

# NOxBOX<sub>i</sub><sup>®</sup> Operating Instructions

## Set- Up

Before you use the Bedfont NOxBOX<sub>i</sub> intelligent Nitric Oxide delivery and monitoring system it is important to follow these steps:

Ensure the device does not require maintenance (monthly) and that the maintenance is not due during the expected duration of the therapy such as:

- NO sensor high calibration
- NO<sub>2</sub> sensor high calibration
- Pump calibration
- Vent calibration

### Checklist

- Ensure the device is clean and free from damage
- Ensure the water trap is empty and has been cleaned from previous use
- Ensure all single use items from previous patient have been discarded

### Equipment you will need for set-up:

- A NOxBOX<sub>i</sub> system test kit (NOXBOX-I TEST)
- A NOXKIT (inspiratory limb size dependant)
- Two cylinders of delivery gas
- A 22mm one-way valve for HFO ventilator circuits (FXS555)

### Additional items

- NOxAIR Environmental monitors
- Manual bagging kit

NOTE: If you do not have the parts listed above or the device has not been maintained the NOxBOX<sub>i</sub> may not be suitable for use and you may be unable to set-up the device. Failure to follow these procedures may result in harm to the operator or the patient.

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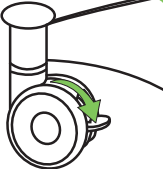
NOxBOX<sub>i</sub><sup>®</sup> Ltd

ISO 9001:2008  
Cert No. FM 31664  
ISO 13485:2003  
Cert No. MD 502905

# NOxBOX<sup>®</sup> Operating Instructions

## Setup

1



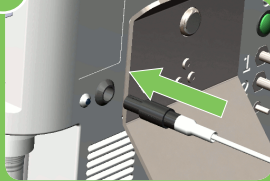
Engage trolley brakes to stabilise system prior to use.

2



To attach monitor to trolley, carefully drop the monitor over the attachment plate.

3



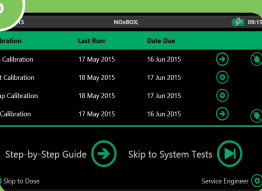
Connect power supply to suitable rated mains outlet.

4



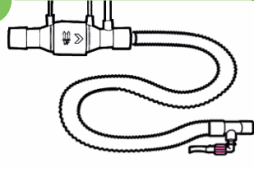
Press power button to start system.

5



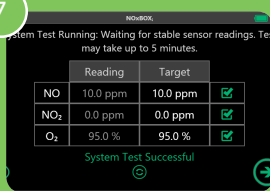
Once zero test is complete, follow instructions on screen to set-up system. Experienced users may choose to skip directly to system tests or skip to dose.

6



System test circuit set-up: NOxFlow<sup>TM</sup> arrow points in direction of flow. 1m vent tubing between sample point and NOxFlow<sup>TM</sup>.

7

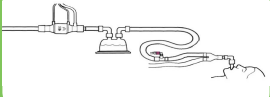


Perform system test to ensure correct system functionality prior to connecting to patient.

	Reading	Target	
NO	10.0 ppm	10.0 ppm	✓
NO <sub>2</sub>	0.0 ppm	0.0 ppm	✓
O <sub>2</sub>	95.0 %	95.0 %	✓

System Test Successful

8

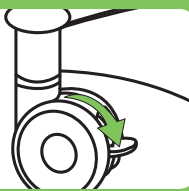


Connect to patient circuit; sample near patient Y-piece. Retain NOxFlow<sup>TM</sup> orientation for flow and 1m distance from sample point.

## NOxBOX<sup>®</sup> Operating Instructions

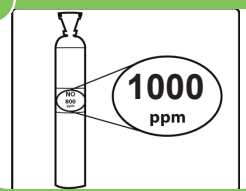
## Cylinder setup

1



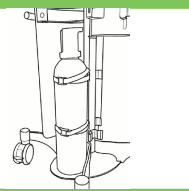
Engage trolley brakes to stabilise system prior to changing cylinder.

2



Check cylinder concentration matches the setting for the system.

3



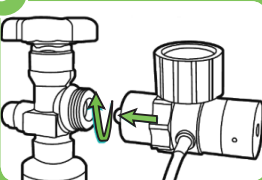
Load cylinders onto trolley. Secure with straps.

4



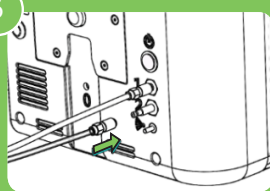
Check regulator surfaces and O rings are damage free. Do not use damaged equipment.

5



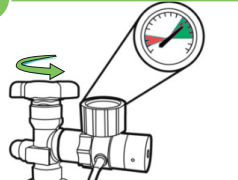
Attach regulator to cylinder. Screw firmly by hand. Attach supply line to regulator.

6



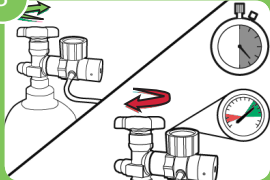
Apply supply line to port on rear of monitor

7



Slowly open cylinder valve. Read gauge. If needle in red zone, replace cylinder before starting treatment.

8

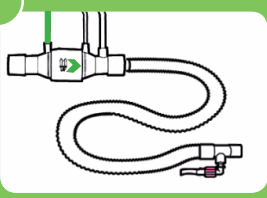


Perform a leak test: open the cylinder valve then close. Observe gauge for 30 seconds, needle should remain stationary.

# NOxBOX<sub>i</sub>® Operating Instructions

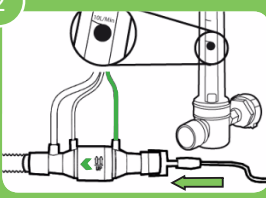
## System tests

**1**



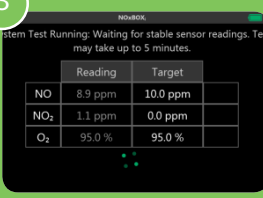
System test circuit set-up: NOxFlow arrow points in direction of flow. 1m vent tubing between sample point and NOxFlow.

**2**



Re-open NO cylinder. Connect O<sub>2</sub> supply to NOxFlow™ inlet. Set O<sub>2</sub> flow to 10 L/min. Press "Next" on system screen to run test.

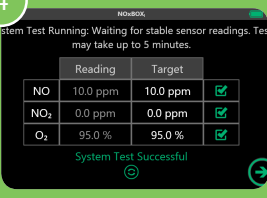
**3**



System test takes approx. 5 minutes to run. This purges NO<sub>2</sub> and ensures correct NOxBOX<sub>i</sub> operation.

