SERVICE

944 turbo

'85

INFORMATION

TECHNIK

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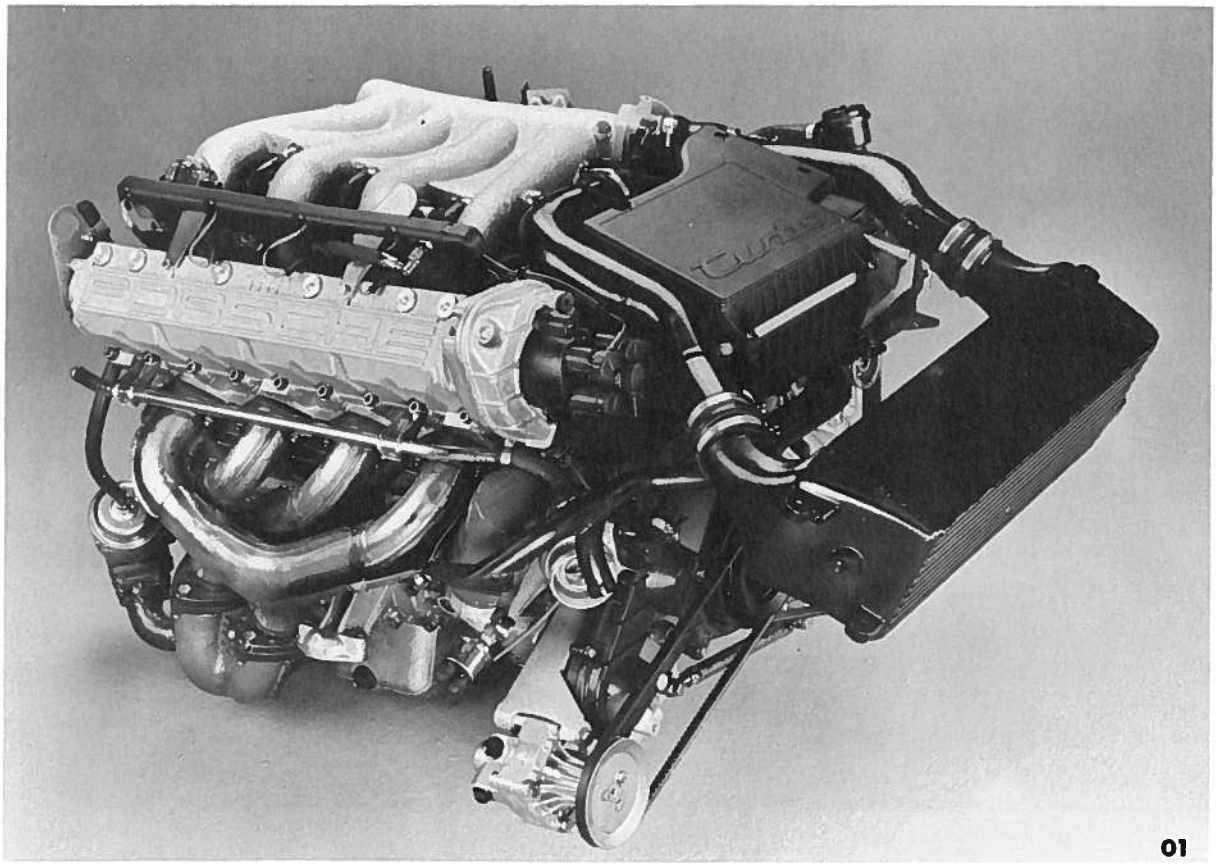
The Porsche 944 Turbo will go into production already during the model year of 1985.

The 944 Series will then have a car with a supercharged engine in addition to the Porsche 944 with a naturally aspirated engine.
Major features of the Porsche 944 Turbo in comparison with model 85/2 Porsche 944 cars:

- Engine with turbocharger (162 kW, 220 HP)
- Stronger five speed manual transmission
- Standard with pressure diecast wheel rims - 7 J x 16 front and 8 J x 16 rear
- Porsche four piston disc brakes on all wheels
- Aerodynamically improved front end with additional air inlets for charge air cooler, engine oil cooler and brake venting
- Cowl panel located underneath car's tail panel
- Side member plates designed as "side spoilers"
- New generation of lights for additional high beams and front fog lamps



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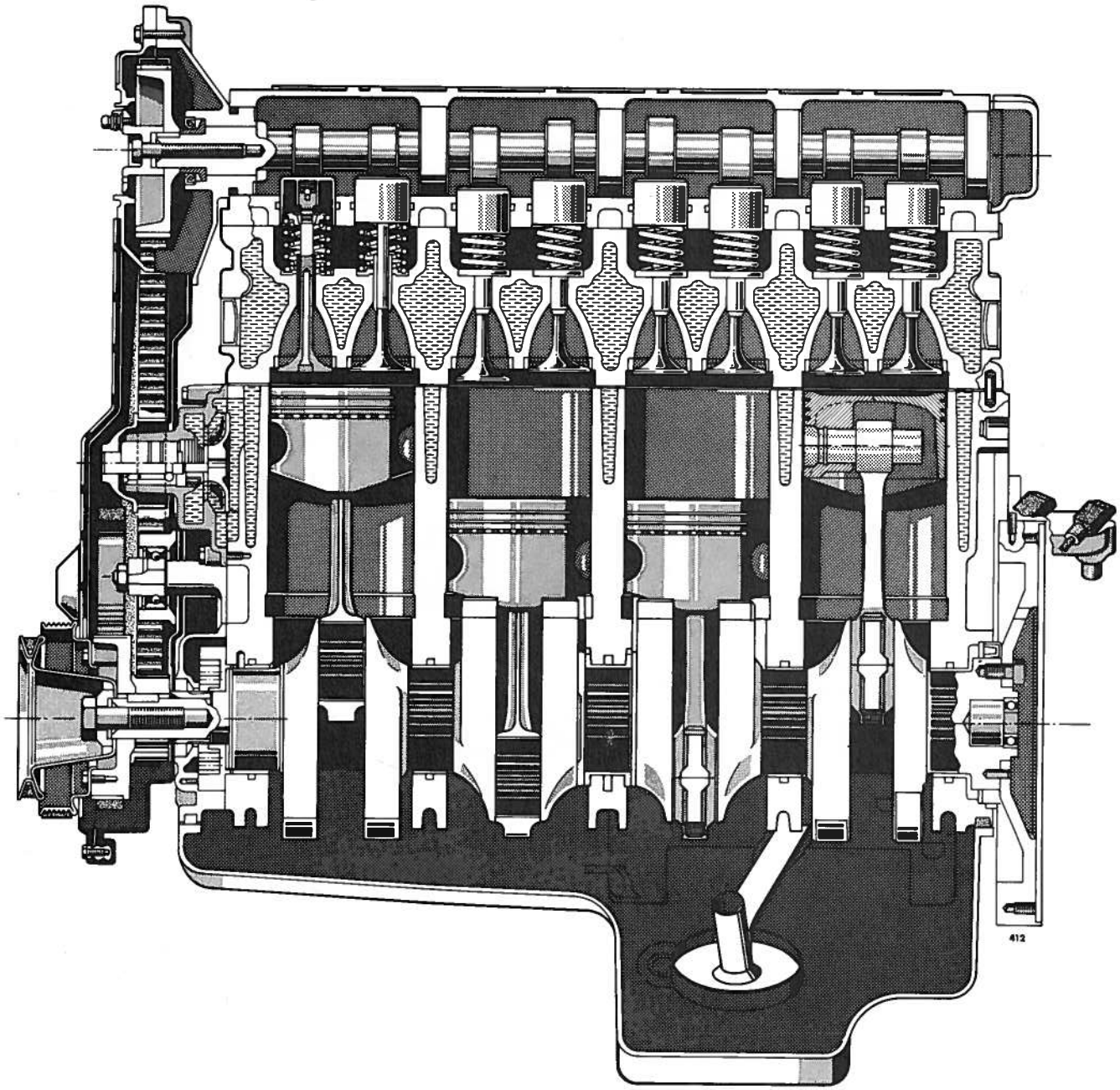
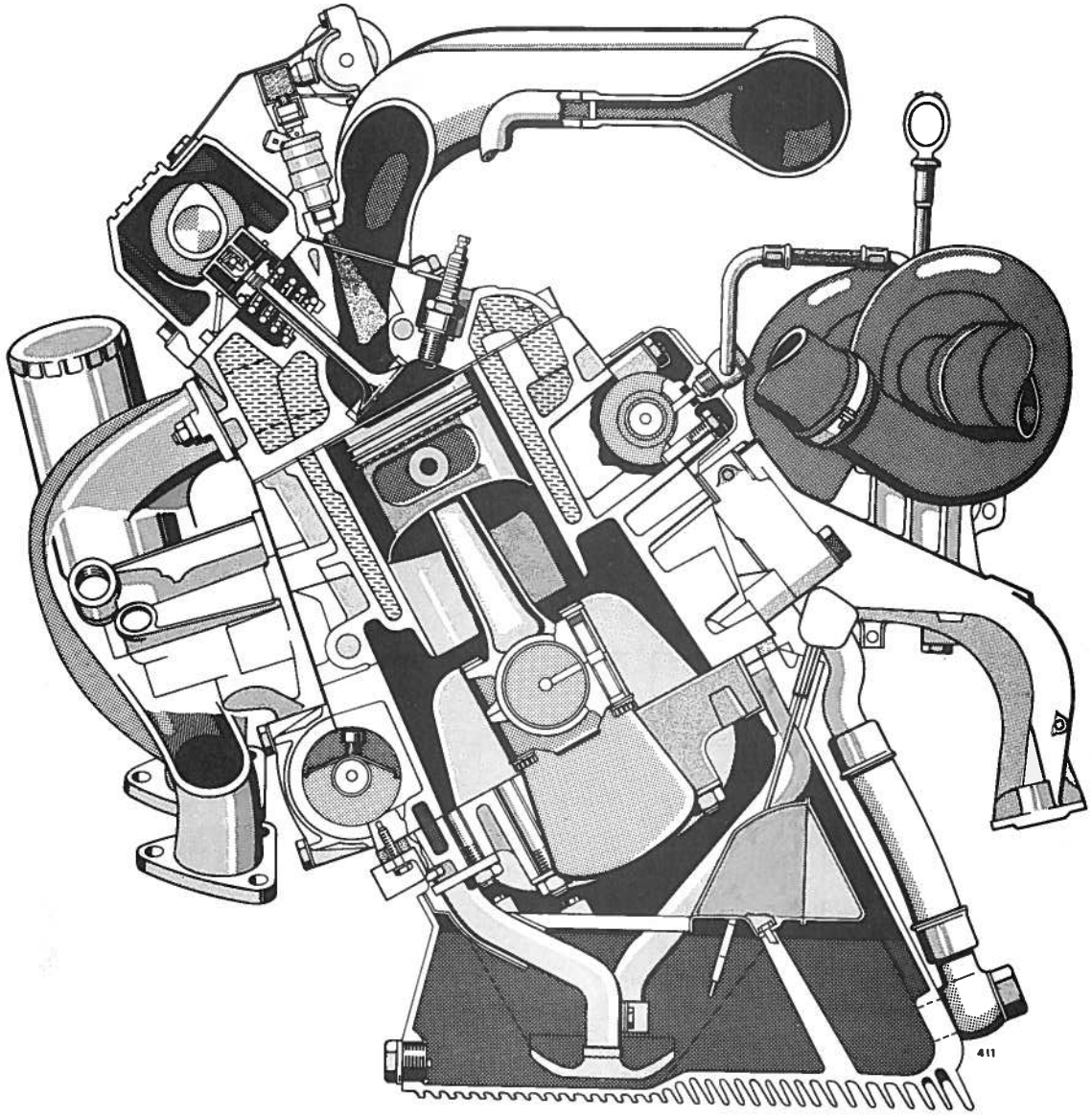
Only one type of engine will be employed worldwide and it will use either leaded or unleaded gasoline with a minumum octane rating of RON 96 / MON 86.
All cars will be equipped with an active carbon tank system for emissionless fuel tank venting.
If the car is operated on unleaded gasoline, the oxygen sensor control system and three-way catalytic converter will provide emission control which is even better than the values required by US legislation.

Technical Data	944 Turbo Worldwide
Displacement	2479 cm^3
Compression ratio	8.0 : 1
Max. engine power output (EC)	162 kW (220 HP)
Top speed	250 km/h
Acceleration from 0 to 100 km/h	sec.
Curb weight	1315 kg
Max. total weight	1600 kg



As a basis the 944 turbocharged engine has the engine block and crankshaft drive (excluding the pistons) of the naturally aspirated engine.

Flywheel, water pump body, oil cooling system, fuel mixture and exhaust system were designed especially for a supercharged engine.



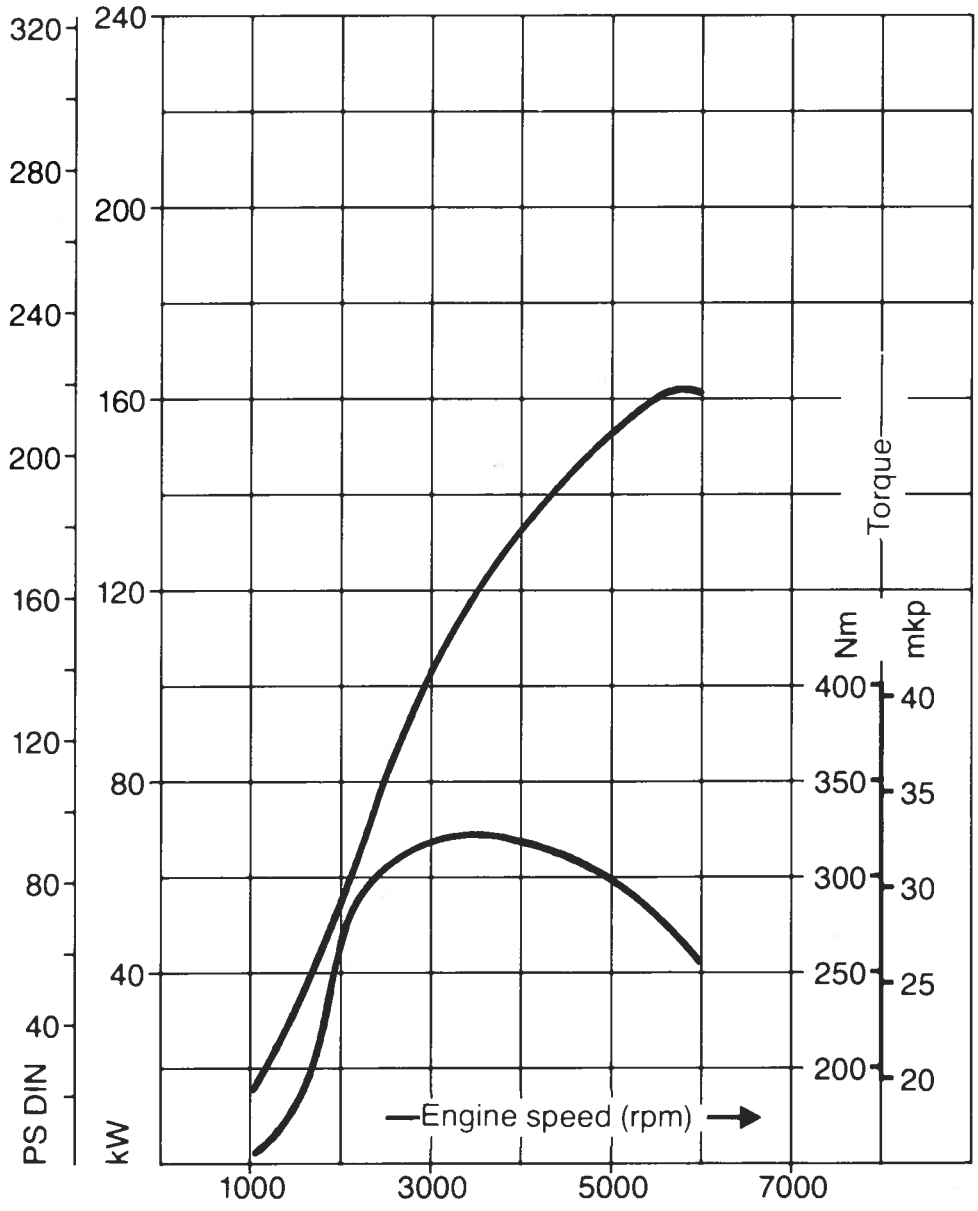
Engine design: Water-cooled, four-cylinder, four-stroke internal combustion engine in-line with two balance shafts.

One overhead camshaft with hydraulic bucket tappets as well as intake and exhaust valves suspended in line.

Supercharging by way of a water-cooled exhaust turbocharger with electronic absolute charging air pressure control and exhaust bypass valve.

The compressed and consequently heated charging air is cooled down by the air stream in a charging air cooler in the front end of the car.

Full-power Curves 944 turbo



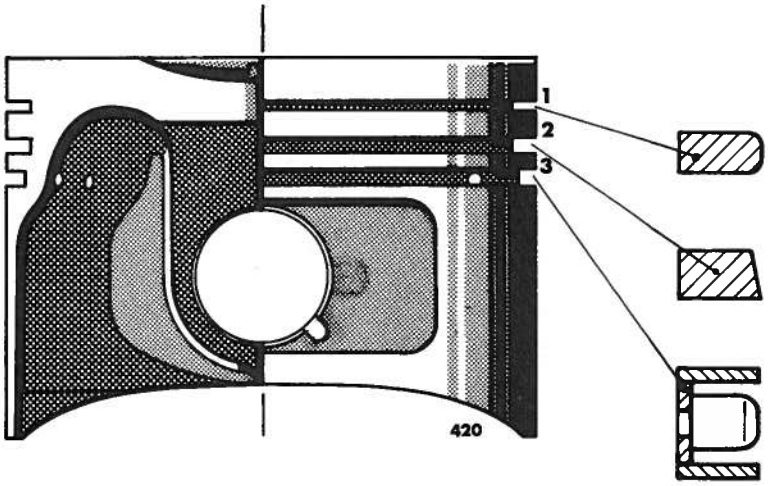
	Displacement (cc)	Stroke (mm)	Bore (mm)	Compression Ratio	Power kW (HP) at rpm	Torque Nm at rpm	Fuel Grade and Octane Rating
944 Turbo Worldwide	2479	78.9	100	8.0 : 1	162 (220) 5800	330 3500	Leaded or unleaded gasoline with at least 96 RON / 86 MON
944 naturally aspirated engine R.o.W. since 1985 models	2479	78.9	100	10.6 : 1	120 (163) 5800	205 3000	Leaded or unleaded gasoline with at least 96 RON / 86 MON

Pistons

The pistons, with a standard diameter of 100 mm, have an oval bowl to match the cylinder head and guarantee reaching a compression ratio of 8.0 : 1.
The installed position is indicated by an arrow, the tip of which points to the pulley (forward).
The piston pin bore is offset from center by 1.0 mm.

Cylinder bore diameters and piston diameters are available in three tolerance groups.

	Piston Diameter (mm)	Cylinder Bore Diameter (mm)	Tolerance Group
Standard size	99.980	100.000	0
	99.990	100.010	1
	100.000	100.020	2



Piston Rings:

Groove 1	Plain compression ring, 1.5 mm, high faced, chrome plated
Groove 2	Taper faced compression ring, 1.75 mm
Groove 3	Three-piece oil scraper ring, 3 mm

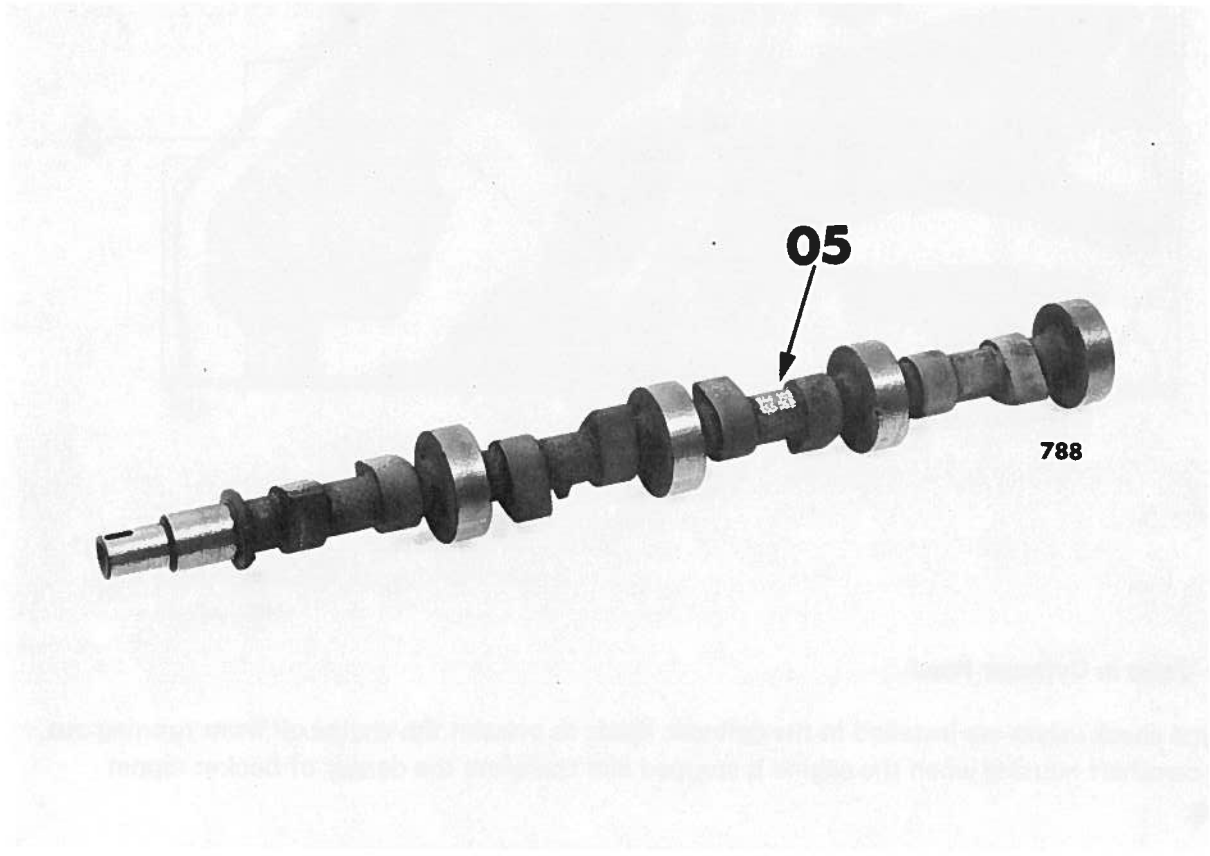
Camshaft

The camshaft of the 944 Turbo differs from the camshaft in 1985 model 944 naturally aspirated engines in **reduced** exhaust cam height.

	944 Turbo	944 Nat. Asp. Eng. 1985 Model
Height – intake cam	12 mm	12 mm
Height – exhaust cam	11 mm	12 mm
Final digits stamped in camshaft	05 R	09 R

Timing of 944 turbocharged engine with 1 mm valve clearance

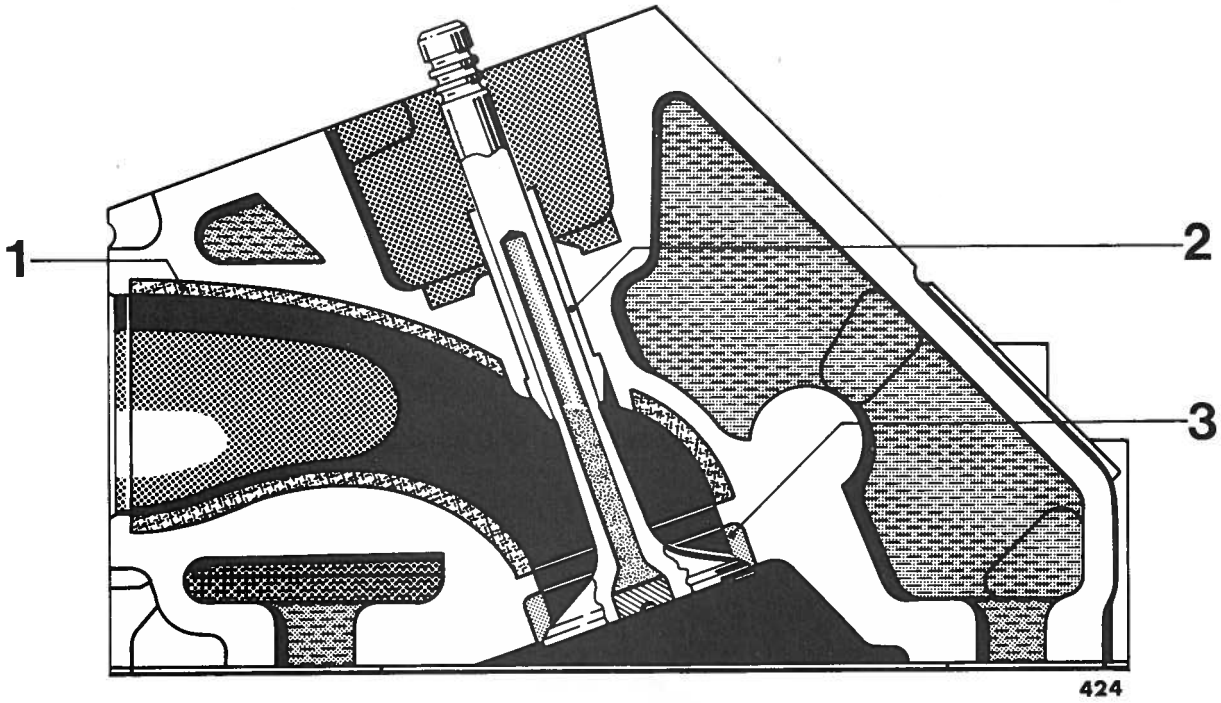
Intake opens	1° after TDC
Intake closes	49° after BDC
Exhaust opens	43° before BDC
Exhaust closes	3° before TDC



The complete number of the 944 Turbo camshaft is 944.105.155.05 (R).
The camshaft of the 944 Turbo is identical with the **former** camshaft used in 944 naturally aspirated engines.

