

NOxBOX[®] Range

Nitric Oxide Monitors and Delivery Systems



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saving lives, one breath at a time

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Inhaled Nitric Oxide (INO) Therapy

Nitric Oxide (NO) is a recognised and selective pulmonary vasodilator in adults and neonates, and used in the treatment of pulmonary hypertension. NO is added to ventilator circuits in the treatment of patients with severe breathing difficulties. It is used to improve gas exchange and reduce pulmonary arterial pressure in neonate, paediatric and adult intensive care units.

NO delivery and monitoring

The use of NO demands precise monitoring and management to avoid causing unnecessary pain and suffering to the patient, this can occur in the following cases:

- NO has a very short duration of action and on its sudden withdrawal, for example the cylinder runs out, there can be rapid pulmonary vasoconstriction and hypoxaemia ² (rebound).
- Inhalation circuits to deliver NO must ensure the accurate continuous delivery of NO while minimizing levels of NO₂ ³.
- Mechanical or human error may produce inadvertently low or high NO concentrations. Therefore it is essential to monitor NO and O₂ concentrations ³.
- Both NO and NO₂ have the potential for toxicity in clinical use ³. Nitrogen dioxide (NO₂) is formed rapidly from combining oxygen and NO, the rate depends on the concentration of oxygen and square of NO concentration ⁴. Approximately 50% of inhaled NO₂ is retained within the lung and once absorbed it remains there for prolonged periods, reacting with water to form nitric and nitrous acids which are responsible for the pulmonary toxicity of NO₂ ⁵.

In summary the use of accurate, real-time NO and NO₂ monitors is essential in order to ensure the correct dosage, reduce side effects of INO therapy and ultimately improve the patients' quality of life.

NOxBOX[®]+

Ideal for uninterrupted INO monitoring whilst transporting patients

Hard wearing, rugged design with lockable front to avoid damage or tampering whilst in transit/transporting patients, to ensure accurate and consistent dosage



Large, clear LCD displays making it easy to instantly see changes in concentration of both NO and NO₂

Visual and audio alarms for instant warning of unacceptable gas levels as well as low battery indicator

The NOxBOX⁺ is a compact, accurate and easy to use side-stream monitor for NO and NO₂. With a battery life of up to 20 days, the NOxBOX⁺ is ideal for INO monitoring whilst transporting patients, by surface or air.

Easy to use by non-technical personnel to enable easy change over of nursing staff when NO therapy is used over long periods of time.

The NOxBOX⁺ features alarms that can be adjusted to suit the range being used, these alarms include:

- Low NO – to prevent sudden cessation of NO delivery
- High NO – warning for potential over dosage of NO
- High NO₂ – avoiding NO₂ poisoning

Compatible with all ventilators operating at >10mb, using a low cost connection kit (NOXKIT-V) **Order Code - NOXBOX-PLUS-V**

Technical Specification

Measuring Range:	0-200ppm NO 0-50ppm NO ₂
Sample Flow Rate:	Approx. 175 ml/min @30 mbar
Detection Principle:	Sealed Electrochemical Sensor
Accuracy:	+/- 5% of reading
Interference:	0% - NO on NO ₂ sensor <25% - NO ₂ on NO sensor
Display:	Dual LCD
Alarms:	Audible and visible Low NO; High NO; High NO ₂
Warm Up Time:	<30 secs
Response Time:	<10 secs to 90% FSD NO <30 secs to 90% FSD NO ₂
Drift:	<2% signal loss/month
Operating Temperature:	0-40°C
Operating Pressure:	5-80 mbar (cm water gauge)
Operating Humidity:	0-100%
Sensor Operating Life:	2-3 years
Sensor Sensitivity:	0.2ppm NO and NO ₂
Battery Life:	20 days (operational, no alarms) 1 year (storage)
Dimensions:	180(D) x 210(W) x 145(H) mm
Weight:	2.3kg including batteries
Construction:	Plastic with aluminium panels

NOxBOX[®]O₂ Coming Soon

The next generation in NO monitoring

Large LCD display making it easy to instantly see changes in concentration of NO, NO₂ and O₂

Auto zeros on power up to save time and improve ease of use



On screen visual and audio warning of unacceptable gas levels, water trap full, pump failure and battery low

Built in pump, exposing the sensor to constant pressure and flow rate

The NOxBOXO₂ is the flagship of NO monitoring, allowing accurate, real-time monitoring of not only NO and NO₂ but also Oxygen (O₂) levels. This additional feature enables the user to monitor the exact concentration of O₂ entering the patient, as this is often different from that indicated on the ventilator once dilution with NO has occurred.

