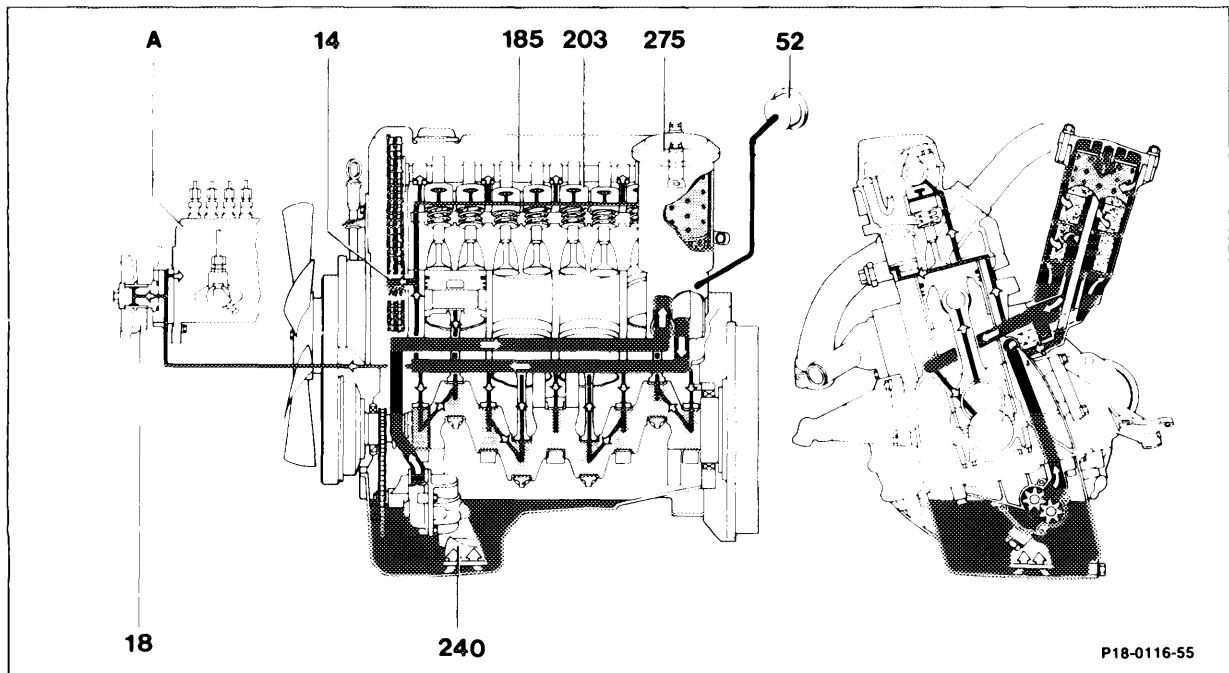
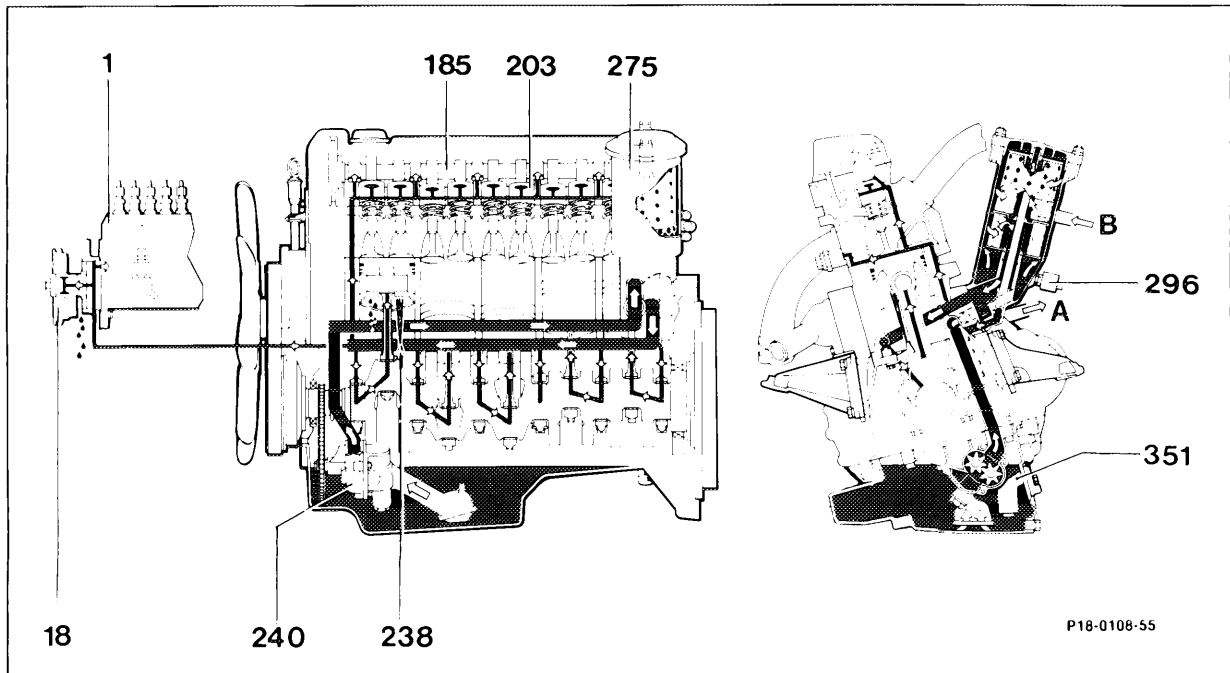


