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# Supply chain applications of RFID — Freight containers

*Applications de chaîne d'approvisionnements de RFID — Récipients de fret*

ICS 55.020

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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.

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ISO 17363 was prepared by the Joint Working Group (JWG) of ISO Technical Committee 122 and ISO Technical Committee 104.

## 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 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 standards, Supply Chain Applications of RFID, with ISO 10374, *Freight containers - RF automatic Identification*, and with ISO 18185, *Freight containers – Electronic seals*. Due to the different data structures in each of these standards they cannot take the form of interchangeability. However, these 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*,
- 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*, and
- ISO 10374, *Freight containers - RF automatic Identification*

These 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 standards are the standards of ISO/IEC 18000; commands and messages are supported by ISO/IEC 15961 and 15962. The semantics of these 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 in multiple parts), and container identification.

This International Standard, together with ISO 10374, forms a complete standard for Supply Chain Applications of RFID – Freight containers. Two different tag types are described, with respective different tag and application requirements. These are:

### **Permanent container 'license-plate' tag:**

This tag, hereinafter referred to as the "container tag", fully described in ISO 10374, *Freight containers - RF automatic Identification* is a permanently affixed, read-only (including Write Once Read Many – WORM) tag containing limited data relating only to physical identification and description of the container to which it is affixed. This tag, affixed by or on behalf of the container owner, should last the lifetime of its associated container (except in situations where the container changes ownership and/or equipment ID).

**Cargo Shipment-specific tag:**

This tag, hereinafter referred to as the “shipment tag”, fully described in this International Standard, is a read-write tag into which data specific to a containerized cargo shipment can be stored. The tag and the data uploaded in it shall be the responsibility of the shipper. The tag may be affixed to the container by the shipper or, per the shipper’s instructions, by the party that physically performs the loading (“stuffing”) of the container. Data capabilities are flexible and may, at the shipper’s discretion, include destination, routing, conveyance or other transportation information, cargo information (including hazardous material information, where applicable) or other trip-specific information. The tag must perform reliably from the point of stuffing of the container to delivery destination, and shall be removed by the consignee upon final delivery. The tag may be reusable.



# 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 on freight containers for supply chain management purposes (“shipment tags”). This standard, through reference to other standards within ISO TC 122, ISO TC 104, and ISO/IEC JTC 1/SC 31, 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.

Specifically, it makes:

- a) Recommendations about a containerized cargo supply chain RFID system, based on shipment tags. Such a containerized cargo supply chain RFID system would co-exist with, but be separate from, a container security and identification RFID framework using permanent container lifetime RFID tags (“container tags”), described in ISO 10374, and cargo shipment-specific electronic seals (e-seals) for which a standard in multiple parts (ISO 18185) is being developed by TC 104/SC 4/WG 2. Specifically, readings for container security and identification purposes of the information in the container tags and e-seals should be done in separate messages and, further, should not be done through the shipment tag.
- b) Specific recommendations about mandatory non-reprogrammable information on the shipment tag.
- c) Specific recommendations about optional, re-programmable information on the shipment tag.

Identified within this International Standard are the air interface and communication parameters for active radio-frequency identification communications using the International Standards from ISO/IEC 18000-7, *Information technology automatic identification and data capture techniques — Radio frequency identification for item management air interface — Part 7: Parameters for an active RFID air interface communications at 433 MHz*.

This International Standard applies to freight containers as defined in ISO 668 and to freight containers that are not defined by other ISO standards. It complements ISO 10374, *Freight containers - RF automatic Identification* for container tags.

This International Standard does not address “smart” container technologies affixed to or inside freight containers, e.g. sensors, for supply chain management purposes. These issues will be addressed in future iterations of the standard.

## 2 Conformance and Performance Specifications

All of the devices and equipment that claim compliance with this International Standard in either performance and/or conformance shall also conform to the appropriate sections and parameters specified in ISO/IEC 18046 for performance and ISO/IEC 18047-7 for conformance of active devices operating at 433.92 MHz.

