
Supply chain applications of RFID — Transport units

Applications de chaîne d'approvisionnements de RFID — Unités de transport

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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 17365 was prepared by Technical Committee ISO/TC 122, *Packaging*.

This second edition cancels and replaces the first edition (ISO 17365:2009), which has been technically revised.

This International Standard has one annex, [Annex A](#), which provides 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 including shipping to a final place of sale, use and maintenance, and potentially disposal. 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 in order to ensure compatibility at the physical, command and data levels with the four other International Standards under the general title *Supply chain applications of RFID*. Where possible, this compatibility takes the form of interchangeability. Where interchangeability is not feasible, the International Standards within this suite are interoperable and non-interfering. The International Standards within the complete series of *Supply chain applications of RFID* 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 information required in each layer of the supply chain. The air-interface and communications protocol standards supported within the *Supply chain applications of RFID* International Standards are ISO/IEC 18000; commands and messages are specified by ISO/IEC 15961 and ISO/IEC 15962; semantics are defined in ISO/IEC 15418; syntax is defined in ISO/IEC 15434.

Although not pertinent to this International Standard, the following work is considered valuable:

- ISO/IEC JTC 1, *Information technology, SC 31, Automatic identification and data capture techniques*, in the areas of air interface, data semantic and syntax construction and conformance standards, and
- ISO/TC 104, *Freight containers*, in the area of freight container security, including electronic seals (e-seals) (i.e. ISO 18185) and container identification.

This International Standard defines the requirements for RFID tags for transport units. Transport units are defined here as either a transport package or a unit load (see ISO 17364:2013, 4.6 and 4.9).

An important concept here is the use cases of such things as *unitized loads*, pallets and returnable transport items. How a pallet is used can determine whether it is covered under ISO 17364 as a *returnable transport item* or within this International Standard as a *transport unit*. If ownership title of the pallet remains with its owner then the applicable International Standard is ISO 17364. If the ownership title of a pallet is transferred to the customer as part of a unitized load then it is considered an element of that unitized load, and this International Standard is applicable.

Specific to transport units is the grouping of (packaged) products, in order to make these more suitable for efficient and effective transport and distribution. The transport unit provides an added value for the product being sold, mostly in terms of logistics performance. RFID tagged transport units can help further optimize the supply chain.

Additionally, this edition of this International Standards introduces the concept of returnable packaging items (RPIs). RPIs are components of the transport unit that must be tracked as well as the transport unit itself as an asset of the owner/shipper. Annex A in ISO 17364:2013 provides guidance on RPIs.

Supply chain applications of RFID — Transport units

1 Scope

This International Standard defines the basic features of RFID for use in the supply chain when applied to transport units. In particular it

- provides specifications for the identification of the transport unit,
- makes recommendations about additional information on the RF tag,
- specifies the semantics and data syntax to be used,
- specifies the data protocol to be used to interface with business applications and the RFID system,
- specifies the minimum performance requirements,
- specifies the air interface standards between the RF interrogator and RF tag, and
- specifies the reuse and recyclability of the RF tag.

2 Conformance and performance specifications

All of the devices and equipment that claim conformance with this International Standard shall also conform to the appropriate sections and parameters specified in ISO/IEC 18046 for performance, and ISO/IEC 18047-6 (for ISO/IEC 18000-63, Type C) and ISO/IEC/TR 18047-3 (for the ASK interface of ISO/IEC 18000-3, Mode 3) for conformance.

When through trading-partner agreement, other specific ISO/IEC 18000 air interfaces are employed (i.e. ISO/IEC 18000-2, Type A) the corresponding part of ISO/IEC 18047 shall be used.

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 445, *Pallets for materials handling — Vocabulary*

ISO 830, *Freight containers — Vocabulary*

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/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*

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ISO/IEC 15459-1, *Information technology — Automatic identification and data capture techniques — Unique identification — Part 1: Individual transport units*

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/IEC 16022, *Information technology — Automatic identification and data capture techniques — Data Matrix bar code symbology specification*

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

ISO/IEC 18000-3, *Information technology — Radio frequency identification for item management — Part 3: Parameters for air interface communications at 13,56 MHz*

ISO/IEC 18000-63, *Information technology — Radio frequency identification for item management — Part 63: Parameters for air interface communications at 860 MHz to 960 MHz Type C*

ISO/IEC 18004, *Information technology — Automatic identification and data capture techniques — QR Code bar code symbology specification*

