TROLEX



AIR XS
SILICA MONITOR

General Purpose

USER MANUAL

trolex.com/air-xs

LEADING SAFETY TECHNOLOGY

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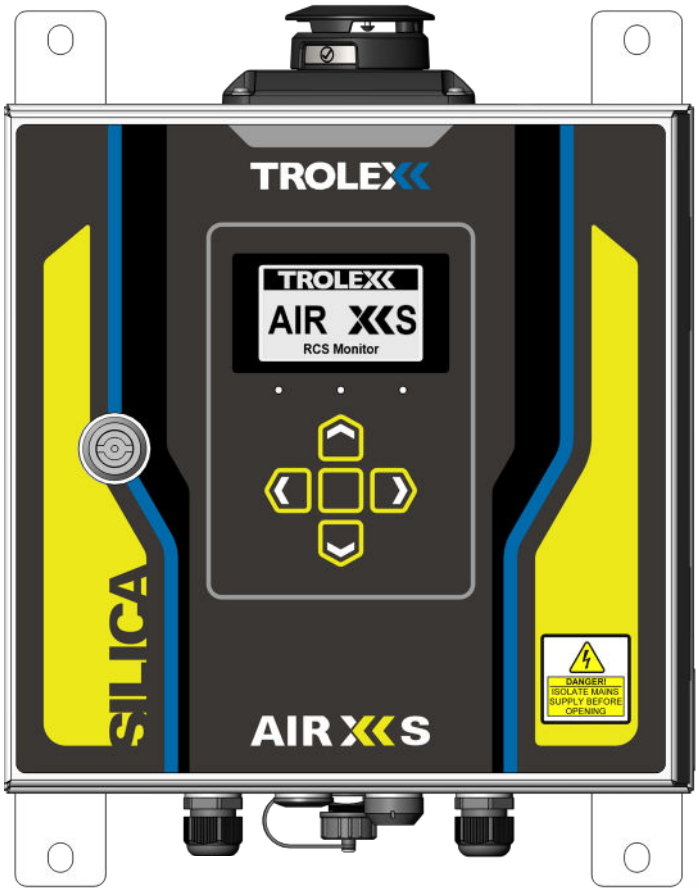
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1. GENERAL DESCRIPTION

The Trolex AIR XS Silica Monitor is designed to provide detailed, accurate and real-time data on airborne respirable crystalline silica (RCS) content. Using innovative optical refraction technology (ORT), the AIR XS combines a consistent particle flow rate with advanced sensing technology to provide information on RCS.

As the AIR XS processes and analyses particulate data, an adaptive algorithm is used to calculate and identify the average level of RCS from the overall particle count. Measurement information can be viewed via the instrument display or as historical readings using the accompanying Trolex BreatheXS application software, which can be viewed live via RS485/Ethernet.



TX8100 AIR XS Silica Monitor

1.1 Main features

- Real time, continuous measurement of atmospheric RCS concentration
- High-reliability and low-maintenance
- On-device display readout
- High visibility alarm warning indicators
- ‘Plug and play’ installation

1.2 Limits of use

The AIR XS has been designed for use in environments where hazardous RCS is present. Resulting RCS detection can be influenced by total particle orientation, shape, size, and overall dust loading. The AIR XS sensor may see some cross-responsivity from poly-crystalline particles present in the local environment.

To ensure the optimum performance and safe operation, the AIR XS must be operated according to the limits 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.

Continual operation of the AIR XS at extremes of the specified temperature limits may reduce the operating lifetime of the product.

Note: 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.

Test and calibration conditions

Considerations for theoretical applications should be considered the following criteria applies during the development and testing of devices:

- The test environment is locally controlled, and other factors such as temperature and humidity remain the same
- Any test particles, including sample saturation, are evenly distributed within the test environment
- The airflow through the sensor is laminar, without turbulence and that the particles move through the sensor at a constant velocity
- The reference device is considered to be basis and reference

Mass concentration

Obtaining a mass concentration from an optical particle count requires several assumptions. Any mass concentration data from an optical sensor should only be treated as an indicator and may vary depending on the environment it was taken from.

As real-time devices can only give an indication of mass concentration, they should be used as indicative measurements to demonstrate the changing nature of the airborne particulate of any period of time. Any results collected could vary depending on the type of test particle, test condition and local environment.

Site/location considerations

The positioning of a device, relative to the target sample may impact the observed measurement values. Due to variance in the saturation of a sample, two devices in relative proximity to each other may give different values.

There may be situation where devices of the same type show considerable output difference, due to the local environment, device configuration, drift over time, heavy dust exposure, irregular and missing maintenance or variance in dust type and airflow patterns.

Validation assumptions

There is no common agreed standard or protocol for the testing of real-time PM sensors, which also extends to measuring them. As such it can be difficult to clearly compare declared performance parameters of different products and sensors.

Whilst particle counting may provide a comparable value, algorithms and theoretical mathematical principles used to convert measured signals into mass concentration vary between sensor manufactures. This can greatly influence observed measurement values and should be considered when evaluating real-time devices.

Test results collected are only as good as the reference equipment and samples tested, human interference, differential in sampling methods and related inherent environmental impacts from sampling, processing and testing may affect all comparative data from any manufacturer.

Cross sensitivity

It is possible that some materials may cause a cross sensitive response, depending on the particles present in the local environment. As the sensor is designed around the response signals exhibited from crystalline particles and the birefringence thereof measurement values may include these interferences.

These cross-sensitivities may be exhibited to different severities dependant on the particle density and crystalline properties. For this reason, the sensor should only be used for indicative real-time monitoring. Real-time monitoring is not currently suitable for compliance monitoring or regulatory compliance, and may show variance compared to other analysis techniques that indicate a differential between crystalline substances.

Whilst the product is intended for use cases where a known concentration of RCS is present, consideration should be given by an appropriate person on other possible interferences, referencing the local compliance method standard list of possible cross sensitivities as a minimum.

2. PRODUCT SAFETY

The following symbols are used in this manual or on the instrument 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 instrument



WARNING Electric shock risk



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.

3. DANGER FROM PROCESS

It is possible that the AIR XS could be installed in environments that contain process particulates which can be hazardous to health.

The AIR XS should be used as an indicative tool to ascertain exposure concentrations within the workplace. The required control measures should be determined by a competent Health & Safety Professional and adhered to by personnel working within the designated area.

Note: This product variant is not designed for use within Explosion Group or Zoned hazardous areas.

The recommended warning should be set at 10% of the WEL. For static samples, an exposure concentration of >10% of the exposure limit is indicative of inadequate control being achieved.

4. 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.

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.

The AIR XS 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 User Manual before using and installing the AIR XS for the first time and keep it in a safe place for future reference.

Peripheral components such as the power supply and communications module/peripheral or interface must be installed according to the manufacturer's instructions and the installation location's prevailing statutory regulations.

The installation of the instrument must only be carried out by competent personnel.

Each installation needs to be considered with reference to the local safety regulations and authorities.

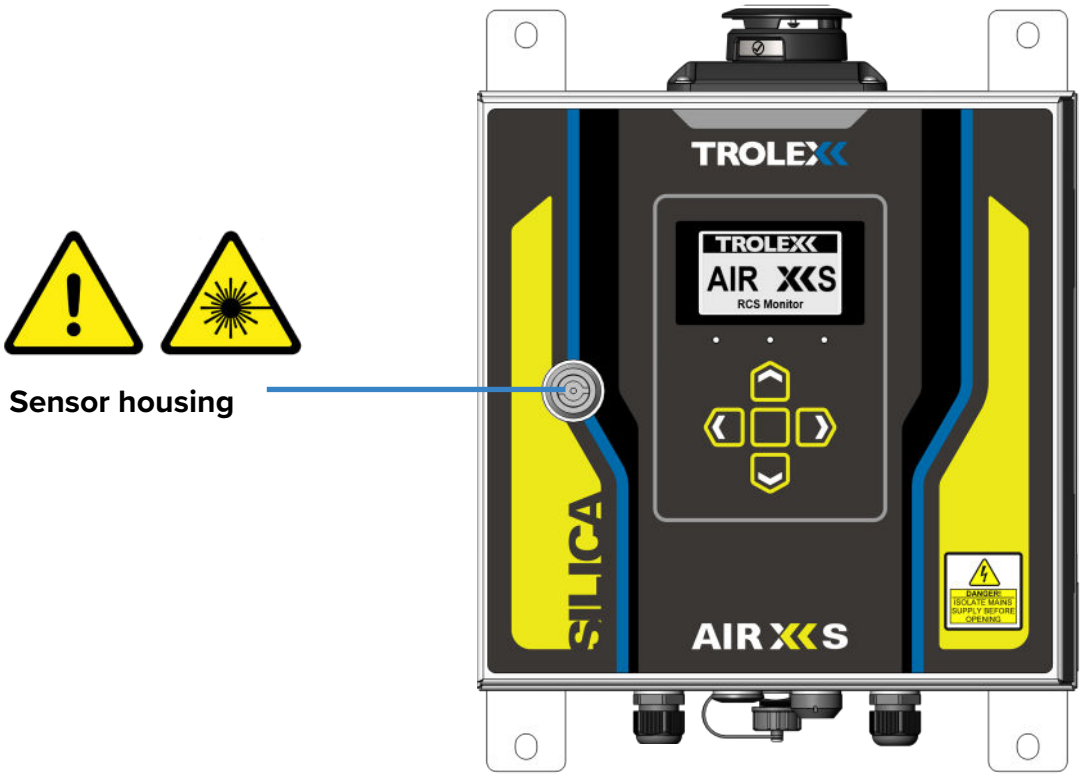
Observe the national safety regulations issued, for example, by the employers' liability insurance association, social security institutions, occupational safety and health or other safety authorities.

