Smart. Wireless. Autonomous.

LoRaWAN®

WILSEN Sensors
for Intelligent Applications

Battery-powered, industrial-grade IoT sensor solution with LoRaWAN® for outdoor use.

Your automation, our passion.

PEPPERL+FUCHS

WILSEN Sensors

Wireless Remote Monitoring with a Rugged Communication Platform

Smart applications need a solid information source. The autonomous wireless IoT sensors in the WILSEN series create this source without a cable connection, e. g. for smart industry, smart city, smart logistics, smart environment, or smart farming. The measurement and diagnostic data is transferred to the internet using LoRaWAN.

Smart city | Smart farming | Smart environment | Smart logistics

Wireless IoT Sensors Bring Intelligence to the Forefront

WILSEN wireless sensors are designed for outdoor use in harsh conditions. The devices have proven their worth in industrial and municipal applications, reliably supplying data on level, distance, valve position, and object presence without a cable connection. Their lithium battery lasts for many years, and data transmission in the globally standardized LoRaWAN network is extremely energy-efficient. Time-consuming cabling for a power supply and controller is not required, and the devices can be used in many different applications.

WILSEN.sonic—Measuring Level and Distance

The WILSEN.sonic ultrasonic sensor measures the distance to liquids, bulk materials, or other objects. In the WILSEN.sonic. level version, for example, it monitors the level in collection containers and silos, typically at isolated locations. The WILSEN. sonic.distance sensor is used, among other things, to measure the level of rivers. A resolution of up to 1 mm, a programmable detection range, and adjustable measurement intervals mean that WILSEN.sonic sensors can be perfectly tailored to any application. They are available with detection ranges of 2.5 m, 4 m, and 7 m.

WILSEN.valve—Monitoring Valve Position

The WILSEN.valve is equipped with energy-optimized inductive sensors. Depending on the valve type and application, single or dual sensors are connected to monitor valve position and display changes. The device allows for the connection of either NAMUR or 2-wire low-power DC sensors. A ready-to-use mounting solution as per EN ISO 5211 is available as an option with mounting brackets, mounting plates, and complete mounting kits. This allows the system to be easily adapted to common valve and fitting systems.

WILSEN.node—Detecting Object Presence

In this case, the WILSEN platform can be used to combine different measurement procedures, e.g. up to two inductive or capacitive sensors to detect the presence of target objects such as shaft covers and transformer station doors. If a float or vibration limit switch is connected, a level can also be monitored, e. g. in a shaft. This configurable device is therefore suitable for many different detection applications. Either NAMUR or 2-wire low-power DC sensors can be connected.

For more information, visit
pepperl-fuchs.com/pf-wilsen

Systemically Rugged and Flexible

A powerful lithium battery reliably supplies WILSEN wireless sensors with power for many years. The device can be parameterized quickly and easily using a smartphone app or remotely using the LoRaWAN downlink channel.

Years of Uninterrupted Operation

WILSEN wireless sensors can be mounted almost anywhere without a cable connection. The measured data is transmitted wirelessly in the LoRaWAN network. The powerful lithium battery with a capacity of 13,000 mAh delivers a useful lifetime of up to 10 years. Depending on the frequency of data retrieval, this value can even be exceeded due to the energy-optimized technology. An online battery runtime calculator calculates the expected service life in the application with the relevant settings. After the operating time has elapsed, the battery can be replaced easily.

Easy Configuration with the WILSEN App

Configuration is simple with the free WILSEN app via Bluetooth® LE—the device can be commissioned on-site and configured precisely for the respective application. Using a tablet or smartphone, you can change the sensor settings, check process values, set transmission parameters, and view diagnostic information, among other things. The app is available for Android and iOS.

Highlights

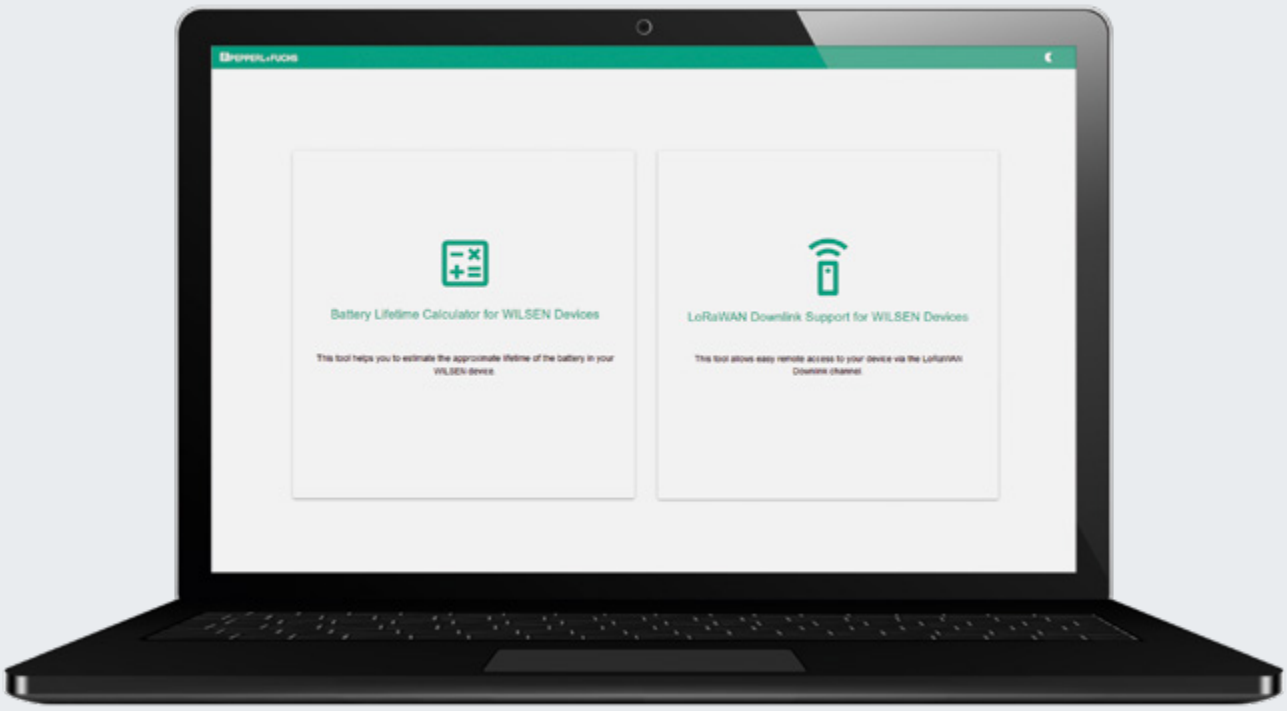
- Rugged wireless sensors, ready for use in harsh environments
- Globally standardized LoRaWAN network for efficient, long-range signal transmission
- Maintenance-free runtimes of several years due to high-performance lithium battery with 13,000 mAh
- Easy device and system configuration via downlink channel, mobile app, and free web services

Easy Operation Using the Downlink Channel

Once integrated into a LoRaWAN network, the downlink channel provides remote access to the parameter settings in the sensor. The free downlink support tool helps to compile and send messages based on hex codes. Downlink payloads can be created with just a few clicks and sent to the send queues of the connected IoT platforms. The hex code can also be copied and pasted and sent manually. The downlink reply decoder facilitates easy decoding of the sensor's received response messages.

