IQ On Metal Labels User Guide and FAQ

Omni-ID office locations: US | UK | China | India | Germany

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INTRODUCTION

Our mission when developing the all new IQ On Metal Range was an unparalleled choice of options to enable the widest possible number of applications for UHF RFID. Extremely high-quality materials and consistent manufacturing processes ensure a competitive upshot on performance, price and consistency.

MEMORY VERSUS READ RANGE

It is well understood that additional memory on passive UHF RFID devices comes at the expense of reduced read range. However, if you need it – we can provide!

IC PRODUCT OPTIONS

Our standard IC choice is the MR6-P which is the default supply format for all our IQ on Metal labels.

Our special-order IC choice is the M4QT and this option can be requested for the IQ 150 and IQ 600 labels.

The Monza R6-P IC offers superior read and write sensitivity with Impinj's autotune technology which helps the IQ On Metal labels achieve a wider bandwidth allowing them to have greater consistency in different environments.

To achieve the greater sensitivity of the Monza R6-P, Impinj has limited some product options, and the features compared to the Monza 4QT can be found in the table below.

	Monza R6-P IC	Monza 4QT IC
Read range	Full read range quoted on datasheet	20% less than MR6 IC
EPC memory (bits)[1]	128 (96)	128
USER memory (bits)[1]	32(64)	512
TID (bits)[1]	48	48
Kill command	Kill command can be applied	Kill command can be applied
Passwords	Full range of temporary lock and permalock on banks of memory	Full range of temporary lock and permalock on banks of memory
Air interface protocol	EPC Gen 2v2 / ISO 18000-63 compliant	
Data profile	Supports single data profile	Supports Private and Public data profiles
Frequency range (MHz)	866-868 (EU) 902-928 (US)	866-868 (EU) 902-928 (US)

[1] EPC and USER memory are reprogrammable. UTID is locked at point of manufacture by IC provider

PRODUCT SELECTION

One of the advantages of Omni-ID's redesign of it's On Metal label portfolio is the availability of smaller products for applications where space is limited.

Setting the read range expectation at an early stage is an important factor in the tag selection process. The summary below is designed to provide an overview of options available.

<u>Regional tag – IQ 150</u> – supplied as standard without Ground Plane and Monza R6-P IC

	Region:			EU or US	
	IC:	Monza R6-P		Monza 4QT (custom option*)	
	Ground Plane:	With GP	Without GP	With GP	Without GP
Read Range (quoted values are 'Up To')	Fixed: On-metal	US 1.6m EU 1.5m	US 1.5m EU 1.4m	US 1.3m EU 1.0m	US 1.2m EU 1.0m
	Fixed: Off-metal	US 3.6m EU 3.6m	US 5.0m EU 3.6m	US 2.2m EU 2.5m	US 2.0m EU 1.1m
	MC 9190: On-metal	US 1.0m EU 0.8m	US 1.0m EU 0.75m	US 1.0m EU 0.85m	US 1.0m EU 0.7m
	MC 9190: Off-metal	US 2.0m EU 1.6m	US 2.7m EU 1.3m	US 1.6m EU 1.7m	US 1.0m EU 1.0m
	MC 3190: On-metal	US 0.5m EU 0.4m	US 0.5m EU 0.35m	US 0.6m EU 0.4m	US 0.6m EU 0.4m
	MC 3190: off-metal	US 1.2m EU 0.7m	US 1.2m EU 0.5m	US 0.7m EU 0.8m	US 0.5m EU 0.5m
	Substrate:	Optimized for On Metal (greater performance off metal)			
	Attachment:	High Performance Acrylic Adhesive			
	Material:	Closed cell foam core with printable PET Facestock			
	Dimensions (mm):	55 x 12.5 x 1.3	55 x 12.5 x 1.2	55 x 12.5 x 1.1	55 x 12.5 x 1.0
	Tolerance:	see Tolerance			
	Operating Temp:	-40°c to +85°c			
	Application Temp:	+18°c to +35°c			

*Minimum Order Quantity with R6-P (with ground plane) and Monza 4QT (with or without Ground plane) is 10,000 labels or 10 rolls

Regional tag – IQ 400 – Limited supply as standard with Ground Plane and Monza R6-P IC*