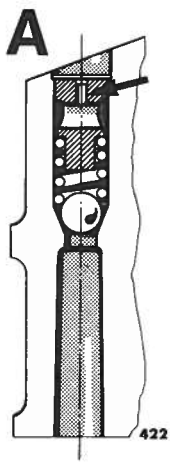
Cylinder Head

The cylinder head of the 944 Turbo differs from the one for 944 naturally aspirated engines in the cast-in, thermal insulating ceramic exhaust ports (1) and the exhaust valve guides (2) which are longer and made of different material.
The valve seat inserts (3) are made of a material with better heat-proof properties.
The valve seat width for exhaust valves has been changed from 2.0 mm to 2.5 mm.

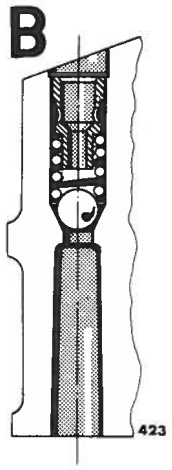


Check Valve in Cylinder Head

Ball type check valves are installed in the cylinder heads to prevent the engine oil from running out of the camshaft housing when the engine is stopped and therefore the danger of bucket tappet rattling.



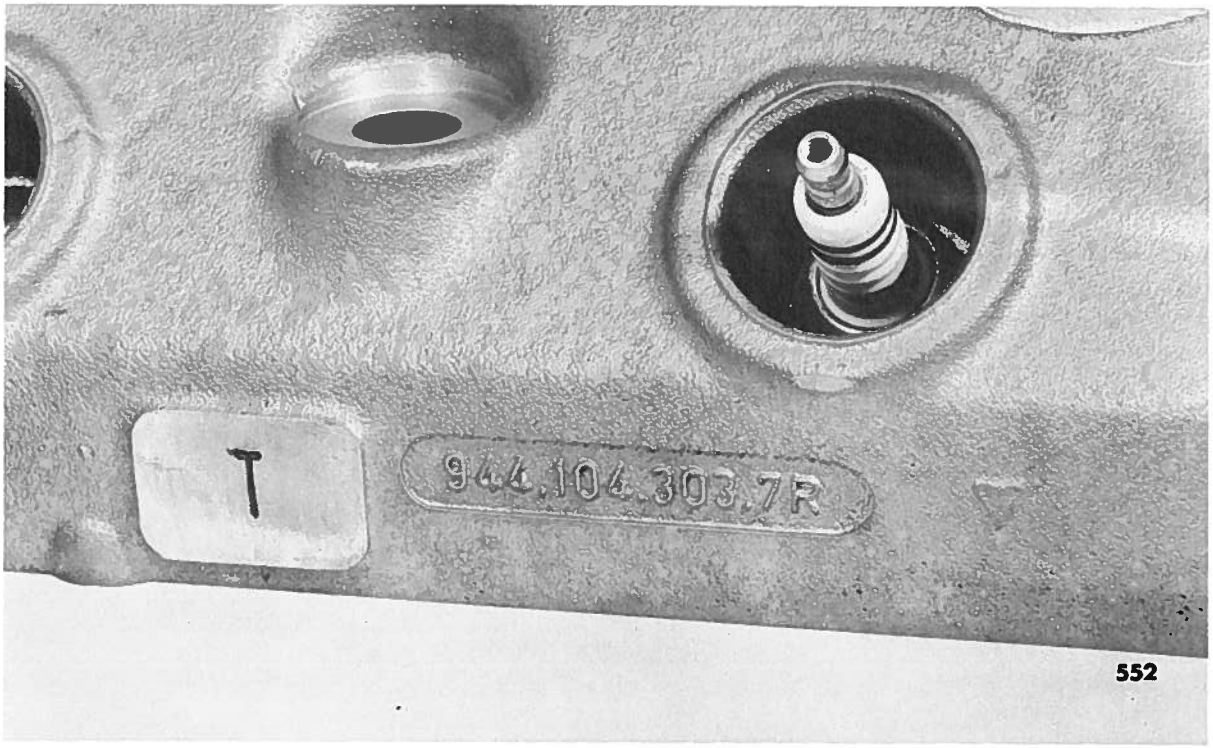
Check valve (A) with a tight jet opening (arrow) is applied in 944 Turbo cars to first build up oil pressure in the crankshaft drive and turbocharger, before filling the camshaft housing.



Version (B) with a greater flow rate in direction of the camshaft housing is used in 944 naturally aspirated engines.

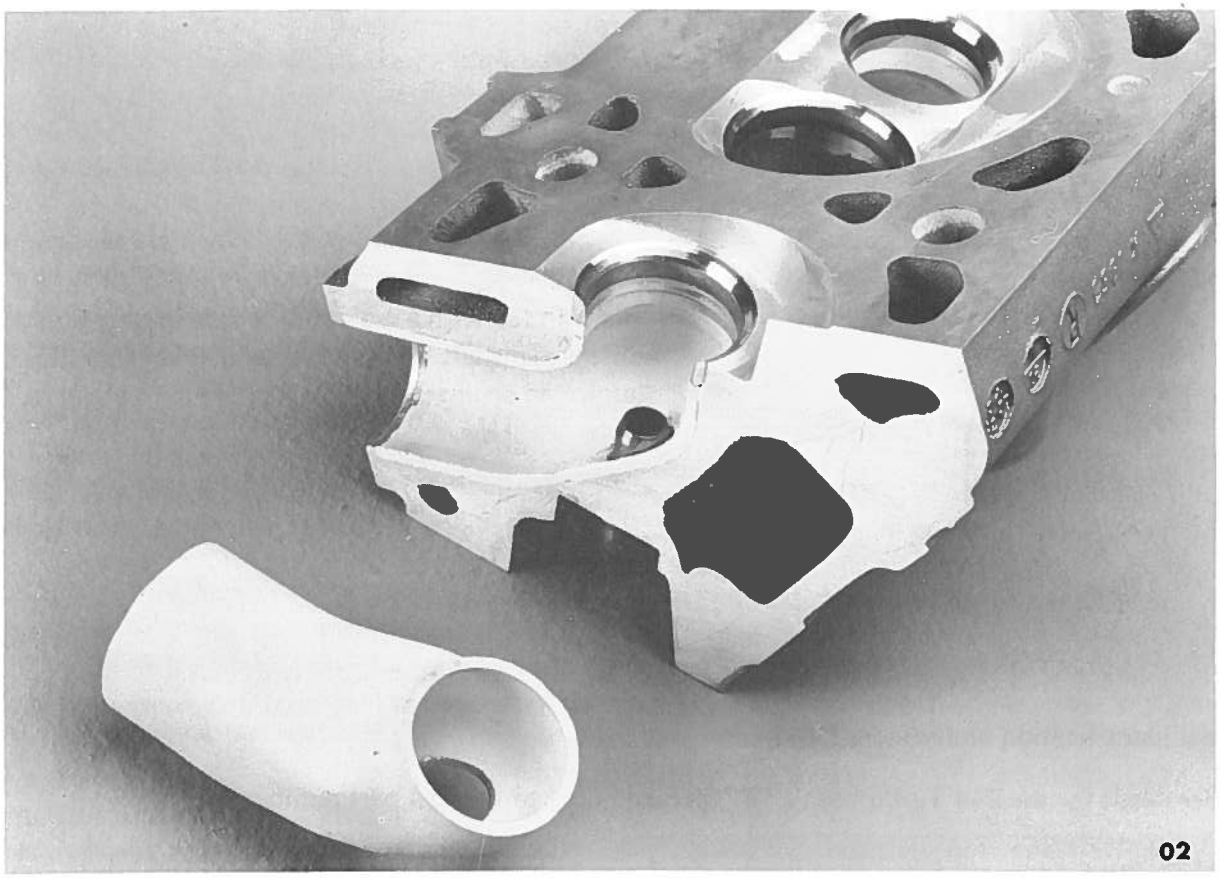
External Identification on Cylinder Head

Cylinder heads for the 944 Turbo have a "**T**" stamped next to the cast part number.



Ceramic Exhaust Ports (Port Liners)

The catalytic converter system with worldwide application in the near future requires that the exhaust gas be supplied to the catalytic converter as hot as possible during the warm-up phase of the engine. This is accomplished with cast-in, thermal insulating exhaust port liners which prevent exhaust heat from being put off into the aluminum walls and therefore the coolant.



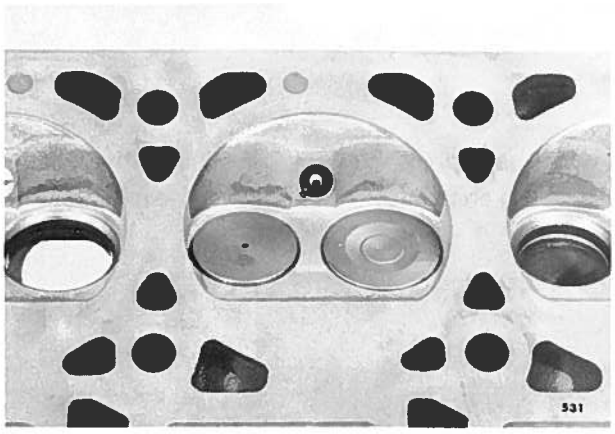
The exhaust manifold system also employs insulated pipes.

Valves

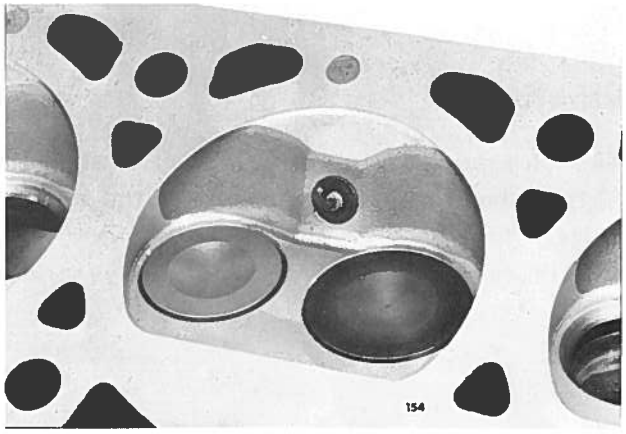
The valves are not identical with the corresponding valves of a 944 naturally aspirated engine, neither in shape nor in material.

Differences:

	944 Turbo	944 Nat. Asp. Engine
Intake valve	Valve head with recess and circular journal	Valve head with recess
Exhaust valve	Valve head completely flat	Valve head with recess



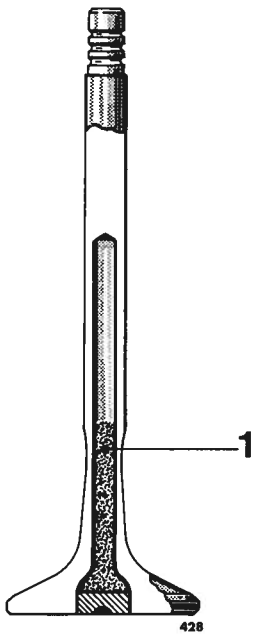
944 Turbo



944 Naturally Aspirated Engine

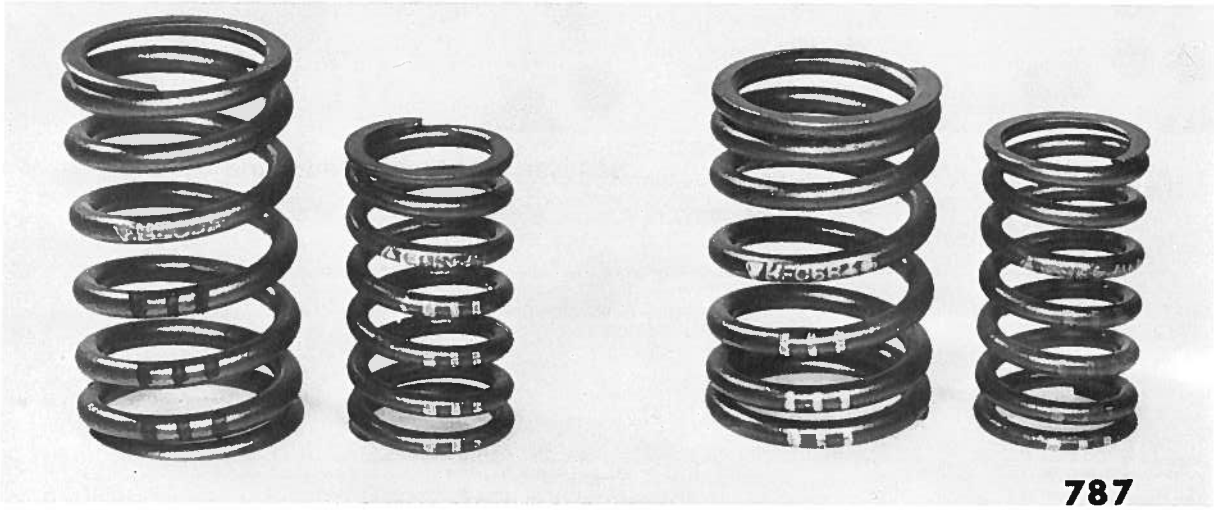
Sodium Cooled Exhaust Valves

The exhaust valve has a hollow drilled valve stem which is filled partially with sodium (1). At room temperature sodium is a solid to pulpy metal, which melts already at 98° C. At engine operating temperature the now liquid metal will be thrown back and forth in the stem bore by valve movement, so that heat is transfered to the cooler stem wall and therefore the valve guides.
In this manner it is possible to have a lower critical temperature range on the valve bell and stem.



Valve Springs

The valve spring assembly must have an installed force which is approx. 20 % higher, due to the higher exhaust gas counterpressure on the exhaust side and the charging air pressure in the exhaust ports.
Modifications **only** concern the outer valve springs.



944 Turbo

944 Naturally Aspirated Engine

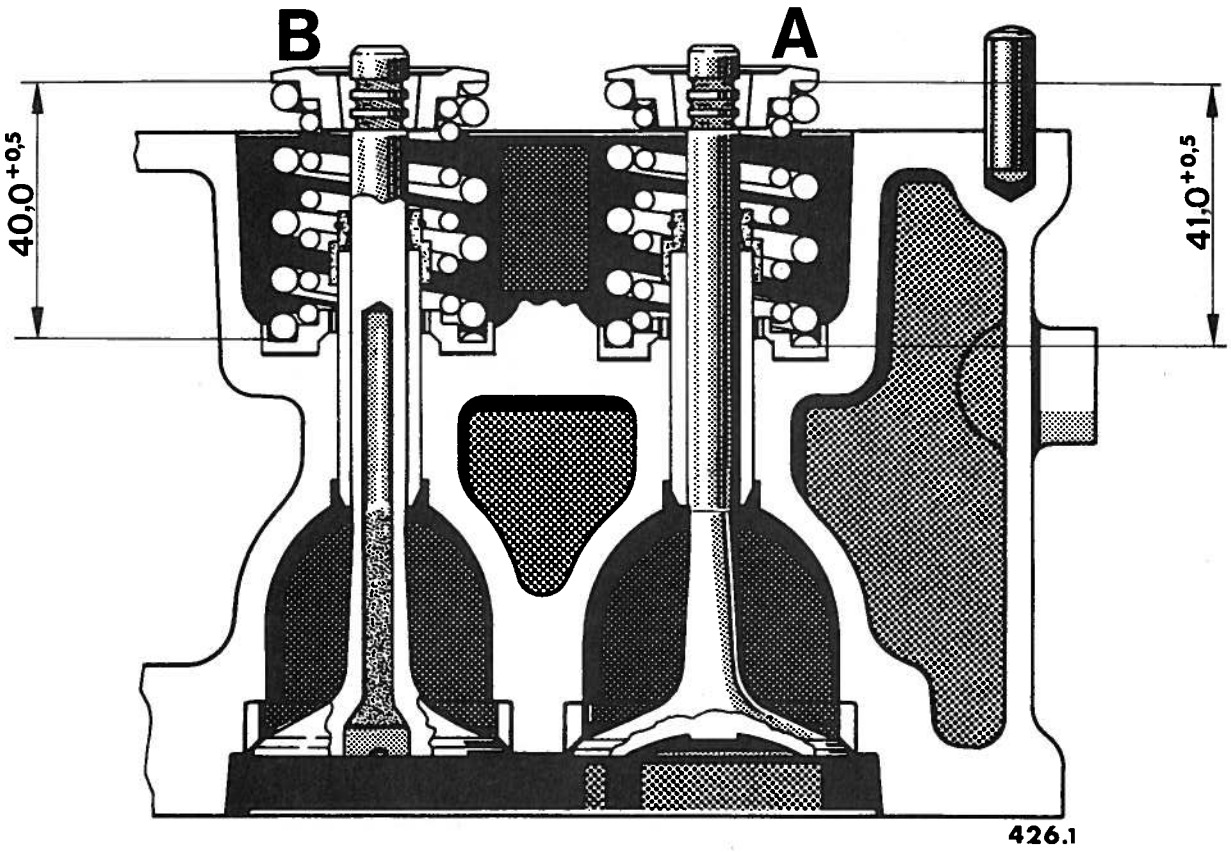
Outer Valve Spring Identification

	944 Turbo	944 Nat. Asp. Engine
Relaxed length	approx. 58 mm	approx. 52 mm
Color code	3 red stripes on spring wire	3 white stripes on spring wire

Installed Distances of Valve Springs

1. **Intake Valve (A)**
   The **installed distance of 41 + 0.5 mm**, measured between the bearing surfaces of the installed valve springs, is identical with the distance of a 944 naturally aspirated engine.

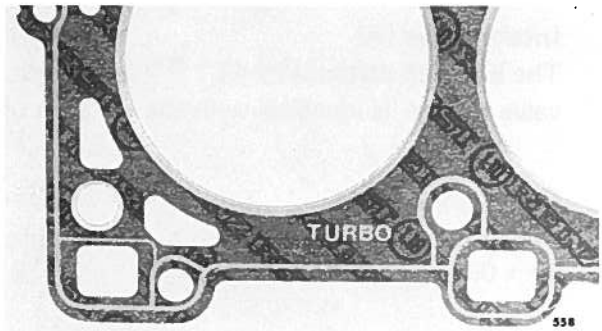
2. **Exhaust Valve (B)**
   The valve springs on an exhaust valve are pre-loaded to 40.0 + 0.5 mm (as compared with 41 + 0.5 mm for the 944 naturally aspirated engine).



Cylinder Head Gasket

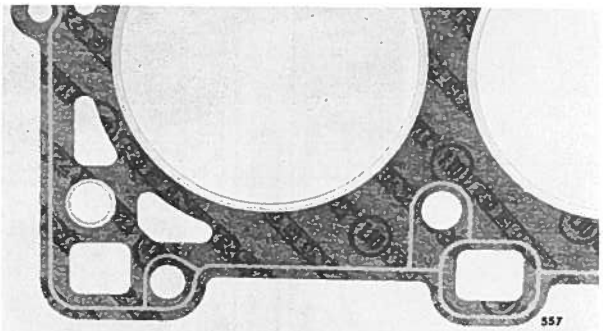
The cylinder head gasket for the 944 Turbo has a partially recessed silicone bead on both sides and a modified combustion chamber fringe.
The word "TURBO" is stamped in the top surface for identification.

Cylinder Head Gasket of Turbocharged Engine



Note: The Turbo cylinder head gasket may be installed in naturally aspirated engines, however not vice versa (gasket of naturally aspirated engines in turbocharged engines).

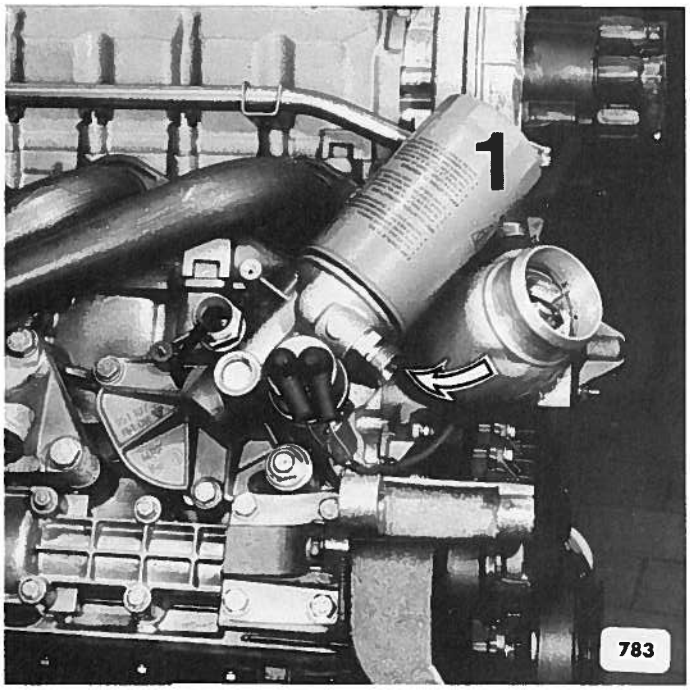
Cylinder Head Gasket of Nat. Asp. Engine



Oil Circuit (USA)

The heat exchanger (oil → coolant) known from the 944 naturally aspirated engine will be standard on the side of the engine block in US cars.
However, an oil cooler in the front end of the car will also be available as optional extra equipment.

Engine oil is delivered by the oil pump to the cooler in the front end of the car (black arrow), where it is cooled by the air stream.
The oil leaves the cooler, flows back to the thermostat housing (white arrow) and passes through oil filter (1). After filtering the oil continues through ports and bores to the various lubrication points of the engine.

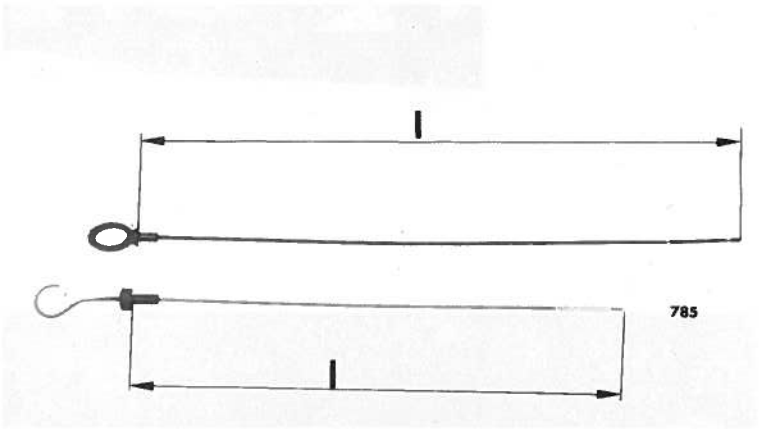


Oil Volume

The oil volume of the 944 supercharged engine is 6.5 liters.

Oil Dipstick

A new oil dipstick is used for the 944 Turbo, since it was necessary to make the upper section of the oil dipstick guide tube longer for better checking of the oil level.

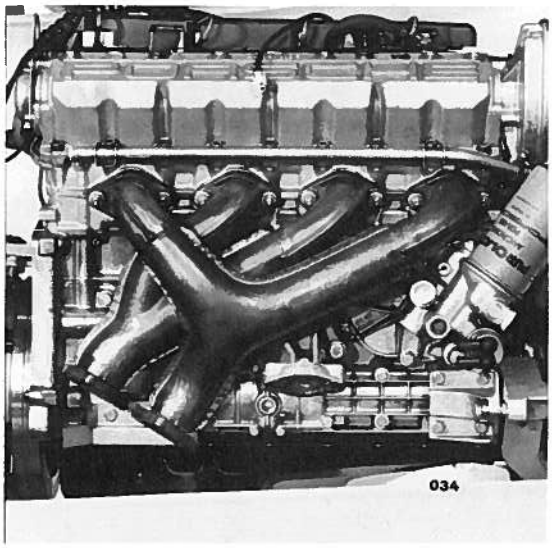


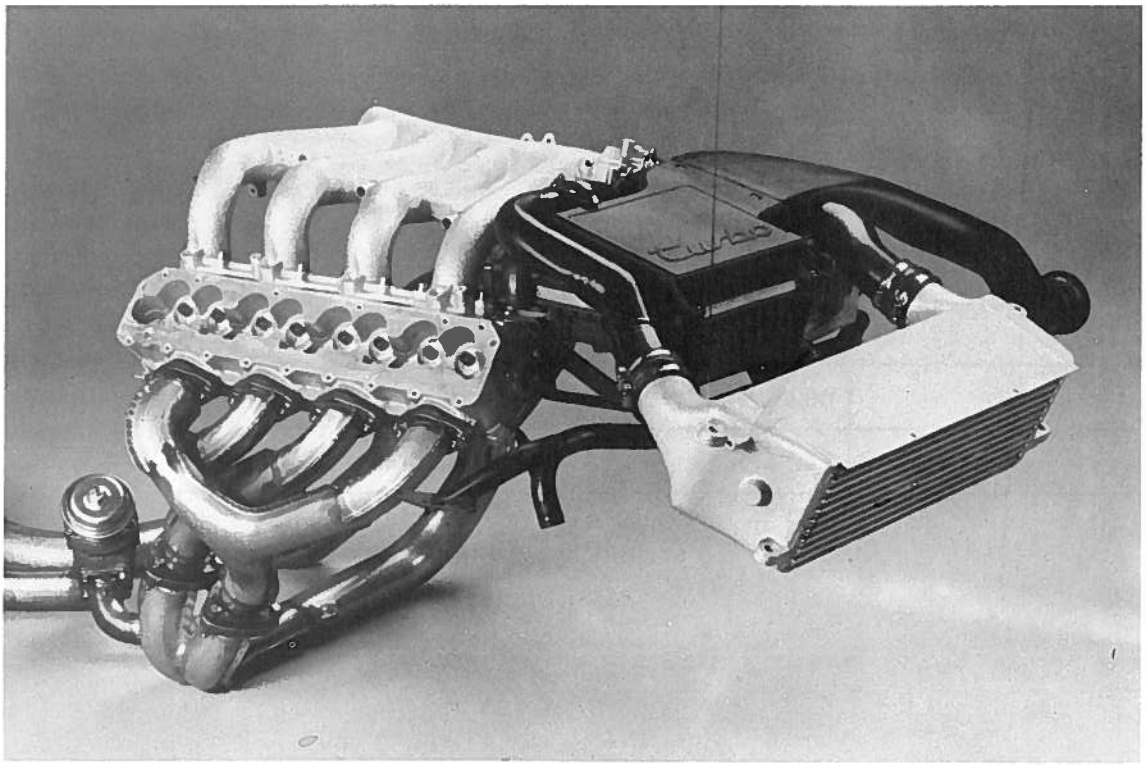
Differences:

	944 Turbo	944 Nat. Asp. Engine
Upper end	plastic ring	wire hook
Length l	540 mm	430 mm

The exhaust manifold is a two-piece part, in that the exhaust pipes for cylinders 1 and 4 as well as 2 and 3 are assembled to make up a single manifold.

