

RAIN RFID Antenna Selection Quick Reference Guide

Transport, Logistics & Supply Chain Series

Conveyor belts
Item-level tracking



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Times-7 designs and manufactures high-performance RAIN RFID antennas that deliver trusted accuracy, reliability, and RF excellence.

Headquartered in New Zealand and supported by a global distribution network, our products power mission-critical applications across retail, healthcare, logistics, manufacturing, and beyond.



Times-7 is a proud member of the RAIN RFID Alliance and an active participant in global industry events.

Fixed RAIN RFID Read Points in Conveyor belts and item-level tracking



RAIN RFID readpoints underpin every stage of the modern supply chain: from the first tag read at a packing station to the final scan at a delivery bay. Our antennas are deployed across the full chain: at dock doors, on conveyors, inside tunnel readers, at yard gates, in cold stores, and on forklifts. Each installation type has a different combination of read zone requirements, environmental conditions, and mounting constraints. Our range is built to address all of them.

Whether you are tracking pallets at a distribution centre dock door, individual items on a sortation conveyor, or vehicles moving through a yard gate, the fundamental requirement is the same: a read that is reliable, repeatable, and defined, catching what it should catch and ignoring what it should not. We design our antennas from the ground up for these environments, with the gain, beam shape, environmental rating, and mounting flexibility to make every readpoint perform as intended.

Our range covers fixed and mobile installations (such as moving vehicles), item-level and pallet-level tracking, indoor and outdoor deployment, and environments from controlled ambient warehouses to freezer stores, outdoor yards, and food production wash-down areas. If you are specifying a readpoint or reviewing an existing installation that is not performing, the guidance below will help you identify the right antenna for the job.

How to use this guide

For conveyor belts and item-level tracking we recommend these antennas: the A6011, A9044M, A5010, A5020CP, A5060, A3042, A1130, A1163, A1001. Each suits a different combination of mounting position, environmental exposure, and read zone control.

We have also included a general guidance section on page 10 for possible antenna configurations. If you have questions regarding antenna selection and antenna placement, our engineering team are available to provide technical support.

Recommended conveyor belt and item-level tracking antennas

See pages **4** for guidance on selecting the right antenna for your application, then **pages 5-9** for full specifications, key features, and customer benefits for each of our recommended antennas.

Note: The read point design will specify the number of antennas, mounting requirements and accessories.

How to Select the Right Antenna

The right antenna for a supply chain application is determined by four factors working together.

01 Environment Rating

How exposed is the bay? Covered indoor bays need **IP54** as a minimum. Outdoor and exposed bays require **IP67** (temporary immersion up to 1 m, 30 min). Bays subject to high-pressure wash-downs, extreme humidity, or chemically aggressive environments, such as food production, cold stores, mining, require **IP68**, which covers prolonged immersion and sustained moisture.

02 Mounting Position

Mounting position determines beam direction and read-zone shape. **Overhead mounts** read downward into the bay opening, suited to consistent pallet heights and forklift paths. **Side mounts** read horizontally across the bay width. **Floor/embedded mounts** read upward through the pallet base, useful where overhead clearance is limited or where a discreet, in-floor read point is required.

03 Installation Constraints

Customer-facing or aesthetic environments, retail distribution centres, food distribution all favour compact, unobtrusive form factors. **Cable routing, backplates** for easy mounting, and **connector type** all affect deployment time for large rollouts.

04 Read Zone Control

How tightly must the read zone be contained? Adjacent bays, nearby inventory, and crossing forklifts all create false-read risk. The tighter the physical environment, the more important it is to choose an antenna whose **beam pattern and gain** minimise reads outside the intended zone. **The read distance is another critical factor that controls the read zone**, with **far-field** for mid to long distance reads, and **near-field** for close range on surface reads.

05 Asset Types and Tag Orientation

Circular polarisation handles randomly oriented tags reliably, making it the standard choice for dock doors, conveyors, and portals. **Linear polarisation** is better suited to controlled-orientation applications where the tag is always presented at the same angle.



