



Industrial IoT Platform

Advantages for Energy Management / ISO 50001

Revision 3.0

For more information, contact sales@episensor.com

EPI-059-03

Introduction

EpiSensor's Industrial IoT platform makes it easier than ever to collect data, so people can make better decisions, reduce cost and improve energy efficiency.

Data produced by our platform can transform the efficiency of an organisation by providing insight into areas of waste that could not be achieved using traditional monitoring, control and automation systems.

Our focus is on ease of use, while meeting the highest standards of accuracy, security, scalability and ruggedness - which are essential for deploying in enterprise-class environments.

Our platform is trusted by some of the world's largest and most secure organisations in Europe, Australia, Asia, and North America.

Key Benefits

- Easy to install and maintain
- Can be deployed with minimal disruption to operations
- Fully wireless, fully secure
- Easy to expand in the future
- One platform supports many types of meters and sensors (electricity, water, gas, temperature, etc.)
- Enterprise class reliability and ruggedness

Key Features for Energy Management / ISO 50001

An overall reduction in energy usage across a portfolio can be achieved by following an ISO 50001 'workflow'.

ISO 50001 is a standard that defines the management process required to improve energy efficiency in an organisation. It is similar to well known standards such as ISO 9001 or ISO 14001, and provides a framework to measure performance, set targets, make decisions that improve efficiency, and then gauge the results.

If you decide not to pursue ISO 50001 certification, the workflow is still relevant for reducing energy consumption and cost, and it is important that the energy management system specified is capable of being used for ISO 50001 certification in the future.

The following section provides an example of a typical ISO 50001 workflow to assist in evaluating the features that an ISO 50001-capable energy management system should have.

This example is shown as a series of questions that an energy analyst would "ask of" a building in a portfolio.

Each question drills down into a higher level of detail. To achieve tangible energy savings, the energy management system needs to be able to support the following activity / workflow:

Question 1 - What is the energy usage per occupant of Building A in Switzerland vs. Building B in Germany?

Answer: Consumption per occupant in Building B is 1.3x higher than Building A

Question 2 - What is the reason for this difference?

Answer: Lighting in Building B accounts for 2x as much energy per occupant as Building A

Question 3 - If we were to put a control system in place, what could we expect to save?

Answer: Consumption in the lighting circuit in Building B was 1,204kWh in October 2016. We expect that configuring a control system will reduce lighting energy consumption in Building B by 40% with an ROI of 6 months - we should take this action.

Question 4 - Has the action we have taken reduced the energy usage per occupancy in Building B?

Answer: Energy consumption for lighting in Building B for November 2016 vs. December 2016 reduced by 10% after the control system was installed.

Question 5 - Why was the expected target not met?

Answer: Daylight hours in December reduced by 20% - with seasonal variation taken into account, lighting energy consumption in Building B reduced by 40% in line with expectations, resulting in a saving of €X, ROI of 5 months and an overall reduction in energy usage of 1% across the portfolio of buildings.

There are two key features that an energy management system needs to have to be an effective tool for following an ISO 50001 workflow:

(a) Granularity

- Can a user drill down into the energy consumption per floor, per comms room, or per lighting circuit?
- Can the same system take live feeds of data from a wide range of sources, like existing water/gas meters and environmental sensors?
- EpiSensor's platform has a wide range of sensors available, and can also interface to any 3rd party sensor using standard industrial communications protocols.

(b) Accuracy

- Is the data I have actual or estimated? If energy usage in a location is being estimated or inferred from the main meter data (i.e. appliance desegregation) this data is a guess as to what the energy consumption is, and is not appropriate for the ISO 50001 workflow above.
- If the data is not accurate, the savings achieved in a given location can't be verified.
- The only way to accurately measure energy consumption in a sub-circuit of a commercial building is to install an accurate electricity meter in that location.

EpiSensor's Industrial IoT Platform meets and exceeds the requirements above, which are essential to achieve meaningful energy savings.

