> </ul>
P0321	Engine Speed Input Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Comparison of counted teeth and number of teeth +/- 1 tooth</li> <li>• Loss of reference gap during normal operation</li> <li>• No reference gap during engine start</li> </ul>

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0322	Ignition/Distributor Engine Speed Input Circuit No Signal	<ul style="list-style-type: none"> <li>• Camshaft signal &gt; 3</li> <li>• Engine speed = no signal</li> </ul>
P0324	Knock Control System Error	<ul style="list-style-type: none"> <li>• Signal fault counter (combustion) &gt; 24</li> <li>or</li> <li>• Signal fault counter (measuring window) &gt; 2.00</li> </ul>
P0327	Knock Sensor 1 Circuit Low Input	<ul style="list-style-type: none"> <li>• Lower threshold &lt; - 0.70 V</li> <li>• Signal range check &lt; 0.55 to 5.60 V</li> </ul>
P0328	Knock Sensor 1 Circuit High Input	<ul style="list-style-type: none"> <li>• Upper threshold &gt; 1 V</li> <li>• Signal range check &gt; 16.50 to 92 V</li> </ul>
P0332	Knock Sensor 2 Circuit Low Input	<ul style="list-style-type: none"> <li>• Lower threshold &lt; - 0.70 V</li> <li>• Signal range check &lt; 0.55 to 5.60 V</li> </ul>
P0333	Knock Sensor 2 Circuit High Input	<ul style="list-style-type: none"> <li>• Upper threshold &gt; 1 V</li> <li>• Signal range check &gt; 16.50 to 92 V</li> </ul>
P0341	Camshaft Position Sensor A Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Signal pattern incorrect</li> <li>• Defect counter = 8</li> </ul>
P0342	Camshaft Position Sensor A Circuit Low Input	<ul style="list-style-type: none"> <li>• Signal voltage permanently low</li> <li>• Crankshaft signal = 8</li> </ul>
P0343	Camshaft Position Sensor A Circuit High Input	<ul style="list-style-type: none"> <li>• Signal voltage permanently high</li> <li>• Crankshaft signals = 8</li> </ul>
P0351	Ignition Coil A Primary/ Secondary Circuit	<ul style="list-style-type: none"> <li>• Signal current &lt; -0.25 to 2.0 mA</li> <li>• Crankshaft signal = 8</li> </ul>
P0352	Ignition Coil B Primary/ Secondary Circuit	<ul style="list-style-type: none"> <li>• Signal current &lt; -0.25 to 2.0 mA</li> <li>• Internal check failed</li> </ul>
P0353	Ignition Coil C Primary/ Secondary Circuit	<ul style="list-style-type: none"> <li>• Signal current &lt; -0.25 to 2.0 mA</li> <li>• Internal check failed</li> </ul>
P0354	Ignition Coil D Primary/ Secondary Circuit	<ul style="list-style-type: none"> <li>• Signal current &lt; -0.25 to 2.0 mA</li> <li>• Internal check failed</li> </ul>
P0355	Ignition Coil E Primary/ Secondary Circuit	<ul style="list-style-type: none"> <li>• Signal current 0.25 to -2.0 mA</li> <li>• Internal check failed</li> </ul>

## Additional Exhaust Regulation

DTC	Error Message	Malfunction Criteria and Threshold Value
P0410	Secondary Air Injection System	Deviation SAI pressure > 50 hPa
P0413	Secondary Air Injection System Switching Valve Circuit Open	Signal voltage 4.70 to 5.40 V
P0414	Secondary Air Injection System Switching Valve Circuit Shorted	<ul style="list-style-type: none"> <li>• Signal voltage 0 to 3.25 V or</li> <li>• Signal current &gt; 2.20 A</li> </ul>
P0418	Secondary Air Injection System Control Circuit	Signal voltage 4.70 to 5.40 V
P0420	Catalyst System Efficiency Below Threshold	<ul style="list-style-type: none"> <li>• Oxygen storage capacity (OSC) vs OSC value of borderline catalyst &lt; 1.00</li> </ul>
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 System Incorrect Purge Flow	Actual EVAP pump current vs. difference from last reading > 1.70
P0442	Evaporative Emission System Leak Detected (Small Leak)	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	<ul style="list-style-type: none"> <li>• Signal current &gt; 2.2 to 4 A or</li> <li>• Signal voltage &lt; 2.74 to 3.26 V</li> </ul>
P0455	Evaporative Emission System Leak Detected (Gross Leak)	Time for pressure drop < 0.95 Sec.
P0456	Evaporative Emission System Leak Detected (Very Small Leak)	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

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0459	Evaporative Emission System Purge Control Valve Circuit High	Signal current > 2.2 A
P0491	Secondary Air System Insufficient Flow	<ul style="list-style-type: none"> <li>• SAI pressure vs. modeled SAI &lt; 50 - 72%</li> <li>or</li> <li>• Absolute deviation of raw pressure signal from filtered signal mean value &lt; 8.98 hPa</li> </ul>

### **Speed and Idle Control**

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0501	Vehicle Speed Sensor A Range/Performance	Vehicle speed < 4 km/h
P0503	Vehicle Speed Sensor Intermittent/Erratic/High	Vehicle speed > 325 km/h
P0506	Idle Air Control System - RPM Lower Than Expected	<ul style="list-style-type: none"> <li>• Engine speed deviation &gt; 100 RPM</li> <li>• RPM controller torque value &gt;= calculated max value.</li> </ul>
P0507	Idle Air Control System - RPM Higher Than Expected	<ul style="list-style-type: none"> <li>• Engine speed deviation &lt; -100 RPM</li> <li>• RPM controller torque value &lt;= calculated min. value.</li> </ul>
P050A	Idle Air Control System Out of Range	<ul style="list-style-type: none"> <li>• Engine speed deviation &gt; 100 RPM</li> <li>• RPM controller torque value &gt;= calculated max. value.</li> <li>or</li> <li>• Engine speed deviation &lt; -100 RPM</li> <li>• RPM controller torque value &lt;= calculated min. value.</li> </ul>
P050B	Cold Start Ignition Timing Performance	Difference between commanded spark timing vs. actual value > 20%
P052A	Cold Start 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	<ul style="list-style-type: none"> <li>• Internal hardware/voltage check - failed</li> <li>• Communication CPU - Sensor IC - failed</li> <li>• EEPROM Check failed</li> </ul>
P0627	Fuel Pump Control Circuit Open/Shorted to ground	<ul style="list-style-type: none"> <li>• Signal voltage 4.50 to 5.50 V (open circuit)</li> <li>• Signal voltage &lt; 3.00 V (grounded circuit)</li> </ul>
P0629	Fuel Pump Control Circuit High	Signal current 0.60 to 1.20 A
P0638	Throttle Actuator Control Range/Performance (Bank 1)	<ul style="list-style-type: none"> <li>• Time to close to reference point &gt; 0.6 Sec. and reference point = 2.88%</li> <li>or</li> <li>• TPS 1 signal voltage, not 0.40 - 0.80 V</li> <li>• TPS 2 signal voltage, not (4.20 - 4.60) V</li> </ul>
P0641	Sensor Reference Voltage A Circuit/Open	Signal voltage deviation > $\pm 0.3$ V
P0651	Sensor Reference Voltage B Circuit/Open	Signal voltage deviation > $\pm 0.3$ V
P0697	Sensor Reference Voltage C Circuit/Open	Signal voltage deviation > $\pm 0.3$ V
U0001	High Speed CAN Communication Bus	CAN message = no feedback
U0002	High Speed CAN Communication Bus	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

