



BONATRANS

Bonatrans Wheels and Wheelsets for High Load Bonatrans 29 Bonatrans BBS

Major advantages:

- **Low residual stress** - reduces the risk of initiation and spreading of cracks
- **Minor deformations** - increase safety against derailment of the vehicle in operation
- **High loading capacity** - for high axle loads
- **High resistance to thermal load** - suitable for composite brake blocks
- **Standard** - among most commonly used new railway wheels in Europe





SAFETY AND LONG SERVICE LIFE

Safety and Long Service Life under Extreme Loads

Optimised railway wheels Bonatrans are dedicated for railway vehicles in which wheels are exposed to high thermal and mechanical load, especially for freight wagons equipped with tread brakes.

Through careful optimisation of wheel design and material and through implementation of the most developed calculation and testing methods, Bonatrans has developed wheels that are considerably more resistant to thermal loading than the existing commonly used wheel designs.

Bonatrans optimised wheels show a low level of internal residual stress and permanent deformations that are substantially lower than e.g. in the standard freight transport wheel UIC-ORE (by **40% to 50% less stress, more than 60% smaller deformations**) which significantly reduces the risk of a wheel defect and the need for premature replacement.

Bonatrans optimised wheels also retain their low stress and minor deformations even in cases of a substantially higher level of permissible wear than e.g. the UIC-ORE wheel, which increases the number of possible reprofiling of the wheel and thus also its service life as concerns possible mileage the wheel can run.

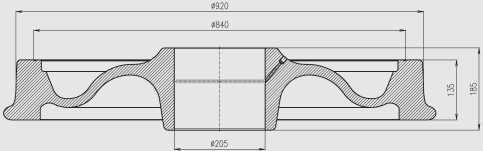
High resistance of the Bonatrans optimised wheels to thermal loading is particularly important in relation to the present trends such as increasing axle load and use of composite tread brake blocks. The composite blocks considerably reduce noise during braking but, at the other hand, they increase the wheel thermal loading due to low thermal conductivity of the blocks.

Bonatrans reliable solution

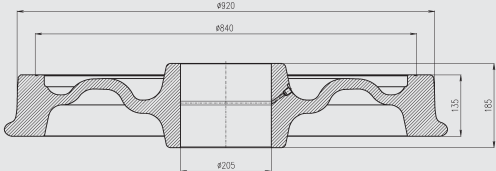
Bonatrans offers a wide range of optimized wheel designs tailored for customers' needs. Bonatrans optimized wheels have been verified by tests as well as proved by certificates issued by the most important European railway companies and by the UIC committee. And most importantly, they have passed tens of millions of kilometres in safe operation. The wheels are fully compatible and certified in compliance with the Technical Specifications for Interoperability (TSI).

Bonatrans offers two main "families" of optimized wheels:

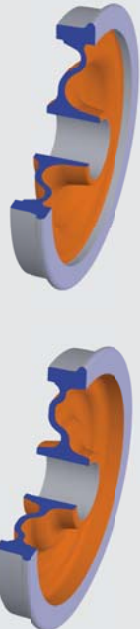
- Bonatrans 29
- Bonatrans BBS
(BBS = Bonatrans Brake Stability).



Bonatrans 29



Bonatrans BBS





CHARACTERISTICS OF BONATRANS WHEELS

Characteristics of Bonatrans Optimized Wheels

Bonatrans 29

- Low weight – from 312 kg for a wheel with a diameter of 920 mm
- Axle load up to 25 tonnes and more
- Nominal diameter of the wheel: 813-920 mm, other diameters are possible upon customer request
- Steel grade: mainly ER7 with a hardened rim according to the European standard EN 13262.
- Certificates: UIC (510-5), DB (Ba 314/324), SBB (Db10/77/97), SNCB, ČD, ŽS, PKP, VR, Network Rail and more
- Certified to TSI in accordance with the subsystem "Rolling Stock - Freight Wagons"

Bonatrans BBS

- Particularly good resistance to increased thermal stress. Optimal wheel for railway cars equipped with composite brake blocks (materials K, L, LL).
- Axle load up to 25 tonnes and more
- Nominal diameter of the wheel: 730-920 mm, other diameters are possible upon customer request
- Steel grade: mainly ER7 with a hardened rim according to the European standard EN 13262.
- Certificates: UIC (510-5), DB (Ba 318/319), SBB (Db-11sa), SNCB and more
- Certified to TSI in accordance with the subsystem "Rolling Stock - Freight Wagons"

Design according to the Strictest Criteria

Wheels Bonatrans 29 and BBS fully meet the requirements of UIC 510-5 specification and the EN 13979-1 Standard. These standards require that tread braked wheels safely endure repeated drag braking corresponding to the condi-

tions on the most extreme European international railway in the Swiss Alps. Designs of wheels 29 and BBS have been verified using the following methods:

- Calculation by means of the finite element method (FEM) analysis
- Brake test on braking stands.

FEM Analysis

The development of new wheel constructions was based on the finite element method analysis, which involved the following basic types of loading modes:

- Thermal stress at drag braking
- Static mechanical load
- Combination of thermal and mechanical loads
- Strength analysis

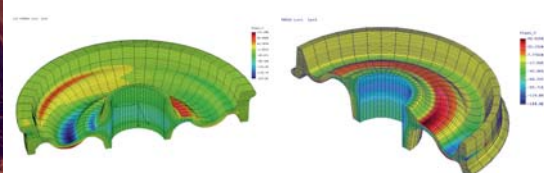
Braking Test according to UIC 510-5

The design of the wheel was verified by the braking test in the accredited laboratory of Slovak Railways in the Technical University of Žilina. During the test the most extreme conditions which could possibly occur on European tracks were simulated.

Test conditions: braking performance 50kW acting for 45 minutes at a speed of 60 kph. The braking cycle was repeated 10 times. The wheel must not exceed limit values of stresses and deformations.

During the braking test the wheel is exposed to the most extreme load.

Graphical outputs of computer simulation using the finite element method.





WE CREATE THE FUTURE

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