



PORSCHE



Product Information

Porsche Cayenne MY11

Cayenne, Cayenne S Hybrid, Cayenne S, Cayenne Turbo

Foreword

To the point – The new Cayenne

With a total of 5 derivatives and 3 different drive types, the 2011 Cayenne models can justifiably claim to offer the right Cayenne for every customer. From the economical Cayenne V6 to the powerful, low-consumption Cayenne S Hybrid with innovative parallel full hybrid drive through to the Cayenne Turbo, which produces 500 hp and a torque of 516 lb ft for supremely confident power and outstanding performance.

This training brochure provides comprehensive and detailed information on the technical features of the Cayenne models and also looks at its strategic competitors.

The aim of this brochure is to prepare you for your discussions with customers and to familiarize you with the unique product features of the Cayenne models so that you can tailor your customer

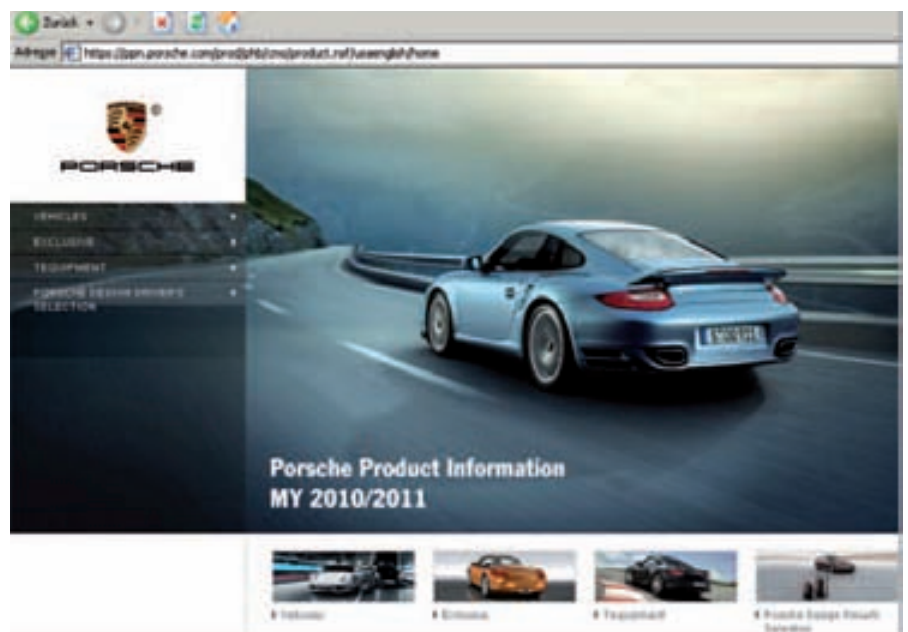
benefit discussions to the specific needs of the customer in question.

Further updated information on the five Cayenne models, as well as all other Porsche models, can be accessed online in the Porsche Partner Network (PPN).

You will find the "Product Information Online" section under the "Products" heading. Among other things, this section contains a technology glossary as well as model-specific information on standard equipment and individual options or competitor comparisons.

Use both media to provide professional and individual advice.

Dr. Ing. h.c. F. Porsche
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The content of this Product Information has been compiled by Product Management in cooperation with the Development, Marketing and Global Training departments.





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This booklet also contains information on the Cayenne Diesel, which is not sold in the US.

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Fig. 1: Cayenne vehicle range

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1 The new Cayenne – To the Point.

With the launch of the 1st generation of Cayenne models, Porsche demonstrated that it was possible to successfully develop a genuine Porsche in the market segment of premium SUVs. The 3rd model line, which was presented for the first time in 2002, has now firmly established itself in many markets. As a result, more than 270,000 vehicles had already left the production line by the end of 2009. **Unique design, superior on-road and off-road performance** as well as **outstanding day-to-day usability** for up to 5 passengers have not just convinced the automotive press but above all customers.

The new Cayenne models will be launched to the respective markets from May 2010. The aim is to raise the bar once more in the sporty SUV class and to build on the success of the previous models.

The development goal was to improve the product characteristics typical for Porsche even further. In other words, the development engineers had the task not just of maintaining the leading position of the Cayenne with its best-in-class standards in the areas of driving dynamics and performance in conjunction with comparatively low fuel consumption and low CO₂ emissions, but also of further extending this lead. Realization of this goal is supported not just by the 3 models with gasoline engine - the Cayenne, Cayenne S and Cayenne Turbo - but for the first time by the Cayenne S Hybrid with its innovative parallel full hybrid drive system.

The following **main development goals** were defined for the new Cayenne models:

- Attractive, dynamically sporty design with coupe-style contours and compact dimensions
- Significant weight reduction
- Enhancement of all engines and use of the latest technologies
- Marked reduction in fuel consumption and emission values
- Focus on on-road characteristics, "closer to the road" without neglecting the off-road characteristics in the areas relevant for customers
- Strengthening the best-in-class position compared with the competition in the areas of driving dynamics and performance
- Improved day-to-day usability with increased space and more variability in the passenger compartment
- Greater spread between sportiness and driving comfort to meet wider-ranging demands
- Excellent comfort and ergonomics as well as easy and intuitive operation
- Highest standards with regard to quality and appearance
- State-of-the-art active and passive safety

- State-of-the-art audio and communication equipment including best-in-class sound systems
- Integration of driver assistance systems to increase comfort and safety

With a total of **5 derivatives** and **3 different drive types**, the objective for the new Cayenne models is clear: **namely to offer the right Cayenne model for every customer.** From the economical Cayenne Diesel (not for US) with an enormous torque of 406 lb ft and the powerful, low-consumption Cayenne S Hybrid with innovative parallel full hybrid drive through to the Cayenne Turbo, which produces 500 hp and a torque of 516 lb ft for supremely confident power and outstanding performance. All of the new Cayenne models have one thing in common: in addition to superior performance with comparatively low fuel consumption values, they also offer a high level of comfort and day-to-day usability. The now even more comprehensive standard equipment and an extended range of attractive optional equipment mean that practically every wish can be met.

1.1 Model range

Versatility paired with high performance and exceptional handling. Every Cayenne has these characteristics. Never before has the Cayenne been available in such different variants. Common to all of the variants is the fact that sportiness, day-to-day usability and driving comfort are at the highest segment-specific level. Fuel consumption, CO₂ emissions and their dependent maintenance costs, on the other hand, have been significantly reduced. This has been achieved above all through a **considerable reduction in weight** (up to 408 lb, depending on model) and **use of the latest technologies.**



Fig. 2

Overview of the new Cayenne models:

Cayenne: Lighter, more powerful and therefore even sportier with lower fuel consumption.

The additional power of the new Cayenne is complemented by improved performance and high efficiency. The acceleration time from 0 - 60 mph is an impressive **7.1 s** with the standard 6-speed manual transmission and the top speed is **143 mph**. In contrast, it has been possible to reduce **the fuel consumption values and CO₂ emissions by approx. 20% for the new optional 8-speed automatic transmission.**

Thanks to extensive **weight reduction measures** on the body, drive and chassis, the new Cayenne **weighs only 4,398 lbs.** New for the Cayenne are not just the design of the alloy wheels, but also the 18-inch wheel size as standard equipment. The attractiveness of the rest of the **standard equipment** has also been enhanced. The equipment features of all Cayenne models therefore now include automatic climate control with separate air flow and temperature settings for 2 zones, automatic headlight control including Welcome Home function, as well as cruise control.

Cayenne Diesel: High torque for superior performance and low fuel consumption for ranges over 1,000 km (not for US)

Long journeys should be a pleasure. The new Cayenne Diesel is ideal for this kind of travel. Even with the standard 85 l fuel tank (with 13 l reserve capacity), the range is **more than 1,000 km thanks to the reduction in fuel consumption by approx. 20% to 7.4 l/100 km (NEDC).** With the **100 l fuel tank** (with 13 l reserve capacity) optionally available at no extra charge, the **maximum range is**

Cayenne (MT/AT)	Unit	MY 10	MY 11	△
3.6 l V6 engine	cm ³	3,598	3,598	=
Max. power at engine speed	kW/hp rpm	213/290 6,200	220/300 6,300	+ 7/ +10
Max. torque at engine speed	lb ft rpm	273 3,000	295 3,000	+ 22
Top speed (MT/AT)	mph	141	143	+ 2
Acceleration 0-60 km/h	(MT) s (AT)	7.5 7.9	7.1 7.4	-0.4 -0.5
Unladen weight (DIN)	(MT) lb (AT)	4,762 4,784	4,398 4,475	-364 -309
Power-to-weight ratio	(MT) lb/hp (AT)	16.4 16.5	14.7 14.9	-1.7 -1.6
Fuel consumption city/highway	(MT) (AT)	14/20 14/20	tba tba	- % - %



Fig. 3: Front view of Cayenne Diesel (not for US)

Cayenne Diesel (AT)	Unit	MY 10	MY 11	△
3,0 l V6 turbo diesel	cm ³	2,967	2,967	=
Max. power at engine speed	kW/hp rpm	176/240 4,000 - 4,400	176/240 4,000 - 4,400	=
Max. torque at engine speed	lb ft rpm	406 2,000 - 2,250	406 2,000 - 2,250	=
Top speed	mph	133	135	+ 2
Acceleration 0-60 mph	s		7.3	
Unladen weight (DIN)	lb	4,938	4,629	- 309
Power-to-weight ratio	lb/hp	20.6	19.3	- 1.3
Fuel consumption (comb. NEDC) l/100 km		9.3	7.4	- 20%
CO ₂ emissions	g/km	244	195	- 20%

increased to up to 1,300 km. The **CO₂ emissions** are only **195 g/km.** The high torque of 550 Nm does not just offer driving pleasure, but also guarantees confident driving performance for journeys with a high trailer load or when

driving off-road. The 3.0 l V6 turbo diesel engine is economical and the noise remains at a relaxed low level even at high speeds on the highway with the standard **8-speed Tiptronic S** transmission.

Cayenne S (AT)	Unit	MY 10	MY 11	△
4.8 l V8 engine	cm ³	4,806	4,806	=
Max. power at engine speed	kW/hp rpm	283/385 6,200	294/400 6,500	+ 11/ + 15
Max. torque at engine speed	lb ft rpm	369 3,500	369 3,500	=
Top speed	mph	155	160	+ 5
Acceleration 0-60 mph	s	6.4	5.6	- 0.8
Unladen weight (DIN)	lb	4,950	4,553	- 397
Power-to-weight ratio	lb/hp	12.9	11.4	- 0.5
Fuel consumption	city/highway	13/19	16/22	+ 23/16 %



Fig. 4: Front view of Cayenne S Hybrid

Cayenne S Hybrid (AT)	Unit	MY 11
3.0 l V6 supercharged engine, additionally 34 kW (47 hp) electric motor	cm ³	2,995
Max. power of overall system at engine speed	kW/hp rpm	279/380 5,500
Max. power of combustion engine at engine speed	kW/hp rpm	245/333 5,500 - 6,500
Max. power of electric motor at engine speed	kW/hp rpm	34/47 > 1,150
Max. torque of overall system at engine speed	lb ft rpm	428 1,000
Top speed	mph	150
Acceleration 0-60 mph	s	6.1
Unladen weight (DIN)	lb	4,928
Power-to-weight ratio	lb/hp	14.8
Fuel consumption	city/highway	tba

Cayenne S: The "S" principle - a symbol and promise of increased performance and high power reserves

In a nutshell, the new Cayenne S offers performance, sportiness and efficiency. The increased sportiness of the new Cayenne S is not just demonstrated by the increase in engine power by 15 hp. A significant **reduction in weight results in an outstanding power-to-weight ratio** of 11.4 lb/hp and also guarantees excellent performance in conjunction with the new standard 8-speed Tiptronic S transmission as well as the **new active all-wheel drive Porsche Traction Management (PTM)** system. The new Cayenne S accelerates from 0-60 mph in 5.6 s and is therefore 0.8 s faster than its predecessor. Thanks to weight reduction and use of new engine technologies, it has been possible to lower the **fuel consumption** by approx. **23%**.

Cayenne S Hybrid: Innovative drive system with high power and low fuel consumption

The new Cayenne S Hybrid impressively shows that 8-cylinder acceleration performance is possible with fuel consumption at the level of a 6-cylinder engine. With its **innovative drive system**, it combines a modern 3.0 l V6 supercharged engine and a powerful electric motor with a maximum power output of 47 hp and 221 lb ft torque. The **parallel full hybrid drive system is compact and powerful**. This system allows driving under exclusively electric power up to approx. 37 mph and also allows additional fuel savings to be achieved in higher speed ranges in out-of-town driving conditions.

Cayenne Turbo: Improved performance, enhanced efficiency - even more sportscar

The new Cayenne Turbo has an unmistakable look. The large air intakes at the front end, the distinctive light design and the twin tailpipes at the rear demonstrate the intrinsic power and dynamic characteristics of the top-of-the-range Cayenne model even when the vehicle is still stationary. The Cayenne Turbo shows impressively that **performance at sportscar level is also possible in SUVs**. With a **weight reduction of 408 lb**, the new Cayenne Turbo offers a more confident driving experience than ever before. One example of this is the ability of the new Cayenne Turbo to accelerate from 0-60 mph in 4.4 s. It achieves this with **unchanged power output and significantly reduced fuel consumption**. The new Cayenne Turbo does not just offer improved performance and lower fuel consumption, but also features more comprehensive standard equipment for significantly enhanced comfort. Standard equipment now includes the driving light assistant, Porsche Dynamic Light System (PDLS), the automatically dimming interior and exterior rear view mirrors and the adaptive sports seats with memory package.

Cayenne Turbo (AT)	Unit	MY 10	MY 11	△
4.8 l V8 biturbo engine	cm ³	4,806	4,806	=
Max. power at engine speed	kW/hp rpm	368/500 6,000	368/500 6,000	=
Max. torque at engine speed	lb ft rpm	516 2,250 - 4,500	516 2,250 - 4,500	=
Top speed	mph	171	173	+ 2
Acceleration 0-60 mph	s	4.9	4.4	- 0.5
Unladen weight (DIN)	lb	5,192	4,784	- 408
Power-to-weight ratio	lb/hp	10.5	9.6	- 0.9
Fuel consumption	city/highway	12/19	15/22	+ 25/16 %



Fig. 5: Front view of Cayenne Turbo

1.2 The main highlights

The development goals for the new Cayenne models have been achieved above all through the following product measures:

- Completely new design for exterior and interior with focus on Porsche design elements and a coupe-type sporty appearance
- Intelligent lightweight concept with weight-optimized material mix
- Use of the latest engine technology to increase efficiency
- New 8-speed Tiptronic S with shift programs especially adapted to the demands of a sporty SUV
- Introduction of the innovative parallel full hybrid drive in the Cayenne S Hybrid
- Use of a new generation of Porsche Traction Management (PTM)
- Wide range of chassis options and setups
- Extended wheelbase for more space in the passenger compartment
- Variable rear seat bench for greater flexibility and day-to-day usability
- More extensive standard equipment

- High-quality material concept throughout
- Large choice of exterior colors, interior options, trim materials and wheels
- Extended option range with attractive personalization options
- State-of-the-art audio and communication options, including new Burmester® High-End Surround Sound System

The actual realization of these features in the new Cayenne models is summarized in this section.

1.2.1 Exterior and interior design

Exterior

The design language is clear. **More Porsche, more sportiness, more dynamic appearance and unmistakably Cayenne at first glance.** The goals for the new design of the Cayenne models were extremely varied and the challenges were great. The **wheelbase has been extended by 1.6 inch in order to increase the space available in the passenger compartment and provide greater variability.** The overall increase in length is 1.9 inch.

The height of the new Cayenne models has been increased by 0.2 inch and the width by 0.4 inch.

The new **design connects the Cayenne models even closer to the road.** In spite of the now larger exterior dimensions, the **new design appears to be considerably more compact and dynamic.** The new Cayenne models are **athletic and self-confident.** The sportscar character is more evident from all angles and the typical Porsche form and design themes are more clearly visible. The **contours** of the exterior design are now less angular, but intentionally focus on **emotive lines with more pronounced sculpting of the vehicle to emphasize the family relationship with Porsche sportscars and the Panamera models.**

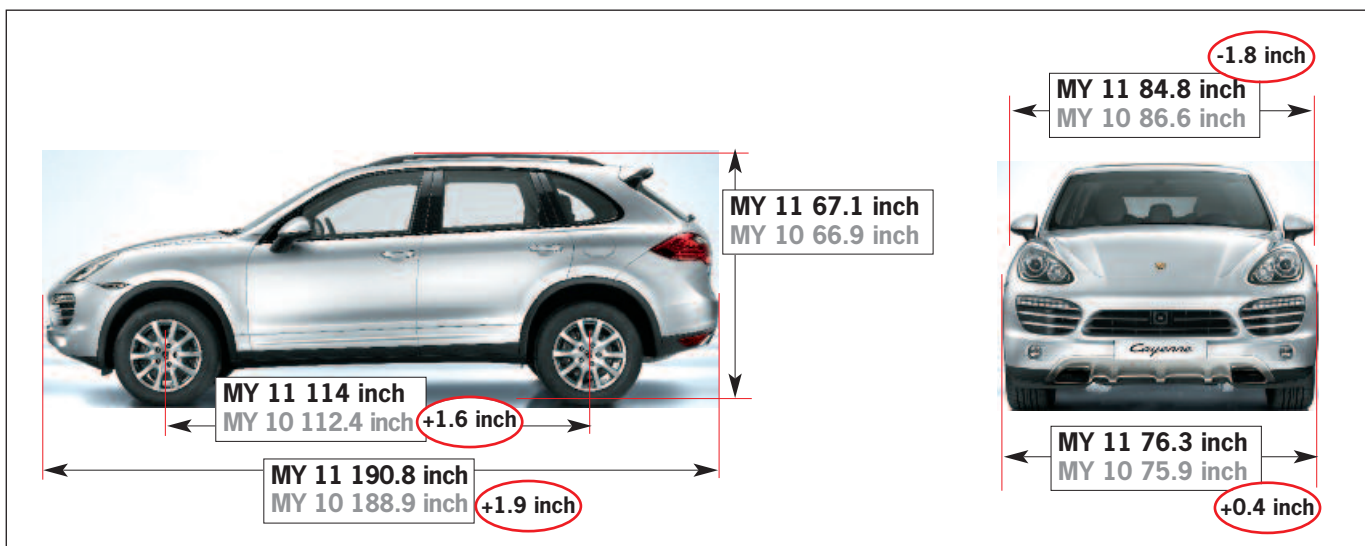


Fig. 6: Exterior dimensions and wheelbase of Cayenne

Front view

Unmistakably Cayenne at the first glance. Membership of the Porsche family is clearly apparent. A typical feature of the Cayenne models is the large center air intake, which is flanked by 2 smaller air intakes. The new Cayenne models display less aggression with the newly designed air intakes and demonstrate instead **sporty elegance, confidently expressing the performance capabilities promised by all Cayenne models.**

This self-confidence is also shown by the more distinctive fenders, which are raised in relation to the hood. In conjunction with outer air intakes that extend a long way to the sides, **the Cayenne models have the kind of wide stance on the road typical of sportscars.**

The greater emphasis of the hood at the front is underlined by the power dome and the new V-shaped hood typical for Porsche. **The vehicle front gains in length and is given a more dynamic appearance by the more pronounced arrow shaping of all elements.** All lines appear to converge at a point in front of the vehicle. In addition, the optical center is lowered by the front end, which tapers in downward direction towards the front. The result is a **vehicle with striking contours**, making the hood in particular appear to be elongated.

Common to all new Cayenne models is the new and **unmistakably Porsche headlight design** with inner auxiliary high-beam headlights. The **presence of the headlights is enhanced** by the **darker inner headlight covers and the silver-colored rings** of the light unit. In conjunction with the front light units incorporated in the side air intakes, these design elements provide the



Fig. 7: Front view of Cayenne Turbo

Cayenne models with a high degree of expressiveness.

The **exterior mirrors** of the new Cayenne models have been completely redesigned. They have a flatter form and positioning of the mirror base plate on the door panel instead of in the mirror triangle area as previously achieves several effects: the new **position and shape reflect and repeat the contours of the front body section, creating an integral unit.** In addition, it has also been possible to reduce the wind noise during driving by an improved aerodynamic design and to enhance visibility in tight curves through an additional window in the previous mirror triangle area.

The **differentiation elements** between the respective models are clearly visible in the front view. The V8 models and the Cayenne S Hybrid have **black side air intakes**, in contrast to the slats of the Cayenne and Cayenne Diesel, which are

painted in the exterior color. For the viewer, these models therefore appear larger and the vehicle wider in comparison with the Cayenne and Cayenne Diesel. With a **unique design of the center air intake** and the **more distinctive power dome**, the Cayenne Turbo sets itself apart from the other models. The **nighttime design** has also been revamped. As a result, **LED daytime driving lights** are now used for all Cayenne models; on the Cayenne, Cayenne Diesel, Cayenne S and Cayenne S Hybrid, these lights are integrated as a light unit in the front light units positioned at the upper edge of the outer air intakes. In contrast, the Cayenne Turbo can be recognized by the front light units projecting freely into the outer intakes as well as the 4 LED spotlights for the daytime driving lights in the main headlights.

Side view

The side view of the new Cayenne models is characterized by length and a

dynamic look. The new design draws attention in particular to the **elongated hood form as well as the flat rear roof pillar** with a fast sweep to the vehicle rear. Overall, the new design contours provide **the new Cayenne models with a sweeping, coupe-style character.**

All design contours follow a striking and dynamic path from the front to the rear. The contours rise slightly from the front to the rear, creating the impression of a wedge shape. As a result, they express power, dynamic performance and sportiness even when the vehicle is stationary. The emphasis of the fenders, a feature typical for Porsche, is further underlined by the fact that the contours extend further to the rear.

The long engine hood is extended a **long way forwards and is therefore reminiscent of the Porsche racing vehicles of the 60s.** This effective emphasis of confident power and the location of the drive system in the Cayenne models make the front section seem closer to the road. The sculpted form and athletic look are more pronounced than before and create an impression of balanced tension. **Like**

the rear of the vehicle, the front section is now more emotive with round design contours and **thus brings out the elegant sportscar character of the new models.**

The especially slim D-pillar and new rear window design create a **fast sweep from the roof line** to the clearly emphasized rear of the Cayenne models, thereby contributing to the **compact and dynamic appearance.** The fender contours extend via the **rear light units** into the rear end of the vehicle. The completely redesigned rear light units with LED technology now also reach further towards the front and underline the vehicle length with their tapered form.

The **window design** makes a crucial contribution to the new appearance. The form of the windows follows the elegant roof line starting from the A-pillar and continuing through to the D-pillar with its rapidly sweeping contour. In order to maintain the focus on length and dynamic characteristics here as well, all new Cayenne models have **side window frames in Chrome-look as well as B- and C-pillars in high-gloss black finish.** The contrast provided by the side

window frames additionally underlines the high quality and character of the new models.

The more pronounced forms of the fenders and doors also lead to greater emphasis of the wheel arches. The **black wheel arch trims and the matching sill covers** make the vehicle body appear flat and ensure the necessary contrast with the newly designed alloy wheels, which are available in sizes between 18 and 21 inches. A discreet designation in Chrome-look on the side of the front fenders serves to identify the Cayenne Diesel and the Cayenne S Hybrid.



Fig. 8: Side view of Cayenne S



Fig. 9: Rear view of Cayenne Turbo

Rear view

The rear design of the new Cayenne models now displays even stronger membership of the Porsche family. **The typical Porsche form themes and design elements have been brought to the fore even more clearly.** The visual height necessary for the wedge shape and dynamic appearance of the models is achieved in the rear area through greater emphasis of the tailgate. The main factors responsible for this are the rapidly falling sweep of the D-pillar to the rear, the consistent realization of the emotive form theme with round contours based on sportscars, as well as horizontal style elements such as the chrome trim strip at the transition from the tailgate to the rear bumper.

Closeness to the road is also expressed at the rear by the more pronounced fenders. The fender form flows further to the rear and underlines the **distinctive shoulder effect, which is typical for all Porsche models.** A familiar theme is also used in the roof area and integrated into the roof design - the 2 convex curves of the roof spoiler flow into the middle of the rear roof area and thus evoke the design of the Carrera GT.

The **rear light units** extend from far outside into the rear end and are **realized fully in LED technology.** With the dynamic transition from the side to the tailgate, they repeat the theme of the roof spoiler.

The newly designed tailpipes provide the visual finish at the bottom end of the vehicle. The Cayenne, Cayenne Diesel, Cayenne S and Cayenne S Hybrid feature single tailpipes and the Cayenne Turbo is equipped with 2 round twin tailpipes.

In addition to the model designation, all new Cayenne models feature the new **chrome-colored PORSCHE logotype** above the license plate recess.

Just as attractive as the exterior design is the **new color range.** There is a choice of **11 colors (with 8 new colors) for the new Cayenne models.**

The color range with solid, metallic and special paint finishes is as follows:

Solid colors:

- Sand White
- Black (available as of 05/2010 at the earliest)

Metallic paints:

- **Classic Silver Metallic, Jet Black Metallic, Meteor Gray Metallic**
- **Dark Blue Metallic, Umber Metallic** (available as of 05/2010 at the earliest)
- **Jet Green Metallic, Auburn Metallic** (available as of 08/2010 at the earliest)

Special colors:

- **Sand Yellow, Amethyst Metallic** (available as of 08/2010 at the earliest)

Interior

The **interior design** is also **completely new** and cleverly continues the exterior design in the passenger compartment.

The striving for even more sportscar character in conjunction with improved flexibility and greater day-to-day usability resulted in a **completely new architecture and enhanced quality in the interior**. The new design quickly becomes familiar irrespective of the viewing perspective since **great importance has been attached to functionality, ergonomics and comfort**.

The result is a new interior design with clear lines, features based on **typical Porsche style elements**, such as the 5 round instruments of the instrument cluster, and **consistent realization of the cockpit concept** for both driver and front passenger. In the **rear cabin**

area, the focus was on achieving additional space, individually adjustable seat positions and increased variability of the luggage compartment.

The first thing that catches the eye is the **elevated center console with raised gearshift**. The driver now feels even more as if he is an integral part of the vehicle and the seat position is especially sporty. The elevated center console also ensures that there is only a short distance between the **redesigned steering wheel** and the gear/selector lever. The most important functions and settings for vehicle operation are combined in logical groups on the center console. Individual functions can be operated quickly and intuitively by means of the buttons located on the left and right of the gear/selector lever, eliminat-

ing the need for long searches in sub-menus.

When looking towards the front, the eyes of all passengers rest on the **completely redesigned dashboard**. The **now 7-inch touchscreen** (6.5-inch screen in the previous models) is located centrally and high up on the dashboard and therefore ensures good visibility and convenient access to the large number of functions on the new Cayenne models. The central screen of the CDR-31 audio system or Porsche Communication Management (PCM) is flanked by striking, silver-colored air vents, which divide the dashboard into the driver and front passenger areas from the center console. The dashboard also includes familiar Porsche elements such as the **5 round instruments typical for the 911** with the **centrally positioned**



Fig. 10: Cockpit of Cayenne Turbo in two-tone Umber/Cream



Fig. 11: Cayenne interior

tachometer and the ignition lock on the left of the steering wheel.

Unmistakably Cayenne - the typically shaped grab handles on the center console. This function and design element is now also repeated on all 4 doors. The proven positioning of the chassis control switches and the central off-road rocker switch for activating the Off-road mode of Porsche Traction Management (PTM) have also been left unchanged.

In the **rear cabin area**, the up to 3 passengers on the rear seat benefit from the fact that the wheelbase has been extended by 1.6 inch, providing them with more freedom of movement. The additional interior space now available can be used individually as required. This is ensured by the new adjustable **rear seat bench equipped standard on all Cayenne models.** A simple operation on the seat console allows the rear seat bench to be moved in longitudinal direction by up to 6.3 inch in a 60:40 split. In addition, the backrest angle can be adjusted by up to a maximum of 6 degrees.

The attractive and **high-quality new design** in the interior of all Cayenne models is underscored by the **tactile qualities of the new materials.** An example of this is the new surface texture in the area of the dashboard and doors that has been developed as part of the standard interior on the Cayenne, Cayenne Diesel, Cayenne S and Cayenne S Hybrid. This design feature significantly improves the quality appearance

of the interior. This impression is further amplified by numerous decorative seams as well as silver and chrome accentuating details.

All Cayenne models are already equipped standard with a **partial leather interior** in embossed leather in 3 attractive colors (Black, Platinum Gray, Luxor Beige). In addition, customers can also optionally choose from a full leather interior in smooth-finish leather in 4 colors (standard on the Cayenne Turbo, additional leather color: Umber), a leather interior in two-tone smooth-finish leather in 3 color combinations (Umber/Cream, Umber/Light Tartufo, Black/Titanium Blue), a natural leather interior (Espresso) or a natural leather interior in a two-tone color combination (Espresso/Cognac). The two-tone leather interiors additionally feature decorative seams on the dashboard, upper door panels, door armrests and center console in the lighter color. A **rooflining made of Alcantara** is standard for the Cayenne Turbo and is optionally available for all other models.



Fig. 12: Carbon interior package

All **trim strips** on the dashboard and upper door panels at the front and rear **are supplemented by silver-colored highlight strips**. The trim strips for the Cayenne, Cayenne Diesel, Cayenne S and Cayenne S Hybrid have a high-gloss Black finish. Trim strips in Brushed Aluminum are standard for the Cayenne Turbo; this finish is optionally available for the other Cayenne models. Additional attractive interior packages in 3 different wood finishes (Walnut, Anthracite Birch, Natural Olive) or Carbon are optionally available. The Tiptronic S selector lever also has the selected trim with these

packages. The steering wheel rim for the multi-function steering wheel can be ordered in wood (not in conjunction with the Natural Olive interior package) or in Carbon to match the chosen trim. Steering wheel heating activatable on the steering wheel is standard for all steering wheels with trim option.

1.2.2 Drive, performance, efficiency

The Cayenne models of the 1st and 2nd generations already set standards in their class with respect to performance and driving dynamics. As could be expected of a model line from the sportscar brand Porsche, these vehicles led the way among segment-specific competitors in the areas of acceleration, top speed and outstanding agility. The new Cayenne models also follow this tradition.

The market launch of the second-generation Cayenne already saw a model-dependent reduction in fuel consumption by up to 8% thanks to the introduction of direct fuel injection (DFI), but the engineers in Weissach have still been able to achieve a further massive model-dependent improvement in fuel economy of up to 23% for the new Cayenne.

New design – the new Cayenne models evoke emotions and desires:

- All Cayenne models embody much more clearly than ever before the Porsche design language and typical Porsche design elements
- Completely new exterior design characterized by dynamism, elegance and sportiness
- Completely new interior design offering a new functionality as well as improved ergonomics and comfort
- New materials express the high quality, exclusiveness and individualism of the new Cayenne models

In order to reconcile these seemingly contradictory goals, the following measures have been implemented to positively influence both efficiency and performance:

- Significant weight reduction through intelligent lightweight design
- Optimized engines with consumption-oriented control of cooling and auxiliary equipment
- Efficient 8-speed Tiptronic S (optional for Cayenne)
- Weight-reduced and efficient all-wheel-drive systems
- New tire generation with optimized rolling resistance
- New parallel full hybrid drive with V6 supercharged engine and electric machine (motor/generator) in the Cayenne S Hybrid

Significant weight reduction through intelligent lightweight design

The most important development goal for the new Cayenne models with a decisive impact on fuel consumption and CO₂ emissions as well as performance, agility and handling was a **significant weight reduction for all models**. Having said this, weight savings are always in conflict with the greater demands for vehicle safety, increased space, extensive standard equipment and improved variability. Starting from the previous models, these additional requirements initially mean an additional model-dependent weight of up to 154 lb. Thanks to **intelligent lightweight design**, use of the **latest materials available for automotive engineering and changes in the design concept for the overall vehicle**, it has been possi-

ble to save around 551 lb. This therefore represents a total saving for the Cayenne S of 397 lb (net) in comparison with the previous model (see illustration showing the weight comparison). The following main areas contributed to achievement of the ambitious weight reduction goals.



Fig. 13: Drivetrain of Cayenne Turbo

Weight comparison for the Cayenne S MY 10 and MY 11 (Tiptronic S) in lb

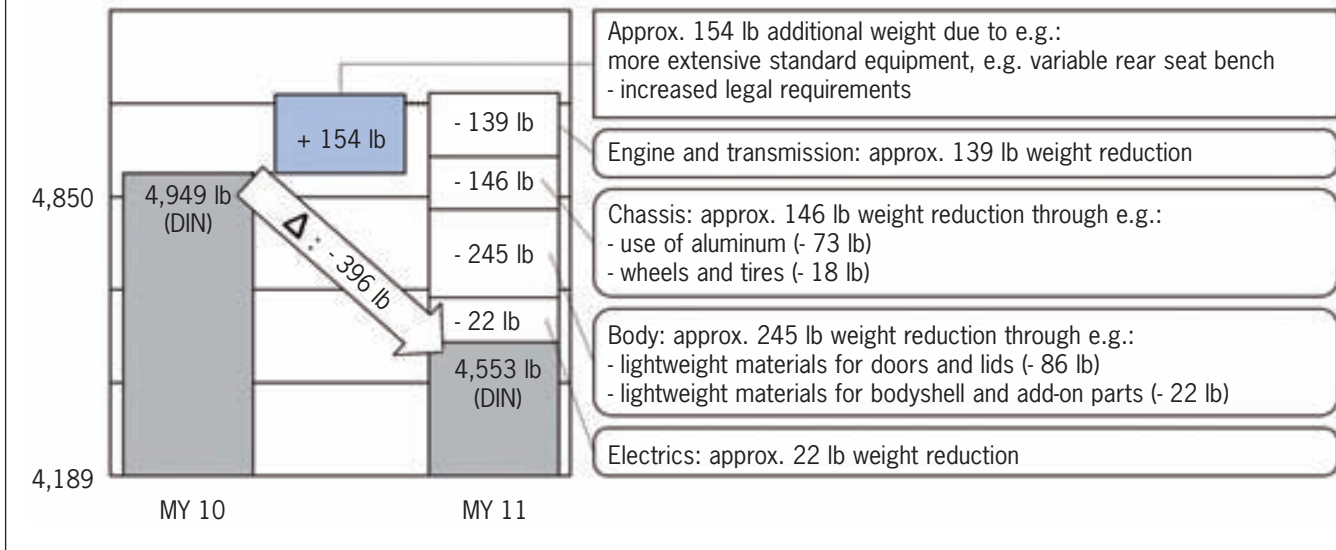


Fig. 14: Weight reduction compared with previous model

The focus was on use of a **new drive-train** for Porsche Traction Management (PTM) in conjunction with the new 8-speed Tiptronic S transmission as well as the consistent use of new materials for chassis, bodyshell and body construction. Use of the new PTM in conjunction with 8-speed Tiptronic S makes it possible to achieve a significant weight reduction by dispensing with the need for a reduction gear – without any compromises in the off-road requirements relevant for normal customer operation. The weight enhancements are continued through the complete drive-train to the exhaust system. Further developments in e.g. steel processing techniques have allowed the use of **extremely thin-walled steels** that are tailored to the respective application in the **body**. These steels additionally have very high rigidity values in order to comply with all relevant safety regulations. The weight enhancements are not restricted to the crash-relevant structures of the **bodyshell**. The **use of aluminum for the hood and tailgate** and new structures in the door also contribute to a significant reduction in the

body weight. **Aluminum is now also used extensively in the chassis area.**

For example, the wishbones and pivot bearings of the front axle and large parts of the multi-link rear axle are made of aluminum.

The weight reduction achieved has double benefits for customers of the new Cayenne models. Firstly, the reduced mass means that less power is needed to move the vehicle in everyday operation, thus reducing fuel consumption. Secondly, if the full engine power is requested, the new Cayenne models also offer improved performance without a significant increase in power, which in turn would mean higher fuel consumption. **This clearly demonstrates the Porsche principle – intelligent performance with significantly improved driving dynamics and agility.**

Reduced fuel consumption and emissions thanks to modern drive technology

The increasingly strict **emission regulations** are met worldwide. For example, EU5 in EU countries for all new Cayenne models and LEV2 – ULEV (for the Cayenne, Cayenne S and Cayenne S Hybrid) and LEV2 – LEV (for the Cayenne Turbo) in the USA and Canada.

Detail modifications on all engines have made it possible to reduce fuel consumption values and CO₂ emissions while at the same time realizing moderate increases in power. The goal for all engines was to achieve the **challenging development goals without increasing the displacement**. Increased power is realized by **measures to reduce friction for the 3.6 l V6 engine** and by a **modified and dethrottled exhaust system with new mass air flow measurement system for the V8 naturally-aspirated engine**.

The 3.6 l V6 engine in the Cayenne now produces 10 hp more and reaches a maximum power output of 220 kW/300 hp at 6,300 rpm. The torque here was increased from 284 lb ft to 295 lb ft. The new generation of the 4.8 l naturally-aspirated engine develops a maximum power of 294 kW/400 hp at 6,500 rpm and a maximum torque of 369 lb ft. The development highlights include in particular the efficiency-enhancing technologies for reducing fuel consumption that are used in all engine variants:

- Thermal management
- Variable deceleration fuel cutoff
- Vehicle electrical system recuperation
- Auto Start Stop function

In order to reduce fuel consumption and the resultant emissions while the engine is warming up after a cold start, **thermal management is used for the engine and transmission cooling circuits**, depending on the engine variant of the new Cayenne models (only for transmission for the Cayenne Diesel). The engine and transmission warm up more quickly thanks to targeted control and demand-based, step-by-step activation of the respective cooling circuits. As a result, the friction losses are reduced in the warm-up phase and this in turn also reduces the fuel consumption as well as CO₂ and pollutant emissions. The thermal management system makes it possible to reduce fuel consumption by up to 3%.

The **variable deceleration fuel cutoff** is an enhancement of conventional deceleration fuel cutoff (not for the Cayenne Diesel). This involves controlled interruption of the fuel supply in driving situations where the combustion engine is not required to output any power but is kept moving by the inertia mass of the vehicle (overrun, e.g. when driving downhill). Compared with the usual deceleration fuel cutoff systems, which resume fuel injection as from a fixed engine speed, variable deceleration fuel cutoff systems resume fuel injection flexibly depending on the driving situation, which may correspond to an even lower engine speed. Depending on the driving situation, fuel injection can resume even later, thereby saving fuel.

Each Cayenne model features the new function of **vehicle electrical system recuperation**. Here, some of the kinetic brake energy is converted into electrical energy via the alternator during vehicle deceleration phases and stored in the starter battery. In acceleration phases, the vehicle electrical system can be supplied with this recuperated energy, thereby relieving the load on the alternator and combustion engine. This leads to a reduction in fuel consumption in the **NEDC (New European Driving Cycle) of 0.15 l/100 km** and therefore also to lower CO₂ emissions. When braking in particular, this function allows the usually lost brake energy to be made available again (recuperation) through a targeted increase in the alternator power. In addition to the benefit of reduced fuel consumption, the driver then has the maximum engine power available for propulsion in acceleration phases.

In conjunction with 8-speed Tiptronic S (optional for the new Cayenne), all Cayenne models have an **Auto Start Stop function**. This switches off the engine automatically, e.g. when waiting at a traffic light when the vehicle is stationary and the brake is held. The tachometer falls to zero and the driver is informed about activation of the Auto Start Stop function by a symbol in the TFT display of the instrument cluster. The audio and communication systems remain switched on in spite of the fact that the engine has been switched off and the climate control also maintains the selected temperature level. In the city cycle, this makes it possible to achieve a reduction in **fuel consumption of up to 10%**. This function is inactive in certain situations, e.g. at very high outside temperatures, on steep gradients or if the battery charge is low. The starter has been adapted to the increased demands and the battery charge and aging condition are continuously monitored. The battery and starter are wearing parts and are subject to increased wear in the event of frequent engine stops.



Fig. 15

**The new 8-speed Tiptronic S:
Dynamic, comfortable and efficient**

The transmission is crucial both for driving performance as well as comfort and fuel consumption. An **8-speed Tiptronic S transmission** is used for the first time for the new Cayenne models (optional for the Cayenne). A hallmark of the new 8-speed Tiptronic S is a wide ratio spread. 1st gear is designed for good acceleration when moving off as well as for good climbing and pulling power – also in off-road operation. Top speed is reached in 6th gear. The two other gears therefore allow the **engine speed to be reduced at high driving speeds** and offer **advantages both for fuel consumption and comfort**. When driving on highways in particular, low engine speeds reduce the noise level in the passenger compartment.

The new 8-speed Tiptronic S transmission is operated primarily by means of the selector lever in the center console or using the 2 shift buttons on the steering wheel. A three-spoke sports steering wheel with shift paddles is also available as an option. The elevated center console and the driver's seat position ensure that there is only a short distance between the steering wheel and selector lever, creating a sporty driving feeling. In manual mode, the gear recommendation in the instrument cluster helps to ensure optimal fuel economy. The selected driving mode and gear are displayed in the digital display of the tachometer. The shift buttons on the steering wheel are arranged to guarantee fast and safe gearshifts.

The **intelligent shift programs** allow the driver to directly influence the shift behavior of the Tiptronic transmission by corresponding operation of the gas and brake pedals. In the event of fast gas pedal movements, an **active switching function** immediately switches the shift points to the dynamic gear-changing map. This takes place without any need for kickdown. **Overrun upshifts** are **suppressed** when the gas pedal is released quickly, e.g. driving into curves. In addition, gear retention prevents upshifts in curves. The result is increased handling stability and safety.

Tiptronic S quickly shifts down to the next gear when the brakes are applied with force in order to exploit the engine braking effect. A **hill detection function** enhances the acceleration capability when driving uphill and provides a higher engine braking torque when driving downhill.

PTM with efficient all-wheel drive systems for outstanding driving dynamics and off-road suitability

The Porsche Traction Management (PTM) all-wheel drive system, familiar from the sportscars and the Panamera, is used for the Cayenne, Cayenne S and Cayenne Turbo. Here, the **active all-wheel drive** with electronic and map-controlled fully variable multi-plate clutch is combined with the automatic brake differential (ABD) and anti-slip regulation (ASR). The electronically controlled fully variable multi-plate clutch regulates the distribution of drive power between the full-time drive rear axle and the front axle. Monitoring of driving conditions enables the system to respond to different driving situations. Sensors continuously monitor various parameters, including the speeds of all four wheels, the longitudinal and lateral acceleration of the vehicle and the steering angle. If there is a risk of the wheels on the rear axle spinning e.g. during acceleration or on loose ground, increased drive power is supplied to the front axle through greater intervention of the multi-plate clutch. ASR also reduces wheelspin. During cornering, the required level of engine torque is distributed to the front wheels to ensure excellent lateral stability. PTM works together with the enhanced Porsche Stability Management (PSM) to ensure that power is distributed appropriately to provide optimum drive force in every situation, whether on long straights, in tight corners or on surfaces



Fig. 16: Off-road rocker switch

with varying levels of grip. The multi-plate clutch can be fully locked by means of the rocker switch on the center console, making it possible to progress on difficult terrain.

The new Cayenne Diesel and the new Cayenne S Hybrid have a **permanent all-wheel drive with self-locking center differential**. Normally, 60% of the drive force is supplied to the rear axle and 40% to the front axle. Locking torque builds up as a reaction to slip. If one or both wheels on an axle spins, the self-locking center differential automatically distributes the drive force to the axle with better traction. The Cayenne Diesel and Cayenne S Hybrid additionally feature **variable torque distribution on the rear axle** to improve steering precision and driving dynamics. Specifically, this means that when entering a corner at high speed, moderate brake pressure is applied to the inside rear wheel. This creates an additional angular momentum in the desired direction to ensure direct and dynamic steering into the curve.

The design of 1st gear in the 8-speed Tiptronic S transmission makes it possible to dispense with an off-road ratio in conjunction with Porsche Hill Control (PHC). This results in a further weight reduction of the drivetrain without any restriction in the off-road suitability relevant for customers. Consequently, all models are able to master tasks such as retrieving or launching a boat, operation on muddy terrain or driving up a snow-covered track to a mountain hut. To provide assistance on steep downhill gradients, all Cayenne models are equipped as standard with **Porsche Hill Control (PHC)**. This can be activated by means of a separate switch on the center console. The driving speed can be controlled in the range from 2 - 19 mph by means of the brake and gas pedals and by the operating control of the cruise control. The downhill speed is kept constant by means of PSM braking interventions so that the driver can concentrate on steering.

The **off-road characteristics** can be improved by the optionally available off-road underbody protection, wheel arch extensions in Black with side door protection moldings or air suspension including PASM. Additional options are also available for the Cayenne, Cayenne S and Cayenne Turbo that improve **off-road traction**. These include the new **Porsche Torque Vectoring Plus (PTV Plus)** as well as **Porsche Dynamic Chassis Control (PDCC)**. PTV Plus enhances driving dynamics and stability through **variable torque distribution at the rear wheels** and an **electronically regulated rear differential lock** (optional for the Cayenne, Cayenne S and Cayenne Turbo). As a result of targeted braking interventions on the right or left rear wheel when steering into a curve, the wheel on the outside of the curve is provided with higher drive force and therefore permits additional angular momentum in the desired steering direction – **allowing the vehicle to steer into the corner more directly and dynamically**. The electronically regulated rear differential lock can be fully locked to improve off-road traction. **PDCC** (optional for the Cayenne, Cayenne S and Cayenne Turbo) improves the traction of the Cayenne models in off-road mode through increased axle articulation.

Like on the previous models, the new PTM is operated via the proven off-road rocker switch on the center console. This makes it possible to adapt the off-road system (in up to 3 different modes depending on the model) in different stages to the conditions of the off-road terrain. In **Off-road mode 1**, all relevant systems such as PTM, PSM and ABS are switched to a traction-oriented off-road program. Porsche Hill Control is also activated (on gradients of at least 12 percent) and High Level I is also selected on vehicles with air suspension including PASM. The rocker switch of the air suspension also permits selection of High Level II in order to increase the approach/departure angle and fording depth.

If the off-road rocker switch is pressed further forward, **Off-road mode 2** is **activated** for the Cayenne, Cayenne S and Cayenne Turbo – in this case the multi-plate clutch is fully closed for better traction on difficult terrain.

The **electronically controlled rear differential lock** of the optional Porsche Torque Vectoring Plus (PTV Plus) system is integrated in all-wheel control. This rear differential lock ensures appropriate power control when driving off-road on particularly difficult terrain. If a rear wheel starts to spin on slippery or loose ground, the differential lock re-establishes traction by sensitive distribution of the drive force to the other wheel. If required by the conditions, it is possible to activate **Off-road mode 3** with full locking of the rear axle differential by pressing the off-road rocker switch once more.

Tire generation with optimized rolling resistance

Tires generally offer a high potential for reducing fuel consumption. A **new generation of tires** will also be introduced with the new Cayenne models. These tires offer improved performance, handling, rolling resistance and weight. The 3 basic components of a tire have been optimized: the rubber mixture, tread design and casing architecture.

The new parallel full hybrid system of the Cayenne S Hybrid

The innovative drive concept in the Cayenne S Hybrid allows acceleration values at the level of a V8 engine and at the same time realizes very low fuel consumption values for this vehicle class. The new **parallel full hybrid** permits special driving modes that are possible only with this drive concept. The Cayenne S Hybrid intelligently combines efficiency with performance and thus interprets an elementary Porsche principle in a new dimension. The hybrid-specific driving modes offer additional customer benefit and a completely new driving experience:



Fig. 17: Parallel full hybrid drive for Cayenne S Hybrid

- **Driving under purely electric power** up to 37 mph with zero local emissions (under moderate acceleration)
- Combustion engine-powered driving (also with simultaneous charging of the NiMH battery pack, depending on driving situation)
- **Powerful boosting** with the combined power from the combustion engine and electric machine
- Unpowered gliding ("**coasting**") from 97 mph
- **Recovery of brake energy** on braking through recuperation
- Automatic **switching off of the combustion engine** when the vehicle is stationary with the Auto Start Stop function

The drivetrain is designed as a **parallel full hybrid** drive and differs from other full hybrid types such as the serial full hybrid through the layout and design of the components. The most important system components of the parallel full hybrid drive in the Cayenne S are as follows:

- 3.0 l V6 supercharged engine
- Compact hybrid module with integrated decoupler and electric machine (motor/generator)
- 288-Volt nickel-metal hydride (NiMH) battery pack including battery manager

- Power electronics to control the energy flows between the NiMH battery and electric machine (motor/generator)
- Electrically powered auxiliary systems for safety and comfort functions

The concept of the parallel full hybrid drive shows how a **combustion engine can combine exemplary fuel consumption values with outstanding power development when paired with an electric machine (motor/generator)**. As a result, 380 hp (279 kW) is available for dynamic propulsion. The maximum torque of the Cayenne S Hybrid is 428 lb ft. This ensures exceptional starting response and permits acceleration from 0 to 60 mph in 6.1 s. The acceleration values are therefore at the level of vehicles with 8 cylinders. In the new Cayenne S Hybrid, intelligent performance means that it is possible to significantly reduce fuel consumption and CO₂ emissions compared with a conventional vehicle with comparable performance.



Fig. 18

The **fully electric drive** makes a great contribution to the low fuel consumption with zero emissions and zero fuel consumption up to a speed of **37 mph**. The fuel economy benefits from driving under purely electric power are particularly evident when driving in towns, residential areas or traffic-calming zones. The switched-off combustion engine is isolated by the decoupler. The NiMH **battery** pack supplies the **electric motor** with energy for practically noiseless driving via the **power electronics**. The Cayenne S Hybrid has an **E-Power button** instead of the button for deactivating and activating the Auto Start Stop function on the center console. When this button is pressed, the gas pedal characteristic is adapted so that the combustion engine is switched on later than in normal mode depending on the amount of power requested by the driver. The flatter gas pedal characteristic allows even more precise throttle control, something which is advantageous particularly in driving situations where continuous electric driving is desired, e.g. when driving through a traffic-calmed zone.

The NiMH battery pack also stores brake energy recovered during so-called **recuperation**. The electric machine then operates as a generator and **makes it possible to use the previously lost brake energy**. At the same time, it also generates a braking torque that reduces the load on the mechanical brake system. The NiMH battery can also be charged by means of a so-called load point shift. In this case, the combustion engine is operated at a higher, more efficient operating point. The electric machine generates energy for the NiMH battery with the additionally available engine power and this is then subsequently available again as drive energy.

The **Auto Start Stop function of the Cayenne S Hybrid** switches off the engine whenever the vehicle is stationary, e.g. when waiting at a traffic light, and thus allows a fuel saving of up to 10% for city driving.

In **"Coasting mode"**, the parallel full hybrid concept also demonstrates its strength on country roads and highways. Here, the combustion engine remains switched off in the phases where no drive power is requested and is even completely decoupled from the drivetrain. The hybrid vehicle therefore coasts or "sails" without fuel consumption and emissions e.g. on country roads and highways, supported by an anticipatory driving style in which the driver takes his foot off the gas pedal. In this mode, speeds of up to **97 mph** can be achieved.

Thanks to the supercharged engine, the Cayenne S Hybrid can exploit the strengths of the drive concept during city driving in particular, e.g. when moving off or at low driving speeds and engine speeds. **Mechanical supercharging** produces high torque at low revs and is ideally complemented by the additional high torque of the electric motor during boosting. The advantages of a **synchronous motor designed as an internal-rotor motor** are the extremely compact dimensions and the high efficiency. It also performs the function of the starter and alternator. The good acceleration values are the result of the combustion engine being supported by the electric motor, which functions as a **power-enhancing E-booster**. At low revs in particular, the electric motor can exploit the strengths offered by its design concept: torque is available immediately and the motor can effectively assist the supercharged

engine. This results in optimum and dynamic power development for the whole engine speed range.

A color TFT display in the left round instrument of the instrument cluster displays information on energy management as well as energy flows during hybrid-specific driving modes. An analog display also integrated in the instrument cluster, the E-Power meter, provides the driver with information about power demand and power generation (battery discharge and charging). The **extended energy flow display in PCM** also records statistical driving values to document especially efficient driving in addition to providing a detailed vehicle representation including energy flows. If desired, the vehicle can therefore provide all the necessary information to fully exploit the system benefits of the parallel full hybrid concept through ecologically aware driving.

A number of the **auxiliary systems have also been switched to electric power for the Cayenne S Hybrid**, since these systems also have to perform their tasks continuously during electric driving or coasting without the combustion engine. These include the steering pump for the power steering and the vacuum pump for the brake booster. As the load with the greatest power requirement, the **air-conditioning compressor was connected directly to the 288 V** system of the NiMH battery. Porsche uses an **electro-hydraulic steering system**, which offers the kind of steering precision typical of Porsche. This also makes a contribution to fuel saving through special functions such as standby mode when driving straight ahead.

Porsche models have always stood for **outstanding performance with maximum efficiency**. Thanks to the hybrid drive, the Cayenne S Hybrid realizes this principle in an innovative way like no other model. The **combination of efficiency and driving dynamics** in the Cayenne S Hybrid strengthens the position of the Cayenne model line in the long term and provides customers with maximum flexibility to individually choose between fuel economy-based and sporty driving styles. The positive image of hybrid technology benefits all Cayenne models and makes a contribution to ensuring the social acceptance of the model and brand through its positive aura. It also takes into account the increasingly stringent global fuel consumption legislation and fiscal measures, particularly in the EU.

Intelligent performance – typical Porsche performance combined with top-class fuel economy and CO₂ emissions:

- All new Cayenne models clearly demonstrate their claim to be sportscars in the SUV class
- All models have significantly improved fuel consumption (up to -23%) and CO₂ emission values (up to -26%)
- Significant weight reduction (by up to 408 lb), 8-speed Tiptronic S including Auto Start Stop function, new PTM, innovative parallel full hybrid drive in the new Cayenne S Hybrid
- In spite of being even closer to the road, the new models still meet customer-relevant off-road requirements as before

1.2.3 Comfort and day-to-day usability

1.2.3.1 Standard equipment

All new Cayenne models have more **extensive standard equipment**. Ideal and comfortable for long journeys and equally practical and functional for everyday use. The following table provides an overview of the most important new standard equipment features:

Overview of most important new standard equipment Changes compared with the previous models are marked in bold ● = Standard equipment ○ = Individual option	Cayenne	Cayenne Diesel*	Cayenne S	Cayenne S Hybrid	Cayenne Turbo
Engine, drive and chassis					
8-speed Tiptronic S incl. Auto Start Stop function, now also standard for Cayenne S	○	●	●	●	●
18-inch wheels, standard for Cayenne	●	●	●	●	
Tire Pressure Monitoring (TPM), standard for Cayenne Turbo	●	○	●	●	●
Lighting system					
Driving light assistant, standard for all models	●	●	●	●	●
Bi-Xenon headlights incl. Porsche Dynamic Light System (PDLS)	○	○	○	○	●
Automatically dimming interior and exterior rear view mirrors, standard for Cayenne Turbo	○	○	○	○	●
Interior					
2-zone climate control, now also standard for Cayenne and Cayenne Diesel	●	●	●	●	●
Cruise control, standard for all models	●	●	●	●	●
Adaptive sports seats with memory package	○	○	○	○	●
Adjustable rear seat bench incl. simplified fold-down mechanism	●	●	●	●	●
Extended storage package in the passenger compartment incl. in-door bottle holders	●	●	●	●	●
Audio and communication					
CDR-31 audio system with touchscreen color display	●	●	●	●	-

*not for US

All Cayenne models are now equipped with standard **2-zone climate control**. A new feature is the possibility of separately controlling the air flow for the driver and front passenger to individual temperature adjustment for 2 zones. The cruise control, which can be operated manually by means of the control stalk, and the driving light assistant are both features that increase comfort on long journeys. The **cruise control** allows the vehicle speed to be automatically maintained in the range from 19 – 149 mph, thereby increasing comfort, e.g. for highway driving. The **driving light assistant** is accommodated together with the standard rain sensor in the mirror base of the interior mirror and automatically switches on the low beam headlights in darkness, e.g. when driving through tunnels. The **CDR-31 audio system** features a central 7-inch color display with touchscreen. This permits fast and intuitive operation.

The **comfort seats** equipped standard at the front for the Cayenne, Cayenne Diesel, Cayenne S and Cayenne S Hybrid feature **8-way electrical adjustment** and are partially covered in leather. The seats offer excellent travel comfort

thanks to the numerous adjustment options and the 2-way headrests.

The **Cayenne Turbo** also has more extensive standard equipment. The **adaptive sports seats with memory package** have an unmistakably sporty design with raised side bolsters and 18-way electrical adjustment. A new feature is the possibility of individually adjusting the side bolsters of the seat cushion and backrest as well as the thigh support (note: as a result of the raised side bolsters, there is a slope of around 15 degrees with respect to the luggage compartment floor when the rear seats are folded down). The **interior and exterior rear view mirrors now feature automatic dimming as standard** and therefore increase comfort, particularly when driving in the dark with following traffic. The standard **Tire Pressure Monitoring** allows the driver to conveniently check the inflation pressure in all 4 tires on the on-board computer either when the vehicle is stationary or when driving. This makes it possible to check quickly whether the tire pressure is correct in order to ensure driving safety and low rolling resistance.

The new Cayenne Turbo is now equipped with the **Porsche Dynamic Light System (PDLS)** for better illumination of the road when driving in darkness. This system includes the static and dynamic cornering light already familiar from the previous models as well as the new speed-dependent headlight range control function, which changes the light cone and luminous intensity depending on the vehicle speed in order to improve visibility.

The new **8-speed Tiptronic S** is optional for the Cayenne and equipped as standard on all other models. Thanks to the related Auto Start Stop function and the particularly long ratios of the 7th and 8th gears, this transmission makes a decisive contribution to reducing the fuel consumption of the new Cayenne models. Manual operation is possible not just using the selector lever but also by means of buttons on the steering wheel.

All Cayenne models now offer **more space at the rear of the passenger compartment**. Mainly responsible for this is the fact that the wheelbase has been extended by 1.6 inch. This benefits rear passengers in particular.

The new **variable rear seat bench for up to 3 persons** is either comfortable or sporty, depending on the front seats chosen. The rear passengers can manually adjust the bench in fore/aft direction by up to 6.3 inch and can also adjust the backrest angle by a total of 6 degrees. In conjunction with the wheelbase extension by 1.6 inch, the rear passengers therefore have a more generous feeling of spaciousness and the possibility of setting an individual seat position of the 60- and 40-percent parts of the rear seat bench.



Fig. 19: Porsche Dynamic Light System (PDLS)



Fig. 20: Variable rear seat bench

At the same time, it has been possible to increase the luggage compartment capacity by 4.6 cu ft to 23.7 cu ft (Cayenne S Hybrid: 20.5 cu ft). The **integrated through-loading facility** allows transport of long objects as well as accommodation of the optional **ski bag**, which can be fixed securely in the luggage compartment and can also be used as a practical carrying bag for skis or snowboards outside the vehicle. Thanks to the improved fold-down mechanism of the rear seat bench, the maximum loading capacity of the new Cayenne models of 62.9 cu ft (+ 0.4 cu ft compared with MY 10, for the Cayenne S Hybrid: 59.7 cu ft;

Cayenne Turbo: 60.2 cu ft) can now be used even more easily and quickly. All that is necessary is to release the backrest of the rear seat bench and fold it forward. The seat cushion and headrests remain in their normal position and do not need to be removed.

The standard **retractable luggage compartment cover** is accommodated in a removable case and screens from view the contents of the luggage compartment. It guarantees privacy even when the rear seat bench is pushed forward thanks to connection with the backrest.

The **storage facilities in the vehicle have also been enhanced.** The famil-

iarly large and easily usable luggage compartment is complemented by a large number of other storage options, e.g. in the doors and center console. The **door storage compartments** are new and are now able to accommodate **bottles up to 1.6 quart at the front and up to 1 quart at the rear.** The 2 cupholders each in the front center console and in the folding armrest of the rear seat bench are flexibly designed to hold bottles and cans in a wide variety of sizes. Under the center armrest at the front, which can now be slid in longitudinal direction, there is an illuminated parcel tray with a 12 V socket. The glove compartment can be cooled by the climate control system.

Day-to-day usability and comfort – more space and greater variability with compact dimensions:

- More extensive standard equipment for all models
- Increased comfort in the rear thanks to more generous space
- Everyone can find the right seat position with the rear seat bench, which permits fore/aft and backrest adjustment
- The larger and variable luggage compartment offers more versatile transport possibilities together with the standard through-loading facility



Fig. 21: Luggage compartment in Cayenne



Fig. 22: Front door storage compartment in Cayenne

1.2.3.2 Individual options

The range of **personalization options for the new Cayenne models** has grown again. New options offer the possibility of further enhancing comfort, day-to-day usability and the sound experience. It is possible to create a sporty or luxurious atmosphere or even a combi-

nation of the two. There is a choice of 5 interior colors and 4 two-tone interiors. Alternatively, customers can choose optional interior packages with noble woods, Carbon or Aluminum. The following table provides an overview of the most important new options:

Overview of most important new individual options	Cayenne	Cayenne Diesel*	Cayenne S	Cayenne S Hybrid	Cayenne Turbo
Changes compared with the previous models are marked in bold					
● = Standard equipment					
○ = Individual option					
W = Optional, without extra charge					
Exterior					
New metallic exterior colors: Jet Black Metallic, Umber Metallic, Dark Blue Metallic, Auburn Metallic, Classic Silver Metallic, Jet Green Metallic	○	○	○	○	●
New special colors: Sand Yellow, Amethyst Metallic	○	○	○	○	○
Heated windshield	○	○	○	○	○
Roof rails in Black/Aluminum Look matte incl. roof transport system	○	○	○	○	○
Engine, drive and chassis					
8-speed Tiptronic S	○	●	●	●	●
Porsche Active Suspension Management (PASM) for steel spring suspension	○	○	○	○	
Porsche Torque Vectoring Plus (PTV Plus)	○		○		○
Porsche Ceramic Composite Brake (PCCB) optional for Cayenne and Cayenne Diesel	○	○	○	○	○
Sports exhaust system for Cayenne and Cayenne S (for Cayenne only in conjunction with Tiptronic S)	○		○		○
Wheels					
New wheel design for all standard and optional wheels	○	○	○	○	○
20-inch All-Season tires	W	W	W	W	W
Interior					
Three-spoke sports steering wheel with shift paddles	○	○	○	○	○
Adaptive sports seats with memory package	○	○	○	○	●
Seat ventilation (front)	○	○	○	○	○
New colors: Luxor Beige, Platinum Gray, Umber (leather interior)	○	○	○	○	●
New colors for two-tone leather interior: Umber/Cream, Umber/Light Tartufo, Black/Titanium Blue	○	○	○	○	○
New color Espresso for natural leather interior and Espresso/Cognac for two-tone natural leather interior	○	○	○	○	○
New wood interior trims: Anthracite Birch, Natural Olive	○	○	○	○	○
Electric roll-up sunscreens on rear side windows	○	○	○	○	○
Audio, communication and driver assistance systems					
Burmester® High-End Surround Sound System	○	○	○	○	○
Compass display on dashboard	○	○	○	○	○
Adaptive cruise control (only in conjunction with Tiptronic S)	○	○	○	○	○
Lane Change Assist	○	○	○	○	○

*not for US



Fig. 23

The familiar range of exterior glazing options with **privacy glass** and **thermally and noise insulated glass** has been extended by a comfort option for the windshield. The new I-number **Heated windshield** allows fast and comfortable starting if the windshield is covered with ice or misted up. Very thin heating wires function using the same principle as for the heated rear window to ensure a clear view to the front. The transport capacity of all Cayenne models can be extended independently of the **roof system with the optional roof rails in Aluminum Look or in Black painted finish** in conjunction with the exterior package Black. The flat roof rails, which are elegantly integrated in the vehicle design, permit mounting of the **roof transport system**, for which a large number of different transport modules are available in the Tequipment range (**note: it is not possible to retrofit the roof rails for mounting the roof transport system**). The maximum roof load is up to 220 lb. The equipment scope of the roof rails additionally includes 3 roof protection strips, which also have a corresponding Aluminum Look or Black finish.

The adaptive **damper control Porsche Active Suspension Management (PASM)** familiar from the air suspension with PASM (standard for the Cayenne Turbo) is now available for the first time for all Cayenne models in conjunction with the steel spring suspension. Like with the air suspension, the driver has the option of choosing from 3 different damper settings. Depending on the driving style and road surface condition, the damper forces are adapted continuously at all 4 dampers independently of each other. **The setting spread of the 3 programs „Comfort,“ „Normal“ and „Sport“ is much more pronounced** so that the driver can specifically select „Comfort“ on poor roads or the „Sport“ program for a sporty driving style and in order to reduce body movements.

PTV Plus is a new system designed to increase driving dynamics and stability (for the Cayenne, Cayenne S and Cayenne Turbo). PTV Plus functions with **variable torque distribution at the rear wheels** and an **electronically regulated rear differential lock**. Depending on the steering angle, driving speed, gas-pedal position and yaw rate, PTV Plus enhances steering response

and precision by **selective braking intervention** at the right or left rear wheel. Specifically, this means that when driving dynamically into a corner, slight brake pressure is applied to the inside rear wheel. As a result, the **rear wheel on the outside of the curve receives a higher drive force** and permits **additional angular momentum in the steering direction**. The result is **direct and dynamic steering into the curve**. PTV Plus significantly increases agility and steering precision at low and medium speeds. The electronically regulated multi-plate clutch of the rear differential lock ensures demand-based force distribution to the wheels. This in turn guarantees **greater traction and driving stability** at high speeds, when driving quickly through curves and if the wheels spin during off-road operation. When driving on different road surfaces and in wet and snowy conditions, the system also demonstrates its strengths to ensure outstanding vehicle stability in conjunction with Porsche Traction Management (PTM) and Porsche Stability Management (PSM). In off-road operation or adverse conditions due to bad weather, PTV Plus prevents the rear wheels from spinning – also when towing

a trailer. The rear differential lock can be fully locked by means of the off-road switch in the center console.

The **Porsche Ceramic Composite Brake (PCCB)** is now also available for the Cayenne and the Cayenne Diesel with a wheel size of 19 inches or greater. It's carbon fiber-reinforced, cross-drilled and internally vented ceramic brake discs with a diameter of 15.35 inch on the front axle and 14.57 inch on the rear axle offer constant braking performance at the highest level, particularly when subjected to exceptionally high loads. The crucial advantage of the ceramic brake system is the extremely low weight of the brake discs. They are around 50% lighter than cast-iron discs of comparable design and size. This reduces the rotating masses in particular. This in turn improves grip and enhances driving and tire comfort, particularly on uneven roads.

A **sports exhaust system** is now also available for the Cayenne and Cayenne S in conjunction with the new Tiptronic S. Featuring a modified main silencer and 2 nano-coated twin tailpipe trims in the design of the Cayenne Turbo made of high-gloss polished aluminum, this system visually and acoustically enhances the vehicle. The Sport sound is set using the standard Sport button.

In addition to a **new wheel design for all standard and optional wheels**, the existing range will be supplemented by **all-season tires for 20-inch alloy wheels**. These tires of size 275/45 R 20 are suitable for year-round use up to a maximum speed of 149 mph.



Fig. 24: Lane Change Assist (LCA)

For the first time, the options available for the new Cayenne models also include a **three-spoke sports steering wheel with shift paddles** made of alloy in addition to multi-function steering wheels with different trims. Located ergonomically behind the left and right spokes of the steering wheel, these paddles allow especially comfortable and sporty gear shifting.

Two **new driver assistance systems** are optionally available for all Cayenne models to increase comfort and relieve the strain on the driver particularly on long highway journeys or during city driving. The **adaptive cruise control** (only in conjunction with Tiptronic S) familiar from the Panamera models monitors the area in front of the vehicle by means of a radar sensor system and has been enhanced for the Cayenne models. In conjunction with the standard Porsche Stability Management (PSM), this system provides an additional warning for the driver in addition to the visual and acoustic warning familiar from the Panamera models. If the distance from the vehicles in front decreases further

and the driver has not reacted to the visual and acoustic warnings of the system, there is a perceptible braking jolt to warn the driver even if the adaptive cruise control is in passive mode. The programmable speed range extends from 19 to 130 mph.

With **Lane Change Assist (LCA)**, Porsche for the first time offers a vehicle assistance system that monitors the area at the side behind the vehicle as well as the blind spot next to the vehicle by means of radar sensors fitted in the rear bumper. Above a speed of 19 mph, this system informs the driver about vehicles that are located at the side behind the vehicle or in the blind spot. A warning is provided by a visual signal in the exterior mirrors. Lane Change Assist therefore increases comfort on highways in particular, but it does not intervene in vehicle control and can also be deactivated at any time by means of a separate button in the driver's door control panel.

In addition to the **driver memory package** with the option of storing the positions of the driver's seat and exterior mirrors, **14-way power seats with memory package** are also optionally available for the driver and front passenger. This option includes electrical steering column adjustment, 4-way lumbar support, electric seat cushion extension as well as memory functions for a large number of seat and vehicle settings (optionally available without additional charge for the Cayenne Turbo). The **adaptive sports seats with memory package (18-way)** fitted as standard on the Cayenne Turbo feature more pronounced side bolsters and a different seam pattern on the seat centers of the front and rear seats. In addition to the adjustment options of the memory package, these seats also permit adjustment of the side bolsters on the seat cushion and backrest in order to ensure optimum lateral support in every driving situation.

A further highlight is the **seat ventilation** optionally available for all Cayenne models (only in conjunction with seat heating and memory package or seat heating and adaptive sports seats with memory package) for the front seats. This permits three-stage ventilation of both front seats that can be operated at the same time as the also optional seat heating (standard for the Cayenne



Fig. 25: Seat ventilation

Turbo). The front passengers can then individually adjust the optimum seat climate as desired.

In order to protect passengers in the rear against the sun or to prevent other people from looking in from outside, **electric roll-up sunscreens for the rear side windows** are available for all Cayenne models. These blinds can be operated conveniently by the switches for the electric power windows, also from the driver's seat.

The range of sound systems has been extended by the **Burmester® High-End Surround Sound System**. This comprises 16 individually controllable speakers with a 300 W active subwoofer and a total output of more than 1,000 W. The acoustically effective diaphragm area of over 372 sq in creates a natural, rich and consistent surround sound.



Fig. 26: Compass display on dashboard

A **high-quality compass display on the dashboard** is optionally available for all Cayenne models. The analog display of the compass indicates the compass direction by means of a rotating compass rose. This is supplemented by a digital display showing the altitude and degree heading of the driving direction.

A comprehensive range of **Exclusive options** will again be available for the new Cayenne. As with the sportscars and the Panamera, this range provides visual and technical styling options for the exterior and interior of the new Cayenne models. A large number of these Exclusive products will also be available from the **Equipment range** for subsequent enhancement of vehicles. An overview of the corresponding options is provided in the section „Product Equipment - Exclusive and Equipment“ in this Product Information.

1.2.4 Audio and communication

The state-of-the-art **infotainment systems** familiar from the Panamera are also available for the Cayenne. The audio and communication systems of the Cayenne meet the highest technical standards and have been optimized to provide enhanced user friendliness. Attention has therefore also been paid to ensuring that the systems feature only the highest quality materials.

A four-level choice of sound systems

is available for the new Cayenne. The standard CDR-31 audio system already offers great quality sound. If the customer chooses the optional (standard on the Cayenne Turbo) Porsche Communication Management (PCM) including navigation module, he is guaranteed a superior sound experience. Other options are the familiar **BOSE® Surround Sound System** (standard on the Cayenne Turbo) with an increased power output of 585 W as well as the new **Burmester®**

High-End Surround Sound System

with output of over 1,000 W.

The **standard CDR-31 audio system** has an extremely high-quality user interface. The look, feel and central functions correspond to the latest PCM generation. The main feature of the new audio system generation is a **7-inch TFT display with touchscreen**. All the functions (except for volume) of the CDR-31 system can be controlled by touching the color screen. This allows fast and simple navigation through the various menus. The standard CDR-31 already has a sound system with **10 speakers** divided into 4 channels with a total output of **100 W** and can be used to play audio CDs and music in MP3 format (formats: mp3, aac, wma).

Extended range of personalization options - for more emotion and character in the new Cayenne models:

- New driver assistance systems contribute to increased comfort and relieve the strain on the driver
- With the heated windshield, auxiliary heater, seat ventilation for the front seats or 4-zone climate control, the Cayenne models are perfectly equipped for all climatic conditions
- Porsche Torque Vectoring Plus (PTV Plus), Porsche Active Suspension Management (PASM) for the steel spring suspension
- Emotions are also created by sound – either for all Cayenne models with the Burmester® High-End Sound System or the sports exhaust system for Cayenne and Cayenne S



Fig. 27: Porsche Communication Management (PCM) including Navigation module



Fig. 28: BOSE® Surround Sound System

The **latest PCM generation including navigation module** has the following main new features compared with the previous version:

- **High-resolution 7-inch WVGA** (Wide Video Graphics Array) screen
- **3D navigation map** incl. **City and Terrain model with superimposed satellite map**
- **Speed limit display** in PCM based on navigation data
- **Lane information display at complex junctions**
- Map display in the **instrument cluster**
- **Energy management** display (Cayenne S Hybrid)

With the navigation function, users have the option of switching the map view between the new **3D representation** of the **Terrain and City models** or the familiar perspective or two-dimensional representations. The 3D Terrain model with superimposed satellite map permits an even more detailed and realistic representation. A **speed limit display**

shows any speed limits that apply on the roads included in the map material either in PCM (Car display) or in the TFT display in the instrument cluster (the availability of the speed limit display depends on the relevant database status of the map material). The navigation module has an integrated hard drive for fast route calculation. Three alternative route suggestions can be displayed for selection in each case. The lane information display at complex junctions is a new feature for even easier orientation when driving.

The **PCM** system (standard on the Cayenne Turbo with BOSE® Surround Sound System) includes **11 speakers** divided into 7 channels, an external amplifier and a **total output of 235 W**. The integrated CD/DVD player supports audio playback of audio and video DVDs and plays music in MP3 format (formats: mp3, aac, wma, wav, Dolby Digital, mlp, dts). The familiar audio interface has been further improved and permits digi-

tal audio transmission that results in higher sound quality in the new Cayenne (also with an iPod®). The standard Apple iPod® USB cable (supplied by Apple) is used as the connecting cable; the previous serial cable has been deleted.

With the new PCM generation, a function for **audio transmission via Bluetooth®** is available for the first time on the Cayenne. This allows audio data to be transferred from external devices such as music players or cell phones via the Bluetooth® interface of PCM if this function is supported by the device.

The optional **BOSE® Surround Sound System** (standard on the Cayenne Turbo) comprises a total of **14 speakers**, a **200 W active subwoofer** with Class D driver and 200 mm diaphragm diameter as well as 9 amplifier channels to provide an impressive sound experience. A total output of **585 W** is available with this system. In conjunction with PCM, the system now opens up the



Fig. 29: Burmester® High-End Surround Sound System

impressive audio spectrum of digital 5.1 recordings when playing music from audio or video DVDs.

The **Burmester® High-End Surround Sound System** has been adapted specifically for the new Cayenne and offers superior total output and sound quality. The performance data figures provide impressive proof of this: **16** individually controlled **speakers** including a **300 W active subwoofer** with Class D driver and 250 mm diaphragm diameter, 16 amplifier channels and a **total output** of more than **1,000 W**. The acoustically effective **diaphragm area** is over **2,400 cm²**. In conjunction with PCM, the Burmester® High-End Surround Sound System naturally also reproduces digital 5.1 recordings when playing back music from audio or video DVDs. The consistent use of the highest quality materials and proven state-of-the-art technologies from the Burmester® home hi-fi area ensure ultimate sound quality in the entire signal chain. In the fully-active system design, every speaker has its own amplifier and maximum signal pro-

cessing capabilities. The **AMT tweeter** (Air Motion Transformer ribbon tweeter) uses a folded sheet as the diaphragm. The extremely small vibrating mass with an unrivaled, large diaphragm area produces extremely precise, clean and clear high-frequency sound from very low up to extremely high volumes. In addition to the usual sound adjustments such as treble/bass, balance and fader, the Burmester High-End Surround Sound System also allows additional sound settings, e.g. the Live function or Sound Conditioner function.

1.2.5 Safety

The **brake systems of the Cayenne models** are designed to cope with the high power of the vehicles and therefore offer the high braking performance typical for Porsche. Larger brake discs are therefore used at the front in all cases for the new Cayenne models: At the front, 6-piston aluminum monobloc fixed-caliper brakes act on brake discs with a diameter of 13.8 inch on the Cayenne and Cayenne Diesel. These brake discs have a diameter of 14.2 inch on the Cayenne S and Cayenne S Hybrid and 15.4 inch on the Cayenne Turbo. At the rear, braking is performed by 4-piston aluminum monobloc fixed-caliper brakes equipped with brake discs with a diameter of 13 inch on the Cayenne, Cayenne Diesel, Cayenne S and Cayenne S Hybrid and 14.1 inch on the Cayenne Turbo. The brake discs are internally vented for better heat dissipation. Composite brake discs with an aluminum bell and gray cast-iron friction ring are fitted as standard on the front axle of the Cayenne

Turbo in order to reduce the weight and unsprung masses.

As with all other Porsche models, the race-proven, high-performance ceramic brake system **Porsche Ceramic Composite Brake (PCCB)** is now also optionally available for the Cayenne and Cayenne Diesel. The PCCB is available for the Cayenne Turbo as from a wheel size of 20 inches and features ceramic brake discs with a diameter of 16.1 inch at the front. A wheel size of at least 19 inches is required for all other Cayenne models since the ceramic brake discs at the front have diameter of 15.4 inch. On the rear axle, brake discs with a diameter of 14.6 inch are used for all models.



