

THE TOYOTA YARIS GRMN

The Yaris GRMN establishes Toyota as a key player in the European performance hatchback market, a car that is precision-engineered to provide the best possible driving experience.

Inspired by Toyota's return to top-flight motorsport in the FIA World Rally Championship, it shares design cues with the Yaris WRC – the car that has already taken Toyota Gazoo Racing to the winner's podium in the team's first year of competition.

A development team based close to the famous Nürburgring focused on giving the car superb dynamic performance, whether driven on the track, or on public roads. Its performance quality is broadcast by its lightweight 17-inch BBS alloy wheels, larger brakes with visible white callipers, central oval tailpipe and a bespoke exterior finish that displays Toyota Gazoo Racing's white, black and red competition colours. Under the bonnet is a 1.8-litre Dual VVT-i engine that produces 209bhp/156kW and benefits from a supercharger, a feature unique among B-segment performance hatchbacks.

The successful application of the supercharged engine helps the Yaris GRMN meet its development goal of high-level performance and maximum responsiveness to the driver's inputs. Close scrutiny to weight-saving in the car's design helped secure a class-leading power to weight ratio of 5.35kg per 1bhp.

Its agile handling is supported by a reinforced chassis, stiffened and lowered suspension, Sachs Performance shock absorbers and a Torsen limited-slip differential – a feature rare among B-segment hot hatches. Large, ventilated front disc brakes with four-piston callipers supplied by ADVICS provide powerful, controllable stopping performance.

The Yaris GRMN's authentic sports car quality is witnessed in a cabin that features bespoke sports seats, designed by specialists Toyota Boshoku to provide best-in-class support and body-holding, and a small-diameter steering wheel, taken from the GT86 coupe and modified to suit the Yaris's unique interior styling, including a rally-inspired centring line.

Not only is this the first GRMN model to be launched in Europe, it is being built in Europe too, at Toyota Motor Manufacturing France's Valenciennes plant (TMMF). Production has been successfully integrated into the same assembly line as the standard Yaris, with each GRMN car put together by a dedicated team comprising the factory's most experienced technicians. Its limited production - just 400 examples are being produced for European

customers – will add an extra dimension of exclusivity to its appeal as a truly performance-focused car.

TOYOTA GAZOO RACING

- The umbrella brand for Toyota's world motorsport activities
- Aims to create ever-better cars that inspire people to drive, drawing on knowledge gained from motorsports competition and building excitement around the Toyota brand
- The ultimate test of motorsport provides an ideal environment for creating authentic, driver-centric cars
- Yaris GRMN directly inspired by Toyota Gazoo Racing's return to the World Rally Championship with the Yaris WRC

Toyota Gazoo Racing was established in 2015 as an umbrella brand that brings together Toyota's global motorsport activities.

The experience gained through competition is used to create cars that are focused on the driver's experience at the wheel. Engagement in the extreme environment of motorsport, where new challenges are encountered and split-second decisions need to be made, inspires people to consider how new technologies and ideas can be used in the development of ever-better road cars.

Through motorsport and building cars that people love to drive, Toyota can also create fans and public enthusiasm for the brand.

Gazoo meaning and heritage

Today the name Gazoo links to the idea of a "garage," something that resonates with the development of the Yaris GRMN at Toyota's garage workshop base close to the Nürburgring. Its origin, however, is in a 1990s website, GAZOO.com, which brought together images and details of cars available at dealerships (in Japanese, *gazo* means an image or photograph). This provided a new channel of communication between retailers and customers, helping dealerships better understand customer needs and preferences, and reducing the lead time for vehicle deliveries. Many people in Toyota were initially cautious about the concept, but for Gazoo it marked the start of its fighting spirit to bring about change, a quality that still defines the brand today in its drive to build ever-better cars.