DTC	Error Message	Malfunction Criteria and Threshold Value
U0402	Invalid Data Received From Transmission Control Module	Implausible data message received
U0415	Invalid Data Received From Body Control Module	<ul style="list-style-type: none"> <li>• Sensor signal failure</li> <li>• None, or implausible information</li> <li>• CAN 1 VSS signal incorrect &gt; 327.08 km/h</li> </ul>
U0422	Invalid Data Received From Body Control Module	Ambient temperature value initialization = 00h
U0423	Invalid Data Received From Instrument Panel Control (IPC) Module	AAT sensor reading from cluster to ECM implausible or no message
U0447	Invalid Data Received From Gateway Module	CAN message incorrect

### Fuel and Air Ratios Control Module

DTC	Error Message	Malfunction Criteria and Threshold Value
P117A	Fuel System out of range	l - 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 deployed	Airbags activated
P2101	Throttle Actuator A Control Motor Circuit Range/ Performance	<ul style="list-style-type: none"> <li>• Duty cycle &gt;80%</li> <li>• Deviation throttle value angles vs calculated value 4 to 50%</li> <li>• ECM driver = no fault</li> </ul>
P2106	Throttle Actuator Control System - Forced Limited Power	Internal check failure
P2122	Accelerator Pedal Position Sensor D Circuit Low Input	Signal voltage < 0.61 V
P2123	Accelerator Pedal Position Sensor D Circuit High Input	Signal voltage > 4.79 V
P2127	Accelerator Pedal Position Sensor E Circuit Low Input	Signal voltage < 0.27 V
P2128	Accelerator Pedal Position Sensor E Circuit High Input	Signal voltage > 2.43 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P2138	Accelerator Pedal Position Sensor D / E Voltage Correlation	Signal voltage sensor 1 vs. 2 > 0.17 to 0.70 V
P2177	System Too Lean Off Idle	Adaptive value > 28%
P2178	System Too Rich Off Idle	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 Biased/ Stuck Lean (Bank 1, Sensor 1)	Delta lambda of 2nd lambda control loop > 0.07
P2196	O2 Sensor Signal Biased/ Stuck Rich (Bank 1, Sensor 1)	Delta lambda of 2nd lambda control loop < -0.07
P2237	O2 Sensor Positive Current Control Circuit/Open (Bank 1, Sensor 1)	<ul style="list-style-type: none"> <li>• O2S signal front 1.49 to 1.51 V</li> <li>• Fuel cutoff &gt; 3 Sec.</li> <li>• Delta lambda controller &gt; 0.10</li> </ul>
P2243	O2 Sensor Reference Voltage Circuit/Open (Bank 1, Sensor 1)	<ul style="list-style-type: none"> <li>• O2S signal front &gt; 4.70 V and Internal resistance &gt; 950 Ω</li> <li>• O2S signal front &lt; 0.20 V And Internal resistance &gt; 950 Ω</li> </ul>
P2251	O2 Sensor Negative Current Control Circuit Open	O2S signal front 1.47 to 1.53 V and > 950 Ω
P2257	Secondary Air Injection System Control Circuit Low	Signal voltage 0 to 3.26 V
P2258	Secondary Air Injection System Control 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%

**DTC Chart**

DTC	Error Message	Malfunction Criteria and Threshold Value
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	<ul style="list-style-type: none"> <li>• O2S rear not oscillating at reference &gt; 0.64 to 0.65 V and enrichment after stuck rich 15%</li> <li>or</li> <li>• Sensor voltage of <math>\geq 0.15</math> V after oxygen mass flow (after fuel cutoff) &gt; 3500 mg with <math>\geq 1</math> check</li> </ul>
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 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
P2312	Ignition Coil E Primary Control Circuit Low	Signal current > 24 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 > 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	<ul style="list-style-type: none"> <li>• High signal voltage &gt; 12 Sec. and number of checks = 30</li> <li>• Cumulative time of high signal voltage during pumping &gt; 10 Sec.</li> </ul>
P2407	Evaporative Emission System Leak Detection Pump Sense Circuit Intermittent/Erratic	<ul style="list-style-type: none"> <li>• Fluctuation of EVAP pump current during reference measurement &gt; 1 mA</li> <li>• Drop of EVAP pump current during pump phase &gt; 6 mA for &gt;= 3 Sec.</li> </ul>
P2414	O2 Sensor Exhaust Sample Error (Bank 1, Sensor 1)	<ul style="list-style-type: none"> <li>• Threshold 1</li> <li>• Signal voltage 3.1 to 4.77 V</li> <li>• Threshold 2</li> <li>• Signal Voltage 2.5 to 3.06 V</li> </ul>
P2431	Secondary Air Injection System Air Flow Pressure Sensor Circuit Range/Performance	Difference between SAI pressure and ambient pressure NOT -60 to 60 hPa

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P2432	Secondary Air Injection System Air Flow/Pressure Sensor Circuit Low	Signal voltage < 0.5 V
P2433	Secondary Air Injection System Air Flow/Pressure Sensor Circuit High	Signal voltage > 4.5 V
P2440	Secondary Air Injection System Switching Valve Stuck Open	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 CDVB

