
**Supply chain applications of RFID —
Freight containers**

Applications RFID à la chaîne logistique — Conteneurs de fret

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Contents

	Page
Foreword	v
Introduction	vi
1 Scope	1
2 Conformance and performance specifications	1
3 Normative references	2
4 Terms and definitions	3
5 Concepts	3
5.1 Differentiation between this layer and the preceding and following layers.....	3
5.2 Unique item identifier.....	4
5.3 International unique identification of freight containers.....	5
5.4 Types of tags.....	5
5.5 Addition to other identification requirements.....	6
6 Differentiation within this layer	6
6.1 General.....	6
6.2 Containerized cargo supply chain RFID system requirements.....	6
6.3 Business processes relevant for the standards suite supply chain applications of RFID.....	8
7 Data content	9
7.1 General.....	9
7.2 Mandatory data.....	9
7.3 Optional cargo shipment-specific (CSS) data.....	9
8 Data security	11
8.1 General.....	11
8.2 Confidentiality.....	11
8.3 Data integrity.....	12
8.4 Authentication.....	12
8.5 Encryption.....	12
8.6 Non-repudiation/audit trail.....	12
9 Tag location	12
10 Tag operation	12
10.1 Data protocol.....	12
10.2 Minimum performance requirements.....	12
10.3 Environmental requirements.....	12
10.4 Air interface.....	13
10.5 Memory requirements.....	13
10.6 Indication of impending power source failure.....	13
10.7 Real time clock option.....	13
10.8 External communications.....	13
10.9 Safety and regulatory considerations.....	14
10.10 Minimum reliability and accuracy.....	14
10.11 Tag recyclability.....	14
10.12 Tag reusability.....	15
11 Privacy of cargo shipment-specific (CSS) data	15
11.1 Data privacy.....	15
11.2 Personal data privacy.....	15
11.3 Authentication and identification.....	15
12 Interoperability, compatibility and non-interference with other RF systems	15
13 Human readable information	16
13.1 Human readable interpretation.....	16
13.2 Human readable translation.....	16

Annex A (normative) Environmental parameters for ISO 17363 electronic devices	17
Annex B (normative) Metadata of commonly used Data Identifiers	22
Bibliography	26

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 17363 was prepared by Technical Committee ISO/TC 122, *Packaging*.

This second edition cancels and replaces the first edition (ISO 17363:2007), which has been technically revised.

ISO 17363 has two annexes, [Annexes A](#) and [B](#), which provide normative information.

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Introduction

The 'Supply Chain' is a multi-level concept that covers all aspects of taking a product from raw materials to a final product to shipping to a final place of sale. Each of these levels covers many aspects of dealing with products and the business process for each level is both unique and overlapping with other levels.

This International Standard has been created with a vision of compatibility both at the physical and command level and the data level with the four other standards within the suite of International Standards, *Supply chain applications of RFID*. Due to the different data structures in each of these International Standards they cannot take the form of interchangeability. However, these International Standards are designed to be interoperable and non-interfering. They include:

- ISO 17363, *Supply chain applications of RFID – Freight containers*;
- ISO 17364, *Supply chain applications of RFID – Returnable transport items (RTIs) and returnable packaging items (RPIs)*;
- ISO 17365, *Supply chain applications of RFID – Transport units*;
- ISO 17366, *Supply chain applications of RFID – Product packaging*;
- ISO 17367, *Supply chain applications of RFID – Product tagging*.

These International Standards define the technical aspects and data hierarchy of supply chain management information required in each layer of the supply chain. Air interface and communication protocol standards supported within these International Standards are ISO/IEC 18000 and ISO/IEC/IEEE 8802; commands and messages are supported by ISO/IEC 15961 and ISO/IEC 15962. The semantics of these International Standards are defined in ISO/IEC 15418 and their syntax is defined in ISO/IEC 15434.