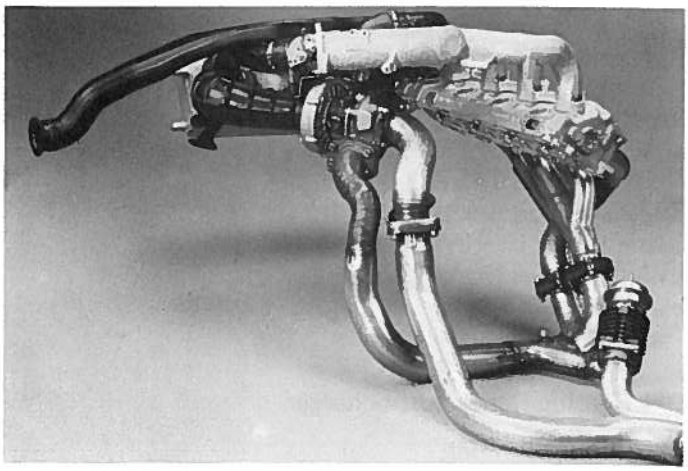
The manifold pipes have insulated sleeves extending up to the flanges, in order to have the exhaust gases reach the catalytic converter as hot as possible.

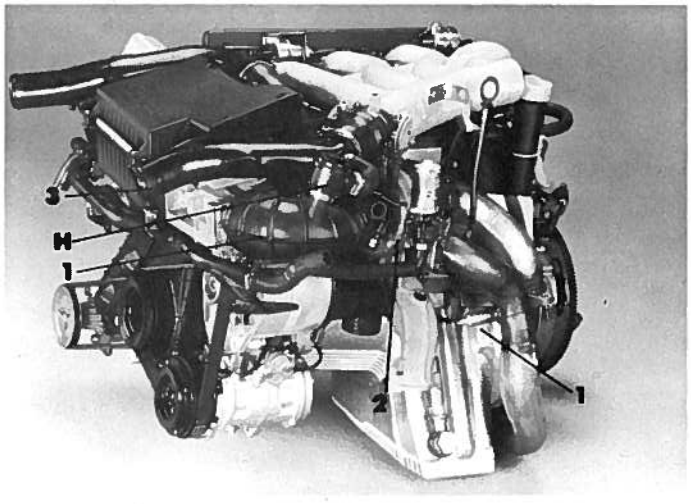




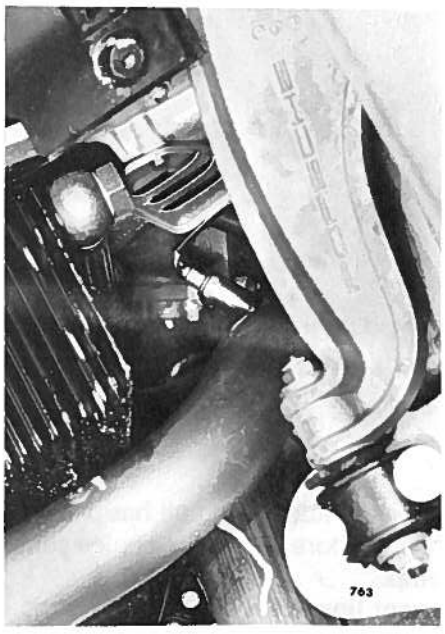
The exhaust gas from both pipe ssystems flows together after the joining flanges.
A pipe, installed transversely, in which a branch leading to the charging air pressure control valve is also integrated, passes underneath the oil pan to the turbocharger located on the left side of the engine.

The exhaust gas continues from the turbocharger to a three-way catalytic converter and are discharged outdoors after passing the main muffler.





An oxygen sensor (1) is inserted in the exhaust pipe at a point shortly before entry of the exhaust gas in the turbocharger.

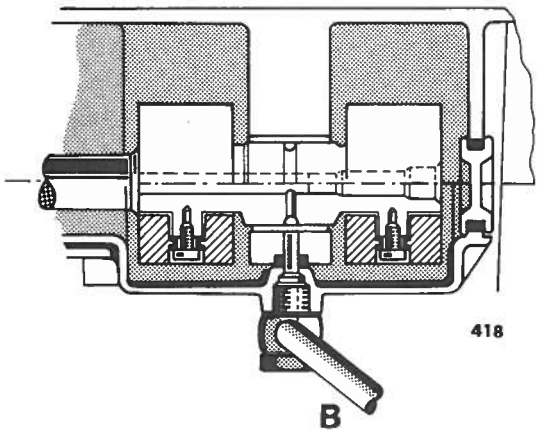


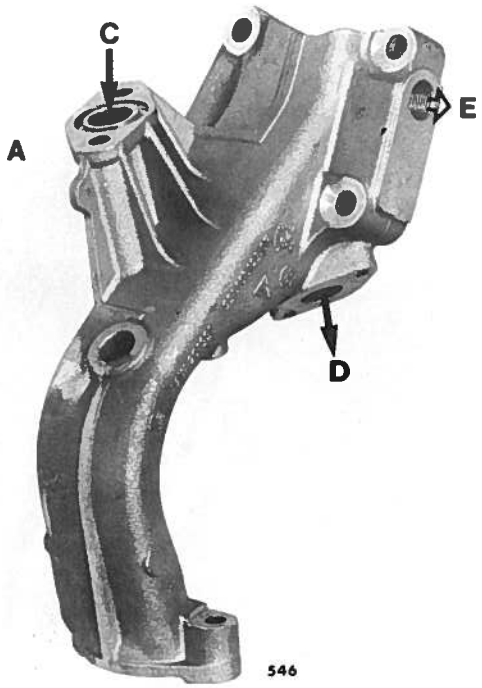
Turbocharger

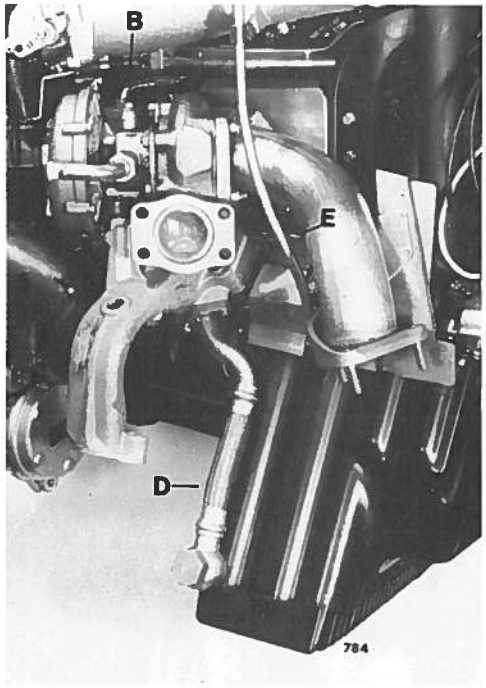
The turbocharger is bolted on a bearing flange (A) on the left engine support with two bolts.

Lubricating oil is supplied from the rear balance shaft bearing.
A line (B) goes from this point to the oil inlet flange on the turbocharger.

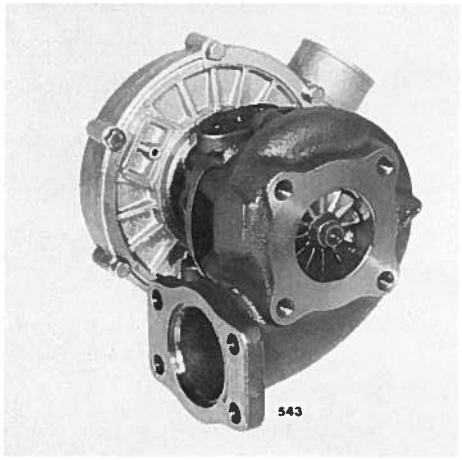
A – Bearing flange/turbocharger
B – Oil supply line
C – Return bore
D – Return line
E – Vent line

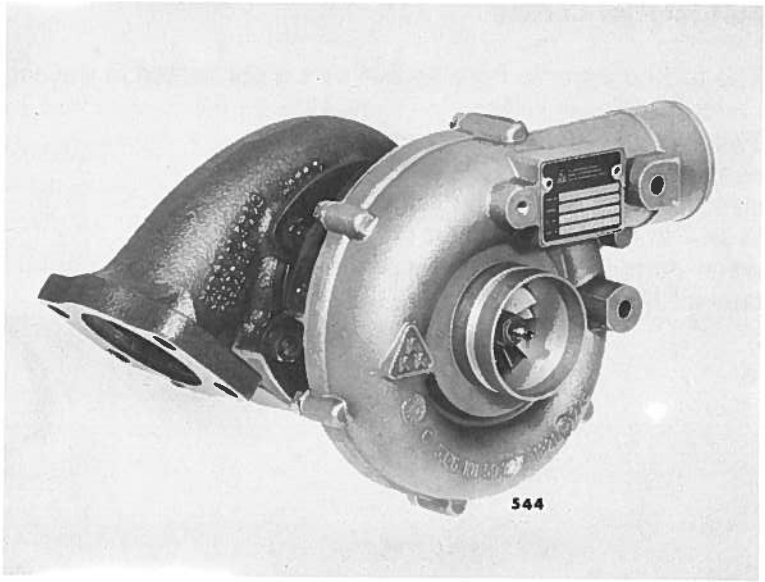


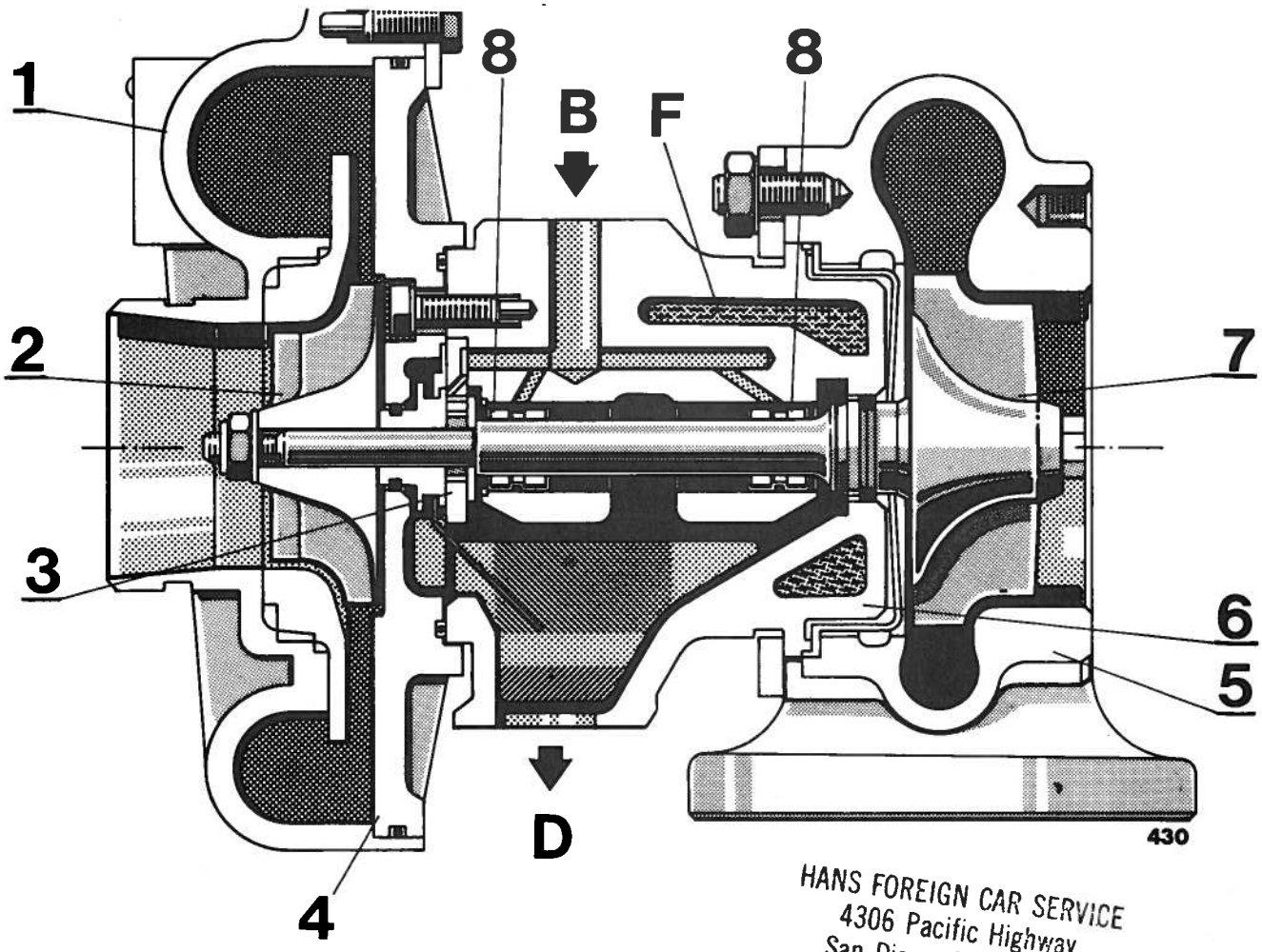




After the lubricating oil has passed the bearing points in the turbocharger, the return oil flows through bore (C) in the engine support and from here via return line (D) into the lubricating oil sump.
A vent line (E) is connected on the side of the engine support and leads to the oil filler neck (oil trap).





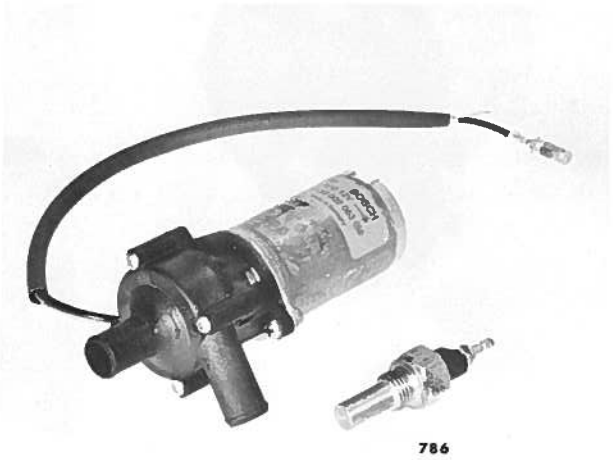


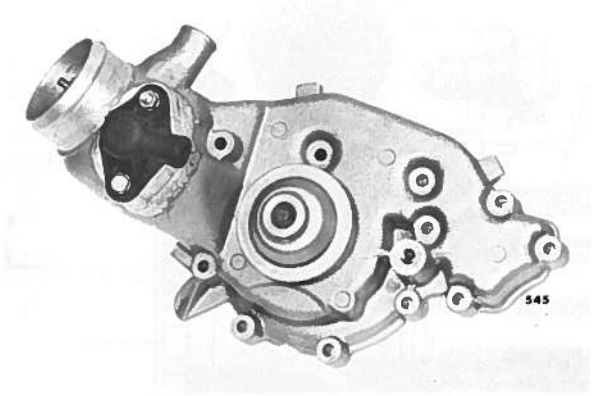
1 – Compressor housing
2 – Compressor wheel
3 – Axial bearing
4 – Compressor back wall
5 – Turbine housing
6 – Bearing housing
7 – Rotor
8 – Bearing sleeve
B – Pressure oil from engine
D – Oil return flow
F – Coolant sleeve

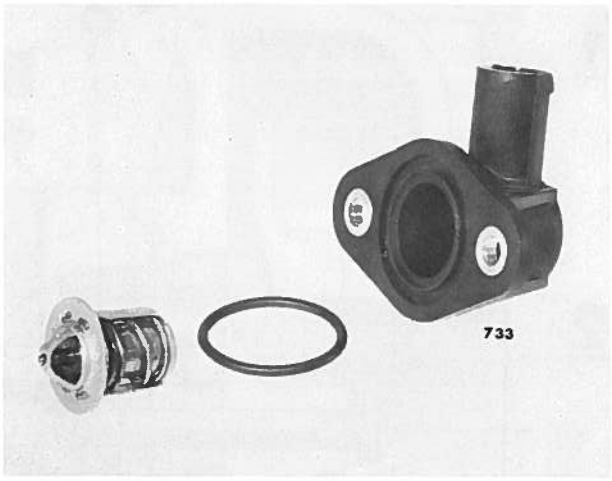
Turbocharger Cooling

The turbocharger in Porsche 944 cars is connected in the engine's coolant circuit.

The coolant circuit of the turbocharger consists of a temperature switch (14), electric circulation pump (12), as well as an additional thermostat (15) in the water pump housing and the pertinent coolant lines.





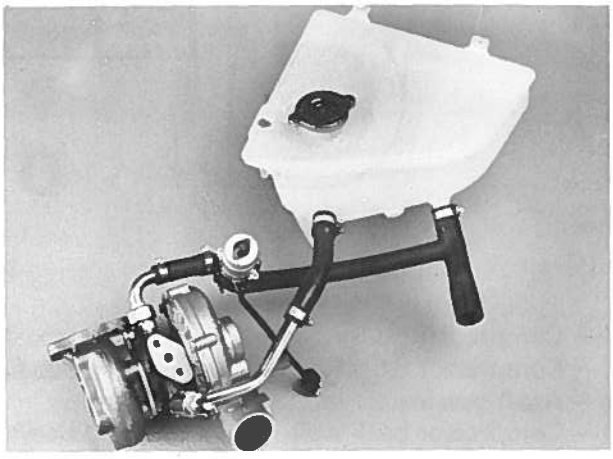


14 - Temperature switch
12 - Electric circulation pump
15 - Additional thermostat

a - To additional thermostat
9 - Filling line

The electric pump is located in the line between the expansion tank and turbocharger. The return line between the turbocharger and expansion tank is connected on the inlet side of the water pump, via the additional thermostat.

The temperature switch is also installed in the return flow line, direct at the outlet of the turbocharger.

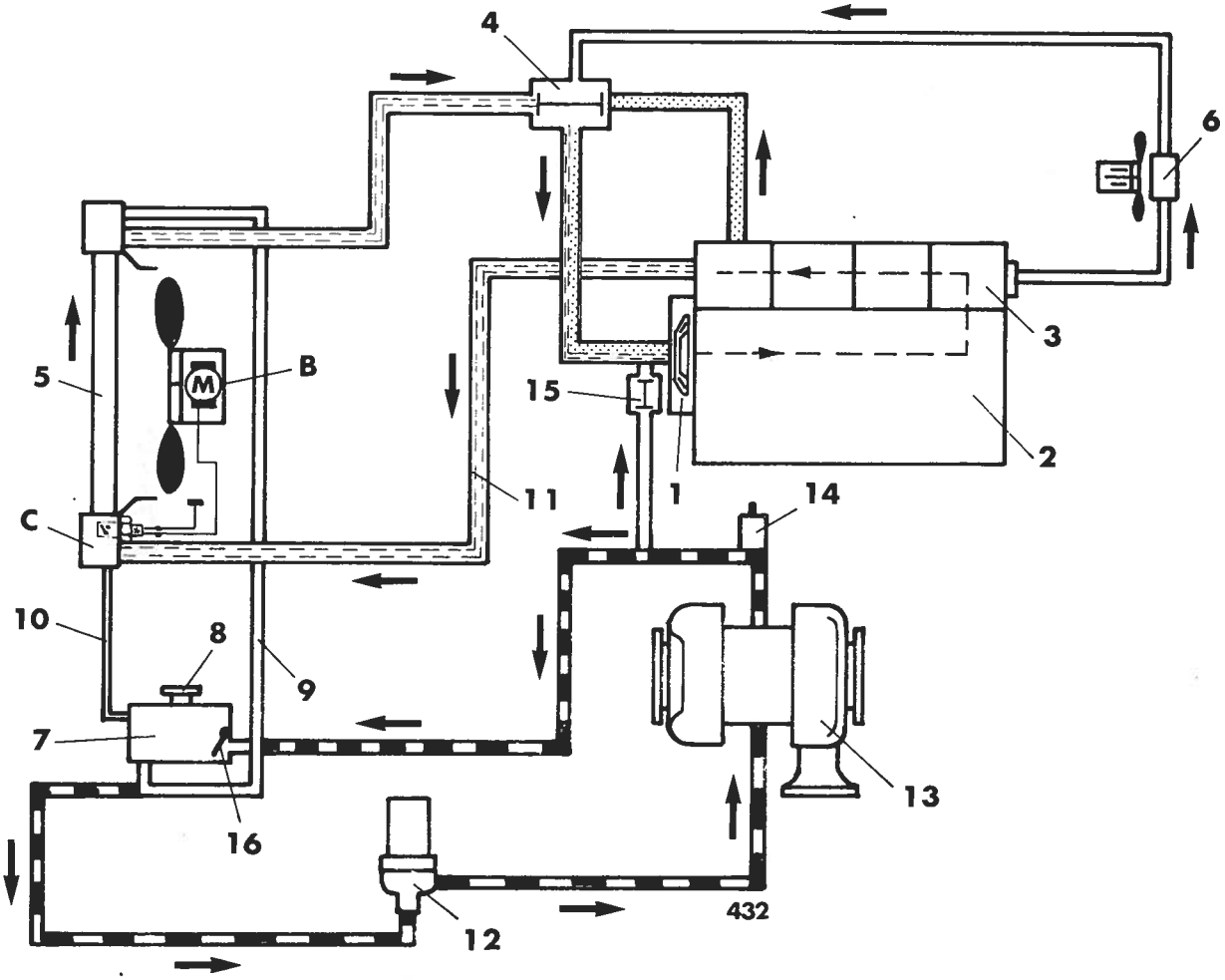


Description of Operation

The additional thermostat of a running engine will open at a temperature of approx. 82° C to make a connection between the engine coolant circuit and turbocharger coolant circuit.
The water pump draws coolant out of the expansion tank, which flows through the turbocharger.

If the temperature of the coolant in the return line of a stopped engine rises to approx. 115° C, the electric pump will be switched on by a temperature switch and the coolant circuit will then be expansion tank → turbocharger → expansion tank. A check valve in the expansion tank prevents the coolant from flowing back to the turbocharger.

The electric pump is always switched on for 25 seconds each time the engine is stopped, regardless of how high the coolant return flow temperature is.

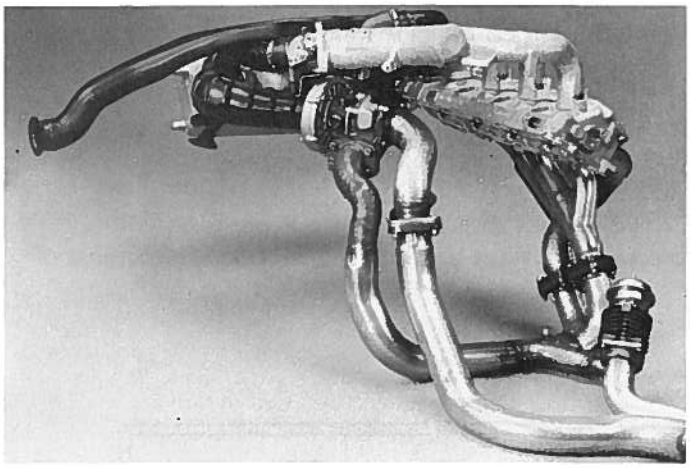


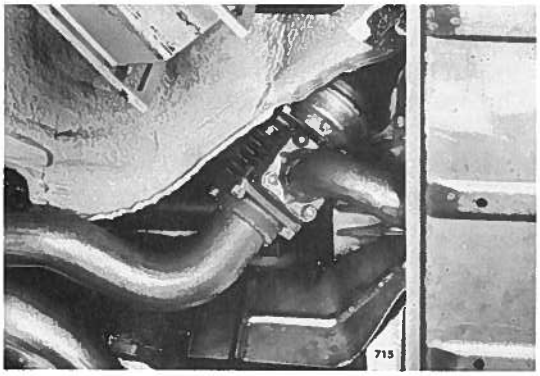
1 - Water pump
2 - Crankcase
3 - Cylinder head
4 - Thermostat (opens at 83° C)
5 - Radiator
6 - Heat exchanger
7 - Expansion tank
8 - Filler neck
9 - Filling line
10 - Vent line
11 - Return line
12 - Electric pump
13 - Turbocharger
14 - Temperature switch
15 - Additional thermostat
16 - Check valve

B - Electric fan
C - Temperature switch

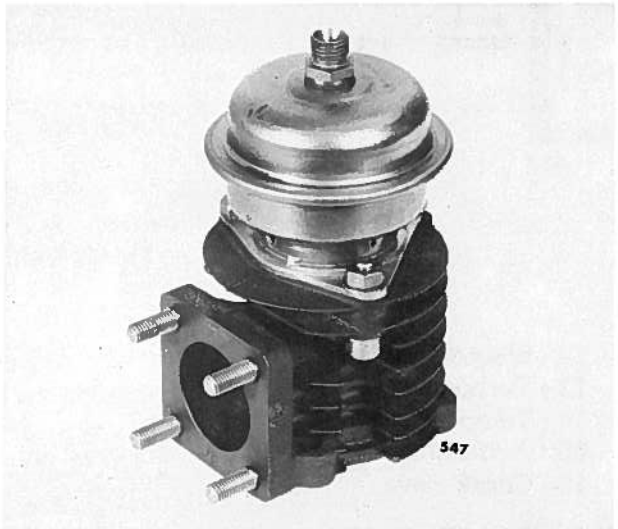
Charging Pressure Control Valve

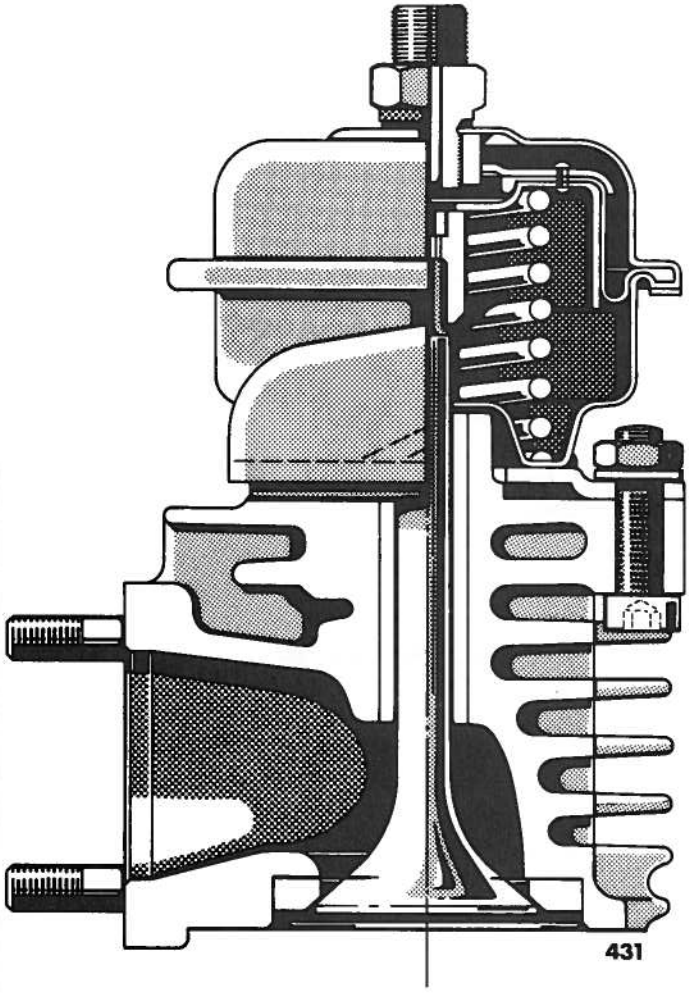
The charging pressure control valve is installed in the bypass line on the right side of the engine, after the junction of both exhaust manifolds.





