

## Contents

<b>00 - Technical data</b>	<b>1</b>
<b>1 Safety information</b>	<b>1</b>
1.1 Safety regulations for working on fuel supply	1
1.2 Safety measures when working on vehicles with a start/stop system	1
1.3 Safety precautions when using testers and measuring instruments during a road test	2
1.4 Safety precautions when working on the cooling system	2
1.5 Safety precautions when working on ignition system	2
<b>2 Identification</b>	<b>3</b>
2.1 Engine number/engine data	3
<b>3 Repair instructions</b>	<b>4</b>
3.1 Rules for cleanliness	4
3.2 Foreign objects in engine	4
3.3 Contact corrosion	4
3.4 Routing and attachment of lines	4
3.5 Fitting radiator and condensers	5
<b>10 - Removing and installing engine</b>	<b>6</b>
<b>1 Removing and installing engine</b>	<b>6</b>
1.1 Removing engine	6
1.2 Separating engine and gearbox	15
1.3 Securing engine on engine and gearbox support	16
1.4 Installing engine	17
<b>2 Assembly mountings</b>	<b>21</b>
2.1 Assembly overview - assembly mountings	21
2.2 Removing and installing engine mounting	26
2.3 Removing and installing gearbox mounting	27
2.4 Removing and installing pendulum support	28
2.5 Supporting engine in installation position	30
<b>13 - Crankshaft group</b>	<b>34</b>
<b>1 Cylinder block (pulley end)</b>	<b>34</b>
1.1 Assembly overview - poly V-belt drive	34
1.2 Assembly overview - sealing flange, belt pulley end	37
1.3 Removing and installing poly-V belt	38
1.4 Removing and installing tensioner for poly V-belt	40
1.5 Removing and installing vibration damper	41
1.6 Removing and installing engine support	43
1.7 Renewing crankshaft oil seal - belt pulley end	45
1.8 Removing and installing sealing flange on pulley end	47
<b>2 Cylinder block, gearbox end</b>	<b>51</b>
2.1 Assembly overview - cylinder block, gearbox end	51
2.2 Removing and installing flywheel	52
2.3 Removing and installing sealing flange on gearbox side	53
<b>3 Crankshaft</b>	<b>61</b>
3.1 Crankshaft dimensions	61
3.2 Renewing needle bearing in crankshaft	61
3.3 Measuring axial clearance of crankshaft	64
<b>4 Pistons and conrods</b>	<b>65</b>
4.1 Assembly overview - pistons and conrods	65
4.2 Separating new conrod	67
4.3 Removing and installing pistons	67
4.4 Removing and installing oil spray jets	68

4.5	Checking pistons and cylinder bores	70
4.6	Checking radial clearance of conrods	71
4.7	Setting piston to TDC position	71
<b>15</b>	<b>Cylinder head, valve gear</b>	<b>76</b>
1	Cylinder head	76
1.1	Assembly overview - cylinder head	76
1.2	Assembly overview - camshaft housing	78
1.3	Removing and installing cylinder head	81
1.4	Removing and installing camshaft housing	85
1.5	Checking compression	88
2	Toothed belt drive	91
2.1	Assembly overview - toothed belt cover	91
2.2	Assembly overview - toothed belt	92
2.3	Removing and installing toothed belt guard	95
2.4	Preassembling and installing valve timing tool	96
2.5	Checking valve timing	109
2.6	Adjusting valve timing	115
2.7	Removing toothed belt from camshaft	133
2.8	Removing and installing toothed belt	138
3	Valve gear	144
3.1	Assembly overview - valve gear	144
3.2	Removing and installing camshaft oil seal	145
3.3	Removing and installing camshaft adjuster	157
3.4	Removing and installing toothed belt pulley	173
3.5	Removing and installing camshaft control valve 1 N205	178
3.6	Removing and installing exhaust camshaft control valve 1 N318	179
3.7	Removing and installing valve stem seals	179
3.8	Removing and installing cam actuators	187
4	Inlet and exhaust valves	191
4.1	Checking valve guides	191
4.2	Checking valves	191
4.3	Valve dimensions	192
<b>17</b>	<b>Lubrication</b>	<b>193</b>
1	Sump, oil pump	193
1.1	Assembly overview - sump/oil pump	193
1.2	Engine oil:	196
1.3	Removing and installing lower part of sump	197
1.4	Removing and installing upper part of sump	201
1.5	Removing and installing oil pump	204
1.6	Removing and installing oil level and oil temperature sender G266	205
2	Engine oil cooler	207
2.1	Assembly overview - engine oil cooler	207
2.2	Removing and installing engine oil cooler	207
3	Crankcase ventilation	209
3.1	Assembly overview - crankcase breather system	209
3.2	Removing and installing oil separator	210
4	Oil filter, oil pressure switch	213
4.1	Assembly overview - oil filter/oil pressure switch	213
4.2	Removing and installing oil pressure switch F1	214
4.3	Removing and installing oil pressure switch for reduced oil pressure F378	215
4.4	Checking oil pressure	216
4.5	Removing and installing oil pressure regulating valve N428	218

- ◆ Commercially available stepladder
- ◆ Safety glasses
- ◆ Safety gloves

#### Removing



#### Note

- ◆ The engine is removed downwards together with the gearbox.
  - ◆ Reinstall all cable ties in the same locations when installing.
- Carefully open filler cap -1- on coolant expansion tank -2- in -direction of arrow-.

#### CAUTION

On a warm engine, the cooling system is under high pressure. Danger of scalding by steam and hot coolant.

Skin and other parts of the body may be scalded.

- Wear protective gloves.
- Wear protective goggles.
- Reduce excess pressure by covering cap of coolant expansion tank with cloths and opening it carefully.

- Remove battery and battery tray ⇒ Electrical system; Rep. gr. 27 ; Battery; Removing and installing battery tray .

