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19

Build the Legendary

DODGE CHARGER R/T



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DODGE CHARGER R/T



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THE FAMILY COMES FIRST

Besides being involved in fast races and thrilling chases, the characters in *Fast & Furious* uphold their own codes and values, such as family, friendship and solidarity.

In the *Fast & Furious* franchise, the family comes before anything else. Behind the action and suspense, the movies focus on a group of people that, whenever they find themselves in trouble, fight to remain united and never give up in the face of adversity.

DISCOVER YOUR CODE

Ever since his first appearance on screen, Dominic Toretto has been a staunch defender of the family. But his concept of the family is as important as it is broad, because he considers "his people" to be his entire team, without distinction, and without the need to be related. As he said in *Furious 7*, "I don't have friends, I got family." He is prepared to do whatever it takes to protect and help them, something that occasionally even disconcerts his enemies. For example, in *Fast & Furious 6*, he has a tense encounter with the dangerous terrorist Owen Shaw, who tells him: "When I was young, my brother always used to say, 'Every man has to have a code.' Mine: Precision. A team is nothing but pieces you switch out until you get the job done. It's efficient. It works. But you? You're loyal to a fault. Your code is about family. That's great in the holidays, but it makes you predictable. And in our line of work, predictable means vulnerable. And that means I can reach out and break you whenever I want." Dom doesn't bat an eyelid. Nor does he justify himself in any way. He just smiles and says: "At least when I go, I'll know what it's for."

Toretto's principles are unshakeable. No threat can make him doubt. The family comes first, something it's worth fighting for, even at the risk of losing.

FAMILY MEALS

The united family, as Dominic Toretto sees it, is at its best at family barbecues. In *Fast Five*, the invincible driver confided to Brian that it was a kind of ritual that he learned when he was just a kid. "My father used to have a barbecue every Sunday after church. For anybody in the neighborhood. If you didn't go to church, you didn't get any barbecue."

Toretto family barbecues are not just simple meals. They are gatherings of equals, where the bonds grow stronger and camaraderie is expressed over hamburgers, chicken wings and beer. They are intimate moments of relaxation

Tyrese Gibson and singer Ludacris, play the parts of Roman and Tej, two indespensable members of Dominic Toretto's "family".

and celebration, when the group leaves behind all the tensions, the chases and the risk, to relax in the best company. This is something that moves Brian O'Conner when, in *The Fast and the Furious*, he goes to a barbecue for the first time and discovers the unusual rules that govern them, like, for example, the first one to start eating is obliged to improvise a prayer and say grace. He immediately feels part of this new community and cannot avoid the fact that he likes it.

A CONTAGIOUS FEELING

But Brian finds himself in a tricky situation. He is an undercover cop and his superiors want him to keep tabs on Toretto. But, as capricious fate would have it, he cannot avoid being fascinated by the sweet personality of Mia, Dom's sister. And this is playing with fire because, above all else, Dominic wants to protect his sister from anything and everything. So when he finds out that the two of them are going out to dinner, Dom warns Brian: "You break her heart, I'll break your neck." To which the undercover agent replies, "That's not gonna happen."

When later on, Brian discovers that Dom is involved in the truck heists he decides to reveal his true identity to Mia, even at the risk of ending their relationship. There is something more important: saving the family. And Brian, who has already caught the family bug, wants to prevent Dominic and his team from being harmed by the truck drivers. He even risks his own life to rescue Vince, the member of the group with whom he has got on the worst since the beginning, when he is left dangling dangerously from the truck door. In that moment Brian has already stopped acting like a police officer and almost without realizing it he has started behaving like a member of the group.

TOGETHER AGAINST THE WORLD

Brian will eventually hand in his badge, in the hope that one day he will be forgiven and be able to join the team, as happens in *Fast & Furious*. After his eagerly awaited reunion with Mia, he says: "One thing I learned from Dom is that nothing really matters unless you have a code." And she asks, "And what's your code, Brian?" To which he smiles and says, "I'm working on it."

Besides Brian joining the team, the family grows with the arrival of more new members. All of them make up a compact group that will travel to Brazil, the United Kingdom, Spain, and even the United Arab Emirates. Despite having increasingly dangerous adventures, this togetherness and mutual trust will make them seem invincible. When the family is united it can handle anything, as Letty Ortiz reminded Dom at the start of *Fast & Furious*: "We'll figure it out. We always do."



Jordana Brewster plays the part of Mia Toretto, Dom's sister and main concern. Like her brother, she makes sure the team works together like an authentic family.

Over time, Dominic will see that he was right to defend the family as the most important thing in his life. And he confesses this to his team in *Fast Five* before carrying out a risky heist, proposing a toast: "Money will come and go, we all know that. The most important thing in life will always be the people in this room. Right here. Right now. Salute, mi familia."

DECISIONS WITH NO HARD FEELINGS

Logically, with the number of experiences they have, the group does not always make the right decisions. Occasionally, Dom Toretto tells them to have faith in things getting better, although without renouncing a sacred principle: "You don't turn your back on the family. Even when they do." And this means generosity and forgiveness. Throughout the series, some characters have mixed feelings, and they even realise they feel guilty for some of the things they have done. On these occasions, Toretto prefers to forget and hold no grudges. But even these mistakes eventually define everyone's personality. Roman Pearce shows this clearly when, at the end of *Fast and Furious 6*, he says grace at the family barbecue at the end of the movie: "Father, thank you for the gathering of friends. We give thanks for all the choices we've made because that's what makes us who we are."

In the *Fast & Furious* family, the heroes are not infallible. They know they can make mistakes. But if they remain loyal and support one another, they will always have another chance to do things better.

