

Welcome

Aplicaciones Inalámbricas

Radioline

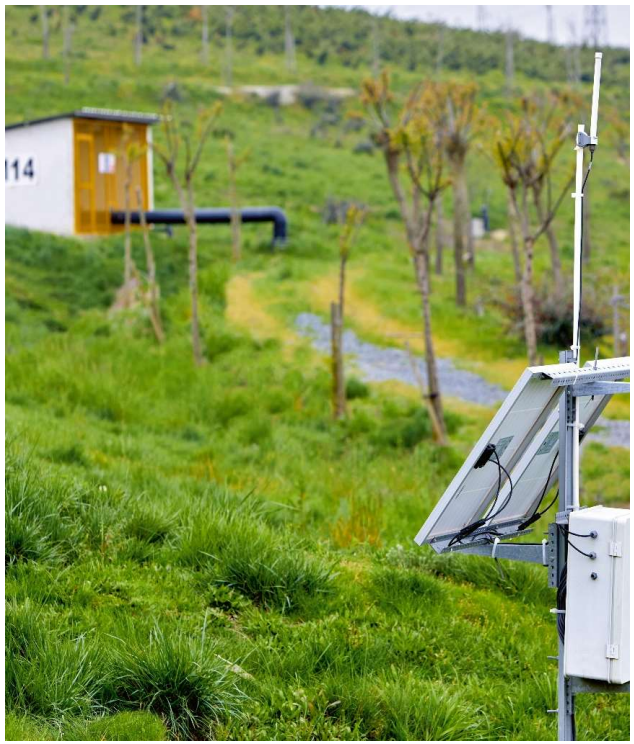
Antonio Gordillo IMA Enero 2021

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Webinars

Agenda Radioline

- Historia
- Experiencia
- Conceptos Básicos
- Tecnología
- Aplicaciones
- Productos Radioline
- Productos más recientes
- Referencias

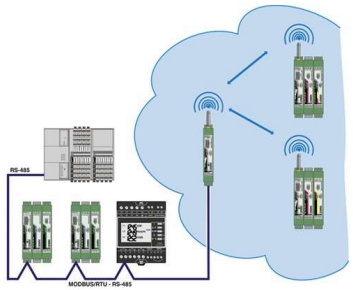


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Webinar IMA Enero 2021

Aplicaciones inalámbricas Radioline





Fecha	**6 Enero 2021**
Hora	9:00
Hora	
Duración	1 hora
Costo	gratuito

Lograr mayor conocimiento en las arquitecturas de la tecnología Trusted Wireless en aplicaciones inalámbricas en exteriores e interiores.

Descubra durante la sesión las diversas arquitecturas y aplicaciones que pueden realizarse con la gama de productos Radioline de 900 MHz y 2400 MHz para aprovechar los beneficios de monitorear y controlar a distancia diversos equipos que son necesarios desde varios cientos de metros hasta arquitecturas en varias decenas de kilómetros incorporando las aplicaciones de entradas/salidas así como las informaciones posibles en comunicación serial en esta tecnología inalámbrica. Grandes beneficios en cuanto a flexibilidad, instalación y costo pueden ser logrados con este tipo de tecnología en diversos sectores industriales.

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History / Experience

The beginnings

Brand label of the first wireless products for unidirectional signal transmission in the process industry. Announce of the proprietary wireless technology "Trusted Wireless".

2003

2004

Expansion of the portfolio



Products for bi-directional radio transmission of multiple digital and analog signals and serial data.

Serial data transmission wirelessly

PSI Bluetooth converter as a cable replacement for serial interfaces RS232 / 485/422. Industrial wireless access points for wireless Ethernet transmission.

2005

Wireless for factory automation



With the Bluetooth MUX and the Fieldline Bluetooth IO System, we offer products for time-critical signal transmission in factory automation.

Ethernet-Port-Adapter

The Ethernet Port Adapter (EPA) allows Ethernet- enabled programmable controllers to communicate wirelessly with PROFINET, Modbus / TCP, or EtherNet / IP ™ control networks.

2007

2008

WirelessHART



With WirelessHART we provide standardized products for the wireless networking of HART sensors in the process industry.

Developement of a new wireless technology

Start of the technology development "Trusted Wireless 2.0" for communication over long distances, between many sensors / actuators, in the process and infrastructure environment.

2010

Trusted Wireless 2.0



The Radioline product family is launching the first Trusted Wireless 2.0-based products for the universal transmission of I / O signals and fieldbus protocols.

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History / Experience

New generation of WLAN-Accesspoints

With the FL WLAN 5100 we provide a new generation of WLAN access points with high performance and MIMO technology.

4G Router

4G cellular routers provide powerful remote connections to industrial Ethernet networks.

New generation of EPAs

The new generation of EPA modules supports both WLAN and Bluetooth communication in a single device.

TC Mobile I/O now with 4G (LTE)

Alarming and switching of relays is also possible via 4G (LTE) mobile networks.

2012 — 2013 — 2016 — 2018 — 2019



3G Security Router

The mGuard products from Phoenix Contact secure your plant network with a strong, flexible and fast firewall. Easy and secure remote maintenance thanks to VPN connection.



Radioline expansion

The product family Radioline will be successively extended with additional communication modules for various media, frequency bands and countries. In addition, further I / O modules are offered.



WLAN 1100

With the WLAN 1100, we present an all-in-one solution in which the access point and antennas are integrated in just one module.



mGuard Secure Cloud

The mGuard Secure Cloud Remote Services are now available in improved performance and scalability. We work with Amazon Web Services (AWS) to do this.

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Our strengths for your success



Innovative products



Technologies & solutions



Service & support



Competence & experience

Phoenix Contact is your competent partner for communication technology:
Products, technologies and services from a single source.

Selection topics



Basics



Antenna technology

Bluetooth WiFi TRUSTED WIRELESS WirelessHART

Wireless technology and coexistence



Products



Applications

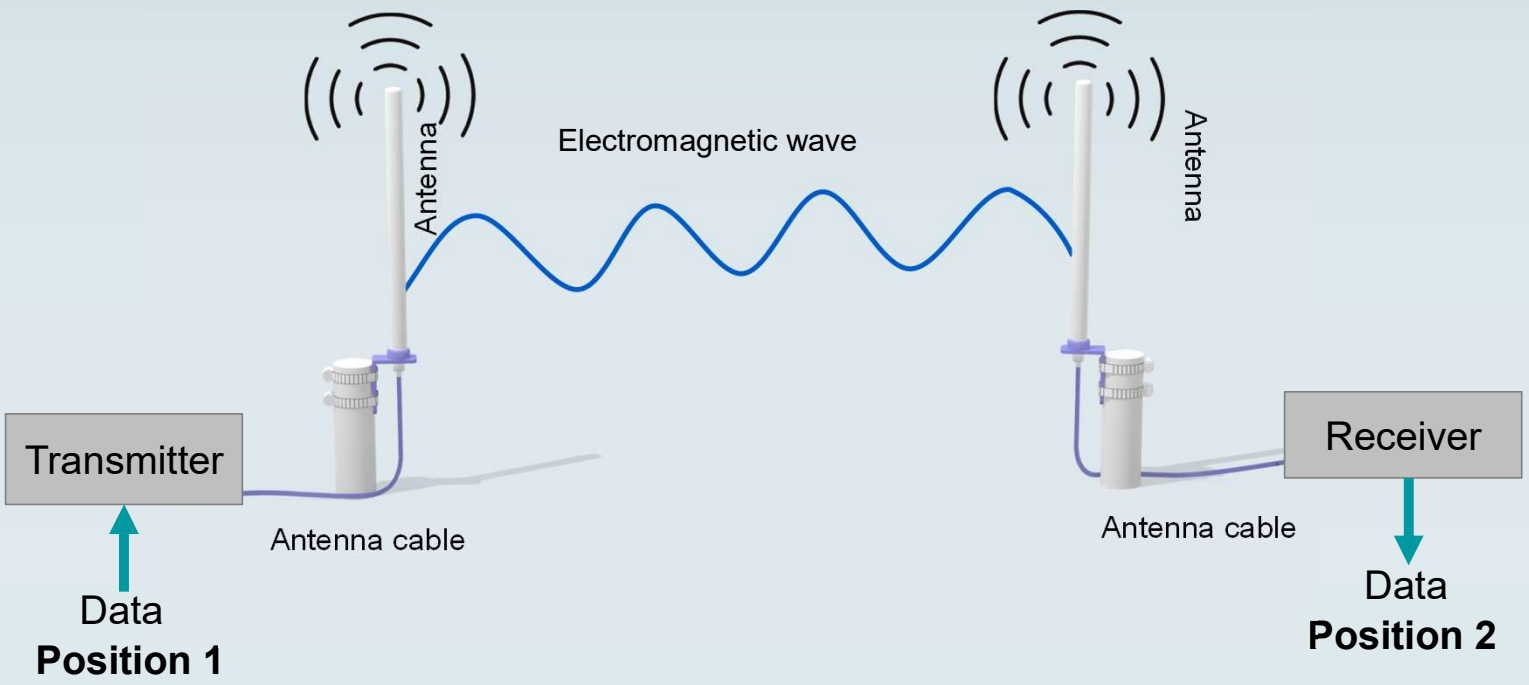


References

Services

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Wireless link



Dezibel (dB)

P_1/P_2	dB	Description
0,001	-30 dB	Attenuation
0,01	-20 dB	
0,1	-10 dB	
1	0 dB	1:1 transmission
10	10 dB	Gain
100	20 dB	
1000	30 dB	

- Decibel is a logarithmic value which describes the relation of Power P1 compare to power P2, e.g. 1 mW

$$L_P(\mathrm{dB}) = 10 \log_{10} \left(\frac{P_1}{P_2} \right)$$

Tip:
A change of 3 dB always corresponds to a doubling or halving.

Power rating in dBm

Power	dBm
1 fW	-120 dBm
1pW	-90 dBm
1 nW	-60 dBm
1 µW	-30 dBm
1 mW	0 dBm
10 mW	10 dBm
100 mW	20 dBm
1 W	30 dBm

- The unit decibel milliwatt (dBm) is a power level based on one milliwatt.
- The transmission power is regulated by regulatory authority

Receiver sensitivity and transmission power

Technology / Frequency band	Data rate	Receiver sensitivity	Transmission-power
WLAN	54 MBit/s	- 84 dBm	+ 19 dBm
Bluetooth	1 MBit/s	- 88 dBm	+ 14 dBm
Trusted Wireless 2,4 GHz	Max. 250 kBit/s	- 93 dBm	+ 20 dBm
Trusted Wireless 2,4 GHz	Min. 16 kBit/s	- 106 dBm	+ 20 dBm
Trusted Wireless 868 MHz	Max. 120 kBit/s	- 103 dBm	+ 27 dBm
Trusted Wireless 868 MHz	Min. 1,2 kBit/s	- 122 dBm	+ 27 dBm
Trusted Wireless 900 MHz	Max. 500 kBit/s	-95 dBm	+30 dBm
Trusted Wireless 900 MHz	Min. 16 kBit/s	- 112 dBm	+ 30 dBm

- The lower the data rate, the higher the receiver sensitivity
- The higher the receiver sensitivity, the bigger the achievable distance

Example:
- The maximum transmission power is 100 mW / 20 dBm @ 2,4 GHz.
- The signal strength at the receiver should be better than the receiver sensitivity of the used radio module.

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Calculating with decibels (dB)



Transmit power	Attenuation cabel	Antenna gain	Free space loss	Antenna gain	Attenuation cable	Receiver sensitivity
+20 dBm	-2 dB	+2 dBi	- 80 dB	+2 dBi	-2 dB	**- 60 dBm**

EIRP: +20 dBm

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Omnidirectional antenna

Article	RAD-ISM-2400-ANT-OMNI-2-1-RSMA	RAD-ISM-2400-ANT-VAN-3-0-RSMA	ANT-OMNI-2459-02	RAD-ISM-2400-ANT-OMNI-6-0	ANT-OMNI-5900-01	RAD-ISM-2459-ANT-FOOD-6-0	RAD-900-ANT-OMNI-2-N	ANT-OMNI-868-01
Article No.	2701362	2701358	2701408	2885919	2701347	2692526	2904802	2702136
Picture								
Frequency	2.4 GHz	2.4 GHz	2.4 + 5 GHz	2.4 GHz	5 GHz	2.4 + 5 GHz	868 MHz	868 MHz
Gain	2 dBi	3 dBi	2.5 / 5 dBi	6 dBi	5 dBi	>3 / >5 dBi	2 dBi	4 dBi
Polarization	vertical	vertical	vertical	vertical	vertical	vertical	vertical	vertical
Beamwidth horizontal	 360°	 360°	 360° (2.4 / 5 GHz)	 360°	 360°	 360°	 360°	 360°
Beamwidth vertical	 75°	 85°	 30° (2.4 GHz) 16° (5 GHz)	 30°	 25°	 30° (2.4 GHz) 25° (5 GHz)	 50°	 30°
Connector	RSMA (m)	RSMA (m)	N (m)	N (f)	N (f)	N (f)	N (f)	N (f)
Protection class	IP 65	IP 55	IP 68	IP 65	IP 64	IP 68	IP 65	IP 65
Temperature range	-20…+65°C	-40…+80 °C	-40…+70°C	-40…+75°C	-45…+70°C	-40…+80°C	-45…+70°C	-40…+75°C
Dimension	82,5x7,8 mm	86 x 43 mm	180 x 23 mm	250 x 22 mm	16 x 160 mm	92 x 52 mm	84 x 36 mm	620 x 20 mm
	Incl. 1,5m cable	Incl. 1,5m cable	Enclosure fitting	Wall & pole fitting	Wall & pole fitting	Enclosure fitting	Enclosure fitting	Wall & pole fitting

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Directional antenna

Article	ANT-DIR-2459-01	ANT-DIR-5900-01	RAD-ISM-5200-ANT-PAR-18-N	RAD-ISM-5200-ANT-PAR-22-N	ANT-DIR-868-01	RAD-ISM-900-ANT-YAGI-6.5-N	RAD-ISM-900-ANT-YAGI-10-N
Article No.	2701186	2701348	5606613	5606174	2702137	2867814	5606614
Picture							
Frequency	2.4 + 5 GHz	5 GHz	5 GHz	5 GHz	868 MHz	868 MHz	868 MHz
Gain	9 / 9 dBi	9 dBi	18 dBi	22 dBi	3,5 dBi	8.5 dBi	12.15 dBi
Polarization	vertical	+/- 45° dual slant	vertical	vertical	circular	vertical	vertical
Beamwidth horizontal	75°(2.4 GHz) 55° (5 GHz)	70°	18°	12°	135°	100°	56°
Beamwidth vertical	55°(2.4 GHz) 55° (5 GHz)	60°	18°	12°	90°	62°	46°
Connector	N (f)	2 x N (f)	N (f)	N (f)	N (f)	N (f)	N (f)
Protection class	IP 67	IP 67	IP 55	IP 55	IP67	IP65	IP65
Temperature range	-40…+80°C	-40…+80°C	-40…+70 °C	-40…+70°C	-40…+80°C	-40…+80°C	-40…+70°C
Dimension	80x101x35 mm	80x101x35 mm	152,4x152,4 mm	304 mm diam.	80 x 101 x 35 mm	170 x 60 mm	172 x 60.5 mm
	Wand & Mast Montage	Wand & Mast Montage	Wand&Mast Montage	Wand & Mast Montage	Wand & Mast Montage	Wand & Mast Montage	Wand & Mast Montage

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Antenna connector

RSMA



Cable side



Radio side

SMA





N





Antenna cabel and accessories





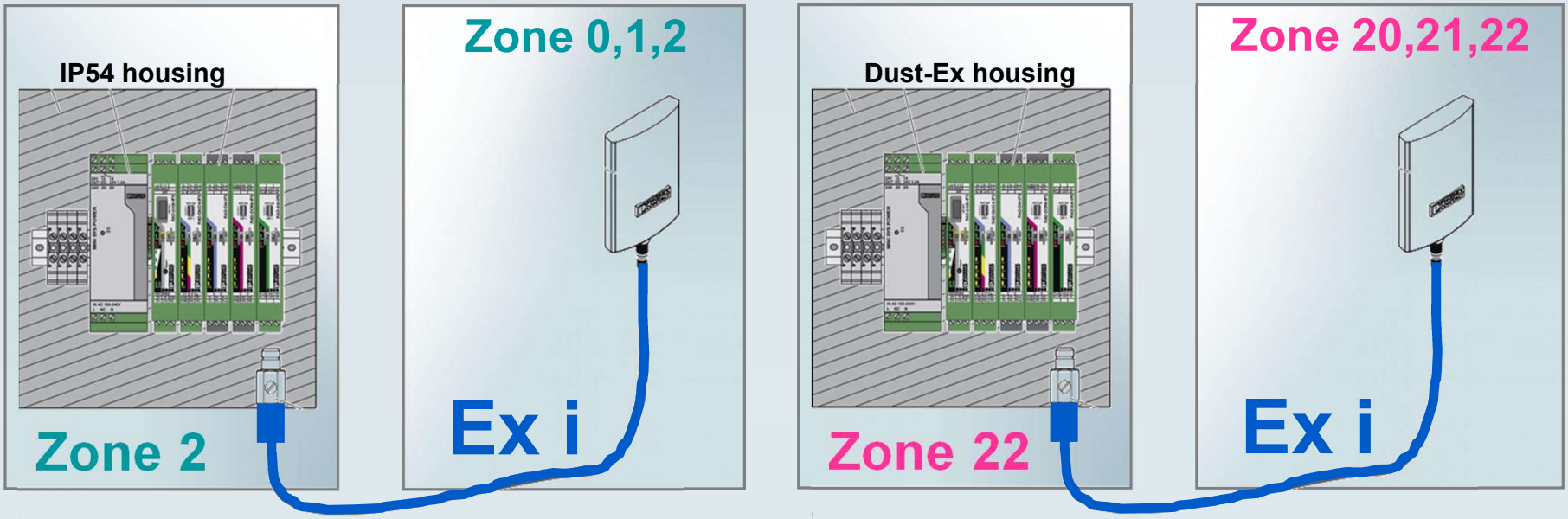



	Antenna cable for the control cabinet lead through	Antenna cable	Antenna cable	Surge protection 2,4 / 5 GHz	Surge protection 868 / 900 MHz	Antenna barrier
Frequency range	0,3 … 6 GHz	0,3 … 6 GHz	0,3 … 6 GHz	2,4 … 5,9 GHz	0,8 … 2,25 GHz	0,3 … 6 GHz
Connector	RSMA (m) -> N (m)	RSMA (m) -> N (m)	N (m) -> N (m)	N (m) -> N (m)	N (m) -> N (m)	N (m) -> N (m)
Characteristics	Easy install through flexible inner conductor, UV-resistant, oil-resistant	Solid inner conductor, low attenuation, UV-resistant	Easy install through flexible inner conductor, UV-resistant, oil-resistant	Overvoltage protection for coaxial signal interfaces with Lambda / 4 technology		Antenna barrier for control cabinet operation, type of protection: Ex i, installation barrier: zone 2, installation antenna: zone 0, 1 or 2
Length / Article No.	0,5 m / 2701402	0,5 m / 2903263 1 m / 2903264 2 m / 2903265 3 m / 2903266 5 m / 2702140	3 m / 2867649 5 m / 2867652 10 m / 2867665 15 m / 2885634	2838490	2801057	2702198

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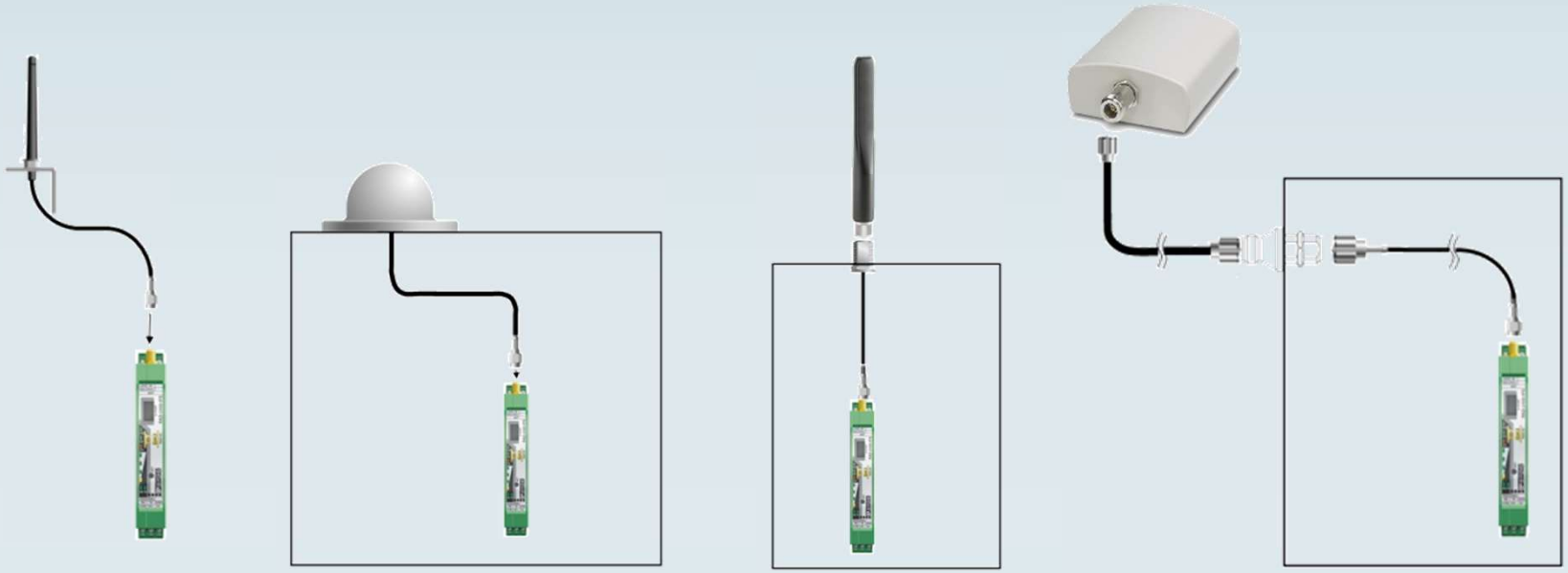
Antenna installation in Ex areas

new



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Installation examples



Tip: Use an antenna overvoltage protection outdoors!

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Wrong antenna installation



Wrong !



Better



Best solution!

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The right distance between antennas

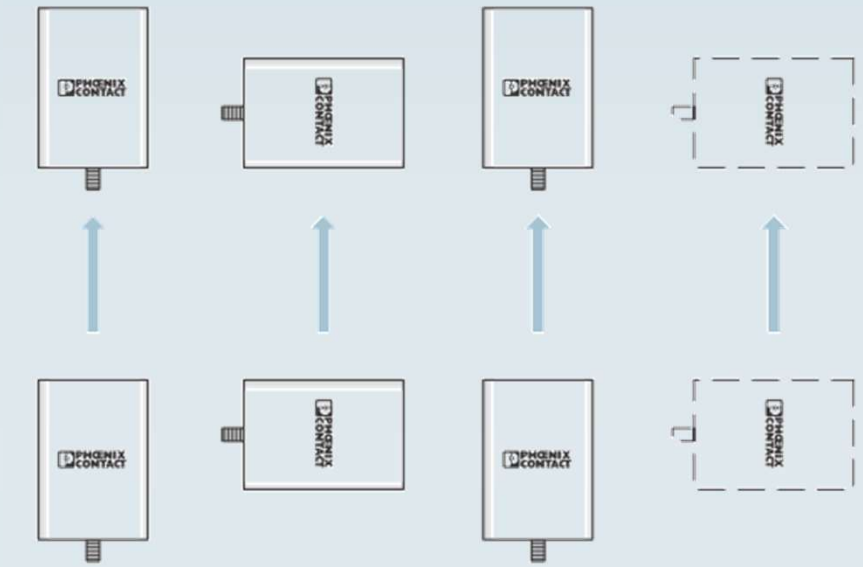
Frequency	Minimum distance (vertical and horizontal)
868/900 MHz	1.5 – 2.5 m
2.4 GHz	0.5 – 1.0 m
5 GHz	0.5 – 0.8 m

Tip: The best way is to mount the antenna on top of each other!



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Decoupling of wireless links



- Decoupling of spark gaps by directivity and different polarisation planes
- The Signals of different radio links are decoupled

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The right installation





- An omnidirectional antenna must always be installed with enough distance to an obstacle (mast, building wall or metallic wall)
- An antenna should be installed, especially outdoors, as high as possible position. With it you can improve the range. Keep the Fresnel zone free.
- The antenna cable should be as short as possible so that there are as few losses on the cable. Attach the wireless module closer to the antenna, e.g. in a small box.
- Always protect connections on the outside cables, junctions and antennas with protective tape.

More Details

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The right installation



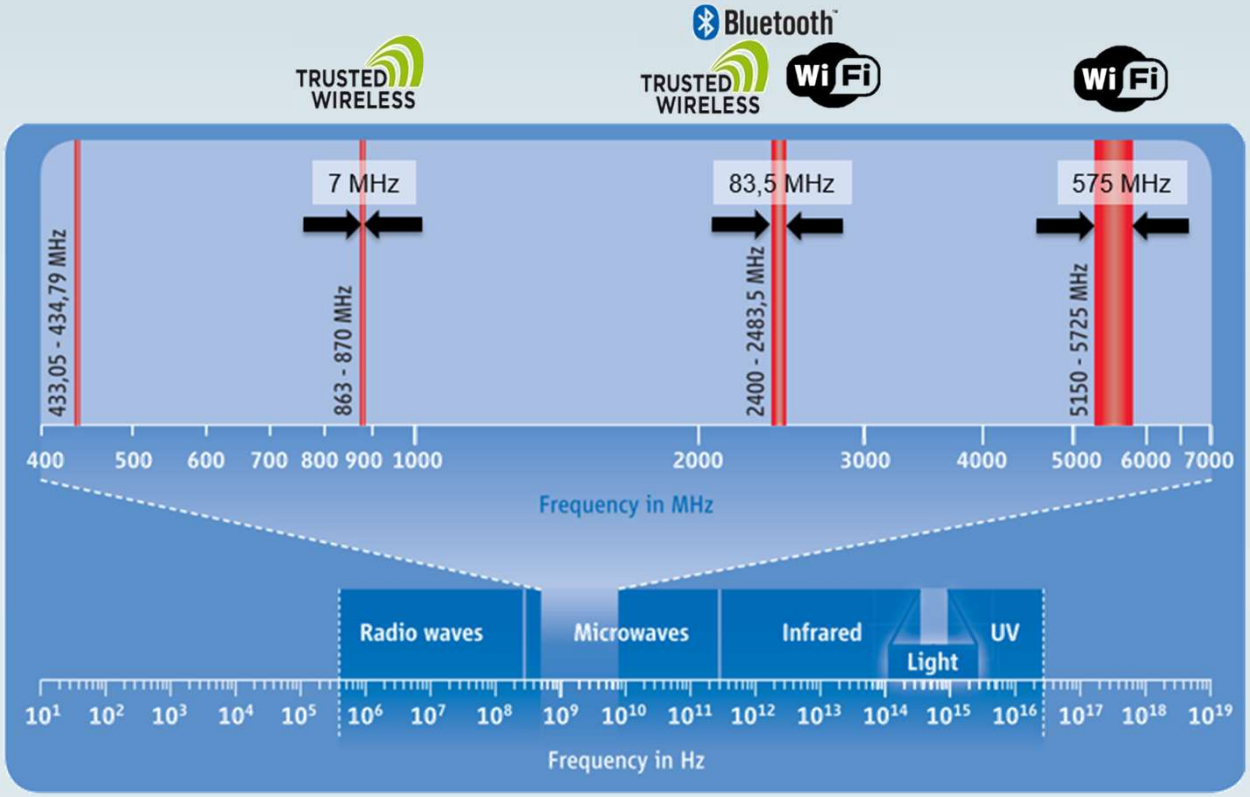


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More Details

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License free frequency bands

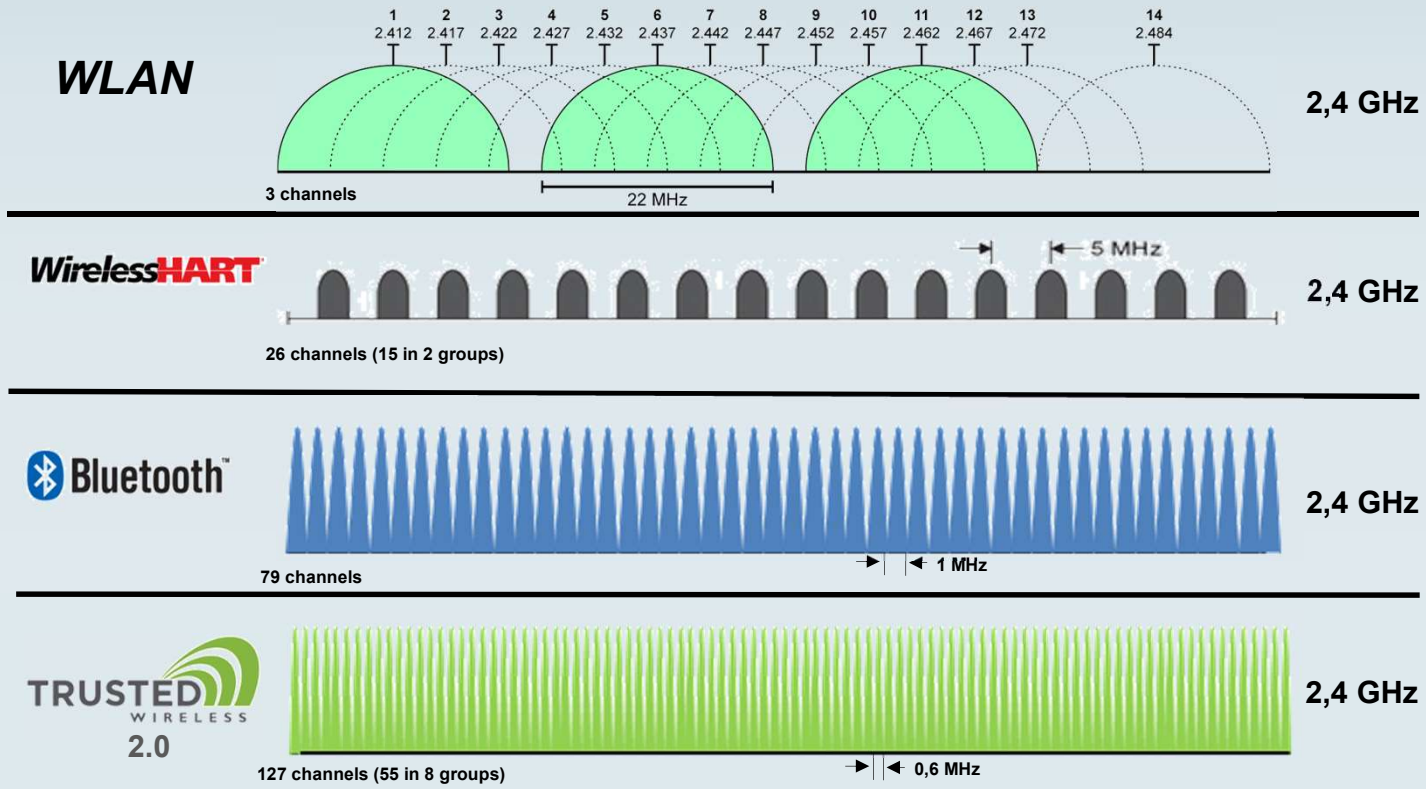


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Wireless Technologies

	Bluetooth	WLAN (Wireless Local Area Network)	Trusted Wireless 2.0	Wireless HART
Network structure	Star structure - 1 Master up to 7 Slaves	Access point can handle endless clients	Mesh network – 1 Master up to 249 Slaves	Full-Mesh network – 1 Master up to 249 Slaves
Standard	IEEE 802.15.1	IEEE 802.11	Propritär by Phoenix Contact	IEEE 802.15.4 HART 7
Transmission method	Frequency hopping (FHSS)	Direct Sequence Spread Spectrum (DSSS)	Frequency hopping (FHSS)	Frequency hopping (FHSS)
Application	fast, small networks	Fast, high data volume, Ethernet	Low/medium data rate, large networks, best for infrastructure application	HART signal, Process industry, short distances
Frequency	2,4 GHz	2,4 GHz, 5 GHz,	868 MHz, 900 MHz, 2,4 GHz	2,4 GHz
Latency time (typical)	>10 ms (IO) > 50ms (Serial)	>16 ms (depending on the data rate / Distance)	0,1 – > 2 s, depending on the OTA data rate / network structure	> 3 s up to serveral minutes
Distance (free line of sight)	Typ. <= 150 m	Typ. <= 150 m	<= 5 km (2,4 GHz) <= 20 km (868 MHz) <= 32 km (900 MHz)	Typ. <= 250 m

Transmission channels



- The wider the transmission channel the higher the data rate or the faster the data transmission
- The higher the number of channels, the more wireless systems can be operated in parallel

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Security Mechanisms



WLAN

- Use MAC-Filter
- Hide WLAN name
- Password protection
- Various types of encryption possible (WEP, WPA2, 802.11i, etc.)