Motorsport activities

Toyota Gazoo Racing competes at the highest levels of international motorsport, notably in the FIA World Endurance Championship, a competition that includes the Le Mans 24 Hours, one of the world's most famous and prestigious races. Its participation in the WEC has helped Toyota build its knowledge of how hybrid powertrains can operate in demanding environments, using the technology in its race cars with event and championship-winning success.

In 2015 Toyota announced it would return to the FIA World Rally Championship after a break of 17 years. Competing with the all-new Yaris WRC, the Toyota Gazoo Racing World Rally Team scored success in 2017, their first season of competition, with wins on Rally Sweden and Rally Finland. Based in Finland, they are led by the four-time World Rally Champion Tommi Mäkinen as Team Principal.

Toyota Gazoo Racing have also been a regular competitor in the VLN endurance racing series at the Nürburgring since 2007 (originally as GazooRacing), fielding a variety of different cars including the Lexus IS F and LFA and Toyota GT86. This participation has helped in the development of Toyota's road cars and also given its employees the chance to work side by side with race engineers in the pit lane.

Toyota Five Continents Drive

Toyota Gazoo Racing organises the 5 Continents Drive project to give Toyota employees the chance to immerse themselves in driving cars not on a test track, but in real-world conditions right around the globe, covering thousands of miles across all kinds of terrain and in all types of climate. This activity fits perfectly with the Toyota Gazoo Racing spirit, aiming to develop and deliver ever-better cars. The 5 Continents Drive project also helps Toyota members to develop their professional and personal skills outside their usual working environment, by giving them a first-hand understanding of the different demands placed on Toyota vehicles in every part of the world. Having successfully completed drives across Australia, the Americas and Europe, the drive will cover Asia in 2019 and culminate in Japan to coincide with the opening of the Tokyo Olympic Games in 2020.

Toyota Gazoo Racing and the Yaris GRMN

The Yaris GRMN is directly inspired by Toyota's return to the World Rally Championship and the Yaris WRC race car.

It has been designed and engineered as an authentic performance hatchback, tuned by specialists to deliver a great driving experience, both on the road and on the track.

The Yaris GRMN development team liaised with their Toyota Gazoo Racing World Rally Team colleagues to identify ways of creating visual and design links between the cars. Both are based on the three-door Yaris body shell and feature details such as a central, oval exhaust tailpipe, a red front lip and a rear diffuser. The Yaris GRMN also has an exclusive white paint finish with black roof and body decals in Toyota Gazoo Racing's black, white and red competition colours.

INTERVIEW: TOMMASO GRASSI, MARKETING

Tommaso Grassi is Toyota Motor Europe's Marketing Manager responsible for sports cars and has been closely involved in designing and executing the unique marketing programme for the Yaris GRMN

What is the thinking behind bringing the Toyota Gazoo Racing brand to Europe?

"With Toyota Gazoo Racing, Toyota is refining its products and improving the skills and engagement of its people through motorsport, which supports our ultimate purpose of making ever-better cars. But the intention is not to limit Toyota Gazoo Racing's influence to competition activities; it gives us a great opportunity to link motorsport to our production cars and bring more excitement and passion to our brand.

"Yaris is our best-selling model in Europe and now the Yaris WRC is our car competing in the World Rally Championship. What was missing was a link between the two, a role that's been filled by the Yaris GRMN. We took the opportunity to create a standard production car that reflects the pinnacle of Toyota Gazoo Racing execution, capturing what we are doing in motorsport and making it accessible to our customers."

What were the priorities for the car?

"We wanted there to be unique elements to the Yaris GRMN, including limiting production to just 400 units for Europe. It would also have exclusive use of the supercharged 1.8-litre engine – unique in its class – and use state-of-the-art components to achieve an excellent power to weight ratio and acceleration."

How did the marketing strategy progress, from announcing the car to it going on sale?

"There was an instant, positive response from the moment the first sketches were revealed, from the media, the public and our national sales and marketing companies that would be

selling the car. The level of attention it received went far beyond our expectations and made our task a lot easier.

