

Providing the most effective solutions
for design and use of test environments
in life science research

Anaesthesia

UNO-LIFESCIENCE.COM

General Information

The demand for anaesthesia equipment that can be used for small laboratory animals has increased substantially. Following this trend, UNO has been and still is actively involved in the design and manufacturing of complete anaesthesia systems even for the smallest animals. In addition to anaesthesia set-ups with effective evacuation of the anaesthesia gas mixture, we also have monitoring equipment available for Temperature, Capnography, Pulse Oximetry and ECG with Respiratory Monitoring available.

We aim not only to supply the products but make sure that once the products arrive at your facility, the know-how about setting up and using the system is also available! A wide range of products and services is provided to help you to obtain the most suitable set-up.

Pro's and Con's of the three most used type of anaesthesia:

Injectable agents: mostly i.p. or i.m.

- PRO's
 - + Quick and easy to apply (1 injection)
 - + Choice between many products (rat/mouse)
- CON's
 - Due to variation (male/female/breed) or calculated time for procedure, it can be necessary to re-adjust the anaesthesia
 - Injection anaesthesia is IN-FLEXIBLE;
 - extra injection agent if deeper or longer anaesthesia is required.
 - too deep/long anaesthesia when “over injected” or injecting antagonist.

Inhalation anaesthesia: face mask

- PRO's
 - + Flexible anaesthesia “depth” / better control
 - + Also for short(er) procedures
 - + Different gasses (mixtures) possible
- CON's
 - No respiratory control (or pressure control)
 - Adjusting could be relatively slow (if long tubes are used)
 - A gas exhaust system is required.

Inhalation anaesthesia: endotracheal intubation and ventilator

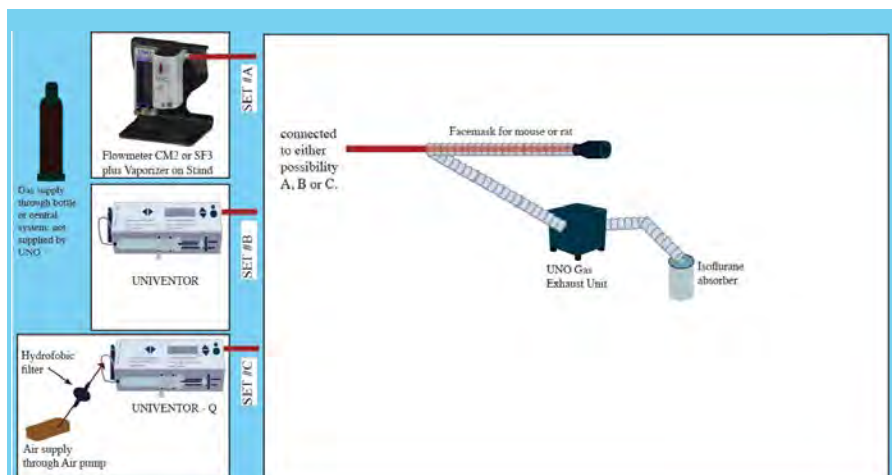
- PRO's
 - + For shorter and longer procedures
 - + Different gasses (mixtures) possible
 - + Full respiratory / -support possible
 - + Quick adjusting when using a **pressure, volume and frequency** driven ventilator.
 - + P.E.E.P. Setting possible (standard AND open thorax)
 - + Economical use of anaesthetic gasses
- CON's
 - Intubation technique is considered to be “difficult” (but with the UNO Intubation Aid it is very easy.)

On the next pages we inform you about the mostly used set-ups available for Inhalation Anaesthesia. But please keep in mind that these are just examples. A large number of adjustments are possible and available.

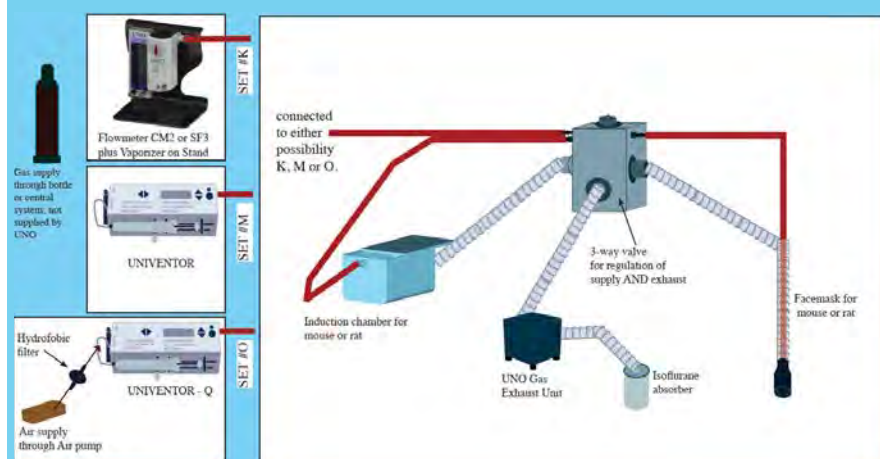
Just contact us if you need assistance determining what is needed in your facility!

General Information

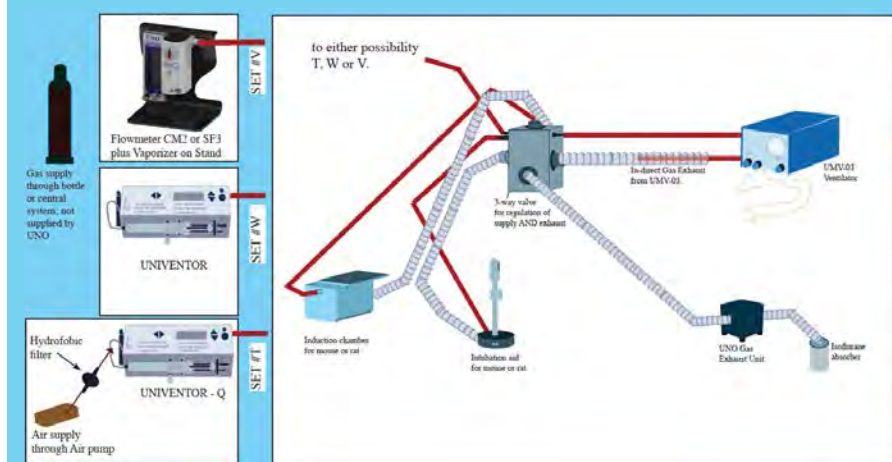
These schemes are just a sample of possible combinations of our anaesthesia products. The dimensions of the separate parts drawn, bear no relation to the real dimensions of the products.



This scheme ABC is an indication of the parts needed to achieve a complete set-up with 1 face mask and 1 gas exhaust unit.



This scheme KMO is an indication of the parts needed to achieve a complete set-up with 1 face mask, 1 induction box and 1 gas exhaust unit.



This scheme TWV is an indication of the parts needed to achieve a complete set-up for controlled anaesthesia with ventilator and intubation aid.

Vaporizers

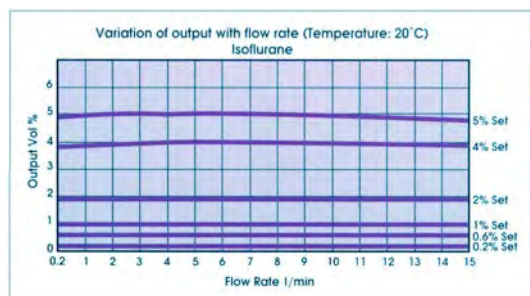
The Sigma Delta Vaporizer is the latest product from Penlon in a distinguished line of vaporizers of the highest quality and reliability. It delivers accurate concentrations under varying conditions of flow rate and temperature, **particularly at low flows**.



- Selectatec®, Dräger Plug-In®, North American Dräger, Cagemount connection
- Superb performance over a wide range of vapour concentration and temperatures, particularly at **low flows**.
- Halothane, Enflurane, Isoflurane, Sevoflurane
- Keyed Filler, Quik Fil®, or Pour fill
- Efficient Selectatec®, Dräger, and North American Dräger compatible interlock systems
- Low Body Weight

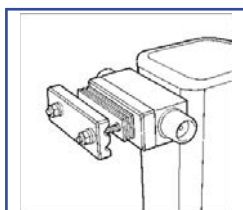
Technical Specification

Capacity (ml)	Volume at MAX Mark	240+/- 10ml
	Volume at MIN mark	35 +/- 10ml
	* After draining approx. 60 +/- 10ml of liquid is retained by the wick.	
Operating Flow range	0,2 to 15 L/min	
Operating temperature range	15 to 35°C	
Dimensions (wxdxh) in mm	Cagemount	133 x 158 x 219
	Selectatec Compatible with Interlock	120 x 190 x 242
	Dräger Plug-In compatible	100 x 190 x 242
Weight	5kg	

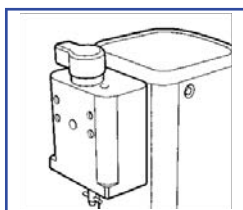


The Sigma Delta Vaporizer is available with different connection systems and gasses:

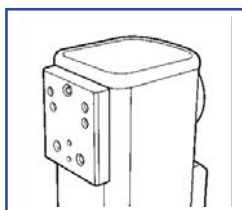
Vaporizer Type	Isoflurane		Sevoflurane			Enflurane		Halothane		
	5%		8%			5%	7%	4%	5%	8%
Filler Type	Pour	Keyed Filler	Pour	Keyed Filler	Quick Fil	Pour	Keyed Filler	Pour	Keyed Filler	
Cagemount Taper mm	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Selectatec Compatible with Interlock	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Dräger plug-In Interlock Compatible	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
North American Dräger	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Selectatec Compatible	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓



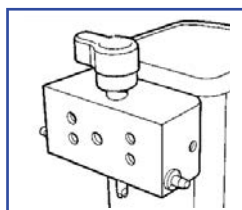
Cagemount
Taper



Dräger Plug-In
Interlock Compatible



North American
Dräger

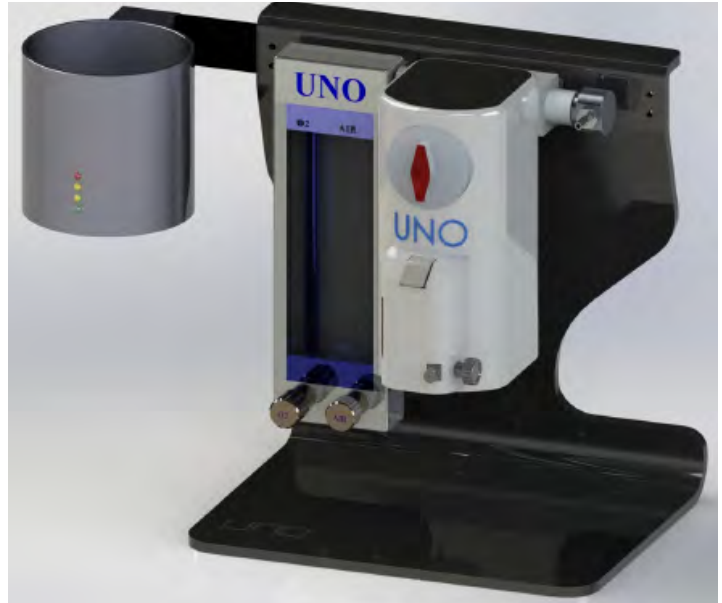


Selectatec Compatible
with Interlock

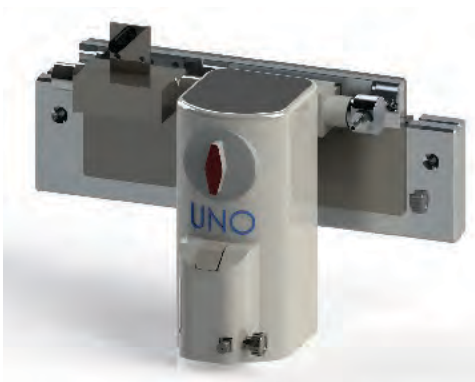
Ordering number	Product
180000002	Isoflurane vaporizer - Cagemount Taper
180000072	Sevoflurane vaporizer - Cagemount Taper
180000010	Key- Filler - Isoflurane
180000010-S	Key- Filler - Sevoflurane
180000005	ISO connector 23mm

Stands and Trolleys

Our standard **Stand** for mounting the vaporizer and flowmeter is made from black anodised aluminum. Ordering Number: 180000206
Optionally it is available with a holder for the LED holder of the Contrafluran Adsorption filter.



A number of custommade mounts are available as well, like Trolleys or mounts to hang the vaporizer and flowmeter on the wall. Please, contact us if you have specific requirements.



Vaporizers

The UNO300VAP has been developed specially for the animal research market and has better accuracy for use with small laboratory animals like mouse, rat etc.



The UNO₃₀₀ VAP is calibrated at 22°C +/- 1°C using an air carrier gas at a flow of 1 litres/minute. The variation in output with temperature, flow rate and duration of use, is small, and the variation of output when used with intermittent Positive Pressure Ventilation is negligible.

The output of the vaporiser is affected by barometric pressure, and it may be necessary to use a correction factor when analysing the output, especially at high altitudes > 1500 metre. The barometric pressure is normally not of clinical significance.

Liquid Capacity

Amount of anaesthetic agent to fully charge the vaporiser from empty is 340ml (dry wick) and 300ml (moist wick).

Amount at min.level (lower ▼) is 80ml.

Flow rate

The UNO₃₀₀ VAP is compatible with Gas Flow of 0,2 to 15 litres/minute. Flow outside this range may affect the performance.

Temperature range.

The UNO₃₀₀ VAP is designed to operate at temperatures between 10°C and 40°C.

The UNO₃₀₀ VAP storage temperature range is -20°C and +60°C.

Note: The UNO₃₀₀ VAP packaging must be protected from condensation.

Performance.

The UNO₃₀₀ VAP is calibrated at 1 Litres/min with Oxygen.

Technical Specification

Concentration Range:	Isoflurane/Enflurane: 0 ~ 5%, Sevoflurane: 08%	
Mounting Type:	Cagemount (ISO 23mm tapers) or Selectatec	
Filler Type:	Quick-Fill	
Filling Volume for Agent	340ml (Dry wick), 300ml (moist wick)	
Temperature range	+ 10°C - 40°C	during operations
	- 20°C - +60°C	during storage
Accuracy	Accuracy range of concentration	
	Operational environment	Concentration
		concentration value <6% concentration value ≥ 6%
	0,2 - 10L/min & 10°C -40°C	+30% or -20% from setting or +7,5% or -5% maximum setting whichever is greater.
	10-15L/min	+30% or -20% from setting or +7,5% or -5% maximum setting whichever is greater N/A
Flow	0,2 - 15L/Min	during operations

This new and accurate vaporiser has for all models, the Easy-fill system for your safety!

This system has the advantage that both the Easy-fill bottle adaptor and the filling socket of the vaporiser have a shut off valve.