WirelessHART

- Authentication and integrity check
- Frequency hopping
- Data encryption (128 Bit AES)

Bluetooth

- Pairing with only authorized devices
- Frequency hopping
- Password protection
- Data encryption (128 Bit AES)
- Hide Bluetooth name

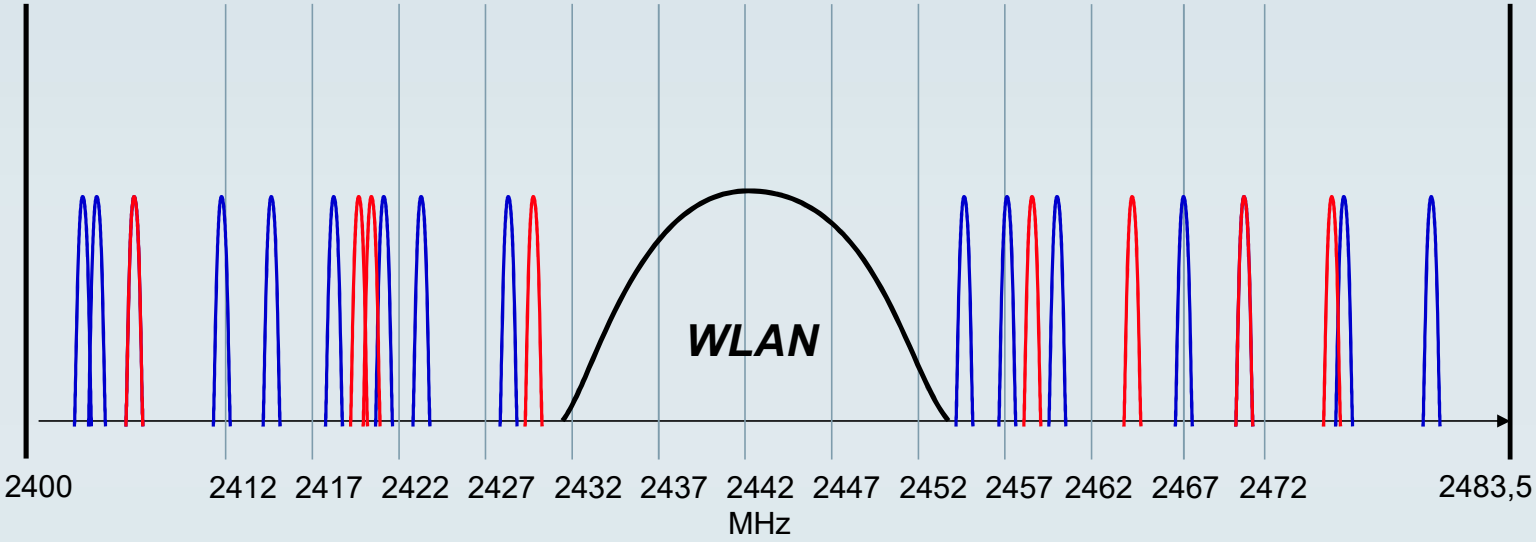
TRUSTED WIRELESS 2.0

- Proprietary technology
- Frequency hopping
- Network ID (unique)
- Authentication
- Data encryption (128 Bit AES)
- WLAN-Blacklist

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Coexistence – Inteference-free parallel operation

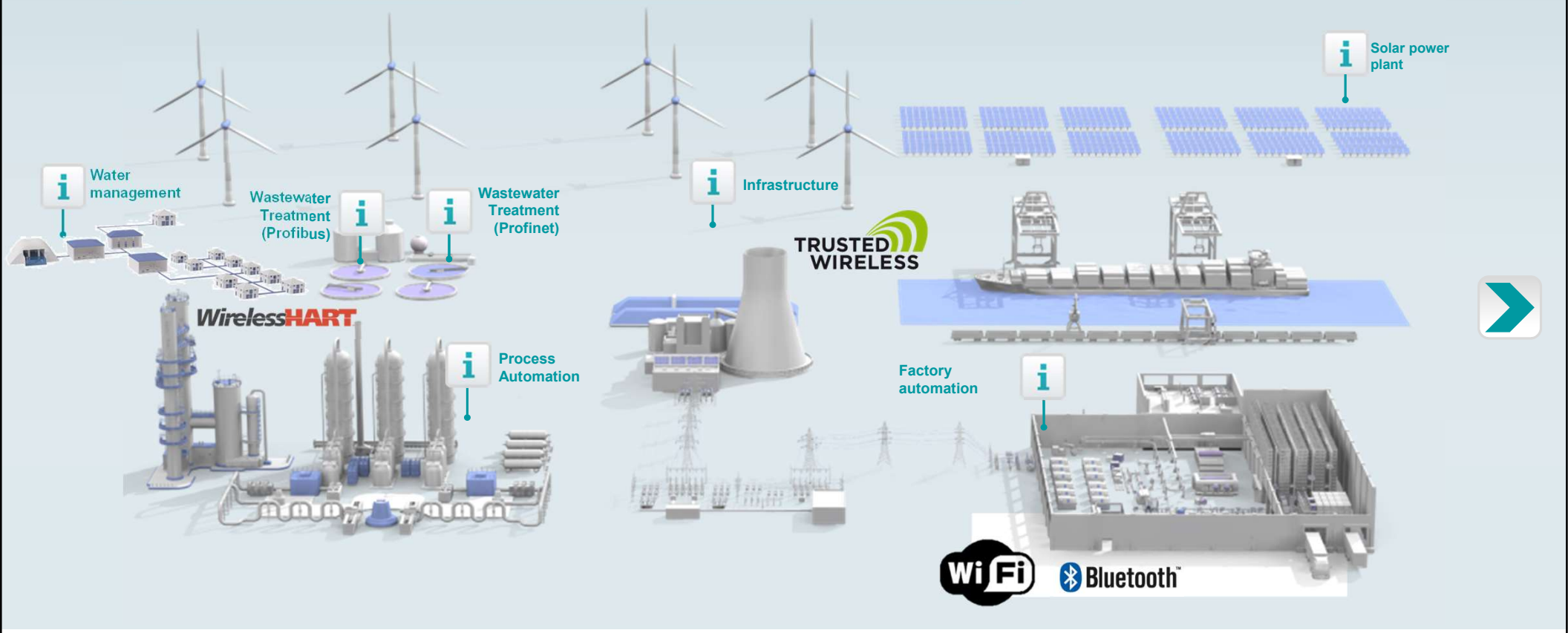
Bluetooth
TRUSTED WIRELESS
WLAN



Tip: WLAN channels can be hidden in Bluetooth and Trusted Wireless systems (blacklisting)

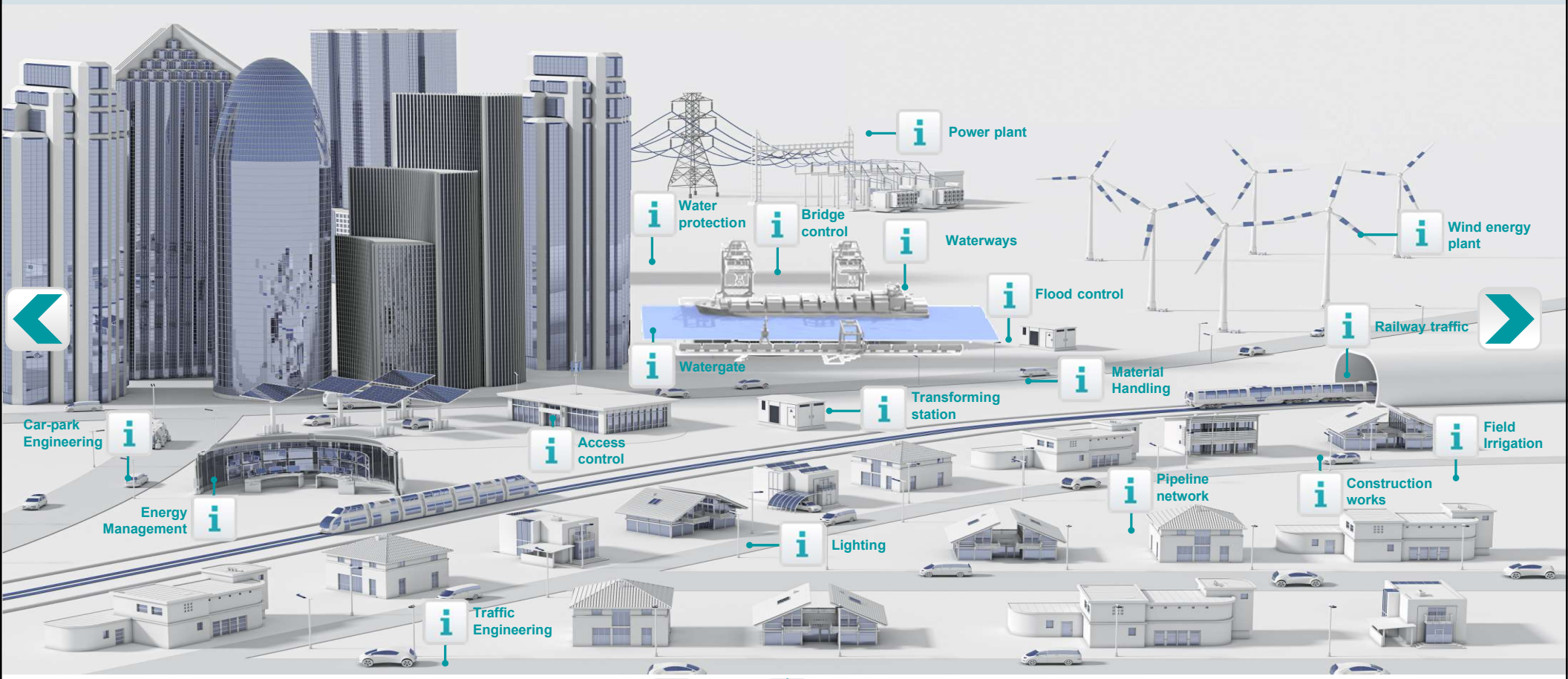
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Matching products for every application



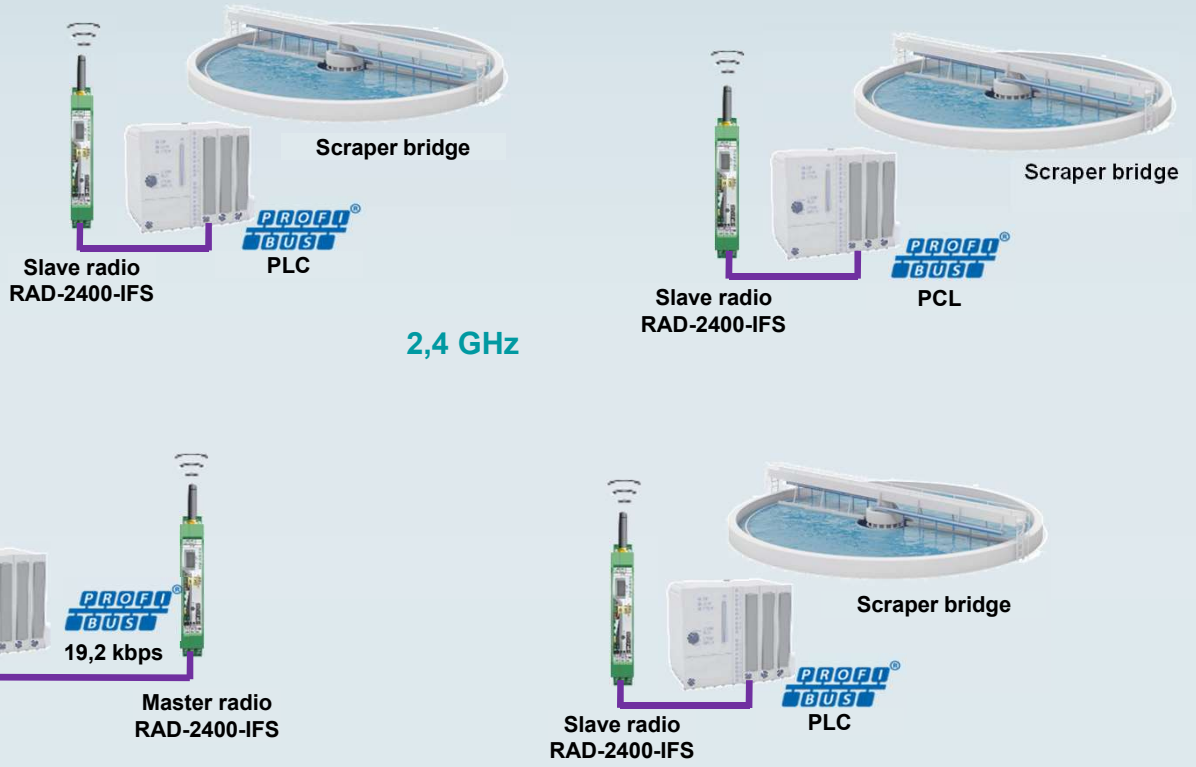
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Infrastructure



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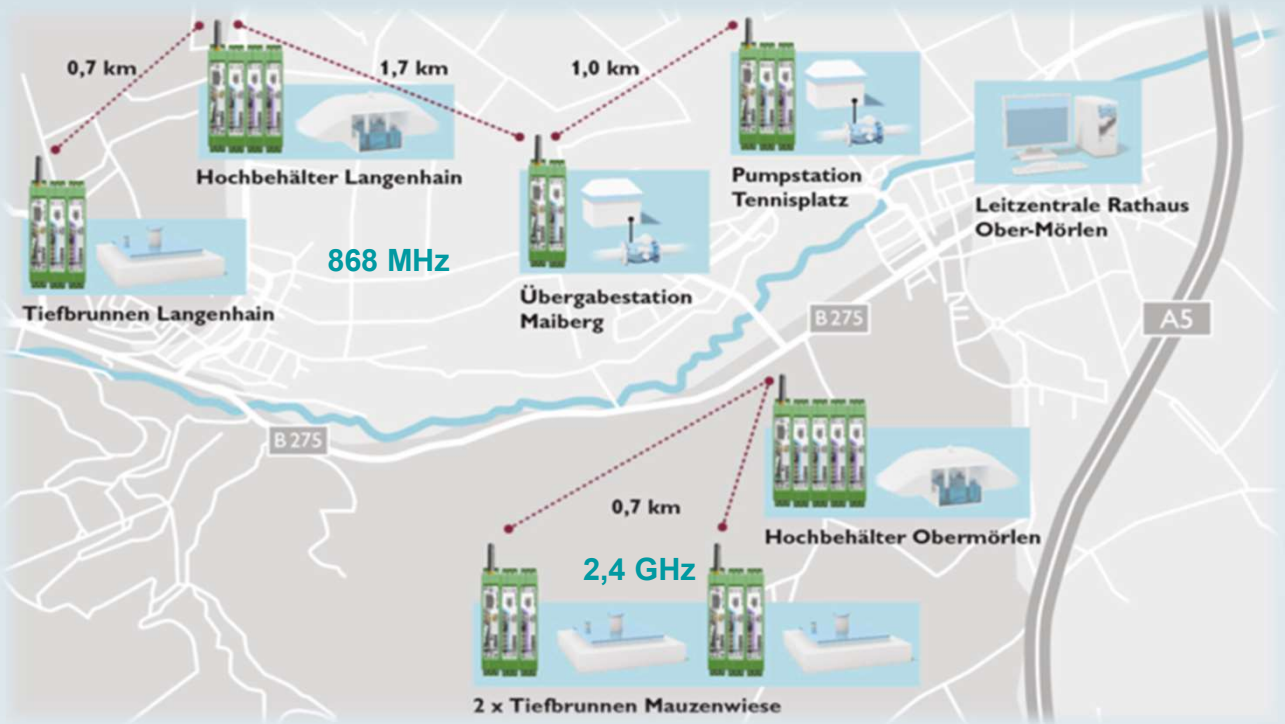
Wastewater Treatment (PROFIBUS)



- Sludge level monitoring
- Data transmission of operating data and alert signals via profibus protocol
- Replacement of expensive sliding contacts which need to be replaced several times a year (fault rate > 30 %)
- Star network
- Up to 14 slaves
- Datarate up to 93,75 kbps

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Water Management



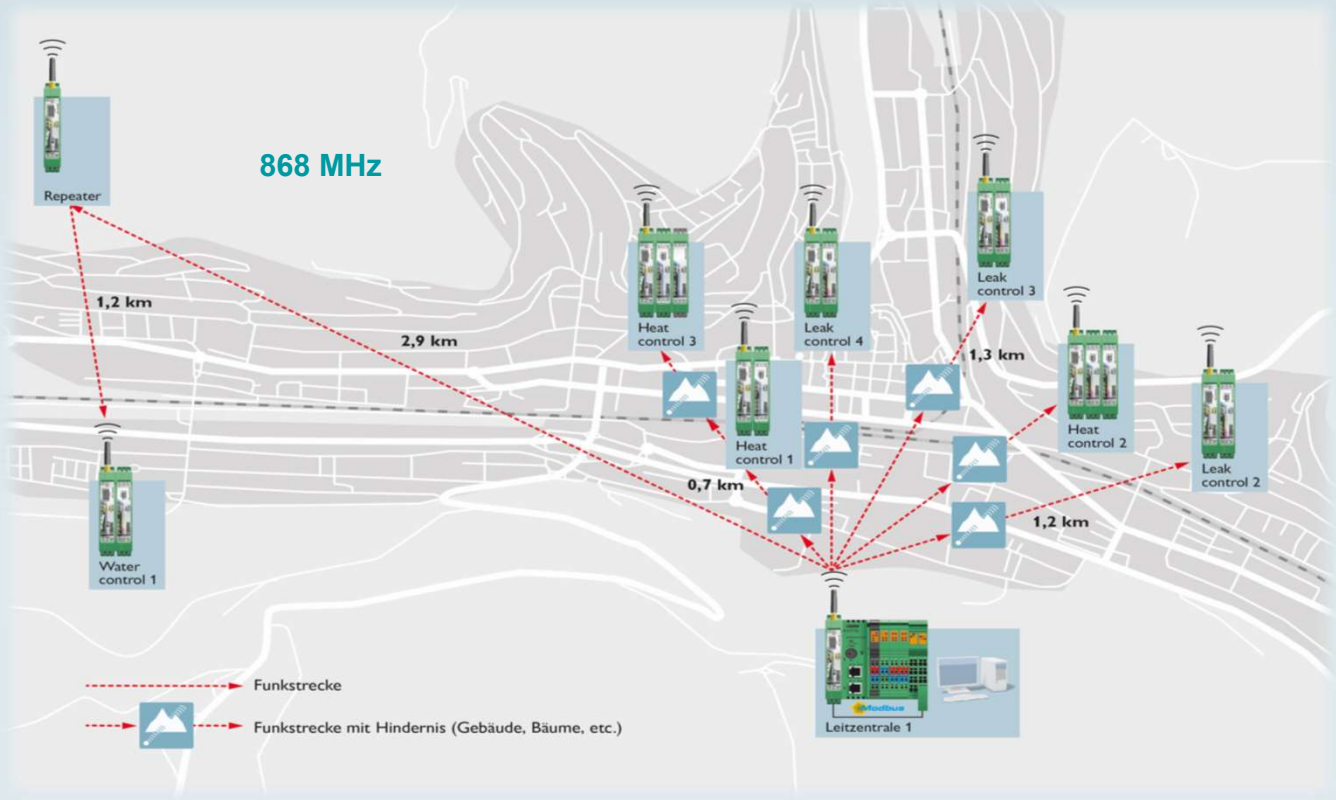
Application examples

- Monitoring of elevated tanks, deep wells, pumping stations, transfer stations, booster stations
- Recording of status signals, pump delivery rate, pressure, water meter pulses, level
- No infrastructure available or existing cables are damaged, cable laying very complex

Advantages of wireless systems

- ☑ Easy Startup – without Software
- ☑ Time and cost saving compared to the cable laying
- ☑ Mesh network up to 249 repeater/slaves

Leakage monitoring of pipeline networks



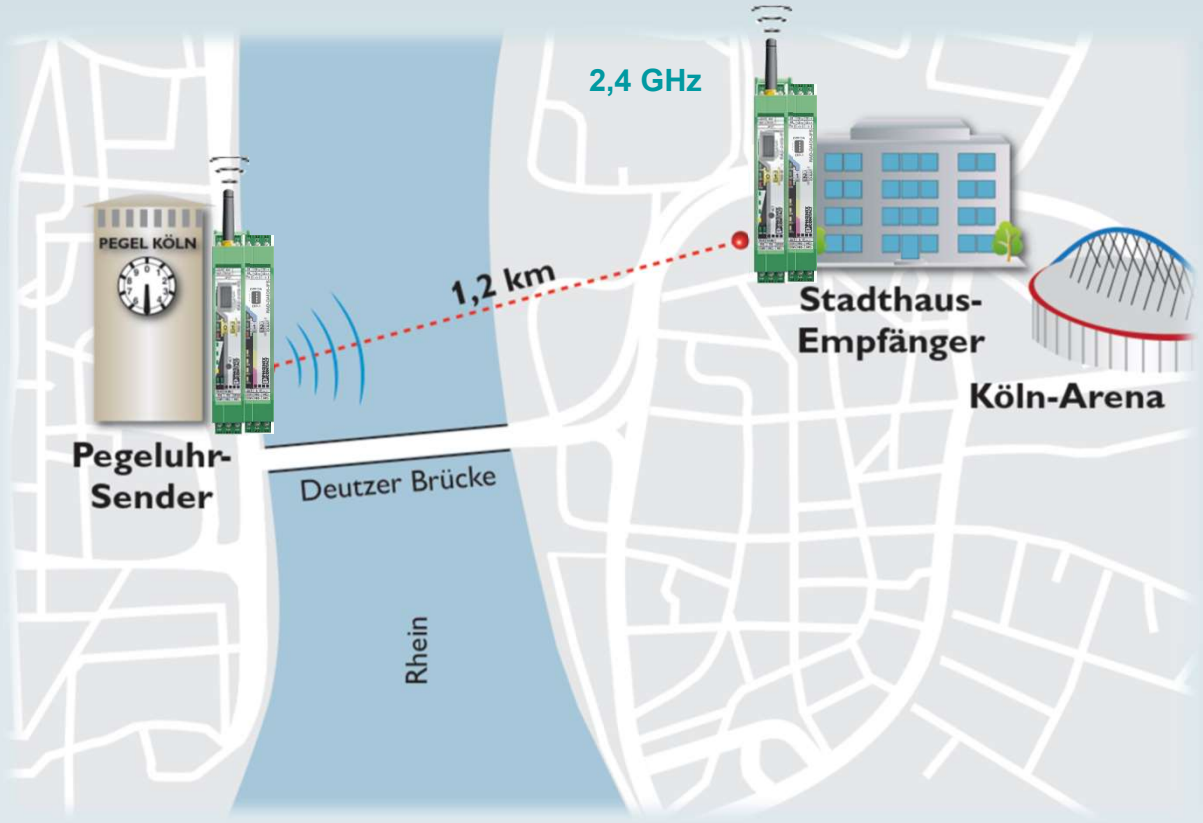
Application examples

- Monitoring of pipelines for energy, district heating and gas
- Several measuring stations for leakage control, water meters, gas meters, fault messages
- Communication lines to the remote local network stations are largely unavailable

Advantages of wireless systems

- ☑ Bridging of big distances and obstacles
- ☑ Saving cost- intensive earthworks
- ☑ Simple integration of additional measurement points
- ☑ Mesh network up to 249 repeater/slaves

Flood protection



Application examples

- The level of the Rhine must be present up to date in the flood control headquarters in Cologne
- Analog leased line was discontinued by provider

Advantages of wireless systems

- ☑ The radio waves are reflected constructively on the buildings, which leads to a very good signal level
- ☑ Provider-independent data transfer without running costs
- ☑ Save expensive earthworks
- ☑ Simple integration of further measuring points

Field irrigation



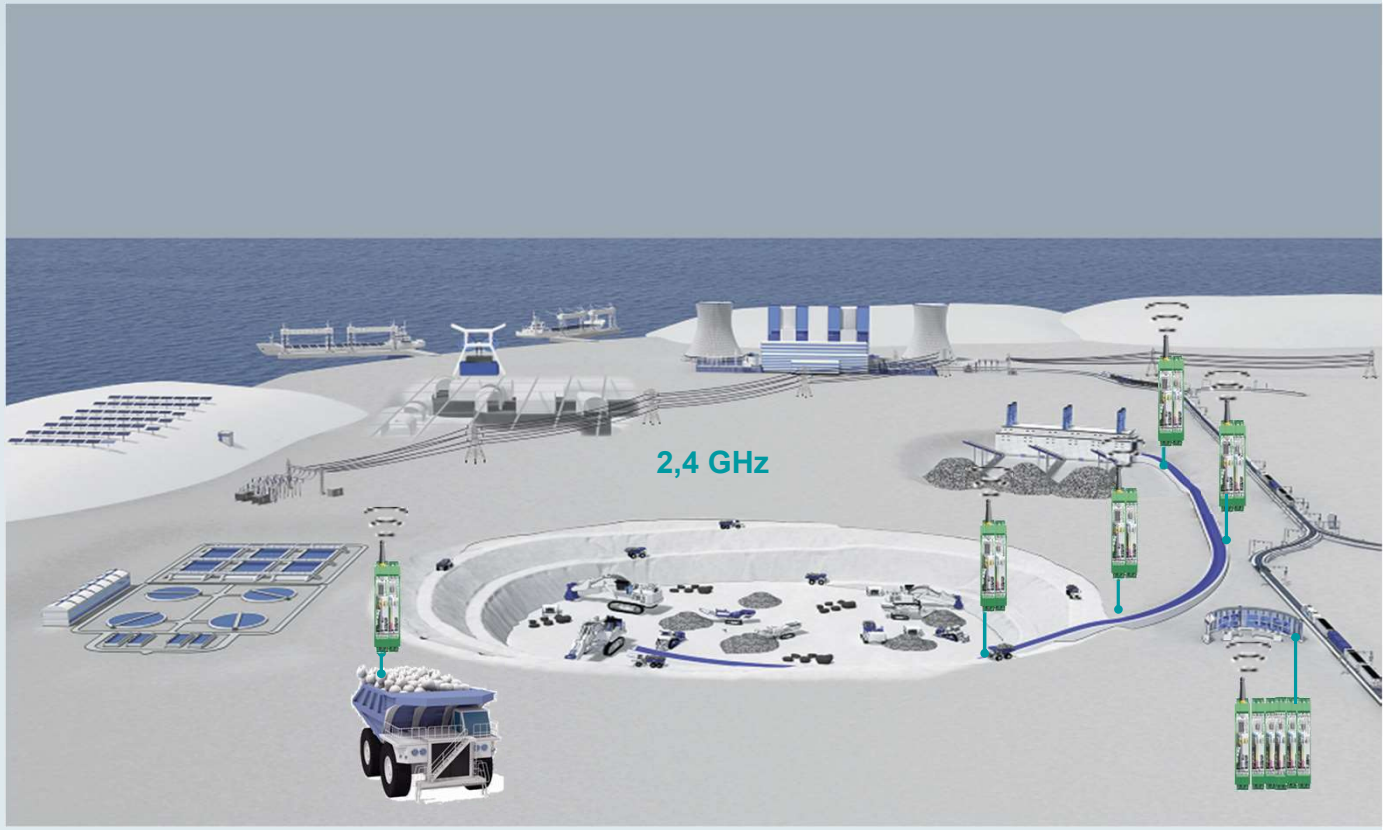
Application examples

- Communication between field irrigation systems and control center
- A central pump control station monitors the line pressure and the flow rate of seven irrigation systems
- Cable laying is not possible for economic reasons

Advantages of wireless systems

- ☑ Secure and reliable wireless connection
- ☑ Easy integration of additional irrigation machines in the future
- ☑ No further maintenance expenses

Material Handling



Application examples

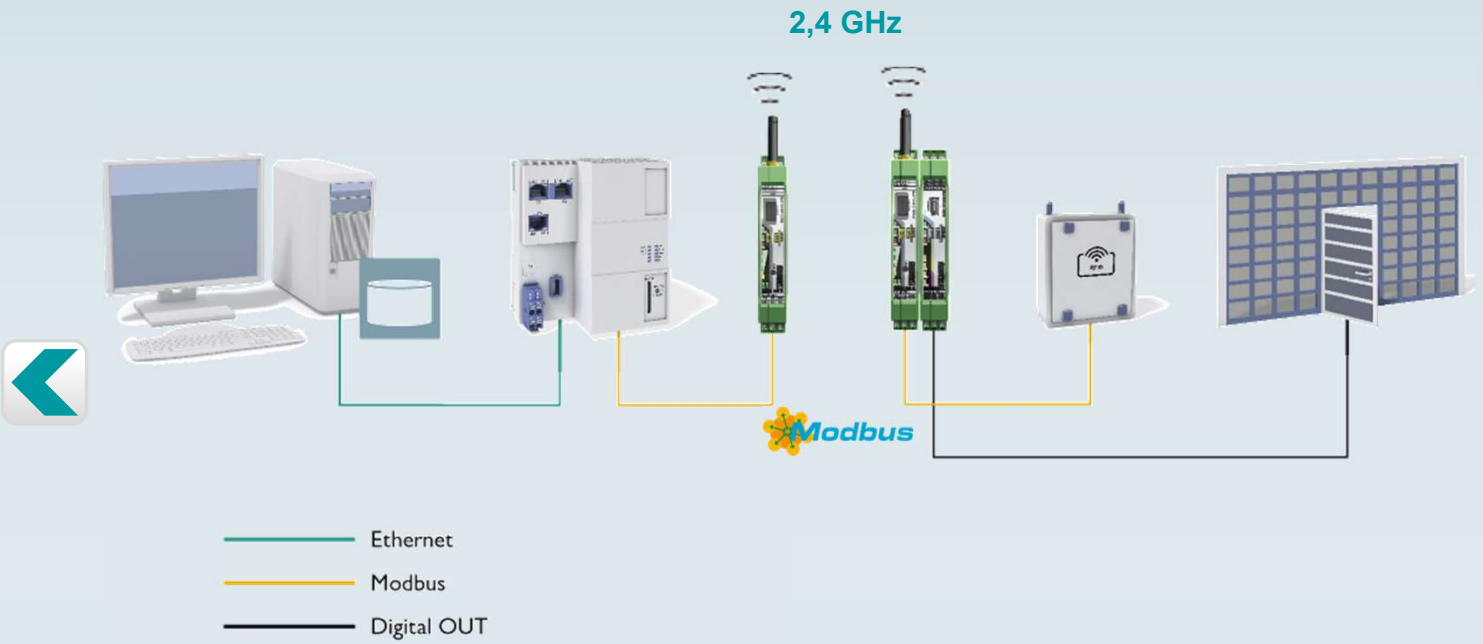
- Monitoring and control of fixed or moving conveyors, stackers and dump trucks
- Transmission of temperature, status and alarm signals
- Replacement of expensive special cable drums