“We chose the concept of online reservations as it was appropriate for the very limited numbers we were building. It’s a unique product, so we wanted a unique process. The traditional approach is to wait for start of production, then host a dynamic product launch just before putting a car on sale, but because of the high expectations for Yaris GRMN, we opened the reservations process right after the Meet the Engineer event at Nürburgring in July. There was a great response, with most countries selling their allocation in around just 72 hours.

“Making it happen presented some challenges, but it struck the right note with customers. We needed to build excitement around the car and this was helped by the very positive media coverage we received. Our national sales and marketing companies have also organised private events for people who have made reservations, giving them the chance to drive the Yaris GRMN on some of Europe’s best racing circuits – Monza, Nürburgring and Silverstone – at an early stage.”

From a marketing perspective, what have been the important learnings from this project?

“We have seen how translating the Toyota Gazoo Racing philosophy into standard production cars gives us the opportunity to target people who Toyota would not have been able to reach in the past. We see clear future potential for this. Europe is the world’s most competitive car market, which means plenty of pressure, but also great opportunities ahead.”

DESIGN AND DEVELOPMENT PROGRAMME

- Intensive development of vehicle dynamics and performance at a dedicated Toyota facility close to the Nürburgring circuit
- Work undertaken by an expert team of European and Japanese technicians, including master drivers who tested the car on the track and on local roads
- Project successfully moved from concept to production-ready vehicle in just two years

The Yaris GRMN has been extensively developed in Europe, the world’s most competitive and demanding market for B-segment performance hatchbacks.

Immediately after the first concept car was completed in 2015, a European-built prototype was shipped to a dedicated Toyota facility close to the legendary Nürburgring race circuit in

Germany. Here a select group of specialists from Europe and Japan honed the car's handling and performance, putting it through rigorous testing both on the notoriously challenging Nordschleife track and on a wide variety of public roads in the immediate neighbourhood, from ultra-fast Autobahns to tightly winding mountain routes. Toyota's belief is that if a car can prove its capabilities in this environment, it can do so anywhere in the world.

The name GRMN itself declares the special efforts that have been invested in the car, standing for Gazoo Racing tuned by the Meister of Nürburgring. The hugely experienced team working on the car have also been able to draw on the experience gained by Toyota Gazoo Racing from its regular participation in endurance races at the circuit.

The development programme contained a number of distinct challenges, including a redesign of the exhaust system so that it emerged through the centre of the rear diffuser; management of engine cooling; securing excellent durability throughout; and control of vehicle weight.

INTERVIEW: STIJN PEETERS, TOTAL VEHICLE DEVELOPMENT

Stijn Peeters is the senior European Technical Project Manager who has led and co-ordinated the Yaris GRMN R&D programme in Europe.

What involvement and responsibilities did Toyota's European teams have in development of the Yaris GRMN?

"Europe has had no previous experience of the Toyota Gazoo Racing brand outside motorsport, but in Japan there have already been five generations of GR-brand vehicles. This means that while a new Yaris (Vitz) GRMN is an evolution in Japan, for Europe it's more of revolution. It was the first time we had been given the opportunity to engineer this kind of vehicle for mass production.

"So, from a product point of view, it's something completely different for us. Also, we have a much more competitive hot-hatch market in Europe than in Japan, so we had to be certain we could engineer something good enough to compete. For instance, having less than 200bhp from the engine simply wouldn't make sense.

"We already make the three-door Yaris on which the GRMN is based at the TMMF factory in Valenciennes, so it was logical for the new model to be built there. The project was also planned by my division at Toyota Motor Europe, drawing on the great knowledge base we had built up about Yaris.