# 18-005 Oil circuit, oil pressure, overpressure and bypass valve, oil filter



Oil circuit diagram engine 602.91

14	Oil spray nozzle	203	Valve tappet
18	Timing device	240	Oil pump
52	Oil pressure gauge	275	Oil filter
185	Camshaft	A	Injection pump

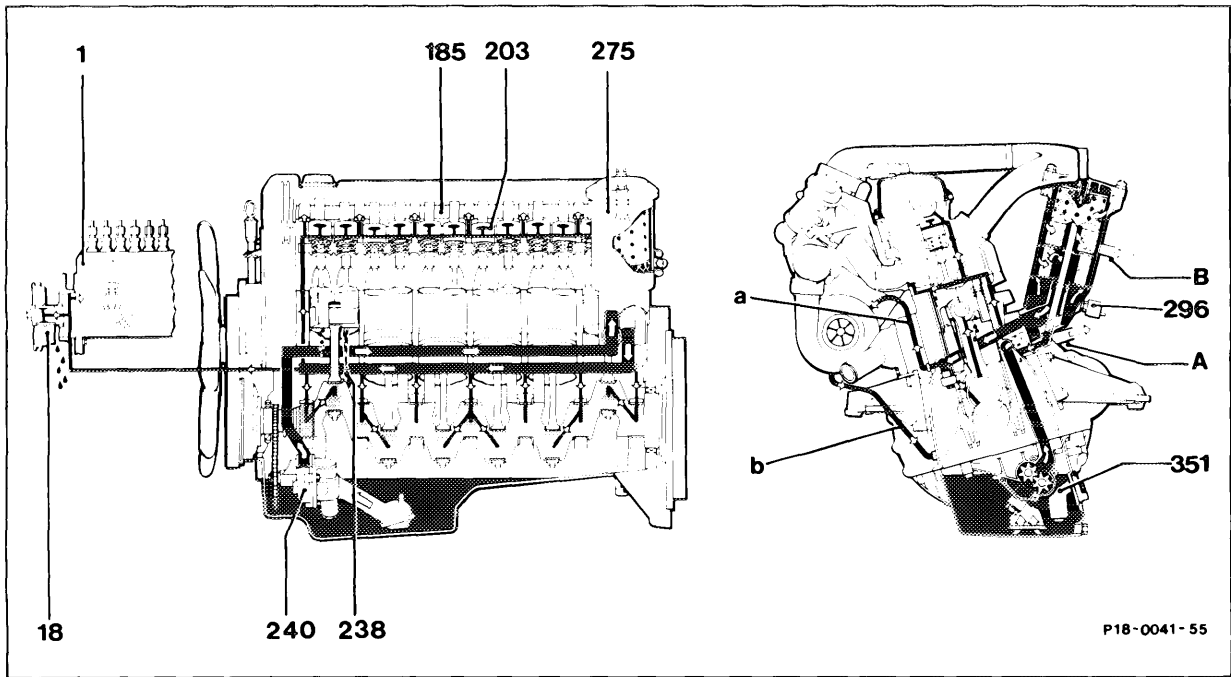


Oil circuit diagram engine 602.91 with exhaust gas recirculation

1	Injection pump	275	Oil filter
18	Timing device	296	Oil pressure switch
185	Camshaft	351	Oil level sensor
203	Valve tappet	A	Unfiltered oil to air-to-oil cooler
238	Oil spray nozzle	B	Unfiltered oil from air-to-oil cooler
240	Oil pump		

**Note**

Engine 602.91 with exhaust gas recirculation and manual transmission in combination with air conditioning.



