Industrial Wireless – Wireless from the sensor to the network

INSPIRING INNOVATIONS

Selection of topics

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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".

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.

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.

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.

2003 | 2004 | 2005 | 2007 | 2008 | 2010

Expansion of the portfolio

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

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.

WirelessHART

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

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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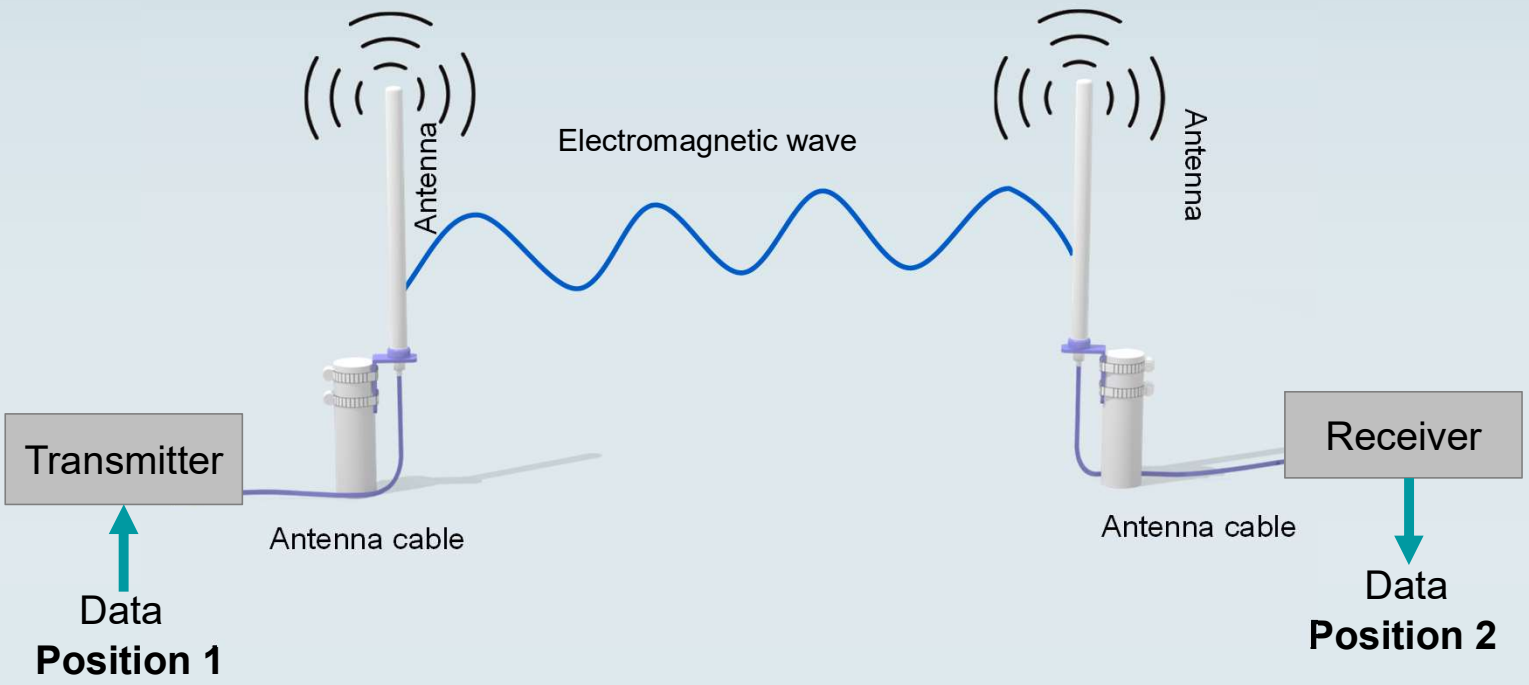
Wireless link



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.

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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

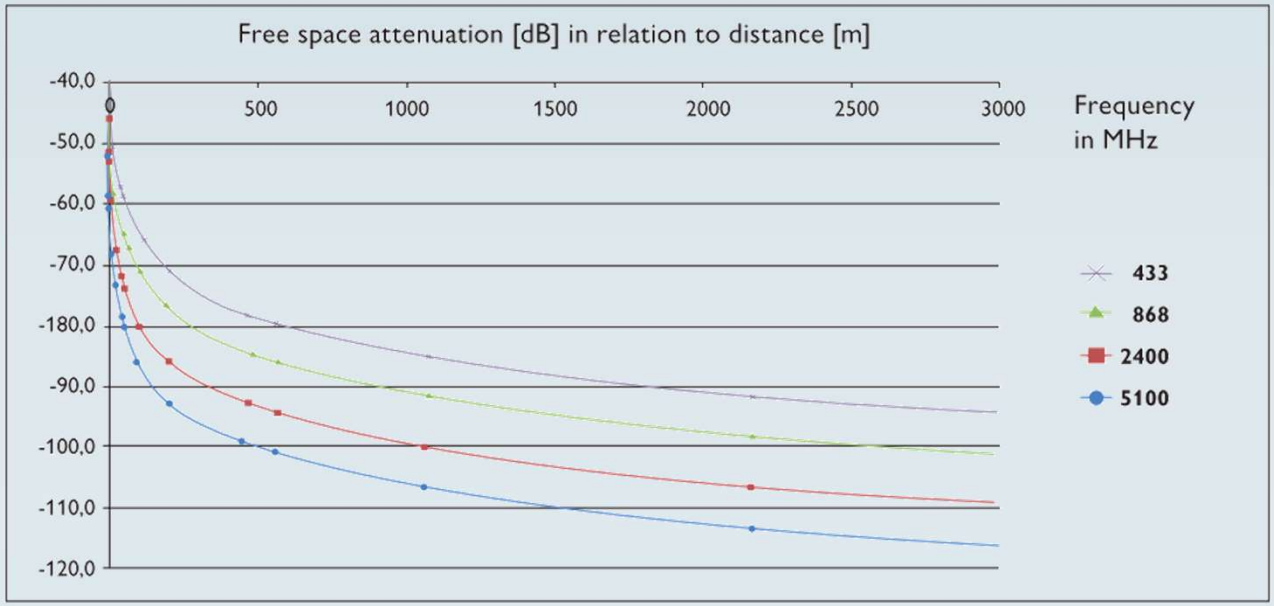
Receiver sensitivity and transmission power

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

- 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.

Free space loss



- The lower the frequency the lower the free space attenuation
- The lower the free space attenuation, the bigger the achievable distance

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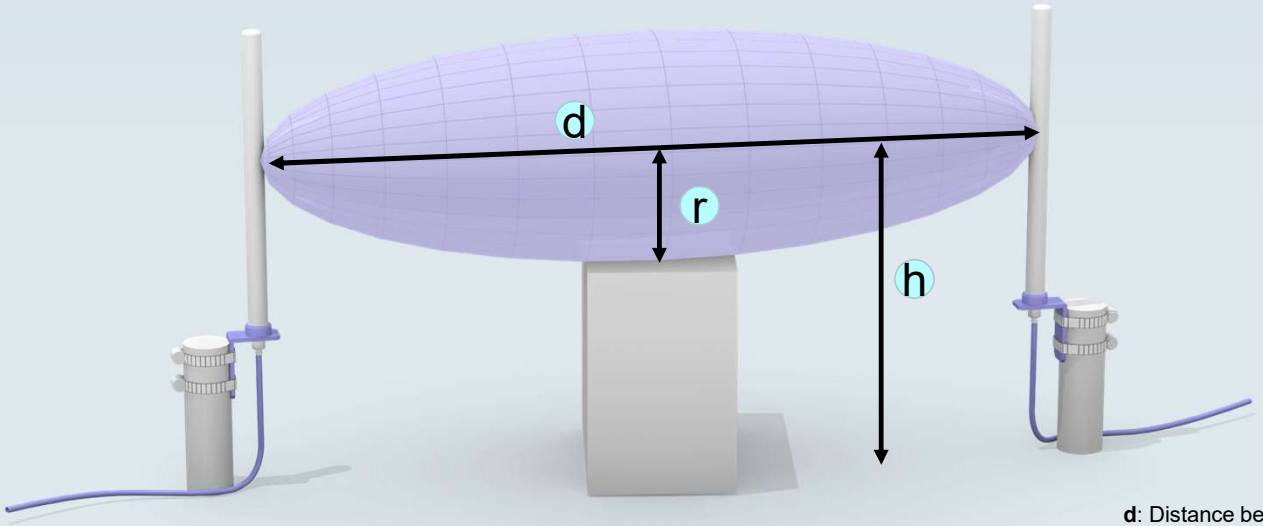
Material attenuation

Obstacles	Typ. attenuation @ 868/900 MHz	Typ. attenuation @ 2,4 GHz
Window	1 – 2 dB	3 dB
Sand-lime brick (24 cm)	5 – 6 dB	9 – 10 dB
Hedge (2 m)	8 dB	15 dB
Reinforced concrete wall (16 cm)	12 – 15 dB	20 – 25 dB
Forest (25 m)	20 dB	40 dB

- The lower the frequency, the lower the material attenuation
- The lower the material attenuation, the bigger the achievable distance

Fresnel Zone



The antenna height increases with the distance!

d: Distance between antennas
r: Radius of the Fresnel-Zone in the middle
h: Necessary total height of the antennas
(Obstacle height + radius Fresnel Zone)

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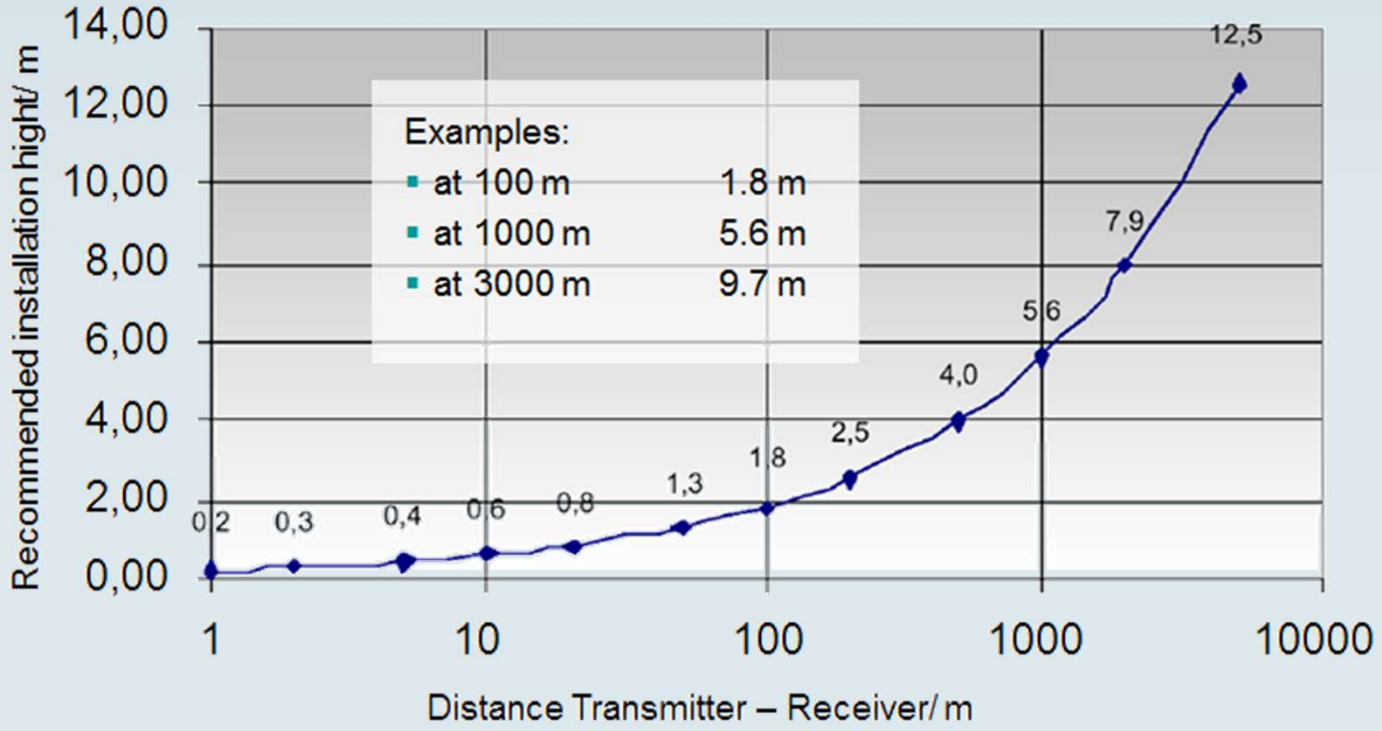
Antenna hight @ 2,4 GHz



- The higher the antenna, the bigger the achievable distance

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Affected by weathering

- Rain, snow have only minimal impact
  - Attenuation of 50 l / m²h is 0,02 dB / km
- Wind has no direct influence, but taken into account when fixing the antenna!

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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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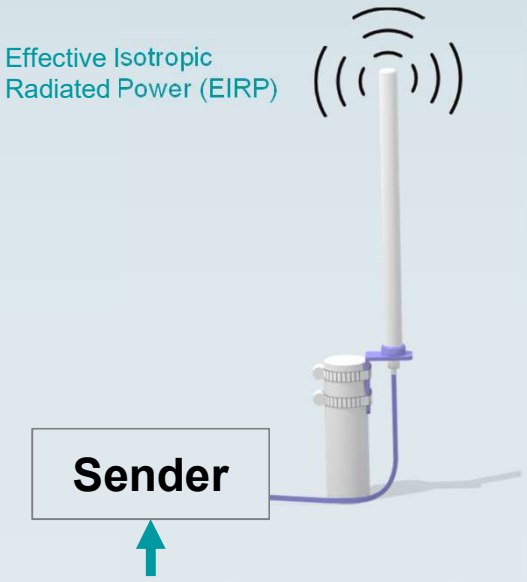
Max. permissible radiated power EIRP



Transmission power	Attenuation cable	Antenna gain	**EIRP**
+16 dBm	-2 dB	+6 dBi	**+20 dBm**
+20 dBm	-2 dB	+2 dBi	**+20 dBm**

For Europe:

- 868 MHz-Band: max. 27 dBm (EIRP)
- 2,4-GHz-Band: max. 20 dBm (EIRP)
- 5,150 GHz bis 5,350 GHz max. 23 dBm (EIRP)
- 5,470 GHz bis 5,725 GHz max. 30 dBm (EIRP)

The legally prescribed radiated power (EIRP) must not be exceeded.

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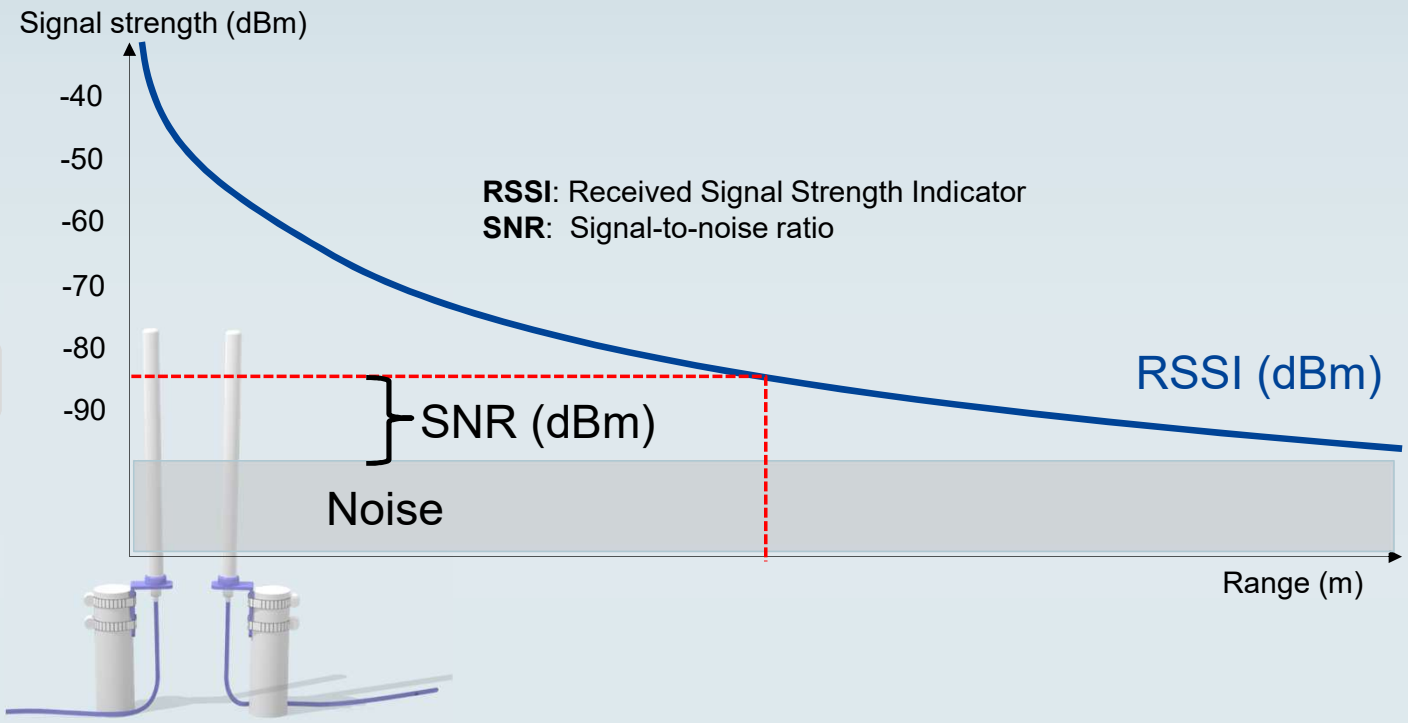
Indications of signal quality



- The lower the data rate, the more "robust" is the communication or the higher the achievable distance
- The lower the SNR, the poorer the signal quality, and transmission problems due to loss of frames must be expected

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Wireless Accessories

- More power for your application through coordinated accessories
- Ideal for industrial applications thanks to special antenna design
- Facilitated selection of the right components with helpful examples

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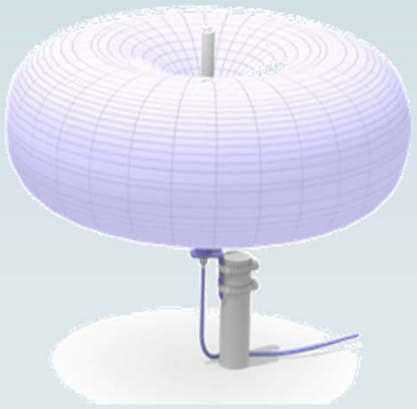
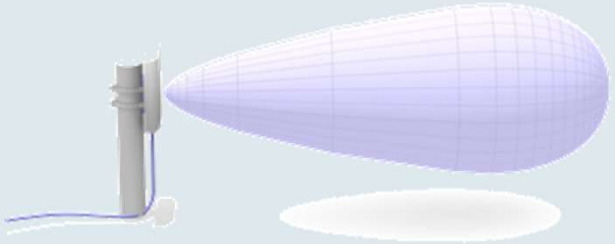
Antenna types

Omnidirectional antenna (OMNI)

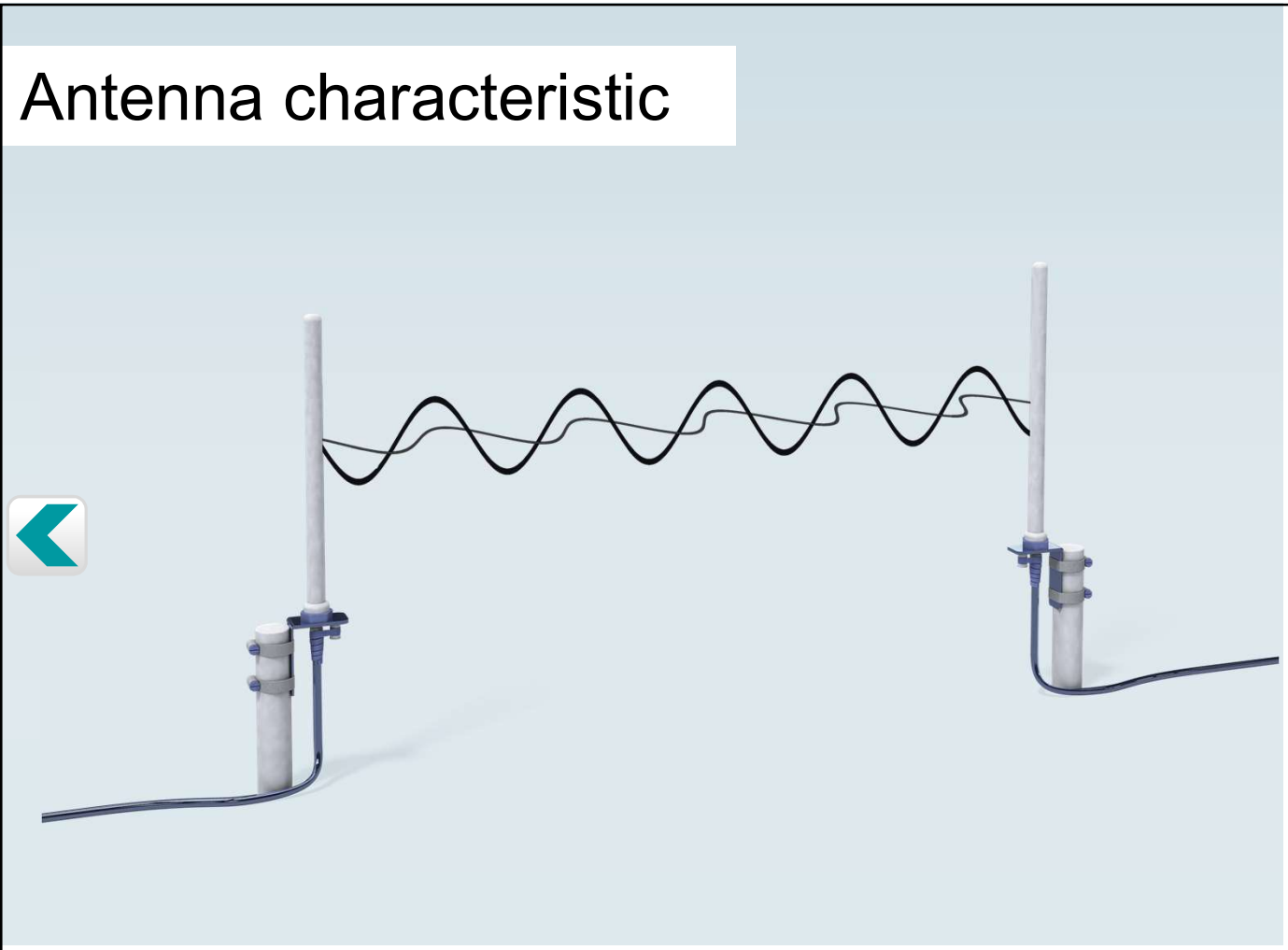


Directional antenna (Yagi)



- The larger the opening angle, the easier the antenna alignment
- The smaller the opening angle the greater the antenna gain

Antenna characteristic



- The characteristic of an antenna can be compared with various light sources :
  - Light bulb → Omni antenna
  - Pocket lamp → Directional antenna
  - Laser pointer → Strong directional antenna e. g. Yagi
- You can also combine omnidirectional and directional antennas. Ensure the same polarization of the antennas.

Tip: You can also combine circular and vertical polarized antennas in certain applications! Example: Antenna installation near the ground.

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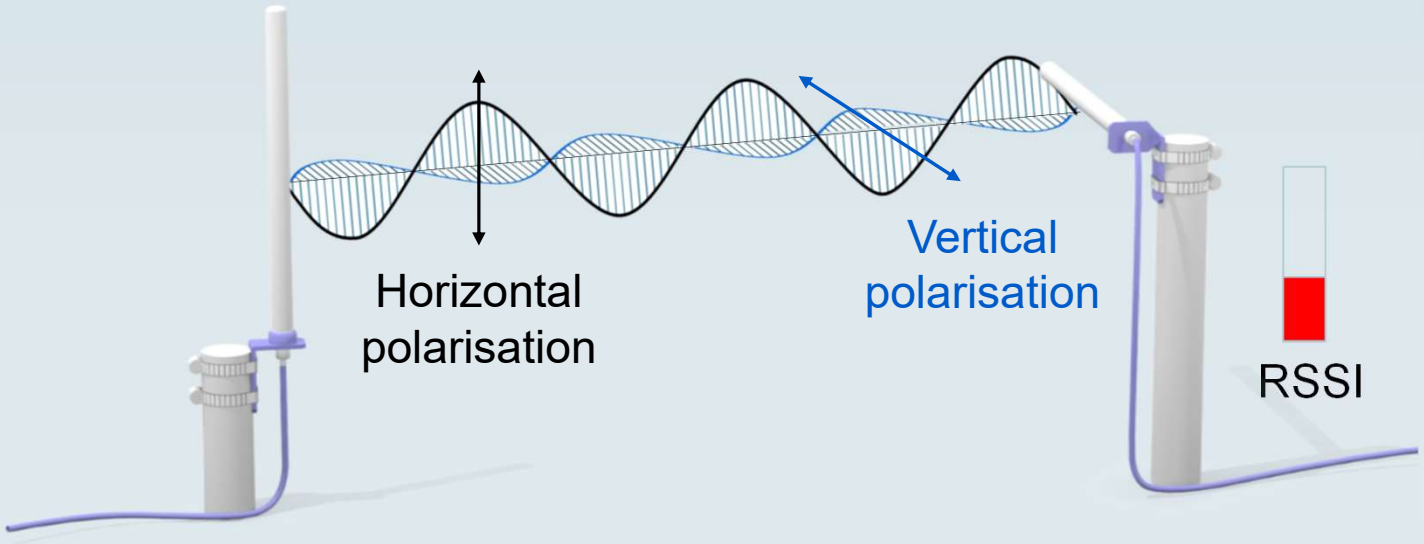
Polarisation



At 90 ° theoretically no reception possible.

Selection of the right antenna

Omnidirectional antenna

- Wireless modules facing different directions
- Mobile applications
- Applications without sight (reflective environments)

Directional antenna

- Cover large distances
- Point-to-point connections
- Stationary or linearly movable applications
- Decoupling due to directivity in the case of multiple point-to-point paths

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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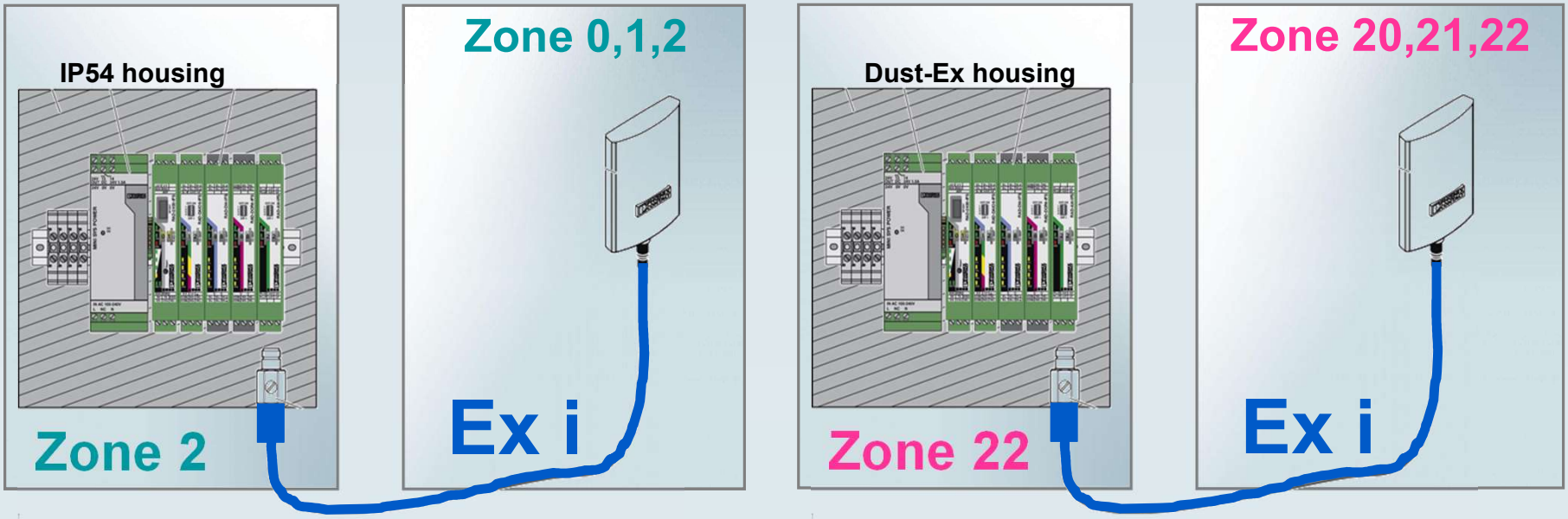
Antenna installation in Ex areas

new



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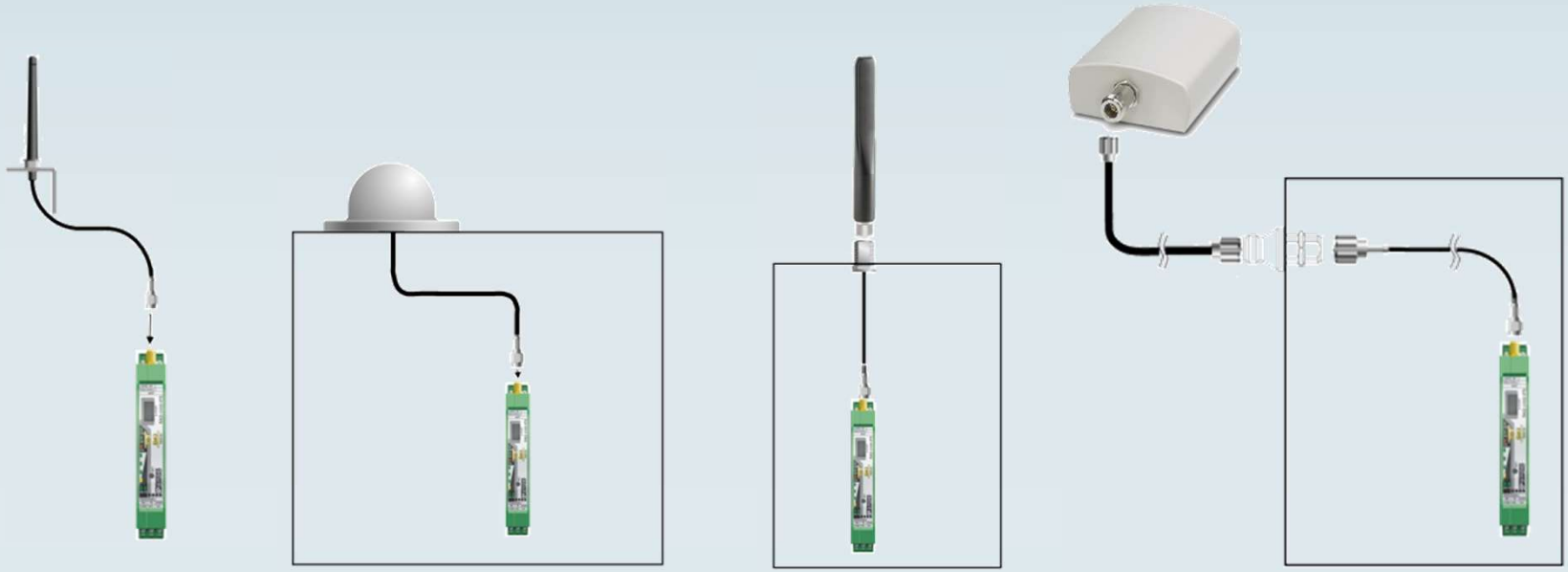
Installation examples



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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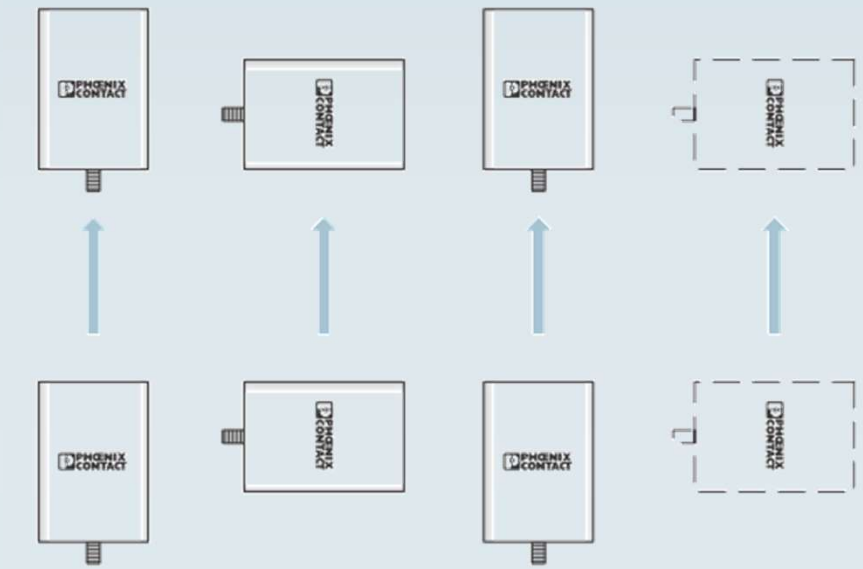
Decoupling of wireless links



- 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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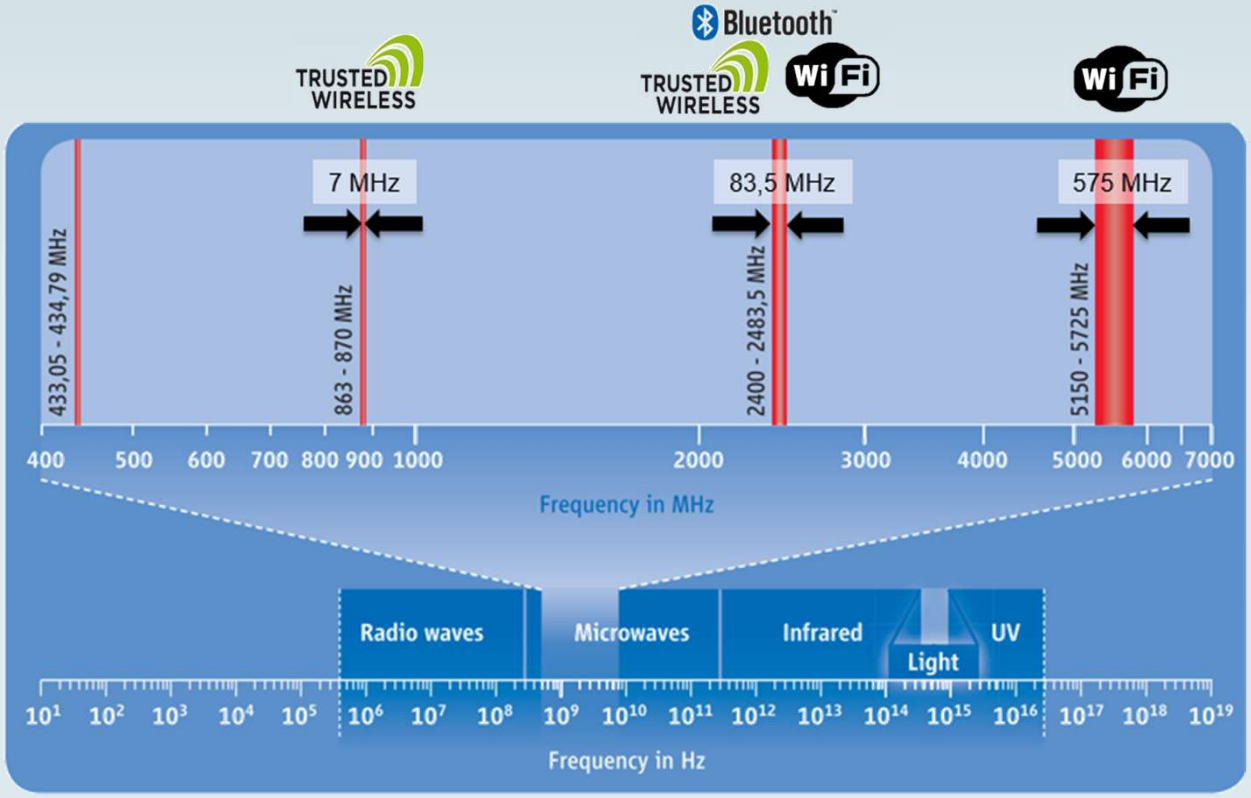
License free frequency bands



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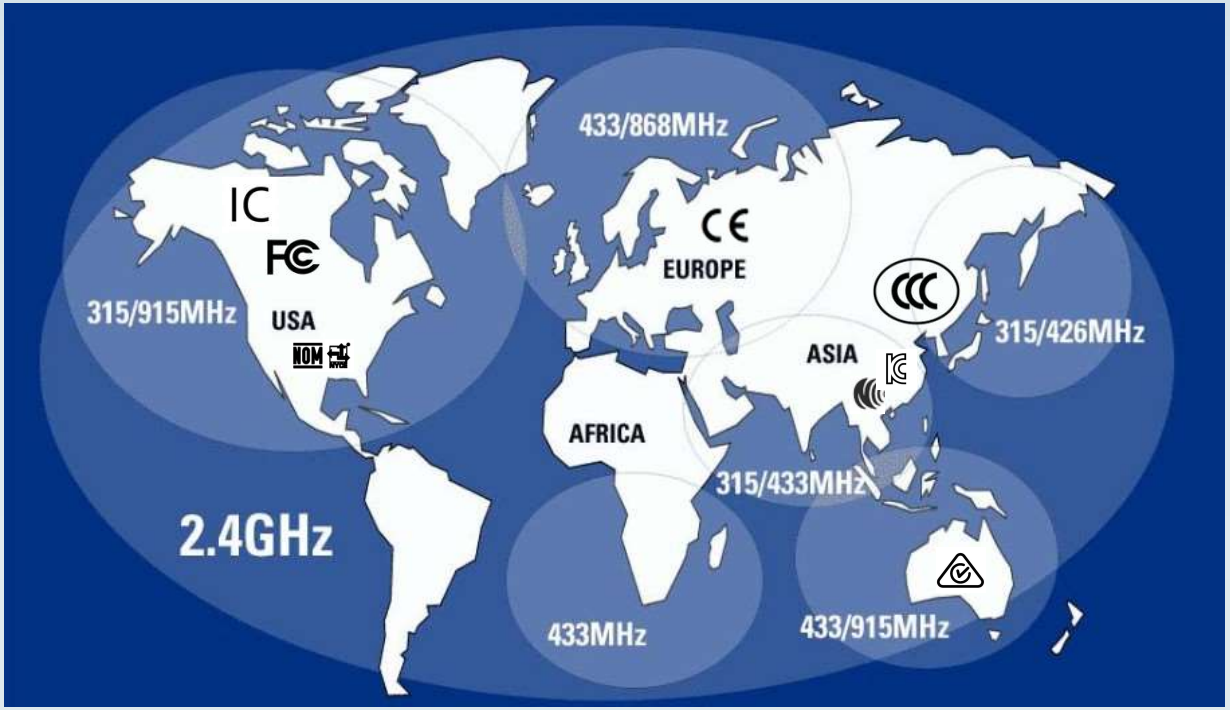
Country approval / notification



Germany

- Radio applications can be used on the shared frequencies without application and formal approval
- The user does not incur any costs in the form of fees or contributions due to the frequency usage

