

## Engine Lubrication System

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<p><b>Air-cooled</b></p> <p>engine oil capacity (with filter) 3.7 US qt (3.5 ltr)</p> <p>engine oil capacity (without filter) 3.2 US qt (3.0 ltr)</p> <p>drain plug 25 Nm (18 ft lb)</p> <p><b>Diesel</b></p> <p>engine oil capacity (with filter) 4.2 US qt (4.0 ltr)</p> <p>engine oil capacity (without filter) 3.7 US qt (3.5 ltr)</p> <p>drain plug 20 Nm (14 ft lb)</p>	<p><b>Air-cooled</b></p> <ul style="list-style-type: none"> <li>—Assembly 17.2</li> <li>—Oil cooler 17.2 checking 17.3</li> <li>—Oil pressure switch 17.2 checking 17.3 removing 17.3</li> <li>—Oil pump 17.2 removing 17.3</li> </ul> <p><b>Diesel</b></p> <ul style="list-style-type: none"> <li>—Assembly</li> <li>—Oil filter 17.4, 17.5</li> <li>—Oil cooler 17.4 checking 17.5</li> <li>—Oil pan 17.4, 17.6</li> <li>—Oil pump 17.4, 17.5</li> <li>—Oil pressure switch 17.4, 17.6</li> </ul>	<p><b>Water-cooled /Syncro</b></p> <ul style="list-style-type: none"> <li>—Assembly 17.7</li> <li>—Heating pipe, crankcase breather 17.9</li> <li>—Oil pressure switch 17.9</li> <li>—Oil pump 17.9</li> </ul>
<p><b>Water-cooled</b></p> <p>engine oil capacity (with filter) 4.7 US qt (4.5 ltr)</p> <p>engine oil capacity (without filter) 4.2 US qt (4.0 ltr)</p> <p>drain plug 25 Nm (18 ft lb)</p>		

# 17 Engine-Lubrication System

Oil pressure  
checking Fig. 5

Oil pressure switch  
removing/installing Fig. 4  
checking Fig. 5

Oil cooler seal  
always replace

25 Nm (18 ft lb)

Oil cooler  
check for leaks Fig. 3  
Replace oil cooler if there are  
metal particles on pistons,  
crankcase bores, or in engine  
oil

Oil  
strainer

Oil filter  
note instructions on  
filter

Self-locking nut  
always replace

Oil pressure relief valve  
20 Nm (15 ft lb)

Oil strainer cover

13 Nm (9 ft lb)

Oil drain plug  
25 Nm (18 ft lb)

Engine oil filling capacity  
with oil filter change—3.5 ltr (3.7 US qt)  
without oil filter change—3.0 ltr (3.2 US qt)

Oil dipstick  
difference between  
min. and max.  
0.6 ltr (0.6 US qt)