LAWRENCE A. HUBBS

Occasionally credited as Larry Hubbs, this movie veteran has for years been considered one of the most prestigious art directors in Hollywood. He began his career in the second half of the 1980s, creating the sets of popular movies like *Coming to America* (1988) and *Back to the Future II* (1989), a challenge that he overcame so favorably that he immediately made a name for himself in the industry. His creative talent was clearly seen soon afterwards when he worked for Barry Sonnenfeld, creating the fantastic world of *Men in Black* (1997). In 2003 John Singleton made Lawrence the art director of *2 Fast 2 Furious*, a job that he also did brilliantly, enriching the visual style of the franchise. He subsequently worked as art director on blockbusters like *National Treasure* (2004), *Superman Returns* (2006) and *Indiana Jones and the Kingdom of the Crystal Skull* (2008), and he demonstrated his innovative ideas when creating the fabulous sets for *Terminator Salvation* (2009) and *Mirror Mirror* (2012).

FOLLOW YOUR HEART

Dom Toretto, Brian O'Conner, Letty Ortiz and Han may at first sight seem individualistic, free characters who act according to their way of life. Nevertheless, they all have a strong commitment: to look after the others, doing what their heart tells them to do.

This, for example, is what will lead Brian to let Dom escape by giving him the keys to his own car at the end of *The Fast and the Furious*: "Do you know what you're doing?" Toretto asks in surprise. "I owe you a ten-second car," Brian says. He knows that it is his duty to arrest him and turn him in to the authorities, but his heart tells him that he cannot agree to that. He cannot be the cause of Toretto spending the rest of his days behind bars. His decision will force him to quit his job, to become yet another fugitive from justice, but it will open the doors to something he wants more: being part of the family. A strong united family that will grow throughout the franchise and which will always do anything and everything to protect the youngest members, as happens in *The Fate of the Furious*.





DODGE PACE CAR IN THE INDIANAPOLIS 500

The Indianapolis 500 is one of the most important races in the world, and without a shadow of a doubt, the most famous one in the United States. In this race, the pace car, the safety car that escorts the rest of the cars when there is an incident, is usually different every year. Dodge has been the chosen marque on four occasions.

In the era of muscle cars, the Dodge company managed to see one of their models, the Dodge Challenger being the pace car at the 1971 race.

For American marques, the Indianapolis 500 is a great commercial showcase. Hence having one of its models as the pace car of the race is very profitable. The organizers of the race, run on the oval circuit of Indianapolis and reserved for single-seater cars, have always chosen important models from the major local marques. In 1911, the first year the race was run, the pace car, the car that leads the assembled field in single file at low speed to allow the track to be cleared after an incident, was a Stoddard-Dayton. The first Chrysler Group model to be chosen was an Imperial E80 in 1926 while the first Dodge to play this promotional role was a Royal 500 in 1954. Since then, the marque has supplied the Indianapolis pace car on three more occasions; in 1971 (Challenger), 1991 (Viper) and 1996 (Viper GTS). It is also a tradition in the race for the driver of the pace car to be an important industrial or sporting personality in the United States. The "drivers" of the four Dodges mentioned were, in chronological order, William C. Newberg, the chairman of the Dodge Division, in 1954; Eldon Palmer, an authorized dealer of the marque, in 1971; the great Carol Shelby in 1991, and the chairman of Chrysler, Bob Lutz, in 1996.



The Dodge Viper GTS model became the pace car in the 80th edition of the Indianapolis 500.

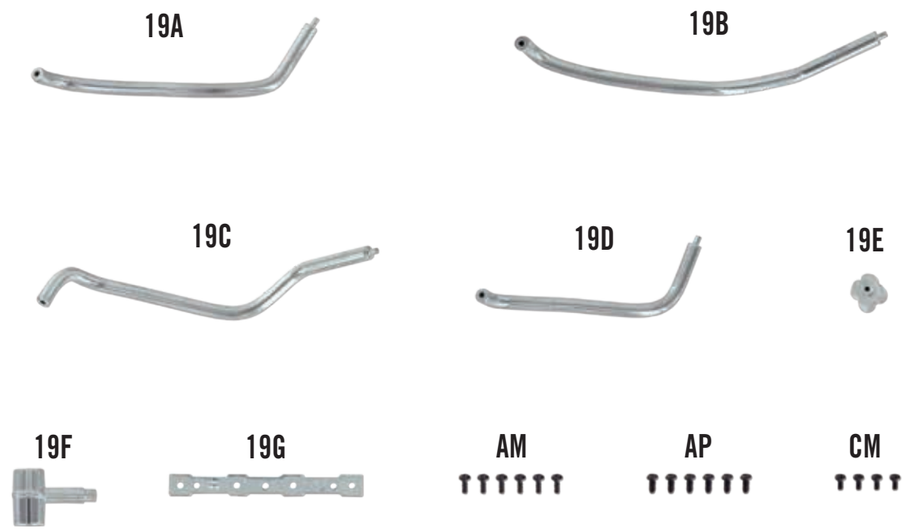


ASSEMBLING THE ENGINE BLOCK (VII)

In this assembly session, we will show you how to mount the headers on the right side of the engine, those corresponding to cylinders 2, 4, 6 and 8. Follow the instructions and the illustrations carefully.

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.

PIECES FOR THIS STAGE



19A Header tube cylinder 6
19B Header tube cylinder 2
19C Header tube cylinder 4
19D Header tube cylinder 8
19E Tube connector
19F Exhaust collector
19G Right bank manifold gasket
AM Screws 2 × 4 mm, (x 6)*
AP Screws 1,7 × 4 mm, (x 6)*
CM Screws 1,7 × 3 mm, (x 4)*

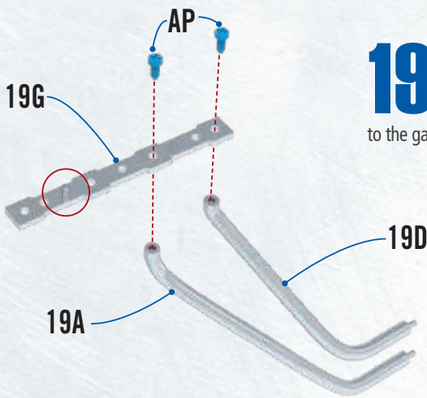
* Some of the parts are spares.

