TROLEX

XD ONE

USER MANUAL

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1. GENERAL DESCRIPTION

The Trolex XD One Personal Dust Monitor is designed to provide data on airborne particulates so that users can take appropriate actions from particulate-related health hazards.

The XD One allows users to specifically monitor respirable particulate matter (PM) to indicate and warn of personal exposure in working and operating environments. The device can be configured to measure and warn users based on selectable particulate matter sizes (PM1.0, PM2.5, PM4.25 and PM10) and report on all environmental total suspended particulates (TSP).

The XD One uses an innovative light scattering photometer that combines adaptive flowrate with advanced sensing technology to ensure a high level of measurement accuracy. The size of each particle is instantaneously measured and classified at up to 10,000 samples per second to allow detailed real-time reporting even in high dust level environments.

Precise data is collected for all measurable particulates, enabling detailed concentration profiling and analysis using the Trolex BreatheLITE software. As the XD One records data on all particulates between 0.35 and 40 µm, users can easily access and view detailed information about a wide range of particulate sizes.

Measurement information is displayed on-device in the form of custom short-term exposure limit (STEL) or long-term exposure limit/time-weighted average (TWA) audio visual alarms, or directly connected to the Trolex BreatheLITE software for live particulate readings.

TX8060 XD One

2. FEATURES

- Personal, portable, mountable and moveable
- Early warning of personal exposure to airborne particulates
- Early warning alerts for increased particulate levels
- PM1, PM2.4, PM4.25, PM10 and TSP measurement ranges
- 0.35 - 40 µm particle sizing range
- Low-end sensor resolution, measuring down to 0.35 µm with 99% capture
- Custom particle density for increased characterisation
- Operational stability in varying atmospheric and environmental conditions
- Custom Logging Intervals from 10 to 60 seconds
- On-device audio/visual alarms
- Custom alarm setpoints
- Custom STEL and TWA period alarm thresholds
- On-device self-check routine
- Battery operated, rechargeable (16+ hours)
- On-device data logging
- Live data readout via BreatheLITE software
- Data analytics functions via BreatheLITE software
- Data analytics functions via BreatheLITE software
- Range of personal, industrial and cabin mounting options
- Low maintenance

2.1 Intended use

The XD One is a personal monitor designed for use in a range of applications and environments. The product alerts users to the change in particulate levels relative to predefined thresholds and limits. Suitable for monitoring in either indoor or outdoor ambient air conditions, the XD One can cope with both high and low particulate concentration levels.

Designed to be low maintenance and does not use pumps or filters.

2.2 Limits of use

To ensure optimum performance and safe operation, the XD One must be operated according to the limits and instruction detailed in the technical data section of this user manual. Operation outside of these limits may result in damage to the equipment or failure to achieve the performance specification.

Trolex will not be liable for any injury or damage caused by incorrect installation, setup, operation, or maintenance resulting from a failure to follow the procedures and safety instructions provided in this user manual.

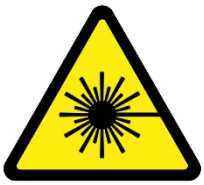
Note: Operating the XD One at extremes of the specified temperature limits may reduce the operating lifetime of the product.

WARNING!

Alerts the user to a potentially hazardous procedure or practice which if not followed correctly can result in serious personal injury or injury of others.

CAUTION!

Alerts the user to a procedure or practice which if not followed correctly can result in damage to the system or ancillary equipment.



WARNING! – LASER RADIATION

The use of controls, adjustments, or procedures other than those specified in this user manual may result in exposure to hazardous optical radiation.

4. DANGER FROM PROCESS

It is possible that the XD One could be installed or operated in environments that contain process particulates which can be hazardous to health.

Unless process conditions are known to be entirely safe, suitable precautions such as the use of breathing apparatus or environmental purging/detoxification should be employed before entry is made into the installation or maintenance environment.

Note: This product variant is not designed for use with flammable or explosive dust in combustible concentrations. In the event of potential combustible concentrations becoming present in a non-hazardous location, this variant of the XD One must be powered down.

It is the responsibility of the installer to risk assess the suitability of the instrument for installation and use in the intended application.

5. SAFETY PROCEDURES

Always observe the safety precautions detailed in this user manual. Personnel installing, operating or maintaining the equipment are responsible for their personal safety and correct handling of the equipment in accordance with all safety instructions in this user manual and those specified in local guidelines or regulations.

Installation in working environments can be challenging and correct set up is critical to the function of the instrument; it is important that you carefully read the entire product user manual before using and installing the XD One for the first time.

Refer to the **Certification and Conformity** section of this user manual and to the relevant certificates for any installation parameters and special conditions of safe use. The installation or use of the XD One must only be carried out by competent personnel. Observe the national safety regulations issued, for example, by the employers' liability insurance association, social security institutions, occupational safety and health authorities or other safety organisations.

The XD One is a personal safety device and it is the operator's responsibility to respond accordingly to any warnings, alarms or alerts in accordance with site regulations and instructions. Follow all warnings and instructions marked on the instrument.

Retain these instructions in a safe and known place for future use.

5.1 Laser safety precautions

The XD One is rated via the *Class 1* 'Laser Safety Guideline' under all conditions of normal use.

Class 1 laser products may contain laser systems of a higher class but there are adequate engineering control measures to ensure that access to the beam is not permitted during normal use.

WARNING – *Class 3B* laser radiation: **do not** open the laser housing when the laser is powered on as it may result in eye damage from directly viewing the laser beam.

The XD One complies with:

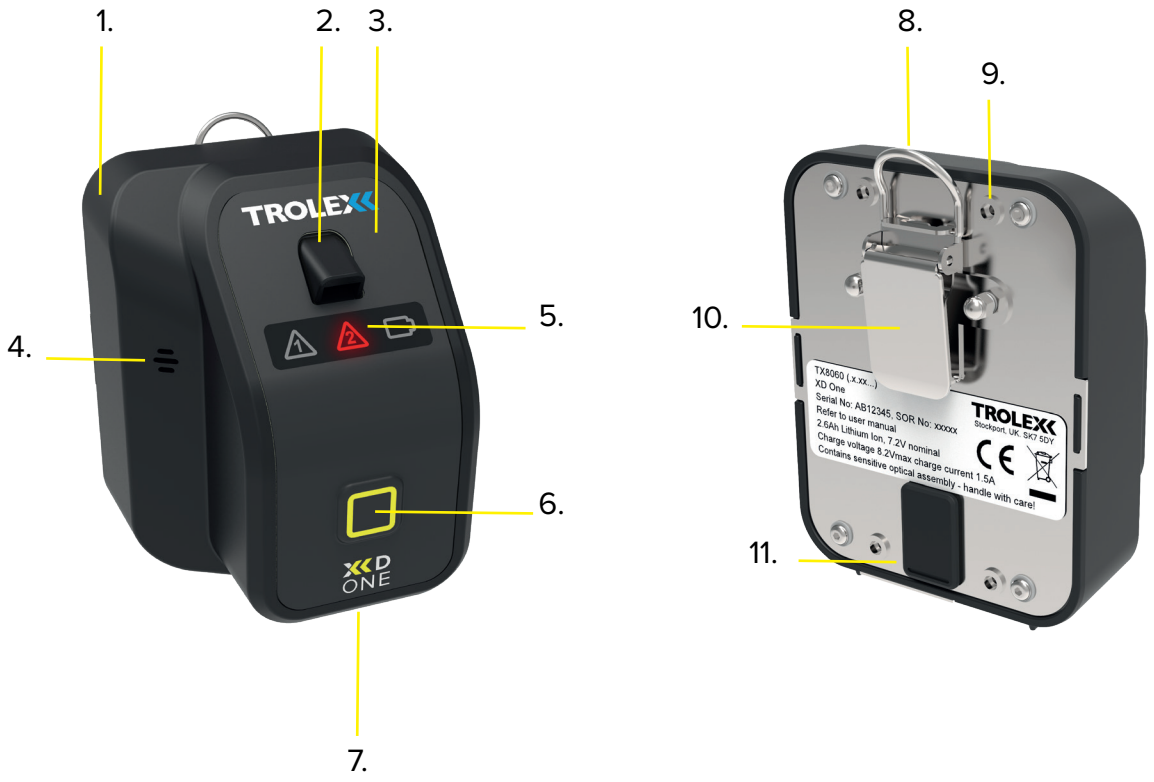
- IEC 60825-1 2014
- 21 CFR-1040.10 and 1040.11

WARNING – There are no user-serviceable parts inside the XD One sensor housing. Servicing should only be carried out by Trolex or an approved service technician.