	Region:	EU or US			
	IC:	Monza R6-P		Monza 4QT	
	Ground Plane:	With GP	Without GP	With GP	Without GP
Read Range (quoted values are 'Up To')	Fixed: On-metal	US 4.1m EU 4.2m	US 4.0m EU 4.0m	US 3.5m EU 3.4m	US 3.4m EU 3.0m
	Fixed: Off-metal	US 4.9m EU 5.1m	US 1.4m EU 1.1m	US 4.3m EU 4.1m	US 1.3m EU 0.9m
	MC 9190: On-metal	US 2.4m EU 1.9m	US 2.4m EU 1.9m	US 2.4m EU 1.8m	US 2.1m EU 1.8m
	MC 9190: Off-metal	US 2.9m EU 2.5m	US 1.2m EU 1.1m	US 2.7m EU 2.5m	US 1.0m EU 0.9m
	MC 3190: On-metal	US 2.0m EU 0.8m	US 1.9m EU 0.8m	US 1.8m EU 0.8m	US 1.7m EU 0.8m
	MC 3190: Off-metal	US 2.6m EU 1.4m	US 0.9m EU 0.6m	US 2.3m EU 1.1m	US 0.8m EU 0.5
	Substrate:	Optimized for On Metal (greater performance off metal)			
	Attachment:	High Performance Acrylic Adhesive			
	Material:	Closed cell foam core with printable PET Facestock			
	Dimensions (mm):	96 x 12.5 x 1.1	96 x 12.5 x 1.0	96 x 12.5 x 1.1	96 x 12.5 x 1.0
	Tolerance:	see Tolerance			
	Operating Temp:	-40°c to +85°c			
	Application Temp:	+18°c to +35°c			

*Minimum Order Quantities may apply. Contact Omni-ID for current inventory.

Regional tag – IQ 600 – supplied as standard with Ground Plane and Monza R6-P IC

	Region:	EU or US		
	IC:	Monza R6-P	Monza 4QT (custom option*)	
	Ground Plane:	With GP	With GP	Without GP
Read Range (quoted values are 'Up To')	Fixed: On-metal	US 6.0m EU 6.0m	US 5.0m EU 5.0m	US 5.0m EU 4.0m
	Fixed: Off-metal	US 6.2m EU 6.2m	US 4.6m EU 5.0m	US 1.5m EU 1.9m
	MC 9190: On-metal	US 3.0m EU 2.8m	US 2.2m EU 2.5m	US 1.9m EU 2.6m
	MC 9190: Off-metal	US 3.0m EU 2.9m	US 2.9m EU 3.0m	US 0.9m EU 1.1m
	MC 3190: On-metal	US 0.9m EU 1.2m	US 0.8m EU 1.0m	US 0.9m EU 0.9m
	MC 3190: Off-metal	US 0.9m EU 1.1m	US 0.9m EU 1.1m	US 0.4m EU 0.6m
	Substrate:	Optimized for On Metal (greater performance off metal)		
	Attachment:	High Performance Acrylic Adhesive		
	Material:	Closed cell foam core with printable PET Facestock		
	Dimensions (mm):	96 x 24 x 1.3	96 x 24 x 1.1	96 x 24 x 1.3	96 x 24 x 1.1
	Tolerance:	see Tolerance		
	Operating Temp:	-40°c to +85°c		
	Application Temp:	+18°c to +35°c		

*Minimum Order Quantity for Monza 4QT with or without Ground plane is 10,000 labels or 10 rolls

Regional tag – IQ 350 – supplied as standard with Ground Plane and Monza R6-P IC

	Region:	EU or US
	IC:	Monza R6-P
	Ground Plane:	With GP
Read Range (quoted values are 'Up To')	Fixed: On-metal	US 3.7m EU 3.8m
	Fixed: Off-metal	US 2.3m EU 2.1m
	MC 9190: On-metal	US 2.5m EU 1.3m
	MC 9190: Off-metal	US 1.5m EU 0.9m
	MC 3190: On-metal	US 1.4m EU 0.7m
	MC 3190: Off-metal	US 0.9m EU 0.3m
	Substrate:	Optimized for On Metal
	Attachment:	High Performance Acrylic Adhesive
	Material:	Closed cell foam core with printable PET Facestock
	Dimensions:	50 x 12.5 x 1.3mm
	Tolerance:	see Tolerance
	Operating Temp:	-40°c to +85°c
	Application Temp:	+18°c to +35°c

SERVICE BUREAU

Need your RFID tags deployment ready? Omni-ID's Service Bureau is available to encode the tag and print a visual representation of the EPC code on the outer label prior to shipping so they arrive at your facility with inventory and associated information already on the tag.

