This press pack accompanied the UK launch of the first generation Lexus CT 200h in March 2011. Some changes were made to the model range during its time on sale, which can be tracked using the Timeline feature available on the CT 200h archive web page. Additional assets and information relating to the CT 200h may be obtained from the Lexus press office if required.

THE LEXUS CT 200h

1 INTRODUCTION

The Lexus CT 200h is the world's first full hybrid to be launched in the heart of the premium compact segment. Its technical innovation, style, quality and driver appeal will bring a new and younger customer group to the Lexus brand.

The CT 200h was created with the European market in mind. Its size, packaging and low 94g/km CO_2 emissions delivered by its hybrid power system meet many of the prime requirements of a young, discerning and environmentally aware customer base. At the same time, these elements are delivered without diminishing the quality, comfort and refinement that are fundamental to every Lexus model.

Lexus Hybrid Drive

Lexus engineers have improved both the environmental and driving performance of the Lexus Hybrid Drive powertrain with specific engineering solutions and software tuning, at the same maintaining its exceptionally low NVH levels.

The full hybrid series/parallel system has a maximum output of 134bhp, giving seamless acceleration from nought to 62mph in 10.3 seconds and a top speed of 112mph. Conversely, it can achieve very low fuel consumption – an official 68.9mpg in combined cycle driving – and class-leading 94g/km CO_2 emissions.

NOx emissions are very low at 3.3mg/km and the powertrain produces no particulates, performance that is significantly better than an equivalent diesel engine. Moreover, when operating in electric vehicle (EV) mode, tailpipe CO_2, NOx and particulates emissions are cut to zero; CT 200h can cover about one mile in EV mode at speeds up to 25mph.

The system's strong environmental credentials are supported by additional energy saving and eco-focused measures, including energy-efficient air conditioning, audio system and LED lighting and extensive use of bio-materials.

Driving experience

The CT 200h has been engineered to give a rewarding driving experience with the ride comfort expected of a Lexus.

It benefits from a new platform that incorporates specific body, chassis and powertrain control applications to give owners the choice of two distinct driving "moods" - Dynamic or Relaxing – in conjunction with the full hybrid system's 'on demand' EV, Eco, Normal and Sport modes. Detailed attention to the bodyshell construction has helped achieve this dual character, with the lowest possible centre of gravity, high body rigidity and the reduction of NVH levels.

The CT 200h is available with a lateral performance damper system – a first in the luxury hatchback segment - designed to absorb and reduce body vibration to give a more linear steering feel and further improve ride comfort.

In the cabin, a focused, driver's cockpit design adds to the quality of the driving experience, with a low-set driver's seat with generous lateral and lumbar support, a wide-grip steering wheel and an instrument binnacle housing large, high-visibility triple dials.

Design

The CT 200h marks a powerful evolution of Lexus's L-finesse design language, combining elegance with dynamism.

On the outside the car has a distinctive, sharp-edged look that sets it apart from competitor models in its segment. A new Lexus front end design, sweeping lines and a wide track, combine to express compact precision and power.

The efficient and elegant cabin design features superior ergonomics, the deployment of advanced human-machine interface technologies and generous passenger space. Using premium quality materials it has a hand-crafted feel that adds to the overall refined driving environment.

The long, 2,660mm wheelbase allows for front and rear occupant accommodation that is among the most spacious in segment. Likewise, the load space compares favourably with any car in its class, with 375 litres (VDA) available, increasing to 985 litres with the rear seats folded.

Safety

CT 200h is equipped with a comprehensive array of active, passive and pedestrian impact safety features. Using advanced technology to achieve class-leading preventive safety, it has been designed to achieve to the top five-star rating in Euro NCAP testing and similar top level performance in Japanese and American crash test programmes.

It is the first model in its class in the world to be offered with a pre-emptive, Pre-Crash Safety (PCS) system with Adaptive Cruise Control (ACC). Eight airbags, including knee airbags for driver and front passenger, are fitted to all versions of CT 200h, along with whiplash injury-lessening (WIL) front seats. The upgraded Electronically Controlled Braking Regeneration system (ECB-R) incorporates ABS, Brake Assist (BA), Traction Control (TRC) and Vehicle Stability Control (VSC).

Cost of ownership

The CT 200h's class-leading cost of ownership profile is underpinned by its low emissions performance, which qualifies it for a zero annual Vehicle Excise duty (road tax) charge, plus the bonus of exemption from the London congestion charge.

The benefits extend to company car drivers, who enjoy the lowest, 10 per cent rating for benefit-in-kind company car tax, and for fleet operators, who earn the advantage of a first-year 100 per cent write down allowance against corporation tax. Factor in the CT 200h's impressive fuel economy, and designed-in low service, maintenance and repair costs, and you have a package that offers a clear cost advantage over its segment rivals.

Service intervals are annually or at every 10,0000 miles, which helps maximise component lifetime. The Lexus Hybrid Drive system is engineered for low maintenance requirements and the hybrid battery is designed to last the lifetime of the car.

The quality of the CT 200h is reflected in its predicted residual values. CAP Monitor has quoted a 39 per cent depreciation figure for the SE-I model over the first three years or 60,000 miles, which equals the best performance in the segment.

Manufacturing, quality and satisfaction

The CT 200h is built at Toyota Motor Kyushu's Kokura plant, which started operations in 2008 as the world's first factory dedicated to hybrid unit production. The plant maintains the highest manufacturing quality through a combination of innovative production quality and the skills of Lexus master craftsmen.

The new model has been developed in line with rigorous standards known as the Lexus MUSTs. These include more than 500 items that set strict guidelines for raising the car's dynamic and environmental performance to unprecedented levels. They even extend to static factors, such as the vehicle's appearance, tactical and sound quality and the sensitivity and performance controls.

CT 200h owners will also experience the full benefit of Lexus's exceptional standards of quality and customer care, reflected in the company's numerous international awards, including an unprecedented 10 successive J.D. Power and Associates gold awards in the UK.

2 THE *QUIET REVOLUTION*

- The first and only full hybrid model in the premium compact – luxury hatchback – segment
- Class-leading environmental performance, with no compromise in refinement and driving pleasure
- CO_2 emissions best in class at 94g/km, with zero particulates and almost no NOx emissions
- Kylie Minogue leads the *Quiet Revolution* marketing campaign

The CT 200h is the first and only full hybrid vehicle in the premium compact segment. It is also the new gateway model to Lexus, destined to attract a younger customer group to the brand through what Lexus calls its *Quiet Revolution*.

This term covers the unique combination of qualities the CT 200h brings to the market: the innovation of full hybrid technology, Lexus quality and refinement, low emissions and excellent fuel economy. Its clean and efficient performance – 68.9mpg combined cycle fuel consumption and a VED-free 94g/km of CO_2 – is unmatched by any of its rivals, and brings the added benefit of class-leading ownership costs, a fiscal advantage that strengthens the appeal to younger buyers.

Working with a new platform, Lexus has introduced a series of exclusive body, chassis and hybrid powertrain control systems that provide the CT 200h with distinct Dynamic and Relaxing driving "moods". A high rigidity bodyshell, the lowest possible centre of gravity, the option of a lateral performance damper system and a new double wishbone rear suspension design all contribute to delivering high speed stability, smooth and precise handling and ride comfort. The focused design of the driver's cockpit and a low-set driver's seat with extra lateral and lumbar support add to the quality of the driving experience.

In 2009, compact models claimed the largest share of the European premium market, with increased demand for smaller cars that are more fuel and CO_2-efficient, but still refined and rewarding to drive. This segment provides a strategic entry point to the wider premium market, with younger customers making the majority of buyers.

Kylie Minogue and the *Quiet Revolution*

Lexus in the UK has recruited Kylie Minogue as a brand ambassador to lead its *Quiet Revolution* marketing campaign. Pop and style icon Kylie fronts a series of cross-media advertising initiatives, including a prime-time television commercial, *Drum Roll,* which also features a star line-up of more than 60 drummers.

Lexus is a sponsor of Kylie's *Aphrodite – Les Folies 2011* UK concert tour and the world-famous singer will be featured in further marketing activities as the CT 200h launch programme progresses.

Lexus is also building a strong presence for the Quiet Revolution through its official social media channels, including uploads of Drum Roll, a behind-the-scene feature and an extended interview with Kylie on YouTube.

3 LEXUS HYBRID DRIVE POWERTRAIN

- Second generation Lexus hybrid technology, benefiting from Lexus Energy Management System
- 98bhp 1.8 VVT-i petrol engine and 82bhp electric motor combine to give total system output of 134bhp
- Class-leading 94g/km CO_2 with zero particulates and near-zero NOx emissions
- EV, Eco and Sport 'on-demand' driving modes

The new CT 200h introduces Lexus's second generation hybrid technology to the premium compact segment. While other manufacturers are taking their first steps in hybrid power development, Lexus has the advantage of more than a decade's experience and an established full hybrid model range that includes the GS 450h sports saloon, LS 600h limousine and RX 450h luxury SUV.

The CT 200h has the benefit of an Energy Management System which ensures quiet running, seamless acceleration and the level of performance customers expect from a premium segment hatchback.

Advances have been made in emissions and fuel economy through the successful application of engine technologies, including the adoption of the Atkinson cycle for the petrol engine, exhaust gas recirculation (EGR) and exhaust heat recovery (EHR).

