Wireless Technology – *Bluetooth*®, WLAN and EnOcean® Components

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8

Radio Technology
General Product Information

Wireless Technology in the Industrial Environment

Wireless technology can support wired applications or enable completely new applications.
In mobile or movable systems, wireless technology is the first choice when greater distances or obstacles must be overcome. It is an alternative for applications in which wired solutions are not economical or technically feasible.

Various wireless technologies can be used depending on the application.

Bluetooth® — Robust, Flexible, High-Performance

Well-known in consumer electronics, *Bluetooth*® technology is also well-suited to industrial use with its internationally approved frequency range, a very robust transmission technology (frequency hopping), real-time response and a range of up to 1000 m. It makes wireless process data communication between two stations possible (point-to-point communication), and also enables the setup of a piconet in which a *Bluetooth*® master can communicate with up to seven slaves, e.g., decentralized mobile sensors.
In addition, *Bluetooth*® can be used as the radio system for commissioning.

Features:

- Secure transmission (encrypted)
- AFH (Adaptive Frequency Hopping)
- Adaptive transmission power
- Uses the license-free 2.4 GHz frequency band

GPRS for Remote Connections

For applications that go beyond site boundaries, *TO-PASS*® telecontrol technology provides the right solution. More detailed information on *TO-PASS*® is available in Section 9.

WLAN — Full IT Integration

WLAN makes it easy to set up a wireless transmission link for ETHERNET protocols. This can be standard ETHERNET protocols, e.g., for communication between a smartphone and automation components. Industrial fieldbus protocols such as PROFINET, MODBUS/TCP or Ethernet/IP can also be used to link mobile equipment with stationary equipment. Ranges up to 400 m are possible depending on the transmission technology used.

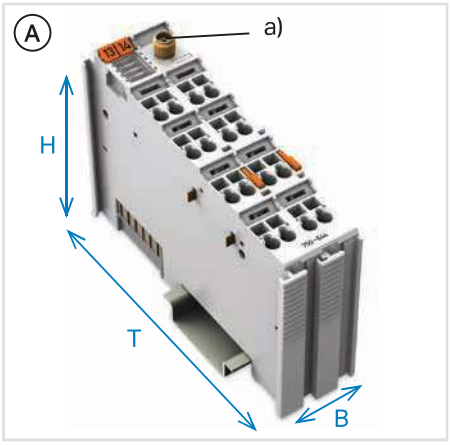
EnOcean® — The Radio Standard in Building Automation

Wireless switches and sensors based on EnOcean® technology harvest available energy to power themselves, e.g., kinetic energy from actuating a switch or sensors powered by ambient light. This energy harvesting completely eliminates maintenance of the radio transmitter at a range of up to 300 m in open air (30 m in buildings).

Advantages:

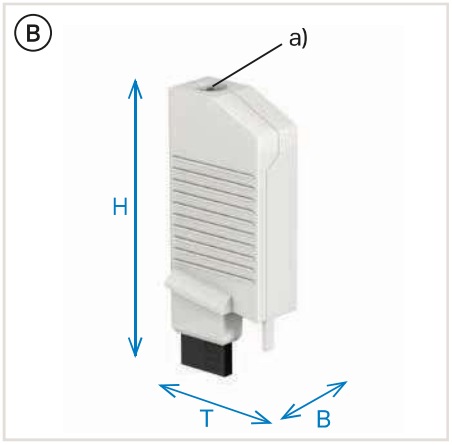
- Branch and application-specific — always the right radio system
- Industrial design: High-performance, rugged and safe
- Tightly integrated into WAGO automation technology

Radio Technology
Interfaces and Types



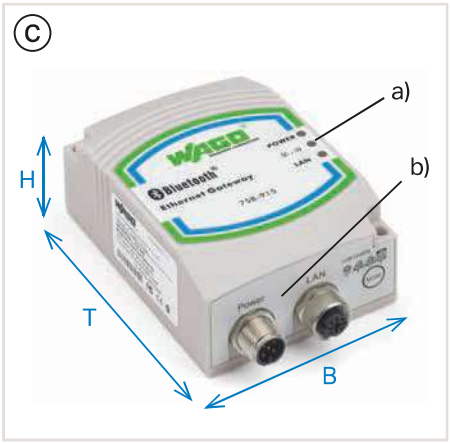
Communication Module for I/O-System (A)

- Can be used with the products:
  - Programmable fieldbus controllers (PFC)
  - Fieldbus couplers (FC) 750 I/O-System
- Antenna connection (a)
- W x H x D (mm) 24 x 72 x 100, approx. 6.5 mm of excess length with antenna socket



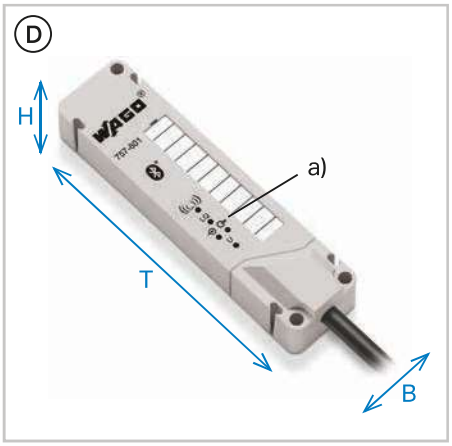
Radio Adapter (B)

- Can be used with the products:
  - PFC, PFC 750 XTR Series, FC, FC 750 XTR Series
  - *JUMPFLEX*® Signal Conditioners, 2857 + 857 Series
- Integrated antenna
- Diagnostic LED (a)
- W x H x D (mm) 15 x 50 x 19