20 Nm (15 ft lb)

Oil pump insert  
removing Fig. 2

25 Nm (18 ft lb)

Oil pump housing  
removing Fig. 1

Oil pump gears

17-064

## 17.2

Oil pump  
Oil pressure switch  
Oil cooler

Air cooled-AFC

H-2

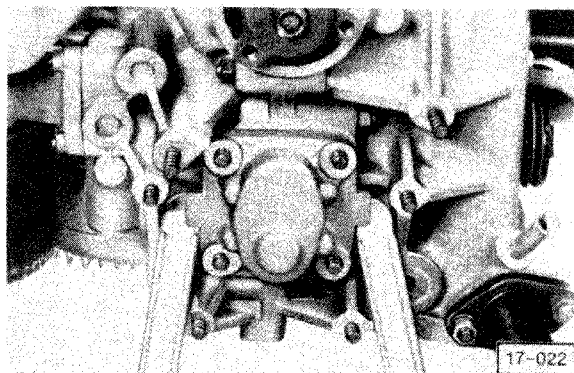


Fig. 1 Oil pump housing, removing

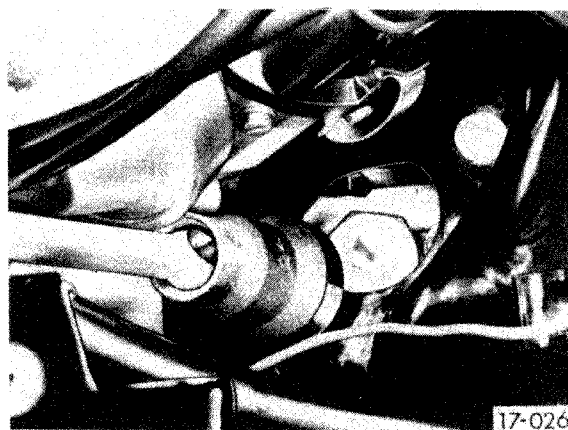


Fig. 4 Oil pressure switch, removing/installing

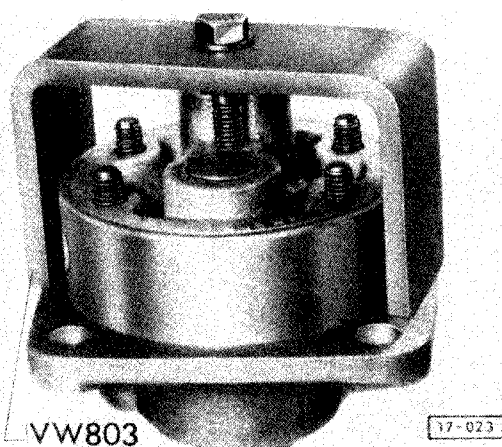


Fig. 2 Oil pump insert, removing

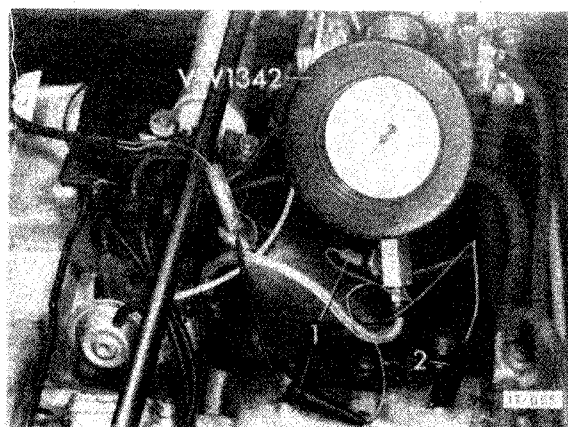


Fig. 5 Oil pressure/switch, checking

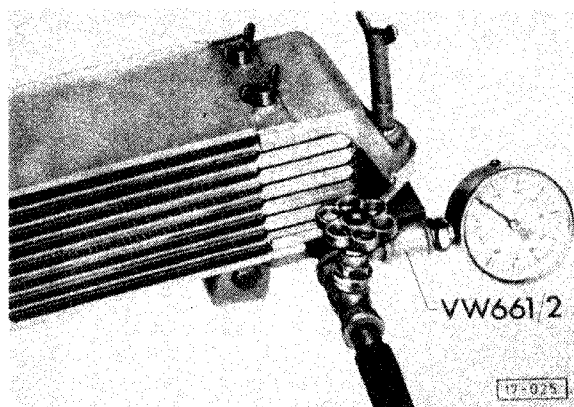
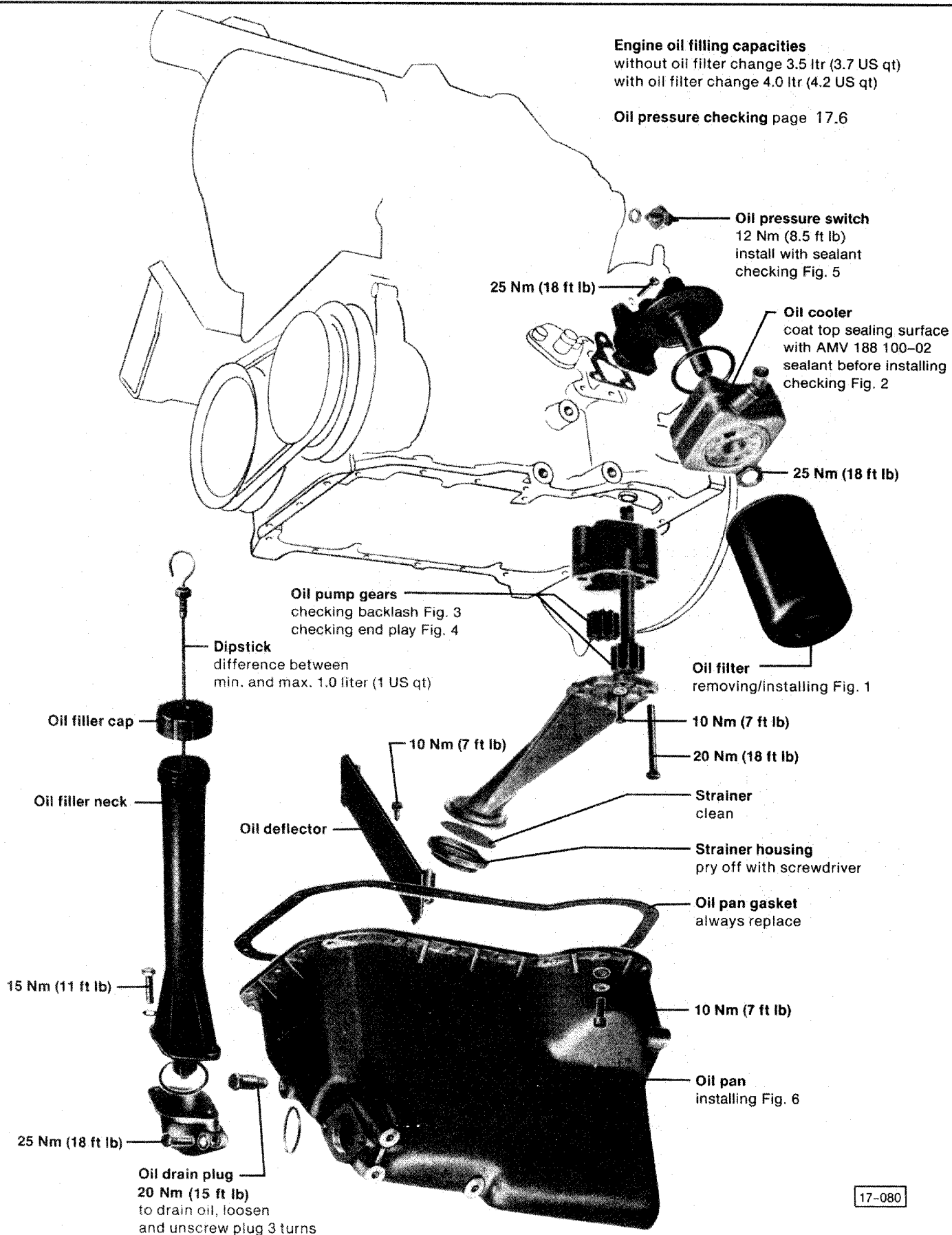