The environmental performance of the engine is further supported by other energy saving and eco-focused measures. These include an energy-saving air conditioning system, extensive use of LED lighting and even a lightweight and energy-efficient audio system. Furthermore, a range of bio-materials are used in place of oil-based plastics in different areas of the vehicle.

Energy management system

Lexus engineers have improved the environmental and driving performance delivered by Lexus Hybrid Drive by means of specific engineering measures and the adoption of an Energy Management System with bespoke software tuning.

This ultra-intelligent system is key to Lexus Hybrid Drive's unrivalled efficiency. It automatically determines when to use power from the petrol engine or electric motor, or to use a combination of both. It can be refined to deliver specific performance characteristics, and it will ensure each component in the powertrain is protected to maximise reliability and durability.

Total system output is 134bhp, which gives the CT 200h performance that is on a par with its segment rivals. At the same time, it returns class leading 94g/km CO_2 emissions, which qualify it for significant cost of ownership benefits in terms of taxation – notably a zero annual charge for Vehicle Excise Duty. Moreover, it produces significantly less NOx than an equivalent diesel engine and no particulate emissions. The levels already meet the proposed Euro 6 emissions standards.

Engine control and throttle responses have been tuned for an engaging drive, with the powertrain displaying the minimal noise, vibration and harshness levels that are characteristic of Lexus Hybrid Drive.

System architecture

As a full hybrid, the CT 200h offers the benefits of both series and parallel powertrain architecture. It can operate in petrol and electric modes alone, as well as a combination of both, as driving conditions require. This means it delivers the both the energy-saving benefits of a series hybrid and the performance characteristics of a parallel hybrid.

The second generation Lexus Hybrid Drive comprises a 1.8 VVT-i petrol engine, a powerful electric motor, a generator, a high-performance nickel-metal hydride battery, a power control unit and a power split device. The latter element uses a planetary gear set to combine and re-allocate power from the engine, electric motor and generator as required.

The system is neatly packaged within the CT 200h platform: the electric motor, generator and power split device are housed in a single, lightweight transmission casing that's similar in size to a conventional gearbox. Drive to the front wheels is via a seamless, controlled-by-wire, electric continuously variable transmission (E-CVT).

During deceleration and under braking, the electric motor works as a high-output generator to provide regenerative braking. This optimises energy management by recovering kinetic energy that would normally be lost as heat and storing it as electrical energy in the hybrid battery.

When running in EV mode – which the driver can select – the CT 200h produces zero CO_2 and NOx tailpipe emissions. The car can run for about one mile on its electric motor alone, at speeds up to 25mph.

Performance

Together the CT 200h's petrol engine and electric motor generate 134bhp. Nought to 62mph acceleration can be accomplished in 10.3 seconds and top speed is 112mph. Official combined cycle fuel consumption is 68.9mpg; CO_2 emissions are a class-leading 94g/km; and NOx emissions are just 3.3mg/km.

1.8-litre Atkinson cycle engine

The four-cylinder, 16-valve, 1,798cc Atkinson cycle petrol engine generates 98bhp at 5,200rpm and a maximum 142Nm of torque at 4,000rpm. Significant gains are achieved in fuel efficiency and emissions by use of the Atkinson cycle, together with a new Exhaust Gas Recirculation (EGR) system and third-generation Exhaust Heat Recovery (EHR).

In a conventional four-cylinder engine, it's sometimes necessary to cool down the exhaust gases to prevent damage to the catalytic converters. In an Atkinson cycle engine, compression and expansion are not symmetrical – the valves close late, delaying compression. This creates a high expansion ratio for less compression, reducing intake and exhaust energy losses and converting combustion energy to engine power more effectively. As a result, exhaust temperature is lower.

EGR reintroduces precise amounts of exhaust gas – cooled from 700 to 300°C – into the intake system via a stainless steel exhaust manifold. This further reduces the engine's operating temperatures and also reduces engine pumping losses by a reduction in intake vacuum pressure.

Together these technologies minimise the situations where fuel enrichment is needed to protect the catalytic converter from overheating damage, thus improving fuel economy and reducing emissions.

The third generation EHR system is small, lighter and more efficient. It redirects exhaust gases via a valve built into the exhaust assembly to heat up the engine coolant at start-up. As well as helping the cabin heat up more quickly, this also improves the hybrid system's efficiency and fuel economy by significantly reducing the time it takes for the engine to warm up, allowing it to be shut down earlier for longer electric motor-only running, particularly in cold weather.

To improve fuel economy and cabin comfort in cold weather, the engine heat management combines a heat recovery system with an electric water pump. Using electric power instead of a drive belt reduces mechanical losses; it also controls the coolant flow rate more precisely and allows the air conditioning and heating to be used without the engine running, all of which supports greater fuel efficiency.

Another feature of the petrol engine that helps improve performance, fuel economy and emissions is VVT-i (variable valve timing – intelligent), which boosts response across the entire rev range by varying the air-fuel intake valve timing to suit conditions at any given time.

The engine also has roller rocker arm valvetrain control, a resin intake manifold, a highly efficient taper squish combustion chamber design and 12-hole atomising long-nozzle fuel injectors. Thin, long-reach spark plugs contribute to better anti-knock performance, and lower tension piston rings, reduced piston friction, a standing oil jet for piston cooling and a stainless steel pipe exhaust manifold all work to improve engine efficiency.

Engine NVH

Ultra-low Noise, Vibration and Harshness (NVH) performance is a key attribute of Lexus Hybrid Drive. Special attention has been paid to reducing engine noise and vibration, with the rigidity of parts, including the cylinder block and crank case, optimised by thorough CAE analysis. The highly rigid, ribbed aluminium cylinder head cover is both lightweight and effective in reducing noise and vibration.

The engine is mounted on a four-point suspension system, with the rubber used for the mounts optimised for suppressing noise and vibration. A two-step dynamic damper is integrated in the engine mount, which also helps reduce engine start-stop shock.

Hybrid transaxle

The transaxle is at the heart of the Lexus Hybrid Drive System, with the electric motor and generator and power split and motor speed reduction devices housed in a single, compact transmission casing.

The shift-by-wire e-CVT is controlled using an electronic shift lever, which is designed always to return to its ‘home’ position when released. The shift position is indicated on the driver’s instrument display.

Next to the shift lever there is a parking switch (with an indicator light) which can be used to engage or release a parking lock mechanism in the transmission gearing. The parking lock is automatically deactivated when driving off, and re-engaged when the car is switched off.

Numerous measures have been taken to reduce component noise and energy losses. A highly advanced internal gear machining process delivers greater precision in the planetary ring gear, minimising transmission noise. The lubrication system has been designed to reduce oil agitation losses, and friction in the transaxle components has been significantly reduced by using tapered bearings instead of ball bearings.

Electric motor

The high-performance, permanent magnet, synchronous 81bhp electric motor works in tandem with the petrol engine to boost acceleration, or to power the driven wheels on its own when the car is in EV mode. As explained above, it also works as a high-output generator during regenerative braking.

The motor is air cooled and generates a maximum 207Nm of torque from zero rpm, with the available torque boosted through a reduction gear device in the transaxle. Maximum drive voltage amplification is 650V DC, but in ordinary driving conditions the motor is driven at unamplified voltage whenever possible, to improve fuel efficiency.

Generator

Like the electric motor, the generator is AC synchronous-type.

Because there is no starter motor in the system, the generator is used to start the petrol engine. In normal driving conditions, engine output is divided according to system requirements to drive the wheels and power the generator, which, via the Power Control Unit (PCU), drives the electric motor and simultaneously charges the high-voltage battery. The generator also controls engine speed, supporting maximum fuel efficiency in the hybrid powertrain.

The petrol engine is automatically shut down when its operation isn't required. However, if the vehicle runs on electric power alone to the point where battery charging is needed, the generator will restart the engine, which itself provides the power for the generator to charge the battery.

Hybrid battery

The CT 200h's 202V hybrid system battery uses proven and reliable nickel-metal hydride technology and is fan cooled. It is position beneath the floor of the boot, its size kept to a minimum to reduce its impact on load and cabin space.

Power Control Unit (PCU)

The PCU is similar in size to a standard 12V battery. It consists of: -

- A voltage boost converter, which boosts electric motor, generator and battery voltage to increase hybrid system power output

- A highly compact inverter for the motor/generator, which converts DC power from the battery into 650V AC power for driving the electric motor and, occasionally, the generator
- A DC/DC converter, which reduces the 202V hybrid battery voltage to 14V to supply power to the car's accessory systems and charge the auxiliary battery

Lexus Hybrid Drive in operation

In the course of any journey, Lexus Hybrid Drive's Energy Management System allows it to operate in different modes to maximise overall efficiency. When the car is at rest, the engine stops automatically to conserve fuel. When running in low-efficiency conditions, such as at start-up and at low to mid-range engine speeds, the vehicle can be driven on its electric motor alone, eliminating tailpipe CO_2 and NOx emissions.

In normal driving conditions, the allocation of power is automatically adjusted between the engine and electric motor to achieve optimum performance and fuel efficiency. Energy management is optimised by the electric motor's Electronically Controlled Braking Regeneration (ECB-R) system.

