Automatic identification and tracking in production

THE PERFORMANCE RANGE

Balluff offers a wide selection of data carriers and read/write heads for LF, HF and UHF applications. With the BIS V multi-frequency processor unit, all systems can be combined with each other. This adds flexibility and saves costs through lower inventory levels.

Cost-effective solution for simple identification tasks

LF INDUSTRIAL RFID SYSTEM

Low frequency (LF) RFID gives you the ability to use different LF processor units. The read/write head can be connected the traditional way using cable, or can be located directly on the processor unit housing. Our most flexible and modern solution is the universal BIS V processor unit.

High transmission speed for large volumes of data

HF INDUSTRIAL RFID SYSTEM

For high frequency (HF) RFID solutions you can combine up to four read/write heads on the BIS V processor unit in addition to connecting an IO-Link device. Many read/write heads can be connected to one IO-Link master, and all IO-Link devices can be freely configured. In addition to connecting an all-in-one read head you have everything – read head and processor unit – in one unit.

Continuous transmission security and data transparency

UHF INDUSTRIAL RFID SYSTEM

For ultra-high frequency (UHF) systems you can select from special high-performance UHF processor units. The multi-frequency BIS V processor unit is also an option. Or you can read the UHF data carriers using one of our handheld readers, for example at manual workstations.

www.balluff.com
Industrial RFID systems – managing all your data

Cost-effective solution for simple identification tasks
LF INDUSTRIAL RFID SYSTEM

Low frequency (LF) RFID gives you the ability to use different LF processor units. The read/write head can be connected the traditional way using cable, or can be located directly on the processor unit housing. Our most flexible and modern solution is the universal BIS V processor unit.

The most important benefits
- Ideal for relative tool identification at short ranges
- High performance and flexible expansion in matching systems with readers and antennas
- Easy expansion through IO-Link and additional read/write heads
- Universal processor unit
- Wear-free, maintenance-free and insensitive to dirt

High transmission speed for large volumes of data
HF INDUSTRIAL RFID SYSTEM

For high frequency (HF) RFID solutions we offer three possible combinations:
You can combine up to four read/write heads on the BIS V processor unit in addition to connecting an IO-Link device. Many read/write heads can be connected to one IO-Link master, and all IO-Link devices can be flexibly combined with each other. In addition to IO-Link, an all-in-one read head you have everything – read head and processor unit – in one unit.

The most important benefits
- High transmission speeds and large data quantities of ranges up to 160 cm
- Seamless integration through global RFID standards ISO 18000-6C (ISO 18000-6C and ISO 18000-6C-M)
- High transmission speeds and large data quantities at short ranges
- Applications: Parts tracking at manual workstations, our handheld readers, for example, can read the UHF data carriers using one of our handheld readers, for example, or you can read the UHF data carriers using one of our handheld readers, for example.

Continuous transmission security and data transparency
UHF INDUSTRIAL RFID SYSTEM

For ultra high frequency (UHF) systems you can select from special high-performance UHF processor units. The multi-frequency BIS V processor unit is also an option. Or you can read the UHF data carriers using one of our handheld readers, for example at manual workstations or through global RFID standards: ISO 18000-6C and EPC Gen2 Class1.

The most important benefits
- For dynamic processes with great read distances up to 6m and more
- Easy integration into applications using global standard interfaces and global standards: ISO 18000-6C and EPC Gen2 Class1
- Applications: Traceability, tracking of automation processes, inventory
Automatic identification and tracking in production

THE PERFORMANCE RANGE

Balluff offers you a wide selection of data carriers and read/write heads for LF, HF and UHF applications. With the BIS V multi-frequency processor unit, all systems can be combined with each other. This adds flexibility and saves costs through lower inventory levels.

Cost-effective solution for simple identification tasks

LF INDUSTRIAL RFID SYSTEM

Low frequency (LF) RFID gives you the ability to use different LF processor units. The read/write head can be connected the traditional way using cable, or can be located directly on the processor unit housing.