ETHERNET Gateway (C)

- Integrated converter from ETHERNET protocols to radio technology
- Integrated antenna
- Diagnostic LEDs (a)
- Connections with M12 pluggable connectors (b)
- Degree of protection: IP65
- W x H x D (mm) 66 x 36.2 x 91



RS-232, IP67 Module (D)

- *Bluetooth*® / RS-232 converter
- Diagnostic LEDs (a)
- Connecting cable
- Degree of protection: IP67
- W x H x D (mm) 30 x 20 x 117

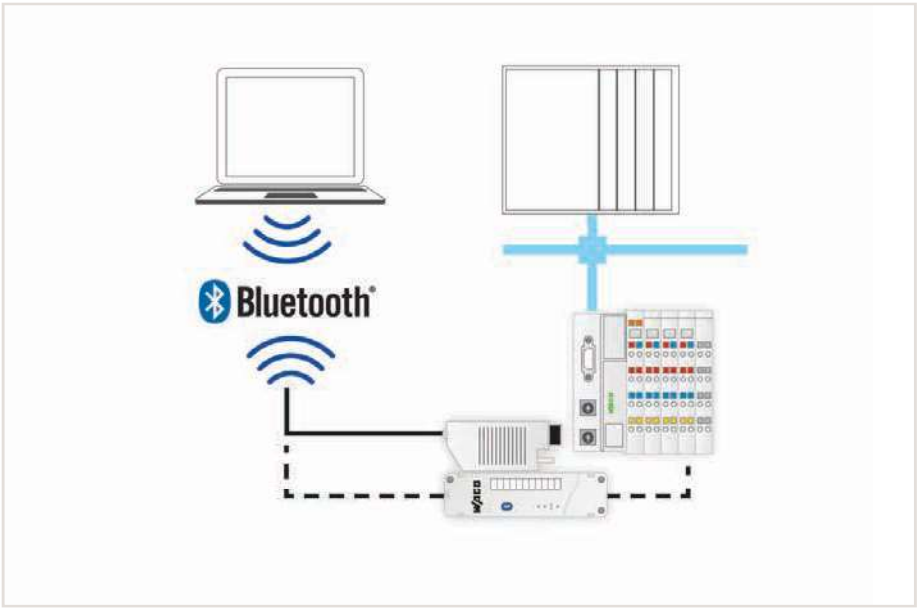
Contact Units (GE

- Universal contact units for standard switch series in building automation
- Compatible with manufacturer programs from BERKER, GIRA, JUNG, MERTEN

Bluetooth® Wireless Technology
Application and Installation Instructions

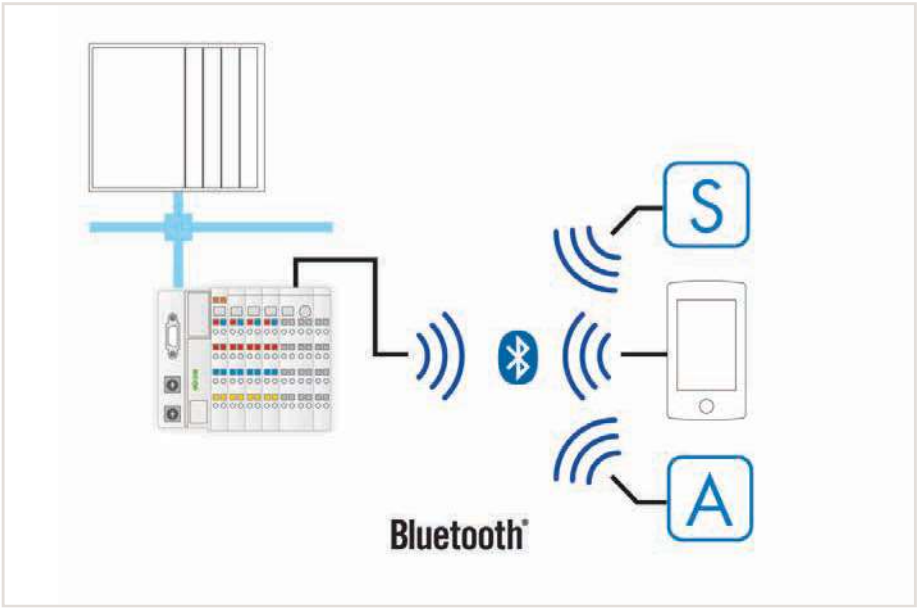
Wireless engineering

- Commissioning, maintenance
- For connecting WAGO software on a PC/notebook to a product's service interface
- Programmable fieldbus controllers
- Programmable XTR Fieldbus Controller
- 750 I/O-System Fieldbus Coupler
- 750 XTR I/O-System Fieldbus Coupler
- Temporary installation via compact *Bluetooth*® adapter
- Permanent installation with high degree of protection



