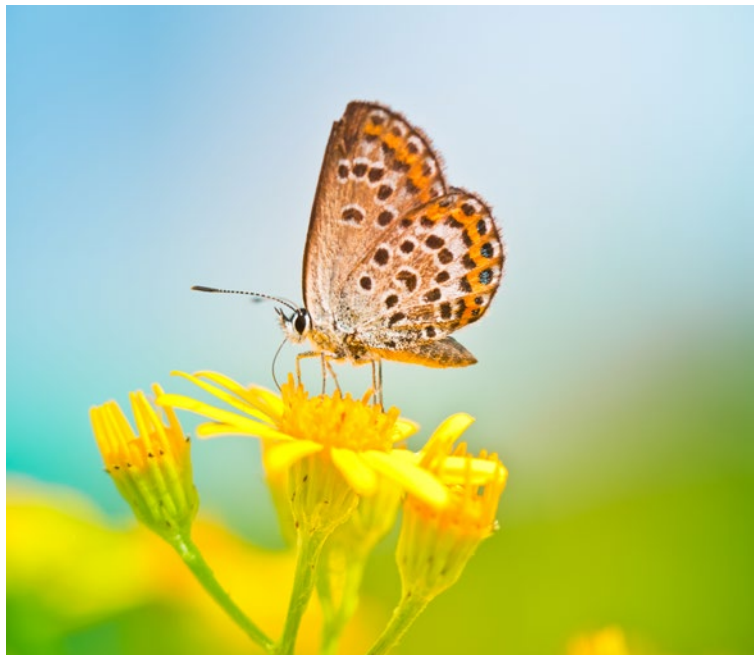


Pocket Guide

# Swegon WISE

Radio technology



**Swegon**<sup>i</sup>

# Contents

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Information .....	3
Today's wireless landscape .....	3
WISE system .....	4
Why use wireless communications? .....	4
How does it work? .....	4
What does Cognitive Coexistence Technology mean? .....	5
Does using radio technology for wireless communications involve any health risks? .....	6
Swegon WISE compared to other common systems .....	8
Technical information .....	9
How long is battery life for nodes that do not have an electrical power supply? .....	9
Are there any security issues? .....	10
Radio frequencies .....	11

# Information

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*Modern properties overwhelmed with radio traffic*

## **Today's wireless landscape**

Modern properties are overwhelmed with radio traffic from many different sources. The benefits and possibilities of wireless technology are numerous, which has resulted in a dramatic increase in traffic.

The available radio spectrum is a limited resource and now when traffic increases the free space decreases, which leads to overloading. 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

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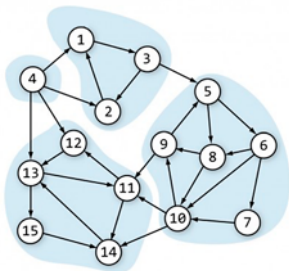
## Why use wireless communications?

WISE uses a revolutionary technology with wireless infrastructure for communications and control. Dispensing with cable connections opens up a world of possibilities, for example, simpler planning and installation combined with increased flexibility. Fewer cables and physical connections facilitate the installation, which saves both materials as well as time and money. Increased flexibility helps in many different ways, for example, when planning a new system or when modifying an existing system - should needs change.

## How does it work?

The structure in a mesh network is based on its nodes receiving and forwarding information. In simple terms the nodes cooperate to distribute data in the network. Each node can be used to receive and send data. A power supply is required in order for a component to work as a node, while products powered by battery act as transmitters.

The network is self-healing, which means that communications are routed around nodes that are out of order.

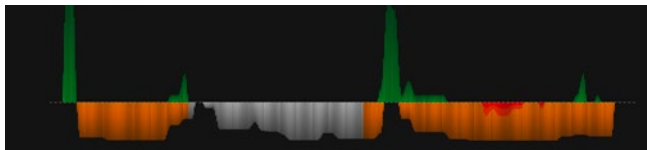


# WISE system

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## What does Cognitive Coexistence Technology mean?

This patented technology helps to avoid creating interference or being disturbed by other systems. The technology is called Cognitive Coexistence (CRMX) and detects activity on other networks. The system analyses information on a node level and then determines which channel to use to ensure interference-free communications.



*Cognitive coexistence in action*

Data are transferred in parallel (redundant), via several nodes, for the highest possible 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 communications are becoming increasingly accepted thanks to extensive research within the field. The technology is now also used in sensitive environments such as on aircraft.

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 such as hospitals, airports and laboratories.

# WISE system

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

The background to Swegon's decision to develop this new platform is that there are substantial benefits with a system based on wireless technology. In 2012 when the decision was made, there was a broad debate regarding the potential health risks of mobile telephony. A collected assessment was made concerning the advantages and risks and resulted in the following:

- The WISE system transmits at a low output, but permits reliable communications using a technology that makes the system a good “listener”. In other words, good radio sensitivity 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 to this, compared to e.g. mobile telephony, the transmitter is not held directly against the body. This means that only a small part of the radio waves' energy reaches the user - their strength diminishes rapidly the further away from the transmitter they come.

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*).

# WISE system

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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.

With the support of these recommendations, and our own design selections, Swegon has chosen to develop and launch wireless systems.



# WISE system

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## 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. 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



Output: 6 W  
Time: Continuous  
Distance: 0.01 metres

WiFi network



Output: 0.1 W  
Time: Continuous  
Distance: 1.0 metres

WISE radio node



Output: 0.05 W  
Time: about 2 sec/min  
Distance: 1.0 metres

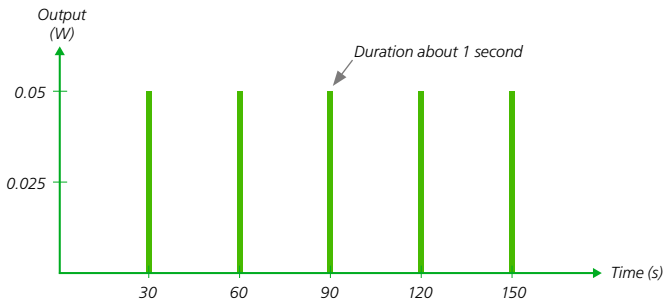


# Technical information

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

The 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” and as a consequence you do not need to “shout” to communicate. This intelligent approach to communicate is extremely energy effective, which results in a battery life of up to 10 years.



### **Batteries**

The batteries used are of the type *Primary Lithium-thionyl chloride (Li-SOCl<sub>2</sub>) 3.6V AA*, and can be purchased in well-stocked electronic stores.

# Technical information

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## Are there any security issues?

The system uses the security algorithms (AES-128), which are recommended for use with top secret state information.

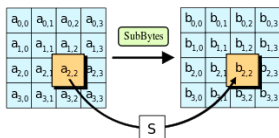
The nodes are paired in the system with unique Swegon hardware to prevent misuse of the network.

Currently, there are no known attacks where encrypted information has been readable for the intruder.

### *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 years to crack ONE encrypted key.



## *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.

# Technical information

## Radio frequencies



	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	>10 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

Poor

\*Due to Energy Harvesting

We make every breath count.

**Swegon**<sup>®</sup>