

# Powertrain

Technology Workshop 911 Carrera



# Powertrain

**Jörg Kerner**

Director of Powertrain Development



# The new Porsche 911 Carrera: Development approaches

- **Sound**
- **Free-revving**
- **Driving experience**

- **Power-to-weight ratio**
- **Engine response**

**Emotions**

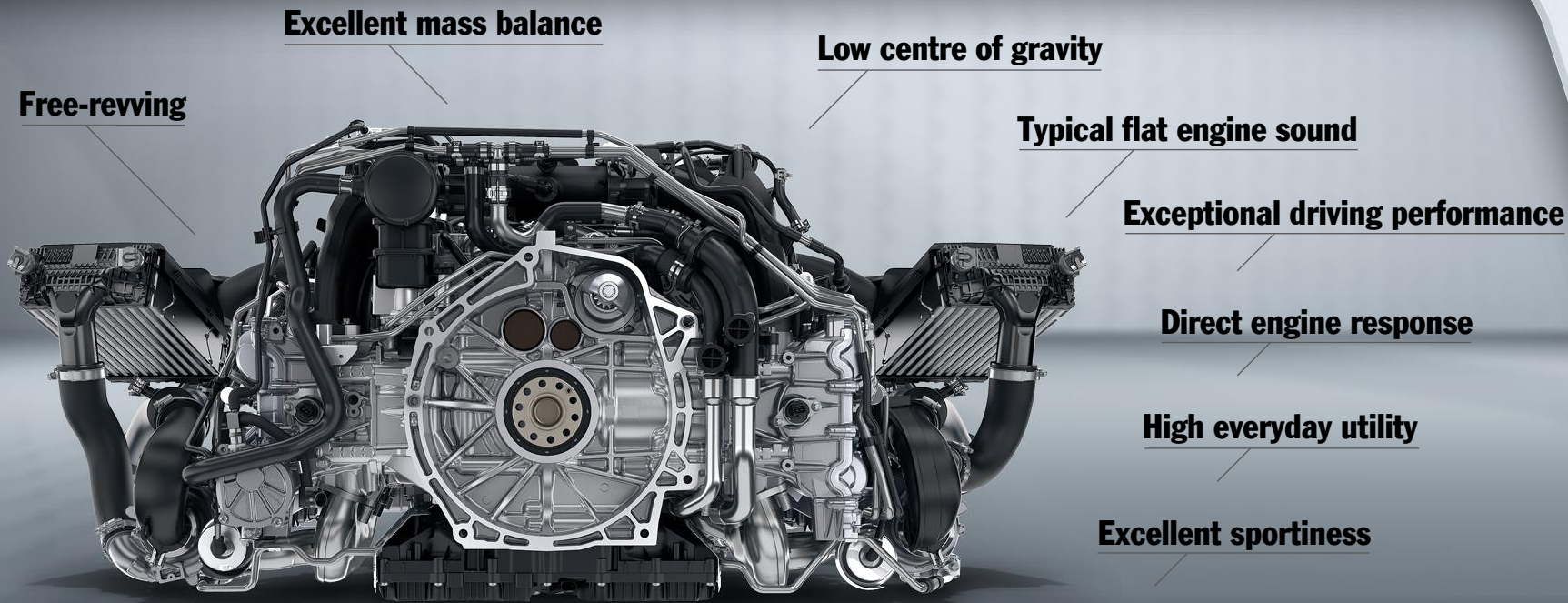
**Efficiency**

**Performance**

- **Turbo rightsizing**
- **Virtual gears**
- **Start-stop plus**
- **Coasting function**
- **Weight reduction**

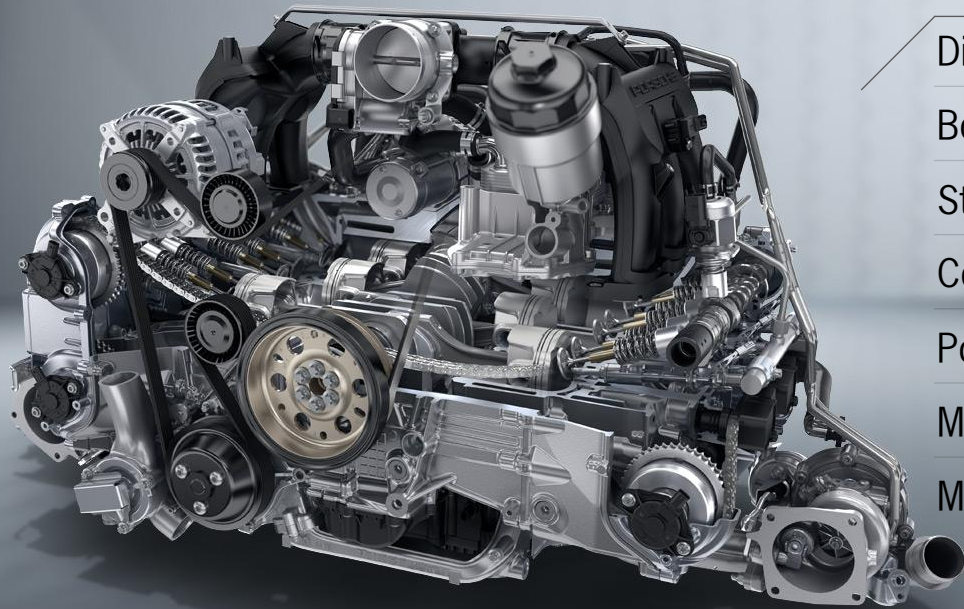
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# Benefits of the Porsche flat engine concept



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# The new 3.0-litre biturbo flat engine: Specifications