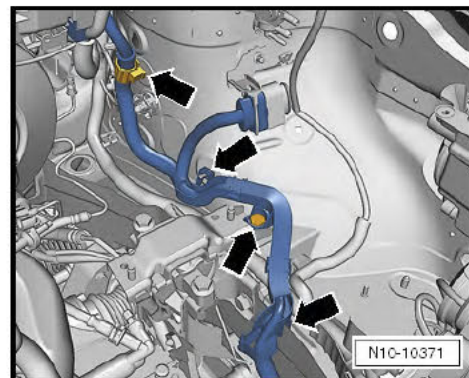
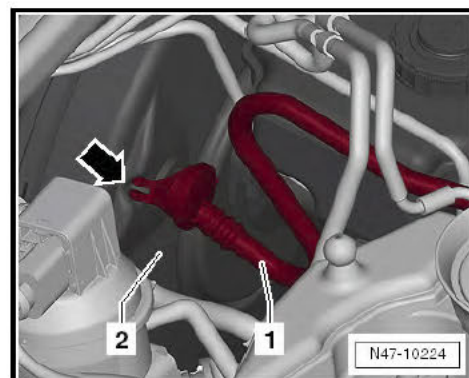
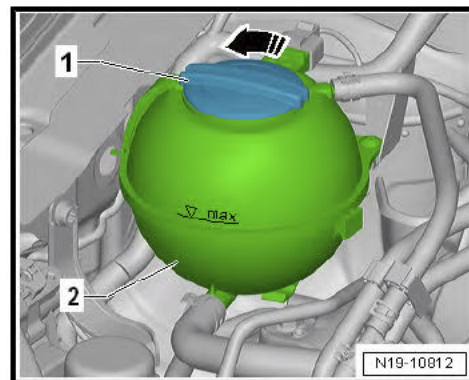
#### Vehicles with manual gearbox

- Pull vacuum line -1- off brake servo -2-.
- If fitted, release and disconnect connector on vacuum sender on vacuum line.

#### Continued for all vehicles

- Remove air filter housing  
⇒ ["3.2 Removing and installing air filter housing", page 308](#) .

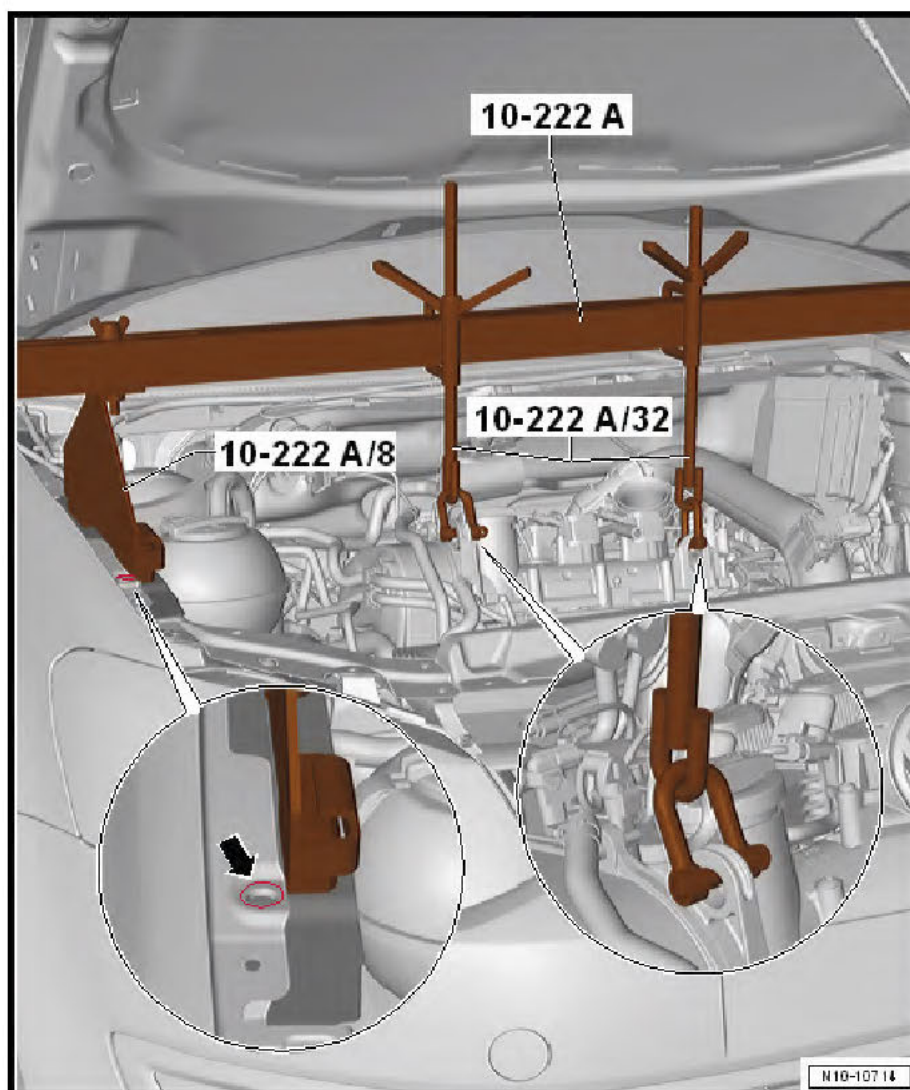
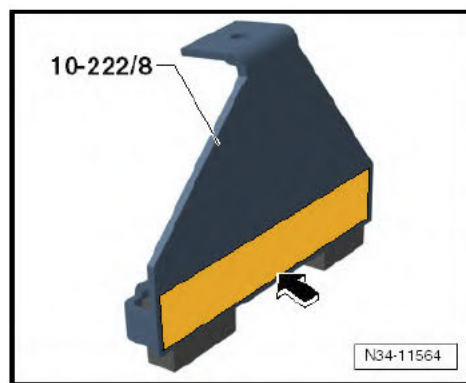
- Carefully loosen wiring harness at its fastening points -arrows-.



To prevent damage to edges of wings, cover lower areas of both adapters - 10 - 222 A /8- with woven adhesive tape -arrow- → Electronic Parts Catalogue (ETKA) .