ISO/IEC 18046 (all parts), *Information technology — Radio frequency identification device performance test methods*

ISO/IEC 18047 (all parts), *Information technology — Radio frequency identification device conformance test methods*

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

ISO 21067, *Packaging — Vocabulary*

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*

ISO/IEC/TR 24729-1, *Information technology — Radio frequency identification for item management — Implementation guidelines — Part 1: RFID-enabled labels and packaging supporting ISO/IEC 18000-6C*

ISO/IEC 29160, *Information technology — Radio frequency identification for item management — RFID Emblem*

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

GS1 EPC, *Tag Data Standard, Version 1.6*

GS1 *General Specifications*

ICNIRP Guidelines, *Guidelines for limiting exposure to time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz)*

IEEE C95-1, *IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz*

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4 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 445, ISO 830, ISO 17364, ISO/IEC 19762 (all parts), and ISO 21067 apply.

For the purposes of this document, hexadecimal characters are represented as 0xnn, where “nn” is the hexadecimal value.

5 Concepts

5.1 Differentiation between this layer and the preceding layers

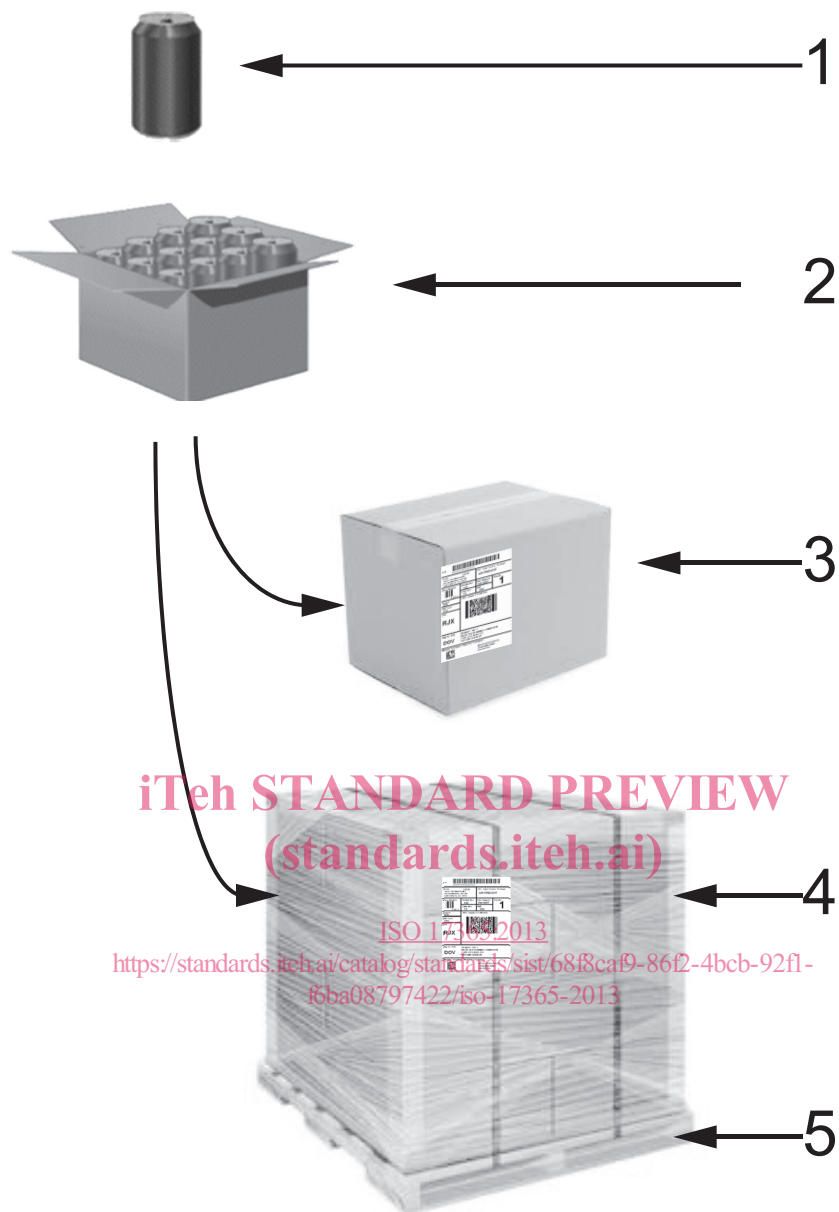
Figures 1 and 2 give a graphical representation of supply chain layers. They show a conceptual model of possible supply chain relationships, not a one-for-one representation of physical things. Although several layers in Figure 2 have clear physical counterparts, some common supply chain physical items fit in several layers depending on the use case. For example, as shown in Figure 2, a repetitively used pallet under constant ownership would be covered by ISO 17364 as an RTI; a pallet that is part of a consolidated unit load would be covered by this International Standard as a transport unit; and a pallet that is integral to a single item would be covered by ISO 17366 as product packaging.