“The powertrain was another European idea. Toyota had been supplying the 2ZR engine to Lotus as a customer for some time and we realised that it could be suitable for use in Yaris’s small engine bay. I proposed investigating this option and working with Lotus to produce a feasibility study. While the full concept study was produced in Europe, our TMC colleagues in Japan supplied parts such as the brakes and suspension so we could set about producing prototypes. The project momentum was established in Europe, from the initial commercial idea, through the feasibility concept to product approval, a task accomplished in around six months. This was a complete departure from the usual project model where responsibility for these tasks would be taken by Japan.”

How did the project progress?

“The concept stage went more smoothly than we anticipated it would, thanks in large part to the fact people were inspired by the project and willing to go the extra mile to make it work. The teams showed great creativity and were able to call on their extensive product knowledge to ensure that the parts we needed to achieve the right performance were compatible.

“Right from the start, vehicle performance was an eye-opener and there was general agreement that this was one of the best concepts we had driven. Usually you get issues around mis-match of parts, roughness and responsiveness, but with Yaris GRMN that simply didn’t happen, giving us confidence that we could deliver exactly the kind of performance we wanted for the car.

“Beyond the vehicle itself, there were new challenges in manufacturing – TMMF is used to making cars that are designed to be produced in their thousands, but for Yaris GRMN it would be just seven cars a day for four months, within the usual production schedule and on the same assembly line as the standard model. It was the same for sales and marketing; they couldn’t launch a multi-million-euro campaign for just 400 vehicles. But at the same time it was an important exercise in building a new brand, it had to be different.”

How did the collaboration with Lotus work?

“There was an immediate advantage, as Lotus uses a large number of Toyota products in its vehicles, so it has built up a lot of knowledge about their performance potential. They gave us lots of information about their quality results and customer behaviour, and we learned a great deal from them about low volume, high-performance vehicle manufacturing.

“Toyota vehicles are typically developed to suit a wide range of customers, so it was very valuable to learn more about the specific requirements of people who drive performance

sports cars. We were also given a great insight into working with a supercharged engine and managing low-volume production.

“Lotus was very happy from the start to supply engineering services because we have always had a good relationship with them.”

What valuable things have been learned from the project and how might they be applied to future work?

“We learned that we were right, that Toyota can make these kinds of products as long as the full organisation is behind them. I saw how passionate people were about this car, which was an important element in its success. It reflects on how Toyota Gazoo Racing wants to inspire not only the customers, but also the whole company, making us think again about just what we can achieve. Personally, I am very pleased that the team who can make a success of the Yaris Hybrid can also make a success of a sports model built on just the same platform.

“In terms of organisation learning, we found that we could integrate Yaris GRMN into the established production line without having to train the entire workforce on how to deal with the unique parts that need to be fitted. By building a small, specialised team, we found that a low-volume model can be almost hand-crafted within a mass-production operation.

“The Yaris GRMN is the start, there will be more products and everything we have learned so far will help us make them a success.”

POWERTRAIN AND PERFORMANCE

- Unique-in-class supercharged 1.8-litre Dual VVT-i engine producing 209bhp/156kW and 250Nm of torque at 4,800rpm
- A Toyota engine, manufactured in the UK, developed with Lotus and with final build and installation by Toyota Motor Manufacturing France (TMMF)
- 6.4 seconds for 0-62mph acceleration and 14.2 seconds for 0-400m

The heart of the Yaris GRMN is its engine, a unit that is unique in the B-hot hatch market in its use of a supercharger to boost performance.

The 1,798cc 2ZR-FE engine is built by Toyota Manufacturing UK at its Deeside factory, with modifications carried out by specialists at the sports car manufacturer Lotus, also in Britain. Final engine build and installation is carried out by Toyota Motor Manufacturing France

(TMMF) at the Valenciennes factory. Each one of the 400 built for European customers bears a numbered plate to mark its special, limited production status.