International

- Country specific
- Registration with the regulatory authority

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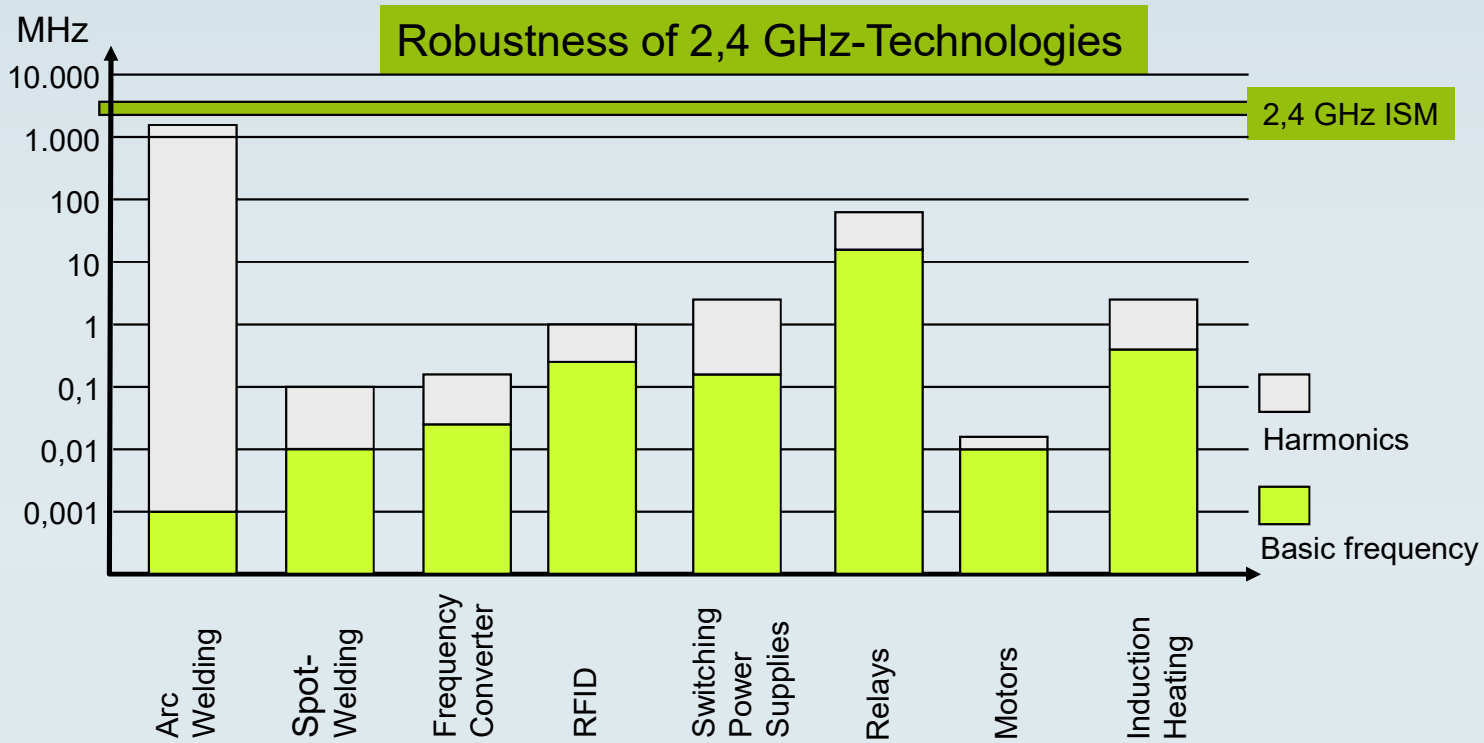
Spectrum of typical industrial applications



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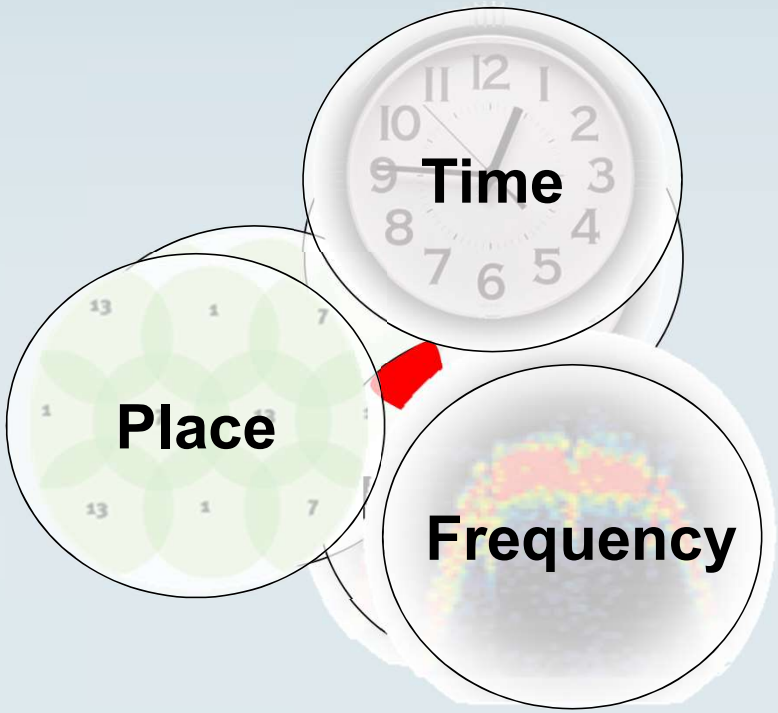
Wireless Technologies

	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

Coexistence – Interference



Influencing of radio operation only happens if several radio systems are transmitting …

- …at the same place
- …at the same time
- …at the same frequency

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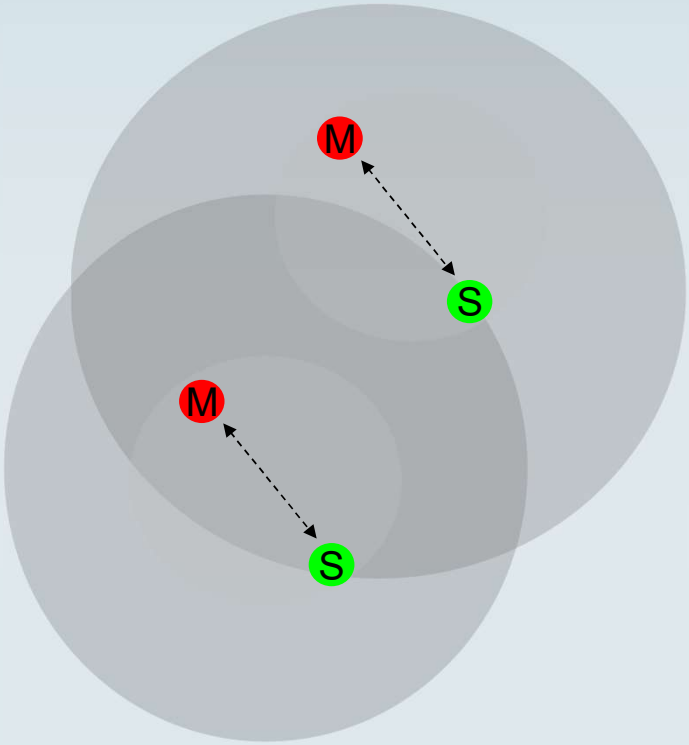
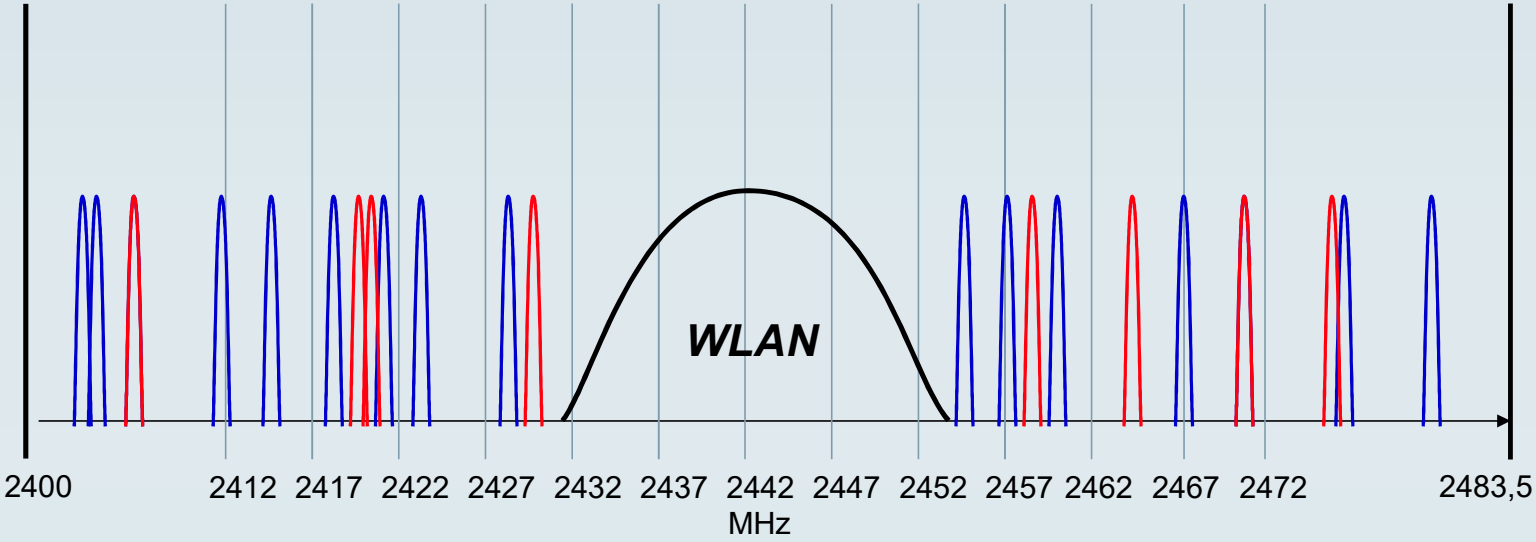
Coexistence – spatial decoupling



- Transmission power determined spatial extent
- Reduction of transmission power enables use of the same frequency bands
- Optimization of the spatial extent by directional antennas

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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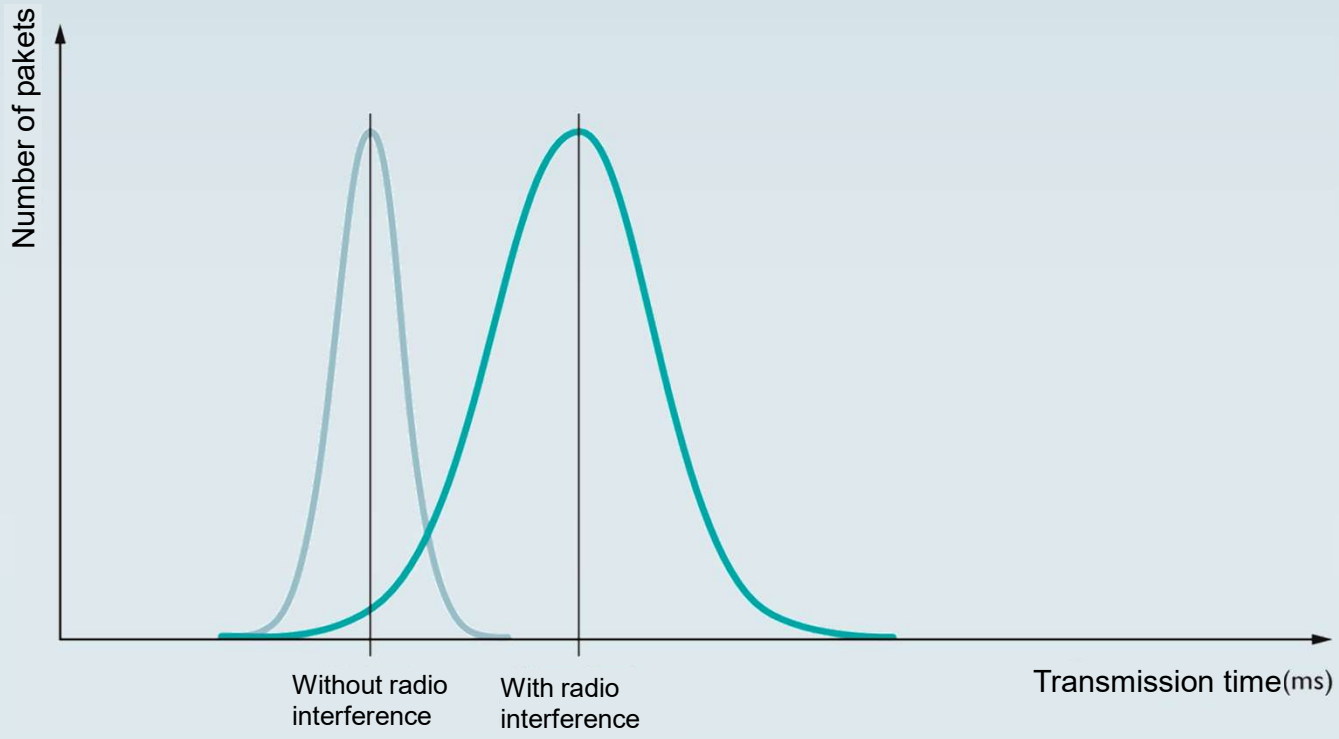
Impact of radio interference



Reduce earthworks, thanks to wireless technology!

- No complicated cable laying
- Bridging problematic distances and areas
- More flexibility
- Mobility and freedom of movement of participants
- Disturbance-free communication, no electromagnetic influences

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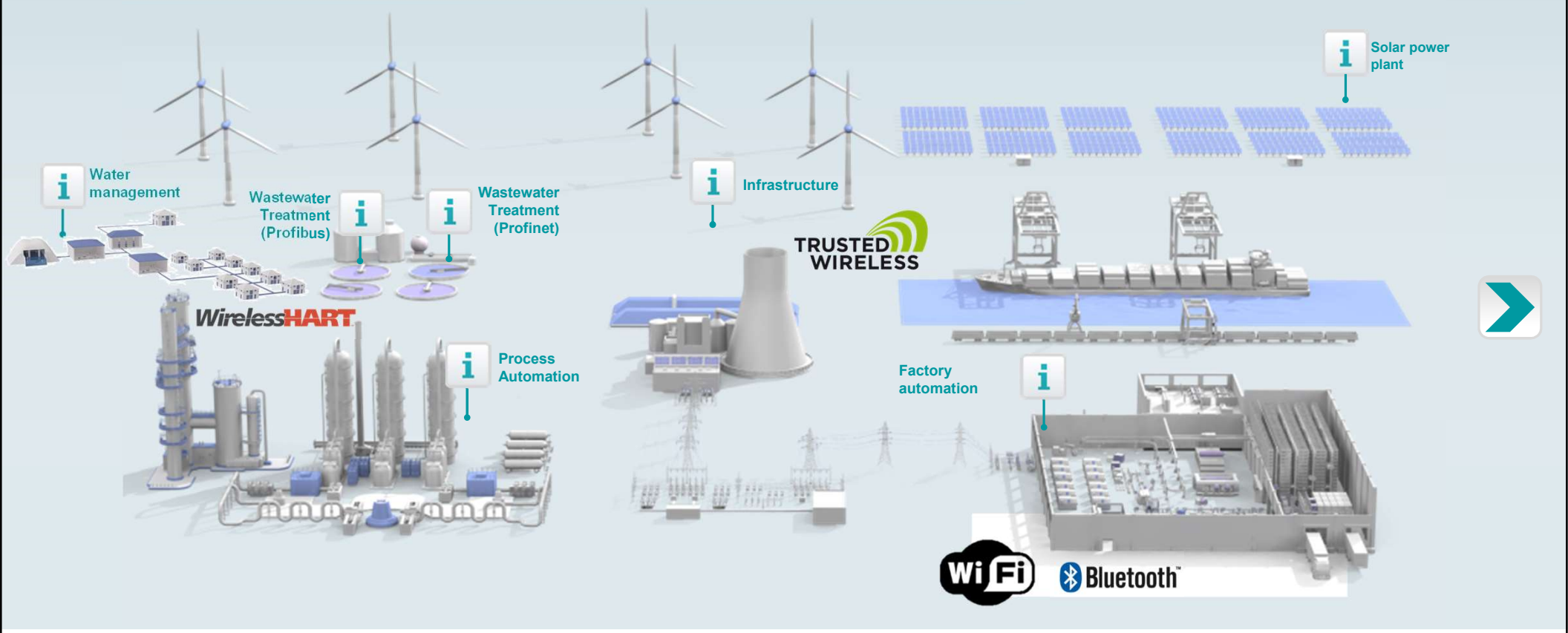
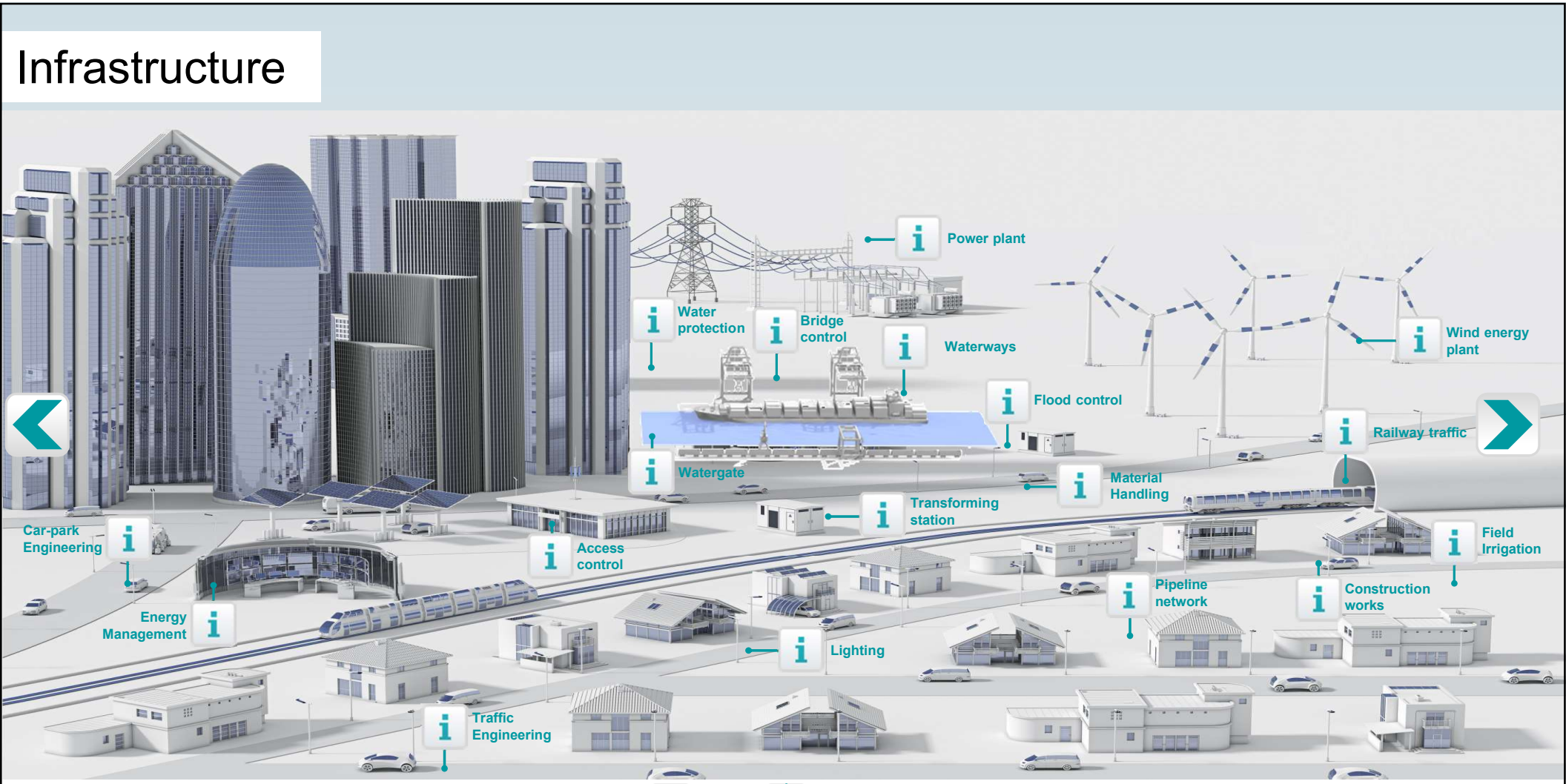
Matching products for every application



INSPIRING INNOVATIONS

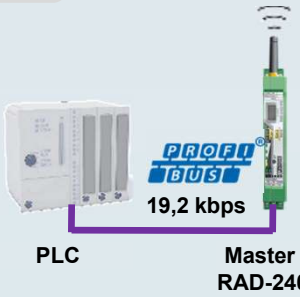
Infrastructure



PHOENIX CONTACT
INSPIRING INNOVATIONS

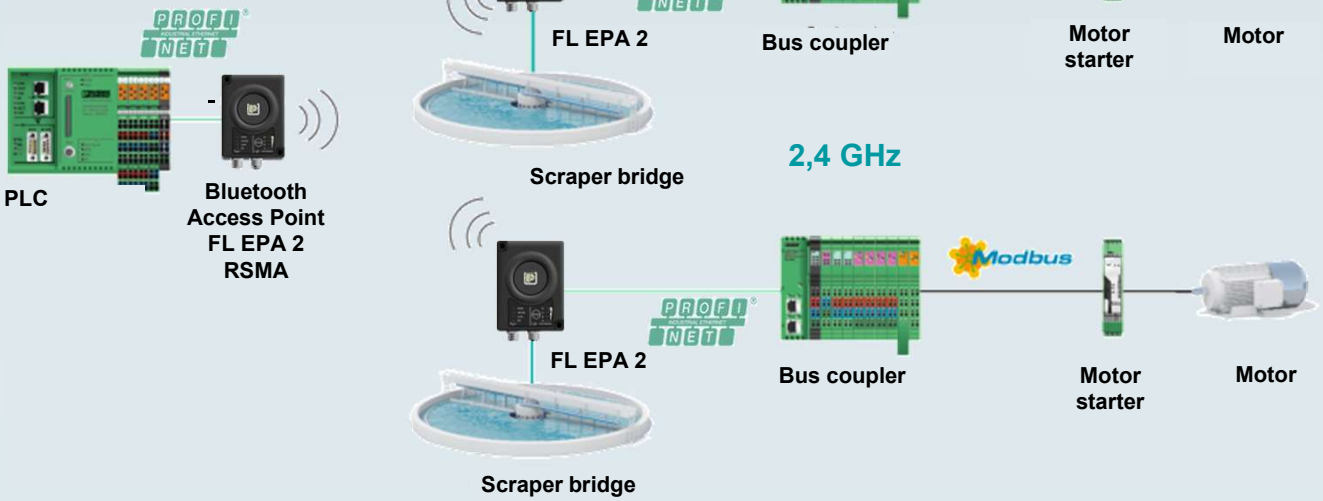
Wastewater Treatment (PROFIBUS)

2,4 GHz



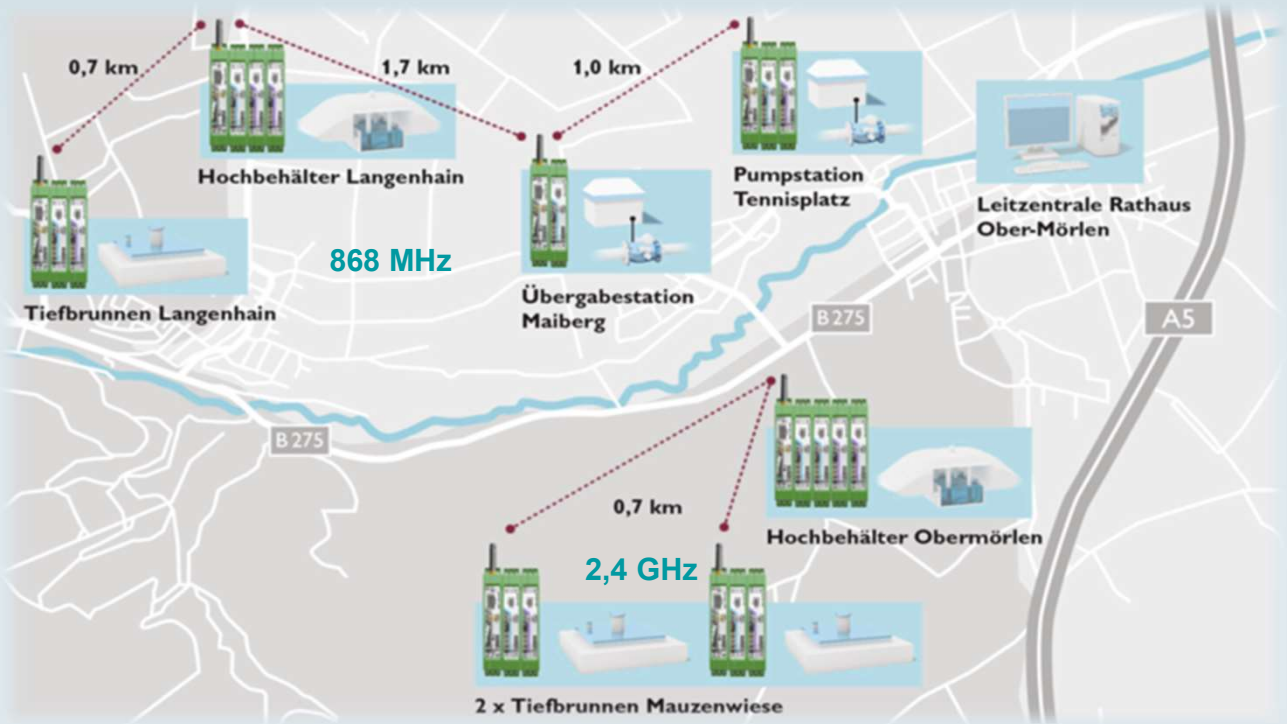
- Sludge level monitoring
- Data transmission of operating data and alert signals via profibus protocol
- Replacement of expensive sliding contacts which need to be replaced several times a year (fault rate > 30 %)
- Star network
- Up to 14 slaves
- Datarate up to 93,75 kbps

Wastewater Treatment (PROFINET)



- Sludge level monitoring
- Data transmission of operating data and alert signals via Profinet protocol
- Star network
- Up to 7 slaves

