

TECHNICAL INFORMATION AND TIPS

PAGID FRICTION COMPOUNDS

PAGID racing compounds are complex formulations with very high content of ceramic materials. The difference to competitor's metallic compounds is the superior thermal insulation and the higher heat resistance of ceramic compared to iron. Ceramic has, to the contrary of iron, very low heat conductivity. Consequently, less disc (rotor) temperature goes through the pad into the caliper.

We measured up to 60°C (140°F) less caliper temperatures with PAGID pads vs competitor's pads. This is very crucial when it comes to brake fluid boiling.

PAGID friction compounds, especially the color-coded yellow endurance materials, have a very low wear rate and are extremely disc friendly. This fact is proven by numerous race wins in 24 hour races world-wide.

Brake modulation, release characteristics and pedal feel with PAGID pads are excellent. Therefore, it is not only less likely to get (tire) flat spots but also improves drivability and driver confidence.

Taking environmental protection seriously / Ecological standards for friction materials

At PAGID / TMD Friction we have been at the forefront of environmental protection within the friction industry for a number of years.

Almost a decade ago the company was instrumental in the development of the ECO-Table, a set of ecological / environmental classification standards for friction materials. It ranges from ECO I to ECO IV and today it is a universally recognized standard. The product portfolio of PAGID / TMD Friction has been constructed in line with the corresponding environmental requirements and it is constantly being further improved.

We believe that we have a responsibility to conserve the planet's precious resources wherever possible therefore we have set ourselves ambitious energy reduction targets and strict recycling processes.

PAGID STEEL BACKING PLATE DESIGN

PAGID uses a unique and patented system to ensure the friction material does not delaminate from the steel backing plate. The friction material is attached to the backing plate in two ways, adhesive bonding and mechanical retention. The mechanical retention (patented) is accomplished by inserting brass torpedoes (studs) - which are welded onto the steel backing plate deep into the friction material. The brass torpedoes do not harm the brake disc (rotor). PAGID is the only race pad that features a retention system which not only connects the steel backing plate with the under-layer (adhesive bonding) but also with the friction material itself. It has turned out that this system, invented in the first place only for racing, has become also the best retention system for heavy truck and bus disc brake applications.



PAGID RACE PAD FITTING INSTRUCTIONS

The new brake pads must move freely in their guides. If necessary remove paint from the contact faces. Delayed release and taper wear can occur if pads do not have enough clearance.

The outer radius of the pad's friction material must align with the brake disc's outer radius. (Because brake discs grow when they get hot the pads may stick out max. 1mm when cold). Especially with custom made uprights (knuckles) or custom made caliper mounting brackets, brake pads very often do not align properly with the brake disc.

After a brake pad change it is advisable to place a note at the steering wheel to let the driver know new pads had been installed.

Never lay hot pads up side down i.e. with the friction material onto the ground unless you throw them away anyway. Asphalt, rubber, oil etc. can melt into the friction material. (The same applies to hot discs!)

When washing the car (especially with high pressure cleaners) we recommend removing the pads or driving the car after washing and apply the brakes a few times in order to dry the brake pads. Oxidation due to water or high humidity can slightly alter the friction behavior of used pads. Some pro race teams use storage or transport pads and vacuum bag the race pads.

AVOIDING BRAKE JUDDER

During bedding and shortly after, some judder is quite normal but should disappear after 5 to 10 laps. Changing back and forth between two incompatible friction materials (e.g. racing brake pads of different brands or street pads) can cause uneven build-up of pad material on the disc surface and can consequently lead to brake judder. Judder is the result of a thickness variation in pad buildup on the disc surface. Brake judder can be from a barely noticeable vibration to a violent judder. When you install Pagid race pads on top of a layer of an incompatible pad material, bedding might take much longer or in worst case won't work at all. It can also result in sub-optimal brake performance.

Another reason for uneven pad transfer is called imprinting. After coming to a complete stop with hot brakes (in the pits or after a spin), do not keep your foot on the brake pedal. The hot pads can leave a deposit behind that in turn again can cause judder and vibrations.

BIGGER VS SMALLER PAD

A larger friction surface will not improve stopping power. The amount of pressure applied, coefficient of friction and the disc diameter determine stopping force. A bigger pad does not apply more pressure, only the same pressure over a bigger area. The size of the pad matters in terms of heat capacity and wear rate. A larger pad will absorb more initial heat and has better wear characteristics.

PAD FADE VS BRAKE FLUID FADE

1.) pad fade

When the temperature at the interface between the pad and the disc exceeds the thermal capacity of the pad, the pad loses friction capability mainly due to out-gassing of binder (matrix) materials in the pad compound. The brake pedal remains firm and solid but the car will not stop no matter how hard you push on the pedal. The first indication is a distinctive smell, a signal to back off.

Solutions: better cooling, higher mass brake discs size and vane configuration or higher heat range pad compound.

2.) fluid fade

Boiling brake fluid develops gas bubbles in the calipers. The brake pedal becomes soft and pedal travel increases (because gas is compressible). One can still stop the car by pumping the pedal but efficient modulation is gone. This is a gradual process with advanced warning. The damaged fluid must be completely replaced. Correcting the problem is improved cooling and / or may only require new or higher grade racing brake fluid. The importance of keeping fresh brake fluid in the system and regular bleeding (before every session) cannot be overstressed.

