Accutron INSTRUMENTS

ONE LIFE
PROTECT IT

TX8060

XKD ONE

USER MANUAL

TX8060 XD One

Contents

1. General Description

The Trolex XD One personal particulate monitor is designed to provide detailed, accurate, real-time data on airborne particulates so that users can take appropriate actions to stay safe and ensure personnel are fully protected 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 a second to allow detailed real-time reporting in high dust environments.

Precise data is collected for all measurable particulates, enabling detailed concentration profiling and analysis using the Trolex BreatheLITE application software. As the XD One records data on all particulates between 0.35µm and 40µm, 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 application for Live particulate readings.

TX8060 XD One

2. Main features

- Personal, portable, mountable and moveable
- Designed to provide early warning of personal exposure to airborne particulates
- On device early warning alerts for increased particulate levels
- PM1, 2.5, 4.25 and 10 and TSP measurement ranges
- 0.35µm - 40µm particle sizing range
- Low-end sensor resolution, measuring down to 0.35µm with 99% capture
- Custom particle density for increased characterisation
- Operational stability in varying atmospheric and environmental conditions
- Custom Logging Intervals from 10s – 60s
- On-device audio/visual alarms
- Custom alarm set points
- Custom STEL and TWA period alarm thresholds
- On-device self-check routine
- Battery operated, rechargeable (16hrs+)
- On-device data logging
- Live data readout via BreatheLITE application
- Data analytics functions via BreatheLITE application
- 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, to ensure appropriate action is taken.

It is intended for the XD One to be personally mounted, located next to workers or operations and statically mounted within an environment as required to provide particulate data in real-time. Suitable for monitoring in either indoor or outdoor ambient air conditions, the XD One can cope with both high and low particulate concentration levels.

The XD One is designed to be low maintenance and does not use pumps or filters in operation as found in other particulate sampling devices. The particulate sensing element is an open path design to ensure sample flow is unrestricted and has an adaptive flowrate to optimise accuracy in environments with varying airflows.

2.2 Limits of Use

To ensure the optimum performance and safe operation, the XD One must be operated as per the limits and instruction detailed in the technical data section of this user manual. Operation outside 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 in 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.

3. Product Safety

The following symbols are used in this manual or on the equipment to indicate procedures that, if not followed correctly, may result in personal injury or damage to equipment.

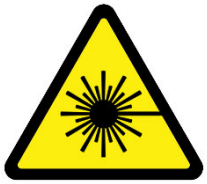
WARNING!

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.

In addition, the following symbols are used on the product:



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/detoxifying 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 detailed or those outlined in local guidelines.

The XD One has been designed to be as simple to install and commission as possible. Nevertheless, 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 and keep it in a safe place for future reference.

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.

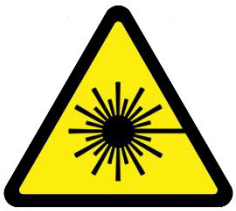
The XD One is a personal safety device and it is the operator's responsibility to respond accordingly to any warnings, alarms or alerts in accordance with site regulations and instructions. Follow all warnings and instructions marked on the instrument. Warning labels are situated on the instrument, indicating a hazard at or near the location of the warning label.

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 when the laser housing is open, do not open the laser housing. Eye damage may result from the direct viewing of the laser beam.

The XD One complies with:

- IEC 60825-1 2014

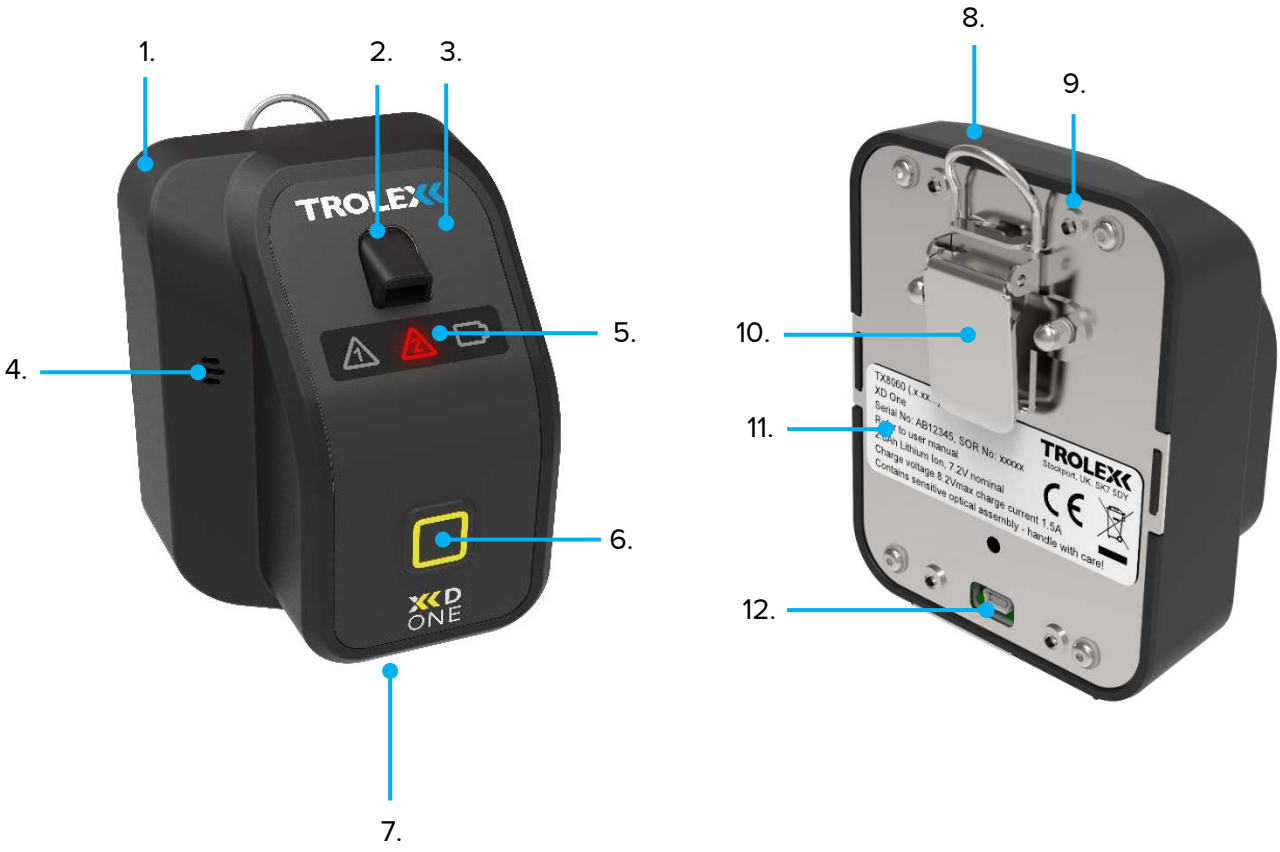
- 21 CFR-1040.10 and 1040.11

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 is designed with end users in mind and allows for quick, robust, and instant installation to suit all applications. The product uses a sensor that 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	10. Alligator Clip
2. Particle Inlet	11. Product Label
3. Product Function Membrane	12. USB Port
4. Sounder Outlet	
5. LED User Interface	
6. On / Off Function Switch	
7. Particle Outlet	
8. Mounting Loop	
9. Threaded Mounting Fixings	

6.1 Particulate Flow Path

The XD One has been designed to allow for the free sampling of particulate concentrations using an unrestricted, vertical flow path as highlighted below. It is recommended that routine inspection and visual checks of the particle inlet is carried out to ensure it is free from any restrictive materials or ingress.

