FAST & FURIOUS™

105

Build the Legendary

DODGE CHARGER R/T



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DODGE CHARGER R/T



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THE DIGITAL REVOLUTION

Luxury sports cars jumping between skyscrapers, vehicles literally raining down from the Manhattan sky, chases on the ice with nuclear submarines … The heavy implementation of computer-generated visual effects has meant that there is now only one limit to the challenges faced by *Fast & Furious*: its creators' imaginations.

Back in 2001 when it all began with The Fast and the Furious, computer-generated visual effects were just beginning to appear in Hollywood movies. For Rob Cohen's legendary movie, which would serve to present the adventures of Dom Toretto and his "family", 36 people worked on creating effects, backgrounds and digital animation, most of them working for the specialist companies Hammerhead Productions and Digiscope. Back then, one of the greatest challenges they had to face was, for example, showing very visually what happened when a driver activated his car's nitrous oxide.

Sixteen years later, in the production of *The Fate of the Furious*, more than 1,000 people, working for prestigious companies like Rodeo FX, Double Negative, Pixomondo or Digital Domain, worked in one way or another on the creation of digital visual effects. Between the two movies, the film industry had undergone a remarkable transformation and the impact of this change could be clearly seen in Universal Studios' most popular franchise.

AN INEVITABLE ENCOUNTER

Right from the start, the *Fast & Furious* franchise was always characterised by the wish for the vehicles' acrobatic maneuvers and the action scenes to be as realistic as possible. With this in mind, the majority of the directors who worked on the franchise wanted to film these extremely intense moments with the camera. But as the challenges gradually became more extraordinary and, at the same time, the possibilities of computer generated visual effects increased, it became impossible to avoid the two worlds encountering one another.

The Lykan Hypersport's jump between the famous Etihad towers in Abu Dhabi was only possible thanks to computer-generated visual effects. It was one of the most thrilling scenes in *Fast & Furious 7*.

KELVIN MCILWAIN

This pioneer and expert in the creation of digital visual effects began his career in the 1990s as an artist in the technique known as matte painting, which recreates realistic landscapes and settings. He worked this way on productions as different as *The Mask of Zorro* (1998), *Muppets from Space* (1999), and *U-571* (2000), maintaining close ties with the company Illusion Arts. In 2001, he also used this technique in *The Fast and the Furious*, thus beginning an intense relationship with the Universal Studios franchise. After working as a matte artist on the second movie in the series as well, from *The Fast and the Furious: Tokyo Drift* onwards he was made the special effects supervisor; ever since then, he has continued in this capacity in the rest of movies in the series, as the person in charge of coordinating the work of all the visual effects companies and as a witness to how the importance of digital technology in the franchise has evolved. Besides his intense work in the world of *Fast & Furious*, Kelvin has also supervised the visual effects of other very well known movies, like *Central Intelligence* (2016), *Aquaman* (2018) and *Shazam!* (2019).

"The franchise is based on quite a complicated balance to maintain the audience's credibility," says Philippe Soeiro, Rodeo FX visual effects supervisor, "in which the spectacular live action manoeuvres have to fit into a rather unlikely narrative framework. In this equation, realism, or rather visual plausibility, becomes a very important component. The film's audience might well suppose that some sequences have been improved because they are too exaggerated; however, the result must always keep you intrigued, so that you can't know for sure which part of the action is real and which is not."

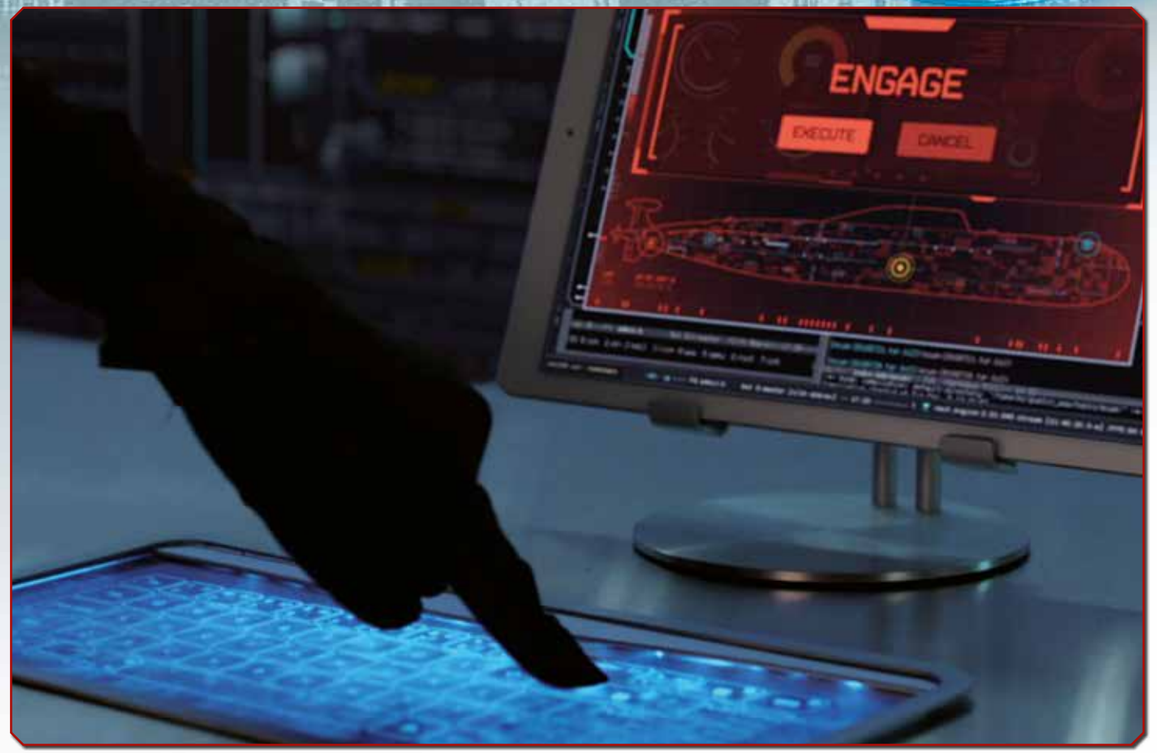
One of the first and most spectacular computer generated visual effects was used in the thrilling start to *Fast & Furious*. After Dom and his team had hijacked a convoy of fuel trucks on a winding road in the Dominican Republic, the huge fuel tanker tipped over and was sliding towards Toretto's car, enveloped in flames and rolling over spectacularly. To film a situation such as this for real is not just risky, it's suicidal. Hence the sequence was completed with the aid of the new technologies.