With a 10:1 compression ratio and the benefit of Dual VVT-i intelligent variable timing for both inlet and exhaust valves, the engine delivers a maximum 209bhp/156kW at 6,800rpm and peak torque of 250Nm at 4,800rpm. Driving the front wheels through a reinforced six-speed manual transmission, and with the significant benefit of a Torsen limited-slip differential, the Yaris GRMN posts a nought to 62mph acceleration time of 6.4 seconds, and a nought to 400m time of 14.2 seconds. Top speed is electronically limited to 143mph.

Weighing a modest 1,135kg, the Yaris GRMN also achieves its performance target of a best-in-class power to weight ratio of 5.35kg per 1bhp.

The supercharger, a Magnusson-Eaton unit, presented a particular design challenge, as only very limited space was available in the Yaris GRMN's engine compartment. The packaging solution cleverly combines the supercharger, cooling unit and air intake in a single, space-saving stacked unit that can be neatly mounted on the front of the engine, within the required space tolerances.

Cooling is crucial for the engine's performance, so an intercooler for the supercharger and an engine oil cooler are used, located in front of the radiator, together with a new, enlarged air intake to provide better engine breathing.

The engineering project also successfully introduced a new fuel injection system, using componentry originally designed for a V6 engine.

The exhaust has been fully reworked, a task that had to be achieved within very tight space limitations, and with careful attention to underbody heat management. The goals were to reduce exhaust back pressure and control emissions and noise levels, while also introducing a centre tailpipe design at the rear of the car – a feature shared with the Yaris WRC competition car. Success in this task has enhanced engine power and produced a rousing exhaust note. The design has also helped reduce the car's overall weight.

CHASSIS AND HANDLING

- Reinforced chassis to increase body rigidity and help secure excellent handling and responsiveness
- Torsen limited-slip differential maximises grip under acceleration and delivers secure, balanced cornering while maintaining the engine's high response
- Sachs Performance shock absorbers, stiffened suspension components and reduced ride height for a lower centre of gravity

Toyota specified the Yaris GRMN should be equipped with a Torsen limited-slip differential – a feature rare among B-segment performance hatchbacks. This provides significant handling benefits, ensuring the car's prodigious power is transferred smoothly to the road, and guaranteeing a better front/rear balance when cornering. Its effect is almost to eliminate understeer, keeping the car precisely to its intended line while maintaining the engine's high response.

The limited-slip differential works with the larger wheels and tyres to achieve a high level of grip. The wheels are 17-inch BBS lightweight multi-spoke forged alloys which not only save weight but also provide sufficient space for larger brakes to be used. Fitted with Bridgestone Potenza RE050A 205/45R17 tyres, they also contribute to the Yaris GRMN's very precise steering feel.

The chassis has been strategically strengthened, most importantly with a lateral brace across the top of the front suspension towers. There is further front, centre and rear underbody bracing, with the reinforcement connecting the rear axle contributing to the car's balanced handling.

The suspension is a development of the standard Yaris's MacPherson strut front and torsion beam rear designs. The stiffest components available have been used for the suspension and the subframe, and a larger, 26mm diameter anti-roll bar has been adopted. Specially developed Sachs Performance shock absorbers are used with shorter springs that allow the car to hug the ground more closely (24mm lower than the standard model) and give it a lower centre of gravity, thus reducing the degree of body movement. The Vehicle Stability Control has also been retuned in line with the car's higher performance.

To achieve precision braking controllability, the Yaris GRMN is fitted with 275mm grooved front discs with bespoke four-piston callipers, supplied by ADVICS. At the rear there are 278mm discs.

The rack and pinion electric power steering has a 12.8:1 ratio; even though the Yaris GRMN rides on larger wheels than the standard Yaris, the retuned steering has a rapid 2.28 turns lock-to-lock, with speed and control supported by the use of a small-diameter steering wheel, developed from the one used in Toyota GT86 coupe. Steering feel has been further optimised through revisions to the Electric Power Steering (EPS) control software to enhance feedback and linearity.