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.

Care should be taken during normal operation to ensure that the device is not subject to unnecessary shock or impact levels.

7. Certification and Conformity

7.1 Compliance

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

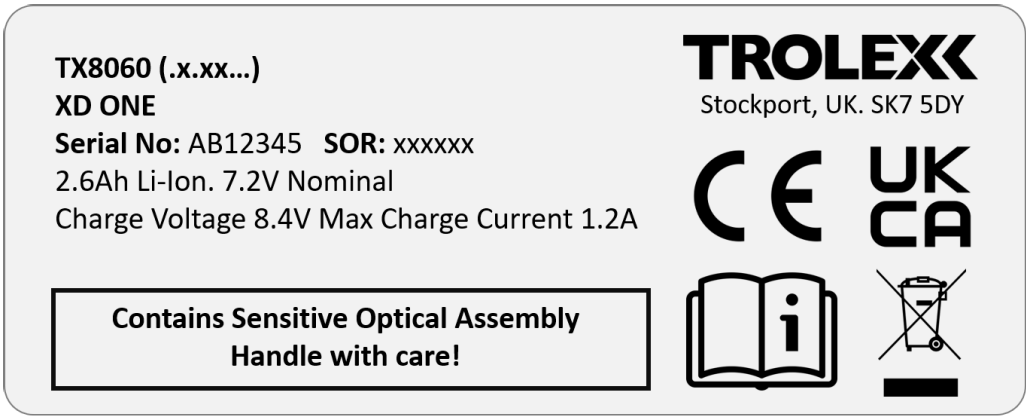
Electromagnetic Compatibility (EMC) Directive 2014/30/EU
Electromagnetic Compatibility (EMC) Regulations 2016 S.I. 2016/1091

- 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. Technical information

8.1 Product Specification

Particulate Sensing Parameters

Sensing Technology	OPC Light Scatter Photometer
Particulate Measurements	0.35µm - 40µm (PM1.0, PM2.5, PM4.25, PM10 and TSP)
TSP range	Up to 40µm logged in µg/m^3
PM measurement capability*	Up to 1500 mg/m^3
PM continuous operating range**	Up to 25 mg/m^3
PM density	0.8 g/ml – 8.0 g/ml (default: 1.65 g/ml) Custom Particle Density Profiling
PM measurement units	µg/m^3 - Logged On-Device mg/m^3 or µg/m^3 - BreatheLITE application
Sampling interval	1s
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 XD One can define particulate measurement peak trends up to the quantity specified.

**During sustained high dust loading periods, the XD One 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, may affect the operating life of the particulate sensor.

Technical Specification

Ambient temperature limits	-10°C to +45°C
Humidity	0 - 95% RH (non-condensing)
Housing material	PC/ABS – Stainless Steel
Protection classification	Main Enclosure: IP54 Particle Flow Path: IP22
Weight	445g
Data Connections	1 x Mini USB (Max Cable Length 2m)
Connectivity	BreatheLITE Application
User Options	Particulate Measurements STEL and TWA Alarm Set Points Latching Alarms
User Interface / Alarms	Visual Icon Illumination (STEL, TWA, Battery Indication) Audible (85 dB)
Self Test	Sensor Hardware, Circuitry and Battery Test on Activation Manual Self Test During Use
Battery Capacity	18.72 Wh
Battery Run Time	16hrs (Full Health at Ambient)
Charging Temperature Limits	0°C to +45°C
Max 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	8GB up to 10 years (Log Rate Dependent) Stored device data can be cleared as required

8.2 Product Dimensions

114.5mm

(4.5 in)

88mm

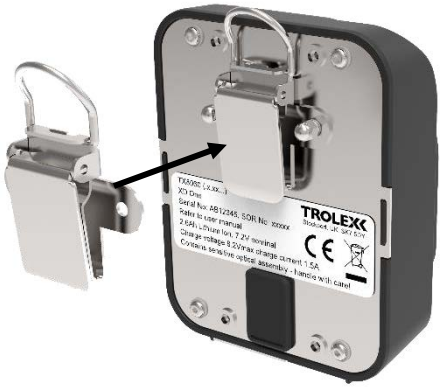
(3.4 in)

74mm

(2.95 in)

8.3 Mounting Details

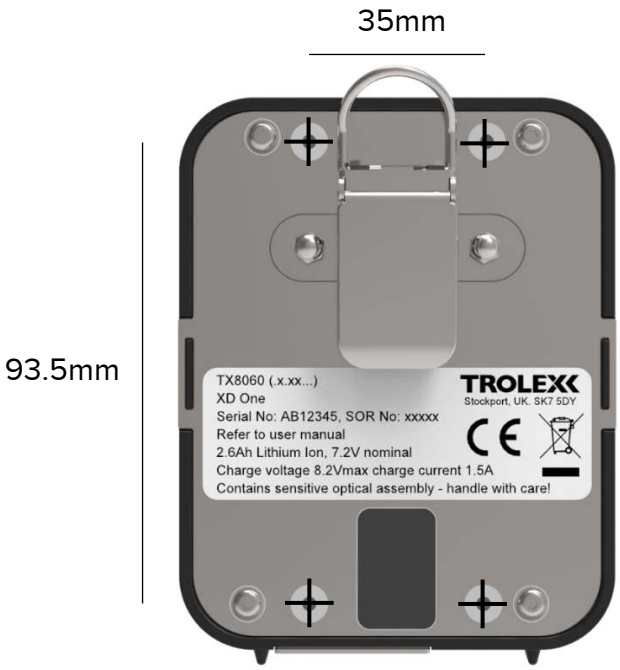
The XD One is supplied with an alligator mounting clip as standard. Where applicable, a KlickFast stud is available to allow the XD One to be compatible with a range of additional body, wall and pole fixing kits. (see product data sheet for additional fixing kit details).



