

# F-TYPE gains all-wheel drive and manual transmission options as the range grows from six to 12 derivatives

## At-a-glance

- F-TYPE, Jaguar's definitive full-size sports car, receives new powertrain and driveline options to broaden the range from six to 12 models
- Torque on demand all-wheel drive (AWD) extends the F-TYPE's performance and dynamic capability on all road surfaces and in all conditions
- In AWD form, the 404kW F-TYPE R Coupé will accelerate from 0-100kph in 4.1 seconds, with a limited top speed of 300kph
- Intelligent Driveline Dynamics (IDD) control strategy developed in-house to exploit maximum performance potential of AWD traction while retaining rear-wheel drive character
- AWD F-TYPE models gain a unique bonnet design featuring a deeper 'power bulge' and distinctive new vents
- Six-speed manual transmission option for rear-wheel drive supercharged V6 models delivers the purest sports car driving experience
- Jaguar's 404kW supercharged V8 comes to the F-TYPE R Convertible - available in both rear- and all-wheel drive configurations
- Electric Power Assisted Steering enables even greater precision and feel and reduces CO2 emissions by up to 4g/km on the EU combined cycle
- Torque Vectoring by Braking improves agility and - standard on R derivatives - is now available on V6 models
- Sport Design Packs for Coupé and Convertible models enhance exterior styling and enable greater personalisation
- The new 2016 model year F-TYPE range goes on sale from mid 2015

*"The F-TYPE Coupé and Convertible already represent everything you'd expect from a Jaguar sports car - seductive design, stunning performance and amazing agility. The addition of all-wheel drive and manual transmission options to the range will further enhance the F-TYPE's dynamic capability and offer even greater driver reward - broadening its appeal to sports car enthusiasts worldwide."*

**Phil Popham, Group Marketing Director, Jaguar Land Rover**

## Summary

The F-TYPE, Jaguar's all-aluminium sports car, will in 2015 set new standards for dynamics and driver involvement with the addition of intelligent all-wheel drive (AWD) and six-speed manual transmission options, and Electric Power Assisted Steering (EPAS) standard across the range.

The fundamentals remain true to Jaguar's core DNA of lightweight construction, refined power, perfect proportions and outstanding design - but now the F-TYPE Coupé and Convertible models deliver an even more rewarding, intuitive drive across a broader range now spanning 12 derivatives.

The latest driveline and chassis technologies heighten the sense of connection between car and driver and enable the F-TYPE to provide an even greater breadth of dynamic capability.

*"Our target with engineering the all-wheel drive F-TYPE was to maintain that engaging rear-drive character that's so important to Jaguar sports car DNA, yet offer even greater dynamic capability. The result is a controllable, exploitable and blisteringly fast performance car in all weather and road conditions.*

*"With the manual transmission option for the V6 F-TYPES, we've gone to intricate lengths to engineer a very precise, technical and responsive level of interaction between the driver, the clutch and the transmission shift mechanism. It's one for the driving purists - and I count myself as one of them".*

**Ian Hoban, Vehicle Line Director, Jaguar**

The enhancements broaden the F-TYPE range to 12 models, from the new 250kW Coupé and Convertible with the supercharged V6 driving the rear wheels through a manual gearbox, to the 404kW F-TYPE R Coupé and Convertible with the supercharged V8, AWD and eight-speed Quickshift transmission. Transmitting the V8's 680Nm to the road through all four wheels helps the R models to accelerate from zero to 100kph in just 4.1 seconds on the way to a maximum speed of 300kph.

Integrating AWD required only subtle changes to the F-TYPE's acclaimed styling - a prerequisite which Jaguar's design and engineering teams worked side by side to achieve - and the enhancements give AWD F-TYPES even more presence.

The aluminium clamshell bonnet gains a deeper central power bulge. Either side are distinctive new vents, positioned further apart and further forward than those of rear-wheel drive F-TYPES. The AWD V6 Coupe also features unique 19-inch Volution alloy wheels in either silver or diamond-turned Technical Grey.

From behind the wheel drivers will quickly notice the extra dimension that AWD adds to performance, handling and road holding in all conditions - and especially on slippery road surfaces.

The AWD system features Intelligent Driveline Dynamics (IDD), a control system designed and developed in-house to exploit the maximum benefits of AWD without any compromise to Jaguar dynamics DNA. IDD is networked to the powertrain, rear differential and centre coupling and Dynamic Stability Control (DSC) system to provide optimum torque distribution.

Operating on the torque-on-demand principle, the AWD system sends 100 per cent of the engine's torque to the rear wheels under normal driving conditions. This maintains the F-TYPE's rear-wheel drive handling characteristics and also reduces parasitic losses in the drivetrain.

If the system determines that the rear wheels are approaching the limit of available grip the electronically-controlled centre coupling transfers torque to the front axle, improving traction.

