PORSCHE

# Technical Manual

## *911 Carrera* (996)

## Technical Information

## Repair

## Contents:

Group 0
Entire vehicle – General

WKD 483 721

## Foreword

The workshop documentation for the 911 Carrera (996) model has the designation
**"911 Carrera (996)" Technical Manual**
and contains **Technical Information** as well as instructions on **Repairs**.

The integration of the technical information published in the "911 Carrera (996)" Technical Manual with the instructions on repairs provides the user with a complex reference work that combines into one book associated or cross-referenced material of relevance to workshops and originating from various information media.

The "911 Carrera (996)" Technical Manual consists of 15 folders, subdivided into the following Groups

| | |
|---|---|
| 0 | Entire vehicle – General |
| 0 | Diagnosis, part 1 (up to Repair Group 45) *1 |
| 0 | Diagnosis, part 2 (as of Repair Group 61) *2 |
| 1 | Engine, part 1 (up to Repair Group 13) *3 |
| 1 | Engine, part 2 (as of Repair Group 15) *4 |
| 2 | Fuel, exhaust, engine electronics |
| 3 | Transmission, manual transmission |
| 3 | Transmission, automatic transmission |
| 4 | Running gear |
| 5 | Body |
| 6 | Body equipment, exterior |
| 7 | Body equipment, interior |
| 8 / 9 | Air conditioning / Electrics |
| 9 | Circuit diagrams, part 1 (up to and including the '99 model) *5 |
| 9 | Circuit diagrams, part 2 (as of the '00 model) *6 |

*1 The two folders with Group 0 are to be regarded as one folder; i.e. file the "Technical Information" notices only in front of the repair descriptions in the folder "Group 0 – Diagnosis, part 1" **(up to Repair Group 45)**.

*2 The **second folder** "Group 0 – Diagnosis, part 2" **(as of Repair Group 61)** includes the further Repair Groups belonging to Group 0.

*3 The two folders with Group 1 are to be regarded as one folder; i.e. file the "Technical Information' notices only in front of the repair descriptions in the folder "Group 1 – Engine, part 1" **(up to Repair Group 13)**.

*4 The **second folder** "Group 1 – Engine, part 2" **(as of Repair Group 15)** includes the further Repair Groups belonging to Group 1.

*5 The two folders with Group 9 are to be regarded as one folder; i.e. file the "Technical Information" notices only in front of the repair descriptions in the folder "Group 9 – Circuit diagrams, part 1" **(up to and including the '99 model)**.

*6 The **second folder** "Group 9 – Circuit diagrams, part 2" **(as of the '00 model)** includes the further circuit diagrams belonging to Group 9.

The "911 Carrera (996)" Technical Manual has the same structure in each folder, with the following breakdown for all Groups:

**Title page: "911 Carrera (996)" Technical Manual**
> Foreword

**Title page: "Technical Information"**
> Table of Contents, Technical information
> Technical information

**Title page: "Repair"**
> Repair Groups: overview
> Table of Contents, repairs
> General / technical data
> Instructions on repairs

As can be seen from the breakdown, the published Technical Information is in the front part of each folder – numbered according to the Groups. The Table of Contents assigned to each Group will be periodically updated.

Following the Technical Information, separated by a title page, the instructions on repairs – assigned according to the Groups or broken down into Repair Groups – are included in the folders.

The instructions on repairs will be extended and updated by means of supplements.

**Note**

Sheets that already exist in the "911 Carrera (996)" Technical Manual and are updated or revised and thereby exchanged by a supplement are designated "replacement sheet". Revisions or technical modifications on pages of these replacement sheets are identified for the user with a vertical bar at the margin.

# 911 Carrera (996) Technical Manual – Repair

## General

The Technical Manual – Repair – describes all essential work operations requiring special instructions to ensure that repairs are performed properly. It should be in the hands of the workshop foremen and the workshop personnel, as careful compliance with the stated instructions is a precondition for maintaining the traffic and operating safety of the vehicle. In addition, of course, the generally customary basic safety rules for the repair of motor vehicles are unrestrictedly applicable.

## Structure

Overview of repair groups

Contents

Technical data / general

Description of repairs

## Breakdown of Repair Groups

Tools, special tools and materials required for repair

Exploded drawing and illustration of sequence

Legend for exploded drawing and description of sequence

Instructions for assembly and adjustment

The Technical Manual is regularly expanded by supplements, which must be incorporated immediately to preserve the usefulness of the Manual. As verification of completeness, the record sheet should be completed.