At all speeds, Lexus Hybrid Drive monitors itself to maintain the best possible performance, fuel efficiency and emissions, either by running the electric motor or petrol engine in isolation, or in combination. Furthermore, the level of power in the battery is constantly managed by the engine-driven generator, so there is no need for the system to be recharged using an external power source.

Lexus Hybrid Drive has three 'on-demand' driving modes in addition to the Normal drive mode: EV, Eco and Sport. These are fully described below in the chapter on driving experience.

ENERGY SAVING AND ENVIRONMENTAL PERFORMANCE

Air conditioning

The CT 200h is equipped as standard with a dual-zone (left and right) air conditioning system that uses a compact, lightweight unit with a powerful, electric, variable capacity compressor. As it is powered by the hybrid battery, the compressor puts less load on the engine, which improves fuel economy. And thanks to its surplus power, the unit can run below full capacity with greater efficiency and less noise.

The compressor (with integrated inverter) has a centrifugal oil separator that removes oil from the refrigerant, so reducing the amount of oil that can escape from the unit. This allows for a more efficient refrigerant cycle, improving cooling performance.

Efficiency is further helped by the use of a lightweight, Multi Flow-IV sub-cool condenser, which reduces the volume of refrigerant. The design of the brushless blower motor has been refined to suppress noise while delivering a large volume of cool air.

Air inlet mode control with humidity sensor

Vehicles can suffer a drop in fuel economy during the winter when there's more often a need to heat the cabin and demist the windscreen. To counter this, Lexus has combined its third-generation EHR system with new air inlet mode control technology, incorporating a humidity sensor.

The EHR helps engine coolant reach normal operating temperature more quickly by circulating it around a section of exhaust pipe. This not only reduces the time needed for the engine to warm up, it also enables the 495W PTC (Positive Temperature Coefficient) heater to deliver warm cabin air sooner.

In wintry conditions, the need to introduce dry, cold air to prevent the windscreen fogging results in a drop in cabin temperature, which means the engine has to run to warm up the interior, thus damaging fuel economy. To avoid this, the CT 200h has a humidity sensor mounted on the windscreen to monitor humidity and cabin and glass temperature. Using this information, the air conditioning automatically controls the air inlet mode, increasing the amount of recirculated air in the cabin to prevent warm air from escaping and reducing the engine run time needed to heat the interior. The more the windscreen fogs up, the greater the volume of fresh air the system introduces, thus combining effective de-misting with optimum fuel efficiency.

Pro-active seat heaters

The CT 200h's front seat heaters are designed to operate pro-actively with the air conditioning, cutting the air-con heater's workload and thus helping improve fuel efficiency.

When the driver switches on the air conditioning to heat the cabin, the seat heaters are automatically switched on, heating the occupants' bodies directly. This allows the air-con heater unit to work at a lower temperature, retaining heat in the engine's core and reducing the amount of time it needs to run in order to warm the cabin.

The automatic seat heater control is overridden when passengers are detected (via seatbelt monitors) in the rear seats.

LED lighting

Lexus was the first auto company to introduce LED headlamps on a production car, the LS 600h in 2007. Using 45 per cent less power than conventional halogen lights, they contribute to fuel economy.

The CT 200h has 89 LEDs – 46 at the front, eight in the indicator lamps in the door mirrors and 35 to the rear – more than any other Lexus model thus far.

Lexus audio system amplifier

The CT 200h is the first Lexus to use a new, energy-efficient Digital Signal Processor-integrated (DSP), eight-channel, full range class D amplifier. It uses 50 per cent less power than a conventional, analogue-powered amplifier and, at 960g, is 26 per cent lighter.

Bio-sourced materials and bamboo charcoal speakers

Several of the CT 200h's larger components, including the sides of the loadspace deck, deck board and deck board trim, are made from a bioplastic that contains 30 per cent plant-based polyethylene terephthalate. The car has also been designed for easy end-of-life dismantling, with recycle marks on the front, rear and tailgate trim.

In a first for Lexus and the auto industry, the audio system is equipped with bamboo charcoal-based resin diaphragm speakers. These are made from a complex compound that combines bamboo charcoal, fibre and resin, and area injection moulded to a thickness of just 0.2 to 0.3mm. They weigh between 10 and 15 per cent less than conventional speaker diaphragms.

4 DRIVING EXPERIENCE

- High-speed stability combined with a comfortable, supple ride
- Front and rear lateral performance damper system to minimise body vibrations
- Focused, ergonomically designed driving position
- EV, Eco and Normal driving modes for relaxing drive with class-leading NVH
- Sharper response from Sport mode
- All-new double wishbone rear suspension and tuned MacPherson strut front suspension

The CT 200h is built on a new platform that has a number of exclusively developed body, chassis and powertrain control features that give the driver a choice of Dynamic or Relaxing driving ‘moods’, in combination with the full hybrid system’s EV, Eco, Normal and Sport drive modes.

The design of the bodyshell plays a critical role in the overall driving experience, with the lowest possible centre of gravity, excellent rigidity and the reduction of NVH levels. The CT 200h is also the first Lexus to benefit from lateral performance dampers – an option on the SE-L Premier version – which absorb body vibrations to give more linear steering feel and improve ride comfort.

The bespoke suspension design features an L-arm MacPherson strut system at the front and a new, fully independent double wishbone and trailing arm set-up at the rear.

High body rigidity

The structural rigidity of the bodyshell promotes superior vehicle stability and in the CT 200h torsional stiffness has been enhanced throughout by the optimisation of weld points.

Underbody rigidity has been maximised through an increase in density of spot welds connecting the rear floor crossmember to the wheel housings and using front and rear suspension member bracing, a high-rigidity front floor brace, high-voltage battery carrier and rear lower support members.

The steering wheel mounts, steering gearbox mount, steering column assembly and the suspension members have all been extensively reinforced to gain maximum rigidity. The front suspension towers are connected by a straight front cowl reinforcement, and a network of bracing connects the front suspension towers, front cowl and A-pillars.

Torsional rigidity has also been strengthened in the upper body by using a fully closed cross-section around the back door aperture, reinforcement of the back side the rear side member and the addition of an inner gusset and outer reinforcement to the rear wheel housings.

Lateral performance damper system

The top-of-the-range version of the CT 200h offers the option of front and rear lateral performance dampers, designed to absorb and minimise body vibrations, give a more linear steering feel and contribute to ride comfort.

In the place of conventional fixed bracing, this system – seen for the first time in a Lexus – features a front performance damper that connects the left and right front suspension towers, and a rear damper connecting the left and right sides of the structural frame.

The basic design of the dampers is like that of a typical monotube suspension damper, but they differ according to the variations in body rigidity, noise and vibration of their surroundings. This optimises their ability to absorb body torsion, flexure and fine vibrations.

Their use reduces vehicle floor vibrations across a wide frequency range, reduces body deformation in left and right front suspension tower displacement, and even lowers the audio system’s white noise levels.

Although difficult to analyse even using CAD, minuscule vibrations manifest themselves to the driver as a slight discomfort when turning the wheel and minute deviations in vehicle behaviour during straight line acceleration. Eliminating these issues delivers an even higher level of steering response and ride comfort.

Lightweight body design with low centre of gravity

Numerous measures were taken to give the CT 200h the lowest possible centre of gravity and moment of inertia. The bodyshell has a long, 2,600mm wheelbase with short overhangs, with occupants seated as close as possible to the centre.

To minimise the yaw inertia moment and improve agility, the bodywork components furthest from the centre of gravity have been made as light as possible. As a result, the bonnet, tailgate and bumper reinforcements have been made of aluminium.

The overall height, ride height and driver's hip point have all been kept as low as possible, and the hybrid battery has been located under the loadspace floor, but within the wheelbase, to help achieve the best weight distribution and balance. The bodyshell itself uses a high percentage of strong but lightweight high tensile steel, as well as aluminium.

Driving position

The CT 200h's highly focused driving position is key to the car's driving experience, with a low hip point and generous lumber and lateral support.

Support wires have been built into the seat's side bolsters to strengthen lateral holding performance, and the lumbar support can be electrically adjusted through a 30mm range. The front edge of the base cushion has been shaped to provide a large contact area, which helps reduce driver fatigue on long journeys, and the cover has a support pleat that more comfortably co-ordinates movement of the driver's body with that of the vehicle.

Driver comfort is further helped by the steering wheel design, which has a wide, 370mm diameter grip and is set at an angle of 21°. The angle of the accelerator and brake pedals has also been calculated to suit the low seating position.

To ensure the best possible forward visibility, the bonnet has also been set low. To maintain the necessary gap between the bonnet and the engine components to maintain pedestrian impact safety, a new air intake was specifically designed for the CT 200h.

On-demand drive modes

In addition to the Normal drive mode, three on-demand modes can be selected (EV, Eco and Sport) using a dedicated switch on the centre console. The choice of mode adapts the car's performance to either a Dynamic or Relaxing driving 'mood'.

EV, Eco and Normal modes place the emphasis on a relaxing drive, with particular attention paid to ride comfort, smooth acceleration and the minimisation of NVH in the body, chassis and powertrain.

From start-up and at speed of less than 28mph, the CT 200h can operate automatically in EV mode, running solely on its electric motor. The drive can also select EV mode manually. This function is not available in mild hybrid systems, as it requires the full hybrid technology used in Lexus Hybrid Drive.

