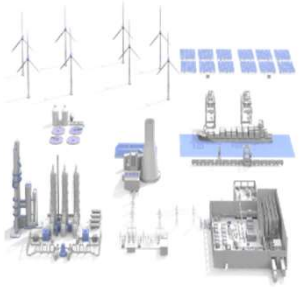
Communication Interfaces – Overview 2021

Products



Application references

NearFi Technology
Designed by Phoenix Contact

PROFIBUS

TRUSTED WIRELESS

Technologies

PoE

HART

5G

"PAVE THE WAY FOR FUTURE BUSINESS"
by addressing relevant trends

SPE & APL

5G

TSN

OPC UA

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Communication Interfaces - Our product portfolio

Fieldbus Communication

Ethernet Infrastructure

Smart Camera Box

new

Wireless

new

Remote Communication

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Fieldbus Communication 1

Converter
Isolator

Repeater
Segment
Coupler

Fast
connectors
(SUBCON)

Fiber optic
converter

Modular hub

Extender
Serial/Profibus

Protocol
converter

Radioline
Multipoint-
Multiplexer

Terminator
resistor

Fieldbus
Communication 2

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Fieldbus Communication 2

Serial Device Server / Gateways

Foundation fieldbus Power

Fieldbus Device Coupler Zone 2

Fieldbus Device Coupler Zone 2

Fieldbus Device Coupler Zone 1

Fieldbus Device Terminal box

Profibus DP/PA Converter

Profibus PA I/O Multiplexer

Ethernet HART Multiplexer

Fieldbus Communication 1

Ethernet Infrastructure

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Ethernet Infrastructure

Ethernet Extender

Media Converter

Ethernet Isolator

Ethernet HART Multiplexer

Patch Panel

PoE Injector

Serial Device Server / Gateways

Data connectors

TIME SERVER

Fieldbus communication 2

Wireless

INSPIRING INNOVATIONS

Wireless

Ethernet Infrastructure

Remote communication

Radioline

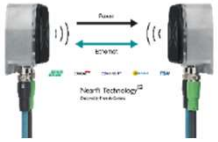
Wireless Multiplexer

Essential Wireless

Radioline Outdoor solution

WLAN 5110

WLAN 1100 / 2100



new

NearFi

Energy and data coupler

new

Bluetooth LowEnergy

new

WLAN 1010 / 2010

Bluetooth EPA

Remote communication

TC Mobile I/O

TC MGuard

new

TC Router

new

TC Cloud Client

mGuard Secure Remote Service

Wireless

Technologies

Technologies

HART Technology

PoE Power over Ethernet

TRUSTED WIRELESS

Remote communication

PROFIBUS

5G

new

NearFi Technology
Designed by Phoenix Contact

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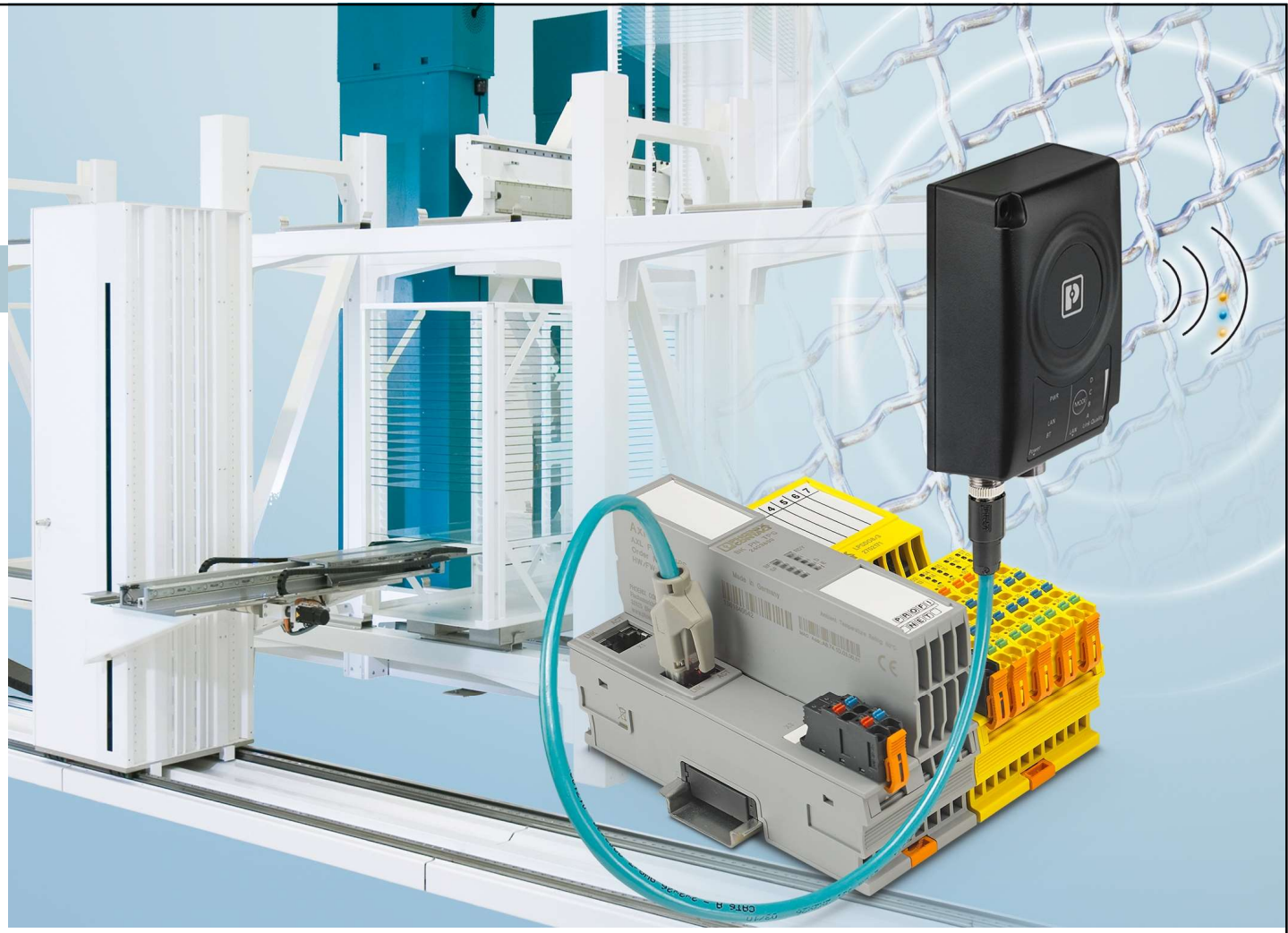
INSPIRING INNOVATIONS

- Bluetooth
- Bluetooth low energy
- Products
- Applications



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Bluetooth

- Origen

H (✱) + B (ᛒ) =

Bluetooth

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Wireless

	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
Spread method	FHSS	DSSS	FHSS	FHSS and DSSS
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
Security	AES 128 bit	AES, WPA2, WPS2/PSK, Authentification	AES 128 bit, Authentification	AES 128 bit, Authentification
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)	<= 150 m	<= 150 m	<= 5 km (2,4 GHz) <= 20 km (868 MHz) <= 32 km (900 MHz)	<= 250 m

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Standard´s

Bluetooth

- Standard

Standard	Function
Bluetooth 1.0a	First published specification (June 1999)
Bluetooth 1.0b	Amendment (December 1999)
Bluetooth 1.1	Stricter guidelines ensure that devices from different manufactures are able to connect to each other new profile (December 2000)
IEEE 802.15.1	WPAN standard 802.15.1 approved based on the Bluetooth 1.1 specification (June 2002)
Bluetooth 1.2	Adaptive frequency technique allows coexistence, with WLAN applications, more stable voice transmission new profile (November 2003)
Bluetooth 2.0+EDR	Three-fold higher transmission rate (3 MBit/s instead of 1 MBit/s)

The Bluetooth SIG (**S**pecial **I**nterest **G**roup) consists in the mean time of ca. 2000 members and has worked on developing and publishing the Bluetooth specification since the year of foundation in 1998. The IEEE 802.15 (Wireless Personal Area Networks) standards committee defined and approved the bit transmission and data link layer for Bluetooth networks as a 802.1.15 substandard on the basis of the Bluetooth 1.1 specification in June 2002. Protocol levels above that are stated only in the Bluetooth specifications.