#### Procedure

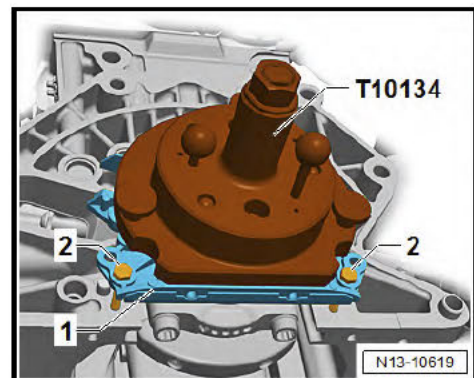
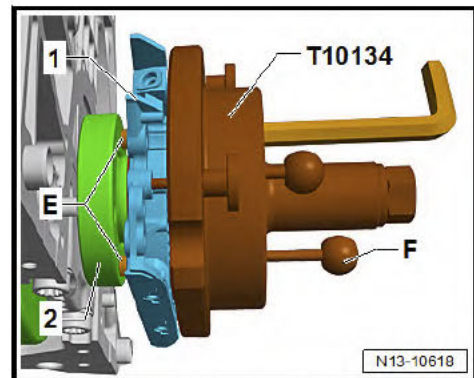
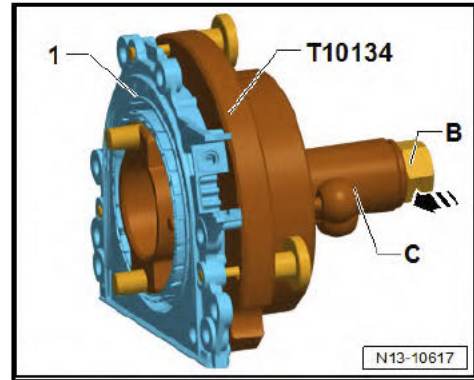
- Remove air filter housing  
⇒ ["3.2 Removing and installing air filter housing", page 308](#) .
- Remove battery tray → Electrical system; Rep. gr. 27; Battery; Removing and installing battery tray .



- Detach seals from upper edge of wing.
- Slide adapter - 10 - 222 A /32- onto engine support bracket - 10 - 222 A- as shown in illustration.
- Mount adapter - 10 - 222 A /8- on engine support bracket - 10 - 222 A- .
- Lift up plenum chamber cover at sides.
- Position engine support bracket - 10 - 222 A- on left and right onto longitudinal members as shown in illustration.

**Mounting assembly tool - T10134- with sealing flange -1- on crankshaft flange:**

- The crankshaft flange must be free of grease and oil.
- Engine is at "TDC" position.
- Screw on nut -B- until it reaches end of threaded spindle.
- Press threaded spindle of assembly tool - T10134- in -direction of arrow-, until nut -B- rests against assembly housing -C-.
- Align flat side of assembly housing to sealing surface of cylinder block on sump side.
- Attach assembly tool - T10134- together with sealing flange -1- to crankshaft flange -2-.
- To do this, screw hexagon socket head bolts -E- into crankshaft flange (approx. 5 full turns) using a hexagon key.
- Push guide pin for petrol engines (red knob) -F- into crankshaft flange.
- To guide sealing flange -1-, screw two M6×35 mm bolts -2- into cylinder block.



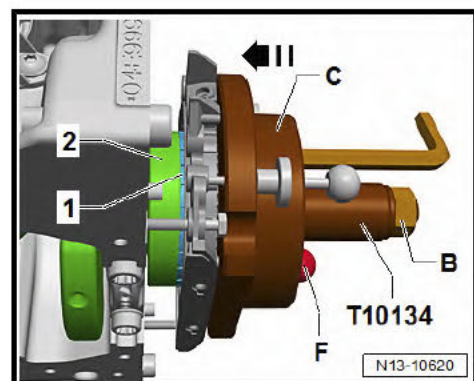
**Bolting assembly tool - T10134- onto crankshaft flange:**

- Push assembly housing -C- by hand in -direction of arrow- until sealing lip support ring -1- rests against crankshaft flange -2-.
- Make sure that guide pin for petrol engines (red knob) -F- is properly seated in hole in crankshaft. This ensures that the sender wheel reaches its final installation position.

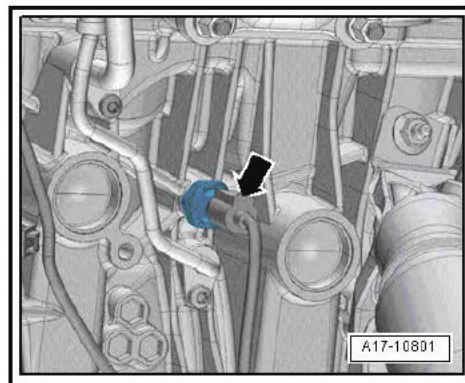
**i** Note

*The guide pin for diesel engines (black knob) must not be inserted in threaded hole of crankshaft.*

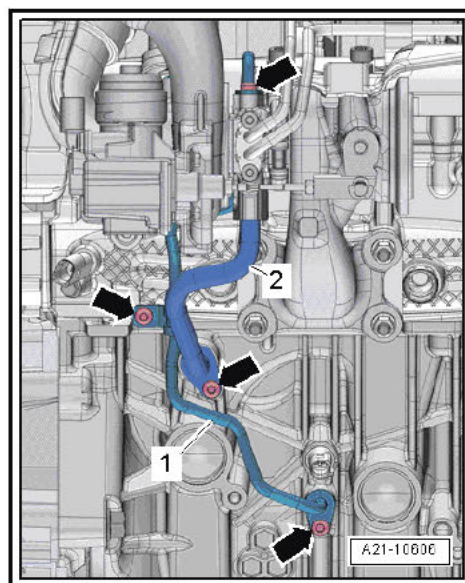
- Tighten the two hexagon socket head bolts of assembly tool hand-tight.
- Screw nut -B- onto threaded spindle by hand until nut rests against assembly housing -C-.



