



**Making ventilation visible**

PULMOVISTA® 500

# The PulmoVista® 500...

## The challenge of achieving lung protective ventilation

Although respiratory care has come a long way over the years, complications attributed to inappropriate settings of mechanical ventilation continue to have an adverse impact on patient outcome. Today lung protective ventilation strategies largely rely on physiological parameters which only reflect global lung function. The well known complications of atelectasis and overdistension call for insight into the distribution of ventilation in the ventral and dorsal regions of the lung so that measures can be taken to individually tailor ventilator settings<sup>1), 2), 3)</sup>. CT and chest x-rays provide regionally specific information but only as a snapshot in time. Determining how different lung regions respond to therapeutic interventions over time is challenging without continuous regional information.

### THE VISION – CONTINUOUSLY VISUALIZING VENTILATION

Dräger understands the need for continuous information about regional distribution of ventilation to be available at the bedside. Our search for a suitable solution revealed that the monitoring technique of Electrical Impedance Tomography (EIT) had the potential to address this need.

The progress of development, and results of clinical studies, confirmed that EIT provides the required information in a superior manner<sup>4), 5), 6)</sup>.

### THE METHOD – ELECTRICAL IMPEDANCE TOMOGRAPHY

EIT monitoring involves the application of a small current and measurement of resulting voltages to determine the ventilation related impedance changes that occur in a thoracic cross-section.

Advanced data acquisition techniques and sophisticated reconstruction algorithms are used to generate tomographic images and parameters which enable the assessment of regional distribution of ventilation as well as short-term changes of end-expiratory lung volume within the cross-section. This offers clinicians a new and unique perspective on respiratory care.

<sup>1)</sup> Meier T et al., Assessment of regional lung recruitment and derecruitment during a PEEP trial based on electrical impedance tomography. *Intensive Care Med* 2008; 34: 543-550

<sup>2)</sup> Putensen C., Electrical impedance tomography guided ventilation therapy, *Current Opinion in Critical Care* 2007, 13:344-350

<sup>3)</sup> Kunst P.W. et al., Monitoring of recruitment and derecruitment by electrical impedance tomography in a model of acute lung injury. *Crit Care Med* 2000; 28: 3891-3895

<sup>4)</sup> Meier T. et al., Assessment of regional lung recruitment and derecruitment during a PEEP trial based on electrical impedance tomography. *Intensive Care Med* 2008; 34: 543-550

<sup>5)</sup> Lüpschen H. et al., Protective ventilation using electrical impedance tomography, *Physiol. Meas.* 28 (2007) S247-S260

<sup>6)</sup> Riedl T. et al., Regional and overall ventilation inhomogeneities in preterm and term-born infants, *Intensive Care Med* (2009) 35:144-151