ASSEMBLY AREA



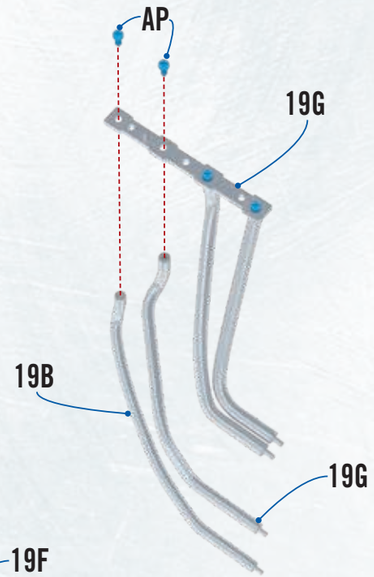
ENGINE BLOCK

Assembling the engine block (VII)

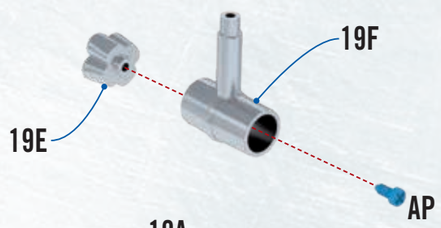


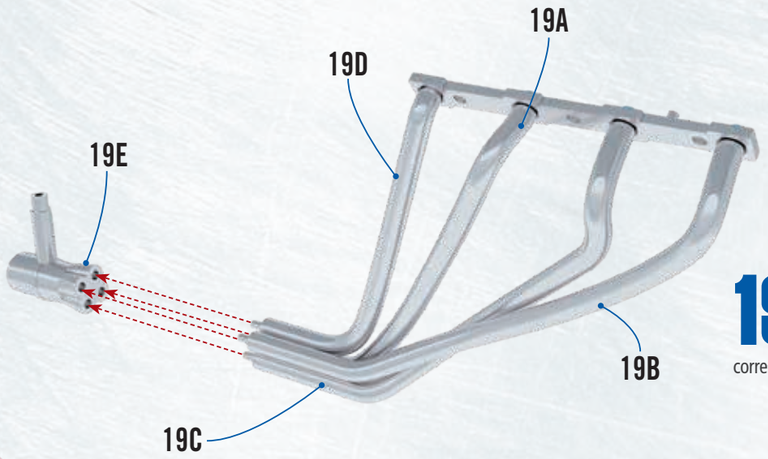
19.1 **TAKE** the manifold gasket **19G** and position it as shown in the illustration (the small pin indicated with the red circle should be facing upwards). Attach the header tube for cylinder 7 **19D** and the header tube for cylinder 5 **19A** to the gasket, using two **AP** screws. ◄

19.2 **ATTACH** the header tube for cylinder 3 **19C** and the header tube for cylinder 1 **19B** to the header gasket **19G** with two **AP** screws. The free ends of the two header tubes should be facing the same way. ►



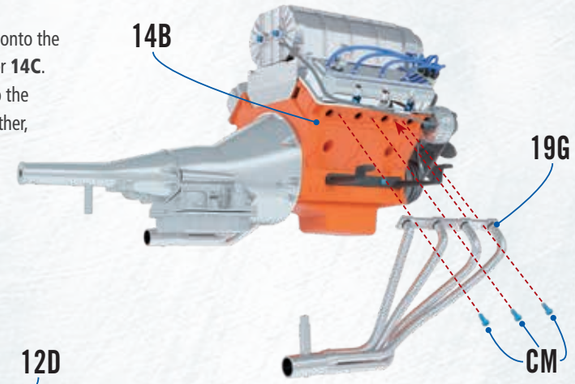
19.3 **WITH** the pieces facing the same way as those shown in the illustration, join the tube connector **19E** to the exhaust collector **19F**. Use an **AP** screw to fix in place. ►

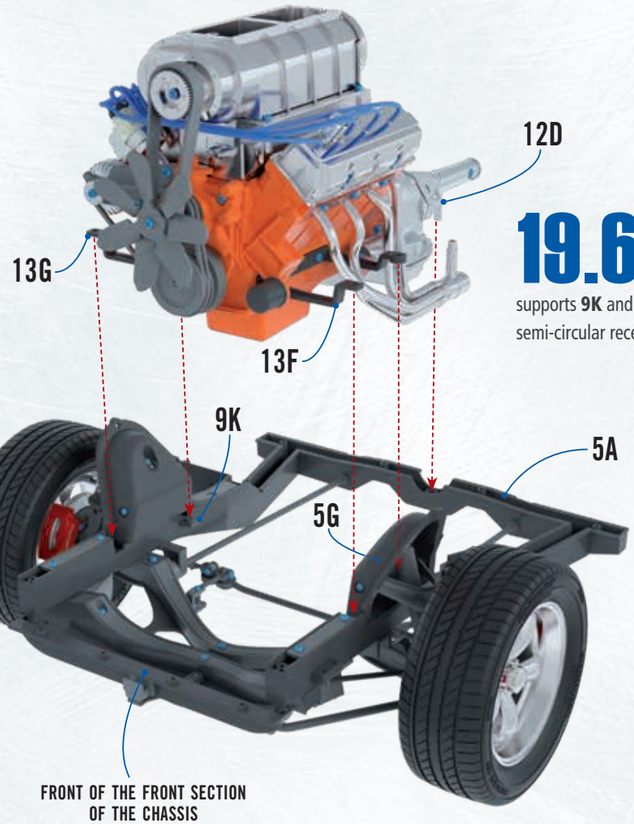




19.4 **INSERT** the pins on the end of each header tube (**19A**, **19B**, **19C** and **19D**) into the four corresponding holes in the tube connector **19E**. ◄

19.5 **POSITION** the left bank manifold gasket **19G** onto the left cylinder head, just underneath the valve cover **14C**. The small pin on the gasket must be inserted into the corresponding hole in the left cylinder head. To join the pieces together, insert three **CM** screws into the middle hole in the gasket. ►