INTERVIEW: VIC HERMAN, VEHICLE DYNAMICS

Vic Herman is one of Toyota's elite master drivers, tasked with testing the Yaris GRMN to the limit of its capabilities to fine-tune its handling and performance.

What is a Toyota master driver and what are they responsible for?

"The master drivers are Toyota's main vehicle evaluators. There are only a few of us, working in Europe and Japan. We look at the vehicle as a whole, not just the suspension or the brakes, but everything that comes into play dynamically when driving a car. Of course you need good driving experience and be able to control a car at the limit at high speeds, but you also need to have a lot of experience in different areas of vehicle performance. It's not mandatory to have motorsport experience, but for my own part, I've been competing since I was a kid and it's through the sport that I've really learned the fundamentals that I use in my work.

"The Yaris GRMN is the first car that I have been in charge of as a master driver. I've worked for Toyota since 1999, initially looking at noise and vibration, then ride and handling, and now overall vehicle dynamics."

How has the vehicle dynamics development programme been shared between Europe and Japan?

"A combined European and Japanese team worked at the Nürburgring on a wide range of elements – chassis reinforcements, coil springs, anti-roll bars, bump stoppers, steering system settings and so on. The work involved a number of loops of the circuit and driving on local roads. There was also a winter confirmation programme in Hokkaido, Japan, where we worked on the car's agility and stability control on snow-covered roads.

"At the same time, we worked closely with our suppliers, such as for the limited-slip differential, to determine what amount of slip the unit should provide. Also, for the driver's seat, I made several visits to the specialist seat manufacturer Toyota Boshoku to make sure we achieved exactly what we wanted."

How did the Yaris GRMN differ from other projects you have been involved in?

“As this was a specialised, low-volume model, there was a much smaller team working on it, which gave us the benefit of excellent communications with each other and with suppliers. For this kind of car, of course, performance was a much bigger priority, which was clearly understood by everyone. That meant it was much easier to align everyone’s efforts. Also there was more freedom, because the cost limitations were not as severe as they are with models produced in large volumes.”

How was the car’s performance measured against the competition?

“There are already quite a few excellent B-segment sports cars in Europe and I evaluated all of them in order to understand what the Yaris GRMN had to deliver. Most of them are fun to drive and they all have their own character, which is great. For the Yaris GRMN, we wanted it to feel like a genuine little sports car – uncomplicated and addictive to drive. It was important for us to engineer a car that is suitable for the road, but equally one that is in its element on a race track.”

What were the most important qualities the Yaris GRMN had to deliver?

“The most important aspect is that the car is responsive and the driver can easily build confidence in the car – the precision of the controls, the consistency of its responses. The Yaris GRMN had to be capable of performing on the Nürburgring, even though most of the time it will be driven on public roads.

“The Nürburgring is an ideal tuning environment for what we wanted to achieve, because there are lots of bumps and uneven corners, just like you find on public roads. This helped us produce a stable, balanced suspension that remains composed and responds predictably to the driver’s inputs.”

What important things can be taken forward from this project?

“What we have learned from working with the Yaris GRMN we will be able to take into account on the cars we develop in the future, especially any further GRMN models. In particular, we were able identify things we couldn’t achieve with the current Yaris platform and this intelligence is already being used in the development of the next platform. From a personal point of view, it was fantastic to see all the team members – we had not worked together before – gain trust and respect for each other and become a really tight team.”

BODY AND EXTERIOR STYLING

- Like the Yaris WRC, the Yaris GRMN is based on the current three-door Yaris hatchback
- Performance styling elements include rear wing-type spoiler, rear diffuser and central oval exhaust tailpipe
- All Yaris GRMN are finished in white with a contrast black roof and body decals matching the colours of the Yaris WRC sporting livery

Like its World Rally Championship counterpart, the Yaris GRMN uses the three-door version of the new Yaris bodyshell, manufactured exclusively by Toyota Motor Manufacturing France at its Valenciennes factory.