6. DEVICE COMPONENTS

The XD One can be rapidly installed to suit a variety of applications. The particulate sensor is located inside the main housing that provides isolation and ingress protection between the particle flow path and control circuits.

The following details highlight the main features of XD One Personal Dust Monitor.



1. Main housing
2. Air inlet
3. Function membrane
4. Sounder outlet
5. LED user interface
6. On/off function switch
7. Air outlet
8. Mounting loop
9. Threaded mounting
10. Aligator clip
11. USB port

6.1 Particulate flow path

The XD One allows the free sampling of particulate concentrations an unrestricted, vertical flow path as highlighted below. It is recommended that routine inspection of the air inlet is carried out to ensure that it is free from any obstruction.

7. CERTIFICATION AND CONFORMITY

7.1 Compliance

The XD One complies with the following European Union directives and United Kingdom Regulations:

Electromagnetic Compatibility (EMC) Directive 2014/30/EU

Electromagnetic Compatibility (EMC) Regulations 2016/1091

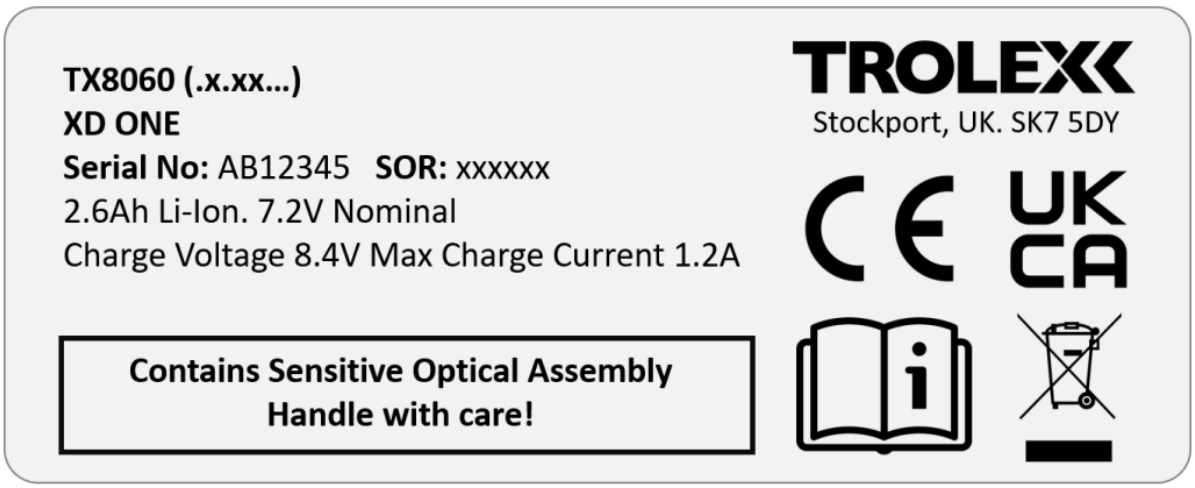
- **EN 61326-1:2013**
- **EN 61000-6:2:2019**
- **EN 61000-6-3:2007+A1:2011**

Restriction of Hazardous Substances (RoHS) Directive 2011/65/EU

Restriction of Hazardous Substances (RoHS) Regulations 2012 S.I. 2012/3032

7.2 Product label

The following information is highlighted on the product label, accessible on the rear of the XD One as highlighted in **section 6**.



8.1 Product specification

Particulate sensing parameters

Sensing technology	OPC light-scatter photometer
Particulate measurements	35 to 40 µm (PM1.0, PM2.5, PM4.25, PM10 and TSP)
TSP range	Up to 40 µm logged in mg/m^3
PM measurement capability*	0.35 to 40 µm over 24 bins
PM continuous operating range**	Up to 1,500 mg/m^3
PM density	0.8 to 8.0 g/ml (default: 1.65 g/ml) Custom particle density profiling
PM measurement units	$\mu g/m^3$ – logged on-device mg/m^3 or $\mu g/m^3$ – BREATHELITE software
Sampling interval	1 second
Particle count	Up to 10,000 (particles/second)
Flow rate	Dynamic (1.2 L/min nominal)
Total flow rate	5.5 L/min (typical)
Accuracy	± 5%

*The instrument can define particulate measurement peak trends up to the quantity specified.

**During sustained high dust loading periods, the instrument will report on PM data up to the quantity specified.

Note: Sustained exposure to PM quantities above 25 mg/m^3 will be logged; however, this may affect the operating life of the particulate sensor.

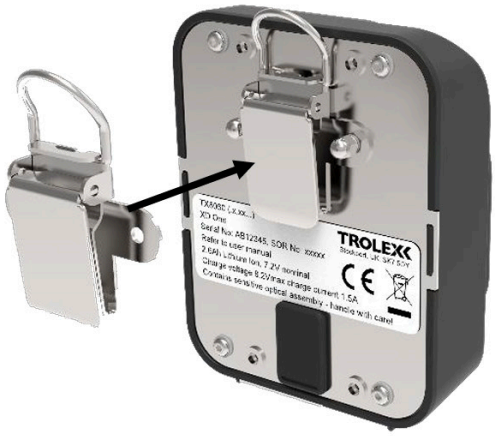
Technical specification

Ambient temperature limits	-10 to 45 °C
Humidy	0 to 95% RH (non-condensing)
Protection classification	Main enclosure, dust and waterproof: IP66 Particulate flow path (cap open): IP22 Particulate flow path (cap closed): IPX6
Housing material	Polymer coated stainless steel
Net weight	445 g
Data connections	1 x mini USB (maximum cable length – 2 m)
User options	Particulate measurements STEL and TWA alarm setpoints Latching alarms
User interface/alarms	Visual icon illumination (STEL, TWA and battery indications)
Self-test	Sensor hardware, circuitry and battery test on activation Manual self-test during use
Battery capacity	18.72 Wh
Battery run time	16 hours (full health at ambient)
Changing temperature limits	0 to 45 °C
Maximum charge current	1.2 A
Product fixing/mounting	Personal mounting clip, klick-fast stud, pole mount or custom bracket
Certification	CE UKCA
On-device data storage	8 GB up to 10 years (log rate dependent) Stored device data can be cleared as required

8.2 Product dimensions

8.3 Mounting details

The XD One is supplied with an alligator mounting clip as standard. A klick-fast stud is available to allow the XD One to be compatible with a range of wearable, wall and pole fixing kits.



XD One alligator clip

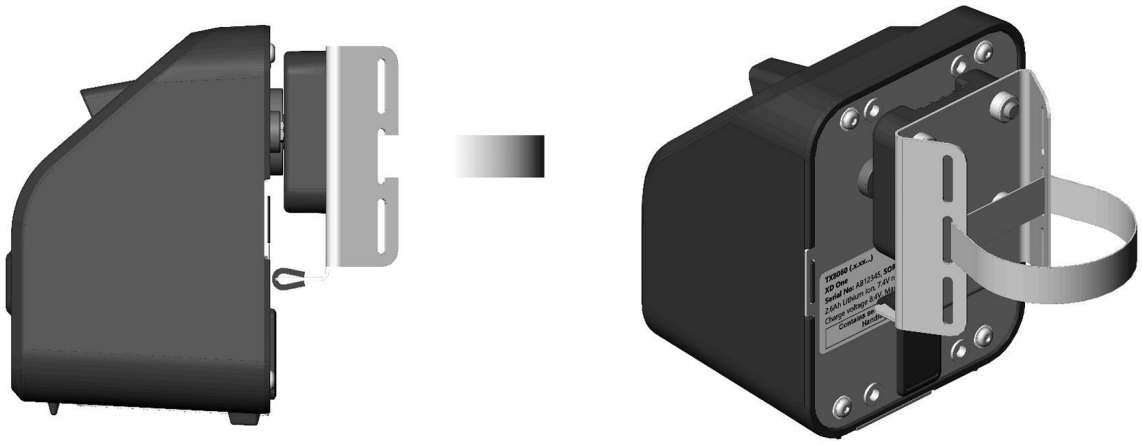
XD One klick-fast stud

The XD One is supplied with four M3 threaded mounting holes as standard to allow for custom mounting of the device.