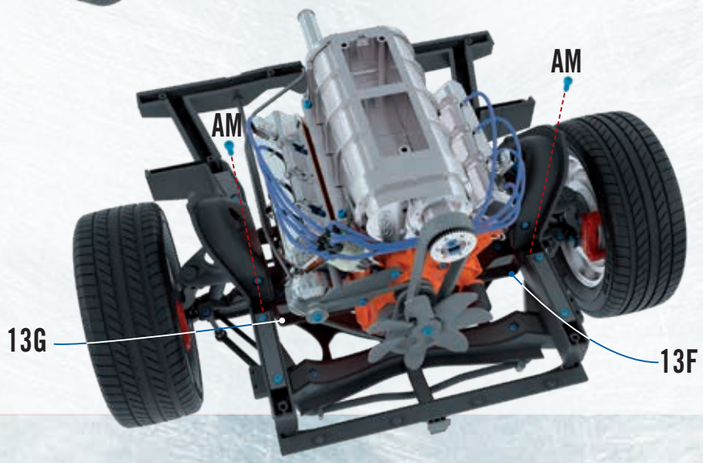




19.6 **POSITION** the engine block onto the chassis: place the two front mounting brackets of **13F** and **13G** onto the front of the front section of the chassis, above the engine supports **9K** and **5G**. The drive-shaft end of the gearbox must sit in the semi-circular recess in the rear beam of the front section of the chassis **5A**. ◄

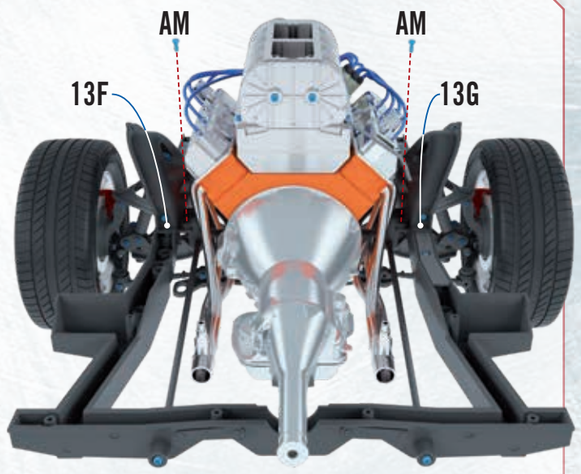


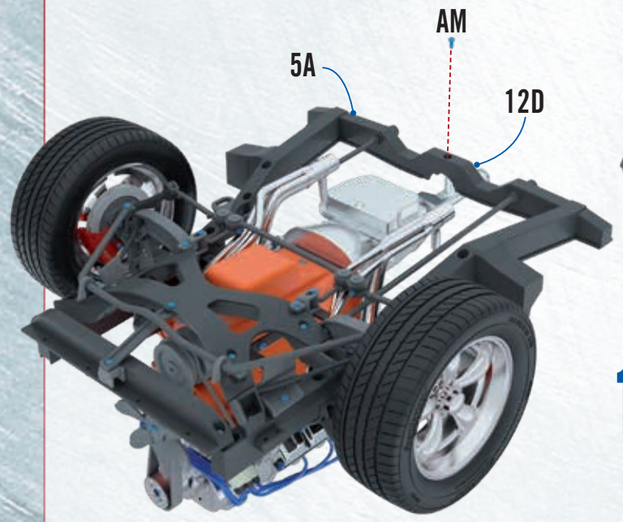
19.7 **JOIN** the engine block to the front section of the chassis with two **AM** screws, one for the right mounting bracket **13G** and the other for the left bracket **13F**. ►



Assembling the engine block (VII)

19.8 **INSERT** two **AM** screws in the back of the engine, one for the left mounting bracket **13F** and the other for the right bracket **13G**. ▶





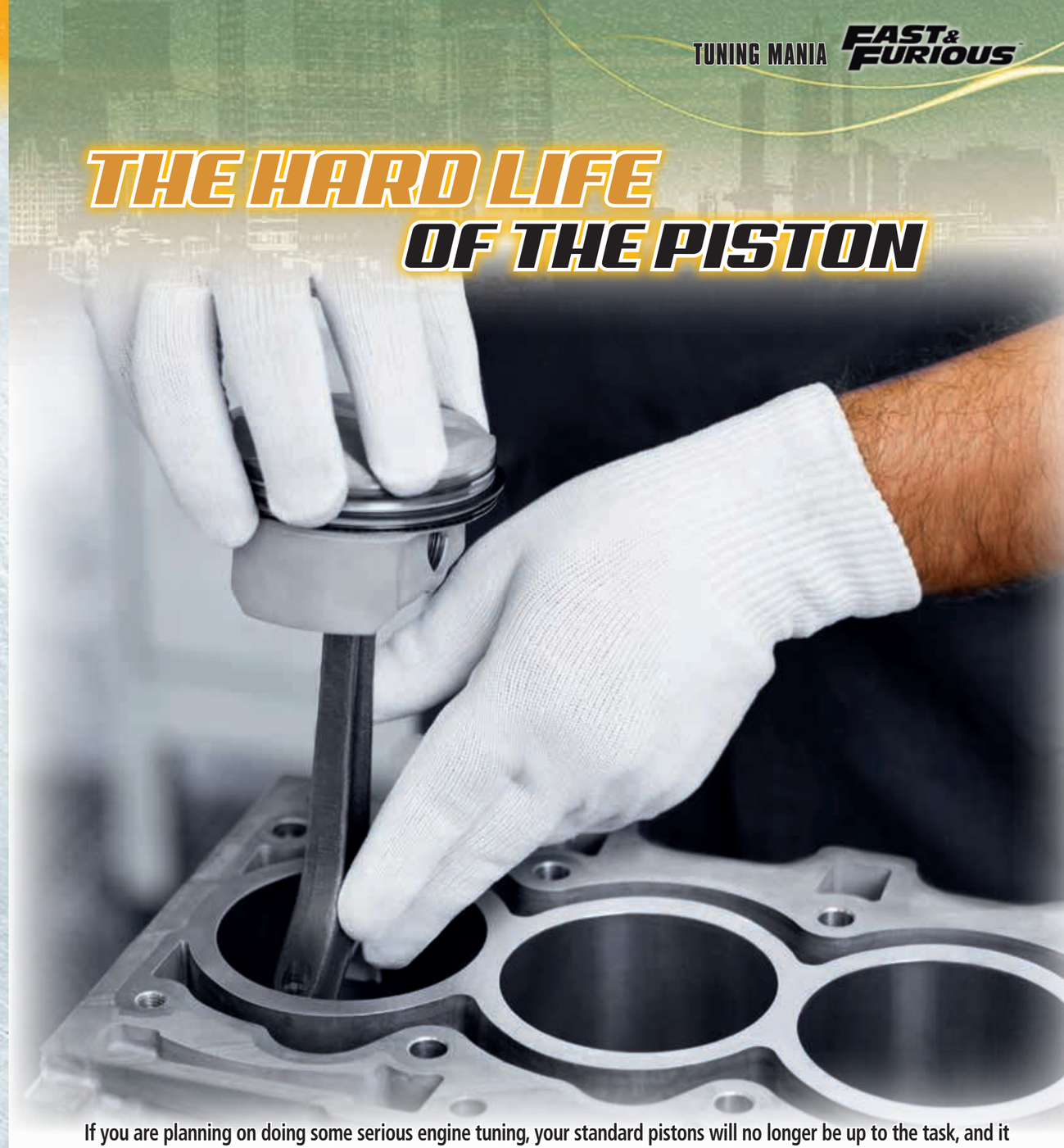
19.9 **TURN** the part upside down and insert an **AM** screw in the hole shown in the illustration, to join the gear box **12D** to the front section of the chassis. ◀

