Remember
It is important to adhere to the following specified conditions:

- Ambient temperature: 50°F to 95°F
- Humidity: 20% to 80% RH (non-condensing)
- Mobile phones, cordless phones and gas emitting appliances might interfere with the instrument and should therefore be kept away from the instrument. Interference could make it impossible to perform a measurement.

- Exhaled breath contains water vapor which can condense inside the instrument. When excessively used in a short period, there is a risk for condensation of water inside NIOX VERO. Normally a maximum of 10 exhalations/hour can be performed with NIOX VERO during continuous use. However, it is possible to perform 20 exhalations in one hour if the instrument is paused for a minimum of 30 minutes prior to the next session of exhalations. Exhalations include failed and successful measurements.

- Avoid spilling water or other fluids on the instrument or Sensor.
- Always use a closed case or bag (NIOX VERO® bag recommended) for transportation and storage of NIOX VERO.

- It is recommended, after inserting a new sensor, to wait for three hours with the instrument switched on before performing a measurement.

- Operational life-time NIOX VERO® Instrument: Minimum 5 years at time of delivery, or 15,000 measurements.

- Operational life-time NIOX VERO® Sensor: Maximum 12 months after opening package and installed in NIOX VERO or expiration date as stated on the Sensor, whichever comes first.

WARNING!
Use of substances containing alcohol close to the NIOX VERO® instrument may cause erroneous measurement results.

DO NOT clean the instrument or handle with products containing alcohol. This includes sprays or wipes containing alcohol!

Do not use substances containing alcohol on or close to the NIOX VERO® instrument. This includes any cleaning agents used to clean the facility, or other equipment in the area, as well as alcohol wipes or sprays used on patients.

CAUTION!: Do not use NIOX VERO® in the proximity of areas where volatile substances such as organic fluids or disinfectants are being used. Special attention should be paid to aerosols and disinfection baths, either open vessels or ultrasonic baths.
# Table of contents

1 Important information ...............................................................3  
1.1 Before using NIOX VERO® Airway Inflammation Monitor........ 3  
1.2 About this manual..................................................................... 3  
1.3 Compliance .............................................................................. 3  
1.4 Responsible manufacturer and contacts.................................. 3  
1.5 Warnings .................................................................................. 3  
1.6 Indications for use .................................................................... 5  

2 Product description .................................................................5  
2.1 NIOX VERO® accessories and parts........................................ 5  
2.2 Instrument ................................................................................ 6  

3 Installation and set up ..............................................................7  

4 User interface ..........................................................................10  
4.1 Main and settings view........................................................... 10  
4.2 Main View............................................................................... 10  
4.3 Settings view .......................................................................... 11  

5 Using NIOX VERO® .................................................................12  
5.1 Start the instrument from power save mode .......................... 12  
5.2 Register patient ID (optional).................................................. 12  
5.3 Measure FeNO....................................................................... 12  
5.4 Demonstration mode.............................................................. 15  
5.5 Measure ambient NO ............................................................. 16  
5.6 Change settings ..................................................................... 16  
5.7 Turn off the instrument ........................................................... 19  
5.8 External Quality Control (QC) procedure ............................... 19  

6 Using NIOX VERO® with NIOX® Panel .................................24  
6.1 Warnings................................................................................ 24  
6.2 Installation of NIOX® Panel .................................................... 25  
6.3 Connect to a PC via USB........................................................ 25  
6.4 Connect to a PC via Bluetooth............................................... 26  
6.5 Setup...................................................................................... 26  
6.6 Firmware update .................................................................... 27  
6.7 Using NIOX® Panel ................................................................ 28  

7 Troubleshooting ......................................................................29  
7.1 Alert codes and actions.......................................................... 29  

8 Preventive care .......................................................................35  
8.1 General care .......................................................................... 35  
8.2 Change disposables .............................................................. 36  
8.3 Operational life-time............................................................... 37  
8.4 Disposal of instrument and accessories ................................ 38  
8.5 Return shipments.................................................................... 38  

9 Safety information ..................................................................39  
9.1 Warnings................................................................................ 39  
9.2 Cautions................................................................................. 39  
9.3 Substances disturbing FeNO measurement .......................... 39  
9.4 Electromagnetic immunity...................................................... 41  
9.5 Emission of electromagnetic energy ...................................... 41  
9.6 Operating conditions .............................................................. 41  

10 Reference information ..........................................................43  
10.1 Buttons and descriptions...................................................... 43  
10.2 Symbols and descriptions .................................................... 43  
10.3 Symbol explanation............................................................. 44
Table of contents

11 Technical data ........................................................................................................45
  11.1 Dimensions and weight ..................................................................................... 45
  11.2 Electrical data ..................................................................................................... 45
  11.3 Noise level .......................................................................................................... 45
  11.4 Exhaled NO - performance data ......................................................................... 45
  11.5 Linearity ................................................................................................................ 45
  11.6 Precision ............................................................................................................... 45
  11.7 Accuracy ............................................................................................................... 45
  11.8 Method comparison ............................................................................................ 45
  11.9 Inhalation parameters ........................................................................................ 45
  11.10 Exhalation parameters ...................................................................................... 46
  11.11 Essential performance ....................................................................................... 46
  11.12 Memory capacity .............................................................................................. 46
  11.13 Patient filter ....................................................................................................... 46
  11.14 Bluetooth ........................................................................................................... 46
  11.15 Rechargeable battery capacity ......................................................................... 47
  11.16 Instructions for transport and storage ................................................................. 47

12 NIOX VERO® parts and accessories .................................................................48
  12.1 Parts included in NIOX VERO® package (Article No. 12-1200) ....................... 48
  12.2 Accessories ......................................................................................................... 48

13 Medical Device Reporting (MDR) .................................................................49

14 Guidance and manufacturer's declaration - Electromagnetic immunity and electromagnetic emissions .........................50
Chapter 1 Important information

1 Important information

1.1 Before using NIOX VERO® Airway Inflammation Monitor

NIOX VERO® may only be operated as directed in this manual by trained healthcare professionals. Trained status is achieved only after careful reading of this manual. Read the entire instructions for use and make certain that you fully understand the safety information.

The User Manual provides instructions on how to operate NIOX VERO®. It contains numbered step-by-step instructions with screens and illustrations. Choices within steps are displayed with bullet points.

For clinical and performance characteristics, refer to the NIOX VERO® Labeling Summary/Package Insert 000249 (EPS-000069).

1.3 Compliance

NIOX VERO® is CE-marked according to In Vitro Diagnostics Device Directive 98/79/EC. NIOX VERO® is RoHS compliant.

1.4 Responsible manufacturer and contacts

Mailing address:
Circassia AB, P.O. Box 3006
SE-750 03 Uppsala, Sweden

Visiting address:
Hansellisgatan 13
SE-754 50 Uppsala, Sweden

www.circassia.com
www.niox.com

1.5 Warnings

• Do not use substances containing alcohol on or close to the NIOX VERO® instrument. This includes any cleaning agents used to clean the facility, or other equipment in the area, as well as alcohol wipes or sprays used on patients.

• NIOX VERO® should only be operated by healthcare professionals.

• Operate NIOX VERO® as stated in this manual. Circassia accepts no responsibility for damaged equipment or faulty results, if the equipment is not handled according to this manual.
Chapter 1 Important information

- When selecting an accessory for your NIOX VERO® product keep in mind that an accessory not recommended by Circassia may result in loss of performance, damage to your NIOX VERO® product, fire, electric shock, injury or damage to other property. The product warranty does not cover product failure or damage resulting from use with non-approved accessories. Circassia takes no responsibility for health and safety problems or other problems caused by the use of accessories not approved by Circassia.

- NIOX VERO® should not be used adjacent to or stacked with other equipment.

- Only use the power supply provided. Pull the plug when disconnecting NIOX VERO® from the power outlet.

- Use only the breathing handle supplied by Circassia.

- No modification of NIOX VERO® instrument, handle or Sensor is allowed.

- Do not drop the instrument or subject it to strong impact.

- Do not use a damaged NIOX VERO® instrument or damaged components.

- Keep the instrument and Sensor out of water. Ensure that no liquid is spilled or dropped on the instrument or Sensor.

- Do not heat or dispose of the instrument or Sensor in fire. Refer to “Disposal of instrument and accessories” on page 38.

- NIOX VERO® and the NO scrubber in the breathing handle contains potassium permanganate. Used or expired instruments and breathing handles should be disposed of as hazardous waste in accordance with local waste disposal regulations.

- The breathing handle must not be used after the expiration date.

- Patient filters should be used immediately after opening.

- NIOX VERO® Sensor contains chemicals that could be harmful if swallowed.

- Do not touch or clean the white Sensor membrane.

- Do not clean the sensor. Cleaning of the Sensor with ethanol or similar disinfectant might destabilize it for a non-predicable time period.

- After inserting a new Sensor it is recommended to wait for three hours with the instrument switched on before performing a measurement.

- Do not reuse the patient filters.

- Do not use NIOX VERO® in the proximity of areas where volatile substances such as organic fluids or disinfectants are being used. Special attention should be paid to aerosols and disinfection baths, either open vessels or ultrasonic baths. Do not use the instrument in the presence of flammable anesthetic, vapors or liquids.

- Make sure to use the correct measurement mode, otherwise incorrect FeNO results might be obtained.
1.6 Indications for use
NIOX VERO® measures Nitric Oxide (NO) in human breath. Nitric Oxide is frequently increased in some airway inflammatory processes such as asthma. The fractional NO concentration in expired breath (FeNO), can be measured by NIOX VERO according to guidelines for NO measurement established by the American Thoracic Society.

Measurement of FeNO by NIOX VERO is a quantitative, non-invasive, simple and safe method to measure the decrease in FeNO concentration in asthma patients that often occurs after treatment with anti-inflammatory pharmacological therapy, as an indication of the therapeutic effect in patients with elevated FeNO levels. NIOX VERO is suitable for children, 7-17 years, and adults 18 years and older.