EVEN MORE DIFFICULT

The first step having been taken, the door was open to continuing to use digital effects in the following movies, although with remarkable restraint compared to what other Hollywood action movies were already starting to do. In *Fast Five*, real images and digital technology went hand in hand to be able to show the audience moments as thrilling as the incredible leap that Dom and Brian make from a bridge after carrying out the spectacular train heist.

The stakes for increasing the spectacular nature of the franchise were more than raised considerably in *Fast & Furious 6*. During the search for and the pursuit of the dangerous mercenary Owen Shaw, who had recruited an amnesiac Letty to his criminal team, there were two high points: a chaotic chase along a highway in Tenerife featuring a tank, and a massive fight inside a huge Antonov airplane that was trying to take off from an airstrip. As crazy as it may seem, the two sequences were filmed for real, with real vehicles and real people. There were explosions, guns firing, and a bridge was seen to collapse onto the highway. Nevertheless, the use of computer-generated effects became essential in order to put the finishing touches to this explosive action.

However, despite wanting to continue the tradition of performing stunts in front of the cameras, when it occurred to someone to launch a luxury sports car between the two tallest skyscrapers in the world it was obvious that to do this they were going to need the best digital technology available. In *Fast Seven*, screenwriter Chris Morgan sent Dom and his team to Abu Dhabi in search of a sophisticated tracking device. This turned out to be hidden inside a Lykan Hypersport, one of the most expensive sports cars in the world. In his attempt to get hold of it, Toretto ended up behind the wheel of the car, launching himself from the 80th floor of one of the most important skyscrapers in the city to land in another of the famous Etihad Towers.



The film crew went to Abu Dhabi, got hold of several replicas of the extremely expensive Lykan Hypersport and with the aid of a helicopter they managed to film around the fabulous buildings from the air. However, the moment of truth, that awesome car jump from one skyscraper to another, was only possible thanks to the digital effects. Of course, the technological wizards responsible for it did everything they could to make the scene look absolutely real.

RAINING CARS

After seeing a Lykan Hypersport flying through the Middle Eastern sky, when it came to planning the eighth movie in the franchise it seemed difficult to find new exploits that could continue to surprise the fans of the franchise. Nevertheless, now that digital technology had been greenlighted for the creation of action scenes, Chris Morgan let his imagination run wild more than ever. To demonstrate the power that the cyber-terrorist Cipher had amassed thanks to her mastery of technology, he decided to include a scene that showed an authentic cascade of cars raining down from the parking lots on top of the skyscrapers in New York – absolutely stunning images that would later be surpassed by the electrifying pursuit of Toretto and his team by a nuclear submarine in the middle of a frozen lake. It took the visual effects specialists involved in the movie more than a year to produce these awesome effects, because their work is far more complex than you might think. Alex Wang, Double Negative visual effects supervisor, who was given the job of working on the cascade of cars in New York by adding digital cars to others that had actually been dropped from the top of a building, explains it with an example.

"When a car hits the ground, there is a huge amount of organic detail that our animation and special effects crew had to imitate. Our aim was to simply mix in carefully choreographed computer-generated cars with actual vehicles."

But the digital effects companies that have collaborated with the franchise do not merely work on the most spectacular sequences. Hundreds of professionals also focus on other details that are more imperceptible, like creating extensions to a set – for example, in *The Fate of the Furious*, in the garage where the luxury cars are kept – distorting backgrounds, inserting images of the actors inside the cars, adding smoke and flames, creating fake creases in the actors' clothes, or designing some 3D elements, like the famous wrecking ball.

↑ Digital technology began to be used for visual effects at about the same time as it was introduced into the storyline. From *Fast & Furious 8* onwards, with the introduction of Cipher, the cyberterrorist, these new technologies took on a more important role in the saga.



A first-generation Dodge Utility (1967) in which it is obvious that it is a simplified model (wheel rims, fenders, absence of chromed parts) destined for professional use.