4.1 Laser safety precautions

The AIR XS 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 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.

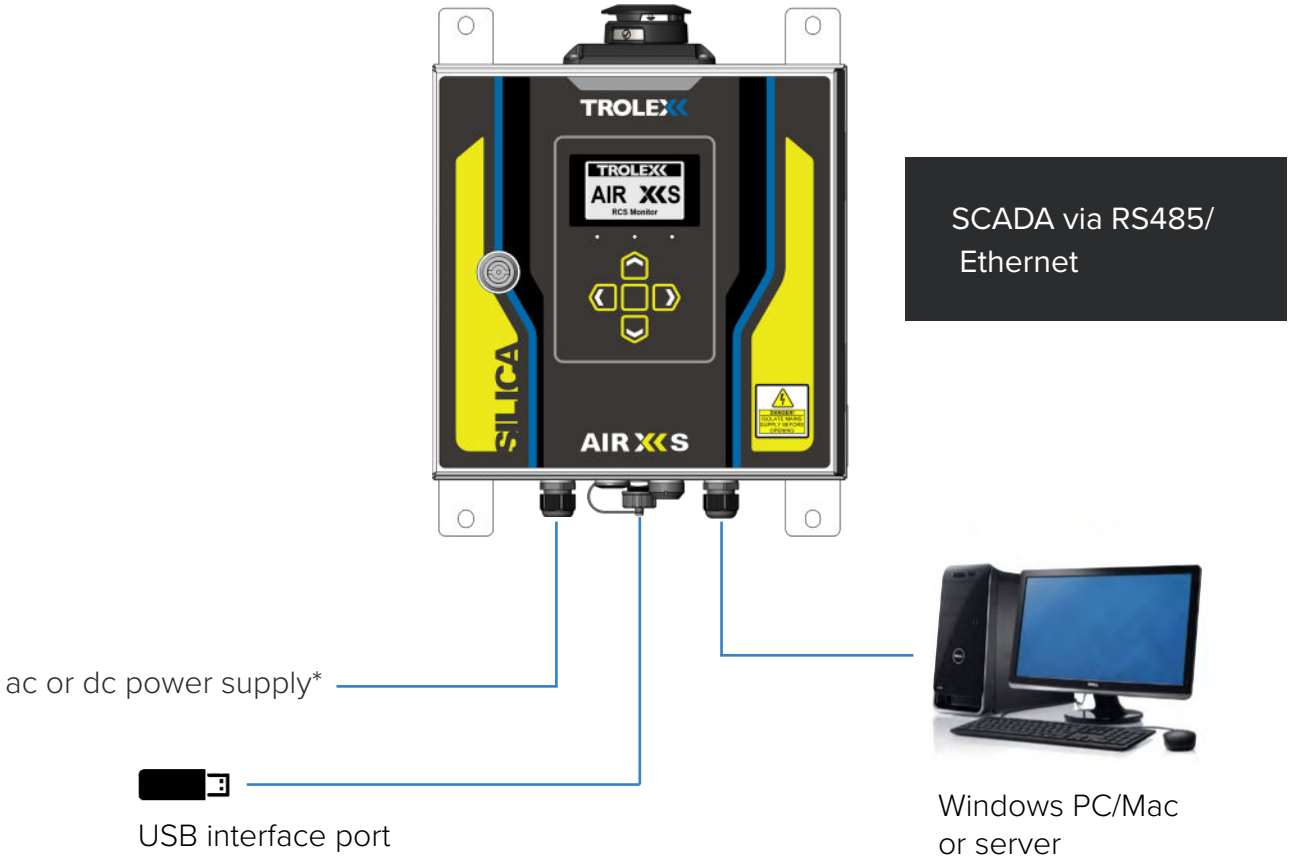


WARNING There are no user-serviceable parts inside the AIR XS unit, except replacing the filters as part of the compliance check. Servicing should only be carried out by Trolex or an approved service technician.

5. SYSTEM COMPONENTS

The AIR XS is typically installed as a stand-alone instrument for general purpose applications. The instrument is supplied with peripherals fitted to allow for the 'plug and play' installation to universal mains/dc power supplies and data outputs.

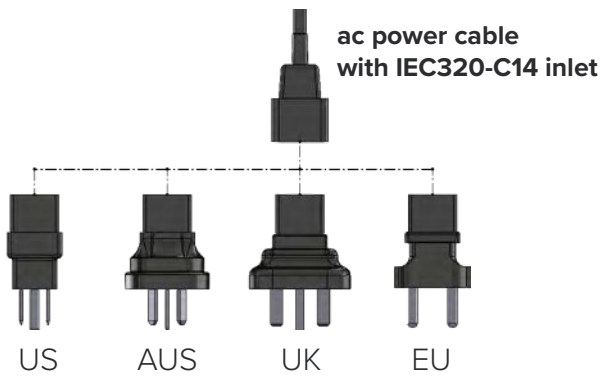
The instrument and Trolex BreatheXS software are specifically designed to work in conjunction with each other using proprietary protocols and design features. The system has, however, been designed to support third-party power supplies and communication protocols where required.



Example installation configuration

Note: M20 gland entries are provided for custom installation requirements. Gland entries may be blanked, and installations may vary from diagram shown.

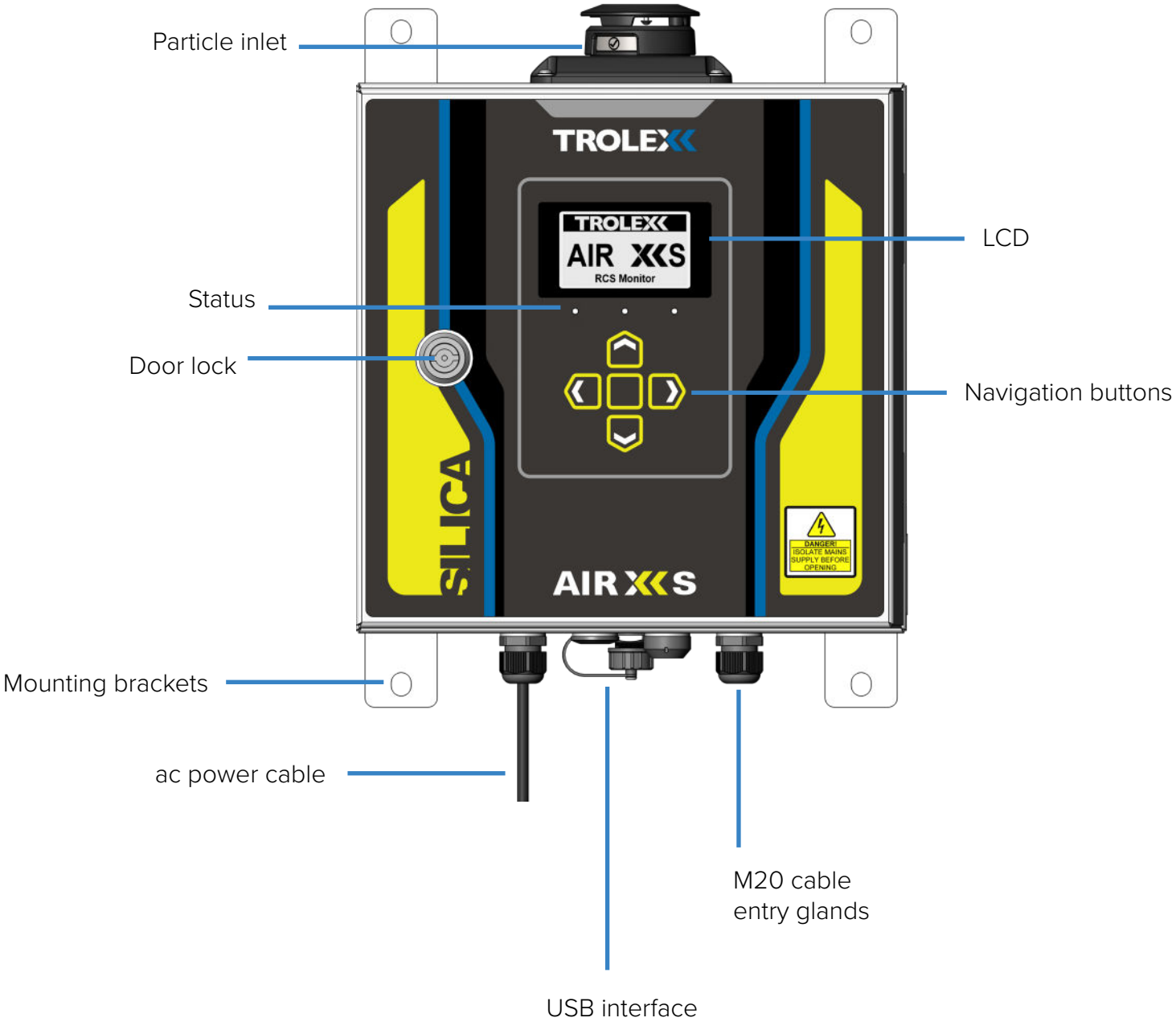
*ac power cable with IEC320-C14 inlet pre-installed. Supplied with US, AUS, UK and EU adaptors.