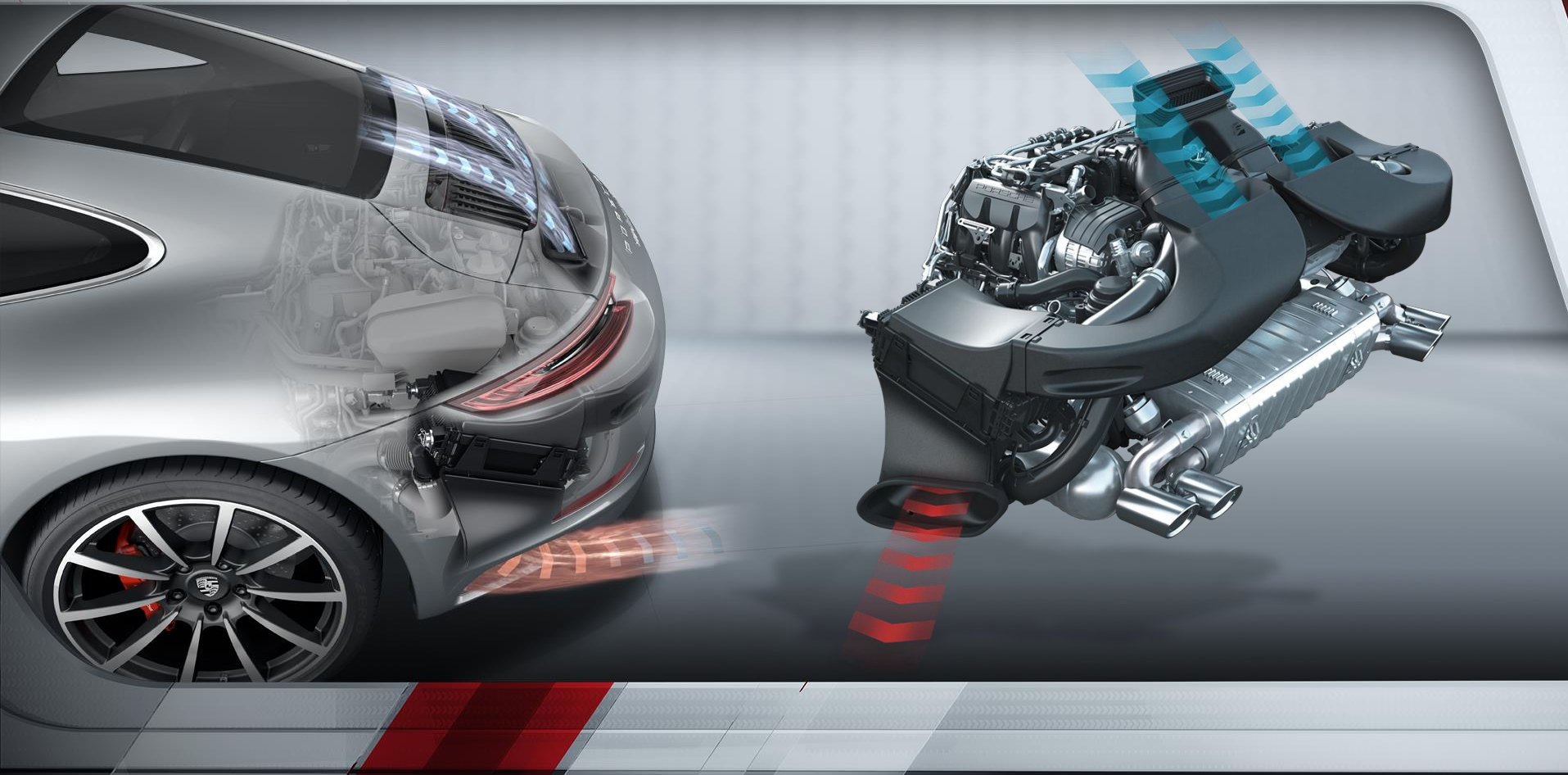


## 911 Carrera      911 Carrera S

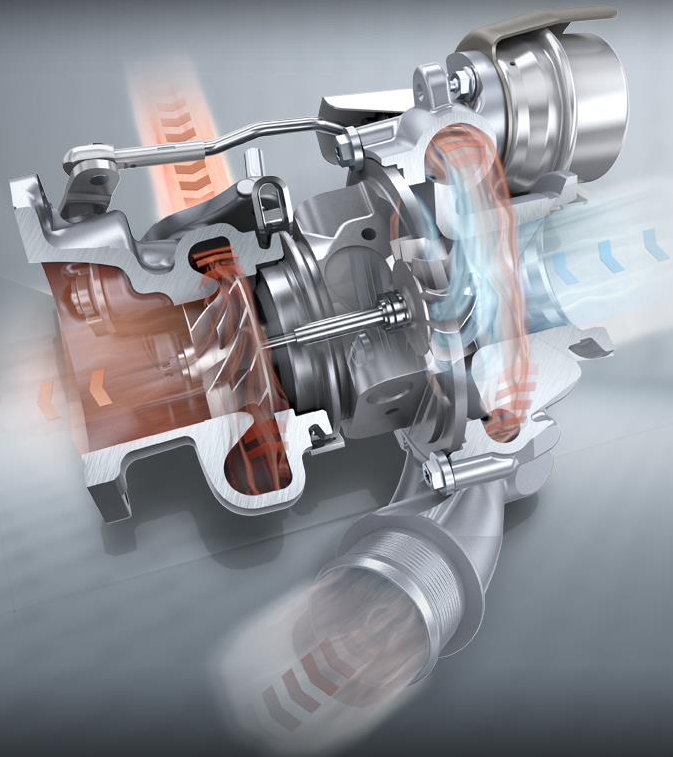
Displacement	2,981 cc	2,981 cc
Bore	91.0 mm	91.0 mm
Stroke	76.4 mm	76.4 mm
Compression	10:1	10:1
Power	(272 kW) 370 hp	(309 kW) 420 hp
Max. torque	450 Nm	500 Nm
Max. speed	7,500 rpm	7,500 rpm

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## Forced induction concept – Air flow control and intercooling