### Fuel and Air Mixture, Additional Emissions Regulations

DTC	Error Message	Malfunction Criteria and Threshold Value
P000A	Intake Camshaft Position Slow Response Bank 1	<ul style="list-style-type: none"> <li>• Difference between target and actual position &gt;12 to 40 °CRK for &gt; 3 Sec.</li> <li>• Adjustment angle <math>\geq 3</math> °CRK</li> </ul>
P000B	Exhaust Camshaft Position Slow Response (Bank 1)	<ul style="list-style-type: none"> <li>• Difference between target and actual position &gt;10 to 22 °CRK for &gt; 2 to 3 Sec</li> <li>• Adjustment angle <math>\geq 3</math> °CRK</li> </ul>
P0010	Intake Camshaft Position Actuator Circuit / Open (Bank 1)	Signal voltage, > 4.7 - 5.4 V
P0011	Intake Camshaft Position Timing - Over-Advanced (Bank 1)	<ul style="list-style-type: none"> <li>• Difference between target and actual position &gt;12 to 40 °CRK for &gt; 3 Sec.</li> <li>• Adjustment angle &lt; 3 °CRK</li> </ul>
P0013	Exhaust Camshaft Position - Actuator Circuit (Bank 1)	Signal voltage, > 4.4 - 5.6 V
P0014	Exhaust Camshaft Position - Timing Over-Advanced or System Performance Bank 1	<ul style="list-style-type: none"> <li>• Difference between target and actual position &gt;10 to 22 °CRK for &gt; 2 to 3 Sec.</li> <li>• Adjustment angle <math>\geq 3</math> °CRK</li> </ul>
P0016	Crankshaft Position - Camshaft Position Correlation (Bank 1, Sensor A)	<ul style="list-style-type: none"> <li>• Deviation in camshaft position to crankshaft position &lt; -11.01 degrees of crank rotation</li> <li>or</li> <li>• Deviation in camshaft position to crankshaft position &gt; 11.01 degrees of crank rotation</li> </ul>
P0017	Crankshaft Position – Exhaust Camshaft Position Correlation Bank 1 Sensor	<ul style="list-style-type: none"> <li>• Deviation in camshaft position to crankshaft position &lt; -11.01 degrees of crank rotation</li> <li>or</li> <li>• Deviation in camshaft position to crankshaft position &gt; 11.01 degrees of crank rotation</li> </ul>
P0030	HO2S Heater Control Circuit Low (Bank 1, Sensor 1)	Heater voltage 4.70 - 5.40 V

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0031	HO2S Heater Control Circuit Low (Bank 1, Sensor 1) Short to Ground	Heater voltage 0.00 to 3.26 V
P0032	HO2S Heater Control Circuit High (Bank 1, Sensor 1)	Heater voltage > 5.50 A
P0036	HO2S Heater Control Circuit (Bank 1, Sensor 2)	Heater voltage 2.34 - 3.59 V
P0037	HO2S Heater Control Circuit Low (Bank 1, Sensor 2)	Heater voltage < 2.34 V
P0038	HO2S Heater Control Circuit High (Bank 1, Sensor 2)	Heater voltage > 3.59 V
P0040	O2 Sensor Signals Swapped Bank 1 Sensor 1/ Bank 2 Sensor 1	Lambda controllers exceed thresholds in opposite directions > 1.20 or < 0.80
P0050	O2 Sensor Heater Control Circuit Bank 2 Sensor 1	Heater voltage 4.70 - 5.40 V
P0051	O2 Sensor Heater Control Circuit Bank 2 Sensor 1 Low	Heater voltage 0.00 to 3.26 V
P0052	O2 Sensor Heater Control Circuit Bank 2 Sensor 1 High	Heater voltage > 5.50 A
P0056	O2 Sensor Heater Control Circuit Bank 2 Sensor 2	Heater voltage 2.34 - 3.59 V
P0057	O2 Sensor Heater Control Circuit Bank 2 Sensor 2 Low	Heater voltage < 2.34 V
P0058	O2 Sensor Heater Control Circuit Bank 2 Sensor 2 High	Heater voltage > 3.59 V
P0068	MAF – Throttle Position Correlation	Plausibility with fuel system <ul style="list-style-type: none"> <li>• Load calculation &lt; -35%</li> <li>• Load calculation &gt; 35%</li> </ul>
P0070	Ambient Air Temperature Sensor Circuit	Ambient air temperature < -50 °C
P0071	Ambient Air Temperature Sensor Range/Performance	<ul style="list-style-type: none"> <li>• Difference in value between ECT vs IAT at engine start (depending on engine off time) &gt; 24.8 K</li> <li>and</li> <li>• Difference in value between AAT vs ECT at engine start (depending on engine off time) &gt; 24.8 K</li> </ul>
P0072	Ambient Air Temperature Sensor Circuit Low	Ambient air temperature > 87 °C



<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P008A	Low Pressure Fuel System Pressure - Too Low	Actual pressure < 40 kPa
P008B	Low Pressure Fuel System Pressure - Too High	Actual pressure > 780 kPa
P0087	Fuel Rail System Pressure - Too Low	<ul style="list-style-type: none"> <li>• Fuel trim activity &gt; 0.80 to 1.20</li> <li>• Pressure control activity &gt; 2.20 MPa</li> <li>• Difference between target vs. actual pressure &gt; 2.20 MPa</li> </ul>
P0089	Fuel Pressure Regulator 1 Performance	<ul style="list-style-type: none"> <li>• Difference between target vs. actual pressure &lt; 150 kPa or &gt; 200 kPa</li> <li>• Feedback control loop &lt; -300 or &gt; 225 kPa</li> </ul>
P0100	Mass Air Flow Circuit	<ul style="list-style-type: none"> <li>• MAF sensor signal 0 <math>\mu</math>s</li> <li>• MAF signal temp correction &lt; 40 mSec.</li> <li>• MAF signal temp correction &lt; 40 and &gt; 65 mSec.</li> </ul>
P0101	ss Air Flow Circuit Range/ Performance	<ul style="list-style-type: none"> <li>• Air mass too low &lt; -10 kg/h</li> <li>• Air mass too high &gt; 1100 kg/h</li> <li>• Mass air flow vs lower threshold model &lt; 0 to 580 kg/h</li> <li>• Load calculation &gt; 20% or &lt; -20%</li> </ul>
P0102	Mass Air Flow Circuit High Input	MAF sensor signal < 66 $\mu$ s
P0103	Mass or Volume Air Flow A Circuit High Input	MAF sensor signal > 910 $\mu$ s
P011F	Engine Coolant Temperature 2 / Ambient Air Temperature Correlation	<ul style="list-style-type: none"> <li>• Difference in value between ECT vs IAT at engine start (depending on engine off time) &gt; 24.8 K</li> <li>and</li> <li>• Difference in value between AAT vs ECT at engine start (depending on engine off time) &gt; 24.8 K</li> </ul>

