PulsioFlex®
Patient focused flexibility

- Modular platform with intelligent visualisation for advanced patient monitoring
- Minimally invasive perioperative cardiac output trend monitoring with ProAQT®
- Enables calibrated cardiac output monitoring with PiCCO®-Module
- Continuous central venous oxygen saturation monitoring with CeVOX®
- Non-invasive liver function monitoring with LiMON®
**PulsioFlex® - Modular Platform with intelligent visualisation for advanced patient monitoring**

**PiCCO®-Technology**
- The PiCCO® Module expands your PulsioFlex® monitor to include the PiCCO®-Technology
- Enhances the accuracy and precision of haemodynamic monitoring by the innovative combination of arterial pulse contour analysis calibrated via transpulmonary thermodilution
- The precise PiCCO® parameters allow physicians to perform patient-individualised therapy with optimal use of inotropes and vasopressors
- PiCCO® enables the measurement of extravascular lung water for pulmonary oedema assessment
- Clinically proven and widely accepted minimally-invasive alternative to the pulmonary artery catheter

**CeVOX®-Technology**
- The CeVOX® Module enables the continuous monitoring of the central venous oxygen saturation (ScvO2)
- Based on fiberoptic measurement via a 2 french CeVOX® probe
- Allows tracking of early goal directed therapy effects to improve outcome
- ScvO2 is highly sensitive to tissue hypoxia and enables early indication of perfusion deficit

**ProAQT®-Technology**
- The ProAQT®-Technology is based on the PiCCO® algorithm and is fully integrated into the PulsioFlex® Monitor
- Beat to beat cardiac trend output for optimal perioperative haemodynamic management
- Works with standard arterial catheters for easy setup
- Reliable and validated interpretation of the patient’s haemodynamic status to recognise patient instability early
- Enables detection of dynamic fluid responsiveness
- Multicenter study showing reduction in complications
- ProAQT® supports manual calibration using external reference cardiac output values (e.g. echocardiography)

**LiMON®-Technology**
- The LiMON®-Module offers non-invasive global liver function monitoring by modified pulse oximetry
- LiMON® measures the plasma disappearance rate of the diagnostic drug Indocyanine Green (PDRICG)
- Supports the physician to evaluate the perioperative risk of liver resection and helps to predict outcome of ICU patients
- Significant better specificity and sensitivity than standard liver function tests

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**Pulse contour analysis (continuous)**
- Flow
- Contractility
- Organ function
- Afterload
- Volume responsiveness

**Cardiac Index (Cl), Stroke Volume Index (SVI)
Left heart contractility (dpmx)
Cardiac Power Index (CPI)
Systemic Vascular Resistance Index (SVRI)
Stroke Volume Variation (SVV), Pulse Pressure Variation (PPV)**

**Thermo-dilution (discontinuous)**
- Flow
- Preload
- Contractility
- Organ function

**Cardiac Index (tdCl), Global End-Diastolic Volume Index (GEDI)
Cardiac Function Index (CFI), Global Ejection Fraction (GEF)
Extra Vascular Lung Water Index (ELWI), Pulmonary Vascular Permeability Index (PVPi)**

**PiCCO**

**ProAQT**

**CeVOX**

**LiMON**

**O2, CeVOX**

**ProAQT**

**O2, CeVOX**

**LiMON**

**Oxygen saturation**

**Central Venous Oxygen Saturation (SvO2)**

**Arterial oxygen saturation (SpO2)**

**ICG elimination**

**Liver function**

**Plasma Disappearance Rate of Indocyanine Green (PDRICG)
ICG Retention Rate after 15 min (R15)**
**ProAQT®-Technology**

Benefits of continuous CO-trend monitoring

- Despite high standards in surgical and anaesthetic care, the perioperative mortality rate is still higher than expected (8)

Pearse R.M. et al., Lancet 2012

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**PiCCO®-Technology**

Benefits of transpulmonary thermodilution

- What is the current cardiovascular situation?
- What is the cardiac preload and afterload?
- Is the patient fluid responsive?
- Is the patient developing lung oedema?

The PiCCO®-Technology helps you to answer these questions.

