



FlowBOS Camera Systems

Gas- / Airflow Imaging & Visualization



LAVISION

FOCUS ON IMAGING



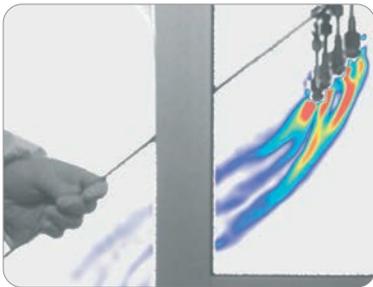
Comprehensive Flow Visualization for Air, Heat, and Gas

Proper airflow and environmental control are crucial for high-performance operations. Whether you want to evaluate airflow dynamics in a cleanroom, ensure effective contaminant removal, detect leaks in a combustion gas chamber, or optimize HVAC ventilation in a server park, precise diagnostics are essential.

LaVision specializes in the visualization and analysis of all flow types, including ambient air, thermal and gas dynamics. Our cutting-edge technology ensures unprecedented insights into your flow systems without introducing tracer particles or contaminants into the environment.

Our solution utilizes an intelligent and intuitive imaging system that is non-invasive and environmentally friendly. With our products, you can achieve precision and reliability in monitoring and optimizing airflow for your specific applications.

FlowBOS: Extensive Utilization Possibilities in Industrial Application Areas



Smokeless Smoke Testing

Airflows in cleanrooms and flowboxes



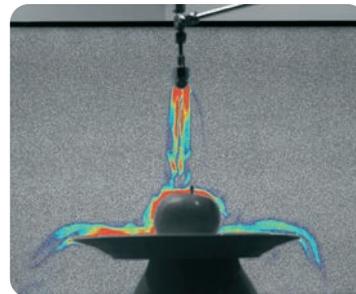
Leakage Detection

Maintenance and inspection



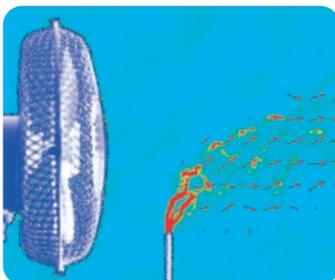
Thermal Flows

Air conditioning and heat management



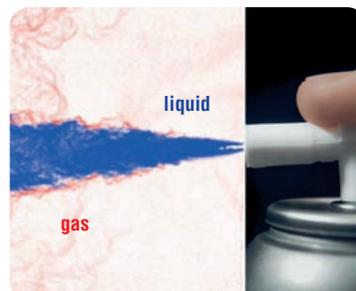
Process Gas Visualization

Gas shielding inspection



Flow Field Imaging

Schlieren imaging velocimetry for quantification



Spray Imaging

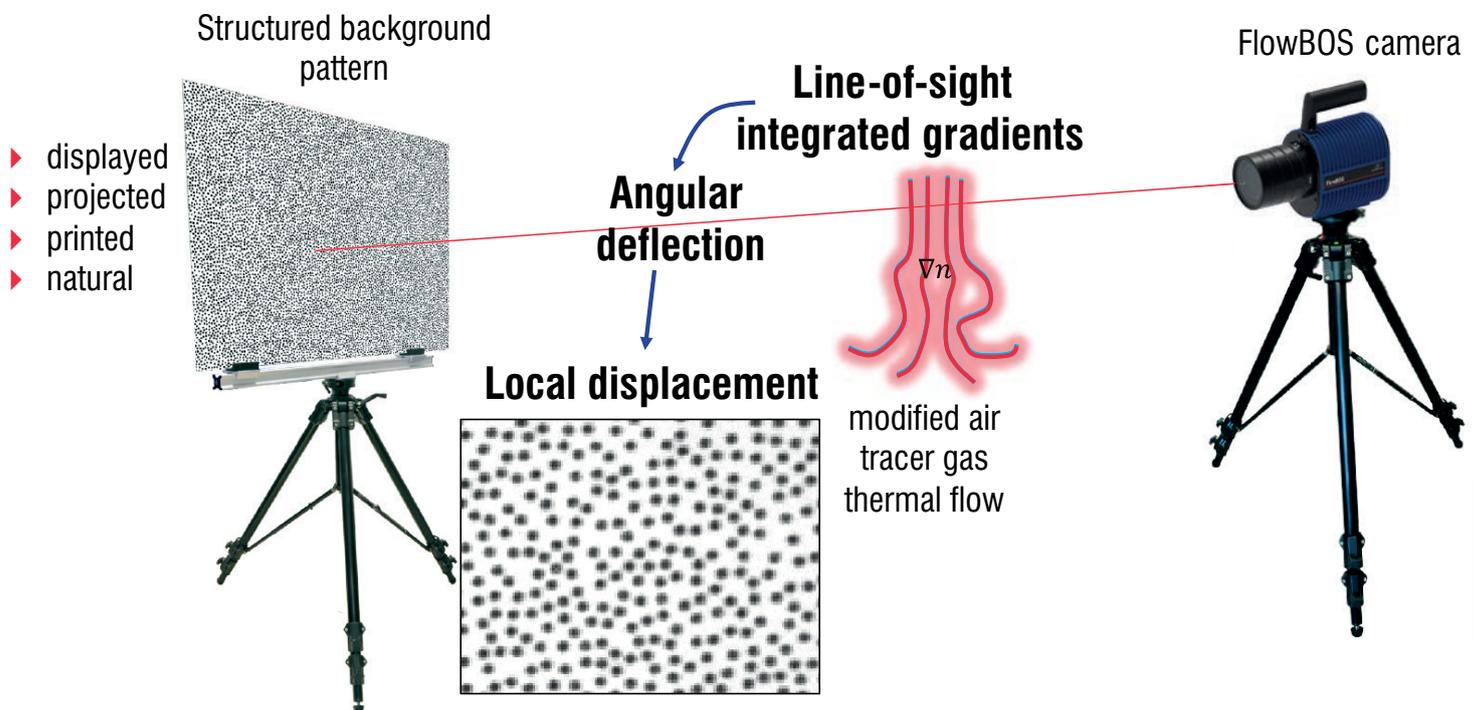
Process optimization



BOS Imaging