The most important benefits

- Ideal for safety identification at short ranges
- High performance and flexibility
- Easy connection to systems with coolants and lubricants
- Use in applications: Intralogistics, IT and paste transport systems, assembly technology and revenue organization
- Wear-free, maintenance-free and insensitive to dirt

High transmission speed for large volumes of data

HF INDUSTRIAL RFID SYSTEM

For high frequency (HF) RFID solutions we offer three possible combinations:

You can combine up to four read/write heads on the BIS V processor unit in addition to connecting an IO-Link device. Many read/write heads can be connected to one IO-Link master, and all IO-Link devices can be easily configured.

The most important benefits

- High transmission speed and large data quantities at ranges up to 450 mm
- Seamless integration in applications through global RFID standards ISO 18000-6C and EPC Gen2
- Easy integration to existing systems and applications
- Applications: Parts tracking at manual workstations, our handheld readers, for example

Continuous transmission security and data transparency

UHF INDUSTRIAL RFID SYSTEM

For ultra-high frequency (UHF) systems you can select from special high-performance UHF processor units. The multi-frequency BIS V processor unit is also an option. Or you can read the UHF data carriers using one of our handheld readers, for example at manual workstations.

The most important benefits

- For dynamic processes with great read distances up to 0.5 m and more
- Easy integration in applications using global standard interfaces and global standards: ISO 18000-6C and EPC Gen2 Class-1
- Simultaneous detection of many data carriers
- Applications: Traceability, tracking of automation processes, inventory

Go online to individually configure your own system

www.balluff.de/go/rfid-configurator
WHAT IS RFID?

RFID (Radio Frequency Identification) is the communication technology for non-contact and automatic identification of objects (microchips, goods, people, animals, for example) using electromagnetic induction or electromagnetic waves. Along with bar codes, data matrix codes, biometrics (fingerprint), optical text recognition as well as contact-type smart cards, RFID is a commonly employed technology.

THE DIFFERENT RFID SYSTEMS

RFID systems are available for three frequency ranges – ultra-high frequency (UHF), high frequency (HF) and low frequency (LF). These are associated with various technical and physical characteristics.

- LF frequency: 0.3 MHz – 30 MHz
  - Ultra low frequency: 0.3 MHz…30 kHz
  - High frequency: 30 kHz…300 kHz
- HF frequency: 30 MHz – 300 MHz
- UHF frequency: 300 MHz…3 GHz

WHAT ARE THE CONSEQUENCES OF THE DIFFERENT FREQUENCIES?

- LF: 0.3 MHz…300 MHz
  - UHF: 300 MHz…3 GHz
  - HF: 30 MHz…300 MHz

Data carriers with various memory types are available

- Magnetic strips and cards
- Magnetic strip and magnetic cards
- Optical strip and optical cards
- Biometric data carriers
- Magnetic and optical data carriers
- Magnetic and biometric data carriers
- Optical and biometric data carriers
- Magnetic, optical and biometric data carriers

Ultra-high frequency (UHF), high frequency (HF) and low frequency (LF)

- UHF (ultra high frequency, 300 MHz…3 GHz)
- LF (low frequency, 30…300 kHz)
- HF (high frequency, 30 MHz…300 MHz)

Data carriers with various memory types

- Active data carriers with power supply
- Passive data carriers
- Active and passive data carriers

RFID systems require three main components:

- Data carrier (data storage)
- Reader and reader head (data transmission)
- Processor and data processing (communication)

UHF systems can be used for industrial applications.

- UHF systems are faster than HF systems.
- HF systems are suitable for close range applications.
- LF systems are best suited for close range applications.