Taking that as its base, it has introduced a number of dedicated exterior styling and performance features including a black, wing-type rear spoiler, a bespoke rear bumper design, a rear diffuser, a front grille with a dedicated honeycomb mesh and – again echoing the rally car’s styling – a central oval exhaust tailpipe within a trapezoid housing.

It also sports a special paint finish – white with red and black flash detailing on the bonnet and sills, directly echoing the competition livery of the Toyota Yaris WRC. There is also a contrasting black roof.

Detailed touches that express the car’s special character include a front lip picked out in red and distinctive black ornamentation for the LED headlights, generating extra visual impact.

INTERIOR DESIGN

- Sports seats specially developed by Toyota Boshoku provide best-in-class support and body-holding
- All-black premium interior colour theme, including Ultrasuede® upholstery and leather trim
- Small-diameter steering wheel adapted from the GT86, plus unique TFT display, aluminium sports pedal set, starter button and aluminium trim inlays

The cabin is equally an expression of the car’s performance focus, with front sports seats designed specifically for the car by the expert team at Toyota Boshoku. Finished in Ultrasuede® upholstery, they meet the development team’s goal of providing best-in-class body holding and support.

An all-black colour theme for the cabin emphasises the sporting quality, with black leather trim for the dashboard and door trims and a black headlining.

The authentic performance details include an engine start button and a small-diameter, leather-wrapped steering wheel, sourced from the Toyota GT86 coupe and further adapted to suit the special requirements of the Yaris GRMN, including a competition-inspired centring line. There is also an aluminium sports pedal set, aluminium trim detailing and a unique TFT display with Toyota Gazoo Racing-inspired start-up animation, reflecting the car's special performance character.

PRODUCTION AT TOYOTA MOTOR MANUFACTURING FRANCE

- Production centre for all Yaris GRMN for Europe and counterpart Vitz GRMN models for Japan
- First time TMMF has integrated a limited-run model into its standard vehicle production schedule, sharing the same assembly line
- New processes developed to accommodate parts specific to the Yaris GRMN, with work undertaken by a team of 20 specially trained members

The Yaris GRMN is built exclusively by Toyota Motor Manufacturing France at its Valenciennes factory. Toyota has successfully integrated production of a specialised, low-volume model into a mass-production environment: both the Yaris GRMN and the standard Yaris are manufactured on the same assembly line.

Valenciennes was a logical choice for production, as it is the only Toyota facility in the world that builds the current three-door Yaris on which the Yaris GRMN is based. However, accommodating the new model required significant challenges to be met, including how parts specific to the car – notably the 1.8-litre supercharged engine – could be incorporated without disrupting the factory's three-shift production schedule.

The introduction of the Yaris GRMN also required a specialist team to be appointed, responsible for building each car. As it was not practical to train the entire workforce for the production of just 600 vehicles (400 Yaris GRMN for Europe and 200 Vitz GRMN for Japan), it was decided to call on the skills of TMMF's most experienced members. A dedicated team of around 20 technicians has been trained to carry out all the processes that are unique to the Yaris GRMN, working across the different production shops, including weld, paint, plastics and assembly.

Yaris GRMN production is confined to one daily shift, with cars produced at a rate of seven per day.

Engine installation

One of the biggest challenges facing the production team was how to install the larger, 1.8-litre supercharged engine in the relatively small Yaris engine bay. If this could not be achieved, it would be impossible to build the car as planned on the same assembly line as the standard Yaris model – something that would have serious repercussions for the entire project.

A prototype was used in the Valenciennes factory to determine whether the existing assembly equipment could be used and whether the engine could be fitted to the car with the required 20mm clearance from the body.

Project leader Guillaume Caron explained: “There were many points where the clearance was respected, but there were also some touch-points, so we focused on three areas to see if we could fix the issue. We challenged the designers to modify some parts of the engine, we looked to adjust the equipment we use for better accuracy in the installation, and we found a way of temporarily re-routing the wiring harness to make more space. It presented a big challenge to the designers, who worked with virtual design tools and even produced some 3D-printed replica parts to help work out what could be done.”