In EV mode the car can be driven with zero tailpipe emissions and minimal noise for up to 1.2 miles, the range dependent on the level of charge in the hybrid battery. As the petrol engine is switched off, EV mode contributes to a significant reduction in overall fuel consumption.

In Eco mode, throttle response to aggressive use of the accelerator is reduced and control of the air conditioning is adjusted to achieve better fuel economy. Depending on driving conditions, Eco mode can promote a more relaxed driving style and achieve a perceptible reduction in fuel consumption.

Sport mode is tuned to deliver more power from the electric motor, creating a more dynamic driving mood to make the most of the CT 200h's performance and agility. The hybrid system PCU boosts supply voltage by 150V to 650V, increasing overall powertrain output. Engine revs are held higher and the throttle and electric power steering (EPS) settings are modified to give a faster response to driver inputs.

Sport mode also brings less intrusive operation of the Vehicle Stability Control (VSC) and Traction Control (TRC).

The switch to Sport mode is also reflected in the instrument display. Backlit in hybrid blue in EV, Eco and Normal modes, the panel illumination, mode select switch and a

central spotlight in the instrument cluster automatically change to red when Sport is selected and the Hybrid System Indicator changes function to become a tachometer.

Suspension

The CT 200h has a bespoke suspension design with an L-arm MacPherson strut front system and a double wishbone and trailing arm set-up at the rear. Many elements have been developed specifically for the model, including the coil spring, shock absorber, bump stop, upper support and upper and lower insulators, a lightweight steering knuckle, hub and bearing, and a new anti-roll bar.

Unsprung weight has been kept to a minimum and shock absorber response has been improved by using aluminium steering knuckles and stabiliser links, with lightweight lower arms, hub bearings and shocks.

The shocks themselves have low friction valves, seals and oil, which also promote better damping response. Using lateral force control coil springs reduces suspension friction, improving ride comfort, while connecting the steering gearbox mounts directly to the front suspension member ensures linear steering feel and improves the car's straight line stability.

The lightweight, large diameter front anti-roll bar improves the CT 200h's controllability, braking stability and evasive manoeuvrability. It features a ball joint link strut connection for excellent roll rigidity, and a fluorine resin coating between the bushes and the bar itself, which reduces friction and enhances ride quality.

The new, fully independent rear suspension incorporates a lightweight trailing arm and positions the coil and shock absorber separately, which minimises intrusion into the loadspace floor. Suspension geometry, including the camber and toe angles and arm layout has been design to give the best ride comfort and stability.

The system is fabricated in stamped steel to give both light weight and high rigidity. Again, many components have been designed specifically for the Ct 200h, including the coil spring, shock absorber, upper support, bump stop, hub and bearing and anti-roll bar.

As in the front suspension, the shock absorbers have low friction valves, seals and oil. Using rebound springs improves roll posture when cornering, and urethane bump stops combine excellent roll rigidity with superior ride comfort. The low resistance rear axle hub bearings help improve fuel economy, and a resin aerodynamic cover on the front of the lower arm to help direct the underbody airflow contributes to high-speed stability and fuel economy.

The rear anti-roll bar bushings have resin spacers and use a rubber compound designed to give greater support and stiffness. As with the front anti-roll bar, there is a fluorine resin coating between the bushings and the bar itself.

Electric Power Steering (EPS)

The EPS's energy-saving and lightweight characteristics make it ideally suited for use in conjunction with Lexus Hybrid Drive. With a quick 14.6:1 ratio and 2.7 turns lock-to-lock, the speed-sensitive system is the most direct in the Lexus range.

Powered by the hybrid battery, the EPS improves fuel economy by using power only when steering force assistance is needed. It is highly durable and requires no hydraulic fluid.

The system's compact, high-output motor and torque sensor are built into the steering column, which allows for more precise vehicle control. Precision is further improved by the mounting of the steering gearbox directly on to the suspension subframe to gain greater installation rigidity. The high rigidity of the steering column and the support bracket promotes better driver feedback and a more linear steering feel.

When the driver selects Sport mode, the EPS automatically governs the degree of steering assistance to give more direct steering feedback and a more involving driving experience.

Aerodynamics

With the benefit of extensive CAD and wind tunnel testing, Lexus was able to fine tune the CT 200h's aerodynamic efficiency. As result, the car has a class-leading drag

coefficient of 0.29, which not only supports fuel efficiency, but significantly improves high-speed stability and ride comfort.

Every aspect of the upper bodywork was detailed to ensure superb airflow management. The deep front bumper, sharply sculpted front air dam, optimised bumper corner angles and the door mirrors have all been designed to smooth airflow over the front and down the sides of the vehicle, minimising wheel arch turbulence.

The flow of air away from the rear of the vehicle is carefully controlled through tapered cabin sides, a deep roof spoiler, aerodynamic fins at the corners of the rear windows and the sharp, near-vertical junction of the rear wing and bumper.

Equal attention was paid to the flow of air beneath the car, keeping the coefficient of lift to a minimum to preserve fuel efficiency and stability with numerous aerodynamic underbody elements. The detailed work extends to the installation of the main exhaust silencer and the shape of the rear bumper cover.

Noise, Vibration and Harshness (NVH)

The CT 200h benefits from a series of measures to minimise wind and road noise and ensure an outstandingly quiet cabin.

Sound absorbing and insulating materials are comprehensively used in the engine compartment, firewall, floor panel and cabin construction. Front wing side protectors prevent road and engine noise from entering the cabin, with wheel arch liners further inhibiting the transmission of road noise.

Sealant and urethane foam are used to fill bodyshell holes, and foam-based sound insulating materials are positioned throughout the body, including in all the cabin pillars and door sill and head sections, to cut sound transmission through the bodyshell to a minimum.

A damping channel is featured on the beltline of each door window, increasing the rigidity of the glass and strengthening the windows' seal to reduce the penetration of road noise, and a dynamic damper inside the tailgate panel reduces booming.

The 0.29 coefficient of drag means wind noise from the body is minimised. Further measures in this area include an acoustic windscreen, which has an inner layer of film, while the rear edge of the bonnet has been shaped to cut the turbulence generated by the flow of air over the wipers. The step between the windscreen and both the roof and side rain gutters has been minimised to reduce wind noise, and a seal positioned in the B-pillar gap between the front and rear doors helps smooth the flow of air down the sides of the body.

5 DESIGN AND HIGH-TECH FEATURES

- Latest expression of Lexus L-finesse design philosophy
- Dynamic, elegant design with hand-crafted quality feel
- 2,600mm wheelbase supports spacious passenger accommodation
- Remote Touch control for on-board information, entertainment and vehicle set-up
- Audio system with world-first bamboo charcoal speakers

DESIGN

Exterior

The look of the new CT 200h has been created to express a combination of elegance and dynamic appeal that will strengthen its appeal to a new, younger Lexus customer.

The front end in particular displays a new take on Lexus's L-finesse design philosophy, projecting a balance of precision and power. The grille is pushed forward of the headlamps for clearer visual integration with the mid-section of the bumper below, and incorporates a deep, sculpted interpretation of Lexus's arrowhead motif. Together the upper and lower grilles form a distinctive spindle shape.

The headlamp clusters are set on a higher plane than the grille, a styling characteristic that's unique to Lexus models, designed to strengthen the impression of speed and agility. The headlights themselves are offered with single halogen or, on the SE-L Premier version, twin LED low-beam lamps. The CT 200h also comes with newly developed LED daytime running lights, arranged in the distinctive Lexus arrowhead shape.

The deep front bumper and sharply sculpted front air dam flow into clean, muscular front wings which reinforce the car's wide-track stance.

The CT 200h's sweeping lines mimic the natural flow of air over and around the bodywork, creating a dynamic yet elegant design. The class-leading 0.29 drag coefficient both maximises fuel efficiency and minimises the level of wind noise experienced in the cabin.

In profile the CT 200h has a distinctive silhouette, thanks to its steeply raked windscreen, long, flowing roofline and trademark Lexus slingshot window graphic. New-design compact and aerodynamic door mirrors feature integrated LED turn indicator lights and have a two-tone finish to give a slimmer appearance. The long roof and sweeping character lines over the doors give the cabin a tapered shape, which curves in at the rear to follow the movement of air as it flows away from the back of the vehicle.

At the rear there is a pronounced step in the tailgate section from the muscular rear wheel arch shoulders, emphasising the wraparound design of the rear window. This step, anchored by sweeping tail lamps in the trademark Lexus L-shape, combined with a broad rear bumper design to emphasis the car's broad, firmly planted stance.

The car rides on 16 or 17-inch alloy wheels. It features Lexus hybrid blue badging and is available in a choice of 10 exterior colours. A wider palette of paint finishes has been introduced, including new Bronze and Yellow metallic finishes.

Interior

The L-finesse design principles are carried through into the interior, which displays a simplicity of form with a hand-crafted quality feel.

The dashboard is divided into two distinct sections: an upper display zone, with an eight-inch LCD multi-display screen, and a lower operation zone, with the shift lever and system controls.

While the cabin is spacious and airy, the driver's environment is a snug, highly focused cockpit, with a low-set seat, wide-grip steering wheel, high-visibility dials, optimally

positioned pedals and ergonomically arrayed controls with advanced human-machine interface technologies.