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 to this 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 standard provided that it meets, and supports, the following six (6) requirements:

1. The required functional performance specified in clause 6.
2. The data requirements specified in clause 7.
3. The data security requirements specified in clause 8.
4. The tag location requirements specified in clause 9.
5. The tag operation requirements specified in clause 10.
6. 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 undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 668, *Series 1 freight containers – Classification, dimensions and ratings*

ISO 830, *Freight containers — Vocabulary*

ISO 3166-1, *Codes for the representation of names of countries and their subdivisions – Part 1, Country codes*

ISO 6346, *Freight containers – Coding, identification and marking*

ISO 10374, *RFID Freight Container Identification*

ISO/IEC 15418, *Information Technology – EAN/UCC Application Identifiers and ASC MH 10 Data Identifiers and maintenance*

ISO/IEC 15434, *Information Technology – Syntax for high capacity ADC media*

ISO/IEC 15961, *Information technology, Automatic identification and data capture techniques – Radio frequency identification (RFID) for item management – Data protocol: Application interface*

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

ISO/IEC 15963, *Automatic identification – Radio Frequency Identification for item management – Unique identification for RF tags*

ISO/IEC 18000-1, *Information technology AIDC techniques – RFID for item management – Air interface, Part 1 – Generic parameters for air interface communication for globally accepted frequencies*

ISO/IEC 18000-7, *Information technology automatic identification and data capture techniques — Radio frequency identification for item management air interface — Part 7: Parameters for an active RFID air interface communications at 433 MHz*

ISO/IEC TR18001, *Information technology – RFID for item management – Application requirements profiles*

ISO/IEC TR18046, *Information technology, Automatic identification and data capture techniques — RFID device performance test methods*

ISO/IEC TR18047-7, *Information technology, automatic information and data capture techniques — RFID device conformance test methods — Part 7: Test methods for an active RFID air interface communications at 433 MHz*

ISO/IEC 19762, *Information technology, AIDC techniques – Harmonized vocabulary*

ANS MH10.8.2, *Data Identifiers and Application Identifiers*

*General EAN.UCC specifications*

ISO 18185 Parts 1 – 4 and 6-7 *Freight containers – Electronic seals*

## 4 Terms and definitions

For the purposes of this document the terms and definitions given in ISO/IEC 19762, *Information Technology – AIDC techniques – Harmonized vocabulary*, ISO 830, *Freight containers — Vocabulary*, and the following apply.

### 4.1

#### **transport unit**

either a transport package or a unit load

[ISO 15394, 4.2]

### 4.2

#### **unit load**

one or more transport packages or other items held together by means such as pallet, slip sheet, strapping, interlocking, glue, shrink wrap, or net wrap, making them suitable for transport, stacking, and storage as a unit

[ISO 15394, 4.2]

### 4.3

#### **transport package**

package intended for the transportation and handling of one or more articles, smaller packages, or bulk material

[ISO 15394, 4.2]

### 4.4

#### **returnable transport item (RTI)**

all means to assemble goods for transportation, storage, handling and product protection in the supply chain which are returned for further usage, including for example pallets with and without cash deposits as well as all forms of reusable crates, trays, boxes, roll pallets, barrels, trolleys, pallet collars and lids.

NOTE: The term returnable transport item is usually allocated to secondary and tertiary packaging. But in certain circumstances also primary packaging may be considered as a form of RTI. Freight containers, trailers and other similar enclosed modules are not covered by the term returnable transport item.

[IC-RTI]

### 4.5

#### **product package (primary)**

first tie, wrap or container to a single item or quantity thereof that constitutes a complete identifiable pack.

NOTE: A product package may be an item packaged singularly, multiple quantities of the same item packaged together or a group of parts packaged together.

[ISO 22742, 3.32]

**4.6  
product**

first level or higher assembly that is sold in a complete end-usable configuration

[EIA 802, 3.16]

**4.7  
mandatory and optional**

status of requirements from the ISO standpoint not implying that a particular status, usage or application of RFID technology, including tags on a container, does or does not result from intergovernmental agreement, legislation, regulations, etc.

**4.8  
mandatory shipment tag information**

mandatory, non-reprogrammable information on a shipment tag consists of two data elements: a unique permanent ID of the integrated circuit (chip ID) and a unique permanent ID of the actual tag (tag ID)

Note: These data elements shall be imbedded in the shipment tag by the tag manufacturer.

**4.9.  
permanent container tag information**

non-reprogrammable information that will reside 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: The permanent, non-reprogrammable information elements are specified in ISO 10374.