Another benefit of AWD is the ability to vary the front: rear torque split to mitigate oversteer during fast cornering by providing yaw damping. Combined with even higher levels of feedback from the new EPAS system - a technology Jaguar's chassis engineers have spent more than five years perfecting - the F-TYPE's performance is now even more accessible and exploitable.

While Jaguar's eight-speed Quickshift transmission offers an unequalled blend of shift speed, comfort and refinement, there will always be a select group of enthusiasts who want the satisfaction which comes from changing gear manually.

To meet that demand, the F-TYPE's engineering team developed a six-speed transmission exclusively for the high-revving V6 and rear-wheel drive (RWD) configuration. The short-travel gear lever with a throw of only 45mm, closely-spaced ratios, and pedals perfectly placed for heel-and-toe changes define what for some will be the definitive Jaguar sports car experience.

The F-TYPE becomes the first Jaguar sports car to use EPAS. Years of development ensure that the technology is now mature enough to deliver the benchmark response and feel expected. And because the system's electric motor provides power assistance only when needed, fuel consumption and CO2 emissions are reduced - by up to 4g/km on the European combined cycle.

The Torque Vectoring by Braking (TVbB) function first developed for the F-TYPE R Coupé is now available on all models. Integrated into the DSC system, selectively braking the inside wheels mitigates understeer, helping the driver to take the ideal line through the bend. TVbB also helps to stabilise the car and minimise steering input during manoeuvres such as emergency lane changes.

Those seeking the ultimate in style and performance will now find it in the new F-TYPE R Convertible, available in RWD and AWD form and replacing the RWD-only 364kW F-TYPE V8 S. Jaguar's renowned 5.0-litre V8 combines direct injection and a twin-vortex supercharger to provide immediate response to the driver's request for power. With the roof down and an open road, this engine's unmistakable soundtrack becomes even more exhilarating.

Developing 404kW and 680Nm, the all-alloy quad-cam unit is matched exclusively to the Quickshift transmission and the choice of rear- or all-wheel drive. The extra traction of AWD enables the R Convertible to accelerate from 0-100kph in only 4.1 seconds - matching the R Coupé - before reaching an electronically-limited top speed of 300kph.

Enhancements are not limited to the chassis and driveline technology, with the instrument cluster featuring new dials and gauges.

Customers who wish to make their F-TYPE look even more exclusive have the option of a Sport Design Pack: the bespoke splitter, sills and venturi, subtly enhance the styling without affecting the purity of line which sets the F-TYPE apart in the sports car segment.

Applying composite technologies first developed in motorsport and aerospace, Jaguar has engineered a carbon-fibre roof option for the F-TYPE Coupé. At just 4.25kg, the carbon-fibre panel is even lighter than the aluminium pressing. The high-gloss lacquer finish leaves the distinctive 'twill' weave of the fibres clearly visible.

The new 2016 model year F-TYPE Coupé range will consist of: F-TYPE Coupé (250kW, RWD Quickshift / RWD manual), F-TYPE S Coupé (280kW, Quickshift RWD or AWD, RWD manual), F-TYPE R Coupé (404kW, Quickshift RWD or AWD).

The new 2016 model year F-TYPE Convertible range will consist of: F-TYPE (250kW, RWD Quickshift / RWD manual), F-TYPE S (280kW, Quickshift RWD), F-TYPE R (404kW, Quickshift RWD or AWD).

## **All-Wheel Drive**

### **Rear-wheel drive feel, all-wheel drive traction**

### **Torque on demand all-wheel drive and Intelligent Driveline Dynamics control maintain the F-TYPE's handling balance while making the performance even more accessible - in all weathers**

Applying Jaguar Land Rover's unrivalled expertise in all-wheel drive (AWD) technology to the F-TYPE makes it the most capable sports car the company has yet produced.

Building on the experience gained from the highly successful AWD XF and XJ, the AWD F-TYPE shares many of the driveline modules with the saloons but benefits from next-generation control. And whereas the focus for the XF and XJ is on traction, the focus for the F-TYPE is on ultimate performance and dynamics - in all conditions.

The AWD system is offered in the 280kW V6 F-TYPE S Coupé and 404kW V8 R Coupé and Convertible, all equipped with the eight-speed Quickshift transmission. The underlying development philosophy for AWD was to maintain the inherent agility and precision of the F-TYPE's rear-wheel drive character while delivering on the limit traction and handling benefits that torque on demand offers.