	Reading	Target	
NO	8.9 ppm	10.0 ppm	
NO <sub>2</sub>	1.1 ppm	0.0 ppm	
O <sub>2</sub>	95.0 %	95.0 %	

**4**

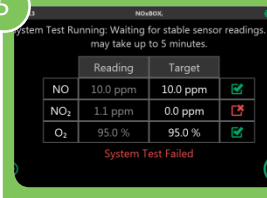


System test passed. Stop O<sub>2</sub> flow and disconnect from NOxflow. Ready to connect to patient.

	Reading	Target	
NO	10.0 ppm	10.0 ppm	✔
NO <sub>2</sub>	0.0 ppm	0.0 ppm	✔
O <sub>2</sub>	95.0 %	95.0 %	✔

System Test Successful

**5**

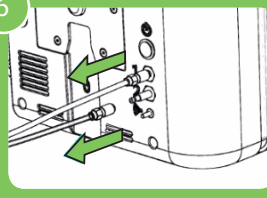


System test failed. Check: NOxFlow orientation; O<sub>2</sub> flow at 10 L/min, NO cylinder connected and valve open. Re-run test.

	Reading	Target	
NO	10.0 ppm	10.0 ppm	✔
NO <sub>2</sub>	1.1 ppm	0.0 ppm	✘
O <sub>2</sub>	95.0 %	95.0 %	✔

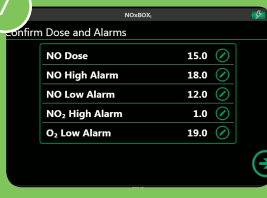
System Test Failed

**6**



If not using in next 10 mins: Unit may time out and may require you to repeat step 4.

**7**



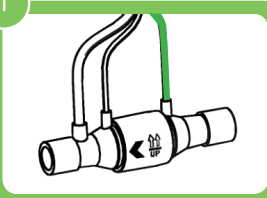
Connect to patient circuit. Enter dose and check alarm levels before commencing treatment.

Alarm	Level	
NO Dose	15.0	✔
NO High Alarm	18.0	✔
NO Low Alarm	12.0	✔
NO <sub>2</sub> High Alarm	1.0	✔
O <sub>2</sub> Low Alarm	19.0	✔

## NOxBOX<sup>®</sup> Operating Instructions

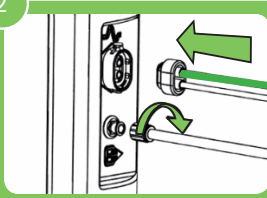
## Ventilator connections

1



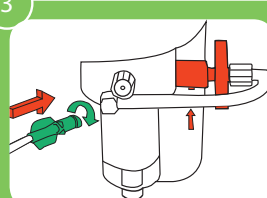
The NOxFlow™ is single patient use. Unwrap and carefully uncoil the lines.

2



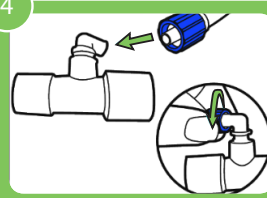
Push and click-to-lock twin sensor line to unit. Twist dose line luer to unit.

3



Change sample line and hydrophobic filter.

4



Select a vent connector with luer port from the NOxKIT™. Connect the male luer of the sample line.

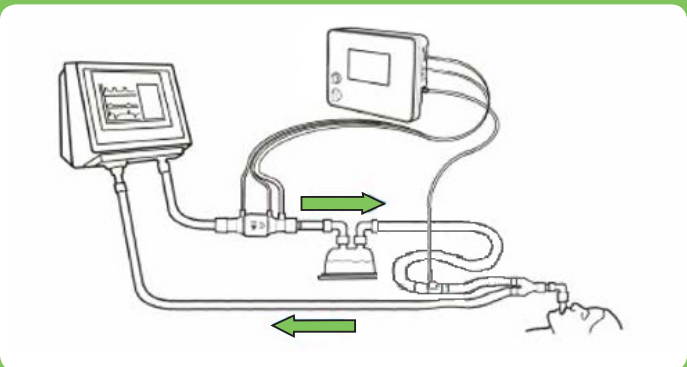
5

NOxFlow™ is situated in the inspiratory limb, before the humidifier.

The sample line is up to 30cm from patient to the patient Y-piece.

NOxFlow should be approx. 1 metre back from the sample point. Ideal range 0.7 m – 1.3 m.

For system test, high frequency and manual bagging circuit diagrams please refer to Technical Guide.



# NOxBOX<sup>®</sup> Operating Instructions

# Dose setting & main screen features

To set or change dose press 'edit dose'. The NOxBOX will then guide you through setting the dose and high/low alarms. Once confirmed the delivery and monitoring will adjust accordingly.

Maximum dose - 80ppm  
Minimum dose - 0.1ppm

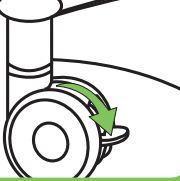
top bar  
gas monitoring  
dose and status  
navigation tabs

The navigation tabs access the alarm history and user settings screens. Alarm history: shows last 10 alarms for current treatment. Unresolved alarms are listed at the top. User settings: change user settings, access Manual Override calculator, Sensor Zero and Service Engineer area.

## NOxBOX<sup>®</sup> Operating Instructions

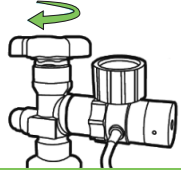
## Cylinder replacement

1



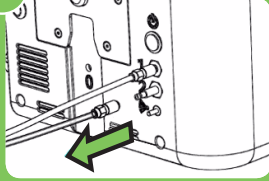
Engage trolley brakes to stabilise system prior to changing cylinder.

2



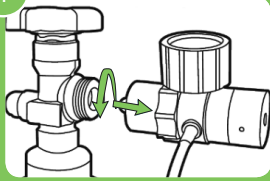
Fully close cylinder valve.

3




Detach hose from monitor and depressurise on purge needle.

4



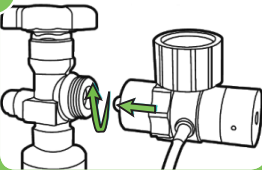
Check regulator gauge pressure is relieved and remove regulator from depleted cylinder.

5



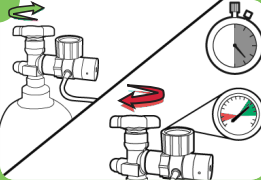
Remove depleted cylinder from trolley and replace with new supply cylinder. Check the concentration matches the value displayed on-screen.

6



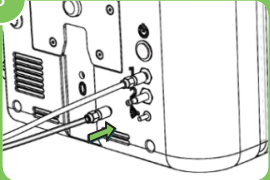
Check O rings and attach regulator to new cylinder.