Water Management



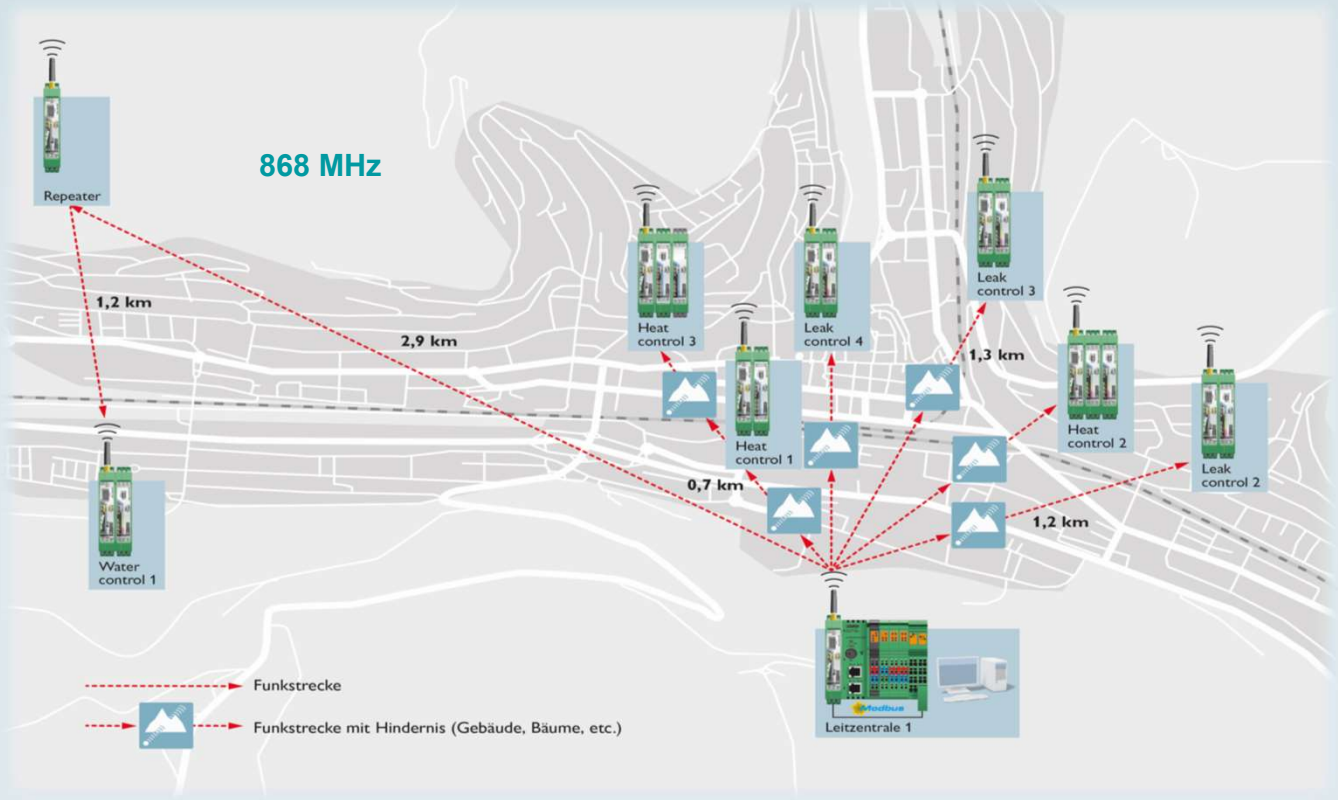
Application examples

- 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



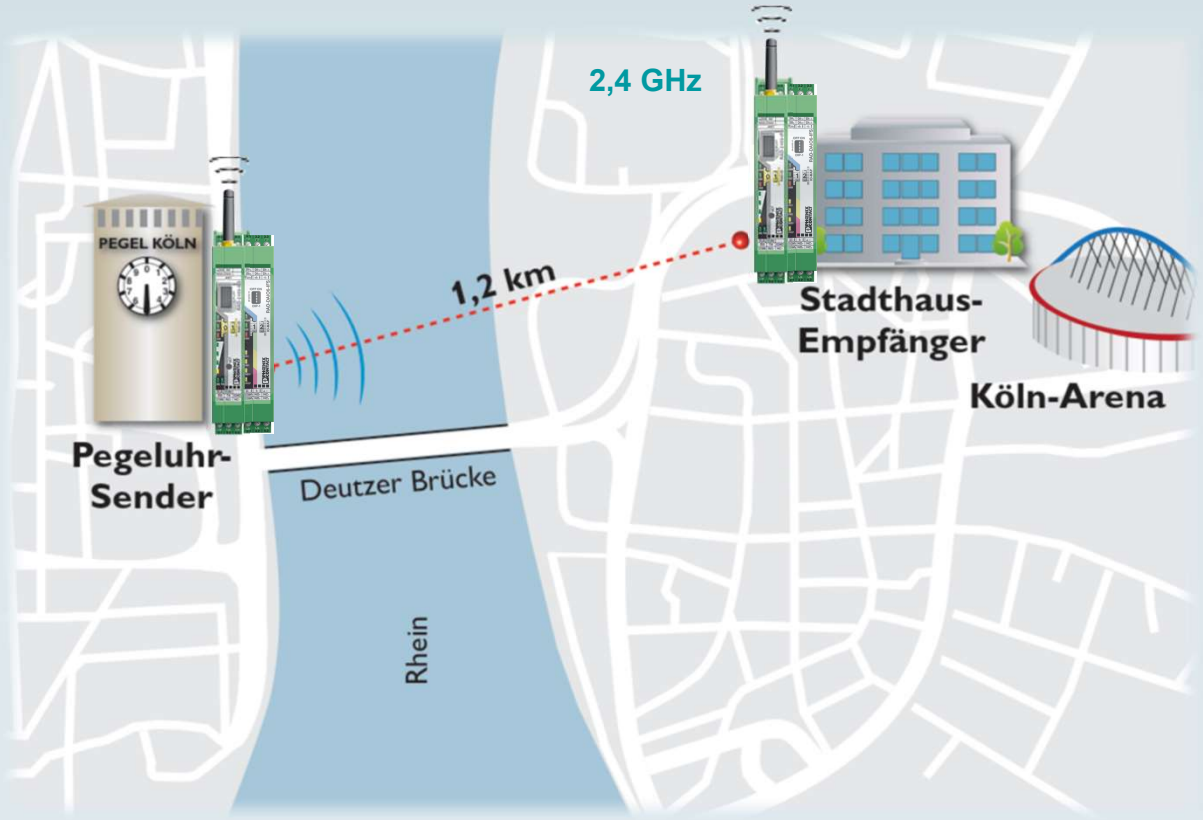
Application examples

- 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

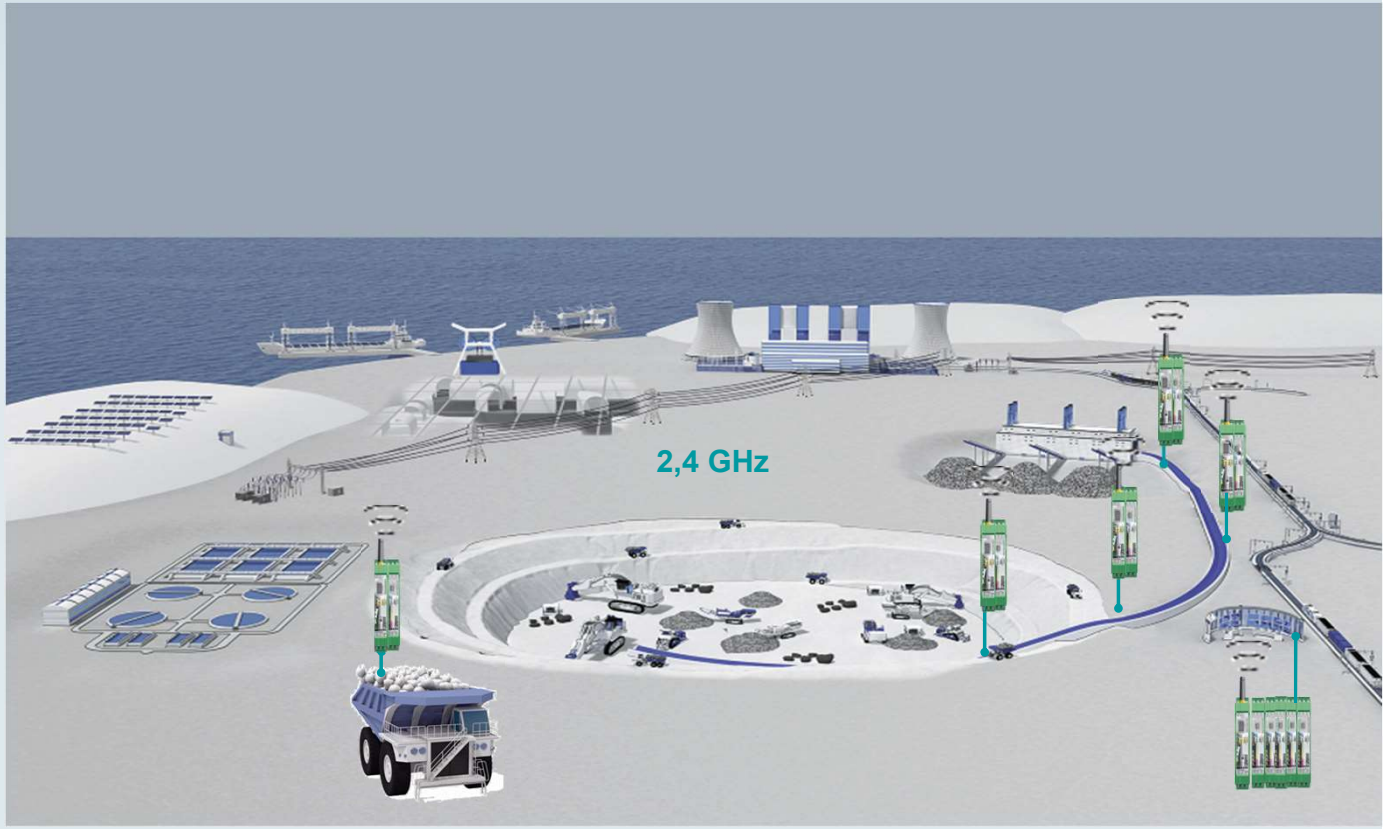
Application examples

- 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



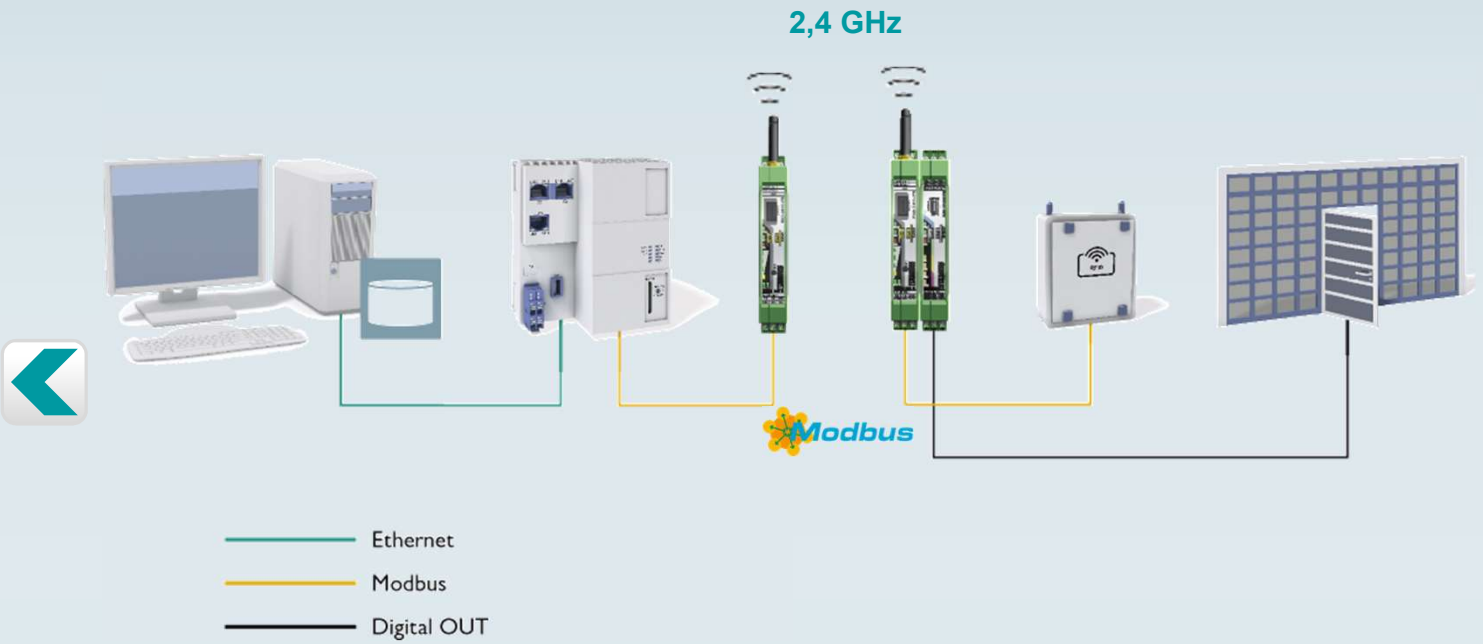
Application examples

- 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

Access control



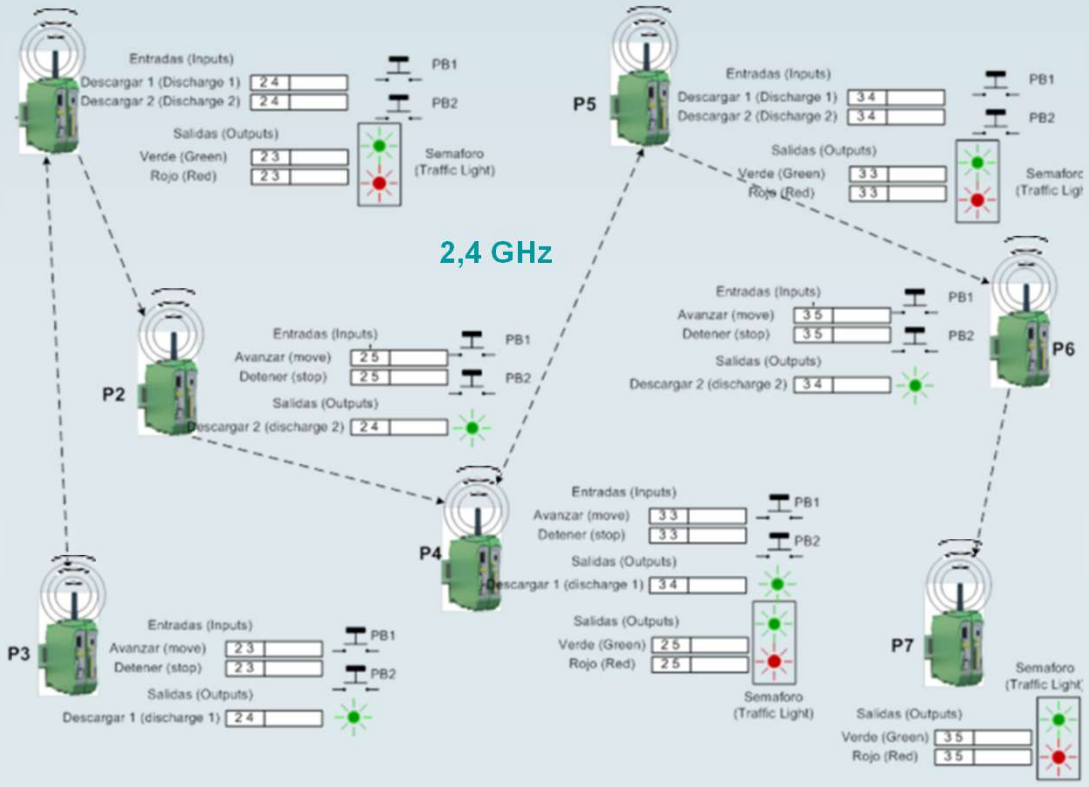
Application examples

- 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



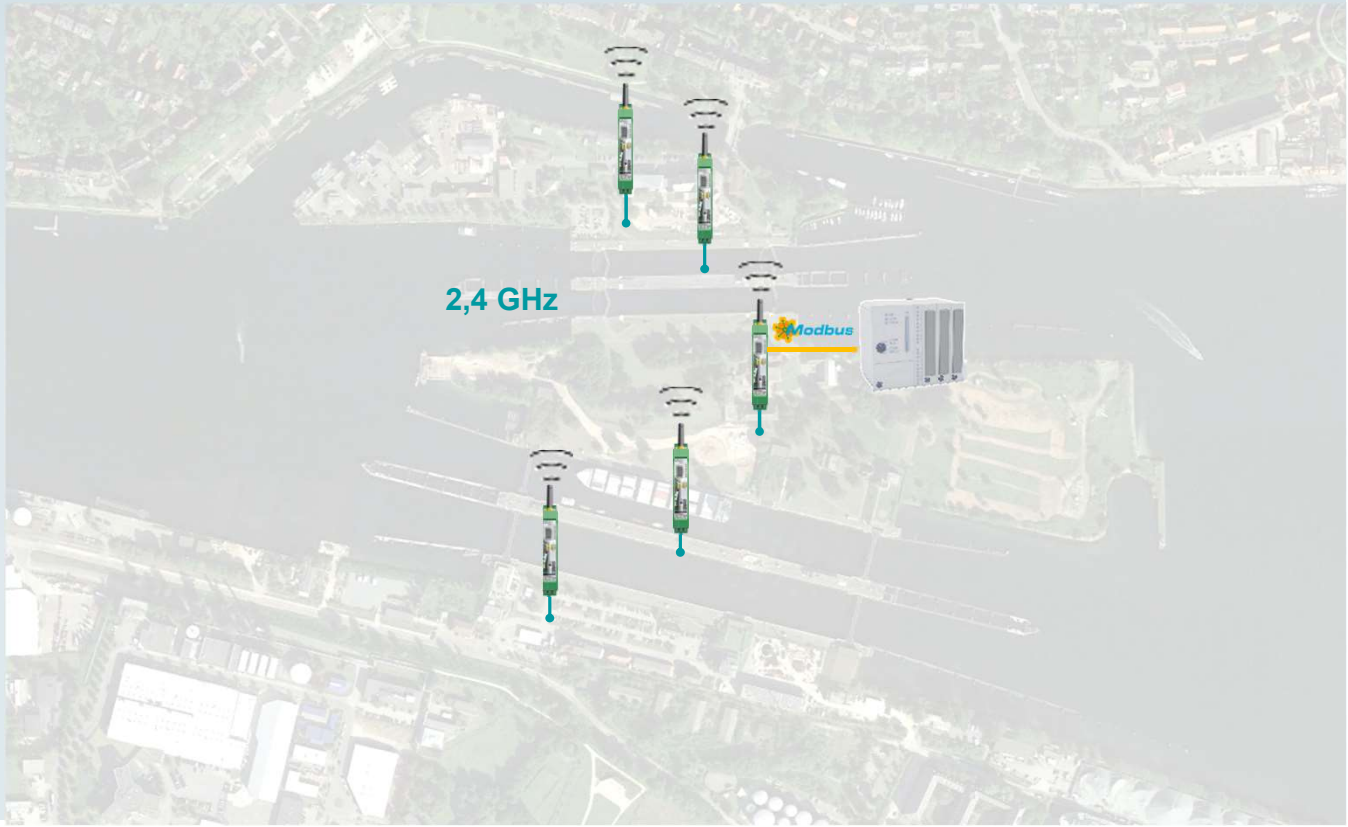
Application examples

- 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



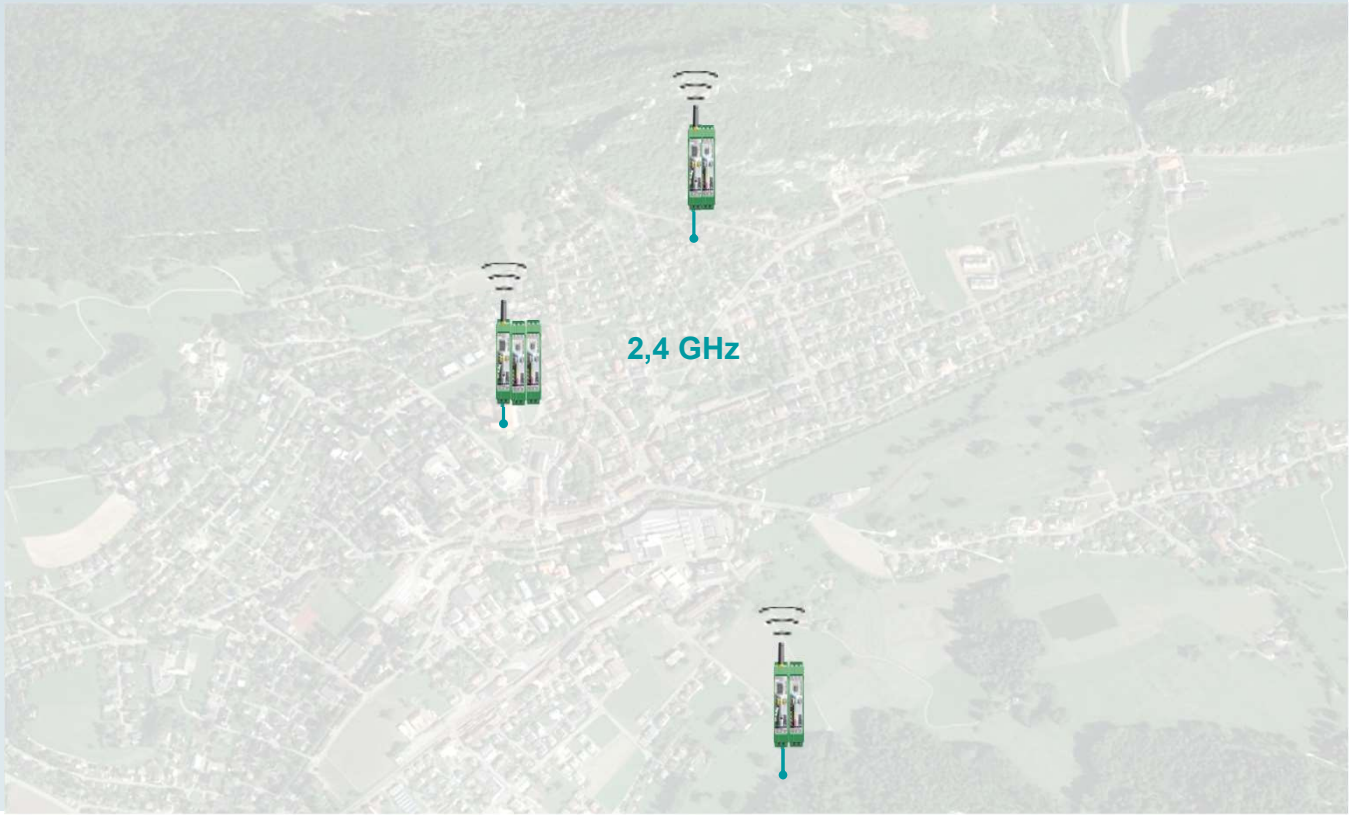
Application examples

- 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

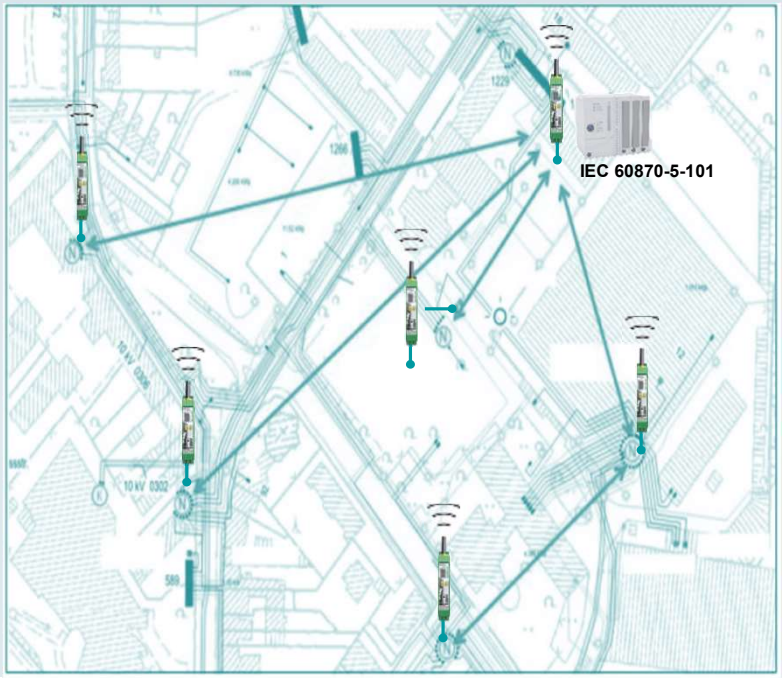
- Central control of the castle lighting from a publicly accessible center
- The first castle is located about 1.5 km south of the headquarters on a mountain
- The second castle is located about 2.5 km north of the headquarters on a mountain

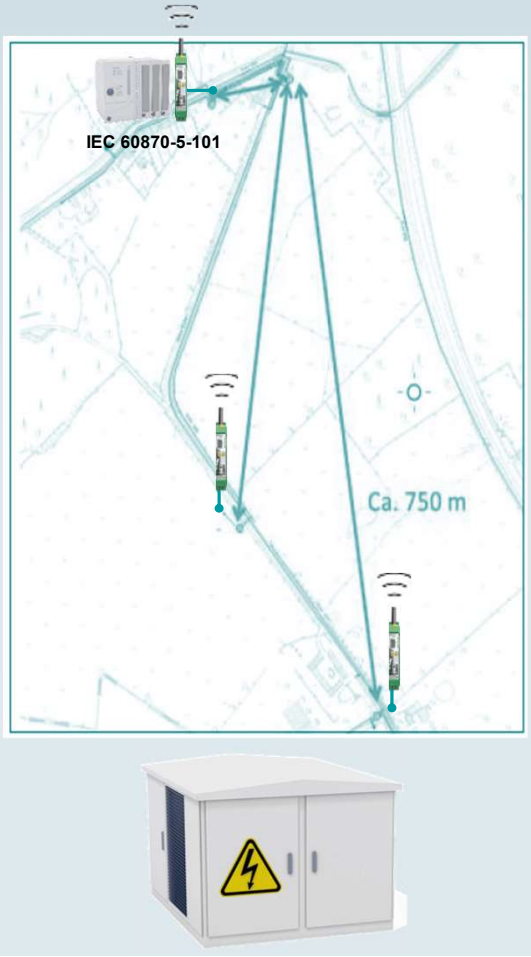
Advantages of wireless systems

- ☑ 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





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

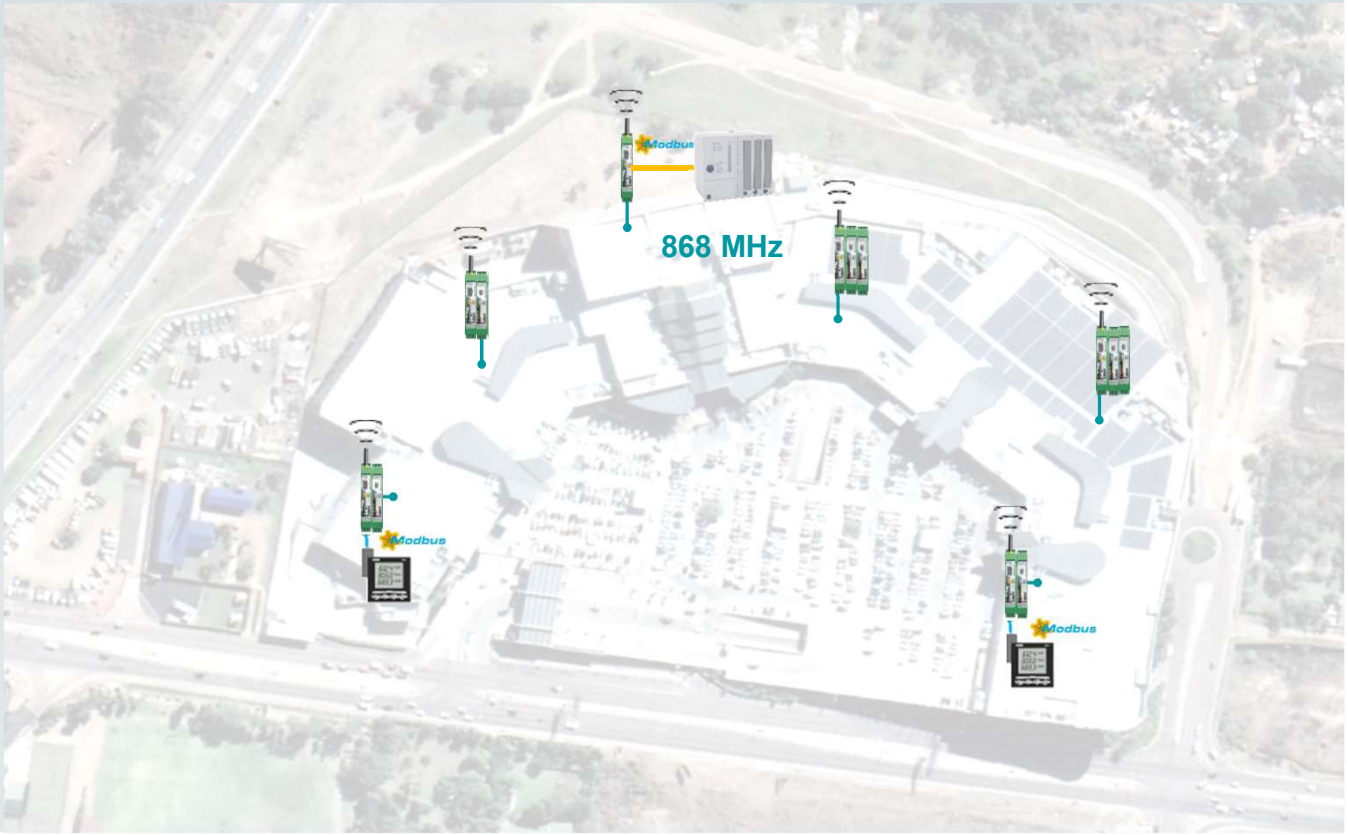
Application examples

- 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



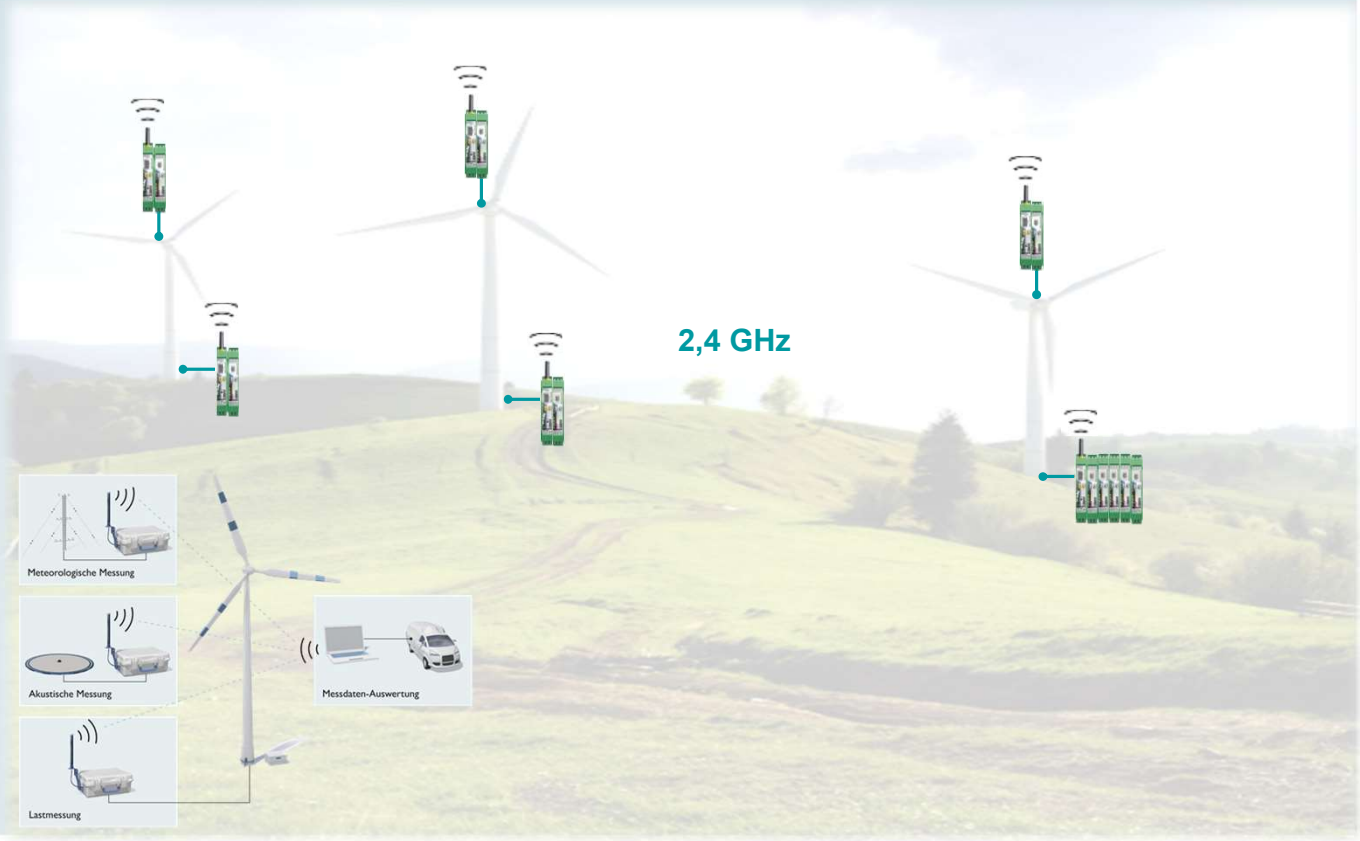
Application examples

- 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
- ☑ Flexible customization and extension
- ☑ Parallel transmission of I/O signals and Modbus data