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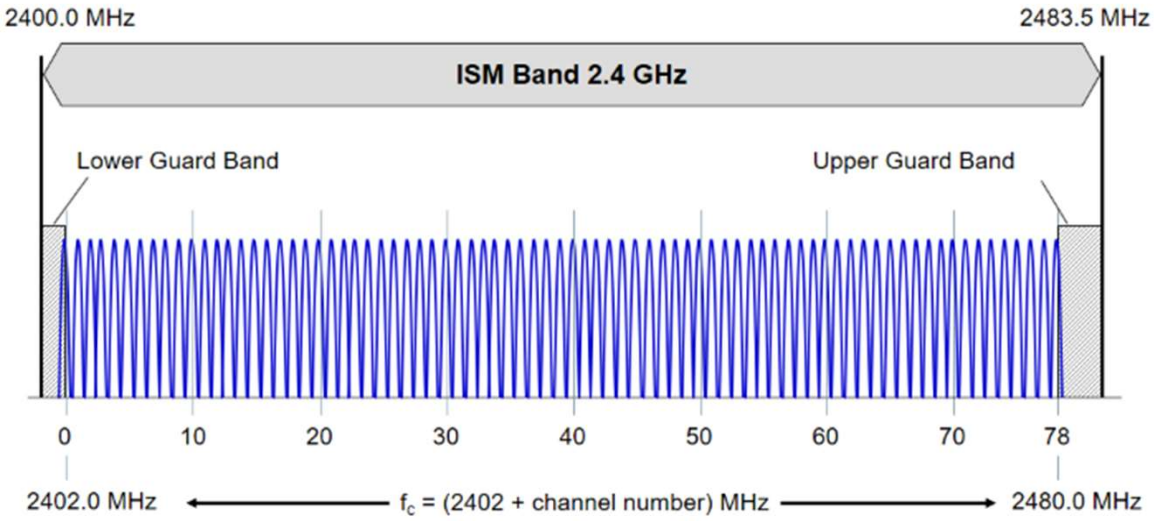
ISM 2.4 GHz

Bluetooth



Bluetooth uses the 2.4-GHz-ISM-Band (2.400 – 2.4835 GHz). This band is split into 79 channels each separated by 1 MHz. The Bluetooth specification defines a protective band at the upper and lower limits of the ISM band, in order to avoid interference with other frequency bands. The so called *Lower Guard Band* has a width of 2 MHz and the *Upper Guard Band* a width of 3.5 MHz. The 2.4-GHz-ISM band is available license-free worldwide albeit in some cases with certain national restrictions.

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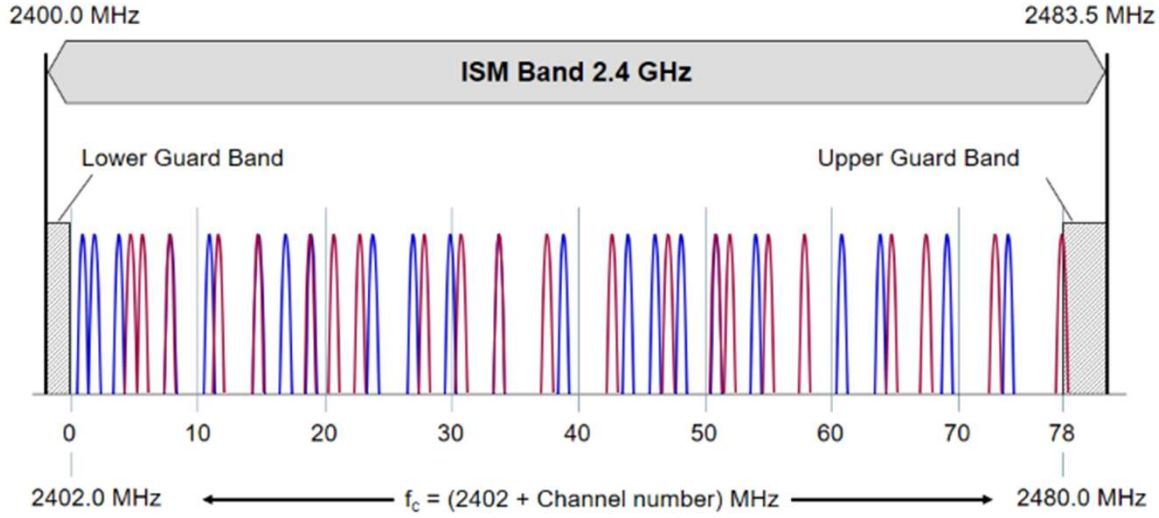
Bluetooth FHSS



Bluetooth uses the Frequency Hopping Spread Spectrum (FHSS) as transmission process. With this a new channel is pseudo randomly selected 1600 times a second from each of the 79 carrier frequencies. Frequency changing (hops) must be carried out simultaneously on both sides of the wireless connection. Each device has a clock for synchronizing the hops which is itself automatically synchronized during establishment of the connection.

The hoping order is different for each Bluetooth network, since it is derived from the network master‘s hardware address and assigned as is the case with Ethernet nodes, only once worldwide.

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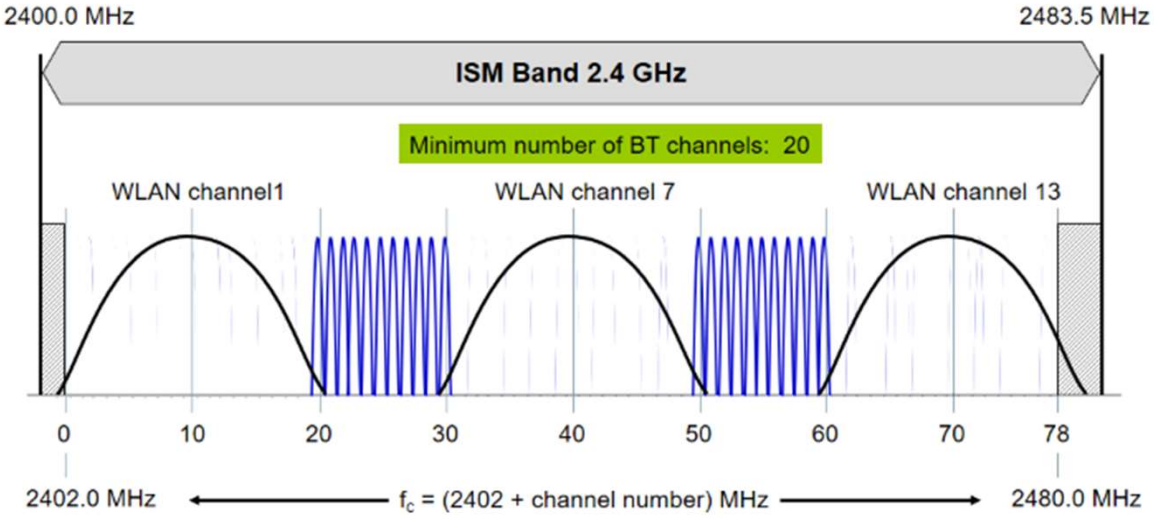
Bluetooth 1.2



Adaptive **F**requency **H**opping (AFH) was defined as part of the Bluetooth 1.2 specification. Those Bluetooth channels that are disturbed by other applications or wireless interference are automatically recognized and not used for transmission. A minimum number of channels to be used is determined for Bluetooth communication. In compliance with the Bluetooth specification 1.2 at least 20 channels from the hopping table must be available.

