









**Knorr-Bremse Systeme für  
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-  **NEW YORK AIR BRAKE**
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# FRICTION TECHNOLOGIES

**BRAKE DISC EXCELLENCE FOR ALL  
TRAIN APPLICATIONS**



**KNORR-BREMSE**



**With the system competence and global know-how** of Knorr-Bremse, Friction Technologies provide the most comprehensive, individual and suitable offer of friction products for all train applications.



**Optimum friction pairing for maximizing performance** and operating life, and for minimizing costs, can only be achieved in a perfectly balanced braking system. As a supplier of brakes and a full range of friction products, Knorr-Bremse is in an ideal position to design the best system.

# FRICTION TECHNOLOGIES

*PRODISC* *ULTRADISC* *LIGHTDISC*

**Knorr-Bremse Friction Technologies** offers a full range of brake discs made out of various materials which are clustered into the following product families

Product family	Material	DESIGNED FOR
<i>PRODISC</i>	Grey cast iron	... cost efficiency and a wide-range of applications
<i>ULTRADISC</i>	Steel	... high speed applications with highest demands for brake energies and associated surface temperatures
<i>LIGHTDISC</i>	Aluminum	... saving weight and energy

## Advantages of Knorr-Bremse Brake Discs

- ▶ **Robust design**
- ▶ **Optimized cooling**
- ▶ **Thermal resistance**
- ▶ **Long service life**



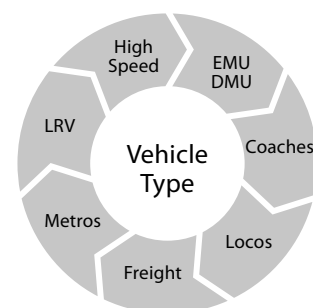
## Axle-mounted brake discs



PRODISC ULTRADISC LIGHTDISC



### Range of application

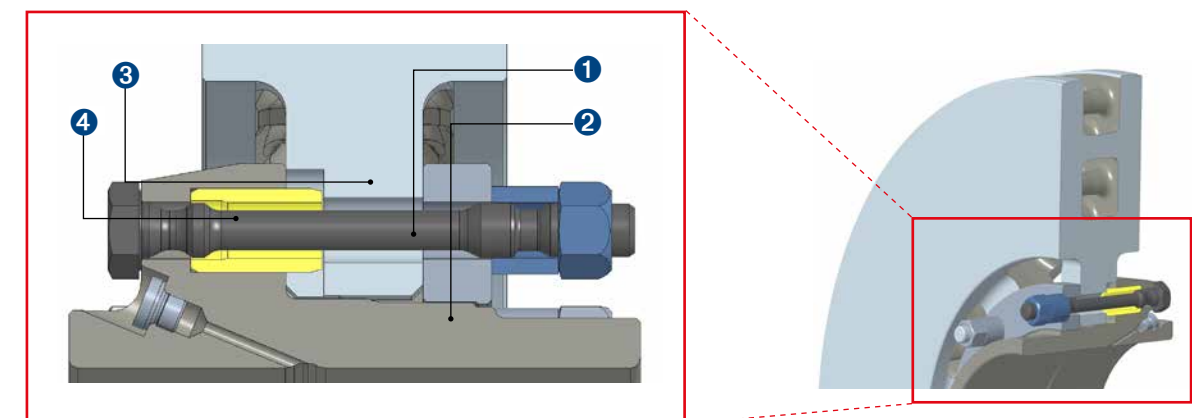


■ applicable  
□ not applicable

ProDisc Axle ProDisc Axle Plus	UltraDisc Axle UltraDisc Axle Plus	LightDisc Axle
Grey cast iron	Steel	Aluminum
<ul style="list-style-type: none"> <li>Available size: 350 – 700 mm</li> <li>Available width: 45 – 170 mm</li> <li>All axle-mounted discs are available as solid- and split discs</li> <li>Flat seated disc is the standard for Knorr-Bremse axle-mounted discs</li> <li>Project specific disc designs available (e.g. mono block discs, specific flange brake disc designs for LRV applications)</li> <li>Compliant with all international standards (EN14535, UIC, GOST, CRCC, etc.)</li> </ul>		

