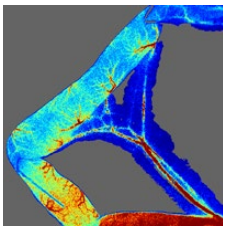
Simultaneous tissue perfusion and oxygenation imaging

with moorO$_2$Flo-2

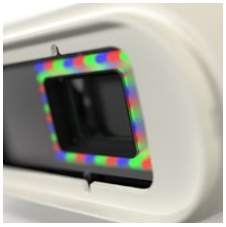


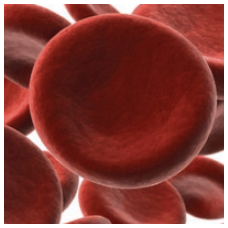


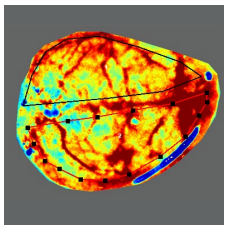












moor instruments

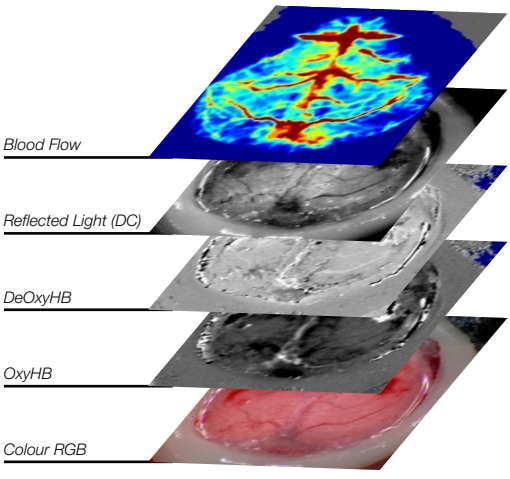
innovation in microvascular assessment

Simultaneous tissue perfusion and oxygenation imaging

The moorO$_2$Flo-2 is a unique imaging system designed to simultaneously image tissue perfusion and relative tissue oxyhaemoglobin and deoxyhaemoglobin changes. .

The moorO$_2$Flo-2 combines Moor Instruments' existing high end laser speckle contrast technology for perfusion imaging with reflectance spectroscopy for oxygenation change imaging. The system offers;

- Non contact imaging.
- Blood flow and oxygen videos of any exposed tissue (skin or surgically exposed tissues).
- Available in Blood flow only spec with up to 100 frames per second imaging.
- Combined Blood flow and Oxygen at up to 20 frames per second, with each frame containing 1 x blood flow image, 1 x oxyHb image, 1 x deoxyHB image and 1 x colour photograph.
- Best spatial resolution of 3.9 microns per pixel to reveal detailed morphology.
- 10 x optical zoom to image areas from 8mm x 6mm to 300mm x 200mm with motorised zoom and autofocus.
- Add multiple "regions of interest" to assess and quantify blood flow and oxygen changes both in real time and post measurement. Area of ROIs calculated automatically.
- Colour photo image matches blood flow and oxygen images precisely to aid identification of features
- 1 camera – 5 parameters.



moorO$_2$Flo-2 – how it works...

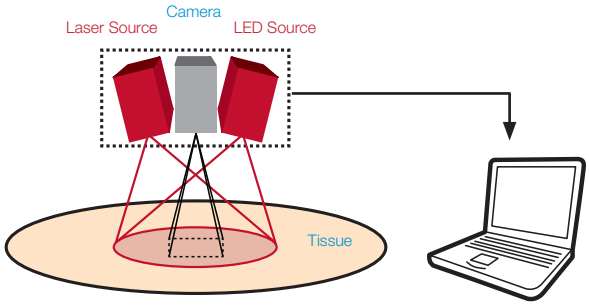
The moorO$_2$Flo-2 is the only commercially available system combining measurements of tissue perfusion and oxygenation changes. Two different techniques are provided within one physical package with measurement and analysis functions grouped into one software suite. The system uses a single video camera for both measurements so the data matches pixel for pixel and also combines a colour image of the scan site for records.