Excluded, though embraced, is the work of:

- ISO/IEC JTC 1/SC 31 in the area of technical standards related to air interface, data semantic and syntax construction, and conformance standards;
- ISO/TC 104 in the area of freight container security, including electronic seals (e-seals) (ISO 18185), and container identification.

Supply chain applications of RFID — Freight containers

1 Scope

This International Standard defines the usage of read/write radio-frequency identification technology (RFID) cargo shipment-specific tags associated with containerized freight for supply chain management purposes (“manifest tags”). This International Standard defines the air interface communications, a common set of required data structures, and a commonly organized, through common syntax and semantics, set of optional data requirements.

This International Standard:

- makes recommendations about a second generation supply chain tag intended to monitor the condition and security of the freight resident within a freight container;
- specifies the implementation of sensors for freight resident in a freight container;
- makes specific recommendations about mandatory non-reprogrammable information on the shipment tag;
- makes specific recommendations about optional, re-programmable information on the shipment tag;
- makes specific recommendations about the data link interface for GPS or GLS services;
- specifies the reuse and recyclability of the RF tag;
- specifies the means by which the data in a compliant RF tag is “backed-up” by bar codes and two-dimensional symbols, as well as human-readable information.

2 Conformance and performance specifications

The underlying conformance requirements of this International Standard are to provide the structure necessary to raise the level of interoperability of components and systems built according to this International Standard, while leaving open opportunity for continued technical improvement and differentiation.

Implementation of a containerized cargo supply chain RFID system and its components shall be deemed in conformance with this International Standard if it meets, and supports, the following six requirements:

- a) the required functional performance specified in [Clause 6](#);
- b) the data requirements specified in [Clause 7](#);
- c) the data security requirements specified in [Clause 8](#);
- d) the tag location requirements specified in [Clause 9](#);
- e) the tag operation requirements specified in [Clause 10](#);
- f) the security and privacy requirements specified in [Clause 11](#).

3 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 6346:1995, *Freight containers — Coding, identification and marking*

ISO 8601, *Data elements and interchange formats — Information interchange — Representation of dates and times*

ISO/IEC/IEEE 8802-15-4, *Information technology — Telecommunications and information exchange between systems — Local and metropolitan area networks — Specific requirements — Part 15.4: Wireless medium access control (MAC) and physical layer (PHY) specifications for low-rate wireless personal area networks (WPANs)*

ISO 10374:1991, *Freight containers — Automatic identification*

ISO/IEC 15418, *Information technology — Automatic identification and data capture techniques — GS1 Application Identifiers and ASC MH10 Data Identifiers and maintenance*

ISO/IEC 15434, *Information technology — Automatic identification and data capture techniques — Syntax for high-capacity ADC media*

ISO/IEC 15459 (all parts), *Information technology — Automatic identification and data capture techniques — Unique identification*

ISO/IEC 15961, *Information technology — Radio frequency identification (RFID) for item management — Data protocol: application interface*

ISO/IEC 15962, *Information technology — Radio frequency identification (RFID) for item management — Data protocol: data encoding rules and logical memory functions*

ISO/IEC 15963, *Information technology — Radio frequency identification for item management — Unique identification for RF tags*

ISO 17364:2013, *Supply chain applications of RFID — Returnable transport items (RTIs)*

ISO/IEC 18000-7, *Information technology — Radio frequency identification for item management — Part 7: Parameters for active air interface communications at 433 MHz*

ISO/IEC 18046, *Information technology — Automatic identification and data capture techniques — Radio frequency identification device performance test methods*

ISO/IEC 19762 (all parts), *Information technology — Automatic identification and data capture (AIDC) techniques — Harmonized vocabulary*

ISO/IEC/IEEE 21451-5 [IEEE 1451.5], *Information technology — Smart Transducer Interface for Sensors and Actuators — Wireless Communication Protocols and Transducer Electronic Data Sheet (TEDS) Formats*

ISO/IEC/IEEE 21451-7, *Information technology — Smart transducer interface for sensors and actuators — Part 7: Transducer to radio frequency identification (RFID) systems communication protocols and Transducer Electronic Data Sheet (TEDS) formats*

IEC 61000-4-2, *Electromagnetic compatibility (EMC) — Part 4-2: Testing and measurement techniques — Electrostatic discharge immunity test*

IEC 61000-4-3:2006, *Electromagnetic compatibility (EMC) — Part 4-3: Testing and measurement techniques — Radiated, radio-frequency, electromagnetic field immunity test*

4 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 19762, ISO 17364, and the following apply.