The control line of the charging pressure control valve is connected with the charging pressure cycling valve (connection W on page 33)



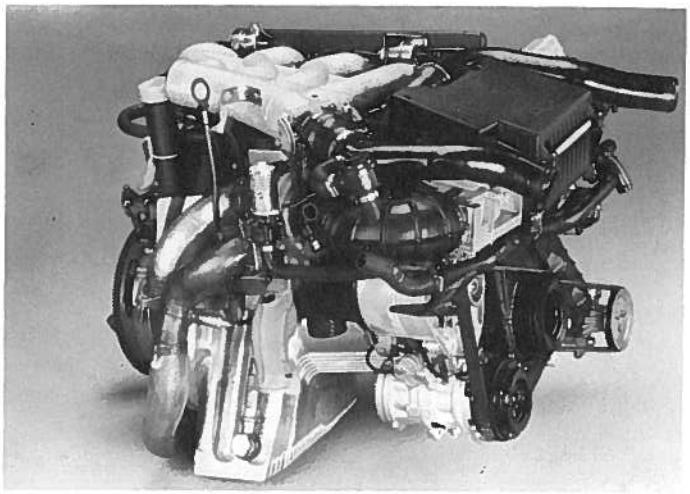


Blowoff Valve

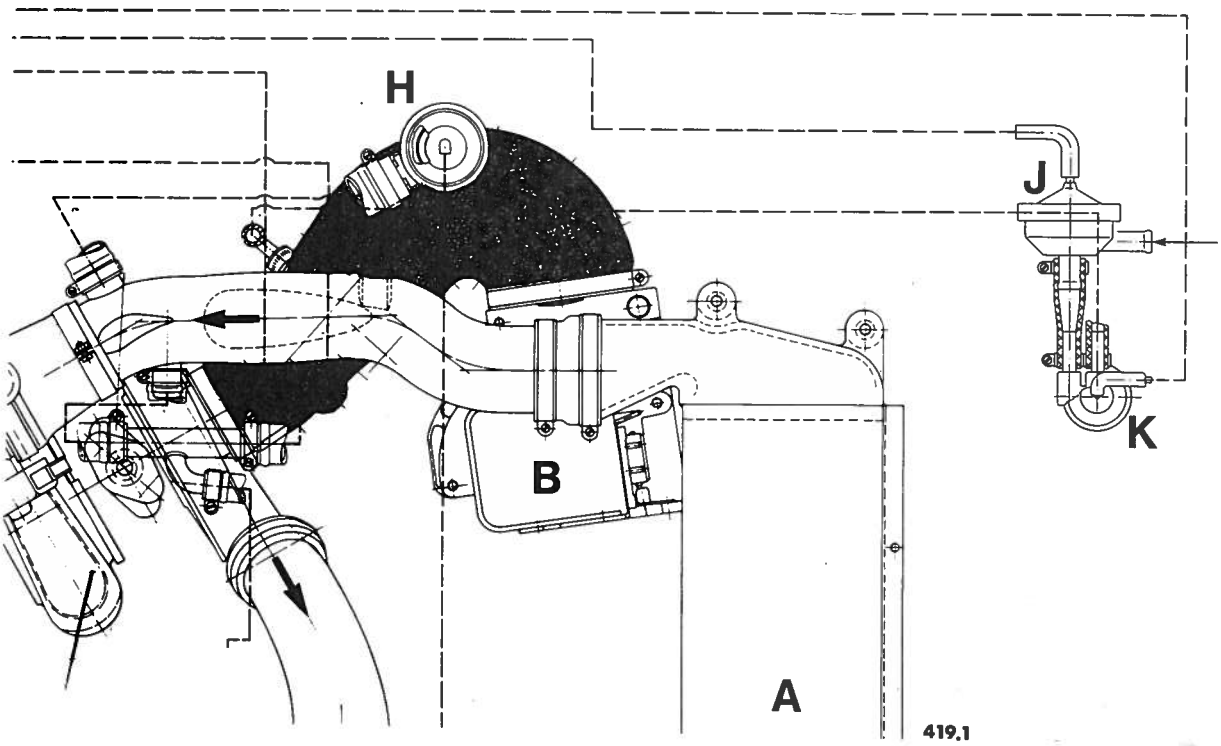
Blowoff valve (H) is installed in connecting cowl (1) between the air flow sensor (B) and turbocharger (2) (intake side).

It is activated with intake pipe vacuum, which is produced in the intake air distributor with the throttle valve closed.

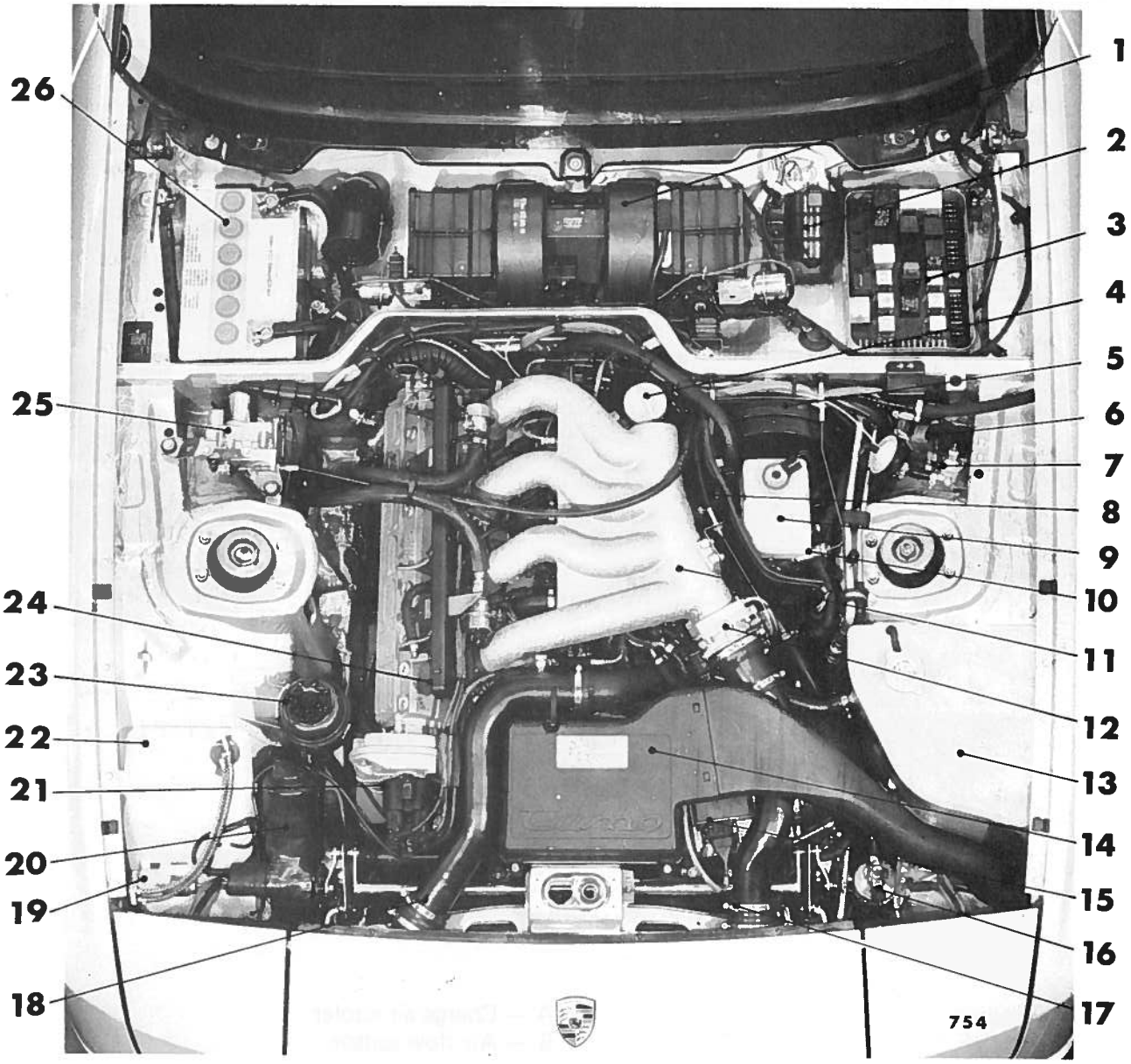
The blowoff valve opens with the throttle valve closed – this provides a bypass circuit between pressure line (3) and suction line (1).



1 – Suction line (connecting cowl)
2 – Turbocharger
3 – Pressure line

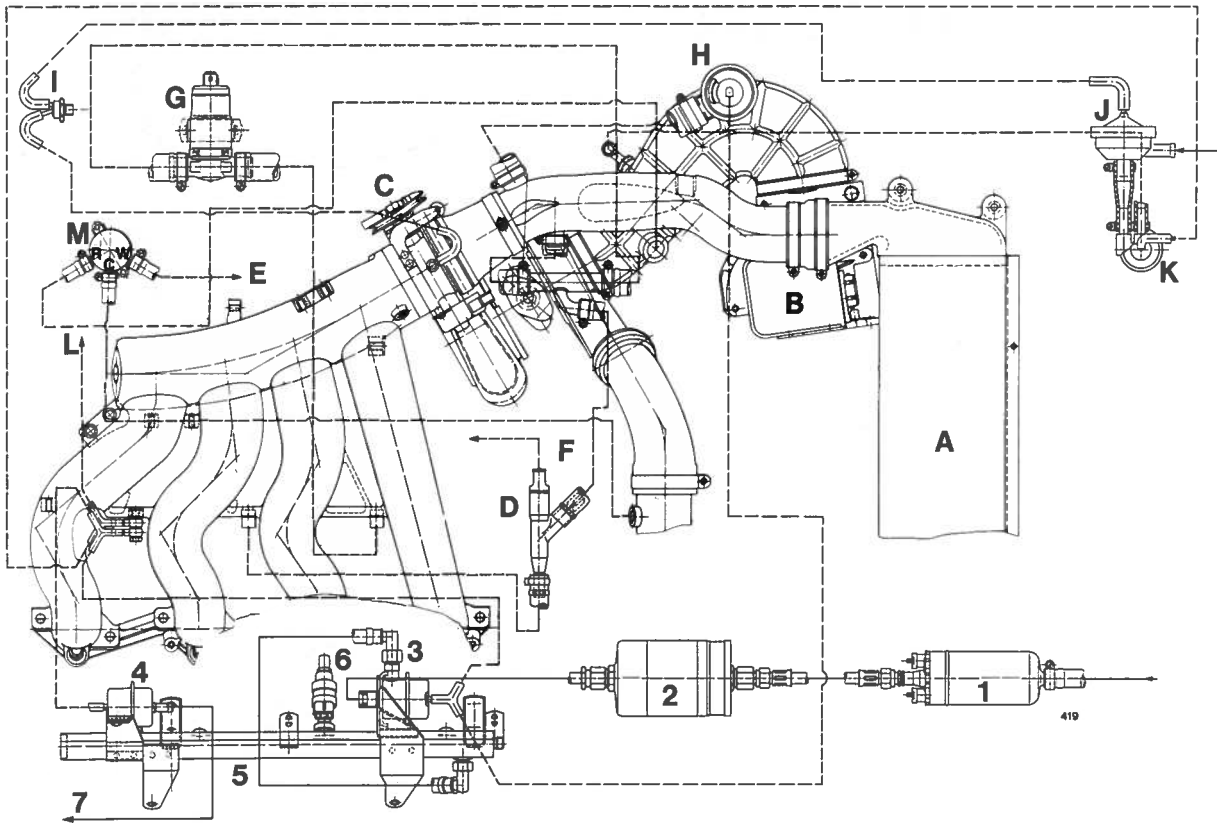


A – Charging air cooler
B – Air flow sensor
H – Blowoff valve
I – Shutoff valve
K – Control valve



1 – Heater blower
2 – Wiper motor
3 – Central electric
4 – Engine oil
5 – Brake booster
6 – DME/knock control diagnosis plug
7 – Tank vent regulating valve
8 – Oil dipstick
9 – Brake fluid reservoir
10 – Brake pressure control for rear axle brake circuit
11 – Intake air distributor
12 – Throttle valve
13 – Coolant expansion tank
14 – Air cleaner
15 – Air flow sensor
16 – Air conditioner sight glass
17 – Pressure pipe from charged air cooler
18 – Pressure pipe from turbocharger
19 – Washing fluid pump
20 – Concealed headlight motor
21 – Distributor
22 – Washing fluid tank
23 – ATF supply tank for power steering
24 – Fuel pressure test connection
25 – Cruise control
26 – Battery

Fuel System Lines (Worldwide)

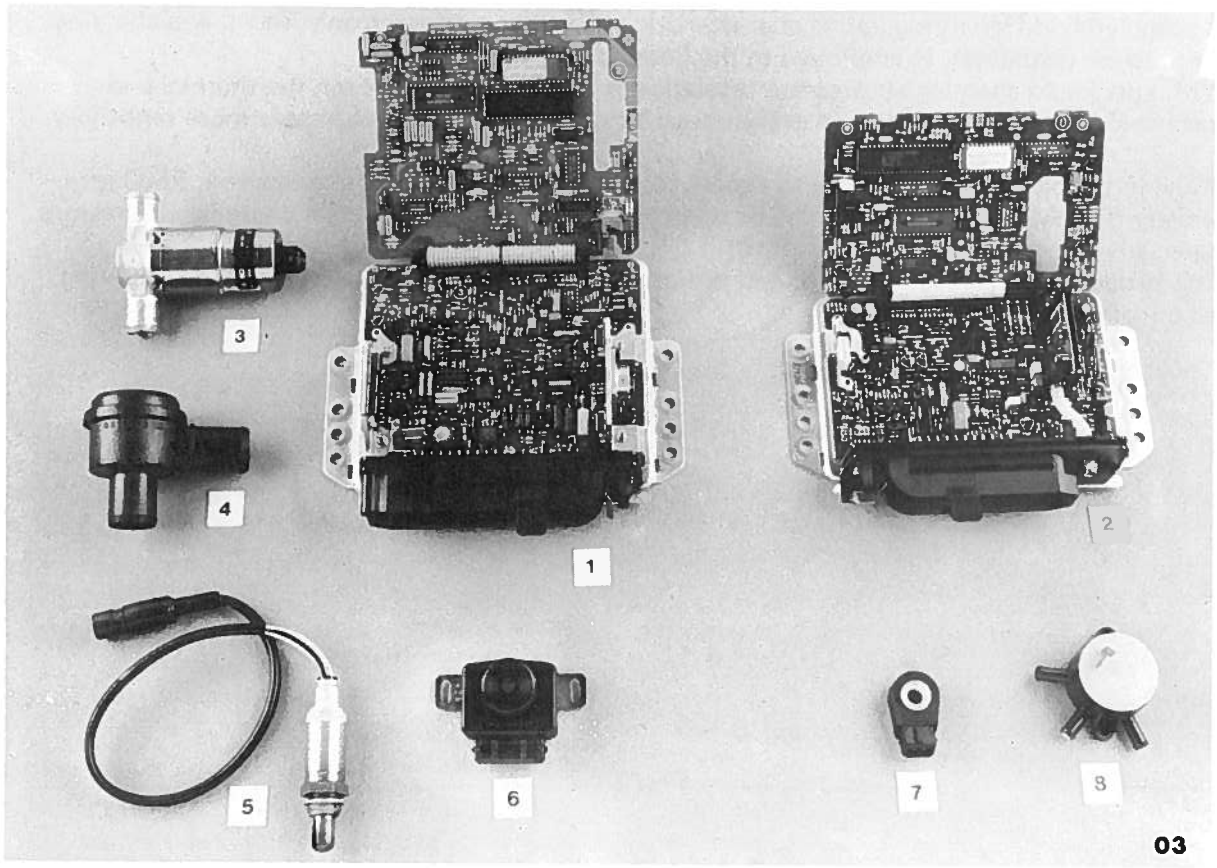


1 – Fuel pump
2 – Fuel filter
3 – Pressure damper
4 – Pressure regulator
5 – Injection line
6 – Fuel injector
7 – Fuel return

A – Charge air cooler
B – Air flow sensor
C – Throttle housing
D – Ejector
E – To charging air pressure control valve
F – To brake booster
G – Idle speed positioner
H – Air control valve
I – Temp. valve (open above 58° C)
J – Shutoff valve
K – Control valve
L – To charging press. reg. control unit
M – Cycling valve for charging air pressure

General Information

The new engine of a Porsche 944 Turbo has **Digital Motor Electronics**, which consists of a transistor coil ignition system and L-Jetronic fuel injection.
In addition, a control unit for **knock and charging air pressure regulation** is applied.
Both electronic components correspond with each other.



Components of Digital Motor Electronics and Knock/Charging Air Pressure Regulation

1. Control unit – digital motor electronics
2. Control unit – knock and charging air pressure regulation
3. Idle speed charging regulator
4. Air circulation valve
5. Oxygen sensor
6. Throttle valve potentiometer
7. Knock sensor
8. Cycling valve for charging air pressure regulation

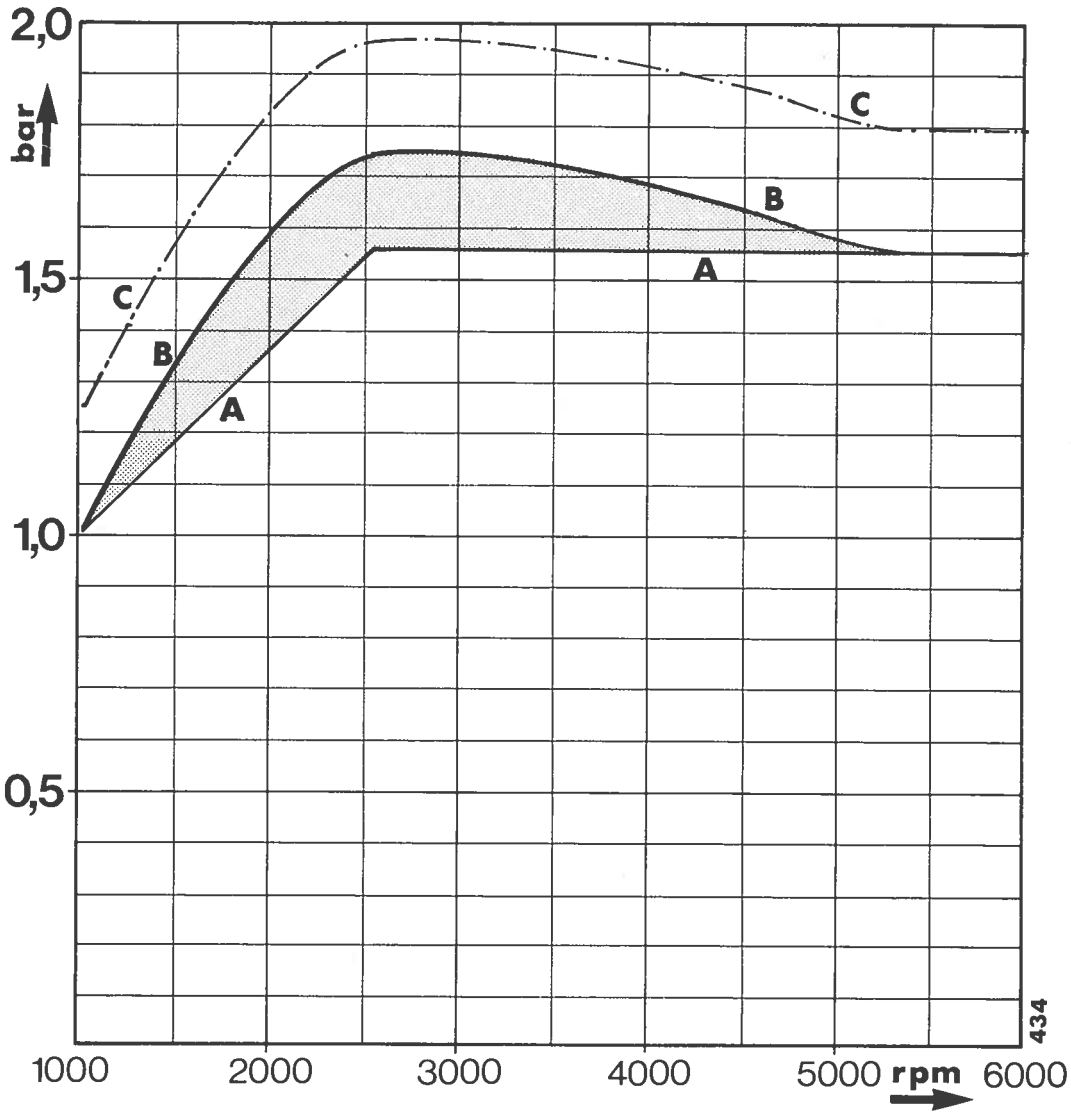
Digital Motor Electronics in Conjunction with Knock and Charging Air Pressure Regulation

A. Charging Air Pressure Regulation

Optimal exploitation of turbocharging cannot be reached with the old method of charging air pressure regulation by way of a charging air pressure control valve (bypass valve), which used the charging air pressure of the turbocharger as a regulating quantity.
The charging air pressure control valve must open at relatively low engine speed and in partial load range, in order to carry off the hot exhaust gas unused (see curve A).
A completely different regulating characteristic is possible with electronic knock and charging air pressure regulation, as employed in the Porsche 944 Turbo.
With knock and charging air pressure regulation it is possible to approach the thermal and mechanical limits of an engine in every operating condition with considerably more sensitivity.

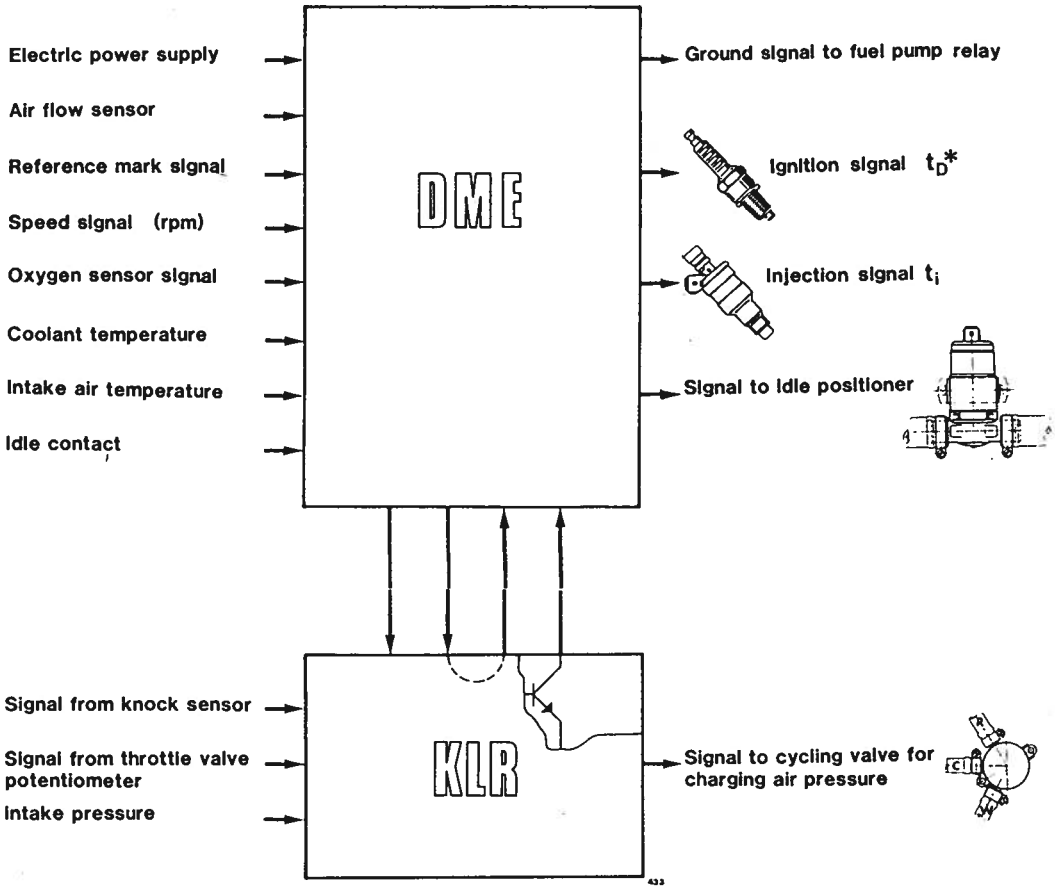
While in the past it was necessary to deactivate the charging air pressure at approx. 2500 rpm already (line A), the engine can now be operated with considerably higher charging air pressure especially in partial load range (curve B).
This produces higher torque values and noticably better response of engine when accelerating, even from low engine speeds.