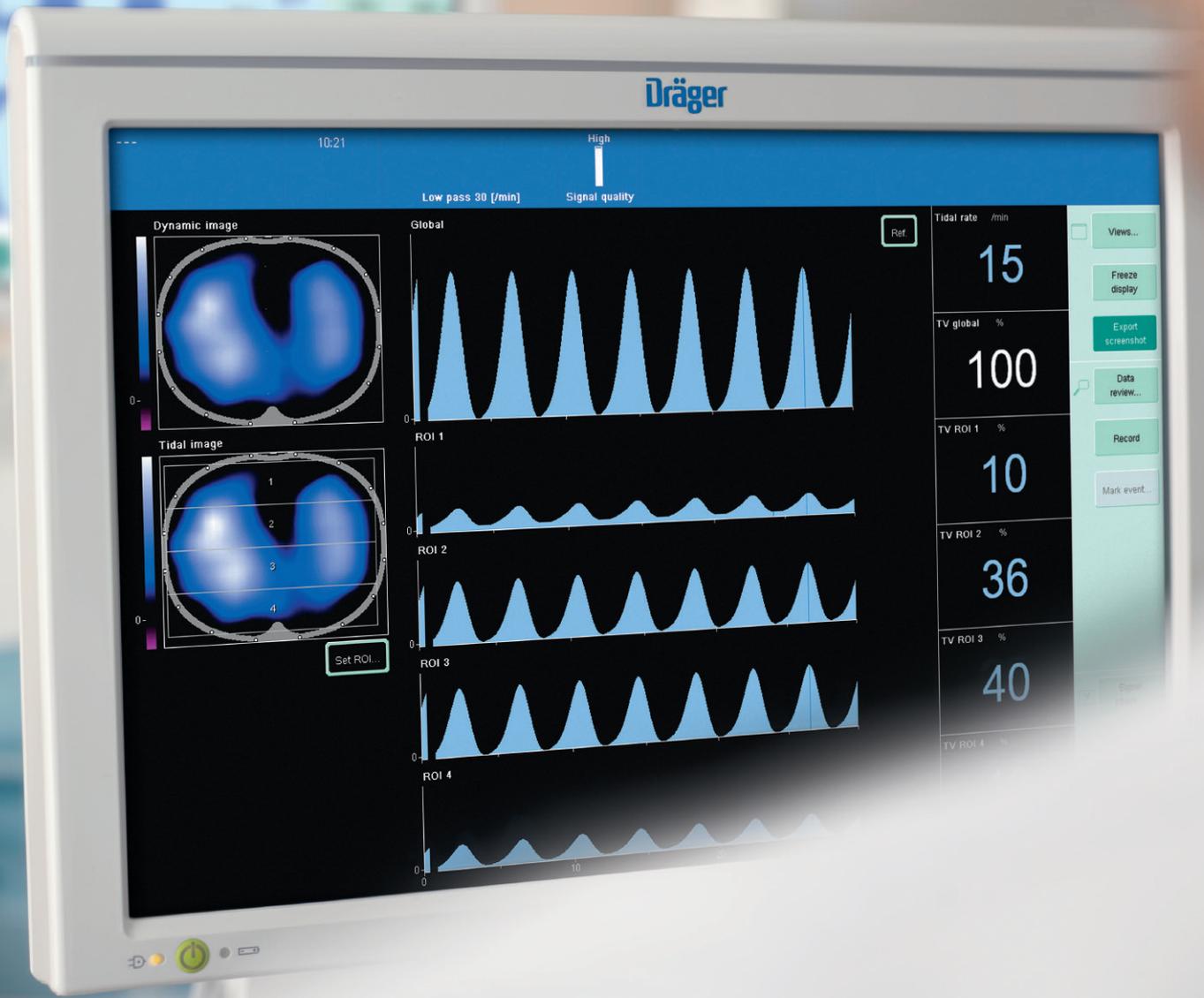
### PulmoVista® 500 offers:

- Continuous information about regional distribution of ventilation, displayed as images, waveforms and parameters
- Trend display of regional distribution of ventilation
- Trend display of changes in end-expiratory lung volume

### THE TOOL – PULMOVISTA® 500

PulmoVista 500 is an Electrical Impedance Tomograph which has been specially designed for use in clinical routine. Data is continuously displayed in the form of images, waveforms and parameters. Simply put, PulmoVista 500 lets you visualize the distribution of ventilation.





## Regionally specific information

Mechanical ventilation is commonly used as a life saving measure for patients with respiratory complications. However, mechanical ventilation may lead to lung injury and cause inflammatory responses. It is often challenging to set PEEP and tidal volume so that the well known adverse effects of mechanical ventilation are minimized.

Due to the heterogeneous properties of the injured lung, alveolar collapse and overdistension may occur in different parts of the lung. Information about the regional distribution of ventilation is valuable for the management of mechanically ventilated patients<sup>7), 8), 9)</sup>. PulmoVista 500 has been specifically designed to display and quantify regionally specific changes of air content.

