

ORGANIS TESTCHEST®
Flight Simulator for Intensive Care Clinicians

Critical Care challenges



Training on ventilation modes with simulation is crucial for patient safety

The equipment and devices intended for the care of critically ill patients make the ICU one of the most technologically sophisticated environment in any hospital. The aim of this technology is to facilitate everyday practice by decreasing workload but it may become a source of dilemma as it is difficult to handle and often not totally trustworthy. ICU is likely the most error prone environment in the hospital.

Mechanical Ventilation is a life-saving method used to assist the patient partially or totally regarding the severity of the respiratory failure. It is more a supportive intervention than a therapeutic one with considerable side effects and unwanted

complications if not properly and timely used ^[1]. Given the abovementioned issues, specific training of physicians and nurses on mechanical ventilation is crucial for optimal outcomes. To date, most common ways for training include animal experiments to achieve realistic physiological and pathological conditions for advanced respiratory education.

With TestChest®, Organis GmbH created an innovative full physiologic artificial lung that provides a breakthrough in mechanical ventilation training. TestChest® promotes a safe and controlled environment free from risks of the clinical environment and eliminates the necessity of training on animals.

1. Tobin, M.J., *Advances in mechanical ventilation.*
N Engl J Med, 2001. 344(26): p. 1986-96.



Respiratory Flight Simulator for Intensivists

Intuitive

The high-end lung simulator is an easy tool to use for training on ventilation management. It supports any kind of artificial respiration in anesthesia, intensive care, emergency medicine and home care.

Realistic

TestChest® combines the simplicity of a physical model with the sophistication of advanced mathematical modelling to provide a complete solution for a real patient's conditions. TestChest® is capable of replicating pulmonary mechanics, gas exchange and hemodynamic responses of healthy and pathological adult.

Self-contained

TestChest® dimensions fit on any bed and it is fully self-contained. It is a stand-alone skill training station and can be easily connected with an intubation head. The latter adds more realistic features to the respiratory simulation (NIV, intubation).

Programmable

TestChest® is programmable and can be remotely operated to simulate in an unprecedented way the evolution of diseases as well as the recovery process. It allows the operator to control respiratory rate and depth to simulate complex breathing patterns and thus allows the evaluation of specific pathological alterations.

Active Learning

TestChest® is the key to modern learning concepts like Problem Based Learning. It facilitates active application of learning concepts of care and promotes a deeper assimilation in a controlled environment.

Key features

TestChest® has unique features in terms of representing complex breathing patterns. Physiological equations realize two modes of spontaneous activity: The driving pressure (p0.1) for ventilator triggering and the loading of respiratory rate. Muscular activity, important criteria for weaning, can be easily simulated.

In contrast to mechanically lungs, TestChest® inspiratory compliance is a non-linear function that can be represented as S-shape curve. TestChest® allows the simulation of lung collapse and recruitment as well as hysteresis of the pressure-volume loop.

A variety of scenarios including ARDS, COPD and ALI are programmed for teaching.

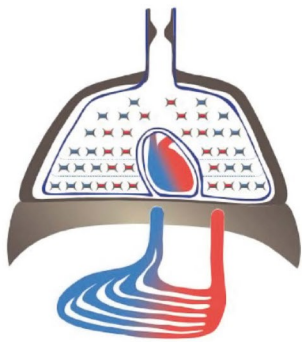
A mass flow controller for the regulation of CO₂ production as well as dead space allows the generation of realistic capnograms. TestChest® is compatible with humidified breathing gas mixtures. The internal bellows can be washed or even replaced if necessary.

TestChest® is not only limited to training as it is further intended to check the functionalities of ventilators, CPAP devices and other respiratory support devices in laboratories facilities.



An artificial finger allows the simulation of oxygen saturation (SpO₂). The variation of pulse amplitude according to different intravascular fillings allows the modeling of heart-lung interactions supporting the testing of the latest Smart ventilation modes.

Wide range of parameters and functionalities for a realistic simulation



The physiological model built into TestChest® was designed to simulate the human cardio-respiratory system for teaching and training purposes.

SETTINGS	PARAMETER	MIN	MAX	UNIT
	Chest wall Compliance	3	200	ml/mbar
	Total Compliance	8	60	ml/mbar BTPS
	Functional Residual Capacity (Predicted)	100	4000	ml
	Airway Resistance	RP5, RP20, RP50, RP200		mbar/(L/s)
	Spontaneous Breathing Activity (P0.1)	0	15	mbar/100ms
	Spontaneous Respiratory Rate	0	100	/min
	lower Inflection Point	0	100	mbar
	Upper Inflection Point	1	100	mbar
MEASUREMENTS	Functional Residual Capacity	300	4000	ml
	Alveolar Pressure	-30	75	mbar
	Airway Pressure	-250	250	mbar
	Airway Temperature	0	50	°C
	Barometric Pressure	800	1100	mbar
	End-expiratory Lung Volume	~500	4000	ml
	Tidal volume	1	2500	ml BTPS
MORE OPTIONS	CO ₂ Production	0	600	ml/min STPD
	Dead Space	small 175, medium 190, large 205		ml
	FiO ₂	0	100	vol %
	SpO ₂	50	100	%
	Pulse Rate	20	300	bpm
	Plethysmograph	-30	100	%
	Cardiac Output	500	10000	ml/min
	Shunt Fraction	0	97.5	%
	Leakage	3 leak sizes, manually adjustable		