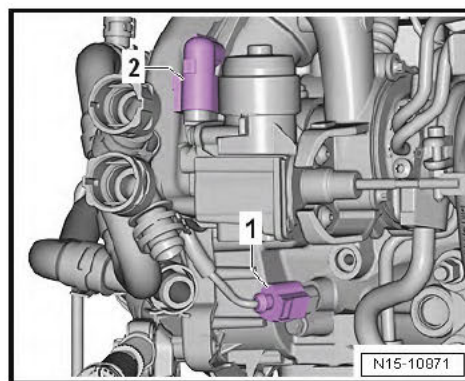
- Remove heat-shield sleeve.
- Separate electrical connector -arrow- on oil pressure switch - F1- .



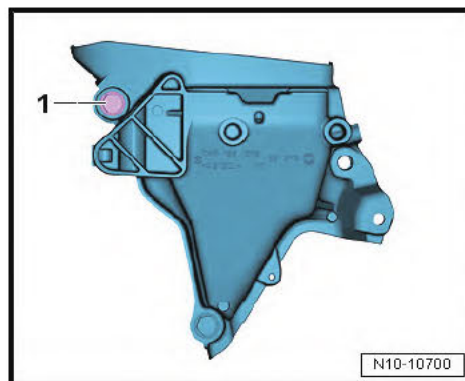
- Unscrew bolts -arrows- and detach oil supply pipe -1- and oil return pipe -2-.



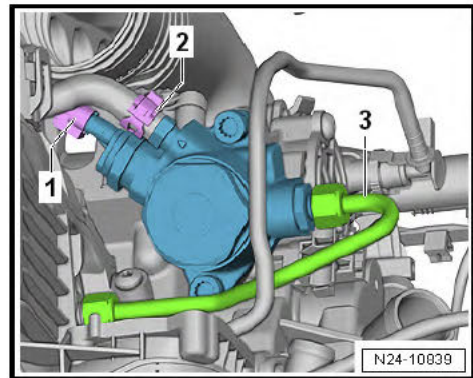
- Release and pull off connectors -1- and -2-.
- 1 - For coolant temperature sender - G62-
- 2 - For charge pressure positioner - V465-



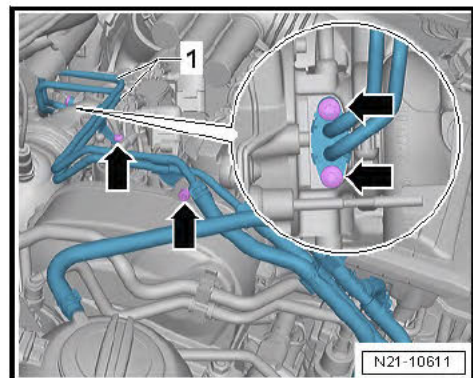
- Unscrew bolt -1- from engine support.



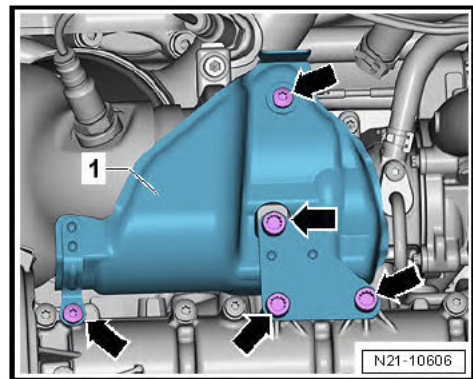
- Remove toothed belt from camshafts  
⇒ ["2.7 Removing toothed belt from camshaft", page 133](#) .
- Disconnect electrical connector -1-.
- Detach hose clip -2- and pull off hose.
- Remove high-pressure pipe -3-  
⇒ ["7.3 Removing and installing high-pressure pipe", page 331](#) .
- Disconnect electrical connector -1-.
- Install connecting piece  
⇒ ["1.4 Removing and installing connection for turbocharger", page 279](#) .



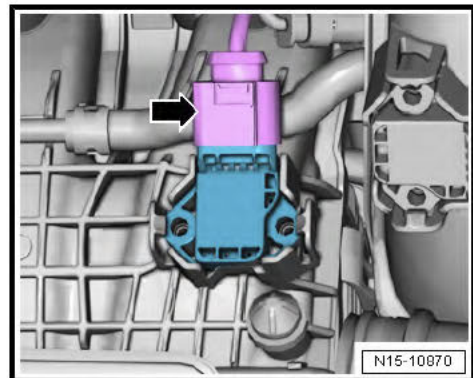
- Unscrew bolts -arrows-.
- Swivel coolant lines -1- to side.



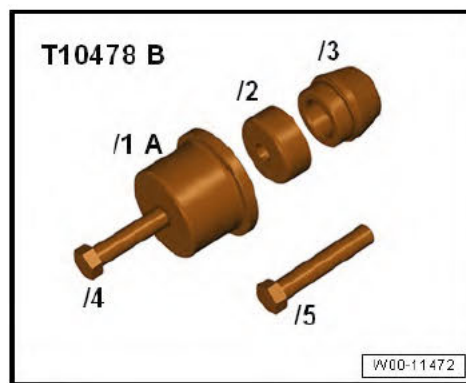
- Unscrew bolts or nuts -arrows-.
- Unclip wiring harness for lambda probe from heat shield -1-.
- Remove heat shield -1-.



- Release and pull off connector -arrow- on intake manifold sender - GX9- .



◆ Assembly tool - T10478 B-

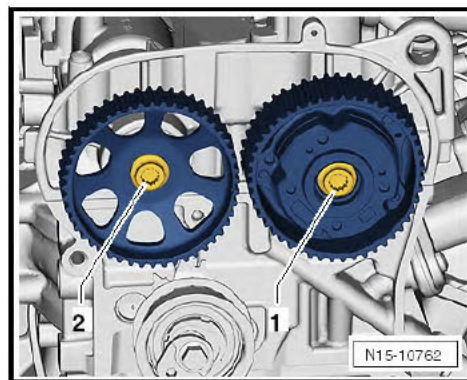


◆ Extractor hook - T20143-



Removing

- Remove toothed belt from camshafts  
⇒ ["2.7 Removing toothed belt from camshaft", page 133](#) .
- Unscrew bolt -1- and remove camshaft toothed belt pulley.