7



Perform a leak test: Slowly open the cylinder valve then close. Observe gauge for 30 seconds, needle should remain stationary.

8

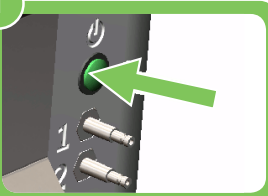


Purge pressure from hose, then reconnect the hose to inlet port monitor. Open valve on cylinder fully.

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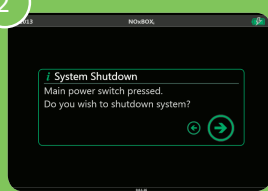
## Shutdown

1



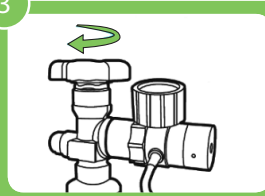
When ready to shutdown the system, briefly press the power button on the monitor.

2



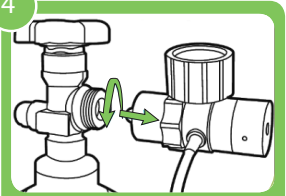
Confirm on-screen that shutdown is required. Follow on-screen instructions.

3



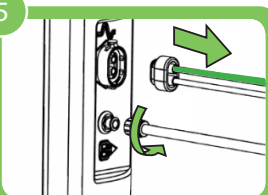
Fully close each cylinder and depressurise the supply lines using the purge needle.

4



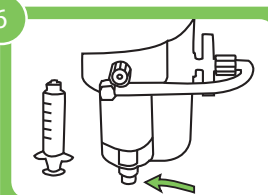
Check regulator gauge pressure is relieved and remove regulator from each cylinder and stow on system trolley.

5



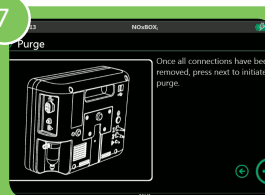
Remove all single patient use devices from monitor and dispose of according to local regulations.

6



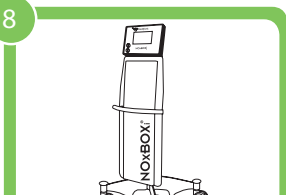
Drain water trap and dispose of drainage syringe.

7



On completion of last instruction screen, system will purge and shutdown safely ready for storage.

8



Remove power supply and store on trolley for transport. Ensure system is attached to suitable mains supply whilst in storage.



## ALARMS TROUBLESHOOTING

The NOxBOX<sub>i</sub> is equipped with audible and visible alarm notifications; this chapter is a guide to the alarm conditions that can occur and common actions for alarm resolution. All alarms are graded into high priority or medium priority alerts.

NOTE: In all instances of alarms sounding, the health and condition of the patient must be ensured before attempting to resolve any issue with the NOxBOX<sub>i</sub> system.

### Alarm Priorities

The system alarms are colour coded to help identify priority of detected issue. Additionally, the two alarm priorities each have an audible warning to help differentiate them.

Priority	Colour & Tone	Meaning
High	Red 5 tone pattern & Red L.E.D. alarm strip.	Critical problem detected. Condition poses immediate threat to patient health or correct functioning of the NOxBOX <sub>i</sub> monitor. Alarm condition should be diagnosed and resolved immediately.
Medium	Amber 3 tone pattern	Problem detected. Condition may impair the functioning of the NOxBOX <sub>i</sub> . If left unresolved, problem may worsen and cause a high priority alarm condition.

**Notifications at Switch on**

The below are a series of notifications which may be seen at start-up (before the home screen) if an issue is detected with the NOxBOX<sub>i</sub>.

Notification	Priority	Possible Cause	Recommended
NOxBOX <sub>i</sub> System Diagnostics	High	The NOxBOX <sub>i</sub> performs self-tests at start-up and during operation to ensure safe performance is maintained. In the event that a critical test fails, the system will display a full-screen notice indicating that the system can no longer be used safely.	Press the on screen reset button.
Sensor Bias Lost	High	The Nitric Oxide sensor requires a constant very low trickle charge to maintain its calibration. In the event that the system is not stored on mains power charge, after an extended period of time the battery may completely discharge and the sensors will lose their calibration bias.	In the event of power loss, connect the unit to mains power and allow 6 hours for the unit to charge before calibrating the NO sensor and re-commissioning the unit. If another system is not readily available and patient requires therapy, engage the manual override mode, replace the system as soon as practically possible and alert the Service Engineer.
		The Nitric Oxide sensor is sensitive to extreme temperature variation, contact with VOCs (such as alcohol based cleaning products), strong fragrances, direct contact with moisture or vibrations (such as during transit in a vehicle).	Follow setup steps as normal, if sensor zero fails re attempt until the unit passes, this can take up to 30 minutes in some cases.
		The NO sensor may require replacing.	If another system is not readily available and patient requires therapy, engage the manual override mode, replace the system as soon as practically possible and alert the Service Engineer.

**High Priority Alarms during therapy**

The below are a series of alarms which may be seen during therapy (once the device has been setup) if an issue is detected with the NOxBOX<sub>i</sub>.

Alarm	Priority	Possible Cause	Recommended Action
NO Low	High	Monitored levels of NO gas being delivered to the patient have dropped below the alarm setting boundary. NOxBOX <sub>i</sub> delivery system cannot maintain correct dose setting.	Check sample line is correctly attached to ventilator circuit and NOxBOX <sub>i</sub> water trap inlet.
			Check sample line for blockages.
			Check water trap (including barrel thread) for damage and/or leaks.
			Check no ventilator circuit breaks or leakages have occurred.
			Check supply cylinder is connected, open; there are no leaks and the concentration matches the system settings.
			Check correct orientation of NOxFLOW.
			Check NOxFLOW dose line and connection is connected and there are no blockages or leaks.
Check NOxFLOW flow detection lines and connection (including O rings) are connected and there are no blockages or leaks.			
		The ventilator minute volume may be too low.	Check ventilator minute volume (see NOxBOX <sub>i</sub> technical guide for flow specifications), you may need to increase the ventilator bias flow.
		The NO low alarm may be inappropriately set by user.	Check NO low alarm value and reduce value if ventilator settings deem necessary.
		The NO sensor may require replacing.	If another system is not readily available and patient requires therapy, engage the manual override mode, replace the system as soon as practically possible and alert the Service Engineer.
NO High	High	Monitored levels of NO gas being delivered to the patient have risen above the alarm setting boundary. NOxBOX <sub>i</sub> delivery system cannot maintain the correct dose setting.	Check supply cylinder concentration matches the system settings. If possible, change the NO supply cylinder for the correct concentration. If not, call Service Engineer to resolve.
			Check no ventilator circuit break/leakage has occurred that may cause build-up of NO concentration due to lack of ventilator flow.
			Check correct orientation of NOxFLOW.
			Check NOxFLOW connection (and O rings) to NOxBOX <sub>i</sub> .
			Check NO high alarm value and increase value if ventilator settings deem necessary.
		The NO high alarm may be inappropriately set by user.	Check NO high alarm value and increase value if ventilator settings deem necessary.
		The NO sensor may require replacing.	If another system is not readily available and patient requires therapy, engage the manual override mode, replace the system as soon as practically possible and alert the Service Engineer.

