

# Chassis Systems Brakes

## **The future of braking.**



**BOSCH**

Invented for life



## Chassis Systems Brakes

**You can expect from us what you expect from our components: perfect coordination.**

Bosch Chassis Systems Brakes develops and produces innovative brake systems for the global automotive industry. We are firmly convinced that we can only do this in close cooperation with automobile manufacturers. As we are a division of the world's biggest independent motor vehicle equipment manufacturer, you can count on our enormous expertise in vehicle engineering. Our products range from individual components right

through to complete brake systems in which all of the components are not only perfectly suited to one another, but also to the individual vehicle platforms. In our development centers we combine the experience of our customers with our own expertise in research and development so that we can offer the right solutions for all markets. And our highest objective is always to fulfill your objectives.

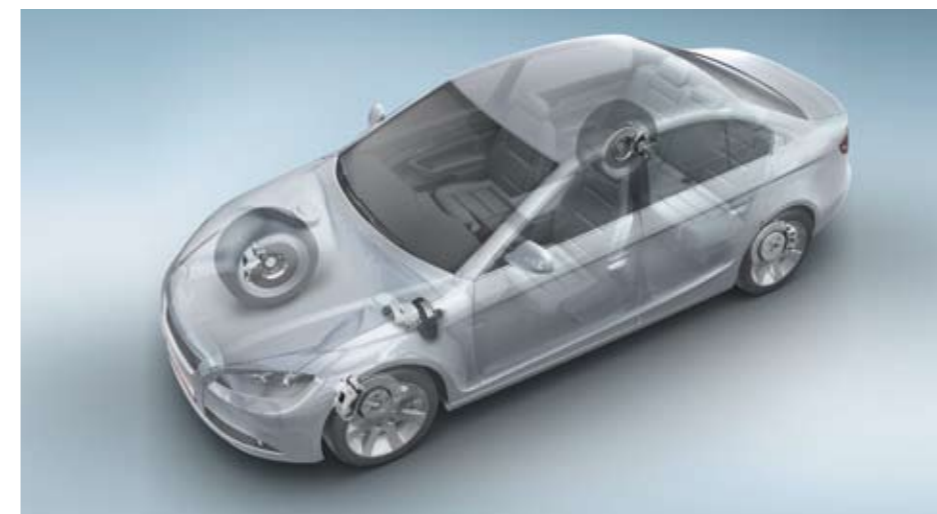
Intensive research and development, as well as close cooperation with our customers, provide the key to our innovative brake systems, which meet the highest standards.



# Chassis Systems Brakes

## A braking system is only perfect if all of its components are perfect.

Bosch Chassis Systems Brakes covers the entire product range, from individual components right through to complete brake systems. Here is a selection of our products:



Our portfolio covers all braking products found inside a vehicle.



### Automated Parking Brake

The Automated Parking Brake APB-Mi significantly increases safety and comfort. Integrating the electronics required for the parking brake into the ESP® controller has enabled a series of additional features. These include protection against accidentally rolling down a slope, AVH (Automated Vehicle Hold), and AVR

(Automated Vehicle Release), which makes it easier for the driver to set off uphill by releasing the brake at the right moment. The APB-Mi button replaces the mechanical parking brake lever, saving valuable space inside the vehicle. The Automated Parking Brake APB-Mi is available with our brake calipers.



### Front disc brake

Bosch manufactures front disc brakes using the floating caliper principle. Take the IPS21 (Inboard Pin Slider), for example. It combines low weight with excellent comfort and safety characteristics. The IPS21 allows larger brake discs for the same wheel dimensions, thereby increasing the thermal

capacity of the brake for more safety. The scalable caliper concept with piston diameters from 38 to 65 mm is available with one, two, or three pistons. It is available in fist frame and shell design and, depending on customer specifications, can be manufactured in cast iron, aluminum, or composite.



### Rear disc brake

The BIR rear disc brake combines the operating and parking brake functions within one component. The integrated Ball-in-Ramp unit transforms the rotation of the brake lever and the traction of the brake cable into a clamping force on the brake pads. Besides

unusually high mechanical efficiency, the BIR is characterized by its light weight and low residual torque, both of which help to save fuel. The BIR is available in cast iron and aluminum depending on customer specifications.



### Drum brake

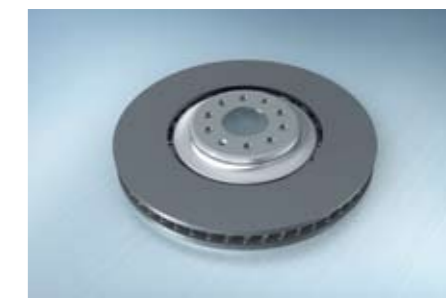
The Bosch drum brake is a service brake with an integrated parking brake function. Its low weight and high reliability make it an extremely economical solution, but one which performs excellently as well. Low pad wear and automatic adjustment with temperature compensation mean these

brakes last longer. Durable maintenance-free actuators in cast iron or aluminum provide trouble-free operation for many miles. The "Blind-Fit" system allows hidden brake cable assembly by plugging and snapping in preassembled brake drums, reducing assembly costs.

