TIVITA® Tissue System

» High Performance Hyperspectral Imaging

Continuous real-time VIS/NIR hyperspectral camera

» Data sheet

NON-INVASIVE ACQUISITION OF TISSUE OXYGENATION, NIR PERFUSION, TISSUE-HEMOGLOBIN-INDEX AND TISSUE WATER INDEX

The innovative TIVITA® Tissue System is a highly integrated, hyperspectral camera system. It enables the non-invasive acquisition of the following parameters – in real-time and above larger areas:

- Tissue Oxygenation (StO_2)
- Near Infrared (NIR) Perfusion
- Tissue-Hemoglobin-Index (THI)
- Tissue-Water-Index (TWI)

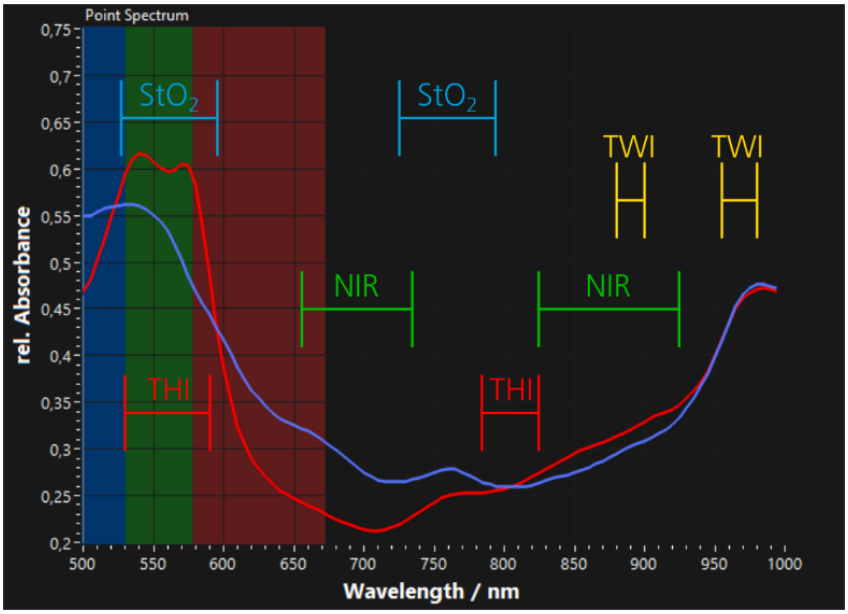

Fig. 1: Typical spectra of human tissue as recorded by the TIVITA® Tissue; red graphs: oxygenated tissue, blue graphs: deoxygenated tissue; the parameters StO_2, NIR Perfusion, THI and TWI are calculated from these spectra

The acquisition of the full spectroscopic data from the integrated absorption spectra in the range from 500 to 1000 nm only takes a few seconds.