NIOX VERO 10 second test mode is for age 7 and up
NIOX VERO 6 second test mode is for ages 7-10 only, who cannot successfully complete a 10 second test.

FeNO measurements provide the physician with means of evaluating an asthma patient’s response to anti-inflammatory therapy, as an adjunct to the established clinical and laboratory assessments in asthma. The NIOX VERO is intended for prescription use and should only be used as directed in the NIOX VERO User Manual by trained healthcare professionals. NIOX VERO cannot be used with infants or by children under the age of 7, as measurement requires patient cooperation.

NIOX VERO should not be used in critical care, emergency care or in anesthesiology.

2 Product description

2.1 NIOX VERO® accessories and parts

(A) Breathing handle and handle cap, (B) Sensor (supplied separately), (C) Instrument (including stand), (D) Rechargeable battery, (E) NIOX® Apps USB memory stick, (F) USB cable, (G) Power adapter and power cord, (H) Patient filter (supplied separately)

Note: Only accessories and parts supplied by Circassia may be used.
Chapter 2 Product description

2.2 Instrument

- **H)** ON/OFF button
- **I)** Power adapter port
- **J)** USB port

- **K)** Battery LED - lit when battery is charging
- **L)** Standby LED - blinking in Standby/Sleep mode
- **M)** Touch panel Display

- **N)** Breathing handle holder
- **O)** Breathing handle port
3 Installation and set up

Open the package with care. Prior to installation, check that the package contains all the parts. (See page 5). A screwdriver is required for opening the compartment lid and installation of Sensor and battery. Remove the plastic film from the display.

1. Carefully place the instrument with the display facing down on a flat and clean surface, then unscrew and remove the compartment lid. There is a taper on the side of the lid for better grip when opening.

2. Open the Sensor can.

WARNING! Open the Sensor can with care. The inside of the opening may have sharp edges.
3. Open the Sensor package.

WARNING! Do not touch or clean the white Sensor membrane.
CAUTION! The Sensor should only be stored in its original unopened package or installed in a NIOX VERO® instrument.

4. Insert the Sensor and turn the swivel clockwise until locked.

5. Open the battery package.
Chapter 3 Installation and set up

**Note:** Only use the correct rechargeable battery supplied by Circassia. Type No BJ-G510039AA, Article No 12-1150

6. Insert the rechargeable battery and replace the lid. Tighten the screw by using a screwdriver.

7. Take the breathing handle tube and push the end of the tube into the breathing handle port slowly until the triangle is no longer visible. The breathing handle and the patient filter are Applied parts Type B.

**Note:** Only attach the breathing handle supplied by Circassia. Article No 12-1010

**Note:** Use care not to bend the handle tube.

**Note:** The triangle should not be visible when assembled correctly.
Chapter 3 Installation and setup

8. Attach the power adapter to the instrument and then to the power outlet. When installing the unit, either use a socket outlet with a readily accessible power switch, or connect the AC cord plug to an easily accessible socket outlet near the equipment. If a fault should occur during operation of the unit, use the power switch to cut the power supply, or remove the AC cord plug.

Note: Only use the power adapter supplied by Circassia with the instrument. Article No 12-1120.

9. Position the instrument with the stand folded out.

Start the instrument by sliding the ON/OFF button to ON and allow the instrument to start up and perform the internal check.

CAUTION! After inserting a new Sensor it is recommended to wait for three hours with the instrument switched on before performing a measurement.

10. When the internal check is completed, the main menu appears.

11. Select the Settings button on the main menu.

12. Select Time and date.
Chapter 4 User interface

This opens the Time and date setting view.

13. Select between 12h US and 24h ISO time and date format.

14. Set time by pressing the button for hour. It changes color to blue. Change the value to the current hour by pressing the increase or decrease buttons. Repeat this procedure for minute, year, month and day.

15. Select OK to accept the changes and return to the main menu. The Undo button closes the view without saving any changes.

16. Select the Settings button on the main menu.

17. Select the Breathing handle button. This opens the Breathing handle view.

18. Select the Reset Breathing handle button. The breathing handle information view opens to confirm the insertion of the breathing handle.

19. Select the OK button to confirm insertion of a new breathing handle. This sets the remaining measurements to 1000 and expiry date one year from the current date. The Return button returns to Settings view without registering change.

4 User interface

4.1 Main and settings view

This section describes the main view, settings view, menus and symbols. Buttons and symbols are further described on page 43.

4.2 Main View

(A) Status bar, (B) Instructive demonstration, (C) Patient ID, (D) Start measurement button
Chapter 4 User interface

4.2.1 Main menu

(a) Measurement mode 10s/6s (only shown when 6s is enabled, for more information see page 18), (b) QC Users (c) Demo, (d) Patient ID entry, (e) Settings

4.2.2 Status bar

(e) Battery status, (f) USB connection (in this position a Bluetooth connection may be indicated instead), (g) QC warning, (h) Breathing handle has expired or is about to expire - blinking symbol, (i) Instrument has expired or is about to expire - blinking symbol, (j) Sound disabled, (k) Sensor status and number of remaining measurements, (l) Temperature outside of specification, (m) Humidity outside of specification, (n) Time

4.3 Settings view

(A) Modes configuration - see page 16, (B) Volume settings - see page 16, (C) Alert log see page 17, (D) Instrument & Sensor info - see page 18, (E) QC log - see page 23, (F) Time and date settings - see page 16, (G) Measurement log - see page 17, (H) Ambient measurement - see page 16, (I) Breathing handle status and settings - see page 36, (J) QC tester info - see page 23, (K) Return to main view
Chapter 5 Using NIOX VERO®

5 Using NIOX VERO®

5.1 Start the instrument from power save mode
If NIOX VERO® is in standby or sleep mode simply touch the display to activate it.

5.2 Register patient ID (optional)
Note: If Patient ID is used, it must be entered before each measurement, even if it is the same patient. Local Regulations on Patient information privacy must be considered when using unique patient identifiers.

1. Select the Register patient ID button from the main menu.
2. Enter up to 12 characters (alpha or numeric).
3. Select the ABC-button to activate a keyboard with the alphabet. The 123-button changes view back to the numerical keyboard.
4. Select OK button to confirm the registration.
   Use the Erase button to erase.
   Use the Undo button to undo a registration.

5.3 Measure FeNO
Verify proper preparations before performing a measurement with NIOX VERO®. A basic preventive inspection is recommended before each use (see page 35).

WARNING! The patient filter is for single use only.

5.3.1 Preparation for measurement
1. Lift the breathing handle from the holder and remove the handle cap.
2. Obtain a new patient filter. Attach the patient filter to the breathing handle. Make sure to twist the patient filter in place until it clicks.

Note: Store the patient filters in the original box prior to use.

Note: Do NOT use sharp objects to open the packaging for the patient filter. Do not touch the filter membrane.

Note: Patient filters should be used immediately after opening.

Note: There is a risk of leakage if the filter is not correctly attached to the breathing handle and this may result in incorrect measurement values.
Chapter 5 Using NIOX VERO®

Note: Do not switch OFF the instrument during measurement procedure.

3. Give the breathing handle to the patient and guide the patient to provide a breath sample as described in the next section.

5.3.2 Measurement

1. Empty the lungs by breathing out thoroughly.
2. Close the lips around the mouthpiece on the patient filter so that no air leakage occurs.
3. Inhale deeply through the patient filter to total lung capacity. During inhalation, the cloud on the display moves upwards.

Note: The procedure is activated by inhaling air from the handle or by pressing the start measurement button.

4. Exhale slowly through the filter while keeping the cloud within the limits as indicated on the display (the white lines).

5. The instrument display and audio signals guide the user to the correct exhalation pressure. A continuous sound indicates correct pressure with a frequency proportional to the pressure. An intermittent high frequency sound - too strong pressure An intermittent low frequency sound - too weak pressure
Chapter 5 Using NIOX VERO®

6. Exhale until the cloud has passed the flag.

7. The instrument will analyze the sample and generate a result in approximately one minute. 

Note: Do not exhale or inhale through the patient filter during the analysis process.

5.3.3 Perform 6s NO measurement

- The NIOX VERO can be operated with two different exhalation times. 10 seconds and 6 seconds. The 10 second test is the preferred mode for all ages. The 6 second test is for children ages 7 - 10 years old who are not able to complete a 10 second mode test. The 6 second mode should not be used with patients over the age of 10.

6s measurement mode is not activated by default, refer to “Enable/disable 6s measurement mode” on page 18.

1. Change to 6s Measurement mode by selecting the 10s button (green man symbol) on the main menu.

2. The button changes to 6s measurement mode (orange, small child symbol).

3. The 6s measurement mode is illustrated with an orange start button.

4. Perform measurement as instructed in the “5.3.2 Measurement” section.

5. Wait for the result.
Chapter 5 Using NIOX VERO®

6. The result screen displays the icon for 6s measurement.
   
   Note: The device will always return to the default 10s mode after a 6s measurement.

5.4 Demonstration mode

To help professionals in guiding patients, the instrument contains three animated demonstrations with visual and audio guides of the different stages of a measurement procedure.

1. Select the Animation button on the main menu.
2. Select which animation to use Cloud, Balloon or Meter

3. Select the Demo button.
4. Select the forward button to move to the following sequence.
5. The undo button closes the demonstration and returns the animation select.
6. Select OK button to confirm the changes.

7. The undo button returns to the main menu without saving changes.

   a. Inhalation through the breathing handle.

   b. Exhalation through the breathing handle with correct pressure.

   c. Exhalation through the breathing handle with pressure too weak.

   d. Exhalation through the breathing handle with pressure too strong.
Chapter 5 Using NIOX VERO®

5.5 Measure ambient NO

Note: An ambient measurement may be requested by customer support during troubleshooting.

Note: An ambient measurement is counted as one measurement on NIOX VERO® Sensor and the instrument.