Components of an UHF system

- Data carrier
- Reader (reader head)
- Processor and data processing unit

Components of an HF system

- Data carrier
- Reader (reader head)
- Processor

Components of an LF system

- Data carrier
- Reader (reader head)
- Processor

UHF systems feature the following characteristics:

- Short read/write path
- High read/write speed
- High data transmission speed
- Low energy consumption
- High read/write distance
- Very small read/write head

HF systems feature the following characteristics:

- Long read/write path
- High read/write speed
- High data transmission speed
- Low energy consumption
- High read/write distance
- Very small read/write head

LF systems feature the following characteristics:

- Short read/write path
- Low read/write speed
- High data transmission speed
- High energy consumption
- Low read/write distance
- Large read/write head

Managing all your data with RFID

- Ultra-high frequency (UHF)
- High frequency (HF)
- Low frequency (LF)

RFID systems that are suitable for industrial applications:

- UHF systems (ultra high frequency, 300 MHz…3 GHz)
- LF systems (low frequency, 30…300 kHz)
- HF systems (high frequency, 30 MHz…300 MHz)

RFID applications:

- Smart cards
- Barcode strips
- Magnetic strips
- Biometric data carriers
- Optical strip
- Magnetic cards
- Biometric cards
- Magnetic and optical data carriers
- Magnetic and biometric data carriers
- Optical and biometric data carriers
- Magnetic, optical and biometric data carriers

HF and LF systems are suitable for industrial applications.

- HF systems are suitable for close range applications.
- LF systems are best suited for close range applications.

UHF systems are suitable for industrial applications.

- UHF systems are faster than HF systems.
- HF systems are suitable for close range applications.
- LF systems are best suited for close range applications.

WHAT ARE THE ADVANTAGES OF RFID?

- Non-contact identification
- High read/write speed
- High data transmission speed
- Low energy consumption
- High read/write distance
- Very small read/write head

RFID systems are suitable for industrial applications.

- UHF systems are faster than HF systems.
- HF systems are suitable for close range applications.
- LF systems are best suited for close range applications.

Components of an UHF system

- Data carrier
- Reader (reader head)
- Processor and data processing unit

Components of an HF system

- Data carrier
- Reader (reader head)
- Processor

Components of an LF system

- Data carrier
- Reader (reader head)
- Processor

UHF systems feature the following characteristics:

- Short read/write path
- High read/write speed
- High data transmission speed
- Low energy consumption
- High read/write distance
- Very small read/write head

HF systems feature the following characteristics:

- Long read/write path
- High read/write speed
- High data transmission speed
- Low energy consumption
- High read/write distance
- Very small read/write head

LF systems feature the following characteristics:

- Short read/write path
- Low read/write speed
- High data transmission speed
- High energy consumption
- Low read/write distance
- Large read/write head

ABOUT UHF SYSTEMS

- Galvanically isolated reader head
- HF reader head
- LF reader head

HF systems feature the following characteristics:

- Long read/write path
- High read/write speed
- High data transmission speed
- High energy consumption
- High read/write distance
- Large read/write head

LF systems feature the following characteristics:

- Short read/write path
- Low read/write speed
- High data transmission speed
- High energy consumption
- High read/write distance
- Large read/write head

UHF systems feature the following characteristics:

- Short read/write path
- High read/write speed
- High data transmission speed
- Low energy consumption
- High read/write distance
- Very small read/write head

UHF systems are suitable for industrial applications.

- UHF systems are faster than HF systems.
- HF systems are suitable for close range applications.
- LF systems are best suited for close range applications.

Components of an UHF system

- Data carrier
- Reader (reader head)
- Processor and data processing unit

Components of an HF system

- Data carrier
- Reader (reader head)
- Processor

Components of an LF system

- Data carrier
- Reader (reader head)
- Processor

UHF systems feature the following characteristics:

- Short read/write path
- High read/write speed
- High data transmission speed
- Low energy consumption
- High read/write distance
- Very small read/write head

HF systems feature the following characteristics:

- Long read/write path
- High read/write speed
- High data transmission speed
- Low energy consumption
- High read/write distance
- Very small read/write head

LF systems feature the following characteristics:

- Short read/write path
- Low read/write speed
- High data transmission speed
- High energy consumption
- Low read/write distance
- Large read/write head

ABOUT LF/HF SYSTEMS

- Data carrier
- Reader and reader head
- Processor

HF systems feature the following characteristics:

- Long read/write path
- High read/write speed
- High data transmission speed
- Low energy consumption
- High read/write distance
- Very small read/write head

LF systems feature the following characteristics:

- Short read/write path
- Low read/write speed
- High data transmission speed
- High energy consumption
- Low read/write distance
- Large read/write head

UHF systems feature the following characteristics:

- Short read/write path
- High read/write speed
- High data transmission speed
- Low energy consumption
- High read/write distance
- Very small read/write head

UHF systems are suitable for industrial applications.

- UHF systems are faster than HF systems.
- HF systems are suitable for close range applications.
- LF systems are best suited for close range applications.

Components of an UHF system

- Data carrier
- Reader (reader head)
- Processor and data processing unit

Components of an HF system

- Data carrier
- Reader (reader head)
- Processor

Components of an LF system

- Data carrier
- Reader (reader head)
- Processor

UHF systems feature the following characteristics:

- Short read/write path
- High read/write speed
- High data transmission speed
- Low energy consumption
- High read/write distance
- Very small read/write head

HF systems feature the following characteristics:

- Long read/write path
- High read/write speed
- High data transmission speed
- Low energy consumption
- High read/write distance
- Very small read/write head

LF systems feature the following characteristics:

- Short read/write path
- Low read/write speed
- High data transmission speed
- High energy consumption
- Low read/write distance
- Large read/write head

ABOUT UHF SYSTEMS

- Galvanically isolated reader head
- HF reader head
- LF reader head

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- High data transmission speed
- High energy consumption
- High read/write distance
- Large read/write head

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- High data transmission speed
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- High read/write distance
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- LF systems are best suited for close range applications.

Components of an UHF system

- Data carrier
- Reader (reader head)
- Processor and data processing unit

Components of an HF system

- Data carrier
- Reader (reader head)
- Processor

Components of an LF system

- Data carrier
- Reader (reader head)
- Processor

UHF systems feature the following characteristics:

- Short read/write path
- High read/write speed
- High data transmission speed
- Low energy consumption
- High read/write distance
- Very small read/write head

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- Long read/write path
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- Short read/write path
- Low read/write speed
- High data transmission speed
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- Large read/write head

ABOUT UHF SYSTEMS

- Galvanically isolated reader head
- HF reader head
- LF reader head

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- LF systems are best suited for close range applications.
WHAT IS RFID?
RFID (Radio Frequency Identification) is the communication technology for non contact and automatic identification of objects (machines, goods, people, animals, for example) using electromagnetic radiation or electrically. Along with bar codes, data matrix codes, biometric (fingerprints), optical text recognition and even contact-type smart cards, RFID is a commonly employed technology.

THE DIFFERENT RFID SYSTEMS
RFID systems are available for three frequency ranges: Ultra-high frequency (UHF), high frequency (HF) and low frequency (LF). These are associated with various technical and physical characteristics.
- LF (low frequency): 125 kHz - 134 kHz
- HF (high frequency): 902...928 MHz
- UHF (ultra-high frequency): 902...928 MHz

UHF systems: Usually passive antennas
HF systems: Usually active antennas

WHAT ARE THE CONSEQUENCES OF THE DIFFERENT FREQUENCIES?

- LF is best suited for close range and for difficult conditions such as metallic surroundings. LF is therefore often used in underground infrastructure.
- HF is ideal for point reading at close ranges up to 650 mm. With HF you can process and store larger quantities of data at high transmission speeds.
- UHF typically communicates at a range of 6-10 m distance. UHF allows simultaneous reading of multiple data carriers (multi-tag reading).