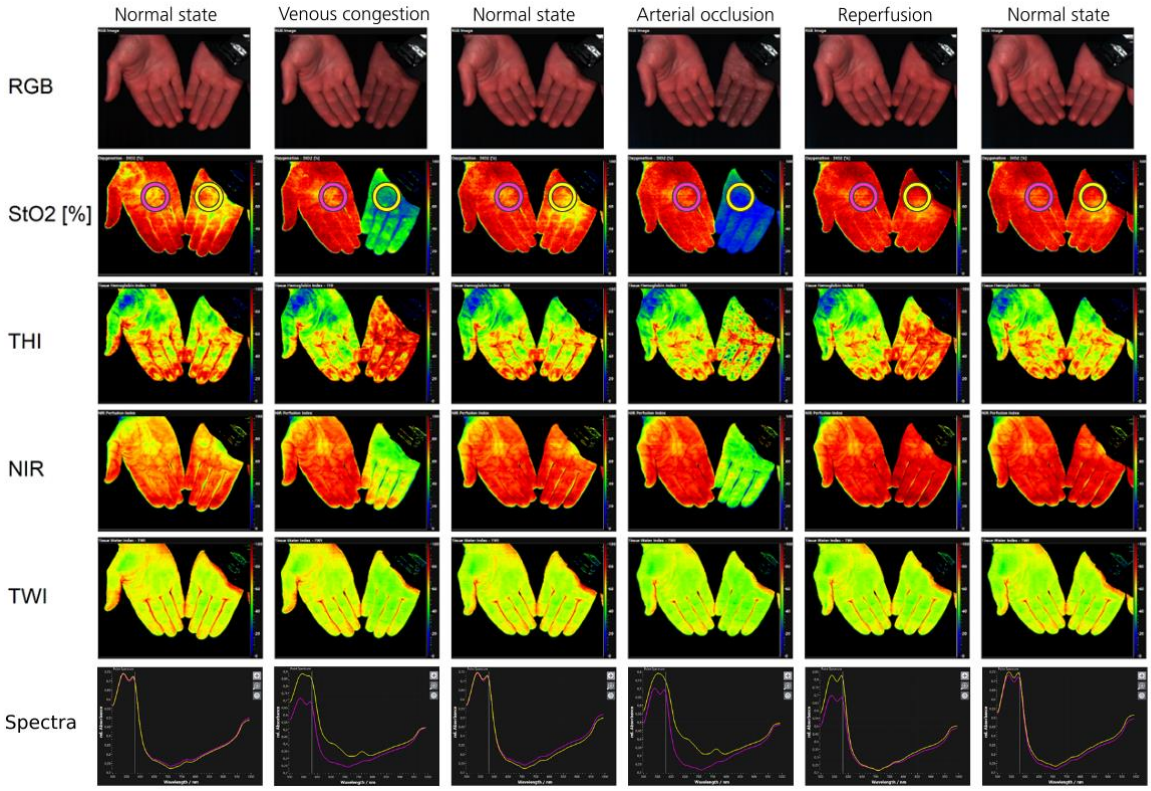

Fig. 2: Example images of an occlusion test. Images were taken during the normal state, the artificially created venous occlusion as well as arterial occlusion and reperfusion. The TIVITA® Tissue functions as an imaging tissue oximeter.

THE TIVITA® TISSUE PRODUCT LINE

Product line TIVITA® Tissue	Article number	Description
TIVITA® Tissue Camera	40-05-02-0118	Consisting of: • Hyperspectral Camera VIS/NIR • Connection cable and power supply • Incl. TIVITA® Suite core software package
TIVITA® Tissue Camera with Lighting Unit and equipment	40-05-02-0119	Consisting of: • Hyperspectral Camera VIS/NIR • Lighting Unit • Desk Mount • Lens • Connection cable and power supply • Incl. TIVITA® Suite core software package
TIVITA® Tissue System	40-05-02-0120	Consisting of: • Hyperspectral Camera VIS/NIR • Lighting Unit • Box-PC • Medical cart • Lens • Connection cable and power supply • Incl. TIVITA® Suite core software package

TIVITA® Suite – The Core Software

The TIVITA® Tissue Camera is operated with a special software: the TIVITA® Suite.