Wind energy plant



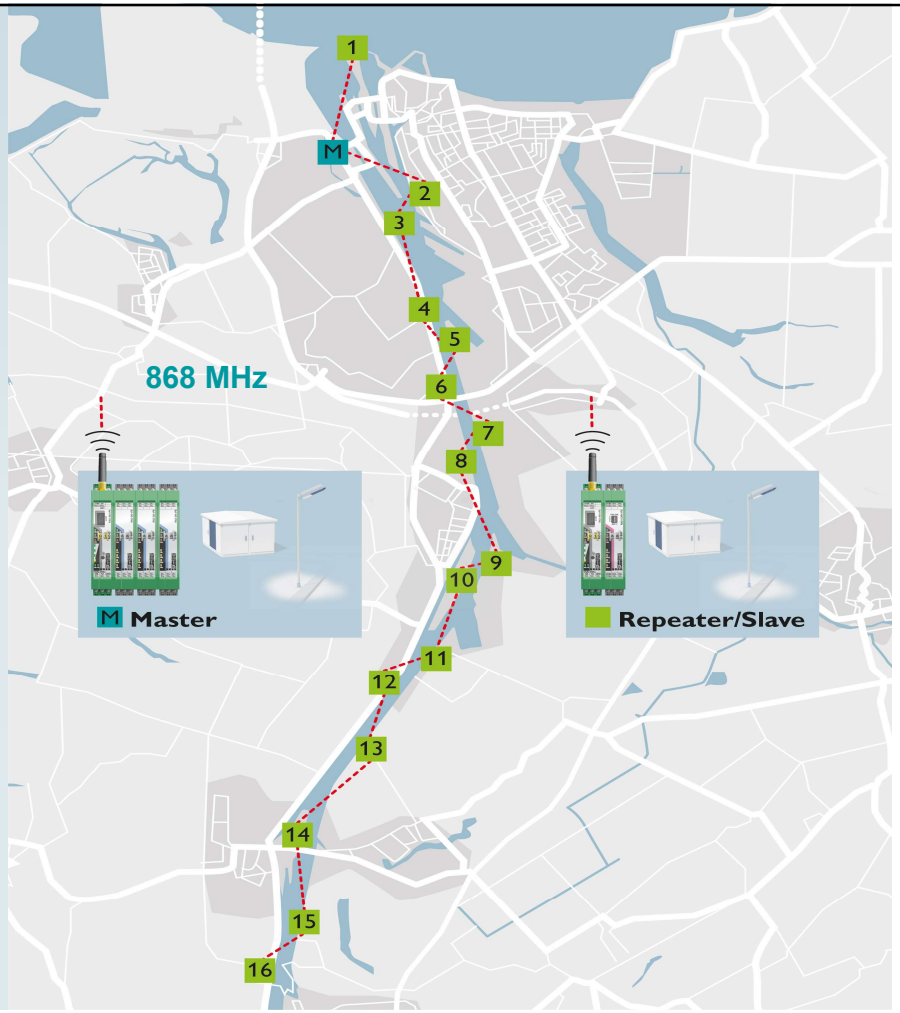
Application examples

- 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



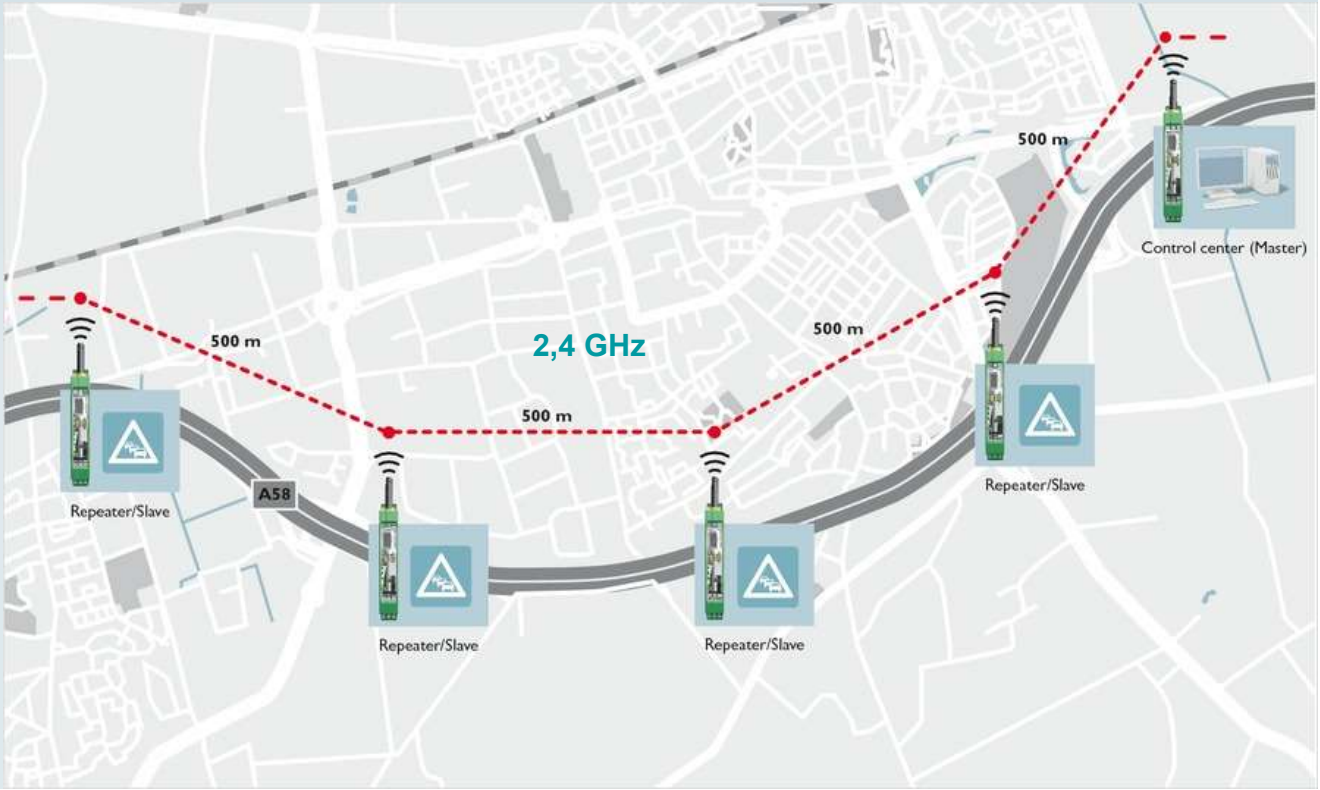
Application examples

- 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



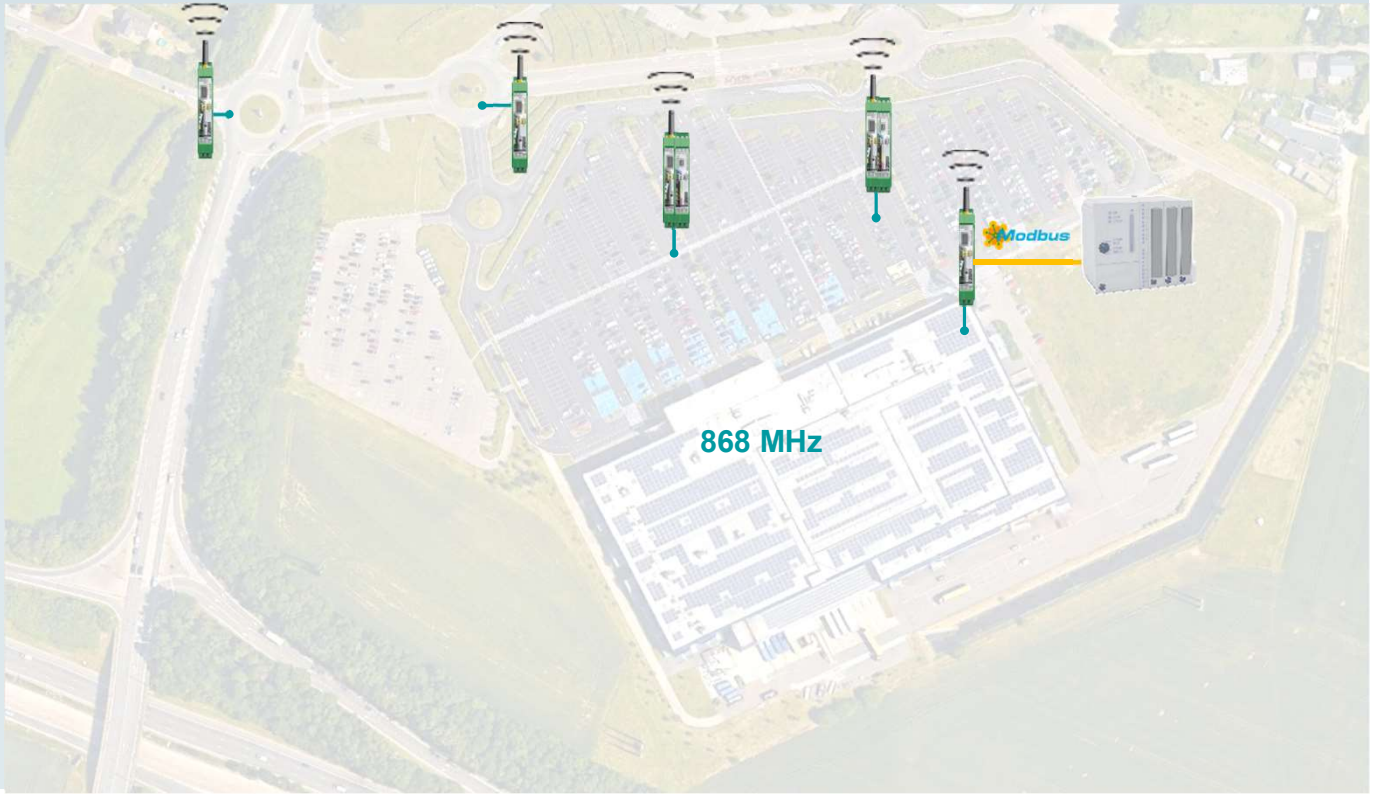
Application examples

- 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

Parking guidance system



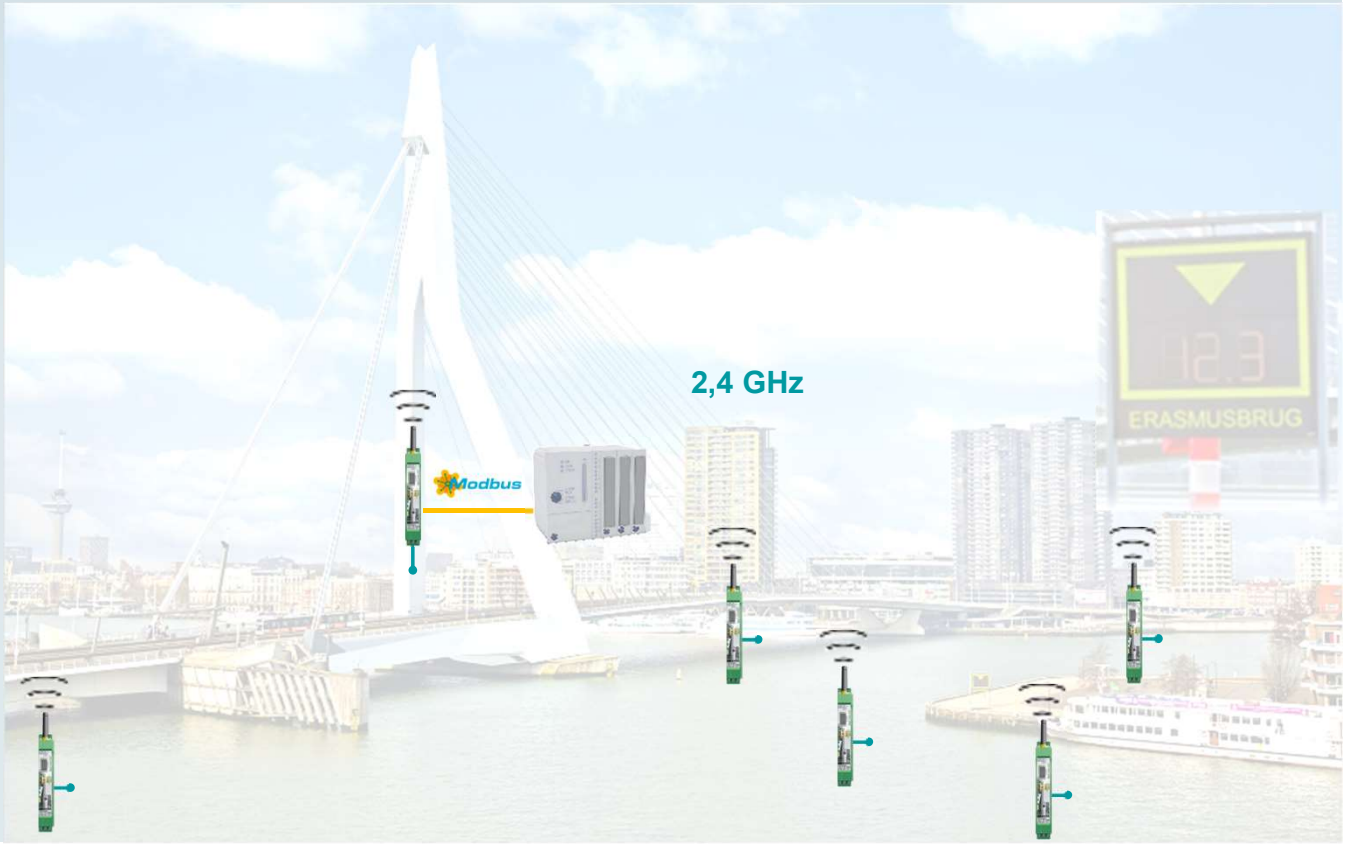
Application examples

- 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



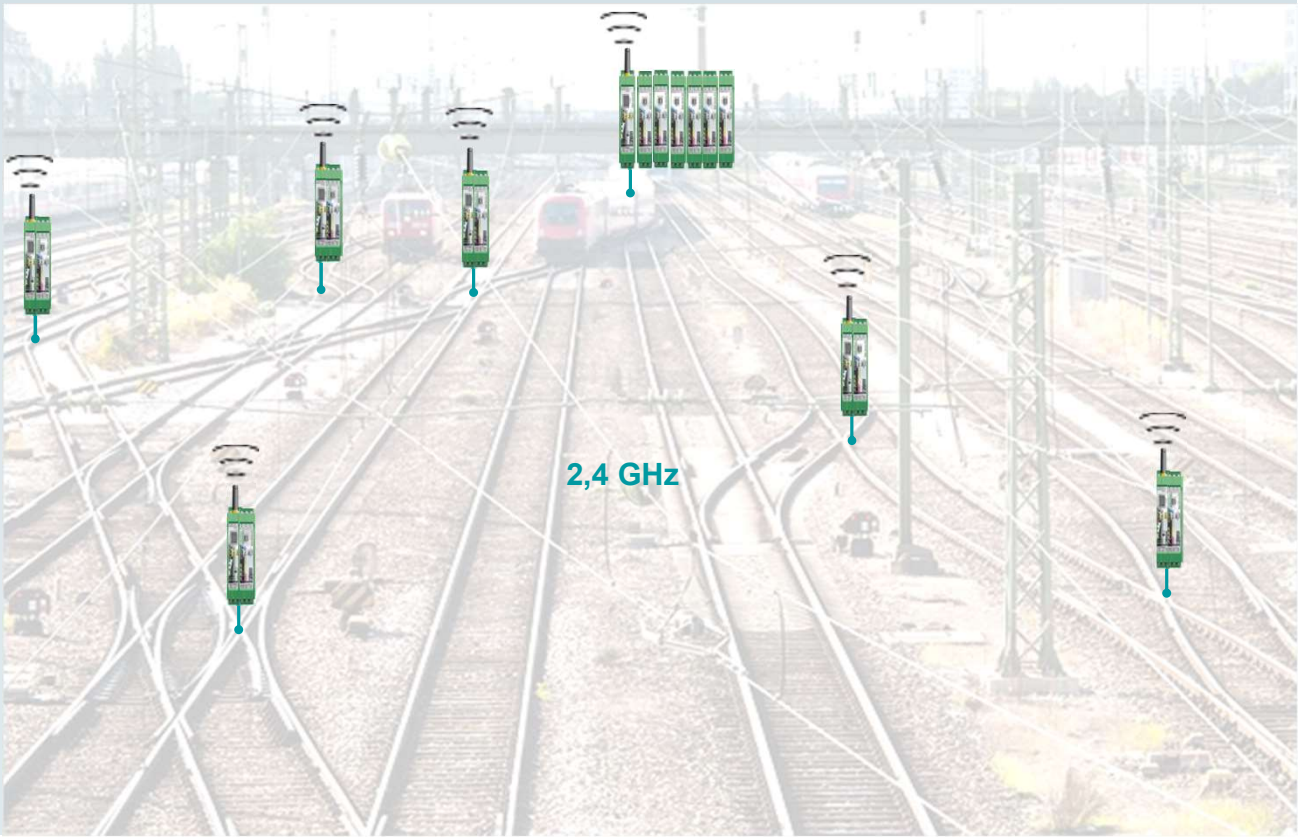
Application examples

- 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



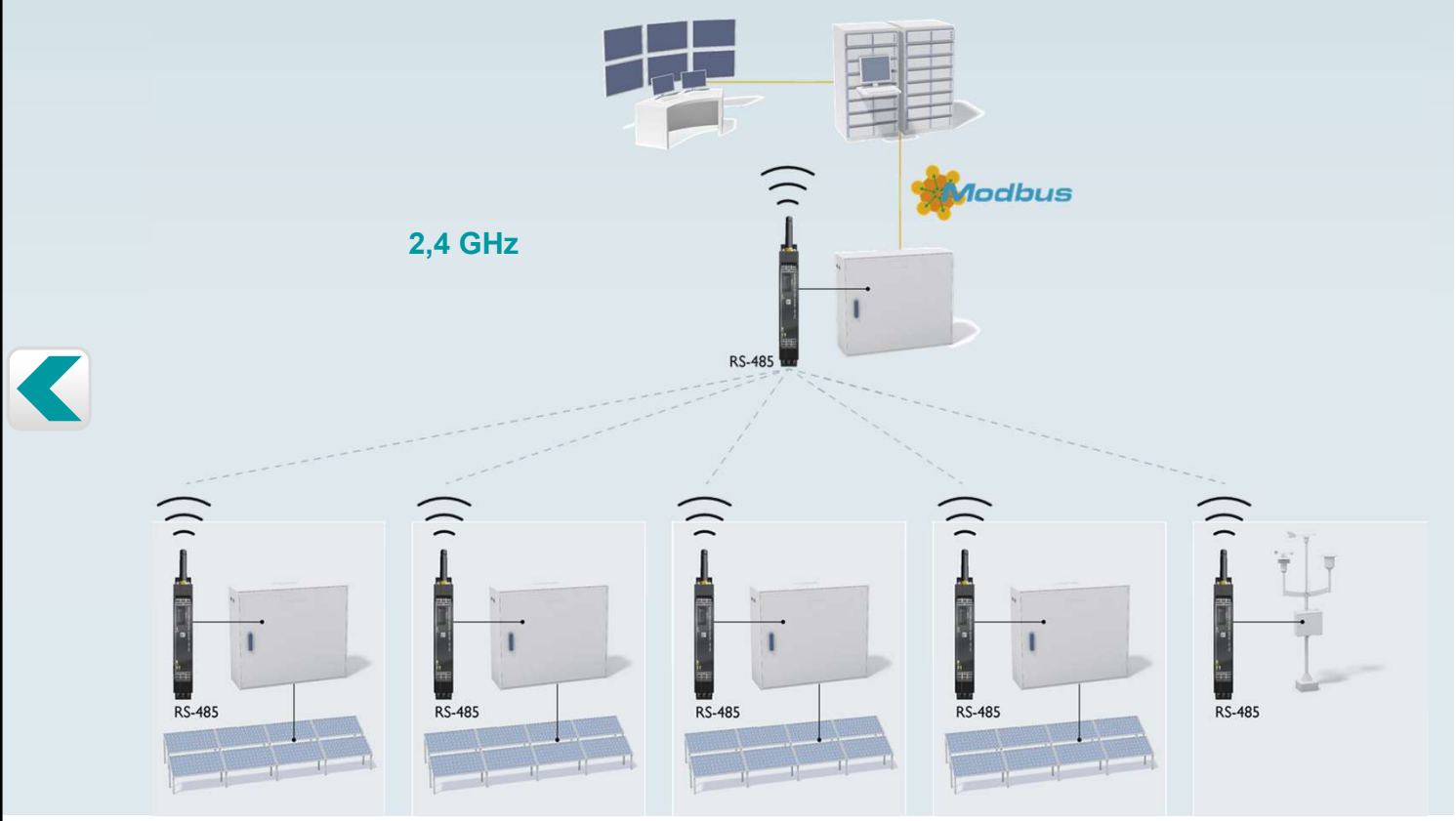
Application examples

- 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



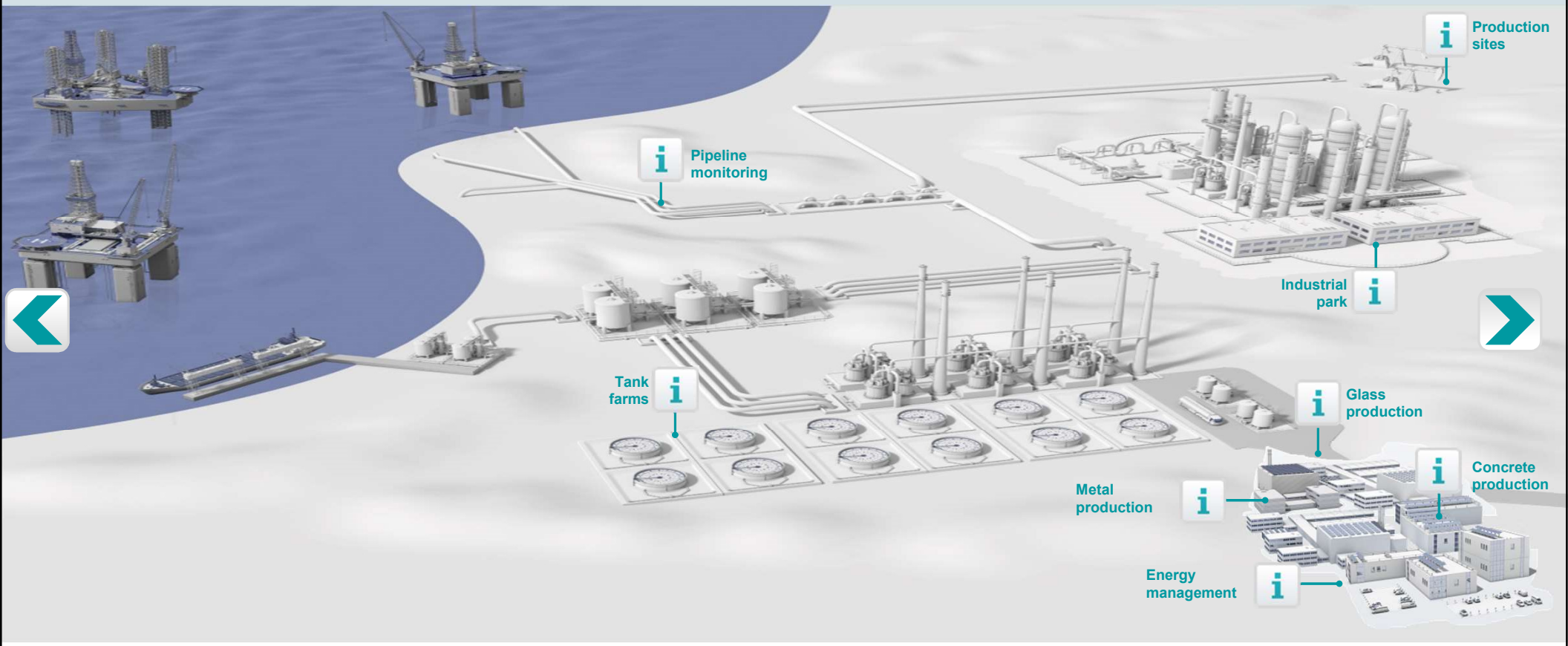
Application examples

- 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

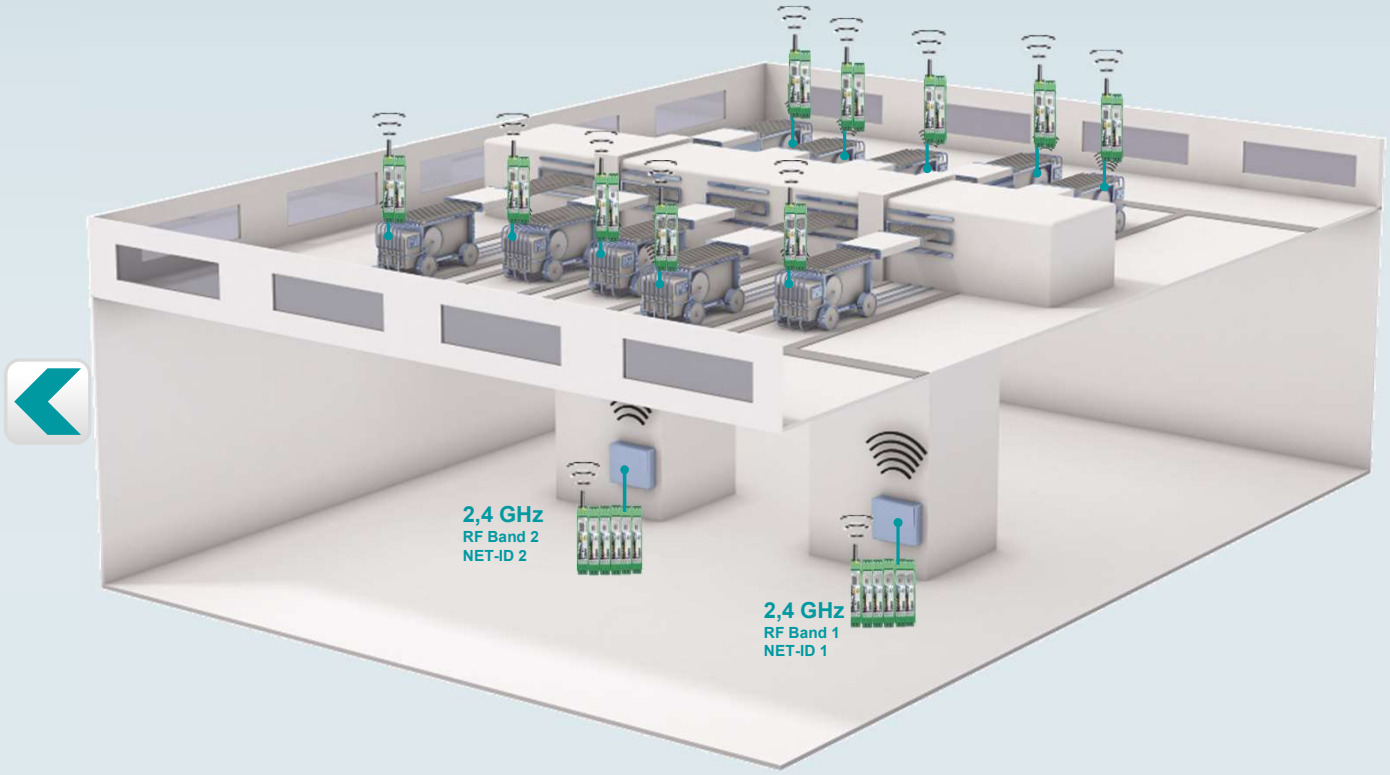
- ☑ Easy integration of existing and new signals into the control system
- ☑ Immune to electromagnetic interference
- ☑ Flexible customization and extension

Process automation



PHOENIX CONTACT
INSPIRING INNOVATIONS

Glass production



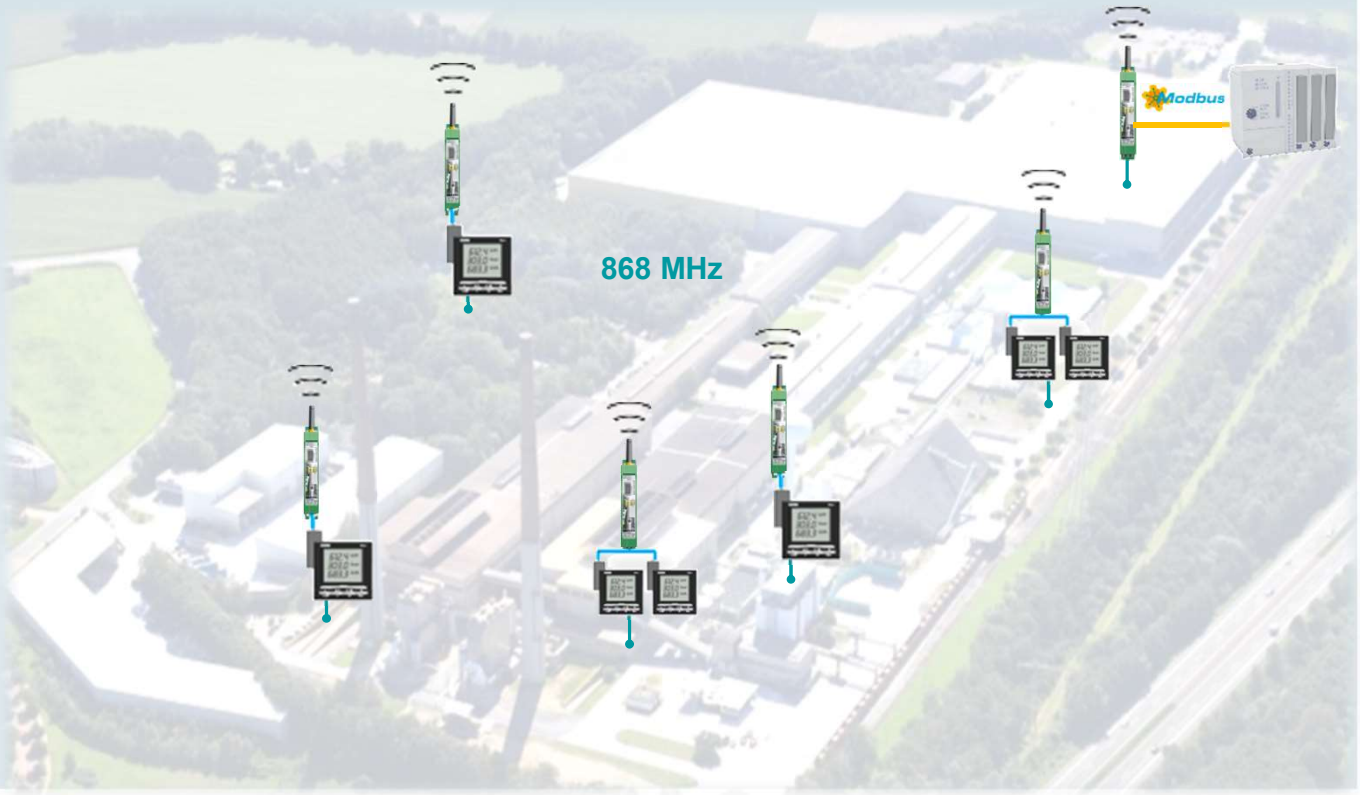
Application examples

- 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



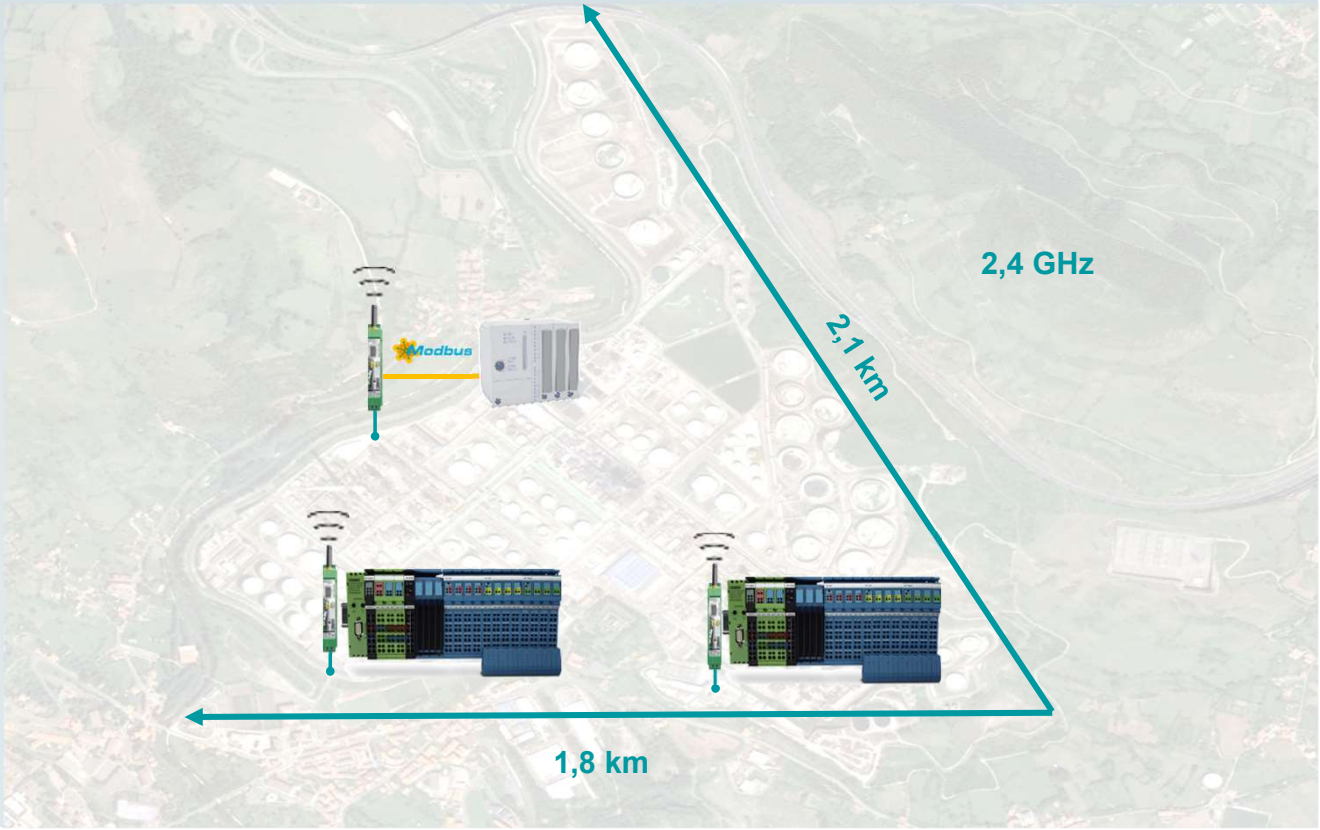
Application examples

- 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



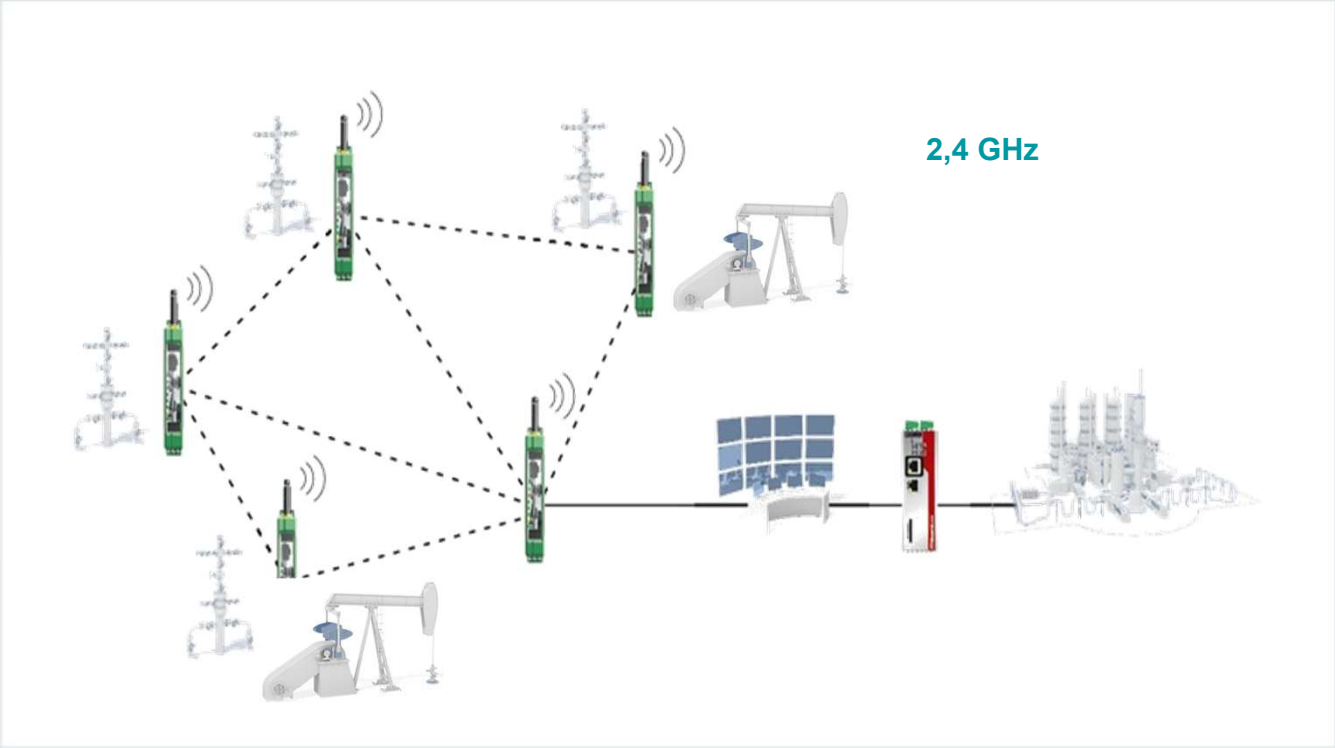
Application examples

- 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

Pipeline monitoring

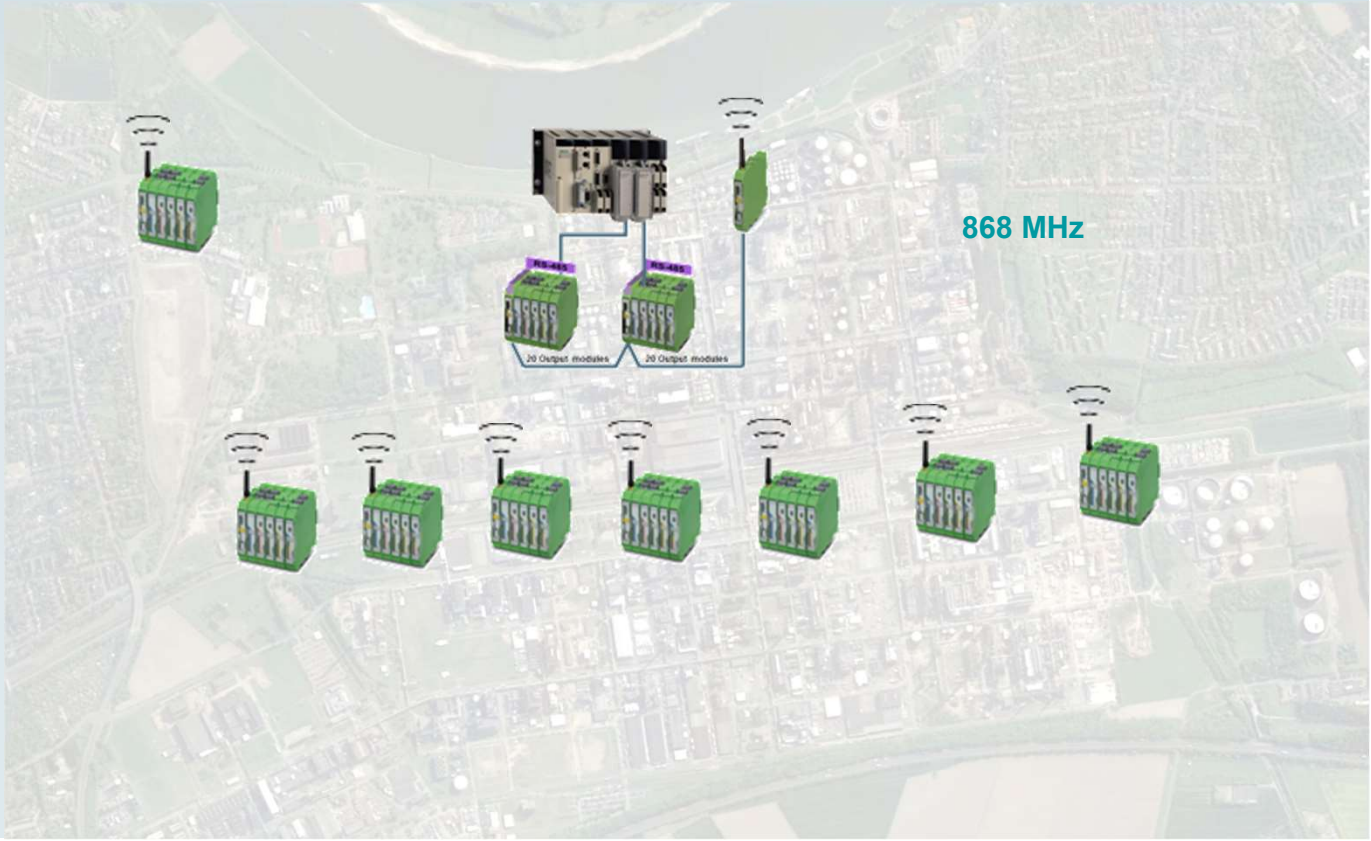
Application examples

- 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



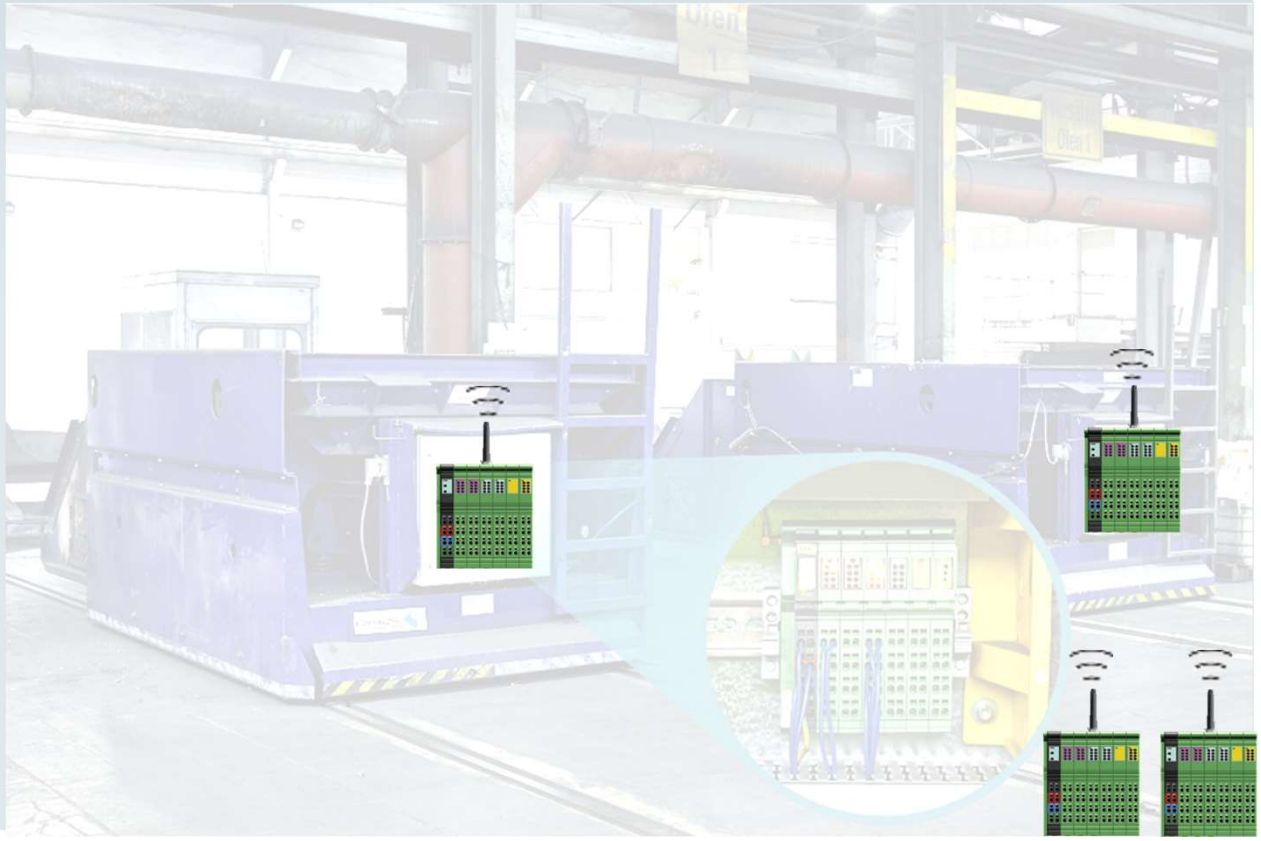
Application examples

- 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

Metal production



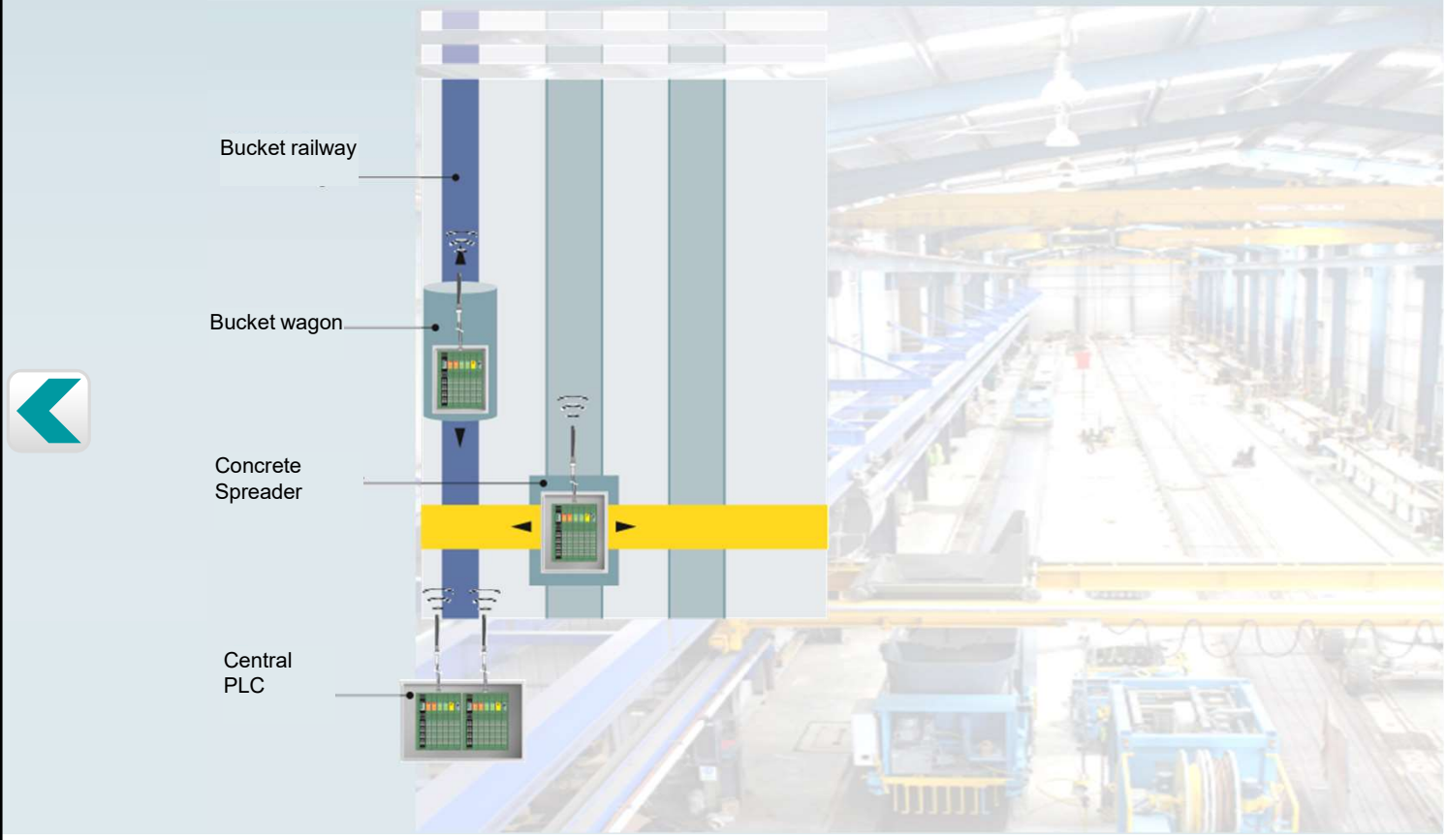
Application examples

- The raw material is transported via a mobile charging machine to the smelting furnaces
- Signal transmission (position, fault, start / stop) between control and charging machine
- The cable drums, turns out to be expensive, prone to failure and maintenance

Advantages of wireless systems

- ☑ Easy setup without software (Plug n Play)
- ☑ In this harsh environment, the data communication works perfect since many years

Concrete production



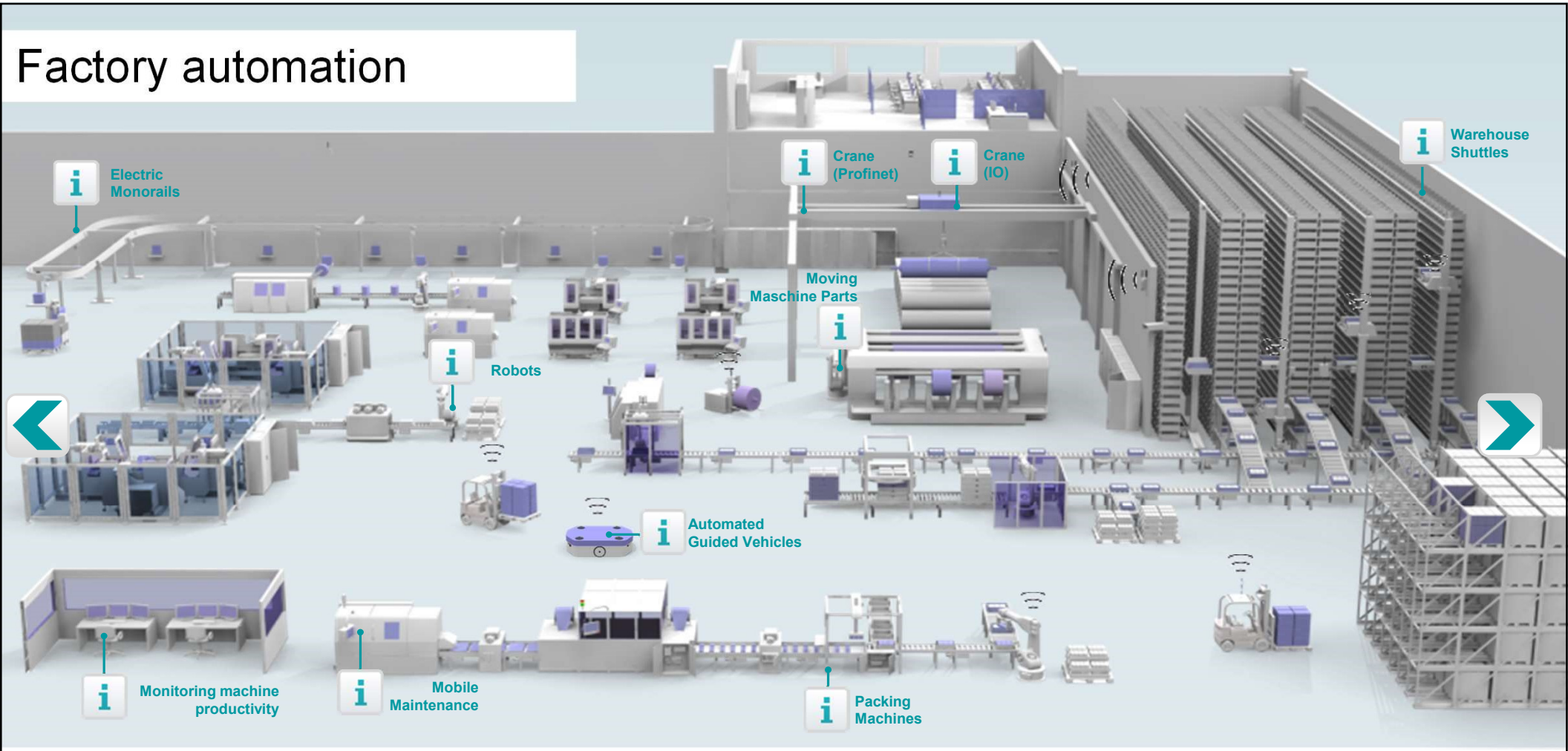
Application examples

- Signal transmission (position, container weight, interlocks, fault messages) between controller and bucket wagon / concrete distributor
- Maintenance-intensive and fault-prone cables

Advantages of wireless systems

- ☑ Easy setup without software (Plug n Play)
- ☑ Replacement of costly special cables drums
- ☑ Reduction of downtime
- ☑ Reduzierung von Ausfallzeiten
- ☑ Wear-free and robust communication
- ☑ Trouble-free parallel operation