Measurement and Diagnostic Data from Outdoor Areas

In addition to the actual measured values, WILSEN sensors also record the geo-position using GPS if required. This makes location-based applications possible, such as mobile silos and containers, as well as locating a device requiring maintenance. Temperature values and battery charge status are also transmitted and can be used for efficient maintenance planning. The rugged outdoor housing with IP66/67 degree of protection and the extended temperature range (–25 to +70 °C) allow operation in harsh outdoor conditions.



Technology—LoRaWAN

Low Power Consumption, Long Detection Range

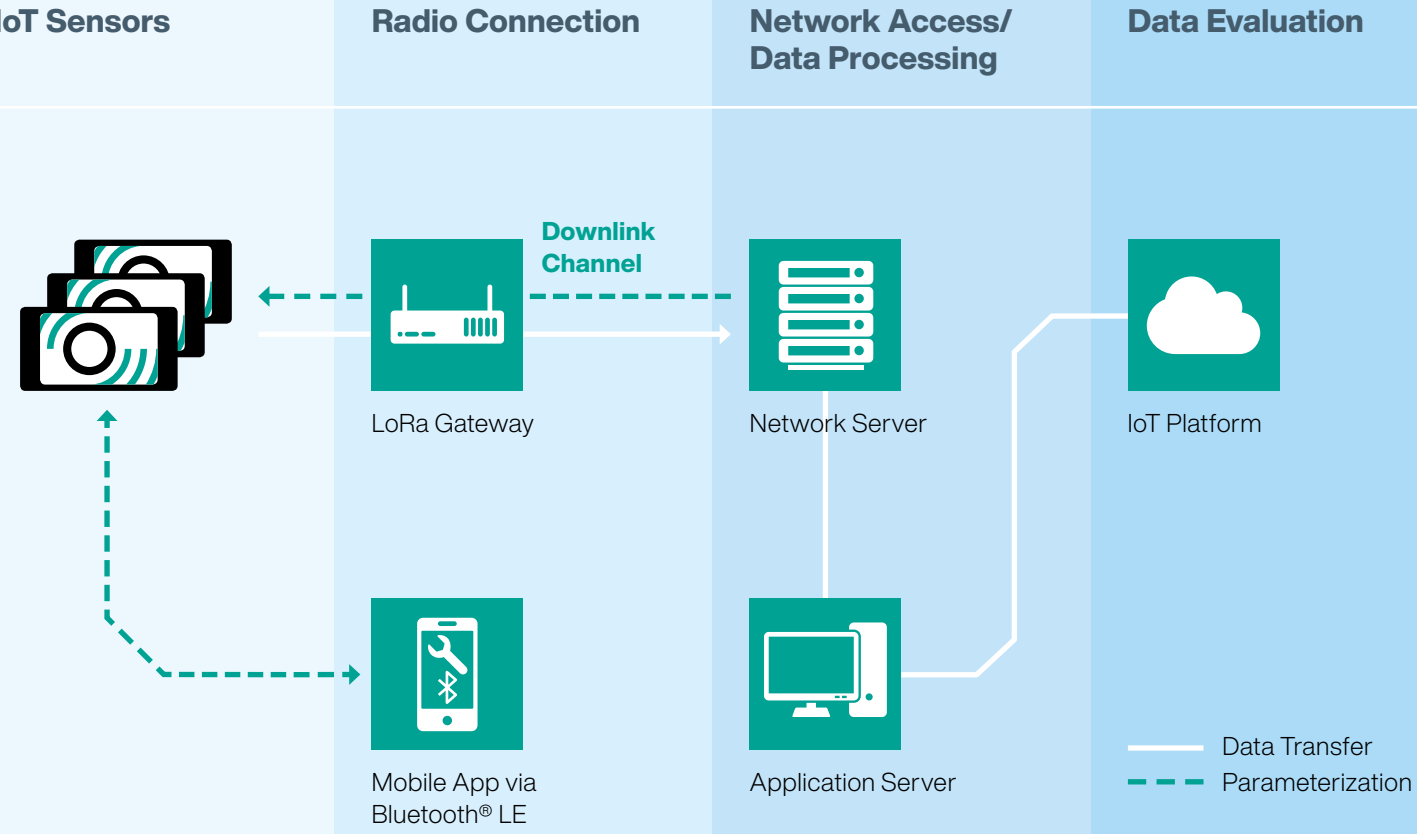
WILSEN sensors use a Long Range Wide Area Network (LoRaWAN), which is available at the respective location, to communicate with the assigned IoT platform. These easily scalable IoT networks provide a long detection range with low power consumption for data transmission.

What is LoRaWAN?

The Long Range Wide Area Network was specifically designed for the Internet of Things (IoT). It is a low-power wireless technology (LPWAN) designed for transmitting status data; the transmission of the radio signals requires very little energy. A typical LoRaWAN architecture consists of IoT end devices such as sensors and long-range gateways arranged in a star shape.

The gateways translate the sensor data into an Ethernet-capable communication protocol and transfer the converted information to the LoRa network server. The server decrypts the data and forwards it to the application server for initial processing. The actual evaluation takes place on the assigned IoT platform.

LoRaWAN®



Bidirectional Communication

The LoRaWAN connection using network servers and gateways enables bidirectional communication between the sensor and the IoT platform. WILSEN devices can be conveniently parameterized via remote access on the downlink channel. Pepperl+Fuchs offers a free web service for this purpose. It supports the user in compiling and sending such messages which are based on hex codes.

Optimized for Good Connectivity

LoRaWAN provides optimal conditions for connecting autonomous field devices:

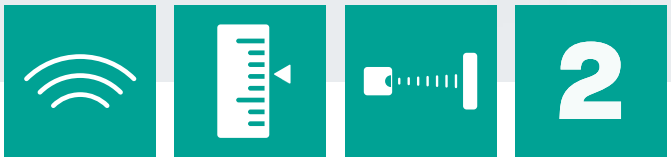
- Up to 15 km transmission range in open field
- Very good penetration of building walls
- Wireless transmission with minimal transmission energy
- Authentication and end-to-end encryption
- Manufacturer-independent, available worldwide, license-free frequency band

LoRaWAN enables the construction of extensive wireless networks with little effort. It is suitable for municipalities and private networks on company premises. Pepperl+Fuchs is a member of the international LoRa Alliance, which ensures global interoperability. Depending on the importance of the transmitted sensor messages, they can be sent either “unconfirmed” or “confirmed” in the LoRaWAN network.

WILSEN.sonic

Smart Monitoring of Levels and Distances

WILSEN.sonic sensors reliably detect and transmit level and distance in challenging environments. They do not require an external power supply or a cable connection to the controller. The devices are optimized for industrial and municipal applications.