By pushing the Easy-fill adaptor into the filler socket of the vaporiser, both valves open and only then the Isoflurane (or...) can flow into the reservoir of the vaporiser. **A more SAFE system is currently not available.**



Ordering number	Product
180000304	Isoflurane vaporizer - UNO300VAP
180000303	Isoflurane vaporizer - UNO300VAP Selectatec
180000305	Sevoflurane vaporizer - UNO300VAP
180000307	Sevoflurane vaporizer - UNO300VAP Selectatec
180000313	Compatibility Block / selectatec Backbar
180000323	Easy fill adaptor
180000005	ISO connector 23mm

Stands and Trolleys

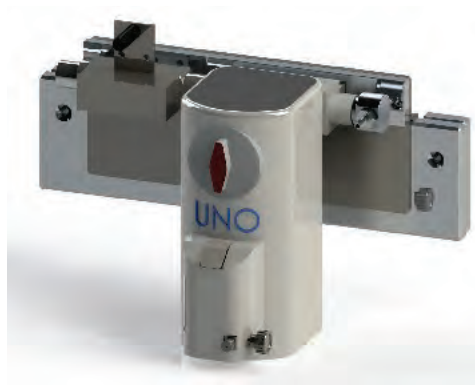
Our **Stand** for mounting the UNO300VAP vaporizer and flowmeter is made from black anodised aluminum.

Ordering Number: 180000606

Optionally it is available with a holder for the LED holder of the Contrafluran Adsorption filter.



A number of custommade mounts are available as well, like Trolleys or mounts to hang the vaporizer and flowmeter on the wall. Please, contact us if you have specific requirements.



Univentor ; digital controlled anaesthesia unit - combined Flowmeter and Vaporizer

- Designed for small rodents
- Precise control of anaesthetic and air
- Minimised anaesthetic consumption
- Air flow from 50 ml/min up to 999 ml/min
- Connects to mask, anaesthetic chamber or ventilator
- Pre-calibrated for Isoflurane
- Very small foot print and no fixed installation
- User, Animal and Environment friendly
- Audible alarm as end of syringe approaches
- Pusher reverses automatically when syringe is empty
- Easy to use



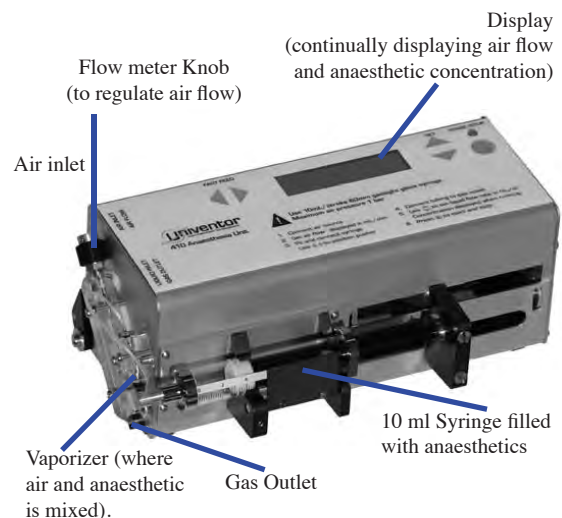
The Univentor 410 Anaesthesia Unit is designed to control the mixture of liquid anaesthetic and air with the precision required to successfully operate on animals weighing from 20-500 grams.

The Univentor 410 is designed to operate with compressed air **reduced to not more than 1 bar** whereas the Univentor 410-Q has been adapted to work with a pulse-free airpump. Air and anaesthetic is mixed in the vaporizer according to the setting and may be delivered into an anaesthetised box, through a mask or to a ventilator.

Even though pre-calibrated for Isoflurane, other anaesthetics may be used taking the various properties into consideration that the unit is calibrated for Isoflurane.

Technical Specification

Dimensions	120 (W) x 285 (L) x 95 (H)mm	
Weight	1,8 kg	
Power supply	110-240 V, AC 50-60Hz, Battery 12V, 400mA	
Drive motor	Pulse free DC Motor with variable speed setting	
Fast feed	Pusher movements of 45 mm/min	
Pusher Movement tolerance	± 0,1mm or ± 1% of total distance	
Max. Pusher Force	100 N	
Concentration tolerance	± 0,15% if displayed value	
Syringes	1 glass, gas-tight 10ml syringe with 60mm stroke	
Display	2 x 16 characters	
Safety features	Audible alarm and red LED	
Min. Liquid Flow rate	0,4 ml/ hr	
Max. Liquid Flow rate	10 ml/ hr	
Min. Air Flow rate	50 ml/ min	
Max. Air Flow rate	999 ml/ min.	
	Univentor 410 - Q	Univentor 410
Min. Air Pressure	0,3 bar	0,5 bar
Max. Air Pressure	0,5 bar	1,0 bar



When using the Univentor 410-Q you need to have a hydrofobic filter between the pump and the Univentor!



Ordering number	Product
180000211 Q	Univentor 410-Q
180000211	Univentor 410
180000011-S	Replacement Glass Syringe
180000082	Pulse free Air Pump
180000080	Hydrofobic filter

The flowmeters type SF1, CM2 and SF3 are devices for the supply of medical gases with antistatic and graduated measure tubes and complete with a dosage unit. The body is made of anodized aluminium and the inlet connection at the bottom of the flowmeter is arranged to be connected to existing circuits of gases centralized feeding or to the cylinders complete with pressure regulators. At the outlet of the dosage unit, an anaesthesia vaporizer can be connected or the gas mixture can be supplied directly to the animal through the gas feeding unit. Different constructions can be made on request.



	SF1		CM2		SF3	
Ordering Code						
Dimensions						
Height	300 mm		300 mm		300 mm	
Width	73 mm		113 mm		132 mm	
Depth	117 mm		117 mm		113 mm	
Weight	1,00 Kg		1,45 Kg		1,9 Kg	
Dosage Range	O ₂	0,1 - 1 L/min	O ₂	0,1 - 2L / min	O ₂	0,1 - 1L / min
			Air	0,1 - 2L / min	Air	0,2- 15L / min
					N ₂ O	0,1 - 1L / min
Alternative dosage ranges	O ₂	0,1-8 L/min and 0,2 - 15L/min			O ₂	0,1-8 L/min and 0,2 - 15L/min
					N ₂ O	0,1 -12L/min
Accuracy	± 10% read value or ± 0,3 L/min.					
Inlet pressures	3,5 - 5 bar ± 20%					
Charge loss level, side under pressure (before the adjusting needle valve)	Less than 25ml/min in normal pressure conditions (ISO 5358)					
Charge loss level, low pressure side (after the adjusting needle valves, vaporizer excluded)	Less than 25ml/min. at 30cm H ₂ O.					
Gas Outlet connection	Connical connection* 23 mm F ISO DIN 5356/1		---		---	



*
Connical connection 23mm,
F ISO DIN 5356/1
Ordering code: 180000005

Induction Box

The UNO Induction Box combined with the UNO Gas Exhaust Unit can be used for inducing inhalation anaesthesia with rats and mice. (An anaesthetic gas mixture from a flowmeter/vaporizer should be available.)



The Induction Box is made in 10mm thick red acrylic with an inlet hose connector at bottom level and at the opposite side an outlet $\varnothing 23\text{mm}$ (at the level of the lid).

The special designed lid can be opened by vertical sliding the lid of the Induction Box. When the Induction Box is connected to the UNO Gas Exhaust Unit and the lid is closed, very little air (anaesthetic gas mixture) is being exhausted from the Induction Box because of a relatively high internal resistance. Therefore the animal is optimally exposed to the anaesthetic gas mixture.

As soon as the animal is anaesthetized, the lid of the Induction Box can be slightly slid open. By sliding the lid only a little bit open ($\leq 10\text{mm}$), the internal resistance has gone and the UNO Gas Exhaust Unit is immediately exhausting at maximum capacity, thus preventing the anaesthetic gas mixture to escape from the Induction Box into the room/working area. The Induction Box is thus rapidly emptied from the anaesthetic gas mixture (10 - 15 seconds /mouse and ± 20 seconds / rat) and the lid can be taken off to get the anaesthetized animal (mouse or rat) out.

Finally it can be mentioned that the UNO Gas Exhaust Unit can also be connected to an Active Charcoal Filter (for adsorbing the isoflurane) or to an appropriate “in-house” exhaust system.

Ordering number	Product	Internal Dimensions (L x W x H)	External Dimensions (L x W x H)	Connection Supply hose	Connection Exhaust hose
180000232	Induction box for mouse	150 x 100 x 70mm	170 x 120 x 95mm	$\varnothing 5,4\text{mm}$	$\varnothing 23\text{mm}$
180000233	Induction box for rat	250 x 130 x 90mm	270 x 150 x 115mm	$\varnothing 5,4\text{mm}$	$\varnothing 23\text{mm}$
on request	Induction box for rabbit	410 x 205 x 268mm	430 x 225 x 293mm	$\varnothing 5,4\text{mm}$	$\varnothing 23\text{mm}$





This **OPEN INDUCTION BOX** is meant to be used for situations where a lot of animals have to be treated or handled for a short procedure (blood – or tissue sampling or other short procedures).

The upper part of the OPEN INDUCTION BOX is double walled with holes on the inside and the exhaust tube connections on the outside. The 3 tubes are brought together and all connected to the Exhaust Unit.

When the Exhaust Unit is turned on, an underpressure is created in the double wall.

The continuous anaesthetic gas mixture from a Flowmeter / Vaporizer combination enters the lower end of the round Open Induction Box just below the perforated s.s. floor on which the animals are placed.

The gas mixture slowly goes through the perforated floor and stays low because the gas mixture is heavier than air. Of course after building up more volume of the gas mixture, the level rises and finally will be exhausted through the double wall part where the underpressure is.

There is only one important matter: the mouse has to be placed in / taken out **WITH A SLOW MOVEMENT** in order to prevent too much turbulence.

Ordering number	Product	Internal Dimensions (Ø x H)	External Dimensions (Ø x H)	Connection Supply hose	Connection Exhaust hose
180000235	Induction box - Open	120 x 140mm	150 x 259mm	ø 23mm	ø 6mm

Face Masks

For inhalation anaesthesia without respiration support, UNO has Face masks available;

All models are to be connected to a supply system for an anaesthetic gasmixture (like vaporizer and flow-meter or univentor). The second connection is to a gas exhaust system which safely removes the exhaled/ non used anaesthetic gasses; like the UNO Gas Exhaust unit. The face masks are supplied with extendable exhasut tubes. (40cm - 120cm length).

Face mask for mouse.

- with small nose “cone” specially designed for use with mice
- excellent gas exhaust*
- good cleanability

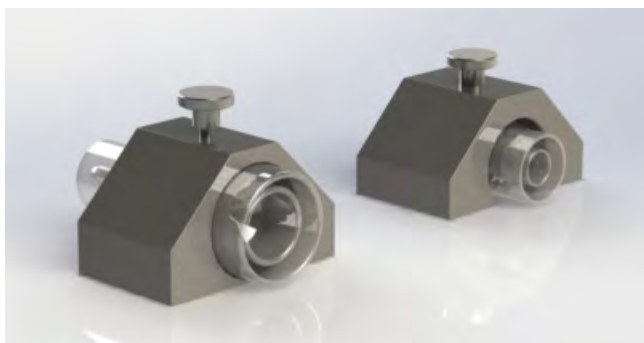


Face mask for rat.

- with larger nose “cone”
- to be used with rats (and mice depending on type of operation)*.
- gas exhaust and cleanability as for the mouse face mask.

* in combination with the UNO Gas Exhaust Unit.

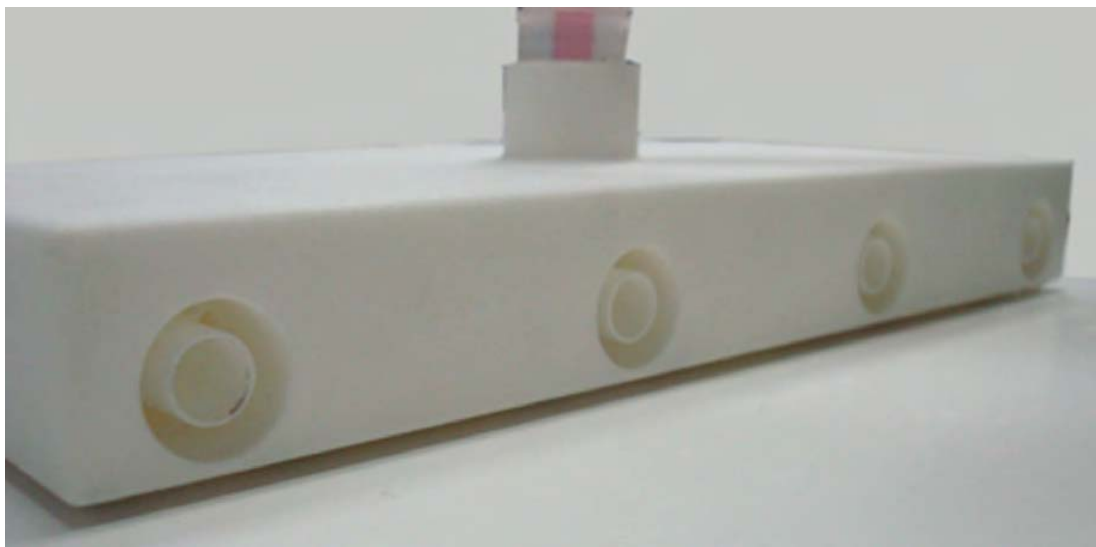
Ordering number	Product	Details
180000265	Face mask Mouse	ID Supply: ø 10mm ID Exhaust: ø 20mm Overall dimensions: 60,5 x 28 x 25,25mm Connection Supply hose: ø 4mm Connection Exhaust hose: ø 22mm
180000237	Face mask Rat	ID Supply: ø 19mm ID Exhaust: ø 29mm Overall dimensions: 81 x 33 x 33mm Connection Supply hose: ø 4mm Connection Exhaust hose: ø 22mm



Fixator for face masks

The face masks are shaped with a flat bottom but sometimes you want to have it secured to a certain place. For this fixators are available.

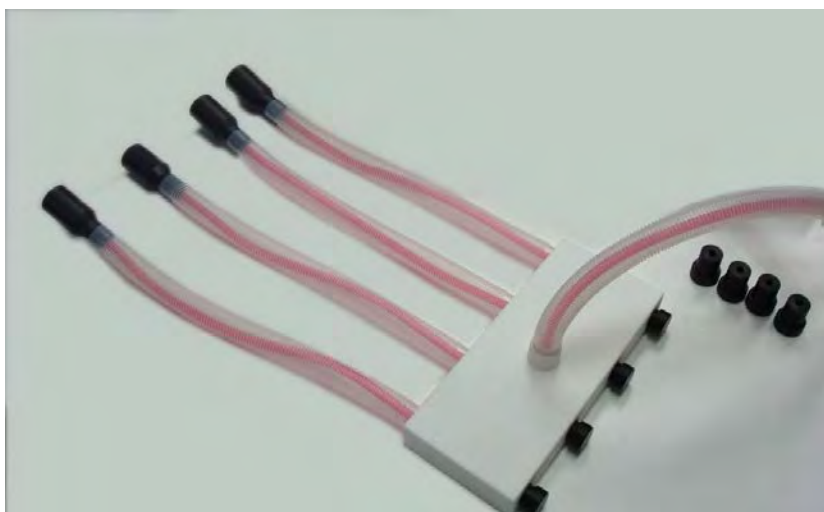
- made in Stainless Steel
- to keep the face mask in place, f.i. on a heating plate.



Multi Face Mask.