Fig. 3 Oil cooler, checking for leaks

- test pressure max. 5.9 bar (85 psi)

- engine oil temperature should be 80°C (176°F)
- install oil pressure gauge/adaptor in place of oil pressure switch
- install switch in gauge
- connect wire 1 to oil pressure switch and to wire from oil pressure warning light
- connect wire 2 to ground
- turn ignition ON
  - oil pressure warning light must light up
  - if NO, switch is defective
- start engine
  - oil pressure warning light must go out at oil pressure of 0.15—0.45 bar (2—6.5 psi)
- increase engine speed
  - at 2000 rpm, pressure should be min. 2.0 bar (29 psi)

# 17 Engine-Lubrication System

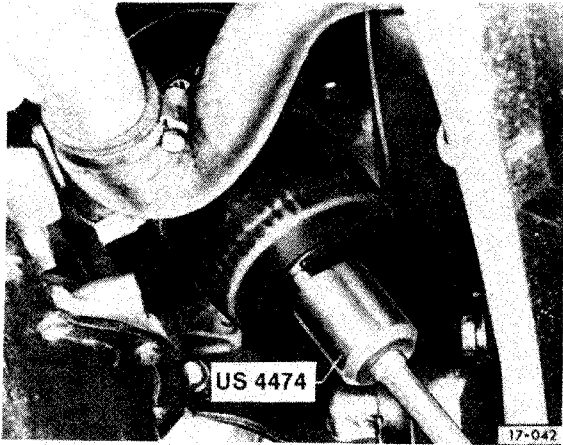


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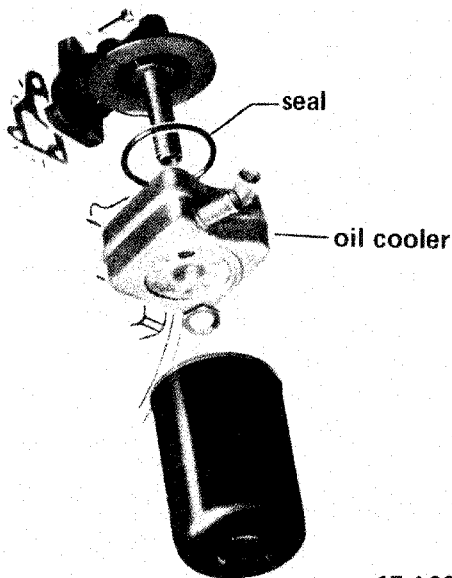
## 17.4

Oil pump  
 Oil filter  
 Oil pan

**Diesel**



**Fig. 1 Oil filter, removing/installing**  
— loosen with US 4474



**Fig. 2 Oil cooler, checking**

If oil contamination is found in the cooling system, one possible source of leakage is the oil cooler.