Fig. 30: Brake system of Cayenne Turbo

The standard **Porsche Stability Management (PSM)** has been adapted to the new Porsche Traction Management (PTM) and includes all the familiar functions from the previous models. In conjunction with the optional adaptive cruise control, PSM also uses the front radar sensor to anticipate critical situations, initiating pre-filling of the brakes even sooner and thus also making the full braking pressure of the brake assist system available even earlier. Even if the adaptive cruise control is deactivated, the system detects vehicles driving in front and prepares the brake assist system if the distances become smaller. In

addition to a visual and acoustic warning, the driver is also warned by means of a short braking jolt if the distance decreases further.

A **standstill management** function is also realized for the Cayenne models with PSM. This makes things much easier for the driver by preventing the vehicle from rolling away in the opposite direction to the desired driving direction when the vehicle is stopped on a hill. This significantly improves move-off comfort on uphill gradients. The **electric parking brake** increases comfort and

safety when the vehicle is parked. The electric parking brake is released automatically upon moving off.

Tire Pressure Monitoring (TPM) is standard for all Cayenne models. This system permanently monitors the tire pressure for each individual wheel. The driver can conveniently call up the tire pressure values on the instrument cluster display and is also informed by the system if there are critical deviations from the required values.

Service brake	Cayenne/Cayenne Diesel*				Cayenne S/Cayenne S Hybrid				Cayenne Turbo			
	FA		RA		FA		RA		FA		RA	
	MY 10	MY 11	MY 10	MY 11	MY 10	MY 11	MY 10	MY 11	MY 10	MY 11	MY 10	MY 11
Brake caliper type	Aluminum monobloc fixed-caliper brake											
Brake disc material	Steel, internally vented											
Brake caliper color	Black				Silver-colored				Red			
Number of pistons	6		4		6		4		6		4	
Brake disc diameter [inch]	13.0	13.8	13.0		13.8	14.2	13.0		14.5	15.4	14.1	
Brake disc thickness [inch]	1.3	1.34	1.1		1.34	1.4	1.1		1.4	1.5	1.1	

*not for US



Fig. 31: Front and rear view of Cayenne Turbo at night

To ensure good visibility at night and a high level of road safety, all Cayenne models are equipped with powerful headlights, auxiliary main-beam headlights, fog lights as well as LED daytime driving lights and LED position lights in the front light units. New features include the **Bi-Xenon main headlights including Porsche Dynamic Light System (PDLS)** already standard on the Cayenne Turbo. The Porsche Dynamic Light System (PDLS) includes **static and dynamic cornering light** as well as a **speed-dependent headlight control function**. This function raises the light cone of the low beam light at higher speeds in order to improve visibility. The **adverse weather function** reduces reflections and glare for the driver by lowering the light cone, e.g. in fog.

The tail lights are realized fully with LED technology on all models and include a rear fog light as well as **adaptive brake lights with pulsating luminous intensity depending** on the severity of braking. These lights also improve active safety thanks to their very short response time. In the event of an accident, the occupants of the new Cayenne models are protected as standard by driver and passenger airbags and curtain airbags as well as side airbags for the front passengers. **Side airbags in the rear** are also available as an option.

The **body design is crucial for passive safety**. Crash-relevant structures must not just possess very high rigidity, but must also dissipate energy and therefore have elastic properties. That is why modern production methods in the steel industry are used for the bodyshell. The steels manufactured in these special processes, e.g. so-called hot-formed steels, are adapted to the locally different loads. They surround the passenger cell like a cage and thus protect the vehicle occupants. At the same time, they also offer the possibility of saving weight due to the comparatively thin-walled design.

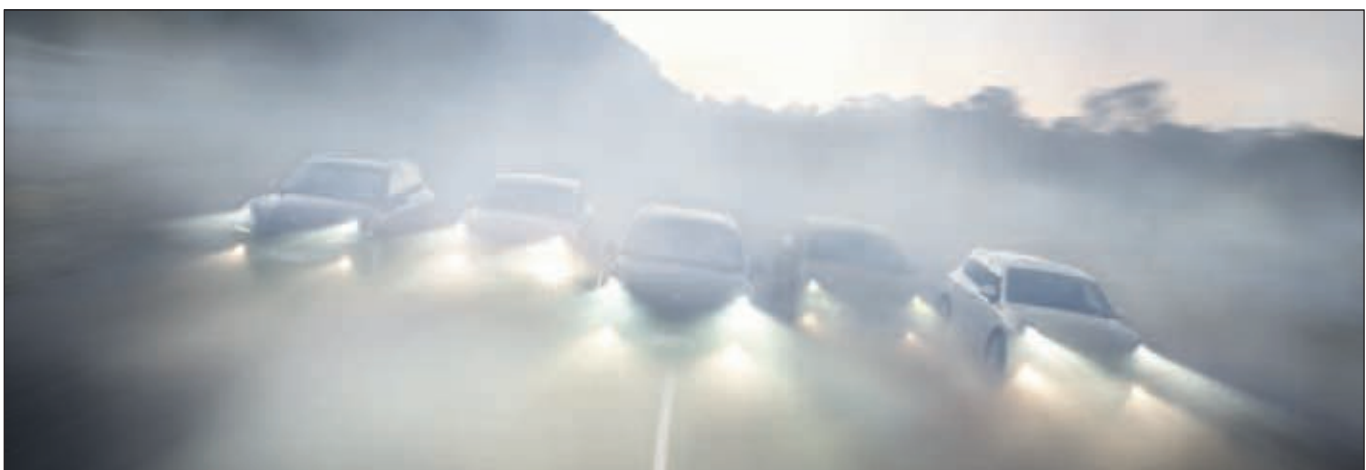


Fig. 32

1.3 The new Cayenne models – overview of highlights

Description based on US model, **important changes compared with the previous models are shown in bold**

New features and highlights of the new Cayenne models Note: Please refer to the overview of individual options for availability dates ● = Standard ○ = Individual option W = Optional without extra charge	Cayenne	Cayenne Diesel*	Cayenne S	Cayenne S Hybrid	Cayenne Turbo
Overall vehicle					
Completely new exterior design	●	●	●	●	●
Completely new interior design	●	●	●	●	●
Extended wheelbase + 1.6 inch for more legroom in the rear	●	●	●	●	●
Use of modern engine technology	●	●	●	●	●
Significant weight reduction of up to 408 lb (model-dependent)	●	●	●	●	●
Significant reduction in fuel consumption by up to 25%, depending on model	●	●	●	●	●
Reduction in CO₂ emissions by up to 26%, depending on model	●	●	●	●	●
Compliance with all worldwide type approval regulations, e.g. EU5 in Europe	●	●	●	●	●
Significantly improved performance	●	●	●	●	●
Use of the innovative parallel full hybrid concept in the Cayenne S Hybrid				●	
Improved day-to-day usability through improved standard equipment, larger luggage compartment volume and variable rear seat bench	●	●	●	●	●
Greater on-road orientation while still meeting all customer-relevant off-road requirements	●	●	●	●	●
Engine					
Increased power of 3.6 l V6 engine, + 10 hp to 300 hp	●				
Increased torque of 3.6 l V6 engine, +11 lb ft to 295 lb ft	●				
Increased power of 4.8 l V8 engine, + 15 hp to 400 hp			●		
Parallel full hybrid				●	
Engine technology					
Thermal management	●	●	●	●	●
Vehicle electrical system recuperation	●	●	●	●	●
Brake energy recovery				●	
Variable deceleration fuel cutoff	●		●	●	●
Auto Start Stop function (for Cayenne only in conjunction with Tiptronic S)	○	●	●	●	●
Power transmission					
6-speed manual transmission with dual-mass flywheel and upshift indicator in instrument cluster	●				
8-speed Tiptronic S with Auto Start Stop function and operation using the steering wheel	○	●	●	●	●
Active all-wheel drive with electronic and map-controlled fully variable multi-plate clutch	●		●		●
Permanent all-wheel drive with self-locking center differential , additionally variable torque distribution on the rear axle by selective braking of wheel on inside of curve		●		●	
Chassis					
New wheel design	●	●	●	●	●
New tire generation optimized for rolling resistance, performance, handling and weight	●	●	●	●	●
Tire Pressure Monitoring (TPM)	●	○	●	●	●
18-inch Cayenne wheel optional without extra charge for Cayenne S and Cayenne S Hybrid	●	●	W	W	

*not for US

New features and highlights of the new Cayenne models	Cayenne	Cayenne Diesel*	Cayenne S	Cayenne S Hybrid	Cayenne Turbo
Note: Please refer to the overview of individual options for availability dates					
● = Standard					
○ = Individual option					
W = Optional without extra charge					
Brake system					
Brake discs with diameter of 13.8 inch at front, 13.0 inch at rear	●	●			
Brake discs with diameter of 14.2 inch at front, 13.0 inch at rear			●	●	
Brake discs with diameter of 15.4 inch at front, 14.1 inch at rear					●
Electric parking brake	●	●	●	●	●
Body					
Slats in side air intakes painted Black			●	●	●
26.4 gal fuel tank (3.4 gal reserve for Cayenne S Hybrid, 4.0 gal reserve for Cayenne, Cayenne S and Cayenne Turbo)	W	W	W	W	●
Power dome on hood	●	●	●	●	
Distinctive power dome on hood					●
„Porsche“ logotype and model designation on tailgate in Chrome-look	●	●	●	●	●
„hybrid“ designation on front fenders left and right				●	
Electrics					
Electrically adjustable heated exterior mirrors, electrically retractable (also by remote control)	●	●	●	●	●
Automatically dimming exterior and interior rear view mirrors, standard for Cayenne Turbo	○	○	○	○	●
ParkAssist (front and rear) with display on central screen	○	○	○	○	●
Cruise control, standard for all models	●	●	●	●	●
CDR-31 audio system with 7-inch color screen (touchscreen)	●	●	●	●	
Porsche Communication Management (PCM) incl. navigation module and 235 W output	○	○	○	○	●
BOSE® Surround Sound System with a total output of 585 W and 14 speakers	○	○	○	○	●
Lighting system					
Bi-Xenon headlights incl. Porsche Dynamic Light System (PDLS)	○	○	○	○	●
Front light units with daytime driving lights, position light and turn signal in LED technology	●	●	●	●	
Daytime driving lights with 4 LED spotlights in each headlight					●
Driving light assistant, standard for all models	●	●	●	●	●
LED tail lights with adaptive brake lights	●	●	●	●	●
Instruments					
5 round instruments integrated in instrument cluster	●	●	●	●	●
Instrument cluster with high-resolution 4.8-inch TFT color display	●	●	●	●	●
Instrument cluster with silver-colored center tube			●	●	
Instrument dials black with „turbo“ logo					●
Digital boost-pressure gauge on the TFT color display					●
Air conditioning					
Climate control, standard for all models	●	●	●	●	●

*not for US

New features and highlights of the new Cayenne models					
Note: Please refer to the overview of individual options for availability dates					
● = Standard					
○ = Individual option					
W = Optional without extra charge					
	Cayenne	Cayenne Diesel*	Cayenne S	Cayenne S Hybrid	Cayenne Turbo
Interior					
8-way power seats (front), electrical adjustment	●	●	●	●	
Adaptive sports seats with memory package	○	○	○	○	●
Rear seat system with split-folding seat bench (40/20/40), manual fore/aft adjustment and backrest adjustment	●	●	●	●	●
Interior trim Black (high-gloss), optional without extra charge for Cayenne Turbo	●	●	●	●	W
Brushed Aluminum interior package	○	○	○	○	●
Trim strips silver-colored	●	●	●	●	●
Luggage compartment and storage					
Luggage compartment capacity: 23.7 cu ft (Cayenne S Hybrid: 20.5 cu ft) , with rear seats in cargo position 62.9 cu ft (Cayenne S Hybrid: 59.7 cu ft; Cayenne Turbo: 60.2 cu ft) max. loading capacity	●	●	●	●	●
New storage concept in passenger compartment	●	●	●	●	●
Center console armrest, fold-up and with sliding adjustment in longitudinal direction	●	●	●	●	●
Bottle holders in the door panels at front and rear	●	●	●	●	●
Individual options – New features					
Heated windshield	○	○	○	○	○
8-speed Tiptronic S with Auto Start Stop function	○	●	●	●	●
Porsche Active Suspension Management (PASM) for steel spring suspension	○	○	○	○	
Porsche Torque Vectoring Plus (PTV Plus)	○		○		○
Porsche Ceramic Composite Brake	○	○	○	○	○
Sports exhaust system (only in conjunction with Tiptronic S)	○		○		
Completely new wheel design for all wheels	○	○	○	○	○
20-inch All-Season tires	○	○	○	○	○
Full-size spare wheel in luggage compartment, stored upright	○	○	○		○
Collapsible spare wheel in luggage compartment, stored upright				○	
Adaptive cruise control (only in conjunction with Tiptronic S)	○	○	○	○	○
Lane Change Assist	○	○	○	○	○
Seat ventilation (front)	○	○	○	○	○
Three-spoke sports steering wheel with shift paddles	○	○	○	○	○
Rear side airbags	○	○	○	○	○
Anthracite Birch interior package	○	○	○	○	○
Natural Olive interior package	○	○	○	○	○
Burmester® High-End Sound System with over 1,000 W	○	○	○	○	○
High-quality compass display on dashboard	○	○	○	○	○
Individual options – modified features					
Running boards with new design	○	○	○	○	○
Wheel arch extensions in Black with side door protection moldings	○	○	○	○	○
Bi-Xenon headlights incl. Porsche Dynamic Light System (PDLS)	○	○	○	○	●
ParkAssist (front and rear) incl. graphic display on central screen	○	○	○	○	●

*not for US

New features and highlights of the new Cayenne models	Cayenne	Cayenne Diesel*	Cayenne S	Cayenne S Hybrid	Cayenne Turbo
Note: Please refer to the overview of individual options for availability dates					
● = Standard					
○ = Individual option					
W = Optional without extra charge					
Reversing camera incl. ParkAssist (front and rear) with display of dynamic guide lines	○	○	○	○	○
Panoramic roof system, 2-part with enlarged field of vision	○	○	○	○	○
Roof rails incl. roof protection strips in Aluminum Look matte as a precondition for fitting the roof transport system	○	○	○	○	○
Roof rails incl. roof protection strips in Black painted finish as a precondition for fitting the roof transport system	○	○	○	○	○
Exterior package Black (high-gloss)	○	○	○	○	○
Off-road underbody protection package without electronically controlled rear differential lock	○	○	○	○	○
Light comfort package with LED technology	○	○	○	○	○
14-way power seats (front) with memory package with extended functions	○	○	○	○	W
Adaptive sports seats incl. memory package with extended functions	○	○	○	○	●
Three-spoke multi-function steering wheel with new design	○		○	○	○
Roll-up sunscreens on rear side windows, electric	○	○	○	○	○
Ski bag, removable	○	○	○	○	○
BOSE® Surround Sound System with 585 W output	○	○	○	○	●
Porsche Rear Seat Entertainment with touchscreen monitors	○	○	○	○	○
Universal audio interface for PCM with USB connection for iPod	●	○	●	●	●
Bluetooth handsfree phone interface for PCM	●	○	●	●	●
Individual options - changed option structure					
Automatically dimming interior and exterior rear view mirrors available separately and standard for Cayenne Turbo	○	○	○	○	●
Roof rails in Aluminum Look matte incl. roof transport system	○	○	○	○	○
Roof rails in Black incl. roof transport system	○	○	○	○	○
Heated seats, front - available separately without heated steering wheel	○	○	○	○	
Heated seats, front and rear - available separately without heated steering wheel	○	○	○	○	●
Heated steering wheel - available separately without heated seats	○	○	○	○	●
Colors					
Solid colors - exterior: Black, Sand White	●	●	●	●	W
Metallic paint - exterior: Classic Silver Metallic, Jet Black Metallic, Dark Blue Metallic, Meteor Gray Metallic, Umber Metallic, Jet Green Metallic, Auburn Metallic	○	○	○	○	●
Special colors - exterior: Sand Yellow, Amethyst Metallic	○	○	○	○	○
Standard colors - interior: Black, Platinum Gray, Luxor Beige	●	●	●	●	
Standard colors for leather interior: Black, Platinum Gray, Luxor Beige, Umber	○	○	○	○	●
Two-tone leather interior: Umber/Cream, Umber/Light Tartufo, Black/Titanium Blue	○	○	○	○	○
Natural leather: Espresso	○	○	○	○	○
Two-tone natural leather: Espresso/Cognac	○	○	○	○	○

*not for US

1.4 Dates and start-up restrictions

The complex **production start-up** of the 5 new Cayenne models will take place in a total of **4 blocks**. Together with this staggered production start-up, there will also be **staggered release of the individual options**. Due to the production restrictions during the first production block (1A, 1B, 1C) from week 05/2010

to week 16/2010, the first vehicles available for the markets cannot be ordered freely. The vehicles (Cayenne S and Cayenne Turbo, blocks 1A and 1B) from this period are therefore available only in conjunction with previously **defined market launch packages**. As from production block 1C in week 14/2010, all available models can be freely configured taking into consideration the start-

up dates applicable to the respective optional items. Please refer to the product equipment overview for information on the start-up dates for the individual options. Details of introduction dates and the defined market launch packages are provided in the following sections.

1.4.1 Dates

Date	Cayenne S, Cayenne Turbo	Cayenne S Hybrid	Cayenne Diesel (not for US)	Cayenne
Lifting of press restrictions	02.25.10			
Autoshow reveal	Geneva, 03.04. - 03.14.10			
Presentation to the press	04.09. - 04.28.10		06.14. - 06.25.10	
Start of production (SOP) (ZP.8)	Week 5/2010	Week 17/2010		Week 27/2010
Production block	Block 1 A/B C (week 14/09)	Block 2		Block 3
Market launch (POS)				
EU (LHD) w/o Turkey	Week 18/2010 (05.08.2010)	Progressively from 06/2010	Progressively from 06/2010	Progressively from 07/2010
EU (RHD)	Week 21/2010 (05.29.2010)			
Turkey	As of 08.01.2010	As of 08.01.2010	As of 08.01.2010	As of 08.01.2010
PCN	Week 35/2010	Week 44/2010	-	Progressively from week 48/2010
PCNA	Week 27/2010 (07.10.2010)	Progressively from 10.23.2010	-	Progressively from 09/2010
PJ (LHD)		at the earliest from 06/2011	-	Progressively from 07/2010
Mexico		Progressively from 10.23.2010	-	
Puerto Rico		Progressively from 06/2010	-	
Brazil & Argentina	Week 22/2010 (06.05.2010)	Week 26/2010	-	Week 31/2010
RoW (LHD)	Week 29/2010 (07.24.2010)	Progressively from 06/2010	Progressively from 08/2010	Progressively from 07/2010
RoW (RHD)				

1.4.2 Market launch packages

A total of 3 market launch packages have been defined for the Cayenne S and the Cayenne Turbo for the market launch vehicles (blocks 1A and 1B). The exterior colors Sand White, Classic Sil-

ver Metallic, Meteor Gray Metallic and Jet Black Metallic will be offered in conjunction with these vehicles. The packages "Basic," "Sport" and "Luxury" will be available similar to the market launch for the Panamera models:

I-no.	Description ○ = Package content ● = Standard	Cayenne S	Cayenne S	Cayenne Turbo	Cayenne S	Cayenne Turbo
		Basic	Sport		Luxury	
	Interior color	Black (basic)	Black (leather)		Platinum Gray (leather)	
	Trim	Basic	Brushed Aluminum		Anthracite Birch	
F09	19-inch Cayenne Design II wheel	○				
3S1	Roof rails incl. roof protection strips in Aluminum Look matte	○	○	○	○	○
1D2	Trailer hitch with removable ball joint	○	○	○		
PA1/PA2	Automatically dimming exterior and interior rear view mirrors	○	○	●	○	●
4A4	Heated seats front and rear	○	○	●	○	●
1NP	Wheel hub cover with colored Porsche Crest	○	○	○	○	○
7T1	Porsche Communication Management (PCM) incl. navigation module	○	○	●	○	●
7X2	ParkAssist (front and rear)	○	○	●	○	●
8JE	Bi-Xenon headlights incl. Porsche Dynamic Light System (PDLS)	○	○	●	○	●
2PH	Heated three-spoke steering wheel	○	○	●	○	●
CZ4	21-inch 911 Turbo II wheel with wheel arch extension			○		
CK0	21-inch SportEdition wheel with wheel arch extension		○			
0AW	Porsche Dynamic Chassis Control (PDCC)		○	○	○	○
1Y1	Porsche Torque Vectoring Plus (PTV Plus)		○	○		
9VL	BOSE® Surround Sound-System		○	●		
PE6	Adaptive sports seats with memory package (18-way)		○	●		
1BK	Air suspension with leveling system and ride height control incl. Porsche Active Suspension Management (PASM)		○	●	○	●

I-no.	Description ○ = Package content ● = Standard	Cayenne S	Cayenne S	Cayenne Turbo	Cayenne S	Cayenne Turbo
		Basic	Sport		Luxury	
7Y1	Lane Change Assist (LCA)		○	○	○	○
PP5/ PP6	Light comfort package		○	○	○	○
5ZF	Porsche Crest on headrests, front and rear (EXC)		○	○	○	○
CP5	20-inch RS Spyder Design wheel				○	○
2JX	Stainless steel skid plates (front and rear)				○	○
VW5	Thermally and noise insulated glass				○	○
QR1	Compass display on dashboard				○	○
9VJ	Burmester® High-End Surround Sound System				○	○
7D7	6-disc CD/DVD changer				○	○
7X8	Reversing camera incl. ParkAssist (front and rear)				○	○
QH1	Voice control				○	○
8T3	Adaptive cruise control				○	○
4F2	Porsche Entry & Drive				○	○
9AH	4-zone climate control				○	○
PE5/Q2J	14-way power seats (front) with memory package				○	○
4D3	Seat ventilation (front)				○	○
6NN	Alcantara rooflining			●	○	●
3Y8	Electric roll-up sunscreen on rear side windows				○	○



Fig. 33

2 The new drive systems

An enhanced generation of engines based on the engines familiar from the previous models is used for the new Cayenne models. The Cayenne features the performance-enhanced 3.6 l V6 naturally aspirated engine, the Cayenne Diesel the high-torque 3.0 l V6 turbo diesel engine, and the Cayenne S and Cayenne Turbo the 4.8 l V8 engine. The Cayenne S Hybrid is the first Porsche model offered with innovative parallel full hybrid drive technology and features a

3.0 l V6 supercharged engine and a 34 kW electric machine (motor/generator). It was possible to meet the ambitious goals for reduced fuel consumption and CO₂ emissions for all engines. Depending on model, the fuel consumption was reduced by up to 23% and the CO₂ emissions by up to 26%, in European testing.

The new-generation engines have the following **characteristics:**

Thanks to improved efficiency and the use of the latest engine technology, it

was possible to significantly reduce the fuel consumption values for all engines compared with the previous models. As a result of the reduction in fuel consumption of up to 23 %, depending on model, it was also possible to reduce CO₂ emissions in European testing. All emission limits are met worldwide.

	Cayenne	Cayenne Diesel*	Cayenne S	Cayenne S Hybrid	Cayenne Turbo
No. of cylinders	6	6	8	6	8
Design	V-engine				
Cylinder angle	15°	90°			
Valves per cylinder	4				
Injection system	Direct fuel injection				
Camshaft control	Intake and exhaust camshafts	-	VarioCam Plus	Intake camshafts	VarioCam Plus
Displacement [cm ³]	3,598	2,967	4,806	2,995	4,806
Bore x stroke [mm]	89 x 96.4	83 x 91.4	96 x 83	84.5 x 89	96 x 83
Compression ratio	11.7:1	16.8:1	12.5:1	10.5:1	10.5:1
Power (DIN) at engine rpm	220 kW/300 hp 6,300	176 kW/240 hp 2,000 - 2,250	294 kW/400 hp 6,500	245 kW/333 hp 5,500 - 6,500	368 kW/500 hp 6,000
Max. torque at engine rpm	295 lb ft 3,000	406 lb ft 4,000 - 4,400	369 lb ft 3,500	325 lb ft 2,500 - 5,000	516 lb ft 2,250 - 4,500
Intake charging	-	turbocharger	-	supercharger	2 turbochargers

*not for US

2.1 Development goals and enhancements

The **development goals** for the new engines were:

- Lower fuel consumption and emissions through efficiency enhancements and use of state-of-the-art engine technology

- Reduced weight through lightweight design measures
- Best-in-class performance through high engine power and high maximum torque with unchanged displacement values

In comparison with the previous models, the new Cayenne engines feature the following main **enhancements** and **new technologies**:

Enhancements and new technologies	Benefit					
		Cayenne	Cayenne Diesel*	Cayenne S	Cayenne S Hybrid	Cayenne Turbo
<ul style="list-style-type: none"> • = Standard ○ = Option 						
Reduced fuel consumption and emissions						
Thermal management using a map-controlled thermostat and integrated flow suppression	Fuel saving (1.5% in NEDC) through faster engine warm-up	•		•	•	•
	Optimized transmission efficiency	•	•	•	•	•
Vehicle electrical system recuperation	Reduced fuel consumption	•	•	•	•	•
Variable deceleration fuel cutoff	Reduced fuel consumption	•		•	•	•
Start Stop system with optimized starter (Hybrid with electric machine (motor))	Fuel consumption is reduced by up to 5% in the NEDC by switching off the engine, e.g. at traffic lights	○	•	•	•	•
Demand-controlled oil pump	Reduced fuel consumption		•	•	•	•
Reduced weight through lightweight design measures						
Timing-case cover and valve cover made of magnesium, lightweight camshaft controllers, aluminum screws, new crank drive	Weight reduction by approx. 15.4 lb			•		•
Best-in-class performance						
New intake system	Better volumetric efficiency of the cylinders			•		
Dethrottling of intake section by new measuring system for mass air flow	Enhanced performance through reduced intake air resistance – pressure-controlled measurement			•	•	•
	Optimized intake air resistance of the mass air flow meter	•				

* not for US

2.2 Important fuel-saving measures

In addition to the significant weight reduction in all Cayenne models, mainly in the body and chassis, numerous detail measures and the use of the state-of-the-art engine technology have contributed to reducing fuel consumption values. The most important new technologies used are as follows:

- Thermal management
- Vehicle electrical system recuperation
- Variable deceleration fuel cutoff
- Auto Start Stop function

2.2.1 Thermal management

All Cayenne engines meet the high demands placed on Porsche engines under all operating conditions and therefore also meet the special requirements that apply in hot countries. This is true irrespective of the performance demands, whether on-road, off-road or pulling trailer loads of up to 7,716 lb (for Cayenne only with Tiptronic S) with braked trailers. The cooling power for the V6, V8, diesel and hybrid drive systems is designed correspondingly. The cooling system ensures that the engines run at a favorable operating temperature for optimum and permanent high performance. A further advantage is provided by the low fuel consumption and emission values, since all components reach the optimum operating temperature more quickly.

The new **closed-loop-controlled thermal management system** in the Cayenne models controls thermal processes in the vehicle with the aim of achieving optimum efficiency for the overall system and bringing all components to their optimum operating temperature quickly. Depending on the engine variant, 2 different systems are used for the Cayenne models:

- Thermal management for engine and Tiptronic S (Cayenne, Cayenne S, Cayenne S Hybrid, Cayenne Turbo)
- Thermal management for Tiptronic S (Cayenne Diesel)

The 3 main areas of the **thermal management system** in the Cayenne, Cayenne S, Cayenne S Hybrid and Cayenne Turbo are heat distribution between **combustion engine, transmission and passenger compartment**. The basic goal is to ensure that all components reach their optimum operating temperature as quickly as possible and to also meet the comfort demands of passengers by heating up the cabin quickly. At low temperatures and for cold engine starts in particular, it is important to manage the low amount of available heat in the best possible way. Efficient use of the available heat helps to save fuel, reduce CO₂ emissions and comply with strict emission regulations. The cooling system is part of the thermal management system and has two circuits which can be regulated depending on the coolant temperature. This takes place via a thermostat. The thermostat permits automatic, demand-based suppression of the coolant flow when the engine is cold (cold start). As a result, the engine heats up more quickly and friction, fuel consumption and pollutant emissions are reduced in the warm-up phase. Depending on the increase in

engine temperature, the coolant flow through the engine (small circuit) is then activated during warming up. After this, the coolant radiator is activated (large circuit) depending on the engine operating point and based on a map stored in the engine control. The thermostat control then regulates the coolant temperature depending on the load to ensure that the friction conditions in the engine are adapted perfectly for the respective load point. This thermal management system made it possible to reduce fuel consumption by up to 1.5% above all by shortening the warm-up phase after a cold start.

In addition, all new Cayenne models with Tiptronic S (optional for Cayenne) feature **thermal management for the transmission**. Here also, the aim is to reach the optimum operating temperature as quickly as possible in order to minimize friction losses. For this purpose, the heat exchanger of the cooling system for the new 8-speed Tiptronic S is connected to the engine cooling system. If necessary, this allows the heat of the engine coolant, which is heated up more quickly, to be used to bring the transmission up to its operating temperature.

2.2.2 Vehicle electrical system recuperation

The Cayenne, Cayenne Diesel, Cayenne S, Cayenne S Hybrid and Cayenne Turbo feature the new function of **vehicle electrical system recuperation** as a further fuel-saving measure. Here, some of the kinetic braking energy can be converted into electrical energy via the alternator during vehicle deceleration phases and stored in the starter battery. As a result, the combustion engine has to supply less power to charge the battery through alternator operation during acceleration, which directly results in lower fuel consumption. In the NEDC (New European Driving Cycle), vehicle electrical system recuperation offers a fuel saving of **0.15 l over 100 km**. The starter battery is preferably charged by the usually otherwise lost braking energy during the braking operation. During braking, the alternator power is increased in a targeted manner by the voltage regulator and the recuperated energy is fed into the starter battery. The voltage is then lowered again and the energy can be fed into the vehicle electrical system in order to supply the loads. The increased alternator power acts with a low braking torque on the crankshaft of the combustion engine via the drive belt. This leads to vehicle deceleration and therefore supports the conventional brake system.

A **new intelligent algorithm in the energy management system** evaluates various input variables of the components involved, thereby allowing active coordination of every recuperation operation based on the battery charge condition and driver request. This control operation includes, among others, the engine control, brake pedal sensor, starter battery with sensor system, alter-

nator and the vehicle electrical system. The powerful AGM (Absorbent Glass Mat) battery meets all requirements with respect to battery life in view of the increased number of cycles due to frequent charging and discharge.

2.2.3 Variable deceleration fuel cutoff

Variable deceleration fuel cutoff is an enhancement of conventional deceleration fuel cutoff (note: not for Cayenne Diesel). It involves controlled interruption of the fuel supply in driving situations where the combustion engine is not required to output any power but is kept moving by the inertia mass of the vehicle (overrun, e.g. when driving downhill). Compared with the usual deceleration fuel cutoff systems, which resume fuel injection as from a fixed engine speed, variable deceleration fuel cutoff systems resume fuel injection flexibly depending on the driving situation, which may correspond to an even lower engine speed. Depending on the driving situation, fuel injection can resume even later, thereby saving fuel. The relevant input variables for controlling variable deceleration fuel cutoff are engine temperature, engine rpm as well as throttle valve or gas pedal position.

2.2.4 Auto Start Stop function

All new Cayenne models with the 8-speed Tiptronic S (optional for Cayenne) are equipped with the Auto Start Stop function. This function switches off the combustion engine under defined conditions when the vehicle is stopped and therefore contributes to reducing fuel consumption when the vehicle is stationary:

- Unnecessary engine idling, e.g. when stopped at a traffic light, is prevented
- Fuel consumption and the corresponding emissions are reduced, particularly in city driving
- The noise level is reduced to zero during the stop phase

The Auto Start Stop function can be deactivated and activated by means of a button in the center console. The function becomes available as soon as the engine and transmission reach operating temperature.

If the vehicle is stopped by brake operation and the brake pedal is held, the Auto Start Stop function switches off the engine after approx. 1 second. The green Auto Start Stop symbol in the instrument cluster informs the driver of this. The tachometer reading falls to zero. The selector lever can remain in position D or M. The engine remains stopped even if the lever is shifted to P and N.

If the engine cannot be switched off automatically, the driver is informed about this by a yellow Auto Start Stop symbol in the instrument cluster. The engine is not switched off or restarted again, if for example:

- trailer operation has been detected.
- „Sport“ mode is activated.
- maneuvering or parking is detected, i.e. reverse gear is engaged or the steering wheel is turned at a large angle.
- the automatic air conditioning/heating with residual heat function cannot guarantee that the set temperature can be maintained without running the engine, e.g. at very low and very high outside temperatures.

Restarting is also prevented:

- if the presence of the driver is not guaranteed, i.e. driver's door is open or driver's seat belt is not fastened.
- if the hood is open.

The criteria described were optimized and adjusted in order to ensure that the engine is switched off automatically in as many cases as possible during regular driving operation. The goal was to exploit the fuel-saving potential of the Auto Start Stop function for the driver.

Detailed information on the Auto Start Stop system is provided in the Product Information for the Panamera. Please refer to the overview of country-specific equipment of details of market-specific restrictions for the Auto Start Stop function.

2.3 Engine variants

2.3.1 V6 gasoline engines

Modern V6 engines with direct fuel injection (DFI) are used for the new Cayenne and new Cayenne S Hybrid. The engine of the Cayenne is based on the 3.6 l V6 naturally aspirated engine familiar from the previous model. For the new Cayenne S Hybrid with innovative parallel full hybrid, Porsche is using a 3.0 l V6 unit with supercharger for the first time.

2.3.1.1 3.6 l V6 engine

In addition to the requirement of complying with all worldwide emission regulations and significantly reducing fuel consumption, the development goal for the 3.6 l engine was to **increase both power output and torque**. The increase in power by 10 hp to an total output of **220 kW/300 hp** and the higher maximum torque of **295 lb ft (+11 lb ft)** at 6,300 rpm were achieved by a number of different measures:

- Optimized hot-film mass air flow sensor
- Reduced friction losses inside the engine
- New setup for electronic engine management

The **optimized hot-film mass air flow sensor** improves the air throughput of the intake system by reducing the intake air resistance. This results in improved cylinder charging. It was possible to reduce weight and internal engine friction losses through the use of weight-optimized forged pistons, newly designed piston ring seals as well as a new surface treatment method (honing) for the cylinder crankcase. The new honing method improves the uniformity of the surface roughness and ensures lower deviations of the cylinder liners. As a secondary effect, this also reduces piston ring wear and gas cycle losses, which in turn results in higher exhaust-gas throughput.

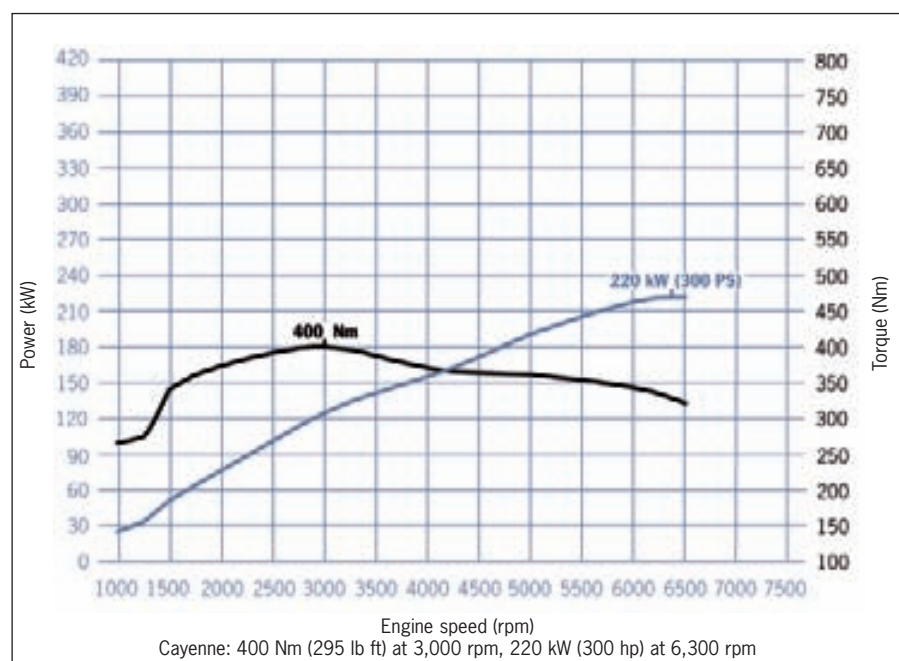


Fig. 34: Output graph for 3.6 l V6 engine

The newly implemented **thermal management, variable deceleration fuel cutoff** and realization of the **Auto Start Stop function** in combination with the new 8-speed Tiptronic S also contribute to further-enhanced efficiency. The focus of development was not just on optimizing fuel consumption and performance, but also on detailed measures designed to enhance running smoothness and comfort during operation. The enhanced 3.6 l V6 engine features a **forged steel crankshaft**, which contributes to lower weight and smoother engine operation. Thanks to use of an electronic oil dipstick, it is now possible to check the engine oil level while the engine is idling without having to open the hood.

2.3.1.2 3.0 l V6 supercharged engine

The **new 3.0 l V6 supercharged engine with direct fuel injection** is used in the new Cayenne S Hybrid. This engine guarantees high efficiency in the hybrid drive in conjunction with an electric machine. In addition to ensuring typical Porsche handling with V8 performance, the main development goal was to achieve low fuel consumption, reduced CO₂ emissions and compliance with all worldwide emission standards. The Cayenne S Hybrid delivers the efficient performance expected of a Porsche in a completely new way.

A V6 supercharged engine is used here by Porsche for the first time. The engine produces **245 kW/333 hp** at 5,500 rpm to 6,500 rpm and develops a maximum torque of **325 lb ft** in the range between 3,000 rpm and 5,250 rpm.

The most important characteristics of the new 3.0 l V6 supercharged engine include:

- 2,995 cm³ displacement
- Aluminum cylinder head
- Fully aluminum engine block
- Four-valve technology
- Continuous intake camshaft control
- Cylinder bank angle of 90 degrees
- Wet-sump lubrication
- Supercharger
- Charge-air cooling
- Fuel economy measures

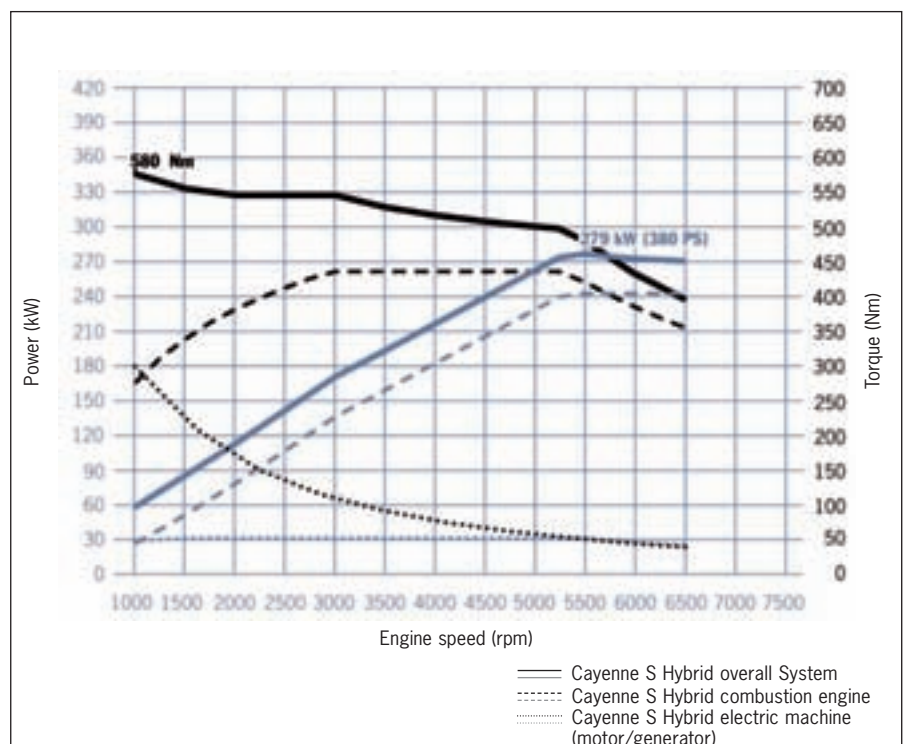


Fig. 35: Output graph for 3.0 l V6 supercharged engine



Fig. 36: Cayenne S Hybrid 3.0 I V6 supercharged engine

The engine is a 6-cylinder, 24-valve gasoline engine with a cylinder bank angle of 90 degrees and two camshafts per cylinder bank. Like the 4.8 I V8 engine of the Cayenne S and Cayenne Turbo, the new 3.0 I V6 engine features an aluminum engine block, an aluminum cylinder head as well as modern engine technology such as thermal management and a regulated oil pump. In the same way as for the other V6 engines, the oil supply is realized as a **wet-sump lubrication system**. This is designed to safeguard the functions of the engine in dynamic driving mode and on slopes or steep uphill climbs when driving off-road, for example.

In contrast to previous turbocharged engines used in Porsche models, **intake charging** of the new unit is realized by a **supercharger with charge-air cooling**. The supercharger with charge-air cooling offers specific advantages for the particular application and characteristics of the parallel full hybrid drive in an SUV. Since the supercharger has a permanent mechanical connection with the crankshaft drive, the **boost pressure is available immediately** and the mass air flow throughput increases continuously together with the speed of the combustion engine. Its installation position directly inside the inner V of the engine means that the compressed intake air only has to travel short distances to the cylinders. As a result, the supercharged engine is characterized by **spontaneous response**. This is especially advantageous at low engine speeds, e.g. in a city driving environment, where the Cayenne S Hybrid demonstrates all of the fuel economy benefits resulting from purely electric driving, Auto Start Stop function and recovery of brake energy. There is also a **benefit for exhaust gas after-treatment** because the catalytic converter

reaches the optimum operating temperature more quickly.

The supercharger in the Cayenne S Hybrid is a so-called **Roots blower** with charge-air cooling and a bypass valve. This blower is located in the inner V of the engine to save space and ensure rapid response. In the supercharger housing, a separate belt drive powers two parallel shafts connected via a gear stage. The gear stage allows absolutely synchronous rotation of the two shafts in opposite directions. Rotors are mounted on both shafts that are designed to ensure sealing on all sides, i.e. with respect to the blades on the second shaft and the supercharger housing. As a result of the opposed rotation of the two shafts, the air mass is routed uncompressed between the rotors from the air inlet into the supercharger and then to the air outlet. The rotors are each fitted with 4 vanes and are twisted at 160 degrees around the longitudinal axis. This guarantees a continuous flow of air. Compression occurs when the air is forced into the air mass that has accumulated in front of the intake valves. The supercharger is fitted with a **charge-air cooler** for each cylinder bank with a low-temperature cooling system to enhance the turbocharging effect.



Fig. 37: Cayenne Diesel V6 diesel drivetrain (not for US)

The supercharger features an integral **boost-pressure control** because charge air is not required in all operating modes and the continuous increase in boost pressure would result in an air backup and therefore a loss in power. A bypass valve is used instead of a complex boost pressure control with a magnetic clutch for engaging and disengaging the supercharger. If the specified or maximum boost pressure is reached, some of the delivered air can be returned to the intake side by opening the bypass valve.

2.3.2 V6 diesel engine (not for US)

For the familiar V3.0 I diesel engine in the Cayenne Diesel, the main focus of development was achieving compliance with the EU5 emission standard as well as exploiting further fuel-saving potential through measures such as integration of the Auto Start Stop function in combination with the new 8-speed Tiptronic S (note: the availability of the Auto Start

Stop function is market-dependent - details on market availability are provided in the overview of country-specific equipment and V numbers). In order to realize the target fuel consumption of **7.4 l/100 km** with an unchanged power output of **176 kW/240 hp** and a torque of 406 lb ft, the following modifications were implemented:

- Use of a regulated oil pump
- Optimization of exhaust gas recirculation module
- Improvement of the fuel system by a 6 bar low-pressure fuel circuit system
- Design of engine unit for the Auto Start Stop function

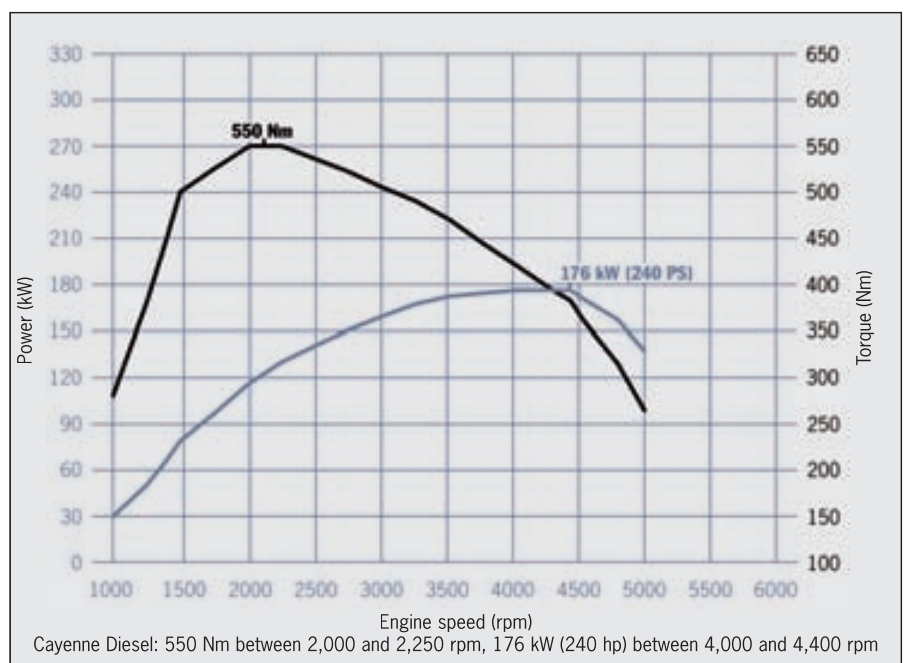


Fig. 38: Output graph for V6 diesel engine (not for US)

The **regulated oil pump** is a further measure designed to enhance efficiency. Demand-based control is provided by the engine management system, while adjustment is hydraulic. The engine management system uses the engine speed, oil temperature and torque as input variables. Based on this information, the engaged gear wheel width and thus the geometric displacement volume of the gear wheel set is changed through the axial movement of a gear wheel (moved hydraulically) and this in turn changes the oil pressure. The pump ensures that only the pumping work required for the relevant load range of the engine is performed. This minimizes the energy consumption of the oil pump.

The **exhaust gas recirculation (EGR) system** was optimized and ensures lower emissions as well as compliance with the requirements for EU5 emission classification. The nitrogen oxides produced during combustion are reduced by the exhaust gas recirculation module. For this purpose, the exhaust gas recirculation module now has a greater cooling power and higher throughput. This allows the volume flow of the exhaust gases returned to the combustion chamber to be varied and also to be cooled down more as required to achieve a better combustion chamber temperature. The peak combustion temperature is reduced as a result and the reaction characteristic is slowed down, leading to reduced production of nitrogen oxides in the combustion chamber.

Thanks to use of a **low-pressure fuel system and a pump with a higher delivery rate**, it was possible to omit the previous additional 2nd fuel pump and therefore save both weight and drive energy. This detail thus contributes to overall optimization of the Cayenne diesel engine.

The Cayenne Diesel engine also features modern **common rail fuel injection** and sophisticated engine-internal and external exhaust gas after-treatment.

The **common rail injection** system is a high-pressure accumulator injection system for diesel engines. The term „common rail“ describes a common fuel rail that at the same time also serves as a fuel accumulator. Pressure generation and fuel injection take place separately with this injection system. A **separate high-pressure pump** generates the high fuel pressure required for injection. This fuel pressure is then stored in the **high-pressure accumulators (common rails)**, which are connected to the **fuel injectors** via short injection lines. The main features of this injection system are:

- A variable injection pressure that can be adapted to the respective operating condition of the engine
- A high injection pressure of up to 1,800 bar that enables good mixture formation
- A flexible injection characteristic with multiple pre-injections and post-injections per working cycle

The **common rail injection system** thus offers many possibilities for adapting the injection pressure and the injection characteristic to the operating condition of the engine. This enables the ever-increasing requirements for improved fuel economy, lower exhaust emissions and smooth engine running to be met. The injection system in the Cayenne Diesel uses **piezo-controlled fuel injectors**. These have the task of injecting fuel into the combustion chambers in the correct quantity at the optimum time. The fuel injectors are controlled by means of a piezo actuator integrated directly in the injector. The operating principle is based on reversal of the piezoelectric effect, i.e. the application of a voltage in order to expand a crystal (piezo actuator). This effect is transferred to the injector needle. This reduces the moving mass at the injector needle in comparison with solenoid-controlled injectors. This has the following advantages:

- Very short switching times
- Multiple injections per working cycle
- Precisely meterable injection quantities

Pre-injection involves injecting a small quantity of fuel into the combustion chamber, which causes the temperature and pressure in the combustion chamber to rise. This shortens the ignition delay (time from start of injection to start of combustion of the fuel-air mixture in the combustion chamber) of the **main injection** and thus reduces the rise in pressure and the pressure peaks in the combustion chamber. The result is less combustion noise and lower exhaust emissions, as the formation of nitrogen oxides (NO_x) can be reduced in this way. The number of pre-injections depends on the operating condition of the engine:

- With a **cold engine** and low rpm, two pre-injections are carried out for acoustic reasons
- With a **higher load and rpm**, only one pre-injection is carried out in order to reduce the exhaust emissions

For **regeneration of the diesel particle filter**, two post-injections are carried out. These post-injections increase the temperature of the exhaust gas, which is necessary to burn off the soot particles in the diesel particle filter. A smooth combustion characteristic, low emissions and efficient utilization of the fuel are thus ensured.

A further technical feature is the **valve technology** of the engine. As with the gasoline engines from Porsche, the Cayenne Diesel also uses **four-valve technology at each cylinder**. There are two intake and two exhaust valves per cylinder in the cylinder head. The central fuel injector is arranged directly above the center piston recess. This design produces good mixture formation, which results in low fuel consumption and low exhaust emissions. The shape, size and arrangement of the intake and exhaust ports ensure good filling and a favorable gas cycle in the combustion chamber. Changing ambient conditions such as temperature or air pressure as well as different operating conditions require highly flexible engine technology to enable optimum operation of the engine. The Cayenne turbo diesel engine achieves a high power output with low fuel consumption through the use of a **throttle valve** in the intake manifold and **swirl flaps** in the intake ports of the cylinders. The **throttle valve** supports the internal engine exhaust recirculation measures. As an air control valve, its position controls the exhaust gas recirculation quantity by influencing charging of the cylinders with exhaust gases and intake air. This reduces the nitrogen oxides (NO_x) so that the stringent emissions regulations of the EU5 standard are complied with.

The **intake manifolds** of both cylinder banks contain **continuously adjustable swirl flaps** in the respective swirl ports of the cylinders. The swirl of the intake air is adjusted by the position of the swirl flaps as a function of the engine speed and load. The **swirl** of the intake air describes the angular momentum of the air as it enters the cylinder. The angular momentum can be changed by varying the angle of the swirl flaps for optimum cylinder charging or mixture formation, e.g. the swirl flaps are closed at idle speed and at low rpm. This produces a high swirl action that leads to good mixture formation. The swirl flaps are continuously opened above a speed of approx. 1,250 rpm. The increased air flow rate results in good charging of the combustion chamber. The swirl flaps are then fully opened at an engine speed of approx. 2,750 rpm.

2.3.3 V8 engines

The completely revamped family of V8 engines comprises the performance-enhanced 4.8 l V8 naturally aspirated engine for the new Cayenne S, which now develops **400 hp and a torque of 369 lb ft**, and a turbocharged version with **500 hp and 516 lb ft torque** for the new Cayenne Turbo. A targeted joint engineering process permitted use of many identical parts in the naturally aspirated and turbo engines.

In addition to **direct fuel injection (DFI)**, which was introduced with the second generation of Cayenne models and which already allowed improvements in fuel economy by 8% compared with the first-generation Cayenne models, the new V8 engines of the Cayenne S and Cayenne Turbo also feature new technologies for reducing fuel consumption. Like the V6 engines, the V8 engines also feature **thermal management, vehicle electrical system recuperation, variable deceleration fuel cutoff and the Auto Start Stop function**.

The proven **alloy design** of the V8 engines was extended by additional use of **aluminum and magnesium** in some areas for the new generation. Overall, it was possible to reduce the engine weight by approx. 15.4 lb through the weight savings in the areas of the timing-case cover, valve cover, camshaft controller, screws and crank drive.

The proven **closed-deck** design of the aluminum **crankcase** is used. In this construction, the housing and coolant ducts around the cylinders form a closed system. This creates a very rigid engine assembly, minimizes cylinder distortion and results in low oil consumption as well as a reduction in the amount



Fig. 39: V8 engine

of combustion gases that make it past the piston rings into the crankcase (blow-by gases). The lightweight, rigid engines therefore achieve low fuel consumption and a long service life. A **fully aluminum bedplate** is used in order to achieve low weight. The forged crankshaft has five bearings and a very rigid design to reduce vibrations in the engine block.

The cylinder head and camshaft housing are integrated into a **one-piece aluminum cylinder head** on the V8 engines. At the same time, the arrangement of the intake port and injector has been optimally designed for direct fuel injection. The water jacket ensures that the cooling system has sufficient reserves even in the cylinder head, which is subject to substantial thermal loads. The one-piece design also made it possible to achieve low weight.

The timing-case cover and valve cover, which serve to cover the timing drive mechanism and the camshaft

respectively, **are manufactured entirely from magnesium** and various **screw connections were changed from steel to aluminum screws**. This lightweight construction measure made it possible to realize a further weight reduction of approx. 7.3 lb. In the Cayenne S, the oil guide housing is additionally manufactured from magnesium, reducing its weight by approximately 4.6 lb.

VarioCam Plus, the system used to control the intake camshafts, is also used in the new Cayenne V8 engines. Apart from continuous adjustment of the valve timing, the system also enables switching of the valve lift for the intake valves. In conjunction with direct fuel injection, this allows high power output and torque values together with low fuel consumption. A new feature of the new generation of V8 engines is a **fully aluminum, lightweight camshaft controller**. This lightweight design measure reduces the weight by approx. 3.7 lb and also reduces the rotating masses.

This in turn results in improved adjustment speeds and more agile engine response.

Mass air flow measurement was changed from a hot-film mass air flow sensor to pressure-controlled measurement for both engines. This made it possible to reduce the intake air resistance and improve the air flow.

The 4.8 l V8 naturally aspirated engine and 4.8 V8 turbo engine also feature additional specific detail measures.

2.3.3.1 V8 naturally aspirated engine

The 4.8 liter V8 naturally aspirated engine in the Cayenne S has the following main features:

- Newly designed, lighter crankshaft and connecting rods
- Oil guide housing made of magnesium
- Intake camshafts optimized for power output and torque characteristics
- New intake system with larger throttle valve

A **lighter crankshaft and lighter connecting rods** are used in the Cayenne S as a lightweight design measure aimed at reducing weight. These are adapted to suit load demands specific to naturally aspirated engines. The diameter of the connecting rods is reduced compared with the previous V8 crank drive and the crankshaft has a larger counterweight radius. As a result, the crank drive is 5.1 lb lighter than the previous V8 crank drive.

The Cayenne S also features an **oil guide housing made of magnesium**, which results in a weight saving of approx. 4.6 lb.

The **intake camshafts** were **optimized for the best possible output and torque characteristics**. Together with the **new intake system** featuring a larger throttle valve and optimized electronic engine management, the 4.8 l V8 naturally aspirated engine now develops **400 hp at 6,500 rpm**.

In combination with the **fuel economy measures** such as thermal management, vehicle electrical system recuperation, variable deceleration fuel cutoff and integration of the Auto Start Stop function, the new Cayenne S has a fuel consumption reduction of approx. **23%** compared with the previous model, in European testing.

2.3.3.2 V8 biturbo engine

The V8 biturbo engine of the Cayenne Turbo is characterized by its high power output and torque with low fuel consumption. The 4.8 l V8 biturbo engine has the following main characteristics:

- Weight-optimized crankshaft
- Oil guide housing made of aluminum



Fig. 40: V8 naturally aspirated engine

Lightweight construction measures on the Cayenne Turbo aimed at reducing weight include a weight-optimized crankshaft and a new oil guide housing made from aluminum. The crankshaft has a larger counter-weight radius than the previous V8 crank drive. As a result, the crank drive is 1.3 lb lighter than on the previous model.

Weight savings and the use of the latest engine technology make the 4.8 l V8 biturbo engine in the Cayenne Turbo even more efficient. These measures enable the Cayenne Turbo to achieve fuel consumption 23% less compared with the previous model, in European testing. The performance has also been improved: the top speed is now 173 mph and the new Cayenne Turbo accelerates from 0 to 60 mph in just 4.4 s.

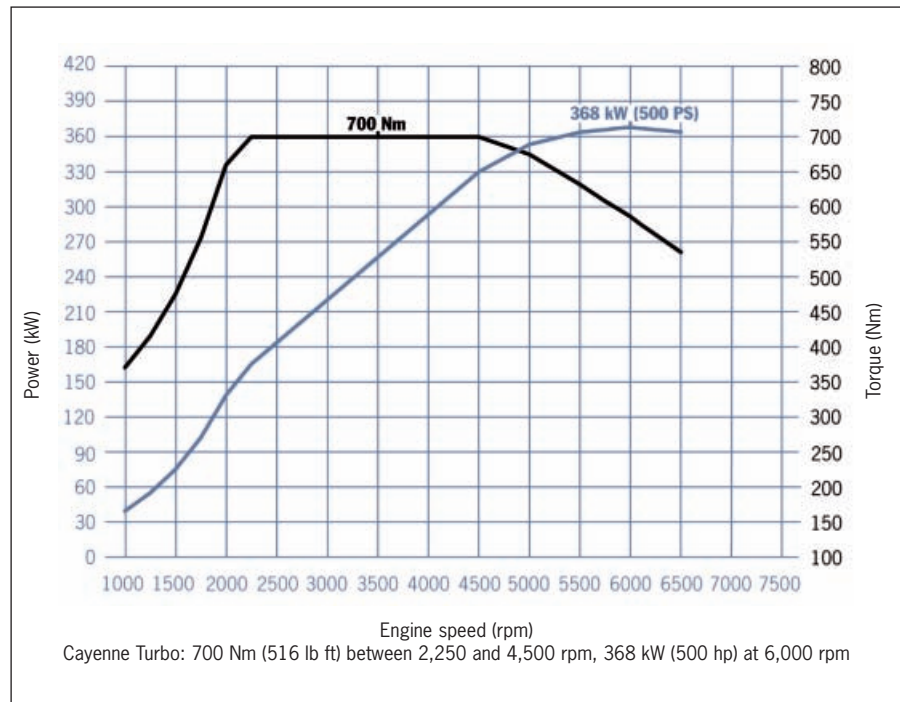


Fig. 42: Output graph for V8 biturbo engine

2.4 Parallel full hybrid drive

The hybrid drive has a long tradition at Porsche: company founder Ferdinand Porsche is considered to be the inventor of this drive system. As early as 1900, he developed the **Lohner-Porsche Mixte**, which functioned as a serial hybrid according to today's terminology. A 15 hp four-cylinder engine was coupled directly with an 80 V dynamo. The generated power flowed either to the electric wheel-hub motors fitted in the front wheels or to a buffer battery. This vehicle is regarded as **the first series-production hybrid car in the world.**



Fig. 41: V8 biturbo engine

Hybrid types (power range)	Micro hybrid (approx. 2-10 kW)	Mild hybrid (approx. 15-30 kW)	Full hybrid (approx. 20-75 kW)
Functions			
Start/stop	X	X	X
Regenerative braking	X	X	X
Boosting		X	X
Electric driving			X
Customer benefits			
Reduced fuel consumption	X	X	X
Driving dynamics		X	X
Electric driving			X

2.4.1 Hybrid types

The word "hybrid" – which has its origins in the Greek language and means "mixed" or "of two origins" – already makes clear that two drives are responsible for vehicle propulsion in a hybrid drive. Depending on functionality, hybrid drives are referred to as **micro, mild and full hybrid drives**. The functional scope, customer benefits, complexity and also related development costs all increase correspondingly from the micro hybrid through to the full hybrid drive. The full hybrid drive permits purely electrical driving off as well as emission-free driving over short distances, depending on the battery capacity, and therefore offers the greatest customer benefit.

Depending on the design of the drivetrain, full hybrids are categorized as **serial hybrids, parallel full hybrids** or mixed forms, such as the **power-split full hybrid**.

In the **serial hybrid drive**, the combustion engine is coupled with a generator (alternator) that acts as an energy converter. The generated electric energy is forwarded to the electric motor or is buffered in the traction battery. The **drives are connected in series** and the energy is converted from kinetic energy into electric energy in several stages before it is available as drive power. The resultant efficiency losses are disadvantageous, as is the technical requirement that all energy converters have to be designed for the same maximum power. The additional generator also increases costs and weight and further restricts the available installation space. On the positive side, the greatest advantages are the simple technical design and stationary operation of the combustion engine at the optimum operating point.

In the **parallel hybrid drive**, the combustion engine and electric motor **are mechanically connected with the drive axle**. This is possible via two separate drive shafts or a single, common drive shaft (single-shaft parallel full hybrid). Both drives can be operated individually or jointly in this configuration. Due to the power addition effect, it is possible to downsize the drive units and thus exploit fuel-saving potential. A further advantage of this design is its relatively simple integration in existing drive systems. The simple mechanical design is supplemented by a transmission and a clutch. The control system for these permits engagement of the combustion engine and must therefore satisfy high demands with respect to comfort, dynamic response and robustness.

The **power-split hybrid drive** as a mixed form has both parallel and serial energy paths and permits combination of mechanical and electrical power transmission. The power-split hybrid drive switches between parallel or serial operation by activation of a planetary gear set. The **power** of the combustion engine is **divided by the planetary gear set** and is mechanically transmitted directly to the axle on the one hand and is stored in the battery via the generator as electrical energy for driving the

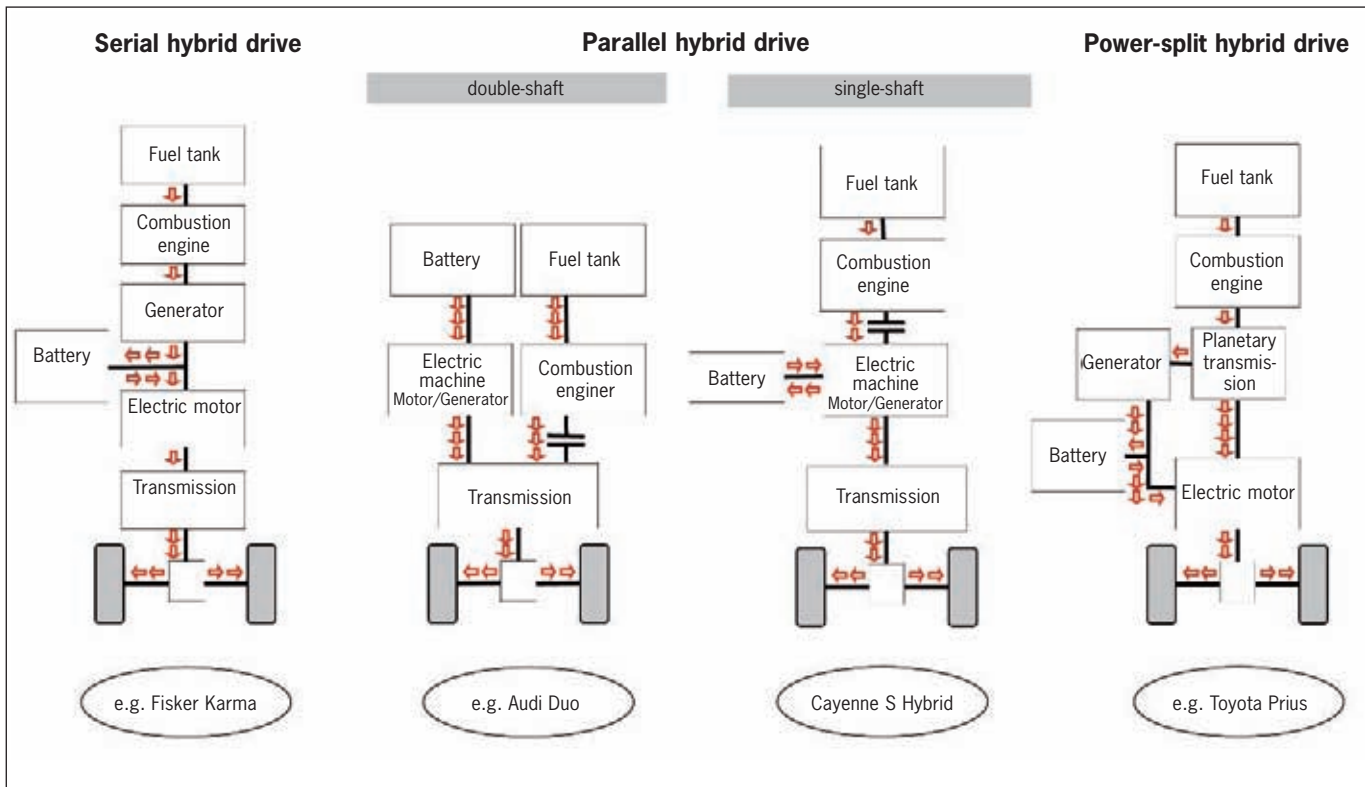


Fig. 43: Hybrid drives

electric motor on the other. Optimum control of the operating states offers very good preconditions for reducing fuel consumption and exhaust emissions. The high level of control complexity in particular is disadvantageous, requiring the use of two electric machines (motor/generator) that are operated via separate power electronics and corresponding high-voltage lines. The related component costs and the system weight therefore increase, which in turn has a detrimental effect on economy and efficiency.

The single-shaft parallel full hybrid drive in the Cayenne S Hybrid

The Cayenne S Hybrid features a single-shaft parallel full hybrid concept that transmits the drive power of the combustion engine and the electric machine simultaneously (i.e. in parallel) via a drive shaft. The primary drive engine is a **3.0 I V6 supercharged engine** with direct fuel injection. This is coupled on the same shaft with a 34 kW (47 hp) **electric machine (motor/generator)**, which either provides power additionally to the combustion engine or functions as the sole drive to allow purely electric propulsion. The electric machine also combines the two functions of a starter/generator and can therefore start the combustion engine and generate power in generator mode (advantage: omission of the external alternator). The electric machine is compactly integrated in the **hybrid module** and is located between the combustion engine and transmission. The electric machine is supplied with power by a powerful

high-voltage NiMH battery pack, which provides the drive energy and can also store the recovered brake energy.

The new **8-speed Tiptronic S** is used for power transmission. Various **electric auxiliary systems** supplement the hybrid drivetrain. These are shown in the following illustration in addition to all the other system components of the Cayenne S Hybrid.

The parallel full hybrid concept offers the following main advantages in the new Cayenne S Hybrid:

- **High compatibility** of the hybrid components with the **Cayenne basic platform**. The risk of having to accept restrictions with respect to luggage compartment volume or all-wheel-drive technology, for example, is minimized by the parallel full hybrid concept.

- The parallel full hybrid drive also impresses with its **simple and clear mechanical design**.
- **High possible fuel savings** on inter-city and highway journeys. The system developed by Porsche also offers the ability to coast („sail“) up to a speed of 97 mph without the combustion engine.
- **Purely electric driving** is possible in constant driving operation and with moderate acceleration up to a speed of 37 mph, depending on the driving situation.
- Preservation of the **familiar transmission characteristics** with respect to comfort and dynamic response, allowing use of the 8-speed Tiptronic S instead of a CVT (Constantly Variable Transmission).
- The parallel full hybrid drive makes it possible to further significantly improve **acceleration and elasticity**.

The concept is therefore an ideal match for the Porsche philosophy of offering outstanding performance combined with maximum efficiency.

The **fuel economy benefits** of the Cayenne S Hybrid in particular result from the overall concept characteristics of the parallel full hybrid drivetrain. The contributing factors here include the **hybrid-specific driving modes** such as purely electric driving, coasting without drive power or recovery of the brake energy (recuperation) as well as the use of electric power for some of the main auxiliary systems. The **reduction in driving resistance** through tires with optimized rolling resistance and **light-weight construction wherever possible**, for example, are fuel economy measures that further enhance the efficiency of the overall vehicle concept. The weight benefits of the system are

above all the result of the compact design. This made it possible to limit the **system-related additional weight** due to the electric motor, decoupler, battery, ventilation system, power electronics and high-voltage lines to just 386 lb compared with the Cayenne S. Of this total, approx. 176 lb is accounted for by the NiMH battery pack and approx. 121 lb by the hybrid module.

2.4.2 Supercharged engine and electric auxiliary systems

The primary drive of the Cayenne S Hybrid is a three-liter V6 supercharged engine with direct fuel injection (for details, see section on 3.0 I V6 supercharged engine). The basic unit was adapted for integration in the hybrid drivetrain.

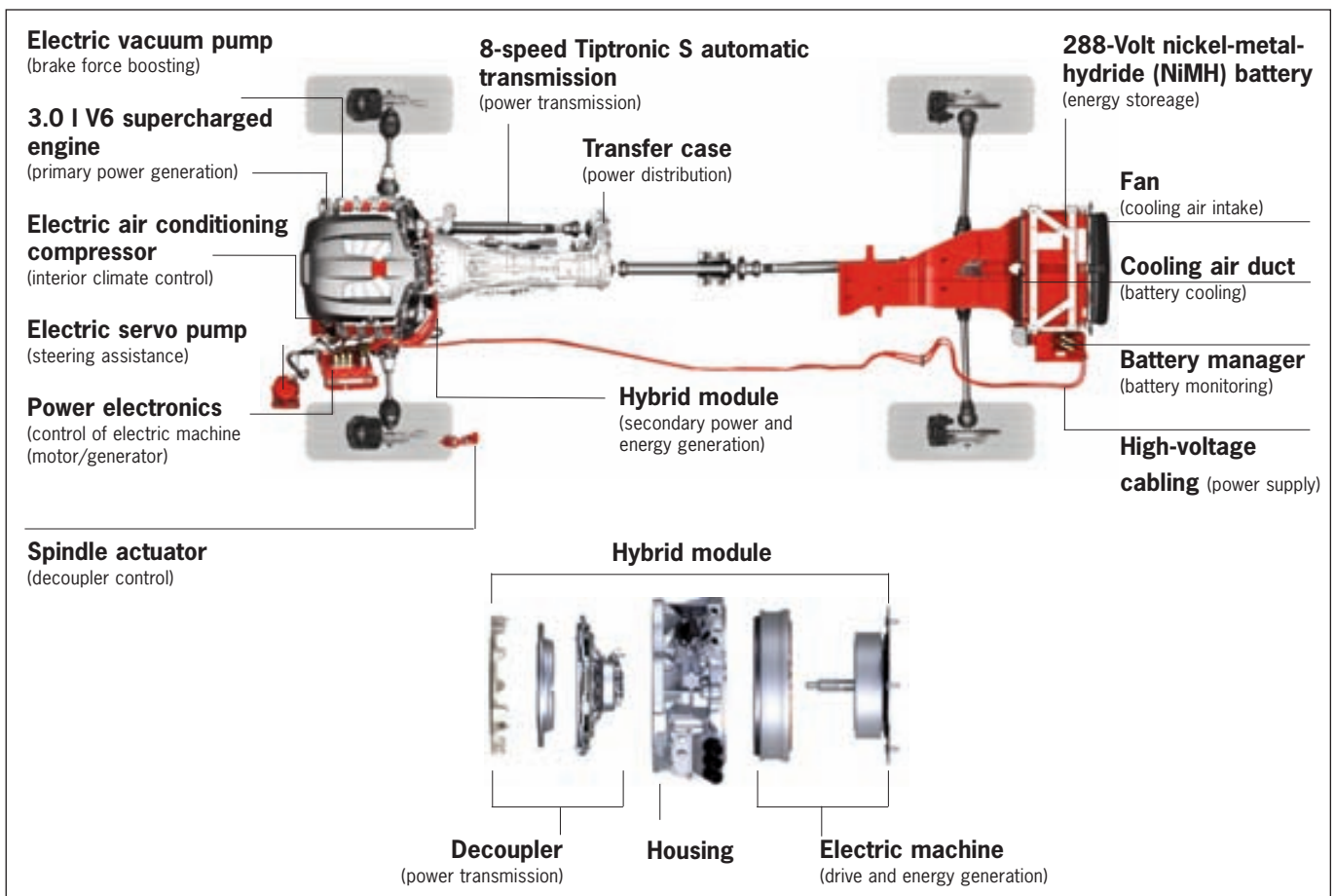


Fig. 44: Cayenne S Hybrid hybrid drivetrain

- Adaptation of basic engine
- Hybrid-specific engine cover
- Electrically-powered auxiliary systems

A number of details on the basic engine were modified for use in the Cayenne S Hybrid. As one example, the required **tensioning force of the chain drive** was reduced, thereby also reducing the friction in the drive. In addition, a completely **new engine control** was defined that is subordinate to the hybrid manager as a control unit (operating strategy of the hybrid drive). Changes in the lubrication system led to a **reduction in the oil pressure**, which is provided by a two-stage pump. In order to reduce internal friction, **piston rings with a lower tension and softer valve springs** are used. These changes result in a further reduction in fuel consumption.

The **engine cover features a hybrid badge** which has a reference to the hybrid drivetrain and a red insert to symbolize the energy flow and interaction between the combustion engine and electric motor.



Fig. 46: Engine compartment of Cayenne S Hybrid

Electric auxiliary systems

In the conventional vehicle design with combustion engine, a running engine is not just necessary for propulsion but also for a number of servo and comfort systems: the power steering and air-conditioning system, for example, are driven via belts. **The following systems** were switched to power from an **electric drive**, since they still have to perform their tasks without any restrictions during electric driving (combustion engine switched off):

- Electric air-conditioning compressor for cabin air conditioning
- Electric vacuum pump for brake power boost (additional component)

- Electric servo pump for power steering
- Electric oil pressure pump for transmission oil supply
- Two electric water pumps for cooling the electric machine (motor/generator) and power electronics

As the load with the greatest power requirement, the **air-conditioning compressor was connected directly to the 288 V system of the NiMH battery**. A high-voltage line connects the air-conditioning compressor initially with the power electronics, which forwards the power from the battery.

For the first time in this vehicle class, Porsche uses an **electro-hydraulic steering system**, which offers the kind of steering precision typical of Porsche. This also makes a significant contribution to fuel saving through special functions such as standby mode when driving straight ahead. Compared with a conventional hydraulic power steering system, this system reduces the steering-specific energy consumption in the NEDC by 93 percent. The 12 V vehicle electrical system is supplied with power by the 12 V battery. During the standstill phases of the combustion engine, the NiMH battery is also available to supply

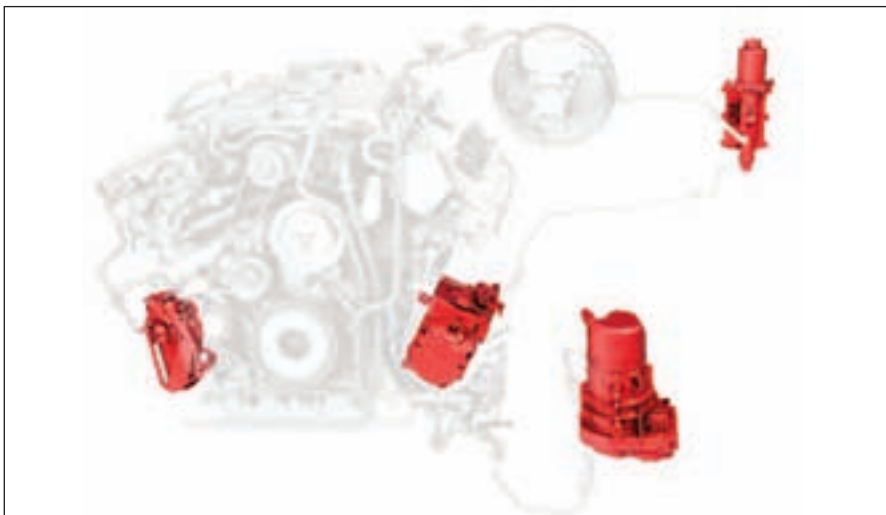


Fig. 45: Electric auxiliary systems in Cayenne S Hybrid

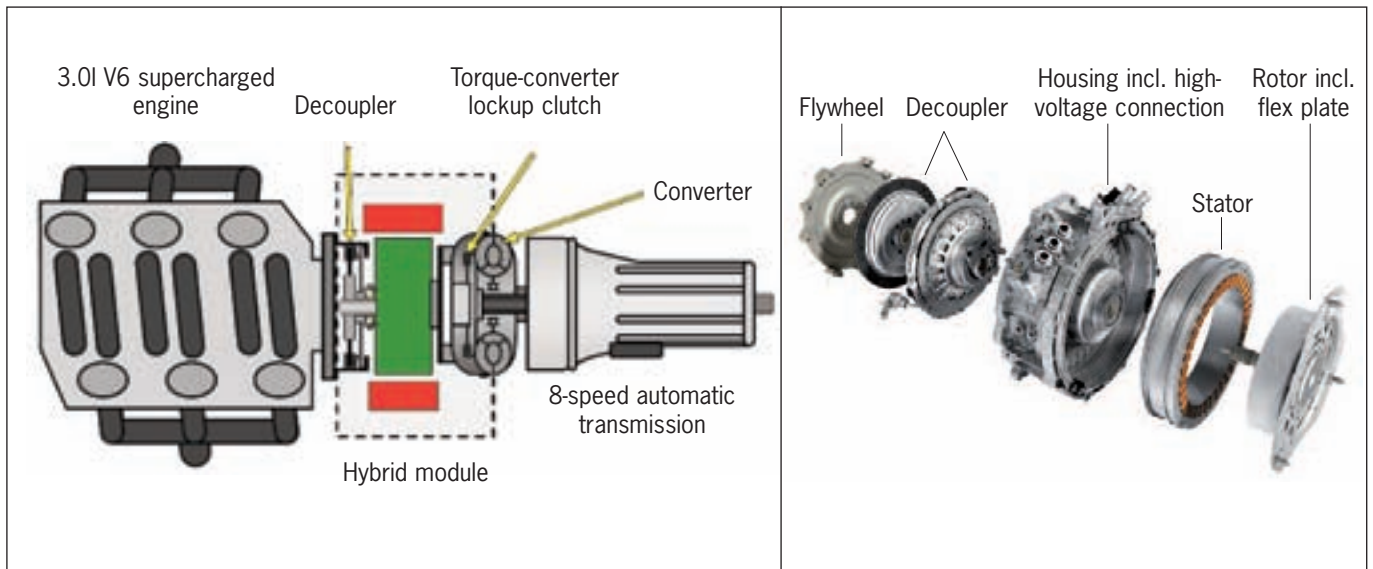


Fig. 47: Hybrid module

power to all loads in the vehicle electrical system. The 288 V voltage is stepped down to 12 V via a voltage transformer (DC-DC converter) in the power electronics and is thus made suitable for all loads in the vehicle electrical system.

