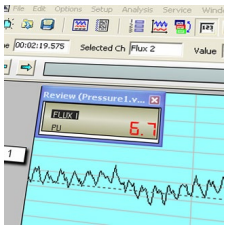
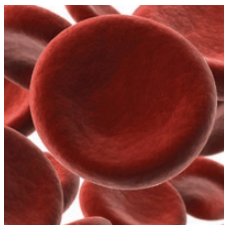
Skin heating for flexible and reproducible challenges to the microvasculature

with moorVMS-HEAT







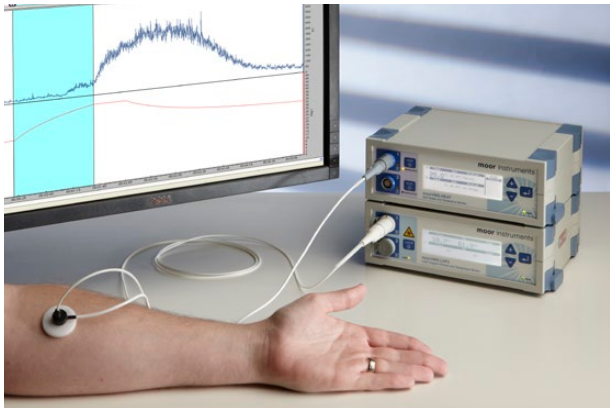


moor instruments
innovation in microvascular assessment

moorVMS-HEAT™ - Skin Heater Unit

The programmable moorVMS-HEAT™ skin heater unit provides reproducible heating of skin tissue to be used with any laser Doppler blood flow monitor, imager or tissue oxygenation monitor. It can also be used as a skin temperature monitor. Features include;

- **Dual channel:** enables simultaneous, independent heating and monitoring of two separate areas.
- **Variable heating rate:** independent channel heating rate 0.01ºC - 0.1ºC per second.
- **Stand-alone:** manual control enables operation without a separate control unit or computer.
- **Protocol control:** to enable fully reproducible procedures in your studies supported by moorVMS-PC software.
- **Measurement and analysis software package:** automated to aid generation and processing of results.
- **Factory calibrated probes:** no calibration necessary for the life time of the probes.
- **Accurate and reproducible:** heater range between 20ºC and 45ºC with 0.1ºC increments and a measurement range between 5ºC and 50ºC.
- **Multi-channel:** combine modules within the moorVMS family for a multi-channel system with software support for your ideal configuration.
- **Easily connectable:** analogue output (0-5V, BNC) and digital (USB) real time data transfer included as standard for connection to data acquisition systems.
- **Reliable:** 3 year manufacturers warranty as standard – no servicing requirement. Annual service plans extend the warranty to 5 years.



moorVMS-HEAT and moorVMS-LDF2 – setup showing skin heater and laser Doppler monitor.

Heater Probes

A range of heating and temperature probes are available, including probes for temperature sensing only. Probe dimensions can be found on the back page in the specification section.

VHP1



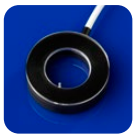
The large area heater has a 11mm active diameter that can be rotated within a special holder to allow eight perfusion measurements (indexes at 45º intervals) to be made within the heated region of skin. These can be averaged to reduce variance of the flux, resulting from the spatial heterogeneity of the skin.

VHP2



Small digit heating probe. Used with flexible probe holder to closely fit fingertip. The small digit probe, 6.5mm active diameter, is ideal for fingertip measurements or for use in conjunction with Moor Iontophoresis equipment.

VHP3

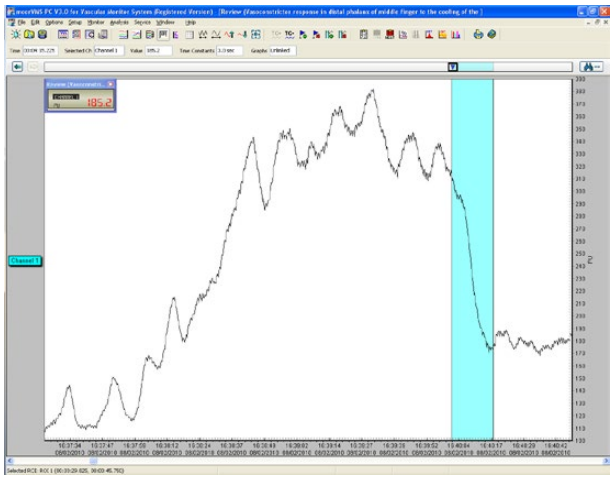


Clear heating probe to allow simultaneous laser Doppler or speckle contrast imaging of microvascular responses. Enclosed water is used as the thermal contact medium.

Applications

The moorVMS-HEAT™ is used to: -

- Standardise local skin temperature when assessing blood flow or tissue oxygenation.
- Provoke microvascular responses with reproducible thermal challenge. Variable heating rates and hold times enable flexible heating protocols.
- Assess maximal blood flow / oxygenation responses to assess reserve relative to baseline.
- Assess indirect responses to heating (flare) to assess small fibre neuropathy.
- Assess vasoconstriction when contra-lateral hand is immersed in cold water (example shown below). Vasoconstriction is absent following sympathectomy.



moorVMS-PC screen shot – laser Doppler response to local heating during contra-lateral cooling (in cold water) during blue highlighted period.