Technology: ultrasonic | Level measurement | Distance measurement | Two versions

Maximum Reliability

The WILSEN.sonic provides reliable and precise measured values using ultrasonic sensors. Detection is independent of the surface structure, color, and material properties of the target object. This is not detected by the sound beam at specific points, but rather over a wide area. The detection is not affected by external influences such as precipitation and dust, nor by contamination of the sensor itself. Two versions are available:

- WILSEN.sonic.level for level measurement (level value as a percentage, distance in mm)
- WILSEN.sonic.distance for distance measurement (distance in mm, amplitude strength of the object echo)

Always Tailored to the Application

The diameter of the sound beam can be changed without any loss of detection range. For example, it can be directed toward the target area through narrow openings or past interfering components. Reliable measurement is possible without time-consuming changes to machines and equipment. The evaluation algorithm can also be adjusted. For example, the formation of an average value from several measurements can be specified to compensate for fluctuations and outliers. Depending on the model, application-based filters and algorithms are also available.

Excerpt from Technical Data	WS-UCC2500-F406-B41-01-02	WS-UCC4000-F406-B41-01-02	WS-UC7000-F406-B41-01-02	WS-UCC2500-F406-B41-01-02-Y	WS-UCC4000-F406-B41-01-02-Y	WS-UC7000-F406-B41-01-02-Y
Sensing range	150 ... 2,500 mm	250 ... 4,000 mm	500 ... 7,000 mm	150 ... 2,500 mm	250 ... 4,000 mm	500 ... 7,000 mm
Version	WILSEN.sonic.level			WILSEN.sonic.distance		
Sensing principle	Ultrasonic diffuse mode sensor					
Power supply	Replaceable high-power lithium battery, service life up to 10 years 3.6 V, 13,000 mAh					
Interface	LoRaWAN					
Frequency band	EU868					
Degree of protection	IP66/67					
Temperature range	–25 °C ... +70 °C					

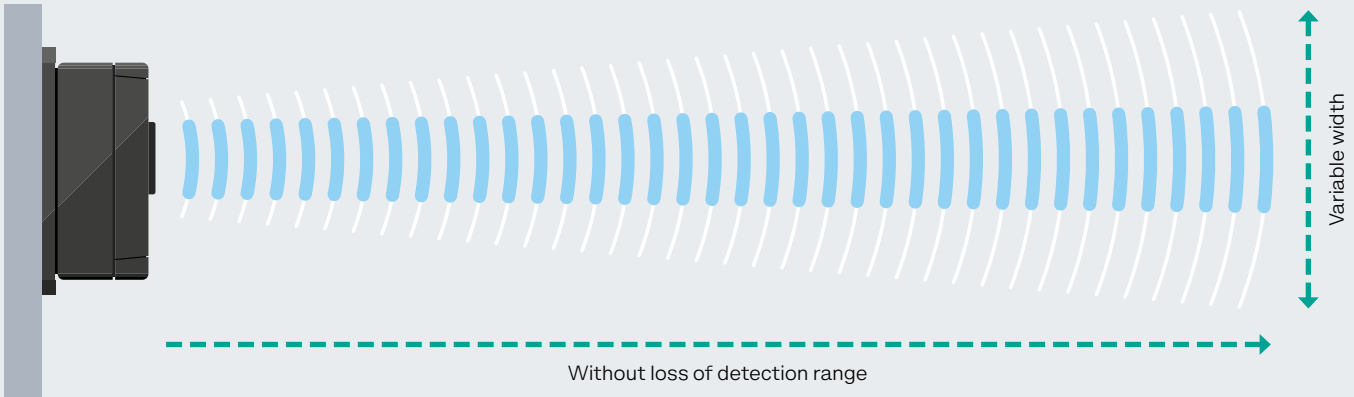
Millimeter Precision

The sensor measures with millimeter precision. This high resolution is required, for example, to measure the level of bodies of water in order to make accurate predictions about the risk of flooding. The measurement and transmission intervals can be set in the device, with the optimal values for the respective application. The smallest possible measurement and transmission interval is 10 minutes. This allows short-term changes in levels to be monitored in heavy rain, for example.

Highlights

- Industrial-grade wireless IoT ultrasonic sensor for level and distance measurement
- Maximum precision due to high resolution and adjustable measurement interval
- Adjustable sound beam and evaluation algorithms for adaption to the respective application
- Unmatched ultrasonic expertise: our sensor solutions meet current and future challenges

Individual Modification: Adjustable Sound Beam Width



For more information, visit
pepperl-fuchs.com/pf-wilsen-sonic

WILSEN.sonic in Use

Smart City and Smart Environment

With its high-precision resolution and adjustable measurement interval, the wireless IoT sensors in the WILSEN.sonic series open up a whole new range of possibilities that enable smart municipal facilities and environmental monitoring as well as automated processes.

Perfect Cycle for Waste Disposal

Maximum efficiency is of great importance in municipal waste disposal for several reasons. For example, the timely emptying of recyclable material collection containers helps protect the environment while preventing overflowing containers from creating an impression of neglect. At the same time, however, unnecessary journeys to half-empty containers should be avoided—for ecological and economic reasons. The increasing shortage of skilled workers also requires the most economical and targeted use of personnel.

Fitted with a WILSEN.sonic, the container itself reports that the next emptying is due shortly. The control center receives the information required for optimal route planning. The waste glass, used clothing, and recyclable material containers are only emptied when they are filled to a certain level. Unnecessary journeys, emissions, traffic jams, and noise in the city area are avoided, while costs are reduced. This concept can also be used for recycling containers on large corporate sites.

