






Sensotek



USER MANUAL

Kappa X™

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1 Introduction

1.1 Who is this Manual For?

This manual has been written for all users of the Sensoteq® Kappa X™ product range, from product handling through to installation and maintenance.

1.2 Disclaimer

Sensoteq Ltd neither assumes nor accepts any liability for damages resulting from the handling, use, or misuse of its products. With your purchase or installation, the owner or user confirms that they have read and understand the following warnings. The owner or user agrees that the user is responsible for all damages and injuries caused by the product which include personal injuries, property damages and magnetic damages.

Please use caution whilst handling or installing this product. Please read and understand our safety warnings below. It is the responsibility of the purchaser or owner to make sure all users of this product are made aware of the information in this letter. If the product is ever sold, transferred or given to a new owner, this warning letter should be provided to the new owner.

1.3 Model Number / Order Coding

Model Number: KPX1001 / KPX1001V4

1.4 ATEX Version of Kappa X™

The Kappa X™ KPX1001 is a self-contained battery powered transducer with integral low power radio transmitter. The equipment comprises a battery and circuit board mounted within a plastic enclosure with stainless steel base and magnetic mounting. The equipment is certified for use in areas requiring equipment protection levels Ga, Da, and Ma.

1.5 Conditions of Manufacture

Where the product incorporates certified parts or safety critical components, Sensoteq are required to ensure that any changes to those parts or components do not affect the compliance of the certified product that is the subject of this certificate.

1.6 Specific Conditions of Use (Special Conditions)

An ATEX approved version of the Kappa X™ is available for purchase to install in explosive environments.

The following conditions relate to safe installation and/or use of the equipment:

- i. Under certain extreme circumstances, the non-metallic parts incorporated in the enclosure of this equipment may generate an ignition-capable level of electrostatic charge. Therefore, the equipment shall not be installed in a location where the external conditions are conducive to the build-up of electrostatic charge on such surfaces. This is particularly important if the equipment is installed in a zone 0 location. In addition, the equipment shall only be cleaned with a damp cloth.
- ii. This equipment contains a single cell which may only be replaced in a non-hazardous area. Use only cell type SAFT 14250 1/2AA.
 - The battery shall be sourced from Sensoteq.
 - The battery replacement process shall follow specific guidelines. It is recommended that a trained Sensoteq installer carries out battery replacements, however this is not mandated.
 - The battery replacement process shall not be conducted within an ATEX zone. Retreat to a safe zone, perform the replacement, and then return to the application.
 - The equipment uses non-metallic materials, their performance should be considered with respect to the chemicals that may be present in the hazardous area.

1.7 Specific Safety and Regulatory Information

WARNING: A WARNING indicates a potential property damage, personal injury, or death

Battery Safety

- ⚠ **WARNING: The Kappa X™ sensor contains a battery. The battery is enclosed within the product however if the battery is damaged then the sensor should not be used.**

Safety and Regulatory Information

You can find additional Safety Best Practices and information on REACH, Electromagnetic Compatibility (EMC), Ergonomics, Transportation, and Tuners on the Regulatory Compliance page, www.sensotek.com/regulatory_compliance.

- ⚠ **WARNING: Use of controls, adjustments, procedures, connections, or signal types other than those specified in your documentation may result in exposure to shock, electrical hazards, and/or mechanical hazards.**
- Sensotek products are not designed for use in hazardous environments unless purchased as ATEX certified Sensotek products. If you require ATEX certified products contact Sensotek for appropriate part numbers.
- Sensotek product are not designed for use in operating or calibrating machinery.
- Sensotek products are monitoring equipment only.
- ⚠ **WARNING: Do not operate your equipment disassembled. The product should remain as purchased with backing plates and mechanical enclosure etc. installed**

AC Power supplies are not IP rated and must be protected from water ingress.

- Do not use damaged equipment, including exposed, frayed, or damaged power cords.
- ⚠ **WARNING: Do not attempt to service the equipment yourself, except as explained in your Sensotek documentation or in instructions otherwise**
- ⚠ **Power and Adapter Safety**
WARNING: RISK OF FIRE or ELECTRICAL SHOCK when using a main plug adapter that is not specified. Use only the Sensotek-provided AC adapter approved for use with this device. Use of another AC adapter may increase the risk of fire or explosion.
- Check the voltage rating before you connect the equipment to an electrical outlet to ensure that the required voltage and frequency match the available power source.

The AC adapter may become hot during normal operation of our product. Ensure adequate ventilation and use care when handling the adapter during or immediately after operation of your device.

- ⚠ **CAUTION:** Your AC adapter has no accessible earthed metal parts, so it is not possible to perform an Earth Continuity Test. The low voltage DC Output Connector Is not an earthed part and should not be subjected to the Earth Continuity Test as this may give an incorrect result and could damage the AC adapter.

Location of Radio Regulatory Labels

For some products, the radio regulatory labels may be found on the product, in the box or on the website, www.sensotek.com/regulatory_compliance.

Recycling Information

Sensotek recommends that customers dispose of their used sensors, gateways, and other peripherals in an environmentally sound manner. Potential methods include reuse of parts or whole products and recycling of products, components, and/or materials.

For specific information on Sensotek's worldwide recycling programs, see:

www.sensotek.com/recycling.

Waste Electrical and Electronic Equipment (WEEE) Directive



In the European Union, this label indicates that this product should not be disposed of with household waste. It should be deposited at an appropriate facility to enable recovery and recycling. For information on how to recycle this product in your country, please visit: www.sensotek.com/recycling.

Battery Disposal

The Kappa X™ sensor contains a Li-SOCl₂ (lithium based) battery and must be recycled according to local regulations.

The Gateway can be recycled as electronic waste according to local regulations.

SIMPLIFIED DECLARATION OF CONFORMITY FOR RADIO EQUIPMENT DIRECTIVE 2014/53/EU

Sensotek Ltd. declares that all CE Marked Sensotek products incorporating Radio Equipment functionality are in compliance with Directive 2014/53/EU.

The Full text of the EU declaration of conformity is available at the following internet address: www.sensotek.com/regulatory_compliance.



In the European Union, this label indicates that the batteries in this product should be collected separately and not be disposed of with household waste. Substances in batteries can have potential negative impact on health and environment and you have a role in recycling waste batteries, thus contributing to the protection, preservation, and improvement of the quality of the environment. You should contact your local authority or retailer for details of the collection and recycling schemes available. Alternatively visit: www.sensotek.com/recycling.

Registration, Evaluation, and Authorisation of Chemicals (REACH)

REACH is the European Union (EU) chemical substances regulatory framework. Information on substances of very high concern contained in Sensotek Products in a concentration above 0.1% weight by weight (w/w) can be found at: www.sensotek.com/REACH.

Regulatory Notices

For Electromagnetic Compatibility (EMC), see www.sensotek.com/regulatory_compliance.

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

- 1) This device may not cause harmful interference, and
- 2) This device must accept any interference received, including interference that may cause undesired operation.

Note:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide

reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- 1) Reorient or relocate the receiving antenna.
- 2) Increase the separation between the equipment and receiver.
- 3) Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- 4) Consult the dealer or an experienced radio/TV technician for help.

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

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

- (1) This device may not cause interference.
- (2) This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

- 1) L'appareil ne doit pas produire de brouillage;
- 2) L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

1.8 FCC Statement

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

1. This device may not cause harmful interference; and
2. This device must accept any interference received, including interference that may cause undesired operation.

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

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Warning: Changes or modifications not expressly approved by Sensotek could void the user's authority to operate the equipment.

This portable transmitter with its antenna complies with FCC/IC RF exposure limits for general population / uncontrolled exposure.

Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

1.9 Industry Canada Statement

This device complies with ISED's licence-exempt RSSs. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. this device must accept any interference received, including interference that may cause undesired operation.

1.10 Radiation Exposure Statement:

This equipment complies with ISED radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with greater than 20cm between the radiator & your body.

Le présent appareil est conforme aux CNR d'ISED applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

1. le dispositif ne doit pas produire de brouillage préjudiciable, et
2. ce dispositif doit accepter tout brouillage reçu, y compris un brouillage susceptible de provoquer un fonctionnement indésirable.