## Axle-mounted brake discs

PRODISC ULTRADISC LIGHTDISC



### ProDisc Axle Plus / UltraDisc Axle Plus: Axle-mounted brake discs for highest brake loads and vibration levels

- Reinforced connection friction ring to hub
  - Highest strength waisted shankbolting
  - Vibration protected thread on bolts
- Advanced hub
  - Optimized shape for heavy duty shock and vibration loads
  - Strengthened flanges
- Friction ring design for highest thermal and mechanical loads
  - Increased permitted thermal load
  - Form-fit centering supported by sliding sleeves
- Sliding keys transferred from service-proven wheel-mounted disc
  - Design variant as sleeves for combined function: guiding and bolting at same place
  - Shock and vibration protected centering

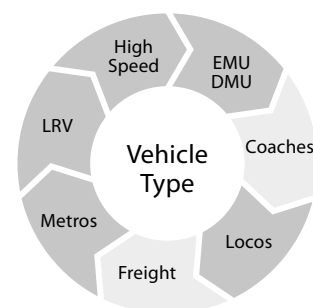
## Wheel-mounted brake discs



PRODISC ULTRADISC LIGHTDISC



### Range of application

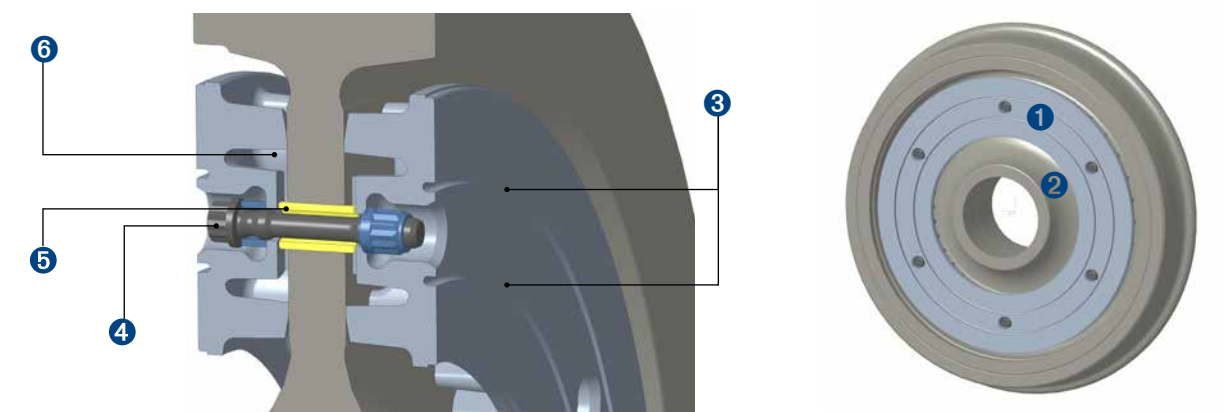


■ applicable  
■ not applicable

ProDisc Wheel	UltraDisc Wheel UltraDisc Wheel Lite	LightDisc Wheel
Grey cast iron	Steel	Aluminum
<ul style="list-style-type: none"> <li>Available size: 370 – 1.085 mm</li> <li>Available width: 120 – 155 mm</li> <li>Standardized interface to wheel ensures highest thermal capacity and minimized weight</li> <li>Lite version for medium speed applications (e.g. regional commuter) – see UltraDisc Wheel Lite on right-hand side</li> <li>Most wheel-mounted discs are available as solid- and split disc version</li> <li>Project specific disc designs available</li> </ul>		