- remove oil cooler from vehicle
- plug one hose fitting and pressurize remaining fitting with air
- submerge cooler in water and check for air bubbles which indicate a leak in cooler
- if leaking is noticed, replace cooler

#### Note

Always use a new seal coated with clean engine oil when reinstalling oil cooler.

- clean cooling system thoroughly (use Prestone Super Flush AS - 107 or equivalent)

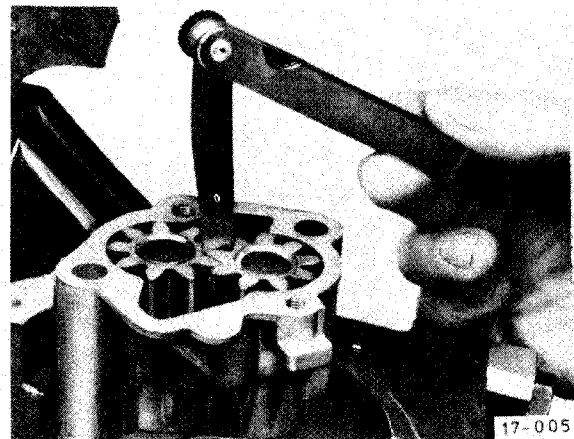
#### CAUTION

Oil contamination of coolant may have deteriorated coolant hoses. Inspect and replace hoses depending on condition and/or length of time oil has been in cooling system.

#### CAUTION

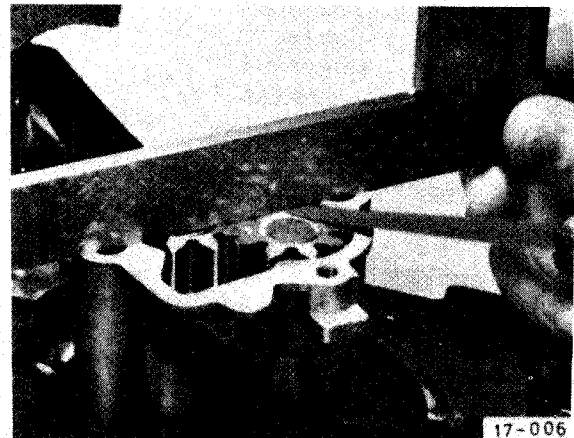
Do not loosen oil cooler when removing oil filter

- when installing, hand tighten according to instructions on filter element or carton



**Fig. 3 Oil pump backlash, checking**

- new: 0.05 mm (0.002 in.)
- wear limit: 0.2 mm (0.008 in.)



**Fig. 4 Oil pump end play, checking**

- maximum 0.15 mm (0.006 in.)