XD One Alligator Clip

XD One KlickFast Stud

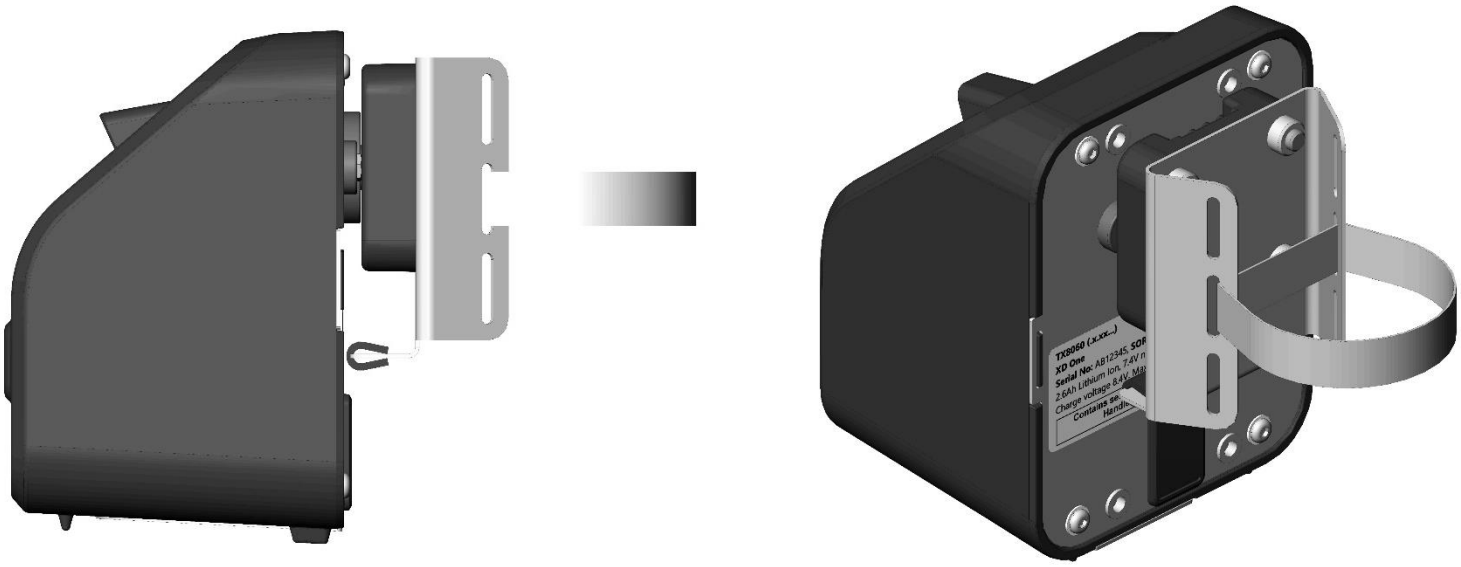
The XD One is supplied with four M3 threaded mounting features as standard to allow for custom positioning, aligning and mounting of the device. The following dimensions are given as a mounting guide.



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

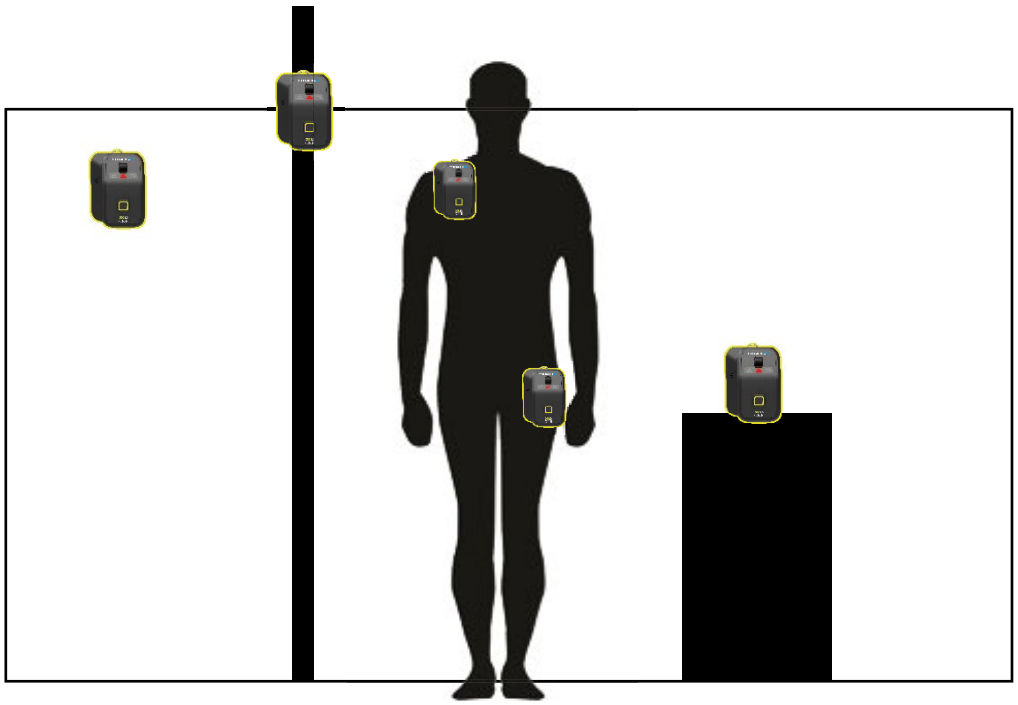
XD One Stability Bracket

The XD One is compatible with a Pole Mounting kit, where required. The kit is supplied with the componentry to allow the mounting of the XD One unit on to pole sizes ranging from 50mm – 150mm. Fit the bracket using the four threaded M3 mounting features and the fixing screws provided.



XD One Pole Mount Bracket

The XD One is designed to be operated in a range of mounting applications and can be configured to suit situational needs. Position the XD One device as required, via personal or body mount fixings, wall and pole adapters or In Cab vehicle mounting.



9. Device Configuration

9.1 Default Settings

The XD One has been programmed with factory default settings prior to delivery which have been detailed in the table below.

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

Serial Number:	ABCDEFG123 (Trolex Custom S/N)
Name:	Blank
Operating Mode:	Normal
Alarm PM size:	PM4.25
TWA Period (mins/hrs):	8hrs
TWA Threshold (µg/m3):	1000
STEL Period (mins/hrs):	15mins
STEL Threshold (µg/m3):	1000
Log Rate (seconds):	10s
Particle Density (g/ml)	1.65

10. First Power On

Please note, 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 use, ensure that the XD One is fully charged using supplied wall charger and USB cable.

