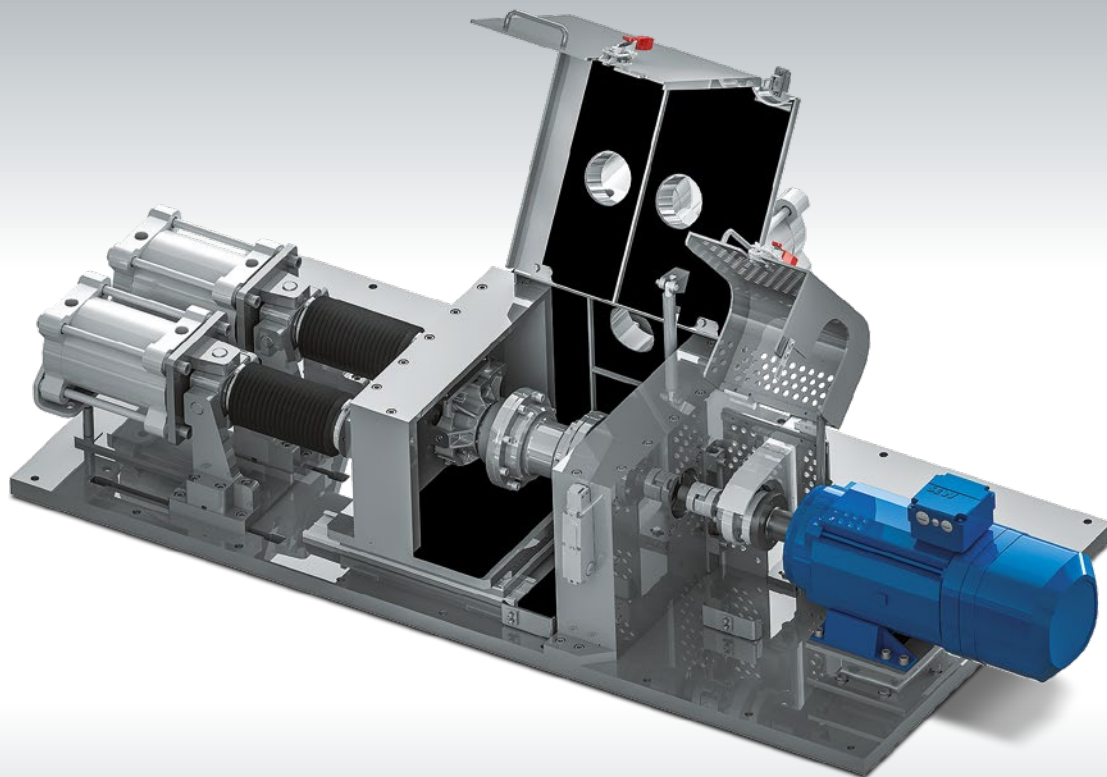


# AVL FRICTION RIG

Optimizing wheel bearing friction



## THE CHALLENGE

Minimizing friction losses is key to driveline performance. With an eye to every detail of possible energy losses in the drivetrain, wheel bearings become an important component for higher performance.

High overall drivetrain efficiencies require in-depth analysis of each single component. While dedicated testing tools and equipment for components e.g. gearbox, differential and full driveline are already available, testing solutions for wheel bearings have been neglected until now. Testing wheel bearings on track is expensive, time-consuming and produces only limited results. In the event of failure, consequential damage must also be considered.

## THE SOLUTION

The AVL Friction Rig is a cost-efficient and standalone wheel bearing measurement solution, developed to uncover an area of unused potential for customers. Unlike a simple runout test, the AVL Friction Rig can apply wheel loads to the bearing without corrupting the results and can therefore measure wheel bearings under real-world conditions.

## BENEFITS

- Dynamic actuators applying wheel load in two axes simultaneously
- Temperature enclosure ensures that tests are done under correct conditions
- High accurate torque flanges
- Powerful input motor for endurance testing
- AVL PUMA 2™ (automation system) and AVL CONCERTO™ (postprocessing) guarantee streamlined data generation and analyzation