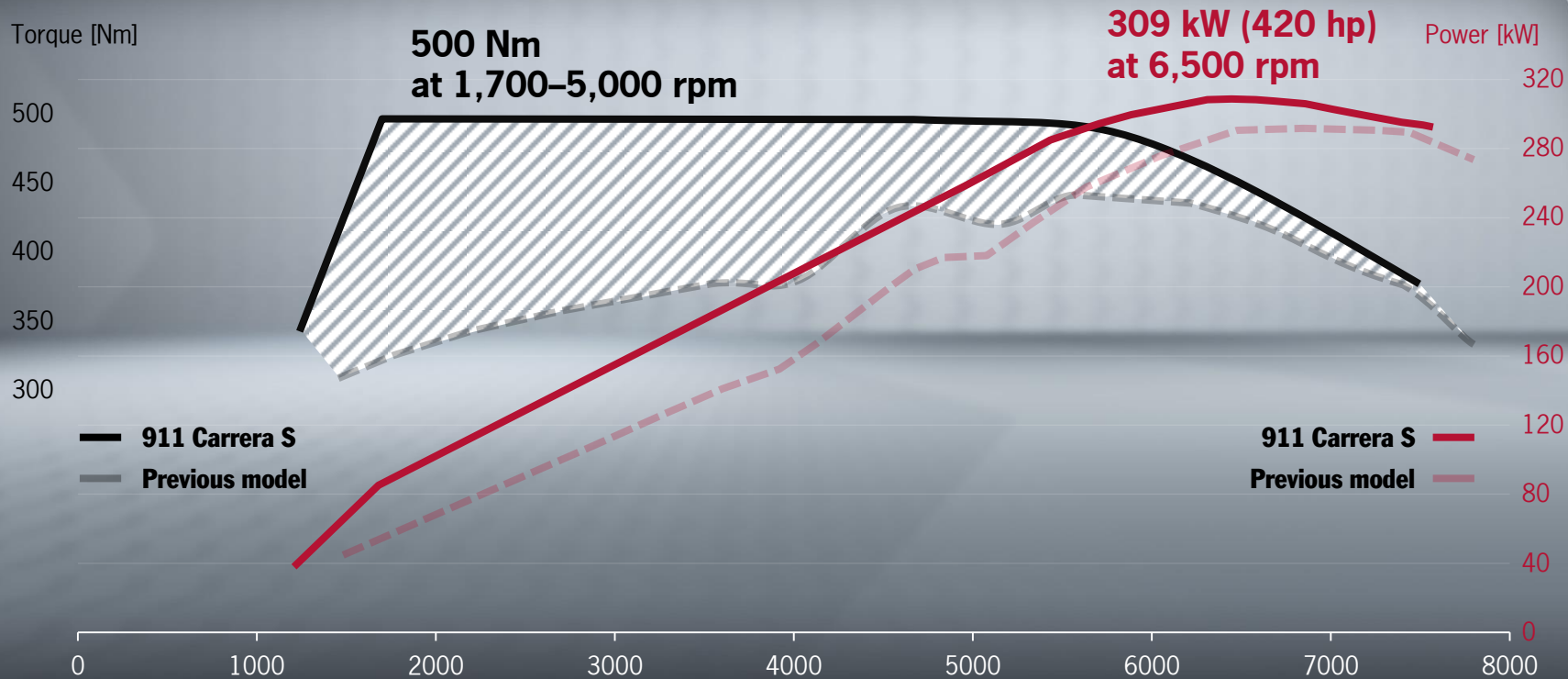
## Forced induction concept – Performance spread by varying turbocharger



	<b>911 Carrera 3.0-l biturbo</b>	<b>911 Carrera S 3.0-l biturbo</b>
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Power	(272 kW) 370 hp	(309 kW) 420 hp
Turbine wheel dia.	45 mm	45 mm
Compressor wheel dia.	49 mm	51 mm
Max. charge pressure	0.9 bar	1.1 bar
Charger type	Electro-pneumatically controlled waste-gate	