The XD One is supplied with a stability bracket and strap for additional support of the product when body-mounting. Fit the bracket using the bottom two threaded M3 mounting holes and the fixing screws provided.

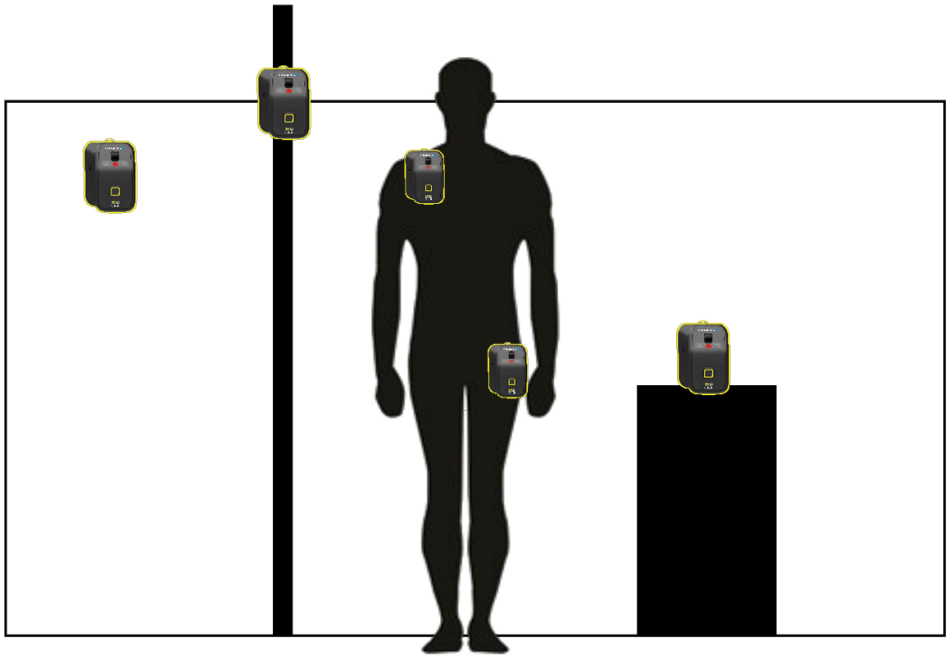
XD One stability bracket

The XD One is compatible with the pole mounting kit, which allows mounting onto the XD unit using the M3 mounting holes ranging from 50 - 150 mm. Fit the bracket using four threaded M3 mounting holes and the fixing screws provided.



XD One pole mount bracket

Position the XD One device via personal or body mount fixings, wall and pole adapters or in-cab vehicle mounting.



9. DEVICE CONFIGURATION

9.1 Default settings

Serial number	ABCDEFG123 (Trolex custom S/N)
Name	Blank
Operating mode	Normal
Alarm PM size	PM4.25
TWA period (minutes/hours)	8 hours
TWA threshold (µm/m^3)	1,000
STEL period (minutes/hours)	15 minutes
STEL threshold (µm/m^3)	1,000
Log rate (seconds)	10 seconds
Particle density (g/ml)	1.65

Default device settings can be manually changed as required using the Trolex BreatheLITE application.

10. FIRST POWER ON

The XD One is shipped with a lithium-ion battery cell that has been factory charged to no more than 30% of operating capacity for transport safety requirements. Before using the XD One ensure that it is fully charged using the supplied wall charger and USB cable.

See **section 14** for further details on charging and device connectivity.

11. DEVICE FUNCTIONALITY

The XD One has been designed around the use of a single-press switch and three illumination icons to indicate on-device warnings, battery levels and operating modes.

User interface icon display

The XD One has a simple tri-icon graphical interface which is used to communicate on-device warnings, sampling modes, battery indication and a device heartbeat.

Audio alarm

The built-in alarm sounder provides audio warnings at 85 db in conjunction with the illuminated icons alerting users to alarm setpoints.

Power/function button

A single power and function button is used on the XD One for device power on/off, alarm acknowledgement and device self-test.

11.1 User interface icons and indicators

Icon 1

Primary function: STEL warning

Secondary function: Sequence function icon

Icon 2

Primary function: TWA warning

Secondary function: Sequence function icon

Icon 3

Primary function: Battery indication/heartbeat

Secondary function: Sequence function icon

11.2 Operational sequences

The following details the main operational sequences of the XD One.

Power on

All icons will illuminate white.

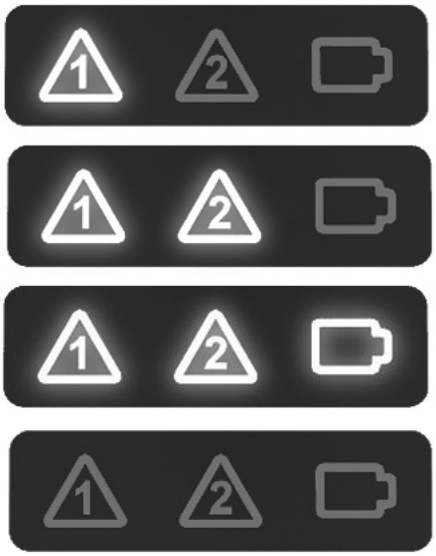
Self-test sequence

On initial power up, the XD One will perform a self-test sequence indicated by a sequential blue flash of each icon.

This is followed by a ‘pass’ indication of flashing green icons and sounder confirmation.

Fault indication.

Power off



All icons will illuminate white incrementally before the XD One powers down.

STEL alarm threshold

Flashing amber warning ‘icon 1’ will be illuminated when the STEL threshold is exceeded.

TWA alarm threshold

Flashing red warning ‘icon 2’ will be illuminated when the TWA threshold is exceeded.

Battery icon

The battery icon will flash green intermittently (three seconds) to indicate a power status between 100 and 70%.

The battery icon will flash amber intermittently (three seconds) to indicate a power status between 69 and 40%.

The battery icon will flash red intermittently (three seconds) to indicate a power status of 39% or lower.

When the XD One reaches a battery level of < 10%, a red warning will flash every second.

Heartbeat

The XD One heartbeat is indicated via the intermittent flashing (three seconds) of the battery icon.

11.3 Power on sequence

Before first power on, ensure that the XD One if fully charged using the charger provided. The XD One will automatically run the following sequence.

1. Device power on

   The XD One will switch on and run the start-up routine.

2. Device self-test

   The XD One will automatically run a self-test sequence and indicate a pass/fail result.

3. Auto-particulate sensing

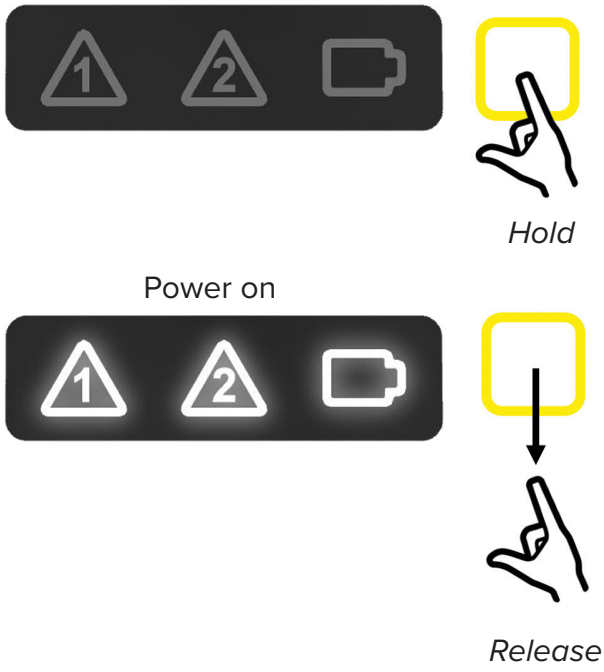
   The XD One will automatically begin sensing and recording particulate levels.