Antennas for conveyor belts and item-level tracking

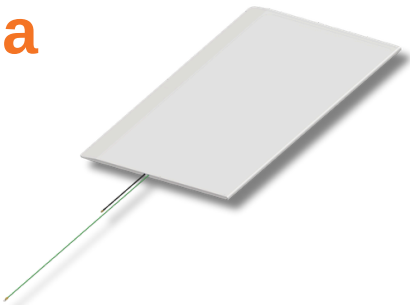
Conveyor systems require accurate, consistent tag detection as items move through the read zone, at varying speeds and tag orientations. Antenna selection and placement are critical to achieving reliable reads while minimising unintended reads from nearby items. Factors such as conveyor width, product composition, tag placement and spacing between items all influence read performance. Selecting the right antenna and configuration helps support continuous item-level tracking without interrupting operational flow.



A6011 Circularly Polarised Antenna

When to use:

Designed for continuous item-level tracking on conveyor systems. Mounted beneath the conveyor belt, the A6011 supports reliable tag detection as items pass through the read zone, even with varying tag orientations. Select the appropriate variant based on conveyor belt width.

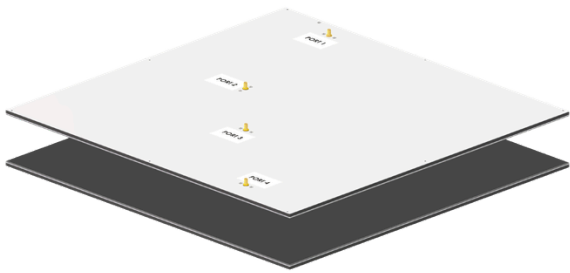


Supporting Spec	Key Feature	Customer Benefit
10 dBiC (800 and 1000), 11 dBiC (1200), RHCP	Gain increases with width, maintains field density across a variety of belt widths	Consistent reads across varied belt deployments.
Read zone up to 900mm above the belt	Covers all standard package heights	Reads the tag on top of a tall bag or carton, not just the ones lying flat on the belt.
Beamwidth 70°/25° (800 and 1000), 60°/22° (1200)	Tight beam in the direction of travel, wide across the belt.	Defines a clean read window so an item is assigned to the right position on the line.
Ultra-thin 12mm UHMWPE radome	Ultra-high molecular weight polyethylene, an abrasion-resistant wear surface, not standard ABS.	Survives years of belt contact and grit under a conveyor where an ABS radome would wear through.
Earthing cable plus DC grounding	Dedicated earthing cable, beyond the DC grounding used across the rest of the range.	Static build-up from belt friction is carried away, so reads stay stable on a line that never stops.
> -20 dB front-to-back (> -22 dB on the 1200)	Rejects reads from below the belt.	Reads only the items on the belt, not tagged stock or the return run underneath.
Affixes directly to the conveyor frame	Mounts under the belt bed without raising it.	Fits existing conveyor infrastructure without re-engineering the frame or losing throughput to a rebuild.
8.0-9.0 kg depending on variant	Substantial panel built for permanent installation.	Stays put under continuous vibration without working loose from the frame.

A9044M Packing Station Antenna

When to use:

Use at conveyor read points or packing stations where tag orientation, position and product types vary. Multiple antenna elements provide spatial diversity to support reliable item-level detection.

