



### Smart Home - intelligent connectivity for comfort, security and energy efficiency

The Smart Home is on the rise. With the increasing range of suitable devices and professional system solutions, connecting one's own four walls is becoming ever easier. What exactly is a Smart Home, for which areas is interconnectivity recommendable and why maintenance-free wireless technology is particularly well suited for this purpose? Just read on for the answers to these questions.

1

Ø

### What is a Smart Home?

Smart Home means professional building automation for the domestic environment. Technical devices of different types are connected in a network (ecosystem), they interact with each other and can be controlled from outside.

#### Alternative terms are

- > Smart Living
- > Connected Home
- > Home automation
- > eHome

### Networked building technology enables intelligent control in various areas.

- > Lighting
- > Shading
- > Heating, air conditioning, ventilation
- > Security
- > Consumer electronics
- > Information technology/telecommunications
- > Charging stations for electric cars



# 2 Smart Home – gaining ground as connected all-in-one solutions

The trend towards the intelligent home persists as the development of the global Smart Home market shows. According to Statista, sales in 2021 amount to around USD 104.401 m. Approximately one third of this is accounted for by the US alone. Forecasts indicate that the market volume will reach USD 187.429 m in 2025. This corresponds to an expected annual sales growth of 15.75% (CAGR 2021-2025).

497.3m

active households are expected in the global Smart Home market by 2025.

21.9%

is the global household penetration expected to hit by 2025 (compared to 12.3% in 2021).

Source: https://www.statista.com/outlook/dmo/smart-home/worldwide#revenue

#### Growth Market Smart Home

Revenue forecast 2025 for Top 5 Smart Home markets by country (in million USD)



Top 5 (2025) in million USD (US\$)

1. United States	46,767
2. China	40,098
3. United Kingdom	13,594
4. Japan	11,897
5. Germany	10,471

(as of May 2021)

urce: https://www.statista.com/outlook/dmo/smart-home/worldwide#revenue



(as of May 2021)



### How does a Smart Home work?

A professional Smart Home is an intelligent ecosystem that interconnects individual components (sensors and actuators). A control center (hub or gateway) processes the information collected by the sensors and transmits the corresponding commands to the actuators (e.g. lamps or radiator valve attachments). The system can be managed remotely via a wall display, smartphone or tablet. In addition, the user can also operate by switch or remote control which is locally related to the specific room.

Important: Stand-alone smart products such as voice assistants or smart meters do not make up a Smart Home.

### What advantages does a Smart Home have?

### Comfort

The connected home can be adjusted in terms of temperature and lighting according to the wishes of its residents. The temperature is controlled room by room based on occupancy, preset routines or weather forecast. Other products analyse the heating behaviour of the occupants and adapt themselves after a self-learning phase. The air quality is continuously monitored by fixed parameters (e.g. CO<sub>2</sub> concentration). And the lighting can also be controlled according to room occupancy, time of day or defined scenarios.





### Security

The connected home controls itself and is therefore safer. Motion, smoke and glass breakage sensors work in conjunction with surveillance cameras and alarms. No danger escapes them. They register window breakage or movement around the house and trigger an alarm. And anyone who wonders whether all the windows and doors are closed can check this on the smartphone in real-time.



### Energy

Smart heating control saves energy thanks to intelligent connectivity in which thermostats react to environmental stimuli such as brightness, movements or temperature. Thus, for example, the heating valve switches down automatically when the room is empty or a window is open. It also maintains a preset comfortable temperature as soon as it is reached. Central functions such as a main switch also save energy. With just one click all electrical appliances in the household are deactivated.



5

## How does communication work in the Smart Home?

In the connected home, communication is everything – no matter if it is wired (e.g. bus system, Ethernet) or wireless. The different options have typical strengths and weaknesses. Wiring in the Smart Home involves relatively high installation costs. Another disadvantage is the inflexibility of the system as, once installed, switches and sensors remain in place. Thus, a hybrid solution of wiring and radio is usually installed in the Smart Home. Wherever possible however, wireless solutions should be used.