- Allows to have 4 mice kept under anaesthesia simultaneously.
- Each mouse is placed with its snout directly into the face mask*¹.
- The multi face mask is delivered with stoppers that can seal the cones shut.
- On the opposite of the openings for the mouse, the Multi facemask has four (4) connections for face masks with tubing. Thus making it possible to connect 3 Rat face Masks with tubing. It is also possible to have 4 facemasks for Mouse connected if you want to place the animals a bit further apart from each other.

Ordering number	Product	Details
180000136	Multi face mask	ID Supply: ø 10mm ID Exhaust: ø 20mm Overall dimensions: 264 x 115,5 x 33mm Connection Supply hose: ø 4mm Connection Exhaust hose: ø 22mm
180000136R	Multi face Mask - extended for 3 rats	See Multi face mask plus 3 facemask rat
180000136M	Multi face Mask - extended for 4 mice	See Multi face mask plus 4 facemask mouse



A face mask for rabbit is also available on request.



The UNO Scavenging Unit with integrated Weighing Mechanism can be used for safe direct-exhaust of waste anaesthetic- and exhaled gas while using Face Masks or Induction Boxes for rat and mouse.

Further the UNO Scavenging Unit with integrated Weighing Mechanism can be used for the indirect-exhaust of the excessive anaesthetic gas from the circle system of f.i. the UNO Micro Ventilator (UMV) at various volume- and pressure settings of the UNO Micro Ventilator - UMV-03.

Features:

- Adjustable scavenging capacity.
- To be used with the UNO ActiSorb filter
- Takes the weight of the Actisorb filter at the beginning and at the end when the scavenging motor is not running.
- To prevent influencing the weight of the filter, the weighing mechanism stops when the scavenging motor is active.
- Visual and audible alarm when the filter has reached its maximum adsorption capacity.
- The filter adsorption capacity has reached when the weight has increased 200 grams from before first use.

UNO ACTISORB - FILTER

The UNO ACTISORB Anaesthetic* Gas Filter consists of small grain activated charcoal for optimal adsorption of anaesthetic gasses.

* Isoflurane, Halothane or Sevoflurane.



- A disposable canister, containing activated charcoal.
- The UNO ACTISORB filter is suitable for Animal Anaesthesia gas removal.
- The charcoal absorbs organic anaesthetic gasses e.g. Sevoflurane, Isoflurane and Halothane.
- The canisters can be used in combination with the UNO Gas Exhaust Unit and the large filter is also to be combined with the Scavenger Unit on the previous page.
- Sold in boxes of 6 pieces.
- The 180000251 - standard canister can be used until the weight has increased by 200grams.
- The 180000252 - mini canister can be used until the weight has increased by 50grams.

Ordering number	Product
180000250	UNO Scavenging Unit with integrated Weighing Mechanisme and 1 box with 6 UNO ActiSorb.
180000251	UNO ActisSorb Filters - box of 6 pcs
180000252	UNO ActisSorb MINI Filters - box of 6 pcs

The UNO Gas Exhaust Unit can be used for the direct-exhaust of waste anaesthetic- and exhaled gas while using Face Masks or Induction Boxes for rat and mouse.

Further the UNO Gas Exhaust Unit can be used for the **indirect-exhaust** of the excessive anaesthetic gas from the circle system of f.i. the UNO Micro Ventilator (UMV) at various volume- and pressure settings of the UNO Micro Ventilator - UMV-03.



In order not to spill the anaesthetic gas mixtures into the working area, and for good functioning of the Gas Exhaust Unit, the supply of the gas mixture to the Face Masks should be set at a maximum of:

- **Face Mask - rat:** - ± 350 ml/min*
- **Face Mask - mouse:** - ± 260 ml/min**
- **UNO Micro Ventilator UMV-03**

The supply of the anaesthetic gas mixture to the UNO Micro Ventilator (UMV) is set at a lower level than the Face Mask, because with the use of the UMV and the correct size intubation tube, there is only little waste of anaesthetic gas mixture***

- * **Face Mask Rat:**
- tidal volume: ca. 2,5ml
 - breathing frequency during anaesthesia: ± 60 -70/min
 - total breathing volume / min: 150 - 175 ml/min
 - not all gas supplied is "used" by the rat and as a rule of thumb, the gas supply to the Face Mask is about twice the breathing volume/min, i.e. 300-350ml/min.

- ** **Face Mask Mouse:**
- tidal volume: ≤ 1 ml
 - breathing frequency during anaesthesia: ± 110 - 130/min
 - total breathing volume / min: 110 - 130 ml/min
 - not all gas supplied is "used" by the mouse and as a rule of thumb, the gas supply to the Face Mask is about twice the breathing volume/min, i.e. 220 - 260 ml/min.

- *** **Ventilator UMV-03**
- The supply of the anaesthetic gas mixture to the UMV-03 is set at a lower level than the Face Mask rat or mouse because with the UMV-03 there is only little waste of the anaesthetic gas mixture. It should be slightly higher than the total breathing volume mentioned under Face Mask Rat and Face Mask Mouse plus some extra for maintaining a P.E.E.P. during the ventilation:
 - Rat 250 - 300
 - Mouse 200 - 230

Ordering number	
180000118	Gas Exhaust Unit
Dimensions	
Weight	
Power	
Inlet Connection	\varnothing 23mm
Outlet Connection	\varnothing 23mm

Adsorption Filters

ACTISORB - FILTER

The ACTISORB Anaesthetic* Gas Filter consists of small grain activated charcoal for optimal adsorption of anaesthetic gasses. * Isoflurane, Halothane or Sevoflurane.



- The ACTISORB filter is suitable for Animal Anaesthesia gas removal.
- A disposable canister, containing activated charcoal.
- The ACTISORB canister can be connected directly to the scavenging tubing (f.i. UNO Gas Exhaust Unit).
- The charcoal adsorbs organic anaesthetic gasses e.g. Sevoflurane, Isoflurane and Halothane.
- The weight of the canister must be monitored so that it can be replaced before it becomes saturated, once saturated any waste gasses will simply be exhausted into the working environment.



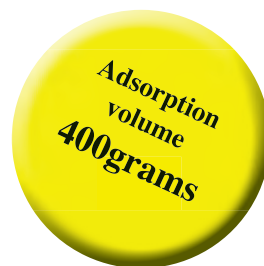
CONTRAfluran™- FILTER



The patented Contrafluran™ Anaesthetic Gas* Scavenging Filter consists of solid materials, distinguished by their rugged grain structure, extensive surface area and high micro-porosity.

This highly porous internal structure adsorbs efficiently and retains anaesthetic gas components selectively from the exhaled- or un-used anaesthetic gas as it passes through the filter.

The storage capacity of the CONTRAfluran Anaesthetic Gas Scavenging Filter is ca. 400gr and the flow resistance is with a $\leq 1,5\text{mm wc}$, **VERY LOW!**



The filter can easily be attached to the flowmeter/vaporizer stand or on a separate rail, with the help of the SENSOfluran™, a mount integrated with a visual FILL-LEVEL-CONTROL-UNIT*.

The differently colored LEDs (green, yellow, red) of the Sensofluran Mount indicate the quality of the filtered expired gas and thus the fill level of the filter.



● LED;

The filter adsorbs the expired gas and has still sufficient free capacity.

● LED:

The capacity of the filter diminishes. A filter change is recommended when the second yellow LED lights up.

● LED:

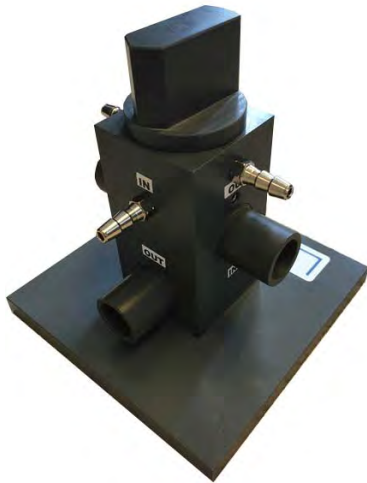
The capacity of the filter is exhausted and should not be used anymore. The used filter must be replaced by a new one.

Ordering number	Product	Weight	Storage Capacity
180000140	UNO Sorb Filter	approx. 1.200gr	approx. 200gr
180000138	Contraflurane Filter	approx. 1.000gr	approx. 400gr
180000139	LED holder for contraflurane filter		

* Due to legal reasons the device must be sent to UNO in a period of 12 months for calibration.

Double 3- and 4-way valves.

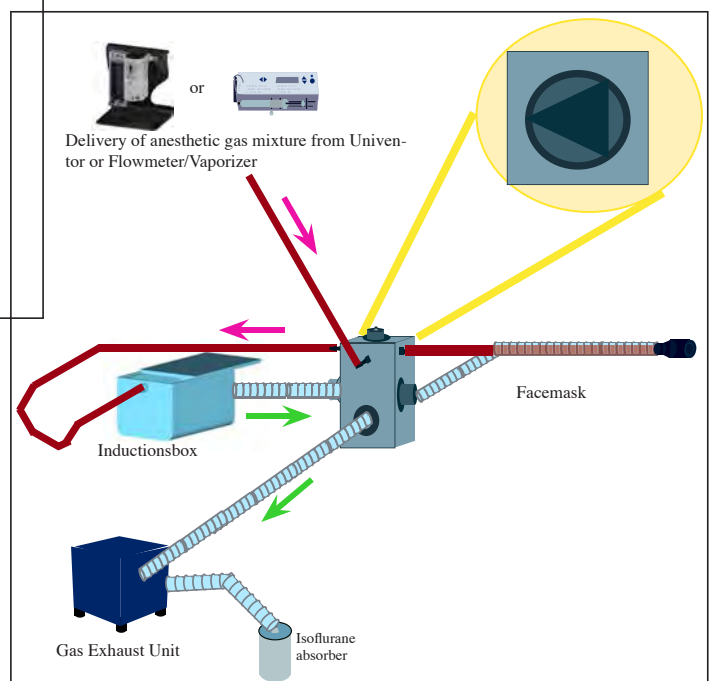
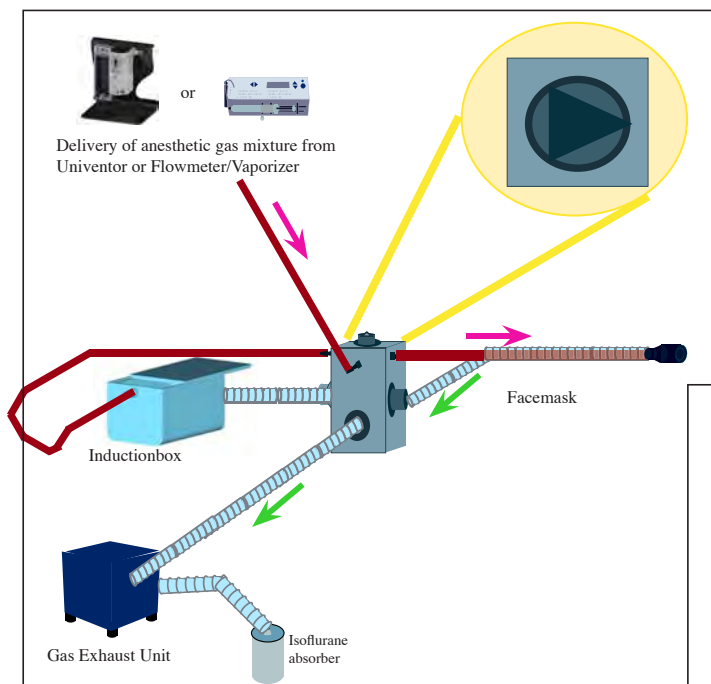
To be used for simultaneously changing the direction of both the **SUPPLY** of the anaesthetic gas mixture **AND** the **EXHAUST** of the anaesthetic gas mixture. The risk of making mistakes when the gas supply and gas exhaust have to be changed individually from f.i. the Induction box to the face mask, is reduced substantially by using these valves.



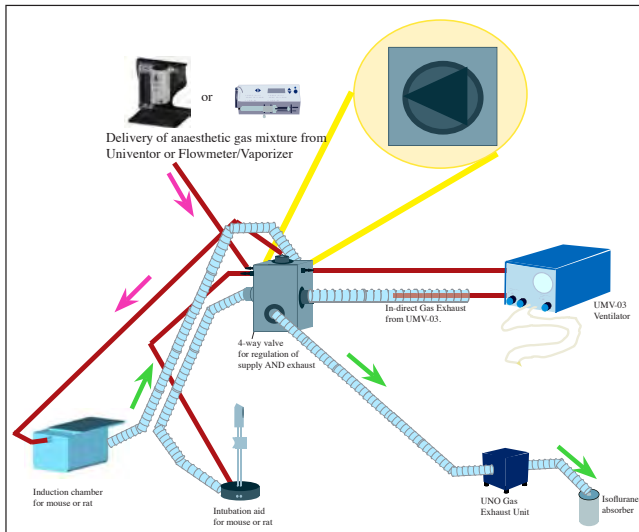
Ordering number	
180000159	Double 3-way valve
180000259	Double 4-way valve

3-Way Valve:

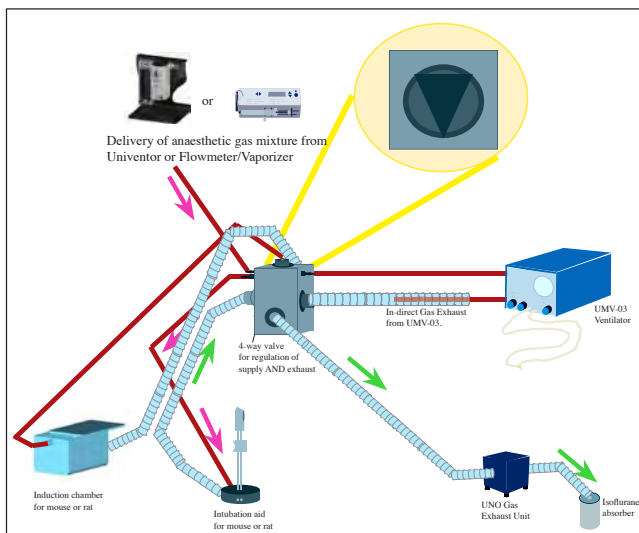
By turning the knob from the right to the left, both supply and exhaust are being directed from the face-mask to/from the Induction box.



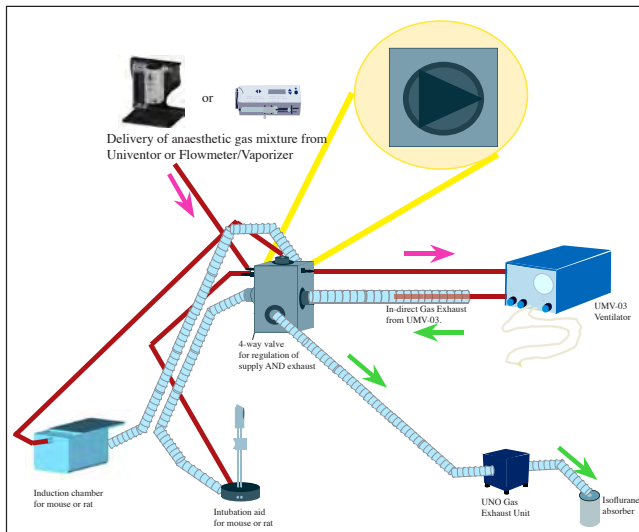
4-Way Valve:



A.. By turning the knob to the left, both supply and exhaust are being directed to/from the induction box.



