

# CASE STUDY

MSC/Link  
Eisenach, Germany  
New Facility

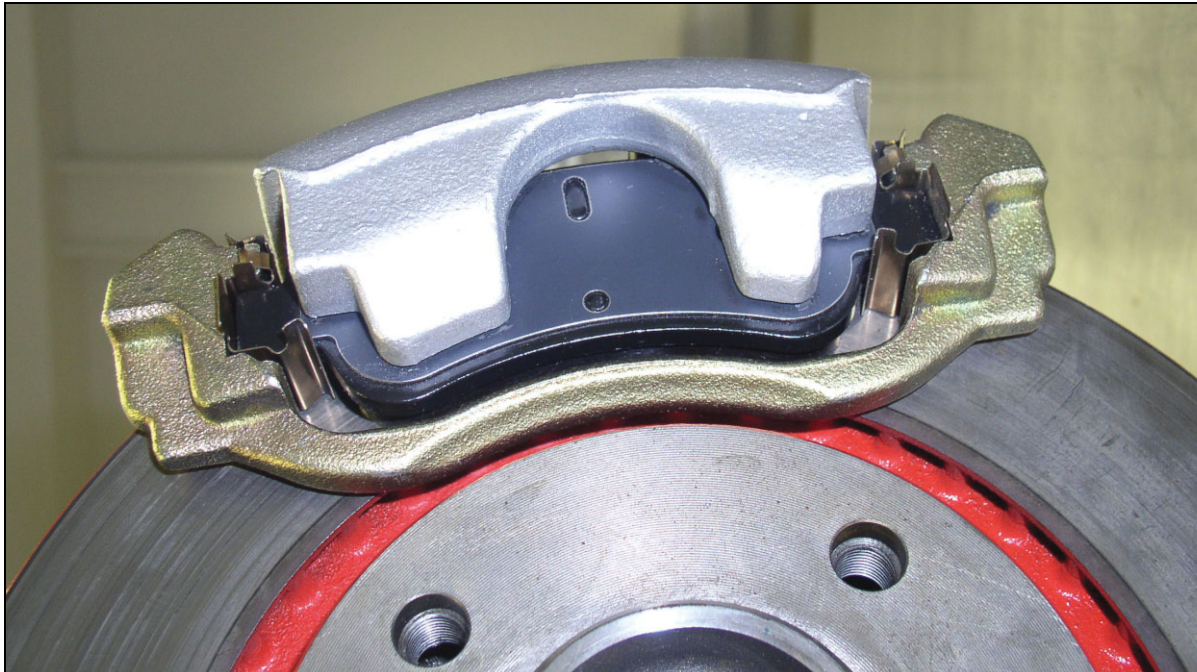
Europe  
Automotive  
PULSE™ NVH Test System

*MSC Europe GmbH and Link Europe GmbH have been working together since March 2007. This new alliance has been providing a wide range of NVH and performance testing services for its European customers. MSC/Link's laboratory in Eisenach, Germany is equipped with Link's models 3900 and 3900SR NVH Dynamometers where the NVH module is based on Brüel & Kjær's PULSE™ 6-channel NVH test system. This is the first major independent testing laboratory for passenger car and light truck brake NVH evaluation in Europe.*

*MSC (Material Sciences Corporation) with manufacturing facilities in Germany, Korea, Malaysia, Brazil and offices in Japan and China is one of the world's leading suppliers of shims to global manufacturers of brake systems.*

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*Fig. 1 Placing of the shim at the brake pad fixed in the calliper*



*Photographs by kind permission of MSC/Link*

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## NVH and Performance Testing – Brake NVH Evaluation

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Andrew Winkley,  
General Manager of  
MSC Europe and  
Michael Rohde,  
General Manager of  
Link Europe



Link is a world leader in Brake NVH Test Systems and, with the Model 3900 Brake Noise Dynamometer, has become an industry standard for many Vehicle Manufacturers (VM) and suppliers of brake systems and components globally. Link provides brake testing facilities at several locations in the USA, Germany, and Korea.

### The Partnership

“Since we held the opening reception in March this year, our business platform has gone only one way – a constantly increasing customer base and more test programs per existing customer”, says Andrew Winkley, General Manager for MSC Europe.