With such a dynamic service on offer, full requirements should be discussed with your sales rep. during the sales consultation period, and the summary below is designed to provide an overview of options available.

	Monza R6-P IC	Monza 4QT IC
Standard label material finish	PET facestock, white	PET facestock, white
Service Bureau – standard option	EPC encoding and barcode printing. Can include a B&W logo	EPC encoding and barcode printing. Can include a B&W logo
Service Bureau – custom option	EPC encoding and barcode printing. Can include a color logo[2] and/or additional text	EPC encoding and barcode printing. Can include a color logo[2] and/or additional text
EPC locking option – standard	No locking	No locking
EPC locking option – custom	Password protected	Password protected
EPC locking option – custom	Perma locking	Perma locking
MOQ – non-Service Bureau	1 Roll	10K
MOQ – standard Service Bureau	1 Roll	10K
MOQ – custom Service Bureau	10K	10K
Recommended Printer	SATO CL4NX[3] Custom Zebra ZT410[4]	SATO CL4NX[3] Custom Zebra ZT410[4]

[2] subject to a set-up fee for artwork preparation and print plates (see price list for full details)

[3] see file "Omni-ID_Sato_NXSeries_Printer_Guide.pdf"

[4] see file "Omni-ID_Custom_ZT410_Printer_Guide.pdf"
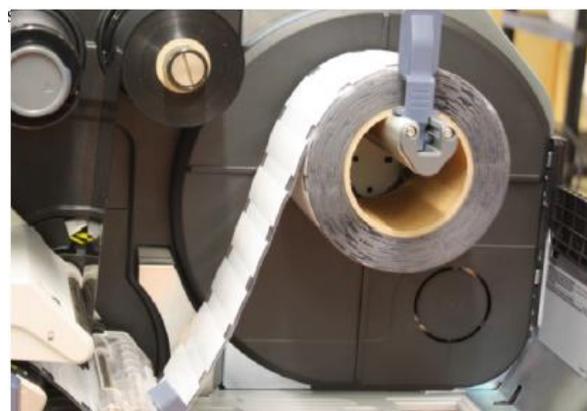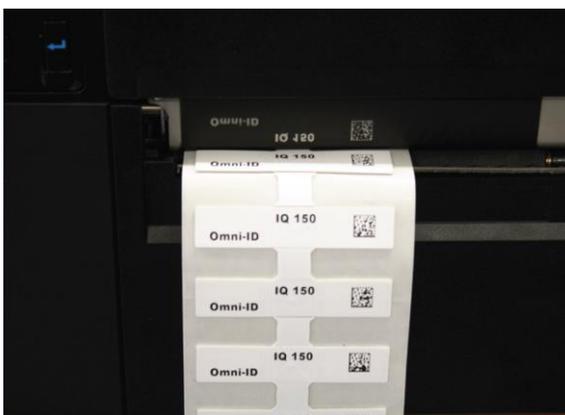
GROUND PLANE PRODUCT OPTIONS

In simple terms the ground plane allows the RF field to be contained within the tag. Without a ground plane the products' performance is heavily dependent on the asset it is placed on.

The ground plane version of our IQ On Metal labels provides a consistent performance irrespective of the asset composition; this is more prominent for the larger IQ products with the IQ 600 being our most balanced performing tag yet! See the graphs on the followings page for details on how the asset affects the performance of the tag.

The use of a ground plane simplifies the deployment process as a single tag type for a range of assets from painted steel cabinets to plastic encased IT equipment can be selected.

A summary of the options can be found in the table below.

