Das Auto.

2014

Touareg

Quick Reference Specification Book

2014 Volkswagen Touareg
Quick Reference Specification Book

TABLE OF CONTENTS

TRANSMISSIONS

GENERAL INFORMATION

Decimal and Metric Equivalents

Distance/Length

To calculate: mm x 0.03937 = in.

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

Tightening Torque

Nm-to-lb·ft (ft·lb)

To calculate: Nm x 0.738 = lb·ft

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

Nm-to-lb·in (in·lb), kg·cm

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

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

N·cm-to-lb·in (in·lb), kg·cm

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

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

kg·cm-to-lb·in (in·lb), N·cm

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

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

Warnings and Cautions

WARNINGS

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

WARNINGS *(cont'd)*

- 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.

(WARNINGS cont'd on next page)

WARNINGS *(cont'd)*

- 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.

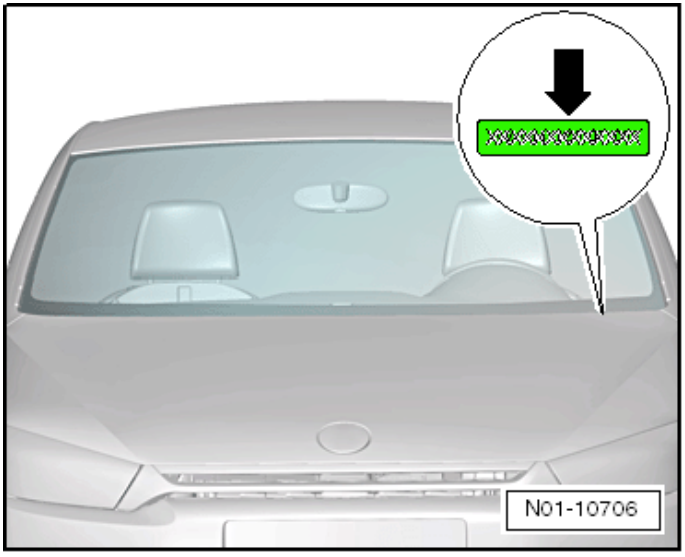
(CAUTIONS cont'd on next page)

CAUTIONS *(cont'd)*

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

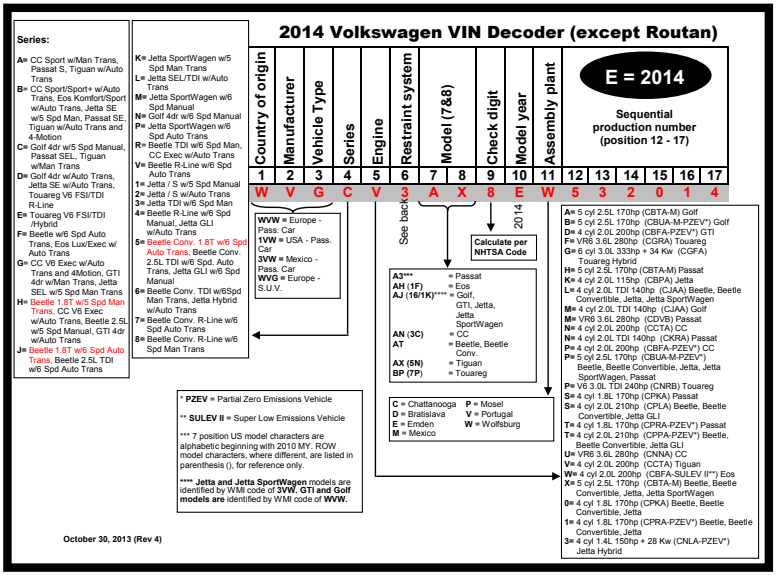
VEHICLE IDENTIFICATION

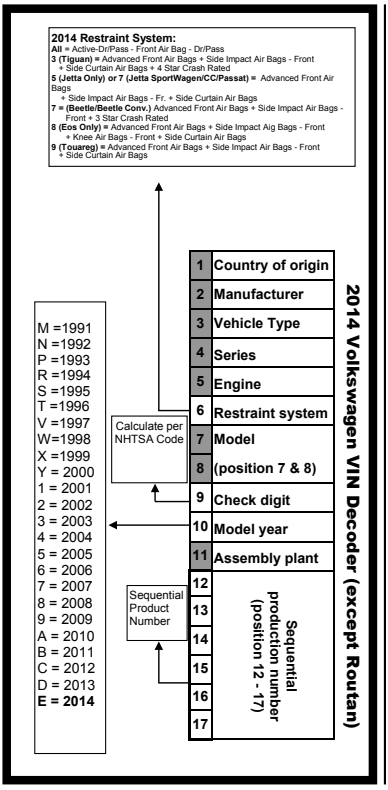
Vehicle Identification Number (VIN) Location



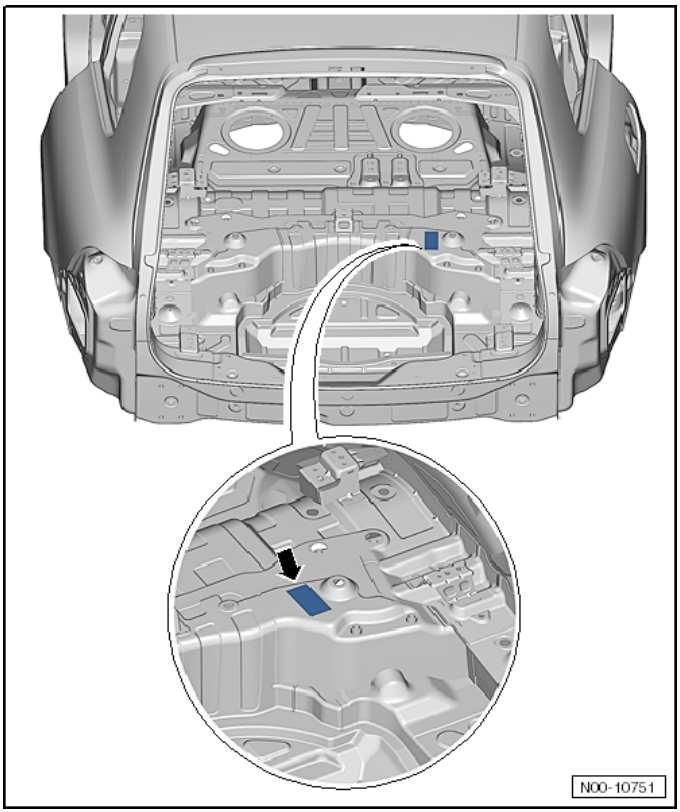
The VIN (➡) is on the left side of the vehicle in the area of the windshield wiper mount. It is visible from the outside. (Typical illustration shown).

VIN Decoder


2014 Volkswagen VIN Decoder (except Routan)
Series:
A= CC Sport w/Man Trans, Passat S, Tiguan w/Auto Trans
B= CC Sport/Sport+ w/Auto Trans, Eos Komfort/Sport 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, Touareg V6 FSI/TDI R-Line
E= Touareg V6 FSI/TDI /Hybrid
F= Beetle w/6 Spd Auto Trans, Eos Lux/Exec w/ Auto Trans
G= CC V6 Exec w/Auto Trans and 4Motion, GTI 4dr w/Man Trans, Jetta SEL w/5 Spd Man Trans
H= Beetle 1.8T w/5 Spd Man Trans, CC V6 Exec w/Auto Trans, Beetle 2.5L w/5 Spd Manual, GTI 4dr w/Auto Trans
J= Beetle 1.8T w/6 Spd Auto Trans, Beetle 2.5L TDI w/6 Spd Auto Trans
K= Jetta SportWagen w/5 Spd Man Trans
L= Jetta SEL/TDI w/Auto Trans
M= Jetta SportWagen w/6 Spd Manual
N= Golf 4dr w/6 Spd Manual
P= Jetta SportWagen w/6 Spd Auto Trans
R= Beetle TDI w/6 Spd Man, CC Exec w/Auto Trans
V= Beetle R-Line w/6 Spd Auto Trans
1= Jetta / S w/5 Spd Manual
2= Jetta / S w/Auto Trans
3= Jetta TDI w/6 Spd Man
4= Beetle R-Line w/6 Spd Manual, Jetta GLI w/Auto Trans
5= Beetle Conv. 1.8T w/6 Spd Auto Trans, Beetle Conv. 2.5L TDI w/6 Spd. Auto Trans, Jetta GLI w/6 Spd Manual
6= Beetle Conv. TDI w/6Spd Man Trans, Jetta Hybrid w/Auto Trans
7= Beetle Conv. R-Line w/6 Spd Auto Trans
8= Beetle Conv. R-Line w/6 Spd Man Trans
Country of origin
Manufacturer
Vehicle Type
Series
Engine
Restraint system
Model (7&8)
Check digit
Model year
Assembly plant
E = 2014
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 G C V 3 A X 8 E W 5 3 2 0 1 4
WVW = Europe - Pass. Car
1VW = USA - Pass. Car
3VW = Mexico - Pass. Car
WVG = Europe - S.U.V.
See back
2014
Calculate per NHTSA Code
A3*** = Passat
AH (1F) = Eos
AJ (16/1K)**** = Golf, GTI, Jetta, Jetta SportWagen
AN (3C) = CC
AT = Beetle, Beetle Conv.
AX (5N) = Tiguan
BP (7P) = Touareg
C = Chattanooga
D = Bratislava
E = Emden
M = Mexico
P = Mosel
V = Portugal
W = Wolfsburg
A= 5 cyl 2.5L 170hp (CBTA-M) Golf
B= 5 cyl 2.5L 170hp (CBUA-M-PZEV*) Golf
D= 4 cyl 2.0L 200hp (CBFA-PZEV*) GTI
F= VR6 3.6L 280hp (CGFA) Touareg
G= 6 cyl 3.0L 333hp + 34 Kw (CGFA) Touareg Hybrid
H= 5 cyl 2.5L 170hp (CBTA-M) Passat
K= 4 cyl 2.0L 115hp (CBPA) Jetta
L= 4 cyl 2.0L TDI 140hp (CJAA) Beetle, Beetle Convertible, Jetta, Jetta SportWagen
M= 4 cyl 2.0L TDI 140hp (CJAA) Golf
M= VR6 3.6L 280hp (CDVB) Passat
N= 4 cyl 2.0L 200hp (CCTA) CC
N= 4 cyl 2.0L TDI 140hp (CKRA) Passat
P= 4 cyl 2.0L 200hp (CBFA-PZEV*) CC
P= 5 cyl 2.5L 170hp (CBUA-M-PZEV*) Beetle, Beetle Convertible, Jetta, Jetta SportWagen, Passat
P= V6 3.0L TDI 240hp (CNRB) Touareg
S= 4 cyl 1.8L 170hp (CPKA) Passat
S= 4 cyl 2.0L 210hp (CPLA) Beetle, Beetle Convertible, Jetta GLI
T= 4 cyl 1.8L 170hp (CPRA-PZEV*) Passat
T= 4 cyl 2.0L 210hp (CPPA-PZEV*) Beetle, Beetle Convertible, Jetta GLI
U= VR6 3.6L 280hp (CNNA) CC
V= 4 cyl 2.0L 200hp (CCTA) Tiguan
W= 4 cyl 2.0L 200hp (CBFA-SULEV II**) Eos
X= 5 cyl 2.5L 170hp (CBTA-M) Beetle, Beetle Convertible, Jetta, Jetta SportWagen
0= 4 cyl 1.8L 170hp (CPKA) Beetle, Beetle Convertible, Jetta
1= 4 cyl 1.8L 170hp (CPRA-PZEV*) Beetle, Beetle Convertible, Jetta
3= 4 cyl 1.4L 150hp + 28 Kw (CNLA-PZEV*) Jetta Hybrid
* PZEV = Partial Zero Emissions Vehicle
** SULEV II = Super Low Emissions Vehicle
*** 7 position US model characters are alphabetic beginning with 2010 MY. ROW model characters, where different, are listed in parenthesis (), for reference only.
**** Jetta and Jetta SportWagen models are identified by WMI code of 3VW. GTI and Golf models are identified by WMI code of WVW.
October 30, 2013 (Rev 4)


2014 Restraint System:
All = Active-Dr/Pass - Front Air Bag - Dr/Pass
3 (Tiguan) = Advanced Front Air Bags + Side Impact Air Bags - Front + Side Curtain Air Bags + 4 Star Crash Rated
5 (Jetta Only) or 7 (Jetta SportWagen/CC/Passat) = Advanced Front Air Bags + Side Impact Air Bags - Fr. + Side Curtain Air Bags
7 = (Beetle/Beetle Conv.) Advanced Front Air Bags + Side Impact Air Bags - Front + 3 Star Crash Rated
8 (Eos Only) = Advanced Front Air Bags + Side Impact Aig Bags - Front + Knee Air Bags - Front + 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
E = 2014
Calculate per NHTSA Code
Sequential Product Number
1 Country of origin
2 Manufacturer
3 Vehicle Type
4 Series
5 Engine
6 Restraint system
7 Model
8 (position 7 & 8)
9 Check digit
10 Model year
11 Assembly plant
12 13 14 15 16 17
Sequential production number (position 12 - 17)
2014 Volkswagen VIN Decoder (except Routan)

Vehicle Data Label Location



The vehicle data label (➡) is above the right spare wheel well.

SALES CODES

Engine Codes

CNRB	3.0L 6-cylinder TDI
CGFA	3.0L 6-cylinder
CGRA	3.6L 6-cylinder

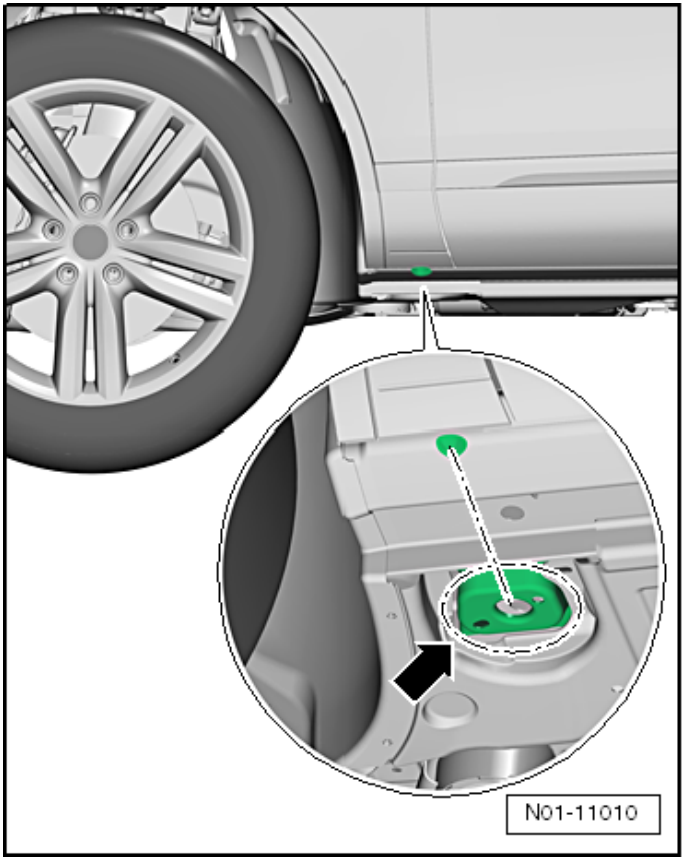
Transmission Codes

0C8	8-speed automatic transmission

VEHICLE LIFTING

Hoist and Jack Mounting Points

Front

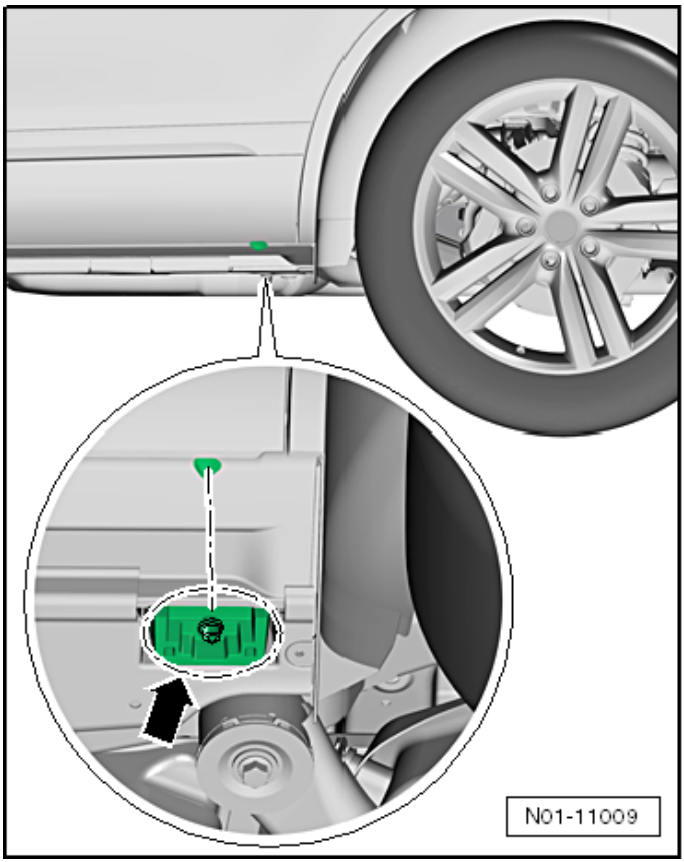


Position the support plate on the floor plate longitudinal reinforcement (➡).

WARNING

Never raise the front of the vehicle by the side member vertical stiffener.

Rear

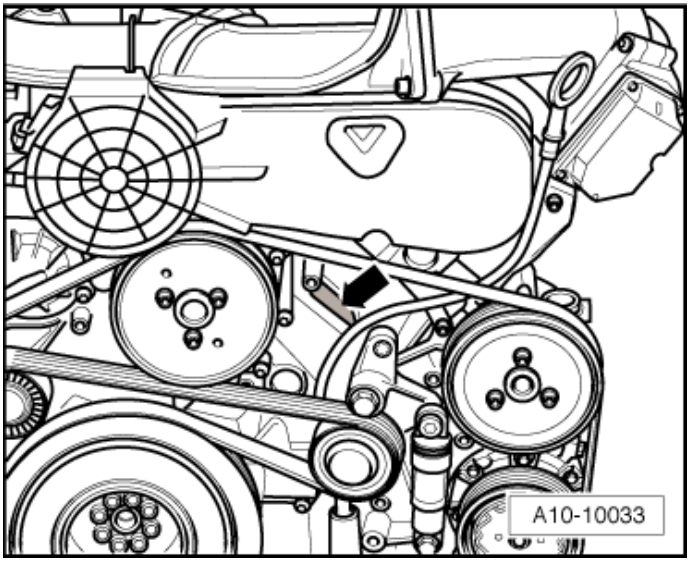


Position the support plate on the floor plate reinforcement near the rear axle (➡).

ENGINE MECHANICAL – 3.0L CNRB (TDI)

General, Technical Data

Engine Number Location



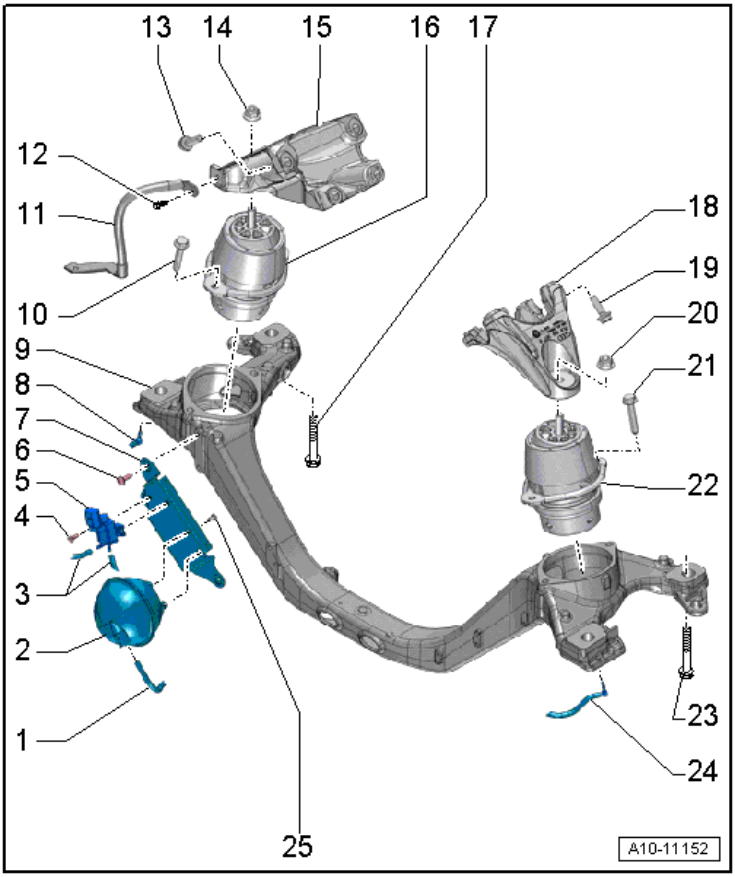
The engine number (engine code and serial number) is located on the left front side under the high pressure pump toothed belt (➡). The first 3 digits of the engine code indicate the displacement and mechanical structure of the engine. The fourth digit describes the engine output and torque.

Engine Data

Engine code		**CNRB**
Manufactured		from 05.12
Emission values in accordance with		BIN5/ULEV2
Displacement	liter	3.0
Output	kW at RPM	176 @ 4000
Torque	Nm at RPM	550 @ 2100
Bore	diameter mm	83.0
Stroke	mm	91.4
Compression ratio		16.8
Fuel	conforms to	---
Ignition sequence		1-4-3-6-2-5
Exhaust Gas Recirculation (EGR)		Yes
Turbocharger, Supercharger		Turbocharger
Catalytic converter		Yes
Particulate filter		Yes
Charge Air Cooler (CAC)		Yes
Oxygen Sensor (O2S) regulation		Yes
Valves per cylinder		4
Selective Catalytic Reduction (SCR) system		Yes

Engine Assembly – 3.0L CNRB (TDI)

Subframe Overview



1 - Vacuum Hose
2 - Vacuum Reservoir
3 - Vacuum Hoses
4 - Bolt
☐ 5 Nm
5 - Right Electrohydraulic Engine Mount Solenoid Valve -N145-
6 - Bolt
☐ 9 Nm
7 - Bracket
8 - Vacuum Hose
9 - Engine Carrier
10 - Bolt
☐ 60 Nm
11 - Ground Cable

12 - Bolt
- ☐ 15 Nm

13 - Bolt
- ☐ 50 Nm + 90° turn
- ☐ Replace after removing

14 - Nut
- ☐ 75 Nm

15 - Right Engine Support

16 - Right Engine Mount

17 - Bolt
- ☐ 120 Nm + 180° turn
- ☐ Replace

18 - Left Engine Support

19 - Bolt
- ☐ 50 Nm + 90° turn
- ☐ Replace after removing

20 - Nut
- ☐ 75 Nm

21 - Bolt
- ☐ 60 Nm

22 - Left Engine Mount

23 - Bolt
- ☐ 120 Nm + 180° turn
- ☐ Replace

24 - Vacuum Hose

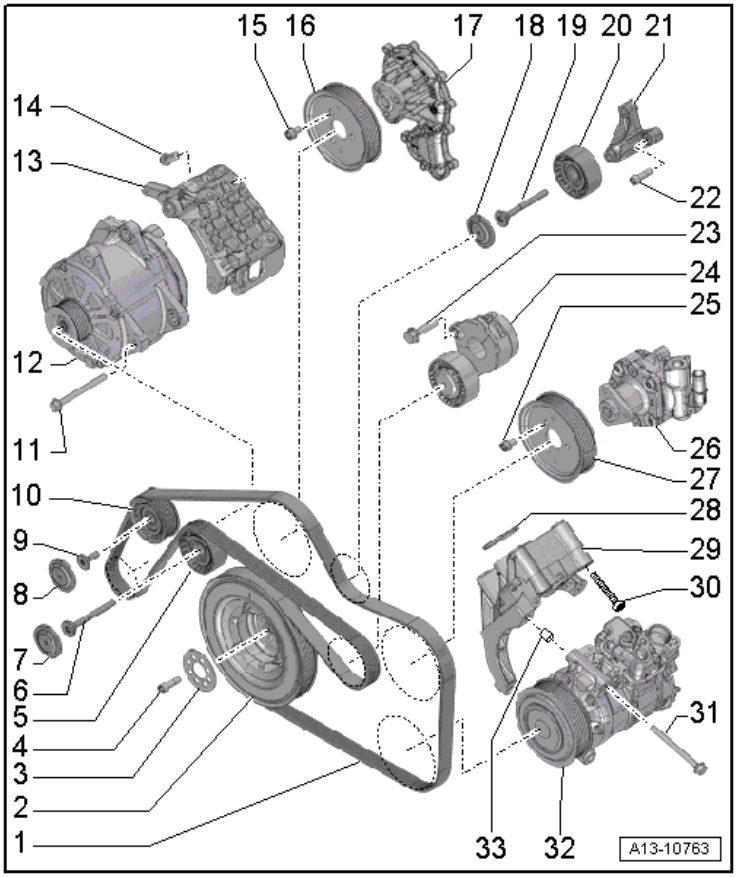
25 - Bolt
- ☐ 2.5 Nm

Fastener Tightening Specifications

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

Crankshaft, Cylinder Block – 3.0L CNRB (TDI)

Ribbed Belt Drive Overview



1 - Ribbed Belt
2 - Vibration Damper
3 - Shim
- ☐ Replace

4 - Bolt
- ☐ 220 Nm + 90° turn
- ☐ Replace

5 - Idler Roller
6 - Bolt
- ☐ 23 Nm

7 - Cover
8 - Cover

9 - Bolt
- ☐ 23 Nm

10 - Idler Roller

11 - Bolt
- ☐ Refer to Electrical Equipment

12 - Generator

13 - Brakcet

14 - Bolt
- ☐ Tighten in 2 steps:
- ☐ 5 Nm diagonally
- ☐ 40 Nm diagonally

15 - Bolt
- ☐ 23 Nm

16 - Ribbed Belt Pulley

17 - Coolant Pump

18 - Cover

19 - Bolt
- ☐ 23 Nm

20 - Idler Roller

21 - Bracket

22 - Bolt
- ☐ 23 Nm

23 - Bolt
- ☐ M10: 50 Nm + 90° turn
- ☐ M11: 60 Nm + 90° turn
- ☐ Replace

24 - Tensioner

25 - Bolt
- ☐ Refer to Suspension, Wheels, Steering

26 - Power Steering Pump

27 - Ribbed Belt Pulley

28 - Gasket

29 - Bracket

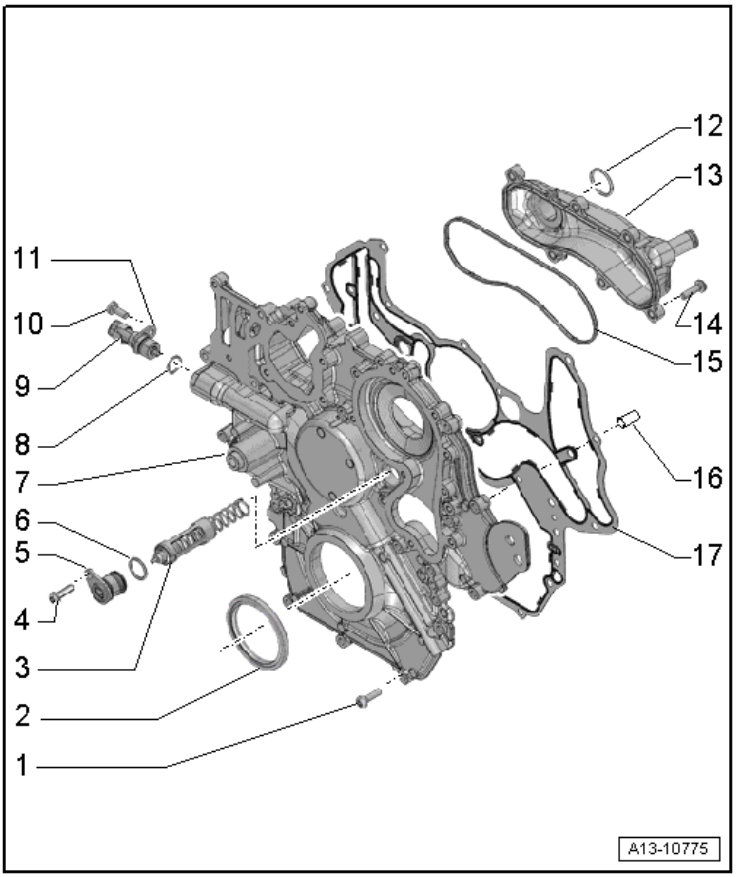
30 - Bolt
- ☐ Tighten in 2 steps:
- ☐ 5 Nm diagonally
- ☐ 40 Nm diagonally

31 - Bolt
- ☐ Refer to Heating, Ventilation and Air Conditioning

32 - A/C Compressor

33 - Alignment Sleeve

Sealing Flange, Ribbed Belt Pulley Side Overview



1 - Bolt
- ☐ Tightening specification and sequence, see Ribbed Belt Pulley Side Sealing Flange - Tightening Specifications and Sequence below

2 - Shaft Seal
3 - Thermostat
4 - Bolt
- ☐ Tightening specification and sequence, see Ribbed Belt Pulley Side Sealing Flange - Tightening Specifications and Sequence below

5 - Cover
6 - O-ring
- ☐ Replace

7 - Sealing Flange
8 - O-ring
- ☐ Replace

9 - Oil Temperature Sensor 2 -G664-
10 - Bolt
- ☐ 9 Nm

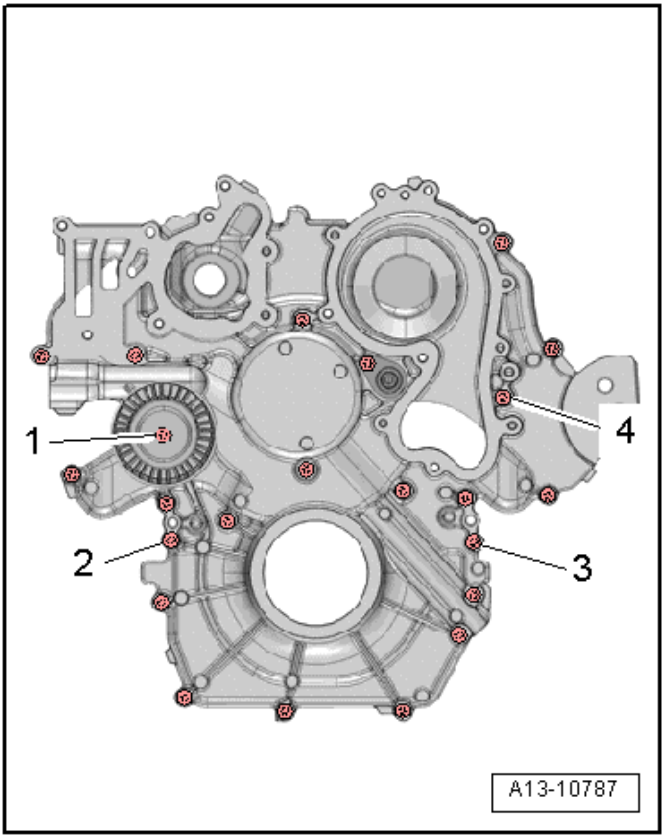
11 - Bracket
12 - O-ring
- ☐ Replace

13 - Cover
14 - Bolt
- ☐ 9 Nm

15 - Gasket
- ☐ Replace

16 - Alignment Pins
17 - Gasket
- ☐ Replace

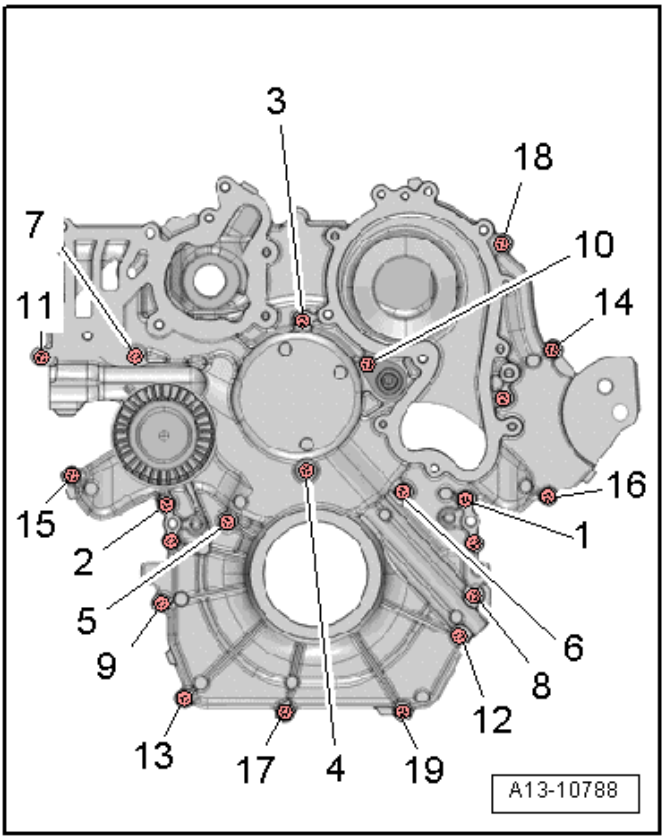
Ribbed Belt Pulley Side Sealing Flange - Tightening Specifications and Sequence



Steps 1-3

Steps	Bolts	Tightening Specification
1		Attach the sealing flange with the seal to the cylinder block
2	-1-	Tighten for the idler roller 23 Nm
3	-2, 3, 4-	Tighten the M6 x 20 to 9 Nm

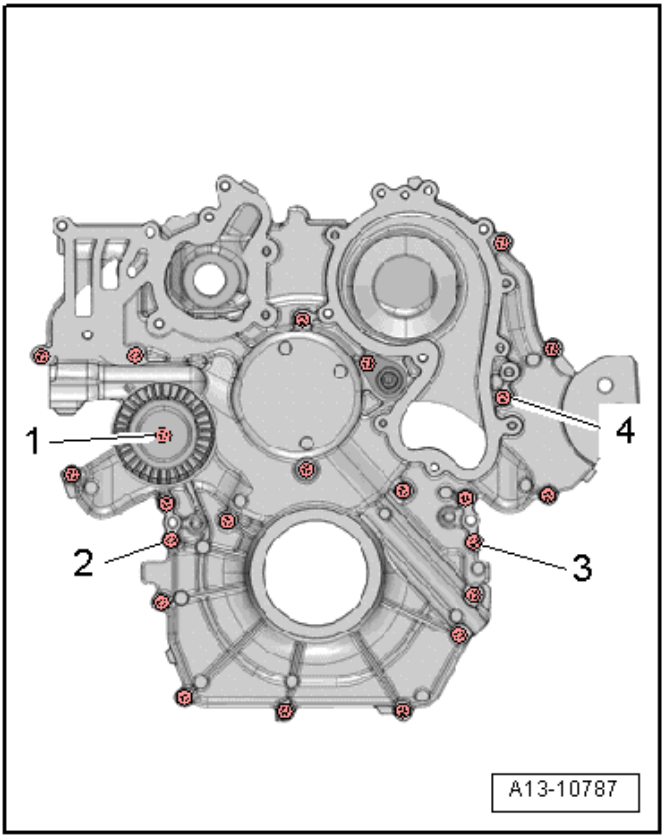
Ribbed Belt Pulley Side Sealing Flange Tightening Specification *(cont'd)*



Steps 4-8

Steps	Bolts	Tightening Specification
4		Insert a temperature regulator for the engine oil cooler with the cover
5	-10-	Install all the way in by hand
6	-1 - 19-	3 Nm
7	-1 - 19-	3 Nm - this measurement accounts for the seal shrinkage
8	-1 - 19-	Tighten 90° additional turn

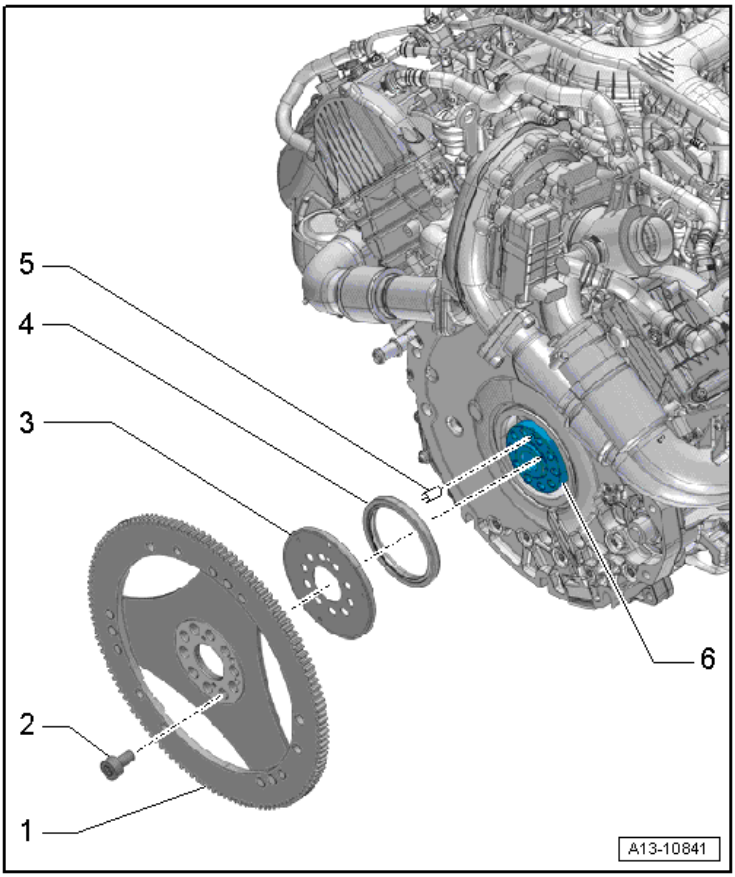
Ribbed Belt Pulley Side Sealing Flange Tightening Specification *(cont'd)*



Steps 9-11

Steps	Bolts	Tightening Specification
9	-2, 3, 4-	Remove the steel bolts M6 x 20
10	-2, 3, 4-	Insert the aluminum bolts and tighten to 3 Nm
11	-2, 3, 4-	Turn the aluminum bolts 90° further

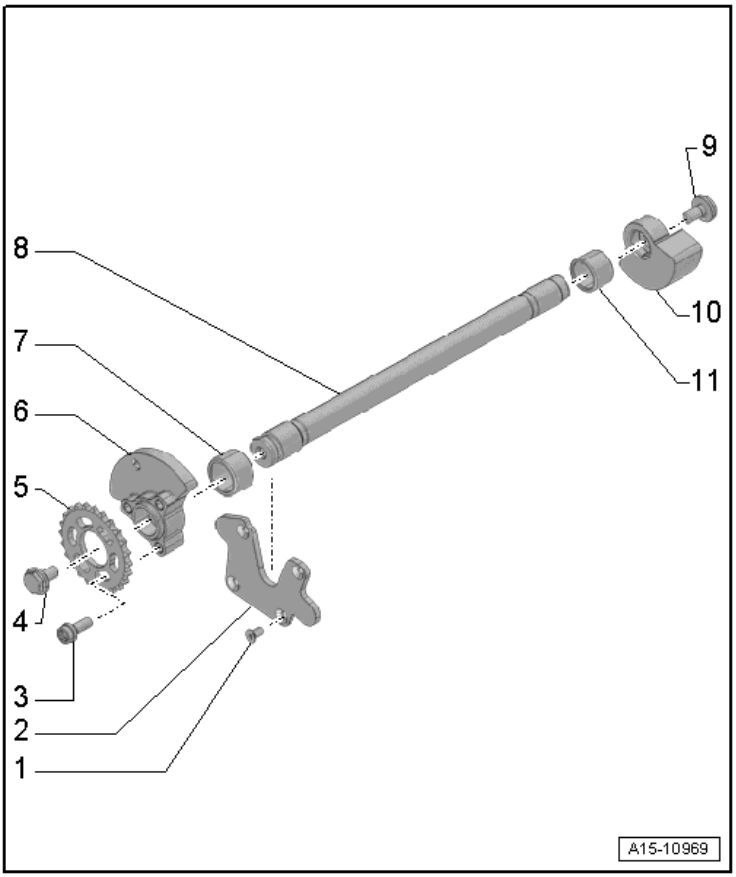
Drive Plate Overview



1 - Drive Plate
2 - Bolt
- ☐ 60 Nm + 90° turn
- ☐ Replace

3 - Sensor Wheel
4 - Shaft Seal
5 - Alignment Pin
6 - Crankshaft

Balance Shaft Overview



1 - Bolt
- ☐ 9 Nm

2 - Gear Carrier

3 - Bolt
- ☐ 23 Nm

4 - Bolt
- ☐ 60 Nm

5 - Drive Chain Sprocket

6 - Balance Weight

7 - Roller Bearing

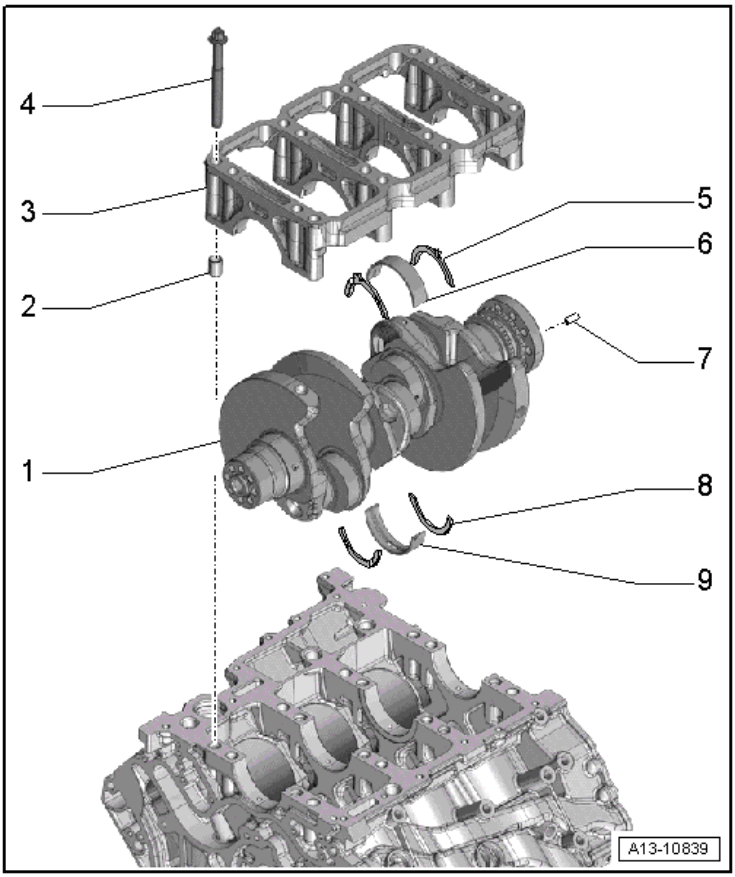
8 - Balance Shaft

9 - Bolt
- ☐ 60 Nm

10 - Balance Weight

11 - Roller Bearing

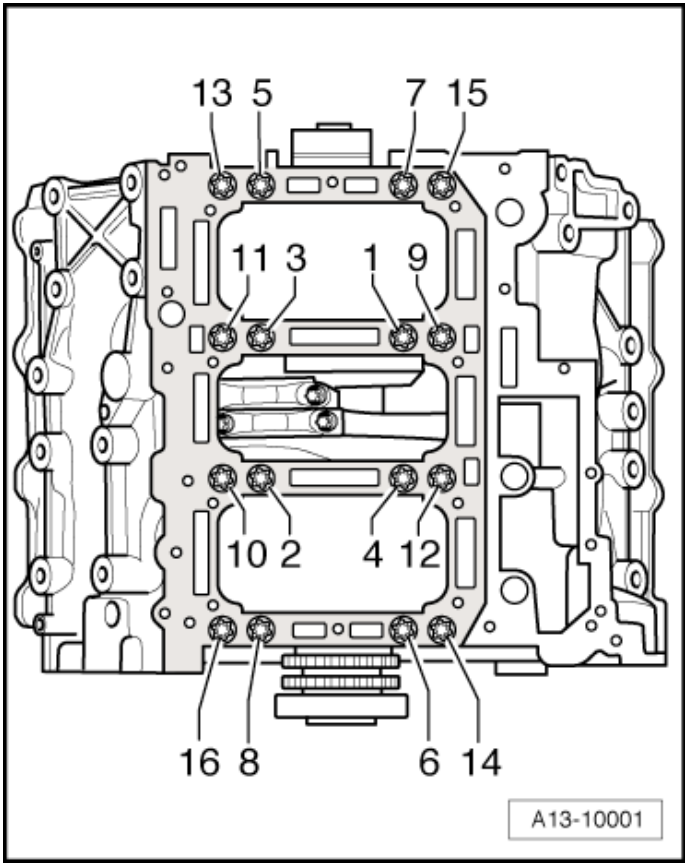
Crankshaft Overview



1 - Crankshaft
2 - Alignment Sleeve
3 - Guide Frame
4 - Bolt
- ☐ Replace
- ☐ Tightening specification and sequence, see Guide Frame Tightening Specifications and Sequence below

5 - Thrust Washer
6 - Bearing Shell
7 - Alignment Pin
8 - Thrust Washer
9 - Bearing Shell

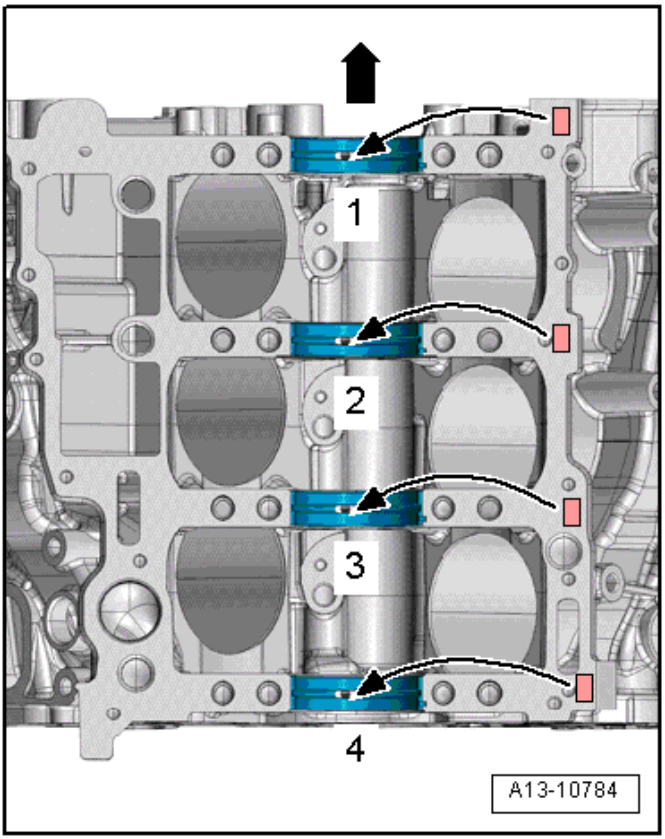
Guide Frame Tightening Specifications and Sequence



Tighten the bolts in 3 steps and in the sequence shown:

Steps	Bolts	Tightening Specification
1	-1 - 16-	30 Nm
2	-1 - 16-	50 Nm
3	-1 - 16-	Tighten 180° additional turn

Allocation of Crankshaft Bearing Shells for Cylinder Block

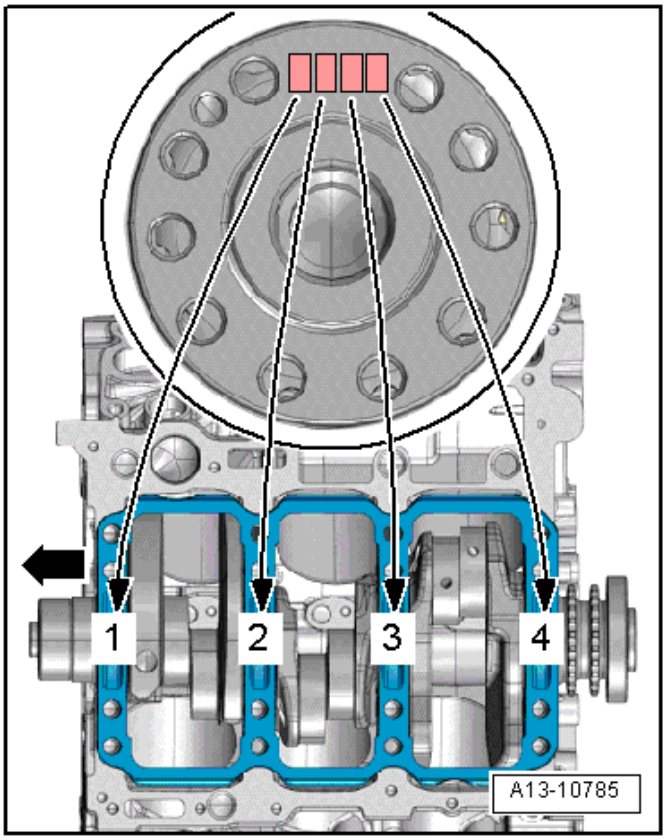


Bearing shells with the correct thickness are allocated to the cylinder block in the factory. Colored dots on bearing shells serve for identifying bearing shell thickness. -Arrow-: belt pulley side.

Allocation of bearing shells to cylinder block is identified with a letter by each bearing.

Letter on Cylinder Block	Color of Bearing
R =	Red
G =	Yellow
B =	Blue

Allocation of Crankshaft Bearing Shells for Guide Frame

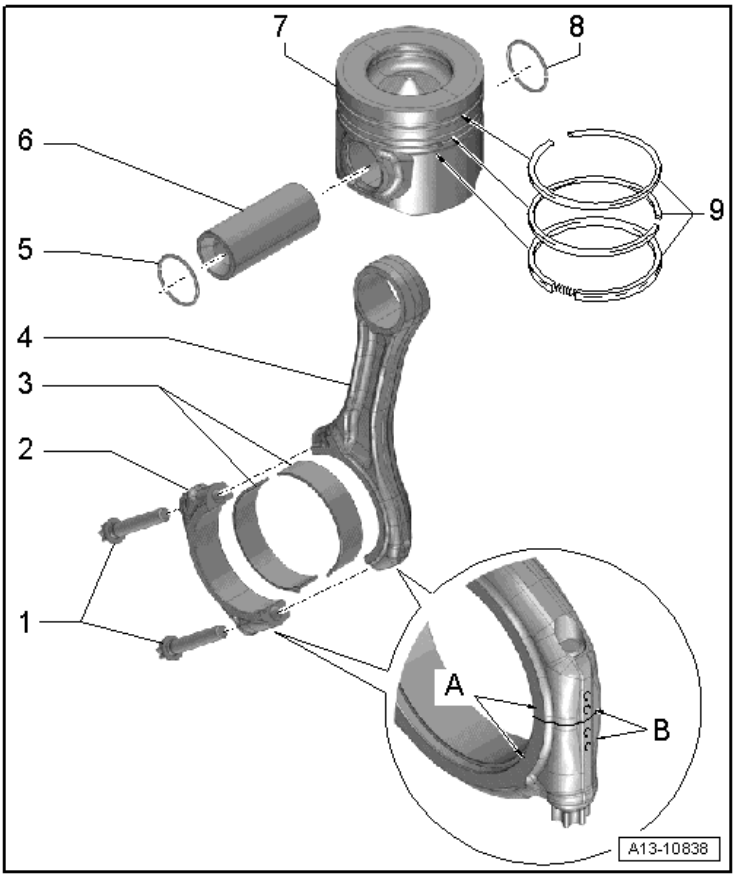


Bearing shells with the correct thickness are allocated to the guide frame in the factory. Colored dots on sides of bearing shells serve for identifying bearing shell thickness.

Allocation of bearing shells to guide frame is marked on flywheel flange of crankshaft by a row of letters. The first letter of the row of letters represents bearing “1”, the second letter is for bearing “2”, etc.

Letter on Cylinder Block	Color of Bearing
R =	Red
G =	Yellow
B =	Blue

Pistons and Connecting Rods Overview



1 - Bolts
- ☐ 35 Nm + 90° turn
- ☐ Replace

2 - Connecting Rod Bearing Cap
3 - Bearing Shells
4 - Connecting Rod
5 - Locking Ring
- ☐ Replace

6 - Piston Pin
7 - Piston
8 - Locking Ring
- ☐ Replace

9 - Piston Rings

Oil Spray Jet for Piston Cooling (not illustrated)
- ☐ 9 Nm

Crankshaft Dimensions

Honing dimension in mm	Crankshaft bearing pin diameter		Crankshaft connecting rod journal diameter	
Basic dimension	65.00	-0.022	60.00	-0.022
		-0.042		-0.042

Piston and Cylinder Dimensions

Honing dimensions in mm	Piston diameter	Cylinder bore diameter
Basic dimension	82.924 to 82.936 [1)]	83.006 to 83.014 [2)]
Repair stage	82.964 to 82.976 [1)]	83.046 to 83.054 [2)]

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

[2)] Measure 50 mm inside the cylinder bore.

Piston Ring End Gaps

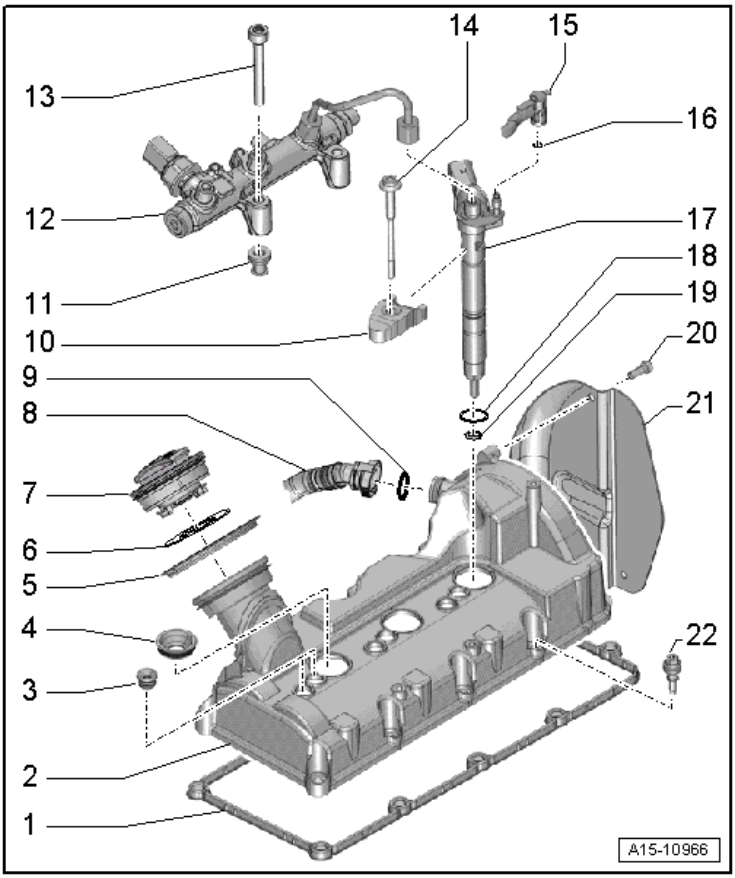
Piston ring dimensions in mm	New	Wear limit
1st compression ring	0.25 to 0.40	0.60
2nd compression ring	0.70 to 0.90	1.20
Oil scraping ring	0.25 to 0.50	0.70

Piston Ring Clearance

Piston ring dimensions in mm	New	Wear limit
1st compression ring	0.009 to 0.130	0.160
2nd compression ring	0.05 to 0.09	0.11
Oil scraping ring	0.03 to 0.09	0.10

Cylinder Head, Valvetrain – 3.0L CNRB (TDI)

Cylinder Head Cover Overview



1 - Gasket
2 - Cylinder Head Cover
3 - Grommet
4 - Seal
5 - Grommet
6 - Seal
7 - Cover
8 - Hose
9 - O-ring
☐ Replace
10 - Tension Clamp
11 - Sealing Bushing
12 - High Pressure Fuel Rail

13 - Bolt
- ☐ Tightening specification, see Diesel Fuel Injection; Fuel Injectors Overview

14 - Bolt
- ☐ Tightening specification, see Diesel Fuel Injection; Fuel Injectors Overview

15 - Fuel Return Hose

16 - O-ring
- ☐ Replace

17 - Injector

18 - O-ring
- ☐ Replace

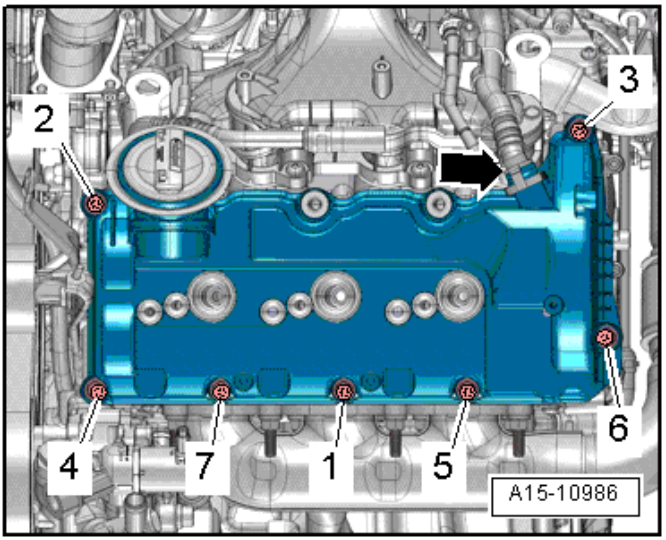
19 - Copper Ring
- ☐ Replace

20 - Bolt
- ☐ 9 Nm

21 - Heat Shield

22 - Bolt
- ☐ Replace if the seal is damaged or leaking
- ☐ Tightening specification and sequence, see Left Cylinder Head Cover - Tightening Specification and Sequence or Right Cylinder Head Cover - Tightening Specification and Sequence below

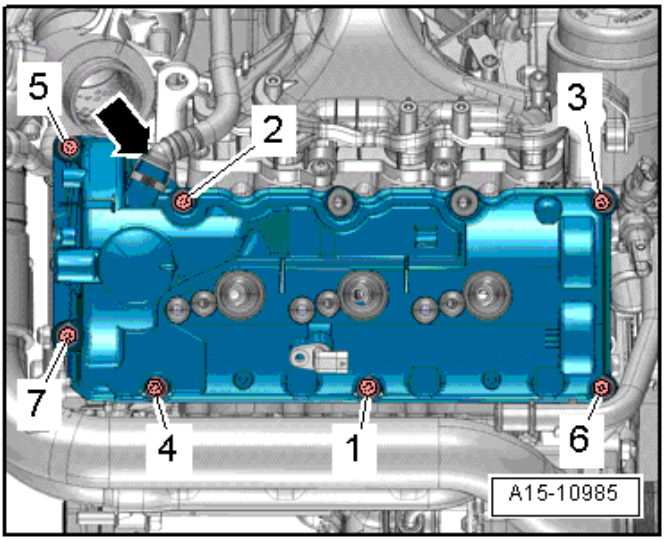
Left Cylinder Head Cover Tightening Specifications



Replace the bolts that have been tightened to additional torque.

