

FlowBOS

Make air flows visible

FlowBOS visualization system

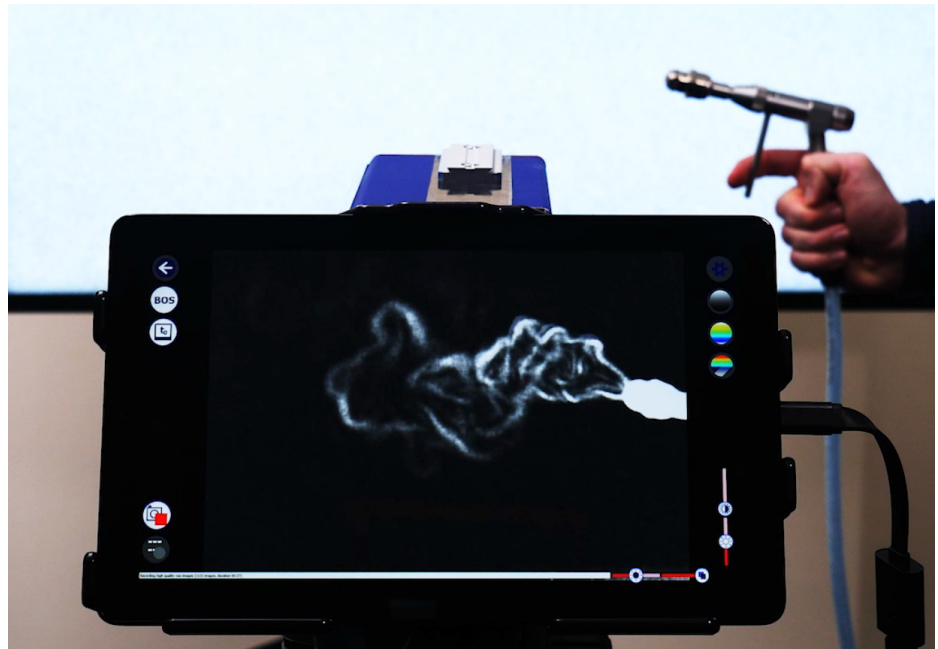
Live flow visualization

The **FlowBOS** system makes invisible air flows visible without any contaminating seeding. The integrated BOS camera recognizes small optical variations in the air by tiny fluctuations in a background pattern and turns this into a video of the flow in real-time. These variations are induced from local air composition or temperature differences which follow the air motion.

BOS (Background Oriented Schlieren) is the digital version of the well-established Schlieren technique for visualizing optical refractive power differences in air. The underlying phenomenon is familiar in everyday life from the flickering of heat over hot roads. The BOS camera, together with a high-contrast pattern placed behind the flow, is extremely sensitive to this flicker and registers changes in the sub-pixel range that are no longer perceptible to the human eye. This effect is triggered by a local change in the air composition or density caused by the seeding with a modified air mixture, gas, or by temperature differences. This makes it possible to track air movement, gas flows and thermal flows.



The BOS camera's interactive view offers a live visualization for online flow observation and video recording.



Software

LaVision's **video BOS software** provides a touch-screen optimized interface designed for intuitive camera control and video recording. Flow visualization is achieved by intelligent image layering of a colored live-image of the scene augmented by the live-processing result of the recorded flow. The live view is recorded to a video file as simple as using a conventional camcorder. An optional HQ-recording mode stores images as raw files for later post processing in higher quality.

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Pattern generation

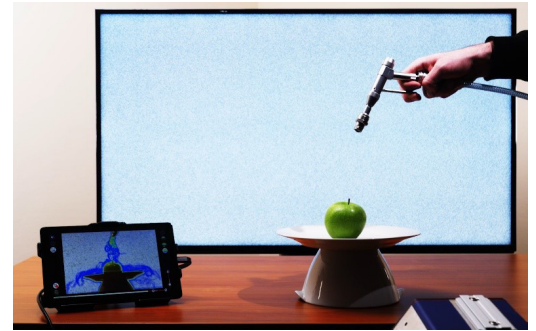


The BOS camera requires a high-contrast structured random pattern to recognize the tiny variations in the air. This background pattern can be generated by different measures, adapted to the situation in the recorded scene:

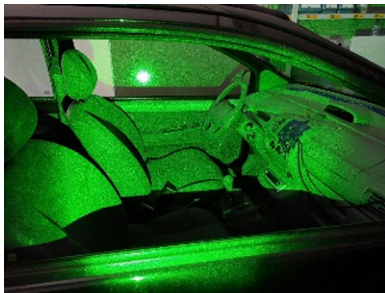
- ▶ LED pattern projector: the most versatile approach
- ▶ TV screen with displayed pattern: for setups with a free view across the scene
- ▶ laser based: for measurement close to surfaces
- ▶ printed pattern: the most cost-effective approach

Using the **FlowBOS** system in combination with a pulsed highly efficient **LED Pattern Projector** allows to capture moving flow structures at exposure times as short as 1/1000 second at full video frame rate. The powerful lens of the LED projector delivers a bright projection of a structured pattern on a variety of surfaces.