5.1 TX8100 AIR XS Silica Monitor

The AIR XS Silica Monitor uses a custom particle sensor that is located inside a robust stainless-steel housing. This provides isolation and ingress protection between the particle flow path and the main control circuits. Control circuits are housed in a lockable, IP66 rated steel enclosure. Information and settings can be accessed using the keypad and display located on the front of the instrument.

The figure below shows the location of the navigation buttons, display screen and status LEDs. Power and network connections enter the main housing via cable entry glands located on the bottom of the instrument. The AIR XS can be wall or stand mounted via the integrated external mounting brackets.



5.2 Particle flow path

The AIR XS has been designed with the ability to restrict ingress through the particulate flow path during routine maintenance and cleaning periods. A rotational top cap is used to open or close the particle flow path to provide ingress protection during cleaning.

It is recommended that the top cap is set to the closed position during instrument maintenance and cleaning to ensure the dust sensor is not exposed to unnecessary ingress. When the top cap is rotated into the closed position, the AIR XS conforms to IPX6.

Note: Rotate the top cap to move between ‘open’ and ‘closed’ positions.

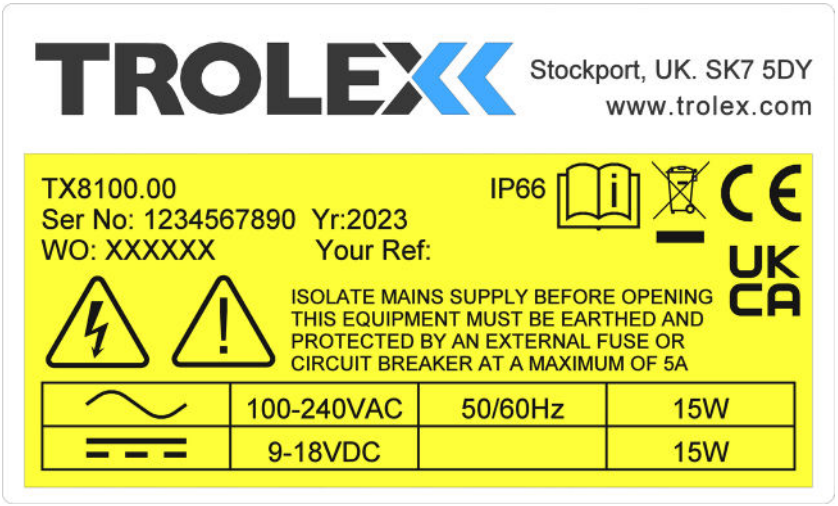


5.3 Peripherals and accessories

Power supply

The AIR XS can be connected to a standard 100 V to 240 V ac power supply **or** a 9 V to 18 V dc power supply. Before connecting a power supply to the instrument, ensure that the supply source is compatible with the instrument and information outlined on the appropriate rating plate.

See below for rating plate details.



6. CERTIFICATION

6.1 Compliance

AIR XS complies with the following European Union directives
Electromagnetic Compatibility (EMC) Directive 2014/30/EU
EN 61326-1:2013
Low Voltage Directive (LVD) 2014/35/EU
EN 61010-2:2010+A1:2019
AIR XS complies with the following RoHS directives
RoHS Directive 2002/95/EC
RoHS Directive 2011/65/EU



7. TECHNICAL INFORMATION

7.1 Sensing parameters

Sensing technology	Optical refraction technology (ORT) Optical Particle Counter (OPC)
Particulate measurement	Target RCS identification range
Max. typical dust loading*	150 mg/m^3
Continuous range	25 mg/m^3
Displayed data	RCS mg/m^3
Measurement resolution	1 µg/m^3 (0.001 mg/m^3)

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

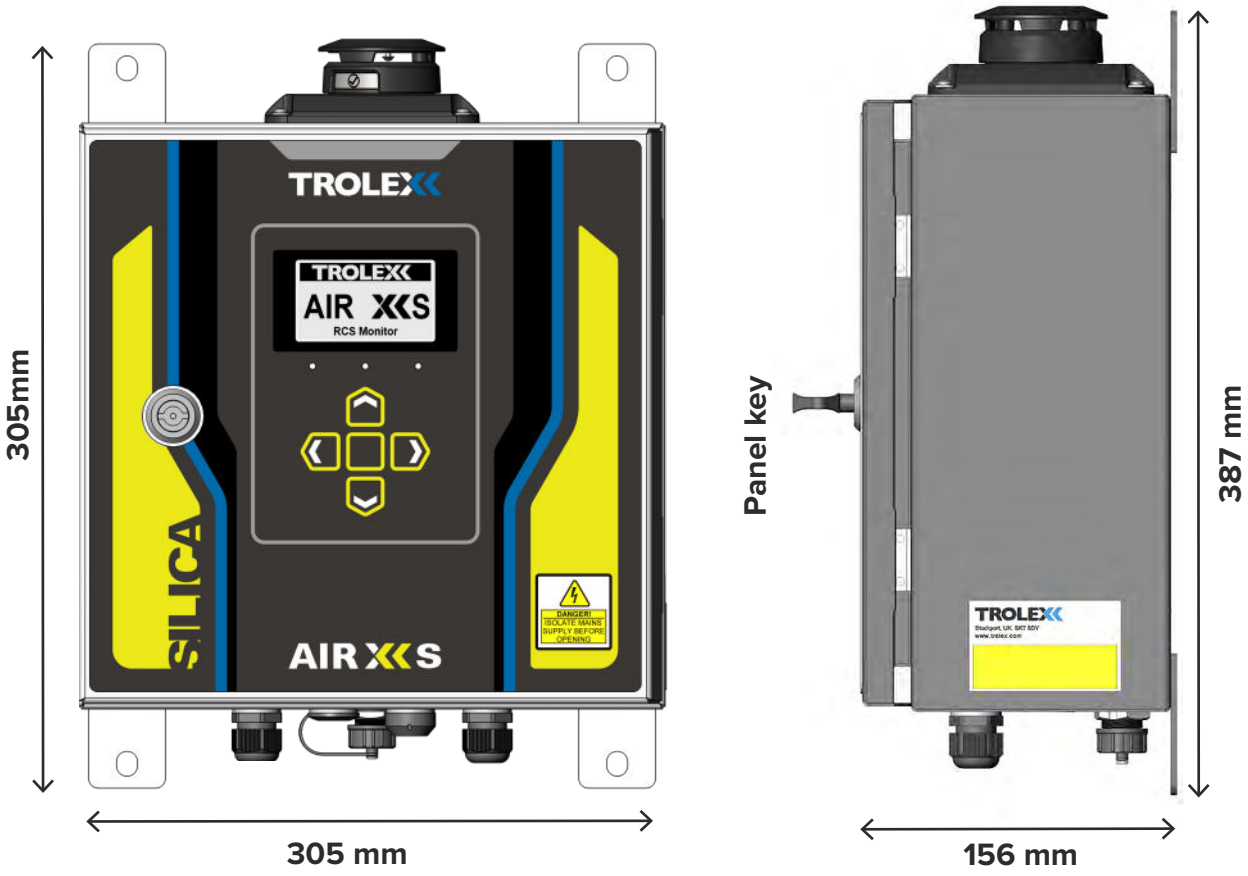
Note: Sustained exposure to dust quantities above 25 mg/m^3 will be logged; however, it may affect the operating life of the AIR XS sensor.