B.. By turning the knob to the center, both supply and exhaust are being directed to/from the intubation aid.



C.. By turning the knob to the right, both supply and exhaust are being directed to/from the UMV-03.

UNO Micro Ventilator UMV-03

The UNO Micro Ventilator-03 is a mechanical ventilator uniquely designed for use with mice and rats for respiratoric support or totally controlled inhalation anaesthetic.

This revolutionary new concept of mechanical ventilation with an extreme small dead volume, has a proven performance, even with **mice of ≥ 12 gr. bodyweight**.

This unit has even been used for lung

The ventilation pattern of the UMV-03 is based on the natural, spontaneous respiratory pattern of rat and mouse, i.e. a **SINUS-form** without a plateau pressure.

The UMV-03 is a **pressure-, volume- and frequency** cycled ventilator which can very easily be integrated in a flowmeter / vaporizer set-up.



Characteristics of the UMV-03:

- ▶ **Tidal Volume** setting at the ventilator (without counter pressure). 0,1 - 24ml
- ▶ **Inspiratory to expiratory ratio** 1 : 1 (= sinus form)
- ▶ **Effective volume** (with counter pressure & endotracheal tube) 0,0ml - 12ml¹
- ▶ **Frequency** (respiratory rate) 15 - 220/min.
- ▶ **Minimum and Maximum pressure setting**
- ▶ **Pressure settings** ≥ 0 mbar - up
- ▶ **External P.E.E.P.** possible
- ▶ **Circle system with CO₂ Absorber**
- ▶ **Easily to be connected to a flowmeter / vaporizer unit**
- ▶ **Distance between UMV and animal position** upto 1 meter²

Ordering number		Ordering number	
180000023	UMV-03 UNO Microventilator	180000009	Small Artificial Lung
Dimensions			- used for setting up to UMV-03
Weight			
Power		MX00001/1L	CO ₂ Absorber - 1 liter
Inlet Connection	ID 5mm		
Outlet Connection	IS 5mm		

¹ Depending on the size of endotracheal tube used.

² If distance is more than 1 meter the local situation has to be checked and an extra valve could be necessary.

Intubation Aid for Mice and Rats.

How does it work?

- expose animal to anaesthetics in the induction box for initial anaesthesia
- take animal out of induction box and place “cord” around its front teeth
- slowly pull the animal with its snout/nose into the nose cone with the cord
- secure “cord”
- because the Intubation Aid is connected to the Vaporizer, the animal is **exposed to anaesthetic gas constantly**
- the “**excessive /exhaled gas**” is being disposed off through the connected Gas Exhaust Unit
- after intubation the animal can be connected to the UNO Micro Ventilator.

Benefits:

- *more time for intubation without the need of i.p. anaesthesia; no hurry!*
- *design forces animal in best pose for intubation*
- *lower jaw automatically opens therewith giving clear view on vocal cords*
- *animal can be connected to UMV for controlled anaesthesia immediately after intubation*

Models



- *This model is suitable for mice and small rats ($\pm < 350\text{gr}$)*



- *This model has an exchangeable nose cone, either for mouse or for rats.*
- *Loose nose cones are available. The nose cone can easily be replaced, thus making the intubation aid suitable to be used for mouse and rat.*
- *The design of the aid also makes it usable for bigger rats (extra support of animal.)*

Ordering number	
180000014	Intubation Aid for mice and small rats($\pm \leq 350\text{gr}$)
180000314	Intubation Aid with Nose cone for Mouse included
180000414	Intubation Aid with Nose cone for Rat included
180000324	Nose cone for Mouse to be used with 180000314 and 180000414
180000424	Nose cone for Rat to be used with 180000314 and 180000414

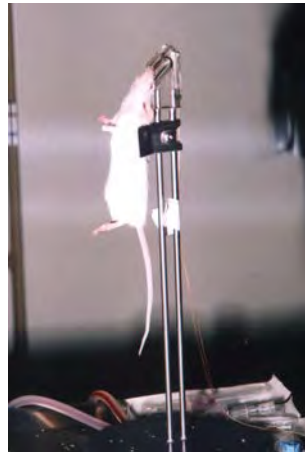
Intubation Aid for Mice and Rats.



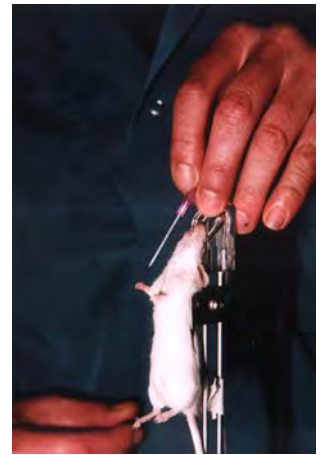
1.



2.



3.



4.

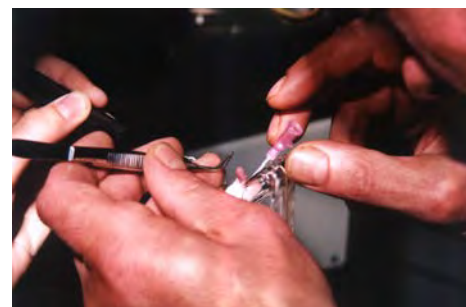
1. Top part of the intubation stand with thread through "nose-cone".
2. Mouse placed with snout in nose-cone. Mouse hanging by its front teeth on the thread supported by the back support.
3. Mouse hanging on intubation stand with anaesthetic gas supply- and gas exhaust tubes connected to the intubation stand.
4. Checking the length of the intubation tube (length should be before the bifurcation of the trachea).
- 5. Light source** placed at animal below the vocal cords of the animal. (Do not use a too strong light source because of too much light spreading).
6. Pull the animal's tongue a little bit thus enabling you to see the vocal cords (light coming through).
7. Place the intubation tube into the trachea in between the vocal cords.
8. Correct position of the intubation tube with regards to length of the tube and position of bifurcation in trachea.



5.



6.



7.



8.

**The animal is now ready to be connected to the ventilator.
Make sure that the tube maintains its position in the animal!**

Controlled Heating System

The UNO Heating devices have been designed specially for the use with small laboratory animals, like mouse and rat during anaesthesia. The UNO Heating systems are powered by a Control Unit.

This Control Unit is available in 3 Versions: **A: Control Unit-01 / CU-01**

B: Control Unit-02 / CU-02

C: Control Unit-MS / CU-MS



Control Unit-MS / CU-MS

Control Unit-02 / CU-02

Control Unit-01 / CU-01

Control Unit-01 and Control Unit-02

The Control Unit 01 has 1, as the Control Unit 02 has 2 connector sockets for one of the below shown heating plates/units and/or a temperature probe. The temperature settings for the Control Unit range from 28°C to 42°C. The connected heating plates/units, heat up till the set temperature on the Control Unit is reached. Once the set temperature is reached the Control Unit maintains this temperature.

The Control Unit 02 does not have an interaction (feedback) between the temperature probe (measured rectal temperature of the animal) and the heating device (set temperature).

The Control Unit-MS does feature this interaction (feedback)!

The **Control Unit-MS** can like the Control Unit-02 be connected to a heating device and a temperature probe. However the interaction (feed back) between the 2 connections allows you **to set the required animals rectal temperature**. The rectal probe measures the animals temperature and feed back is given to the controls of the heating device to keep the animals temperature as constant as possible. A safety feature is built-in to prevent over-heating in case the rectal probe is not in the animal. The heating element will not heat up over 42°C (also an acceptable norm for human skin).

With the Control Unit-MS you have a **self-regulating system** and do not need to manually adjust the temperature settings during the procedure.



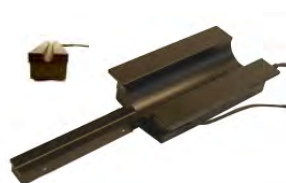
Flat Heating plate

34,5 x 23cm, 12mm thick
Closed surface for easy cleaning.



Half-Pipe Heating Unit

for rats during prolonged procedures like cardiac flow measurement.



Tail Heating Unit

for blood sampling. With or without the half pipe.



Temperature Probe

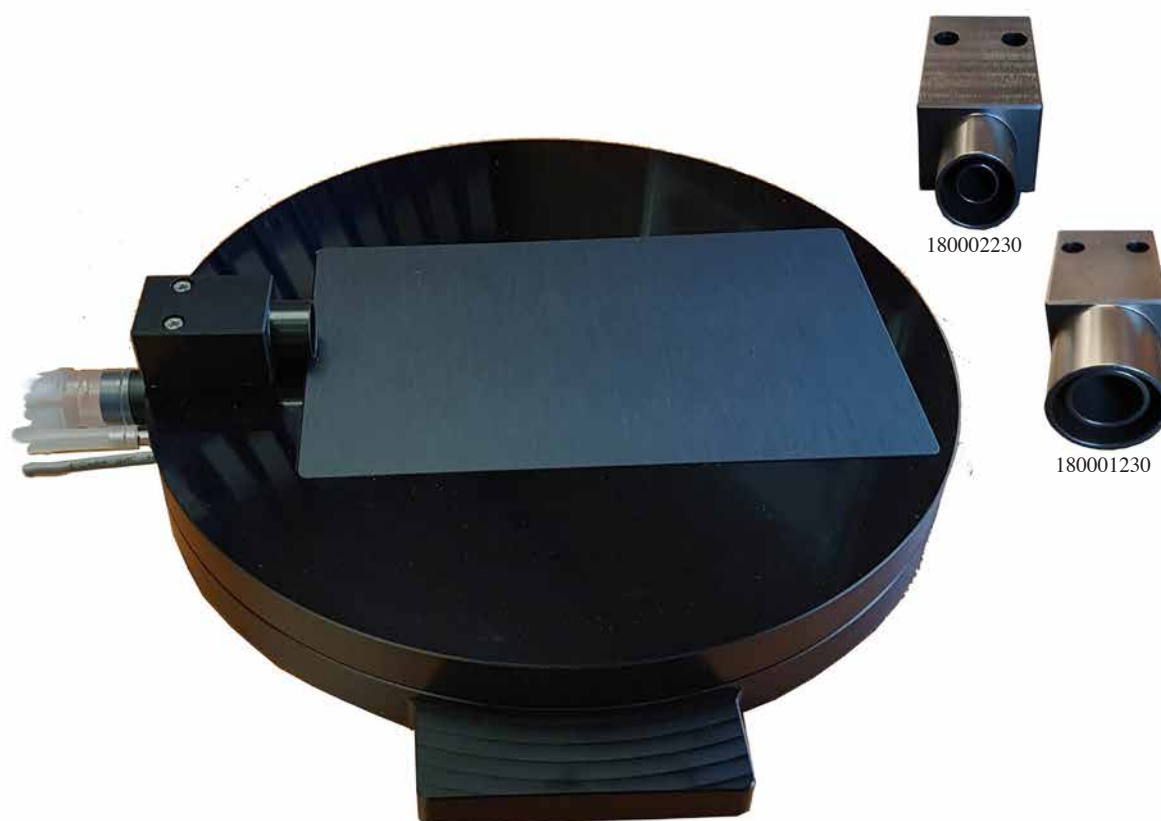
for rectal temperature measuring. Mouse or Rat.

Ordering number	
180000123	Control Unit -01
180000122	Control Unit -02
180000124	Control Unit -MS
180000028	Flat Plate / 34,5 * 23cm
180000128	Flat Plate / 18,5 x 11cm
180000027	Half-Pipe Heating Unit
180000029	Tail Heating Unit
180000066	Temperature Probe - Mouse
180000026	Temperature Probe - Rat

Heated 360° Rotating Surgical Plate / RSP-H30

With the RSP-H30 and its integrated face mask,
it is possible to reposition the mouse or rat 360°, **WITHOUT** moving all the tubes of the face mask for the anaesthetic gas supply and gas evacuation (exhaust).

- The RSP-H30 has a static Base Plate with the tube connections for the anaesthetic gas supply and gas evacuation (exhaust).
- The Face Mask on the upper plate, is specifically designed for the RSP-H30. There is a face mask for mouse and a face mask for rat supplied with each RSP-H30.
- The upper plate can be rotated 360° while maintaining the anaesthetic gas supply and gas evacuation (exhaust) of the face mask.
- In combination with the UNO Exhaust Unit, the RSP-H30 is **leak free!**
- The RSP-H30 is heated by the UNO Control Unit - 01! If you also want to use a temperature probe, the RSP-H30 can also be connected to the UNO Control Unit-MS.

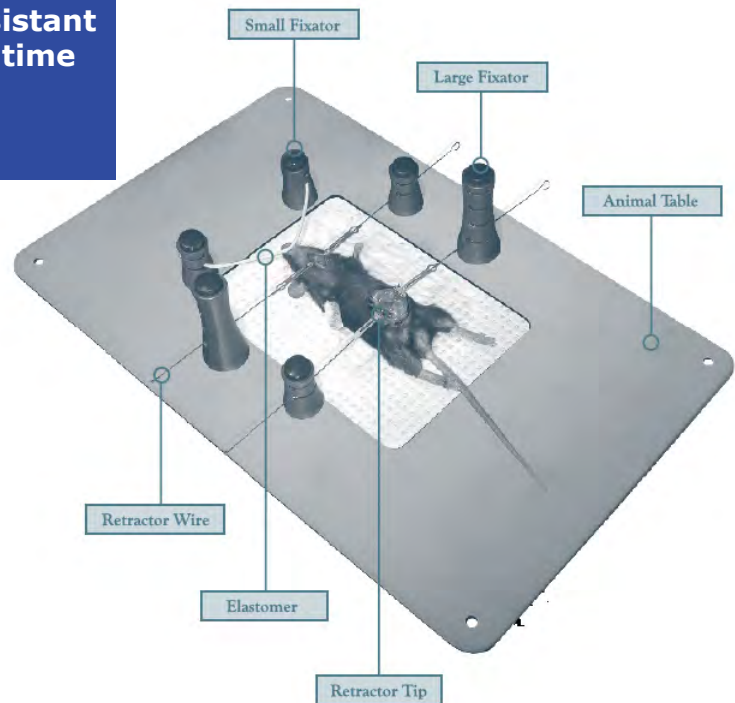


Ordering number	Rotating Surgical Plate - RSP-H30 with Face mask Mouse AND Face mask Rat	
180000230	Diameter	ø 300mm excl Handle
	Height	40mm
	Dimensions Heating Area	220 x 135mm
	Supply tube connector	ø 6mm
	Exhaust tube connector	ø 22/23mm conical
Ordering Number		
180002230	Additional/replacement Face mask for mouse	
180001230	Additional/replacement Face mask for rat	
180000123	Control Unit -01	
180000124	Control Unit -M/S	
180000066	Temperature Probe Mouse	
180000026	Temperature Probe Rat	

Small Animal Retraction System

The UNO retraction systems are a new standard of procedural control. The fully integrated procedural and stabilization system provides precisely controlled retraction at the operative site. The retraction system allows researchers to operate independently, eliminating the requirement for an assistant or improvised assistive devices. The system removes the complexities and distractions of improvised set-ups, allowing the researcher to focus full attention on the surgical procedure.