SYSTEM STRUCTURE

- **RFID requires three main components.** These form an RFID system.
  - **Data carrier (data storage)**
  - **Read/write head (data transmission)**
  - **Processor and data processing and communication**

The system components in detail:

- **Data carrier (data storage)**
  - Stores all kinds of data which is read or written by computers or automation equipment. The data carrier antenna sends and receives the signals. Read/write versions are available in various memory capacities and with various storage mechanisms.
  - Passive data carriers without power supply: Active data carriers with power supply

- **Read/write head**
  - Provides power to the data carrier, reads the data and writes new data to it. To read the data in the processor unit when the data is further processed.

- **Antenna**
  - Transmits the power.
  - HF systems: Antenna is integrated in the read/write head.
  - LF systems: Antenna is separate and must be aligned to the read/write head without read/write head electronics (integrated into the processor unit).

Components of an UHF system:

- **Data carrier**
- **Active antenna with read/write electronics**
- **Processor and power supply**

In UHF systems close placement of the data carrier in front of the antenna is not necessary because of the large working range. UHF systems can therefore achieve long read/write distances.

Various industry standards are used for both the LF/HF range and UHF for communication between the system components. These ensure the information transmitted. There are also proprietary manufacturer-specific solutions available. (What you need to know about UHF systems/RFID systems).

Typical RFID systems:

- **HF**
  - Used in access control and key management.
  - Typically low cost, high read/write distance.
- **UHF**
  - Optimized for reading many tags in a short time.
  - Great for industrial applications.
- **LF**
  - Used in small area operations.
  - More stable and secure than HF.

RFID systems have been classified as LF, HF, UHF, and microHF. These systems can be combined to create complex systems.

**WHAT ARE THE NEEDS OF THE DATA CARRIER?**

- **Power transmission**
  - Power is transmitted to the data carrier by the antenna.
  - The antenna shape determines different field distributions (E-field, H-field) and read/write distances. It also determines the active communication fields.

**High-performance solutions from Balluff**

In addition to the industry standards there are proprietary systems that are not described by any standard. For example, high-performance solutions have a read/write distance of 1,000 to 2,000 mm. These are also used for industrial applications. There are also proprietary manufacturer-specific solutions available (see information below). (What you need to know about UHF systems).

- **Linear polarized antennas**
  - The electromagnetic field is linear and either vertical or horizontal. It can be adjusted to the orientation of the read/write head.
  - The read/write head antenna and the data carrier must be linearly polarized in order to transmit power.

- **Circular polarized antennas**
  - These antennas have a circular field of view.

**Power transmission**

Power transmission between data carrier and read/write head is essential for optimal operation of a UHF RFID system. Whether and how the antenna need to be aligned with each other depends on the type of polarization of the antenna.

Mainly used with UHF RFID systems:

- **LF**
  - A single antenna can be used for open area read/write distances.
  - Several antennas are combined to achieve the desired read/write distance.
- **HF**
  - A single antenna can be used for open area read/write distances.
  - Several antennas are combined to achieve the desired read/write distance.
- **UHF**
  - A single antenna can be used for open area read/write distances.
  - Several antennas are combined to achieve the desired read/write distance.

**SYSTEM CHARACTERISTICS**

**Why data storage is important**

Selection of the data storage determines where data can be stored on the data carrier and how the data is processed.

- **Passive data storage**
  - No additional power supply required.
  - Data can be read or written using reader.
- **Active data storage**
  - Requires additional power supply.
  - Data can be read or written using reader.

**Central data storage**

- **All data records are stored in a central database**
  - Data carrier is simply an identifier.
- **For both reading and writing information**
  - Data carrier is used to store additional information.

**RFID antenna field**

- **The location of the antenna field is distributed unevenly and with additional information**
- **The polarization and directionality, which allows greater read distance than with a round antenna**
- **The location of the data carrier and the read/write head is important in order to achieve greater read distance**

**Desynchronization data retention**

- **No data can be read if the distance between data carrier and reader is too great**
  - No data can be read if the distance between data carrier and reader is too great.