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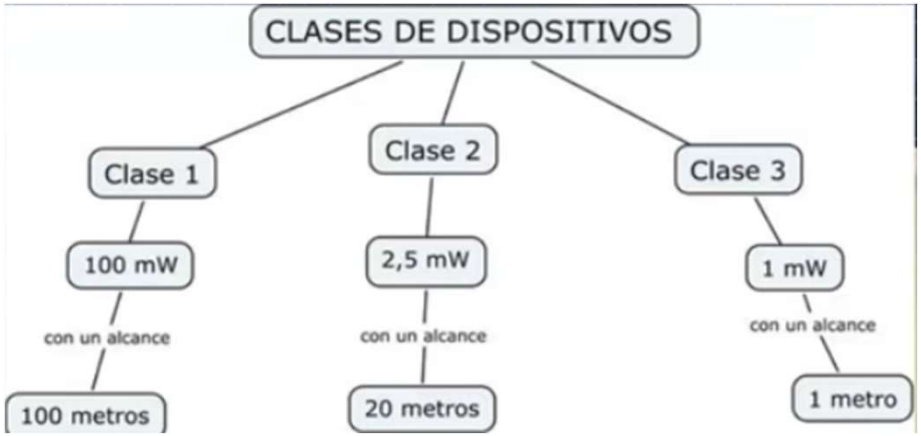
Bluetooth

- Clases existentes

Clase	Potencia máxima permitida (mW)	Potencia máxima permitida (dBm)	Alcance (aproximado)
Clase 1	100 mW	20 dBm	~100 metros
Clase 2	2.5 mW	4 dBm	~5-10 metros
Clase 3	1 mW	0 dBm	~1 metro



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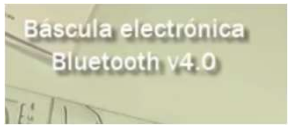
Bluetooth

- Versiones



Versión	Ancho de banda (BW)
Versión 1.2	1 Mbit/s
Versión 2.0 + EDR	3 Mbit/s
Versión 3.0 + HS	24 Mbit/s
Versión 4.0	32 Mbit/s

Versión de Bluetooth	Lanzamiento	Máxima velocidad de trasmisión de datos
Bluetooth 4.0 LE (también: **Bluetooth** smart)	Diciembre de 2009	24 Mb/s
Bluetooth 4.1	Diciembre de 2013	25 Mb/s
Bluetooth 4.2	Diciembre de 2014	25 Mb/s
Bluetooth 5.0	Diciembre de 2016	50 Mb/s

Bluetooth low energy explained by ellisys

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Wireless Multiplexer

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

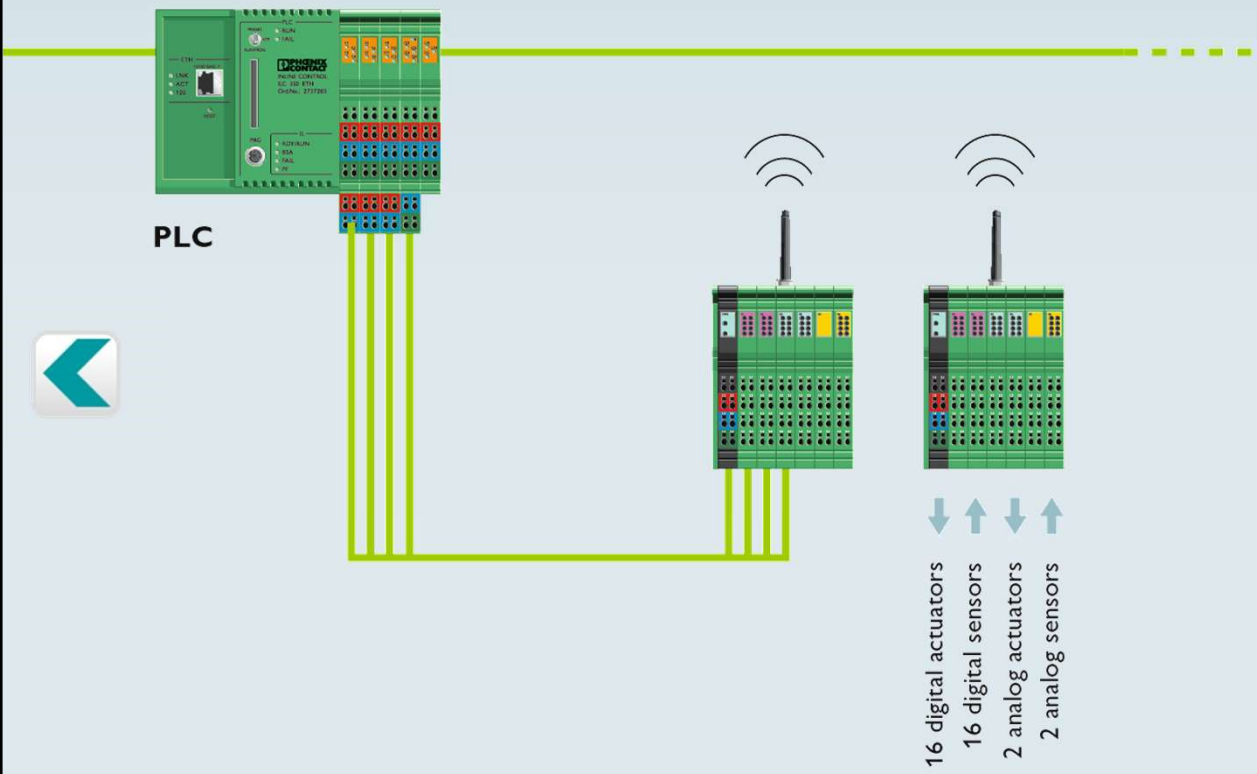
High number of channels in a compact housing

- Analog / digital

Bluetooth 4.0 Low Energy

PHOENIX CONTACT INSPIRING INNOVATIONS

Wireless Multiplexer



- 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 Multiplexer

	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

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Industrial Bluetooth – FL EPA 2