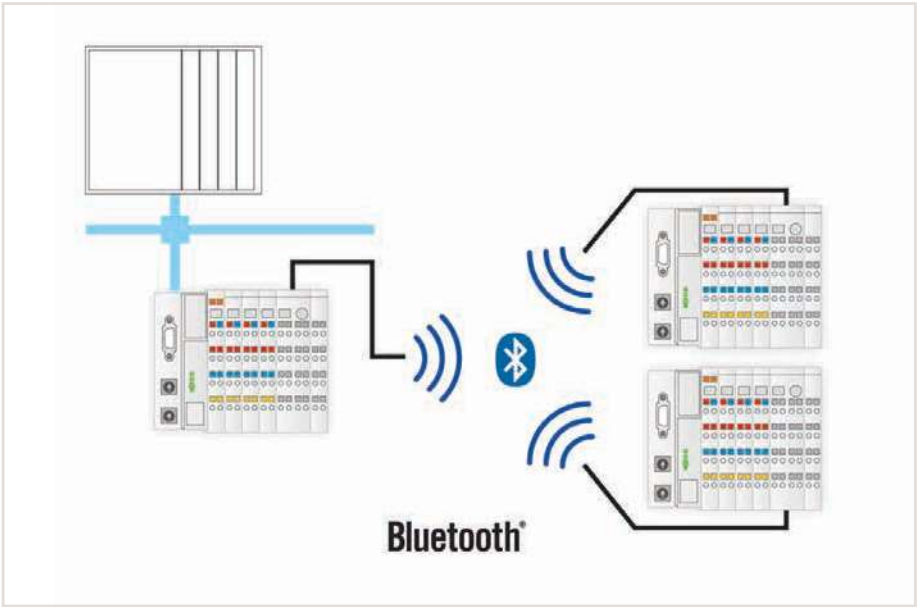
Integration of Mobile Sensors/Actuators

- Data exchange between up to eight modules
- Radio transmitter/receiver in the I/O module
- Operation on
  - Programmable fieldbus controllers
  - Fieldbus couplers
- Range: Up to 1000 m in open air



Connect Mobile Systems and Exchange Data Between Two or More Stations

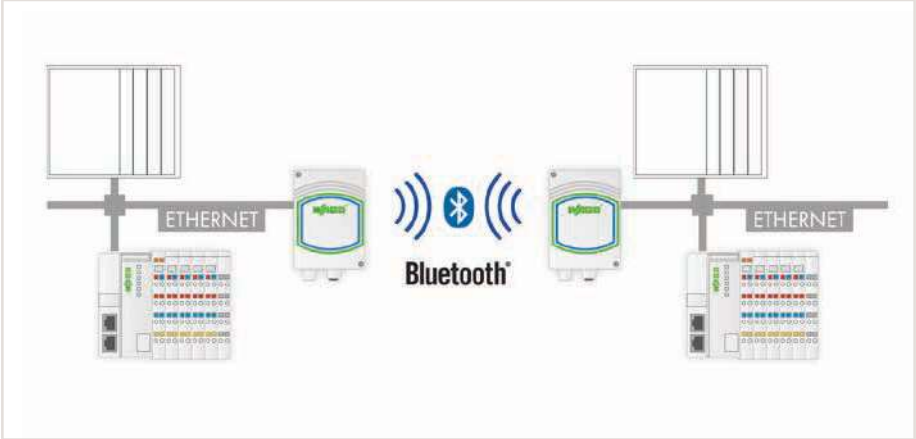
- Fieldbus-independent coupling of I/O stations (up to eight) or programmable fieldbus controllers
- E.g., for coupling a mobile unit with a stationary basic system
- Or for wireless data exchange between several stations over long distances
- Process data coupling
- Range: Up to 1000 m in open air



Bluetooth® Wireless Technology
Application and Installation Instructions

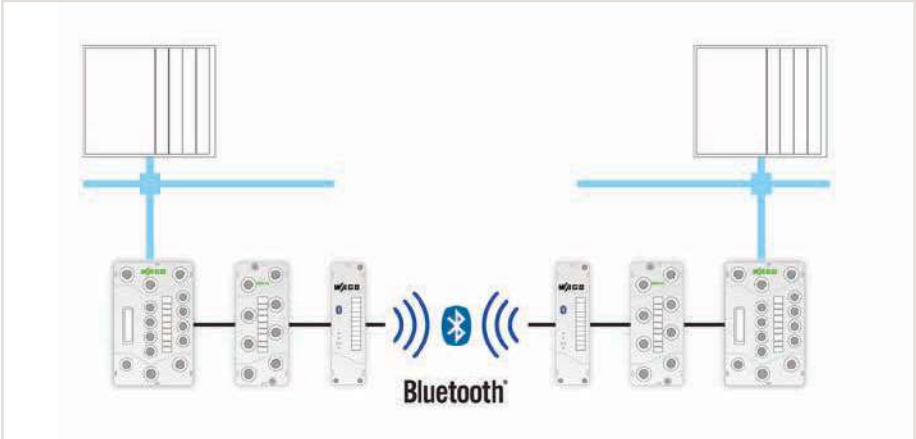
Tunneling ETHERNET Fieldbuses

- Point-to-point connection (between two nodes), e.g., for connecting mobile units to a central controller or for connecting stationary stations
- Tunneling PROFINET, MODBUS/TCP, ETHERNET/IP, etc., via Bluetooth® wireless technology
- Process data coupling
- Range: Up to 300 m in open air



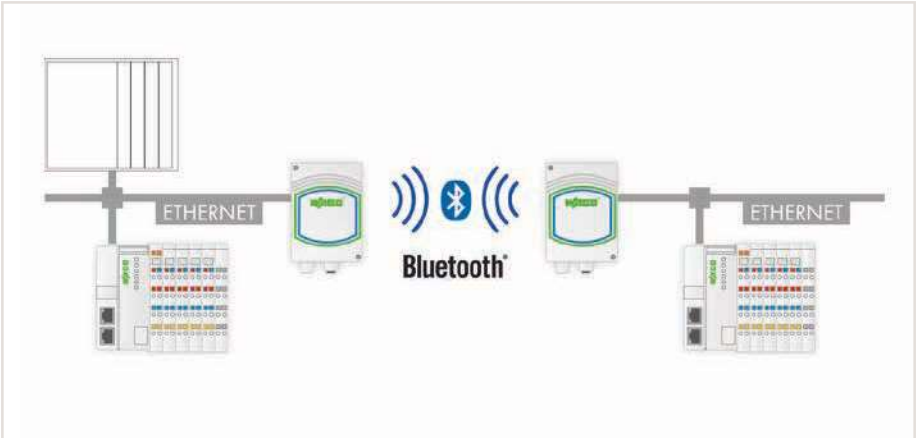
Connect Mobile Systems (IP67)