Advantages of wireless systems

- ☑ Bridging of big distances and obstacles
- ☑ Easy startup – without software
- ☑ Simple integration of additional measurement points
- ☑ Mesh network up to 249 repeater/slaves

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Access control



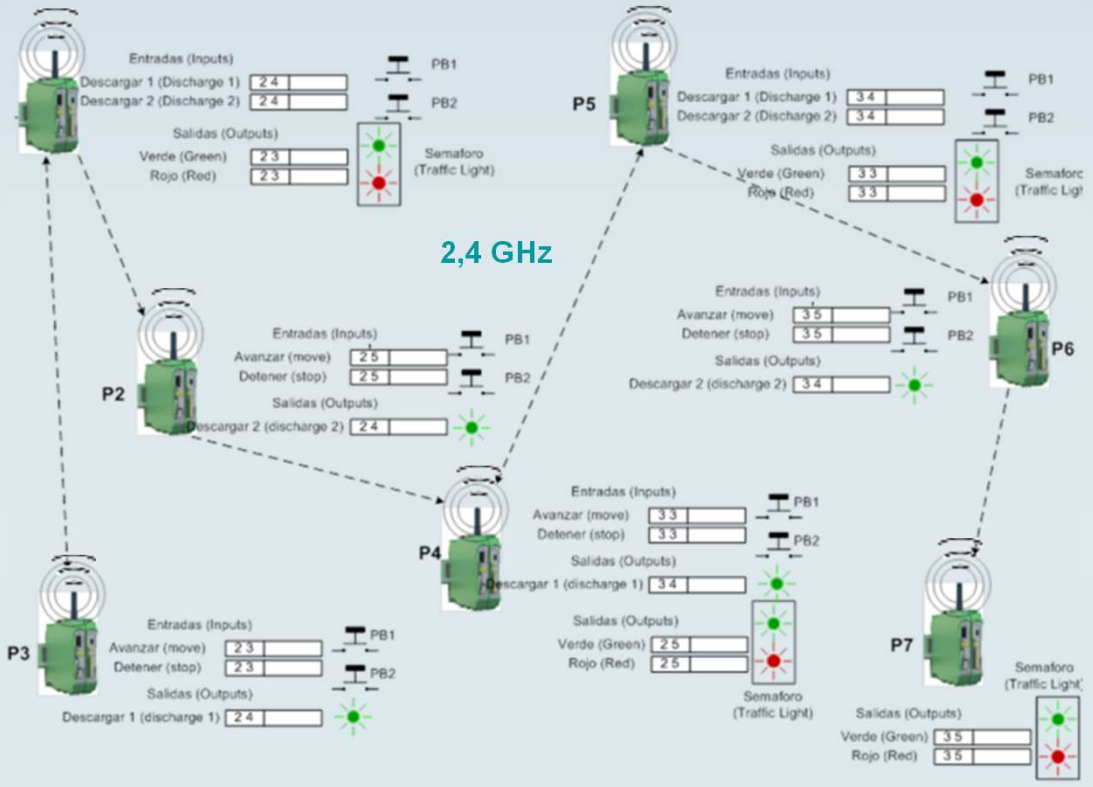
Application examples

- Security systems for access control, burglary detection, for employees, for suppliers, visitors as well as a vehicle counting and visitor management
- Modbus communication between RFID card reader and PLC
- The PLC checks if the cardholder is authorized to enter the hall and releases the wicket door in the gate with a positive feedback on a switching signal

Advantages of wireless systems

- ☑ Bridging of big distances and obstacles
- ☑ Time and cost savings compared to cable laying
- ☑ Easy integration of existing and new signals into the control system

Construction site traffic lights



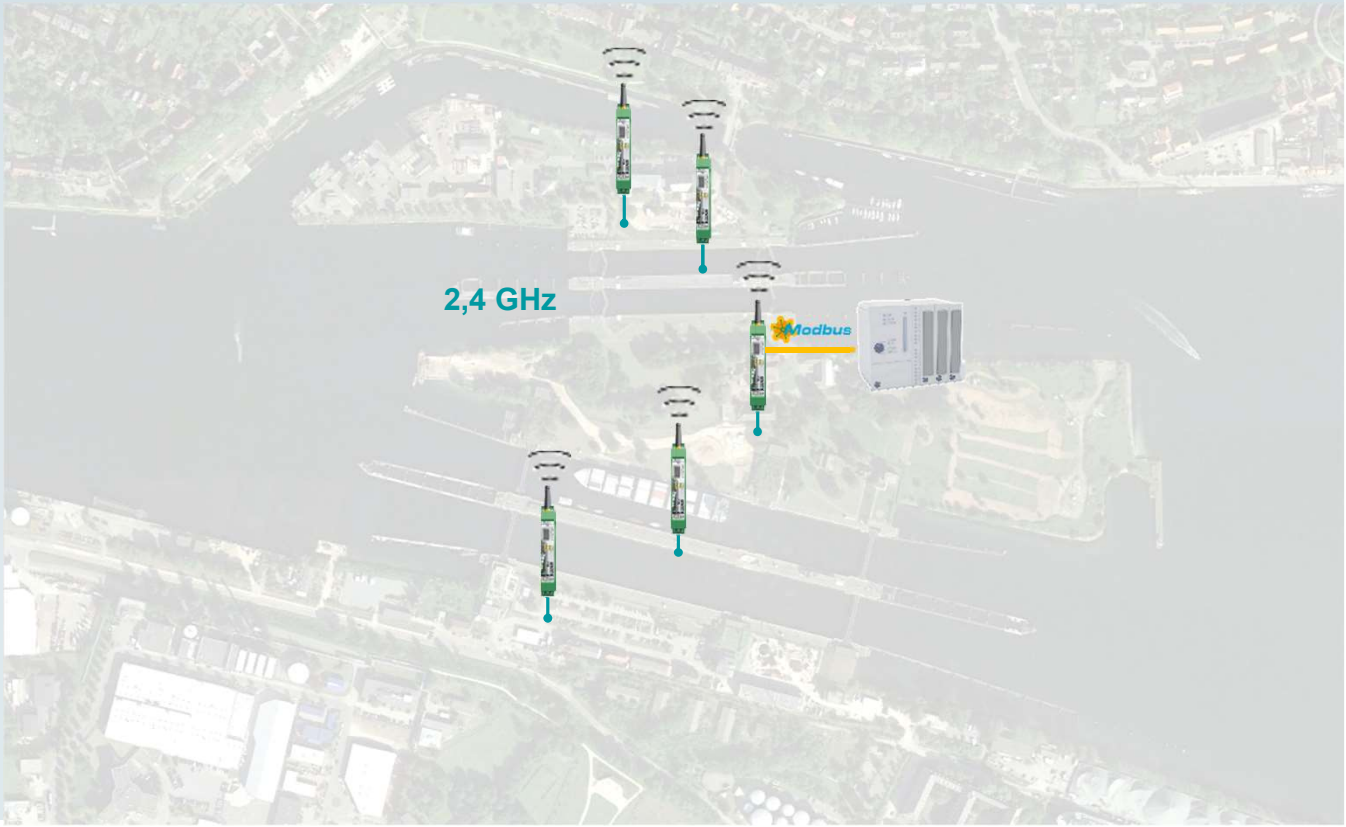
Application examples

- Temporary installation of construction site traffic lights
- Synchronization of the traffic lights

Advantages of wireless systems

- ☑ No manual traffic light switching necessary anymore
- ☑ Easy startup – without software
- ☑ Bridging of big distances and obstacles
- ☑ Fast, cost effective alternative to complex cable laying

Watergate construction



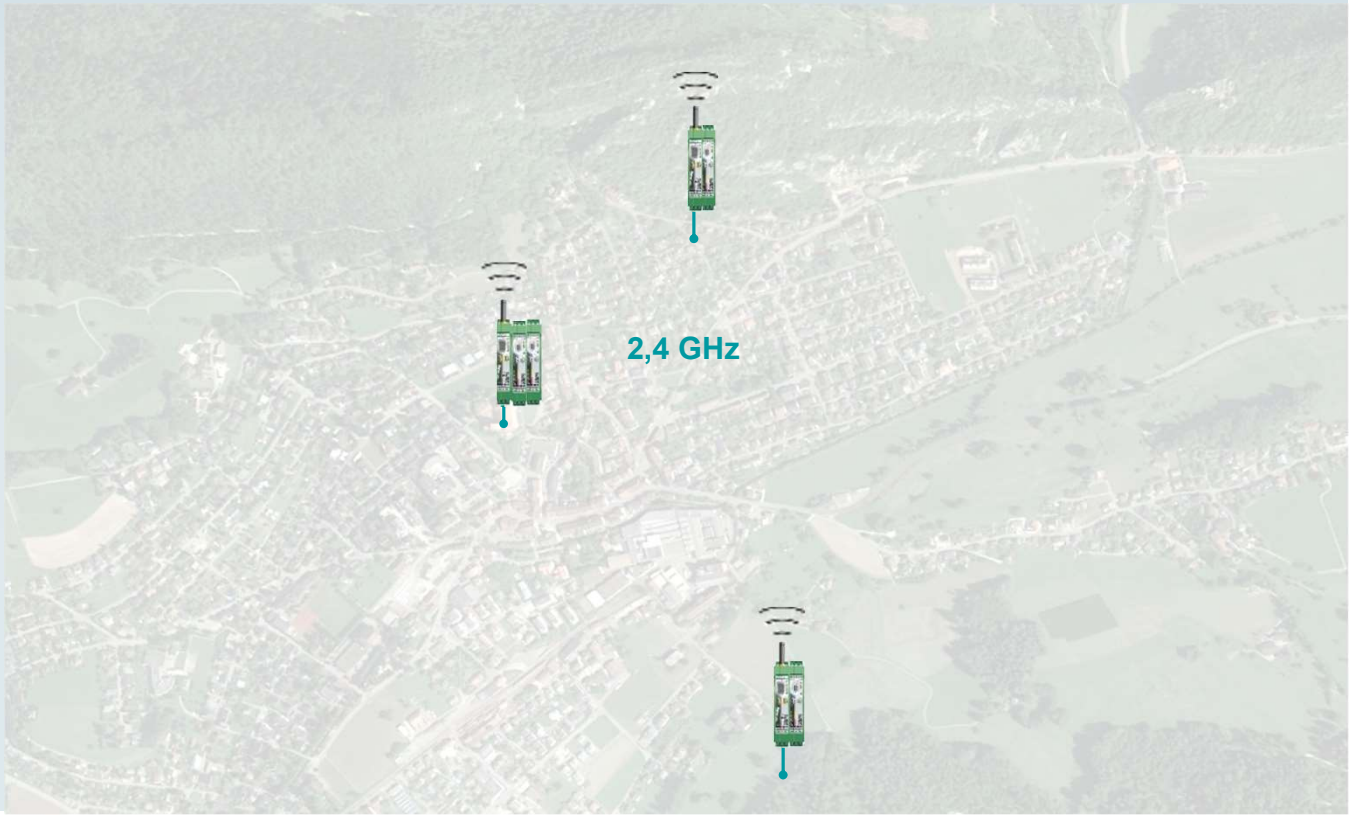
Application examples

- During the construction sensors measure all important points of the underground lock structure (inclinometer, position transducer, etc.)
- Hundreds of sensors are connected to decentralized measurement collecting points (Modbus-RTU)
- Distance between collecting points 100-300 m with obstacles

Advantages of wireless systems

- ☑ Bridging of big distances and obstacles
- ☑ Time and cost savings compared to the cable laying
- ☑ Easy integration of existing and new signals in the control system

Lighting



Application examples

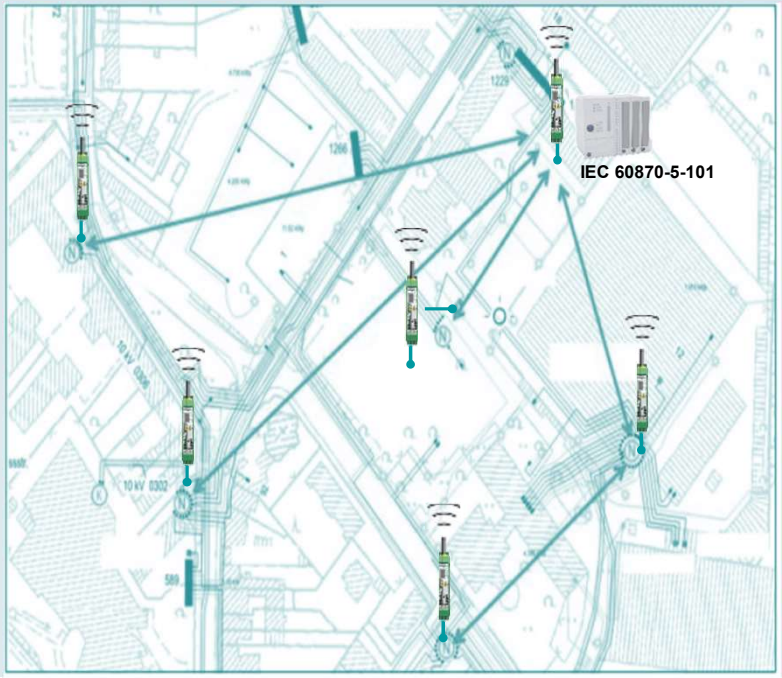
- Central control of the castle lighting from a publicly accessible center
- The first castle is located about 1.5 km south of the headquarters on a mountain
- The second castle is located about 2.5 km north of the headquarters on a mountain

Advantages of wireless systems

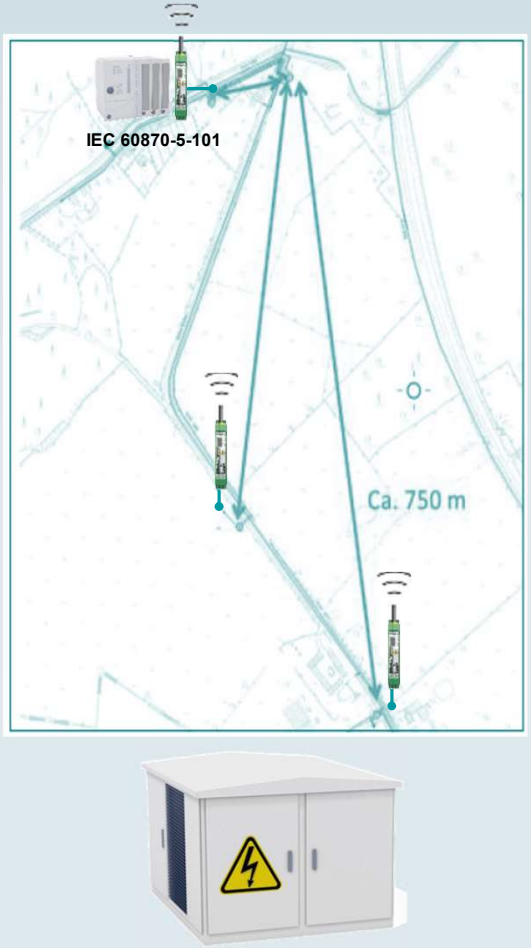
- ☑ Bridging of big distances and obstacles
- ☑ Significantly improved accessibility of the lighting control, especially during the winter months
- ☑ Safe and reliable communication

Transforming stations

868 MHz
Implemented in Europe



900 MHz
In America



Application examples

- Monitoring of decentralized automated local network stations
- Transmission of status, fault and alarm messages
- Communications lines to the decentral local network stations are largely not available
- The mobile broadband coverage in the area isn´t stain-free

Advantages of wireless systems

- ☑ Bridging big distances and obstacles
- ☑ Easy startup
- ☑ Saving cost-intensive earthworks
- ☑ Simple integration of additional substations

Hydropower plants



Application examples

- Damaged underground cables between the other remote stations, repair impossible
- Monitoring of pump stations
- Level measurement in water reservoir

Advantages of wireless systems

- ☑ Bridging big distances and obstacles
- ☑ Easy I/O integration in TIA Portal thanks to free function blocks
- ☑ Central monitoring and archiving

Water protection



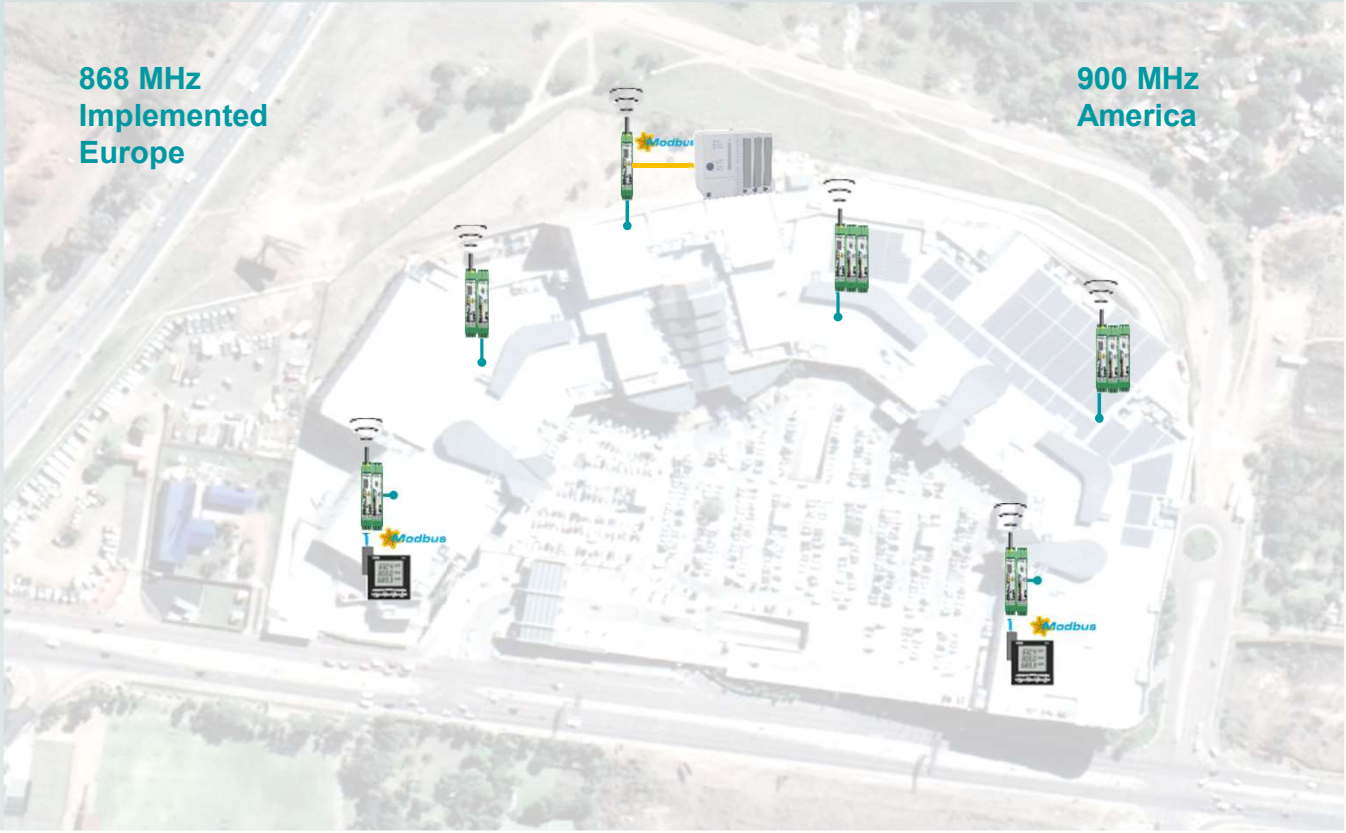
Application examples

- Cooling water taken from rivers and is introduced again, need to checked at the inlet and outlet
- Operators need to document to the authorities the level and the temperature
- The measurement points along the river are approx 1 km away from the plant

Advantages of wireless systems

- ☑ Easy setup without software
- ☑ Saving cost-intensive earthworks
- ☑ Simple integration of future outer buildings of the power plant

Building - Energy Management



Application examples

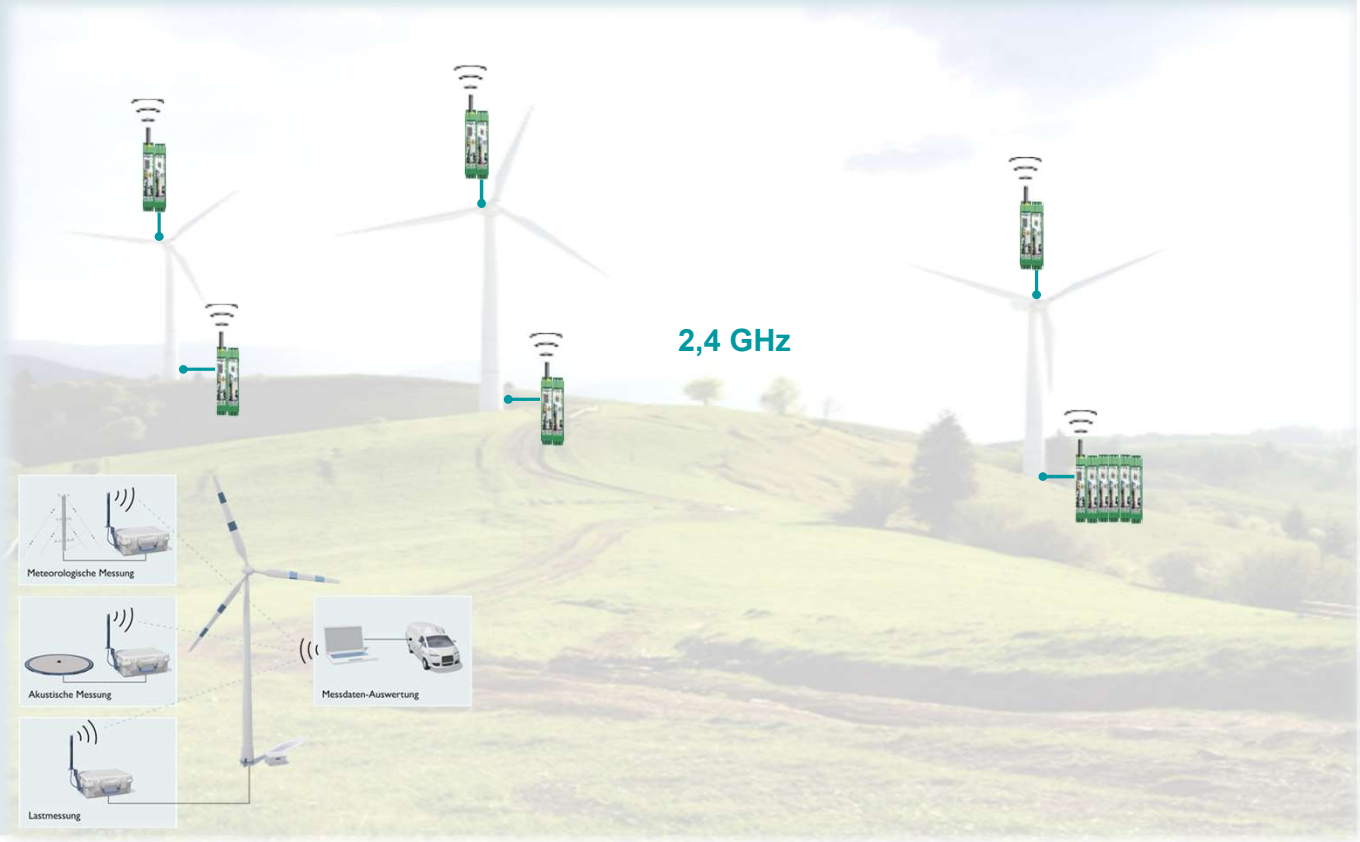
- The power supply is subject to strong voltage fluctuations, which can lead to short-term power failures
- Gasoline generators and PV inverters to safeguard the supply of the shopping center must be continuously monitored
- In addition, the energy consumption and yield data of the individual units must be recorded

Advantages of wireless systems

- ☑ Secure and reliable wireless connection through obstacles such as walls, etc. thanks to the 868 MHz radios, or Future 900 MHz in America
- ☑ Flexible customization and extension
- ☑ Parallel transmission of I/O signals and Modbus data

PHOENIX CONTACT
INSPIRING INNOVATIONS

Wind energy plant



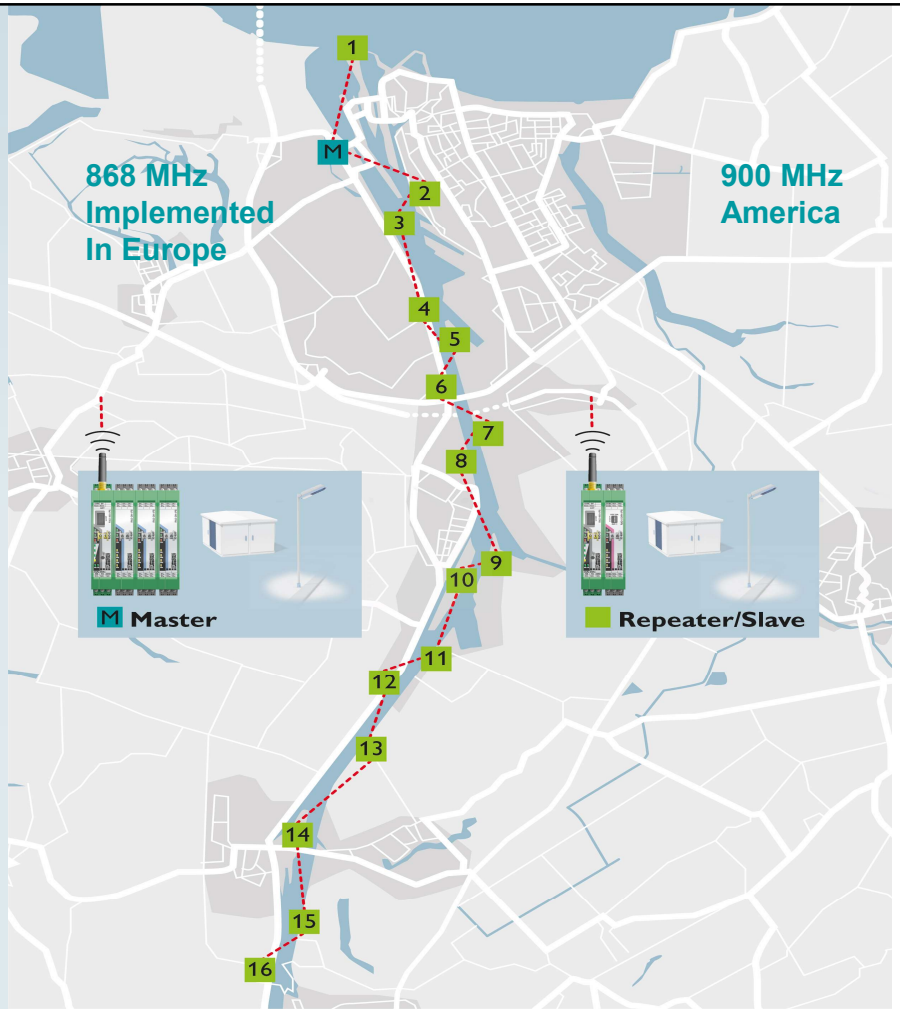
Application examples

- Regulation of the intensity of obstacle lighting and synchronization of all wind farm installations
- Retrofitting of fire alarm systems
- Temporary installation for recording acoustic, meteorological and other plant data for plant certification

Advantages of wireless systems

- ☑ Easy startup
- ☑ Flexible customization and extension
- ☑ Relief for test engineers because there is no need to tow or unroll heavy cables

Canal light control



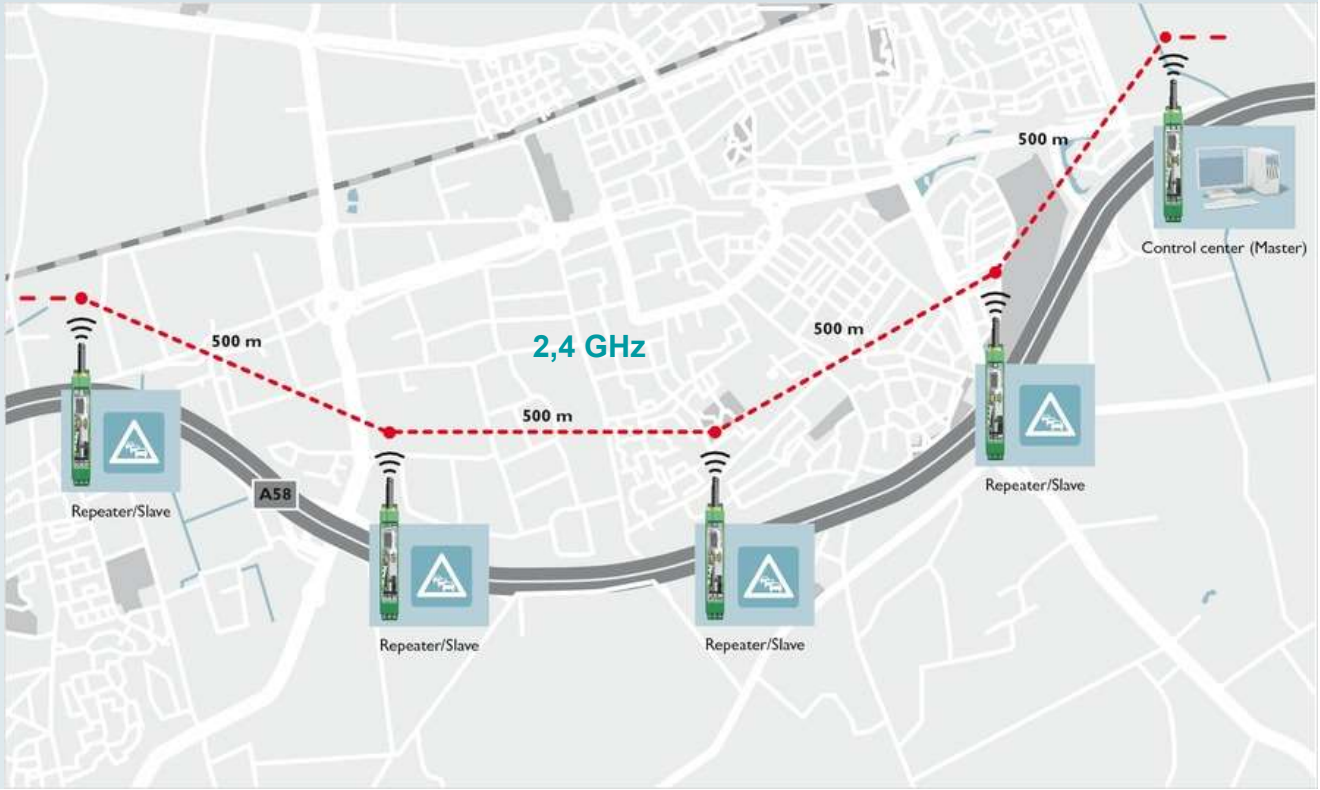
Application examples

- For the conduct of shipping, lighting is available on 300 masts on both sides of the canal
- The network is divided into 3 sections with 17 switching stations, so that part of the lighting can also be switched by bridge keepers or from the central traffic control center