DTC	Error Message	Malfunction Criteria and Threshold Value
P0111	Intake Air Temperature Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Difference in value between ECT vs IAT at engine start (depending on engine off time) &lt; 24.8 K</li> <li>and</li> <li>• Difference in value between AAT vs ECT at engine start (depending on engine off time) &gt; 24.8 K</li> </ul>
P0112	Intake Air Temperature Sensor Circuit Low Input	IAT > 130 °C
P0113	Intake Air Temperature Sensor Circuit High Input	T < -45.0 °C
P0116	Engine Coolant Temperature Sensor 1 Circuit Range/Performance	<ul style="list-style-type: none"> <li>• No change on signal, threshold - 1.5 K</li> <li>and</li> <li>• Signal in range 80 °C with no change on signal 1.5 K</li> </ul>
P0117	Engine Coolant Temperature Sensor 1 Circuit Low Input	ECT >137 °C
P0118	Engine Coolant Temperature Sensor 1 Circuit Open	ECT < -44 °C
P0121	Throttle/Pedal Position Sensor A Circuit Range/Performance	<ul style="list-style-type: none"> <li>• TPS 1 - TPS 2 &gt; 5.10 to 6.30%</li> <li>• Actual TPS 1 calculated value &gt; TPS 2 calculated value or TPS 2 calculated value &gt; 9%</li> </ul>
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	<ul style="list-style-type: none"> <li>• EWMA filtered max differential transient time at fuel cutoff &gt;= 5 Sec.</li> <li>• Number of checks &gt;= 2</li> </ul>
P013C	O2 Sensor Bank 2 Sensor 2 Slow Response - Rich to Lean	<ul style="list-style-type: none"> <li>• EWMA filtered max differential transient time at fuel cutoff &gt;= 5 Sec.</li> <li>• Number of checks &gt;= 2</li> </ul>
P0130	O2 Sensor Circuit (Bank 1, Sensor 1)	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 Slow Response (Bank 1, Sensor 1)	<ul style="list-style-type: none"> <li>• O2S signal front vs. modeled O2S signal ratio -0.30 to 0.30 or gradient ratio &gt;= 0.27</li> <li>• Lower value of both area ratios &lt; 0.15</li> </ul>
P0135	O2 Heater Circuit (Bank 1, Sensor 1)	<ul style="list-style-type: none"> <li>• Heater duty cycle, &gt; 90%</li> <li>• O2S ceramic temperature, &lt; 685 °C</li> <li>or</li> <li>• O2S ceramic temperature &lt; 715°C</li> <li>• Time after O2S heater on 40 Sec.</li> </ul>
P0137	O2 Circuit Low Voltage (Bank 1, Sensor 2)	<ul style="list-style-type: none"> <li>• Signal voltage, &lt; 40 mV for &gt; 3 Sec.</li> <li>• Difference of sensor voltage with load pulse and without &lt; 0.01 V</li> </ul>
P0138	O2 Circuit High Voltage (Bank 1, Sensor 2)	Signal voltage > 1.08 V for > 5 Sec.
P0139	O2 Circuit Slow Response (Bank 1 Sensor 2)	<ul style="list-style-type: none"> <li>• EWMA filtered transient time at fuel cutoff &gt; 0.5 Sec.</li> <li>• In voltage range 201.20 - 401.40 mV</li> <li>• Number of checks &gt;= 1</li> </ul>
P0140	O2 Circuit No Activity Detected (Bank 1, Sensor 2)	<ul style="list-style-type: none"> <li>Signal voltage</li> <li>• Signal voltage .40 - .60 mV for &gt; 3 Sec</li> <li>• Difference of sensor voltage with load pulse and without &lt; 0.01 V</li> <li>• Internal resistance</li> <li>• &gt; 120,000 ohm</li> <li>• Exhaust temperature &gt; 600 °C</li> </ul>
P0141	O2 Heater Circuit (Bank 1, Sensor 2)	Heater resistance, 416 - 3600 Ohm

DTC	Error Message	Malfunction Criteria and Threshold Value
P0150	O2 Sensor Circuit Bank 2 Sensor 1 Malfunction	O2S ceramic temp. < 640 °C
P0151	O2 Sensor Circuit Bank 2 Sensor 1 Low Voltage	<ul style="list-style-type: none"> <li>• Virtual Mass &lt; 1.75 V</li> <li>• Nernst voltage &lt; 1.50 V</li> <li>• Adjustment voltage &lt; 0.30 V</li> </ul>
P0152	O2 Sensor Circuit Bank 2 Sensor 1 High Voltage	<ul style="list-style-type: none"> <li>• Virtual Mass &gt; 3.25 V</li> <li>• Nernst voltage &gt; 4.40 V</li> <li>• Adjustment voltage &gt; 7 V</li> </ul>
P0153	O2 Sensor Circuit Bank 2 Sensor 1 Slow Response	<ul style="list-style-type: none"> <li>• O2S signal front vs. modeled O2S signal ratio -0.30 to 0.30 or gradient ratio <math>\geq 0.27</math></li> <li>• Lower value of both area ratios &lt; 0.15</li> </ul>
P0155	O2 Sensor Heater Circuit Bank 2 Sensor 1 Malfunction	<ul style="list-style-type: none"> <li>• Heater duty cycle, &gt; 90%</li> <li>• O2S ceramic temperature, &lt; 685 °C</li> </ul> or <ul style="list-style-type: none"> <li>• O2S ceramic temp &lt; 715 °C</li> <li>• Time after O2S heater on 40 Sec.</li> </ul>
P0157	O2 Sensor Circuit Bank 2 Sensor 2 Low Voltage	<ul style="list-style-type: none"> <li>• Signal voltage, &lt; 40 mV for &gt; 3 Sec.</li> <li>• Difference of sensor voltage with load pulse and without &lt; 0.01 V</li> </ul>
P0158	Sensor Circuit Bank 2 Sensor 2 High Voltage	Signal voltage > 1.08 V for > 5 Sec
P0159	O2 Sensor Circuit Bank 2 Sensor 2 Slow Response	<ul style="list-style-type: none"> <li>• EWMA filtered transient time at fuel cutoff &gt; 0.5 Sec.</li> <li>• In voltage range 201.20 - 401.40 mV</li> <li>• Number of checks <math>\geq 1</math></li> </ul>
P0160	O2 Sensor Circuit Bank 2 Sensor 2 No Activity Detected	Signal voltage <ul style="list-style-type: none"> <li>• Signal voltage, 0.40 - 0.60 V for &gt; 3 Sec</li> <li>• Difference of sensor voltage with load pulse and without &lt; 0.01 V</li> </ul> Internal resistance <ul style="list-style-type: none"> <li>• &gt; 120,000 ohm</li> <li>• Exhaust temperature &gt; 600 °C</li> </ul>
P0161	O2 Sensor Heater Circuit Bank 2 Sensor 2 Malfunction	Heater resistance, 416 - 3600 Ohm