As applications of use are outside our control, the information provided is given without legal responsibility. Customers should test under their own conditions to ensure that the unit is suitable for their own requirements.

7.2 Technical specification

Operating temperature	-10 °C to +45 °C
Humidity	0 to 95% RH (non-condensing)
Housing material	PC/ABS – stainless steel
Ingress protection	• Main enclosure: IP66 • Particle flow path (cap open): IP22 • Particulate flow path (cap closed): IPX6
Weight	8.2 kg
Cabel entries	• 3 x M20 with removable blanks • 1 x M20 breather gland • 1 x M20 USB connector
Nominal power supply	• 100 V ac to 240 V ac 50/60 Hz • 9 V dc to 18 V dc
Power consumption	15 W
Communications	• RS485 data output with MODBUS RTU protocol • Ethernet (MODBUS TCP/IP)
External power output	1 x 15 V dc 1 A output (for powering external devices)
Connectivity	Trolex BreatheXS software
Data download	External USB interface
Instrument data storage	32 GB
User interface	• 128 x 64 dot matrix display with RGB backlight • Navigation keypad (membrane)
Visual alarms	• Custom alarm setpoints • Latching/non-latching
Self-test routine	Sensor hardware, circuitry and communications on power on manual self-test during use
Certification	CE compliant

7.3 Product dimensions



8. HARDWARE INSTALLATION

8.1 Safety precautions

Refer to section 4 of this user manual before undertaking the installation of the AIR XS device. The installation location of the AIR XS device is the prerogative of the installer and care should be taken to ensure an appropriate position has been selected. Consider the location of a suitable power supply and external fuses, access to a communications network and the protection of cabling from damage.

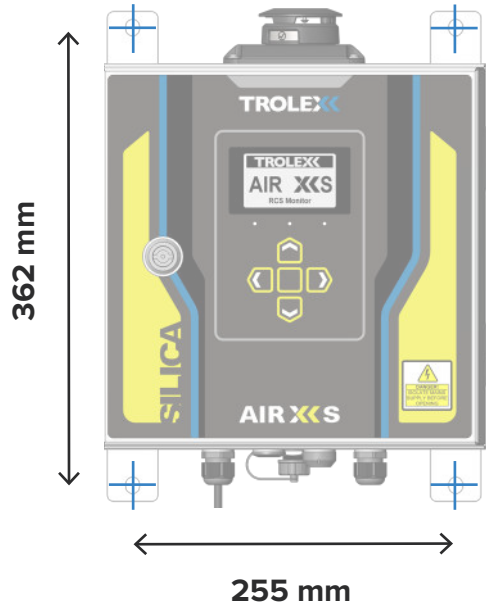
1. Secure the AIR XS to a suitable mounting surface using the integrated mounting brackets.
2. Ensure that the AIR XS is mounted in an upright position.
3. Unlock and open the enclosure door to access the internals of the enclosure.
4. Ensure power is isolated before making electrical connections to the instrument.
5. Power supply voltage and frequency must match the instrument (refer to rating plate).
6. Ensure external switches or fuses are installed where applicable.
7. Run the required cables through the cable glands provided in the bottom of the enclosure.
8. Wire the cables into the relevant terminals as indicated on the internal plate

   REFER TO SECTION 8.3

9. Tighten the cable gland against the cable to ensure an IP seal.
10. Close and lock the door after use to maintain IP rating of the enclosure.
11. Ensure that the particulate entry and exit ports are not restricted or covered.

Note: The instrument is susceptible to ingress when the door is open so care must be taken to ensure the location is clean during installation.

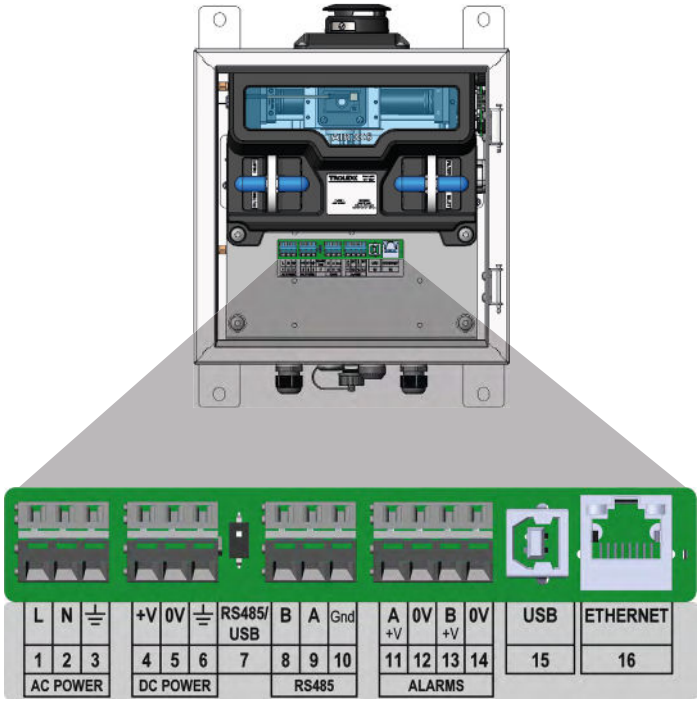
8.2 Mounting details

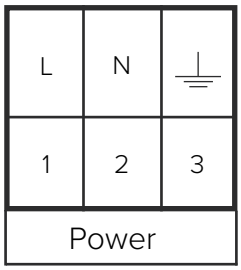


Note: Ensure the AIR XS is mounted vertically during installation.

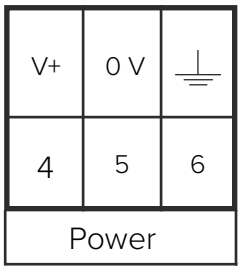
8.3 Electrical connections

The figure and tables below detail the connections available internally in the AIR XS.
The connections can be accessed by opening the front housing of the instrument using the supplied key.





ac power



dc power

ac power in		dc power in		Outputs			
1	Live	4	Supply voltage	7	RS485/USB switch	11	Supply voltage
2	Neutral	5	0 V	8	RS485 B	12	0 V
3	Earth	6	Earth	9	RS485 A	13	Supply voltage
				10	RS485 0 V	14	0 V
						15	USB
						16	Ethernet

Table 1: Power, RS485, external power, USB and ethernet terminal connections.

8.4 I/O terminals

Power, RS485, 4 to 20 mA and relay connection terminal data is highlighted below.

Actuation type	Operating tool
Solid/stranded conductor	0.08 mm^2 to 2.5 mm^2 or 28 AWG to 12 AWG
Conductor with ferrule	0.25 mm^2 to 1.5 mm^2
Strip length	5 mm to 6 mm or 0.2 in to 0.24 in

8.5 Power connections

For instruments connected to an ac power supply, it is the responsibility of the installer to ensure that the instrument is installed with the following protection:

- An external fuse or circuit breaker at a maximum of 5 A.
- Externally earthed. It is recommended installation practice that an additional Earth connection is made to the AIR XS enclosure.

See label below for details.



For instruments connected to a **dc power supply**, it is the responsibility of the installer to ensure that the instrument is installed with a dc supply, meeting re-enforced insulation requirements of **EN61010-1** or equivalent.

For instruments connected to an **ac power supply**, ensure that the equipment is protected by an external fuse or circuit breaker at a maximum of 5 A.

9.COMMISSIONING

Once installed and powered for first time use, the AIR XS will begin to monitor and sample the passing environmental particulates.

9.1 First power on

Prior to commissioning and first use, the instrument should be inspected for any visible damage and integrity of the enclosure.

1. Ensure that the electrical connections are correctly installed, as described in **section 8.3**.
2. Ensure that the door is closed and secured.
3. Apply power to the AIR XS.
4. A splash screen will be displayed for several seconds whilst the instrument auto configures.
5. Once configuration is complete, the AIR XS will automatically display on screen particle data.
6. Data is automatically logged to the internal memory for data download and offline analysis using the Trolex BreatheXS software.

9.2 System shutdown

1. Navigate to the main menu.
2. Scroll to the ‘System Shutdown’ menu selection.
3. Select “Confirm” to begin the system shutdown procedure.

Following this, the device will shut down and the power supply can be safely disconnected.

Note: Before disconnecting power to the AIR XS unit, it is recommended that the system shutdown procedure is followed correctly. This is to ensure that the onboard operating system and data capture integrity remains stable.