Interference-free parallel operation with WLAN networks

Various application areas

Integrated special antennas for reliable wireless connections

Quick and easy startup

Optimized for operation in PROFINET networks

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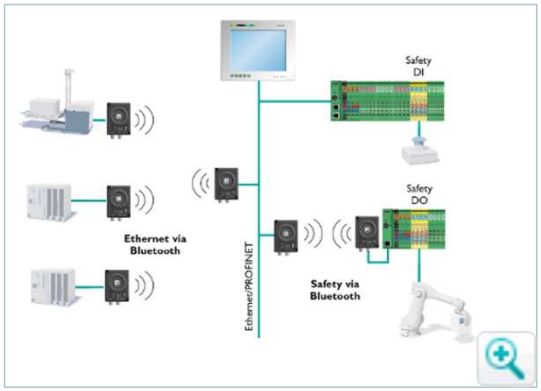
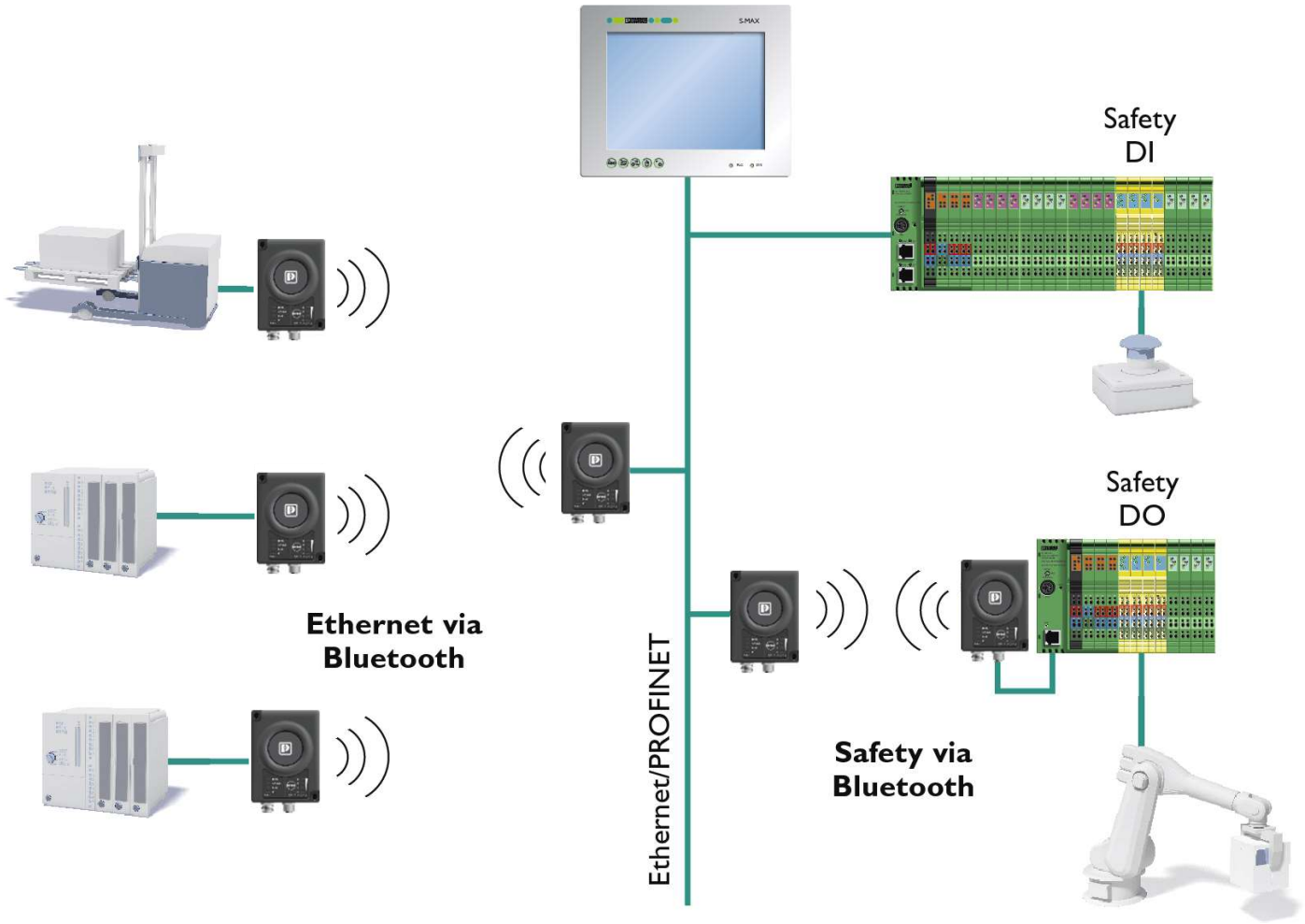
Industrial Bluetooth – FL EPA 2

Various application areas

- Point-to-point connection (Cranes, traveling bridge collectors, robots)
- Multipoint connection (I/O components, scanners, PCs)



INSPIRING INNOVATIONS


Safety
DI
Safety
DO
Ethernet via
Bluetooth
Safety via
Bluetooth
Ethernet/PROFINET

Industrial Bluetooth – FL EPA 2

Interference-free parallel operation with WLAN networks

- Adaptive frequency hopping (AFH)
- Low emission mode (LEM)
- Black channel list (BCL)

Industrial Bluetooth – FL EPA 2

	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

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Industrial Bluetooth

	FL EPA 2 (WLAN Mode)	FL EPA 2 RSMA (WLAN Mode)
Function	Bluetooth Ethernet Client Adapter	Bluetooth Access Point
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

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Industrial Bluetooth – FL BLE 1300