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.

The Item Level through Freight Container Level layers are addressed within the suite of standards for “supply chain applications of RFID” and are intended to enhance supply chain visibility. The Movement Vehicle Level is the purview of ISO/TC 204/WG 7.

The Transport Unit Level in Figure 2, and specifically transport units (as defined in ISO 17364:2013, 4.7) is the subject of this International Standard.

Transport unit layer tags can be distinguished from following or preceding 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 transport unit layer tags.



Key

- 1 primary packaging - consumer packaging - (*product*)
- 2 secondary packaging - outer packaging - (*product package*)
- 3 tertiary packaging - transport packaging - (*transport unit*)
- 4 tertiary packaging - unitized transport packaging - (*transport unit*)
- 5 pallet - (*returnable transport item - RTI*)

Figure 1 — Packaging

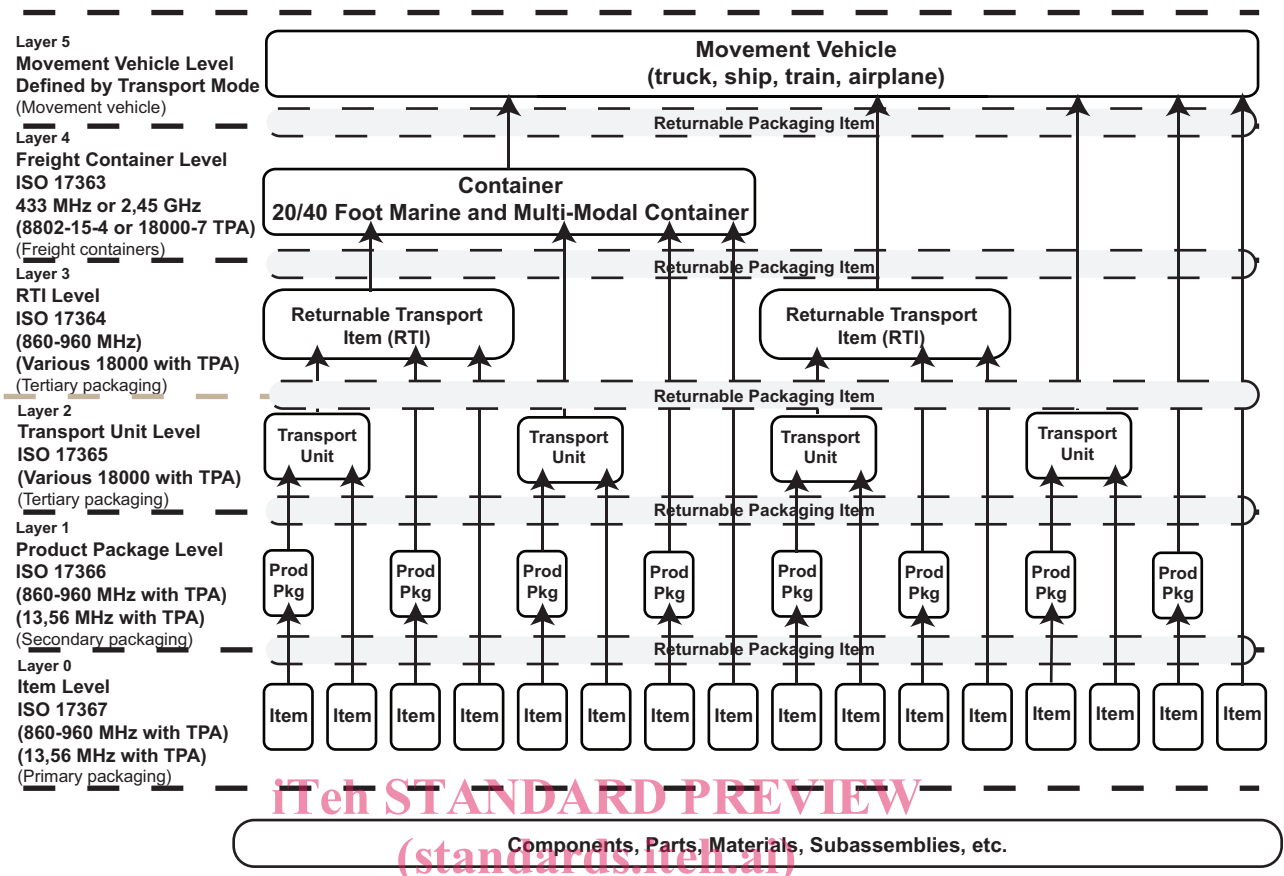


Figure 2 — Supply chain layers

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5.2 Returnable packaging item

At all layers within the supply chain are materials that are shipped to a customer with full expectation that such devices will be returned to the supplier. These returnable packaging items (RPis) are assets of value as well as potentially the physical transport unit. RPis and their identification are well addressed in Annex A of ISO 17364.

5.3 Unique identification of transport units

5.3.1 General

Unique transport unit identification is a process that assigns a unique data string to an individual transport unit, or in this case to an RFID tag that is associated to the transport unit. The unique data string is called the unique transport unit identifier. Unique item identification of transport units allows data collection and management at a granular level. The benefits of granular level data are evident in such areas as maintenance, warranties and enabling electronic transactions of record. This granularity is possible only if each tagged item has a unique item identifier.

The information on items in the supply chain is often held on computer systems and may be exchanged between parties involved via electronic data interchange (EDI) and extensible mark-up language (XML) schemas. The unique item identifier is used as a key to access this information.

The unique transport unit identifier described above shall be the unique identifier as described in ISO/IEC 15459-1. The unique item identifier (UII) 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 and is not the unique transport unit identifier defined in this International Standard.