DODGE UTILITY

The Dodge Utility was a model sold in the 1970s by the Chrysler Corporation's Australian subsidiary, which used the Dodge brand's name to offer the least equipped version, aimed more at professional use, of the Chrysler Valiant UTE, a typically Australian pick-up version of the brand's mid-range model in that market.

A Dodge Utility vehicle, of the generation that was on sale from 1971 to 1973.



To assess the Dodge Utility it is useful to know that the Chrysler Corporation's Australian subsidiary began manufacturing the Plymouth Valiant in Australia in 1960. In 1965, with the launch of the model's third generation, it launched UTE bodywork (the abbreviation for Utility, it was applied to a typically Australian type of bodywork that derived a pick-up from a conventional saloon car).

In 1967, for a new generation of the car, the Chrysler Corporation opted to expand the UTE range. So as well as the Chrysler Valiant and Valiant Wayfarer (more deluxe and equipped), there was now a version providing access to the less equipped range, with painted instead of chromed fenders, less interior features and more cargo space in the back, designed more for professional use. This model was named the Dodge Utility despite being identical to the Chrysler models.

Although the Valiant range was derived from the 1960 Plymouth Valiant, the car evolved differently to the American one and it was the Australian subsidiary that carried out the constant updates. The name Utility was kept during the model's various generational changes until 1973.



SPARE WHEEL CARRIER

In this assembly session you will attach the spare wheel carrier to the boot floor panel. Please follow our instructions and the accompanying illustrations carefully.

PIECES FOR THIS STAGE



105A



105B



105C



MP

105A Boot floor panel
105B Spare wheel carrier
105C Spare wheel carrier rod
MP Screws 1.7 × 3.5mm (× 3)*

* Some of the parts are spares.

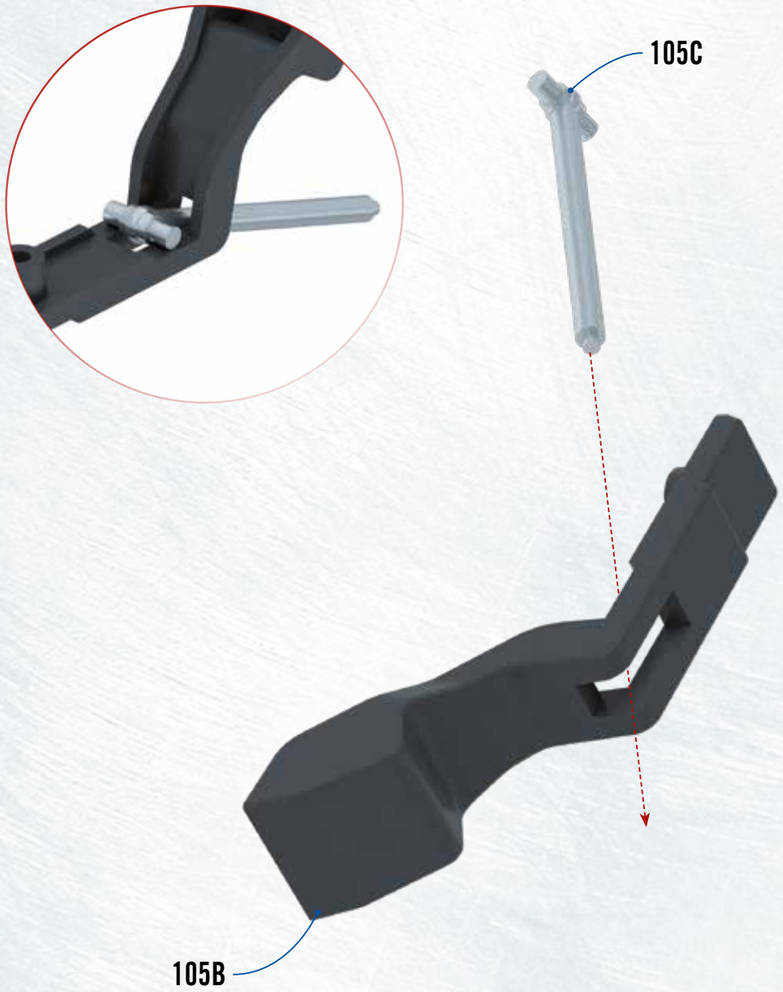
Editor's note: The parts shown here may differ slightly from the parts supplied with this issue. This does not affect the quality or the assembly instructions in any way.

