TMD FRICTION

Pure Braking Power


GT3 RSR

High-technology braking for the world's fastest cars

My name is Ludwig Ervens and I am the Chief Technology Officer of TMD Friction. With this brochure I would like to invite you to escape to the world of motor racing and high performance vehicles, the super cars. A world that places almost impossible demands on brake friction, a world for which we have been developing customised products for decades.

Most people are unaware of the exhaustive research and development required to design a relatively small wearing part, not to mention the enormous performance required from brake friction products. For instance, look at a high performance vehicle like the Bugatti Veyron. It needs roughly 1000 HP to accelerate to a speed of 300 km/h in 16.7 seconds. To bring it to the quickest possible stop at this speed, approximately twice the engine power – 2000 HP – is required in the brake system. This is an incredible achievement for the brake pads and discs, one that is required whilst maintaining safe control of the car dynamics and balancing the incredible power of the engine.

But stopping power alone is not enough; braking should also be individually controllable and comfortable at any time, every time, even at these forces. The thrill of speed is seriously compromised if braking is not without juddering, without jerking and without squealing.

Here at TMD Friction, we are working full time, every day on the optimisation of our friction solutions, in our Leverkusen research and development centre, and also on our test track in Sherburn, England, and race tracks around the world.

TMD Friction – bringing safety to the road. Worldwide.

Ludwig Ervens
Chief Technology Officer of TMD Friction

TMD FRICTION

TMD Friction – welcome to a world of brake friction

The TMD Friction Group ranks among the worldwide leading manufacturers of brake friction products for original equipment in the automotive brake industry. In addition to disc brake pads and drum brake linings for passenger cars and commercial vehicles, the product range also includes brake friction products for motor racing and friction materials for industrial applications. With the leading brands Textar, Pagid, Mintex, Don, Cobreq and Cosid, TMD Friction also supplies the worldwide aftermarket. At sites in Germany and seven other European countries, in the US, Brazil, Mexico, China, Japan and Malaysia, the company produces a sales volume of approximately 700 million Euros, and has 4,400 employees. For more information on TMD Friction, visit the website at www.tmdfriction.com

TMD Friction supplies original equipment to the following car manufacturers:

- Alfa Romeo
- Aston Martin
- Audi
- Bentley
- BMW
- Bugatti
- Cadillac
- Chevrolet
- Citroën
- Dacia
- Daewoo
- Ferrari
- Fiat
- Ford
- Honda
- Hyundai
- Jaguar
- Kia
- Lamborghini
- Lancia
- Land Rover
- Lexus
- Lincoln
- Lotus
- Maserati
- Maybach
- Mazda
- Mercedes-Benz
- Mitsubishi
- Nissan
- Opel / Vauxhall
- Peugeot
- Porsche
- Proton
- Renault
- Rolls-Royce
- Rover
- Saab
- Seat
- Škoda
- Smart
- SsangYong
- Suzuki
- Toyota
- Volkswagen
- Volvo

