

Fiber Optic Sensors for use with Small Animals

SA Instruments offers a variety of fiber optic sensors that can be used in imaging and laboratory environments to make physiological measurements on mice, rats and larger animals. All of these sensors are compatible with MR, PET, CT, SPECT and Optical imaging systems.

The fiber optic sensors can be used in the MR environment by connecting them to modules which are optionally available for the MR-compatible Model 1025 and 1030 Small Animal Monitoring and Gating System. The sensors and associated modules are backward compatible with all existing Model 1025 systems. Simply add the option to your existing system, download new PC-sam software from the SAII website and your ready to go. Fiber optic temperature sensors can also be used in the MR environment in stand alone mode with the multi-channel Fiber Optic Temperature Module. All the sensors can be used in other imaging environments or in the laboratory by connecting them to the Multi-parameter Fiber Optic Module which is an available option for the Model 1025T and Model 1025L.

Each type of fiber optic sensor has either multiple available lengths and/or operates with optical sensor extension cables to accommodate different setups. All of the sensors have multiple attachments to accommodate different animals and/or different applications.

Sensor type	Available channels	Multiple lengths	Optical extension
Temperature	up to 4	yes	yes
Pulse Oximetry	1	yes	no
Pressure	up to 3	no	yes

Fiber Optic Temperature Sensors

Fiber optic temperature probes provide an alternative method to thermister temperature probes for measuring temperature. The fiber optic temperature probes use florescence technology to make accurate and reliable temperature measurements. Despite the fact that the probes are small, flexible and made from optical fiber, they are remarkably durable.

The fiber optic temperature probes have a tip diameter of either 0.040" OD (1 mm) or 0.120" (3 mm). Standard probe lengths are 2' and 6'. Fiber optic temperature extension cables are also available.

The primary application for the temperature probe is to measure animal core temperature rectally. However, the probes are small, flexible and can be used to measure temperature in a variety of locations. Often, especially in MR, a second temperature probe is used to monitor the ambient temperature around the animal.



Specifications

Tip OD	0.040" (1 mm) and 0.120" (3 mm)
Length	2' (0.6 m) and 6' (1.8 m)
Optical extension cable	yes
Temperature Range	20 – 60 °C
Accuracy	±0.2 °C
Response time	300 msec



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Fiber Optic Pulse Oximetry Sensors

Pulse Oximetry provides noninvasive monitoring of heart rate and arterial blood oxygen saturation. Fiber optic oximetry sensors are used to transmit pulses of red and infrared light through the animal's peripheral vascular region. Oxygen saturation is determined by measuring the differential absorption of the red and infrared light. In addition to oxygen saturation, the sensor provides the cardiac plethysmogram waveform, generates a plethysmogram gate, measures pulse distension and the animal's heart rate.

The sensor incorporates interchangeable clips and forms for attachment to the animal. Small, large and extra large clips are available. The clips are typically attached to the rat foot or the shaved mouse thigh. Other useful locations include the ankle, paw, wrist and tail. For rabbits, the ear is often the location of choice.

Mouse and rat tail/ankle forms are also available. These forms are easy to use as shaving is not required. They give especially reliable measurements from both the tail and ankle.



Specifications

Probe length	6' (1.8 m) and 10' (3.0 m)
Heart rate	40 – 700 BPM
Rate accuracy	±1.7%
SpO2 range	0 – 100%
resolution	1 count

Ultra-miniature Fiber Optic Pressure Sensors

The ultra-miniature fiber optic pressure sensors are intended for use in small infusion needles, catheters and guide wires enabling minimally invasive physiology pressure measurements.

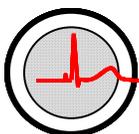
The pressure sensors can be used to measure pressure in a number of locations like the aorta, left ventricle of the heart, ventricles of the brain and in the spinal canal. However, for many users, the most exciting application is to provide minimally invasive, continuous monitoring of blood pressure and heart rate by simply inserting the sensor tip into an artery.

The pressure sensor consists of a tiny silicon cavity attached to a relatively long fiber optic cable. White light is sent via the fiber to and from the cavity. Polarization interferometer processing electronics precisely computes the Fabry-Perot cavity length and determines the corresponding pressure reading.



Specifications

Tip OD	0.012" (300 μm)	0.016" (400 μm)
Length	5' (1.5 m)	5' (1.5 m)
Optical extension cable	2' and 10'	2' and 10'
Pressure	0 – 300 mmHg	0 – 300 mmHg
Precision	±2 mmHg	±1 mmHg
Resolution	0.5 mmHg	0.2 mmHg
Thermal shift	<0.3 mmHg/°C	<0.15 mmHg/°C



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