DTC	Error Message	Malfunction Criteria and Threshold Value
P0169	Incorrect Fuel Composition	Comparison with fuel quantity = incorrect.
P0171	System Too Lean (Bank 1)	At idle • Adaptive value > 5.02% At part-load • Adaptive value 21%
P0172	System Too Rich (Bank 1)	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 Circuit Range/Performance	Actual pressure > 14.60 MPa or < 0.005 MPa
P0192	Fuel Rail Pressure Sensor A Circuit Low Input	Signal voltage < 0.2 V
P0201	Injector Circuit/Open - Cylinder 1	• Low side signal current < 2.1 A • Internal logic failure
P0202	Injector Circuit/Open - Cylinder 2	• Low side signal current < 2.1 A • Internal logic failure
P0203	Injector Circuit/Open - Cylinder 3	• Low side signal current < 2.1 A • Internal logic failure
P0204	Injector Circuit/Open - Cylinder 4	• Low side signal current < 2.1 A • Internal logic failure
P0205	Injector Circuit Open - Cylinder 5	• Low side signal current < 2.1 A • Internal logic failure
P0206	Injector Circuit Open - Cylinder 6	• Low side signal current < 2.1 A • Internal logic failure
P0221	Accelerator Pedal Position Sensor Circuit Range/Performance	• TPS 1 - TPS 2 > 5.10 to 6.30% • Actual TPS 1 calculated value > TPS 2 calculated value or TPS 2 calculated value > 9%
P0222	Accelerator Pedal Position Sensor Circuit Low Input	Signal voltage < 0.20 V
P0223	Accelerator Pedal Position Sensor Circuit High Input	Signal voltage > 4.81 V
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

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P025D	Fuel Pump Module Control Circuit High	Signal current > 1.10 A
P0261	Cylinder 1 Injector Circuit Low	Low side signal current < 2.10 A
P0262	Cylinder 1 Injector Circuit High	Low side signal current > 14.70 A
P0264	Cylinder 2 Injector Circuit Low	Low side signal current < 2.10 A
P0265	Cylinder 2 Injector Circuit High	Low side signal current > 14.70 A
P0267	Cylinder 3 Injector Circuit Low	Low side signal current < 2.10 A
P0268	Cylinder 3 Injector Circuit High	Low side signal current > 14.70 A
P0270	Cylinder 4 Injector Circuit Low	Low side signal current < 2.1 A
P0271	Cylinder 4 Injector Circuit High	Low side signal current > 14.70 A
P0273	Cylinder 5- Injector Circuit Low	Low side signal current < 2.10 A
P0274	Cylinder 5- Injector Circuit High	Low side signal current > 14.70 A
P0276	Cylinder 6- Injector Circuit Low	Low side signal current < 2.10 A
P0277	Cylinder 6- Injector Circuit High	Low side signal current > 14.70 A
P2088	A Camshaft Position Actuator Control Circuit Low (Bank 1)	Signal voltage 0.0 - 3.25 V
P2089	A Camshaft Position Actuator Control Circuit High (Bank 1)	Signal current > 2.2 A
P2090	"B" Camshaft Position Actuator Control Circuit Low (Bank 1)	Signal voltage 0.0 to 3.25 V
P2091	"B" Camshaft Position Actuator Control Circuit High (Bank 1)	Signal current > 2.20 A
P2096	Post-Catalyst Fuel Trim System Too Lean (Bank 1)	1 portion of 2nd lambda control loop < -0.035
P2097	Post-Catalyst Fuel Trim System Too Rich (Bank 1)	1 portion of 2nd lambda control loop > 0.035
P2098	Post Catalyst Fuel Trim System Bank 2 Too Lean	1 portion of 2nd lambda control loop < -0.035
P2099	Post Catalyst Fuel Trim System Bank 2 Too Rich	1 portion of 2nd lambda control loop > 0.035
P3081	Engine Temperature Too Low	Difference between ECT and modeled ECT > 9.8 °K

## Ignition System

DTC	Error Message	Malfunction Criteria and Threshold Value
P0300	Random Misfire Detected	<ul style="list-style-type: none"> <li>• Emission threshold misfire rate (MR) &gt; 1.9%</li> <li>• Catalyst damage misfire rate (MR), &gt; 1.05% - 13.33%</li> </ul>
P0301	Cylinder 1 Misfire Detected	<ul style="list-style-type: none"> <li>• Emission threshold Misfire Rate (MR), &gt; 1.9%</li> <li>• Catalyst damage misfire rate (MR), &gt; 1.05% - 13.33%</li> </ul>
P0302	Cylinder 2 Misfire Detected	<ul style="list-style-type: none"> <li>• Emission threshold Misfire Rate (MR), &gt; 1.9%</li> <li>• Catalyst damage misfire rate (MR), &gt; 1.05% - 13.33%</li> </ul>
P0303	Cylinder 3 Misfire Detected	<ul style="list-style-type: none"> <li>• Emission threshold Misfire Rate (MR), &gt; 1.9%</li> <li>• Catalyst damage misfire rate (MR), &gt; 1.05% - 13.33%</li> </ul>
P0304	Cylinder 4 Misfire Detected	<ul style="list-style-type: none"> <li>• Emission threshold Misfire Rate (MR), &gt; 1.9%</li> <li>• Catalyst damage misfire rate (MR), &gt; 1.05% - 13.33%</li> </ul>
P0305	Cylinder 5 Misfire Detected	<ul style="list-style-type: none"> <li>• Emission threshold Misfire Rate (MR), &gt; 1.9%</li> <li>• Catalyst damage misfire rate (MR), &gt; 1.05% - 13.33%</li> </ul>
P0306	Cylinder 6 Misfire Detected	<ul style="list-style-type: none"> <li>• Emission threshold Misfire Rate (MR), &gt; 1.9%</li> <li>• Catalyst damage misfire rate (MR), &gt; 1.05% - 13.33%</li> </ul>
P0321	Engine Speed Input Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Comparison of counted teeth vs reference = incorrect</li> <li>• Missing reference gap</li> <li>• Camshaft signals &gt; 8 and no engine speed signal.</li> </ul>
P0322	Engine Speed Input Circuit No Signal	<ul style="list-style-type: none"> <li>• Camshaft signal &gt; 3</li> <li>• Engine speed, no signal</li> </ul>
P0324	Knock Control System Error	<ul style="list-style-type: none"> <li>• Signal fault counter (combustion) &gt; 28</li> <li>or</li> <li>• Signal fault counter (measuring window) &gt; 5</li> </ul>
P0325	Knock Sensor 1 Circuit Malfunction	Signal voltage < 1.80 V or > 3.20 V