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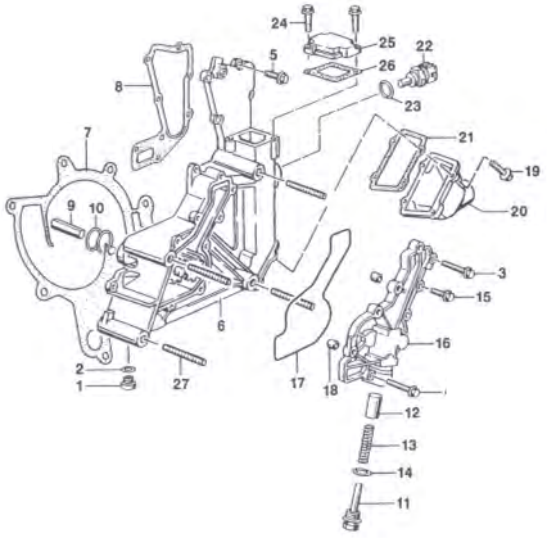
# Structure of exploded view

A 17 B Engine - Lubrication C 911 Carrera (996)

H Removing and installing oil pump with coolant guide housing




D F 17 20 19 Removing and installing oil pump with coolant guide housing E 996171 G Printed in Germany, 1997

C 911 Carrera (996) B Engine - Lubrication A 17

H Removing and installing oil pump with coolant guide housing

| J No. | Designation | Qty. | Removal | K Note: Installation |
|---|---|---|---|---|
| | Coolant drain plug M10 x 1 | | | |
| 2 | Sealing ring A18 x 13.5 | | | |
| 3 | Hexagon-head bolt M6 x 70 | | | |
| 4 | Hexagon-head bolt M6 x 70 | | | |
| 5 | Hexagon-head bolt M6 x 20 | | | Tightening torque 10 Nm (7.5 ftlb.) |
| 6 | Oil pump with coolant gu housing | | | |
| 7 | Gasket | | | Always replace; insert or fit only if coolant guide housing has been put onto the crankcase |
| 8 | Gasket | | | Always replace; insert or fit only if coolant guide housing has been put onto the crankcase |
| 9 | Driver | | | |
| 10 | O-ring | | | Always replace |
| 11 | Plug with guide pin | | | Tightening torque 25 (19 ftlb.) |
| 12 | Piston | | | Oil |
| 13 | Spring | | | |
| 14 | Sealing ring | | | Replace |

17 20 19 Removing and installing oil pump with coolant guide housing F D 17 - 7
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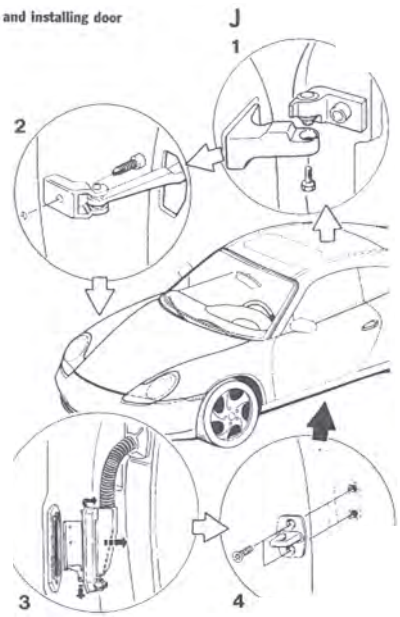
| | | |
|---|---|---|
| **A** | = | Repair Group, numbers |
| **B** | = | Repair Group, text |
| **C** | = | Vehicle type |
| **D** | = | Page number |
| **E** | = | Internal Porsche number |
| **F** | = | Work operation, consisting of **"After-sales service number"** and **"Title"** |
| **G** | = | Imprint, supplement number, year of printing |
| **H** | = | Title of exploded view |
| **J** | = | Item number of exploded view, in disassembly sequence |
| **K** | = | Special instructions to be followed during installation or removal |

## Structure of sequence description

A 57 B Door front, central locking system C 911 Carrera (996)

H Removing and installing door




D 57 - 2 E F G

C 911 Carrera (996) B Door front, central locking system A 57

H Removing and installing door

**Observe the safety instructions for handling airbag vehicles before removing the door with side airbag.**

1. Remove the ignition key
2. Disconnect and cover the negative terminal of the battery
3. After disconnecting the battery, assembly work or other work must be started only after a waiting time of **1 minute**.