Monitoring Electricity

EpiSensor's ZEM-6X product range is capable of monitoring electricity consumption in many types of commercial and industrial buildings. The meter is capable of monitoring circuits from 0.1A up to 6000A per phase.

The product comes pre-calibrated to Class 1 accuracy ($\pm 1\%$ of the actual value) and paired with a set of current transformers, is fully water and dust-proof and has integrated ZigBee wireless communications. The figure below shows a typical installation with the EpiSensor ZEM-6X meter installed inside an electrical distribution board.



EpiSensor meter installed in an electrical distribution board

For some main incoming supplies, EpiSensor pulse counters have been specified, which can interface to an existing utility meter and detect pulses, which represent an amount of kWh energy consumption. These products are also housed in IP67 waterproof enclosures, and have integrated wireless communications.

Monitoring Water & Gas

Water, gas, oil and other fluids are typically monitored by interfacing to a pulse output from an existing utility meter. For every litre, or cubic meter of fluid, a pulse is generated by the utility meter, and this signal is monitored and transferred over the wireless network to the EpiSensor Gateway.

There are two options for pulse counters; battery powered and mains powered. For interfacing to water and gas meters, where a mains power supply may not be available, the battery powered version of the product is usually best.

If for any reason the wireless network is not available, for example during a power outage on site, these units will continue to monitor the consumption, with capacity for approximately 2 years of data storage. Data will be uploaded to the Gateway automatically when connectivity is restored.

Expanding the system

EpiSensor's Industrial IoT Platform can monitor a variety of other parameters that might be of interest for future projects, such as temperature, humidity, CO2 levels, etc.

Additional sensors can be added to the system by non-specialised personnel - simply by pressing a button and "joining" a new sensor to the system.

When monitoring environmental data, alerts can be triggered, for example to send an email when the temperature or humidity in an office exceeds a set limit.



EpiSensor HTS-10 wireless temperature & humidity sensor

Wireless Infrastructure

EpiSensor's platform uses a mesh network topology, enabling large areas to be covered with a single wireless network.

Each wireless "node" needs only to communicate with the next closest mains powered device on the network - as opposed to a "star" network, where every device needs to connect back to a central location.



EpiSensor mesh network topology

EpiSensor's platform uses ZigBee Pro (IEEE 802.15.4) as its wireless communications standard, which was designed for transferring small amounts of data reliably in industrial and commercial environments. The wireless

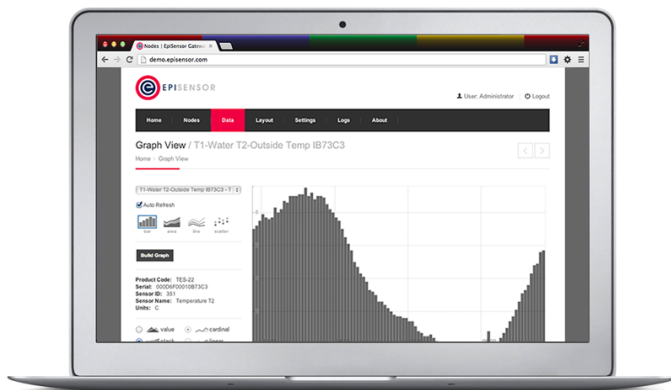
radios operate in the 2.4GHz ISM band, which is the same frequency as is used by Wi-Fi and Bluetooth, and can be deployed worldwide without a license.