4.1

mandatory shipment tag information

information consisting of two non-reprogrammable data elements, namely a unique permanent ID of the integrated circuit (chip ID) and a unique permanent ID of the actual tag (tag ID), and one reprogrammable data element, namely the tag data routing code

Note 1 to entry: The non-reprogrammable data elements are to be imbedded in the shipment tag by the tag manufacturer.

4.2

permanent container tag information

non-reprogrammable information that resides on the container tag for the duration of the lifetime of the container (or until the container changes ownership and/or equipment ID), and which is uploaded and maintained by, or on behalf of, the container owner and at its responsibility

Note 1 to entry: The permanent, non-reprogrammable information elements are specified in ISO 10374.

4.3

cargo shipment-specific (CSS) tag information

optional information residing in the shipment tag for the duration of the containerized cargo shipment until its final delivery

4.4

integrity

designed such that any modification of the electronically stored information, without proper authorization, is not possible

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4.5

originality

validity

designed such that a compromise of the shipment through misrepresentation of the information on the shipment tag is not possible under the following circumstances:

- any modification of the mandatory non-reprogrammable information;
- any unauthorized modification of optional re-programmable information

4.6

classified information

information which for reasons of national security is restricted to government authorized or approved persons

4.7

tag data routing code

data string that enables the system that reads the tag header to forward Intransit visibility data to the owner of the tag

5 Concepts

5.1 Differentiation between this layer and the preceding and following layers

The term “supply chain layers” is a multi-level concept that covers all aspects of taking a product from raw materials to a final product to shipping to a final place of sale, use, maintenance and potentially disposal and returned goods. Each of these levels covers many aspects of dealing with products and the business process for each level is both unique and overlapping with other levels.

Figure 1 below provides a graphical representation of “supply chain layers”. The Item Level through Freight Container Level layers are addressed within the suite of standards for “supply chain applications of RFID” (see Introduction) and are intended to enhance supply chain visibility. The Movement Vehicle Level is the purview of ISO/TC 204/WG 7.

The Freight Container Level in Figure 1 is the subject of this International Standard.

