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Six Factors to Consider When Choosing the Appropriate UHF Tag

Tag-specific Requirements in RFID Systems

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Content

How Do I Choose the Appropriate UHF Tags for My Application? 3

Frequency Ranges 3

Material of the Objects Being Identified 4

Size and Position of the Tag 5

Tag Design 5

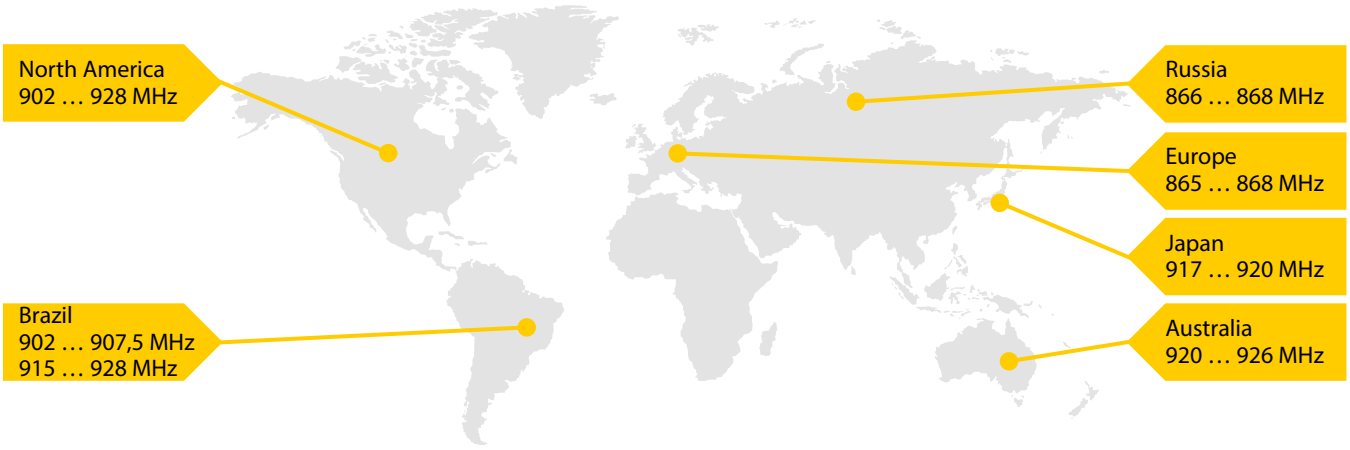
Memory Buffer or Size 6

Optimum Mounting Method 7

How Do I Choose the Appropriate UHF Tags for My Application?

With particularly high frequencies, UHF RFID systems allow reading ranges of several meters. Tags, whose communication via the air interface is defined in accordance with ISO/IEC 18000-63 (EPC global Class 1 Gen 2), play a decisive role in this. If the chosen tags are, however, not suitable for the application, if they are not sufficiently durable to withstand the process or if they do not deliver the necessary performance (in terms of reading range), the reading rate of the RFID system will be too low or the entire system may fail. It is therefore necessary to understand the technical demands and physical conditions of the relevant process in as much detail as possible. These diverse conditions of different industries and applications generate a wide variety of tag-specific requirements, affecting aspects such as the design or the memory size. UHF RFID systems are being used for more applications all the time so the process of choosing the appropriate tag is becoming more and more complex.

Frequency Ranges



Question
In which region will the tag be used?
There are basically three variants

- ETSI (European Telecommunication Standard Institute): The tag is optimized for a frequency range of 865-868 MHz; this range is used in Europe, Russia and India, for example.
- FCC (Federal Communications Commission): The tag is optimized for a frequency range of 902-928 MHz; this range is primarily used in America and Asia.
- Global: The tag functions over the wide frequency range of 860-960 MHz and can be used in all international regions.

When choosing a tag, it is essential to know where the tag will be used.

Potential application scenarios

- The tag is being used at a plant in Europe. The tag always remains in the same region when it is read after the end of production. In this scenario, the ETSI variant is required.
- The tag is not removed from the product after the end of the production in Europe; instead, the product is sent to a site in America and the tag data is read there. In this scenario, the global variant is required.

Material of the Objects Being Identified

Question

What type of tag is appropriate for my process or application?