1. Attach a patient filter to the breathing handle until it clicks into place.

2. Select the Settings button on the main menu.

3. Select Ambient Measurement button.

4. Select the Start measurement button.

5. The progress bar is visible until the measurement is finished and the result is displayed: Ambient measurement value (in ppb), measurement mode, and measurement sequence number.

5.6 Change settings

5.6.1 Change time and date

1. Select the Settings button on the main menu.

2. Select the Time and Date button.

For more details refer to page 9.

5.6.2 Change sound volume

1. Select the Settings button on the main menu.

2. Select the Sound button.
3. The settings for sound and volume opens.

![Volume Settings]

4. Select **increase/decrease** to adjust volume.

![Volume Adjustment]

5. The volume bar indicates the set volume.

6. Select the **OK** button to save settings and return to the Settings view.

![OK Button]

The **Undo** button closes the view without saving changes.

7. The status bar indicates mute status when the sound volume is set to zero.

5.6.3 **View measurement logs**

All measurement results are stored in the instrument and can be viewed at any time.

1. Select the **Settings** button on the main menu.

![Settings Button]

2. Select the **Patient measurements log** view button.

![Patient Measurements Log]

3. The selected log will display the following:

![Measurement Log]

- (A) Patient ID - if defined,
- (B) FeNO value,
- (C) Measurement date and time,
- (D) Measurement mode,
- (E) Return to settings,
- (F) Backward,
- (G) Forward,
- (H) Measurement sequence number,
- (I) QC Warning, only shown if the daily QC measurement is not performed or if the results from the QC are outside limits

4. Browse through the measurement logs using the **backward** and **forward** buttons.

![Navigation Buttons]

5. Select the **Return** button to return to settings.

5.6.4 **View alert logs**

Alerts are stored in the instrument and can be viewed at any time. The alert codes are for Circassia Technical Support use.

1. Select the **Settings** button on the main menu.

![Settings Button]

2. Select **Alert log** button.
3. Select the **Return** button to return to settings.

### 5.6.5 View instrument information

Detailed information about the instrument and Sensor can be viewed.

1. Select the **Settings** button on the main menu.
2. Select the **Instrument** button.

3. This opens the Instrument information view displaying the following:

(A) Numbers of remaining measurements on the instrument, (B) Instrument serial number, (C) Software version number, (D) Instrument expiration date, (E) Return to settings, (F) Numbers of remaining measurements on the Sensor, (G) Sensor serial number, (H) Sensor expiration date, (I) Enter configuration code (only used on request from Circassia)

### 5.6.6 Enable/disable 6s measurement mode

1. Select **Settings** in the main menu.
2. Select **Modes configuration**.
3. Check the 10s/6s icon to enable using the 6s mode. Uncheck to disable.
4. Press **OK**.
Chapter 5 Using NIOX VERO®

5.7 Turn off the instrument
1. To turn off the instrument, slide the ON/OFF button to OFF.

Note: Before transportation remove the used patient filter (if still attached) and attach the handle cap.

Note: Always use a closed bag or case (NIOX VERO® bag recommended) for transportation and storage of the instrument.

5.8 External Quality Control (QC) procedure
The external Quality Control is one of the procedures that ensures the system is operating within the specifications.

Note: The Quality Control function must always be activated as a daily QC measurement is mandatory when the instrument is clinically used.

A QC icon in the status bar on the screen indicates that a daily external QC assessment is needed or that there are not any currently qualified QC individuals who have completed their initial 4 qualification attempts.

The external Quality Control consists of two parts. One positive control from a qualified staff member with a stable FeNO value providing a normal biological FeNO sample and a negative control consisting of a NO free gas sample automatically generated from ambient air.

NIOX VERO® will allow for one daily QC measurement that will not affect the number of remaining tests on the NIOX VERO® Sensor. (During the first 20 days of instrument start-up, a maximum of seven QC testers can be qualified without impact to the number of remaining tests on the Sensor.)

Note: It is also possible to store the QC users in a database, see chapter “6.7.6 Perform QC measurement” for information.

Note: The Quality Control function is performed in the 10 second mode only.

5.8.1 Selection and qualification of QC testers
A minimum of one individual (two individuals are recommended) needs to qualify for this procedure. If possible, identify one or two individuals as a backup.

Identify the staff members who will perform the Quality Control and meet the following criteria:
Chapter 5 Using NIOX VERO®

- Over 18 years of age.
- No ongoing cold or known airway disease.
- Non-smoker.
- Expected stable FeNO values between 5 and 40 ppb.
- Preferably no allergies (except seasonal, see below) or asthma.

A QC tester will be qualified over the course of four days within a seven day period.

Note: After a QC tester has been qualified, if the most recent QC measurement is older than 30 days, then the qualification is suspended and the QC tester needs to re-qualify according to the qualification procedure. Perform four QC measurements, one per day within seven days, according to the QC measurement section, in order to qualify a QC tester.

A mean value is calculated from the three qualifying measurements that must be between 5-40 ppb for the QC tester to be qualified. The QC measurement on the fourth day (daily QC) must be within ± 10 ppb from the mean value and the negative control approved. If this has been met the Quality Control has passed for that staff member and the instrument is ready for clinical use. The moving mean value is recalculated when the QC tester performs a QC measurement after seven days.

5.8.2 QC measurement

This procedure applies for qualification and daily QC measurements. The instrument will prompt for a daily QC procedure by showing in the status bar or when there are no staff who are currently qualified as a tester. Always consider the following in order to obtain reliable results.

Before any measurement:

- Avoid nitrate rich food for up to 3 hrs before the measurement.
- Avoid strenuous exercise at least 1 hour before the measurement.

- Preferably do not perform a measurement in case of:
  - Ongoing cold
  - Acute seasonal allergy
- Always attach a new patient filter for each new QC tester.

1. Select QC.

2. Select QC Settings to verify which QC IDs are available.

Note: Each QC tester must select an individual number.

3. Select an available QC ID.

4. Empty the lungs by breathing out thoroughly.

5. Put the NIOX VERO® patient filter to your mouth making sure no air leakage occurs.

6. Inhale deeply through the patient filter to total lung capacity. During
Chapter 5 Using NIOX VERO®

 inhalation, the cloud on the display moves upwards.

7. Exhale slowly through the filter while keeping the cloud within the limits as indicated on the display (the white lines).

8. Exhale until the cloud has passed the flag.

9. Remove the patient filter and immediately attach the handle cap.

10. Press to proceed.
Chapter 5 Using NIOX VERO®

11. The progress bar is visible until the analysis phase is complete. The QC control result is displayed.

Note: During the qualification days of a new QC tester the result is displayed as presented below.

(A) Control result FeNO value limits (mean value +/- 10 ppb), (B) Control result in ppb, (C) QC Measurement date and time, (D) Measurement sequence number, (E) QC tester number

Press ✔️ to return to main menu.

Repeat the QC test if the positive and/or the negative control fail. If the QC failure persists, discontinue use of NIOX VERO® and contact Circassia Technical Support.

Note: The prompt to QC the device will remain if the QC measurement was performed by a non-qualified QC candidate. It is not an indication of an unsuccessful (failed) QC measurement.

12. Remove the handle cap.

13. Press ✔️ to return to main menu.
Chapter 5 Using NIOX VERO®

Note: If the daily Quality Control is not successfully performed, or if the results from the QC are outside limits, a warning alert will be displayed beside the measurement value.

5.8.3 View QC logs
1. Select the Settings button on the main menu.
2. Select the QC log button.

The QC log window opens.

3. Browse through the measurement logs using the backward and forward buttons.

5.8.4 View QC information
After day 3 the QC qualification procedure is complete. A qualified tester is displayed in the QC tester view

1. Select the Settings button on the main menu.
2. Select QC tester button.
3. The QC qualifying results are displayed as follows.

(A) QC tester number, (B) Last date to perform a QC measurement without having to re-qualify the QC tester, (C) Status buttons (green = within specifications, white = not within specifications), (D) Mean value in ppb, (E) Edit button, (F) Delete button

Note: To add or edit a name to a QC tester number press the Edit button.

4. Select the Return button to return to settings.

5.8.5 Reset QC tester
This instruction will delete the data for the selected individual.

1. Select the Settings button on the main menu.
2. Select QC Settings to verify which QC IDs are available.
Chapter 6 Using NIOX VERO® with NIOX® Panel

The following window is displayed:

3. Select the Delete button for the user ID to be reset.

4. Select to accept deletion of the selected user ID.

6 Using NIOX VERO® with NIOX® Panel

Your NIOX VERO® instrument can be used together with NIOX® Panel. NIOX Panel is a PC application and visual aid allowing you to operate the instrument from your PC.

6.1 Warnings

- NIOX® Panel shall only be operated by trained healthcare professionals.
- Operate NIOX® Panel as stated in this manual. Circassia accepts no responsibility for damaged equipment or faulty results, if the equipment is not handled according to this manual.
- When selecting an accessory for your NIOX® Panel product keep in mind that an accessory not recommended by Circassia Inc may result in loss of performance, damage to your NIOX® Panel product, fire, electric shock, injury or damage to other property. The product warranty does not cover product failure or damage resulting from use with non approved accessories. Circassia takes no responsibility for health and safety problems or other problems caused by the use of accessories not approved by Circassia.
- If the equipment is used in a manner not specified by Circassia, the protection provided by the equipment may be impaired.
- Modification of NIOX® Panel application is not allowed.
- Do not use damaged components.
Chapter 6 Using NIOX VERO® with NIOX® Panel

6.2 Installation of NIOX® Panel

The NIOX® Panel located in the NIOX® Apps software is supplied on a USB storage device.

1. Insert the USB storage device in the computer’s USB port.
2. Select the file named setup.exe.
3. If .NET Framework 4.5, VC++ 2013 or SQL Server Compact is not installed, an installation wizard for each of the programs opens, one at the time.
4. Select to accept license agreement for the program.
5. Follow the instructions and wait for the programs to install.
6. The Installation wizard for NIOX® Apps opens.
7. Follow the instructions and install the program.