The additional **electric oil pressure pump for supplying oil to the transmission** ensures that gear changes are still possible even when the combustion engine is switched off. The **use of electric pump units for the brake boost and steering power assistance systems** means that these systems can also still function during purely electric driving (see Chassis section for further details). The electric machine and power electronics are powerful components of the hybrid drivetrain and have to be cooled via **electric water pumps**.

2.4.3 Hybrid module

The hybrid module is based on a **modular principle** and is integrated between the combustion engine and the transmission. The module essentially comprises the **electric machine (motor/generator) and a decoupler** on the combustion engine side that establishes the

power connection with the transmission. The transmission-side connection of the hybrid module with the torque converter of the 8-speed automatic transmission is produced by the rotor on the electric machine together with the flex plate. The entire hybrid module including clutch weighs around **121 lb**. If required, the decoupler can disengage the combustion engine and the electric motor can independently provide emission-free propulsion. The complete **hybrid module consisting of electric motor and clutch has a length of 5.8 inch and is therefore extremely compact**. This meant that it was possible to integrate it in the drivetrain between the combustion engine and transmission without any major modifications. The overall system is characterized by precise and reliable functioning of the hybrid module components under extreme dynamic loads. The **flywheel** at the combustion engine establishes the connection to the hybrid module on the engine side and reduces fluctuations in speed through mass inertia. The **housing of the hybrid module** protects the internal components against the weather and other external influences. A three-phase power connection supplies the electric machine with three-

phase current via the high-voltage cable connection. The figure above shows the individual components of the hybrid module and their layout in a realistic exploded view and a schematic drawing.

2.4.4 Decoupler

The decoupler transmits power from the combustion engine to the drivetrain and therefore establishes the **power connection from the combustion engine to the hybrid module**. The following requirements apply to the decoupler:

- High torque accuracy
- Outstanding driving comfort
- High degree of reliability
- Extremely robust

The decoupler is one of the technical highlights of the single-shaft parallel full hybrid drive, since it permits fast and above all comfortable engagement and disengagement of the combustion engine during transitions between the hybrid-specific operating modes. The decoupler ensures that engagement of the combustion engine from purely electric driving mode takes place unnoticeably for the driver, comfortably and quickly. During this process, the decou-

pler connects the combustion engine with the drivetrain **with maximum torque accuracy** and under all operating conditions of the combustion engine. For spontaneous acceleration with a high power demand, for example, the combustion engine is started and the decoupler realizes the **exact and fast power connection in approx. 70 milliseconds**. The clutch makes sure that power from the combustion engine is transferred rapidly and without comfort restrictions to the transmission and then to the road. This permits spontaneous realization of the driver request with high dynamic response combined with a high level of comfort.

The decoupler is a dry clutch consisting of pressure plate and the actual clutch plate. In order to withstand the high demands with respect to operational reliability and torque transmission, the decoupler features **specially devel-**

oped friction linings that are mounted on the driver plate. During automatic engagement, this driver plate is pressed against the flywheel by the clutch pressure plate and thus establishes the frictional connection for power transmission. The decoupler is highly stressed as a result of the frequent changes in the hybrid-specific driving modes and was therefore specifically designed for **high stability under load**. The connection for the hydraulic line to the spindle actuator – a hydraulic control unit – is mounted on the pressure plate of the decoupler. The decoupler is opened and closed by the also **hydraulically controlled central clutch operator**. This clutch operator is controlled by the spindle actuator. The spindle actuator is a hydraulic control unit in which the control system of the actuator converts electrical input signals from the hybrid manager into mechanical work via a hydraulic mechanism. The hybrid man-

ager controls the spindle actuator corresponding to the required driving situation and thereby allows permanent switching between the hybrid-specific driving modes.

The demands placed on the control dynamics of the decoupler are very high with respect to **positioning accuracy and good reproducibility**. An **intelligent controller in the hybrid manager** coordinates optimum operation corresponding to the driving situation and driver requests through continuous adaptation and diagnosis of the decoupler system. In particular, this takes into account compensation of environmental influences, adaptation of the mechanical clutch behavior as well as complex diagnosis of the overall system state.

2.4.5 Electric machine (motor/generator)

Electric machines are used in many different types and in large quantities in cars, e.g. as starters and alternators. Synchronous and asynchronous motors operated with three-phase current in particular are suitable as drive motors in vehicles. In **synchronous motors**, the rotor rotates synchronously with respect to the magnetic field of the stator, whereas the rotor in an **asynchronous motor** asynchronously lags behind the stator with a small speed difference (slip).

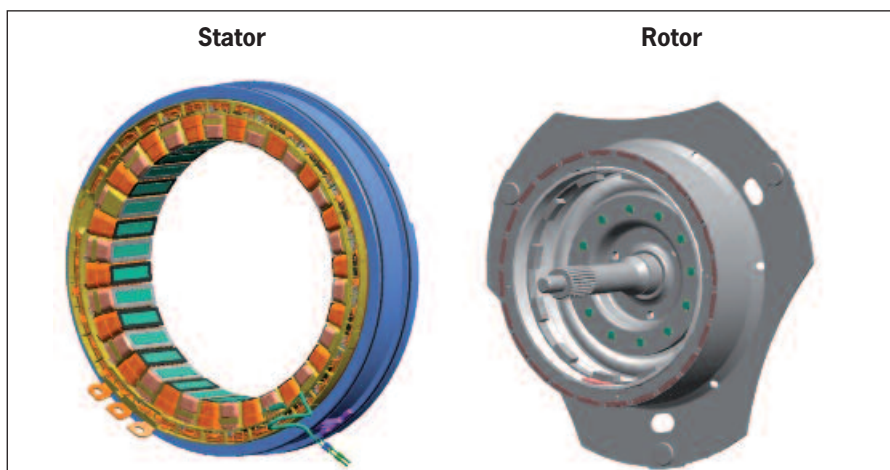


Fig. 48: Stator and rotor of electric machine (motor/generator)

Feature	Unit	Value/Description
Engine type		Three-phase synchronous electric machine, internal rotor, brushless with permanent magnets
Cooling		Water cooling
Power	kW	38 electrical / 34 mechanical
Torque	lb ft	210 (max. 221)
Nominal voltage	V	288
Efficiency	%	Approx. 90

Excursus on electric machines

All electric machines function based on the interaction of magnetic fields. The magnetic fields can be generated by an electric current or directly by magnets. A magnetic field can remain in the same place (DC motors) or rotate (three-phase motors). For conversion of electrical energy into mechanical energy, the electric motor develops a **rotating movement due to forces that act on each other in magnetic fields**. These forces can thus be used to provide drive power. The general motor behavior is determined by the field strength of the field winding as well as the characteristics of the windings or magnets. In generator mode, the electric machine generates electrical energy from mechanical energy - based on the inverse principle. Here, the rotating magnetic field of the motor acts on the electric charges in the stator windings (Lorentz force) and induces an electric voltage due to the moving charges.

An electric motor is already able to develop its full torque from a standstill and can **be subjected to short time loads that are significantly higher** than would correspond to its nominal power. There is a hyperbolic fall in torque as a result of increasing speed with constant power. Whereas a combustion engine requires a clutch, the electric motor does not need this technical aid, but already provides the full torque at low rpm. The **efficiency** of electric machines **is over 90%** compared with 30 to 40 % for combustion engines. The design of an electric machine is considerably less complex than for a combustion engine. This initially applies to the number of components, but is also valid for the specific requirements. In addition to the basic engine, cylinders, shafts and valve drive, a combustion engine system also has to integrate an intake and exhaust system as well as various auxiliary systems together with media such as oil. High temperatures and high mechanical loads occur in a combustion engine during the combustion process. This necessitates use of sophisticated materials with high endurance strength in order to counteract high wear. In an electric machine, on the other hand, **the design complexity is considerably less** and the number of components remains easily manageable.

A ring-shaped, synchronous electric machine is used in the Cayenne S Hybrid (functioning simultaneously as an electric motor and generator). The electric machine is very compact with a stator diameter of 11.8 inch and an overall length of only 2.8 inch. It is integrated directly on the drive shaft between the combustion engine and automatic transmission. The electric machine essentially comprises a **stator (fixed motor part)** and a **rotor (rotating motor part)**.

The **rotor** is designed as an **internal rotor** and generates a magnetic field by means of **permanent magnets made from neodymium iron boron**. The **stator** also generates a magnetic field via the **energized stator windings**, which are supplied with power by the NiMH battery. The two magnetic fields interact and generate a rotary movement. The

rotor is fixed on the drive shaft and fitted exactly in the stator so that a rotary movement is possible. The stator is the fixed and non-moving outer part of the electric machine. It has 36 single-tooth windings made of copper wire and is supplied with three-phase AC generated by the power electronics from energy supplied by the NiMH battery. The **three-phase alternating current in the stator generates a rotating electrical magnetic field offset by 120°**. The magnetic field of the stator causes the rotor to rotate.

Thanks to its power-optimized electromagnetic design, the electric machine can produce a maximum electrical power output of **38 kW (51 hp)** with a system voltage of **288 V**. This corresponds to a mechanical power output of 34 kW (46 hp). Below an engine speed

of 1,150 rpm, e.g. when driving off, the torque of 210 lb ft can be **briefly** increased to 221 lb ft.

Heat is produced in the electric machine due to power losses and the electric current. This heat is dissipated by the existing **water-based high-temperature system** of the combustion engine (the cooling system of the electric machine is integrated in that of the combustion engine). For this purpose, the die-cast aluminum housing of the electric machine features cast-in cooling ducts, which ensure effective temperature control. The electric machine can be isolated from the cooling system by the thermal management system by way of a vacuum-controlled rotary slide valve. This allows the coolant to be heated up as quickly as possible by the combustion engine and therefore helps to

reduce fuel consumption. **Temperature sensors** are directly embedded in the stator windings and permit efficient and demand-based cooling.

2.4.6 Nickel-metal hydride battery

In automotive engineering, it is possible to distinguish between starter and drive batteries. Whereas starter batteries are primarily used to start the combustion engine in conventionally powered vehicles, **drive batteries in hybrid vehicles** are also used for purely electric driving.

A **nickel-metal hydride battery** (NiMH) is used in the Cayenne S Hybrid. This battery convinces through operating reliability, long battery life and costs and also incorporates **proven technology**. When used in a hybrid vehicle, it offers both **high energy density** for purely electric driving as well as **high power density** to guarantee fast energy absorption and discharge. The NiMH battery is accommodated in the spare-wheel well, which means that it was possible to minimize restrictions as regards luggage compartment volume. The installation position over the rear axle is



Fig. 49: Nickel-metal hydride battery

also favorable for weight distribution.

The battery consists of the following components:

- Accumulator (energy store)
- Battery manager (battery monitoring)
- Ventilation system (battery cooling)
- Protective housing
- Connections for high-voltage cables

The characteristic data of the NiMH battery in the new Cayenne S Hybrid:

The battery weighs **just under 176 lb including protective housing** and consists of **240 cylindrical cells** that are connected in series and therefore generate the required voltage of **288 V**. Of the three basic cell designs for battery systems (flat cell, round/cylindrical cell and prismatic cell), the cylindrical cell is the most widespread because it has extremely stable mechanical properties, a high energy density and is cheap to manufacture. **Nickel hydroxide** (nickel compound) is used for the **cathode**, while the **anode** consists of a **metal hydride** (metal-hydrogen compound).

Feature	Unit	Value/Description
Battery type		Nickel-metal hydride
Power	kW	38 (electric)
Energy content	kWh	1.7
Voltage	V	288
Number of cells		240 (each 1.2 V)
Weight	lb	Approx. 176
Operating range at max. power	°C	10 - 38 (for engine start only > -30 °C)
Dimensions		
- Depth	inch	16.8
- Width	inch	36.4
- Height	inch	11.3
Efficiency	%	Approx. 90
Cooling		Intake of air-conditioned air from the passenger compartment

Battery

As a network of individual cells, the battery operates with a total power of **38 kW** and stores the energy which is generated during driving, e.g. by recuperative braking. The battery has an energy content of **1.7 kWh**. The operating range in which the energy can be used effectively for propulsion is approx. 30% – 70%. The effective battery capacity is shown in the display on the instrument cluster and the PCM in a range from 0% – 100% and represents the relative charge status. On this basis, **effectively 40% (0.68 kWh)** of the 1.7 kWh battery energy is available for purely electric driving mode and as charging volume for energy recovery. This operating range takes into consideration the high requirements with respect to battery safety and long battery life (cycle strength) and prevents critical battery conditions such as exhaustive discharge, which would damage the battery pack.

The much discussed lithium-ion technology has a comparatively higher energy density and therefore offers weight benefits for the same power specifications. On the negative side, however, are high purchasing and manufacturing costs, low technological maturity in comparison with nickel-metal hydride technology as well as a lack of empirical data in the mass automotive market.

Battery manager

The battery manager has a separate control unit for processing data and communication with the hybrid manager to permit **monitoring of all the important battery characteristics**. This control unit is connected with the central vehicle control system via a CAN interface and also has a sensor system for monitoring the **battery and cell tem-**

perature. The input variables include the sensor data from cell voltage monitoring as well as the cell and battery temperature, in addition to data from a current sensor that monitors the state of charge and battery load.

Ventilation system

The operating temperature range of the NiMH battery for starting the combustion engine starts at -22 °F and therefore guarantees **excellent cold starting performance**. The battery must be operated in the temperature range from 50 °F – 100 °F in order to obtain the maximum power of 38 kW. When the battery is charged and discharged, the battery generates heat due to its internal resistance. This must be dissipated in order to prevent the chemicals in the cells from degrading during the service life of the vehicle.

For this reason, the battery features a **specially developed ventilation system**. This system operates the battery in the optimum temperature profile and thus guarantees high cycle strength and endurance with respect to the continuous discharge and charging processes. A supply air duct under the rear seat

bench delivers the air-conditioned air from the cabin directly into the battery in order to dissipate the heat given off by the cell system. For this purpose, the two fans located at the rear end of the battery housing suck the air-conditioned **air from the rear passenger compartment area** directly through the battery and thus regulate the accumulator temperature. Targeted air routing means that each individual round cell is cooled, in order to minimize the temperature difference between the cells. The air sucked through the system escapes through openings (forced-air ventilation through plastic slats) in the underbody of the luggage compartment. The fan control is synchronized with the vehicle speed and is not audible for the vehicle occupants (acoustic comfort). Control of **cooling is monitored by the battery manager**. The air-conditioning system is not activated automatically if the passenger compartment is too warm for battery cooling. In this case, the hybrid-specific functions such as purely electric driving are restricted successively in order to protect the battery. The opening of the supply air duct under the rear seat bench must always remain unobstructed so that air can be drawn in.

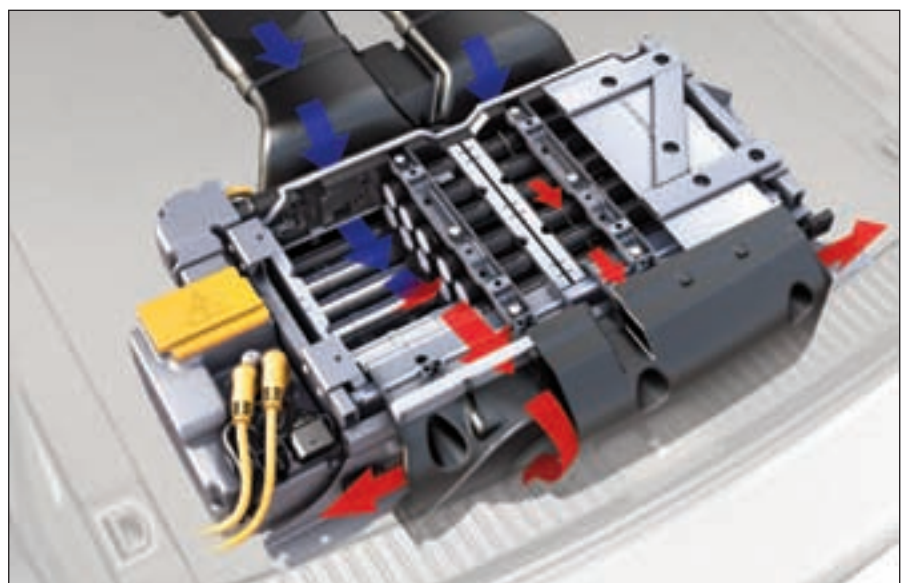


Fig. 50: Ventilation system of nickel-metal hydride battery

Protective housing and connections for high-voltage cables

The protective battery housing made of especially robust extruded aluminum sections accommodates the cell system and protects the accumulator against external influences. The housing forms part of the comprehensive safety concept of the battery (see section Safety). The high-voltage cables conduct the direct current from the battery to the power electronics and from there as AC or three-phase current to the electric machine. The air-conditioning compressor is connected directly with the battery via the high-voltage cabling.

External charging concept

For legal reasons, the 288 V high-voltage system must be disconnected from the vehicle electrical system when the ignition is switched off. In order to switch the NiMH battery to operationally ready state, the conventional 12 V battery closes a heavy-duty circuit breaker on the NiMH battery after a key start. The energy is then available to the hybrid system via the high-voltage cable connections. The 12 V battery can still be charged at the 12 V terminal using a **conventional external charging concept**. The NiMH battery is protected against **self-discharge**. Self-discharge of the battery may be negatively influenced only as a result of adverse conditions with constantly high temperatures over a long period. A vehicle start is possible only via the NiMH battery, since the electric machine in the hybrid mod-

ule replaces the conventional starter as a starter/generator and can be operated only with three-phase AC. In exceptional cases, the Porsche Service also has the possibility of charging the NiMH battery via a high-voltage terminal using a corresponding charging device. In parking mode, the **battery manager regularly checks the charge state** and the individual cell voltages. In order to optimize the charge state of the overall battery and keep cell voltages in the tolerance range, it is possible to perform automatic charge compensation between the cells or targeted cell discharge. When the vehicle is parked, the entire high-voltage circuit is opened by the heavy-duty circuit breaker. This prevents discharge of current during vehicle standstill phases.

Excursus on battery technology

The most important **components** of a battery are the two electrodes, the separator and the electrolyte. During the discharge process, the negative electrode is referred to as the anode and gives off electrons, while the second electrode receives the electrons as a positive cathode. The electrolyte consists of an organic solution with conductive salt and allows the electrons to flow. The separator separates the two electrodes from each other, permits a controlled flow of electrons and thus prevents a short circuit. In addition to the active mass (electrodes) relevant for the energy density, a battery also consists of inactive components such as the housing, separator and conductive grids, which practically limit the battery potential.

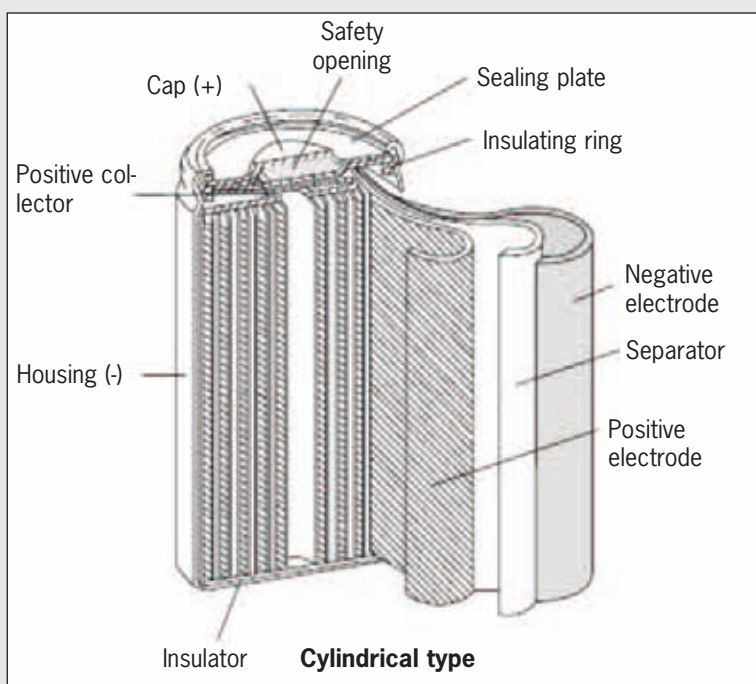


Fig. 51

A battery consists of interconnected galvanic cells and is also referred to as an accumulator. An accumulator is an electrochemical energy store and an energy converter at the same time. Stored chemical energy is converted into electrical energy by an **electrochemical redox reaction**. In this reaction, one reaction partner transfers electrons to the other one. This process of emitting electrons is referred to as oxidation and that of electron absorption as reduction. An electrochemical cell (galvanic ele-

ment) is produced as a result of spatial separation of reduction and oxidation. This cell consists of a combination of two different metals that are connected by means of an electrolyte (electrically conductive substance). A voltage with electrolytic potentials occurs between the metals. When the cell is discharged by short circuiting the two electrodes, a current flows which can then be used. In contrast, charging of an accumulator functions according to the **principle of electrolysis**. The voltage source produces a lack of electrons and the process of electron movement takes place in reverse direction, so that the battery is charged.

The **life** of a battery is an **important characteristic** and is influenced by the number of cycles, whereby a cycle corresponds to one charge and discharge process. The **cycle life** of a battery describes the number of cycles up to which the battery can still output 80% of its nominal capacity. The cycle strength is determined by the electrode material. The energy content of the battery falls if the voltage potential decreases. The **power density** (specific power) is a measure of the maximum energy that can be made available per unit of mass (W/kg) and therefore describes that ability to make stored energy available as quickly as possible. In contrast, the **energy density** (specific energy) is a measure of the maximum amount of energy that can be stored per unit of mass (Wh/kg) and therefore plays a crucial part when it comes to vehicle range. A battery with high **energy density** can be compared to a marathon runner, whereas a sprinter has a high **power density**. As the most important battery operating characteristics, the energy and power density are conflicting variables when it comes to battery optimization, since improving one leads to a deterioration in the other. This is related to the electrode materials used in a battery, which each have specific chemical properties and therefore both strengths and weaknesses. The **Ragone plot** shows this relationship for important battery types.

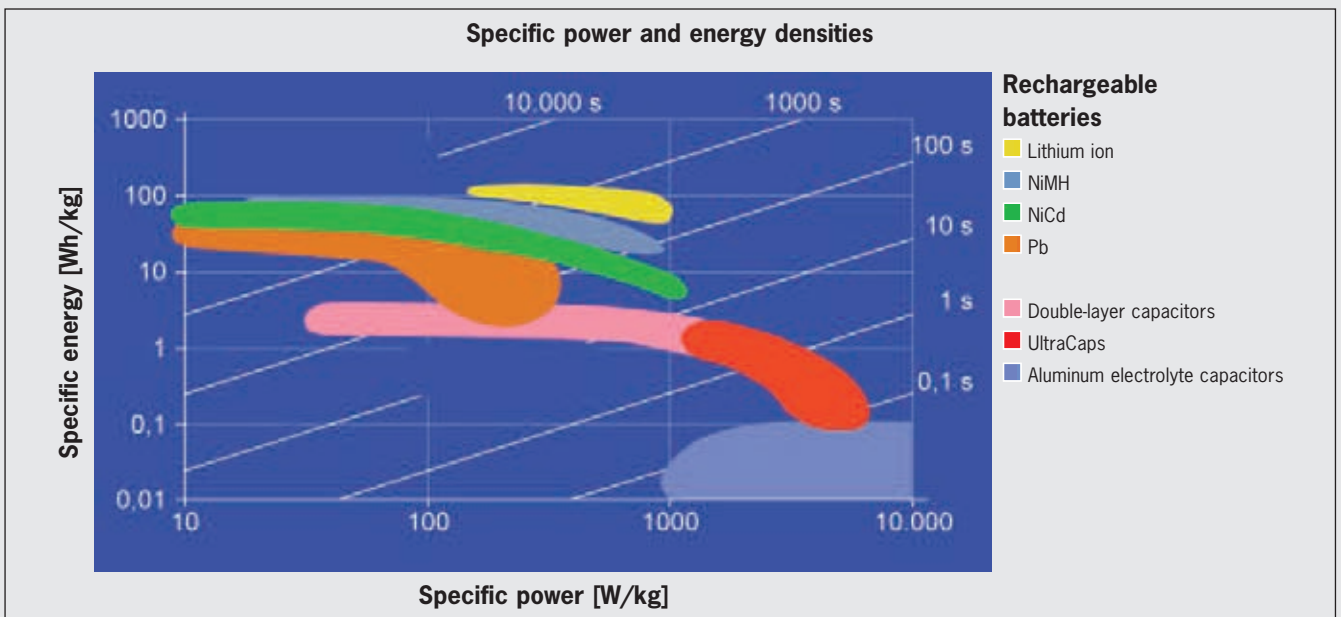


Fig. 52: Ragone plot

The requirements with respect to the battery technology are determined by the vehicle concept. **Power density plays an important part in hybrid vehicles**, since the electric currents must be made available very quickly in the hybrid-specific driving modes, e.g. for boosting, when the electric machine has to spontaneously and powerfully support the combustion engine. Fast and efficiency power absorption is also very important for recuperation of brake energy and makes an important contribution to fuel economy for hybrid drives in particular. In contrast, **energy density has absolute priority for electric vehicles**, since this is the decisive factor for the vehicle range. Due to the cost-intensive use of resources and complex production process with high quality and safety standards, batteries for automotive applications in hybrid and electric vehicles are very expensive.

2.4.7 Power electronics

The direct current from the NiMH battery must be converted into a **three-phase alternating current** before it can be used for propulsion in the electric motor. If the electric machine is in generator mode when energy is recuperated during braking, the alternating current generated is converted back into a direct current so that it can be stored in the battery. This function is performed by the **pulse-controlled inverter**, which is accommodated in the power electronics. As an additional main component in the power electronics, a **voltage transformer** (DC-DC converter) steps down the direct current from the 288 V battery to the 12 V level of the vehicle electrical system in order to provide the power supply for the auxiliary systems and other loads in the vehicle electrical system. A **housing protects the sensitive power electronics**, which is accommodated in the left fender area of

the front body section and also contains the cooling system.

The **pulse-controlled inverter** can make available a short-time **current of 370 A** in electric motor operation. In normal continuous operation, a current of 100 to 150 A flows in the nominal range both in electric motor and generator operation. The heat produced as a result of current inversion and voltage transformation is dissipated by an additional **low-temperature circuit with an electric water pump**. The cooling system with a coolant consisting of a water-glycol mixture is integrated in the charge-air cooling system of the combustion engine. This ensures that the power electronics can always be operated in the optimum temperature range. During the course of optimization of the package of individual components it was possible to reduce the weight of the power electronics by 30%. It now weighs less than 31 lbs.

2.4.8 Hybrid-specific driving modes

The Cayenne S Hybrid has **six special driving modes** that are **only available with a parallel full hybrid** and make a decisive contribution to increasing fuel economy.

- Pure electric driving
- Boosting (addition of combustion engine and electric machine torques)
- Combustion engine-powered driving with load point shift for charging the NiMH battery
- Gliding without drive power („coasting“)
- Recovery of brake energy (recuperation)
- Automatic stopping and restarting of engine when the vehicle is stationary (Auto Start Stop function)

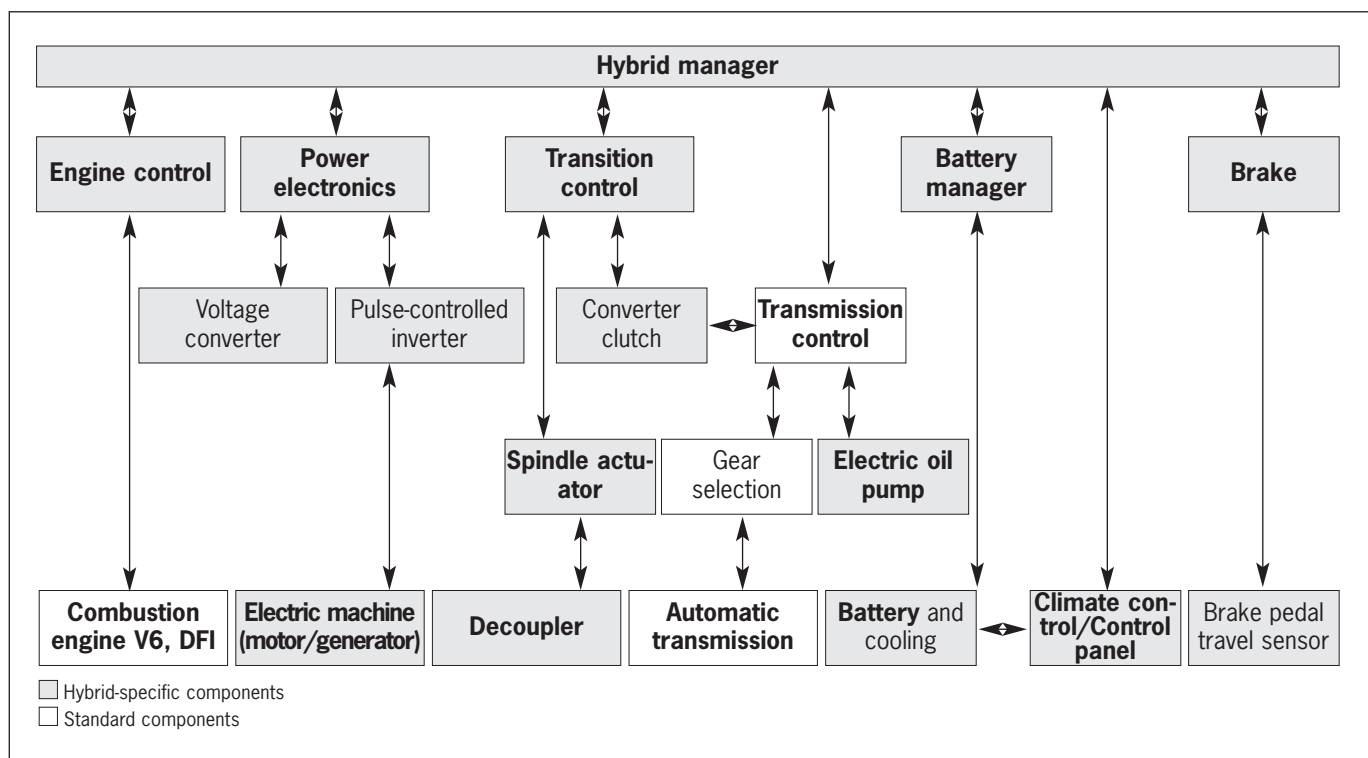


Fig. 53: Overview of hybrid manager

The interaction between the combustion engine, hybrid module (electric machine and decoupler), transmission and battery is **controlled during the hybrid-specific driving modes via the hybrid manager**. The hybrid manager supplements the existing engine control and collects all driving and energy information for the vehicle in order to be able to control the electric machine and combustion engine for optimum fuel consumption in every driving situation. As an energy supply, the battery is **neither discharged too exhaustively nor**, with respect to the number of cycles, **charged and discharged too frequently**. For this calculation, approx. **20,000 data parameters** in total must be defined for the hybrid manager. This compares with around 10,000 parameters that are already sufficient for a conventional engine control.

Electric driving

The great advantage of a full hybrid drive is the possibility of **purely electric driving off** and driving **without emissions** and combustion engine noise up to a speed of **37 mph**. With a moderate driving style, it is then possible to cover a distance of **approx. 1.2 miles solely under electric** power. This is particularly **useful in residential areas** or traffic-calmed zones and saves fuel. The **electric machine** supplies a power output of **47 hp** for propulsion and is supplied with power itself by the NiMH battery. The combustion engine is switched off in this case and the auxiliary systems together with vehicle electrical system and loads are supplied via the 12 V starter battery. The air-conditioning compressor is even supplied directly via the NiMH battery. Purely electric driving off with a cold combustion engine or preheated unit depends on various parameters, whereby the battery

charge state and temperature have the greatest influence. The **battery** must have a temperature of at least **50 °F** for purely electric driving. The battery stores heat for a certain standstill time due to its thermal inertia and thus allows purely electric and noiseless driving off in most cases if the vehicle has been stopped for a short time. An electric cold start in the morning after the vehicle has been standing outside initially leads to automatic starting of the combustion engine after the key start.

For electric driving off, the **battery manager** receives a request from the hybrid manager during the vehicle start to close the main contactors of the NiMH battery and to set the battery meter (State of Charge) to the current battery charge state. Electric driving off is then possible if the charge state, battery temperature and cell voltages are in the operating range. During operation, the battery manager permanently calculates the battery charge state and **monitors key battery data** to prevent critical states such as overheating and exhaustive discharge. The current limits for charging and discharge are adapted dynamically and fully automatically. In communication with the hybrid manager, the battery manager thus signals whether charging of the battery is necessary via a load point shift or whether discharging is more appropriate to provide capacity for recovery of brake energy (recuperation).

Combustion engine-powered driving

If the power request exceeds the potential of the electric machine or the charge state of the battery, the combustion engine is switched on and takes over the task of primary power generation. When the combustion engine is activated, the driving situation, e.g. speed, gradient, and the acceleration request are evaluated by the hybrid manager and a **suitable start procedure** is selected. It is possible to realize a **"comfort start"** of the combustion engine or, if the driver has requested higher power, an especially spontaneous **"power start"**. The start procedures differ with respect to the comfort and dynamic response of combustion engine activation. Thanks to the immediate response of the hybrid manager, decoupler, combustion engine and electric motor, spontaneous intermediate acceleration is possible at any speed in exactly the same way as with a Cayenne with a conventional engine. As a result, the correct engine start is possible in any driving situation.

For the restart of the combustion engine in approx. 350 milliseconds, the **torque converter lockup clutch** in the automatic transmission is moved to **"slip"** position and the speed of the electric machine is briefly increased to a set-point specified by the transmission control unit. The engine control unit receives permission to operate the decoupler only after this has taken place. The **combustion engine is "pulled up" by the electric machine** through the clutch connection with a defined pressure characteristic. As soon as the cylinder charge permits realization of the set-point torque, the combustion engine is started by enabling the injection and ignition processes. The torque of the electric machine is increased during the pull-up process corresponding to the torque

currently transmitted by the decoupler. After the combustion engine has started, the torque is reduced again analogously to the torque increase, so that the combustion engine can run up to the required rpm practically without any load. The torque converter lockup clutch is closed again when there is no longer any power connection at the decoupler. The **key element is** therefore the **decoupler** between the combustion engine and electric motor, which is coordinated by the **innovative spindle actuator**. This controls the hydraulic pressure that actuates the clutch and does this with a level of precision not reached before. The engine restart procedure can be scaled between a comfort and dynamic orientation by varying the duration of the sub-processes. In this way, it is possible to effectively realize driver requests that are detected from the gas pedal. The system interaction is so sensitive that the driver and passengers do not notice automatic activation and deactivation of the combustion engine. The full acceleration power of both the combustion engine and electric motor is available to the driver simultaneously at any time.

Boost

The **maximum power** is available to the driver in **so-called "boost" mode**. Here, the drive torques of the combustion engine and electric motor are superimposed and thus added. The decoupler again produces the power connection between the combustion engine and transmission. The electric motor simultaneously transmits its torque to the drive shaft and thus permits realization of a **total system power of 380 hp**. This is a great advantage of the single-shaft parallel full hybrid concept. Whereas the combustion engine develops its maximum torque of 325 lb ft at 3,000 – 5,250 rpm, the electric motor can already use its full torque of up to 221 lb ft for propulsion at practically zero rpm. The maximum power of both drives of 380 hp is available at 5,500 rpm, while a **combined torque of 428 lb ft** ensures sufficient power reserves. The maximum torque of the drives is available in different speed ranges, which means that these values cannot simply be added. At higher rpm, the torque of the electric motor drops off again due to its operating principle. The combustion engine then ensures continued constant and efficient power development at high rpm with the support of the electric motor. The engine and motor therefore complement each other

perfectly and it is possible to realize effective power development over the whole rpm range. Thanks to the interaction of the combustion engine and electric motor, the Cayenne S Hybrid therefore profits from **particularly sporty "take-off behavior"** (starting performance) as well as **high driving dynamics, also at high vehicle speeds**, e.g. overtaking maneuvers. Electric boosting is available immediately in "Normal" mode by means of the "kickdown function". When the Sport button is activated, the boost range is moved forward and the two drives already work together from a gas pedal position of 80%. The torque diagram illustrates the advantage offered by the parallel full hybrid drive in the area of dynamic response due to torque addition.

Load point shift

A further elementary task of the **hybrid manager** is **active control of the load point shift** of the combustion engine. The behavior of the engine at different engine speeds is stored in maps in the engine management system, thereby defining the engine operating points. The hybrid manager evaluates the decision-relevant parameters in a very short time and selects the optimum driving strategy.

Every engine has a certain load range where it operates most economically. With the hybrid drive from Porsche, the operating points of the combustion engine are shifted into the range of higher mean pressures for the purpose of recharging the NiMH battery and in order to realize fuel consumption benefits. This load point shift forms a main part of the hybrid operating strategy. As a result of this, the combustion engine is shifted into an **operating range with improved specific consumption and the charge state of the energy store is increased at the same time**. If the combustion engine is operating in partial load state below this range, the hybrid manager switches the electric motor to generator operation and opens the throttle at the same time. Electric power take-off and throttle valve opening are adjusted so that the combustion engine is operating in its range with maximum efficiency. This ensures optimum use of the fuel consumed and also allows part of the power generated to be buffered in the battery as electrical energy. Absolute fuel consumption increases when the load point is shifted upwards, but the fuel is used with greater efficiency in relative terms and the **vehicle range under purely electric power without emissions can be extended**. The driver does not notice the shift in the

load point because neither the engine speed nor the vehicle speed changes. The Cayenne therefore behaves in the same way as if it drives from the flat onto a gradient with activated cruise control and constant speed. As a result of the load point shift, the NiMH battery can be charged when the combustion engine is running and the battery is not being charged by recuperation. The graph below shows how an increase in the load point at approx. 2,000 rpm improves the efficiency of the combustion engine.

A load point shift can take place by increasing or reducing the load point. In the event of a **load point increase, the combustion engine produces more torque** than the torque requested by the driver, whereby the electric machine of the vehicle compensates for the difference through generator operation. As a result, the total torques of the combustion engine and electric machine correspond to the torque requested by the driver and the energy store is charged from fuel energy. In the event of a **load point reduction, the combustion engine provides less torque** than the

torque requested by the driver and the electric machine compensates for the difference by motor operation, which results in discharging of the energy store. The **charging strategy** for the energy store **is focused on a load point increase for the Cayenne S Hybrid**. A load point reduction is used only in situations where the battery charge is too high. In this case, the power difference compared with the driver request is then compensated by the electric motor in order to keep the battery in an optimum charge state.

Coasting ("Sailing")

Coasting mode helps to improve the efficiency of the hybrid drive even at high or relatively constant speeds, e.g. during highway driving, since the vehicle uses the kinetic energy from the **mass inertia during unpowered coasting for propulsion**. Coasting is already possible at low speeds and occurs as soon as the driver releases the gas pedal. The decoupler is then opened and the combustion engine is automatically switched off. The rotor of the electric machine rotates on the drive shaft during the coasting phases and generates power

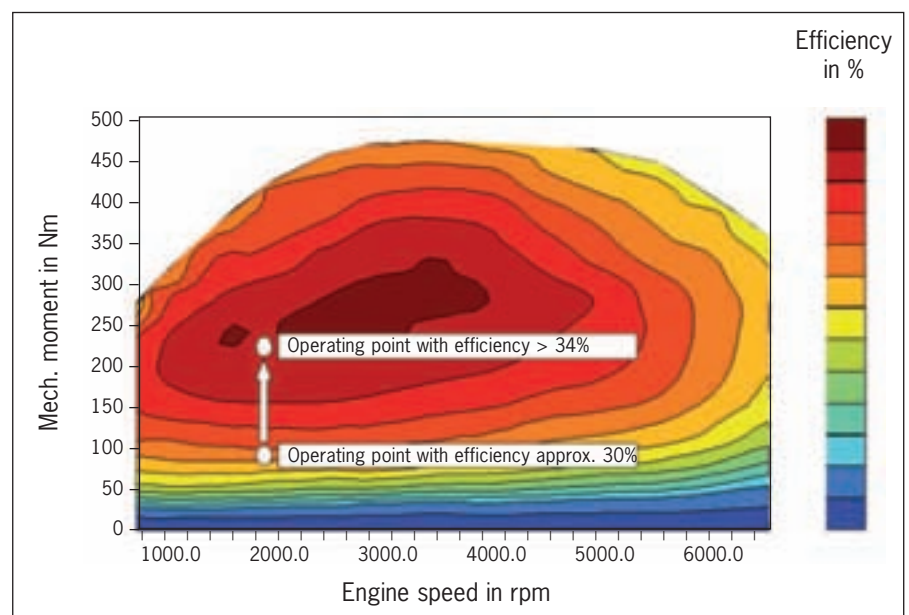


Fig. 54: Load point shift diagram

from the kinetic energy is order to support the 12 V vehicle electrical system with its loads such as PCM. The electric machine creates a drag torque in generator mode. This gives the driver a **similar driving experience to a conventionally powered vehicle** even when coasting with the combustion engine switched off. This is beneficial on downhill stretches in particular, since the vehicle speed is reduced slightly by the drag torque (in a similar way as with engine drag torque for deceleration fuel cutoff). The energy flow displays (instrument cluster and PCM) show energy recovery during coasting in exactly the same way as for recuperation (braking). The electrical energy obtained is converted into a direct current in the power electronics and is then stored in the NiMH battery. This energy is then supplied to the 12 V starter battery if required in order to provide power for the vehicle electrical system loads.

Coasting is thus comparable with gliding or rolling **without any combustion engine power or electric drive support**. The vehicle is braked only by the driving resistances of the air, road and electric machine in generator operation. The maximum coasting speed of **97 mph** is facilitated by the **relatively long final-drive ratio** (engine speed reduction) in the new Cayenne. At higher vehicle and engine speeds, the decoupler cannot meet the torque requirements for restarting the combustion engine with respect to endurance and comfort and the vehicle speed for coasting mode is therefore limited.

Recuperation

In addition, to the new fuel-saving function of vehicle electrical system recuperation (standard for all new Cayenne models), the Cayenne S Hybrid also features an important extension of the function for brake energy recovery. As soon as the driver of the Hybrid presses the brake, **it is possible to recover significantly more power in the form of brake energy** through generator operation of the electric machine. In this driving mode (recuperation), the decoupler is opened and the combustion engine is automatically switched off simultaneously. The hybrid manager ensures that as much energy is possible is generated by operation of the brake pedal and returned to the battery before the conventional disc brake system is activated (refer to section Chassis/Brake system for further information).

Auto Start Stop function

The Auto Start Stop function is used in all new Cayenne models with 8-speed Tiptronic S. This function switches off the combustion engine under defined conditions when the vehicle is stationary and therefore exploits fuel-saving potentials, above all during city driving with many vehicle stop phases. In the Cayenne S Hybrid, the vehicle electrical system is supplied with power via the 12 V starter battery when the combustion engine is switched off. This in turn obtains its power from the 288 V NiMH battery if necessary. In order to compensate for the voltage difference, the voltage is stepped down to the 12 V system by the power electronics. The air-conditioning compressor is connected directly to the high-voltage system in order to ensure climate comfort in the vehicle.

Conditions for hybrid-specific driving modes

Like all other Cayenne models, the Cayenne S Hybrid boasts a wide range of comfort and driving functions that have all been adapted to the hybrid drive system. Hybrid-specific driving modes such as pure electric driving or coasting mode are also available when towing a trailer, driving in reverse gear or driving in manual shift mode (manual shift gate). If the standard Sport button is activated, the following parameters are adapted for a more dynamic overall vehicle setup:

- Electric driving still possible (no activation of E-Power button)
- Boosting with additional assistance by the electric motor already at approx. 80% gas pedal position
- Increased recuperation torque when braking through increased generator power
- Coasting mode is limited to approx. 43 mph in order to permit spontaneous response of the combustion engine

There are also system-related settings (vetoes) that may prevent a hybrid-specific driving mode. These settings are defined by means of limit and threshold values. The following overview contains a selection of the most important reasons that prevent the combustion engine from switching off (engine stop vetoes):

- Driver torque request, vehicle speed or engine speed too high
- Battery charge state too low or too high
- Engine/catalytic converter temperature too low
- Battery too warm or too cold
- Gradient too steep
- Hood open (protection for workshop personnel)
- Driver's seat belt not fastened or driver's door open when selector lever is in P or N position
- Engine diagnosis active (catalytic converter diagnosis, mixture adaptation)
- Vehicle electrical system power or air-conditioning power too high

2.5 Sport button

The Sport button is standard for all Cayenne models. This is located in the middle of the center console on the side of the gearshift lever or Tiptronic S selector lever facing the driver. This allows the driver to choose between a setup with optimized comfort and consumption or a sporty setup in the new Cayenne models. When the Sport button is pressed, a "SPORT" logo lights up in the instrument cluster. A sportier vehicle setup is obtained when Sport mode is switched on.

The electronic engine management system controls the engine with more bite. The dynamic response of the engine then becomes even more direct. On vehicles with 8-speed Tiptronic S, upshifts take place later and downshifts earlier in automatic mode. The Auto Start Stop function is also deactivated. In addition, the chassis control systems Porsche Active Suspension Management

(PASM) and the optional Porsche Dynamic Chassis Control (PDCC) are switched to Sport mode. This makes damping sportier and the steering behavior in curves is more direct. This in turn leads to improved road contact.

2.6 E-Power button

The Cayenne S Hybrid permits purely electric driving at moderate speeds over short distances. Activation of the **E-Power button in the center console** can extend the availability of purely electric driving mode. When the button is activated, a diode in the button lights up and the blue message text "E-Power" appears in the instrument cluster. The availability of electric driving mode depends on parameters such as the battery charge state and battery temperature. When the E-Power button is activated, the hybrid manager extends the window in which purely electric driving is possible by changing the signal charac-

	Standard settings	Sport mode
Engine tuning	<ul style="list-style-type: none"> • Optimized performance and fuel consumption 	<ul style="list-style-type: none"> • Sporty engine tuning
Gas pedal characteristic	<ul style="list-style-type: none"> • Dynamically comfortable gas pedal characteristic 	<ul style="list-style-type: none"> • Sportily dynamic gas pedal characteristic • Throttle response is more spontaneous • Throttle valve is opened further with the same pedal travel
PTM (for Cayenne, Cayenne S and Cayenne Turbo)	<ul style="list-style-type: none"> • Everyday mode, designed for driving stability • Tendency towards higher drive torques on the front axle • Optimal driving dynamics on road surfaces with poor friction coefficients (snow, ice) 	<ul style="list-style-type: none"> • Agility and performance are emphasized • Rear-biased drive torque distribution
PASM	<ul style="list-style-type: none"> • PASM in Comfort mode • Damper control comfort-orientated 	<ul style="list-style-type: none"> • PASM in Sport mode • Suspension damping set harder • More direct steering and better road contact
PDCC	<ul style="list-style-type: none"> • PDCC intervention occurs at reduced control speed • Emphasis on comfort 	<ul style="list-style-type: none"> • PDCC automatically in Sport mode • Roll of the vehicle is reduced further
Air suspension	<ul style="list-style-type: none"> • Normal Level 	<ul style="list-style-type: none"> • Low Level
Transmission control (only in combination with Tiptronic S in automatic mode)	<ul style="list-style-type: none"> • Gear changes optimized for comfort and fuel economy 	<ul style="list-style-type: none"> • Upshifting takes place later and downshifting earlier

teristic of the gas pedal and **thus prevents early automatic starting of the combustion engine in response to higher power demands.** The changed gas pedal characteristic results in much more moderate execution of the acceleration request and permits longer driving without emissions and noise than in normal mode (flatter gas pedal characteristic = less torque for same gas pedal travel). The available battery capacity of the traction battery remains unchanged, as does the possible range under electric power.

If the charge level of the battery is at least 45% and the battery temperature is between 50 °F and 100 °F, purely electric driving is possible up to a vehicle speed of approx. 37 mph after activation of the E-Power button. The E-Power button function cannot be activated above 34 mph. The E-Power button is **not a measure to reduce fuel consumption**, but is instead focused specifically on the function of purely electric driving.

2.7 Exhaust systems

The exhaust system not only ensures that **pollutants are cleaned from combustion exhaust gases**, but also has a significant effect on the **acoustics of the vehicle.** The main function of the exhaust system is after-treatment of the exhaust gas. Many factors can prevent optimum combustion of the fuel-air mixture. As a result, combustion does not just produce CO₂ and water vapor, but also small quantities of pollutants (nitrogen oxides (NO_x), hydrocarbons (HC), carbon monoxide (CO) and soot particles). In order to ensure compliance with all the globally valid emission regulations, all Cayenne models have an exhaust system that is specially adapted to the respective engine unit. All exhaust systems are made of long-life stainless steels. To keep emissions low in the cold start phase in particular, it is important that the catalytic converter reaches its optimum operating temperature quickly. For this reason, the exhaust manifolds of all Cayenne models are designed very short, in order to use the high exhaust temperature to heat the catalytic converters. This allows the highly-efficient primary and main catalytic converters to heat up quickly and guarantee effective emission control.

The following sections describe the main changes compared with the exhaust systems of the previous models and also describe in detail exhaust gas after-treatment in the Cayenne Diesel.

2.7.1 Cayenne exhaust system

The exhaust system of the V6 engine was adapted in order to achieve compliance with the strict worldwide emission standards. The previous system with one primary and one main catalytic converter was changed to 2 close-coupled main catalytic converters. The close-coupled arrangement of the 2 main catalytic converters achieves faster heating up to the optimum operating temperature as well as a lower heat loss during start-stop phases.

2.7.2 Cayenne Diesel exhaust system (not for US)

The amount of CO₂ produced during combustion is dependent on the proportion of hydrocarbon compounds in the fuel. A diesel engine emits approx. 8 % more CO₂ per volume share compared with a gasoline engine. The only way to achieve a reduction in CO₂ emissions is by reducing the amount of fuel used by the engine. The low fuel consumption of the Cayenne Diesel therefore means CO₂ emissions of 195 g/km. Together with the measures inside the engine designed to reduce pollutant emissions, the stringent emissions limits for compliance with the EU5 standard are thus met. The **exhaust system of the new Cayenne Diesel** consists of the following components:

- Exhaust gas recirculation system
- Exhaust manifold
- Turbocharger
- Oxidation catalytic converter
- Diesel particle filter
- Rear silencer
- Sensors

The **exhaust system is made from stainless steel** to be able to withstand the extreme conditions such as mechanical loads, large changes in temperature and other environmental influences. The exhaust gases reach the turbocharger via short exhaust manifolds arranged directly on the engine in order to drive the compressor. They then flow through the oxidation catalytic converter, the diesel particle filter and finally, to minimize noise, the rear silencer. **Exhaust gas recirculation returns some of the exhaust gases to the combustion process.** The exhaust gases are routed through the **exhaust gas recirculation cooler** after the connection point of the exhaust manifolds before the oxidation catalytic converter. The exhaust gas recirculation quantity is controlled by the electronic engine management system and the exhaust gas recirculation valve. A bypass valve inside the exhaust gas recirculation cooler controls whether the exhaust gases are cooled or not before they reach the intake section (behind the throttle valve) and are thus recirculated into the combustion process. To reduce the combustion temperature and consequently allow as much of the exhaust gases as possible to flow back into the

combustion process, the exhaust gases are cooled by the exhaust gas recirculation cooler (the bypass valve is closed, allowing the exhaust gases to flow through the cooler). The **decrease in the oxygen concentration** in the fuel-air mixture **retards combustion in the cylinder** and reduces the peak combustion temperature, thereby reducing nitrogen oxide emissions (NOx). A further advantage of exhaust gas recirculation is in the **start phase of the engine**, if the components are still cold. In this case, the exhaust gases enter the cylinder directly without cooling (the bypass valve is open) so that the optimum operating temperature, e.g. of the catalytic converter, is achieved as quickly as possible.

The 3.0 I V6 turbo diesel engine features a close-coupled **oxidation catalytic converter** and a **diesel particle filter (DPF)** to optimize the emission characteristics. The catalytic converter is used to convert the pollutants in the exhaust gas into harmless substances by means of a chemical reaction. For this purpose, the catalytic converter consists of a substrate and a catalytically active layer that initiates the chemical reactions without



Fig. 55: Exhaust system on Cayenne Diesel (not for US)

being consumed itself in the process. The different exhaust gas compositions and temperatures of gasoline and diesel engines mean that different catalytic converters have to be used for exhaust gas after-treatment. Whereas gasoline engines use a three-way catalytic converter containing platinum, rhodium and/or palladium, diesel engines use a so-called oxidation catalytic converter with platinum as the catalyst. The design of the oxidation catalytic converter essentially corresponds to that of a three-way catalytic converter. In a three-way catalytic converter, reduction of the harmful nitrogen oxides (NO_x) to nitrogen and oxygen takes place in addition to the oxidation reactions (1) and (2). In the diesel engine, the NO_x reduction cannot be performed in the catalytic converter due to the high oxygen content of the exhaust gas. This problem is solved in the diesel engine by means of measures inside the engine and exhaust gas recirculation in order to achieve compliance with the stringent limits of the EU5 standard. The chemical reactions of the oxidation catalytic converter are restricted to the following oxidation reactions:

- (1) Carbon monoxide (CO) is converted into carbon dioxide (CO₂) by means of an oxidation reaction (reaction with oxygen)
- (2) Unburned hydrocarbons (HC) are converted into carbon dioxide (CO₂) and water (H₂O)

A diesel particle filter is used to collect the particles (diesel soot) from the exhaust gases of the diesel engine produced during the diesel combustion process and render them harmless. This consists of a honeycomb body in a metal housing. The honeycombs are divided up into many small channels that have alternate open and closed ends. This results in intake and exhaust channels that are separated by filter walls. The exhaust gas containing the soot flows through the porous filter walls of the intake channels. The soot particles are retained in the intake channels during this process, while the gaseous components of the exhaust gas pass through them. The particle filter must be regenerated at regular intervals to stop it becoming clogged with soot particles and its function being impaired. Without regeneration, the pores of the filter would become clogged over time and the exhaust gases would no longer be able to flow through them freely. This would cause a rise in the exhaust back-pressure, which would result in impaired performance and increased fuel consumption. The automatic regeneration process carried out differs depending on the load condition of the filter and the driving style:

- Passive regeneration
- Active regeneration

Both **passive** and **active regeneration** involve burning the soot particles collected in the diesel particle filter. Both operations take place automatically and unnoticed by the driver. A prerequisite for passive generation is high exhaust temperatures, such as occur under conditions with high engine load, e.g. during highway driving. This process runs continuously. If the vehicle is mainly driven in city traffic under low engine load, the temperatures are too low for passive regeneration. The soot particles consequently accumulate in the diesel particle filter. Once the maximum capacity of the diesel particle filter is reached, active regeneration is initiated. Numerous measures produce an increase in the exhaust gas temperature so that the soot particles in the diesel particle filter can be burned off. These include temporary suspension of exhaust gas recirculation or retarded post-injection during the compression stroke. The exhaust back-pressure is slightly increased during the regeneration process. The boost pressure of the turbocharger is increased so that the torque does not change perceptibly for the driver.

Note: Sulfur-free diesel fuel is required for EU5 classification and operation of the diesel particle filter. Sulfur-free diesel fuel is not available everywhere in markets with EU4 and EU3 classification. For this reason, exhaust gas after-treatment takes place without a diesel particle filter in these markets.

2.7.3 Exhaust systems for the Cayenne S, Cayenne S Hybrid and Cayenne Turbo

In order to achieve compliance with the worldwide emission limits, the Cayenne S Hybrid features secondary-air injection. Secondary-air injection improves heating of the catalytic converters during a cold start. A check valve allows additional air to be supplied to the exhaust system ahead of the catalytic converter for a defined period by means of the secondary-air pump. The uncombusted hydrocarbons and carbon monoxide either contained in the exhaust gas or deposited in the catalytic converter then react with the oxygen in the air. The heat that is released during post-combustion means that the optimum operating temperature of the catalytic converter for optimum exhaust after-treatment is reached more quickly.

2.7.4 Sports exhaust system

A **sports exhaust system** is offered additionally for the Cayenne and Cayenne S (note: only in combination with Tiptronic S for the Cayenne). Like the standard exhaust system, the sports exhaust system up to the rear silencer comprises 2 primary catalytic converters and 2 main catalytic converters as well as a center silencer. The main silencer provides a rich and full sound. There are two exhaust flaps between each of the rear silencers and the tailpipe covers that can be opened in order to achieve improved throughput. The sports exhaust system is activated using the standard Sport button in the center console. The sound of the sports exhaust system is controlled taking into account the load, speed, engine speed and gear. This provides a richer sports car sound at the push of a button.



Fig. 56: Exhaust system on Cayenne Turbo

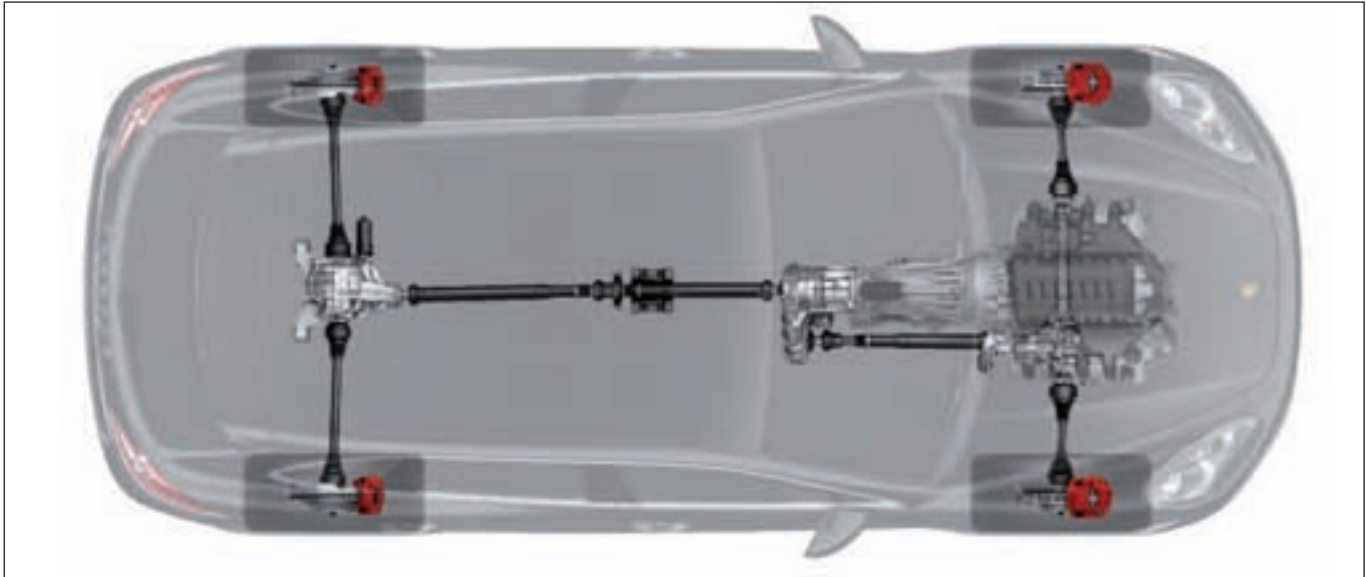


Fig. 57: All-wheel drive Porsche Traction Management (PTM)

3 Power transmission

The new Cayenne models feature a **6-speed manual transmission** (standard for Cayenne) and an **8-speed Tiptronic S transmission** (standard for Cayenne Diesel, Cayenne S, Cayenne S Hybrid, Cayenne Turbo, optional for Cayenne). All Cayenne models are equipped with the **new all-wheel drive system** Porsche Traction Management (PTM). On the Cayenne, Cayenne S and Cayenne Turbo, the power is transferred via an **active all-wheel drive** with electronic and map-controlled fully variable multi-plate clutch. **A permanent all-wheel drive** with self-locking center differential

is used on the Cayenne Diesel and Cayenne S Hybrid models.

Use of the new PTM meant that numerous measures were possible to reduce the weight in the rest of the drivetrain. The use of lightweight cardan shafts and lighter axle drives on the front and rear axles together with omission of the reduction gear reduced the overall vehicle weight by approximately 86 lb. The measures implemented in the drivetrain therefore made a decisive contribution to reducing the overall weight of all Cayenne models.

The new Cayenne is equipped as standard with a **6-speed manual transmission** that has been optimally adapted to the high power output and individual characteristics of the engine. The final-drive ratio guarantees outstanding performance, good suitability for long-distance driving and a high level of comfort. The **standard upshift indicator** in the instrument cluster provides the driver with a recommendation to select the next-higher gear depending on the currently selected gear, engine speed and gas pedal position. This helps to improve fuel economy. Exceptional comfort is ensured by the dual-mass flywheel integrated between the engine and transmission, thereby reducing vibrations.

The Tiptronic S automatic transmission has 2 additional gears compared with the previous model. 1st gear is designed for fast acceleration and good climbing and pulling power - also for off-road driving. Top speed is reached in 6th gear. The two other gears allow the engine speed to be reduced at high driving speeds in order to reduce fuel consumption. An additional benefit for highway driving in particular is that the low engine speeds reduce the noise level in

Transmission	Cayenne	Cayenne Diesel*	Cayenne S	Cayenne S Hybrid	Cayenne Turbo
<ul style="list-style-type: none"> ● = Standard equipment ○ = Optional equipment 					
6-speed manual transmission with upshift indicator in the instrument cluster	●				
8-speed Tiptronic S including Auto Start Stop function, with manual operation and automatic mode, Gear recommendation in manual shift mode	○	●	●	●	●

* not for US

the passenger compartment. On the Cayenne S Hybrid, the 8-speed Tiptronic S is specifically adapted to the different driving modes and their respective requirements. An electric oil pump is used here in order to guarantee an adequate oil pressure in the transmission, such as is required for transfer of the high torques at low rpm. This pump also permitted realization of the **Auto Start Stop function** in the new Tiptronic S. This function switches off the engine when the vehicle is stopped at a traffic light, for example, and the driver presses the brake. In order to ensure that driving readiness is available quickly after an engine restart, the electric oil pump provides the oil supply to the necessary switching elements during the stop phase.

Porsche Traction Management (PTM) distributes the drive power as required to the rear and front axles with the goal of realizing high traction and driving stability as well as exceptionally dynamic handling. The transfer case of the all-wheel drive of the new Cayenne models is accommodated in a separate housing and is connected directly to the 6-speed manual transmission or 8-speed Tiptronic S. The drive power is distributed from here.

3.1 Manual transmission

The Cayenne is equipped as standard with a 6-speed manual transmission. Compared with the 1st generation, this transmission has the following characteristics:

- Optimum adaptation to the power and engine characteristics
- Upshift indicator



Fig. 58: Shift lever for 6-speed manual transmission in Cayenne

The manual transmission of the Cayenne was adapted to the changed power and torque values and the engine characteristics. This was achieved by reinforcing the gear wheels and using friction-optimized axle bearings.

An economy-oriented **upshift indicator in the instrument cluster** is used as standard in the Cayenne with 6-speed manual transmission to help reduce fuel consumption. The upshift indication occurs depending on the selected gear, engine speed, engine load and gas

pedal position. Illumination of this indicator **provides the driver with a clear recommendation to shift to the next-higher gear** in order to reduce fuel consumption. The driver is recommended to perform an upshift only if the previously selected speed and acceleration can be continued in the next-higher gear. The indicator appears in the form of a triangle on the digital speedometer of the tachometer on the right of the digital speed display. It can be activated/deactivated when required via the instrument cluster menu.

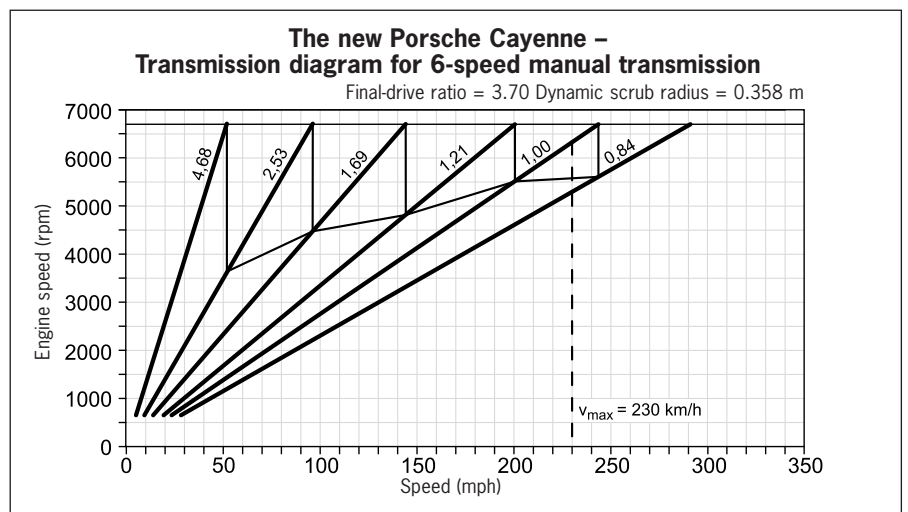


Fig. 59

3.2 8-speed Tiptronic S

The **new 8-speed Tiptronic S** (optional for Cayenne, standard for all other Cayenne models) is a new transmission designed to reliably transfer the high power output and torques of all Cayenne models. It goes without saying that this transmission offers **high efficiency** and **fast shift operations** in combination with **exceptional gear changing and driving comfort**.

The new Tiptronic S is characterized by a host of innovations:

- 2 additional gears as overdrive gears
- Auto Start Stop function
- Thermal management
- Enhanced response and shifting times

An increased gear spread was required for the new 8-speed transmission to achieve a clearly noticeable reduction in fuel consumption compared with the previous model without affecting performance. The powerful engines of the Cayenne models with their high torques offer the best preconditions for optimum dimensioning of the new transmission. It was thus possible to fully utilize the 20 % increase in the gear spread and real-

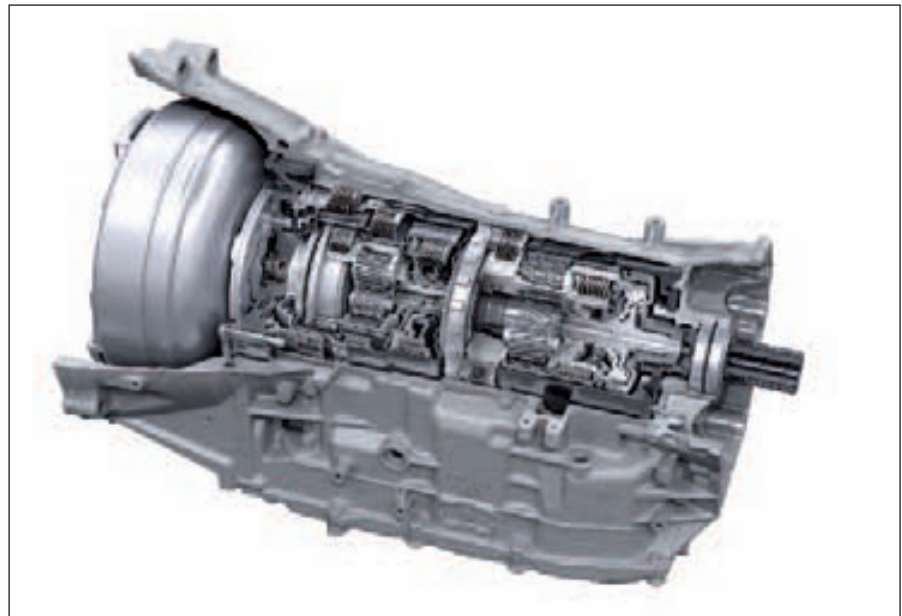


Fig. 61: 8-speed Tiptronic S transmission

ize the 2 additional gears as so-called overdrive gears.

Based on the proven design of the previous 6-speed Tiptronic S, inclusion of an additional shifting element in the transmission permitted realization of the two additional gears. This also made it possible to keep the space requirement of the new transmission the same as for its predecessor. The installation length of the 8-speed transmission is identical to that of the 6-speed transmission, for example.

These **two additional gears** make it possible to realize a wider transmission spread with the following advantages:

- Low engine speeds in the high driving speed range in order to reduce fuel consumption and keep noise levels low
- Good drive-off characteristics and sufficient power reserves in 1st gear for excellent climbing and pulling power
- Optimized shifting programs for rpm ranges that are ideally matched to the required engine torque

A larger overall spread compared with the 6-speed transmission ensures that the engine always runs in the optimum operating range. The engine speed is reduced by 20% in 7th and 8th gears, which makes a decisive contribution to reducing the fuel consumption during long journeys on highways in particular. The new 8-speed Tiptronic S always drives away in first gear to achieve the best starting performance. Top speed is reached in 6th gear.

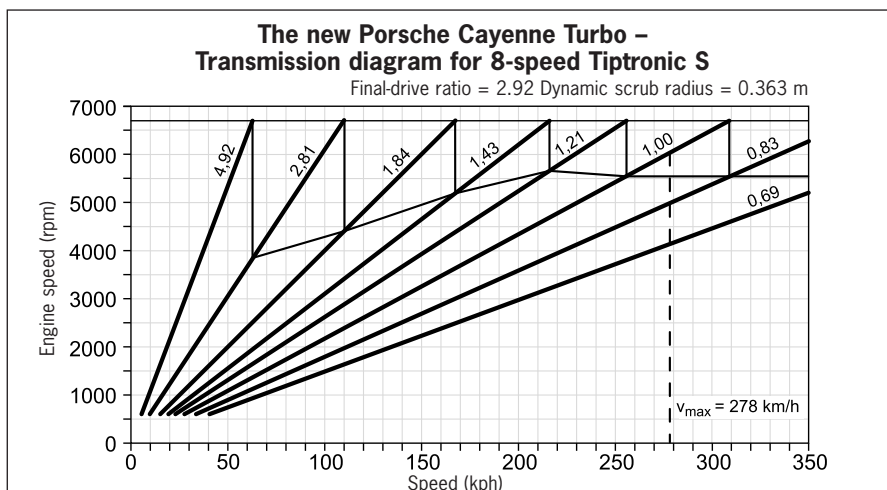


Fig. 60

The improved power-to-weight ratio of the transmission and the detailed optimization of individual transmission components have also contributed to the overall increase in efficiency. For example, the use of significantly more powerful vibration dampers on the torque converter lockup clutch allows the engine to operate at lower speeds with the torque converter lockup closed in order to increase fuel economy and guarantee a high degree of driving comfort.

The **Auto Start Stop function** makes a significant contribution to increasing fuel economy in urban driving. When developing the Auto Start Stop function for an automatic transmission, the main challenge was guaranteeing rapid driving readiness of the vehicle after an engine restart. In order to permit delay-free drive-away after a stop phase, sufficient oil pressure must be available within a very short time to ensure power transmission without slip. On automatic transmissions without an Auto Start Stop function, oil pressure is generated by a mechanically operated transmission-oil pump. This pump can achieve the oil pressure and volume flow the vehicle requires to drive off only when the engine speed increases. The electric oil pump continues to supply the required quantity of oil to the switching elements even during the period when the engine is stopped. The use of this pump was a precondition for minimizing the response time of the transmission to such an extent that the driver and passengers are hardly able to distinguish the drive-away operation after an Auto Start Stop phase from one where the engine is already running. The main challenge relating to use of the electrically operated transmission-oil pump was finding a suitable installation location, since the available space in the area of the drive-

train and exhaust system is quite restricted. In order to nevertheless permit realization of short pressure lines, the transmission-oil pump was installed directly under the transmission in the direct proximity of the mechanical transmission-oil pump.

A **thermal management** system is used for the first time to ensure that the engine reaches the optimum operating temperature as quickly as possible after a cold start and to minimize friction inside the transmission. The transmission cooling system is connected to the engine cooling system via a heat exchanger for this purpose. This allows specific heat exchange between the engine and transmission as required and makes a contribution to increasing the fuel economy of the new Cayenne models. After a cold engine start, for example, the more rapidly heated engine coolant warms up the transmission cooling system to reduce frictional resistance inside the transmission as quickly as possible. When the temperatures increase, the heat exchanger is then used for cooling purposes. If the cooling effect of the heat exchanger on its own is not sufficient, the system also makes use of the powerful air heat exchanger installed in the body front section.

Outstanding agility and maximum driving pleasure are guaranteed by **gear changes** that are up to 0.15 seconds faster. This means that they are hardly perceptible for the driver. Fast gear changes with practically no interruption in tractive power permit very agile driving even in automatic mode. The improved shift times are achieved by redesigned shifting hydraulics (direct activation) and optimized clutch operation. The **intelligent shift programs** allow the driver to directly influence the shift behavior of the Tiptronic transmission by corresponding operation of the gas and brake pedals. In the event of fast gas pedal movements, an active switching function immediately switches the shift points to the dynamic gear-changing map. This takes place without any need for kickdown.

Overrun upshifts are suppressed when the gas pedal is released quickly, e.g. before curves. In addition, gear retention prevents upshifts in curves. The result is increased handling stability and safety.

Tiptronic S quickly shifts down to the next gear when the brakes are applied with force in order to exploit the engine braking effect. A hill detection function enhances the acceleration capability when driving uphill and provides a higher

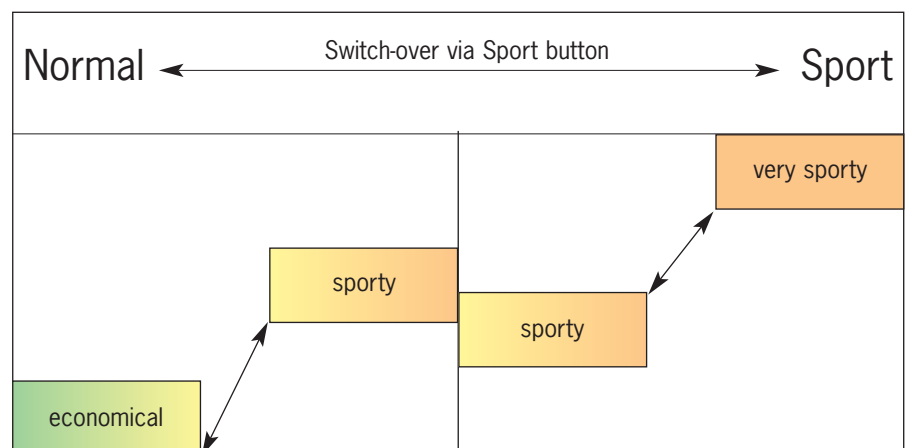


Fig. 62: Shift characteristics for "Sport" and "Normal" modes

engine braking torque when driving downhill.

As before, **adaptive adjustment of the shift characteristics to the driving style also occurs in Sport and Normal modes.**

In order to permit the sportiest possible driving style immediately after the Sport button is activated, the shift characteristics of the Tiptronic S change to the sportier map more quickly than in Normal mode. Gears 7 and 8 are no longer selected depending on the driving style and speed, and braking downshifts are performed even after slight deceleration so that the vehicle can accelerate more readily afterwards. In Normal mode, Tiptronic S ensures a particularly economical driving style and reduces fuel consumption. The savings result from earlier upshifting and later downshifting.

The Tiptronic S has an **off-road setup** designed especially for off-road driving. If Off-road mode 1 is activated via the central off-road rocker switch on the center console on the Cayenne, Cayenne Diesel, Cayenne S or Cayenne Turbo,

Tiptronic S switches to a shift program that is tailored to the requirements of off-road driving. The focus is then primarily on traction and controlling power. Later upshifts and earlier downshifts reduce the shifting frequency by utilizing the rpm range available for each gear speed over a wider range. In order to guarantee maximum control of the vehicle, no automatic upshifts and downshifts are performed in the manual gate, even after kickdown. The torque converter lockup clutch also closes later compared with Normal and Sport mode. This allows power transmission to be controlled with greater precision at lower speeds and over difficult sections of terrain.

The new 8-speed Tiptronic S is operated primarily by means of the **selector lever** in the center console or using the **2 shift buttons on the steering wheel.**

The elevated center console and the driver's seat position ensure that there is only a short distance between the steering wheel and selector lever, creating a sporty driving feel. In manual mode, the gear recommendation in the instrument

cluster helps to ensure optimal fuel economy.

The selected driving mode and gear are displayed in the digital display of the tachometer. The shift buttons on the steering wheel are located in an optimum ergonomic position to guarantee fast and reliable gearshifts. The Tiptronic S shifts up a gear when one of the two sliding buttons is pressed forwards and shifts down a gear when a button is pressed towards the driver from the back of the steering wheel.

A 3-spoke sports steering wheel with shift paddles

is optionally available for all Cayenne models in combination with the new 8-speed Tiptronic S. The two high-quality shift controls made of light alloy are positioned behind the 3 and 9 o'clock spokes on the steering wheel. The paddles are pulled towards the driver to shift gear - the paddle on the right shifts up a gear and the paddle on the left shifts down a gear. If shift buttons or paddles are pressed/pulled and then held, the transmission shifts up and



Fig. 63: Steering wheel with 2 sliding buttons in the Cayenne Diesel (not for US) in Luxor Beige



Fig. 64: Steering wheel with 2 sliding buttons in the Cayenne in two-tone Black/Titanium Blue

down sequentially to the maximum or minimum permitted gear in each case.