NO <sub>2</sub>	<b>High</b>	Monitored levels of NO <sub>2</sub> gas being delivered to the patient have risen above the alarm setting boundary.	High NO dose settings on low ventilator flows with High O <sub>2</sub> content may cause higher NO <sub>2</sub> build-up than expected. Increase ventilator bias flow to help reduce stagnation in delivery.
		Poor quality NO cylinders can contain high levels of NO <sub>2</sub> .	Connect a second supply cylinder to the alternate inlet port. Open the cylinder and disconnect the previous cylinder, forcing a cylinder changeover to see if this resolves the issue.
		The NO <sub>2</sub> high alarm is set to a default value of 1.0ppm. NO <sub>2</sub> is extremely toxic and poses risk to patient health.	The alarm value can be increased to a maximum of 5.0ppm if required. Please see INO guidelines for more information on maximum NO <sub>2</sub> values during INO therapy.
		Incorrect placement of NOxFLOW and sample line.	See ventilator circuit diagram for correct placement of NOxFLOW and sample line.
		Whilst in standby mode NO <sub>2</sub> can build up in supply lines.	Purge supply lines (see cylinder change procedure).
		Stagnant gas in manual bag circuit causing NO <sub>2</sub> .	Purge manual bag circuit before connecting to patient (see manual bagging procedure).
		The NO <sub>2</sub> sensor may require replacing.	If another system is not readily available and patient requires therapy, engage the manual override mode, replace the system as soon as practically possible and alert the Service Engineer.
O <sub>2</sub> Low	<b>High</b>	Monitored levels of O <sub>2</sub> gas being delivered to the patient have fallen below the alarm setting boundary.	Check sample line for blockages.
			Check water trap (including barrel thread) for damage and/or leaks.
			Check sample line is correctly attached to ventilator circuit and NOxBOX <sub>i</sub> water trap inlet.
			Check no ventilator circuit breaks or leakages have occurred.
		The NO gas is balanced in N <sub>2</sub> , this is an asphyxiant gas. At high NO dose levels for low concentration cylinders (e.g. 200 ppm) the level of gas delivered into the ventilator stream can reduce the % v/v of O <sub>2</sub> being delivered to the patient.	Check O <sub>2</sub> concentration setting at ventilator.
			Adjust O <sub>2</sub> alarm value if deemed necessary.
The O <sub>2</sub> sensor may require replacing.	If another system is not readily available and patient requires therapy, engage the manual override mode, replace the system as soon as practically possible and alert the Service Engineer.		

Water Trap Full	High	Water trap is filled with condensate from sample line. If the water trap is allowed to overflow, the sample path will block and water ingress to the NOxBOX <sub>i</sub> system could damage the internal mechanisms and gas sensors. Delivery accuracy is compromised and patient safety could be put at risk.	Use disposable male-luer lock syringe contained in NOXKIT to empty fluid from water trap via the self-sealing drain tap located at the bottom of the water trap. Dispose of entire syringe and contents according to local directives (e.g. sharps waste).
			The water trap uses a small float to activate the alarm, if no moisture is present gently tap the barrel to see if the alarm float is in the off position.
			If issues persist, remove the barrel and check position of alarm float. Removing the water trap barrel will dilute NO sample causing inaccurate dose and readings. Take care not to damage/cross thread the water trap thread when replacing the barrel.
Sample Line block	High	Sample line to monitor has become blocked, pinched or occluded. Sample monitoring is affected which may compromise delivery accuracy and patient safety.	Check sample line for any pinch/crush points from external bodies, or blockages that may have occurred.
			Check water trap does not require emptying.
			Change sample line and hydrophobic filter.
Battery Critical	High	NOxBOX <sub>i</sub> is running from internal battery and battery charge level has been detected as critical. System power could fail within the next 10 minutes. Power failure will stop automatic intelligent delivery of NO.	If another system is not readily available and patient requires therapy, engage the manual override mode, replace the system as soon as practically possible and alert the Service Engineer.
			Reconnect the NOxBOX <sub>i</sub> system to the mains using the NOxBOX <sub>i</sub> power supply. This will ensure continued powered operation of the NOxBOX <sub>i</sub> and will start to recharge the internal battery.
			Check green (mains power) L.E.D on mains power plug is lit indicating mains supply OK. If not, try a different mains power socket/supply.
			Disconnect power supply and reconnect, check blue (charging) L.E.D is lit indicating mains supply OK. If not, try a different mains power/supply.
			If possible replace NOxBOX <sub>i</sub> power supply and alert service engineer.



			In the event that no mains power can be restored to the device, be prepared to engage the manual override mode.
Cylinder Supply Critical	High	NOxBOX <sub>i</sub> detects that available NO gas supply is running low, and no alternate cylinder supply is detected. Without action to replenish the NO gas supply treatment delivery will cease.	Install a new gas cylinder supply and connect to the alternate gas inlet port at the rear of NOxBOX <sub>i</sub> .
			If a new gas cylinder is already installed, ensure the cylinder valve is fully open and connected to inlet port at rear to allow the device to use the supply for delivery.
			Check the supply cylinder regulator gauges indicate adequate cylinder pressure (>20bar). If regulator gauge indicates adequate pressure, check for leaks. If issues persist, replace regulator and alert service engineer.
Vent Flow Idle	High	The NOxFLOW has not detected any vent flow activity for an extended period of time (typically over 30 seconds) during delivery.	Check correct orientation of NOxFLOW; the green arrow printed on the NOxFLOW should be pointing towards the patient in the direction of the ventilator flow.
			Check NOxFLOW flow detection lines and connection (including O rings) are connected and there are no blockages or leaks.
			Check there is not a serious leak or break in the ventilator circuit. Attend to the ventilator circuit requirements.
			Check the ventilator is connected and supplying sufficient flow.
Critical Delivery Fault	High	The NOxBOX <sub>i</sub> has detected a critical fault within the intelligent delivery system, and can no longer guarantee safe delivery function. Occlusion on NO outlet.	If another system is not readily available and patient requires therapy, engage the manual override mode, replace the system as soon as practically possible and alert the Service Engineer.
			Check for occlusions on the NO outlet, delivery line or NOxFLOW. Once resolved, reset the dose to resume delivery.
Touch screen won't respond.	High	The NOxBOX <sub>i</sub> has detected a critical fault within the intelligent delivery system, and can no longer guarantee safe delivery function. NO delivery to the patient may have stopped.	If another system is not readily available and patient requires therapy, engage the manual override mode, replace the system as soon as practically possible and alert the Service Engineer.