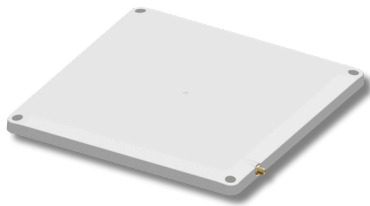


Supporting Spec	Key Feature	Customer Benefit
4 ports, multi-linear polarised, 7 dBi typical	Four independently driven elements in one panel.	One antenna and one mounting point does the work of four, cutting install cost.
Port 1 and Port 4: multi-linear directional, 15-20° tilt	Two tilted directional beams built into the panel.	Specialised to read static items
Port 2: horizontal polarisation, Port 3: vertical polarisation, both 65° symmetrical beam	Dedicated horizontal and vertical elements.	All tags will be captured irrespective of tag orientation.
-15 dB front-to-back ratio	Rejects reads from behind the unit.	No false reads from stock stacked behind the antenna.
640 x 650 x 8.6 mm (21.1 mm with connectors), 2 kg	Large-area 8.6 mm panel with rear-exit connectors.	Covers a wide range of box sizes
-20 °C to +55 °C, IP54	Wide temperature tolerance for an indoor unit.	Performs from an ambient warehouse through to a cooler fulfilment hall.
UV-resistant flame-retardant ABS radome	Rated radome material.	Holds up under continuous facility lighting and meets fire requirements for enclosed sortation.

A5010 Circularly Polarised Antenna

When to use:

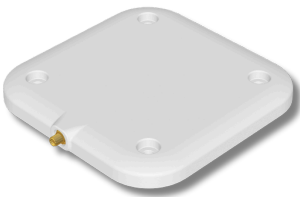
Ideal for overhead conveyor applications where a wide, symmetrical beam supports reliable tag detection across varying orientations as items pass beneath



Supporting Spec	Key Feature	Customer Benefit
68° symmetrical beam, 8.5 dBiC RHCP	Wide circularly polarised beam covers the full belt width from a single overhead mount.	Supports consistent tag detection across the conveyor read zone, accommodating varying tag orientations
IP67	Sealed against dust ingress and temporary immersion.	Provides protection against dust and water exposure in demanding industrial environments.
250 x 250 x 14mm, 0.575 kg	Slim, lightweight design	Simplifies overhead installation where mounting space is limited.
0 °C to +65 °C	Operating temperature range suited to ambient environments	Supports reliable operation in indoor conveyor applications within the specified temperature range.

A5020CP Circularly Polarised Antenna

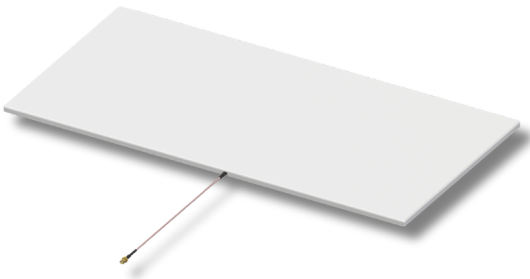
When to use:
Ideal for overhead or side-mounted conveyor applications where space is limited and wide read coverage is required.



Supporting Spec	Key Feature	Customer Benefit
IP68, -30 °C to +65 °C	Sealed enclosure with a wide operating temperature range.	Supports reliable operation in dusty, wet and cold-storage conveyor environments.
105° beam, RHCP	Wide circular beam compensates for tag orientation variance on the belt.	Helps capture tags across a broad read zone, reducing sensitivity to tag orientation as items move along the conveyor.
150.7 x 149.4 x 14.5mm, 0.23 kg	Compact, lightweight, low-profile design.	Simplifies installation in space-constrained conveyor systems where larger antennas may not fit.
5 dBiC gain, 4m typical read range	Moderate gain, wide coverage	Covers the belt without over-reaching into the neighbouring line.

A5060 Circularly Polarised Antenna

When to use:
Ideal for conveyor applications requiring a more focused read zone to detect tagged items as they pass through, while helping minimise unintended reads from surrounding areas.