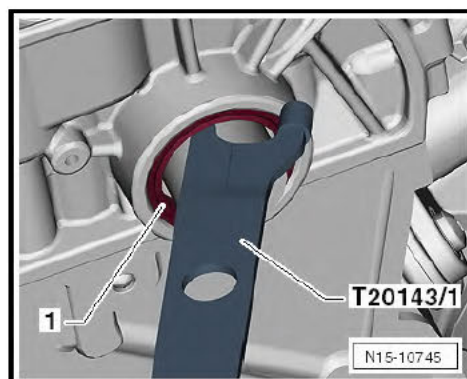


- Remove seal -1- using extractor hook -T20143/1- .

Installing

 Note

*Do not lubricate new seal.*





## 19 – Cooling

### 1 Cooling system/coolant

⇒ [“1.1 Connection diagram - coolant hoses”, page 220](#)

⇒ [“1.2 Checking cooling system for leaks”, page 223](#)

⇒ [“1.3 Draining and adding coolant”, page 225](#)

#### 1.1 Connection diagram - coolant hoses



Note

- ◆ *The arrows point in the direction of coolant flow.*
- ◆ *The arrow markings on coolant pipes and on ends of coolant hoses must align.*

Vehicles ▶ June 2013

1 - Coolant expansion tank

2 - Cap

- For coolant expansion tank
- Check pressure relief valve ⇒ [page 225](#)

3 - Cylinder head/cylinder block

- Renew coolant after replacing
- Assembly overview ⇒ [“1.1 Assembly overview - cylinder head”, page 76](#)

4 - Exhaust turbocharger

- Assembly overview ⇒ [“1.1 Assembly overview - turbocharger”, page 270](#)
- Removing and installing ⇒ [“1.2 Removing and installing turbocharger”, page 274](#)

5 - Integrated exhaust manifold

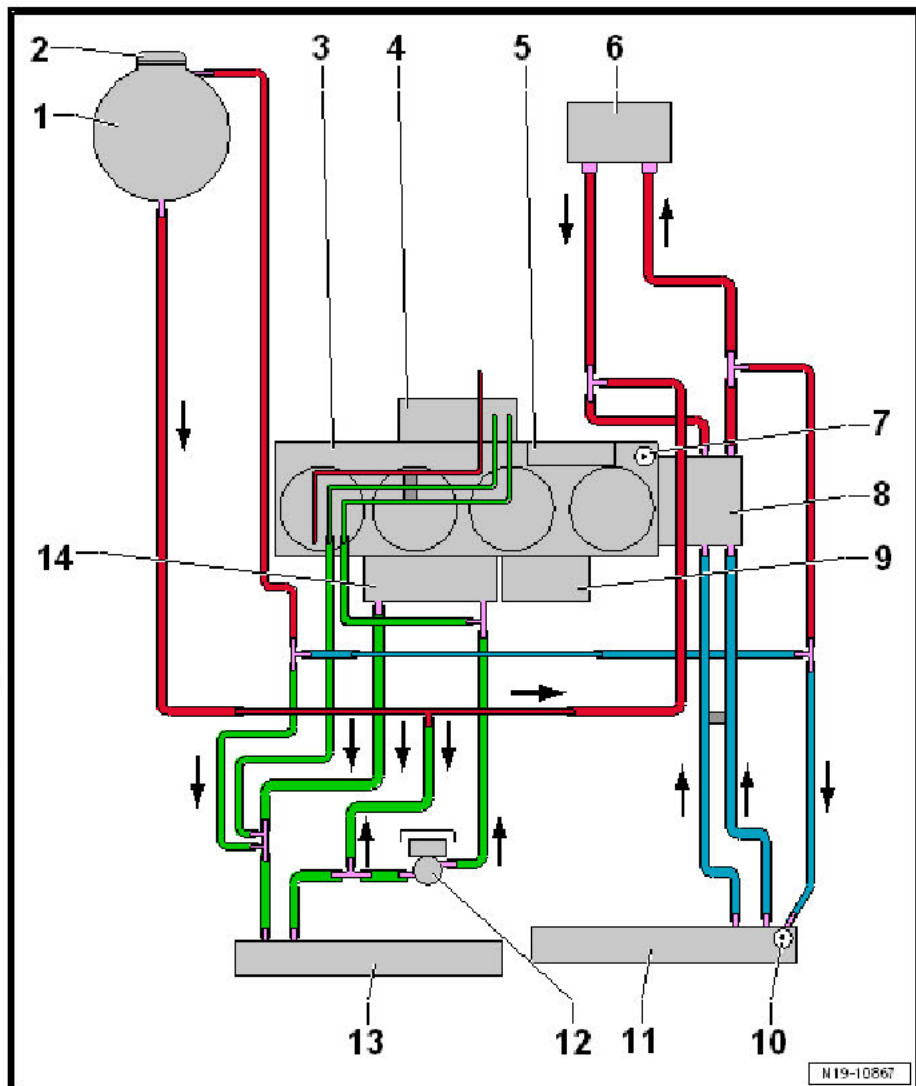
6 - Heat exchanger for heater

- Renew coolant after replacing

7 - Radiator outlet coolant - G62-

- Assembly overview ⇒ [“2.3 Assembly overview - coolant temperature sender”, page 236](#)

- Removing and installing ⇒ [“2.8 Removing and installing coolant temperature sender G62”, page 248](#)



## Draining

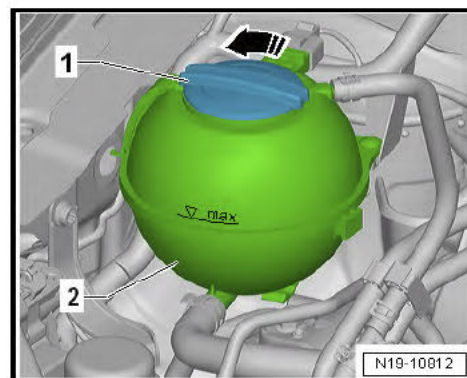
- Carefully open filler cap -1- on coolant expansion tank -2- in -direction of arrow-.

### CAUTION

On a warm engine, the cooling system is under high pressure. Danger of scalding by steam and hot coolant.