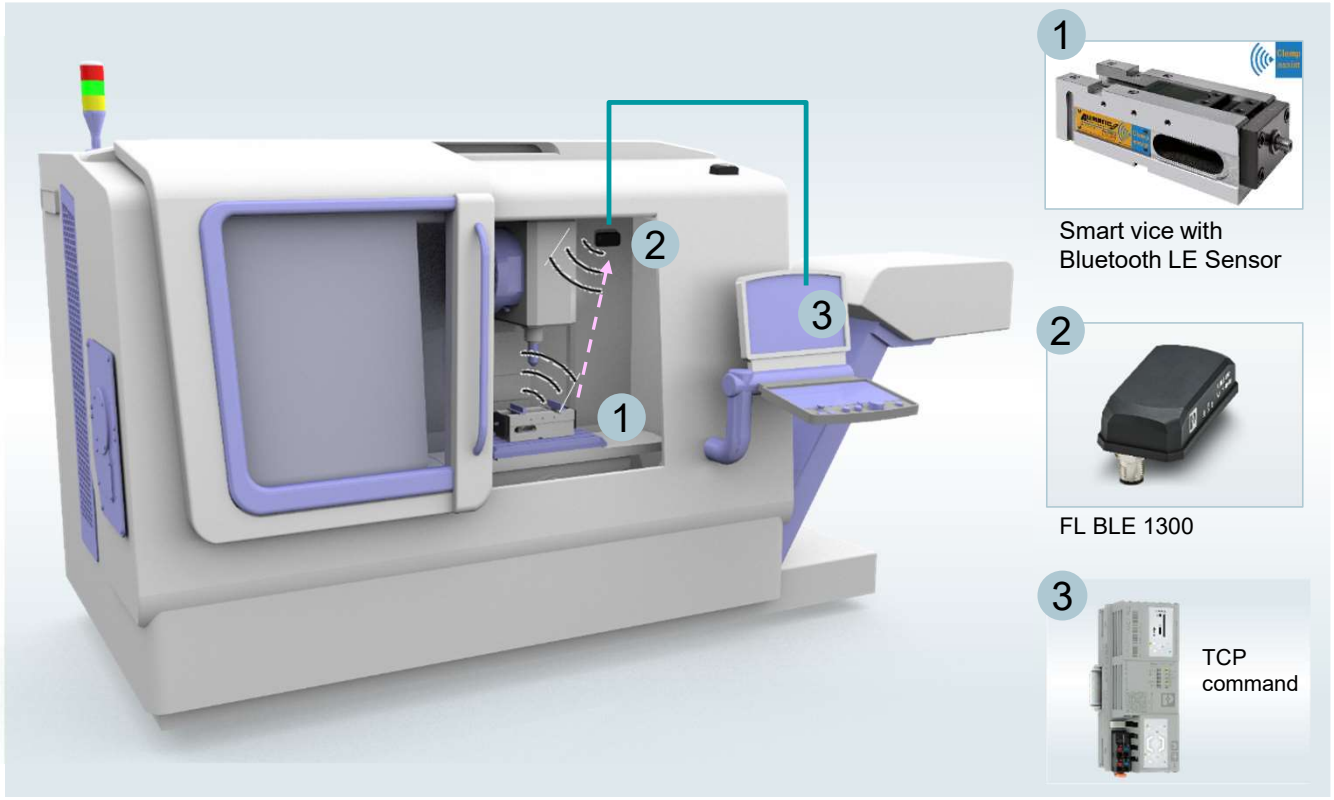
Protection class
IP65

Bluetooth
LowEnergy

GATT

Status LEDs

Up to 8 sensors via TCP



1

Smart vice with
Bluetooth LE Sensor

2

FL BLE 1300

3

TCP
command

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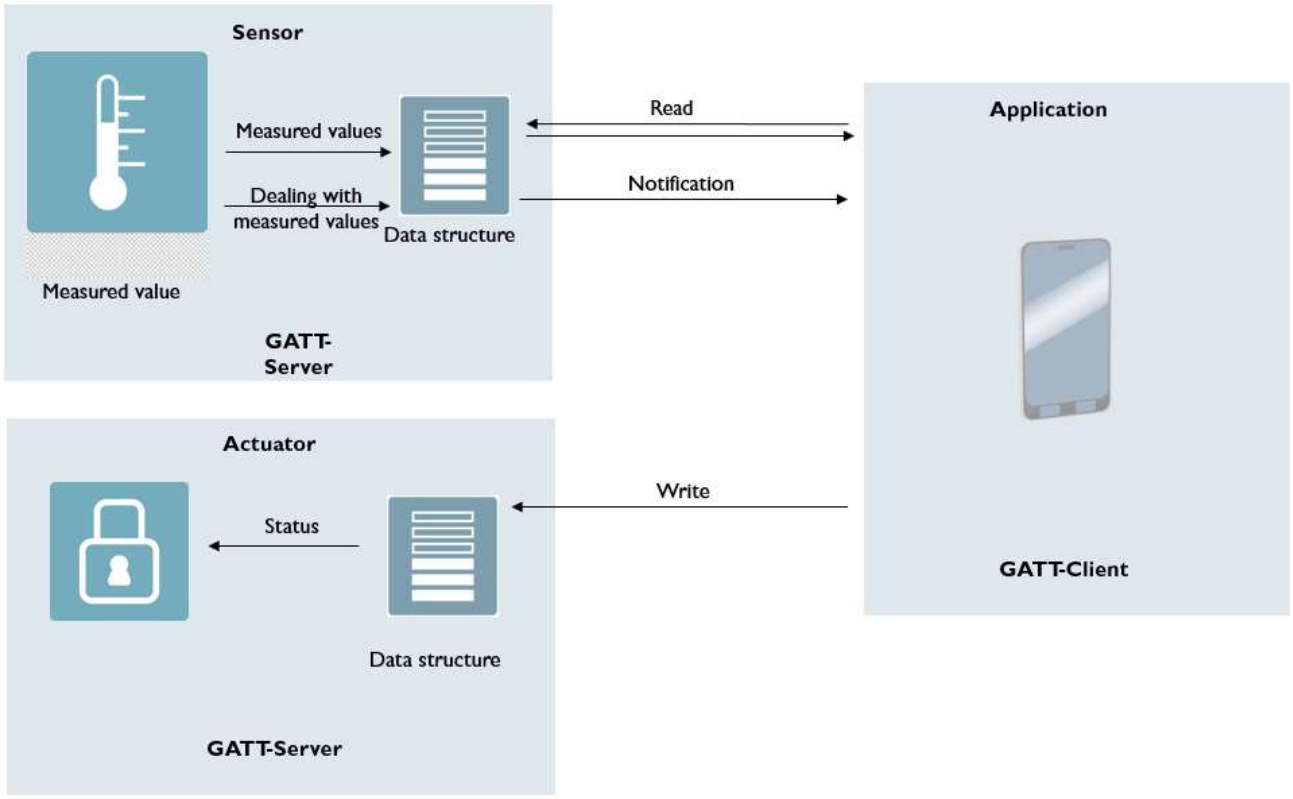
INSPIRING INNOVATIONS


Sensor
Measured values
Dealing with measured values
Data structure
Measured value
GATT-Server
Read
Notification
Application
GATT-Client
Actuator
Status
Write
Data structure
GATT-Server

Industrial Bluetooth – FL BLE 1300

	FL BLE 1300
Function	Bluetooth LE 5.0 wireless module
Antenna	Internal antenna
Frequency band	2,4 GHz
Degree of protection	IP65
Temperature range	-40 °C … 65 °C
Order number	1118418

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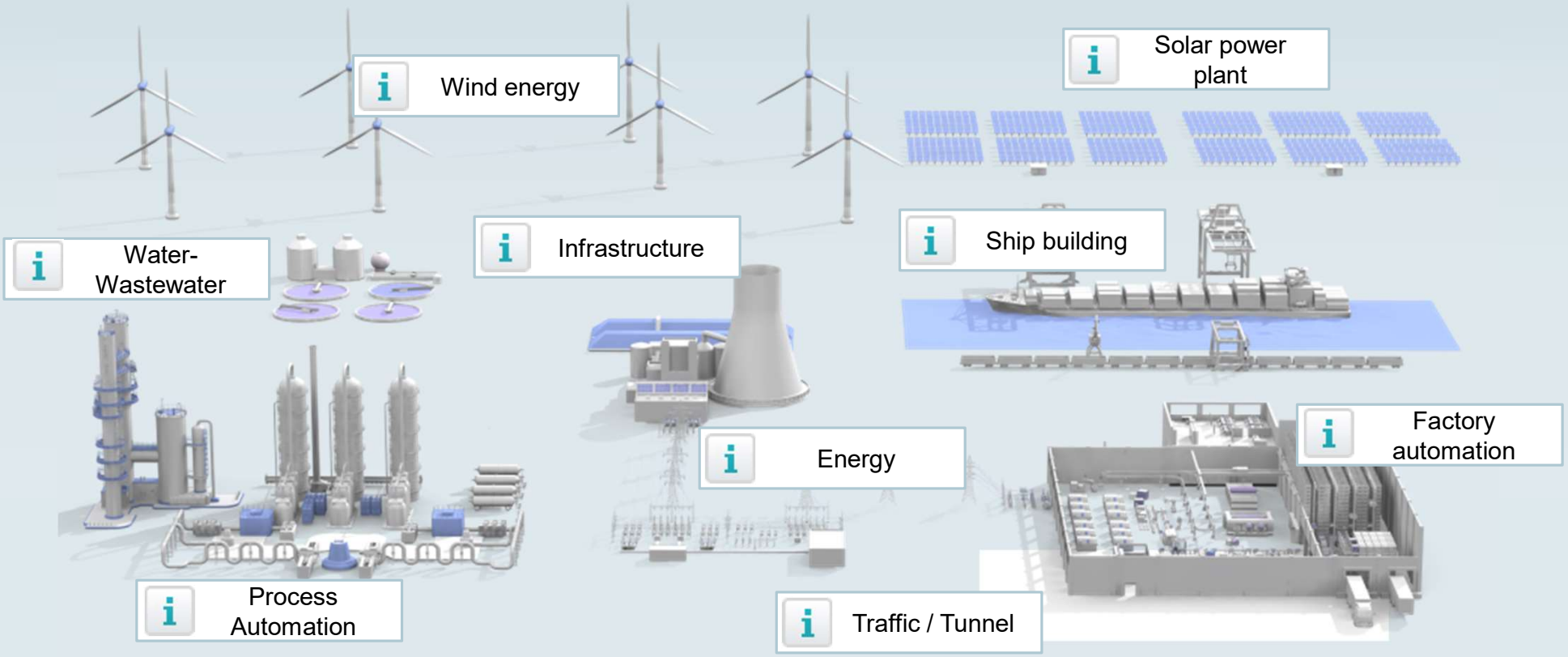
INSPIRING INNOVATIONS

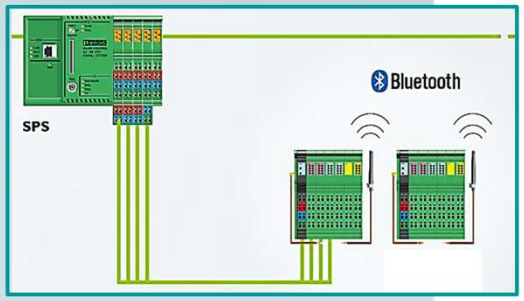
Application references



Bluetooth

Applications

- Range of 50 m - 100 m in industrial halls and over 200 m outdoors
- Transmission time ≥ 10 ms
- 16 digital inputs/outputs
- 2 analog inputs/outputs



Product features

Wireless MUX

It cannot be simpler

- Unpack – connect – switch on

Distances

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

Suitable for time-critical signal transmission

- Transmission time < 10 ms

Diagnose

- Radio link diagnostics via LED bargraph

High number of channel in compact housing

- 16 digital inputs/outputs
- 2 analog inputs/outputs
  - 0-20 mA, 0-10 V

Video

MUX

19…30 V DC
-25…+60°C
UL, FCC, MIC

Bluetooth

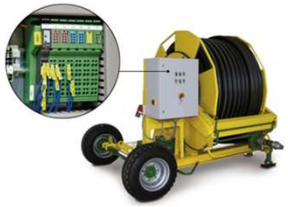
Application

Task: **Crane control**

- Communication between crane and control room

Benefit:

- Easy installation and operation
- Fast wear-free communication between cranes and control room



Task: **Composting machines**

- Switching on and off of the hydraulic motor to the water supply, record flow rate

Benefit:

- License-free wireless solution – no running costs
- Easy integration of existing and new signals in the machine control