STAGE 19 FINAL RESULT



This photo shows the engine block with its header tubes on each side, sitting on the front section of the chassis.

THE HARD LIFE OF THE PISTON



If you are planning on doing some serious engine tuning, your standard pistons will no longer be up to the task, and it would be sensible to replace them. Let's take a look at some of the features they should have, to avoid nasty surprises!

The cars we use for our daily life nowadays are impressively reliable compared with their predecessors. Automotive engineering has advanced enormously, and parts are designed to be able to stand up to the stresses that they will encounter during their operational life, with an ample safety margin. That's why we can often go quite a way beyond the engine's design limits with little risk of destroying engine components that are expensive to replace. However, if we push too hard, parts can begin to fail as they are no longer able to withstand the enormous stresses that come into play. Inside the engine, in particular, the

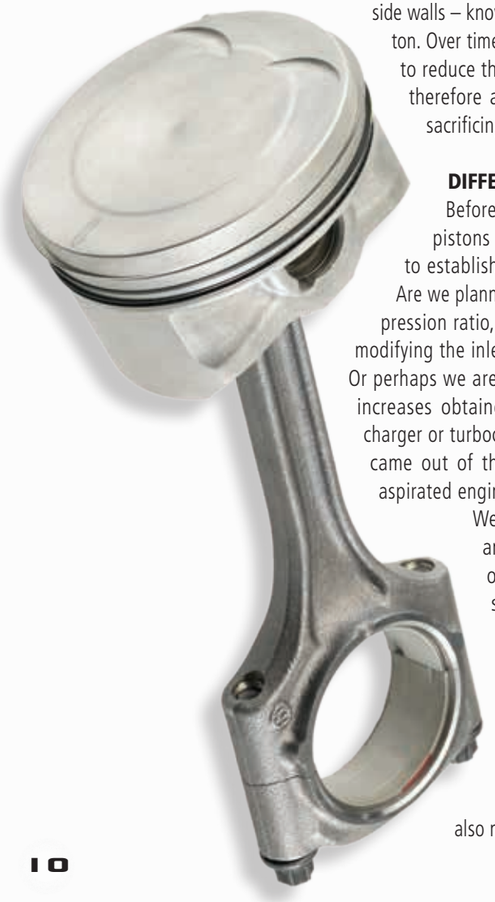
The task of replacing pistons is a lengthy and costly job that is best done by a professional.

pistons can be pushed to their limits. But go too far, and they will fail spectacularly.

INSIDE THE CYLINDERS

The pistons that move invisibly inside the cylinders are subjected to enormous thermal and mechanical stresses, which increase with higher engine rotation and pressure. Over the past few years, stock pistons have undergone considerable evolution, both in terms of design and dimensions, as well as the construction materials and the treatments and surface coatings that are applied to them.

Although the materials used have remained almost unchanged, some special alloys have recently been developed that offer higher resistance to thermal fatigue. With the passing of the years, more accurate design methods have appeared with the help of increasingly advanced tools thanks to the technological development of computerised systems such as simulators and 3D visualisation. The advances have allowed design engineers to test new piston design before the parts are actually made. One of the major changes has been to the side walls – known as the skirt – of the piston. Over time, designers have been able to reduce the height of the skirts, and therefore also their weight, without sacrificing strength.



Often, pistons are replaced to vary the compression ratio in the cylinder. In most cases, the objective is to increase the ratio, and convex piston crowns are used. But sometimes, pistons are installed which allow lower compression ratios.