Schlieren imaging is based on the deflection of light beams crossing gradients of the index of refraction in a transparent medium. These index of refraction gradients can be introduced by density discontinuities in a fluid or in mixing processes of different optical materials. Schlieren is a line-of-sight imaging technique allowing only a qualitative flow visualization.

The digital version of Schlieren imaging is called Background Oriented Schlieren (**BOS**). In practice, only a random dot pattern in the background of the flow is imaged with a high resolution camera before and during the test. By comparing the two pictures using a correlating method the local displacement of the background pattern can be used to provide lateral information on path-integrated refractive index variations.



Visualizing your flow with the **FlowBOS** cameras is as simple as recording a movie: point the flow inspection camera through the flow onto the provided background pattern to reveal flow structure and speed that are not visible by eye.

These extremely versatile cameras can be used in a wide range of applications from small scale leak detection, through car interior ventilation, to full room flow behaviour in cleanrooms or for HVAC testing. Because the approach has zero contaminants it is safe to use in all environments and works residue-free.

System setup is fast and straightforward and can be deployed at short notice and supports on-line process control applications.



The **FlowBOS** cameras allow the following basic visualization options:

Particle-free visualization of airflows

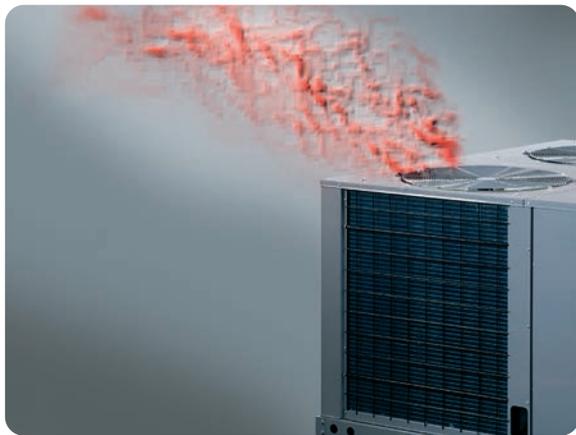
LaVision's **FlowBOS** cameras for visualizing airflows work with a harmless and optically active tracer gas instead of aerosols, which also prevents particle contamination. Against a sample background, the innovative BOS imaging method precisely depicts the airflow to be examined, whereby air and tracer gas behave identically in terms of flow physics.

