

We can brake ...

Industrial disc brakes – small, detailed, essential

RINGSPANN GmbH offers a wide product range of industrial disc brakes, which are used as holding, stopping and controlling brakes in small construction spaces. Generally known from the automotive area, this functional element is used in many industrial applications as well.

Disc brakes are generally known from cars, where they have replaced drum brakes entirely these days. After all, this brake design matches the increased safety demands in vehicles. In contrast to drum brakes, disc brakes are exposed to the airflow, which improves the discharge of friction heat. Since all of the kinetic energy is converted into heat during a braking process, the discharge of this gained heat is a vital part of the functionality of the brake.

Areas of application, Possibilities

Suitable brake discs are used not only in vehicles, yet also in the industrial area. RINGSPANN GmbH has been using disc brakes in in-

dustrial applications since the early 1970s. Example applications include steel processing, paper production, cable and wire production, textile machines, print machines, elevator and escalator construction, as well as conveyor systems. In wind turbines, disc brakes are used, e.g., for the "rotor brake" function or to "fixation of the nacelle".

There are essentially three different ways of using a brake. As a holding brake, the clamping force fastens a moveable part to prevent movement. The stopping brake, in contrast, is the common application of a disc brake in cars. It stops a moving mass in a predefined time, generating friction heat that the brake must be able to deal with. The brake energy is also decisive for the design of a regulating brake, the third area of use. In this case, the brake regulates the force and speed of an application. Since this may occur across a long period of time, heat ma-

agement must be considered with great depth and detail. After all, the brake energy will lead to a temperature increase of the brake disc.

In controlled brake systems, the coordination between the regulating system and the brake performance requires a very fine tuning. Brake systems, consisting of a hydraulic unit and a control unit optimised for the use of hydraulic brake calipers, can be delivered by RINGSPANN GmbH.

Design

Industrial disc brakes use different brake calipers. The braking torque results from the generated clamping force and the diameter of the brake disc, which is chosen to keep the desired braking torque in the application within specific thresholds. A high-performance design is achieved by placing several calipers on one brake disc. The possibility of this kind of setup is an often-used benefit of the disc



Disc brakes have a long tradition in technology; they are used for diverse applications in the industrial environment.

Illustrations: RINGSPANN GmbH

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Widely extended brake caliper programme: Large hydraulic brake calipers were developed

be tested for the specific application. A brake pad wear indicator can technically be implemented and are sometimes even mandatory; in applications such as elevators for example. In stopping or regulating brakes the brake pads will be exposed to wear, indicating that an automatic wear adjustment could be a helpful tool to secure a constant braking torque. Another small constructional detail that contributes to a reliable functionality of the brake is to securely align the brake pads parallel to the brake discs when engaging or disengaging.

Expansion of Brake Calipers

The RINGSPANN GmbH brake sector has seen some considerable new developments in the last few years. Among others, the brake caliper range was broadly expanded and large hydraulic brake calipers were developed. Depending on the configuration selected, they can be used in a variety of different applications. The possible designs are optimised for the use in wind turbines,

conveyor technology or general applications in engineering.

For azimuth applications in wind turbines, the focus is on low noise generation at low speeds. Since the brakes are always engaged, a draw-back function for the pistons is not required. This, however, is mandatory for rotor application and very common in general engineering. These brake calipers have already proven themselves in various critical applications. Depending on the target of the tests performed, test rigs are deemed as one of the most sophisticated and demanding applications in general engineering. High cycle numbers, vibrations or high precision pose extreme demands to the brake system. Such tasks can be solved with the established know-how of the RINGSPANN GmbH brake experts.

Modular System

Another new development is the brake caliper series established in the last months. The modular assembly system has become recognized in the con-

struction of industrial product series in the last few years and an impressive new series of RINGSPANN GmbH brake calipers were introduced on this basis. Several different actuation cylinders can be attached flexibly in the sizes of 25, 30 and 35 brakes and are already available.

This permits precise adjustment of the brake to the required brake torque of the specific application. The cylinder can be attached on the right or left, giving the user more freedom in his construction design.

Heat Management

The brake energy is completely converted into heat in dynamic braking processes. Most of this energy is absorbed by the brake disc. This brake disc thickness determines the heat capacity. The modular assembly system for the RINGSPANN GmbH brake caliper series permits the implementation of brake calipers for various disc thicknesses, which in turn permits adjustment to the specific requirements of the respective application.

Generously dimensioned brake pads are important as well as they distribute heat across a large area at the brake disc. In case of short braking times, this will lead to lower brake disc temperature than when using smaller linings. The size of the brake pads also determines the possible wear volume and specifies surface pressure at the brake pads. The wear will change depending on the existing surface pressure, as will the resulting friction coefficient between the pads and brake disc.

High Performance Density

The FE method optimised the brake levers of the new brake series to be able to withstand high forces. Accordingly, it is possible to attach high-performance brake cylinders.