Note: Last step of the installation “Removing backup files” takes a few minutes.

8. When the installation is complete, click Close.
9. The application is now available on the start menu.
10. Refer to the NIOX Patient user manual located on the USB stick for instructions on use of the additional NIOX Apps software.

6.3 Connect to a PC via USB

In order for NIOX VERO® to be able to communicate with a PC, you may use a USB cable.

An alternative option is Bluetooth communication (see how to enable Bluetooth in the next section).

Note: Only USB cables supplied by Circassia may be used. Article no 12-1002

1. Plug the USB cable into the instrument and connect it to a PC.

2. An enabled USB connection is displayed on NIOX VERO with a symbol on the status bar.

Note: If the instrument is in sleep or power saving mode no connection will be established.
6.4 Connect to a PC via Bluetooth

6.4.1 Activate Bluetooth functionality
1. Select the Settings button on the main menu.
2. Select the Measurement Mode button. This opens the Configuration modes view.
3. To enable Bluetooth, check the checkbox. (Unchecking the box disables Bluetooth communication.)
Select OK to confirm change.

This returns to the Settings view.
An enabled Bluetooth function is indicated by a symbol on the status bar (provided that the instrument is not connected to a PC via cable).
Refer to the PC User Manual on how to enable Bluetooth on the PC.

6.4.2 Connect by Bluetooth in NIOX® Panel
1. Select in the NIOX Panel window
2. A search view opens, select to search for devices.
3. Select the instrument and click OK.

Note: If the instrument is in power saving mode no connection will be established.

6.5 Setup
1. Turn on the PC and monitor.
2. Turn on the instrument.
3. Select the Start or the Windows button normally found in the left lower hand corner of your monitor.
4. Select NIOX® Panel from the program list.

5. Plug the USB cable into the USB port on the NIOX VERO® and connect it to the USB port on the PC or connect by Bluetooth. This icon is shown on the display to indicate that a connection is established and NIOX VERO is running remote controlled.

6. The NIOX Panel application opens and you can start to operate your NIOX VERO instrument via your PC

Note: When starting NIOX Panel for the first time the connectivity details dialog opens.

6.5.1 NIOX Panel connectivity module
The connectivity module in NIOX Panel utilizes Microsoft's secure cloud service, Microsoft Azure, to automatically transmit technical data from the device via the internet to Circassia.

Technical data such as time stamp, alert codes and number of remaining measurements on the device and sensor are received. This information will ensure better service and support.
Circassia recommends completion of the details dialog box to allow receipt of technical data and provide better service and support functions to its customers. Mandatory fields are marked with a *.

Complete these, leave the box checked, and click OK to continue.

When connection to Microsoft Azure is established a cloud icon is shown in the status bar.

If the connection to Microsoft Azure is lost or the user has chosen to not send technical data, the cloud icon is crossed over.

To decide at a later stage to allow Circassia to collect data, press cancel and the dialog box will open again next time NIOX Panel is started, or click on the cloud icon in the status bar.

To reject collecting of Circassia technical data (not recommended) uncheck the box in the bottom of the window and click OK.

Note: Only technical data and no patient data is collected by Circassia.

Changing contact details

To edit contact details click on the cloud icon in the status bar to open the contact details dialog box.

6.6 Firmware update

Note: If NIOX VERO firmware is older than 1D1C-xxxx the firmware needs to be updated.

Note: Do not disconnect the USB or power cable during firmware update.

1. Connect the instrument via USB. Make sure that the power cable is connected.
2. Press the update firmware button and wait for the update to be finished.

3. The instrument will automatically restart and reconnect to NIOX Panel when the update is finished.

6.7 Using NIOX® Panel

Note: The buttons, symbols and views are similar on NIOX Panel and on NIOX VERO.

6.7.1 Measure FeNO

See “Measure FeNO” on page -12.

CAUTION! Do not disconnect the instrument from the PC during measurement and analyzing process.

6.7.2 Demonstration mode

See “Demonstration mode” on page -15.

6.7.3 Change settings

See “Change settings” on page -16.

6.7.4 View measurement logs

See “View measurement logs” on page -17.

6.7.5 View alert logs

Alerts are stored in the instrument and can be viewed at any time. The alert codes are for Circassia Technical Support use.

1. Select the Settings button on the main menu.
2. Select Alert log button.

(A) Alert code (for customer support purpose only), (B) Return - returns to previous view, (C) Date and time of alert, (D) Scroll list (blue), (E) Download service data (only used upon request by Circassia)
6.7.6 Perform QC measurement

There are two options to perform a QC measurement when NIOX Panel is used:

- Either stand alone like in chapter “5.8.2 QC measurement”
- If NIOX Panel is connected to the NIOX database it is possible to create the QC users and store the QC measurements in the database. This allows a QC user (after qualification) to qualify a new instrument with just one QC measurement. For instructions how to create QC users in the database see NIOX Patient User Manual.

7 Troubleshooting

7.1 Alert codes and actions

Alert messages and other information are shown as a code on the instrument display. The tables below provide the alert codes and recommended actions to be taken for an alert code. If the alert persists, contact your local Circassia representative or Circassia Technical Support.

<table>
<thead>
<tr>
<th>User alerts</th>
<th>Screen</th>
<th>Action</th>
</tr>
</thead>
</table>
| A10         | ![Image](A10.png) | Exhalation too strong  
Press Return and repeat the measurement with less exhalation force. |
| A11         | ![Image](A11.png) | Exhalation too weak  
Press Return and repeat the measurement with greater exhalation force. |
| A12         | ![Image](A12.png) | Measurement failed  
No exhalation detected or the user failed to exhale within 15 seconds from inhaling.  
Press Return button, restart the measurement and exhale into the instrument directly after inhalation. |
### Troubleshooting

<table>
<thead>
<tr>
<th>User alerts</th>
<th>Screen</th>
<th>Action</th>
</tr>
</thead>
</table>
| A13         | ![A13](image) | **Analysis interrupted**  
Repeat the measurement and do not breathe through the handle during analysis. |
| A21         | ![A21](image) | **Measurement failed**  
Remove any sources of disturbance (such as cordless phones/mobile phones or gas emitting appliances). Then press Return. When the instrument is ready for use repeat the measurement.  
If the alert persists, unplug and reconnect the power supply unit to restart the instrument. |

<table>
<thead>
<tr>
<th>Instrument alerts</th>
<th>Screen</th>
<th>Action</th>
</tr>
</thead>
</table>
| A01               | ![A01](image) | **Unstable temperature**  
Make sure that the ambient temperature is between 50°F and 95°F. Wait for the Sensor to stabilize. If necessary move the instrument to another location and restart the instrument. |
| A02               | ![A02](image) | **Sensor stabilization**  
Remove any sources of disturbances (such as cordless phones, mobile phones or gas emitting appliances). Wait for the Sensor to stabilize. |
| A03               | ![A03](image) | **Unstable system**  
Remove any sources of disturbances (such as cordless phones, mobile phones or gas emitting appliances). Wait for the system to stabilize. |
| A04               | ![A04](image) | **Count down time**  
The remaining time until the instrument is ready to use is displayed. |
| A05               | ![A05](image) | **Lock MMI**  
When the instrument is connected to a PC the main view buttons will be locked. |
| A06               | ![A06](image) | **Configuration code error**  
Only provided by Circassia upon request.  
The configuration code entered is incorrect. Enter correct configuration code.  
If this error continues to be shown contact Circassia Technical support. |
| A07               | ![A07](image) | **Lid open warning**  
Check if the battery or sensor lid is open and close if needed. Click the OK button when finished. |
## Troubleshooting

<table>
<thead>
<tr>
<th>Instrument alerts</th>
<th>Screen</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>A08 Battery problem</td>
<td><img src="image1" alt="Battery problem" /></td>
<td>Low power in battery or other failure. Change the battery and click the OK button when finished.</td>
</tr>
<tr>
<td>A09 Condensation countdown</td>
<td><img src="image2" alt="Condensation countdown" /></td>
<td>Too frequent use of the instrument. Remaining time until instrument has dried out.</td>
</tr>
<tr>
<td>A15 Condensation alert</td>
<td><img src="image3" alt="Condensation alert" /></td>
<td>Reduce frequency of measurements. Continue measuring at this frequency causes condensation in the instrument and will make the instrument unusable for 30 minutes</td>
</tr>
<tr>
<td>A22 Memory access failure</td>
<td><img src="image4" alt="Memory access failure" /></td>
<td>Contact Circassia Technical support.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Instrument alerts</th>
<th>Screen</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>A25 Temperature or base line failed to stabilize within 30 minutes</td>
<td><img src="image5" alt="Temperature check" /></td>
<td>Check that the ambient temperature and relative humidity is within specification. If necessary, move the instrument to another location and restart the instrument.</td>
</tr>
<tr>
<td>A26 Self test failure</td>
<td><img src="image6" alt="Self test failed" /></td>
<td>The self test of the instrument failed. Restart the instrument. If alert code persists contact Circassia Technical support.</td>
</tr>
<tr>
<td>A27 Internal hardware error unrecoverable</td>
<td><img src="image7" alt="Internal error" /></td>
<td>Contact Circassia Technical support.</td>
</tr>
<tr>
<td>A28 Internal hardware error recoverable</td>
<td><img src="image8" alt="Internal error" /></td>
<td>Check that the Sensor, battery and lid is in its correct position, also make sure that the tube is not folded When finished restart the instrument.</td>
</tr>
</tbody>
</table>
### Instrument alerts