Factory automation



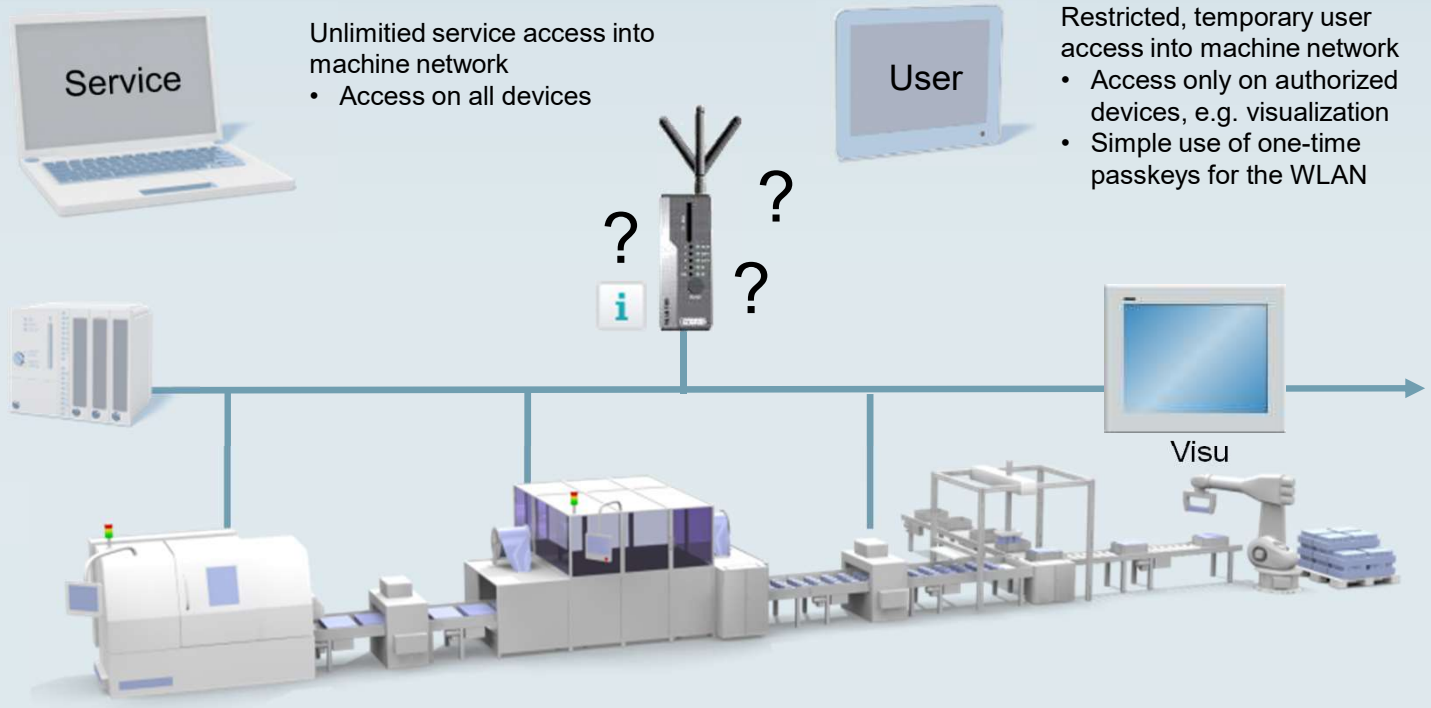
PHOENIX CONTACT
INSPIRING INNOVATIONS

Smart Device integration

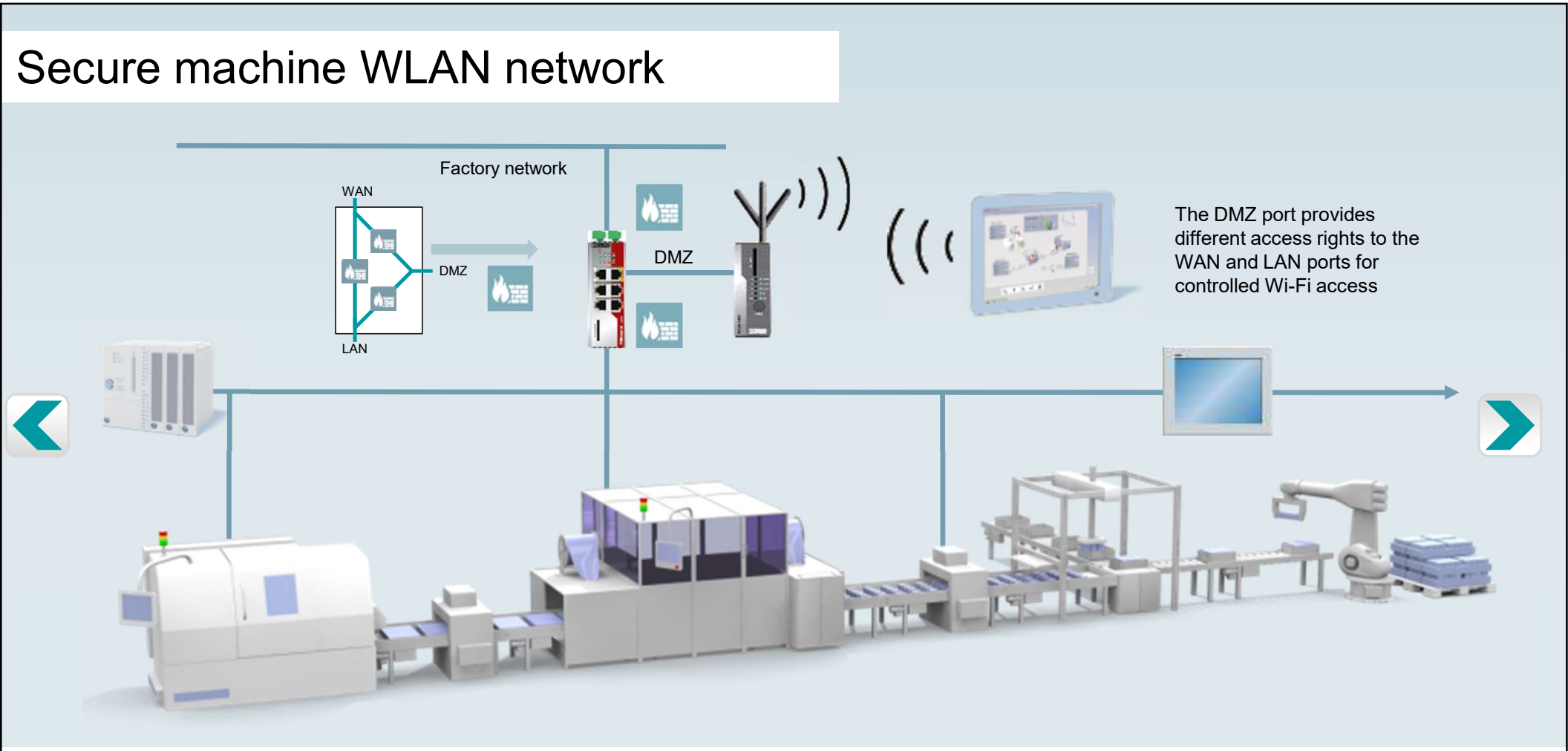
Product overview

PHOENIX CONTACT
INSPIRING INNOVATIONS

Smart Device integration

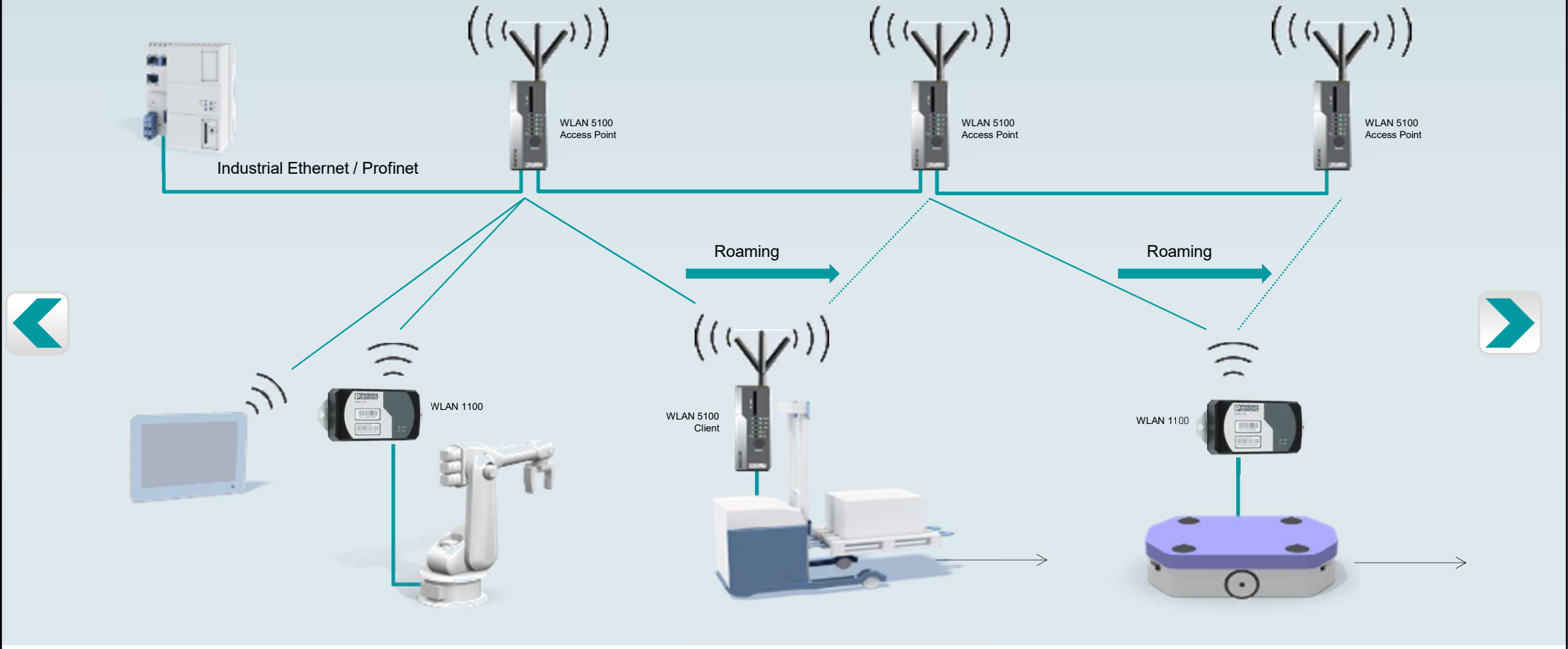


Secure machine WLAN network

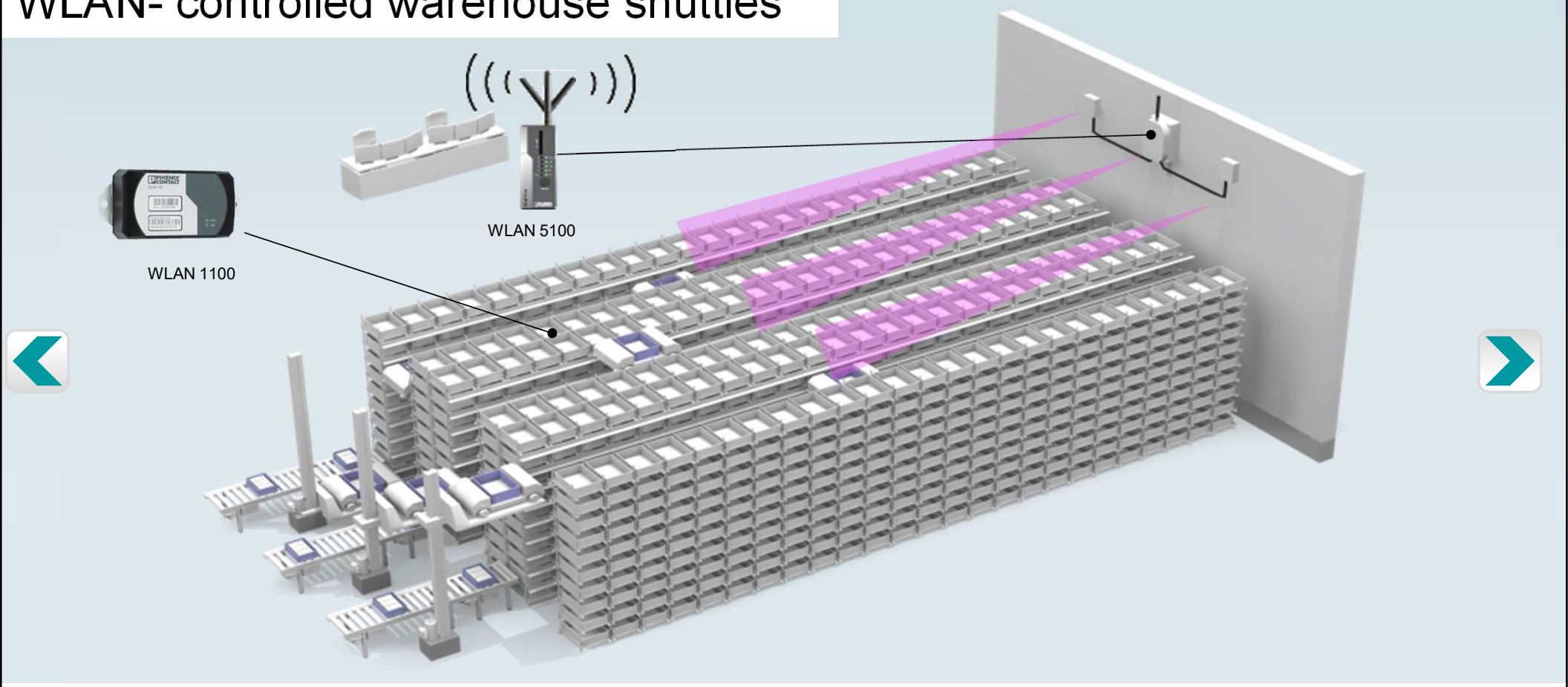


The DMZ port provides different access rights to the WAN and LAN ports for controlled Wi-Fi access

Automated Guided Vehicles



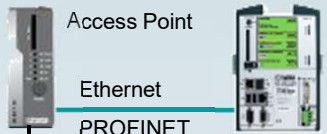
WLAN- controlled warehouse shuttles



Product overview

INSPIRING INNOVATIONS

Electric monorails



Access Point

Ethernet

PROFINET

PLC

Wireless LAN

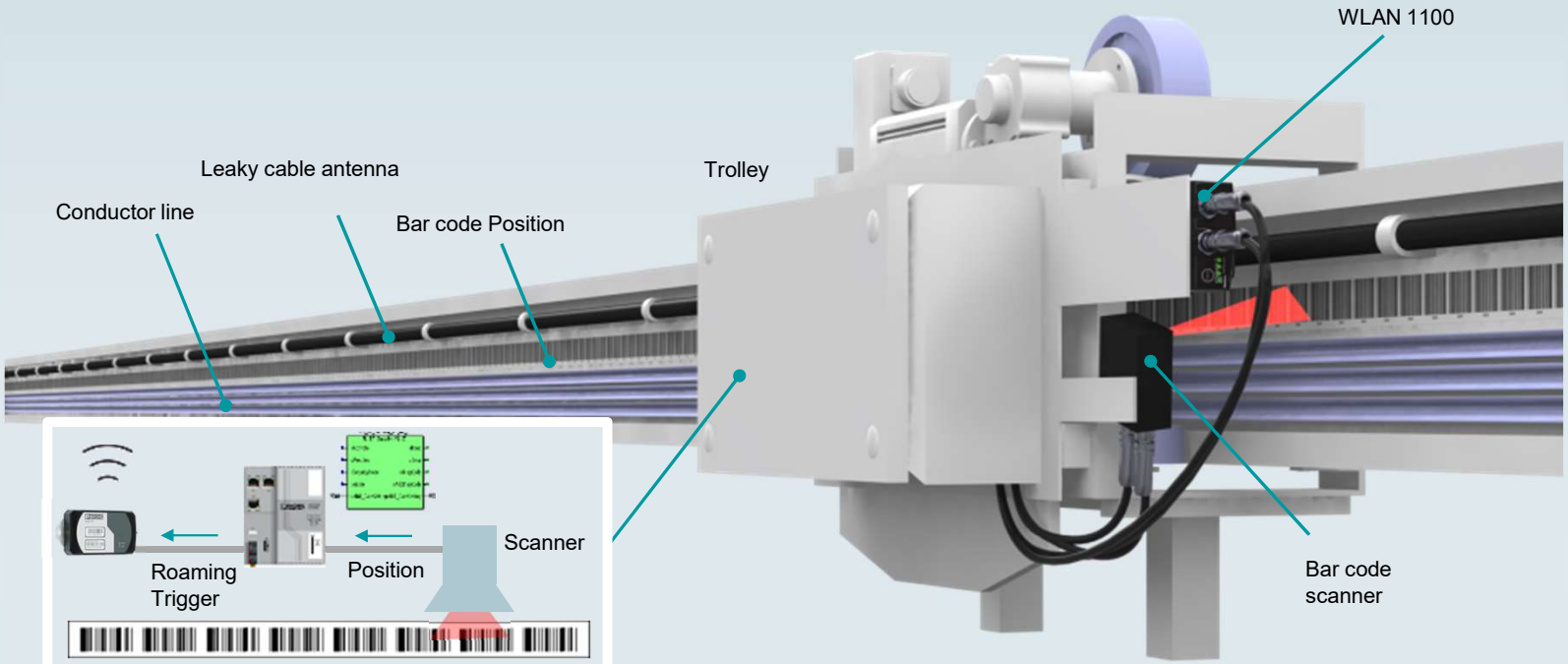
Leaky cable

Controlled Roaming

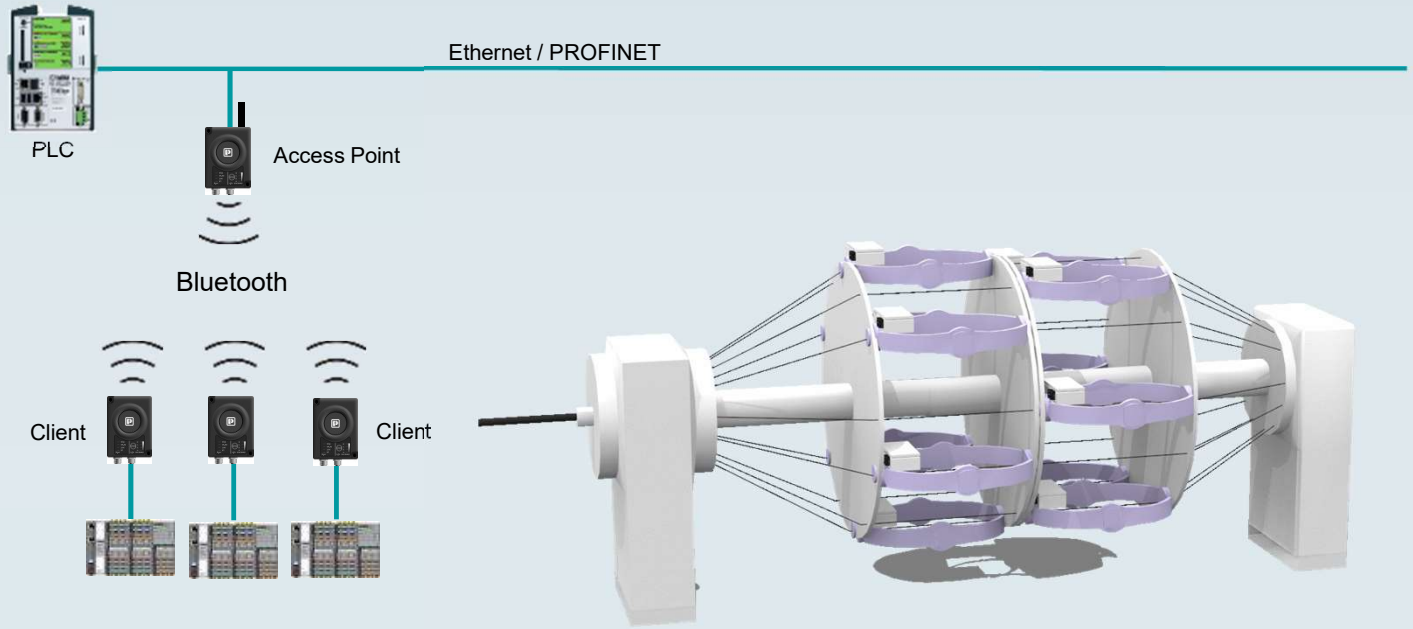
Product overview

INSPIRING INNOVATIONS

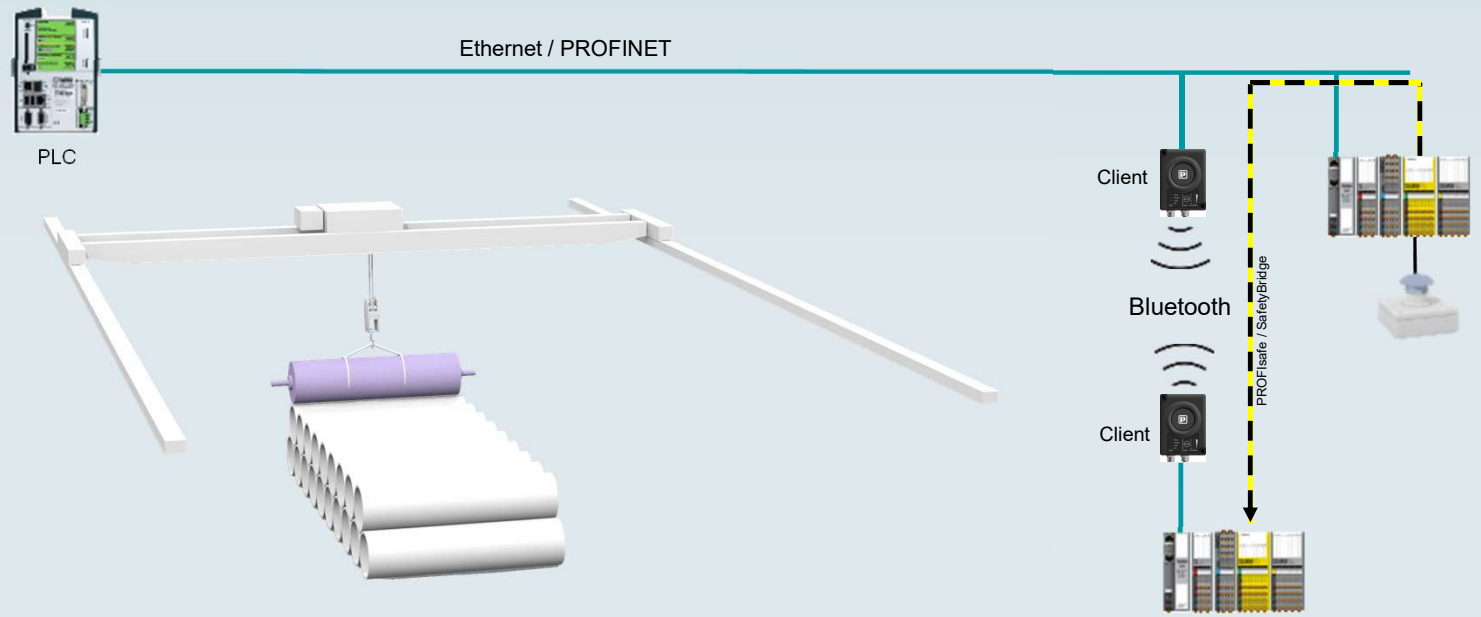
Controlled roaming depending on position



Moving parts



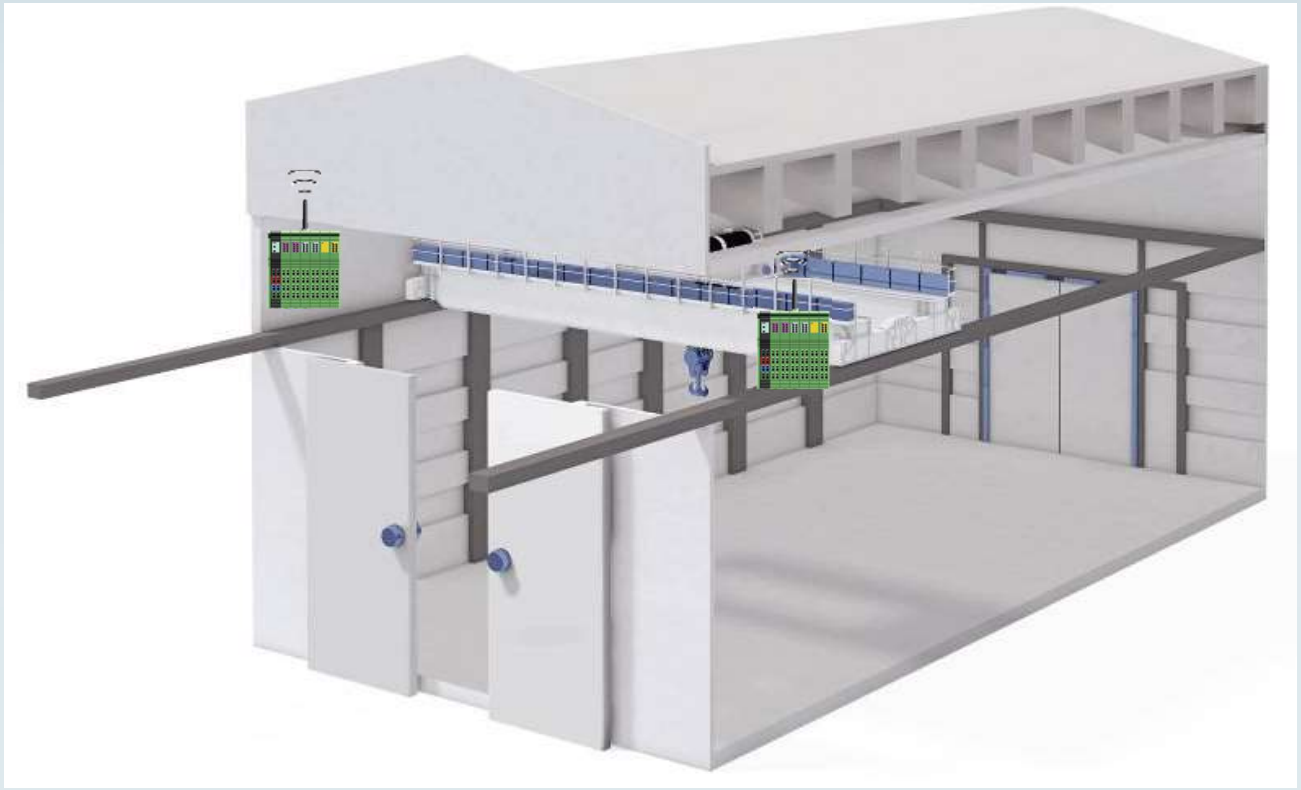
Crane control (Profinet)



Product overview

PHOENIX CONTACT
INSPIRING INNOVATIONS

Crane control (IO)



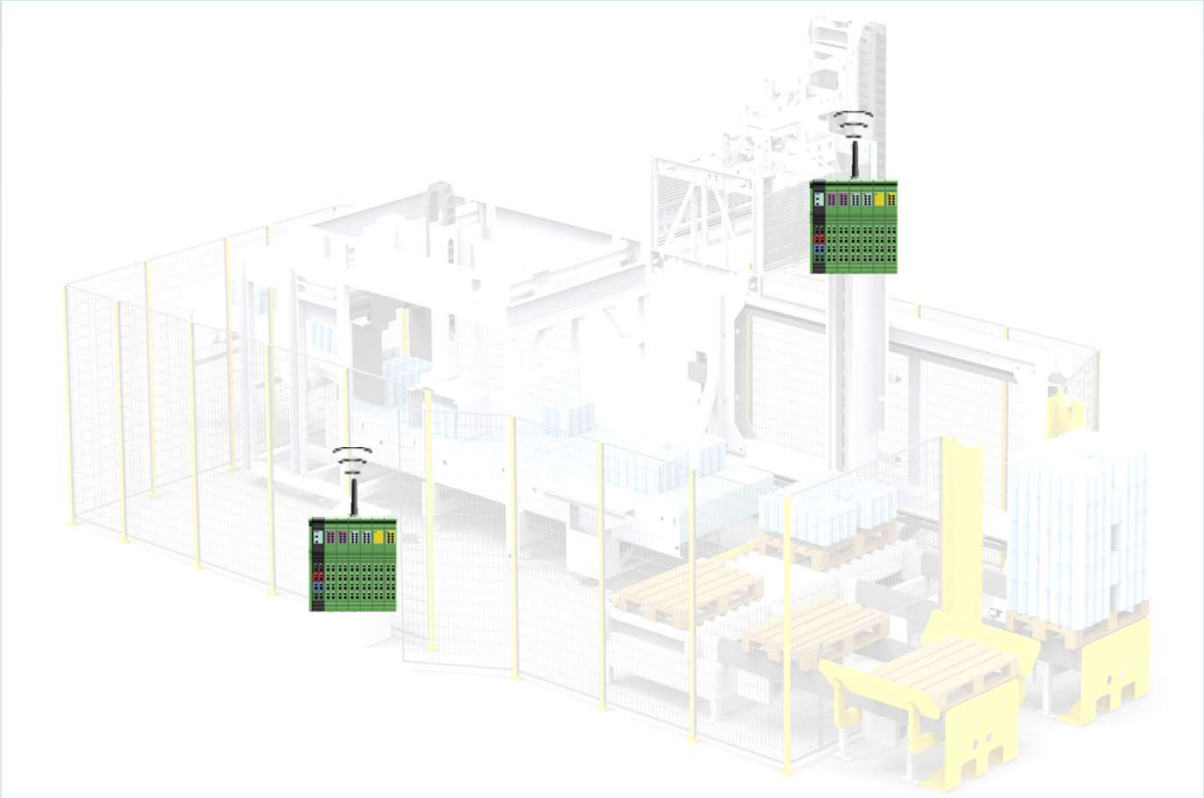
Application examples

- In some applications, the so-called "trolleys" need to move the prefabricated concrete parts in the production hall and outside the hall
- In order for the trolley to move from the inside to the outside, it requires an opening in the outer wall. Depending on the position of the trolley, the door in the ceiling wall must open and close automatically

Advantages of wireless systems

- ☑ Easy startup without software (Plug n Play)
- ☑ Wear-free and robust communication
- ☑ Replacement of costly special cables drums
- ☑ Trouble-free parallel operation

Packing machines



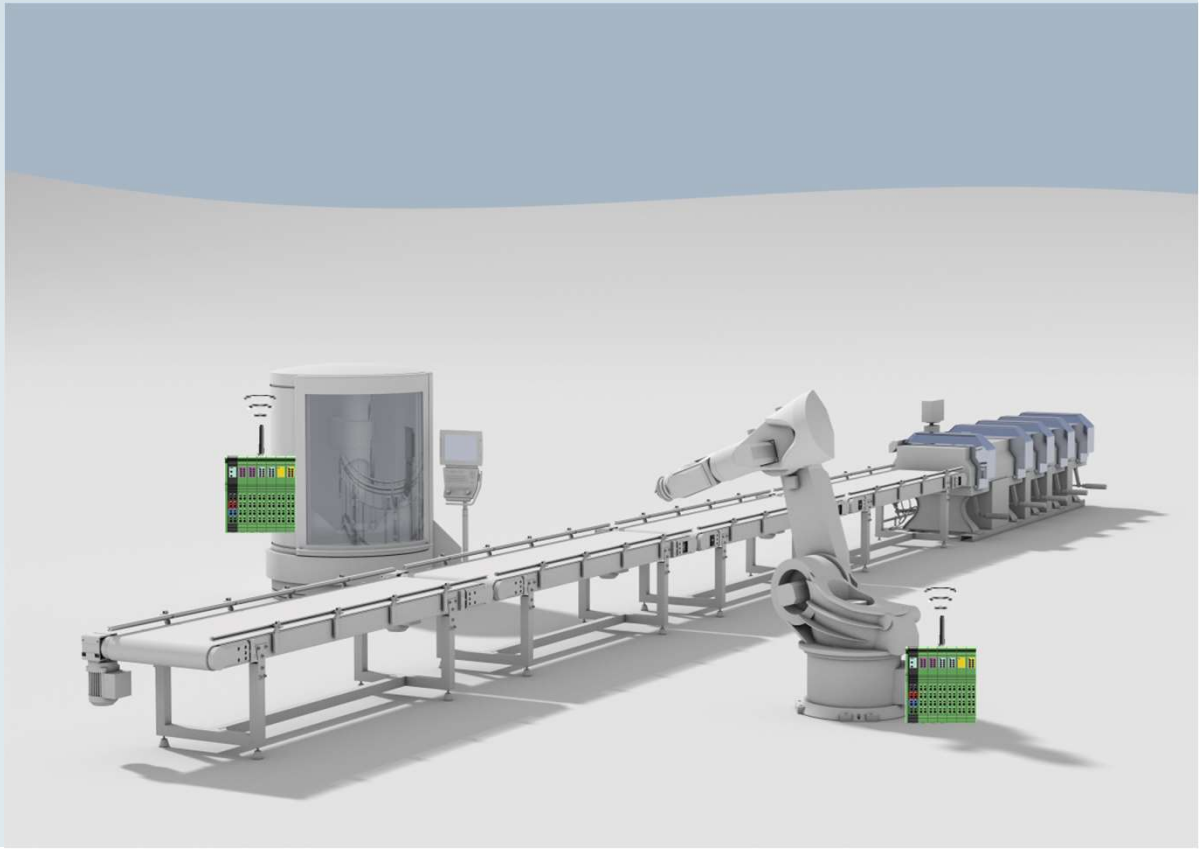
Application examples

- A pallet wrapper consists of a roll of film that is wrapped around the product on a revolving platform that rotates the product around a static spindle
- A problem caused by rotating machines is the communication with the "fixed world“
- Due to wear on slip rings, this solution is very maintenance intensive

Advantages of wireless systems

- ☑ Easy startup without software (Plug n Play)
- ☑ High number of channels in a compact housing
- ☑ Reliable wireless communication

Robots



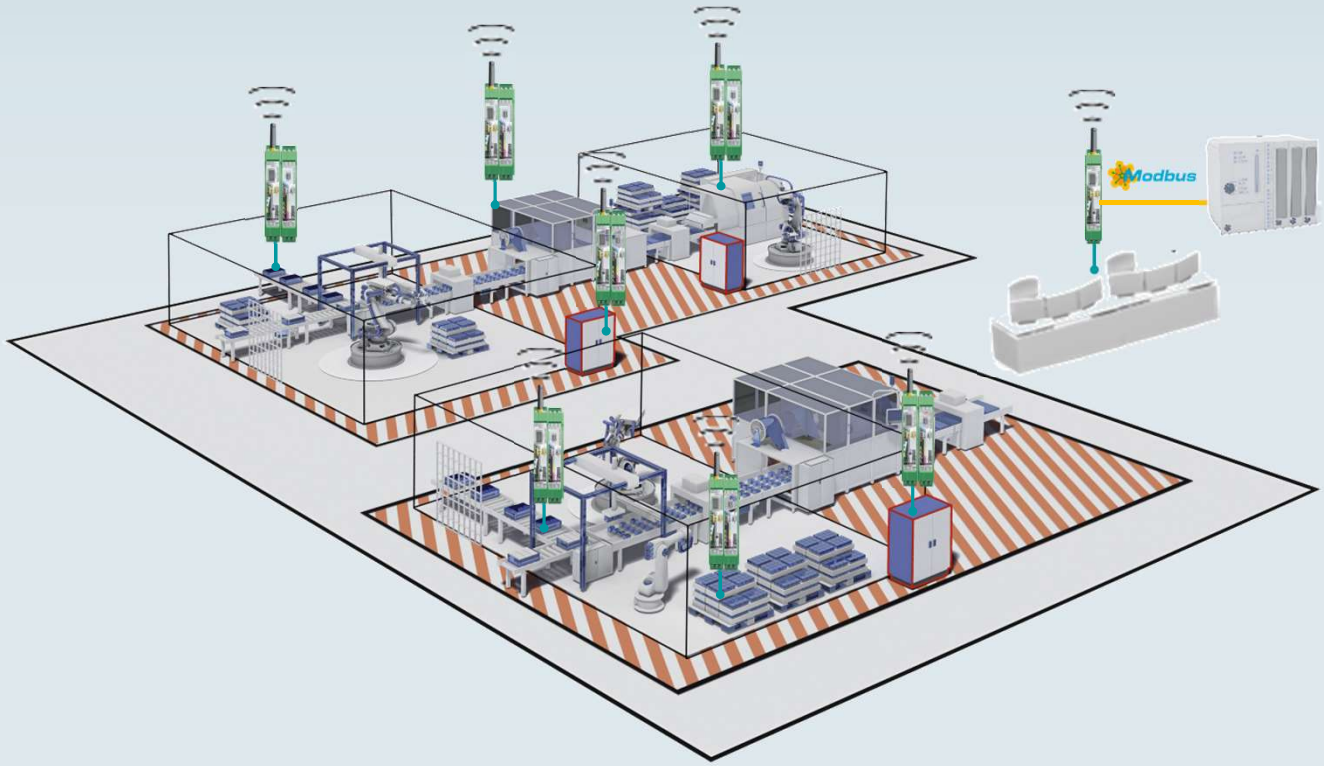
Application examples

- Replacement of fault-prone signal cables
- Transmission of up to 32 digital signals
- Application area: Drop lift and Turn table of body build line (car manufacturing)

Advantages of wireless systems

- ☑ Customer don´t want to learn a new system – Wireless MUX don´t need any setting
- ☑ No downtime during production
- ☑ Interference-free parallel operation of other radio systems

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

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

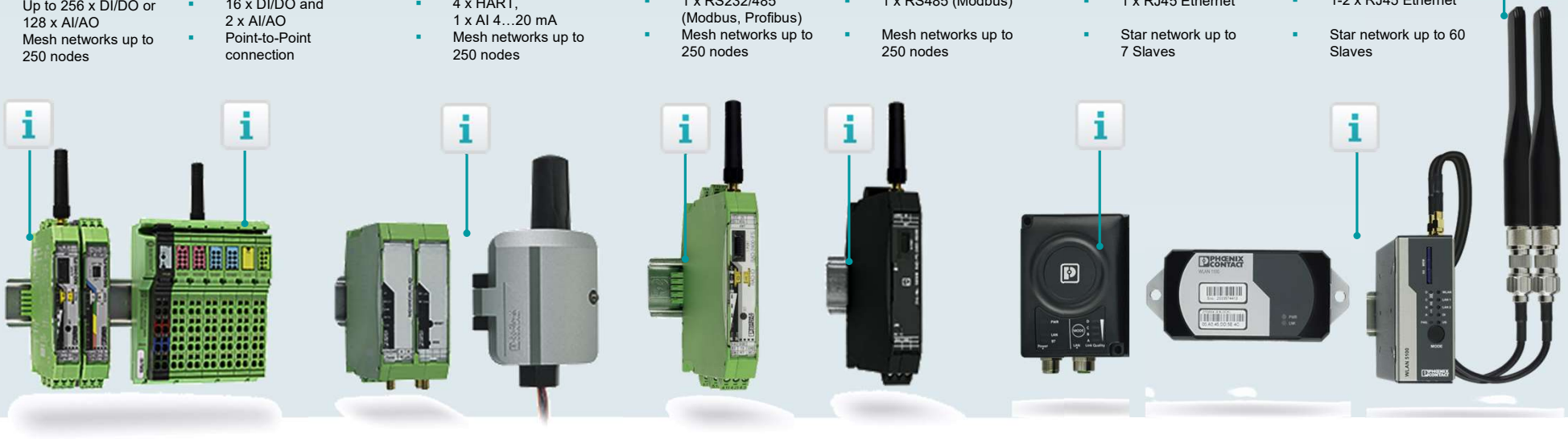
Bluetooth

- 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



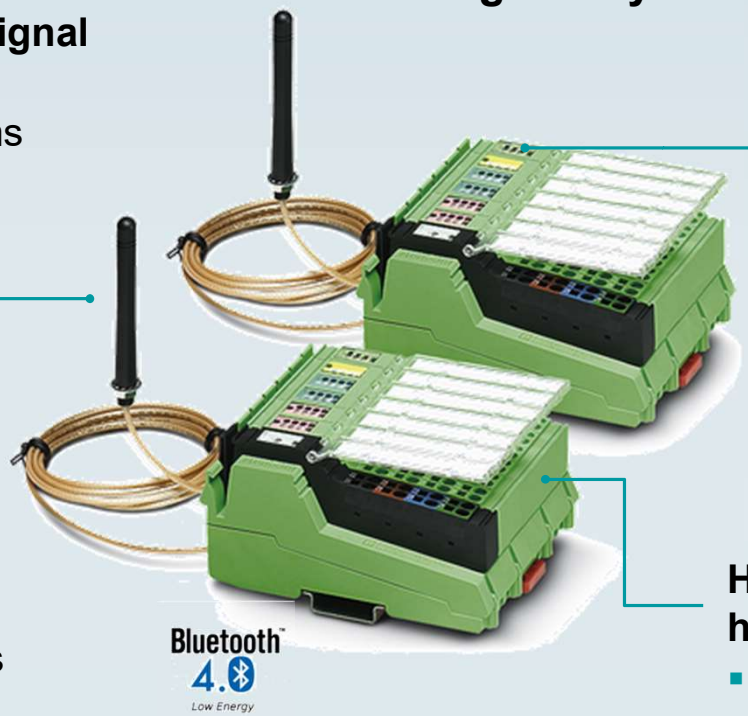
INSPIRING INNOVATIONS

Wireless MUX

Plug & Play - startup without configuration

Suitable for time- critical signal transmission

- Transmission time < 10 ms



Diagnose

- Radio link diagnostics via LED bargraph

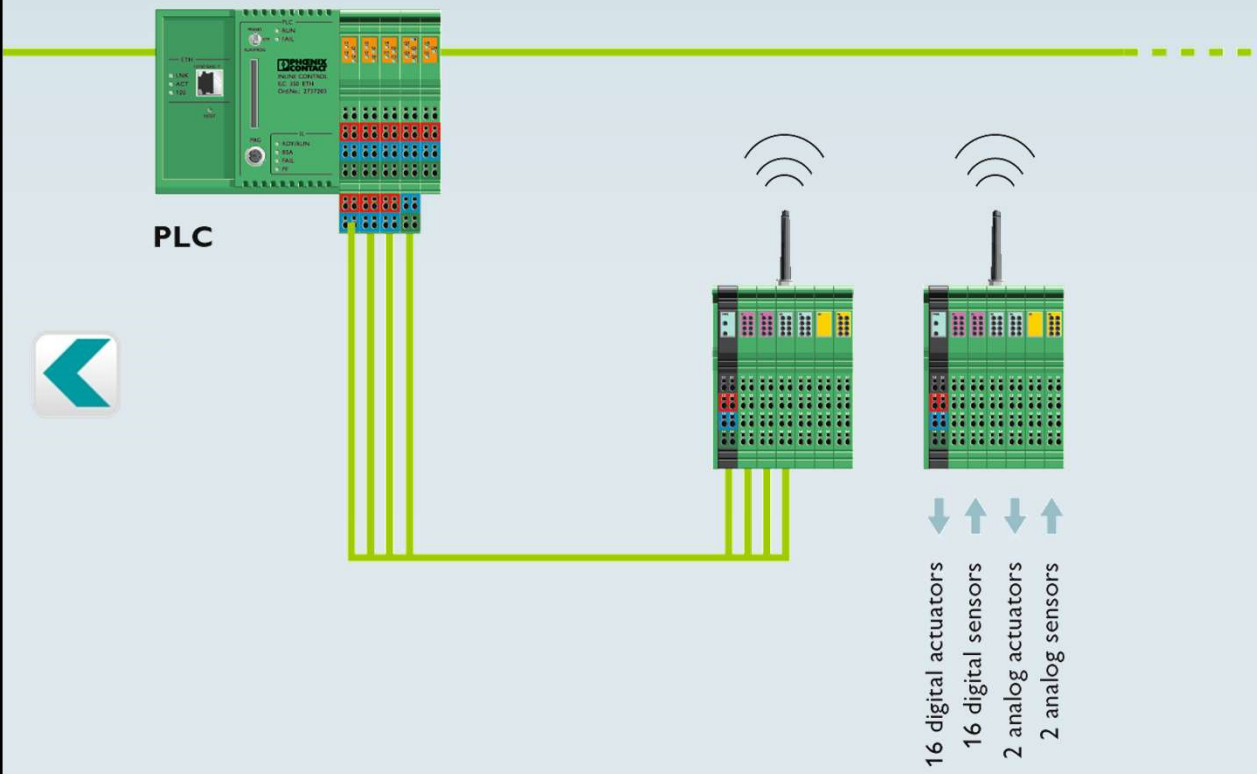
Distances

- 50 m – 100 m indoors
- 200 m – 400 m outdoors

High number of channels in a compact housing

- Analog / digital

Wireless MUX



- Point-to-point communication
- 16 digital inputs/outputs
- 2 analog inputs/outputs
  0-20 mA, 0-10 V
- Transmission time
  ≥ 10 ms
- Bluetooth 4.0 technology

Wireless MUX

	ILB BT ADIO MUX-OMNI	ILB BT ADIO MUX
Description	Wireless set including omnidirectional antennas with 1,5 m cable	Wireless set without antennas
Transmission power	20 dBm / 100 mW	
Number of I/O channels	16 DI/DO + 2 AI/AO (0-20 mA / 0-10 V) Not expandable	
Temperature range	-25°C … 60°C	
Network structure	Point-to-Point	
Order number	2884208	2702875

INSPIRING INNOVATIONS

Wireless MUX – exemplary applications

Mechanical and plant engineering

Mobile applications

Water / Wastewater

Conveyor technology / crane systems

Wireless HART

WirelessHART Gateway

- manages the WirelessHART network
- connects to the control system

WirelessHART adapter

- retrofit wired instruments to WirelessHART
- may be loop, line, or battery powered