In the **manual gate**, gears changes can also be performed comfortably with the selector lever. The upshift suppression function ensures a sporty and direct driving feeling. Up to 100% gas pedal position, this mode prevents automatic upshifts when the rpm limiter threshold is reached. An upshift then takes place only after operation of the selector lever or the shift buttons on the steering wheel or after kickdown.

8-speed Tiptronic S in the Cayenne S Hybrid

The 8-speed Tiptronic S was adapted in the following areas for use in the hybrid drivetrain in order to specifically assist the hybrid-specific driving modes:

- Additional electric transmission-oil pump for increased volume flow
- Modified gearshift setup and shift characteristic
- Modified torque converter lockup clutch
- Enhanced transmission control unit functionality

The conventional oil pump was supplemented by an **additional electrically powered pump unit**. This is necessary to ensure that all of the necessary clutch and shift operations in the transmission can still be performed even when the combustion engine is switched off. Compared with the other Cayenne models, the two oil pumps generate a higher volume flow. This is required specifically to meet high load demands resulting from boosting or recuperation, for example, so that the high drive torques can be transmitted. The electric oil pump is additionally activated according to demand. The transmission is designed so that the top speed is already reached in 6th gear. The two upper speed ranges then function as "overdrive" gears in order to reduce engine rpm and thus save fuel.

The spread over 8 gears also allows better exploitation of the torque advantage of the synchronous motor, particularly in the lower transmission ranges when driving purely on electric power and during boosting. The transmission is mounted directly on the hybrid module and is extremely important for efficient and comfortable power transmission in all hybrid-specific driving modes, e.g. during recuperation. The **shift characteristic was modified** in order to increase recuperation performance during brake force recovery through adaptation of the gear-changing speeds (downshifts) or to achieve comfortable restarting of the combustion engine when driving solely on electric power with reduced shifting frequency. The special setup of the 8-speed Tiptronic ensures an **optimum gearshift strategy** during boosting with additional drive torque from the electric motor.



Fig. 65

The **torque converter lockup clutch** in the torque converter of the automatic transmission was adapted to the high torque in the boost phases and therefore has a high torque capacity even at very low rpm.

The enhanced transmission control unit functionality with modified shift maps for the Cayenne S Hybrid facilitates control of power transmission in the hybrid-specific driving modes and ensures optimum efficiency. In addition, the control coordinates the **interaction between the electric oil pump** and the existing mechanical pump unit.

3.3 Porsche Traction Management (PTM)

All Cayenne models are equipped with Porsche Traction Management (PTM) for superior driving stability, outstanding traction and sportscar-like handling. The new development of the PTM for all Cayenne models focused on **optimizing on-road performance as well as maintaining the off-road characteristics required by the vehicle concept**. This resulted in two different PTM sys-

tems, which are specifically matched to the 3 different drive types of the new Cayenne models. Both all-wheel drive systems are extremely compact, and their lower weight contributes to improved fuel economy. In addition, both systems are equipped with automatic brake differential (ABD) for improved traction, anti-slip regulation (ASR) for enhanced vehicle stability and **Porsche Hill Control (PHC)** for controlled driving down steep inclines.

3.3.1 Active all-wheel drive PTM

The **active all-wheel-drive system** (Porsche Traction Management, PTM) is standard in the Cayenne, Cayenne S and Cayenne Turbo and is designed to influence longitudinal and lateral dynamics. The system provides increased driving stability, traction and more agile handling, depending on the driving situation. PTM comprises the following systems:

- Active all-wheel drive with electronic and map-controlled fully variable multi-plate clutch
- Automatic brake differential (ABD)
- Anti-slip regulation (ASR)

PTM on the Cayenne, Cayenne S and Cayenne Turbo is designed as an **active fully variable all-wheel drive**. The system is characterized by an especially compact overall design. **The multi-plate clutch is controlled electronically by an electric motor**. This permits fully variable regulation of drive power between the full-time drive rear axle and the front axle **without a fixed basic distribution**. Permanent monitoring of the driving state allows corresponding reactions to different driving situations and driver requests, e.g. gas pedal position, steering wheel angle or PSM switch positions, Sport button, etc. This is made possible by additional software of the fully variable all-wheel drive designed for driving dynamics, which enables **appropriate reactions to specific driving situations and even advance interventions** to prevent undesired slip on an axle before it occurs. A precondition for this is integration of the all-wheel drive system in the system network of the other chassis systems. Sensors continuously monitor various parameters, including the speeds of all four wheels, the longitudinal and lateral acceleration of the vehicle and the steering angle. If the slip at the rear axle



Fig. 66

increases, e.g. as a result of acceleration, additional drive power (if necessary up to 100% more) is distributed forward through greater engagement of the multi-plate clutch. The **all-wheel drive is therefore fully variable**.

The distribution of the drive torque between the front and rear axles depends on a number of factors such as speed, acceleration, selection of Normal or Sport mode as well as the selected PSM mode, etc. In order to achieve good traction when driving off or accelerating, the front axle torques tend to be higher in these situations than when the vehicle travels at constant speed in a straight line. For example, the system reacts to constant driving by reducing the drive torque for the front axle in order to minimize friction losses.

The **rear axle is in principle always powered**. The front axle receives its drive torque from the rear axle depending on the locking ratio of the electronically controlled multi-plate clutch. This means that torque distributions of 100% on the rear axle and 0% on the front axle are possible. Only in situations where the wheels on the rear axle are standing on a surface such as ice with a considerably lower frictional coefficient than the front axle wheels and would therefore spin during driving off can it become necessary to transmit 100% of the required torque to the front axle. However, the rear axle is not disengaged at any time. Instead, the multi-plate clutch ensures that 100% of the torque is transmitted to the front axle.

The new fully variable all-wheel drive of the Cayenne, Cayenne S and Cayenne Turbo allows further **enhancement of the driving dynamics combined with high traction and stability**. Variability of the torque distribution between the rear and front axles is a precondition for situation-dependent and preventive intervention in driving situations that first require high agility and lateral acceleration, such as when driving into a curve (high cornering forces of the front axle due to reduced drive torque at the front axle) and then accelerating out of it (high traction through distribution of the drive torque to the rear and front axles). **In terms of driving dynamics, the new Cayenne models therefore further extend their lead in the competitive comparison**. The variability and controllability of the hang-on all-wheel drive also allow the maximum front-axle torque to be matched precisely to the demands of the new Cayenne models by way of the programmable software parameters. This made it possible to produce weight-optimized designs for the drive shafts, transfer case and front-axle final drive. In addition to the weight savings, this system also contributes to the enhanced efficiency of the Cayenne models since the lubrication concept for the fully variable all-wheel drive was realized without a pump.

The operating principle of the fully variable all-wheel drive is essentially the same as that of Porsche Traction Management (PTM) in the Panamera and sportscar models. For the new Cayenne models, great importance was also attached to complex matching of on-road and off-road demands. The multi-plate clutch is controlled by an electric motor.

Anti-slip regulation (ASR) additionally reduces spinning of individual wheels. In curves, the front wheels receive only the amount of drive power needed to ensure optimum lateral stability. PTM works together with the enhanced Porsche Stability Management to ensure that power is distributed appropriately to provide optimum drive force in every situation, whether on long straights, in tight curves or on surfaces with varying levels of grip. The **automatic brake differential (ABD)** function also additionally improves traction. In the event of intervention by the brake control systems, PTM disengages the front axle completely to facilitate PSM interventions on individual wheels.

Porsche Hill Control (PHC) can be activated in all models by a separate switch in the center console. This system assists the driver when driving down steep slopes (the gradient must be at least approx. 12 percent). The driving speed can be controlled in the range from 2 - 19 mph by means of the brake and gas pedals and by the operating control of the cruise control. The downhill speed is kept constant by means of PSM braking interventions so that the driver can concentrate on steering.

3.3.2 Porsche Torque Vectoring Plus (PTV Plus)

PTV Plus is a new **system to enhance driving dynamics and stability. It functions with variable torque distribution at the rear wheels** and an **electronically regulated rear differential lock**. PTV Plus improves the steering behavior and steering precision as a function of the steering angle and steering speed, gas pedal position as well as yaw rate and vehicle speed through selective braking interventions at the right-hand or left-hand rear wheel. Specifically, this means that when driving dynamically into a curve, slight brake pressure is applied to the inside rear wheel. As a result, the rear wheel on the outside of the curve receives a higher drive force and permits additional angular momentum in the steering direction. **The result is direct and dynamic steering into the curve.** This reduces the need for PSM control intervention.

The Cayenne Diesel and Cayenne S Hybrid feature the sub-functionality of selective braking intervention in the standard PSM.

At slow and medium speeds, PTV Plus considerably enhances agility and steering precision. **At high speeds**, during fast cornering and with spinning wheels, the **electronically regulated rear differential lock ensures additional stability**. When driving on different road surfaces and in wet and snowy conditions, the system also demonstrates its strengths to ensure outstanding vehicle stability in combination with Porsche Traction Management (PTM) and Porsche Stability Management (PSM).

For **off-road operation**, PTV Plus reduces spinning of the rear wheels. In addition, the braking interventions are adapted specifically to the requirements of off-road driving. The rear differential lock can be fully locked by means of the off-road rocker switch in the center console. The system is optionally available for Cayenne, Cayenne S and Cayenne Turbo.

3.3.3 Permanent all-wheel drive PTM

The Cayenne Diesel and the Cayenne S Hybrid have a **permanent all-wheel drive with self-locking center differential**. This is designed as a mechanical center differential that uses a planetary differential and multiple plates to distribute the drive torque mechanically and reactively to the front and rear axles, depending on the traction. The main advantage of this version is the low system weight. Like with the fully variable all-wheel drive, it was possible to omit a pump for system lubrication.

Normally, 60% of the drive torque is transmitted to the rear axle and 40% to the front axle. If one of the wheels on an axle spins, e.g. on an icy surface, the difference in rotational speed between the two axles causes the self-locking center differential to automatically transmit the drive power to the axle offering the better traction (axle rotating more slowly).

Input variables	Control unit	Output variables
Steering angle	PSM	Locking ratio of the rear differential lock Selective braking interventions at the wheel on the inside of the curve
Speed		
Wheel speed		
Lateral acceleration		
Yaw rate		
Oversteer signal		
Understeer signal		
Engine torque		

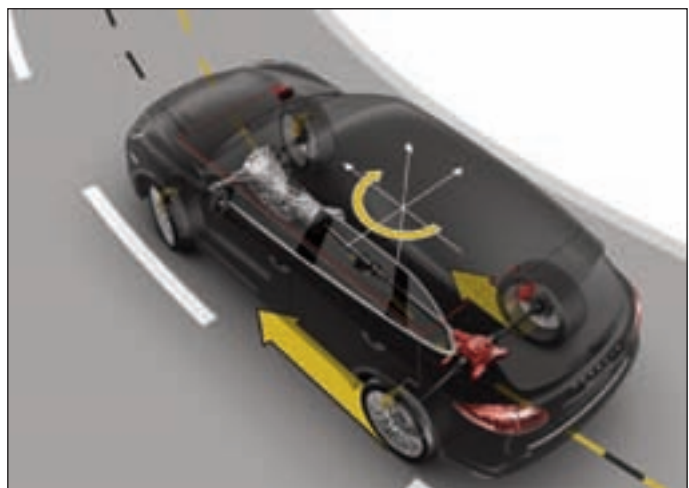


Fig. 67: Porsche Torque Vectoring Plus (PTV Plus)



Fig. 68

In the Cayenne Diesel, the driver has the option of switching the driver assistance systems to off-road mode by means of the off-road rocker switch on the center console (not available for Cayenne S Hybrid).

3.3.4 PTM operation

Steep approaches to snowy mountain huts, uneven ground or muddy, loose terrain – all these are situations in which all Cayenne models demonstrate their superior off-road driving performance with intelligent all-wheel drive technology. The engines of the new Cayenne models with their high torque values offer high power reserves.

The operating concept of Porsche Traction Management (PTM) follows a quite clear principle: it is already enough if the driving conditions are difficult. All systems are **optimized for off-road operation with the goal of improving traction on difficult terrain**. Using the central off-road rocker switch in the center console, the driver can improve the off-road capabilities of the Cayenne, Cayenne Diesel, Cayenne S and Cayenne

Turbo in up to 3 stages, depending on model, by a simple movement forwards or to the rear. He can also switch back to the original mode just as easily.

In **Off-road mode 1**, for example, all relevant systems such as ABS are switched to a traction-oriented off-road program. Porsche Hill Control is activated additionally (on gradients of at least 12 percent) and High Level I is also selected on vehicles with air suspension. The rocker switch of the air suspension

also permits selection of High Level II in order to increase the approach/departure angle and fording depth.

If the off-road rocker switch is pressed forward again, **Off-road mode 2** is activated for the Cayenne, Cayenne S and Cayenne Turbo – in this case the multi-plate clutch is closed fully for better traction on difficult terrain.

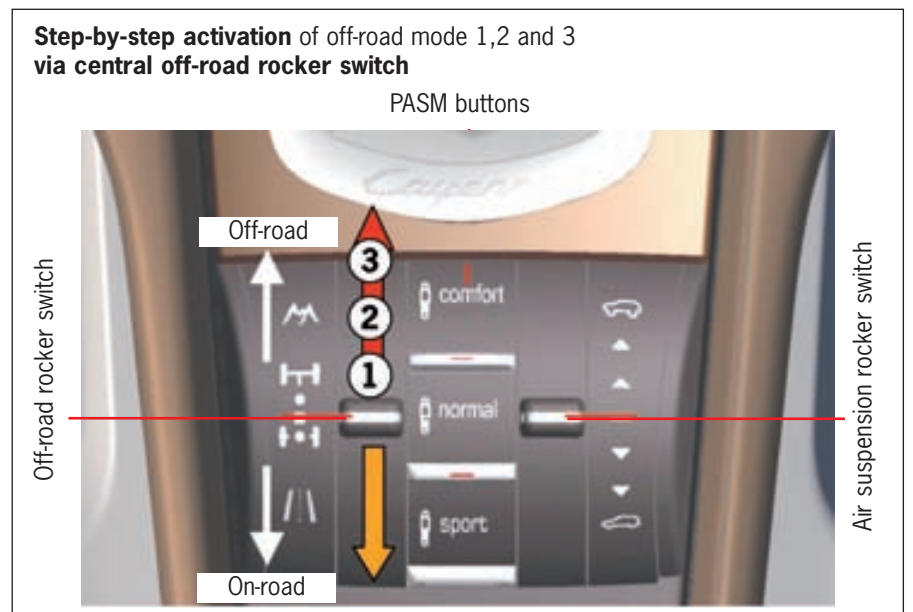


Fig. 69: Central off-road rocker switch

The electronically controlled rear differential lock of the optional Porsche Torque Vectoring Plus (PTV Plus) system is integrated in all-wheel control. This rear differential lock ensures appropriate power control when driving off-road on particularly difficult terrain. If a rear wheel starts to spin on slippery or loose ground, the differential lock re-establishes traction by sensitive distribution of the drive force to the other wheel. If required by the conditions, it is possible to activate **Off-road mode 3** with full locking of the rear axle differential by pressing the off-road rocker switch once more.

If the going is really tough, the **optional off-road underbody protection package** offers additional protection. This includes rock rails with integrated skid plates, a reinforced engine-bay guard, protection for the fuel tank and rear axle and a second towing lug.

The following table provides an overview of the possibilities for influencing the traction of Porsche Traction Management by means of the central off-road rocker switch on all Cayenne models.

Note: For the Cayenne S Hybrid, only the Porsche Hill Control can be activated as required by means of a separate button on the center console. The Cayenne S Hybrid does not have any other off-road programs.

	Cayenne, Cayenne S and Cayenne Turbo			Cayenne Diesel (not for US)
	Off-road mode ①	Off-road mode ②	Off-road mode ③	Off-road mode ①
Multi-plate clutch	Off-road setup	+	Multi-plate clutch fully closed	No influence – PTM with self-locking center differential
Gas-pedal characteristics PSM/ABS	Off-road setup			Off-road setup
Porsche Hill Control (PHC)	Activated (prerequisite: downhill gradient of at least 12% detected)			Activated (prerequisite: downhill gradient of at least 12% detected)
8-speed Tiptronic S	Off-road setup (optional for Cayenne)			Off-road setup
Air suspension incl. PASM	Activation of High Level I (optional for Cayenne and Cayenne S)			Activation of High Level I (optional for Cayenne Diesel)
PTV Plus	Off-road setup (optional)	+	Fully closed	Not available for Cayenne Diesel
PDCC	Off-road mode for greater axle articulation (optional)			Not available for Cayenne Diesel



Fig. 70: Chassis on Cayenne S

4 Chassis

The concept used for the chassis makes a decisive contribution to the handling characteristics of a vehicle. The demands for the Cayenne models were particularly high, since in addition to the important aim of ensuring outstanding **comfort and day-to-day usability**, the development goals also included achieving best-in-class performance for driving dynamics and agility **with sportscar-like handling**. The objective defined for the new Cayenne models was thus to further extend their lead in the competitive comparison. At the same time, the development engineers were given the challenge of making an important contribution to improved fuel economy by reducing component weights.

4.1 Driving dynamics

In order to enhance the already exceptional handling of the previous models, the following objectives were defined for the new Cayenne models:

- Increased driving enjoyment and agility
- Improved comfort and day-to-day usability
- Improved driving dynamics

In order to achieve these goals, all the chassis variants and the all-wheel drive Porsche Traction Management (PTM) were enhanced for the new Cayenne models. In addition to fundamental design modifications on the front and rear axles, new materials are used for lightweight construction wherever possible. In addition, two attractive new options are available in the form of **Porsche Active Suspension Management (PASM)** for the steel spring suspension and **Porsche Torque Vectoring Plus (PTV Plus)**.

The following table provides an overview of all chassis components used and available in the Cayenne models.

System/Designation	Scope	Customer benefits
<p>Porsche Traction Management (PTM), active all-wheel drive (Cayenne, Cayenne S and Cayenne Turbo)</p>	<p>Active all-wheel drive with variable drive torque distribution and driving situation detection</p> <ul style="list-style-type: none"> • Electronic, map-controlled multi-plate clutch • Automatic brake differential (ABD) • Anti-slip regulation (ASR) 	<ul style="list-style-type: none"> • Efficient utilization of the friction potential between tires and road • Combination of high traction typical for all-wheel drive with excellent agility • Increased driving safety and driving dynamics • Optimum vehicle control, even at the performance limits • Longitudinal dynamics control/Traction improvement
<p>Porsche Traction Management (PTM), permanent all-wheel drive (Cayenne Diesel and Cayenne S Hybrid)</p>	<p>Permanent all-wheel drive with self-locking center differential</p> <ul style="list-style-type: none"> • Mechanical center differential with fixed standard torque distribution: 60% rear axle and 40% front axle • Automatic brake differential (ABD) • Anti-slip regulation (ASR) • Wheel-selective braking intervention for variable torque distribution on the rear axle via PSM 	<ul style="list-style-type: none"> • Neutral and safe handling • Optimum vehicle control, even at the performance limits • Traction improvement • Better steering behavior and steering precision as well as enhanced agility
<p>Enhanced Porsche Stability Management (PSM)</p>	<p>Longitudinal dynamics control:</p> <ul style="list-style-type: none"> • Anti-lock braking system (ABS) • Engine drag torque control (MSR) • Brake assist • Pre-filling of the brake system <p>• Standstill management</p> <ul style="list-style-type: none"> • Earlier pre-filling of the brake system and readying of brake assist (in conjunction with adaptive cruise control) • Longitudinal deceleration control in conjunction with adaptive cruise control <p>Lateral dynamics control:</p> <ul style="list-style-type: none"> • Wheel-selective braking intervention to ensure driving stability 	<ul style="list-style-type: none"> • Primary driving dynamics control system for longitudinal and lateral dynamics control • High active safety for maneuvers with extreme longitudinal and lateral dynamic forces, while still preserving typical Porsche agility • Assistance through standstill management, making it easier for the driver to drive off on hills • Further enhanced brake assist function, resulting in even shorter stopping distances (in conjunction with adaptive cruise control) • Driver assistance function for observing a defined speed and distance • Additional warning by a braking jolt if the distance is reduced further (in conjunction with adaptive cruise control) <p>• Enhanced driving safety through vehicle stabilization in the dynamic limit range</p>

System/Designation	Scope	Customer benefits
Steel spring suspension with Porsche Active Suspension Management (PASM)	<ul style="list-style-type: none"> • Fully load-bearing steel spring struts with integrated twin-tube dampers • Anti-roll bars on front and rear axles • Electronically regulated damping system with demand-controlled damping on front and rear axles • Sensors for detection of body and wheel movements • PASM control unit for system control • 3 manually selectable damping modes 	<ul style="list-style-type: none"> • Damper control for optimization of driving safety, agility and comfort • 3 selectable modes for comfortable to sporty handling • Reduced roll and pitch movements
Air suspension with leveling system and height adjustment incl. PASM (standard on Cayenne Turbo)	<ul style="list-style-type: none"> • Fully load-bearing air-spring struts with integrated PASM dampers • Closed air supply system with pressure accumulator • Sensors for detection of body and wheel movements • Control unit for system control • Anti-roll bars on front and rear axles • Electronically regulated damping system with demand-controlled damping on front and rear axles • Leveling system for load compensation • Six-stage height adjustment 	<ul style="list-style-type: none"> • Large spread between comfort and sportiness • Level control for constant vehicle position • 3 selectable damping modes for comfortable to sporty handling • High performance through lowering to Low Level as from a speed of 86 mph and to Low Level II from 130 mph • Increased ground clearance for off-road driving or greater comfort by lowering to Loading Level (when stationary): <ul style="list-style-type: none"> - High Level II (manual) - High Level I (manual) - Normal Level (manual) - Low Level (manual/automatic) - Low Level II (automatic) - Loading Level (manual)
Porsche Dynamic Chassis Control (PDCC) (only for Cayenne, Cayenne S and Cayenne Turbo)	<ul style="list-style-type: none"> • Hydraulic high-pressure pump and valve blocks • Anti-roll bars on the front and rear axles with adjusting motor • Control unit including driving dynamics control • Off-road mode 	<ul style="list-style-type: none"> • Active chassis control system for anti-roll stabilization • Reduces the lateral inclination of the vehicle when cornering and increases agility, driving performance and comfort on uneven roads • Improved handling and increased comfort thanks to optimum steering behavior and balanced load alteration behavior • Improved traction through greater axle articulation
Porsche Torque Vectoring Plus (PTV Plus) (only for Cayenne, Cayenne S and Cayenne Turbo)	<ul style="list-style-type: none"> • Variable torque distribution on the rear axle through targeted braking intervention • Electronically controlled rear differential lock, full locking by means of rocker switch on center console 	<ul style="list-style-type: none"> • Better steering behavior and steering precision as well as enhanced agility • Increased driving stability and traction • Improved traction on difficult off-road terrain

System/Designation	Scope	Customer benefits
Tire Pressure Monitoring (TPM) (standard on all models)	<ul style="list-style-type: none"> • Wheel electronics in the wheels mounted on valve stems • Trigger transmitter in the wheel housings for fast pressure assignment to the wheel positions • Receiver units on the vehicle floor 	<ul style="list-style-type: none"> • Permanent measurement and monitoring of the tire air pressure takes place separately for all 4 wheels and the driver is informed about pressure losses • Driver can check air pressures conveniently on the instrument cluster display • Fast pressure indication after a wheel change or filling with air
Servotronic	<ul style="list-style-type: none"> • Speed-sensitive steering assistance 	<ul style="list-style-type: none"> • Speed-sensitive power steering • Reduces the steering effort when maneuvering and at low speeds, e.g. making parking easier

4.2 Chassis variants

The following chassis variants are available for the Cayenne models:

Chassis and options ● = Standard ○ = Option Changes compared with the previous models are marked in bold .	Cayenne	Cayenne Diesel*	Cayenne S	Cayenne S Hybrid	Cayenne Turbo
Steel spring suspension	●	●	●	●	
Steel spring suspension with Porsche Active Suspension Management (PASM)	○	○	○	○	
Air suspension with leveling system and height adjustment incl. PASM	○	○	○	○	●
Porsche Dynamic Chassis Control (PDCC)	○		○		○
Porsche Torque Vectoring Plus (PTV Plus)	○		○		○

* not for US

All chassis variants have the following characteristics in common:

- Large-format double wishbone suspension with chassis subframe
- Multi-link rear axle with direct connection
- Anti-roll bars on the front and rear axles

The chassis design also makes an important contribution to reducing the overall weight of the new Cayenne by up to 408 lb compared with the predecessor, depending on model. It was possible to save around 146 lb through increased use of aluminum (e.g. front axle wishbones) and plastics (pedal bearing block, torque support V8), lightweight construction wherever possible (e.g. hollow-bored drive shafts on the rear axle) as well as concept modifications (e.g. improved body connection at the front axle). The

resultant weight reduction does not just lead to enhanced driving dynamics with lower fuel consumption, but also makes a decisive contribution to improved comfort by reducing the unsprung masses.

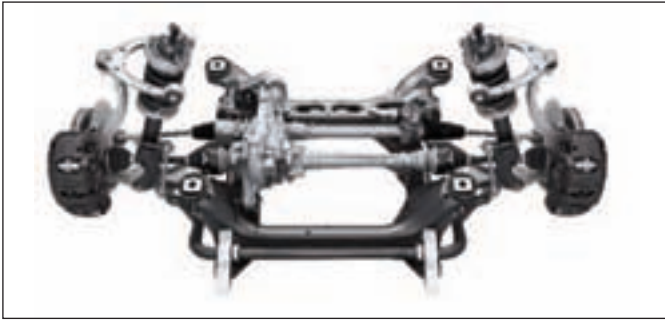


Fig. 71: Front axle of Cayenne



Fig. 72: Rear axle of Cayenne

4.2.1 Steel spring suspension

The new Cayenne, Cayenne Diesel, Cayenne S and Cayenne S Hybrid are equipped standard with a steel spring suspension, which meets the high requirements for performance, driving pleasure and off-road usability. A standard steel spring suspension is used worldwide. The characteristic of this suspension is comfort-oriented, but still allows all performance goals to be met.

For the first time, the **standard steel spring suspension is optionally available with Porsche Active Suspension Management (PASM)** for the Cayenne, Cayenne Diesel, Cayenne S and Cayenne S Hybrid. This means that the steel spring suspension is even better equipped to meet the high demands for long-distance comfort, performance and agility.

Porsche Active Suspension Management (PASM) is a shock absorber system for active and continuous damper control on the front and rear axles. It regulates the damping force for each wheel individually, depending on driving style and driving conditions. Uneven road surfaces act on the chassis via the wheels and cause vertical movements and vertical accelerations of the vehicle body. By actions such as steering, acceleration and braking, etc, the driver also produces pitch, roll and/or

yaw reactions of the vehicle. Active damper control reduces the above effects and stabilizes the vehicle body.

In addition to body movements such as those produced by acceleration, cornering or uneven roads, the sensors also detect signals such as lateral acceleration, steering angle, brake pressure, engine torque and vehicle speed. This information is supplied to the control electronics, which then individually regulates the required damping force for each wheel in just a few milliseconds on the basis of this data. As a result, only the actually required damping forces are generated in all driving situations, thereby reducing body movements. The system also adapts to the respective driving situation, so that driving pleasure is still guaranteed. For example, only

moderate damping forces are requested for steady highway driving. If the driver favors a sporty driving style, the system automatically adjusts and allows the driver to feel the desired contact with the road. Optimally regulated damping improves the vehicle grip and at the same time ensures increased driving stability, more comfort, enhanced performance and shorter braking distances.

In the new Cayenne models, the driver can choose between **3 modes** by means of the **PASM chassis buttons on the center console: Comfort, Normal and Sport.**

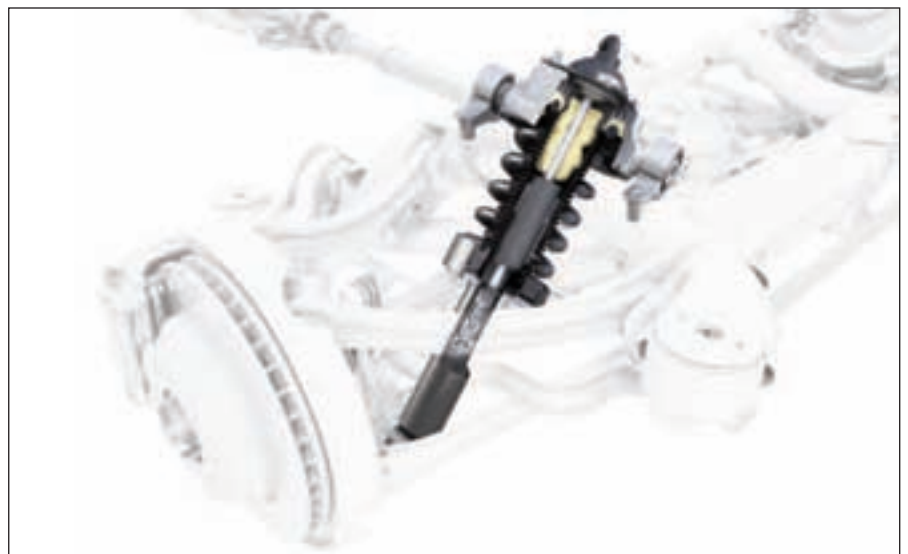


Fig. 73: Steel spring strut incl. PASM on rear axle

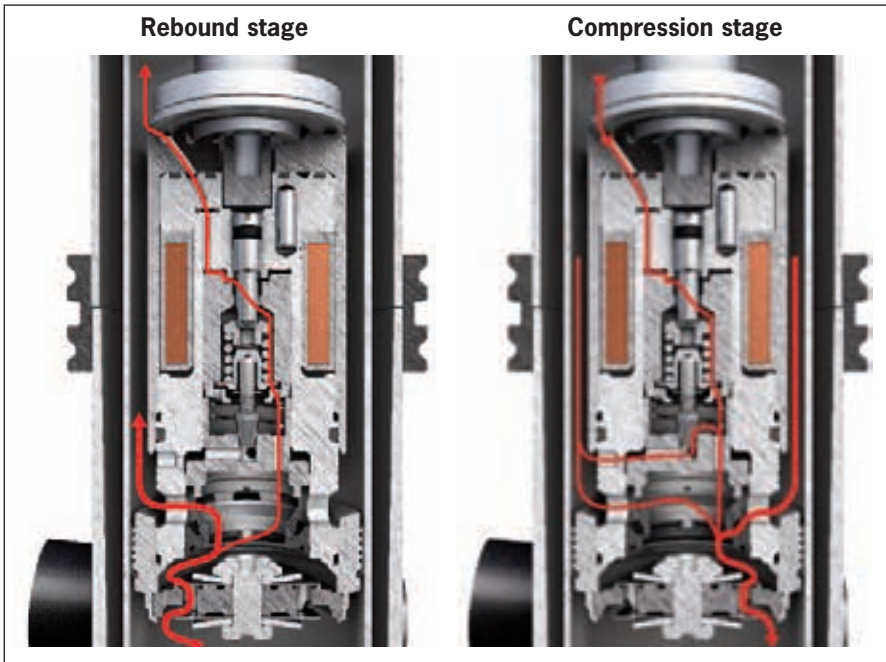


Fig. 74: Oil flow regulation in dampers (PASM)

Depending on the selected mode and the current road and driving conditions, PASM individually regulates the optimum damping force for each wheel as required. The required damping force is continuously calculated and applied for each wheel in all three modes, as described above. However, the emphasis is different in each mode, depending on the driver's wish for more comfort or more performance. PASM is controlled by **regulating the oil flow in the dampers**. In Comfort mode, for example, the oil can flow freely and the dampers have comfortable control characteristics. Depending on the selected

mode, the flow paths close or are narrowed and the oil is prevented from flowing through. This principle allows the damping force and vehicle handling to be controlled at the push of a button.

4.2.2 Air suspension with Porsche Active Suspension Management (PASM)

All air-spring struts on the front and rear axles are weight-optimized — the new design for connection to the chassis means that it was possible to omit the mounting saddle on the front axle. On

the rear axle, axle mounting parts were integrated rigidly in the body (integrated cross-member) in order to improve torsional rigidity. This contributes to improved handling of the new Cayenne models. The **new air suspension is also designed as a closed system**, where the air is stored temporarily in a pressure accumulator when the height level is changed. Intermediate storage of the air **saves energy** thanks to the use of a compressor that has been optimized for the new demands. In addition, **changes in the height setting are performed more quickly after manual or automatic selection**.

The new air suspension system with PASM features new software programming to create a **wider adjustment range for the 3 PASM modes Comfort, Normal and Sport**.

In all Cayenne models, the driver can activate the different manually selectable levels by means of the separate rocker switch on the center console. This makes it possible to further enhance the off-road suitability of the Cayenne by setting a greater fording depth as well as larger approach/departure angles (the height difference of the Cayenne, Cayenne Diesel, Cayenne S and Cayenne S Hybrid compared with the Cayenne Turbo with air suspension is due to the



Fig. 75: Rear axle and air spring strut on rear axle with Porsche Active Suspension Management (PASM)

Height level	Ground clearance with standard tires		Activation
	Cayenne, Cayenne Diesel, Cayenne S, Cayenne S Hybrid	Cayenne Turbo	
High Level II	10.6 inch	10.7 inch	Manual up to 19 mph
High Level I	9.4 inch	9.6 inch	Manual up to 50 mph
Normal Level	8.3 inch	8.5 inch	Manual
Low Level	7.4 inch	7.6 inch	Manual/Via Sport button and automatic from 86 mph
Low Level II	7.0 inch	7.2 inch	Automatic from 130 mph
Loading Level	6.2 inch	6.4 inch	Manual at standstill

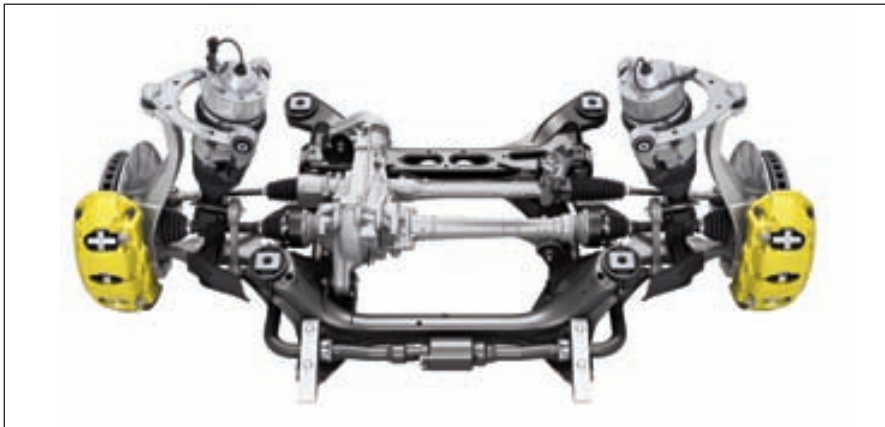


Fig. 76: Front axle incl. Porsche Dynamic Chassis Control (PDCC)



Fig. 77: Functional representation of active anti-roll bar (PDCC)

different standard tire sizes of 18 and 19 inches).

4.2.3 Porsche Dynamic Chassis Control (PDCC)

The active chassis control system PDCC is optionally available for the Cayenne, Cayenne S and Cayenne Turbo in conjunction with the air suspension with PASM. It is an **active system for stabilizing the vehicle body**. For the driver, this means enhanced performance and comfort and also maximum agility and vehicle balance thanks to dynamic rolling moment distribution. This is achieved with the aid of hydraulic swivel motors on the active anti-roll bars on the front and rear axles. The system responds to the current steering angle and lateral acceleration by producing a stabilizing force that counteracts the lateral inclination of the vehicle. The result is an extremely comfortable yet highly sporty driving experience, offering maximum agility at every speed with precise steering and stable load alteration behavior. The rocker switch in the center console allows the driver to also switch PDCC to a traction-oriented mode by activation of **Off-road mode 1**. The two halves of the active anti-roll bar can then twist even more with respect to each other. This in turn permits greater axle articulation. The wheels remain in contact with the ground longer as a result and can transfer more power. This ensures even better traction on uneven ground.

Service brake	Standard				Standard				Standard				PCCB				PCCB			
	FA		RA		FA		RA		FA		RA		FA		RA		FA		RA	
	MY10	MY11	MY10	MY11	MY10	MY11	MY10	MY11	MY10	MY11	MY10	MY11	MY10	MY11	MY10	MY11	MY10	MY11	MY10	MY11
Cayenne		●											○							
Cayenne S						●								○						
Cayenne S Hybrid						●								○						
Cayenne Turbo									●											○
Brake caliper type	Aluminum monobloc fixed-caliper brake																			
Brake disc material	Steel, internally vented										Carbon-fiber-reinforced ceramic, internally vented and cross-drilled									
Brake caliper color	Black				Silver-colored				Red				Yellow							
Number of pistons	6		4		6		4		6		4		6		4		6		4	
Brake disc diameter [inch]	13.0	13.8	13.0		13.8	14.2	130		14.5	15.4	14.1		-	15.4	-		14.6	16.1	14.6	
Brake disc thickness [inch]	1.3	1.34	1.1		1.34	1.4	1.1		1.4	1.5	1.1		-	1.5	-		1.2	1.5	1.2	

4.3 Brake system

To ensure that the high requirements with regard to the braking performance of a Porsche are met even better than before, **all new Cayenne models are equipped with an even larger and optimized brake system.** The brake systems can be identified visually according to the familiar logic: black brake calipers identify the Cayenne and Cayenne Diesel, silver-colored brake calipers the Cayenne S and Cayenne S Hybrid and red brake calipers the Cayenne Turbo. The racing-proven Porsche Ceramic Composite Brake (PCCB) is optionally available for all Cayenne models. The table provides an overview of the brake systems available for the individual Cayenne models.

4.3.1 Standard brake system

At the front, 6-piston aluminum monobloc fixed-caliper brakes and integral-type brake discs with a diameter of 13.8 inch are used for the Cayenne and Cayenne Diesel (+0.8 inch compared with the previous model). The front discs have a diameter of 14.2 inch (+0.4 inch) on the Cayenne S and Cayenne S Hybrid, while composite brake discs with a diameter of 15.4 inch are used for the Cayenne Turbo (+0.9 inch). At the rear, all models are braked by 4-piston aluminum monobloc fixed-caliper brakes and integral-type brake discs with a diameter of 13.0 inches. Due to its high power, the Cayenne Turbo also has larger brake discs with a diameter of 14.1 inch on the rear axle. The brake

discs are internally vented for better heat dissipation. The standard composite brake discs with an aluminum hub and gray cast-iron friction ring on the front axle of the Cayenne Turbo help to reduce the weight and unsprung masses. This ensures better grip, enhanced driving and tire comfort as well as increased agility and improved handling.



Fig. 78: Electric parking brake

4.3.2 Electric parking brake

All new Cayenne models feature an **electrically operated parking brake**, which can be controlled conveniently by means of a button at the left of the steering column. The electric parking brake can be activated manually using this switch and deactivated when the footbrake is pressed. It is also released automatically following manual activation when the driver's intention to drive off is detected via the gas pedal. The electric parking brake therefore increases comfort and safety when the vehicle is parked.

4.3.3 Porsche Ceramic Composite Brake (PCCB)

As with all other Porsche models, the race-proven high-performance ceramic brake system **Porsche Ceramic Composite Brake (PCCB)** is also optionally available. The PCCB is offered for the first time for the models Cayenne and Cayenne Diesel. It is available as from a

wheel size of 20 inches for the Cayenne Turbo and as from 19 inches for the other Cayenne models. The PCCB has a brake disc diameter of 15.4 inch at the front and 14.6 inch at the rear for the Cayenne, Cayenne Diesel, Cayenne S and Cayenne S Hybrid. Brake discs with a diameter of 16.1 inch at the front and 14.6 inch at the rear are used for the Cayenne Turbo. Here also, all Cayenne models have 6-piston aluminum monobloc fixed-caliper brakes on the front axle and 4-piston aluminum monobloc fixed-caliper brakes on the rear axle. The PCCB can be recognized by the yellow-painted brake calipers.

The brakes respond even faster and with greater precision and **significantly less pedal pressure is required**. The high fading stability of the PCCB is advantageous when braking at high speeds in particular. The decisive advantage of the ceramic brake system is the **extremely low weight of the brake discs**: these are around 50% lighter than cast-iron discs of comparable design and size.

This factor does not just have a positive effect on performance and fuel consumption, but above all also reduces unsprung and rotating masses. This results in improved grip and enhanced driving and tire comfort, particularly on uneven roads.

4.3.4 Brake system for Hybrid (recuperation)

A special feature of the Cayenne S Hybrid is the highly efficient brake system, as it recovers part of the usually otherwise lost braking energy and renders it reusable for the drive system. In addition to the hydraulic brake system on the front and rear axles familiar from the Cayenne S, which is actuated via a tandem brake booster, the electric machine (motor/generator) of the hybrid module contributes **part of the braking power in generator mode**. The electric machine uses the mechanical kinetic energy from the drive shaft of the moving vehicle. For this purpose, the rotating rotor, which turns with the shaft, induces an electric voltage in the stator windings. The voltage is stored as electrical energy in the NiMH battery. The **brake pedal detects** the degree of deceleration desired by the driver, and this information is input as a parameter in the operating strategy in order to generate braking torque in the electric machine. Recuperation is thus possible in the free travel range (pedal travel without braking force) of the brake pedal before hydraulic brake pressure can actually be generated. The free travel was increased by 4 mm for more precise control. The following systems work together in the recuperating brake system of the Cayenne S Hybrid:

- Hybrid manager
- PSM
- Pedal travel sensor
- E-Power meter
- Electric vacuum pump

The **hybrid manager controls the braking operation** so that as much energy as possible can be recuperated in the NiMH battery through generator operation of the electric machine when the brake pedal is pressed. For this purpose, the functionality of PSM was extended to take into account the requirements of a recuperating brake system. Whereas the braking torque of the electric machine is specifically reduced when coasting, the generator power can be increased with the help of the recuperation system in the event of a braking request. In this case, the hybrid manager adjusts the generator power depending on the brake pedal position and recuperates part of the kinetic energy into the battery. The **increase in the field current in the stator winding due to an increase in the voltage level** leads to generation of a higher generator power. The higher generator power acts as braking torque on the drive shaft and decelerates the vehicle.

The mechanical brake system is activated when a defined pedal travel is exceeded. Using the information from the **pedal travel sensor of the brake pedal**, the hybrid manager controls the braking force component of the electric machine depending on the vehicle speed. The authentic pedal feeling of a conventional brake system is still preserved. **The E-Power meter** in the instrument cluster provides the driver with visual information on the function of the electric machine in generator mode during recuperation (Charge mode).

Recuperation does not just protect the components of the mechanical brake system (e.g. brake linings and discs), but also makes braking energy available for propulsion in subsequent acceleration phases. The braking power of the electric machine is available continuously, but is dependent on the charge state of the battery. In order to avoid overcharging of the battery, the battery is actively discharged by using energy to operate the electric motor if it has a high charge level. The system can optimally recover the braking energy if **the braking operation is performed uniformly**, since this allows the generator power to be built up successively and a higher share of the braking power to be provided by the generator. The E-Power meter described above indicates the generator power to the driver by means of the needle deflection. The braking power results from **combination of the power from the mechanical brake system** and the generator power of the electric machine, whereby the braking power of the electric machine is highest in the lower speed

range, in the same way as for drive power. At higher speeds, the mechanical brake system increasingly takes over braking. In addition to showing the combined braking power characteristic, the following schematic diagram also shows that it is predominantly the conventional brake system that operates in the walking speed range.

The Cayenne S Hybrid uses an **additional electric vacuum pump**, which can supply the required brake pressure even when the engine is switched off. This is the case if the Cayenne S Hybrid drives on purely electric power, coasts or is in Auto Start Stop mode.

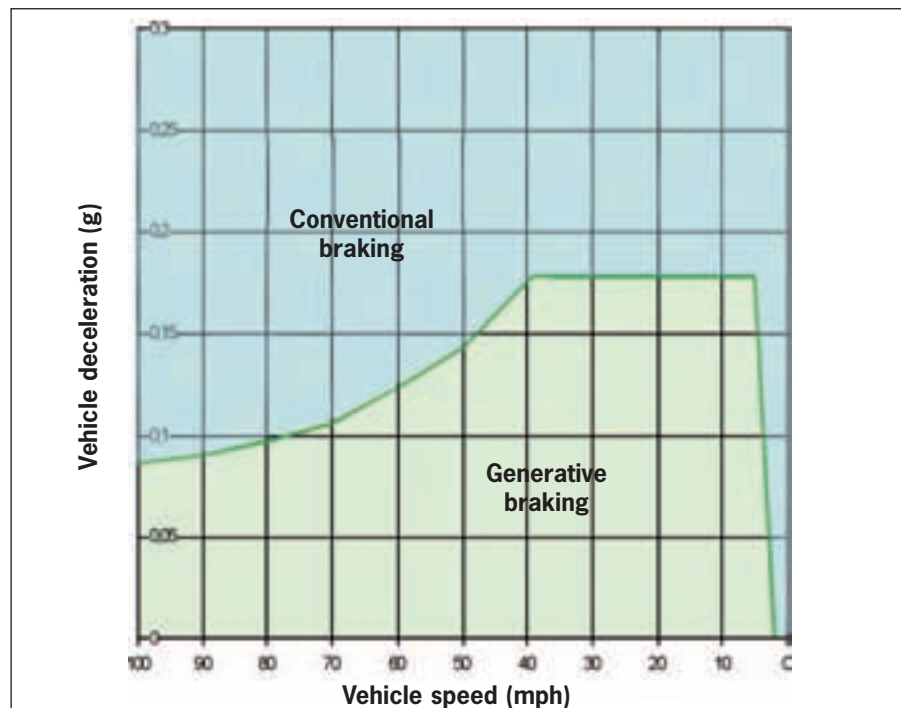


Fig. 79: Schematic representation of braking operation

4.4 Porsche Stability Management (PSM)

The standard **enhanced Porsche Stability Management (PSM)** ensures superior active driving safety even in the longitudinal and lateral dynamic limit range while still maintaining typical Porsche agility. The PSM setup was modified specifically for the new Cayenne models and adapted to use of the new Porsche Traction Management (PTM) or new optional Porsche Torque Vectoring Plus (PTV Plus), for example.

Sensors continuously monitor the direction of travel, vehicle speed, yaw velocity and lateral acceleration of the vehicle. Using this information, PSM calculates the actual direction of movement. If it deviates from the intended course, PSM initiates selective braking on individual wheels, for example, in order to restore stability. Such PSM intervention is indicated by the flashing cockpit indicator light.

PSM improves active safety through the following functions/systems:

- ABS (anti-lock brake system)
- MSR (engine drag torque control)
- ASR (anti-slip regulation)
- ABD (automatic brake differential)
- Brake assist
- Improved braking readiness through pre-filling of the brake system
- Earlier pre-filling of the brake system and readying of brake assist (in conjunction with adaptive cruise control)
- Standstill management: Auto-Hold function in conjunction with the electric parking brake
- Longitudinal deceleration control in conjunction with adaptive cruise control

The following illustration shows the system links of PSM with other chassis and drive components for the new Cayenne models:

The enhanced braking readiness through pre-filling of the brake system serves to shorten the stopping distance in emergencies. If the gas pedal is released quickly, PSM switches the brake system to a state of **enhanced braking readiness: pre-filling of the brake system** builds up a slight pressure in the system. The brake pads are therefore already in light contact with the brake discs. If the driver then actually presses the brake, maximum braking power can be achieved more quickly and this results in a shorter stopping distance.

Brake assist, on the other hand, is able to detect an emergency braking situation when a defined pressure is exceeded on the brake pedal, and then acts to ensure that the brake pressure required for maximum deceleration is made available via the hydraulic unit of PSM.

With adaptive cruise control, PSM initiates selective braking action to maintain the pre-selected distance from the vehicle in front. If the environment sensors in the adaptive cruise control system report that the driver is getting closer to

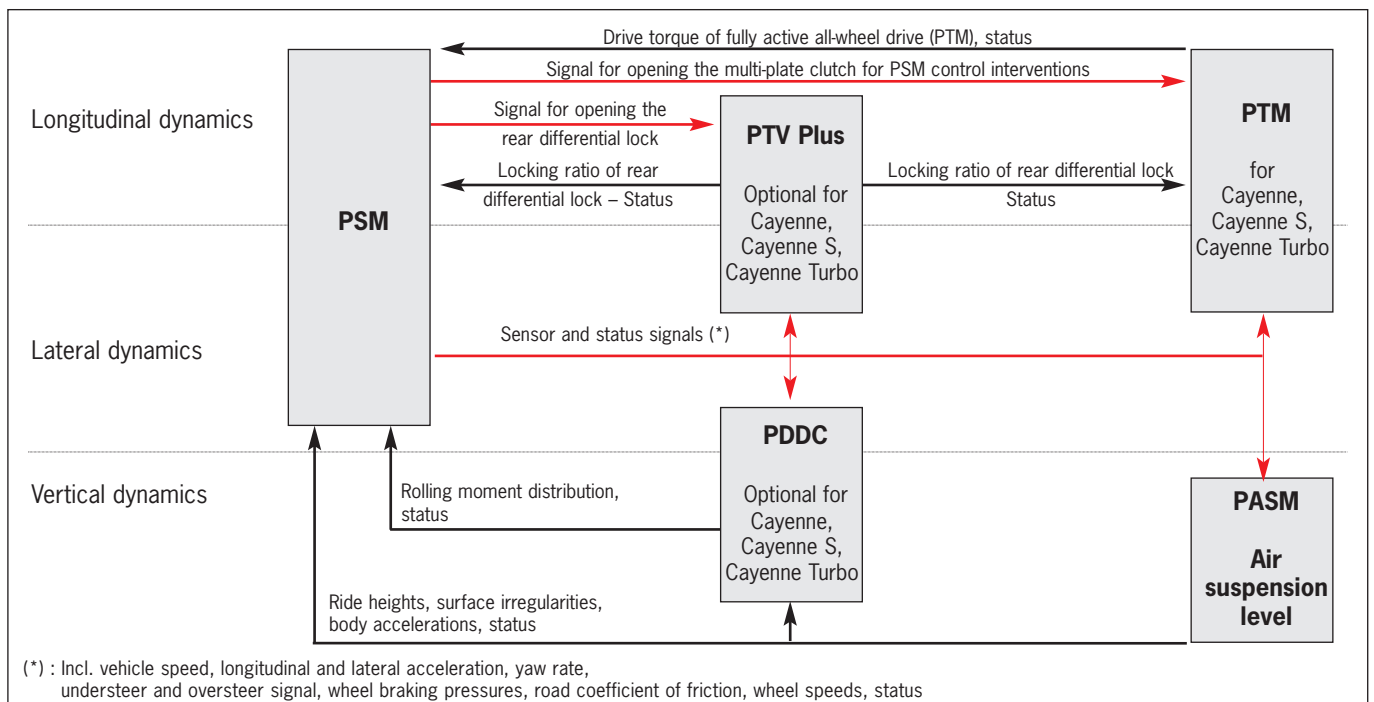


Fig. 80: System links of PSM with other chassis and drive components

a vehicle in front, the brake system is automatically switched to enhanced braking readiness mode. In addition, the brake hydraulic system also supports the driver here in the event of an impending full-braking operation so that the required brake pressure is provided. The driver is first warned **visually by a message on the TFT display as well as by an audible signal. If the distance from the vehicle in front continues to decrease, there is a braking jolt as an additional warning.**

The **standstill management function (Auto Hold function)** prevents the vehicle from rolling back in the opposite direction to the desired driving direction. This assist system is available in the Cayenne without an additional operating control. If the vehicle is braked to a stop on an uphill gradient, the Auto Hold function is active and the required brake pressure is maintained via PSM. On vehicles with 8-speed Tiptronic S, the Auto Hold function also holds the vehicle if the driver allows the vehicle to coast to a stop on a gradient. The Auto Hold function is also activated in the event of automatic distance control by the adaptive cruise control. As soon as the vehicle comes to a stop without any intervention by the driver, the brake pressure is maintained via PSM until the vehicle moves off again. The hold function is transferred to the electric parking brake after 5 minutes or if the system detects that the driver intends to leave the vehicle.

Depending on the vehicle equipment with other chassis control systems such as PASM and air suspension, PSM uses the sensor information provided by these chassis systems to optimally match the sub-functions of PSM control with the behavior of the other control systems. PASM supplies information about road contact forces and uneven road surfaces. This information is read in by PSM and is used for optimal, situation-based adaptation of ABS control in order to optimize the braking distance in emergency braking situations, even with different road conditions.

A further new sub-function of PSM is **Porsche Hill Control (PHC)**, which is standard for all new Cayenne models. PHC assists the driver when driving slowly downhill at speeds between approx. 2 mph and approx. 19 mph, e.g. on steep slopes or wintry mountain roads. The function is active both when driving forwards and when reversing. The system limits the vehicle speed by selective braking intervention on all 4 wheels. ABS remains active in order to prevent the wheels from locking. On vehicles with manual transmission, the system adapts the speed so that the engine is not braked below idle speed. PHC is activated for all models by means of the separate switch on the center console. In the Cayenne, Cayenne Diesel, Cayenne S and Cayenne Turbo, it is also activated by selection of Off-road mode 1 with the central off-road rocker switch.

4.5 Steering

The **steering** was completely revamped. It is now even sportier and even more direct around the center position in particular. The variable steering ratio and the setup of the hydraulic power assistance guarantee outstanding agility for the new Cayenne models. A high level of safety is provided for frontal collisions through multiple angle bends with two universal joints on the steering column and a deformation element. The efficiency was also improved. The **oil pump operated by the combustion engine is now demand-controlled.** This means that the required volume flow can be controlled variably depending on the driving situation.

The **Servotronic speed-sensitive power assistance system is fitted standard in the Cayenne S Hybrid** and is optionally available for the other Cayenne models. The steering becomes firmer at high speeds. The steering maneuvers are then more precise, while still offering outstanding steering comfort. At low speeds, Servotronic makes the steering lighter to facilitate maneuvering and parking.

4.6 Steering system for Hybrid

Unlike the other Cayenne models, which have hydro-mechanical steering, the Cayenne S Hybrid is equipped with an **electro-hydraulic steering system** with an individual steering ratio setup to guarantee high steering dynamics and a precise steering feel. It was largely possible to avoid design changes thanks to the high proportion of identical parts shared with the purely hydraulic power steering. The only modification was therefore a change in the effective piston area of the pump unit for a lower volume flow. The main difference between the systems is the use of an **electric** and therefore **demand-controlled pump**. This is supplied with power from the 12 V vehicle electrical system. The demand-controlled pump only generates the energy required for power assistance in response to a steering request from the driver and otherwise remains in standby mode, e.g. when driving straight ahead. This contributes to a **reduction in fuel consumption of more than 93%** compared with purely hydraulic systems. The use of electric power for the unit means that its functioning is guaranteed even in driving states with the combustion engine switched off. The Servotronic thus also functions when maneuvering in purely electric mode. The electric steering is audibly inconspicuous and permits **the kind of direct feedback to the driver typical for Porsche**.

The hydraulic parameters of the **steering gear** were modified to take into account the lower volume flows. The pump drive power is controlled for optimum fuel consumption according to the vehicle speed, steering angle and, most importantly, the steering angle dynamics. Efficient control means that cooling of the power-steering fluid is not required.

4.7 Wheels and tires










4.7.1 Wheels

The new Cayenne models feature **newly developed wheels in a unique design** in sizes from 18 to 21 inches. During the development of each wheel, great emphasis was placed on lightweight construction combined with an attractive and unique design. As a result, the wheels ideally complement the attractive new exterior design of all Cayenne models. The production technologies used (flow forming and forging) contribute to reducing weight and therefore also improve driving comfort by reducing the unsprung masses.

The Cayenne and Cayenne Diesel now stand on **18-inch Cayenne wheels**. The Cayenne S and Cayenne S Hybrid are equipped standard with **18-inch Cayenne S III wheels**, which are also optionally available for the Cayenne and Cayenne Diesel. The **19-inch Cayenne Turbo** standard wheel catches the eye with its unique 5-spoke design and thus underlines the enormous power reserves of the Cayenne Turbo even when the vehicle is at a standstill.

A highlight in the wheel range is the new 21-inch 911 Turbo II wheel with wheel arch extensions and wheel hub cover with colored Porsche Crest. **The advantages of forged wheels** compared with cast wheels made of aluminum include the **lower weight**, which in turn means lower unsprung masses, as well as the **high material strength**, which permits realization of a unique design.

Wheel hub covers with a colored Porsche Crest are optionally available for all wheels (standard for 21-inch wheels).

Wheels	Description ● = Standard ○ = Option W = Optional, without extra charge	Cayenne	Cayenne Diesel*	Cayenne S	Cayenne S Hybrid	Cayenne Turbo
	18-inch Cayenne wheel One-piece alloy wheel in 10-spoke design FA: 8 J x 18 RO 53 with 255/55 R 18 tires, RA: 8 J x 18 RO 53 with 255/55 R 18 tires	●	●	W	W	
	18-inch Cayenne S III wheel One-piece alloy wheel in double-spoke design FA: 8 J x 18 RO 53 with 255/55 R 18 tires, RA: 8 J x 18 RO 53 with 255/55 R 18 tires	○	○	●	●	
	19-inch Cayenne Turbo wheel One-piece alloy wheel in 5-spoke design FA: 8.5 J x 19 RO 59 with 265/50 R 19 tires, RA: 8.5 J x 19 RO 59 with 265/50 R 19 tires	○	○	○	○	●
	19-inch Cayenne Design II wheel One-piece alloy wheel in double-spoke design FA: 8.5 J x 19 RO 59 with 265/50 R 19 tires, RA: 8.5 J x 19 RO 59 with 265/50 R 19 tires	○	○	○	○	
	19-inch Cayenne Design II wheel One-piece alloy wheel in double-spoke design FA: 8.5 J x 19 RO 59 with 275/45 R 19 tires, RA: 8.5 J x 19 RO 59 with 275/45 R 19 tires					○
	20-inch Cayenne SportDesign II wheel One-piece alloy wheel in 10-spoke design FA: 9 J x 20 RO 57 with 275/45 R 20 tires, RA: 9 J x 20 RO 57 with 275/45 R 20 tires	○	○	○	○	○
	20-inch RS Spyder Design wheel One-piece alloy wheel in racing look FA: 9 J x 20 RO 57 with 275/45 R 20 tires, RA: 9 J x 20 RO 57 with 275/45 R 20 tires	○	○	○	○	○
	21-inch 911 Turbo II wheel with wheel arch extension One-piece alloy wheel in 911 Turbo II design (forged), wheel hub cover with colored Porsche Crest FA: 10 J x 21 RO 50 with 295/35 R 21 tires, RA: 10 J x 21 RO 50 with 295/35 R 21 tires	○	○	○	○	○
	21-inch Cayenne SportEdition wheel with wheel arch extension One-piece alloy wheel, wheel hub cover with colored Porsche Crest FA: 10 J x 21 RO 50 with 295/35 R 21 tires, RA: 10 J x 21 RO 50 with 295/35 R 21 tires	○	○	○	○	○
	Wheel hub cover with colored Porsche Crest	○	○	○	○	○

* not for US

4.7.2 Tires

A **new generation of tires** will also be introduced with the new Cayenne models. These tires offer improved performance, handling, rolling resistance, tire wear and weight. Tires generally offer a high potential for reducing fuel consumption. The 3 basic components of all tires were optimized: the rubber mixture, tread design and casing architecture. For a tire to obtain Porsche series approval, it must meet all the demanding specifications down to the very last detail. For the market launch of the new Cayenne models, the new tire generation from all manufacturers was optimized in the area of rolling resistance in particular, while still guaranteeing the performance typical for Porsche with respect to handling and braking distance. Porsche works closely with the tire industry for this purpose and above all also with its partner Michelin. A new generation of tires with especially low rolling resistance was developed together with Michelin. These tires are now used for the first time in the Cayenne.

Summer tires

All summer tires have been newly developed and contribute to improved fuel economy thanks to lower rolling resistance. The new tire generation can be recognized by the N code on the sidewall. The following table provides an overview of all available tires.

Basic characteristics of all tires available for the Cayenne models:

Summer tire range				Cayenne	Cayenne S	Cayenne S Hybrid	Cayenne Turbo
Wheel	Tire	Type	Speed index				
18-inch	f: 255/55 r: 255/55	Summer	Y (186 mph)	●	●	●	
19-inch	f: 265/50 r: 265/50	Summer	Y (186 mph)	○	○	○	●
19-inch	f: 275/45 r: 275/45	Summer	Y (186 mph)				○
20-inch	f: 275/45 r: 275/45	Summer	Y (186 mph)	○	○	○	○
21-inch	f: 295/35 r: 295/35	Summer	Y (186 mph)	○	○	○	○

- High performance on wet and dry roads
- Lightweight design
- Very good traction and vehicle stability
- High driving comfort, low vibrations
- Low rolling resistance
- Improved wear pattern and longer tire life

The 21-inch tires are designed especially for performance and sporty driving. Thanks to their special rubber mixture and low tire cross-section, they are particularly advantageous for fast cornering.

All-season tires

In addition to the familiar 18- and 19-inch tire sizes, 20-inch all-season tires are now available for the first time for the Cayenne models. All-season tires

enable year round use under all weather conditions (note: all-season tires do not deliver the same driving characteristics as pure summer or winter tires under the respective operating conditions and represent a compromise).

The new generation of all-season tires for the Cayenne models was also completely revamped. Alongside the addition of the 20-inch tire size to the range, all tires offer improved rolling resistance without any losses in comfort or performance.

All all-season tires for the new Cayenne models are approved up to a speed of 149 mph.

All-season tire range				Cayenne	Cayenne S	Cayenne S Hybrid	Cayenne Turbo
Wheel	Tire	Type	Speed index				
18-inch	f: 255/55 r: 255/55	All-season	V (149 mph)	W	W	W	W
19-inch	f: 265/50 r: 265/50	All-season	V (149 mph)	W	W	W	W
20-inch	f: 275/45 r: 275/45	All-season	V (149 mph)	W	W	W	W

Winter tires

Complete wheel-and-tire sets with 18-, 19- and 20-inch winter tires are also available through the Tequipment program. All winter wheel sets are designed for operation with snow chains (note: Porsche snow chains can be fitted on all 4 wheels on vehicles with 18-inch tires; on vehicles with 19- and 20-inch wheels, snow chains can be fitted only on the rear wheels).

4.7.2.1 Tire repair systems

The Cayenne S Hybrid comes with a space-saving tire repair system comprising tire sealing compound and an electric pneumatic compressor. Cayenne, Cayenne S and Cayenne Turbo have an 18- or 19-inch collapsible spare wheel as standard. A full-size spare wheel with running tire is also available for the models Cayenne, Cayenne Diesel, Cayenne S and Cayenne Turbo. The following table provides an overview of the complete range of tire repair systems:

All wheels installed on an internal holder in the luggage compartment have a cover for the wheel. The tools and jack are accommodated in space-saving manner either in the wheel or, in the case of the Cayenne S Hybrid, in the floor holder panel.

Note: If a tire repair system is chosen that is installed on an internal holder in the luggage compartment, the luggage compartment cannot be closed off by the retractable luggage compartment cover to prevent persons looking in from outside. The useful luggage compartment capacity is reduced and the adjustment possibilities for the variable rear seat bench are restricted in combination with 21-inch wheels.

4.8 Tire Pressure Monitoring (TPM)

Timely detection of a gradual loss of pressure increases driving safety. It can also prevent uneven tire wear and high

fuel consumption due to inadequate tire pressure. The correct tire pressure additionally supports safe driving and high driving dynamics.

With the Tire Pressure Monitoring (TPM) system provided as standard for the Cayenne Turbo and available as an option for the other models, the tire pressure of the running tires is permanently and separately monitored for all 4 wheels. The driver can conveniently call up the tire pressure values on the instrument cluster display and is also informed by the system if there are critical deviations from the required values. A lowered air pressure can be used for increased driving comfort up to a maximum speed of 100 mph. This is also monitored by TPM. The system quickly adjusts to a new set of wheels and displays the current pressure for each tire.

Tire repair systems	Cayenne	Cayenne S	Cayenne S Hybrid	Cayenne Turbo
<ul style="list-style-type: none"> ● = Standard ○ = Option 				
Tire repair system			●	
18-inch collapsible spare wheel (under luggage compartment floor) Note: Tire sealing compound and electric compressor are omitted in this case	●	●		○
19-inch collapsible spare wheel (under luggage compartment floor) Note: Only in combination with PCCB for Cayenne, Cayenne Diesel and Cayenne S; tire sealing compound and electric compressor are omitted in this case	○	○		●
18-inch collapsible spare wheel with internal holder on right of luggage compartment Note: The rail system of the cargo management system is also installed in the luggage compartment floor; tire sealing compound and luggage compartment cover are omitted			○	
19-inch collapsible spare wheel with internal holder on right of luggage compartment Note: Only in combination with PCCB. The rail system of the cargo management system is also installed in the luggage compartment floor; tire sealing compound and luggage compartment cover are omitted			○	
Full-size spare wheel with running tire (18-21-inch) on internal holder on right of luggage compartment Note: The rail system of the cargo management system is also installed in the luggage compartment floor	○	○		○

5 Body

The following objectives have been pursued in the development of the body of the new Cayenne models to further enhance the visual attractiveness, safety and performance of the vehicles:

- Exciting, sporty and typical Porsche design
- Clear visual model differentiation
- Significant weight reduction
- Improved occupant protection



Fig. 81: Exterior design: headlights, door mirrors, tail light, rear spoiler

5.1 The design

The exterior design of the new Cayenne models is uniquely Porsche. The **Porsche design DNA** is clearly visible from every angle. From the front, the typical Porsche **curved fender contours** catch the eye. The **elongated hood** of the Cayenne models is reminiscent of Porsche racecars from the 1960s. The aerodynamic design of the **exterior mirrors** is closely related to that of the Panamera. For the first time, the exterior mirrors on the Cayenne are mounted on the door panel and no longer in the door mirror triangle. From the side, the drawn-in flanks emphasize the sporty look of the Cayenne. As is to be expected from Porsche, the rear fenders are especially pronounced; the Cayenne has "shoulders". At the rear of the vehicle, the design of the **rear spoiler** with its two convex curves is based on the spoiler of the Carrera GT.

The new **tail lights** are dynamically integrated into the rear design. The new Cayenne models are now longer, which means more space and flexibility in the passenger compartment with **dynamic but still compact dimensions** compared with the competition.

5.2 Exterior differentiation

Front view

The first thing that catches the eye about the front view of the Cayenne models is the front end with its **3 large air intakes**. The slats in the side air intakes are painted in the exterior color on the Cayenne and Cayenne Diesel and are black on the other models. The Cayenne Turbo has enlarged air intakes. Another characteristic feature of the front is **the power dome**, which gives a sporty, dynamic look. The **power dome of the Cayenne Turbo is 0.5 inch** higher than the power domes on the other models and its model-specific design gives the Cayenne Turbo a dominant appearance. The design of the Bi-Xenon headlights on the Cayenne Turbo and the H7 headlights



Fig. 82: Front view of Cayenne Turbo

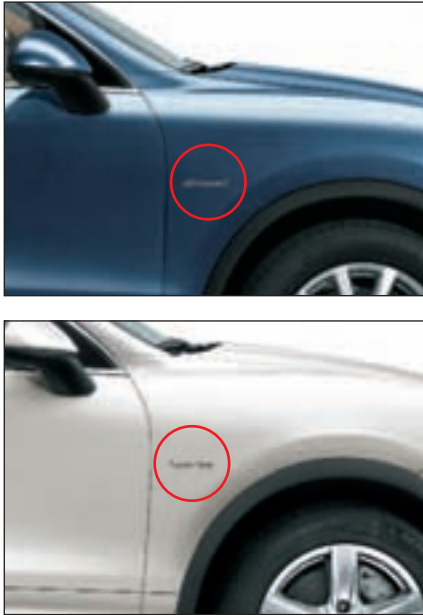


Fig. 83: Chrome-colored "diesel" (not for US) or "hybrid" designation/Side view of Cayenne Turbo

on the other models gives the Cayenne a sporty look.

On the Cayenne, Cayenne Diesel, Cayenne S and Cayenne S Hybrid, the **LED daytime driving lights** are housed in the horizontally arranged front light units at the top of the side air intakes. On the Cayenne Turbo, on the other hand, the 4 LED spotlights for the daytime driving lights are integrated in the main headlights and the front light units appear to be floating in the large side air intakes. The front light units for all models additionally contain the direction indicator and position light, both in LED technology.

Side view

The extended wheelbase of the new Cayenne models is clear to see from the side, yet the wedge shape lends the **flowing coupe-like silhouette** a very dynamic appearance. The large wheels provide the Cayenne with a powerful and confident appearance on the road. The Cayenne, Cayenne Diesel, Cayenne S and Cayenne S Hybrid come with stan-

Exterior differentiation	Cayenne	Cayenne S	Cayenne S Hybrid	Cayenne Turbo
Front				
Front end with integrated air intakes, slats in the side air intakes painted in exterior color	•			
Front end with integrated air intakes, slats in the side air intakes in black		•	•	
Turbo front end with enlarged air intakes, slats in the side air intakes in Black				•
Horizontal LED daytime driving lights in the front light units	•	•	•	
Daytime driving lights integrated in the headlights as LED spotlights				•
Side				
Brake system black	•			
Brake system silver-colored		•	•	
Brake system red				•
Chrome-colored "hybrid" designation on front fenders			•	
Rear				
"PORSCHE" logotype	•	•	•	•
"Cayenne" logotype	•			
"Cayenne S" logotype		•	•	
"Cayenne turbo" logotype				•
2 oval single tailpipes at outside left and right	•	•	•	
2 round twin tailpipes at outside left and right				•

standard 18-inch wheels, while the Cayenne Turbo comes with 19-inch wheels. Sporty rim designs allow an unobstructed view of the brake systems. The fixed calipers are black on the Cayenne and Cayenne Diesel, silver-colored on the Cayenne S and Cayenne S Hybrid and red on the Cayenne Turbo. A chrome-colored "diesel" or "hybrid" designation on the front left and right fenders of the Cayenne Diesel and Cayenne S Hybrid identifies the respective model.


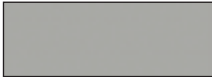


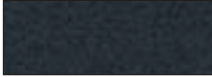



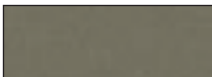


Rear view

At the rear, the model designation and now the **"PORSCHE" logotype** are in Chrome-look. The Cayenne Turbo has two round twin tailpipes at the rear on the outside left and right while the other models have oval individual tailpipes on the outside left and right.

The following **exterior colors** are available for the new Cayenne:



Fig. 85: Rear view of Cayenne

Solid/Standard colors		Metallic colors		Special colors	
Sand White		Classic Silver Metallic		Sand Yellow ²⁾	
Black ¹⁾		Jet Black Metallic		Amethyst Metallic ²⁾	
		Dark Blue Metallic ¹⁾			
		Meteor Gray Metallic			
		Umber Metallic ¹⁾			
		Jet Green Metallic ²⁾			
		Auburn Metallic ²⁾			

¹⁾ Available as of 05/2010 at the earliest
²⁾ Available as of 08/2010 at the earliest

Fig. 84

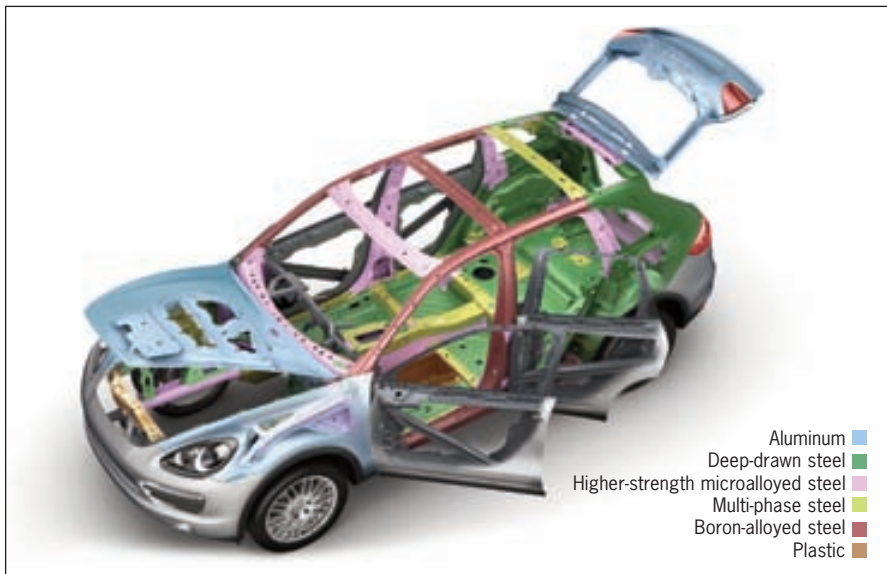


Fig. 86: Body design of Cayenne

5.3 Bodyshell

The consistent further development of the lightweight steel design makes a crucial contribution to safety and excellent handling. It has also enabled a further improvement in the rigidity values compared with the predecessor. In the event of a crash, the forces that occur are distributed in a defined pattern to longitudinal and cross member structures in the front and rear end. The multi-phase steels used ensure high strength, clear deformability and optimum energy absorption.

Reinforcements made from high-strength, hot-formed steels also protect occupants in the event of a side impact. They surround the passenger cell like a cage and with their extreme dimensional stability play an important role in maintaining the integrity of the cabin and therefore protecting the occupants. The use of these hot-formed steels in the area of the roof structure has enabled a further improvement in the safety level compared with the predecessor.

The use of high-strength materials and hot-formed steels also plays a significant role in reducing the vehicle weight. The use of lightweight construction measures for the body has enabled weight savings of 245 lbs or around two-thirds of the total weight reduction of up to 408 lb (depending on the model) compared with the previous models. The doors as well as the hood and rear lid account for a saving of 86 lb on their own. Despite the increased safety level, this therefore permitted an improvement in both the driving dynamics and the fuel consumption values.

5.4 Doors, lids and exterior mirrors

The four doors are **pressed lightweight doors** made from steel with high-strength integrated steel profiles to improve the side impact protection for the occupants. The front and rear doors on the new Cayenne have three different detent positions. An additional detent on the rear door has further improved the comfort when getting into and out of the vehicle, e.g. in narrow parking spaces.

Thanks to lightweight construction measures and in particular the use of aluminum and design modifications, the standard **powerlift tailgate** for all Cayenne models is approx. 40% lighter than its predecessor. Thanks also go to a completely redesigned drive unit. In addition to the weight saving, great emphasis was also placed on improving the opening behavior (now quieter and smoother). The new system is based on an electric spindle drive on both sides that is assisted by a coil spring. This increases the comfort and day-to-day usability when loading the vehicle. The driver can open the tailgate in three dif-

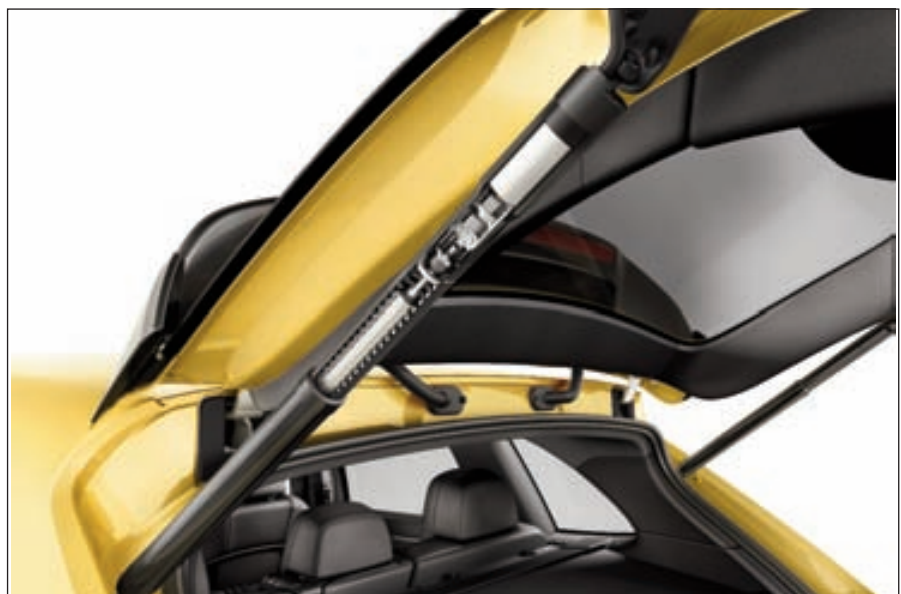


Fig. 87: Powerlift tailgate

ferent ways: using the switch in the passenger compartment, the key remote control or the momentary-switch handle on the tailgate. The tailgate is closed by means of a button on the inside.

The opening height of the tailgate can be individually adjusted. This is done by interrupting the opening operation at the desired height and pressing the closing button in the tailgate interior trim panel for three seconds. If the tailgate stops at the preset height but the full opening height is desired, this can be achieved by gently pressing against the tailgate.

The side window surrounds and the trim strip on the tailgate have a Chrome-look finish and provide the Cayenne with a strikingly elegant appearance.

The model designation on the tailgate can be deleted on request. The "PORSCHE" logotype is then positioned slightly lower.



Fig. 88: Side view of Cayenne S

5.5 Exterior package Black, wheel arch extension and running board

If the **exterior package Black (high-gloss)** is chosen, the window surrounds are in High-gloss Black. If the exterior color is Black or Jet Black Metallic, the rear trim strip is additionally Black.

A **black wheel arch extension** that is combined with side door protection moldings in the exterior color is available as an option and permits visual personalization. **Running boards** are optionally available for the new Cayenne and making getting into and out of the vehicle and loading the optional roof transport system even easier.



Fig. 89: Front view of Cayenne Diesel (not for US)

5.6 Roof systems

The basic equipment on the Cayenne includes a headliner with fabric interior. A headliner in Alcantara is available as standard equipment on the Cayenne Turbo and as an option on all other models. An electric slide/tilt glass roof is optional on Cayenne and standard on Cayenne S, Cayenne S Hybrid and Cayenne Turbo. A Panoramic roof system can also be optionally installed.