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

11. Device Functionality

The following information details the operational functionality of the XD One device. With simplicity in mind, 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 85db in conjunction with the illuminated icon interface to alert users to on-device alarm threshold breaches.

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.

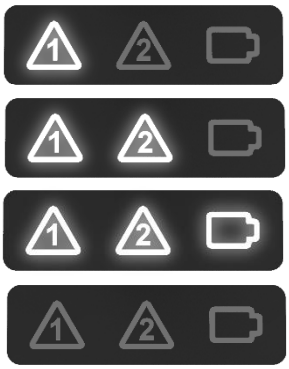
11.1 User Interface Icons and Indicators

The XD One has been designed to provide simple and reliable functionality during use through the implementation of multi colour user interface Icons and a single interface button. The following information highlights the XD One icons and main operational functions.

Icon 1		Primary Function: Secondary Function:	Short Term Exposure Limit Warning Sequence Function Icon
Icon 2		Primary Function: Secondary Function:	Time Weighted Average Warning Sequence Function Icon
Icon 3		Primary Function: Secondary Function:	Battery Indication / Heartbeat Sequence Function Icon

11.2 Operational Sequences

The following table details the main operational user interface sequences of the XD One.

Power On:		All UI icons will illuminate white on device power on.
Self-Test Sequence:		On initial power up, the XD One will perform a self-test sequence highlighted by a sequential blue flash of each icon.
		This is followed by a 'pass' indication of flashing green icons and sounder confirmation.
		If the self-test fails or identifies any faults during the routine, flashing red icons will be indicated.
Power Off:		During the power off sequence the XD One will illuminate all icons white incrementally before powering down the device.
STEL Alarm Threshold:		Flashing amber warning icon 1 will be illuminated when the STEL threshold is breached.
TWA Alarm Threshold:		Flashing red warning icon 2 will be illuminated when the TWA threshold is breached.

Battery Icon:		The battery icon will flash green intermittently (3s) to indicate a power status between 100 – 70%.
		The battery icon will flash amber intermittently (3s) to indicate a power status between 69 – 40%.
		The battery icon will flash red intermittently (3s) 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 (3s) of the battery icon.

11.3 Power On Sequence

The XD One has been designed to be simple to operate and the following information details the power on sequence. On device power on, please note that the XD One will automatically run the following sequence.

Note: Before first power on, ensure that the XD One if fully charged using the charger provided.

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 operation environment particulate levels.

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

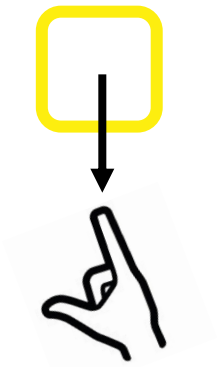
To power on the XD One, follow the steps below.

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

Hold

Power 'ON'

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



Release

Start up 'SELF-TEST' Routine

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

'SELF-TEST' Result

4. Following the self-test routine the XD One will display a PASS / FAIL result via an audible visual alarm.

'SAMPLE' Routine

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

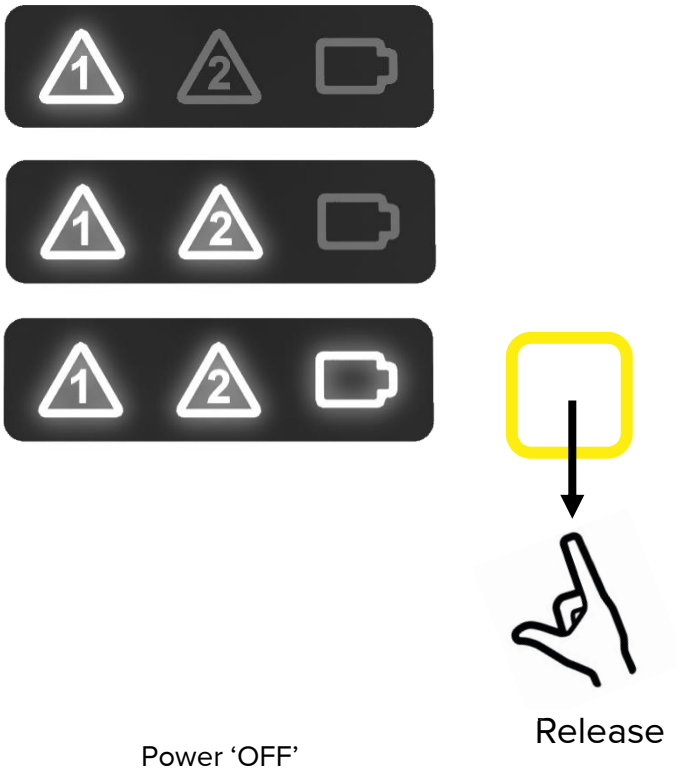
11.4 Power Off Sequence

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.

Power ‘OFF’ Routine

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



Power ‘OFF’

3. The XD One will power down, and switch 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 through specified user initiation.

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.

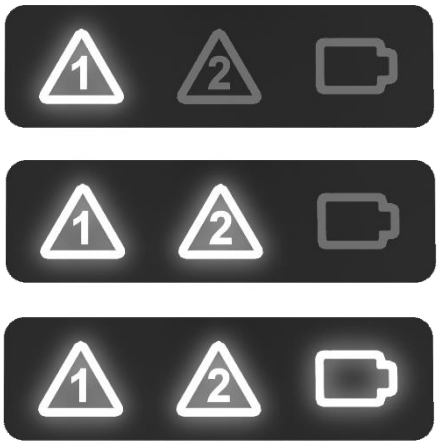
Note: On return of a Pass result, the XD One will automatically continue with sensing operation.

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

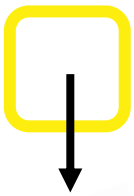
1. Press and hold the function button on the front of the XD One to initiate the function sequence.

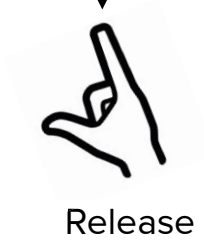
Power ‘OFF’ Routine



Start up ‘SELF-TEST’ Routine

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





‘SELF-TEST’ Result

3. Following the self-test routine the XD One will display a PASS / FAIL result via an audible visual alarm.

‘SAMPLE’ Routine

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

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 a press, hold and release functionality and during normal operation accidental activation of the power swich, via a single press and release, is unlikely.

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 16hr 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 3s intervals)

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

Amber Flashing Icon (Intermittent at 3s intervals)

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

Red Flashing Icon (Intermittent at 3s intervals)

When the XD One is displaying a red flashing icon, the battery charge level is between 39 – 10%.

When the battery decreases to a level below 10% charge, the red flashing icon will blink at 1s intervals.

