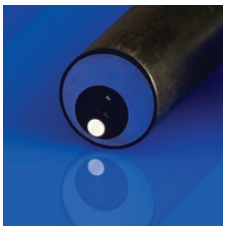
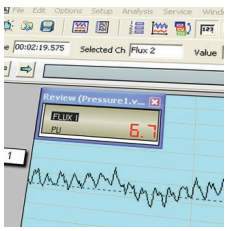
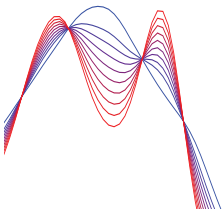
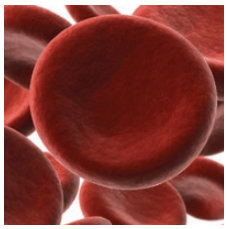
Continuous tissue oxygenation and temperature monitoring

with moorVMS-OXY









moor instruments

innovation in microvascular assessment

moorVMS-OXY - Continuous Tissue Oxygenation Monitoring

Adequate oxygen supply is essential for the life and health of all biological tissue. Both oxygen levels and tissue blood flow (measured by moorVMS-OXY and moorVMS-LDF respectively) are therefore important physiological indicators of tissue health and viability.

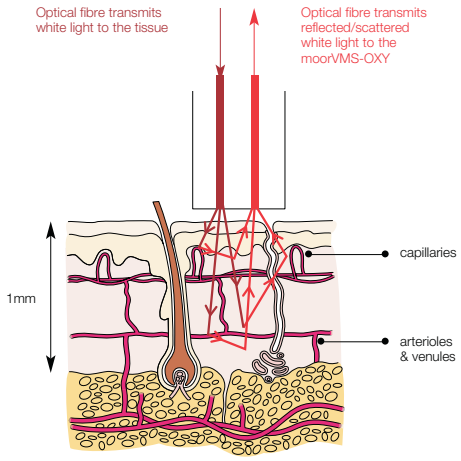
These indicators can provide vital information on current status and link closely to many applications, for example wound healing, re-epithelialisation, angiogenesis and improved immune function. The ability to measure oxygen delivery is a useful aid to wound management for prompt and successful healing.

The moorVMS-OXY monitor allows accurate and convenient real-time assessment of oxygenated / deoxygenated haemoglobin concentration, oxygen saturation (%) and skin temperature in the microcirculation, with the use of small, easy to use optic probes. The features include;

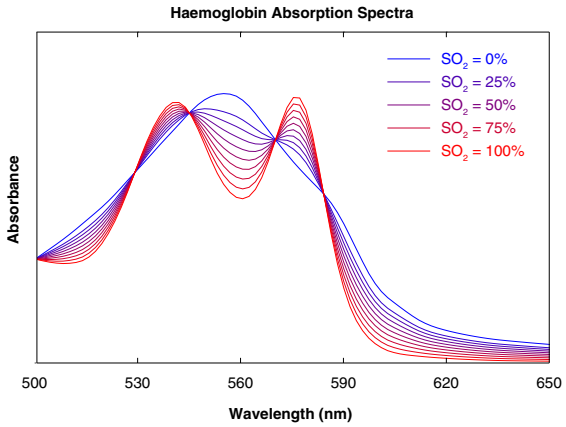
- **Non-invasive**, immediate and real time measurements at up to 40Hz, that start on contact with the tissue.
- **Flexibility** to measure baseline (resting) and maximal tissue oxygenation. Suitable for long term measurements.
- **Quick** and simple probe application.
- **Compact**, portable and lightweight.
- **Probes** for skin use, needle designs for other tissues.
- **"Same-site"** combined probes that offer simultaneous assessments of tissue oxygenation and laser Doppler blood flow (in surface or needle probe formats).
- **Full compatibility** with other moorVMS family products (laser Doppler, iontophoresis, skin heating and pressure cuff control options).
- **Advanced Windows™ PC software** with extensive analytical features and automatic report generation.
- **Convenient connections:** Analogue (0-5V, BNC connection) and digital (USB) real time data transfer included as standard.
- **High quality:** medical grade design for clinical and research applications.
- **Reliability:** 3 year manufacturers warranty as standard – no servicing requirement. Annual service plans extend the warranty to 5 years.

The White Light Spectroscopic Technique

The moorVMS-OXY uses the white light reflectance spectroscopy technique for tissue oxygenation measurements. It uses a bright white LED as a light source with the light transmitted to the skin through an optic fibre. The reflected light which has travelled through the tissue is collected via either a single, or a bundle of collecting fibre(s). On its path through the tissue, it interacts with the red blood cells which contain haemoglobin and a fraction of the light is absorbed. The absorption of light depends on its wavelength and on the oxygenation status of the haemoglobin.



The moorVMS-OXY analyses the back scattered reflected light in the wavelength range of 500 to 650nm and calculates tissue oxygenation by matching the collected spectra to the absorption curves from known concentrations of oxygenated / deoxygenated haemoglobin.



This is to allow a rapid and accurate measurement of oxygenation saturation SO_2(%), total haemoglobin and oxygenated / deoxygenated haemoglobin levels in the sample volume. Because the technique uses a non-heating light source and optical fibres to transmit the light, practical advantages of the technique include small probe size and continuous, real time measurements. The data provided by moorVMS-OXY is directly relevant to the microcirculation in baseline or stimulated conditions and is therefore different to pulse oximetry which relates to arterial oxygenation only and $TCPO_2$ which relates to maximal oxygen levels transmitted through the skin.