Advantages of wireless systems

- ☑ Easy integration of existing and new signals in the control system
- ☑ Time and cost savings compared to the cable laying
- ☑ High availability and coverage of large distances

Traffic control



Application examples

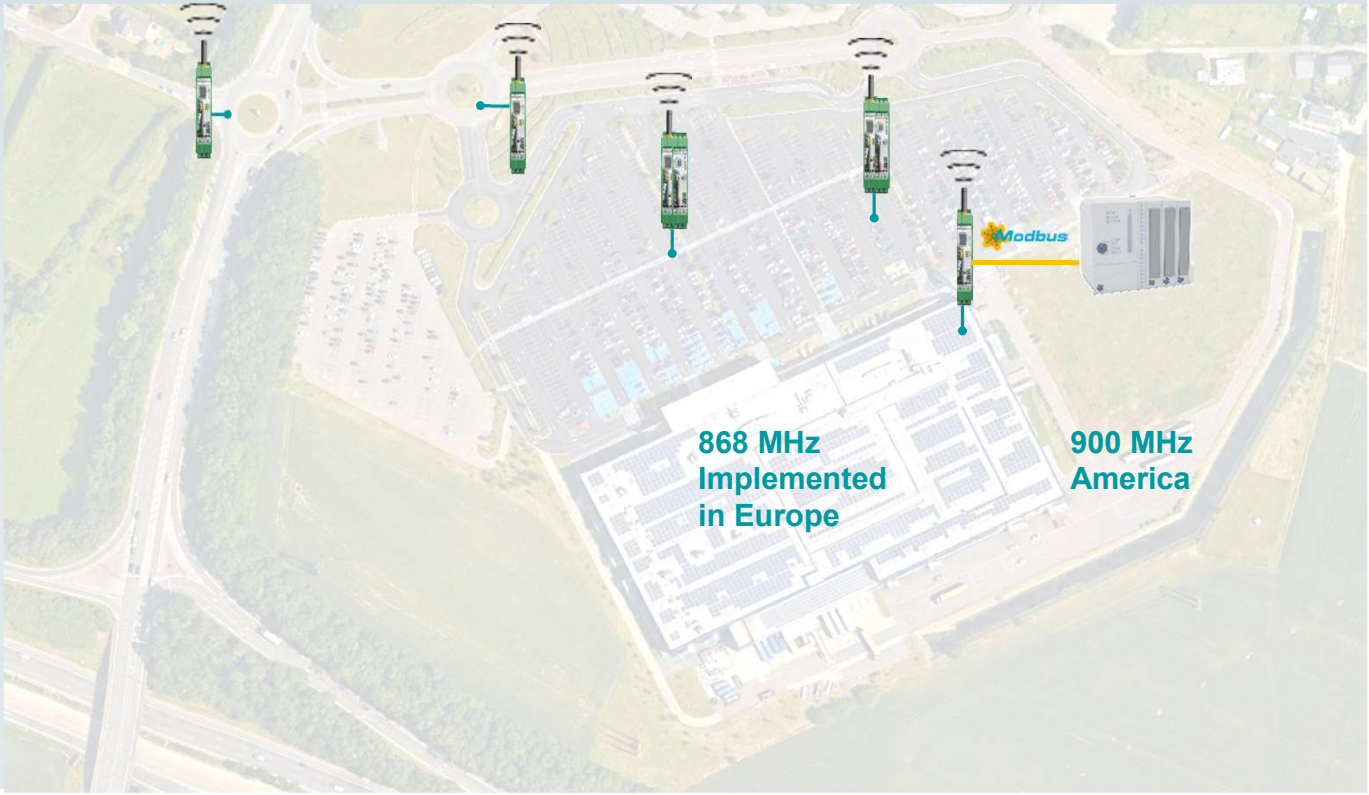
- Control of sign boards for traffic jam information
- Cable installation impossible during highway traffic
- Power supply via solar system
- Distance between sign boards, each 500 – 1000 m

Advantages of wireless systems

- ☑ Easy integration of existing and new signals in the control system
- ☑ Time and cost savings compared to the cable laying
- ☑ High availability and coverage of large distances
- ☑ Installation during highway traffic

PHOENIX CONTACT
INSPIRING INNOVATIONS

Parking guidance system



Application examples

- Display of currently available parking spaces
- Communication between parking guidance system and 3 scoreboards with Modbus-RTU interface
- Car park lighting control

Advantages of wireless systems

- ☑ Easy integration of existing and new signals in the control system
- ☑ Time and cost savings compared to the cable laying
- ☑ High availability and coverage of large distances
- ☑ Installation during traffic
- ☑ Parallel transmission of I/O signals and Modbus data

Bridge control



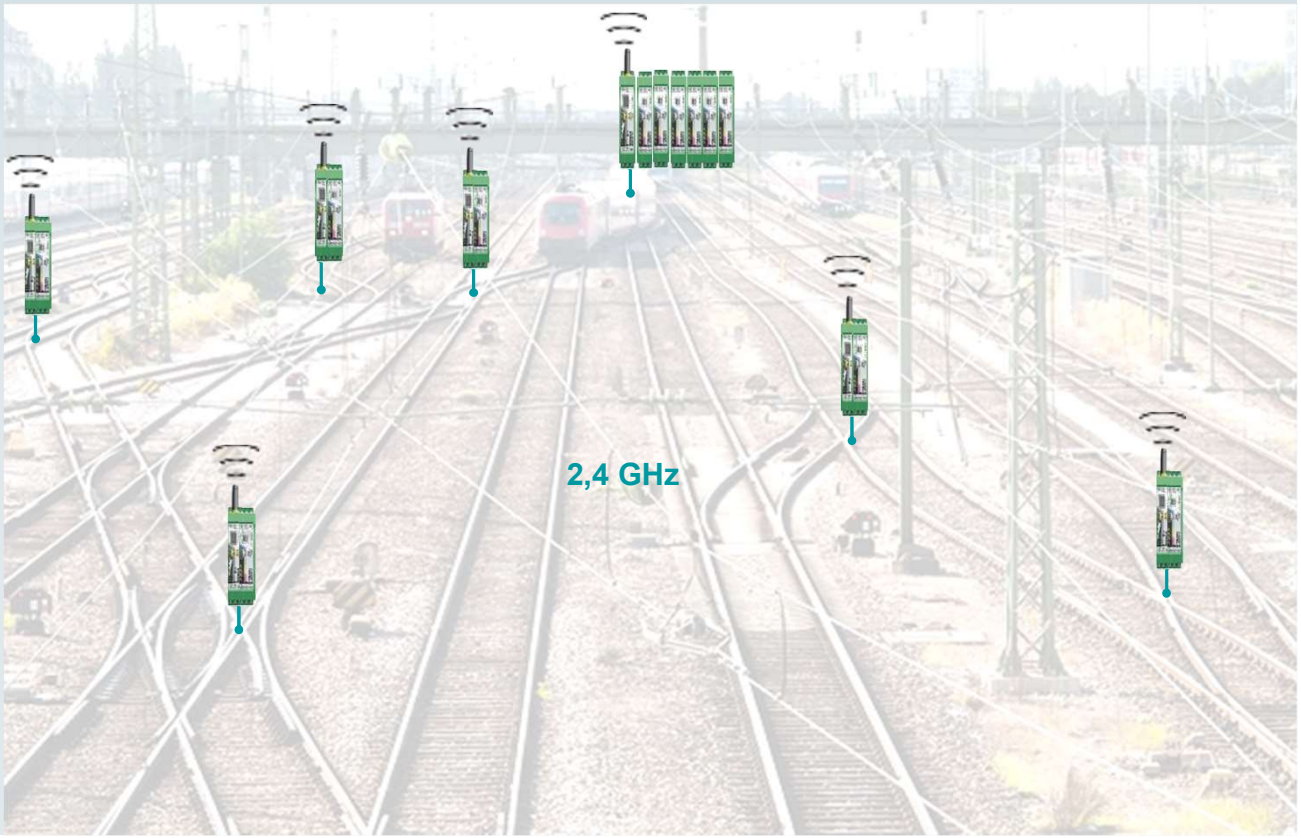
Application examples

- The maximum clearance hight dependent on the current water level is visualized to the ship's crews on 6 displays with Modbus-RTU interface
- Communication between displays and central plc

Advantages of wireless systems

- ☑ Easy integration of existing and new signals in the control system
- ☑ License-free wireless solution, no running costs
- ☑ High availability and bridging of big distances with obstacles

Train tracks



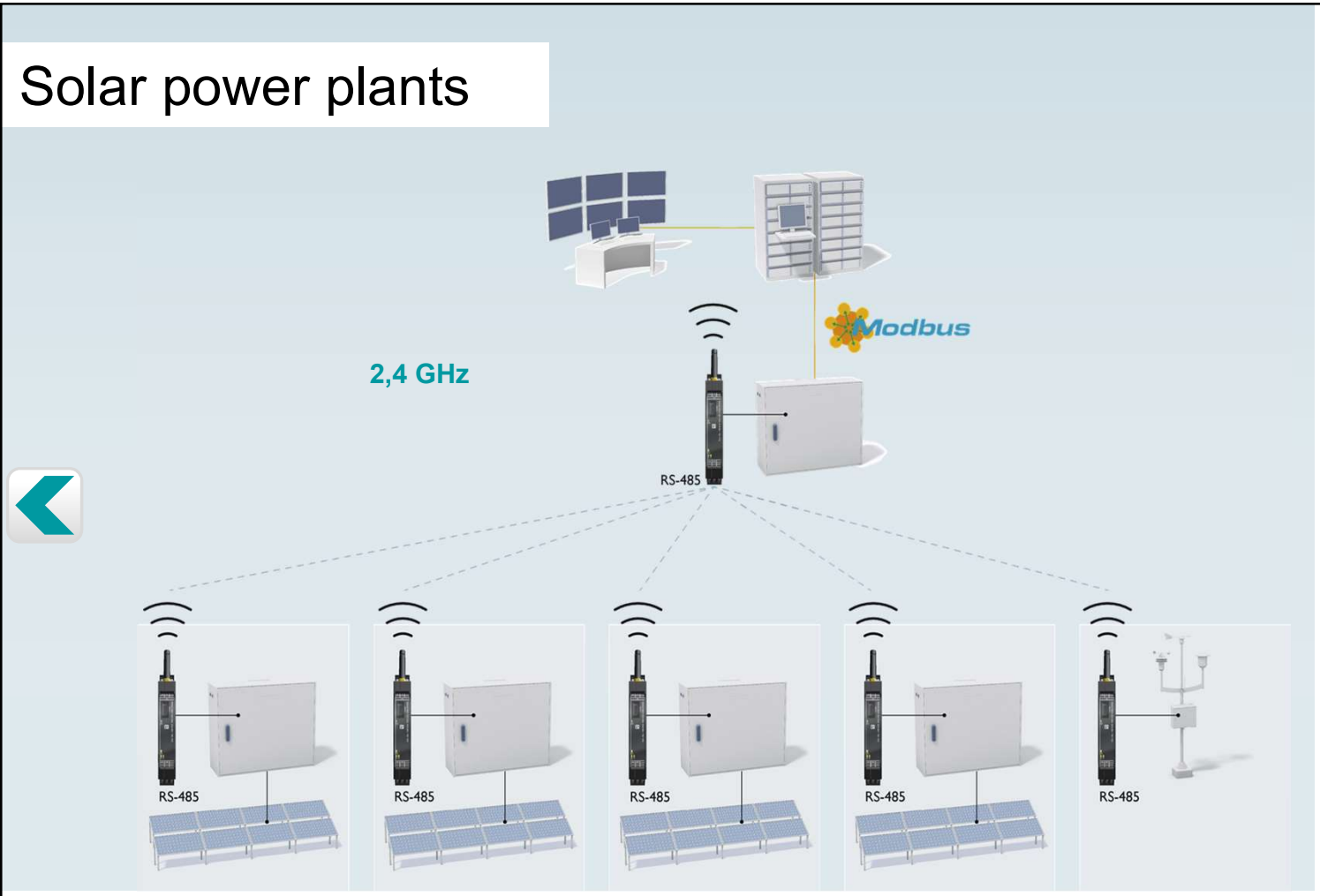
Application examples

- Monitoring the heating elements to heat the rails during the winter months
- Range several hundred meters

Advantages of wireless systems

- ☑ Immune to electromagnetic interference
- ☑ High availability and bridging of big distances with obstacles
- ☑ Installation during traffic
- ☑ Easy integration of additional measuring points

Solar power plants



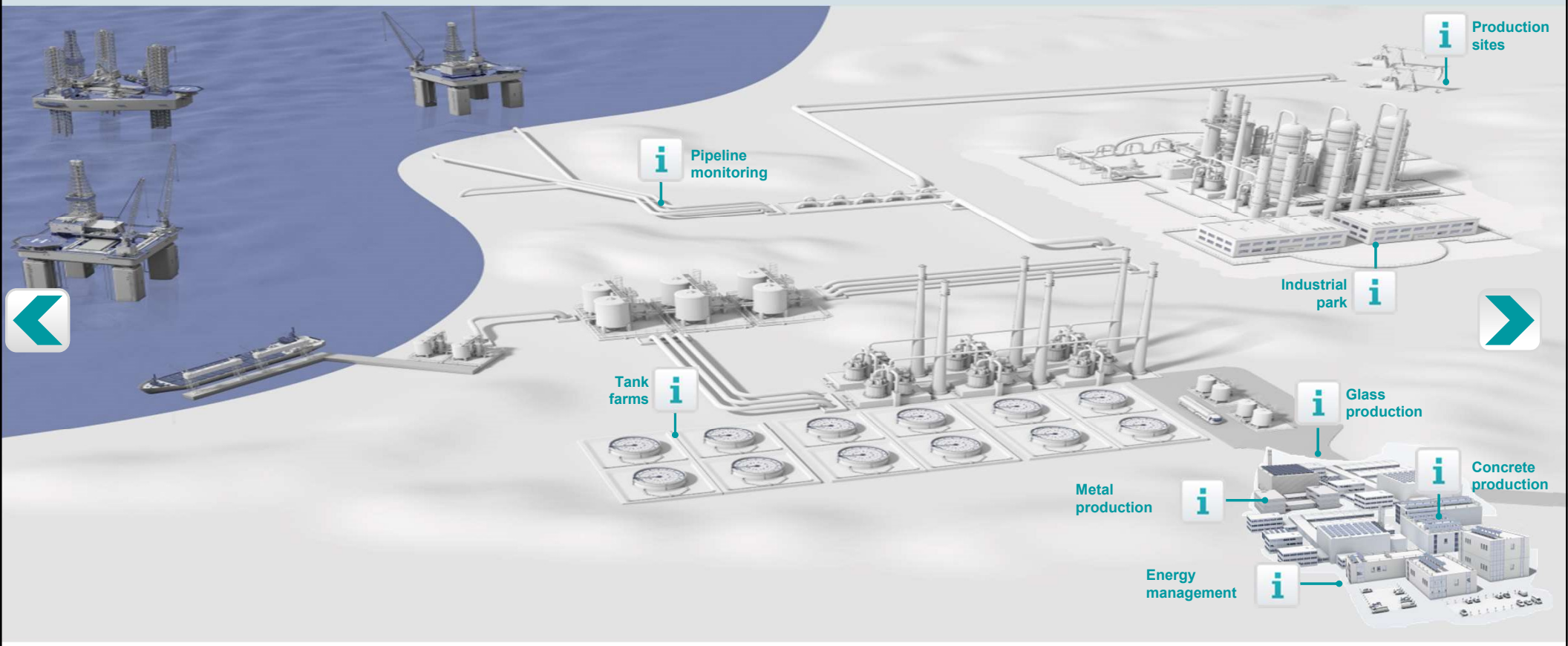
Application examples

- String monitoring of open field systems, rooftop systems, tracking systems and inverters
- Continuous monitoring of the yield data on the DC and AC side with respect to solar irradiation
- The distributed inverters use a Modbus RTU interface and must be able to communicate wirelessly with the central datalogger
- Distance several hundred meters

Advantages of wireless systems

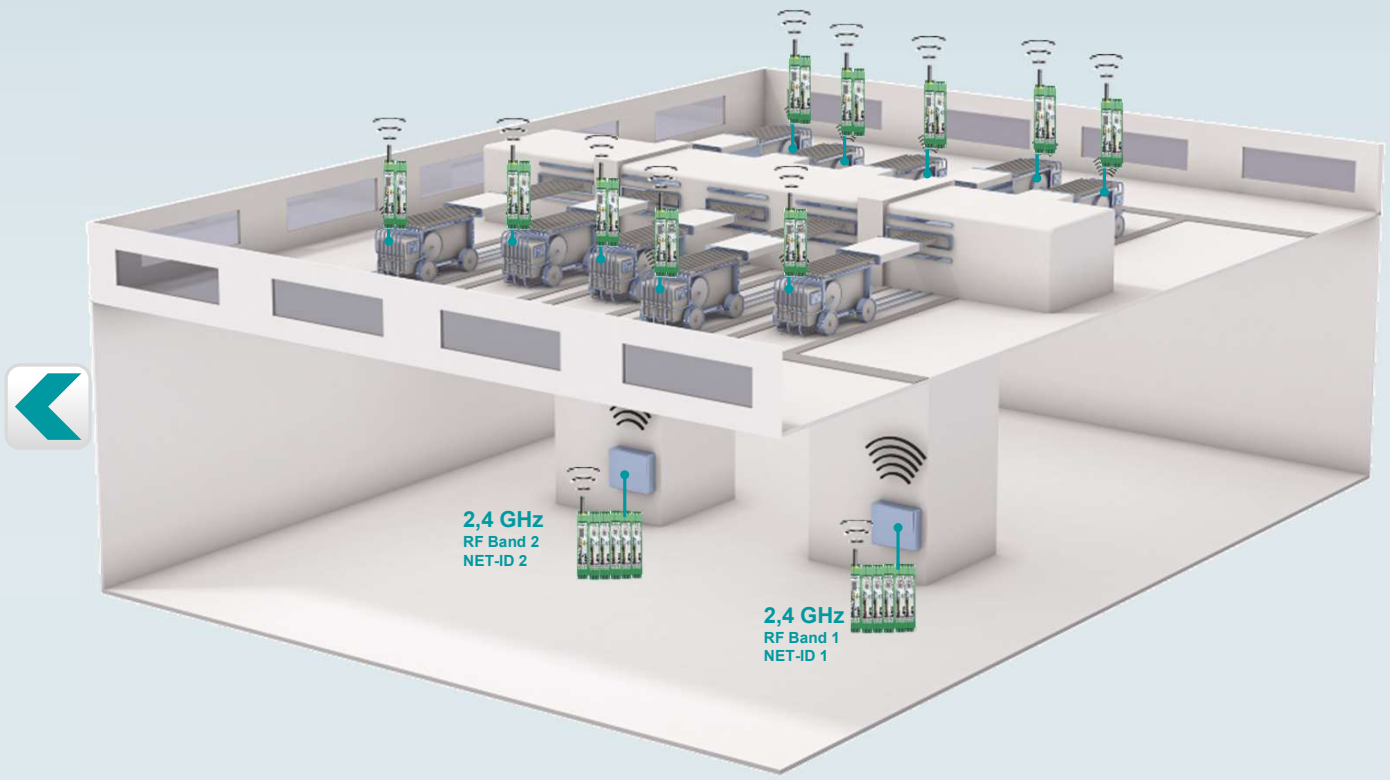
- ☑ Easy integration of existing and new signals into the control system
- ☑ Immune to electromagnetic interference
- ☑ Flexible customization and extension

Process automation



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INSPIRING INNOVATIONS

Glass production



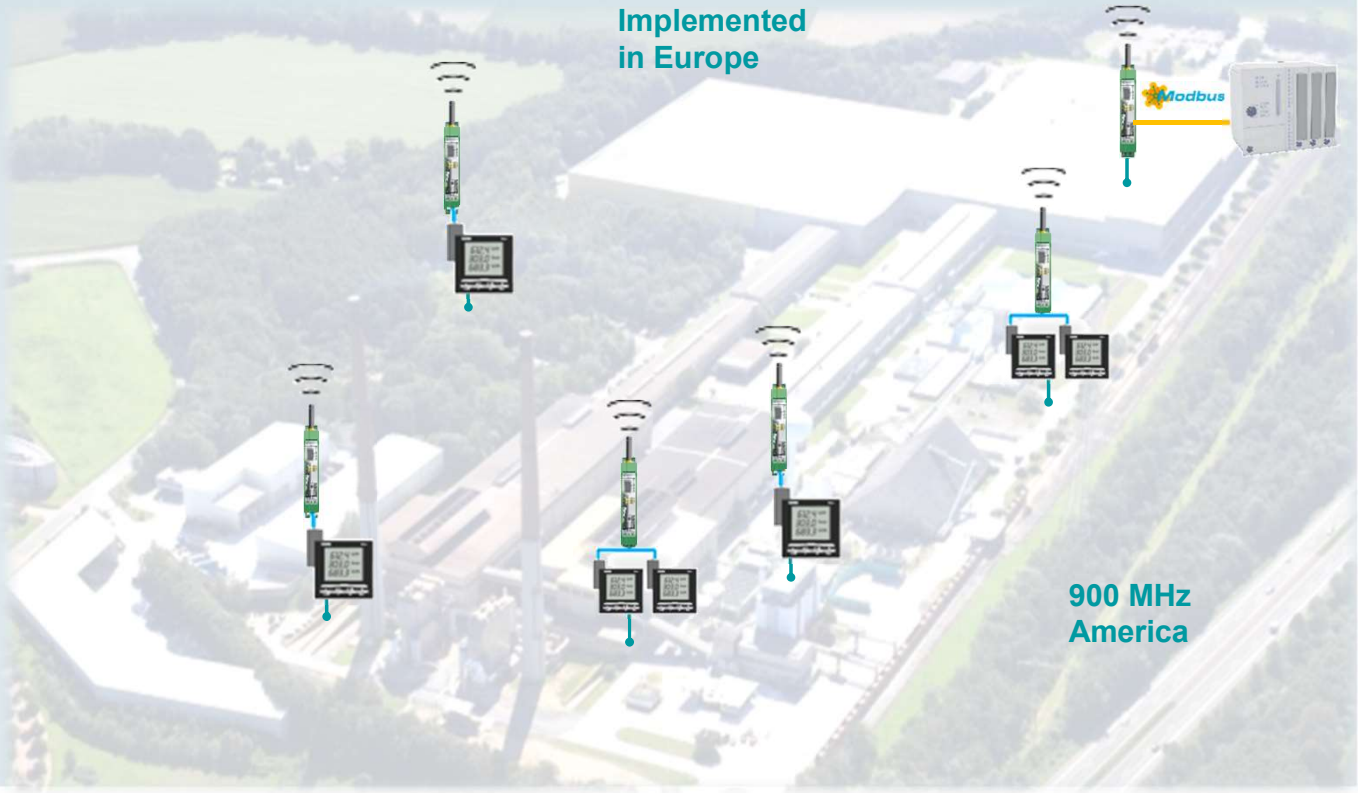
Application examples

- There are cooling rods on the movable units, which cool the liquid glass transported on the tin bath
- In order to pass on the additional sensor data for flow and temperature monitoring, there were no free wires in the cable drums
- Transmission of sensor data between the cooling units and the controller in the basement

Advantages of wireless systems

- ☑ Easy installation and operation
- ☑ Simple integration of further measuring points
- ☑ Transmission also through thick reinforced concrete walls

Energy management



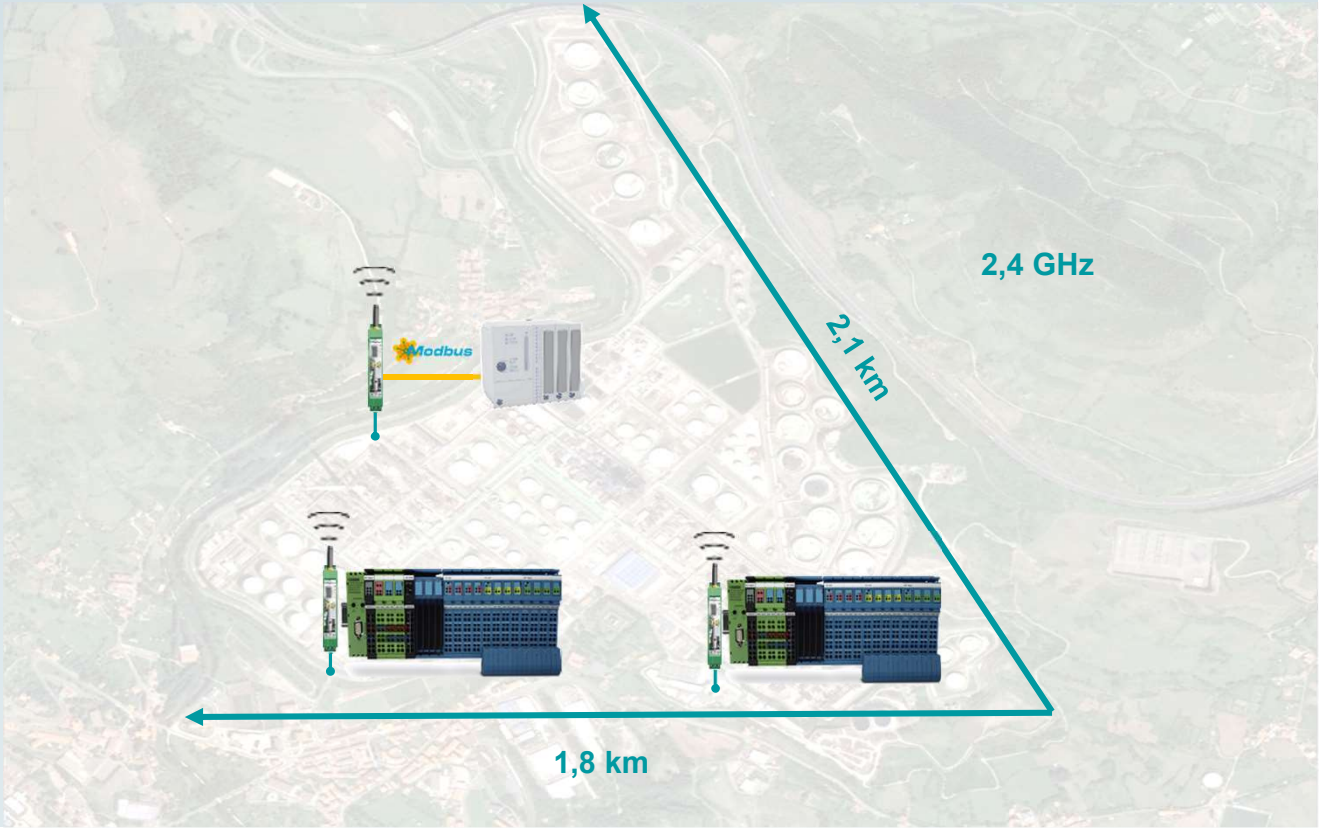
Application examples

- To collect the relevant energy values, new electricity meters with Modbus interface have been installed
- Due to the long distances, we were unable to integrate all the meters into the energy management system by cable
- The energy data must be sent through several halls, walls and other obstacles

Advantages of wireless systems

- ☑ Bridging big distances with many obstacles
- ☑ Easy installation and operation
- ☑ Simple integration of further measuring points

Tank farms



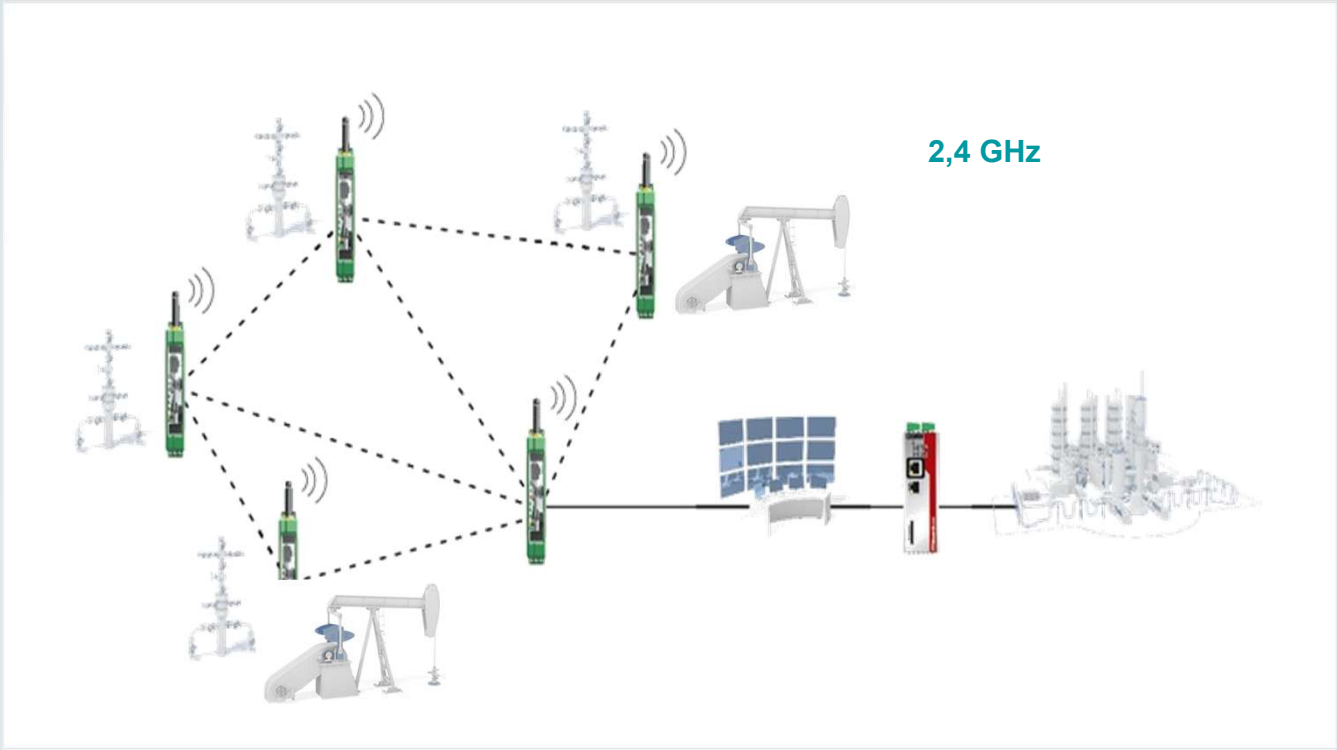
Application examples

- VPI is a valve position detection system for manual valves
- Automatic recognition of the valve position and message to the control system
- To keep costs down, management was looking for alternatives to cable laying

Advantages of wireless systems

- ☑ Thanks to Radioline, the process components can be networked at drastically reduced costs
- ☑ The high flexibility and reliability of Radioline and the excellent experience of users from other industrial sectors were convincing
- ☑ Complete solution from a single source

Production sites



Application examples

- Monitoring of production sites
- Monitoring of pump stations
- Detection of valve positions
- Recording of temperature, pressure, flow
- Early detection of system errors

Advantages of wireless systems

- ☑ Bridging large distances and obstacles
- ☑ Cheap diagnosis and efficient monitoring
- ☑ Complete solution from one source
- ☑ Flexible customization and extension

