IZAR RADIO

A safe form of radio

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Radio-based technologies have found their way into almost all areas of our lives. And when it comes to recording consumption data, wireless connections between meters and receivers offer a whole host of new possibilities. For instance, automatic reading of household meters would not be financially viable without radio technology.

However, the increasing spread of wireless technologies has also led to concerns among the public. Our approach is to address these reservations with the utmost openness. So, with this in mind, the following information aims to not only highlight the benefits of the IZAR RADIO, but also demonstrate how safe it is in terms of health and data security risks.

What is IZAR RADIO?

Diehl Metering's term IZAR refers to the interplay between all components as part of remote meter reading. These components range from the meters themselves, to data concentrators (in which the information from numerous meters is collected and then forwarded on), to meter data management software.

In this context, IZAR RADIO describes the radio communication between the consumption meter and the data concentrator. Meters – or the radio modules installed on them – emit telegrams containing information on the meter number, meter reading and alarm status in a compressed and encrypted format. These telegrams can then be received through a Fixed Network of IZAR RDC radio receivers, as well as mobile receivers known as IZAR RECEIVER BT. Once the intelligent meters have been installed, they can be read using both stationary and mobile methods (Walk-by or Drive-by).

In this way, IZAR RADIO facilitates precise, secure and variable consumption recording with minimum effort for suppliers and consumers. Meter information can be recorded quickly and conveniently without having to arrange an appointment with the end customer.
IZAR RADIO additionally provides the option of shorter intervals between readings, enabling detection of risks and irregularities – such as leaks – better and earlier. It also allows you to give your customers greater consumption transparency and a real-time bill. In this way, you can reduce invoice disputes and the administrative expense that comes with them.

Thanks to their simple design, IZAR readout systems are also quick and easy to expand, making them a secure investment.

What is radio?

Radio means wireless transmission of information by means of electromagnetic waves – spreading oscillations of an electromagnetic field. We come across these fields on a regular basis in our everyday lives. Alongside natural electro-magnetic fields, there are also artificial electromagnetic fields, such as those generated by television masts, WLAN routers and mobile phones. Different devices generate different fields. In addition, the oscillations emitted differ in amplitude (height of waves) and frequency (width of waves) depending upon the properties of the electromagnetic field. The former describes the intensity of the oscillation, whilst the latter describes the number of oscillations per second, specified in the unit of hertz (1 Hz = 1 oscillation per second). Our IZAR RADIO devices transmit at a frequency of 868 megahertz at a power level of < 25 milliwatts.

The aim of IZAR RADIO is to transmit a message – at the right time and quality – wirelessly from a meter to a receiver. One key factor that influences quality is the level of "radio traffic". In other words, if our meters transmitted too often, their signals would simply interfere with one another. For this reason – and in the interest of preserving our meters' battery life – a consistently active radio would actually be undesirable.

In fact, at 4 to 15 milliseconds, transmission only takes a fraction of a second. This means that, even at the shortest possible transmission interval of 10 to 15 seconds, our IZAR RADIO is only active for approximately 50 seconds a day. However, such short transmission intervals are only of benefit if you wish to read meters by means of the Drive-by method. In Fixed Networks, the intervals are typically 5 minutes. In this case, the actual transmission time is far below the aforementioned 50 seconds.

How often and how long the IZAR RADIO is active thus depends upon your preferred readout type, and can be chosen on an individual basis.

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Radio emissions

High intensities of high-frequency electromagnetic waves can have detrimental effects on people, animals and plants. We take the issue of "electrosmog" very seriously: your health and that of your customers must not be put at risk by our radios! We have carried out extensive testing regarding the health effects of IZAR RADIO, meaning that we can confidently assure you that the electromagnetic emissions from our devices are far below the safe limits for humans.

Legal guidelines

EU Directive 2014/53/EU (formerly 1999/5/EC) applies in the European Union. This refers to limits that were set out in the Council of the European Union's recommendation (1999/519/EC) "on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz)". These values are, in turn, based on recommendations from the Commission on Radiological Protection and the International Commission on Non-Ionizing Radiation Protection (INCIRP). The German ordinance on electromagnetic fields (26. BImSchV) of the Federal Office for Radiation Protection (BfS) is also guided by these values. In addition, the European Union's Meter-Bus standard (EN 13757) prescribes industry-specific rules for the reading of consumption meters.

In order to allow you to better assess the electromagnetic emissions generated by the IZAR RADIO and its effects upon people and the environment, please find below reference values from typical high-frequency applications for the three key factors in radiation exposure:

• Transmission power:
All of our IZAR RADIO devices transmit at a power level of less than 25 milliwatts. This means that, compared with other everyday devices, the power radiated from our devices is marginal. This can be illustrated by way of a simple example: an IZAR RADIO module has around the same battery capacity as a mobile phone. However, mobile phone batteries do not last

more than a week at the most, whilst our radio devices have a battery life of around 15 years. It is not difficult, therefore, to imagine how great the difference in transmission power must be. Depending upon the network, your mobile phone actually transmits at up to 100 times the power of an IZAR RADIO module. The power that it radiates can even be much higher when the reception is poor or when connecting to a GSM network.