- Fieldbus-independent coupling of I/O stations or programmable fieldbus controllers
- E.g., for coupling a mobile unit with a stationary basic system
- Process data coupling
- Range: Up to 100 m in open air



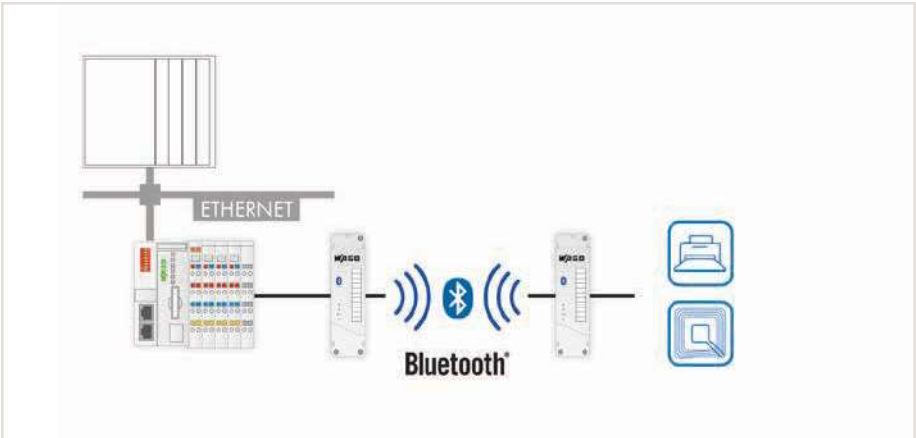
Coupling Mobile Systems

- Tunneling ETHERNET telegrams via Bluetooth® wireless technology
- Point-to-point connection, e.g., for coupling a mobile unit with a stationary basic system
- Process data coupling
- Range: Up to 300 m in open air



Wirelessly connect to serial devices

- Coupling of standard devices with RS-232 interface
- E.g., a printer to a mobile unit controlled by a stationary basic system
- Or to a portable RFID reader
- Range: Up to 100 m in open air



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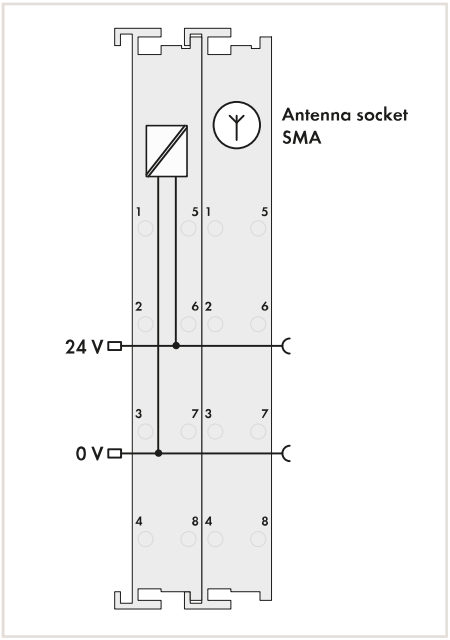
Bluetooth® RF Transceiver

Bluetooth® RF Transceiver



Item description	*Bluetooth*® RF-Transceiver
Item no.	750-644
Technical Data	
Antenna	External via SMA socket
Radio technology	*Bluetooth*® 2.0 + EDR
Topology	Piconet (1 master, max. 7 slaves)
Profiles	SPP, PAN
Frequency band	ISM band, 2402 … 2480 MHz
Transmitter power	Up to 20 dBm (*Bluetooth*® Class 1)
Receiver sensitivity	–94 dBm
Transmission range	Max. 1000 m free field, 100 m within buildings*
Power supply (*Bluetooth*®)	24 VDC via power jumper contacts
System supply voltage	5 VDC via data contacts
Internal data width	Configurable to 12, 24, 48 bytes, including 1 control/status byte
Diagnostics (via visual indicator)	Device status, connection status (radio connection quality, signal strength, interference)
Diagnostics (via process image)	Device status, connection status (radio connection quality, signal strength, interference), time monitoring
EMC immunity to interference	acc. to EN 61000-6-2
EMC emission of interference	acc. to EN 61000-6-3
Ambient temperature (operation)	0 … +55 °C
Dimensions W x H x D	24 x 72 x 100 mm
Approvals	FCC approval (this device complies with Part 15 of FCC rules), *Bluetooth*® approval, CE, UL 508, ANSI/ISA, ATEX/IECEx
Data sheet and further information, see:	wago.com/750-644

Accessories	Item no.	Page
External antenna	758-912	405

The *Bluetooth*® Transceiver enables wireless exchange of process data with up to seven other devices using *Bluetooth*® 2.0 radio technology. Interoperability with *Bluetooth*® devices is provided via the *Bluetooth*® PAN and SPP profiles and is not restricted to any one manufacturer.
The module's extended diagnostic functions include cyclic and acyclic state information. For quick on-site diagnostics, main information on operational status and radio connection is also displayed via 8 LEDs.