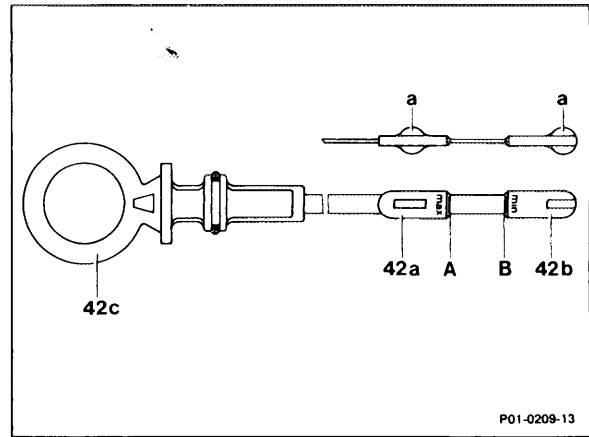
Oil circuit diagram engines 602.96, 603.96/97 (Turbo)

1	Injection pump	296	Oil pressure switch
18	Timing device	351	Oil level sensor
185	Camshaft	A	Unfiltered oil to air-to-oil cooler
203	Valve tappet	B	Unfiltered oil from air-to-oil cooler
238	Oil spray nozzle	a	To exhaust gas turbocharger
240	Oil pump	b	From exhaust gas turbocharger
275	Oil filter		

## Dipstick

Effective 05/84 the Min and Max markings on engine 601 are made of plastic.

- 42a Max marking
- 42b Min marking
- 42c Round handle
- A - B Filling range

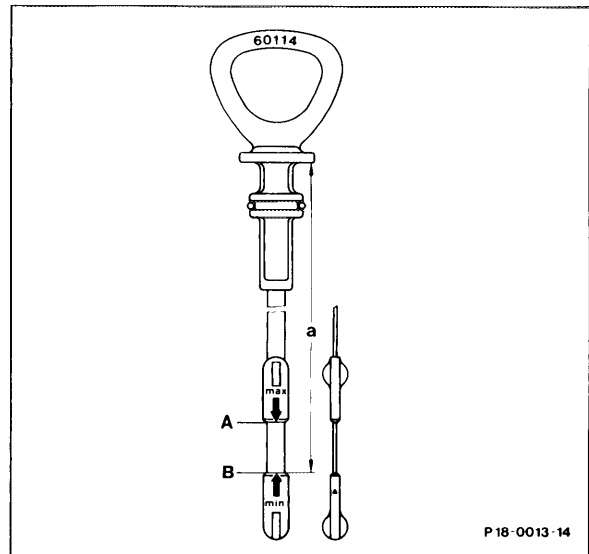


### Production breakpoint: 05/84

Model	Engine	Engine End No.		Vehicle Ident End No.	
		manual transmission	automatic transmission	A	F
201.122	601.921	001552	004036	092057	015430

On engine 602 a dipstick with black handle was fitted to achieve standardization with engine 603.

- 42a Max marking
- 42b Min marking
- 42c Handle shaped like a bottle opener
- A - B Filling range



### Production breakpoint: 01/86

Model	Engine	Engine End No.		Vehicle Ident End No.	
		manual transmission	automatic transmission	A	F
201	602.911	011154	002690	276209	186941

Effective 01/87 a dipstick with green handle (previously black) is fitted to engine 602.96 (Turbo).

**Production breakpoint: 01/87**

Model	Engine	Engine End No.		Vehicle Ident End No.	
		manual transmission	automatic transmission	A	F
201.128	602.961	-	000405	*	*

\* not registered

Engine 602.91 is fitted with a dipstick with a brown handle.

**Production breakpoint: 02/87**

Model	Engine	Engine End No.		Vehicle Ident End No.	
		manual transmission	automatic transmission	A	F
201.126	602.911	036659	009332	*	*

\* not registered

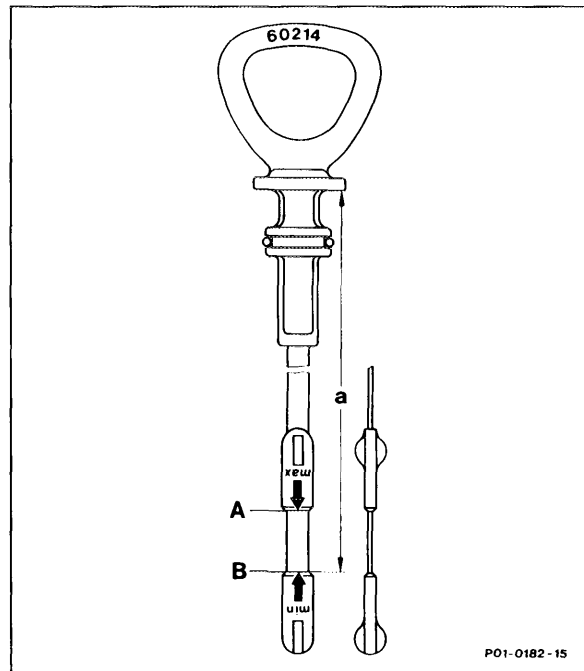
Effective 03/90 the oil level sensor position on engine 602.91 is lowered, which results in a change to the dipstick.