<table>
<thead>
<tr>
<th>A29</th>
<th>Analysis failure</th>
<th>Ambient measurement failure. Click the OK button and obtain a new measurement.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A30</td>
<td>Bluetooth connection error</td>
<td>Check the Bluetooth connection with the PC. When finished click the OK button.</td>
</tr>
<tr>
<td>A31</td>
<td>USB connection error</td>
<td>Check the USB connection with the PC. When finished click the OK button.</td>
</tr>
<tr>
<td>A40</td>
<td>No Sensor inserted</td>
<td>Insert Sensor. See page 37 (replacement of sensor) or page 7 (initial placement of sensor).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>A41</th>
<th>Sensor error</th>
<th>Remove any sources of disturbance (such as cordless/mobile telephones or gas emitting appliances). When the instrument is ready for measurement try to repeat the measurement. If alert persists, power off the instrument, remove and insert the Sensor and restart the instrument.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A42</td>
<td>Sensor warning</td>
<td>Contact Circassia Technical support. This warning indicates that the sensor may soon stop working due to battery failure.</td>
</tr>
<tr>
<td>A50</td>
<td>Measurement failure</td>
<td>The measurement value does not fall between 5-50 ppb. Restart the QC tester qualification from day one.</td>
</tr>
<tr>
<td>A51</td>
<td>Too many QC attempts</td>
<td>In one day the same test person has attempted to perform several QC measurements. Wait one day and perform the next QC measurement.</td>
</tr>
</tbody>
</table>
### Chapter 7 Troubleshooting

<table>
<thead>
<tr>
<th>Instrument alerts</th>
<th>Screen</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>A52</td>
<td><img src="image" alt="A52" /></td>
<td><strong>QC measurement failure</strong>&lt;br&gt;Moving mean value out of range. Restart the QC tester qualification from qualification day one.</td>
</tr>
<tr>
<td>A53</td>
<td><img src="image" alt="A53" /></td>
<td><strong>NO-scrubber result out of range</strong>&lt;br&gt;NO scrubber result over 10 ppb. Check that the handle cap was attached when instructed. Restart the QC measurement. If continuously shown replace the NO scrubber.</td>
</tr>
<tr>
<td>A54</td>
<td><img src="image" alt="A54" /></td>
<td><strong>QC daily result too low</strong>&lt;br&gt;QC daily result lower than limits from moving mean.</td>
</tr>
<tr>
<td>A55</td>
<td><img src="image" alt="A55" /></td>
<td><strong>QC daily result too high</strong>&lt;br&gt;QC daily result higher than limits from moving mean.</td>
</tr>
<tr>
<td>A56</td>
<td><img src="image" alt="A56" /></td>
<td><strong>Handle cap time out</strong>&lt;br&gt;Failure to press the forward button in time (within 2.5 min.). Repeat the QC measurement and make sure to press the forward button immediately after the Handle Cap is attached.</td>
</tr>
<tr>
<td>A57</td>
<td><img src="image" alt="A57" /></td>
<td><strong>NO scrubber analysis error</strong>&lt;br&gt;NO scrubber analysis phase error. Restart the QC measurement.</td>
</tr>
<tr>
<td>A80</td>
<td><img src="image" alt="A80" /></td>
<td><strong>The instrument is about to expire</strong>&lt;br&gt;Order a new instrument. This alert is visible when less than 500 measurements remain or less than 120 days until expiry date. Press OK to acknowledge.</td>
</tr>
<tr>
<td>A81</td>
<td><img src="image" alt="A81" /></td>
<td><strong>The Sensor is about to expire</strong>&lt;br&gt;Order a new Sensor. This alert is visible when less than 10% of the measurements remain or less than 2 weeks until expiry date. Press OK to acknowledge.</td>
</tr>
</tbody>
</table>
## Chapter 7 Troubleshooting

<table>
<thead>
<tr>
<th>Instrument Alerts</th>
<th>Screen</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>A82</td>
<td><img src="image" alt="Screen" /></td>
<td><strong>The breathing handle is about to expire</strong>&lt;br&gt;This alert is visible when less than 100 measurements remain or less than 2 weeks until expiry date.&lt;br&gt;Press OK to acknowledge. Prepare to change breathing handle.</td>
</tr>
<tr>
<td>A90</td>
<td><img src="image" alt="Screen" /></td>
<td><strong>All measurements on the instrument have been used</strong>&lt;br&gt;It is still possible to view measurements stored in the instrument memory.</td>
</tr>
<tr>
<td>A91</td>
<td><img src="image" alt="Screen" /></td>
<td><strong>All measurements on the Sensor have been used.</strong>&lt;br&gt;Replace the Sensor, see page 37.</td>
</tr>
<tr>
<td>A92</td>
<td><img src="image" alt="Screen" /></td>
<td><strong>Instrument expiration date has passed</strong>&lt;br&gt;It is still possible to view measurements stored in the instrument memory.</td>
</tr>
<tr>
<td>A93</td>
<td><img src="image" alt="Screen" /></td>
<td><strong>Sensor expiration date has passed</strong>&lt;br&gt;Replace the Sensor, see page 37.</td>
</tr>
<tr>
<td>A94</td>
<td><img src="image" alt="Screen" /></td>
<td><strong>The breathing handle has expired</strong>&lt;br&gt;Press OK. Change breathing handle. See page 36. <strong>CAUTION!</strong> The breathing handle’s NO scrubber contains potassium permanganate and should be disposed of as hazardous waste in accordance with local waste disposal regulations.</td>
</tr>
<tr>
<td>A95</td>
<td><img src="image" alt="Screen" /></td>
<td><strong>Breathing handle expiration date has passed</strong>&lt;br&gt;Replace the handle, see page 36. It is still possible to view measurements stored in the instrument memory.</td>
</tr>
</tbody>
</table>
Chapter 8 Preventive care

8 Preventive care

8.1 General care

In the following sections, actions for preventive care and maintenance are described. Do NOT try to repair the instrument. Any attempt will make the warranty invalid and performance according to the specifications cannot be guaranteed.

WARNING! DO NOT clean the instrument or handle with products containing alcohol. This includes sprays or wipes containing alcohol!

WARNING! DO NOT clean area immediately surrounding the NIOX VERO® with products containing alcohol. This includes sprays or wipes containing alcohol.

1. Clean the instrument with a cloth dampened with water or a mild soap solution.
   
   CAUTION! Minimize use of solvents

2. Clean the breathing handle with a cloth dampened with water or a mild soap solution.

   Note: The breathing handle and patient filter are not intended for sterilization.

WARNING!

- The breathing handle and the instrument can not be cleaned with an aerosol.
- Do not use disinfectants or wipes containing alcohol, these might permanently damage the sensor and instrument.

- Do not use spray detergents.
- Exchange the patient filter for each new patient.
- This device is not user serviceable. Do not open the device except for sensor or battery replacement as outlined in this manual.
- Never attempt to perform sensor or battery replacement while the device is in operation.
- Do not modify the handle tube.

8.1.1 Preventive inspections

Before each measurement verify that the NIOX VERO® working properly, is not damaged and that normal operating conditions are fulfilled (see page 41).

If any item is missing or damaged, contact your local Circassia representative or Circassia Pharmaceuticals Inc.
8.2 Change disposables

8.2.1 Change breathing handle

The breathing handle contains an NO scrubber which can be used for 1000 measurements or one year, whichever comes first. The breathing handle view is used for viewing the status of the breathing handle and for resetting breathing handle usage parameters.

Perform the following steps to change the breathing handle:

1. Place the device on its side on a level secure surface.

2. Remove the used handle from the instrument by pushing the socket into the device and gently pulling out the tube.

3. Discard the breathing handle. **CAUTION!** The breathing handle contains potassium permanganate and should be disposed of as hazardous waste in accordance with local waste disposal regulations.

4. Attach a new breathing handle to the instrument by pushing the tube into the socket until the triangle is no longer visible.

5. Select the **Settings** button on the main menu.

6. Select the **Breathing handle** button.

7. Select the **Reset Breathing handle** button.

8. The breathing handle information view opens to confirm the replacement of the breathing handle. Select the **OK** button to confirm insertion of a new breathing handle and to set the remaining measurements to 1000 and expiration date one year from the current date. **Note:** The **Return** button returns to settings view without registering change.

(A) Breathing handle symbol, (B) Remaining number of measurements, (C) Expiration date, (D) Breathing handle reset button, (E) Return button

**Note:** The breathing handle status icon appears blinking in the status bar two weeks prior to expiration or when 10% of its capacity is left.
8.2.2 Exchange of NIOX VERO® Sensor

1. Turn off the instrument.
2. Open the compartment on the back of the instrument using a screwdriver. Turn the swivel to release the Sensor.
3. Remove the old Sensor.
4. Replace with a new Sensor.

**WARNING!** Make sure not to touch or clean the white Sensor membrane.

**WARNING!** Be careful when opening the Sensor can. The inside of the opening may have sharp edges.

5. Turn the swivel to lock.
6. Replace the compartment lid.

**CAUTION!** Make sure there are no foreign material or particles in the Sensor compartment before closing it.

8.2.3 Change battery

If the rechargeable battery is no longer charging properly, malfunctioning, or requires charging more frequent than normal, then it needs to be replaced.

**Note:** Only rechargeable batteries supplied by Circassia may be used. Type No BJ-G510039AA, Article No 12-1150

The battery is placed in the compartment on the back of the instrument.

1. Turn off the instrument.
2. Open the compartment lid (see previous section).
3. Remove the old battery and insert a new battery.
4. Close the compartment lid.

**CAUTION!** Used batteries should be recycled according to the local recycling program for rechargeable batteries.

8.3 Operational life-time

8.3.1 NIOX VERO® instrument

Minimum 5 years at time of delivery or 15,000 measurements, whichever comes first.

The user is prompted for expiry parameters via the device display. It is not possible to perform further measurements after expiry, although stored measurement data can still be retrieved.

8.3.2 NIOX VERO® Sensor

Maximum 12 months after opening package and installation in NIOX VERO® or expiration date as stated on the Sensor, whichever comes first.

The Sensor will expire after the pre-programmed number of measurements have been depleted, or after one year (whichever comes first). When there is
less than 10% of the number of the measurements left, or less than 2 weeks of use remaining, a message is shown on the display. The expiry date is also shown on the Sensor label.