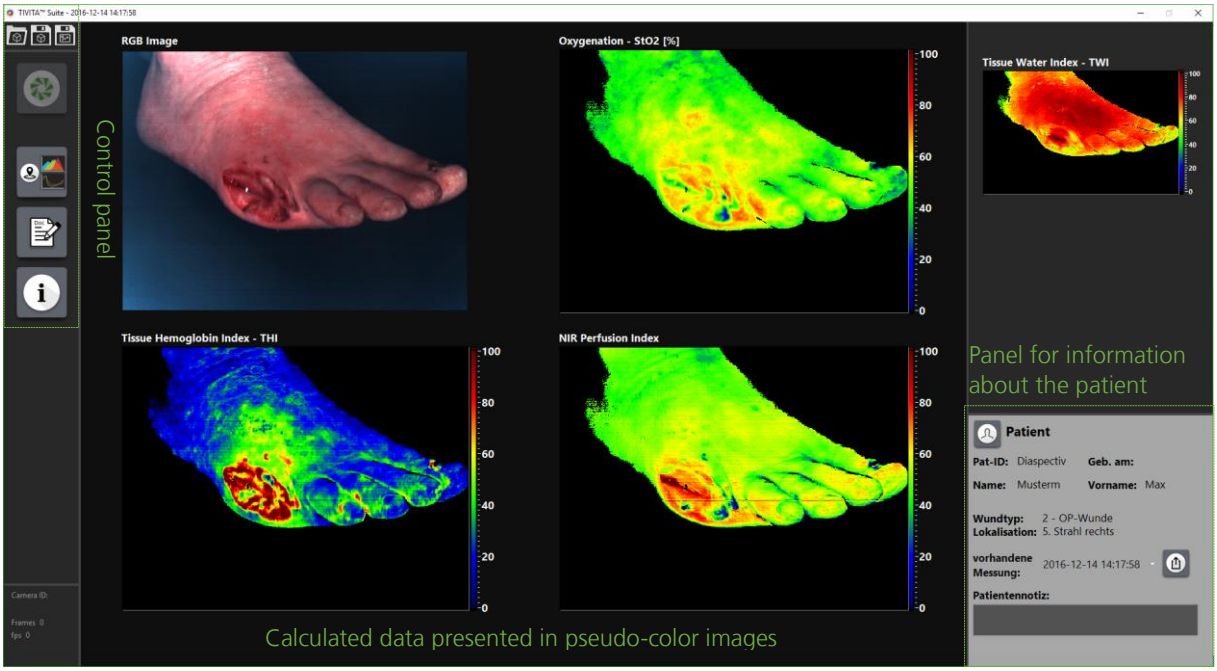

Fig. 3: Screenshot of the user interface of the TIVITA® Suite. Top left: control panel, e.g. with buttons "Record", "Documentation Tool" and "Information". Middle: pseudo-color images as calculated by the TIVITA™: parameters oxygenation (top right), THI (bottom left), NIR perfusion (bottom right) and regular RGB image (top left). Top right: further available parameter: TWI (can be relocated to the middle area via drag & drop). Left bottom: Panel for information about the patient; data input via documentation tool.

TIVITA® Tissue Camera – Overview of System Performance

Parameter	Description	Range of measured values
RGB color image	The red-green-blue color image is extracted of the recorded data and a normalized color image.	-
Oxygenation StO_2	The parameter describes the relative oxygen saturation of the blood in the microcirculary system in superficial tissue layers. The penetration depth is about 1 mm.	1 – 100 [%]
Tissue Hemoglobin Index THI	The THI describes the existing hemoglobin distribution in the microcirculary system of considered tissue area. This is an index and not an absolute value.	1 – 100
Near-infrared Perfusion Index NIR Perfusion	The parameter describes the relative oxygen saturation of the blood in microcirculary system in deeper tissue layers. The penetration depth can be 4 - 6 mm. This is an index and not an absolute value.	1 – 100
Tissue Water Index TWI	The TWI describes the existing water distribution in the considered tissue area. This is an index and not an absolute value.	1 – 100

Sophisticated and Compact – The Design of the TIVITA® Tissue

The technology of the TIVITA® Tissue is based on the principles of spectroscopy, therefore, it can be equated to an imaging spectrometer. The camera records the light which is reflected by the sample object and from the acquired wavelengths it is able to calculate the chemical composition of the object.

In the process, the visible as well as the invisible spectrum of the near infrared (NIR) range of the light is recorded by the TIVITA® Tissue.

The visible part of the spectrum serves as a means for the software to create the regular RGB image (color photography) – this image is calculated from standardized data sets, thus it is always looks the same way. A further purpose of the visible part of the spectrum is to provide information on the melanin and hemoglobin content of the tissue in the surface area. Deeper tissue layers can be analyzed with the NIR spectral range, thus revealing hemoglobin, water or fat levels in layers as deep as 6 mm.

Quick and Easy to Handle – The Measuring Process

For the measuring process, the TIVITA® Tissue is placed approx. 50 cm above the sample patient. A measurement with standard image resolution takes about 6 sec.

The data recorded by the camera is processed and provided in easy to interpret pseudo-color images. The analysis and calculation of the data takes about 15 sec.

TIVITA® Tissue Camera – Overview of System Components

Spectrograph	
Spectral range	500 – 1000 nm

Camera	
Sensor	CMOS image sensor

Power supply and connections	
Power supply	External
Supply Voltage	24 V
Power connection socket	DC connector 2.5 mm round, screwable
Networking	GigE, RJ45

Lighting Unit – Halogen [optional]	
Technology	Halogen spots, Thermic energy emission
Operation mode	automatically switching

Medical Cart [Optional]	
Dimensions (W x H x D)	56 x 150 x 73 cm
Weight	ca. 25 kg
Material	Plastic / Metal

Box-PC [optional]	
Operating system	Windows-based
Disk capacity	1 TB / 128 GB SSD
RAM	DDR4 16 GB

Mechanics	
Dimensions (L x W x H)	133 x 90 x 95 mm
Casing	Aluminum
Weight	ca. 450 g
Mounting	Adapter plate

Operating range	
Temperature – in use	0 – 30 °C
Temperature – transport	-10 – 45 °C
Temperature – long time storage	15 – 26 °C