The electronically regulated charging air pressure curve (B) is considerably higher than curve A even in the lower speed range. The **highest** charging air pressure of 1.75 bar* (absolute) is reached at approx. 2300 rpm.
As the engine speed rises further the charging air pressure **drops** and reaches a value of 1.55 bar* (absolute) at the rated speed of 5800 rpm.



* Note: The former charging air pressure values of 0.5 to 0.8 bar for the 911 Turbo represented **normal pressure values.**
The present charging air pressure values of 1.5 to 1.75 bar for the 944 Turbo are **absolute pressure values.**

Absolute pressure means:	Bar (absolute)	Bar (pressure)
Complete vacuum (space)	0	–
Air pressure at sea level	1	0
Air pressure in 944 Turbo tires	3.5	2.5



t_r = Trigger signal (cylinder reference mark)

t_D = DME ignition signal

t_D*= Corrected ignition signal

VL= Full load signal beginning with throttle valve angle of 66°

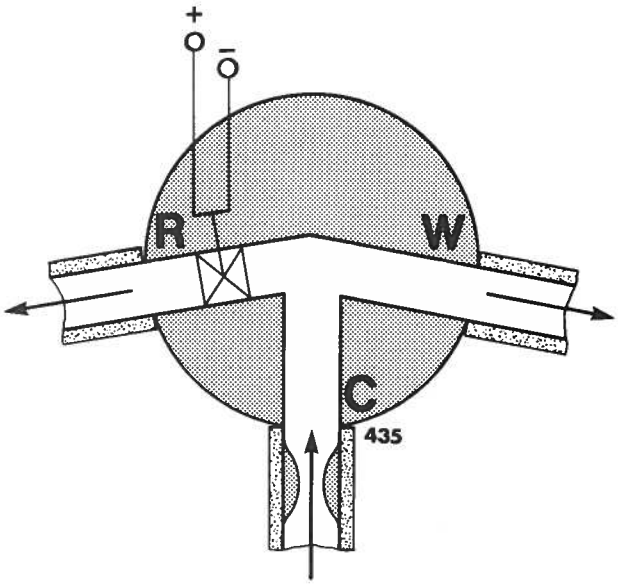
An electro-pneumatic cycling valve (solenoid), which receives rectangular signals from the control unit, operates between the knock and charging air pressure control unit and charging air pressure control valve.
Compressed air (or in other words air pressure) from the turbocharger is supplied as an activator to the cycling valve via a pressure line and pressure pipe between the turbocharger and charging air cooler.

The cycling valve has three connections for air lines*.

C – Connection for pressure pipe

R – Air return to intake side of turbocharge

W – Control line to charging air pressure control valve



If electric power is supplied to the solenoid coil of the cycling valve, all three connections (C, R and W) are open so that air can stream to the intake side of the turbocharger, **no pressure** builds up **on the charging air pressure control valve**, which **remains closed**, and there is high **charging air pressure.**

If there is **no electric power** on the cycling valve, opening R (return flow) remains closed. The **complete charging air pressure** builds up above the diaphragm in the **charging air pressure control valve**. The **valve opens** the bypass line and the turbocharger receives only a small amount of the hot exhaust gas so that it no longer rotates so quickly and the **charging air pressure drops.**

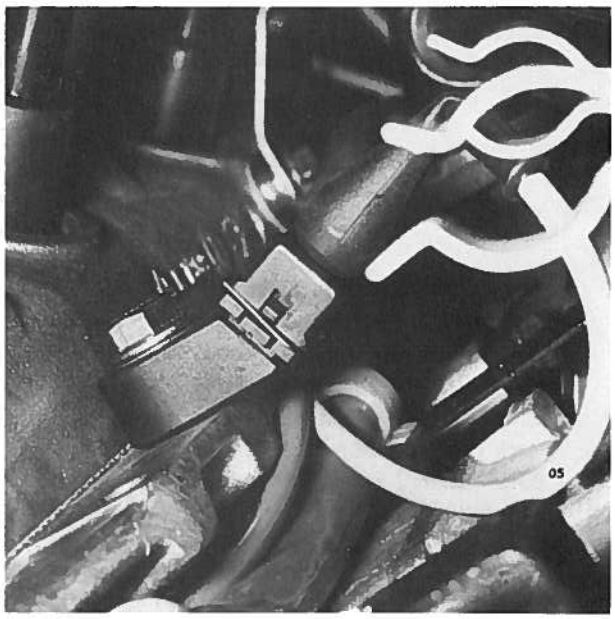
The control pressure on the charging air pressure control valve can now be regulated with very fine feeling by way of rectangular signals from the control unit (15 Hertz).

* Also refer to component M on page 28

B. Knock Regulation

Knocking in an engine is an uncontrolled combustion process, which can lead to excessive heat and mechanical engine damage even after a brief period.
Knocking could be caused by excessively advanced ignition timing, poor grade gasoline and very high intake air temperatures (e.g. in summer).

A knock sensor, which is bolted on the engine block next to the cylinder head with a M 8 bolt, monitors knocking in the engine of a Porsche 944 Turbo.



The knock sensor consists of two seismic materials, between which a piezo crystal is located. Oscillation, especially engine knocking, produces forces on the crystal by way of the seismic materials and the crystal reacts to these forces with changes in the electric voltage.
These changes in voltage are sent to the knock (and charging air pressure) control unit as signals.

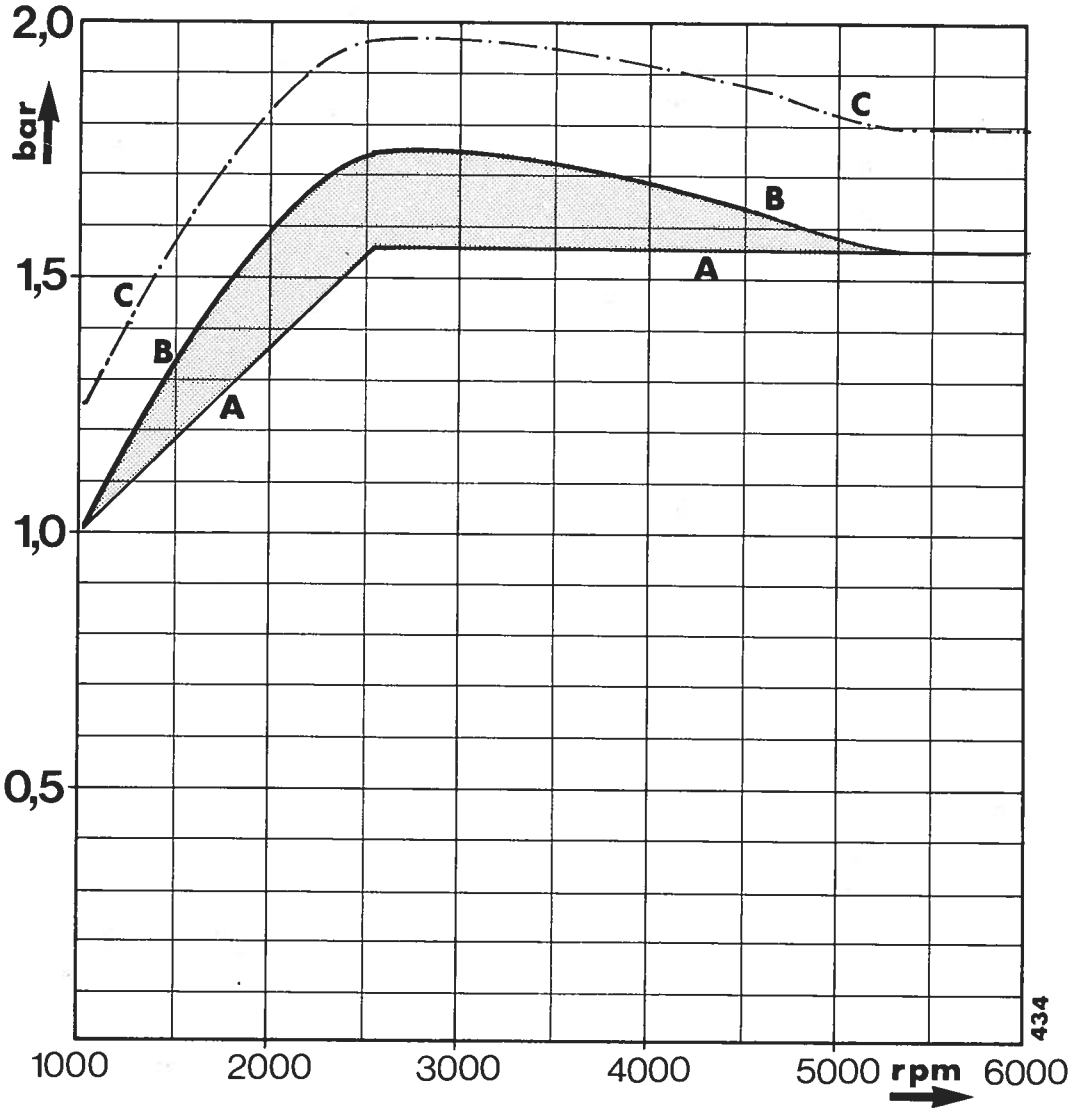
With the trigger signal (t_R) for each individual cylinder, the DME ignition signal (t_D) and the signal from the knock sensor the knock control unit can recognize, in which cylinder there had been uncontrolled combustion (knocking).

With the next ignition pulse from the DME control unit for this cylinder the "t_D" signal will be delayed in the knock control unit and fed back as a "t_D*" signal, so that the ignition for the pertinent cylinder is retarded 3^o.
If knocking occurs again, the ignition of the correct cylinder will be retarded **again by 3^o**.
If this then stops the engine knocking, the ignition will be advanced to the correct value in steps of 0.3^o per 100 ignition pulses.

However, if knock pulses continue, the charging air pressure will then be taken back in steps of 30 to 50 mbar (0.03 to 0.05 bar). Taking back the charging air pressure is accomplished by changing the rectangular signals to the cycling valve and therefore increasing the pressure on the diaphragm of the charging air pressure control valve.
When the engine is running perfectly, the charging air pressure will also be corrected in small steps to the nominal curve (B).

Precaution Against Excessive Charging Air Pressure

If the charging air pressure leaves the nominal curve and reaches or exceeds the safety curve (C) for more than 3 seconds because of damage on the charging air pressure control valve or in the knock and charging air pressure regulating system, the injection signal (t_i) is switched off immediately – the injection of gasoline is stopped.
Injection starts up again only after the sensor plate in the air flow sensor has gone back to approx. 3/4ths of the full deflection travel by way of the engine speed and/or accelerator pedal position. Full acceleration and driving is then possible after about 1 minute.



Automatic Diagnosis of Knock Regulation

The control unit of knock regulation has a memory for the disturbances occurring during operation.

The knock regulation system can be checked with a test adapter and LED in the case of assumed or determined disturbance or malfunction of components in the knock regulation system; for example: insufficient engine power because of low charging air pressure, engine knock or ignition timing not conforming with the test values.

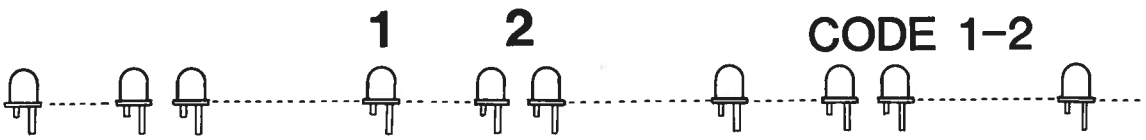
The test adapter is then applied on the diagnosis plug (No. 6 Fig. 754 on page 27).
The engine speed is now increased to **more than 1500 rpm.**

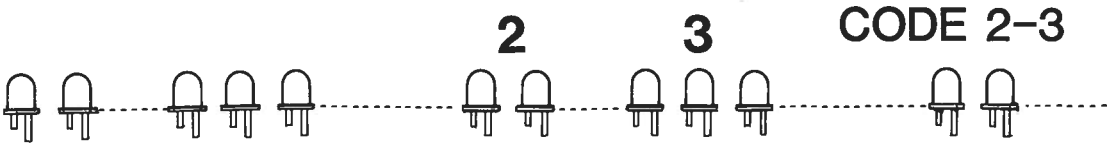
If the LED remains dark, there is no fault in the knock regulation system or its components. However, if the LED is on continuously, there is a disturbance.

The disturbance can be found by dropping the engine speed to a value **below 1500 rpm**, e.g. idle speed.

The LED will now put out interrupted light signals, which are easy to recognize as flashing codes.

Examples:



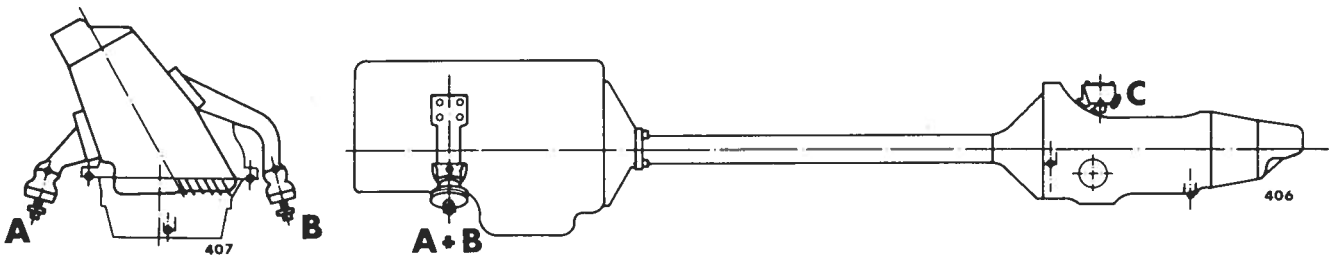


Troubleshooting Table

Flashing Code	Disturbance	Elimination / Check
1 – 2	Battery voltage too low (less than 10.2 V)	Alternator, battery, regulator, wiring, relays
2 – 1	Knock sensor	Engine damage, bucket tappets rattle, faulty valve, connecting rod bearing damage, engine knocks
2 – 2	Knock sensor	Sensor installation, plug connections for sensors
2 – 3	Knock regulation control unit	Faulty unit; replace
3 – 1	Charging air pressure too low	Charging air pressure control valve faulty, turbocharger faulty, charging air cooler leaks
3 – 2	Charging air pressure too high	Charging air pressure control valve, cycling valve for charging air pressure regulation, hose to charging air pressure control valve fallen off
3 – 3	Faulty pressure sensor in knock regulation control unit	Control unit faulty; replace
4 – 1	Throttle potentiometer	Power feed wires to potentiometer (wire connections), ground contact, potentiometer tap dirty
4 – 2	Throttle potentiometer	Potentiometer faulty, but first check wire connections in spite of this

Suspension of Transaxle System

The engine – central tube – transmission unit is only suspended elastically at three points, as also the 1985 model 944 with naturally aspirated engine.
Suspension points A and B are connected with the front axle cross member by way of hydraulic mounts designed especially for the 944 Turbo.
The transmission now only has one rubber/metal mount behind the transmission bell housing, which is mounted on a new transmission cross member.



Hydraulic Mounts on Engine Supports A and B

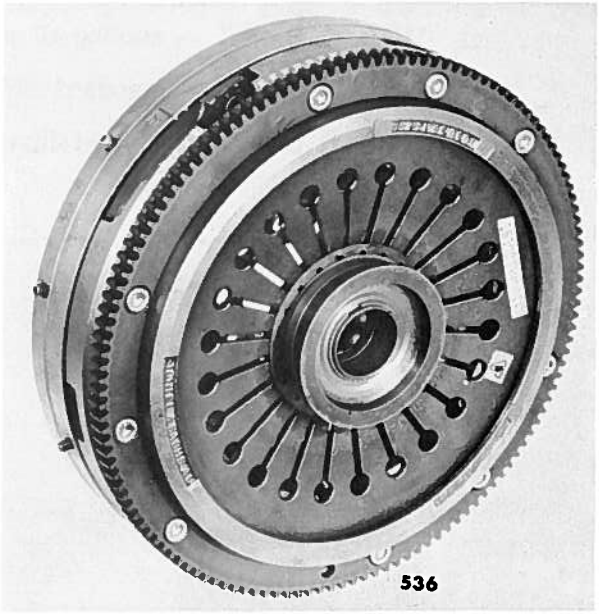
Mounts are stiffer to cope with the extra weight of a turbocharged engine and made of a temperature resistant rubber composition. The base of mounts has a green color code, because the outside dimensions of the mounts are identical with those for the naturally aspirated engine (black color code for 944 naturally aspirated engine).

Transmission Mount C

The mount above the transmission case is identical with that used for 944 naturally aspirated engines.

Clutch

The type of clutch used is a Fichtel & Sachs single plate clutch with a diameter of 240 mm. The clutch is operated hydraulically and has a pulled, continuously running release bearing.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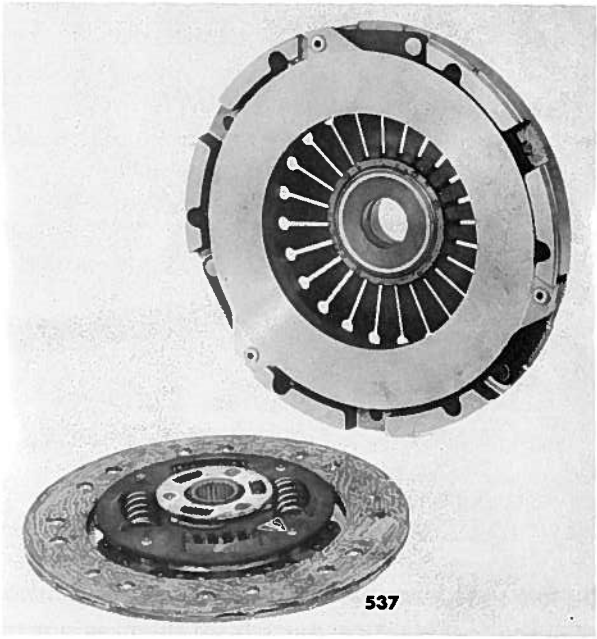
A diaphragm spring provides the contact force of force of 8700 n. 9500.
Pressure plate (A) is guided on three tangential springs (B).


537

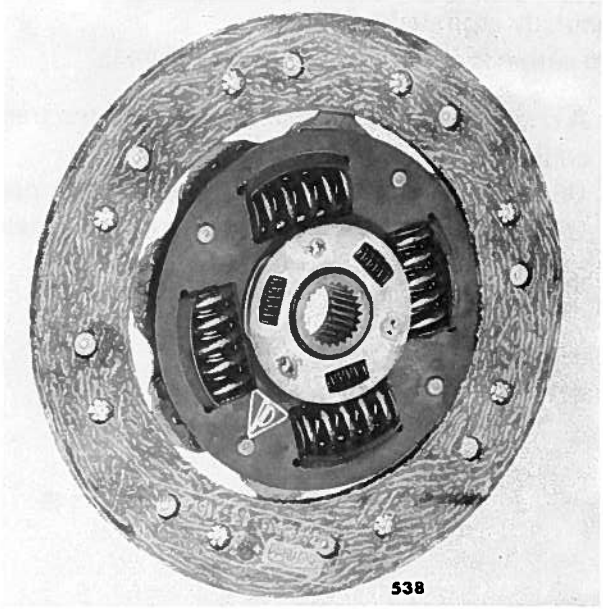
Drive plate (C) has a double stage steel spring damper.

Stage I:

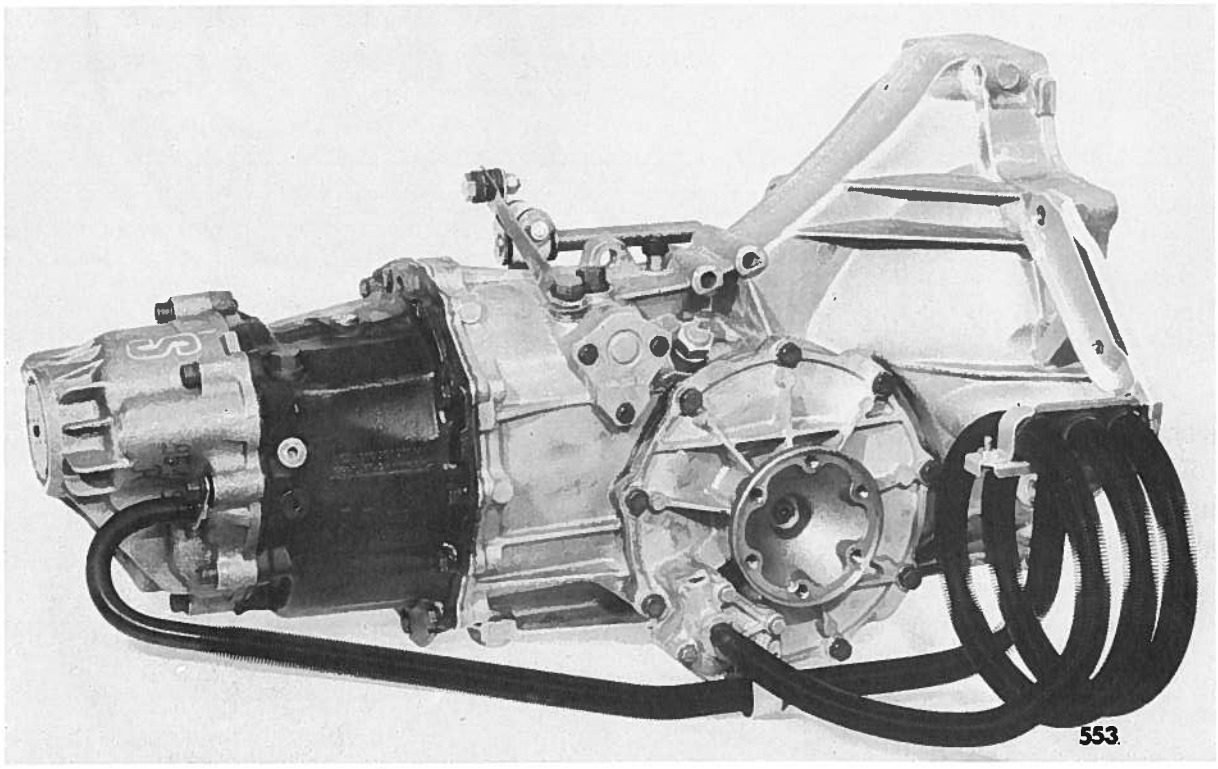
Three weak springs (D) dampen the rotational oscillation of the engine at idle speed and with the transmission in neutral position, to prevent rattling of the loose gear wheels in the transmission.

Stage II:

Four strong spring sets (E) dampen the rotational oscillation produced by an engine during acceleration from low engine speed and consequently also dampen the resonance, which would lead to a rattling noise in the transmission from the gear wheel sets which are **not** operated.


538

Transmission	016.5 P	R.o.W.	– cooling oil pump and standard differential
	016.5 R	R.o.W.	– cooling oil pump and limited slip differential
	016.UY	USA*	– standard differential
	016.9 U	USA*	– limited slip differential



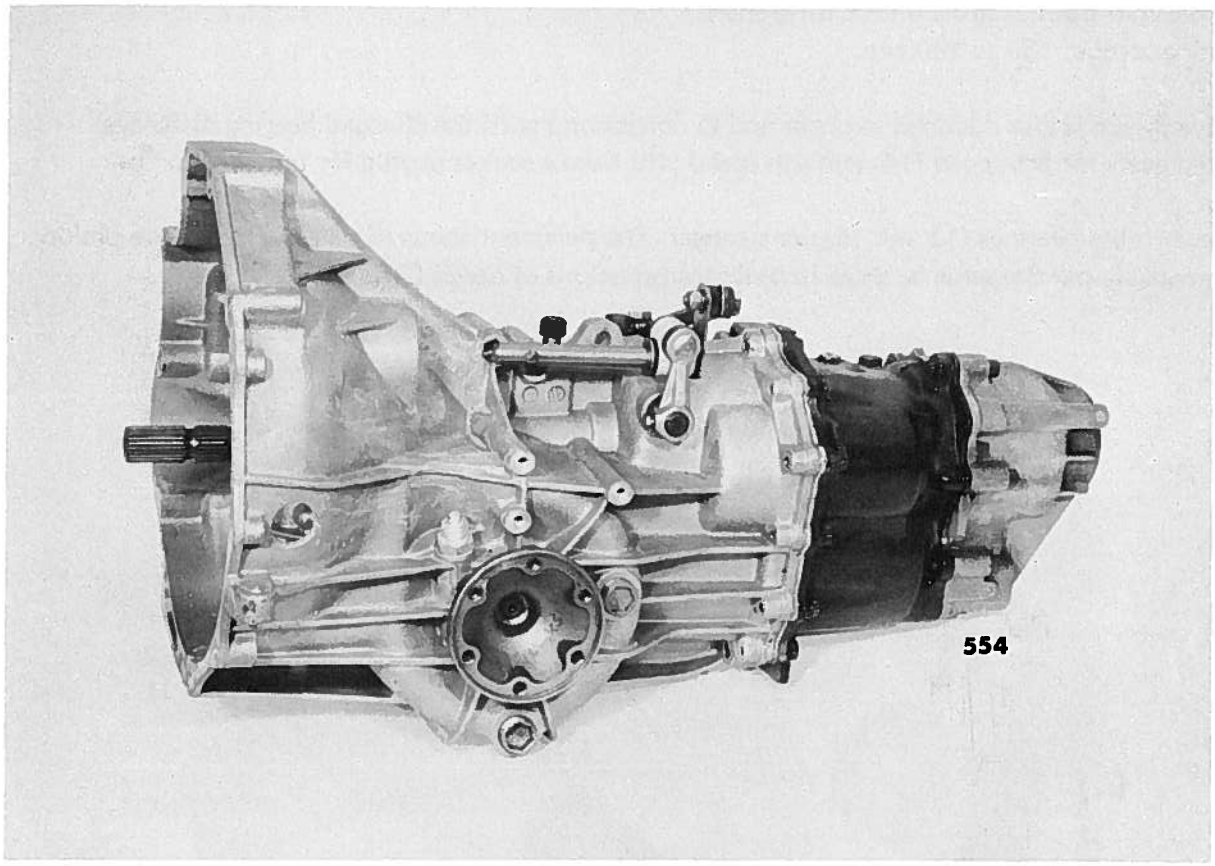
Crash protection plate removed

The five speed manual transmission in 944 Turbo cars is designed for the high engine power and has only very few identical parts from the previous transmissions of Series 016 (for 924 and 944 naturally aspirated engines).
An automatic transmission is not offered.