Step	Component	Nm
1	Tighten bolts 1 through 7 in sequence	Hand-tighten
2	Tighten bolts 1 through 7 in sequence	8
3	Tighten bolts 1 through 7 in sequence	an additional 90° (¼ turn)

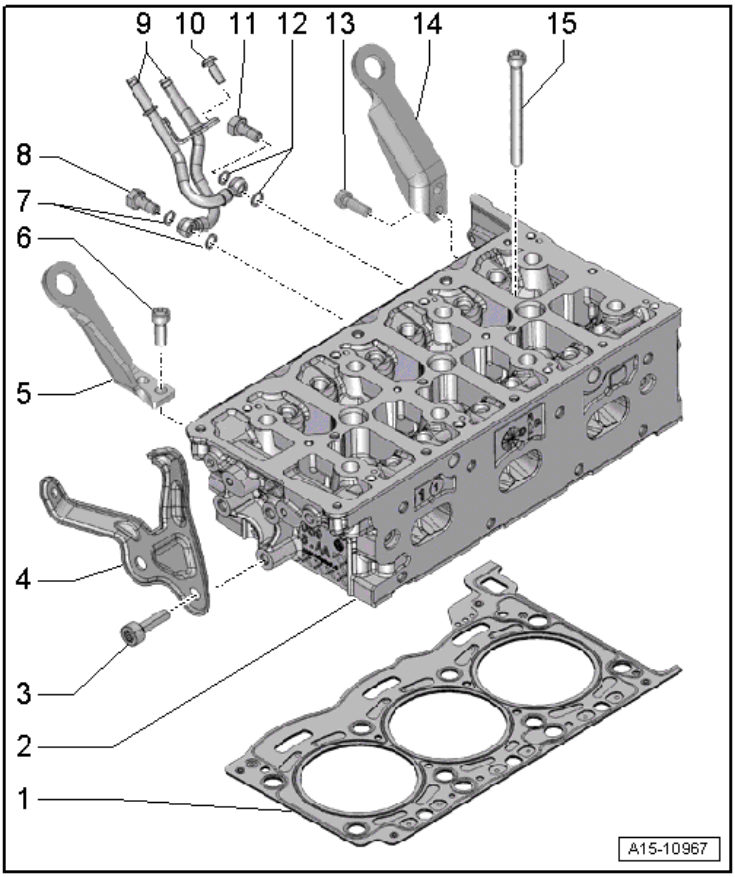
Right Cylinder Head Cover Tightening Specifications



Replace the bolts that have been tightened to additional torque.

Step	Component	Nm
1	Tighten bolts 1 through 7 in sequence	Hand-tighten
2	Tighten bolts 1 through 7 in sequence	8
3	Tighten bolts 1 through 7 in sequence	an additional 90° (¼ turn)

Cylinder Head Overview



1 - Cylinder Head Gasket
2 - Cylinder Head
3 - Bolt
- ☐ 23 Nm

4 - Bracket
5 - Engine Lifting Eye
6 - Bolt
- ☐ 23 Nm

7 - Seals
- ☐ Replace

8 - Banjo Bolt
- ☐ 12 Nm

9 - Coolant Lines
10 - Bolt
- ☐ 9 Nm

11 - Banjo Bolt
- ☐ 12 Nm

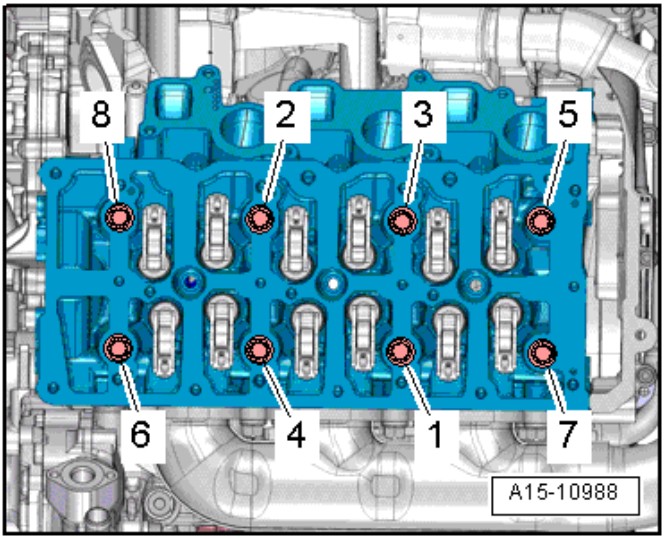
12 - Seals
- ☐ Replace

13 - Bolt
- ☐ 23 Nm

14 - Engine Lifting Eye

15 - Bolt
- ☐ Replace
- ☐ Tightening specification and sequence, see Cylinder Head - Tightening Specification and Sequence below

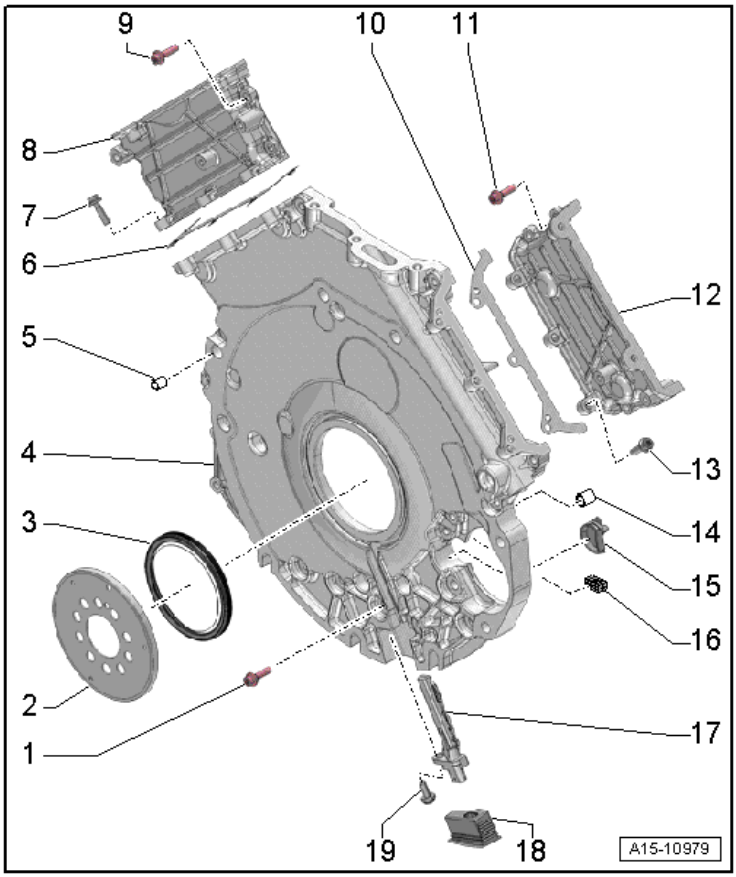
Cylinder Head Tightening Specifications



Replace the bolts that have been tightened to additional torque.

Step	Component	Nm
1	Tighten bolts 1 through 8 in sequence	Hand-tighten
2	Tighten bolts 1 through 8 in sequence	35
3	Tighten bolts 1 through 8 in sequence	60
4	Tighten bolts 1 through 8 in sequence	an additional 90° (¼ turn)
5	Tighten bolts 1 through 8 in sequence	an additional 90° (¼ turn)

Timing Chain Cover Overview



1 - Bolt
- ☐ Replace
- ☐ Tightening specification and sequence, see Lower Timing Chain Cover, Tightening Specifications and Sequence below

2 - Sensor Wheel
3 - Shaft Seal
4 - Timing Chain Cover Lower Section
5 - Alignment Sleeve
6 - Gasket
- ☐ Replace

7 - Bolt
- ☐ Replace
- ☐ Tightening specification and sequence, see Upper Timing Chain Cover, Tightening Specifications and Sequence below

8 - Left Timing Chain Cover

9 - Bolt

- ☐ Replace
- ☐ Tightening specification and sequence, see Upper Timing Chain Cover, Tightening Specifications and Sequence below

10 - Gasket

- ☐ Replace

11 - Bolt

- ☐ Replace
- ☐ Tightening specification and sequence, see Upper Timing Chain Cover, Tightening Specifications and Sequence below

12 - Right Timing Chain Cover

13 - Bolt

- ☐ Replace
- ☐ Tightening specification and sequence, see Upper Timing Chain Cover, Tightening Specifications and Sequence below

14 - Alignment Sleeve

15 - Cover

16 - Seal

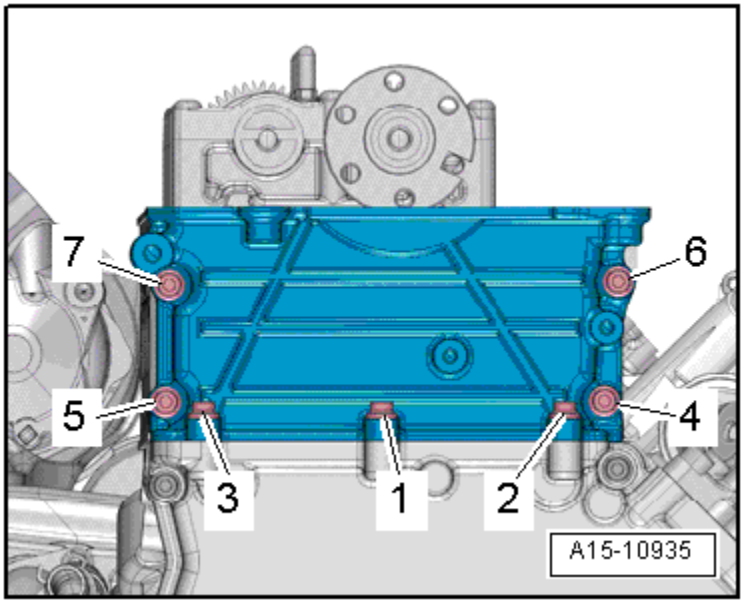
17 - Engine Speed Sensor -G28-

18 - Cover

19 - Bolt

- ☐ Tightening specification, see Ignition/Glow Plug System; Preglow System Overview“

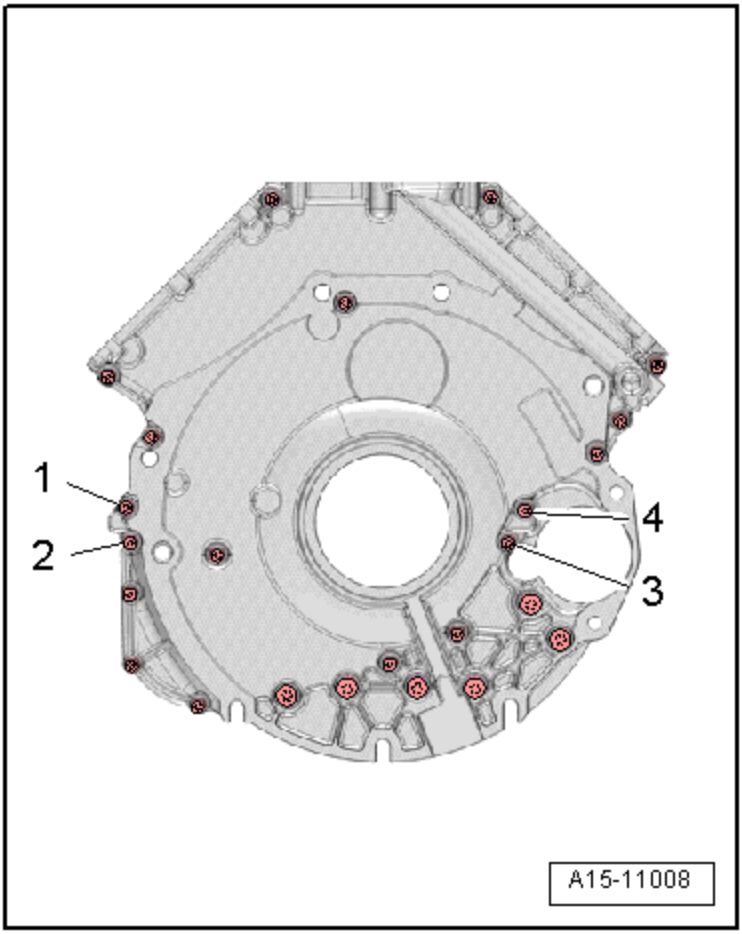
Upper Timing Chain Cover Tightening Specifications



Replace the bolts that have been tightened to additional torque

Step	Component	Nm
1	Tighten bolts 1 through3 in sequence	Hand-tighten
2	Tighten bolts 4 through 7 in sequence	Hand-tighten
3	Tighten bolts 1 through 7 in sequence	8
4	Tighten bolts 1 through 7 in sequence	8 Nm - this measurement takes into account the timing chain guard shrinkage.
5	Tighten bolts 1 through 7 in sequence	an additional 90° (¼ turn)

Lower Timing Chain Cover Tightening Specifications

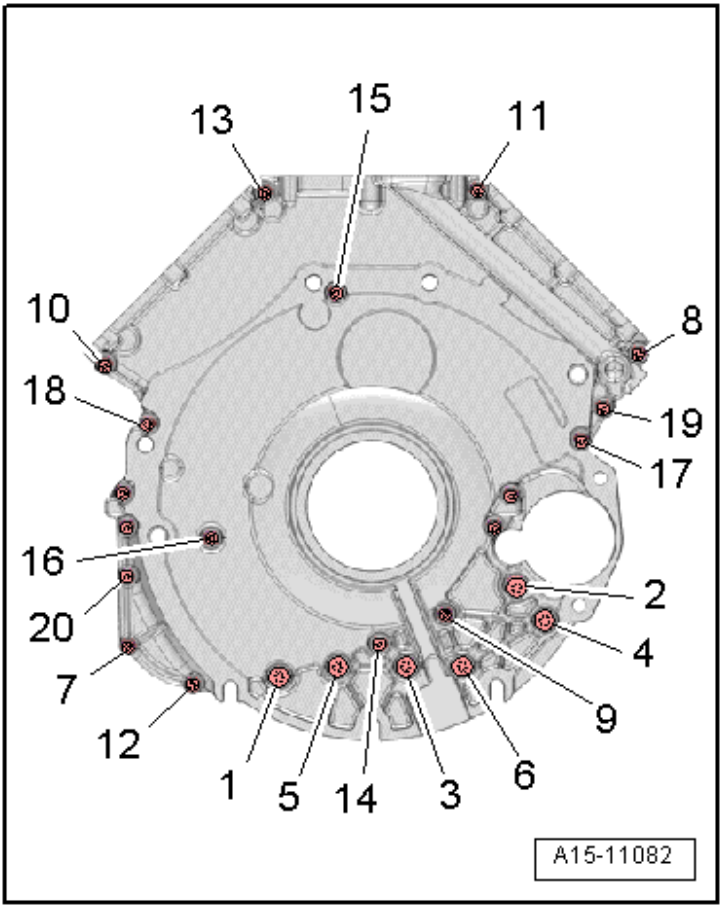


Tighten the bolts in 8 steps as follows:

Replace the bolts that have been tightened to additional torque.

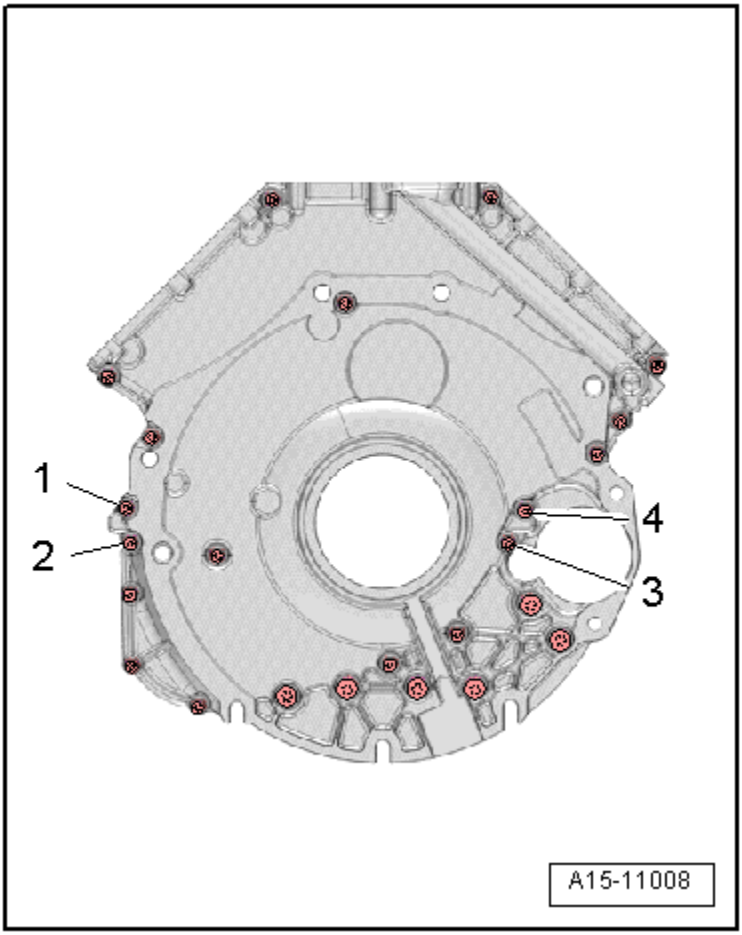
Step	Component	Fastener Size	Nm
1		-	Attaching the timing chain guard lower section with the sealant and the sealing pieces to the cylinder block
2	Tighten bolts 1 - 4 in sequence	M26x20	9

Lower Timing Chain Cover
Tightening Specifications *(cont'd)*



Step	Component	Nm
3	Tighten bolts 1 through 20 in sequence	3
4	Tighten bolts 1 through 20 in sequence	3 Nm - this measurement takes into account the timing chain guard lower section shrinkage
5	Tighten bolts 1 through 20 in sequence	an additional 90° (¼ turn)

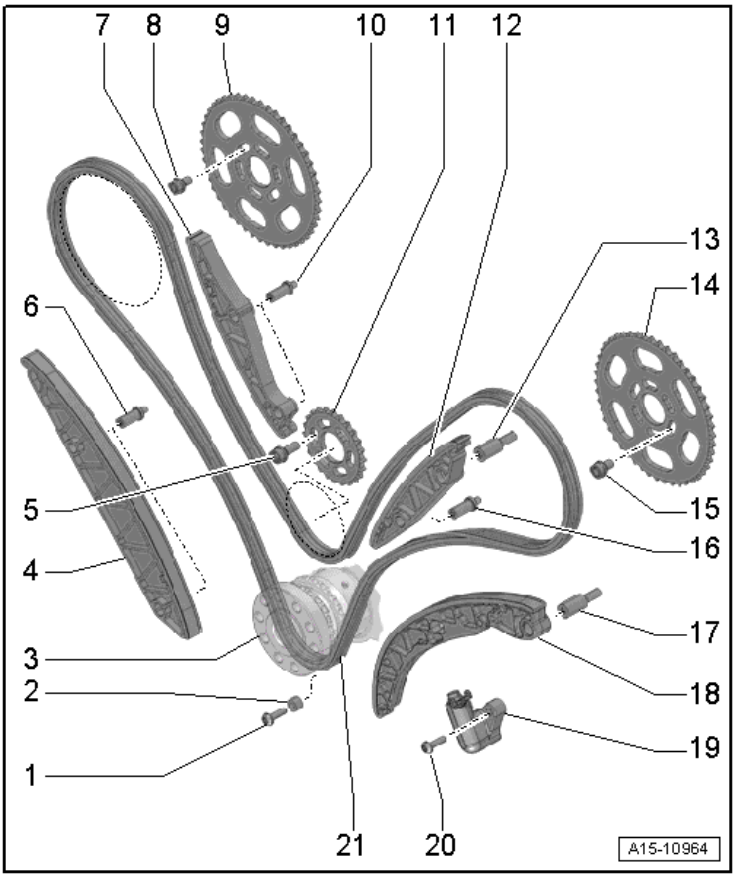
Lower Timing Chain Cover
Tightening Specifications *(cont'd)*



Replace the bolts that have been tightened to additional torque.

Step	Component	Fastener Size	Nm
6	Tighten bolts 1 through 4 in sequence	M26x20	Remove the steel bolts
7	Tighten bolts 1 through 4 in sequence	-	Insert the aluminum bolts and tighten to 3 Nm
8	Tighten bolts 1 through 4 in sequence	-	an additional 90° (¼ turn)

Camshaft Timing Chain Overview



1 - Bolt
- ☐ 9 Nm

2 - Jump Protector

3 - Crankshaft

4 - Glide Track

5 - Bolt
- ☐ 23 Nm

6 - Guide Pin
- ☐ 5 Nm + 90° turn
- ☐ Replace after removing

7 - Guide Rail

8 - Bolt
- ☐ 23 Nm

9 - Camshaft Chain Sprocket

10 - Guide Pin
- ☐ 5 Nm + 90° turn
- ☐ Replace after removing

11 - Chain Sprocket
12 - Guide Rail
13 - Guide Pin
- ☐ 23 Nm

14 - Camshaft Chain Sprocket
15 - Bolt
- ☐ 23 Nm

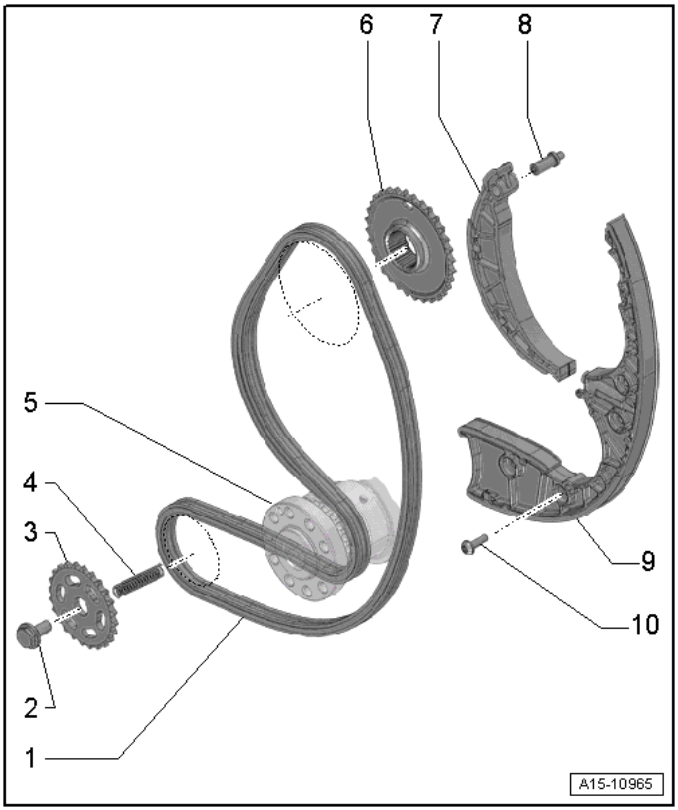
16 - Guide Pin
- ☐ 5 Nm + 90° turn
- ☐ Replace after removing

17 - Guide Pin
- ☐ 23 Nm

18 - Tensioning Rail
19 - Chain Tensioner
20 - Boltt
- ☐ 5 Nm + 90° turn
- ☐ Replace after removing

21 - Camshaft Timing Chain

Oil Pump and High Pressure Pump Drive Chain Overview

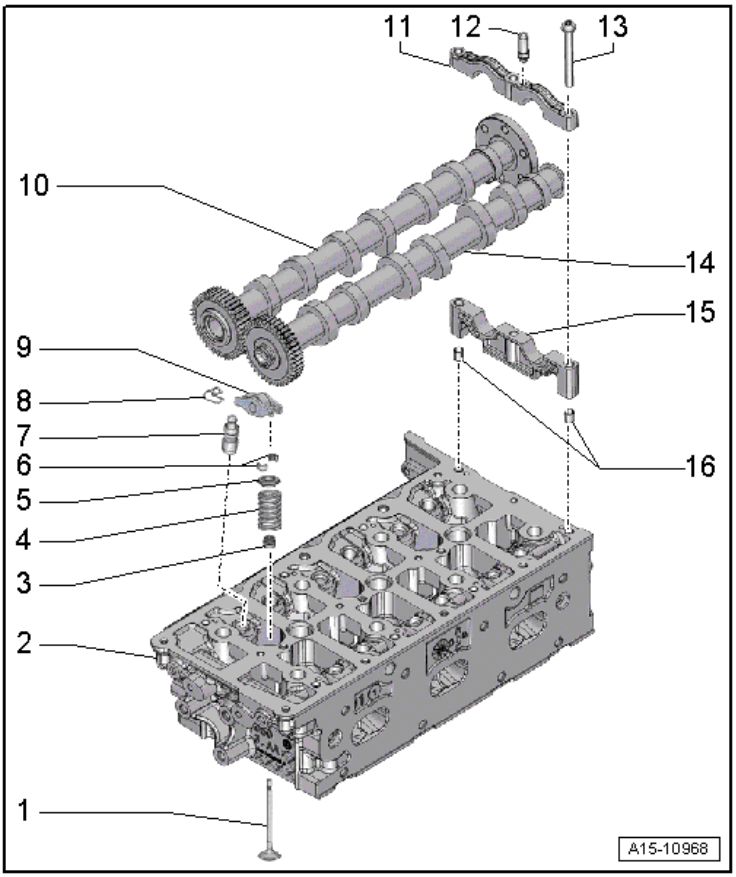


1 - Oil Pump Drive Chain and High Pressure Pump
2 - Bolt
- ☐ 30 Nm + 90° turn
- ☐ Replace

3 - Drive Chain Sprocket
4 - Pressure Spring
5 - Crankshaft
6 - Drive Chain Sprocket
7 - Glide Track
8 - Guide Pin
- ☐ 5 Nm + 90° turn
- ☐ Replace

9 - Chain Tensioner
10 - Bolt
- ☐ 5 Nm + 90° turn
- ☐ Replace

Valvetrain Overview

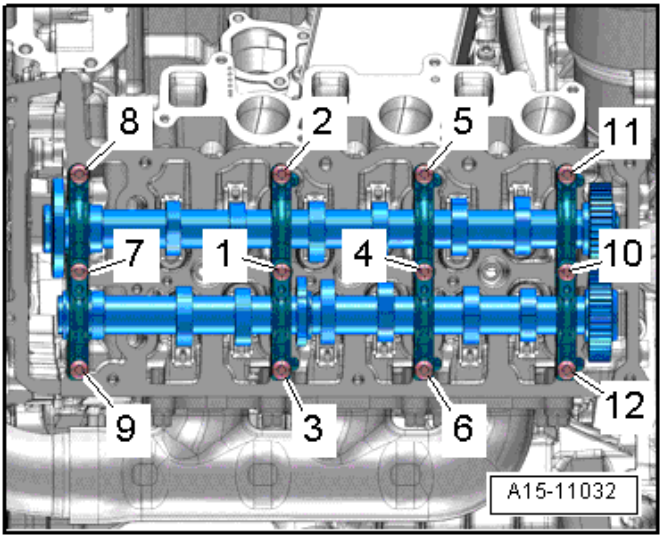


1 - Valve
2 - Cylinder Head
3 - Valve Stem Seal
4 - Valve Spring
5 - Valve Spring Retainer
6 - Valve Retainers
7 - Hydraulic Adjusting Element
8 - Clip
9 - Roller Rocker Lever
10 - Intake Camshaft
11 - Bearing Cap
12 - Bracket
13 - Bolt

- ☐ Tightening specifications and sequence, see Cylinder Bank 1 (Right) Bearing Cap - Tightening Specification and Sequence or Cylinder Bank 2 (Left) Bearing Cap - Tightening Specification and Sequence below

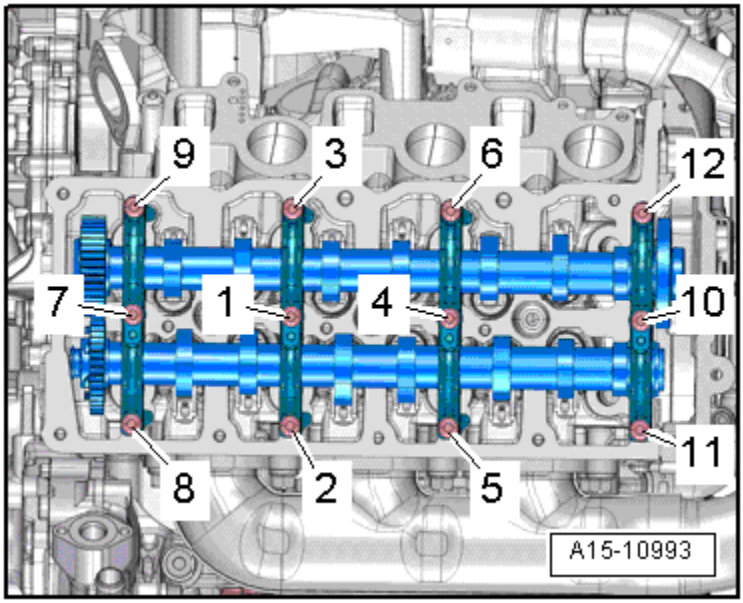
14 - Exhaust Camshaft
15 - Bearing Block
16 - Adapter Sleeves

Cylinder Bank 1 (Right) Bearing Cap Tightening Specifications



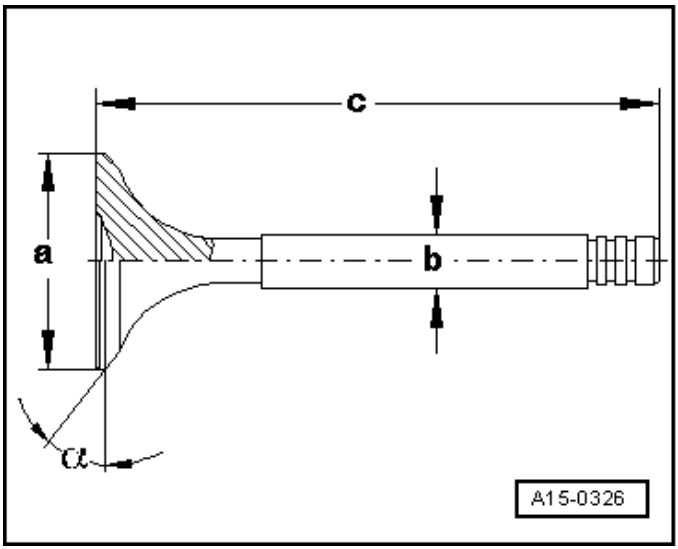
Step	Component	Nm
1	Tighten bolts 1 through 12 in sequence	Hand-tighten
2	Tighten bolts 1 through 12 in sequence	9

Cylinder Bank 2 (Left) Bearing Cap Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 12 in sequence	Hand-tighten
2	Tighten bolts 1 through 12 in sequence	9

Valve Dimensions

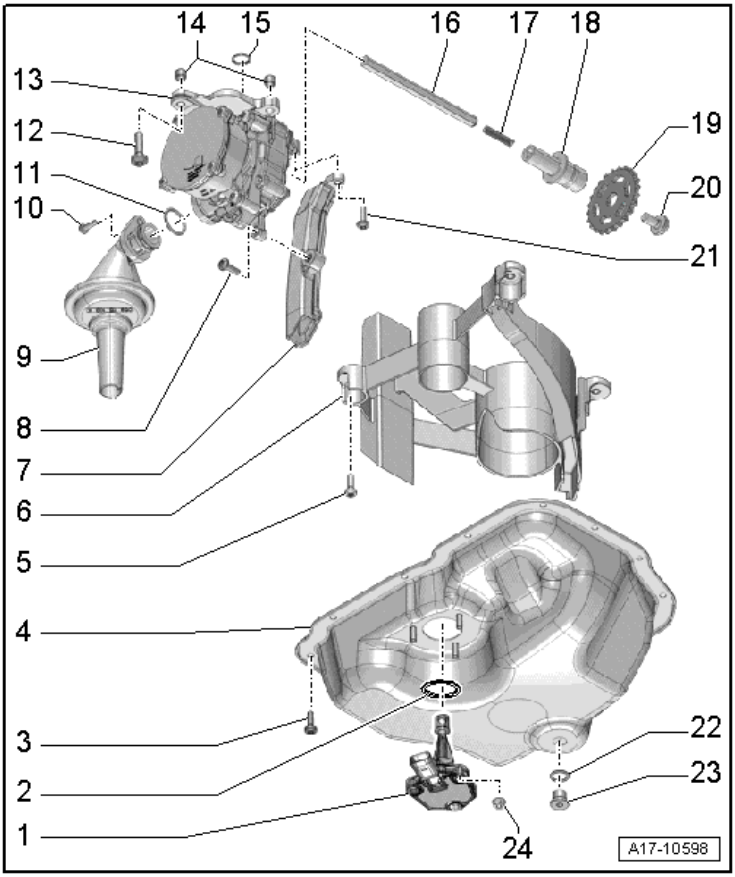


Dimension		Intake valve	Exhaust valve
Diameter a	mm	28.5 to 28.7	25.9 to 26.1
Diameter b	mm	5.968 to 5.982	5.958 to 5.972
c	mm	97.2 to 97.4	99.0 to 99.2
α	∠°	45° 10’	45° 10’

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

Lubrication – 3.0L CNRB (TDI)

Oil Pump and Lower Oil Pan Overview



1 - Bolt
- ☐ 9 Nm

2 - Oil Pressure Regulation Valve -N428-

3 - O-ring
- ☐ Replace

4 - Oil Pan Upper Section

5 - Seal
- ☐ Replace

6 - Alignment Sleeve

7 - Guide Tube

8 - Bolts
- ☐ 9 Nm

9 - O-ring
- ☐ Replace

10 - Plug

11 - Seal
- ☐ Replace

12 - Oil Return Valve

13 - Seal
- ☐ Replace

14 - Alignment Sleeve

15 - Bolt
- ☐ Tightening specification and sequence, see Upper Oil Pan, Tightening Specifications and Sequence below

16 - Seal
- ☐ Replace

17 - Drain Plug
- ☐ 25 Nm

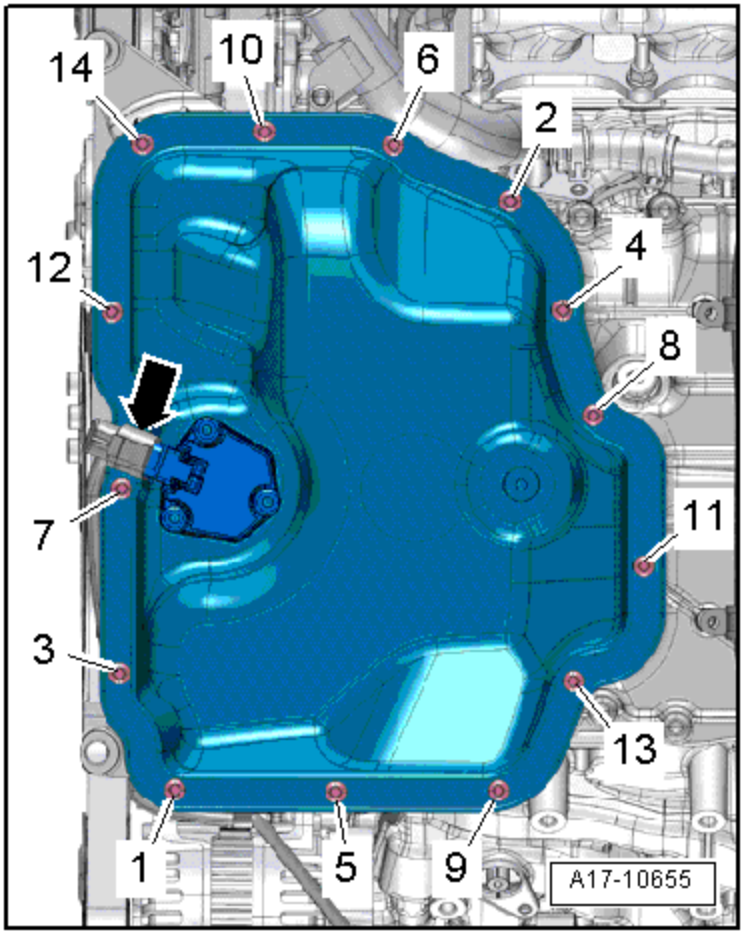
18 - Vacuum Line

19 - Bolt
- ☐ 3 Nm + 45° turn
- ☐ Replace

20 - O-ring
- ☐ Replace

21 - Bolt
- ☐ 9 Nm

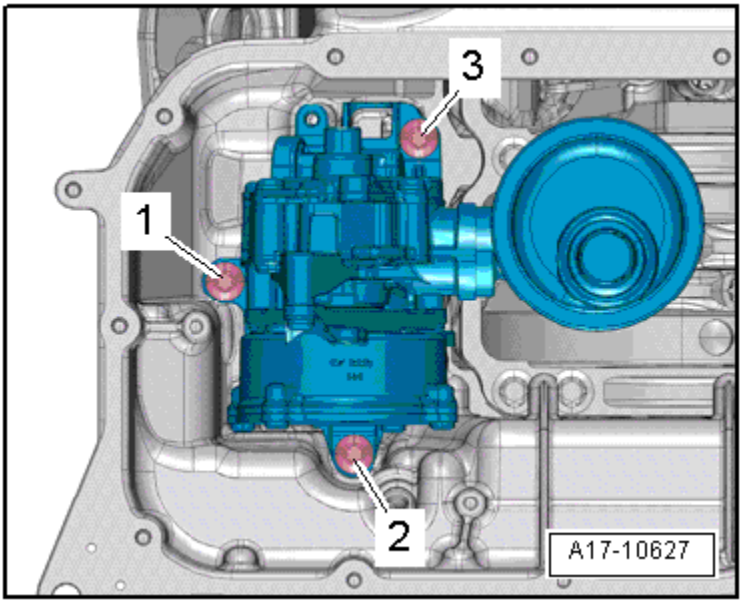
Oil Pan Tightening Specifications



Replace the bolts that have been tightened to additional torque.

Step	Component	Nm
1	Tighten bolts 1 through 14 in a diagonal sequence	2
2	Tighten bolts 1 through 14 in a diagonal sequence	3
3	Tighten bolts 1 through 14 in a diagonal sequence	an additional 90° (¼ turn)

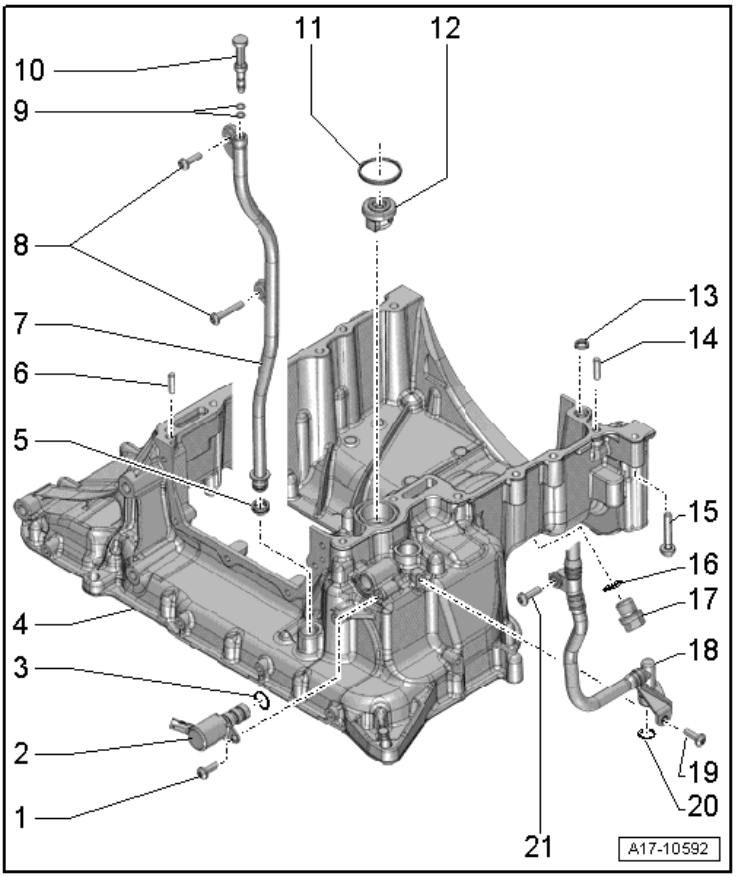
Oil Pan Tightening Specifications



Replace the bolts that have been tightened to additional torque.

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

Upper Oil Pan Overview



1 - Bolt
- ☐ 9 Nm

2 - Oil Pressure Regulation Valve -N428-

3 - O-ring
- ☐ Replace

4 - Oil Pan Upper Section

5 - Seal
- ☐ Replace

6 - Alignment Sleeve

7 - Guide Tube

8 - Bolts
- ☐ 9 Nm

9 - O-ring
- ☐ Replace

10 - Plug

11 - Seal
- ☐ Replace

12 - Oil Return Valve
13 - Seal
- ☐ Replace

14 - Alignment Sleeve
15 - Bolt
- ☐ Tightening specification and sequence, see Upper Oil Pan, Tightening Specifications and Sequence below

16 - Seal
- ☐ Replace

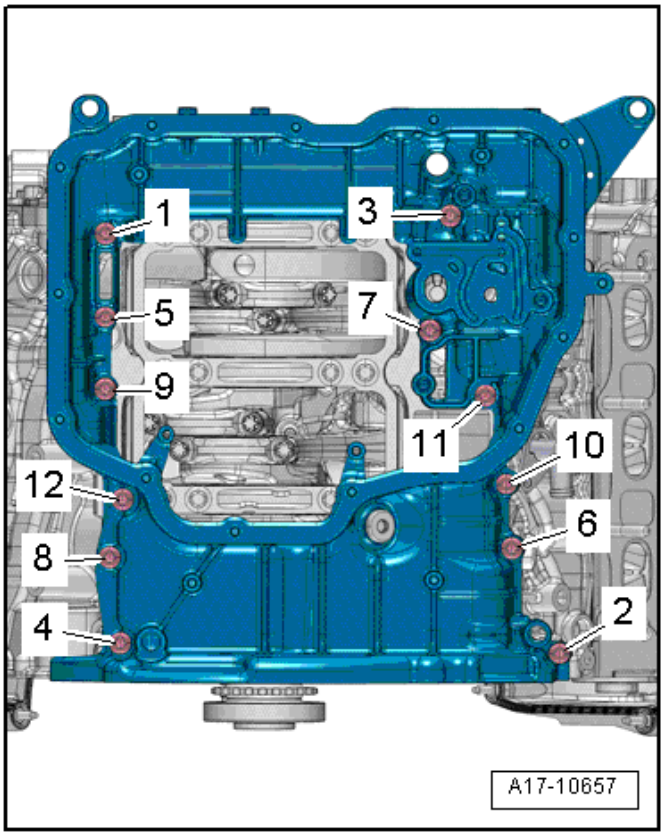
17 - Drain Plug
- ☐ 25 Nm

18 - Vacuum Line
19 - Bolt
- ☐ 3 Nm + 45° turn
- ☐ Replace

20 - O-ring
- ☐ Replace

21 - Bolt
- ☐ 9 Nm

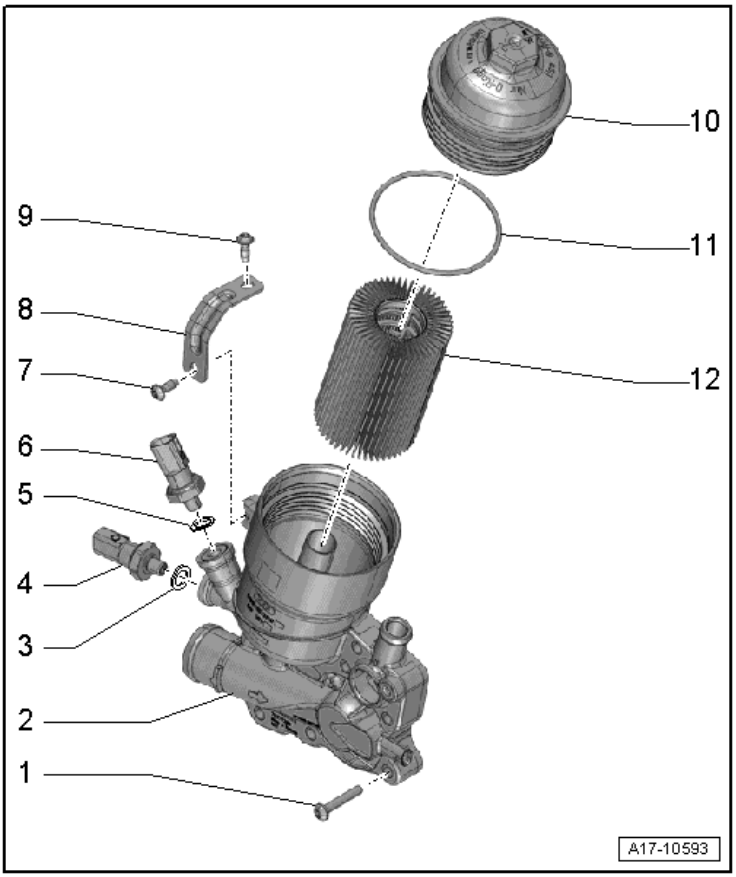
Upper Oil Pan Tightening Specifications



Replace the bolts that have been tightened to additional torque.

Step	Component	Nm
1	Tighten bolts 1 through 12 in a diagonal sequence	2
2	Tighten bolts 1 through 12 in a diagonal sequence	5
3	Tighten bolts 1 through 12 in a diagonal sequence	an additional 90° (¼ turn)

Oil Filter Housing and Oil Pressure Switch Overview



1 - Bolt
- ☐ 9 Nm

2 - Oil Filter Housing

3 - Seal

4 - Oil Pressure Switch -F22-
- ☐ 20 Nm

5 - Seal

6 - Reduced Oil Pressure Switch -F378-
- ☐ 20 Nm

7 - Bolt
- ☐ 4 Nm
- ☐ Not installed on all vehicles

8 - Bracket
- ☐ Not installed on all vehicles

9 - Bolt
- ☐ 4 Nm
- ☐ Not installed on all vehicles

10 - Cover

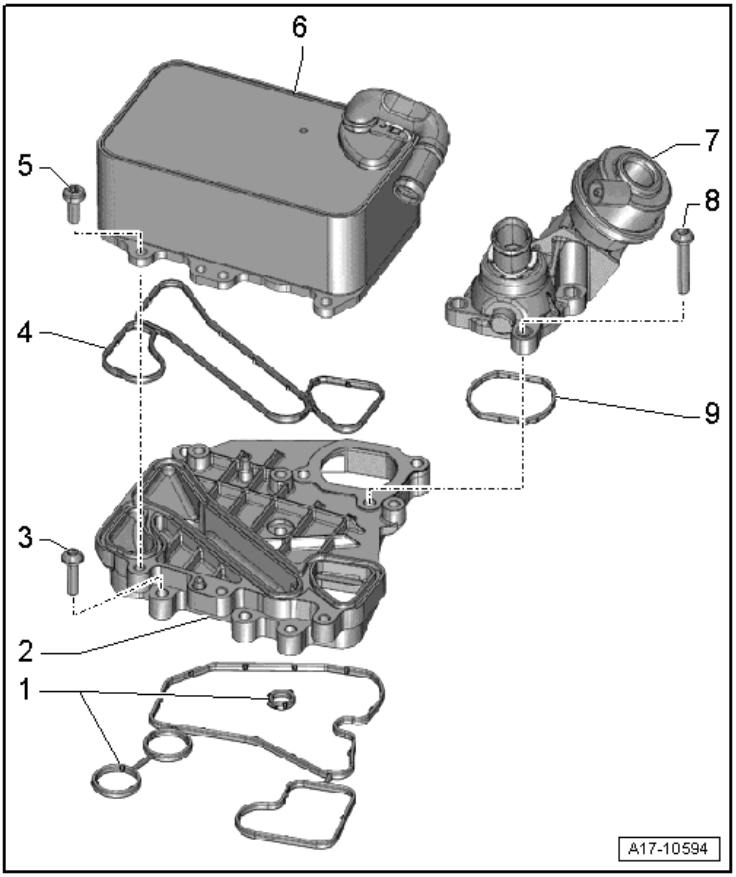
- ☐ 35 Nm

11 - O-ring

- ☐ Replace

12 - Oil Filter

Engine Oil Cooler Overview
Engine Oil Cooler, Coolant Shut-Off Valve



1 - Gasket
2 - Mounting Plate
3 - Bolt
- ☐ 9 Nm

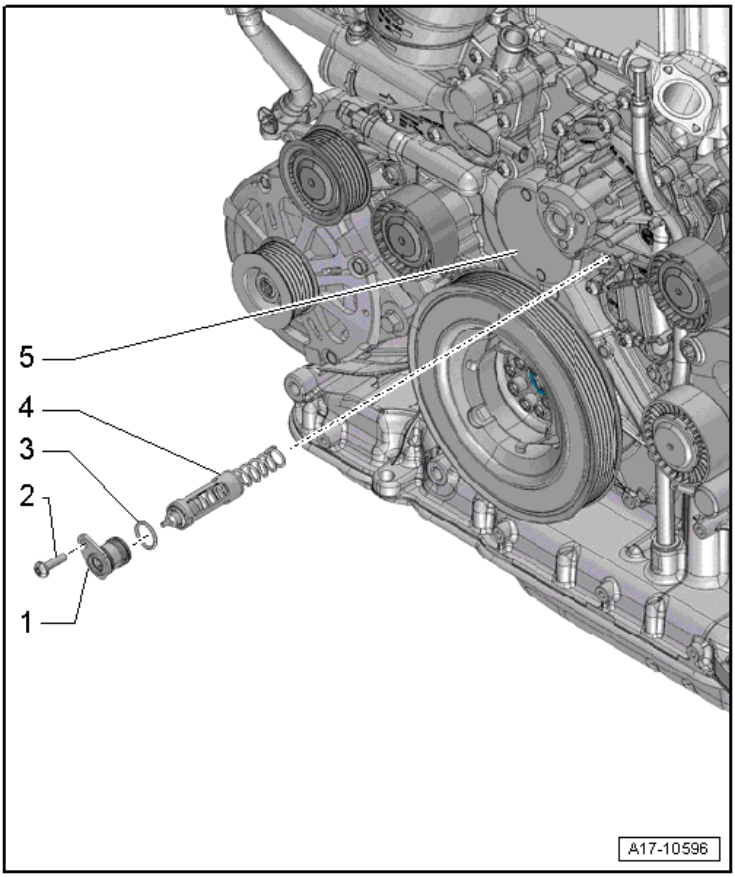
4 - Gasket
- ☐ Replace

5 - Bolt
- ☐ 9 Nm

6 - Engine Oil Cooler
7 - Coolant Shut-Off Valve
8 - Bolt
- ☐ 9 Nm

9 - Gasket
- ☐ Replace

Engine Oil Cooler Thermostat



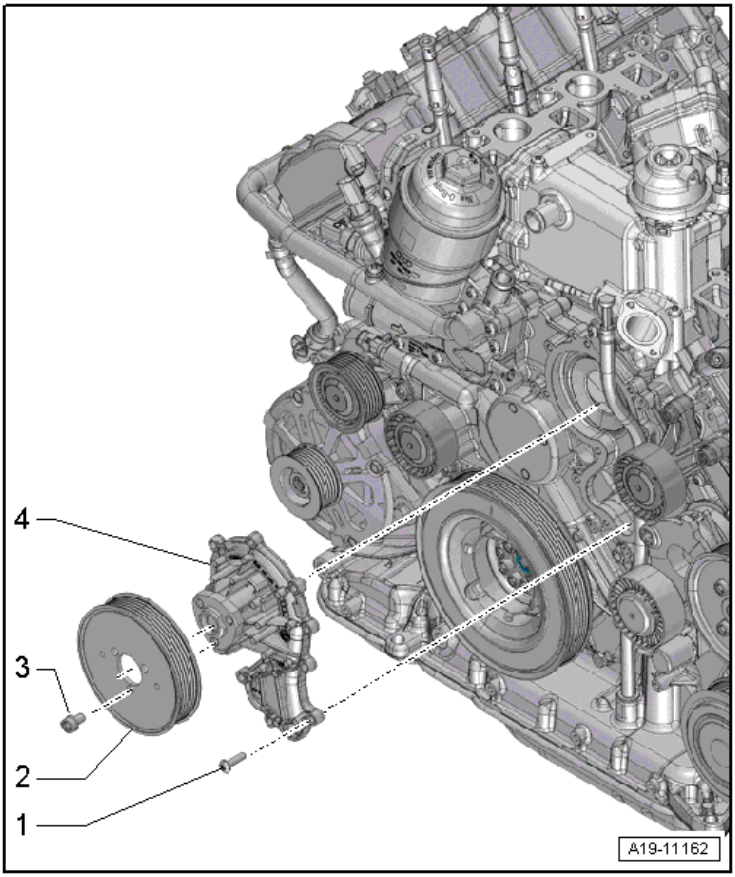
1 - Cover
2 - Bolt
- ☐ 3 Nm + 90° turn
- ☐ Replace

3 - O-ring
- ☐ Replace

4 - Engine Oil Cooler Thermostat
5 - Sealing Flange

Cooling System – 3.0L CNRB (TDI)

Coolant Pump Overview



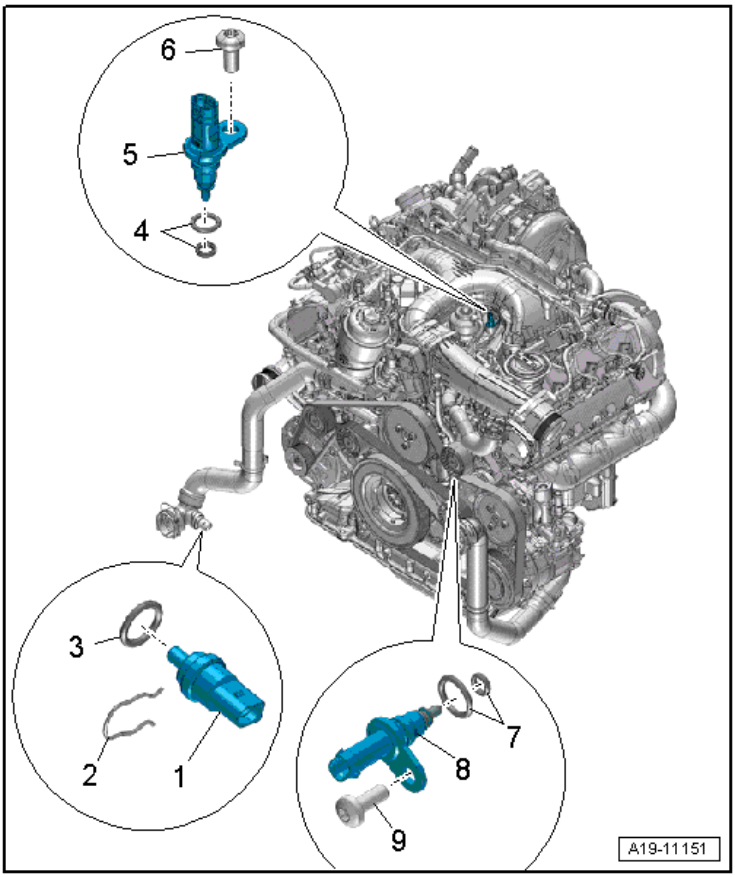
1 - Bolt
- ☐ 9 Nm
- ☐ Tighten diagonally in steps.