5.6.1 Electric slide/tilt roof

The electric **slide/tilt roof** with a glass area of 4.2 square feet, made from tinted single-sheet safety glass with manually operated sliding sunscreen and remote closing function is standard on Cayenne S, Cayenne S Hybrid and Cayenne Turbo. It provides the vehicle occupants with an additional ventilation option and lets more light into the passenger compartment. The electric slide/tilt roof can be conveniently operated via a switch on the roof console.

5.6.2 Panoramic roof system

The **Panoramic roof system** available at extra cost is almost four times as large as the slide/tilt roof system at approx. 15 square feet. Even when closed it provides an impressive panoramic view and improves the feeling of space for the occupants with a glass surface that extends over the second row of seats. The Panoramic roof system on the new Cayenne consists of two glass elements, the front one of which can be moved back over the rear one to create an opening of 4.7 square feet and therefore a unique feeling of space and a unique driving experience. All critical components for space such as the guide rails and drive have been optimized so as to not restrict the headroom in the passenger compartment. The Panoramic roof is operated in the same way as the electric slide/tilt roof via an ergonomic switch on the roof console that allows the opening positions to be selected. In addition to the highly effective heat-insulating glass used, the Panoramic roof system also has a roll-up sunscreen to protect against excessive sunlight. This can also be operated electrically via a button on the roof console.

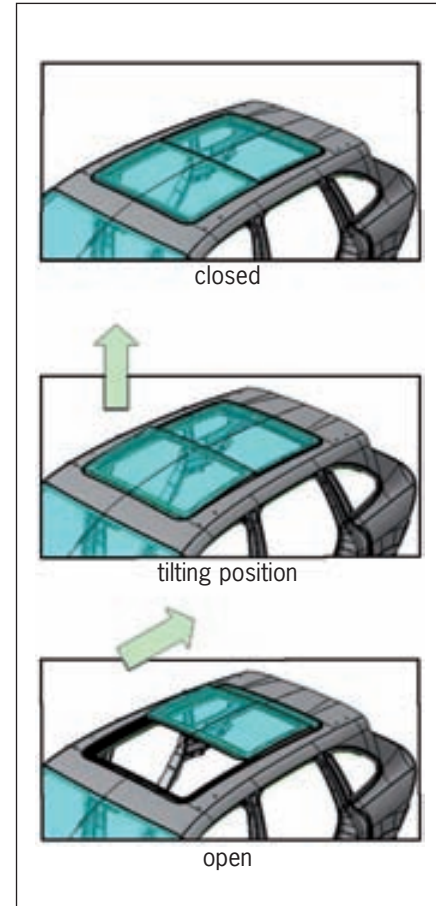


Fig. 90: Panoramic Roof System

When the Panoramic roof system is open, the integrated windstop automatically extends and helps to reduce the noise level.

A main focus in the development of the new Panoramic roof system was maintaining the rigidity of the body. The high level of rigidity compared with a vehicle without Panoramic roof system and therefore the dynamic driving characteristics have been retained thanks to the use of additional reinforcing frame. The new design also enables a weight reduction of more than 28 lbs compared with the predecessor system.

Comparison of the Panoramic roof system	Cayenne MY 10	Cayenne MY 11	△
Glass area			
Total glass area (ft ²)	15.8	15	-5%
Number of glass elements	4	2	-2
Number of interruptions by cross-bars	2	1	-1
Opening area			
Maximum opening (ft ²)	6.7	4.7	-29%
Rooflining opening (ft ²)	9.9	11.8	+16%
Viewing area			
Viewing area (ft ²)	7.6	11	+30%
Weight			
Weight (lb)	99	69	-30%



Fig. 91: Roof transport system

5.7 Roof transport system

High-quality **roof rails made of aluminum** that are integrated in the vehicle design are optionally available. These can either be silver-colored or painted black. The roof rails include **three protective strips for the roof** (these are not required in combination with the Panoramic roof). The roof rails are a prerequisite for the roof transport system available as an option for all Cayenne models. The roof rails cannot be retrofitted.

All load-carrying devices from the Cayenne Tequipment range, e.g. roof box, ski rack and snowboard holder, can be mounted on the **roof transport system**. The maximum roof load of the new Cayenne is 220 lb. This further enhances the flexibility and touring qualities of the Cayenne.

5.8 Trailer hitch

All Cayenne models are equipped with a **preparation for the trailer hitch** to make subsequent installation easier. A trailer hitch without ball joint is available as an option for the Cayenne, Cayenne Diesel, Cayenne S and Cayenne Turbo models. The maximum trailer load is 7716 lb, or 5952 lb on the Cayenne with manual transmission.

Trailer hitch availability	Cayenne	Cayenne S	Cayenne S Hybrid	Cayenne Turbo
USA, Canada, Australia				
Trailer hitch without ball joint (not electric)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Fig. 92: Electrically extendable trailer hitch (not for US)

6 Interior

The interior of the new Cayenne has been completely redesigned with the passenger compartment repeating the typical Porsche shapes of the exterior. The **highlights in the interior** are:

- New design with typical Porsche driver orientation and improved ergonomics
- High-quality materials, even in the basic equipment
- New color range
- 6 different interior trims
- 14-way power seats (front) with memory package
- 18-way adaptive sports seats with memory package
- Variable rear seat bench, fore/aft adjustment by 6.3 inch and backrest angle adjustment by up to 6 degrees
- Seat ventilation (front)

Design

The new Cayenne is recognizable as a Porsche at first glance, also in the passenger compartment. The **redesigned interior with its new architecture** reflects the objective of greater flexibility and day-to-day usability. The focus for the interior design was **functionality, ergonomics and comfort** for up to 5 passengers. A striking feature is the **elevated center console** with raised gearshift that lends the passenger compartment the look of a cockpit. The seat position and new, striking design of the center console and dashboard integrate the front passengers even further into the vehicle with a feeling of a sportier seated position. **Characteristic design elements** of the Cayenne are the **grab handles** on the center console (typically Cayenne) and now also on all four doors. The buttons for the most important functions are arranged in logical groups to the left and right of the gear/selector



Fig. 93: Cockpit of Cayenne Turbo in two-tone Umber/Cream

lever, which permits quick and intuitive operation without lengthy searches in confusing sub-menus. This operating comfort is boosted by the **large 7-inch TFT touchscreen** positioned centrally on the center console. The **dashboard and instrument cluster have also been completely redesigned**. Their Porsche DNA is nevertheless clearly apparent, for example in the **5 round instruments typical for the 911** with the **centrally positioned tachometer**.

6.1 Materials

The choice of materials in the new Cayenne models and the new design language of the passenger compartment **set new standards** and create a **high quality and elegant look and feel**. The carpets in the passenger compartment are made of tufted velvet in the interior color, the color of the rooflining matches the chosen passenger compartment combination and the seat belts are black. A dilour carpet is used in the luggage compartment of the new Cayenne models to meet the challenges of every-

day life. It is in the interior color or, with two-tone interiors, in the darker dashboard color.

The material concept for the passenger compartment:

- High-quality standard interior for the Cayenne, Cayenne Diesel, Cayenne S and Cayenne S Hybrid with partial leather seats and other items in smooth-finish leather
- Smooth-finish leather interior in 4 attractive color tones (standard for the Cayenne Turbo)
- Wide selection of personalization options in the passenger compartment thanks to two-tone leather and natural leather interiors in new color combinations
- Comprehensive selection of trims with wood, aluminum and carbon packages
- Silver-colored highlight strips to emphasize the trims

The **standard interior** of the Cayenne, Cayenne Diesel, Cayenne S and Cayenne S Hybrid **in the standard color** already satisfies high demands. Modern production technologies, for example, have permitted a new surface texture to be developed for the dashboard and doors of the standard interior that significantly improves the quality appearance. To ensure a pleasant feel and high-quality look, many of the surfaces in the Cayenne are covered with standard embossed leather in the standard colors Black, Platinum Gray (new) or Luxor Beige (new).

The extensive range of interior options offers many possibilities for individual personalization of the Cayenne. The **leather interior in standard color with smooth-finish leather** is standard on the Cayenne Turbo and available as an option on all other models. The leather interior in standard color is available in Black, Platinum Gray (new), Luxor Beige (new) and additionally in Umber (new). The 6 available trims cover a wide style from sporting carbon through

Brushed Aluminum to classic or modern wood trims.

The following illustration provides an overview of the possible color variants in the interior:

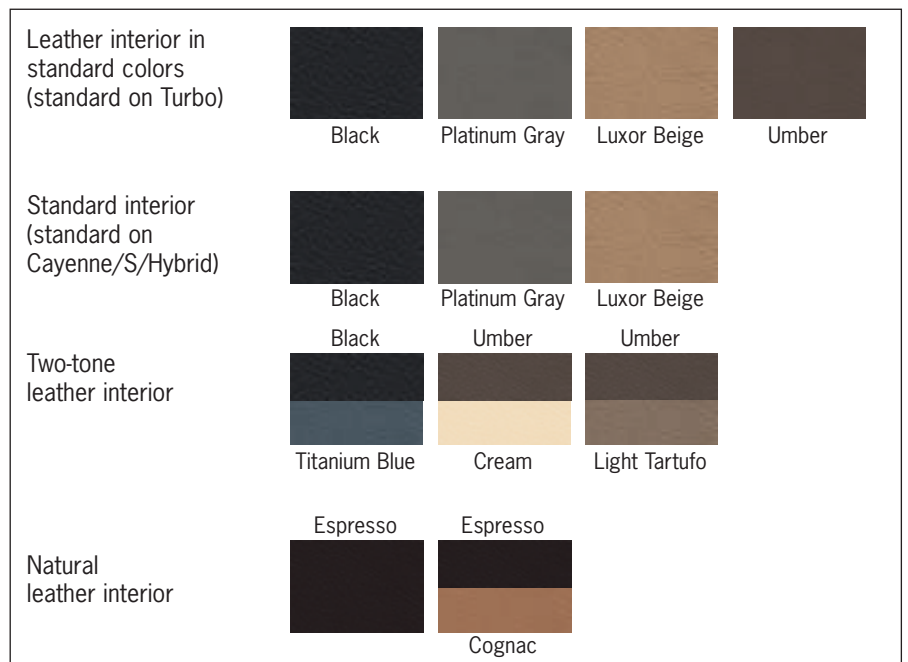


Fig. 94

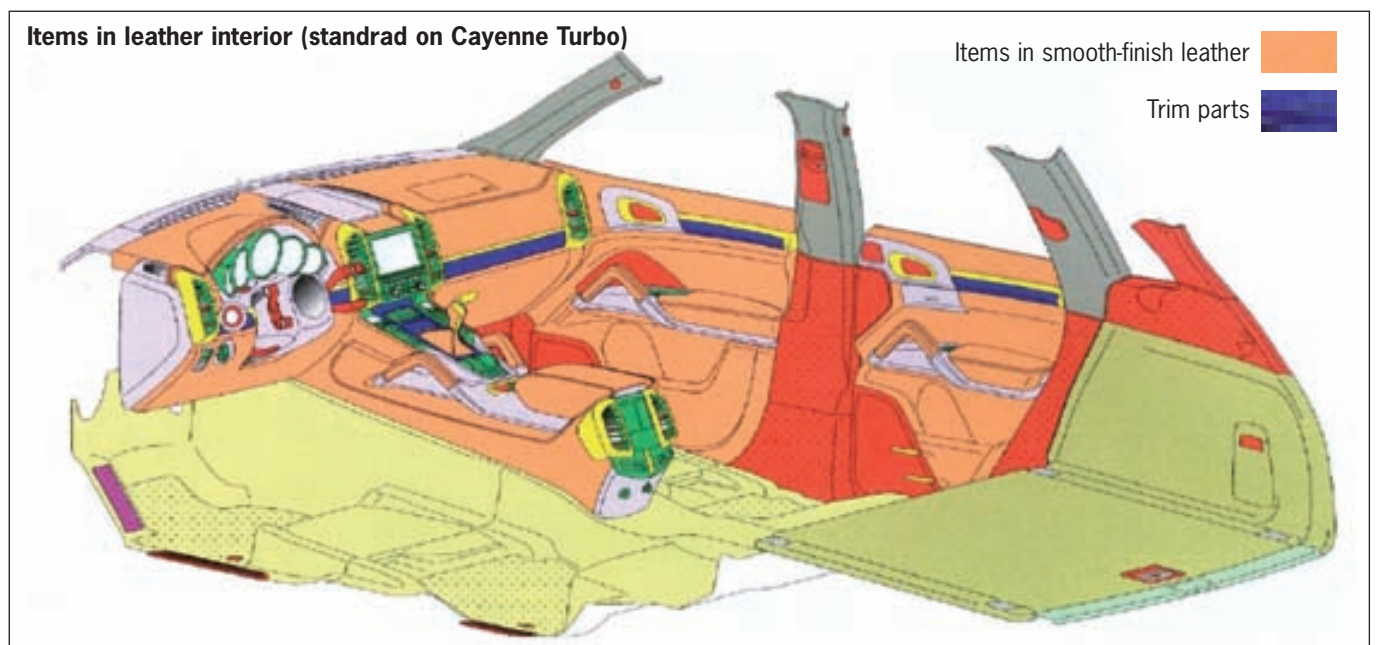






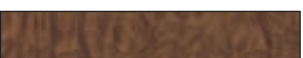

Fig. 95

The leather items of the leather interior in embossed leather and smooth-finish leather are compared below:

With the **two-tone leather interior** option, the passenger compartment interior comprises leather in 2 contrasting colors. The use of different colors in the interior creates a sporty and elegant atmosphere right down to the very last detail. The available combinations are Black/Titanium Blue, Umber/Cream and Umber/Light Tartufo. The upper part of the dashboard as well as the upper parts of the door panels, the armrests in the doors and the center console are covered with the darker color. The decorative seams as well as the other leather surfaces are covered in the lighter contrast color.

The **leather interior in natural leather** includes the same items as the leather interior in standard colors. In contrast to the smooth-finish leather interior, carefully dyed leather is used in this case. The special tanning process ensures that the original grain and natural features of the leather are preserved and this provides the passenger compartment with an especially refined atmosphere. The natural leather interior is available in the **new interior color Espresso** or, as an especially exclusive variant, in the **two-tone version Espresso/Cognac**.

Items	Standard embossed leather	Smooth-finish leather Standard on the Cayenne Turbo
Dashboard		
Dashboard upper section incl. instrument shroud		•
Dashboard lower section incl. glove compartment lid		•
Steering wheel airbag module		•
Gear lever or Tiptronic S gear selector	• (smooth-finish leather)	
Steering wheel rim	• (smooth-finish leather)	
Seat system (note: adaptive sports seats with memory package always in smooth-finish leather)		
Front and rear seat centers	•	•
Front and rear inner seat bolsters	•	•
Headrest front section	•	•
Leather seats incl. leather-covered outer seat side bolsters at front and rear		•
Back of front seat backrests	• (leatherette)	
Doors		
Door handles at front and rear	•	•
Door panel armrests at front and rear	•	•
Center console handles	•	•
Upper part of door panels at front and rear		•
Lower part of door panels at front and rear		•
Door storage compartments, front and rear		•
Armrest and center console		
Center console armrest	•	•
Armrest on rear seat bench	•	•
Center console side section	•	•
Center console base element		•

Interior packages	Description ● = Standard ○ = Option W = Optional, without extra charge		Cayenne	Cayenne S	Cayenne S Hybrid	Cayenne Turbo
Basic trim	Interior trim Black (high-gloss) 		●	●	●	W
Aluminum	Brushed Aluminum interior package 		○	○	○	●
Wood	Walnut interior package 		○	○	○	○
	Anthracite Birch interior package 		○	○	○	○
	Natural Olive interior package 		○	○	○	○
Carbon	Carbon interior package 		○	○	○	○

Other leather options:

- **Soft ruffled leather:** Soft ruffled leather seat centers are available in combination with comfort seats and the comfort package for exceptional seating comfort and a sophisticated look. Soft ruffled leather seat centers are combined with a different seam pattern for the seat cushion and backrest (horizontal seams) with more leather. The folds produce an especially soft seat surface (note: not available in conjunction with the I-no. Seat ventilation (front) and adaptive sports seats with memory package).
- **Exclusive:** Leather covering of additional surfaces e.g. steering column trim, rooflining grab handles, interior mirror, seat bracket as well as reversible footwell and luggage compartment mats with leather border are optionally available, as is the Porsche Crest on the front or front and rear headrests.

The **Alcantara rooflining**, standard on the Cayenne Turbo and available as an option on the other Cayenne models, improves the look and feel of the interior even further. In addition to the rooflining, the A-pillar trim, B-pillar and C-pillar cover and sun visors are also included in the scope of items in Alcantara.

Trim elements

The **trims underline the high quality of the passenger compartment on the new Cayenne models**. The trim surfaces create an effective contrast to the leather interior and provide elegant highlights.

As part of this new concept, the **trim strips are highlighted with silver-colored accent strips** that make the passenger compartment of the Cayenne even more interesting and luxurious.

Trim variants

The numerous trim options provide customers with additional possibilities for personalization. The standard trim strips have a **High-gloss Black** finish; these strips are **Brushed Aluminum** on the standard Cayenne Turbo. The door handles, trim strips on the doors and dashboard and the air vent surrounds are silver-colored with a metallic look and feel. The door entry guards on the Cayenne and Cayenne Diesel are made from plastic. A model-specific logo at the front of the stainless steel door entry guards is available as an option on the Cayenne and Cayenne Diesel and comes standard on the other models (Cayenne and Cayenne Diesel: "Cayenne"; Cayenne S and Cayenne S Hybrid: "Cayenne S"; Cayenne Turbo: "Cayenne turbo").

The **interior packages "Walnut," "Anthracite Birch", "Natural Olive" and "Carbon"** permit personalization and are available as an option on all models.

The following surfaces are covered with the specified materials in the respective packages:

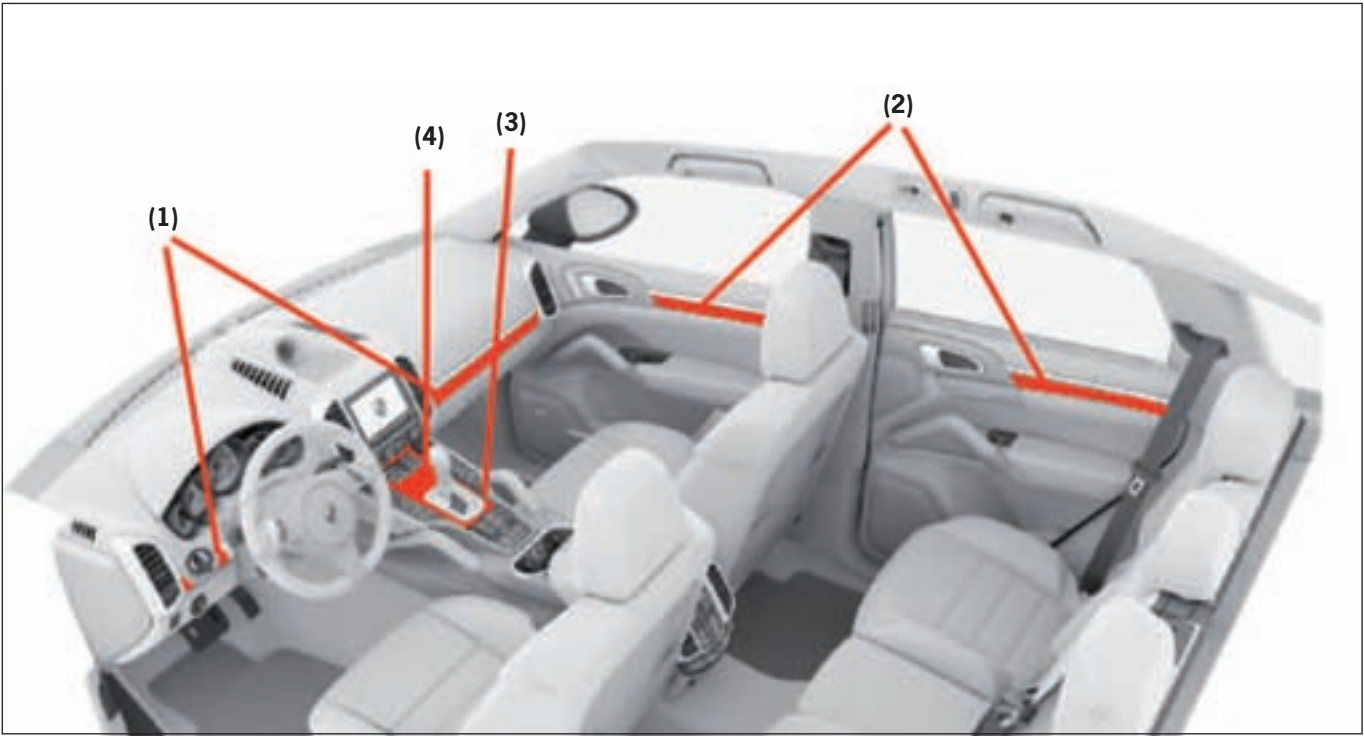


Fig. 96: Trim elements

Overview of trim variants for the Cayenne:

Trim scope	
(1)	Dashboard trim strip
(2)	Door trim strip at front and rear
(3)	Center console trim panel
(4)	Ashtray cover at front

6.2 Steering wheels

The driver expects a sporty and comfortable sitting position with a typical Porsche steep-angle steering wheel. The **diameter of the steering wheel** has been reduced by 0.8 inch in comparison with the predecessor. All Cayenne models use standard **three-spoke steering wheels**. The grip areas are covered in smooth-finish leather in the standard colors on all steering wheel variants. The **three-spoke sports steering wheel** with **shift paddles** and the **three-spoke multi-function steering wheel** are available as options. The steering wheel rim on the three-spoke multi-function steering wheel can be additionally provided with inlays in "Walnut," "Anthracite Birch" or "Carbon".

Steering wheel heating is available independently of seat heating on the new Cayenne (note: not available for three-spoke sports steering wheel with shift paddles) and is included in all steering wheels with optional trim. With a heated steering wheel, heating of the steering wheel rim can be switched on and off separately by means of a button on the back of the 6 o'clock spoke. When the steering wheel heating is activated, the rim temperature is kept constant at 95 °F by a sensor on the rim.

The **three-spoke steering wheel** with steering wheel rim in smooth-finish leather is standard on all models. The color of the airbag module and the steering wheel spokes is matched to the dashboard. Models equipped with Tiptronic S can be shifted manually using shift buttons on the steering wheel. It makes no difference which of the two shift buttons is used for changing gears. The shift buttons themselves have a high-quality galvanized surface. The height and reach of the steering column can be adjusted.



Fig. 97: 3-spoke steering wheel

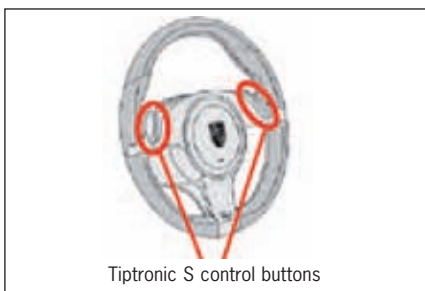


Fig. 98: 3-spoke steering wheel with Tiptronic S shift buttons

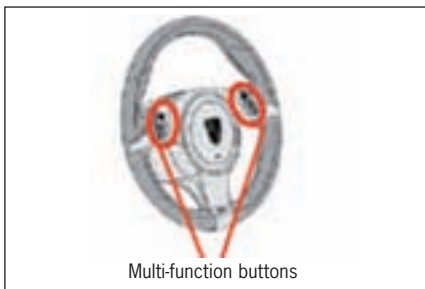


Fig. 99: 3-spoke multi-function steering wheel

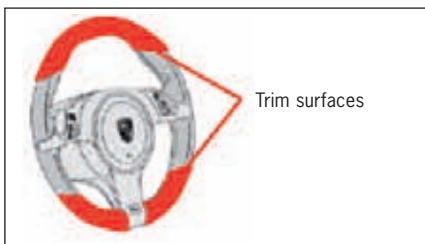


Fig. 100: 3-spoke multi-function steering wheel with trim elements

The steering column of the standard **three-spoke steering wheel** on the **Cayenne Turbo is electrically adjustable**; this function is available as an option with the memory package or the adaptive sports seats with memory package on the other models.

Steering wheel heating is available as an option (standard on the Cayenne Turbo).

The **three-spoke sports steering wheel** with alloy shift paddles is available as an option on all models and has a striking sporty design. In the case of the optional leather interior, the airbag module is additionally covered in leather (standard on the Cayenne Turbo).

With the **three-spoke multi-function steering wheel in leather**, the driver can quickly and easily operate a variety of functions by means of multi-function buttons and thumb rollers, e.g. audio/communication, on-board computer and telephone, even while driving. **Steering wheel heating** is available as an option.

The **three-spoke multi-function steering wheel** with trim elements is available in "Walnut," "Anthracite Birch" and "Carbon". The steering wheel rim then features wood or carbon inlays. The functions are the same as those of the leather multi-function steering wheel. The three-spoke multi-function steering wheel with trim elements is always equipped with **steering wheel heating**.

6.3 Seat system

The **seat system** has been completely redeveloped for the new Cayenne models and offers all passengers **more comfort. For passengers in the rear, there is also significantly more space thanks to the wheelbase extended by 1.6 inch and the space-optimized front seats.** The Cayenne has 5 seats: 2 individual seats in the front and a bench with 3 seats in the rear. The front and outer rear headrests can be individually adjusted (2-way). The backrests of the rear bench can now be folded in the ratio 40:20:40. **The rear bench can be moved in longitudinal direction by 6.3 inch and the backrest angle can be adjusted by up to 6 degrees.** The flexible luggage compartment cover prevents prying eyes from looking into the luggage compartment regardless of the fore/aft position or backrest angle of the rear seat bench. The luggage compartment cover is hooked onto the backrests of the rear seat bench for this purpose and moves forwards or backwards with it.

The **8-way power seats** at the front are standard on the Cayenne, Cayenne Diesel, Cayenne S and Cayenne S Hybrid and offer the following adjustment options:

- Seat height
- Seat angle
- Backrest angle
- Fore/aft adjustment

They are extremely comfortable and in addition to offering excellent lateral support, their broad range of adjustment options ensures perfect adaptation to the user and outstanding traveling comfort, even on long journeys.

The **driver memory package** is available as an option for the comfort seats on the Cayenne, Cayenne Diesel, Cayenne S and Cayenne S Hybrid and includes storage of the individual settings for the driver's seat and exterior mirrors. If the driver's seat has been moved, a stored configuration can be restored in just a few seconds.

The 14-way power seats with **memory package** available as an option on the Cayenne, Cayenne Diesel, Cayenne S and Cayenne S Hybrid and without extra charge on the Cayenne Turbo include the following additional features:

- Electrical seat cushion depth adjustment
- 4-way lumbar support for driver and front passenger
- Electrical adjustment of steering column
- Mirror lighting



Fig. 101: 14-way power seats (front) with memory package

The individual settings for the following configurations can be stored on the vehicle key or on additional memory buttons in the door:

- Driver and front passenger seat position
- Steering column and exterior mirror position
- Settings for lights, windshield wiper, air conditioning, door locking, instrument cluster and PCM

The **adaptive sports seats with memory package** (18-way adjustment) are available for optimum lateral support in every situation. They are standard on the Cayenne Turbo and optional on the other models. Striking is the sporty design and the additional lateral support provided by the following features:

- Higher side bolsters on the seat cushions and backrests
- More pronounced shaping in the shoulder area
- Custom seam pattern



Fig. 102: Adaptive sports seats with memory package (18-way adjustment)

In addition to electrical adjustment as per the memory package, this option also includes electrical adjustment of the following:

- Seat cushion side bolsters
- Backrest side bolsters

Note: The settings for the seat cushion and backrest side bolsters cannot be memorized.

The adaptive sports seats can be exactly adapted to the body contours of the driver by means of **individually fillable air cushions in the side bolsters**, among other things. The seat therefore offers **optimum lateral support even during particularly sporty driving**. The rear bench also has the sporty seam pattern. The exterior mirror lights illuminate the entrance area in front of the doors.

The day-to-day usability of the Cayenne models has also been significantly increased through the **manually adjustable rear seat system**. This system now permits fore/aft adjustment (40/60) of up to 6.3 inch and includes a through-loading feature in the form of the center seat backrest. The backrests of the rear seat system can be split-folded in the ratio 40:20:40 without removing the headrests, which enables the luggage compartment volume to be increased from 23.7 cu ft up to 62.9 cu ft depending on model. The 3 different positions of the adjustable backrest also offer greater comfort.

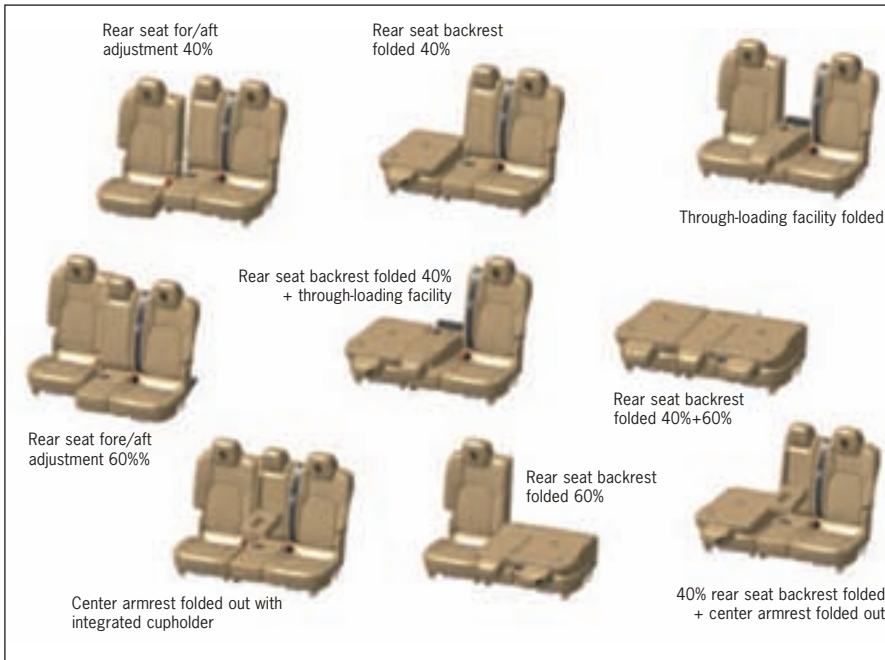


Fig. 103: Manually adjustable rear seat system

The 40% and 60% sections can be moved forwards or backwards by 3 degrees starting from the standard setting independently of each other. There is now a double cupholder integrated in the folding center armrest on the middle seat. The rear bench adapts to the respective design of the front seats; with the sports variant, the outer rear seats also have a more pronounced shape compared with the comfort seats or the memory package.

6.3.1 Seat system controls

Front seat controls

The various switches on the front seats permit precise and individual adjustment of the seats. Each of these switches is assigned a specific function.

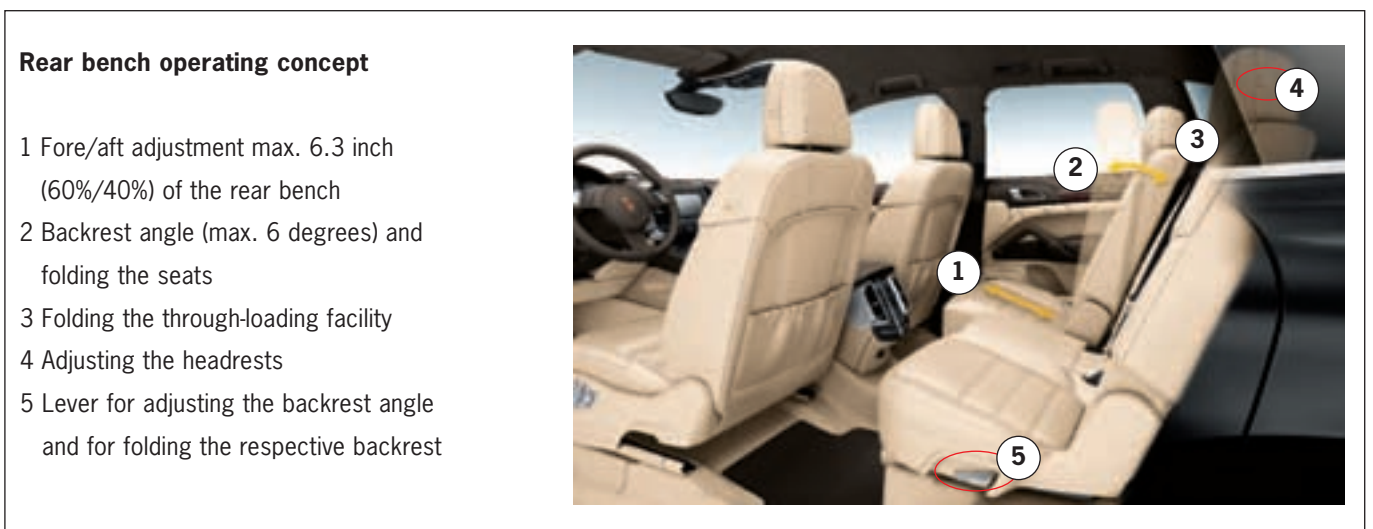
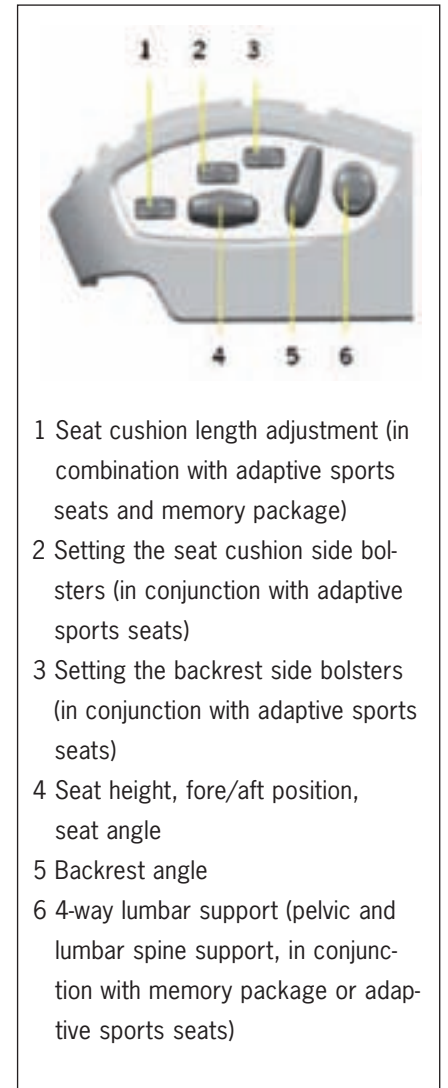


Fig. 104: Rear seat bench operating concept

6.3.2 Seat climate control

Seat heating is available as an option for the front seats and can be ordered independently of steering wheel heating for the first time on the new Cayenne. Seat heating heats the centers of the seat cushions and the backrests as well as the side bolsters to a pleasant temperature. Seat heating is also optionally

available for the front seats and rear bench (standard on the Cayenne Turbo). The heating operates in three stages in each case and can be individually controlled via switches on the front and rear center console.

Seat ventilation is optionally available for the front seats (only in conjunction with seat heating/not in combination with

soft ruffled leather). This enhances comfort for passengers by regulating the transport of heat and moisture. The active ventilation of the perforated seat cushion and backrest center sections creates a suction air flow. The moisture is drawn away from the body and transported away via specially arranged air ducts, thereby ensuring a pleasant seat climate even at high temperatures. In addition, the air flow passing close to the body creates a pleasant cooling effect due to evaporative cooling. The **seat ventilation** can be individually controlled in 3 stages; the highest stage is set by one-touch operation of the switch. To prevent excessive cooling, the seat ventilation cannot be switched on if the seat temperature is below 59 °F. Seat heating can be switched on at the same time as seat ventilation. The combination of seat heating and seat ventilation enables each occupant to set their personal seat climate.



Abb 105: Seat ventilation

6.3.3 Overview of seat variants

		Comfort seats (standard)	Driver memory package (optional)*	Memory package (optional)*	Adaptive sports seats with memory package (optional, standard on the Cayenne Turbo)
Front seats	Seat height	Electric	Electric & memory	Electric & memory	Electric & memory
	Fore/aft adjustment	Electric	Electric & memory	Electric & memory	Electric & memory
	Seat and backrest angle	Electric	Electric & memory	Electric & memory	Electric & memory
	Seat cushion length adjustment		–	Electric & memory	Electric & memory
	4-way lumbar support		–	Electric & memory	Electric & memory
	Adjustment of side bolsters for seat cushions and backrests		–		Electric
Other functions	Steering column adjustment	Manual		Electric & memory	Electric & memory
	Exterior mirrors	Electric	Electric & memory	Electric & memory	Electric & memory
	Light, wiper, air conditioning and door lock settings		–	Memory	Memory
	Mirror lighting	–	Included	Included	Included

* Only available for comfort seats

6.4 Interior lighting

The **interior lighting** of the Cayenne models ensures pleasant illumination of the passenger compartment without appearing intrusive or disruptive. The interior lighting is designed so that it optimally complements the interior in darkness and selectively emphasizes the highlights. A **light comfort package** is available as an option to meet the very highest requirements for lighting.

6.4.1 Interior lighting concept

The standard interior lighting concept facilitates orientation in darkness. It comprises the following features:

Feature	Customer benefits
Dimmable ambient lighting	Permits flexible control of the luminous intensity
Lighting in the front roof console and rear reading lights in LED technology	Special light atmosphere
Side trim panels at front and rear with lighting in LED technology	Special light atmosphere
Footwell light at front and rear	Makes entering the vehicle in darkness easier
2nd plug socket on the left of the rear center console	For connecting an additional electrically powered device (cell phone, MP3 player, etc)
Courtesy lighting in the left and right exterior mirrors	Makes exiting and entering the vehicle in darkness easier

6.4.2 Light comfort package

With the light comfort package, many of the lights are equipped with LEDs instead of conventional light bulbs. This produces a very special light atmosphere with a bright white light color. The LED light shows the interior design to its best advantage, e.g. with LED light guides inserted in all four door panels

between the armrest and storage compartment that enable continuously adjustable illumination of the passenger compartment. The dimming can be individually adjusted by means of a separate button on the roof console.

Feature	Customer benefits
Switch-off delay	The interior lighting remains switched on even after the engine is switched off so that the occupants can leave the vehicle comfortably.
Illumination of: - door openers - storage compartment in front center console - front and rear door storage compartments	Objects can be easily stowed and found in all storage compartments even in darkness
Ignition lock light	The driver can easily find the ignition lock in darkness
Reading spotlights and interior lights at front, reading lights on left and right at rear	Facilitate both orientation and other activities, e.g. reading in darkness
Orientation lights at front and rear	Facilitate orientation in the passenger compartment in darkness
Door entry lights, front and rear	Make it easier to enter the passenger compartment in darkness
Front and rear footwell lights	Illuminate the footwell in darkness
Illuminated vanity mirrors for driver and front passenger	These lighting features facilitate use of the respective items even in darkness
Luggage compartment lighting	
Ashtray lighting	
Glove compartment light	
Door guard lights in red/white at front and rear, also in tailgate	Passing vehicles are warned in darkness that the vehicle occupants have opened the doors and are leaving the vehicle. Make it easier for the vehicle occupants to leave the vehicle by illuminating the ground

6.5 Operation and display concept

The operating and display functions also immediately identify the new Cayenne as a Porsche. The visual membership of the Porsche family has been significantly increased, all elements are easy to control and have a high-quality look and feel.

6.5.1 Instruments

The Cayenne also features the **5 round instruments typical of the 911 models**. They provide all the important information about the operating condition of the vehicle. The driver can concentrate on the central tachometer, which provides all the main information via indicator and warning lights. The driver is therefore not distracted unnecessarily and can concentrate on the road at all times.

The dials of the instruments have silver-colored inner bezels on all models and these provide a striking contrast from the black background. The 4 outer round instruments are always in black and the central tachometer has a model-specific design. The dial face of the tachometer on the Cayenne and Cayenne Diesel is black. The tachometer on the Cayenne S has a silver-gray dial face, while the dial face on the Cayenne S Hybrid also bears the designation "hybrid". On the Cayenne Turbo, the outer edge of the black tachometer is silver-gray and the dial face bears the designation "turbo".

To the left of the central tachometer is the speedometer and to the right the TFT color display. There is an analog engine oil pressure and engine oil temperature display on the outer left on the Cayenne, Cayenne Diesel, Cayenne S and Cayenne Turbo. On the outer right on all models is an analog display for the coolant temperature and the analog fuel gauge.

6.5.2 Instrument cluster – TFT color display

The new Cayenne features a 4.8-inch **high-resolution TFT color display in the instrument cluster**. This is integrated in the second tube from the right. This can be easily operated either using the right on-board computer lever or the

right steering-wheel thumb roller on the optional multi-function steering wheel.

The menu structure of the on-board computer is based on the basic logic of PCM. Comprehensive display options are available on the TFT display for the areas of vehicle settings, audio, phone, navigation, map display, trip, tire pressure monitoring and adaptive cruise control. For more detailed information on the TFT color display, please refer to the Product Information for the Panamera.

	Instrument	Function
(1)	Tachometer	RPM, current speed (digital) Tiptronic S shift pattern (P-R-N-D-M), gear indicator Upshift recommendation, key indicator lights
(2)	Speedometer	Current speed (analog) Current mileage and trip meter (digital) Other indicator lights
(3)	Multi-function display (4.8-inch TFT)	Communication and Infotainment Navigation map display (in conjunction with PCM)
(4)	Oil check	Engine oil temperature (analog) Engine oil pressure (analog)
(5)	Coolant temperature and fuel level	Coolant temperature (analog) Fuel level in tank (analog)

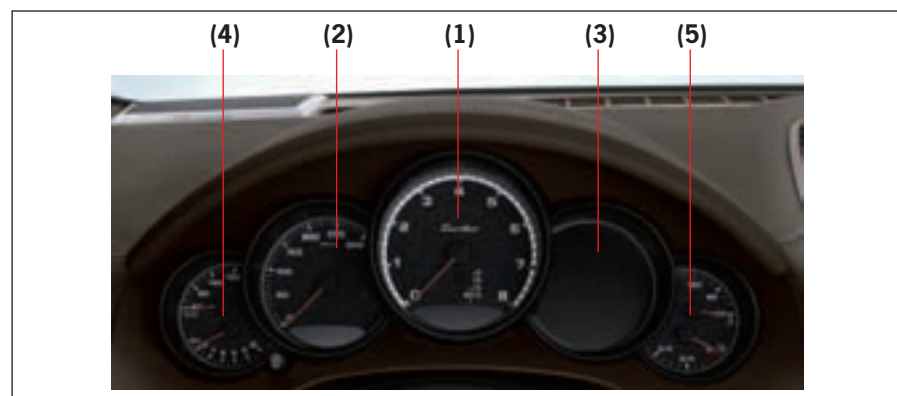


Fig. 106: Instrument cluster - Cayenne Turbo

6.5.3 Hybrid instrument cluster

The instrument cluster of the Cayenne S Hybrid differs from the other Cayenne models in a few technical details that emphasize the **unique vehicle concept** and allow the driver to experience the innovative hybrid drive via the instrument cluster also. A **"Ready indicator"** has been added to the tachometer in the central tube. This indicates the readiness of the hybrid drive to move off purely under electric power when the vehicle is started with the key. The position of the rev pointer at "Ready" and an acoustic signal indicate to the driver that the **system is ready** since there is no familiar sound of the engine starting and no idle speed displayed.

If the basic requirements of the hybrid system, e.g. outside or battery temperature, prevent moving off under purely electric power, the combustion engine starts as normal when the vehicle is started using the key and the tachometer shows the corresponding revs. The operating strategy of the hybrid drive is defined so that the combustion engine always starts for a so-called **cold start (engine cold)**. Driving away under purely electric power without emissions is possible for a **warm start (engine pre-heated)**.

A **"hybrid" designation** that identifies the hybrid drive is mounted on the silver-gray dial face in the center round instrument. The **electric power meter** in the left-hand tube is an **analog power display** that provides the driver with real-time feedback on the power status of the electric machine (motor/generator). When the needle is in the **E-Power range, this indicates the power required** by the electric motor or the two drives together to propel the vehicle

	Instrument	Function
(1)	Tachometer for gasoline engine	RPM, current speed (digital) Tiptronic S shift pattern (P-R-N-D-M), gear indicator Upshift recommendation, key indicator lights, "Ready" readiness display
(2)	Speedometer	Current speed (analog) Current mileage and trip meter (digital) Other indicator lights
(3)	Multi-function display (4.8-inch TFT)	Communication and Infotainment Navigation map display (in conjunction with PCM) Energy management display
(4)	E-Power meter and oil check	Electric machine power display (analog) Engine oil temperature (analog)
(5)	Coolant temperature and fuel level	Coolant temperature (analog) Fuel level in tank (analog)

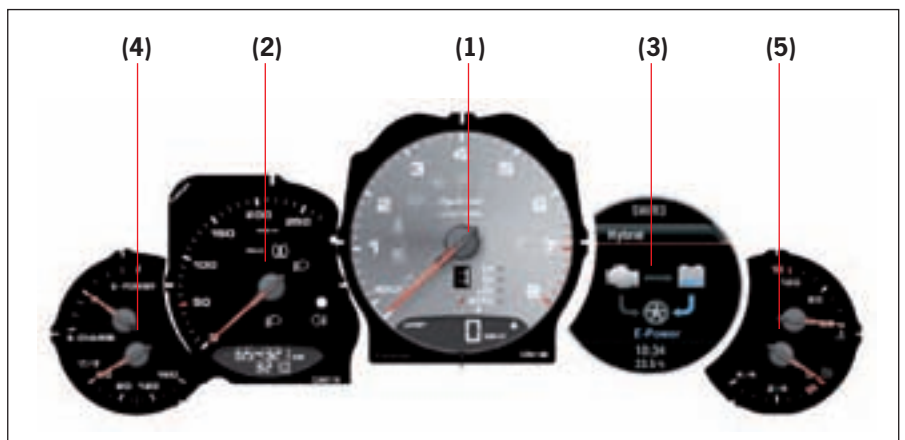


Fig. 107: Instrument cluster in Hybrid

during the acceleration phases. The **charge display**, on the other hand, shows the **generator power** during recuperation and thus the recovered brake energy. The electric power meter points slightly into the charge area during the coasting phases. This indicates that only slight recuperation is taking place and that all driving resistance is reduced as much as possible to make efficient use of the kinetic energy of the moving vehicle for as long as possible.

The interaction of the two drive sources as well as the **hybrid-specific driving modes** are displayed in the **TFT display** in the instrument cluster to provide the driver with information. The energy flows are also shown here in color in real time

by means of an arrow symbol pointing in the appropriate flow direction and provide the driver with feedback on his driving style.

The **hybrid-specific driving modes in the TFT display** show the interaction and the energy flows between the hybrid drive components using a simplified representation (combustion engine, wheel and battery). The current driving mode is indicated by the arrow color: the color orange stands for the combustion engine's energy flow, blue for electric drive currents and green for brake energy recovery. The charge status of the NiMH battery is shown using eight blue bars. The number of bars corresponds to the operating range of the


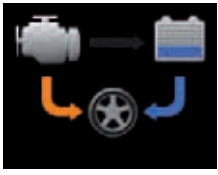
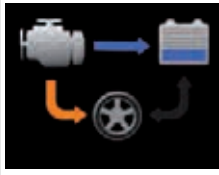



Hybrid-specific driving mode					
Driving under electric power	Boosting	Load point shift	Recuperation	Coasting	Start/Stop
Electric machine driving vehicle No assistance from combustion engine	Combustion engine and electric machine driving vehicle Addition of the drive power	Combustion engine operating at more energy efficient load point Combustion engine driving vehicle and charging battery	Conversion of kinetic into electric energy Battery charging	Combustion engine decoupled during driving Conversion of kinetic into electric energy Battery charging	Combustion engine switched off when stationary
					

Fig. 108

battery and represents the effectively usable energy. The battery charge status decreases when the electric motor is operating and increases when the battery is charged during recuperation and load point shifts (the bars are colored blue to indicate this).

6.5.4 Center console

The **elevated center console** structures the passenger compartment of the new Cayenne models and is a key element in defining the interior design. It also accommodates the controls for operating numerous functions at the front and rear. The buttons are arranged in function groups and are located on the left and right of the gear/selector lever at the front. The layout was chosen so that operation by the driver is fast, simple and intuitive. The driver therefore does not need to spend a long time searching for the main controls in complicated sub-menus of an on-board computer. The rear center console enables the rear passengers to control the air distribution, temperature setting or seat heating (depending on the individual options).

The **combination control stalk** allows the driver to control the wiper and washer system, direction indicators, cruise control and, where applicable, functions of the multi-function display and the adaptive cruise control without taking his hands from the steering wheel.

Additional functions such as ParkAssist, the optional electric slide/tilt roof or Panoramic roof as well as the garage door opener and dimming of the ambient lighting can be operated with the controls on the **roof console**. The roof console also accommodates the reading/interior lights as well as an indicator light for passenger airbag deactivation.

Equipment	Setting options on the center console
2-zone climate control	Air direction (left and right separately) Air flow (left and right separately) Temperature (left and right separately)
4-zone climate control (not for Cayenne S Hybrid)	Air direction (left and right separately) Air flow (left and right separately) Temperature (left and right separately) Controls the additional side air vents on the B-pillars
Rear seat heating	Seat temperature (left and right separately)

6.6 Air conditioning

2-zone climate control, previously available as an option on the Cayenne and Cayenne Diesel, is standard on all models of the new Cayenne. 4-zone climate control is also available as an option (not for the Cayenne S Hybrid).

6.6.1 2-zone climate control

All Cayenne models come with standard **2-zone climate control**. The temperature, air distribution and for the first time on the Cayenne also the air quantity are controlled fully automatically and if necessary separately for the driver and passenger. The functions can also be manually adjusted by means of a centrally located control unit on the center console. In addition, the driver and front passenger can individually adjust the air flow and direction at the air vents. The air flow can be varied between "Soft", "Normal" and "Strong" in the instrument cluster menu "Vehicle – Settings – Air conditioning". The **automatic air-recirculation function** and the **extended ventilation panel** on the upper side of the dashboard (center) are also switched on or off in this menu. With the **AUTO function**, which is selected by means of two separate buttons on the center console for the driver's and front passenger's side, the passenger compartment temperature desired by the passengers is automatically regulated. It also determines independently when it makes sense to use the extended ventilation panel depending on the ambient conditions and the driver's settings. The objective is to reach the desired passenger compartment temperature as quickly as possible. For example, if the temperature in the passenger compartment has been increased by the sun in summer, AUTO mode cools the vehicle with maxi-

mum cooling output. The passengers can also increase the air conditioning output to the maximum at any time by pressing the **AC Max button** and in this way cool the vehicle very quickly. Particular attention has also been paid to ensuring the acoustic comfort of the air-conditioning unit and air vents.

The climate control also has an air quality sensor. This sensor provides the input values for the **automatic air-recirculation control** that automatically switches from fresh air mode to recirculation mode if the air quality is poor, e.g. due to exhaust fumes. The **residual heat function** (button labeled REST on the center console) allows the engine heat to be used to heat the passenger compartment for up to 20 minutes after the engine is switched off. A **cooled glove compartment** is part of the standard equipment.

In addition to the desired temperature set by the passengers, the **passenger compartment control** takes into consideration a large number of input variables to guarantee a balanced climate in the passenger compartment of the vehicle, e.g. interior temperature, sun radiation, sun direction, outside temperature, driving speed, vent setting, risk of window misting, air discharge temperature, standstill time and engine speed. The necessary energy requirement for each climate zone is continuously determined from these values. The output of the air-conditioning compressor is then regulated fully automatically and according to requirements.

A standard **active carbon filter** cleans the fresh and recirculated air to remove particulate matter and pollen so that they do not enter the vehicle through the ventilation system. It also absorbs odors.

A **condensation sensor** monitors the window temperature and the relative humidity close to the windows and calculates the dew point from this information. This enables demand-based control of the necessary air flow for a condensation-free windshield. The sensor is installed in the Cayenne for the first time and has been fully integrated in the mirror base.

The **3D sun sensor** determines the intensity and angle of sun radiation, also from the rear, and therefore ensures individual sun compensation in the climate zones. This permits a selectively adjusted air flow for the individual passengers. The sensor's 3 diodes are arranged on the right, left and in the front to sense all angles of sun radiation. The signals are forwarded to the air conditioning control unit depending on light intensity and the air conditioning settings are readjusted.

The cooling output on the Cayenne has been significantly increased in comparison with the previous generation of the Cayenne by means of an **enlarged condenser** as well as the use of an additional **integrated heat exchanger in the refrigerant circuit**. This enables even faster cooling, in particular during hot summer weather. At the same time, the heat exchanger integrated in the refrigerant circuit reduces the fuel consumption.

6.6.2 4-zone climate control

In addition to the standard 2-zone climate control, **4-zone climate control** is optionally available for all Cayenne models apart from the Cayenne S Hybrid. This system permits individual climate control for the rear seats. Rear climate control is realized by means of a separate rear air conditioning system with evaporator and heat exchanger. It functions independently of the front climate control system and can be controlled by means of a separate control panel on the rear center console. The additional 2-zone control in the rear permits separate temperature and air flow adjustment for the left and right sides of the rear passenger compartment. With the 4-zone climate control, it is therefore possible to control the passenger compartment individually and without mutual interference for a total of 4 zones. This climate control variability is able to satisfy very different requirements of individual passengers and ensures a pleasant comfort level in the passenger compartment even in adverse weather conditions. The control unit for rear climate control is located at the back end of the center console between the front seats so that it is easily accessible for passengers on the rear bench. The control panel is adapted to the design of the front climate control system. The 4-zone climate control has been improved in a number of areas for the new Cayenne models. These improvements include a so-called outside air control that regulates the intake air depending on the vehicle speed to ensure that the required quantity of air in the passenger compartment remains constant. Optimizing numerous components such as the air cleaner and evaporator unit by minimizing the pressure



Fig. 109: 4-zone climate control

losses in two respects also helps to improve air conditioning:

- Reduces the noise level in the passenger compartment
- Reduces the electrical energy required by the fan

Unlike 2-zone climate control, 4-zone climate control has additional vents for ventilating the rear compartment integrated into the B-pillar.

The **3D sun sensor** determines the intensity and angle of sun radiation, also from the rear, and therefore ensures individual sun compensation for each climate zone. This permits a selectively adjusted air flow for the individual passengers. The four sensor diodes are directed to the right and left as well as up and down. The diodes forward signals to a control unit depending on light intensity. The control unit then performs the corresponding adjustments of the air-conditioning system.

6.7 Glazing and sun protection

All Cayenne models come with standard **tinted heat-insulating glass all around** with a **gray top-tint in the windshield** and **hydrophobic side windows** at the front. The front side windows are provided with a coating based on nano-technology that ensures that the windows become significantly less dirty, thereby improving visibility through the windows in rainy weather and in winter. (The coating is subject to normal wear and, depending on use and maintenance, eventually has to be replaced.) Thanks to the heat-insulating glass, the passenger compartment heats up less quickly and to a lesser extent in summer in particular. The gray top-tint reduces sunlight and therefore protects passengers from glare. The double sun visors for driver and passenger offer protection against the glare of the sun, regardless of whether the sun is shining in the front or side of the vehicle.

A **heated windshield** is also available for the first time for all new Cayenne models. It can be combined with all glass options and ensures a condensation-free windshield, even under extreme conditions, by means of the fine heating wires integrated in the windshield.

The **privacy glass** available as an option for all Cayenne models guarantees protection against prying eyes thanks to the tinted rear side windows and rear window. The privacy glass also provides the Cayenne models with an individual and dynamic look. All Cayenne models are optionally available with **thermally and noise insulated glass all around** that includes the privacy glass. This option comprises special laminated glass that provides exceptionally good protection against sunlight by



Fig. 110: Electric roll-up sunscreen for rear side windows

enhanced reflection of infrared radiation. In addition, the glazing also protects the passengers from disturbing outside noise. This ensures a pleasant atmosphere in the passenger compartment. Electrically extendable roll-up sunscreens for the rear door side windows are available as an option for all Cayenne models as protection against direct sunlight and in order to provide privacy. These can also be operated from the driver's position.

6.8 Luggage compartment and storage

The spacious passenger compartment is based on a well-planned concept that includes a range of practical storage options. Even with the standard equipment, it is extremely flexible and equal to all day-to-day requirements. It can transport 5 people and their luggage as well as bulky objects with ease. Over and above the comprehensive standard equipment, a wide range of personalization options enable the luggage compartment of the Cayenne to be precisely tailored to specific requirements.

Storage concept	
(1)	Glove compartment: lockable and cooled by the air-conditioning system
(2)	Two cupholders integrated in the front center console
(3)	Oddments tray underneath the center console armrest
(4)	Storage compartment under the driver's and front passenger's seat. Note: The storage compartment under the passenger's seat is not available if a fire extinguisher is ordered
(5)	Ashtrays in the front center console and in the rear door panels, with non-smoker package: parcel tray
(6)	Front door pockets with holder for 1.6 qt bottles and rear door pockets with holder for 1 qt bottles
(7)	Pockets on the back of the front seats
(8)	Rear center console (not in conjunction with 4-zone air conditioning)
(9)	2 cupholders in the rear armrest
(10)	Storage compartment under the luggage compartment cover (not on the Cayenne S Hybrid and with BOSE®, Burmester® or collapsible spare wheel)
(11)	Stowage net in left luggage compartment side trim panel (not on the Cayenne S Hybrid/not in conjunction with BOSE® Surround System and Burmester® High-End Sound System)



Fig. 111: Front door storage compartment in Cayenne

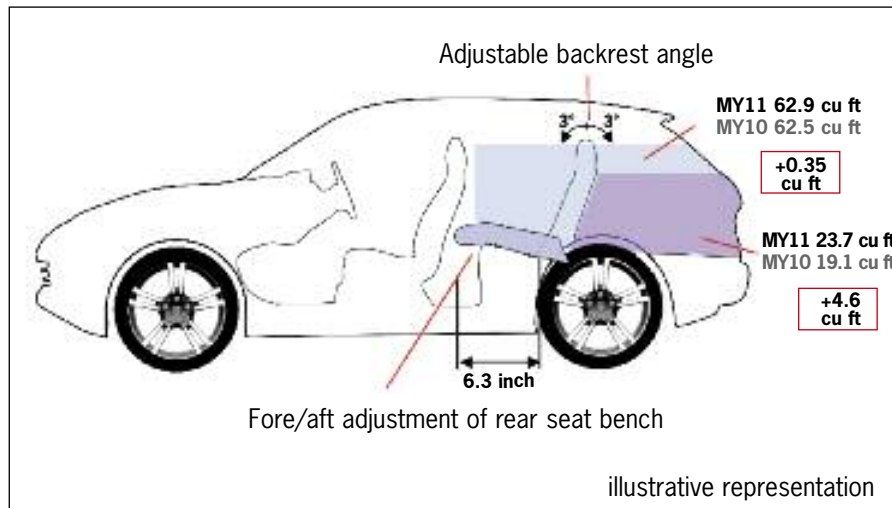


Fig. 112: Luggage compartment volume

Luggage compartment comparison

Luggage compartment		Cayenne MY10	New Cayenne MY11
Luggage compartment volume			
Up to top edge of rear seats	cu ft	19.1	23.7
Rear seats folded down	cu ft	62.5	62.9
Luggage compartment height (up to lower edge of roller blind)	inch	15.4	17.4
Luggage compartment length of luggage compartment floor			
Rear bench is rearmost position to tailgate	inch	38.4	38.9
Rear bench is foremost position to tailgate	inch	-	45.2
Maximum (rear bench folded down)	inch	65.0	70.9
Luggage compartment width	inch	45.6	45.9

There are two cupholders integrated in the front center console and two cupholders in the armrests standard on the Cayenne.

The **luggage compartment** of the new Cayenne models is ideally suited for even long journeys with 5 people with a volume of 23.7 cu ft (Cayenne, Cayenne Diesel, Cayenne S and Cayenne Turbo) or 20.5 cu ft (Cayenne S Hybrid), a storage compartment at the rear left, a side stowage net and an additional storage compartment underneath the luggage compartment floor (not on the Cayenne S Hybrid). The NiMH battery of the Cayenne S Hybrid is accommodated underneath the luggage compartment, which results in the following differences compared with the other models: the optionally available collapsible spare wheel on the Cayenne S Hybrid is stored upright in the luggage compartment and the subwoofer of the BOSE® or Burmester® Sound System is installed on the left-hand side in the luggage compartment instead of the additional storage compartment standard on the other models.

Full or split-folding (ratio 40:20:40) rear seats increase the luggage compartment volume if necessary to 62.9 cu ft (Cayenne, Cayenne Diesel, Cayenne S and Cayenne Turbo in conjunction with memory package) or 60.2 cu ft for the Cayenne Turbo in conjunction with adaptive sports seats with memory package and 59.7 cu ft for the Cayenne S Hybrid.

This also makes it possible to transport very bulky items, e.g several bicycles. The through-loading facility (separate folding function for the backrest of the center seat) is standard equipment. When the seats are not folded, the distance from the tailgate to the longitudi-



Fig. 113: Ski bag

nally adjustable rear bench is between 38.9 and 45.2 inch, depending on the position of the rear bench. The luggage compartment of the Cayenne is 45.9 inches wide at the narrowest point when the rear seats are folded down.

The optionally available **cargo management** enables the luggage compartment to be divided up according to individual needs. The system comprises the following elements:

- Rail system (integrated in the luggage compartment floor)
- Telescopic rod
- Strap roller
- Four variable lashing eyelets
- Reversible mat
- Luggage compartment partition net

The telescopic rod, strap roller or lashing eyelets can be simply inserted in the rail system integrated in the luggage compartment floor. Once inserted, they can be easily moved to the desired position and locked there. The luggage compartment can be variably divided with the **telescopic rail** so that individual objects can be secured. The **reversible mat** protects the carpet in the luggage

compartment from dirt and its special surface prevents luggage from slipping out of place. The **luggage compartment partition net** can be attached at two different points on the rooflining and is either attached to the lashing points in the luggage compartment floor or, when the seats are folded down, secured to the eyelets integrated in the seat back. Cargo management increases safety during transport.

The **ski bag** that can be ordered as an option is no longer integrated in the rear seat system and can be removed if necessary. It also offers much more volume than before, e.g. enough for four pairs of standard carving skis.

The standard **retractable luggage compartment cover** protects luggage from prying eyes. It is easy to operate, optimally covers even large objects and can be removed if necessary. The case is permanently attached and houses two roll-up blinds. One covers the space as far as the adjustable rear bench, regardless of its position. A second roll-up blind covers the space between the case and tailgate.

7 Safety

Passenger safety is very important for Porsche. This is demonstrated by numerous details on the new Cayenne models. Starting from the already high level of the predecessor, the safety of all the new Cayenne models has been further improved. **Active and passive safety have been enhanced and supplemented with new technologies.** In addition to the systems related to the body, extensive safety features are also provided in the passenger compartment. As an example, all Cayenne models protect their passengers with 8 airbags as well as side impact protection integrated in the doors.

7.1 Active safety

Particular emphasis has been placed on the following points in relation to active safety in the development of the new Cayenne models:

- Reinforced brake system for all models
- Enhanced Porsche Stability Management (PSM)
- Driving light assistant
- Bi-Xenon headlights with Porsche Dynamic Light System (PDLS) (standard on the Cayenne Turbo, optional on the other models)

- Driver assistance systems (optional)

The brake system customized to the respective model provides typical Porsche deceleration values. All new Cayenne models use an **enlarged and redesigned brake system** on the front axle to take account of the increased performance of the Cayenne.

The **Porsche Ceramic Composite Brake (PCCB)** is available for all Cayenne models for even better braking performance and even lower weight.

All Cayenne models are equipped as standard with the further-developed vehicle stability system **Porsche Stability Management (PSM)**. This permanently monitors the driving direction, driving speed, yaw velocity and lateral acceleration of the vehicle and intervenes by selective braking of individual wheels if the actual vehicle direction deviates from the intended course. The PSM tuning for all Cayenne models has been adapted to, among other things, the new Porsche Traction Management (PTM). In addition to ABS, the enhanced PSM includes a brake assist function as well as a function for pre-filling the brake system in order to enhance braking readiness and further reduce the braking distance. In conjunction with the optional **adaptive cruise control**, the brake system is also pre-filled if the system detects a

decreasing distance to the vehicle in front. In addition to a visual warning in the TFT display in the instrument cluster, the driver is also warned by means of a short braking jolt if the distance to the vehicle in front decreases quickly. Further information on PSM be found in section 4 "Chassis".

The **driving light assistant** standard for all new Cayenne models is not just practical and convenient, but also a safety aspect. It switches on the lights automatically when it gets dark, e.g. when driving through tunnels or when dusk is approaching.

Powerful vehicle lighting is an essential prerequisite when driving on the road, as this allows obstacles, other road users and one's own vehicle to be seen early on. That is why all Cayenne models are equipped with standard powerful **halo-gen headlights** (Cayenne, Cayenne Diesel, Cayenne S and Cayenne S Hybrid) with projector type technology. Especially powerful **Bi-Xenon headlights** are standard on the Cayenne Turbo and optional on the other models. These headlights are around twice as bright as halogen lamps and also include the **Porsche Dynamic Light System (PDLS)** with static and dynamic cornering light as well as speed-sensitive headlight range control. The PDLS ensures a greater range at high speed (highway

Service brake	Cayenne				Cayenne S/Cayenne S Hybrid				Cayenne Turbo			
	FA		RA		FA		RA		FA		RA	
	MY10	MY11	MY10	MY11	MY10	MY11	MY10	MY11	MY10	MY11	MY10	MY11
Brake caliper type	Aluminum monobloc fixed-caliper brake											
Brake disc material	Steel, internally vented											
Brake caliper color	Black				Silver-colored				Red			
Number of pistons	6		4		6		4		6		4	
Brake disc diameter [inch]	13.0	13.8	13.0		13.8	14.2	13.0		14.5	15.4	14.1	
Brake disc thickness [inch]	1.3	1.34	1.1		1.34	1.4	1.1		1.4	1.5	1.1	

light) and better illumination in poor visibility (adverse weather light). The headlights permit more uniform illumination of the road.

All Cayenne models are equipped with standard **LED daytime driving lights**, **LED tail lights** and **high-level 3rd brake light with LED technology**. The LED daytime driving lights (in the front light unit on the Cayenne, Cayenne Diesel, Cayenne S and Cayenne S Hybrid; as 4 LED spotlights in the headlights on the Cayenne Turbo) ensure good visibility of the new Cayenne models thanks to their high luminous power. The advantages of LED technology are extremely fast responsiveness as well as high light output for greater safety. These advantages are complemented by energy efficiency, environmental friendliness through a long service life as well as an unmistakable design both day and night through the use of different layouts for the position lights in the front fascia on the Cayenne Turbo and the other models.

7.2 Passive safety

7.2.1 Body design

All Cayenne models meet all legal requirements for occupant protection. They comply with the legal limit values for frontal, side and rear impacts. The design of the vehicle bodyshell is crucial for a high level of passive safety. To this end, the new Cayenne models use **modern metal processing methods** that enable "tailoring" of the individual body components. In the event of a crash, the forces that occur are distributed in a defined pattern to longitudinal and cross member structures in the front and rear end. The multi-phase steels used ensure high strength, selective deformability and optimum energy absorption. Reinforcements made from high-strength, hot-formed steels also protect occupants in the event of a side impact. They surround the passenger cell like a cage and with their extreme dimensional stability play an important role in maintaining the integrity of the cabin and therefore protecting the occupants. For example, hot-formed steel is

used in the area of the B-pillar that also has the necessary deformation capability besides the required dimensional stability. The new material has enabled both requirements to be realized in one component. In the roof area too, the efficient use of the hot-formed steels in the roof structure has enabled a significant reduction in weight combined with an improvement in the safety level compared with the predecessor.

All the components of the vehicle bodyshell are designed and joined so that the impact energy in the event of a crash is dissipated and the vehicle structure deforms in a defined pattern. Side impact protection integrated e.g. in the doors contributes to safety at the sides of the vehicle.



Fig. 114: Body design of Cayenne



Fig. 115: Airbags

7.2.2 Passive safety in the passenger compartment

The comprehensive passenger compartment safety concept of the new Cayenne models includes the following features:

- Two-stage, full-size airbags for the driver and front passenger
- Knee airbags
- Porsche Side Impact Protection System (POSIP) comprising curtain airbags across the entire roof frame and side windows from the A- to the C-pillar, thorax side airbags for the driver and front passenger as well as side impact protection in the doors
- Optional side airbags in the rear
- Safety steering column
- Seat-belt height adjustment (front)
- 3-point automatic seat belts

- Seat-belt pretensioners (front and rear on the outer seats) and force limiters (front)
- Roll-over sensor
- LATCH mountings on the outer rear seats and on the front passenger seat

The driver and front passenger are protected by **full-size airbags** which are deployed in two stages depending on the severity and type of accident, e.g. head-on or diagonally from the front. Two sensors at the front of the vehicle detect a crash together with the sensor technology in the airbag control unit and accurately evaluate this information in just fractions of a second. In less severe accidents, the occupants are restrained by the first stage. The airbag is softer in this stage, reducing the stress on the occupants.

The standard **Porsche Side Impact Protection System (POSIP)** includes **front thorax side airbags** integrated in the seat, **curtain airbags** covering the complete roof frame and the side windows from the A- to the C-pillar as well as **side impact protection** in the doors. **Side airbags in the rear** are available as an option.

All Cayenne models also feature a standard **safety steering column**, **seat-belt height adjustment in the front** and **3-point automatic seat belts** with pyrotechnic **seat-belt pretensioners** at the front and rear (outer seats), plus **force limiters** at the front and energy-absorbing structures in the dashboard. A **roll-over sensor** detects an imminent roll-over and automatically activates the curtain airbags and seat-belt pretensioners.

LATCH mountings are installed as standard on the outer rear seats of all Cayenne models, allowing child seats to be installed easily and securely. This means that child seats with the particularly safe and standardized **LATCH system** can be used.

7.3 Hybrid-specific safety systems

The high-voltage NiMH battery system of the hybrid drive calls for a **special safety concept**. On the new Cayenne S Hybrid, this safety concept has been **realized in several levels** taking into consideration the legal and internal requirements. The hybrid concept also takes into consideration the requirements for the entire vehicle life cycle from production (assembly) and vehicle operation (driver safety) to After Sales (training service personnel) and disposal (recycling the NiMH battery).

- **Level 1 – active safety:** Monitoring, switch-off and operating strategy
- **Level 2 – passive safety:** Battery design, shock-hazard protection and protective housing

The **first safety level (active safety)** includes continuous monitoring of malfunctions by the **battery manager** as well as automatic disconnection of the battery terminals from the high-voltage wiring. The battery is equipped with a fuse to enable the electric circuit to be interrupted in the event of a short circuit. In addition, the **high-voltage system is actively discharged** (lines and power electronics) as soon as the ignition is switched off or other faults such as short circuits occur. The high-voltage battery can also be switched off manually via a service disconnecter on the battery. In the event of an accident, the battery manager interrupts the high-voltage power supply and **discharges the high-voltage system in a matter of seconds** (opening the main contactors and discharging the system is less than 2 seconds). For this to happen, the accident must at least be severe enough for the driver's and passenger's airbag to be triggered. The vehicle is then no longer roadworthy and the workshop must read out and reset the fault memory before the journey can be continued. In addition to the safety advantages of the nickel-metal hybrid technology during operation as a result of the easily controlled chemical processes, the battery cells are also maintenance-free, gas-tight and fully recyclable. Unlike the heavy metal cadmium used in nickel-cadmium batteries, the metal hybrid used in the anode is **non-toxic** and also easily recyclable, which means that the raw materials (including the metals) can be reused after processing.

The **second level (passive safety)** takes into consideration the battery design and **construction of the high-voltage technology**. The individual battery cells have been designed for a high level of safety that minimizes possible risks due to overloading, deformation or short circuit. All cables carrying high voltage have been specially insulated for **uninterrupted shock-hazard protection** and are identified with an **orange color** to ensure clear identification for maintenance work but also as a safety measure to protect emergency rescue personnel in the event of an accident. From the outside, the Hybrid is also clearly recognizable as a hybrid vehicle by the "hybrid" designations on the two front transitions from the wheel housing liner to the door. The NiMH battery itself is located in a **high-strength protective housing** and is additionally secured.



Fig. 116: Front view of Cayenne Turbo at night



Fig. 117: LED tail lights

8 Lighting and assistance systems

8.1 Lighting system

The Porsche styling evident in the lighting system of the new Cayenne models is unmistakable, both day and night. The Cayenne models (with the exception of the Cayenne Turbo) are equipped as standard with H7 headlights based on projector type technology with automatic static range adjustment. The light from the light source is projected onto the road via a reflector and lens and thus allows homogeneous illumination without distracting oncoming traffic. A new feature that is standard on the Cayenne

Turbo and optional for the other Cayenne models is **Bi-Xenon headlights including Porsche Dynamic Light System (PDLS)**. Standard on all models are the fog lights integrated in the front end, the high-level 3rd LED brake light integrated in the roof spoiler and LED tail lights. All models are also equipped as standard with a driving light assistant, which turns lights on automatically when it gets dark or when driving through tunnels. Finally all new Cayenne models have **daytime driving lights in LED technology**: on the Turbo these are 4 LED spotlights per headlight, while the other models feature horizontal LED daytime driving lights in the front light units. The direction indicators and position lights are also posi-

tioned separately from the headlights in the bar-shaped light units in the outer air intakes.

The **Xenon headlights** (standard on the Cayenne Turbo) are Bi-Xenon headlights (low beam/high beam) with halogen auxiliary high beam as standard. The Bi-Xenon headlights feature automatic dynamic range adjustment as well as a headlight cleaning system and are additionally equipped with the adaptive light system **Porsche Dynamic Light System (PDLS)**. PDLS offers the functions **dynamic** and **static cornering light**, **speed-sensitive headlight control** (country road light and highway light) and **fog light**.



Fig. 118: Halogen headlights on Cayenne, Cayenne S, Cayenne S Hybrid

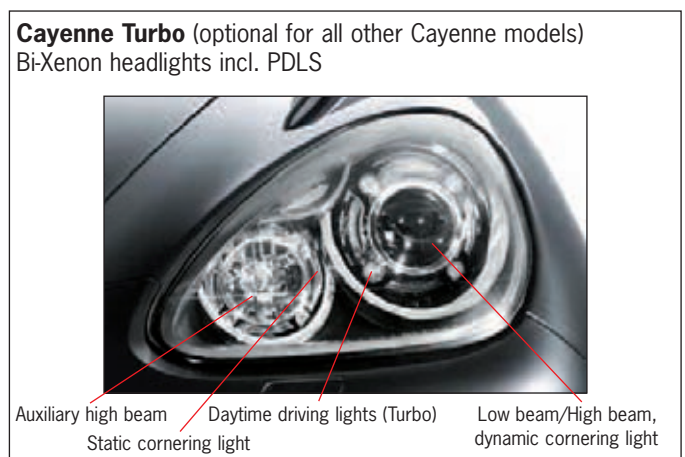


Fig. 119: Bi-Xenon headlights incl. PDLS on Cayenne Turbo

The automatic dynamic range adjustment automatically adapts the range of the headlight beam to the vehicle load when the ignition and low beam are switched on. The headlight beam range is also automatically kept constant during acceleration and braking to reduce glare for oncoming traffic.

PDLS consists of a swiveling PDLS module for the dynamic cornering light and range adjustment and, like the halogen headlights, is based on the projection system (PDLS is active when the light switch is set to "Auto"). The projection system includes a rotating drum with various contours for modifying the light/dark border of the light as well as a lens. The Bi-Xenon headlight can be set to different light modes such as country road light and highway light by means of the drum and changes in the light output (see the Product Information for the Panamera). PDLS is supplemented by the static cornering light. A halogen auxiliary high beam light is also installed in the PDLS in conjunction with the normal Xenon high beam light, which already illuminates the area in front of the vehicle particularly effectively due to the drum position with the cover open fully and increased light output.

The **dynamic cornering light** is activated above a speed of > 1 mph. The light control swivels the headlights to the side by up to 15 degrees (15 degrees for the light unit on the outside of the curve, 7.5 degrees for the light unit on the inside of the curve), depending on the steering angle and vehicle speed in the curve. The light beam is projected onto the road to a maximum range without distracting on-coming traffic. Consequently, when driving in the dark on twisting roads, the driver can see which way the road is going and can detect any obstacles much earlier and adapt his driving style accordingly. This feature also provides a significant increase in safety when driving on country roads and in protracted highway curves by optimally illuminating those curves. The low beam light in the Bi-Xenon headlights follows the driver's steering movements and continuously adjusts to the current driving speed. Sensors continuously record the driving speed, lateral acceleration and steering angle and use this information to 'measure' the corner. A control unit uses the data it receives to work out the best angle for the dynamic cornering light. The cornering light also remains active when the high beam is switched on and therefore improves the driver's visibility.

The **static cornering light** activates an additional halogen light source with a beam angle of approx. 30° with respect to the direction of travel. The static cornering light is activated by turning the steering wheel when the vehicle is stationary and while driving at speeds of up to 81 mph. As a result, the edge of the roadway is illuminated over a greater distance, e.g. when turning into a side street.

The **country road light** of the PDLS ensures better illumination of the surroundings and better range compared with the low beam of a conventional Bi-Xenon headlight. This is done by adapting the light cone by means of a special anti-glare contour in such a way that there is no glare for oncoming traffic.