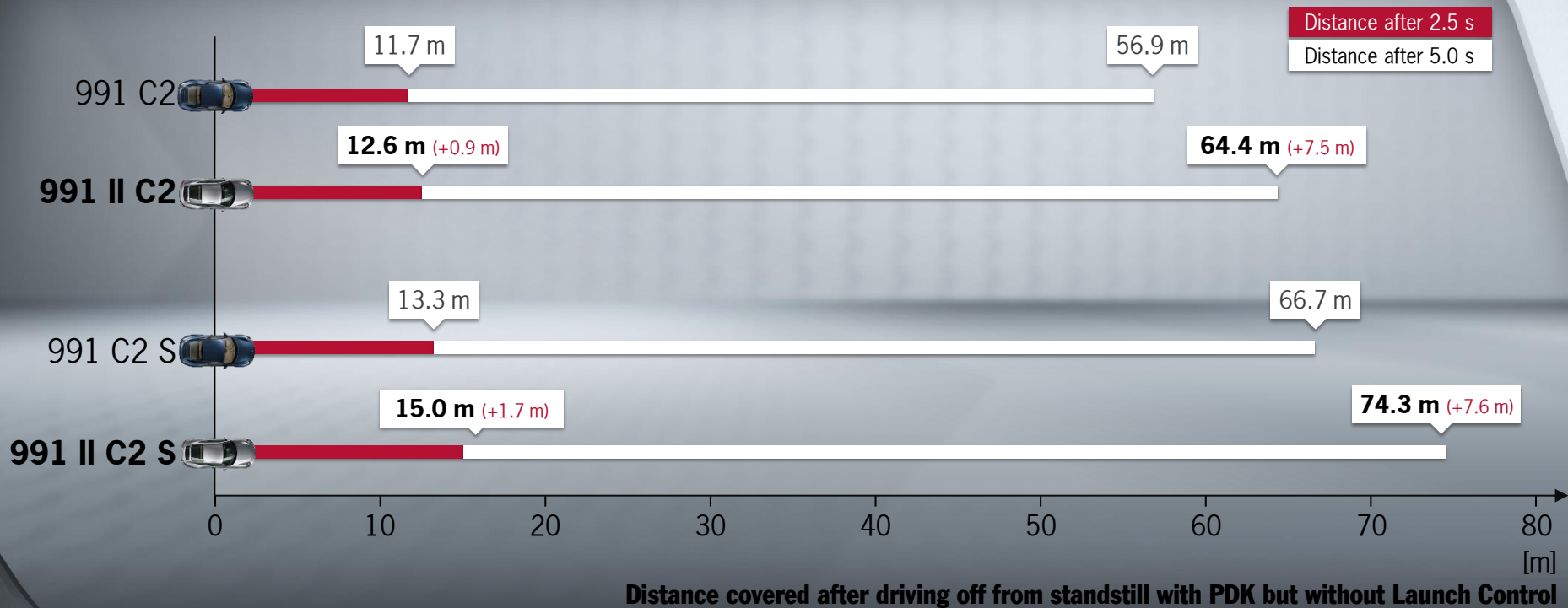
# 911 Carrera S: Power and torque



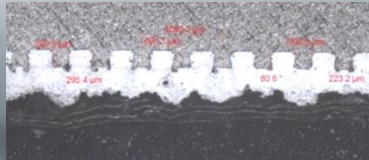
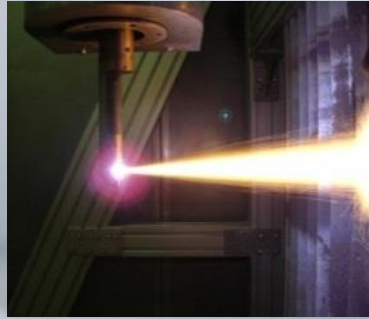
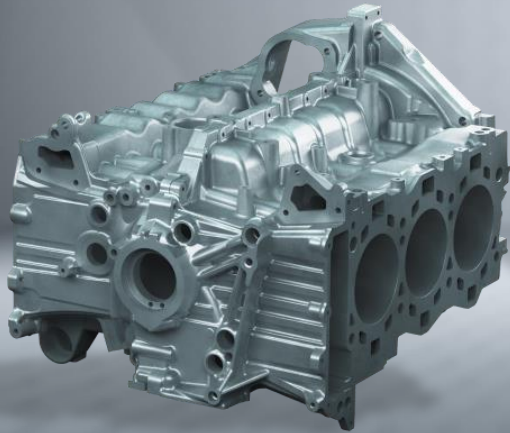
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# More direct response and boosted dynamics



# Lighter weight crankcase with new cylinder lining



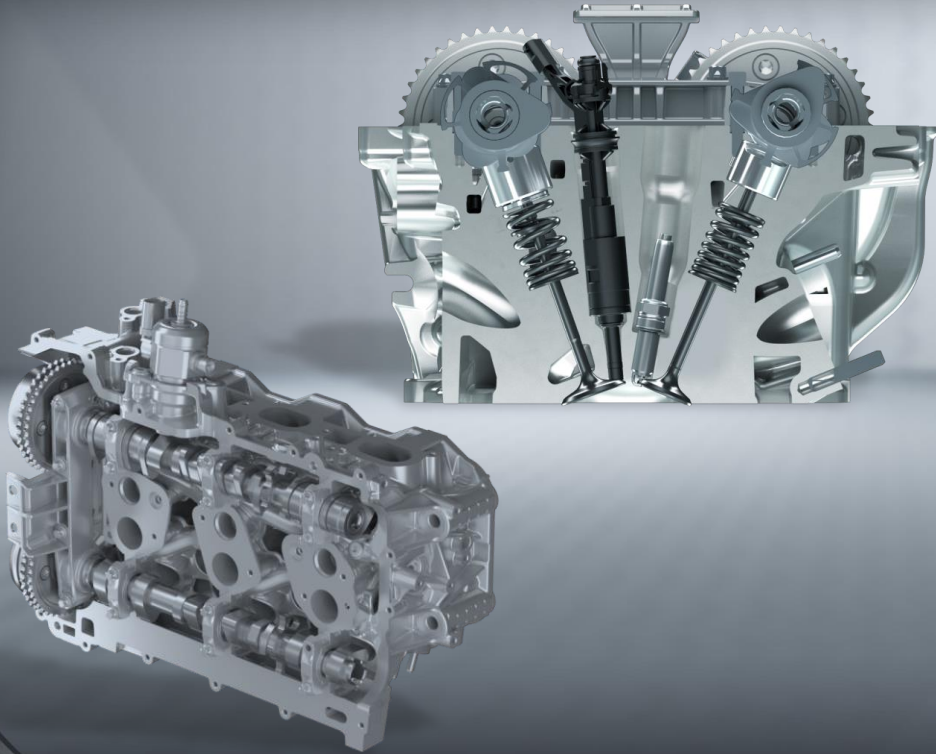
## Crankcase:

- Increased strength by optimised casting process and special heat treatment
- Weight reduced by 1.5 kg

## Cylinder lining technology with iron coating:

- Iron coated lining (RSW – Rotating Single-Wire)
- Optimised friction pairing for higher peak pressures
- Reduced CO<sub>2</sub> and friction
- Worldwide use and compatible with poor fuel quality

## New cylinder head with central injector position for new combustion process

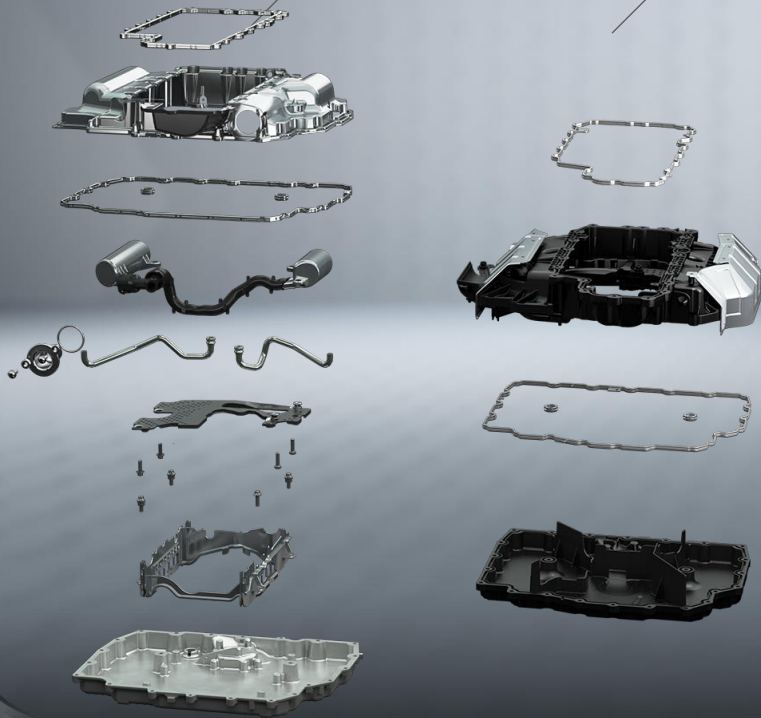


- Central injector position
- Pre-cast oil galleries
- Wall thickness reduced by up to 40 per cent
- Reduced temperatures with increased strength
- Optimised cross-flow cooling
- Optimised flow in intake ports (tumble)