8.3.3  NIOX VERO® Patient filter
The shelf life of the NIOX VERO Patient Filter in its unopened primary package is 3 years from manufacturing date.

NIOX VERO Patient Filter is for single use and must be replaced for every patient.

Store the patient filters in the original box prior to use.

8.3.4  NIOX VERO® Breathing handle
The breathing handle contains a NO scrubber which can be used for 1000 measurements or one year, whichever comes first.

When there is less than 10% of the number of the measurements left, or less than 2 weeks of use remaining, a message is shown on the display (blinking breathing handle symbol in the status bar).

8.4  Disposal of instrument and accessories
WARNING! NIOX VERO® and the NO scrubber in the breathing handle contain potassium permanganate. Used or expired instruments and handles should be disposed of as hazardous waste in accordance with local waste disposal regulations.

Used or expired Sensors should be recycled according to local recycling program for electronic equipment.

Used batteries should be recycled according to the local recycling program for rechargeable batteries.

Used patient filters should be recycled according to the local recycling program for biohazard waste.

Note:  There is a LiMnO₂ backup battery inside the instrument in addition to the replaceable and rechargeable battery.

Note:  There is a silver-oxide battery and a LiMnO₂ battery in the Sensor.

NIOX VERO® is RoHS compliant.

8.5  Return shipments
For return shipments, contact your local Circassia representative or Circassia Technical support.
# 9 Safety information

## 9.1 Warnings

See “Warnings” on page -3.

## 9.2 Cautions

- Mobile phones and cordless phones and gas emitting appliances might interfere with the instrument and could make it impossible to perform a measurement.
- Elevated ambient Nitrogen Dioxide (NO₂) may interfere with FeNO measurement; therefore, ensure that the patient inhales correctly according to instruction solely through the filter.
- The instrument might produce some heat during normal operation, the temperature could increase up to 9°F above the ambient temperature. Make sure that the ventilation slots are not blocked. Do not place the instrument on a bed, sofa, carpet, or other soft surface.
- Exhaled breath contains water vapor which can condense inside the instrument. When excessively used in a short period, there is a risk for condensation of water inside NIOX VERO. Normally a maximum of 10 exhalations/hour can be performed with NIOX VERO during continuous use. However, it is possible to perform 20 exhalations in one hour if the instrument is paused for a minimum of 30 minutes prior to the next session of exhalations. Exhalations include failed and successful measurements.
- The Sensor shall be kept in its original unopened package before installation. For transportation and storage conditions, refer to page 48.
- The Sensor is sensitive to changes in ambient temperature and humidity. The best performance is achieved if the ambient conditions are stable. Refer to the recommended environmental conditions see page 41. Keep the unit away from windows, direct sun, radiators, stoves or open fire in order to avoid unstable conditions.
- When transporting the unit from one location to another, a prolonged stabilization period before measurement might be required. Refer to the recommended transportation conditions in the “Transport and Storage” section on page 47. Always use a bag for transportation.
- Make sure that the gas outlet (four parallel slots to the left of the lid) on the rear side of the device is not covered.
- The device contains a Lithium-ion Battery which may induce an increased risk of heat, smoke or fire if handled incorrectly; do not open, crush, heat above 140°F or incinerate.
- Keep the Sensor out of reach of children.
- Any person who connects external equipment to signal input and signal output ports of this device has formed a Medical Electrical System and is therefore responsible for the system to comply with the requirements of IEC 60601-1.
- A PC connected to the USB connector has to be certified for one of the standards IEC 60601-1, IEC 61010-1, IEC 60950 or comparable with safety extra low voltage on the USB ports.
- The connected PC should be placed out of reach from the patient. Do not, simultaneously, touch the connected PC and the patient.
- The 6s measurement mode is used in ages 7 - 10 years when the 10s measurement is unsuccessful.

## 9.3 Substances disturbing FeNO measurement

Known patient factors that could interfere with FeNO measurements are described in the ATS Guidelines (Am j Respir Crit Care Med 2005; 171:912-930) as follows:

To assure correct results when performing FeNO measurement with NIOX VERO®, the following cautions apply:

- **Respiratory maneuvers** - Because spirometric maneuvers have been...
shown to transiently reduce exhaled NO levels, it is recommended that NO measurement be performed before spirometry. The same stipulation applies to other taxing respiratory maneuvers, unless these can be shown not to influence exhaled NO. The FeNO maneuver itself and body plethysmography do not appear to affect plateau exhaled NO levels.

- **Age/sex** - In adults there is no consistent relationship between exhaled NO level and age, but it has been reported that, in children, FeNO increases with age. In adults, there are conflicting reports regarding the effects of sex, menstrual cycle and pregnancy, so these patient characteristics should be recorded at the time of measurement.

- **Airway caliber** - It has been demonstrated that FeNO levels may vary with the degree of airway obstruction or after bronchodilatation, perhaps because of a mechanical effect on NO output. Depending on setting, it may be prudent to record the time of last bronchodilator administration and some measure of airway caliber, such as FEV.

- **Food and beverages** - Patients should refrain from eating and drinking before NO analysis. An increase in FeNO has been found after the ingestion of nitrate or nitrate-containing foods, such as lettuce (with a maximum effect 2 hours after ingestion) and drinking of water and ingestion of caffeine may lead to transiently altered FeNO levels. Until more is known, it is prudent when possible to refrain from eating and drinking for 1 hour before exhaled NO measurements and to question patients about recent food intake. Alcohol ingestions reduces FeNO in patients with asthma and in healthy subjects.

- **Circadian rhythm** - Although FeNO levels are higher in nocturnal asthma, there was no circadian rhythm in two studies, but another study did report a circadian pattern, so it is uncertain whether measurements need to be standardized for time of day. It is, however, prudent, where possible, to perform serial NO measurements in the same period of the day and to always record the time.

- **Smoking** - Chronically reduced levels of FeNO have been demonstrated in cigarette smokers in addition to acute effects immediately after cigarette smoking. Despite the depressant effect of smoking, smokers with asthma still have raised FeNO. Subjects should not smoke in the hour before measurements, and short- and long-term active and passive smoking history should be recorded.

- **Infection** - Upper and lower respiratory tract viral infections may lead to increased levels of exhaled NO in asthma. Therefore FeNO measurements should be recorded in the chart. HIV infections are associated with reduction in exhaled NO.

- **Medications and exhaled NO** - The potential effect of drugs on NO cannot be excluded, and so all current medication and time administered should be recorded. Exhaled NO falls after treatment with inhaled or oral corticosteroids in subjects with asthma and after inhaled NO synthase inhibitors. Leukotrine-axis modifiers also reduces FeNO. NO donor drugs and oral, inhaled, and intravenous L-arginine increase FeNO and nasal FeNO. Even if a certain medication does not effect NO production, it might affect the apparent level of NO through other mechanisms, such as changes in airway caliber.

- **Other factors** - The manipulation of physiologic parameters has been shown to affect FeNO. Changing pulmonary blood flow has no effect in humans, but hypoxia decreases exhaled NO, and this may occur in subjects at high altitude, particularly those prone to high-altitude pulmonary oedema. The application of positive and-expiratory pressure has been shown to increase FeNO in animals, but airway pressure in humans does not affect exhaled NO plateau levels according to most reports, although one study suggests the opposite. Many studies have examined the effect of exercise on FeNO. During exercise, according to one report, FeNO falls, whereas NO output increases, and this effect may last up to 1 hour. Others have reported that FeNO remains stable after exercise. It would seem prudent to avoid strenuous exercise for 1 hour before the measurement.

- **Ethnic differences** - Ethnic differences in ‘healthy’ FeNO levels have been observed. In schoolchildren Asian (boys) could have 6- 14 ppb higher FeNO levels
than Caucasians boys. By contrast, Asian girls have elevated FeNO levels to a lesser extent. African-American children seem to have slightly higher ‘healthy’ FeNO levels than Caucasians; 17 ppb versus 12 ppb. In African-Americans adults slightly higher average ‘healthy’ FeNO levels than Caucasians, 20 ppb versus 17-18 ppb have been observed.

- Measurement results are to be used as an adjunct to establish clinical and laboratory assessments in asthma.

9.4 Electromagnetic immunity

NIOX VERO® has been tested to comply with the emission and immunity requirements described in the parts of the IEC 61326 series for electrical equipment for measurement, control and laboratory use, and found to comply with IEC 60601-1-2:2007 General requirements for basic safety and essential performance-Collateral standard: Electromagnetic compatibility- Requirements and tests.

For more information see “Electromagnetic immunity” on page 50.

**CAUTION!** The test limits are designed to provide protection against harmful interference in a typical medical installation. However, because of the increased use of radio-frequency transmitting equipment and other sources of electrical noise emitters in the healthcare and home environments, such as base stations for radio, cellular/cordless telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast, it is possible that high levels of such interferences due to close proximity or strength of a source, may result in disruption of performance of the instrument. If abnormal performance is observed, it may be necessary to reorient or relocate the NIOX VERO®.

**WARNING!** NIOX VERO® should not be used adjacent to or stacked with other equipment.

9.5 Emission of electromagnetic energy

**CAUTION!** This equipment has been designed and tested to CISPR 11 Class B. In a domestic environment it may cause radio interference, in which case, you may need to take measures to mitigate the interference.

For more information see “Electromagnetic emissions” on page 53.

9.6 Operating conditions

Ensure stable operating conditions by avoiding placement of the instrument in direct sunlight, near sources radiating heat, or ventilation. NIOX VERO operates during the following conditions:

- NO in ambient air up to 300 ppb
- Exhaled flow during FeNO measurements at 50 ml/s (3 L/min) ± 10% BTPS* during 10 seconds.
- Temperature range of 50°F to 95°F
- A relative humidity range of 20% to 80%, non condensing
- An atmospheric pressure range of 700 hPa to 1060 hPa

Performance shall be sustained when measuring continuously at a rate of up to 10 measurements / hour. Exhaled breath contains water vapor which can condense inside the instrument. When excessively used in a short period, there is a risk for condensation of water inside NIOX VERO.

