

# The Ultimate Guide to Industrial RFID Labels & Tags



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# Overview

## About This Guide

This comprehensive guide is for industry professionals seeking a more reliable way of identifying and tracking equipment, material, and personnel on and off the worksite.

IndustriTAG's experts created this guide to show fellow industry professionals the path to efficient, accurate, error-free, and successful identification of equipment and inventory using radio-frequency identification (RFID). We aim to empower you with this knowledge so that you may navigate our RFID products and decide which are right for you. This guide is part of the ultimate solution, and we are here for you every step of the way.



## Who We Are

For over two decades, IndustriTAG, a subsidiary of GA International, has innovated and developed laboratory labels and labeling solutions that satisfy the stringent identification requirements needed in harsh environments. Our success can be attributed to our vast catalog of application-specific labels — a concept we are delighted to have pioneered.

If you find yourself in a particular case where your requirements have no available options, you can always take advantage of our **custom manufacturing capabilities**.

# IndustriTAG's RFID Labels & Tags

IndustriTAG has an extensive catalog of RFID label solutions that each fulfill a different purpose. This guide outlines our various label classes and their main differentiating attributes, which you should consider when assessing your needs. These classes are available in many sizes, colors, and configurations, which are identifiable by SKU#.

### Benefits & Requirements of RFID Labeling

- RFID printer and reader required
- Tags can be scanned and read from a distance with minimal line of sight
- Remain readable even if the label is defaced
- Scan multiple tags simultaneously
- Must not be obstructed/surrounded by metal surfaces
- Monitor many assets consistently
- Tags can be re-encoded
- Higher data storage capacity
- Increased security
- Face stock can be printed with barcodes

## Custom Solutions

IndustriTAG also has the equipment and expertise to create custom-made solutions tailored to your exact needs and requirements. Our flexible RFID inlays can be added to any of our existing durable label solutions to produce an RFID label or tag that can withstand a wide range of harsh environments and conditions, perfect for any application. Our **team of experts** are always ready to help our customers with their label design and creation needs.



# Industries Served

RFID technology utilizes radio waves to identify physical objects, with most common RFID systems today comprised of 3 main components, a tag, reader, and data processing software (management system). This technology is already being used by hospitals for record-keeping, by industrial facilities to regulate access to secure areas, as well as by retail and logistics for inventory and supply chain management.

## Aviation / Aerospace

The aerospace field were early adopters of RFID technology, having implemented it in a variety of forms for over 20 years. This has allowed them to better identify, track, and manage the various critical components used in airplanes and aircrafts, which can be composed of thousands, and sometimes millions of parts. RFID technology has also improved aircraft maintenance by ensuring all parts are present, placed in the proper location, are serviceable, and authenticated, reducing time waste and human error. RFID tags also effectively reduce inspection times, mission-threatening errors, and operational costs, enabling improved communication between the airline/airframer and its suppliers when a part is determined to require replacement or repair.

We recommend our **low temperature RFID labels** for identifying aircraft components, as they will remain firmly attached even when exposed to the low temperatures encountered at high altitudes.

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## Agriculture

RFID technology has recently become an integral part of the agriculture industry with the adoption of vertical farming. This energy-intensive system of crop production involves the integration of multiple technologies, allowing crops to grow without any agronomic constraint. RFID labels and tags allow readings to be collected on various metrics, including CO2 levels, temperature, and light intensity.

We recommend using durable RFID labels and tags that can stand up to the harsh elements of the outdoors and the humid environments used in greenhouses. **Low temperature RFID labels** should be used when identifying seeds during storage and conservation, while **chemical-resistant labels** should be used if exposure to fertilizers and pesticides is likely. We can also integrate RFID chips into our plant labels if individual crops need to be identified. Our labels can also meet FDA compliance (FDA 21 CFR 175.105) for indirect food contact if necessary.