# Optimised oil management

old

new

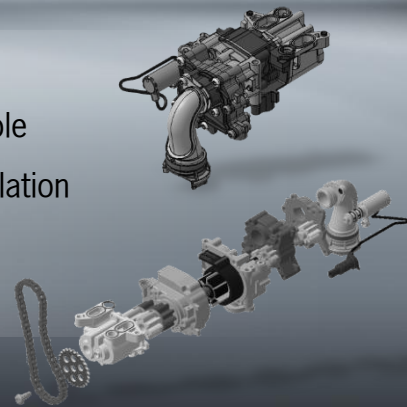


## Polymer oil pan:

- Integrated dry sump
- Fewer components by functional integration
- Oil management optimised for circuit track driving
- Weight reduced by 2 kg

## Oil pump:

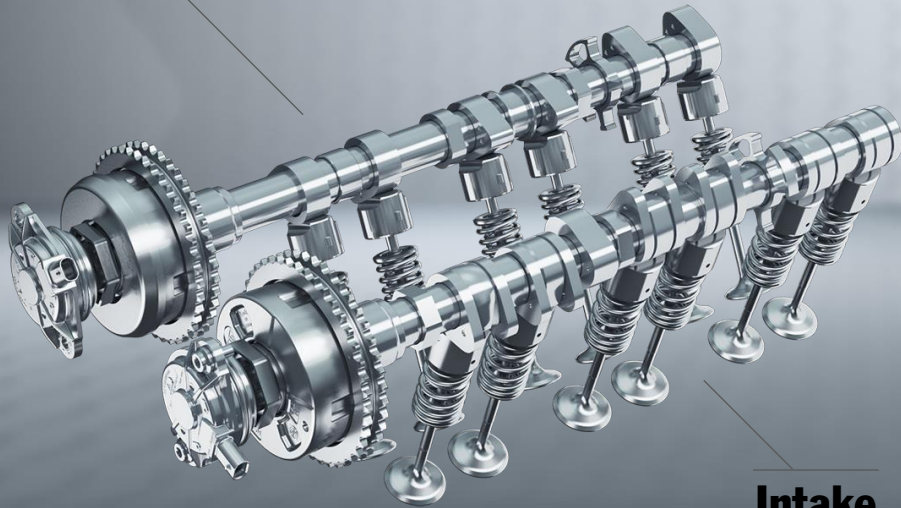
- Modular and fully controllable
- Intelligent oil pressure regulation
- Weight reduced by 1.2 kg
- Compact construction



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# High-revving turbocharged engines – modified valve train

**Exhaust**



**Intake**

- Reduced valve train masses for engine speeds up to 7,500 rpm
- Assembled camshafts with two radially driven high-pressure pumps and a vacuum pump
- VarioCam Plus with valve lift adjustment on intake side
- Camshaft adjustment on intake and exhaust sides

# Typical Porsche sound for a passionate driving experience



## Exterior sound:

- Three exhaust systems:
  - 911 Carrera
  - 911 Carrera S with flap control
  - Optional sport exhaust system with flaps

## Interior sound:

- Two individually tuned sound symposers

# Sport Chrono Package with new mode switch in steering wheel



## Driving modes:

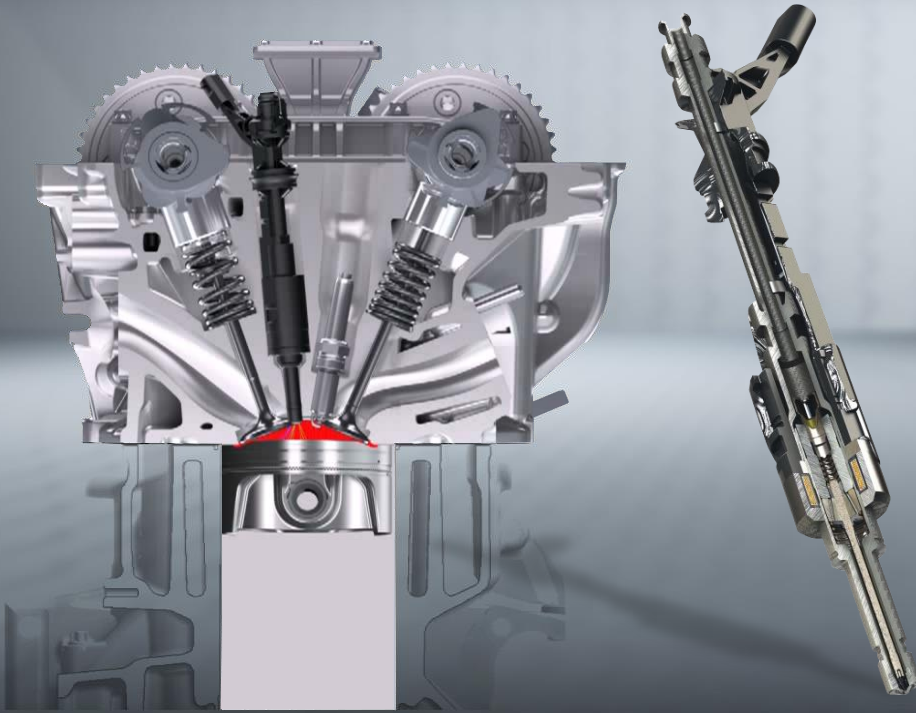
- Normal
- SPORT
- SPORT Plus
- Individual



## Sport response button:

- Engages the optimal gear
- Rev step-up
- Buildup of charge pressure

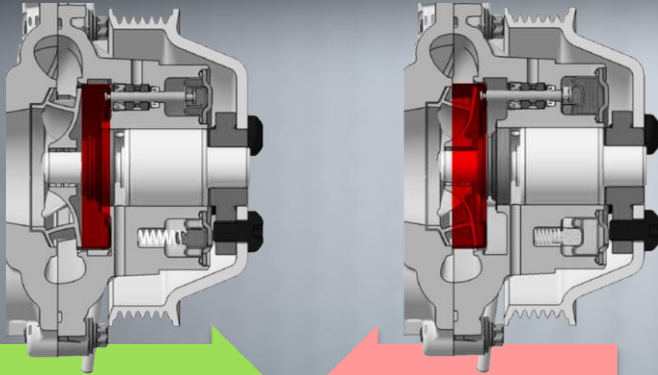
# Petrol direct injection with new combustion method