Here is an overview of the common wireless protocols:

		Suitability of the frequency band	Manufacturer independence	Compatibility	Component selection (ecosystem)	Power supply (switches & sensors)	Encryption
Radio	5G/LoRa/ NB·IoT/Sigfox	(unnecessarily high range and high energy demand)	*	*	*	*	*
	WLAN	(unnecessarily high data rate and high energy consumption)	*	*	*	*	*
	BLE	+++	++	++	++	Battery	+++
	EnOcean	+++	+++	+++	+++	Energy Harvesting	+++
	KNX RF	+++	+++	++	++	Battery	+++
	Thread	++	+++	++	+	Battery	+++
	Zigbee	+++	++	++	++	Battery	+++
	Z·Wave	+++	++	++	+++	Battery	+++

\* Consideration irrelevant due to lack of suitability of the frequency band

urce: Trends in the 'Smart Buildings' sector and suitability comparison of radio-based transmission protocols; IGT – Institut für Gebäudetechnik (Institute for Building Technology); 202

# What are the benefits of wireless technology in the Smart Home?

#### Radio-based solutions offer clear advantages:

- > Simple installation without cable lines
- Cost advantage over wired solutions (up to 70 % for retrofits, up to 15 % for new buildings)
- > Flexibility: sensors or push-buttons can be installed anywhere, easily added or repositioned.



### The maintenance-free wireless EnOcean technology offers further benefits:

- Self-powered operation thanks to energy harvesting: wireless modules harvest energy from the environment (e.g. movement, light, temperature differences)
- > No maintenance, no battery changes, thus cost and time savings
- > High range of radio transmission (up to 30 m indoors, up to 300 m outdoors).

### 100 - 200

**sensors** are typically used in a Smart Home. With EnOcean wireless technology they function maintenance-free without batteries.



# What are the benefits of open radio standards in terms of interoperability?

In contrast to self-contained Smart Home systems based on proprietary communication standards, systems based on open wireless standards such as EnOcean increase flexibility and enable seamless expansion of the Smart Home and automation of processes.

The EnOcean wireless standard (ISO/IEC 14543-3-10) is designed for solutions with particularly low energy consumption and energy harvesting. In Europe, the wireless radio technology operates on the 868 MHz frequency channel, which is only approved for pulse signals.



#### Interoperable ecosystems in the Smart Home

The EnOcean Equipment Profiles pave the way for a fully interoperable wireless technology enabling devices from different manufacturers to work together seamlessly. The ecosystem of interoperable EnOcean products includes maintenance-free switches, smart windows, temperature, humidity and light sensors, presence detectors, actuators, gateways as well as complete Smart Home systems.



### What about security in the Smart Home?

Intelligent networking in residential buildings requires additional security levels for radio systems to prevent:

- > Unwanted intrusions into privacy
- > Interception of data
- > Loss of control over the system

A central protective measure against the misuse of a system is the encryption of data in the Smart Home. Every EnOcean-based sensor or switch has a unique ID (24 bits). In addition, the radio signals can be encrypted (AES 128 bit). Constantly changing rolling codes protect against replay attacks or eaves dropping.

## 9 Are radio-based Smart Homes healthier?

Short signals on demand The radio signals are only transmitted for a few milliseconds and on activity demand.
Institute shows that the high-frequency fields of maintenance-free radio solutions are a hundred times lower than those of wired solutions.
No electro-smog Wireless sensors/switches do not generate low-frequency electromagnetic emissions.

### Conclusion: Even radio-sensitive people can safely use radio solutions in their Smart Home.

Source: https://www.enocean-alliance.org/wp-content/uploads/2020/12/ECOLOG\_measuringreport\_v1.4.pdf

# $10\,$ A dynamic network for professional Smart Homes

As an international association of leading companies in the building and IT industries, the EnOcean Alliance has been committed since 2008 to enabling and promoting interoperable, maintenance-free and proven eco-systems based on the wireless EnOcean radio standard (ISO/IEC 14543·3·10/11). With their decades of experience, EnOcean Alliance members strive to co-create a healthy, safe and sustainable environment in smart homes, smart buildings and smart spaces for the benefit of all.



Scan the QR code to learn more about the world of energy harvesting wireless Smart Homes.

www.enocean-alliance.org/products



© 2021, EnOcean Alliance