Removing door

| J No. | K Procedure | L Instructions |
|---|---|---|
| 1 | Loosen fastening screw. | Unscrew fastening screw from |
| 2 | Loosen door brake. | Unscrew hexagon brake. |
| | Disconnect plug connection. | Loosen Torx screw (T25), push plug up by approx. 3 mm and then pull the whole plug connection out of the A-pillar. **Caution: Latching lugs in the plug can break off!** Pull out locking element at the bottom part of the plug connection and disconnect the plug connection. Unscrew locking screw from the door hinge and lift the door upwards out of the hinges. |
| 4 | Loosen latch striker. | Loosen Torx screw on latch striker and remove latch striker. |

57 51 19 Removing and installing door Printed in Germany, 1997 G F 996571 E D 57 - 3

| | | |
|---|---|---|
| **A** | = | Repair Group, numbers |
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| **J** | = | Sequence number in order of sequence |
| **K** | = | Procedure in the sequence |
| **L** | = | Description or explanation of the procedure |

# 0 Entire vehicle – General

## 0 General



## 01 Sales check



## 03 Maintenance




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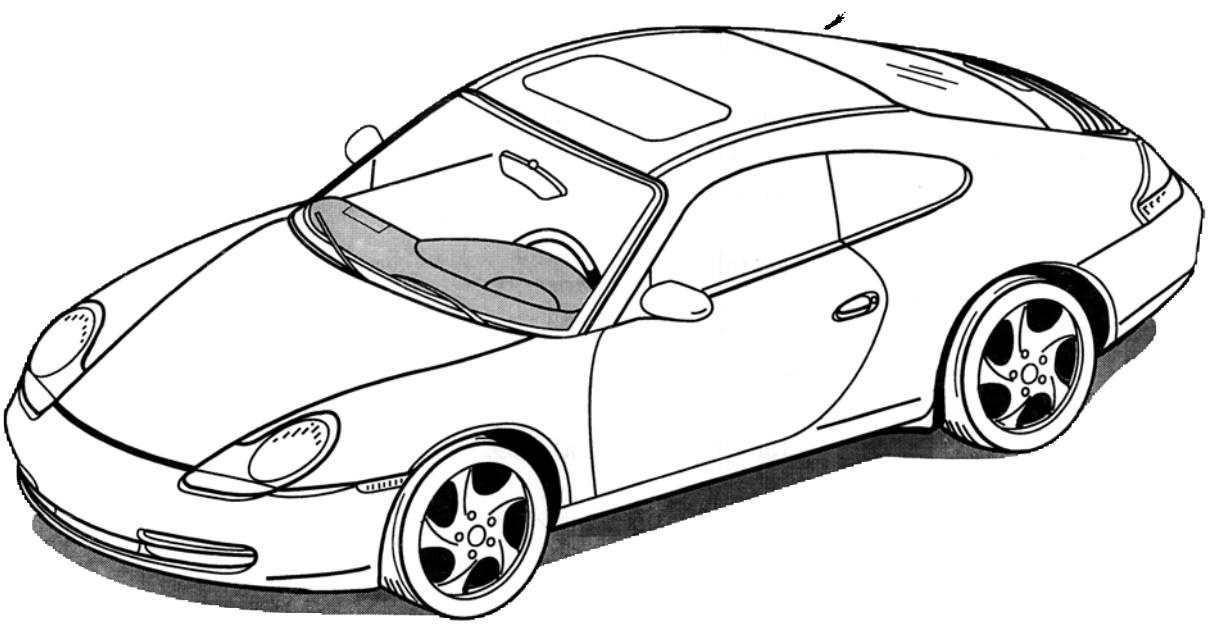

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# 0 Technical data

## Engine

| | | |
|---|---|---|
| **Engine type:** | | M 96/01 |
| Number of cylinders | 6 | |
| Bore | mm (in.) | 96 (3.78) |
| Stroke | mm (in.) | 78 (3.07) |
| Displacement | $cm^3$ (cu. in.) | 3387 (206.67) |
| Compression ratio | 11.3 : 1 | |
| Max. engine power as per 80/1269/EWG | kW (HP) | 220 (300) |
| at engine speed | rpm | 6800 |
| Max. torque as per 80/1269/EWG | Nm (ftlb.) | 350 (259) |
| at engine speed | rpm | 4750 |
| Max. litre output | kW/l (HP/l) | 63.8 (86.8) |
| Rpm limitation by fuel supply interruption at | rpm | 7300 |
| Idle speed | rpm | 700 |
| Automatic transmission | rpm | 700 |

| | Manual trans. | Automatic transmission |
|---|---|---|
| Engine weight as per DIN 70020 A kg (lbs) | 190* (418.86) | 179 (394.60) |