9.3 Application software

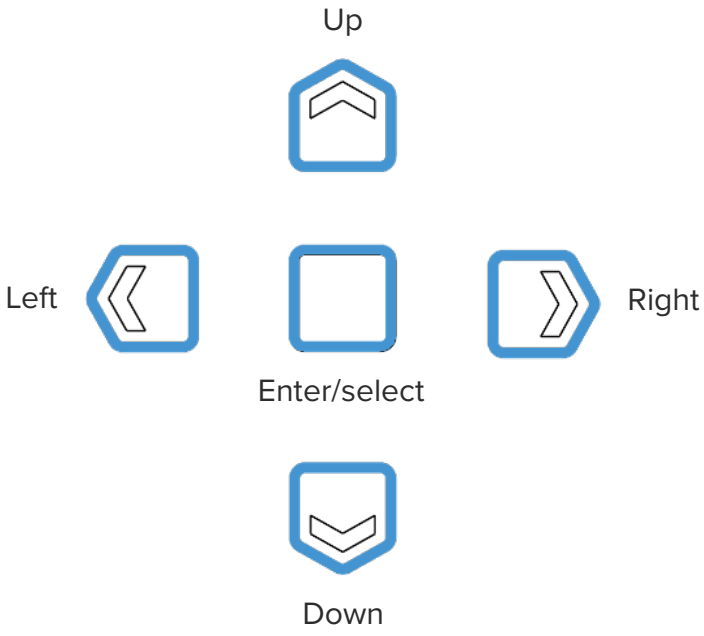
The Trolex BreatheXS software is available for download and installation from **trolex.com/air-x-software** and is specifically designed for the import and review of data sets collected by the AIR XS instrument.

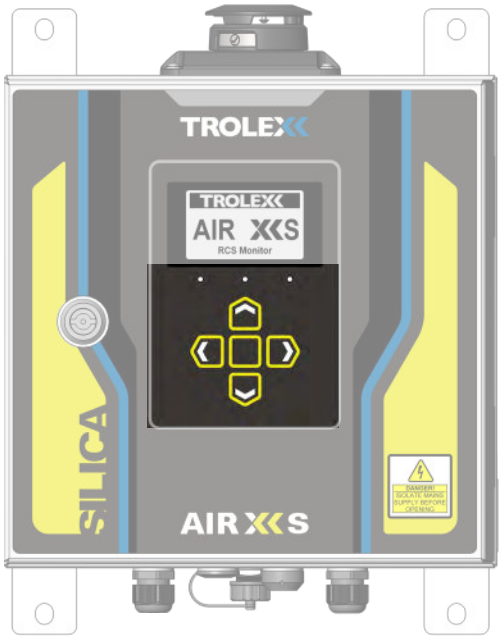
Note: The Trolex BreatheXS software is not required for general AIR XS operation.

10. CONTROLS AND INDICATORS

10.1 Navigation

The AIR XS user interface is controlled and navigated using the on-device keypad and display. The keypad consists of four directional keys and a central enter key to allow the scrolling, selection and input of data into the instrument.

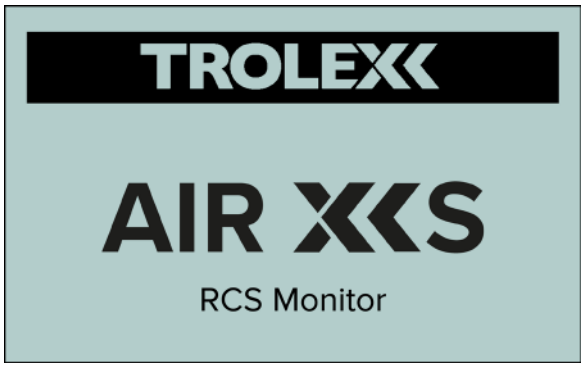




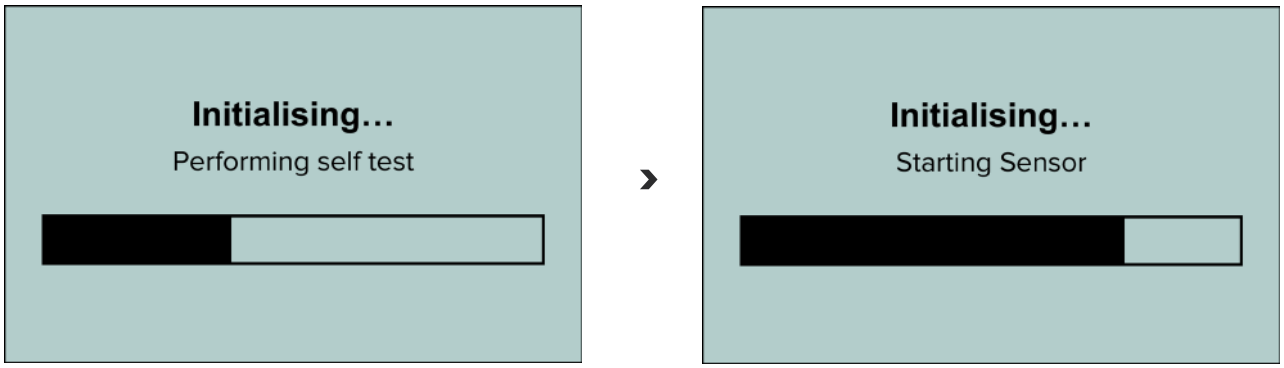
11. GENERAL OPERATION

11.1 User interface display

On initial power up of the AIR XS, particulate sampling will automatically start, and the graphical display will show the following screens. Once the instrument has been auto-configured, the AIR XS will begin sampling the environmental dust mixtures.



Title screen



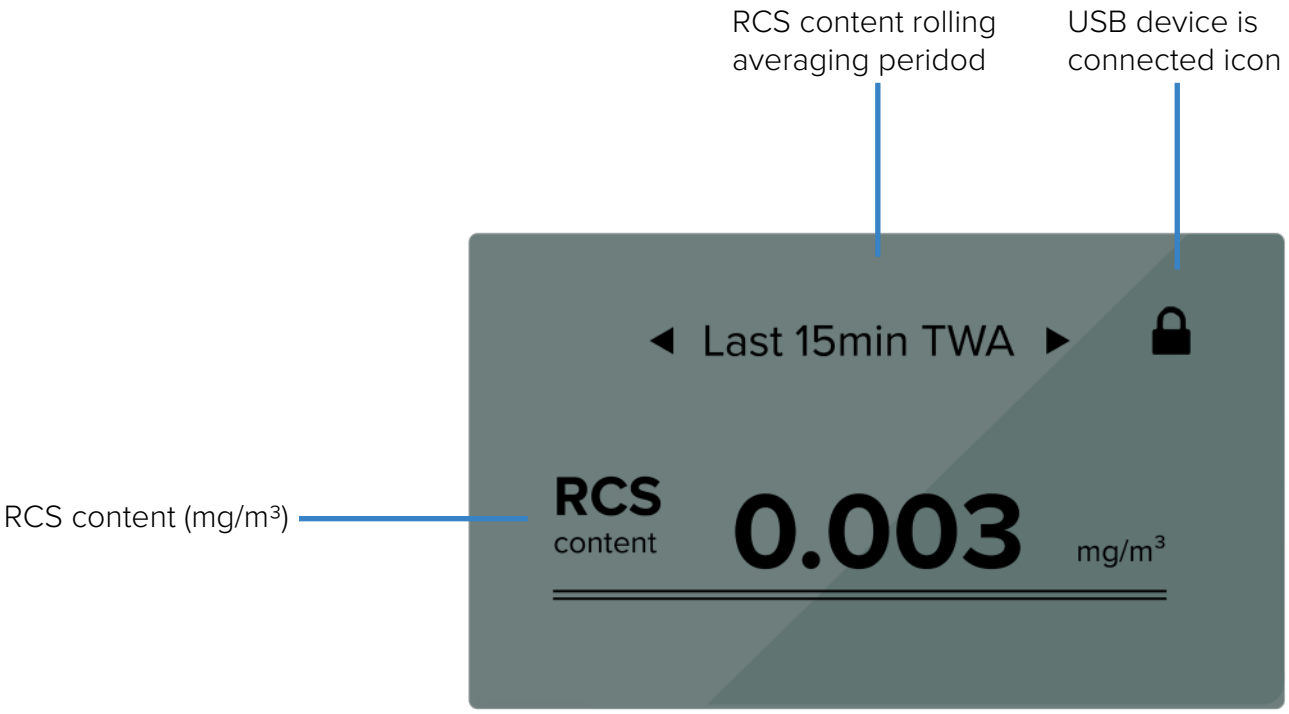
Device installation



Particle information
(Default landing screen)

11.2 Particulate display information

The following information is presented on the AIR XS display during particle sampling and operation.