With Ground Plane	Without Ground Plane
This is the standard offering and should be considered for all projects that involve any painted or coated metal surface including steel	Suitable for bare aluminum surfaces but is susceptible to shift in performance depending on asset material
Can be encoded and printed with most industry standard RFID printers with the exception of Zebra. For a consistent performance we recommend the SATO CL4NX	Comparable to competitor products using most industry standard RFID UHF printers such as Zebra RZ400. For a consistent performance, we recommend the SATO CL4NX, Custom Zebra ZT410 Silverline

The IQ 350, a 3rd Generation IQ label uses a ¼ wave antenna, requiring an electrical connection between the antenna on the top of the tag and the ground plane.

The IQ 150, IQ 400 and IQ 600 are 2nd Generation IQ labels that utilize a ½ wave antenna where there is no electrical connection between the antenna on the top and the ground plane. With 2nd Generation IQ labels, the metallic asset can be used to form the ground plane. However as seen in the bar graph on pages 11 & 12, the ground plane option provides better RF consistency irrespective of asset material.

The IQ 350 is only offered with the ground plane due to the required electrical connection. This antenna design benefits from a significantly broader radiation pattern. This is a significant advantage for portal type applications where wider read angle (broader radiation pattern) is beneficial. Another benefit to this antenna design is that it works with all printer types as it radiates from the top and bottom and therefore works with the low power antenna array on the bottom of the Zebra ZT410 printers.

PRINTERS

One of the great things about on-metal labels is local encoding and printing. However, printer manufacturers configure their machines in different ways – no worries, Omni-ID has produced two different designs that will work with the two main types of printer.

Omni-ID has spent a significant amount of time developing a range of options that maximize successful printing and encoding their On-Metal labels.

The 3rd Generation of IQ's (IQ 350) works well with all printer types due to its ¼ wave antenna design.