**Dipstick marking**

Color: red

Marking on handle 60214

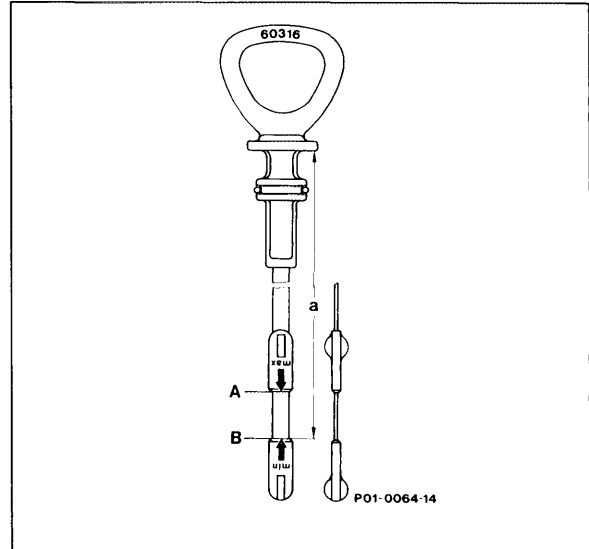
Size: A – B      previously 28 mm, now 24 mm  
           a        previously 516 mm, now 516 mm



**Production breakpoint: 03/90**

Model	Engine	Engine End No.		Vehicle Ident End No.	
		manual transmission	automatic transmission	A	F
201.122	602.911	089320	017352	558126	723643

On engine 603.970 the dipstick is marked on handle with the number 60316.



a 512 mm  
A - B Filling range

**Dipstick marking**

Engine	Model	Colored marking Round handle	Colored marking Bottle opener shaped handle	Numerical marking on handle
602.91	201	-	green <sup>2)</sup>	60214 <sup>1)</sup>
602.96	124, 201	-	green <sup>3)</sup>	-
603.96	124	-	black	-
603.97	126	-	-	60316

1) 1st version color marking "red"  
2nd version color marking "black"  
3rd version color marking "brown"

2) Only on engines with exhaust gas recirculation and side part on oil sump

3) 1st version color marking "black"

**Note**

The dipsticks must not be interchanged.

## Oil pressure and oil pressure indicator

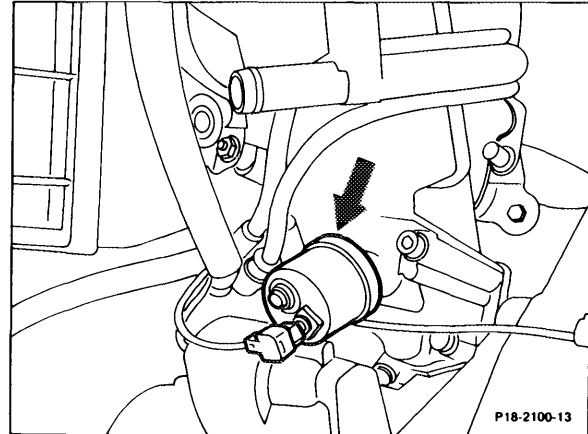
### Specified oil pressure at normal operating temperature

	Idle speed	3000 rpm
Oil pressure	$\geq 0.3$ bar	$\geq 3$ bar

Voltage exists at the gauge in the instrument cluster when ignition is switched on. In the pressure sensor on the oil filter housing (arrow) ground is switched to the gauge. Any change in oil pressure results in different electrical resistances in the pressure sensor and thus in a different reading in the gauge.

### Resistances of pressure sensor as a function of oil pressure

bar gauge pressure	0	1	2	3
Resistance approx. $\Omega$	10	69	129	184

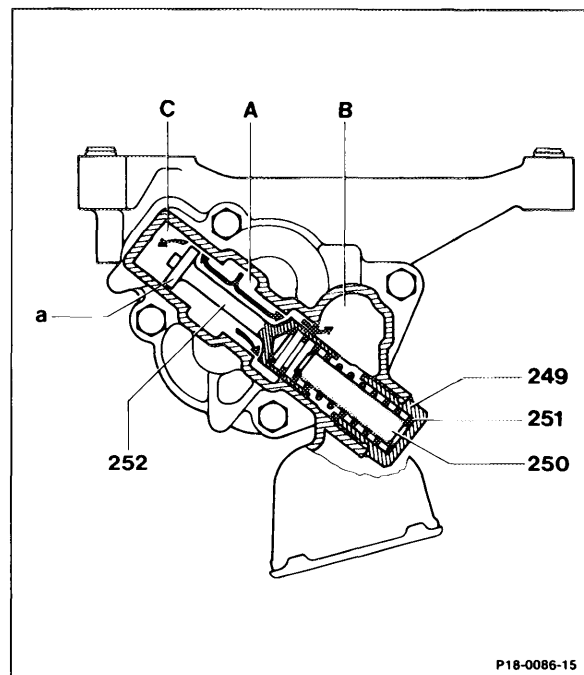


## Oil overpressure valve

The oil is drawn through the suction strainer to the suction chamber (B) from the lowest point in the sump. From here, the oil flows through the gears to the pressure chamber (A) and on into the main oil gallery to the filter.

From an oil pressure of 5.8 bar gauge pressure, the piston (252) is pushed against the compression spring (251) and opens the relief bore (arrows) to the suction chamber (B).