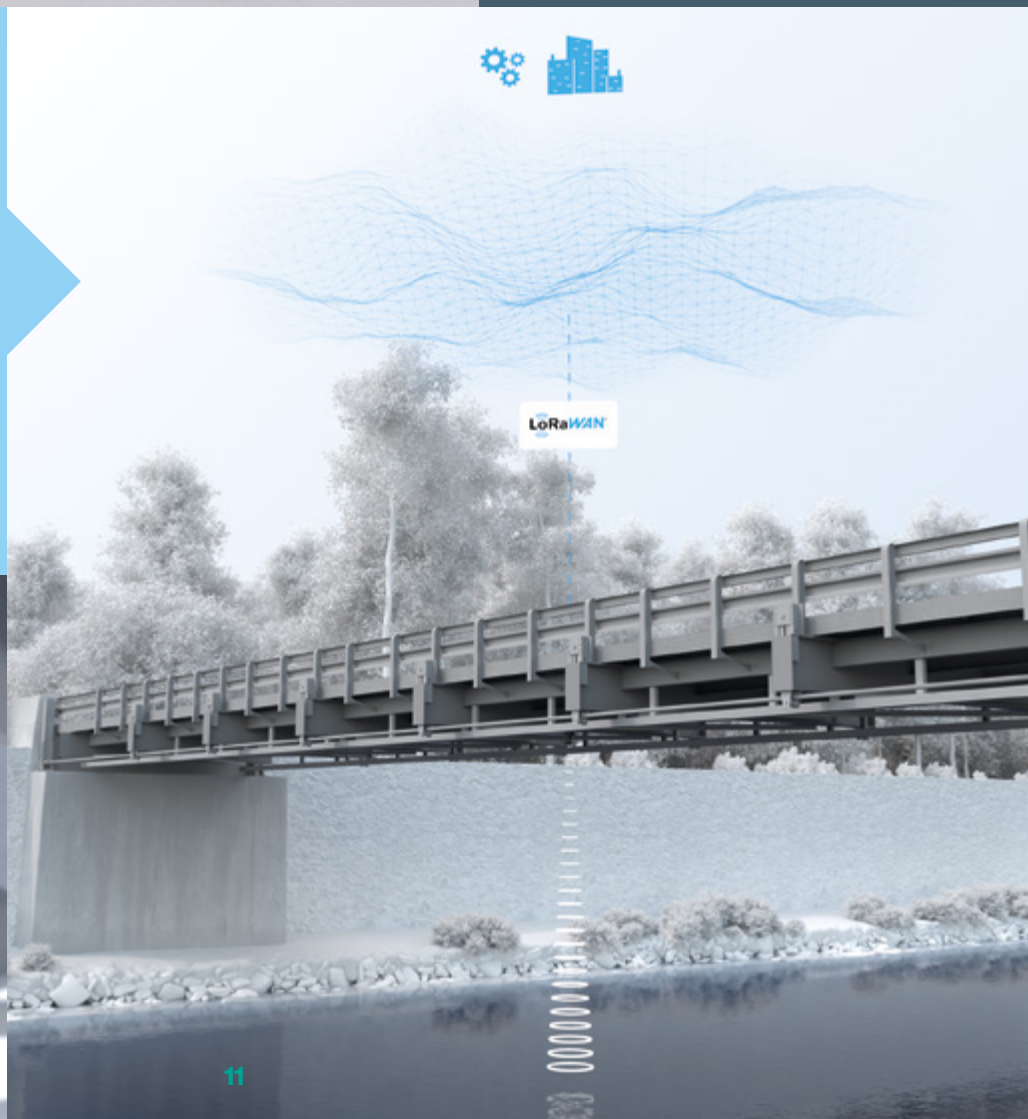
Targeted Action for Flooding

Climate change means that the number of heavy rainfall events is increasing. Large-scale flooding is one of the biggest risks to the population and buildings in many areas close to rivers. More accurate and up-to-date monitoring of levels results in more effectively targeted action taken against the dangers of flooding.

WILSEN.sonic sensors can even monitor water levels in remote locations. Since the devices transmit not only the measured value but also their respective geo-position, the data from different sensors can be spatially assigned and linked to form a detailed situational picture. Close monitoring, together with historical and current weather data, makes precise forecasts possible. The measurement and transmission interval of the sensors can be adjusted based on weather data or other triggers, minimizing transmission in normal situations to a few measurements per day to further extend the service life of the long-life batteries. If the risk of flooding rises, the monitoring frequency can also be increased.

Smart City

Smart Environment



Smart Logistics and Smart Farming

The WILSEN.sonic supplies up-to-date level data from containers, tanks, and silos in any location at any time. The devices therefore make new, smart applications possible as well as automated processes in logistics and agriculture.

Mobile Containers, Remote Locations

Ultrasonic sensors detect the surface of bulk materials and liquids. This allows them to display the level in containers with any content and a wide range of designs without time-consuming wiring and complex system integration. Transport containers and remote storage units can also be monitored. The detection range of the WILSEN.sonic devices can be selected to suit the type and size of the container.

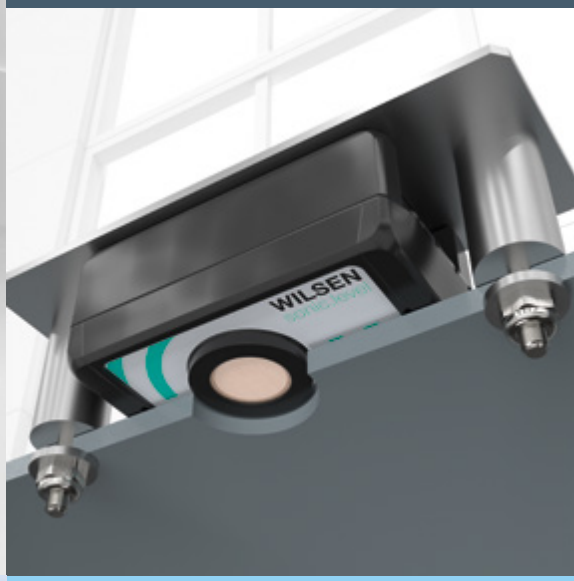
The version with a sensing range of up to 2,500 mm is ideal for compact intermediate bulk containers (IBCs). The device with a detection range of 4,000 mm is suitable for medium-sized containers, while the device with a detection range of 7,000 mm is ideal for larger containers and silos. The high degree of protection (IP66/67) reliably shields the sensors against liquid, gaseous, and dusty substances that are present in or form in the containers. The rugged ultrasonic measuring principle ensures reliable detection even in the event of strong interference such as dust, mist, and the formation of dirt films on the sensor.

Silos in Agriculture

The classic method of checking the level of agricultural silos is often still a heavy blow to the outer shell. The acoustic resonance then enables an assessment of the level to be made. This process is as inaccurate as it is unreliable and carries the risk of accidents on ladders in large silos, which only provide meaningful sound information near the top. Retrofitting a conventional level sensor with a cable connection is too expensive or impossible in most cases. In addition, many types of sensors are sensitive to dust and dirt and are not suitable for this application.

Ultrasonic sensors, on the other hand, are virtually immune to dust and dirt. The WILSEN.sonic does not require a cable connection and can be very easily mounted in the headroom of a silo using the supplied mounting plate. From there, it continuously transmits the current level data wirelessly. Due to its wide temperature range of –25 to +70 °C and IP66/67 degree of protection, the sensor withstands temperature fluctuations in the silo as well as cleaning with water.

Smart Logistics



Smart Farming

WILSEN.valve

Position Information for Manual Valves

Many process engineering plants use manual valves that are only operated occasionally or in emergencies and are not connected to the control room. The WILSEN.valve IoT sensor monitors the position of these valves and reports this wirelessly to the responsible authority.

Technology: inductive

Valve position feedback

Mounting kits available

4

Four versions

Simple and Reliable

The WILSEN.valve detects the position of up to two valves with single or dual inductive sensors. Energy-optimized sensors can be selected from a very wide range to suit the valve type and application. They feature a NAMUR or 2-wire low-power DC connection. The WILSEN.valve also sends diagnostic data and reports fault states such as short circuits and lead breakage. The direct transmission of the valve status means that evaluations of the individual sensor states and assignment of them to the respective valve status are not required on the IoT platform.

Quick Installation

The sensors are connected to the central processing unit by means of standardized M12 connectors. This makes initial installation and sensor replacement very easy. An off-the-shelf mounting solution as per EN ISO 5211 is also available as an accessory. It includes mounting brackets and plates as well as complete mounting kits and allows the system to be adapted especially quickly to most valves and fittings to minimize installation costs. The cable length between the central processing unit and sensors can be freely selected up to 10 m.