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**GEDI - Global Enddiastolic Volume Index**

- The GEDI is a reliable and validated clinical parameter of preload (1)
- GEDI together with ELWI and stroke volume variation or pulse pressure variation measured by the PiCCO®-Technology is a valuable solution for your patient’s fluid management (2)
- GEDI based protocol is able to reduce length of ICU stay (3)

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**ELWI - Extravascular Lung Water Index**

- ELWI provides easy assessment of pulmonary oedema (4)
- Serves as a warning parameter for volume overload (5)
- Allows reduction in the frequency of thoracic X-rays for lung oedema quantification (6)

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**Optimized therapy in cardiac surgery patients**

- Complications reduced by 36 % (6)
- Length of ICU stay reduced by 32 % (6)

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**GDT - Goal Directed Therapy**

ProAQT® enables goal directed therapy which helps save time and money as shown by Salzwedel et al. (9)

- Supporting the optimisation of fluid resuscitation
- Decreasing postoperative complications
- Reducing infections

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**Improve outcome in major abdominal surgery**

- Complications reduced by 27.7 % (9)
- Length of ICU stay reduced by 32 % (3)

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**ProAQT® is applicable for use in:**

- Complex procedures with high risk of intra- and post-operative complications
- Anticipated high blood loss (>20%) and volume shifts during the procedure which can result in hypo- or hypervolaemia
- Long surgery time (>120min)

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**Pulmonary oedema is not easily detected by chest X-ray as demonstrated by the pictures above. ELWI is much more sensitive than chest X-ray. (7)**
Oxygen Consumption -

• If risk of hypoxia is how much oxygen is being extracted by the organs before the blood returns to the right side of the heart.

• If intermittent ScvO2, start continuous ScvO2 monitoring.

Benefits of continuous ScvO2 monitoring

CeVOX®
mixed venous oxygen saturation. Inserted via a standard CVC the fiberoptic CeVOX® probe provides an indication as to how much oxygen is being extracted by the organs before the blood returns to the right side of the heart.

- Continuously and immediately tracks therapy effects
- Traditional vital signs may be late indications of inadequate oxygen delivery to tissue
- Simplify the workflow of nursing staff
- Costs are similar to BGA measurements
- Reduce length of hospital stay

ScvO2 reflects the transportation and metabolism of oxygen. CeVOX®-Technology is a less invasive surrogate marker of mixed venous oxygen saturation. Inserted via a standard CVC the fiberoptic CeVOX® probe provides an indication as to how much oxygen is being extracted by the organs before the blood returns to the right side of the heart.

Enables Early Intervention

• Detect acute changes in systemic balance between oxygen delivery and consumption
• Traditional vital signs may be late indications of inadequate oxygen delivery to tissue
• Continuously and immediately tracks therapy effects

Reduce Complications & Mortality

• Low ScvO2 is related to an increased risk of post-operative complications in high-risk surgery
• Early goal directed therapy using ScvO2 improves outcome
• Decreases risk of infection by reducing frequency of BGA sampling
• Low ScvO2 is associated with probability of lower survival
• Identify early life-threatening decreases in systemic oxygen delivery that would not be identified by intermittent sampling

Reduce Cost

• Reduce length of hospital stay
• Costs are similar to BGA measurements
• Simplify the workflow of nursing staff

LiMON®-Technology

Benefits of non-invasive liver function monitoring

• Is the patient at risk of an existing or developing liver dysfunction?
• Is there increased risk due to affected splanchnic perfusion/microcirculation?
• Is the remaining liver function enough to tolerate liver resection?
• Is there graft dysfunction post liver transplantation?

PDRICG measurements via non-invasive LiMON® finger sensor supports physicians efficiently in a broad field of applications to answer these questions and help to choose targeted therapy.

Intensive Care

• LiMON® immediately detects liver hypoperfusion
• Superior in predicting the survival probability
• PDRICG of less than 16%/min requires intervention
• Optimised fluid therapy by LiMON® in combination with PiCCO
• Serves as an indicator of regional perfusion

Liver Transplantation

• Peri-operative evaluation of graft quality and function to reduce the probability of need for re-transplantation
• Provides a reliable indicator of graft outcome early after surgery
• Helps to identify complications prematurely

Liver Resection

• LiMON® provides decisive parameters in pre-operative risk assessment
• A low PDRICG excludes patients from major resection
• Early identification of post-operative liver dysfunction
• Offers predictive power significantly higher than conventional markers

Cardiac Surgery

• Pre-, peri- and early postoperative measurements of PDRICG can serve as a predictor of prolonged ICU treatment
• Goal-directed strategies aimed at improving the PDRICG can be considered to be undertaken in cardiac surgical patients at risk to improve outcome

Hepatology

• Valuable tool for the evaluation of prognosis in liver cirrhosis
• Enables prediction of survival in intermediate advanced liver disease
• Estimation of functional liver cell mass

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