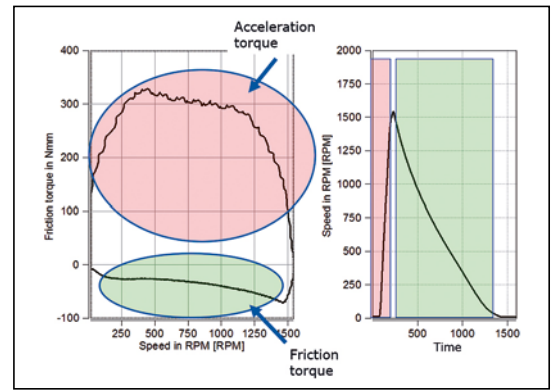
## SOLUTION OVERVIEW AND DETAILS

### TRADITIONAL MEASUREMENT

Traditional measurement principles are testing the wheel bearing without applying wheel loads to the upright, without temperature conditioning or possibility for endurance testing:

- Bearing is accelerated to target speed
- Decoupled system coasts down to standstill
- Friction torque is calculated from measured speed gradient and known inertia

As the bearing friction is also driven by road loads and operating temperatures, only measurements under realistic conditions are valuable.



Traditional measurement principle

### NEW MEASUREMENT FOR FRICTION OPTIMIZATION

The AVL Friction Rig combines the accuracy of traditional runout tests with the possibility to test under on-track conditions.

The following test rig capabilities can be identified:

#### Load case

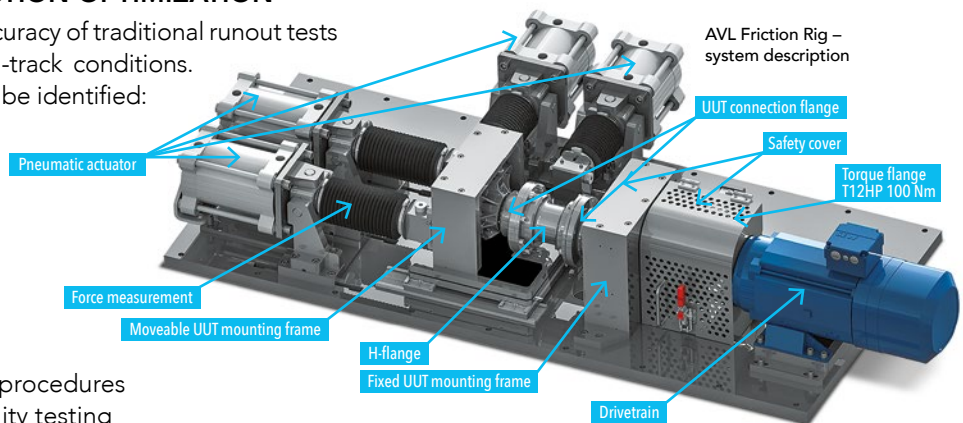
- Advanced simulation model
- Track measurement

#### On-track conditions conditions

- Replication of wheel loads
- Applying high temperatures

#### Applications

- Efficiency improvement
- Checkout testing
- Supplier selection
- Run-in procedures
- Durability testing



AVL Friction Rig – system description

### ADJUSTABLE TUNING PARAMETERS FOR UUT

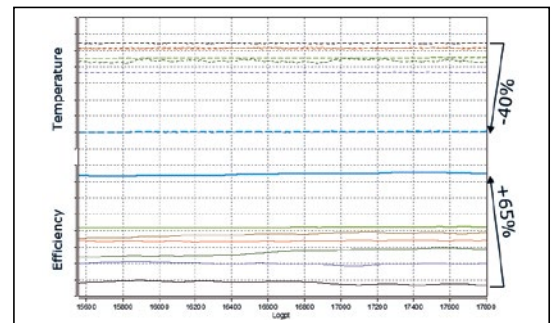
As the stock wheel bearings are set up with high safety margins, they offer multiple options for adjustments. By using the AVL Friction Rig, you will be able to optimize the bearing for your application. The target is to balance minimum friction and sufficient durability by tuning these dimensions:

#### External parameters

- Wheel loads
- Temperature

#### Internal parameters

- Pre-load
- Lube type and amount
- Sealings
- Materials



Comparison of stock to optimized wheel bearing. Combination of multiple measures shows the full potential.

Testing bearings and tuning parameters under realistic conditions enables you to get the most out of your driveline. The AVL Friction Rig combines the different measures that increase the efficiency and reduce temperature in the wheel hub significantly. Reduced bearing losses lead to better lap times, better fuel economy and less emissions.

### FIND OUT MORE

AVL List GmbH, Hans-List-Platz 1, 8020 Graz, Austria  
Daniel Blaindorfer, Application Manager RACING

E-mail [daniel.blaindorfer@avl.com](mailto:daniel.blaindorfer@avl.com)  
[www.avlracetech.com](http://www.avlracetech.com)