2 - Coolant Pump Ribbed Belt Pulley

3 - Bolt
- ☐ 23 Nm

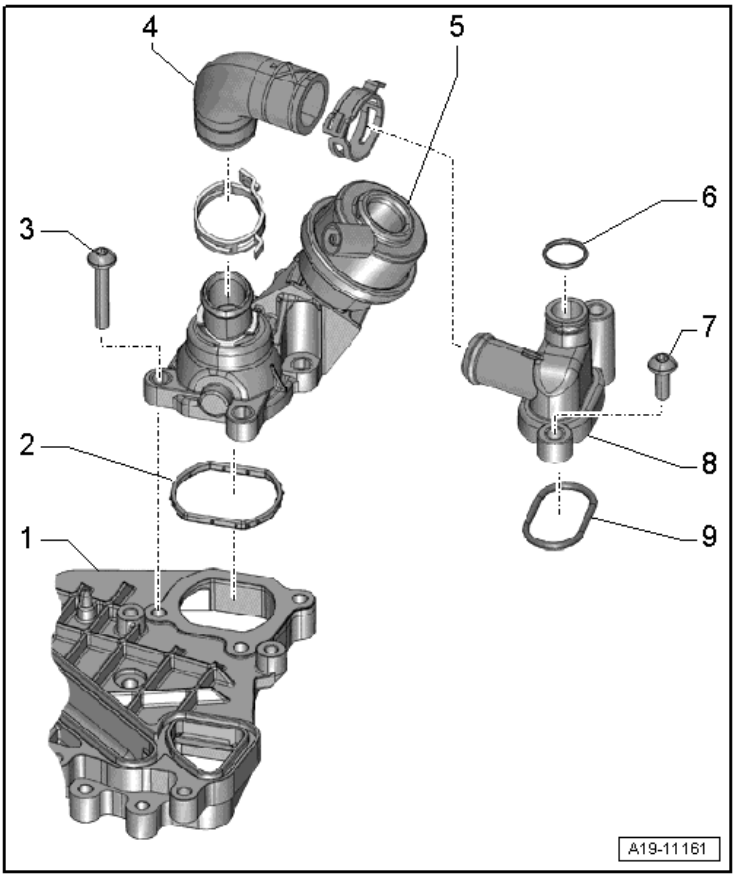
4 - Coolant Pump

Coolant Temperature Sensors Overview



1 - Engine Coolant Temperature Sensor on Radiator Outlet -G83-
2 - Clamp
3 - O-ring
☐ Replace
4 - O-ring
☐ Replace
5 - Engine Coolant Temperature Sensor -G62-
6 - Bolt
☐ 9 Nm
7 - O-ring
☐ Replace
8 - Engine Temperature Control Temperature Sensor -G694-
9 - Bolt
☐ 9 Nm

Coolant Shut-Off Valve Overview



1 - Mounting Plate
2 - Gasket
- ☐ Replace

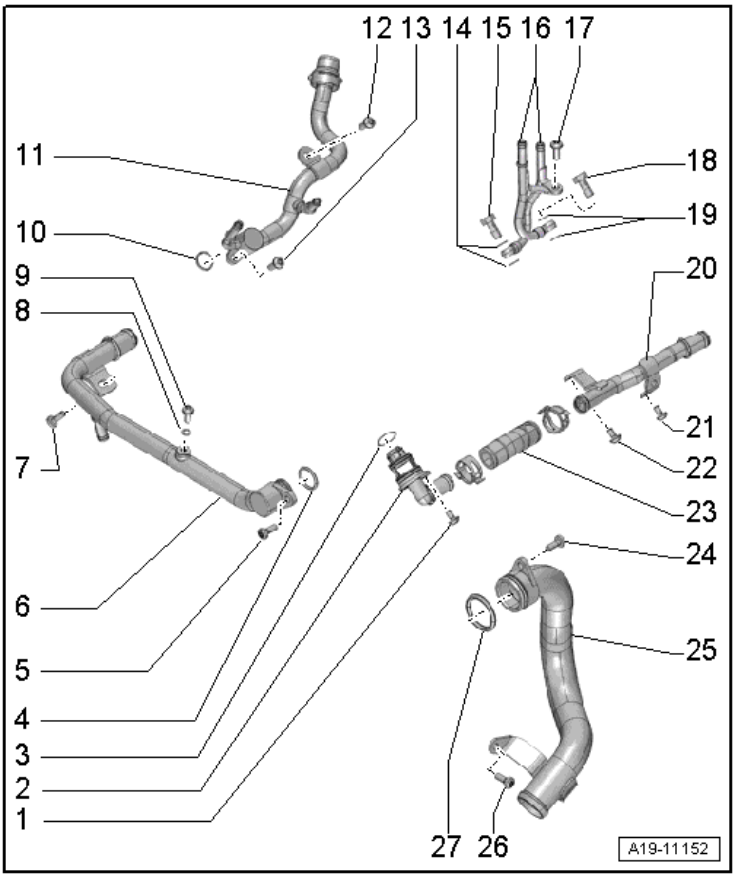
3 - Bolt
- ☐ 9 Nm

4 - Coolant Hose
5 - Coolant Shut-Off Valve
6 - O-ring
- ☐ Replace

7 - Bolt
- ☐ 9 Nm

8 - Coolant Connection
9 - Gasket
- ☐ Replace

Coolant Pipes on Engine Overview



1 - Bolt
- ☐ 9 Nm

2 - Connection

3 - O-ring
- ☐ Replace

4 - O-ring
- ☐ Replace

5 - Bolt
- ☐ 9 Nm

6 - Front Coolant Pipe

7 - Bolt
- ☐ 9 Nm

8 - Seal
- ☐ Replace

9 - Bleed Screw
- ☐ 9 Nm

10 - O-ring
- ☐ Replace

11 - Upper Coolant Pipe

12 - Bolt
- ☐ 9 Nm

13 - Bolt
- ☐ 9 Nm

14 - Seal
- ☐ Replace

15 - Banjo Bolt
- ☐ 12 Nm

16 - Coolant Lines

17 - Bolt
- ☐ 9 Nm

18 - Seal
- ☐ Replace

19 - Seal
- ☐ Replace

20 - Left Coolant Pipe

21 - Bolt
- ☐ 9 Nm

22 - Bolt
- ☐ 9 Nm

23 - Coolant Hose

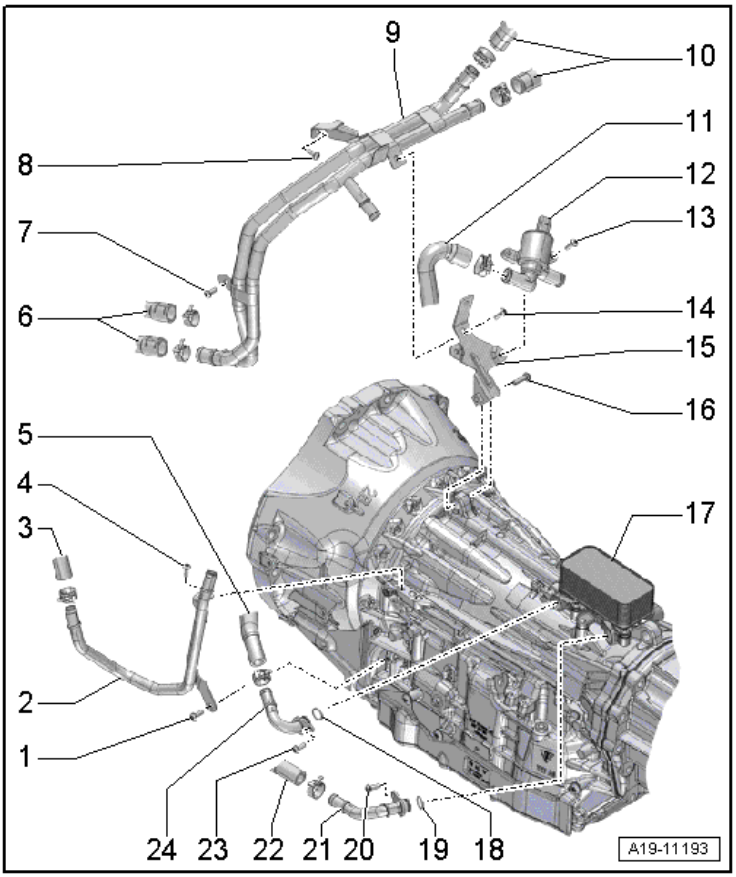
24 - Bolt
- ☐ 9 Nm

25 - Left Lower Coolant Pipe

26 - Bolt
- ☐ 9 Nm

27 - O-ring
- ☐ Replace

Coolant Pipes on Transmission Overview



1 - Bolt
- ☐ 9 Nm

2 - Coolant Pipe on the Left Side of the Transmission
3 - Coolant Hose
4 - Bolt
- ☐ 9 Nm

5 - Coolant Hose
6 - Coolant Hoses
7 - Bolt
- ☐ 9 Nm

8 - Bolt
- ☐ 9 Nm

9 - Coolant Pipes On The Left Side Of The Transmission
10 - Coolant Hoses
11 - Coolant Hose
12 - Transmission Coolant Valve -N488-

13 - Bolt
- ☐ 9 Nm

14 - Bolt
- ☐ 9 Nm

15 - Bracket

16 - Bolt
- ☐ 23 Nm

17 - ATF Cooler

18 - O-ring
- ☐ Replace

19 - O-ring
- ☐ Replace

20 - Bolt
- ☐ Tightening specification, refer to Automatic Transmission

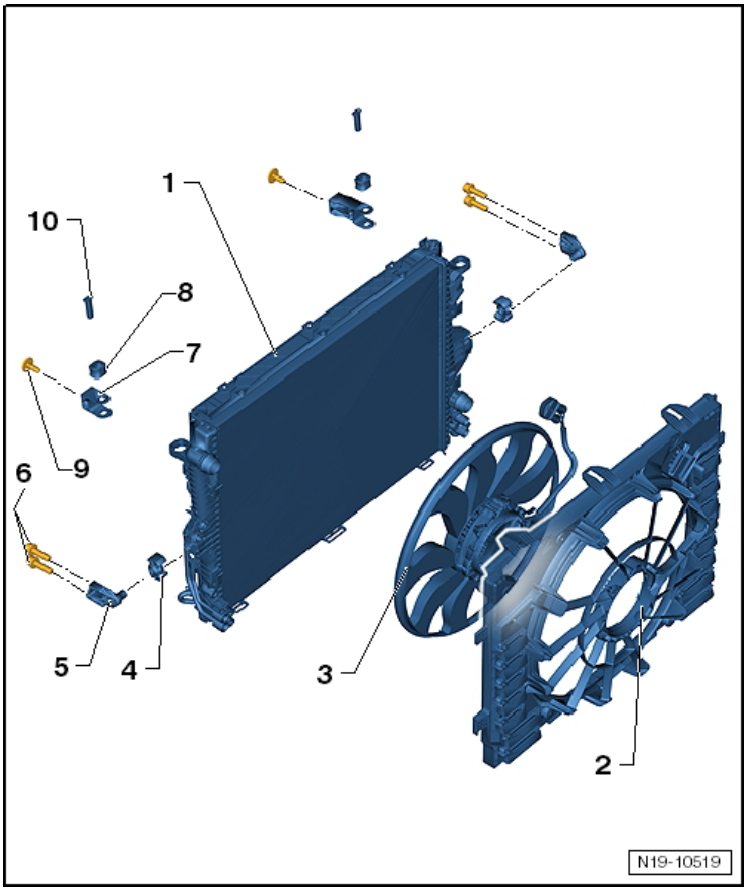
21 - Coolant Pipe

22 - Coolant Hose

23 - Bolt
- ☐ Tightening specification, refer to Automatic Transmission

24 - Coolant Pipe

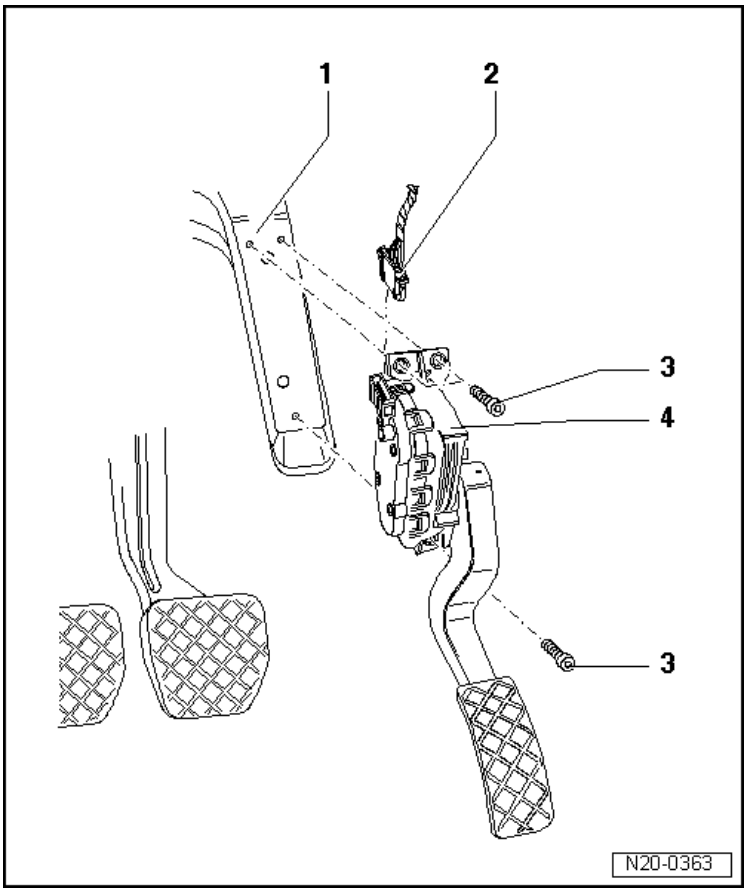
Radiator/Coolant Fan Overview



1 - Radiator
2 - Fan Shroud
3 - Coolant Fan -V7-
4 - Rubber Bushing
5 - Lower Radiator Mount
6 - Bolts
☐ 25 Nm
7 - Upper Radiator Mount
8 - Rubber Bushing
9 - Bolt
☐ 5 Nm
10 - Locking Bolt

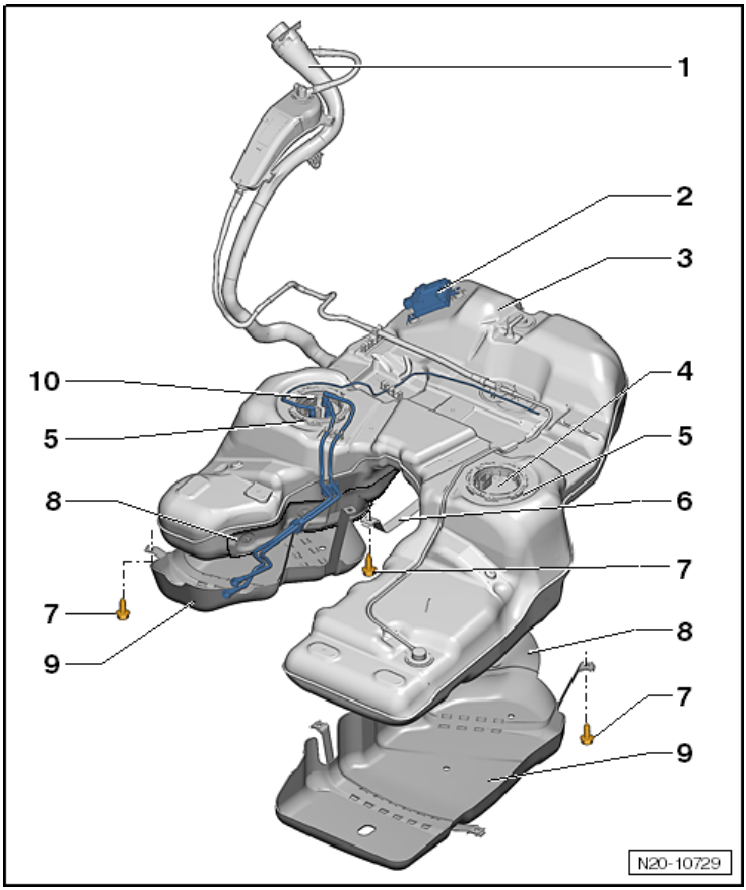
Fuel Supply – 3.0L CNRB (TDI)

Accelerator Mechanism Overview



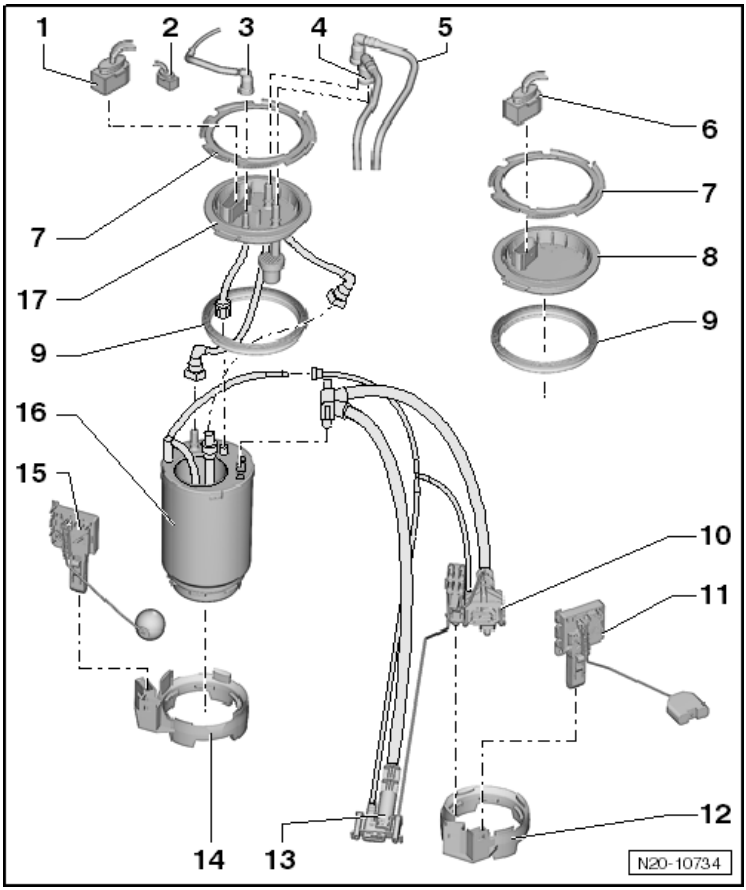
1 - Bracket
2 - Connector
3 - Bolt
☐ 10 Nm
4 - Accerator Pedal Position Sensor -G79-

Fuel Tank and Attachments Overview



1 - Fuel Filler Tube
2 - Fuel Pump Control Module -J538-
3 - Fuel Tank
4 - Flange
5 - Lock Ring
☐ 145 Nm
6 - Fuel Tank Strap
7 - Bolt
☐ 33 Nm
8 - Heat Shield
9 - Protective Cover
10 - Flange

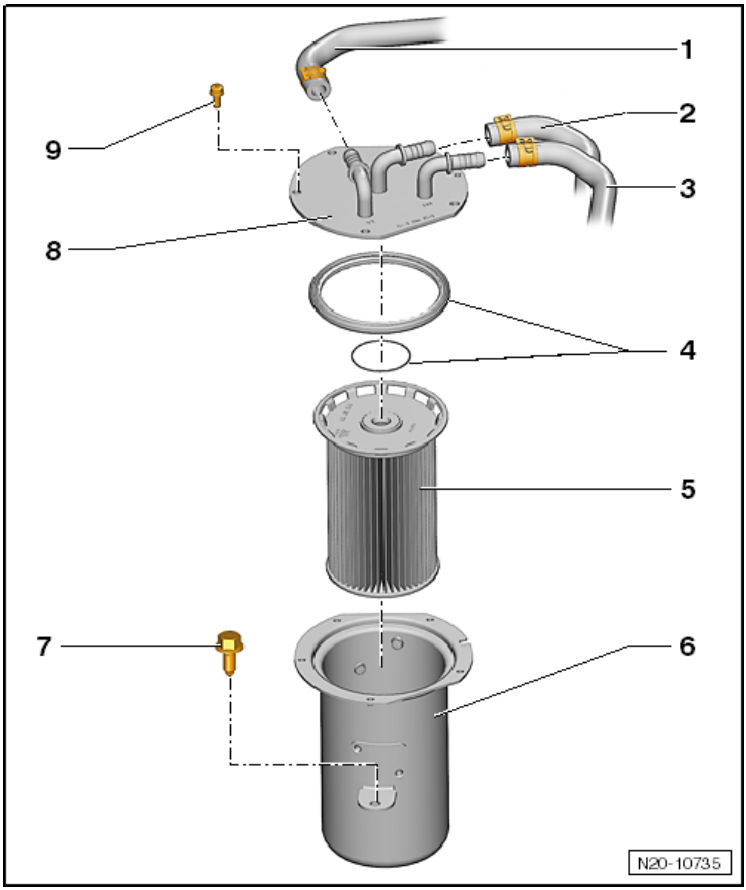
Fuel Delivery Unit/Fuel Level Sensor Overview



1 - Connector
2 - Connector
3 - Fuel Line
4 - Fuel Supply Line
5 - Fuel Return Line
6 - Connector
7 - Lock Ring
☐ 145 Nm
8 - Flange
9 - Seal
10 - Suction Jet Pump
11 - Fuel Level Sensor 3 -G237-
12 - Retaining Ring
13 - Suction Jet Pump
14 - Retaining Ring
15 - Fuel Level Sensor -G-

16 - Fuel Delivery Unit
17 - Flange

Fuel Filter Overview



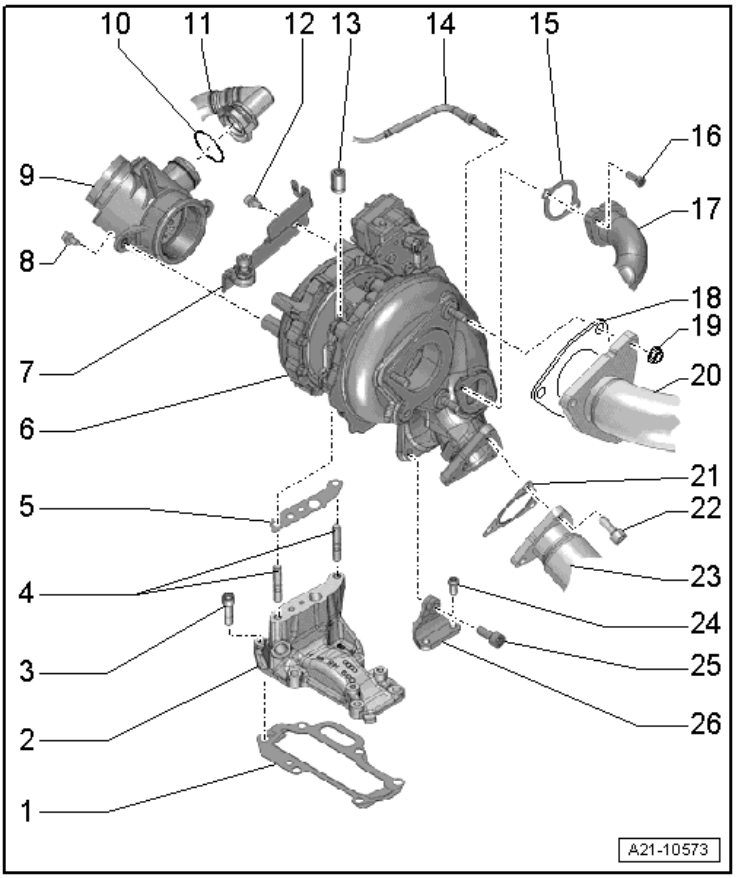
1 - Supply Line
2 - Return Line
3 - Supply Line
4 - Seal
- ☐ Always replace

5 - Fuel Filter Element
6 - Fuel filter Housing
7 - Bolt
- ☐ 10 Nm

8 - Fuel Filter Housing Cover
9 - Bolt
- ☐ 8 Nm

Turbocharger, G-Charger – 3.0L CNRB (TDI)

Turbocharger Overview



1 - Gasket
- ☐ Replace

2 - Bracket

3 - Bolt
- ☐ Tighten last to 23 Nm diagonally and in steps

4 - Stud Bolt
- ☐ 10 Nm
- ☐ Replace nuts after each time they are loosened

5 - Gasket

6 - Turbocharger

7 - Bracket

8 - Bolt
- ☐ 9 Nm

9 - Connection

10 - O-ring

- ☐ Replace

11 - Hose

12 - Bolt

- ☐ 9 Nm

13 - Nut

- ☐ Replace
- ☐ Coat the thread with hot bolt paste. Refer to the Parts Catalog.
- ☐ Tightening specification and sequence, see Turbocharger - Tightening Specification and Sequence below

14 - Exhaust Gas Temperature Sensor 1 -G235-

15 - Gasket

- ☐ Replace

16 - Bolt

- ☐ Replace
- ☐ Tightening specification and sequence, refer to Exhaust System, Emission Controls; Exhaust Gas Recirculation Overview; EGR Pipe at the Turbocharger - Tightening Specification and Sequence

17 - Pipe

18 - Gasket

- ☐ Replace

19 - Nut

- ☐ Replace
- ☐ Coat the thread with hot bolt paste. Refer to the Parts Catalog.
- ☐ Tightening specification and sequence, refer to Exhaust System, Emission Controls; Exhaust Gas Recirculation Overview; EGR Pipe at the Turbocharger - Tightening Specification and Sequence

20 - Primary Catalytic Converter

21 - Gasket

- ☐ Replace

22 - Bolt

- ☐ 30 Nm + 90° turn
- ☐ Replace
- ☐ Coat the thread with hot bolt paste. Refer to the Parts Catalog.

23 - Exhaust Manifold

24 - Bolt

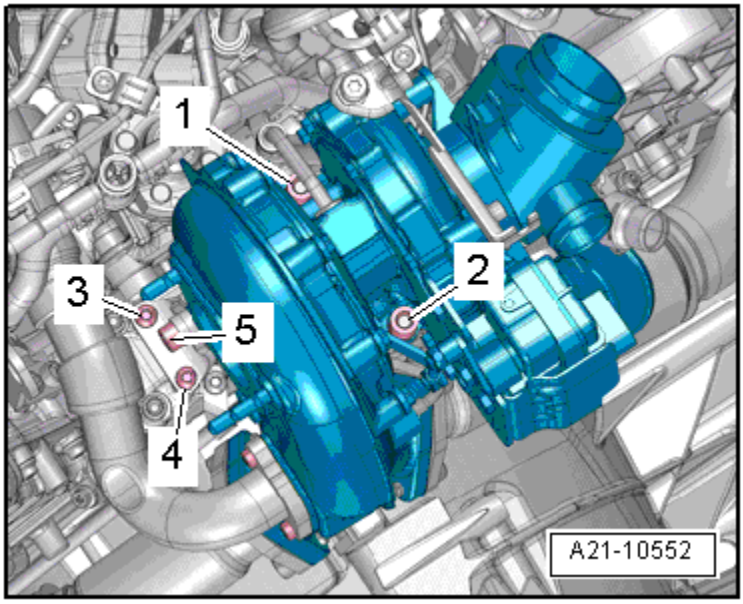
- ☐ Tightening specification and sequence, see Turbocharger - Tightening Specification and Sequence below

25 - Bolt

- ☐ Tightening specification and sequence, see Turbocharger - Tightening Specification and Sequence below

26 - Bracket

Turbocharger - Tightening Specification and Sequence

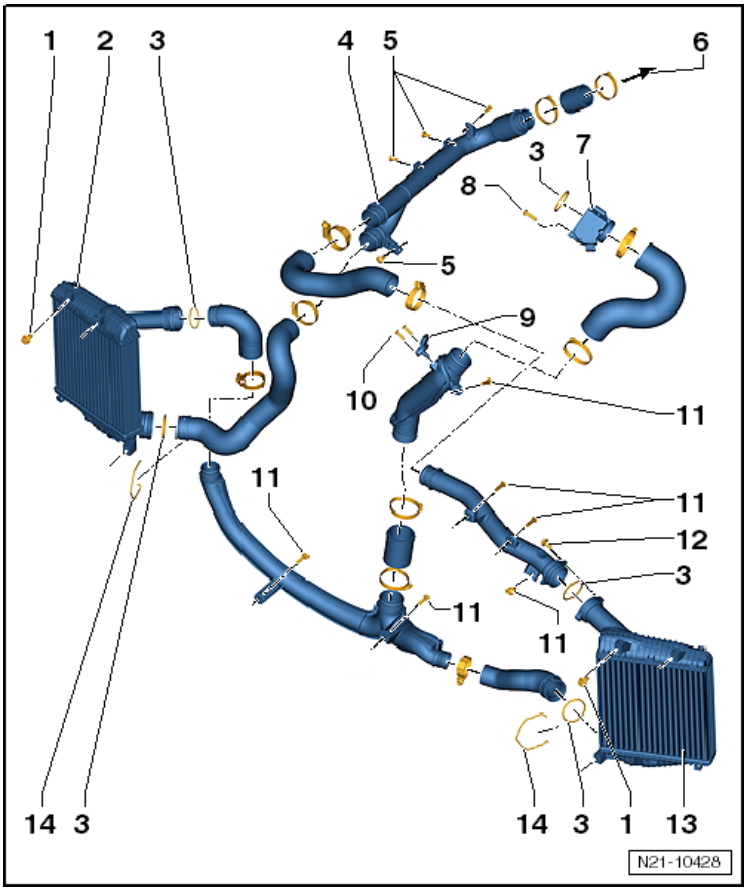


Replace stud bolts and nuts.

Tighten the bolts and nuts in 7 steps in the sequence shown:

Step	Component	Nm
1	Tighten 1 through 9 in sequence	10
2	Stud bolts for the nuts 1, 2	Hand-tighten
3	Stud bolts for the nuts 1, 2	9
4	Stud bolts for the nuts 1, 2	an additional 90° (¼ turn)
5	3, 4, 5	Hand-tighten
6	3, 4	9
7	5	23

Charge Air System Overview



1 - Bolt
- ☐ 9 Nm

2 - Right Charge Air Cooler

3 - O-ring
- ☐ Replace

4 - Right Air Guide Pipe

5 - Bolt
- ☐ 9 Nm

6 - From the Turbocharger

7 - Throttle Valve Control Module -J338-

8 - Bolt
- ☐ 9 Nm

9 - Intake Air Temperature Sensor -G42-

10 - Bolt
- ☐ 5 Nm

11 - Bolt
- ☐ 9 Nm

12 - Bolt

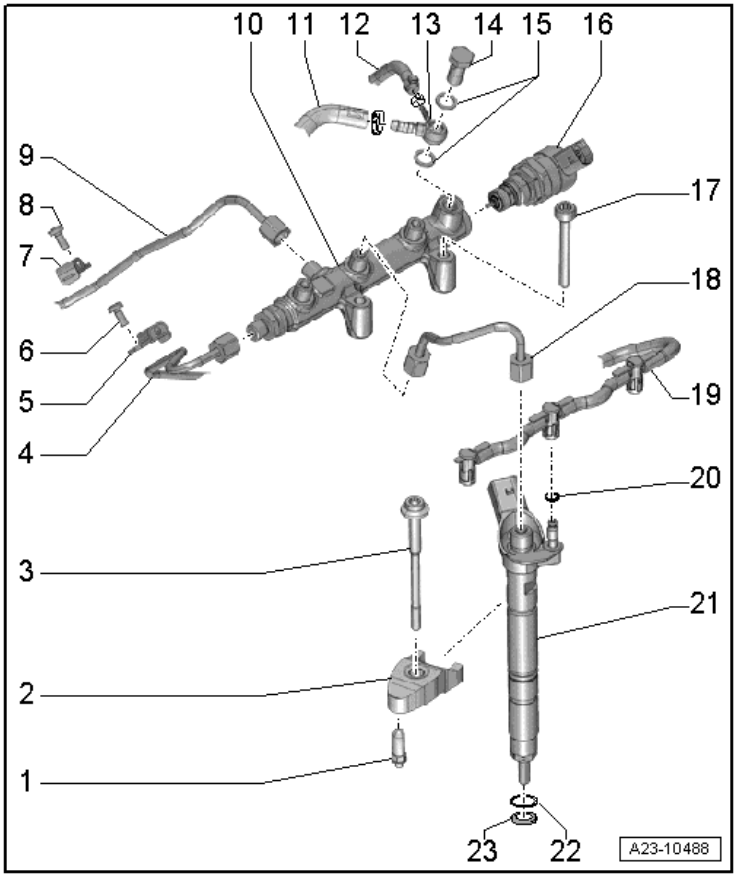
☐ 9 Nm

13 - Left Charge Air Cooler

14 - Clip

Diesel Fuel Injection – 3.0L CNRB (TDI)

Fuel Injectors Overview



1 - Guide Pin
- ☐ Various tightening specifications:
- ☐ 2.5 Nm on camshaft bearing
- ☐ 9 Nm on cylinder head

2 - Tension Clamp
- ☐ Replace when changing fuel injection unit

3 - Bolt
- ☐ 14 Nm

4 - High Pressure Line
- ☐ 25 Nm
- ☐ Coat the union nut threads with clean engine oil

5 - Clamp

6 - Bolt
- ☐ 9 Nm

7 - Clamp

8 - Bolt
- ☐ 9 Nm

9 - High Pressure Line
- ☐ 25 Nm
- ☐ Coat the union nut threads with clean engine oil

10 - High Pressure Rail

11 - Fuel Return Hose

12 - Fuel Return Hose

13 - Hose Connection Ring

14 - Banjo Bolt
- ☐ 25 Nm

15 - Seal
- ☐ Replace

16 - Fuel Pressure Regulator Valve -N276-

17 - Bolt
- ☐ 22 Nm

18 - High Pressure Line
- ☐ 25 Nm
- ☐ Coat the union nut threads with clean engine oil

19 - Fuel Return Hose

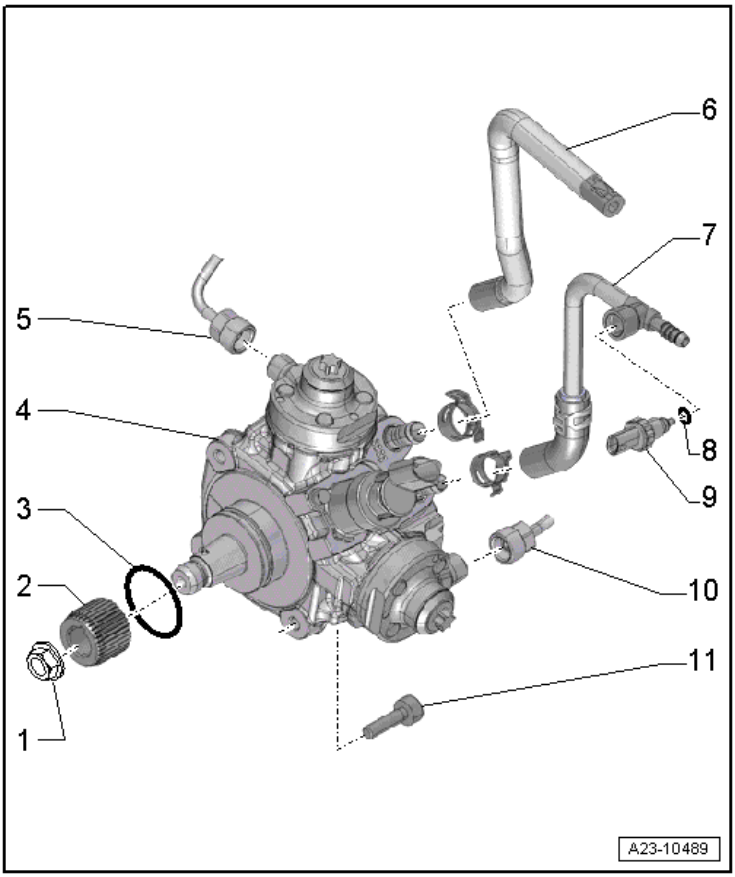
20 - O-ring
- ☐ Replace

21 - Injector

22 - O-ring
- ☐ Replace

23 - Copper Ring
- ☐ Replace

High Pressure Pump Overview



1 - Nut
- ☐ 70 Nm

2 - Engine Support Adapter

3 - O-ring
- ☐ Replace after removing

4 - High Pressure Pump

5 - High Pressure Line
- ☐ 25 Nm
- ☐ Coat the union nut threads with clean engine oil

6 - Fuel Supply Hose

7 - Fuel Return Hose

8 - O-ring
- ☐ Replace after removing

9 - Intake Air Temperature Sensor -G42-

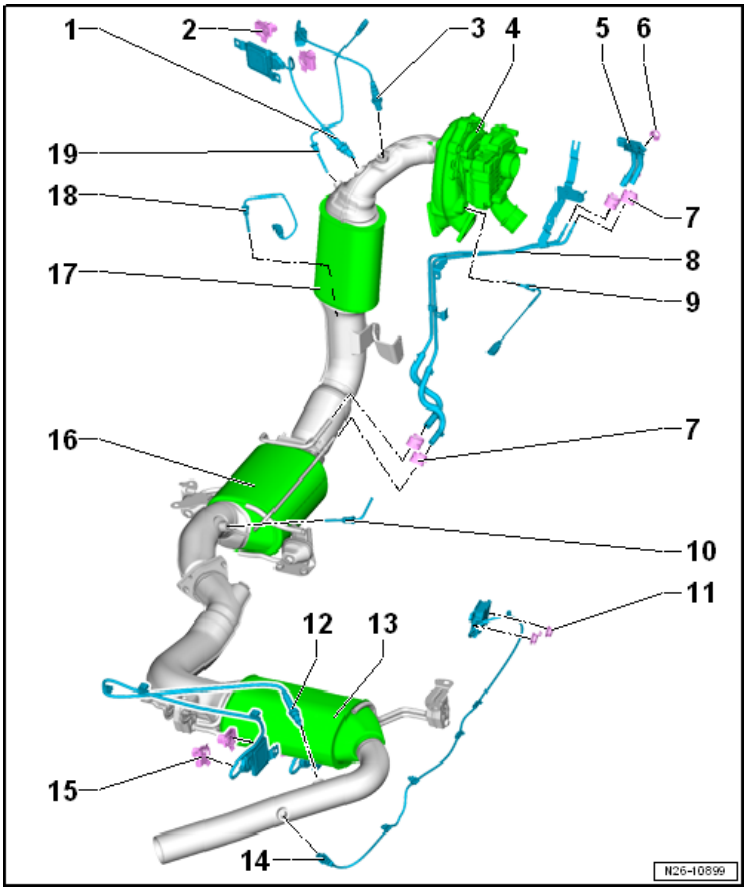
10 - High Pressure Line

- ☐ 25 Nm
- ☐ Coat the union nut threads with clean engine oil

11 - Bolt

- ☐ 22 Nm

Heated Oxygen Sensor Overview



1 - NOx Sensor -G295-
- ☐ 45 Nm

2 - Nut
- ☐ 2.5 Nm

3 - Oxygen Sensor 1 Before Catalytic Converter -GX10-
- ☐ 50 Nm
- ☐ Grease the threads with hot bolt paste -G 052 112 A3-. Do not allow the hot bolt paste -G 052 112 A3- to enter the slits on the sensor body.

4 - Turbocharger

5 - Differential Pressure Sensor -G505-

6 - Nut
- ☐ 3.5 Nm

7 - Spring Clamp

8 - Pressure Line for the Differential Pressure Sensor -G505-

9 - Exhaust Gas Temperature Sensor 1 -G235-
- ☐ 45 Nm
- ☐ Coat with hot bolt paste. Refer to the Parts Catalog.

10 - Exhaust Gas Temperature Sensor 4 -G648-
- ☐ 45 Nm
- ☐ Coat with hot bolt paste. Refer to the Parts Catalog.

11 - Nut
- ☐ 3.5 Nm

12 - NOx Sensor 2 -G687-
- ☐ 45 Nm

13 - Reduction Catalytic Converter

14 - Particulate Sensor -G784-
- ☐ 50Nm
- ☐ Coat with hot bolt paste. Refer to the Parts Catalog.

15 - Nut
- ☐ 2.5 Nm

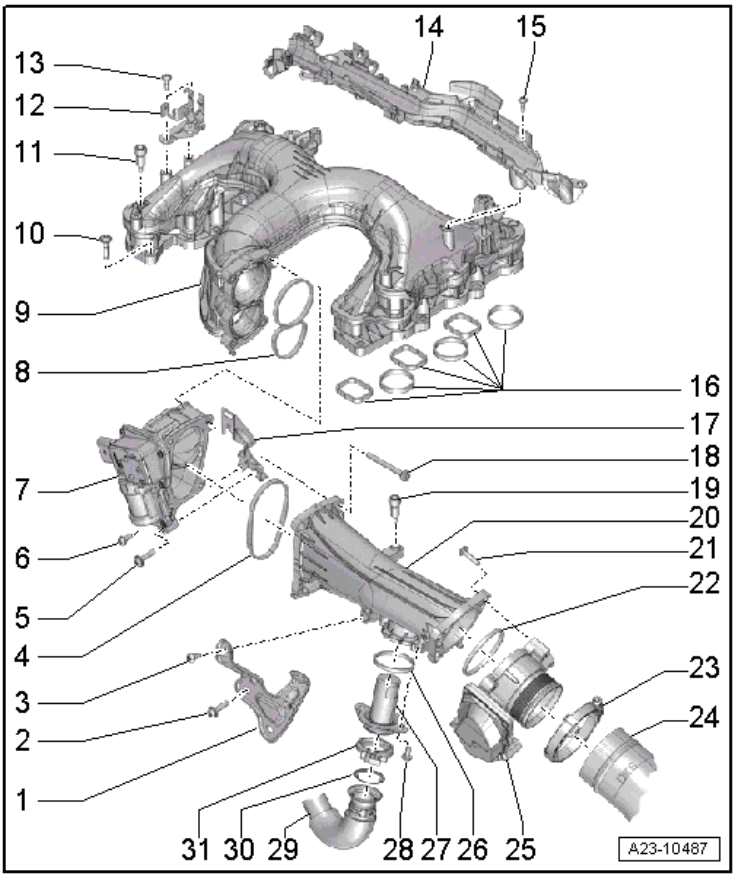
16 - Particulate Filter

17 - Primary Catalytic Converter

18 - Exhaust Gas Temperature Sensor 3 -G495-
- ☐ 45 Nm
- ☐ Coat with hot bolt paste. Refer to the Parts Catalog.

19 - Exhaust Gas Temperature Sensor 2 -G448-
- ☐ 45 Nm
- ☐ Coat with hot bolt paste. Refer to the Parts Catalog.

Intake Manifold Overview



1 - Bracket
2 - Bolt
☐ 9 Nm
3 - Bolt
☐ 9 Nm
4 - Gasket
5 - Bolt
☐ 9 Nm
6 - Bolt
☐ 9 Nm
7 - Intake Flap Motor -V157-
8 - Gasket
9 - Intake Manifold
10 - Bolt
☐ Tightening specification and sequence, see Intake Manifold - Tightening Specification and Sequence below

11 - Mounting Pins
- ☐ 5 Nm

12 - Bracket

13 - Bolt
- ☐ 4 Nm

14 - Wiring Guide

15 - Bolt
- ☐ 4 Nm

16 - Gasket
- ☐ Replace

17 - Bracket

18 - Bolt
- ☐ 9 Nm

19 - Mounting Pins
- ☐ 5 Nm

20 - Air Guide Pipe

21 - Bolt
- ☐ 9 Nm

22 - Gasket

23 - Screw-Type Clamp

24 - Air Guide Hose

25 - Throttle Valve Control Module -J338-

26 - Gasket
- ☐ Replace

27 - Pipe

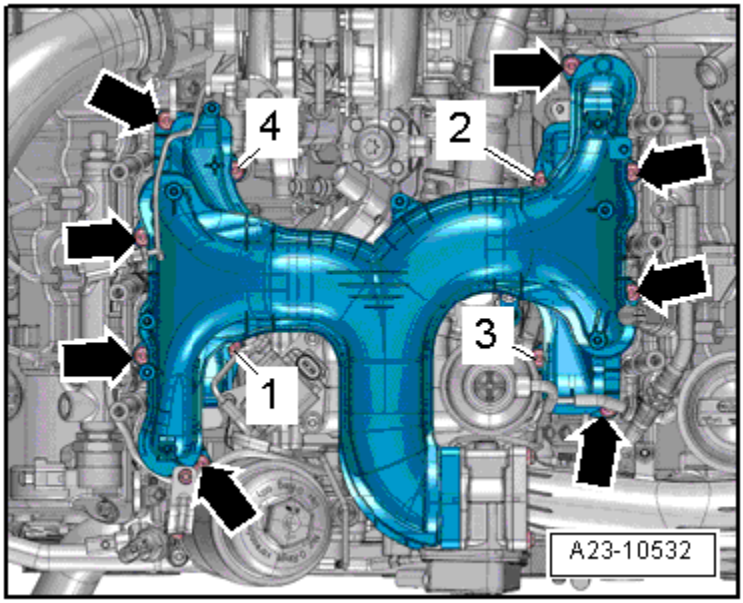
28 - Bolt
- ☐ 9 Nm

29 - Pipe

30 - Gasket
- ☐ Replace

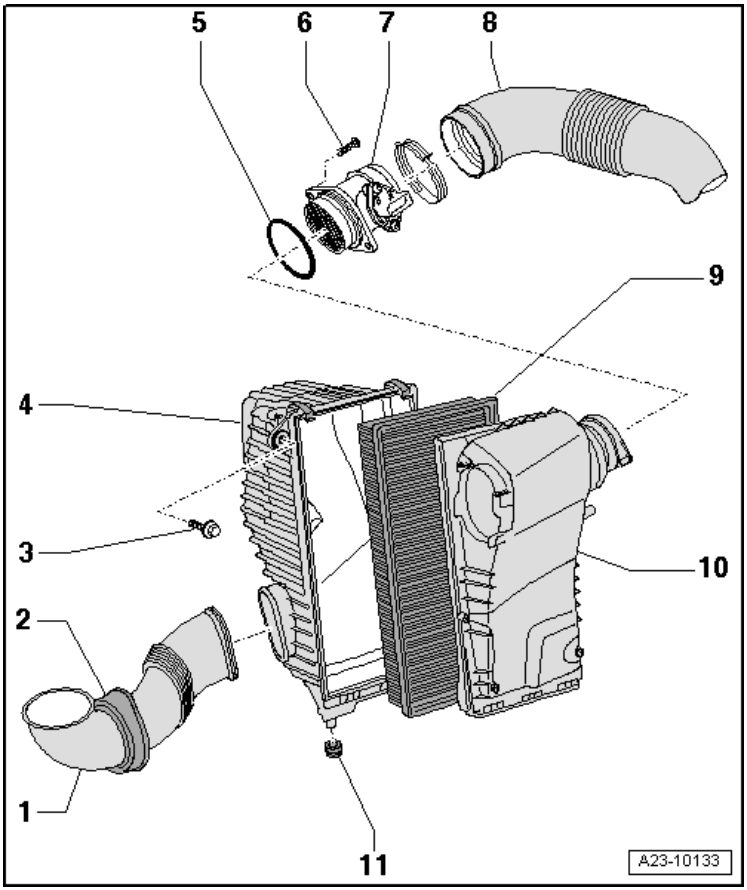
31 - Screw-Type Clamp
- ☐ Refer to Exhaust Gas Recirculation Overview
- ☐

Intake Manifold Tightening Specifications



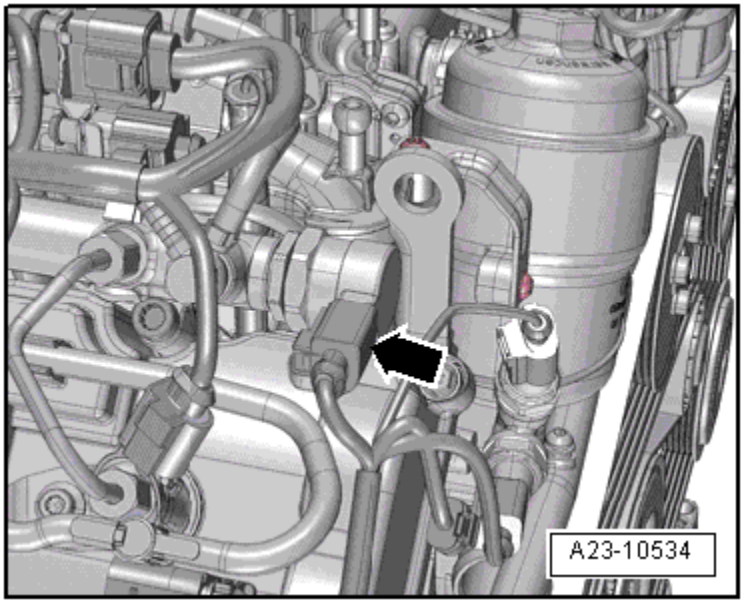
Step	Component	Nm
1	Tighten bolts 1 through 4 in sequence and arrows	Hand-tighten
2	Tighten bolts 1 through 4 in sequence	9
3	Tighten arrows in any sequence	9

Air Filter Housing Overview



1 - Air Guide
2 - Rubber Grommet
3 - Bolt
☐ 10 Nm
4 - Air Filter Housing Lower Section
5 - O-ring
☐ Replace
6 - Bolt
☐ 1.5 Nm
7 - Mass Air Flow Sensor -G70-
8 - Air Guide Hose
9 - Air Filter
10 - Air Filter Housing Upper Section
11 - Rubber Grommet

Fuel Pressure Regulator Valve -N276-
- Tightening Specification

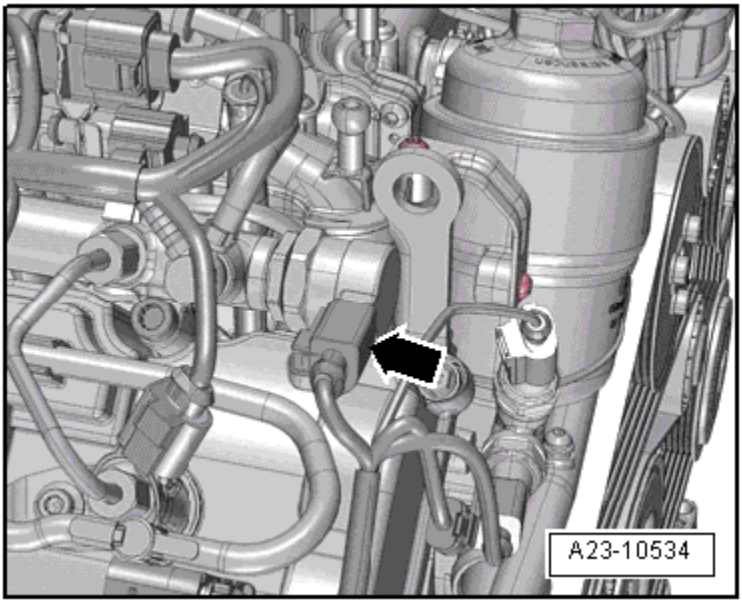


Align the fuel pressure regulator valve -N276- such that connecting the harness connector -arrow- does not cause the electrical wiring to be placed under tension.

Tighten the union nut on the regulator valve in 4 steps as follows. Counterhold it by the housing.

Step	Nm
1	Install all the way in by hand
2	60 Nm
3	Turn back 180°
4	85 Nm

Fuel Pressure Sensor -G247- Tightening Specifications



Special tools and workshop equipment required

4 mm Socket Wrench -T40218-, Torque wrench.

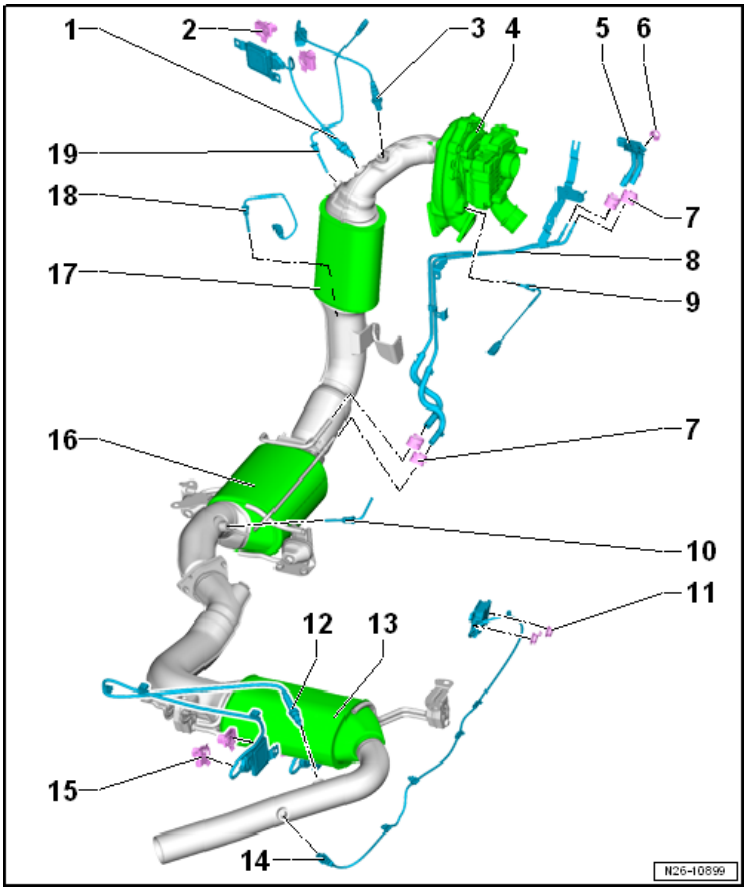
Tighten the fuel pressure sensor -G247- in 4 steps:

Note: Do not use an open-end wrench for opening or tightening.

Step	Nm
1	Install all the way in by hand
2	60 Nm
3	Turn back 180°
4	85 Nm

Exhaust System, Emission Controls – 3.0L CNRB (TDI)

Emissions Control Overview



1 - NOx Sensor -G295-
- ☐ 45 Nm

2 - Nut
- ☐ 2.5 Nm

3 - Oxygen Sensor 1 Before Catalytic Converter -GX10-
- ☐ 50 Nm
- ☐ Only grease the threads with hot bolt paste -G 052 112 A3-. Do not allow the hot bolt paste to enter the slits on the sensor body.

4 - Turbocharger

5 - Differential Pressure Sensor -G505-

6 - Nut
- ☐ 3.5 Nm

7 - Spring Clamp

8 - Pressure Line for the Differential Pressure Sensor -G505-

9 - Exhaust Gas Temperature Sensor 1 -G235-

- ☐ 45 Nm
- ☐ Coat with hot bolt paste. Refer to the Parts Catalog.

10 - Exhaust Gas Temperature Sensor 4 -G648-

- ☐ 45 Nm
- ☐ Coat with hot bolt paste. Refer to the Parts Catalog.

11 - Bolt

- ☐ 9 Nm

12 - Nut

- ☐ 3.5 Nm

13 - Reduction Catalytic Converter

14 - Particulate Sensor -G784-

- ☐ 50 Nm
- ☐ Coat with hot bolt paste. Refer to the Parts Catalog.

15 - Nut

- ☐ 2.5 Nm

16 - Particulate Filter

17 - Primary Catalytic Converter

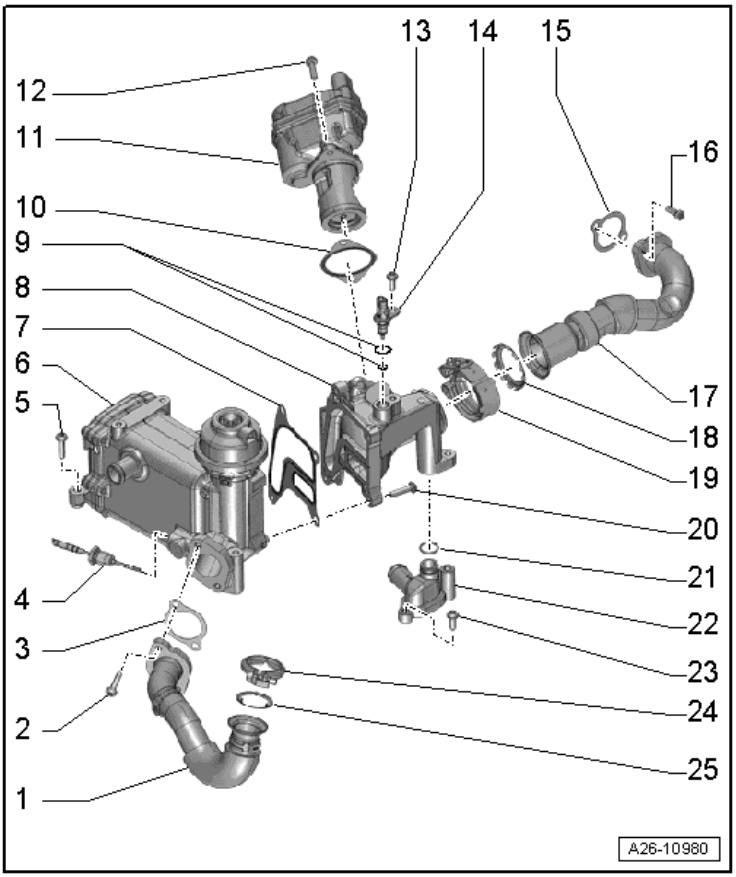
18 - Exhaust Gas Temperature Sensor 3 -G495-

- ☐ 45 Nm
- ☐ Coat with hot bolt paste. Refer to the Parts Catalog.