* The specifications only apply when the antenna listed as an accessory is used.
The maximum range in the field decreases with use in buildings and changes depending on the building materials used and the spatial geometry. Therefore range specifications within buildings can only represent typical values which can normally be reached. More detailed information is available in the manual.

Software WAGO-I/O-*PRO* V2.3, WAGO-I/O-*CHECK*, see Section 1

Approvals and corresponding ratings, see Page 521 or www.wago.com

Bluetooth® ETHERNET Gateway

Power connector:
M12 plug, A-coded

1: Vin + (DC 9 ... 30 V)
2: External Trigger Ground
3: Vin GND (0 V)
4: External Trigger + (DC 9 ... 30 V)
5: n.c.

ETHERNET connector:
M12 socket, D-coded

1: Transmit +
2: Receive +
3: Transmit -
4: Receive -

Item description	*Bluetooth*® ETHERNET Gateway
Item no.	**758-915**
Technical Data	
Radio technology	*Bluetooth*® 2.0
Topology	Peer-to-peer connection
Profiles supported	Generic Access Profile (GAP), Personal Area Networking Profile (PANU, NAP)
Frequency band	ISM band, 2402–2480 MHz
Transmission range	Up to 400 m (Class 1)*
Antenna	Integrated
Power supply	24 VDC
Voltage range	9–30 VDC
Connections	- ETHERNET: M12 connector, D-coded; - Supply: M12 connector, A-coded
Configuration	Simple, push-button operation and Web-based management
Number of inputs	1 (trigger input)
Ambient temperature (operation)	–30 … +65 °C
Dimensions W x H x D	66 x 36.2 x 91 mm
Protection type	IP65
EMC immunity to interference	acc. to EN 61000-6-2
EMC emission of interference	acc. to EN 61000-6-3
Approvals	R&TTE (Europe), FCC/CFR 47 part 15, IC (Industrie Canada), CE
Data sheet and further information, see:	wago.com/758-915

* The maximum range in the field decreases with use in buildings and changes depending on the building materials used and the spatial geometry. Therefore range specifications within buildings can only represent typical values which can normally be reached. More detailed information is available in the manual.

The *Bluetooth*® ETHERNET gateway simplifies creation of a wireless transmission link for ETHERNET protocols (e.g., PROFINET, MODBUS/TCP, Ethernet/IP).
The gateway is used as a cable substitute to create a robust, industry-proven *Bluetooth*® 2.0 link between two automation devices.
IP65 degree of protection and an internal circularly polarized antenna allow it to be used even in harsh industrial environments. Simple, push-button operation provides very fast connection between two *Bluetooth*® ETHERNET gateways.
Additional settings can be made via Web-based management.
Bluetooth® Adaptive Frequency Hopping (AFH) and "Low Emission ModeTM" provide excellent coexistence with other wireless systems, such as WLAN.

Note:
Two *Bluetooth*® ETHERNET gateways are required to establish a peer-to-peer connection.

IP67 cables and connectors
see Section 11

Bluetooth® Module

Item description	*Bluetooth*® Module
Version	RS-232, IP67
Item no.	**757-801**

Technical Data

Version	*Bluetooth*® 2.1
Radio	Class 1 / max. 100 m*
Antenna	Integrated
Frequency range	ISM band, 2402 … 2483 MHz
Type of communication	Peer-to-peer connection
Profiles supported	Serial Port Profile (SPP)
Security encryption	*Bluetooth*® security mode 4 "Secure Simple Pairing" 128-bit encryption
Baud rate	9600 … 115200 bit/s
Power supply	+24 VDC
Display	Five LEDs
Mounting	Screw mount
Connections	RS-232
Ambient temperature (operation)	–20 … +60 °C (static); –5 … +60 °C (moving)
Dimensions W x H x D	30 x 20 x 117 mm
Protection type	IP67
EMC immunity to interference	acc. to EN 61000-6-2
EMC emission of interference	acc. to EN 61000-6-3
Connecting cable	Cable length: 5 m
Approvals	*Bluetooth*® approval, CE
Data sheet and further information, see:	wago.com/757-801

* The maximum range in the field decreases with use in buildings and changes depending on the building materials used and the spatial geometry. Therefore range specifications within buildings can only represent typical values which can normally be reached. More detailed information is available in the manual.

WAGO's 757-801 *Bluetooth*® Module wirelessly connects a serial interface to external *Bluetooth*® devices (e.g., PCs/notebooks with *Bluetooth*®). Data is exchanged via *Bluetooth*® SPP (Serial Port Profile).
Substitute cabling between two serial devices by automatically restoring the outgoing wireless connection (e.g., to a second *Bluetooth*® module).
High protection class provides enhanced, wireless *Bluetooth*® module's installation outside of control cabinets.
Diagnostic LEDs signal the quality of the wireless connection and communication via the RS232 interface.