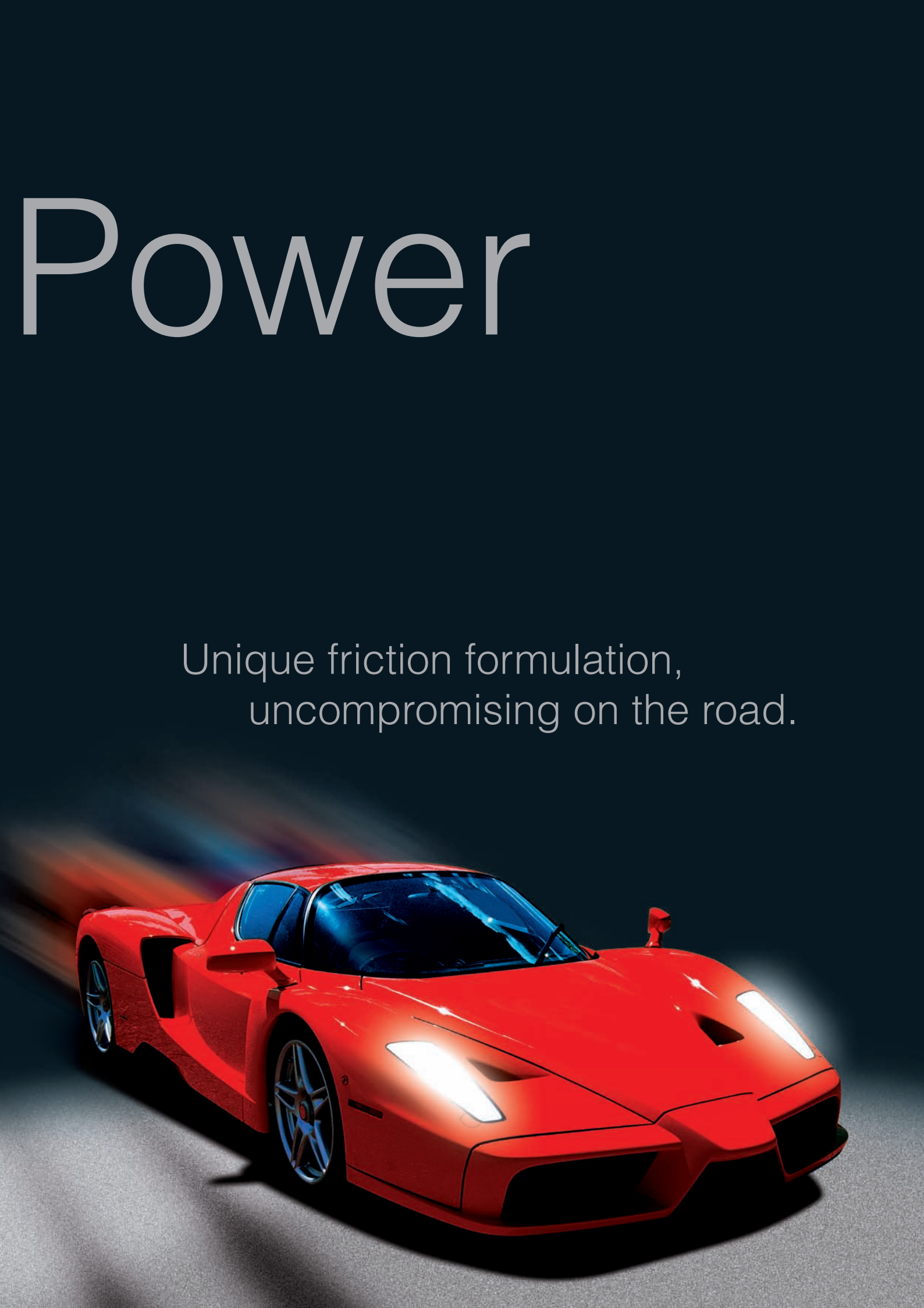
Braking

Supercars: The most superb driving machines in the world. TMD Friction tames these beasts of the highways – safely and with confidence. With our know-how and experience we create the right balance between brake reaction and pedal modulation. Result: The thrill of driving with superior braking power.

Our brake friction products are backed by a decade of development work. Up to 30 raw materials from around the world flow into our high-tech products. Our unique friction fomulations are highly protected trade secrets, the pride of our chemists and engineers. No wonder – When braking at 350 km/h, our friction products reach up to 2,500 Nm on each wheel and unleash their full braking power even at maximum tolerances. Our testing has demonstrated this time after time at temperatures exceeding 1,000 °C.

Power

Unique friction formulation,
uncompromising on the road.