19 - Exhaust Gas Temperature Sensor 2 -G448-

- ☐ 45 Nm
- ☐ Coat with hot bolt paste. Refer to the Parts Catalog.

Exhaust Gas Recirculation Overview



1 - Exhaust Gas Recirculation Pipe
2 - Bolt
- ☐ Tightening specification and sequence, see EGR Pipe at the Intake Manifold - Tightening Specification and Sequence below

3 - Gasket
- ☐ Replace

4 - EGR Temperature Sensor -G98-
- ☐ 45 Nm

5 - Bolt
- ☐ 9 Nm

6 - EGR Cooler
7 - Gasket
- ☐ Replace

8 - Connection
9 - O-ring
- ☐ Replace

10 - Gasket
- ☐ Replace

11 - EGR Valve 1 -GX5-

12 - Bolt
- ☐ 9 Nm

13 - Bolt
- ☐ 9 Nm

14 - Engine Temperature Control Sensor -G694-

15 - Gasket
- ☐ Replace

16 - From the Turbocharger
- ☐ Replace
- ☐ Tightening specification and sequence, see EGR Pipe at the Turbocharger - Tightening Specification and Sequence below

17 - Exhaust Gas Recirculation Pipe
- ☐ Tightening specification and sequence, see EGR Pipe at the Turbocharger - Tightening Specification and Sequence below

18 - Gasket
- ☐ Replace

19 - Screw-Type Clamp
- ☐ 5 Nm
- ☐ Replace

20 - Bolt
- ☐ 9 Nm

21 - O-ring
- ☐ Replace

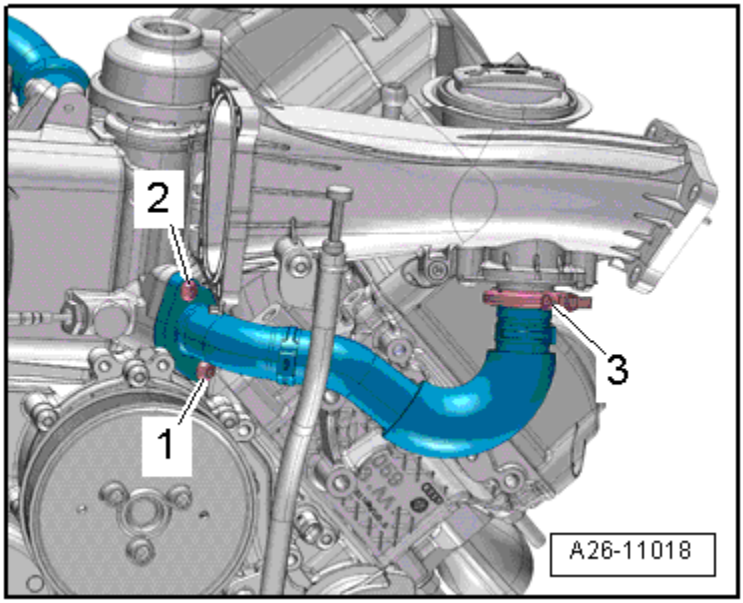
22 - Coolant Connection

23 - Bolt
- ☐ 9 Nm

24 - Screw-Type Clamp
- ☐ Replace
- ☐ Tightening specification and sequence, see EGR Pipe at the Intake Manifold - Tightening Specification and Sequence below

25 - Gasket
- ☐ Replace

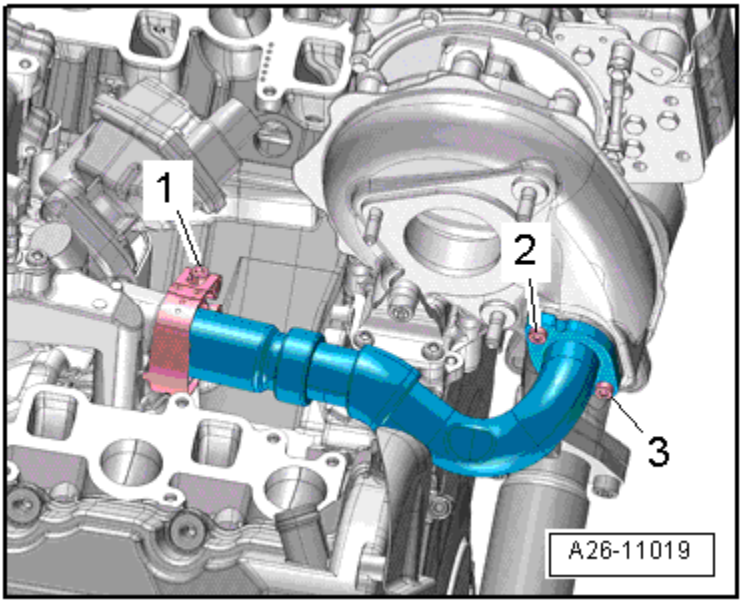
EGR Pipe at the Intake Manifold
Tightening Specifications



Coat the screw thread with hot bolt past. Refer to the Parts Catalog.

Step	Bolts/screw-type clamps	Nm
1	1, 2	Hand-tighten
2	3	2.5
3	1, 2	9

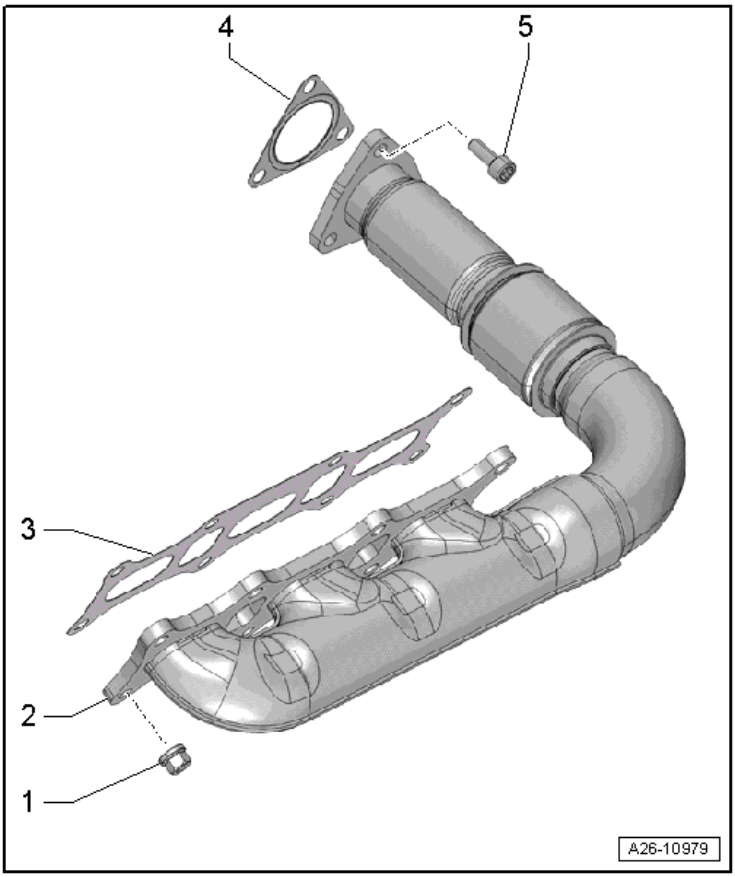
EGR Pipe at the Turbocharger
Tightening Specifications



Coat the screw thread with hot bolt past. Refer to the Parts Catalog.

Step	Bolts/screw-type clamps	Nm
1	2, 3	Hand-tighten
2	1	6
3	2, 3	5
4	2, 3	an additional 90° (¼ turn)

Exhaust Manifold Overview



1 - Nut
- ☐ 25 Nm
- ☐ Replace
- ☐ Coat the thread with hot bolt paste. Refer to the Parts Catalog.

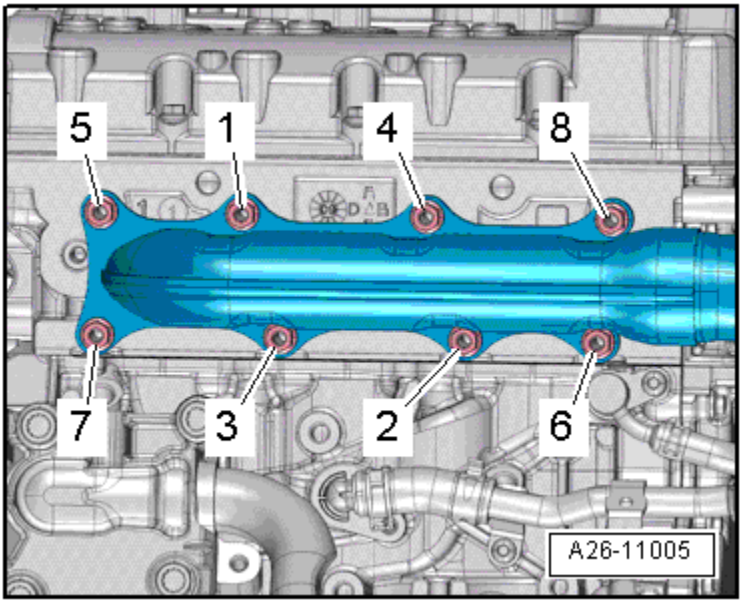
2 - Exhaust Manifold

3 - Gasket
- ☐ Replace

4 - Gasket
- ☐ Replace

5 - Bolt
- ☐ 30 Nm + 90° turn
- ☐ Replace
- ☐ Coat the thread with hot bolt paste. Refer to the Parts Catalog.

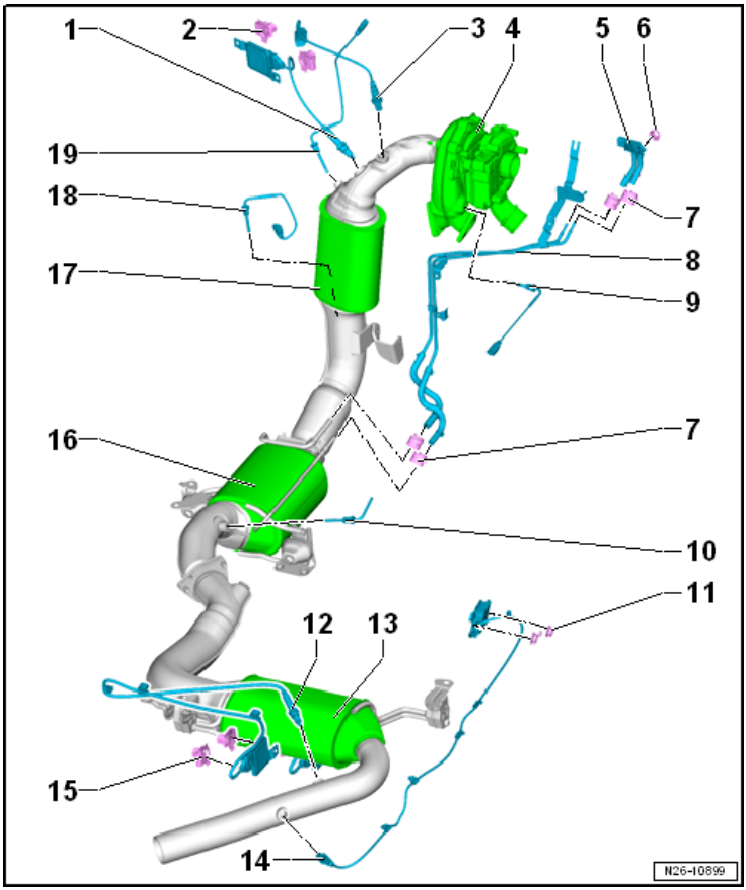
Exhaust Manifold Tightening Specifications



Replace nuts. Coat the nut thread with hot bolt paste. Refer to the Parts Catalog.

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

Exhaust Temperature Regulation Overview



1 - NOx Sensor -G295-
- ☐ 45 Nm

2 - Nut
- ☐ 2.5 Nm

3 - Oxygen Sensor 1 Before Catalytic Converter -GX10-
- ☐ 50 Nm
- ☐ Only grease the threads with hot bolt paste -G 052 112 A3-. Do not allow the hot bolt paste to enter the slits on the sensor body.

4 - Turbocharger

5 - Differential Pressure Sensor -G505-

6 - Nut
- ☐ 3.5 Nm

7 - Spring Clamp

8 - Pressure Line for the Differential Pressure Sensor -G505-

9 - Exhaust Gas Temperature Sensor 1 -G235-
- ☐ 45 Nm
- ☐ Coat with hot bolt paste. Refer to the Parts Catalog.

10 - Exhaust Gas Temperature Sensor 4 -G648-
- ☐ 45 Nm
- ☐ Coat with hot bolt paste. Refer to the Parts Catalog.

11 - Bolt
- ☐ 9 Nm

12 - Nut
- ☐ 3.5 Nm

13 - Reduction Catalytic Converter

14 - Particulate Sensor -G784-
- ☐ 50 Nm
- ☐ Coat with hot bolt paste. Refer to the Parts Catalog.

15 - Nut
- ☐ 2.5 Nm

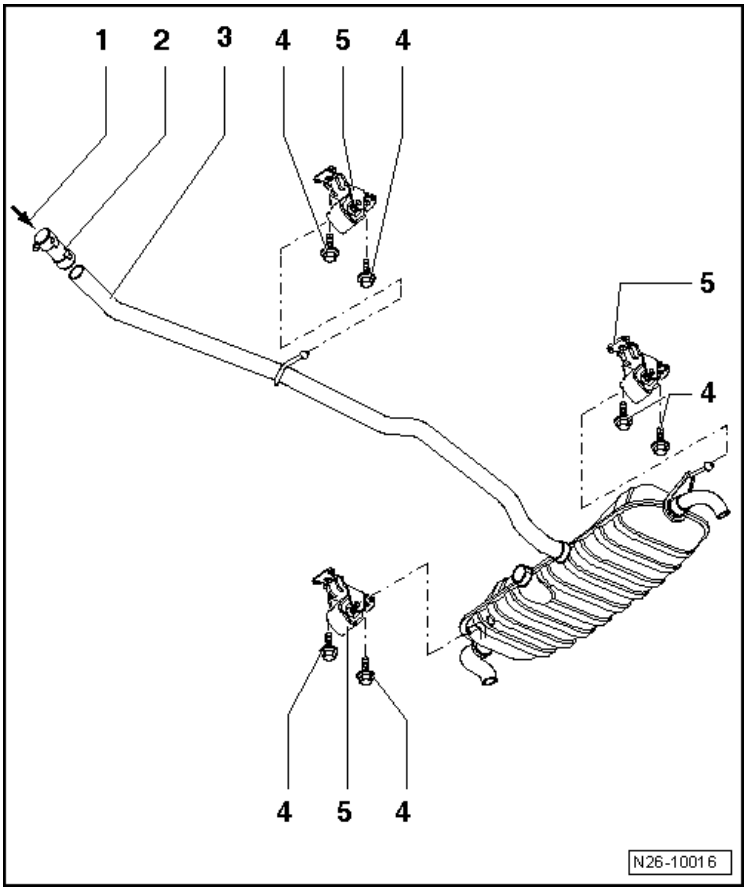
16 - Particulate Filter

17 - Primary Catalytic Converter

18 - Exhaust Gas Temperature Sensor 3 -G495-
- ☐ 45 Nm
- ☐ Coat with hot bolt paste. Refer to the Parts Catalog.

19 - Exhaust Gas Temperature Sensor 2 -G448-
- ☐ 45 Nm
- ☐ Coat with hot bolt paste. Refer to the Parts Catalog.

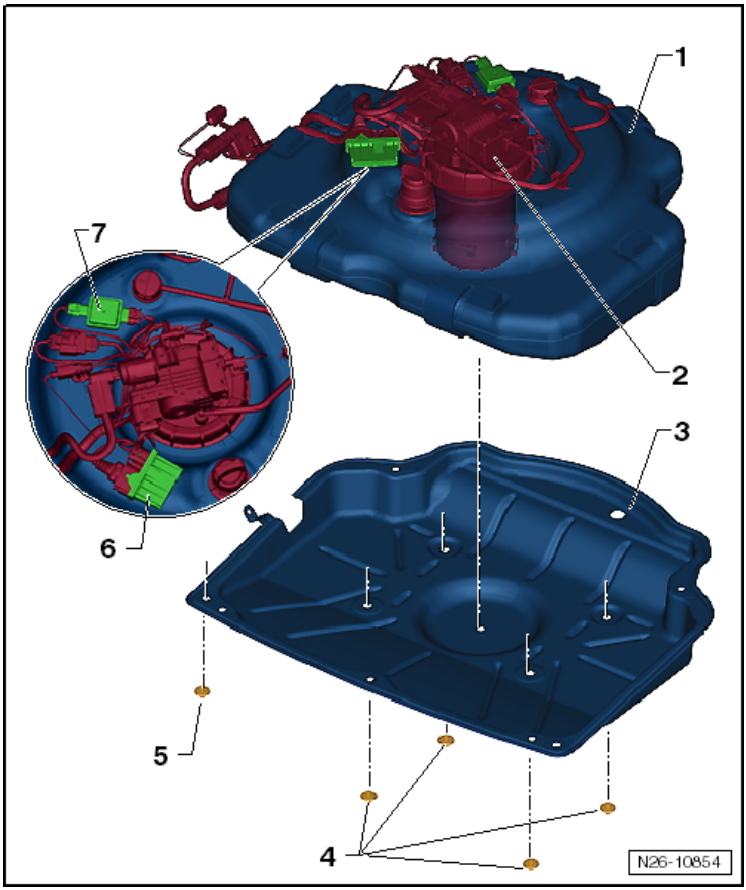
Muffler Overview



1 - Muffler Overview
2 - Double Clamp
3 - Exhaust Pipe with Rear Muffler
4 - Bolt
- ☐ 25 Nm

5 - Suspended Mount

Reducing Agent Tank Overview

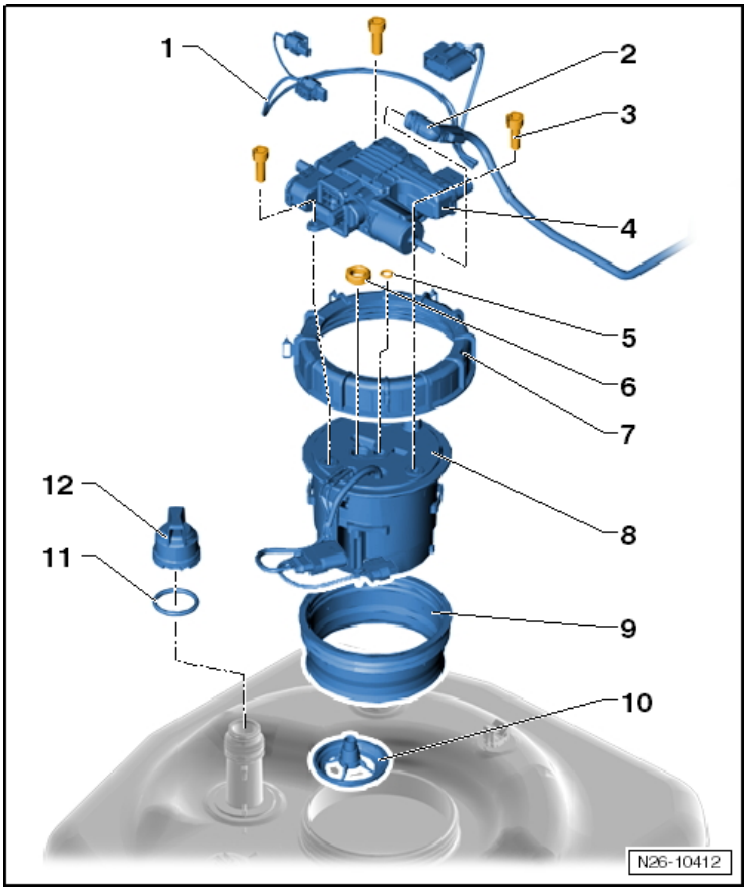


1 - Reducing Agent Tank
2 - Delivery Module
3 - Tray
4 - Nut
- ☐ 10 Nm

5 - Nut
- ☐ 20 Nm

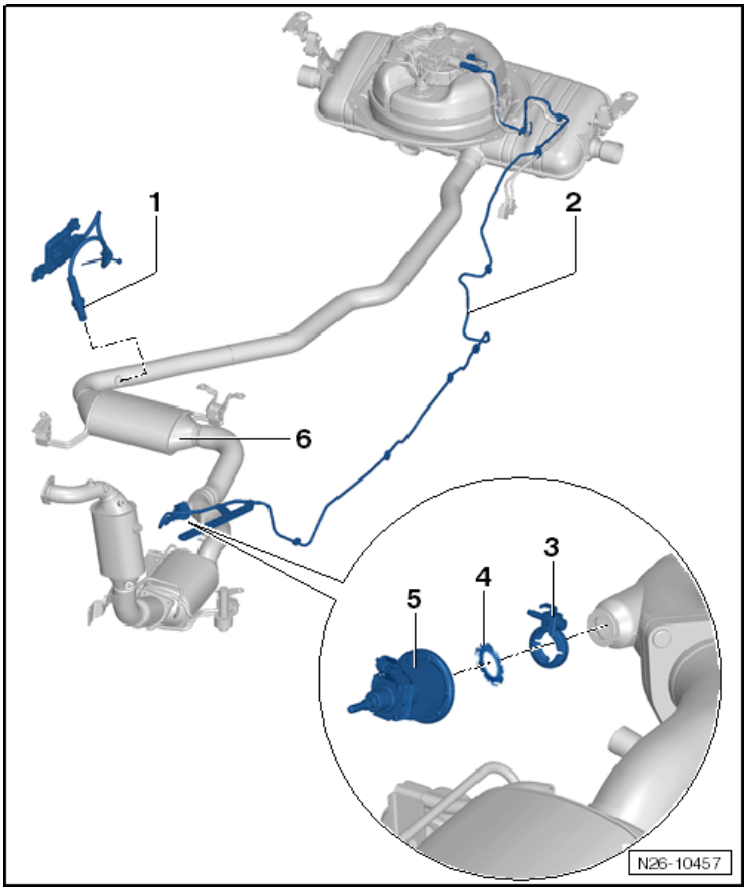
6 - Reducing Agent Heater Control Module -J891-
7 - Reducing Agent Reservoir Processing Unit -G698-

Reducing Agent Delivery Module Overview



1 - Wiring Harness
2 - Delivery Line
3 - Bolt
☐ 5 Nm
4 - Reducing Agent Pump -V437-
5 - Seal
☐ Replace
6 - From the Turbocharger
7 - Locking Ring
☐ 80 Nm
8 - Heating Element
9 - Gasket
10 - Filter
11 - Seal
12 - Cover

Reducing Agent Delivery Line Overview



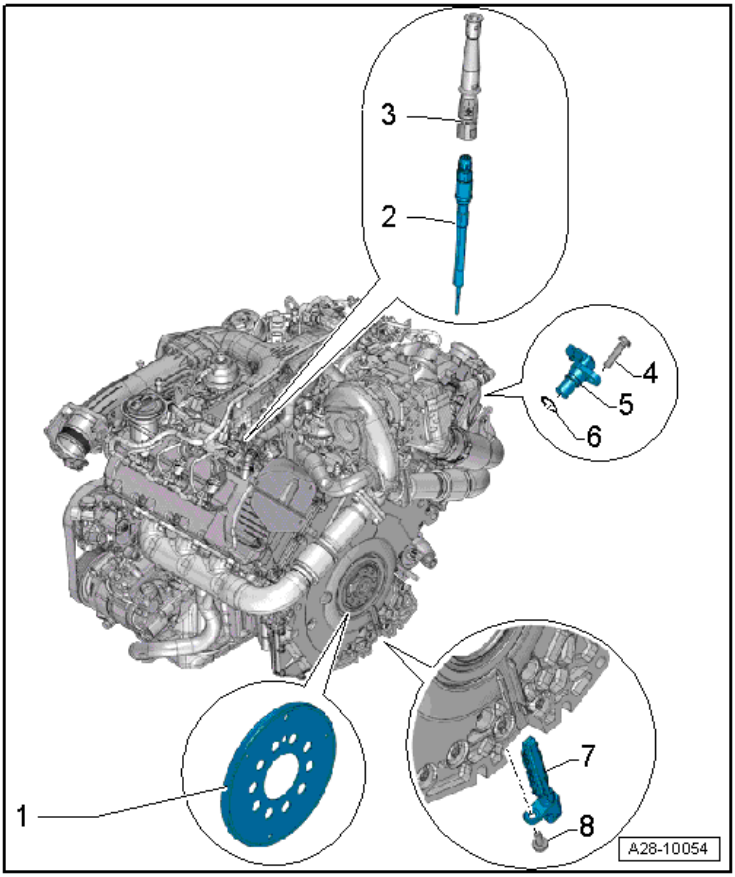
1 - NOx Sensor 2 -G687-
2 - Reducing Agent Delivery Line
3 - Clip
- ☐ 5 Nm
- ☐ Replace

4 - Gasket
- ☐ Replace

5 - Reducing Agent Injector -N474-
6 - Reduction Catalytic Converter

Ignition/Glow Plug System – 3.0L CNRB

Preglow System Overview



1 - Sensor Wheel
2 - Glow Plug
- ☐ 12 Nm

3 - Connector
4 - Bolt
- ☐ 9 Nm

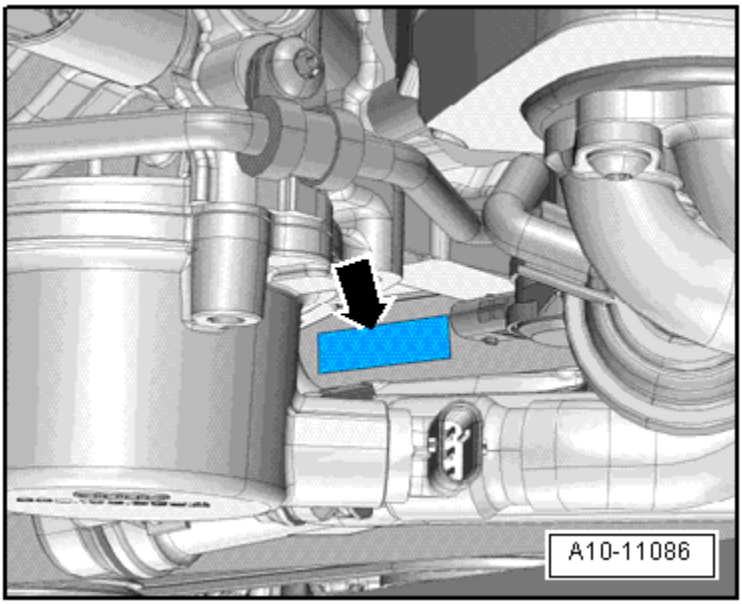
5 - Camshaft Position Sensor -G40-
6 - O-ring
- ☐ Replace

7 - Engine Speed Sensor -G28-
8 - Bolt
- ☐ 9 Nm

ENGINE MECHANICAL – 3.0L CGFA

General, Technical Data

Engine Number Location



The engine number (engine code and serial number) is located on the top front of the cylinder block, below the right cylinder head (➡). Engine codes beginning with C are four-digit. The first 3 digits of the engine code indicate the displacement and the mechanical structure of the engine. The fourth digit describes the engine output and torque.

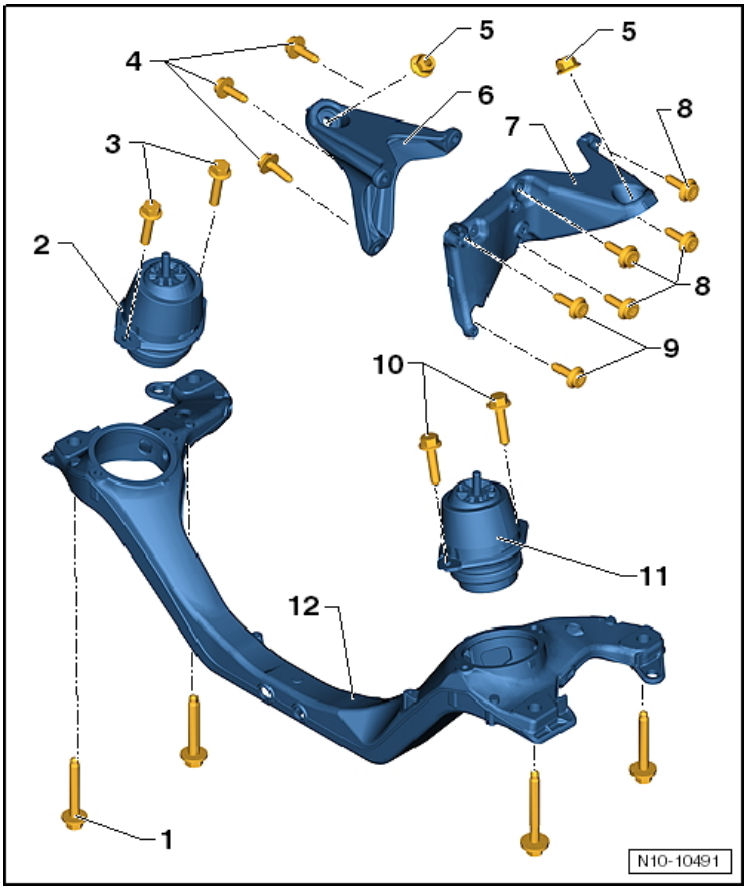
Engine Data

Engine code		**CGFA**
Displacement	liter	2.968
Output combustion engine	kW at RPM	245 @ 5500
Electro-drive drive motor output	kW	30
Combustion engine tightening specification	Nm at RPM	440 @ 1600
Bore	diameter mm	84.5
Stroke	mm	89.0
Compression ratio		10.5
Research Octane Number (RON)	minimum	98 [1)]
Fuel injection system and ignition system		Motronic MED 17
Emission values in accordance with		ULEV 2 [2)]
Ignition sequence		1-4-3-6-2-5
Exhaust Gas Recirculation (EGR)		no
Turbocharger, Supercharger		Supercharger
Knock control		2 sensors
Oxygen Sensor (O2S) regulation		4 heated oxygen sensors
Charge Air Cooler (CAC)		Yes
Variable valve timing		Intake
Variable intake manifold		No
Secondary Air Injection (AIR) system		Yes
Valve per cylinder		4

[1)] Unleaded RON 95 is permitted but performance is reduced.
[2)] Ultra Low Emissions Vehicle 2.

Engine Assembly – 3.0L CGFA

Engine Carrier, Engine Mount and Engine Mount Bracket Overview



1 - Bolt
- ☐ 120 Nm + 180° turn
- ☐ Always replace

2 - Right Engine Mount

3 - Bolt
- ☐ 60 Nm

4 - Bolt
- ☐ 40 Nm

5 - Nut
- ☐ 75 Nm

6 - Right Engine Mount Bracket

7 - Left Engine Mount Bracket

8 - Bolt
- ☐ 40 Nm

9 - Bolt
- ☐ 20 Nm

10 - Bolt
- ☐ 60 Nm

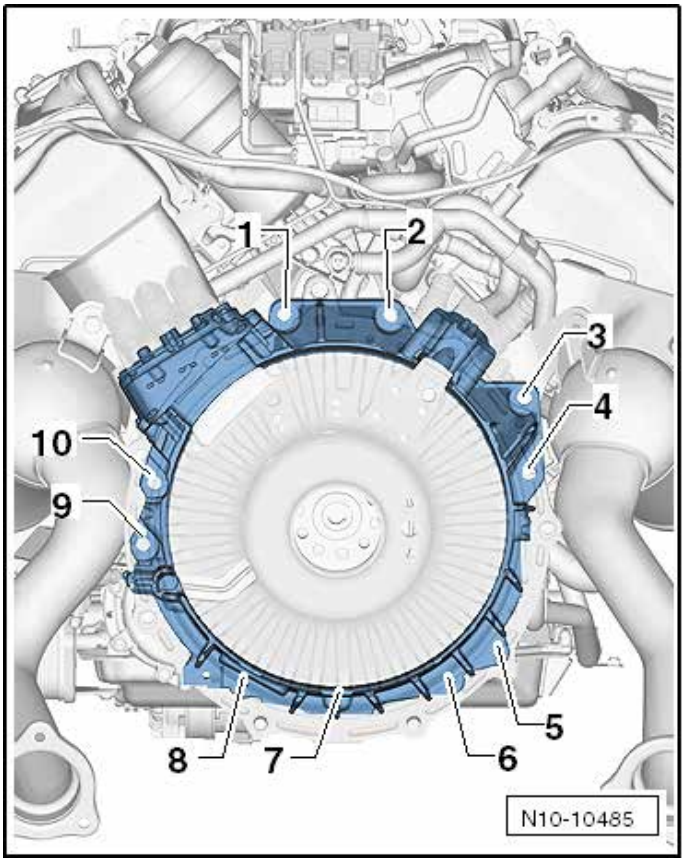
11 - Left Engine Mount

12 - Engine Carrier

Fastener Tightening Specifications

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

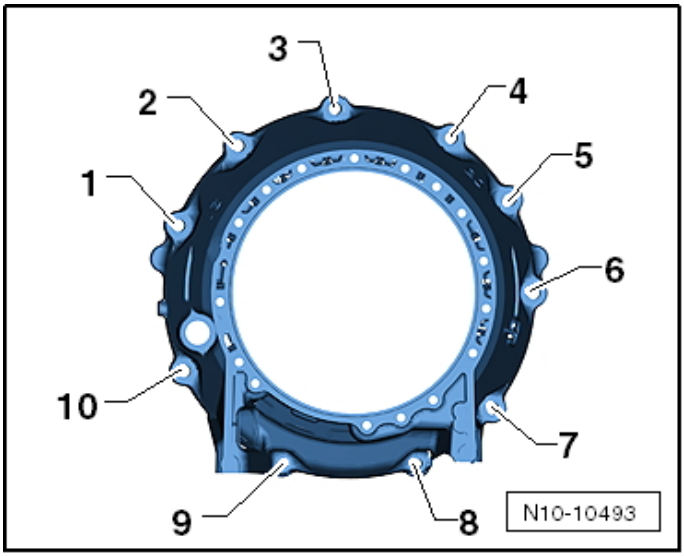
Electro-Drive Drive Motor to Engine Tightening Specifications



Item	Fastener	Nm
1, 2, 3	M12 x 70	65
4	M10 x 85 with nut	45
5, 6, 7, 8 [1)]	M10 x 60	20 plus an additional 90° (¼ turn)
9	M12 x 70	65
10	M12 x 60 internal multipoint bolt	65

[1)] Replace fastener(s).

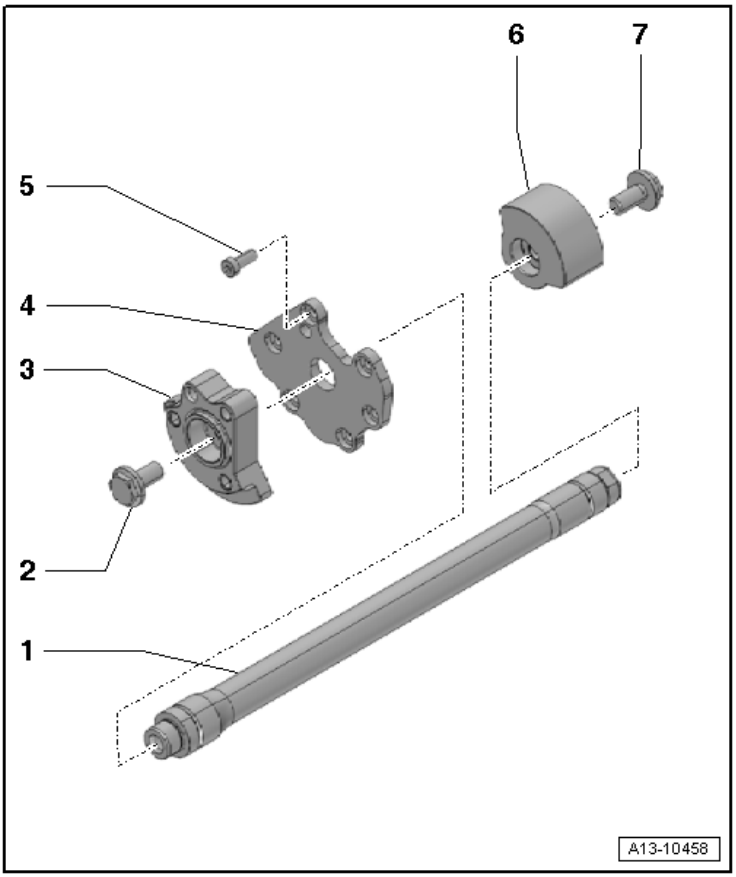
Transmission to Electro-Drive Drive Motor Tightening Specifications



Step	Fastener	Nm
1	Tighten new bolts 1 through 10 in sequence	30 plus an additional 90° (¼ turn)

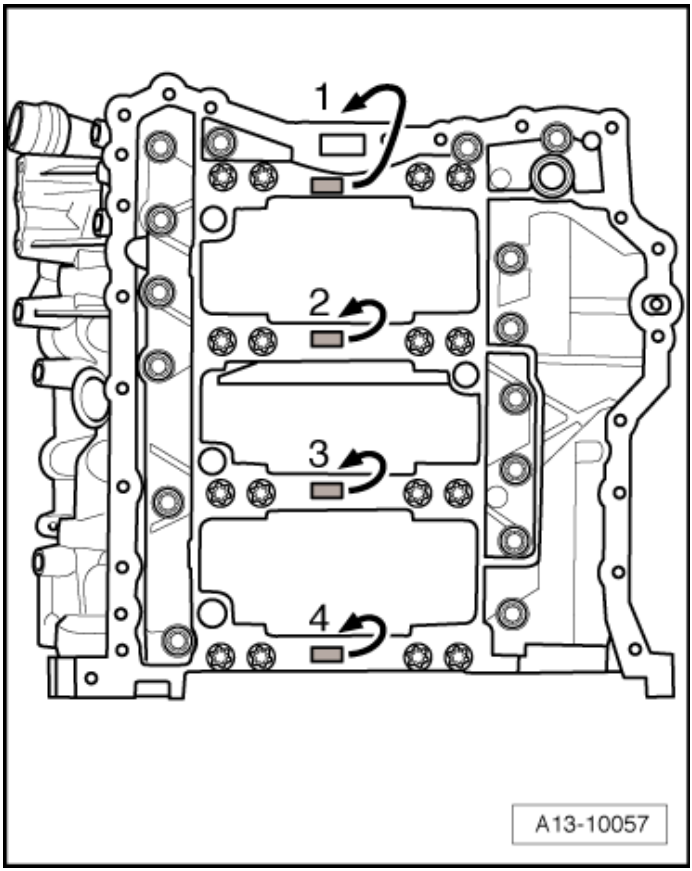
Crankshaft, Cylinder Block – 3.0L CGFA

Balance Shaft Overview



1 - Balance Shaft
2 - Bolt
☐ 60 Nm
3 - Balance Weight, Transmission Side
4 - Bearing End Bracket
5 - Bolt
☐ 13 Nm
6 - Balance Weight, Belt Pulley Side
7 - Bolt
☐ 60 Nm

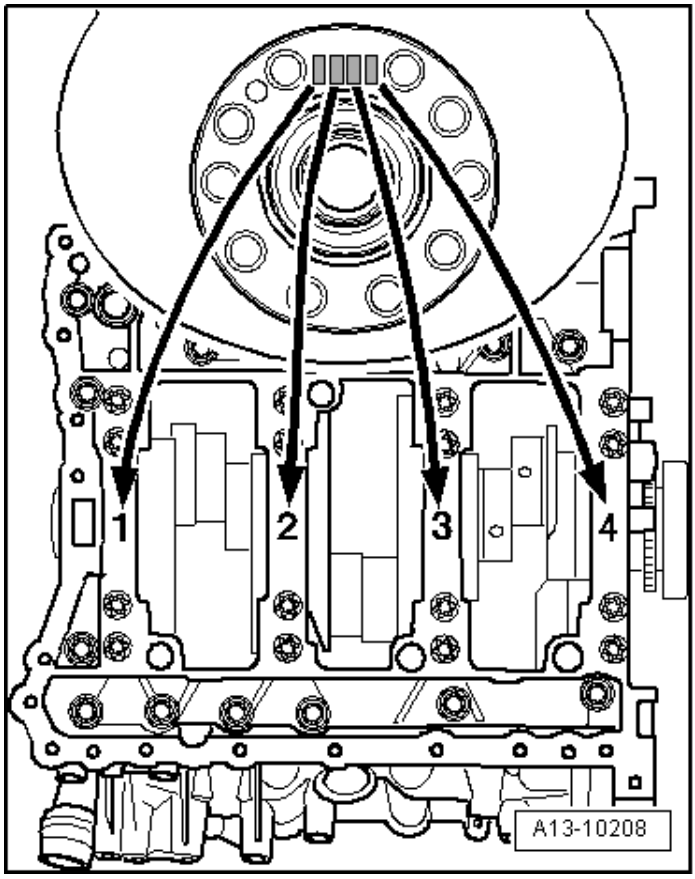
Allocation of Crankshaft Bearing Shells for Cylinder Block



Bearing shells with the correct thickness are allocated to the cylinder block in the factory. Colored dots on the sides of the bearing shells identify the bearing shell thickness. The allocation of the bearing shells to the cylinder block is marked by a letter on the respective bearing on the guide frame.

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

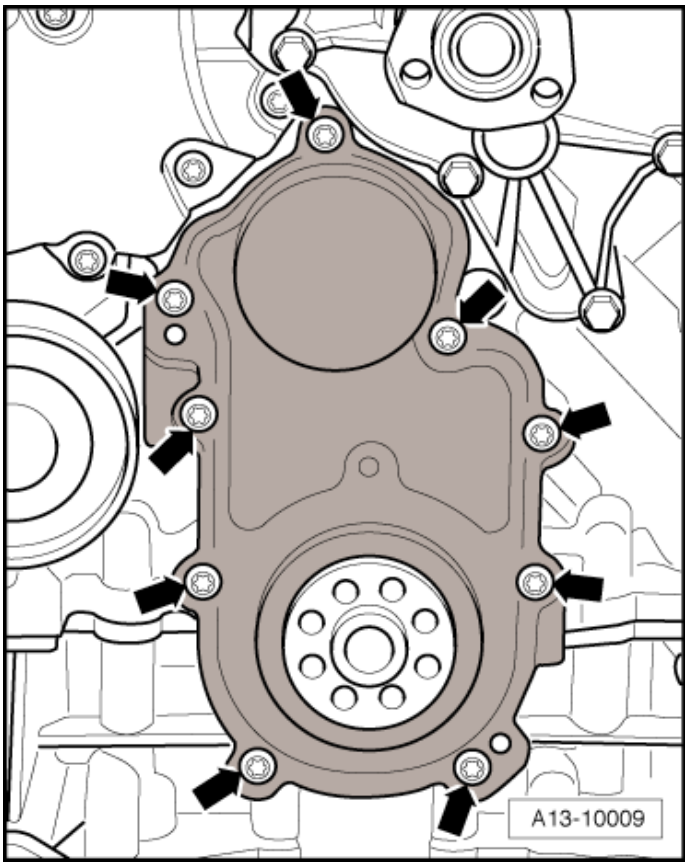
Allocation of Crankshaft Bearing Shells for Guide Frame



Bearing shells with the correct thickness are allocated to the guide frame at the factory. Colored dots on the sides of the bearing shells identify the bearing shell thickness. The allocation of the bearing shells to the guide frame is marked on the flywheel flange of the crankshaft by a row of letters. The first letter represents bearing 1, the second letter is for bearing 2, etc.

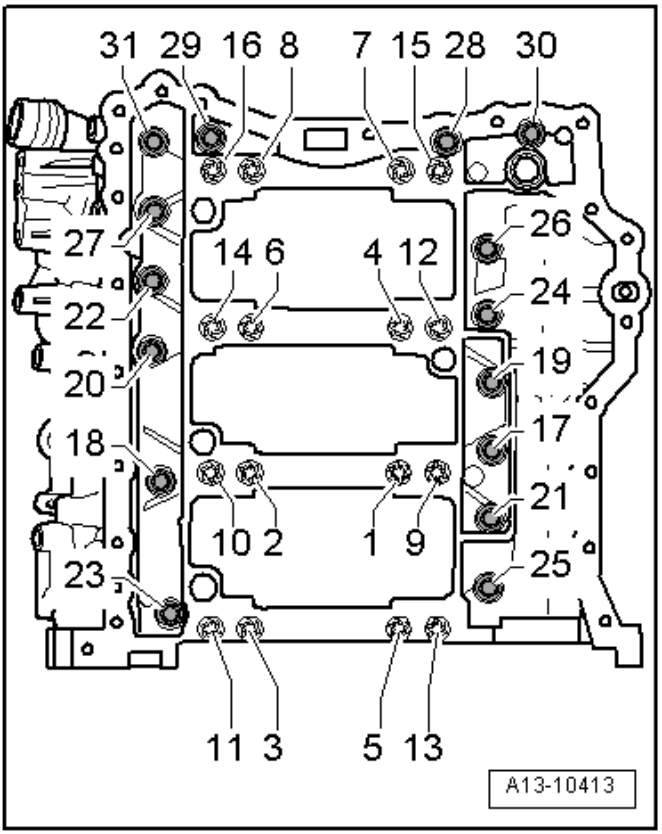
Letter on guide frame	Color of bearing
R	Red
G	Yellow
B	Blue
S	Black

Ribbed Belt Sealing Flange Tightening Specification



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

Guide Frame Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 16 in sequence [1)]	50
2	Tighten bolts 1 through 16 in sequence	an additional 90° (¼ turn)
3	Tighten bolts 17 through 31 in sequence (for guide frame sealing surfaces on cylinder block)	23

[1)] Replace fastener(s).

Crankshaft Dimensions

Honing dimension in mm	Crankshaft bearing pin diameter		Crankshaft connecting rod journal diameter	
Basic dimension	65.000	-0.022	56.000	-0.022
		-0.042		-0.042

Piston Ring End Gaps

Piston ring dimensions in mm	New	Wear limit
1st compression ring	0.20 to 0.30	0.80
2nd compression ring	0.50 to 0.70	0.80
Oil scraping ring	0.25 to 0.50	– 1)

1) Not determined yet.

Piston Ring Clearance

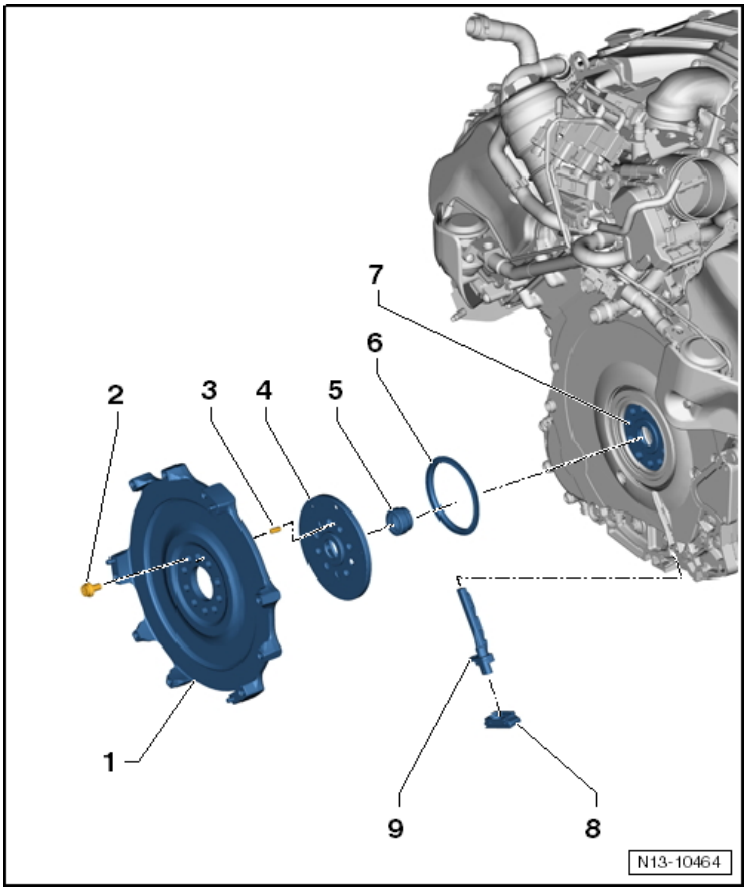
Piston ring dimensions in mm	New	Wear limit
1st compression ring	0.04 to 0.08	0.20
2nd compression ring	0.03 to 0.07	0.20
Oil scraping ring	0.02 to 0.06	0.15

Piston and Cylinder Dimensions

Honing dimension in mm	Piston diameter	Cylinder bore diameter
Basic dimension	84.49 1)	84.51

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

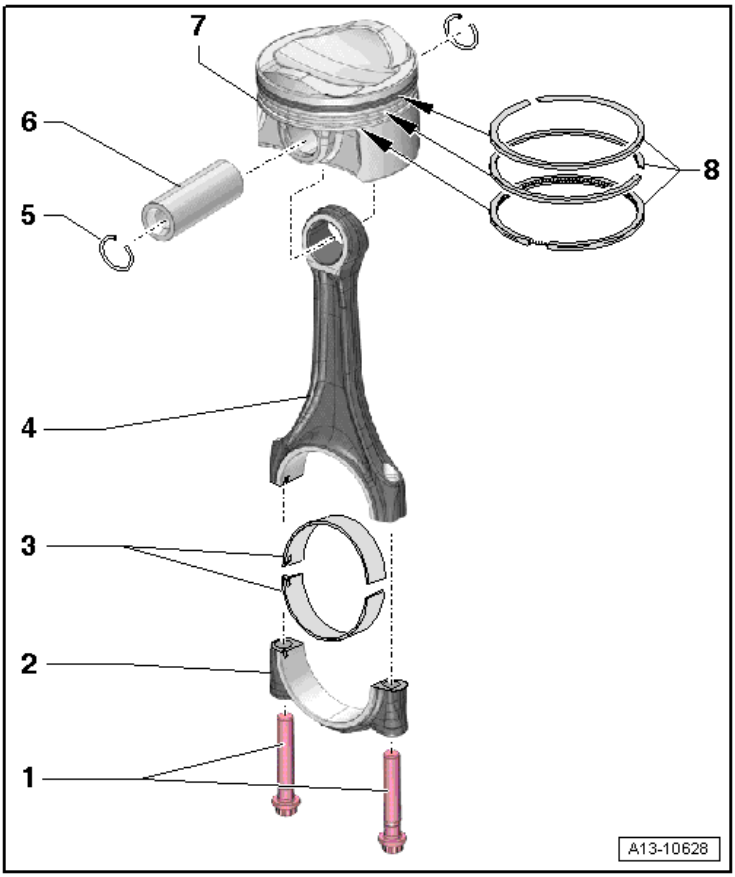
Drive Plate Overview



1 - Drive Plate
2 - Bolt
- ☐ 60 Nm + 90° turn
- ☐ Always replace

3 - Alignment Pin
4 - Sensor Wheel
5 - Needle Bearing
6 - Seal
7 - Crankshaft
8 - Rubber Plug
9 - Engine Speed Sensor -G28-

Pistons and Connecting Rod Overview

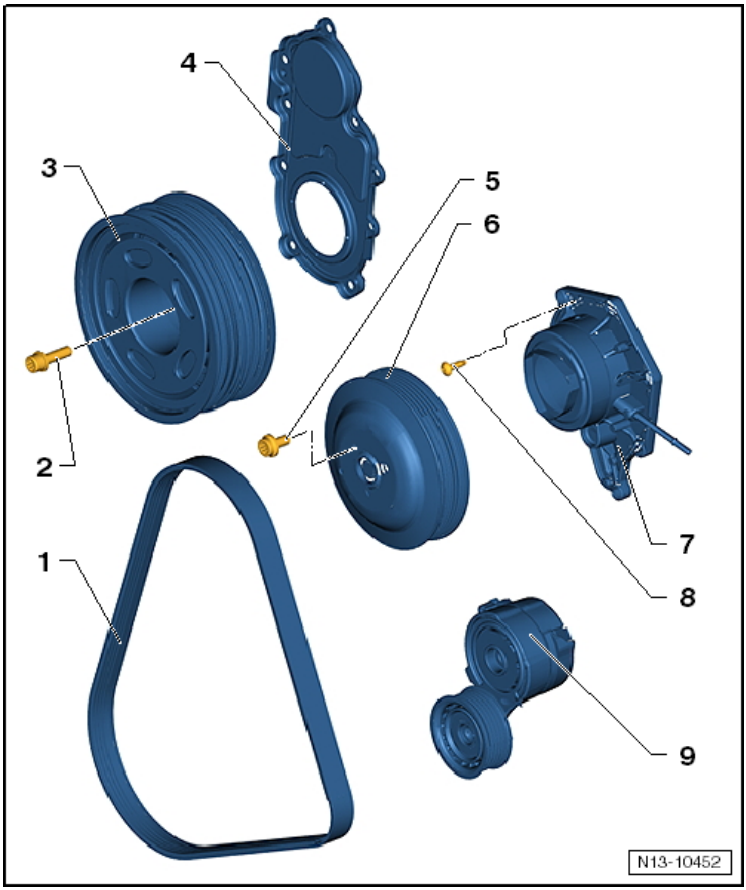


1 - Bolt
- ☐ 50 Nm + 90° turn
- ☐ Always replace
- ☐ Lubricate the threads and contact surface

2 - Connecting Rod Bearing Cap
3 - Bearing Shells
4 - Connecting Rod
5 - Circlip
- ☐ Always replace

6 - Piston Pin
7 - Piston
8 - Piston Rings

Ribbed Belt Drive Overview



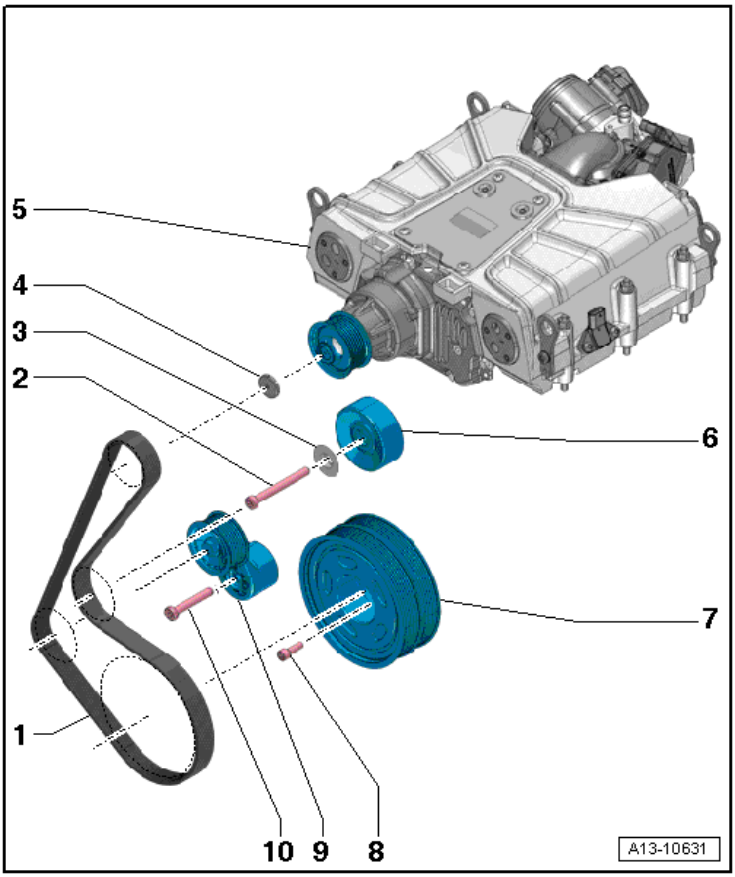
1 - Ribbed Belt
2 - Bolt
- ☐ 20 Nm + 90° turn
- ☐ Always replace

3 - Vibration Damper
4 - Sealing Flange, Belt Pulley Side
5 - Bolt
- ☐ 13 Nm

6 - Coolant Pump Pulley
7 - Coolant Pump
8 - Bolt
- ☐ 9 Nm

9 - Ribbed Belt Tensioner
- ☐ 40 Nm

Supercharger Ribbed Belt Overview



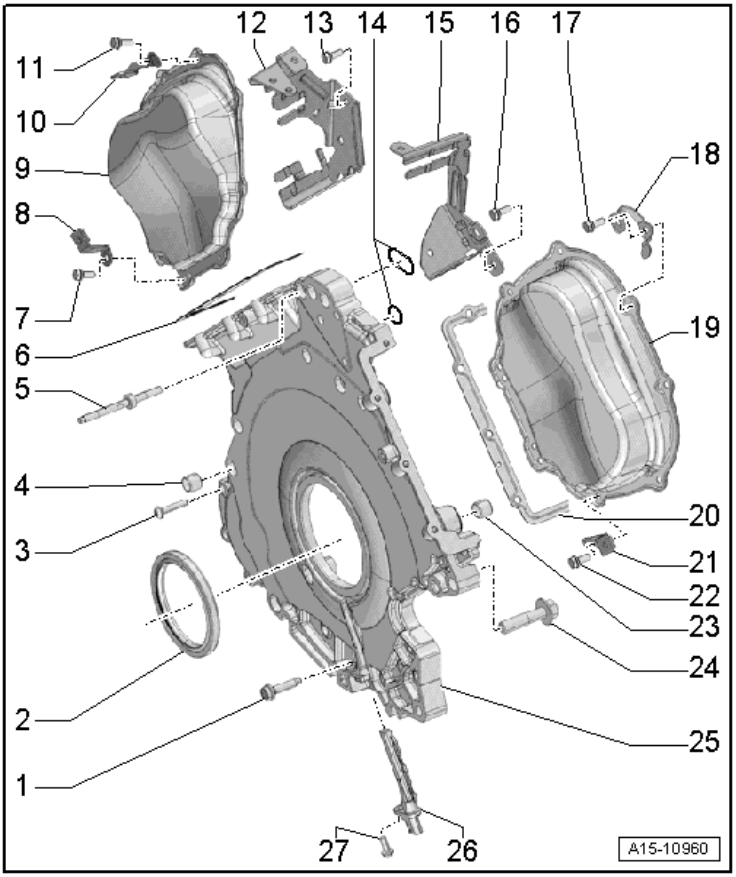
1 - Ribbed Belt
2 - Bolt
- ☐ 42 Nm

3 - Washer
4 - Cover
5 - Supercharger
6 - Idler Pulley
7 - Vibration Damper
8 - Bolt
- ☐ 20 Nm + 90° turn
- ☐ Always replace

9 - Ribbed Belt Tensioner
10 - Bolt
- ☐ 40 Nm

Cylinder Head, Valvetrain – 3.0L CGFA

Timing Chain Covers Overview



1 - Bolt

- ☐ Tightening specification and sequence, see Lower Timing Chain Cover Bolt Tightening Sequence and Specification below

2 - Seal

3 - Bolt

- ☐ Tightening specification and sequence, see Lower Timing Chain Cover Bolt Tightening Sequence and Specification below

4 - Alignment Sleeve

5 - Stud Bolt

- ☐ 16 Nm

6 - Left Cylinder Head Gasket

7 - Bolt

- ☐ Always replace
- ☐ Tightening specification and sequence, see Left Timing Chain Cover Bolt Tightening Sequence and Specification below

8 - Bracket
9 - Left Timing Chain Cover
10 - Bracket
11 - Bolt
- ☐ Always replace
- ☐ Tightening specification and sequence, see Left Timing Chain Cover Bolt Tightening Sequence and Specification below

12 - Bracket
13 - Bolt
- ☐ 10 Nm

14 - Seal
- ☐ Replace

15 - Bracket
16 - Bolt
- ☐ 10 Nm

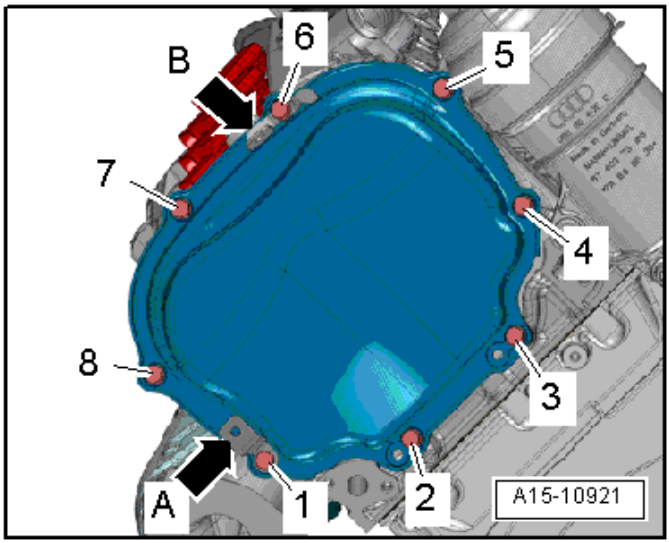
17 - Bolt
- ☐ Always replace
- ☐ Tightening specification and sequence, see Right Timing Chain Cover Bolt Tightening Sequence and Specification below

18 - Bracket
19 - Right Timing Chain Cover
20 - Right Cylinder Head Gasket
21 - Bracket
22 - Bolt
- ☐ Always replace
- ☐ Tightening specification and sequence, see Right Timing Chain Cover Bolt Tightening Sequence and Specification below

23 - Alignment Sleeve
24 - Bolt
- ☐ Tightening specification and sequence, see Lower Timing Chain Cover Bolt Tightening Sequence and Specification below

25 - Lower Timing Chain Cover
26 - Engine Speed Sensor -G28-
27 - Bolt
- ☐ 10 Nm

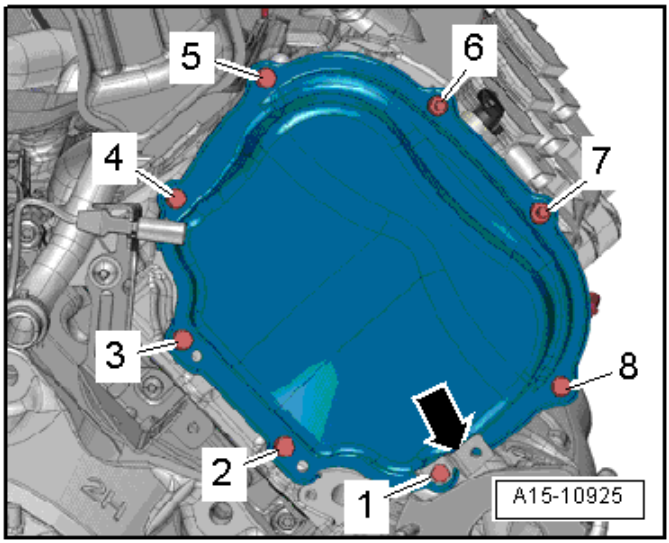
Left Timing Chain Cover Tightening Specifications



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

The brackets (A and B) are connected with the left timing chain cover.