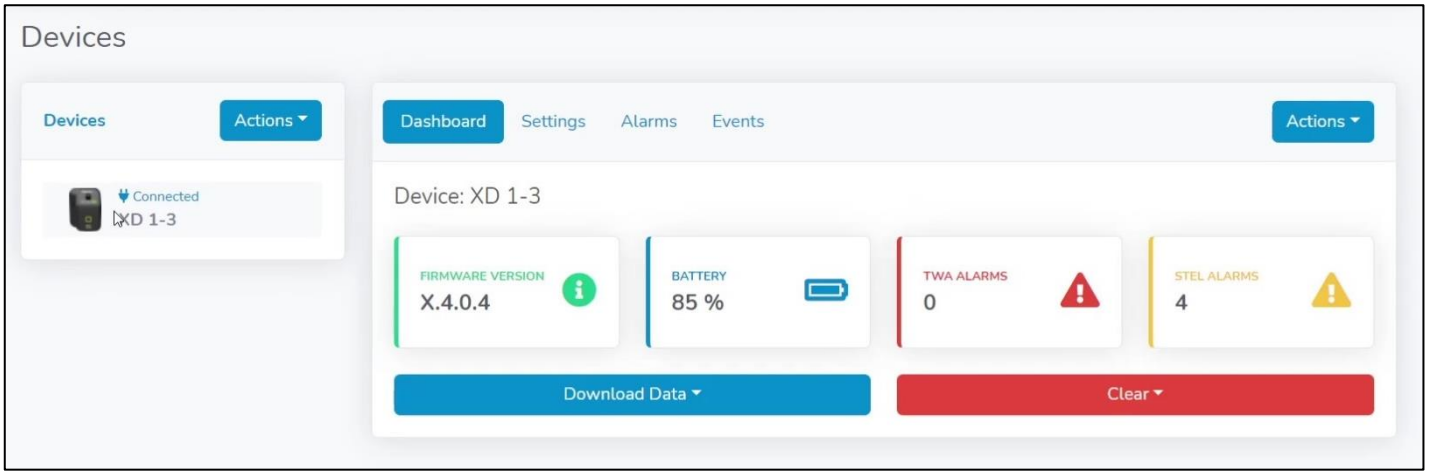
11.9 Low Power Shut Down

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.

11.10Detailed Battery Indication

The XD One is designed to give 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

The following information details each mode and supporting functionality during operation.

12.1 Normal (Default)

Normal mode captures and records data at the 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 device is used to monitor individual personal 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.

This operating 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 alerting and on-device data capture to take place simultaneously. The XD One is designed to allow warning alarms to be set against a single Particulate Measurement (PM) value, however the device itself 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 Total Suspended Particulate (TSP) measurement for all particulates that have passed through the sensor during its operational period. This includes particulates between the size range of 0.35um and 40um.

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, however, it allows the particulate sensor and device warnings to remain active when connected or powered via USB interfaces which allows the device to be continuously used in a vehicle.

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

Note: When configured to In Cab mode, the XD One will automatically turn itself off after five minutes, when the USB power has been removed to save battery power.

12.3 Data Log Mode

The XD One Data Log mode follows the operational functionality of Normal mode, however 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 application.

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

12.4 Live Readout Mode

The Live Read Out mode allows the XD One to stream live particulate data to the BreatheLITE application software, via USB connection.

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

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

13. Alarm Warnings and Calculations

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

If a threshold is breached during operation, the following alarm sequence is used to alert users to act based on the change in the working environment.

Icon 1 - Short Term Exposure Limit (STEL) Alarm:

The XD One will flash the amber STEL Icon alongside an audible alarm (2 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 (3 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 Short Term Exposure Limit (STEL) and Long Term Exposure Limit / Time Weighted Average (TWA) alarm warning thresholds.

- STEL Alarm Warning Threshold – 1000 µm/m3 over 15 minutes
- TWA Alarm Warning Threshold – 1000 µm/m3 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 Short Term Exposure Limit 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 Short Term Exposure Limit threshold breach.

STEL, where STELTIME is in minutes:

$$STEL = (\sum_{n=0}^{STEL\ TIME} PM_{Reading(n)})/STEL\ TIME$$

The XD One uses the following calculation for the monitoring of Long Term Exposure Reading / Time Weighted Average threshold breach.

TWA, where TWATIME 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.

It is only at the point of particulate level decrease to below the permissible threshold, 95% of the alarm set point, will the alarm reset and illuminated LED switch off.

To acknowledge a latched alarm, press, hold and release the power button after 2 seconds which will confirm response via 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 single USB port for battery charging, device configuration, live operating modes and data review purposes.

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

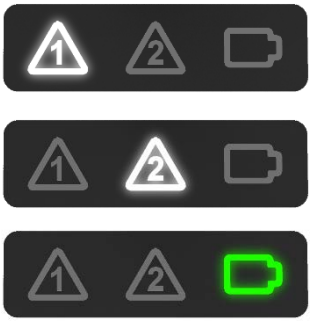
14.1 Charging

The XD One Device is charged via the on-device 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)