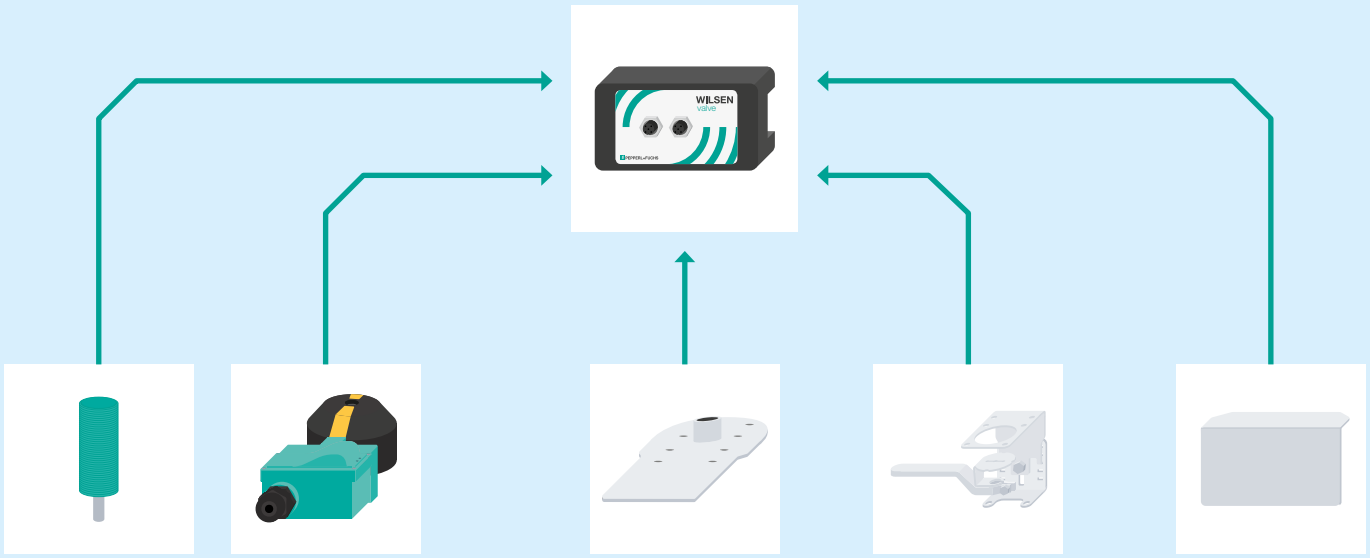
Excerpt from Technical Data	WS-VAL-2N-F406-B41-01-02	WS-VAL-2N4-F406-B41-01-02	WS-VAL-2ZL-F406-B41-01-02	WS-VAL-4ZL-F406-B41-01-02
Sensor types that can be connected	NAMUR single sensors	NAMUR dual sensor(s)	2-wire single sensors	2-wire dual sensor(s)
Power supply	Replaceable high-power lithium battery, service life up to 10 years 3.6 V, 13,000 mAh			
Interface	LoRaWAN			
Frequency band	EU868			
Degree of protection	IP66/67			
Temperature range	–25 °C ... +70 °C			

As Often as Necessary and as Infrequently as Possible

The user decides when the sensor measures and transfers data. The intervals can be set so that this happens as often as necessary and as infrequently as possible to maximize battery life. Intervals between 10 minutes and 24 hours can be selected for regular transmission. Additional event-dependent monitoring checks the states of the connected valves at selectable intervals between one minute and 24 hours. A message is only sent when the status changes, providing prompt information about the change.

Highlights

- Industrial-grade wireless IoT sensor for valve position feedback
- High signal reliability via diagnostic data and sophisticated NAMUR and 2-wire DC sensors
- Easy installation and high cost efficiency due to standardized mounting concept
- Maintenance-free operation of many years with adjustable regular and event-based monitoring interval



For more information, visit
pepperl-fuchs.com/pf-wilsen-valve

Location-Independent Intelligence

In addition to process-relevant information, process engineering plants often require additional information to optimize production processes. As an M+O (monitoring and optimization) sensor, the WILSEN.valve provides this information regardless of location, operating environment, and valve type.

Constant View of the Valve Position

Monitoring the end position and feedback of the valve position of drain and distribution valves provides important information for optimizing processes in production. Additional information prevents the waste of process heat or products, since accidentally opened valves can be quickly identified. The WILSEN.valve detects the valve position using an inductive dual sensor with two inductive sensor elements, one for each of the two end positions (open/closed). They monitor the position of the actuator and therefore detect the position of the valve. This concept minimizes installation and maintenance. The inductive detection is noncontact, wear-free, and extremely durable. In contrast to magnetic detection and other detection methods, it is also impervious to interference.

The WILSEN.valve can be mounted directly on the fitting with a sensor and actuator, from where it reliably detects the valve position and transmits it to the desired target system over a distance of several kilometers using LoRaWAN. An alarm or a follow-up action is triggered in defined cases. The previously “silent” manual valve is integrated into the smart communication with the control system.

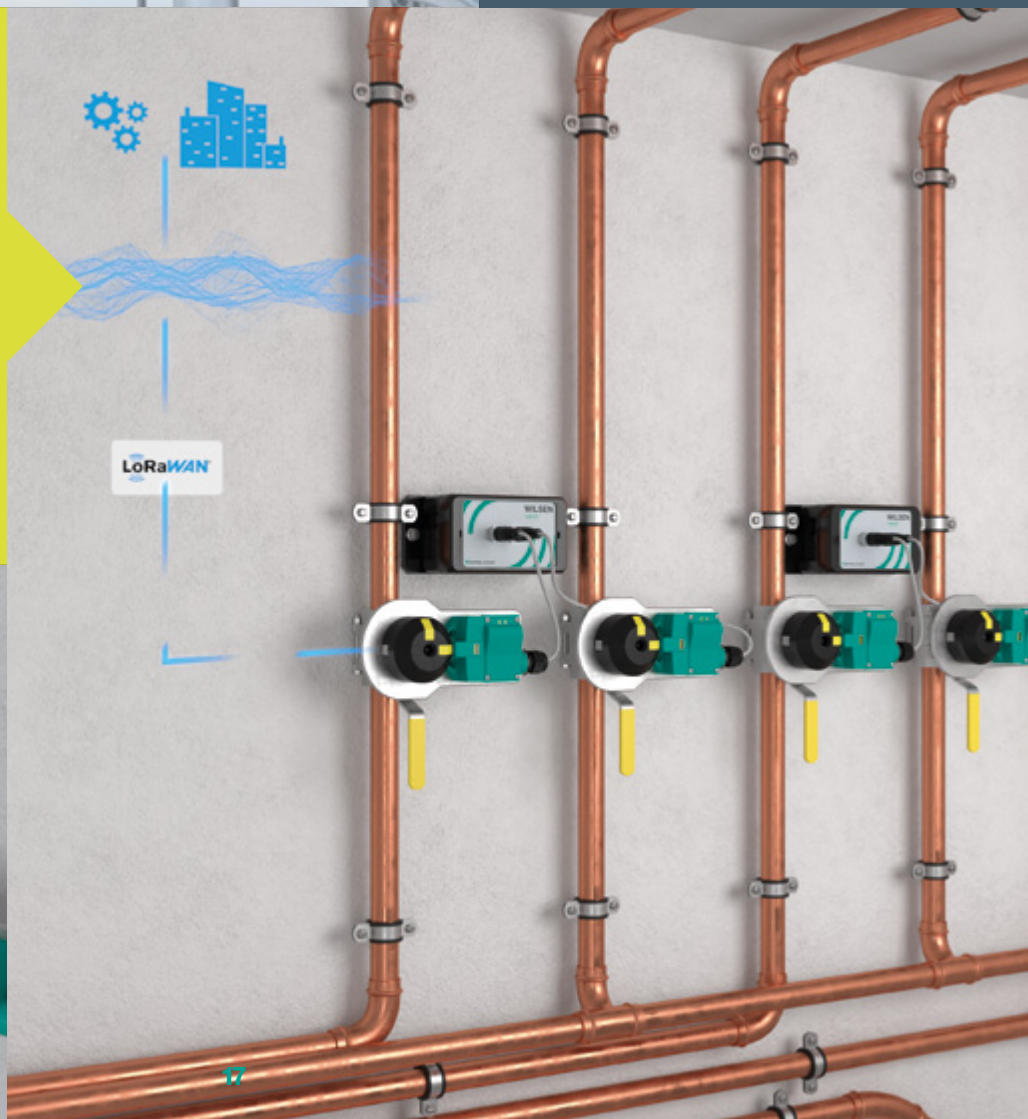
Database for Reliable Water Distribution

Whether in a municipal utility, a multi-occupancy building, or in an industrial process, the manually operated valves must be in the correct position to deliver continuous hot water or heating. The WILSEN.valve detects the position of valves and ball valves in water distribution systems, even in remote locations. Up to two inductive dual sensors, such as the F31 series, can be connected to a WILSEN device, allowing the IoT sensor to monitor up to two valves simultaneously.