Normally a maximum of 10 exhalations/hour can be performed with NIOX VERO during continuous use. However, it is possible to perform 20 exhalations in one hour if the instrument is paused for a minimum of 30 minutes prior to the next session of exhalations. Exhalations include failed and successful measurements.
9.6.1 Limited warranty
Circassia provides a Limited Warranty for this instrument and original accessories delivered with the instrument. Conditions are defined when the items are purchased.

Do NOT try to repair the instrument. Any attempt will make the warranty invalid and performance according to the specifications cannot be guaranteed.

9.6.2 Support
Contact your local Circassia representative or Circassia Technical Support if you encounter problems which you cannot solve with the information in this manual.

For contact details, see back cover, and provide the following information:

- Your name, address and telephone number.
- Serial number for both the instrument, handle and Sensor.
- Problem description (as thorough as possible)
- Alert codes or lists.
Chapter 10 Reference information

10 Reference information

10.1 Buttons and descriptions

10.1.1 Control buttons

- OK - accept changes/verify result
- Undo - closes view without saving changes
- Return
- Skip
- Erase button
- Decrease/step downwards
- Increase/step upwards
- Check box (not active)
- Check box (active)
- Radio button - off/QC not performed
- Radio button - on/QC performed

10.1.2 Main menu buttons

- 10s measurement mode
- Demo
- 6s measurement mode
- Settings

10.1.3 Settings view buttons

- Configuration
- Volume
- Alert logs
- Instrument status
- Time and date
- Enable Bluetooth
- Patient measurements
- Ambient measurements
- Breathing handle status
- QC tester information
- QC measurements

10.2 Symbols and descriptions

10.2.1 Status bar

- Battery - fully charged
- Battery ≤ 87% charge
- Battery ≤ 62% charge
- Battery ≤ 37% charge
- Battery ≤ 12% charge
- Sensor status - no Sensor
- Sensor status - followed by number of measurements remaining
- Warning - temperature is not within operating conditions range
- Warning - humidity is not within operating conditions range
- Audio - mute
- Breathing handle - about to expire or has expired (blinking)
- Instrument - about to expire or has expired (blinking)
Chapter 10 Reference information

10.2.2 Display

- Analysis progress bar
- Time
- Volume bar
- General warning
- Not connected to Microsoft Azure (Only shown in NIOX Panel status bar)
- Connected to Microsoft Azure (Only shown in NIOX Panel status bar)
- Screen code - correct
- Screen code - incorrect
- Result screen - Ambient measurement
- Cloud - pressure within limits
- Cloud - goal reached
- Cloud - warning pressure too high or too low

10.3 Symbol explanation

- Responsible manufacturer
- The product meets the requirements of applicable European directive
- Electrical safety Type B applied parts: Breathing handle and patient filter
- The product should be recycled according to the local program for electronic equipment.
- Consult instructions for use
- Expiration date
- Transport and storage temperature limitation
- For single use only
- In Vitro Diagnostic Device
- Transport and storage humidity limitation
- Transport and storage atmospheric pressure limitation
- Equipment protected throughout by DOUBLE INSULATION or REINFORCED INSULATION
- The Device includes a Radio Frequency (RF) transmitter (Bluetooth)
- NRTL-listed
- Prescription use only

The product meets the requirements of applicable European directive
Electrical safety Type B applied parts: Breathing handle and patient filter
The product should be recycled according to the local program for electronic equipment.
Consult instructions for use
Expiration date
Transport and storage temperature limitation
For single use only
In Vitro Diagnostic Device
Transport and storage humidity limitation
Transport and storage atmospheric pressure limitation
Equipment protected throughout by DOUBLE INSULATION or REINFORCED INSULATION
The Device includes a Radio Frequency (RF) transmitter (Bluetooth)
NRTL-listed
Prescription use only
Chapter 11 Technical data

11 Technical data

11.1 Dimensions and weight
Height: 145 mm  
Width: 185 mm  
Depth: 41 mm  
Weight of instrument including Sensor: 1 kg

11.2 Electrical data

| Electrical safety classification: | The equipment complies with the requirements according to IEC 60601-1 Class II ME EQUIPMENT while externally powered, and as INTERNALLY POWERED ME EQUIPMENT while powered by battery. |
| Mains Voltage: | 100-240 V ~47-63 Hz |
| Secondary voltage (external power adapter): | 5 V |
| Power consumption: | < 15 VA |

11.3 Noise level
< 65 dBA, at a distance of 1 m

11.4 Exhaled NO - performance data

The instrument is verified to fulfill the specified performance under the temperature range within 50 to 95 °F, relative humidity range of 20-80% and pressure range of 700-1060 hPa.

Measurement range:
FeNO: 5 to 300 ppb
Lowest Detection Limit: 5 ppb
Determination by analyzing gas concentrations around and below the detection limit. 5 ppb was the lowest detectable level.

11.5 Linearity
Squared correlation coefficient $r^2 \geq 0.998$, slope 0.95 - 1.05, intercept $\pm 3$ ppb.

11.6 Precision
< 3 ppb of measured value for values < 30 ppb, < 10% of measured value for values $\geq$ 30 ppb. Expressed as one standard deviation for replicate measurements with the same instrument, using a certified gas concentration of Nitric Oxide reference standard.

11.7 Accuracy
$\pm 5$ ppb for measured values $\leq 50$ ppb or 10% of measured value for values $> 50$ ppb. Expressed as the upper 95% confidence limit, based on absolute mean of differences from certified gas concentration of Nitric Oxide.

11.8 Method comparison
< 10 ppb for values $\leq 50$ ppb, < 20% for values $> 50$ ppb. Expressed as the difference between a NIOX MINO® FeNO value and the corresponding FeNO value measured with NIOX VERO® instrument from Circassia.

11.9 Inhalation parameters

Inhale to TLC (Total Lung Capacity) before start of exhalation. Inhalation in instrument is triggered by a pressure of -3 cm H$_2$O.
11.10 Exhalation parameters

Exhalation time:
- Standard mode: 10 s
- Pediatric mode: 6s (used after an unsuccessful 10s attempt)

All exhalations are to be performed at an exhalation pressure of 10 - 20 cm H₂O, to maintain a fixed flow rate of 50 ±5 ml/s. The instrument stops the measurement at pressures outside the interval. Warning alerts sounds at 10 - 12 and 18-20 cm H₂O.

11.11 Essential performance

Essential performance for NIOX VERO consists of
1. The measurement of the NO concentration of exhaled human breath
2. The control of exhaled breath for Asthma management according to ATS/ERS

NIOX VERO contains internal monitoring functionality for safety and essential performance parameters. Recurrent testing is not necessary to maintain essential performance or basic safety.

11.12 Memory capacity

Up to 15,000 measurements, depending on the size of the measurement files.

11.13 Patient filter

Disposable bacterial/viral filter to be changed for each patient.

11.14 Bluetooth

NIOX VERO® has a Bluetooth class 2 receiver/transmitter with:
- Frequency band of 2402MHz~2480 MHz.
- Modulation method
  - 0.5BT Gaussian Filter 2 FSK modulation index: 0.28~0.35 (Basic Rate 1Mbps)
  - π/4-DQPSK (EDR 2Mbps)
  - 8DPSK (EDR 3Mbps)
  - ERP
  - Power class 2

11.14.1 R&TTE Directive

Hereby, Circassia AB, declares that this NIOX VERO is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.

11.14.2 IC

This Class B digital apparatus complies with Canadian ICES-003.

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d’Industrie Canada applicables aux appareils radio exempts de licence.

L’exploitation est autorisée aux deux conditions suivantes: (1) l’appareil ne doit pas produire de brouillage, et (2) l’utilisateur de l’appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d’en compromettre le fonctionnement.
Chapter 11 Technical data

Contains IC: 337L-MBH7BTZXXC2

11.14.3 FCC

FCC CAUTION

Changes or modifications not expressly approved by the party responsible for compliance could void the user’s authority to operate the equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and

(2) this device must accept any interference received, including interference that may cause undesired operation.

Properly shielded and grounded cables and connectors must be used for connection to host computers and / or peripherals in order to meet FCC emission limits.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

Consult the dealer or an experienced radio/TV technician for help.

Contains FCC ID: SQK-MBH7BTZXXC2

11.15 Rechargeable battery capacity

Only use the power adapter or USB cable supplied by Circassia to charge the battery.

Capacity: Approx. 30 measurements per day or 36 hours stand-by in 77°F environment condition.

Lifetime: At least one year with normal use.

Charging time: <8 hours under normal conditions.

Lowered capacity, and/or when 8 hours of charging time does not charge the battery fully, indicates that the battery should be replaced.

Battery Type No BJ-G510039AA, Article No 12-1150.

Note: To charge the battery by USB cable, the instrument needs to be powered off.

11.16 Instructions for transport and storage

CAUTION! Always use a closed bag or box for transportation and storage of NIOX VERO®.

1. Verify that the instrument is turned off and disconnected from the power supply.
2. Remove the patient filter and attach the protective cap on the handle.
3. Place the instrument and accessories in the bag and close bag.
4. Verify that the storage environment conditions are appropriate (see recommendations for NIOX VERO, including Sensor).
11.16.1 NIOX VERO®, including Sensor (transportation and storage)
- Relative humidity range: 20% to 80%, non condensing.
- Temperature range: 50 to 95 °F
- Atmospheric pressure range: 700 to 1060 hPa
When transporting the instrument from one location to another with different ambient conditions, a prolonged stabilization period might be required before measurements can be performed.