* A cooling oil pump is also available for the transmission in US models as optional extra equipment (M 414).
USA – Order M 414: car delivered with Europe transmission 016.5 P
USA – Order M 414 + M 220: car delivered with Europe transmission 016.5 R

Most Important Changes:

- Transmission case stronger and 4 mm longer
- Side transmission cover with cooling oil pump and outboard cooling oil pipe
- Gearbox with cooling oil pipe connection
- Stronger bearings
- Stronger gears and different gear ratios
- Stronger final drive and different ratio
- Stronger differential
- Different oil volume



The aluminum transmission case (1) is designed stronger and 4 mm longer. The drive shaft (2) with four bearings runs on two bearings in the transmission case, namely

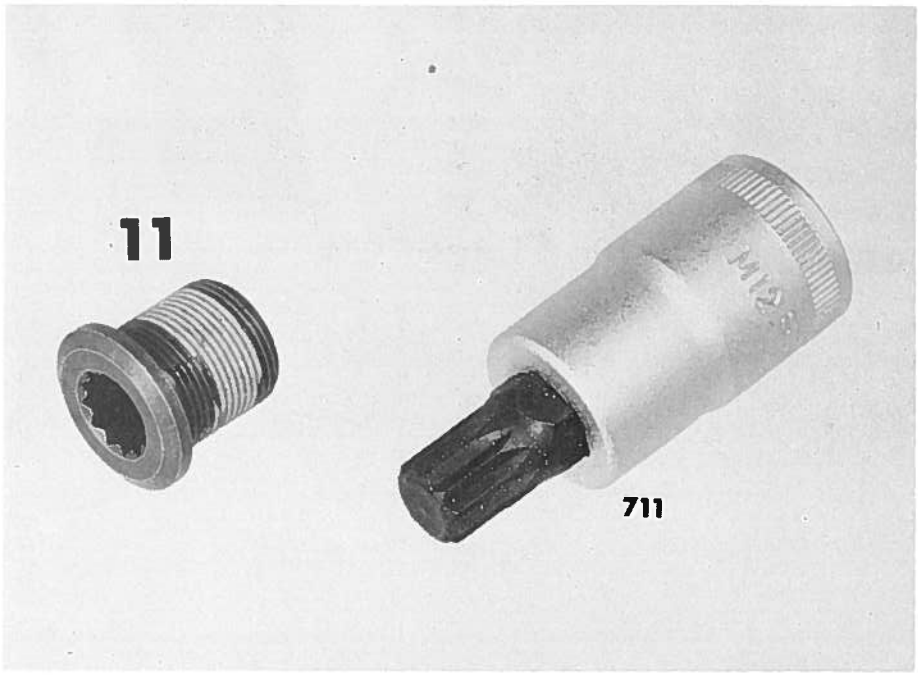
- in needle bearing (4) in front of the differential and
- in cylindrical roller bearing (6) in the intermediate wall.

Other drive shaft bearing points are

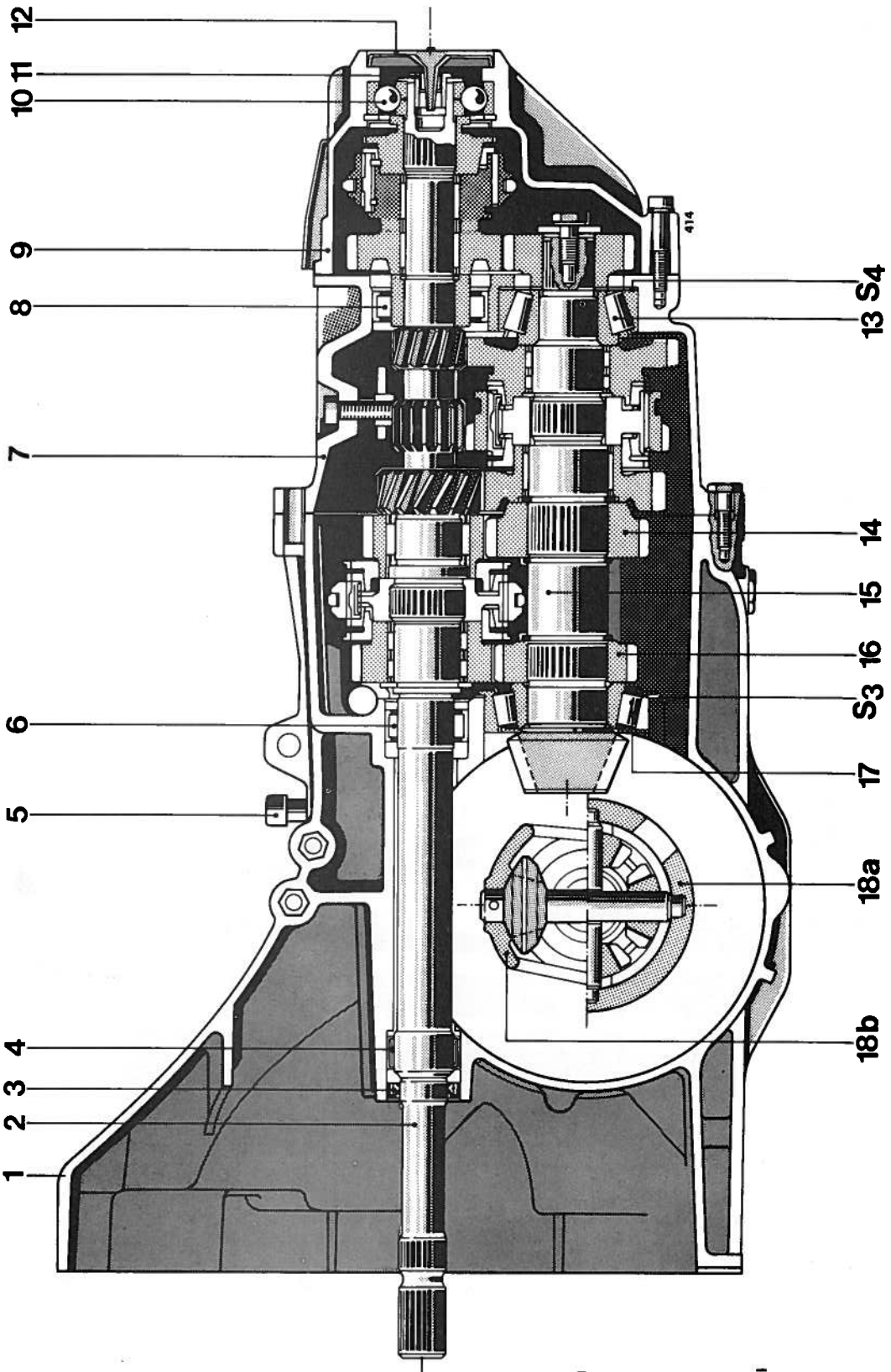
- a cylindrical roller bearing (8) in the bearing bracket and
- a four-point ball bearing (10) in the rear transmission case cover.

A special screw (11), which can be loosened or tightened with a 12 mm socket wrench, is used to mount the four point bearing on the drive shaft.
Tightening torque: 150 to 180 Nm.

The drive pinion is also designed stronger and to correspond with the changed bearing distances. The fixed gears for 3rd speed (14) and 4th speed (16) have a socket profile for transmission of torque.
Both taper roller bearings (13 and 16) are stronger. The pertinent shims (S_3 and S_4) for drive pinion adjustments are not the same as those in older transmissions of Series 016.



Section Drawing of Transmission 016.5



1 Transmission case
2 Drive shaft
3 Radial shaft seal
4 Needle bearing
5 Vent
6 Cyl. roller bearing
7 Bearing bracket
8 Cyl. roller bearing
9 Rear transm. cover
10 Four point ball bearing
11 Special screw
12 End cover
13 Taper roller bearing
14 Gear, 3rd speed
15 Drive pinion
16 Gear, 4th speed
17 Taper roller bearing
18a Limited slip differential
18b Standerd differential

Shift Mechanism

Shift motion is transmitted to the rear-mounted transmission via the shift lever and shift rod.

A transverse-mounted shift shaft (2) transmits the shift and initial selection motions to three different shift rods

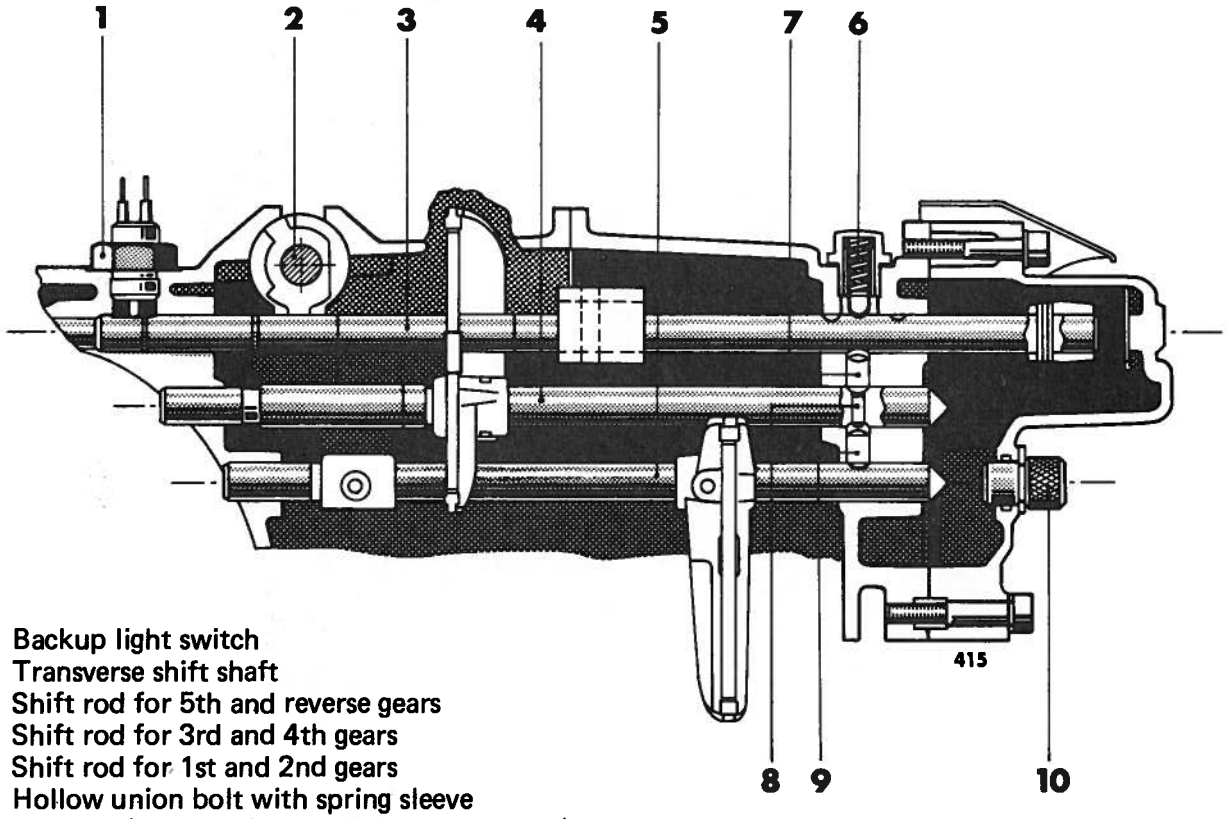
(3) for 5th gear and reverse gear,

(4) for 3rd and 4th gears, as well as

(5) for 1st and 2nd gears.

Lockpins (7 and 9) are used to arrest the shift rods and prevent unintentional shifting of two gears simultaneously.
The small lockpin (6) in the selector rod for 3rd and 4th gears is provided additionally, so that the immediately neighboring shift rods for 5th and reverse gears (3) and 1st and 2nd gears (5) cannot be arrested in opposition of each other.

The shift rods are no longer identical with parts in older transmissions of Series 016 (924 and 944).



1 Backup light switch
2 Transverse shift shaft
3 Shift rod for 5th and reverse gears
4 Shift rod for 3rd and 4th gears
5 Shift rod for 1st and 2nd gears
6 Hollow union bolt with spring sleeve
7 Lockpin (locks shift rod 5 + R against 3 + 4)
8 Lockpin (locks shift rod 5 + R against 1 + 2)
9 Lockpin (locks shift rod 3 + 4 against 1 + 2)

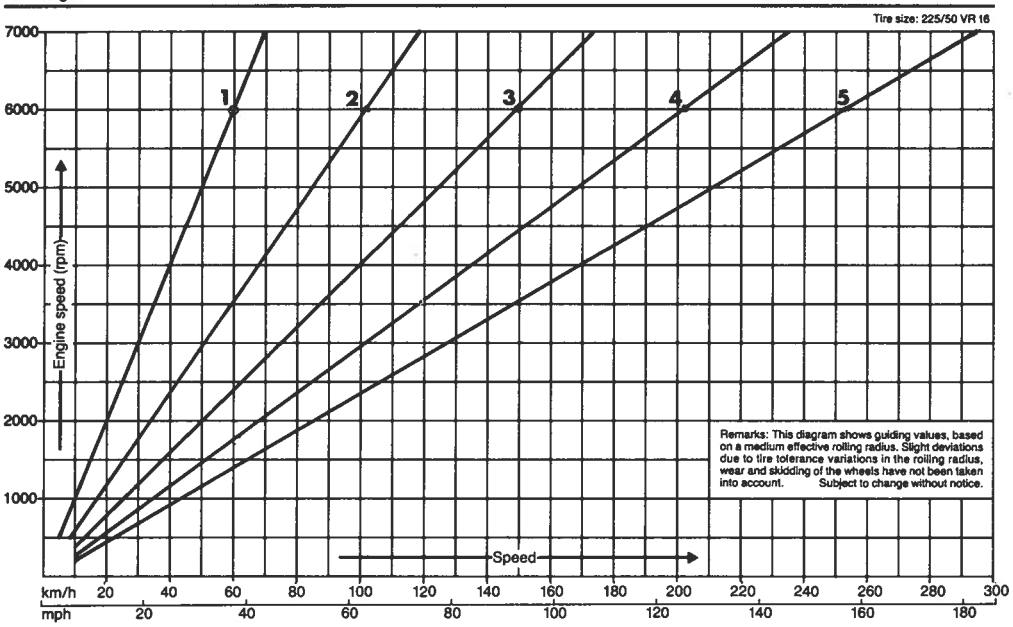
Ratios of Transmissions 016.5 P, 016.5 R, 016.UY and 016.9 U

	Z_1	Z_2	i_Z $Z_2 : Z_1$	i_A 27 : 8	$i_{tot.}$ $i_Z \cdot i_A$	V_{1000} (km/h)	V_{6000} (km/h)
1st gear	10	35	3.500	3.375	11.812	9.989	59.934
2nd gear	17	35	2.059	3.375	6.949	16.980	101.883
3rd gear	25	35	1.400	3.375	4.725	24.973	149.838
4th gear	29	30	1.034	3.375	3.489	33.819	202.919
5th gear	35	29	0.829	3.375	2.798	42.172	253.033
Reverse	12	42	3.500	3.375	11.812	9.989	59.937

Z_1 = No. of teeth of first gear in power flow of pertinent gear
Z_2 = No. of teeth of second gear in power flow of pertinent gear
i_Z = Gear ratio
i_A = Final drive ratio
V_{1000} = Road speed at 1,000 rpm engine speed*
V_{6000} = Road speed at 6,000 rpm engine speed*

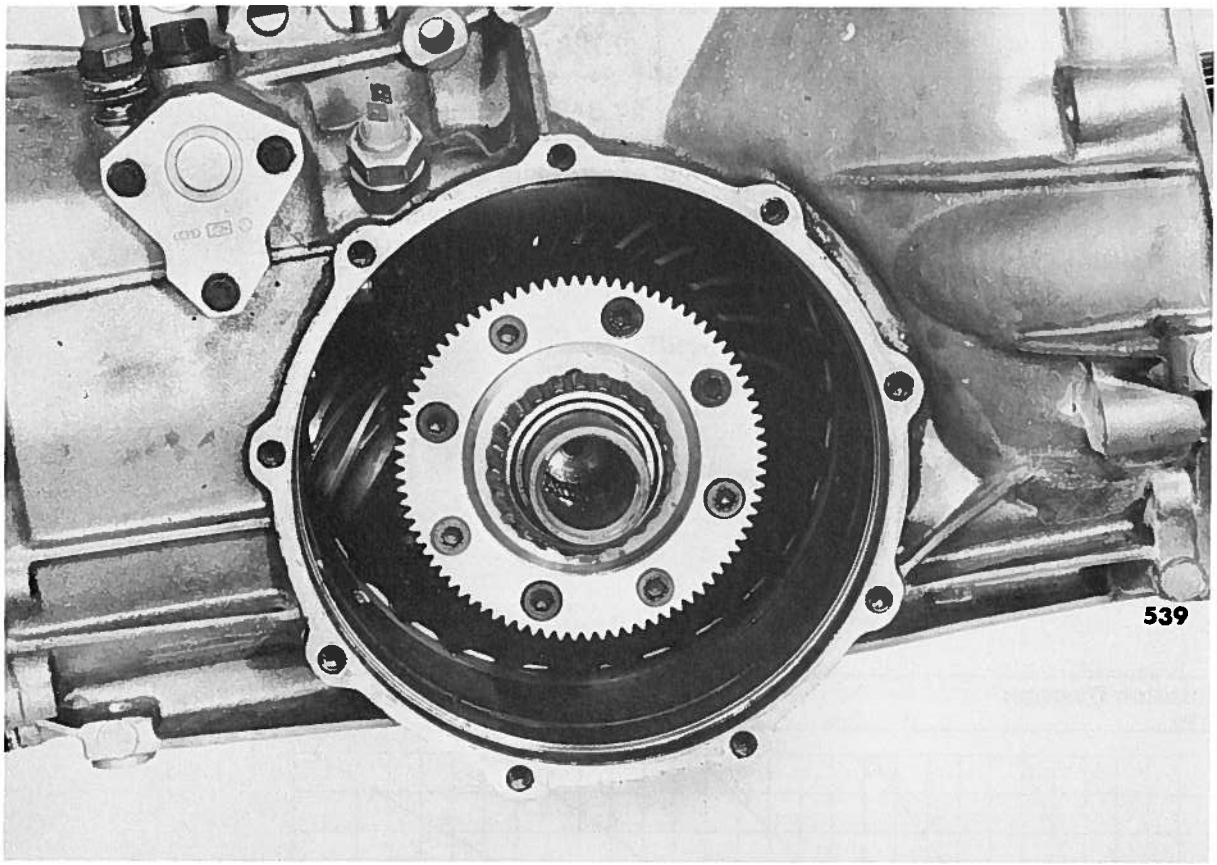
* with 225/50 VR 16 tires (r_{dyn} 313 ± 2 mm)

Transmission Diagram
Manual gearbox



Differential

a.) Standard Differential
The differential is built stronger. The differential gears are made of high value forged steel. Tooth flanks are no longer machined after the fine forging procedures.
The large gear wheel for cooling oil pump drive is now also located on the differential case.



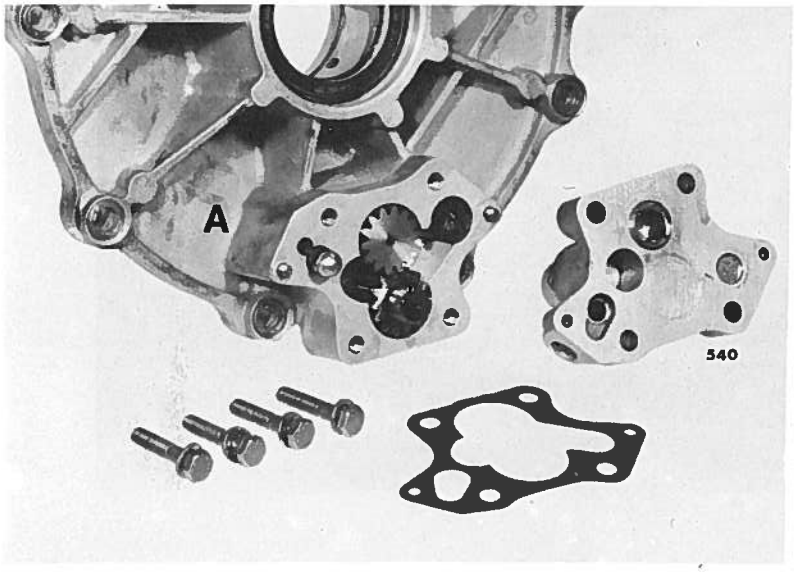
b.) Limited Slip Differential (M 220)
Various minor changes and reinforcements have been introduced on the diaphragm springs, differential case and bolts.
The cooling oil pump drive gear is mounted on the limited slip differential case.

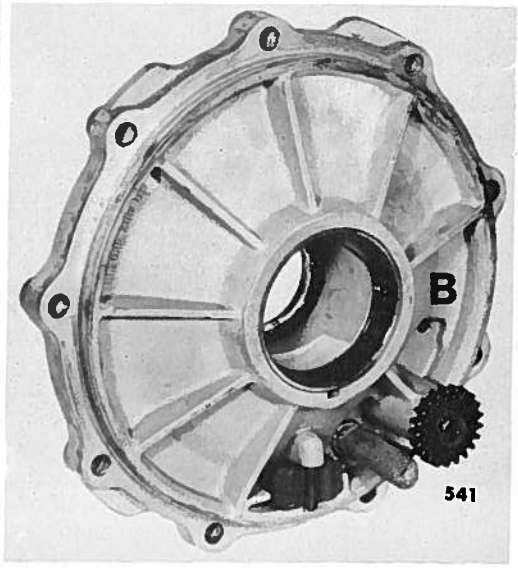
Note: The new limited slip differential can also be used on Series 016 transmissions manufactured earlier.

Transmission Oil Cooling

The manual transmission for 944 Turbo cars has a forced transmission oil cooling system*.
A small gear-type pump in the side transmission cover (approx. 17 liter per minute delivery rate at maximum engine speed) is driven by the differential, draws in oil from the differential case chamber and pumps the oil through the cooling oil pipe coil back into the gearbox.

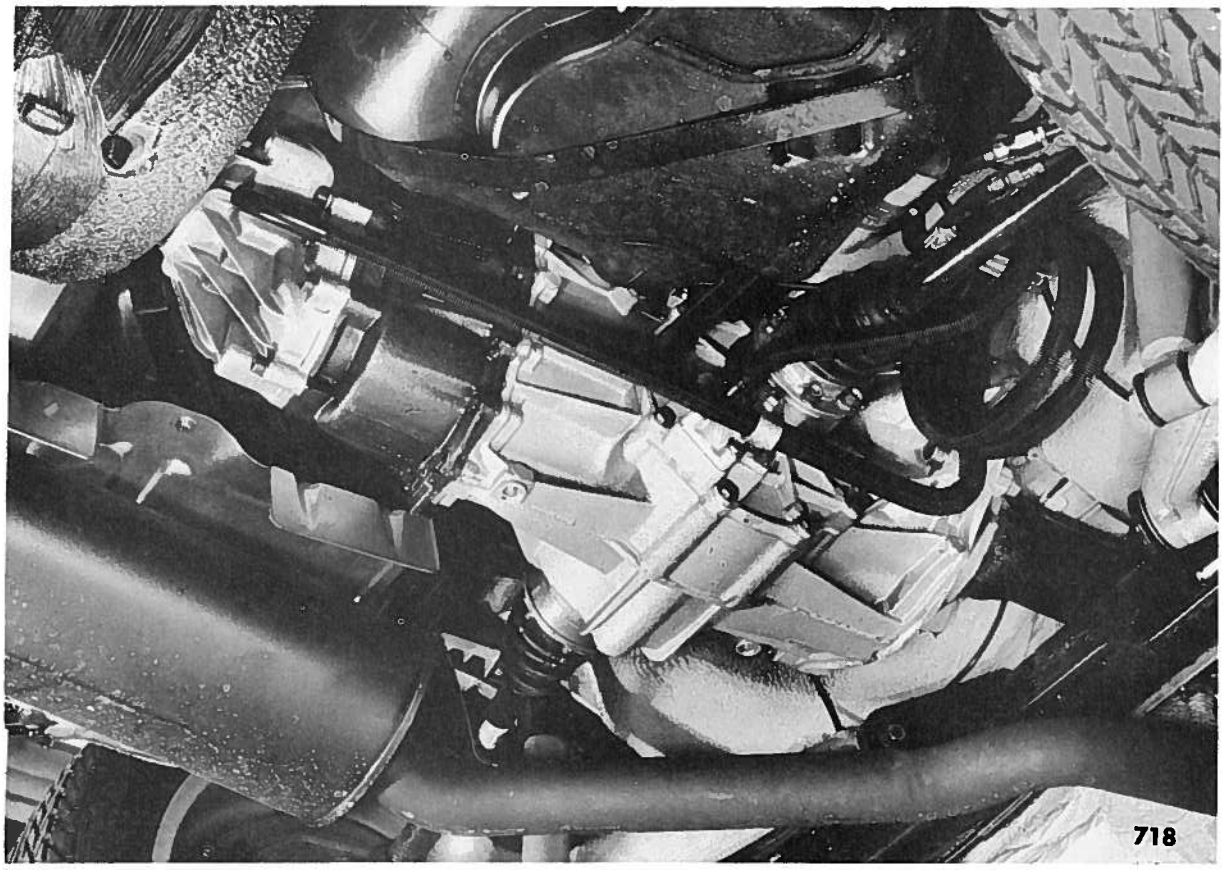
The delivery pump has a pressure relief valve (A) and excessive oil is pumped back into the oil sump via bore (B).