For particularly quick and easy installation, the dual sensor is mounted on a mounting plate and the actuator is connected to the shaft of the hand-operated lever. The central unit of the WILSEN.valve can be placed at a suitable location, such as on a wall or a strut near the valve. The device transmits the position of the connected valves in the water distribution system to the control room via LoRaWAN with a high degree of reliability. The valve position can also be identified on-site by means of a marking on the actuator. Its reflective signal color is easy to see even from a distance.

Smart Logistics

Smart City



WILSEN.node

Detecting Object Presence Remotely

The location of an object in the intended position can be crucial—take manhole covers, transformer enclosures, hall gates, or pasture gates as examples. The WILSEN.node wireless sensor signals the presence or absence of such objects, opening up new possibilities for smart city, smart farming, and smart industry applications.

Connection of a very wide range of sensor technologies

Object presence detection

Two versions

Flexibility in Sensor Selection

Various sensor technologies are used to detect object presence, such as inductive and capacitive measurement procedures. Up to two suitable sensors from the large Pepperl+Fuchs portfolio can be connected to the central unit of the WILSEN.node. Float and vibration limit switches as well as sensors of other technologies can also be used. In addition to the sensor signals, the WILSEN.node transmits diagnostic data and error messages, such as short circuits and lead breakage.

Universal Detection Solution with Retrofit Option

Any type of NAMUR sensor or 2-wire inductive low-power DC sensor can be connected to the WILSEN.node. The standardized M12 connector connects them to the central unit. A level or fill height can also be monitored using a float or vibration limit switch. The cable length is freely selectable up to 10 m. The WILSEN.node can be used in many detection applications, e. g. for monitoring manhole covers and transformer enclosures. The autonomous device concept also means that retrofitting to existing equipment is very straightforward.

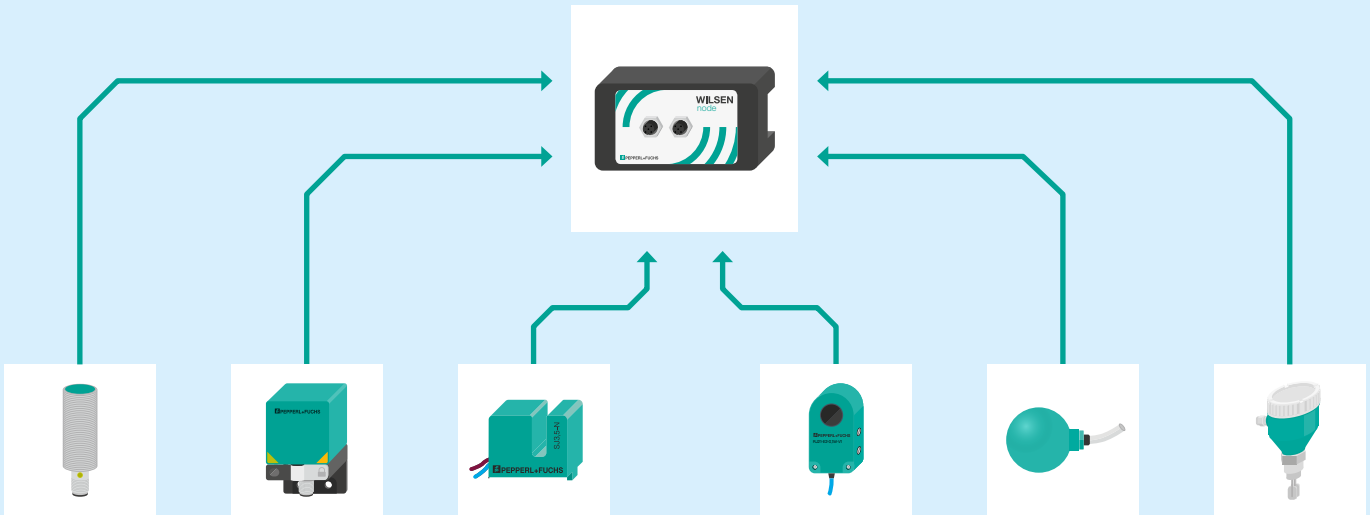
Excerpt from Technical Data	WSN-2N-F406-B41-01-02	WSN-2ZL-F406-B41-01-02
Sensor types that can be connected	NAMUR sensor(s)	2-wire sensor(s)
Power supply	Replaceable high-power lithium battery, service life up to 10 years 3.6 V, 13,000 mAh	
Interface	LoRaWAN	
Frequency band	EU868	
Degree of protection	IP66/67	
Temperature range	–25 °C ... +70 °C	

Event-Based and Interval Detection

Detection and data transmission intervals can be freely selected within a wide range of applications—as often as necessary and as infrequently as possible to maximize battery life. Intervals between 10 minutes and 24 hours can be selected for regular transmission. Additional event-dependent monitoring checks the states of the connected sensors at selectable intervals between one minute and 24 hours. A message is only sent when the status changes, providing prompt information about the change.

Highlights

- Industrial-grade wireless IoT sensor for object presence detection
- Maximum flexibility through connection of various sensor technologies
- High signal reliability via diagnostic data and sophisticated NAMUR and 2-wire DC sensors
- Maintenance-free operation of many years with adjustable regular and event-based monitoring interval



Cylindrical | Cubic type | Slot type | Ring type | Float switch | Vibration limit switch

For more information, visit
pepperl-fuchs.com/pf-wilsen-node

Smart City

Wireless IoT sensors in the WILSEN.node series are ideal for smart city applications. They reliably detect object presence and therefore monitor whether manhole covers or transformer enclosure doors are properly closed, for example.