Skin and other parts of the body may be scalded.

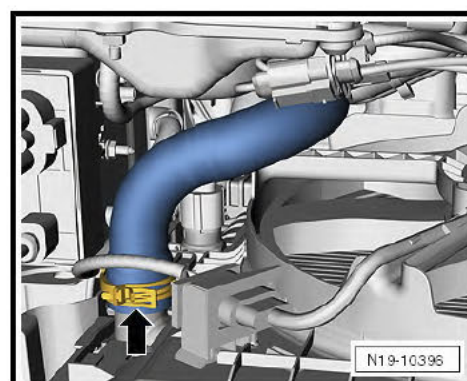
- Wear protective gloves.
- Wear protective goggles.
- Reduce excess pressure by covering cap of coolant expansion tank with cloths and opening it carefully.



- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation .
- Place drip tray for workshop hoist - VAS 6208- underneath.

## Draining coolant from radiator:

- Open spring-type clip -arrow- and pull coolant hose off.



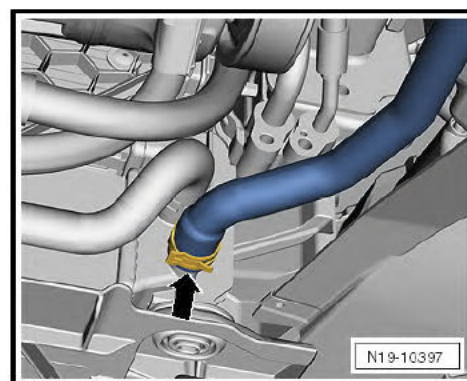
## Draining coolant from radiator for charge air cooling circuit:

- Open spring-type clip -arrow-.
- Pull coolant hose off water radiator for charge air cooling circuit.

Continued for all vehicles:

### Note

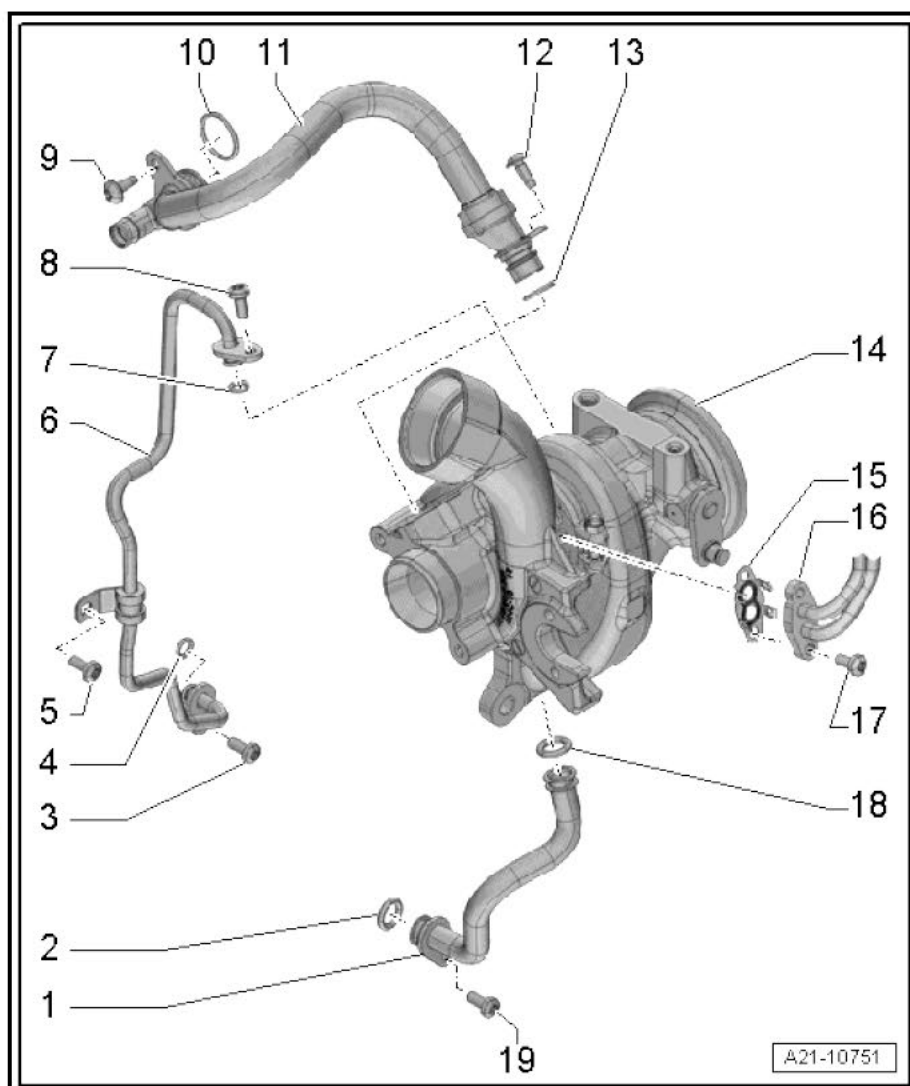
*Do not reuse coolant which has been drained off.*