ASSEMBLY AREA

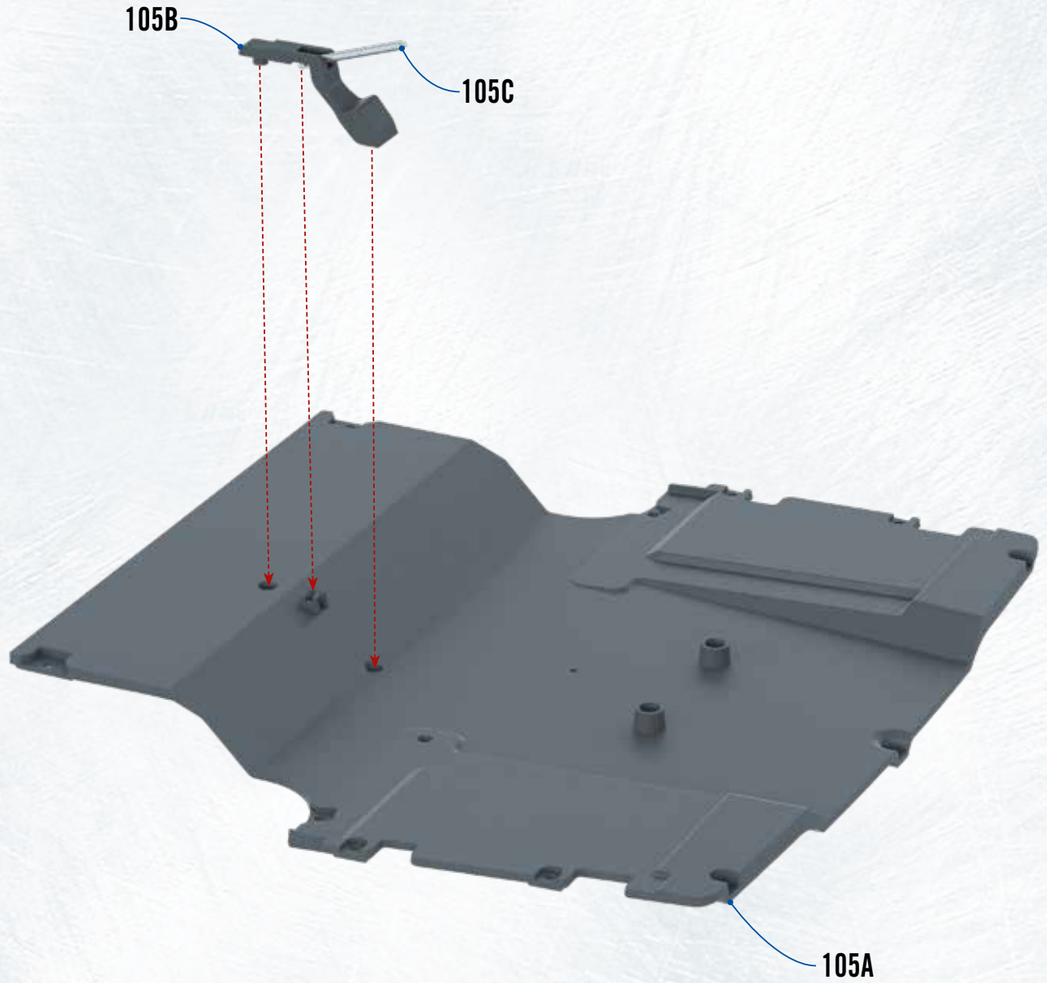


BOOT

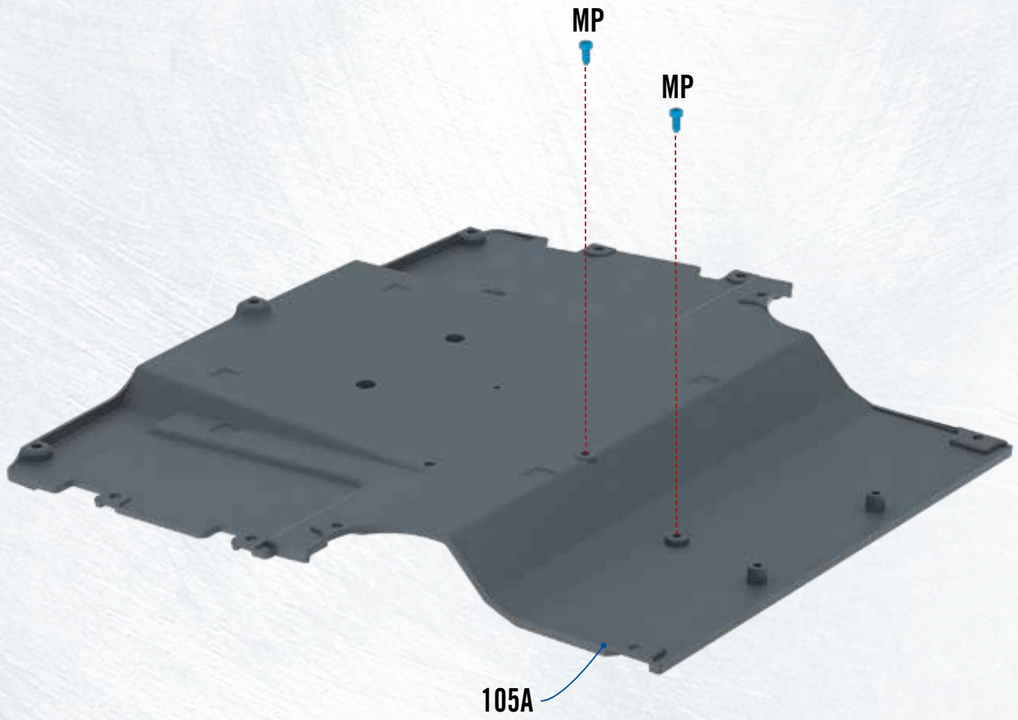
105.1 **INSERT** the cylindrical end of the rod **105C** into the corresponding slot in the middle of the spare wheel carrier **105B**.▼