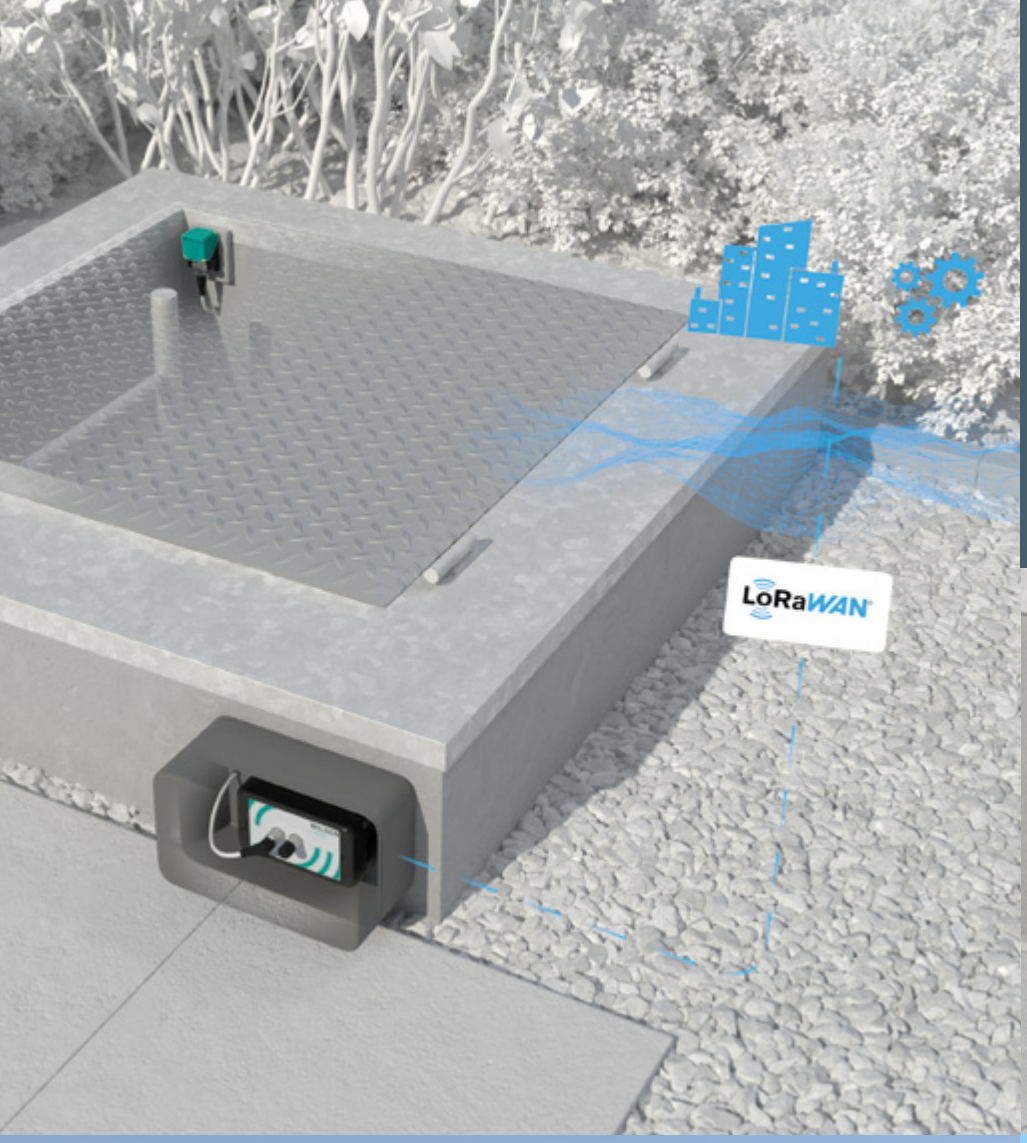
Safe Manhole Covers Guaranteed

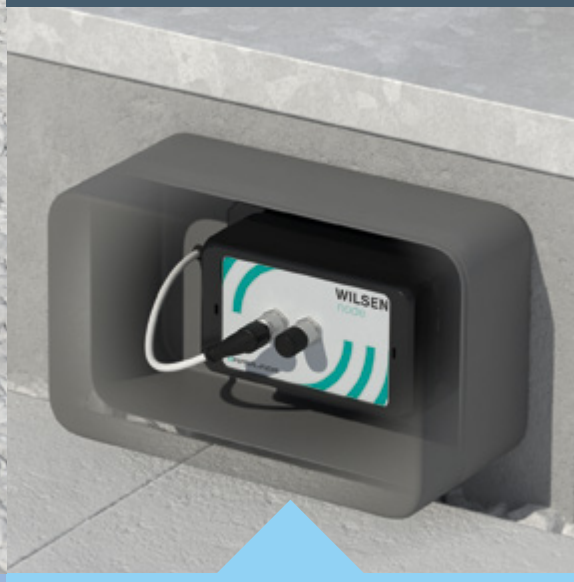
Fountains, canal entrances, and other shaft openings in the floor require a secure cover. A correctly positioned manhole cover prevents accidents and protects people and property. The WILSEN.node can be used to continuously check whether it is in place. The device is installed on the outside of the shaft and connected to a suitable sensor inside that detects the position of the manhole cover. The position of the manhole cover (open/closed) is sent directly to the desired target system using LoRaWAN.

Door Monitoring in Transformer Stations

Transformer stations are used to reduce voltages of several thousand volts from the regional distribution grid to 230 V for the domestic grid. Substation equipment is often located in small transformer enclosures. Due to the high voltage of the incoming lines, there is a danger to life and the doors of the transformer enclosures must be closed at all times. They may only be opened for maintenance work after appropriate safety measures have been taken.

The WILSEN.node monitors the door. In this context, an inductive sensor is connected to the central unit, which detects the closed state. If the door is left open outside scheduled working hours, the sensor signal can trigger a defined alarm to ensure that residents and passers-by are protected.





Smart City

WILSEN.node in Use

Smart Farming

Modern agriculture is increasingly reliant on automation and remote monitoring. The WILSEN.node checks the closing status of doors and gates so that the farmer can see from the farm whether intervention is necessary in the pasture or a farm building.

