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Georg Schlegel GmbH & Co. KG

Radio systems are more flexible

Interview with Torsten Singer regarding wireless solutions for the control of machines

*Cell phones, garage opener or navigation systems: We use wireless solutions naturally in our everyday life while the industry still mainly uses wired solutions to control machines. But here, too, radio systems gain ground as SCHLEGEL product manager Torsten Singer explains. The reason is that radio systems offer clear advantages for certain fields of application.*

Mr. Singer, what exactly is a wireless solution and how does radio technology work?

A wireless solution, or to be more precise, a wireless system is a system of communication that enables wireless data transmission. To put it simple: An application sends a wireless signal via a special frequency to a receiver which catches this signal with its antenna and processes it.

The range of wireless signals mainly depends on the frequency, the strength of the signal and the absorption by objects. For example, metal absorbs stronger than wood. The basic rule (with some exceptions) is: The higher the frequency, the shorter the transmission range and the larger the data rate. There are various wireless solutions and radio technologies as well as standards/norms for all kinds of requirements, whether it is WLAN, bluetooth, ZigBee or EnOcean which operate in the license-free frequency range under 1 GHz (e.g. 868 or 915 MHz) or from 2.4 GHz to 5 GHz.

What advantages for the implementation of wireless solutions in the industry do you see?

The most important advantage is the flexibility. The application of radio systems can be realised everywhere without the moving space being influenced by a cable. Thus, radio technology is always a reasonable solution if wiring would disturb or even endanger operations, where the cabling effort is very high or it simply is not possible to install cables. In addition, the aspect of comfort should not be forgotten as a wireless solution often make the control of machines or devices significantly easier. In many cases, radio technology is also the cheaper solution when the number of integrated devices is very high because there is no wiring effort. Thanks to radio technology, the devices can be integrated much easier and faster into an existing wireless network and in theory this is limitless.

Then why are wireless solutions not implemented more often?

To find the ideal solution for a certain field of application is much more complex for radio technology than for systems that are based on cables. There are many factors to be considered in the radio sector, such as other wireless systems that operate in the same frequency range or the environment in which the system shall be implemented. Even external influences like the weather can influence the radio signal.

Also, radio technology does not only offer advantages. A paramount disadvantage of radio technology is the open system and the susceptibility to failures. Generally speaking, anyone who is within the transmission range of a wireless system can receive and read its signals. Therefore, there is a certain effort to be made to secure the signal, for example by encrypting the data. In case of very sensible data sometimes interfering transmitters have to be installed so that the data cannot even be received from another source. The encrypted data can be decrypted with corresponding effort.

Is there any technical aid to reduce negative influences?

The transmission of data can be influenced in a negative way by an unfavourable environment such as concrete walls or interfering transmitters of other wireless systems. While in case of any absorbing objects the signal can be improved via repeaters the trick level in case of interfering signals of other wireless systems is higher. For example, some systems use frequency hopping to change into a less loaded frequency band or check beforehand if the channel is free and send the data afterwards.

The important thing is: Wireless systems are continuously being improved and become more reliable and safe. A good example is the new 5G network that is supposed to even make autonomous driving possible. In the industrial sector, too, statistics show a perpetual increase in implemented wireless systems within the last years and predict an even higher acceptance in the coming years so that it can be assumend that the radio technology will establish itself even further in this sector.

Are there any technical restrictions or minimum requirements for the use of wireless solutions?

Definite minimum requirements basically do not exist, with the exception that the wireless system needs to transfer the data safe and reliable in accordance with the requirements and the environment of the system. However, two important points have to be considered: The frequency being used for transmission and the legal guidelines.

It is not allowed to transmit on any desired frequency. A lot of frequencies require a license, furthermore each country has its own regulations on which frequencies even can be used. Also, those who want to supply wireless systems need to be familiar with the regulation 2014/53/EU (Radio Equipment Directive, short RED) to be able to explain the system´s conformity.

What does SCHLEGEL offer in regards to wireless solutions?

SCHLEGEL currently offers two systems with wireless solution. In the case of the battery-free wireless pushbuttons and switches from SCHLEGEL the necessary energy for transmitting the signal is being generated by an electrodynamic power generator when pushing the button. This makes the system independent from any energy source and uses the so-called principle of energy harvesting. This principle is also known as EnOcean. Behind that is an alliance of companies that support and enable ecosystems according to the maintenance-free wireless standard (ISO/IEC 14543-3-10/11). Our wireless pushbuttons and switches are certified in accordance with the EnOcean standard.

The transmitter of the battery-free wireless pushbuttons and switches is located inside the contact block which can be combined with various pushbuttons and switches. This could be a pushbutton, but also a selector or key switch. Additionally, SCHLEGEL offers suitable receivers that fulfil different requirements such as voltage, number of transmitters or relay outputs, as well as other modules such as a bus actor, a repeater or a switching power supply.

The other system is our enclosure proboxx with S-Wave radio technology from steute. The proboxx can be equipped with 1 to 4 command points while an internal battery supplies the system with energy. Whereas the battery-free wireless pushbuttons and switches can only use the generated energy once to send data, more functions can be generated with the proboxx thanks to the batterie. That would be for example the monitoring of the battery´s charge level. When this gets too low, a continuously red blinking LED indicates that the battery needs to be charged. But the energy demand of the wireless proboxx is so low that the lifetime of the battery at one operation per minute is about 6 years.

How safe is the system?

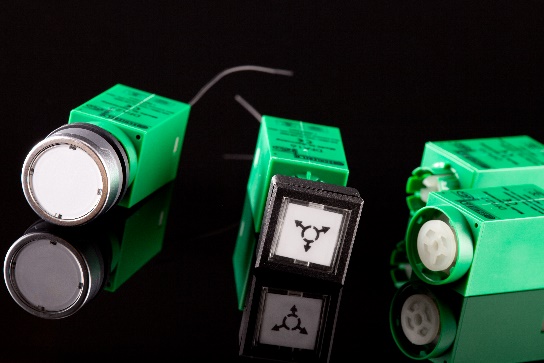
To prevent loss of data due to collision we have implemented the so-called LBT (Listen Before Talk) in the wireless proboxx. The LBT checks beforehand if the radio channel is free so that the recipient can receive the data safely. There are two different receivers that can be used with the wireless proboxx: One receiver with 4 channels and one potential-free relay output each and one receiver with TCP/UDP/IP connection, RJ45 interface for 10/100 Base-T-Ethernet and web browser administration. Both receiver can manage up to 40 transmitters.

The battery-free wireless pushbuttons and switches as well as the wireless proboxx use the license-free transmission frequency of 868 MHz. This low frequency enables transmission ranges from 30 m to 40 m, pass through absorbing objects more easilly, is less prone to failure and requires less energy.

Photos



Caption: When cables hinder or even endanger the operation, wireless solutions are an appropriate option.



Caption: The battery-free wireless pushbuttons and switches from SCHLEGEL generate the necessary energy with each push of the button.



Caption: The proboxx is also available as wireless variant.



Caption: Product manager Torsten Singer

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Schlegel stands for innovation, quality and design. Founded in 1945, Schlegel is today a globally operating company with headquarters in Germany, sales offices in Austria and Singapore, and exports to more than 80 countries on all five continents. The core competences: Development and production of control units, pilot lights and terminal blocks. The product portfolio further includes bus systems, enclosures, limit switches, control panels and functional components. When developing new products, Schlegel sets high standards as to the design. More than 100 national and international design awards confirm the company's high level of design expertise, among these prizes are the iF Design Award, the Red Dot Award, the Good Design Award and the German Design Award.