- Two high-pressure pumps with roller tappets
- Fuel pressure up to 250 bar
- Symmetrical jet distribution
- Defined jet angle layout
- Good spatial filling
- Low wall wetting
- Efficient combustion with low raw emissions



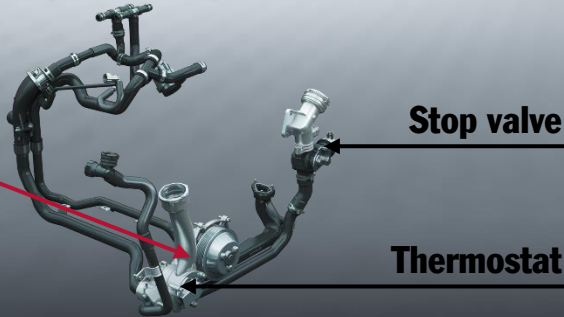
# Thermal management with switchable water pump



open

closed

New:  
Switchable  
water pump

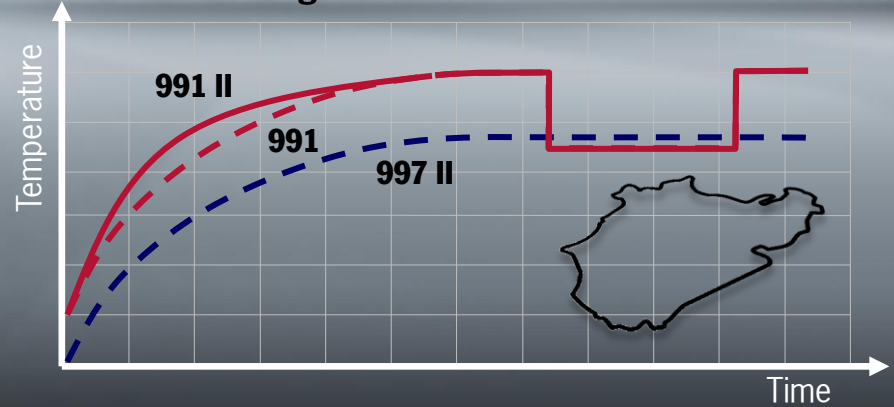


Stop valve

Thermostat

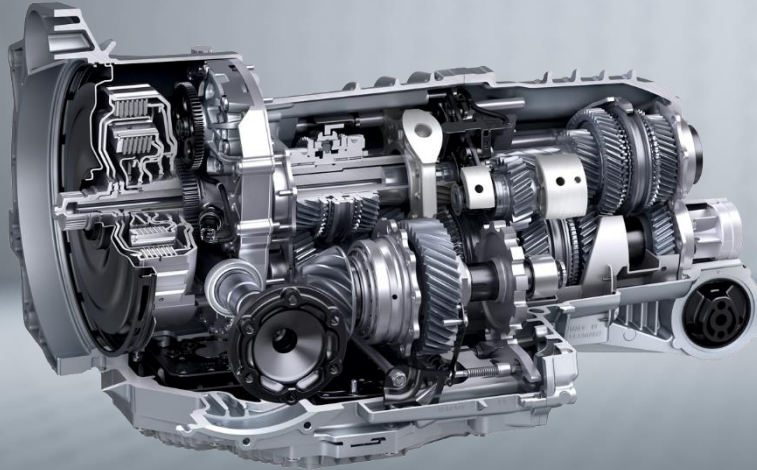
- Quick control
- Need-based cooling
- Higher coolant throughput at full load
- Low weight

Schematic diagram:



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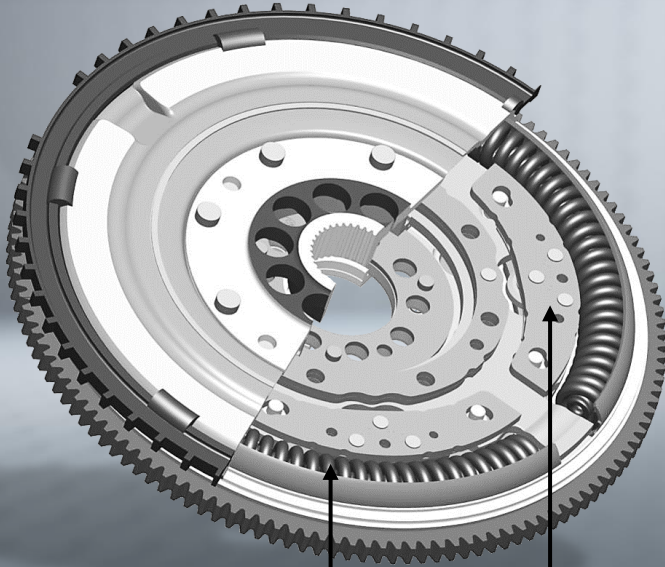
# Modified seven-speed Porsche dual-clutch gearbox



## Seven-speed PDK:

- Modified gear ratios and torque capacity
- Optimised wheel set oil (load-bearing capacity)
- New dual-mass flywheel with centrifugal pendulum
- Intelligent shifting strategy
- Sportier full-load shifts
- Launch Control