11.2.1 Data capture format

During normal operation the AIR XS will capture the associated function data and generate a single log file for the relevant time span – this typically results in one file a day.

Note: If the AIR XS is restarted, a new file will be generated and saved for the associated period.

11.2.2 Data download

The AIR XS allows users to download collected data sets via the ‘data download’ menu. Data is stored on the instrument internal memory and can be locally downloaded onto a removable USB device when connected via the external USB connector positioned on the bottom face of the instrument.

Note: We recommend using a USB device with a minimum storage capacity of 8GB for local data download. The AIR XS only supports FAT32 file formatted USB devices.

Collected data can be retrieved from the AIR XS instrument by selecting the ‘USB Download’ function from the download menu.

Data download functionality is only available when a remote USB drive is connected to the AIR XS. If the USB drive is removed from the AIR XS during a download operation, the sequence will be interrupted, and the unit will require restarting before continuing with a data download.

Note: Depending on the overall size of the data collected by the AIR XS, remote data download can take several minutes to complete.

12. INSTRUMENT CONFIGURATION

12.1 Default settings

The AIR XS has been programmed with factory default settings prior to delivery which are detailed in the table below.

RCS averaging period	User selectable: 1, 15-minute, 1, 4, 8 hour (rolling avg.)
Display units	mg/m^3 (for the selected rolling average period)
RS485 baud rate	Default 115200
Alarms	Disabled

12.2 On-site configuration

The AIR XS instrument is designed not to require any specific user configuration beyond the following alarm parameters.

12.3 Custom alarms

The AIR XS has two user-configurable alarm that can be used to warn users of a specific particulate threshold breach based on a chosen limit or value. To enable the alarm functionality, follow the sequence outlined below.

1. Navigate to the ‘Main Menu’
2. Select the ‘Alarms’ function from the list
3. The ‘Detail’ function will provide an overview of any pre-set alarms and threshold values
4. Select ‘Configure’ to assign an alarm to the following parameters
    a. Channel (averaging period)
    b. Value (threshold)
    c. Mode (latching/non-latching)
    d. Units (mg/m^3)

NOTE ››

Note: To save the changes to the alarm function, exit the menu using the left arrow key, which will prompt a 'Settings saved' dialogue box. To exit the alarm function menu without saving any changes, just allow the menu to time out.

In order to maintain a high level of hazard control and accommodate any detection variability, it is good practice to set any on device warning thresholds to ~10% of the applicable WEL Limit.

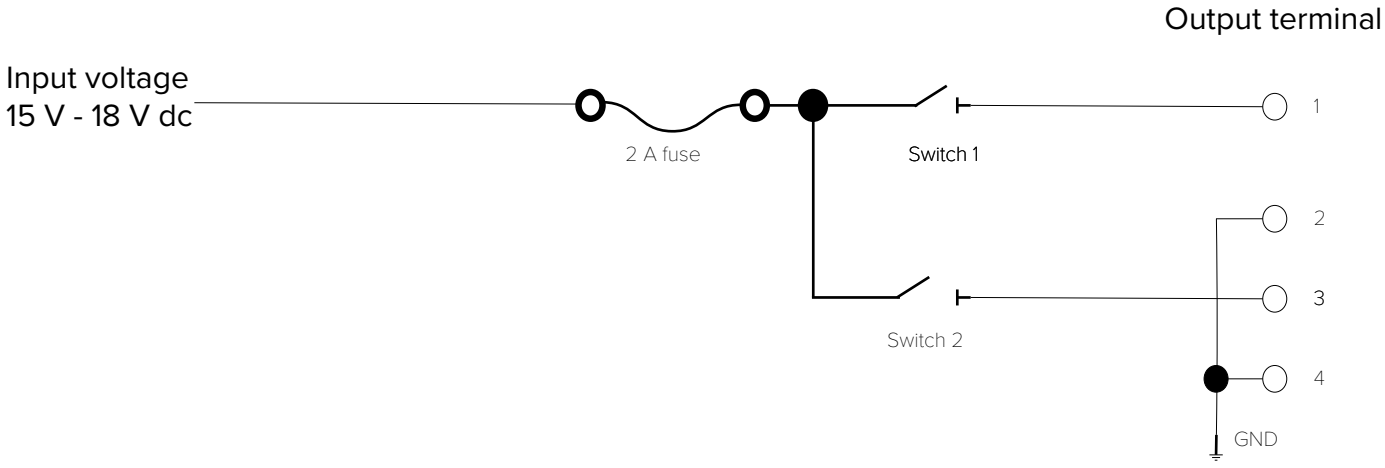
External audio-visual (A/V) alarm set-up

AIR XS contains a single programmable alarm output, which allows for powering an external A/V alarm or a relay. The output can be programmed with its own setpoint, and can be configured for normally on/normally off operations.

The output can deliver a total current of 1 A and are internally protected by a resettable 2 A fuse. If AIR XS is powered from a main power source (+100 V to +265 V ac), then the output voltage on the alarm terminals is 15 V dc.

If AIR XS is powered from a dc source, then the output voltage of the alarm will be equal to the voltage at the dc power terminals.

An option is also included to permanently power the output to essentially allow for powering an external modem.



Equivalent circuit if powered from a dc voltage.

13. UPDATING UNIT FIRMWARE

On notification of firmware update and release, the AIR XS can be updated via the on-device firmware update functionality. The instrument requires the update to take place via the connection of an external USB device loaded with the latest firmware.

Carry out the following steps to update your firmware:

1. Insert the USB and wait a few seconds for it to be recognised.
2. Navigate to ‘Main Menu’ > ‘System > ‘Firmware Update’
3. Follow the onscreen instructions.
4. The unit will update and automatically restart within a few seconds.

13.1 MODBUS communications

The AIR XS supports MODBUS/RTU via RS485 and MODBUS/TCP via Ethernet.

Please refer to the register tables below for details.

MODBUS address	1	**Stop bits**	1
Baud rate	115200	**Endian**	Big endian
Parity	None	**Byte swap**	Disabled

Ethernet IP assignment	Dynamic (DHCP)

The RS485 and ethernet settings can be observed and adjusted on device via the Communications menu.

‘Main Menu’ > ‘Communication’

Both RS485 and ethernet sub-menus allow the settings to be viewed, using the ‘Details’ menu, or changed, via the ‘Configure’ menu.

13.2 Registers

'Input Register' (function code 4)

Register	Description	Data type	Units
0	Product TX number	Unit16	-
1	Firmware version (Major)	Char	Ascii Format
2	Firmware version (Minor)	Char	Ascii Format
3	Firmware version (Patch)	Char	Ascii Format
4	Serial Number (Characters 1 & 2)	Char	Ascii Format
5	Serial Number (Characters 3 & 4)	Char	-
6	Serial Number (Characters 4 & 5)	Char	-
7	Serial Number (Characters 7 & 8)	Char	-
8	Serial Number (Characters 9 & 10)	Char	-
10	Live RCS	Unit16	-
13	RCS average period (15 min)	32-bit float	mg/m^3
15	RCS average period (1 hr)	32-bit float	mg/m^3
17	RCS average period (4 hrs)	32-bit float	mg/m^3
19	RCS average period (8 hrs)	32-bit float	mg/m^3
21	RCS average period (12 hrs {firmware V1.2.1 and below}) / (1 min {firmware V1.2.2 onwards})	32-bit float	mg/m^3
23	Live flow rate (Pump 1)	Unit16	mL/m
25	Temperature	Unit16	°C * 10
26	Humidity	Unit16	°C * 10
27	Internal voltage	Unit16	mV
28	Alarm A status	Unit16	0: Alarm off 1: Alarm active 2: Alarm acknowledged

‘Input Register’ (function code 4) (continued)

Register	Description	Data type	Units
0	Product TX number	Unit16	-
1	Firmware version (Major)	Char	Ascii Format
2	Firmware version (Minor)	Char	Ascii Format
3	Firmware version (Patch)	Char	Ascii Format
4	Serial Number (Characters 1 & 2)	Char	Ascii Format
5	Serial Number (Characters 3 & 4)	Char	-
6	Serial Number (Characters 4 & 5)	Char	-
7	Serial Number (Characters 7 & 8)	Char	-
8	Serial Number (Characters 9 & 10)	Char	-
10	Live RCS	Unit16	-
13	RCS average period (15 min)	32-bit float	mg/m^3
15	RCS average period (1 hr)	32-bit float	mg/m^3
17	RCS average period (4 hrs)	32-bit float	mg/m^3
19	RCS average period (8 hrs)	32-bit float	mg/m^3
21	RCS average period (12 hrs {firmware V1.2.1 and below}) / (1 min {firmware V1.2.2 onwards})	32-bit float	mg/m^3
23	Live flow rate (Pump 1)	Unit16	mL/m
25	Temperature	Unit16	°C * 10
26	Humidity	Unit16	°C * 10
27	Internal voltage	Unit16	mV
28	Alarm A status	Unit16	0: Alarm off 1: Alarm active 2: Alarm acknowledged
29	Alarm B status	Unit16	0: Alarm off 1: Alarm active 2: Alarm acknowledged