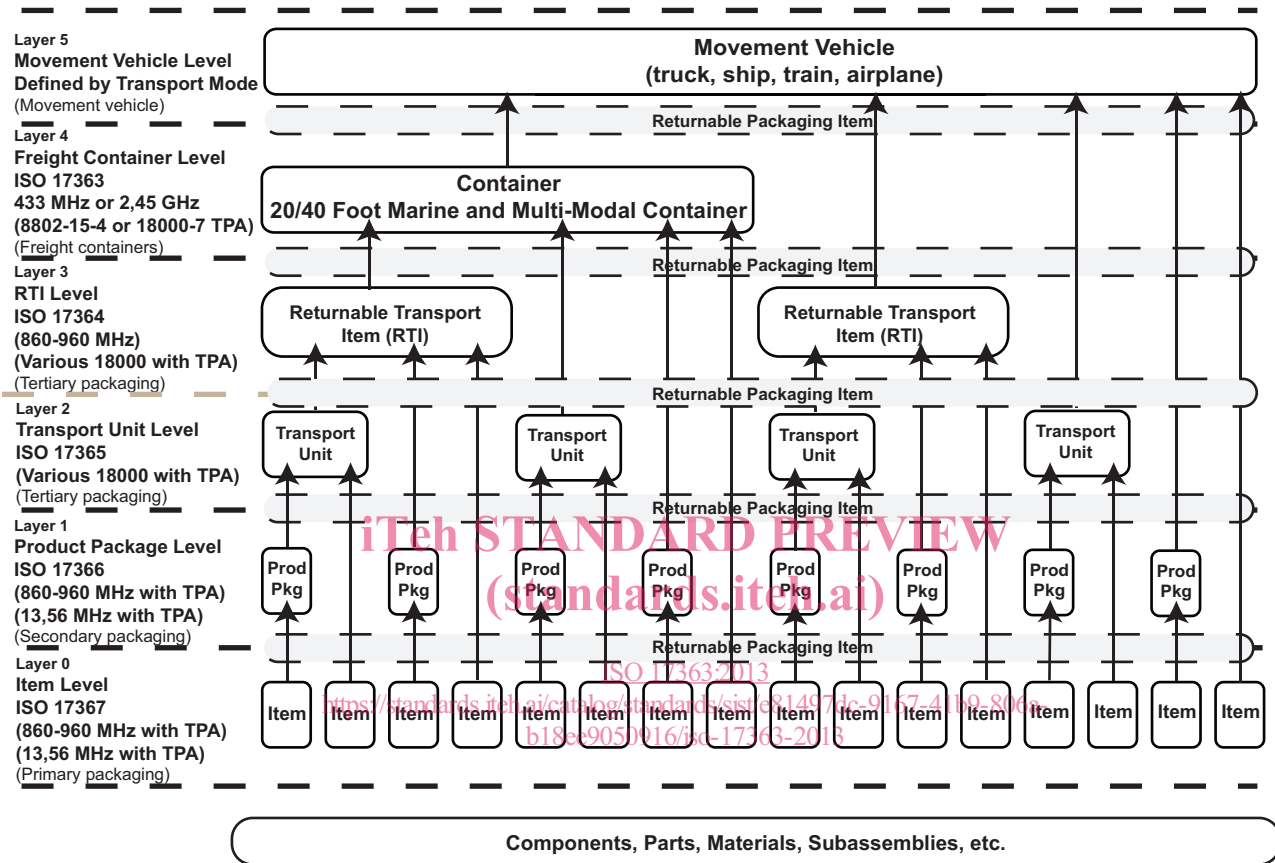


Figure 1 — Supply chain layers

Once tagged, product layer tags can be distinguished from the layer tags that follow by use of a “group select” methodology contained in the RFID interrogator/reader. This group select function allows the interrogator and supporting Automated Information Systems (AIS) to quickly identify product package layer tags.

5.2 Unique item identifier

Unique item identification is a process that assigns a unique data string to an individual freight container or in this case to an RFID tag that is associated to the cargo resident in the freight container. For freight container tagging to be meaningful it is necessary that each serialized RFID tag be unique worldwide. Unique serialization of freight containers allows data collection and management at a granular level. The benefits of granular level data are evident in such areas as maintenance and enabling electronic transactions of record. This granularity is possible only if each tagged freight container has a unique identification.

The Unique Item Identifier (UII) as defined by ISO/IEC 15459, provides granular discrimination between like items that are identified with RFID tags. The unique tag ID (as defined by ISO/IEC 15963) is a mechanism to uniquely identify RFID tags.

There exists historical reference for the identification of freight containers, specifically ISO 6346. The freight container identification structure in this International Standard shall be as defined in ISO 6346 and ISO 10374.

For the purposes of this International Standard, the following data structure is employed to uniquely identify the freight container. ISO tags include an Application Family Identifier (AFI) in front of the Unique Item Identifier.

The ANS MH10.8.2 Data Identifier “7B” followed by a three letter container owner code (OC) assigned in cooperation with the Bureau International des Containers et du Transport Intermodal (BIC), followed by a one letter equipment category identifier (EI), followed by a six digit serial number (CSN), followed by a one digit modulus 11 check digit (CD) calculated in accordance with Annex A of ISO 6346:1995.