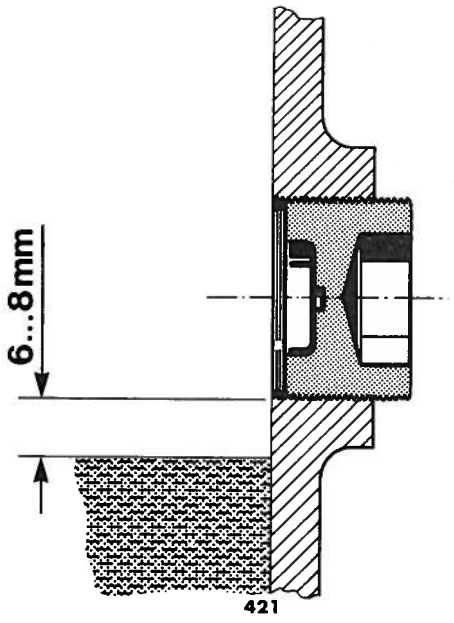
* For USA, Canada and Japan only as optional extra equipment (M 414).

The hot transmission oil pumped out of the differential case chamber by the delivery pump into the cooling oil pipe coil is cooled by the air stream from driving and returned to the transmission.



Oil Volume

The transmission is filled in the plant with precisely 2.0 liters of SAE 80 hypoid gear lube conforming with MIL-L 2105 (API Classification GL 4).
The oil level will not reach the edge of the oil filler bore, but instead will be approx. **6 to 8 mm deeper.**
This must be considered when checking the oil level.
The oil is replaced at intervals of 30,000 miles (or 80,000 km for Rest of World).



Front Axle

The front axle control arms and their rubber mounts are identical with those of the Porsche 944.
The spring struts (McPhearson System) have been redesigned. The double-tube gas pressure absorbers are matched with stronger coil springs to cope with the vehicle weight.
Tube-type stabilizers of size 24 mm dia. x 3.7 mm are available as optional extra equipment for even better vehicle stabilization.
Solid material stabilizers with a diameter of 22.5 mm are standard equipment.

Rear Axle

The rear axle suspension also employs double-tube gas pressure absorbers, which are identical with those in 944 cars with a naturally aspirated engine.
The diameter of the rear stabilizer has been changed to 18 mm (944 still 14 mm).

Power Steering

All vehicles get as standard equipment power steering.

The steering ratio is 18,85 : 1 (in the middle).

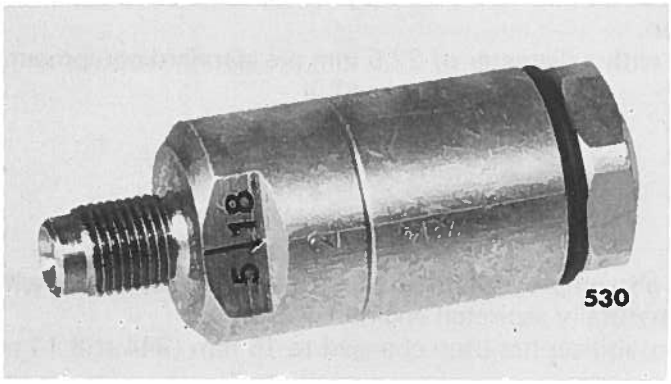
There are 3,24 turns of the steering wheel from lock to lock.

The high pressure pump of the power steering is supplied with ATF (ATF DEXRON B spermoil free):

The reservoir is situated front right in the engine compartment and is accessible from above.

Brakes

The Porsche 944 Turbo is equipped with a hydraulic, dual circuit braking system. The brake circuits are divided between the front and rear axles. The rear axle brake circuit has a brake pressure reducer BRE 5/18 (switching-in pressure: 18 bar; reducing factor: 0.46).



The brake discs of all four wheels have inboard venting. Front brake discs have a diameter of 298 mm and are 28 mm thick, while the rear brake discs with inboard-mounted drums (180 mm diameter) for parking brake operation are 24 mm thick and 299 mm in diameter.

The brake master cylinder and brake booster are the same as in 944 models.

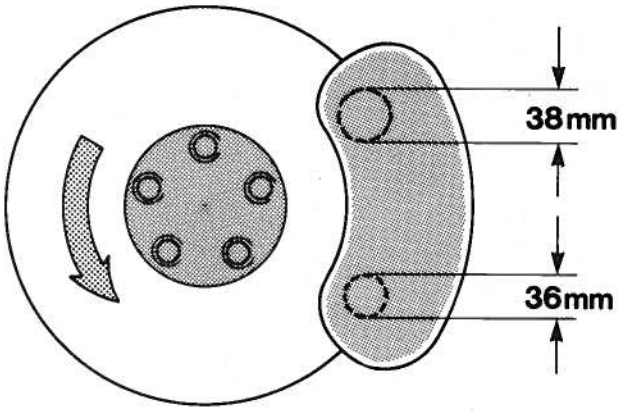
PORSCHE Four Piston Disc Brakes

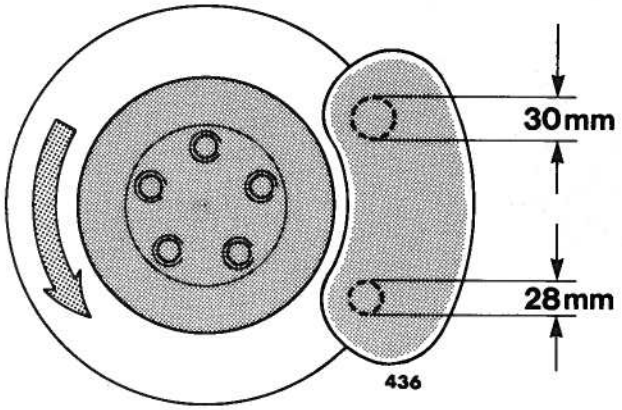
The new four piston disc brake calipers were developed and tested by Porsche until ready for use in standard production. The Porsche four piston brake calipers in Porsche 944 Turbo cars are very closely related to those used in the famous braking system of Type 917 racing cars and Type 930 (911 Turbo cars).

The complete brake calipers are made of light alloy, anodized after machining and coated with double component polyurethane paint after assembly.
The blank parts are at first identical for front and rear wheel brakes. However, there are differences in the diameter of brake pistons.

Piston Diameters of Front Brake Calipers

Inlet brake disc	36 mm dia.
Outlet brake disc	38 mm dia.





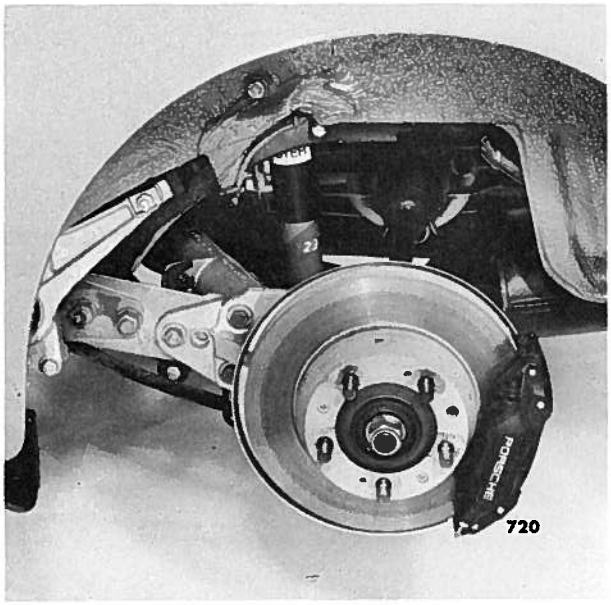
Piston Diameters of Rear Brake Calipers

Inlet brake disc	28 mm dia.
Outlet brake disc	30 mm dia.

Different amounts of force are produced on the bearing surfaces of pistons with the brake pads while braking due to the different brake piston diameters. This fact is applied to reach an uniform wear pattern on brake pads.

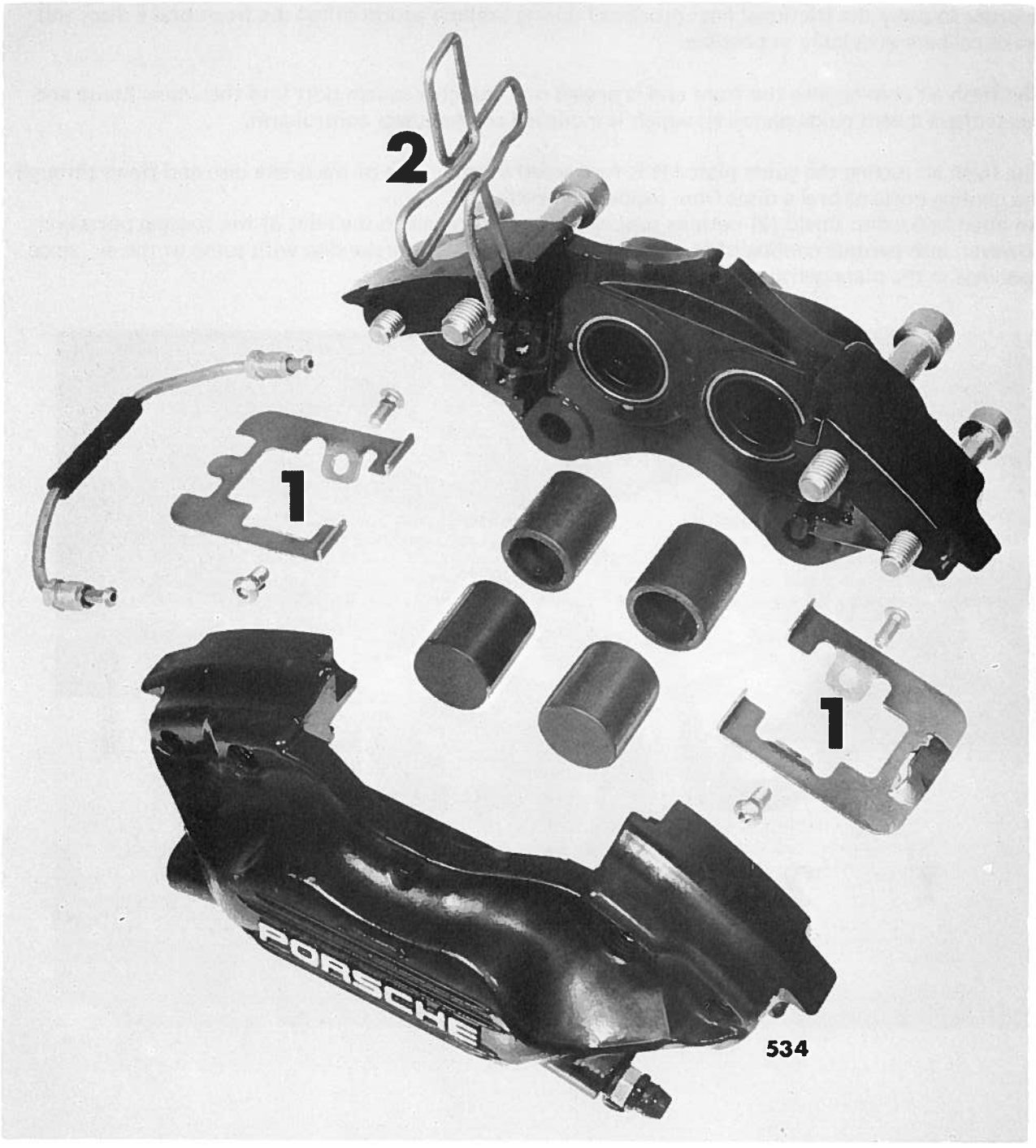
In order to be able to check whether brake calipers are in correct installed position, the cast parts have an arrow **above** the PORSCHE trademark, which indicates the rotating direction of the brake disc.

Installed Position of Brake Calipers



On both axles the brake calipers are located on the rear section of the brake discs, as seen looking forward in the car,

Because of the different piston diameters and inversed installed positions (for example, front right and front left), there are **four different brake calipers** for the 944 Turbo.



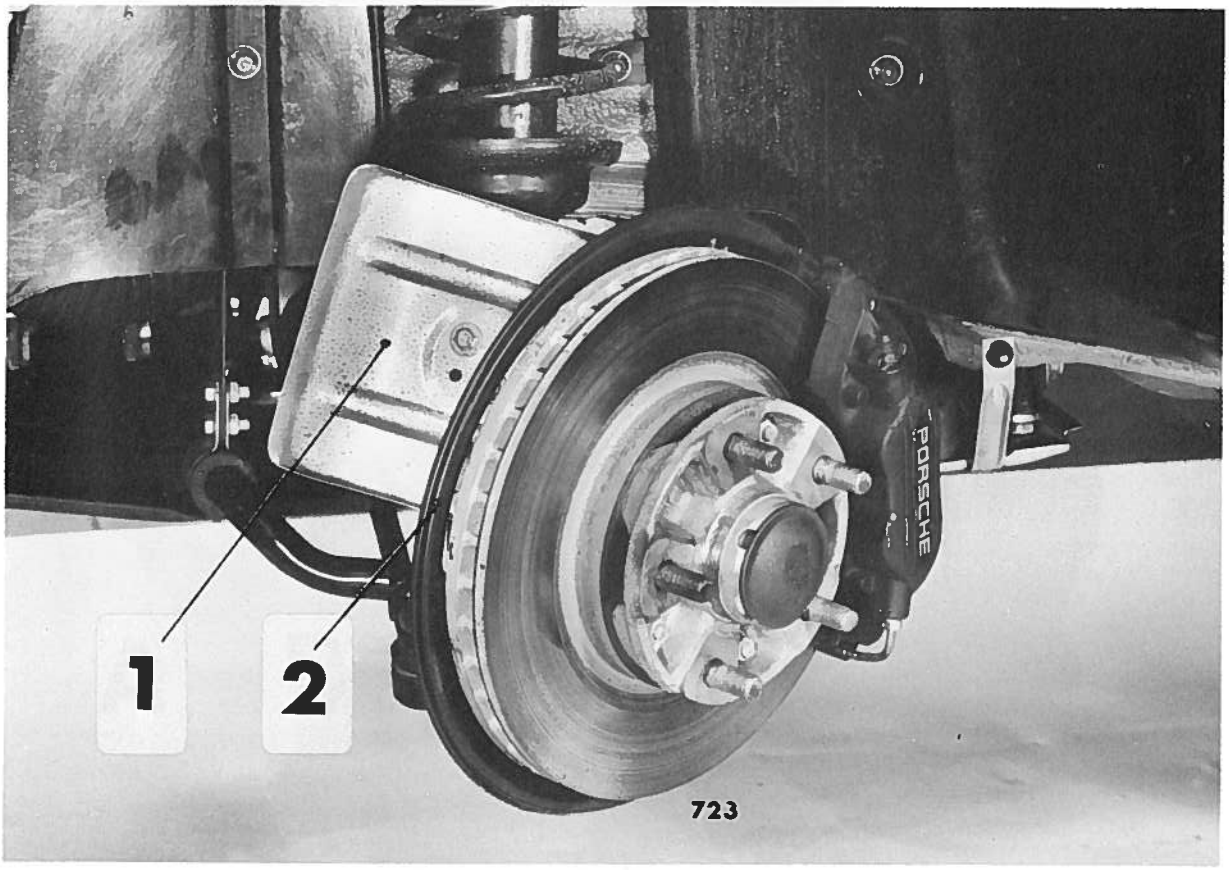
Brake calipers can be disassembled and wear parts, such as pistons and gaskets, are available as replacement parts, since legislation in various countries, e.g. Japan, requires that the braking system be overhauled after the car has been operated a certain time.
The recess plates (1) and cross springs (2) are made of corrosion-proof stainless steel.

Venting Brake Discs

All brake discs have inboard venting. Fresh air streaming out of the front end of the car through special air inlet openings in the lower section of the front spoiler is guided into the wheel housings, in order to carry the frictional heat produced during braking action off of the front brake discs and brake calipers as quickly as possible.

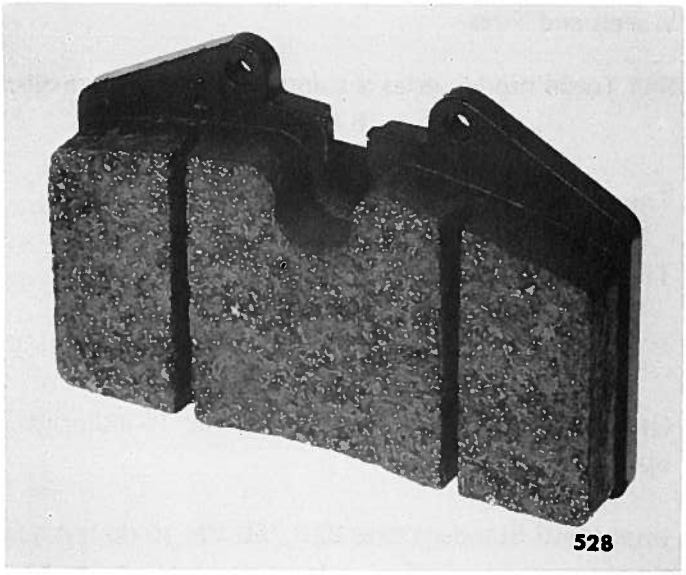
The fresh air coming into the front end is passed on through a square port into the wheel house and meets there a bent guide plate (1), which is mounted on the lower control arm.

The fresh air hitting the guide plate (1) is forwarded to the inside of the brake disc and flows through the cooling ports of brake discs from inside to outside.
An open brake disc shield (2) permits supplying the cooling air to the inlet of the cooling ports and, however, also permits cooling of the inner friction surface of a brake disc with some of the air, since openings in the plate permit venting.



Disc Brake Pads Free of Asbestos

Disc brake pads without asbestos (Jurid 502) have been developed for the 944 Turbo. The pads are identical for front and rear wheel brakes.



Wheels and Tires

944 Turbo model series is standard with pressure diecast light alloy wheel rims.

7 J x 16 H 2 front
8 J x 16 H 2 rear

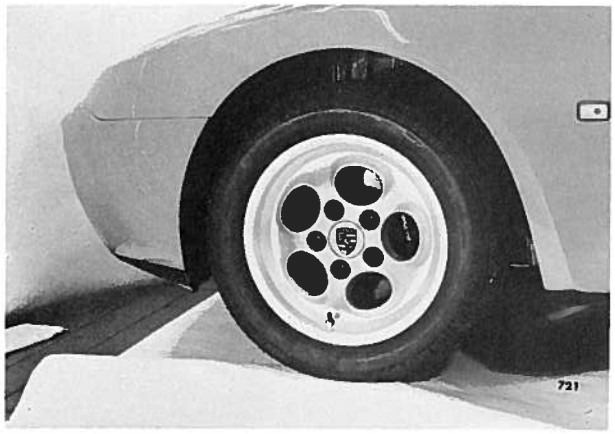
The rim offset is 23.3 mm in each case.

Tire specifications are

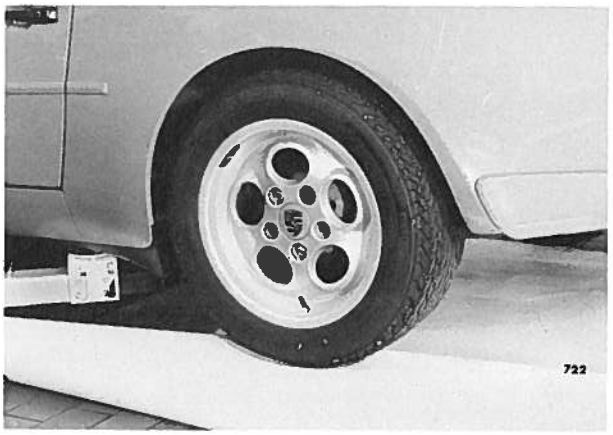
205 / 55 VR 16 front
and
225 / 50 VR 16 rear.

Other rims and other tires, in particular 15 inch rims and tires, are not approved for summer operation .

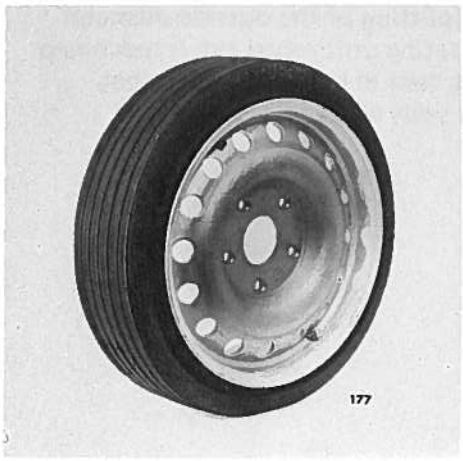
Important! Standard tires 225 / 50 VR 16 do not guarantee **clearance for tire chains.**



Front Wheel Consisting of
7 J x 16 H 2 Rim and
205 / 55 VR 16 Tire



Rear Wheel Consisting of
8 J x 16 H 2 Rim and
225 / 50 VR 16 Tire



New Spare Wheel Rim

The former spare wheel rims for collapsible tires were welded steel rims of conventional design with an inflation valve and a safety blowoff valve.

A new light alloy rim, a so-called "split rim" of size 5 1/2 J x 15, was developed from aluminum wrought alloy in order to reduce car weight by approx. 3.0 kg.

The manufacturing process of a "split rim" is quite interesting.

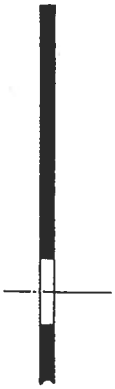


Bild 1

First of all a round blank is produced with a metal thickness of approx. 10 mm.

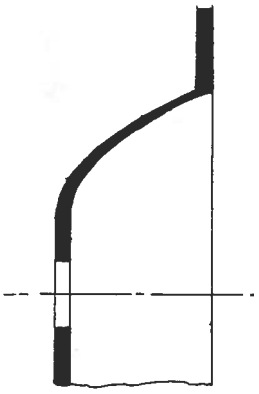


Bild 2

The bowl shape is reached by applying pressure.

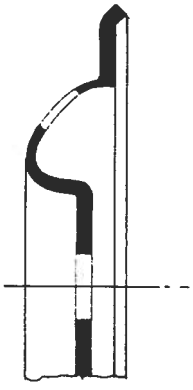


Bild 3

The wheel nave is given its final shape in the following pulling process.
Ventilation holes are punched.

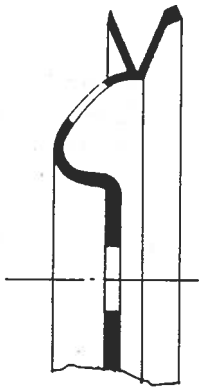


Bild 4

And now the **splitting** of the outside diameter begins. The rotating unfinished rim is machined with a splitting tool in such a manner, that both rim bead seats are produced.

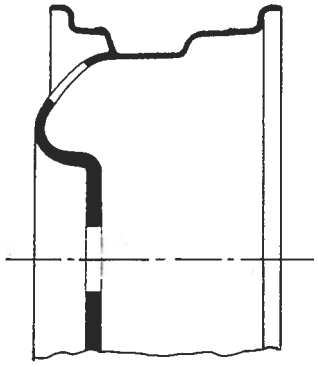


Bild 5

The rim bead seats are now rolled out. In so doing the wall thickness can be changed infinitely, depending on operating loads.

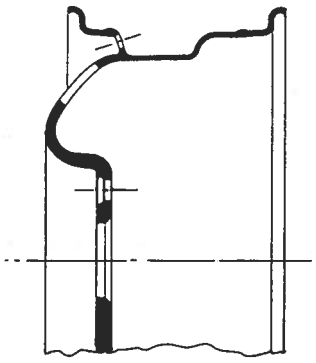
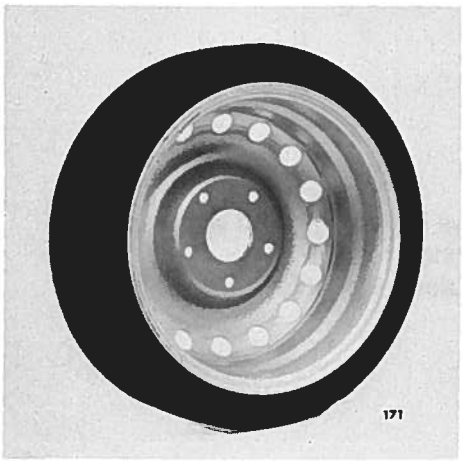


Bild 6

The last procedures concern the machining of bores for wheel bolts, the center and valves as well as smoothing the surface finish.



Important Information for All Collapsible Tire and Spare Wheels:

The collapsible tire spare wheel may **only** be used on the **front axle**. This means that in case of a defective rear wheel, the good front wheel on the same side of the car must be mounted on the rear axle. This provides better car handling and less tire wear, which is especially applicable to cars equipped with a limited slip differential.

The collapsible tire spare wheel must be mounted on the car **before** inflating the tire.
First screw the hose of the on-board compressor on the tire inflation valve and then operate the compressor.

Adjust the pressure to exactly 2.2 bar with a pressure tester (pressure gage).

Caution! The safety blowoff valve responds only after an air pressure of approx. 4.5 bar.

The collapsible tire spare wheel must only be used for short distances in an emergency situation. The maximum permissible road speed is

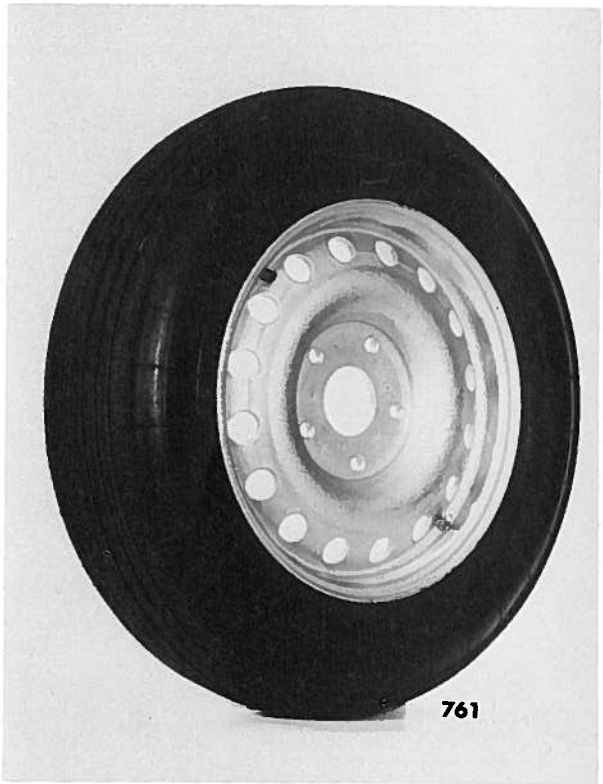
„ 50 mph"

and must not be exceeded because of altered handling properties and tire wear. The tread depth of the collapsible tire is subjected to the same legislation as for standard tires.