**4.10  
cargo shipment specific (CSS) tag information**

cargo shipment-specific (CSS) tag information is optional and will reside in the shipment tag for the duration of the containerized cargo shipment until its final delivery

Note: Such information is defined at the discretion of the shipper and is its responsibility. The information is uploaded into the tag and modified, altered, changed or deleted, as necessitated by commercial business processes and practices in the commercial international supply chain, by the shipper itself or - per its instructions - by any agent, representative or entity authorized by the shipper to do so. Cargo shipment-specific information is always optional. The optional CSS data stored in or communicated to or from the tag shall be secured to meet the requirements of this standard. The shipment tag with its cargo shipment-specific information shall be removed by the consignee upon final delivery.

**4.11  
integrity**

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

**4.12  
originality (also 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

**4.13  
freight container**

ISO freight container as specified in ISO 668 as well as containers not defined by other ISO standards

#### 4.14

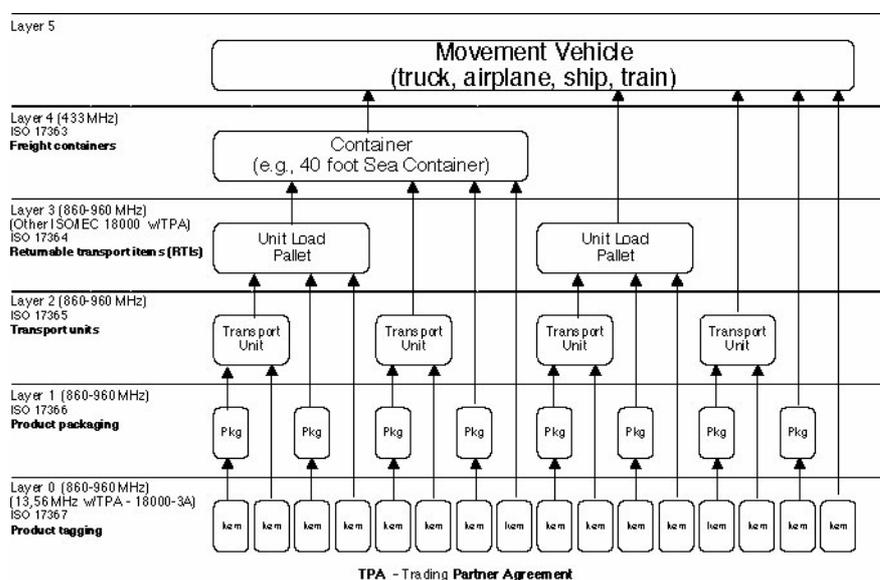
##### classified information

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

## 5 Concepts

### 5.1 Differentiation between this layer and the preceding and following layers

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, 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 the "supply chain". Layers 0 through 4 are addressed within the suite of standards for "supply chain applications of RFID" and are intended to enhance supply chain visibility.



**Figure 1 – Supply chain layers  
(see Fig1\_SC\_Layers.dwg)**

Once tagged, product layer tags can be distinguished from following layer tags 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.

This International Standard covers Layer 4 in Figure 1.

### 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 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 15459 provides granular discrimination between like items that are identified with RFID tags. The unique tag ID (as defined by ISO 15963) is a mechanism to uniquely identify RFID tags.

There exists historical reference for the identification of freight containers, specifically ISO 6346, *Freight containers – Coding, identification and marking* and for radio frequency identification ISO 10374, *Freight containers – Automatic identification*. The freight container identification structure in this International Standard shall be as defined in ISO 6346 and encoded as in ISO 10374.

### 5.3 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:

#### 5.3.1 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.

#### 5.3.2 Cargo shipment-specific tag

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

#### 5.3.3 Container electronic seal

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

#### 5.3.4 Item tag

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.

### 5.4 Additive 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.

## 6 Differentiation within this layer

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.

### 6.1 Unique identifier

There exists historical reference for the identification of freight containers, specifically ISO 6346, *Freight containers – Coding, identification and marking* and for radio frequency identification ISO 10374, *Freight containers – Automatic identification*. The freight container identification structure in this International Standard shall be as defined in ISO 6346 and encoded as in ISO 10374.