Tissue perfusion imaging is achieved with the laser speckle contrast analysis and oxygenation imaging achieved with reflectance spectroscopy. Simultaneous perfusion and oxygenation imaging is achieved by rapidly alternating between the two techniques.

Perfusion Imaging – How it works: Tissue is illuminated with a diverging infrared laser beam. The resulting random speckle pattern is imaged with the video camera. Movement, mainly of red blood cells within the tissue, causes the speckle pattern to blur, reducing contrast. Reduced contrast is associated with higher flow accordingly and these contrast variations are analysed to generates colour-coded maps of tissue perfusion.

Oxygenation Imaging – How it works: Tissue is illuminated sequentially with red, green and blue LEDS. The tissue is imaged with the video camera and illumination synchronised such that separate red, green and blue images are generated. These are subsequently analysed using the modified Beer-Lambert law to relate changes in the diffuse reflectance to generate colour coded maps of oxy-haemoglobin and deoxy-haemoglobin changes.

This system can be provided with all parameters activated or with oxygen deactivated to increase blood flow frame rates 5-fold. The O_2 parameters can be re-activated later.



Software and Analysis

Dedicated software for measurement and analysis is provided to take advantage of the high acquisition speeds and spatial resolution provided by moorO_2Flo-2. Our software is fully featured for setup, measurement, protocol control, analysis, reporting and exporting.

Setup offers full flexibility to choose scan size and temporal resolution, enabling you to collect data that is appropriate to your measurement, be it just a single image or a longer capture sequence. Zoom and auto focus is set conveniently using either the front panel control or via software control.

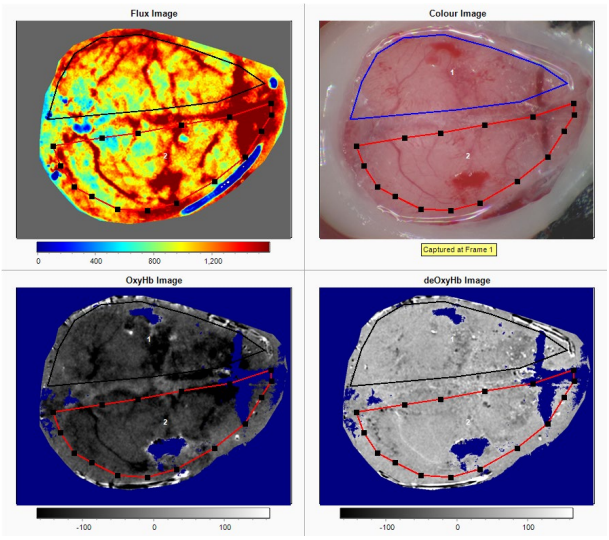
Measurement starts with a single click. Mark events and see changes in flow and oxygenation at predefined regions of interest (ROIs) that update graphically and histographically. Scan and ROI areas calculated automatically.

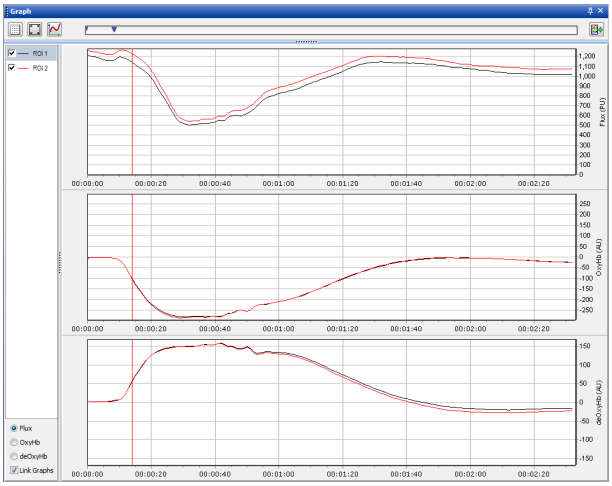
Analysis post measurement includes the ability to replay and re-analyse data offline by re-positioning regions of interest. This allows maximum utilisation of the data set. Five different colour palettes, and optional functions such as smoothing, image XY shift (to counteract movement mid measurement) and variable speed sequence playback enables you to present your data clearly.