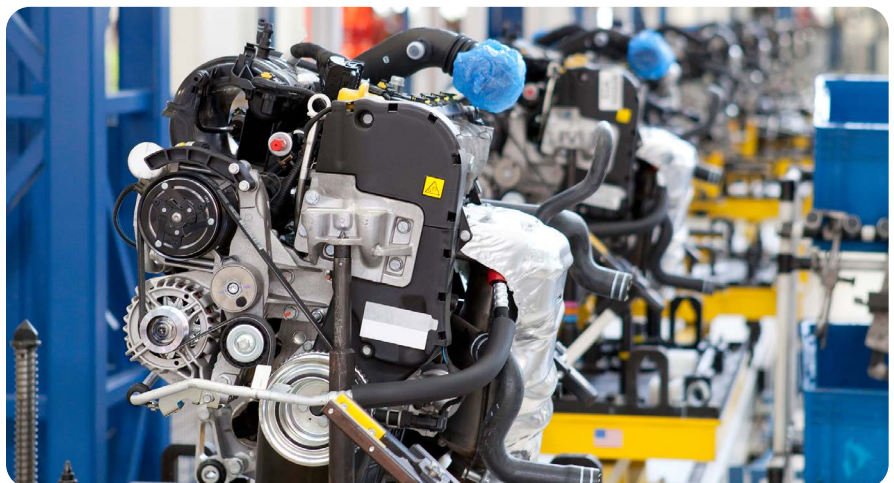
## Automotive

The automotive industry is integrating smart new digital and engineering technology into their products currently in development. As a result, wide-area RFID technology, which can significantly increase performance and efficiency, has rapidly become indispensable for any manufacturer seeking to remain competitive. This can be used to ensure parts are delivered to the assembly line in advance, ensuring workers are never waiting for parts to arrive, minimizing inefficiency and time waste. RFID technology can also identify and track assembled vehicles by associating the unique RFID serial number with the VIN, making it easier to build a service history of the vehicle and verify whether it has been involved in an accident or crime.

**Chemical-resistant** and **heat-resistant RFID labels** are suggested for identifying automotive parts, especially if they are found under the hood or may be exposed to oils, grease, or fuel. We also offer **RFID labels for tires** that will firmly adhere to rubber surfaces, such as rough tire tread, and will also resist exposure to various chemicals and solvents found in garages, dealerships, and repair shops. Moreover, our **RFID labels for hard-to-stick surfaces** can be used inside the vehicle to identify low-surface energy materials, which can be challenging to label.

## Construction

RFID technology can help mitigate the dangers present on construction sites and provide accurate tracking data on valuable equipment and material. RFID can automate the task of identifying and tracking materials and construction tools that can often get lost on large construction sites. It enables thousands of high-value assets to be tracked in real-time, allowing a company to know on a daily basis where assets are located. An RFID-enabled solution can also be used to track the number of workers on job sites, as well as their identities. This allows managers to track personnel as they enter and exit the site, providing an up-to-date total of the number of workers present. It can also alert workers when they are approaching a potential hazard or when workers enter unauthorized areas. We can also provide custom **RFID label solutions** integrated into labels designed to identify hard-to-label surfaces encountered during construction, including **brick**, **stone**, and **lumber**.





## Electronics

The consumer electronics industry has a complex supply chain with high theft rates and a high potential for elevated out-of-stock rates that would benefit greatly from the added tracking and visibility offered by RFID. It can be used during manufacturing, particularly for printed circuit board (PCB) assembly, where identification and work-in-process tracking are essential. RFID can also help improve security through enhanced tracking and by enabling a remote lock feature that can be activated throughout the supply chain, ensuring it cannot be used if it is stolen. Additionally, given that, unlike other consumer products, electronics retailers do not stock many goods on store shelves, RFID can provide a real-time picture of available inventory, mitigating out-of-stock concerns. In fact, many electronics companies and big box stores have already started implementing the technology, including Microsoft and Walmart.

**Heat-resistant RFID labels** that can withstand the elevated temperatures needed during PCB assembly are suggested for use during the manufacturing process. We can also **custom produce** an RFID solution for your electronic identification needs that is compatible with your existing supply chain.

## Oil & Gas

RFID systems have a variety of applications in the oil and gas sector, from increasing operational efficiency to enhancing overall production, as well as improving safety and security. It can be combined with traditional GPS technologies to improve hardware and personnel tracking, monitor equipment, and help manage projects and logistics. RFID tags and readers can be used to automate and expedite the receiving and monitoring of material throughout expansive work sites and rigs, with oil drilling companies already using RFID to improve delivery and processing times. **Chemical-resistant RFID labels** can be used to maintain pipelines and other equipment exposed to harsh environments by measuring joint pressure, indicating proper assembly, and identifying oil leakage. RFID technology can also automatically provide headcounts during evacuations and emergencies, assist in search and rescue operations, and even alert supervisors to hazardous situations.