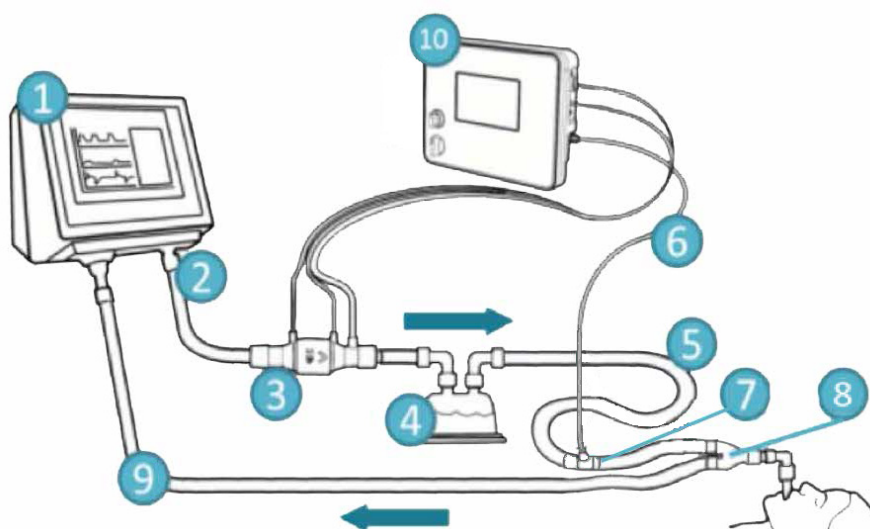
**Medium Priority Alarms during therapy**

Alarm	Priority	Possible Cause	Recommended Action
Zero Calibration	Medium	<p>Every 24 hours during use the NOxBOX<sub>i</sub> prompts the user to perform a sensor zero. This operation ensures the most accurate system performance by checking the gas sensor reading performance.</p> <p>NOTE: This test takes up to 2 minutes to perform. During this time the monitored patient gases will be offline. The NOxBOX<sub>i</sub> continues to deliver NO during this time.</p>	<p>No special connections are required; the zero calibration is fully automatic.</p> <p>Press the tick to start the zero calibration.</p> <p>The zero calibration can be delayed if the system is not currently in a stable dose delivery state: e.g. If the patient dose has recently been changed and the system is still stabilising to the new dose level, dismiss this alarm message and perform the zero when the notice next appears.</p>
Zero Calibration Fail	Medium	One or all of the sensors have failed the zero (low) calibration.	Check ambient NOxAIR monitor for high levels of NO. If high levels are detected, check the regulator(s) and supply line(s) for leaks.
		Ambient conditions may be affecting the zero sample.	Repeat zero calibration.
		A sensor may have become unstable or residual gas may be present in the system.	Check the zero port (rear) has not been blocked.
Cylinder Low	Medium	This will appear when an alternate viable gas supply is detected, but the current feed cylinder is nearly depleted.	If another system is not readily available and patient requires therapy, engage the manual override mode, replace the system as soon as practically possible and alert the Service Engineer.
			<p>Replace the cylinder with a fresh supply to resolve this alarm.</p> <p>Alternatively, once the cylinder is empty, close the cylinder valve fully, remove the feed hose from the rear of the system and release the pressure using the purge needle on the monitor. Please note, once the second cylinder begins to deplete, if this first cylinder has not been replaced in the interim period, the 'cylinder supply critical' alarm will be triggered.</p>

High Calibration Overdue	Medium	<p>To keep the NOxBOX<sub>i</sub> functioning accurately, it is important that the system sensors be fully calibrated by a suitably qualified Service Engineer once a month.</p> <p>The system records the last date of each successful calibration in the service engineer section.</p>	<p>This action may be performed whilst the system is in use via the service engineer area. However Bedfont strongly recommend that the sensor high calibrations are not performed during therapy to minimise risk to the patient.</p> <p>To resolve, the system sensors must be calibrated by the appointed Systems Engineer using calibration gases.</p>
Manual Override	Medium	<p>Manual Override mode is engaged.</p> <p>The system alarms to alert the user that the system is not delivering in intelligent mode. Changes to the ventilator setting or patient demand cannot be automatically corrected on the system. A specific dose setting cannot be dialled in and achieved.</p> <p>The patient must be closely monitored and ensure the gas alarms are correctly set to alert for any abnormal gas delivery behaviour.</p>	<p>This alarm will resolve when the system is returned to normal Intelligent Delivery Mode.</p>



Issue	Possible Cause	Recommended Action
NOxBOX <sub>i</sub> turns on and off immediately. NOxBOX <sub>i</sub> attempts to start up but shuts down. NOxBOX <sub>i</sub> won't turn on at all.	Low battery power.	Connect NOxBOX <sub>i</sub> to mains power and turn on NOxBOX <sub>i</sub> . Check mains power is connected and battery is charging (see battery critical).
	An internal fault has occurred; the system shuts down to protect integral components.	If another system is not readily available and patient requires therapy, engage the manual override mode, replace the system as soon as practically possible and alert the Service Engineer.
Zero Calibration Fail	One or all of the sensors have failed the zero (low) calibration.	Check ambient NOxAIR monitor for high levels of NO. If high levels are detected, check the regulator(s) and supply line(s) for leaks.
	Ambient conditions may be affecting the zero sample.	
	One or all of the sensors may have become unstable or residual gas may be present in the system.	Repeat zero calibration. Check the zero port (rear) has not been blocked. If another system is not readily available and patient requires therapy, engage the manual override mode, replace the system as soon as practically possible and alert the Service Engineer.
System Test Fail	The NOxBOX <sub>i</sub> has failed the safety test and cannot accurately deliver and monitor Nitric Oxide intelligently mode.	Check the Oxygen source is flowing.
		Check the NOxFLOW is connected to the Oxygen source and the NOxBOX <sub>i</sub> -TEST kit.
		Check the correct orientation of NOxFLOW.
		Check the NOxFLOW is connected to the NOxBOX <sub>i</sub> .
		Check NOxFLOW flow detection lines and connector O rings for damage.
		Check sample line is connected to the water trap and the NOxBOX <sub>i</sub> -TEST kit.
		Check water trap (including barrel thread) for damage.
	Repeat the system test.	
If second test fails, replace the NOxFLOW and sample line.		
One or all of the sensors may have become unstable.	If another system is not readily available and patient requires therapy, engage the manual override mode, replace the system as soon as practically possible and alert the Service Engineer.	
Fluctuations/ Oscillations in excess of 3ppm.	May be due to noxflow.	Ensure O-ring and NOxFLOW are present and connected.
	Mass flow sensor due for service.	Contact Service Engineer.
	HFO frequency.	Adjust the frequency slightly based upon your clinical judgement.