Extensive use of metallic finishes and dark, soft-touch materials reinforces the premium quality feel of the cabin. The shape, form and tactile quality of each interior component has been carefully considered, an attention to detail that's evident in the brushed metal finish of the door handle bezel and the Drive Mode Select switch, the quality of the shift lever – constructed seemingly from a single billet of metal – and the leather-bound steering wheel.

Even the operation of the electric windows has been tailored to reinforce the luxury feel. When fully closing, the windows slow down for the last 110mm of travel to minimise the sound of closure; similarly, when fully opening from the closed position, they slow for the final 150mm.

The windscreen uses green-tinted UV-cut glass to help reduce the build-up of heat in the cabin, and similarly tinted front door glazing that has a water-repellent coating. Darker tinted rear privacy glass is also fitted as standard to all models.

The front and rear seats are positioned close to the centre of the 2,600mm wheelbase, to help reduce the car's moment of inertia. The front seats are set at a distance of 710mm, and the rear seat spacing is 620mm with a hip point raised by 25mm to give passengers in the back of the vehicle a greater feeling of spaciousness and better visibility.

The driver and front passenger enjoy class-leading head and shoulder room. Six-way manual seat adjustment is provided, with front seats on SE-L Premier grade models benefiting from eight-way power adjustment, power lumbar adjustment and heating.

Lexus has increased interior roominess with detailed measures, including making the centre section of the rear seats flatter, reducing the thickness of the front seatbacks and creating a flat cabin floor. The result is roominess that's comparable to any vehicle in the luxury compact hatchback segment.

By fitting the hybrid battery as low as possible beneath the boot floor and using a trailing arm rear suspension design, Lexus has avoided compromising the amount of loadspace available. Comparing favourably with the segment average, the CT 200h offers 375 litres of space with the rear seats in place; with the rear seats folded, this extends to a maximum 985 litres.

CT 200h is available with the widest choice of interior trim colour schemes of any mainstream Lexus models with five fabric options, three leathers and three accessory trims (ash burl, bamboo and metallic).

HIGH TECH EQUIPMENT FEATURES

Remote Touch

Lexus's innovative Remote Touch multi-function control, an integral part of the satellite navigation system fitted as standard to the SE-L Premier model, is located directly behind the shift lever. It differs radically from the remote control devices offered by other manufacturers in that it operates on the same basic principles as a computer mouse, adapted for use in the driving environment.

It provides simple, fast and intuitive operation with reaction force feedback designed-in for a reassuring tactile quality. Using the Remote Touch control, a cursor can be moved quickly and easily across the icons presented on the multi-display screen to access the vehicle's audio, navigation, climate control, phone and vehicle-set up controls. This function is made all the easier by the system automatically "pulling" the cursor to an icon when it passes close to it on the screen, making selections quicker to achieve and thus reducing driver distraction time.

Lexus Navigation System

The Lexus Navigation System available in the CT 200h – standard on the SE-L Premier model – uses a 40Gb hard disc drive (HDD), making it one of the fastest and most accurate on the market. It provides full European coverage, including local traffic information infrastructure in each country, with a voice recognition function and a menu of 14 operating languages.

Lexus Audio System

Lexus's established excellence in in-car hi-fi is reflected in the quality of the audio systems available in the CT 200h.

The entry level premium sound system (SE-I and SE-L) features a CD player with steering wheel-mounted controls and six speakers. It is DAB-ready and comes with a USB port and audio jack socket for connecting personal music players, such as iPods. Bluetooth enables mobile phone connectivity and audio/video streaming.

As an option, SE and SE-L models can be equipped with a 10-speaker audio package that offers all the same features, plus a six-disc changer in the dashboard and the Lexus Navigation System. It benefits from Lexus's first high-performance Digital Signal Processing-integrated (DSP) amplifier, which uses 50 per cent less power than a conventional analogue amplifier and is 26 per cent lighter in weight.

Sound distortion has been reduced and the 10 speakers are controlled by specially developed sound image control technology, which creates a natural soundscape, regardless of where in the car you are seated. New loudness characteristics have been incorporated in the system and the volume tuning has been designed to suit the exceptionally quiet cabin, improving sound quality at low volumes.

A first for Lexus, both premium sound systems use bamboo charcoal-based resin diaphragm speakers. Made from a complex compound of bamboo charcoal, bamboo fibre and resin, they weigh between 10 and 15 per cent less than a conventional speaker diaphragm, yet are 20 per cent stiffer and have a 10 per cent greater sonic speed. As result, sound is clearer and more natural.

Mark Levinson Premium Surround Audio system

The CT 200h SE-L Premier is equipped with a new Mark Levinson Premium Surround Audio System with 13 speakers and an eight-channel amplifier. Benefiting from the navigation system's HDD, it also provides a sound library facility, using Compact Disc Data Base technology to transfer and store up 10Gb of audio files.

A number of unique system features support the exceptionally high sound quality. A centre channel coaxial speaker unit, comprising a 90mm metal cone mid-range and

16mm tweeter, widens the scope of supported frequencies to produce vocals and instrumentals with a greater degree of precision than a conventional system, while also matching harmonics between the front left and right channels.

Secondary 90mm coaxial speakers are mounted in the centre and rear cabin pillars to expand the sound reproduction frequency range. Satellite speakers are positioned at the top of the rear pillars to life the rear mid to high range tones upwards for a more realistic sound, and a 200mm Mark Levinson subwoofer is housed in a bespoke enclosure in the loadspace wall, producing extremely deep bass with ease.

Back guide monitor

A back guide monitor (standard on SE-L Premier models) automatically projects a full-colour, real time image of the view behind the vehicle onto the navigation system display, or, on models without navigation, a section of the rear view mirror, whenever reverse gear is selected/ Integral guide lines on the image further help the driver make precise manoeuvres into parking spaces, or alongside kerbs.

6 SAFETY

- Pre-Crash Safety system with Adaptive Cruise Control (PCS and ACC)
- Electronically Controlled Braking-Regeneration system (ECB-R)
- Eight airbags as standard
- Whiplash Injury Lessening front seats (WIL)
- Designed to meet Euro NCAP five-star crash test performance

Following an established Lexus principle, the CT 200h's advanced safety features are built around an Integrated Safety Management Concept, designed to provide the best possible safety performance in all driving scenarios.

With a highly rigid, impact-absorbing bodyshell, and a comprehensive range of active, passive and pedestrian impact features, the CT 200h is designed to meet the top, five-star standard in Euro NCAP's independent crash test programme.

In a world-first for the luxury hatchback segment, SE-L Premier versions of the model can be specified with an optional Pre-Crash Safety system with Adaptive Cruise Control.

Eight airbags and Whiplash Injury-Lessening front seats are fitted as standard and the Electronically Controlled Braking-Regeneration system incorporates ABS, Brake Assist, Traction Control and Vehicle Stability Control.

ACTIVE SAFETY

Pre-Crash Safety (PCS)

The SE-L Premier versions of the CT 200h can be equipped as an option with PCS, which can help the driver avoid a collision, and mitigate damage and injury should a collision happen.

It uses a front-mounted millimetre-wave radar that scans the area ahead of the vehicle to detect obstacles, even when cornering. The PCS computer analyses data from an array of sensors monitoring vehicle speed, steering angle and yaw rate inputs to determine whether a collision is imminent and unavoidable.

If there is a high probability of a collision, PCS will alert the driver by a buzzer and a warning light on the multi-information display and activate the front seatbelt pretensioners. When the driver begins to brake, PCS provides supplementary assistance; if the driver does not brake and an impact becomes inevitable, the system automatically applies the brakes to reduce collision speed.

Adaptive Cruise Control (ACC)

ACC operates in tandem with the PCS, using same radar technology, it works in two modes: constant speed control (in the same manner as conventional cruise control) and vehicle-to-vehicle distance control to maintain a safe distance from the vehicle ahead.

ACC can distinguish between vehicles immediately in front the car and those travelling in adjacent lanes. Using the radar sensor and constant speed, decelerator, follow-up and accelerator controls, it will automatically slow the CT 200h to match the speed of the vehicle in front, then accelerate to the pre-set cruising speed once the way ahead is clear. The driver can select long, middle or short vehicle-to-vehicle distances, with the settings shown on the multi-information display.

Electronically Controlled Braking-Regeneration system (ECB-R)

The Electronically Controlled Braking-Regeneration system was upgraded by Lexus engineers for installation in the CT 200h to give better braking feel and performance. This second generation system co-ordinates control of both hydraulic and regenerative braking, supporting fuel economy by proactively using braking force from the hybrid drive system's electric motor to recover as much electrical energy as possible.

The vehicle is fitted with 255mm ventilated front discs with lightweight aluminium callipers, a resin piston and high-friction pads. At the rear there are 279mm solid discs with aluminium callipers and a V-spring to reduce drag and help fuel economy.

The brake pedal itself is hollow, which saves weight, with ratio and efficiency optimised, reducing initial pedal effort and providing a pedal stroke that helps the driver better modulate braking force.

At speeds above 34mph, if the ECB-R determines that emergency braking is taking place, it automatically triggers rapid on-off flashing of the stop lights to warn any following vehicles.

