POCKET GUIDE

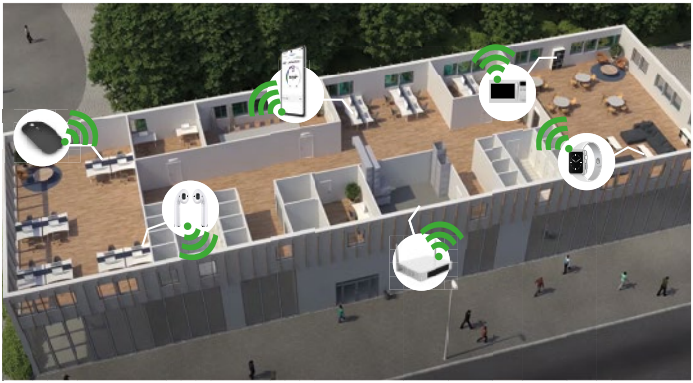
SWEGON WISE

Radio technology

Swegon

Content

Information



Modern properties are overwhelmed with radio traffic

Today's wireless landscape

Modern properties are overwhelmed with radio traffic from many different sources. Radio traffic offers many benefits and possibilities, which has resulted in a dramatic increase in traffic.

At the same time as traffic is increasing and the available radio spectrum is limited, the free space is overloaded and accessibility is reduced. A short-term solution can be to increase the signal's strength to overpower other traffic, which in the long-term impairs the situation further.

This guide provides an insight into how the Swegon WISE system works in this challenging environment, and how stable and safe communications are guaranteed - with a minimum of ambient interference.

WISE-system

Why use wireless communications?

WISE uses a revolutionary technology with wireless infrastructure for communications and control, using the 2.4 GHz frequency band.

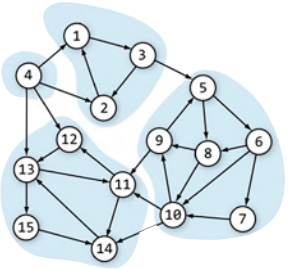
Wireless communication means that installation is made easier, with less cable routing and fewer physical connections, which saves both materials as well as time and money. The level of flexibility is increased, facilitating the adaptation of the system according to changes as regards the premises' needs, both when planning and designing a new system as well as when adapting an existing one.

How does it work?

The structure in a mesh network is based on its nodes receiving and forwarding information. The nodes cooperate with each other to distribute data in the network.

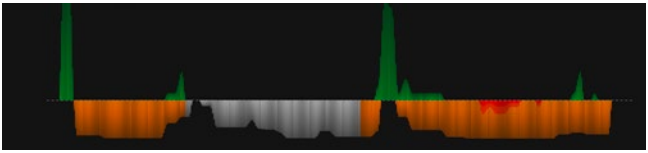
A 24 V power supply is required in order for a component to work as a mesh node and for products with batteries to act as leaf nodes. The difference between these is that mesh nodes help to transfer data, while leaf nodes only send their own data and do not cooperate with other nodes.

The network is self-healing, which means that communications are routed around nodes that are out of order. In the unlikely event of a node failing, the network automatically finds an alternative route, which ensures that the data reaches its destination.



What does Cognitive Coexistence Technology mean?

Cognitive Coexistence Technology (CRMX) is a patented technology that helps to avoid the system either creating interference or being disturbed by other systems. It detects activity on other networks and analyses the data at node level. The system skips in real-time between available channels and predicts which channel can be used to ensure interference-free communications.



Cognitive coexistence in action

Data are transferred in parallel (redundant) via multiple nodes, which provides the highest possible level of reliability. This resource efficient approach makes it possible to communicate in large networks with many nodes.

The system has the best coverage within the frequency band 2.4 GHz by using this innovative radio technology.

Sensitive environments

Wireless communication is an area that is constantly being developed and improved. Thanks to more research in the area, it is becoming increasingly accepted and is used even in sensitive environments such as hospitals, airports and laboratories.

The radio technology in the WISE system is extremely energy efficient with low output levels, which combined with the functionality for cognitive coexistence guarantees a minimum of interference. This makes it more than just secure for sensitive environments.

Does using radio technology for wireless communications involve any health risks?

