Accredited competence for measurements in railway operations: **Aerodynamics Test Laboratory**

DB Systemtechnik

Test expertise:
for rolling stock, components, infrastructure and interfaces

As experts in aerodynamic testing systems we offer you:
- a test result recognised the approvals authorities
- overall execution of the measuring campaign during ongoing rail operations
- the use of measuring systems that have been proven in service

We offer you the following specific services:
- rolling stock, infrastructure and component testing
- the development of measurement and diagnostic systems with bespoke applications for special questions concerning railway aerodynamics

Thus we supply you with:
- service testing e.g. of your infrastructure in danger areas in the railway environment
- approval-dependent limit value monitoring e.g. of your infrastructure components and rolling stock that are undergoing the approvals process
- identification of the cause of damage due to pressure and air flow loads
- potential for optimising energy-efficient measures

From a single source:
DB Systemtechnik is happy to support you – with aerodynamic engineering services too.

Photo Credits: Robert Deopito

Railway aerodynamics is a cross-sectional task concerning the safe and efficient interplay between rolling stock, infrastructure and operations. It has a significant influence on ride properties, traction performance, energy efficiency, safety and comfort.

We offer you here, during ongoing railway operations, a multitude of individual measurements:

Rolling stock

- Aerodynamic loads when trains pass by in the open air and in tunnels, e.g. bow waves, air flow loads, pressure signature in tunnels
- Special subjects e.g. rolling resistance, underfloor aerodynamics, pantograph aerodynamics, certification of particular specifications

Infrastructure components

- the behaviour of movable and non-movable objects as a reaction to the aerodynamic load when trains pass by, e.g. pressure loads with reactions on noise barriers, platform roofs, signalling installations, switch boxes, fixed barriers on construction tracks, movable objects on the platform (luggage trollies) or bridge inspection vehicles
- Special topics such as flying ballast

Tunnels and underground stations

- Measurements for commissioning, e.g. amplification of entry pressure waves (sonic boom) and pressure loads with reactions on emergency exit doors, coping slabs, utility rooms or equipment cabinets
- pressure waves during controlled passing of trains
- ventilation of and air extraction from tunnel structures
- comfort considerations for air flow and ventilation conditions as well as meteorological boundary conditions (temperature, humidity, ambient pressure)


Photo Credit: DB AG/Erhard Hehl

Photo Credit above: DB Systemtechnik

Measuring aerodynamic loads in a technical railway environment

- Differential pressures in a measurement range of up to ± 7000 Pa
- Air flow velocities up to 90 m/s
- Forces in a measurement range of up to ± 10000 N
- Distances in a measurement range of 0.1 mm up to 1 km
- Deflections in a measurement range of up to ± 100 mm
- Accelerations in a measurement range of up to 10 g

Measuring meteorological influence values and boundary conditions

- Temperatures in a measurement range of -40°C bis +60°C
- Atmospheric humidity up to 100 % r.F
- Absolute pressure in a measurement range of 800 hPa to 1100 hPa.
- Wind velocities in a measurement range of up to 60 m/s
- Wind directions in a measurement range of up to 360°
- Train speeds up to 400 km/h

Measuring rolling stock and systems in wind tunnel tests

- Forces in a measurement range of up to ± 5000 N
- Torque in a measurement range of up to ± 500 Nm
- Differential pressures in a measurement range of up to ± 7000 Pa

Sample references for accredited quality

Neutral and independent

Our test laboratory in Munich is accredited by the Deutsche Akkreditierungsstelle GmbH (DAkkS) for a flexible scope of testing in the field of aerodynamic studies for a railway environment in accordance with DIN EN ISO/IEC 17025.

The accreditation comprises all pertinent test and measurement values, e.g. in accordance with TSI Regulations and in accordance with EN 14067. See annex to accreditation certificate.

QUALITY SYSTEM CERTIFICATION DNV·GL ISO 9001

ilac-MRA

DAkkS Deutsche Akkreditierungsstelle D-PL-11081-01-00

Selected references for the Aerodynamics Test Laboratory

- **DB ProjektBau:** commissioning measurements for the Katzenberg tunnel for micro-pressure waves and aerodynamic loads on emergency exit doors
- **Austrian Federal Railways:** general aerodynamic tunnel measurements in the Vienna Woods and Stierschweiffeld tunnels within the scope of the Innovation Runs in 2012
- **MOOG:** service testing of a bridge maintenance vehicle along the Cologne – Rhine/Main High Speed Line
- **DB Netz:** measuring aerodynamic loads and reactions on noise barriers
- **DB Station & Service:** measuring aerodynamic loads and reactions on platform roofs as trains pass through

Photo Credits: DB Systemtechnik

- **Siemens:** approval measurements of pressure and air flow loads as well as tunnel aerodynamics up to 320 km/h for the Velaro D and also rolling resistance measurements
- **DB ProjektBau:** measuring air surges in an underground S-Bahn station during normal operations
- **Siemens:** monitoring aerodynamic loads on infrastructure components using technical measurement techniques during high speed trials with the Velaro D (up to 352 km/h)
- **Expresso:** service testing of luggage trollies on the platform for passing speeds of up to 200 km/h

Cover Photo: Adif

Imprint

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