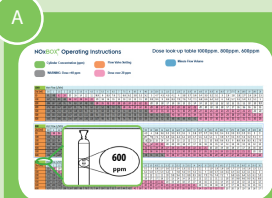
1. Ventilator
2. Ventilator Inspiratory Port
3. NOxFLOW™ (use 22F or 15M to vent tube adaptors)
4. Humidifier
5. 0.7m-1.3m Corrugated Tubing (15mm or 22mm)
6. NOxBOX<sub>i</sub> Sample Line
7. 10M - 10F, 12M - 12F, 15M - 15M luer port or 22M-22F luer port connector
8. Patient Y-piece
9. Expiratory limb
10. NOxBOX<sub>i</sub>

NOTE: To improve accuracy it is recommended to have up to 30cm between the patient Y-Piece (8) and the sample line (7).

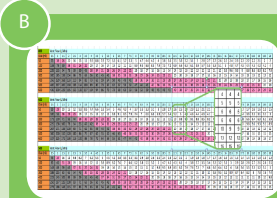
# NOxBOX<sup>®</sup> Operating Instructions

# Manual override

1

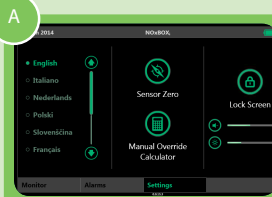


Use the look-up tables in this guide. To set flow rate, find the table matching NO supply concentration.

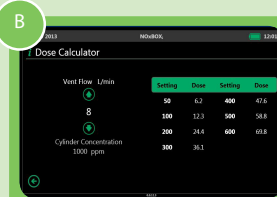


Find the vent flow setting to best match patient settings. The column lists the approx. dose per valve setting.

OR



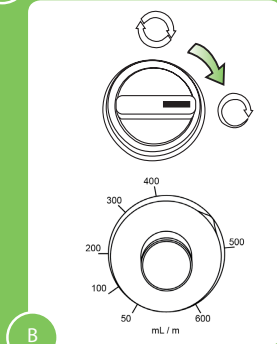
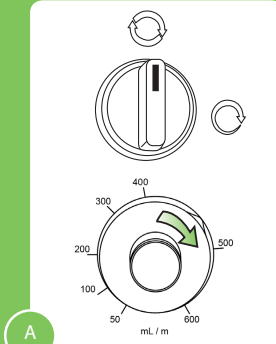
Using on-screen calculator access the manual override calculator from Settings.



Adjust vent flow to best match patient settings. Table displays approx. dose per valve setting.

To set flow rates

2



If Manual Override is required:

- A First check suitable flow rate is set.
- B Then engage mode selection valve to the position seen on right hand side image.

**NOTE: All dose information for the Manual Override are approximations. Monitoring must be used to ensure the patient is receiving the correct dose.**

# NOxBOX<sub>i</sub> Operating Instructions

## Dose look-up table 1000ppm, 900ppm, 800ppm, 500ppm

- Cylinder Concentration (ppm)
- Flow valve setting
- Minute flow volume
- WARNING: Dose >40 ppm
- Dose over 20ppm

1000 Minute Volume (L/Min)	
Dial	0.5 1 1.5 2 2.5 3 3.5 4 4.5 5 5.5 6 6.5 7 7.5 8 8.5 9 9.5 10 10.5 11 11.5 12 12.5 13 13.5 14 14.5 15 15.5 16 16.5 17 17.5 18 18.5 19 19.5 20
50	91 48 32 24 20 16 14 12 11 9.9 9 8.3 7.6 7.1 6.6 6.2 5.8 5.5 5.2 5 4.7 4.5 4.3 4.1 4 3.8 3.7 3.6 3.4 3.3 3.2 3.1 3 2.9 2.8 2.8 2.7 2.6 2.6 2.5
100	167 91 63 48 38 32 28 24 22 20 18 16 15 14 13 12 12 11 10 9.9 9.4 9 8.6 8.3 7.9 7.6 7.4 7.1 6.8 6.6 6.4 6.2 6 5.8 5.7 5.5 5.4 5.2 5.1 5
200	286 167 118 91 74 63 54 48 43 38 35 32 30 28 26 24 23 22 21 20 19 18 17 16 16 15 15 14 14 13 13 12 12 12 11 11 11 10 10 9.9 9.9
300	375 231 167 130 107 91 79 70 63 67 62 58 54 51 48 44 41 38 36 34 32 31 29 28 27 25 24 23 23 22 21 20 20 19 18 18 17 17 16 16 16 15 15
400	444 286 211 167 138 118 103 91 82 74 68 63 58 54 51 48 45 43 40 38 37 35 34 32 31 30 29 28 27 26 25 24 24 23 22 22 21 21 20 20 20
500	500 333 250 200 167 143 125 111 100 91 83 77 71 67 63 59 56 53 50 48 45 43 42 40 38 37 36 34 33 32 31 30 29 29 28 27 26 26 25 24
600	545 375 286 231 194 167 146 130 118 107 98 91 85 79 74 70 66 63 59 57 54 52 50 48 46 44 43 41 40 38 37 36 35 34 33 32 31 31 30 29

900 Minute Volume (L/Min)	
Dial	0.5 1 1.5 2 2.5 3 3.5 4 4.5 5 5.5 6 6.5 7 7.5 8 8.5 9 9.5 10 10.5 11 11.5 12 12.5 13 13.5 14 14.5 15 15.5 16 16.5 17 17.5 18 18.5 19 19.5 20
50	82 43 29 22 18 15 13 11 9.9 8.9 8.1 7.4 6.9 6.4 6 5.6 5.3 5 4.7 4.5 4.3 4.1 3.9 3.7 3.6 3.4 3.3 3.2 3.1 3 2.9 2.8 2.7 2.6 2.5 2.4 2.4 2.3 2.2
100	150 82 56 43 35 29 25 22 20 18 16 15 14 13 12 11 10 9.9 9.4 8.9 8.5 8.1 7.8 7.4 7.1 6.9 6.6 6.4 6.2 6 5.8 5.6 5.4 5.3 5.1 5 4.8 4.7 4.6 4.5
200	257 150 106 82 67 56 49 43 38 35 32 29 27 25 23 22 21 20 19 18 17 16 15 14 14 13 13 12 12 11 11 11 10 10 9.9 9.6 9.4 9.1 8.9
300	338 208 150 117 96 82 71 63 56 51 47 43 40 37 35 33 31 29 28 26 25 24 23 22 21 20 20 19 18 18 17 17 16 16 15 15 14 14 14 13
400	400 257 189 150 124 106 92 82 73 67 61 56 52 49 46 43 40 38 36 35 33 32 30 29 28 27 26 25 24 23 23 22 21 21 20 20 19 19 18 18
500	450 300 225 180 150 129 113 100 90 82 75 69 64 60 56 53 50 47 45 43 41 39 38 36 35 33 32 31 30 29 28 27 26 26 25 24 24 23 23 22
600	491 338 257 208 174 150 132 117 106 96 89 82 76 71 67 63 59 56 53 51 49 47 45 43 41 40 38 37 36 35 34 33 32 31 30 29 28 28 27 26