MemoryChip Probes

The moorVMS-OXY probes feature memory chip technology to store unique probe constants that are read by the monitor as soon as they are connected. Bio-compatible materials that can be sterilised are used throughout to ensure safety in clinical use. The moorVMS-LDF (laser Doppler tissue blood flow) users can use “same-site” combined probes for simultaneous tissue oxygenation and blood flow measurements. Probes are available for OXY only, OXY+TEMP, OXY+LDF and OXY+LDF+TEMP formats.

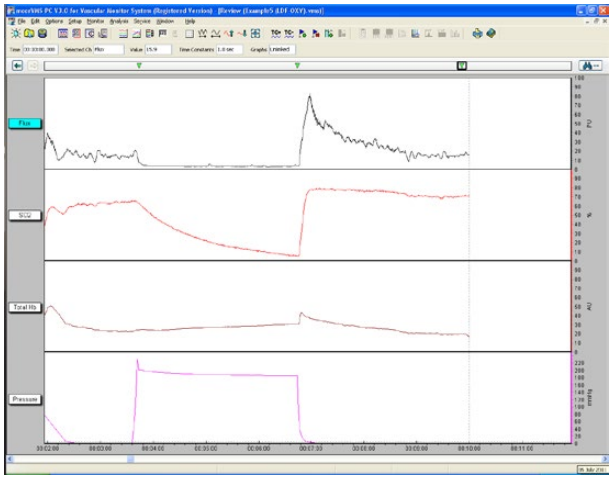
Skin probes are available with 1mm or 2mm fibre separations with the wider separation sampling from a larger tissue volume. Both include temperature measurement as standard.

Needle probes can be used for surface research measurements (e.g. nasal, oral, cortical) and inserted into bulk tissue (e.g. muscle, cerebral, adipose). The compact needle design (just 1.65mm diameter) is available in both OXY only or combined OXY+LDF formats.

Applications

The importance of tissue oxygenation measurements in many research applications has been recognised for years. Growth and developing research applications include;

- Neurology and neuroscience pre-clinical research (e.g. neurovascular coupling)
- Wound healing
- Plastic surgery (e.g. post operative flap monitoring in combination with laser Doppler) endothelial function
- Hyperbaric oxygenation (e.g. tissue assessments at elevated atmospheric oxygen concentrations)
- Neonatal intensive care
- Sepsis
- Vascular occlusion and critical ischaemia



moorVMS-PC screen shot – please refer to the moorVMS-PC software brochure for further details.

References

M. Kohl-Bareis et al, “System for the Measurement of Blood Flow and Oxygenation in Tissue Applied to Neurovascular Coupling in Brain,” in Photon Migration and Diffuse-Light Imaging II, K. Licha and R. Cubeddu, eds., Vol. 5859 of Proc. SPIE (Optical Society of America, 2005), paper WA3.

H Liu et al, “Design of an oxygenation monitor and verification on human skin tissue”, European Conferences on Biomedical Optics, Proc. of SPIE Vol. 8087 80871Y-1, 22 - 26 May 2011, Munich, Germany

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.

moorVMS-OXY – tissue oxygen saturation, haemoglobin and temperature monitor with optional moorVMS-LDF laser Doppler monitor.

Specifications:

Quality Control
Moor Instruments is certified to ISO 13485: 2016.
The moorVMS-OXY is CE marked as a medical device.

Measurement Parameters
SO_2 (tissue oxygen saturation)
Range: 0-99 %
Accuracy: ± 2 SO_2 units
Resolution: 1 SO_2 unit

oxyHb* (relative oxygenated haemoglobin concentration)
Range: 0-1000 AU
Accuracy: ±10%
Resolution: 0.1 AU

deoxyHb* (relative deoxygenated haemoglobin concentration)
Range: 0-1000 AU
Accuracy: ± 10%
Resolution: 0.1 AU

totalHb (relative total haemoglobin concentration)
Range: 0-1000 AU
Accuracy: ± 10%
Resolution: 0.1 AU

Temperature (tissue temperature)
Range: 5-50°C
Accuracy: ± 0.3°C
Resolution: 0.1 °C

Reliability
3 year manufacturers warranty as standard.

Light Source
White light, wavelength range: 400nm-700nm
Maximum optical output power: 6mW.

SO_2 Signal Processing
Wavelength range: 500-650nm
Spectral resolution: 2nm
Integration time: 1ms-20ms auto setting, 1ms-10sec manual setting*

Outputs
LCD screen providing display of oxygen saturation SO_2, total haemoglobin and temperature (temperature enabled probes only).
USB interface for connection to PC. Data rate (for all measurement parameters): 40Hz
Analogue outputs: BNC sockets, 0-5V.
1 x SO_2, 1 x oxyHb, 1 x deoxyHb, 1 x Temperature
All outputs have independent user selectable scaling.

General
Power source: Universal voltage, 100-230V AC, 30VA, 50 to 60Hz.
Dimensions: W x H x D mm, Weight: Kg
moorVMS-OXY: 235 x 80 x 200, 1.8kg.
Operating environment: Clinic or laboratory, excluding domestic.
Operating temperature: 15-30ºC.

Classification
Medical devices directive 93/42/EEC: Class IIa, Active device for diagnosis.
LED classification: Exempt group per BS EN 62471:2008.
Type of protection against electric shock: Class I.
Degree of protection against electric shock: Type BF applied parts.
Protection against harmful ingress of water: IPX0 (not protected).
Not suitable for use in an oxygen rich atmosphere.
Not suitable for use in the presence of flammable anaesthetics.

Safety Standards
Complies with:
IEC 60601-1:2005+A1:2012, IEC 60601-1-2:2007, BS EN 62471:2008.
Medical devices directive 93/42/EEC and amendment 2007/47/EC.

Moor Instruments reserves the right to change specifications without notice.

*Feature only available whilst using the PC Windows™ software, please contact us for a demo version.

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