1.11 Compliant Standards

This product has been designed and development in conformity with the relevant community harmonisation legislation below:

- Directive 2014/30/EU - Electromagnetic Compatibility
- Directive 2014/53/EU - Radio Equipment
- Directive 2011/65/EU - Restriction of Hazardous Substances in Electrical and Electronic Equipment
- ISO 60079-0: Explosive atmospheres – Part 0: Equipment – General requirements.
- ISO 60079-11: Explosive Atmospheres – Part 11: Equipment protection by intrinsic safety
- ISO 80079-34: Explosive atmospheres – Part 34: Application of quality systems for equipment manufacture.
- ISO 17050-1: Conformity Assessment – Supplier's declaration of conformity.
- CMLEx: Certified body for international approvals including Ex compliance.
- IECEx: Conformity assessment for IECEx quality system requirements.
- UKEx: UKSI 2016:1107 (as amended) Product or Protective System Intended for use in Potentially Explosive Atmospheres

Rated power 433.4 MHz 0.2mW peak

1.12 Product Markings

Symbol	Description
	This product complies to EU guidelines for regulating the use of hazardous chemicals in electrical and electronic equipment (EEE)
	This product complies to all relevant EU Directives including health and safety or environmental protection. The notified body number (nnnn) is included for the ATEX version of this product.
	This product complies to all relevant UK legislation. The notified body number (nnnn) is included for the ATEX version of this product.
	Waste of electrical and electronic equipment. This symbol indicates that this product should not be discarded as unsorted waste but must be sent to separate collection facilities for recovery and recycling. Please see Section 1.6
	Signifies an important piece of safety documentation that must be completely understood before handling or operating equipment.
	An ATEX version of this product is available, which complies with the ATEX Directive, UKCA requirements & IECEx specifications. Sections of this manual with this logo contain ATEX specific information.
	Highlighting important user information.

1.13 General Safety Information

1.13.1 Chemical Compatibility

Please ensure that the chemicals that may be present in the hazardous area are considered before implementation. For specific chemicals or cleaning agents, please contact Sensoteq Ltd for an evaluation of chemical compatibility and sensor performance.

For the purposes of understanding a general chemical compatibility, the non-metallic components externally exposed to the environment are listed below:

Plastic Enclosure: Acetal Copolymer >POM-C< or >ABS<

Rubber Seal: Nitrile Shore A 70 & Silicone Shore A 70

1.13.2 Pacemakers or other medical devices and mechanical implants

Individuals with health issues which require that they wear electronics, (e.g. pacemakers, defibrillators or other internal and external medical devices) should use caution when handling strong magnets, such as the type included in the Kappa X™™ sensor base. Pacemakers may be damaged or switched to "Test Mode" in the presence of a strong magnetic force. If a pacemaker or other medical device is in use, magnetic fields may affect the operation of these devices. If any user has any type of electronic, mechanical, implanted or external medical device, consult their physician and the manufacturer of their medical device to determine its susceptibility to static magnetic fields prior to allowing them to handle the Sensoteq sensors. All magnetic products should be kept at a

safe distance from individuals with these devices. The maximum magnetic field strength (pull force) at the surface of the sensor base is 27kg.

The strong magnetic fields of neodymium magnets that are a part of this product can damage magnetic media such as floppy disks, hard drives, credit cards, magnetic I.D. cards, cassette tapes, video tapes or other such devices. They can also damage televisions, computers, cell phones, computer monitors, storage devices and displays. Never place neodymium magnets near electronic appliances, mechanical watches, hearing aids, or loudspeakers. Keep away from any mechanical device that could be affected by a magnetic field.

1.13.3 Pinch Hazard

Sensotek Kappa X™ and magnets included in this product can pose a serious pinch hazard due to their attractive force on each other and to any object containing magnetic elements. Take care that the magnetic product is carefully held at a controlled distance from other magnetic elements.

Fingers and other body parts can get severely pinched between two attracting sensors or ferritic materials.

2 Installation Preparation

2.1 Checking Equipment

When you receive the Sensoteq equipment please check:

- None of the equipment has been visually damaged during transport
- You have at least one sensor for each point you wish to measure
- You have at least one gateway per group of sensors
- A power supply (or connector) for each gateway

2.2 Sensor Identification

Take special care if the sensor is ATEX rated, please note the *Special Use Cases* described on the supplied certificates as necessary.

Sensor Key Features

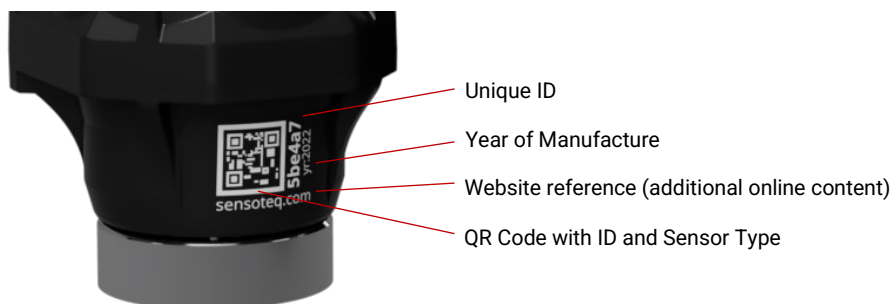
- All Kappa X™ sensors:
 - Can measure up to 10kHz on all axis
 - Feature a replaceable battery with standard 5-year life
 - Can be configured for specific machines to ensure the best vibration readings.
- ATEX Kappa X™ sensors operate using a replaceable battery, but special care must be taken when replacing.

2.3 Sensor Label Description

There can be up to three labels on a Kappa X™ Sensor:

- Identification
- Model & Regulatory Compliance
- Special Use Case (ATEX)

2.3.1 Identification (ID) Label



The Identification (ID) label is represented as both a number in hexadecimal format, and as a Quick Response (QR) matrix barcode. Both contain the same information but allow for different methods of data entry.

The Identification number is primarily used during installation to ensure the sensor corresponds to the correct location as defined by the customer.

2.3.2 Model & Regulatory Compliance

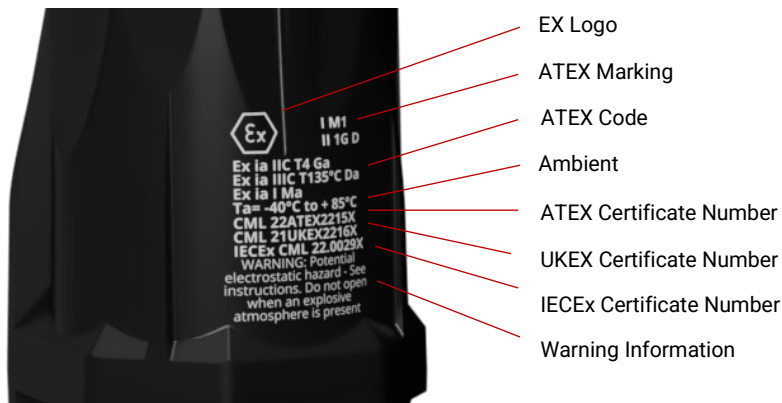


- CE Marking (nnnn included for ATEX version Only)
- WEEE Logo
- Model Number
- Manufacturer including Address
- UKCA Marking (nnnn included for ATEX version Only)
- Made in UK
- Contains FCC & IC Approvals for US and Canada
- Hardware Version Indicator

The model number, company information and regulatory compliance details for regions where the product is sold.

NOTE: This label and User Manual may be updated as new relevant region approvals are added.

2.3.3 Special Use Case Label – ATEX Version






- EX Logo
- ATEX Marking
- ATEX Code
- Ambient
- ATEX Certificate Number
- UKEX Certificate Number
- IECEx Certificate Number
- Warning Information

The ATEX version of this product contains modifications for intrinsic safety, that are not present in the standard version of the Kappa X™. The ATEX version will be supplied with the additional markings shown above, to distinguish the differences between the standard and ATEX products. The ATEX product will also be supplied with documentation containing certification details, including “Special Use Conditions”. Please ensure that this documentation is reviewed and

understood before installing product into industrial applications with explosive environments.