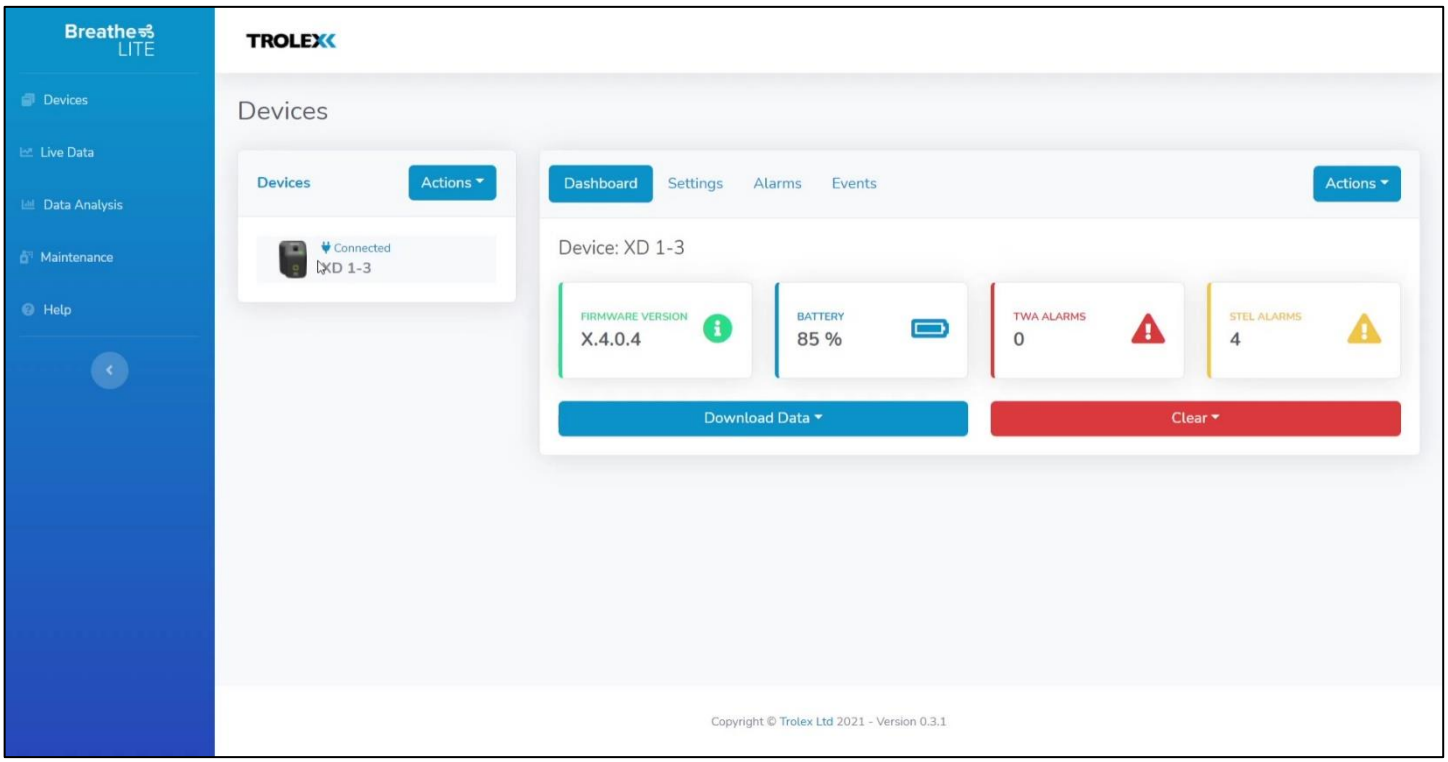
Note: When the XD One is operated in Live and In Cab modes and consequently connected via USB during operation, the sequence highlighted above does not apply. These modes are designed to function during continued power of the XD One unit via a USB or 12 – 24V vehicle charger.

14.2 Trolex BreatheLITE Application Software

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

Connecting the XD One to the Trolex BreatheLITE application 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 help section is available on download of the software.

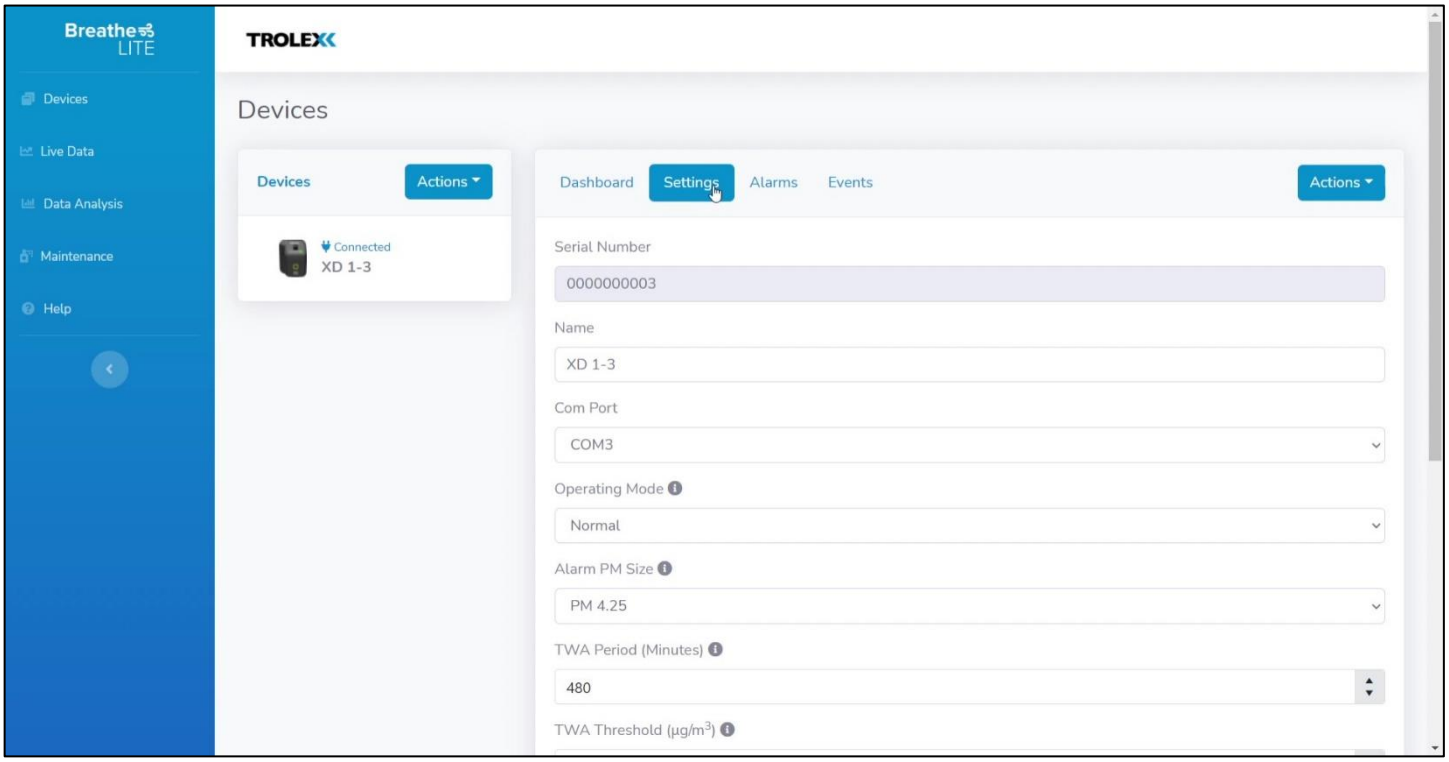


The Trolex BreatheLITE application can be downloaded by following the supporting information at www.trolex.com

14.3 Configuration

The XD One can be connected to the supporting BreatheLITE application software to allow for device configuration and user set up as highlighted below. Devices can be configured based on application requirements for the following parameters.