# 17 Engine-Lubrication System

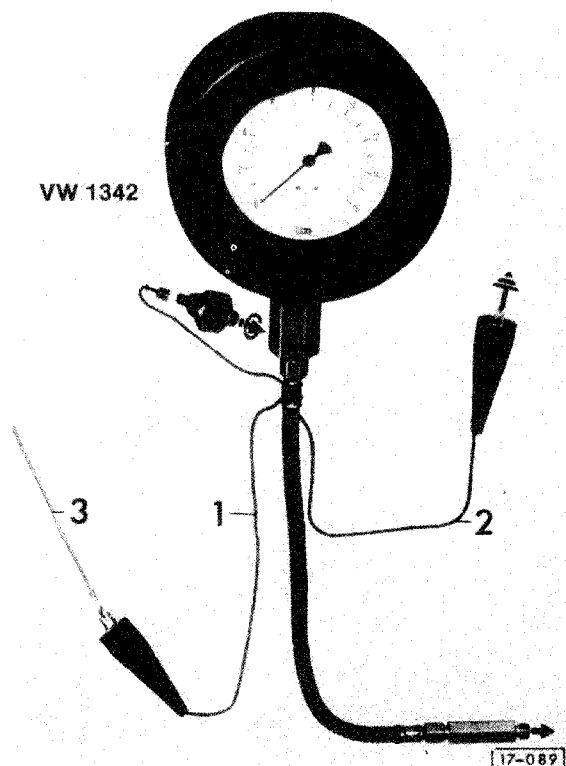


Fig. 5 Oil pressure switch, checking

- remove oil pressure switch and insert into tester
- connect tester into cylinder head in place of switch
- connect test wire 1 (blue) of tester to oil pressure switch and wire 3 from oil pressure switch
- connect test wire 2 (brown) to ground
- turn ignition **ON**, oil warning light must light (assuming bulb and wire are OK)
  - if **NO**, switch is defective
- start engine and increase speed slowly. At oil pressure of 0.15–0.45 bar (2–6 psi) oil pressure warning light must go out
  - if **NO**, switch is defective
- increase speed further. At 2000 rpm and oil temperature of 80 °C (176 °F) minimum oil pressure must be 2.0 bar (28 ft lb)

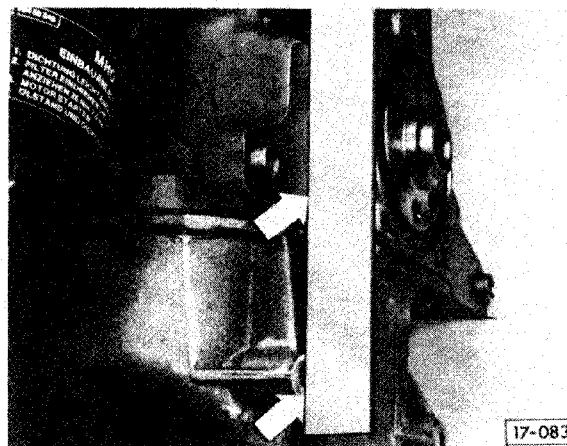


Fig. 6 Oil pan, installing (engine installed)

- align oil pan to engine block with straightedge (arrows)
- tighten bolts

**(engine removed)**

- start all bolts including those in clutch housing
- press oil pan by hand against clutch housing so that there is no gap between oil pan and clutch housing
- lightly tighten all bolts
- fully tighten all bolts
  - M6 to 10 Nm (7 ft lb)
  - M10 to 45 Nm (33 ft lb)

**CAUTION**

Oil pan must be flush with end face of engine block. If it protrudes or there is a gap, clutch housing will be stressed and could break