**WHAT YOU NEED TO KNOW ABOUT UHF SYSTEMS**

- **Antenna type**
  - Need to know about UHF systems
  - The type of antenna and the read/write head is important in order to achieve greater read distance.

- **Application**
  - The working range of the Balluff BIS RFID systems
  - Frequently used in the automotive industry.

- **Installation**
  - Installing data carriers
  - The installation of the data carrier must be kept clear of any metal types.

- **Mode**
  - How to achieve optimal power transmission
  - The entire area of the data carrier must be kept clear of any metal types.

- **Performance**
  - How to achieve optimal power transmission
  - The entire area of the data carrier must be kept clear of any metal types.

- **Limitations**
  - How to achieve optimal power transmission
  - The entire area of the data carrier must be kept clear of any metal types.
Automatic identification and tracking in production

**THE PERFORMANCE RANGE**

Balluff offers you a wide selection of data carriers and read/write heads for LF, HF and UHF applications. With the BIS V multi-frequency processor unit, all systems can be configured with each other. By using cable, or can be located directly on the processor unit housing. The read/write heads can be connected the traditional way using cable, or can be located directly on the processor unit housing. The read/write heads for all systems can be combined with each other. By using cable, or can be located directly on the processor unit housing.

**Low frequency (LF) RFID gives**
- High transmission speeds and large data quantities at ranges up to 400 mm
- Seamless integration in applications through global RFID standards ISO 15693 and ISO 14443A
- Easy integration in applications using global standard interfaces and global solutions realizable

**Applications:**
- Parts tracking at manual workstations.
- Machine parts, for example on manual palletizing, data recording close range, production control (palletizing, data recording close range, production control), tracking of automation processes, intralogistics

**The most important benefits**
- Ideal for relative tool identification at short ranges
- High performance and flexible read/write heads in matching systems with co-interferes and co-interferences
- High performance and flexible read/write heads in matching systems with co-interferes and co-interferences
- Wear-free, maintenance-free and insensitive to dirt
- Completely automatic, no personnel involvement

**High frequency (HF) RFID solutions**
- For high frequency (HF) RFID solutions, you can combine up to four read/write heads on the BIS V processor unit in addition to connecting an IO-Link device. Many read/write heads can be connected to one IO-Link device and all IO-Link devices can be flexibly combined with each other. By using cable, or can be located directly on the processor unit housing.
- For dynamic processes with great read distances up to 6 m and more
- Easy integration in applications using global standard interfaces and global standards: ISO 18000-6C and EPC Gen2 Standard
- Applications: Parts tracking at manual workstations, data recording close range, production control (palletizing, data recording close range, production control), tracking of automation processes, intralogistics, customerspecific developments

**The most important benefits**
- High transmission speeds and large data quantities at ranges up to 400 mm
- Seamless integration in applications through global RFID standards ISO 15693 and ISO 14443A
- Easy integration in applications using global standard interfaces and global standards: ISO 18000-6C and EPC Gen2 Standard
- Applications: Parts tracking at manual workstations, data recording close range, production control (palletizing, data recording close range, production control), tracking of automation processes, intralogistics, customer-specific developments

**Ultra-high frequency (UHF) systems**
- For ultra-high frequency (UHF) systems you can select from special high-performance UHF processor units. The multi-frequency BIS V processor unit is also an option. Or you can read UHF data carriers using one of our handheld readers, for example on manual palletizing, data recording close range, production control (palletizing, data recording close range, production control), tracking of automation processes, intralogistics

**The most important benefits**
- Low losses and high transmission speeds between 860 to 960 MHz
- Read distances up to 6 m and more
- Easy integration in applications using global standard interfaces and global standards: ISO 18000-6C and EPC Gen2 Standard
- Applications: Traceability, tracking of automation processes, intralogistics

**MANAGING ALL YOUR DATA**

Go online to individually configure your own system - www.balluff.com/go/rfid-configurator

**www.balluff.de**