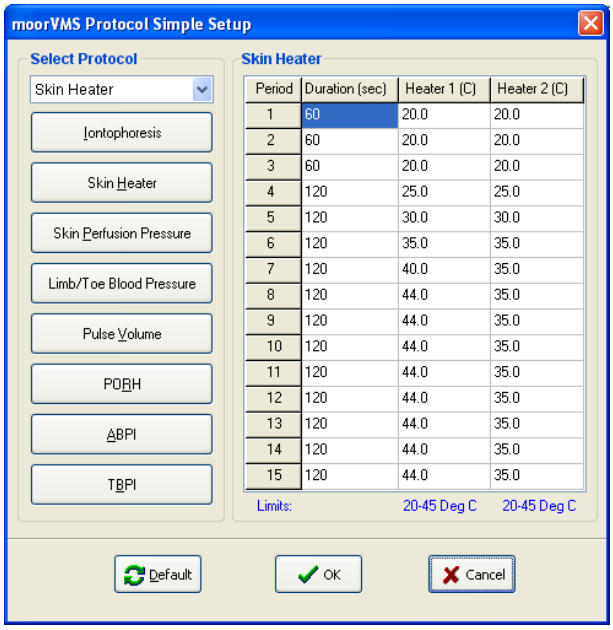
Small Fibre Neuropathy

Can be assessed by the flare response to heating (Krishnan et al). In this test the skin was heated to 44°C and the flare response was assessed by measuring the area of surrounding hyperaemia by moorLDI laser Doppler Imaging.

Critical Ischaemia

In patients with impaired capacity for vasodilation it is important to avoid rapid heating to prevent discomfort. The moorVMS-PC software enables repeatable, multi-period protocols to be executed so that skin temperature can be increased gently.

moorVMS-PC™ Software



The moorVMS-PC™ software makes protocol setup and execution simple and reproducible. The skin heating protocol can be fully customisable offering control of both the moorVMS-HEAT™ and moorVMS-LDF™. Analysis reports can be produced with a single click of a button and exported as a Adobe® PDF if required.

References

Gebuhr P, Jorgensen J P, Vollmer-Larsen B, Nielsen S L, Alsbjorn B. Estimation of Amputation Level With a Laser Doppler Flowmeter. J Bone Joint Surg (Br) 71-B; 514-7, 1989.

Rayman G, Williams SA, Spencer PD, Smaje LH, Wise PH and Tooke JE Impaired microvascular hyperaemic response to minor skin trauma in Type I diabetes. British Medical Journal 292, 1295-1298, May 1986.

Krishnan STM, Rayman G. The LDIflare: a novel test of C-fiber function demonstrates early neuropathy in type 2 diabetes. Diabetes Care. 2004 Dec;27(12):2930-5.

Sandeman DD, Pym CA, Green EM, Seamark C, Shore AC, Tooke JE Microvascular vasodilation in feet of newly diagnosed non-insulin dependent diabetic patients. British Medical Journal 302, 1122-1123, May 1991.

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-HEAT and moorVMS-OXY – setup showing skin heater and tissue oxygenation monitor.

Specifications:

Quality Control
Moor Instruments is certified to ISO 13485:2016.

Temperature measurement
Range: 5 – 50ºC.
Accuracy: VHP1 and VHP2 +/- 0.3ºC (5ºC - 50ºC).
VHP3 +/- 0.5ºC (5ºC - 50ºC).
Resolution: 0.1ºC.

Temperature control
Range: 20ºC (or ambient) - 45ºC.
Resolution: 0.1ºC .

Reliability
Assured by our three year warranty on all electronic products manufactured by Moor Instruments.

Outputs
LCD screen providing display of temperature.
USB Interface for connection to PC.
Analogue outputs: BNC sockets, 0-5V.
moorVMS-HEAT 2x temperature.

General
Power source: Universal voltage, 100-230V AC, 30VA, 50 to 60Hz.
Dimensions: W x H x D mm, Weight: Kg
moorVMS-HEAT: 235 x 80 x 200, 1.3Kg.
Operating environment: Clinic or laboratory, excluding domestic.
Operating temperature: 15-30ºC.

Safety Standards
Complies with:
IEC 60601-1:2005+A1:2012(E), EN 60601-1-2:2015.

Classification
Type of protection against electric shock: Class I.
Degree of protection against electric shock: Type BF applied parts.
Not suitable for use in an oxygen rich atmosphere.
Not suitable for use in the presence of flammable anaesthetics.

VHP1
Height: 11.5mm.
Diameter (including rotating disc): 35mm.
Heating element diameter: 11mm.
Holder fixes to tissue with double sided adhesive discs (SHAD).

VHP2
Height: 11.5mm.
Diameter: 8mm to 10mm taper.
Heating element diameter: 6.5mm.
Fixes to tissue with flexible probe holder (PH1-V2) and double sided adhesive disc (PAD).

VHP1 & VHP2 lead length 2m. Both require VP12 type needle probe for laser Doppler measurement (not included).

VHP3
Height: 8mm.
Diameter: 36mm.
Imaging window: 20mm.
Fixes to tissue with double sided foam adhesive discs (VHP-FP) or double sided adhesive discs (IAD).
Lead length: 2m.

Moor Instruments reserves the right to change specifications without notice.

This product and its accessories are not for sale for use within the EU and UK.

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