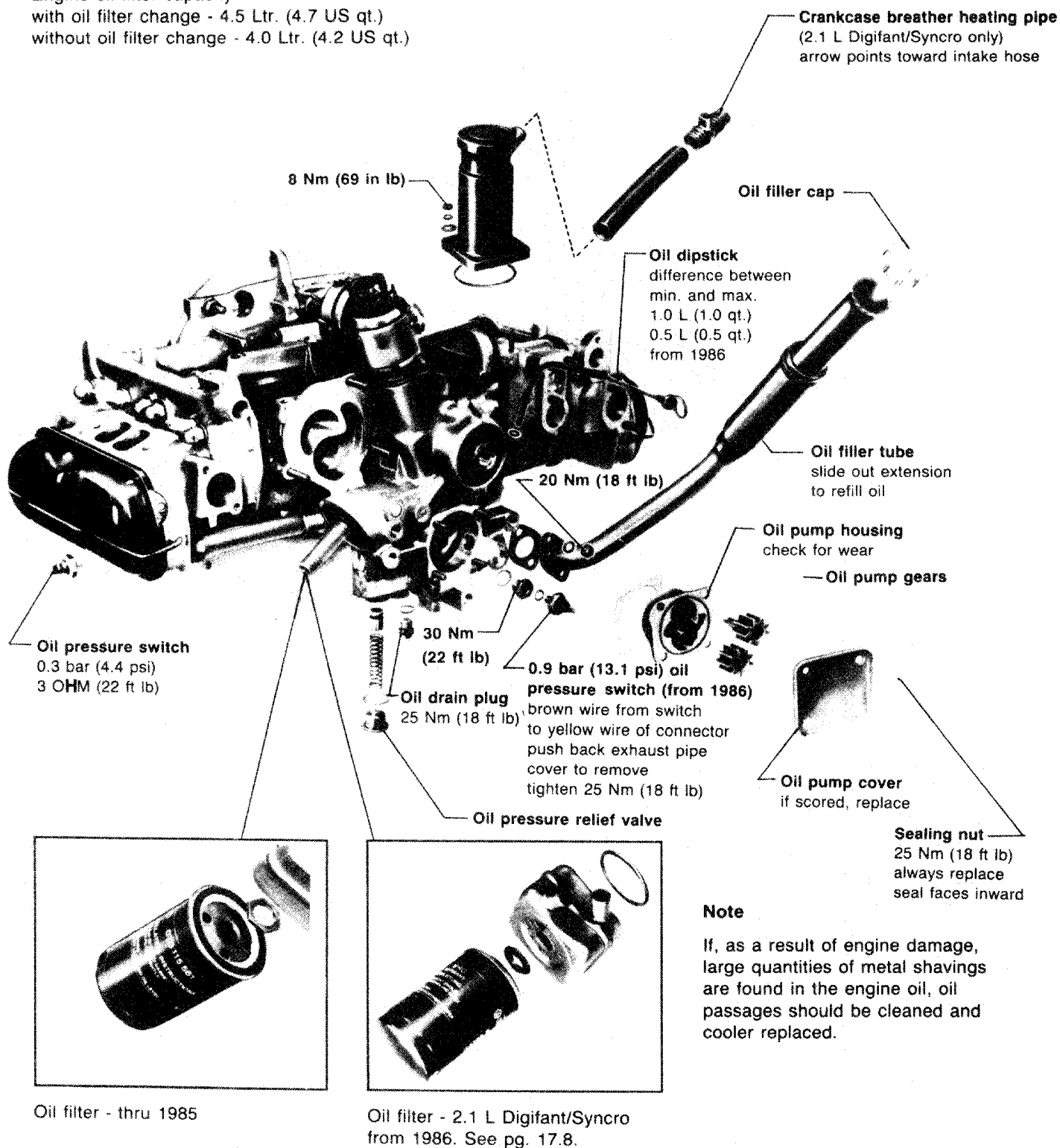
## Note

Always replace all gaskets and sealing rings.

Engine oil filter capacity

with oil filter change - 4.5 Ltr. (4.7 US qt.)

without oil filter change - 4.0 Ltr. (4.2 US qt.)



## Note

If, as a result of engine damage, large quantities of metal shavings are found in the engine oil, oil passages should be cleaned and cooler replaced.

## Note

Observe installation instructions on filter

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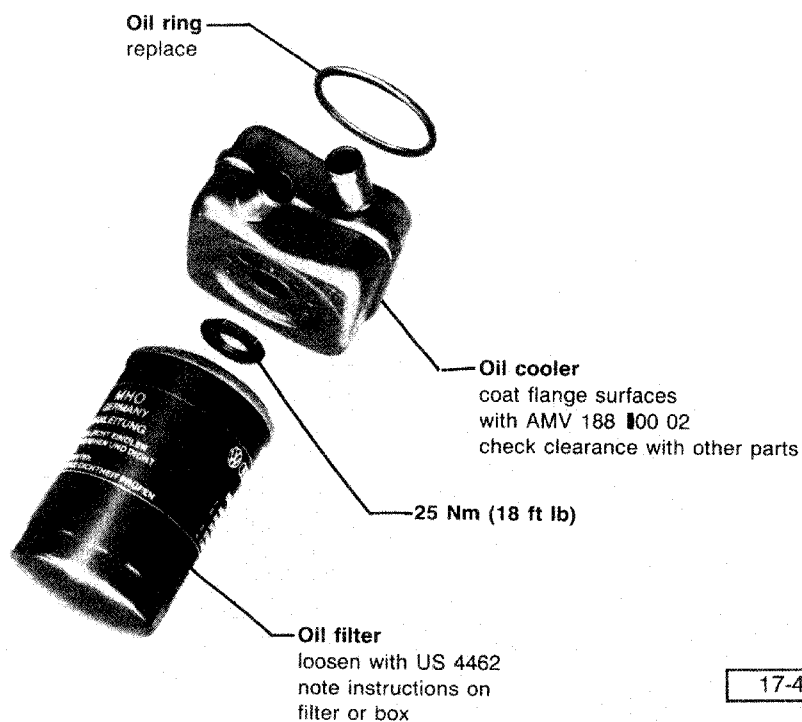
Water-cooled

Oil pump  
Oil pressure switch  
Oil filter

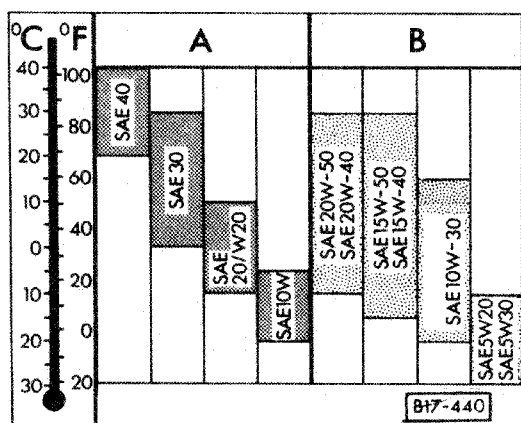
17.7

# 17 Engine-Lubrication System

Oil cooler - from 1986



17-448



B17-440

Oil viscosity grades

A - single weight oils

B - Multigrade oils

Only use oils marked 'SF' under API system.