* including ZMS (dual-mass flywheel)

## Engine design

| | |
|---|---|
| Type | 6-cylinder aluminium opposed-cylinder engine, water cooled |
| Radiators | Two in the front end (+ 3rd radiator in Tiptronic vehicle) |
| Crankcase | Vertically split light alloy cylinder housing with separate crankshaft bearing housing |
| Crankshaft | Forged, supported by 7 bearings |
| Crankshaft bearings | Plain bearings |
| Connecting rods | Forged |
| Con-rod bearings | Plain bearings |
| Pistons | Light alloy, pressed |
| Cylinders | Lokasil cylinder lining |
| Cylinder head | 3-part light alloy head |
| Valve guide | Pressed in |
| Valve arrangement | 2 inlet valves suspended in parallel V arrangement<br>2 exhaust valves suspended in parallel V arrangement |
| Valve control | Via flat-based tappets |
| Camshaft | From the crankshaft via a double chain to the intermediate shaft, and from there to the exhaust camshafts via one double chain each.<br>Inlet camshaft coupled with exhaust camshaft via a single chain. |

| | | |
|---|---|---|
| Camshaft adjustment | Porsche VarioCam with 25° adjustment | |
| Valve clearance | Hydraulic valve clearance compensation | |
| Valve timing<br>with 1 mm valve travel and zero clearance | Inlet opens<br>Inlet closes<br>Outlet opens<br>Outlet closes | 15° after TDC<br>59° after BDC<br>39° before BDC<br>7° before TDC |
| Intake system | 2-stage tuned-intake system (plastic) | |

**Engine cooling**

Water cooling; two radiators ahead of the front wheels.
(Additional radiator for Tiptronic vehicles)
Two electric fans, controlled in two stages

**Engine lubrication**

| | |
|---|---|
| Type | Integrated dry sump |
| Oil cooling | Via oil-water heat exchanger |
| Oil filter | On pressure side behind oil pump |
| Oil pressure at n = 5000 rpm | Approx. 0.5 bar at 90 °C |
| Oil pressure indication | Oil pressure indicator light |
| Oil consumption | Approx. 1.0 l/1000 km |

| | |
|---|---|
| **Exhaust system** | 2-pipe system with one 3-way catalytic converter per pipe, 2 rear mufflers |
| **Emission control** | Oxygen sensor closed-loop control and 3-way catalytic converter (metallic substrate)<br>USA - additional electrical secondary-air pump |
| **Heating** | Via water heat exchanger, closed loop-controlled on air side |

**Fuel system**

| | |
|---|---|
| Fuel injection | DME (Digitale - Motor - Elektronik – engine control module ECM)<br>Injection valves controlled sequentially |
| Fuel supply | 1 electrical internal gear pump |
| Fuel quality (RON) | 98 unleaded |

**Electrical system**

| | | |
|---|---|---|
| Radio interference suppression | | ECE - R 10 and 72/245/EWG |
| Rated voltage | V | 12 |
| Battery capacity | Ah/A | 70/340 |
| Rated generator output | W | 1680 (alternator) |


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| | |
|---|---|
| Ignition | DME (ECM), individual ignition coils, knock control |
| Firing order | 1 - 6 - 2 - 4 - 3 - 5 |
| Ignition timing control | Via DME (ECM) |
| Spark plugs | Bosch FR 6 LDC<br>Beru 14 FR 6 LDU |
| Electrode gap mm (in) | 0.8 + 0.1<br>(0.031 + 0.004) |

**Power transmission**

Engine and transmission bolted together to form a power unit. Power is transferred to the rear wheels via double-jointed drive shafts.