## Wheel-mounted brake discs

PRODISC ULTRADISC LIGHTDISC



### UltraDisc Wheel Lite: Innovative low-weight steel wheel-mounted brake disc

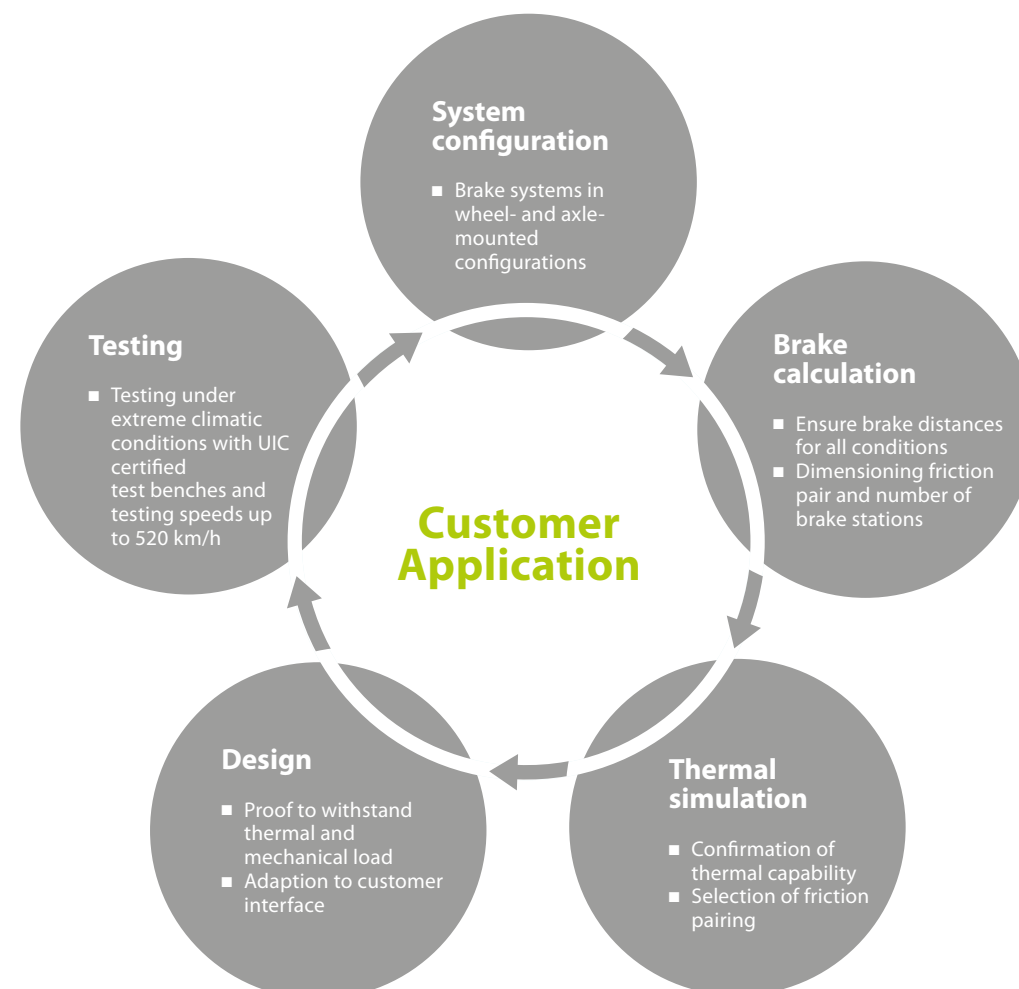
- Weight optimization (~20%) for applications up to 160 (200) km/h
- Service-proven casted steel technology
- Stress-relieving grooves in friction face
- Service-proven waisted bolts and lock nuts
- Slide key centering at 6 places
- Service-proven "3-Point-Support" on wheel web:
  - Parallel friction faces for constant friction performance and wear behavior
  - Compatibility to existing wheels
  - Fits to standard KB interface



## System & Testing Excellence



One of the most advanced testing facilities worldwide allows Knorr-Bremse to close up the cycle for every customer application with the assurance that the most reliable system has been designed for our customers. Knorr-Bremse's holistic approach as a system supplier puts the customer specific applications into the focus.