Secure Pasture Gates

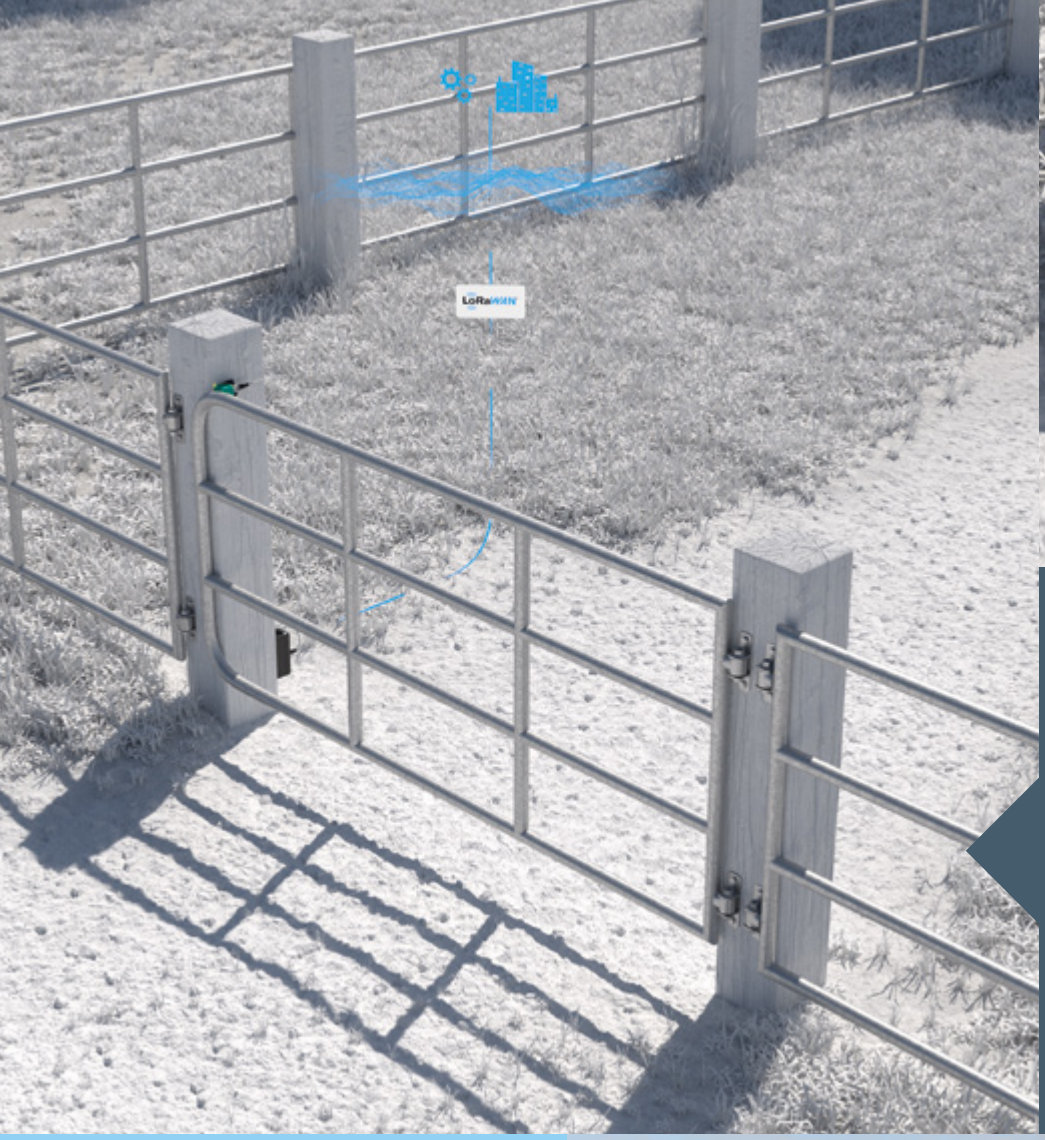
Grazing animals should remain in the allocated field for a fixed period of time. This is not only important for management, but also for safety and liability reasons. The pasture gate must be reliably closed during this time. At the same time, most gates are easy to open, because the pastures should be accessible to livestock owners—and in some vacation regions, to hikers as well.

The risk of an open gate can be minimized with little effort using a WILSEN.node. Featuring a suitable sensor for object presence detection, the device monitors the position of the gate. If it remains open unintentionally, a signal is sent to the relevant IoT platform, from where the farmer receives the corresponding message. The WILSEN.node is designed to be extremely rugged, has IP66/67 degree of protection, and a wide temperature range of –25 to +70 °C. This makes it especially suitable for outdoor use in the harsh conditions of an animal pasture.

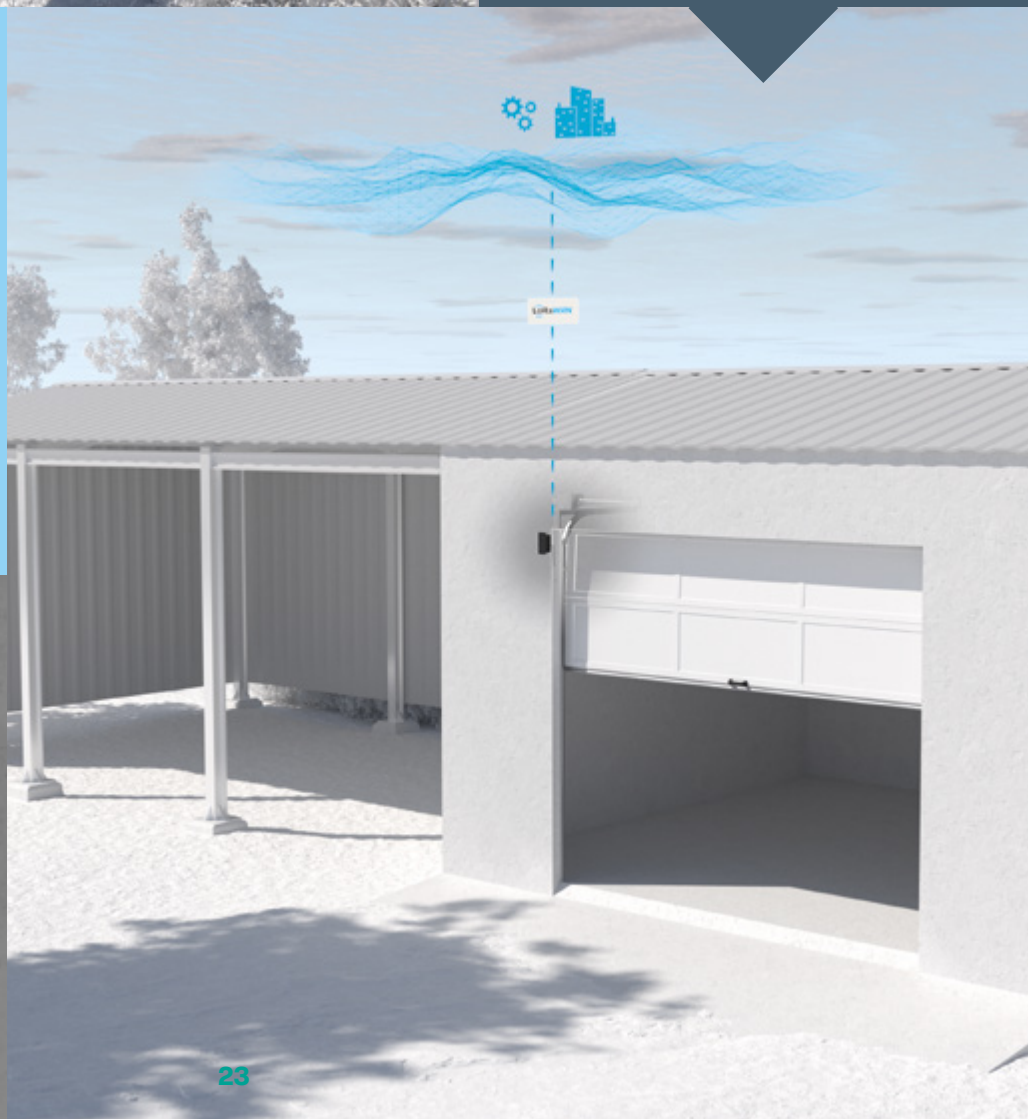
Barn Door Monitoring

Barns are used to store crops, animal feed, and straw, as well as agricultural machinery and equipment. It is not uncommon for the value of these items to be very high. To protect these items from the weather, damage, and theft, the doors should be closed as long as no work is being carried out there or people are not coming and going from them for operational reasons.

The WILSEN.node is mounted on the inside of the door. Featuring the appropriate sensor for object presence detection, the device detects the position of the barn door (open/closed) and and thus ensures transparency. Its use prevents damage and loss without time-consuming cabling or complex installation.



Smart Farming



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- Industrial Communication and Interfaces
- Enterprise Mobility
- Hazardous Area Products and Solutions

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