**Clutch**

| | |
|---|---|
| Manual transmission | Single-plate dry clutch<br>Hydraulic actuation<br>Double-mass flywheel |
| Contact plate | GGG 60 (nodular cast iron) |
| Clutch plate ø | 240 |
| Automatic transmission: | |
| Torque converter ø mm (in) | 260 (11.03) Screw center point diameter<br>282 (11.11) Largest outer diameter, screwed axially |

| | | |
|---|---|---|
| Moving-off ratio | | 1.92 |
| Stall speed | rpm | 2450 |
| Transmission | Manual transm.<br>Carrera 2<br>G 96.00 | Tiptronic<br>Carrera 2<br>A 96.00 |
| Number of gears, forward/reverse | 6/1 | 5/1 |
| Internal designation | | |
| Transmission ratios (i) | | |
| 1st gear | 3.82 | 3.66 |
| 2nd gear | 2.20 | 2.0 |
| 3rd gear | 1.52 | 1.41 |
| 4th gear | 1.22 | 1.0 |
| 5th gear | 1.02 | 0.74 |
| 6th gear | 0.84 | — |
| Reverse gear | 3.55 | 4.10 |
| Final drive: | Bevel gear wheel | |
| Final drive ratio (i) | 3.444 | 3.676 |
| Transmission weight (dry) kg (lbs) | 60.5 (133.4) | 106.82 (235.48) with torque converter<br>94.72 (208.8) without torque converter |
| Transmission weight (wet and ready for installation) kg (lbs) | 62.9 (138.6) | 115.62 (254.88) with torque converter<br>103.52 (228.21) without torque converter |

**Body designs**

Lightweight, galvanized all-steel integral body-frame
Full-size airbag for driver and passenger
Coupé: Number of seats = 2 + 2

## Running gear

| | | |
|---|---|---|
| Front axle | | Spring strut axle:<br>Wheels individually suspended by control arms with trailing arms and spring struts<br>(McPherson type, Porsche optimized)<br>Springs:<br>One truncated cone spring per wheel, with vibration damper inside spring |
| Vibration dampers | | Double-acting hydraulic twin-tube gas-filled vibration dampers |
| Steering | | |
| Steering wheel ø | mm (in) | 380 (14.97) |
| Steering ratio | | 16.9 : 1 Left-hand drive vehicle<br>16.9 : 1 Right-hand drive vehicle |
| Turning circle ø | m (ft) | 10.6 (34.8) |
| Track circle ø | m (ft) | 10.2 (33.5) |
| Steering wheel revolutions from lock to lock | | 2.98 Left-hand drive vehicle<br>2.98 Right-hand drive vehicle |
| Power steering pump | | Driven via poly V-belt<br>Ratio i = 1 : 1.18 |
| Rear axle<br>Wheel suspension | | Multi-link axle<br>Wheels individually guided by 5 control arms |
| Springs | | Cylindrical coil spring per wheel, with coaxial vibration vibration damper inside spring |
| Vibration dampers | | Double-acting hydraulic single-tube gas-filled vibration dampers |

## Brakes

| | | |
|---|---|---|
| Operating brake | | Foot operated, hydraulic-mechanical boost<br>Dual-circuit brake system, 4-piston Al monobloc brake calipers at FA and RA, distributed per axle, internally ventilated brake discs at front and rear axles, ABS standard, Traction Control (TC) optional with switch-over possibility to automatic brake differential (ABD). |
| Vacuum brake booster (boost factor) | | 3.85 |
| Brake master cylinder ø | mm (in) | 23.81/23.81 (0.94/0.94) |
| Brake master cylinder stroke | mm (in) | 18/18 (0.71/0.71) |
| Pressure reducer - switching-on pressure | | 55 bar |
| - reducing factor | | 0.46 |
| Brake disc ø | mm (in) | Front 318 (12.53)<br>Rear 299 (11.78) |
| Effective brake disc ø | mm (in) | Front 261.8 (10.31)<br>Rear 247.6 (9.75) |
| Brake disc thickness | mm (in) | Front 28 (1.10)<br>Rear 24 (0.95) |
| Effective total brake area per wheel | $cm^2$ (sq.in) | Front 127 (19.69)<br>Rear 98 (15.195) |
| Piston ø in brake caliper | mm (in) | Front 36 (1.42) and 40 (1.576)<br>Rear 28 (1.10) and 30 (1.182) |
| Parking brake | | Drum-type parking brake |

| | | |
|---|---|---|
| Brake drum ø | mm (in) | 180 (7.092) |
| Brake shoe width | mm (in) | 25 (0.985) |
| Lining area per wheel | $cm^2$ (sq.in) | 85 (13.08) |