	Frequency	Maximum transmission power
IZAR RADIO	868 MHz	< 25 mW
Bluetooth	2400 MHz	100 mW
WLAN	2400 MHz	100 mW
DECT (cordless telephone)	1900 MHz	250 mW
GSM (E-Netz)	1800 MHz	1000 mW
GSM (D-Netz)	900 MHz	2000 mW
Television transmitter	470-790 MHz	5 000 000 000 mW
Radar transmitter	1-3 GHz	100 000 000 000 mW

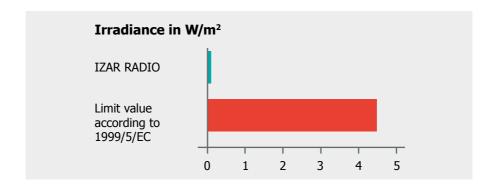• Meters' daily transmission time:
International regulations apply to the radio transmission of meter data. According to these regulations, a meter may only re-transmit after 1000 times the time that transmission takes. As described above, our IZAR RADIO is active for a maximum of 50 seconds per day. Cordless telephones, mobile phones and WLAN routers, on the other hand, which transmit at considerably higher power even in stand-by mode, have an effect on you several hours a day – if not around the clock.
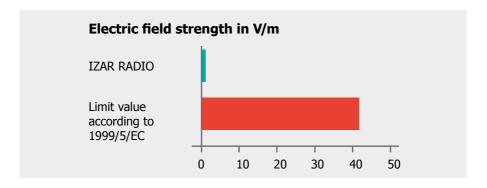
• Distance from the radio source:
The strength of electromagnetic fields decreases rapidly as you get further away from the source. Even outdoors, the waves attenuate approximately 31 decibels (dB) at just one metre away – and as little as 3 dB means half the transmission power. As such, at a distance of one metre our IZAR RADIO has just a tenth of its original transmission power.

The distance between the occupants of a house and their meter is typically several times that – with walls and ceilings in the way of transmission, providing considerably greater attenuation than open air. By comparison, users generally hold mobile and cordless telephones directly to their ear.

The electromagnetic effect of our IZAR RADIO is not just marginal when compared with everyday high-frequency applications. It is also far below the legally permissible limits, as the following graphs illustrate.

Irradiance in W/m²

IZAR RADIO

Limit value
according to
1999/5/EC

| 0 | 1 | 2 | 3 | 4 | 5 |

Electric field strength in V/m

IZAR RADIO

Limit value
according to
1999/5/EC

| 0 | 10 | 20 | 30 | 40 | 50 |

What does "OMS" stand for?

The Open Metering System (OMS) group is a special interest group made up of associations and companies with the goal of developing cross-medium and cross-manufacturer standards for communication within smart metering systems. Put simply, the desire is for all meters to speak the same language – making it possible to use one single readout system for gas, water, electricity and heating, and read meters from different providers. It should be noted here that the OMS defines the communication, not the methods of measurement.

The OMS specifications stipulate both the structure of radio protocols and the security standards to be complied with during their transmission. If a meter meets these specifications, it corresponds to the OMS group's minimum requirements as regards an interoperable, stable and secure radio system. The OMS group is in close contact with legislators on European and national level. In terms of radio transmission from the meter to the data concentrator, the Meter-Bus standard issued by the European Union (EN 13757) sets out various procedures that can be used to encrypt radio transmissions of metering data. The OMS reviews these and translates them into "Security Profiles", with levels of security ranging from Profile A to Profile C. You will find a detailed description of these profiles on our download portal. The following tables merely aim to provide you with a brief overview of the three profiles (A, B and C) defined by the OMS.

Security Profile as per OMS	Encryption method	Type of key	Security level as per EU standard EN 13757
Security Profile A	AES 128-Bit	symmetric/static	Mode 5
Security Profile B	AES 128-Bit	symmetric/ dynamic	Mode 7
Security Profile C	TLS 1.2	elliptic curve	Mode 13

It is important to note that the OMS profiles themselves do not represent binding legal provisions. They simply aim to interpret legislation in a manner that is easy to understand. This allows you to judge the data security offered by various providers and solutions better. More information on which Diehl Metering meters meet which security profiles can also be found on our download portal.

EU member states are also free to pass their own laws on individual media and forms of readout. For example, the German Federal Office for Information Security (BSI) recently issued regulations on radio reading of gas meters, which largely meet OMS Security Profile B. Generally speaking, the German laws on radio readout are – in many respects – stricter than European standard EN 13757. This is why we are particularly interested in promoting the issue of data security within the industry and achieving recognition of the German standards on European level.

Data security

In the IZAR system, consumption data is transmitted from the meter to your PC via receivers. We are aware that you – as the holder of this sensitive information – have a high degree of responsibility. You must be able to depend upon our system protecting you against attacks from outside.

It is for this reason that all of our intelligent meters and radio modules are equipped with a radio system that corresponds to the European standard (EN 13757). For particularly sensitive media, we are already meeting the requirements recently issued by the BSI, which are very strict by international standards.

Legal guidelines

The European Union's EN 13757 series of standards stipulate both the structure of radio protocols and the security standards to be complied with during their transmission.
In Germany, the "Technical guidelines on intelligent metering systems and their secure operation" (TR-03109) issued by the BSI define the data security requirements for radio-based reading of consumption meters. In it, reference is made to the more general technical guidelines TR-02102 and TR-03116. These stipulate the encryption methods and key lengths to be used for remote reading.

It recommends AES 128-bit encryption, which is used in IZAR RADIO. This method involves the generation of an individual 32-digit key, which – even with great computing power – cannot be hacked within a reasonable period of time. Before radio transmission, the data to be transmitted is subdivided and altered with this meter-specific key – i.e. according to a specific logic – in such a way that it can no longer be interpreted. Therefore, potential attackers are unable to access consumption values even if they have managed to intercept tele-grams. This is because only the receivers that have the corresponding key can decode and interpret the radio telegrams.

It is important to note that it is not the data concentrators themselves – either the IZAR RDC or the IZAR@MOBILE 2 TABLET – that decode the individual telegrams. Decryption does not take place until the data has reached the IZAR@NET 2 software within your office network, which is protected against third-party access by your firewall. This means that communication between the data concentrator and the application software is also protected against attacks.

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