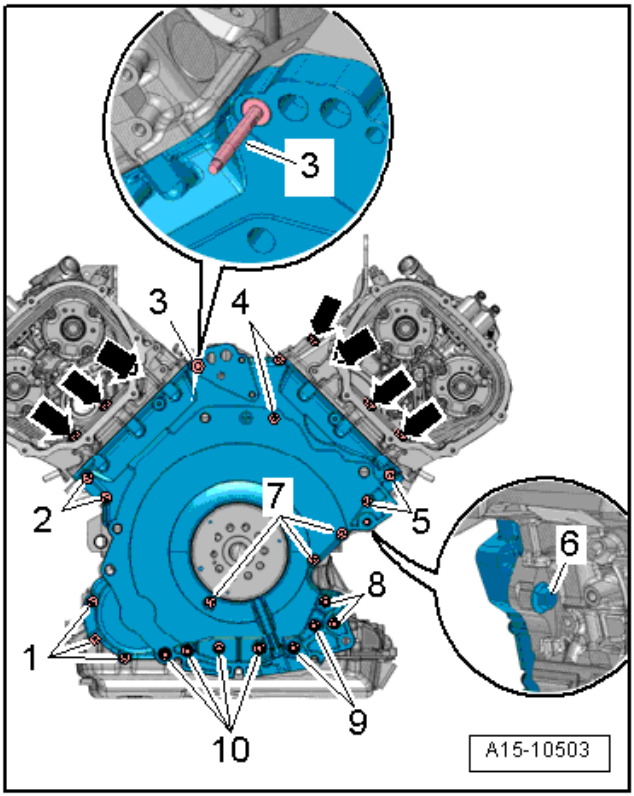
Right Timing Chain Cover Tightening Specifications



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

The bracket (➡) is connected with the right timing chain cover.

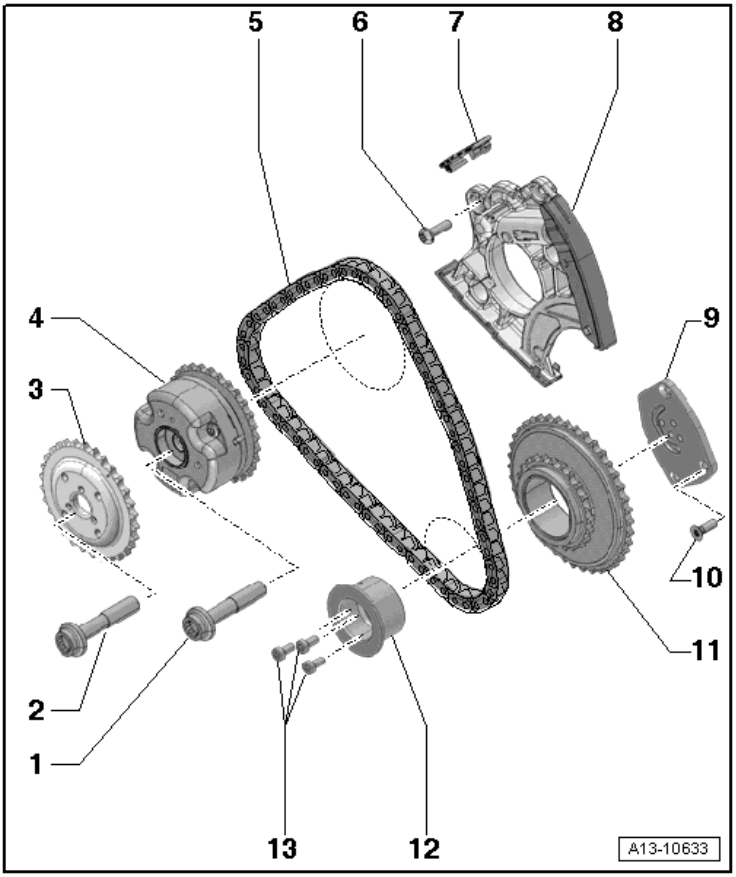
Lower Timing Chain Cover Tightening Specifications



Replace all fasteners except 3.

Step	Component	Nm
1	Tighten the bolts (➡)	3
2	Tighten bolts 1 through 10 in a diagonal sequence	3
3	Tighten bolts 1, 2, 4, 5, 7, and ➡	an additional 90° (¼ turn)
4	Tighten bolts 8, 9 and 10	8
5	Tighten bolts 8, 9 and 10	an additional 90° (¼ turn)
6	Tighten bolt 3	16
7	Tighten bolt 6	20
8	Tighten bolt 6	an additional 90° (¼ turn)

Camshaft Timing Chain Overview
Left Side



1 - Bolt
- ☐ 80 Nm + 90° turn
- ☐ Always replace

2 - Bolt
- ☐ 80 Nm + 90° turn
- ☐ Always replace

3 - Camshaft Sprocket
4 - Camshaft Adjuster
5 - Left Camshaft Timing Chain
6 - Bolt
- ☐ 9 Nm

7 - Lining
8 - Chain Tensioner
9 - Plate

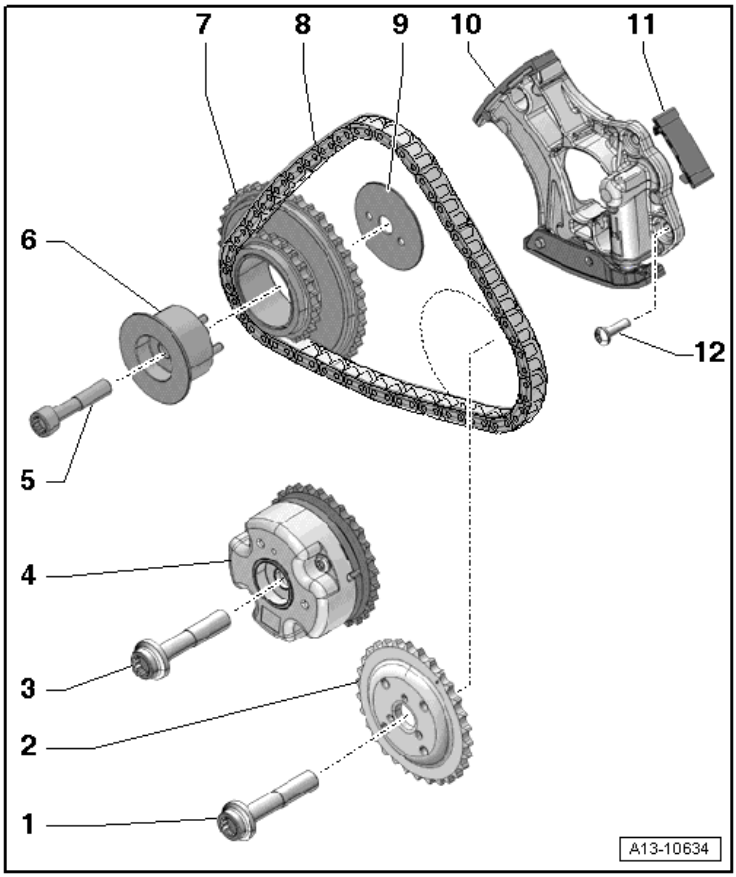
10 - Bolt
- ☐ 8 Nm + 45° turn
- ☐ Always replace

11 - Drive Sprocket

12 - Pin

13 - Bolt
- ☐ 5 Nm + 60° turn
- ☐ Always replace

Right Side



1 - Bolt
- ☐ 80 Nm + 90° turn
- ☐ Always replace

2 - Camshaft Sprocket

3 - Bolt
- ☐ 80 Nm + 90° turn
- ☐ Always replace

4 - Camshaft Adjuster

5 - Bolt
- ☐ 30 Nm + 90° turn
- ☐ Always replace

6 - Pin

7 - Drive Sprocket

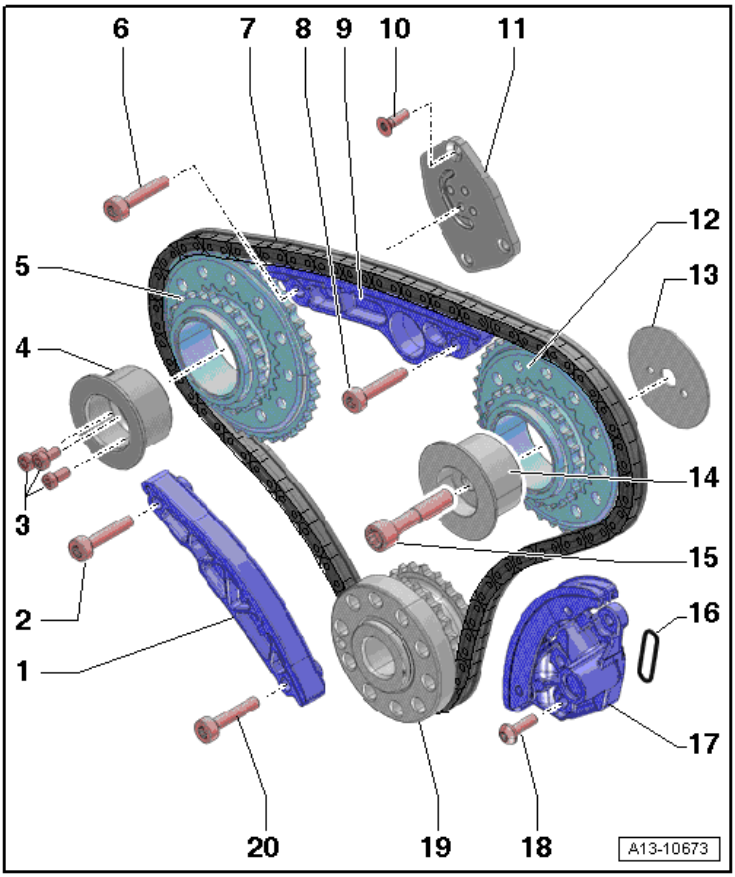
8 - Right Camshaft Timing Chain

9 - Axial (Thrust) Washer

10 - Chain Tensioner

11 - Lining
12 - Bolt
☐ 9 Nm

Timing Mechanism Drive Chain Overview



1 - Ribbed Belt
2 - Bolt
- ☐ 10 Nm + 90° turn
- ☐ Always replace

3 - Bolt
- ☐ 5 Nm + 60° turn
- ☐ Always replace

4 - Pin
5 - Drive Sprocket
6 - Bolt
- ☐ 10 Nm + 90° turn
- ☐ Always replace

7 - Drive Chain
8 - Bolt
- ☐ 10 Nm + 90° turn
- ☐ Always replace

9 - Guide Rail

10 - Bolt
- ☐ 8 Nm + 45° turn
- ☐ Always replace

11 - Plate

12 - Drive Sprocket

13 - Axial (Thrust) Washer

14 - Pin

15 - Bolt
- ☐ 30 Nm + 90° turn
- ☐ Always replace

16 - Gasket
- ☐ Always replace

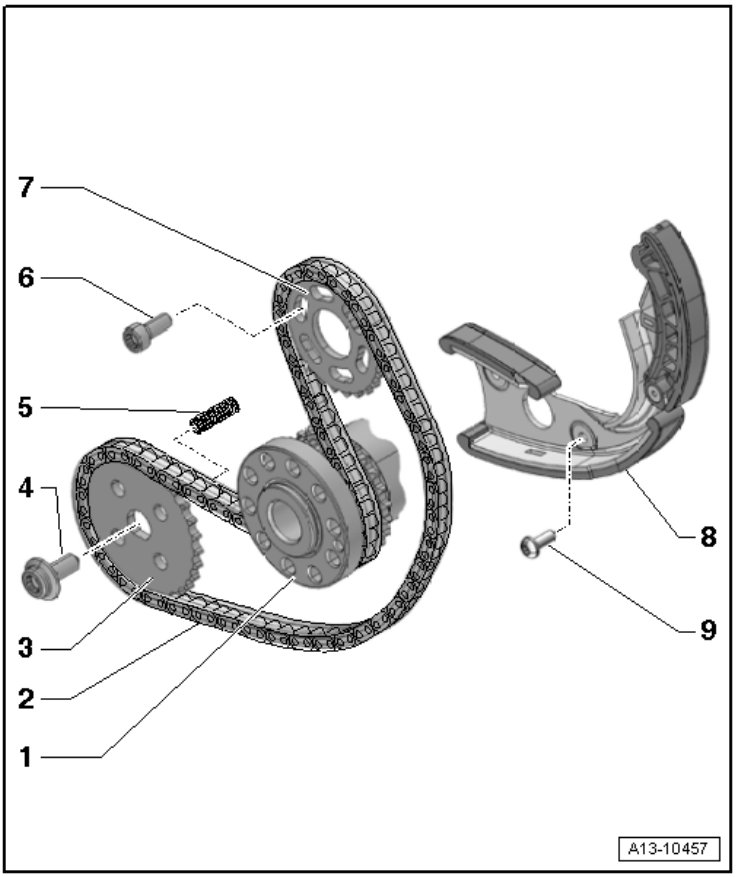
17 - Chain Tensioner

18 - Bolt
- ☐ 9 Nm

19 - Crankshaft

20 - Bolt
- ☐ 10 Nm + 90° turn
- ☐ Always replace

Oil Pump and Balance Shaft Drive Chain Overview

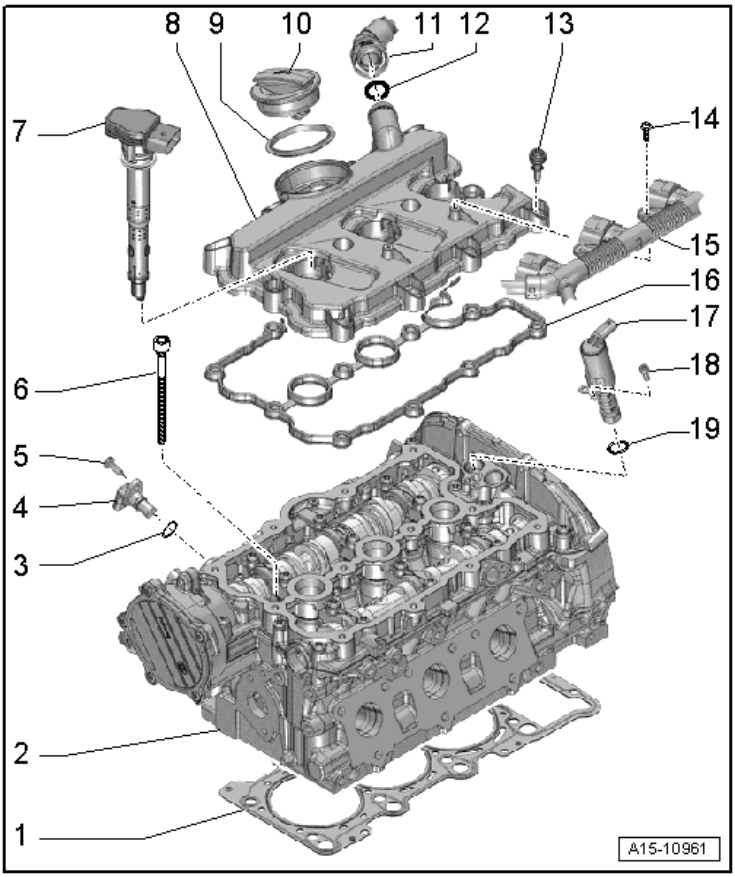


1 - Crankshaft
2 - Drive Chain
3 - Drive Sprocket
4 - Bolt
- ☐ 30 Nm + 90° turn
- ☐ Always replace

5 - Pressure Spring
6 - Bolt
- ☐ 15 Nm + 90° turn
- ☐ Always replace

7 - Balance Shaft Sprocket
8 - Chain Tensioner
9 - Bolt
- ☐ 10 Nm + 90° turn
- ☐ Always replace

Cylinder Head and Cover Overview



1 - Cylinder Head Gasket
2 - Cylinder Head
3 - O-ring
- ☐ Always replace

4 - Camshaft Position Sensor
5 - Bolt
- ☐ Tightening specification, refer to Ignition/Glow Plug System; Ignition Component Overview

6 - Bolt
- ☐ Always replace
- ☐ Tightening specification and sequence, see Cylinder Head Bolt Tightening Sequence and Specification below

7 - Ignition Coil
8 - Cylinder Head Cover
9 - Gasket
10 - Cap
11 - Crankcase Ventilation Pipe

12 - O-ring
- ☐ Always replace

13 - Bolt
- ☐ Tightening specifications and sequence, refer to one of the following:
- ☐ Left Cylinder Head Cover Bolt Tightening Sequence and Specification below
- ☐ Right Cylinder Head Cover Bolt Tightening Sequence and Specification below

14 - Bolt
- ☐ 5 Nm

15 - Connector Strip

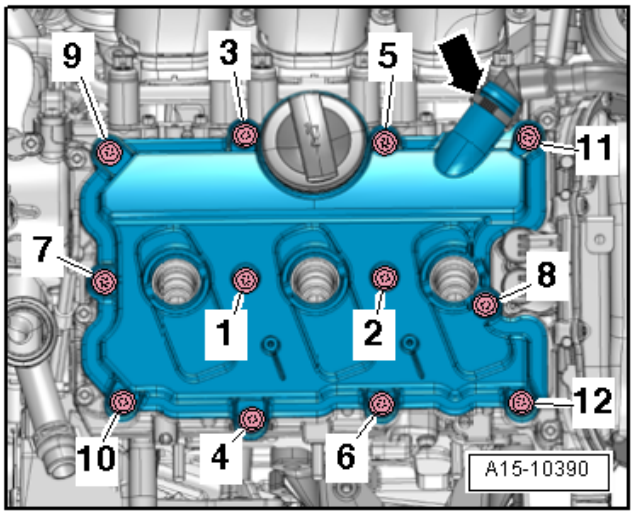
16 - Gasket

17 - Camshaft Adjustment Valve

18 - Bolt
- ☐ 5 Nm

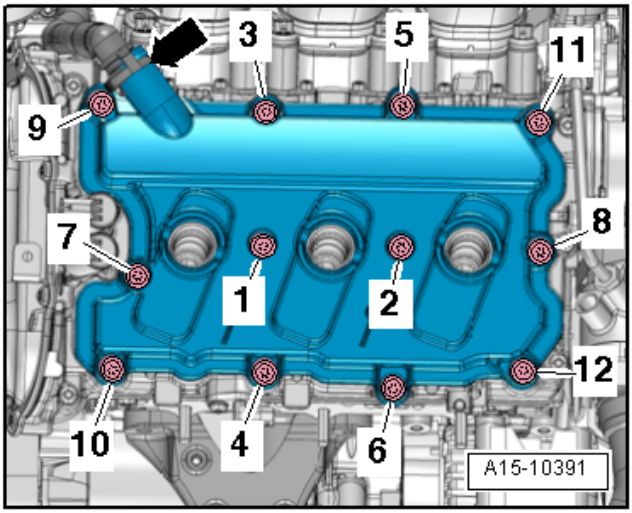
19 - O-ring
- ☐ Always replace

Left Cylinder Head Cover Tightening Specification



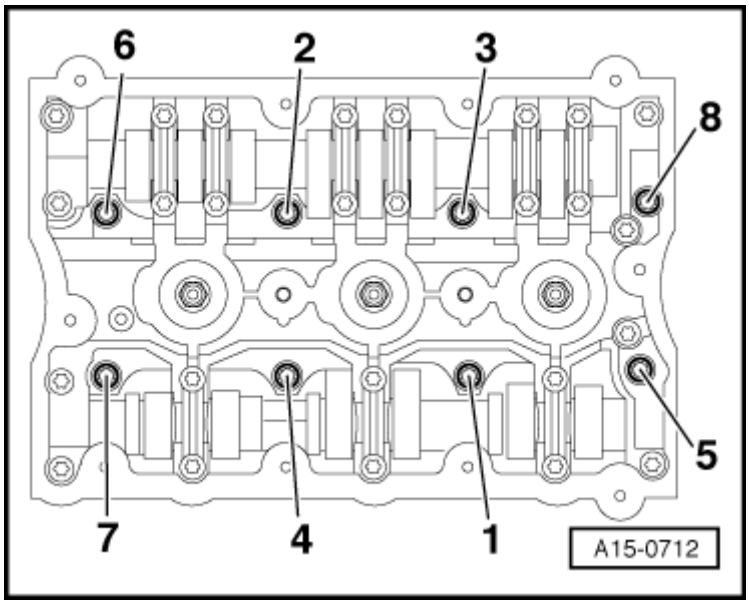
Step	Component	Nm
1	Tighten bolts 1 through 12 in sequence	9

Right Cylinder Head Cover Tightening Specification



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

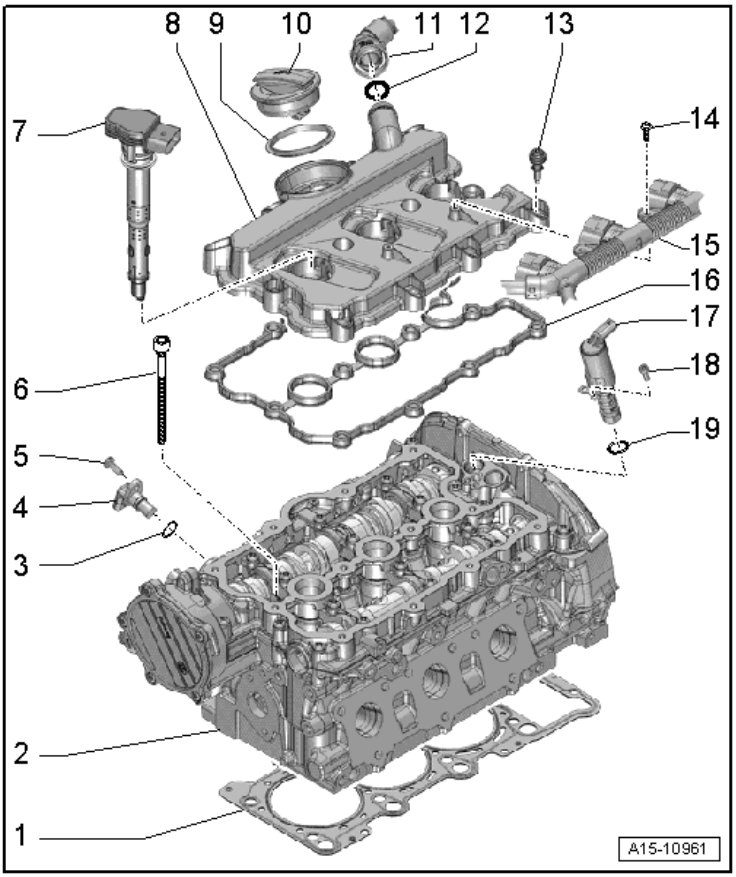
Cylinder Head Tightening Specifications



NOTE: The left cylinder head is shown. The right cylinder head is identical.

Step	Component	Nm
1	Tighten bolts 1 through 8 in sequence (replace bolt)	Hand-tighten
2	Tighten bolts 1 through 8 in sequence	40
3	Tighten bolts 1 through 8 in sequence	an additional 90° (¼ turn)
4	Tighten bolts 1 through 8 in sequence	an additional 90° (¼ turn)

Valvetrain Overview

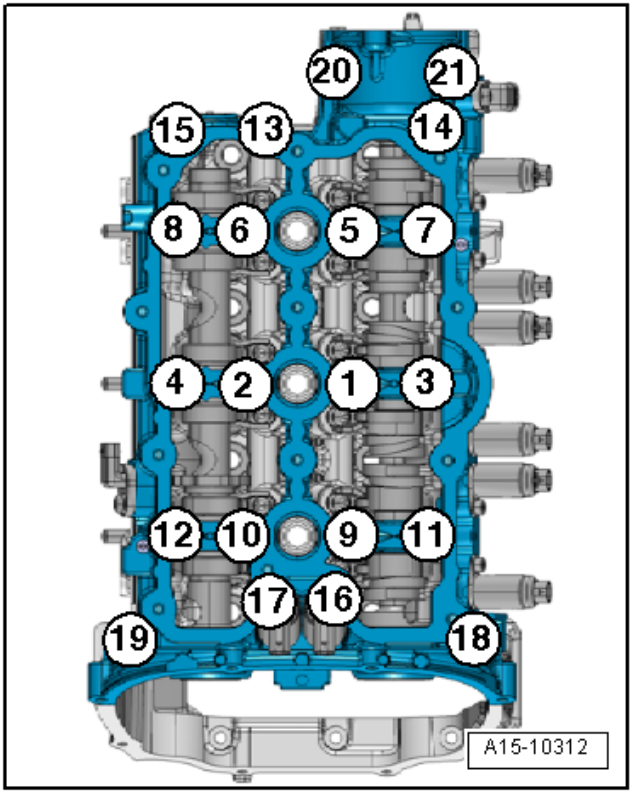


1 - Plug
2 - Cylinder Head
3 - Valve Stem Seal
4 - Valve Spring
5 - Hydraulic Lash Adjuster
6 - Spring Seat
7 - Valve Retainers
8 - Roller Rocker Arm
9 - Clip
10 - Intake Camshaft
11 - Bolt
- ☐ Always replace
- ☐ Tightening specification and sequence, see Guide Frame Bolt Tightening Sequence and Specification below

12 - Guide Frame
13 - Seal
14 - Seal

15 - Exhaust Camshaft
16 - Screen
17 - Intake Valve
18 - Exhaust Valve

Camshaft Guide Frame Tightening Specifications

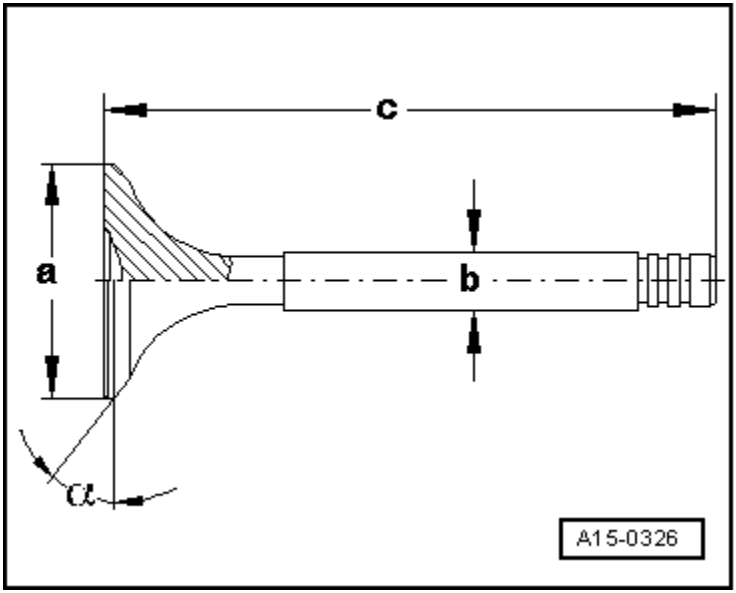


NOTE: The left cylinder head camshaft guide frame is shown.
The right cylinder head camshaft guide frame is identical.

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

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

Valve Dimensions



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

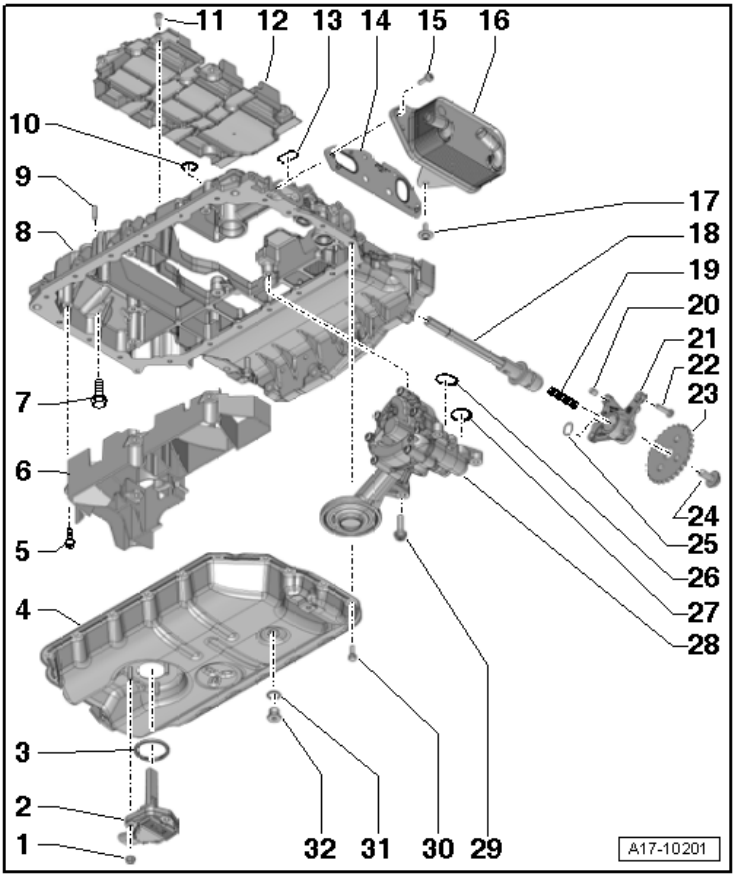
NOTE: Intake and exhaust valves must not be refaced by grinding. Only lapping is permitted.

Compression Checking Specifications

Compression pressure	Bar pressure
New	11.0 to 14.0
Wear limit	10.0
Maximum difference between cylinders	3.0

Engine Lubrication – 3.0L CGFA

Oil Pan, Oil Pump and Oil Cooler Overview



1 - Nut
- ☐ 9 Nm

2 - Oil Level Thermal Sensor -G266-

3 - Seal
- ☐ Always replace

4 - Lower Oil Pan

5 - Bolt
- ☐ 3 Nm + 90° turn
- ☐ Always replace

6 - Lower Oil Baffle

7 - Bolt
- ☐ Always replace
- ☐ Tightening specification and sequence, see Upper Oil Pan Bolt Tightening Sequence and Specification below

8 - Upper Oil Pan

9 - Alignment Bushing
10 - O-ring
- ☐ Always replace

11 - Bolt
- ☐ 9 Nm
- ☐ Install using locking fluid. For the correct locking fluid, refer to the Parts Catalog.

12 - Upper Oil Baffle
13 - Gasket
- ☐ Always replace

14 - Gasket
- ☐ Always replace

15 - Bolt
- ☐ 3 Nm + 90° turn
- ☐ Always replace

16 - Engine Oil Cooler
17 - Bolt
- ☐ 9 Nm

18 - Oil Pump Driveshaft
19 - Pressure Spring
20 - Sleeve
21 - Bracket
22 - Bolt
- ☐ 9 Nm

23 - Oil Pump Sprocket
24 - Bolt
- ☐ 30 Nm + 90° turn
- ☐ Always replace

25 - O-ring
- ☐ Always replace

26 - Gasket
- ☐ Always replace

27 - O-ring
- ☐ Always replace

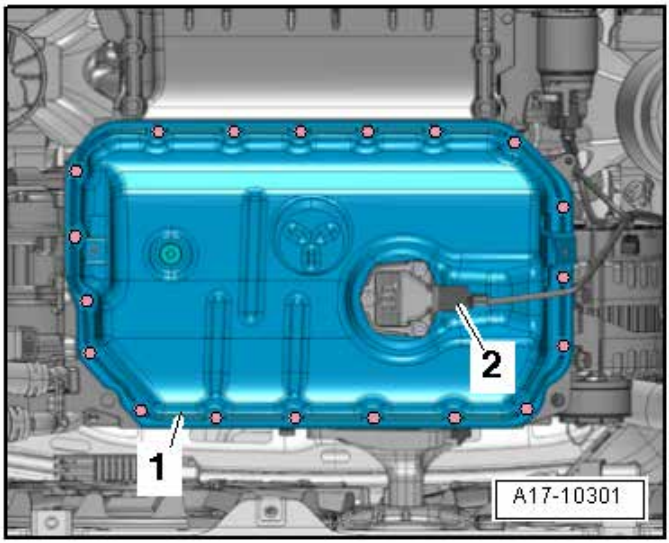
28 - Oil Pump
29 - Bolt
- ☐ 20 Nm

30 - Bolt
- ☐ Always replace
- ☐ Tightening specification and sequence, see Lower Oil Pan Bolt Tightening Sequence and Specification below

31 - Seal
- ☐ Always replace

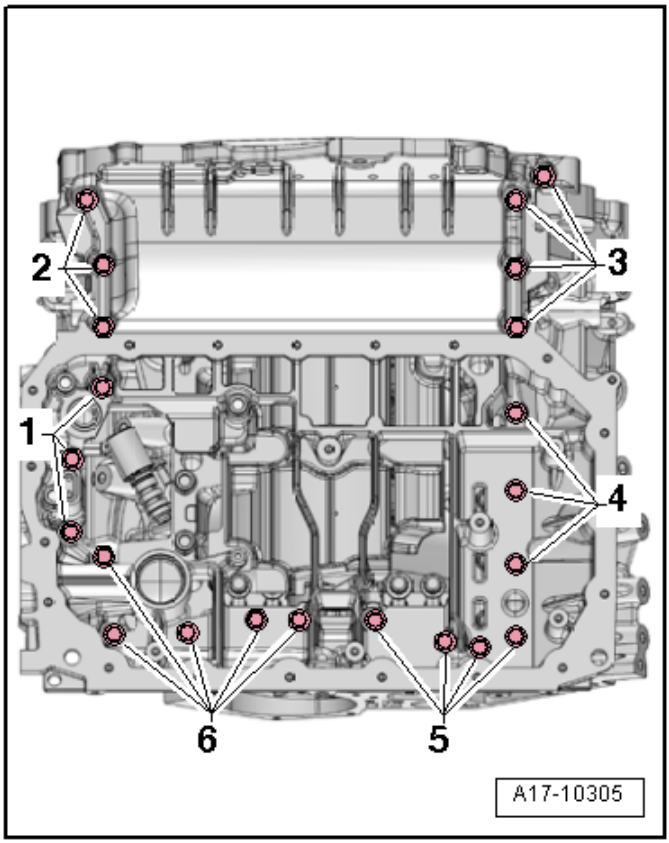
32 - Oil Drain Plug
- ☐ 30 Nm

Oil Pan Tightening Specifications



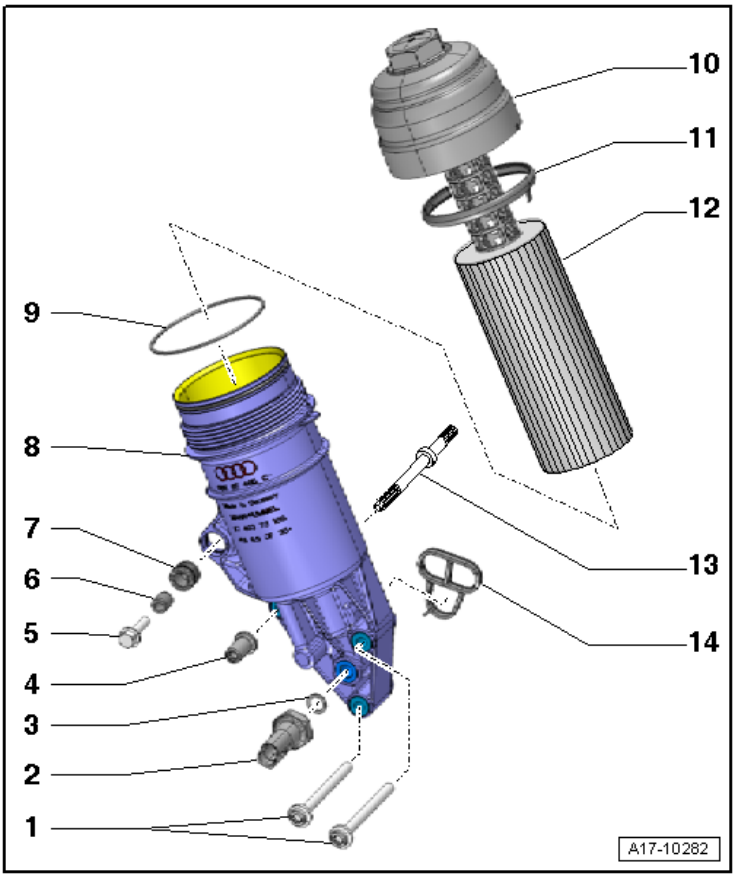
Step	Component	Nm
1	Tighten bolts in a diagonal sequence	5
2	Tighten bolts in a diagonal sequence	an additional 90° (¼ turn)

Upper Oil Pan Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 6 in a diagonal sequence	8
2	Tighten bolts 1 through 6 in a diagonal sequence	an additional 90° (¼ turn)

Oil Filter Housing/Oil Pressure Switch Overview



1 - Bolt
- ☐ 13 Nm

2 - Oil Pressure Switch -F22-
- ☐ 20 Nm

3 - Seal
- ☐ Always replace

4 - Nut
- ☐ 13 Nm

5 - Bolt
- ☐ 9 Nm

6 - Sleeve

7 - Rubber Grommet

8 - Oil Filter Housing

9 - O-ring
- ☐ Always replace

10 - Cap
- ☐ 25 Nm

11 - Seal

- ☐ Always replace

12 - Oil Filter Element

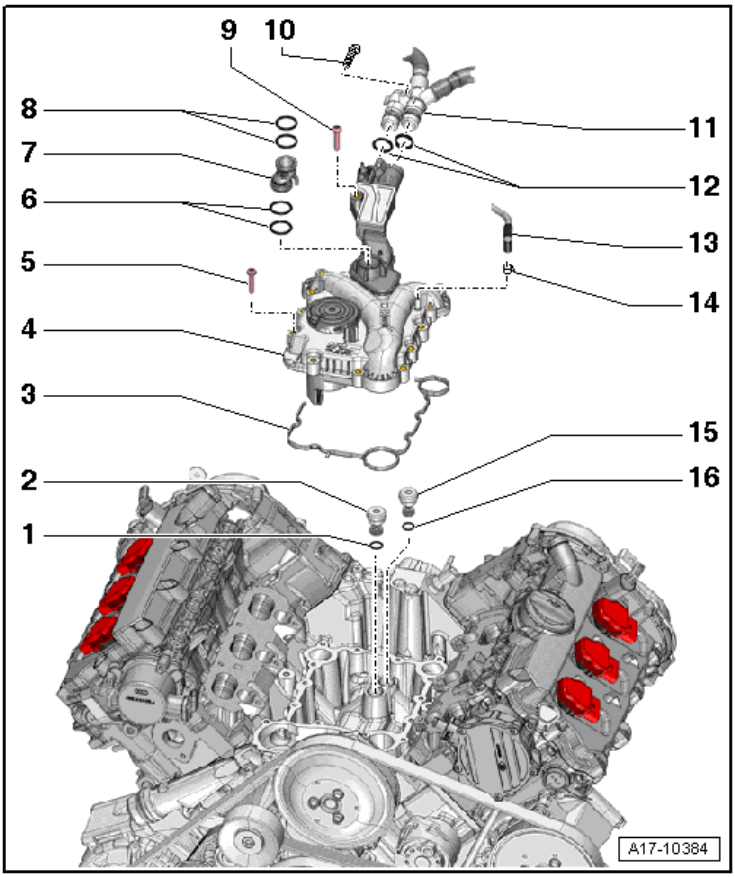
13 - Stud Bolt

- ☐ 16 Nm

14 - Gasket

- ☐ Always replace

Crankcase Ventilation Overview



1 - O-ring
- ☐ Always replace

2 - Oil Check Valve
- ☐ 20 Nm

3 - Gasket
- ☐ Always replace

4 - Cover with Oil Separator

5 - Bolt
- ☐ 9 Nm

6 - O-ring
- ☐ Always replace

7 - Connecting Piece

8 - O-ring
- ☐ Always replace

9 - Bolt
- ☐ 9 Nm

10 - Bolt
- ☐ 3 Nm

11 - Crankcase Ventilation Pipes

12 - O-ring
- ☐ Always replace

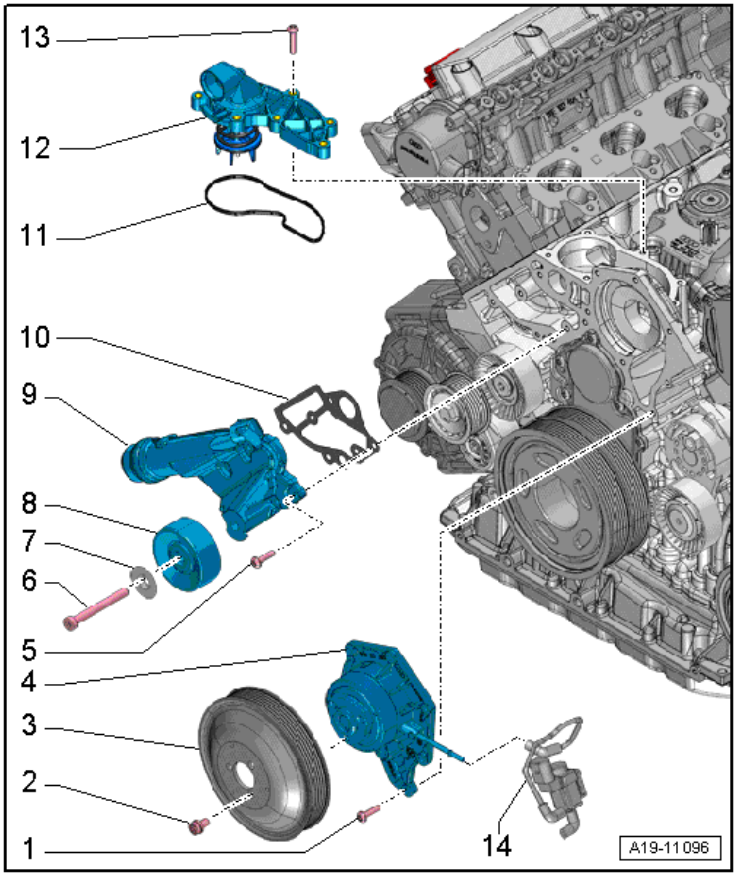
13 - Hose for Crankcase Ventilation

14 - Hose Clamp

15 - Oil Check Valve
- ☐ 20 Nm

16 - O-ring
- ☐ Always replace

Coolant Pump, Thermostat and Connecting Piece Overview



1 - Bolt
- ☐ 9 Nm

2 - Bolt
- ☐ 20 Nm

3 - Coolant Thermostat with Housing

4 - Engine Coolant Temperature Sensor -G62-

5 - Bolt
- ☐ 9 Nm

6 - Bolt
- ☐ 42 Nm

7 - Washer

8 - Idler Pulley

9 - Connecting Piece

10 - Gasket

- ☐ Always replace

11 - Gasket

- ☐ Always replace

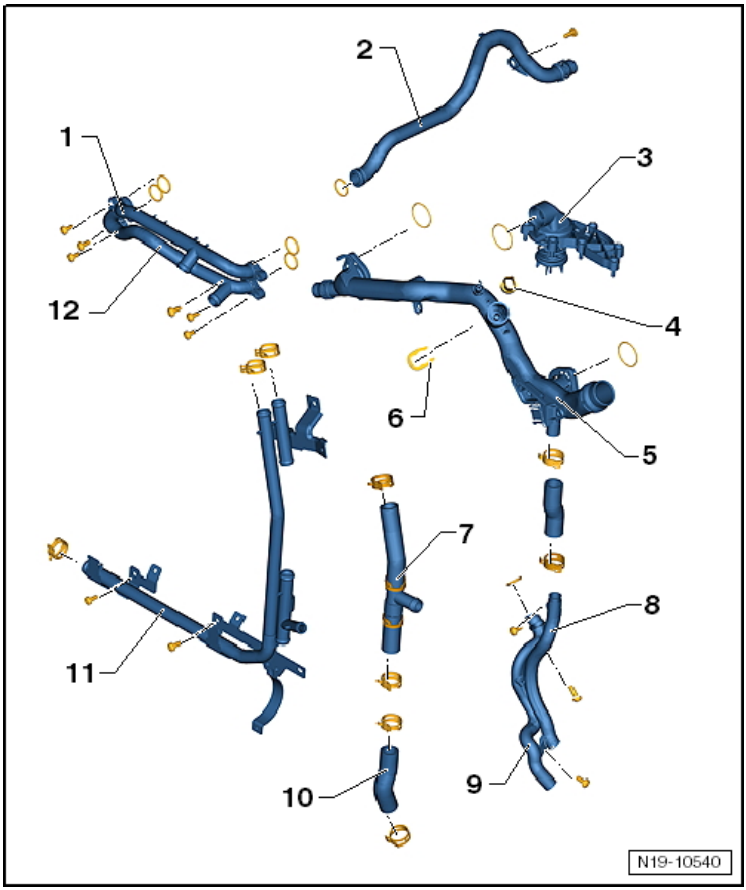
12 - Connecting Piece/Coolant Thermostat

13 - Bolt

- ☐ 9 Nm

14 - Coolant Regulation Valve -N515-

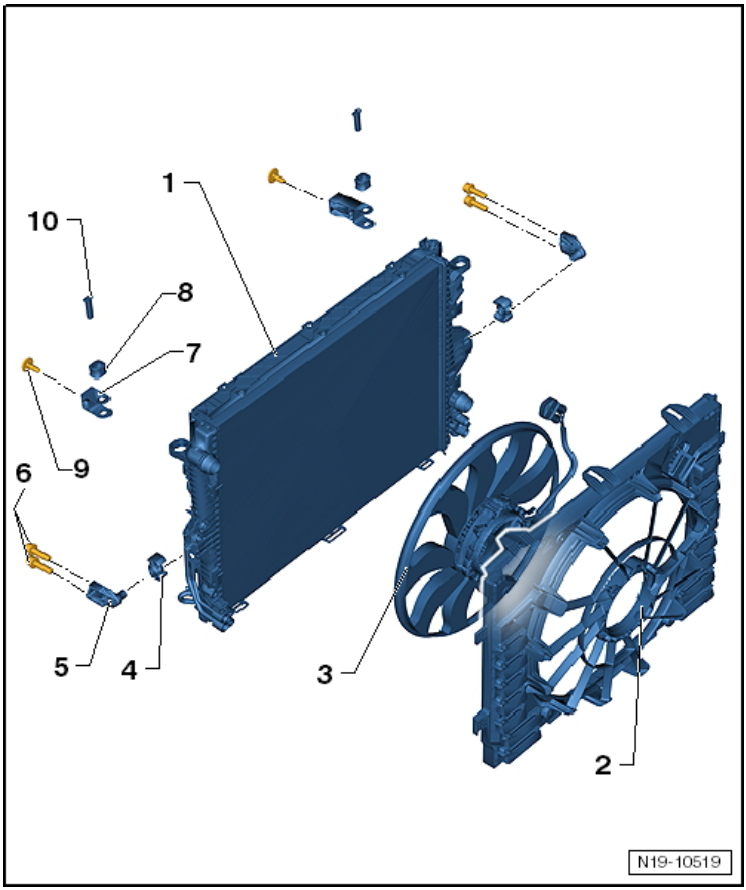
Coolant Pipes Overview



Replace the O-rings and seals. Make sure the couplings are tight.
Tightening specifications:
M6 bolts: 10 Nm
M8 bolts: 20 Nm

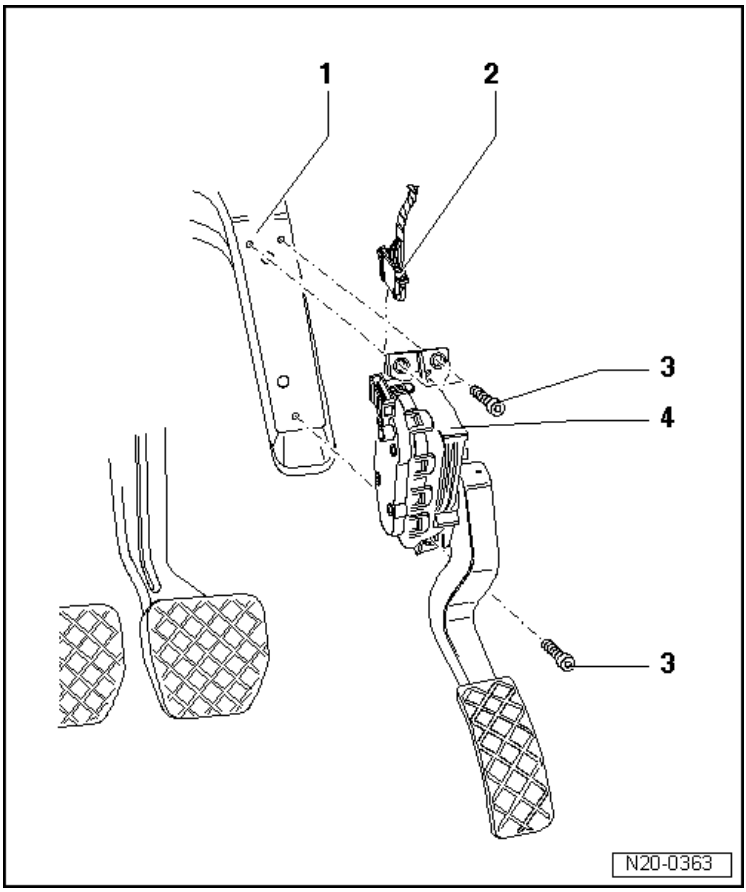
1 - Charge Air Cooler Coolant Pipe
2 - Upper Coolant Pipe
3 - Coolant Thermostat with Housing
4 - Engine Coolant Temperature Sensor -G62-
5 - Front Coolant Pipe
6 - Retaining Clip
7 - T-Connection
8 - Engine Oil Cooler Return Pipe
9 - Engine Oil Cooler Supply Pipe
10 - Hose
11 - Front Coolant Pipes
12 - Charge Air Cooler Coolant Pipe

Radiator/Coolant Fan Overview



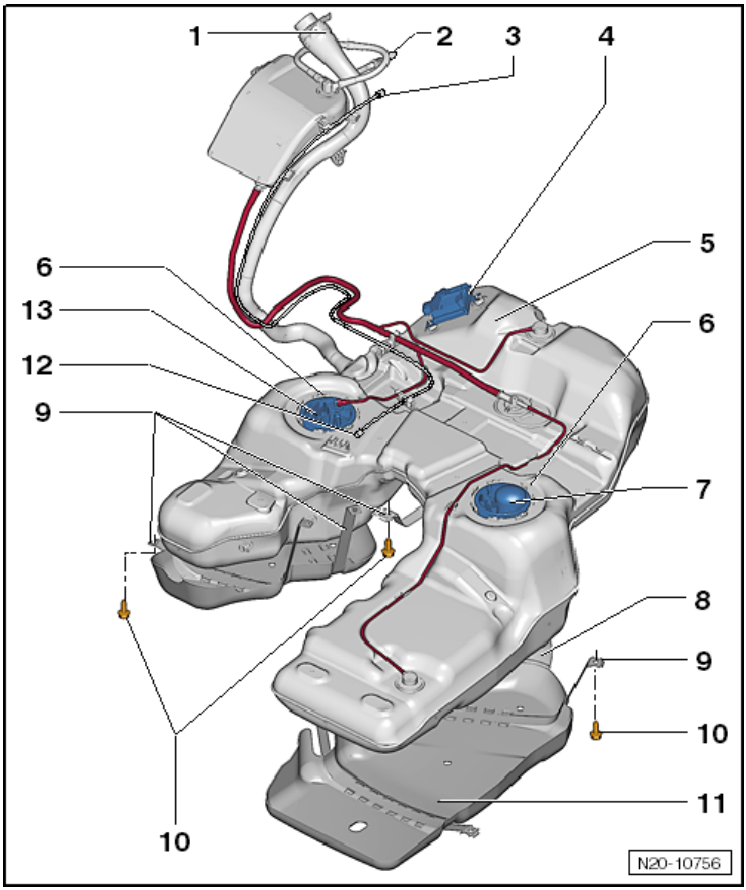
1 - Radiator
2 - Fan Shroud
3 - Coolant Fan -V7-
4 - Rubber Bushing
5 - Lower Radiator Mount
6 - Bolts
☐ 25 Nm
7 - Upper Radiator Mount
8 - Rubber Bushing
9 - Bolt
☐ 5 Nm
10 - Locking Bolt

