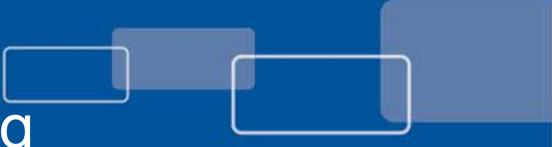


# Top 7 Considerations to Choose the Right RFID Tag

A decorative graphic on the right side of the title banner, featuring several overlapping, semi-transparent rectangular shapes in shades of blue and white.

**With thousands of RFID tag configurations to choose from, and new ones introduced almost daily, how do you sort through the sea of passive transponders to find cost effective tags that will deliver optimal performance for your application? Here are 7 items to consider when choosing the right RFID tag for any task.**

## **1. Operating frequency: LH, HF or UHF**

The “RF” in RFID stands for “radio frequency.” Each RFID system operates within one of three bands on the electromagnetic spectrum: low frequency (LF), high frequency (HF), or ultrahigh frequency (UHF). In general, as operating frequency increases, data processing speed increases, as does read range – or the distance between the powered reader and the passive tag it reads. However, increasing frequency tends to decrease a radio wavelength’s ability to penetrate some materials. In general:

- LF is a cost effective option for applications allowing consistent physical placement of tags on items, enabling readers to identify individual tags one at a time at close range. LF is the is almost not affected by the environment e.g. water or metal.
- HF tags can be read from distances of a few to several inches, allowing greater flexibility for tag and reader placement, and enabling higher processing speed and accuracy. In addition, HF processing enables larger memory capacity on each tag. (See more on memory capacity below.)
- UHF technology is rapidly expanding the boundaries of data collection speed and accuracy. Some UHF tags can be scanned from up to 25 feet (8 meters) or more, with readers identifying multiple tags simultaneously. Using UHF, an entire truckload of hundreds of individually tagged containers can be accounted for in the few seconds it takes for a truck to roll into or out of a distribution point. On the other side, UHF is sensitive to the environment for issues like reflection, dampening, detuning based on the surrounding materials.

If tags are to be used with an existing reader network, then select a tag whose operating frequency is compatible with your legacy system.

## 2. . Environmental conditions

While integrated chips are relatively delicate, they can be housed in materials to protect them under even the harshest conditions.

In a stable environment, such as tagging books in a library, a relatively modest housing will provide adequate protection for each tag's electronic components.

At the other end of the spectrum, tags used in many industrial applications must perform despite repeated exposure to extreme heat or cold, physical impact, vibration, moisture and chemical agents.

Consider the conditions tags will be exposed to when deployed in your application.



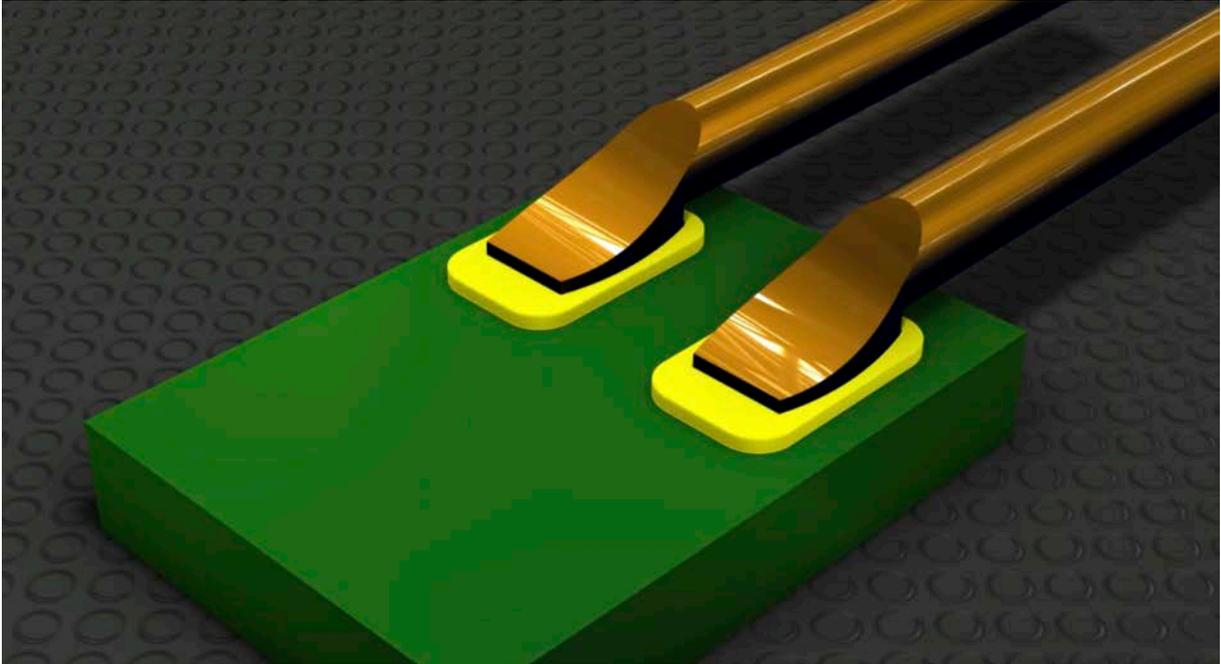
During a 20-to-40-year keg life, this tag will withstand numerous high-pressure washes with high-heat sterilization; plus repeated exposure to, liquids, harsh chemicals, the rigors of distribution and collection, and sub-freezing temperatures.