The internal pump ensures that the sensor is constantly exposed to constant gas pressure and flow rate, enabling the NOxBOXO₂ to be used with all ventilators and spontaneous breathing patients.

The NOxBOXO₂ features alarms that can be adjusted to suit the range being used, these alarms include:

- Low NO – to prevent sudden cessation of NO delivery
- High NO – warning for potential over dosage of NO
- High NO₂ – avoiding NO₂ poisoning
- Low O₂ – to ensure correct concentration of O₂

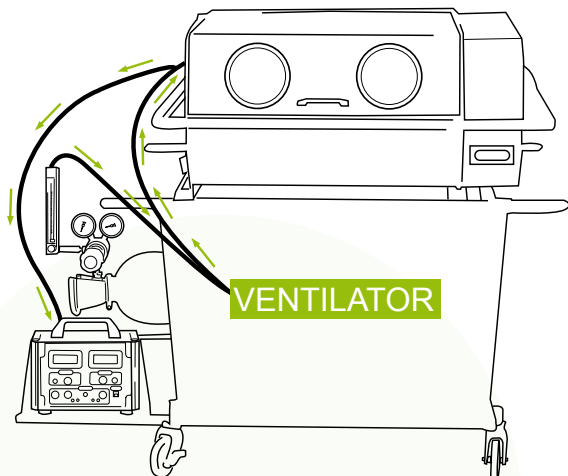
Compatible with all ventilators, using a low cost connection kit (NOXKIT-V)

Order Code – NOXBOXO2

Technical Specification

Measuring Range:	0-200ppm NO 0-50ppm NO ₂ 0-100% O ₂
Sample Flow Rate:	Approx. 250 ml/min
Detection Principle:	Sealed Electrochemical Sensor
Accuracy:	<5% of reading
Display:	Graphics LCD
Alarms:	Audible and visible
Warm Up Time:	<30 secs
Response Time:	<10 secs to 90% FSD NO <30 secs to 90% FSD NO ₂
Operating Temperature:	10-40°C
Sensor Operating Life:	1-2 years
Sensor Resolution:	0.1ppm NO and NO ₂
Battery Life (approx.):	4-6 hours (operational, no alarms) 1 Year (storage)
Dimensions:	240(D) x 210(W) x 140(H) mm
Weight:	4.06kg including batteries
Construction:	Metal

NOxBOX[®]+ pressure and control continuous flow system-
Ideal for patient transport



Stainless steel flow meter with flow rate range 0-100ml/m to set desired flow rate

2 stage stainless steel regulator for accuracy and to improve flow control

Polyurethane tubing carries NO & O₂ mixture through a water trap and dryer to remove moisture

The NOxBOX⁺ pressure and control continuous flow system combines simple design with hard-wearing, accurate performance. This system is ideal for patient transport due to the NOxBOX⁺ battery life of 20 days or for those with limited budgets and can be easily adapted to suit any situation.