Note: The XD One begins particulate sampling as soon as power on and the start up routine is complete. STEL/TWA calculations, alarm warnings and data recording are immediately active alongside particulate sampling following the power on sequence.

To power on the XD One, follow the steps below.

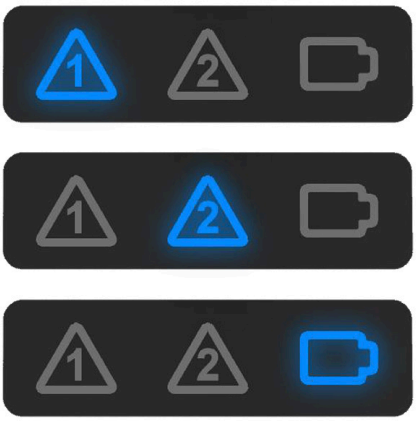
1. Press and hold the function button on the front of the XD One to initiate the power on sequence.

2. Release the function button on the front of the XD One when all icons are illuminated white.



3. The XD One will perform a self test routine to check the sensor element, electronic circuitry and battery health.

Start up ‘self-test’ routine



4. Following the self-test routine the XD One will display a “Pass”/“Fail” result via an audible visual alarm.

‘Self-test’ result

5. The XD One will automatically begin to sample particulate concentrations.

‘Sample’ routine

11.4 Power off sequence

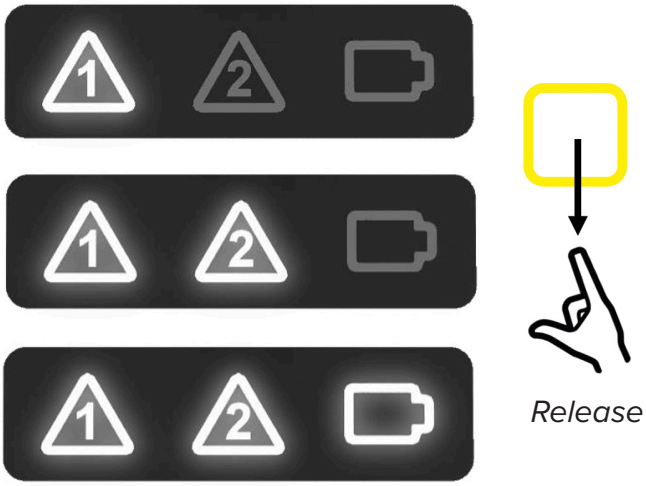
To power down the XD One, follow the steps below.

1. Press and hold the function button on the front of the XD One to initiate the power OFF sequence.

Hold

2. Release the function button on the front of the XD One when all icons are illuminated white.

Power off routine



Release

3. The XD One will power down, and switch off.

Power off

11.5 Instrument ‘self-test’ routine

On initial power on, the XD One is programmed to perform a set of initialisation tests which are listed and described below. The device will perform the self-test routine every time it is switched on, with results displayed in the form of green flashing icons for a pass result and red flashing icons when an error is identified.

Refer to **section 11.2** for sequence illumination details.

- **Sensor comms check**

  Ensures communications and correct functionality of the OPC sensor.

- **Device hardware check**

  Ensures functionality of the internal electronic hardware.

- **Device battery check**

  Ensures that the internal battery pack is functional and calibrated for use.

- **Data logging comms test**

  Ensures communications and correct functionality of the XD One internal memory storage.

- **EEPROM memory test**

  Ensures communications and functionality of the EEPROM is correct and that custom defined user settings are not lost.

11.6 User initiated ‘self-test’ routine’

At any point during normal operation, the XD One can run the ‘self-test’ routine to ensure system functionality.

To perform a ‘self-test’, press and hold the power button until all three function icons are blue, at this point, release the power button and the device will initiate the ‘self-test’ sequence.

‘Self-test’ results

After the self-test routine has been performed, the XD One will indicate the result via illuminated icon status.

Refer to **section 11.2** for “Pass”/“Fail” illumination details.

Note: On return of a “Pass” result, the XD One will automatically continue with sensing operation.

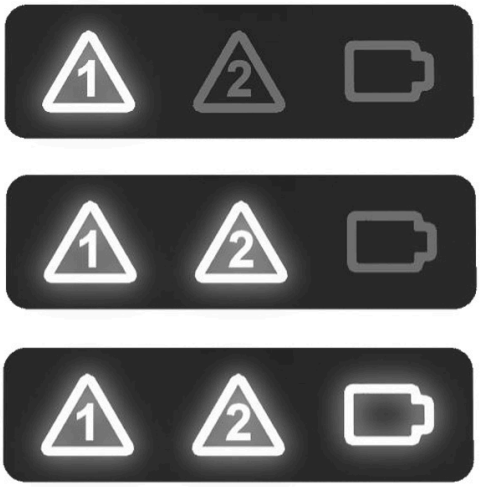
On return of a “Fail” result, the XD One will check if the fault is recoverable and repeat the ‘self-test’. This will take place up to a maximum of four times before the device will return a fatal error indication. In the unlikely case of fatal error indication, it is recommended to contact the Trolex service team.

To activate the self-test routine, follow the steps below.

1. Press and hold the function button on the front of the XD One to initiate the function sequence.

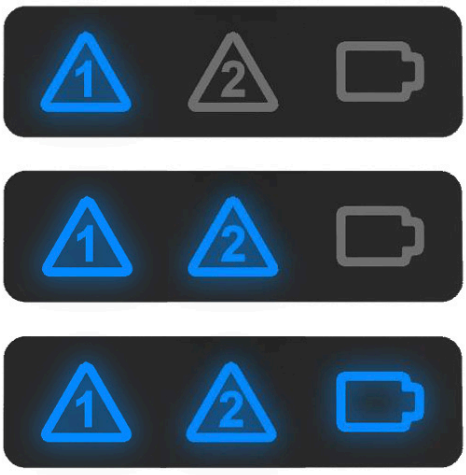
Hold

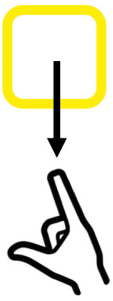
Power off routine



2. Release the function button on the front of the XD One when all icons are illuminated blue.

Start up ‘self-test’ routine





Release

3. Following the self-test routine the XD One will display a “Pass”/“Fail” result via an audible visual alarm.

‘Self-test’ result

4. The XD One will automatically begin to sample particulate concentrations.

‘Sample’ routine

11.7 Accidental activation of power/function switch

The XD One has a single power/function switch that has been designed for all device input operations. All positive inputs are completed via press, hold and release to prevent accidental activation of the power switch during operation.

In the event that the XD One power/function switch is accidentally activated during operation, the device will alert the user to the prolonged button press and hold via a series of sequential audio alarms.

Once the power/function switch is released, the XD One will automatically perform a self-test and revert to normal sensing operation.

11.8 Power management

The XD One uses a single battery icon to identify the battery life of the device. The internal battery has a 16-hour operating capacity when fully charged and it is recommended that the device is charged between shifts to ensure maximum operational charge during use.

During normal operation, the battery indication icon is used to display the following battery status.

Green flashing icon (intermittent at three-second intervals)

When the XD One is displaying a green flashing icon, the battery charge level is between 100 and 70%.