Gateways

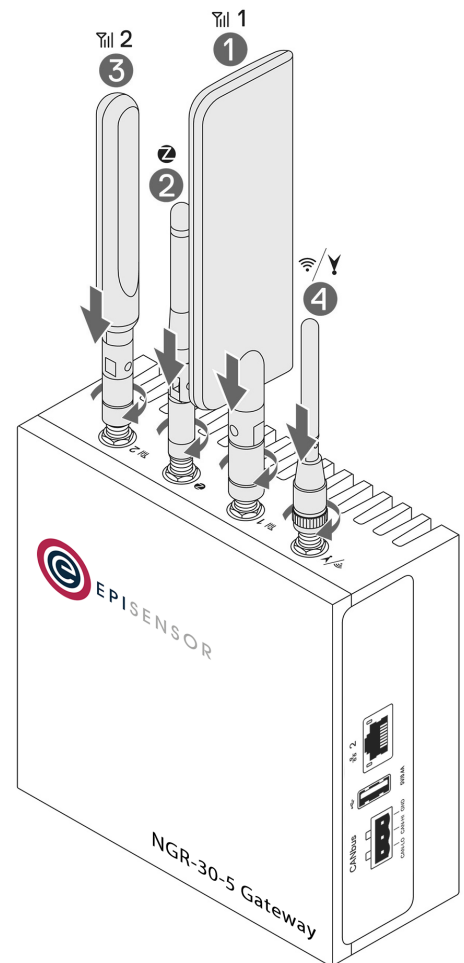
Each system will require an EpiSensor Gateway. This is a powerful embedded computer that manages the flow of data from the wireless sensors to 3rd party software applications where it can be archived, analysed and displayed on live dashboards and reports. EpiSensor currently has over 75 software integrations, and more are being added each month.

There are many features available on the Gateway for viewing live data, configuring how each sensor reports data, monitoring the status of the system, and troubleshooting issues during installation.

All of the Gateway's features can be accessed remotely from an easy to use web interface. Wireless sensors can also easily be moved between sites and Gateways if required.



EpiSensor Gateway with a screenshot of the live “data view” from the Gateway’s web interface



Range Extenders

Wireless coverage can be extended across large areas by using range extenders. Each EpiSensor range extender will provide wireless coverage for (on average) $1000m^2$ of a commercial building.



EpiSensor Range Extender, used to boost the wireless signal strength

Internet Connectivity & Security

To transfer data from the sensors and meters on each site to 3rd party software applications, a cellular modem can be used to provide an independent Internet connection, or the EpiSensor Gateway can be connected to the Internet via the local area network on-site.

There are a range of SIM card providers available, and they can be selected based on the best mobile phone coverage available on each site.

No remote access to the system is required by EpiSensor, and if maintenance work is needed, a session can be hosted and supervised by the end customer.

An architecture diagram for the EpiSensor platform has been included in Annex A.

Warranty, RMA & Support

EpiSensor offers a 365 day return to base warranty as standard on all hardware. If a problem is identified by the end customer, or an EpiSensor partner, we have a clearly defined process to report and escalate issues, so they are dealt with quickly and with minimum down-time.

EpiSensor's standard warranty terms have been included in Annex B, and our support terms have been included in Annex C.

Key Features

There are many features that distinguish EpiSensor's platform, but some of the highlights are as follows:

Sensor-level data logging

If for some reason the wireless network is not available, for example because some of the infrastructure has been powered off accidentally or for maintenance, each wireless device will switch into data-logging mode. Up to 70,000 time-stamped data points can be stored on the sensor device, which represents up to 2 years of data storage. When the wireless network is available again, each of the data points will be uploaded to the server in sequence. This feature means that data is never lost - a problem that can be associated with less advanced wireless systems.

Full range of sensors

Apart from electricity, temperature, water and gas sensors, EpiSensor provides a full product range that can collect data from any analogue or digital signal. This means the system can easily be expanded to application areas beyond energy, for audiences in production and health and safety. We can also interface to legacy equipment using Modbus or M-Bus communications protocols.

Waterproof enclosures

The majority of EpiSensor products are housed in waterproof polycarbonate enclosures. This means that there is flexibility to install the sensors indoors or outdoors, in clean or dirty environments. This feature also increases the reliability of the electronics dramatically.