High radio exposure can cause health risks, but the WISE system transmits at such a low output that it does not entail any risks. Despite the fact that the WISE system transmits at a low output, reliable communications are permitted thanks to a technology that makes the system a good "listener", which can be equated with good hearing.

On average the system only transmits every thirty seconds, when information is transferred, and in between there are no transmissions. In addition, the strength of the output diminishes rapidly the further away you move from the transmitter, and as the transmitter is not held directly against the body, unlike with mobile technology for example, only a small proportion of the radio waves' energy reaches the user.

Read more about this on the ***World health Organization (WHO)*** website or the local agency that deals with these issues (for example, ***the Swedish Radiation Safety Authority***).

The ***Swedish Radiation Safety Authority*** has measured exposure to radio waves in school environments where wireless computer networks are used. The measurements show that exposure rates are very low and lower than one hundred thousandth of what is required to cause significant impact on health. The measurement made by the British agency ***Public Health England*** shows the same result.

Accordingly, the assessment made by the ***Swedish Radiation Safety Authority*** is that there are no health risks with exposure to radio waves from wireless computer networks, and thus no radiation protection or health reasons to refrain from installing or using the technology - whether in schools or a home environment.

World Health Organization

Strål säkerhets myndigheten
Swedish Radiation Safety Authority

European Commission
SCENIHR
health effects from emf/rf
Scientific Committees

Public Health England

Swegon WISE compared to other common systems

There are three main factors that influence exposure to radiation from wireless communications systems. The ***output***, the ***time*** the system communicates and the ***distance*** between the user and transmitter.

The example calculation below clearly shows the difference between the WISE system and other typical systems in use that communicate wirelessly.

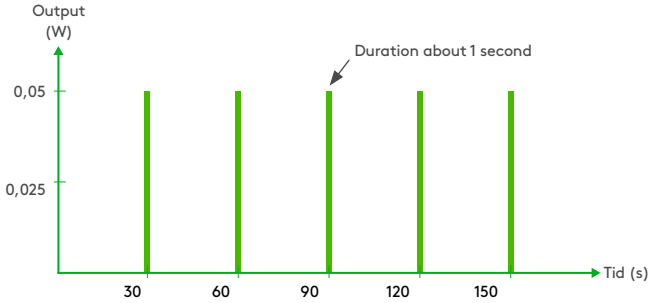
A mobile phone transmits with a higher output and is used closer to the body than a WiFi router or a WISE radio node. A telephone call of 2 1/2 minutes gives the same exposure to radiation as 150,000 minutes (104 days) from a WiFi router or 90,000,000 minutes (171 years) from a WISE radio node.

Mobile telephone	WiFi network	WISE radio node
		
Output: 6 W Time: Continuous Distance: 0.01 metres	Output: 0.1 W Time: Continuous Distance: 1.0 metres	Output: 0.05 W Time: about 2 sec/min Distance: 1.0 metres

Technical information

How long is the battery life for nodes that do not have an electrical power supply?

The WISE system is extremely resource efficient as it only sends in short pulses, with a low output (0.05 W). Data is only transferred when needed, and not continuously, which saves additional energy.



These factors, together with the cognitive coexistence technology, makes the WISE system a "very good listener" that as a consequence does not need to "shout" to communicate. This intelligent approach to communicate is extremely energy effective, which results in a battery life of up to 5 years.

Batteries

The batteries used are of the type ***Primary Lithium-thionyl chloride (Li-SOCl2) 3.6V AA***, and can be purchased in well-stocked electronic stores.

Are there any security issues?

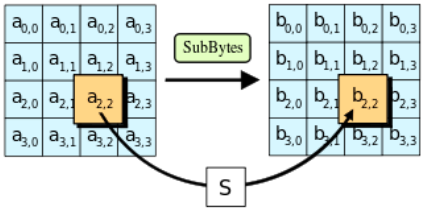
The system uses security algorithms (AES-128), and these are recommended for use with critical applications. As WISE units are encrypted, this means that no usable information can be deduced from any messages that are intercepted. At present, there are no known attacks where encrypted information has been readable for the intruder.

The system also has a time parameter in the encrypted algorithm, which protects that system against messages that could confuse or overload it.