2.4 Gateway Identification

Wi-Fi/Cellular	Wi-Fi/Wired Ethernet	PLC (ProfiNet/Modbus TCP)
		
Single socket on bottom	Two sockets on bottom	Additional socket on left side

Gateway Key Features

- All gateways:
 - Work with all Kappa X™ variants
 - Are fully water and dust proof

Gateway Requirements

- Typically, one gateway per physical room or large piece of equipment
- One gateway will work with up to 30 sensors (range dependant)

2.5 Additional Equipment

Please ensure that you have the following tools available during the installation process.

- Tools to affix the gateway to a secure mounting position
- Cleaning supplies for removal of dirt and oil from mounting surface
- An Android, iOS Mobile or Windows Device to aid with software installation
- Paper clip for Wi-Fi installation (hardware mode setting)

For specific use case, please ensure that you have the following tools.

- Thread (or stud) mounting sensors:
 - M6 Tap (if stud mounting and no threaded hole exists)

2.6 Mobile Device Applications

Mobile devices can be used to speed up the installation process but are not required to complete any stage of the setup. It is advised to use a mobile device for Gateway Wi-Fi setup.

All applications are available on both the *Android Play Store* and the *Apple App Store*. Applications will work on the relevant devices:

- Any Android phone or tablet running **Android OS 9, 10, 11 or later**
- Any Apple phone running **iOS 13, 14, 15 or later**

Please download the following apps on your mobile device:

- "Sensoteq Install App"
- "Sensoteq Credentials App"
- "Sensoteq Configuration App"



Guided wizard for setup of all Sensoteq gateways and sensors



Selection of a WiFi network and credential setup on a Sensoteq WiFi Gateway



Changing the configuration of the Kappa X sensor to improve battery life or suit application

2.7 Setup Checklist

Please use this checklist to ensure you have everything you need when setting up your equipment.

Condition Monitoring

Item	Notes	Complete
List of Machine for Monitoring	It's useful to have an idea of the machines you want to monitor	
<i>(Optional) Machine Access</i>	<i>Do you have all that is required to access the machine? Escort, keys, ladder, or lift?</i>	<i>(Opt)</i>
<i>(Optional) Machine Safety</i>	<i>Are there additional requirements, such as lockout procedures or permits?</i>	<i>(Opt)</i>

Physical Equipment

Item	Notes	Complete
Gateway/s	One as required	
Sensor/s	One for each measuring point to be monitored	
<i>(Optional) Mobile Phone</i>	<i>Required for WiFi credential setup. Optional for install wizard</i>	<i>(Opt)</i>
Gateway Power Supply/s	One for each gateway with correct plug for your region	
Mounting Accessory	Either magnetic or stud mount (supplied)	
<i>(Optional) Mounting Tap</i>	<i>If planning to stud mount, then an M6 tap and spot facing tool may be required</i>	<i>(Opt)</i>

Infrastructure

Item	Notes	Complete
Power Source for Gateway	110 or 240v Socket Within 3 meters of gateway	
<i>(Optional) WiFi Password</i>	<i>If WiFi Install</i>	<i>(Opt)</i>
<i>(Optional) Firewall Setup</i>	<i>If WiFi or Wired Ethernet and firewall has good security</i>	<i>(Opt)</i>

3 Physical Installation Process

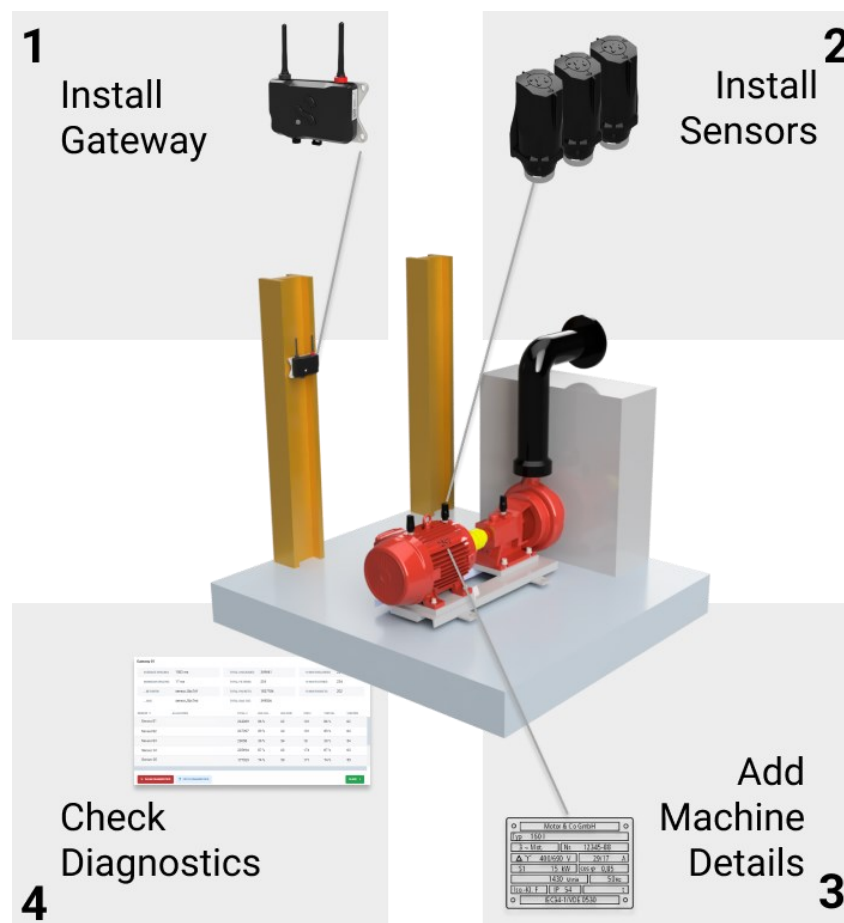
3.1 Installation Overview

The installation process for Kappa X™ sensor has been made as simple as possible for users of all technical ability.

The general process follows 4 main steps that ensure a successful install.

Process

1. Start by setting up and placing the gateway in a suitable location
2. Physically place the sensors on each machine and record the sensor ID against a location, either by using the recommended install app, or written copy
3. Write down, or record the machine details in the install app, including running speed
4. Check that the sensors are being successfully received by the gateway



3.2 Powering the Gateway

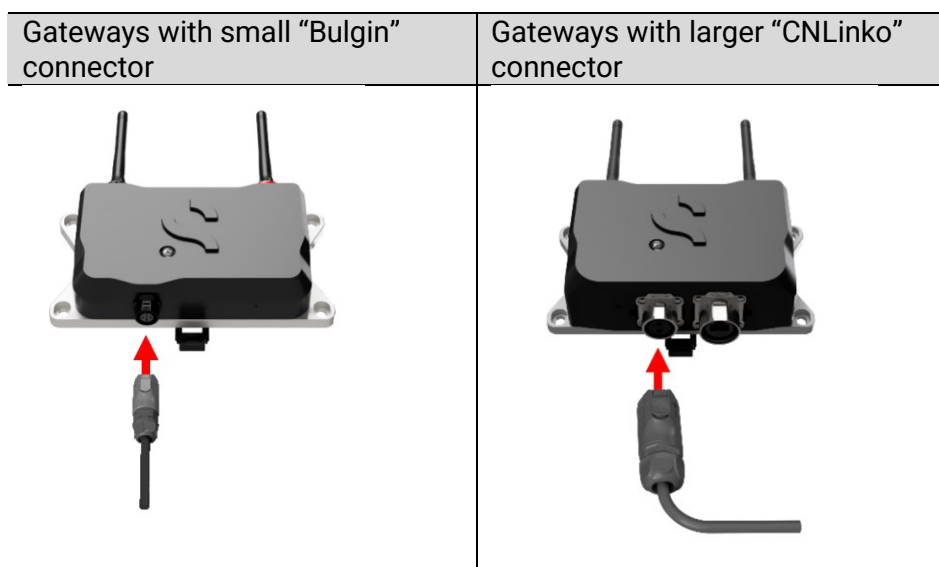
Ensure the correct voltage is applied to the gateway.

Voltage Range	9-24v
---------------	-------

Push the supplied connector into place for the specific type of gateway. Power supply connectors are a different shape and size to other connectors present on the gateway.

Process

1. Firmly press the connector all the way into the socket.
2. You will hear a “click” when the connection is successful.
3. The connectors are self-locking and for removal, require a toggle release button to be depressed.