Accelerator Pedal Overview



1 - Bracket
2 - Connector
3 - Bolt
☐ 5 Nm
4 - Accelerator Pedal Position Sensor -G79- with Accelerator Pedal Position Sensor 2 -G185-

Fuel Tank and Attachments Overview



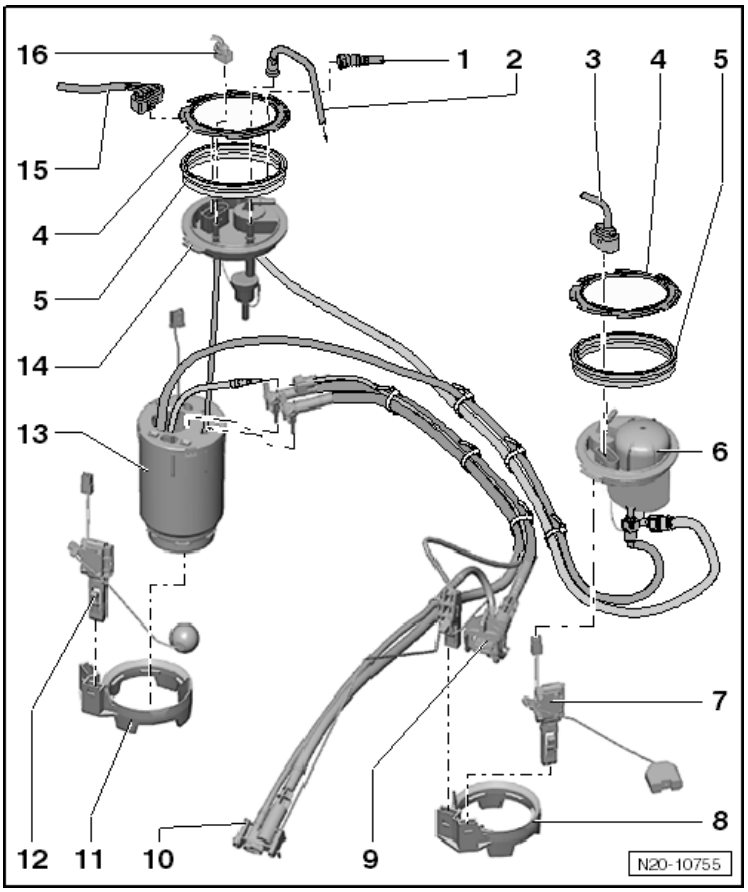
1 - Fuel Filler Tube
- ☐ Tighten the bolts to the body to 9 Nm

2 - Vent Line
3 - Vent Line
4 - Fuel Pump Control Module -J538-
5 - Fuel Tank
6 - Lock Ring
- ☐ 145 Nm

7 - Fuel Filter
8 - Heat Shield
9 - Securing Strap
10 - Bolt
- ☐ 33 Nm

11 - Protective Cover
12 - Line Coupling
13 - Fuel Delivery Unit

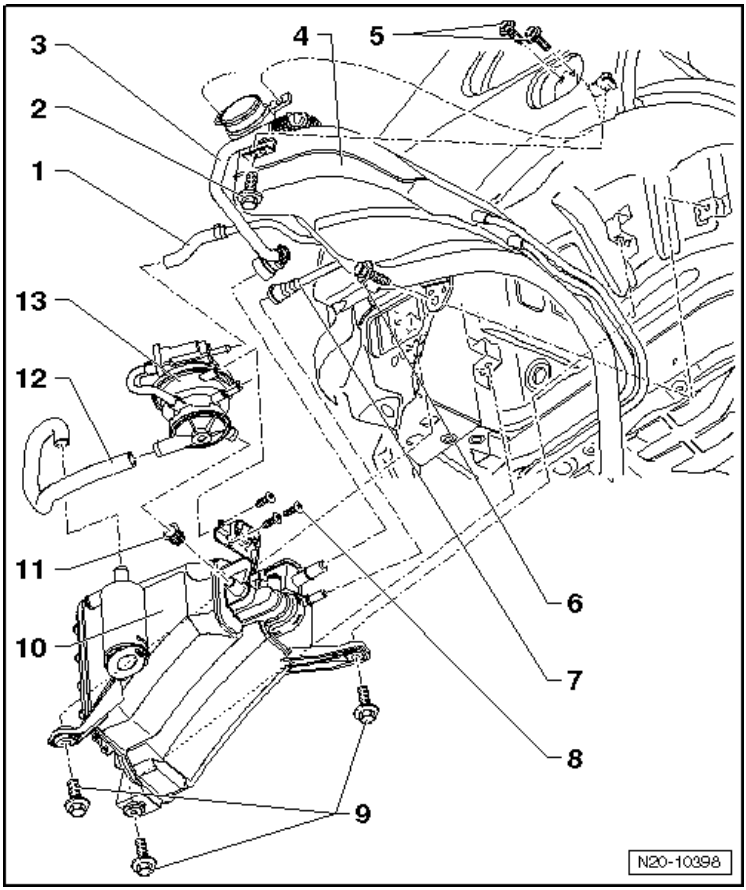
Fuel Delivery Unit, Fuel Level Sensor, Suction Jet Pumps Overview



1 - Vent Line
2 - Fuel Supply Line
3 - Connector
4 - Lock Ring
☐ 145 Nm
5 - Seal
☐ Always replace
6 - Fuel Filter
7 - Fuel Level Sensor 2 -G169-
8 - Retaining Ring
9 - Suction Jet Pump
10 - Suction Jet Pump
11 - Retaining Ring
12 - Fuel Level Sensor -G-
13 - Fuel Delivery Unit

14 - Flange
15 - Connector
16 - Connector

EVAP System Overview



1 - Vacuum Line
2 - Bolt
- ☐ 9 Nm

3 - Vent Line
4 - Fuel Filler Tube
5 - Bolt
- ☐ 5 Nm

6 - Bolt
- ☐ 9 Nm

7 - Vent Line
8 - Bolt
- ☐ 5 Nm

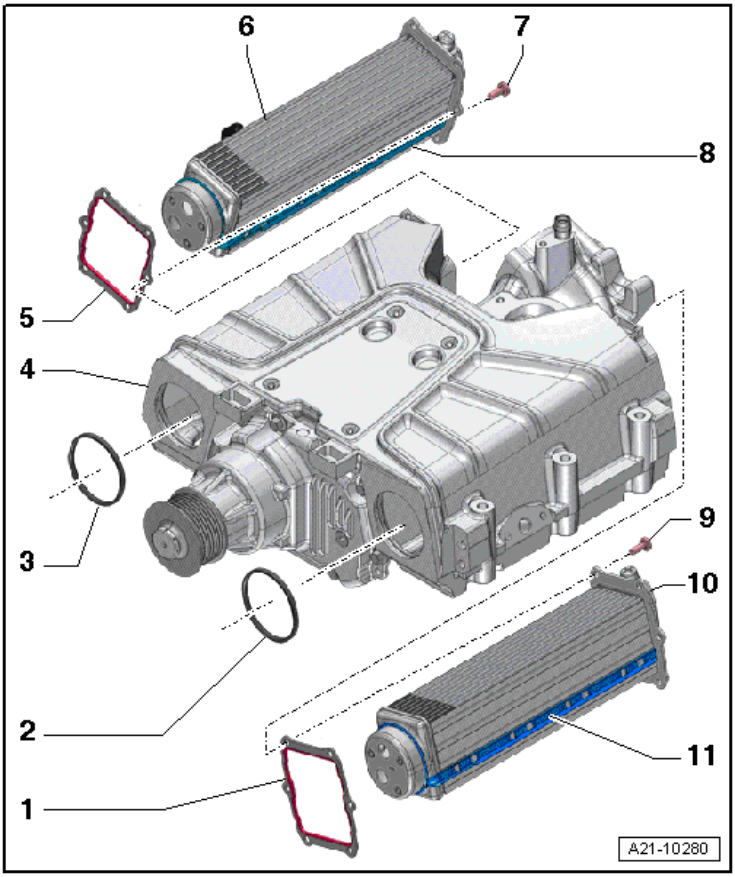
9 - Bolt
- ☐ 9 Nm

10 - Evaporative Emission (EVAP) Canister
11 - Rubber Bushing

12 - Connecting Hose
13 - Leak Detection Pump -V144-

Turbocharger, G-Charger - 3.0L CGFA

Charge Air Cooler Overview



1 - Gasket
- ☐ Always replace

2 - O-ring
- ☐ Always replace

3 - O-ring
- ☐ Always replace

4 - Supercharger

5 - Gasket
- ☐ Always replace

6 - Right Charge Air Cooler

7 - Bolt
- ☐ 10 Nm
- ☐ Always replace

8 - Gasket

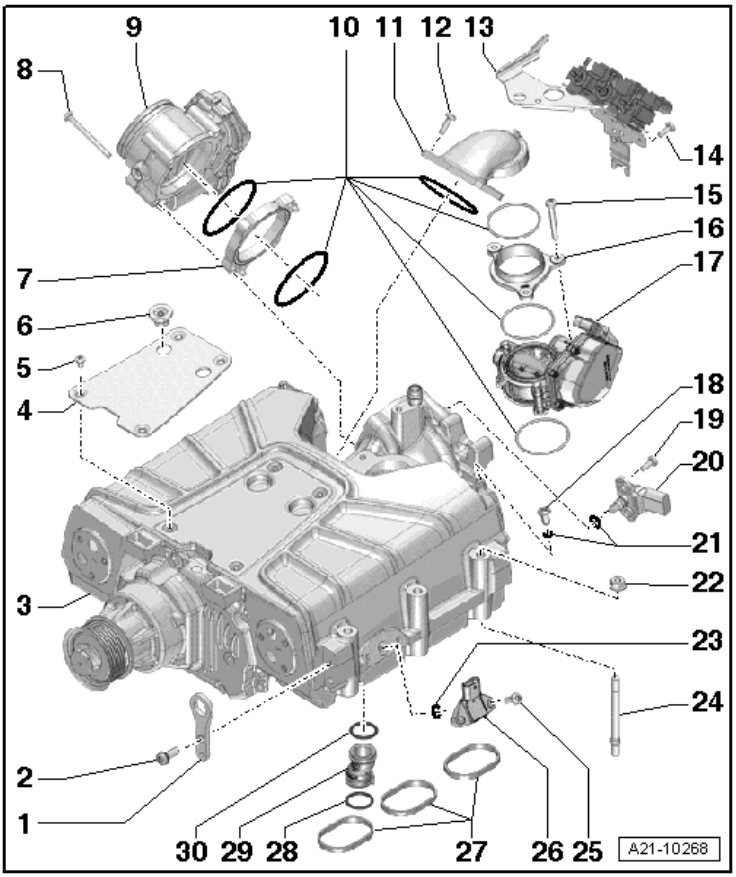
9 - Bolt

- ☐ 10 Nm
- ☐ Always replace

10 - Left Charge Air Cooler

11 - Gasket

Supercharger Overview



1 - Lifting Bracket
2 - Bolt
☐ 27 Nm
3 - Supercharger
4 - Insulation Plate
5 - Bolt
☐ 5 Nm
6 - Rubber Grommet
7 - Adapter
8 - Bolt
☐ 10 Nm
9 - Throttle Valve Control Module -J338-
10 - O-ring
☐ Always replace
11 - Adapter
12 - Bolt
☐ 10 Nm

13 - Bracket
14 - Bolt
- ☐ 9 Nm

15 - Bolt
- ☐ 10 Nm

16 - Adapter
17 - Control Valve Control Unit -J808-
18 - Breather Valve
19 - Bolt
- ☐ 10 Nm
- ☐ Always replace

20 - Intake Air Temperature Sensor -G42-
21 - O-ring
- ☐ Always replace

22 - Nut
- ☐ 20 Nm

23 - O-ring
- ☐ Always replace

24 - Pin
- ☐ 17 Nm

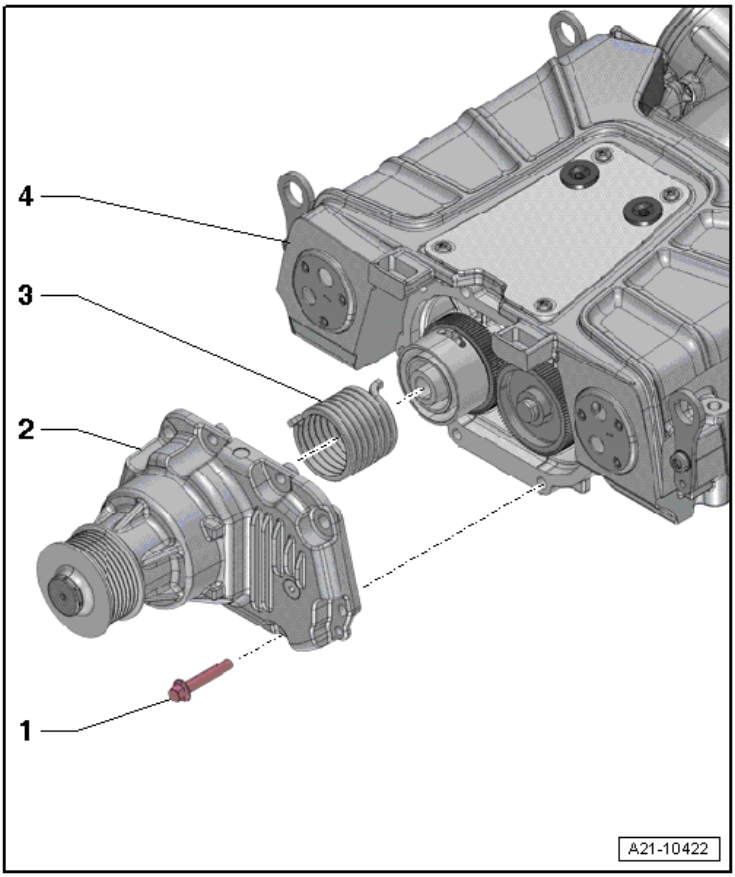
25 - Bolt
- ☐ 10 Nm
- ☐ Always replace

26 - Charge Air Pressure Sensor
27 - Seals
- ☐ Always replace

28 - O-ring
- ☐ Always replace

29 - Connecting Piece
30 - O-ring
- ☐ Always replace

Drive Unit Overview

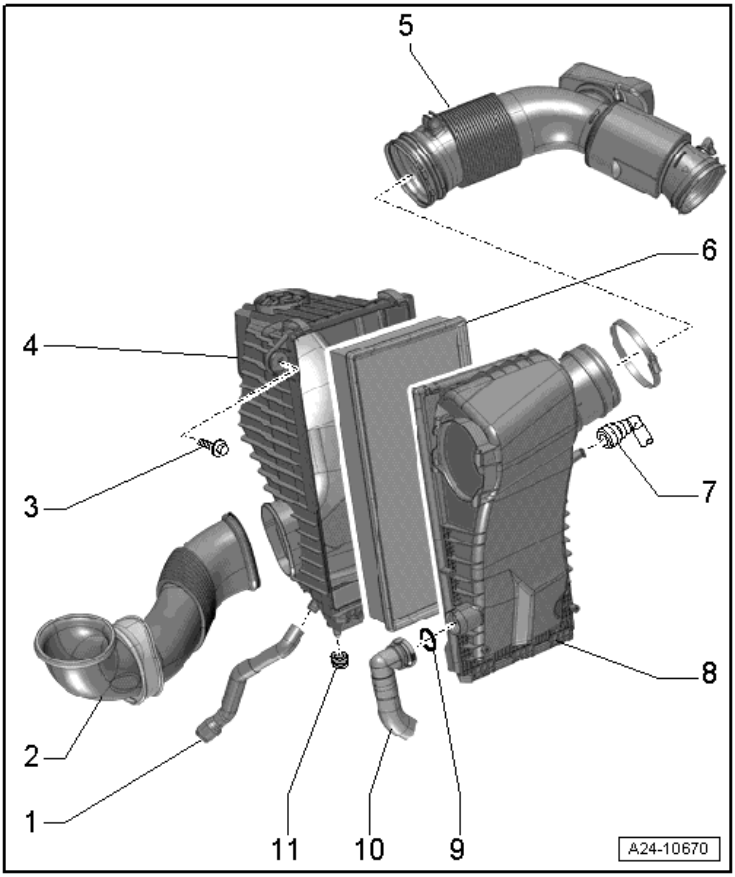


1 - Bolt
- ☐ 25 Nm
- ☐ Always replace

2 - Drive Unit
3 - Spring
4 - Supercharger

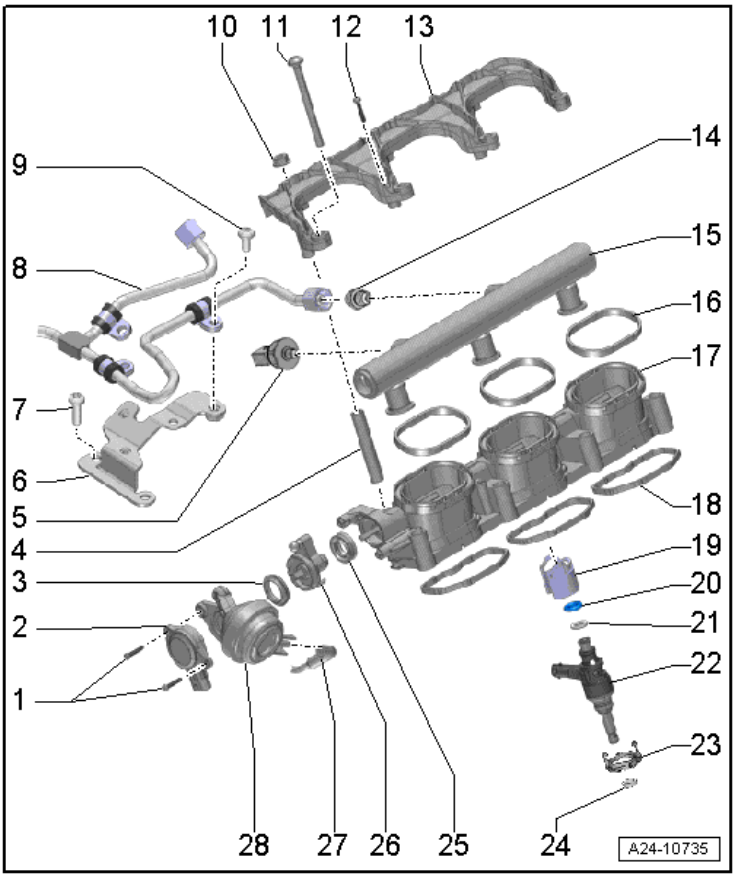
Multiport Fuel Injection – 3.0L CGFA

Air Filter Housing Overview



1 - Water Drain Hose
2 - Air Pipe
3 - Bolt
☐ 9 Nm
4 - Lower Air Filter Housing
5 - Intake Air Duct
6 - Air Filter Element
7 - Vent Hose
☐ Not installed
8 - Upper Air Filter Housing
9 - O-ring
☐ Always replace
10 - Hose
11 - Rubber Grommet

Lower Intake Manifold with Fuel Rail Overview



1 - Bolt
- ☐ 2.5Nm

2 - Intake Manifold Runner Position Sensor

3 - Seal
- ☐ Replace

4 - Sleeve

5 - Fuel Pressure Sensor -G247-
- ☐ 22 Nm
- ☐ Lubricate threads

6 - Bracket

7 - Bolt
- ☐ 9 Nm

8 - High Pressure Line
- ☐ 27 Nm

9 - Bolt
- ☐ 9 Nm

10 - Nut
- ☐ 9 Nm

11 - Bolt
- ☐ 9 Nm

12 - Bolt
- ☐ 2.5 Nm

13 - Retainer

14 - Connecting Piece
- ☐ 40 Nm

15 - Fuel Rail

16 - Gasket
- ☐ Always replace

17 - Lower Intake Manifold

18 - Gasket
- ☐ Always replace

19 - Support Ring

20 - O-ring
- ☐ Always replace

21 - Spacer Ring

22 - Fuel Injector

23 - Washer
- ☐ Always replace

24 - Combustion Chamber Seal

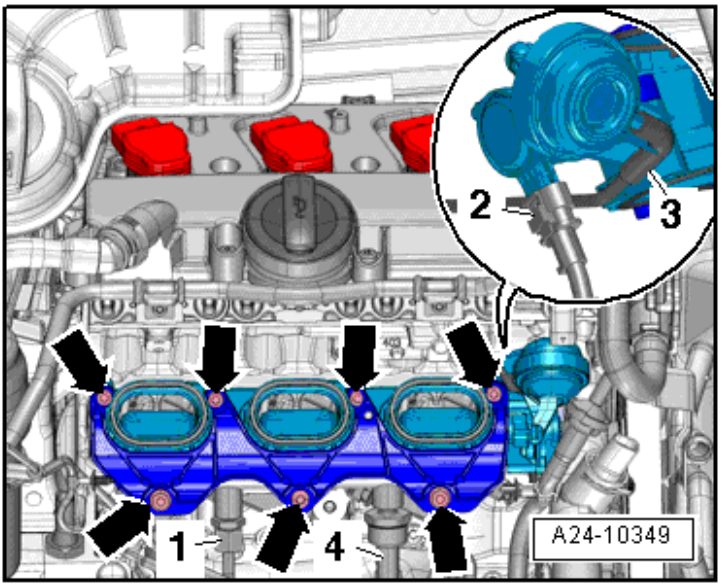
25 - Seal

26 - Actuator Lever

27 - Vacuum Hose

28 - Vacuum Actuator for Intake Manifold Runner Control

Lower Intake Manifold Tightening Specification



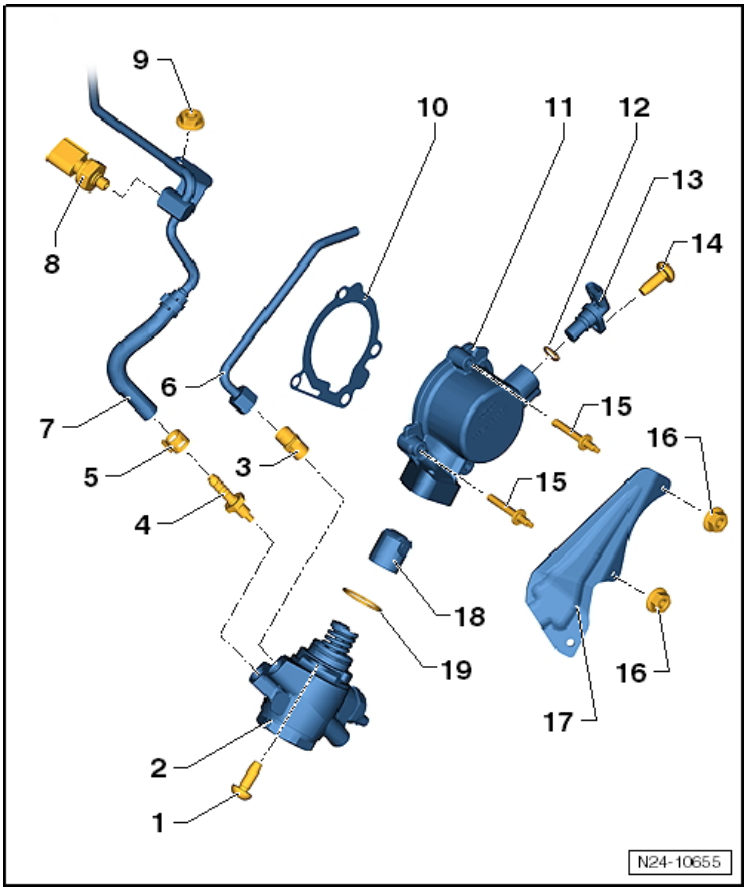
Step	Component	Nm
1	Tighten bolt and nuts (➡) diagonally in stages	10

Technical Data

Engine code		**CGFA**
Idle check		
Engine idle speed [1]		600 to 800 RPM
Engine Control Module (ECM) (J623)		
System designation		Motronic MED 17.1
Part number		Refer to the Electronic Parts Catalog (ETKA)
Engine Speed (RPM) limitation		Approximately 6200 RPM
Fuel pressure		
Low pressure	bar	Approximately 6.0
High pressure	bar	18 to 120

[1] Idle speed is not adjustable.

High Pressure Pump Overview



1 - Bolt
- ☐ Tightening specification and sequence, see High Pressure Pump Bolt Tightening Sequence and Specification below

2 - High Pressure Pump

3 - Connecting Piece
- ☐ 27 Nm

4 - Connecting Piece
- ☐ 27 Nm

5 - Hose Clamp

6 - High Pressure Line
- ☐ 25 Nm
- ☐ Lubricate the threads on the union nut with fuel.

7 - Fuel Supply Line

8 - Low Fuel Pressure Sensor -G410-
- ☐ 15 Nm

9 - Nut
- ☐ 9 Nm

10 - Gasket
- ☐ Always replace

11 - Housing

12 - O-ring
- ☐ Always replace

13 - Camshaft Position Sensor -G40-

14 - Bolt
- ☐ 9 Nm

15 - Bolt
- ☐ 9 Nm

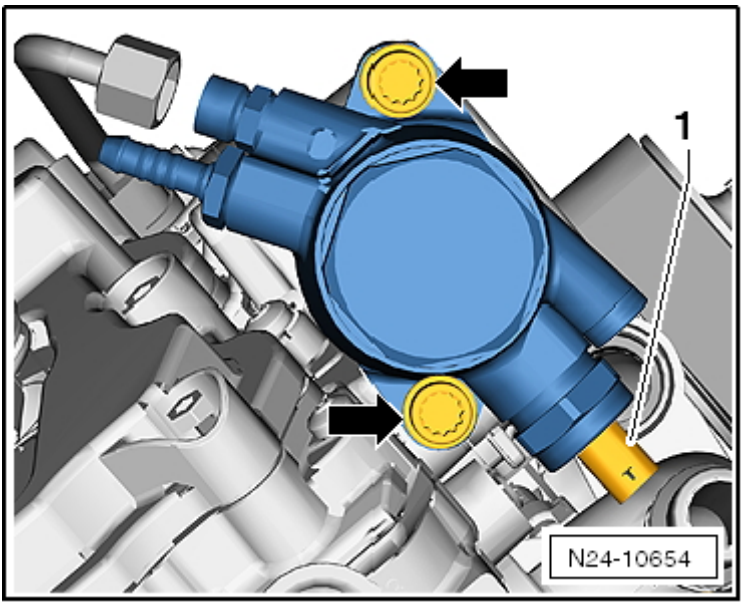
16 - Nut
- ☐ 9 Nm

17 - Protective Plate

18 - Cam Follower

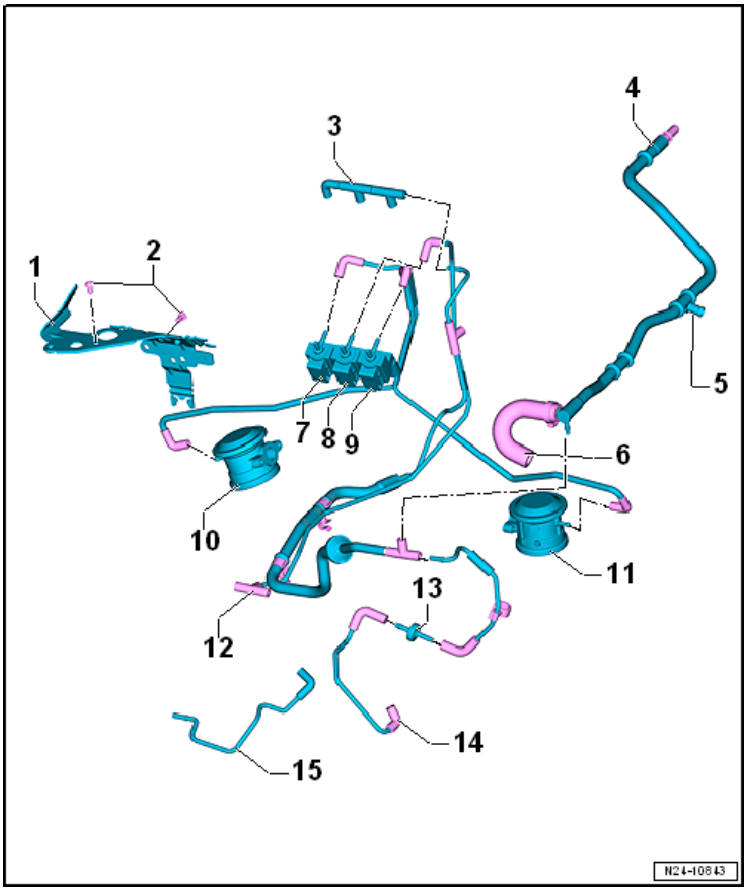
19 - O-ring
- ☐ Always replace

High Pressure Pump Bolt Tightening Sequence and Specification



Step	Bolt	Nm
1	-Arrows-	Alternating, install all the way by hand
2	-Arrows-	in steps to 9 Nm

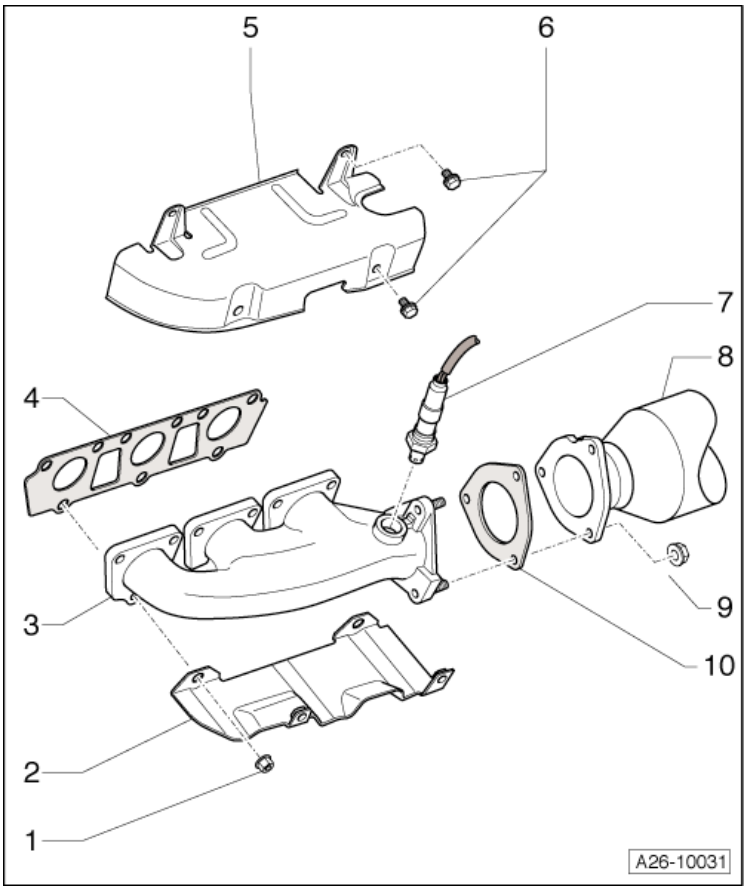
Vacuum System Overview



1 - Retaining Plate
2 - Bolt
☐ 9 Nm
3 - Distribution Piece
4 - To Brake Booster
5 - To Coolant Valves
6 - To Vacuum Pump
7 - Secondary Air Injection Solenoid Valve -N112-
8 - Intake Manifold Runner Control Valve -N316-
☐ 5 Nm
9 - Secondary Air Injection Solenoid Valve 2 -N320-
10 - Right Combination Valve
11 - Left Combination Valve
12 - T-Connection
13 - Check Valve
14 - Low Pressure Connection
15 - Hose

Exhaust System, Emission Controls – 3.0L CGFA

Exhaust Manifold Overview



1 - Nut
- ☐ Always replace
- ☐ Tightening specifications and sequence, refer to the following:
- ☐ Left Exhaust Manifold Nut Tightening Sequence and Specification below
- ☐ Right Exhaust Manifold Nut Tightening Sequence and Specification below
- ☐ Lubricate with hot bolt paste, refer to the Parts Catalog.

2 - Heat Shield Bracket

3 - Exhaust Manifold

4 - Gasket
- ☐ Always replace

5 - Heat Shield

6 - Bolt
- ☐ 10 Nm

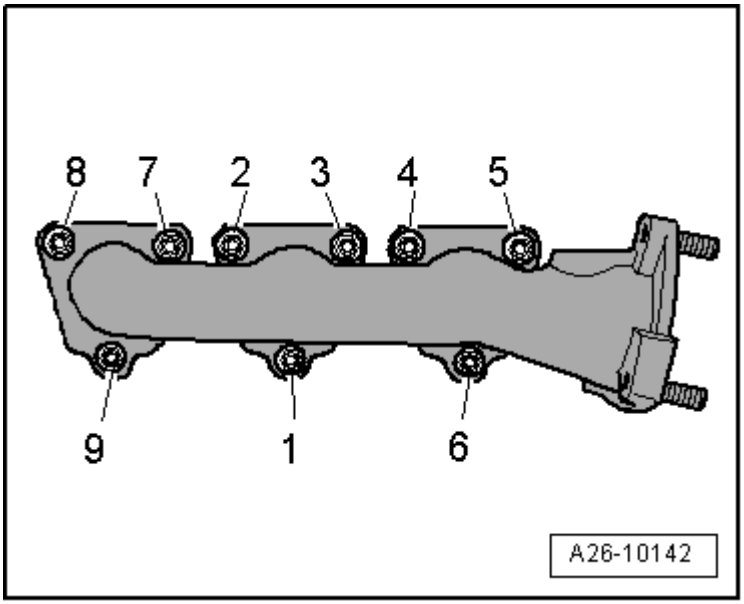
7 - Heated Oxygen Sensor

8 - Front Exhaust Pipe with Catalytic Converter

9 - Nut
- ☐ 23 Nm
- ☐ Always replace
- ☐ Lubricate with hot bolt paste, refer to the Parts Catalog.

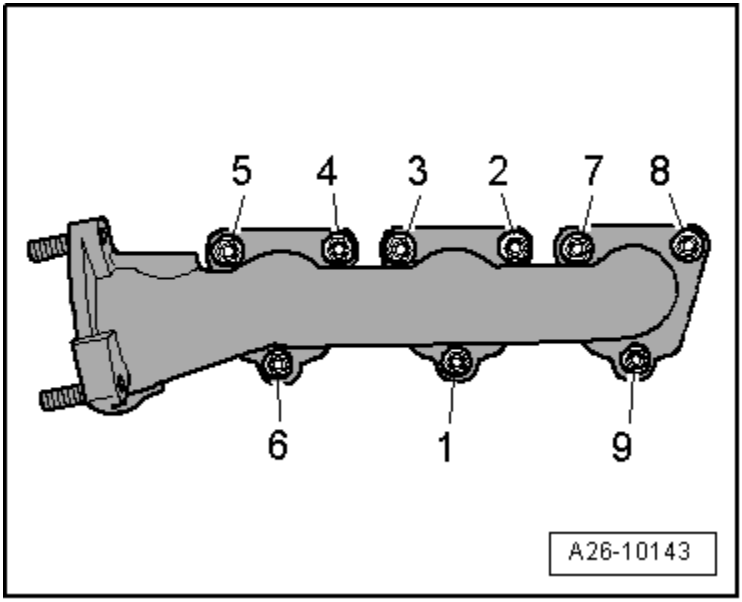
10 - Gasket

Left Exhaust Manifold Tightening Specifications



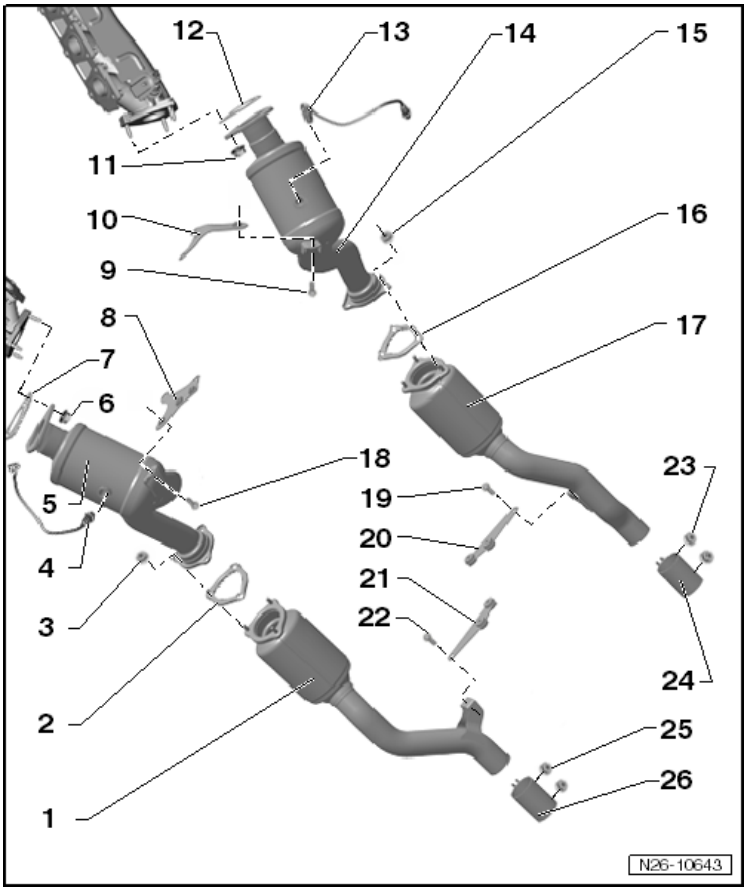
Step	Component	Nm
1	Tighten bolts 1 through 9 in sequence	Hand-tighten
2	Tighten bolts 1 through 9 in sequence	15
3	Tighten bolts 1 through 9 in sequence	25

Right Exhaust Manifold Tightening Specifications



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

Front Exhaust Pipe with Catalytic Converter Overview



1 - Left Front Muffler
2 - Gasket
- ☐ Always replace

3 - Nut
- ☐ 23 Nm
- ☐ Always replace

4 - Oxygen Sensor 2 after Catalytic Converter -G131-
5 - Front Exhaust Pipe with Catalytic Converter
6 - Nut
- ☐ 23 Nm
- ☐ Always replace

7 - Gasket
- ☐ Always replace

8 - Support, for the Left Catalytic Converter
9 - Bolt
- ☐ 23 Nm

10 - Support, for the Right Catalytic Converter

11 - Nut
- ☐ 23 Nm
- ☐ Always replace

12 - Gasket
- ☐ Always replace

13 - Oxygen Sensor after Three Way Catalytic Converter -G130-

14 - Front Exhaust Pipe with Catalytic Converter

15 - Nut
- ☐ 23 Nm
- ☐ Always replace

16 - Gasket
- ☐ Always replace

17 - Right Front Muffler

18 - Bolt
- ☐ 23 Nm

19 - Bolt
- ☐ 23 Nm

20 - Support, for the Right Front Muffler

21 - Support, for the Left Front Muffler

22 - Bolt
- ☐ 23 Nm

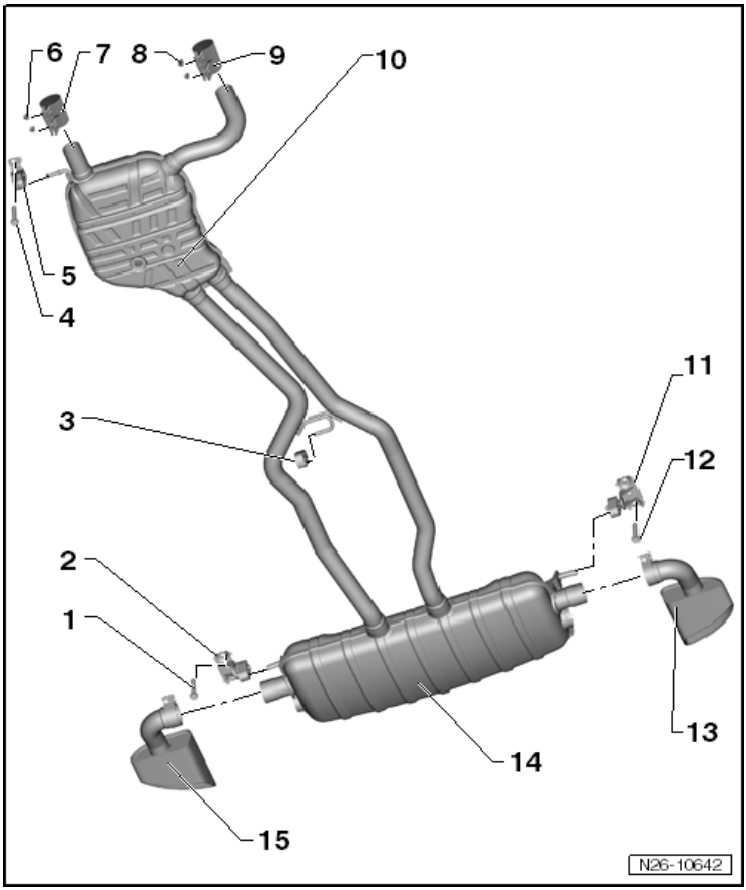
23 - Nut
- ☐ 35 Nm

24 - Right Clamping Sleeve
- ☐ Always replace

25 - Nut
- ☐ 35 Nm

26 - Left Clamping Sleeve
- ☐ Always replace

Center and Rear Mufflers Overview



1 - Bolt
- ☐ 23 Nm

2 - Suspended Mount
3 - Suspended Mount
4 - Bolt
- ☐ 23 Nm

5 - Suspended Mount
6 - Nut
- ☐ 35 Nm

7 - Front Clamping Sleeves
- ☐ Always replace

8 - Nut
- ☐ 35 Nm

9 - Front Clamping Sleeves
- ☐ Always replace

10 - Center Muffler
11 - Suspended Mount

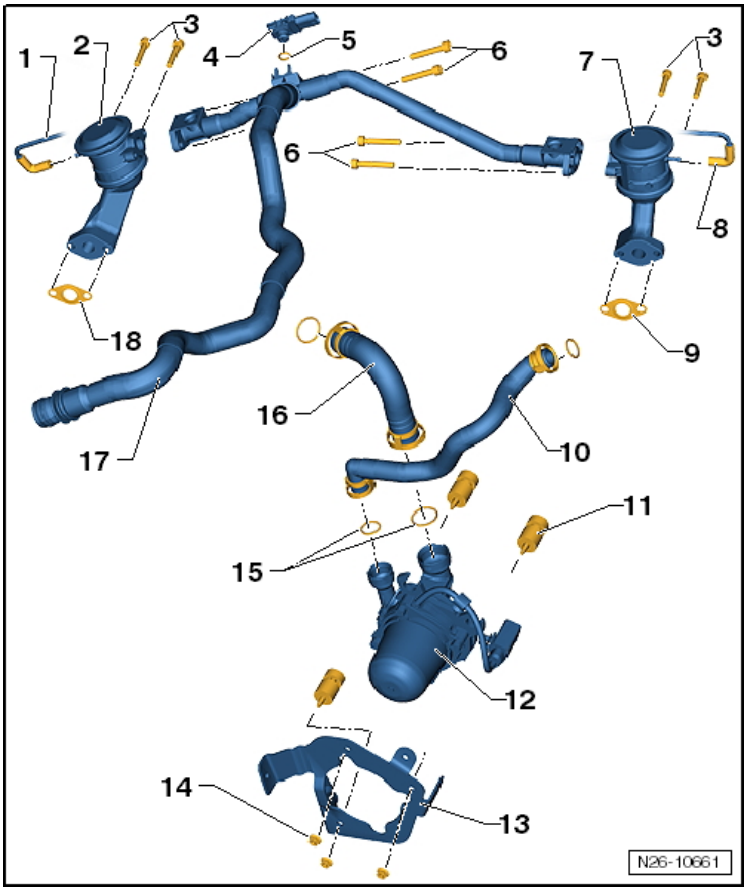
12 - Bolt
- ☐ 23 Nm

13 - Left Tailpipe
- ☐ 60 Nm

14 - Rear Muffler

15 - Right Tailpipe
- ☐ 60 Nm

Secondary Air Injection System Overview



1 - Vacuum Hose
2 - Right Secondary Air Injection Combination Valve
3 - Bolt
☐ 9 Nm
4 - Secondary Air Injection Sensor 1 -G609-
5 - O-ring
☐ Always replace
6 - Bolt
☐ 5 Nm
7 - Left Secondary Air Injection Combination Valve
8 - Vacuum Hose
9 - Gasket
☐ Always replace
10 - Secondary Air Hose
11 - Bonded Rubber Bushing
12 - Secondary Air Injection Pump Motor -V101-
13 - Bracket

14 - Nut
- ☐ 9 Nm

15 - O-rings

16 - Secondary Air Hose

17 - Secondary Air Injection Pipe

18 - Gasket
- ☐ Always replace

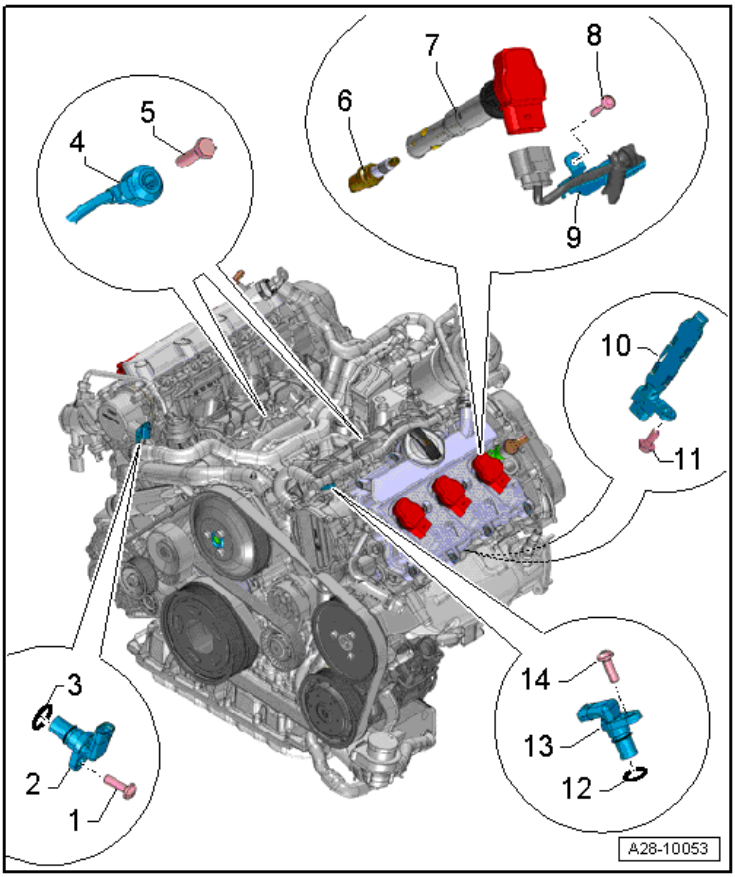
Ignition/Glow Plug System – 3.0L CGFA

Technical Data

Engine code	**CGFA**
Ignition sequence	1-4-3-6-2-5
Spark plugs	
VW/Audi	101 905 611 G
Electrode gap	Maximum 1.1 mm
Tightening specifications [1)]	30 Nm

[1)] Remove and install spark plugs using the spark plug removal tool (3122 B).

Ignition Component Overview



1 - Bolt
- ☐ 9 Nm

2 - Camshaft Position Sensor -G40-

3 - O-ring
- ☐ Always replace

4 - Knock Sensor

5 - Bolt
- ☐ 20 Nm

6 - Spark Plug
- ☐ 30 Nm

7 - Ignition Coil

8 - Bolt
- ☐ 5 Nm

9 - Wiring Harness

10 - Engine Speed Sensor -G28-

11 - Bolt
- ☐ 9 Nm

12 - O-ring

☐ Always replace

13 - Camshaft Position Sensor 2 -G163-

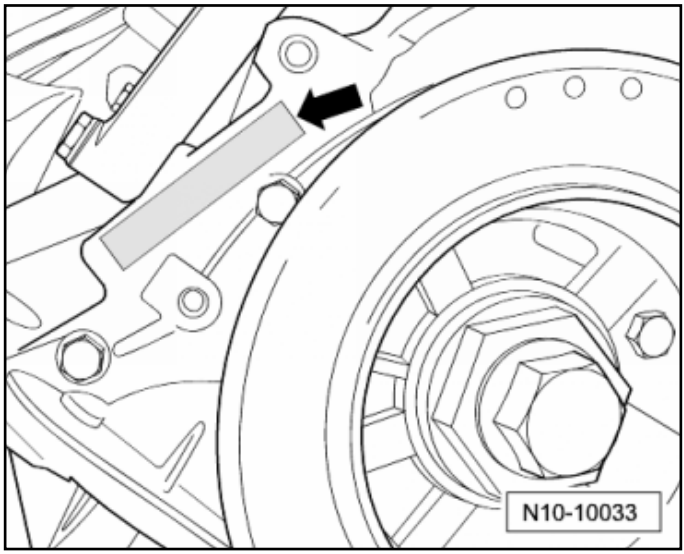
14 - Bolt

☐ 9 Nm

ENGINE MECHANICAL – 3.6L CGRA

General, Technical Data

Engine Number Location



The engine number (engine code and serial number) is located next to the vibration damper (➡) on the cylinder block. Engine codes beginning with C are four-digit. The first 3 digits of the engine code indicate the displacement and the mechanical structure of the engine. The fourth digit describes the engine output and torque.

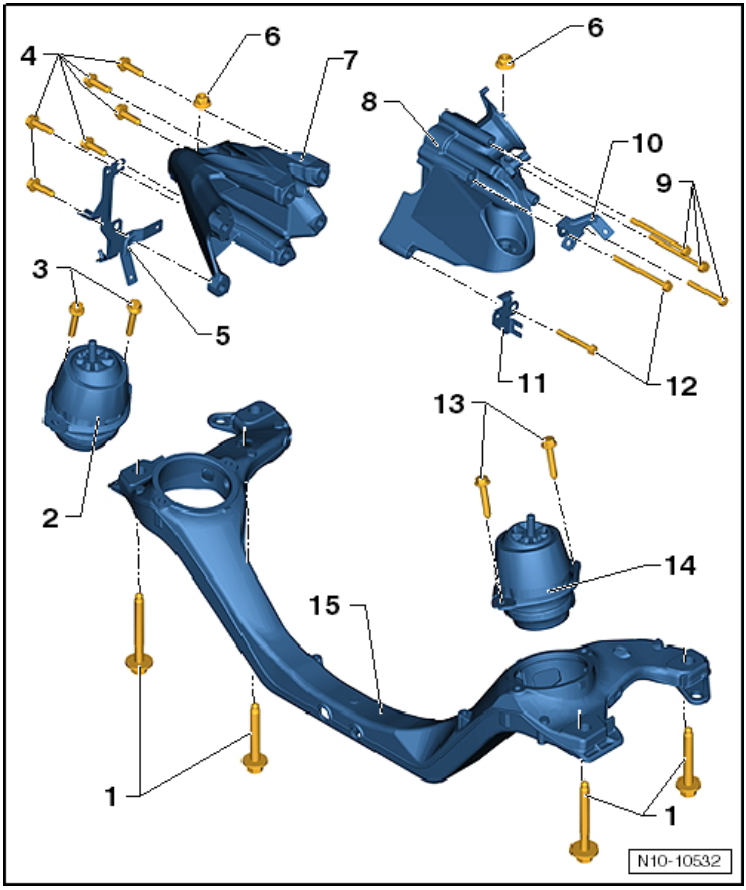
Engine Data

Code letters		CGRA
Manufactured		from CW 15.2010
Displacement	cm^3	3597
Output	kW at RPM	206 @ 6200
Torque	Nm at RPM	360 @ 2900 to 4000
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)		98 unleaded [1)]
Fuel injection, ignition		Motronic MED 17
Knock control		2 knock sensors
Oxygen Sensor (O2S) regulation		Yes, 4 Heated Oxygen Sensors (HO2S)
Catalytic converter		Yes
Leak detection system		Yes
Exhaust Gas Recirculation (EGR)		No
Thermo management		Yes

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

Engine Assembly – 3.6L CGRA

Engine Carrier, Engine Mount and Bracket Overview



1 - Bolt
- ☐ 120 Nm + 180° turn
- ☐ Always replace

2 - Right Engine Mount

3 - Bolt
- ☐ 60 Nm

4 - Bolt
- ☐ 40 Nm

5 - Wire Bracket

6 - Nut
- ☐ 75 Nm

7 - Right Engine Mount Bracket

8 - Left Engine Mount Bracket

9 - Bolt
- ☐ 25 Nm

10 - Wire Bracket
11 - Wire Bracket
12 - Bolt
- ☐ 25 Nm

13 - Bolt
- ☐ 60 Nm

14 - Left Engine Mount
15 - Engine Carrier

Fastener Tightening Specifications

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

Crankshaft, Cylinder Block – 3.6L CGRA

Allocation of Crankshaft Bearing Shells for Cylinder Block

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

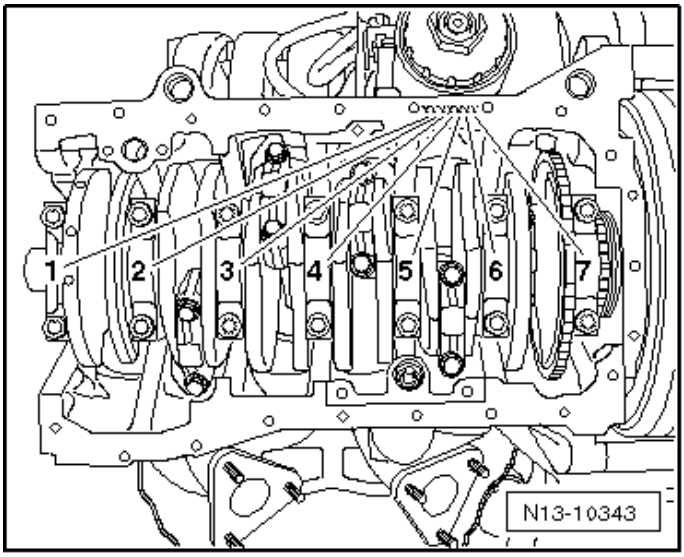
Allocate the bearing shells if the cylinder block or the crankshaft are being replaced.

The bearing shell for the cylinder block (upper bearing shell) is always marked in yellow.

Using the letters on the cylinder block and crankshaft, determine the correct colored identification for the bearing shell in the bearing cover (lower bearing shell).

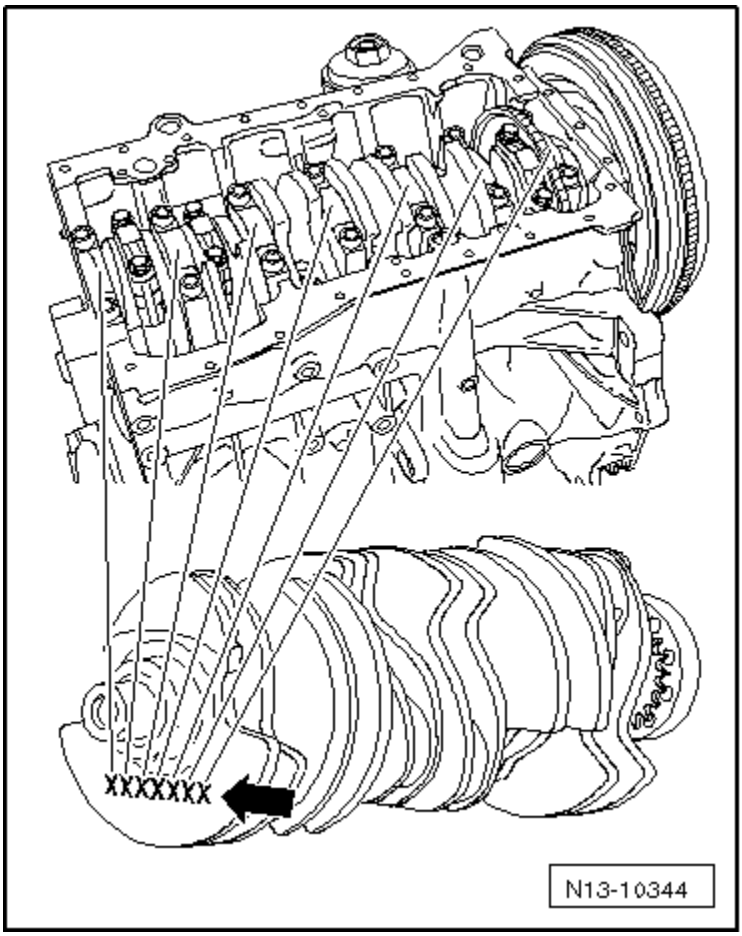
The first letter is for bearing cap 1, the second for bearing cap 2, etc.