**This technology is already being used by hospitals for record-keeping, by industrial facilities to regulate access to secure areas, as well as by retail and logistics for inventory and supply chain management.**



*GA International*

# Environmental Conditions

Determining the environmental conditions your RFID labels will need to perform is crucial to proper implementation. You may require a label that performs in different environmental conditions, including extreme temperatures or weather conditions, or that will be exposed to harsh working conditions, including heavy-use and chemical exposure.



## Low Temperatures

Our line of low temperature RFID labels is designed to withstand short-term exposure and long-term storage under low temperature conditions (-80°C/-112°F), including specialty RFID labels that withstand temperatures as low as -196°C/-321°F. Moreover, our passive, thermal-transfer cryo labels for low temperatures have a flexible UHF antenna and low-temperature adhesive that allows them to firmly adhere to curved and wet surfaces. Perfect for use in aerospace, logistics, construction, and wherever ultra-low temperature storage or simulations are required.

Our **ZCRF-class** and **ZRF3-JTTA-class** labels can withstand a wide temperature range from -80°C to 110°C, perfect for various outdoor applications, such as identifying construction tools, oil & gas equipment, and agriculture products. In addition, our **ZRF3-VPT-class** RFID labels can be mechanically fastened or used as hang tags on various items such as lumber, pallets, horticultural products, and other moveable assets, are also weather-resistant and can be used in low temperature conditions. Conversely, our **ZRF3-JTTA-class** RFID labels can resist extremely low temperatures, as low as -196°C, and can be read when immersed in liquid, including liquid nitrogen. Ideal for the aerospace and aircraft industries, as well as testing and research centers.



## High Temperatures

Our heat-resistant RFID labels are designed for identifying containers and surfaces that will undergo high heat treatments and exposure. These thermal-transfer RFID labels will withstand temperatures up to +230°C/+446°F, ensuring both the printed visual information and encoded RFID data are preserved in high heat conditions. Ideal for use in industrial painting and drying processes, such as automotive and epoxy powder coating, as well as other industrial procedures requiring high heat.

Our **ZRF3-AUTT-class** labels will resist long-term exposure to high heat, up to +150°C/+302°F or more short-term exposure (3 hrs) at +230°C/+446°F. Perfect for RFID identification and tracking of items subjected to elevated temperatures, including for the oil & gas industry, forging, manufacturing, and other industrial procedures requiring high heat.



## Chemical Exposure

These chemical-resistant thermal-transfer RFID labels are intended for applications requiring chemical resistance, such as on surfaces that will undergo extended exposure to chemicals and solvents, including bulk containers, drums, gallon buckets, and glass reagent bottles. Ideal for use in chemical storage and processing, including in the petrochemical and manufacturing sectors, or for identifying fertilizers and pesticides used in agriculture.

Our **ZRF3-FTT-class** labels are intended for chemical industries, as well as petrochemical, agriculture (fertilizer), and manufacturing sectors, wherever container identification requires a high level of chemical resistance and monitoring. On the other hand, our **ZRF3-PRF-class** labels will adhere to hard-to-stick surfaces, such as PTFE chemical bottles and containers, PTFE/PFA pipes, PTFE/PFA fittings, ABS sports and worker safety helmets, and ABS cases and housings, ideal for the oil & gas industry, mining, construction, manufacturing, supply chain, and sports facilities.

# Printing Methods

At this point, you have identified what containers you are labeling, which environments the labels will be subject to, and which special features you require. It is time to choose your printing method. While we offer labels for various printing methods, our RFID labels are only available for printing with thermal-transfer RFID-enabled printers. However, if you do not wish to deal with on-demand label printing yourself, you can always take advantage of our **custom label printing** services.



## Thermal-Transfer

Thermal-transfer is the gold standard of printing methods as it provides the most versatility and resistance. The technology works by heating a ribbon to transfer ink onto the label. When printing your own labels in-house, using thermal-transfer ribbons made of resin provides the most resistance against harsh chemicals and solvents, extreme temperatures, as well as smudging, and scratching.

These printers use rolls of labels and print using a thermal ribbon in only one color (commonly black). Thermal-transfer printing provides the most options for different label materials, so you're highly likely to find the product you need by sticking with thermal-transfer as your printing method. Using a dedicated thermal RFID printer allows labels to be simultaneously printed and encoded with information, as well as barcodes. This will save you time by automating the otherwise manual process of encoding each tag.