“Holding registers” (function codes 3, 6 and 16)

Register	Description	Data type	Units
0	MODBUS data polarity	Unit16	0: Big endian, bytes normal 1: Big endian, bytes swapped 2: Little endian, bytes normal 3: Little endian, bytes swapped
1	Particle density	32-bit float	kg/m^3
3	Alarm A threshold	32-bit float	mg/m^3
5	Alarm A channel	Unit16	0: 1 min. avg. period 1: 15 min. avg. period 2: 1 hr avg. period 3: 4 hr avg. period 4: 8 hr avg. period
6	Alarm A mode	Unit16	0: dc power 1: Disabled 2: Auto-reset 3: Latching
7	Alarm A invert	Unit16	0: Normally off 1: Normally on
8	Alarm B threshold	32-bit float	-
10	Alarm B channel	Unit16	-
11	Alarm B mode	Unit16	-
12	Alarm B invert	Unit16	-
13	Time (Seconds)	Unit16	-
14	Time (Minutes)	Unit16	-
15	Time (Hours)	Unit16	-
16	Time (Date)	Unit16	-

“Holding registers” (function codes 3, 6 and 16) (continued)

Register	Description	Data type	Units
17	Time (Month)	Unit16	-
18	Time (Year)	Unit16	-

‘Coil Register’ (function codes 1 and 5)

Register	Description	Units
0	Alarm A active	0: Alarm not active 1: Alarm active. Read only, write has no effect
1	Alarm B active	0: Alarm not active 1: Alarm active. Read only, write has no effect
2	Alarm A acknowledge	Write 1 to acknowledge active alarm. Read 0 returns
3	Alarm B acknowledge	Write 1 to acknowledge active alarm. Read 0 returns

Reading floating point registers

MODBUS itself does not define a floating point data type, but it is industry standard to use the IEEE-754 standard for defining floating point numbers. There is, however, no clear-cut definition of the byte order for the data payload.

By default, the Trolex AIR XS uses a little-endian format for the floating point numbers, split across two 16-bit MODBUS registers. If this is not compatible with your system and a big-endian format or byte swapping is required, the byte ordering can be switched using the on-device menu.

‘Main Menu’ > ‘Communication’ > ‘RS485/MODBUS’ > ‘Configure’

14. MAINTENANCE

The maintenance of the AIR XS must only be carried out by competent personnel. Maintenance shall be considered with reference to the local safety regulations, authorities, and guidelines.

14.1 Visual checks

Periodic visual checks should be carried out to assess if there are any issues arising with the AIR XS instrument. Check for the following.

1. External damage to the instrument. Plastic parts should not be cracked or broken which could affect the IP rating of the instrument.
2. Internal or external damage to wiring that is connected to the AIR XS instrument.
3. Labels on the instrument are still in place and are not peeling or discolouring.

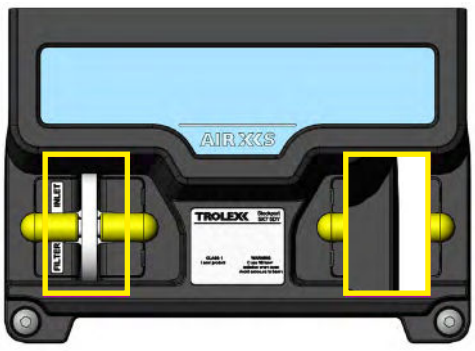
14.2 Particulate entry/exit apertures

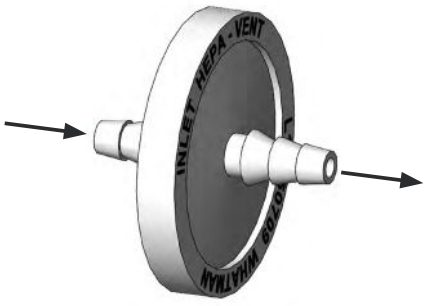
The particulate exit aperture is protected by a stainless-steel grille to minimise the ingress of flora and fauna into the AIR XS instrument. It is recommended that the grille is checked and cleaned during maintenance periods to ensure that it has not become clogged with ingress that may obscure the particulate sensing airflow.

It is important to ensure that the particle top cap inlet is periodically checked for obstruction or blockages caused by particle build up or settling.

14.3 Filter replacement

The AIR XS uses two HEPA inlet and outlet filters for the purpose of providing a clean sample air flow within the device. These filters must be replaced every month to maintain the performance of the device.

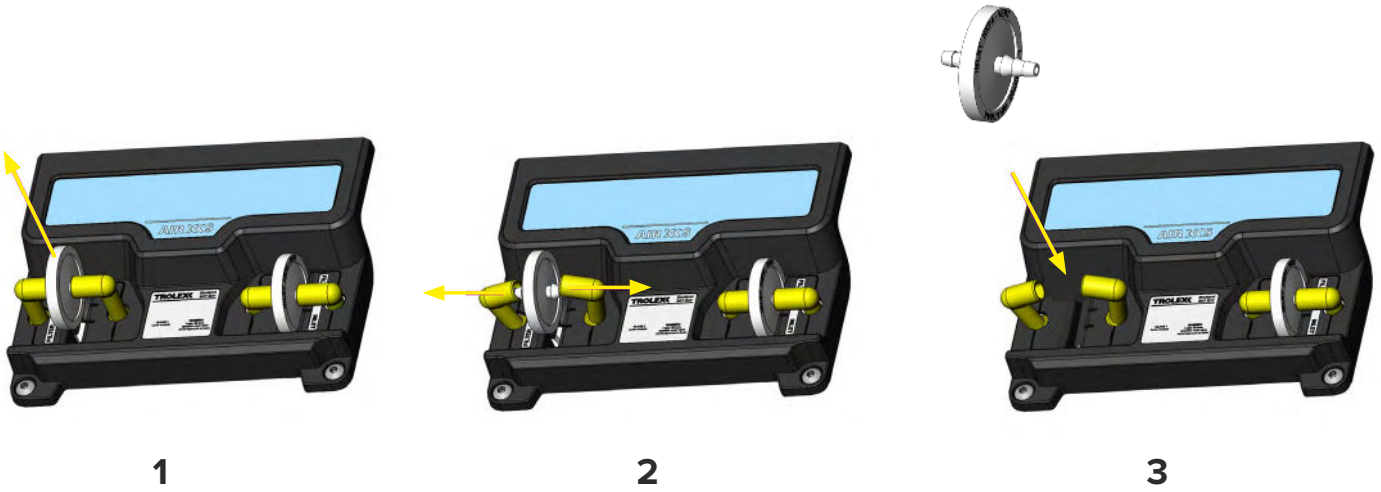




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When replacing the HEPA filters, be sure to observe the flow direction specified and ensure it matches that specified on the AIR XS filter cover plate.

To replace the HEPA filters, follow the steps below:



1 2 3

1. Pull up the filter cartridge to free it from the filter cover plate.
2. Remove the filter adapters from each side of the filter cartridge and remove.
3. Replace the filter cartridge with the new part, taking care to correctly orientate the flow direction.
4. Compliance audit checks must be completed after filter replacement to ensure functionality of the device to maintain warranty.

14.4 Cleaning

It is recommended to periodically clean the instrument with a damp cloth, to ensure the display, keypad and rating labels are clean and legible.

As part of the routine maintenance schedule, it is recommended that the sensor is cleaned from time to time following the steps below.

1. Wipe down the AIR XS inlet surfaces with a damp cloth in both **open** and **closed** positions.
2. Using the canned compressed clean air, spray the device inlet for 10 to 15 seconds to clean the dust path.