When installing a new WISE unit in an existing system, physical access to SuperWISE is required in order to ascertain the network's encryption key and connect the unit to the network. This is normally located in a room that is subject to strict access controls. Each installation has a unique encryption key.

The WISE system is much less sensitive to interference compared to other wireless systems. This is because the units in a WISE system are constantly changing channels, as opposed to other wireless systems that normally use one and the same channel.

The system's nodes are paired with unique Swegon hardware to prevent misuse of the network.



However, is it really secure?

Let's assume that everyone on earth owns 10 computers, and that the current population is 7.3 billion people. If each computer can test one billion combinations per second, and was able to crack a key after testing 50 % of all possible combinations, it would take these computers 77,000,000,000,000,000,000,000,000 years to crack ONE encrypted key.

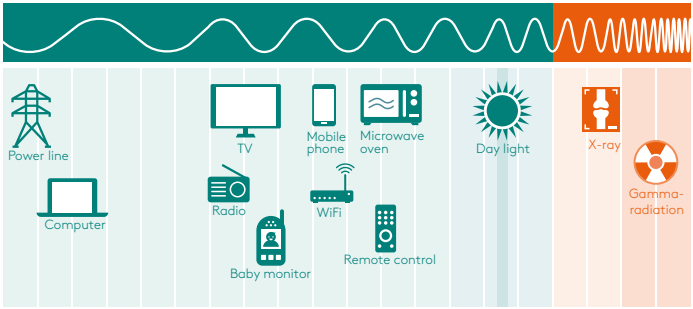
The WISE system boasts an extremely high level of security, as the radio communication is functionally separated from other IT infrastructure.

Jammers

Jammers are used to intentionally disrupt and block radio communications. In most countries it is illegal to use or possess these devices. There is no effective protection against jammers, and as all radio traffic can be blocked in this way the WISE system is also affected. However, it is important to point out that if communications are subjected to jammers radio transmissions are broken and no data or its information will be accessible to unauthorised persons.

Radio frequencies

The application areas of the various frequencies are described in the figure below.



	WISE	WiFi	Bluetooth	ZigBee	EnOcean
Range indoors	>300 m	<100 m	<30 m	<100 m	<30 m
Frequency	2,4 Ghz	2,4 Ghz	2,4 Ghz	2,4 Ghz	Many diff.
Battery service life	≤5 years	days	weeks	<5 years	Infinitely*
Multi-hop					P2P
Cognitive coexistence					
Security	AES(+)				
Speed	<250 kbps	>10 mbps	<2 mbps	<250 kbps	<120 kbps
Self-healing					
No. of nodes/network	>500	32	8	<100	<200

Good | Average | Less good

*Due to Energy Harvesting

The WISE system in practice

Økern Portal

Økern Portal was completed in Oslo, Norway, in 2021. The building, measuring a total of approximately 80,000 m^2, contains a mixture of flexible offices, restaurants, a hotel and green areas both inside and out.

Økern Portal is one of the largest buildings to have had the WISE system installed, with a clear focus on sustainability and interaction. The BREEAM-certified building is intended to be a place to come together, and has been built to be smart, efficient and green.

- **Certification:** BREEAM Excellent
- **Products installed:** WISE Parasol, WISE Colibri Ceiling, WISE Damper, WISE IRT, WISE RTA, WISE IAQ, WISE OCS, WISE IORE, SuperWISE, WISE Director
- **Number of wireless nodes:** Approx. 4,300

Torsplan

Torsplan in Stockholm is a state-of-the-art property encompassing around 4,000 m^2 of retail space and approximately 18,800 m^2 of offices. Shops, restaurants, cafés and a training facility can be found on the ground floor. On the roof there is vegetation, a velodrome-like running track and an outdoor gym.

More than 500,000 buildings around the world have been certified by BREEAM, a method for evaluating the sustainability of buildings from environmental perspectives. Of these, only around a dozen have secured the highest award, Outstanding. The office section of Torsplan 2 is one of these.

- **Certification:** BREEAM Outstanding
- **Products installed:** WISE Colibri Ceiling, WISE Damper, WISE RTA, WISE IAQ Multi, WISE OCS, SuperWISE
- **Number of wireless nodes, Torsplan 2:** Approx. 1,500

2022-06-07

Feel good **inside**

Swegon