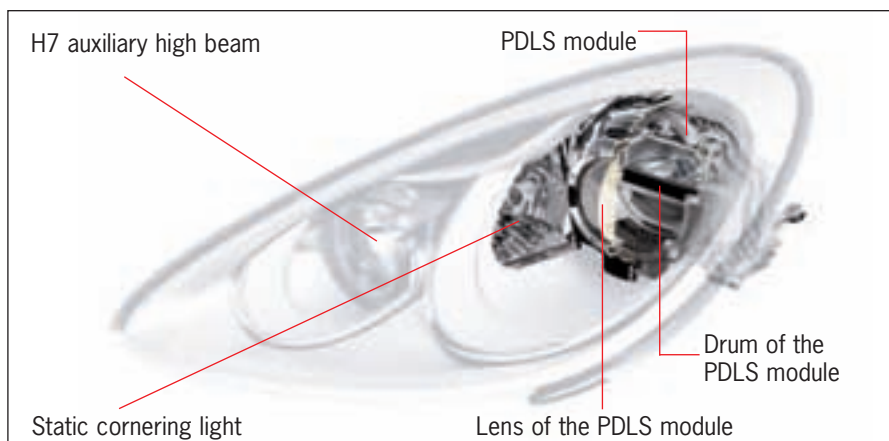


Fig. 120: Porsche Dynamic Light System (PDLS)

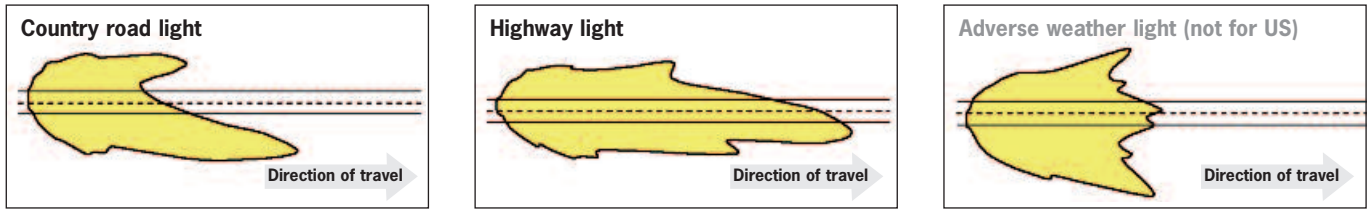


Fig. 121

The **highway light** increases the range of vision on multi-lane roads with no oncoming traffic and ensures optimum illumination of the second lane with reduced glare for the traffic in front. It increases the driver's range of vision by up to 55 yards compared with the conventional low beam. The highway light is automatically activated if the vehicle speed exceeds 68 mph for more than 3 minutes or above 81 mph without pre-conditions. It is switched off immediately without any other conditions at speeds of less than 43 mph. It must be noted that the highway light is not activated in markets with speed limits of less than 68 mph, e.g. parts of the USA.

All models also feature **front light units** with LED direction indicator lights (turn signal) and LED position lights (LED light guides). With the exception of the Cayenne Turbo, the front light units also house the LED daytime driving lights. On the Cayenne Turbo, the daytime driving lights with 4 LED spotlights each are located in the headlights. The position light (LED light guide) surrounds the direction indicator light. Daytime driving lights increase driving safety during the day by making the vehicle more visible for other road users.

The **LED tail light units** comprise the adaptive brake lights, a rear fog light and a back-up light as well as the rear, direction indicator and position lights. There is also a high-level 3rd brake light in LED technology integrated in the roof spoiler.

In addition to the visual impact and the **long service life**, the main advantage of **LED technology** is its **short response time**. Compared to around 100 ms for conventional incandescent lamps, the response time for LEDs is only around 0.1 ms. This difference corresponds to a distance of almost 10 feet at a speed of 60 mph due to the faster perception time, which means that the vehicle traveling behind can stop much faster in an emergency. Earlier signaling of braking therefore means that traffic driving behind the vehicle is warned more quickly and thus also contributes to active safety.

Light mode for Bi-Xenon incl. PDLs	Activation	Speed range
Static cornering light	Automatic based on steering angle	0 - 81 mph
Dynamic cornering light	Automatic based on steering angle	> 1 mph
Country road light (low beam)	Basic setting – low beam when light on	0 - 81 mph
Highway light	Automatic based on vehicle speed	Above 81 mph
Fog lights	Manual via light switch	Above 0 mph

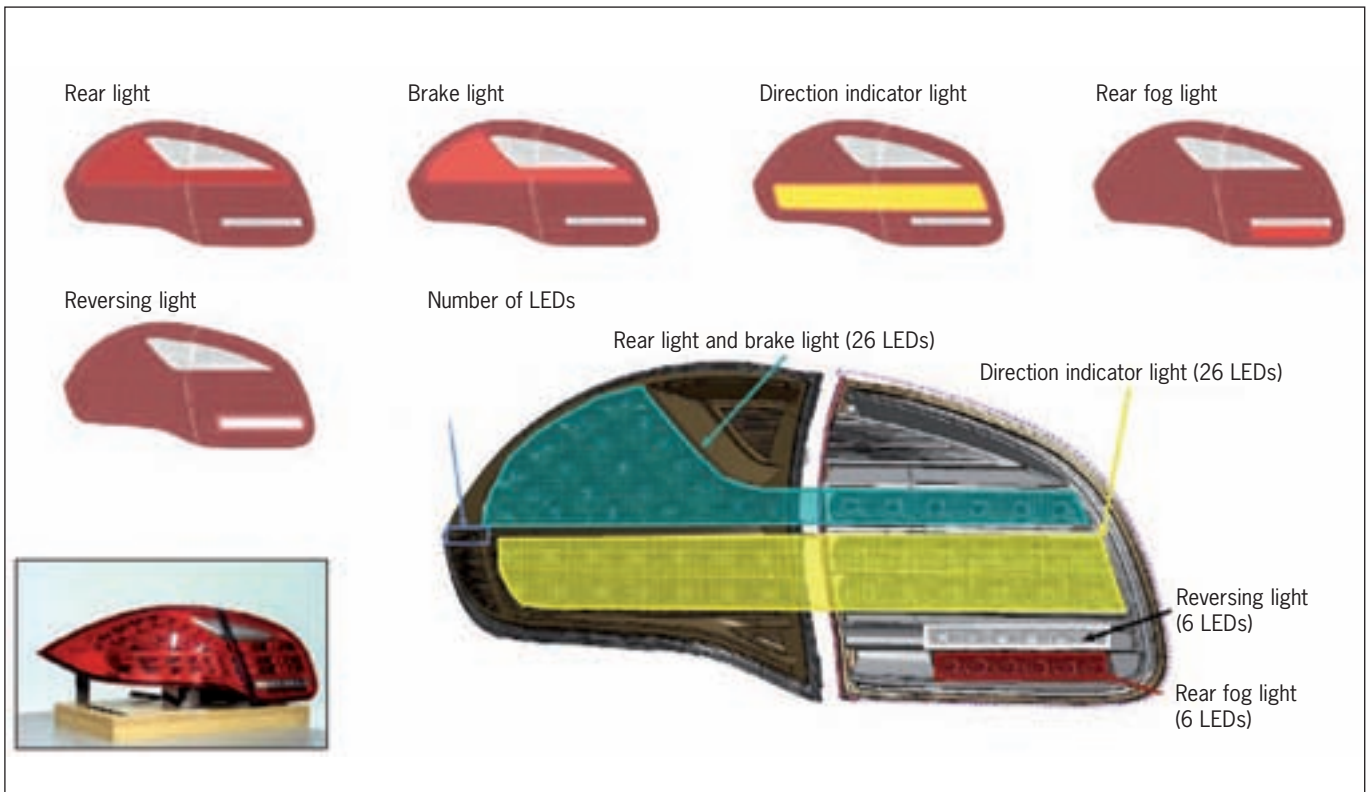


Fig. 122: LED tail lights

The Cayenne models are additionally equipped with automatic headlight activation and automatic switch-off with Welcome Home function.

8.2 Assistance systems

8.2.1 Adaptive cruise control

The Cayenne models are fitted with automatic speed control (**cruise control**) as standard. On long journeys, this increases driver comfort, as the selected cruising speed is automatically maintained through automatic deceleration and acceleration. The programmable speed range extends from 19 to 149 mph. **Adaptive cruise control** is optionally available (only in conjunction with Tiptronic S). It uses radar sensors to monitor the distance from the vehicle in front, automatically maintains the distance and brakes if the distance to the vehicle in front is reduced - if necessary

bringing the vehicle to a complete stop. The programmable speed range extends from 19 - 130 mph.

When the road ahead is free, the **adaptive cruise control** (ACC) behaves like the conventional cruise control and maintains the chosen set speed. The difference with ACC is that it can maintain a constant speed even on gradients by activating the brake system or executing downshifts. As traffic volumes increase, it is rarely possible to maintain a constant speed over long distances. Adaptive cruise control relieves the driver of the task of having to adjust the set speed to the changing traffic conditions. This has been achieved by taking a cruise control system and developing it into **adaptive cruise control**: if no vehicle is detected in front, the desired speed is set. If a vehicle is detected in front, the system attempts to keep the time interval (speed-dependent distance) with this vehicle as constant as possible.

The distance is measured with a radar sensor (long-range radar with 76-77 GHz), which is installed in the center of the front fascia. In following mode, the vehicle decelerates smoothly to a stop if the vehicle in front stops (adaptive cruise control "follow to stop" mode). The required vehicle deceleration calculated by the adaptive cruise control is set in the wheel brakes at maximum 3.5 yard/s^2 via PSM by actively changing the brake pressure so that the distance from the vehicle in front selected by the driver can be maintained. To increase driver comfort, the system activates a crawl phase before finally coming to a stop so that if the vehicle in front only stops briefly, the driver's own vehicle does not actually stop at all and a fluid, slow movement is possible. The driver can initiate or confirm moving off after a stop by pressing the operating lever or gas pedal.

As on the Porsche Panamera, the adaptive cruise control on the new Cayenne also offers the customer the special functions of overtaking aid, boost function and cornering speed control (see the Product Information for the Panamera). **The functions have been extended within the framework of active safety.** If the system detects a decreasing distance to the vehicle in front, as on the Panamera it enhances braking readiness in order to reduce the stopping distance if necessary. The interaction between the adaptive cruise control and PSM already results in the brake system being pre-filled. The system also warns the driver in dangerous situations visually and acoustically as well as **for the first time with an additional short braking jolt.** This alerts the driver to critical situations. The active safety functions operate independently of adaptive and normal cruise control but there is no response to stationary objects.

In conjunction with adaptive cruise control, an adaptive cruise control display in the color display of the instrument cluster can display comprehensive information such as target and actual distance, desired speed or speed of the vehicle traveling in front. In this mode, a speed bar in the color display shows how much of the available target speed range (19 to 130 mph) is currently being utilized. Time interval bars, speed bars, desired speed and the speedometer symbol are shown in orange when control operation is active. If the system is only switched on ("standby") but is not active, the specified display elements are gray. The operating states are displayed via the color display in the instrument cluster in the ACC menu. Warnings are also accompanied by an acoustic signal. You will find a detailed description of the display and operating concept in the Product Information for the Panamera.

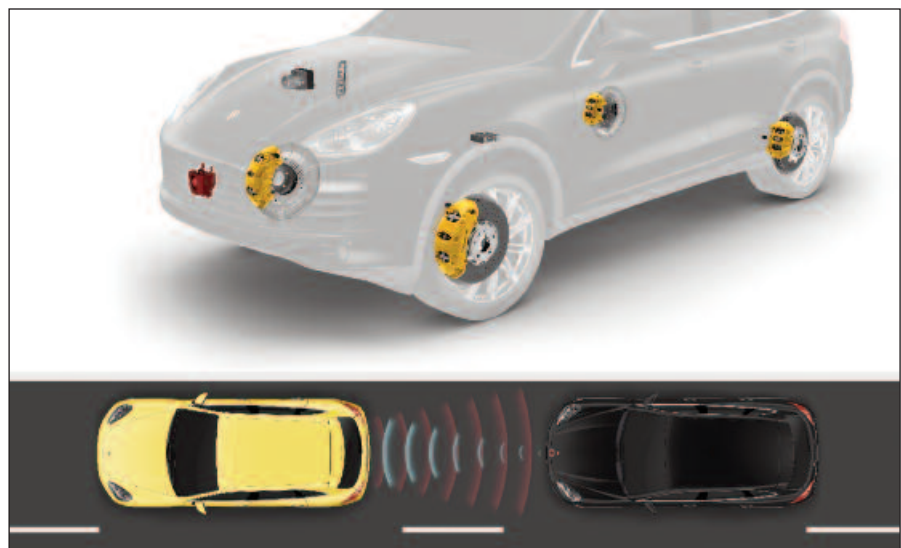


Fig. 123: Adaptive Cruise Control

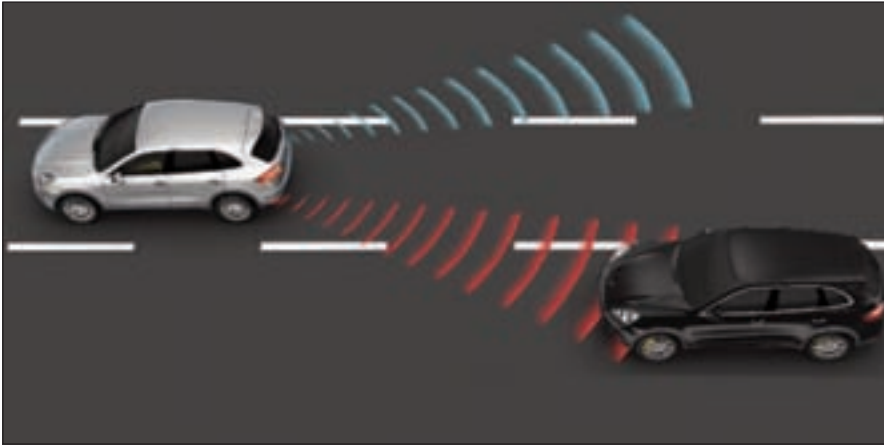


Fig. 124: Lane Change Assist (LCA)



8.2.2 Lane Change Assist (LCA)

The optional **Lane Change Assist (LCA)** is used for the first time on the new Cayenne. Lane Change Assist is a driving assistance/comfort system that uses two radar sensors at the right and left side of the bumper to monitor the right and left lanes up to 77 yards behind the vehicle as well as the blind spot. This enhances driving comfort, particularly when driving on the highway. LCA is available in the speed range between 19 mph and max. 155 mph.

If there is a vehicle in the blind spot or approaching quickly from behind, an LED information display lights up on the inside of the respective exterior mirror (information stage) once the distance falls below 60 yards. There are 4 LEDs installed in each of the two mirrors for this. If the driver sets the direction indicator in this scenario, the information display flashes brightly as a clear warning about the approaching vehicle (warning stage). This information is provided in two stages: as long as the driver

does not set the direction indicator, the light unobtrusively and subtly signals detected vehicles in the neighboring lanes. LCA decides whether or not to indicate the presence of the vehicle based on the relative speed and the distance to it. If the driver sets the direction indicator, the light will inform him of the detected vehicle by flashing brightly.

LCA does not intervene in vehicle control and can be deactivated at any time by the driver by means of a separate button in the door button module. When LCA is activated using the LCA button, both LED modules in the exterior mirrors briefly light up to provide visual feedback that the system is active. There is no system feedback when LCA is deactivated. The activation status of LCA can be determined using the function light in the button panel (door button module).

The basic brightness of the LED modules (information display) can be adapted to the driver's wishes in 3 brightness levels via a menu in the instrument cluster. The effective brightness of the information display depends on this basic setting and is tracked in parallel to the current outside brightness. The system stores the last system mode (activated or deactivated) as well as the chosen LED brightness for a specific key.

The range of the radar sensor is greatly dependent on the weather conditions. Temporary unavailability due to dirt on the bumper and/or bad weather conditions (fog, spray thrown up behind the vehicle, etc) or a potential system malfunction are indicated via text messages in the instrument cluster and result in automatic deactivation of the system. The system can be reactivated by simply switching it back on manually. The system will generally be deactivated when towing a trailer.

8.2.3 ParkAssist

Park Assist (front and rear) with 8 sensors with visual and acoustic warning is available as standard on the Cayenne Turbo and as an option for the other models.

The function range extends from 0 mph to a speed of around 9 mph.

The sound of the acoustic warning is deeper in the rear than in the front. The intervals decrease to a continuous tone as the vehicle comes closer to an obstacle. The acoustic warning starts from 40 inches at the front and from 47 inches at the rear. A one-time initial warning tone is played when an obstacle is detected within a 71 inch range. If the distance to the obstacle does not change, the tone is faded out after approx. 8 seconds. If the vehicle continues to approach the obstacle, the acoustic warning starts again.

In addition, a top view of the distances to obstacles is displayed in the central display in the form of a schematic representation of the vehicle.

The visual representation of detected obstacles takes place within a detection area in front of and behind the vehicle. Obstacles up to 47 inches in front of the vehicle, up to 47 inches to the side of the vehicle and up to 71 inches behind the vehicle can theoretically be displayed in the detection area. The sensor range enables obstacles to the side and front of the vehicle up to approx. 24 inches and to the side and rear of the vehicle up to approx. 28 inches to be displayed.

The distance values determined by the system are filtered to achieve a steady and stable display of obstacles. As a result, obstacles are only displayed after approx. 2 seconds when the vehicle is stationary (as opposed to when it is moving).

ParkAssist is activated when the ignition is switched on. It can be switched off using the ParkAssist OFF switch on the roof console (LED of the button lights up in this case). ParkAssist remains deactivated until it is switched on again via the button or the ignition is switched off and on again.

Color of the field	Distance in front of the vehicle	Distance behind the vehicle
Green	32 - 37 inch	32 - 71 inch
Yellow	16 - 31 inch	16 - 31 inch
Red	< 16 inch	< 16 inch
Red with continuous tone	< 12 inch	< 12 inch



Fig. 125: Sensor fields of ParkAssist



Fig. 126: Reversing camera

8.2.4 Reversing camera

The optionally available reversing camera (only in conjunction with PCM as well as ParkAssist (front and rear)) makes it easier to perform precise reverse parking and reverse maneuvering as well as to attach a trailer. The system determines the preconditions for switching on and off independently and then switches the camera on. The display output is activated when reverse gear is engaged or if the system detects that the vehicle is rolling backwards. Manual activation via PCM is also possible. The system is deactivated once a speed of 9 mph is

exceeded after the driver shifts out of reverse gear or when transmission range P is engaged and/or the parking brake is engaged.

The reversing camera is integrated in the momentary-switch handle of the rear lid and transmits the video image to the camera control unit, which is located under the bottom right trim panel in the luggage compartment. There the picture is equalized and the guide lines incorporated. The image is then transmitted to PCM. The image is only displayed if the electric parking brake is not activated. If a trailer was detected or the rear lid is

open, the video image is displayed but the guide lines are not incorporated.

The **dynamic guide lines** can be displayed in the reversing camera image if desired. They change corresponding to the position of the front wheels. The lines illustrate the driving path with the current steering wheel position and thus show the driver where he would travel with the steering wheel in its current setting. In addition, the colored rectangular area on the screen symbolizes the vehicle length. Voice control is not available while the image is displayed. In addition, ParkAssist's top view display can be overlaid on the image output from the reversing camera. In this case, the ParkAssist display can be shown and hidden again by touching the vehicle on the screen. Depending on the steering angle, ParkAssist is displayed on the left or the right edge of the screen.



Fig. 127: Image output of reversing camera with dynamic guide lines

9 Audio and communication

The state-of-the-art generation of audio and communication systems familiar from the Panamera is also available for the Cayenne. These meet the highest technical standards and have been optimized to provide enhanced user friendliness. The now 7-inch color screen of the CDR-31 audio system (standard for the Cayenne, Cayenne Diesel, Cayenne S and Cayenne S Hybrid) as well as Porsche Communication Management (PCM) (standard for the Cayenne Turbo, optional for all other Cayenne models) is positioned higher on the dashboard for improved ergonomics and designed as a touchscreen for quick and easy operation. Attention has been paid to ensuring that the systems feature only the highest quality materials.

The personalization options in the area of audio and communication have been further extended for the new Cayenne in comparison with the predecessor. A new feature is the high-end surround sound system from Burmester® also available on the Panamera. The universal audio interface has also been modified: various iPod® and iPhone® models are now connected to the audio system via the USB connection. The telephone module is now also compatible with a greater number of cell phones.

9.1 CDR-31 audio system and options

9.1.1 CDR-31 audio system

The new **CDR-31 audio system** (standard for the Cayenne, Cayenne Diesel, Cayenne S and Cayenne S Hybrid) has an **extremely high-quality user interface. The look and feel and central functions correspond to the latest PCM generation.** The main feature of the new audio system generation is a **7-inch TFT display with touchscreen.** All the functions of the CDR-31 system (except for volume) can be selected by touching the color screen. This allows fast and simple navigation through the various menus. In addition, the new display guarantees excellent legibility and clarity.

The user interface is adapted to suit the new color screen – both the operating structure and the screen design are the same as for PCM. The screen display is very clear thanks to the fact that many functions that are rarely used have been moved to the second menu level ("OPTION"). A maximum of 5 easy-to-read list entries are displayed on each page. Activating functions via the touchscreen will be the preferred mode of operation for the majority of customers. Nevertheless, virtually all functions can still be operated in the conventional way using the right rotary/pushbutton switch, depending on individual user preference.

The standard CDR-31 already has a sound system with 10 speakers divided into 4 channels with a total power output of 100 W and can be used to play audio CDs and music in MP3 format (formats: mp3, aac, wma). For radio listeners, there are up to 36 memory locations available. 30 locations can be freely assigned, 6 memory locations are automatically assigned at regular intervals by the Best FM feature of the CDR-31 system to the stations with the best reception.

9.1.2 CDR-31 audio system options

The Bluetooth® Hands free telephone interface is now standard on Cayennes with CDR-31. This system allows calls made from the customers paired telephone to transmit through the vehicles microphone and speakers. Phones with V-card capability may transfer contact information to the CDR-31 system for storage. The phones antenna is always utilized for connections.

A **6-disc CD changer** integrated in the CDR-31 system is also available instead of the standard single CD player. It is located directly within reach of the driver and, like the single CD drive, also supports the music formats aac, mp3 and wma.



Fig. 128: CDR-31 audio system

The standard **universal audio interface** makes it possible to connect an external audio source via the AUX interface. Operation takes place directly on the connected device. The AUX interface is located in the parcel tray in the front center console. There is also a 12-volt plug socket in the parcel tray for supplying power to the external audio source.

The optional **digital satellite radio SDARS (Satellite Digital Audio Radio Services)** from the provider XM is also available for the first time in conjunction with the CDR-31 audio system for the new Cayenne. This opens up an extensive range of music, sport, entertainment and information stations for customers, with approx. 170 channels in the USA and approx. 130 channels in Canada at present. After a free, 3-month trial period, customers can opt to continue using the XM service by paying a subscription. New functions such as searches for tracks and artists as well as auto-search for previously stored favorites allow excellent operating comfort.

The new Cayenne is also optionally available from the factory with **Porsche Rear Seat Entertainment**. This system, a new development of the system installed in the Cayenne up to now, features a swiveling, high-resolution 7-inch WVGA TFT display. The main advantage of the new system, besides the elegant integration of the two players in the display consoles, is the brand new touch-screen control feature. The vibration-proof system plays films on DVD as well as all current formats, e.g. CD, MP3, etc. Each display console has a USB interface for connecting USB storage media for playing e.g. films or photos (the following formats among others are supported: JPEGs, MPEG 1/2/4 Video, DivX 3.11/4.x/5.x). The system also allows connection of two separate, individually selectable AV sources, such as a game console, an iPod® or a digital camera. Using the crosslink function, it is possible to insert a data medium into one player or connect a data medium to one player and have the films and data displayed on both players. The system meets the high Porsche requirements with respect to safety, quality and ergonomics and is integrated harmoniously into the passenger compartment.

9.2 Porsche Communication Management (PCM) with navigation module and options

9.2.1 Porsche Communication Management (PCM) with navigation module

The latest generation of Porsche Communication Management (PCM) including navigation module is available on request for the new Cayenne (standard on the Cayenne Turbo). The **main features** of the **latest generation of PCM** in comparison with the predecessor are:

- High-resolution 7-inch WVGA (Wide Video Graphics Array) screen
- 3D navigation map incl. City and Terrain model with superimposed satellite map
- Lane information display at complex junctions
- Speed limit display in PCM based on navigation data
- Map display in the instrument cluster
- Energy management display (Cayenne S Hybrid)



Fig. 129: Porsche Communication Management (PCM) with navigation module

With the navigation function, users have the option of switching the map view between the new 3D representation (Terrain and City models) or the familiar perspective or two-dimensional representation. The 3D Terrain model with superimposed satellite map permits an even more detailed and realistic representation.

A **speed limit display** shows any speed limits that apply on the roads included in the map material either in PCM (Car display) or in the TFT display on the instrument cluster (the availability of the speed limit display depends on the relevant database status of the map material). This has been enhanced.

The navigation module has an integrated hard drive for fast route calculation. Three alternative route suggestions can be displayed for selection in each case.

The PCM system offers **11 speakers** divided into **7 channels**, an **external amplifier** and a **total output of 235 W**. The integrated CD/DVD player supports audio playback of audio and video DVDs and plays music in MP3 format (formats: mp3, aac, wma, wav).

For radio listeners, the audio system includes up to 48 memory locations (42 locations can be freely assigned, 6 presets for Best FM). The integrated CD/DVD player supports audio playback of audio and video DVDs and plays music in mp3 format. In conjunction with the BOSE® Surround Sound System or the Burmester® High-End Surround Sound System, output is also available in 5.1 Discrete Surround Format (see section 9.3.2), otherwise in stereo.

With the new PCM generation, a function for **audio transmission via Bluetooth®** is available for the first time on the Cayenne. This allows audio data to be transferred from external devices such as music players or cell phones via the Bluetooth® interface of PCM if this function is supported by the device.

9.2.2 Porsche Communication Management options

The Bluetooth® Hands free telephone interface is also standard on Cayenne's with PCM 3.1. This system allows calls made from the customers paired telephone to transmit through the vehicles microphone and speakers. The customers contact information also transfers to PCM 3.1 for storage, allowing the customers phone book to be naturally accessed via the PCM 3.1 interface.

A **6-disc CD/DVD changer** integrated into the PCM system is also optionally available instead of the standard single CD/DVD drive.

The now standard **universal audio interface** has been further improved and now permits digital audio transmission that results in higher sound quality (including in conjunction with an iPod®). In general, the universal audio interface makes it possible to connect an external audio source such as an iPod® or a USB stick. 2 connection points are provided for this purpose in the storage compartment in the front center console:

1. The USB jack not only enables USB memory sticks containing MP3 music as well as MP3 players to be connected, but also various iPod® and iPhone® models; they are operated via PCM, the optional multi-function steering wheel or the optional voice control. Digital audio transmission means much higher sound quality in conjunction with the iPod®. The audio data is now transmitted to PCM in digital format instead of the analog format used in the previous model. A further advantage is the noticeably faster list operation feature in PCM. Access to all track and playback lists has also been made much faster and enables even faster music searches. The standard Apple iPod® USB cable (supplied by Apple) is used as the connecting cable; the previous serial cable has been deleted. This USB connection also ensures simultaneous charging of the iPod®.
2. Other external audio sources such as a portable CD player can be connected via an AUX interface; operation takes place directly on the connected device.



Fig. 130: Universal audio interface

As with the CDR-31 audio system, the optional **digital satellite radio SDARS** from the provider XM is also available in combination with PCM (see section 9.1.2). In conjunction with PCM, the traffic information sent by XM can now additionally be taken into consideration during dynamic route guidance. Furthermore, extended data services for weather, sport and stock market information are also available. Weather information can additionally be displayed in the map in conjunction with the optional XM Nav Weather function.

The **electronic logbook** is also offered on the Cayenne as an option in conjunction with PCM. It is used to automatically record the mileage, distance traveled, date and time as well as the start and destination address for each trip.

A latest-generation **voice control system** is available in conjunction with the new hard-drive navigation system. With this system, the entries for the city and road are evaluated together to ease ambiguity. This method of matching two lists simplifies operation compared with the previous two-stage successive evaluation and at the same time increases the probability of immediate detection of the sought address. This enables relaxed and controlled driving comfort. The dri-

ver's hands can stay on the steering wheel and his eyes can stay on the road.

As with the CDR-31 audio system, **Porsche Rear Seat Entertainment** is available as an option in conjunction with PCM (see section 9.1.2).

In addition to the standard display of the 4 cardinal and intercardinal points in the instrument cluster with the PCM system, a **compass display** on the dashboard is optionally available in conjunction with PCM. The compass consists of the fixed LCD display in the center and the outer movable ring. The red marking on the ring indicates the compass direction. The central display provides information on the current degree heading of the driving direction and the altitude of the vehicle position.



Fig. 131: Porsche Rear Seat Entertainment

9.2.3 Energy management display (Cayenne S Hybrid)

All hybrid-specific driving modes can be tracked in the optionally available PCM system in a **detailed vehicle graphic** showing the drivetrain in real time. The animated graphic provides information on the current operating condition of the hybrid drive by showing the corresponding energy flows between the components of the hybrid drive. This gives the driver **feedback on the driving situation** and his driving style. Visualization makes the **driving style** transparent and can be deliberately reproduced for **economical driving**.

In addition to the combustion engine, the vehicle graphic also shows the hybrid module, the NiMH battery and the wheels. The color of the animated energy flows shows the current driving mode: the **color orange** stands for the **combustion engine's** energy flow, **blue for electric drive currents** and **green for brake energy recovery**. The charge status of the NiMH battery is shown using **eight blue bars**. The number of bars corresponds to the operating range of the battery and represents the effectively usable energy. The battery charge status decreases when the

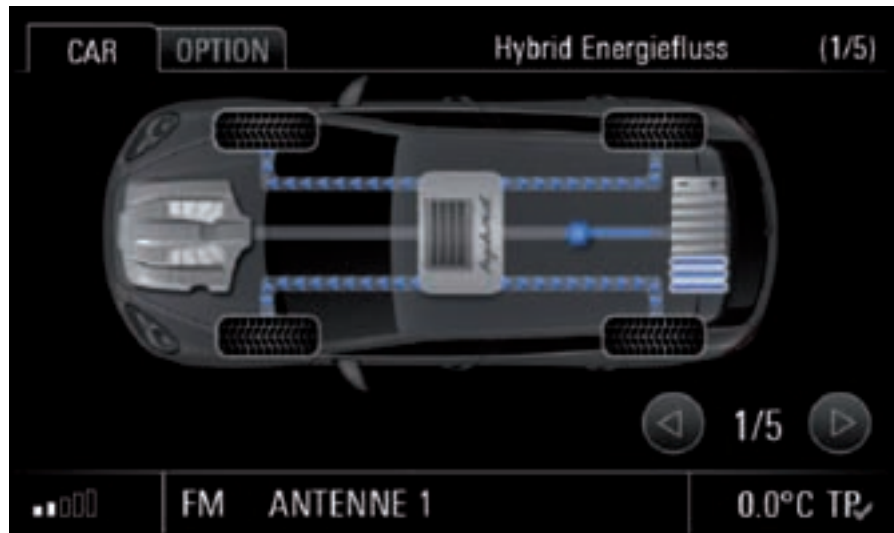


Fig. 132: Energy management display (Cayenne S Hybrid) in PCM

electric motor is operating and increases when the battery is charged during recuperation and load point shifts (the bars of the battery symbol are colored blue to indicate this).

The following table (Fig. 133) shows a graphical overview of the main driving modes.

To increase the appeal of efficient driving, a separate screen display in the PCM system shows a **statistical evaluation of driving operation**. A clear bar chart shows the portion of the journey time without emissions as a percentage of the total journey time (**Engine-off Mode**). Engine-off Mode stands for all driving modes in which the hybrid drive permits particularly efficient and emission-free operation. The displayed percentage values include all **times when the engine is switched off, is not using any fuel and is not giving off any emissions such as CO₂**. The display also documents and summarizes the consumption-reducing operating phases when the electric machine is

Hybrid-specific driving mode					
Electric driving	Boosting	Load point shift	Recuperation	Coasting	Start/Stop
Electric motor driving vehicle No assistance from combustion engine	Combustion engine and electric motor driving vehicle Addition of the drive power	Combustion engine operating at more energy efficient load point Combustion engine driving vehicle and charging battery	Conversion of kinetic into electric energy Battery charging	Combustion engine decoupled during driving Conversion of kinetic into electric energy Battery charging	Combustion engine switched off when stationary

Fig. 133

generating electrical energy in generator mode with the combustion engine switched off (recuperation), as well as start/stop mode when the engine is also automatically switched off and the electric auxiliary systems such as the steering are still electrically operated. The following specific operating modes are taken into consideration in the statistics and are factored into the overall Engine-off Mode value:

- Electric driving
- Coasting
- Auto Start Stop
- Recuperation

In addition to the current emission-free portion of the journey time in percent, the time axis also shows the **last 30 minutes of the journey** after the vehicle is started using the key. The 5 minute time intervals are moved dynamically to the right on the time axis in the form of green bars. The Engine-off time in percent can be read off on the Y-axis up to a value of 49% and is shown above the bars as a numerical value as soon as the value exceeds 49%. If you move off using the combustion engine after starting the Cayenne S Hybrid with the key and then use other hybrid-specific driving modes for 2.5 minutes within the first five minutes of the journey time, e.g. driving under exclusively electric power or coasting mode, the graph will show an Engine-off value of 50%. The Engine-off Mode statistic can therefore serve as an **index for efficient driving** and can be increased through efficient use of the hybrid-specific driving modes. Like the trip display, the statistics are reset in PCM after two hours.





9.3 Sound systems – details

A four-level choice of sound systems is available for the new Cayenne.

The standard CDR-31 audio system already offers great quality sound. If the customer chooses the optional (standard on the Cayenne Turbo) Porsche Communication Management (PCM) with navigation module, he is guaranteed a superior sound experience. The BOSE® Surround Sound System or the Burmester® High-End Surround Sound System are also optionally available to further increase the sound performance.



Fig. 134: Statistical evaluation of Cayenne S Hybrid driving operation in PCM

	CDR-31 audio system	Porsche Communication Management	BOSE® Surround Sound System	Burmester® High-End Surround Sound System
Criterion				
Total output in W	100	235 (+ 110 W)*	585 (+ 175 W)*	1,003
Number of channels	4	7	9	16
Number of speakers	10 Dashboard: 2x 19 mm tweeters Front doors: 2x 100 mm mid-range speakers 2x 165 mm woofers Rear doors: 2x 19 mm tweeters 2x 165 mm woofers	11 Dashboard: 2x 19 mm tweeters 1x 80 mm center Front doors: 2x 100 mm mid-range speakers 2x 200 mm woofers Rear doors: 2x 19 mm tweeters 2x 165 mm woofers	14 Dashboard: 2x 19 mm tweeters 1x 80 mm center Front doors: 2x 100 mm mid-range speakers 2x 220 mm woofers Rear doors: 2x 19 mm tweeters 2x 165 mm woofers Rear: 2x 80 mm Surround Luggage compartment: 1x 200 mm subwoofer	16 Dashboard: 2x AMT tweeters 1x 80 mm center Front doors: 2x 100 mm mid-range speakers 2x 220 mm woofers Rear doors: 2x 25 mm tweeters 2x 100 mm mid-range speakers 2x 200 mm woofers Rear: 2x 80 mm Surround Luggage compartment: 1x 250 mm subwoofer
Amplifier	4 x 25 W	5 x 25 W 2 x 55 W	1 x 25 W 5 x 40 W 2 x 80 W 1 x 200 W (active subwoofer)	3 x 41 W 4 x 25 W 6 x 50 W 2 x 90 W 1 x 300 W (active subwoofer)
Audio playback formats	Audio CD MP3	Audio CD Audio and video DVD MP3	Audio CD Audio and video DVD MP3 Digital 5.1 recordings (in conj. with PCM)	Audio CD Audio and video DVD MP3 Digital 5.1 recordings (in conj. with PCM)
Details			Centerpoint® 2 SurroundStage® AudioPilot® Noise Compensation	Fully active system AMT tweeter, FIR filter intelligent lightweight construction preset sound sets

*Compared with previous model

9.3.1 BOSE® Surround Sound System

The optional BOSE® Surround Sound System (standard on the Cayenne Turbo) comprises a total of 14 speakers, a 200 W active subwoofer with Class D driver and 7.9 inch diaphragm diameter as well as 9 amplifier channels to provide an impressive sound experience. A total output of 585 W is therefore available. A frequency range from 40 Hz to 20 kHz is available at every seat; the maximum undistorted continuous sound pressure level for music signals is greater than 115 dB.

In conjunction with PCM, the system now opens up the impressive audio spectrum of digital 5.1 recordings when playing

music from audio or video DVDs. The audio experience is the next best thing to a live performance with sound similar to what you get from a sophisticated home cinema system. In conjunction with

the CDR-31 system, sound reproduction is generally in stereo. The system is immediately recognizable by the BOSE® logo on selected speakers.



Fig. 135: BOSE® Surround Sound System

9.3.2 Burmester® High-End Surround Sound System

The Burmester® High-End Surround Sound System has been adapted specifically for the new Cayenne and offers superior total output and sound quality. The performance data figures provide impressive proof of this: 16 individually controlled speakers including a 300 W active subwoofer with Class D driver and 9.8 inch diaphragm diameter, 16 amplifier channels and a total output of more than 1,000 W. The acoustically effective diaphragm area is over 2,400 cm². A frequency range from 30 Hz to 20 kHz is available at every seat; the maximum undistorted continuous sound pressure level for music signals is greater than 120 dB.

In conjunction with PCM, the Burmester® High-End Surround Sound System naturally also reproduces digital 5.1 recordings when playing back music from audio or video DVDs. In conjunction with the CDR-31 system, sound reproduction is generally in stereo.

The consistent use of the highest quality materials and proven state-of-the-art technologies from the Burmester® home hi-fi area ensures best-in-class sound quality in the entire signal chain. 3 central goals can be achieved through the consistent use of glass fiber diaphragms in the mid-tone range: glass fiber is lighter than conventional paper diaphragms, enables more stable oscillations through its greater rigidity and leads to an undistorted sound through its higher internal damping.

In a **fully-active system**, every speaker has its own amplifier and maximum signal processing capabilities. Optimal acoustic adaptation of the speakers to the vehicle environment guarantees uniquely balanced, realistic music playback.

The **AMT tweeter** (Air Motion Transformer ribbon tweeter) uses a folded sheet as the diaphragm. The extremely small vibrating mass with an unrivaled, large diaphragm area produces extremely precise, clean and clear high-frequency sound from very low up to extremely high volumes.

A further highlight is the use of specific, suitable filter technologies. Digital **FIR filters** (Finite Impulse Response) are available, while in the mid- and high-frequency range, additional analog filters with selected precise-tolerance components are used. These are optimized for the relevant application to guarantee the highest level of resolution and best possible pulse reproduction over the entire transmission range.

In the area of **amplifier technology**, the hybrid installation of Class A/B and Class D drivers, optimized for the relevant intended use, enables maximum sound output taking into account size, weight, current consumption and power loss.

To underline the position of the new Cayenne as a sporty premium SUV, the Burmester® High-End Surround Sound System was designed for maximum sound performance with low system weight. This **intelligent lightweight design** can be seen in the consistent use of highly efficient, particularly light Neodym® magnet material, die-cast aluminum speaker baskets and light fiber-reinforced plastic composites. Despite the outstanding performance on offer, it proved possible to achieve an extraordinarily low system weight of less than 26 lb.



Fig. 136: Burmester® High-End Surround Sound System

In addition to the usual sound adjustments, i.e. treble, bass, balance and fader, further optimizations for the different seats are also available for the Burmester® High-End Surround Sound System in conjunction with the CDR-31 audio system and PCM.

Sound and technology are not the only areas of excellence offered by the Burmester® High-End Surround Sound System: its design also meets the highest standards. Externally, the system is recognizable by its discreet, galvanized trims with metal surface and Burmester® logos on selected speaker covers. The unique sound and high-quality design of the Burmester® High-End Surround Sound System are therefore the perfect match for the new Cayenne.



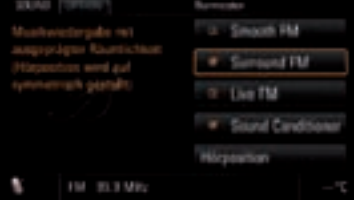
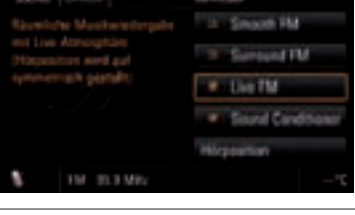
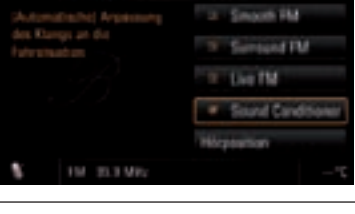
	<p>Driver mode/Chauffeur mode</p> <ul style="list-style-type: none"> • Exclusively in the Burmester® High-End Surround Sound System, there is the option of optimizing the sound specifically for the front (driver mode) and the rear seats (chauffeur mode) at the push of a button. • With the symmetrical setting, all the seats receive the best possible sound.
	<p>Smooth function</p> <ul style="list-style-type: none"> • With the “Smooth function”, overemphasized frequencies in the middle to high ranges are sensitively lowered; these can occur in particular in highly compressed music material. • As a result, even these music sources can be played with a relaxed, pleasant sound.
	<p>Surround function</p> <ul style="list-style-type: none"> • With the “Surround function”, a virtual surround signal is generated from a conventional stereo music signal (CD, FM, iPod, MP3, etc). • This creates a particularly spatial and impressive 360° sound.
	<p>Live function</p> <ul style="list-style-type: none"> • The “Live function” generates surround sound reminiscent of a live concert from every stereo music signal (CD, FM, iPod, MP3, etc). • The algorithm was taken directly from Burmester® Home Entertainment devices and adapted for use in the new Cayenne. • An exciting “live sound” can therefore be selected whenever desired.
	<p>Sound Conditioner function</p> <ul style="list-style-type: none"> • The “Sound Conditioner function” ensures that once the sound is set, it is maintained unchanged even while driving (interference noise). • An intelligent algorithm differentiates between the desired music signal and unwanted interference. Depending on the classification, the sound is then automatically and precisely readjusted.

Fig. 137

10 Intelligent performance

The new Cayenne reflects the increasing importance of vehicle efficiency through its focus on improved fuel economy. At the same time, and typically for Porsche, our design engineers always have the task of ensuring that this goes hand in hand with enhanced performance. This is a contradiction that at first glance appears challenging to say the least. The new Cayenne models impressively prove that it is nevertheless possible. The new **Cayenne S Hybrid** embodies this philosophy in a unique way and **intelligently combines efficiency with performance**. The hybrid drivetrain combines the apparent contradictions in a single vehicle concept and therefore sets new standards in efficiency and performance, expressed in a

level of vehicle agility and driving dynamics that are typical for Porsche. In the other new Cayenne models also, intelligent efficiency measures lead to significantly **reduced fuel consumption in combination with enhanced performance values**. The principle of intelligent performance was applied consistently in new development of the Cayenne model line. It was possible to reduce the weight and driving resistance values through the use of new technologies in all areas of the vehicle. Intelligent lightweight design permits weight savings and therefore reduces fuel consumption. At the same time, the lower weight increases the agility and driving dynamics of the vehicle. Improved fuel economy in combination with reduced CO₂ emissions cuts fuel costs and also means lower consumption- and emission-dependent taxes

and charges for customers in many markets.

10.1 Intelligent efficiency measures

Extensive measures designed to improve efficiency were realized for the new Cayenne models. All of these measures were individually tailored to the overall vehicle concept. Model-specific measures underline the character of each Cayenne model. The following table provides an overview of which **new functions in the overall model line** achieve improved efficiency in the drive system and which functions benefit the efficiency of the vehicle as a whole.







Efficiency enhancement Drive	Efficiency enhancement Overall vehicle
<p>New 8-speed Tiptronic S</p> <p>Top speed is reached in 6th gear. The new gears 7 and 8 have a longer ratio and serve to reduce engine rpm at high vehicle speeds, thereby helping to save fuel.</p> 	<p>Intelligent lightweight construction for less weight</p> <p>A model-dependent weight reduction of up to 408 lb, which was achieved by the use of lightweight materials and new design concepts, allows significant fuel savings while at the same time enhancing driving dynamics.</p> 
<p>New Auto Start Stop function (for vehicles with Tiptronic S)</p> <p>The combustion engine is automatically switched off when the vehicle is stationary. In city driving with many vehicle stops in particular, this reduces fuel consumption by up to 10 %.</p> 	<p>New tire generation with optimized rolling resistance</p> <p>The new tire generation was optimized with respect to rolling resistance, driving performance, handling, tire wear and weight. The reduction in rolling resistance lowers the overall driving resistance and therefore reduces fuel consumption.</p> 
<p>Extended thermal management</p> <p>The thermal processes in the engine and transmission are controlled with the aim of achieving maximum efficiency. To achieve this, the thermal management system ensures that the optimum operating temperature is reached as quickly as possible in order to also reduce friction losses.</p> 	<p>New vehicle electrical system recuperation for brake energy recovery</p> <p>The electrical system can be supplied with recuperated brake energy, which is stored in the starter battery. This energy then does not need to be generated by the combustion engine via the generator, and this results in fuel savings.</p> 

Fig. 138

Each Cayenne model has its specific strengths when it comes to efficiency and performance. This was reinforced by model-specific measures that underline the individual model character and additionally sharpen the vehicle profile. The

characteristics of the Cayenne models take into account the different customer target groups and each offer an attractive benefit.






<p>The new Cayenne</p>	<p>"Sporty, comfortable – The talented all-rounder"</p>
	<ul style="list-style-type: none"> • Powerful V6 engine with enhanced power • Sporty, dynamic driving in the basic version thanks to the standard 6-speed manual transmission • Significantly reduced fuel consumption (with optional 8-speed Tiptronic S)
<p>The new Cayenne Diesel (not for US)</p>	<p>"Maximum range, efficiency and torque"</p>
	<ul style="list-style-type: none"> • Efficient 3.0 l V6 turbo diesel engine with direct fuel injection • Ranges of more than 621 miles possible with standard 22.5 gal fuel tank (more than 808 miles with 26.4 gal fuel tank, optional without extra charge) • High propulsive power, high torque of 406 lb ft at an engine speed of 2,000 - 2,250 rpm and increased top speed
<p>The new Cayenne S</p>	<p>"The S principle – A promise of enhanced performance"</p>
	<ul style="list-style-type: none"> • Powerful performance with 400 hp power output (+ 15 hp), 160 mph V_{max} and acceleration from 0 to 60 mph in 5.6 s • New: standard 8-speed Tiptronic S • Fuel consumption TBA
<p>The new Cayenne S Hybrid</p>	<p>"Best of two worlds"</p>
	<ul style="list-style-type: none"> • Innovative full parallel hybrid with 3.0 l V6 supercharged engine and additional electric machine for increased dynamic response and efficiency • Driving performance at the level of an 8-cylinder engine and with the fuel consumption values of a 6-cylinder model. System power: 380 hp. Fuel consumption TBA • Purely electric driving up to 37 mph, brake energy recovery (recuperation) and coasting mode for more efficiency up to 97 mph
<p>The new Cayenne Turbo</p>	<p>"Outstanding power and emotion combined"</p>
	<ul style="list-style-type: none"> • Performance on sportscar level • 500 hp power and 4.4 s from 0 to 60 mph • Fuel consumption TBA

Fig. 139

10.2 Reduced fuel consumption and enhanced performance

The average fuel consumption was reduced for all model variants **by up to 23 %**, according to the NEDC (New European Driving Cycle). This also allowed a reduction in CO₂ emissions **by up to 26 %**. Both the new Cayenne and the new Cayenne S now develop even **more power** with outputs of 300 and 400 hp respectively. In spite of this, the fuel consumption in the NEDC was reduced by 20 % for the Cayenne and 23 % for the Cayenne S. The following diagram shows how the most important individual measures contribute to a reduction of fuel use and emissions in the new Cayenne S.

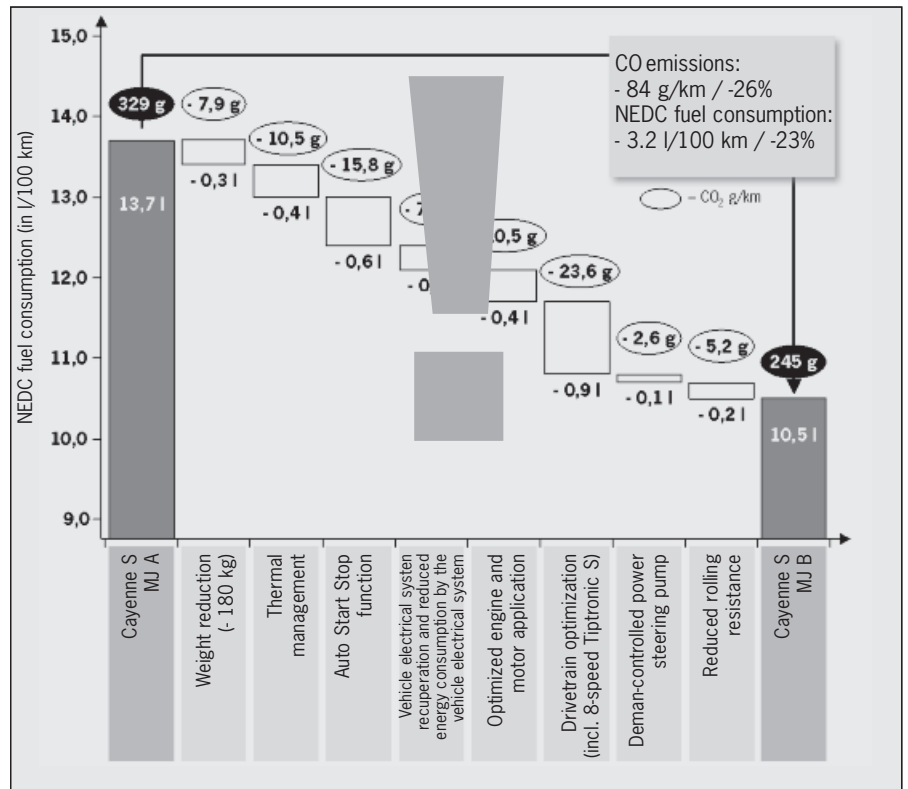


Fig. 140: Example reduction in fuel consumption based on Cayenne S

Fuel consumption compared with previous model

Following the motto "Intelligent performance: increased efficiency combined with enhanced performance", it was possible to significantly improve the fuel consumption and enhance the performance of the new Cayenne models in direct comparison with the previous models. The following comparison clearly shows that the new Cayenne

models have become more efficient and more powerful.

Cayenne

The Cayenne feels at home both on the road and off it. Whether on highways, country roads, in towns or on open terrain, the Cayenne convinces both through its performance and a low average fuel consumption.

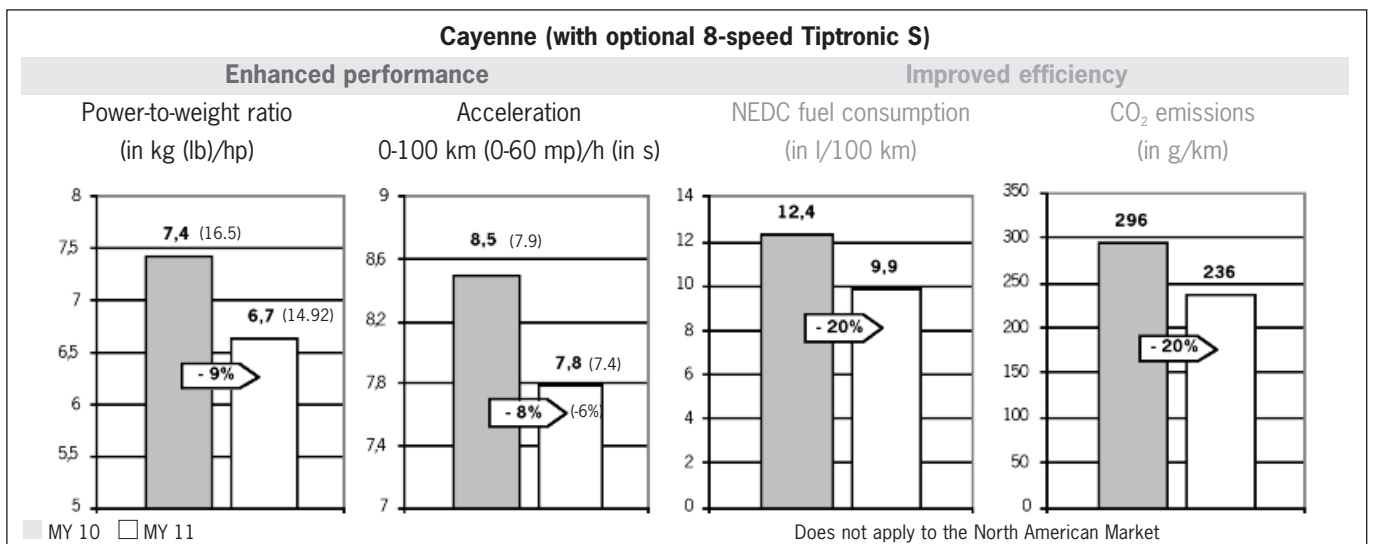


Fig. 141: Performance and efficiency increase for Cayenne

Cayenne S

At Porsche, the "S" has always stood for exceptional **performance, dynamics and emotion**. The new Cayenne S proves that this does not exclude low fuel consumption and low CO₂ emissions.

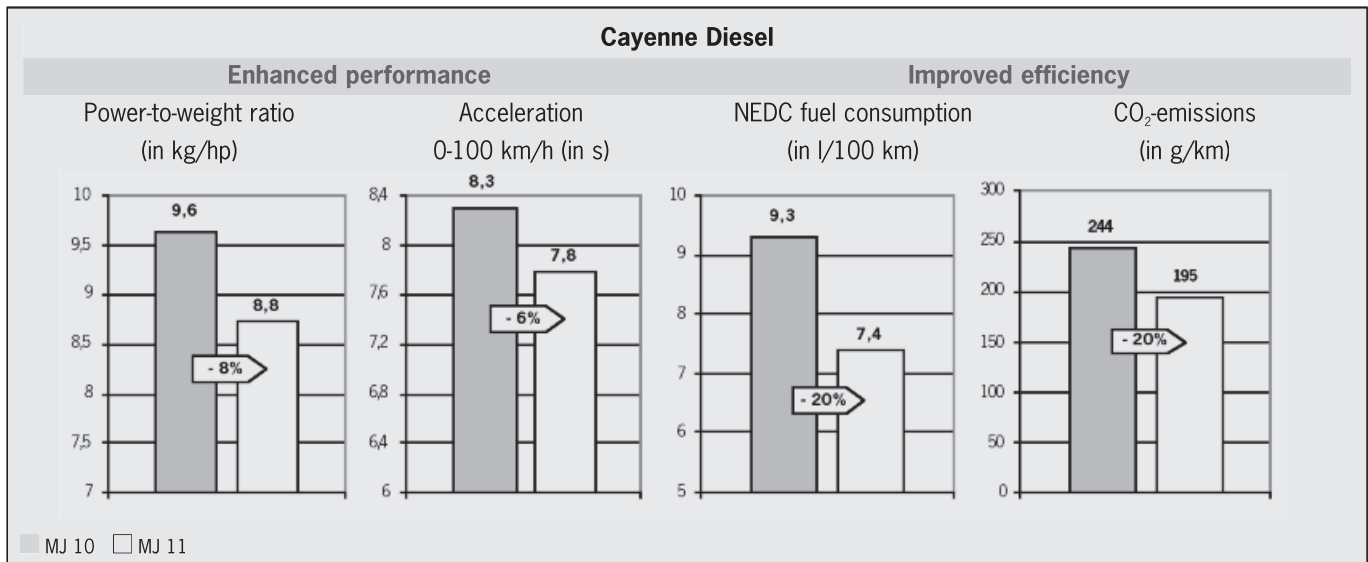


Fig. 142: Performance and efficiency increase for Cayenne Diesel (not for US)

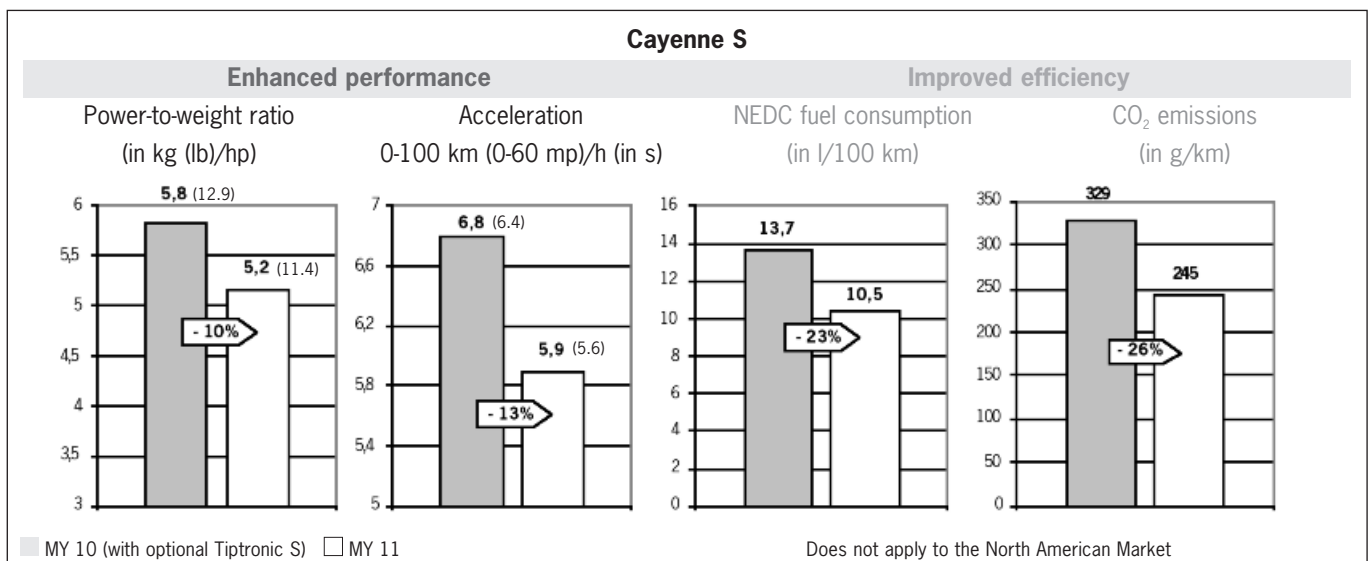


Fig. 143: Performance and efficiency increase for Cayenne S

Cayenne Turbo

Acceleration from 0-60 mph in just 4.4 seconds would not be bad for a sports car. It is therefore all the more astonishing that this acceleration is achieved by an SUV model. The fact that the vehicle in question is the new Cayenne Turbo provides some explanation: the "Turbo" principle.

Fuel consumption compared with the competition

In a comparison with competitor vehicles, the new Cayenne models are able to further consolidate their leading position in the second model generation, as is impressively proven by the following illustrations.

Here, the new **Cayenne** once again convincingly demonstrates its power and is **"Best-in-Class"** for performance and efficiency.

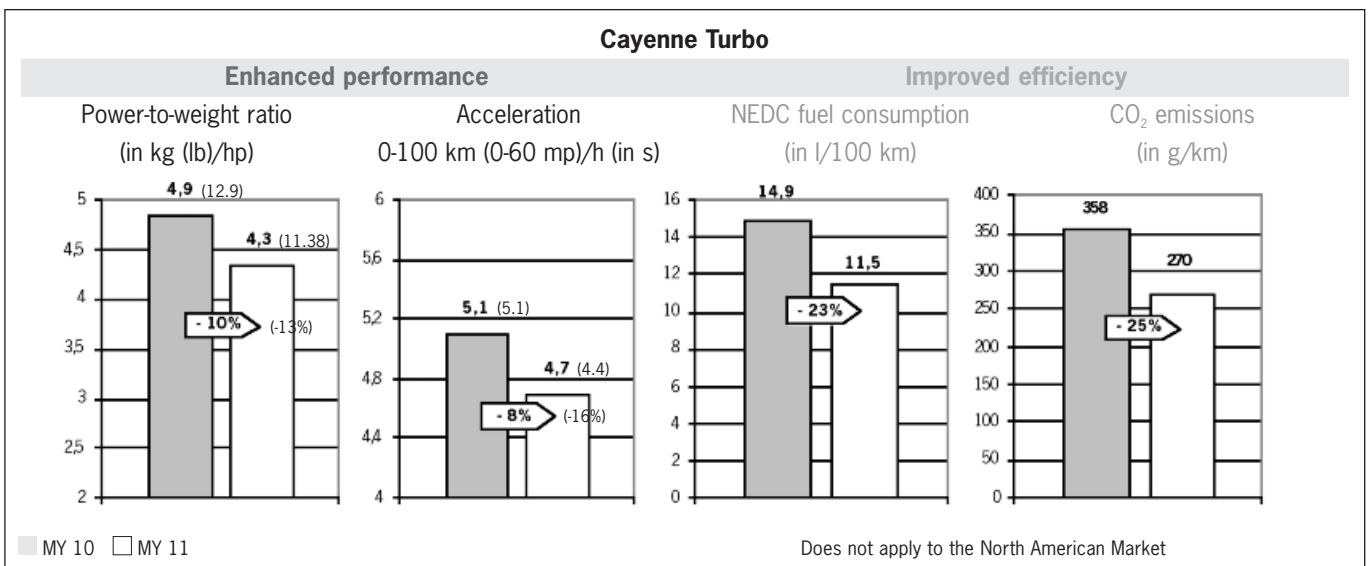


Fig. 144: Performance and efficiency increase for Cayenne Turbo

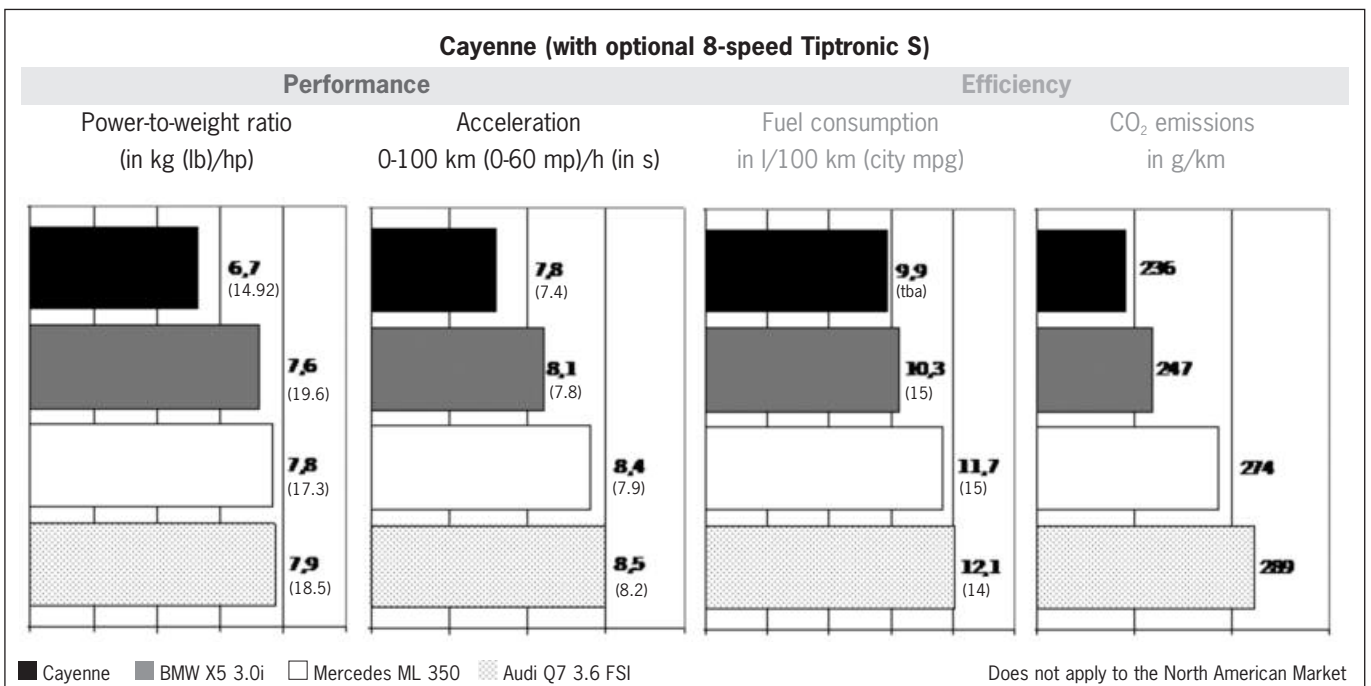


Fig. 145: Fuel consumption of Cayenne compared with the competition

The Cayenne S leads the way in almost all the areas compared. It **sets new standards** in the area of **fuel consumption** in particular.

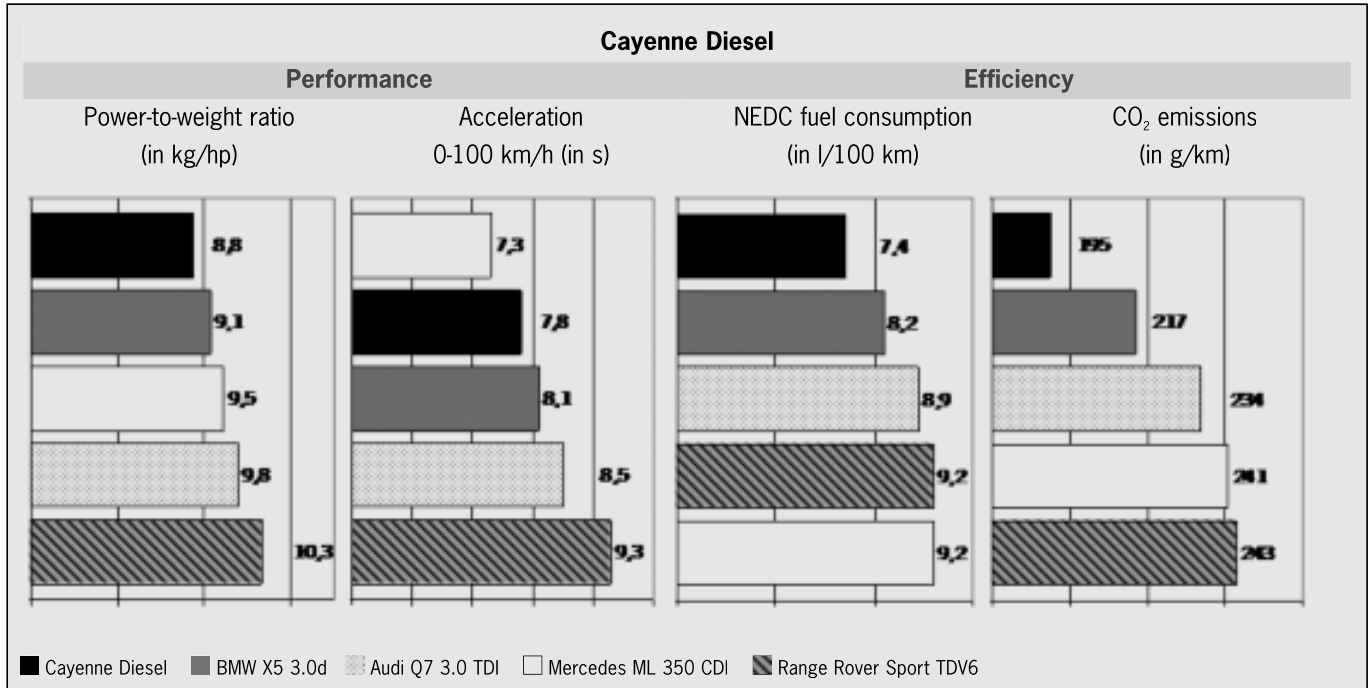


Fig. 146: Fuel consumption of Cayenne Diesel compared with the competition (not for US)

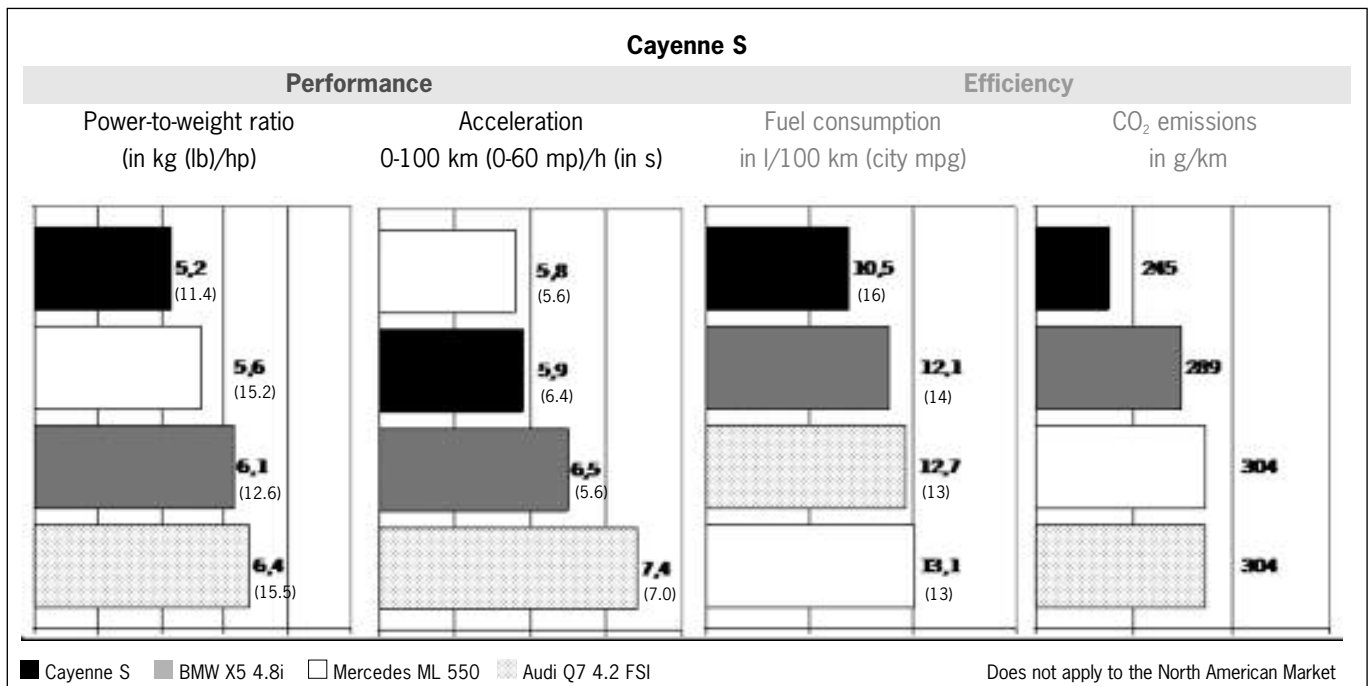


Fig. 147: Fuel consumption of Cayenne S compared with the competition

According to the motto "Best of both worlds", the Cayenne S Hybrid achieves the **best performance values in the comparable hybrid segment.**

The **new Cayenne Turbo will remain the measure of all things in the future as well.** It is able to further build on its leading position with outstanding performance values. It is "Best in class" even for CO₂ emissions.

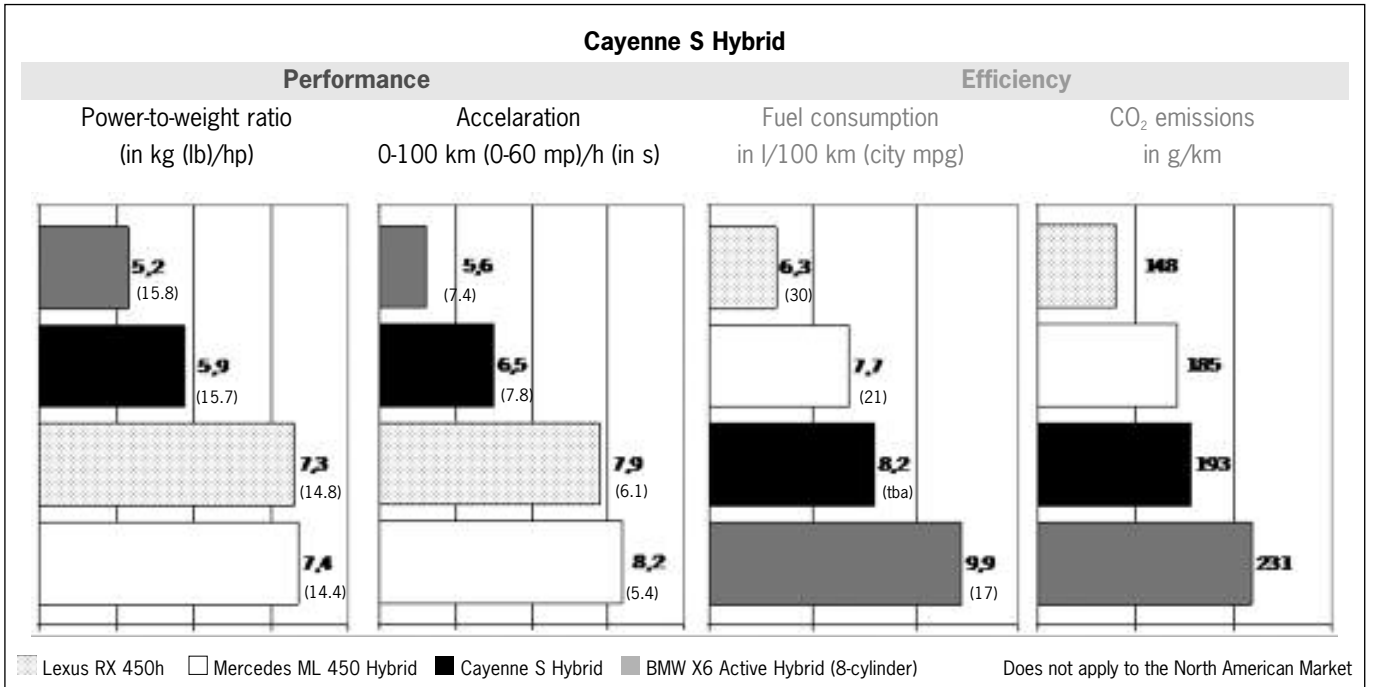


Fig. 148: Fuel consumption of Cayenne S Hybrid compared with the competition

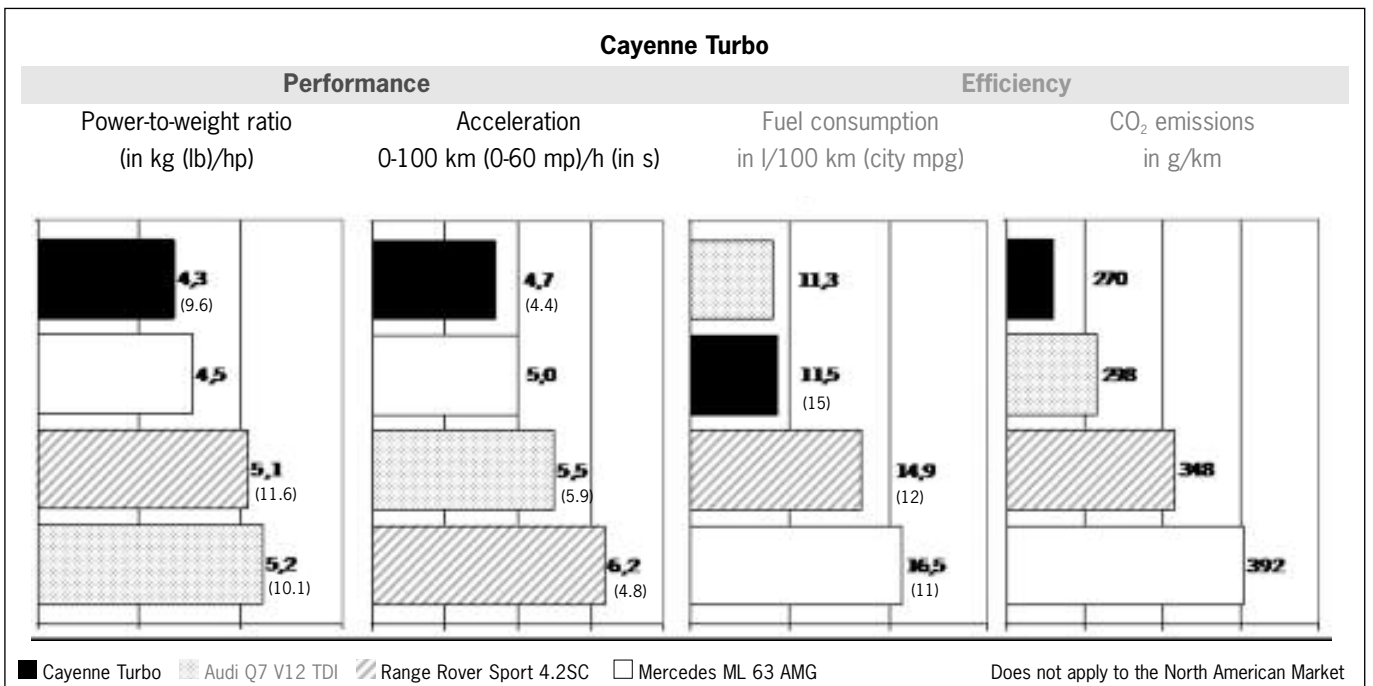


Fig. 149: Fuel consumption of Cayenne Turbo compared with the competition

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Maintenance

Compared with the competition, all new Cayenne models offer outstanding performance, which is achieved by using highly advanced engines. In spite of the increased performance values, it has still been possible to keep the maintenance intervals and maintenance scope constant for all the new Cayenne models through implementation of targeted measures. The **intermediate maintenance interval** of the new Cayenne models **is 10,000 miles**. This interval is a **top value amongst the competition** and allows the customer to enjoy a long period of driving pleasure without having to visit a workshop for maintenance. The Cayenne S and Cayenne Turbo reach the maintenance interval of 10,000 miles as soon as this value is reached, irrespective of driving style. With the Cayenne, Cayenne Diesel and Cayenne S Hybrid, the maintenance interval may be less than 10,000 miles, depending of the driving style. These engines have an intelligent maintenance computer which calculates and displays the maintenance intervals on the multi-function display depending on the driven kilometers, the time since the last maintenance and the operating conditions of the vehicle. If the vehicle is subject to high driving loads, the maintenance interval is shorter than under normal operating conditions. However, regardless of the mileage, **all Cayenne models** must have a **service inspection every 1 year at the latest**.