- **Eliminates the need for an assistant**
- **Reduces setup and procedure time**
- **Provides superior control**
- **Improves visualization**



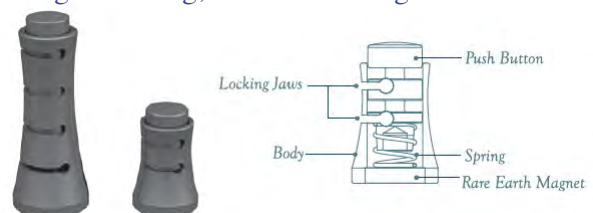
The UNO retraction system is unlike any other, providing glove-friendly, operative simplicity. With the touch of a finger, the system can be set, released and manipulated. This is made possible by patented mechanisms in the fixators which use rare earth magnets and push-button spring locks to form a fully integrated small-animal procedure system. All system components are compatible with standard lab instrument cleaning systems.

The System Components

Fixators- The Heart of the System; Fixators hold retractors. They contain rare earth magnets that attach anywhere on the animal table. A push-button top operates multi-level locking jaws that grip wires or elastomers firmly. They can be adjusted linearly or rotationally with finger-tip release. Complete depression of the push-button allows for insertion of the wires or elastomer while partial depression of the push-button allows for adjustment. Fixators can also lock onto other lab components that require stabilization in the surgical setting, such as neurological or rectal probes or anaesthesia delivery systems.

The magnetic field is well controlled within the fixator to minimize interference with sensitive instrumentation.

In fact, at a distance of just a few centimeters the effects of these small but powerful magnets are completely gone.

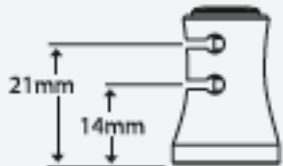
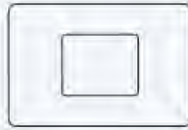


Small Animal Retraction System

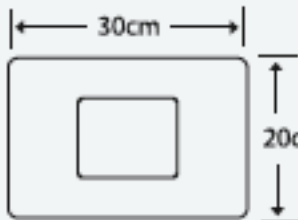
UNO Retraction System - Mouse

Contains:

- 1pcs, 20cm x 30cm table with window
- 6pcs, 3cm fixators
- 10pcs, 10cm wire retractor handles
- 10cs, 2 meter roll elastomer
- 10pcs, assorted retractor tipe, two of each style
- User documentation (english)



Magnetic Fixator with Spring Lock
3cm tall, Two locking jaws
ACD-001



Mouse Table 20 x 30cm
With 13 x 10cm Window
ACD-003



Retractor tip Sharp - 1mm
(10 per pack) ACD-009



Retractor tip Blunt - 1mm
(10 per pack) ACD-010



Retractor tip Blunt - 2,5mm
(10 per pack) ACD-011



Retractor tip Blunt - 5mm
(10 per pack) ACD-012



Retractor tip Blunt - 7,5mm
(10 per pack) ACD-013



Retractor Wire- 10cm
(10 per pack) ACD-005



Retractor Wire- 14cm
(10 per pack) ACD-006



System Elastomer
(2 meter roll) ACD-007

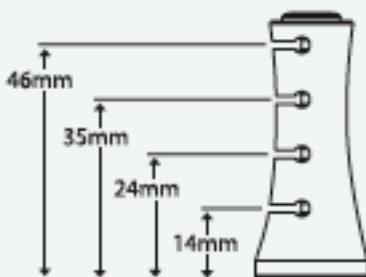
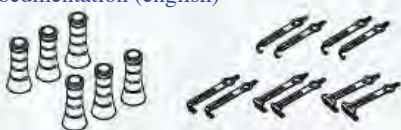


Retractor Tip-
Sample Package
(2 each style, 5 sizes
per pack) ACD-008

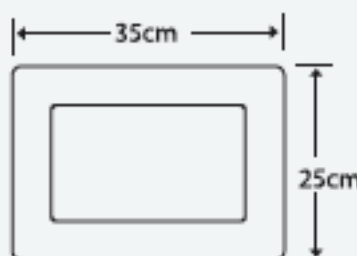
UNO Retraction System - Rat

Contains:

- 1pcs, 25cm x 35cm table with window
- 6pcs, 6cm fixators
- 10pcs, 14cm wire retractor handles
- 10cs, 2 meter roll elastomer
- 10pcs, assorted retractor tipe, two of each style
- User documentation (english)



Magnetic Fixator with Spring Lock 6cm
tall, Four locking jaws
ACD-002



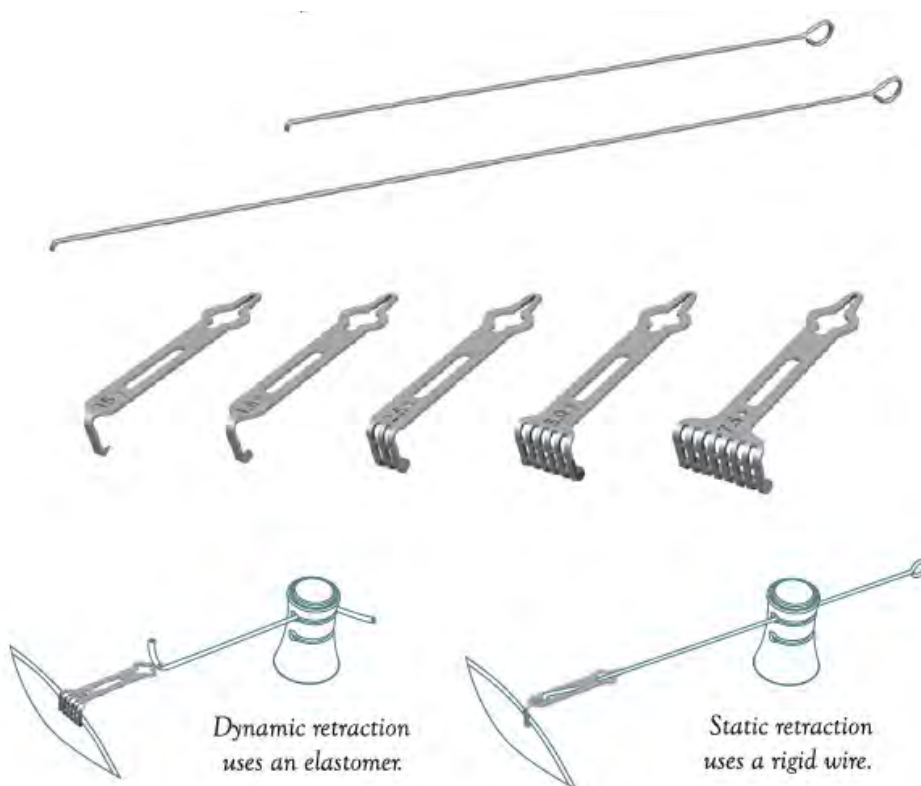
Rat Table 25 x 35cm
With 25 x 20cm Window
ACD-004

Small Animal Retraction System

Animal Tables- Animal Tables are made of ferro-magnetic stainless steel and incorporate a window for compatibility with body temperature maintenance systems. Table are available in a variety of sizes and shapes to suit a range of animals.



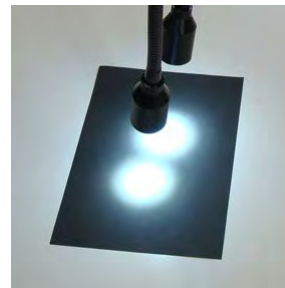
Retractors- The retractor wires are formed from light, flexible stainless steel. This simple approach produces an economical instrument that performs its job with minimal clutter, while providing superb control and feel. Retractor wires can either be used on their own or retract or manipulate tissue or retractor tips can be fitted to provide a wide range of retractor styles. Retractor wires engage and lock into the fixator jaws at the desired elevation allowing both linear and rotational adjustment over the entire length of the wire. One end of the wire is formed in a loop to provide grip for a gloved hand, and the business end is formed into a right angle hook that can retract on its own or lock to a range of retractor tips.



The wires can also be reformed to create restraints or engage other lab apparatus that need to be secured in the surgical field. Wires are available in 10 and 14cm lengths for mouse and rat procedures. Retractor tip widths range from 1mm to 7.5mm, plus a single point, sharp tissue hook. Each tip can be locked onto a wire for static retraction, or affixed to an elastomer to form a dynamic retractor.

Ordering number	
180000055	Retraction System RAT
180000056	Retraction System MOUSE

The new **UNO Cold Light Source** is designed to meet the current requirements for a cold light source during surgical procedures.



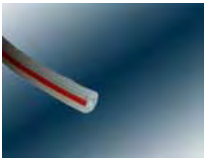









Advantages

- New power - LED technology
- Colour temperature 6300°K (Pure white)
- No cooling ventilator required
- Narrow beam lens: 13° View Angle
- With rechargeable battery with up to 10 hours battery life at maximal light strength.
- Power consumption: 700mA, Power max: 4 Watt
- Luminous flux max. 100lm - dimmable
- Power requirement 110 - 240V, 50/60Hz
- Very long service life of Power LED'S
- Very small footprint (14 x 12 x 5cm (W x D x H))

In order to maintain a distance between the CLS and the illuminated object, the CLS is equipped with two (2) flexible 60cm long arms (custom lengths available on request).

Ordering number	
180000901	Cold Light Source - CLS

Replacement parts

	Ordering Number	Description
	180000024 180000025	Silicone tubing Ø 4 x 7mm - sold per meter Silicone tubing Ø 6 x 12mm - sold per meter
	180000240	Silicone Tubing Ø 6 x 8,6mm - sold per meter
	180000040	Red PVC tubing Ø 6 - sold per meter
	180000234	Ribbed extensible Tube for evacuation - ID 22mm - sold per piece 30-140cm
	180000034	Ribbed Tubing for evacuation - on roll - sold per 40cm
	180000045	Connector 22M / 22M - ID 22mm- sold per piece
	180000046	Connector 22M - 22F - sold per piece
	180000052	Tube valve - sold per piece
	180000047	3 way valve (PP/PE) - sold per piece
	180000044	Parallel Y-Piece - sold per piece

Pulse Oximeter VET Handheld Pulse Oximeter

The 2500A Veterinary Oximeter is a universal tool with unmatched versatility and cost-effectiveness for all veterinary monitoring and research applications. Compact and easy to use, this Pulse Oximeter is proven accurate for pulse rates up to 450 beats per minute (bpm) and is ideal for monitoring during surgeries.

The 2500A Pulse Oximeter has an audible pulse indicator and large LED displays that are visible in low-light situations. The tricolor perfusion indicator provides immediate feedback to assess pulse quality. This information is useful to determine if repositioning of the sensor is necessary and requires little training to interpret.

Sensors

Purelight Vet sensors produce the pure light spectrum which eliminates variations in readings from animal-to-animal and sensor-to-sensor.

2000SL - Clip-on sensor for tongue applications, paw pads, and well-vascularized areas.

2000T - For placement on the underside base of the tail or other well-vascularized surfaces.

2000SA - Wrap sensor for placement on the toe (large animal) or base of the tail or foot (small animal).



Key features

- * Durable - extremely rugged construction
- * Extensive Memory - 72 hours data storage
- * Easy to Use - Simple two button operation
- * Compact Size - 7 x 13,8 x 3,2cm
- * Flexible Operation - operates on AA batteries and rechargeable batteries

Pulse Oximeter Specifications

Oxygen Saturation Display Range	: (%SpO ₂) 0 -100%
Pulse Range Display Range	: 18 - 450 beats per minute (BPM)
Accuracy	: Blood oxygen Saturation (%SpO ₂ ± 1 SD) 70 - 100% ± 2 digits. Pulse Rate: 18 - 450 bpm ±3% ± 1 digit
Measurement Wavelengths	: Red 660 Nanometers Infrared 925 Nanometers
Dimensions	: 7 x 13,8 x 3,2cm (w x h x d)
Weight	: 213 gr with alkaline batteries, 233 grams with NiMH batteries
Temperature	: Operating -20°C to +50°C Storage -30°C to +50°C
Humidity	: Operating 10 - 95% noncondensing Storage 10 - 95% noncondensing
Power requirements	: Four 1,5V AA-size alkaline batteries

SENSOR PLACEMENT

The **2000SL LINGUAL CLIP SENSOR** is convenient for spotchecks and for monitoring during recovery while the animal is immobile. However the sensor is held in place by light spring pressure that could allow it to become dislodged with movement. Further, over time even light spring compression may interfere with blood flow resulting in signal loss and need to reposition the sensor. The 2000SL is most easily applied to the rear foot, but the front foot and tail can also be used. For mice, the sensor can be best placed high into the groin.



The **2000T TRANSFLECTANCE SENSOR** also suitable for continuous monitoring, the 2000T transreflectance sensor is the smallest probe and can be applied to the rear of front feet, or to the ventral surface of the tail of the rat. Secured with adhesive tape.



Alternatively the sensor can be attached to the surface of an operating or imaging table and the foot simply taped into position over it.

The **2000SA SMALL ANIMAL WRAP SENSOR** can be easily secured and less prone to accidental displacement, making it an ideal option for continuous monitoring during long surgical or other procedures. Adhesive tape, cohesive bandage or a Posey Wrap can be used to assure that the sensor diodes are aligned directly opposite each other and that excessive pressure is avoided. The 2000SA should not be applied to hair-covered or highly pigmented areas.



Ordering number	
180000143	Pulse Oximeter 2500 VET incl 2000SL
2000SL	Sensor Lingual clip Sensor
2000T	Transflectance sensor
2000SA	Small Animal Wrap

* Above mentioned sensor placement recommendation are taken from the article Pulse Oximetry for Rodents by Dr. George A. Vogler, DVM. A copy is available on request.

* More detailed information on sensor placement and reported possible sensor sites are available on request.

Capnograph AMP for Rats and large Animals (not suitable for use with Mice!)

CAPNOTRUE® AMP MAINSTREAM CO₂ /SPO₂ MONITORS

Advanced and reliable capnograph and pulse oximeter combined in a single monitor.



Key features of CapnoTrue® AMP

- Mainstream CO₂ measurement with the IRMA™ CO₂ analyzer
- Warm-up time: < 10s full specification
- Direct measurement without time delay
- Small, light-weight and shock-resistant: the IRMA™ CO₂ analyzer weighs less than 30 g
- Adult/paediatric, infant/neonatal, and a **for rat modified** IRMA™ airway adapter
- Plug and measure technology
- IRMA™ airway adapters with non-condensing light transmission XTP™ window
- No occlusion by water or mucus possible
- Maintenance and calibration-free technology
- Full range of key technology accessories
- Wide range of high-quality SpO₂ sensors

Delivery Package of CapnoTrue® AMP

- Mainstream device
- IRMA™ CO₂ analyzer
- Reusable SpO₂ sensor
- CapnoTrue® power supply (EU and UK plug)
- Silicone protective cover
- USB data cable
- IRMA™ airway adapter (adult/paediatric)
- Instruction manual
- 1 Li-ion rechargeable battery
- PC software
- 4 batteries (AA)

The CapnoTrue AMP Mainstream Monitor can be used in combination with the UNO MICROVENTILATOR - UMV-03.