Super cars

Aston Martin DB9
Cubic capacity: 5,935 cm^3 | Top speed: 300 km/h
Power output kW/HP: 335/455 | From 0 to 100: 4.9 sec

Disc: Cast iron | TMD Friction material: RS4-2-2

Lamborghini Gallardo
Cubic capacity: 4,961 cm^3 | Top speed: 315 km/h
Power output kW/HP: 382/520 | From 0 to 100: 3.95 sec

Disc: Ceramic | TMD Friction material: P40-3V

Bugatti Veyron
Cubic capacity: 7,993 cm^3 | Top speed: 407 km/h
Power output kW/HP: 736/1,001 | From 0 to 100: 2.5 sec

Disc: Ceramic | TMD Friction material: T4400

Mercedes McLaren SLR
Cubic capacity: 5,439 cm^3 | Top speed: 332 km/h
Power output kW/HP: 460/626 | From 0 to 100: 3.8 sec

Disc: Ceramic | TMD Friction material: PA4201

Dodge Viper SRT10
Cubic capacity: 8,285 cm^3 | Top speed: 314 km/h
Power output kW/HP: 372/506 | From 0 to 100: 3.9 sec

Disc: Cast iron | TMD Friction material: T4045

Audi R8
Cubic capacity: 4,163 cm^3 | Top speed: 301 km/h
Power output kW/HP: 309/420 | From 0 to 100: 4.6 sec

Disc: Ceramic | TMD Friction material: P40-3V

BMW M5
Cubic capacity: 4,999 cm^3 | Top speed: 250 km/h
Power output kW/HP: 373/507 | From 0 to 100: 4.7 sec

Disc: Cast iron | TMD Friction material: T4166

Porsche 997 GT3
Cubic capacity: 3,600 cm^3 | Top speed: 310 km/h
Power output kW/HP: 305/415 | From 0 to 100: 4.2 sec

Disc: Ceramic | TMD Friction material: P40-3

Stopping the world's super cars

In pole posit

TMD Friction is successfully represented at almost all sectors of motor sport with motor racing brake friction. From club sport level all the way to the works teams of vehicle manufacturers. For example, TMD Friction are official series partner of both the Porsche Cup Germany and the international Porsche Super Cups.

We have been aiding the success of motor sports teams for many years. If you want to step up to the winner's podium you need brakes that react both quickly and precisely, even under extreme conditions. During the 2007 24 hour Daytona race, 52 of 70 vehicles were equipped with racing pads from TMD Friction, the drivers choice confirming the quality and standing of our brake products.

TMD Friction are always track side, together with the racing teams, allowing us to continuously gather valuable experience in dynamic real time environments. These results are immediately integrated into the research for future materials, leading to the development of new friction solutions optimised to individual racing platforms.

ion for braking

Our products live on the race track,
and you can make a safe bet they
are always leading the field.

Racing

12 hours of Sebring – Winning at this race is a TMD Friction tradition and 2007 was no different. The Ferrari F430 GT of the Risi Competizione Team was race champion, as well as of winning four other races in the American Le Mans Series (ALMS), all with racing pads developed by TMD Friction. Since 1999, the only GT vehicles to have won the 12 hours of Sebring have been fitted with TMD Friction racing pads, and unlike many of our competitors, all these endurance races have been driven and won without needing to change our brake pads.

American Le Mans Series (ALMS) – For years, TMD Friction racing pads have dominated the ALMS GT class. Renowned racing teams and manufacturers, such as BMW, Ferrari, Panoz and Porsche, depend on TMD Friction racing pads. Since the year 2000, TMD Friction racing pads have won every ALMS championship. After winning five races in 2007, the next championship title is practically assured for Team Risi Competizioni and TMD Friction brake pads.

Rally Sport – Rally sport stirs up a lot of dust. In combination with dirt and mud, these are the trademarks of rally tracks – all over the world. TMD Friction brakes champions, providing reliable safety and consistent performance on the race track. Such was the case with Wyn Humphreys, who catapulted to the top with his Subaru Impreza during the 2007 British Championship. And in 2006, Guy Woodcock won the Rally Championship of the Netherlands. Both put their trust in the brake know-how of TMD Friction – on-road and off-road.