## 17.8

Oil viscosity  
Oil cooler

Water-cooled - from 1986



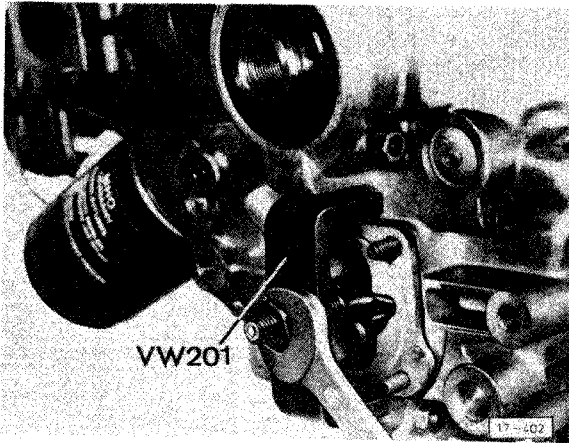


Fig. 1 Oil pump housing, removing

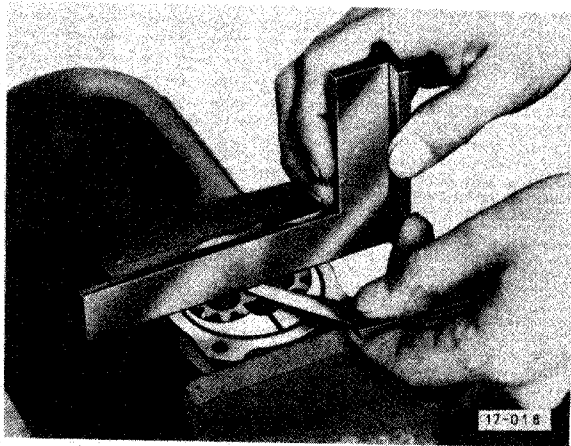


Fig. 2 Oil pump end play, checking

- max. 0.1 mm (0.004 in.)