Amber flashing icon (intermittent at three-second intervals)

When the XD One is displaying an amber flashing icon, the battery charge level is between 69 and 40%.

Red flashing icon (intermittent at three-second intervals)

When the XD One is displaying a red flashing icon, the battery charge level is between 39 and 10%. The red flashing icon will blink at one-second intervals when the battery decreases below 10%.

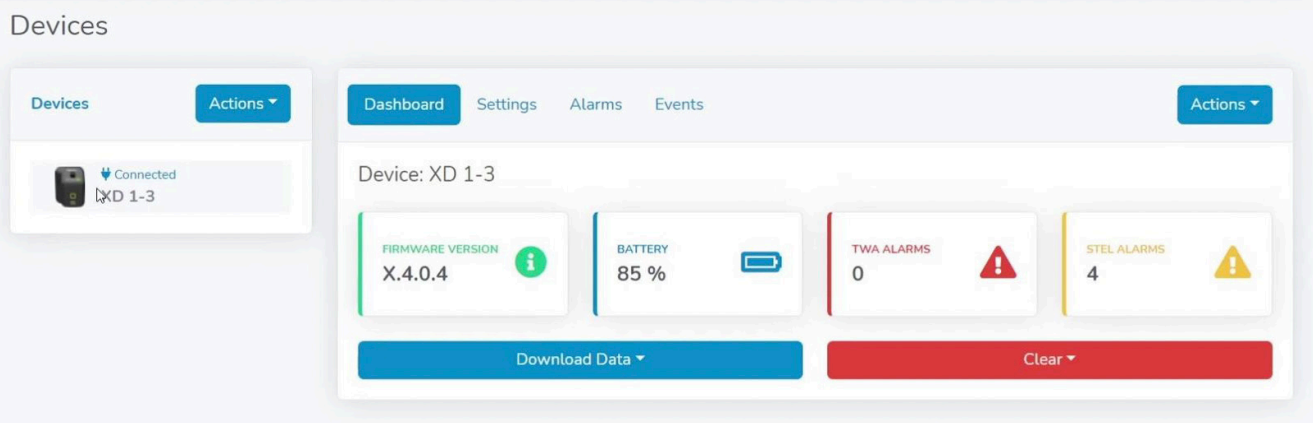
11.9 Low-power shut down

An automatic low power shut down is initiated when the battery level reaches 0%. The XD One will alert the user to a low power shut down by running the power off sequence described above.

If an attempt is made to power on the device without sufficient battery charge, the XD One will immediately run the shutdown sequence again.

11.10 Detailed battery indication

The XD One gives an on-device visual indication of operational battery life whilst in use; however, a detailed battery percentage level can be accessed by connecting the device directly to the accompanying BreatheLITE software application and navigating to the dashboard as highlighted below.



11.11 Battery calibration

The battery health is continuously monitored during normal operation and is calibrated when the battery is fully charged. If for any reason the battery is fully depleted, the XD One will lose the current stored battery calibration data.

Fully charging the XD One will recalibrate the battery monitoring functionality.

12. OPERATING MODES

The XD One has four user-selectable operating modes for use in varying environments and reporting requirements.

- Normal (default)
- In-cab
- Data log
- Live data

12.1 Power management

'Normal' mode captures and records data at a specified logging interval, allowing the XD One to provide real-time warnings and alarms on changing particulate levels.

'Normal' mode is intended for use when the XD One is used to monitor individual exposure to particulate levels within a working environment.

When configured to 'Normal' mode and connected via USB interfaces, the XD One will power down its particulate sensor to allow for faster charging and data download.

'Normal' mode is indicated through the flashing of the battery indication symbol during normal operation.

The use of the XD One in 'Normal' mode allows for both real-time alerts and data capture to take place simultaneously. Warning alarms can be set against a single PM value; however the XD One will log sensor data for the following sizes for offline review.

- PM1.0
- PM2.5
- PM4.25
- PM10.0

The XD One also records the TSP measurement for all particulates that have passed through the sensor during its operational period. This includes particulates between the size range of 0.35 μm and 40 μm.

During Normal operation mode, the XD One will record data for all PM values at the specified log rate for download and offline analysis. When recording PM readings to the internal memory, the XD One will log the maximum value for each size at the specified logging interval.

In ‘Normal’ mode, the user-selected alarm PM size readings are taken every second and used to update the applicable STEL and TWA calculations which are then checked against the configured alarm thresholds.

12.2 ‘In-cab’ mode

The XD One ‘In-cab’ mode allows for the same operating functionally as ‘Normal’ mode but can also be continuously used in a vehicle when connected or powered via USB.

This mode is indicated via the solid illumination of the battery symbol during operation as highlighted below.

The XD One will turn itself off after five minutes after USB power has been removed to save power.

12.3 ‘Data log’ mode

The XD One ‘Data log’ mode follows the operational functionality of ‘Normal’ mode, but readings are not checked against alarm threshold levels and on-device warnings/alarms will not trigger.

This mode is intended for use during passive monitoring of environments where data is captured for download and post-analysis using the BreatheLITE software.

This mode is indicated via two turquoise illuminated icons as highlighted below.

12.4 ‘Live readout’ mode

The ‘Live readout’ mode allows the XD One to stream live particulate data to the BreatheLITE software via USB connection.

Particulate data is also logged to the internal memory for download and analysis as required.

This mode is indicated by two violet illuminated icons as highlighted below.

13. ALARM WARNINGS AND CALCULATIONS

The XD One uses two LED icons alongside audio sequences to alert users to changing levels of airborne particulates as highlighted below.

If a threshold is breached during operation, the following alarm sequence is used to alert users.

'Icon 1': Short-term exposure limit (STEL) alarm

The XD One will flash the amber STEL icon alongside an audible alarm (two beeps per second).

'Icon 2': Long-term exposure limit/time-weighted average (TWA) alarm

The XD One will flash the red TWA icon alongside an audible alarm (three beeps per second).

In the event that both alarms are triggered simultaneously, the TWA alarm will take priority.

Note: The XD One is factory programmed with the following default STEL and long-term exposure limit/TWA alarm warning thresholds:

- STEL alarm warning threshold – 1,000 µm/m^3 over 15 minutes
- TWA alarm warning threshold – 1,000 µm/m^3 over 8 hours

The default threshold limits have been defined based on a quarter of the permissible limit for most respirable dusts as outlined in the EH40/2005 guidelines.

Advice outlined in EH40/2005 states that where no specific STEL is listed, a figure three times that of long-term exposure limit should be used. However, always refer to local guidelines and legislation to ensure that alarm warning thresholds are set at appropriate and permissible values for the intended operating environment.

13.1 Alarm calculations

The XD One uses the following calculation for the monitoring of STEL threshold breach.

STEL, where STEL TIME is in minutes:

$$STEL = \frac{\sum_{n=0}^{STEL\ TIME} PM\_Reading(n)}{STEL\_TIME}$$

The XD One uses the following calculation for the monitoring of long-term exposure reading/ TWA threshold breach.

TWA, where TWA TIME is in minutes:

$$TWA = \sum_{n=0}^{\infty} \frac{PM\_Reading(n)}{TWA\_TIME}$$

Note: The TWA calculation will reset on device power cycle, the sum is calculated on device start up and initial sampling to the current run time and will accumulate until the device is switched off.

13.2 Alarm acknowledgement

In the event that a warning alarm is triggered, the XD One will auto-latch to ensure that a conscious action is made to acknowledge the warning. During alarm state, users can acknowledge triggered alarms which will silence the audio alarm; however, the LED warning indication will remain illuminated (solid) to indicate the alarm conditions are still present.

At the point of particulate levels decreasing below the permissible threshold (95%) of the alarm set point, the alarm will reset and the illuminated LED will switch off.

To acknowledge a latched alarm, press and hold the power button for 2 seconds then release after which the XD One will confirm with an LED sequence: scrolling illumination of alarm colour, followed by a scrolling green sequence.

Note: If an alarm is not acknowledged by the user, the XD One will remain latched with the illuminated LED and audio warning indefinitely.