Additional active safety features

ECB-R incorporates a full range a full range of active safety systems, including latest-generation ABS with Brake Assist (BA), Traction Control (TRC) and Vehicle Stability Control (VSC).

PASSIVE SAFETY

Body structure

The CT 200h has been engineered with the clear aim of achieving the highest safety performance in frontal, offset, side and rear collisions. Going beyond the security of vehicle occupants, the vehicle has been designed also to offer excellent pedestrian impact protection.

The high-strength body structure has been engineered to distribute collision loads through multiple energy-absorbing paths, limiting the extent of cabin deformation. The use of high-tensile sheet steel for the front side members, and the inclusion of an under member allows for impact load to be distributed from the radiator support in a frontal

impact. Attention has also been paid to the strength of the door belt line reinforcement so that the structure can distribute collision loads effectively between the A-pillars, door belt line and rockers.

A cross member in the dash panel distributes impact load from the front side member to the floor member and upper body, and the inclusion of a floor tunnel side member improves floor tunnel strength and further allows impact load from the front side member to be distributed.

Side collision performance is enhanced through high-tensile steel reinforcement of the outer B-pillar and hinge, inner and outer rocker, front door belt line and roof centre. Bulkheads located at the ends of several floor crossmembers effectively transmit side impact load to the crossmembers, and a side impact support box has been positioned in the front floor tunnel between the front seats.

The rear body structure has been designed to comply with revised US regulations regarding high-speed (50mph) collisions, with high-strength rear floor side members used to suppress body deformation under a rear impact load.

Occupant protection is further improved in the cabin with the use of energy-absorbing padding beneath the dash panel to help reduce leg injuries, and within the front and rear door trims. Energy-absorbing materials have also been built into the roof trim and each pillar, helping to reduce head injuries.

Pedestrian impact safety

Extensive measures have been designed in the front end of the CT 200h to reduce the risk of pedestrian injury. The bumper structure is designed minimise leg injury, including impact-absorbing materials within the bumper and under the radiator support to help prevent a pedestrian’s legs from sliding beneath the vehicle.

The bonnet structure incorporates an impact-absorbing cavity to maximise the impact stroke. In addition, the cowl and cowl louvres have an easily crushable, energy-absorbing open cross-section structure to absorb impacts from above, helping to reduce head injury.

Airbags and seatbelts

The CT 200h is fitted with eight airbags as standard: driver and passenger front, knee and side airbags and curtain airbags. In a collision, they are deployed in line with the force of impact, seat position and fastened/unfastened status of the seatbelts. The passenger front airbag can be deactivated, its status shown by a warning light on the dashboard. The seatbelt pretensioners remain active, so a rear-facing baby seat can be safely fitted.

All front and rear seats have three-point seatbelts with Emergency Locking Retractors (ELR). The driver, front passenger and outer rear seat seatbelts are also equipped with pretensioners and force limiters. Both front seatbelts have a tension reducer function for added comfort.

Whiplash Injury-Lessening seats (WIL)

The CT 200h has second-generation WIL seats. The revised system features a new seatback structure and headrest design in which the headrest is designed to sit as close as possible to the occupant's head during normal use. In the event of a rear impact, the lower seatback pushes backwards, effectively closing the gap between the occupant's head and the headrest, reducing the risk of whiplash injury.

7 UK MARKET AND COST OF OWNERSHIP

- The equipment grades – SE-I, SE-L and SE-L Premier
- On sale now, on-the-road prices from £23,485
- Class-leading ownership costs, with low emissions attracting favourable tax rates and zero annual VED charge

CT 200h in the UK

From launch (official on-sale date 1 March), the Lexus CT 200h is available in three model grades: SE-I, SE-L and SE-L Premier. A new gateway model for the Lexus range, it is priced from £23,485 on-the-road.

Prices, insurance and VED

The table below sets out the launch on-the-road prices, insurance groups and Vehicle Excise Duty bands for the CT 200h.

MODEL	OTR PRICE	INSURANCE GROUP	VED BAND
CT 200h SE-I	£23,485	15E	A
CT 200h SE-L	£25,200	15E	A
CT 200h SE-L Premier	£30,635	17E	A

Equipment highlights

A high equipment specification is an established quality of all Lexus models and the CT 200h sustains the company's reputation for a generous tick-list of premium comfort, convenience and safety features.

Across the board, all version of the CT 200h are fitted with alloy wheels – 16 or 17-inch according to customer preference – dual-zone climate control, a USB port and Aux socket for connecting portable music players, Bluetooth for mobile phone connection and audio streaming, front fog lights, automatic wipers and dark-tinted rear privacy glass.

Key equipment features for each grade are shown in the table below.

SE-I	SE-L adds	SE-L PREMIER adds
16/17in alloy wheels	Leather upholstery	LED headlamps
USB port	Heated front seats	Convenience Pack (cruise control and electrochromic rear view mirror)
Active brake lights	Front and rear parking sensors	Smart Entry and Start
Dual-zone climate control		Electric front seat adjustment
Push button start		Electrochromic door mirrors
Leather steering wheel trim		Mark Levinson 13-speaker audio system
Front fog lights		HDD satellite navigation
LED daytime running lights		Remote Touch control
Rear privacy glass		Rear parking monitor
Rain-sensing wipers		

Equipment options

Given the comprehensive equipment specifications for the CT 200h range, there is a concise but focused list of optional features.

The SE-I can be fitted with front and rear parking sensors and a premium 10-speaker audio system with HDD full-map satellite navigation.

A Convenience Pack is available for SE-L models, comprising cruise control, an Electrochromic rear view mirror and a rear parking monitor which displays images in a section of the rear view mirror. The premium audio pack with satellite navigation can also be specified for the SE-L

The options for the SE-L Premier are the advanced lateral damper system and Pre-Crash Safety system with Adaptive Cruise Control.

Metallic paint and digital DAB radio tuner are options on all CT 200h versions.

Competitor Comparison

Competitor models in the luxury hatchback segment are unable to match the CT 200h on equipment levels and pricing. Customers opting for an equivalent BMW 1-Series or Audi A3 need to find around an extra £1,500 in order to gain what comes standard on the Lexus, as the table below demonstrates.

	LEXUS CT 200h SE-I E-CVT	**BMW 118d SE Auto**	**AUDI A3 2.0 TDi 140 SE Steptronic**
OTR price	£23,485	£23,685	£22,760
17in alloy wheels	✓	£415	£650
6-speaker audio with CD/MP3 player	✓	£145	✓
USB port	✓	£205	£180
Bluetooth	✓	£200	£245
Active brake lights	✓	Not available	Not available
Leather steering wheel trim	✓	£200	✓
UV-cut glazing	✓	£235	✓
Rear privacy glass	✓	✓	£325
Rain-sensing wipers	✓	£90	£100
Full specification	£23,485	£25,175	£24,260

adjusted price			
Price variance vs CT 200h	✓	+£1,690	+£775

Source: manufacturer UK web sites

Total Ownership Costs

The CT 200h's low emissions performance is central to its exceptional total ownership cost profile.

The official CO_2 figure of 94g/km gains the car a zero annual VED (Vehicle Excise Duty/road tax) charge. And for drivers in London, there is exemption from the congestion charge, with further discounted or free parking on offer in a number of areas around the country. A 15E insurance group rating adds to the low running costs, together with excellent fuel economy and highly competitive service, maintenance and repair costs.

For company car drivers the benefits are even more marked. The emissions performance places the CT 200h in the lowest band for benefit-in-kind company car tax, with an annual 10 per cent charge. This strengthens its performance against rival models to deliver significant cost savings over a three-year period, as the table below demonstrates.

	LEXUS CT 200h SE-I E-CVT	**BMW 118d SE Auto**	**AUDI A3 2.0 TDi 140 SE Steptronic**
OTR price	£23,485	£23,685	£22,760
P11D value	£23,430	£23,565	£22,890
BiK rate/cost 2011/12	10%/£937	21%/£1,979	18%/£1,648
BiK rate/cost 2012/13	10%/£937	22%/£2,074	19%/£1,740
BiK rate/cost 2013/14	10%/£937	23%/£2,168	20%/£1,831
5,000 annual private mileage	£1,232	£1,593	£1,474
Total cost	£4,044	£7,814	£6,693
Variance vs CT 200h	-	+£3,770	+£2,649

Source: VCA

For company fleet operators, the CT 200h qualifies for a 100 per cent write-down allowance against corporation tax in the first year of ownership. The savings which can accrue over the first three years of running the CT 200h are detailed below.

	LEXUS CT 200h SE-I E-CVT	**BMW 118d SE Auto**	**AUDI A3 2.0 TDi 140 SE Steptronic**
WDA year 1	£23,485	£4,747	£4,589
WDA year 2	0	£3,798	£3,671
WDA year 3	0	£3,004	£2,926
Cashflow year 1	£6,576	£1,329	£1,285
Cashflow year 2	0	£1,063	£1,028
Cashflow year 3	0	£841	£819
Total cashflow gain	**- £6,576**	**- £3,234**	**- £3,132**
Employer NI 2011/12	£300	£633	£527
Employer NI 2012/13	£300	£664	£557
Employer NI 2013/14	£300	£694	£586
Depreciation	£12,917	£14,716	£13,538
VED costs	0	£360	£195
Fuel (15K business miles pa)	£3,697	£4,939	£4,571
Insurance	£2,655	£3,210	£3,435
SMR	£1,457	£1,601	£1,784
Total cost inc. WDA	£15,049	£23,583	£22,060
Variation vs Lexus	**-**	**+ £8,534**	**+ £7,011**
Total cost exc. WDA	£21,625	£26,817	£25,192
Variation vs Lexus	**-**	**+ £5,192**	**+ £3,567**

Source: VCA

Service, Maintenance and Repairs

The CT 200h's service, maintenance and repair (SMR) costs are as much as 40 per cent cheaper than its key segment competitors, thanks to lower parts prices and labour charges. The annual/10,000-mile service intervals maximise component lifetime efficiency, with the Lexus Hybrid Drive specifically designed for low maintenance and durability.