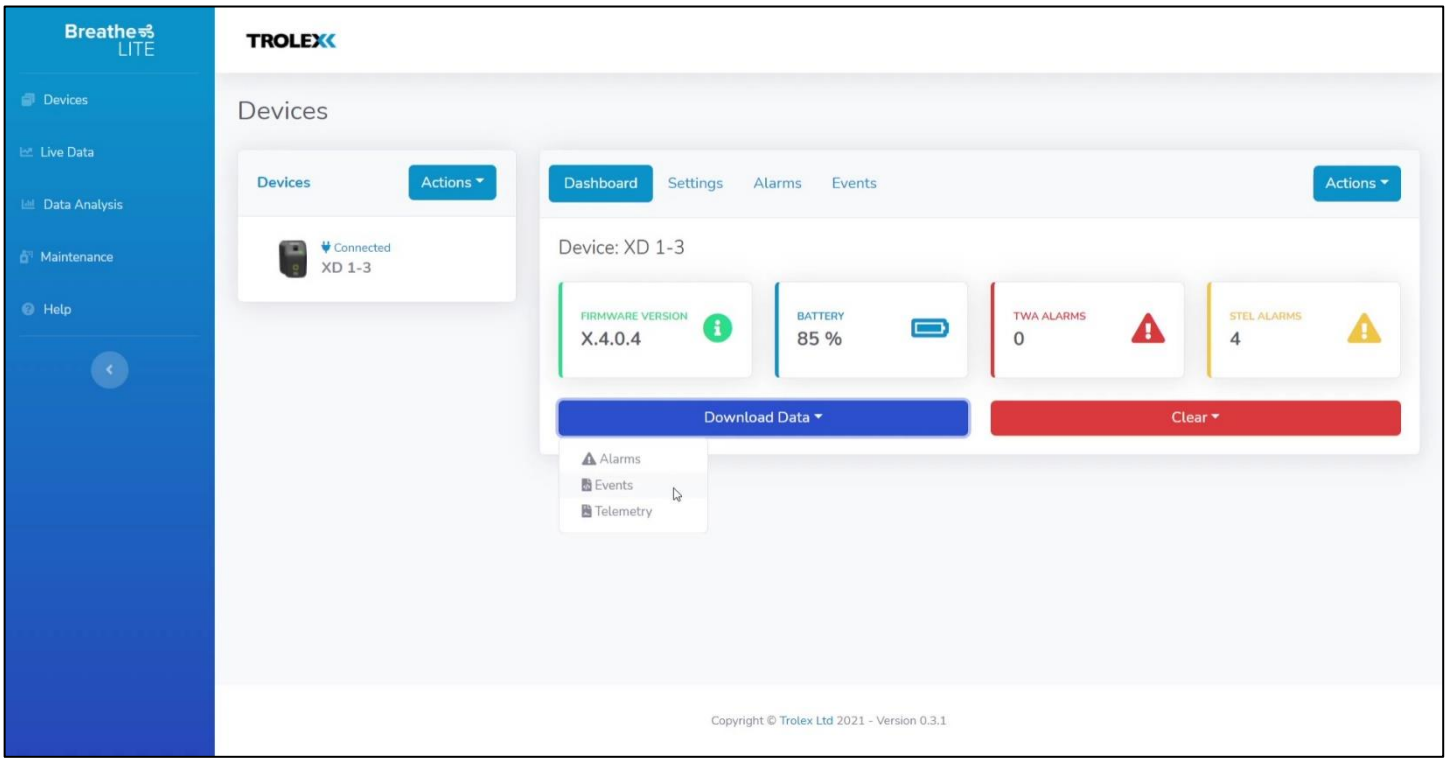
- Device Name
- Com Port
- Operating Mode
- Alarm PM Size
- TWA Period (mins/hours)
- TWA Threshold (µg/m3)
- STEL Period (mins/hours)
- STEL Threshold (µg/m3)
- Log Rate (Seconds)
- Particle Density (g/ml)



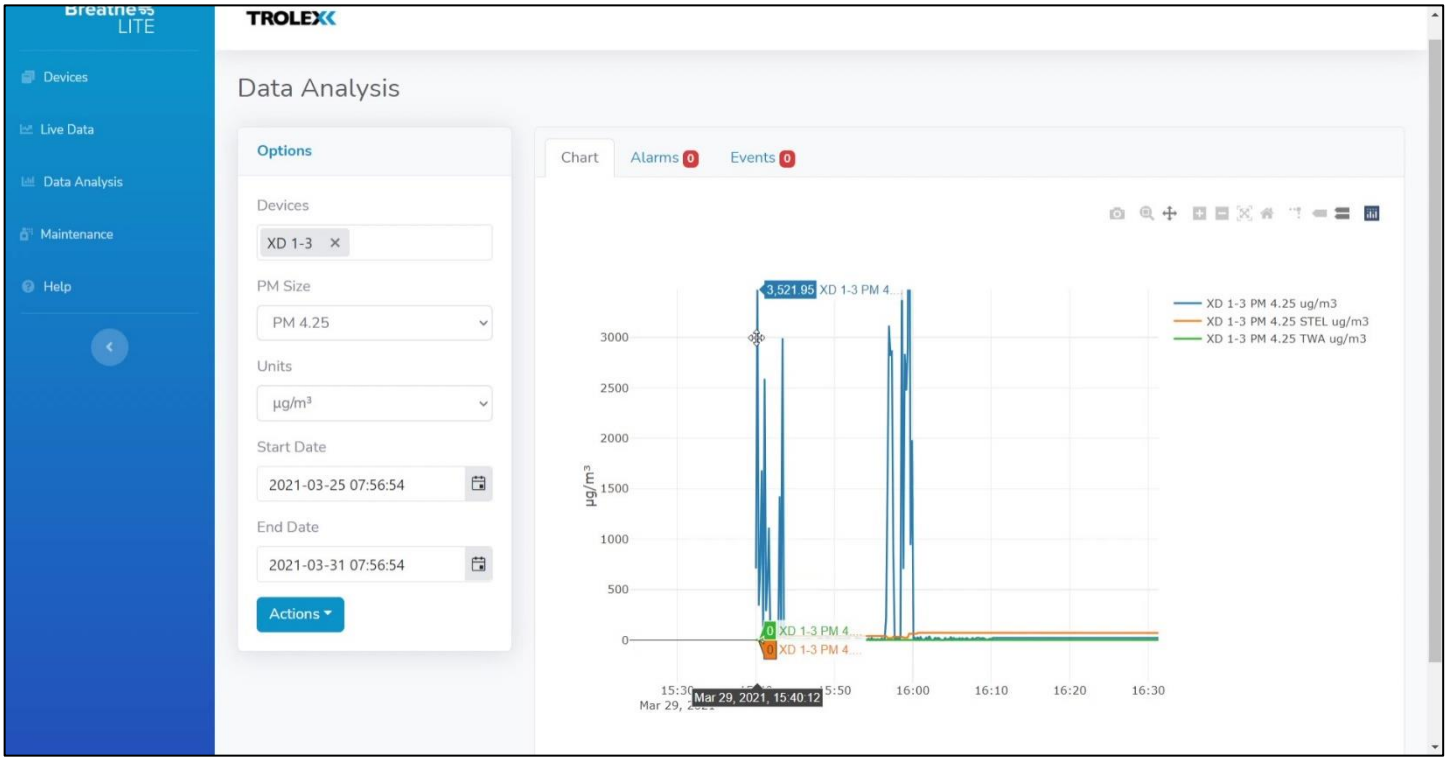
Note: For further details, please refer to the BreatheLITE in application help on device configuration. Refer to section 9.1 for details on standards and default device settings.