## Direct Thermal

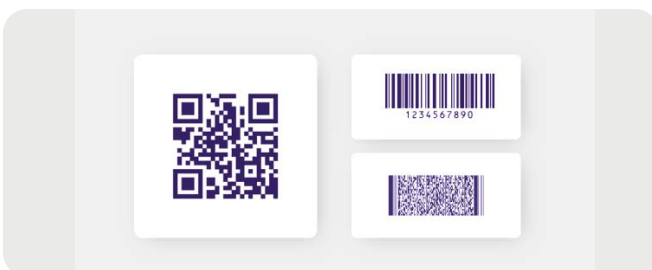
Direct thermal printers use rolls of labels coated with a leuco dye, a chemical that changes color when heat from the print head is applied to it. Direct thermal labels **do not** use ribbons, and the printout is only black, not colored. Direct thermal printing does not require a ribbon and provides a hassle-free option when a thermal-transfer printer is unavailable.

RFID printers that can print in both thermal-transfer and direct thermal modes can be used to print direct thermal RFID labels if desired, though we don't offer any direct thermal RFID labels at this time.



# Data

Best practices state that a label should display human-readable data alongside a scannable code. Common elements displayed on a label are a unique identifier, batch number, date, and company logo. Scannable barcodes and RFID chips both offer great ways of tracking samples and managing inventory. Each has its own unique advantages.



## 1D & 2D Barcodes

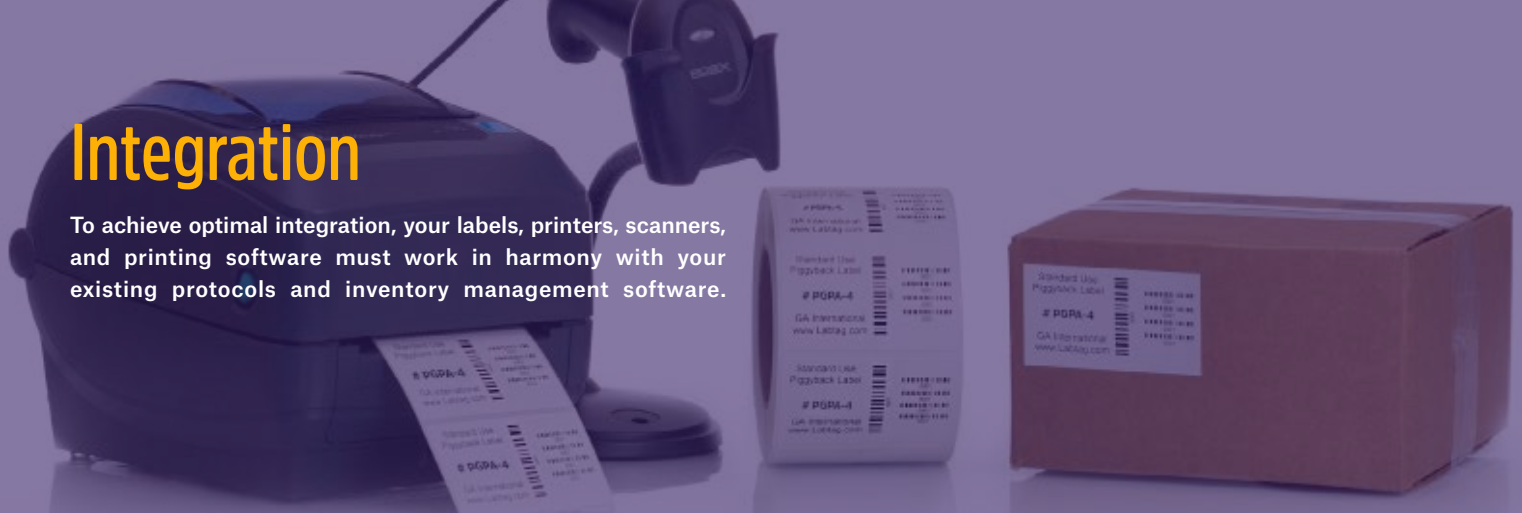
- Low start-up cost
- Printable using any printer
- Scanners are inexpensive
- Scannable with smartphone applications
- Scan one barcode at a time, no mix-ups
- Adaptable to a large variety of applications





# Integration

To achieve optimal integration, your labels, printers, scanners, and printing software must work in harmony with your existing protocols and inventory management software.