## Friction Pairing Excellence

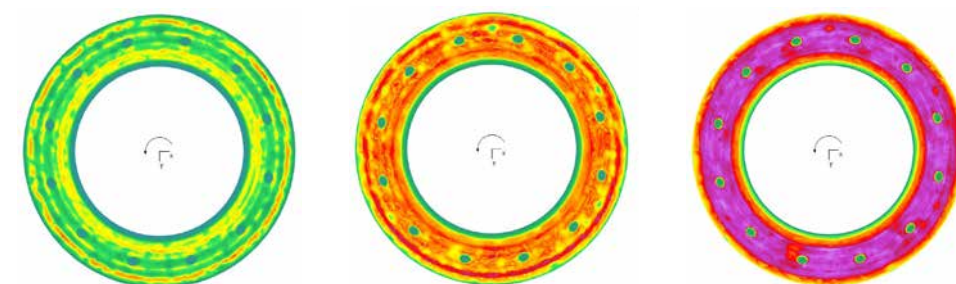


Knorr-Bremse has the expertise to optimize life-cycle costs of friction pairs. Value-add for customers by:

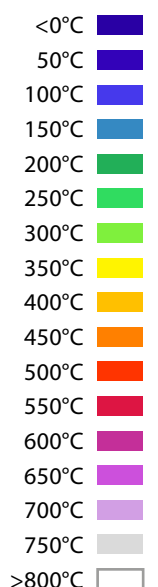
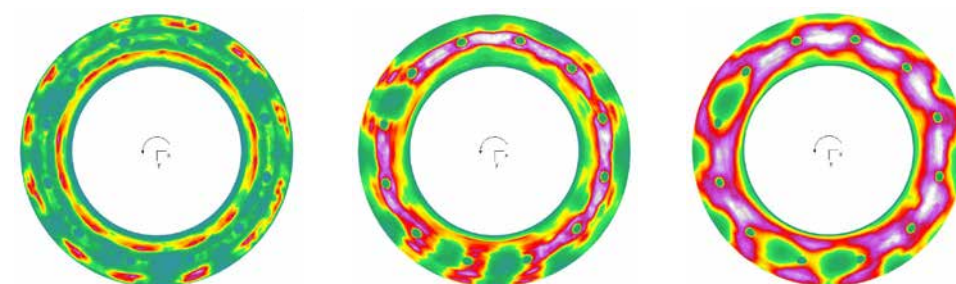
- Optimizing pad design (flexible vs. rigid design) and wear volume (KRS shape)
- Optimizing heat flow and heat distribution on friction surface of disc and pad
- Optimizing cooling performance of brake disc and brake pad
- Avoiding hot spots on friction surfaces

Thermographic investigation of friction pair with state-of-the-art testing equipment in the Knorr-Bremse technology center:

Flexible sinter pad



Rigid sinter pad



speed →

## Production Excellence

With one of the biggest production footprints, Knorr-Bremse assures supply chain excellence. Our facilities are equipped with state-of-the-art production technology to ensure high-quality and reliable products.



### Knorr-Bremse Berlin (Germany)

- Manufacturing since 1996
- **Products:** Axle- and wheel-mounted discs for all types of rail vehicles



### Knorr-Bremse Suzhou (China)

- Manufacturing since 2005
- **Products:** Axle- and wheel-mounted discs for EMUs/DMUs and locomotives



### Knorr-Bremse Palwal (India)

- Manufacturing since 2014
- **Products:** Axle- and wheel-mounted disc



### Knorr-Bremse St. Petersburg (Russia)

- Manufacturing since 2016
- **Products:** Axle- and wheel-mounted discs

## References (extract)

### Knorr-Bremse delivers brake discs all over the world with local sales teams