WATCH THE TEMPS!

It is highly recommended that brake temperatures are being monitored. Three temperature brake paints or similar products should be used. Ideally, the green paint (430°C / 806°F) should be completely oxidized (turns white), the orange paint (560°C / 1040°F) should be symmetrically beginning to oxidize and the red paint (610°C / 1130°F) should be un-touched or change only slightly.

Caliper temperatures can be monitored with temperature strips. Checking the temperatures in the pit lane with a thermometer is a good way to oversee brake bias.

Heat cracks in racing brake pads and discs

Multiple small heat cracks (hairline cracks) in pads and discs (rotors) are normal and accepted for this type of use. Friction material delamination is prevented by PAGID's patented retention system (see above). Heat cracks on brake discs must not reach to the outer or inner edge of the disc.

PAGID RACE PAD MOUNTING AND BEDDING IN

MOUNTING NEW PADS ON USED DISCS (ROTORS)

We do not recommend using discs, which are pre-bedded, or have been used with friction material other than PAGID. When Pagid race pads are installed on top of a layer of incompatible pad material, bedding might take much longer or in worst case won't work at all. It can also result in sub-optimal brake performance. Used discs have a slight ridge on the outer and inner edge (radius). For a little while, until bedded, new pads would ride only on this ridge and not on the complete disc surface. That can cause a soft pedal. Therefore it is recommended to chamfer the outer and inner edges of new pads a little bit in order to have full pad contact from the beginning. That is very important in long endurance races with pad changes to provide a firm pedal right after the pit stop.

BRAKE DISCS (ROTORS)

PAGID racing brake pads can be used either on solid, grooved or cross-drilled discs. If possible, pads should be bedded on used but NOT worn out brake discs. (If bedding new pads on new discs, focus on disc bedding first.) For disc bedding please refer to the disc manufacturers own instructions. Usually, disc bedding is performed at lower temperatures than pad bedding.

WHY BEDDING?

- To transfer a layer of friction material onto the brake disc (rotor) faces to achieve maximum performance.
- To stabilize compressible materials to avoid a spongy pedal.
- To boil off volatile elements in the friction compound in order to have the initial green fading during bedding and not during the race.
- To align the pad surface with the brake disc (rotor) surface to have full contact.

If pads do not get bedded properly and / or used too hard right out of the box will likely lead to pad glazing. Pad glazing is a condition where the resins in the pad crystallize on both, the pad friction surface and the brake disc (rotor) surface, resulting in poor stopping performance, brake judder and vibrations. Also rapidly escaping volatile elements and moisture from the resin would seek an immediate escape route out of the friction compound, creating small fissures that would lead shortly to cracking and chunking.

RECOMMENDED VEHICLE BEDDING IN PROCEDURE

1. BREAKING-IN

(creating a perfect contact-pattern between rotor and brake pad surface)

10 stops with low pressure and low temperature from 150 km/h (90 MPH) to approximately 80 km/h (50 MPH). Distance between each brake stop approximately 600 – 800 meters (600 to 800 yards).

2. HEATING-UP

(Warm up in order to initiate some core heat in the whole brake system)

A sequence of 5 stops with medium to high pressure from 180 km/h (112 MPH) to approximately 60 km/h (37 MPH) with maximum acceleration between the stops. After the last stop cool down for 3 minutes with the speed preferably not higher than 100 km/h (62 MPH).

3. RECOVERY STOPS

3 to 5 stops with low pressure from 150 km/h (90 MPH) to approximately 80 km/h (50 MPH). Distance between each brake stop approximately 600 – 800 meters (600 to 800 yards).

PLEASE NOTE

It is imperative that the bedding in procedures are NOT performed on public roads. PAGID racing materials are NOT for street use. Failure to follow bedding in procedure may result in a sub-optimal brake performance.

USAGE OF PRE BEDDED PARTS

USING PRE BEDDED PARTS FROM THE SUPPLIER GUARANTEE OPTIMAL BRAKE PERFORMANCE RIGHT FROM THE BEGINNING WITHOUT LOSING PRACTICE TIME ON THE TRACK AND WITH THE SAVING OF OPERATIONAL COST OF THE CAR.

LIMITED WARRANTY

PAGID racing brake pads are developed for use in motor sport. They have not been developed for use on public roads and must not, under any circumstances, be used on public roads. Because motor sport is inherently dangerous and use of PAGID racing brake pads in motor sports results in unusual stresses and uses over which TMD has no control, TMD does not warrant or guarantee any aspect of the design, use or performance of these brake pads.

TMD only warrants that the PAGID racing brake pads have been manufactured in accordance with the manufacturing specifications for such pads.

In particular, and without in any way limiting the scope of the foregoing disclaimer, no warranty or guarantee, express or implied, is made as to the ability of the PAGID racing brake pads to protect the user from injury or death. The user assumes all such risks.

FURTHER TO THE FOREGOING, EXCEPT FOR THE EXPRESS WARRANTY GIVEN IN RESPECT OF CONFORMITY OF THE BRAKE PADS TO THE MANUFACTURING SPECIFICATIONS, TMD DISCLAIMS ANY AND ALL WARRANTIES OF ANY KIND, INCLUDING WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.