7B AAA A NNNNNN N

5.3 International unique identification of freight containers

For unique item identification formats using multiple memory banks, the following AFI formats, specifically 0xA9 or 0xAA, should be used preceding the “7B” format above.

Table 1 — 1736x Application Family Identifiers (AFIs)

AFI	Assigned organization or function
0xA1	ISO 17367 product tagging
0xA2	ISO 17365 transport unit
0xA3	ISO 17364 returnable transport unit
0xA4	ISO 17367 product tagging, but for hazardous materials
0xA5	ISO 17366 product packaging
0xA6	ISO 17366 product packaging, but for hazardous materials
0xA7	ISO 17365 transport unit, but containing hazardous materials
0xA8	ISO 17364 returnable transport unit, but containing hazardous materials
0xA9	ISO 17363 freight containers
0xAA	ISO 17363 freight containers, but containing hazardous materials

5.4 Types of tags

There are four types of RF devices envisioned for use with freight containers. The individual uses of each of these devices are listed in 5.4.1 to 5.4.4.

5.4.1 Permanent container “license-plate” tag

This tag, referred to as the “container tag”, is mentioned in the Introduction to this International Standard and is fully described in ISO 10374.

5.4.2 Cargo shipment-specific tag

This tag, referred to as the “shipment tag”, is fully described in this International Standard.

5.4.3 Container intrusion detection

5.4.3.1 ISO 18185 electronic seal

A read-only, non-reusable freight container seal conforming to high-security seal defined in ISO 17712, and conforming to ISO 18185, that electronically evidences tampering or intrusion through the container doors.

5.4.3.2 ISO/IEC/IEEE 8802-15-4 intrusion sensor

Sensor-equipped RFID tags shall conform to ISO/IEC/IEEE 21451-7 for the wired or wireless interface and either ISO/IEC 18000-7 or a combination of an ISO/IEC/IEEE 8802-15-4 2450 MHz DSSS PHY employing O-QPSK modulation and ISO/IEC/IEEE 21451-5 for the wireless interface between the tag or access point and the sensor. The choice of wireless air interface should be decided by trading partner agreement.

5.4.4 Item level tag

This tag is typically a passive tag that is affixed to an item that is to be tracked. This item may be a product itself, the packaging around a product or the transportation method used to convey the product (pallet, case etc.). This tag is usually disposable, though in the case of returnable transport items, etc., it may be re-usable. Depending on the layer within the supply chain to which this tag is affixed (see [Figure 1](#)), the appropriate part of ISO/IEC 15459 shall be used.

5.4.5 Returnable Packaging Item tags

There exist items associated with a freight container, e.g., straps, bracing, ratchets, cores, loadlocks, etc., that are assets in their own right and are owned by the shipper. These assets shall be tracked and associated with the freight container through the use of Annex A of ISO 17364:2013.

5.5 Addition to other identification requirements

This International Standard does not supersede or replace any applicable safety or regulatory marking or labelling requirements, and is to be applied in addition to any other mandated labelling requirements.

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6 Differentiation within this layer

6.1 General

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This International Standard defines the requirements for Layer 4 as shown in [Figure 1](#) above. This layer is differentiated from the other layers in the following ways.

6.2 Containerized cargo supply chain RFID system requirements

6.2.1 RFID system components

The containerized cargo supply chain RFID system shall consist of two basic components:

- a) a shipment tag affixed on the freight container, and
- b) equipment located apart from the freight container that reads from and writes to the shipment tag identified in this International Standard.

6.2.2 RFID system capabilities

The containerized cargo supply chain RFID system shall be capable of:

- a) maintaining the integrity of the information on the shipment tag;
- b) encoding its information into a form suitable for conveyance to reading equipment;
- c) being written to at distances up to and including 35 m from the interrogator and when:
 - 1) sufficiently separated from other ISO 17363 tags by more than 3 m to allow discrimination,
 - 2) operated and stored in the environmental conditions specified in [Annex A](#),