The XD One device will only re-alarm on increasing or continued particulate levels above the permissible threshold, after the original alarm has been user acknowledged and self-cleared.

14. CONNECTIVITY

The XD One has been designed to be connected via the configuration single, live operating modes and data review purposes.

To connect the XD One to the USB cable supplied, simply sealing cover and insert the connector as shown below.

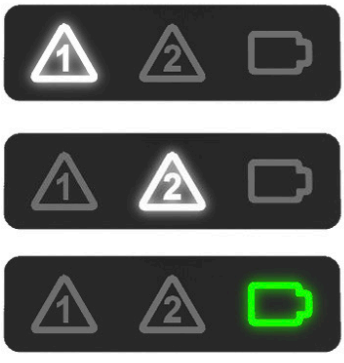
14.1 Charging

The XD One Device is charged via the ondevice USB port and cable provided. It is recommended that the XD One is charged using the supplied wall adapter where possible to ensure that the maximum power is delivered to the battery in the shortest timeframe.

The XD One can be charged via a PC USB port; however, please note that this will take significantly longer to charge due to standard PC USB power delivery limitations.

The following sequence is displayed on the XD One during battery charging and is used to indicate the battery charge level. The XD One charge sequence will run at differing speeds for fast (wall adapter) or slow (PC USB) charging.

Once charging is complete the XD One will display two solid white icons and a flashing green battery indication.



XD One charge sequence.

Fully charged indication (flashing green icon).

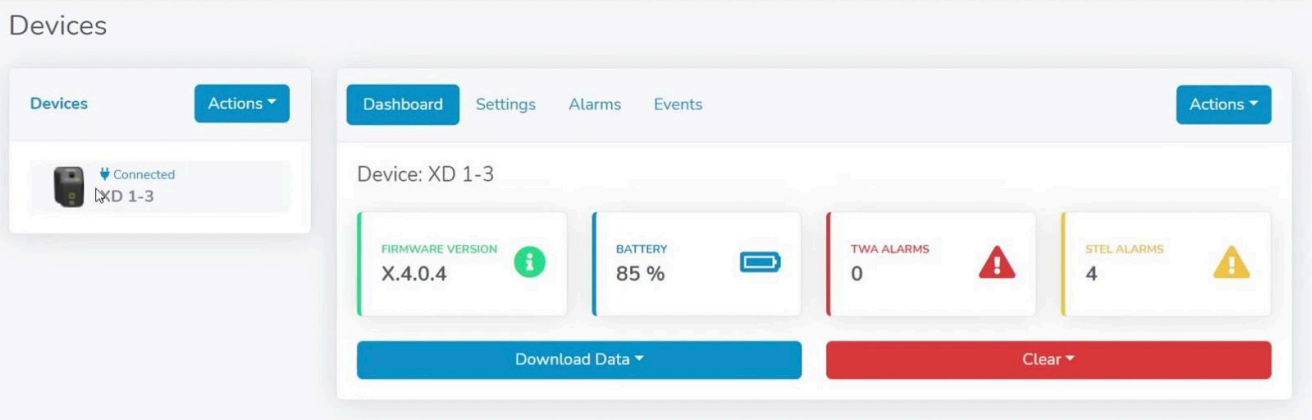
Note: When the XD One is operated in 'Live' or 'In-cab' modes and consequently connected via USB during operation, the sequence highlighted above does not apply. These modes are designed to function during continued power of the XD One unit via a USB or 12 to 24 V vehicle charger.

14.2 Trolex BreatheLITE software

BreatheLITE serves as the dashboard interface for the XD One and allows users to connect single and multiple devices.

Connecting the XD One to the Trolex BreatheLITE software allows for easy device navigation, set-up and custom threshold setting as required. BreatheLITE is also used to store, view and analyse collected data from a single location and is an essential tool to support the maintenance of the XD One.

Application information, details and a help section is available on download of the software.

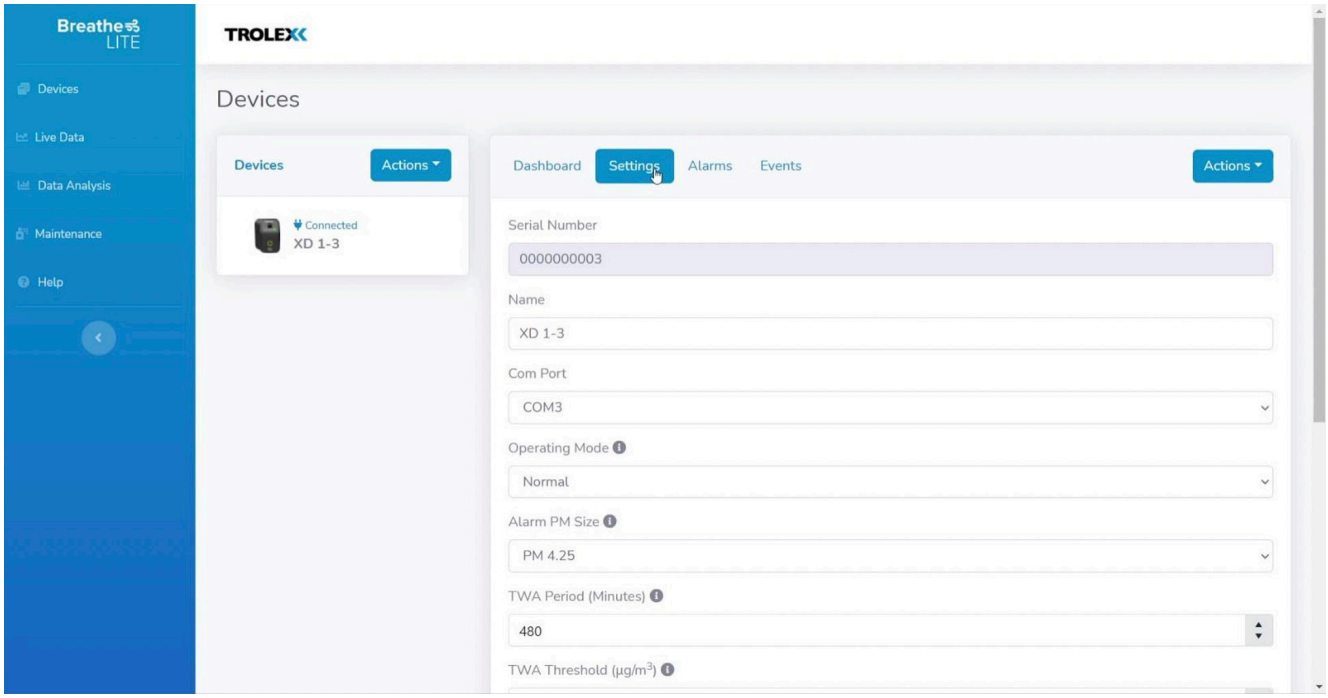


The Trolex BreatheLITE software can be downloaded by following the supporting information at www.trolex.com.