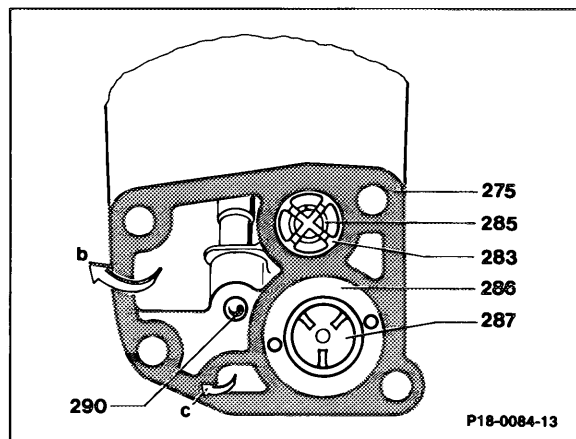
At the same time, the oil flows over two flat faces fitted to the collar (a) into the damping chamber (C). This oil counteracts the piston movements produced by the pulsating oil pressure and results in a damping of the piston.



- 249 Screw plug
- 250 Guide pin

## Bypass valve

As the filter element becomes increasingly fouled, the lubrication points of the engine are supplied with less and less oil and the pressure in the oil filter rises. Once the filter element is so severely fouled that the oil pressure is 2 bar above the pressure of the oil delivered by the pump, the bypass valve (285) opens. As a result, unfiltered oil flows directly from the sump to the lubrication point, bypassing the filter element.



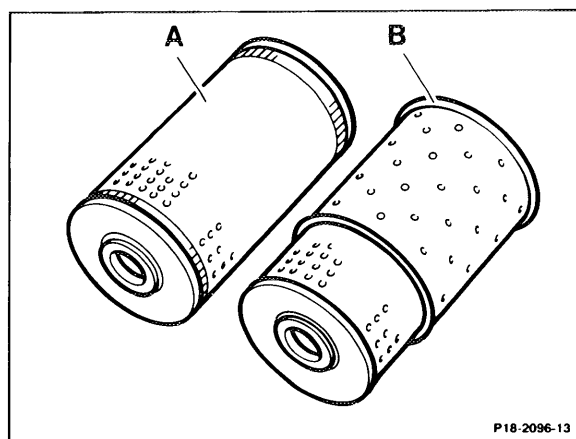
- 275 Oil filter housing
- 283 Spring plate
- 285 Bypass valve
- 286 Return check valve seat
- 287 Return check valve cone
- 290 8 mm Ø ball
- b To the bearing points
- c Finely filtered oil to sump

## Oil filter element

The full-flow and bypass-flow filter elements are combined in a cartridge.

During the inspection (800 – 1000 miles) the break-in oil filter element (A) should be replaced by the combination oil filter element (B).

The combination oil filter element (B) must be replaced every 7500 miles.



## Caution!

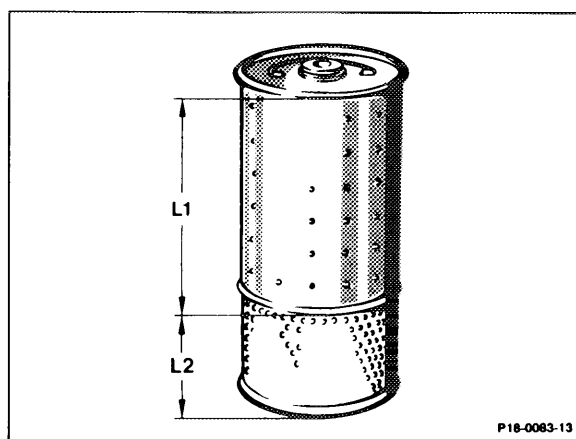
The filter element and the rubber seal on the oil filter cover must not be interchanged with those of engines 615, 616 and 617 as they are different in size.

