

# Laser Airflow Test Lab

## LDA and PIV Laser Airflow Analysis



Visteon European Testing Operations comprises a powerful climatic vehicle wind tunnel, a unique laser lab for airflow measurements and a large size climatic lab with modern test rigs. The facilities are located directly at the Kerpen motorway junction between Aachen and Cologne.

### Laser Techniques to Investigate Flows

Visteon's laser lab at Kerpen is dedicated to investigating flows on various applications. Visualisation and measurement of flow, play a crucial role in the development process. Due to the variety of different flow conditions, Visteon uses different techniques for flow investigations.

### Flow Visualisation

A high-powered laser light sheet makes the flow visible and provides qualitative data on its behaviour and direction

### Laser Doppler Anemometry (LDA) and Particle Image Velocimetry (PIV)

Techniques that measure both velocity magnitude and direction of flow, generating contour maps of even the most complex flow fields

All applied laser techniques allow measurement without disturbing the original flow. The obtained data is transferred into optimised designs with improved flow.



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### Measuring Flow Along Windscreen — Reduced Development Costs

To have a good de-icing performance of the windscreen and side windows it is mandatory to understand and optimise the flow along these windows. With flow visualisation the basic flow phenomena along the windows become visible. LDA is used to quantify the velocity pattern. Optimisation in the laser lab reduces the number of time- and cost-intensive de-icing tests in the climate chamber to a necessary minimum, thereby lowering development costs.

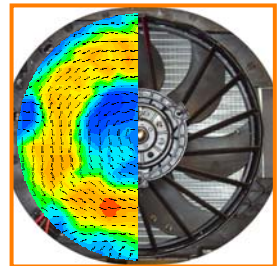
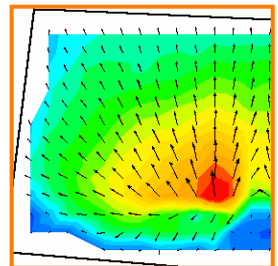


### Measurement of 3-Dimensional Complex Flows — Complex Flow Analyses

With 3D PIV or 3D LDA complex flow phenomena such as

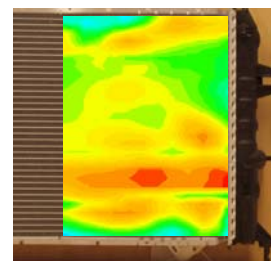
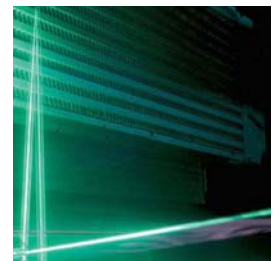
- flows behind fans
- wakes of a side mirror
- flows at the rear end of a vehicle

can be explored. Velocity and turbulence data are valuable inputs when optimising a design but also significant when correlating CFD simulation results or for benchmark studies.



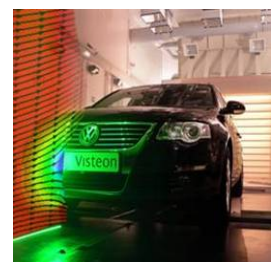
### Flow Through Cooling Module — Optimised System Performance

Understanding the airflow through the cooling module is important to optimise the performance of e.g. AC circuits, engine cooling circuits or vehicle aerodynamics. With the help of laser techniques the airflow rate through, as well as the velocity distribution in front of a cooling module can be determined. Additionally recirculation through or around the cooling module can be detected. Airflow optimisation through the cooling module leads to better system performance or delivers downsizing potential of certain components.



### Use of PIV in Climatic Wind Tunnel — Large Scale Aerodynamic Investigations

The advantage of the PIV technique is a precise velocity measurement over a large area within a short measurement time. Therefore PIV is very applicable for aerodynamic investigations in the wind tunnel. Front end airflow as well as flow around vehicles can be mapped in a short time once the equipment is set up. Another application is examining the flow in the wind tunnel test cell to support wind tunnel calibration.



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