Success Criteria

When the gateway is successfully powered, the LED will flash, pulse or remain a solid colour (to ensure power is ON, colour or sequence does not matter). The LED location is shown below.




3.3 Setup the Gateway

The primary step to setup the gateway is to ensure that it is connected to the cloud servers. Depending on the variant of gateway, this may require several different steps to get started.

3.3.1 WiFi

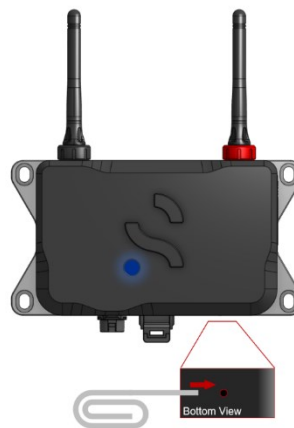
WiFi devices will require access to the Local Area Network (LAN) via a wireless Access Point (AP).

For LAN security concerns, please see DOC-00157_Network_Specification.

 **Info:** A paper clip is required to place the gateway into the required Mode.

Process

1. Power the gateway
2. Wait 1 minute for the device to boot
3. Place the gateway into "Listening mode"
 - Have a thin paperclip ready and folded out
 - Press the function button
 - It will "click" when activated
 - Hold function button for 1 seconds
 - The gateway LED will change to solid blue (no flashing), it is now in "listening mode"

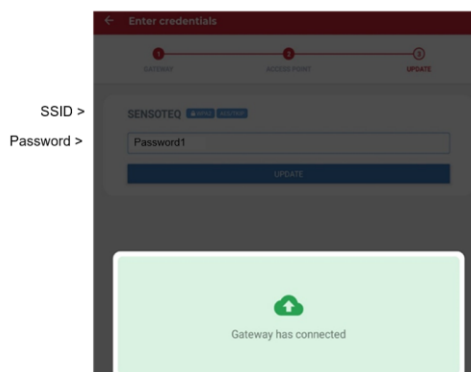


4. Continue the rest of the process using the Sensoteq WiFi Credential Application on your mobile device.
 - Download the Install app on your iOS or Android device
 - Search your app store for "Sensoteq Credentials"
 - Look for this icon:




5. Ensure Bluetooth is enabled on your device
 - a. Select the specific gateway from the list (as per the ID located on the gateway label)
 - b. Select your WiFi SSID as the Access Point
 - i. The SSID is the name of your WiFi network
 - c. Enter your WiFi password
 - d. Press update and confirm
 - e. WiFi connection process takes around 30 seconds

6. You will be shown the following message when it is successful



Success Criteria

The gateway LED will slowly cycle a “Cyan” colour. This indicates the gateway is successfully connected to Sensoteq’s Analytix cloud platform.

LED Colour	Description	Outcome
	Cyan Slow “Breathing”	Connected to Cloud Working as expected.

3.3.2 Ethernet

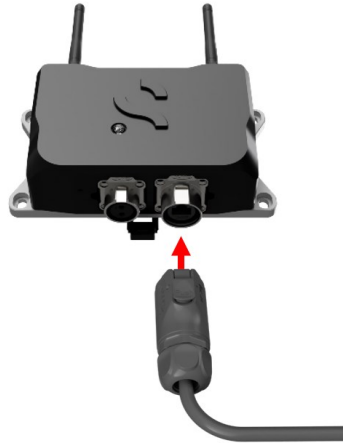
Wired Ethernet devices will require access to the Local Area Network (LAN) via wired connection.

For LAN security concerns, please see DOC-00157_Network_Specification.

i **Info:** The Sensoteq Gateway will only operate using a dynamically assigned IP address (from a DHCP server). Static IP addresses are not supported.


Process

1. Install the ethernet cable into the supplied waterproof connector.
 - a. The plug must be of RJ45 type.
2. Insert waterproof connector into the right-hand connector on the gateway.
 - a. You will hear a “click” when the connection is successful.
3. Power the gateway
4. Wait 1 minute for the connection



Success Criteria

The gateway LED will slowly cycle a “Cyan” colour. This indicates the gateway is successfully connected to Sensoteq’s Analytix cloud platform.

LED Colour	Description	Outcome
	Cyan Slow “Breathing”	Connected to Cloud Working as expected.

3.3.3 Cellular


Sensoteq Cellular Gateways come with a pre-installed global SIM card. This card will work in most countries across the globe. The gateway will automatically connect to the strongest network provider (MNO or MNVO) available.


Process


1. Power the gateway
2. Wait at least 10 minutes for the gateway to make a connection
 - a. This step can take up to 20 minutes depending on the network
3. Once a connection has been indicated as per the criteria below, ensure that the LED remains in this state for 5 minutes to highlight a good connection

Success Criteria

The gateway LED will slowly cycle a “Cyan” colour. This indicates the gateway is successfully connected to Sensoteq’s Analytix cloud platform.

LED Colour	Description	Outcome
	Cyan Slow “Breathing”	Connected to Cloud Working as expected.

 **Info:** Additional setup is required when using the Cellular gateway within Brazil – this is due to local regulations governing roaming SIM cards. Please contact your reseller or Sensoteq support.

 **Info:** Where cellular network availability is poor, Sensoteq can provide a range of additional options to ensure that the signal is at an adequate level

3.3.4 PLC TCP/IP Connection

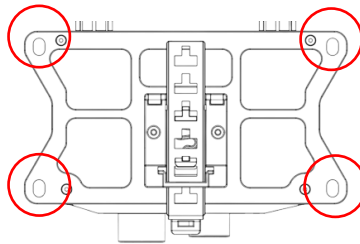
Please refer to the separate documentation pack related to the setup, install and software guidance for PLC gateways.

- DOC-01079 Gateway PLC Table Map
- DOC-01058 Introduction to Profinet Gateway
- DOC-01135 PLC Install Guide

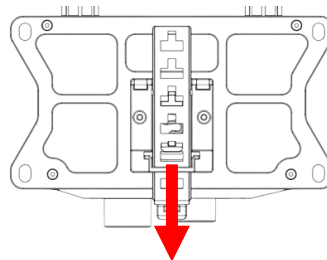
3.4 Installing the Gateway

3.4.1 General Guidelines

- Gateways are designed to be installed in a variety of settings
- Different mounting options are available:
 - Screw or bolts
 - DIN rail mount
 - Pole mount (optional accessory)
- To mount the gateway onto a flat surface, use appropriate fixings through the highlighted points



- To mount onto a DIN rail, pull down on the lower end of the central fixing and place onto the rail. When in the correct position on the rail, release the fixing.



Please ensure the gateway is securely mounted and shall not become loose under normal conditions.

3.4.2 RF Reception Guidelines

The product uses an RF communication protocol during operation. Consideration of a suitable mounting location will ensure the best connectivity performance.

Different factory environments will have different effects on the connectivity performance of the system, especially if there are excessive amounts of metalwork and/or high communication frequency noise floor.

Excessive metalwork or protective metallic equipment covers may have an adverse effect on the sensor communication.

- The gateway should be as close to the equipment being monitored as possible
- Place the gateway as high as possible above the level of the equipment
- Direct line-of-sight to the equipment works best, but is not essential
- Ensure no cables or other objects are close to or touching the antennas
- Attempt to maintain at least 50mm of free space around the antennas (A DIN rail top hat spacer can be supplied to achieve a 90mm clearance for extreme cases)
- Objects between equipment and the gateway
 - The gateway will still work with objects between the gateway and the equipment/sensors
 - The thickness, metallic properties and number of objects will have an impact on the ability of the gateway to receive signals from the sensors
- It may be necessary to move the gateway after the sensors are installed to ensure optimum signal strength

3.5 Installing the Sensor on the Machine

3.5.1 A Note about the Kappa X™ Sensor Design

The Kappa X™ sensor has been designed for capturing high frequency signals (up to 10kHz).

The base of the sensor is solid stainless steel and has a direct connection to the sensitive electronic components. Combined with a low product weight, the design guarantees the sensor itself will not impact the vibration reading.

The centre of gravity (CoG) for the Kappa X™ sensor lies directly at the location of the vibration accelerometer. This ensures no spurious vibration signals impact the quality of the vibration reading.