### Engine 602, 603

Size	L1	113 mm
	L2	49 mm

### Engine 615, 616, 617

Size	L1	131 mm
	L2	55 mm

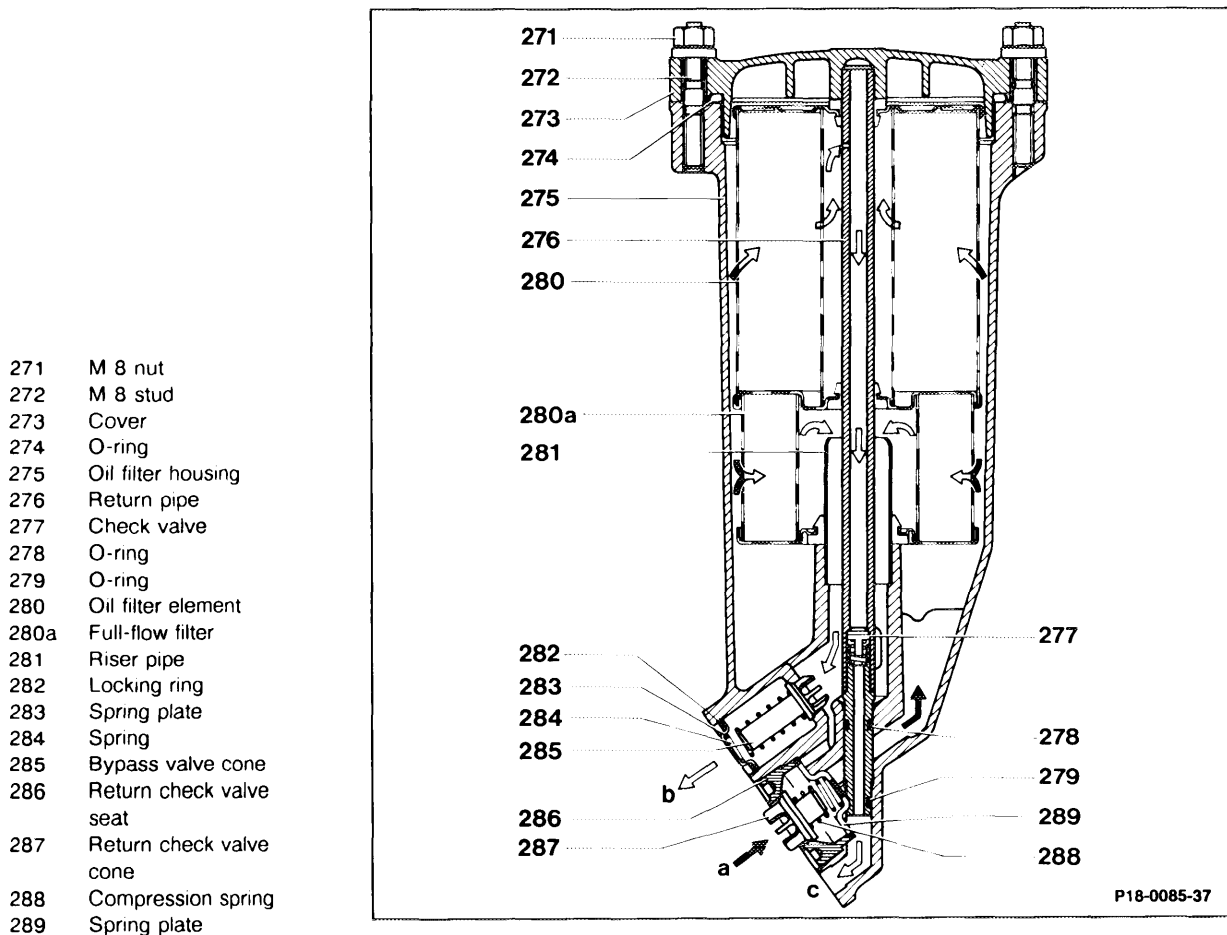




## Oil filter (without air-to-oil cooler connections)

The oil flows from the inlet passage (a) through the return check valve (286, 287) into the oil filter housing and flows direct to the oil filter element (280). It flows through the filter element and then through the riser pipe (281) and the passage (b) to the main oil gallery and on to the main bearings. The finely filtered oil flows through the return pipe (276) and the passage (c) to the oil pan.

A rubber seal is fitted in the oil filter element (280) to separate the full flow and bypass flow.



**Note**

When changing the oil filter element, unscrew the cover (273) and raise it slightly. As a result, the return pipe (276) attached to the cover clears an opening which connects the passages (b) and (c) to each other. The oil in the filter flows back along passage (c) into the oil pan.

The return pipe on engines 601, 602 and in engine 603 – 1st version is press-fitted. On engine 603 in model 124 – 2nd version, this return pipe can be unscrewed when changing oil to more easily remove the oil filter cover.