24 hours of Daytona – The racecars of the GT class are based on series models that have been modified for racing. Not only did these teams, equipped with TMD Friction racing pads, occupy the winner's podium with first place (Porsche GT3) and second place (Pontiac GXP-R), but all positions from 1 to 8, just the same as last year. With the Daytona prototypes (DP), high performance vehicles that have been specifically designed for racing start in the Rolex Sports Car Series. In 2007, 52 of 70 vehicles were equipped with TMD Friction racing pads. They won, among others, 2nd and 3rd place. In 2005, 43 of 66 teams counted on TMD Friction brake technology. Result: the Winner's podium, from 1st to 3rd place.

NASCAR – Jarit Johnson closed out the 2007 points season at Hickory Motor Speedway in dominating fashion taking his TMD Friction equipped race car to victory lane from the pole. It was Johnson's 8th win and 4th pole of the season. From mid-May to mid-June Johnson was unbeatable collecting five wins in a row. Three times he won the race and the pole award in the same event. In all Johnson collected 12 top fives out of 18 races. He finished the season 3rd in the Championship Points.

24 hours of Le Mans – Le Mans – alone the name causes motor sports enthusiasts to shiver. TMD Friction is much at home at this classic event. In 2007, the Porsche works drivers Patrick Long (USA) and Richard Lietz (Austria) were the first to pass the checkered flag with their Porsche GT3 RSR fitted with TMD Friction racing pads. Our racing friction is also to be found in the Ferrari of the Risi Competizione Team and the Italians secured a successful second place.

Braking for champions

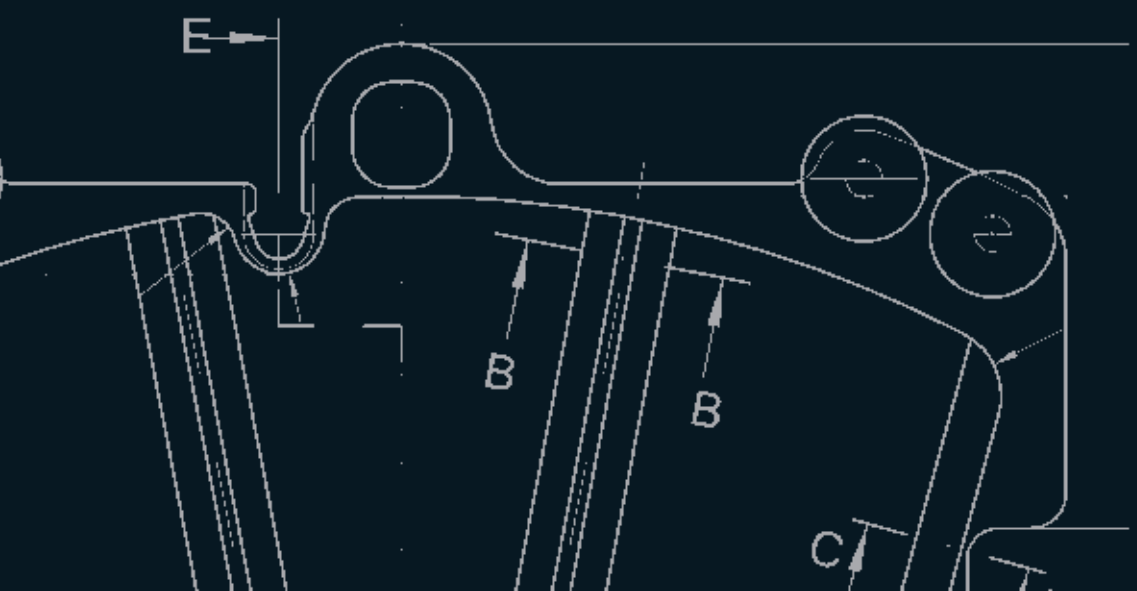
Innovating tomorrow’s brakes today

The requirements on brake systems are growing every day. Reason: Rising vehicle weights, increasing top speeds and higher torques with corresponding acceleration. The key to the future: Ceramics.