3.5.2 Guidance

Take time to evaluate the sensor mounting stability, if possible, utilise a dedicated mounting stud designed for condition monitoring.

Mounting a sensor on an unstable surface may cause the measured vibration signal to be inaccurate or attenuated.

3.5.3 Location/Placement

Typically, a Kappa X™ sensor will perform best when placed close to a bearing. Identify a suitable location based on the following:

- The structure is solid metal through to the bearing
- The location is the closest possible to the bearing
- Only the metal part of the sensor is touching the machine

Attempt to avoid placement on the following:

- Motor fins
- Motor fan covers
- Loose metal housing

3.5.4 Surface Preparation (Magnetic Mount)

For magnetic mounting, ensure that the surface is:

- Ferrous metal
- Clean from lubricants, dirt and other contaminants
- Free from unnecessary paint build-up
- Smooth and even

Where necessary, some cleaning or other preparation may be required.

3.5.5 Surface Preparation (Stud Mount)

Kappa X™ can be supplied with our proprietary stud mounting interface “Axy-Fix”. This unique stud nut has been designed to ensure that sensors orientation can be secured in the expected direction.

NOTE: This mechanism requires an internal threaded hole (M6) to be present on the equipment mounting location.

1. Insert the Axy-Fix into the base of the Kappa X™ sensor
 - Use thread locker and tighten with an allen key
2. Drill and tap an M6 hole at the specified location
3. Screw the exposed stud into the tapped hole (10mm deep)
4. Set the orientation of the Kappa X™ as needed (See section 3.5.6)

Once the orientation is set, try to have the depth of thread located with a small gap (e.g. 1mm) above and below the Axy-Fix nut.

5. Whilst maintaining orientation, twist the Axy-Fix nut clockwise to that it travels downwards towards the machine, until resistance is felt
 - Continue turning the nut past this point
6. The nut will now separate into two pieces, and the upper half will move towards the base of the sensor
7. Hand tighten the Axy-Fix nut with a clockwise motion to axially clamp the threaded screw, and apply a tightening force against the base of the sensor
8. Check the sensor orientation



Thread into mounting surface.

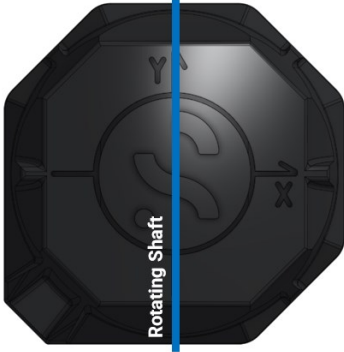
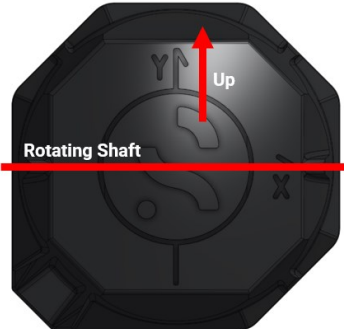
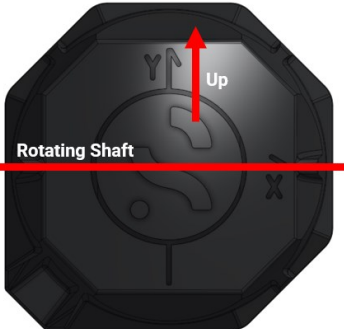
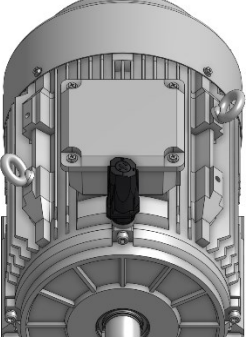
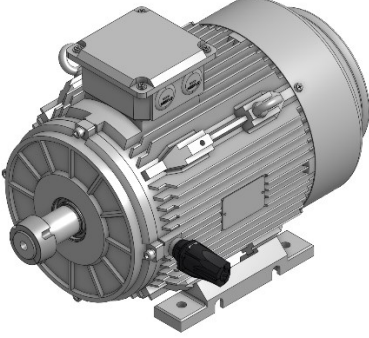
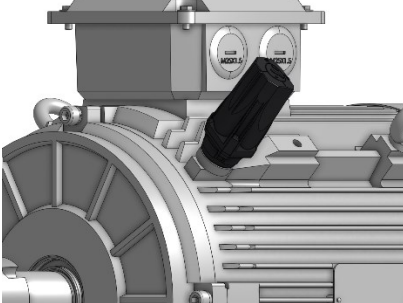
3.5.6 Sensor Orientation

Ensure that the orientation of the sensor is correct for the placement location on the machine.

It is essential to get the correct orientation so that data can be adequately assessed later.

If the sensor orientation changes it can impact the continuity of the data.

Please adhere to the following convention when mounting the sensor:

Top	Side	45° Angle
Install with Y axis in line with the drive shaft	Install the X axis in line with the drive shaft	Install the X axis in line with the drive shaft
		
		

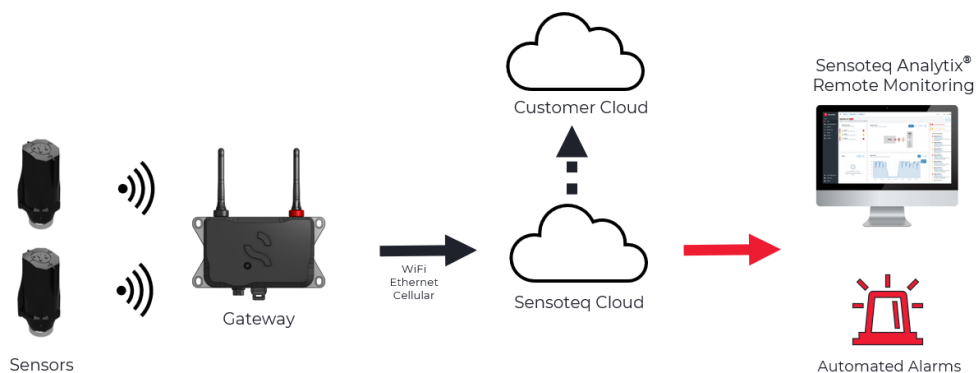
i **Info:** The sensor orientation can be selected during the software setup phase.


4 Software Setup

Sensoteq Analytix is a key part of the Kappa X™ product. It is the interface to the data that Kappa X™ produces. It is used to sort and store the data, provide a platform for the end user to view that data, and generate alerts if the levels go beyond set values.

4.1 System Architecture

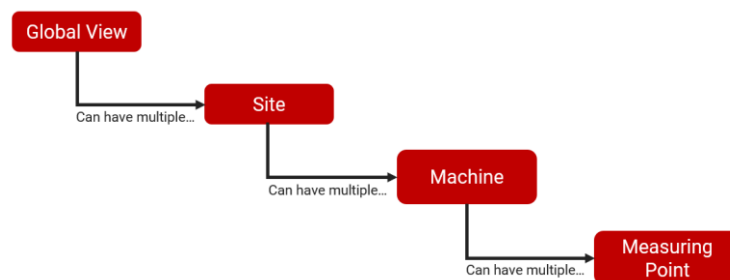
Many sensors can connect to one gateway (up to 30). Each gateway will communicate directly with the cloud platform, and the cloud serves the data to the user via the internet.




 **Info:** Other architectures are available (such as PLC)

4.2 System Hierarchy

The Analytix platform is structured in the following manner.




 **Info:** When a sensor is placed on a machine, it is then called a “measuring point”

4.3 Software Permission Levels

As a security feature, only certain users are permitted to undertake certain actions. Each user, no matter of permission level, will only have access to sites assigned to them.

Level	Actions
Partner	Site Creation, general admin
Site Administrator	User creation and management
Installer	System setup, maintenance, alarms
User	Viewing data, reporting, event handling


 **Info:** In order undertake the actions listed in the software section of this document, a user must have “Installer” level permissions or greater.

4.4 Software Setup Options

The system can be setup during any of the following phases:

- **Prior** to the installation of equipment
- **During** the installation of equipment
- **After** the installation of equipment

The preferred method is to setup the system **during** the physical installation of equipment, as this ensures that all the data correctly recorded and utilises the Sensoteq Install App for a fast and secure setup.