### 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.

- (i) A shipment tag affixed on the freight container, and

(ii) Equipment located apart from the freight container that reads from and writes to the shipment tag identified in this 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 in the field except for mandatory non-reprogrammable information.
- d) Having a shipment tag that is affixed to the container until final delivery at which time the consignee shall remove the tag, and which is as small as possible but not to exceed a size of 30 cm x 6 cm x 2 cm.
- e) Providing an indication of impending power source failure.
- f) Being read when the shipment tag is
  - 1) Within range of 10 m or less
  - 2) Moving in relation to the RFID reading system at a speed of 50 km/h or less.
  - 3) Sufficiently separated from adjacent similar tags by not more than 3 m to allow discrimination
  - 4) Operated and stored in the environmental conditions specified in ISO 18185-3.

### 6.3 Business processes relevant for the suite of standards for supply chain applications of RFID

- g) Procurement/Acquisition: Ordering including the identification of relevant specifications and requirements can be facilitated by referencing the items original acquisition data using the RFID tag's unique ID as a data base key.
- h) Shipping: Where item can have different configurations or capabilities such as with computer software loads that differentiate items with otherwise identical form fit and function can be issued and shipped with the tag read providing assurance that the correct item was shipped. This level of non-intrusive tracking and tracing can serve as a front end to the higher level RFID applications detailed in the other standards in this suite.
- i) Receiving: Non-intrusive collection of receipt data can shorten data collection times, in support of automated inventory management systems and provide an electronic transaction of record much earlier in the process. Earlier knowledge of on-hand inventory can reduce stock outs and the need for expedited premium transportation.
- j) Cross Docking: In addition to recording inbound receipts and outbound shipments, tagged items can be sorted. Many items will have exterior marking (tagging) that are used in lieu of reading the product tag.
- k) Work in Process: Used to track individual components and the final assembly (bill of material) and to monitor any item through a fabrication or manufacturing process
- l) Maintenance: Related to work in progress and differentiated in that it covers functions prior to and subsequent to the actual work. This includes fault analysis, identification, preparation of packing and packaging.

- m) Inventory Control: Item level serialization yields a granularity of visibility that supports the management of individual items. This allows data collection, tracking and tracing of individual items and selection at point of issue.
- n) Disposal: Identification of items that have recycling or other disposal requirements
- o) Sortation: A process that places individual items into groups based upon some selection criteria, often performed at speed.
- p) Identification: A process that is an inherent part of each of the functions set out above.

## 7 Data content

### 7.1 General

There are two types of data that may be present in a shipment tag compliant with this International Standard

- a) Mandatory, non-reprogrammable data as defined in clause 7.2; and
- b) Optional, reprogrammable cargo shipment-specific (CSS) data as defined in clause 7.3.

Should the shipper, at its discretion and responsibility, upload into the shipment tag information that resides in the container tag and/or the e-seal, such information would be accessed and read as part of the containerized cargo supply chain RFID system. Readings for container security and identification purposes of the information in the container tags and e-seals should be done in separate messages and, further, should not be done through the shipment tag.

### 7.2 Mandatory data

The tag ID shall be as described in ISO/IEC 15963 above. This mandatory data element is always non-reprogrammable and is embedded in the shipment tag by the tag manufacturer.

### 7.3 Optional cargo shipment-specific (CSS) data

#### 7.3.1 General

Optional CSS data is defined at the discretion and responsibility of the shipper, while following the semantics and syntax rules in 7.3.2 and 7.3.3, respectively.

Optional CSS data shall be encrypted or otherwise secured at the point and time it is first written into the shipment tag and during any subsequent modifications, alterations, changes and/or erasures. Optional cargo-shipment data that is not encrypted or otherwise secured shall not be accepted by and stored in the shipment tag.

#### 7.3.2 Data semantics

The optional CSS data contained in the shipment tag shall conform to the semantics of ISO/IEC 15418.

#### 7.3.3 Data syntax

The optional CSS data contained in the shipment tag shall conform to the syntax of ISO/IEC 15434.