105.2 **POSITION** the spare wheel carrier **105B** over the holes in the rear of the boot floor panel **105A**. The "T-shaped" end of the spare wheel carrier rod **105C** goes into the corresponding slots on the boot floor panel **105A**.▼



105.3 **TURN** the boot floor panel **105A** over and secure the spare wheel carrier using two **MP** screws. ▼

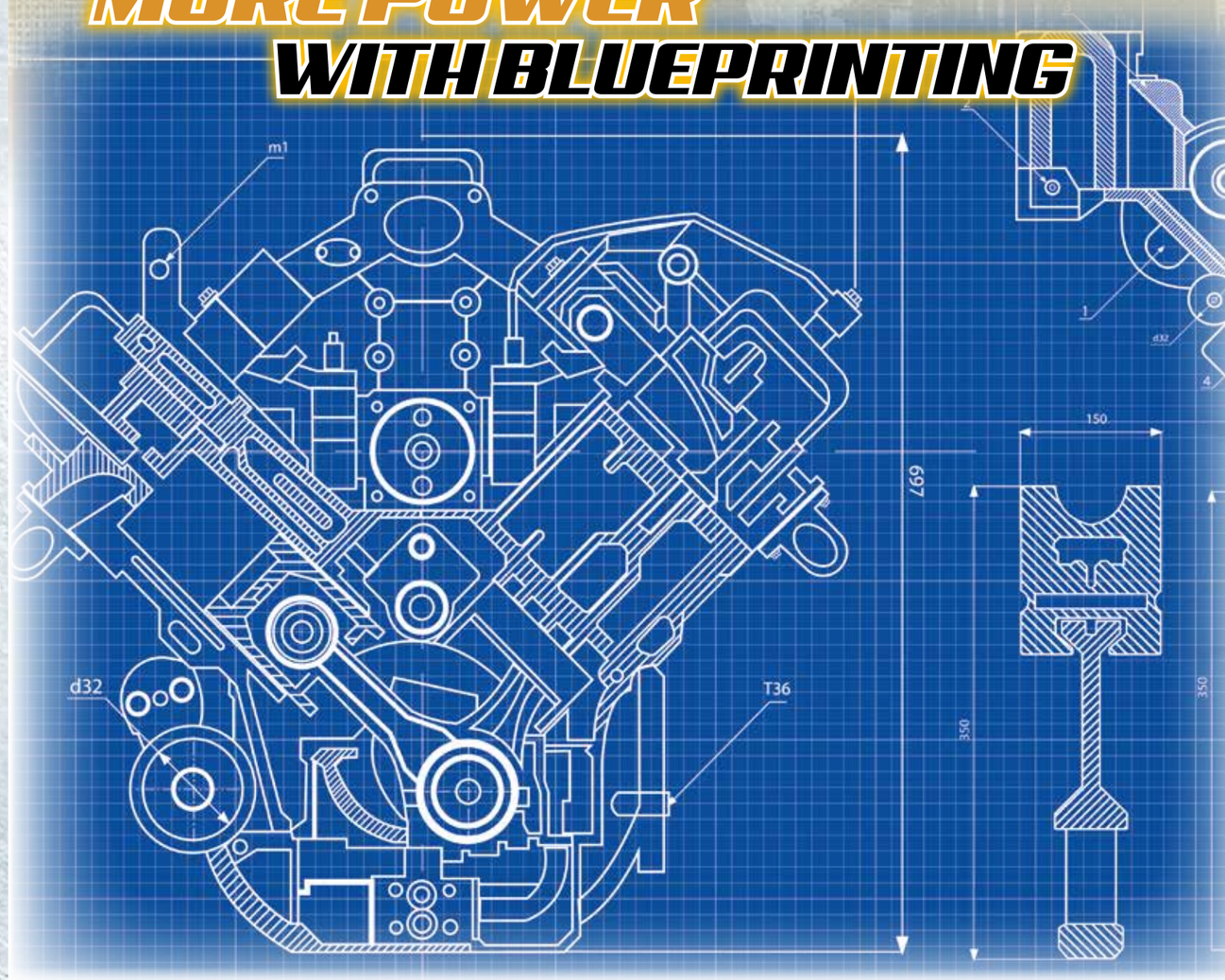


RESULTS OF STAGE 105



You have now attached the spare wheel carrier to the boot floor panel. Put all the pieces in a safe place for the following assembly sessions.