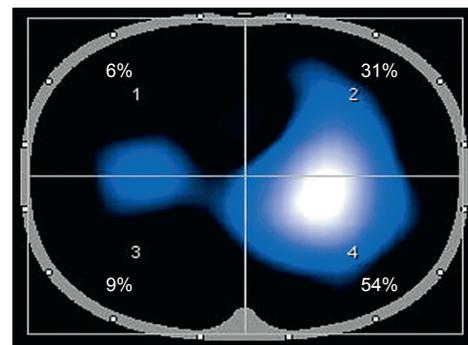
“With EIT the clinician can follow changes in distribution of ventilation over time”

(Prof. Dr. med. Dr.-Ing. Steffen Leonhardt, RWTH Aachen University, Aachen, Germany, Sep. 2009)

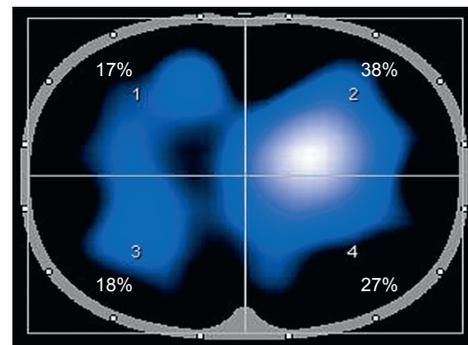
## Continuous dynamic bedside imaging

PulmoVista 500 provides continuous real-time dynamic images of ventilation and intrapulmonary air distribution at the bedside. Monitoring is possible for up to 24 hours, enabling a close watch to be kept on critical lung conditions and the effect of therapy changes. Additionally, clever use of trended information provides further insight into patient progress.

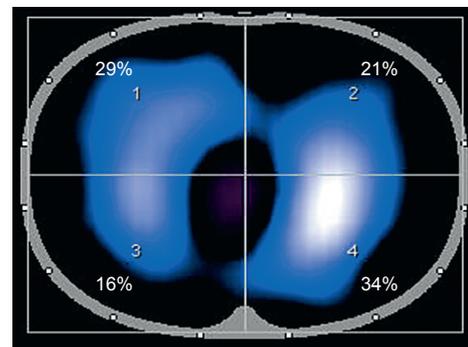
### QUANTIFICATION OF DISTRIBUTION OF VENTILATION OVER TIME



Prior to recruitment maneuver



10 mins after recruitment



4 hrs after recruitment

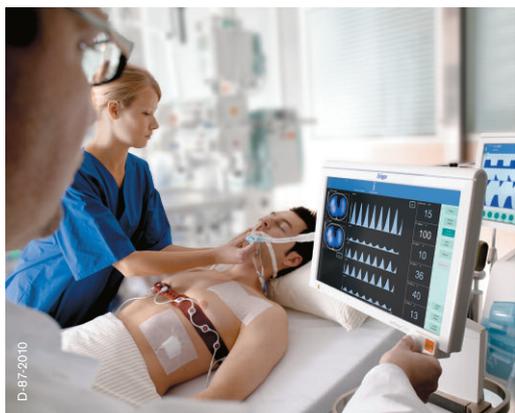
The same tidal volume setting was used pre and post recruitment.

<sup>7)</sup> Erlandson K. et al., Positive end-expiratory pressure optimization using electric impedance tomography in morbidly obese patients during laparoscopic gastric bypass surgery, *Acta Anaesthesiol Scand* 2006; 50: 833–839

<sup>8)</sup> Lindgren S. et al., Regional lung derecruitment after endotracheal suction during volume- or pressure-controlled ventilation: a study using electric impedance tomography, *Intensive Care Med* (2007) 33:172–180

<sup>9)</sup> Odenstedt H. et al., Slow moderate pressure recruitment maneuver minimizes negative circulatory and lung mechanic side effects: evaluation of recruitment maneuvers using electric impedance tomography, *Intensive Care Med* (2005) 31:1706–1714

# ...a new window to pulmonary function



D-87-2010



D-102-2010



D-28201-2009

## Non-invasive tomographic monitoring

The regional ventilation monitoring provided by PulmoVista 500 is non-invasive and without any side-effects. Unlike chest x-rays or CT, there's no ionizing radiation involved. EIT involves minimal preparation so monitoring is established in just a few minutes. Patient preparation only requires the positioning of a flexible non-adhesive belt around the patient's chest. PulmoVista 500 has been designed with the busy ICU environment in mind and does not interfere with the ICU workflow.

“EIT allows continuous quantification of changes of end-expiratory lung volume in the individual patient and at the bedside.”