DTC	Error Message	Malfunction Criteria and Threshold Value
P0327	Knock Sensor 1 Circuit Low Input (Bank 1)	<ul style="list-style-type: none"> <li>• Lower threshold -0.07 V</li> <li>• Signal range lower threshold &lt; 0.30 to 2.50 V</li> </ul>
P0328	Knock Sensor 1 Circuit High Input (Bank 1)	<ul style="list-style-type: none"> <li>• Upper threshold &gt; 1.00 V</li> <li>• Signal range upper threshold &lt; 50 to 110.15 V</li> </ul>
P0330	Knock Sensor 2 Circuit	Signal voltage < 1.80 V or > 3.20 V
P0332	Knock Sensor 2 Circuit Low Input	<ul style="list-style-type: none"> <li>• Lower threshold -0.07 V</li> <li>• Signal range lower threshold &lt; 0.30 to 2.50 V</li> </ul>
P0333	Knock Sensor 2 Circuit High Input	<ul style="list-style-type: none"> <li>• Upper threshold &gt; 1.00 V</li> <li>• Signal range upper threshold &lt; 50 to 110.15 V</li> </ul>
P0340	Camshaft Position Sensor A Circuit (Bank 1)	Cam adaption values out of range <ul style="list-style-type: none"> <li>• &gt; 20° KW</li> <li>• &lt; -20° KW</li> <li>• Difference of adapted and actual values &gt; 9° KW</li> </ul>
P0341	Camshaft Position Sensor A Circuit Range/Performance (Bank 1)	<ul style="list-style-type: none"> <li>• Signal pattern not alternating</li> <li>• Defect counter = 12</li> </ul>
P0342	Camshaft Position Sensor A Circuit Low Input (Bank 1)	<ul style="list-style-type: none"> <li>• Signal voltage low</li> <li>• Crankshaft signals = 8</li> </ul>
P0343	Camshaft Position Sensor A Circuit High Input (Bank 1)	<ul style="list-style-type: none"> <li>• Signal voltage high</li> <li>• Crankshaft signals = 8</li> </ul>
P0351	Ignition Coil A Primary/ Secondary Circuit	<ul style="list-style-type: none"> <li>• Signal current 0.25 to -2.0 mA or</li> <li>• Internal check failed</li> </ul>
P0352	Ignition Coil B Primary/ Secondary Circuit	<ul style="list-style-type: none"> <li>• Signal current 0.25 to -2.0 mA or</li> <li>• Internal check failed</li> </ul>
P0353	Ignition Coil C Primary/ Secondary Circuit	<ul style="list-style-type: none"> <li>• Signal current 0.25 to -2.0 mA or</li> <li>• Internal check failed</li> </ul>
P0354	Ignition Coil D Primary/ Secondary Circuit	<ul style="list-style-type: none"> <li>• Signal current 0.25 to -2.0 mA or</li> <li>• Internal check failed</li> </ul>
P0355	Ignition Coil E Primary/ Secondary Circuit	<ul style="list-style-type: none"> <li>• Signal current 0.25 to -2.0 mA or</li> <li>• Internal check failed</li> </ul>



DTC	Error Message	Malfunction Criteria and Threshold Value
P0356	Ignition Coil F Primary/ Secondary Circuit	<ul style="list-style-type: none"> <li>• Signal current 0.25 to -2.0 mA or</li> <li>• Internal check failed</li> </ul>
P0366	Crankshaft Position Sensor A Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Signal pattern incorrect</li> <li>• Crankshaft signals = 8</li> </ul>
P0367	Camshaft Position Sensor "B" Circuit (Bank 1) Low Input	<ul style="list-style-type: none"> <li>• Signal voltage low</li> <li>• Crankshaft signals = 8 revolutions</li> </ul>
P0368	Camshaft Position Sensor "B" Circuit Bank 1 High Input	<ul style="list-style-type: none"> <li>• Signal voltage high</li> <li>• Crankshaft signals = 8 revolutions</li> </ul>
P2300	Ignition Coil A Primary Control Circuit Low	Signal current > 24 mA
P2301	Ignition Coil A Primary Control Circuit High	Signal current > 5.10 - 7.0 mA
P2303	Ignition Coil B Primary Control Circuit Low	Signal current > 24 mA
P2304	Ignition Coil B Primary Control Circuit High	Signal current > 5.10 - 7.0 mA
P2306	Ignition Coil C Primary Control Circuit Low	Signal current > 24 mA
P2307	Ignition Coil C Primary Control Circuit High	Signal voltage > 5.10 - 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 > 5.10 - 7.0 mA
P2312	Ignition Coil "E" Primary Control Circuit Low	Signal current > 24 mA
P2313	Ignition Coil "E" Primary Control Circuit High	Signal voltage > 5.10 to 7.0 V
P2315	Ignition Coil "F" Primary Control Circuit Low	Signal current > 24 mA
P2316	Ignition Coil "F" Primary Control Circuit High	Signal voltage > 5.10 to 7.0 V

## Additional Exhaust Regulation

DTC	Error Message	Malfunction Criteria and Threshold Value
P0420/ P0430	Catalyst System Efficiency Below Threshold Bank 1 (P0420) or Bank 2 (P0430)	<ul style="list-style-type: none"> <li>• Measured oxygen storage capacity (OSC) &lt; 1.00 HC correlated</li> <li>• Measured oxygen storage capacity (OSC) catalyst system &lt; 1.00 NOx correlated</li> </ul>
P0441	Evaporative Emission System Incorrect Purge Flow	Deviation lambda control < 5.00 to 5.51%
P0442	Evaporative Emission System Leak Detected (Small Leak)	Time for pressure drop < 1.5 - 1.7 Sec.
P0444	Evaporative Emission System Purge Control Valve Circuit Open	Signal voltage > 4.70 - 5.40 V
P0455	Evaporative Emission System Leak Detected (Gross Leak/ No Flow)	Time for pressure drop < 1.1 - 1.3 Sec.
P0456	Evaporative Emission System Leak Detected (Very Small Leak)	Time for pressure drop, < 4.8 - 6.0 Sec.
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 > 2.20 A

## Speed and Idle Control

DTC	Error Message	Malfunction Criteria and Threshold Value
P050A	Cold Start Idle Air Control System Performance	<ul style="list-style-type: none"> <li>• Engine speed deviation &lt; -200 RPM</li> <li>• Idle controller at max value 8% or</li> <li>• Engine speed deviation &gt; 200 RPM</li> <li>• Idle controller at min value -4.98%</li> </ul>
P050B	Cold Start Ignition Timing Performance	Difference between commanded spark timing and actual value > 22%

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0501	Vehicle Speed Sensor A Range/Performance	VSS signal < 4 km/h
P0506	Idle Air Control System - RPM Lower Than Expected	Engine speed Deviation > 100 RPM and Idle controller at max value
P0507	Idle Air Control System - RPM Higher Than Expected	Idle speed Deviation < -100 RPM and Idle controller at min value -4.98%
P052A	Cold Start "A" Camshaft Position Timing Over-Advanced Bank 1	Difference between target position vs. actual position > 12 to 40 °CRK
P053F	Cold Start Fuel Pressure Performance	<ul style="list-style-type: none"> <li>• Difference between target pressure vs actual pressure: &gt; 1.50 MPa</li> <li>or</li> <li>• &lt; -1.50 MPa</li> </ul>
P054A	Cold Start "B" Camshaft Position Timing Over-Advanced Bank 1	Difference between target position vs. actual position > 10 to 22 °CRK