In all models, the maintenance times are displayed to the driver in the instrument cluster. Various maintenance items to be performed as part of a service inspection have been reduced to a minimum by the use of high-quality components and materials. For example, the air-cleaner element has to be replaced only every 80,000 miles in all new Cayenne models (except for the Cayenne Diesel). In very dusty areas, the air cleaner change interval may be less than 80,000 miles.

The most important operating fluids, e.g. transmission oil, servo fluid and coolant, are designed for the lifetime of the respective unit. All auxiliary units (except on the Cayenne S Hybrid), such as the generator, power steering pump and A/C compressor, are driven by a drive belt with self-adjusting belt tensioner. Regular replacement is not necessary.

The following table shows all the most important maintenance intervals.

	Cayenne	Cayenne Diesel*	Cayenne S	Cayenne S Hybrid	Cayenne Turbo
Intermediate maintenance	Every 20,000 miles or after 2, 6 or 10 years				
Maintenance	Every 40,000 miles or after 4, 8 or 12 years				
Engine oil/oil filter	According to flexible service interval indicator, at the latest after 10,000 mls or 1 year		Every 10,000 mls or 1 year	According to flexible service interval indicator, at the latest after 10,000 mls or 1 year	Every 10,000 mls or 1 year
Replace spark plugs	Every 40,000 mls or 4 years	–	Every 40,000 mls or 4 years		Every 30,000 mls or 4 years
Replace air-cleaner element	80,000 mls or 6 years	60,000 mls or 6 years	80,000 mls or 6 years		
PDCC: Replace expansion tank	60,000 mls or 6 years				
Change brake fluid	2 years				
Replace tire sealing compound	4 years				

* not for US

10.3 Efficient driving

Fuel consumption is naturally influenced to a great extent by the driving profile in real operation. Here, different parameters have a crucial influence. In addition to factors ranging from the vehicle load and route profile, tire pressure and other driving resistances (e.g. ski box on the roof) through to the driver's individual driving style, the vehicle settings (e.g. air conditioning mode) also play an important part here. A number of useful driving tips for Cayenne customers are provided below. These will help customers to achieve a particularly efficient driving style with the new Cayenne models without compromising on driving pleasure:

- **Activate the Auto Start Stop function:** Automatic engine switch-off when the vehicle is stationary reduces fuel consumption particularly, when stopping and starting frequently in city traffic. The function should therefore always be active in order to permit a reduction in fuel consumption by up to 10% in city driving.
- **Reduce driving resistance:** Ski boxes or luggage racks fitted on the roof increase driving resistance, thereby increasing the vehicle's fuel consumption. Increased driving resistance is naturally also caused by unnecessary ballast, which reduces efficiency as extra weight in the luggage compartment. It is important to minimize these driving resistance factors in order to promote an efficient driving style.

- **Make sure that the tire pressure is correct:** The optimum tire pressure reduces the rolling resistance of the vehicle and therefore also the fuel consumption. In addition, the correct tire pressure also ensures safety and driving stability when the vehicle is driven dynamically. The standard Tire Pressure Monitoring (TPM) in the new Cayenne Turbo allows the driver to check that the tire pressure is correct on the instrument cluster at any time. This feature is also optionally available for all other Cayenne models.
- **Reduce electric loads:** The general rule is that every electric load directly increases fuel consumption. For example, the air-conditioning system requires electricity to generate the cooling power. This electricity is produced by an alternator driven by the combustion engine. Through reduced or targeted operation of electric loads such as the air-conditioning system, it is possible to use this fuel efficiently for vehicle propulsion. Operation of a parking heater also leads to increased fuel consumption, since fuel is consumed to heat the passenger compartment.
- **Anticipatory driving:** A further reason for increased fuel consumption is frequent braking and subsequent acceleration, since a relatively large quantity of fuel is injected for this and the combustion engine operates with low efficiency. An anticipatory driving style and utilization of the vehicle's kinetic energy have a positive effect on fuel consumption in this case.

- **Sensible journey planning:** Short distances prevent the engine from warming up. This increases fuel consumption, since the drive components of the vehicle are subject to increased friction when cold. Journeys should therefore be planned exactly in advance in order to avoid unnecessary short-distance trips.
- **Optimal gear changes:** Changing gears at the optimal shift time also reduces fuel consumption. An indication of the optimum gear shifting points is provided by the shift point indicator in the instrument cluster of the Cayenne, which is equipped as standard with a manual transmission.
- **Look after the engine by regular maintenance:** Regular vehicle maintenance, particularly of the engine, leads to reduced fuel consumption since the engine and add-on parts such as the electronics, auxiliary units and exhaust treatment system can be checked to ensure that they are functioning optimally.
- **Deactivate Sport mode:** Sport mode allows the driver to drive in an even sportier style thanks to a more dynamic vehicle setup. In order to drive as efficiently as possible, Sport mode should be selected when a dynamic driving style is specifically desired.

Performance indicators		Efficiency indicators	
Acceleration 0 - 60 (in s)	6.1	Fuel consumption	tba
Total power (in hp)	380		
Max. torque (lb ft)	428	Pure electric driving	up to 37 mph
Top speed (mph)	150	Gliding without drive power ("coasting")	up to 97 mph

Fig. 150: Performance and efficiency indicators for Cayenne S Hybrid

Cayenne S Hybrid driving tips

No other Cayenne model offers the driver as much flexibility to choose between sporty or efficient driving styles as the new Cayenne S Hybrid with full hybrid drive. This model offers both sporty driving thanks to its high performance as well as especially efficient operation with low fuel consumption. The hybrid drive therefore **simultaneously offers high driving dynamics and efficiency in a single vehicle concept**. The driver can make deliberate use of this new flexibility and adapt his driving style accordingly. The table above shows in figures the performance and efficiency potential combined by the Cayenne S Hybrid in a single vehicle concept.

In the new Cayenne S Hybrid also, the "S" principle stands for power and points to a performance level that almost matches that of the Cayenne S. If this power is used to the full, this is also reflected in the fuel consumption in the same way as for a conventional vehicle. In order to **fully exploit the fuel saving potential**, the driving style should be adapted so that the hybrid drive can also make the most of its strengths in the area of efficiency. A number of useful tips are provided below that can specifically assist Cayenne S Hybrid drivers.

- **Anticipatory driving in order to fully exploit the efficient hybrid driving modes:** An anticipatory driving style is of great importance for the Cayenne S Hybrid in particular, as this is a precondition for effectively exploiting the hybrid-specific driving modes. The displays on the instrument cluster or PCM allow the driver to see the current driving state of the hybrid system by showing the energy flows (TFT energy flow display) or the current power requirement (E-Power meter).
- **Make the most of coasting or "sailing" mode by taking your foot off the gas pedal early:** Gliding without power in coasting or "sailing" mode can be deliberately used to utilize the vehicle's kinetic energy for driving without fuel consumption. This can be beneficial on downhill stretches, when speed limits are announced ahead or when approaching the next highway exit. In order to use this mode, the gas pedal must be consciously released so that the vehicle reduces speed itself as slowly as possible by way of the driving resistance forces, e.g. drag, rolling resistance, electric machine in moderate generator mode. Coasting mode can be seen clearly and quickly on the displays. For example, the tachometer needle falls to the "Ready" indication since the engine is automatically switched off and no longer consumes any fuel.
- **Electric driving through careful acceleration:** Electric driving mode can be maintained without local emissions and without fuel consumption under optimum conditions by carefully pressing the gas pedal up to a speed of 37 mph. The more careful the load request from the gas pedal, the longer it is possible to drive on purely electric power. In E-Power mode, early switching on of the combustion engine can be delayed by means of the E-Power button.
- **Recover brake energy by uniform braking:** In the normal case, the hybrid drive allows part of the brake force to be fed back into the NiMH battery through generator operation of the electric machine. Every braking operation should be performed uniformly in order to fully exploit the recuperation potential. The E-Power meter shows the generator power through the deflection of the analog needle into the Charge range and therefore serves as an indicator of effective energy recuperation.

- **Reduce electrical power consumption by selective use of electric loads:** Selective use of electric loads is even more important for the Hybrid than for the Cayenne models with conventional drive systems. Electric loads are powered by the NiMH battery, particularly in the hybrid-specific driving modes, e.g. purely electric-powered driving, and can therefore reduce the range you can drive on electric power only. Loads such as the air-conditioning system as well as rear window, seat and steering wheel heating should therefore be used selectively as required.
- **Do not switch off air conditioning with hot outside temperatures:** The air-conditioned air in the interior keeps the traction battery at its optimum temperature. If the passenger compartment temperature becomes too hot (>86 °F), the hybrid-specific driving modes are restricted successively (e.g. shortened electrically powered range), since the battery can provide its full power only under the optimum temperature conditions.

- **Avoid full-throttle acceleration by using a defensive driving style:** Accelerating sharply increases fuel consumption even on the Cayenne S Hybrid. In comparison with a conventional drive, the Hybrid uses electrical boost energy for acceleration that was previously recovered by recuperation, for example. However, the electrical energy can be used most efficiently for pure electrical driving at low speeds with moderate acceleration.
- **Park the vehicle in the garage:** The traction battery of the Cayenne S Hybrid works most effectively in the optimal temperature range and reaches this range faster if the vehicle is parked overnight in a garage. Night-time temperatures, in winter in particular, required targeted heating of the battery ("warm-up pulsing" of the battery). This costs energy and reduces the battery charge.

The driver can use the special hybrid displays on the instrument cluster and PCM to **enhance the efficiency of his driving style**. The current driving condition is displayed in real time and the hybrid-specific driving states are documented for targeted tracking. In this way, the driver can deliberately use the hybrid-functions and driving states to reduce fuel consumption.

Hybrid display in the instrument cluster

- E-Power meter: shows the recuperation and drive power
- Ready display: indicates system readiness and coasting mode
- Energy flow display on the TFT display: shows the energy flow for each driving state

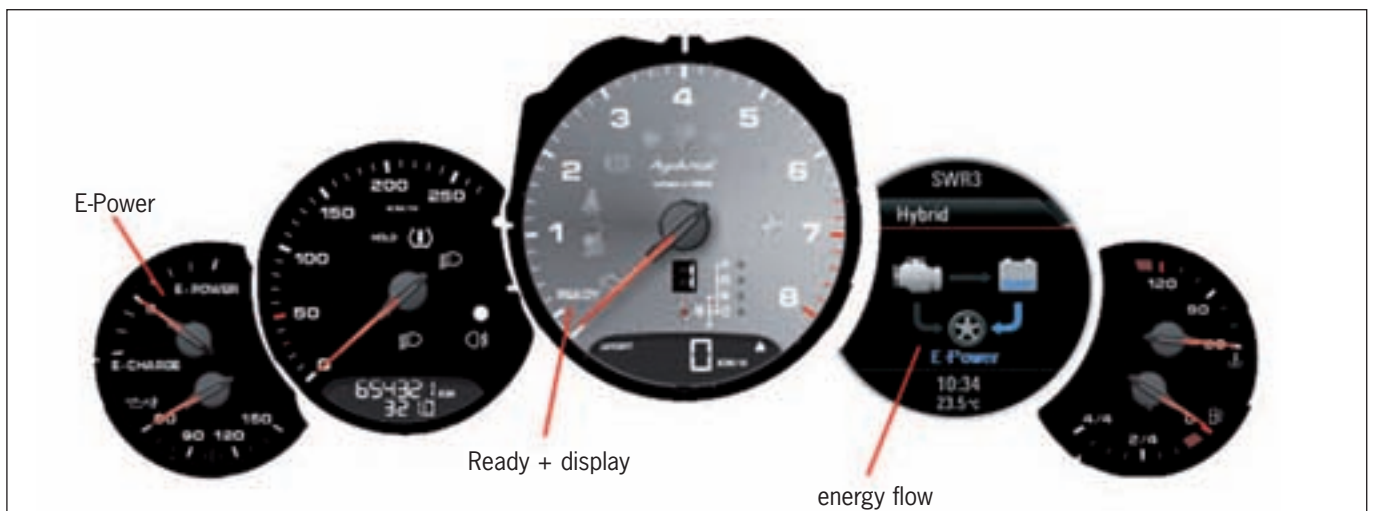


Fig. 151: Hybrid display in the instrument cluster

Hybrid display in PCM

- Energy flow display in PCM: shows the detailed energy flow for every driving state
- Statistics display in PCM: shows the driving share without combustion engine (without emissions) in relation to the total driving time and displays this graphically

The efficiency of the Cayenne S Hybrid is due above all to the different hybrid-specific driving modes that the driver can use actively. The outstanding characteristic of the parallel full hybrid drive is that these design strengths can be used in all typical driving cycles – i.e. in towns, on country roads and even on the highway – and therefore benefit both efficiency and performance. **In towns** or also on the highway in a traffic jam, for example, the driver profits from the **purely electric driving mode**, which propels the vehicle almost noiselessly and without emissions. Unpowered **coasting** already functions at low speeds in towns, but can also be used **on the highway up to 97 mph**. In this case, the fuel-saving effect of the Auto Start Stop function, which is used only

when the vehicle is stationary in conventional vehicles, is also extended to driving operation. **Brake energy recovery** can be used fully both in towns each time the vehicle is braked or also when the vehicle is braked on country roads or highways. In addition to efficiency, the **performance benefits can also be used in all driving cycles**, since the electric motor ensures dynamic driving off in towns and also increases dynamic response for overtaking maneuvers on country roads and highways by electrical boosting, for example. The innovative hybrid drive in the new Cayenne S Hybrid therefore demonstrates impressively how the Porsche principle "Intelligent Performance" can be realized in a future-orientated vehicle concept.

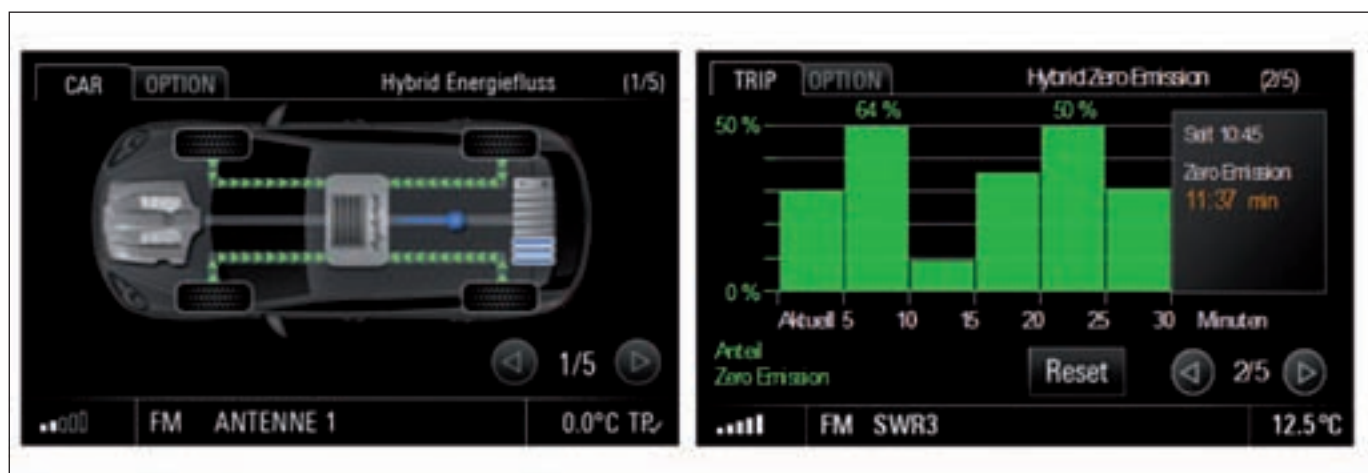


Fig. 152: Hybrid display in PCM

11 Product equipment

The product description is based on the US model. Subject to changes in offer-

ing, technical data and availability until start of production.

Important changes compared with the Cayenne previous models are shown in bold.

11.1 Standard equipment

Standard equipment for US model	Cayenne	Cayenne Diesel*	Cayenne S	Cayenne S Hybrid	Cayenne Turbo
<ul style="list-style-type: none"> ● = Standard ○ = Individual option W = Optional, without extra charge 					
Engine					
V6 engine, 3.6 l displacement, maximum power 220 kW (300 hp) , maximum torque 295 lb ft , intake system with resonance induction and variable intake manifold	●				
V6 diesel engine, 3.0 l displacement, maximum power 176 kW (240 hp), maximum torque 406 lb ft, turbocharger		●			
V8 engine, 4.8 l displacement, maximum power 294 kW (400 hp) , maximum torque 369 lb ft, intake system with resonance induction and variable intake manifold			●		
Parallel full hybrid V6 engine, 3.0 l displacement, maximum power 245 kW (333 hp), maximum torque 325 lb ft, supercharger; electric machine, maximum power 34 kW (47 hp), maximum torque 221 lb ft				●	
V8 engine, 4.8 l displacement, maximum power 368 kW (500 hp), maximum torque 516 lb ft, intake system with resonance induction, 2 turbochargers					●
Engine technology					
Direct fuel injection (DFI)	●		●	●	●
Common rail injection system (direct fuel injection)		●			
Piezo-controlled fuel injectors		●			
Sport button	●	●	●	●	●
E-Power button				●	
Aluminium cylinder head	●	●	●	●	●
Water cooling	●	●	●	●	●
Four-valve technology	●	●	●	●	●
Hydraulic valve-clearance compensation	●	●	●	●	●
Electronic engine management EDC 17 CP 44		●			
Electronic engine management MED 17 (for Cayenne S Hybrid incl. hybrid manager)	●			●	
Electronic engine management EMS SDI 8			●		●
Electronic throttle	●	●	●	●	●
Thermal management	●	●	●	●	●
Vehicle electrical system recuperation	●	●	●	●	●
Brake energy recovery				●	
Variable deceleration fuel cutoff	●		●	●	●
Stereo lambda control circuits	●		●	●	●
Static high-voltage ignition distribution with individual ignition coils	●		●	●	●
Idle charge compensation	●		●	●	●

* not for US

Standard equipment for US model	Cayenne	Cayenne Diesel*	Cayenne S	Cayenne S Hybrid	Cayenne Turbo
<ul style="list-style-type: none"> ● = Standard ○ = Individual option W = Optional, without extra charge 					
On-board diagnosis II for monitoring the emission control system	●	●	●	●	●
Cylinder-specific knock control	●		●	●	●
Returnless fuel system	●		●	●	●
Gray cast-iron engine block	●	●			
Aluminum engine block			●	●	●
Continuous intake and outlet camshaft control	●				
Continuous intake camshaft control				●	
VarioCam Plus (continuous camshaft control and valve lift adjustment)			●	●	
Wet-sump lubrication	●	●		●	
Integrated dry-sump lubrication with 2-stage oil extraction			●		●
Turbocharger with variable turbine geometry (VTG)		●			
Biturbocharging					●
Supercharger				●	
Diesel particle filter (DPF)		●			
Cylinder-specific outlet cam contours			●		●
Auto Start Stop function (for Cayenne only in conjunction with Tiptronic S)	○	●	●	●	●
288-Volt nickel-metal hydride battery (NiMH) incl. battery manager				●	
Electric auxiliary systems Cayenne S Hybrid:					
– Electric air-conditioning compressor				●	
– Electro-hydraulic power steering				●	
– Electric brake booster				●	
Hybrid module Cayenne S Hybrid					
– Electric machine				●	
– Decoupler with hydraulic control unit				●	
Power electronics to control the electric machine (motor/generator)				●	
Power transmission					
6-speed manual transmission with dual-mass flywheel and upshift indicator in instrument cluster (recommended gear for optimum fuel economy)	●				
8-speed Tiptronic S with Auto Start Stop function and operation on steering wheel	○	●	●	●	●
Porsche Traction Management (PTM): fully variable all-wheel drive with electronic and map-controlled multi-plate clutch, automatic brake differential (ABD) and anti-slip regulation (ASR)	●		●		●
Porsche Traction Management (PTM): permanent all-wheel drive with self-locking center differential as well as automatic brake differential (ABD) and anti-slip regulation (ASR), additionally variable torque distribution at rear axle by selective braking intervention on wheel on inside of curve. Note: For Cayenne, Cayenne S and Cayenne Turbo in conjunction with Porsche Torque Vectoring Plus (PTV Plus)		●		●	
Chassis					
18-inch Cayenne wheel	●	●	W	W	
18-inch Cayenne S III wheel	○	○	●	●	
19-inch Cayenne Turbo wheel	○	○	○	○	●
Tire Pressure Monitoring (TPM)	●	○	●	●	●
Tire sealing compound with electric compressor				●	

* not for US

Standard equipment for US model					
● = Standard ○ = Individual option W = Optional, without extra charge	Cayenne	Cayenne Diesel*	Cayenne S	Cayenne S Hybrid	Cayenne Turbo
Power steering	●	●	●	●	●
Servotronic	○	○	●	●	●
Double-wishbone suspension at FA	●	●	●	●	●
Multi-link rear axle	●	●	●	●	●
Steel spring suspension	●	●	●	●	
Air suspension with leveling system and ride height control, incl. Porsche Active Suspension Management (PASM)	○	○	○	○	●
Vehicle stability system Porsche Stability Management (PSM) with ABS, ASR, ABD, MSR and Trailer Stability Management	●	●	●	●	●
Brake system					
6-piston aluminum monobloc fixed-caliper brakes at front, internally vented brake discs	●	●	●	●	●
4-piston aluminum monobloc fixed-caliper brakes at rear, internally vented brake discs	●	●	●	●	●
Brake discs with diameter 13.8 in. at front, 13.0 in. at rear	●	●			
Brake discs with diameter 14.2 in. at front, 13.0 in. at rear			●	●	
Brake discs with diameter 15.4 in. at front, 14.1 in. at rear					●
Black brake calipers	●	●			
Silver-colored brake calipers			●	●	
Red brake calipers					●
Brake pad wear indicator on each brake pad	●	●	●	●	●
Electric parking brake					
Anti-lock braking system (ABS)	●	●	●	●	●
Recuperating brake system					
				●	
Body					
Fully-galvanized, self-supporting body	●	●	●	●	●
4 doors with integral side impact protection	●	●	●	●	●
Door handles painted in exterior color	●	●	●	●	●
Top-hinged tailgate with integrated rear spoiler	●	●	●	●	●
Front end with integral air intakes	●	●	●	●	
Front end with substantially enlarged air intakes					●
Slats in side air intakes painted in exterior color	●	●			
Slats in side air intakes painted Black			●	●	●
2 single tailpipes in matte silver at outside left and right	●	●	●	●	
2 twin tailpipes in matte silver at outside left and right					●
Metallic paint	○	○	○	○	●
Tinted heat-insulating glass all around with gray top-tint in windshield	●	●	●	●	●
100 l fuel tank (15 l reserve for Cayenne, Cayenne S and Cayenne Turbo; 13 l reserve for Cayenne Diesel and Cayenne S Hybrid)	●	W	●	●	●
Power dome on hood					
	●	●	●	●	
Distinctive power dome on hood					
					●

* not for US

Standard equipment for US model	Cayenne	Cayenne Diesel*	Cayenne S	Cayenne S Hybrid	Cayenne Turbo
● = Standard ○ = Individual option W = Optional, without extra charge					
"Porsche" logotype and model designation on tailgate in Chrome-look	●	●	●	●	●
"hybrid" designation on front fenders left and right				●	
"diesel" designation on front fenders left and right		●			
Preparation for trailer hitch: pre-wiring for simplified subsequent installation of a trailer hitch	●	●	●	●	●
Electrics					
Power windows front and rear, with remote closing function, anti-pinch protection and one-touch open/close function	●	●	●	●	●
Central locking system incl. remote control	●	●	●	●	●
Windshield wiper system with 2 wiping speeds and intermittent wipe, including rain sensor and heated windshield washer jets	●	●	●	●	●
Rear wiper with intermittent wipe and washer jet	●	●	●	●	●
Heated rear window with "Auto-Off" function	●	●	●	●	●
Electrically adjustable heated exterior mirrors, electrically retractable (also by remote control) Aspherical on the driver's side	●	●	●	●	●
Manually dimming inside rear view mirror	●	●	●	●	
Automatically dimming outside and inside rear view mirrors	○	○	○	○	●
Heated seats front and rear	○	○	○	○	●
ParkAssist (front and rear) with acoustic and visual proximity warning	○	○	○	○	●
5 plug sockets (12 V): 1 in front below the glove compartment, 1 in front center console, 1 in center console storage compartment, 1 in front of rear seats at edge of center console, 1 at side of luggage compartment	●	●	●	●	●
On-board computer	●	●	●	●	●
Cruise control					
Two-tone fanfare, additional single-tone horn for alarm system	●	●	●	●	●
CDR-31 audio system with 7-inch color touchscreen display, radio with double tuner, single-disc MP3-compatible CD drive, 10 speakers, total output 100 W	●	●	●	●	
Porsche Communication Management (PCM) including hard-drive based navigation module with 3D navigation map, high-resolution 7-inch WVGA (Wide Video Graphics Array) TFT color display , radio with RDS double tuner and single CD/DVD drive incl. playback of MP3 music, total of 11 speakers and external amplifier, total output 235 W	○	○	○	○	●
BOSE® Surround Sound System with 585 W total output and 14 speakers	○	○	○	○	●
Integrated antenna system for audio, navigation, telephone and TV (depending on equipment: CDR-31 audio system with phase diversity, PCM with antenna scan diversity)	●	●	●	●	●
Lighting system					
H7 projector-type headlights with automatic static range adjustment	●	●	●	●	
Bi-Xenon headlights with Porsche Dynamic Light System (PDLS), with static and dynamic cornering light, dynamic range adjustment, speed-dependent headlight range control, fog light and headlight cleaning system	○	○	○	○	●
Front light units with LED daytime driving lights, position light and turn signal in LED technology	●	●	●	●	
Front light units with position light and turn signal in LED technology					●
Daytime driving lights with 4 LED spotlights in each headlight					●

* not for US

Standard equipment for US model					
● = Standard ○ = Individual option W = Optional, without extra charge	Cayenne	Cayenne Diesel*	Cayenne S	Cayenne S Hybrid	Cayenne Turbo
Fog lights, integrated in front end	●	●	●	●	●
Time-programmable courtesy lighting via daytime driving lights (Welcome Home function)	●	●	●	●	●
Driving light assistant	●	●	●	●	●
3rd brake light (LED), integrated in roof spoiler	●	●	●	●	●
LED tail lights	●	●	●	●	●
Interior lighting concept: delayed switch-off, dimmable inner door handle lighting, footwell lighting front and rear, ashtray lighting, glove compartment light, ignition lock light, center console storage compartment lighting, interior light at front with reading spotlights, reading lights rear left and right	●	●	●	●	●
Instruments					
5 round instruments integrated in instrument cluster	●	●	●	●	●
Instrument cluster with black center tube	●	●			
Instrument cluster with silver-colored center tube			●		
Instrument cluster with silver-colored center tube and "hybrid" designation incl. readiness display				●	
Instrument dials black with "turbo" designation					●
Instrument cluster with high-resolution 4.8-inch TFT color display , gear indicator for Tiptronic S where appropriate, service interval indicator, outside temperature display and various warning indicators	●	●	●	●	●
Analog displays for oil temperature, oil pressure, coolant temperature and fuel level	●	●	●		●
Energy management display on the TFT color display of the instrument cluster and additional analog E-Power meter as well as oil temperature, coolant temperature and fuel level				●	
Digital boost-pressure gauge on the TFT color display					●
Safety					
Side impact protection in doors	●	●	●	●	●
Bumper system with high-strength cross members and 2 deformation elements, with screw-thread attachment points for the towing lug in the on-board tool kit	●	●	●	●	●
Seat belts in black	●	●	●	●	●
3-point automatic seat belts with pretensioners (front and outer rear seats) and force limiter (front), 3-point automatic seat belt on central rear seat	●	●	●	●	●
Manual belt-height adjustment for driver and front passenger	●	●	●	●	●
Belt warning device for driver and front passenger seats	●	●	●	●	●
Full-size airbags for driver and front passenger	●	●	●	●	●
Side airbags at front integrated in seat	●	●	●	●	●
Curtain airbags as cover across the entire roof frame and side glazing from the A- to the C-pillar	●	●	●	●	●
Roll-over sensing for triggering the curtain airbags and pretensioners in the event of imminent roll-over	●	●	●	●	●
LATCH child seat anchoring system on outer rear seats	●	●	●	●	●
Engine immobilizer (transponder system), safe lock system, anti-theft alarm system with ultrasonic interior surveillance	●	●	●	●	●

* not for US

Standard equipment for US model	Cayenne	Cayenne Diesel*	Cayenne S	Cayenne S Hybrid	Cayenne Turbo
<ul style="list-style-type: none"> ● = Standard ○ = Individual option W = Optional, without extra charge 					
Air conditioning					
Climate control with separate temperature settings for driver and front passenger, also automatic air recirculation control including air quality sensor and separate air flow regulation for driver and passenger sides, AC-Max button and humidity sensor	●	●	●	●	●
Particle/pollen filter including active carbon filter	●	●	●	●	●
Interior					
5 seats, seat system in rear with 2 comfortable outer seats and a central seat	●	●	●	●	●
8-way power seats (front) with adjustment of seat height, cushion angle, backrest angle and fore/aft position	●	●	●	●	
Adaptive sports seats with memory package	○	○	○	○	●
2-way headrests (except for central rear seat)	●	●	●	●	●
Storage pockets in backrest shell of front seats	●	●	●	●	●
Rear seat system with split-folding seat bench (40/20/40) , fold-out center armrest with 2 cupholders, manual fore/aft adjustment and backrest angle adjustment Note: In conjunction with adaptive sports seats with memory package, the raised side bolsters leave a slope of around 15 degrees with respect to the luggage compartment floor when the rear seats are folded down	●	●	●	●	●
Steering wheel with manual height and reach adjustment, steering wheel rim in smooth-finish leather	●	●	●	●	
Steering wheel with electric height and reach adjustment, steering wheel rim in smooth-finish leather Note: For Cayenne, Cayenne Diesel, Cayenne S and Cayenne S Hybrid: part of individual option memory package or adaptive sports seats with memory package	○	○	○	○	●
Fabric rooflining	●	●	●	●	
Alcantara rooflining	○	○	○	○	●
Double sun visors for driver and front passenger	●	●	●	●	●
Door sill guards in plastic	●	●			
Door sill guards in stainless steel with model designation at front Cayenne/Cayenne Diesel: "Cayenne"; Cayenne S/Cayenne S Hybrid : "Cayenne S"; Cayenne Turbo: "Cayenne turbo"	○	○	●	●	●
Pedal pads in plastic	●	●			
Pedal pads in stainless steel			●	●	●
Standard interior Cayenne, Cayenne Diesel, Cayenne S and Cayenne S Hybrid in standard colors, partial leather seats in embossed leather	●	●	●	●	
Leather interior in standard colors, smooth-finish leather	○	○	○	○	●
Interior trim Black (high-gloss)	●	●	●	●	W
Brushed Aluminum interior package	○	○	○	○	●
Trim strips silver-colored	●	●	●	●	●

* not for US

Standard equipment for US model					
<ul style="list-style-type: none"> ● = Standard ○ = Individual option W = Optional, without extra charge 					
Luggage compartment and storage					
Luggage compartment capacity: approx. 23.7 cu ft , with rear seats in cargo position approx. 62.9 cu ft max. loading capacity. Note: Without extra charge for Cayenne Turbo in conjunction with comfort seats with memory package	●	●	●		W
Luggage compartment capacity: approx. 23.7 cu ft , with rear seats in cargo position approx. 60.2 cu ft max. loading capacity. Note: In conjunction with adaptive sports seats with memory package	○	○	○		●
Luggage compartment capacity: approx. 20.5 cu ft , with rear seats in cargo position approx. 59.7 cu ft max. loading capacity				●	
Retractable, flexible luggage compartment cover in removable case	●	●	●	●	●
Storage in passenger compartment (depending on model and individual options): glove compartment (cooled by A/C system), storage compartment in the center console with cradle for the active handset, door storage compartments, storage pockets on the backrest shells of the front seats and 1 storage compartment at the side of the luggage compartment	●	●	●	●	●
Center console armrest, fold-up and with sliding adjustment in longitudinal direction	●	●	●	●	●
2 integrated cupholders each at front and rear with variable diameter	●	●	●	●	●
In-door bottle holders at front and rear	●	●	●	●	●
Colors					
Solid colors – exterior: Black ¹ , Sand White	●	●	●	●	W
Metallic paint – exterior: Classic Silver Metallic Jet Black Metallic Dark Blue Metallic ¹ Meteor Gray Metallic Umber Metallic ¹ Jet Green Metallic ² Auburn Metallic ²	○	○	○	○	●
Standard colors – interior: Black, Platinum Gray, Luxor Beige ¹	●	●	●	●	
Standard colors for leather interior: Black, Platinum Gray, Luxor Beige ¹ , Umber ¹ Note: For the Cayenne, Cayenne Diesel, Cayenne S and Cayenne S Hybrid in conjunction with I-no. Leather interior	○	○	○	○	●

* not for US

1) Available from 05/10 at earliest

2) Available from 08/10 at earliest

11.2 Individual options

Individual options for US model		Cayenne	Cayenne Diesel*	Cayenne S	Cayenne S Hybrid	Cayenne Turbo	Availability
<ul style="list-style-type: none"> ● = Standard ○ = Individual option W = Optional 							
Exterior							
Code	Sand White, Black	●	●	●	●	●	SOP 05/10
Code	Metallic paint; Color range: Jet Black Metallic, Meteor Gray Metallic, Classic Silver Metallic, Dark Blue Metallic, Umber Metallic, Jet Green Metallic, Auburn Metallic	○	○	○	○	●	SOP 05/10 08/10
Code	Special colors; Color range: Sand Yellow, Amethyst Metallic	○	○	○	○	○	08/10
VR1	Running boards Improved comfort when getting in and out and when loading the roof transport system. Note: Restricted off-road use	○	○	○	○	○	08/10
6GB	Wheel arch extensions in black with side door protection moldings For protection of the wheel arch edges and visual personalization	○	○	○	○	○	SOP
2JC	Stainless steel skid plate For visual personalization	○	○	○	○	○	SOP
2JX	Stainless steel skid plates (front and rear) For visual personalization	○	○	○	○	○	SOP
8JE	Bi-Xenon headlights incl. Porsche Dynamic Light System (PDLS) With static and dynamic cornering light, automatic dynamic range adjustment, speed-sensitive headlight control , adverse weather light and headlight cleaning system	○	○	○	○	●	SOP
4F6	Porsche Entry & Drive Vehicle utilization without active key use: vehicle transmitter, system of internal and external antennas, proximity sensors, locking buttons in the exterior door handles and a dual closing button for the powerlift tailgate	○	○	○	○	○	SOP
7X2	ParkAssist (front and rear) Parking aid with ultrasound sensors in the bumpers. Acoustic indication of the distance in front of and behind the vehicle as well as graphic representation of the immediate surroundings in the central screen	○	○	○	○	●	SOP
7X8	Reversing camera incl. ParkAssist (front and rear) Enables precise, controlled reverse parking or reverse maneuvering by displaying a color camera image with dynamic guide lines on the Porsche Communication Management (PCM) screen	○	○	○	○	○	SOP
4KF	Privacy glass Heavily tinted glazing of the rear side windows and rear window	●	○	●	●	●	SOP
VW5	Thermally and noise insulated glass Sound- and heat-insulating laminated glass with enhanced reflectivity all around, tint similar to privacy glass behind B-pillar	○	○	○	○	○	SOP
4GG	Heated windshield for fast and draft-free de-misting and de-icing at cold temperatures	○	○	○	○	○	SOP
PA1/PA2	Automatically dimming exterior and interior rear view mirrors Exterior and interior rear view mirrors dim automatically	○	○	●	●	●	SOP

* not for US

Individual options for US model		Cayenne	Cayenne Diesel*	Cayenne S	Cayenne S Hybrid	Cayenne Turbo	Availability
<ul style="list-style-type: none"> ● = Standard ○ = Individual option W = Optional 							
3FE	Electric slide/tilt glass roof Electric slide/tilt roof in tinted single-sheet safety glass with manually operated sliding sunscreen and remote closing function	○	○	●	●	●	SOP
3FU	Panoramic Roof System 2-part , electric actuation for tilting and opening the front glass section, tinted glass insert, electrically operated roller blind over the entire glass area and remote closing function	○	○	○	○	○	08/10
4E7	Powerlift tailgate Permits automatic opening and closing of the tailgate, including individual adjustment of the opening height, operation via switch in the passenger compartment, key remote control and switch on the tailgate	●	○	●	●	●	SOP
1D6	Trailer hitch without hitch ball Steel cross-member with vertically mounted trailer receiver, max. trailer load 7716 lb (braked trailer, Cayenne with manual transmission: 5952 lb), max. tongue weight 309 lb	○	○	○	○	○	
ONA	Deletion of model designation Includes deletion of the model designation on the rear of the vehicle and, in the case of the Cayenne Diesel, also the "diesel" designation on the front fenders left and right. Note: The Porsche designation on the rear of the vehicle and, in the case of the Cayenne S Hybrid, the "hybrid" designation on the front fenders left and right are kept	W	W	W	W	W	SOP
3S1	Roof rails incl. roof protection strips in Aluminum Look matte High-quality aluminum roof rails painted in Aluminum Look matte, integrated in the vehicle design. Additional visual accent in the roof area: 3 plastic strips, painted in Aluminum Look matte. Note: A roof transport system can be installed only in combination with the roof rails. Retrofitting of the roof rails is not available. Deletion of roof rails in combination with Panoramic Roof System	○	○	○	○	○	SOP
5W1	Roof rails in Aluminum Look incl. roof transport system Roof rails in Aluminum Look matte, including 2 movable and lockable transverse bars for fixing on the roof rails, suitable for all Porsche add-on modules such as roof box, ski rack. Additional visual accent in the roof area: 3 plastic strips, painted in Aluminum Look matte	○	○	○	○	○	SOP
3S5	Roof rails incl. roof protection strips in Black High-quality aluminum roof rails painted in Black, integrated in the vehicle design. Additional visual accent in the roof area: 3 plastic strips, painted in Black. Note: A roof transport system can be installed only in combination with the roof rails. The roof rails cannot be retrofitted. Deletion of roof rails in combination with Panoramic Roof System	○	○	○	○	○	08/10
5W4	Roof rails in Black incl. roof transport system Roof rails painted in Black, including 2 movable and lockable transverse bars for fixing on the roof rails, suitable for all Porsche add-on modules such as roof box, ski rack. Additional visual accent in the roof area: 3 plastic strips, painted in Black	○	○	○	○	○	08/10
QJ4	Exterior package Black (high-gloss) Side window surrounds and trim strip on rear bumper in Black for exterior colors Black and Jet Black Metallic	○	○	○	○	○	SOP

* not for US

Individual options for US model		Cayenne	Cayenne Diesel*	Cayenne S	Cayenne S Hybrid	Cayenne Turbo	Availability
<ul style="list-style-type: none"> ● = Standard ○ = Individual option W = Optional 							
Engine, drive and chassis							
G1G	8-speed Tiptronic S incl. Auto Start Stop function 8-speed Tiptronic S incl. controls on steering wheel. Includes Auto Start Stop function for reduced fuel consumption	○	●	●	●	●	SOP
1BH	Porsche Active Suspension Management (PASM) Electronically controlled damping system with 3 manually selectable maps	○	○	○	○		SOP
1BK	Air suspension with leveling system and ride height control, including Porsche Active Suspension Management (PASM) Fully load-bearing air-spring struts with integrated dampers, total of 6 ride-height settings, variable damper system with situation-dependent, continuous damper force adjustment to reduce body movements, PASM damper map with 3 manually activatable modes ("Comfort," "Normal" and "Sport"), including leveling system	○	○	○	○	●	SOP
OAW	Porsche Dynamic Chassis Control (PDCC) Active chassis control system for anti-roll stabilization. Reduces the lateral inclination of the vehicle when cornering and increases agility and driving performance. Provides more comfort on uneven roads as well as improved off-road traction through greater axle articulation. Includes active anti-roll bars on the front and rear axle	○		○		○	SOP
1Y1	Porsche Torque Vectoring Plus (PTV Plus) Variable torque distribution at the rear wheels through targeted braking of the wheel on the inside of the curve, including electronically controlled rear differential lock	○		○		○	SOP
1N3	Servotronic Speed-sensitive power steering. Reduces the steering effort when maneuvering and at low speeds	○	○	●	●	●	SOP
PB2	Porsche Ceramic Composite Brake (PCCB) Ceramic brake system, carbon-fiber reinforced ceramic brake discs, internally vented and cross-drilled, brake disc diameter 15.4 in. front and 14.6 in. rear , 6-piston brake calipers on front axle and 4-piston brake calipers on rear axle, brake calipers Yellow. Note: Available from wheel size 19-inch	○	○	○	○		SOP
PB1	Porsche Ceramic Composite Brake (PCCB) For Cayenne Turbo with brake disc diameter 16.1 in. front and 14.6 in. rear. Note: Available from wheel size 20-inch					○	SOP
PT1	Off-road underbody protection Rock rails with integrated skid plates, reinforced engine guard, additional protection for fuel tank and rear axle to protect underbody, additional second towing lug	○	○	○	○	○	SOP
OP8	Sports exhaust system With modified main silencer, including 2 twin tailpipes in the Cayenne Turbo design, in high-gloss polished aluminum, nano-coated. The Sport sound is set using the standard Sport button Note: Available for Cayenne only in conjunction with 8-speed Tiptronic S	○		○			09/10

* not for US

Individual options for US model		Cayenne	Cayenne Diesel*	Cayenne S	Cayenne S Hybrid	Cayenne Turbo	Availability
<ul style="list-style-type: none"> ● = Standard ○ = Individual option W = Optional 							
Wheels							
C1J	18-inch Cayenne wheel One-piece alloy wheel in multi-spoke design, front and rear axle: 8 J x 18 RO 53 with 255/55 R 18 tires	●	●	W	W		05/10
C1Q	18-inch Cayenne S III wheel One-piece alloy wheel in five-spoke design, front and rear axle: 8 J x 18 RO 53 with 255/55 R 18 tires	○	○	●	●		SOP
C8K	19-inch Cayenne Turbo wheel One-piece alloy wheel in double-spoke design, front and rear axle: 8.5 J x 19 RO 59 with 265/50 R 19 tires	○	○	○	○	●	SOP
F09	19-inch Cayenne Design II wheel One-piece alloy wheel in 5-spoke lightweight design, front and rear axle: 8.5 J x 19 RO 59 with 265/50 R 19 tires For the Cayenne Turbo: front and rear axle: 8.5 J x 19 RO 59 with 275/45 R 19 tires	○	○	○	○	○	SOP
CP5	20-inch RS Spyder Design wheel One-piece alloy wheel in racing look, front and rear axle: 9 J x 20 RO 57 with 275/45 R 20 tires	○	○	○	○	○	SOP
CN7	20-inch Cayenne SportDesign II wheel One-piece alloy wheel in 10-spoke design, front and rear axle: 9 J x 20 RO 57 with 275/45 R 20 tires	○	○	○	○	○	SOP
CZ4	21-inch 911 Turbo II wheel with wheel arch extension One-piece alloy wheel in 911 Turbo II design, wheel hub covers with colored Porsche Crest, front and rear axle: 10 J x 21 RO 50 with 295/35 R 21 tires	○	○	○	○	○	SOP
CK0	21-inch Cayenne SportEdition wheel (EXC) with wheel arch extension One-piece alloy wheel in multi-spoke design with wheel center painted in GT Silver Metallic, wheel hub covers with full-color Porsche Crest, wheel arch extension in exterior color, front and rear axle; 10 J x 21 RO 50 with 295/35 R 21 tires			○		○	SOP
CK0	21-inch Cayenne SportEdition wheel (EXC) with wheel arch extension One-piece alloy wheel in multi-spoke design with wheel center painted in GT Silver Metallic, wheel hub covers with full-color Porsche Crest, wheel arch extension in exterior color, front and rear axle; 10 J x 21 RO 50 with 295/35 R 21 tires	○	○		○		07/10
CN5	21-inch Cayenne SportEdition wheel painted (EXC) with wheel arch extension One-piece alloy wheel in multi-spoke design with wheel center painted in exterior color, wheel hub covers with full-color Porsche Crest, wheel arch extension in exterior color, front and rear axle; 10 J x 21 RO 50 with 295/35 R 21 tires	○	○	○	○	○	09/10
CQ1	21-inch Cayenne SportEdition wheel, painted in high-gloss Black (EXC), with wheel arch extension One-piece alloy wheel in multi-spoke design with wheel center painted in Black (high-gloss), wheel hub covers with full-color Porsche Crest, wheel arch extension in exterior color, front and rear axle; 10 J x 21 RO 50 with 295/35 R 21 tires	○	○	○	○	○	09/10

* not for US

Individual options for US model		Cayenne	Cayenne Diesel*	Cayenne S	Cayenne S Hybrid	Cayenne Turbo	Availability
<ul style="list-style-type: none"> ● = Standard ○ = Individual option W = Optional 							
H9M	All-Season tires for 18-inch alloy wheels Tires suitable for all-year use with M+S designation 255/55 R 18. Note: Up to max. 149 mph	●	W	●	●		05/10
HQ3	All-Season tires for 19-inch alloy wheels Tires suitable for all-year use with M+S designation 265/50 R 19. Note: Up to max. 149 mph	W	W	W	W	●	05/10
HQ4	All-Season tires for 20-inch alloy wheels Tires suitable for all-year use with M+S designation 275/45 R 20. Note: Up to max. 149 mph	W	W	W	W	W	05/10
3F4	Full-size spare wheel (in luggage compartment) Spare wheel with running tire; accommodated vertically in separate holder on right of luggage compartment , including cover; additionally with jack with folding wedges and rail system in the luggage compartment floor; deletion of tire sealing compound. Note: This option results in reduced luggage compartment volume and restricted visibility to the rear. There is no possibility of using the luggage compartment cover or the optional cargo management system at the same time when the spare wheel is installed	○	○	○		○	05/10
1G1	18-inch collapsible spare wheel Located in the luggage compartment under the loading floor, additionally jack with folding wedges, deletion of tire sealing compound	●	○	●			SOP
1G4	19-inch collapsible spare wheel Located in the luggage compartment under the loading floor, additionally jack with folding wedges, deletion of tire sealing compound. Note: Only available for Cayenne, Cayenne Diesel and Cayenne S in conjunction with PCCB	○	○	○		●	SOP
1G1	18-inch collapsible spare wheel with internal holder in luggage compartment 18-inch collapsible spare wheel accommodated vertically in separate holder on right of luggage compartment , including cover; additionally with jack with folding wedges and rail system in the luggage compartment floor; deletion of tire sealing compound and luggage compartment cover. Note: This option results in reduced luggage compartment volume and restricted visibility to the rear. There is no possibility of using the luggage compartment cover or the optional cargo management system at the same time when the collapsible spare wheel is installed				○		SOP
1G4	19-inch collapsible spare wheel with internal holder in luggage compartment 19-inch collapsible spare wheel accommodated vertically in separate holder on right of luggage compartment , including cover; additionally with jack with folding wedges and rail system in the luggage compartment floor; deletion of tire sealing compound. Note: This option results in reduced luggage compartment volume and restricted visibility to the rear. There is no possibility of using the luggage compartment cover or the optional cargo management system at the same time when the collapsible spare wheel is installed. Only in conjunction with PCCB				○		SOP
7K3	Tire Pressure Monitoring (TPM) Permanent monitoring of the tire pressure in the running tires (separate for all 4 wheels) and status display in the instrument cluster	●	●	●	●	●	SOP
1NP	Wheel hub cover with colored Porsche Crest	○	○	○	○	○	SOP

* not for US

Individual options for US model		Cayenne	Cayenne Diesel*	Cayenne S	Cayenne S Hybrid	Cayenne Turbo	Availability
<ul style="list-style-type: none"> ● = Standard ○ = Individual option W = Optional 							
Interior							
5TL	Interior trim Black (high-gloss)	●	●	●	●	W	
PP5/PP6	Light comfort package Includes dimmable ambient lighting in the door panels and roof console in LED technology, LED reading lights at rear and courtesy lights on exterior mirrors, additionally 2nd socket on rear center console	○	○	○	○	○	SOP
8T3	Adaptive Cruise Control Uses radar sensors to monitor the distance to the vehicle in front, automatically maintains the distance and brakes smoothly if the distance to the vehicle in front is reduced – if necessary bringing the car to a complete stop. Programmable speed range: 30 – 210 km/h. (Only in conjunction with Tiptronic S)	○	○	○	○	○	SOP
7Y1	Lane Change Assist (LCA) Assists the driver when changing lane. Lane Change Assist monitors the area at the side behind the moving vehicle and informs the driver by means of a signal in the exterior mirror if the system has detected another vehicle in the adjacent lane. Can be activated by a pushbutton in the driver's door. Speed range: 30 – 250 km/h Note: Function not available when towing a trailer	○	○	○	○	○	SOP
3L4	Driver memory package Memory function covers driver's seat and exterior mirror settings, also mirror courtesy lights	○	○	○	○		SOP
PE5/Q2J	14-way power seats (front) with memory package Includes electrical seat cushion length adjustment and 4-way lumbar supports for driver and front passenger, electric steering column adjustment and courtesy lights on exterior mirrors. Memory functions include personal settings for driver and front passenger seats, steering column, exterior mirrors, lights, wipers, air conditioning, door locks, instrument cluster and PCM. Settings stored on vehicle key or accessible via memory buttons in door	○	○	○	○	W	SOP
PE6	Adaptive sports seats with memory package (18-way) Sporty seats with a distinctive seam pattern on the seat centers and higher side bolsters. Individual electrical adjustment and memory functions analogous to 14-way power seats with memory package. Additional electrical adjustment of the seat cushion and backrest side bolsters (front). The rear seat bench also features the sports seat look (seam pattern, raised side bolsters). Note: As a result of the raised side bolsters, there is a slope of around 15 degrees with respect to the luggage compartment floor when the rear seats are folded down	○	○	○	○	●	SOP
4A3	Heated seats, front Independently adjustable front left and right, three-stage	○	○	○	○		SOP
4A4	Heated seats, front and rear Independently adjustable front and rear and left and right, three-stage	○	○	○	○	●	SOP
4D3	Seat ventilation (front) Seat cushions and backrests of front seats ventilated , independently adjustable left and right, three-stage Note: Only in conjunction with heated seats and memory package or heated seats and adaptive sports seats with memory package	○	○	○	○	○	SOP

* not for US

Individual options for US model		Cayenne	Cayenne Diesel*	Cayenne S	Cayenne S Hybrid	Cayenne Turbo	Availability
<ul style="list-style-type: none"> ● = Standard ○ = Individual option W = Optional 							
2ZM	Three-spoke multi-function steering wheel For operation of audio and communication functions and on-board computer	●	○	●	●		SOP
2ZH	Heated three-spoke multi-function steering wheel Can be switched on and off as required, with function indicator in instrument cluster, activation by means of button on steering wheel	○	○	○	○	●	SOP
1ML	Three-spoke sports steering wheel with shift paddles Three-spoke steering wheel with shift paddles behind the steering wheel for comfortable and sporty upshifts and downshifts	○	○	○	○	○	SOP
9AH	4-zone climate control Separate electronic control of temperature, fan speed and air distribution for rear right and left from both rear seats and front, includes additional air vents in B-pillar for rear seats	○	○	○		○	SOP
4X4	Rear side airbags Side airbags in the rear outer seats	○	○	○	○	○	SOP
3Y8	Electric roll-up sunscreens on rear side windows Electrically extendable protection against direct sunlight on the rear door side windows. Can also be operated from the driver's position	○	○	○	○	○	SOP
3X1	Ski bag Removable ski bag for practical transport of several pairs of skis or snowboards also outside the vehicle	○	○	○	○	○	SOP
VC1	HomeLink® (garage door opener) Freely programmable remote control integrated in the vehicle for up to 3 garage doors and gates, lighting systems or alarm systems. Compatible with nearly all standard garage door and gate systems, operation via 3 buttons on the roof console	●	○	●	●	●	SOP
9JA	Non-smoker package Deletion of ashtray	W	W	W	W	W	SOP
6A7	Fire extinguisher Compact DIN EN3 powder extinguisher beneath front passenger seat, contains 1 kg extinguishing agent	○	○	○	○	○	SOP
7M1	Door sill guards in stainless steel with model designation at front Create an effective visual accent on driver's and front passenger's side as well as at the rear. Logos at front: Cayenne/Cayenne Diesel: "Cayenne" Cayenne S/Cayenne S Hybrid: "Cayenne S" Cayenne Turbo: "Cayenne turbo"	○	○	●	●	●	SOP
3GN	Cargo management Variable system for safe transport of items in the luggage compartment. 2 rails (integrated in the floor of the luggage compartment), 1 telescopic rod, 4 lashing points, 1 strap roller, luggage compartment partition net, reversible mat. Note: The cargo management system cannot be used at the same time if a spare wheel with running tire (for Cayenne, Cayenne Diesel, Cayenne S and Cayenne Turbo) or 18- or 19-inch collapsible spare wheel (for Cayenne S Hybrid) is installed in the luggage compartment	○	○	○	○	○	05/10
OTD	Floor mats In matching interior color for single-color interiors, in darker interior color for two-tone interiors, with Porsche logo	●	○	●	●	●	SOP

* not for US

Individual options for US model		Cayenne	Cayenne Diesel*	Cayenne S	Cayenne S Hybrid	Cayenne Turbo	Availability
<ul style="list-style-type: none"> ● = Standard ○ = Individual option W = Optional 							
Interior leather							
Code	Standard interior in Cayenne/Cayenne Diesel/ Cayenne S and Cayenne S Hybrid in Black, Platinum Gray, Luxor Beige	●	●	●	●		SOP 05/10
Code	Leather interior in Black, Platinum Gray, Luxor Beige, Umber	○	○	○	○	●	SOP 05/10
Code	Leather interior in two-tone color combinations Black/Titanium Blue, Umber/Cream and Umber/Light Tartufo	○	○	○	○	○	08/10 10/10
Code	Leather interior in Espresso Natural Leather	○	○	○	○	○	08/10
Code	Leather interior in two-tone natural leather Combination of color tones Natural Espresso and Cognac	○	○	○	○	○	10/10
7NF/N7D/ N5Y	Seat centers in soft ruffled leather	○	○	○	○	○	08/10
3J7	Porsche Crest on headrests (front) (EXC)	○	○	○	○	○	SOP
5ZF	Porsche Crest on headrests, front and rear (EXC)	○	○	○	○	○	SOP
Alcantara interior							
6NA	Alcantara roofing Rooflining, A-pillar trim, upper sections of B-pillar and C-pillar and sun visors in Alcantara	○	○	○	○	●	SOP
Wood interior							
	Walnut interior package With Walnut finish: dashboard trim, door trim at front and rear, center console trim panel, front ashtray cover	○					05/10
PH4	Walnut interior package In combination with Tiptronic S, the selector lever is finished with Walnut	○	○	○	○	○	05/10
1XJ	Three-spoke multi-function steering wheel in Walnut including steering wheel heating For operation of audio and communication functions and on-board computer; with Walnut finish and covered with smooth-finish leather in interior color: steering wheel rim	○	○	○	○	○	05/10
	Natural Olive interior package Finished in ash wood with "Olive" grain: dashboard trim, door trim at front and rear, center console trim panel, front ashtray cover	○					05/10
PH5	Natural Olive interior package In combination with Tiptronic S, the selector lever is finished with Natural Olive	○	○	○	○	○	05/10
	Anthracite Birch interior package Finished with Anthracite Birch: dashboard trim, door trim at front and rear, center console trim panel, front ashtray cover	○					SOP
PH6	Anthracite Birch interior package In conjunction with Tiptronic S, the selector lever is finished with Anthracite Birch	○	○	○	○	○	SOP
1XE	Three-spoke multi-function steering wheel in Anthracite Birch including steering wheel heating For operation of audio and communication functions and on-board computer; with Anthracite Birch finish and covered with smooth-finish leather in interior color: steering wheel rim	○	○	○	○	○	SOP

* not for US

Individual options for US model		Cayenne	Cayenne Diesel*	Cayenne S	Cayenne S Hybrid	Cayenne Turbo	Availability
<ul style="list-style-type: none"> ● = Standard ○ = Individual option W = Optional 							
Interior in Carbon							
	Carbon interior package Finished in carbon: dashboard trim, door trim at front and rear, center console trim panel, front ashtray cover	○					08/10
PH7	Carbon interior package In conjunction with Tiptronic S, the selector lever is finished with Carbon	○	○	○	○	○	08/10
2FX	Three-spoke multi-function steering wheel in Carbon including steering wheel heating For operation of audio and communication functions and on-board computer; finished with Carbon and covered with smooth-finish leather in interior color: steering wheel rim	○	○	○	○	○	08/10
Aluminum/Stainless Steel interior							
5TE	Brushed Aluminum interior package Finished with Brushed Aluminum: dashboard trim, door trim at front and rear, center console trim panel, front ashtray cover	○	○	○	○	●	SOP
Audio and communication for vehicles with the CDR-31 audio system							
	CDR-31 audio system Audio system comprising 7-inch TFT color touchscreen display . Including double-tuner radio, MP3-compatible single-disc CD player and 10 speakers, total output 100 W	●	●	●	●		SOP
7D7	6-disc CD changer 6-disc CD changer with buffer memory for vibration protection, integrated in CDR-31 audio system. Includes audio playback of MP3 music	○	○	○	○		SOP
UF1	Universal audio interface (AUX) Comprises an AUX interface in the front center armrest storage compartment for connecting an external audio source which is then controlled directly via the connected device	●	○	●	●		SOP
9VL	BOSE® Surround Sound-System BOSE® Surround Sound System with 14 speakers incl. 200 W active subwoofer, 9 amplifier channels and a total output of 585 W . The BOSE® technologies Centerpoint® 2 and SurroundStage® allow the system to reproduce stereo sources in Surround mode. AudioPilot® Noise Compensation Technology achieves a consistent, balanced sound in all driving situations	○	○	○	○		SOP
9VJ	Burmester® High-End Surround Sound System Burmester® High-End Surround Sound System with 16 individually selectable speakers incl. 300 W active subwoofer and a total output of more than 1,000 W. A natural, rich and consistent surround sound is achieved in all driving situations thanks to the 16-channel amplifier technology, including a 25 cm active subwoofer with Class D digital amplifier, the use of special ribbon tweeters (Air Motion Transformers, AMT), an acoustically effective diaphragm area of more than 2,400 cm ² and a microphone for interior noise compensation	○	○	○	○		SOP
9W5	Cell phone preparation (HFP) With Bluetooth® interface to connect a cell phone to the Hands-Free Profile (HFP). Comprises the hands-free function and muting as well as operation of all important telephone functions, including call lists and phonebook access (depending on cell phone), via the CDR-31 or the optional multi-function steering wheel. Includes microphone, wiring	●	○	●	●		SOP
AEU	Porsche Rear Seat Entertainment Contains: 2 display consoles integrated in front seat backrests, each with swiveling, high-resolution 7-inch WVGA TFT color touchscreen displays , including integrated player, 2 wireless infrared headphones as well as one USB interface each. Permits playback of DVDs and CDs as well as connection of one AV source each (game console, MP3 player). The crosslink function allows films and data to be transferred from one screen to the other. Smooth-finish leather in interior color and partially with decorative seams: display consoles. Note: The Porsche Rear Seat Entertainment preparation must be ordered as well (without additional charge)	○	○	○	○		08/10

* not for US

Individual options for US model		Cayenne	Cayenne Diesel*	Cayenne S	Cayenne S Hybrid	Cayenne Turbo	Availability
<ul style="list-style-type: none"> ● = Standard ○ = Individual option W = Optional 							
Audio and communication for vehicles with PCM							
7T1	<p>Porsche Communication Management (PCM) incl. navigation module Central information and communication system</p> <ul style="list-style-type: none"> – High-resolution 7-inch WVGA (Wide Video Graphics Array) TFT color display with touchscreen – Radio with RDS double tuner and scan/phase diversity for improved reception – CD/DVD drive including audio playback of MP3 music and audio/video DVDs – Cayenne, Cayenne Diesel, Cayenne S and Cayenne S Hybrid: 11 speakers, total output 235 W – Navigation module with: <ul style="list-style-type: none"> – Hard drive with map data for most European countries – Perspective map display and 3D navigation map incl. 3D Terrain model with superimposed satellite map – Dynamic route guidance (TMC) – Automatic route tracing and subsequent reverse route navigation as well as navigation in non-digitized regions using a compass and GPS Additionally for Cayenne S Hybrid: Energy management display – Energy flow display for the different driving conditions in a vehicle representation – Statistics display in a diagram for the hybrid-specific driving conditions 	○	○	○	○	●	SOP
7D7	<p>6-disc CD/DVD changer 6-disc CD/DVD changer with buffer memory for vibration protection, integrated in PCM. Includes audio playback of MP3 music</p>	○	○	○	○	○	SOP
UF1	<p>Universal audio interface (AUX, USB, iPod®) Comprises 2 connections in the front center console storage compartment:</p> <ul style="list-style-type: none"> – USB jack for connection and charging of various iPod® and iPhone® models and connection of USB memory sticks with MP3 music and MP3 players. Includes operation via PCM, the optional multi-function steering wheel or optional voice control. The USB jack can also be used to download electronic logbook data. The standard Apple iPod® USB cable (supplied by Apple) is used as the connecting cable; the previous serial cable has been deleted. – AUX interface for connecting an external audio source, whereby operation takes place directly on the connected device 	●	○	●	●	●	SOP
9VL	<p>BOSE® Surround Sound System BOSE® Surround Sound System with 14 speakers incl. 200 W active subwoofer, 9 amplifier channels and a total output of 585 W. The BOSE® technologies Centerpoint® 2 and SurroundStage® allow the system to reproduce stereo sources in Surround mode and open up the audio spectrum of digital 5.1 recordings. AudioPilot® Noise Compensation Technology achieves a consistent, balanced sound in all driving situations.</p>	○	○	○	○	●	SOP
9VJ	<p>Burmester® High-End Surround Sound System Burmester® High-End Surround Sound System with 16 individually selectable speakers incl. 300 W active subwoofer and a total output of more than 1,000 W. A natural, rich and consistent surround sound is achieved in all driving situations thanks to the 16-channel amplifier technology, including a 25 cm active subwoofer with Class D digital amplifier, the use of special ribbon tweeters (Air Motion Transformers, AMT), an acoustically effective diaphragm area of more than 2,400 cm² and a microphone for interior noise compensation.</p>	○	○	○	○	○	SOP

* not for US

Individual options for US model		Cayenne	Cayenne Diesel*	Cayenne S	Cayenne S Hybrid	Cayenne Turbo	Availability
<ul style="list-style-type: none"> ● = Standard ○ = Individual option W = Optional 							
9W5	Cell phone preparation (HFP) With Bluetooth® interface to connect a cell phone to the Hands-Free Profile (HFP). Comprises the hands-free function and muting as well as operation of all important telephone functions, including call lists and phonebook access (depending on cell phone), via PCM or the optional multi-function steering wheel. Includes microphone, wiring	○	○	○	○	●	SOP
9ZP	Telephone module with cordless handset Additionally comprises a Bluetooth® handset with display and own keypad; this allows discrete telephone calls to be made, also from the rear seat bench. Operation of the Bluetooth® handset is not supported in HFP mode	○	○	○	○	○	SOP
QH1	Voice control Allows practically complete operation of all PCM functions using defined voice commands. With whole-word input of e.g. navigation destinations, phonebook entries or radio station names, without the system having to learn them. Simplified operation by means of interactive input and display of menu-specific selection lists	○	○	○	○	○	SOP
9NY	Electronic logbook Allows the automatic recording of current mileage, distance covered, date and time as well as the starting point and destination for each trip. Includes PC software for later analysis of the data. The software meets the requirements of the German tax authorities for documenting automatic logbook recording	○	○	○	○	○	SOP
QR1	Compass display on dashboard High-quality compass installed centrally on the dashboard , with analog display of compass direction by rotating compass rose and digital display of altitude and degree heading of driving direction	○	○	○	○	○	SOP
AEU	Porsche Rear Seat Entertainment (EXC) Contains: 2 display consoles integrated in front seat backrests, each with swiveling, high-resolution 7-inch WGA TFT color touchscreen displays , including integrated player, 2 wireless infrared headphones as well as one USB interface each. Permits playback of DVDs and CDs, connection of one AV source each (games console, MP3 player) as well as transmission of the TV signal from the PCM to the screens of the Porsche Rear Seat Entertainment system (only in conjunction with TV tuner) . The crosslink function allows films and data to be transferred from one screen to the other. Smooth-finish leather in interior color and partially with decorative seams: display consoles. Note: The Porsche Rear Seat Entertainment preparation must be ordered as well (without extra charge)	○	○	○	○	○	08/10
Cayenne factory collection							
S9Y	Cayenne factory collection	○	○	○	○	○	

* not for US

11.3 Exclusive and Tequipment

The following **Exclusive** options permit additional personalization of the new Cayenne straight from the factory.

Exclusive equipment for US model	Cayenne	Cayenne Diesel*	Cayenne S	Cayenne S Hybrid	Cayenne Turbo	Availability
<ul style="list-style-type: none"> ● = Standard ○ = Individual option W = Optional 						
Exterior						
Air intake grilles painted Painted in exterior color: air intake grille in front section (three-part)	○	○	○	○	○	SOP
Porsche logotype and model designation painted (NEW) Painted in exterior color: Porsche logotype and model designation on rear	○	○	○	○	○	SOP
Porsche logotype, painted (NEW) Painted in exterior color: Porsche logotype on rear	○	○	○	○	○	SOP
Door mirrors painted Painted in exterior color: door mirror bottom half including frame at front, door mirror base plate	○	○	○	○	○	SOP
Roof spoiler separation edge, painted (NEW) Painted in exterior color: roof spoiler separation edge	○	○	○	○	○	SOP
Extended exterior package painted in Black (high-gloss) (NEW) Painted in Black (high-gloss): air intake grille in front end (three-part), door mirror bottom half incl. frame at front, door mirror base plate, roof spoiler separation edge	○	○	○	○	○	SOP
Engine, drive and chassis						
Sports exhaust system With modified main silencer, including 2 twin tailpipes trims in the Cayenne Turbo design, in high-gloss polished aluminum, nano-coated. The Sport sound is set using the standard Sport button (note: for the Cayenne only in combination with Tiptronic S)	○		○			09/10
Wheels						
21-inch Cayenne SportEdition wheel with wheel arch extension (NEW) One-piece alloy wheel in multi-spoke design with wheel center painted in GT Silver Metallic, wheel hub covers with full-color Porsche Crest, wheel arch extension, front and rear axle: 10 J x 21 RO 50 with 295/35 R 21 tires			○		○	SOP
21-inch Cayenne SportEdition wheel with wheel arch extension (NEW) One-piece alloy wheel in multi-spoke design with wheel center painted in GT Silver Metallic, wheel hub covers with full-color Porsche Crest, wheel arch extension, front and rear axle: 10 J x 21 RO 50 with 295/35 R 21 tires	○	○		○		07/10
21-inch Cayenne SportEdition wheel painted with wheel arch extension (NEW) One-piece alloy wheel in multi-spoke design with wheel center painted in exterior color, wheel hub covers with full-color Porsche Crest, wheel arch extension, front and rear axle: 10 J x 21 RO 50 with 295/35 R 21 tires	○	○	○	○	○	09/10
21-inch Cayenne SportEdition wheel, painted in high-gloss Black with wheel arch extension (NEW) One-piece alloy wheel in multi-spoke design with wheel center painted in Black (high-gloss), wheel hub covers with full-color Porsche Crest, wheel arch extension, front and rear axle: 10 J x 21 RO 50 with 295/35 R 21 tires	○	○	○	○	○	09/10

* not for US

Exclusive equipment for US model	Cayenne	Cayenne Diesel*	Cayenne S	Cayenne S Hybrid	Cayenne Turbo	Availability
<ul style="list-style-type: none"> ● = Standard ○ = Individual option W = Optional 						
Interior						
Painted interior package Painted in exterior color: dashboard trim, door trim at front and rear, center console trim panel, front ashtray cover	○	○	○	○	○	SOP
Painted air vent slats Painted in exterior color: side air vent slats front, central air vent slats front, central air vent slats rear	○	○	○	○	○	SOP
Colored instrument dials In interior color (Luxor Beige) or in contrasting color (White, Guards Red)	○		○		○	09/10
Vehicle key painted (NEW) Painted in exterior color: additional vehicle key (side faces)	○	○	○	○	○	06/10
Interior leather						
Interior package leather Smooth-finish leather in interior color: dashboard trim, door trim at front and rear, center console trim panel, front ashtray cover	○	○	○	○	○	SOP
Rooflining grab handles in leather Smooth-finish leather in interior color and partially with decorative seams: rooflining grab handles	○	○	○	○	○	SOP
Sun visors in leather Smooth-finish leather in interior color and partially with decorative seams: sun visors	○	○	○	○	○	SOP
Interior mirror in leather (NEW) Smooth-finish leather in color of rooflining and partially with decorative seams: interior mirror, antenna cover	○	○	○	○	○	06/10
Switch panel package leather Smooth-finish leather in interior color and partially with decorative seams: frame of side defroster trim, center dashboard trim	○	○	○	○	○	06/10
Leather dashboard closing trim panel (NEW) Smooth-finish leather in interior color and partially with decorative seams: dashboard end trim, door trim panel	○	○	○	○	○	06/10
Leather air vent slats Smooth-finish leather in interior color: side air vent slats front, central air vent slats front, central air vent slats rear	○	○	○	○	○	06/10
Steering column casing in leather Smooth-finish leather in interior color and partially with decorative seams: steering column trim	○	○	○	○	○	06/10
Leather seat console Smooth-finish leather in interior color and partially with decorative seams: seat console at front, seat storage tray front, seat adjustment elements incl. trim front	○	○	○	○	○	06/10
Extended interior package with grab handles in leather (NEW) Smooth-finish leather in interior color and decorative seams: upholstered door handles front and rear, upholstered handles on center console	○	○	○	○	○	06/10
Leather key pouch (NEW) Smooth-finish leather in interior color, with embossed Porsche Crest and decorative stitching	○	○	○	○	○	04/10
Porsche Crest on headrests Embossed on the headrest centers of the front seats	○	○	○	○	○	06/10
Embossed on the headrest centers of the front and outer rear seats (NEW)	○	○	○	○	○	06/10

* not for US

Exclusive equipment for US model ● = Standard ○ = Individual option W = Optional	Cayenne	Cayenne Diesel*	Cayenne S	Cayenne S Hybrid	Cayenne Turbo	Availability
Custom floor mats with leather edging Set of four mats. Carpet in Black, Platinum Gray, Luxor Beige, Umber, Titanium Blue, Cream, Tartufo, Espresso, Cognac. Smooth-finish leather edging and decorative double seams. Leather inlay in color of edging with embossed Porsche logotype and decorative seam. Free choice of colors for leather edging and decorative seams (all standard and individual leather colors from current range)	○	○	○	○	○	08/10
Custom reversible luggage-compartment mat with leather edging Custom reversible luggage-compartment mat with leather edging incl. loading sill protection. Carpet in Black, Platinum Gray, Luxor Beige, Umber, Titanium Blue, Cream, Tartufo, Espresso, Cognac. Smooth-finish leather edging and decorative double seams. Leather inlay in color of edging with embossed Porsche logotype and decorative seam. Free choice of colors for leather edging and decorative seams (all standard and individual leather colors from current range)	○	○	○	○	○	08/10
Audio and communication						
Porsche Rear Seat Entertainment Contains: 2 display consoles integrated in front seat backrests, each with swivel-mounted, high-resolution 7-inch WVGA TFT color touchscreen displays, including integrated player for each console, one USB interface each and 2 wireless infrared headphones. Permits playback of DVDs and CDs, connection of one AV source each (game console, MP3 player) as well as transmission of the TV signal from the PCM to the screens of the Porsche Rear Seat Entertainment system (only in conjunction with TV tuner). The crosslink function allows films and data to be transferred from one screen to the other. Smooth-finish leather in interior color and partially with decorative seams: display consoles	○	○	○	○	○	08/10
SportDesign package	○	○	○	○	○	12/10
Walnut interior package Finished with Walnut: dashboard trim, door trim at front and rear, center console trim panel, front ashtray cover. In combination with Tiptronic S, the selector lever is finished with Walnut	○	○	○	○	○	07/10
Anthracite Birch interior package (NEW) Finished with Anthracite Birch: dashboard trim, door trim at front and rear, center console trim panel, front ashtray cover. In combination with Tiptronic S, the selector lever is finished with Anthracite Birch	○	○	○	○	○	07/10
Natural Olive interior package Finished in ash wood with "Olive" grain: dashboard trim, door trim at front and rear, center console trim panel, front ashtray cover. In combination with Tiptronic S, the selector lever is finished in ash wood with Olive grain	○	○	○	○	○	07/10
Carbon interior package Finished in carbon: dashboard trim, door trim at front and rear, center console trim panel, front ashtray cover. In combination with Tiptronic S, the selector lever is finished with Carbon	○	○	○	○	○	07/10
Brushed Aluminum interior package (NEW) Finished with Brushed Aluminum: dashboard trim, door trim at front and rear, center console trim panel, front ashtray cover	○	○	○	○	○	07/10
Three-spoke multi-function steering wheel in Walnut including steering wheel heating For operation of audio and communication functions and on-board computer. Finished with Walnut and covered with smooth-finish leather in interior color: steering wheel rim	○	○	○	○	○	07/10
Three-spoke multi-function steering wheel in Anthracite Birch including steering wheel heating (NEW) For operation of audio and communication functions and on-board computer. Finished with Anthracite Birch and covered with smooth-finish leather in interior color: steering wheel rim	○	○	○	○	○	07/10
Three-spoke multi-function steering wheel in Carbon including steering wheel heating For operation of audio and communication functions and on-board computer. Finished with Carbon and covered with smooth-finish leather in interior color: steering wheel rim	○	○	○	○	○	07/10

* not for US

Exclusive equipment for US model	Cayenne	Cayenne Diesel*	Cayenne S	Cayenne S Hybrid	Cayenne Turbo	Availability
<ul style="list-style-type: none"> ● = Standard ○ = Individual option W = Optional 						
Air intake grilles painted Painted in exterior color: air intake grille in front section (three-part)	○	○	○	○	○	SOP
Door mirrors painted Painted in exterior color: door mirror bottom half including frame at front, door mirror base plate	○	○	○	○	○	SOP
Roof spoiler separation edge, painted (NEW) Painted in exterior color: roof spoiler separation edge	○	○	○	○	○	SOP
Decorative side logo with model designation Decorative side logo in selected colors	○	○	○	○	○	08/10
Rubber floor mats with raised edge (NEW) Set of four mats, in Black, in attractive design with vehicle silhouette and silver Porsche logotype. Anti-slip, water-impermeable and with raised edges to protect the carpeting against moisture	○	○	○	○	○	08/10
Rear bicycle carrier Lockable, folding aluminum rear carrier in Black for up to 2 bicycles. The carrier is mounted on the trailer hitch. Note: Only in combination with trailer hitch	○	○	○	○	○	SOP
Add-on kit for rear bicycle carrier Add-on kit for transporting a third bicycle on the rear bicycle carrier. Note: Only in combination with rear bicycle carrier	○	○	○	○	○	SOP
21-inch Cayenne SportEdition wheel (NEW) One-piece alloy wheel in multi-spoke design with wheel center painted in GT Silver Metallic, wheel hub covers with full-color Porsche Crest, wheel arch extension in exterior color, front and rear axle; 10 J x 21 RO 50 with 295/35 R 21 tires	○	○	○	○	○	07/10
21-inch Cayenne SportEdition wheel, painted in High-gloss Black (NEW) One-piece alloy wheel in multi-spoke design with wheel center painted in Black (high-gloss), wheel hub covers with full-color Porsche Crest, wheel arch extension in exterior color, front and rear axle; 10 J x 21 RO 50 with 295/35 R 21 tires	○	○	○	○	○	09/10
Snow chains 2 chains with fine-link chain strands. Available for 18-inch, 19-inch and 20-inch wheels	○	○	○	○	○	08/10
Wheel hub covers with full-color Porsche Crest	○	○	○	○	○	08/10
Decorative sleeves	○	○	○	○	○	08/10

* not for US

12 V numbers (standard equipment in specific markets)

		Cayenne	Cayenne S	Cayenne S Hybrid	Cayenne Turbo
<ul style="list-style-type: none"> ○ = Individual Equipment ● = V number S = Standard equipment W = No-cost options 					
Code	C02 - PCNA				
4KF	Privacy glass	●	●	●	●
3FE	Electric slide/tilt sunroof in glass	○	●	●	●
4E7	Powerlift tailgate	●	●	●	●
1N3	Servotronic	○	●	S	●
7K3	Tire Pressure Monitoring (TPM)	●	●	●	S
H9M	All-Season tires for 18-inch alloy wheels	●	●	●	
HQ3	All-Season tires for 19-inch alloy wheels	○	○	○	●
1G1	18-inch collapsible spare wheel	●	●		
1G4	19-inch collapsible spare wheel Note: Only available for Cayenne, Cayenne Diesel and Cayenne S in combination with PCCB	○	○	○	●
3L4	Driver memory package	○	●	●	
2ZM	Three-spoke multi-function steering wheel	●	●	●	
2ZH	Heated three-spoke multi-function steering wheel	○	○	○	●
VC1	HomeLink® (garage door opener)	●	●	●	●
9W5	Cell phone preparation (HFP)	●	●	●	●
QV4	Satellite radio	○	○	○	●
OTD	Floor mats	●	●	●	●
UF1	Universal audio interface (AUX)	●	●	●	
UF1	Universal audio interface (AUX, USB, iPod®)				●
Code	C36 - PCL				
4E7	Powerlift tailgate	●	●	●	●
4KF	Privacy glass	●	●	●	●
1N3	Servotronic	○	○	S	●
7K3	Tire Pressure Monitoring (TPM)	●	●	●	S
H9M	All-Season tires for 18-inch alloy wheels	●	●	●	
1G1	18-inch collapsible spare wheel	●	●		
HQ3	All-Season tires for 19-inch alloy wheels	○	○	○	●
1G4	19-inch collapsible spare wheel Note: Only available for Cayenne, Cayenne Diesel and Cayenne S in combination with PCCB	○	○	○	●
3L4	Driver memory package	○	●	●	
4A3	Heated seats, front	●	●	●	
2ZH	Heated three-spoke multi-function steering wheel	●	●	●	●
OTD	Floor mats	●	●	●	●
9W5	Preparation for cell phone	●	●	●	●
UF1	Universal audio interface (AUX)	●	●	●	
UF1	Universal audio interface (AUX, USB, iPod®)				●