Further savings are achieved through the fact the full hybrid powertrain does not need a conventional starter motor, alternator or clutch. The petrol engine is fitted with a maintenance-free timing chain, a low-cost paper element oil filter and miniaturised spark plugs. It also has no drive belts, which contributes to excellent reliability and reduced costs.

The stainless steel exhaust system has a life expectancy of more than five years, while the LED headlamps (SE-L Premier) are not only brighter than conventional high-intensity discharge (HID) or halogen bulbs, they also last much longer.

The hybrid battery's reliability has a proven reliability record, having clocked up more than 60 billion kilometres of driving worldwide, and is designed to last the lifetime of the car. It is covered by a five-year/60,000-mile warranty.

Because the Electronically controlled Braking-Regeneration system (ECB-R) supplies the first 50 per cent of all braking force – that's about 60 per cent of everyday braking use – the CT 200h's brake components enjoy outstanding longevity. Over 60,000 miles of driving the front brake pads usually only need replacing once, while the rear pads and all discs may last the full distance.

Lexus Hybrid Drive is equally efficient in minimising tyre wear. The even distribution of the system components reduces the load on the front tyres, spreading the weight more evenly over all four wheels. Its smooth, linear power delivery also reduces wear under acceleration and the use of a higher than average tyre pressure reduces shoulder wear, as well as improving fuel economy.

Many of the car's components have been developed specifically to reduce repair costs following impact damage. The body structure itself has also been designed for lower repair bills in the event of a minor collision.

Residual Values

Depreciation has a significant impact on whole-life vehicle costs, making it a key consideration for both private owners and fleet operators. RVs for the CT 200h are expected to be at the top of the luxury hatchback segment.

Based on three years/60,000 miles, figures from CAP Monitor (February 2011) put the CT 200h SE-I at the top of its segment with expected depreciation of 39 per cent. This compares to 39 per cent for the Audi A3 2.0 TDI and 35 per cent for the BMW 118d SE.

The CT 200h's RVs are expected to remain high, as the car is a unique proposition in the fleet market with a number of segment-first features, built to exacting quality standards. Also, Lexus's pricing model avoids excessive discounting, which, combined with intelligent volume planning and a balanced supply and demand strategy has a positive effect on the rate of depreciation.

Lexus's pan-European remarketing programme and business-to-business used car sales platform help drive a seamless de-fleet process to stimulate market demand. The close involvement of Lexus centres in the remarketing process helps exploit special vehicle features, such as full hybrid technology, in the second vehicle life-cycle.

8 MANUFACTURING, QUALITY AND CUSTOMER SERVICE

- High-precision assembly line, combining new production technology with master craftsman skills
- Lexus MUST standards assure highest quality of design, engineering and manufacturing
- Industry-leading customer service

Innovative production technology and craftsman skills

The CT 200h is built alongside the RX 450h on Line 1 Toyota Motor Kyushu's (TMK) Kokura factory.

Kokura was the world's first factory dedicated to hybrid vehicle production when it came on stream in 2008 and it maintains the highest standards of manufacturing quality through its fusion of innovative technology with the skills of Lexus master craftsmen. Its success was recognised in 2010 with a J.D. Power and Associates Gold Quality Award.

Throughout the CT 200h production process the focus is on reducing inconsistencies. One of the most effective approaches to achieving this is data-driven manufacturing: in each process on the line, from stamping, painting and assembly through to inspection, precise data are measured, collated and managed. For example, all bolts and screws are tightened by electric wrenches and the data for each wrenching application is recorded and linked to each VIN number.

By monitoring measurement data in real time, inconsistencies and abnormalities can be instantly detected. The information is cross-checked against the design parameters and stored on a database, and is used to hone assembly operations to even higher levels of precision.

Although robots, digital devices and sophisticated testing equipment perform many of the assembly tasks and inspections for the CT 200h, there are still areas of the manufacturing process where human skills exceed those of even the most advanced automated systems.

With a senior engineer on station throughout vehicle assembly, the TMK production process integrates Lexus's renowned manufacturing quality with a human focus on subliminal quality; those aspects of a car which cannot be measured or quantified mechanically, but which contribute at a fundamental level to people's perceptions of overall product quality.

For instance, subtle imperfections such as virtually invisible scratches, dull patches in the surface coating and gaps or misalignments in body panels may be undetectable by machines, but are quickly spotted by master craftsmen and finished meticulously, vehicle by vehicle.

Stamping

Creating a flawless bodyshell requires a dust-free stamping process – a dust particle only needs to measure 20 microns, the size of a grain of pollen, to be able to leave scratches on body panels, so stringent controls are needed to keep the stamping clear of dust.

Twice a week the dies are sanded and washed on-site. To ensure the fine dust created by this process does not re-enter the stamping area, the maintenance area is surrounded by a dust-catching curtain of water, nicknamed Niagara. Niagara is a three-metre high green net with water flowing constantly down its surface, which traps more than 90 per cent of airborne particles. This results in a significant improvement in the quality of the stamped panels.

Bodyshell

The CT 200h's driving performance, ride comfort and quietness are underpinned by a high degree of body rigidity, a quality achieved through developments in high-precision, advanced welding technologies.

Robots perform the spot-welding assembly of the bodyshell while it is held in place by a series of jigs. The rigidity and precision of the body is determined by the number of spots the robots can reach and weld. By introducing slim robots between the standard units, Lexus has achieved a big increase in the number of weld points.

Careful analysis determines the right number of weld points for each area of the bodyshell, which not only improves rigidity, but also reduces inconsistencies.

Painting

To ensure an outstanding paint surface is maintained throughout the finishing process, both robotised processes and skilled hand spraying are used for applying the base and top coats.

The body and doors are painted together before following separate routes on the assembly lines. Bodyshell painting is done individually, instead of in batches. The only separation is for white (Arctic Pearl) cars, which have their own paint line

Special equipment and procedures are used to ensure no cross-contamination of paint colours. The car's body is magnetised and the paint is charged with static electricity so it is attracted to the surface. Airflow in the paint shop controls the dispersion of paint, and all waste and airborne particles are sucked into the floor, so there can be no contact with car ahead or the one following.

The exceptional surface quality achieved by Lexus's multi-coat painting process is underpinned by meticulous cleanliness in the paint application, particularly in the top-coating booths in the second half of the process. TMK has introduced a system like those used in semiconductor factories, using a number of small, one-way air outlets to pressurise the area prior to the top coat booth, thus forcing air away from the booth.

This has significantly reduced the infiltration of airborne particles, achieving an air quality approximately half way between Class 1,000 and Class 10,000 for cleanrooms (US FED standard).

Assembly

The CT 200h assembly process involves fitting several thousand parts to the bodyshell. Lexus has introduced its Set Part System (SPS), in which all the parts needed to assemble a particular vehicle travel along the line with that vehicle in a gondola. This minimises the time needed for parts to be located; the system also has in-built flexibility to handle complex part combinations.

Numerous 'Clean and Silent' initiatives are being taken at all TMK plants. Using a 'friction-driven conveyance' system in the assembly process plays a big part in creating a quiet factory environment: the conventional chain-driven conveyor has been replaced by a system that uses urethane rollers to move bodyshells along the assembly line.

The resulting dramatic reduction in noise inside the plant helps the technicians concentrate on their work, leading to improved efficiency and precision, even allowing them to hear when a part has been installed correctly. Even the andon system is silent: instead of triggering a buzzer or chime, operating the andon illuminates a light and signals the exact location of the issue to the supervisor.

Inspection and checking

Lexus again combines cutting-edge digital technology with the sensory skills of master craftsmen in the inspection process, to ensure the highest levels of vehicle quality and appearance.

Technicians carry out automated, in-line measurements throughout the body welding and assembly processes, with a final fitting inspection in which panel gaps and alignment are checked by hand and eye. The inspectors who do this work undergo daily training and testing to maintain their skills.

There are 1,700 inspection points during the build of each car, not just in final assembly, but also in the sub-assembly and component manufacturing areas.

There are two final checking lines, one for assembly and one for function. Assembly checks include fit, finish, vehicle specification and visual quality; functional checks include vehicle function, NVH and a rolling road test at speeds up to 75mph. Headlamp adjustment is carried out electronically, by inserting a robot-controlled screwdriver into each lamp's adjustment port.

Every completed vehicle is inspected in a 'Quiet Dome' area, where the sound quality of every aspect of the car is assessed, from switchgear operation to door opening and closing. The cars are then checked for leaks in a shower test booth, which simulates a downpour of 250mm an hour – worse conditions than a severe typhoon – and are then driven on a proving course that simulates different road conditions and driving situations.