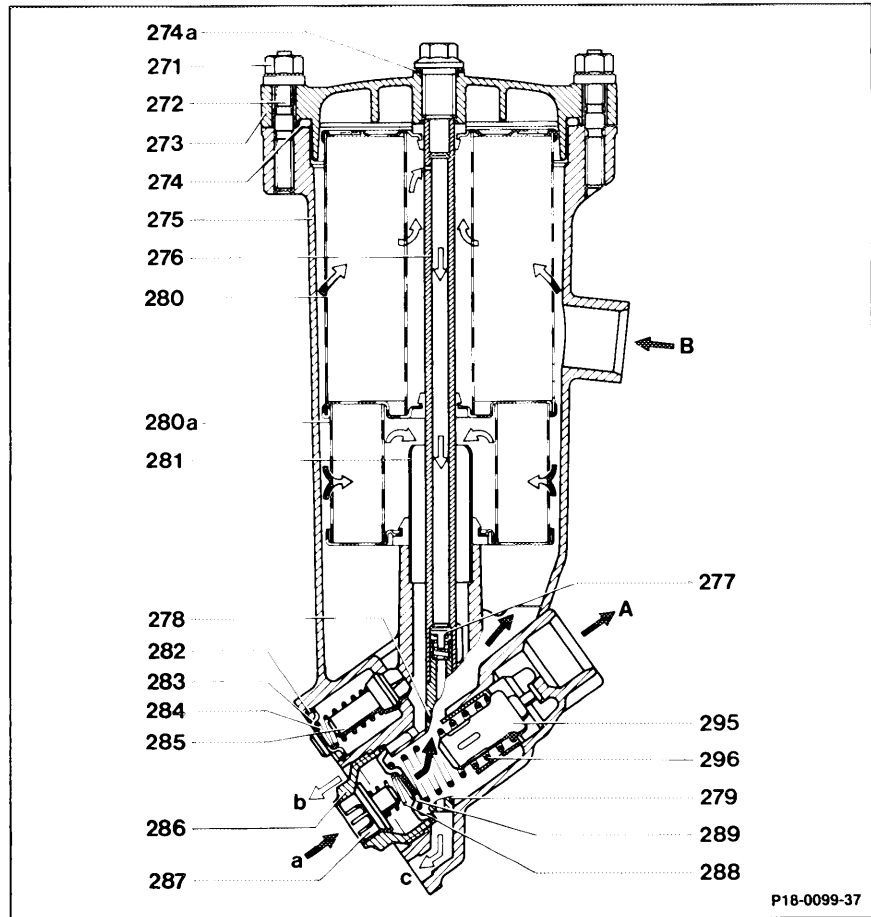
**Oil filter (with air-to-oil cooler connections)**

A thermostat (295) for controlling the oil circuit through the air-to-oil cooler is fitted in the oil filter.

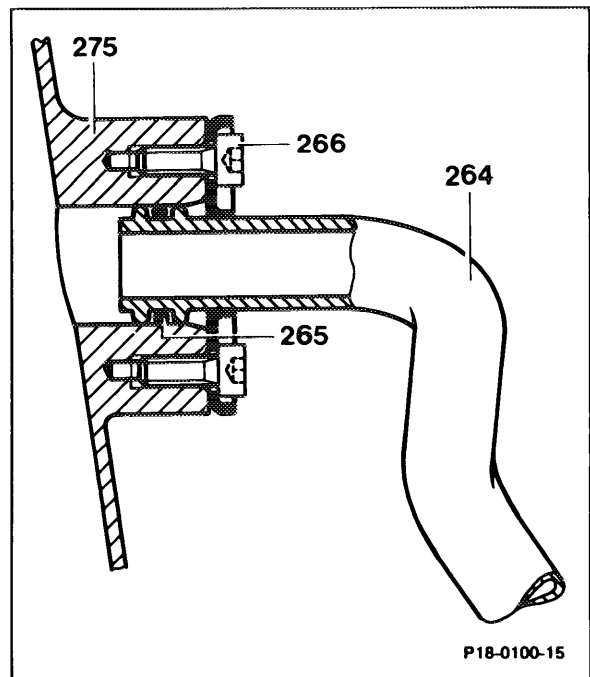
Start of opening approx. 110 °C oil temperature.  
Fully open at approx. 125 °C oil temperature.

When the thermostat is fully open, only a slight quantity of oil flows directly to the oil filter element.

- 271 M 8 nut
- 272 M 8 stud
- 273 Cover
- 274 O-ring
- 274a Seal (only engine 603 in model 124)
- 275 Oil filter housing
- 276 Return pipe
- 277 Check valve
- 278 O-ring
- 279 O-ring
- 280 Oil filter element
- 280a Full-flow filter part
- 281 Riser pipe
- 282 Locking ring
- 283 Spring plate
- 284 Spring
- 285 Bypass valve cone
- 286 Return check valve seat
- 287 Return check valve cone
- 288 Compression spring
- 289 Spring plate
- 295 Thermostat
- 296 Spring
- A Unfiltered oil to air-to-oil cooler
- B Unfiltered oil from air-to-oil cooler
- a To oil filter
- b To bearing points
- c To oil pan



The air-to-oil cooler lines at the oil filter housing are sealed by O-rings (265).



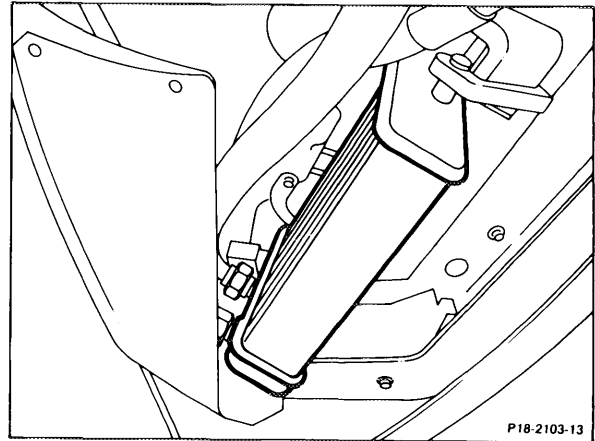
- 264 Air-to-oil cooler lines
- 265 O-ring
- 266 2 screws M 6 x 16
- 275 Oil filter housing

**Air-to-oil cooler (engines 602, 603 with exhaust gas circulation and engines with turbocharger)**

The air-to-oil cooler is attached to the left wheelhouse behind the bumper.