In cases of an open measurement area without a projection plane an appropriate solution is a **monitor for pattern display**. A typical 75" screen covers an area of more than 1m in diameter, is very simple to setup and flexible in use.

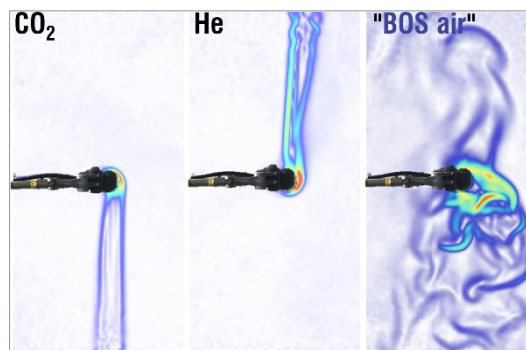


A **laser with diffusor** can be used as an alternative pattern projector. This is beneficial when measuring close to surfaces (non-moving). The coherent properties of laser light produce a virtual wall of random pattern appearing behind the surface. This approach is very suitable in closed compartments, e.g. for passenger cabin climate control.



Tracer gas

For flow monitoring without natural composition or temperature differences, e.g. in normal ambient air, a tracer is added. LaVision offers BOS air which is balanced for monitoring of slow flows, e.g. in laminar flow boxes or natural convection.



This air supplement is safe to use (non-toxic, non-reactive, non-asphyxiant). More cost-effective gas mixtures are available for higher flow rates (>1.5 m/s).

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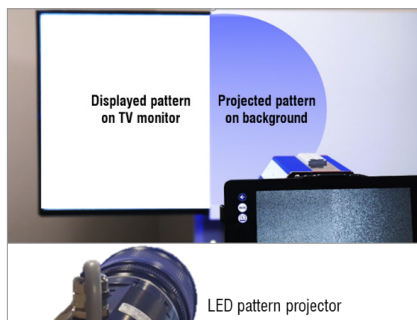
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Specifications

FlowBOS system standard specifications with a LED pattern projector	
Working distance (WOD) of BOS camera	0.5-3 m
Field of view (FOV)	1x1 m ² @ 2 m WOD
Measurement distance from surface	10%-50% of WOD
BOS air concentration	5% - 100%* seed gas concentration
Detectable temperature difference	>2 K for thermal flows
Spatial resolution	1% of FOV (e.g. 1 cm of 1 m FOV)
Live movie	25 fps full-HD mpeg4
Recording duration	20 hrs normal video 2 hrs HQ raw video format
Camera sensors	5 MPix low-noise 12 bit BOS full-HD color video
BOS camera head dimensions	170 × 150 × 120 mm ³
Pattern projector head dimension	160 × 70 × 70 mm ³
Cable length to PC	10 m standard, longer on request
Compliance	CE mark, RoHS, camera head: IP54
* under typical laminar flow conditions and working distance	

System components



Add-ons

The **FlowBOS** system is ready to use out-of-the-box and consists of:

- ▶ video BOS camera with touch screen for live display, including the high dynamic range low-noise BOS sensor and a full-HD color camera for the real-world scene
- ▶ powerful PC with integrated controller for camera and projector
- ▶ pattern projector with blue LED and controller
- ▶ tripods
- ▶ DaVis software with post-processing for high-quality rendering and further analysis
- ▶ video BOS software module with live view and video recording capability

The system can be upgraded with a 2nd LED pattern projector to reduce shadows in crowded measurement areas. BOS air as tracer gas is available in pressurized containers, as well as a seeding rake with air-gun and a flow controller.

Ordering information

Part number	Description
1106350	FlowBOS camera system
1106355	LED pattern projector
1106356	Laser illumination for laser-speckle BOS
1106357	FlowBOS seeding gas, 1500 liters, pressurized bottle 150 bar
1106359	FlowBOS seeding rake
1106358	4k monitor (75") for pattern display

Data provided by LaVision are believed to be true. However, no responsibility is assumed for possible inaccuracies or omissions. All data are subject to change without notice.

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