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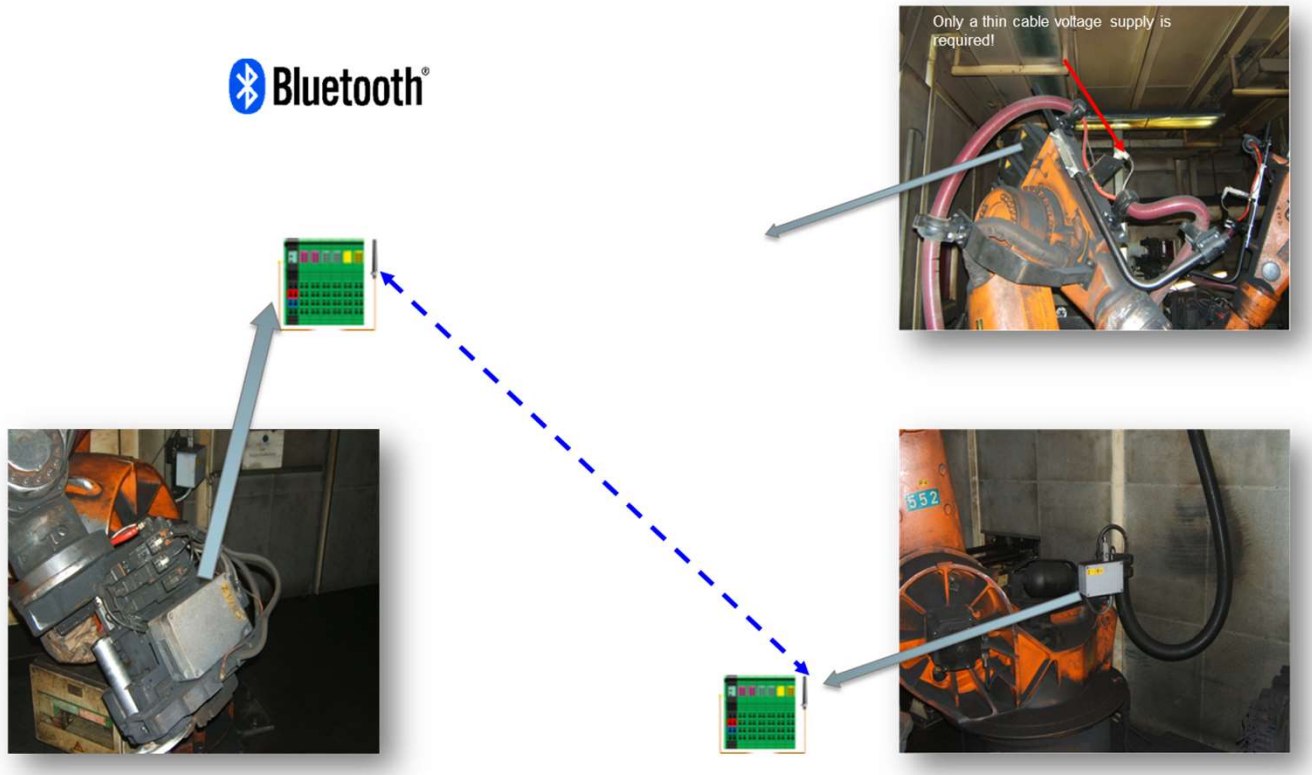
Bluetooth

Application



Bluetooth – Application areas

Slipring replacement

Bluetooth

Wireless Ethernet

Moving machine parts, Packaging and Winding Machines

Cranes

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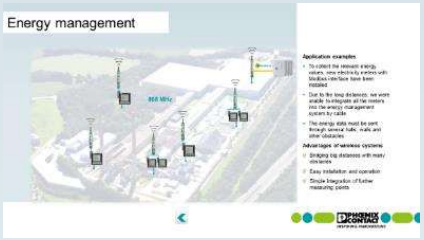
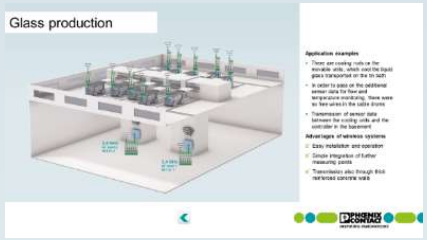
Factory automation applications

Click on image!

Wireless MUX

Radioline





Comserver

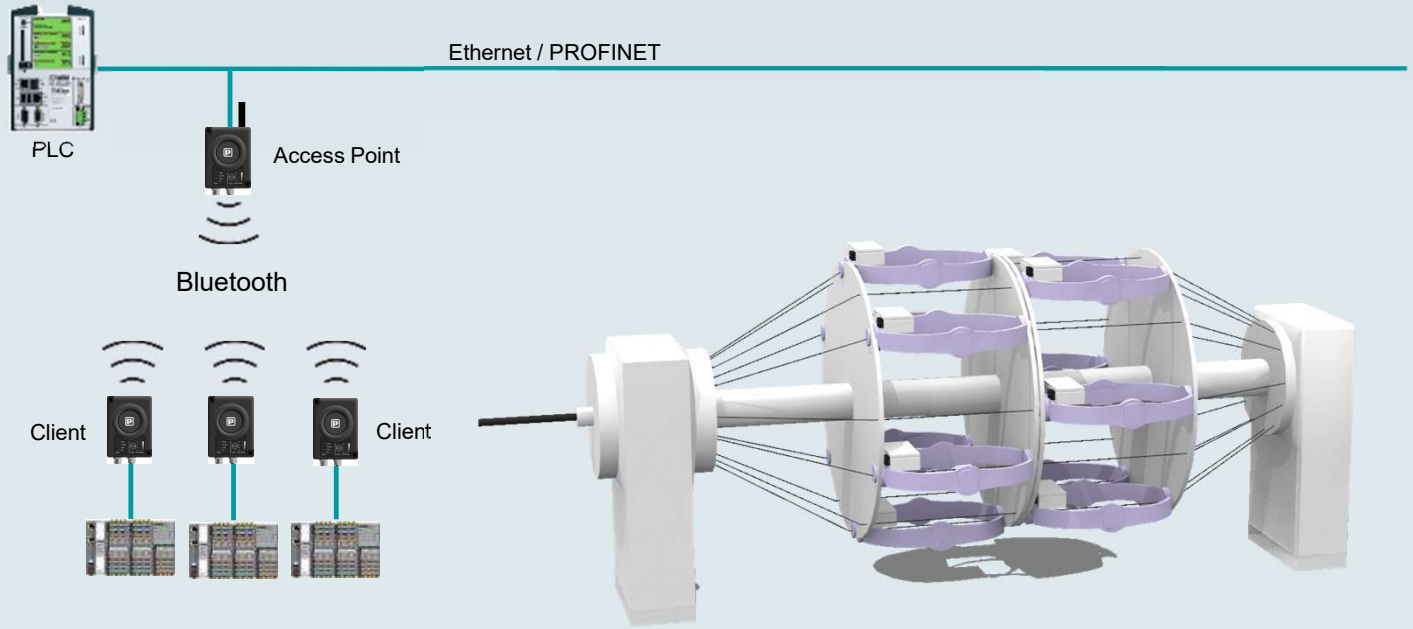
Foundry MPG Mendener Präzisionsrohr

"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.