Full ownership of data

Data does not flow through EpiSensor's servers, and is not stored by EpiSensor - the end customer will own all of the hardware and the data it produces.

Over-the-air firmware updates

EpiSensor's engineering team are regularly releasing new features and improving stability. The firmware of every wireless device, and the EpiSensor Gateway can be upgraded remotely to take advantage of any future updates that are released.

Fully secure

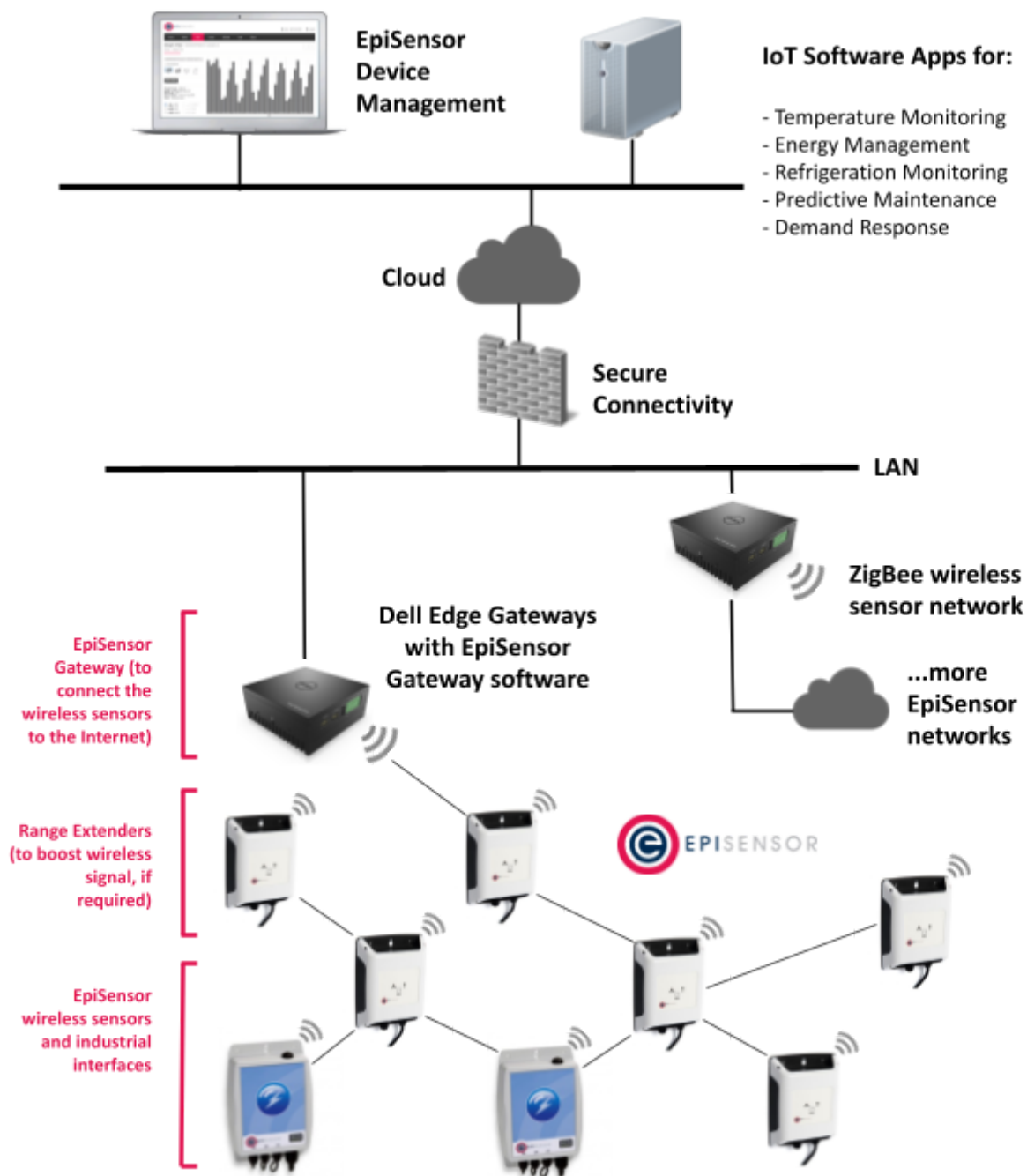
The architecture of EpiSensor's system means that no access to a customer's corporate network is needed. Data does not flow through EpiSensor's servers, and there is no remote access required by EpiSensor. The ZigBee wireless communications network is secured with 128-bit AES encryption, and communications between the EpiSensor Gateway and 3rd party platforms is also fully encrypted. This is important for a system that can contain sensitive data that relates to the occupancy of a building, the energy spend, or the environmental