Applications

- ▶ Clean rooms
- ▶ Safety cabinets, flow boxes
- ▶ Flow machines
- ▶ Extraction systems
- ▶ Building services engineering
- ▶ Data center & server rooms
- ▶ ...



Heat management support



Heat flow imaging

Visualization of thermal flows

LaVision's **FlowBOS** cameras directly visualize heat flows of all kinds. The innovative imaging method is sensitive to temperature gradients in the air and makes heat streaks directly visible.

Applications

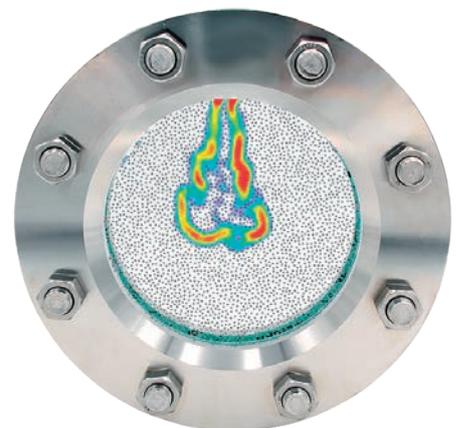
- ▶ HVAC (Heat - Ventilation - Air - Conditioning)
- ▶ Convection
- ▶ Body heat
- ▶ Breathing air
- ▶ Waste heat from appliances
- ▶ ...

Visualization of specific gases

LaVision's **FlowBOS** cameras allow the direct visualization of gas flows in air. Almost all gases can be visualized, which enables a very wide range of applications in many areas of production and development.

Applications

- ▶ (Inert) gas shielding
- ▶ Welding
- ▶ 3D printing
- ▶ Food industry
- ▶ Semiconductor processing
- ▶ Leakage detection
- ▶ Hydrogen imaging
- ▶ ...



Visualization of hydrogen injection



FlowBOS Camera SE (Standard Edition)

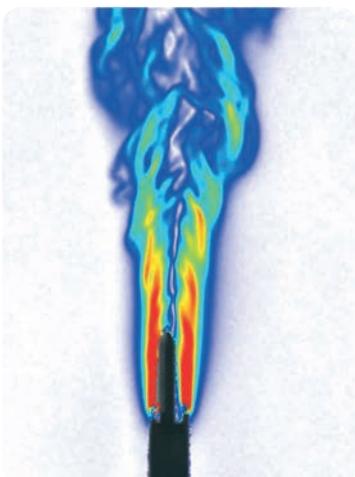


The **FlowBOS Camera SE** (Standard Edition) is designed for multi-purpose applications and flexible working distances. It enables real-time flow-visualization using fast computer algorithms. A visible airflow is created from small light-deflections induced from local differences in air composition or temperature that follow the overall motion of the flow. It is highly sensitive to the optical changes, scalable to different measurement areas and monitors the flow motion in real time. Beside the background pattern nothing else is needed for flow capture.

This camera tracks smallest air movements using light-deflections from refractive index variations induced by local seeding.

It is supplied in an IP44 housing with interchangeable lenses and feature a detachable tablet for intuitive camera control and an interactive view of the flow.

This extremely versatile camera is used to detect leaks, display heat flows in passenger compartments and monitor air-conditioning systems.



Visualization of shielding gases



Visualization of gas leaks



Visualization of thermal flow



FlowBOS Camera CR (Cleanroom Edition)



The innovative **FlowBOS Camera CR** from LaVision is designed for cleanrooms to overcome the main drawback of common airflow tests with smoke: It avoids contamination from residues, as it uses a neutral gas instead of smoke.