MORE POWER WITH BLUEPRINTING

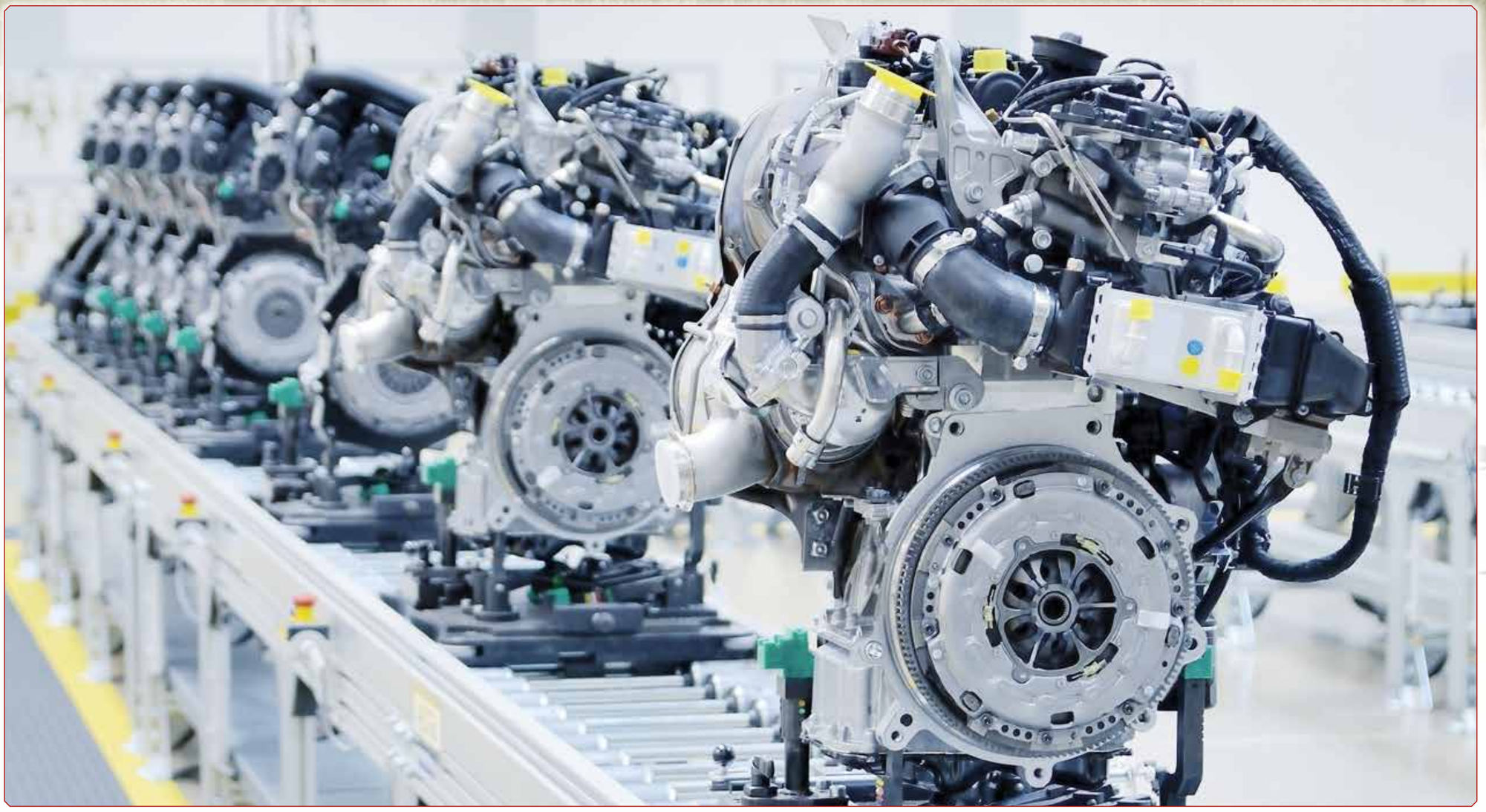


Accurate coupling of the components of an engine is essential to obtain maximum performance, and excessive tolerances and clearances are undesirable. Mass-produced engines are not always perfect. However, with blueprinting we can improve the situation.

Before computers took over the design process, technical drawings were reproduced using the blueprinting process, which involved contact printing on photosensitive sheets. The copies were recognised by their white lines on a blue background. This was, of course, also the case in the automotive industry, which is why in this sector we still talk about "blueprinting". This includes all the operations that contribute to geometrical and dimensional values that are as close as possible to those of the reference engine, reducing to a minimum any tolerances.

NOT ALL ENGINES ARE THE SAME

Nothing is perfect, as we know, and this also applies to mass-produced components and devices. Engineers establish ideal dimensions and geometries during the design process,



Mass production must also be cost-efficient and consequently employs processes and procedures that inevitably generate dimensional and geometric differences between theoretically identical components.

and then try to get as close to them as possible during manufacturing. However, there are external factors, such as the need to keep costs down while at the same time keeping productivity high. These can lead to quality differences between theoretically identical parts.

For example, the production processes used for racing or super sports engines are not the same as those used to build engines for production cars. In the first case, where cost is often immaterial, not only can very expensive materials and treatments be used, but also more sophisticated and considerably more accurate processes can be involved. In other words, very low machining tolerances can be achieved, with the result that the parts produced are much closer to the ideal parameters in terms of size and geometry, and will be practically identical to each other. This is not the case in mass production, even though the situation is much better than it was in the past. We are, of course, talking about very small inaccuracies, but that does not mean that they can be ignored. However, it is also true that some of these deviations from the nominal values can also be relatively large, without affecting the functionality and durability of the individual components or of the device of which they are a part.

It is not uncommon to find owners of theoretically identical vehicles who experience slightly different performance in the real world. This is probably because the two engines came from different production lines with slightly different manufacturing parameters.