*"What we require of our AWD system in F-TYPE is optimal traction in all weather conditions, but preserving the Jaguar DNA and sports car character - that means rear-drive feel and steering without any corruption. The key to this is Intelligent Driveline Dynamics - IDD.*

*"IDD allows us to provide 'torque on demand' - only delivering torque to the front wheels when it's required to enhance traction. That means we get great steering precision and the efficiency of a rear-drive car, but with additional traction via the front wheels precisely delivered to match the driver's demand, the road surface and the driving situation."*

### **Russ Varney, Vehicle Programme Director, Sports Cars, Jaguar**

Under normal sub-limit driving conditions, 100 per cent of engine torque is sent to the rear axle. When required, the electromechanically-actuated coupling in the transfer case enables smooth transfer of torque to the front axle - the process is virtually transparent to the driver.

### **Everything under control: Intelligent Driveline Dynamics**

To exploit the maximum potential of AWD, the system features Intelligent Driveline Dynamics (IDD). This highly-sophisticated control strategy - developed entirely in-house - is built around a high-level controller managing the interaction of AWD, the rear electronic

active differential (EAD) or mechanical limited-slip differential in V6 S models, TVbB, and the Dynamic Stability Control system (DSC).

The decision to develop IDD in-house means complete control of design and calibration. The vehicle attribute team which calibrated IDD for the F-TYPE is also responsible for DSC, ensuring the best possible interaction between the two systems.

Algorithms within the IDD controller continuously estimate road surface friction. The controller uses measurements from yaw rate, steering wheel angle, wheel speed, lateral and longitudinal acceleration sensors. It also takes into account the Driving Dynamics mode selected by the driver.

The IDD controller and the EAD controller use this data to determine what the vehicle is doing - a so-called state estimate - and the design of the IDD system enables a common state estimate to be used in both controllers.

This detailed monitoring of the vehicle's dynamics enables optimised torque distribution across the rear axle, and from front to rear, by applying both pre-emptive and feed-back control of the active driveline technologies. The result is improved agility and steering response, and the extra level of control this brings increases driver confidence.

On entering a corner, the TVbB system can mitigate understeer by lightly and selectively braking the inside wheels to keep the car on line. If the car begins to oversteer, torque can be transferred to the front axle, generating a stabilising moment. As a result, entry speeds can be higher, and the driver can apply more power sooner in preparation for corner exit.

Integrating control of these systems within IDD means that their interaction is seamless and virtually transparent to the driver. Another benefit that AWD and IDD bring compared to rear-wheel drive is greater differentiation between Normal, Rain/ice/snow and Dynamic modes - especially with DSC switched off.

mode providing the most rear-biased character. And because the system is continually updating its estimate of road surface friction, IDD will select the most suitable calibration for any condition.

Visually, AWD models are differentiated by discreet badging and subtle but distinct changes to the F-TYPEs' award-winning styling.

The aluminium clamshell bonnet gains a deeper central power bulge. As well as giving the F-TYPE even greater presence, the feature optimises packaging around the powertrain. On either side are new vents: positioned further apart and further forward than those of rear-wheel drive F-TYPEs, they provide an even greater cooling effect.

Unique new 19-inch 'Volution' alloy wheels, available in silver or grey with a diamond-turned finish, are fitted to AWD V6 S Coupe.

Beneath the surface, the electronically-controlled dampers feature recalibrated control software, and springs are up to 10% stiffer. Still of dual-rate design, they now operate in the linear range for longer. The front control arm bushes are stiffer too, helping to further improve steering response and on-centre feel.

Meticulous attention to detail during system integration means that the AWD F-TYPE retains excellent weight distribution characteristics, the balance moving forwards by only 1.2 percentage points compared to the rear-drive models.

## **Manual Transmission**

### **Engaging, rewarding: A sports car for purists**

**The F-TYPE's six-speed manual transmission has been designed to give enthusiasts the most rewarding driving experience possible.**

**The combination of the free-revving supercharged V6, semi-dry sump gearbox and precise, perfectly-weighted shifts deliver enjoyment on a completely new level**

Jaguar's outstanding Quickshift transmission is still a benchmark for shift speed and refinement but for a select group of enthusiasts around the world, the purest driving experience comes from executing perfectly timed shifts using a manual gearbox.

To meet this demand, Jaguar's engineers have integrated a highly efficient six-speed transmission into the F-TYPE's lightweight aluminium body structure, matched exclusively to the rear-wheel drive 250kW and 280kW V6 powertrains.

*"A manual transmission in a sports car is always the purist driver's choice - and to meet their expectations the manual F-TYPE had to offer a completely engaging driving experience.*

*"The short throw of the gear lever, the mechanical quality of the shift, pedal spacing ideally suited to heel-and-toe changes, the tune of the V6 supercharged engine itself - all have been subject to detailed scrutiny to ensure driving a manual F-TYPE is as fun as it is fast."*

### **Mike Cross, Chief Engineer, Vehicle Integrity, Jaguar**

Everything from the gearbox detent profiles to the shift lever mounting bushes to the shape of the centre console armrest have been optimised to make the driving experience as intuitive, rewarding and enjoyable as possible.