Quality control

From the start of the project, there were to be no compromises in the quality of the Yaris GRMN. Even though production numbers are small, it has had to meet the same high quality standards as any other Toyota vehicle.

TMMF has produced dedicated quality control tests for all parts that are specific to the model, including the additional welding points, braking system, chassis reinforcements, seats and precision application of the body decals. In the paint shop, a new process has had to be designed for the contrast black roof as the styling is different from the bi-tone finish used for other Yaris models.

At the end of the assembly process the final inspection requirements are also designed to take into account the Yaris GRMN's special performance capabilities and include an intensive dynamic test of each vehicle to check areas such as engine performance, chassis handling and braking.

The project is a great source of pride for the TMMF workforce, as Guillaume Caron explained: “The project team were very proud to have been asked to work on this vehicle and they were very motivated to succeed. It gave us the opportunity to look at new ways of working and problem-solving. This feeling of pride has extended to the entire workforce, who have shown a keen interest in the Yaris GRMN and what it means for Toyota. They are also pleased to be building cars that will for the first time be exported from TMMF to Japan and Toyota’s home market.”

TECHNICAL SPECIFICATIONS

ENGINE		1.8 DUAL VVT-i
Engine code		2ZR-FE
Type		4 cylinders in-line
Valve mechanism		DOHC 16-valve with Dual VVT-i
Fuel system		EFI
Supercharging		Magnusson Eaton rotor-type supercharger
Displacement (cc)		1,798
Bore x stroke (mm)		80.5 x 88.3
Compression ratio		10.0:1
Max. power (bhp/kW @ rpm)		209/156 @ 6,800
Max. torque (Nm @ rpm)		250 @ 4,800
Emissions level		Euro 6 (b)
TRANSMISSION		
Type		6-speed manual
7 th	1 st	3.538
	2 nd	1.913
	3 rd	1.310
	4 th	0.971
	5 th	0.714
	6 th	0.619
	Reverse	3.333
Differential gear ratio		4.214
PERFORMANCE		
Weight/power ratio (kg:hp)		5.35:1
Max. speed (mph)		143 (electronically limited)
0-62mph acceleration (sec)		6.4
0-400m acceleration (sec)		14.2
FUEL CONSUMPTION & EMISSIONS		
Urban (mpg)		26.7
Extra-urban (mpg)		49.6
Combined (mpg)		37.7
Fuel tank capacity (l)		42
CO ₂ emissions – combined cycle (g/km)		170

CHASSIS		
Front suspension		MacPherson strut
Front spring rate (N/mm)		34.6
Rear suspension		Torsion beam
Rear spring rate (N/mm)		34.2
Shock absorbers		Sachs Performance
Steering type		Rack and pinion Electric Power Steering
Turns lock-to-lock		2.28
Min. turning circle (m)	Tyre	10.2
	Body	11.0
Brakes	Front diameter x thickness (mm)	Ventilated, grooved discs 275 x 25 with 4-pot callipers
	Rear diameter x thickness (mm)	Solid discs 278 x 9 with single-pot callipers
Tyres		Bridgestone Potenza RE050A 205/45R17
EXTERIOR DIMENSIONS		
Overall length (mm)		3,945
Overall width (mm)		1,695
Overall height (mm)		1,510
Wheelbase (mm)		2,510
Front track (mm)		1,465
Rear track (mm)		1,455
Running ground clearance		24mm lower than donor car
Coefficient of drag (Cd)		0.312
INTERIOR DIMENSIONS		
Load space (VDA litres, rear seats in place)		286
Length (mm)		1,915
Width (mm)		1,420
Height (mm)		1,250
WEIGHTS		
Kerb weight (kg)		1,135
Gross vehicle weight (kg)		1,545

REF:180103M