800 Minute Volume (L/Min)	
Dial	0.5 1 1.5 2 2.5 3 3.5 4 4.5 5 5.5 6 6.5 7 7.5 8 8.5 9 9.5 10 10.5 11 11.5 12 12.5 13 13.5 14 14.5 15 15.5 16 16.5 17 17.5 18 18.5 19 19.5 20
50	73 38 26 20 16 13 11 9.9 8.8 7.9 7.2 6.6 6.1 5.7 5.3 5 4.7 4.4 4.2 4 3.8 3.6 3.5 3.3 3.2 3.1 3 2.8 2.7 2.7 2.6 2.5 2.4 2.3 2.3 2.2 2.2 2.1 2 2
100	133 73 50 38 31 26 22 20 17 16 14 13 12 11 11 9.9 9.3 8.8 8.3 7.9 7.5 7.2 6.9 6.6 6.3 6.1 5.9 5.7 5.5 5.3 5.1 5 4.8 4.7 4.5 4.4 4.3 4.2 4.1 4
200	229 133 94 73 59 50 43 38 34 31 28 26 24 22 21 20 18 17 16 16 15 14 14 13 13 12 12 11 11 11 10 10 9.9 9.6 9.3 9 8.8 8.6 8.3 8.1 7.9
300	300 185 133 104 86 73 63 56 50 45 41 38 35 33 31 29 27 26 24 23 22 21 20 20 19 18 17 17 16 16 15 15 14 14 13 13 13 12 12 12
400	356 229 168 133 110 94 82 73 65 59 54 50 46 43 41 38 36 34 32 31 29 28 27 26 25 24 23 22 21 21 20 20 19 18 18 17 17 16 16 16
500	400 267 200 160 133 114 100 89 80 73 67 62 57 53 50 47 44 42 40 38 36 35 33 32 31 30 29 28 27 26 25 24 24 23 22 22 21 21 20 20
600	436 300 229 185 155 133 117 104 94 86 79 73 68 63 59 56 53 50 48 45 43 41 40 38 37 35 34 33 32 31 30 29 28 27 27 26 25 24 24 23

500 Minute Volume (L/Min)	
Dial	0.5 1 1.5 2 2.5 3 3.5 4 4.5 5 5.5 6 6.5 7 7.5 8 8.5 9 9.5 10 10.5 11 11.5 12 12.5 13 13.5 14 14.5 15 15.5 16 16.5 17 17.5 18 18.5 19 19.5 20
50	45 24 16 12 9.8 8.2 7 6.2 5.5 5 4.5 4.1 3.8 3.5 3.3 3.1 2.9 2.8 2.6 2.5 2.4 2.3 2.2 2.1 2 1.9 1.8 1.8 1.7 1.7 1.6 1.6 1.5 1.5 1.4 1.4 1.3 1.3 1.3 1.2
100	83 45 31 24 19 16 14 12 11 9.8 8.9 8.2 7.6 7 6.6 6.2 5.8 5.5 5.2 5 4.7 4.5 4.3 4.1 4 3.8 3.7 3.5 3.4 3.3 3.2 3.1 3 2.9 2.8 2.8 2.7 2.6 2.6 2.5
200	143 83 59 45 37 31 27 24 21 19 18 16 15 14 13 12 11 11 10 9.8 9.3 8.9 8.5 8.2 7.9 7.6 7.3 7 6.8 6.6 6.4 6.2 6 5.8 5.6 5.5 5.3 5.2 5.1 5
300	188 115 83 65 54 48 39 35 31 28 26 24 22 21 19 18 17 16 15 15 14 13 13 12 12 11 11 10 10 9.8 9.5 9.2 8.9 8.7 8.4 8.2 8 7.8 7.6 7.4
400	222 143 105 83 69 59 51 45 41 37 34 31 29 27 25 24 22 21 20 19 18 18 17 16 16 15 14 14 13 13 13 12 12 11 11 11 11 10 10 9.8
500	250 167 125 100 83 71 63 56 50 45 42 38 36 33 31 29 28 26 25 24 23 22 21 20 19 19 18 17 17 16 16 15 15 14 14 14 13 13 13 12
600	273 188 143 115 97 83 73 65 59 54 49 45 42 39 37 35 33 31 30 28 27 26 25 24 23 22 21 21 20 19 19 18 18 17 17 16 16 15 15 15

All dose information shown in these tables is for guidance only. The patient monitored gas level should be used for actually dose delivery information. All nitric oxide (NO) doses shown in parts per million (ppm) when introduced to continuous flow rates indicated. Doses of NO above 40 ppm are not recommended. Doses above 20ppm are considered clinically high.



# NOxBOX<sup>®</sup> Operating Instructions

- Cylinder Concentration (ppm)
- Flow valve setting
- Minute flow volume
- WARNING: Dose >40 ppm
- Dose over 20ppm