11.16.2 NIOX VERO® instrument (transport and storage in its unopened original package without Sensor)
- Relative humidity range: 10% to 90%, non condensing (maximum 1 week when outside relative humidity range 10% to 80%).
- Temperature range: -4°F to 140°F (maximum 1 week when outside temperature range 50°F to 95°F).
- Atmospheric pressure range: 500 to 1070 hPa

11.16.3 NIOX VERO® Sensor (transport and storage in original package)
- Relative humidity range: 10% to 99%, non condensing.
- Recommended temperature range: 41°F to 95°F (maximum 1 week for the ranges -4°F to 41°F and 95°F to 140°F)
- Atmospheric pressure range: 700 to 1070 hPa

12 NIOX VERO® parts and accessories

CAUTION! When selecting an accessory for your NIOX VERO® product keep in mind that an accessory not recommended by Circassia may result in loss of performance, damage to your NIOX VERO® product, fire, electric shock, injury or damage to other property. The product warranty does not cover product failure or damage resulting from use with non approved accessories. Circassia takes no responsibility for health and safety problems or other problems caused by the use of accessories not approved by Circassia.

12.1 Parts included in NIOX VERO® package (Article No. 12-1200)
- NIOX VERO® Instrument (12-1000)
- NIOX VERO® Breathing Handle (12-1010)
- NIOX VERO® Handle Cap (12-1009)
- NIOX VERO® Power Adapter (12-1120)
- NIOX VERO® Power Cord (12-1230)
- NIOX VERO® USB Cable (12-1002)
- NIOX VERO® Battery (12-1150)
- NIOX VERO® Stand (12-1001)
- NIOX VERO® User Manual (EPM-000165)
- NIOX® Apps USB Memory stick (12-1004)

12.2 Accessories
NIOX VERO® Test Kit 100 (12-1810)
Contains: 1 Sensor* for 100 tests and 100 NIOX VERO® Filters**
13 Medical Device Reporting (MDR)

Circassia, as a medical device manufacturer, must have a Medical Device Reporting system in place to report to the FDA, any adverse events that have occurred with its medical products. The purpose of the Medical Device Reporting system is to ensure the health and safety of patients, users and others using medical products by reducing the likelihood of the same type of adverse event being repeated. This is achieved by immediate notification of experienced incidents to enable corrective and preventive actions.

Specific guidelines, Medical Device Reporting system for user facilities, are applicable for users of medical devices. An MDR reportable event is an event about which a user facility becomes aware of information that reasonable suggests that a device has or may have caused or contributed to a death or serious injury. Manufacturers of medical devices are obliged to report adverse incidents to the FDA. Any user of Circassia's products, who experience an adverse event related to the product, must therefore immediately report this to Circassia Inc. The report should contain the following:

- Description of the incident
- When and where did the incident occur?
- What product / accessory was involved, serial number/batch number?
- Was the incident related to instructions for use of the product?
- Was the risk foreseeable and clinically acceptable in view of potential patient benefit?
- Was the outcome adversely affected by a patient's pre-existing condition?
- Has the event been reported to the FDA? (only applicable if the use of the device has or may have caused or contributed to injury or death)
14 Guidance and manufacturer's declaration - Electromagnetic immunity and electromagnetic emissions

14.0.1 Electromagnetic immunity

<table>
<thead>
<tr>
<th>Immunity test</th>
<th>Compliance</th>
<th>Electromagnetic environment - guidance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrostatic discharge (ESD)</td>
<td>’+/− 6 kV contact</td>
<td>Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should at least 30%.</td>
</tr>
<tr>
<td>IEC 61000-4-2</td>
<td>+/− 8 kV air</td>
<td></td>
</tr>
<tr>
<td>Electrical fast transient/burst</td>
<td>’+/− 2 kV for power supply</td>
<td>Mains power quality should be that of a typical commercial or hospital environment.</td>
</tr>
<tr>
<td>IEC 61000-4-4</td>
<td>lines</td>
<td></td>
</tr>
<tr>
<td></td>
<td>+/- 1 kV for input/output</td>
<td></td>
</tr>
<tr>
<td></td>
<td>lines</td>
<td></td>
</tr>
<tr>
<td>Surge</td>
<td>’+/− 1 kV line(s) to line(s)</td>
<td>Mains power quality should be that of a typical commercial or hospital environment.</td>
</tr>
</tbody>
</table>
Voltage dips, short interruptions and voltage variations on power supply input lines  
IEC 61000-4-11

<table>
<thead>
<tr>
<th>Voltage dip</th>
<th>IEC 61000-4-11</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 5% U _T (&gt; 95% dip in U _T) for 0.5 cycle</td>
<td>40% U _T (60% dip in U _T) for 5 cycles</td>
</tr>
<tr>
<td>70% U _T (30% dip in U _T) for 25 cycles</td>
<td>&lt; 5% U _T (&gt; 95% dip in U _T) for 5 s</td>
</tr>
</tbody>
</table>

Mains power quality should be that of a typical commercial or hospital environment.

If the user of the NIOX VERO\textsuperscript{®} requires continued operation during power mains interruptions, it is recommended that the NIOX VERO\textsuperscript{®} be powered from an uninterruptible power supply or a battery.

**Note:** 
$U_T$ is the a.c. mains voltage prior to application of the test level.

<table>
<thead>
<tr>
<th>Conducted RF</th>
<th>IEC 61000-4-6</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Vrms</td>
<td>150 kHz to 80 MHz</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Radiated RF</th>
<th>IEC 61000-4-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 V/m</td>
<td>80 MHz to 2.5 GHz</td>
</tr>
</tbody>
</table>

Portable and mobile RF communications equipment should be used not closer to any part of the NIOX VERO, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter.

**Recommended separation distance**

\[
d = \left[ \frac{3.5}{3} \right] \times \sqrt{P} \\
\text{at 80 MHz to 800 MHz} \\
d = \left[ \frac{7.0}{3} \right] \times \sqrt{P} \\
\text{at 800 MHz to 2.5 GHz}
\]

where “$P$” is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and “$d$” is the recommended separation distance in meters (m).

Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey (**a), should be less than the compliance level in each frequency range (**b). Interference may occur in the vicinity of equipment marked with the following symbol:
Chapter 14 Guidance and manufacturer’s declaration - Electromagnetic immunity and electromagnetic emissions

**Note:** At 80 MHz and 800 MHz, the higher frequency range applies.

**Note:** These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

### Field strengths from fixed transmitters

Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast can not be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitter, an electromagnetic site survey should be considered. If the measured field strength in the location in which the NIOX VERO® is used exceeds the applicable RF compliance level above, the NIOX VERO® should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the NIOX VERO®.

### Over the frequency range 150 kHz to 80 MHz

Over the frequency range 150 kHz to 80 MHz, field strengths should less than 3.0 V/m.

### Rated maximum output power of transmitter

<table>
<thead>
<tr>
<th>Separation distance according to frequency of transmitter (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated maximum output power of transmitter (W)</td>
</tr>
<tr>
<td>150 KHz to 80 MHz</td>
</tr>
<tr>
<td>d = \left{ \begin{array}{ll} 3.5 \times \sqrt{P} &amp; \text{if } P &lt; 1 \ 3.0 \times \sqrt{P} &amp; \text{if } P \geq 1 \end{array} \right.</td>
</tr>
<tr>
<td>80 MHz to 800 MHz</td>
</tr>
<tr>
<td>d = \left{ \begin{array}{ll} 3.5 \times \sqrt{P} &amp; \text{if } P &lt; 1 \ 3.0 \times \sqrt{P} &amp; \text{if } P \geq 1 \end{array} \right.</td>
</tr>
<tr>
<td>800 MHz to 2,5 GHz</td>
</tr>
<tr>
<td>d = \left{ \begin{array}{ll} 3.5 \times \sqrt{P} &amp; \text{if } P &lt; 1 \ 3.0 \times \sqrt{P} &amp; \text{if } P \geq 1 \end{array} \right.</td>
</tr>
</tbody>
</table>

For transmitters rated at a maximum output power not listed above, the recommended separation distance \( d \) in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where “\( P \)” is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

**Note:** At 80 MHz to 800 MHz, the separation distance for the higher frequency range applies.

**Note:** These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

---

**Recommended separation distances between portable and mobile RF communications equipment and the NIOX VERO®**

The NIOX VERO® is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the NIOX VERO® can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the NIOX VERO® as recommended below, according to the maximum output power of the communications equipment.
## 14.0.2 Electromagnetic emissions

<table>
<thead>
<tr>
<th>Emission test</th>
<th>Compliance</th>
<th>Electromagnetic environment - guidance</th>
</tr>
</thead>
<tbody>
<tr>
<td>RF emissions CISPR 11</td>
<td>Group 1</td>
<td>The NIOX VERO® uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.</td>
</tr>
<tr>
<td>RF emissions CISPR 11</td>
<td>Class B</td>
<td>The NIOX VERO® is suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.</td>
</tr>
<tr>
<td>Harmonic emissions IEC 61000-3-2</td>
<td>Class D</td>
<td></td>
</tr>
<tr>
<td>Voltage fluctuations / flicker emissions IEC 61000-3-3</td>
<td>Complies</td>
<td></td>
</tr>
</tbody>
</table>
Information in this document is subject to change.

Amendments will be made available by Circassia AB as they occur.

Based on the company’s intellectual property, Circassia develops and commercializes products for the monitoring of nitric oxide (NO) as a marker of inflammation, to improve the management and care of patients with inflammatory disease in the airways.

Patents:

Circassia’s NIOX products are protected by a number of patents in the US, Europe and a range of other countries.

Circassia AB, an ISO 13485 certified company

Circassia Pharmaceuticals Inc, 5151 McCrimmon Parkway, Morrisville, Suite 260, NC 27560, USA
Phone: +1 (866) 275-6469, Fax: +1 (877) 630-6469, E-mail: service.us@circassia.com
www.niox.com
Copyright 2017 Circassia AB, Uppsala, Sweden.
Circassia is a registered trademark of Circassia Limited
NIOX, NIOX MINO and NIOX VERO are registered trademarks of Circassia AB.