The CapnoTrue AMP and ASP - CO₂/SpO₂ monitors including the IRMA™ CO₂ analyzer, ISA™ CO₂ analyzer and SoftCap Sensors are classified and certified as class IIb products.

Capnograph AMP for Rats and large Animals

(not suitable for use with Mice!)

TECHNICAL DATA

Specification		
Measurement range	EtCO ₂ and FICO ₂	0-15%
	SpO ₂	0-100%
	Respiration rate	0-150 breaths/min
	Pulse rate	20-300 beats/min
Accuracy	EtCO ₂ and FICO ₂	+/- (0.2 vol % + 2% of reading) +/- (0.3 vol % + 4% of reading) incl. interfering gases
	SpO ₂	+/- 2% (70 - 100%)
	Respiration rate	+/- 1 digit at 60 breaths/min
	Pulse rate	+/- 1 digit (up to 100/min) or +/- 1% (> 100/min)
Display		
Characteristics	Active OLED colour graphic display, 262,000 colours, 240 x 320 dots	
Displayed data	End-tidal CO2 and inspired CO2 in vol %, kPa or mmHg, oxygen saturation, respiration rate, pulse rate, capnogram, plethysmogram and short term trend	
Indicators	Signal strength and signal quality, pulse amplitude, battery status, alarm mute, pulse tone mute, neonatal mode, time	
Trend information		
Long term trend	up to 400 hours	
Short term trend	15 min/1h/6h	
Language versions		
	English	(additional language versions on request)
Environmental conditions		
Operation	0 - 50°C, 15 - 95% r.H. (non-condensing), 60 - 120 kPa (excl. Li-ion battery)	
Storage	-30 - 70°C, 10 - 95% r.H. (non-condensing), 60 - 120 kPa (excl. Li-ion battery)	
Classification		
Product class	IIb (in accordance with MDD 93 / 42 / EEC)	
Safety	Class of protection II / type BF	
Construction	IPX1	
Standards	EN 60601-1:2006, EN 60601-1-1:2001, EN 60601-1-2:2007, EN 60601-1-8:2004, DIN EN 60529, EN ISO 21647:2004, EN ISO 9919:2005	
Miscellaneous		
Dimensions	(LxWxD) 150 mm x 75 mm x 35 mm	
Weight	< 400 g (complete device with batteries)	
Power supply	90-260 VAC/6 VDC, 50-60 Hz, 4 AA batteries, 2.5 Ah Li-ion battery	
Battery capacity	up to 6 hours continuous operation	
Communication interface	USB 2.0	

CapnoTrue MG for Rats and large Animals (not suitable for use with Mice!)

CAPNOTRUE® MG-AA/CO₂/SPO₂ MONITORS

High-performance and versatile anaesthetic agent monitoring.



Key features of CapnoTrue® MG

- Innovative micro-optic technology
- Direct mainstream measurement without time delay
- Compact, robust and ultra-light multigas analyzer
- Warm-up time <20 seconds full specification
- Maintenance and calibration free technology
- Self-explanatory, ergonomic operating function facilitate intuitive operation
- The colour information display, as well as the simple information structure, support quick decisions and a rapid user reaction in critical situations
- Leading-edge power management with standard alkaline batteries or Li-Poly batteries or medical power supply (or combined)
- Two years warranty.

Delivery Package of CapnoTrue® MG

- CapnoTrue MG Multigas/SpO₂ Monitor
- IRMA™ AX+ Analyzer
- Instruction manual
- 1 Li-ion rechargeable battery
- PC software
- 4 batteries (AA)
- IRMA™ Airway Adapter
- Reusable SpO₂ sensor
- Silicone protective cover
- USB data cable
- Manual

**The CapnoTrue MG Monitor can be used in combination with the
UNO MICROVENTILATOR - UMV-03.**

The CapnoTrue MG monitors including the IRMA™ CO₂ analyzer, ISA™ CO₂ analyzer and SoftCap Sensors are classified and certified as class IIb products.

TECHNICAL DATA

Display

Parameters displayed	Numerical	End-tidal (et) CO ₂ -, N ₂ O- and agent concentrations, inspired (Fi) CO ₂ -, N ₂ O- and agent concentrations, oxygen saturation (SpO ₂), Respiration Rate (RR), Pulse Rate (PR)
	Graphical	Capnogram and trends of numerical data (15 min/1 h/6 h)
	Indicators	Signal Strength and signal quality, pulse amplitude, battery status, alarm mute, pulse tone mute, storage status, real-time mode, neonatal mode, time.
Characteristics	Active OLED colour graphic display, 262000 colours, 240 x 320pixel (42mm x 56mm)	

Capnography and anaesthetic agent measurement specifications

Measurement range	etCO ₂ and FICO ₂	0-15%
	FIN ₂ O	0-100%
	Hal, Iso, Enf	0-8%
	Sev	0-10%
	Des	0-22%
	Respiration rate	0-150 l/min
Accuracy	EtCO ₂ and FICO ₂	+/- (0.2 vol % + 2% of reading) +/- (0.3 vol % + 4% of reading) incl. interfering gasses
	N ₂ O	+/- (2 vol % + 2% of reading) +/- (3 vol % + 5% of reading) incl. interfering gasses
	Hal/Iso/Enf/Sev/Des	+/- (0,15 vol % + 5% of reading) +/- (0,2 vol % + 10% of reading) incl. interfering gasses
	Respiration rate	+/- 1 digit
Warm-up time	< 20 seconds full specification	

Pulse Oximetry specifications

Measurement Range	SpO ₂	1 -100%
	Pulse Rate	20 -300 BPM/min
Accuracy	SpO ₂	+/- 2% (70 bis 100%)
	Pulse Rate	+/- 1 digit (up to 100 l/min) or +/- 1% (> 100 l/min)

Trend Information

Long term trend	up to 150 hours
Short term trend	15 min/1h/6h

Alarms

Limits	Adjustable limits for all numerical parameters except for MAC
Alerts	Audible and visual alarms (complies with EN60601-1-8)

Storing Data

Communication interface	USB 2.0
Data memory capacity	up to 150 hours
Real-time mode	Visualisation and storage of numerical parameters on a computer every 4 seconds
Computer Software	CapnoTrue® MG PC Software for data download and real-time mode

Power supply

Battery	Working time with full functionality approx. 4,5 hours, 4 alkaline batteries (AA/LR6/AM3/MN1500/Mignon), 1,5V
Li-Poly battery	Working time with full functionality approx. 7 hours, Li-Poly battery, Model No CT-2500, 3.7V, 2500 mAh, charging time approx 5 hours
AC power supply	Model No. FW 7660M/06, medical power supply with option for country-specific input plug, input: 100-240 V AC/50-06Hz / 250 mA, output: 6 V DC/1,4A

Specification	
Environmental conditions	
Operation	10 - 40°C, 15 - 95% r.H. (non-condensing), 60 - 120 kPa (excl. Li-poly battery)
Storage	-20 - 70°C, 10 - 95% r.H. (non-condensing), 60 - 120 kPa (excl. Li-poly battery)
Classification	
Product class	IIB (in accordance with MDD 93 / 42 / EEC)
Safety	Class of protection II / type BF - Type and degree of protection against shock
Construction	IPX1 (with silicone protective cover)
Standards	EN 60601-1:2006, IEC 60601-1-1:2001, IEC 60601-1-4:2000; IEC 60601-1-8:2006; ISO 21647:2004; ISO 9919:2005; ISO5356-1:2004; DIN EN 1789:2007, EN846:1996
Miscellaneous	
Dimensions	150 mm x 75 mm x 35 mm
Weight	< 400 g (complete device with batteries)

With its ultra-compact, light and easy to handle design, the CapnoTrue®MG is the perfect flexible and mobile monitor for identifying and quantifying the five most important anaesthetic agents as well as other gases and parameters:

- Halothane, Isoflurane, Enflurane, Sevoflurane and Desflurane
- N₂O
- etCO₂, FICO₂
- Oxygen saturation
- Respiration and Pulse Rate

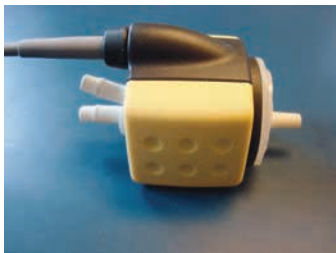
By direct measurement in the mainstream, there is no time delay in the measuring data.

Reliable automatic agent identification and quantification

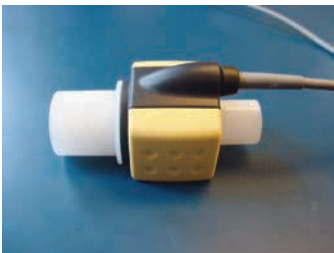
The IRMA AX+ Analyzer is equipped with state-of-the-art NDIR technology with up to 9-channel gas type analysis in the 4-10µm range and offers reliable agent identification and quantification even in gas mixtures. It weighs less than 25 g.



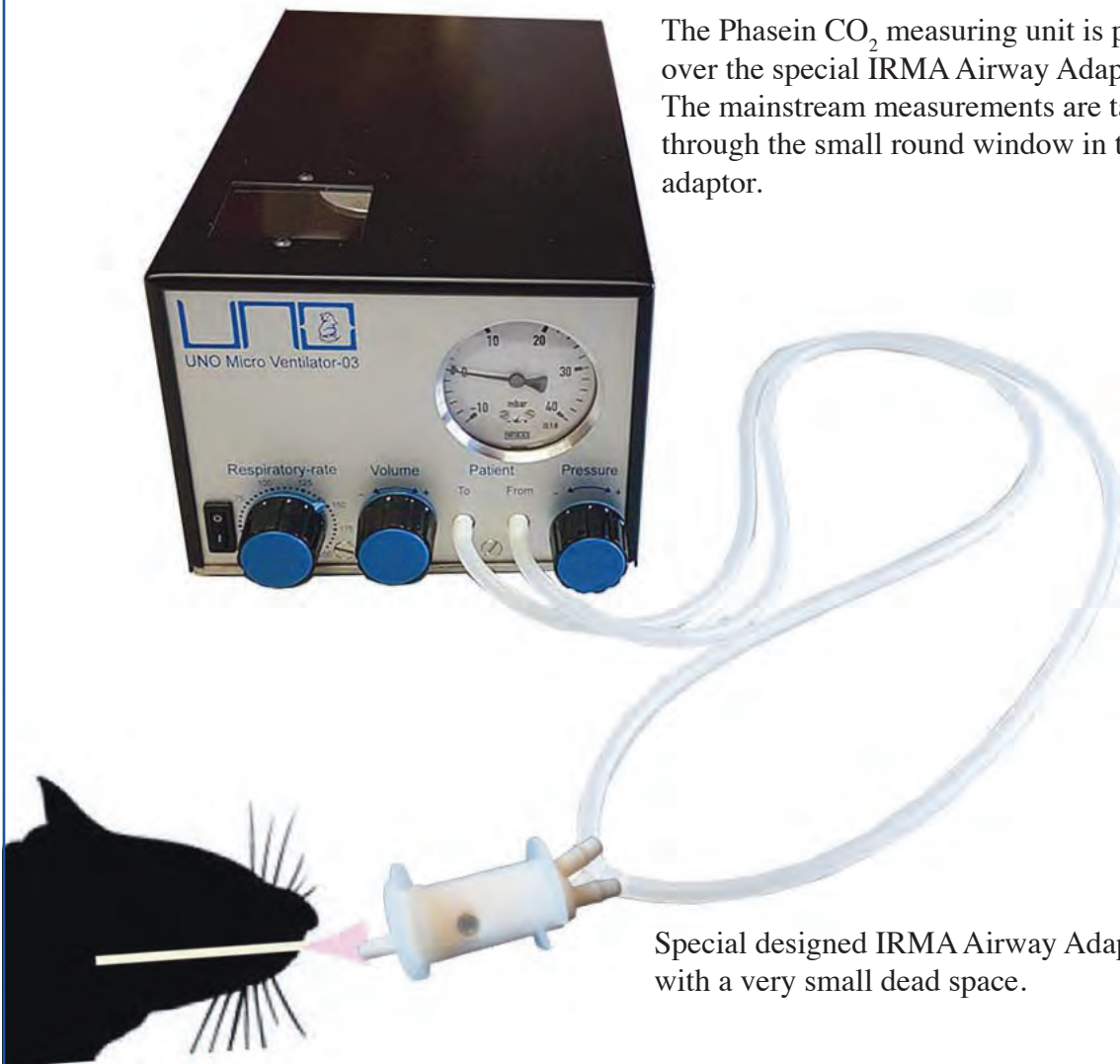
Probes to be used with rat



Probes to be used with larger animals



UMV-03 - Ventilator



The Phasein CO₂ measuring unit is placed over the special IRMA Airway Adaptor. The mainstream measurements are taken through the small round window in the adaptor.

Special designed IRMA Airway Adaptor with a very small dead space.

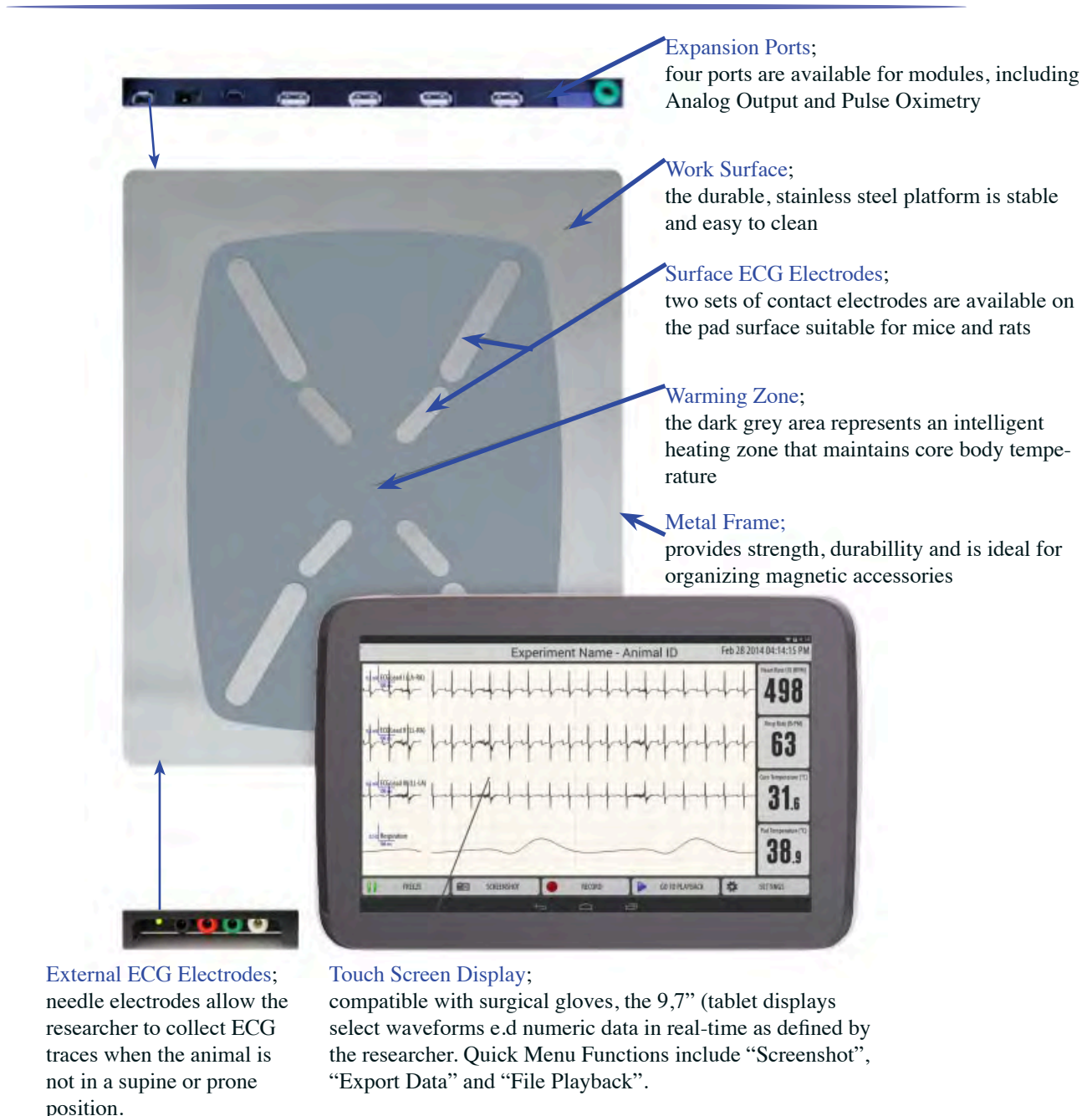
Ordering number	
180000170	Capnotrue AMP
180000171	Capnoture MG (Multigas)
180000172	Adjusted Probe to be used with Rats
180000173	Probe to be used with larger Animals