## Dose look-up table 225ppm, 200ppm, 100ppm

225		Minute Volume (L/Min)																																						
Dial	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10	10.5	11	11.5	12	12.5	13	13.5	14	14.5	15	15.5	16	16.5	17	17.5	18	18.5	19	19.5	20
50	20	11	7.3	5.5	4.4	3.7	3.2	2.8	2.5	2.2	2	1.9	1.7	1.6	1.5	1.4	1.3	1.2	1.2	1.1	1.1	1	1	0.9	0.9	0.9	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.6	
100	38	20	14	11	8.7	7.3	6.3	5.5	4.9	4.4	4	3.7	3.4	3.2	3	2.8	2.6	2.5	2.3	2.2	2.1	2	1.9	1.9	1.8	1.7	1.7	1.6	1.5	1.5	1.4	1.4	1.4	1.3	1.3	1.2	1.2	1.2	1.1	1.1
200	64	38	26	20	17	14	12	11	9.6	8.7	7.9	7.3	6.7	6.3	5.8	5.5	5.2	4.9	4.6	4.4	4.2	4	3.8	3.7	3.5	3.4	3.3	3.2	3.1	3	2.9	2.8	2.7	2.6	2.5	2.5	2.4	2.3	2.3	2.2
300	84	52	38	29	24	20	18	16	14	13	12	11	9.9	9.2	8.7	8.1	7.7	7.3	6.9	6.6	6.3	6	5.7	5.5	5.3	5.1	4.9	4.7	4.6	4.4	4.3	4.1	4	3.9	3.8	3.7	3.6	3.5	3.4	3.3
400	100	64	47	38	31	26	23	20	18	17	15	14	13	12	11	11	10	9.6	9.1	8.7	8.3	7.9	7.6	7.3	7	6.7	6.5	6.3	6	5.8	5.7	5.5	5.3	5.2	5	4.9	4.8	4.6	4.5	4.4
500	113	75	56	45	38	32	28	25	23	20	19	17	16	15	14	13	13	12	11	11	10	9.8	9.4	9	8.7	8.3	8	7.8	7.5	7.3	7	6.8	6.6	6.4	6.3	6.1	5.9	5.8	5.6	5.5
600	123	84	64	52	44	38	33	29	26	24	22	20	19	18	17	16	15	14	13	13	12	12	11	11	10	9.9	9.6	9.2	8.9	8.7	8.4	8.1	7.9	7.7	7.5	7.3	7.1	6.9	6.7	6.6

200		Minute Volume (L/Min)																																						
Dial	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10	10.5	11	11.5	12	12.5	13	13.5	14	14.5	15	15.5	16	16.5	17	17.5	18	18.5	19	19.5	20
50	18	9.5	6.5	4.9	3.9	3.3	2.8	2.5	2.2	2	1.8	1.7	1.5	1.4	1.3	1.2	1.2	1.1	1	1	0.9	0.9	0.9	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5
100	33	18	13	9.5	7.7	6.5	5.6	4.9	4.3	3.9	3.6	3.3	3	2.8	2.6	2.5	2.3	2.2	2.1	2	1.9	1.8	1.7	1.7	1.6	1.5	1.5	1.4	1.4	1.3	1.3	1.2	1.2	1.2	1.1	1.1	1.1	1	1	1
200	57	33	24	18	15	13	11	9.5	8.5	7.7	7	6.5	6	5.6	5.2	4.9	4.6	4.3	4.1	3.9	3.7	3.6	3.4	3.3	3.1	3	2.9	2.8	2.7	2.6	2.5	2.5	2.4	2.3	2.3	2.2	2.1	2.1	2	2
300	75	46	33	26	21	18	16	14	13	11	10	9.5	8.8	8.2	7.7	7.2	6.8	6.5	6.1	5.8	5.6	5.3	5.1	4.9	4.7	4.5	4.3	4.2	4.1	3.9	3.8	3.7	3.6	3.5	3.4	3.3	3.2	3.1	3	3
400	89	57	42	33	28	24	21	18	16	15	14	13	12	11	10	9.5	9	8.5	8.1	7.7	7.3	7	6.7	6.5	6.2	6	5.8	5.6	5.4	5.2	5	4.9	4.7	4.6	4.5	4.3	4.2	4.1	4	3.9
500	100	67	50	40	33	29	25	22	20	18	17	15	14	13	13	12	11	11	10	9.5	9.1	8.7	8.3	8	7.7	7.4	7.1	6.9	6.7	6.5	6.3	6.1	5.9	5.7	5.6	5.4	5.3	5.1	5	4.9
600	109	75	57	46	39	33	29	26	24	21	20	18	17	16	15	14	13	13	12	11	11	10	9.9	9.5	9.2	8.8	8.5	8.2	7.9	7.7	7.5	7.2	7	6.8	6.6	6.5	6.3	6.1	6	5.8

100		Minute Volume (L/Min)																																						
Dial	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10	10.5	11	11.5	12	12.5	13	13.5	14	14.5	15	15.5	16	16.5	17	17.5	18	18.5	19	19.5	20
50	9.1	4.8	3.2	2.4	2	1.6	1.4	1.2	1.1	1	0.9	0.8	0.8	0.7	0.7	0.6	0.6	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	
100	17	9.1	6.3	4.8	3.8	3.2	2.8	2.4	2.2	2	1.8	1.6	1.5	1.4	1.3	1.2	1.2	1.1	1	1	0.9	0.9	0.9	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.3	0.3	0.3
200	29	17	12	9.1	7.4	6.3	5.4	4.8	4.3	3.8	3.5	3.2	3	2.8	2.6	2.4	2.3	2.2	2.1	2	1.9	1.8	1.7	1.6	1.6	1.5	1.5	1.4	1.4	1.3	1.3	1.2	1.2	1.2	1.1	1.1	1.1	1	1	1
300	38	23	17	13	11	9.1	7.9	7	6.3	5.7	5.2	4.8	4.4	4.1	3.8	3.6	3.4	3.2	3.1	2.9	2.8	2.7	2.5	2.4	2.3	2.3	2.2	2.1	2	2	1.9	1.8	1.8	1.7	1.7	1.6	1.6	1.6	1.5	1.5
400	44	29	21	17	14	12	10	9.1	8.2	7.4	6.8	6.3	5.8	5.4	5.1	4.8	4.5	4.3	4	3.8	3.7	3.5	3.4	3.2	3.1	3	2.9	2.8	2.7	2.6	2.5	2.4	2.4	2.3	2.2	2.2	2.1	2.1	2	2
500	50	33	25	20	17	14	13	11	10	9.1	8.3	7.7	7.1	6.7	6.3	5.9	5.6	5.3	5	4.8	4.6	4.3	4.2	4	3.8	3.7	3.6	3.4	3.3	3.2	3.1	3	2.9	2.9	2.8	2.7	2.6	2.6	2.5	2.4
600	55	38	29	23	19	17	15	13	12	11	9.8	9.1	8.5	7.9	7.4	7	6.6	6.3	5.9	5.7	5.4	5.2	5	4.8	4.6	4.4	4.3	4.1	4	3.8	3.7	3.6	3.5	3.4	3.3	3.2	3.1	3.1	2	2.9

All dose information shown in these tables is for guidance only. The patient monitored gas levels should be used for actual dose delivery information. All nitric oxide (NO) doses shown in parts per million (ppm) when introduced to continuous flow rates indicated. Doses of NO above 40 ppm are not recommended. Doses above 20ppm are considered clinically high.