## Dual-mass flywheel with centrifugal pendulum



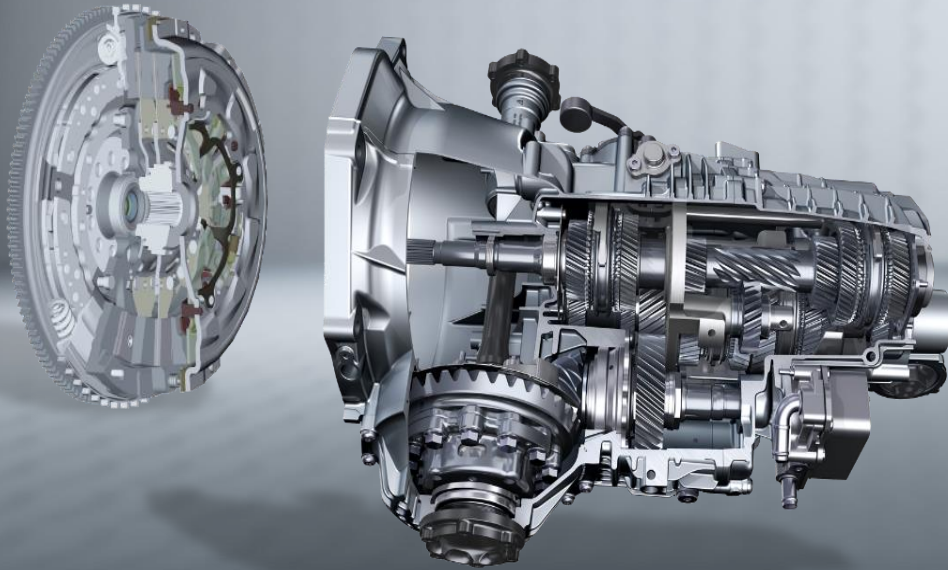
Damper

Centrifugal pendulum

### Enhanced comfort and reduced fuel consumption

- Optimised spring-mass damper system
- Higher decoupling quality at low engine revs

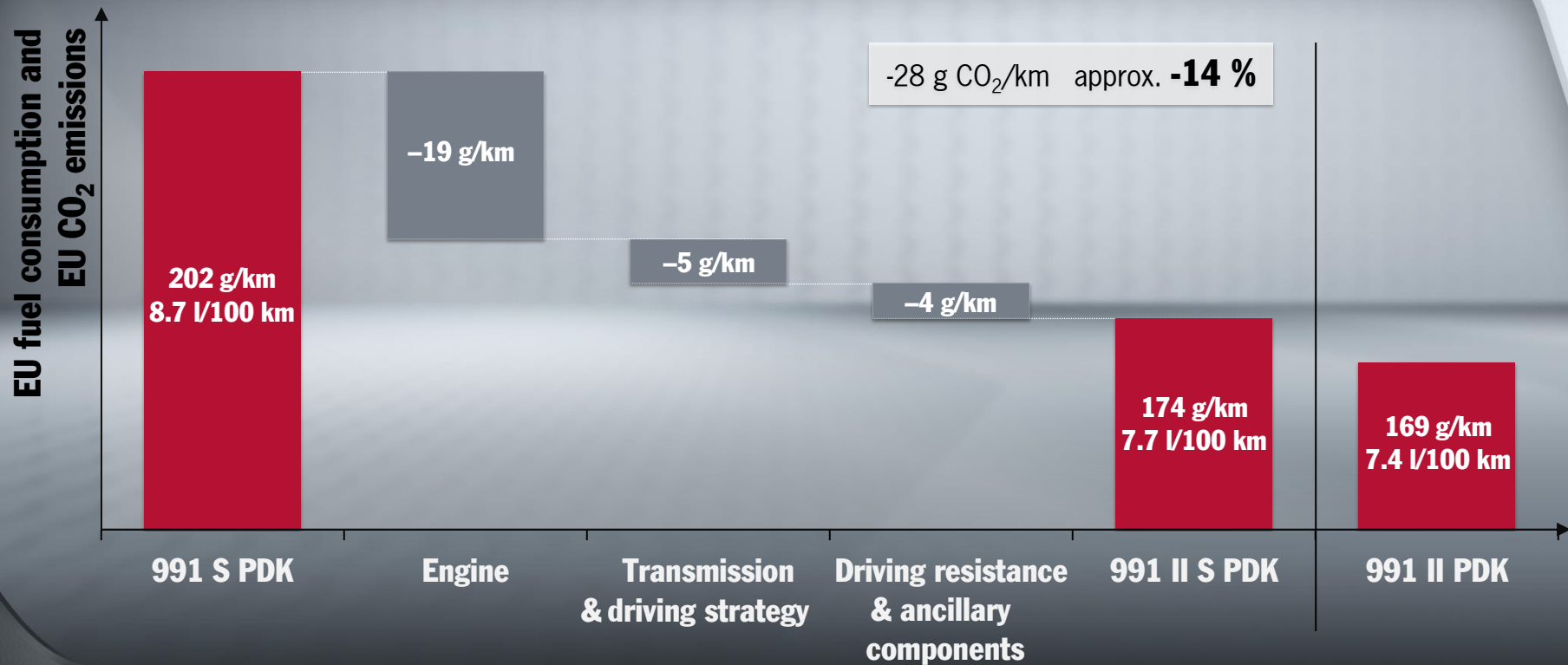
# Seven-speed manual gearbox with dual-plate clutch