Transport unit tagging provides unique identification of transport units. The minimum data elements required for unique identification are an enterprise identifier/company identification number and a serial number that is unique within that enterprise identifier.

This International Standard uses the following identification mechanisms for unique transport unit identification:

- unique identifier for transport units (ISO/IEC 15459-1;
- GS1 Serial Shipping Container Code (SSCC).

5.3.2 International unique identification of transport units

The unique identifier of ISO/IEC 15459 provides identification schemes for various layers of the supply chain, from layer 1 (products) up to layer 4 (returnable transport items). The unique identification of transport units shall use ISO/IEC 15459-1. Unique identification is provided contextually by three components:

- a) issuing agency code (IAC),
- b) company identification number (CIN),
- c) serial number (SN),

preceded by an AFI and Data Identifier (DI). The AFI code assignments table in ISO/IEC 15961-3, Data Constructs Register and shown below in [Table 1](#) permits identification of the supply chain layer, i.e. product = 0xA1, transport unit = 0xA2, returnable transport item = 0xA3, and product package = 0xA5.

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Table 1 — 1736x AFI Assignments

AFI	Assigned organization or function
0xA1	ISO 17367 product tagging ISO 17365:2013
0xA2	ISO 17365 transport unit f6ba08797422/iso-17365-2013
0xA3	ISO 17364 returnable transport item or returnable packaging item
0xA4	ISO 17367 product tagging, containing hazardous materials
0xA5	ISO 17366 product packaging
0xA6	ISO 17366 product packaging, containing hazardous materials
0xA7	ISO 17365 transport unit, but containing hazardous materials
0xA8	ISO 17364 returnable transport item or returnable packaging item, containing hazardous materials
0xA9	ISO 17363 freight containers
0xAA	ISO 17363 freight containers, containing hazardous materials

EPC does not use AFIs; consequently, there are no AFIs used for transport units employed in retail applications using EPC. AFI 0xA2 may be used for transport units intended solely for commodities other than consumer goods. [Annex A](#) provides an in-depth discussion of the ISO approach to encoding.

The Data Identifier shall be one of the “J” series shown in [Table 2](#). To define its class (in the ISO/IEC 15459 sense), the unique identifier of transport units ‘J, 1J, 2J, 3J and 4J’ can be up to 35 alphanumeric characters in length, excluding the Data Identifier (an..2+an..35) and the unique identifier of transport units ‘5J, and 6J’ can be up to 20 alphanumeric characters in length, excluding the Data Identifier (an..2+an..20). With the mutual agreement of the trading partners the length may be extended to 50 characters (an3+an..50). See [Table 2](#).