## Printers

Our labels work with most brands of thermal printers. The printer you choose should fit seamlessly into your lab's workflow alongside all other components. For warehouses and facilities that process high volumes of products or depend on inventory informatics software, having a dedicated label printer (e.g., thermal-transfer) rather than a desktop printer is necessary to ensure workflow isn't compromised. **Thermal-transfer barcode printers** and **RFID printers** are available through IndustriTAG. RFID printers can also accommodate thicker labels, due to the added RFID inlay.



## Label Software

**Label software** can be categorized as label design software or informatics software.

Label design software can offer a range of basic and advanced features, allowing you to design, create, automate, and manage labels. You can connect databases to your templates, encrypt documents, generate serial numbers and variable data, design 1D and 2D barcodes, encode RFID tags, and much more. IndustriTAG offers two popular options, **BarTender™** and **ZebraDesigner Professional 3**, and can support other options.

Informatics software like laboratory information management systems, inventory management systems, and electronic witnessing systems handle patient and sample information. This software might include a label printing portion. If not, they can integrate with label design software. We partner with several informatics software providers to have seamless integration with our labeling solutions.



## Scanners & Readers

Scanners and RFID readers are available with different options and additional features. Handheld scanners/readers are portable, emitting a scanning light or radio wave at the push of a button, while stationary scanners require the container to be held directly under or above the scanner to register the barcode. Stationary RFID readers emit a continuous radio wave that allows RFID tags to be tracked in real-time. Handheld scanners/readers can work online or offline by sending data to a computer or storing data in the scanner before downloading the information to another system. They can also be wireless or wired, depending on how much flexibility you require when scanning. Depending on the tracking method used, mobile app scanners can also be implemented (e.g., 2D barcodes can often be scanned with mobile apps).





# Why Choose IndustriTAG?

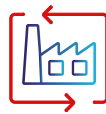
We became a worldwide leader in specialty identification solutions thanks to our R&D and technical support team, which comprises experts who understand the importance of being error-free, efficient, and innovative on the job site. By prioritizing personalized customer service, we are able to deliver tailored solutions on a deeper level and in record time. Being a manufacturer and a retailer allows us to have complete control over the entire development, production, delivery, and support of our products.

As an ISO-certified company, we implement stringent protocols to ensure we uphold high standards of quality in our products and services. We also offer free samples so that you can try our labels before buying to confirm that they will work seamlessly with your application's conditions.



## Dedication to Quality

Rigorously tested high-grade materials and high-quality products.



## Business Continuity

Continue to support customers during service interruptions from unexpected disruptions or disasters.



## Industrial Label Experts

Deep understanding of industry-specific identification requirements.



## Two Decades of Business

Continuously scaling and improving our products and services to better serve our customers.



## Product Innovation

In-house R&D team continuously innovates and creates unique, exclusive products.



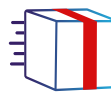
## Tailor-Made Solutions

Helping you realize your multifaceted projects with custom labels and creative solutions.



## Worldwide Distribution

Strategically located warehouses facilitate product deliveries across the globe.



## Fast Order Fulfillment

Daytime and evening crews ensure short lead times so you can meet your project deadlines.



## Satisfaction Guarantee

Easy returns and exchanges if total satisfaction is not met.



## Free Samples

Generous, free sample service allows you to try products before purchasing.



## ISO 9001:2015 Certified

We are committed to providing reliable products and services that meet customer and regulatory requirements, through our quality management system.

## ISO 22301:2012 Compliant

Our ISO 22301:2012 business continuity management system allows us to prepare for and reduce the likelihood of unexpected disruptions so that we may continue to serve our clients.



**Experts ready to help**



IndustriTAG provides excellent, personalized customer service and technical support – before, during, and after your purchase. We are with you every step of the way to help you achieve your labeling goals. Our highly educated experts will assist you throughout the label selection process, ensure you get your labels on time, and help you troubleshoot any issues that may arise. This service is free for all our customers.

## Shop Online at **Industritag.com**

- Discover a large selection of labels in many sizes and colors
- Find the right product by searching for keywords or item number
  - Place your purchase orders (P.O.) online
- Use our live chat to get help from our support team



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