Marking strips, felt-tip pen
see Accessories, Section 10

Bluetooth® Adapter

Item description	*Bluetooth*® Adapter
Item no.	**750-921**
Technical Data	
Range:	30 m free field (Class 2)*
Data transfer rate	9600 ... 115000 bit/s
Frequency range	ISM band, 2402 ... 2483 MHz
Type of communication	Peer-to-peer connection
Profiles supported	Serial Port Profile (SPP)
Version	*Bluetooth*® 2.1
Radio	Class 2
Antenna	Integrated
Connections	4-pole service connector
Configuration	AT commands, e.g., via hyperterminal
Function	Master or slave
LED	Operating mode
Security encryption	128-bit encryption
Ambient temperature (operation)	–20 ... +60 °C
Dimensions W x H x D	15 x 50 x 19 mm
Approvals	*Bluetooth*® approval, CE
Data sheet and further information, see:	wago.com/750-921

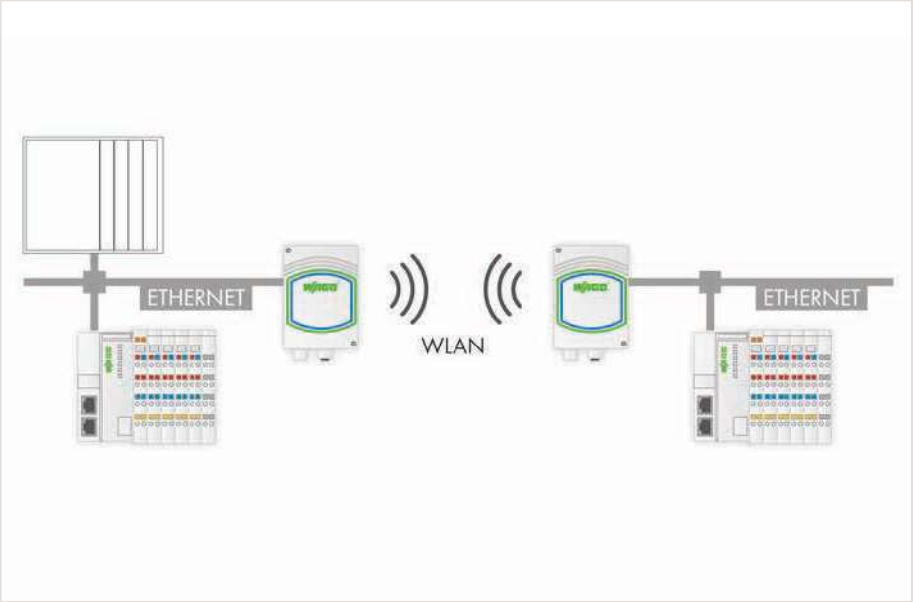
* The maximum range in the field decreases with use in buildings and changes depending on the building materials used and the spatial geometry. Therefore range specifications within buildings can only represent typical values which can normally be reached. More detailed information is available in the manual.

The *Bluetooth*® Adapter wirelessly connects a notebook computer with *Bluetooth*® functionality to the service interface of the fieldbus coupler/controller. It also provides an active connection to a programmable fieldbus controller.
As a cable substitute, the *Bluetooth*® Adapter allows communication between two controllers, as well as between fieldbus couplers/controllers via WAGO software tools.
The adapter is supplied via the service interface and, therefore, via the power supply of the fieldbus coupler/controller.

WLAN Wireless Technology
Application and Installation Instructions

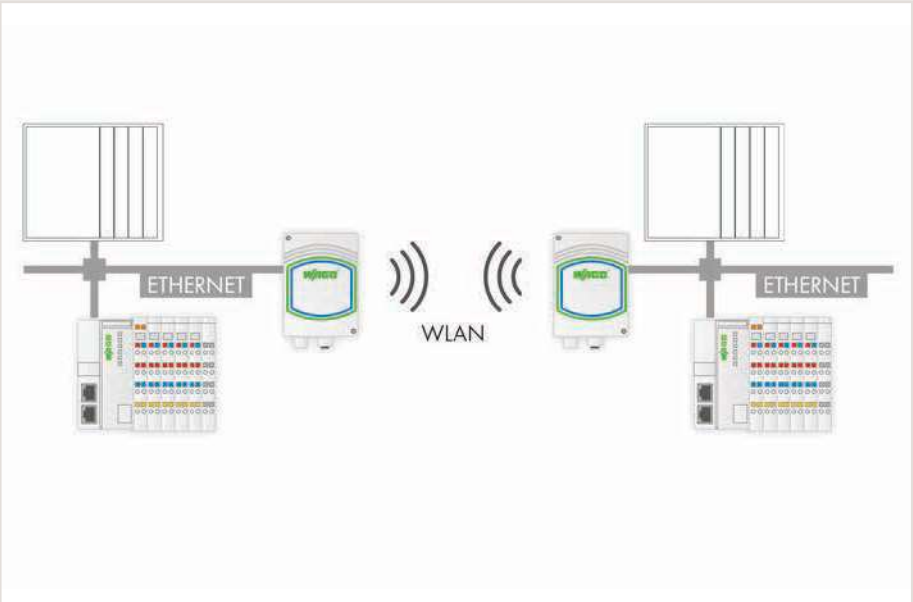
Connect Mobile Systems

- Peer-to-peer connection (between two nodes), e.g., for coupling a mobile unit with a stationary basic system
- Tunneling ETHERNET telegrams via WLAN wireless technology
- Process data coupling
- Range: Up to 400 m in open air (2.4 GHz frequency band)
- Range: Up to 200 m in open air (5 GHz frequency band)



Tunneling ETHERNET Fieldbuses

- Peer-to-peer connection (between two nodes), e.g., for connecting mobile units to a central controller
- Tunneling PROFINET, MODBUS/TCP, Ethernet/IP, etc., via WLAN wireless technology
- Process data coupling
- Range: Up to 400 m in open air (2.4 GHz frequency band)
- Range: Up to 200 m in open air (5 GHz frequency band)



WLAN ETHERNET Gateway

Power connector:
M12 plug, A-coded

1: Vin + (DC 9 ... 30 V)
2: External Trigger Ground
3: Vin GND (0 V)
4: External Trigger + (DC 9 ... 30 V)
5: n.c.