Kaizen

All TMK plant workers are encouraged to submit their own ideas for improving any aspect of the manufacturing processes and operations, leading ultimately to continuous improvement – *kaizen* – in efficiency and quality. An example of this is the fitting of lights under the assembly line, illuminating the car for clearer underbody assembly operations.

Lexus MUSTs

The CT 200h has been developed in accordance with a rigorous set of development standards, known as the Lexus MUSTs. These include more than 500 points that set strict guidelines for design, engineering and every stage of the manufacturing process, raising every aspect of the car's dynamic and environmental performance to unprecedented levels.

The Lexus MUSTs also set NVH standards to ensure the quietness and durability expected of Lexus Hybrid Drive and the Lexus brand. They even apply to static factors, such as the car's appearance, tactile and sound quality and the performance and sensitivity of controls.

Customer satisfaction

Quality and industry-leading customer service from the dealer network have always been fundamental to the Lexus brand and the introduction of the CT 200h opens up these benefits to a new group of customers. In the UK, Lexus's unmatched standards are acknowledged in an unprecedented 10 successive J.D. Power and Associates gold awards for customer satisfaction.

LEXUS CT 200h TECHNICAL SPECIFICATIONS

HYBRID SYSTEM	
Type	Lexus Hybrid Drive, series/parallel, full hybrid
Combined power (bhp)	134
ENGINE	
Engine code	2ZR-FXE (Atkinson cycle)
Type	4 cylinders, in-line
Valve mechanism	4 valves per cylinder, DOHC with VVT-i
Bore x stroke (mm)	80.5 x 88.3
Displacement (cc)	1,798
Compression ratio	13.0:1
Fuel system	Intake port (multi-point)
Fuel type	95 octane petrol, or higher
Max. power (bhp @ rpm)	98 @ 5,200
Max. torque (Nm @ rpm)	142 @ 2,800 – 4,400
ELECTRIC MOTOR/GENERATOR	
Type	AC synchronous, permanent magnet
Max. power (bhp)	81
Max. torque (Nm)	207
Max. voltage (V)	650
HIGH VOLTAGE BATTERY	
Type	Nickel-metal hydride (NiMH)
Nominal voltage (DC V)	201.6 (168 x 1.2V cells)
Number of modules	28
Max. voltage (V)	650
Capacity (Ah)	6.5
Max. output (bhp)	37
TRANSMISSION	
Type	E-CVT
Differential gear ratio	3.267
PERFORMANCE	
0-62mph (sec)	10.3
Maximum speed (mph)	112
FUEL CONSUMPTION	
Combined (mpg)	68.9
Extra urban (mpg)	70.6
Urban (mpg)	68.9
Fuel tank capacity (l)	45
Cruising distance (miles)	682

EMISSIONS		
CO_2	Combined (g/km)	94
	Extra urban (g/km)	93
	Urban (g/km)	94
NOx (mg/km)		3.3
CO (mg/km)		187.2
PM (mg/km)		-
TC (mg/km)		28.1
NMHC (mg/km)		25.1
SUSPENSION		
Front		MacPherson strut
Rear		Double wishbone
BRAKES		
Brake type	Front	Ventilated discs (hydraulic, power assisted with ABS and regenerative braking system)
	Rear	Solid discs (hydraulic, power assisted with ABS)
Brake size	Front (diameter x thickness, mm)	255 x 25
	Rear (diameter x thickness, mm)	259 x 9
Parking brake		Pedal
STEERING		
Steering gear type		Rack and pinion
Ratio		14.6:1
Turns lock-to-lock		2.7
Minimum turning radius	Tyre (m)	5.2
	Body (m)	5.6
Power steering type		Electric power steering (EPS)
EXTERIOR DIMENSIONS		
Length (mm)		4,320
Width (mm)		1,470
Height (mm)		1,440
Wheelbase (mm)		2,600
Track	Front (mm)	1,525
	Rear (mm)	1,520
Overhang	Front (mm)	920
	Rear (mm)	800
Ground clearance (mm)		140
Drag coefficient (Cd)		0.29
Luggage compartment capacity (l)		375
Fuel tank capacity (l)		45
INTERIOR DIMENSIONS		
Length (mm)		1,735
Width (mm)		1,470
Height (mm)		1,135
Couple distance (m)		835
Headroom	Front (mm)	960
	Rear (mm)	940
Legroom	Front (mm)	1,055

	Rear (mm)	835
Shoulder room	Front (mm)	1,370
	Rear (mm)	1,335
Hip room	Front (mm)	1,345
	Rear (mm)	1,315
LUGGAGE COMPARTMENT		
VDA capacity – rear seats up (l)		375
VDA capacity – rear seats down (l)		965
Floor to ground height (mm)		693
Length (mm)		665
Width (mm)		840
WHEELS AND TYRES		
Wheels		16 or 17in alloy
Tyres		205/55R16 215/45R17
WEIGHTS		
Kerb weight (kg)		1,410 – 1,465
Gross vehicle weight (kg)		1,845

LEXUS CT200h EQUIPMENT LIST

SAFETY	**SE-I**	**SE-L**	**SE-L PREMIER**
Driver & front passenger airbags	✓	✓	✓
Driver & front passenger side airbags	✓	✓	✓
Driver & front passenger knee airbags	✓	✓	✓
Curtain Shield airbags	✓	✓	✓
Front passenger airbag cut-off switch	✓	✓	✓
ABS	✓	✓	✓
Electronic Brakeforce Distribution (EBD) with Brake Assist system (BA)	✓	✓	✓
Vehicle Stability Control (VSC)	✓	✓	✓
Traction Control (TRC)	✓	✓	✓
Electronic front seatbelt pretensioners with force limiters	✓	✓	✓
Five three-point seatbelts and headrests	✓	✓	✓
High mounted rear stop light	✓	✓	✓
Seatbelt warning system	✓	✓	✓
Twin front & rear fog lamps with auto-cancel function	✓	✓	✓
Tyre Pressure Warning System (TPWS)	✓	✓	✓
Adaptive Cruise Control (ACC) and Pre-crash Safety (PCS)	×	×	Opt
INSTRUMENTS & CONTROLS			
Electric headlamp levelling	✓	✓	✓
Rain-sensing windscreen wipers	✓	✓	✓
Front and rear parking sensors	Opt	✓	✓
Cruise control	×	Opt*	✓
Push-button start	✓	✓	✓

Smart Entry and Start	×	×	✓
Remote Touch control	Opt*	Opt*	✓
Speed-sensitive Electric Power Steering (EPS)	✓	✓	✓
Back guide monitor	Opt*	Opt*	✓
Lateral performance damping system	×	×	Opt
AUDIO, NAVIGATION & INFORMATION			
Multi-information display	✓	✓	✓
6-speaker audio system, CD/MP3 player, tuner	✓	✓	×
Full-map HDD navigation with 10-speaker audio system, CD/MP3 player, tuner	Opt*	Opt*	×
Mark Levinson 13-speaker audio system with 6-DVD changer	×	×	✓
Full-map HDD navigation	×	×	✓
Bluetooth	✓	✓	✓
Aux-in socket and USB port	✓	✓	✓
COMFORT & CONVENIENCE			
Electrically adjustable, retractable heated door mirrors	✓	✓	✓
Electrochromic auto-dimming rear view mirror	×	Opt*	✓
Electrochromic auto-dimming door mirrors	×	×	✓
Tilt and telescopic adjustable steering column	✓	✓	✓
Remote fuel flap release	✓	✓	✓
Electric front and rear windows	✓	✓	✓
Dual zone climate control air conditioning	✓	✓	✓
SECURITY			
Intrusion sensor and alarm	✓	✓	✓
Remote central locking with deadlocks	✓	✓	✓
Two-step double locking	✓	✓	✓
Speed-sensitive door locking	✓	✓	✓
Locking wheelnuts	✓	✓	✓
Transponder key engine immobiliser	✓	✓	✓
SEATING, UPHOLSTERY & TRIM			
6-way manually adjustable front seats	✓	✓	×
Electrically adjustable front seats with lumbar support	×	×	✓
Heated front seats	×	✓	✓
Front and rear armrests	✓	✓	✓
Fabric upholstery	✓	×	×
Leather upholstery	×	✓	✓
Leather steering wheel trim	✓	✓	✓
EXTERIOR			
Halogen headlamps with LED daytime running lights	✓	✓	×
LED low-beam headlamps with LED daytime running lights	×	×	✓
LED rear lamps and active brake lights	✓	✓	✓
Front fog lamps	✓	✓	✓
Green tinted (ultraviolet-reducing) glass	✓	✓	✓
Dark-tinted rear privacy glass	✓	✓	✓
16in alloy wheels	Opt	Opt	Opt

17in alloy wheels	Opt	Opt	Opt
Temporary spare wheel	✓	✓	✓
Rear spoiler	✓	✓	✓
OPTION PACKS			
Convenience Pack Cruise control Electrochromic rear view mirror Back Guide Monitor	×	Opt	×
Full-Map Navigation Pack 10-speaker audio system 6-CD changer, FM/AM tuner HDD navigation system with dynamic route guidance Back Guide Monitor Remote Touch control	Opt	Opt	×

* These features are available as part of option packs, not as stand-alone options