PHOENIX CONTACT
INSPIRING INNOVATIONS

Pipeline monitoring



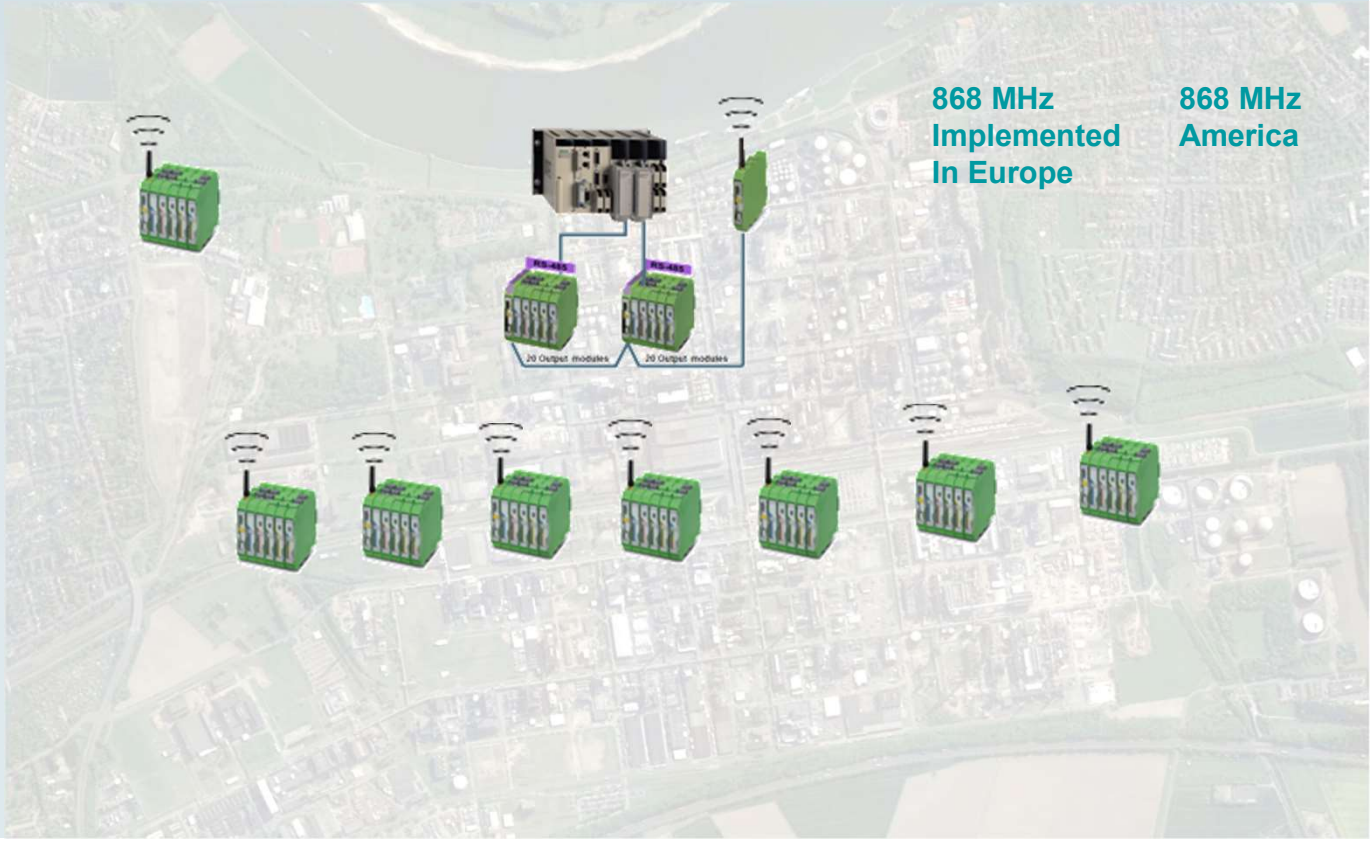
Application examples

- To detect leaks, pressure, temperature and flow must be determined along a pipeline
- Early detection of system errors
- Secure communication solution for transferring data to the control center

Advantages of wireless systems

- ☑ Bridging large distances and obstacles
- ☑ Cheap diagnosis and efficient monitoring
- ☑ Complete solution from one source
- ☑ Flexible customization and extension

Industrial park



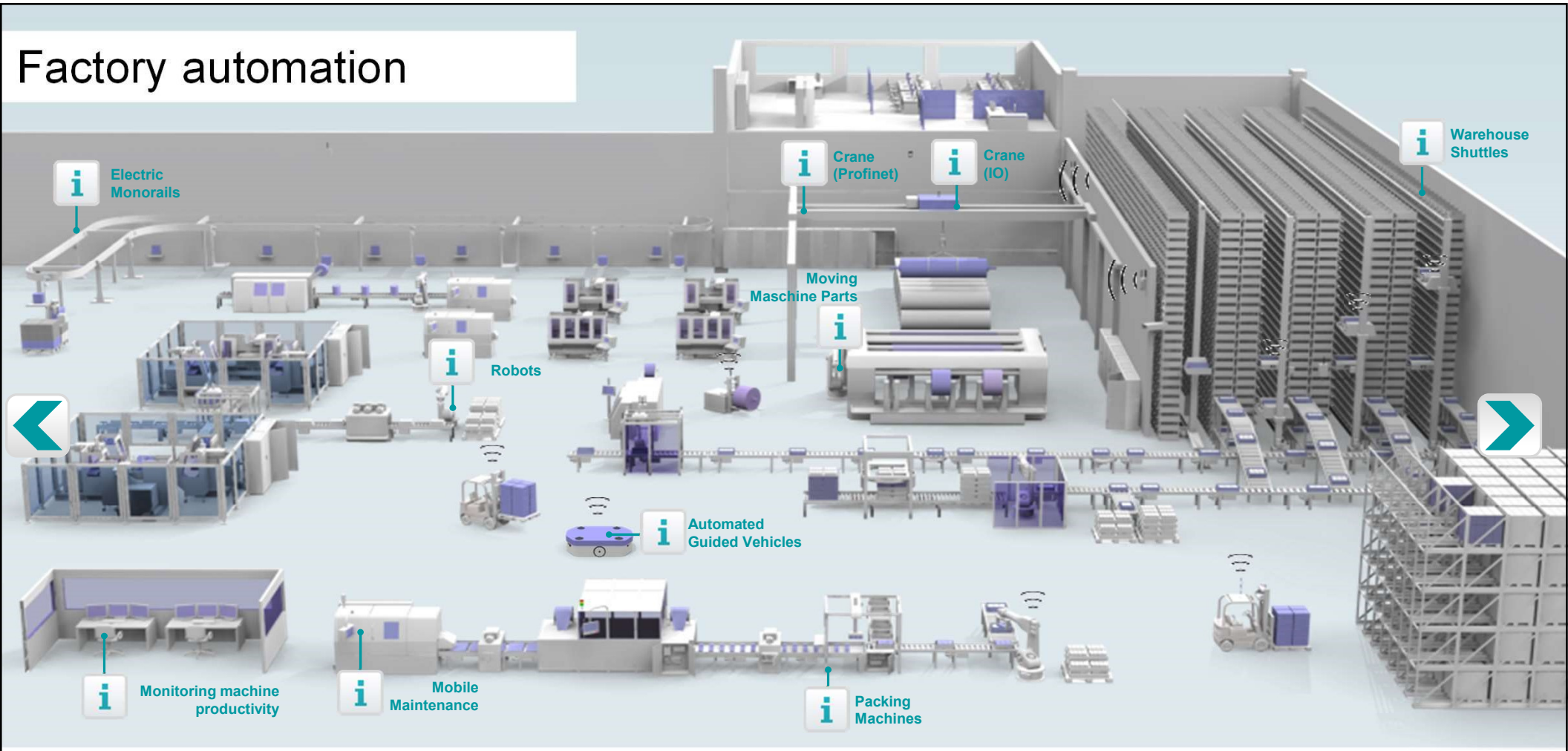
Application examples

- Monitoring of pumping stations, recording of status and flow rate
- Transmission of the measured values from the pumping stations to the control center

Advantages of wireless systems

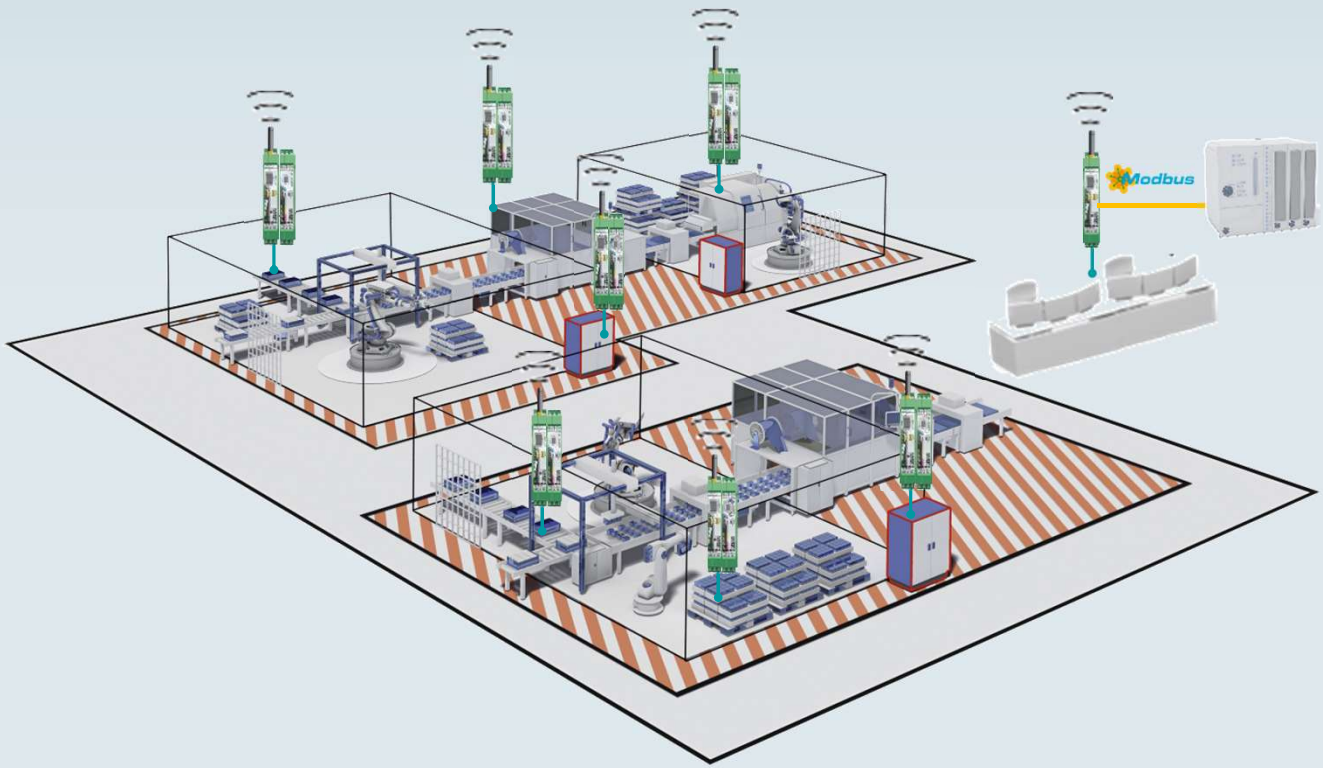
- ☑ Continuous monitoring of measurements by Radioline system increases process quality
- ☑ Huge cost savings compared to cable laying
- ☑ Easy startup, flexible adaptation and expansion
- ☑ Complete solution from a single source

Factory automation



PHOENIX CONTACT
INSPIRING INNOVATIONS

Monitoring the productivity of machines



Application examples

- Acquisition of machine states and collective fault messages
- The collected data can be used to determine the productivity of the individual machines and systems
- The cabling and installation effort for connecting the machines and equipment to the control room by cable would have driven the costs to an unacceptable level
- Machines need to change the position frequently

Advantages of wireless systems

- ☑ Continuous monitoring of measurements by Radioline system increases process quality
- ☑ Huge cost savings compared to cable laying
- ☑ No downtime during production
- ☑ Flexible customization and extension

PHOENIX CONTACT
INSPIRING INNOVATIONS

Wireless from the sensor to the network

Wireless I/O

Digital signals
0 … 250 V AC/DC

Analog signals
0 … 20 mA, 4 … 20 mA
0 … 10 V, HART



Wireless Ethernet

PROFINET®
Modbus
EtherNet/IP™

Wireless Serial

PROFIBUS® Modbus

RS-232 RS-422 RS-485

PHOENIX CONTACT
INSPIRING INNOVATIONS

Portfolio

Wireless I/O

Radioline

- Range up to 32 km
- Up to 256 x DI/DO or 128 x AI/AO
- Mesh networks up to 250 nodes

Wireless MUX

- Range up to 400 m
- 16 x DI/DO and 2 x AI/AO
- Point-to-Point connection

WirelessHART

- Range up to 250 m
- 4 x HART, 1 x AI 4…20 mA
- Mesh networks up to 250 nodes

Wireless Serial

Radioline

- Range up to 32 km
- 1 x RS232/485 (Modbus, Profibus)
- Mesh networks up to 250 nodes

ESSENTIAL edition

- Range up to 500 m
- 1 x RS485 (Modbus)
- Mesh networks up to 250 nodes

Wireless Ethernet

Bluetooth

- Range up to 200 m
- 1 x RJ45 Ethernet
- Star network up to 7 Slaves

WLAN

- Range up to 500 m
- 1-2 x RJ45 Ethernet
- Star network up to 60 Slaves

Antenna and cables



INSPIRING INNOVATIONS

This is Radioline



TRUSTED WIRELESS™

This is Radioline

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Radioline

TRUSTED WIRELESS

Easy startup
- Without programming
- Adjustable via thumbwheel
- I/O mapping

Universal applications
- I/O-to-I/O cable replacement
- Serial cable replacement RS-232/485
- I/O integration in Modbus RTU PLCs
- RS-485 extension possible

PROFIBUS Modbus



Worldwide use
- 2,4 GHz, 868 MHz, 900 MHz and wired head stations
- Adjustable baud rates
- Ranges up to 5, 20 or 32 km

Flexibly expandable
- Up to 250 Stations in a network
- Up to 32 I/O modules per station
- Various digital and analog extension modules
- Hot-Swapping
- Galvanic channel-to-channel isolation

Wireless technology for the industry



- **Industrial wireless technology**
  Specially developed for industrial use
- **Extremely safe**
  Proprietary, AES encryption, integrity checking
- **Big distance**
  Due to adjustable data rates and high receiver sensitivity
- **Excellent coexistence properties**
  Frequency hopping, WLAN blacklisting

Trusted Wireless 2.0

TRUSTED WIRELESS

Global wireless technology

- 2.4 GHz, 900 MHz, 868 MHz (Europe) license free ISM- bands
- Range increase due to adjustable data rates
- Optimal adaptation to the respective application

Secure data transmission

- Proprietary, "non-open" technology
- Encryption: 128-bit AES
- Authentication / integrity check: unique coding key for each message checks the validity of the transmitter

Flexible network structures

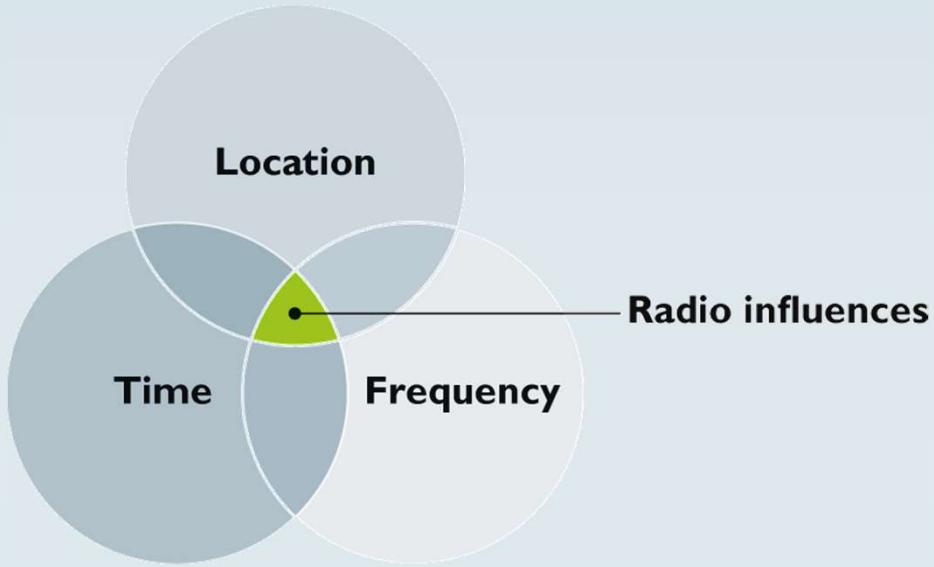
- Automatic network building
- Self- healing networks
- Point-to-point, star, mesh and line structures

Robust communication

- Coexistence mechanisms: FHSS, WLAN blacklist, adjustable RF bands
- Unique NET ID by CONF-Stick
- Multiple transfers

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INSPIRING INNOVATIONS

Trusted Wireless 2.0 - Coexistence



Network-ID:

- To identify the radio modules in a network
- Only radios with the same Net-ID can connect to each other

RF-Band:

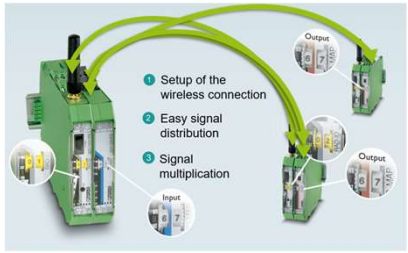
- Group of individual frequencies
- Different RF bands use different frequencies

WLAN-Blacklist:

- Allows manual hiding of Wi-Fi frequencies

Wireless technologies

	Bluetooth	Wi Fi	TRUSTED WIRELESS	WirelessHART
Technologies	**Bluetooth**	**WLAN (Wireless Local Area Network)**	**Trusted Wireless 2.0**	**Wireless HART**
Network structure	Star structure - 1 Master up to 7 Slaves	Access point can handle endless clients	Mesh network – 1 Master up to 249 Slaves	Full-Mesh network – 1 Master up to 249 Slaves
Standard	IEEE 802.15.1	IEEE 802.11	Proprietary by Phoenix Contact	IEEE 802.15.4 HART 7
Application	fast, small networks	Fast, high data volume, Ethernet	Low/medium data rate, large networks, best for infrastructure application	HART signal, Process industry, short distances
Frequency	2,4 GHz	2,4 GHz, 5 GHz,	868 MHz, 900 MHz, 2,4 GHz	2,4 GHz
Latency time (typical)	>10 ms (IO) > 50ms (Serial)	>16 ms (depending on the data rate / Distance)	0,1 – > 2 s, depending on the air data rate / network structure	> 3 s up to several minutes
Distance (free line of sight)	Typ. <= 150 m	Typ. <= 150 m	<= 5 km (2,4 GHz) <= 20 km (868 MHz) – Europe only <= 32 km (900 MHz)	Typ. <= 250 m





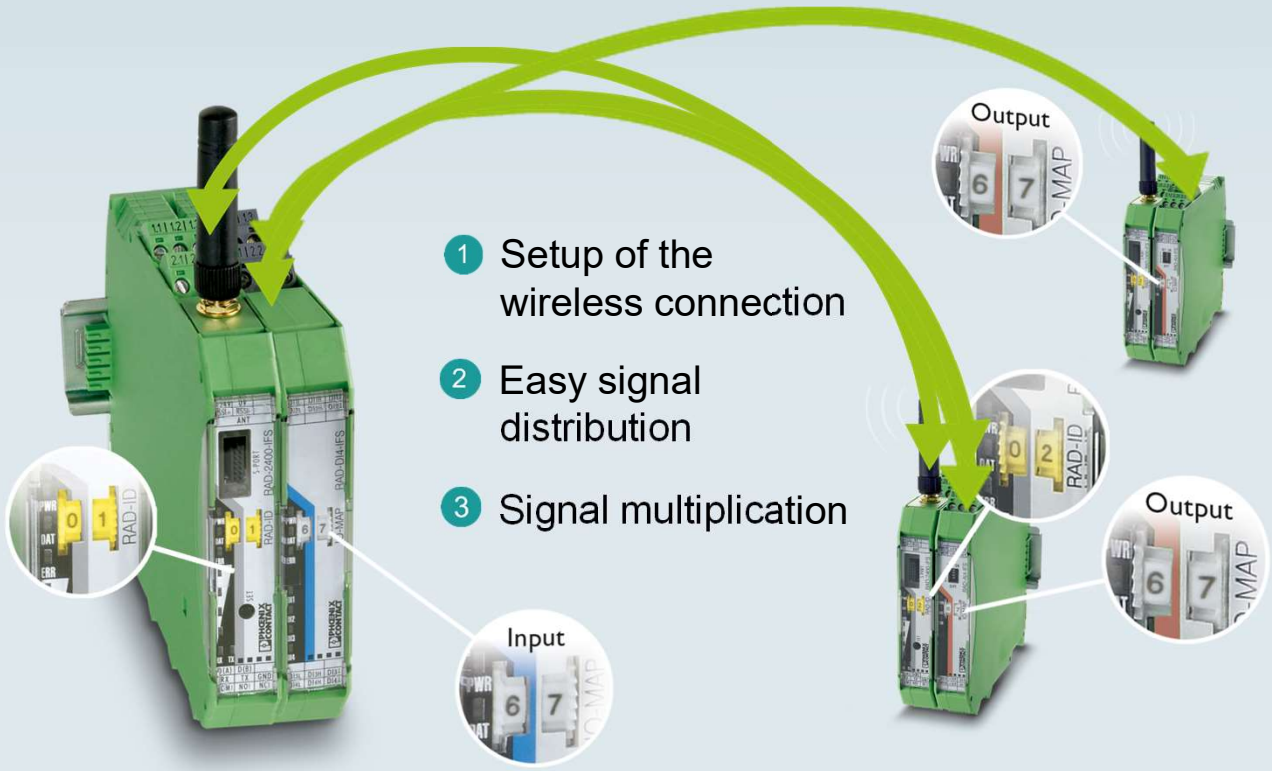
TRUSTED WIRELESS™

Video Radioline Easy Setup ! **Radioline Software-free configuration -**

PHOENIX CONTACT
INSPIRING INNOVATIONS

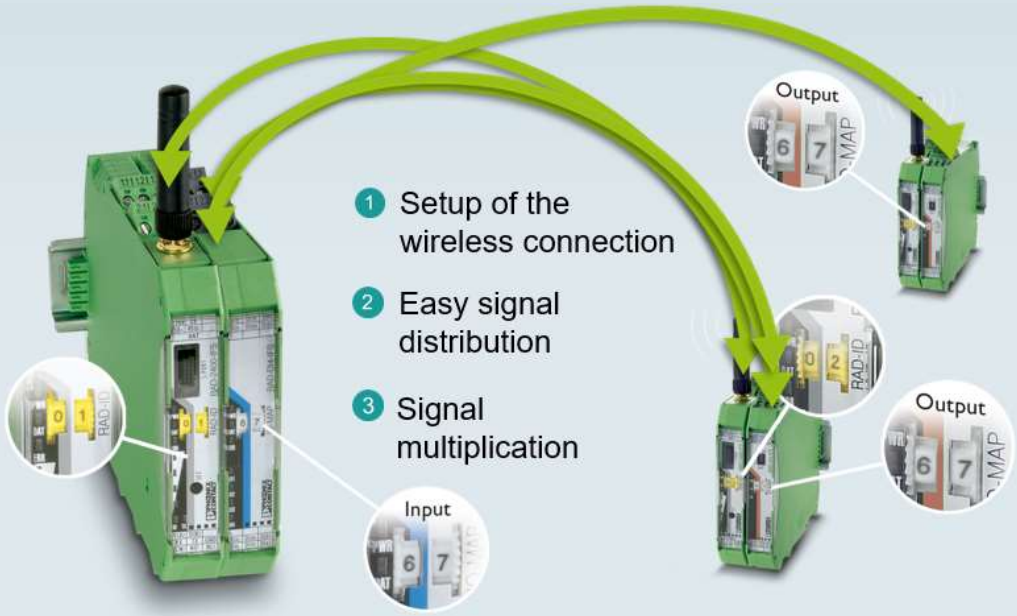
Radioline

TRUSTED WIRELESS



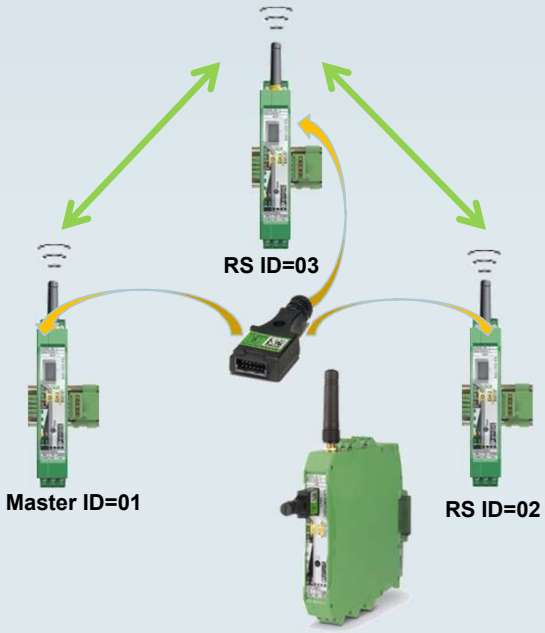
1. Setup of the wireless connection
2. Easy signal distribution
3. Signal multiplication

Workshop I/O-Mapping



- **Setup wireless connection**
  - Master = RAD-ID „01“
  - Repeater/Slave = RAD-ID „02-99“
- **Easy signal distribution (I/O-Mapping)**
  - Input module receives the same I/O-MAP address as the associated output module
  - Double assignment of the I/O-MAP address is not permitted, exception multipoint connection with several output modules

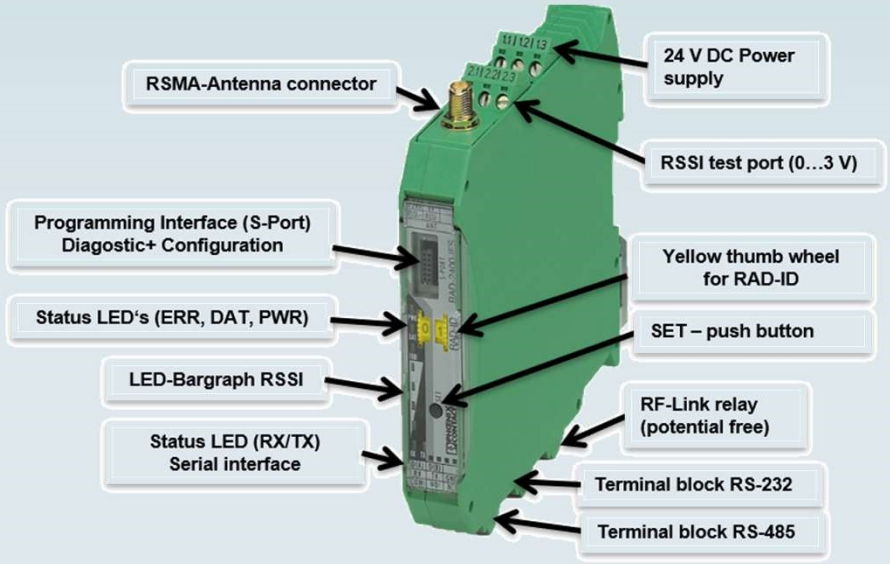
Workshop CONF-Stick



Reading the device configuration via Confstick

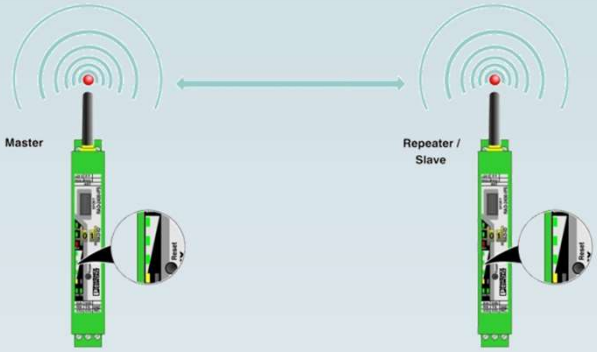
1. Insert the Confstick into the S port of the RAD-2400-IFS module
2. Press the SET button for one second
3. DAT-LED lights up once -> reading is finished -> new parameters are activated!
4. Remove the Confstick
5. Repeat the process on each wireless module in the network

Diagnostic – Head module

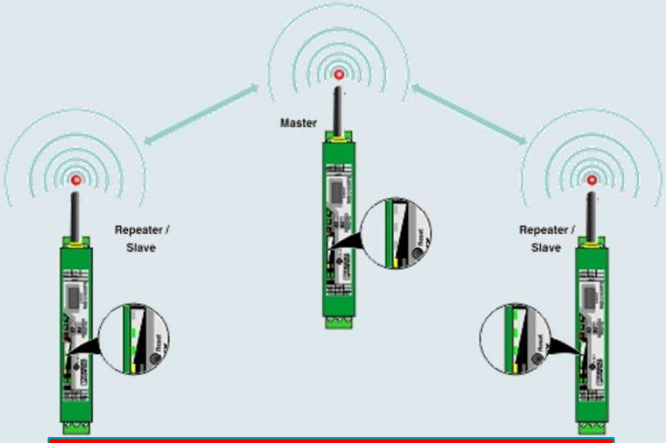


LED	Status	Comment
PWR	Green ON	Supply voltage ok
DAT	Green ON flashing	Cyclic communication on TBUS Configuration mode
ERR	Red ON flashing slow flashing fast	Local IFS-Bus error e.g. Double assignment of IO-MAP address Radio Link interrupted
Bargraph	3 x Green, 1 Yellow ON	Received Signal Strength (RSSI)

Point-to-Point connection

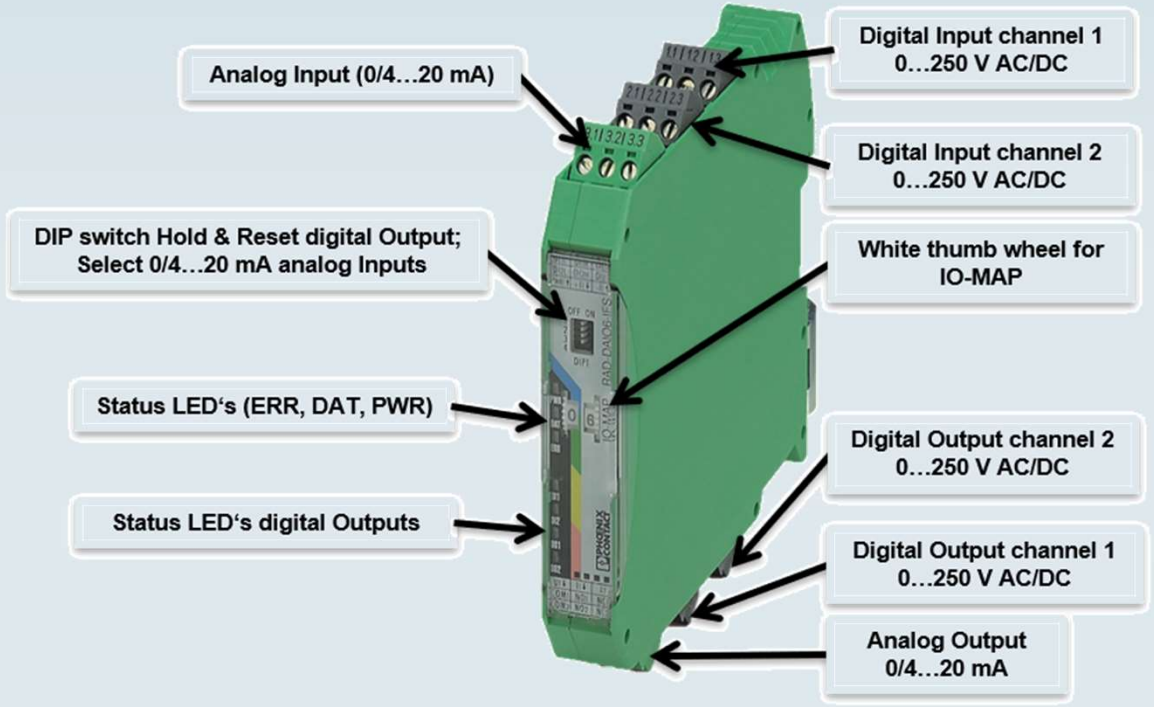


Point-to-Multipoint connection



Master = only yellow LED ON!