conditions.

Annex A: EpiSensor System Architecture

EpiSensor's system makes the link from "sensor to server". The system can be linked with a variety of software applications, depending on user requirements.

At the lower levels, the system can also interface to many types of existing meters and industrial outputs. The following diagram shows the various layers in the system, with the layers that EpiSensor provides highlighted in pink.



Annex B: EpiSensor Warranty Terms

All EpiSensor products are provided with a 365 day limited warranty effective from the shipping/invoice date of an order. During the warranty period, under the conditions of normal use, EpiSensor will repair or replace any product that has a manufacturing defect. It is possible to raise an RMA request via EpiSensor's website. You will need to login or register for an account to use this feature. You can also contact us by emailing support@episensor.com

Warranty Terms

Repairs made by EpiSensor's support centre are warranted for the remainder of the warranty period. If a component is removed from a product during a repair and replaced, this will remain the property of EpiSensor. EpiSensor's product warranty does not cover accessories supplied with the product such as mounting kits etc, and does not cover replacement of batteries.

The return of an EpiSensor product during the warranty period does not necessarily mean that it will be repaired free of charge. Upon receipt of the product in question, EpiSensor will verify whether the conditions for application of the guarantee are met. If the defective product does not meet the criteria of warranty, the customer will be requested to bear the cost of repair and associated shipping costs.

For an RMA request to be processed, goods must be shipped in a securely protected shipping container or packaging. If EpiSensor product is received which is physically damaged, tampered with, altered and abused, the RMA request will be refused and warranty voided. Similarly, if a product has been installed incorrectly and damaged, for example connected to a high voltage that is out of specification for the product, this will not be covered under our warranty. If a product is installed in a location or environment that causes damage, such as in a wet, humid, hot or high/low pressure environment that is out of specification for the product, it will also not be covered by our warranty.

RMA Procedure

Before returning products to EpiSensor you must first raise an RMA request from the helpdesk section of the EpiSensor website. You will need to create an account and log in to access this section of our website. Please include as much technical information as possible in the request, and also the serial numbers of the hardware being returned. An RMA is valid for 15 days from the date of request – if this period has expired without returning the product, you will need to re-submit the RMA request form. All returns to EpiSensor must be freight prepaid.

All RMA returns must be received by EpiSensor before the expiration date of the warranty. Returned items diagnosed "No Problem Found" by EpiSensor technical support will be charged a shipping and handling fee of €80. Our standard RMA turnaround time is 30 days from the date of received goods.

Shipping Damage

If a product or shipment has been damaged in transit, please notify the courier, take a photo of the damaged packaging and contact support@episensor.com – EpiSensor will work with you and the courier to resolve the issue and replace the damaged product or shipment.

Annex C: EpiSensor Support Terms

EpiSensor aim to provide world-class support for our products by publishing all documentation, how-to guides and keeping our FAQ page up to date. Users can access our help-desk by registering for an account, logging in, clicking on Helpdesk and opening a support ticket.

Customers who use our systems in critical environments require a more flexible support and maintenance package, which we call premium support. The packages offer direct access to our engineering team to solve problems quickly and efficiently.