RODENT SURGICAL MONITOR

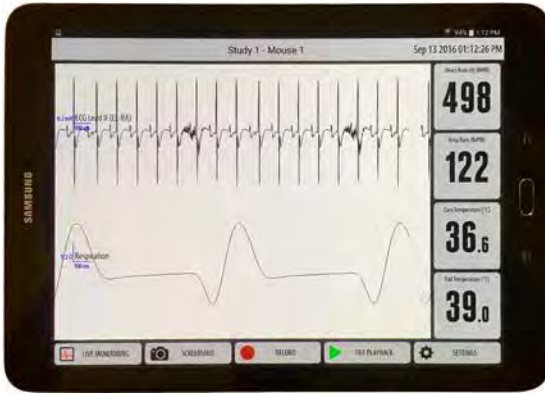


The **Rodent Surgical Monitor** is an integrated surgical warming and vital signs monitoring solution for small animal research offering **core body temperature, ECG, respiration rate, heart rate, and pulse oximetry (SpO2) measurement.**

The unit consists of three components: Heated Surgical Platform, Temperature Probe and 9,7" touch screen Display Unit.



Touchscreen Display Unit



Display Type	High Resolution Color Display with Capacitive Touch
Display Size	9,7" (24,6cm)
Display Resolution	2048 x 1536 pixels
Storage Capacity	32GB Total, with approximately 25,5 GB for data storage
Power Supply	Universal Adapter (110 - 240 VAC)

Physiologic Measurements

Display Type	Range	Waveform Display Options
Heart Rate (Lead I, II, III)	60 - 999 BPM	ECG Lead I, II, III
Respiration Rate	15 - 400 BrPM	ECG Lead aVL
Core Temperature	0 - 50°C	ECG Lead aVR
Pad Temperature	25,0 - 43,5°C	ECG Lead aVF
SpO2 (module required)	80 - 100%	Respiration
R-R Interval (Lead I, II, III)	60 - 1000 ms	Pulse Plethysmogram (module required)

Heated Surgical Platform



Platform Dimensions	24,5 x 30,5 x 1,9cm
Platform Weight	2,94 kg
Heater type	Responsive Electronic Heater with Multiple Zone Controle
Heater Uniformity	< 0,5°C Across Active Area
Heater Startup Time	< 2 minutes from room temperature
Heater Set Temperature	Adjustable, 25,0 - 43,5°C by 0,1°C
Power Supply	Universal Adapter (100 - 240VAC)
Noninvasive ECG Electrodes	Two sets of limb contact electrodes; inner set for mouse, outer for rats of subjects of similar size
External ECG Electrodes	Standard 1,5mm DIN ECG Leads (ANSI/AAMI EC53 & DIN 42-802 compliant)

Temperature Probe



Each Rodent Surgical Monitor is delivered with a single rectal temperature probe. Customers may indicate the size they prefer, which include probes ideal for adult mice, adult rats or neonatal mice.

The temperature probe sensor is a Copper-Constantan Thermocouple, located at the tip of the probe. Probe temperature resolution is +/- 0,1°C. CALibrated probe accuracy if +/- 0,1°C when the system is at operating teperature.

Ordering number	
180000300	Rodent Surgical Monitor
180000311	Analog Output and Trigger Cable
180000302	Pulse Oximetry/SPO2 Module
180000303	Platinum External Needle Electrodes
180000304	Stainless Steel External Needle Electrodes

Bio-imaging and Analysis

VISQUE® InVivo Smart-LF

Compact Preclinical In Vivo Fluorescent & Bioluminescent Imaging and Analysis System

- ONLY 57cm High, 40cm Wide and 40cm Deep - Weight: 22kg!



VISQUE™ InVivo Smart-LF is an ideal in vivo imaging system for bioluminescent and fluorescent imaging as it provides outstanding performance at a reasonable price.

The scientific CMOS camera developed solely for VISQUE™ InVivo Smart-LF provides high sensitivity with a quantum efficiency up to 94% at 550 nm.

Its high sensitivity and low noise capabilities allow you to precisely detect and quantitate very weak signals in bioluminescent and fluorescent imaging.

For multispectral fluorescent imaging, the system is equipped with a filter wheel providing four filter slots for GFP, PE, Cy5.5 and ICG fluorescent dyes and five filter slots for customized filters.

For precise pharmacokinetic analysis and biodistribution studies, VISQUE™ InVivo Smart-LF not only allows real-time imaging of up to 37 frames per second but also provides 10 patented algorithms to analyze kinetics of drug distribution.

VISQUE™ InVivo Smart-LF featuring a compact size also allows you to save valuable laboratory space and to simply operate it with a laptop computer.

VISQUE® InVivo Smart-LF

Compact Preclinical In Vivo Fluorescent & Bioluminescent Imaging and Analysis System

Main Features

- Highly sensitive imaging from 300 - 940nm
- Intelligent image analysis software
- Real-time imaging
- Space-saving compact design
- Reasonable price with outstanding performance

Applications

- Pharmacology and toxicology y Oncology
- Cardiovascular function
- Photo-stability test of molecules & Cell therapy test
- Biodistribution of nanoparticle

Specifications

System				
Model		VISQUE™ InVivo Smart-LF		
Imaging Capability		In Vivo Imaging, Bioluminescence, Fluorescence, Real-time Imaging		
Weight and Dimension		About 22 kg (48.5 lb), 40 cm × 40 cm × 57 cm		
Camera				
Sensor		1.2" Backside Illuminated sCMOS		
Cooling		-50℃ below ambient temperature, Thermoelectric Peltier Cooling		
Resolution (H × V)		1824 × 1824		
Pixel Size		6.5 μm × 6.5 μm		
Exposure Time		25 ms – 15 min		
Maximum Frame Rate		37 fps		
Digital Output		16 bit		
Binning		1 × 1, 2 × 2, 4 × 4		
Fluorescence				
Light Source		LED		
Fluorescence Filter		Up to 9 (optional)		
Lens				
Control		Motorized Iris / Zoom / Focus		
Zoom (Field of View, H × V)		15 cm × 15 cm (1×) – 5 cm × 5 cm (3×)		
CleVue™ Software				
Image Acquisition Mode		Single-frame, Accumulation, Time-lapse		
Supported File Format		cif (exclusive file format), tif, bmp, jpg, png		
Kinetic Analysis		Dynamics graph and 10 kinds of algorithms for kinetic analysis		
Image Analysis		Autofluorescence removal, Spectral unmixing, Merge of multi-spectral images		
Stage				
Stage Type		Sliding stage, up to 3 mice		
Optional Accessory		Heating Stage, Anesthesia Ventilator Adaptor		
Representative Detectable Fluorophores				
Imaging – Filter	Imaging – Light	Excitation (nm)	Emission (nm)	Fluorescent Dyes
GFP	Blue	390 – 490	500 – 550	GFP / EGFP / Alexa 488 / FITC / QD 525
PE	Green	530 – 570	575 – 640	RFP / DsRed / PE / Alexa 568 / TRITC / QD 585 / QD 605 / QD 625
Cy5.5	Red	620 – 650	690 – 740	Cy5.5 / PKE680 / Alexa 680 / Alexa 700 / QD 705
	HyperRed	630 – 680		
ICG	NIR	740 – 790	810 – 860	ICG / QD 800

UNO Euthanasia Unit

During euthanasia of rodents using the UNO Euthanasia Unit, the following benefits are achieved:

- The animals can stay in their cage, because the UNO Euthanasia Unit includes a transparent polycarbonate “container”, in which the complete rat- or mousecage can be placed.
- First, Carbogen gas is introduced at the bottom of the cage, by means of a PLC controlled valve. Carbogen is a gas mixture of 95% O₂ + 5% CO₂. This causes a high concentration O₂ in the cage and in the container, while the 5%-concentration CO₂ does not cause any reaction at the CO₂ receptors in the animal lungs. The pO₂ level in the blood becomes maximal.
- After 1 min. the Carbogen flow is stopped and 100% CO₂ is introduced into the cage. In this way the high concentration O₂ is slowly replaced by CO₂. This relatively slow replacement of O₂ by CO₂ is responsible for the reduction of stress for the animal.

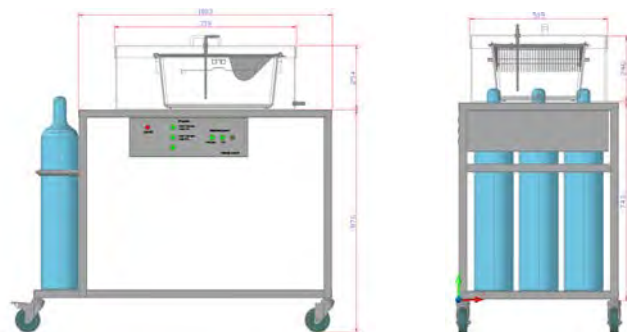


If mice and rats are being exposed directly to 100% CO₂, the stress level, measured according to EEG, EKG and proportionally, is very high. The article “Carbon Dioxide euthanasia in rats;” handles about the 3 above mentioned criteria in detail. This article can be downloaded on our website:

<http://www.unobv.com/afbeeldingen/Carbon%20Dioxide%20in%20rats.pdf>

The UNO Euthanasia Unit includes:

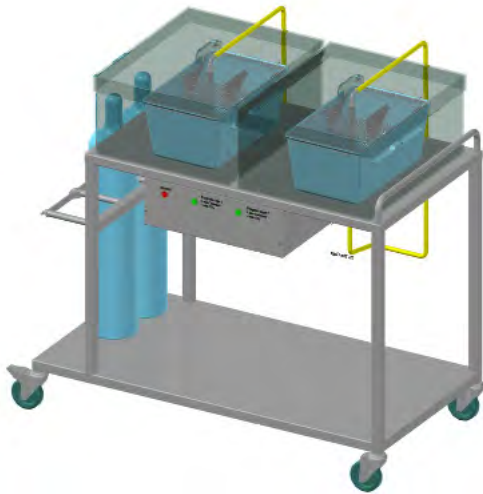
- A polycarbonate box with lid, in which the mice and rat cages can be placed.
Dimensions: 50 x 75 x 25cm (lxbxh) (other dimensions custom made available!)
- Tube for the gas supply. This tube can be put between the bars of the wirelids into the cage.
- A valve in the macrolon box to connect the unit to an exhaust system.
- The s.s. trolley has a tray on which the gas cylinders can be placed.
- A switchboard for the supply of the gas (mixture) O₂ and CO₂, according a PLC pre-set program.



One of the advantages of the mentioned PLC pre-set programs is that the procedures for euthanasia in rats and mice can be easily described in a protocol for the users of the unit. The UNO Euthanasia Unit contains a program that uses 2 different gasses in order to, during euthanasing mice and rats, reduce the animal's stress to a minimum.

Ordering number	
180000100	Euthanasia Unit complete

Different configurations and set-ups for euthanasia units are available on special request. Below are some examples.



A Euthanasia Unit with two separate euthanasia boxes that can each hold a cage. This unit was equipped with two separate control with each just one program. Also a safety to prevent unauthorized changes made in the flowmeter settings was integrated.



A Euthanasia Unit to be placed on a table without the trolley is also possible.



Euthanasia cabinets in different configurations. For ordering information, please contact us.

UNO Euthanasia System for Neonates (Mouse Pups)

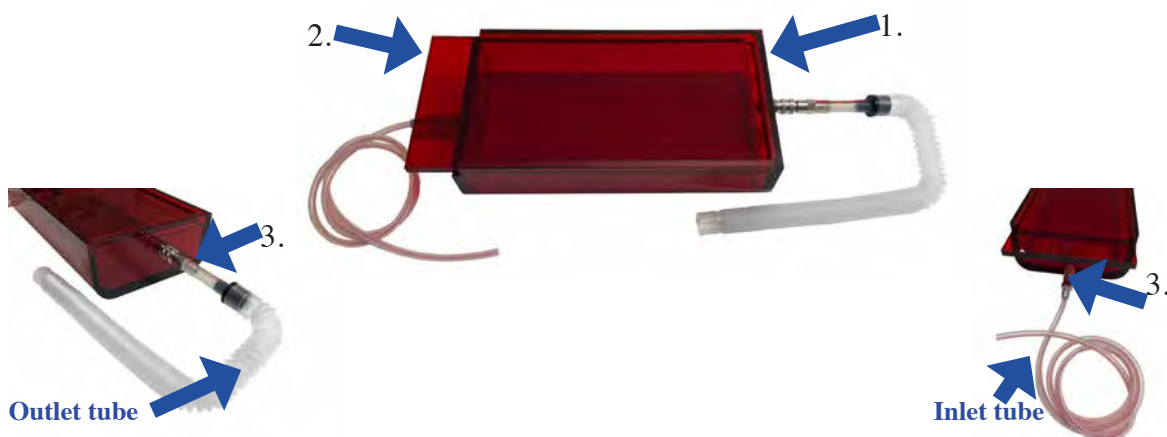
Neonates 10 days of age or less, are resistant to hypoxia; if CO₂ is used to euthanise the neonates, prolonged exposure time is needed to cause loss of consciousness or death and therefore this method is considered unethical.

The alternatives euthanasia method for these neonates, with less stress for the neonate, is according to the Dutch Government the following procedure:

- Place the neonates in a “box” and close this “box”
- Introduce Isoflurane to bring the neonates under anaesthesia
- Be sure to keep the Isoflurane in the “box” and place this closed “box” in a freezer and leave it there until neonates are dead.