Report templates can be custom defined to produce the analysis and reporting that is needed from your studies from standard statistical to FFT / wavelet analysis. Export data to AVI, Matlab and graphical forms to extend the use of data for further analysis or presentations.

Your research

Please contact Moor or your nearest approved distributor to discuss your specific application. Ask to see the new system in action and evaluate it at your own facility. Current publications are updated online at www.moor.co.uk.





Cerebral Hypoxia protocol – illustrating changes in blood flow, oxy/ deoxy Hb and colour photo of imaging site.

About Moor Instruments

Moor Instruments, established in 1987, is a world leader in the design, manufacture and distribution of monitoring and imaging systems for micro-vascular assessments. We are proud now to include tissue oxygenation assessments within this portfolio.

Firsthand experience of laser Doppler research and development within Moor dates back to 1978 and with this we have the breadth of knowledge to help with your application and the enthusiasm to try and find answers to any of your questions.

By giving priority to performance, quality and service, we strive to ensure the highest levels of customer satisfaction.

Our dedicated design team is involved with a number of development projects for other partners and manufacturers. Whatever your needs, as a researcher, clinician or manufacturer, Moor will work harder for you.



moorO$_2$Flo-2 with LIGHTFRAME-SIZE1 or dark environment required for oxygen measurements.

Specifications:

Quality Control
The moorO$_2$Flo-2 is CE marked.

Measured Parameters
Tissue perfusion, in PU.
Relative oxygenated and deoxygenated haemoglobin concentration change, in AU.

Working Distance
100-380 mm (measured from front edge of enclosure).

Imaging Area
8 x 6mm (maximum zoom, minimum distance)
300 x 200mm (minimum zoom, maximum distance)

Image Resolution
2060 x 1540 for haemoglobin images.
2064 x 1544 for perfusion and colour photo/video images.

Combined Imaging Frame Rate
Up to 20 frames per second for oxygenation imaging or combined perfusion + oxygenation imaging. 1 Frame consists of: 1x perfusion image, 1x oxyHb change image, 1x deoxyHb change image and 1x colour video image.
Up 100 frames per second for perfusion only imaging.

Operating Environment
Indoor laboratory use.
Temperature range: 15 – 30°C.
Atmospheric pressure: 86-106 kPa.
Humidity: 20-80%, non-condensing.
Maximum altitude: 2000 m.
Pollution degree: Pollution degree 2

Lighting Conditions
Oxygenation imaging: near-dark, controlled light environment or used inside a light proof enclosure
Perfusion only imaging: normal, ambient room lighting

Storage And Transportation Environment
Temperature range: 5 – 45°C.
Atmospheric pressure: 50-106 kPa.
Humidity: 20-80%, non-condensing.

Power Source
AC mains, 100-240 V +/-10%, 0.5A max, 50/60 Hz.

Dimensions
Scan head: 220x112x245 mm (WxHxD), 2.3 kg
PSU: 28x86x56 mm (WxHxD), 0.2 kg

Laser Classification
Class 1 (EN 60825-1:2014+A11:2021).

Measurement Laser
Emission pattern: Diverging circular beam.
Wavelength: 785nm ± 10nm
Maximum power: 90mW, accessible power below EN60825-1:2014+A11:2021 Class 1 limits.

Aiming Lasers
Emission pattern: Collimated.
Wavelength: 650nm
Maximum power: 0.1mW per laser.

The moorO$_2$Flo-2 is intended for use in research and educational life science applications only and is not a medical device.

WARNING: The moorO$_2$Flo-2 emits flashing light which may potentially trigger seizures for people with photosensitive epilepsy. Do not use the moorO$_2$Flo-2 in the presence of individuals with photosensitive epilepsy.

Moor Instruments reserves the right to change specifications without notice.

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innovation in microvascular assessment

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Please visit www.moor.co.uk for full details of our international distributors and partners