Two typical scenarios are differences in the compression ratio and distribution timing. During design, the manufacturer specifies a reference value, but it is never rigorously respected in series production. We could test this ourselves very quickly, by measuring the capacity of the combustion chambers of a single engine - the differences between any two cylinders can be in the order of 0.3 to 0.5 percentage points. Similarly with the timing, the difference between two engines of an identical model can be significant, sometimes even 3-4 degrees compared to the manufacturer's specifications.

BLUEPRINTING

Perfection enthusiasts can choose to work on the engine in order to achieve optimal clearances and bring all the cylinders up to the same ideal operating specifications. In most cases, the only components that are replaced are those with dimensional or geometric differences when compared to the manufacturer's specifications. In simpler words, the best

components are chosen - those whose shape and dimensions are closest to perfect. Or, perhaps, those that allow you to obtain the most advantageous results.

TAKE CARE WITH TOLERANCES!

Take pistons as an example. These may have a difference in diameter between them in the order of hundredths of a millimetre. The tolerance for the cylinder liners can be similar, with the result that in the same engine the clearance between the two components may differ by up to two hundredths of a millimetre in any one cylinder. Manufacturers usually accept some tolerance between the ideal and the actual values of between 0.03 to 0.04mm.

Similar considerations can be expressed for bearing shells, which will have values that vary from the design specifications for the absorption of energy from friction and mechanical efficiency. These are tiny differences, especially in modern engines, but it is these small details which, when added together, reduce engine output. By improving these aspects, performance can be optimised.

MEASURE AND CHECK

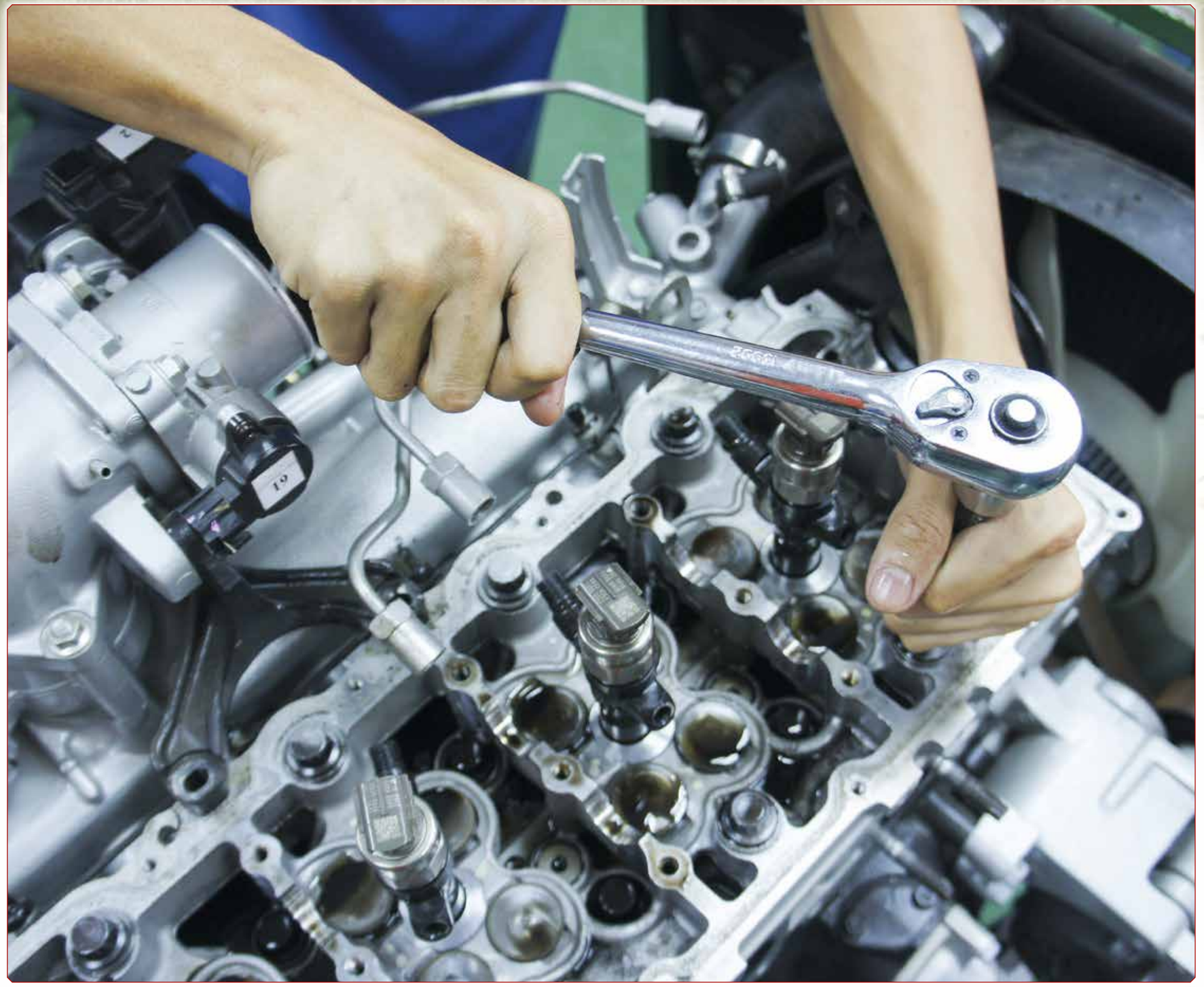
These are the watchwords for completing the "blueprinting" of the engine. Measurements should be carried out with the aid of sensitive instruments that are in perfect condition.