**Wheels and tyres**

| Summer tyres | | Rim offset (mm) |
|---|---|---|
| Tyre size, front – on wheel | 205/50 ZR 17 - 7 J x 17 | 55 * |
| Tyre size, rear – on wheel | 255/40 ZR 17 - 9 J x 17 | 55 * |
| Tyre size, front – on wheel | 225/40 ZR 18 - 7.5 J x 18 | 50 * |
| Tyre size, rear – on wheel | 265/35 ZR 18 - 10 J x 18 | 65 * |

| Winter tyres ** | | Rim offset (mm) |
|---|---|---|
| Tyre size, front – on wheel | 205/50 R 17 89T M + S - 7 J x 17 | 55 |
| Tyre size, rear – on wheel | 225/45 R 17 90T M + S - 8.5 J x 17 | 50 *** |

Only if specified make is fitted.
M + S tyres with higher load rating and/or higher speed symbols can also be mounted optionally (max. "H" = max. 210 km/h).
Snow chains approved if special chains are used.

## Spare wheel

| | | | |
|---|---|---|---|
| High-pressure tyre | | 105/95 * - R 17 * bound to make | |
| Wheel | | 3.5 J x 17 rim offset 19 | |
| Tyre pressure | | 17" | 18" |
| front | bar | 2.5 | 2.5 |
| rear | bar | 2.5 | 3.0 |
| Spare wheel | bar | 4.2 | 4.2 |

## Dimensions

| | | | |
|---|---|---|---|
| Length | mm (in) | 4430 (174.54) | |
| Width | mm (in) | 1765 (69.5) | |
| Height | mm (in) | 1305 (51.42) at DIN empty weight | |
| Wheel base | mm (in) | 2350 (92.59) | |
| Track widths | | 17" | 18" |
| Front | mm (in) | 1455 (57.33) | 1465 (57.72) |
| Rear | mm (in) | 1500 (59.10) | 1480 (58.31) |
| Ground clearance | mm (in) | 100 (3.94)<br>65 (2.56) at max. gross weight | |

| | | |
|---|---|---|
| | Vehicle in design position * | |
| Ramp angle | Degrees | 13.0 |
| Overhang angle, front | Degrees | 12.0 |
| Overhang angle, rear | Degrees | 14.5 |

* Design position according to Porsche definition:

| | | | |
|---|---|---|---|
| DIN empty | + driver | = | 68 kg |
| | + passenger | = | 34 kg |
| | + luggage | = | 10 kg |

**Weights according to DIN 700 20**

| | Manual transmission | Tiptronic |
|---|---|---|
| Empty weights according to equipment kg (lbs.) | | |
| Front | 500 - 540 | 505 - 545 |
| Rear | 820 - 840 | 860 - 880 |
| Total, Coupé | 1320 - 1380 * (2909.9 - 3042.2) | 1365 - 1425 * (3009.1 - 3141.4) |

* For EU homologation plus 75 kg driver's share (35 kg at front axle, 40 kg at rear axle)

| | | |
|---|---|---|
| Permissible axle load | | |
| Coupé, front | 775 (1708.49) | 775 (1708.49) |
| rear | 1100 (2425.06) | 1100 (2425.06) |
| Max. gross weight | 1720 (3791.74) | 1765 (3791.74) |
| Max. trailer load | | |
| Braked | none | none |
| Unbraked | none | none |
| Permissible towed weight | none | none |
| Permissible drawbar load | none | none |
| Permissible roof load, kg (lbs.) | | |
| With original Porsche Roof Transport System | 75 (165) | 75 (165) |

**Filling capacities:**

Measurement of the engine oil level by instrument or oil dipstick.
The Driver's Manual is definitive.

| | | |
|---|---|---|
| Engine specification | | Approved: |
| | Europe - | According to ACEA Specification A4 - 96 and special Porsche requirements (refer to Techn. Info bulletin about engine oils) |
| | USA, RoW - | According to API SG and SHn Specifications and special Porsche requirements (refer to Techn. Info bulletin about engine oils) |