(Dr. D. Gommers, vice chairman of the Adult Intensive Care Unit at Erasmus Clinical Center in Rotterdam, The Netherlands, Oct. 2009)

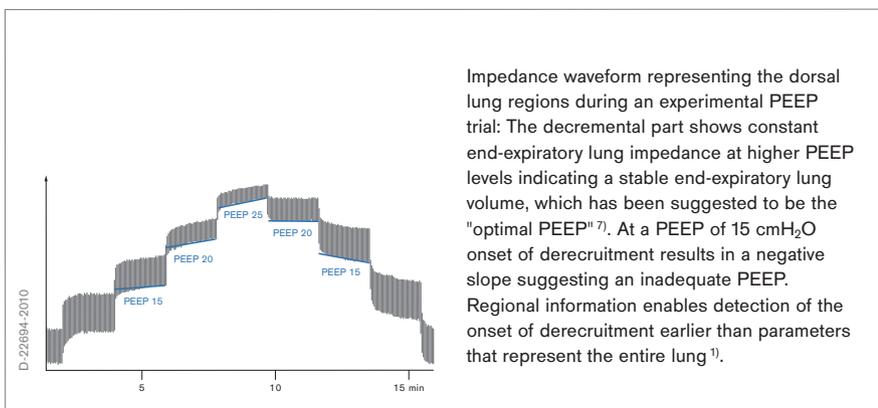
## Supporting your everyday work

PulmoVista 500 provides valuable information about the effects of:

- Endotracheal suctioning
- Tidal volume settings
- PEEP settings
- Recruitment maneuvers
- Patient positioning

“As soon as we start using EIT and get EIT information it will change our attitude towards ventilation”

(Dr. O. Stenqvist, Dept. of Anesthesia and Intensive Care, Sahlgrenska University Hospital, Göteborg, Sweden, Oct. 2009)



Seeing rather  
than assuming –  
The PulmoVista® 500

PulmoVista 500 provides new and valuable real-time information. The quantification of regional distribution of ventilation provides a new way of looking at the lung to help treat, or even prevent, atelectasis and overdistension. With insight into end-expiratory lung volume changes PEEP settings can be optimized so that lung regions remain open throughout the breath cycle which may avoid the problems associated with cyclic recruitment.

PulmoVista 500 provides a method to closely monitor the patient's lung condition and to continuously assess the effect of respiratory treatment, thus guiding a strategy of lung protective ventilation.

#### HEADQUARTERS

Drägerwerk AG & Co. KGaA  
Moislinger Allee 53-55  
23558 Lübeck, Germany

[www.draeger.com](http://www.draeger.com)

#### REGION EUROPE CENTRAL AND EUROPE NORTH

Dräger Medical GmbH  
Moislinger Allee 53-55  
23558 Lübeck, Germany  
Tel +49 451 882 0  
Fax +49 451 882 2080  
[info@draeger.com](mailto:info@draeger.com)

#### REGION EUROPE SOUTH

Dräger Médical S.A.S.  
Parc de Haute Technologie d'Antony 2  
25, rue Georges Besse  
92182 Antony Cedex, France  
Tel +33 1 46 11 56 00  
Fax +33 1 40 96 97 20  
[d1mfr-contact@draeger.com](mailto:d1mfr-contact@draeger.com)

#### REGION MIDDLE EAST, AFRICA, CENTRAL AND SOUTH AMERICA

Dräger Medical GmbH  
Branch Office Dubai  
Dubai Healthcare City  
P.O. Box 505108  
Dubai, United Arab Emirates  
Tel + 971 436 24 762  
Fax + 971 436 24 761  
[contactuae@draeger.com](mailto:contactuae@draeger.com)

#### REGION ASIA / PACIFIC

Draeger Medical South East Asia Pte Ltd  
25 International Business Park  
#04-27/29 German Centre  
Singapore 609916, Singapore  
Tel +65 6572 4388  
Fax +65 6572 4399  
[asia.pacific@draeger.com](mailto:asia.pacific@draeger.com)

#### Manufacturer:

Dräger Medical GmbH  
23542 Lübeck, Germany  
The quality management system at  
Dräger Medical GmbH is certified  
according to ISO 13485, ISO 9001  
and Annex II.3 of Directive  
93/42/EEC (Medical devices).