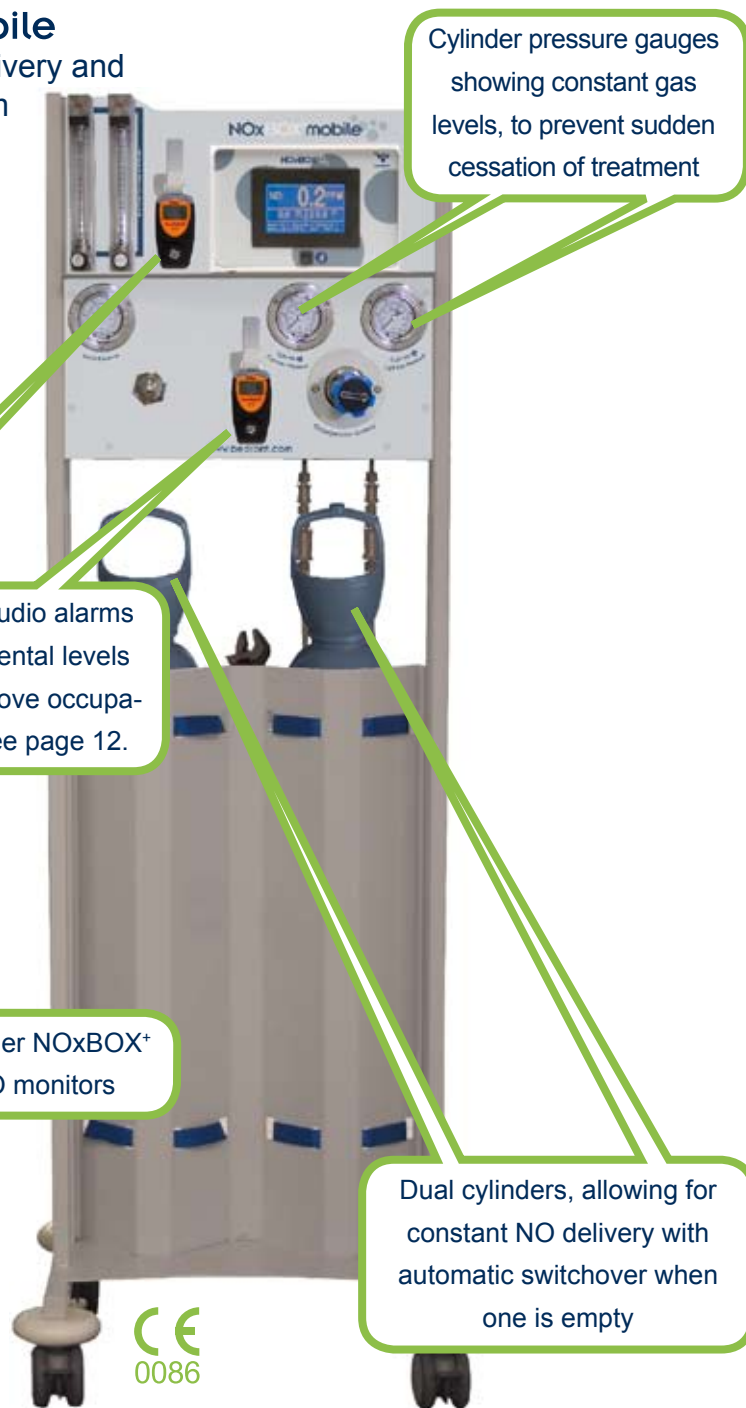
The use of environmental NO and NO₂ monitors are recommended when delivering NO. See page 12. **Order Code - NOXSC**

Technical Specification

Measuring Range:	0-200ppm NO 0-50ppm NO ₂
Sample Flow Rate:	Approx. 175 ml/min @30 mbar
Detection Principle:	Sealed Electrochemical Sensor
Accuracy:	+/- 5% of reading
Interference:	0% - NO on NO ₂ sensor <25% - NO ₂ on NO sensor
Display:	Dual LCD
Alarms:	Audible and visible Low NO; High NO; High NO ₂
Warm Up Time:	<30 secs
Response Time:	<10 secs to 90% FSD NO <30 secs to 90% FSD NO ₂
Drift:	<2% signal loss/month
Operating Temperature:	0-40°C
Operating Pressure:	5-80 mbar (cm water gauge)
Operating Humidity:	0-100%
Sensor Operating Life:	2-3 years
Sensor Sensitivity:	0.2ppm NO and NO ₂
Battery Life:	20 days (operational, no alarms) 1 year (storage)
Dimensions:	180(D) x 210(W) x 145(H) mm
Weight:	2.3kg including batteries
Construction:	Plastic with aluminium panels
Max. Inlet Pressure (regulator)	248bar
Regulator Control Range	0-6.8bar
Flow Meter Control Range	10-100 cc/min

NOxBOX®mobile

Complete NO delivery and monitoring system



Cylinder pressure gauges showing constant gas levels, to prevent sudden cessation of treatment

Portable, visual and audio alarms warn staff if environmental levels of NO and NO₂ rise above occupational safety limits. See page 12.

Can be used with either NOxBOX+ or NOxBOXO₂ INO monitors

Dual cylinders, allowing for constant NO delivery with automatic switchover when one is empty

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The NOxBOX®mobile is a completely self contained NO delivery and monitoring system. Allowing NO to be deployed, monitored quickly and used easily close-by the patient's ventilator, as research shows that hoses containing NO/O₂ mixtures must be kept as short as possible³ in order to limit the build up of NO₂.