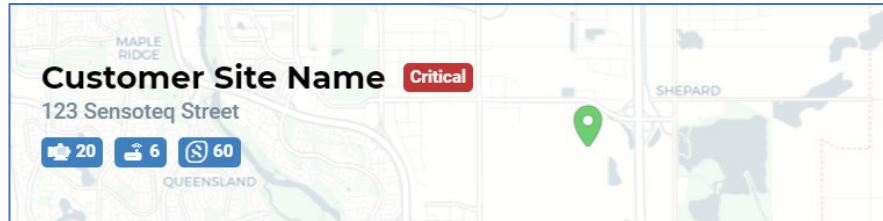
 **Info:** If setting up *before* the equipment is installed, then everything is organised on the Analytix platform, noted down and then the sensors and gateways are placed at the prescribed locations based on the pre-assigned IDs.

If setting up *after* the equipment is installed, then all the sensor and gateway are installed, details noted down and then everything is organised on the Analytix platform.

This step might be necessary if no internet connection is available, or mobile devices are not permitted within the install location. (For example: in explosive atmosphere environments)

4.5 Site Management

A site is the physical plant, mine, building or area that contains the machinery/equipment to be monitored. Sites contain a list of assets that are monitored by Sensoteq equipment. Access to each site is controlled by a list of users who are permitted to view the site status and data.



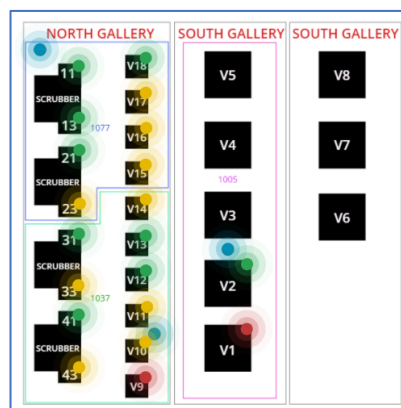
4.5.1 Site Details

Creation of a site is undertaken by Sensoteq Support or an authorised reseller. Please have the following ready ahead of the installation:

- Site name
- Site address
- Site location (Latitude and Longitude – required when the address does not clearly indicate the sites location on a map)

4.5.2 Site Map

As an optional step it is possible to add a site map into the Analytix platform. This can add a visual cue to the landing page for the site making it easier for the user to assess the sites condition.



4.6 System Setup using the Install App

4.6.1 Download the App

Before downloading the app please ensure the following:

- You have a valid Sensotek user account (for Analytix)
- You have the necessary installer permissions
- Your device has Bluetooth connectivity

- Download the Install app on your iOS or Android device
- Search your app store for “Sensotek Install”
- Look for this icon:



Warning: When downloading software from the internet, please ensure that the supplier or developer is listed as “Sensotek” or “Sensotek Ltd”.

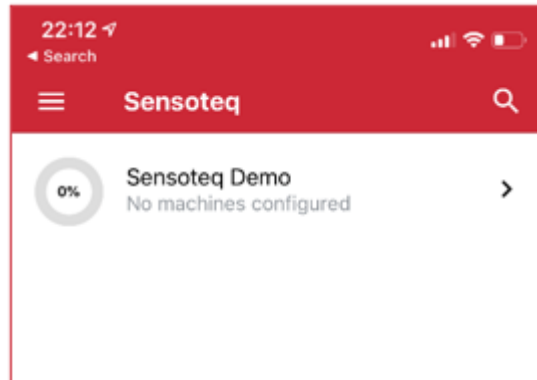


Info: The install app requires internet connectivity on the mobile device to operate correctly.

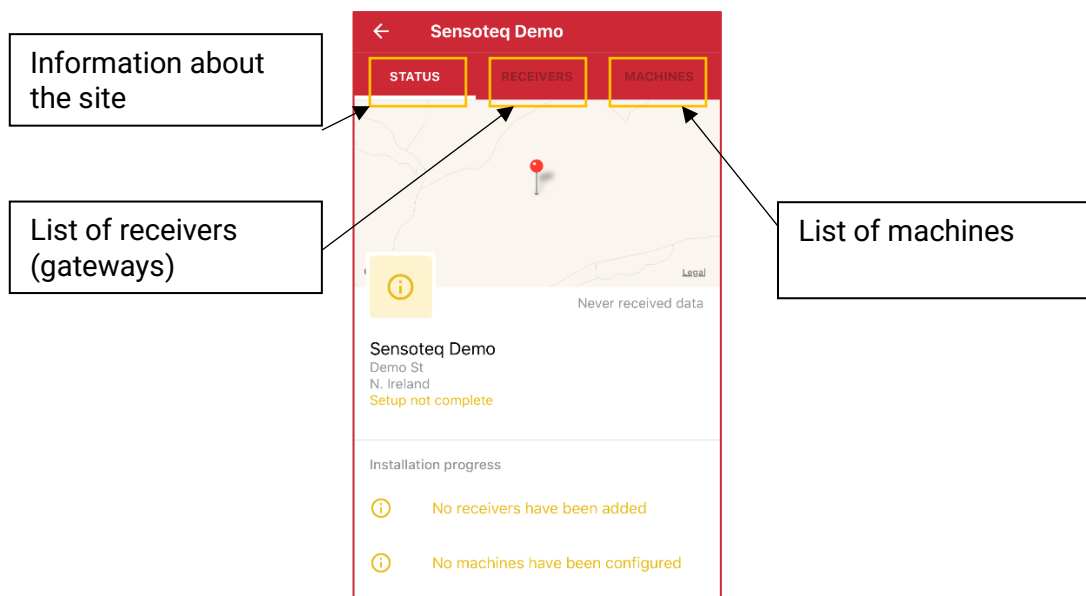
4.6.2 App Start-up & Site Selection

Process

1. Start the app on your mobile device
 - You will be presented with your assigned sites



1. Each assigned site will show you a percentage complete, informing the user of how many machines for each install has been completed
2. Select a site to start/continue the install process
3. Use the tabs to select different pages



Success Criteria

If the site is visible, then you have successfully logged into the app and have permission to view the site.

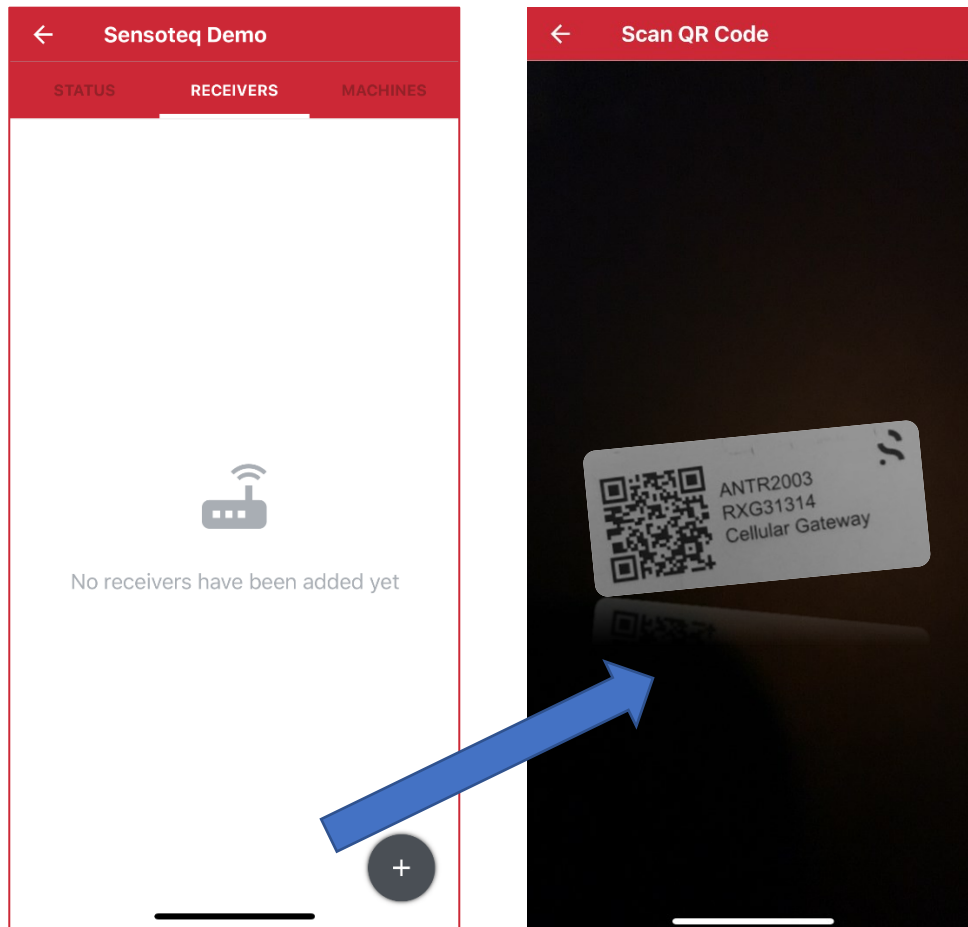
4.6.3 Assign Gateways to the Site

In most cases the gateways will be pre-assigned to the site during the site setup by Sensoteq or your authorised reseller.