The 2nd Generation of IQ's (IQ 150, IQ 400 & IQ 600) have two variants to aid printing with certain printers:
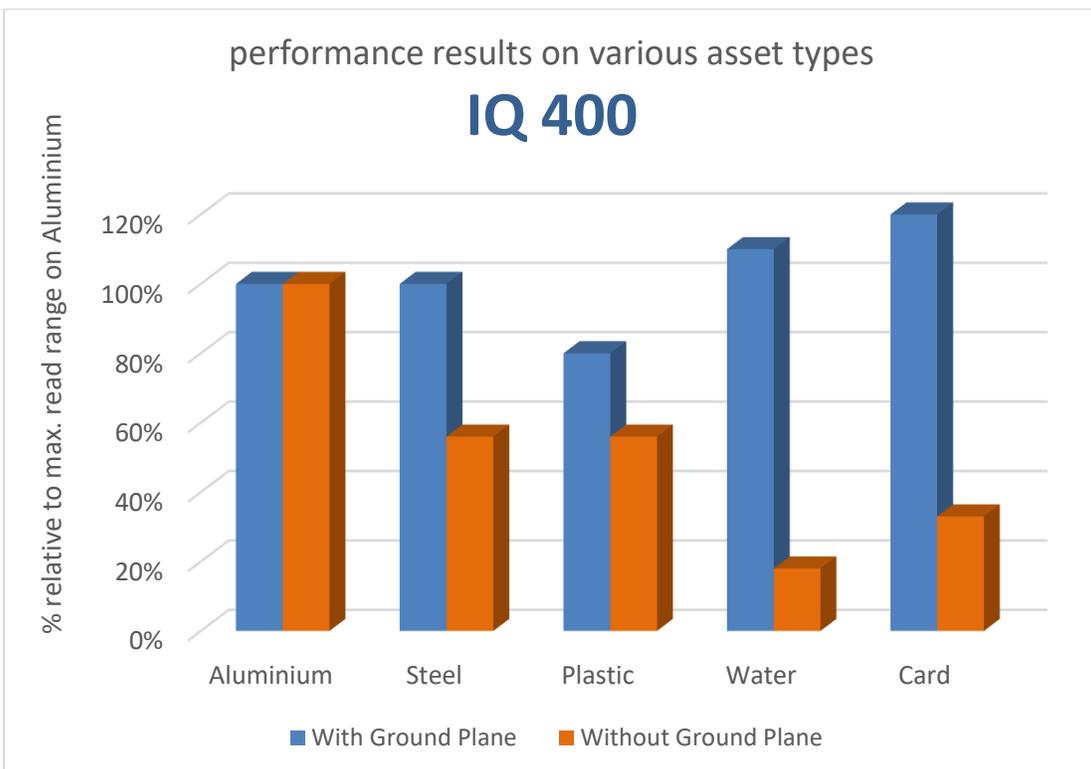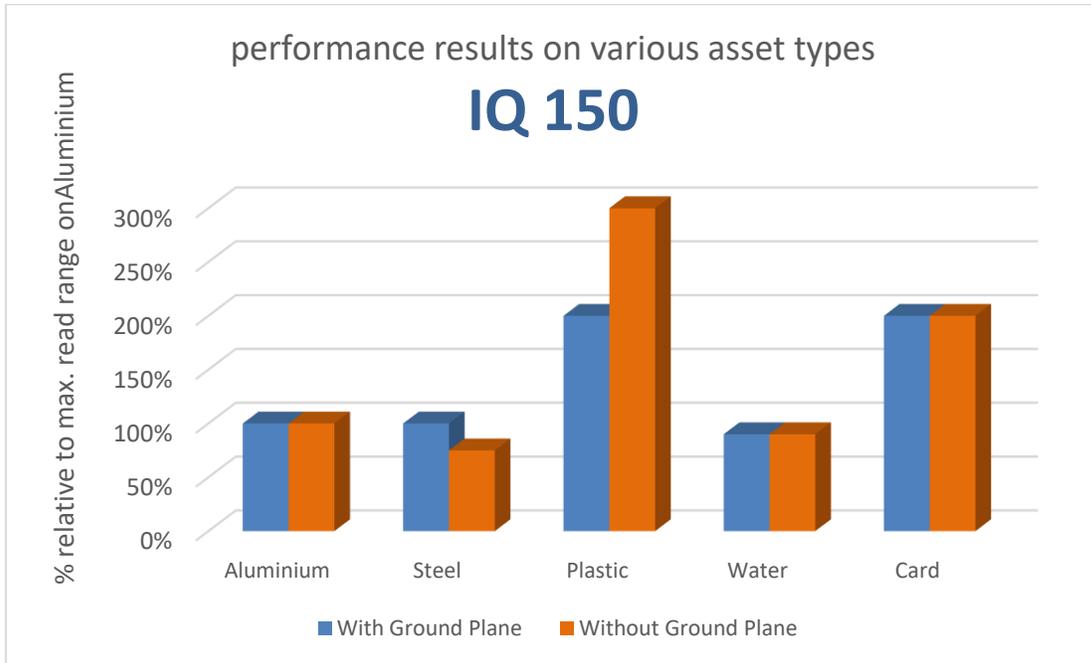
- For printers with the antenna positioned above the label (Sato) there is a product with a ground plane.
- For printers with the antenna positioned below the label (Zebra) there is a product without a ground plane.