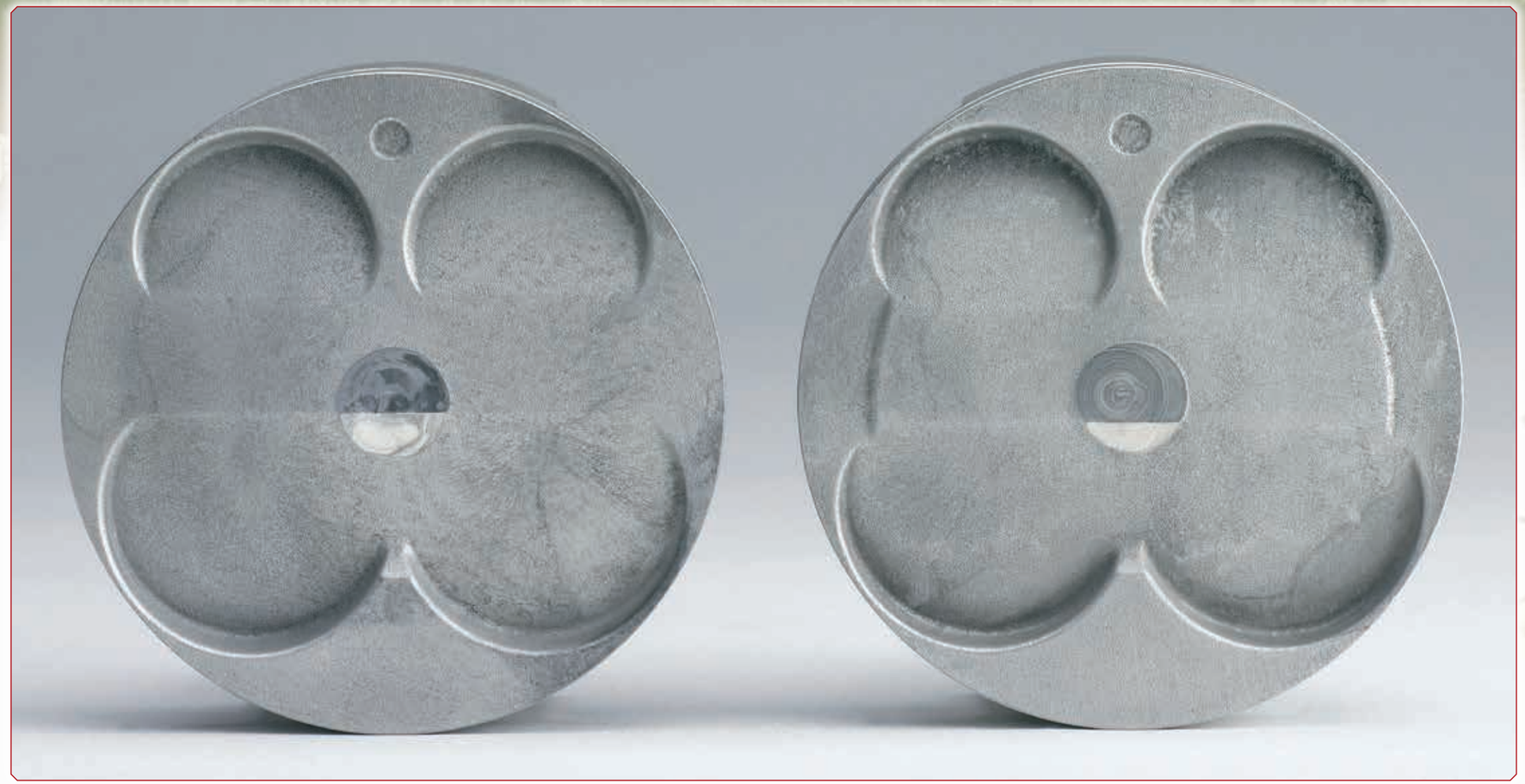
DIFFERENT NEEDS

Before rushing off to replace the pistons in our tuned car, we have to establish what our real needs are. Are we planning on increasing the compression ratio, installing new camshafts, modifying the inlet and exhaust manifolds? Or perhaps we are considering the dramatic increases obtained by installing a supercharger or turbocharging a power unit that came out of the factory as a normally-aspirated engine.

We must, therefore, carefully analyse our objectives. One of the first things to understand is the compression ratio. To what sort of stresses will we submit our pistons and valves? We might also be considering a modified camshaft. Don't forget that if you modify the camshaft lift, you will also modify the travel distance of the valve shaft. This might require grooved or countersunk pistons to avoid valves hitting the top of the piston, especially if the piston crown is convex-shaped to provide a higher compression ratio.

If the engine tuning is really extreme, we can also consider replacing the connecting rods with stronger parts. You might want to spend a little more money on a forged piston rather than a cast-aluminium version because it will withstand higher stresses. And nowadays, you can get racing-type, short-skirted pistons with smaller gudgeon pins (wrist pins). These are used in racing cars and are much lighter. The decrease in mass is also helpful.

Then the shape and thickness of the piston crown needs to be evaluated, as mentioned above. When slots or indentations are needed to allow greater valve travel, the thickness of the crown will need to be taken into account.



AN EXTRAORDINARY RANGE

There are many manufacturers of pistons. They can offer you both standard, high-performance, ready-made parts as well as custom-designed pistons in limited quantities.

So it is not hard to find suitable pistons for your car tuning project, with different shapes and characteristics depending on your own objectives. They can offer variations to match the design features you are looking for. In fact, there are so many options that you are spoiled for choice!