Process

Use the Install App to add a new gateway to the site (if not already listed).

1. Select the Receiver tab to add/view gateways
2. Click the “Add” button
3. Scan the QR code on the side of the gateway



4. Repeat until all gateways have been added to the site

Success Criteria

- Once successful the gateway/s will now appear in the “Receiver” list
- They have been assigned and authorised for use on that site

4.6.4 Create Each Machine

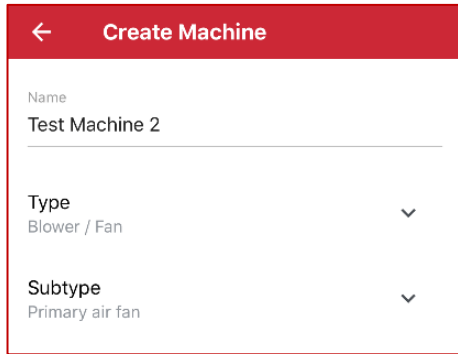
A machine is defined as one connected piece of equipment that rotates at a given speed.

A machine is separate to another machine if there is no mechanical connection between them. Each machine should be separated within the Sensoteq Analytix even if they are part of one larger machine system.

Process

Use the Install App to add a new machine to the site:

1. Select the Machine tab to add/view machines
2. Click the “Add” button
3. Enter the machine name
 - This could be an asset number or a more descriptive title
4. Select the machine type
 - If it’s not obvious which type it is, select “other”
5. Select the subtype
 - Subtype is based on the machine type
6. Click “Create Machine” to save changes



The options selected will set several parameters in the system that ensure alarm levels are appropriate for each installation. These options can be changed later.

Success Criteria

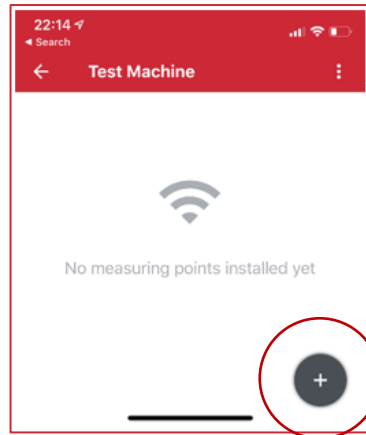
Once successful the machine will now appear in the “Machine” list.

4.6.5 Assign and Install Each Sensor

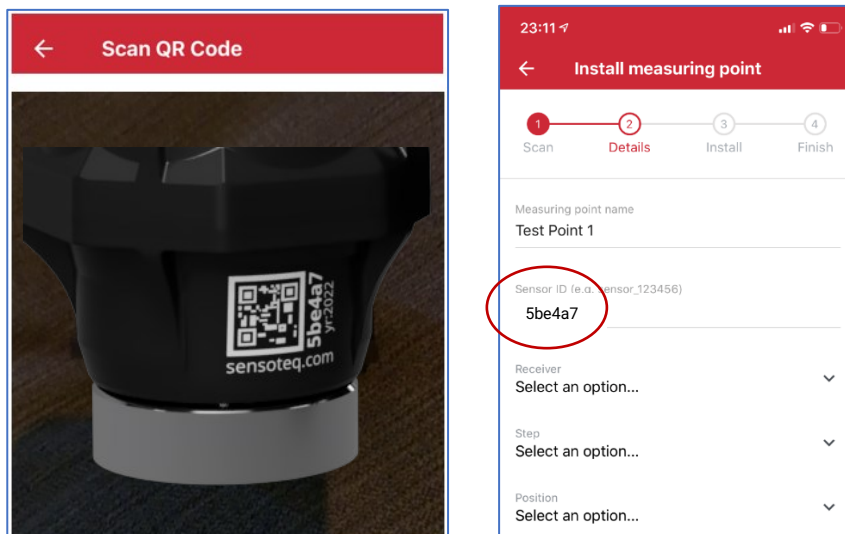
Before placing a sensor on the machine, you will need to assign it within the system. When a sensor is placed at a specific location on a machine, it is now called a “Measuring Point” within the system.

Process

1. Click the “Add Sensor” button



2. Either scan the QR Code or enter the code manually



5. Confirm the ID matches the one on the sensor label
6. Enter a name for the measuring point
 - This name is for the customer reference later – so it should reflect the customers understanding of the sensor location.

3. Select a receiver (gateway) to assign the sensor to
 - Ideally the closest gateway to the sensor
 - Gateway must be assigned to the site
4. Select the step
 - This is the part of the machine the sensor is being installed on
 - It could be the motor (the drive)
 - The end application
 - Or an intermediary step (such as a belt or gearbox)
5. Select the position
 - Drive End or Inboard (DE or IB)
 - Non-Drive End, Opposite Drive End or Outboard (NDE, ODE, OB)
 - Housing (housing that protects or guards the machine)
 - Support (structural support for the machine)
 - Other
6. Select “Next” to continue the installation
7. Physically install the sensor on the machine. (See section 3.5)
8. Take an image of the install when prompted by the App (the sensor should be mounted on the machine)
9. Add in the expected RPM at the measurement point. This value should be the maximum RPM the machine can run at when – please reference the motor name plate if unsure.
10. Select the Orientation based on the installation (See section 3.5.6)
 - Top
 - Side
 - Axial

Success Criteria

Once installed, all the measurement points on the machine will be viewable within the app

Sensors turn **green** when the gateway receives data from that sensor



Info: It can take up to 10 minutes for a sensor to show successfully on this screen

5 Product Maintenance

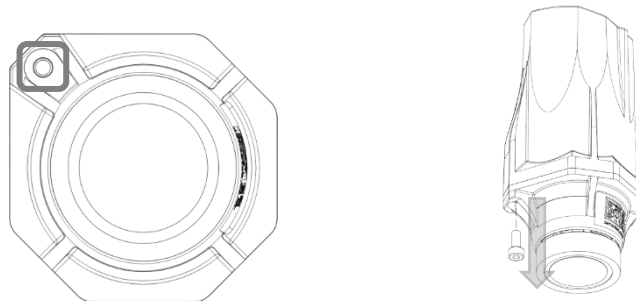
5.1 Battery Replacement

The Kappa X™ sensor is fitted with a 1/2AA battery, which will require replacement as part of the system's maintenance schedule. The time at which the battery should be replaced can vary based on the sensor's configuration and the ambient temperature of the operating conditions.

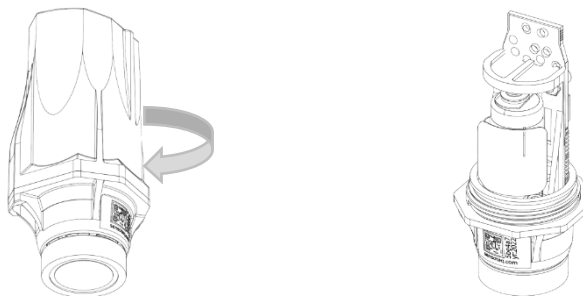
Please Note: The battery should only be replaced once the sensor has been removed from the monitored machine's casing.