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13 Technical data

		Cayenne	Cayenne S	Cayenne S Hybrid	Cayenne Turbo
Engine					
Number of cylinders		6	8	6	8
Valves per cylinder		4	4	4	4
Turbocharging		-	-	Supercharger	Biturbo
Effective displacement	cm ³ / cu. in	3,598 / 219.5	4,806 / 293.3	2,995 / 182.7	4,806 / 293.3
Bore x stroke	mm in	89 x 96.4 3.50 x 3.80	96 x 83 3.78 x 3.27	84.5 x 89 3.33 x 3.50	96 x 83 3.78 x 3.27
Max. power (EEC) at engine speed	kW / hp rpm	220 / 300 6,300	294 / 400 6,500	245 / 333 5,500 - 6,500	368 / 500 6,000
Max. torque at engine speed	Nm / lb-ft rpm	400 / 295 3,000	500 / 369 3,500	440 / 325 3,000 - 5,250	700 / 516 2,250 - 4,500
Max. power (EEC) at engine speed Overall system, hybrid	kW / hp rpm	- -	- -	279 / 380 5,500	- -
Max. torque at engine speed Overall system, hybrid	Nm / lb-ft rpm	- -	- -	580 / 428 1,000 >= 550 1,000 - 3,000	- -
Max. power (EEC) at engine speed (electric machine)	kW / hp rpm	- -	- -	34 / 47 > 1,150	- -
Max. torque at engine speed (electric machine)	Nm / lb-ft rpm	- -	- -	300 / 221 < 1,150	- -
Compression ratio		11.7 : 1	12.5 : 1	10.5 : 1	10.5 : 1
Horsepower per liter	kW/l hp /l	61.4 83.4	61.2 83.2	81.8 111.3	76.6 104
Power-to-weight ratio	lb/ hp	14.7 (MT) 14.9 (AT)	11.4	14.8	9.6
Engine cooling (cylinder head)		Longitudinal water flow	Cross water flow	Longitudinal water flow	Cross water flow
Engine management		Bosch MED 17	Siemens SDI 8	Bosch MED 17	Siemens SDI 8
Fuel grade		Super unleaded 93	Super unleaded 93	Unleaded 92	Super unleaded 93
Ignition		Static high-voltage ignition distribution with individual ignition coils directly on the spark plugs	Static high-voltage ignition distribution with individual ignition coils directly on the spark plugs	Static high-voltage ignition distribution with individual ignition coils directly on the spark plugs	Static high-voltage ignition distribution with individual ignition coils directly on the spark plugs
Valve control		Variable intake/outlet valve control	VarioCam Plus	Variable intake valve control	VarioCam Plus
Charge-air cooling		-	-	1 charge-air cooler at front	2 separate charge-air coolers at front
Exhaust system		Twin-branch exhaust system, 2 main catalytic converters, 1 center and 1 rear silencer	Twin-branch exhaust system with 2 pre- and 2 main catalytic converters, 1 rear silencer	Twin-branch exhaust system with 2 main catalytic converters, 1 front and 1 rear silencer	Twin-branch exhaust system with 2 pre- and 2 main catalytic converters, 1 rear silencer
Rated generator output	kW	3.08	2.66	-	2,66
Starter	kW	2.5 (SG) 3.2 (AT)	1.9	-	1.9
Battery capacity	Ah	92	92	92	92
Idle speed	rpm	650	600	800	600
Max. engine speed	rpm	6,700	6,700	6,500	6,700
Engine weight					
with manual transmission	kg / lbs	200.2/441.4	-	-	-
with Tiptronic S	kg / lbs	190.1/419.1	210.6/464.3	180.7 / 398.4	229.4/505.7

		Cayenne	Cayenne S	Cayenne S Hybrid	Cayenne Turbo
Power transmission					
All-wheel drive		Active all-wheel drive with electronically controlled multi-plate clutch	Active all-wheel drive with electronically controlled multi-plate clutch	Permanent all-wheel drive with self-locking center differential	Active all-wheel drive with electronically controlled multi-plate clutch
Torque distribution		Variable	Variable	40/60	Variable
Transmission ratio for manual transmission	1st gear	4.68			
	2nd gear	2.53			
	3rd gear	1.69			
	4th gear	1.21			
	5th gear	1			
Reverse gear		4.27			
Final-drive ratio		3.27 (FA), 3.7 (RA)			
Clutch diameter	mm / in	260 / 10.24			
Tiptronic S	1st gear	4.85	4.97	4.92	4.92
Transmission ratio	2nd gear	2.84	2.84	2.81	2.81
	3rd gear	1.86	1.86	1.84	1.84
	4th gear	1.44	1.44	1.43	1.43
	5th gear	1.21	1.21	1.21	1.21
	6th gear	1	1	1	1
	7th gear	0.82	0.83	0.83	0.83
	8th gear	0.67	0.69	0.69	0.69
Reverse gear		3.83	4.07	4.02	4.03
Final-drive ratio		3.27 (FA)	2.73 (FA)	3.27	2.58 (FA)
		3.7 (RA)	3.09 (RA)		2.92 (RA)
Converter diameter	mm / in	241 / 9.49	272 / 10.71	241 / 9.49	272 / 10.71
Chassis					
Front axle		Aluminum large-format double-wishbone suspension			
Toe-in	min	5	5	5	5
Camber	min	-15	-15	-15	-15
Caster	Degrees	8° 35'	8° 35'	8° 35'	8° 35'
		Multi-link axle, independent wheel suspension			
Toe-in per wheel	min	10	10	10	10
Camber	Degrees	-1° 20'	-1° 20'	-1° 20'	-1° 20'
Steering ratio (LHD/RHD)	i	15.9 : 1 to 12.5 : 1	15.9 : 1 to 12.5 : 1	16.7 : 1 to 13.3 : 1	15.9 : 1 to 12.5 : 1
Steering wheel revolutions lock to lock (LHD/RHD)		2.63	2.63	2.63	2.63
Steering wheel diameter	mm / in	370 / 14.57	370 / 14.57	370 / 14.57	370 / 14.57
Brakes					
Brakes		6-piston aluminum monobloc brake calipers (FA) and 4-piston aluminum monobloc brake calipers (RA)			
ABS		Integrated in PSM			
Vehicle stability system	PSM mit ABS	PSM with ABS, ASR, ABD, MSR, Trailer Stability Management			
Brake discs FA	Version			Internally vented	Internally vented
	Diameter	mm / in	350 / 13.78	360 / 14.17	360 / 14.17
	Thickness	mm / in	34 / 1.34	36 / 1.41	36 / 1.41
Brake discs RA	Version			Internally vented	Internally vented
	Diameter	mm / in	330 / 12.99	330 / 12.99	330 / 12.99
	Thickness	mm / in	28 / 1.10	28 / 1.10	28 / 1.10

		Cayenne	Cayenne S	Cayenne S Hybrid	Cayenne Turbo
Wheels/Tires					
Wheel design		One-piece aluminum alloy wheels			
Wheels					
18-inch Cayenne wheel					
	FA wheels	8.0 J x 18 RO 53			
	Summer tires	255/55 R18 109Y XL			
	Winter tires (TEQ)	255/55 R18 109V XL			
	RA wheels	8.0 J x 18 RO 53			
	Summer tires	255/55 R18 109Y XL			
	Winter tires (TEQ)	255/55 R18 109V XL			
18-inch Cayenne S III wheel					
	FA wheels	8.0 J x 18 RO 53			
	Summer tires	255/55 R18 109Y XL			
	Winter tires (TEQ)	255/55 R18 109V XL			
	RA wheels	8.0 J x 18 RO 53			
	Summer tires	255/55 R18 109Y XL			
	Winter tires (TEQ)	255/55 R18 109V XL			
19-inch Cayenne Turbo wheel					
	FA wheels	8.5 J x 19 RO 59			
	Summer tires	265/50 R19 110Y XL			
	Winter tires (TEQ)	265/50 R19 110V XL			
	RA wheels	8.5 J x 19 RO 59			
	Summer tires	265/50 R19 110Y XL			
	Winter tires (TEQ)	265/50 R19 110V XL			
19-inch Cayenne Design II wheel					
	FA wheels	8.5 J x 19 RO 59			8.5 J x 19 RO 59
	Summer tires	265/50 R19 110Y XL			275/45 R19 110Y XL
	Winter tires (TEQ)	265/50 R19 110V XL			265/50 R19 110V XL
	RA wheels	8.5 J x 19 RO 59			8.5 J x 19 RO 59
	Summer tires	265/50 R19 110Y XL			275/45 R19 110Y XL
	Winter tires (TEQ)	265/50 R19 110V XL			265/50 R19 110V XL
20-inch Cayenne SportDesign II wheel					
	FA wheels	9.0 J x 20 RO 57			
	Summer tires	275/ 45 R20 110Y XL			
	Winter tires (TEQ)	275/ 45 R20 110V XL			
	RA wheels	9.0 J x 20 RO 57			
	Summer tires	275/ 45 R20 110Y XL			
	Winter tires (TEQ)	275/ 45 R20 110V XL			
20-inch RS Spyder Design wheel					
	FA wheels	9.0 J x 20 RO 57			
	Summer tires	275/ 45 R20 110Y XL			
	Winter tires (TEQ)	275/ 45 R20 110V XL			
	RA wheels	9.0 J x 20 RO 57			
	Summer tires	275/ 45 R20 110Y XL			
	Winter tires (TEQ)	275/ 45 R20 110V XL			
21-inch 911 Turbo II wheel					
	FA wheels	10.0 J x 21 RO 50			
	Summer tires	295/35 R21 107Y XL			
	RA wheels	10.0 J x 21 RO 50			
	Summer tires	295/35 R21 107Y XL			
21-inch Cayenne SportEdition wheel					
	FA wheels	10.0 J x 21 RO 50			
	Summer tires	295/35 R21 107Y XL			
	RA wheels	10.0 J x 21 RO 50			
	Summer tires	295/35 R21 107Y XL			

		Cayenne	Cayenne S	Cayenne S Hybrid	Cayenne Turbo
18-inch tire pressure (V _{max})					
FA partially loaded	bar / psi	2.6 / 37	2.6 / 37	2.6 / 37	-
fully loaded	bar / psi	2.6 / 37	2.6 / 37	2.6 / 37	-
RA partially loaded	bar / psi	2.9 / 42	2.9 / 42	2.9 / 42	-
fully loaded	bar / psi	3.2 / 46	3.2 / 46	3.2 / 46	-
19-inch tire pressure (V _{max})					
FA partially loaded	bar / psi	2.6 / 37	2.6 / 37	2.6 / 37	2.6 / 37
fully loaded	bar / psi	2.6 / 37	2.6 / 37	2.6 / 37	2.6 / 37
RA partially loaded	bar / psi	2.9 / 42	2.9 / 42	2.9 / 42	2.9 / 42
fully loaded	bar / psi	3.2 / 46	3.2 / 46	3.2 / 46	3.2 / 46
20-inch tire pressure (V _{max})					
FA partially loaded	bar / psi	2.6 / 37	2.6 / 37	2.6 / 37	2.6 / 37
fully loaded	bar / psi	2.6 / 37	2.6 / 37	2.6 / 37	2.6 / 37
RA partially loaded	bar / psi	2.9 / 42	2.9 / 42	2.9 / 42	2.9 / 42
fully loaded	bar / psi	3.2 / 46	3.2 / 46	3.2 / 46	3.2 / 46
21-inch tire pressure (V _{max})					
FA partially loaded	bar / psi	2.6 / 37	2.6 / 37	2.6 / 37	2.6 / 37
fully loaded	bar / psi	2.6 / 37	2.6 / 37	2.6 / 37	2.7 / 39
RA partially loaded	bar / psi	2.9 / 42	2.9 / 42	2.9 / 42	2.9 / 42
fully loaded	bar / psi	3.2 / 46	3.2 / 46	3.2 / 46	3.2 / 46
Tire repair system		Equipped with tire sealing compound and compressor			
18-inch collapsible spare wheel					
Wheel		6.5 x 18 R0 28			-
Tires		195/75 18 106P			-
19-inch collapsible spare wheel					
Wheel		6.5 x 19 R0 28			
Tires		195/65 19 106P			
Collapsible spare wheel tire pressure					
18-inch	bar / psi	3.5 / 51			
19-inch	bar / psi	3.5 / 51			
Weight (depending on equipment)					
Weight unladen (DIN)					
Manual transmission	kg / lbs	1,995 / 4,398	-	-	-
Tiptronic S	kg / lbs	2,030 / 4,475	2,065 / 4,553	2,240 / 4,938	2,170 / 4,784
Weight unladen (EG)					
Manual transmission	kg	2,070	-	-	-
Tiptronic S	kg	2,105	2,140	2,315	2,245
Permissible gross weight					
Manual transmission	kg / lbs	2,765 / 6,096	-	-	-
Tiptronic S	kg / lbs	2,800 / 6,173	2,840 / 6,261	2,910 / 6,415	2,880 / 6,349
Permissible axle load					
FA					
Manual transmission	kg / lbs	1,315 / 2,899	-	-	-
Tiptronic S	kg / lbs	1,320 / 2,910	1,360 / 2,998	1,375 / 3,031	1,400 / 3,086
RA					
Manual transmission	kg / lbs	1,535 / 3,384	-	-	-
Tiptronic S	kg / lbs	1,535 / 3,384	1,535 / 3,384	1,600 / 3,527	1,535 / 3,384
Maximum payload	kg / lbs	770 / 1,698	775 / 1,709	670 / 1,477	710 / 1,565
Max. permissible roof load with original Porsche roof transport system	kg / lbs	100 / 220	100 / 220	100 / 220	100 / 220
Max. permissible trailer load, braked					
Manual transmission	kg / lbs	2,700/5,952	-	-	-
Tiptronic S	kg / lbs	3,500 / 7,716	3,500 / 7,716	3,500 / 7,716	3,500 / 7,716
Max. permissible trailer load, unbraked	kg / lbs	750 / 1,653	750 / 1,653	750 / 1,653	750 / 1,653

			Cayenne	Cayenne S	Cayenne S Hybrid	Cayenne Turbo
Performance						
Top speed						
	Manual transmission	km/h / mph	230 / 142.9	-	-	-
	Tiptronic S	km/h / mph	230 / 142.9	258 / 160.4	242 / 150.4	278 / 172.8
Acceleration 0-96 km/h (0-60 mph)						
	Manual transmission	s	7.1	-	-	-
	Tiptronic S	s	7.4	5.6	6.1	4.4
Acceleration						
0-100 km/h	Manual transmission	s	7.5	-	-	-
	Tiptronic S	s	7.8	5.9	6.5	4.7
Acceleration						
0-160 km/h	Manual transmission	s	19	-	-	-
	Tiptronic S	s	19.7	13.9	16.5	10.5
1,000 m from standing start						
	Manual transmission	s	28.2	-	-	-
	Tiptronic S	s	28.7	25.5	27	23.5
¼ mile from standing start						
	Manual transmission	s	15.4	-	-	-
	Tiptronic S	s	15.7	14.2	14.7	13
Elasticity in 5th gear, 80-120 km/h						
	Manual transmission	s	9.6	-	-	-
In-gear acceleration, 80-120 km/h						
	Tiptronic S	s	5.4	4	4.6	3.1
Exterior dimensions						
Length		mm / in	4,846 / 190.8	4,846 / 190.8	4,846 / 190.8	4,846 / 190.8
Width	without exterior mirrors	mm / in	1,939 / 76.3	1,939 / 76.3	1,939 / 76.3	1,939 / 76.3
	with exterior mirrors	mm / in	2,155 / 84.8	2,155 / 84.8	2,155 / 84.8	2,155 / 84.8
Height		mm / in	1,705 / 67.1	1,705 / 67.1	1,705 / 67.1	1,702 / 67.0
Wheelbase		mm / in	2,895 / 114	2,895 / 114	2,895 / 114	2,895 / 114
Front track width						
	18-inch wheels	mm / in	1,655 / 65.2	1,655 / 65.2	1,655 / 65.2	-
	19-inch wheels	mm / in	1,643 / 64.7	1,643 / 64.7	1,643 / 64.7	1,643 / 64.7
	20-inch wheels	mm / in	1,647 / 64.8	1,647 / 64.8	1,647 / 64.8	1,647 / 64.8
	21-inch wheels	mm / in	1,661 / 65.4	1,661 / 65.4	1,661 / 65.4	1,661 / 65.4
Rear track width						
	18-inch wheels	mm / in	1,669 / 65.7	1,669 / 65.7	1,669 / 65.7	-
	19-inch wheels	mm / in	1,657 / 65.2	1,657 / 65.2	1,657 / 65.2	1,657 / 65.2
	20-inch wheels	mm / in	1,661 / 65.4	1,661 / 65.4	1,661 / 65.4	1,661 / 65.4
	21-inch wheels	mm / in	1,675 / 65.9	1,675 / 65.9	1,675 / 65.9	1,675 / 65.9

		Cayenne	Cayenne S	Cayenne S Hybrid	Cayenne Turbo
Drag coefficient cd		0.36	0.36	0.36	0.36
Frontal area A	m ²	2.8	2.8	2.8	2.79
Drag cd x A		1,008	1,008	1,008	1,004
Turning circle	m / ft	11.9 / 39.1	11.9 / 39.1	11.9 / 39.1	11.9 / 39.1
Interior dimensions					
Luggage compartment volume					
Rear seat bench not folded over (up to top edge of rear bench), in rearmost position	l / US gal.	670 / 177	670 / 177	580 / 153	670 / 177
Rear seat bench fully folded	l / US gal.	1,780 / 470.3	1,780 / 470.3	1,690 / 446.5	1,705 / 450.5
Luggage compartment dimensions					
Luggage compartment height up to lower edge of roller blind	mm / in	443 / 17.4	443 / 17.4	443 / 17.4	443 / 17.4
Luggage compartment length of loading floor (rear seats to tailgate)	mm / in	987 - 1,147/38.9	987 - 1,147/38.9	987 - 1,147/38.9	987 - 1,147/38.9
Max. luggage compartment width		1,166 / 45.9	1,166 / 45.9	1,166 / 45.9	1,166 / 45.9
Tank capacity/reserve	l	85 / 15	85 / 15	85 / 13	100 / 15
Off-road properties					
Max. fording depth with steel suspension or air suspension at Normal Level (DIN unladen)	mm / in	500 / 19.7	500 / 19.7	500 / 19.7	500 / 19.7
Max. fording depth with air suspension at High Level II (DIN unladen)	mm / in	555 / 21.9	555 / 21.9	555 / 21.9	555 / 21.9
Approach angle (DIN unladen)					
Steel suspension	Degrees	26	26	26	-
Air susp. Normal Level		25.5	25.5	25.5	26
Air susp. High Level II		29.5	29.5	29.5	29.5
Departure angle (DIN unladen)					
Steel suspension	Degrees	24.5	24.5	24.5	-
Air susp. Normal Level		24	24	24	24.5
Air susp. High Level II		27.5	27.5	27.5	27.5
Ramp breakover angle (DIN unladen)					
Steel suspension	Degrees	20.5	20.5	20.5	-
Air susp. Normal Level		20	20	20	20
Air susp. High Level II		24.5	24.5	24.5	25
Locks		Regulated multi-plate clutch , switchable center differential lock	Regulated multi-plate clutch , switchable center differential lock	Self-locking center differential	Regulated multi-plate clutch , switchable center differential lock
Ground clearance (DIN unladen), referred to axle center					
Steel suspension	mm / in	215 / 8.5	215 / 8.5	215 / 8.5	-
Air susp. Normal Level		210 / 8.3	210 / 8.3	210 / 8.3	215 / 8.5
Air susp. High Level II		268 / 10.6	268 / 10.6	268 / 10.6	273 / 10.7

14 Product differentiation

The main differences between the new Cayenne models are described below. The product description is based on the US model.

Differences compared with the standard model are shown in bold.

Cayenne	Cayenne Diesel*	Cayenne S	Cayenne S Hybrid	Cayenne Turbo
Engine				
3.6 l V6 engine Power 220 kW/300 hp Torque 400 Nm	3.0 l V6 engine Power 176 kW/240 hp Torque 406 lb ft Turbocharger	4.8 l V8 engine Power 294 kW/400 hp Torque 369 lb ft	3.0 l V6 engine Power 245 kW/333 hp Torque 325 lb ft Supercharger	4.8 l V8 engine Power 368 kW/500 hp Torque 516 lb ft Biturbocharger
-	-	-	Electric motor Power 34 kW/47 hp Torque 221 lb ft	-
-	-	-	Total system Power 279 kW/380 hp Torque 428 lb ft	-
All-wheel drive				
PTM with fully variable all-wheel drive with electronically controlled multi-plate clutch	PTM with permanent all-wheel drive with self-locking center differential	PTM with fully variable all-wheel drive with electronically controlled multi-plate clutch	PTM with permanent all-wheel drive with self-locking center differential	PTM with fully variable all-wheel drive with electronically controlled multi-plate clutch
Transmission				
8-speed Tiptronic S incl. Auto Start Stop function				
Chassis				
Steel suspension				Air suspension incl. PASM
18-inch Cayenne wheel		18-inch Cayenne S III wheel		19-inch Cayenne Turbo wheel
Integral-type brake discs front/rear with diameter 13.8/13.0 inch, internally vented		Integral-type brake discs front/rear with diameter 14.2/13.0 inch, internally vented		Integral-type brake discs front/rear with diameter 15.4/14.1 inch, internally vented
Black brake calipers		Silver-colored brake calipers		Red brake calipers
Body				
Solid paint				Solid/metallic paint
Front end with integrated cooling air intakes, slats of the side air intakes painted in exterior color		Front end with integrated cooling air intakes, slats of the side air intakes in Black		Turbo front end with enlarged air intakes, Black
"Power dome" on hood				Distinctive power dome
Oval single tailpipes at outside left and right				2 round twin tailpipes , at outside left and right
Logotype on rear "Cayenne"		Logotype on rear " Cayenne S "		Logotype on rear " Cayenne turbo "

* not for US

Cayenne	Cayenne Diesel*	Cayenne S	Cayenne S Hybrid	Cayenne Turbo
-	"diesel" designation on front fenders left and right	-	"hybrid" designation on front fenders left and right	-
26.4 gal fuel tank with 4 gal reserve capacity	85 l fuel tank with 13 l reserve capacity	26.4 gal fuel tank with 4 gal reserve capacity	26.4 gal fuel tank with 4 gal reserve capacity	26.4 gal fuel tank with 4 gal reserve capacity
Interior				
8-way power seats on the driver's and front passenger's side				Adaptive sports seats with memory package, 18-way adjustment
-	-	-	-	Heated seats front and rear
-	-	-	-	Heated steering wheel
Rooflining made of fabric				Alcantara rooflining incl. sun visors
Sun visors in plastic with imprint				
Partial leather interior in the colors Luxor Beige, Platinum Gray and Black				Leather interior in smooth-finish leather in the colors Luxor Beige, Platinum Gray, Black and Umber
Trim strips in High-gloss Black				Trim strips in Brushed Aluminum
Door sill guards in plastic	Door sill guards in stainless steel with logotype "Cayenne S" (front)			Door sill guards in stainless steel with logotype "Cayenne turbo" (front)
Electrics				
5 round instruments with silver-colored bezels, incl. 4.8-inch TFT color display				
Tachometer with black background	Tachometer with gray background	Tachometer with gray background, "hybrid" designation and Ready indicator	Tachometer with black background, silver-colored bezels and "turbo" designation	
-	-	-	Analog electric power meter	-
-	-	-	-	ParkAssist (front and rear)
-	-	-	-	Automatically dimming exterior and interior rear view mirrors
Audio and communication				
CDR-31 audio system, double-tuner radio, single CD drive				Porsche Communication Management (PCM) incl. navigation modul and CD/DVD drive
10 speakers, total output 100 W				BOSE® Surround Sound System (digital) with 585 W
Lights				
LED daytime driving lights in front light units				Daytime driving lights with 4 LED spotlights in the headlight
H7 projector-type headlights with automatic static range adjustment				Bi-Xenon headlights incl. PDLs

15 Main product advantages

The following is a comparison of key competitive advantages and technical data between the new Cayenne and the various **main competitors**. For the purposes of this study, the same drive concepts of the Cayenne models and competitors were chosen in each case. The competitor models with gasoline engine are therefore compared with the Cayenne or Cayenne S depending on the number of cylinders, the diesel variants with the Cayenne Diesel and the competitors with hybrid systems with the Cayenne S Hybrid.

Note: The competitor comparison relates to US-specification models, except for the Cayenne Diesel, which is not available in the US. Information

on competitor vehicles has been obtained from brochures, press reports and dealerships. Accuracy cannot be guaranteed.

15.1 Main advantages of the Cayenne

Main advantages of the Porsche Cayenne compared with the 2010 Audi Q7 3.6 FSI



Criterion	Advantages compared with the 2010 Audi Q7 3.6 FSI
Engine/Performance	<ul style="list-style-type: none"> • Higher engine power (+20 hp) • Higher torque (+29 lb ft) • Better power-to-weight ratio (-3.54 lb/hp with Tiptronic S) • Higher top speed (+13 mph) • Better acceleration (-0.8 s from 0-60 mph) • Sports exhaust system (optional)
Power transmission	<ul style="list-style-type: none"> • Active all-wheel drive with fully variable torque distribution (Q7: permanent) • 6-speed manual transmission for a sporty, active driving experience • Optional 8-speed Tiptronic S for lower fuel consumption and low noise level even at higher speeds (Q7: 6-speed)

Chassis	<ul style="list-style-type: none"> • PASM electronic damper adjustment with 3 manually selectable chassis settings also for steel suspension (optional) • Electric parking brake (Q7: foot-operated parking brake) • Porsche Torque Vectoring Plus (PTV Plus) with electronically controlled rear differential lock (optional) • Porsche Dynamic Chassis Control active anti-roll stabilization (PDCC; optional)
Off-road properties	<ul style="list-style-type: none"> • Greater approach/departure angle with steel suspension (+5.0°/+1.1° respectively) and air suspension (optional; +6.0°/+2.1° respectively) • Greater ground clearance with steel suspension (+0.4 inch) and air suspension (optional; +1.1 inch) • Greater fording depth (+0.8 inch) and ramp breakover angle (+0.7°) with air suspension
Exterior	<ul style="list-style-type: none"> • Heated windshield (optional) • Electric roll-up sunscreen for rear side windows (optional; Q7: manual) • Electric slide/tilt glass roof (optional; Q7: Panoramic roof only)
Interior	<ul style="list-style-type: none"> • More extensive range of interior colors • Standard rear seat bench can be adjusted by 6.3 inch in longitudinal direction
Electrics, audio and communication	<ul style="list-style-type: none"> • Standard sound system with higher total output (+20 W) and 2 additional speakers • Electronic logbook (optional)
Overall vehicle	<ul style="list-style-type: none"> • More agile cornering due to shorter wheelbase (-4.2 inch) • More compact exterior dimensions (-9.6 inch length, -1.7 inch width, -1.3 inch height) • Lower total weight (-695 lb)

Main advantages of the Porsche Cayenne compared with the 2010 BMW X5 xDrive 30i



Criterion	Advantages compared with the 2010 BMW X5 xDrive 30i
Engine/Performance	<ul style="list-style-type: none"> • Higher engine power (+40 hp) • Higher torque (+70 lb ft) • Better power-to-weight ratio (-4.24 lb/hp with Tiptronic S) • Higher top speed (+13 mph) • Better acceleration (-0.4 s with Tiptronic S from 0-60 mph) • Sports exhaust system (optional)
Power transmission	<ul style="list-style-type: none"> • 6-speed manual transmission for a sporty, active driving experience • Optional 8-speed Tiptronic S for lower fuel consumption and low noise level even at higher speeds (X5: 6-speed)
Chassis	<ul style="list-style-type: none"> • PASM electronic damper adjustment with 3 manually selectable chassis settings also for steel suspension (optional) • Air suspension with 6-stage height adjustment incl. PASM (optional) • Porsche Torque Vectoring Plus (PTV Plus) with electronically controlled rear differential lock (optional) • Porsche Ceramic Composite Brake (PCCB; optional)

Off-road properties	<ul style="list-style-type: none"> • Greater approach/departure and ramp breakover angles • Greater maximum ground clearance, fording depth as well as approach/departure and ramp breakover angles through High Level II of air suspension incl. PASM
Exterior	<ul style="list-style-type: none"> • Heated windshield (optional) • Electric roll-up sunscreen for rear side windows (optional; X5: manual) • Electric slide/tilt glass roof (optional; X5: Panoramic roof only)
Interior	<ul style="list-style-type: none"> • More extensive range of optional interior colors • Standard electrically adjustable partial leather seats (8-way) (X5: fabric seats, partially electrical) • Standard bottle holders in the doors front and rear • Greater flexibility through split rear seat bench in the ratio 40:20:40 (X5: 60:40) • Standard rear seat bench can be adjusted by 6.3 inch in longitudinal direction, standard backrest angle can be adjusted by 6° • Side airbags in the rear (optional on X5)
Electrics, audio and communication	<ul style="list-style-type: none"> • Standard LED tail lights • Adaptive cruise control (optional) • Lane Change Assist (optional) • BURMESTER® High-End Surround Sound System with a total output of more than 1,000 W (optional; X5: max. 825 W)
Overall vehicle	<ul style="list-style-type: none"> • More agile cornering due to shorter wheelbase (-1.5 inch) • Sportier character due to lower height (-2.8 inch), shorter length (-0.3 inch) and greater width (+0.2 inch) • Larger luggage compartment volume (+1.8 cu ft) • Higher maximum payload (+198 lb) • Lower curb weight (-507 lb with Tiptronic S) • Higher maximum trailer load (+1764 lb with Tiptronic S)

Main advantages of the Porsche Cayenne compared with the 2010 Mercedes-Benz ML 350



Criterion	Advantages compared with the 2010 Mercedes-Benz ML 350
Engine/Performance	<ul style="list-style-type: none"> • Higher engine power (+32 hp) • Higher torque (+38 lb ft) • Better power-to-weight ratio (-2.36 lb/hp with Tiptronic S) • Higher top speed (+13 mph) • Better acceleration (-0.5 s with Tiptronic S from 0-60 mph) • Sports exhaust system (optional)
Power transmission	<ul style="list-style-type: none"> • Active all-wheel drive with variable torque distribution (ML: permanent) • 6-speed manual transmission for a sporty, active driving experience • Optional 8-speed Tiptronic S for lower fuel consumption and a low noise level even at higher speeds (ML: 7-speed)
Chassis	<ul style="list-style-type: none"> • PASM electronic damper adjustment with 3 manually selectable chassis settings also for steel suspension (optional) • Internally vented brake discs front and rear (ML: front only) • Porsche Ceramic Composite Brake (PCCB; optional) • Electric parking brake (ML: foot-operated parking brake) • Porsche Torque Vectoring Plus (PTV Plus) with electronically controlled rear differential lock (optional) • Porsche Dynamic Chassis Control active anti-roll stabilization (PDCC; optional)

Off-road properties	<ul style="list-style-type: none"> • Greater ramp breakover angle with steel suspension (+3.5°) and air suspension (+3° in the Normal Level, +1.5° in High Level II)
Exterior	<ul style="list-style-type: none"> • Heated windshield (optional) • Electric roll-up sunscreen for rear side windows (optional) • Panoramic Roof System (optional)
Interior	<ul style="list-style-type: none"> • More extensive range of optional interior colors • Standard partial leather seats (ML: imitation leather) • Standard bottle holders in the doors front and rear • Greater flexibility through split rear seat bench in the ratio 40:20:40 (ML: 60:40) • Standard rear seat bench can be adjusted by 6.3 inch in longitudinal direction, backrest angle can be adjusted by 6° • Removable ski bag (optional)
Electrics, audio and communication	<ul style="list-style-type: none"> • Standard position light, daytime driving light and direction indicator light in the front light unit in LED technology • Standard LED tail lights • Lane Change Assist (optional) • 4-zone climate control (optional; ML: 3-zone climate control) • BURMESTER® High-End Surround Sound System with a total output of more than 1,000 W (optional; ML: max. 610 W) • Electronic logbook (optional)
Overall vehicle	<ul style="list-style-type: none"> • More agile cornering due to shorter wheelbase (-0.8 inch) • Sportier character due to lower height (-4.3 inch) • Lower total weight (-230 lb)

15.2 Main advantages of the Cayenne Diesel

Main advantages of the Porsche Cayenne Diesel compared with the Audi Q7 3.0 TDI



Criterion	Advantages compared with the Audi Q7 3.0 TDI
Engine/Performance	<ul style="list-style-type: none"> • Better power-to-weight ratio (-0.50 kg/hp) • Higher top speed (+8 km/h) • Better acceleration (-0.7 s from 0-100 km/h) • Lower fuel consumption (-1.7 l/100 km) • Lower CO₂ emissions (-44 g/km) • Complies with the EU5 standard (Q7: EU4) • Longer range (+252 km with 100-liter fuel tank)
Power transmission	<ul style="list-style-type: none"> • 8-speed Tiptronic S for lower fuel consumption and a lower noise level even at higher speeds (Q7: 6-speed) • Variable torque distribution on the rear axle
Chassis	<ul style="list-style-type: none"> • PASM electronic damper adjustment with 3 manually selectable chassis settings also for steel suspension (optional) • Electric parking brake (Q7: foot-operated parking brake)
Off-road properties	<ul style="list-style-type: none"> • Greater approach/departure angle with steel suspension (+5.0°/+1.1° respectively) and air suspension (optional; +6.0°/+2.1° respectively) • Greater ground clearance with steel suspension (+10.2 mm) and air suspension (optional; +28.2 mm) • Greater fording depth (+20 mm) and ramp breakover angle (+0.7°) with air suspension

Exterior	<ul style="list-style-type: none"> • Heated windshield (optional) • Electric roll-up sunscreen for rear side windows (optional; Q7: manual) • Electric slide/tilt glass roof (optional; Q7: Panoramic roof only)
Interior	<ul style="list-style-type: none"> • More extensive range of interior colors • Standard electrically adjustable partial leather seats (8-way) (Q7: fabric seats, manual) • Standard rear seat bench can be adjusted by 160 mm in longitudinal direction • Standard seat-belt pretensioners on the outer rear seats
Electrics, audio and communication	<ul style="list-style-type: none"> • Standard position light, daytime driving light and direction indicator light in the front light unit in LED technology (Q7: LED daytime driving lights optional) • Adaptive brake lights • Standard cruise control (Q7: optional) • Standard alarm system with ultrasonic interior surveillance • Standard sound system with higher total output (+20 W) and 2 additional speakers • Electronic logbook (optional)
Overall vehicle	<ul style="list-style-type: none"> • More agile cornering due to shorter wheelbase (-107 mm) • More compact exterior dimensions (-243 mm length, -44 mm width, -32 mm height) • Lower total weight (-120 kg)



Main advantages of the Porsche Cayenne Diesel compared with the BMW X5 xDrive 30d



Criterion	Advantages compared with the BMW X5 xDrive 30d
Engine/Performance	<ul style="list-style-type: none"> • Higher engine power (+5 hp) • Higher torque (+30 Nm) • Better acceleration (-0.3 s from 0-100 km/h) • Lower fuel consumption (-0.8 l/100 km) • Lower CO₂ emissions (-22 g/km) • Complies with the EU5 standard (X5: EU4) • Longer range (+314 km with 100-liter fuel tank)
Power transmission	<ul style="list-style-type: none"> • 8-speed Tiptronic S for lower fuel consumption and a low noise level even at higher speeds (X5: 6-speed)
Chassis	<ul style="list-style-type: none"> • PASM electronic damper adjustment with 3 manually selectable chassis settings also for steel suspension (optional) • Air suspension with 6-stage height adjustment incl. PASM (optional) • Porsche Ceramic Composite Brake (PCCB; optional) • Tire Pressure Monitoring (TPM; optional)
Off-road properties	<ul style="list-style-type: none"> • Greater approach/departure and ramp breakover angles • Greater maximum ground clearance, fording depth as well as approach/departure and ramp breakover angles through High Level II of air suspension incl. PASM

Exterior	<ul style="list-style-type: none"> • Heated windshield (optional) • Electric roll-up sunscreen for rear side windows (optional; X5: manual) • Electric slide/tilt glass roof (optional; X5: Panoramic roof only)
Interior	<ul style="list-style-type: none"> • More extensive range of optional interior colors • Standard electrically adjustable partial leather seats (8-way) (X5: fabric seats, partially electrical) • Standard bottle holders in the doors front and rear • Greater flexibility through split rear seat bench in the ratio 40:20:40 (X5: 60:40) • Standard rear seat bench can be adjusted by 160 mm in longitudinal direction, standard backrest angle can be adjusted by 6° • Side airbags in the rear (optional) • Standard seat-belt pretensioners on the outer rear seats
Electrics, audio and communication	<ul style="list-style-type: none"> • Standard position light, daytime driving light and direction indicator light in the front light unit in LED technology • Standard LED tail lights with adaptive brake lights • Adaptive cruise control (optional) • Lane Change Assist (optional) • Standard alarm system with ultrasonic interior surveillance • Standard 2-zone climate control with separate temperature controls for driver and passenger (X5: 1 zone) • BURMESTER® High-End Surround Sound System with a total output of more than 1,000 W (optional; X5: max. 825 W) • Telephone module with Bluetooth® interface and telephone module with cordless handset and Bluetooth® interface (optional)
Overall vehicle	<ul style="list-style-type: none"> • More agile cornering due to shorter wheelbase (-38 mm) • Sportier character due to lower height (-71 mm), shorter length (-8 mm) and greater width (+6 mm) • Larger maximum luggage compartment capacity (+50 l) • Higher maximum payload (+80 kg)



Chapter 15.2 Main advantages of the Cayenne Diesel does not apply to the North American market

Main advantages of the Porsche Cayenne Diesel compared with the Mercedes-Benz ML 350 CDI



Criterion	Advantages compared with the Mercedes-Benz ML 350 CDI
Engine/Performance	<ul style="list-style-type: none"> • Higher engine power (+9 hp) • Higher torque (+10 Nm) • Better power-to-weight ratio (-0.38 kg/hp) • Lower fuel consumption (-1.5 l/100 km) • Lower CO₂ emissions (-40 g/km) • Longer range (+284 km with 100-liter fuel tank)
Power transmission	<ul style="list-style-type: none"> • 8-speed Tiptronic S for lower fuel consumption and a low noise level even at higher speeds (ML: 7-speed)
Chassis	<ul style="list-style-type: none"> • PASM electronic damper adjustment with 3 manually selectable chassis settings also for steel suspension (optional) • Porsche Ceramic Composite Brake (PCCB; optional) • Electric parking brake (ML: foot-operated parking brake) • Standard 18-inch wheels (ML: 17-inch)
Off-road properties	<ul style="list-style-type: none"> • Greater ramp breakover angle with steel suspension (+3.5°) and air suspension (+3° in the Normal Level, +1.5° in High Level II)

Exterior	<ul style="list-style-type: none"> • Heated windshield (optional) • Electric roll-up sunscreen for rear side windows (optional) • Panoramic Roof System (optional) • Electrically extendable trailer hitch (optional; ML: mechanical)
Interior	<ul style="list-style-type: none"> • More extensive range of optional interior colors • Standard electrically adjustable partial leather seats (8-way) (ML: imitation leather, manual) • Standard bottle holders in the doors front and rear • Greater flexibility through split rear seat bench in the ratio 40:20:40 (ML: 60:40) • Standard rear seat bench can be adjusted by 160 mm in longitudinal direction, standard backrest angle can be adjusted by 6° • Removable ski bag (optional)
Electrics, audio and communication	<ul style="list-style-type: none"> • Standard position light, daytime driving light and direction indicator light in the front light unit in LED technology • Standard LED tail lights with adaptive brake lights (ML: optional) • Rain sensor (ML: optional) • Lane Change Assist (optional) • 4-zone climate control (optional; ML: 3-zone climate control) • BURMESTER® High-End Surround Sound System with a total output of more than 1,000 W (optional; ML: max. 610 W) • Telephone module with Bluetooth® interface and telephone module with cordless handset and Bluetooth® interface (optional) • Electronic logbook (optional)
Overall vehicle	<ul style="list-style-type: none"> • More agile cornering due to shorter wheelbase (-20 mm) • Sportier character due to lower height (-110 mm) • Lower total weight (-10 kg)



Main advantages of the Porsche Cayenne Diesel compared with the Range Rover Sport TDV6



Criterion	Advantages compared with the Range Rover Sport TDV6
Engine/Performance	<ul style="list-style-type: none"> • Better power-to-weight ratio (-1.60 kg/hp) • Higher top speed (+25 km/h) • Better acceleration (-1.5 s from 0-100 km/h) • Lower fuel consumption (-1.8 l/100 km) • Lower CO₂ emissions (-48 g/km) • Longer range (+437 km with 100-liter fuel tank)
Power transmission	<ul style="list-style-type: none"> • 8-speed Tiptronic S for lower fuel consumption and a lower noise level even at higher speeds (RRS: 6-speed) • Variable torque distribution on the rear axle
Chassis	<ul style="list-style-type: none"> • Porsche Ceramic Composite Brake (PCCB; optional) • Tire sealing compound with electric compressor
Off-road properties	<ul style="list-style-type: none"> • Greater maximum ground clearance with air suspension (+41 mm)

Exterior	<ul style="list-style-type: none"> • Electrically retractable exterior mirrors (RRS: optional) • Heated windshield (optional) • Electric roll-up sunscreen for rear side windows (optional) • Panoramic Roof System (optional) • Electrically extendable trailer hitch (optional; RRS: removable)
Interior	<ul style="list-style-type: none"> • More extensive range of standard interior colors • More extensive range of optional decorative inlays • Seat ventilation in front (optional) • Electric 4-way lumbar support (optional; RRS: manual) • Adaptive sports seats with electrical 18-way adjustment (optional) • Greater flexibility through split rear seat bench in the ratio 40:20:40 (RRS: 60:40) • Standard rear seat bench can be adjusted by 160 mm in longitudinal direction, standard backrest angle can be adjusted by 6° • Removable ski bag (optional) • Cargo management (optional) • Powerlift tailgate (optional)
Electrics, audio and communication	<ul style="list-style-type: none"> • Bi-Xenon headlights incl. Porsche Dynamic Light System (optional; RRS: Bi-Xenon only) • Lane Change Assist (optional) • 4-zone climate control (optional) • BURMESTER® High-End Surround Sound System with a total output of more than 1,000 W (optional; RRS: 720 W) • HomeLink® garage door opener (optional) • Electronic logbook (optional)
Overall vehicle	<ul style="list-style-type: none"> • More compact exterior dimensions (-65 mm width, -34 mm height) • Lower total weight (-360 kg) • Higher maximum payload (+45 kg)



15.3 Main advantages of the Cayenne S

Main advantages of the Porsche Cayenne S compared with the 2010 Audi Q7 4.2 FSI



Criterion	Advantages compared with the 2010 Audi Q7 4.2 FSI
Engine/Performance	<ul style="list-style-type: none"> • Higher engine power (+50 hp) • Higher torque (+44 lb ft) • Better power-to-weight ratio (-4.11 lb/hp) • Higher top speed (+20 mph) • Better acceleration (-1.4 s from 0-60 mph) • Sports exhaust system (optional)
Power transmission	<ul style="list-style-type: none"> • Active all-wheel drive with fully variable torque distribution (Q7: permanent) • 8-speed Tiptronic S for lower fuel consumption and a lower noise level even at higher speeds (Q7: 6-speed)
Chassis	<ul style="list-style-type: none"> • PASM electronic damper adjustment with 3 manually selectable chassis settings also for steel suspension (optional) • Electric parking brake (Q7: foot-operated parking brake) • Porsche Torque Vectoring Plus (PTV Plus) with electronically controlled rear differential lock (optional) • Porsche Dynamic Chassis Control active anti-roll stabilization (PDCC; optional)
Off-road properties	<ul style="list-style-type: none"> • Greater approach/departure angle with steel suspension (+5.0°/+1.1° respectively) and air suspension (optional; +6.0°/+2.1° respectively) • Greater ground clearance with steel suspension (+0.4 inch) and air suspension (optional; +1.1 inch) • Greater fording depth (+0.8 inch) and ramp breakover angle (+0.7°) with air suspension

Exterior	<ul style="list-style-type: none"> • Heated windshield (optional) • Electric roll-up sunscreen for rear side windows (optional; Q7: manual) • Electric slide/tilt glass roof (optional; Q7: Panoramic roof only)
Interior	<ul style="list-style-type: none"> • More extensive range of optional interior colors • Standard electrical 8-way seat adjustment (Q7: optional) • Standard rear seat bench can be adjusted by 6.3 inch in longitudinal direction
Electrics, audio and communication	<ul style="list-style-type: none"> • Standard position light, daytime driving light and direction indicator light in the front light unit in LED technology (Q7: LED daytime driving lights optional) • Adaptive brake lights • Standard alarm system with ultrasonic interior surveillance • Standard sound system with higher total output (+20 W) and 2 additional speakers • Electronic logbook (optional)
Overall vehicle	<ul style="list-style-type: none"> • More agile cornering due to shorter wheelbase (-4.2 inch) • More compact exterior dimensions (-9.6 inch length, -1.7 inch width, -1.3 inch height) • Lower total weight (-617 lb)

Main advantages of the Porsche Cayenne S compared with the 2010 BMW X5 xDrive 48i



Criterion	Advantages compared with the 2010 BMW X5 xDrive 48i
Engine/Performance	<ul style="list-style-type: none"> • Higher engine power (+45 hp) • Higher torque (+19 lb ft) • Better power-to-weight ratio (-3.86 lb/hp) • Higher top speed (+20 mph) • Better acceleration (-0.8 s from 0-60 mph) • Sports exhaust system (optional)
Power transmission	<ul style="list-style-type: none"> • 8-speed Tiptronic S for lower fuel consumption and a low noise level even at higher speeds (X5: 6-speed)
Chassis	<ul style="list-style-type: none"> • PASM electronic damper adjustment with 3 manually selectable chassis settings also for steel suspension (optional) • Air suspension with 6-stage height adjustment incl. PASM (optional) • Porsche Torque Vectoring Plus (PTV Plus) with electronically controlled rear differential lock (optional) • Porsche Ceramic Composite Brake (PCCB; optional)
Off-road properties	<ul style="list-style-type: none"> • Greater approach/departure and ramp breakover angles • Greater maximum ground clearance, fording depth as well as approach/departure and ramp breakover angles through High Level II of air suspension incl. PASM

Exterior	<ul style="list-style-type: none"> • Heated windshield (optional) • Electric roll-up sunscreen for rear side windows (optional; X5: manual) • Electric slide/tilt glass roof (optional; X5: Panoramic roof only)
Interior	<ul style="list-style-type: none"> • More extensive range of optional interior colors • Standard electrically adjustable partial leather seats (8-way) (X5: fabric seats, partially electrical) • Standard bottle holders in the doors front and rear • Greater flexibility through split rear seat bench in the ratio 40:20:40 (X5: 60:40) • Standard rear seat bench can be adjusted by 6.3 inch in longitudinal direction, standard backrest angle can be adjusted by 6° • Side airbags in the rear
Electrics, audio and communication	<ul style="list-style-type: none"> • Standard position light, daytime driving light and direction indicator light in the front light unit in LED technology • Standard LED tail lights • Adaptive cruise control (optional) • Lane Change Assist (optional) • BURMESTER® High-End Surround Sound System with a total output of more than 1,000 W (optional; X5: max. 825 W)
Overall vehicle	<ul style="list-style-type: none"> • More agile cornering due to shorter wheelbase (-1.5 inch) • Sportier character due to lower height (-2.8 inch), shorter length (-0.3 inch) and greater width (+0.24 inch) • Larger luggage compartment volume (+1.8 cu ft) • Lower total weight (-782 lb) • Higher maximum payload (+209 lb)

Main advantages of the Porsche Cayenne S compared with the 2011 Mercedes-Benz ML 550



Criterion	Advantages compared with the 2011 Mercedes-Benz ML 550
Engine/Performance	<ul style="list-style-type: none"> • Higher engine power (+12 hp) • Higher top speed (+20 mph) • Sports exhaust system (optional)
Power transmission	<ul style="list-style-type: none"> • Active all-wheel drive with fully variable torque distribution (ML: permanent) • Optional 8-speed Tiptronic S for lower fuel consumption and a low noise level even at higher speeds (ML: 7-speed)
Chassis	<ul style="list-style-type: none"> • Porsche Ceramic Composite Brake (PCCB; optional) • Electric parking brake (ML: foot-operated parking brake) • Porsche Torque Vectoring Plus (PTV Plus) with electronically controlled rear differential lock (optional) • Porsche Dynamic Chassis Control active anti-roll stabilization (PDCC; optional)
Off-road properties	<ul style="list-style-type: none"> • Greater ramp breakover angle with air suspension (optional; +3° in the Normal Level, +1.5° in High Level II)

Exterior	<ul style="list-style-type: none"> • Heated windshield (optional) • Electric roll-up sunscreen for rear side windows (optional) • Panoramic Roof System (optional)
Interior	<ul style="list-style-type: none"> • More extensive range of optional interior colors • Standard bottle holders in the doors front and rear • Greater flexibility through split rear seat bench in the ratio 40:20:40 (ML: 60:40) • Standard rear seat bench can be adjusted by 6.3 inch in longitudinal direction, standard backrest angle can be adjusted by 6° • Removable ski bag (optional)
Electrics, audio and communication	<ul style="list-style-type: none"> • Standard LED tail lights • Lane Change Assist (optional) • 4-zone climate control (optional; ML: 3-zone climate control) • BURMESTER® High-End Surround Sound System with a total output of more than 1,000 W (optional; ML: max. 610 W) • Electronic logbook (optional)
Overall vehicle	<ul style="list-style-type: none"> • More agile cornering due to shorter wheelbase (-0.8 inch) • Sportier character due to lower height (-4.3 inch) • Lower total weight (-243 lbs) • Higher maximum payload (+121 lbs)

12.2.4 Main advantages of the Cayenne S Hybrid

Main advantages of the Porsche Cayenne S Hybrid compared with the 2010 BMW ActiveHybrid X6



Criterion	Advantages compared with the 2010 BMW ActiveHybrid X6
Engine/Performance	<ul style="list-style-type: none"> • 3.0 I V6 supercharged engine with high power and torque at low rpm for intelligent performance (BMW: 4.4 I V8 biturbo engine) • Higher top speed (+4 mph) • Lower fuel consumption, according to European testing • Longer range (+224 miles) • Lower total weight (-827 lb) • More compact hybrid system with only 1 electric machine (X6: 2), for lower weight • Coasting up to 97 mph for improved efficiency • E-Power button for more comfortable driving under electric power
Power transmission	<ul style="list-style-type: none"> • 8-speed Tiptronic S for lower fuel consumption and a low noise level even at higher speeds (X6: 7-speed)
Chassis	<ul style="list-style-type: none"> • Porsche Ceramic Composite Brake (PCCB; optional)

Exterior	<ul style="list-style-type: none"> • Heated windshield (optional) • Electric roll-up sunscreen for rear side windows (optional; X6: manual) • Panoramic Roof System (optional; X6: electric slide/tilt roof only)
Interior	<ul style="list-style-type: none"> • More extensive range of optional interior colors • Standard bottle holders in the doors front and rear • More space in the rear for up to 3 people (X6: 2 people) • Greater flexibility through split rear seat bench in the ratio 40:20:40 (X5: 60:40) • Standard rear seat bench can be adjusted by 6.3 inch in longitudinal direction, standard backrest angle can be adjusted by 6° • Side airbags in the rear (optional) • Heated seats front and rear (optional; X6: front only)
Electrics, audio and communication	<ul style="list-style-type: none"> • Standard LED tail lights • Lane Change Assist (optional) • Adaptive cruise control (optional) • Energy management display in the TFT color screen of the instrument cluster • Extensive energy management display in the central information screen with statistics display (optional) • BURMESTER® High-End Surround Sound System with a total output of more than 1,000 W (optional; X6: max. 825 W)
Overall vehicle	<ul style="list-style-type: none"> • More agile cornering due to shorter wheelbase (-1.5 inch) • Sportier character due to lower height and shorter length (-1.2 inch) • Larger luggage compartment volume (+3.9 cu ft) • Higher maximum payload (+209 lb) • Higher maximum trailer load (+3307 lb)

Main advantages of the Porsche Cayenne S Hybrid compared with the 2010 Lexus RX 450h



Criterion	Advantages compared with the 2010 Lexus RX 450h
Engine/Performance	<ul style="list-style-type: none"> • 3.0 I V6 supercharged engine for high torque at low rpm • Higher combustion engine power (+84 hp) • Higher total system power (+81) • Higher combustion engine torque (+91 lb ft) • Higher top speed (+26 mph) • Better acceleration (-1.4 s) • More compact hybrid system with only 1 electric machine (RX: 3), for lower weight • Higher top speed for driving under electric power (+6 mph) • Higher top coasting speed (+53 mph)
Power transmission	<ul style="list-style-type: none"> • Permanent all-wheel drive with self-locking center differential (Lexus: all-wheel drive via electric motor at the rear axle) • 8-speed automatic transmission (Lexus: continuously variable transmission)
Chassis	<ul style="list-style-type: none"> • PASM electronic damper adjustment with 3 manually selectable chassis settings also for steel suspension (optional) • Air suspension with 6-stage height adjustment incl. PASM (optional) • Electric parking brake (Lexus: mechanical foot-operated parking brake) • Porsche Ceramic Composite Brake (PCCB; optional)
Off-road properties	<ul style="list-style-type: none"> • No off-road restrictions imposed by the hybrid system

Exterior	<ul style="list-style-type: none"> • Panoramic Roof System (optional) (Lexus: slide/tilt roof only) • Roof rails (optional)
Interior	<ul style="list-style-type: none"> • Heated seats front and rear (optional) • 14-way power seats (front) with memory package (optional) • Adaptive sports seats with memory package (18-way adjustment) (optional) • Sports steering wheel with shift paddles (optional) • Cargo management (optional)
Electrics, audio and communication	<ul style="list-style-type: none"> • LED daytime driving lights (Lexus: optional) • Driving light assistant • Lane Change Assist (optional) • CDR-31 audio system with touchscreen operation • Porsche Communication Management (PCM) incl. navigation module with touch-screen operation (optional) • BURMESTER® High-End Sound System with output of more than 1,000 W (optional)
Overall vehicle	<ul style="list-style-type: none"> • Larger luggage compartment volume (+4.7 cu ft) • Larger maximum luggage compartment capacity (+4.2 cu ft)

Main advantages of the Porsche Cayenne S Hybrid compared with the 2010 Mercedes-Benz ML 450H



Criterion	Advantages compared with the 2010 Mercedes-Benz ML 450H
Engine/Performance	<ul style="list-style-type: none"> • 3.0 I V6 supercharged engine for high torque at low rpm • Higher combustion engine power (+54 hp) • Higher total system power (+45 hp) • Higher combustion engine torque (+ 66 lb ft) • Higher top speed (+19 mph) • More compact hybrid system with only 1 electric machine (ML: 2), for lower weight • Coasting up to 97 mph for improved efficiency • E-Power button for more comfortable driving under electric power
Chassis	<ul style="list-style-type: none"> • Internally vented brake discs front and rear (ML: front only) • Porsche Ceramic Composite Brake (PCCB; optional) • Electric parking brake (ML: foot-operated parking brake) • Standard 18-inch wheels (ML: 17-inch)

Exterior	<ul style="list-style-type: none"> • Heated windshield (optional) • Electric roll-up sunscreen for rear side windows (optional) • Panoramic Roof System (optional)
Interior	<ul style="list-style-type: none"> • More extensive range of optional interior colors • Standard bottle holders in the doors front and rear • Greater flexibility through split rear seat bench in the ratio 40:20:40 (ML: 60:40) • Standard rear seat bench can be adjusted by 6.3 inch in longitudinal direction, standard backrest angle can be adjusted by 6° • Removable ski bag (optional)
Electrics, audio and communication	<ul style="list-style-type: none"> • Standard LED tail lights • 4-zone climate control (optional; ML: 3-zone climate control) • BURMESTER® High-End Surround Sound System with a total output of more than 1,000 W (optional; ML: max. 610 W) • Electronic logbook (optional)
Overall vehicle	<ul style="list-style-type: none"> • More agile cornering due to shorter wheelbase (-0.8 inch) • Sportier character due to lower height (-4.3 inch) • Lower total weight (-309 lb)

15.5 Main advantages of the Cayenne Turbo

Main advantages of the Porsche Cayenne Turbo compared with the Audi Q7 V12 TDI



Criterion	Advantages compared with the Audi Q7 V12 TDI
Engine/Performance	<ul style="list-style-type: none"> • Better power-to-weight ratio (-0.72 kg/hp) • Complies with the EU5 standard (Q7: EU4) • Higher top speed (+28 km/h) • Better acceleration (-0.8 s from 0-100 km/h) • Lower CO₂ emissions (-28 g/km)
Power transmission	<ul style="list-style-type: none"> • Active all-wheel drive with variable torque distribution (Q7: permanent) • 8-speed Tiptronic S for lower fuel consumption and a lower noise level even at higher speeds (Q7: 6-speed)
Chassis	<ul style="list-style-type: none"> • Electric parking brake (Q7: foot-operated parking brake) • Porsche Torque Vectoring Plus (PTV Plus) with electronically controlled rear differential lock (optional) • Porsche Dynamic Chassis Control active anti-roll stabilization (PDCC; optional) • Full-size spare wheel in the luggage compartment or collapsible spare wheel (optional)

Exterior	<ul style="list-style-type: none"> • Exterior mirrors with standard memory function (Q7: optional) • Heated windshield (optional) • Electric roll-up sunscreen for rear side windows (optional; Q7: manual) • Electric slide/tilt glass roof (optional; Q7: Panoramic roof only)
Interior	<ul style="list-style-type: none"> • More extensive range of optional interior colors • Electrical 18-way seat adjustment (Q7: 12-way) • Standard memory package for storing personal settings for driver and passenger seats, steering column and exterior mirrors as well as other comfort-related settings (Q7: optional) • Standard electrical steering-wheel adjustment (Q7: optional) • Standard heated steering wheel (Q7: optional) • Standard rear seat bench can be adjusted by 160 mm in longitudinal direction
Electrics, audio and communication	<ul style="list-style-type: none"> • PDLS incl. static and dynamic cornering light, speed-sensitive driving light control, fog light function, headlight cleaning system as well as standard dynamic headlight leveling (Q7: dynamic cornering light optional) • Adaptive brake lights • Standard sound system with greater total output (+315 W) • Electronic logbook (optional)
Overall vehicle	<ul style="list-style-type: none"> • More agile cornering due to shorter wheelbase (-107 mm) • More compact exterior dimensions (-217 mm length, -61 mm width, -35 mm height) • Lower total weight (-360 kg) • Higher maximum trailer load (+200 kg)



Advantages compared with the Audi Q7 V12 TDI does not apply to the North American market

Main advantages of the Porsche Cayenne Turbo compared with the 2010 BMW X5 M



Criterion	Advantages compared with the 2010 BMW X5 M
Engine/Performance	<ul style="list-style-type: none"> • Higher torque (+16 lb ft) • Higher top speed (+18 mph)
Power transmission	<ul style="list-style-type: none"> • 8-speed Tiptronic S for lower fuel consumption and a low noise level even at higher speeds (X5: 6-speed)
Chassis	<ul style="list-style-type: none"> • Air suspension with 6-stage height adjustment (incl. PASM) • Porsche Torque Vectoring Plus (PTV Plus) with electronically controlled rear differential lock (optional) • Porsche Ceramic Composite Brake (PCCB; optional)
Off-road properties	<ul style="list-style-type: none"> • Greater approach/departure and ramp breakover angles • Greater maximum ground clearance, fording depth as well as approach/departure and ramp breakover angles through High Level II of air suspension incl. PASM

Exterior	<ul style="list-style-type: none"> • Exterior mirrors with memory function • Heated windshield (optional) • Electric roll-up sunscreen for rear side windows (optional; X5: manual) • Electric slide/tilt glass roof (X5: Panoramic roof only)
Interior	<ul style="list-style-type: none"> • More extensive range of optional interior colors • Standard 4-way lumbar support for driver and passenger (X5: optional) • Standard heated seats front and rear (X5: rear optional) • Standard bottle holders in the doors front and rear • Greater flexibility through split rear seat bench in the ratio 40:20:40 (X5: 60:40) • Standard rear seat system can be adjusted by 6.3 inch in longitudinal direction, standard backrest angle can be adjusted by 6° • Side airbags in the rear
Electrics, audio and communication	<ul style="list-style-type: none"> • Standard position light, and direction indicator light in the front light unit in LED technology (daytime driving light as 4 LED spots in headlight) • Standard LED tail lights • Adaptive cruise control (optional) • Lane Change Assist (optional) • Porsche Communication Management (PCM) incl. hard drive based navigation module (BMW DVD based) • BURMESTER® High-End Surround Sound System with a total output of more than 1,000 W (optional; X5: max. 825 W)
Overall vehicle	<ul style="list-style-type: none"> • More agile cornering due to shorter wheelbase (-1.5 inch) • More compact exterior dimensions (-0.2 inch length, -2.2 inch width, -2.4 inch height) • Larger maximum luggage compartment capacity (+2.1 cu ft) • Lower total weight (-584 lb) • Higher maximum payload (+243 lb)

Main advantages of the Porsche Cayenne Turbo compared with the 2010 Mercedes-Benz ML 63 AMG



Criterion	Advantages compared with the 2010 Mercedes-Benz ML 63 AMG
Engine/Performance	<ul style="list-style-type: none"> • Higher torque (+51 lb ft) over a greater rpm range (2,250-4,500 rpm compared with 5,200 rpm) • Higher top speed (+18 mph) • Better acceleration (-0.4 s from 0-60 mph)
Power transmission	<ul style="list-style-type: none"> • Active all-wheel drive with fully variable torque distribution (ML: permanent) • Optional 8-speed Tiptronic S for lower fuel consumption and a low noise level even at higher speeds (ML: 7-speed)
Chassis	<ul style="list-style-type: none"> • Porsche Ceramic Composite Brake (PCCB; optional) • Electric parking brake (ML: foot-operated parking brake) • Porsche Torque Vectoring Plus (PTV Plus) with electronically controlled rear differential lock (optional) • Porsche Dynamic Chassis Control active anti-roll stabilization (PDCC; optional) • Full-size spare wheel in the luggage compartment (optional)
Off-road properties	<ul style="list-style-type: none"> • Greater approach/departure angle (+8.5°/+1.5° respectively, in each case in High Level II) • Greater ground clearance (+1.7 inch, in each case in High Level II) • Greater ramp breakover angle (+4° in High Level II)

Exterior	<ul style="list-style-type: none"> • Heated windshield (optional) • Electric roll-up sunscreen for rear side windows (optional) • Panoramic Roof System (optional)
Interior	<ul style="list-style-type: none"> • More extensive range of optional interior colors • Standard heated seats in the rear (ML: optional) • Standard bottle holders in the doors front and rear • Greater flexibility through split rear seat bench in the ratio 40:20:40 (ML: 60:40) • Standard rear seat bench can be adjusted by 6.3 inch in longitudinal direction, standard backrest angle can be adjusted by 6° • Removable ski bag (optional)
Electrics, audio and communication	<ul style="list-style-type: none"> • Standard position light, and direction indicator light in the front light unit in LED technology (daytime driving light as 4 LED spots in headlight) • Standard LED tail lights • Lane Change Assist (optional) • 4-zone climate control (optional; ML: 3-zone climate control) • Porsche Communication Management incl. hard drive based navigation module (ML: DVD based) • BURMESTER® High-End Surround Sound System with a total output of more than 1,000 W (optional; ML: max. 610 W) • Electronic logbook (optional)
Overall vehicle	<ul style="list-style-type: none"> • More agile cornering due to shorter wheelbase (-0.8 inch) • Sportier character due to lower height (-4.4 inch) • Lower total weight (-309 lb) • Higher maximum payload (+143 lb)





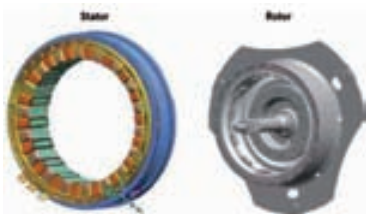
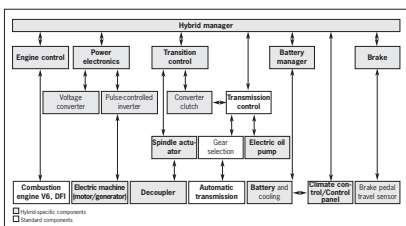
Main advantages of the Porsche Cayenne Turbo compared with the 2010 Range Rover Sport 5.0l V8 Supercharged



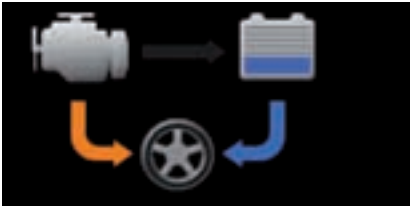






Criterion	Advantages compared with the 2010 Range Rover Sport 5.0l V8 Supercharged
Engine/Performance	<ul style="list-style-type: none"> • Higher torque (+55 lb ft) • Better power-to-weight ratio (- 1.98 lb/hp) • Higher top speed (+33 mph) • Better acceleration (-1.5 s from 0-60 mph)
Power transmission	<ul style="list-style-type: none"> • Active all-wheel drive with fully variable torque distribution (RRS: permanent) • 8-speed Tiptronic S for lower fuel consumption and a lower noise level even at higher speeds (RRS: 6-speed)
Chassis	<ul style="list-style-type: none"> • Porsche Ceramic Composite Brake (PCCB; optional) • Porsche Torque Vectoring Plus (PTV Plus) with electronically controlled rear differential lock (optional)
Off-road properties	<ul style="list-style-type: none"> • Greater maximum ground clearance (+1.8 inch with air suspension in High Level II)

Exterior	<ul style="list-style-type: none"> • Heated windshield (optional) • Electric roll-up sunscreen for rear side windows (optional) • Panoramic Roof System (optional)
Interior	<ul style="list-style-type: none"> • More extensive range of decorative inlays • Adaptive sports seats with electrical 18-way adjustment (RRS: 12-way) • Seat ventilation in front (optional) • Heated steering wheel (RRS: optional) • Greater flexibility through split rear seat bench in the ratio 40:20:40 (RRS: 60:40) • Standard rear seat bench can be adjusted by 6.3 inch in longitudinal direction, standard backrest angle can be adjusted by 6° • Removable ski bag (optional) • Cargo management (optional) • Powerlift tailgate
Electrics, audio and communication	<ul style="list-style-type: none"> • Lane Change Assist (optional) • 4-zone climate control (optional) • BURMESTER® High-End Surround Sound System with a total output of more than 1,000 W (optional) • Electronic logbook (optional)
Overall vehicle	<ul style="list-style-type: none"> • More compact exterior dimensions (-2.6 inch width, -1.5 inch height) • Lower total weight (-1,107 lb) • Higher maximum payload (+88 lb)

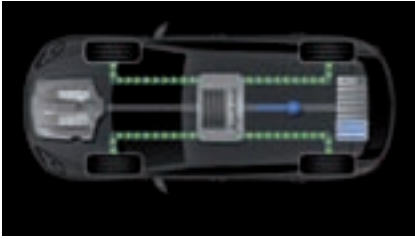
16 Technology glossary Cayenne S Hybrid

Drive	
<p>Supercharged engine</p> 	<p>3.0 I V6 engine with supercharger and direct fuel injection, 333 hp max. power and 325 lb ft max. torque.</p> <p>In contrast to an engine with turbocharger, a supercharged engine already offers greater power development at low engine speeds and ensures outstanding take-off behavior.</p>
<p>Hybrid module</p> 	<p>Comprises a protective housing and contains the decoupler as well as the electric machine (motor/generator). The hybrid module protects the internal components. Thanks to its especially compact design, it was possible to integrate the module directly between the transmission and combustion engine.</p>
<p>Decoupler</p> 	<p>Especially powerful mechanical dry clutch that connects the combustion engine with the drivetrain.</p> <p>This makes it possible to disengage the combustion engine, e.g. when coasting, and to engage the engine spontaneously if greater power is requested. The decoupler is designed to meet very high demands (forces transmitted, fast response times, good durability).</p>
<p>Spindle actuator</p> 	<p>Hydraulic control unit for opening and closing the decoupler in order to engage and disengage the combustion engine with the drivetrain. Precise control is possible with comfort or dynamic orientation.</p>
<p>Electric machine</p> 	<p>Compact synchronous motor/generator with 34 kW (47 hp) mechanical power and a maximum torque of 221 lb ft. As an electric motor, the electric machine is used to drive the vehicle. In generator mode, it allows brake energy to be recovered (recuperation).</p>
<p>Hybrid manager</p> 	<p>This is a higher-level control for the engine control and controls interaction of the combustion engine, hybrid module, transmission and NiMH battery. For this purpose, approx. 20,000 data parameters from other vehicle systems are processed.</p>

Driving modes	
<p>Auto Start Stop function</p> 	<p>This function switches off the engine when the vehicle is stationary, e.g. when standing at a traffic light, and initiates an automatic engine restart as soon as the brake is released. In city driving in particular, this function contributes to reducing fuel consumption.</p>
<p>Electric driving</p> 	<p>Driving without the combustion engine – powered only by the electric machine – is possible up to 37 mph. In this case, the vehicle has no CO₂ emissions and drives almost noiselessly, e.g. when driving through a residential area (the energy flow is indicated by arrows on the instrument cluster).</p>
<p>Boosting</p> 	<p>The electric machine assists the combustion engine and supplies an additional torque of up to 221 lb ft for better acceleration. The dynamic response of the vehicle is improved by the enhanced take-off behavior.</p>
<p>Load point shift</p> 	<p>Change in the operating point of the combustion engine. An increase in the load point allows the combustion engine to operate in a more efficient operating range. It therefore generates more power than required by the driver. This additional power is used to recharge the traction battery.</p>
<p>Coasting („Sailing“)</p> 	<p>During constant driving at up to 97 mph, e.g. on a highway, the combustion engine is separated from the drivetrain by the decoupler and switched off. The car then coasts without drive power and without CO₂ emissions.</p>
<p>Recuperation</p> 	<p>This is recovery of part of the brake energy otherwise lost. During braking, the electric machine operates in generator mode and generates energy that is stored in the NiMH battery and can then be used again later for propulsion.</p>
<p>E-Power button</p> 	<p>Function for extending the range in which purely electric driving is possible. The button is located in the center console and changes the gas pedal characteristic when activated. As a result, the combustion engine starts later than in normal operation.</p>

Hybrid displays / Driver information

Energy flow display



Graphic overview on the instrument cluster and PCM showing the **current driving state** together with the energy flow. A detailed energy flow display in the form of a detailed vehicle graphic (see figure on left) is available in PCM. The vehicle silhouette and the most important components of the hybrid drive visualize the **functional principle of the hybrid drive** with **animated energy flows and different colors**.

E-Power meter



Analog display in the left area of the instrument cluster that indicates the **generator and drive power** of the hybrid drive. The display provides the driver with feedback on the recuperation power (E-Charge) from braking and on the power demand in acceleration phases (E-Power).

Engine-off Mode



Statistics display in PCM, shows the **percentage share of the driving time** in which the **combustion engine is switched off and does not consume fuel**. The vehicle is powered by the electric systems during this time. Engine-off Mode includes the driving times for electric driving, recuperation and coasting. It also includes the vehicle standstill times in Auto Start Stop mode. The graphic evaluation documents driving operation and provides the driver with valuable assistance in achieving an efficient driving style.

Ready display







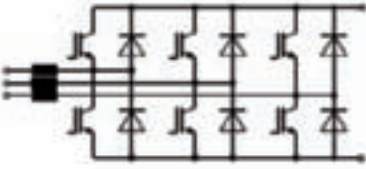



After the ignition is switched on, this display indicates to the driver that the **hybrid drive is ready for operation even without engine noise** with the tachometer needle at the „Ready“ position. In addition, the tachometer needle drops to the „Ready“ position if the combustion engine is automatically switched off in coasting mode.

TFT display in instrument cluster



Shows the driver the **energy flows in the instrument cluster** during the hybrid-specific driving modes. The most important hybrid components are represented by icons and the arrows show the energy flow.

Energy supply	
<p>Nickel-metal hydride battery (drive battery or NiMH battery)</p> 	<p>The drive battery provides energy storage for the hybrid drive with 288 V and an energy content of 1.7 kWh. Installed in the spare-wheel well, this supplies the electric machine with energy and stores energy that is recovered by recuperation. When the combustion engine is switched off, the drive battery also provides energy for the 12 V vehicle electrical system as required.</p>
<p>Battery cooling</p> 	<p>Required in order to ensure an optimum operating temperature of the NiMH battery. Cool air is sucked in from the passenger compartment through an intake duct under the rear bench and used to cool the battery. The warm air is then discharged to the outside.</p>
<p>Battery manager</p> 	<p>Monitors all operating values of the NiMH battery, e.g. charge state, battery temperature and cell voltages. This information is forwarded to the hybrid manager, which controls the hybrid-specific driving modes corresponding to the current situation and prevents critical states such as exhaustive discharge of the NiMH battery.</p>
<p>State of charge (SOC)</p> 	<p>Characteristic value for the charge state of the NiMH battery. This value indicates the currently available battery capacity in relation to the maximum value and is therefore an important control variable for the battery manager.</p>
<p>High-voltage cables</p> 	<p>High-voltage cables are designed specifically for high voltages and currents. They are therefore primarily used as a power connection from the NiMH battery to the electric machine via the power electronics. The air-conditioning compressor is also connected directly to the high-voltage system with a high-voltage cable.</p>
<p>Power electronics</p> 	<p>The power electronics consists of a pulse-controlled inverter and a DC-DC converter. These components control the electric currents corresponding to the different voltage demands.</p>
<p>Pulse-controlled inverter</p> 	<p>The pulse-controlled inverter is part of the power electronics and converts the direct current of the NiMH battery into three-phase current for operation of the electric machine.</p>
<p>DC-DC converter</p> 	<p>Steps down the 288 V of the NiMH battery to the 12 V vehicle electrical system voltage in order to support the 12 V system battery, which supplies power to vehicle electrical system loads such as the radio, when the combustion engine is switched off. The DC-DC converter is part of the power electronics.</p>

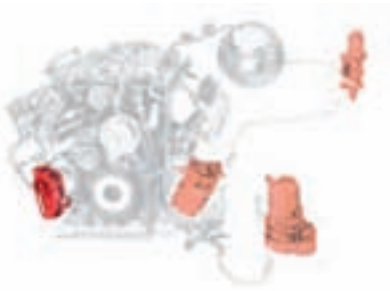
Auxiliary systems

Electric air-conditioning compressor



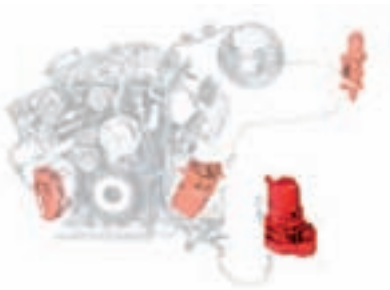
The **air-conditioning compressor** is driven electrically instead of mechanically since it must also provide the required cooling power during electric driving without the combustion engine. Due to its high energy requirement, it is connected **directly to the 288 V NiMH battery**.

Electric vacuum pump



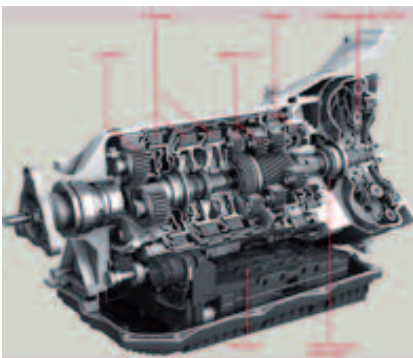
The **additional electric vacuum pump** is not powered by a drive belt via the combustion engine, but is supplied directly with electrical energy, allowing it **ensure the availability of brake boosting** even when the combustion engine is switched off, e.g. in coasting mode.

Electric servo pump



The **electric servo pump assists the driver when steering** so that the familiar steering comfort is offered even when the combustion engine is switched off. In addition, **the electro-hydraulic steering reduces** steering-specific energy consumption by 93% compared with a conventional steering system.

Electric oil pressure pump



The **electric oil pump** is powered **electrically** instead of mechanically in order to guarantee the basic functions of the transmission, e.g. shift operations, even during purely electric driving or in coasting mode. The required oil pressure is therefore still available even when the combustion engine is switched off.

Publisher's data

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Note:

All information provided in this document is correct as of April 2010. Porsche reserves the right to alter the design, technical specification, pricing, equipment and final scope of delivery at any time prior to the market launch of the 2011 Cayenne models.

Note that details and product features may vary up to the market launch and throughout the service life of the vehicle.

Status: April 2010

You will find additional updated information online under "Product Information Online." This can be accessed via the Porsche intranet or via the Porsche Partner Network (PPN).

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