UNO has introduced the equipment enabling this alternatives euthanasia method for neonates and comprises of the following items:

- Special designed box¹ with sliding lid² and with 2 quick stop-lock tube connections³ for the supply/inlet and the evacuation (outlet) of the anaesthetic gas mixture
- A scavenger to evacuate excess anaesthetic gas mixture. (If a scavenger is available, it it could be used if it has sufficient suction power)
- An Anaesthesia setup with Flowmeter and Vaporiser.



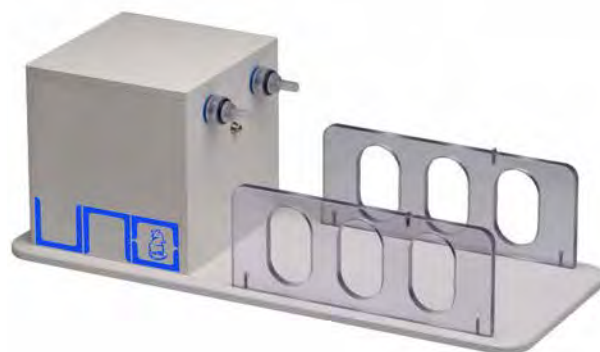
Procedure:

- Connect the Flowmeter/Vaporiser setup to the inlet tube
- Connect the scavenger or Exhaust Unit to the ribbed outlet tube
- Set the scavenger (or Exhaust Unit) to “ON”
- Set the flowmeter at ± 6-700 ml/min
- Place the neonates (“mouse pups”) in the box and close the sliding lid well
- Set the vaporiser at 5% Isoflurane
- Wait until all mouse pups are unconscious
- Set the vaporiser on 0% Isoflurane
- Close the flow on te Flowmeter
- Keep the sliding lid closed and disconnect the Quick stop-lock of both the inlet- and outlet tube.
- Place the closed box in the freezer and leave it in the freezer until all pups are euthanised.
- Only than take the box out of the freezer an connect it to the Flowmeter/Vaporiser setup and to the scavenger or Exhaust Unit; keep the sliding lid closed
- Set the scavenger (or Exhaust Unit) to “ON”
- Set the flow of AIR to 600 ml/min (the vaporiser stays at 0%)
- Open the sliding lid of the box for < 1 cm; this allows for the remaining Isoflurane in the box, to be evacuated
- After about 20 seconds, open the sliding lid further and take out the euthanised mouse pups.

Ordering number	
180000110	Euthanasia Unit Neonates

A docking station, enabling human- and animal-welfare-compliant, intuitive and reliable euthanasia for mice in their home IVC. **Just dock your IVC cage into the unit and the euthanasia process will start.**

The UNO Euthanasia Unit for IVC-Cage has to be connected to an electrical wall outlet AND to a CO₂ cylinder or in-house CO₂ distribution system. The inlet pressure to the unit needs to be set at 0,5 bar via an external pressure regulator (not included).



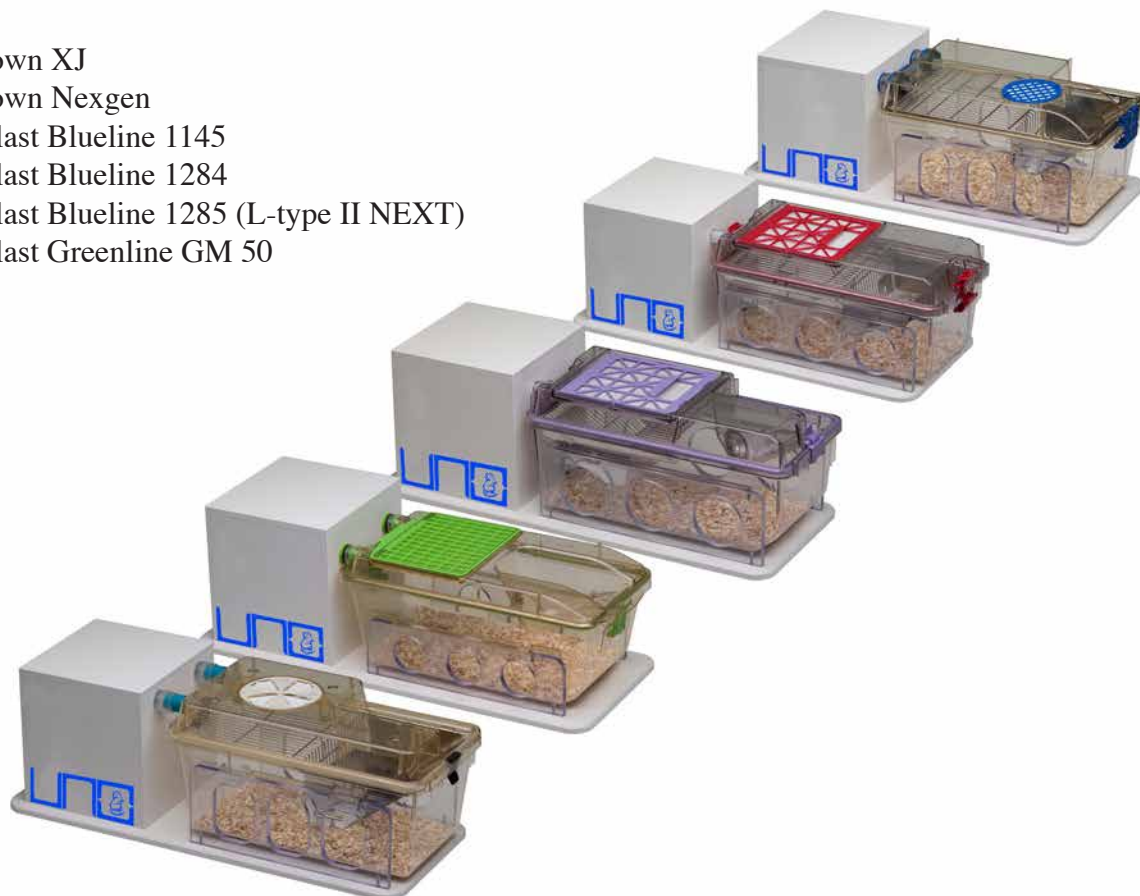
When the IVC cage is correctly docked the unit ensures an even distribution of CO₂ and thus a homogeneously increasing concentration of CO₂ within the IVC cage. If the IVC cage is prematurely removed from the unit, the gas supply stops and the cycle ends prematurely.

The mice are euthanised in accordance with the AVMA Guidelines for the Euthanasia of Animals (2013), the German Animal Protection Act and Animal Welfare Regulation Governing Experimental Animals (2013).

The cycle begins when the CO₂ starts flowing into the unit and lasts 6 minutes to completion.

The UNO Euthanasia Unit for IVC-Cage is available for the following IVC cages:

- Allentown XJ
- Allentown Nexgen
- Tecniplast BlueLine 1145
- Tecniplast BlueLine 1284
- Tecniplast BlueLine 1285 (L-type II NEXT)
- Tecniplast GreenLine GM 50



Ordering number	
180000201 + cage type	Euthanasia Unit IVC cage

UNO CO₂ Multi-Modules Euthanasia Rack

Euthanasia Equipment

The **UNO Multi-modules euthanasia rack** provides an adaptable platform to preform secured and independant protocols for all brands of IVC & conventional cages.

Independance

Each module can be started at any time, and performs an independant session per compartment.

Modularity

Available from 1 to 8 modules, the evolutive solution can be upgraded at any convenience or adapted to any new cage model.

Quite simple

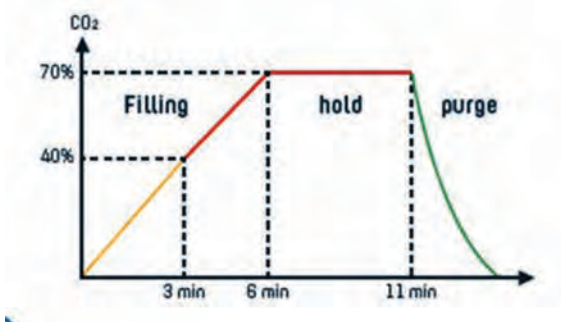
Compatible with all known cages (all brands of inlet nozzles) in the market, the rack and module settings can be easily configured.



Technical specifications

The UNO CO₂ multi-module euthanasia rack is strictly dedicated to rodents (except newborns) - 2010/63/UE directive.

- Touchscreen control panel.
- Protocols memory.
- Stainless Steel housing; easy to clean.
- Doors with electronic safety lock.
- On top of the module a lighting display control, visualises the stage of the program.



Additional products:

1. Soda Lime
2. Lab Air compressor



Ordering number	
180000500	Multi- Module cage rack
180000501	Soda Lime
180000502	Lab Air compressor

Oxygen Concentrator U/PRO5

A reimagined, compact, and highly mobile machine demonstrates that it can stand and deliver a high-quality concentration of Oxygen in an affordable yet sleek layout.

Description

Produced in a lightweight yet tough thermoplastic cabinet to accommodate the components and machinery of the concentrator, while not hindering mobility or convenience of the overall unit. U/PRO5 also has a flame retardant incorporated into the plastic as an added safety feature.

U/PRO5:

- Outside material: Acrylonitrile Butadiene Styrene (ABS)
- Sits atop 4 recessed caster-style wheels, to prevent potential damage or impede movement.
- U/PRO5 also have a handle at the top, to allow for easy handling.
- Overall weight: 14,5kg
- Dimensions: 36x23x58,5cm
- Flow rate: between 0,125 - 5,0 liters per minute (LPM)
- Concentration Range: 90,0% (+5,6/-3,0) purified Oxygen
- Storage temperature: -20 to 40°C
- Average power consumption: 300 Watts for the 230 Volt/ 50 Hertz setup.
- With an easy interface and ease of operation, U/PRO5 is made to be as simple as possible. The U/PRO5 has an Oxygen flow rate knob that is marked, and comes with 12 distinct flow settings, to allow for accurate Oxygen generation for the needs at hand. The units have a standard power switch with just an “On/OFF” setting, as well as visual aids, and a resettable Circuit Breaker.
- The U/PRO5 is designed for easy, low-maintenance service. The hour meter is visible on the outside of the machine, and the dual filters are both readily accessible on the back on unit.
- The U/PRO5 has a spring-mounted Thomas Compressor to aid in a reduction of both vibration and overall sound of the running machine. The compressor makes use of a 50 PSI Pressure Relief Valve as well as a Thermal Switch that will activate automatically and turn off the compressor if the compressor’s temperature meets or exceeds 165°C during operation.
- Enriched Oxygen is provided by Rapid Pressure Swing Adsorption (RPSA) through two tubes of molecular sieve, which are intermittently timed to provide continuous oxygen.
- Outlet Pressure for The U/PRO5: 7.0 PSI / 0.483 Bar / 0.477 ATM
- Pressure rate for the Oxygen output is controlled by the internal 2-way Regulator.
- The U/PRO5 makes use of an Oxygen Content Sensor Indicator (OCSI) that comes standard on the Circuit Board. The purified Oxygen passes through a chamber that measures the concentration of the gas via ultrasonic waves, and will notify via both visual and auditory aids if that purity were to drop below the threshold of 83% purified O₂.
- The U/PRO5 utilizes a resettable Circuit Breaker to protect the circuitry from damage in the event of a short circuit or power overload. 10-amp Breakers are used on the 230 Volt Models.
- The U/PRO5 machine has a barbed Oxygen outlet fitting to ensure a secure connection to the outlet and prevent accidental disconnecting.
- The outer filter of the machine can be washed with warm water to remove dust and other foreign materials caught in it; doing so regularly not only increases the purity of the oxygen generated, but also increases the longevity of the machine overall.
- Comes with numerous safety features, such as an auditory alarm in the event of Loss of Power, High/Low Pressure, overall process failure, and if purity falls below a certain point. This is also accompanied by a solid red LED light to alert the user that there is a problem.



With the UNO O₂ concentrator, it is very easy to get the required O₂ flow to the Induction box, to the face mask or to the ventilator.

1. Connect the tube from the O₂ concentrator to the O₂ connection of the flow meter.
2. Switch the O₂ concentrator ON.
3. Set the small flow meter of the O₂ concentrator to 5LPM (max.).
4. Now use the flow meter of the basic anesthesia set-up to regulate the O₂ flow to the Induction Box, the face mask or Ventilator. You should leave the small flowmeter at 5 LPM because only the flow meter of the basic anesthesia set-up has to be used to regulate the flow.

Ordering number	
180000399	Oxygen Concentrator U/PRO5
180000499	Replacement filterset

Recovery / Nursery / Warming

For improving the temperature of weak animals or animals recovering after a surgical procedures, we have a flexible recovery system available. The system is based on the cage type IVS and can be used as a compact system with one or two cages, placed on desk, table of other available space or delivered in a moveable rack.

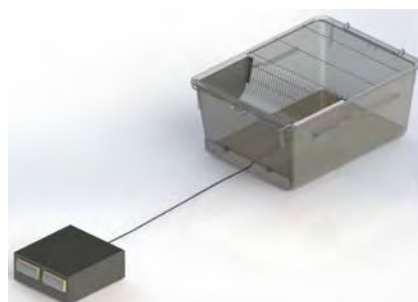
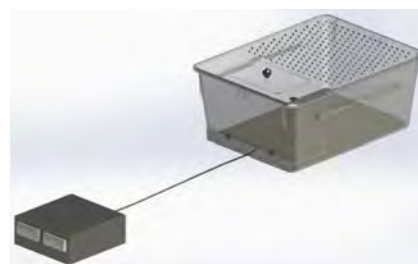
A silicone rubber mat is placed on the heating plate at the bottom of the cage. This mat can be changed easily in order to minimize contact with an other mouse or rat in the cage after a period of recovery/nursery.

The heating plate on the bottom of the cage can be taken out through a slot at the short side of the cage. This slot is closed and the closure keeps the heating plate in place. The heating system is controlled by a heating Control Unit which is positioned on the top of the rack. The temperature range is 28°C- 42°C and can be easily adjusted.



We have two options for the cover of the cage.

1. A perforated polycarbonate plate covering the total opening of the cage. In this perforated plate is a small lid that can be opened to be able to put the animal (or water and feed) into the cage. With this system the warmth will stay longer in the cage because the total openings are smaller.
2. A conventional wire lid. With this wire lid the animal is still in contact with the heating system via the silicone rubber mat. The warmth does not stay in the cage too long; it will go out through the wire lid.



Ordering number	
Please contact us.	

Ergonomic Table Top Stereo Microscope

for use in Micro-Surgery and Stereotaxic procedures

The standard microscope set-up is with the 0,3x objective (ABCD) is designed for use with a stereotaxic instruments because of the 276mm working distance. It can also be used for microsurgery.

The working distance with this unit is 276mm and a magnification upto 15x. If the 0,3x objective is changed for a 0,5 objective (E), the working distance is 126mm and a magnification upto 25x.



Modular Set-up

- Head.
- Zoom Unit.
- Eyepieces.
- Objective.
- Stand.

Features

- Ergonomical binocular 0-35° tilting head with 2 eyepieces.
- Large working distance for use during stereotaxic procedures.
- Wide field of view.
- Central Zoom Unit 1:8 .
- 19kg very stable stand with one articulating arm.
- Planachromatic common main 0,3 x objective working distance upto 276mm.
- Optional objective 0,5x for working distance upto 25x.

Ordering number	
18002020	Table Top Microscope with 0,3x objective
18004005	Optional 0,5x objective



P.O. Box 15
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