14.5 Compliance audit check

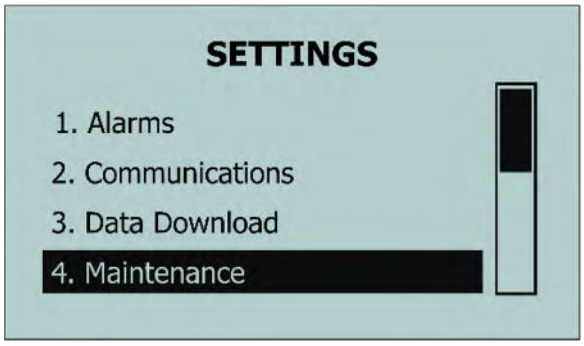
The AIR XS has been designed with an inbuilt compliance audit check to allow for the routine checking of device functionality against a selection of sized reference particulates. The on-device compliance audit check must be carried out using the Trolex Compliance Audit Kit, which contains the accessories required to conduct the procedure, including:

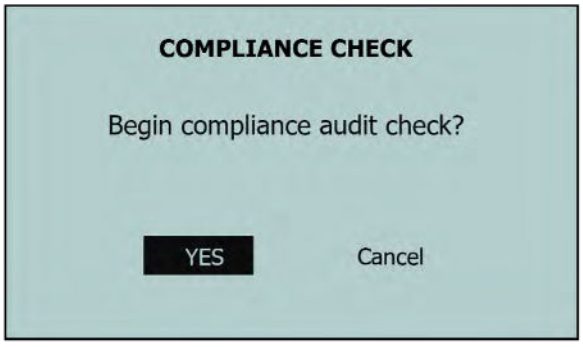
- Particle dispersion hood
- Reference particle sizes (reference material)
- Dosing bottle

Carrying out a monthly compliance checks to your AIR XS **takes no longer than a minute, and is a simple, cost-effective way of keeping your particulate monitoring operations moving and validates the initial warranty period.**

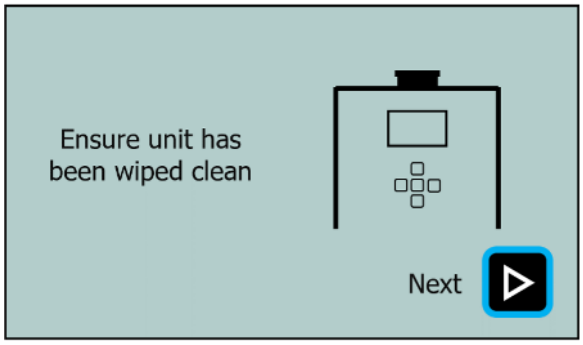
To complete the on-device compliance audit check, follow the on-screen sequence when selecting '4. Maintenance' from the main settings menu.

1. On selecting '4. Maintenance', the AIR XS will start up the compliance audit check sequence. To begin the sequence, select "YES".



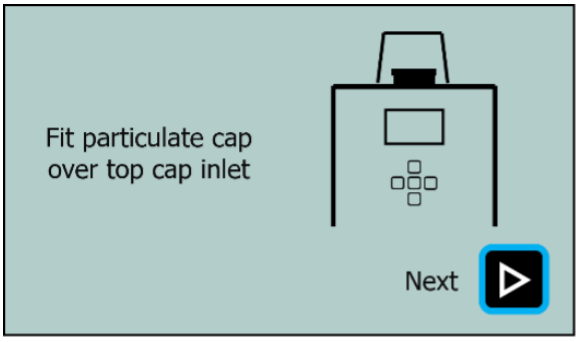


2. Ensure that the AIR XS has been cleaned as required and that the top cap inlet is rotated to the open position. Press the right arrow to progress



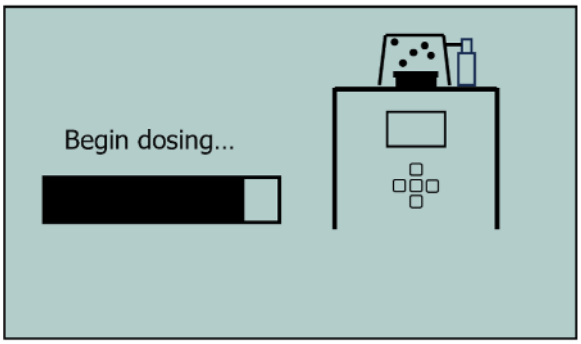
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3. Fit the Particulate Dispersion Hood over the AIR XS top cap inlet, ensuring that the dosing opening is accessible.

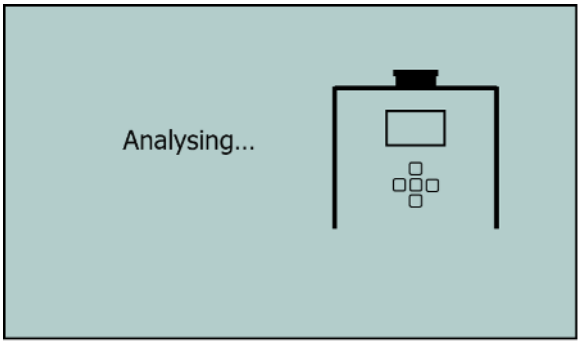


4. Follow the on-screen countdown and dose the AIR XS with the sample material using the dosing bottle that has been filled with the sample material. Shake dosing bottle thoroughly before and during use.

Note: It is important to dose the AIR XS with several measures of the reference particulate material during the first 10 seconds of the compliance audit check.



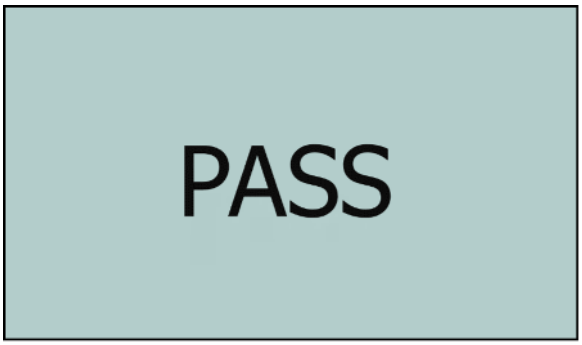
5. Wait for the AIR XS to analyse the sample.



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6. A “PASS” or “FAIL” result will be displayed to indicate the response of the device.

   The AIR XS is designed to return an on-device “PASS” or “FAIL” result based on the compliance audit check results and the threshold response to reference material. On return of a “PASS” result, the particulate sensor is functioning as expected and normal monitoring can resume.



   On return of a “FAIL” result, run a sensor cleaning operation as highlighted in **section 14.5**. Following this, repeat the compliance audit check and note the “PASS” or “FAIL” result.

   If the AIR XS returns a repeated “FAIL” result, please contact Trolex to discuss support or servicing options of the device.

14.6 Warranty

All AIR XS products and accessories will come with a 12-month warranty.

Note: AIR XS products that do not undergo monthly compliance checks will not be covered by the 12-month warranty.

14.7 Full calibration check

There is the option to send your AIR XS back to Trolex, where it will undergo a full calibration check, service and receive a certificate.

Where serviceable items are replaced, the AIR XS will undergo a full calibration in our purpose built, in-house calm air chambers so we can validate the readings before we return the unit to you.

Following the service, we will provide a document detailing the manufacturing checks, an inspection of the unit and read-out certificate.

15. TROUBLESHOOTING

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

15.1 High temperature operating

The AIR XS operates a protective thermal cut-out sequence when the temperature inside the instrument exceeds the maximum operating temperature specification, detailed in **section 7**. This protective measure is in place to maintain the lifespan and operating functionality of the optical sensor assembly when the AIR XS is installed in environments with high ambient temperatures.

15.2 Fault codes

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

Code	Fault name	Fault description	Fault check
1	Top cap closed	The particle inlet top cap is closed and will not allow particles to flow into the device	Check top cap position and move to open
3	Blockage error	The AIR XS has detected that the silica filters are blocked	Replace internal HEPA filters
4	Laser fault	A laser anomaly has been detected	Contact Trolex for advice
5	Storage full	The AIR XS internal memory is at 100% capacity and requires erasing	Erase internal memory via “Data Download” menus

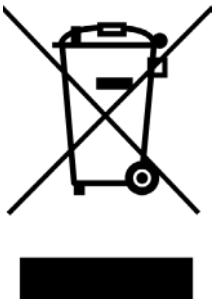
16. GLOSSARY AND DEFINITIONS

RCS	Respirable crystalline silica
Flow rate	The volume of air mixture which passes per unit time
IP	Ingress protection
mg/m^3	Milligram per metre cubed
OPC	Optical Particulate Counter
ORT	Optical Refraction Technology
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
PMx	PMx is particulate matter *x* micrometer or less

17. DISPOSAL

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

The AIR XS operates a protective thermal cut-out sequence when the temperature inside the instrument exceeds the maximum operating temperature specification, detailed in **section 7**. This protective measure is in place to maintain the lifespan and operating functionality of the optical sensor assembly when the AIR XS is installed in environments with high ambient temperatures.



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.

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.

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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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