**Fig. 2** Dr. James Thompson, Link's Executive Director of Sales, Marketing, and NVH



Link and MSC are also working together in the USA where they, in cooperation with Brüel & Kjær, have founded the Application Research Center (ARC) in Detroit – a test facility with state-of-the-art capabilities and highly efficient equipment for NVH measurements. For MSC, the number of customers in Europe has increased. Andrew explains, “With the objective of supporting our European customers it was only natural to continue our partnership, and our strong reputation in the US market helped during the establishment stage in Germany”. At the same time, Link has planned the development of a testing laboratory in Germany for some time. “This cooperative agreement has been helpful to both parties in developing new business in this highly competitive field,” explains Jim Thompson, Link's Executive Director of Sales, Marketing, and NVH.

“For both parties it is essential to be close to the customer and to provide fast response to NVH issues and test needs,” adds Andrew. Jim notes, “While we are doing testing for customers from around the world in our laboratories in the USA and Korea, there is no substitute for being close to the customer. We have already established major test programs in this new test facility that could not have been supported from our other locations”.

### Brake NVH Test Procedure

This facility and dynamometers are specifically designed for brake noise testing according to customer specifications as well as existing test protocols including SAE J2521. Link's model 3900 and 3900SR Brake Noise Dynamometers have become the standard configuration and are used by the brake industry around the world.

### Test Programs

“The dynamometer that we have – the Link Model 3900 for squeal and other NVH testing – provides capability for NVH testing of corner and axle type brake fixtures”, says Thomas Keul, MSC NVH Test Engineer. “Our customers' individual fixtures for specific test programs are stored in our in-house tool shop leading to huge advantages for the flexibility of test programs as well as quick test start-ups when needed.”

**Fig. 3** Thomas Keul, MSC NVH Test Engineer, controlling the latest modal measurement



The system can reproduce a wide range of brake noise issues including state-of-the-art technology for optimal correlation to actual operating conditions.

The Link dynamometers provide a free-field sound environment that simulates what is seen by the braking system during normal operation on the road. The test chamber temperature can be set in a range from  $-20$  to  $+50^{\circ}\text{C}$  with humidity from 10 to 90% RH. Generally, the speed used at most NVH tests is not particularly high, however, these dynamometers support testing from less than 1 km/h to over 180 km/h.

The NVH Module of the Link system is based on Brüel & Kjær's PULSE NVH test system. The basic configuration of the system gives 6-channel full audible frequency range for NVH measurement. The PULSE system runs under the ProLink software package to maximise ease of use while providing a full set of NVH analysis capabilities. "The PULSE system provides us with the opportunity to perform precision analysis rapidly and to use as many channels as are necessary to understand the noise sources and causes", says Thomas.

### Modal Analysis

"To provide the best possible test results we support our NVH test programs with modal testing and analysis based on the PULSE platform", says Thomas. "The brake test is very delicate since the friction pads and shims react differently depending on speed, temperatures and humidity."

"During the NVH performance program the shim, supporting the stability of the brake pad, could easily behave unexpectedly, and we need to take this into consideration when choosing the right material and dimensions", says Thomas.

Modal analysis enables the selection of the best possible match between the brake pad and the shim for a given brake caliper. Furthermore, it provides a platform for controlling correlation between test analysis and calculations. "Modal analysis is a strong tool when working with constrained layer shim materials", states Thomas.

### Data Handling

"To ensure our position as the major independent laboratory for Brake NVH evaluation we are in a situation that requires strict rules and powerful guidelines for professional data handling", says Andrew and continues, "This is something that we have taken extremely seriously ever since we started this business".

### The Future

"Brüel & Kjær has been a fantastic partner while setting up our test facilities both in the US and here in Europe", says Andrew, "And for the future expansion of our activities it is only natural to seek professional guidance and to continue using Brüel & Kjær's state-of-the-art NVH measurement technology".

Having sold over 100 Brüel & Kjær PULSE systems, Link Engineering is the largest independent vendor of such systems worldwide. Jim Thompson states, "A key part of the success of Link dynamometers is the industry leading technology from PULSE. We have been able to provide unique capabilities for our customers in an easy to use environment. With this new laboratory, we are bringing this technology to Europe".

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