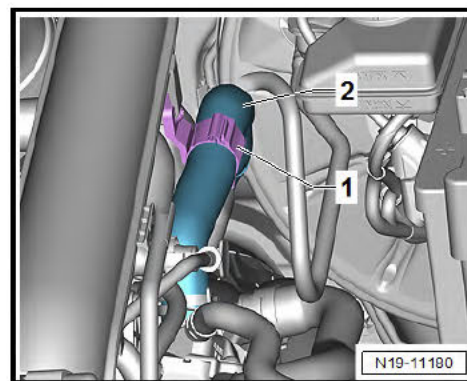
## Filling

### 1.1.3 Assembly overview - lines on turbocharger

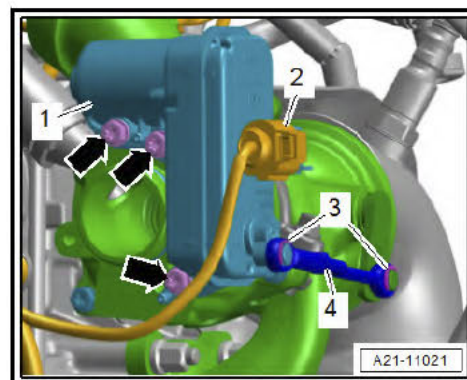
- 1 - Oil return line
- 2 - O-ring
  - Renew after removal
- 3 - Bolt
  - 9 Nm
- 4 - O-ring
  - Renew after removal
- 5 - Bolt
  - 9 Nm
- 6 - Oil supply line
- 7 - O-ring
  - Renew after removal
- 8 - Bolt
  - 9 Nm
- 9 - Bolt
  - Renew after removal
  - 5 Nm
- 10 - O-ring
  - Check for damage, and renew if necessary; see → Electronic parts catalogue (ETKA)
- 11 - Hose
  - For crankcase ventilation.
- 12 - Bolt
  - Renew after removal
  - 5 Nm
- 13 - O-ring
  - Check for damage, and renew if necessary; see → Electronic parts catalogue (ETKA)
- 14 - Exhaust turbocharger
  - Removing and installing ⇒ ["1.2 Removing and installing turbocharger", page 274](#)
- 15 - Seal
  - Renew after removal
- 16 - Coolant lines
  - Supply and return
- 17 - Bolt
  - 8 Nm
- 18 - O-ring
  - Renew after removal
- 19 - Bolt
  - 9 Nm



- Open hose clip -1- and push coolant hose -2- to one side.
- Unscrew bolts -arrows- and remove crankcase breather hose.
- Remove connection for turbocharger  
⇒ ["1.4 Removing and installing connection for turbocharger"](#),  
[page 279](#) .



- Pull off securing clips -3-, and remove operating lever -4-.
- Unscrew bolts -arrows-.
- Disconnect connector -2-, and remove charge pressure positioner - V465- -1-.



#### Installing

Install in reverse order of removal, observing the following:

Always renew securing bolts and the securing clip.

Renew O-rings after removal.

Before installing, lightly moisten O-rings with clean engine oil.

#### Charge air pressure controller without adjustable linkage

- Adapt engine control unit - J623- to charge pressure positioner - V465- using ⇒ Vehicle diagnostic tester; "Guided functions" .

#### Charge air pressure controller with adjustable linkage

- Fit thread of charge pressure positioner -V465- at central position in joint element.
- Adjust charge air pressure controller - V465- : ⇒ Vehicle diagnostic tester Select 01 - Adjust charge air pressure controller V465 in Guided functions.
- Adjust to specified value by turning linkage. For specified value, see ⇒ Vehicle diagnostic tester.
- Tighten lock nut to 6 Nm and secure with sealing paint.

#### Torque settings

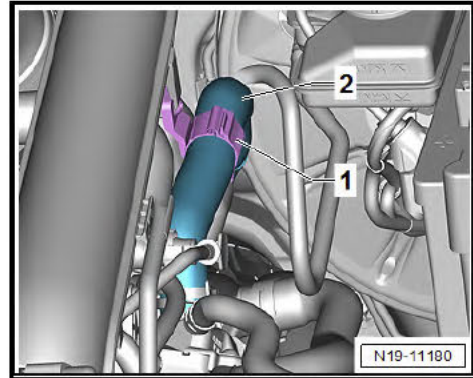
- ◆ ⇒ ["1.1.2 Assembly overview - turbocharger, version 2"](#),  
[page 271](#)
- ◆ ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft;  
Assembly overview - drive shaft

## 1.4 Removing and installing connection for turbocharger

Special tools and workshop equipment required

Continued for all vehicles:

- Lay wiring harness to one side.
- Open hose clip -1- and push coolant hose -2- to one side.



- Unscrew bolts -arrows- using insert tool - T10572- and Torx bit T30 - T10573- .
- Remove support -1-.

Installing:

Install in reverse order of removal, observing the following:

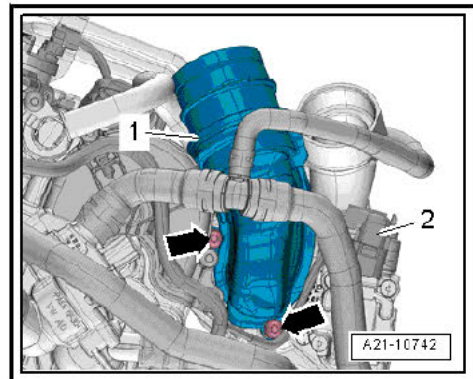


Note

- ◆ *Renew seals, O-rings and securing nuts of cylinder head.*
  - ◆ *Before installing, lightly moisten O-rings with clean engine oil.*
  - ◆ *Secure hose connections with hose clips according to production standard ⇒ [Electronic parts catalogue](#) .*
- Tighten bolts using insert tool - T10572- , Torx bit T30 - T10573- and torque wrench - V.A.G 1783- .
  - Set torque wrench - V.A.G 1783- to 4.2 Nm.

Torque settings

- ◆ ⇒ ["1.1 Assembly overview - turbocharger", page 270](#)



## 2 Charge air system

⇒ [“2.1 Assembly overview - charge air system”, page 283](#)

⇒ [“2.2 Removing and installing charge air cooler”, page 285](#)

⇒ [“2.3 Removing and installing charge pressure sender GX26”, page 286](#)

⇒ [“2.4 Checking charge air system for leaks”, page 287](#)

⇒ [“2.5 Removing and installing air intake pipe”, page 289](#)

### 2.1 Assembly overview - charge air system



#### Note

*Before performing any checks or any repair work, make sure that all air pipes, air hoses and vacuum lines are firmly seated and leak-tight.*

#### 1 - O-ring

- Renew after removal
- Before installing, lightly moisten O-ring with clean engine oil

#### 2 - Union

#### 3 - O-ring

- Renew after removal
- Before installing, lightly moisten O-ring with clean engine oil

#### 4 - Air intake pipe

- Removing and installing  
⇒ [“2.5 Removing and installing air intake pipe”, page 289](#)