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.

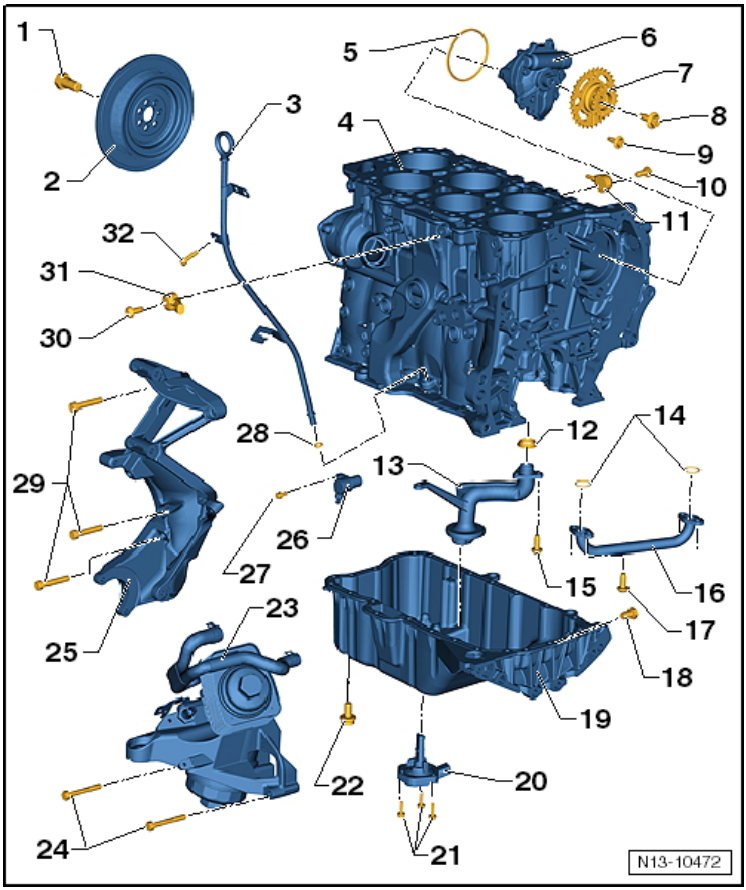
Note the letters and then match them to the color identification in the table.

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
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

Cylinder Block and Attaching Components



1 - Bolt
- ☐ 60 Nm + 180° turn
- ☐ Always replace

2 - Vibration Damper

3 - Guide Tube

4 - Cylinder Block

5 - Seal
- ☐ Always replace

6 - Oil Pump

7 - Sprocket

8 - Bolt
- ☐ 60 Nm + 90° turn
- ☐ Always replace

9 - Bolt
- ☐ 8 Nm
- ☐ Install using liquid locking fluid -D 000 600 A2-

10 - Bolt
- ☐ 20 Nm

11 - Knock Sensor (KS) 1 -G61-

12 - Gasket
- ☐ Always replace

13 - Suction Pipe

14 - Bolt
- ☐ 9 Nm

14 - O-ring
- ☐ Always replace

15 - Bolt
- ☐ 8 Nm
- ☐ Install using liquid locking fluid -D 000 600 A2-

16 - Oil Pipe

17 - Bolt
- ☐ 8 Nm
- ☐ Install using liquid locking fluid -D 000 600 A2-

18 - Oil Drain Plug
- ☐ 30 Nm
- ☐ Always replace

19 - Oil Pan

20 - Oil Level Thermal Sensor -G266-

21 - Bolt
- ☐ 12 Nm

22 - Bolt
- ☐ 10 Nm

23 - Oil Filter Housing/Left Engine Mount Bracket

24 - Bolt
- ☐ 23 Nm

25 - Accessory Bracket

26 - Engine Speed Sensor -G28-

27 - Bolt
- ☐ 10 Nm

28 - O-ring
- ☐ Always replace

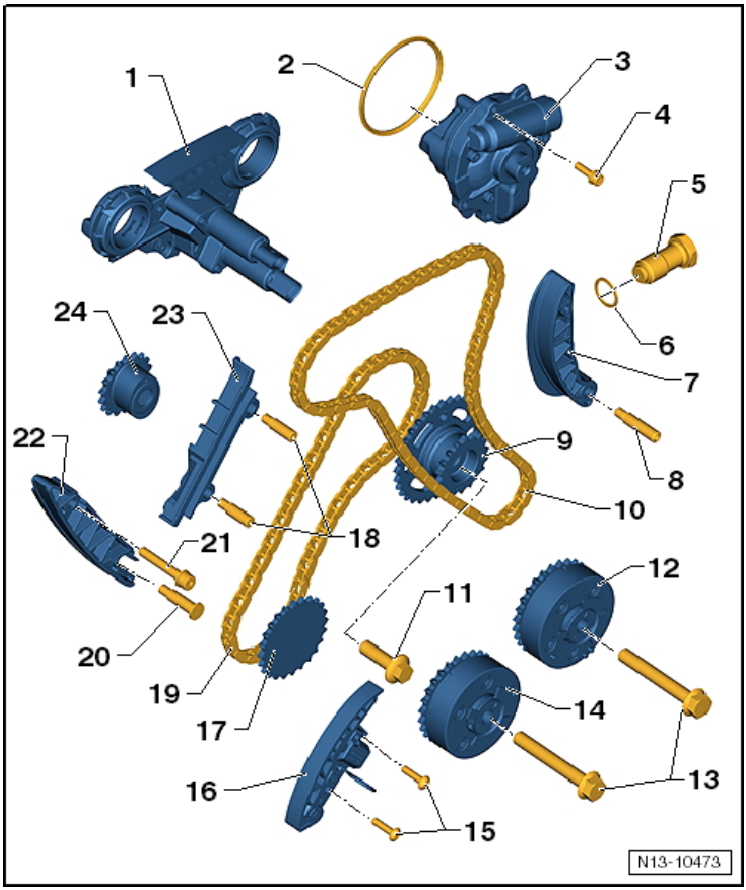
29 - Bolt
- ☐ 25 Nm

30 - Bolt
- ☐ 20 Nm

31 - Knock Sensor (KS) 2 -G66-

32 - Bolt
- ☐ 6 Nm

Timing Chains and Adjusters



1 - Control Housing
2 - Seal
- ☐ Always replace

3 - Oil Pump
4 - Bolt
- ☐ 8 Nm
- ☐ Install using liquid locking fluid -D 000 600 A2-.

5 - Chain Tensioner
- ☐ 50 Nm

6 - Seal
7 - Tensioning Rail
8 - Pin
- ☐ 10 Nm

9 - Sprocket
10 - Camshaft Timing Chain

11 - Bolt
- ☐ 60 Nm + 90° turn
- ☐ Always replace

12 - Exhaust Camshaft Adjuster

13 - Bolt
- ☐ 60 Nm + 90° turn
- ☐ Always replace

14 - Intake Camshaft Adjuster

15 - Bolt
- ☐ 10 Nm

16 - Chain Tensioner with Tensioning Rail

17 - Drive Gear

18 - Pin without Collar
- ☐ 10 Nm

19 - Timing Chain

20 - Pin
- ☐ 10 Nm

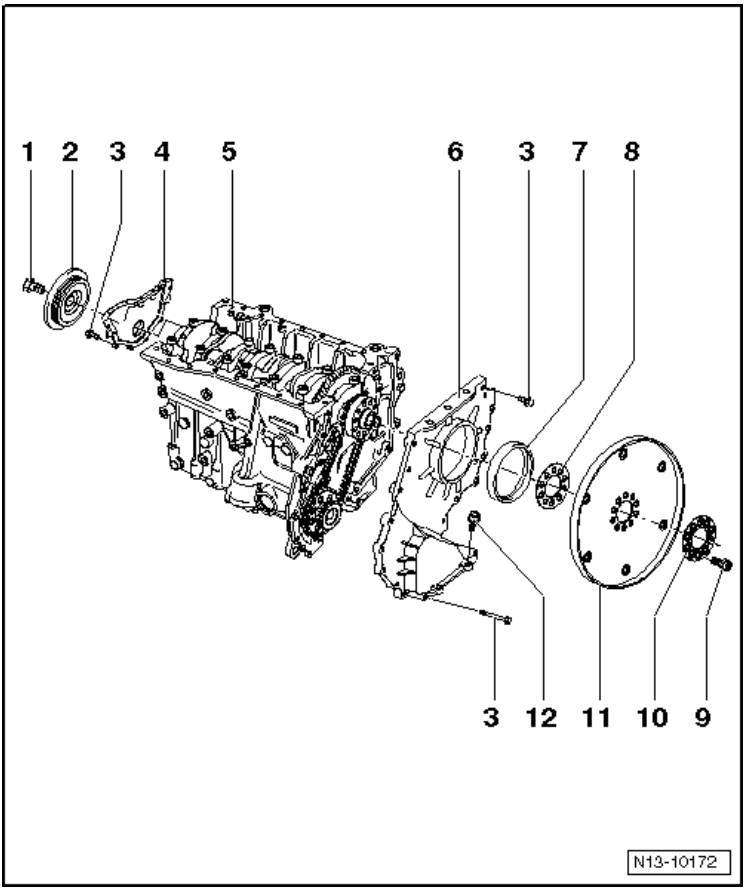
21 - Bolt
- ☐ 23 Nm

22 - Guide Rail

23 - Guide Rail

24 - High Pressure Pump Sprocket

Sealing Flanges and Drive Plate Overview



1 - Bolt
- ☐ 60 Nm + 180° turn
- ☐ Always replace

2 - Vibration Damper

3 - Bolt
- ☐ 10 Nm

4 - Sealing Flange

5 - Cylinder Block

6 - Sealing Flange

7 - Seal

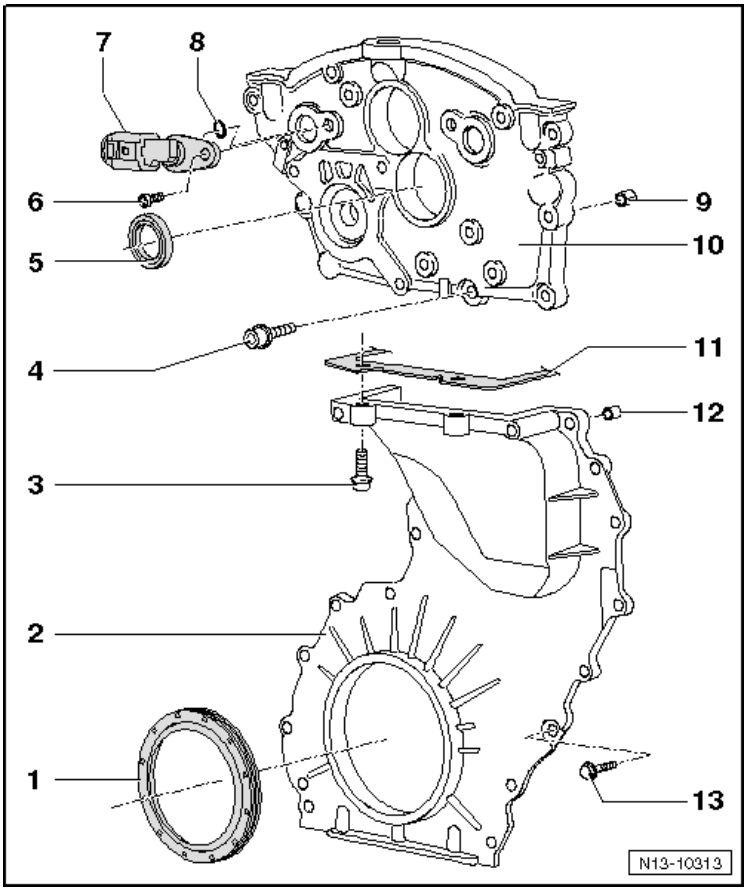
8 - Shim

9 - Bolt
- ☐ 60 Nm + an additional 90° (1/4) turn.
- ☐ Always replace

10 - Washer

11 - Drive Plate
12 - Bolt
- ☐ 23 Nm

Timing Chain Cover and Sealing Flange Overview



1 - Seal
2 - Sealing Flange
3 - Bolt
- ☐ 23 Nm

4 - Bolt
- ☐ 8 Nm
- ☐ Tighten in a diagonal sequence and in steps.

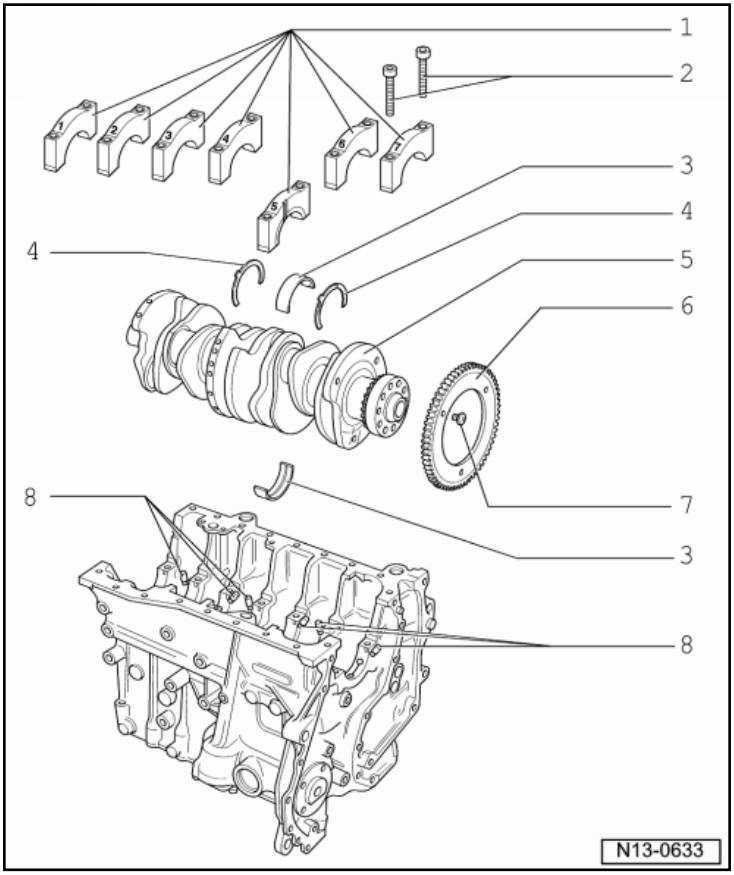
5 - Seal
6 - Bolt
- ☐ 8 Nm

7 - Camshaft Position Sensor
8 - O-ring
- ☐ Always replace

9 - Alignment Pins
10 - Cover
11 - Cylinder Head Gasket

12 - Alignment Pins
13 - Bolt
- ☐ 10 Nm

Crankshaft Overview

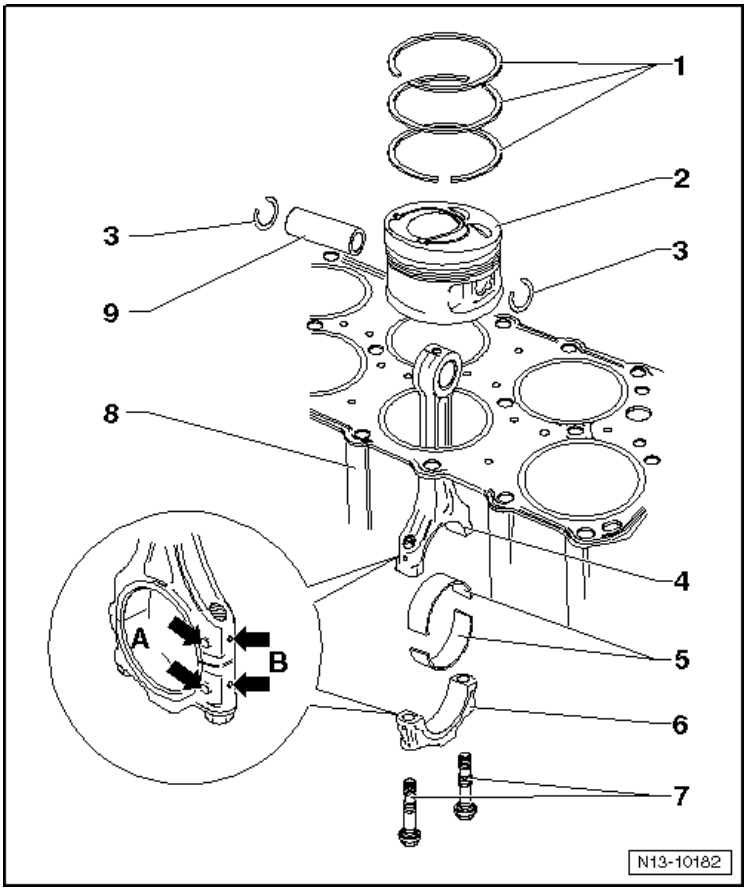


1 - Bearing Cap
2 - Bolt
- ☐ 30 Nm + 180° turn
- ☐ Always replace
- ☐ 2 additional 90° turns is permitted

3 - Bearing Shell, 1 through 7
4 - Thrust washer
5 - Crankshaft
6 - Sensor Wheel
7 - Bolt
- ☐ 10 Nm + 90° turn
- ☐ Always replace

8 - Oil Spray Jet

Pistons and Connecting Rod Overview



1 - Piston Rings
2 - Piston
3 - Circlip
4 - Connecting Rod
5 - Bearing Shell
6 - Connecting Rod Bearing Cap
7 - Bolt
- ☐ 40 Nm + 90° turn
- ☐ Always replace
- ☐ Lubricate the threads and contact surface.

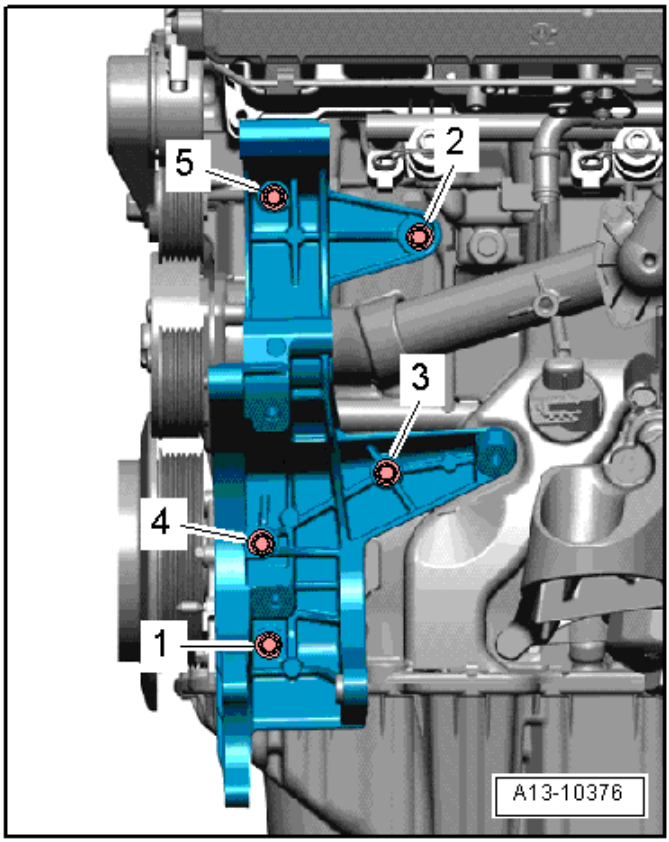
8 - Cylinder Block
9 - Piston Pin

installing.

4) Tightening specification affects the function of the Knock Sensor (KS).

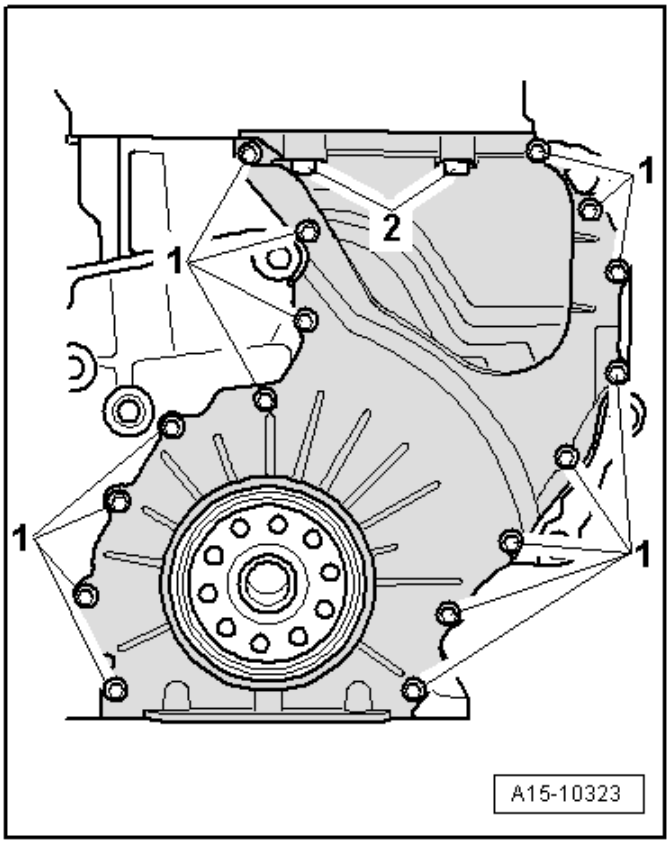
5) Tighten in a diagonal sequence and in stages.

Accessory Bracket Tightening Specifications



Step	Component	Nm
1	Tighten bolts 1 through 5 in sequence	Hand-tighten
2	Tighten bolts 1 through 5 in sequence	25

Sealing Flange (Transmission Side) Bolt Tightening Sequence and Specification



Step	Component	Nm
1	Tighten the bolts -1-	5
2	Tighten the bolts -2-	23
3	Tighten the bolts -1-	10

Crankshaft Dimensions

Crankshaft bearing	Crankshaft connecting rod bearing
59.958 to 59.978 mm	53.958 to 53.978 mm

Piston Ring End Gaps

Piston ring dimensions in mm	Gap	
	New	Wear limit
Compression ring	0.20 to 0.40	1.0
Tapered ring	0.20 to 0.40	1.0
Oil scraping ring	0.25 to 0.50	1.0

Piston Ring Clearance

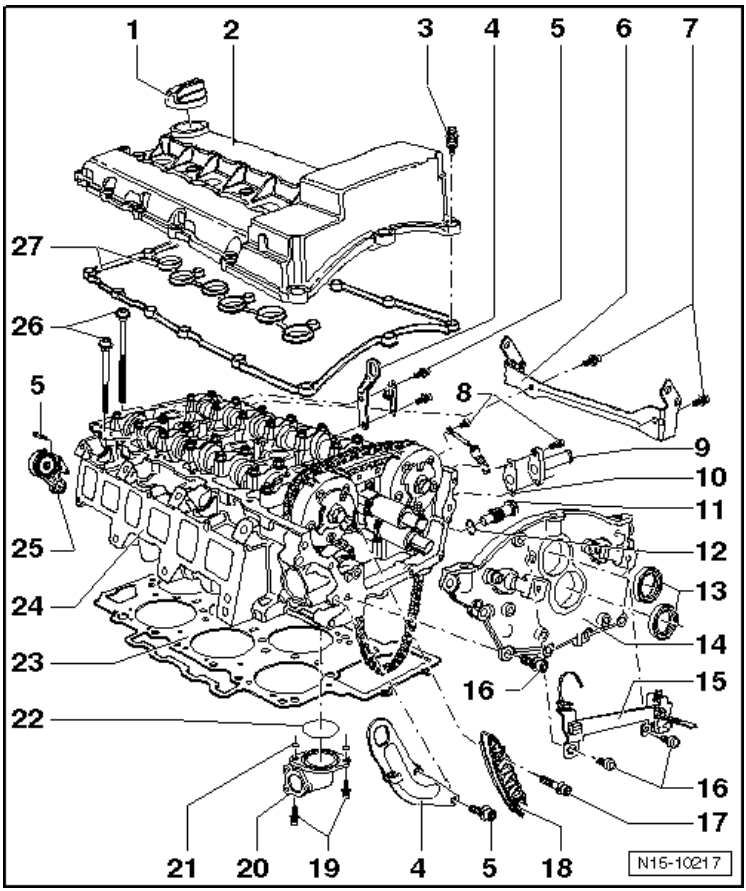
Piston ring dimensions in mm	Ring to groove clearance	
	New	Wear limit
Compression ring	0.04 to 0.09	0.15
Tapered ring	0.03 to 0.06	0.15
Oil scraping ring	0.02 to 0.06	0.15

Piston and Cylinder Dimensions

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

Cylinder Head, Valvetrain – 3.6L CGRA

Cylinder Head Overview



1 - Cap
2 - Cylinder Head Cover
3 - Bolt
- ☐ 10 Nm

4 - Lifting Eye
5 - Bolt
- ☐ 23 Nm

6 - Intake Manifold Support
7 - Bolt
- ☐ 23 Nm

8 - Bolt
- ☐ 10 Nm

9 - Water Connection
10 - Gasket
- ☐ Always replace

11 - Chain Tensioner
- ☐ 50 Nm

12 - Seal
- ☐ Always replace

13 - Seal

14 - Cover

15 - Bracket

16 - Bolt
- ☐ 8 Nm

17 - Bolt
- ☐ 23 Nm

18 - Guide Rail

19 - Bolt
- ☐ 23 Nm
- ☐ Install using liquid locking fluid -D 000 600 A2-

20 - Water Connection

21 - O-ring
- ☐ Always replace

22 - Seal
- ☐ Always replace

23 - Cylinder Head Gasket

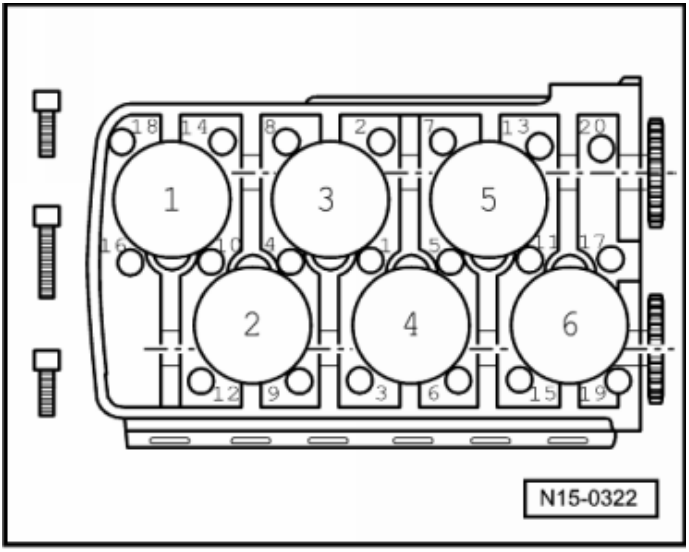
24 - Cylinder Head

25 - Alignment Pins

26 - Bolt
- ☐ Always replace
- ☐ Before installing, lubricate the bolts with liquid locking fluid -D 197 300 A2-.

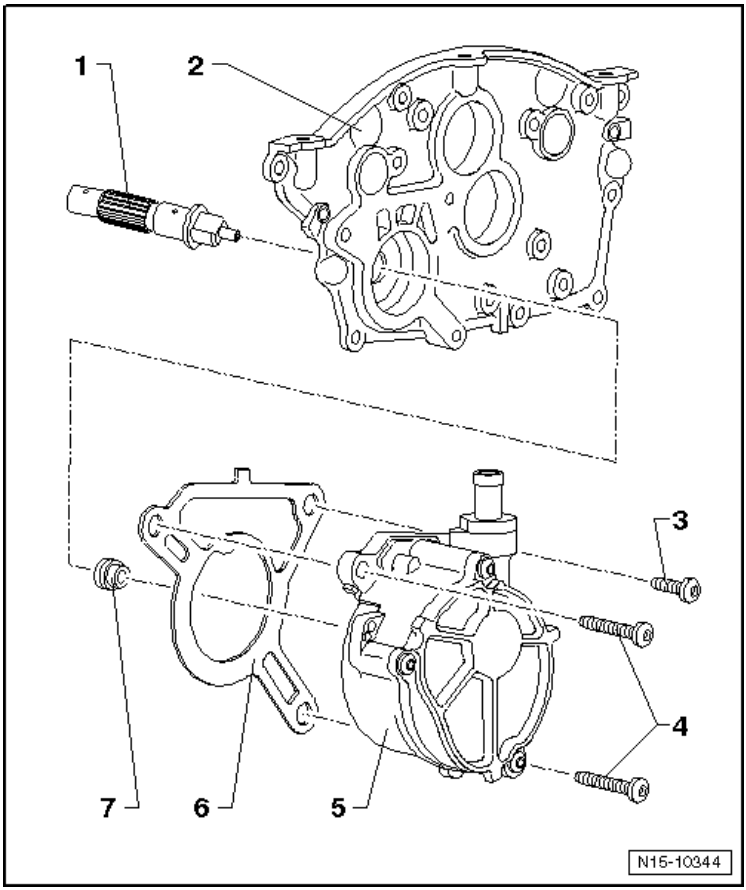
27 - Cylinder Head Cover Gasket

Cylinder Head Tightening Specifications



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)

Mechanical Vacuum Pump Overview



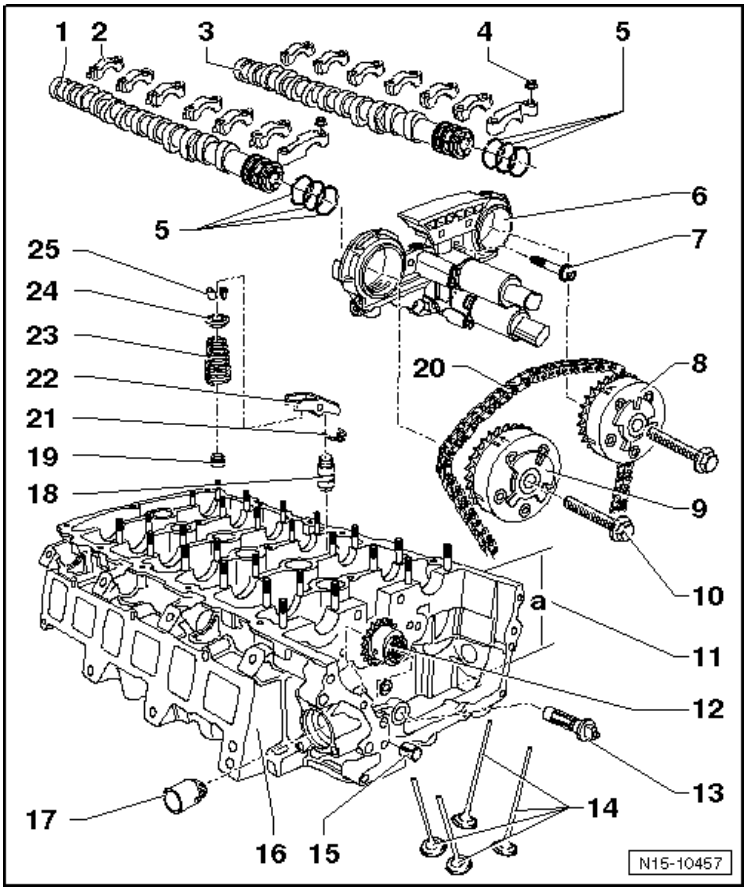
1 - Drive Shaft
2 - Cover
3 - Bolt, Short
- ☐ 8 Nm

4 - Bolt, Long
- ☐ 8 Nm

5 - Vacuum Pump
6 - Gasket
- ☐ Always replace

7 - Seal

Valvetrain Overview



1 - Intake Camshaft
2 - Camshaft Bearing Cap
3 - Exhaust Camshaft
4 - Nut
- ☐ 5 Nm 45° turn

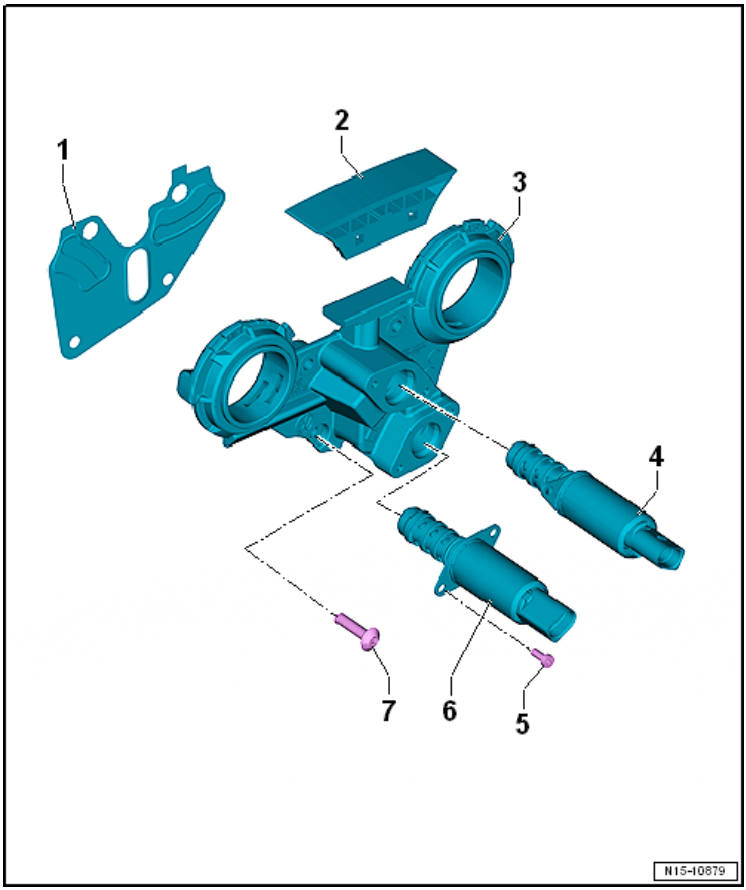
5 - Seal
6 - Control Housing
7 - Bolt
- ☐ 8 Nm + 180° turn
- ☐ Replace

8 - Exhaust Camshaft Adjuster
9 - Intake Camshaft Adjuster
10 - Bolt
- ☐ 60 Nm + 90° turn
- ☐ Always replace

11 - Cylinder Head Height
12 - High Pressure Pump Sprocket

13 - Drive Shaft
14 - Valves
15- Alignment Sleeve
16 - Cylinder Head
17 - Cam Follower
18 - Hydraulic Lash Adjuster
19 - Valve Stem Seal
20 - Camshaft Timing Chain
21 - Securing Clip
22 - Roller Rocker Lever
23 - Valve Spring
24 - Valve Spring Plate
25 - Valve Retainers

Control Housing Overview



1 - Gasket
- ☐ Replace

2 - Guide Rail

3 - Control Housing

4 - Camshaft Adjustment Valve 1 -N205-

5 - Bolt
- ☐ 3.8 Nm

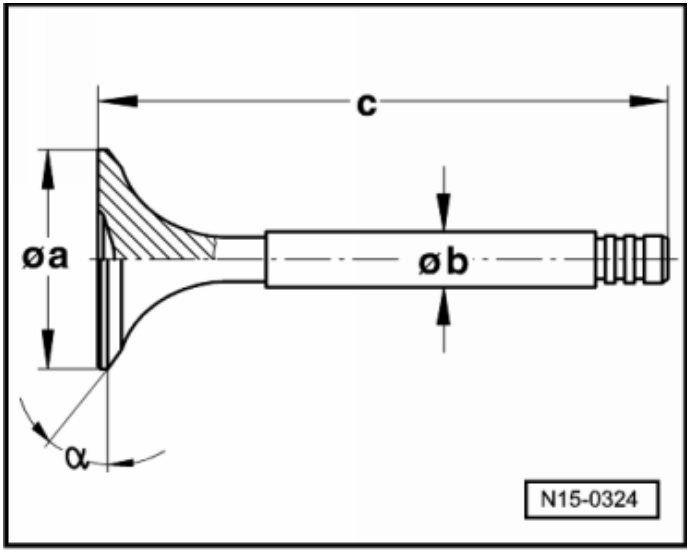
6 - Exhaust Camshaft Adjustment Valve 1 -N318-

7 - Bolt
- ☐ 8 Nm + 180° turn
- ☐ Replace

Compression Checking Specifications

Compression pressure	Bar pressure
New	11.0 to 13.0
Wear limit bar positive pressure	8.0
Maximum difference between cylinders	3.0

Valve Dimensions



Dimensions for Intake Valves

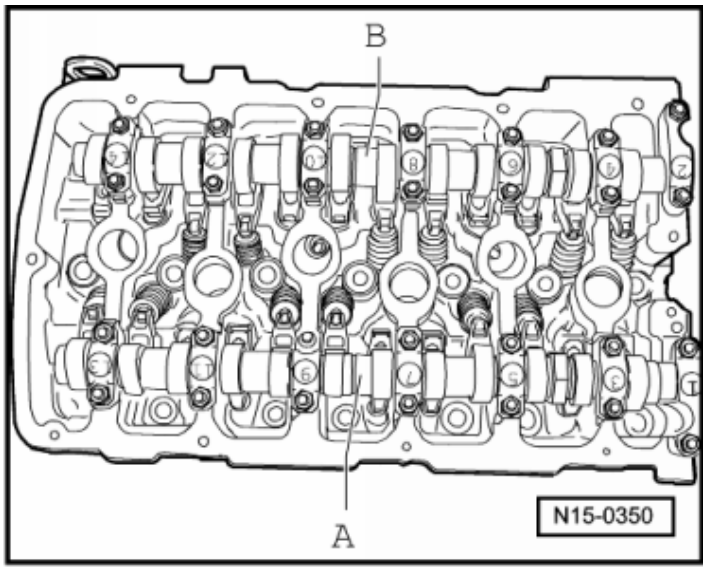
Dimension		Short valve	Long valve
Diameter a	mm	33.20	33.20
Diameter b	mm	5.98	5.98
c	mm	102.46	136.36
α	∠°	44° 40’	44° 40’

Dimensions for Exhaust Valves

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
α	∠°	44° 40’	44° 40’

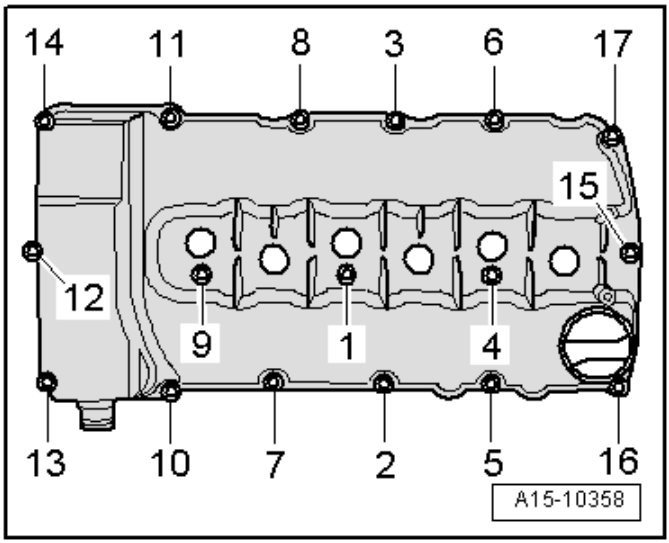
NOTE: Intake and exhaust valves must not be refaced by grinding. Only lapping is permitted.

Camshaft Bearing Cap Tightening Specifications



Step	Component	Nm
A - Intake Camshaft		
1	Alternately tighten bearing caps 5 and 9 and in a diagonal sequence	5 plus an additional 45° (⅛ turn)
2	Alternately tighten bearing caps 1 and 13 and in a diagonal sequence	5 plus an additional 45° (⅛ turn)
3	Tighten bearing cap 7	5 plus an additional 45° (⅛ turn)
4	Alternately tighten bearing caps 3 and 11 and in a diagonal sequence	5 plus an additional 45° (⅛ turn)
B - Exhaust Camshaft		
1	Alternately tighten bearing caps 6 and 10 and in a diagonal sequence	5 plus an additional 45° (⅛ turn)
2	Alternately tighten bearing caps 2 and 14 and in a diagonal sequence	5 plus an additional 45° (⅛ turn)
3	Tighten bearing cap 8	5 plus an additional 45° (⅛ turn)
4	Alternately tighten bearing caps 4 and 12 and in a diagonal sequence	5 plus an additional 45° (⅛ turn)

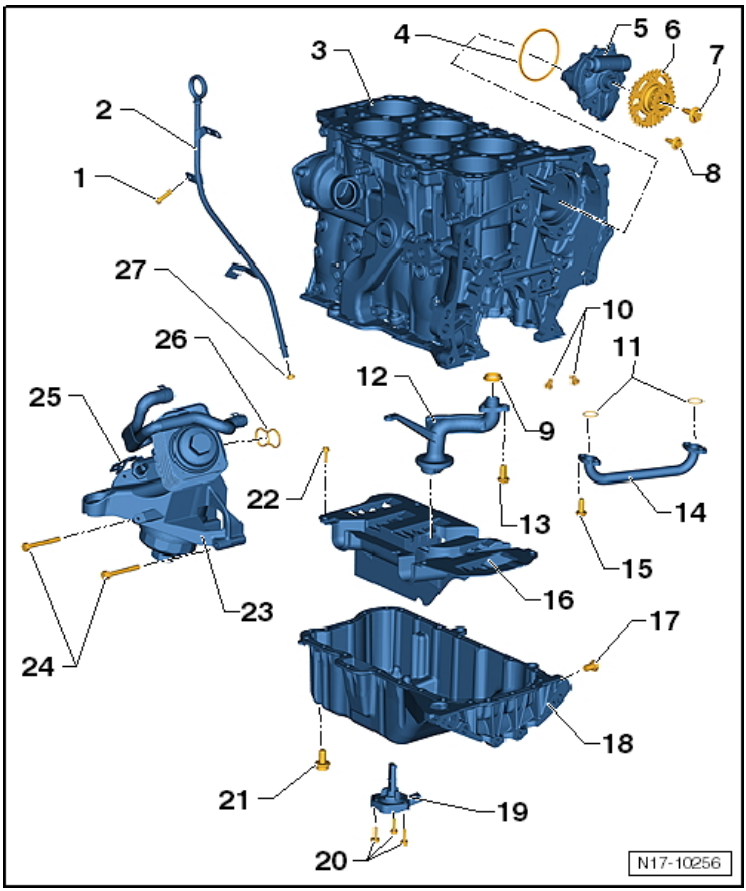
Cylinder Head Cover Tightening Specification



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

Lubrication – 3.6L CGRA

Oil Pan, Pump and Filter Bracket Overview



1 - Bolt
- ☐ 6 Nm

2 - Guide Tube

3 - Cylinder Block

4 - O-ring
- ☐ Always replace

5 - Oil Pump

6 - Sprocket

7 - Bolt
- ☐ 60 Nm + 90° turn
- ☐ Always replace

8 - Bolt
- ☐ 8 Nm
- ☐ Install using liquid locking fluid -D 000 600 A2-

9 - Seal
- ☐ Always replace

10 - Oil Spray Jet

11 - Seal
- ☐ Lubricate before installing

12 - Suction Pipe

13 - Bolt
- ☐ 8 Nm
- ☐ Install using liquid locking fluid -D 000 600 A2-.

14 - Oil Pipe

15 - Bolt
- ☐ 8 Nm
- ☐ Install using liquid locking fluid -D 000 600 A2-.

16 - Baffle Plate

17 - Oil Drain Plug
- ☐ 30 Nm
- ☐ Always replace.

18 - Oil Pan

19 - Oil Level Thermal Sensor -G266-

20 - Bolt
- ☐ 10 Nm

21 - Bolt
- ☐ 12 Nm

22 - Bolt
- ☐ 10 Nm

23 - Oil Filter Housing/Left Engine Mount Bracket

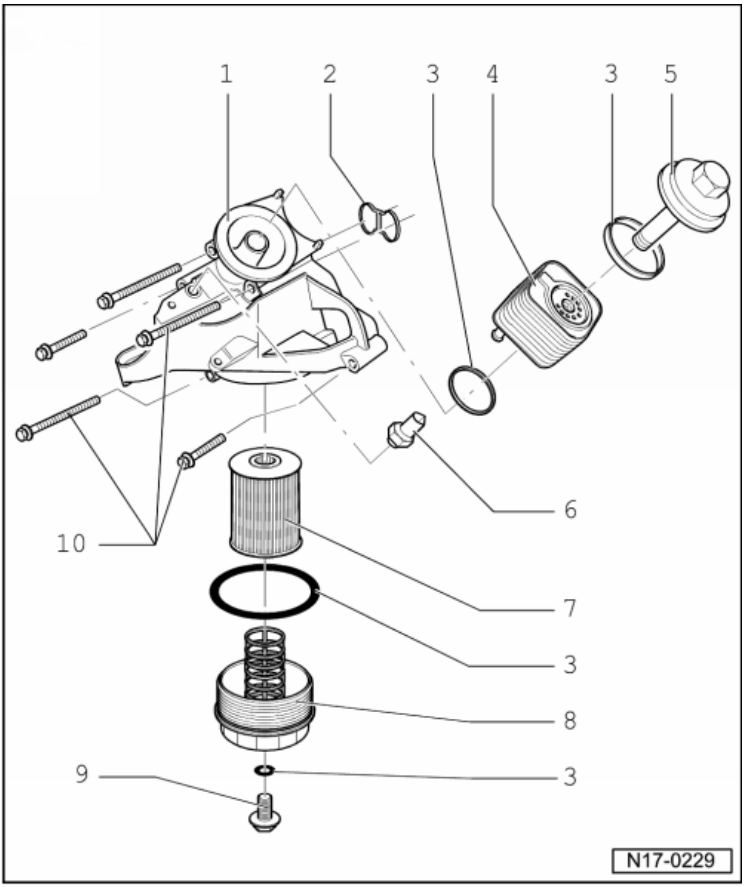
24 - Bolt
- ☐ 23 Nm

25 - Oil Pressure Switch

26 - Seal
- ☐ Always replace

27 - Seal
- ☐ Always replace

Oil Filter Housing Overview



1 - Oil Filter Housing/Left Engine Mount Bracket
2 - Seal
- ☐ Always replace, lubricate before installing

3 - Gasket
- ☐ Always replace, lubricate before installing

4 - Oil Cooler
5 - Cover
- ☐ 25 Nm

6 - Oil Pressure Switch -F1-
- ☐ 20 Nm

7 - Oil Filter Element
8 - Filter Housing
- ☐ 25 Nm

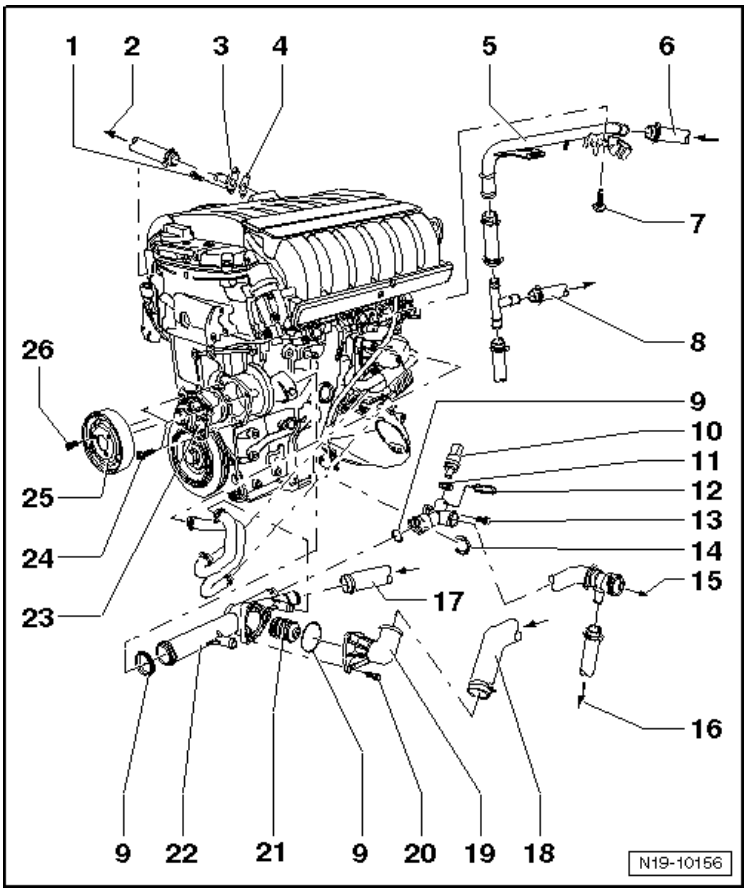
9 - Oil Drain Plug
- ☐ 10 Nm

10 - Bolt

- ☐ 23 Nm
- ☐ Replace

Cooling System – 3.6L CGRA

Coolant Pump and Thermostat Overview



1 - Bolt
- ☐ 10 Nm

2 - To Recirculation Pump/Expansion Tank Connection
3 - Water Connection
4 - Gasket
- ☐ Always replace

5 - Coolant Line
6 - From Expansion Tank Lower Connection
7 - Bolt
- ☐ 60 Nm

8 - From Generator
9 - Seal
- ☐ Always replace

10 - Engine Coolant Temperature Sensor -G62-

11 - O-ring
- ☐ Always replace

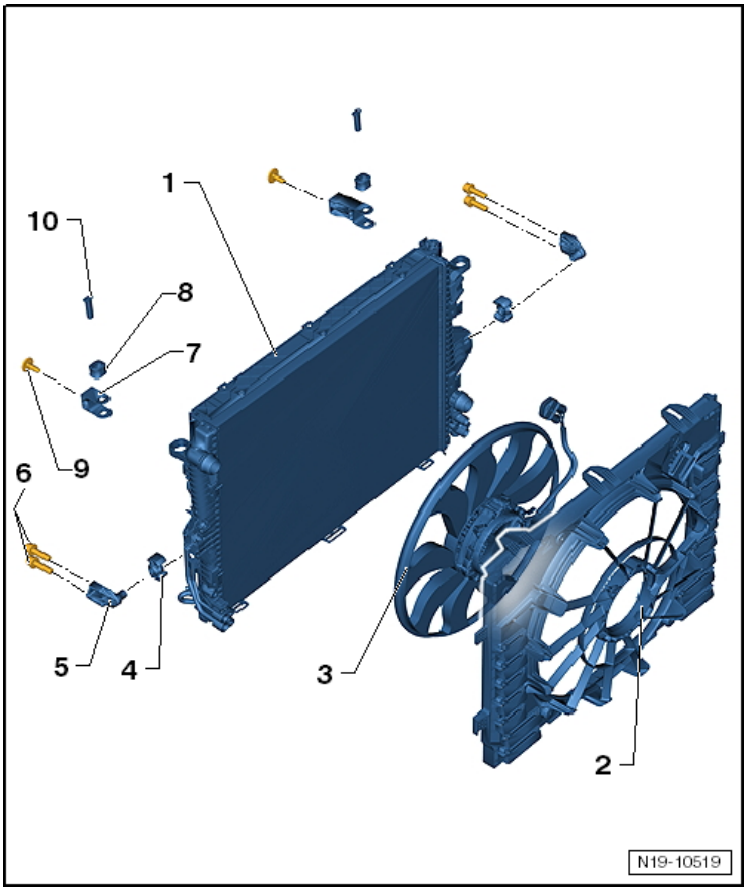
12 - Retaining Clip
13 - Bolt
- ☐ 10 Nm

14 - Retaining Clip
15 - To Radiator Upper Connection
16 - To Expansion Tank Upper Connection
17 - From Heater Core
18 - From Front Coolant Pipe
19 - Cover
20 - Bolt
- ☐ 8 Nm

21 - Coolant Thermostat
22 - Thermostat Housing
23 - Coolant Pump
24 - Bolt
- ☐ 8 Nm

25 - Pulley
26 - Bolt
- ☐ 20 Nm

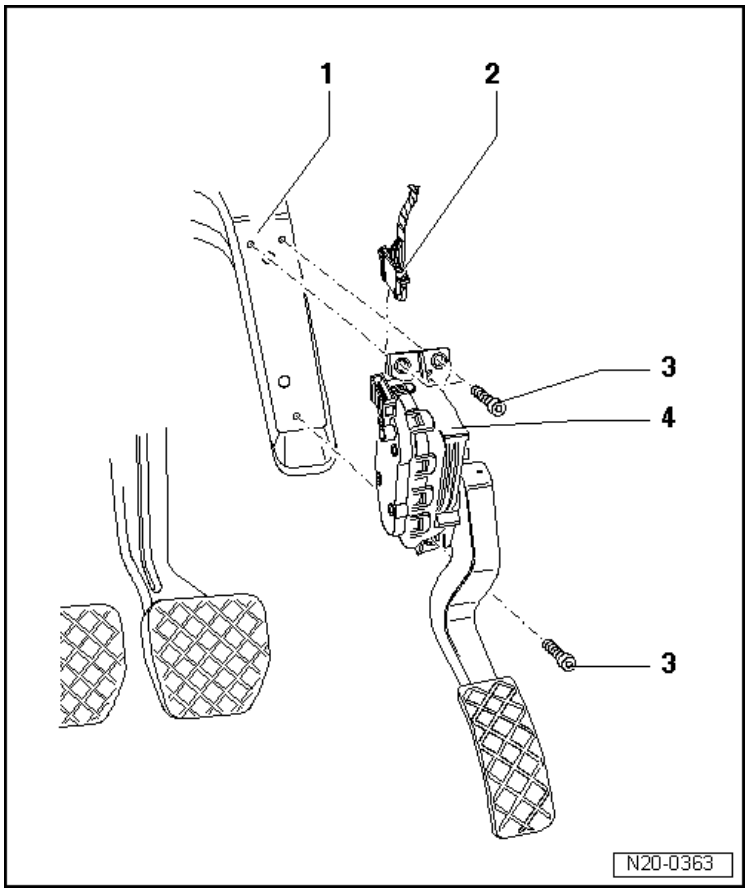
Fan Shroud and Radiator Overview



1 - Radiator
2 - Fan Shroud
3 - Coolant Fan -V7-
4 - Rubber Bushing
5 - Lower Radiator Mount
6 - Bolts
☐ 25 Nm
7 - Upper Radiator Mount
8 - Rubber Bushing
9 - Bolt
☐ 5 Nm
10 - Locking Bolt

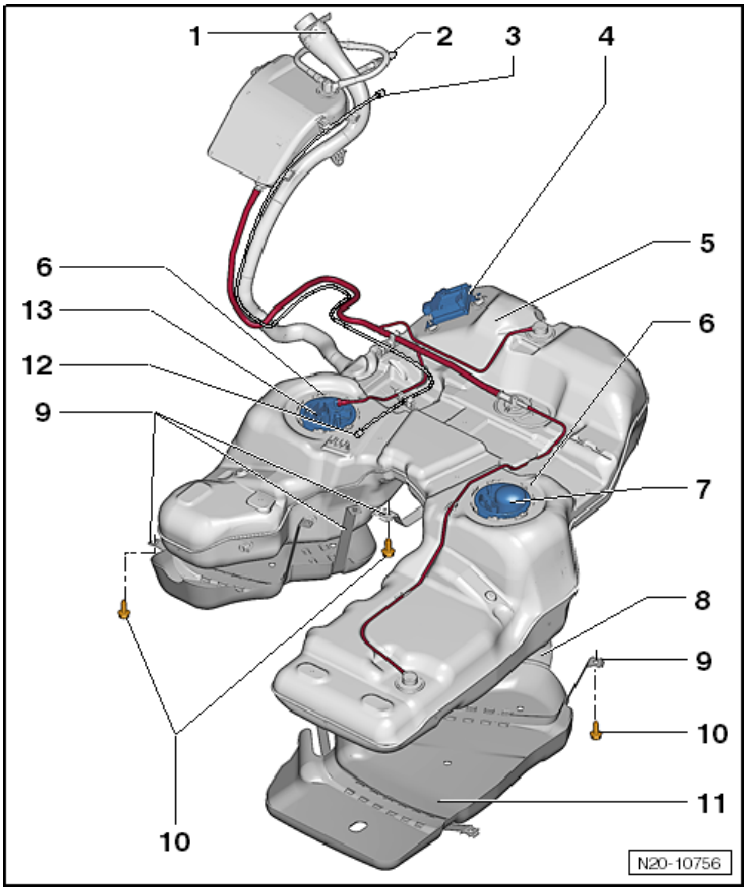
Fuel Supply – 3.6L CGRA

Accelerator Pedal Overview



1 - Bracket
2 - Connector
3 - Bolt
☐ 5 Nm
4 - Accelerator Pedal Position Sensor -G79- with Accelerator Pedal Position Sensor 2 -G185-