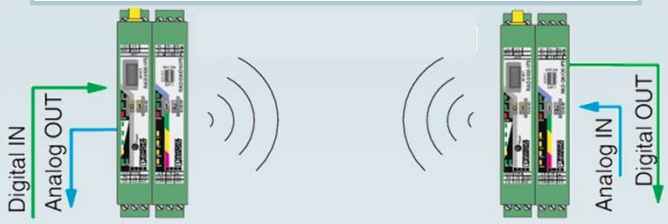
Diagnostic – IO module



LED	Status	Comment
PWR	Green ON	Supply voltage ok
DAT	Green ON Flashing	Cyclic communication on IFS-BUS Adressing mode
ERR	Red ON Red Flashing	Critical internal error I/O error, incorrect addressing, not yet addressed (delivery state)
DI 1/ DI 2		State of digital input 1/digital input 2
DO 1 / DO 2		State of digital output 1/digital output 2

Radioline – Operation modes

Option 1



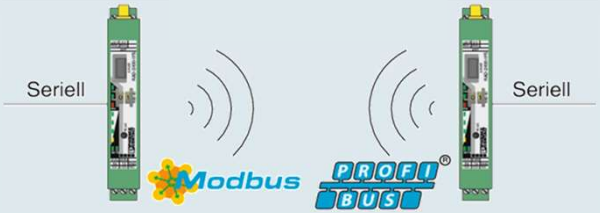
I/O to I/O

Option 2



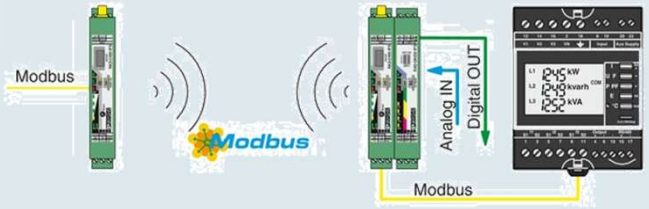
I/O to Modbus RTU

Option 3



Serial to Serial (RS 232/485)

Option 4



I/O and Modbus parallel

Radioline

900 Mhz

PSI Conf

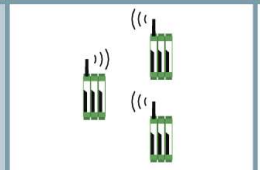
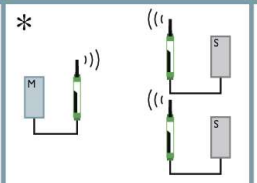
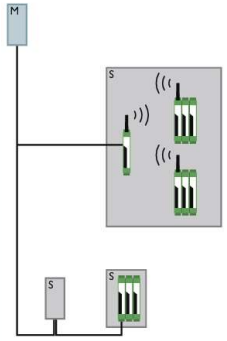
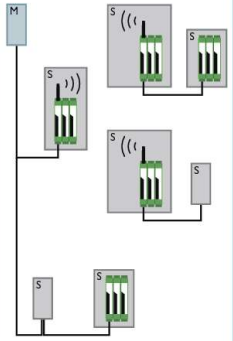
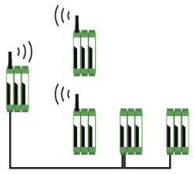
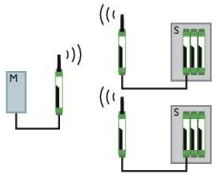
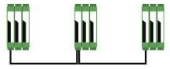
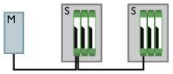


TRUSTED WIRELESS™

Radioline PLC Mode Configuration

PHOENIX CONTACT
INSPIRING INNOVATIONS

Radioline – Application overview

Application overview for the Radioline system	I/O to I/O	Serial to Serial	I/O to Serial	
	I/O data mode	Serial data mode	PLC/Modbus RTU mode	PLC/Modbus RTU **Dual** mode
Communication between wireless stations				
Combined communication between wireless- and RS-485 stations				
Communication between RS-485 stations				

Explanation



Radioline – Serial operation mode





Modbus

- Serial Datarate: < 115,2 kbps
- Distance: up to 32 km (868, 900, 2400 MHz)
- Topology: Mesh < 249 repeater/slaves
- The transmission delay through the radios, must be adjusted in the MODBUS master

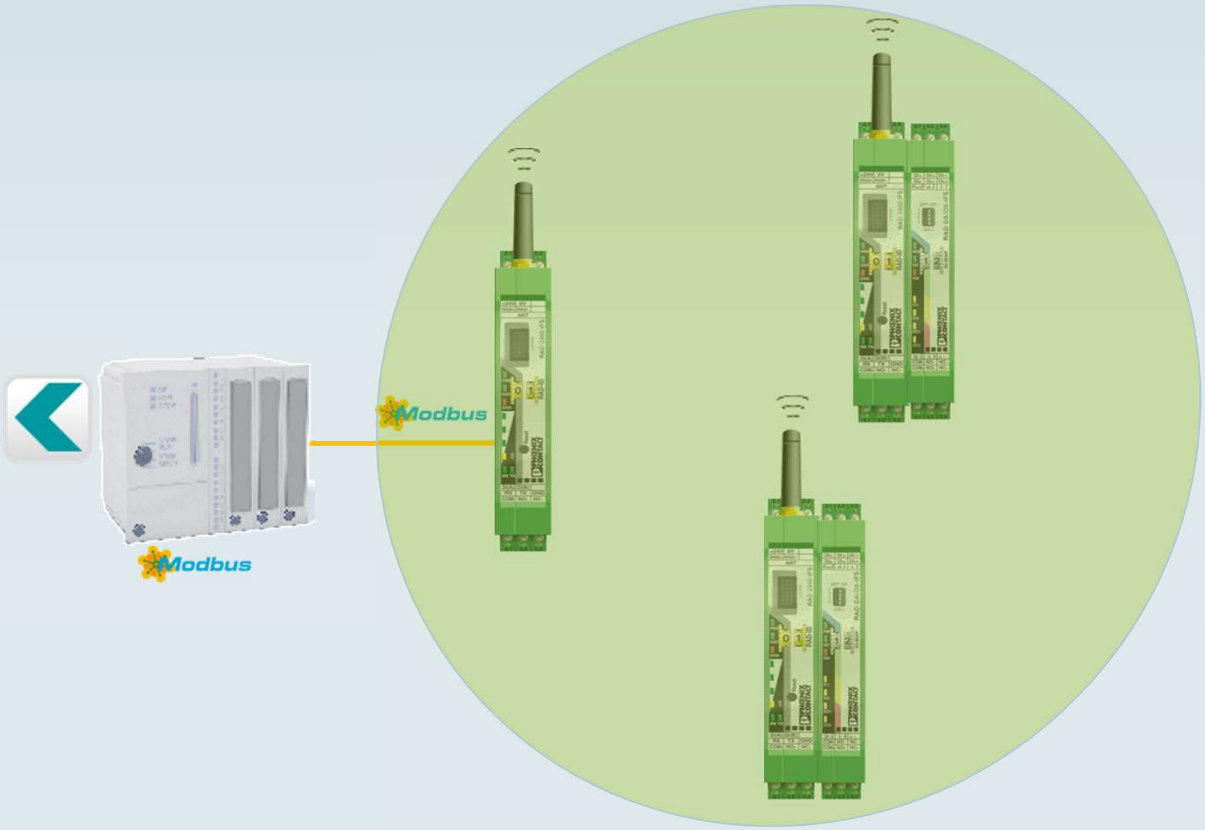
Profibus (limitations)

- Serial Datarate: < 93,75 kbps
- Distance: up to 3 km (only 2,4 GHz)
- Topology: Star < 14 slaves
- The transmission delay through the radios, must be adjusted in the PROFIBUS master
- A PROFIBUS network must only have one PROFIBUS master
- No other PROFIBUS devices must be connected to the local PROFIBUS master.
- Multi-master systems are not permitted
- The transmission time increases with the number of wireless devices. Reduce the PROFIBUS data rate, if necessary

Other protocols

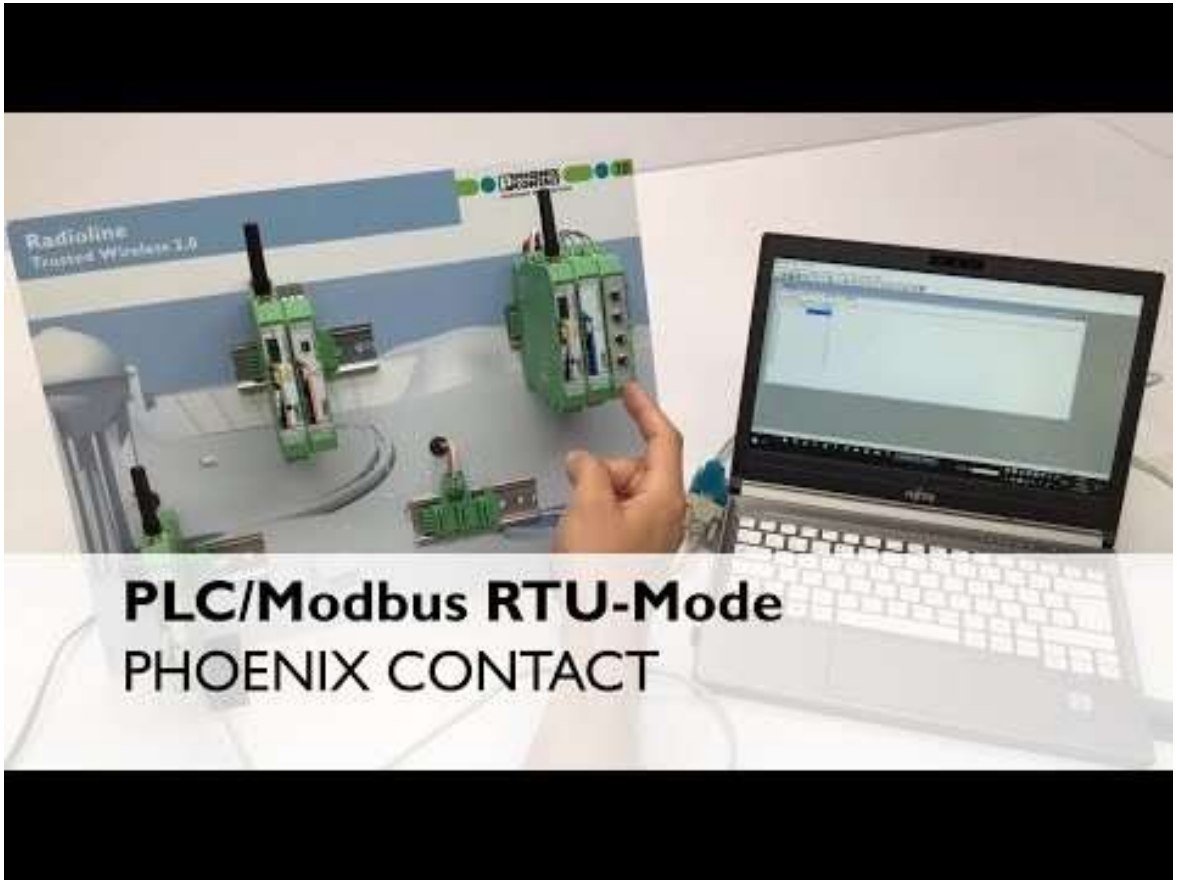
- Depends on telegram length and timing
- Some protocols can be adjusted via special “TFrameEnd” and “TidleMin” settings (Special protocol knowing or oscilloscope diagrams necessary)

Radioline – PLC/Modbus-RTU mode





- IO integration in MODBUS PLC
- Central MODBUS memory map stored in radio master
- The radio master is simultaneously a MODBUS-Slave
- Just one MODBUS-Slave address represent the complete wireless network
- Max. 99 IO modules per wireless network
- Diagnostic parameter (RSSI value, IFS-Bus status) stored in MODBUS memory map

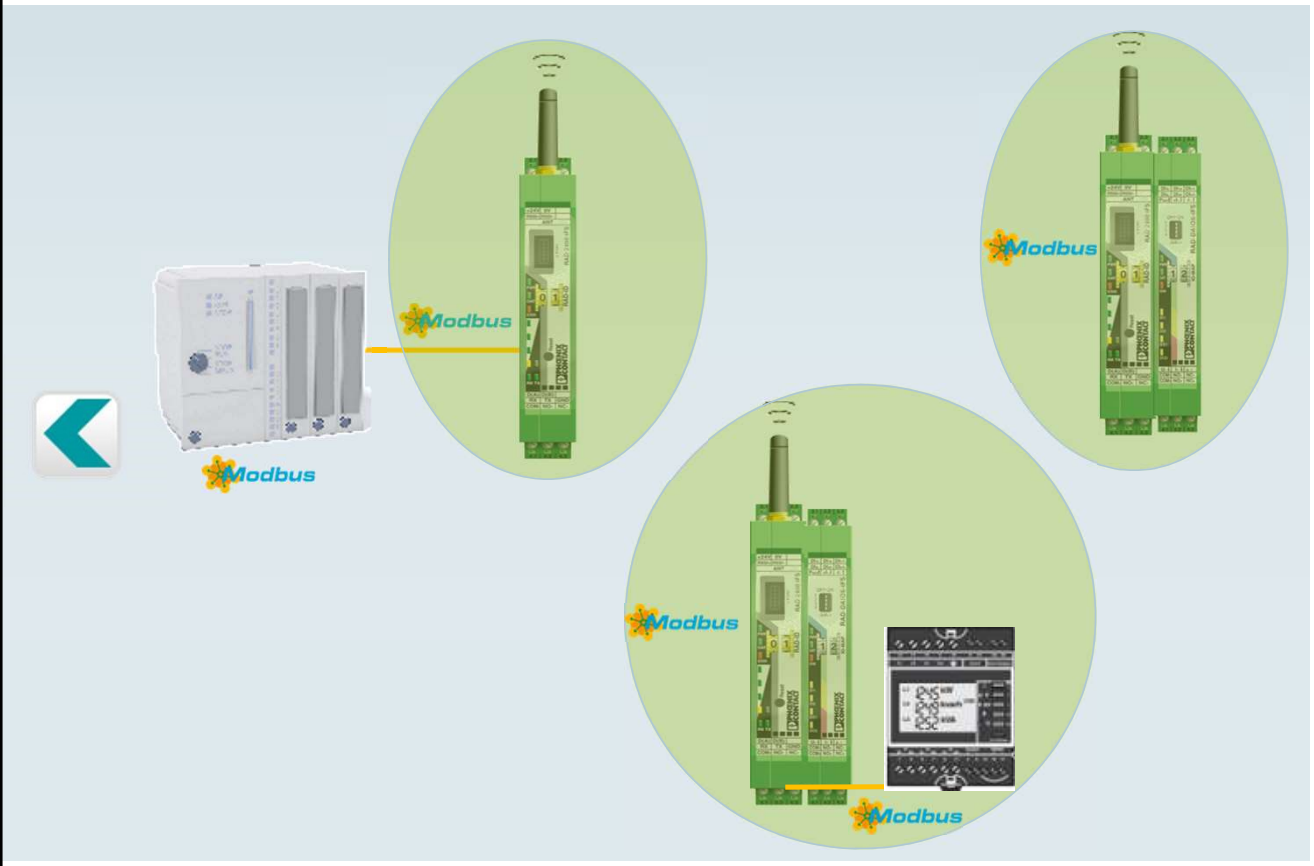


TRUSTED WIRELESS™

Radioline PLC/Modbus-RTU mode

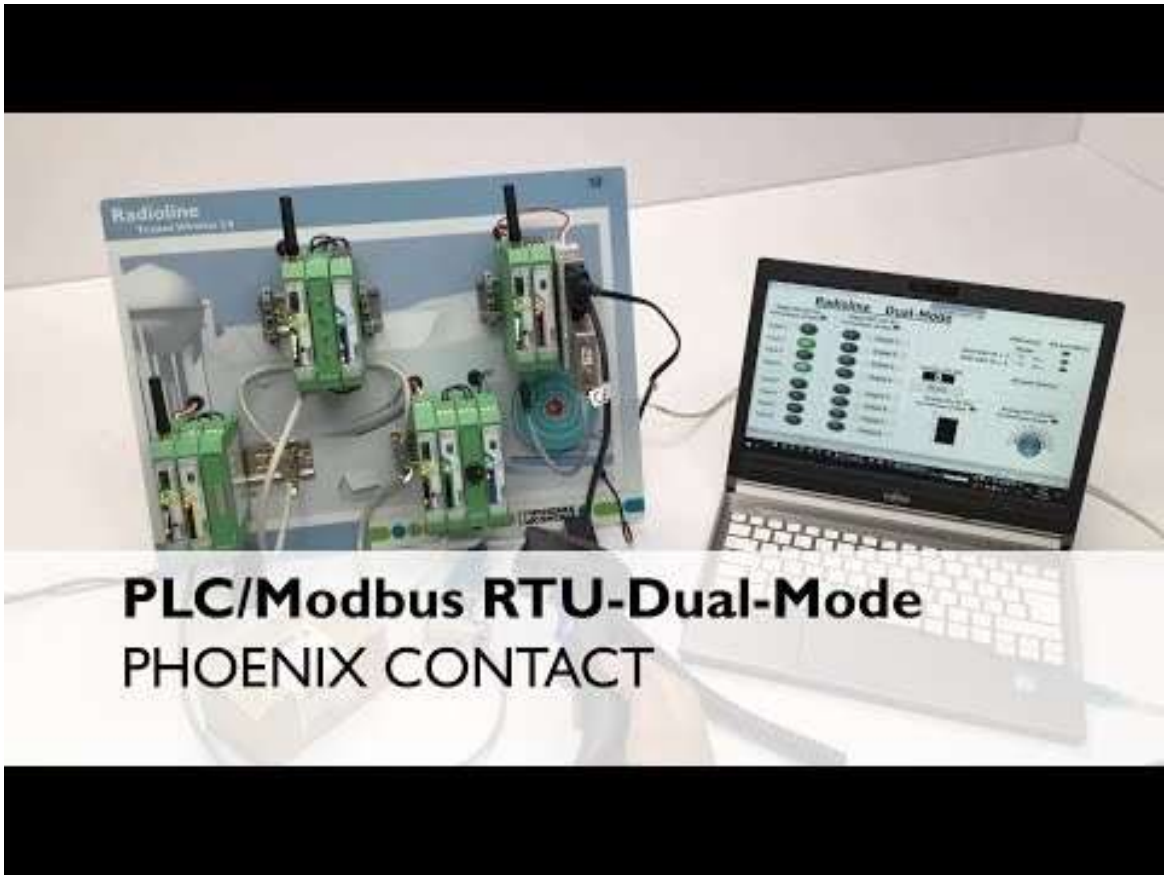
PHOENIX CONTACT
INSPIRING INNOVATIONS

Radioline – PLC/Modbus-RTU **dual** mode





- Parallel communication of IO signals and MODBUS data
- MODBUS memory map stored in each radio slave
- RAD-ID = MODBUS-Slave address
- Max. 32 IO modules per radio head station
- Diagnostic parameter (RSSI value, IFS-Bus status) stored in MODBUS memory map

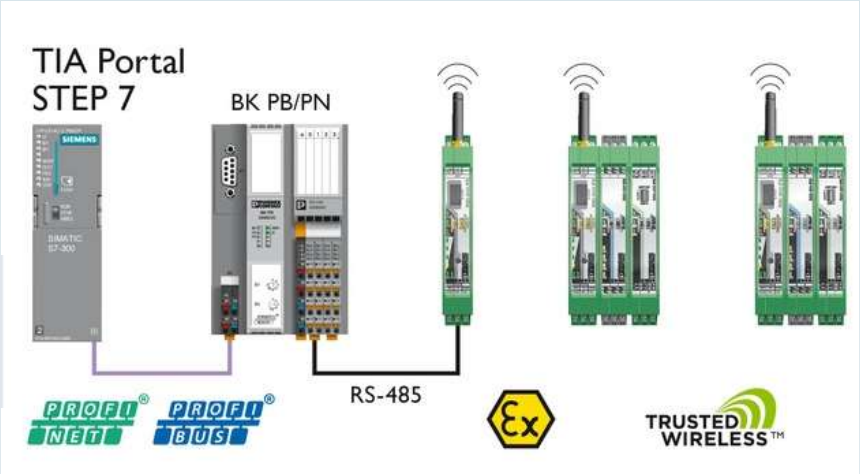


TRUSTED WIRELESS™

Radioline PLC/Modbus-RTU dual mode

PHOENIX CONTACT
INSPIRING INNOVATIONS

Radioline function blocks for PCWORX / STEP 7 / TIA Portal



- Monitoring and control of remote stations without cable access
- Simple reading of process data, status and diagnostic parameters of the individual radio stations
- Flexibility, simple installation and cost savings compared to wired installations
- Reduced development times
- License free and cost free function blocks

Supported Hardware and Software

- Siemens: S7-3xx, S7-12xx, S7-15xx PLCs, STEP 7, TIA Portal
- Phoenix Contact: Inline + Axioline PLCs / BKs, PCWORX

Radioline – Head modules



Reachable distance

Outdoor solutions

IO modules

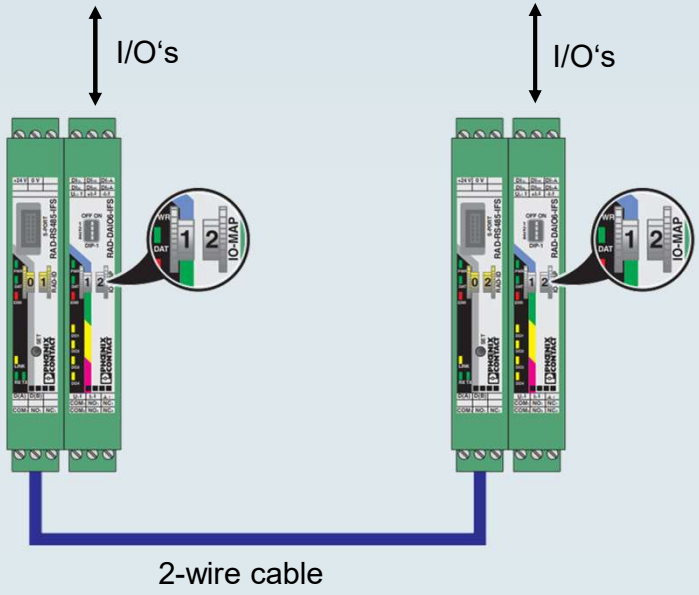
Accessories

Region	Worldwide	Japan	America	Australia	Europe	Worldwide (no radio)
Type	RAD-2400-IFS (Radio)	RAD-2400-IFS-JP (Radio)	RAD-900-IFS (Radio)	RAD-900-IFS-AU (Radio)	RAD-868-IFS (Radio)	RAD-RS485-IFS (RS485 bus module)
Frequency range	2,4002 ... 2,4785 GHz		902 ... 928 MHz	915 ... 928 MHz	869,4 ... 869,65 MHz	-
Range up to	< 5 km (suitable for big mesh networks with line of sight)		< 32 km (suitable for big distances with obstacles)		< 20 km (suitable for big distances with obstacles)	< 1,2 km (over existing 2-wire copper lines or more with converter or repeater)
Transmit power	20 dBm		30 dBm		27 dBm	-
Air data rate	16…250 kBit/s		16…500 kBit/s		9,6 … 120 kBit/s	-
Transmission time (typ.)	> 200 ms (I/O mode) > 25 ms (Serial mode)		> 200 ms (I/O mode) > 25 ms (Serial mode)		> 2 s (I/O mode) > 390 ms (Serial mode)	> 80 ms (I/O mode)
Article No.	2901541	2702863	2901540	2702878	2904909	2702184

INSPIRING INNOVATIONS

Radioline Multipoint Multiplexer





- Multipoint multiplexer (I/O to I/O)
- Multipoint multiplexer (Intermedia)
- Modbus RTU slave (I/O to Seriell)
- Modbus RTU slave (Intermedia)

PHOENIX CONTACT
INSPIRING INNOVATIONS

Radioline Multipoint Multiplexer

I/O-Mapping via 2-wire-cables



Stand-Alone as Modbus-Slave
Operation on any Modbus/RTU-Master

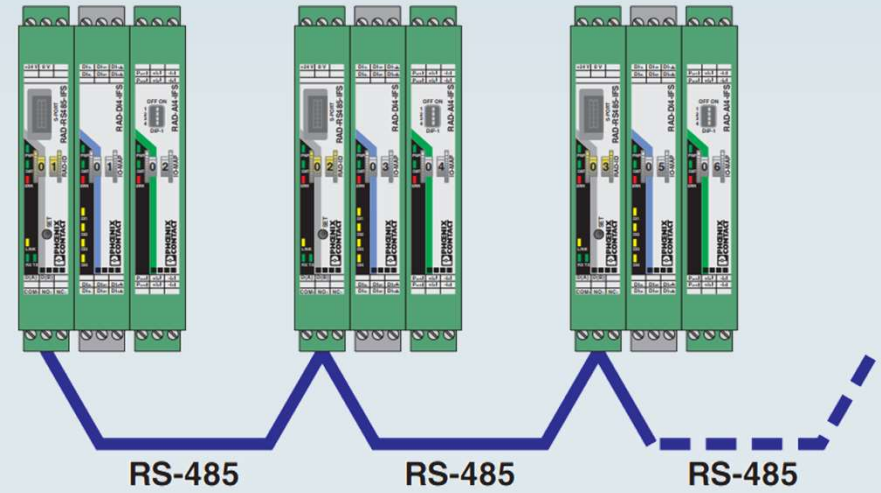
Multipoint-Multiplexer
Distribution of I/O signals via existing 2-wire-cables



Intermedia communication
Wireless and wired modules form a combined system.



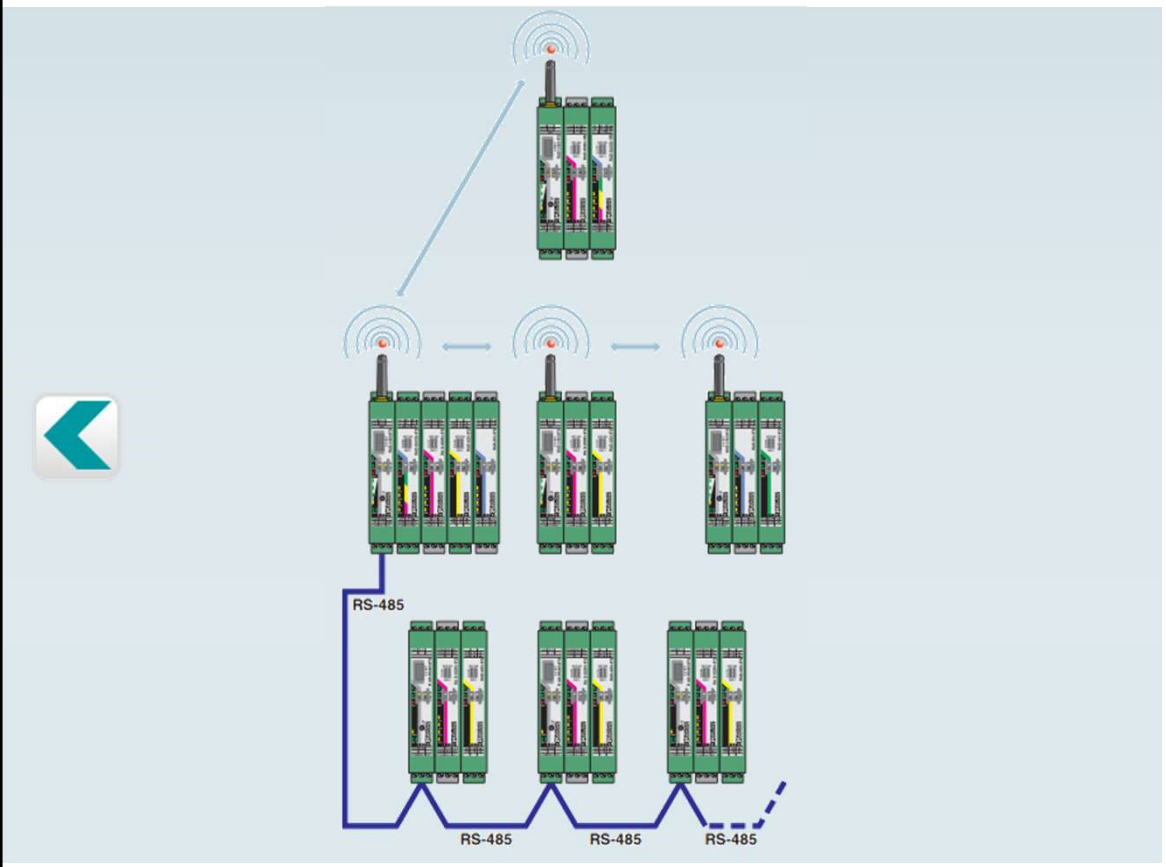
Radioline Multipoint Multiplexer I/O to I/O



- Multipoint multiplexer – easy I/O distribution between multiple stations
- Up to 99 stations via RS-485
- Addressing using yellow thumbweel
- Easy I/O mapping using white thumbwheel on the extention modules
- Fast startup via Plug and Play

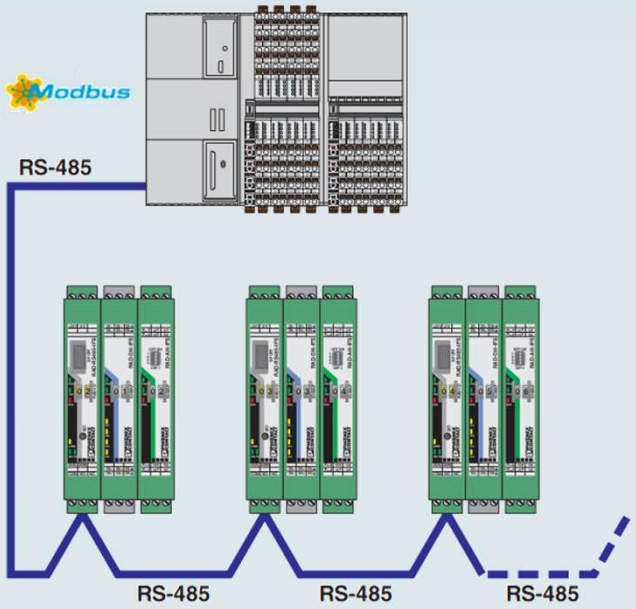
PHOENIX CONTACT
INSPIRING INNOVATIONS

Radioline Multipoint Multiplexer (Intermedia)