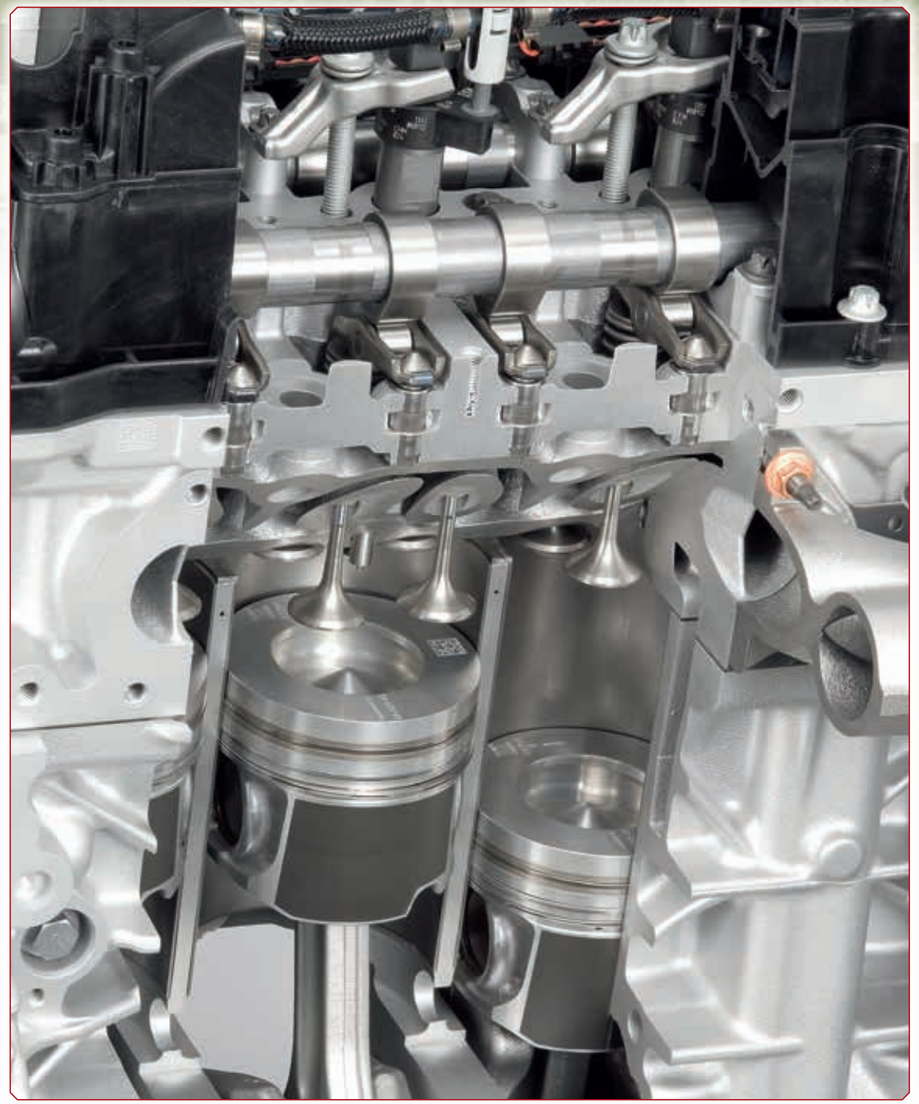
Pistons for standard engines are almost always manufactured by casting molten aluminium alloy in a mould. Those intended for racing engines are much more elaborate. They are generally forged from a single block of aluminium alloy. Hot forging is carried out at a temperature of around 450-500 C by placing the block of aluminium under a hydraulic press: this manufacturing process imparts to the material better mechanical characteristics thanks to the finer and more homogeneous crystalline grain. Recognising a forged piston from a moulded piston is easy: in this second case on the side-wall supports – those that join the skirt to the channel for the gudgeon pin – you can generally see symbols or letters, such as the manufacturer's logo, that are engraved into the mould and are reproduced on the piston head.

THE MATERIAL MAKES A DIFFERENCE

The cast pistons are made of specific aluminium alloys designed for this type of use. The most common in Europe and Japan are those that include 12% silicon. In the United States, those that use silicon most often contain between 8.5 and 10.5% of this element.

The main reasons for adding silicon is to improve the casting property by lowering the melting point and by facilitating the flow of molten metal. It also helps restrict deformation at high temperatures by lowering the

In the case of tuned engines with limited increases in performance, it is possible to continue using standard pistons. But when the changes are dramatic, it becomes essential to change these parts for high-performance components.



A reduction in the height and circumference of the skirt reduces losses due to friction. These days, this type of design is becoming commonplace.

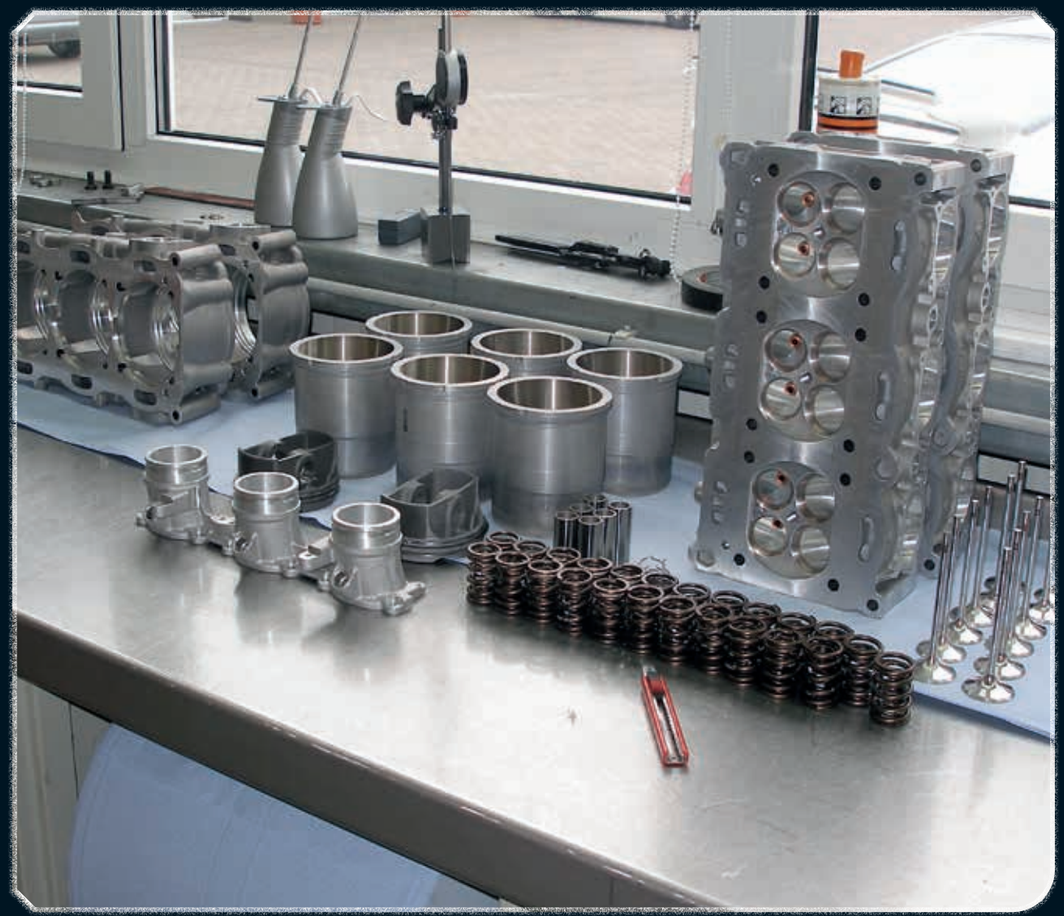
coefficient of thermal expansion. And finally, it improves resistance against wear and fatigue caused by friction. The lowering of the coefficient of thermal expansion and the improvement of the resistance against wear is proportional to the amount of silicon contained in the alloy. Therefore, the higher the output of an engine and thermal load on the piston, the greater the amount of silicon added.