#### 5 - Charge air pressure sender - GX26-

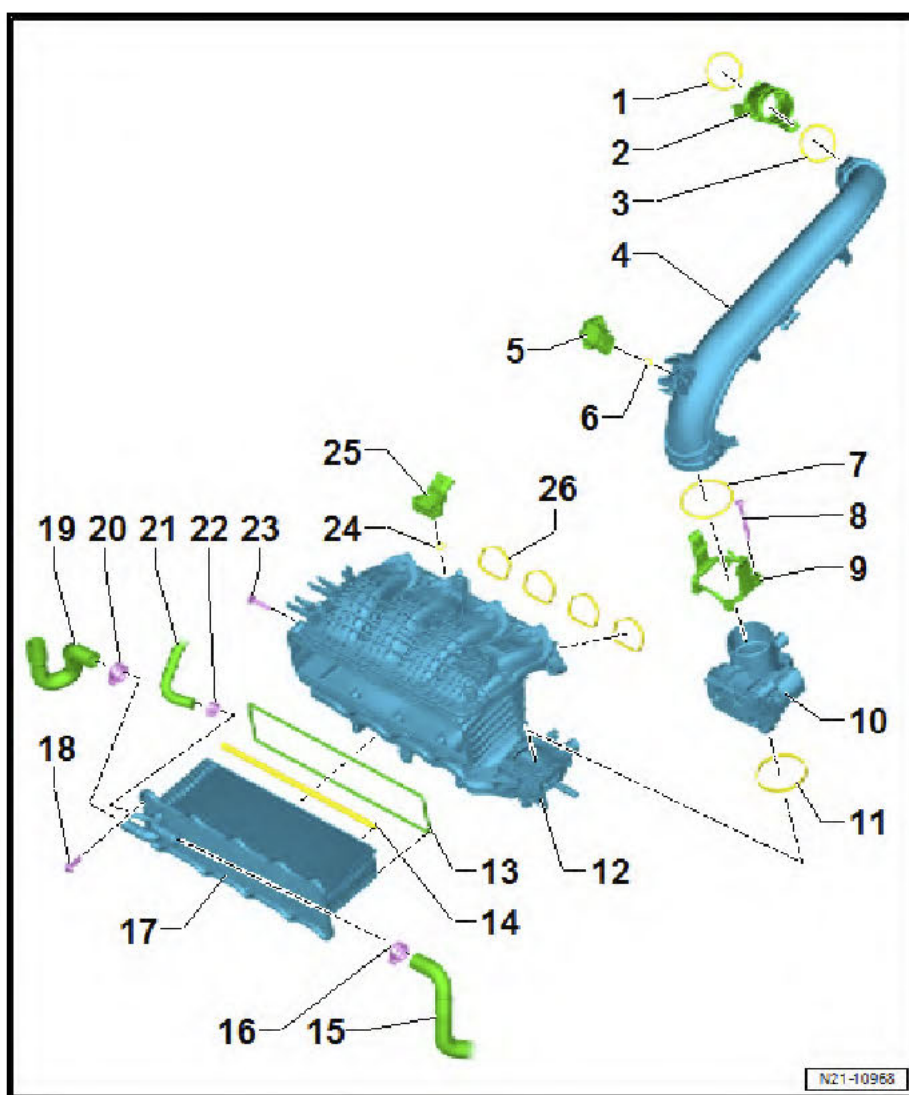
- Consisting of
  - Charge pressure sender - G31-
  - Intake air temperature sender - G42-
- Removing and installing  
⇒ [“2.3 Removing and installing charge pressure sender GX26”, page 286](#)

#### 6 - O-ring

- Not sold separately
- If damaged, renew charge pressure sender - GX26-

#### 7 - O-ring

- Renew after removal
- Before installing, lightly moisten O-ring with clean engine oil



Volkswagen Technical Site: <http://vwts.ru> <http://vwts.info>

### 1.1.3 Engine (from above), vehicles with Active Cylinder Management

#### 1 - Exhaust camshaft control valve 1 - N318-

- ❑ Removing and installing ⇒ [“3.5.2 Removing and installing camshaft control valve 1 N205, exhaust side with toothed belt pulley”, page 178](#)

#### 2 - Ignition coil 1 with output stage - N70-

- ❑ Removing and installing ⇒ [“1.2 Removing and installing ignition coils with output stage”, page 349](#)

#### 3 - Ignition coil 2 with output stage - N127-

- ❑ Removing and installing ⇒ [“1.2 Removing and installing ignition coils with output stage”, page 349](#)

#### 4 - Exhaust cam actuator for cylinder 2 - N587-

- ❑ Removing and installing ⇒ [“3.8 Removing and installing cam actuators”, page 187](#)

#### 5 - Ignition coil 3 with output stage - N291-

- ❑ Removing and installing ⇒ [“1.2 Removing and installing ignition coils with output stage”, page 349](#)

#### 6 - Exhaust cam actuator for cylinder 3 - N595-

- ❑ Removing and installing ⇒ [“3.8 Removing and installing cam actuators”, page 187](#)

#### 7 - Hall sender 3 - G300-

- ❑ Removing and installing ⇒ [“1.4.2 Removing and installing Hall sender 3 G300”, page 353](#)

#### 8 - Ignition coil 4 with output stage - N292-

- ❑ Removing and installing ⇒ [“1.2 Removing and installing ignition coils with output stage”, page 349](#)

#### 9 - Hall sender - G40-

- ❑ Removing and installing ⇒ [“1.4.1 Removing and installing Hall sender G40”, page 352](#)

#### 10 - High-pressure pump

- ❑ Assembly overview ⇒ [“7.1 Assembly overview - high-pressure pump”, page 326](#)
- ❑ Removing and installing ⇒ [“7.2 Removing and installing high-pressure pump”, page 330](#)

#### 11 - Inlet cam actuator for cylinder 2 - N583-

- ❑ Removing and installing ⇒ [“3.8 Removing and installing cam actuators”, page 187](#)

#### 12 - Inlet cam actuator for cylinder 3 - N591-

- ❑ Removing and installing ⇒ [“3.8 Removing and installing cam actuators”, page 187](#)