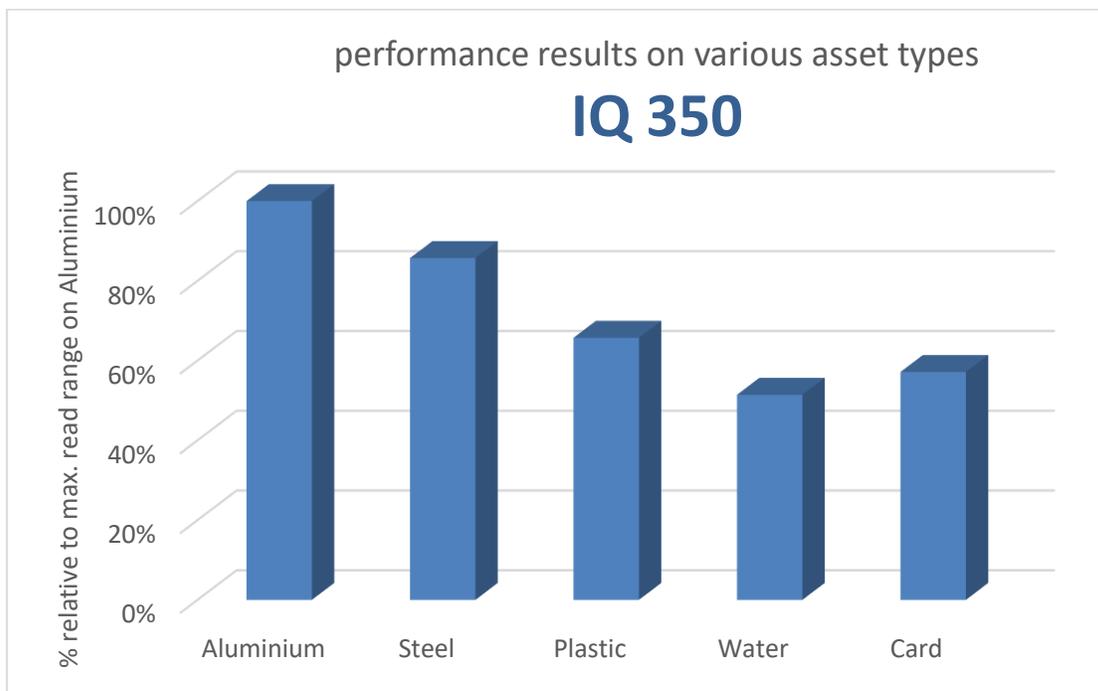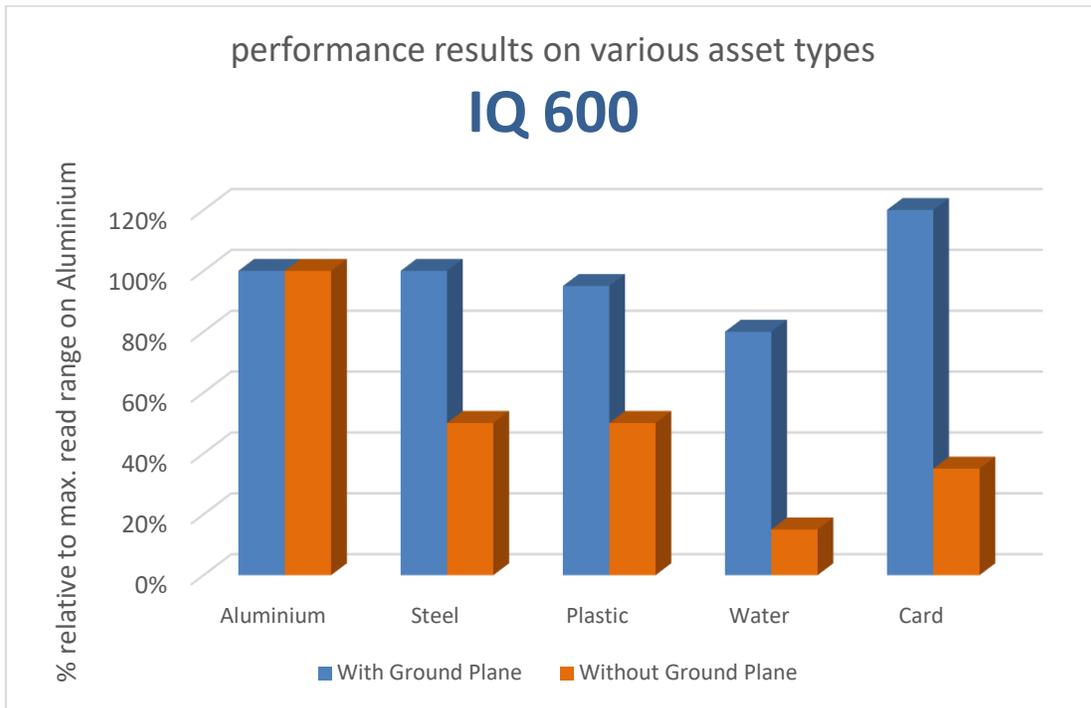
The Sato CL4NX is an excellent easy to use printer and provides a consistent performance on all Omni-ID On-Metal label tags. (3rd Generation IQ 350, 2nd Generation both with ground plane and without ground plane). It is possible to successfully print and encode On Metal labels with Zebra printers although they do require careful set up and configuration.