| | | | |
|---|---|---|---|
| Engine oil quantity | (imp. gal.) | Approx. 10.25 (2.22)<br>Change quantity 8.25 (1.79) | |
| Manual transmission with differential | l (imp. gal.) | 2.7 (0.59) | |
| Automatic transmission with torque converter | (imp. gal.) | Approx. 9.5 (2.06) | |
| Differential | (imp. gal.) | 0.8 (0.17) | |
| Transmission oil specification | | Manual transmission | Tiptronic |
| | | SAE 90 GL5 | |
| Specification for differential transmission oil (Tiptronic) | | | GL5 SAE 75 W 90 or<br>GL5 SAE 90 |
| Fuel tank | (imp. gal.) | Approx. 65 (14.1) actual volume<br>10 (2.2) reserve | |
| | | Approx. 64.0 (13.87) refill volume | |
| Coolant: | l (imp. gal.) | 22.5 (4.88) | |
| Brake fluid reservoir | (imp. gal.) | Approx. 0.45 (0.097) | |
| Tank for windscreen washer and headlight cleaning system | (imp. gal.) | Approx. 2.5/6.5 (0.54/1.41) | |
| Power-assisted steering | (imp. gal.) | 1.27 (0.28) Pentosin CHF 11 S | |

## Performance data

| | | Manual transmission | Tiptronic |
|---|---|---|---|
| Top speed | km/h | 280 | 275 |
| | mph | 173.9 | 170.8 |
| Acceleration | 0 - 100 km/h | 5.2 s | 6.0 s |
| Acceleration | 0 - 160 km/h | 11.5 s | 13.0 s |
| Acceleration | 0 - 200 km/h | 18.3 s | 20.4 s |
| Kilometre from standing start | | 24.2 s | 25.3 s |
| 1/4 mile from standing start | | 13.5 s | |
| Elasticity | | | |
| 80 - 120 km/h | 5th gear | 7.1 s | 6.9 s |
| | 6th gear | 8.9 s | 9.7 s |
| 100 - 200 km/h | 5th gear | 17.3 s | 18.3 s |
| | 6th gear | 23.4 s | 28.5 s |

| **Climbing performance** | | |
|---|---|---|
| | 1st gear | |
| | 2nd gear | |
| | 3rd gear | |
| | 4th gear | |
| | 5th gear | |
| | 6th gear | |

| **Specific power** | | | | |
|---|---|---|---|---|
| | kg/kW | 6.0 | 6.3 | 6.2 ... 6.5 |
| | kg/HP | 4.4 | 4.6 | 4.6 ... 4.8 |


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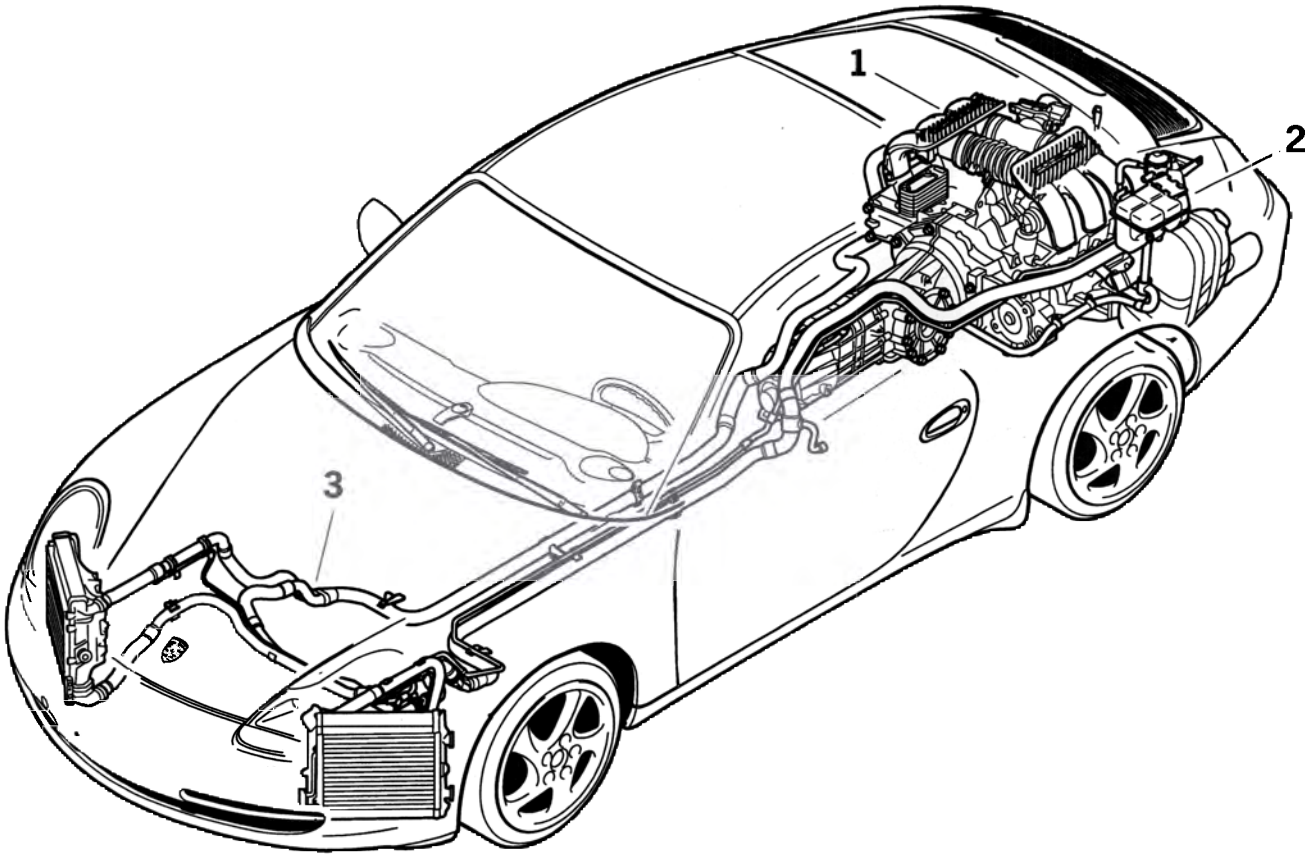
## Engine-cooling diagram