When choosing a tag, it is important to consider the surface on which the tag will be mounted. In certain circumstances, the read/write range can be greatly reduced by the electrical conductivity of the mounting surface. For example, the ends of the antenna will short-circuit if a conventional paper label is mounted on a metallic surface. As a result, the tag cannot be supplied with energy and is no longer readable. Other materials and substances that suppress the electric field include:

- Liquids
- Wood
- Textiles
- Plastics

For some applications, special requirements are set out in the data sheet of the tag

- „On metal“: These tags are suitable for mounting on metal. Insulating materials inside the tag prevent a short-circuit of the ends of the antenna. It is important to note that on-metal tags often function within a smaller frequency range. Different versions are therefore available for the ETSI and FCC frequency ranges.
- High temperature: In certain processes, tags may be subjected to significant temperature fluctuations. Before choosing a tag, it is therefore important to know what operating and storage temperatures to expect and whether high temperatures occur occasionally or regularly. It should be tested how fast the tags heat up or cool down in the application. In this context, it is necessary to consider the expected number of cycles and thus the impact on the life expectancy of a tag.



RTI-Tracking: Clear identification of returnable containers. Some hard tags are also suited for direct mounting on metal.



Seamless tracking of skid conveyors, also during all production steps in the paint shop. High-temperature tag remains firmly attached to the skid and is insensitive to external influences.

Size and Position of the Tag

Question
How large can or must the tag be? Where can the tag be mounted?

Depends on
- The physical size of the object being tagged and its characteristics (plastic, metal, glass, etc.)
- The required reading range. In general: In addition to the tag's integrated circuit (IC), the size of the antenna structure on a tag has a significant impact on the reading range.

Tag Design

Question
Which body style should the tag have?

Tags come in several body styles, based on application environments, ambient conditions and the ability to fulfill different purposes
- Label: The antenna and chip are placed on a thin base layer and then covered with a thin film or printable paper. This type of tag is protected against mechanical stresses only to a very limited extent. If the tag is deformed as a result of impacts or bending, there is a risk that the connection between the antenna and the chip will be broken and the tag will no longer function.



UHF RFID Smart Label

- Hard Tag: These tags comply with high protection classes up to IP69K and are made from materials that are resistant to many substances and will not show cracks, breaks or other damage even after a long service life.



UHF RFID Hard Tag

- Sensor Tag: Combining sensors and RFID tags (labels and hard tags) is an interesting technical solution. In this case, familiar components of the tag, generally the antenna and IC, are enhanced by electronics for carrying out various measurements. Temperature and humidity measurements are often performed by sensor tags.

Memory Buffer or Size

Question
How much data does my customer need to store? What data needs to be stored on the tag?

Depends on
- Data storage and processing
  - Scenario 1: The customer saves all process-relevant data on the tag. A high storage capacity is required. Risk: If the tag is lost or becomes faulty, all data will be lost.
  - Scenario 2: The customer assigns only a unique ID and stores all process-relevant data in their own system. A low capacity is sufficient in this scenario; 96 bit is usually enough, which is equivalent to a barcode.
- Customer's requirements
  - In particular larger customers have already specified how much storage capacity is required on a tag and what data in what format needs to be stored on the RFID tag.

Data can be stored in two memory buffers on the UHF tag
- The EPC memory (Electronic Product Code): This memory buffer must be present in accordance with the EPC Global Class 1 Gen2 specification and is usually at least 12 bytes in size. Depending on the chip type, this buffer can also be up to 62 bytes in size. It is suitable for assigning a unique ID and can be read in bulk; multitag applications are also possible.
- User memory buffer: This memory buffer is optional. It can be up to several kilobytes in size, making it suitable for storing large amounts of data. This memory buffer cannot be read in bulk so multitag applications are not possible. However, it is possible to read the memory buffer of a specific tag within a group by specifying the EPC.

Optimum Mounting Method

Question
How can a tag be mounted to an object?

There are several ways to mount a tag to an object
- Glue
- Screws
- Cable ties
- Potting
- Welding

The optimum mounting method depends on the type of tag, the ambient conditions and the surface of the tag.



Full transparency along the entire supply chain: detection of goods at RFID gates by using simple, cost-effective labels.

RFID Systems from a Single Source
The BL ident complete RFID system from Turck offers solutions in the HF or UHF range with interfaces for use in a plant or switch cabinet. Since 2006, this RFID system has been used successfully in industrial environments and is being developed continuously. Over the years, Turck specialists have acquired in-depth expertise that you can benefit from today in your own RFID projects. Our integration partner, Turck Vilant Systems, operates a proven middleware system to help you smoothly integrate a UHF system into your processes. This company has demonstrated its expertise in integrating solutions in MES and ERP systems via several complex projects. Please do not hesitate to contact us if we can offer you further assistance. We look forward to exploring every new challenge. **contact@turck.com**

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Further information

At a Glance: UHF RFID Reader Q300 – The IoT Multi Tool
RFID Solutions for the Automotive Industry
RFID Solutions for the Food and Beverage Industry
Identification Solutions for the Pharmaceutical Industry

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