A substantial reduction of cleaning costs and avoiding production downtime is achievable using the **FlowBOS Camera CR**. Not only most of the standard smoke tests can be substituted by this camera, but it also opens new opportunities for efficient cleanroom production.

Due to its digital nature, quantification of the flow like flow speed and direction is now available. Additional application scenarios are conceivable that go beyond the usual use of conventional smoke testing: emergency test in running production, training at lines in operations and many more.



Smokeless smoke testing in cleanrooms



FlowBOS Camera LD (Large Distance Edition)



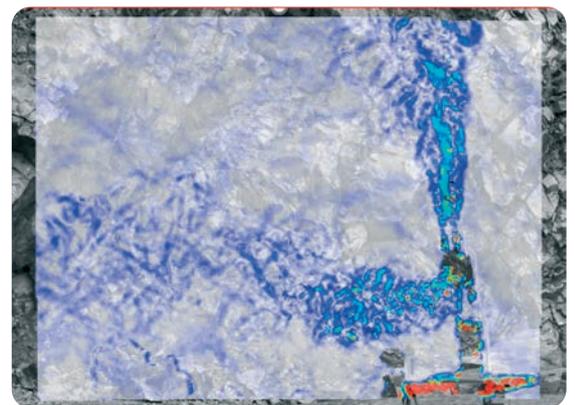
The **FlowBOS Camera LD** has been specially developed for very large measuring distances and demanding applications with naturally moving backgrounds.

Like the FlowBOS Camera SE the **FlowBOS Camera LD** is supplied in an IP44 housing with interchangeable lenses and a detachable tablet for intuitive camera control and an interactive view of the flow.

This high-performance camera for large-area measurements is therefore ideally suited for outdoor applications, such as detection or monitoring of hydrogen emissions at pipelines, pumping stations or storage and production sites.



Pipeline monitoring



Gas blow-out imaging

Working with this camera, you can make use the following benefits:

- ▶ Direct visualization of H₂ over larger distances and fields of view
- ▶ Determination of the dispersion behavior
- ▶ Increased efficiency through precise localization compared to portable sensors when detecting leaks
- ▶ Scalable fields of view
- ▶ Easy to use

The FlowBOS Camera Family

Standard design	Cleanroom design	Large distance design
		
<ul style="list-style-type: none"> ▶ Single-camera ▶ Interchangeable lens ▶ Detachable tablet ▶ IP44 housing ▶ Robustness ▶ Flexibility 	<ul style="list-style-type: none"> ▶ Single-camera ▶ Fixed lens ▶ Closed design ▶ IP64 housing ▶ Easy to clean 	<ul style="list-style-type: none"> ▶ Stereo-camera ▶ Interchangeable lenses ▶ Detachable tablet ▶ IP44 housing ▶ Robustness ▶ Flexibility
<div data-bbox="124 1182 430 1272" style="background-color: #1a3d54; color: white; padding: 10px; text-align: center;"> Multi-Purpose </div>	<div data-bbox="614 1182 920 1272" style="background-color: #1a3d54; color: white; padding: 10px; text-align: center;"> Cleanroom environments </div>	<div data-bbox="1066 1182 1439 1272" style="background-color: #1a3d54; color: white; padding: 10px; text-align: center;"> Natural backgrounds, e.g. outdoor gas leaks </div>

LaVisionUK Ltd

2 Minton Place / Victoria Road
Bicester / Oxon / OX26 6QB / United Kingdom
E-Mail: sales@lavisisionuk.com
www.lavisisionuk.com
Phone: +44-(0)-870-997-6532
Fax: +44-(0)-870-762-6252

LaVision GmbH

Anna-Vandenhoeck-Ring 19
37081 Göttingen / Germany
E-Mail: info@lavisision.com
www.lavisision.com
Tel.: +49-(0)5 51-9004-0
Fax: +49-(0)551-9004-100

LaVision Inc.

211 W. Michigan Ave. / Suite 100
Ypsilanti, MI 48197 / USA
E-Mail: sales@lavisisioninc.com
www.lavisision.com
Phone: (734) 485 - 0913
Fax: (240) 465 - 4306