### **Light, smooth, efficient**

Like the Quickshift sequential transmission, the new manual gearbox was developed for the F-TYPE with experts from ZF. The compact unit features a lightweight aluminium alloy casing and an innovative semi-dry sump lubrication system to improve efficiency.

Instead of relying on the usual splash lubrication method, the F-TYPE's gearbox uses a compact mechanical pump driven from the layshaft to spray oil on to the meshing gear teeth, bearings and the synchroniser rings. Providing lubrication only to where it's needed using a low viscosity oil significantly reduces drag losses. It also means that the gearbox contains just 1.2-litres of fluid, saving weight and improving packaging.

The custom-designed bellhousing contains a dual-mass flywheel for the best possible NVH properties and a single-plate dry clutch optimised for rotational inertia, and therefore reduced shift loads.

## **Positive, precise and perfectly-weighted changes**

Connecting the driver to the gearbox is a shift mechanism which combines the direct, short throw essential to a sports car application with the comfort and refinement demanded by Jaguar customers. Everything from the gearbox itself right the way back to the gear knob influences shift feel, and that's why every component has been scrutinised in order to ensure that every change the driver makes can be perfect.

The F-TYPE's rod linkage provides the most direct connection between the gear lever and the selector forks. Every mounting bush has been carefully tuned to strike the perfect balance between shift feel and isolation from unwanted vibration. Optimisation of the detent profiles gives smooth, precise changes without the high peak loads which result in notchiness when going into gear. A throw of just 45mm ensures fast, precise shifts.

Extensive development and testing results in a gear knob set at the ideal height and position for road and track driving. Such is the attention to detail that the centre console armrest has been reprofiled for manual transmission models to allow for the optimum movement of wrist, elbow and shoulder during each gear change. To satisfy the most demanding enthusiasts, the brake and throttle pedals are ideally positioned for heel-and-toe shifts.

## **The perfect match: Supercharged V6**

The manual transmission is paired exclusively with Jaguar's all-aluminium 3.0-litre V6. This supercharged direct-injection unit, in both 250kW and 280kW ratings, is defined by its linear power delivery and willingness to rev and the new gearbox makes it even more enjoyable to exploit the engine's full performance potential. And because the manual demands - and rewards - greater driver involvement, the V6 gains a unique calibration to enhance the driving experience while maintaining the F-TYPE's duality of character.

Under hard acceleration the engine has been tuned to respond even more directly to throttle pedal inputs. Coupled with the reduced rotational inertias this enables the enthusiast driver to execute fast, precise heel-and-toe downshifting - without the aid of an auto throttle blip function.

The engine ECU provides a speed matching function on upshifts, making each gear change smoother. An anti-stall function makes the F-TYPE effortless to drive at low speed.

## **Electric Power ASSISTED Steering Steering feel redefined**

### **The F-TYPE's steering system still sets the benchmark for feel and response and the adoption of electric power assistance also cuts CO2 emissions**

Steering response and feel are core elements of Jaguar's brand DNA. These are key to the '50 metre feel' - what the customer experiences when driving a car out of the dealership for the first time. This initial impression has to tell them everything they need to know about how the car will behave on the road.

Jaguar sports cars have always relied on hydraulic power assistance because it has previously delivered the most natural, intuitive performance. Electric Power Assisted Steering (EPAS) offers far greater tuning potential and better energy efficiency but Jaguar's engineers have not considered the technology sufficiently mature - until now.

*"We felt very strongly that the efficiency gains offered by Electric Power Assisted Steering should be matched by levels of feel, feedback and responsiveness that would enhance the*

*F-TYPE driving experience still further.*

*"We're satisfied that our EPAS system outperforms anything we've previously offered, providing the agility and interaction you'd demand of a Jaguar sports car."*

**Tim Clark, Chief Technical Specialist, Jaguar**

The EPAS system fitted to the latest F-TYPE is the result of R&D work which began in 2008. The years of development and tuning have ensured that this steering system delivers the immediate response and connected feel expected from a Jaguar sports car.

State-of-the-art control algorithms ensure that the F-TYPE's steering is free from any trace of the synthetic feel which can taint some EPAS systems.

And so intelligent is it that the software even compensates for differences in ambient temperature, ensuring absolute consistency in the feedback the driver gets through the wheel.

Hardware contributes to the improvements too: increasing the torsional stiffness of the steering column intermediate shaft helped to deliver the on-centre feel needed to achieve the demanding attribute targets set at the start of the programme.

Unlike hydraulic systems, which drain power from the engine from the moment it starts, EPAS only uses energy when assistance is actually needed, thereby reducing fuel consumption and CO2 emissions by up to 4g/km on the European combined cycle.

These improvements make the lightweight aluminium F-TYPE even more efficient, and help the 250kW Coupé and Convertible with Quickshift transmissions to become the first sub-200g/km Jaguar sports cars.

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