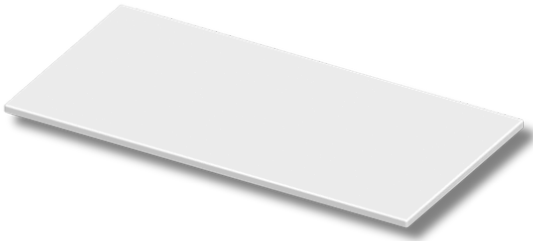


Supporting Spec	Key Feature	Customer Benefit
25° × 60° asymmetrical beam	Narrow, directional beam concentrates coverage within a defined read zone.	Helps isolate reads to the intended conveyor line, reducing unintended detection of tags on adjacent lines.
10.5 dBiC gain, read range exceeding 10 m	High gain for deep penetration of dense assets	Great read coverage regardless of tag density
-25 dB front-to-back ratio	Strong rejection of RF signals from behind the antenna.	Helps minimise unintended reads from tagged items located behind the antenna.

A3042 Robust High Gain Antenna

When to use:

Ideal for conveyor applications requiring a more focused read zone to detect tagged items as they pass through, while helping minimise unintended reads from surrounding areas and where rear cable routing through a fixed backplate is preferred.

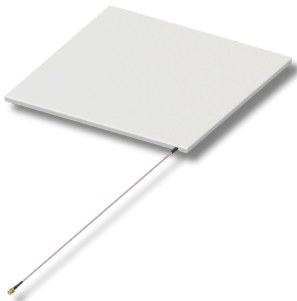


Supporting Spec	Key Feature	Customer Benefit
25° x 60° beam, 10.5 dBiC gain	Same lane isolation and gain as the A5060.	No cross-reads from adjacent lines.
Rear RP-TNC on an integrated backplate	Clean rear cable exit, direct connector rather than a fly lead.	Tidy installation above or beside the conveyor with no cable in the product path.
RHCP and LHCP both catalogued SKUs	Standard left-hand option, not a special order.	Facing readpoints across a line can be polarisation-separated instead of physically shielded.

A1130 True NearField™ Antenna

When to use:

Ideal for close-range, item-level verification on conveyor belts where tags need to be detected within a defined read area, while minimising unintended reads from nearby items or adjacent conveyor lines.

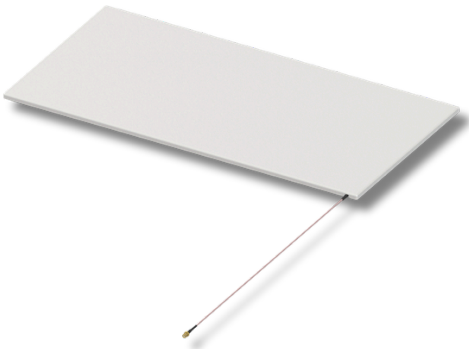


Supporting Spec	Key Feature	Customer Benefit
Far-field equivalent gain -10.5 dBi	Near-field read zone	Helps limit unintended reads from surrounding tagged items, improving control over the verification point.
304 x 304mm read footprint	Defined read area with consistent surface coverage.	Zero background reads from neighbouring items or lanes, and no blind patch in the middle of the zone.
Polarisation-independent at the surface	Near-field coupling accommodates varying tag orientations.	Reduces the need for precise tag orientation when verifying items passing over the antenna.
Reads tags on metal and liquid containing products	Near-field operation supports detection of suitably tagged challenging materials.	Reads liquid-filled and metal items
304 x 304 x 8.6mm, 0.154kg, VSWR 1.95	Slim, light-weight, flat-panel design.	Easy to integrate within the belt structure

A1163 True NearField™ Antenna

When to use:

Ideal for conveyor applications requiring a larger, controlled near-field read zone to detect tagged items across wider belts or larger cartons, while minimising unintended reads from surrounding stock..



Supporting Spec	Key Feature	Customer Benefit
600 x 300 mm near-field read footprint	Largest near-field footprint in the series.	Supports item-level verification across wider conveyor belts or larger packages without requiring multiple antennas.
Far-field equivalent gain -12.5 dBi	Strong suppression of far-field radiation helps confine detection to the near-field region.	Reduces unintended reads from nearby tagged items, improving control over the verification point.
Even field coverage	Minimised far-field components with an even field across the full 600 x 300 mm face.	An item is read wherever it crosses the panel, not only over the centre.
604 x 304 x 8.5mm formed, 1.175 kg	Large-format panel, slim profile antenna design	Provides a wider verification area while allowing integration into conveyor systems where vertical mounting space is limited..