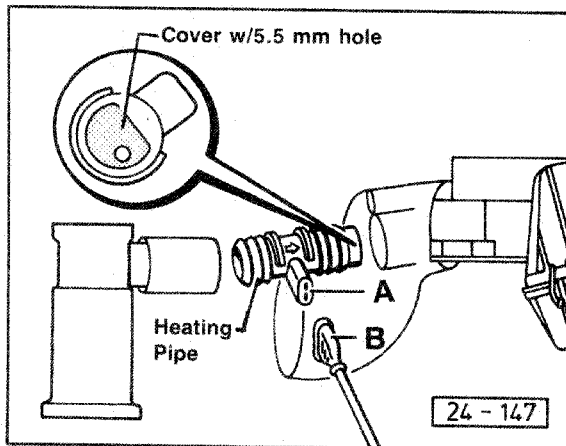


Fig. 3 Checking heating pipe for crankcase breather

- A = resistance 4-17 ohms @ 25°C (77°F)
- B = approx. 12V, with ignition on

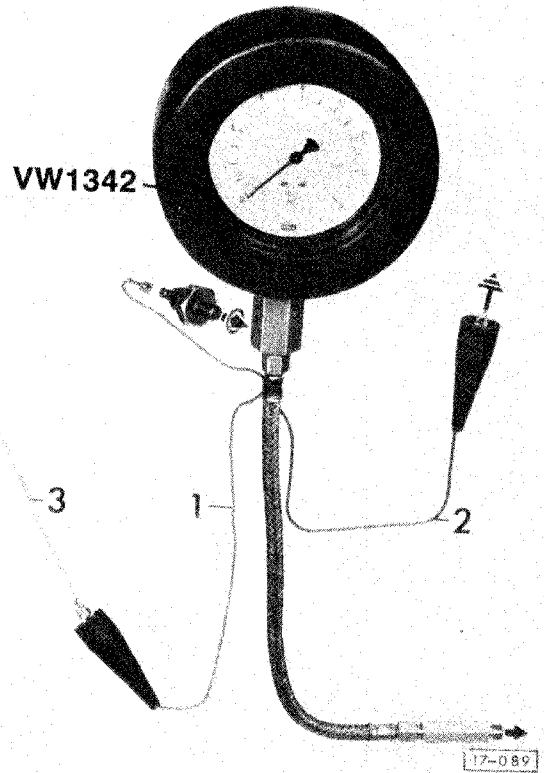


Fig. 4 Oil pressure/switch, checking

- engine oil temperature should be 80°C (176°F)
- remove oil pressure switch and install in gauge
- install oil pressure gauge/adaptor in place of oil pressure switch
- connect wire 1 (blue) of gauge to oil pressure switch and wire of oil pressure warning light 3 as shown
- connect wire 2 (brown) to ground
- turn ignition ON
  - oil pressure warning light must light up
- if NO, switch is defective, replace switch
- start engine
  - oil pressure warning light must go out at an oil pressure of 0.15-0.45 bar (2-6.5 psi)
- increase engine speed
  - at 2000 rpm, pressure should be minimum 2.0 bar (29 psi)

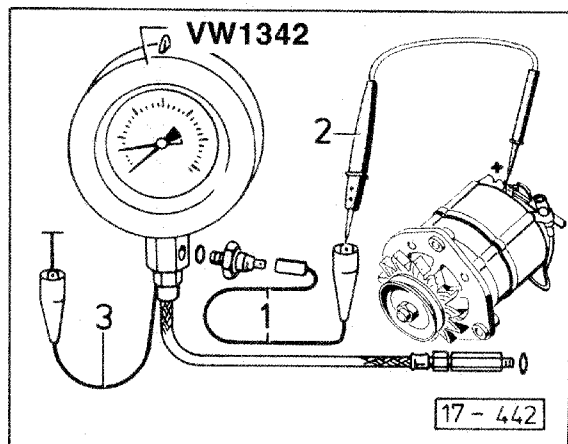
# 17 Engine-Lubrication System

## Oil pressure switch, checking

0.9 bar (13.1 psi) switch, near oil pump

### Work procedure

- push back exhaust cover plate (mounting screw under oil pump) with screw driver
- remove 0.9 bar (13.1 psi)



- screw oil pressure switch into tester VW1342
- connect wire 1 (blue)
- screw tester into crankcase in place of oil pressure switch
- connect test lamp 2 to wire 1 and alternator positive connection
- ground wire 3 (brown)
- start engine, slowly raise RPM
- at tester reading 0.75-1.05 bar (10.9-14.8 psi) test lamp must **light up**
  - replace oil pressure switch if tester does **not** light

### Note

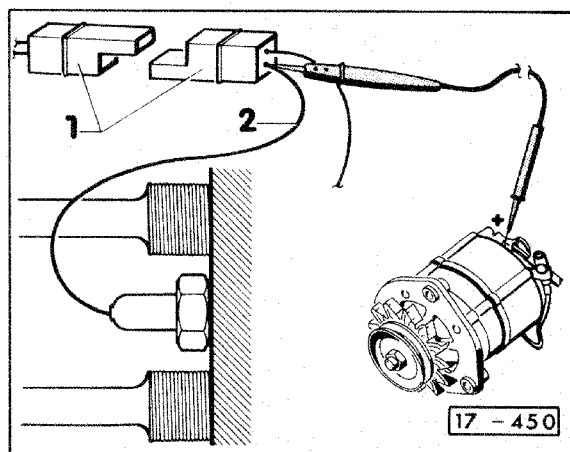
As necessary, check switching point of oil pressure switch at starting RPM

0.3 bar (4.4 psi) oil pressure switch

### Note

Tester connections are identical to 0.9 (13.1 psi) switch

0.3 bar (4.4 psi) oil pressure switch located between left side push rod tubes



- disconnect connector 1
- connect test lamp to wire 2 of 0.3 bar (4.4 psi) oil pressure switch and to alternator positive
- test lamp **must** light up
- start engine, raise RPM

When pressure goes to 0.15-0.45 bar (2.2-6.5 psi) test lamp must go **out**.

If not, replace oil pressure switch

- raise RPM
- at oil temperature of 80°C (176°F) and RPM of 2000, oil pressure should be 2.0 bar (29 psi)

## 17.10

Oil pressure switch,  
checking

Water-cooled from 1986