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 application as highlighted below.



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



Note: For further details, please refer to the BreatheLITE in application help on data download and analysis.

14.5 Firmware Update

On instruction and release of updated operating firmware by Trolex, the XD One can be locally updated by connecting to the BreatheLITE application.

Trolex will notify users of the latest updates and accompanying release notes on release 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 discoloring.

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 10-15 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 flora and fauna into the XD One device. It is recommended that the grille it 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.

3. Insert the XD One into the compliance dock

2. Cover with particulate dispersion hood

1. Run BreatheLITE compliance check

The routine must be carried out using the Trolex ‘Compliance One Kit’ which contains the accessories required to conduct the procedure, including:

- Reference Particle Sizes (Reference Material)
- Dosing Bottle

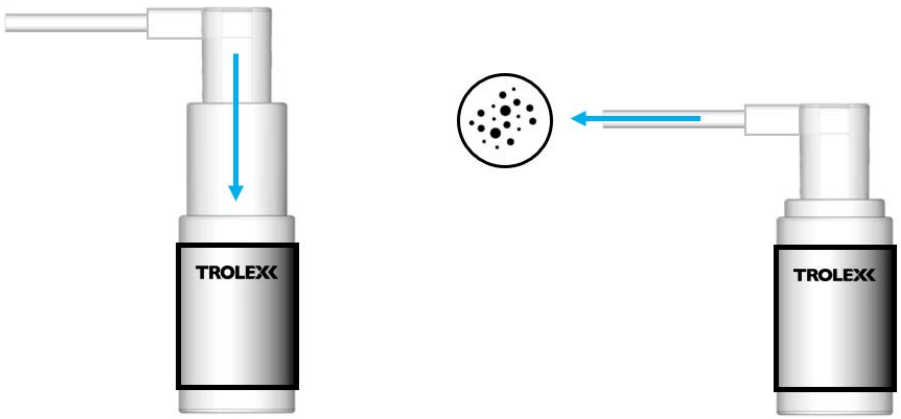
Sized reference material is used to periodically test specific operational aspects of the XD One particulate detector during the compliance audit check.

Once the XD One is connected to the BreatheLITE application 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-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

On return of a Fail result, the following procedure should be followed.

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 return of a repeat Fail result, please contact Trolex direct to discuss support or servicing of the XD One unit.

15.7 Preventative Maintenance

The XD One has been designed to be as maintenance free as possible. In some circumstances, it is possible that 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/m3	Expected Maintenance Schedule
Low	up to 5mg/m3	6-12 Months
Medium	up to 10mg/m3	3-6 Months
High	10mg/m3 or above	1-3 Months

Note: Trolex understands all particulate types are different and therefore this matrix should be used as a continual maintenance guide only, operational environments may be different. It is recommended that an assessment of the site environmental and operating conditions is carried out from time to time to support the required frequency of a routine maintenance schedule.

Required maintenance routines may vary based on specific site conditions, dust type and loading.

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.

16. Troubleshooting

The following sections detail and contain information to assist with the troubleshooting of the XD One functionality if required. If an issue is non-resolvable based on the information below, please contact the Trolex product support team.

16.1 Recoverable Errors

Please note, on any rare occasion 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 always recommended that on note of recovery from an error, that previous data capture and device settings are checked before continued operation.

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

16.2 Non-recoverable Fatal Errors

Please note, on the very rare occasion 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 section 19.

16.3 Device Fault Codes

The following codes relate to on-screen warnings (visual) that the XD One will display when a fault is encountered during normal operations. Faults will be displayed using the on-device LEDs and are described in the table below.

Any faults encountered during device operation are captured by the on-device log for offline analysis as required.

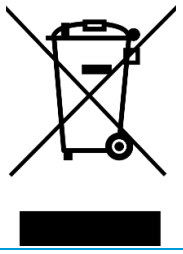
No.	Sequence	Fault Name	Fault Description	Fault Check
1		Internal memory corruption	A corruption in the XD One's internal memory was detected. Loss of data readings has occurred, or readings cannot be recovered.	The device will automatically format its memory and continue its operation.
2		Internal memory full	The XD One's internal memory is full.	Download and clear the devices data, event and alarm logs.
3		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 error occurs more than 4 times, the XD One will alert the user and enter an error state.	Contact Trolex or approved distributor.
4		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.
5		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 approved distributor.
6		Internal memory electronics failure	The XD One has detected an electronic hardware failure of the internal memory. The XD One will alert the user and enter an error state.	Contact Trolex or approved distributor.

17. Glossary and Definitions

Flow rate	The volume of fluid which passes per unit time
IP	Ingress Protection
µg/m3	Microgram per meter cubed. The concentration of an air pollutant given in micrograms (one-millionth of a gram) per cubic meter of air
mg/m3	Milligram per meter cubed. The concentration of an air pollutant given in milligrams (one-thousandth of a gram) per cubic meter 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

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



This symbol, if marked on the product of 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. Technical Support

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

Please contact our technical services team:

Tel: +44 (0) 161 483 1435

Email: Service@trolex.com

20. Disclaimers

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 analysis, evaluation and testing of the products with respect to the relevant specific application or use. Trolex shall not be responsible or liable for misuse of the information contained herein. When devices 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 product. 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.

21. Revisions

Description	ECR	Date	Initials
Revision A Release	-	13/04/2021	KH

22.Feedback

If you have any suggestions for improvements or amendments, or find errors in this publication, please notify us at marketing@trolex.com.

23.Trademarks

Trolex Ltd, Newby Road, Hazel Grove, Stockport, Cheshire, SK7 5DY, UK

+44 (0) 161 483 1435 sales@trolex.com

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.

For more information on Trolex or if you'd like to find out more about the XD One Personal Dust Monitor please contact us at:

Enquiries
info@accutroninstruments.com

Telephone
1-705-682-0814

Website
www.accutroninstruments.com

accutroninstruments

Accutron Instruments Inc
11 Mary Street
Sudbury, Ontario
P3C1B4, Canada