Omni-ID has specifically developed a version of On Metal labels without a ground plane to enable easier use of Zebra's printers. Internal testing has shown the IQ labels deliver superior or equivalent results to ANY available On Metal labels in the market. The 3rd Generation, IQ 350 is also printable in Zebra Printers.

Printer	Summary	2nd Generation, IQ 150 & IQ 600		3rd Generation, IQ 350
		With Ground Plane	Without Ground Plane	
SATO CL4NX	Excellent easy to use printer with consistent performance	✓	✓	✓
Zebra RZ400	Problematic and requires careful setting up	✗	✓	✓
Zebra ZT410	Problematic and requires careful setting up	✗	✓	✓
Custom Zebra ZT410 Silverline	Works well without Ground Plane	✗	✓	✓

performance results on various asset types
IQ 150

performance results on various asset types
IQ 400

performance results on various asset types

IQ 600

% relative to max. read range on Aluminium

| | Aluminium | Steel | Plastic | Water | Card |

■ With Ground Plane ■ Without Ground Plane

performance results on various asset types

IQ 350

% relative to max. read range on Aluminium

| | Aluminium | Steel | Plastic | Water | Card |

EVERYTHING YOU WANTED TO KNOW ABOUT OMNI-ID'S NEW IQ LABEL TAGS

FAQ

Q. What was the rationale for developing these new tags?

A. To maintain our position in the market as the #1 Manufacturer and Supplier of Industrial RFID Tags and Solutions Globally, we are enhancing our line of low-profile and printable on-metal RFID labels.

Q. What is the benefit of the 3rd Generation IQ (IQ 350)?

A. The third Generation IQ uses a ¼ wave antenna design vs the 2nd Generation that uses a ½ wave design. The benefit of the ¼ wave design is that for a given footprint, tags have significantly increased read range, which have allowed us to both reduce the size of the tags and increase the read range. The new design radiates from the back as well as the front allowing a single variant to be printed in all printer types.

Q. Which IQ labels work best in portal applications?

A. The 3rd Generation IQ (IQ 350) includes a far broader radiation pattern, which allows the tags to be read both earlier and later as they pass through a portal. This will maximize your read counts as the assets transition through a portal. To benefit from the wider radiation pattern as assets move through the portal, ensure that the tags are positioned in a landscape orientation on the asset. This wider radiation pattern is also beneficial in applications where the readers are not directly facing the front of the tag.

Q. Why are there two versions of IC's available?

A. Omni-ID has chosen to adopt the Industry Leading Monza R6-P as the standard IC in its ultrathin IQ label tags. While this offers superior sensitivity and autotune technology for a wider bandwidth, it has limited memory capacity, therefore there is a custom version of the tag available with a higher capacity memory IC; the M4QT

Full details and comparative data are provided earlier in this document.

Q. What does 'with Ground Plane' and 'without Ground Plane' mean?

A. Omni-ID's IQ Label tags are supplied as standard with an aluminum back plane. In simple terms, this 'Ground Plane' allows the RF field to be contained within the tag resulting in a consistent performance irrespective of the asset composition that it is attached to.   Without a Ground Plane the performance of the tag is heavily dependent on the asset it is attached to.

Omni-ID can customize their IQ Label tags and supply them without the Ground Plane to accommodate customers wishing to use a Zebra RFID thermal printer; this is necessary due to the incompatibility of the Zebra RFID printer range with any tags with a Ground Plane due to the placement of the low power ceramic antennas. Further details and comparative information can be found earlier in this document [table 2] The 3rd Generation IQ (IQ 350) is only offered with ground plane and is compatible with both Zebra and Sato printers due to the ¼ wave antenna.

Q. On the product datasheet it mentions there may be a variation on the length dimension – why is this?

A. Here at Omni-ID we are committed to optimizing our supply chain and to ensure we achieve the best results from common parts and materials we individually tune each batch of produced products to achieve the best results. This ensures consistent performance and quality; the consequence can be **up to** a 5% size reduction on the overall length of the tag. Unspliced sections will be within 0.2mm tolerance.
The datasheet value is the maximum.

Q. What RFID printer model does Omni-ID recommend for these ultrathin RFID label tags?

A. Omni-ID has qualified the SATO CL4NX RFID printer for compatibility with their IQ Label tags. See the user guide (Omni-ID_Sato_NXSeries_Printer_Guide) for details on calibrating and operating this model which is available from your Sales Rep.

Q. Can Omni-ID tags be used with any RFID reader?

A. Omni-ID tags use the Class-1 Gen2 UHF air interface protocol for transmitting and receiving information. Therefore   Omni-ID tags can be used with any Class-1 Gen2 UHF reader provided it is calibrated to operate in the correct geographical region. Omni-ID tags are currently in use in deployments with both handheld and fixed portal reader setups.