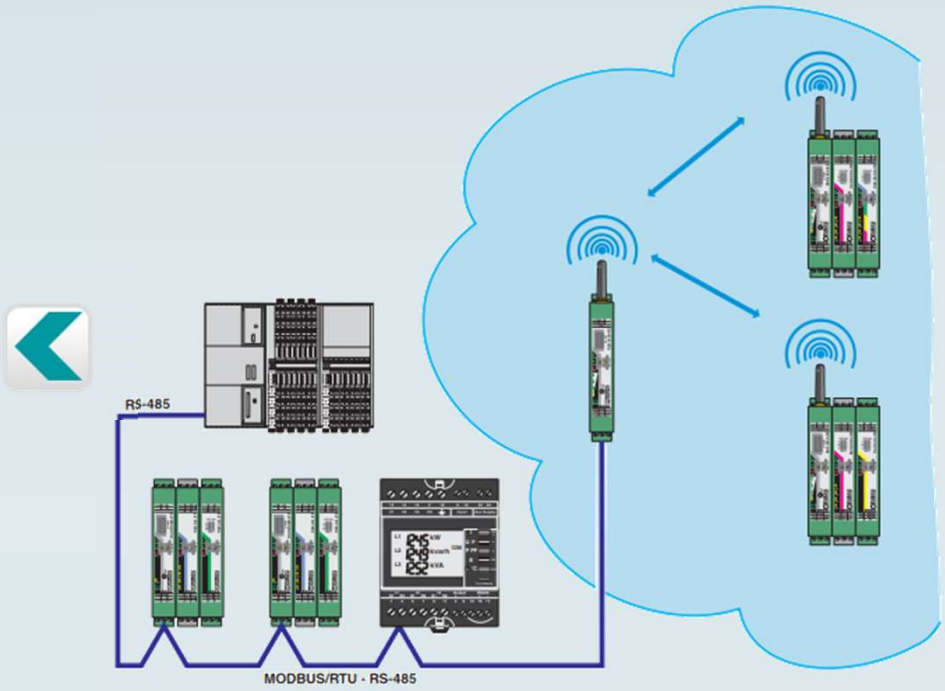
- Cross-media distribution of I/O signals
- Up to 250 stations in total:
  - 98 RS-485 stations and
  - 152 wireless stations
- Easy I/O mapping using white thumbwheel on the extension modules
- Fast startup via Plug and Play

Radioline Modbus RTU slave (I/O to serial)



- Operation as a bus Couplets for Modbus RTU with Radioline extension modules
- As a Modbus slave to any master
- Up to 98 stations per Modbus network
- Integration in existing Modbus networks
- Fast startup via Plug and Play
- Default setting of the RS-485 interface: 19.2/8/E/1

Radioline Modbus RTU slave (Intermedia)



- Radioline wireless system and RS-485 stations at a Modbus master (I/O to serial)
- Support for all Radioline wireless systems (2,4 GHz, 868 MHz, 900 MHz)
- Up to 98 RS-485 stations and up to 250 wireless stations
- The wireless network acts like a single Modbus RTU slave
- All devices in the RS-485 network are standard Modbus RTU slaves
- Integration in existing Modbus networks

Bridging of big distances



- Which distances can be bridged depends on the following parameters:
  - Environmental conditions
  - Antenna gain, antenna height
  - Transmit power / receiver sensitivity
  - Air data rate
  - Network structure



PHOENIX CONTACT
INSPIRING INNOVATIONS

Radioline – Outdoor-Box

new



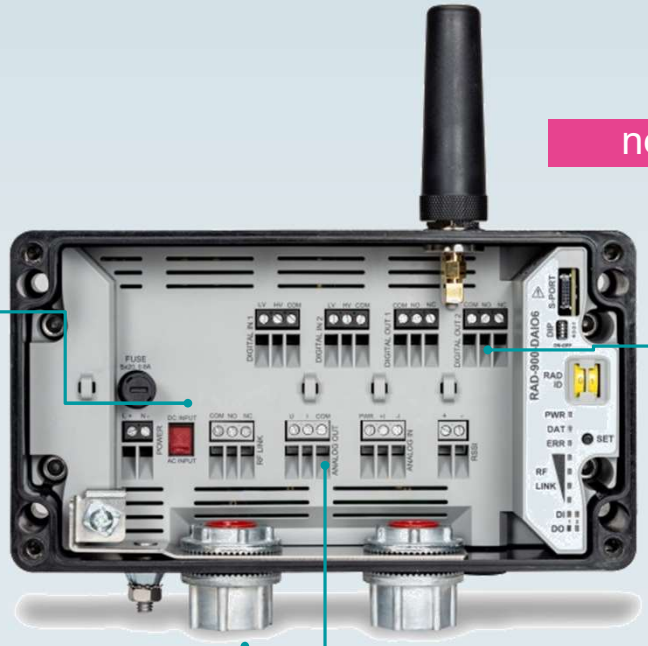
new



	Outdoor box for use in America	Outdoor box for worldwide use (configurable)
Type	RAD-900-DAIO6	RAD-RUGGED-BOX-CONF
Integrated	900 MHz radio, 6 integrated IO channels (2 x digital IN and OUT, 1 x analog IN and OUT), power supply	Fully pre-wired box with integrated power supply, over-voltage protection, selectable radio module and up to three selectable IO extension modules
Degree of protection	**NEMA 4X (IP 66)**	**IP 66**
Range up to	**32 km**	**Depends on selected radio**
Supply voltage	10,8 …30,5 V DC, 100 … 240 V AC	100 … 240 V AC
Temperature range	-40°C…+70°C	-25°C…+55°C
Order number	2702877	1091638

Radioline – RAD-900-DAIO6

new



Fused AC/DC Power selection

Six built- in I/O points 2DI, 2DO, 1AI,1AO

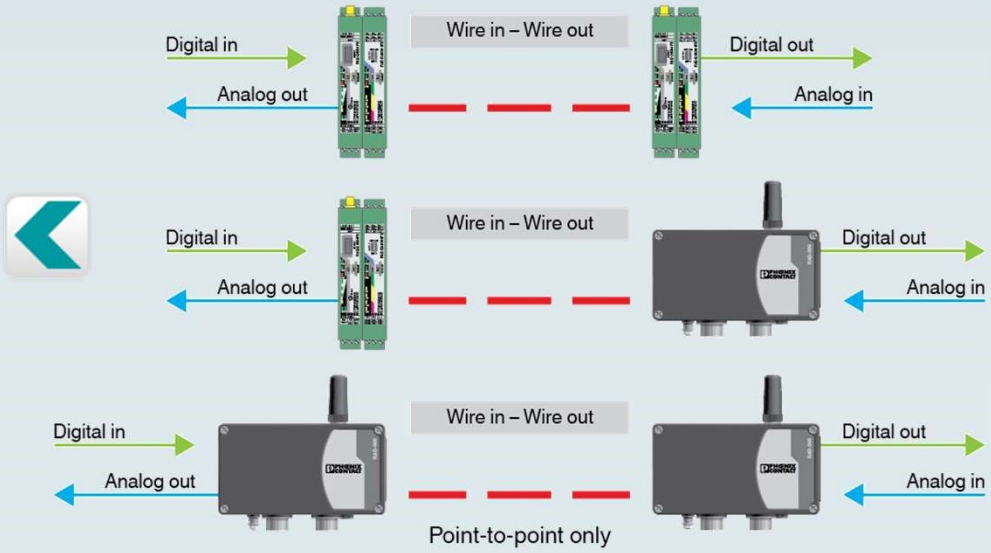
Dual half-inch NPT fittings for power and data isolation

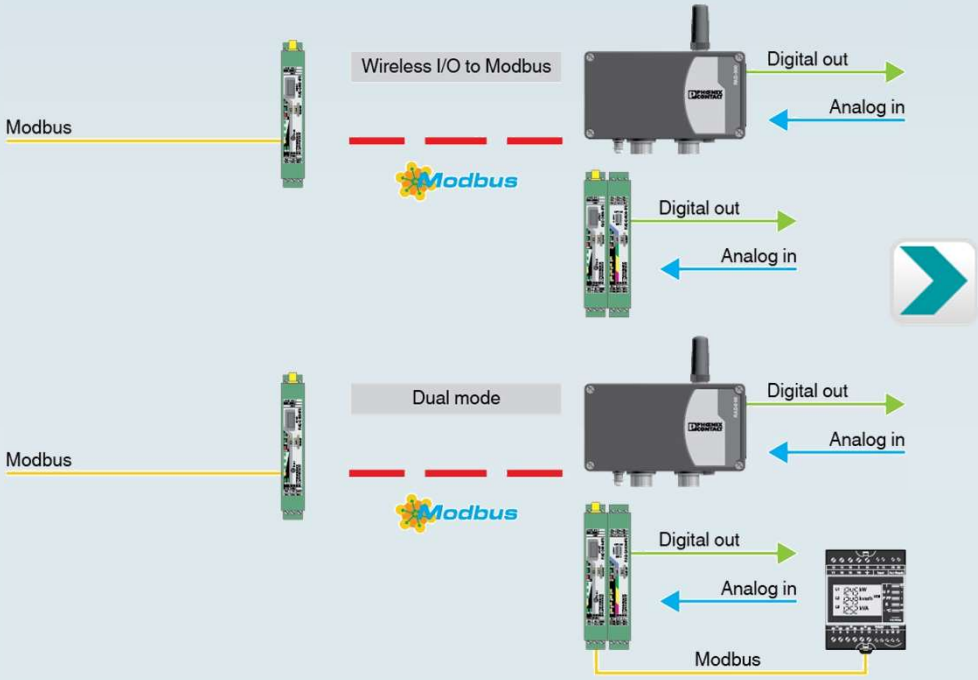
Seperated terminals and wire-tie loops for cable management

- Compact NEMA4X housing
- Compatible with existing RAD-900-IFS installations
- Class I Division 2
- Up to 1000 ft out of the box
- Software-free installation for I/O-to-I/O applications
- **Only for North and South America and Canada**

Radioline – RAD-900-DAIO6

Modes of operation





Radioline – RAD-RUGGED-BOX-CONF

Outdoor box solution (configurable)

- Fully pre-wired control box with integrated 230V power supply, over-voltage protection, selectable radio module and up to three selectable IO extension modules
- Quick and easy connection of power supply and IO signals
- Outdoor use thanks to robust UV-resistant and impact-resistant IP-66 housing

new



For worldwide use

868 MHz | 900 MHz | 2,4 GHz

Radioline – RAD-RUGGED-BOX-CONF

new

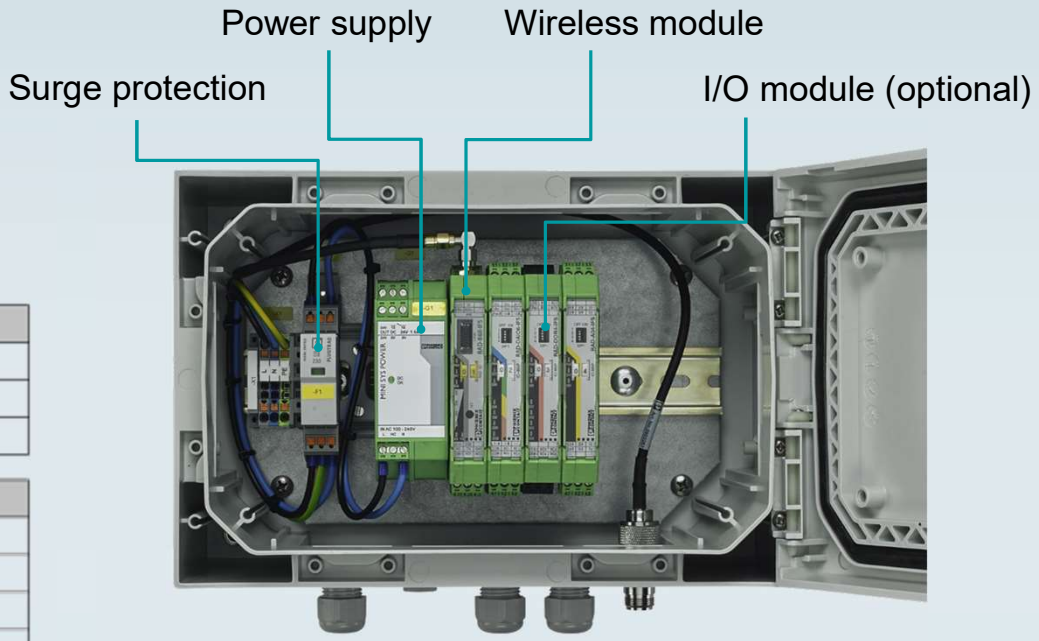
Order key

Example:

Order No.	Wireless module	I/O module (optional)		
		1	2	3
1091638	2400	DI4	AI4	DO8

Wireless module (1 unit)	Area of application	Order key
2.4 GHz	Worldwide	2400
868 MHz	Europe	868
900 MHz	America	900

Type of I/O extension module (optional, up to 3 units)	Order key
2 digital inputs/outputs and 1 analog input/output	DAIO6
4 digital inputs	DI4
8 digital inputs	DI8
4 analog current inputs	AI4
4 Pt 100 inputs	PT100
4 digital relay outputs	DO4
8 digital transistor outputs	DO8
4 analog current or voltage outputs	AO4



For worldwide use

868 MHz | 900 MHz | 2,4 GHz

Radioline – I/O- Extension modules

new new



	Digital In 4 channel	Digital Out 4 channel	Digital In 8 channel	NAMUR In 4 channel	Digital Out 8 channel	Analog In 4 channel	Analog In 4 channel	Analog Out 4 channel	Analog / digital 6 channel	PT 100 4 channel
Type	RAD-DI4-IFS (Input)	RAD-DOR4-IFS (Output)	RAD-DI8-IFS (Input)	RAD-NAM4-IFS (Input)	RAD-DO8-IFS (Output)	RAD-AI4-IFS (Input)	RAD-AI4-U-IFS (Input)	RAD-AO4-IFS (Output)	RAD-DAIO6-IFS (Input / Output)	RAD-PT100-4-IFS (Input)
Details	4 digital wide range inputs 0…250V AC/DC	4 digital relay outputs 0 … 250 V AC/DC / 5 A	8 digital inputs 0…30,5 V DC	4 digital NAMUR inputs, Line break / short circuit detection	8 digital transistor outputs 30,5 V DC / 200 mA	4 analog inputs 0/4…20 mA, Line break / short circuit detection	4 analog inputs 0…10 V	4 analog outputs 0/4…20 mA, 0…10 V DC	1 analog In-/outputs 0/4…20 mA 2 digital In-/outputs 0…250 V AC/DC	4 Pt100 inputs Temperature measuring range: -50°C…+250°C
Related IO module	RAD-DOR4-IFS	RAD-DI4-IFS	RAD-DO8-IFS	RAD-DO8-IFS	RAD-DI8-IFS	RAD-AO4-IFS	RAD-AO4-IFS	RAD-AI4, RAD-AI4-U, RAD-PT100-4-IFS	RAD-DAIO6-IFS	RAD-AO4-IFS
Order No.	2901535	2901536	2901539	2316275	2902811	2901537	2702290	2901538	2901533	2904035

Radioline – Accessories

Configuration via Confstick

Configuration via Software





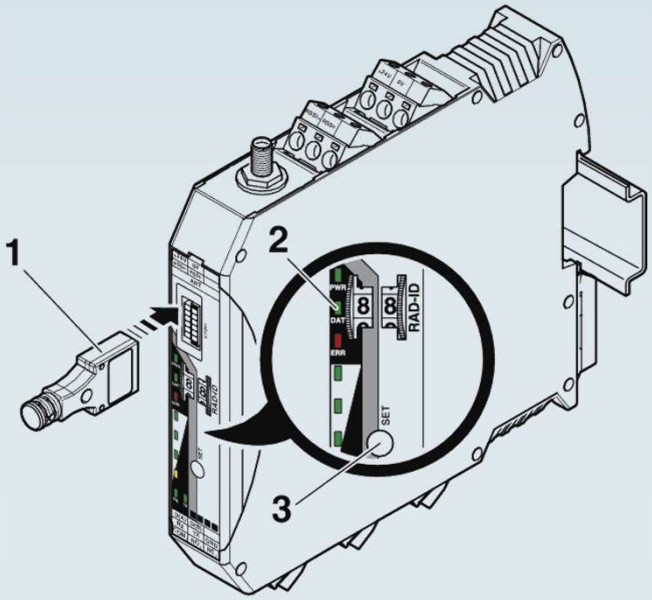




	RAD-CONF-RF3	RAD-CONF-RF5	RAD-CONF-RF7	RAD-CONF-RF1	RAD-CONF-RF1	RAD-MEMORY	RAD-CABLE-USB
Frequency	**2,4 GHz**	**2,4 GHz**	**2,4 GH**	**868 MHz**	**900 MHz**	For all Radioline front modules	For all Radioline front modules
Description	Configuration stick for the 2,4 GHz wireless module unique network ID, RF band 3	Configuration stick for the 2,4 GHz wireless module unique network ID, RF band 5	Configuration stick for the 2,4 GHz wireless module unique network ID, RF band 7	Configuration stick for the 868 MHz wireless module unique network ID, RF band 1	Configuration stick for for the 900 MHz wireless module, unique network ID, RF band 1	Memory stick for saving custom configuration data	Data cable for communication between the PC and Radioline devices
Features	For easy and secure network addressing with unique network ID					Freely configurable	for diagnostics and configuration, 2m cable
Order No.:	2902814	2902815	2902816	2702197	2702122	2902828	2903447

INSPIRING INNOVATIONS

Radioline – Configuration sticks



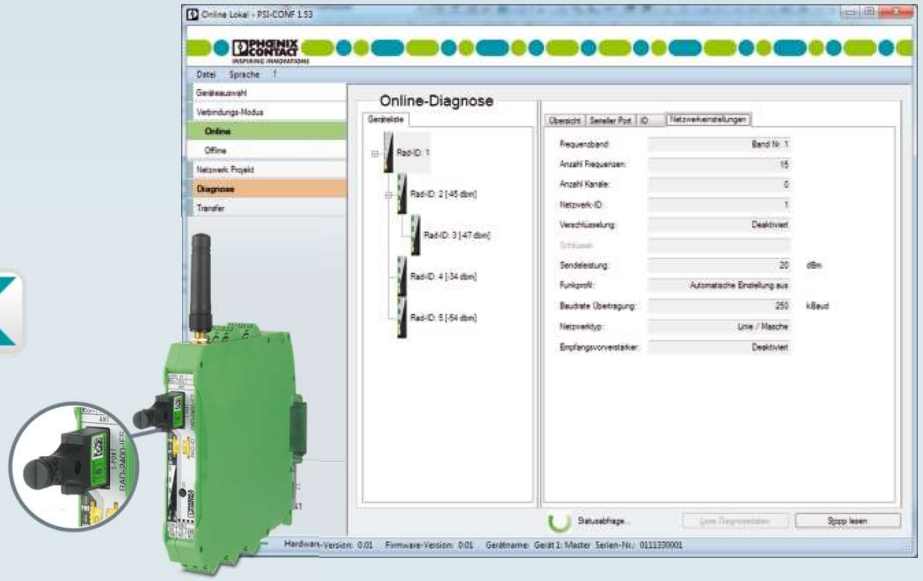
1. CONFIGSTICK RAD-CONF-RF….
2. Status LEDs
3. SET button

Using a CONFIGSTICK, you can configure a **unique and secure** network. This enables the parallel operation of multiple networks (using different RF bands).

Reading in the device configuration using the CONFSTICK

- Insert the CONFSTICK into the S-PORT of the wireless module.
- Press and hold down the SET button on the wireless module for 1 second.
- Parameter read in is started
- Read-in has been completed when the DAT LED lights up once. The new parameters are activated.
- Remove the CONFIGSTICK from the wireless module.

Diagnosis and advanced configuration



- Secure parallel operation of several networks via CONF-Stick
- Unique NET ID by CONF-Stick
- Comprehensive diagnosis of all network participants
- Setting advanced network parameters
- Backup of customer-specific configurations

Radioline – exemplary applications



Water / Wastewater

Video



Traffic engineering



Process industry



Power engineering / Materials handling

ESSENTIAL Wireless

new



Intuitive start-up
- Thanks to comfortable software wizards

Universal use
- Fully transparent cable replacement for serial RS-485 interfaces

Article information
- RAD-EE-2400-RS485
- Art-No. 1081818

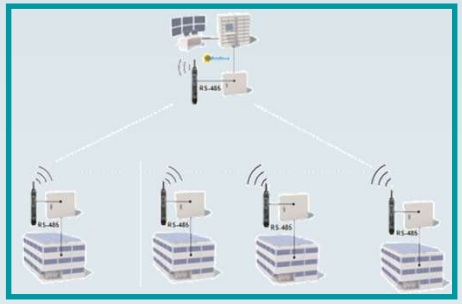
Worldwide use
- Special radio module with reduced functionality for price-sensitive PV applications
- License- free 2,4-GHz band
- CE, FCC, UL approval
- Adjustable data rates
- Range up to 500 m

Reliable communication
- Interference-free communication through automatic and manual coexistence mechanisms
- Immune to electromagnetic interference
- Mesh network with up to 250 nodes

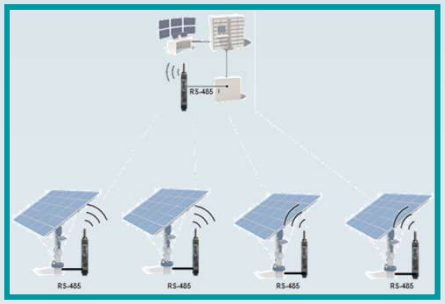
ESSENTIAL Wireless – Application examples



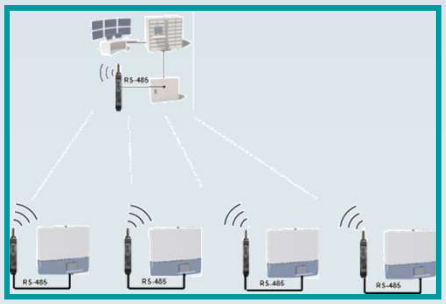
Wireless string monitoring in open field installations



Wireless monitoring of rooftop systems

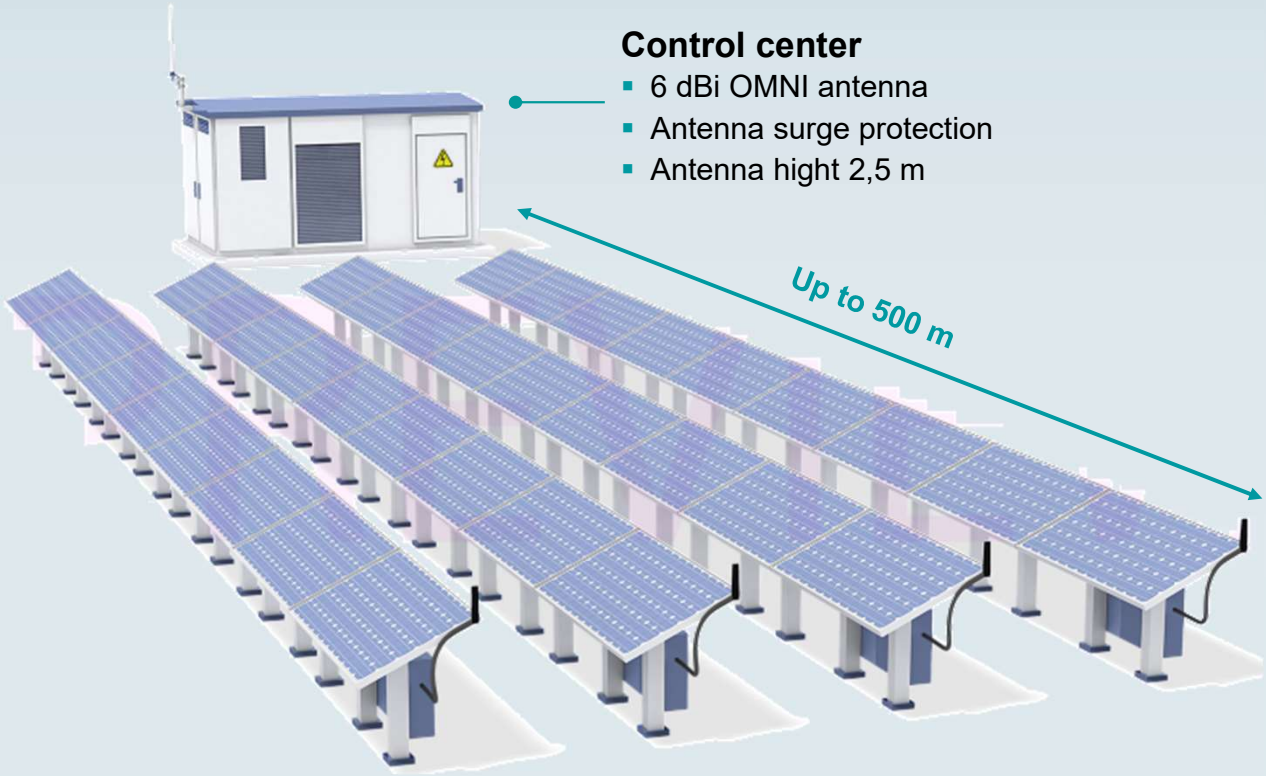


Wireless monitoring of tracking systems



Wireless monitoring of inverters

ESSENTIAL Wireless - Anwendungsgebiete



Control center

- 6 dBi OMNI antenna
- Antenna surge protection
- Antenna hight 2,5 m



String monitoring box

- 2 dBi OMNI antenna
- Can be sticked directly to control cabinet or PV module
- Antenna hight 1,5 m

New products 2019

Radioline Outdoorbox
For use in America
New 2019



Radioline Outdoorbox (configurable)
For worldwide use
New 2019



Radioline I/O-Modules
4 x NAMUR inputs / 4 x 0...10 voltage inputs
New 2019





ESSENTIAL Wireless
For installation in PV parks
New 2019



Antennas
for 868 MHz and 2,4 GHz
New 2019





Antenna barrier
For installation in dust Ex areas
New 2019



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Radioline Outdoor box for use in America



New 2019

- ☑ Splashproof NEMA 4X housing saves time and effort during installation
- ☑ Universal AC or DC power supply
- ☑ Intuitive startup and configuration
- ☑ Connection to standard 900 MHz Radioline radios

Main features

- 900 MHz wireless module
- 6 integrated I / O channels
- 1000 ft out of the box, up to 20 mile
- Supply voltage range: 10.8 ... 30.5 V DC, 100 ... 240 V AC
- Temperature range: -40 ° C to +100 ° C

Order information

- RAD-900-DAIO6
- Order No.: 2702877

Radioline Outdoor box for worldwide use



New 2019

- ☑ Splashproof IP66 housing saves time and effort during installation
- ☑ Fully pre-wired control box with integrated power supply, overvoltage protection, selected radio module and I / O extension modules
- ☑ Intuitive startup and configuration
- ☑ Individually configurable

Main features

- Radio module selectable
- Expandable with up to three selectable I / O extension modules
- Incl. M20 cable glands, antenna feedthrough and pressure compensation element
- Temperature range: -20 ... +55 ° C
- Universal power supply 100 ... 240 V AC

Order information

- ANT-OMNI-0627-01
- Order No.: 1089617

Radioline – New NAMUR input module



New 2019

- ☑ 4 x digital NAMUR inputs
- ☑ Hot Swappable
- ☑ Galvanical channel-to-channel isolation

Main features

- Line break detection
- Short circuit detection
- 19,2 V DC …. 30,5 V DC supply voltage via T-BUS
- Temperature range: -40 ° C to +70 ° C
- International approvals (ATEX, IECEx, UL Class 1 Div. 2)

Order information

- RAD-NAM4-IFS
- Order No.: 2316275

Radioline – New voltage input module



New 2019

- ☑ 4 x analog 0…5/10 V inputs
- ☑ Hot Swappable
- ☑ Galvanical channel-to-channel isolation

Main features

- Overrange detection
- Underrange detection
- 19,2 V DC …. 30,5 V DC supply voltage via T-BUS
- Temperature range: -40 ° C to +70 ° C
- International approvals (ATEX, IECEx, UL Class 1 Div. 2)

Order information

- RAD-AI4-U-IFS
- Order No.: 2702290

ESSENTIAL Wireless for installation in PV parks



New 2019

- ☑ Special radio module with reduced functionality for price-sensitive PV applications
- ☑ Fully transparent cable replacement for serial RS-485 interfaces
- ☑ Interference-free communication through automatic and manual coexistence mechanisms
- ☑ Immune to electromagnetic interference

Main features

- Licence free 2,4 GHz frequency band
- Adjustable data rates
- Range up to 500 m
- Mesh networks up to 250 nodes
- Temperature range: -20 ° C to +70 ° C

Order information

- RAD-EE-2400-RS485
- Order No.: 1081818

Stick antenna for installation in PV parks



New 2019

- ☑ Flexible installation - Antenna can be stick directly to control cabinet, PV module, wall or mast
- ☑ Splash water and UV resistant
- ☑ Flat design

Main features

- Frequency range: 689 … 2700 MHz
- Gain: 2 dBi
- Protection class: IP67
- Connector: RSMA (male)
- Incl. 1,5 m cable

Order information

- ANT-OMNI-0627-01
- Order No.: 1089617

Antenna barrier for dust Ex areas



- ☑ Use of low-cost standard antennas in hazardous areas Zone 0, 1, 2
- ☑ Use of low-cost standard antennas in hazardous areas Zone 20, 21, 22 **New 2019**
- ☑ Installation as control cabinet feedthrough (IP65)

Main features

- Compact housing design
- International approvals (ATEX, IECEx)
- Frequency range: 0.3 ... 6 GHz
- Temperature range: -40 ° C to +75 ° C
- Connector: N (female)

Order information

- BAR-ANT-N-N-EX
- Order No.: 2702198

Radioline

WNP Wireless Network Planner



Choose Technology

Configure Map

Select Master – Slaves

Select Antenas

Select I/O´s (Radioline)

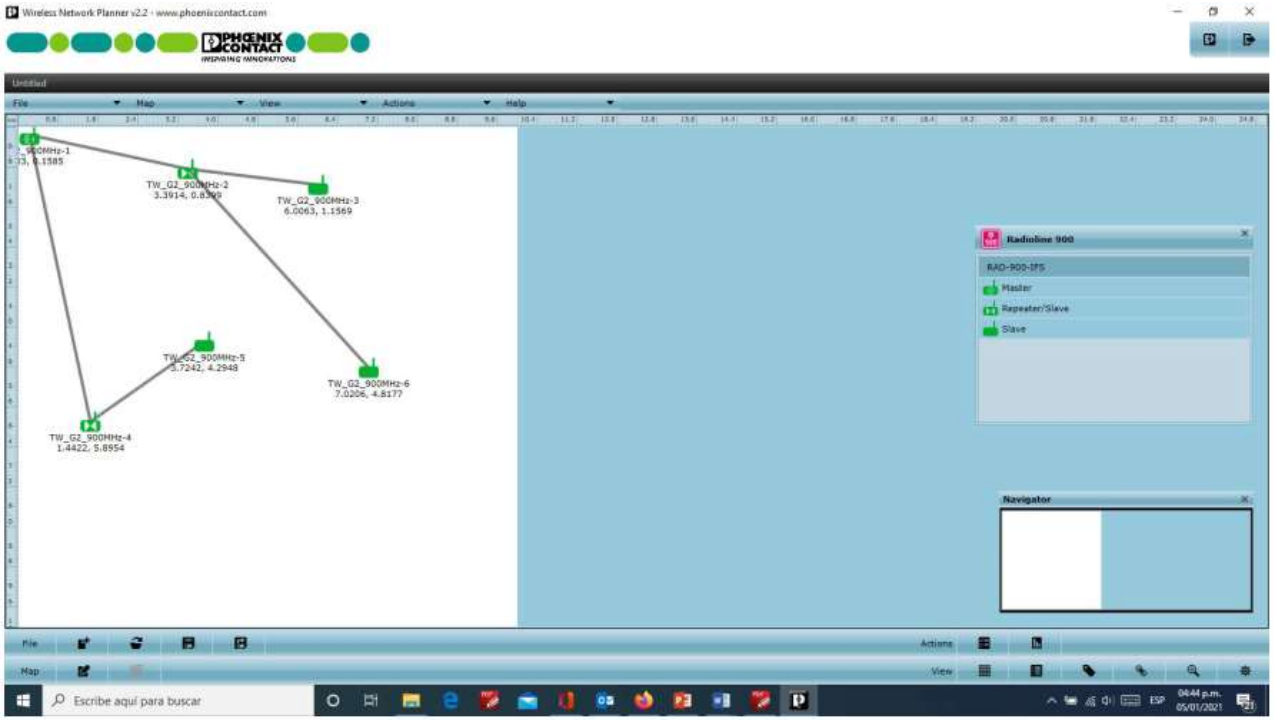
Select ID for several networks



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Radioline

WNP Wireless Network Planner



Network Report

Bill of materials

Device Placement

Network Connectivity

Network Map

Neighbor Devices

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Successfully implemented customer projects