**Control Module and Output Signals**

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0601	Internal Control Module Memory Check Sum Error	ECM internal checksum incorrect
P0604	Internal Control Module Random Access Memory (RAM) Error	Write ability check, failed
P0606	ECM Processor Fault	ECM internal check failure
P062B	Internal ECM Fuel Injector Control Performance	Internal logic failure
P0638	Throttle Actuator Control Range Performance	<ul style="list-style-type: none"> <li>• Time to close to reference point &gt; 0.6 Sec.</li> <li>and</li> <li>• Reference point 2.88%</li> <li>• TPS 1 signal voltage 'NOT 0.40 to 0.80 V</li> <li>• TPS 2 signal voltage 'NOT 4.20 to 4.60 V</li> <li>• ECM power stage no failure</li> </ul>
P0641	Sensor Reference Voltage A Circuit Open	Signal voltage deviation > ± 0.3 V

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P0651	Sensor Reference Voltage B Circuit Open	Signal voltage deviation > $\pm 0.3$ V
P0657	Actuator Supply Voltage A Circuit Open	Signal voltage > 4.4 - 5.6 V
P0685	ECM/PCM Power Relay Control Circuit Open	Control voltage > 0.7 V
P0686	ECM/PCM Power Relay Control Circuit Low	Control voltage < 0.51 V
P0687	ECM/PCM Power Relay Control Circuit High	Control voltage > 4.0 V
P0688	ECM/PCM Power Relay Sense Circuit	• Sense voltage < 3.0 V
P0697	Sensor Reference Voltage C Circuit Open	Signal voltage deviation > $\pm 0.3$ V
U0001	High Speed CAN Communication Bus	CAN message = no feedback
U0002	High Speed CAN Communication Bus Performance	Global Time Out failure. No module communication on CAN.
U0101	Lost Communication with TCM	Time Out failure. No message received by ECM from TCM > 5 Sec.
U0121	Lost Communication With Anti-Lock Brake System (ABS) Control Module	CAN communication with ABS Time Out.
U0146	Lost Communication With Gateway A	CAN communication with gateway Time Out
U0155	Lost Communication With Instrument Panel Cluster (IPC) Control Module	CAN communication with IPC timed out.
U0302	Software Incompatibility with Transmission Control Module	AT vehicle, ECM coded as MT vehicle
U0402	Invalid Data Received From Gear Shift Control Module	Transmission Data Length Code incorrect or invalid information.
U0415	CAN Communication With ABS Error	<ul style="list-style-type: none"> <li>• Speed sensor initialization failed</li> <li>• Speed sensor low voltage error failed</li> <li>• Speed sensor &gt; 326 km/h</li> </ul>

DTC	Error Message	Malfunction Criteria and Threshold Value
U0423	Invalid Data Received From Instrument Panel Cluster Control Module	CAN message incorrect.

### Fuel and Air Ratios Control Module

DTC	Error Message	Malfunction Criteria and Threshold Value
P12A1	Fuel Rail Pressure Sensor Inappropriately Low	<ul style="list-style-type: none"> <li>• Pressure control activity &gt; 0.13 MPa</li> <li>• Fuel trim activity &lt; 0.78</li> <li>• Difference between target pressure vs actual -16 to 16.38 MPa</li> </ul>
P12A2	Fuel Rail Pressure Sensor Inappropriately High	<ul style="list-style-type: none"> <li>• Pressure control activity &lt; -0.13 MPa</li> <li>• Fuel trim activity &gt; 1.21</li> <li>• Difference between target pressure vs actual -16 to 16.38 MPa</li> </ul>
P12A4	Fuel Rail Pump Control Valve Stuck Closed	<ul style="list-style-type: none"> <li>• Fuel trim activity .80 to 1.20</li> <li>• Pressure control activity &lt; -4.0 MPa</li> <li>• Difference between target and actual pressure &lt; -4.00 MPa</li> </ul>
P150A	Engine Off Time Performance	<ul style="list-style-type: none"> <li>• Difference between engine off time and ECM after run time &lt; -8 Sec.</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>• Difference between engine off time and ECM after run time &gt; 8 Sec.</li> </ul>
P2101	Throttle Actuator Control Motor Circuit Range/Performance	<ul style="list-style-type: none"> <li>• Duty cycle &gt;80%</li> <li>• ECM power stage no failure</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>• Deviation throttle value angles vs. calculated value: 4 to 50%</li> </ul>
P2106	Throttle Actuator Control System - Forced Limited Power	<ul style="list-style-type: none"> <li>• Duty cycle &gt;80%</li> <li>• ECM power stage failure</li> </ul>
P2108	Throttle Actuator Control Module Performance	Time to close under reference point > 0.60 Sec. and reference point 11.56%

DTC Chart

DTC	Error Message	Malfunction Criteria and Threshold Value
P2122	Accelerator Pedal Position Sensor D Circuit Low Input	Signal voltage < 0.61 V
P2123	Accelerator Pedal Position Sensor D Circuit High Input	Signal voltage > 4.79 V
P2127	Accelerator Pedal Position Sensor E Circuit Low Input	Signal voltage < 0.27 V
P2128	Accelerator Pedal Position Sensor D / E Voltage Correlation	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 to 0.70 V or • Signal voltage sensor 1 <= 0.90 V and Signal voltage sensor 2 > 0.50 V or • Signal voltage sensor 1 > 1.01 V and Signal voltage sensor 2 <= 0.45 V
P2146	Fuel Injector Group A Supply Voltage Circuit/Open	• High side signal current, < 2.60 A or • High side signal current > 14.90 A
P2149	Fuel Injector Group B Supply Voltage Circuit/Open	• High side signal current, < 2.60 A or • High side signal current > 14.90 A
P2152	Fuel Injector Group "C" Supply Voltage Circuit Open	• High side signal current, < 2.30 A or • High side signal current > 18.60 A
P2155	Fuel Injector Group "D" Supply Voltage Circuit/Open	• High side signal current, < 2.60 A or • High side signal current > 14.90 A
P2177	System too lean off idle, (Bank 1)	Fuel adaptive value > 30%