ETHERNET connector:
M12 socket, D-coded

1: Transmit +
2: Receive +
3: Transmit -
4: Receive -

Item description	WLAN ETHERNET Gateway	
Version	2.4 GHz IP65	5 GHz IP65
Item no.	**758-916**	**758-917**
Technical Data		
Radio technology	IEEE 802.11 bgn	IEEE 802.11 an
Topology	Peer-to-peer connection	
Security authentification	Open, shared, WPA/WPA2 PSK, LEAP, PEAP	
Security encryption	None, WEP64, WEP128, TKIP, AES/CCMP	
Frequency band	ISM band, 2.4 GHz	ISM band, 5 GHz
Transmission range	Up to 400 m*	Up to 200 m*
Antenna	Inside	
Power supply	24 VDC	
Connections	- ETHERNET: M12 connector, D-coded, - Supply: M12 connector, A-coded	
Configuration	Simple, push-button operation and Web-based management	
Number of inputs	1 (trigger input 9–30 VDC)	
Ambient operating temperature (operation)	–30 … +65 °C	
Dimensions W x H x D	66 x 36.2 x 91 mm	
Protection type	IP65	
EMC immunity to interference	Per EN 61000-6-2	
EMC emission of interference	Per EN 61000-6-3	
Approvals	R&TTE (Europe), FCC/CFR 47 part 15, IC (Industry Canada), CE	
Data sheet and further information, see:	wago.com/758-916	wago.com/758-917

* The maximum range in the field decreases with use in buildings and changes depending on the building materials used and the spatial geometry. Therefore range specifications within buildings can only represent typical values which can normally be reached. More detailed information is available in the manual.

WAGO WLAN ETHERNET Gateways simplify creation of a wireless transmission link for ETHERNET protocols (e.g., PROFINET, MODBUS/TCP, Ethernet/IP).
The gateway is used as a cable substitute to create a robust, industry-proven WLAN link between two automation devices.
IP65 degree of protection and an internal circularly polarized antenna allow it to be used even in harsh industrial environments. Simple, push-button operation provides very fast connection between two WLAN ETHERNET Gateways.
Additional settings can be made via Web-based management.

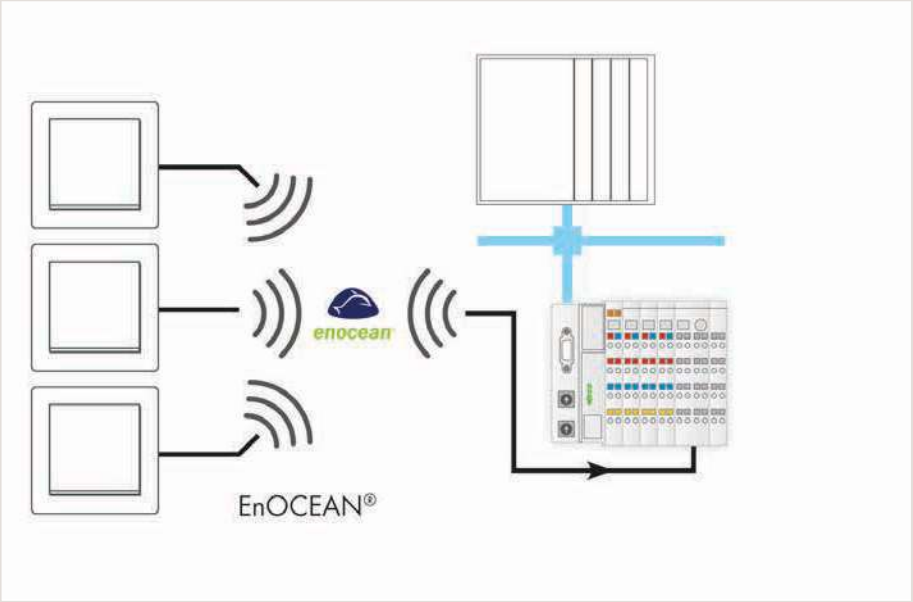
Note:
Two WLAN ETHERNET Gateways of the same type are required to establish a peer-to-peer connection.

IP67 cables and connectors
see Section 11

EnOcean® Radio Technology
Application and Installation Instructions

Integration into the WAGO-I/O-SYSTEM

- Receiver in the I/O module
- Operation on
  - Programmable fieldbus controllers
  - Fieldbus couplers
- Range: Up to 300 m in open air, approx. 30 m in buildings



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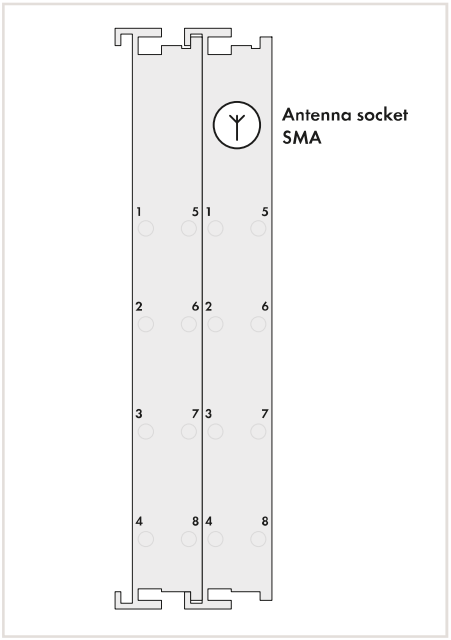
Radio Receiver EnOcean