WirelessHART device

- add new measurement or control devices without any wires
- may be line or battery powered

WirelessHART

Global RF band

Security

Mesh networking

time synchronized

Product overview

PHOENIX CONTACT
INSPIRING INNOVATIONS

Wireless HART Gateway

Integrated WLAN

- Redundant connection as backup for ethernet cable
- Mobile access for programming and diagnostic

Access process data via

- HART IP, Modbus TCP, FDT/DTM (supports up to 250 field devices)
- configure with a web browser

Ethernet-Port

- For easy programming and diagnostics with integrated web server

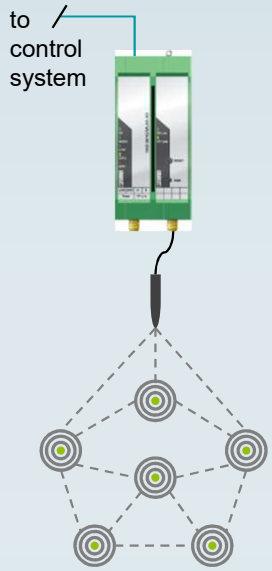
Environmental

- -40…70°C
- ATEX, IECEx, CSA Zone 2

Process data access

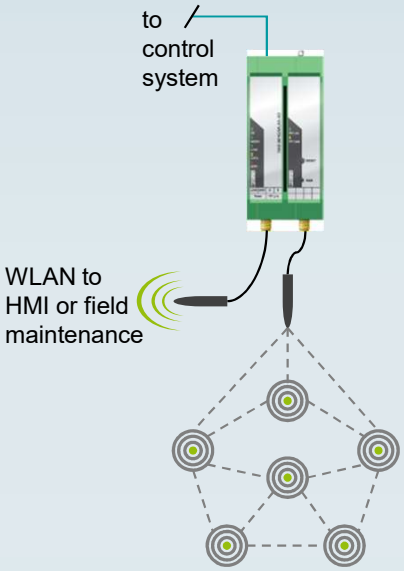
- HART IP, Modbus TCP, FDT/DTM (supports up to 250 field devices)

Wireless HART Gateway – Installation options



WLAN disabled

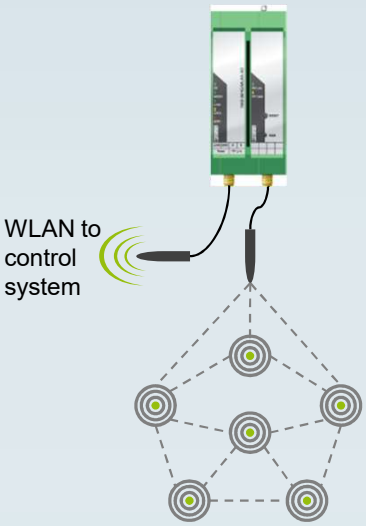
Ethernet connection to control system



WLAN maintenance port

Ethernet connection to control system

WLAN connection to HMI, maintenance PC or tablet



WLAN backhaul

WLAN connection to control system

Wireless HART Adapter

Removable outdoor antenna

- Can optionally be replaced for increased performance by antennas with more gain

Environmental

- -40…70°C
- ATEX, IECEx, CSA Zone 2

Mechanical

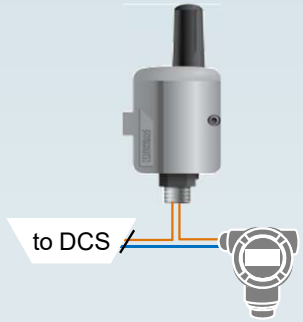
- rugged cast aluminum housing
- 1/2NPT or M20 fitting

Sensor connection

- Connection of up to 4 HART devices
- Direct supply of one HART- device (loop-powered)

Wireless HART Adapter – Installation options

retrofit existing installations

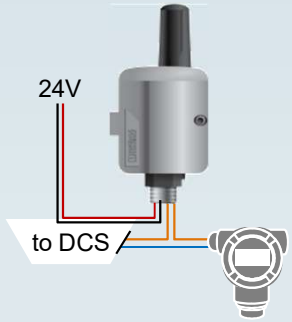


loop powered

retrofit an existing device

the loop stays intact

WHA is loop powered



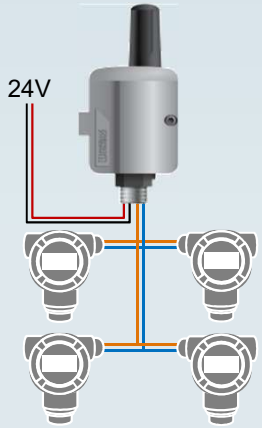
line powered

retrofit an existing device

the loop stays intact

WHA is 24V powered

add new measurement points

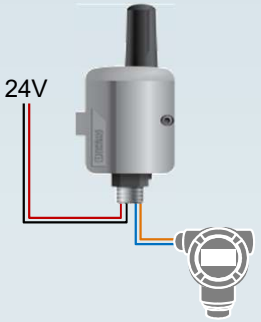


multidrop

connect up to 4 HART devices

WHA is 24V powered

WHA supplies loop power for the HART devices



4…20mA

WHA is 24V powered

WHA supplies loop power for a 4…20mA device

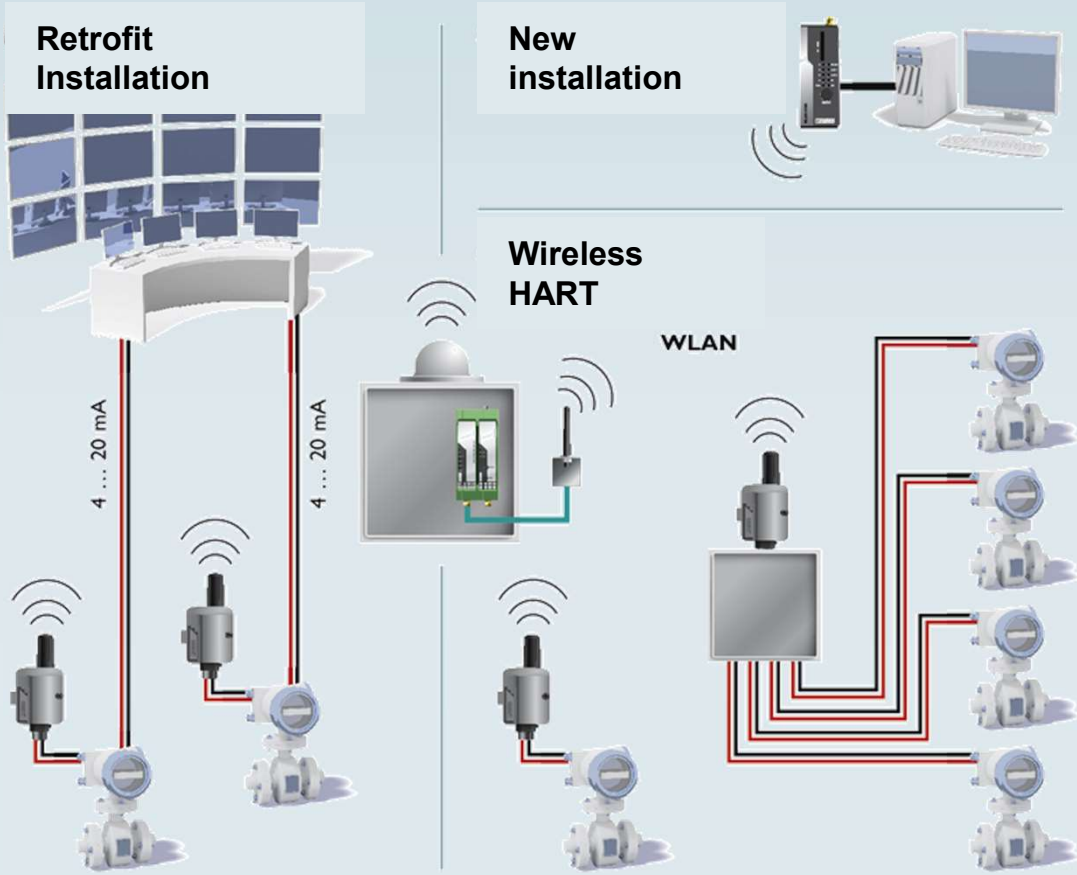
WHA reports 4…20mA loop value as PV

Wireless HART

Wireless HART can:

New installation
- Accelerate system extension
- Reduce start time
- Lower investment costs

Retrofit installation
- Meet new directives
- Increase efficiency
- Lower maintenance costs



INSPIRING INNOVATIONS

HART USB MODEM

USB modem for configuration and commissioning HART devices

The GW HART USB MODEM is suitable as a replacement for old RS232 HART modems or a cost effective alternative to expensive handheld devices.

Main Features

- Includes test utility to diagnose connection or configuration errors
- USB powered
- Unique form factor eliminates tangled cables
- Compatible with all major software packages

Ord. no. 1003824 GW HART USB MODEM

Wireless HART

	RAD-WHG/WLAN-XD	RAD-WHA-1/2NPT	GW HART USB MODEM (Zubehör)
Description	Gateway between WirelessHART field devices and 802.11b/g		Adapter that can be used to interface HART field devices into a WirelessHART network.
Wireless Interface	2,4 GHz…2,4835 GHz		
Interface	Supports 250 Wireless HART devices	Up to 4 HART devices can be connected to one adapter	
Antenna connection	RSMA (female) (without antenna)	N (female) (Removable antenna)	
Degree of protection	IP20	IP65	
Order number	2900178	2900100	

PHOENIX CONTACT
INSPIRING INNOVATIONS

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 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

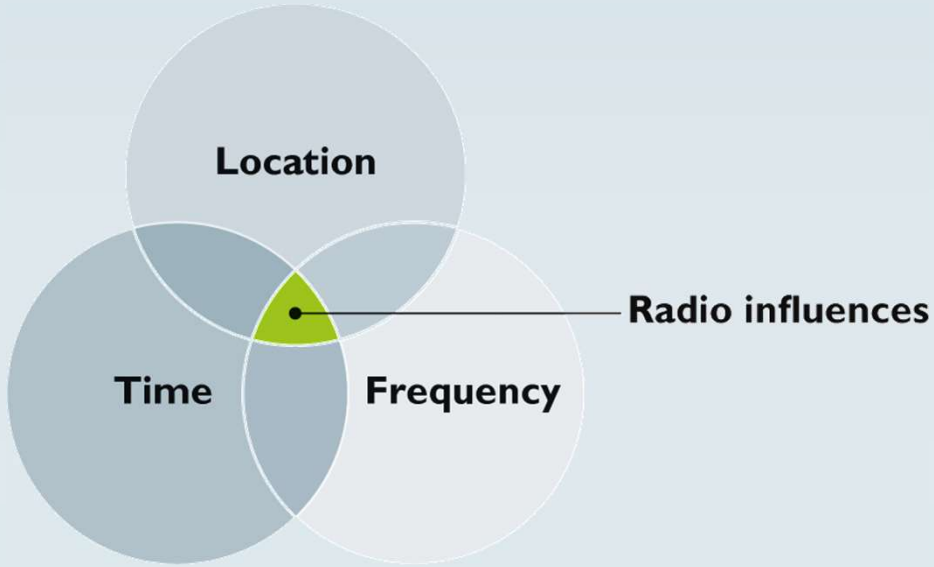
- Automatic network building
- Self- healing networks
- Point-to-point, star, mesh and line structures

Robust communication

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

PHOENIX CONTACT
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:

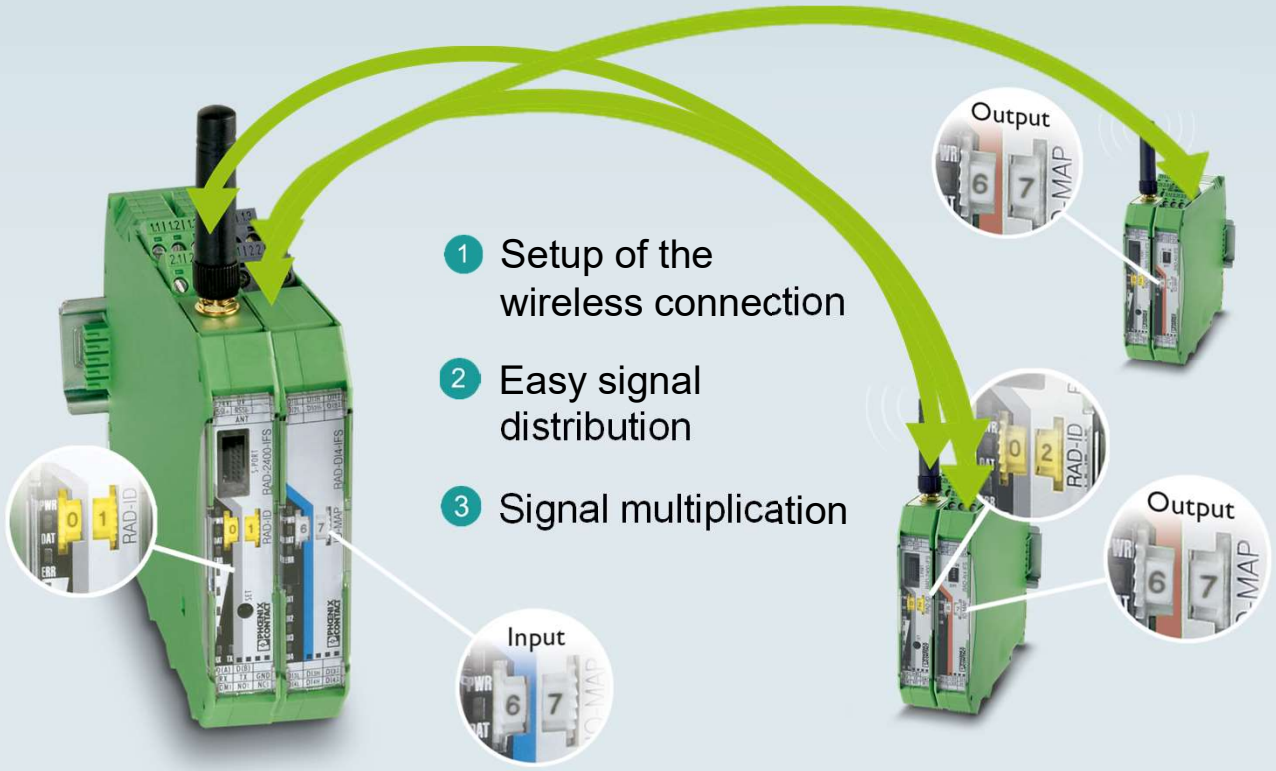
- Allows manual hiding of Wi-Fi frequencies

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) <= 32 km (900 MHz)	Typ. <= 250 m

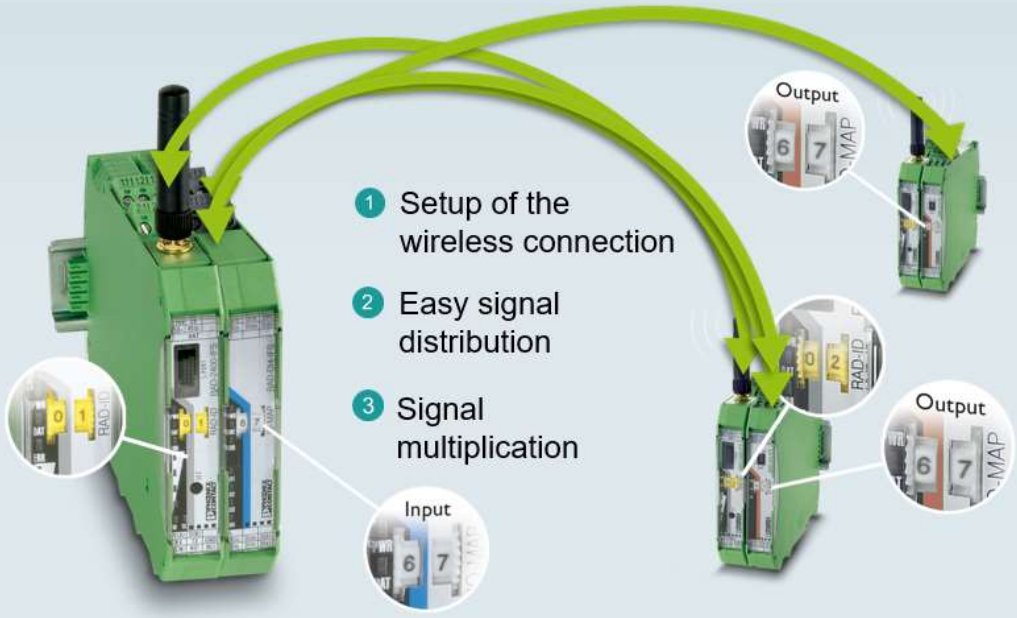
Radioline

TRUSTED WIRELESS



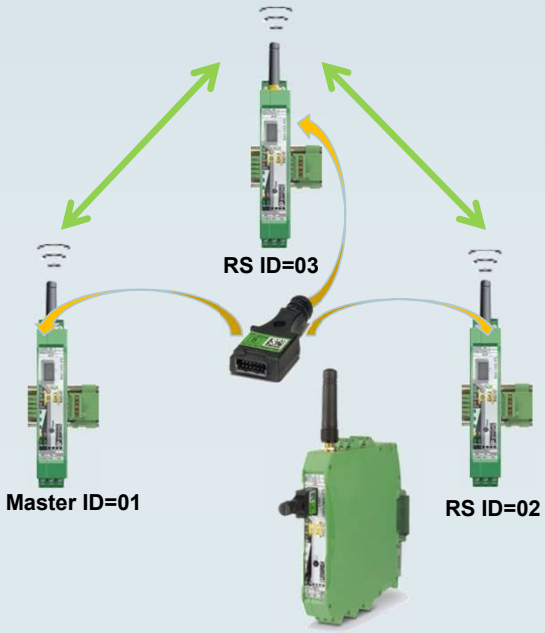
1. Setup of the wireless connection
2. Easy signal distribution
3. Signal multiplication

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

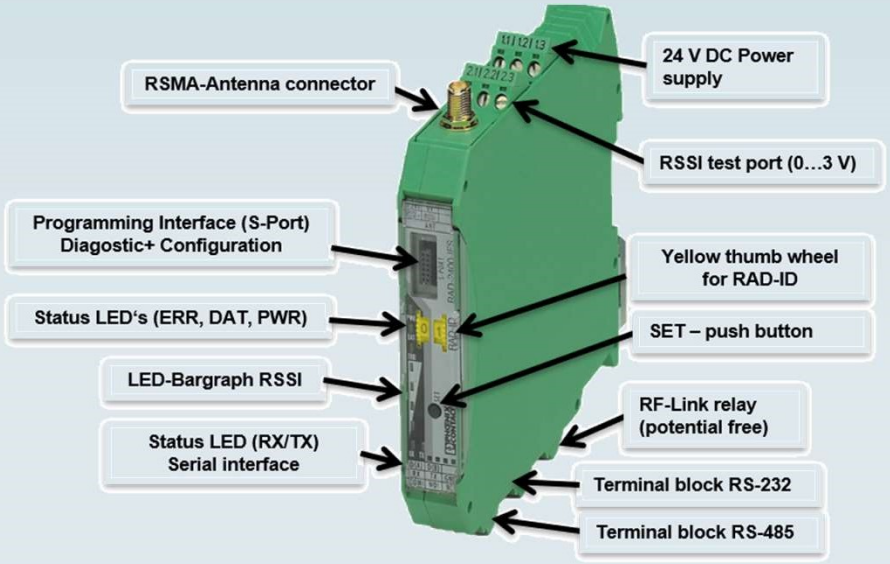
Workshop CONF-Stick



Reading the device configuration via Confstick

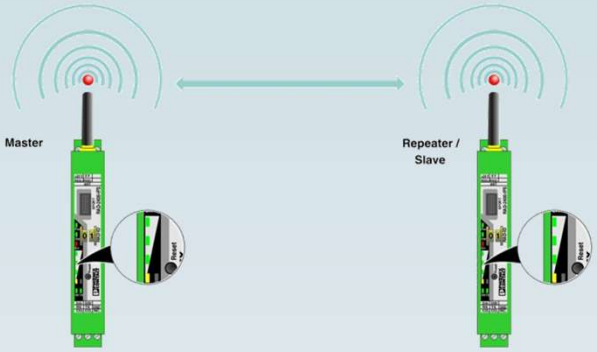
1. Insert the Confstick into the S port of the RAD-2400-IFS module
2. Press the SET button for one second
3. DAT-LED lights up once -> reading is finished -> new parameters are activated!
4. Remove the Confstick
5. Repeat the process on each wireless module in the network

Diagnostic – Head module

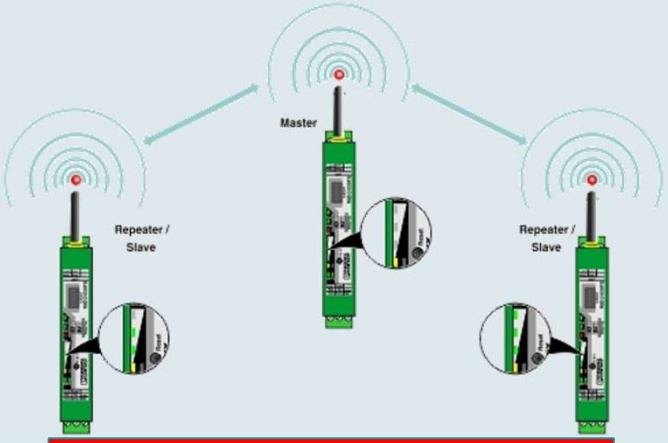


LED	Status	Comment
PWR	Green ON	Supply voltage ok
DAT	Green ON flashing	Cyclic communication on TBUS Configuration mode
ERR	Red ON flashing slow flashing fast	Local IFS-Bus error e.g. Double assignment of IO-MAP address Radio Link interrupted
Bargraph	3 x Green, 1 Yellow ON	Received Signal Strength (RSSI)

Point-to-Point connection

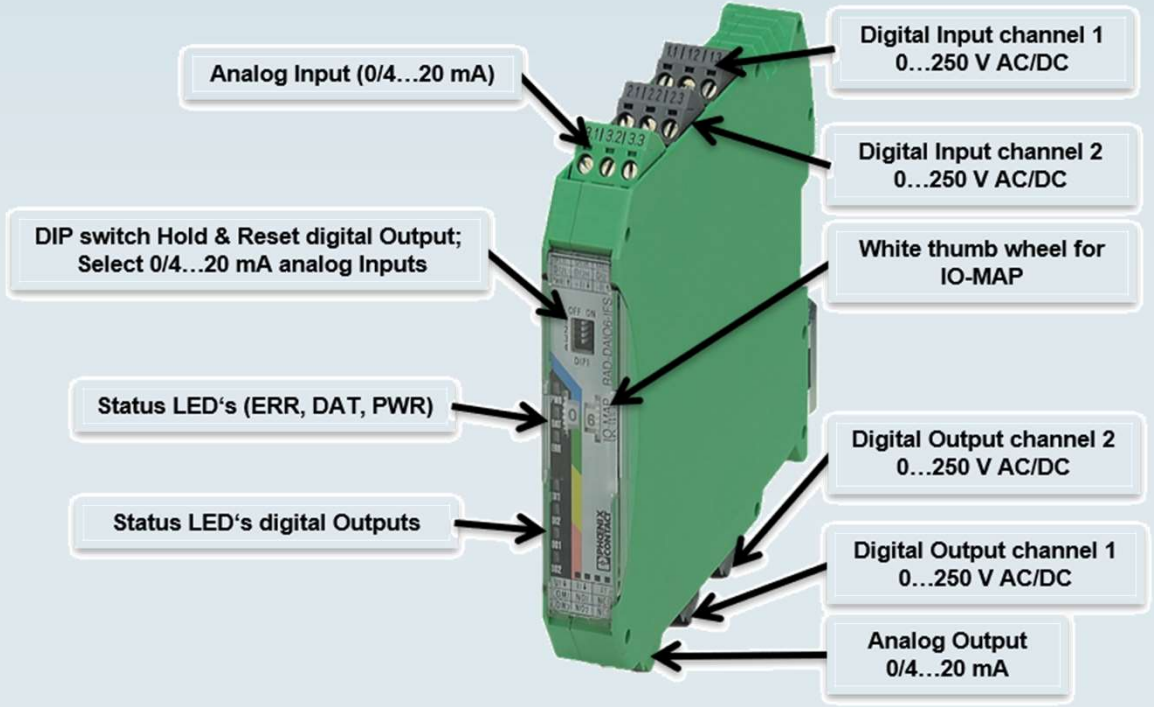


Point-to-Multipoint connection



Master = only yellow LED ON!

Diagnostic – IO module



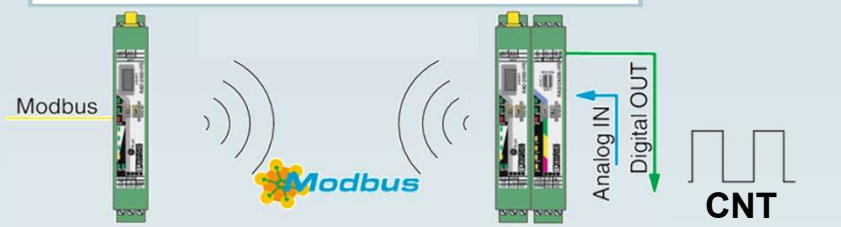
LED	Status	Comment
PWR	Green ON	Supply voltage ok
DAT	Green ON Flashing	Cyclic communication on IFS-BUS Adressing mode
ERR	Red ON Red Flashing	Critical internal error I/O error, incorrect addressing, not yet addressed (delivery state)
DI 1/ DI 2		State of digital input 1/digital input 2
DO 1 / DO 2	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

Radioline – Operation modes

Option 1

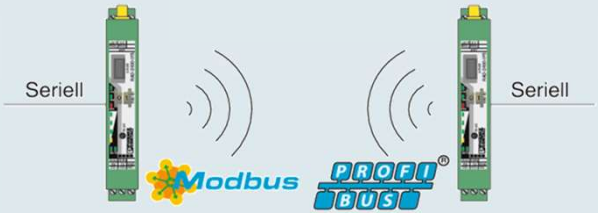
I/O to I/O

Option 2



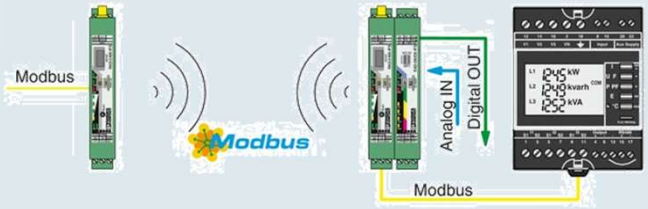
I/O to Modbus RTU

Option 3



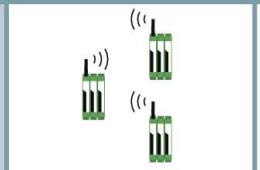
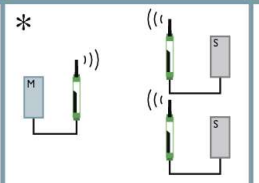
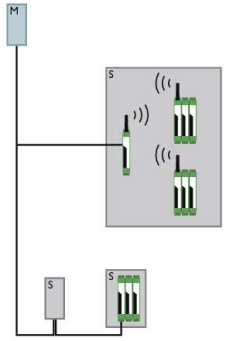
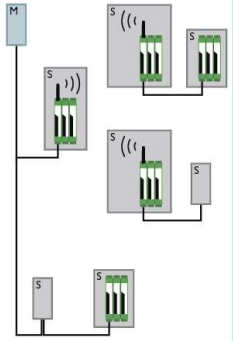
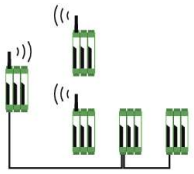
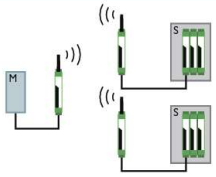
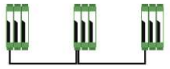
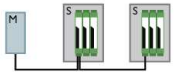
Serial to Serial (RS 232/485)

Option 4



I/O and Modbus parallel

Radioline – 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

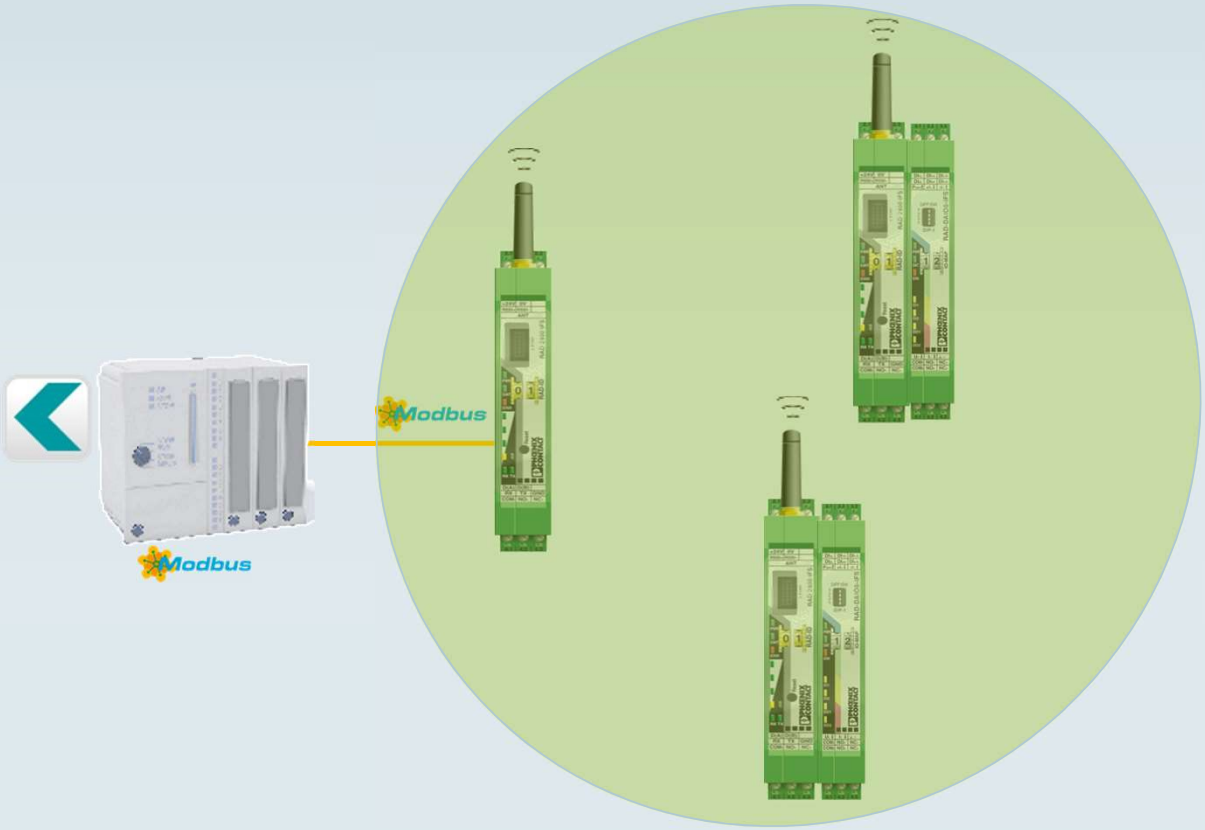
Profibus (limitations)

- 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

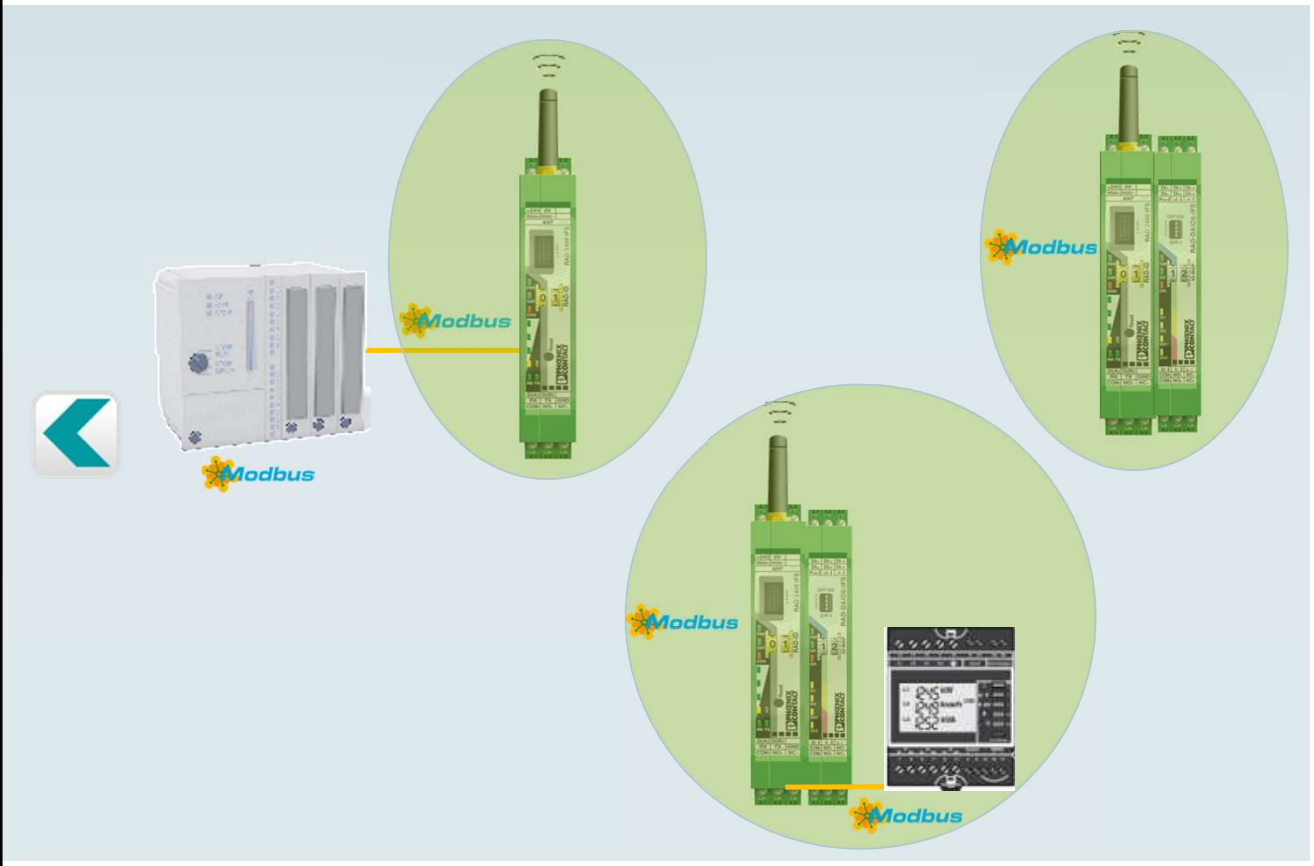
- Depends on telegram length and timing
- Some protocols can be adjusted via special “TFrameEnd” and “TidleMin” settings (Special protocol knowing or oscilloscope diagrams necessary)

Radioline – PLC/Modbus-RTU mode



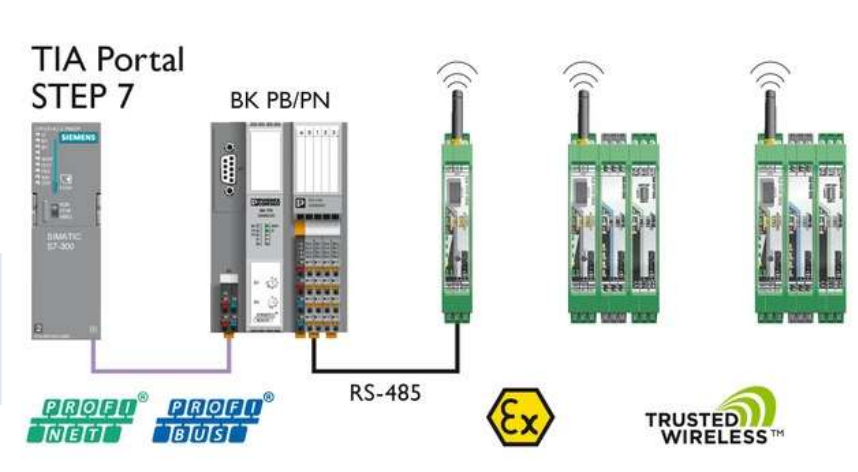
- IO integration in MODBUS PLC
- Central MODBUS memory map stored in radio master
- The radio master is simultaneously a MODBUS-Slave
- Just one MODBUS-Slave address represent the complete wireless network
- Max. 99 IO modules per wireless network
- Diagnostic parameter (RSSI value, IFS-Bus status) stored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

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

Radioline function blocks for PCWORX / STEP 7 / TIA Portal



Supported Hardware and Software

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

- 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

Radioline – Head modules




Reachable distance

Outdoor solutions

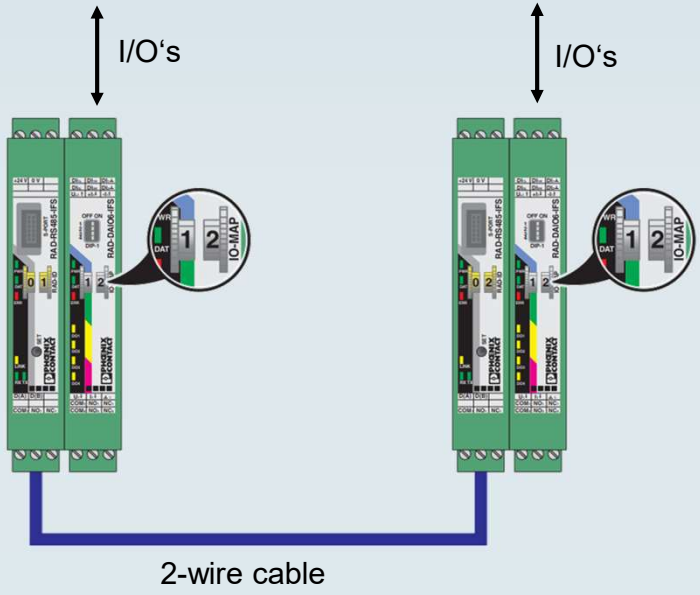
IO modules

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)

Radioline Multipoint Multiplexer

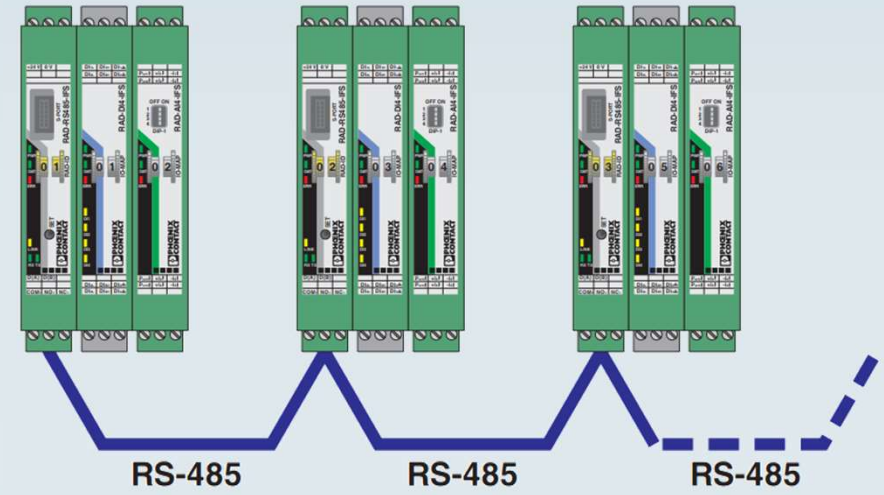
I/O-Mapping via 2-wire-cables

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

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

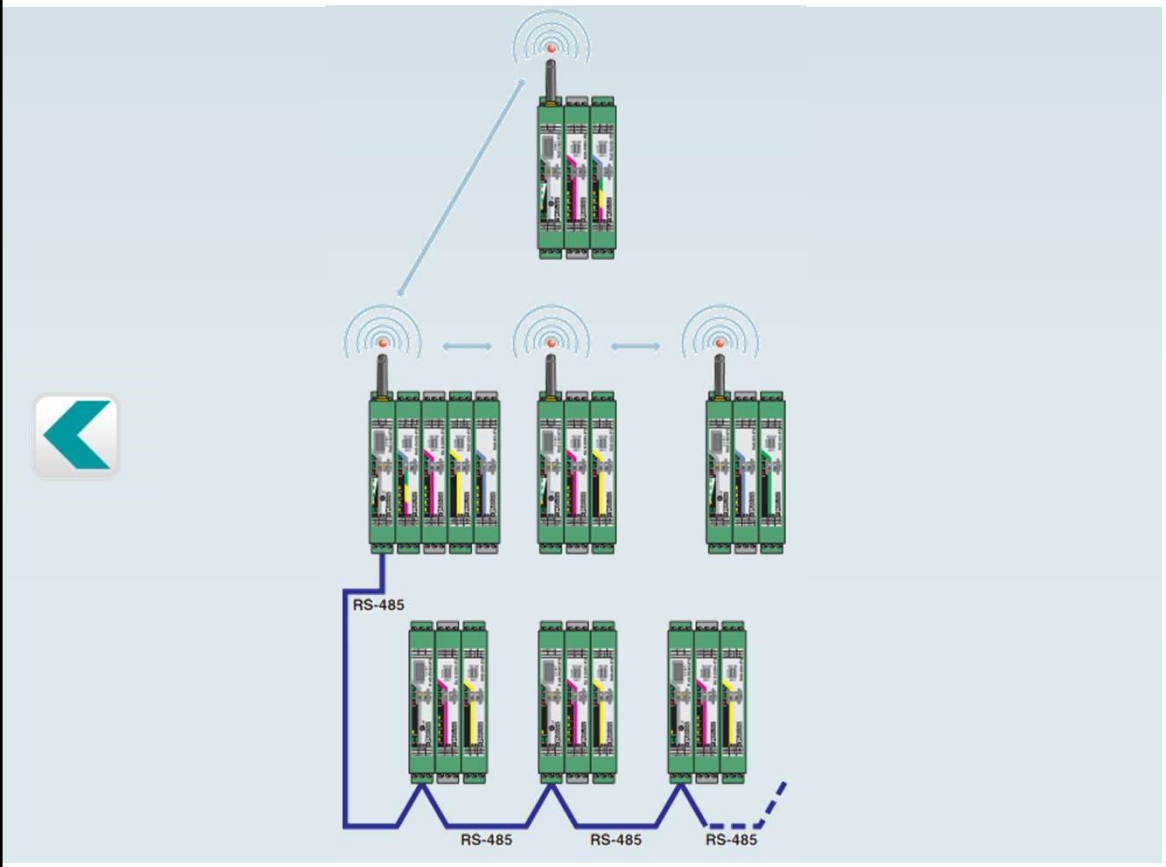
Intermedia communication
Wireless and wired modules form a combined system.