Automatic wear adjustment

This leads to a considerable performance density increase compared to the previously known brake calipers of similar sizes. A connection for a second venting valve was created in the standard compressed air cylinder to be able to use this impressive brake performance quickly. Attachment of a second ventilation valve will lead to very short engaging times of only fractions of seconds. This can be decisive if only a very short time is available for braking in sophisticated applications.

The brakes can be adjusted manually after wear in dynamic applications. The adjustment is possible inside the lever opposite to the brake cylinder to guarantee perfect brake force distribution between the two levers even when the pads are worn.

Automatic Wear Adjustment

RINGSPANN GmbH achieved an impressive new development setting new standards on the

market with automatic wear adjustment in the spring-actuated cylinders. The previously elaborate adjustment mechanisms for wear was now greatly simplified, leading to higher braking torques than in the previous design. High amounts of wear can easily be compensated for at the brake pads. Users do not need to manually inspect and adjust the brakes when automatic wear adjustment is installed.

The adjustment of the pads when wear is occurring is performed in tiny steps. This is an essential difference from other wear adjustment systems known on the market. Wear adjustment starts right after the first wear process and will usually be completed after a few releases of the brake cylinder. The air gap will no longer grow and a stable condition will have been reached.

Thus, consistent brake behaviour is ensured even in applications in which wear of the brake pads cannot be avoided. Comprehensive

experience with automatic wear adjustment shows that wear adjustment still works reliably even if several brake pads have already been worn out.

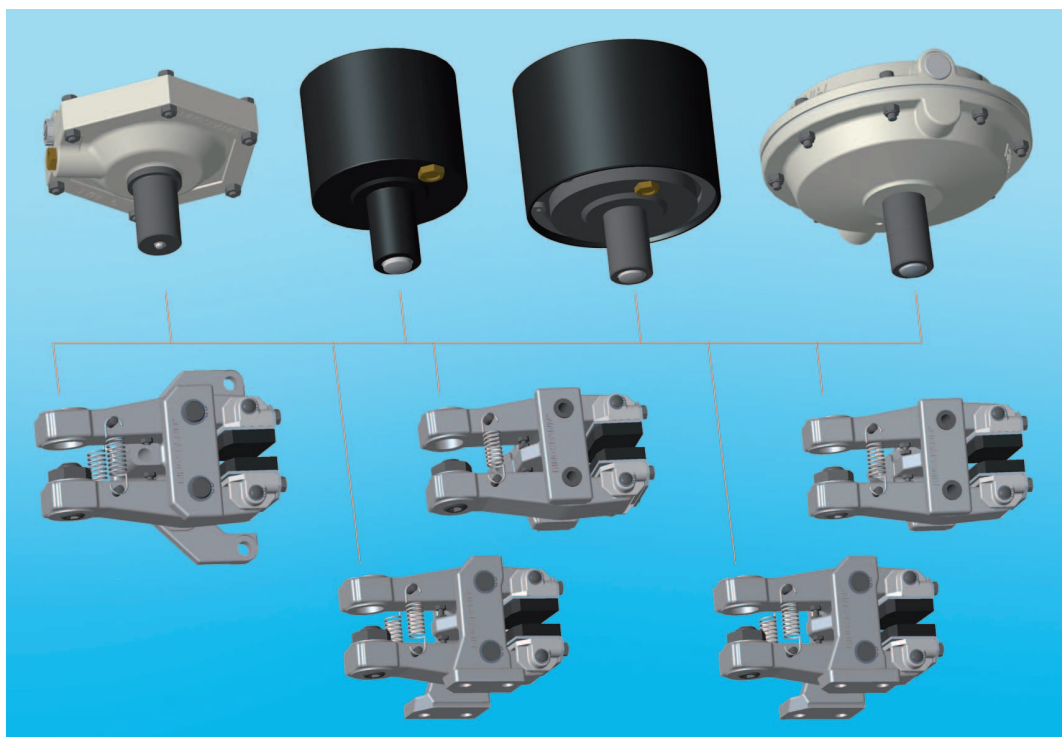
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brake set-up. With this design a considerable braking torque can be achieved in a small installation space. If the brake calipers are placed suitably, the strain created by the braking force of an individual brake will be counter-acted by the opposite brake avoiding additional strain on the shaft bearing.

The manner of actuation is a characteristic classification feature for brakes. Spring, pneumatically, hydraulically, electromagnetically or manually operated or vented brakes are mainly used in the industry. Depending on the requirements of the application, one of the options named can be selected for activation or venting. Spring-actuated brakes are often required since they offer the benefit that the installed springs will let the brake engage when the release pressure drops.

Furthermore, the brake pads are decisive for function. There are many different options in this

area. Targeted use of a suitable brake pad requires the corresponding experience. In some cases, the pads will even have to



Modular System for Brakes: the modular system method has established itself in the design of industrial product series over the last few years.