## 3. Composition and contents of tagged items

The RFID tags and readers may interact differently depending upon the surface material on which tags are mounted, including metal, glass, plastic or wood. Liquids may also impact readability, both as contents of a tagged container, and when liquids are present in close proximity to tags and readers. Ensure the tags you choose are tested to perform in your application.

#### 4. Physical space available for tag placement

Tags come in a multitude of sizes and shapes, from high-visibility units to be placed on the exterior of 45-foot cargo containers, to tiny tags that attach discreetly or are embedded into small objects. Knowing tag placement options and potential size limitations for each item to be tagged will help identify the tag size and shape that is right for your application.



Direct bonding technology attaches chip antennas without the need for bulky housings, enabling production of smaller, thinner RFID tags.

#### 5. Optimal mounting method

The optimal mounting method will depend upon a combination of where a tag will be secured, the environmental conditions it will be exposed to, and the composition of the surface on which the tag will be placed. Options include:

- Cable ties – Attach easily and provide tamper evidence when used as closure for bags or containers
- Embedding – Tags may be sealed within an item's material components or secured in a cavity
- Glues – A variety of industrial adhesives are available to bind virtually any materials and hold securely under a wide range of environmental conditions
- Screws, rivets or nails – Many tags include pre-drilled holes to help make this method swift and secure
- Welding – Some tags feature mounts which can be securely welded to metal cylinders, containers, tools or machinery



This flexible tag mounts quickly and securely to pipes, posts or tubes with cable ties.



Pre-drilled holes accommodate fast, secure mounting with screws or nails.

## 6. Memory capacity

Tags with large memory capacities enable more detailed records. Still, low memory tags are sufficient for some tasks when used with an on-line database that holds the additional data.

In its infancy, the industrial RFID tracking industry used relatively simple 8 bit and 16 bit, read-only, alphanumeric codes to distinguish between individually tagged items. Very little memory space is required to store these simple codes. For some applications, a 16-bit identifier may still be sufficient. UHF tags mostly use a standardized 96 bit EPC code, which is the electronic counterpart of an industrial barcode.

However, technological advancements are packing larger amounts of data in ever-shrinking integrated chips. Larger memory tags enable tracking systems to employ more secure coding and encryption techniques, to ensure greater data accuracy and veracity.

High memory tags – with up to 64 kilobytes or more and read-write capability – are redefining RFID potential. A single tag can securely store detailed maintenance records for a piece of industrial equipment or fleet vehicle. Complete records of production process steps stored in a high-memory tag can provide instant status information even in-off line scenarios, when no real-time database access is possible.

For many RFID users, increasing tag memory capacity has significantly expanded logistics tracking and reporting capabilities.

## 7. Mix and match components for a custom solution

- If the first 6 items above have not revealed the ideal tag for your requirements, explore the potential of a custom design. Leading manufacturers can customize a tag to fit your unique requirements for chip type, dimensions, programming and materials. Mixing and matching standard components to create a custom tag can be cost effective, while optimizing the potential of your logistics application.
- Customization also offers the possibility to embed multiple technologies in a single RFID tag, providing paths that connect legacy systems with new initiatives.