DTC	Error Message	Malfunction Criteria and Threshold Value
P2178	System too rich off idle, (Bank 1)	Fuel adaptive value < -30%
P2179	System too lean off idle, Bank 2	Fuel adaptive value > 30%
P2180	System too rich off idle, Bank 2	Fuel adaptive value < -30%
P2181	Cooling System Performance	Cooling system temperature too low after a sufficient mass air flow integral < 61 to 70 °C
P2184	Engine Coolant Temperature Sensor 2 Circuit Low	Signal voltage < 0.20 V
P2185	Engine Coolant Temperature Sensor 2 Circuit High	Signal voltage > 4.95 V
P2187	System too lean at idle, (Bank 1)	Fuel adaptive value > 6%
P2188	System too rich at idle, Bank 1	•Fuel adaptive value < -6%
P2189	System too lean at idle, Bank 2	Fuel adaptive value > 6%
P2190	System too rich at idle, Bank 2	Fuel adaptive value < -6%
P2195	O2 Sensor Signal Biased/ Stuck Lean (Bank 1, Sensor 1)	Delta lambda of 2nd lambda control loop > 0.059
P2196	O2 Sensor Signal Biased/ Stuck Rich (Bank 1, Sensor 1)	Delta lambda of 2nd lambda control loop < -0.059
P2197	O2 Sensor Signal Stuck Lean (Bank 2 Sensor 1)	Delta lambda of 2nd lambda control loop > 0.059
P2198	O2 Sensor Signal Stuck Rich (Bank 2 Sensor 1)	Delta lambda of 2nd lambda control loop < -0.059
P2237	O2 Sensor Positive Current Control Circuit/Open (Bank 1, Sensor 1)	• O2S signal front 1.49 - 1.51 V • Delta lambda controller > 0.07
P2240	O2 Sensor Positive Current Control Circuit Bank 2 Sensor 1 Open	• O2S signal front 1.49 - 1.51 V • Delta lambda controller > 0.07
P2243	O2 Sensor Reference Voltage Circuit/Open (Bank 1, Sensor 1)	• O2S signal front > 4.70 V and Internal resistance > 950 Ohms • O2S signal front < 0.20 V and Internal resistance > 950 Ohms

DTC	Error Message	Malfunction Criteria and Threshold Value
P2247	O2 Sensor Reference Voltage Circuit Bank 2 Sensor 1 Open	<ul style="list-style-type: none"> <li>• O2S signal front &gt; 4.70 V and Internal resistance &gt; 950 Ohms</li> <li>• O2S signal front &lt; 0.20 V and Internal resistance &gt; 950 Ohms</li> </ul>
P2251	O2 Sensor Negative Current Control Circuit Bank 1 Sensor 1 open	<ul style="list-style-type: none"> <li>• O2S signal front 1.47 - 1.52 V and</li> <li>• Internal resistance &gt; 950 ohms</li> </ul>
P2254	O2 Sensor Negative Current Control Circuit Bank 2 Sensor 1 open	<ul style="list-style-type: none"> <li>• O2S signal front 1.47 - 1.52 V and</li> <li>• Internal resistance &gt; 950 ohms</li> </ul>
P2270	O2 Sensor Signal Stuck Lean (Bank 1 Sensor 2)	<ul style="list-style-type: none"> <li>• O2S signal rear not oscillating at reference &lt; 0.65 V</li> <li>• Enrichment after stuck lean 25%</li> </ul>
P2271	O2 Sensor Signal Stuck Rich (Bank 1, Sensor 2)	<ul style="list-style-type: none"> <li>• Sensor voltage of <math>\geq 0.15</math> V after oxygen mass &gt; 1100 to 1800 mg</li> <li>• Number of checks <math>\geq 1</math></li> </ul>
P2272	O2 Sensor Signal Stuck Lean (Bank 2 Sensor 2)	<ul style="list-style-type: none"> <li>• O2S signal rear not oscillating at reference &lt; 0.65 V</li> <li>• Enrichment after stuck lean 25%</li> </ul>
P2273	O2 Sensor Signal Stuck Rich (Bank 2 Sensor 2)	<ul style="list-style-type: none"> <li>• Sensor voltage of <math>\geq 0.15</math> V after oxygen mass &gt; 1100 to 1800 mg</li> <li>• Number of checks <math>\geq 1</math></li> </ul>
P2279	Intake Air System Leak	<ul style="list-style-type: none"> <li>• Threshold to detect a defective system 2.10 and</li> <li>• Ratio of the tie system defective during the measurement window to the whole duration of the measurement window 0.80</li> </ul>
P2293	Fuel Pressure Regulator 2 Performance	<ul style="list-style-type: none"> <li>• Difference between target pressure vs. actual pressure: &gt; 1.50 mPa</li> <li>or</li> <li>• &lt; -1.50 mPa</li> </ul>
P2294	Fuel Pressure Regulator 2 Control Circuit	<ul style="list-style-type: none"> <li>• Signal voltage 1.40 - 3.20 V</li> </ul>



DTC	Error Message	Malfunction Criteria and Threshold Value
P2295	Fuel Pressure Regulator 2 Control Circuit Low Short to Ground	Signal voltage < 1.40 - 3.20 V
P2296	Fuel Pressure Regulator 2 Control Circuit High	Signal voltage > 3.20 V

### 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
P2401	Evaporative Emission System Leak Detection Pump Control Circuit Low	Signal voltage < 2.15 to 3.25 V
P2402	Evaporative Emission System Leak Detection Pump Control Circuit High	Signal current > 3.0 A
P2403	Evaporative Emission System Leak Detection Pump Sense Circuit/Open	Low signal voltage > 0.5 Sec.
P2404	Evaporative Emission System Leak Detection Pump Sense Circuit Range/Performance	<ul style="list-style-type: none"> <li>• High signal voltage &gt; 12 Sec.</li> <li>• Number of checks = 30</li> <li>• Cumulative time of high signal voltage during pumping &gt; 20 Sec.</li> </ul>
P2414	O2 Sensor Exhaust Sample Error (Bank 1, Sensor 1)	Threshold 1 • Signal voltage 3.70 - 4.81 V Threshold 2 • Signal voltage 2.51 - 3.00 V
P2415	O2 Sensor Exhaust Sample Error, Bank 2 Sensor 1	Threshold 1 • Signal voltage 3.70 - 4.81 V Threshold 2 • Signal voltage 2.51 - 3.00 V
P2539	Low Pressure Fuel System Sensor Circuit	Signal voltage > 4.80 V
P2541	Low Pressure Fuel System Sensor Circuit Low Input	Signal voltage < 0.20 V
P2600	Coolant Pump Control Circuit/ Open	Signal voltage 4.5 - 5.5 V

<b>DTC</b>	<b>Error Message</b>	<b>Malfunction Criteria and Threshold Value</b>
P2602	Coolant Pump Control Circuit Low	Signal voltage < 3.0 V
P2603	Coolant Pump Control Circuit High	Signal current 0.60 - 1.20 A
P2626	O2 Sensor Pumping Current Trim Circuit/Open (Bank 1 Sensor 1)	O2S signal front > 4.81 V
P2629	O2 Sensor Pumping Current Trim Circuit/Open Bank 2, Sensor 1	O2S signal front > 4.81 V

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