To replace the battery:

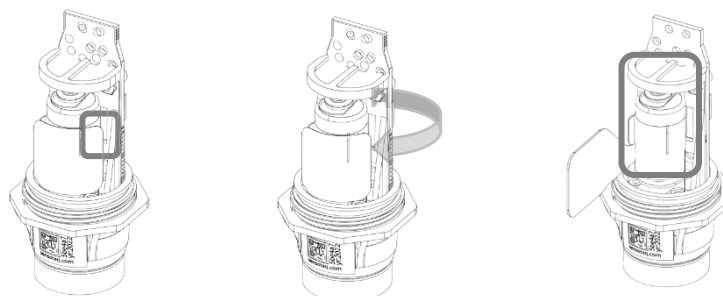
- Remove the locking screw located on the underside of the sensor casing (highlighted).



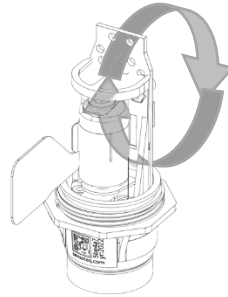
- With a firm grip on the lower case, twist the upper casing anticlockwise until it is fully detached from the threaded base. This shall expose the battery compartment (shown).



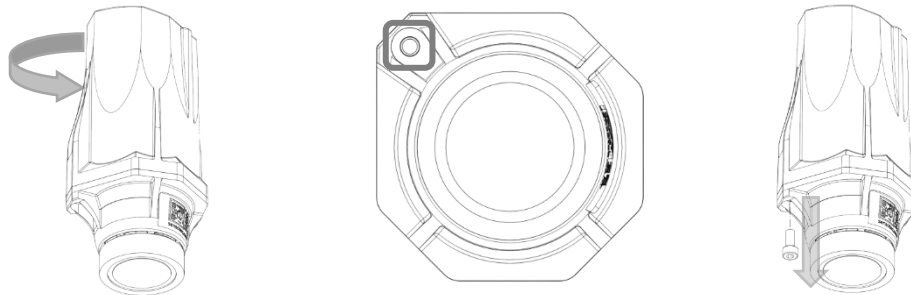
- Locate and undo the fastening for the NFC Antenna. Unwrap the antenna until the battery holder is fully visible (highlighted).



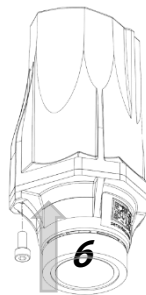
- Remove the current battery from the holder and insert the replacement vertically, with the anode (+) to the top. The battery should be secure within the battery holder when successfully inserted. Wrap and refasten the NFC Antenna around the front of the battery holder.



- Twist the upper casing onto the threaded base until the locking screw hole(s) are perfectly aligned. The edging of both casings should be flush with one another.



- Reinsert the locking screw until tight. The sensor can now be reattached to the machine casing.



5.2 Sensor Cleaning

As part of the machine's servicing schedule, it is advised that the Kappa X™ sensors are kept clean to avoid unnecessary 'wear and tear'. Using a damp cloth, wipe the outer casing to remove any unwanted residue or particulate. Use a second cloth to clean the 'point of contact' between the sensor and machine casing.

Please Note: Explosive environments require specific cleaning procedures, please refer to the ATEX certificate for the *Special Use Conditions*.

5.2.1 Pressure washing

Kappa X™ mechanical design has an ingress protection rating of IP69K. This makes it suitable for jet/power/pressure washing at ambient or elevated temperatures up to 85°C.

However, if the user has performed battery maintenance, then the ingress protection can only be guaranteed to IP65. The IP69K can be retained with support from Sensotek, or a trained installer.

5.2.2 Caustic cleaning

Kappa X™ chemical resistance is compatible with most industrial detergents or caustic cleaning solutions, if unsure, please contact Sensotek support with specific details.

6 Troubleshooting

6.1 Poor RF Reception

6.1.1 Gateway

- Ensure the gateway is at least 50mm away from any metal structure
- Move the gateway closer to the sensor(s)
 - Make sure this does not impact cellular or WiFi connection
- Add an additional gateway closer to the problem sensor(s)
- High gain antennas are available for special circumstances
- When installing the gateway in an external enclosure avoid metal or highly conductive enclosures. If using this type of enclosure it might be necessary to extend the antenna outside of the enclosure. Sensoteq can provide design assistance.

6.1.2 Sensor

- It is best not to move the sensor from its location – keep this optimal for vibration measurement

6.1.3 Factors Impacting RF Range

Please observe the following guidance when it comes to placing Kappa X™ sensors and locating gateways close to the equipment. Radio Frequency (RF) is term applied to any wireless technology used to transmit information.

Sensoteq Kappa X™ uses the *Sub-1GHz ISM Band* to send data between the sensor and the gateway. This frequency is well suited to industrial plant environments, as it remains battery efficient whilst maintaining a good range and transmissibility through a range of materials.

Green indicates the signal is good, blue indicates that the signal is being impacted.



The following list of typical conditions indicates what can impact the range of the sensor.

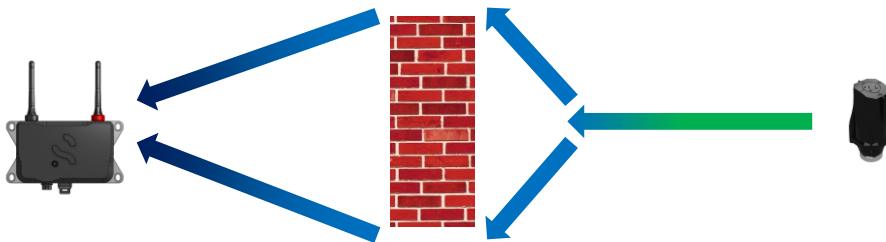
Line of Sight (LoS)

Direct line of sight between the sensor and gateway will work up to 250m in optimum conditions. As distance increase the RF energy will decrease.



Indirect or structural blockage

Any object that blocks the path from the sensor to the gateway will reduce the range. It is best to place the gateway on the same side of the structure as the sensor.



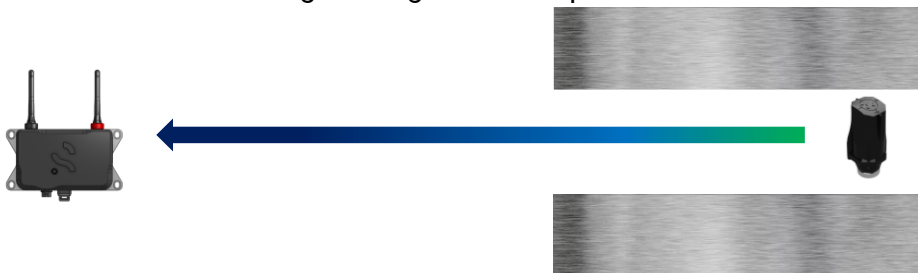
Sensor within protective housing

If the protective housing is made from plastic or a thin gauge metal with ventilation or other holes, then there is a good possibility that RF will be received outside the housing. Range will be impacted.



Line of Sight with metal surroundings






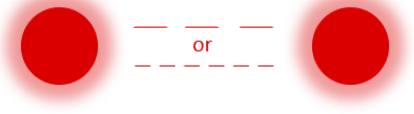
Any additional metal surrounding the sensor will attenuate the signal, even if you still have direct line of sight. Range will be impacted.



6.2 Gateway Mode Indication (LED)

The following chart indicates which mode the gateway is in.

Under normal conditions the gateway should be in “Connected to Cloud” mode, indicated by a slow breathing cyan LED.

Colour	Description	Meaning
	<i>Dark blue</i> Solid	Listening Mode No WiFi configured, please connect to the device and set WiFi credentials.
	<i>Cyan</i> Slow “Breathing”	Connected to Cloud Working as expected.
	<i>Cyan</i> Fast blink	Searching for Cloud The device is connected to WiFi and internet is available. Attempting to connect with Sensoteq cloud services
	<i>Bright Green</i> Fast blink	Searching for WiFi The device is attempting to connect to WiFi. If it remains in this state for more than 3 minutes please see your IT administrator.
	<i>Magenta</i> Fast blink	System: Firmware Updating The gateway is performing an update of its firmware. This is an automatic process.
	<i>Red</i> Fast blink or Slow Flash	System: Fault Detected The gateway will attempt to restart automatically. If this pattern persists, please contact Sensoteq.



Sensotek

Getting help and contacting Sensotek Ltd.

To contact Sensotek for sales, technical support, or customer service issues, see: www.sensotek.com/contact

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