We recommend the use of NOxBOXO₂ with NOxBOXmobile due to the extra advantage of O₂ monitoring. The monitors are both mains powered with back up batteries for emergency's or transportation, those using the NOxBOXmobile for transport purposes may wish to use the NOxBOX+ due to its superior battery life of 20 days.

The NOxBOXmobile can be used with different suppliers of NO medical gas products to suit preferences.

Compatible with all continuous flow ventilators and spontaneous breathing patients if NOxBOXO₂ is used.

The use of environmental NO and NO₂ monitors are recommended when delivering NO. See page 12.

Order Code – NOXBOXMOBILE

Technical Specification

Dimensions:	1590(H) x 500(W) x 528(D) mm
Weight:	approx. 40kg complete trolley and cylinders
Construction:	Powder coated steel
Wheels:	75mm anti-static castors, with kick-stop lock
Flow meters:	0-100cc/min and 0-600cc/min
Regulators:	Stainless steel changeover regulator, 2 bar preset outlet
Storage Conditions:	Dry, clean atmosphere, between 0 and 40°C

Optional Extras

Manual Bagging System

at the turn of a switch the NOxBOXmobile can be switched from the ventilator to manual bagging for emergency transportation situations or other non-ventilated procedures.

Order Code - NOXBAG



NOxAIR Portable, visual and audio alarms warn staff if environmental levels of NO and NO₂ rise above occupational safety limits and detect leaks.

**Order Codes – NOXAIR-NO-V
NOXAIR-NO2-V**



Hard plastic carry case

for transportation of up to 2 high capacity calibration cylinders used for NOxBOX calibration.

Order Code – CCG-V

Consumables

Nafion drying tube – this should be changed at every service, annually or if contaminated with water

Order Code – NOXNAF-V

Water Trap for NOxBOX⁺ – collects water removed from the circuit and should be emptied when full

Order Code – NOXWT-V

Water Trap for NOxBOXO₂ – collects water removed from the circuit, and should be emptied when full

Order Code – NOXO2WT-V

Polyurethane Tubing – 1.5 metres of tubing to be cut to required size

Order Code – POLYTUBE

NOxBOX Calibration System – the NOxBOX+ and NOxBOXO₂ require calibration before each new patient, once a week whilst in use and once a month when not in use.

Order Code – NOX-T-CAL

Ventilator Connection Kit – selection of fitments and tubing

Order Code – NOXKIT-V

NOxBOX Cleaning wipes – pack of 25 non-alcohol wipes for cleaning all NOxBOX products. DO NOT USE ANY CLEANING PRODUCTS THAT CONTAIN ALCOHOL, as this will damage the equipment and cause inaccurate readings.

Order Code – WIPE-BB

NOxBOX® Range & Order Codes

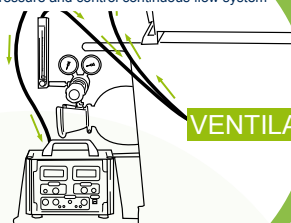
notes...

NOxBOX®+



Order Code - NOXBOX-PLUS-V

NOxBOX®
pressure and control continuous flow system



Order Code - NOXSC

NOxBOX®O₂



Order Code - NOXBOXO2

NOxBOX®mobile



Order Code - NOXBOXMOBILE

Optional Extras

Manual Bagging



Order Code - NOXBAG

NOxAIR



**Order Code - NOXAIR-NO-V
NOXAIR-NO2-V**

Sources

1. Nitric Oxide, available at: http://en.wikipedia.org/wiki/Nitric_oxide
2. Frostell C. Nitric oxide inhalation – future drug or an invitation to disaster? Paediatr Anaeth 1194; 4: 147-50.
3. Body S. C. et al (1995) Nitric Oxide: Delivery, Measurement, and Clinical Application. Journal of Cardiothoracic and Vascular Anaesthesia, Vol 9 No 6 pp748-763.
4. Austin AT. The chemistry of the higher orders of nitrogen as related to the manufacture, storage and administration of nitric oxide. BR J Anaesth 1967; 39: 345-50.



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Issue 8 - August 2009, Part No: MKT003
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