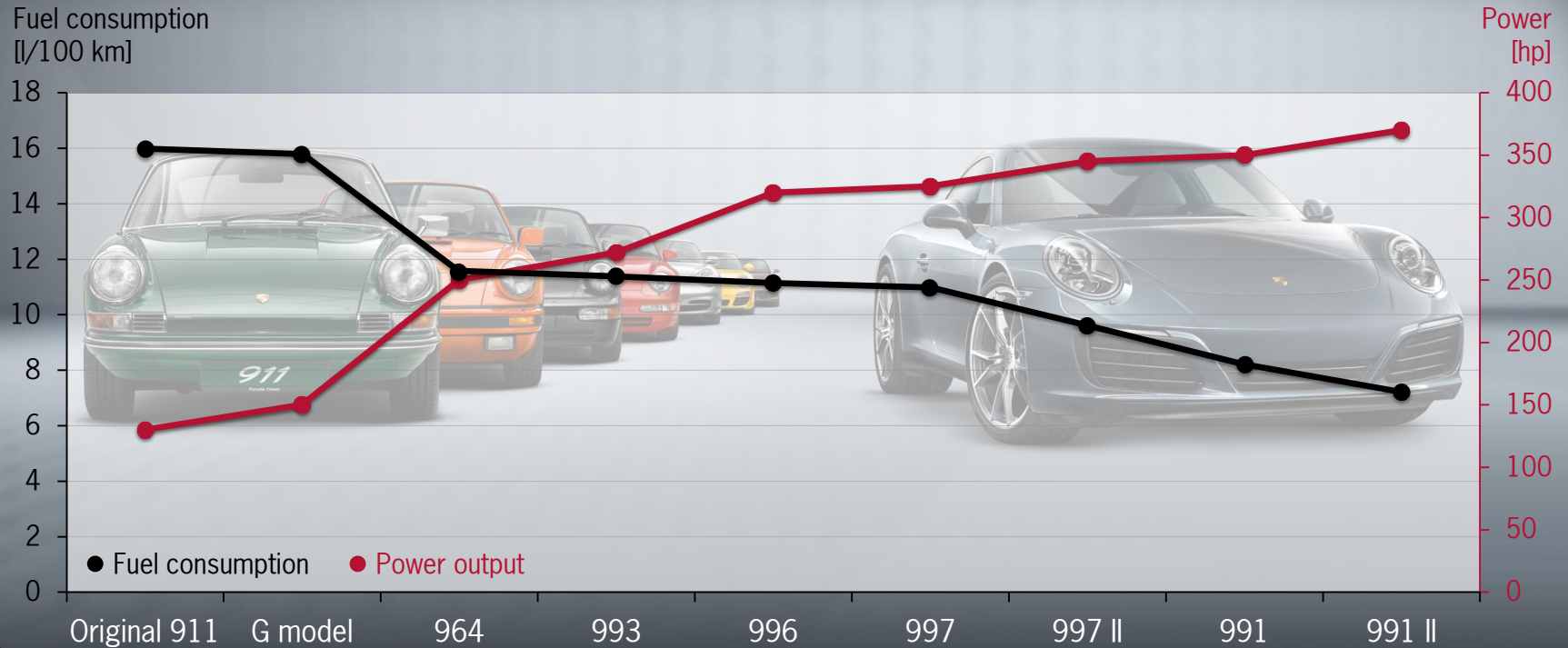
## Seven-speed MT:

- Modified gear ratios and torque capacity
- Optimised wheel set oil (load-bearing capacity)
- New dual-mass flywheel with centrifugal pendulum
- New dual-plate clutch with lower pedal forces

# Lower fuel consumption and emissions compared to predecessor

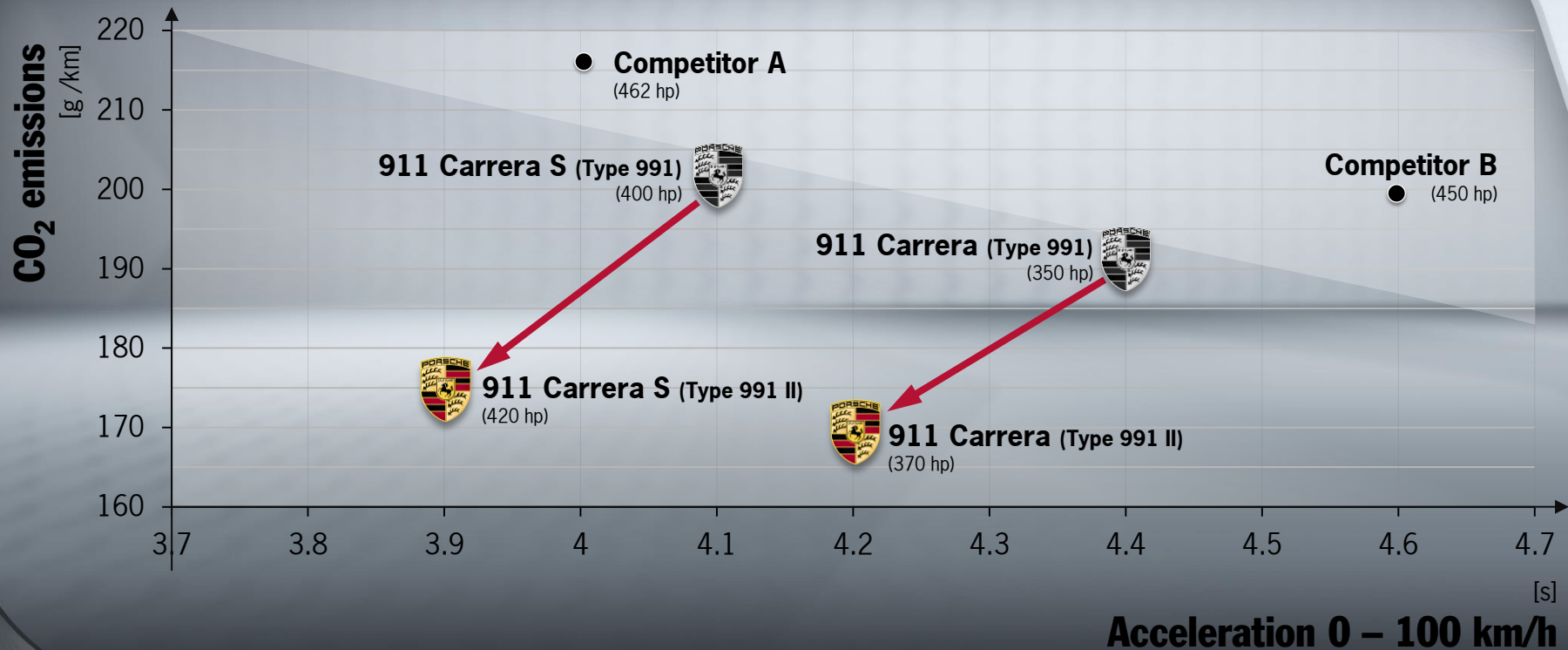


# Over 50 years of 911 development: Power is up – fuel consumption down



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# Significant improvements in performance and efficiency



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## The new 911 Carrera: Summary



- Entirely new generation of engines
- Continues tradition of high-revving, spontaneously responding Porsche flat engines
- Considerable increase in driving performance by turbocharging technology
- Power boosted by 20 hp
- Considerable increase in torque over the entire engine speed range
- Typical Porsche sound and emotional driving experience
- CO<sub>2</sub> reduced by up to 14 per cent

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Technology Workshop: 911 Carrera

Thank you for your attention.