The compression ratio in production engines can also vary considerably from cylinder to cylinder, and not only because of the construction tolerances of the combustion chambers, which in most cases are obtained from castings and not by machining. It is also because the connecting rods may not be exactly the same length and therefore the pistons are at different heights when they are at Top Dead Centre (TDC). Once again we have to be careful with tolerances.

The situation was even more complex in the car industry of the past, because not all cylinders breathed in exactly the same way or got an air-fuel mixture with the same dosage. Fortunately, the situation changed with the arrival of electronically controlled multi-point injection and the use of high-performance intake manifolds. Even so, there are still problems relating to unequal pressures inside each cylinder.

CARE WITH THE ASSEMBLY!

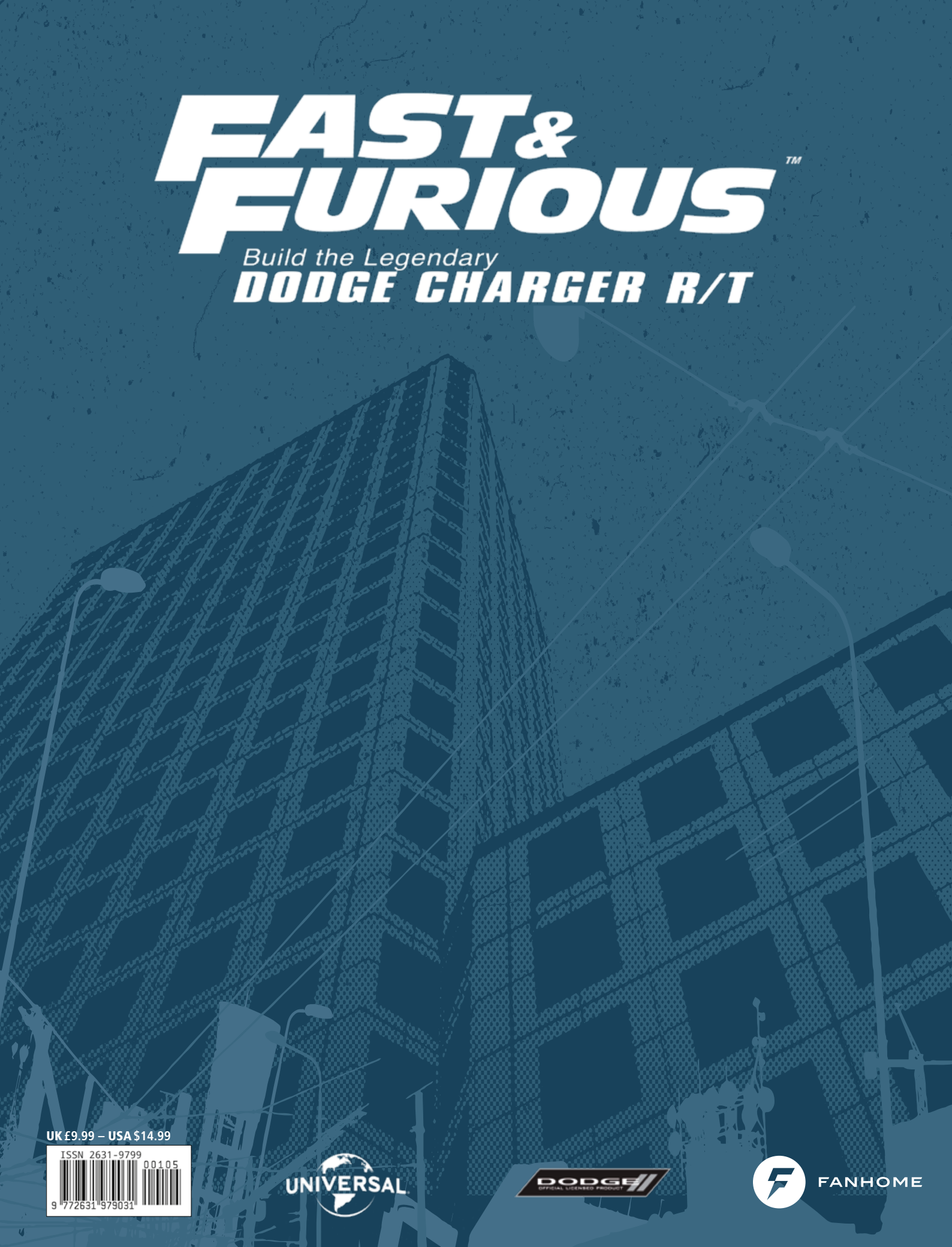
Blueprinting does not end with measurements, and assembly is also critical. Each step must be carried out calmly and with the utmost care, which is not always possible on the assembly lines of large factories. Care must be taken with tightening, too, because if it is not carried out correctly, it can cause significant distortion of the liners and cylinders. Of course, it is essential to work under conditions of absolute cleanliness, as if in an operating theatre. Each moving part must be lubricated before installing it, using the proper lubricant - ordinary engine oil is not always suitable.



In addition to checking the components, blueprinting demands extreme care during assembly, with a great deal of attention paid to proper tightening.

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