Oil capacity:

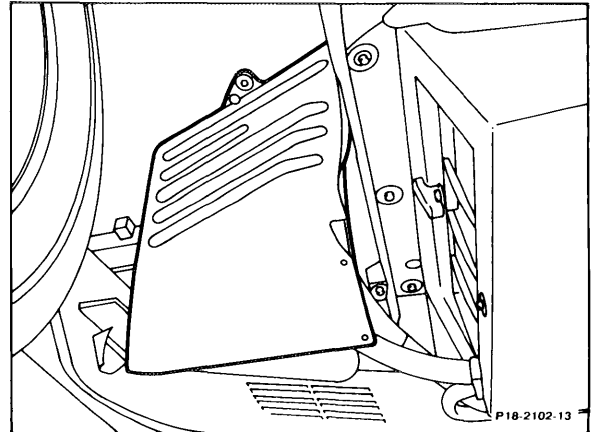
Engine 602.91	0.4	liters
Engines 602.961	0.9	liters
Engine 603.96/97	0.65	liters



The air-to-oil cooler is shielded by a cover plate.

When changing the oil, it is not necessary to drain the oil in the air-to-oil cooler.

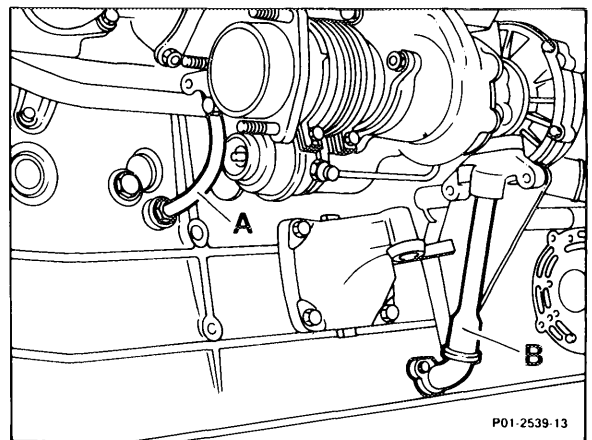
Cover for air-to-oil cooler, shown on model 124



**Lubrication of exhaust gas turbocharger**

The oil supply of the turbocharger comes from an oil passage in the crankcase and from an oil feed line (A) connected at that point.

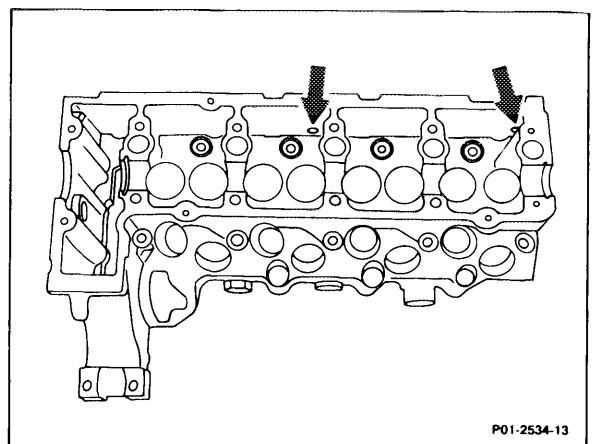
The oil return line (B) is likewise located on the right side of the crankcase and is connected directly above the oil pan.



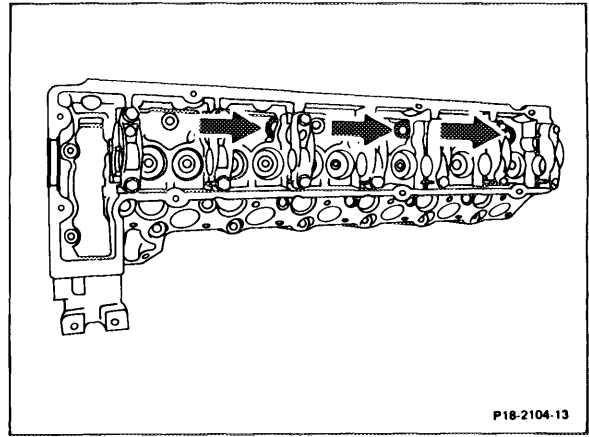
**Oil return**

Part of the oil from the cylinder head returns to the oil pan through the timing chain case. Because of the installation position tilted 15° to the right, the cylinder heads and crankcase are fitted with two and three return passages (arrows), respectively, for improving the oil return.

Engine 601  
Oil return in cylinder head



Engines 602 and 603  
Oil return in cylinder head



Engines 602 and 603  
Oil return in crankcase