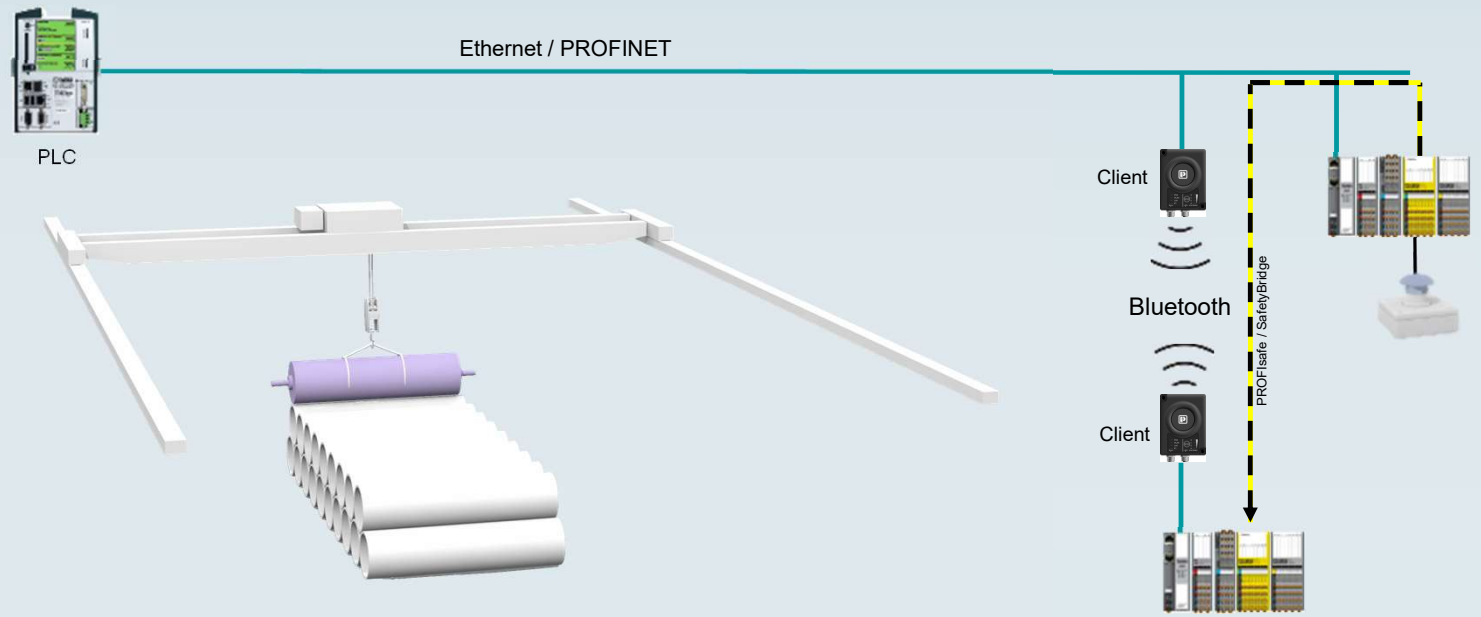
At MPG, the metals to be melted are transported to the furnace via charging trolleys.

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

Moving parts

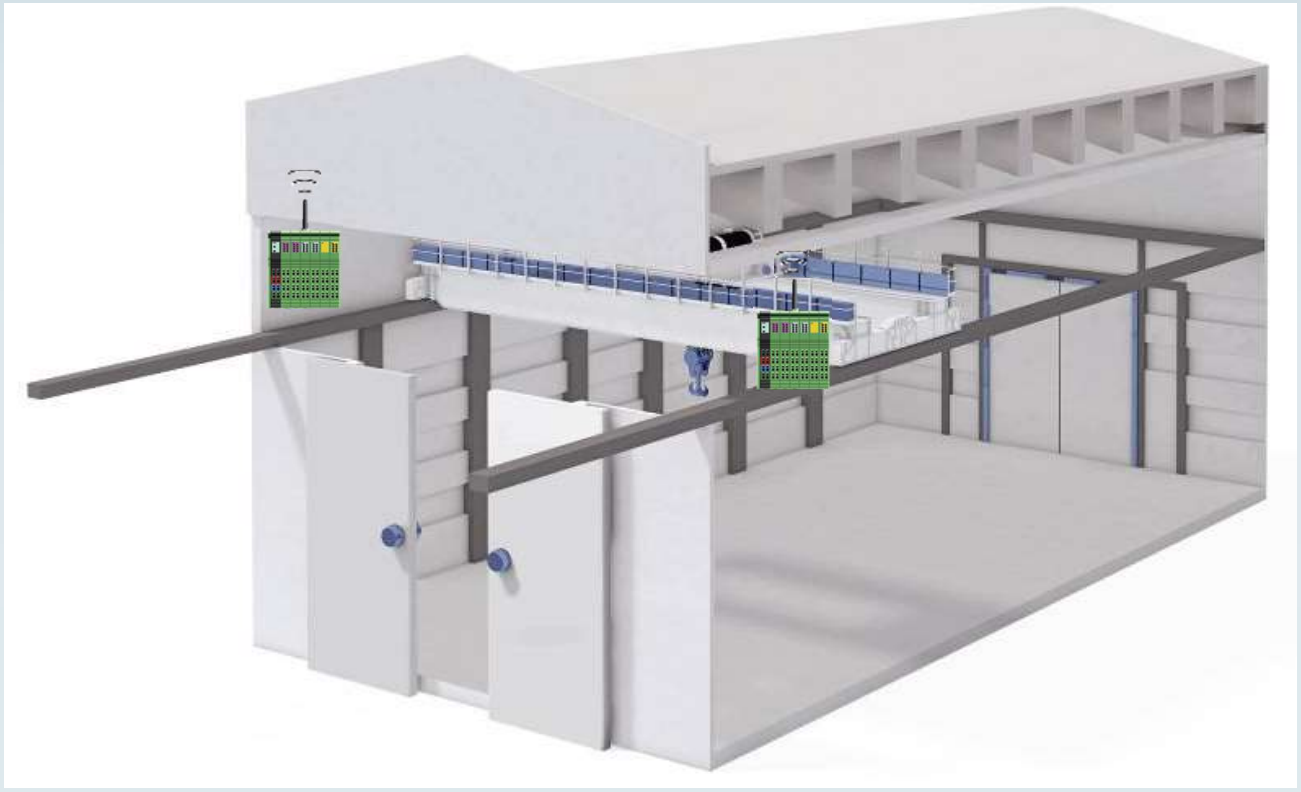


Crane control (Profinet)



Product overview

Crane control (IO)