Q. What are the competitive advantages of these new tags against similar competitive products?
- Read performance exceeds comparable sized competitor products by over 25%
- Highly consistent manufacturing methods ensure consistent performance on all metals
- Easy printing & encoding with standard RFID printers
- Best in class thermal and environmental stability

Q. How do I ensure the best possible adhesion to my asset?

A. Preparation of the surface to which the tag is going to be applied is key to ensuring the best possible performance of the acrylic adhesive. Please follow these simple steps for the surface preparation and attachment of the tag:
- Make sure the area is clean, dry and dust free
    - an alcohol wipe or cleaning agent such as IPA Isopropyl Alcohol are generally used
- Apply in ambient temperatures of minimum 18°C.
- Remove the label from the release liner and immediately press into place
- Apply pressure for 30 seconds
- 70% strength is achieved within 2 hours
- full strength is achieved in 24 hours

Q. Can the labels be attached to curved surfaces?
A. Yes, they can be attached to curved metal and plastic surfaces
- Omni-ID's all new IQ On Metal labels have passed 700hrs of product validation on a curved surface with no delamination effects
- When the tag is placed horizontally on the asset it is recommended that the radius is no smaller than 58mm to avoid excessive RF degradation
- If the asset has a radius less than 58mm it is recommended that the tag is placed vertically
- Attaching the product to a curved surface may affect the response frequency so samples should always be provided for testing and evaluation before a large deployment order is placed

Q. What is the best position for the tag on a flat surface?
A. Our On-Metal labels are a rectangular shape and it is easy to determine that the polarization of the tag is on the horizontal This is clearly explained in the diagram below:

Tag polarization
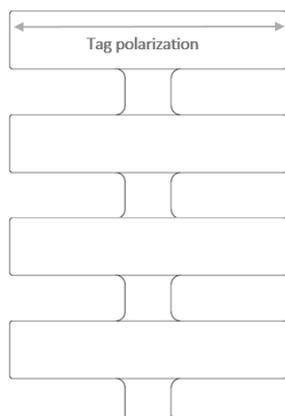
Q. What are the typical applications targeted for these new tags?

A. Typical applications include (but not limited to):

- indoor IT assets
- office equipment / furniture
- hospital supplies and laboratory equipment

And due to the IP68 rating:

- low cost RTI's
- cylinders and pipes

Q. What benefits do Omni-ID tags bring to IT asset identification applications?

A. Omni-ID tags play an integral role in IT asset identification RFID deployments. IT environments are particularly challenging for RFID tagging due to the mix of metallic and plastic components within the assets. Omni-ID's products remove the complexity associated with RFID tagging within this environment by offering a single UHF tag solution which has a suitably small footprint and strong read performance to deliver a robust RFID solution. The result is an RFID solution which is reliable and provides maximum ROI to the end-user.

Q. Can Omni-ID's IQ Label tags be customized?

A1. Barcodes are often applied to Omni-ID tags to allow integration with systems in which RFID is only partly used, or to integrate into an existing barcode system. Omni-ID offers a value-added service which provides barcode and human readable information associated with the tag prior to shipping to ensure the tag is deployment ready when it reaches its destination. Compliance with EPC standards should be considered by the customer before advising Omni-ID of the data string to use.

The Omni-ID tag commissioning service programs data into the EPC section of the memory, see [table 1a] for values and memory capacity per IC type. Typical sequencing is done in Hexadecimal form which utilizes an extension (A-F) of the regular 0-9 numbering so that more data can be stored on a chip using less characters. Omni-ID also allows decimal sequencing if required.

A2. Omni-ID has the expertise and ability to enable customization of most SKU's. Based on a full understanding and justification of the requirements, Beta type samples can be produced in a relatively short timeframe and offered for evaluation by the customer, upon approval of Product Management and VP Sales.

Examples of customizations are such things as custom sizes/shapes, higher strength adhesives (application dependent), different facestock material and overlaminates to provide a protective layer for the print if the tags will be subjected to cleaning chemicals. Requirements should first be discussed with your Sales Rep. MOQ's apply.