A1001 Near-field Antenna

When to use:

Ideal for close-range item-level verification in compact conveyor systems or enclosed sortation areas where installation space is limited and a small, controlled read zone is required.



Supporting Spec	Key Feature	Customer Benefit
82 x 82 x 9.6 mm, 0.05 kg	Ultra-compact, lightweight near-field antenna.	Fits into confined conveyor and sortation systems where larger antennas cannot be accommodated.
0-10 cm read range, peaks at the surface	Short-range detection with RF energy concentrated close to the antenna surface.	Supports targeted item-level verification while helping minimise unintended reads from nearby tagged items.
Wideband 865-928 MHz, single SKU	Supports both ETSI and FCC frequency bands.	Simplifies inventory management and deployment across regions using different RAIN RFID frequency bands.
IP54, 0 °C to +50 °C	Protection against dust and splashing water, with an operating range suited to indoor environments.	Supports operation in standard indoor conveyor and sortation environments within the specified temperature range.

How a conveyor belt and item-level tracking readpoint is configured

A conveyor RFID read point is configured around the movement of tagged items, their orientation and the required read zone. Antennas can be mounted beneath, above or beside the conveyor, depending on the application, available space and level of read control required.

What determines the number and position of antennas

Conveyor width and layout

Belt width, spacing between conveyor lines and available mounting positions determine antenna placement and coverage requirements.

Tag orientation and product materials

Tag position, orientation and materials such as liquids or metals influence RF performance and antenna selection.

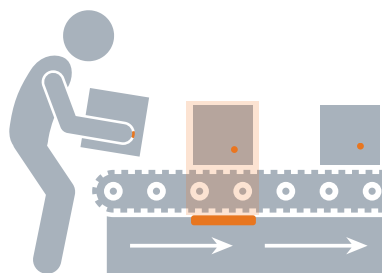
Read-zone requirements

Near-field antennas support close-range verification, while far-field antennas provide coverage over greater distances.

Item movement and spacing

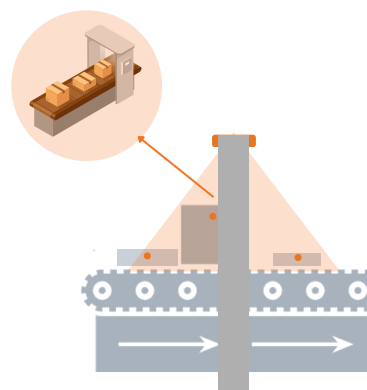
Conveyor speed, item spacing and the number of tagged items passing through the read zone influence detection performance and system configuration.

Schematic side and front elevations, with orange rectangles showing antenna position, orange dots representing RFID tags and orange shading indicative antenna coverage. (Schematics are illustrative only)



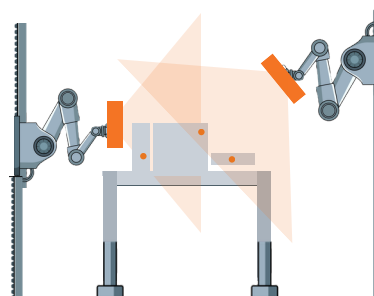
Under-belt mounted

For close-range item-level tracking as tagged products pass directly over the antenna. Suitable for applications requiring a defined read zone while minimising unintended reads from nearby items.



Overhead mounted

Suitable for detecting tagged items passing beneath an overhead antenna, particularly in lower-density tag environments where a single antenna provides sufficient read coverage.



Side-mounted

For conveyor applications where tag positions and orientations vary. Directional or multiple antennas provide coverage from different angles, helping detect densely packed items that may not be accessible from a single mounting position.

Depending on the application and required read coverage, a combination of antenna configurations may be needed to achieve reliable tag detection.