Ceramic brake material is perfectly adaptable to these new challenges and the trends within the automotive industry. On one hand, the brake performance is optimised, resulting in improved brake reaction for more powerful vehicles. On the other hand, driving dynamics and driving comfort are increased, since more and more vehicles are designed and manufactured with lightweight construction.

This technology has been continuously developing since the initial carbon ceramic brake disc application in Porsche 911 GT2 and Mercedes CL 55 AMG F1 Limited Edition. The new material for brake discs is a carbon fibre reinforced silicon carbide (C/SiC). The advantages of the carbon-ceramic brake disc in safety, weight, strength, durability and comfort characteristics has led to it being implemented in several high performance series vehicles and sports cars. Since establishing the performance advantage of these brake systems, carbon ceramics have found their way into a number of global vehicle development projects as a dynamic partner for TMD Friction brake pads.

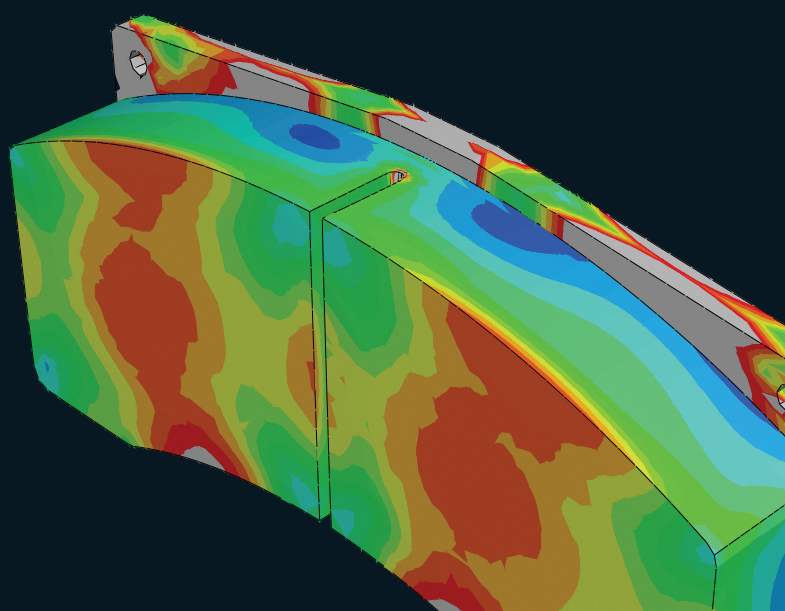
The performance benefits of ceramic braking place significantly higher demands on the brake pad, including:
- Sliding speeds up to 50 m/s
- Brake operation energy up to 3,000 kJ
- Maximum temperature load of brake disc up to 1,100 °C
- High mechanical load due to high braking torque and brake clamping force (up to 53 KN)



TMD Friction is globally leading in the development of brake friction products for high performance brake systems with carbon-ceramic brake discs. Our know-how in this area is no mere accident, for more than 10 years our development engineers and chemists have been researching side by side with the manufacturers of carbon-ceramic brake discs, leading to the development of special friction materials, optimally tuned to the wear-resistant ceramic composite friction partner.

During the braking process, this unique synergy causes the formation of a transfer layer from both pad and disc, giving an unbeatable, consistent friction level performance and optimal wear of the friction components, particularly in the high performance arena.

In recent times, carbon-ceramic braking is the most significant innovation in the field of brake technology evolution. TMD Friction are proud to be a driving force within this development.



TMD FRICTION

TMD Friction Services GmbH, Schlebuscher Str. 99, 51381 Leverkusen, Germany
T. +49 2171 703 0 F. +49 2171 703 388

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