This support policy page defines what you can expect from EpiSensor's premium support. If you have any questions about our policies, please feel free to contact us for more information. We may amend this support policy from time to time, so you should check this page to ensure that you are aware of any changes that have been made. This support policy is effective from 1st November 2016. If you require engineering support but don't have an active support policy with us, we can provide an ad-hoc quotation – please contact us for more information.

Raising a support ticket

When you sign up for one of our premium support packages, your user account will be put into a special category depending on the package you have selected. The process of raising a support ticket and escalating an issue is the same for all packages, but the response times, communications channels available, number of Gateways covered and engineering hours vary.

Status and Ticket Type

When you submit a ticket, you will be asked to select a type such as Question, Problem, Feature Request, etc. A ticket will be marked as 'Open' until the support request has been concluded, when it will be marked as 'Closed'. Email notifications will be sent when a ticket has been received, replied to or updated by our support team. All support requests must originate from the helpdesk page as a support ticket.

Ticket Classification

Please include information on the severity of the issue when submitting the ticket so it can be prioritised accordingly. Problems or potential faults are classified as (a) Critical, (b) Major and (c) Minor. The class of each

problem is to be agreed mutually by the Customer and EpiSensor Support staff at the time of reporting the issue. The following general principles apply to the classification of issues.

(a) Critical

A Critical fault is defined as an error which makes impossible the performance of one or more critical functions of the system, i.e. the system or one of its major subsystems cannot perform the basic functions for which it was intended. This category is typically resulting in loss of data, and impacting on the reporting or other critical activity on a customer site.

(b) Major

A major fault is defined as one where there is a severe reduction in performance i.e. the system performs the basic function for which it was intended, but some major functions are impaired or the overall performance is reduced. Also in this category are faults that prevent data from flowing, but are not likely to result in data loss, and will result in a delay in reporting or data being produced.

(c) Minor

A minor issue is one which does not impair the performance or continued performance of any critical functions of the system. EpiSensor support staff will respond with a workaround or a plan to resolve minor faults, track reported bugs or suggest an alternative approach that resolves the issue.

Software Updates

We regularly release new versions of our Gateway software and we make these updates available to premium support account holders via our website. To request the latest Gateway software version, simply raise a ticket from the helpdesk and we will email you a download link for the Gateway software update. For information on applying these updates, see the Documentation section on our website. Software updates provided within your premium support account do not cover updates to ZAP or node firmware. Your engineering time allocation can be used to assist with deploying software updates.

Allocated Engineering Time

Premium support accounts are allocated a number of one-to-one engineering hours which can be used for troubleshooting system issues, training or advice on system design etc. If the allocation of engineering hours has been consumed within the year, the user will be notified and has the option of purchasing ad-hoc engineering time or upgrading the premium support account. All other features of the premium support account will remain the same, such as software updates and access to the helpdesk. If engineering time has not been consumed and the premium support account is renewed, the engineering time allocation does not carry-over to the following year.

Office Hours

Our normal support hours are Monday to Friday, 09:00 to 17:30 GMT excluding public holidays in the Republic of Ireland. We try to answer all support questions as quickly as possible, but response times will vary depending on the volume of requests we receive, and the complexity of your enquiry.

Glossary

“Electronic Communications” means any text, voice, sound, image or video message sent over an electronic communications network which can be stored in the network or in the recipient’s terminal equipment until it is collected by the recipient or on the recipient’s behalf;

Helpdesk means the service available within your account interface on our Website where you can raise support tickets and check status updates.

Software Updates means newly released version of EpiSensor Gateway software.

Live Chat refers to instant messaging services such as Skype and Google Hangouts.

Account Manager refers to an EpiSensor support engineer that will be assigned to manage your account.

Remote Support Sessions refer to remote desktop / screen-sharing sessions hosted by EpiSensor’s technical support team.