Water supply



Wastewater disposal



Process automation



Oil & Gas



Power generation / distribution



Transportation infrastructure



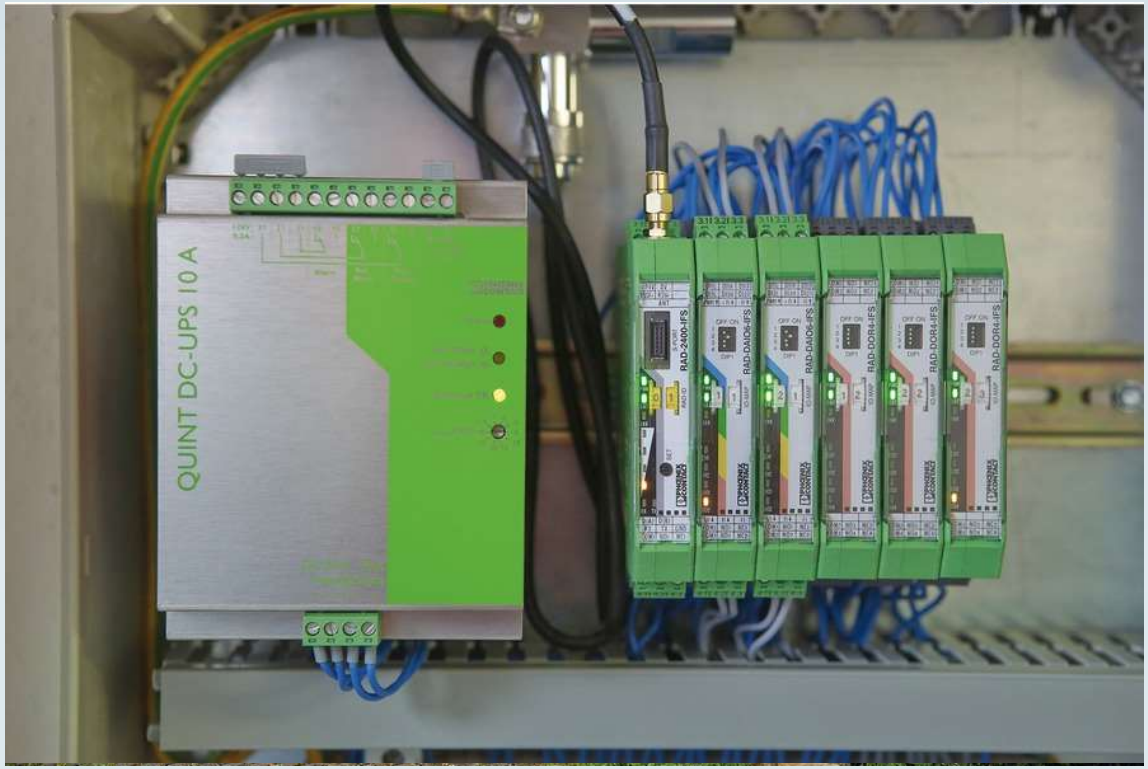
Machine building



Warehouse logistics

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Water Supply „Zweckverband Seebachgebiet“

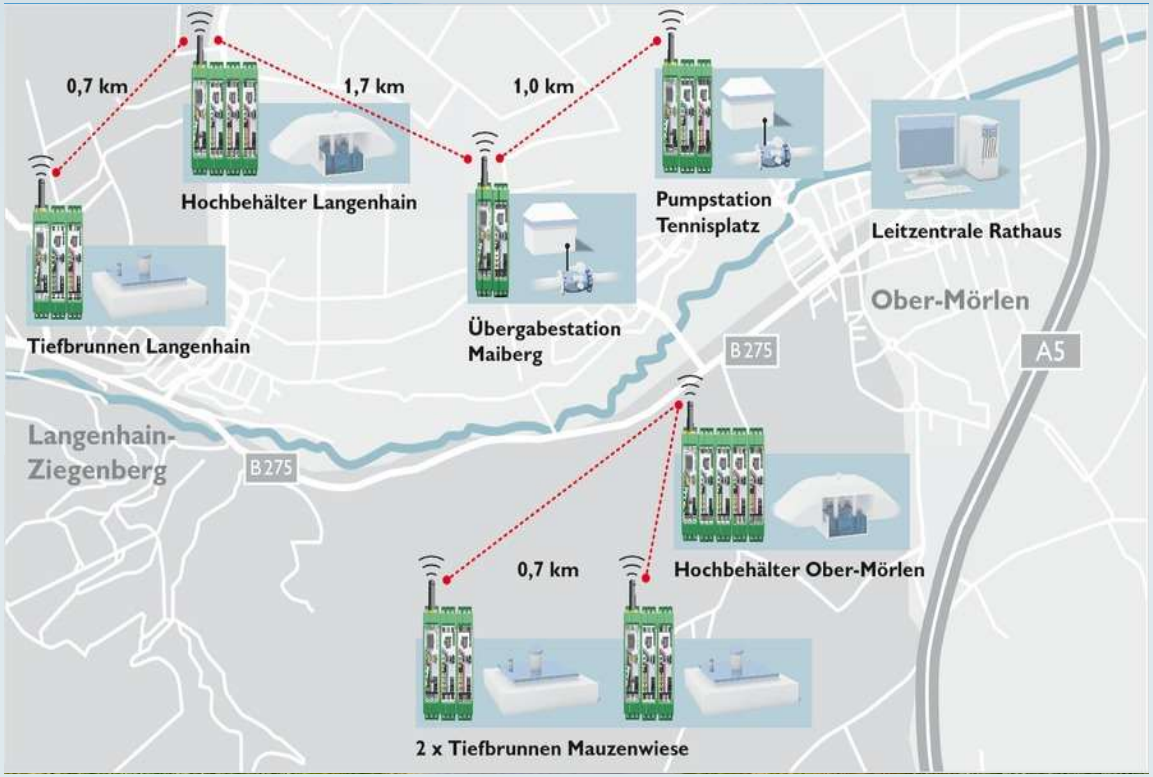


„We have saved a lot of time and money by using the Radioline wireless system“, says Hermann-Josef Hofmeister from the waterworks Osthofen.

The water supplier “Zweckverband Seebachgebiet” uses an industrial wireless solution based on the Radioline system from Phoenix Contact for communication between the various substations.

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Water Supply „Stadtwerke Obermörlen“



„ The radio links are stable and have not even failed since the first day”, says Karlheinz König.

Most of the substations are controlled by a telephone network whose cables have decayed over the years.

This is why the Radioline wireless system now reliably links the distant outdoor structures to the control system.

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Central wastewater plant Wilhelmshaven



"By using the wireless solutions, we have solved numerous challenges, such as the replacement of wear-prone slip rings, and saved a lot of money," sums up Frank Jakobs.

As part of the modernization of the wastewater treatment plant, four secondary sedimentation tanks, sand traps and pumping stations and digestion towers were equipped with a Phoenix Contact wireless system.

Wastewater plant RWE Power Neurath

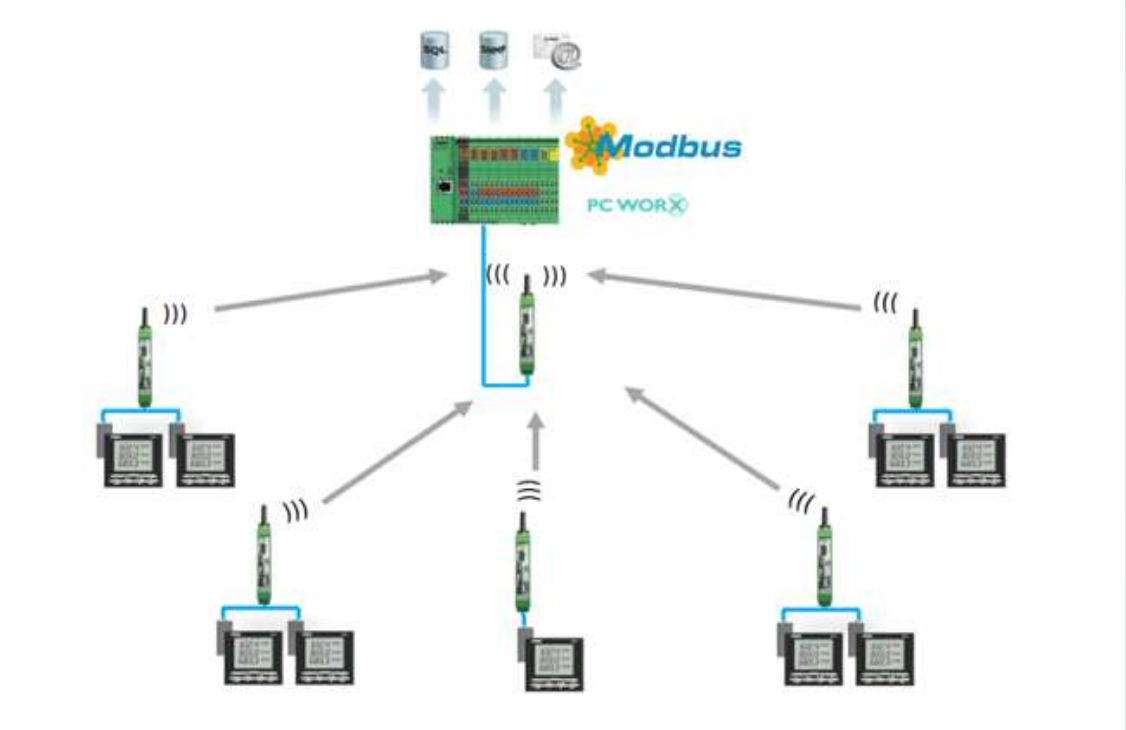


"The commissioning of the Radioline modules has proven to be really easy“, sums up Stefan Strasser from RWE.

As part of a modernization, the treatment plant should be able to be operated via a remote control operation.

Wireless technology and other components from Phoenix Contact contribute to the flexible and reliable operation of the system.

Metal production Walter Mester



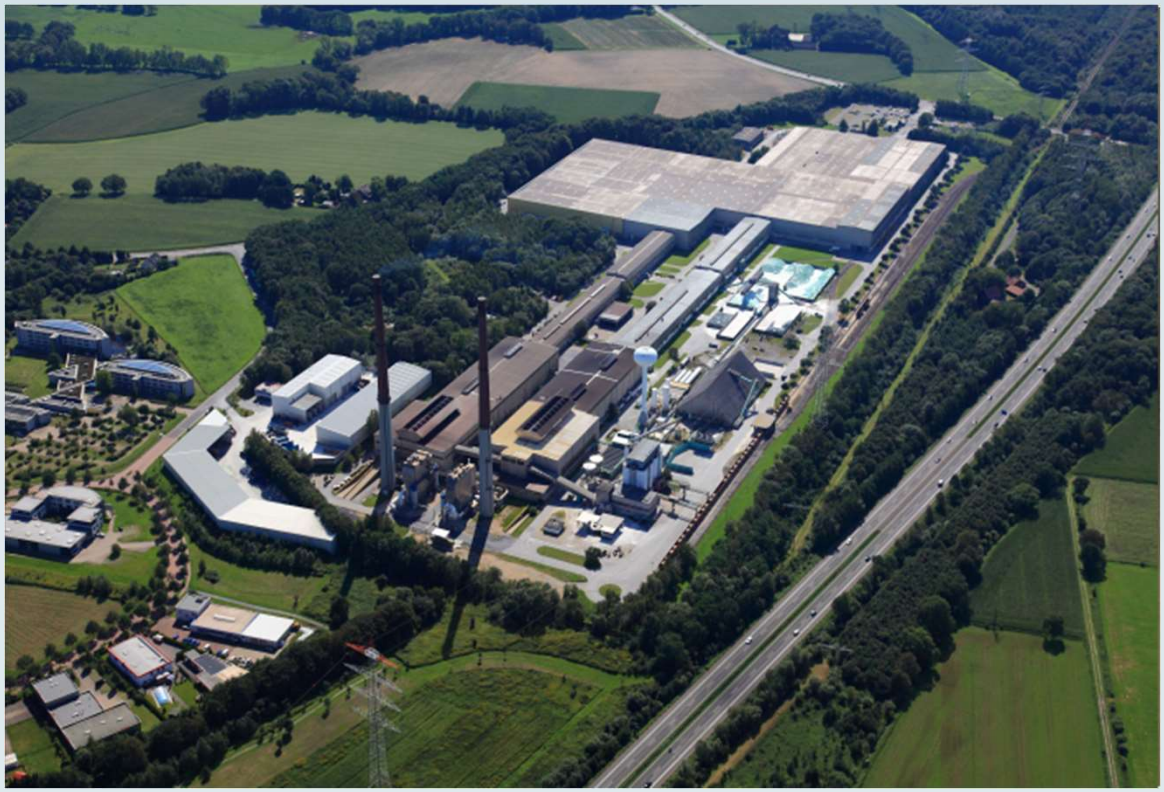
"We were not sure that wireless communication always works reliably in the harsh environment of a forge. But after the implementation of a similar application in another forge, all doubts are dispelled“, sums up Thomas Besbes from Isertech GmbH.

In order to benefit from tax deductions for energy-intensive businesses, energy consumption must be recorded transparently.

The implemented solution shows how the energy consumption can be determined transparently by means of measuring devices systematically installed at the energy focal points in combination with a reliable Radioline wireless transmission.

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Glass production NSG Group



"We were enthusiastic about the fast and competent support of Phoenix Contact and could hardly believe our eyes when we realized that Radioline itself can transmit through several halls, walls and other obstacles“, says Björn Niemann.

A lot of energy has to be expended for the glass production, therefore the energy acquisition and the resulting increase in efficiency in the production is unavoidable.

The Radioline wireless system not only helps to transparently record energy consumption, but also to increase cost-effectiveness.

Glass production Saint-Gobain



"We could hardly believe that Radioline could transmit data even through the rather thick reinforced concrete ceiling. The setup was a child´s play, with just one turn on the wheel, the inputs and outputs are assigned to each other“, explains Wilfried Brepols.

The windows installed in cars are heated to more than 600° C in the furnace during their production and then tempered by mobile refrigeration units due to the rapid cooling.

The Radioline system transmits the signals from the cooling units through a ceiling to the controller in the building basement.

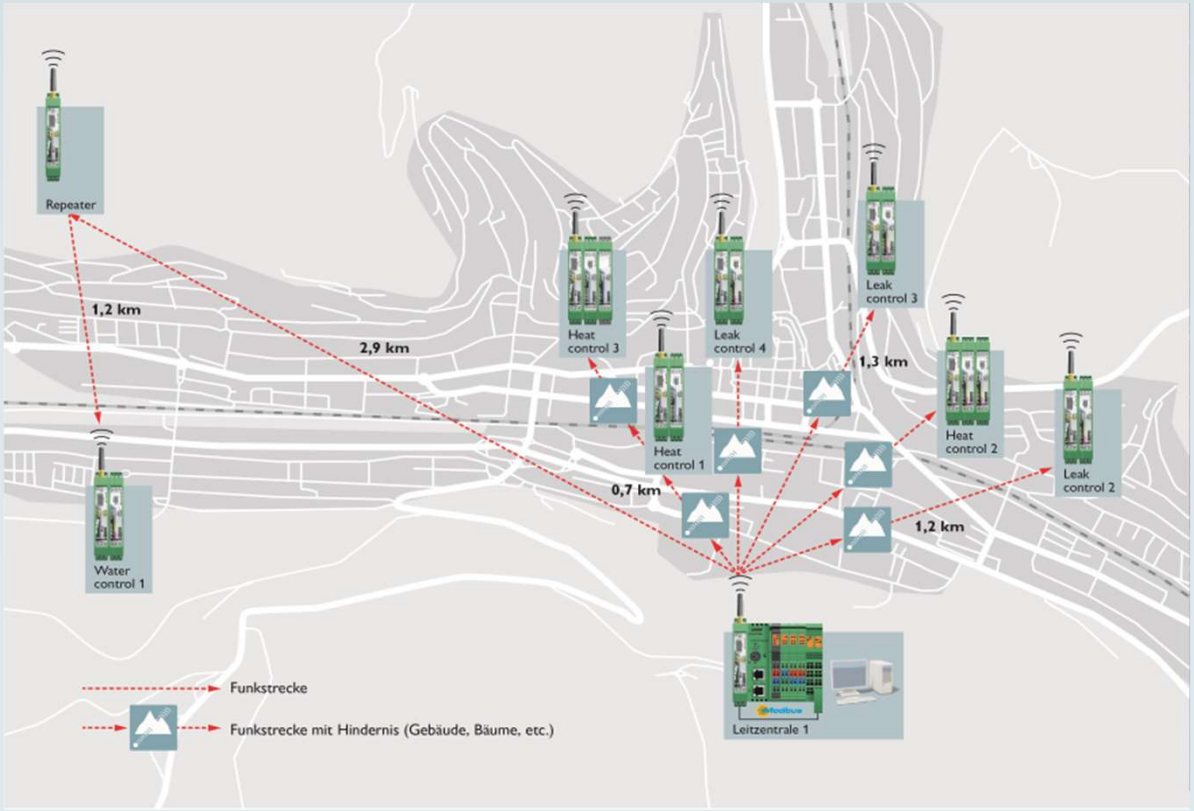
Oil refinery Petronor



A refinery utilizes hundreds of thousands of barrels of oil every day. Between the individual process steps, liquids and gases are produced, which are constantly pumped back and forth between the process plants and storage tanks via pipelines.

At the Petronor refinery in Muskiz, Spain, the Radioline wireless system provides remote monitoring of valve positions, pump status and system pressures.

Leakage monitoring „Albstadtwerke“



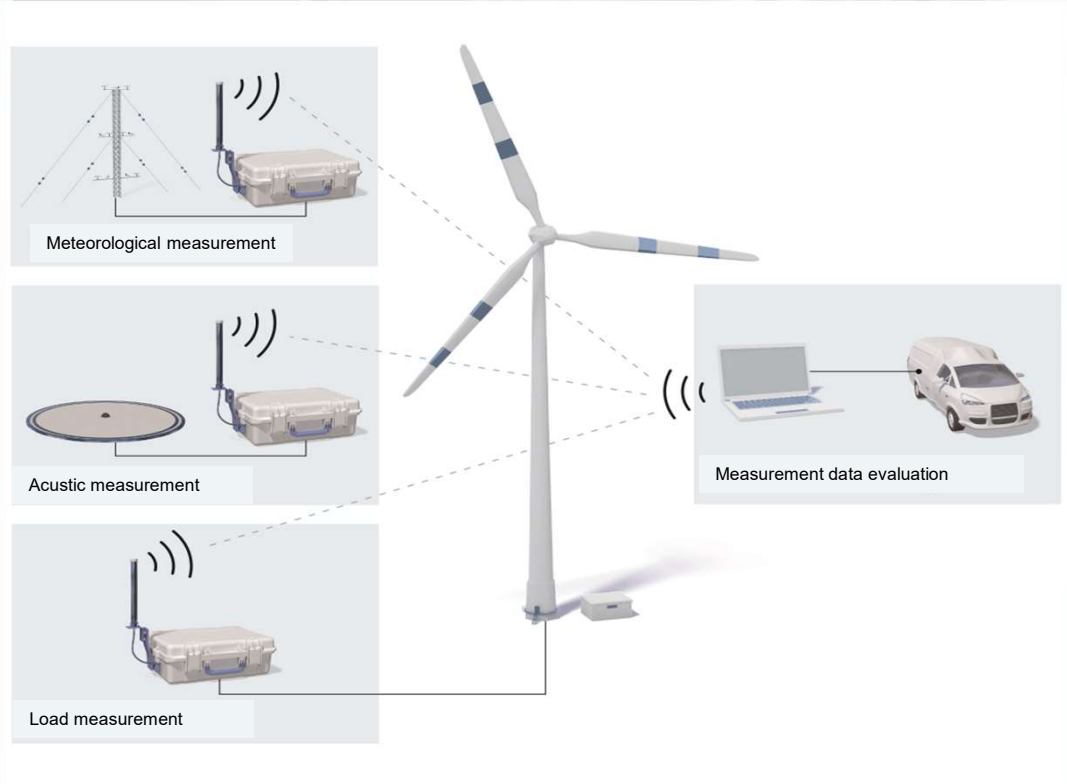
"New underground cables could not be laid due to the available budget and local conditions. A mobile communication solution was also out of the question, since we need to be able to exert influence in the event of a fault”, sums up Thomas Haas.

To ensure that the pipelines required for the energy supply (district heat and water) always function perfectly, they must be continuously monitored.

By using Radioline, all measurements can now be recorded continuously and obstacles can be passed.

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Generation plants certification - MOE

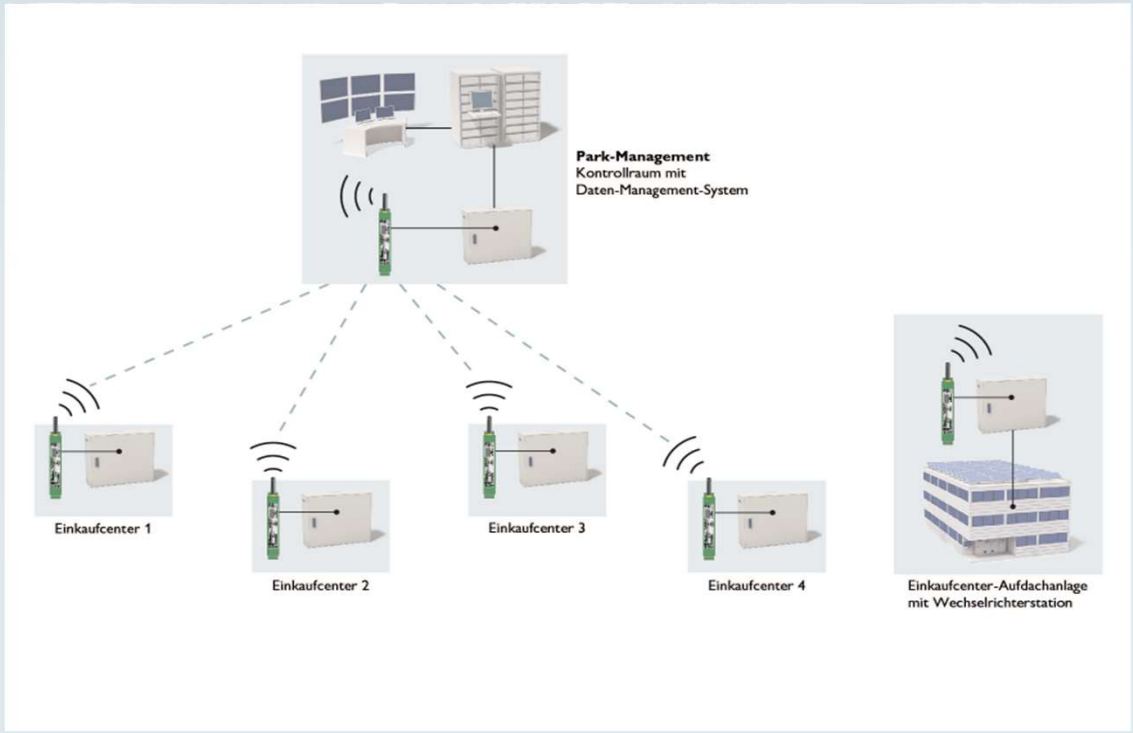


"By using the autonomous wireless measuring boxes, we save a lot of wiring time during installation“, sums up Christoph Thiel from Moeller Operating Engineering GmbH.

In total, three measuring boxes will be placed around the wind turbine. A box is placed on the acoustic sensor, one near the plant control and the last finally on the meteorological sensor mast.

Radioline pass the recorded data wirelessly to their remote stations in the parked vehicle, which they transfer to the computer. There, the data is archived and processed.

Wireless networking of PV inverters



ValloSol GmbH specializes in the technical operation of renewable energy producers.

The number of photovoltaic systems installed on the rooftops of buildings and in the open air has risen steadily in recent years. In order for the operators to achieve the highest possible return, central plant monitoring plays an important role

With the Radioline system, various remote rooftop systems can be combined to form a network and transmit the Modbus-RTU coded data to a data management system.

Erasmus Bridge Rotterdam



Due to the tides of the North Sea, not every ship can pass under the Erasmus Bridge in Rotterdam at any time.

To prevent damage to the ships and the bridge, six scoreboards visualize the current maximum headroom.

The corresponding analog values are obtained by the display boards of a small AXC 1050 controller via the Radioline wireless system.

Lighting Gent-Terneuzen canal

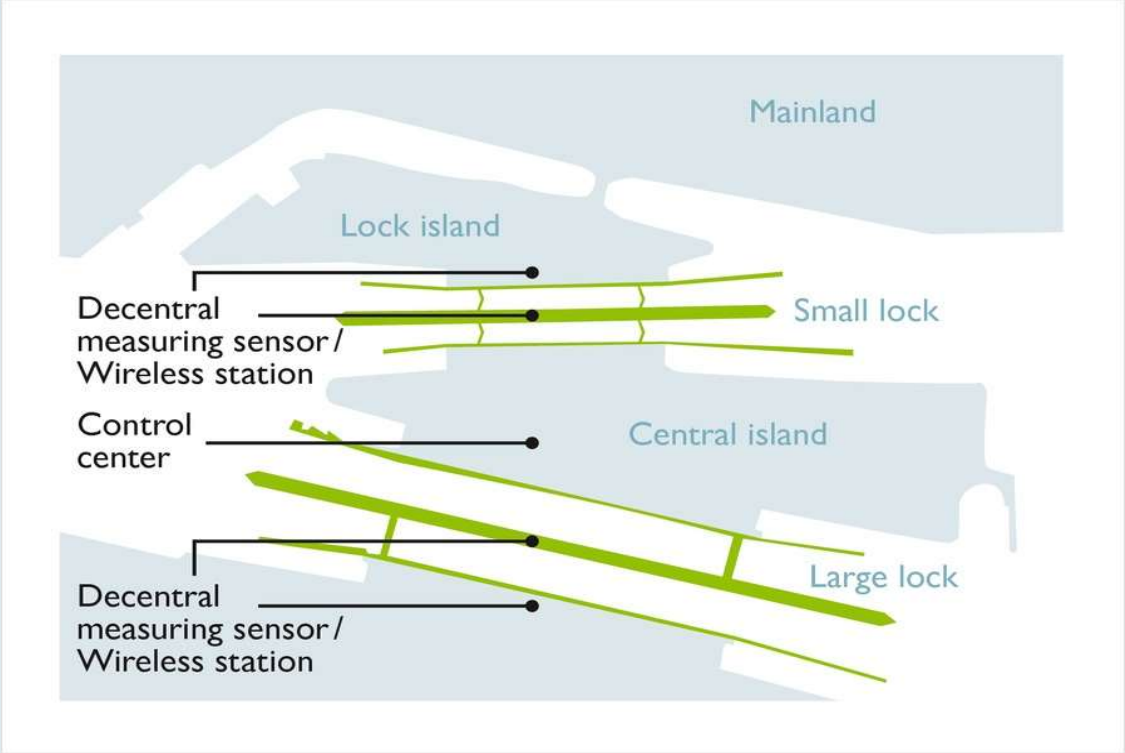


The lighting of the Dutch section of the canal Gent-Terneuzen should be switched centralized and decentralized.

Along the canal are a total of 17 control boxes for switching the lighting.

To transmit the control commands, each control box includes a Radioline 868 MHz module and an I/O extension module.

Watergate Kiel-Holtenau



“All measured values can now be permanently recorded so that we can respond promptly to early incidents, "says Jürgen Glözl from Glözl Baumesstechnik.

During construction, high-quality sensors measure all important points of the lock construction, whereby the remote measuring stations are connected via Radioline wireless systems.

Your benefit

- Easy and fast installation
- No earthworks
- No breakthroughs
- No maintenance costs
- High flexibility
- No fees

Cost and time saving

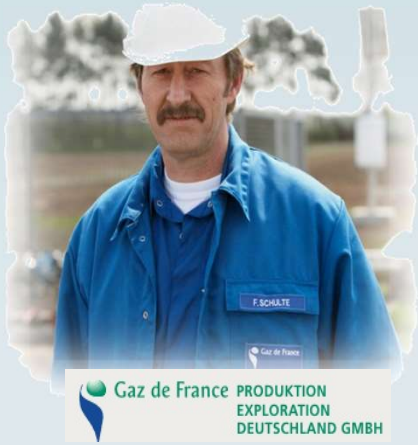


WASSERWERK ZWECKVERBAND SEEBACHGEBIET

„Using the service of the cost free path study the hill was detected already during the planning phase.“

„The Trusted Wireless technology allows IO data transfer over big distances.“

„By using Radioline we have saved a lot of time and money.“



Gaz de France PRODUKTION EXPLORATION DEUTSCHLAND GMBH

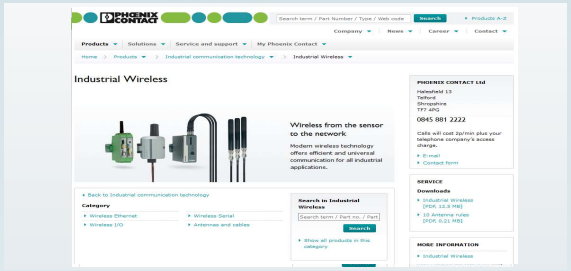
„The continous wireless transmission of the measured values increases the process reliability.“

„In search of an alternative for expensive cables and earthworks we have decided to use the Trusted Wireless devices from Phoenix Contact.“

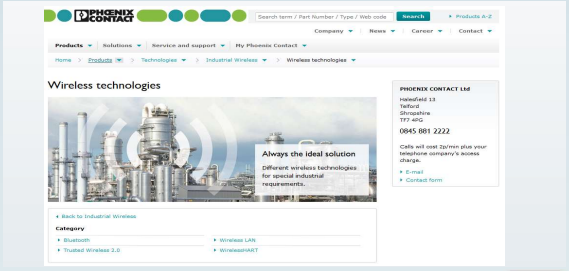
„This technology is trend-setting for us“

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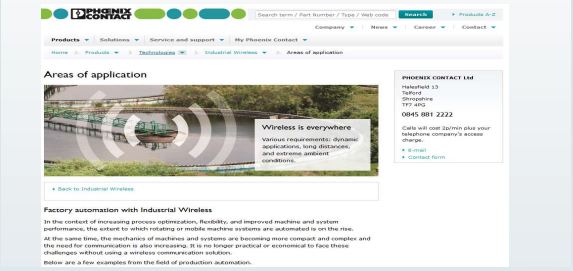
Further information on the homepage



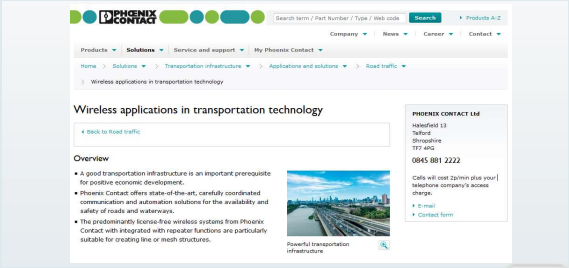
Product information



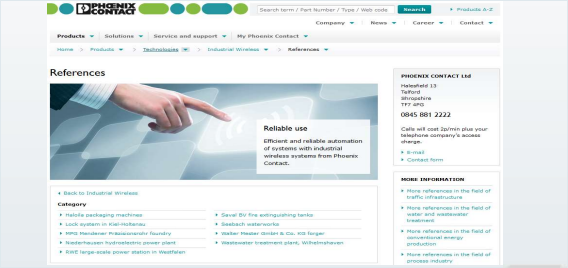
Technology informations



Applications



Solutions



References

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