### Brake discs

Bosch brake discs are highly developed safety components that work reliably even under the most extreme loads. High temperature conductivity, low thermal tension, high resistance to thermal cracks, ideal damping characteristics, reduced brake judder, low noise generation – all

characteristics of our brake discs. The innovative, noise-optimized Light Weight Composite Disc sets completely new standards. Its special pin design and the combination of aluminum and cast iron reduces weight considerably while allowing even better temperature distribution.



### Brake booster

Bosch offers scalable, innovative brake booster solutions in single and tandem designs. NOAH, the latest generation of conventional vacuum brake boosters, incorporates valve technology which enables the integration of mechanical brake assist systems. It is engineered to

improve the pedal feel and comfort. The technology in the Tie Rod vacuum brake booster reduces the installation space considerably, resulting in improved crash behavior. The Tie Rod is also stiffer, which reduces pedal slack during rapid braking – meaning more safety and comfort.



### Brake master cylinder

The TMC8 is the latest generation of tandem master cylinders from Bosch. Around 30% shorter and 20% lighter than conventional master cylinders, it not only saves space but also helps to save fuel. Its static seals and plunger pistons enable a high flow rate

even at low temperatures, which is very important for the performance of ESP®. The TMC8 is a modular system that can be scaled from 19 to 33 mm and which can therefore provide a suitable solution for every customer requirement.



### Brake assist

The mechanical brake assist system EVA actively increases passenger safety and improves pedestrian protection. In the event of an emergency stop, the brake assist is activated by the high speed of the pedal. EVA then helps the driver to reach the pressure required to activate the ABS

as quickly as possible, meaning maximum vehicle deceleration. This can reduce braking distances by up to 60%, depending on the driver's reactions. Because of the modular integration into the valve, EVA can be combined with the NOAH brake booster and Tie Rod.



# Chassis Systems Brakes

## Reduce your speed – not your comfort.

One of the most important areas of research and development in braking technology is understanding how to avoid vibrations and unwanted noise. Chassis Systems Brakes researches and develops in order to continue improving braking comfort.



To ensure that our customers anywhere in the world receive a perfect, low-noise and low-vibration braking system, our NVH experts (noise, vibration, harshness) work in our competence centers using the latest testing and simulation technology. The key to their success

is their comprehensive, cross-discipline expertise, which allows them to understand and correctly assess the complex interactions between the various components involved in the braking process: brake disc, lining, caliper, and mounting. This means that our NVH experts have to be

familiar with six different areas of physics. Apart from expertise, the most important factor in maximizing braking comfort is close cooperation with car manufacturers. Every platform has its own particular requirements – as does every market and target group. You could say that quiet doesn't

always mean quiet and comfort does not mean the same thing everywhere either. After all, a sports car driver will be ready to accept certain noises, whereas the driver of a limousine would immediately complain about them.

## Chassis Systems Brakes

# The sign of a good partner is that they are always there where you need them.

Our employees are always on hand wherever our customers are. Their expertise and team spirit are what drive the improvements and innovations that characterize our division – all over the world. At the same time, we maintain uniform standards of quality and a uniform level of knowledge all over the world in our development and production. This global presence enables us to respond at any time to local market requirements and to assist car manufacturers on location with their global projects. And of course, it helps that we are able to support and advise our

customers on location in their own language. From the first design sketch through to the manufacturing of our products, numerous coordination and approval processes are required which span continents. To safeguard quality, reduce development times, and minimize costs, we employ simultaneous engineering worldwide in conjunction with all of our external partners. And because our products are always manufactured near to our customers, we are able to reduce transport distances, cut costs, and thus contribute towards the protection of the environment.



## Chassis Systems Brakes

# Brakes can even slow down climate change.

In our efforts to make vehicles more environmentally friendly, we work ceaselessly on new braking concepts for all of our existing and future brake systems. Bosch continues to invest heavily in research and development, as it remains committed to innovative solutions and products. 3.25 billion euros were spent on the development of new automotive engineering technologies in 2008 alone. Much of this is of course spent on developing new,

more environmentally friendly technologies – and that includes the innovation work done by Chassis Systems Brakes.

Emissions are already being reduced by brakes and brake systems, largely on account of the reduction in their weight. We have achieved this partly by researching and using new lighter and recyclable materials, and also by consistently rethinking existing braking concepts.

One of these weight-saving developments is the Tie Rod brake booster, which can reduce the weight of the component by approximately 10%, depending on the model. Another example is the Automated Parking Brake APB-Mi. This brake works by eliminating the need for the entire mechanical system involved in conventional parking brakes.

This in turn means more space in the passenger cell and also a reduction in vehicle weight.

Braking will become more and more important for environmental protection in the future. We are already developing completely new regenerative systems to go with new drive concepts such as hybrid vehicles and electric vehicles.

These new brake systems enable the recycling of much of the energy produced when braking. In short, we are investing an enormous amount of energy so that in the future you can save even more energy yourself.

Today, Bosch Chassis Systems Brakes develops innovative systems in order to make braking even more environmentally friendly in the future.



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