## 8 Data Security

### 8.1 General

For a containerised cargo supply chain RFID system to be compliant with this standard, it shall protect and secure the optional cargo shipment-specific data as defined in clauses 4.10 and 7.3 above. The system's data protection and security shall be at or exceed the minimum level prescribed in clause 8. The minimum level of data security and protection provided by the containerised cargo supply chain RFID system shall prevent any observability of unprotected cargo shipment-specific data. The minimum level of data security and protection shall be established no later than at the activity first writing to the shipment tag, and is required to:

- Prevent cargo from being identified, either directly or indirectly
- Prevent supply chain information from being identified, accessed, altered, amended, changed and deleted by anyone not authorized by the shipper or any agent, representative or entity acting on its behalf
- Protect the network and associated information systems from hostile attacks (hacking, viruses, and denial of service)
- Ensure the validity and integrity of the data accepted, processed and stored by the system

### 8.2 Confidentiality

The optional CSS data stored in or communicated to or from the tag shall be secured to meet the requirements of clause 8.1. The technique of securing the data shall be identified in trading partner communications, e.g., EDI. CSS data shall be encrypted or otherwise secured at the point and time when it is first written into the shipment tag and during any subsequent modifications, alterations, changes and/or erasures. If encryption is chosen as a method of CSS data security, the level and type of encryption shall be at the discretion and responsibility of the shipper. The tag shall be capable of having encrypted or otherwise secured data written to it and read from it without interference from the tag design or structure.

### 8.3 Data integrity

All shipment tags compliant with this International Standard shall have the ability to prevent the alteration or erasure of re-programmable cargo shipment-specific data commonly known as "locking" data. This shall be at the discretion and responsibility of the shipper. Tag manufacturers shall have the option of locking a portion of the tag data for identification and storage of data related solely to the manufacturer.

### 8.4 Authentication

The data storage and transfer protocols of all shipment tags compliant with this International Standard shall require authentication of the interrogator's authorization prior to reading the tag data. Reading of only the tag ID and chip ID shall not require authentication.

### 8.5 Non-repudiation / Audit trail

All shipment tags compliant with this International Standard shall not intentionally provide incorrect or misleading data. Tags shall be capable of identifying their manufacturer, size and type of data content when properly interrogated.

## 9 Tag location

The shipment tag shall be located in near proximity to the location of the container tag as prescribed in ISO 10374. Both the shipment tag and the container tag should match the polarization of the reading equipment.

## 10 Tag operation

### 10.1 Data protocol

The data protocol, i.e. commands and messages to and from shipment tags compliant with this International Standard, shall support the requirements in ISO/IEC 15961 and ISO/IEC 15962. The data syntax and semantics shall be as identified in clauses 7.3.2 and 7.3.3 above.

### 10.2 Minimum performance requirements

The performance for shipment tags compliant with this International Standard shall be measured in accordance with ISO/IEC 18046. The containerized cargo supply chain RFID system minimum performance requirements, including passing speed, range, and discrimination (tag separation), are as defined in clause 6.2.2 above.

### 10.3 Environmental requirements

In addition to the minimum environmental requirements as defined in clause 6.2.2 above, containerized cargo supply chain RFID systems compliant with this International Standard shall be capable of full operation in the electromagnetic environment typically found at transportation facilities. The shipment tag shall survive and maintain the integrity of stored data in a maximum peak field strength of 50 V/m for 60 seconds, as may be encountered from any radio-frequency source such as a ship borne radar under normal operation or other such devices.

### 10.4 Air interface

The air interface parameters for shipment tags compliant with this International Standard are as defined in ISO/IEC 18000-7.

### 10.5 Memory requirements

The minimum memory capacity for shipment tags compliant with this International Standard is 256 bytes.

### 10.6 Indication of impending power source failure

The shipment tag shall provide an indication of whether there is sufficient battery power to last for a trip of 60 days and a minimum of 20 readings per trip. In addition, the tag shall have a battery life countdown timer that, when interrogated, can indicate remaining battery life.

### 10.7 Real time clock option

The shipment tag shall not be required to have, but may be equipped with, a date and time counter that increments every second. If included in the shipment tag, the counter shall be programmed to number of seconds elapsed since midnight January 1<sup>st</sup>, 1999, UTC. This is initialised at time of manufacture and is unchangeable thereafter. Accuracy of time is within +/- 5 seconds per day.

### 10.8 External communications (Reserved)

Future iterations of this International Standard incorporating "smart" container technologies, e.g. sensors, for containerized cargo supply chain management purposes would need to address the inclusion of external communications with shipment tags.