Radioline Multipoint Multiplexer I/O to I/O



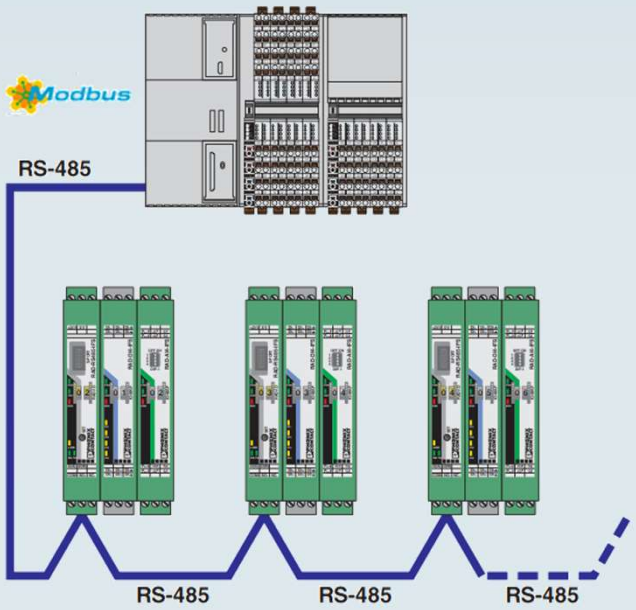
- Multipoint multiplexer – easy I/O distribution between multiple stations
- Up to 99 stations via RS-485
- Addressing using yellow thumbweel
- Easy I/O mapping using white thumbwheel on the extention modules
- Fast startup via Plug and Play

Radioline Multipoint Multiplexer (Intermedia)



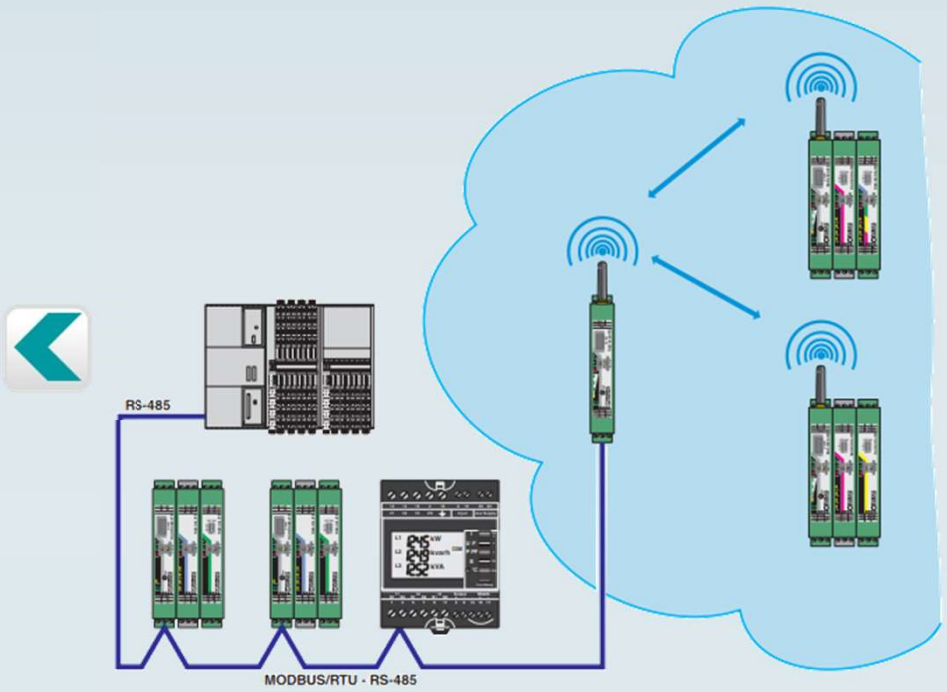
- Cross-media distribution of I/O signals
- Up to 250 stations in total:
  - 98 RS-485 stations and
  - 152 wireless stations
- Easy I/O mapping using white thumbwheel on the extension modules
- Fast startup via Plug and Play

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

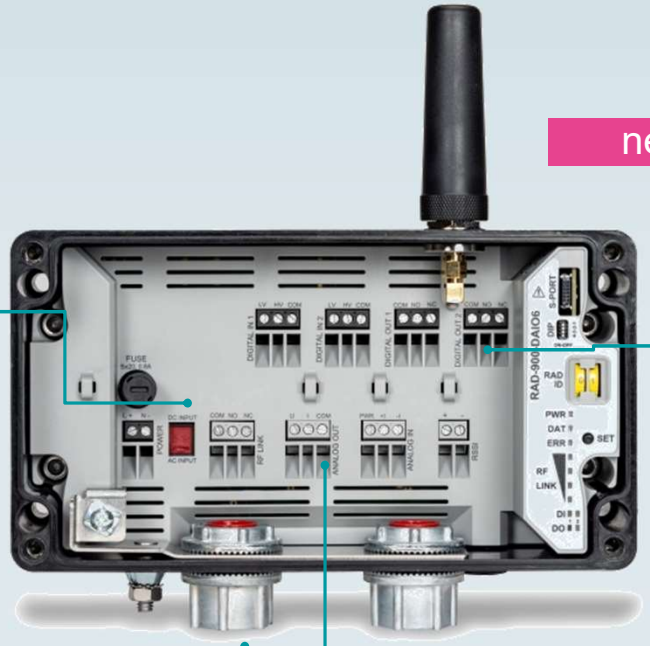
new

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

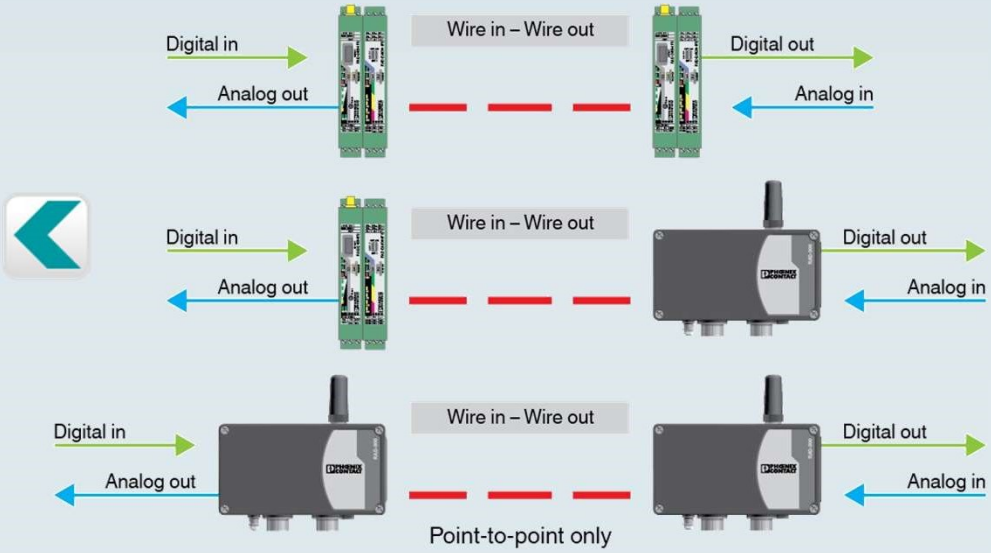
Dual half-inch NPT fittings for power and data isolation

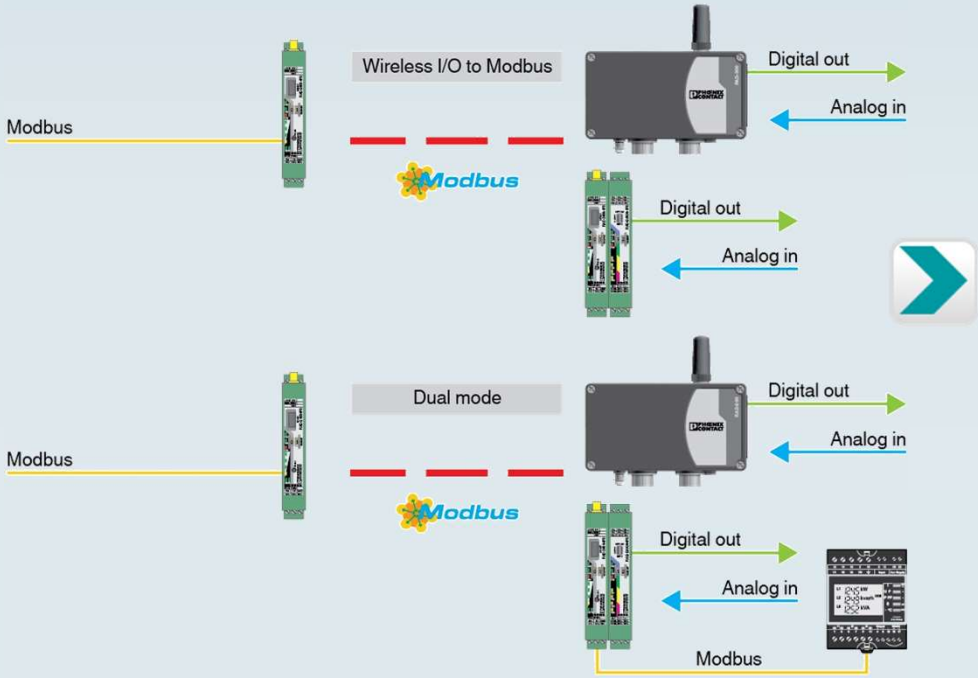
Seperated terminals and wire-tie loops for cable management

- 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

TRUSTED WIRELESS

new

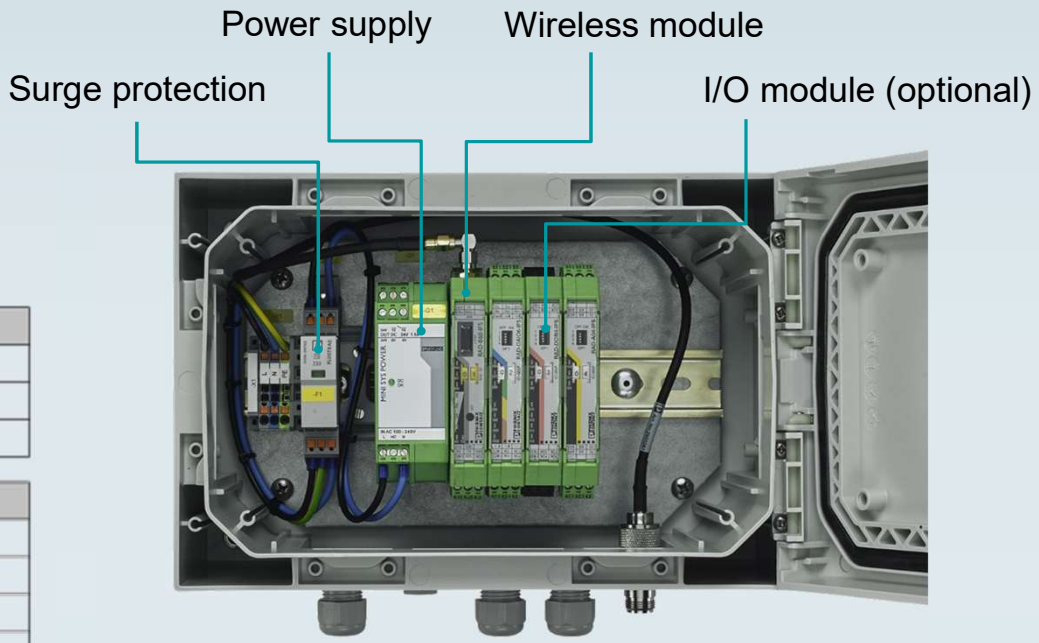
Order key

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

PHOENIX CONTACT INSPIRING INNOVATIONS

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

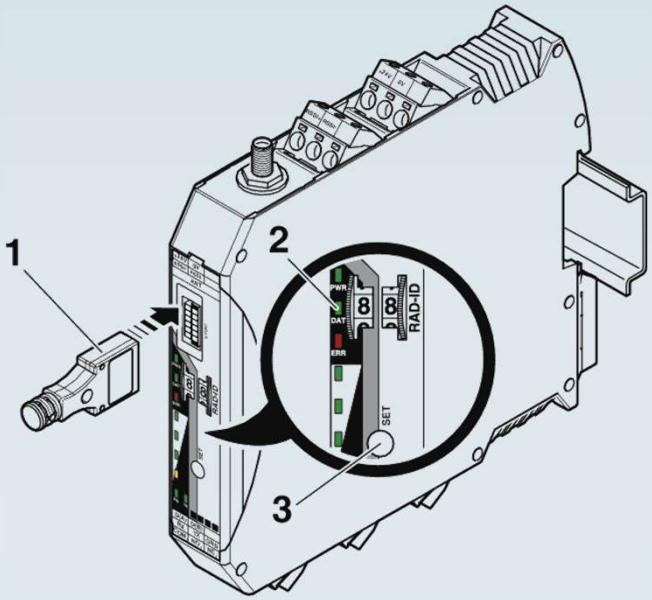






	RAD-CONF-RF3	RAD-CONF-RF5	RAD-CONF-RF7	RAD-CONF-RF1	RAD-CONF-RF1	RAD-MEMORY	RAD-CABLE-USB
Frequency	**2,4 GHz**	**2,4 GHz**	**2,4 GH**	**868 MHz**	**900 MHz**	For all Radioline front modules	For all Radioline front modules
Description	Configuration stick for the 2,4 GHz wireless module unique network 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

Radioline – Configuration sticks



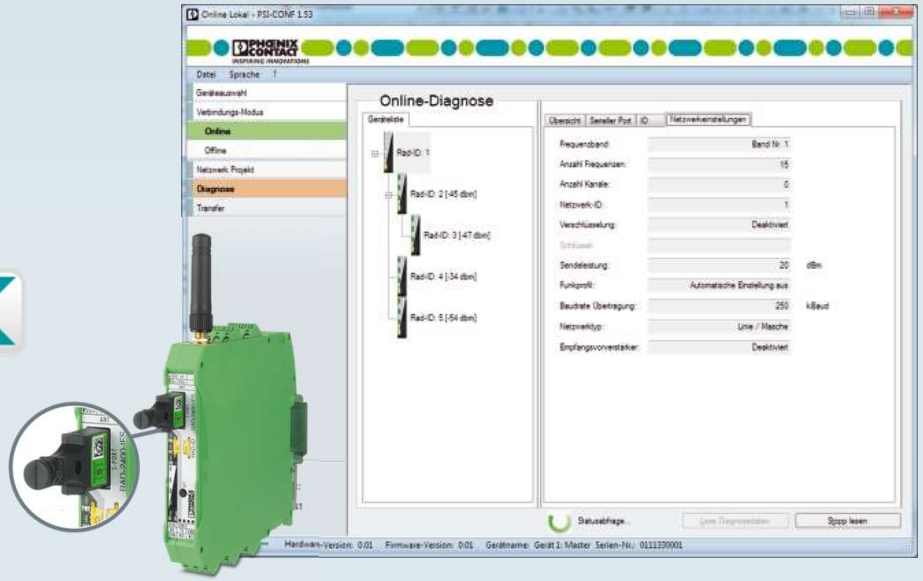
1. CONFIGSTICK RAD-CONF-RF….
2. Status LEDs
3. SET button

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

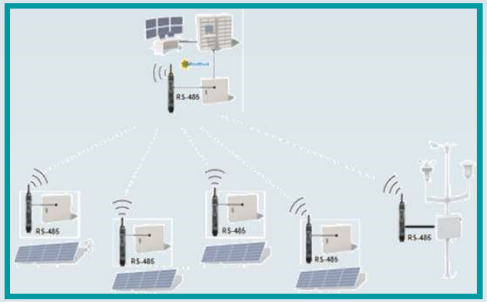
Worldwide use

- 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

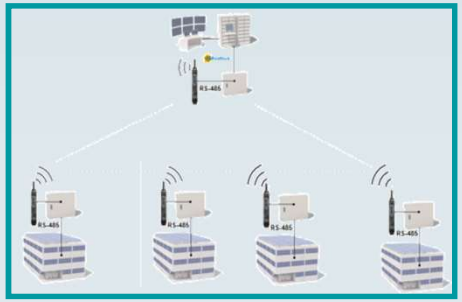
Reliable communication

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

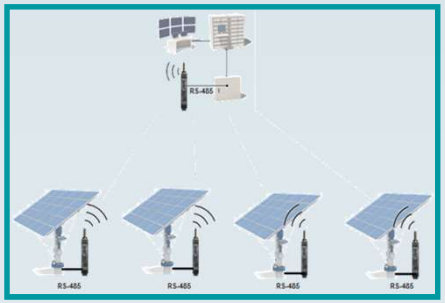
ESSENTIAL Wireless – Application examples



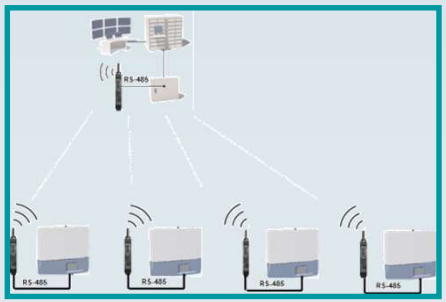
Wireless string monitoring in open field installations



Wireless monitoring of rooftop systems

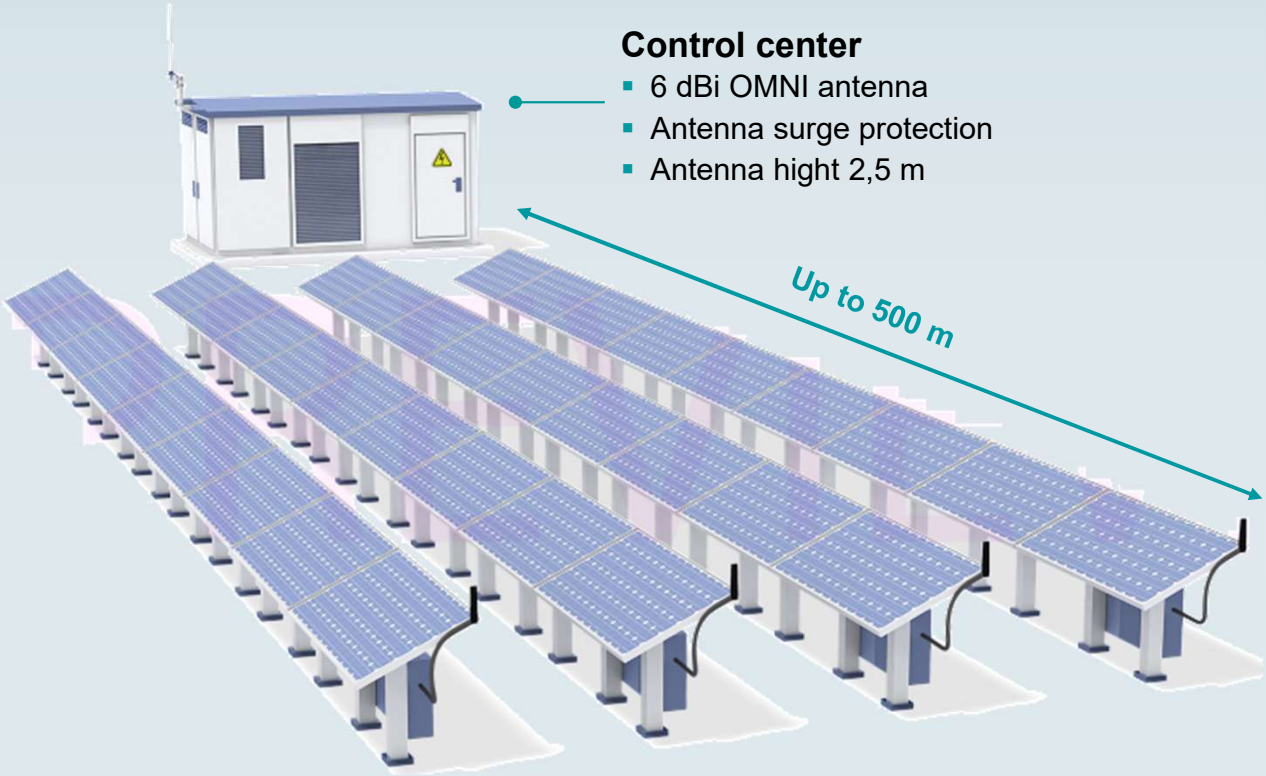


Wireless monitoring of tracking systems



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

Industrial Bluetooth

Quick installation

- IP65 complete solution with integrated antenna
- M12 connections for Ethernet and voltage
- Easy installation in the field

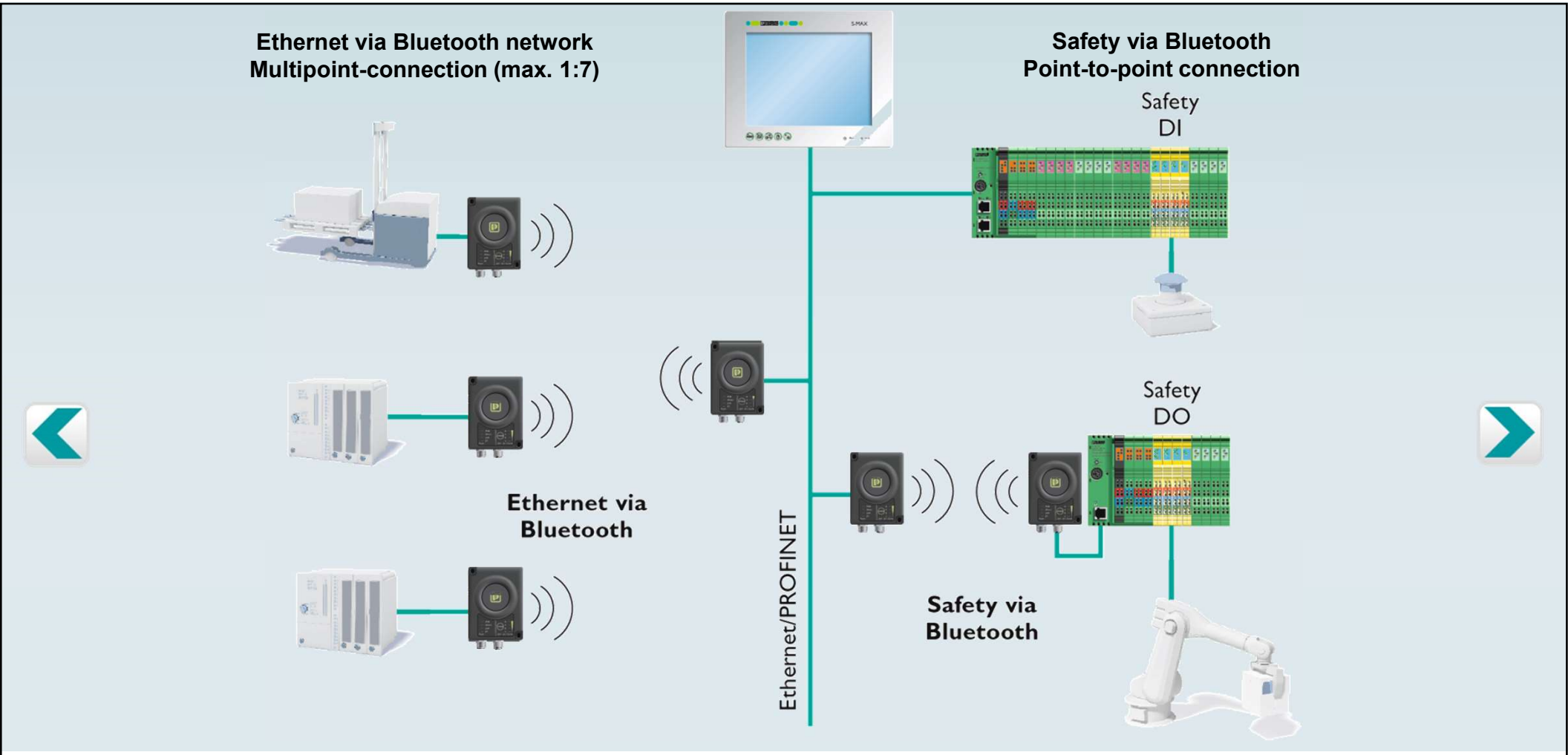
Easy and secure setup

- Automatic configuration with the mode button

Functionally secure communication via PROFIsafe or SafetyBridge technology

Extended setting options via AT commands

- For automated configuration or control in operation, e. g. for roaming operations


Ethernet via Bluetooth network
Multipoint-connection (max. 1:7)
Safety via Bluetooth
Point-to-point connection
Safety
DI
Safety
DO
Ethernet via
Bluetooth
Safety via
Bluetooth
Ethernet/PROFINET

Industrial Bluetooth

			
	FL EPA 2 (BT Mode)	**FL EPA 2 RSMA (BT Mode)**	**FL BT EPA 2**
Function	Bluetooth Ethernet Client Adapter	Bluetooth Access Point	Bluetooth Ethernet Client Adapter
Antenna	Internal panel antenna	Omnidirectional antenna supplied as standard	Internal panel antenna
Frequency band	2,4 GHz	2,4 GHz	2,4 GHz
Connection type	M12 connection	M12 connection	M12 connection
Degree of protection	IP65	IP65	IP65
Temperature range	-40 °C … 65 °C	-40 °C … 65 °C	-40 °C … 65 °C
Order number	1005955	1005957	1005869

PHOENIX CONTACT
INSPIRING INNOVATIONS

Industrial Bluetooth – exemplary applications

Water / Wastewater

Machine building

Crane systems

Robots

Industrial WLAN

Reliable communication thanks to MIMO technology

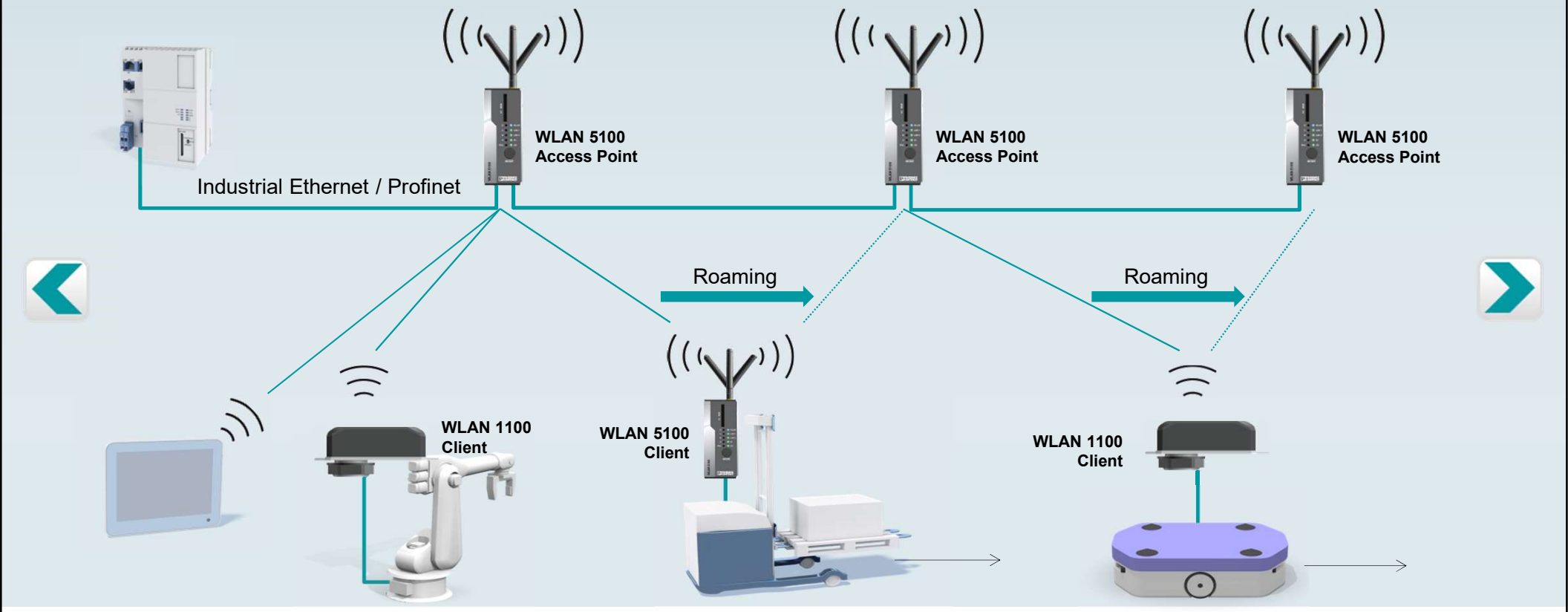
Compatible with standards IEEE 802.11 a/b/g/n

All-in-one-solution

Quick and easy startup

Optimized for operation in PROFINET and EtherNet/IP networks

Industrial WLAN



Industrial WLAN

Integrated antannas and wireless module in one single device

- Space-saving
- Cost-saving

Easy to mount

- Single-hole mounting via M40-thread
- Power connection: Combicon
- Ethernet connection: RJ45

All-in-one-solution

Robust

- Shockproof in accordance to IK08, 7 Joule at -50 °C
- Seal up to P67 (with connecting adapter)

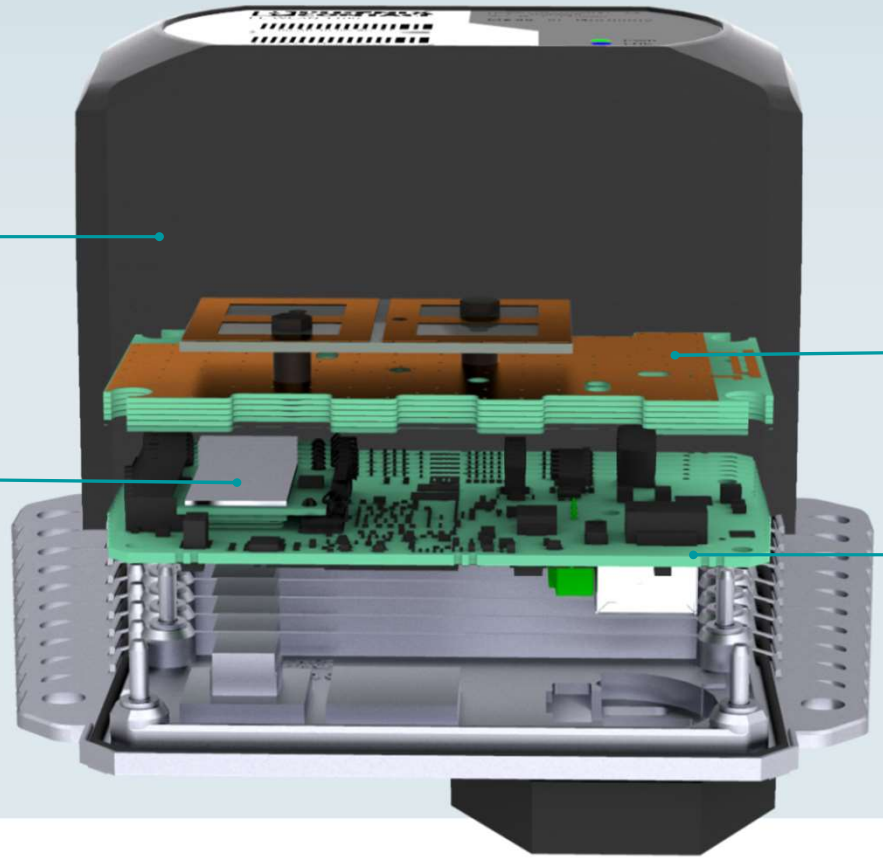
Reliable

- Two antennas with MIMO technology
- Powerful WLAN board 802.11 a/b/g/n
- Linux operating system

Industrial WLAN

Extremely robust housing,
shockproof in accordance
with IK08, 7 Joule at -50°C
Protection Class IP 54

Powerful WLAN Board
802.11a/b/g/n
Dual band, 2,4 & 5 GHz

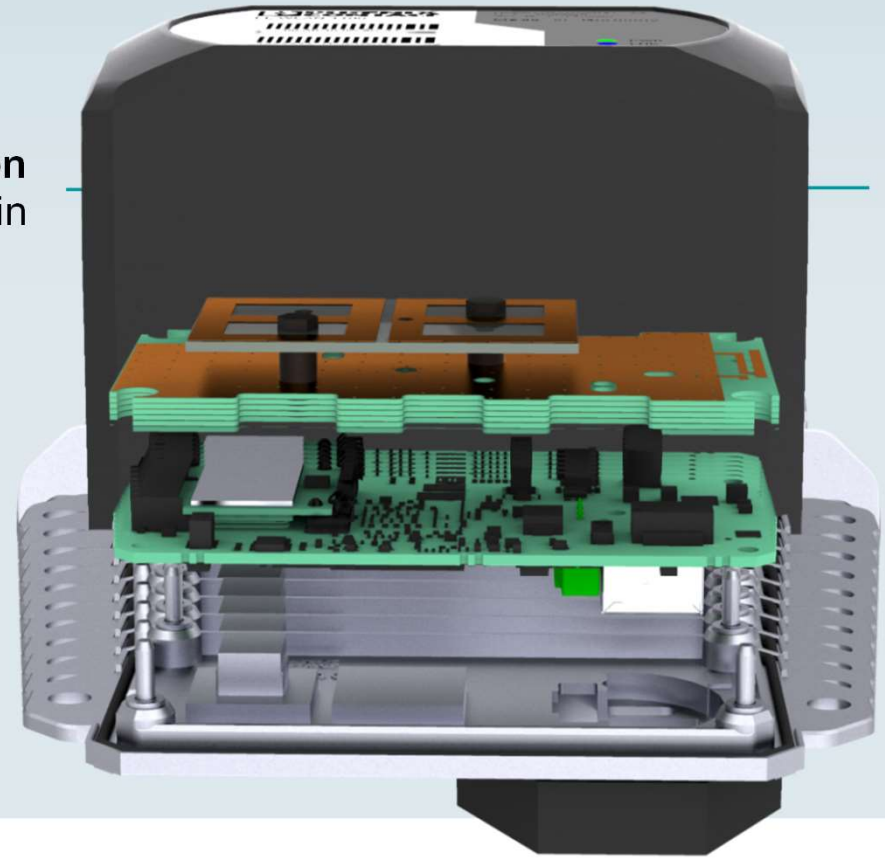


Special antennas
For fast and reliable
communication

Powerful Access Point
Linux operating system

Industrial WLAN

Power connection
Push-in



Ethernet connection
Standard RJ45

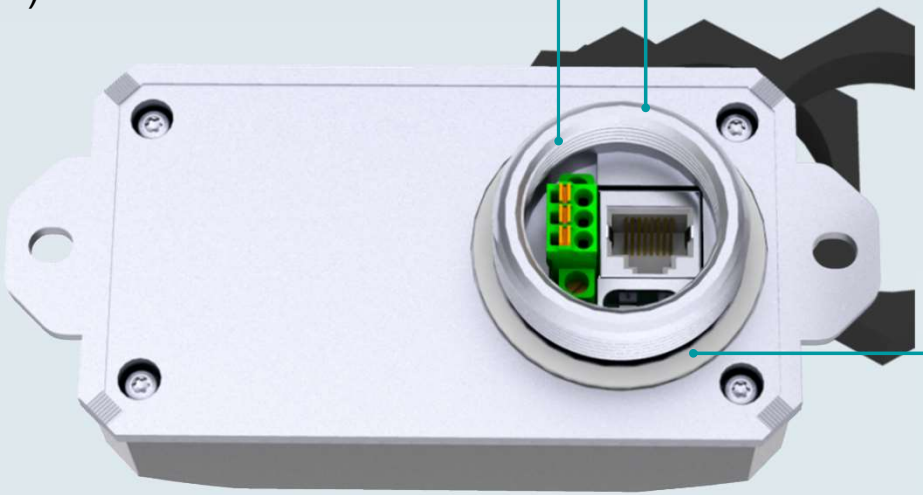
Product overview

INSPIRING INNOVATIONS

Industrial WLAN

M32 inside thread
For optional IP67-connection adapter
(if not mounted on cabinet)