Radio Receiver EnOcean



Item description	Radio Receiver EnOcean
Item no.	**750-642**
Technical Data	
Antenna	External via SMA socket
Frequency band	868.3 MHz
Transmission range	Up to 300 m in open field (30 m typical in buildings, see manual)*
Transmission protocol (radio telegram)	EnOcean
System supply voltage	5 VDC via data contacts
Internal data width	1 x 24 bits in/out (3 bytes user data), 1 x 8 bits control/status
EMC immunity to interference	acc. to EN 61000-6-2
EMC emission of interference	acc. to EN 61000-6-3
Ambient temperature (operation)	0 … +55 °C
Dimensions W x H x D	24 x 72 x 100 mm
Approvals	CE, KC, Marine, UL 508, ANSI/ISA, ATEX/IECEx
Data sheet and further information, see:	wago.com/750-642

Accessories	Item no.	Page
External antenna	758-910	405

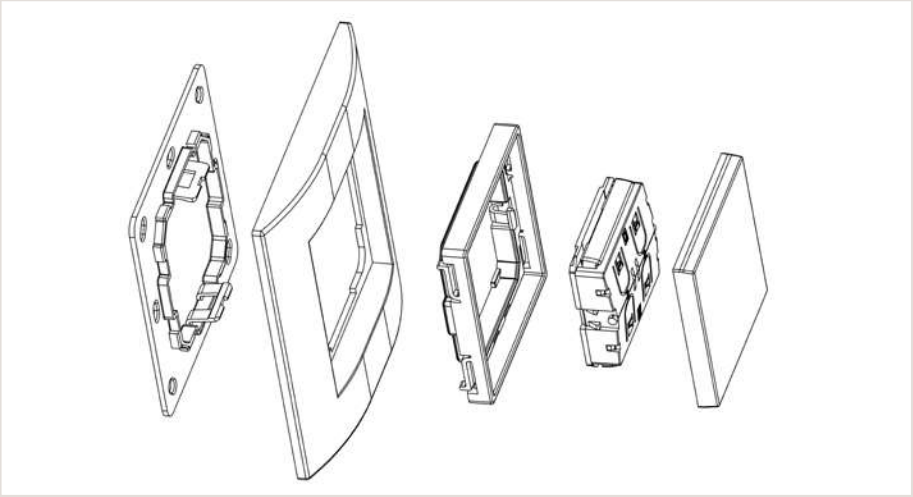
* The maximum range in the field decreases with use in buildings and changes depending on the building materials used and the spatial geometry. Therefore range specifications within buildings can only represent typical values which can normally be reached. More detailed information is available in the manual.

This radio receiver receives radio telegrams from maintenance-free, battery-less and wireless switches and sensors based on EnOcean radio technology.
The energy required for switch or sensor operation is produced by converting one type of energy (heat, solar or mechanical energy) into usable electrical energy.
The LED (RSSI) indicates a sufficient input level.

Preprogrammed function blocks for WAGO Controllers make integration easy.

Approvals and corresponding ratings, see Page 521 or www.wago.com

EnOcean® easyfit PTM 250 Radio Transmitter



Item description	EnOcean easyfit PTM 250			
Version	2-channel light	4-channel light	2-channel roller blind	4-channel roller blind
Item no.	758-940/001-000	758-940/003-000	758-940/002-000	758-940/004-000

Technical Data				
Integrated radio transmitter	EnOcean PTM 200			
Radio technology	EnOcean 868 MHz, RPS type 2			
Range:	300 m free field, 30 m typical within buildings*			
Antenna	Integrated			
Total installation height	14 mm (frame lies directly on surface)			
Dimensions of rocker / frame cut-out / center plate	50 x 50 mm / 55 x 55 mm / 71 x 71 m			
Assembly	Flat on surface, glued (double-sided mounting film enclosed) or screwed			
Color	Pure white			
Rocker switch variant	Rocker switch with neutral middle position	Series rocker switches	Rocker switch with neutral middle position	Series rocker switches
Relative humidity	95 % non condensing			
Ambient temperature (operation)	–25 … + 65 °C			
Compatibility	BERKER, GIRA, JUNG, MERTEN			
Approvals	R&TTE, CE			
Data sheet and further information, see:	wago.com/758-940			

PTM 250 is a universal, extremely flat function switch insert with maintenance-free energy generator. The universal switch insert fits in numerous frame programs from various installation material suppliers. The base plate can be glued or screwed into position for easy attachment to glass as well as plaster. Integration into the frame is similar to universal inserts for antenna sockets.

Delivered without frame; frames must be ordered separately from the desired manufacturer program

* The maximum range in the field decreases with use in buildings and changes depending on the building materials used and the spatial geometry. Therefore range specifications within buildings can only represent typical values which can normally be reached. More detailed information is available in the manual.

External Antenna

Item description	External Antenna	External Antenna
Version	GSM 900/1800	WLAN/*Bluetooth*® 2.4 GHz
Item no.	**758-910**	**758-912**
Technical Data		
Frequency band	870 … 960 MHz; 1710 … 1880 MHz	2400 … 2485 MHz
VSWR	< 1.5	
Gain	0 dB	2 dBi
Max. power	20 W	
Cable length	250 cm	250 cm
Connector	SMA right angle plug + ferrite bead	SMA angled plug
Data sheet and further information, see:	wago.com/758-910	wago.com/758-912

Notes on operating the antenna with WAGO EnOcean radio receivers:
The antenna is to be mounted on a plate measuring at least 25 x 25 cm.
The distance of interfering sources to the antenna and antenna line must be at least 30 cm and the free space between the antenna and the next wall must be at least 35 cm.
The antenna cable should, under no circumstances, be bent sharply, since irreversible damage may result to the antenna line (RG174 bending radius > 15 mm).