Fuel Tank and Attachments Overview



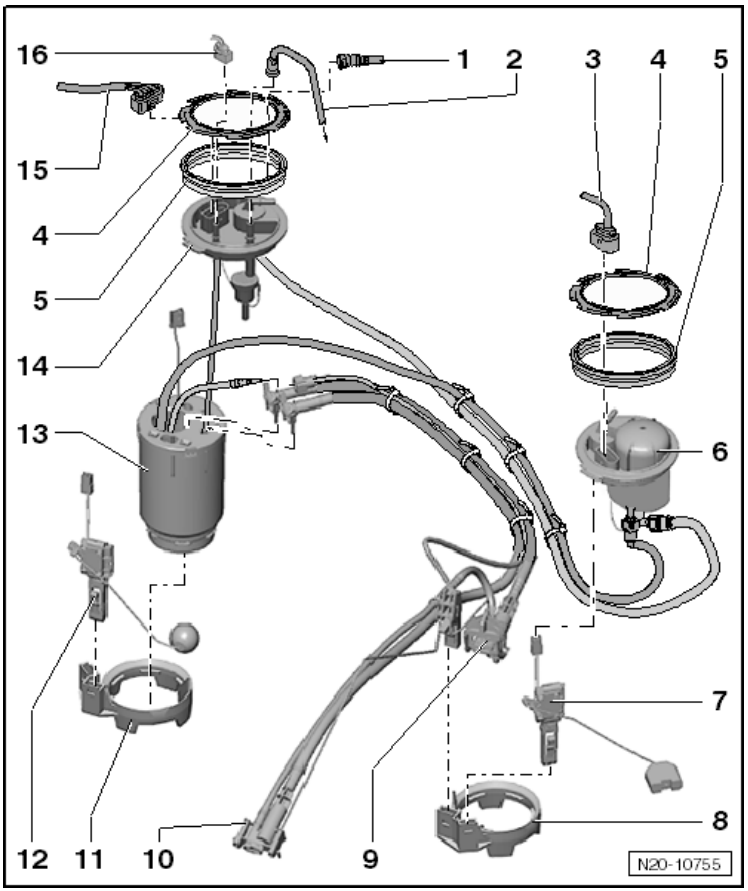
1 - Fuel Filler Tube
- ☐ Tighten the bolts to the body to 9 Nm

2 - Vent Line
3 - Vent Line
4 - Fuel Pump Control Module -J538-
5 - Fuel Tank
6 - Lock Ring
- ☐ 145 Nm

7 - Fuel Filter
8 - Heat Shield
9 - Securing Strap
10 - Bolt
- ☐ 33 Nm

11 - Protective Cover
12 - Line Coupling
13 - Fuel Delivery Unit

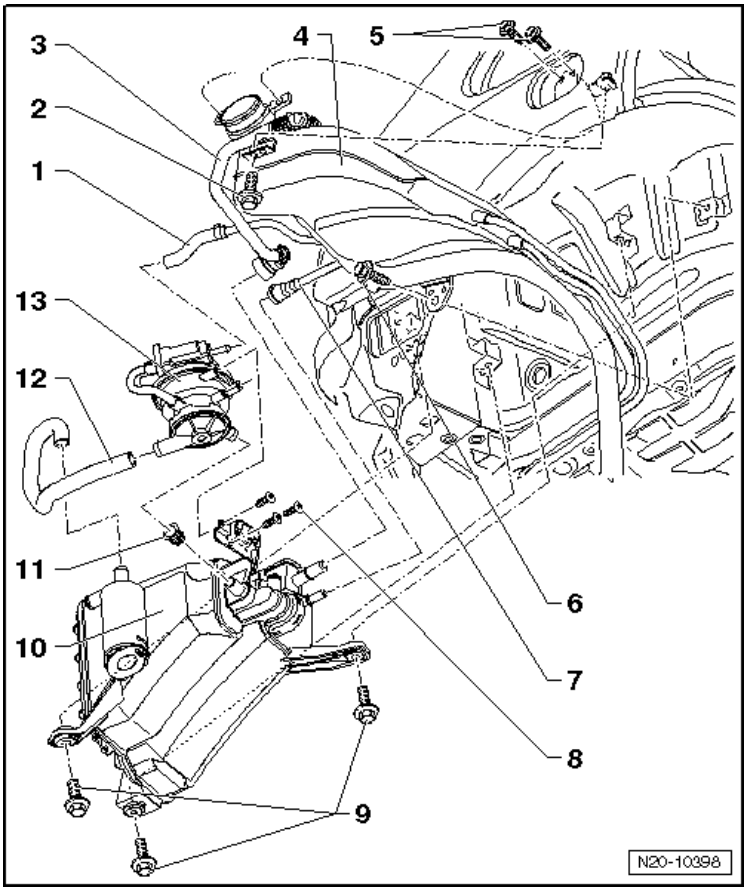
Fuel Delivery Unit, Fuel Level Sensor, Suction Jet Pumps Overview



1 - Vent Line
2 - Fuel Supply Line
3 - Connector
4 - Lock Ring
☐ 145 Nm
5 - Seal
☐ Always replace
6 - Fuel Filter
7 - Fuel Level Sensor 2 -G169-
8 - Retaining Ring
9 - Suction Jet Pump
10 - Suction Jet Pump
11 - Retaining Ring
12 - Fuel Level Sensor -G-
13 - Fuel Delivery Unit
14 - Flange

15 - Connector
16 - Connector

Evaporative Emissions (EVAP) System Overview



1 - Vacuum Line
2 - Bolt
- ☐ 9 Nm

3 - Vent Line
4 - Fuel Filler Tube
5 - Bolt
- ☐ 5 Nm

6 - Bolt
- ☐ 9 Nm

7 - Vent Line
8 - Bolt
- ☐ 5 Nm

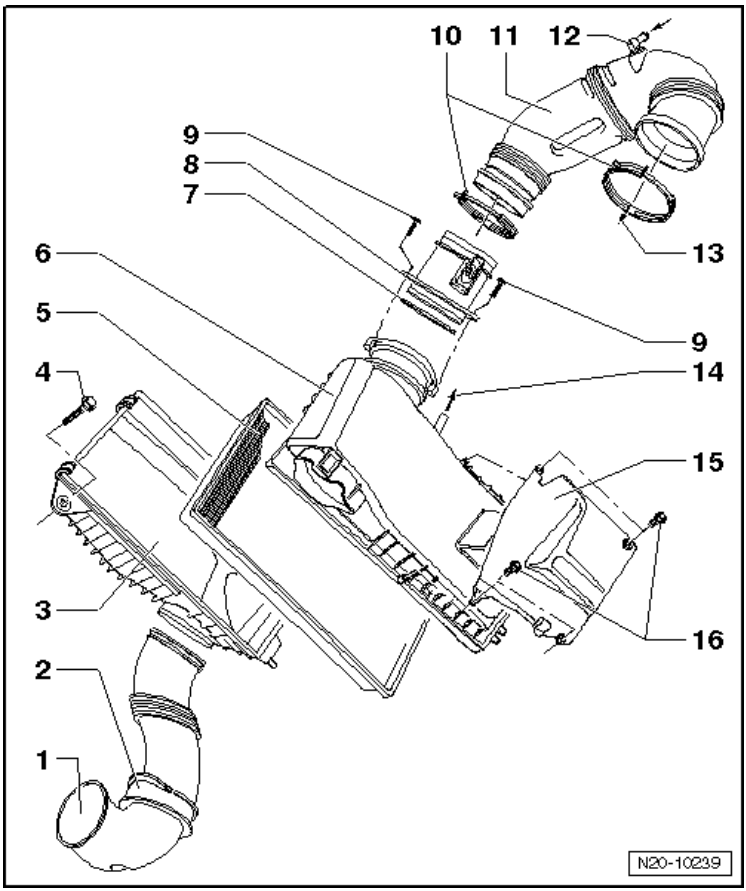
9 - Bolt
- ☐ 9 Nm

10 - Evaporative Emission (EVAP) Canister

11 - Rubber Bushing
12 - Connecting Hose
13 - Leak Detection Pump -V144-

Multiport Fuel Injection – 3.6L CGRA

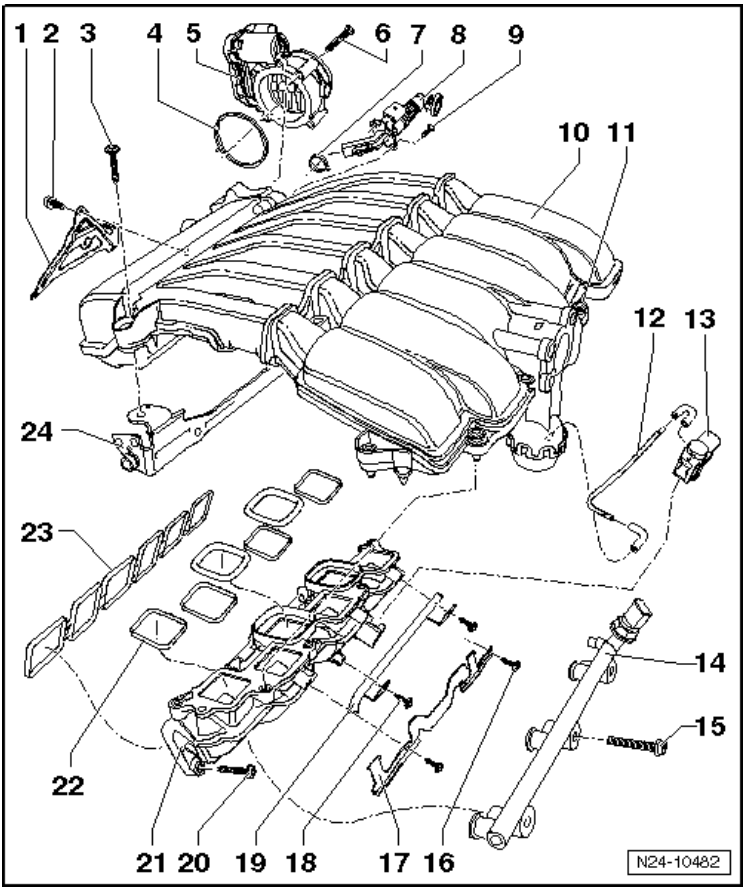
Air Filter Housing Overview



1 - Air Duct
2 - Protective Grommet
3 - Lower Air Filter Housing
4 - Bolt
☐ 10 Nm
5 - Air Filter Element
6 - Upper Air Filter Housing
7 - Seal
8 - Mass Airflow (MAF) Sensor -G70-
9 - Bolt
☐ 6 Nm
10 - Spring Type Clip
11 - Connecting Pipe
12 - Vacuum Line Bracket

13 - To Throttle Valve Control Module -J338-
14 - To Compressor for Air Suspension
15 - Heat Shield
16 - Bolt
- ☐ 6 Nm

Intake Manifold Overview



1 - Intake Manifold Support
2 - Bolt
- ☐ 20 Nm

3 - Bolt
- ☐ 10 Nm

4 - Gasket
- ☐ Always replace

5 - Throttle Valve Control Module -J338-
6 - Bolt
- ☐ 7 Nm

7 - Gasket
- ☐ Always replace

8 - Vent Hose
9 - Bolt
- ☐ 3.5 Nm

10 - Upper Intake Manifold

11 - Bolt
- ☐ 10 Nm

12 - Vacuum Line
13 - Intake Manifold Runner Control Valve -N316-
14 - Fuel Rail
15 - Bolt
- ☐ 30 Nm + 90° turn
- ☐ Always replace.
- ☐ Tighten uniformly, starting from the inside and working toward the outside.

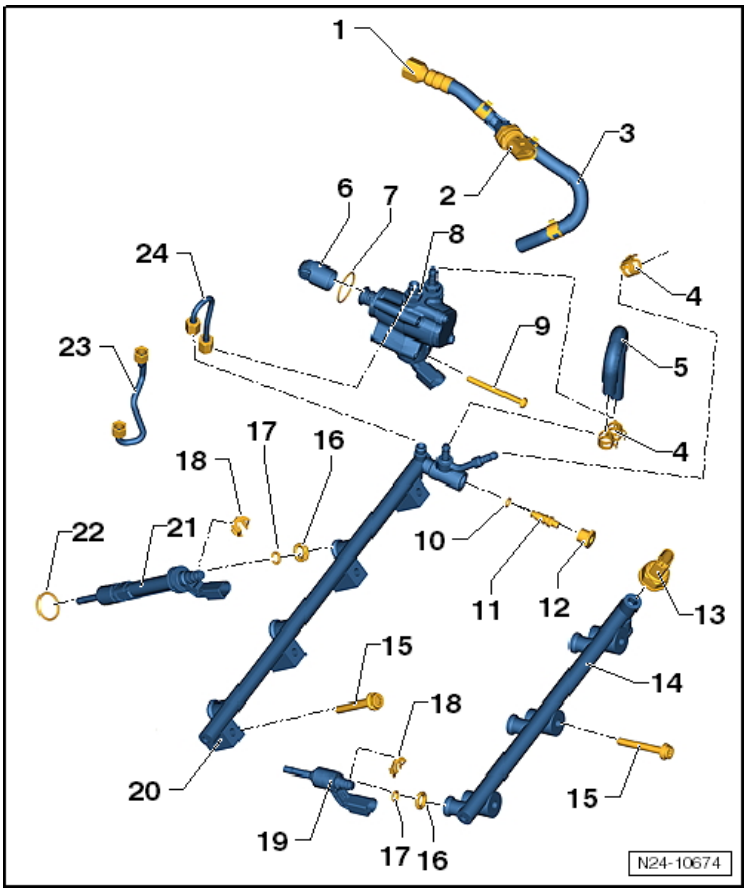
16 - Bolt
- ☐ 3.5 Nm

17 - Mounting Plate
18 - Bolt
- ☐ 3.5 Nm

19 - Coolant Line
20 - Bolt
- ☐ 8 Nm

21 - Lower Intake Manifold
22 - Gasket
23 - Gasket
24 - Intake Manifold Support

Fuel Rail with High Pressure Pump and Injectors Overview



1 - Fitting
- ☐ 30 Nm

2 - Low Fuel Pressure Sensor -G410-
- ☐ 15 Nm

3 - Fuel Supply Hose

4 - Spring Clamps

5 - Low Pressure Fuel Hose

6 - Cam Follower

7 - Seal
- ☐ Always replace
- ☐ Before installing, lubricate with clean engine oil.

8 - High Pressure Pump
- ☐ Connection for high pressure line: 40 Nm.
- ☐ Connection for low pressure hose: 28 Nm.

9 - Bolt
- ☐ 8 Nm

10 - O-ring
- ☐ Lightly coat the O-ring with clean engine oil before installing.

11 - Pressure Relief Valve

12 - Plug
- ☐ 22 Nm

13 - Fuel Pressure Sensor -G247-
- ☐ 22 Nm

14 - Fuel Rail

15 - Bolt
- ☐ 30 Nm + 90° turn
- ☐ Always replace
- ☐ Tighten uniformly, starting from the inside and working toward the outside.

16 - O-ring
- ☐ Lightly coat the O-ring with clean engine oil before installing.

17 - Support Washer

18 - Spring
- ☐ Replace for every removal of the fuel rail.

19 - Cylinder 2 Fuel Injector -N31-

20 - Fuel Rail

21 - Cylinder 1 Fuel Injector -N30-

22 - Seal

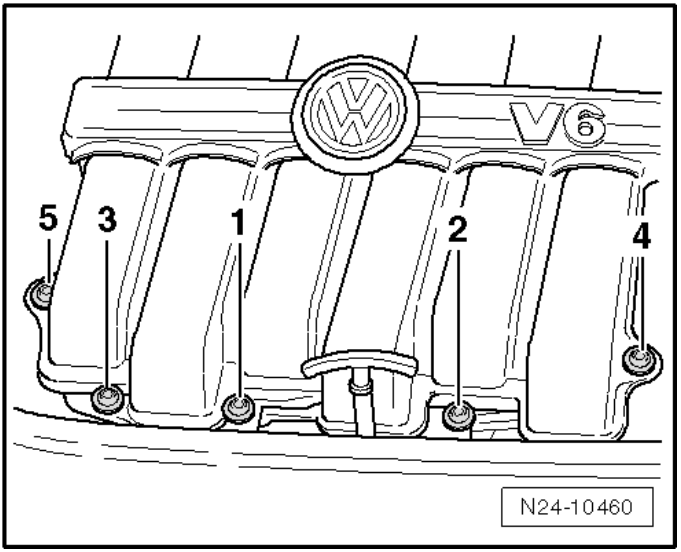
23 - High Pressure Fuel Pipe
- ☐ 28 Nm

24 - Connecting Pipe
- ☐ 28 Nm

Technical Data

Engine codes	CGRA
Idle check	
Engine idle speed	600 to 800 RPM
Engine Control Module (ECM)	
System designation	Motronic MED 17
Part number	Refer to the Electronic Parts Catalog (ETKA)
Engine speed limitation	Approximately 6200 RPM

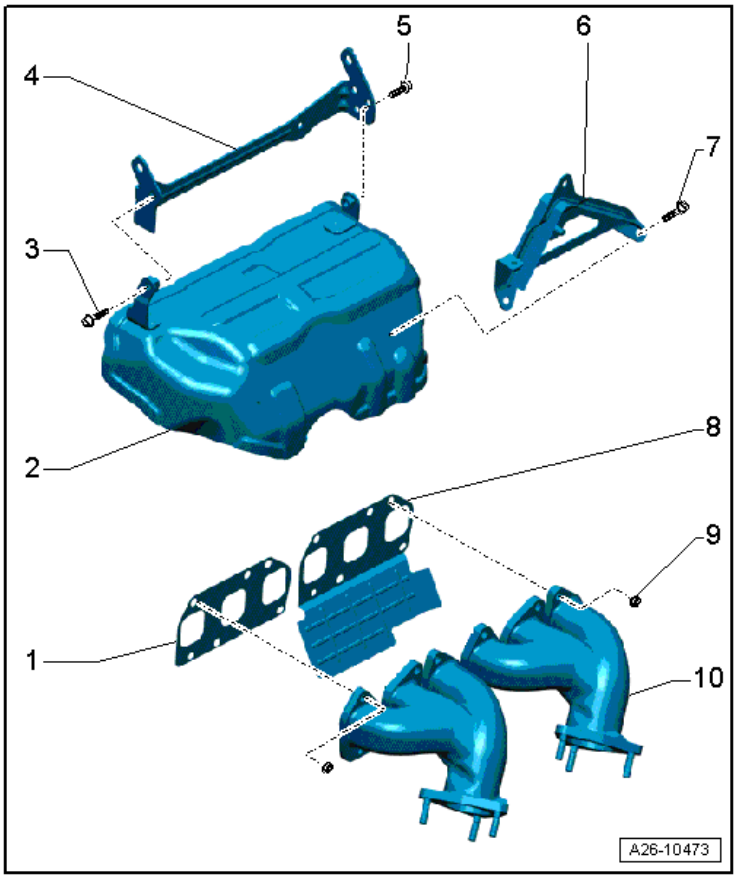
Upper Intake Manifold to Lower Intake Manifold Tightening Specification



Step	Component	Nm
1	Tighten bolts 1 through 5 in sequence	10

Exhaust System, Emission Controls – 3.6L CGRA

Exhaust Manifold Overview



1 - Gasket
- ☐ Always replace

2 - Heat Shield

3 - Bolt
- ☐ 20 Nm

4 - Intake Manifold Support

5 - Bolt
- ☐ 20 Nm

6 - Intake Manifold Support

7 - Bolt
- ☐ 20 Nm

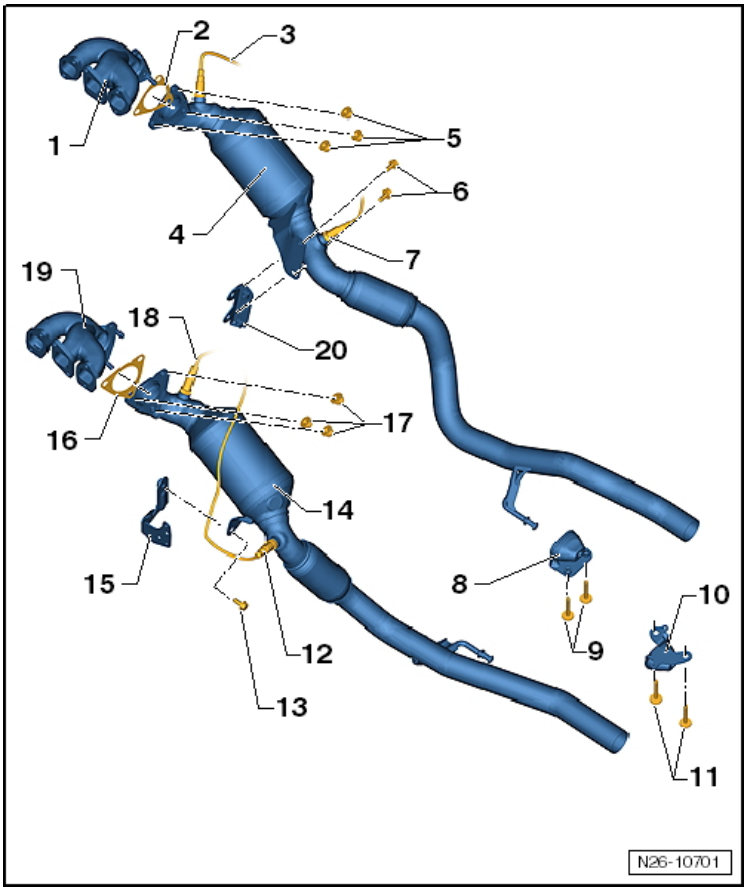
8 - Gasket
- ☐ Always replace

9 - Nut

- ☐ 23 Nm
- ☐ Always replace

10 - Exhaust Manifold

Exhaust Pipe with Catalytic Converter Overview



1 - Bolt
- ☐ 23 Nm

2 - Low Fuel Pressure Sensor -G410-t
- ☐ 15 Nm

3 - Suspended Mount

4 - Bolt
- ☐ 23 Nm

5 - Suspended Mount

6 - Nuts
- ☐ 23 Nm

7 - Clamping Sleeve
- ☐ Always replace

8 -Nuts
- ☐ 35 Nm

9 - Clamping Sleeve
- ☐ Always replace

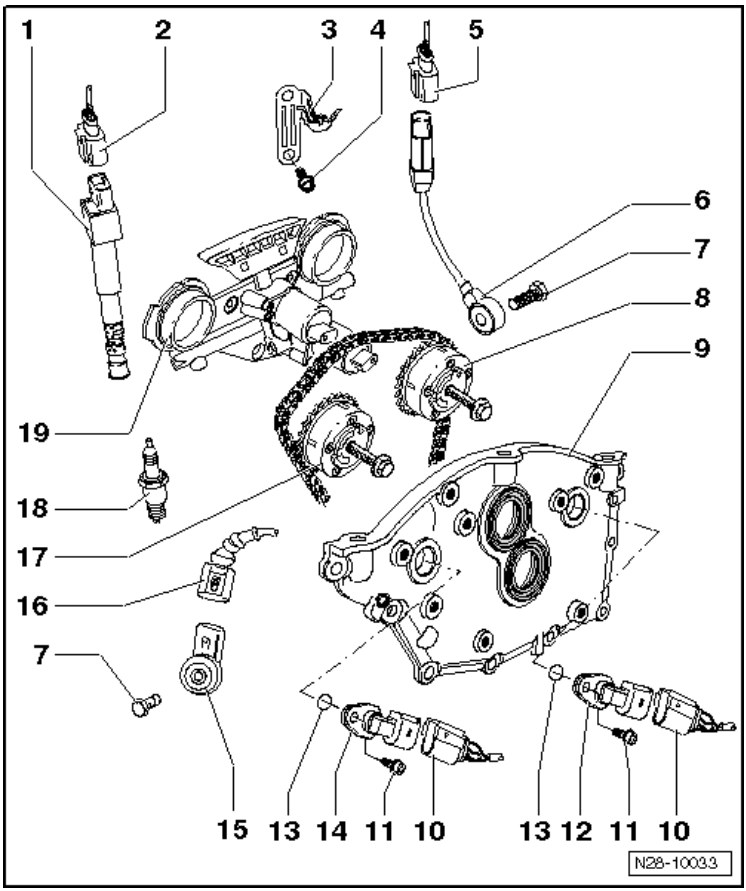
10 - Center Muffler

11 - Suspended Mount
12 - Bolt
- ☐ 23 Nm

13 - Tailpipe
14 - Rear Muffler
15 - Tailpipe

Ignition – 3.6L CGRA

Ignition System Component Overview



1 - Ignition Coil with Power Output Stage -N70, N127, N291, N292, N323, N324-
2 - Connector
3 - Bracket
4 - Bolt
☐ 20 Nm
5 - Connector
6 - Knock Sensor (KS) 1 -G61-
7 - Bolt
☐ 20 Nm
8 - Exhaust Camshaft Adjuster
9 - Cover
10 - Connector
11 - Bolt
☐ 10 Nm

12 - Camshaft Position (CMP) Sensor 2 -G163-
13 - Seal
- ☐ Always replace

14 - Camshaft Position (CMP) Sensor -G40-
15 - Knock Sensor (KS) 2 -G66-
16 - Connector
17 - Intake Camshaft Adjuster
18 - Spark Plug
- ☐ 18 Nm

19 - Control Housing

Technical Data

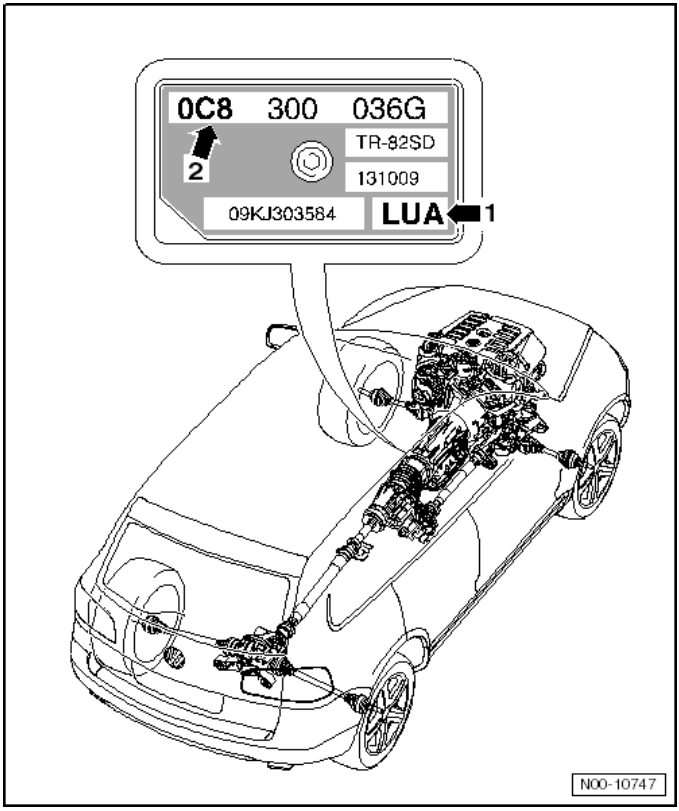
Engine code	**CGRA**
Ignition sequence	1-5-3-6-2-4
Spark plugs [1)]	
VW/Audi	101 905 622
Electrode gap	0.8 to 0.9 mm
Tightening specification	18 Nm
Change intervals	Refer to Maintenance Intervals Rep. Gr. 03

[1)] Remove and install spark plugs using the spark plug removal tool (3122 B).

AUTOMATIC TRANSMISSION – 0C8

General, Technical Data

Transmission Identification



Transmission code letters are located on the type plate on the bottom left side of the transmission.

Example:
1 - Code Letters
2 - Automatic Transmission 0C8

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

Code Letters and Transmission Allocations
Vehicles with a Hybrid Engine

Engine	Transmission code
3.0L - 245 kW V6	LUA, MXP, NNP

Vehicles with a Gas Engine

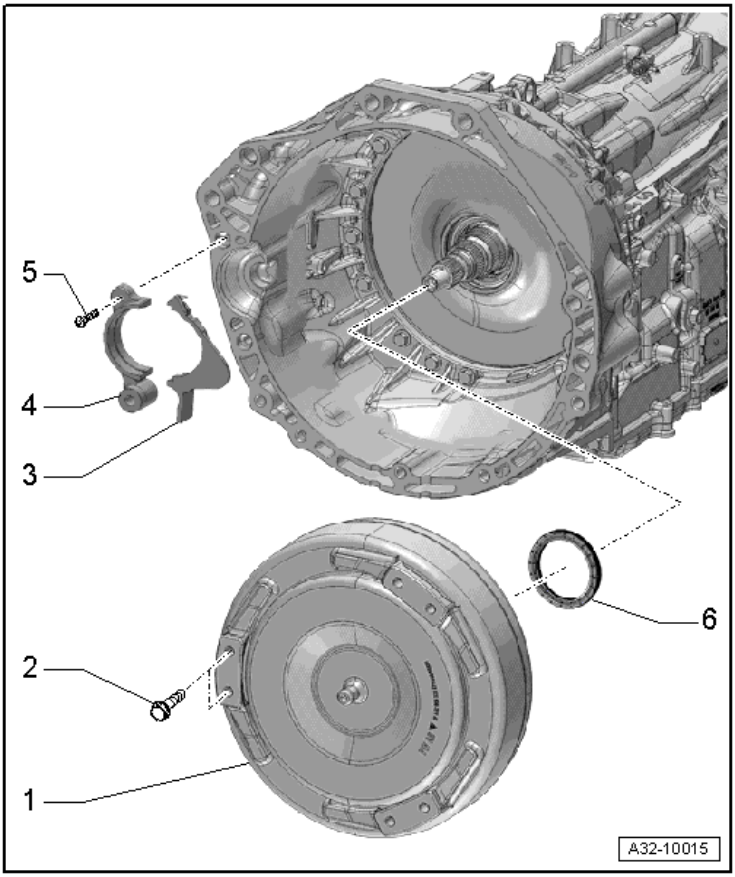
Engine	Transmission code
3.6L - 206 kW VR6	LSK

Vehicles with a Diesel Engine

Engine	Transmission code
3.0L - 165 kW V6	MHC, NAB

Torque Converter

Torque Converter Overview



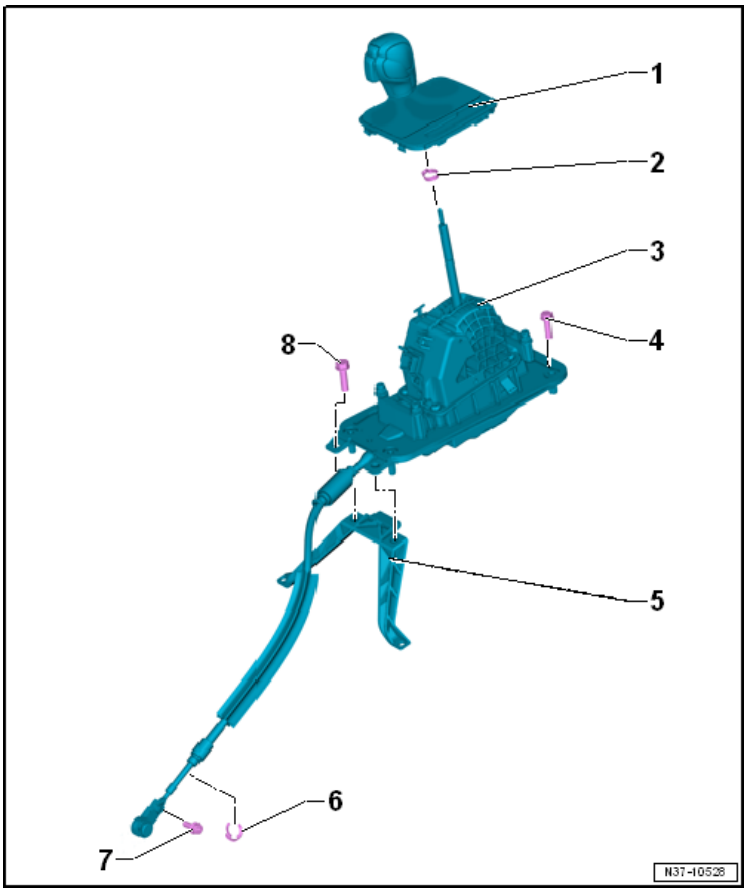
1 - Torque Converter
2 - Bolt
- ☐ 85 Nm

3 - Cover
4 - Flange
5 - Bolt
- ☐ 20 Nm

6 - Seal

Controls, Housing – 0C8

Selector Mechanism Overview



1 - Handle with Shift Cover
2 - Clamp
3 - Selector Mechanism with Shift Housing and Selector Lever Cable
4 - Bolt
- ☐ 10 Nm

5 - Centering Bracket
- ☐ Is not installed again after being removed

6 - Lock Washer
- ☐ Always replace after removing

7 - Bolt
- ☐ 12 Nm

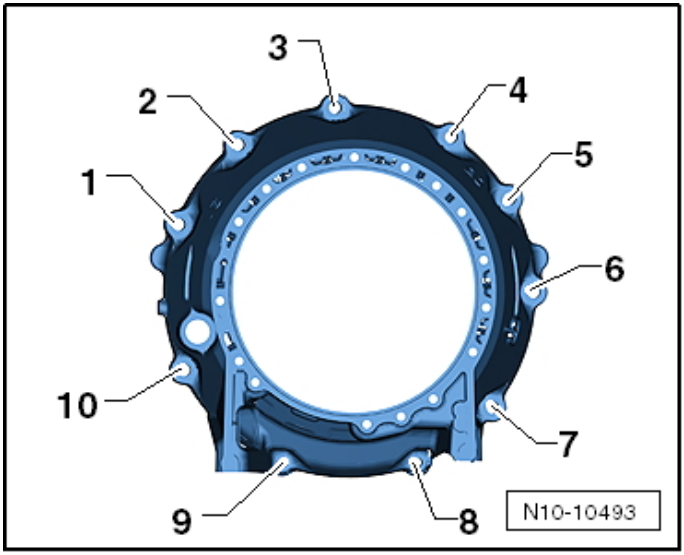
8 - Bolt
- ☐ Are not installed again after being removed

Fastener Tightening Specifications

Component	Nm
Catalytic converter bracket-to-transmission bolt [3]	20
Selector housing-to-body bolt	10
Selector housing-to-bracket bolt	6.5
Selector lever cable set screw	10
Selector lever sensor system control module with Tiptronic switch-to-selector mechanism screw	6.5
Selector mechanism-to-body/selector housing bolt	6.5
Torque converter-to-drive plate bolt [2]	60
Transmission fluid pipe-to-automatic transmission bolt [1]	20
Transmission fluid pipe-to-automatic transmission fluid pre-heater bolt [1]	8
Transmission fluid auxiliary hydraulic pump-to-transmission bolt [2]	32
Transmission fluid pipe clamp-to-automatic transmission bolt	20
Transmission fluid pipe clamp-to-catalytic converter bracket bolt [3]	8
Transmission fluid pipe heat shield bolt [3]	8
Transmission fluid pipe-to-thermostat bolt [1]	20
Transmission fluid pre-heater-to-automatic transmission bolt	20
Transmission oil pan drain plug	16
Transmission oil pan overflow tube	2

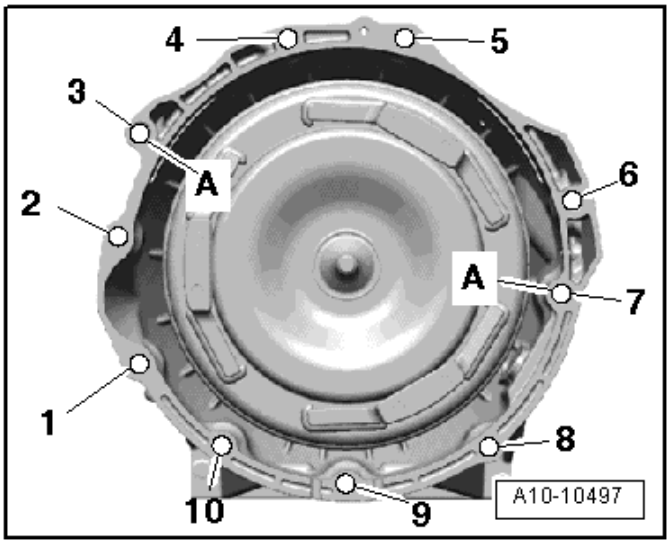
[1] Before tightening the bolt, push in the pipe by hand, until seated.
[2] 3.0L hybrid engine only.
[3] 3.6L engine only.

Securing Transmission to a 3.0L Hybrid Engine



Step	Component	Nm
1	Tighten bolts 1 through 10 in sequence	30 plus an additional 90° (¼ turn)

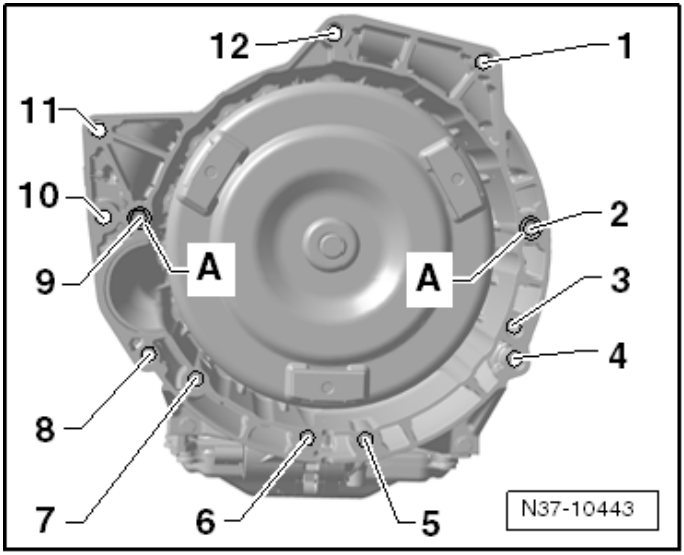
Securing Transmission to a 3.0L TDI Engine



Item	Fastener	Nm
1[1) 2)]	M10 x 70	65
2 [1)]	M10 x 90	65
3, 4, 5 and 7	M12 x 80	80
6	M12 x 70	80
8, 9 and 10 [2)]	M10 x 70	45
A	Alignment sleeves	
Torque converter drive plate		85

1) Also secures the starter.
2) Installed from the engine side.

Securing Transmission to a 3.6L Engine



Item	Fastener	Nm
1 and 12	M12 x 50	80
2 and 3	M12 x 140	80
4, 5, 6 and 7 [2]	M10 x 80	45
8 and 9 [1] [2]	M12 x 60	80
11	M12 x 60	80
A	Alignment sleeves	
Torque converter drive plate		85

[1] Also secures the starter.
[2] Installed from the engine side.

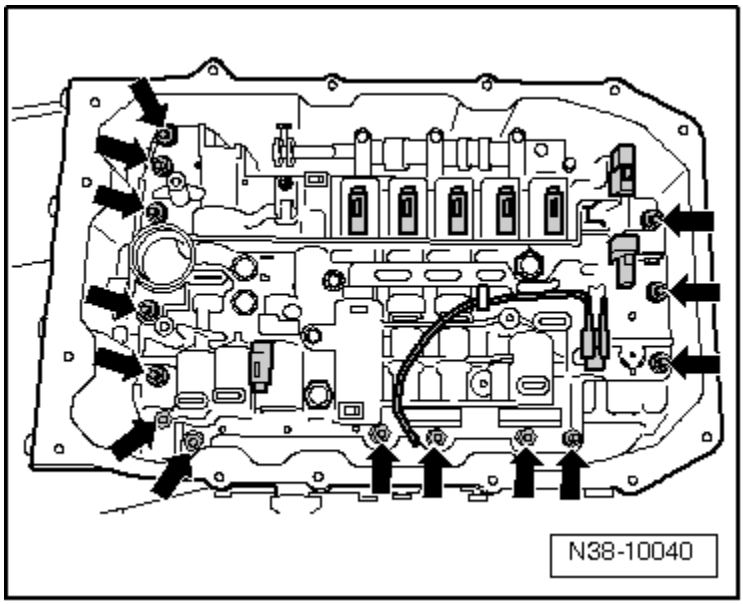
NOTE: Position 10 does not have a bolt

Fastener Tightening Specifications

Component	Nm
Overflow tube-to-transmission fluid pan	2
Transmission fluid filter-to-valve body/transmission bolt	10
Transmission fluid pan drain plug	8
Transmission fluid pan-to-transmission bolt	8
Valve body-to-transmission bolt [1]	8 plus an additional 90° (¼ turn)

[1] Tighten the bolts diagonally.

Valve Body Tightening Specifications

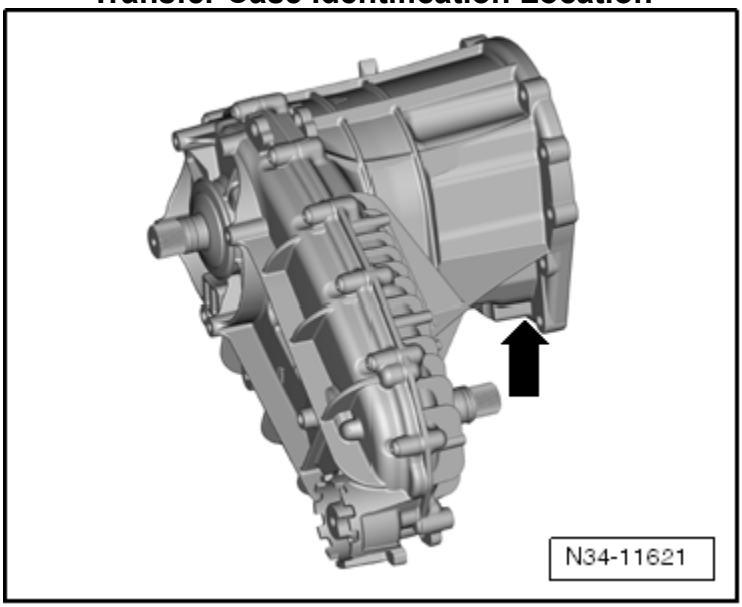


Step	Component	Nm
1	Tighten bolts (➡) diagonally	Hand-tighten
2	Tighten bolts (➡) diagonally	8
3	Tighten bolts (➡) diagonally	an additional 90° (¼ turn)

TRANSFER CASE AND FINAL DRIVE

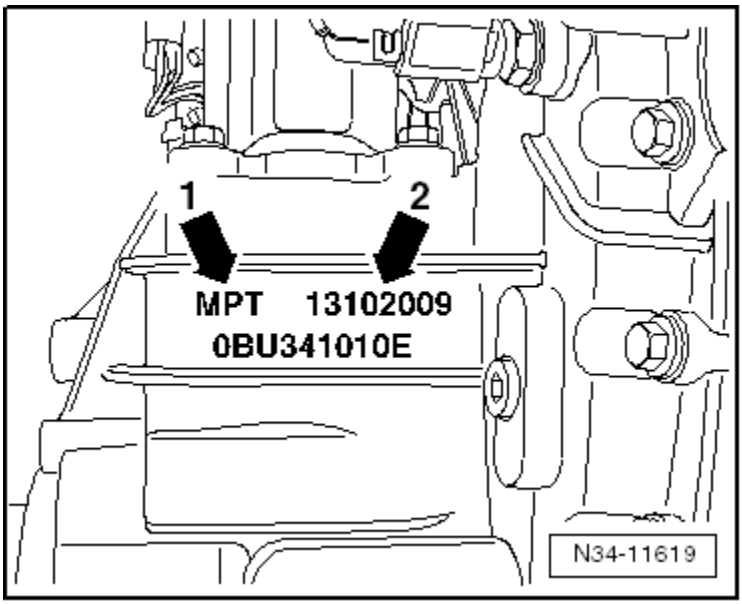
General, Technical Data

Transfer Case Identification Location



Transfer case 0BU or 0BV, code letters and dates of manufacture (➡).

Transfer Case Identification



1- Transfer case code letters.
2- Transfer case build date.

Example:

MPT	13	10	2009
Code letters	Day	Month	Year (2009) of manufacture

Transfer Case Code Letter, Allocation and Capacities

Transfer case		0BU	
Identification codes		MTT, NCF and NDZ	LER, MTK, MTJ, MZV, NCA, NCB and NMU
Allocation	Type	Touareg from MY 2010	Touareg from MY 2010
Engine		3.0L - 245 KW V6 Hybrid	3.0L - 165 kW Turbo Diesel
Capacity		Refer to Fluid Capacity Tables Rep. Gr. 03	

Transfer Case		0BU	0BV
Identification codes		MTK, NCB, NMV	MEH
Allocation	Type	Touareg from MY 2010	Touareg from MY 2010
Engine		3.6L - 206 kW VR6 Gas	3.6L - 206 kW VR6 Gas
Capacity		Refer to Fluid Capacity Tables Rep. Gr. 03	

Refer to the Electronic Parts Catalog (ETKA) for the following data:
- Allocation for the proper vehicle via the code letters on the automatic transmission and PR number.
- Transmission fluid specification.

Controls, Housing

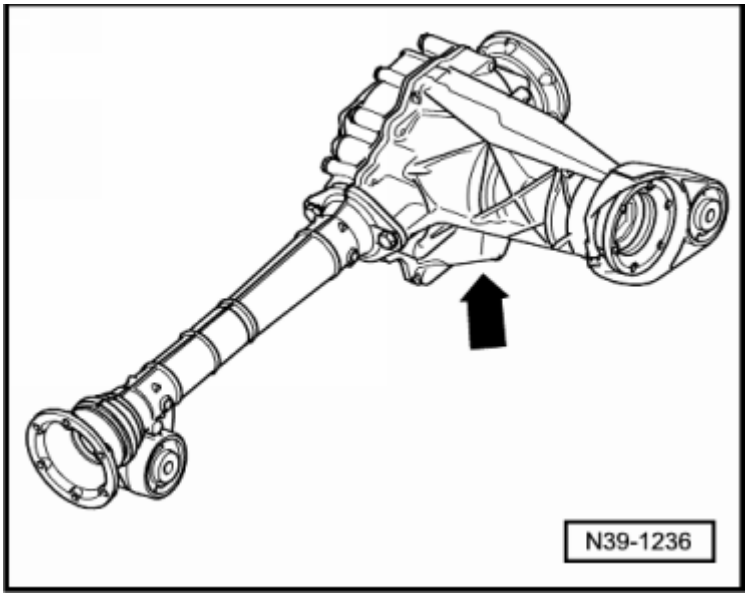
Fastener Tightening Specifications

Component	Fastener size	Nm
Balance weight-to-transfer case bolt	-	50
Transfer case drain/fill plug [2]	-	17
Transfer case carrier bracket-to-transfer case bolt	M8 x 35	20
	M8 x 70	20
Transfer case carrier bracket-to-transfer case carrier bolt [1]	-	50 plus an additional 90° (¼ turn)
Transfer case carrier-to-underbody bolt [1]	M10 x 80	50 plus an additional 90° (¼ turn)
Transfer case end balancer-to-transfer case bolt	-	32
Transfer case-to-transmission bolt	-	20 plus an additional 90° (¼ turn)

[1] Replace fastener(s).
[2] Install using liquid locking fluid (AMV 185 101 A1).

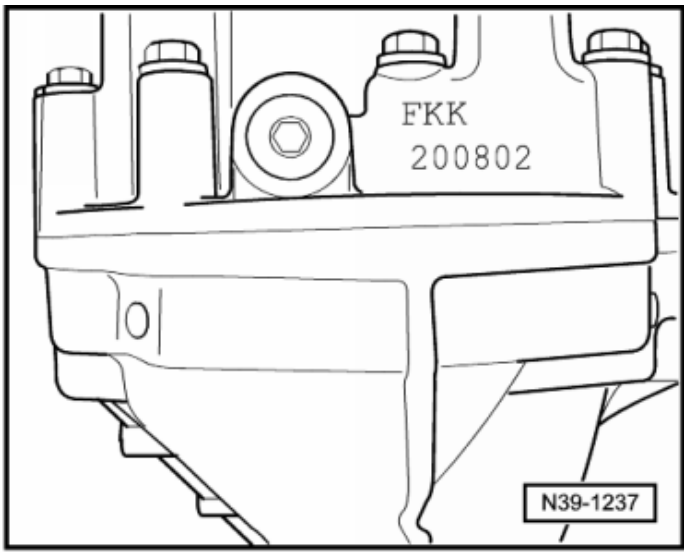
Front Final Drive – 0BM, 0C1

Front Final Drive Identification Location



Front final drive 0BM, 0C1, code letters and dates of manufacture (➡).

Front Final Drive Identification

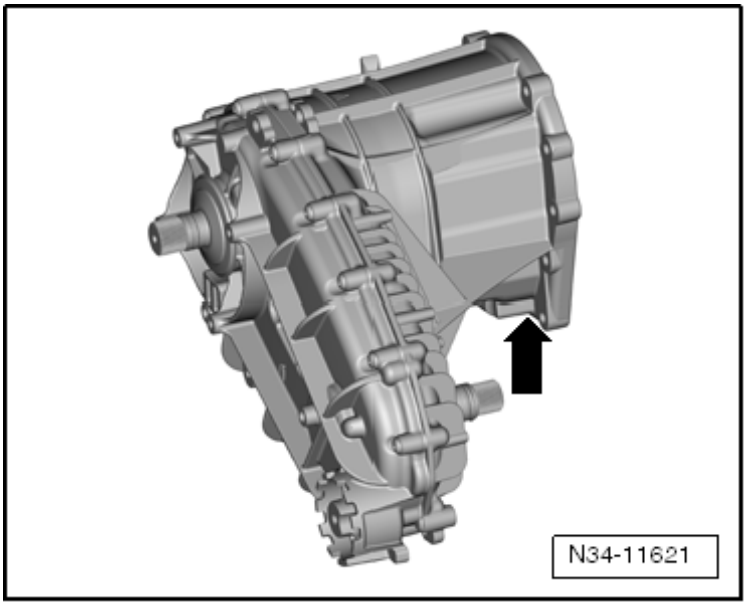


Example:

FKK	20	08	02
Identification codes	Day	Month	Year of production (2002)

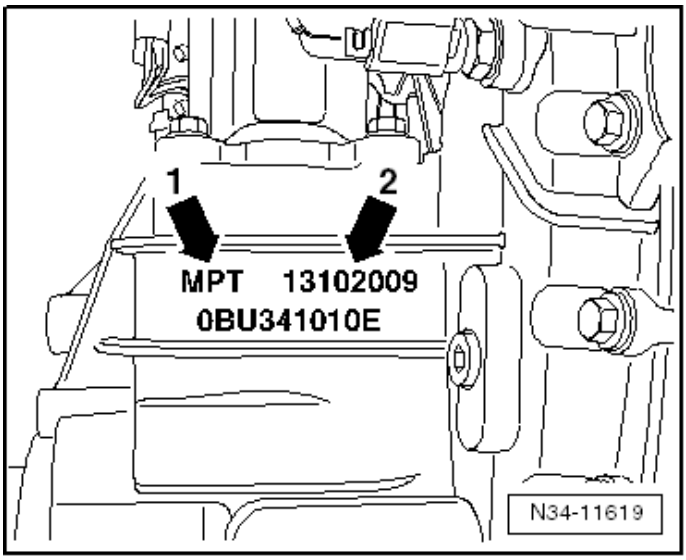
Transfer Case 0BU or 0BV

Transfer Case Identification Location



Location on transfer case (➡).

Transfer Case Identification



Example:

MPT	13	10	2009
Identification codes	Day	Month	Year of Manufacture

Front Final Drive Code Letters, Allocation, Ratios and Capacities

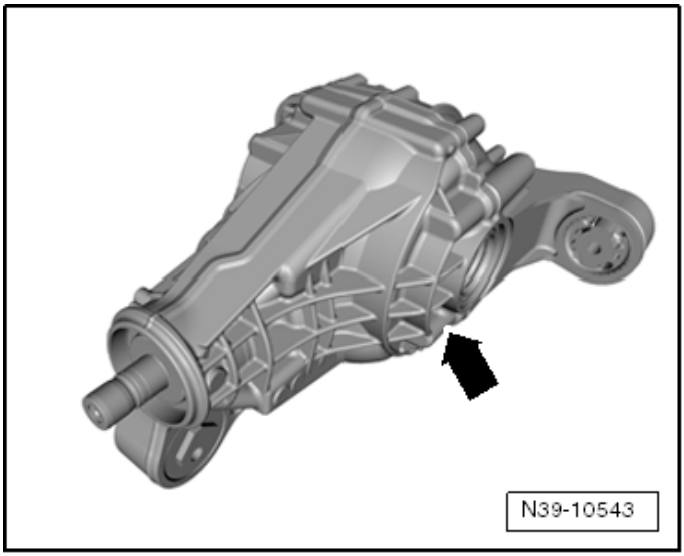
Front final drive		**0BM**	
Identification codes		MUN	MES
Allocation	Type	Touareg from MY 2010	Touareg from MY 2010
	Engine	3.0L - 245 kW V6 Hybrid	3.6L - 206 kW VR6 Gas
Ratio: Z_1: Z_2	Final drive	36:11 = 3.273	37:10 = 3.700
Capacity		Refer to the Fluid Capacity Tables Rep. Gr. 03	

Front final drive		**0BM**	**0C1**
Identification code		MUN	MUM
Allocation	Type	Touareg from MY 2010	Touareg from MY 2010
	Engine	3.0L - 165 kW Turbo Diesel	3.6L - 206 kW VR6 Gas
Ratio: Z_1: Z_2	Final drive	36:11 = 3.273	37:10 = 3.700
Capacity		Refer to the Fluid Capacity Tables Rep. Gr. 03	

Refer to the Electronic Parts Catalog (ETKA) for the following data:
- Allocation of the flange shafts.
- Vehicle allocation according to the engine code.
- Fluid specification.

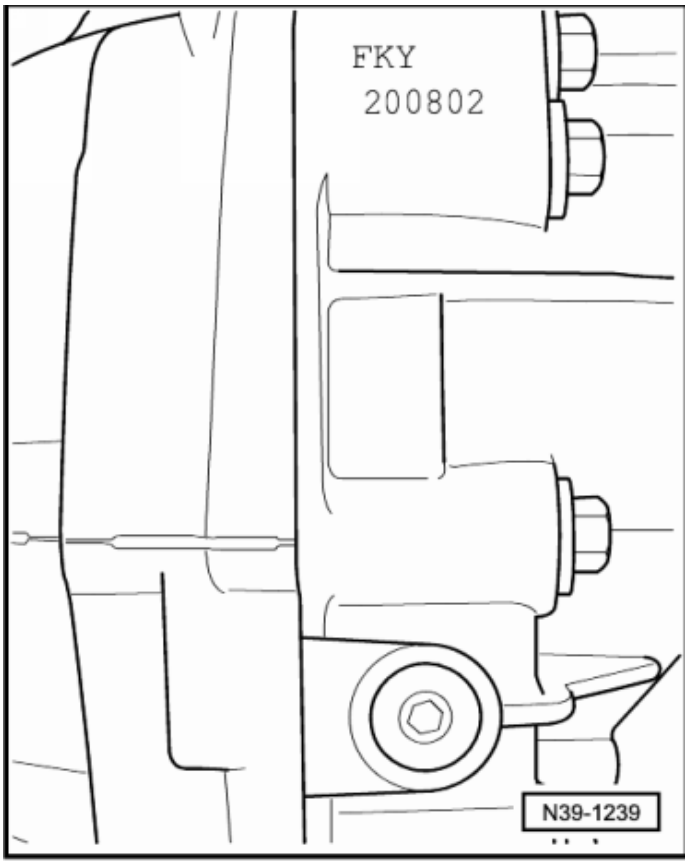
Rear Final Drive – 0BN, 0BP

Rear Final Drive Identification Location



Rear final drive 0BN, 0BP code letters and dates of manufacture (➡).

Rear Final Drive Identification



Example:

FKY	20	08	02
Identification codes	Day	Month	Year of production (2002)

Rear Final Drive Code Letters, Allocation, Ratios and Capacities

Rear final drive		**0BN**	**0BP**
Identification codes		MFF	MEX, NKX
Allocation	Type	Touareg from MY 2010	Touareg from MY 2010
	Engine	3.6L - 206 kW Gas	3.0L - 245 kW V6 Hybrid
Ratio: Z_2: Z_1	Final drive	37:10 = 3.700	36:11 = 3.273
Capacity		Refer to Fluid Capacity Table Rep. Gr. 03	
Electromechanical differential lock		With	Without

Rear final drive		**0BP**	
Identification codes		MEX	MEY
Allocation	Type	Touareg from MY 2010	Touareg from MY 2010
	Engine	3.0L - 165 kW Turbo Diesel	3.6L - 206 kW VR6 Gas
Ratio: Z_2: Z_1	Final drive	36:11 = 3.273	37:10 = 3.700
Capacity		Refer to Fluid Capacity Table Rep. Gr. 03	
Electromechanical differential lock		Without	Without

Refer to the Electronic Parts Catalog (ETKA) for the following data:
- Vehicle allocation according to the engine code.
- Fluid specification.

Fastener Tightening Specifications

Component	**Nm**
Differential lock motor-to-rear final drive bolt	8
Driveshaft center support-to-underbody bolt	20
Front final drive filler plug	35
Rear final drive filler plug	35
Transfer case end balancer-to-transfer case bolt	32
Underbody bracket bolt	60