14.3 Configuration

The XD One can be connected to the BreatheLITE software where users can setup the following parameters:

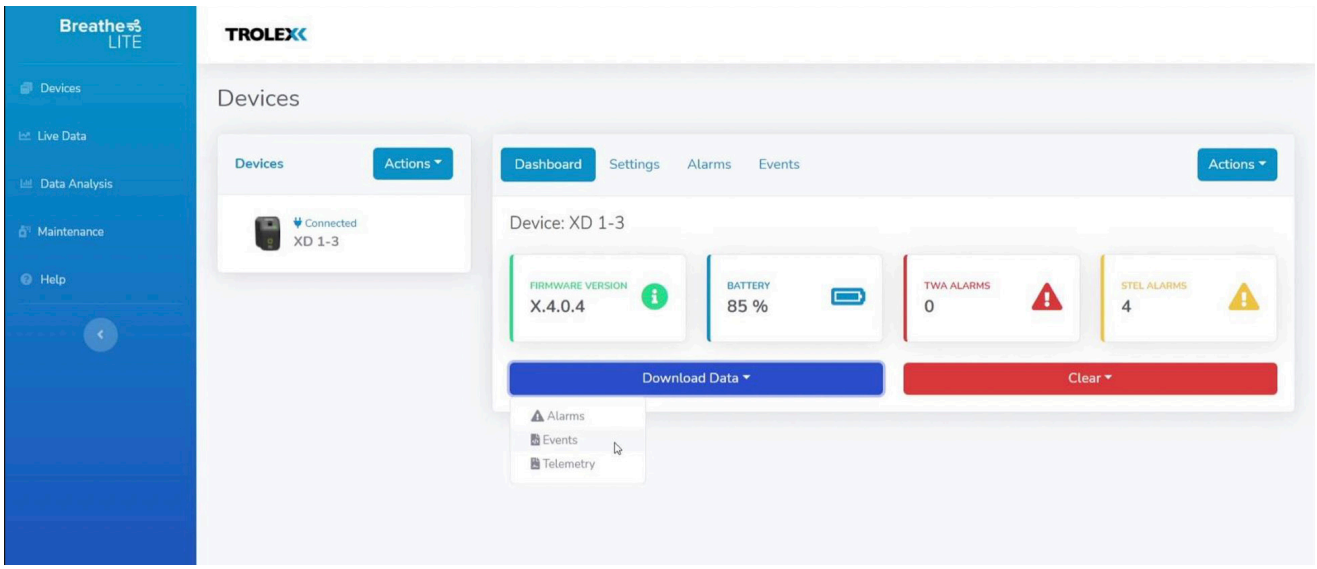
- Device name
- Com port
- Operating mode
- Alarm PM size
- TWA period (minutes/hours)
- TWA threshold (µg/m^3)
- STEL period (minutes/hours)
- STEL thershold (µg/m^3)
- Log rate (seconds)
- Particle density (g/ml)



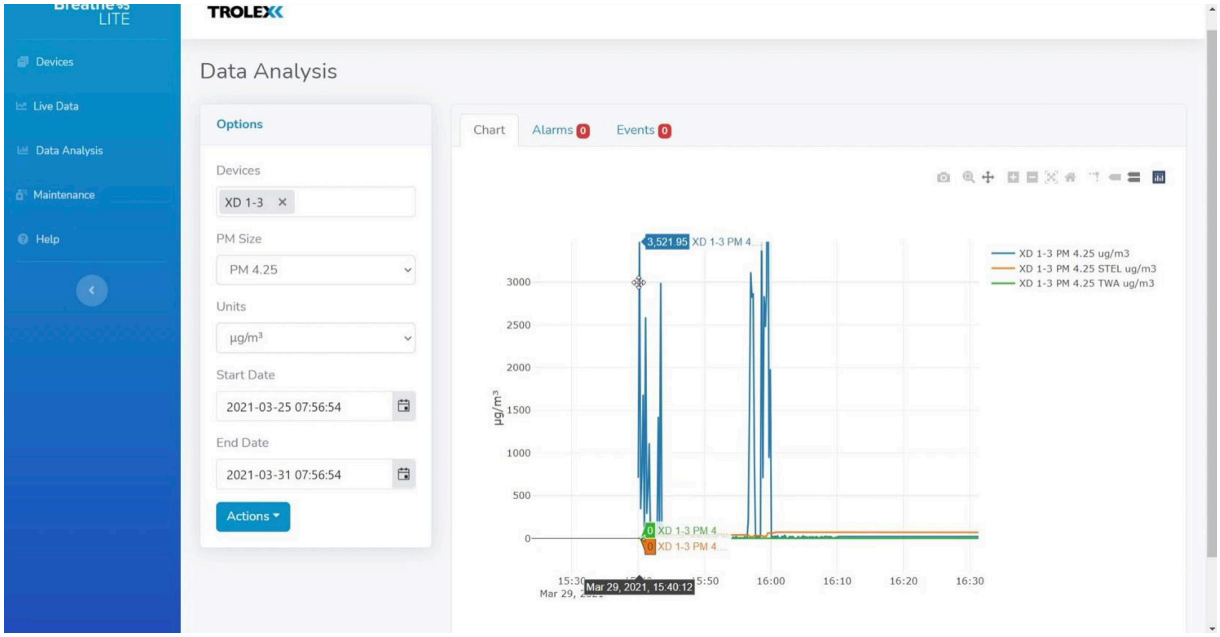
Note: For further details on XD One configuration, please refer to the BreatheLITE software help section. Refer to **section 9.1** for details on standards and default device settings.

14.4 Data download

The XD One is designed to collect particulate data information during operation for download, review and analysis as required via the BreatheLITE software as highlighted below.



On download of captured data, the BreatheLITE software allows particulate information to be reviewed using the data analysis tool set as highlighted below.



For further details, please refer to the BreatheLITE 'Help' section on data download and analysis.

14.5 Updating firmware

After the release of updated operating firmware by Trolex, the XD One can be locally updated by connecting to the BreatheLITE software. Trolex will notify users of the latest update and accompanying release notes, and provide further instruction on updating XD One devices.

15. MAINTENANCE

The maintenance of the XD One must only be carried out by competent personnel. All maintenance and repair must be considered with reference to the local safety regulations and authorities.

The XD One contains no user-serviceable components and the limits of user maintenance are outlined in the following information.

15.1 Visual checks

Periodic visual checks should be carried out to assess if there are any issues or faults arising with the XD One device. Periodically, unsure devices are checked for the following:

1. Any external damage to the device. Plastic parts should not be cracked or broken which could affect the IP rating of the product.
2. Any obstruction to the particulate inlet/outlet.
3. Any damage or wear to the main product membrane, LED icons and power/function switch.
4. Any damage to the USB data/charge port.
5. Any damage to USB cable that is periodically connected to the XD One device.
6. Any damage to mounting hardware, clips, or fixings.
7. Labels on the product are still in place and are not peeling or discolouring.

15.2 Device cleaning

As part of the routine maintenance schedule and during use in high dust loaded environments, it is recommended that the XD One sensor is cleaned from time to time following the steps below:

1. Wipe down the XD One inlet surfaces with a damp cloth to remove any external dust and debris.
2. Using canned compressed clean air, spray the device inlet for 10 to 15 seconds to clean the dust path.

15.3 Cleaning labels

It is recommended to periodically clean the instrument with a damp cloth, to ensure the instrument user interface and keypad is clean and legible.

15.4 Particulate entry/exit apertures

The particulate exit aperture is protected by a stainless-steel grille to minimise the ingress of debris into the XD One. It is recommended that the grille is checked and cleaned regularly to ensure that the airflow is not obstructed. It is recommended that the grille is checked and cleaned during maintenance periods to ensure that it has not become clogged with ingress that may obscure the particulate sensing airflow.

15.5 Compliance audit check

The XD One has been designed with an inbuilt compliance check routine/test to allow for the infrequent checking of device functionality against a selection of sized reference particulates.

The Compliance Check uses certified sample material that can be passed through the sensor to ensure that all sensing and sizing parameters are functioning as intended. Reference material with a size spread ranging from 0.35 to 40µm allows each sensing region to be populated with reference data during the process.

To run the Compliance Check sequence, connect the XD One to the BreatheLITE software application, position in the supplied compliance base and cover with the particulate dispersion hood before selecting the automated test routine within the device maintenance menu.

The use of the compliance base and particulate dispersion hood allows for units to be isolated within a known volume during testing as highlighted below.

1. Insert the XD One into the compliance dock.

2. Cover with particulate dispersion hood.

3. Run BreatheLITE compliance check.

The routine must be carried out using the Trolex ‘Compliance required to conduct the procedure, including:

- Reference particle sizes (Reference material)
- Dosing bottle

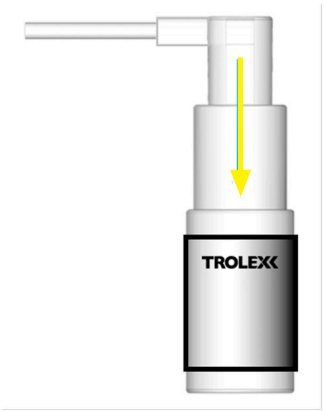
Sized reference material is used to periodically test specific operational aspects of the XD One during the compliance audit check.