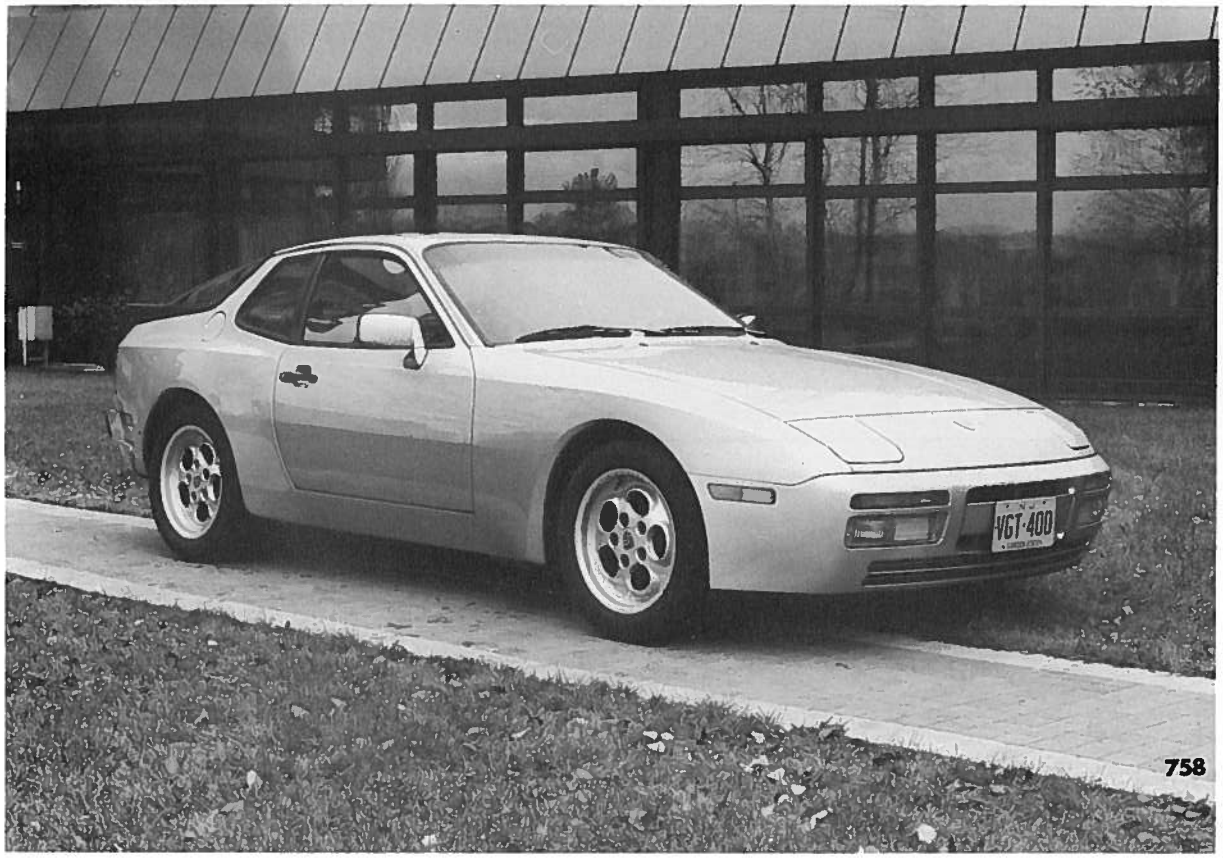
A vehicle may be operated with only **one** collapsible tire spare wheel.

Heat will cause the collapsible tire to expand when used. When letting air out of the collapsible tire (valve unscrewed completely), the tire will take on its original shape when cold and can then be placed in the spare wheel well again.

A collapsible tire cannot be repaired or mounted with conventional workshop equipment. All work on the spare wheel may only be performed by the manufacturer.



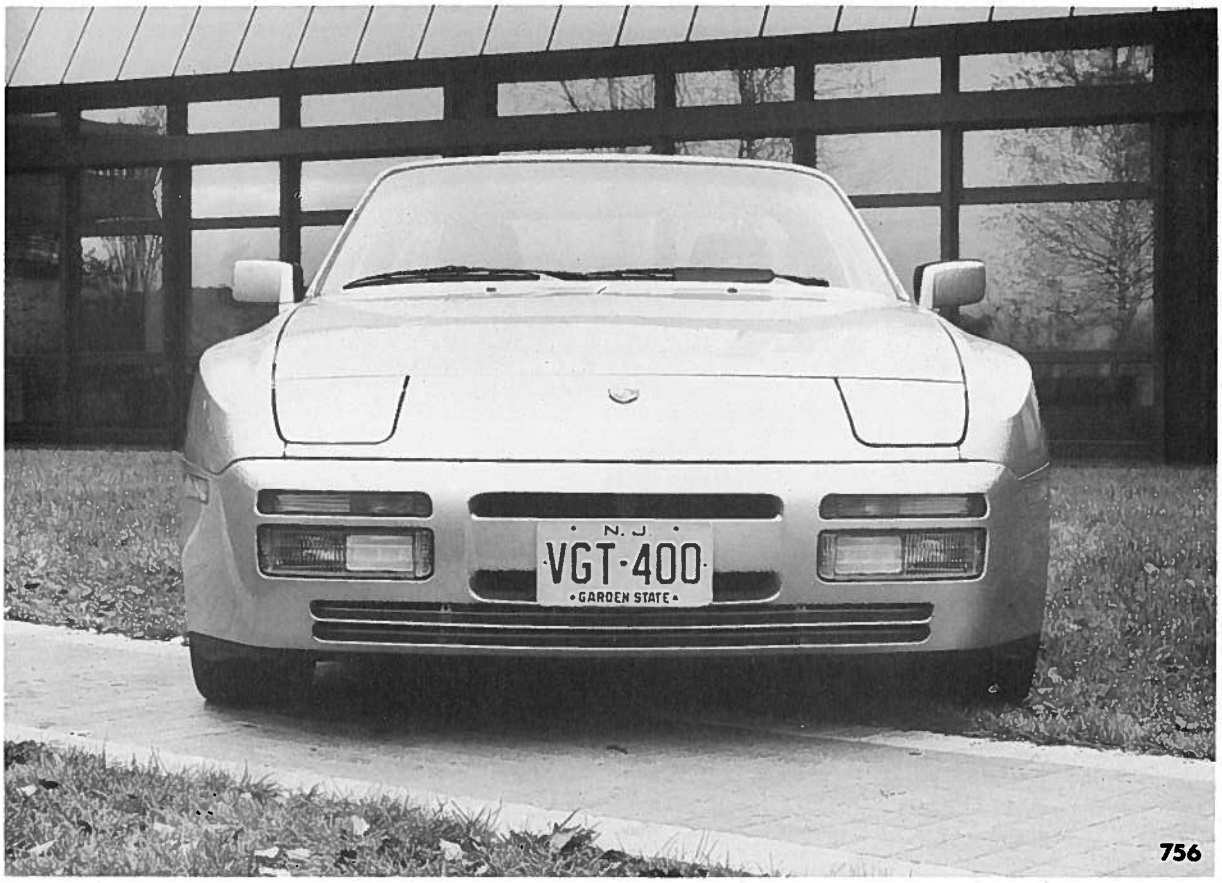
Outside



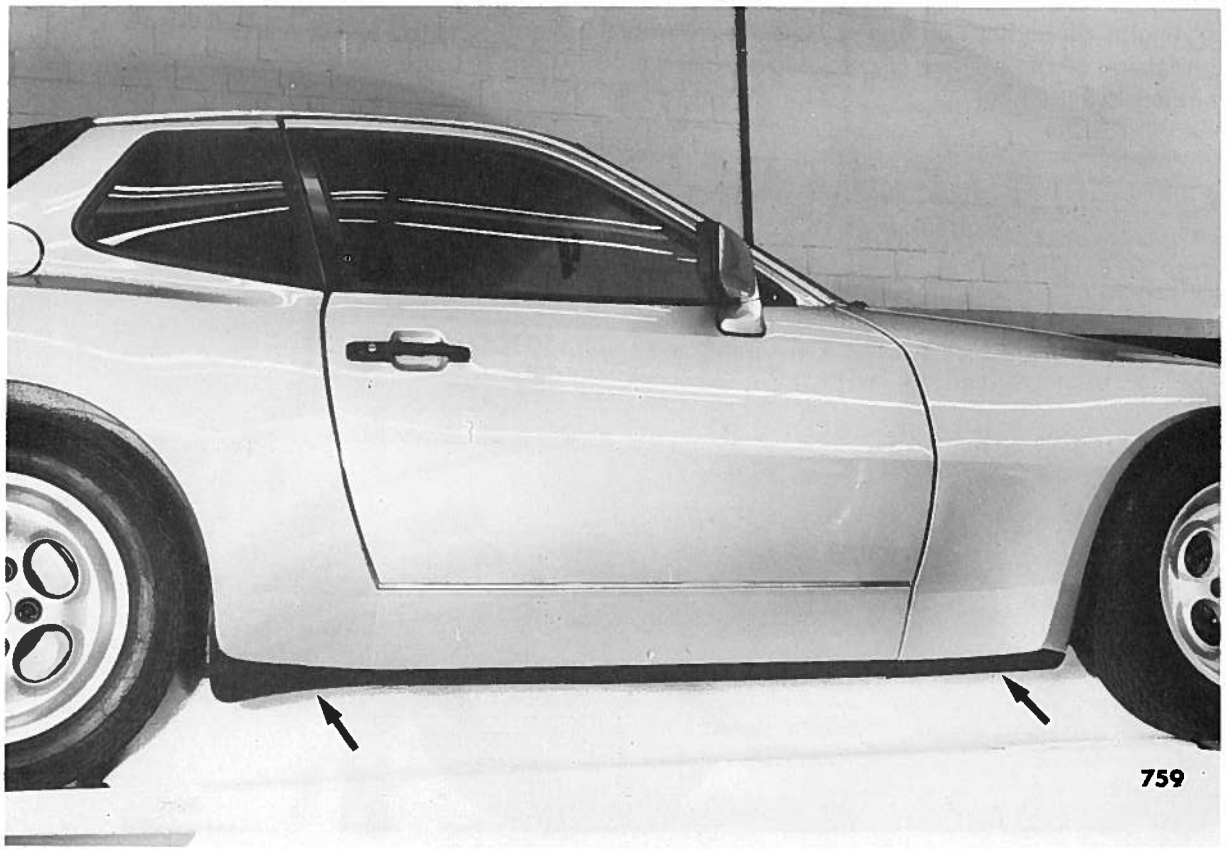
The front end of the Porsche 944 Turbo has been perfected aerodynamically.

Additional air inlet openings have been made in the PU front panel for cooling of the charge air cooler, engine oil cooler and brakes. The front fenders are also adapted to the new front end design. The underside of the car was also revised aerodynamically and has aerodynamic panelling up to the front axle cross member.

The area around the turn signals and additional headlights is a new design.



Plastic side member plates (arrows) protrude down between the wheel openings and, similar to the side spoilers of racing cars, provide positive aerodynamic road holding effect of the car at high speed.



A tail panel mounted underneath the rear bumper covers the fuel tank and spare wheel area, and conforms with the characteristic styling of the Porsche 944 Turbo.

Interior Equipment

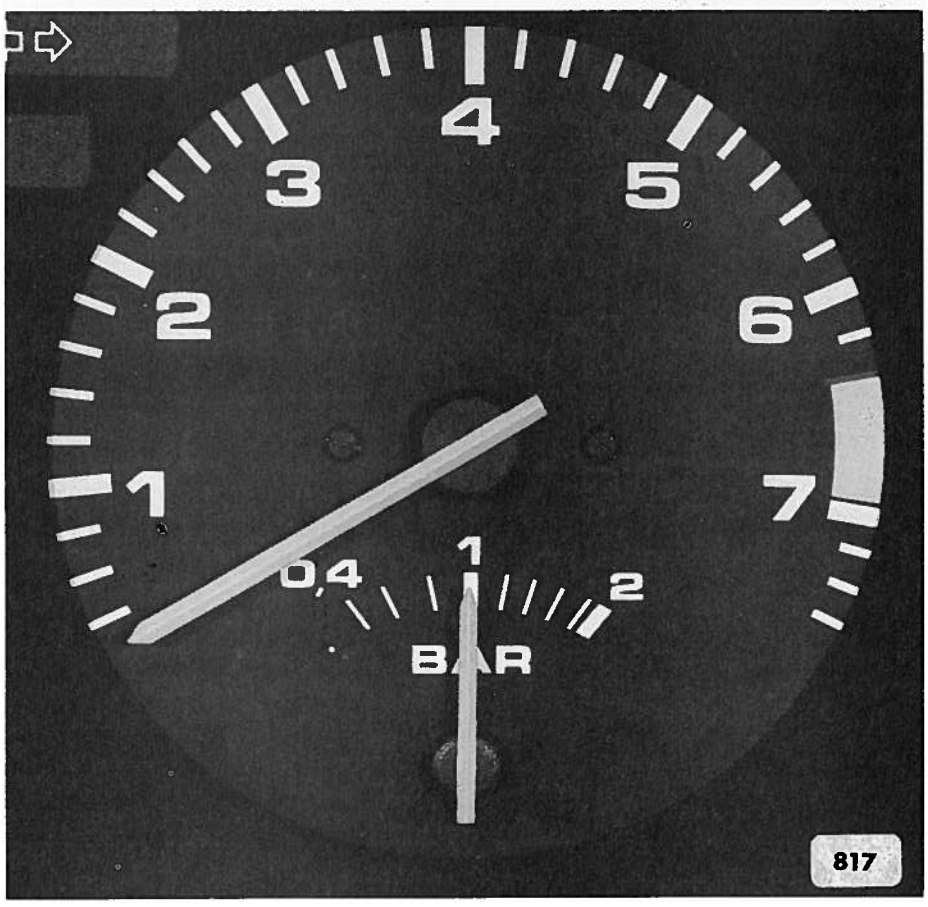
The interior equipment corresponds extensively with that of the 1985/2 model Porsche 944. Differences will be found in the instruments.

The fuel economy control instrument common in 944 cars has been omitted and replaced by an instrument displaying the charging air pressure.

Charging Air Pressure Gage

The charging air pressure gage of the 944 Turbo will display the absolute pressure in the intake pipe system in comparison to the old charging air pressure gages, the needle of which pointed to **0** with the engine stopped. With the engine stopped the new gage displays **1**, the ambient air pressure (1000 mbar barometer display = 1 bar).

After starting the engine, at low speed, the display drops to a value between 0.5 and 1 bar (absolute). The charging air pressure rises only after reaching higher speeds and with the throttle valve open, and reaches its highest value of approx. 1.75 bar (absolute) at full load and engine speed of approx. 2400 rpm.
At higher engine speeds the charging air pressure is reduced by the charging air pressure regulation system and reaches approx. 1.5 bar (absolute) at rated engine speed.



Running Gear		944 Turbo USA, Canada, Japan
Front Axle		
Stabilizer diameter		
Standard	mm	22,5
Special equipment	mm	tube 24 ø x 3,7
Rear Axle		
Torsion bar dia.	mm	23.5
Stabilizer dia (spec. equipm.)	mm	18
Wheel Alignment (at DIN curbweight)		
Front Axle		
Toe, unpressed		+ 1o' ± 5'
Camber		- 2o' ± 15'
max. left to right difference		2o'
Caster		2°3o' +3o' -15'
Max. left to right difference		-
Toe difference angle at 2o° lock		-1° ± 2o'
Rear Axle		
Toe (total)		0° ± 1o'
Max. left to right difference		2o'
Camber		-1° ± 2o'
Max. left to right difference		3o'
Spring strut inclination		-
Max. left to right difference		0,5°
Height Adjustment		
Center of cross tube to center of rear wheel	mm	
Max. left to right difference with front end of car lifted	mm	-
1° change in spring strut inclination equals change in car heigt by about	mm	-
Center of steering knuckle to center of front wheel	mm	-
Brakes		
Brake pads - front		Jurid 502*
rear		Jurid 502*

* free of asbestos

		944 Turbo USA, Canada, Japan
Engine		
Type		M 44/51
Number of cylinders		4
Bore	mm/in.	1oo/3.94
Stroke	mm/in.	78.9/3.11
Total displacement	$cm^3/in.^3$	2479/151
Compression ratio		8,0 : 1
Max. power, DIN 70020	kW/HP	162/22o
Net power, SAE 1349	kW/HP	162/217
At engine speed	rpm	5800
Max. torque, DIN 7oo2o	Nm/kpm	33o/33,6
Net torque, SAE 1349	Nm/ft.lbs	330/2434
At engine speed	rpm	35oo
Max. engine speed	rpm	65oo
Engine weight (dry)	kg/lbs.	182/4o1
Valve Clearance		
Cold (approx. 20° C)		
Intake	mm	not applicable
Exhaust	mm	not applicable
Operating temperature		
Intake	mm	not applicable
Exhaust	mm	not applicable
Timing		with 1 mm lift
with 1 mm valve clearance		zero clearance
Intake opens		1° ATDC
Intake closes		49° ABDC
Exhaust opens		43° BBDC
Exhaust closes		3° BTDC
Engine cooling system		
Electrical system		
Battery		12 V 5o Ah
Special equipment		12 V 63 Ah
Alternator		1610 W/115 A
Ignition system		DME, electronic ign., breakerless
Spark plug caps		without series gap
Firing order		1-3-4-2
Drive belt	mm	Polyrib belt

		944 Turbo USA, Canada, Japan
Engine Lubrication		forced circulation with crescent pump, full flow oil filter, heat exchanger in bypass cooling circuit
Oil pressure at 6000 rpm and 80 to 100° C	bar	approx. 3.5
Approx. oil consumption	ltr./1000 km	1.0
Exhaust system		manifold, single pipe up to catalytic converter, 3-way cat. conv. with heated oxygen sensor, final muffler
Fuel system		DME (L-Jetronic)
Fuel delivery		1 roller cell pump
Fuel octane rating ROZ/MOZ		96/86 unleaded fuel
Fuel consumption, DIN 70030		
in liters/100 km a) at 90 km/h (constant) b) at 120 km/h (constant) c) EC cycle test		
Average $\frac{a + b + c}{3}$		
Power Train via central shaft Central shaft dia. No. of bearings	 mm	 25 4
5-speed manual transmission Ratios 1st gear 2nd gear 3rd gear 4th gear 5th gear Reverse gear		016 UY, 9U, 5P, 5R 10/35 = 3,500 17/35 = 2,059 25/35 = 1,400 29/30 = 1,034 35/29 = 0,829 12/42 = 3,500
Final drive ration		8/27 = 3,375
Limited slip differential (M-Equipment)		40 %
Clutch		single-plate, dry clutch with diaphragm spring in pulled version, hydraulic operation
Pressure plate/clutch disc		GMFZ 240/WTD 240
Transmission weight	kg/lbs.	56/123

	944 Turbo USA, Canada, Japan
Performance with DIN curbweight plug 1/2 payload	
Top speed	250 km/h/155 mph
Acceleration 0-1oo km/h sec. 0- 6o mph sec.	
Kilometer from standing start sec. 1/4 mile sec.	
Hill climbing ability (calculated values for DIN curbweight and 1/2 playload)	
1st % 2nd % 3rd % 4th % 5th %	

		944 Turbo USA, Kanada, Japan
Running Gear		
Front axle		Independent wheel suspension from control arms and spring struts, (Mc Phearson)
Springs		One coil spring coaxial with shock absorber per wheel
Stabilizer dia.		
Standard	mm	22,5
Special equipment	mm	tube 24 ø x 3,7
Steering wheel diameter		
Standard	mm	380/4 spokes leather
Special equipment	mm	36o/4 spokes 380/4 spokes leather with raised hub
Power steering wheel ratio at center		18,85 : 1
No. of steering wheel turns from lock to lock		3,24
Rear axle		Independent wheel suspension from trailing arms
Torsionbar dia.	mm	23,5
Stabilizer dia.		
Standard	mm	18,0
Brakes		
Standard service brakes		Hydr. dual circuit brakes with front/ rear circuit division, brake booster, inboard vented brakes discs
Brake booster dia.	in	9
Master cyl. dia	mm	23,81
Brake disc dia., front/rear	mm	298/299

		944 Turbo USA, Canada, Japan
Disc thickness, front/rear	mm	28/24
Total eff. brake pad area	cm^2	344
Piston dia. in calipers,		
front	mm	2 x 38 + 2 x 36 per caliper
rear	mm	2 x 3o + 2 x 28 per caliper
Parking brake		Mechanical action on both rear wheels (drum brakes)
Parking brake drum dia.	mm	180
Brake shoe width	mm	25
Brake liner area per wheel	cm^2	85
Wheel rims and tires		
Standard tires	front	205/55 VR 16 on rims 7J x 16
	rear	225/50 VR 16 on rims 8J x 16
Special equipment (for winter tires only)		
front and rear		tires 185/70 SR 15 on rims 7J x 15
		215/60 SR 15 7J x 15
front and rear		205/55 SR 16 7J x 16
	front	205/55 SR 16 7J x 16
	rear	225/5o SR 16 8J x 16
Tire inflation pressure (for all road speeds, cold tires)	bar	2,5 (36 psi) front 2,5 (36 psi) rear
Spare wheel (165-15 4 PR 83 P - 5 1/2 J x 15	bar	2,2
Weights (DIN 70020)		
Curbweight - total	kg	1315 (2899 lbs.)
- front	kg	660 (1455 lbs.)
- rear	kg	655 (1444 lbs.)
Max. total weight	kg	16oo (3527 lbs.)
Max. axle load - front*	kg	73o (1609 lbs.)
- rear	kg	92o (2o28 lbs.)
Max. roof load***	kg	35 (77 lbs.)
Max. drawbar load***	kg	75 (165 lbs.)

* Maximum total weight must not be exceeded
Important: Installation of special equipment (air donditioner, etc.) will reduce the payload accordingly.
*** Only applicable when using original PORSCHE spare parts.

		944 Turbo USA, Canada, Japan
Filling Capacities		
Engine oil	ltr.	approx. 6[1] total oil volume as measured with dipstick. Difference between min. and max. marks on oil dipstick:
	ltr.	approx. 1,3
Cooling system, incl. heater	ltr.	approx. 8,5 of coolant, plant filling, with anti-freeze for -25° C (-35° C for northern countries
Manual transm. + differential	ltr.	approx. 2[2]
Fuel tank	ltr.	approx. 80 (8 ltr. in res.)
Power steering oil		approx. 0,7[3]
Brake fluid tank	ltr.	approx. 0,2[4]
Washing fluid tank for head-lights and windshield	ltr.	approx. 6,o
Dimensions (at DIN curbweight)		
Wheel base	mm	2400 (94.488'')
Track width, front	mm	1477 (58.150'')
Track width, rear	mm	1451 (57.1'')
Track width, rear (7J x 16) and 8J x 16	mm	1451 (57,1'')
Length	mm	4290 (168.9'')
Width	mm	1735 (68.307'')
Height	mm	1275 (50.197'')
Ground clearance (at max. total weight)	mm	120 (4.72'')
Curved surface ground clearance	mm	53 (2.09'')
Front overhang angle limited by front apron panel (at max. total weight)		14°
Rear overhang angle, limited by exhaust (at max. total weight)		15°

1) Approved specifactions API SE/SF with combinations API SE/CC - SE/CB - SF/CC - SF/CB.
Multigrade oils SAE 10W40, 10W50, 20W50.
SAE 20W50 should not be used at temperatures below 15° C/F5° F.
2) SAE 80 gear lube of API Classification GL 4 (MIL-L 2105)
3) ATF Dexron B (sperm oil free) to RL 70.
4) Only use brake fluid conforming with SAE J 1703, DOT 3 and/or 4.

Contents

SW = BLACK
WS = WHITE
RT = RED
GN = GREEN
GE = YELLOW
GR = GREY
BR = BROWN
BL = BLUE
LI = VIOLET

CYCLE VALVE
CYLINDER 1
CYLINDER 2
CYLINDER 3
CYLINDER 4
FUEL INJECTION
DIAGNOSTIC PLUG
THROTTLE SWITCH
AIR FLOW SENSOR
ONLY USA
OXYGEN SENSOR
CONNECTION POINT OXYGEN SENSOR
SPEED MARK SENSOR
CONNECTION POINT SPEED MARK SENSOR
REFERENCE MARK SENSOR
CONNECTION POINT REFERENCE MARK SENSOR
IDLE POSITIONER
NTC SENSOR WATER
ONLY USA
ALTITUDE CORRECTION BOX
CONNECTOR NEAR DME CONTROL UNIT
KNOCK SENSOR
KNOCK REGULATOR CONTROL UNIT
DME CONTROL UNIT
CODES PLUG
DME CONNECTION POINT
WATER TEMPERATURE SWITCH SENSOR
OIL PRESSURE SENSOR
DIGITAL MOTOR ELECTRONIC (DME) WIRE HARNESS

GROUND CLUTCH HOUSING
GROUND BODY
BATTERIE
BATTERIE STARTER WIRE HARNESS
ALTERNATOR
STARTER
ALTERNATOR STARTER WIRE HARNESS
BATTERY RHD
BATTERY LHD
CONNECTION RHD ONLY
CONNECTION LHD ONLY
PASSENGER ROOM WIRE HARNESS
RADIO
SPARK PLUG
DISTRIBUTOR
IGNITION COIL
DRIVE TEMPOSTAT
TEMPOSTAT SWITCH
TEMPOSTAT MARK SENSOR
IN THE CASE OF AUTOM. TRANSM. BRIDGE TO GROUND INSTEAD OF SWITCH
CLUTCH SWITCH
IGNITION SWITCH
STARTER INTERLOCK ONLY AUTOMATIC
CONNECTION POINT
FUEL PUMP
FUEL PUMP/SENSOR
KL. 30
KL. 31
DME
RADIO 7,5A
CENTRAL ELECTRIC
FRONT WIRE HARNESS

WELDING POINT
CONNECTION WITH GROUND TERMINALS
WELDING POINT CONNECTION WITH FIELD INDICATION
MP FIELD INDICATION