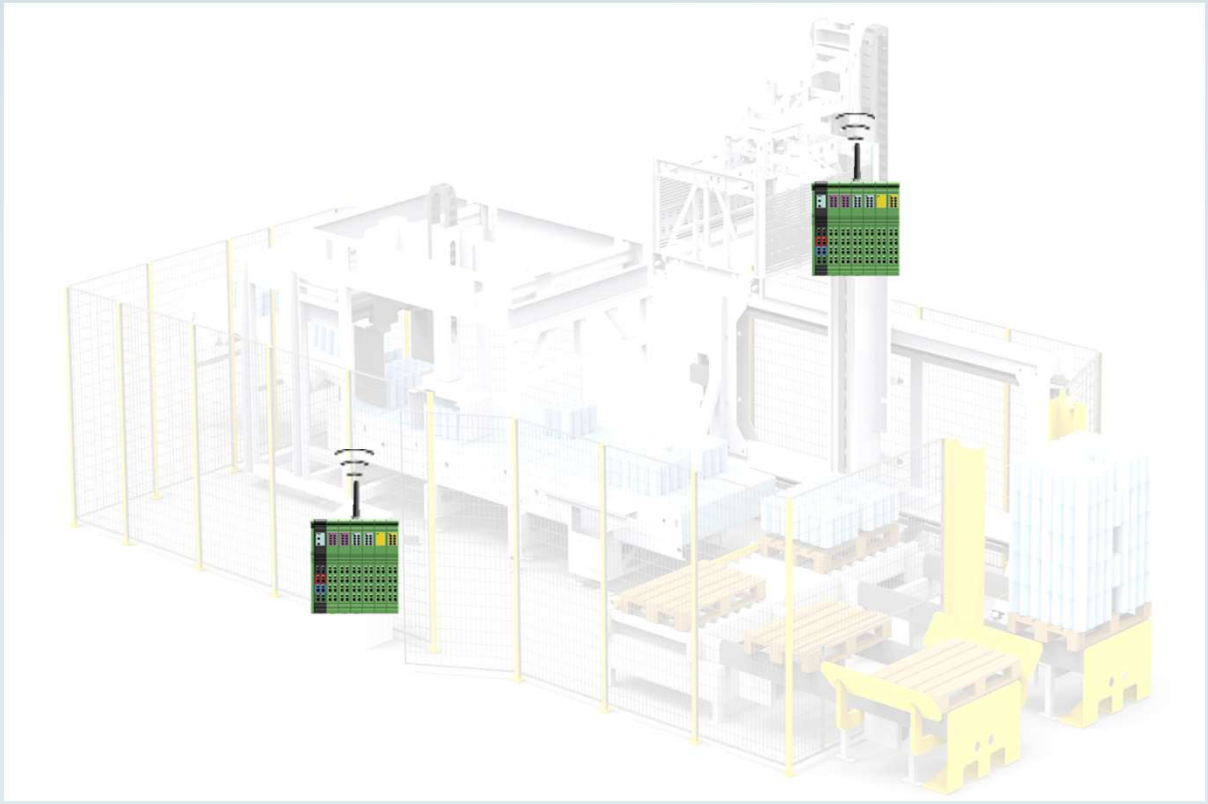
Application examples

- 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



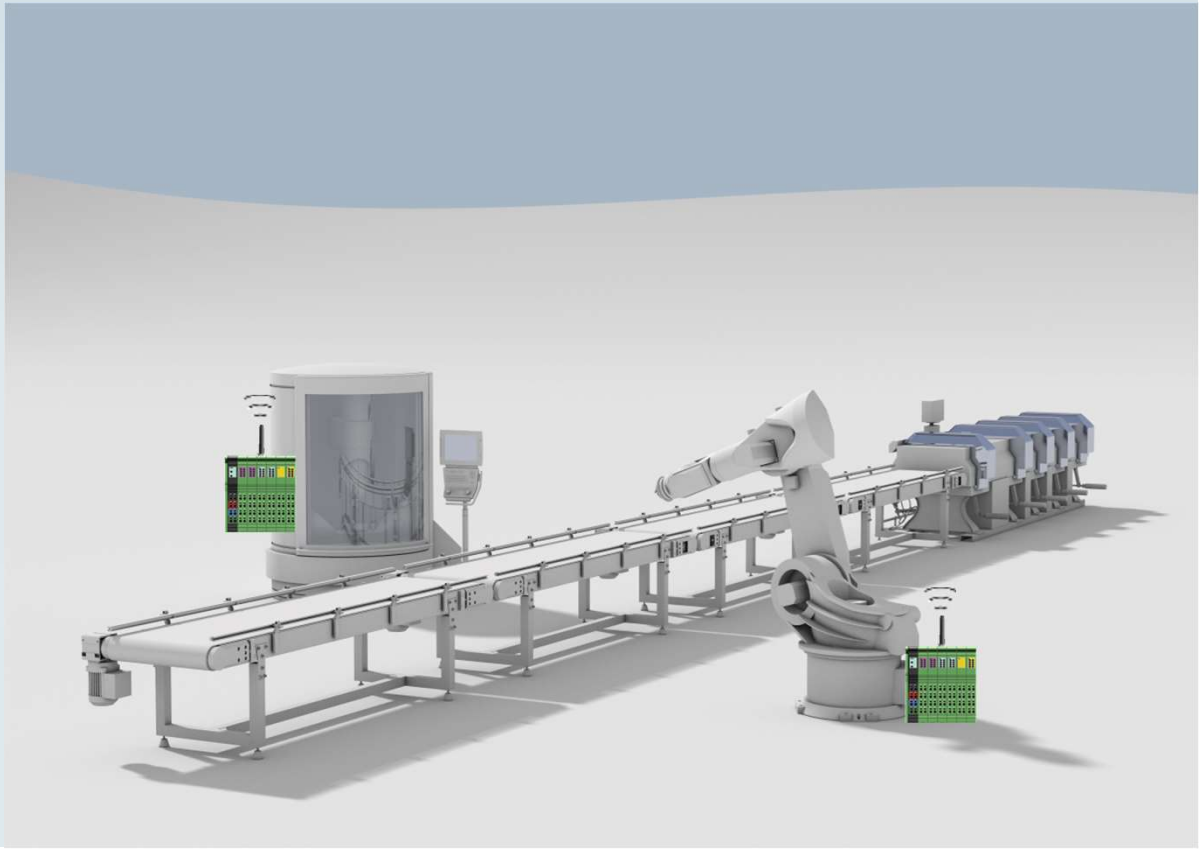
Application examples

- 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

Gracias

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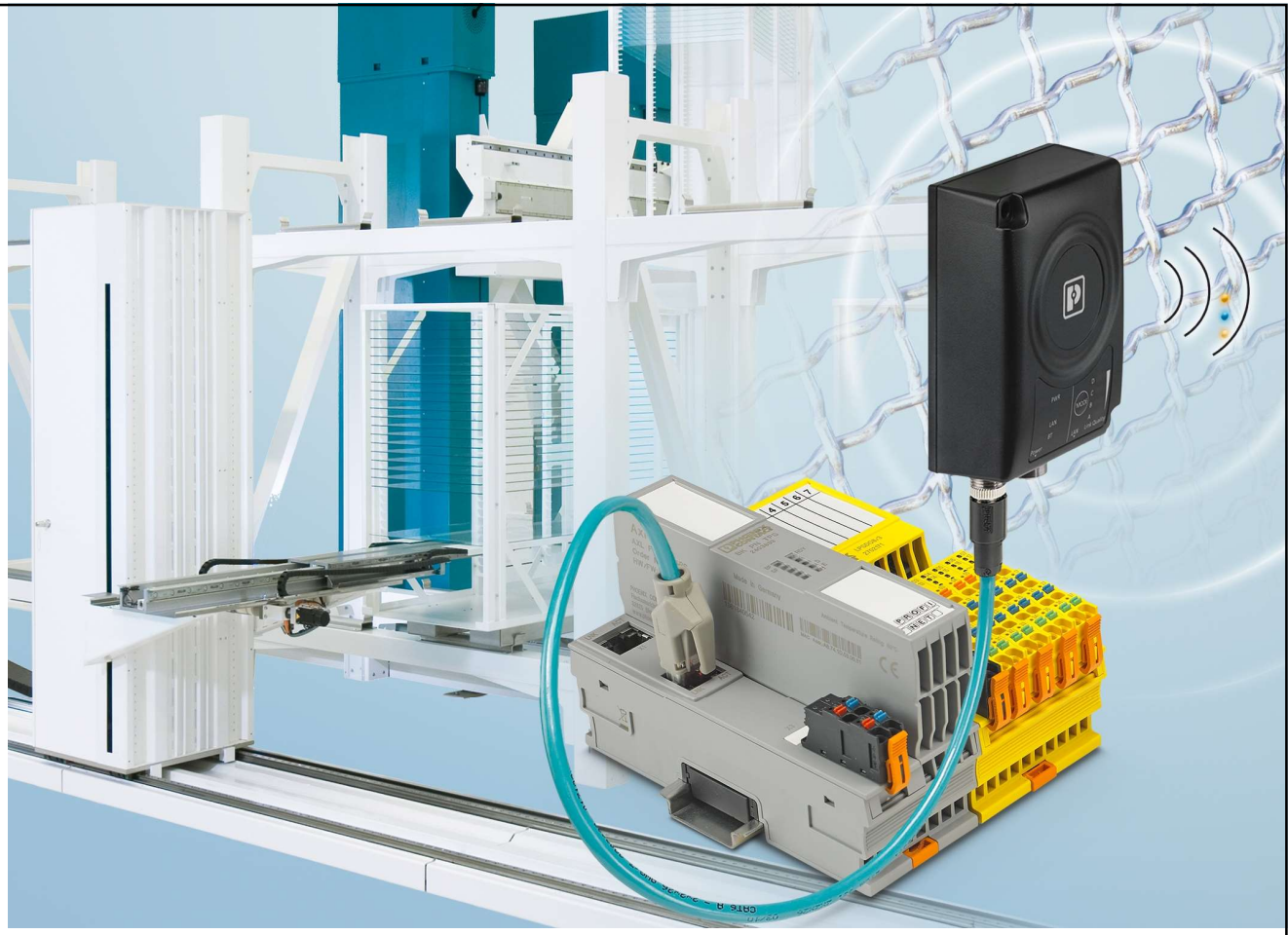

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