For forged pistons, intended for racing cars and tuned engines, a 4032 alloy which includes silicon is used. (Its formula is Al Si12 Mg Cu Ni). However, when the stresses become really extreme, as for example in Formula 1 or in drag race cars, a 2618 alloy (Al Cu3,5 Fe Mg Ni) is preferred. As you can see, it does not include silicon. Instead, about 3.5% of the alloy is copper.

In this case, however, a higher expansion coefficient means manufacturers can allow greater assembly tolerances when the engine is cool. It makes an engine noisier when it is cold, until heat expands the alloy to close the tolerances. But this can be safely overlooked in a racing engine, also because the alloy in question has excellent mechanical characteristics which, very importantly, it maintains even when very hot.

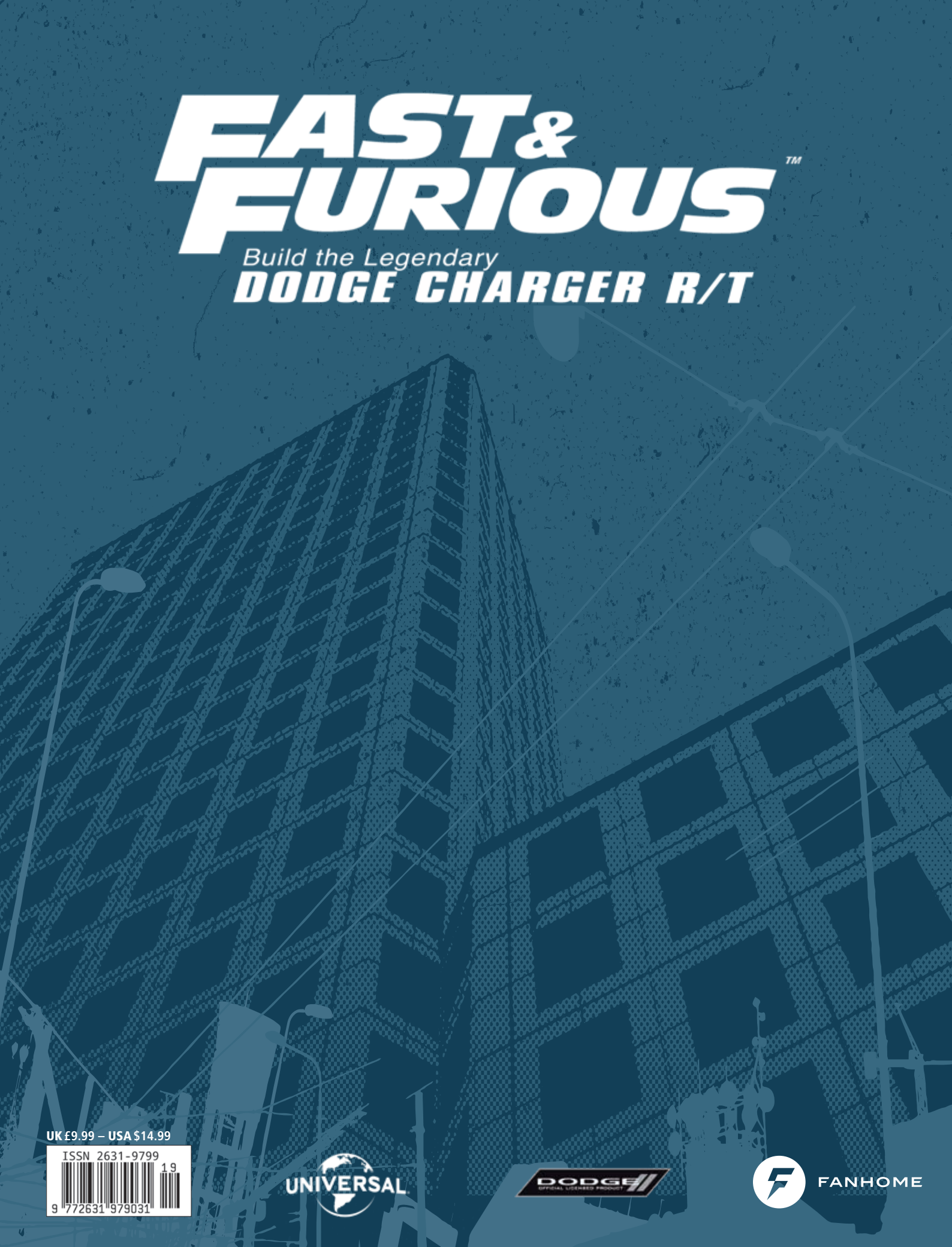
Competition pistons

Pistons intended for top-level racing engines are significantly different from those used on production cars. This is quite logical if you think about how different the stresses involved are, and the different needs that arise in each case. Production engines are designed to have a long life, operate with minimal mechanical noise, and have almost negligible oil consumption. They also have mechanical and thermal stresses that are much lower than those encountered in racing engines. This allows the use of cheaper production systems, like casting instead of forging, more conservative designs, and less expensive materials. Among the points most taken into consideration by the manufacturers is that of reducing the clearance tolerances to minimal values in order to facilitate the work of the piston rings, thanks to the smaller lateral movement of the piston, and above all to limit mechanical noise. On the other hand, pistons intended for racing engines must be able to withstand enormous mechanical and thermal loads. Therefore, they must be both very strong and extremely light. Noise is not even taken into consideration. As far as longevity is concerned, the parts just need to do their job for the duration of the race, or for the time established by the regulations. In the case of racing engines, that is not long compared to your family car.



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