M40 external thread
for mounting



Seal
up to IP67

Industrial WLAN

Fast and easy connection
thanks to single-hole mounting

Product overview

PHOENIX CONTACT
INSPIRING INNOVATIONS

Industrial WLAN

Fast and easy connection
thanks to single-hole mounting

Quick fastening

Product overview

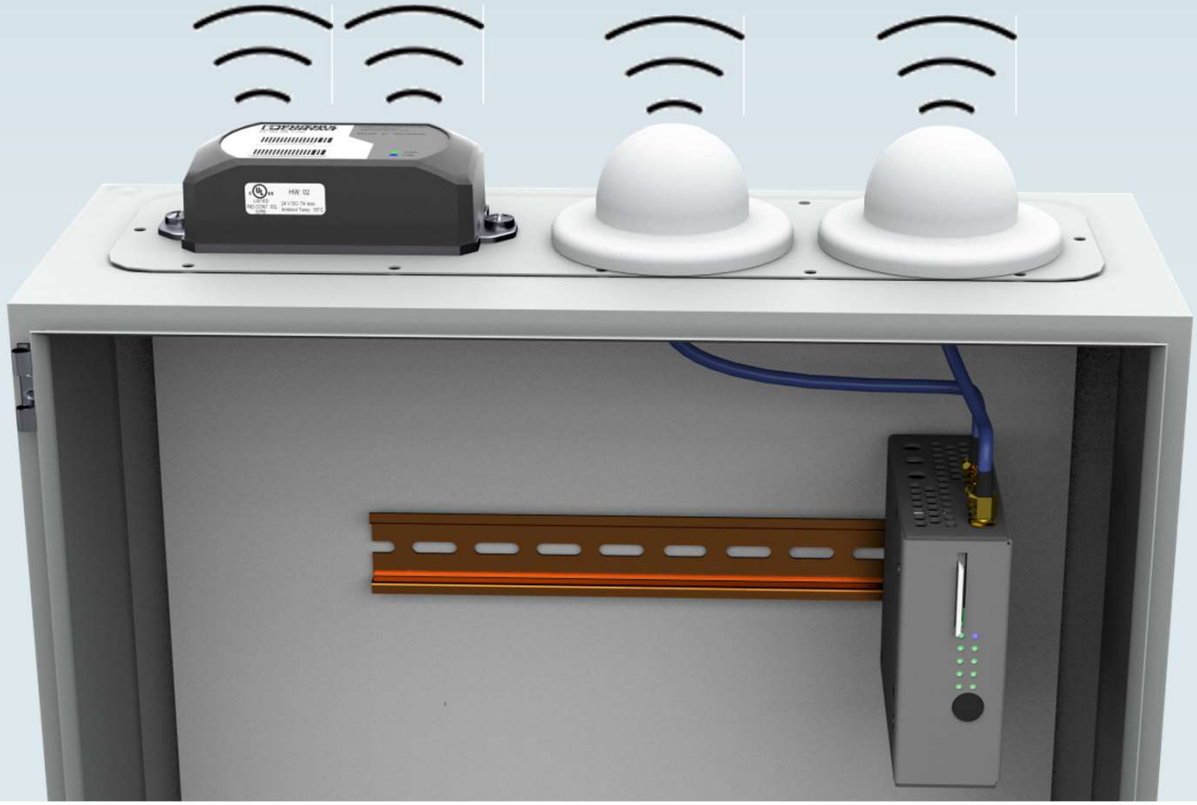
PHOENIX CONTACT
INSPIRING INNOVATIONS

Industrial WLAN

Product overview

INSPIRING INNOVATIONS

Industrial WLAN



Product overview

PHOENIX CONTACT
INSPIRING INNOVATIONS

Industrial WLAN

	FL WLAN 5110 (Europe)	FL WLAN 5111 (USA, Canada)
Function	Wireless access point an client	
Antenna	2 x external Antennas (not included in scope of supply) with MIMO technology	
Wireless standard	IEEE 802.11 a/b/g/n	
Frequency band	2,4 and 5 GHz	
Connection type	RJ45	
Degree of protection	IP20	
Temperature range	-40 °C … 60 °C	
Order number	1043193	1043201

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INSPIRING INNOVATIONS

Industrial WLAN

	 FL WLAN 1100 (Europe)	 FL WLAN 1101 (USA, Canada)	 FL WLAN 2100 (Europe)	 FL WLAN 2101 (USA, Canada)
Function	Wireless access point and client		Wireless access point and client	
Antenna	2 x integrated Antennas with MIMO technology		2 x integrated Antennas with MIMO technology	
Wireless standard	IEEE 802.11 a/b/g/n		IEEE 802.11 a/b/g/n	
Frequency band	2,4 and 5 GHz		2,4 and 5 GHz	
Connection type	RJ45		RJ45	
Degree of protection	IP54 above, IP20 below		IP66/68 above, IP20 below	
Temperature range	0 °C ... 60 °C		-40 °C … 60 °C	
Order number	2702534	2702538	2702535	2702540

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INSPIRING INNOVATIONS

Industrial Bluetooth and WLAN

	FL EPA 2 (WLAN Mode)	FL EPA 2 RSMA (WLAN Mode)
Function	Combined Ethernet wireless module with Bluetooth and WLAN	Combined Ethernet wireless module with Bluetooth and WLAN
Antenna	Internal antenna	Omnidirectional antenna supplied as standard
Frequency band	2,4 and 5 GHz	2,4 and 5 GHz
Connection type	M12 connection	M12 connection
Degree of protection	IP65	IP65
Temperature range	-40 °C … 65 °C	-40 °C … 65 °C
Order number	1005955	1005957

Industrial WLAN Rugged Box

	FL RUGGED BOX	FL RUGGED BOX OMNI-1	FL RUGGED BOX OMNI-2	FL RUGGED BOX DIR-1
Included	incl. mounting rail, plugs and screw connections, without WLAN devices	incl. three omnidirectional antennas 2,4 / 5 GHz, which can be screwed on directly, with mounting rail, plugs and screw connections, without WLAN devices	incl. three omnidirectional antennas 2.4 / 5 GHz, with mounting rail, plugs and screw connections, with power supply 100 ... 240 V, without WLAN devices	incl. directional antenna and antenna cable 3 m for 2.4 / 5 GHz, with mounting rail, plugs and screw connections, with power supply 100 ... 240 V, without WLAN devices
Degree of protection	IP66			
Dimension	25 x 18 x 13 cm			
Material	Polycarbonat			
Order number	2701204	2701430	2701439	2701440

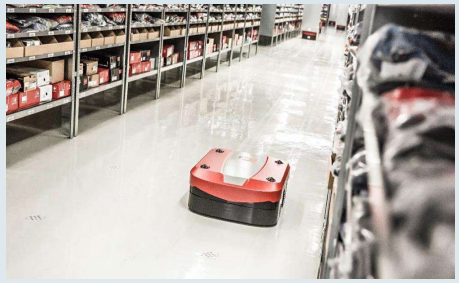
INSPIRING INNOVATIONS

Industrial WLAN – exemplary applications

Water / Wastewater

Wireless machine access with smart devices

Warehouse logistics



Flexible autonomous transport systems in intralogistics

New products 2019

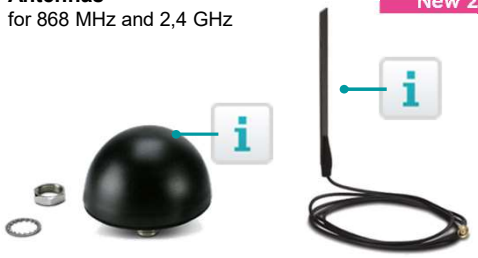
Radioline Outdoorbox
For use in America
New 2019

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

PHOENIX CONTACT
INSPIRING INNOVATIONS

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

868 MHz vandalism antenna

New 2019

- ☑ Direct installation on switch cabinets
- ☑ Robust impact-proof outdoor housing
- ☑ Splash water and UV resistant
- ☑ Wall or pole mounting via accessories

Main features

- Frequency range: 868 ... 870 MHz
- Gain: 2.5 dBi
- Protection class: IP67
- Impact- proof: IK 08
- Connector: N (female)

Order information

- ANT-OMNI-VAN-868-01
- Order No.: 1090616

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

Service & Support

- **Professional path study**
  Give us the coordinates of the stations to be networked, we check the feasibility for you
- **Configuration and start-up**
  We help you put your network into operation and show you how to increase performance
- **Maintenance and support**
  We assist you with troubleshooting and provide assistance and recommendations
- **Trainings and workshops**
  We offer individually tailored training courses

PHOENIX CONTACT
INSPIRING INNOVATIONS

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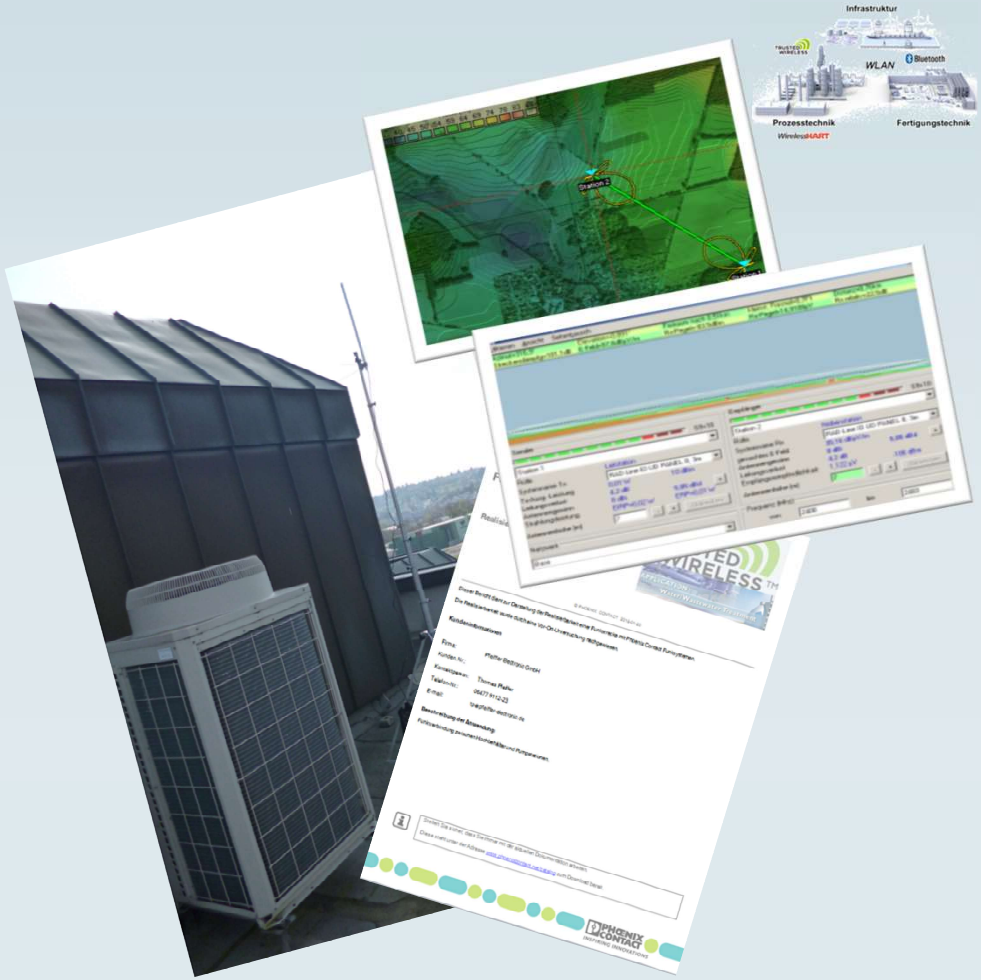


INSPIRING INNOVATIONS

Planning

Determination of basic conditions

- Type of interface (I/O, RS-232 /485/422)
- Data protocol (e.g. Modbus, Profibus, SC1000)
- Number of network nodes (end devices)
- Maximum allowable response time (a few ms or s)
- Maximum distance or geographic location of the stations (GPS coordinates)

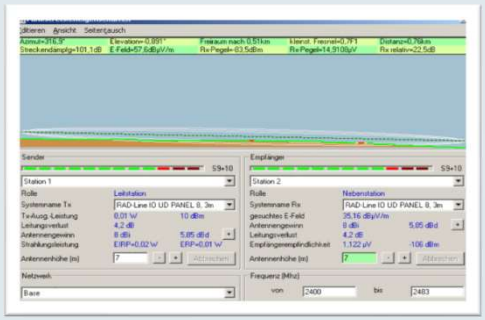
Feasability analysis

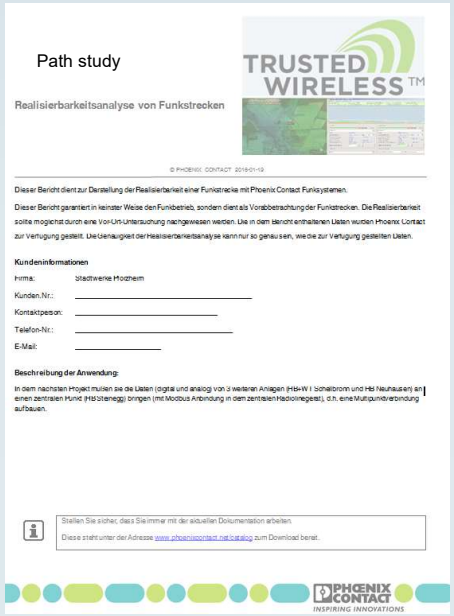
- Wireless path study with special planning software based on the provided coordinates

Feasibility test on site

- Optional: On-site feasibility check if analysis is not clear

Feasability analysis





Path study

Realisierbarkeitsanalyse von Funkstrecken

TRUSTED WIRELESS™

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Dieser Bericht dient zur Darstellung der Realisierbarkeit einer Funkstrecke mit Phoenix Contact Funksystemen.

Dieser Bericht garantiert in keinster Weise den Funkbetrieb, sondern dient als Vorabbetrachtung der Funkstrecken. Die Realisierbarkeit sollte möglichst durch eine Vor-Ort-Untersuchung nachgewiesen werden. Die in dem Bericht enthaltenen Daten wurden Phoenix Contact zur Verfügung gestellt. Die Genauigkeit der Realisierbarkeitsanalyse kann nur so genau sein, wie die zur Verfügung gestellten Daten.

Kundeninformationen

Firma: Stadtwerke Hirzheim

Kunden.Nr.: _____

Kontaktperson: _____

Telefon-Nr.: _____

E-Mail: _____

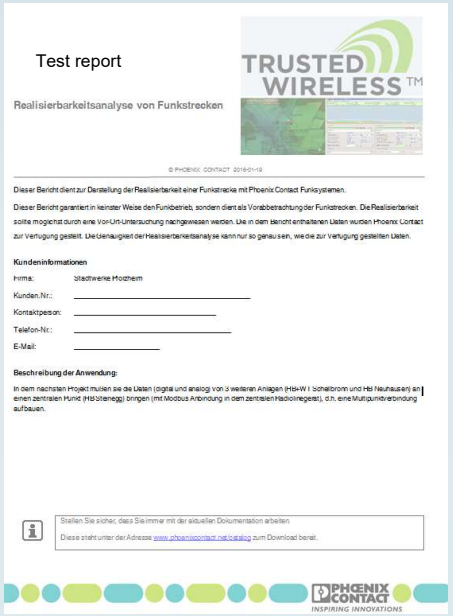
Beschreibung der Anwendung:

In dem nächsten Projekt müssen sie die Daten (digital und analog) von 3 weiteren Anlagen (Hbf+W I Schellbronn und Hbf Neuhausen) an einen zentralen Hund (Hbf Steinegg) bringen (mit Modbus Anbindung in dem zentralen Hadioline gate), d.h. eine Multipunktverbindung aufbauen.

Stellen Sie sicher, dass Sie immer mit der aktuellen Dokumentation arbeiten.
Diese steht unter der Adresse www.phoenixcontact.net/catalog zum Download bereit.

PHOENIX CONTACT INSPIRING INNOVATIONS

Feasability test



Test report

Realisierbarkeitsanalyse von Funkstrecken

TRUSTED WIRELESS™

© PHOENIX CONTACT 2016-01-19

Dieser Bericht dient zur Darstellung der Realisierbarkeit einer Funkstrecke mit Phoenix Contact Funksystemen.

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Kundeninformationen

Firma: Stadtwerke Hrozheim

Kunden.Nr.: _____

Kontaktperson: _____

Telefon-Nr.: _____

E-Mail: _____

Beschreibung der Anwendung:

In dem nächsten Projekt müssen sie die Daten (digital und analog) von 3 weiteren Anlagen (Hbf-W I. Schelbronn und Hbf Neuhausen) an einen zentralen Punkt (Hbf-Steinegg) bringen (mit Modbus Anbindung in dem zentralen Radiolinegerät), d.h. eine Multipunktverbindung aufbauen.

Stellen Sie sicher, dass Sie immer mit der aktuellen Dokumentation arbeiten.
Diese steht unter der Adresse www.phoenixcontact.net/catalog zum Download bereit.

PHOENIX CONTACT INSPIRING INNOVATIONS

Feasability test forest
Feasability test city
Feasability test tunnel

Feasability test forest

760 m

Waterworks
- 868 MHz (Master)
- 9,6 kbps
- 8 dBi Yagi

Obstacles
- spruce forest

Water supply well
- 868 MHz (Slave)
- 9,6 kbps
- 8 dBi Yagi

INSPIRING INNOVATIONS

Feasability test city

Wastewater treatment plant
- 868 MHz (Master)
- 9,6 kbps
- 12 dBi Yagi

Obstacles
- Trees
- Buildings
- A44 bridge

Pump station
- 868 MHz (Slave)
- 9,6 kbps
- 4 dBi OMNI

INSPIRING INNOVATIONS

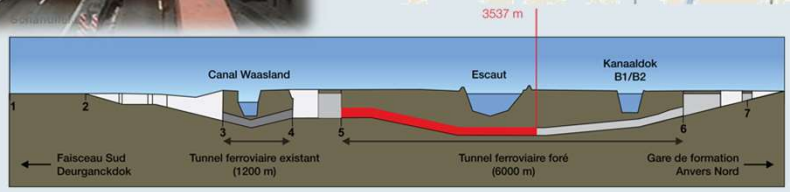
Feasability test tunnel

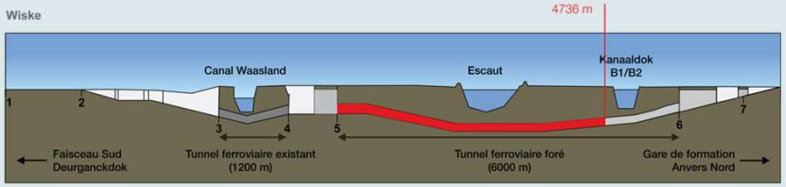
Tunnel information:

- Length ca. 1400 m
- 4 roads each 3,75 m width
- Hight ca. 5 m
- No lign of sight

Test results:

- RSSI Signal 2,4 GHz: 1,3 V (OMNI)
  2,5 V (PANEL)
- RSSI Signal 868 MHz: 2,3 V (OMNI)
  2,9 V (PANEL)





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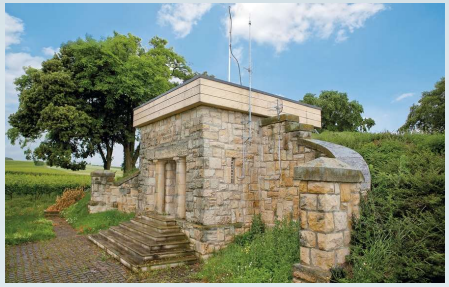
INSPIRING INNOVATIONS

Successfully implemented customer projects



Water supply

Wastewater disposal

Process automation

Oil & Gas

Power generation / distribution

Transportation infrastructure

Machine building

Warehouse logistics

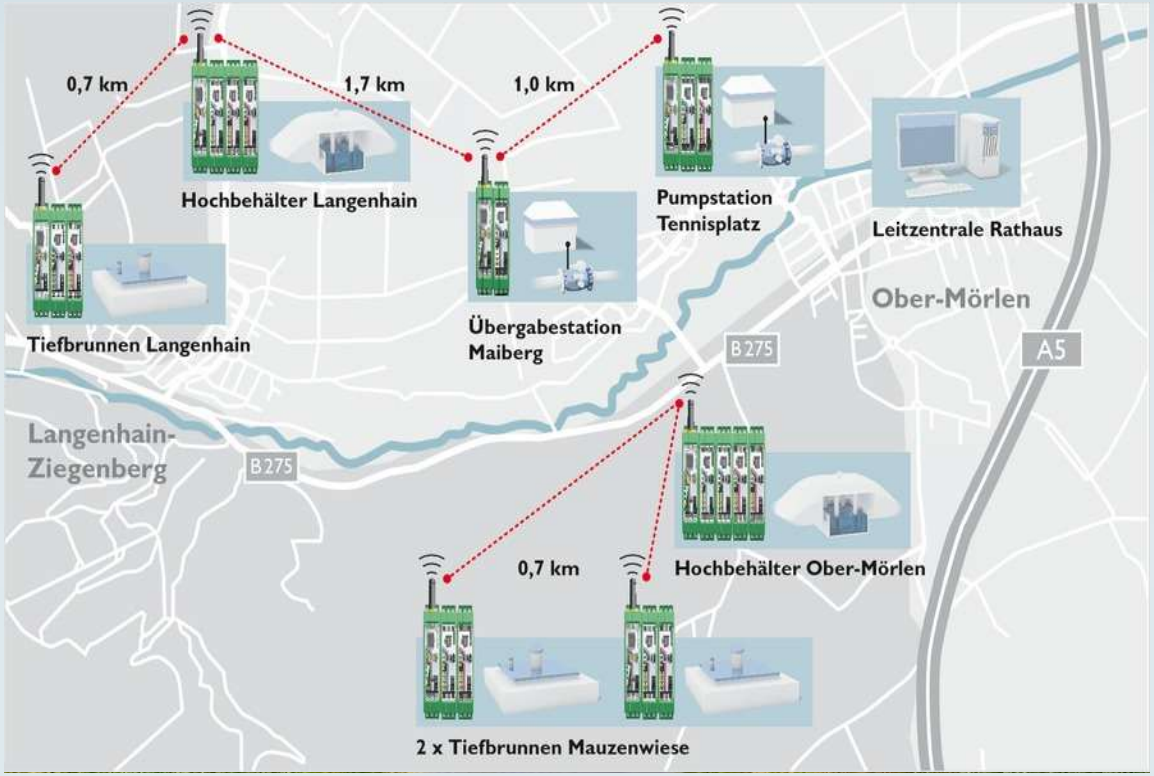
PHOENIX CONTACT
INSPIRING INNOVATIONS

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.

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.

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.

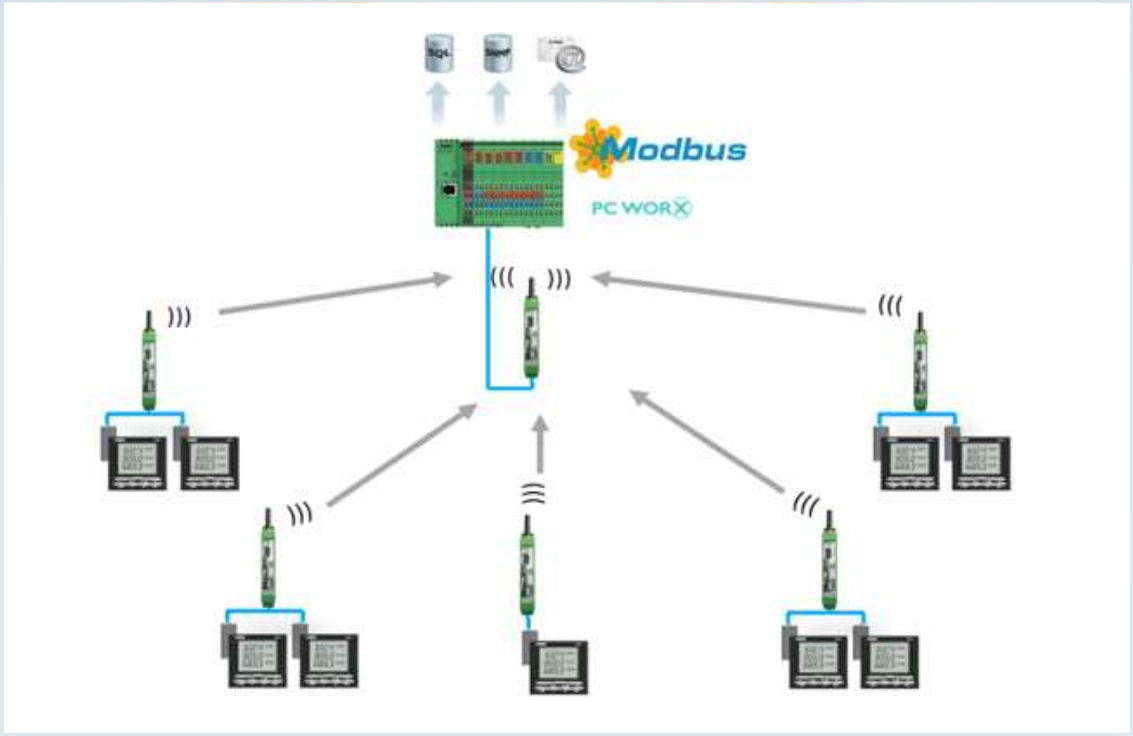
Foundry MPG Mendener Präzisionsrohr

"By using the wireless solutions, we were able to replace the interference-prone cable drums and saved a lot of money“, sums up Thomas Vos from Bregar Systems Engineering.

At MPG, the metals to be melted are transported to the furnace via charging trolleys.

With the Wireless MUX, the signals are sent from the charging trolley to the central machine control.

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.

Glas 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.

Glas 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.

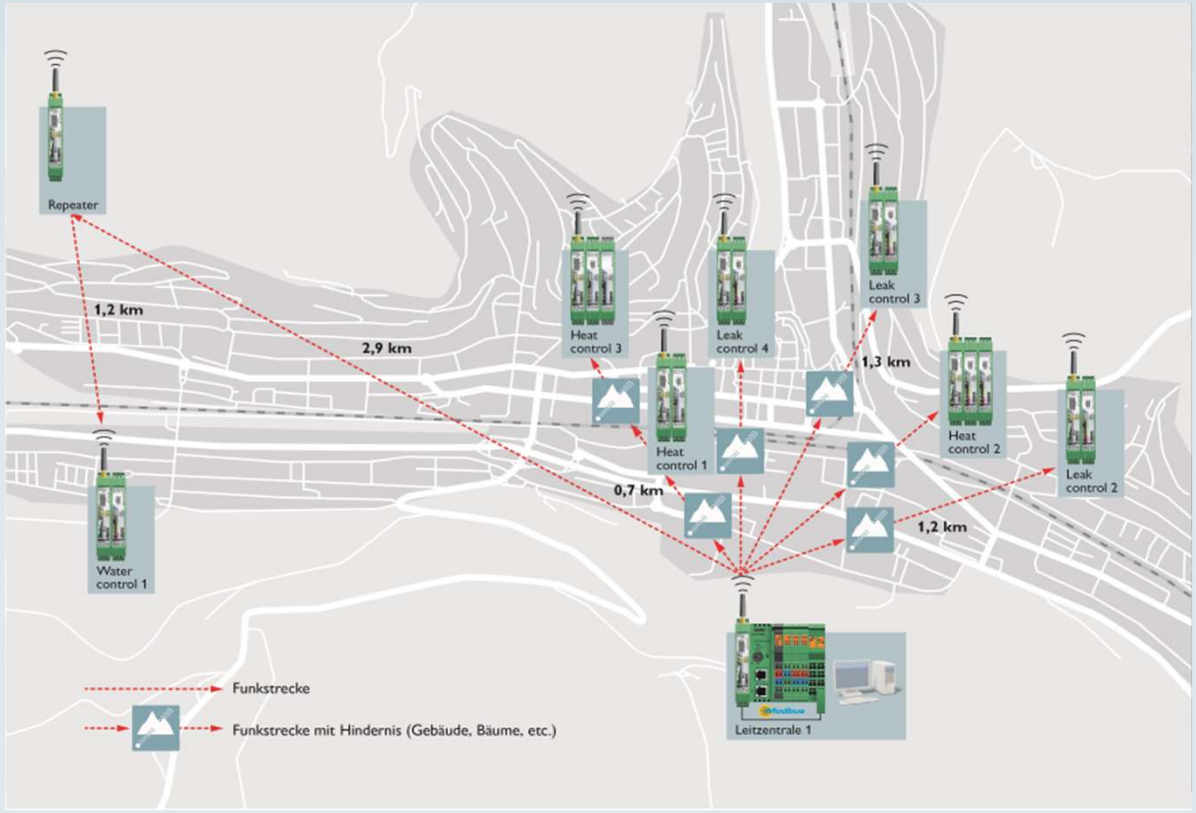
RWE power plant Westfalen

In extensive infrastructure facilities, data often has to be transmitted from remote outstations to the control center.

In this way, the measured values recorded for documentation can be easily and economically transferred to the control system.

For this purpose, RWE uses the industrial wireless system Radioline from Phoenix Contact.

Leakage monitoring „Albstadtwerke“

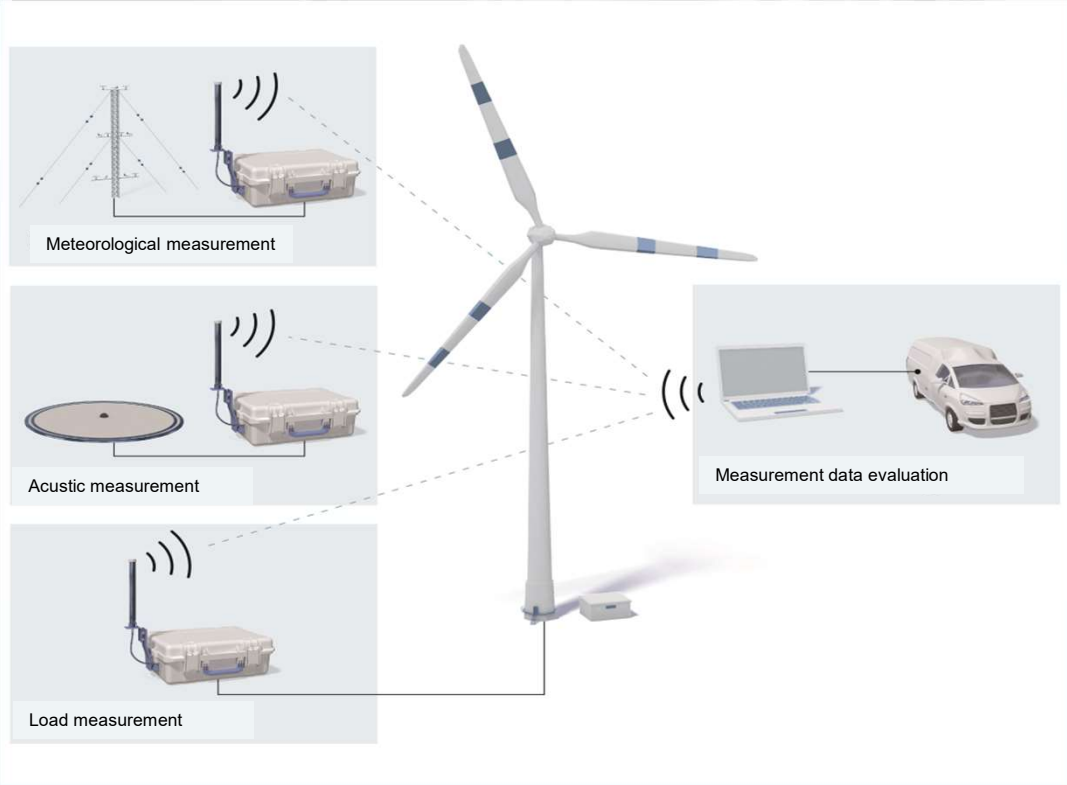


"New underground cables could not be laid due to the available budget and local conditions. A mobile communication solution was also out of the question, since we need to be able to exert influence in the event of a fault”, sums up Thomas Haas.

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.

Generation plants certification - MOE

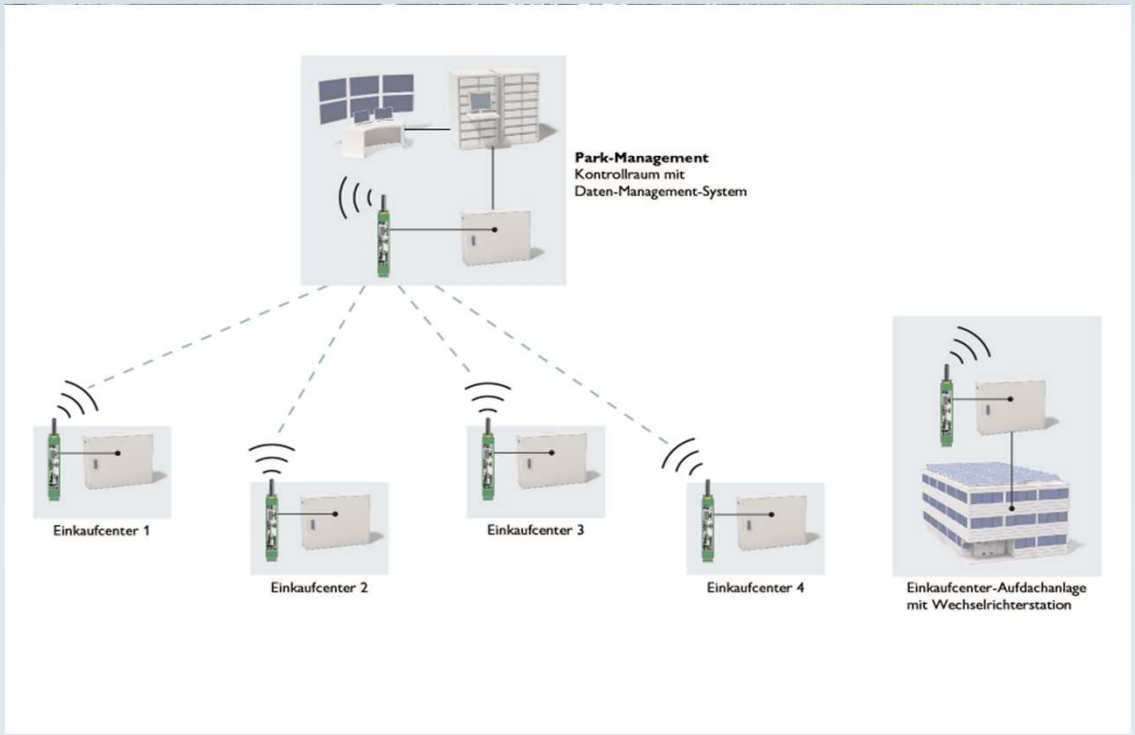


"By using the autonomous wireless measuring boxes, we save a lot of wiring time during installation“, sums up Christoph Thiel from Moeller Operating Engineering GmbH.

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.

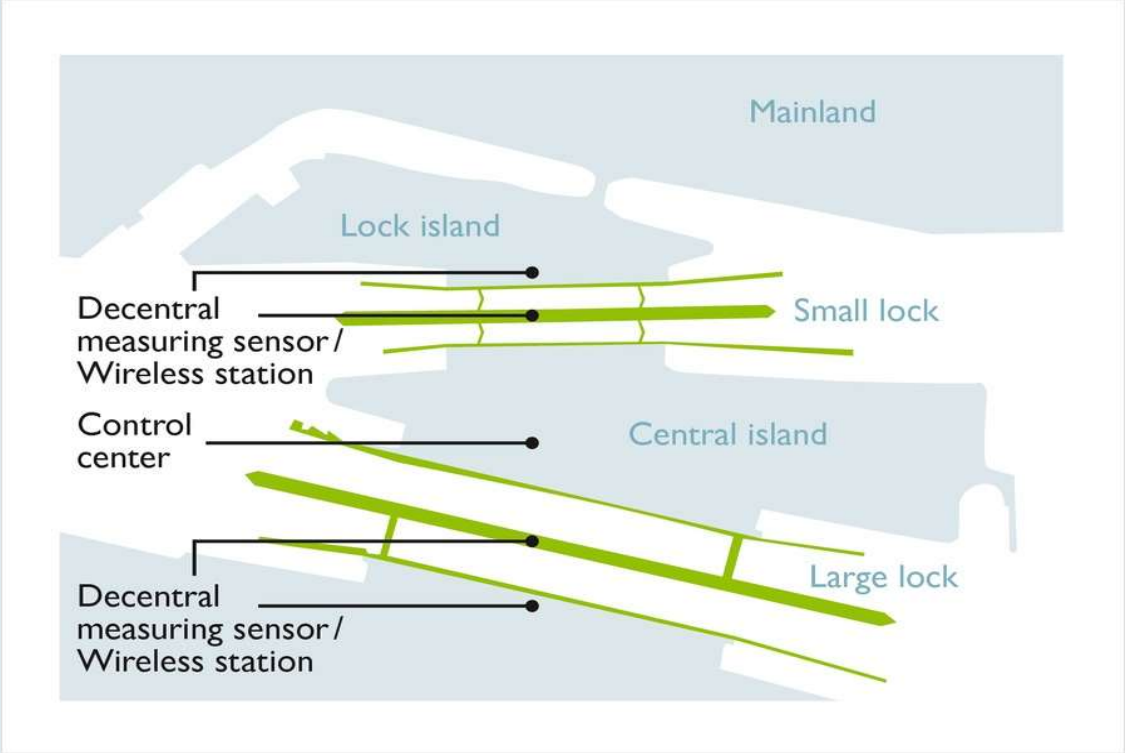
Lighting Gent-Terneuzen canal

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.

Packaging machines from Haloila

"The previous design of the Octopus machines has significantly reduced the data transmission between the actuators of the control system and the actuators in the moving parts," sums up Janne Koskela.

The wireless modules FL BT EPA provide a reliable and wear-free solution for the communication between central control and rotating machine parts.

Automation of transport systems

Industrial wireless systems are the solution for reliable communication between the central control system and the shuttle.

Fast roaming, real-time communication between controller and carry, and sufficient reserve even for data-intensive applications, are just some of the advantages of intralogistics 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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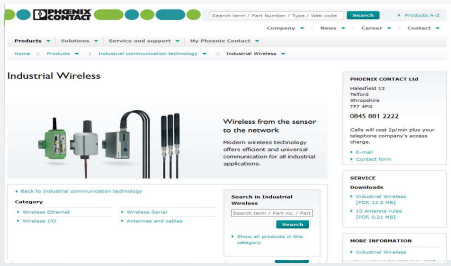
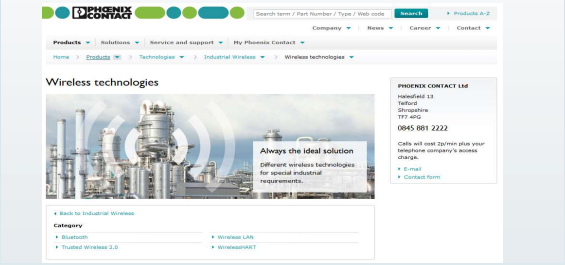
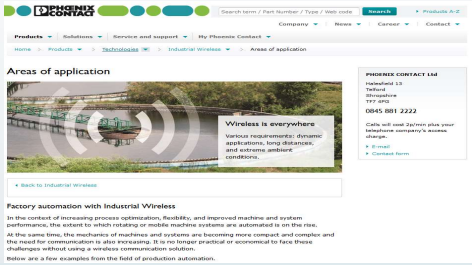
Further information on the homepage



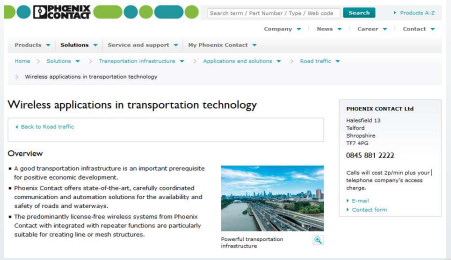
Product information



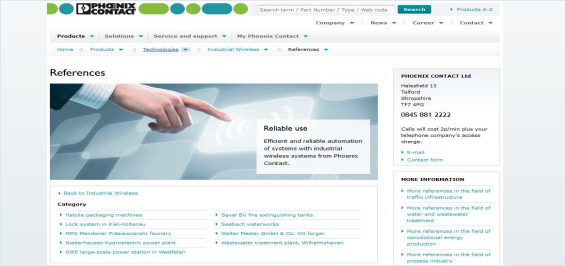
Technology informations



Applications



Solutions



References

PC World (internal)

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