## 10.9 Sensor interface, if applicable (Reserved)

Future iterations of this International Standard incorporating “smart” container technologies, e.g. sensors, for containerized cargo supply chain management purposes will address the standardization of the sensor interface.

## 10.10 Safety and regulatory considerations

All shipment tags compliant with this International Standard, including their antennas and interrogators, shall meet the safety and regulatory requirements of the appropriate government regulations, e.g., FCC Part 15, ERC 70-03, ICNIRP, to include power, duty cycle and electromagnetic radiation. In addition, such tags and their antennas and interrogators shall comply with the relevant safety and regulatory requirements, including radio frequency regulations, of the country where the technology is being used. Furthermore, the use of these devices shall be restricted in hazardous environments such as near or around explosives or flammable gasses unless they have been certified as safe for such use by the appropriate authorities.

## 10.11 Minimum reliability and accuracy

Containerized cargo supply chain RFID systems, where tags are positioned, programmed and presented to reading equipment in accordance with the provisions of ISO/IEC 18046 and clauses 6.2.2; 7; 8; and 9 above, shall have a minimum read reliability of 99,99%, i.e. no more than one no-read in 10,000 readings, and a read accuracy of 99,998%, i.e. two undetected incorrect reading in 100,000 readings.

## 10.12 Tag recyclability

The recyclability of shipment tags is dependent upon the component materials used in the individual tags used. The tag manufacturer shall clearly mark shipment tags with recycling instructions or appropriate logo to assist in the proper disposal of the tag. Guidelines for tag recyclability can be found in ISO/IEC TR24729-2, *Information technology – Radio frequency identification for item management – Implementation guidelines – Part 2: Recyclability of RF tags*.

## 10.13 Tag reusability

Shipment tags may be reusable upon their removal by the consignee upon final delivery of the containerised cargo shipment. The shipper or, by the shipper’s instructions, the party that physically performs the stuffing of the container shall clearly mark reusable shipment tags with appropriate human readable characters or logos to enable their identification, reclamation and return by the consignee to the party identified by the shipper or its agent, representative or entity authorized by the shipper.

# 11 Privacy of cargo shipment-specific (CSS) data

## 11.1 Data privacy

The sensitive nature of the CSS data that a shipper, at its discretion and responsibility, may decide to upload and store in the shipment tag is such that the shipper in addition to the data security requirements mentioned in clause 8 above may choose to implement data privacy measures. The containerized cargo supply chain RFID system shall accommodate such data privacy measures provided that they do nothing to impact on, interfere with or deteriorate the operation of other RFID devices that may be affixed to the same or other containerised shipments.

## 11.2 Personal data privacy

Security of aggregated data shall be the responsibility of the collector. Collectors and storage operators of cargo shipment-specific data from shipment tags shall comply with all relevant personal data privacy regulations and requirements of the country where the data collection and/or storage is being undertaken.

Personal data collected and/or stored by or incident to the reading of a shipment tag shall be accorded the same protection and security as personal data collected and/or stored by any other means.

### **11.3 Authentication and identification**

**11.3.1** In addition to authentication of the interrogator's authorization in accordance with clause 8.3, any information system that collects, stores, processes, shares, disseminates or otherwise handles cargo shipment-specific data as part of the containerized cargo supply chain RFID system defined in this International Standard shall use non-repudiation and personal identification access control measures. Such personal identification and non-repudiation measures shall be implemented at both the device and network level.

**11.3.2** Wireless devices shall not be used for storing, processing, or transmitting classified information as defined in clause 4.14 above.

## **12 Interoperability, compatibility and non-interference with other RF systems**

All containerized cargo supply chain RFID systems, including their shipment tags, antennas and interrogators, claiming conformance with this International Standard shall operate on a strict non-interference basis with all other RFID systems operating in the same spectrum, and shall be interoperable and compatible at the specific frequency designed.

## Bibliography

- [1] ISO 17364, *Supply chain applications of RFID – Returnable transport items*
- [2] ISO 17365, *Supply chain applications of RFID – Transport units*
- [3] ISO 17366, *Supply chain applications of RFID – Product packaging*
- [4] ISO 17367, *Supply chain applications of RFID – Product tagging*
- [5] ISO/IEC TR18001, *Information technology – RFID for item management – Application requirements profiles*