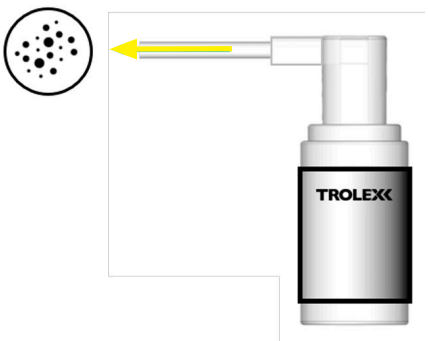
One Once the XD One is connected to the BreatheLITE software, and the compliance audit test has been selected from the maintenance menu follow the on screen instructions to dose the device with reference particulate material.

Note: The dosing bottle is a dispersing mechanism for the sample particulate material. Please ensure that these components are kept in a clean and dry environment, free from moisture and contaminants.

It is important to ‘prime’ the dosing bottle by shaking it vigorously to ensure the reference material is free to disperse into the hood.

To dose the reference material into the particulate dispersion hood, use the built mechanism several times to active dosing.in pumping mechanism several times to active dosing.





15.6 Compliance audit check: Results

BreatheLITE is designed to return a “Pass”/“Fail” result based on the compliance audit check results and operational threshold for the applicable particulate sizes. This is displayed on completion of the check and is detailed in the device log of each connected XD One.

Return of a “Pass” result

On return of a “Pass” result, the particulate sensor is functioning as expected and normal monitoring operation can resume. Return of a “Fail” result.

Return of a “Fail” result

1. Run a sensor cleaning operation as highlighted in **section 15.2**.
2. Repeat the compliance audit check sequence and note the test result.
3. On return of a “Pass” result, the particulate sensor is functioning as expected and normal monitoring operation can resume.
4. On One unit return of a repeat “Fail” result, please contact Trolex direct to discuss support or servicing of the XD One.

15.7 Preventative maintenance

In some circumstances, a routine preventative maintenance schedule should be used to ensure that the performance of the device is upheld. The following table should be used as guidance to the level of unit maintenance required based on environmental dust loadings.

Dust loading	Average dust loading in mg/m^3	Expected maintenance schedule
Low	Up to 5 mg/m^3	6 to 12 months
Medium	Up to 10 mg/m^3	3 to 6 months
High	10 mg/m^3 or above	1 to 3 months

Note: All particulate and operating environment types are different and therefore this matrix should be used as a guide only. It is recommended that an assessment of the site environmental and operating conditions is carried out periodically to determine the required frequency of a routine maintenance schedule.

15.8 Atomised particulate suppression and mist spray

It is recommended that the XD One is operated with location and proximity consideration relating to atomising dust suppression systems. Instrument readings will include atomised or misted sizes that pass through the XD One sensor, within the particle detection range.

If an issue is non-resolvable based on the information below, please contact the Trolex product support team.

16.1 Recoverable errors

In the unlikely event that the XD One encounters a recoverable operating error, the device will log the event and automatically take appropriate action to resolve the issue.

It is recommended that on notification of recovery from an error, previous data capture and device settings are checked before continued operation.

User settings and configurations may need to be redefined using the BreatheLITE software.

16.2 Non-recoverable fatal errors

In the unlikely event that the XD One encounters a non-recoverable operating error, the device will cease normal operation and alert the user to the issue via flashing red LED's and an audible sequence as shown below.

In the case of a rare and non-recoverable fatal error, please contact the Trolex service team for support as detailed in.

16.3 Device fault codes

The following codes relate to on-screen warnings that the Air XD will display when a fault is encountered during normal operations.

Sequence	Fault name	Fault description	Fault check
	Internal memroy corruption	A corruption in the XD One's internal memory. was detected. Loss of data occured, or readings cannot be recovered.	The device will automatically format its memory and continue its. operation.
	Internal memory full	The XD One's internal memory is full.	Download and clear the device data event and and alarm logs.
	Particulate sensor data error	The data received from the particulate sensor was found to be corrupt. The XD One will ignore this reading, log the event and continue its operation. If this occus more than four times, the XD One will alert the user and enter an error	Contact Trolex or an approved distributor.

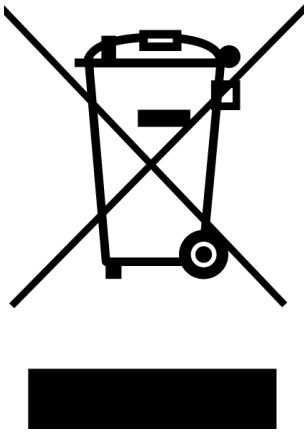
		state.	
	Device settings corruption	A corruption in the XD One's device settings was detected.	The device will automatically revert to factory defaults and continue its operation.
	Particulate sensor electronic failure	The XD One has detected an electronic hardware failure of the particulate sensor. The XD One will alert the user and enter an error state.	Contact Trolex or an approved distributor.
	Internal memory electronics failure.	The XD One has detected an electronic failure of the internal memory. The XD One alert the user and enter an error state.	Contact Trolex or an approved distributor.

17. GLOSSARY AND DEFINITIONS

Flow rate	The volume of air mixture which passes per unit time.
IP	Ingress protection.
µg/m^3	Microgram per cubic metre. The concentration of an air pollutant given in micrograms (one-millionth of a gram) per cubic meter of air.
mg/m^3	Milligram per cubic metre. The concentration of an air pollutant given in milligrams (one-thousandth of a gram) per cubic metre of air.
OPC	Optical particulate counter.
PPM	Parts per million.
Particulate matter (PM)	General term for a mixture of solids and liquid droplets suspended in the air from typical processes including combustion, industrial activities or natural sources.
TSP	Total suspended particulate.

18. DISPOSAL

18.1 Waste of Electrical and Electronic Equipment (WEEE) Directive (2012/19/EU)



This symbol, if marked on the product or its packaging, indicates that this product must not be disposed of with general household waste.

In the European Union and many other countries, separate collection systems have been set up to handle the recycling of electrical and electronic waste.

At the end of the product's life, do not dispose of any electronic sensor, component or instrument in the domestic waste. Contact Trolex or the distributor for disposal instructions.

19. GET IN TOUCH

19.1 Technical support

Our UK technical services team are available to provide expert ongoing technical assistance and technical support packages tailored to your specific requirements.

Please contact our technical services team:

Telephone: +44 (0)161 483 1435

Email: service@trolex.com

19.2 Feedback

If you have any suggestions for improvements or amendments, or find errors in this publication, you can contact marketing@trolex.com directly.

DISCLAIMER

The information provided in this document contains general descriptions and technical characteristics of the performance of the product. It is not intended as a substitute for and is not to be used for determining suitability or reliability of this product for specific user applications. It is the duty of any user or installer to perform the appropriate and complete risk assessment, evaluation and testing of the products with respect to the specific application or use. Trolex shall not be responsible or liable for misuse of the information contained herein. When instruments are used for applications with technical safety requirements, the relevant instructions must be followed.

All pertinent state, regional, and local safety regulations must be observed when installing and using this instrument. For reasons of safety and to help ensure compliance with documented system data, only Trolex or its affiliates should perform repairs to components.

Trolex Ltd. reserves the right to revise and update this documentation from time to time without obligation to provide notification of such revision or change. Revised documentation may be obtainable from Trolex.

Trolex Ltd. reserves the right, without notice, to make changes in equipment design or performance as progress in engineering, manufacturing or technology may warrant.

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At Trolex, we save lives.

We believe that no person should risk their life to earn a living.

Our aim is to become the world's leading name in health and safety technology, through pioneering products that provide real-world benefits to our customers, whenever workers operate in hazardous environments.

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