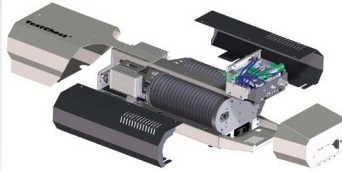
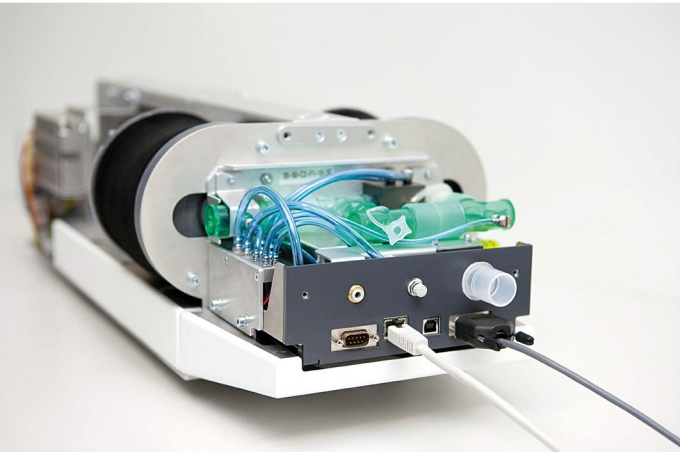
Technical Specifications

TestChest® consists of two bellows driven by a linear motor. The large volume ensures a realistic replication of vital capacity and FRC of an ICU adult patient.

TestChest® contains alveolar, airway, and ambient pressure sensors as well as a temperature sensor.

TestChest® features a detachable calibration module, which makes it accurate for years of use.

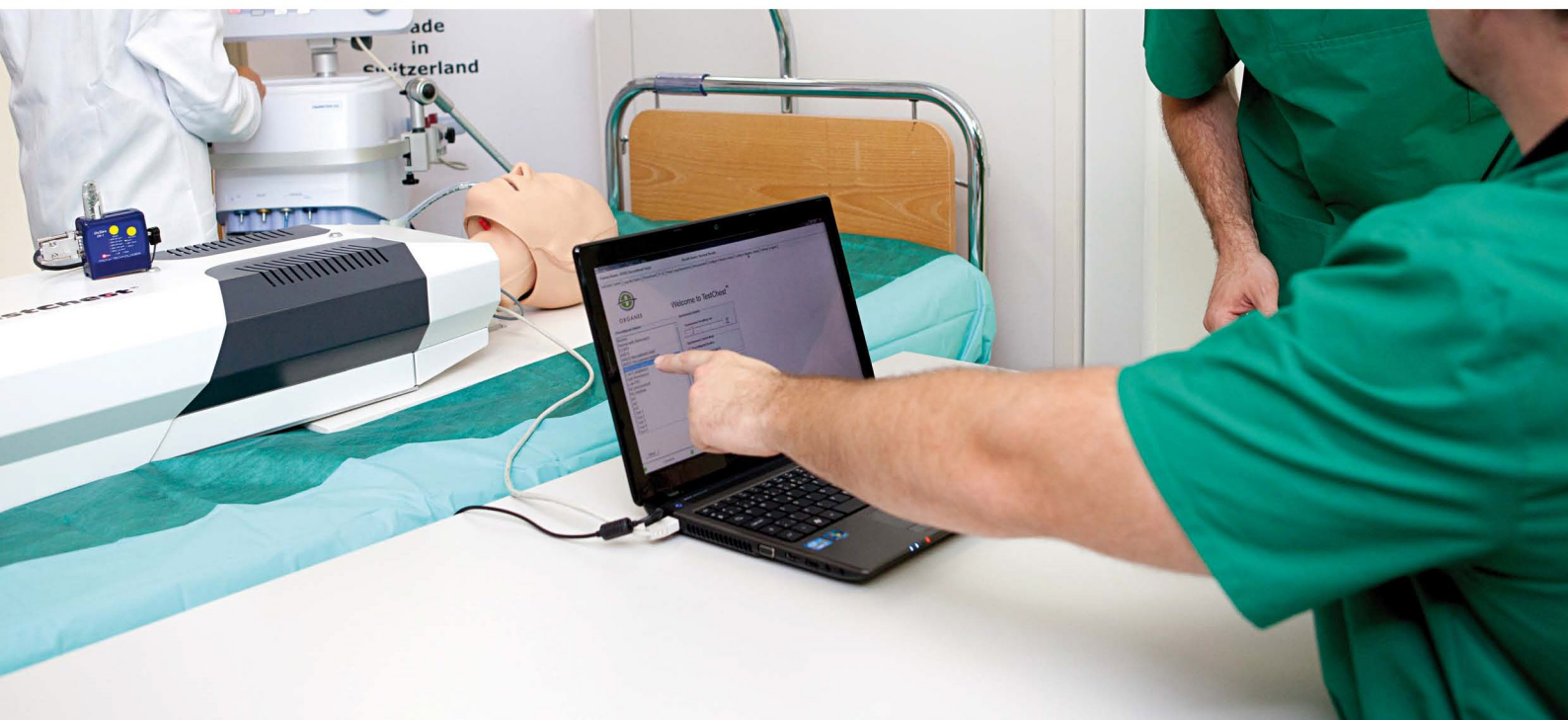
Options including intrapulmonary oxygen sensor, mass flow controller for CO2 production, pulse oximeter simulator in form of an "artificial finger", variable dead space and variable leakage are available.



TestChest® consists of three modules: Active elements, Calboard and Housing

TestChest® is loaded with highly accurate sensors which make it a reference to test ventilators, anaesthesia machines, home care ventilators, sleep apnea devices, and CPAP systems.

DIMENSIONS	PARAMETER	UNIT
	Length	685 mm
	Width	292 mm
	Height	202 mm
	Weight	16 kg
	Voltage	110/230 VAC
	Frequency	50/60 Hz
	Wattage	520 W
GAZ SUPPLY	CO2	Max. 4 bar



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