392 - 97

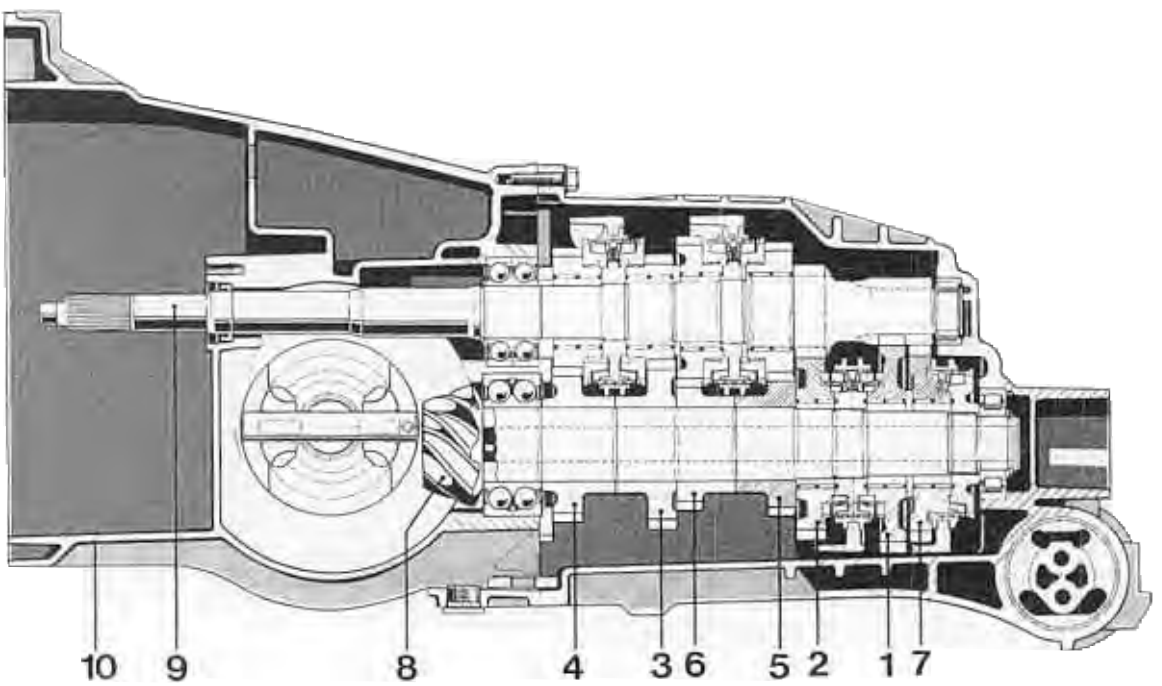
1 Opposed-cylinder engine, water cooled

2 - Expansion tank

3 - Water circuit

# 0 Transmission – general

## Manual transmission (G96)




332 - 97

1st gear

2 - 2nd gear

3 - 3rd gear

4 - 4th gear

5 - 5th gear

6 - 6th gear

7 - Reverse gear

8 - Output shaft

9 - Input shaft

10 - Transmission housing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