TECHNICAL SPECIFICATION

ISO/TS 10891

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Freight containers — Radio frequency identification (RFID) — Licence plate tag

Conteneurs pour le transport de marchandises — Identification par radiofréquence (RFID) — Étiquette de plaque de licence

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Contents

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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.

In other circumstances, particularly when there is an urgent market requirement for such documents, a technical committee may decide to publish other types of document:

— an ISO Publicly Available Specification (ISO/PAS) represents an agreement between technical experts in an ISO working group and is accepted for publication if it is approved by more than 50 % of the members of the parent committee casting a vote;

— an ISO Technical Specification (ISO/TS) represents an agreement between the members of a technical committee and is accepted for publication if it is approved by 2/3 of the members of the committee casting a vote.

An ISO/PAS or ISO/TS is reviewed after three years in order to decide whether it will be confirmed for a further three years, revised to become an International Standard, or withdrawn. If the ISO/PAS or ISO/TS is confirmed, it is reviewed again after a further three years, at which time it must either be transformed into an International Standard or be withdrawn.

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/TS 10891 was prepared by Technical Committee ISO/TC 104, *Freight containers*, Subcommittee SC 4, *Identification and communication*.

Introduction

This Technical Specification has been developed to be compatible with ISO 18185, *Freight containers — Electronic seals.* Due to differences in data structures and air interface parameters, equipment manufactured in compliance with these International Standards and this Technical Specification is not interchangeable and might not be interoperable. However, assurance is given that equipment compliant with ISO 17363, ISO 18185 or this Technical Specification is non-interfering and therefore operable in close proximity to each other.

With regard to ISO 18185 and this Technical Specification:

— supported air interface and communication protocol are specified in ISO/IEC 18000;

— supported commands and messages are specified in ISO/IEC 15961 and ISO/IEC 15962;

— semantics are defined in ISO/IEC 15418;

— syntax is defined in ISO/IEC 15434.

Though not used in this Technical Specification, recognition is given to the standardization work of

— ISO/IEC JTC 1/SC 31 in the area related to air interface, data semantic and syntax construction, and conformance;

— ISO/TC 104 in the area of freight container security, including electronic seals [(e-seals) ISO 18185], and container identification. This work is relevant and highly important since electronic seals are RF devices with their own air interface. Such International Standards ensure that electronic seals are compatible, or at least non-interfering, with tags described in this Technical Specification.

This Technical Specification provides a systemic approach for automatic identification and supply chain applications of RFID for freight containers. Each can be applied to a freight container independently of the other. They describe two different tag types with respectively different tag and application requirements. These are as follows.

a) Permanent container "license-plate" tag:

This tag, hereinafter referred to as the "container tag", fully described in this Technical Specification, is a permanently affixed, read-only [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 Technical Specification describes the use of two tags, permanently affixed by, or on behalf of, the container owner. These tags are permanently affixed to and should last the lifetime of their associated container (except possibly in situations where the container changes ownership or equipment ID or the tag is damaged).

b) Cargo shipment-specific tag:

This tag, hereinafter referred to as the "shipment tag", is a read-write tag into which data specific to a containerized cargo shipment can be stored. Use of this type of tag and the data stored within it is at the discretion 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. A compliant tag performs reliably from the point of stuffing of the container to the container's final delivery to the consignee; it is removed by the consignee upon final delivery. The tag may be reusable.

This Technical Specification is one part of a three-part approach within the ISO system for the use of RFID applications on containers. The other related standards apply to e-seals (ISO 18185) and cargo shipment tags. ISO/TS 10891 replaces ISO 10374. ISO 10374 was used as a foundation for ISO 18185 and this Technical Specification [as well as for other (industrial) standards] and will remain active some years in order to provide additional support.

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Freight containers — Radio frequency identification (RFID) — Licence plate tag

1 Scope

This Technical Specification establishes:

a) a set of requirements for container tags, which allow the transfer of information from a container to automatic processing systems by electronic means;

b) a data coding system for container identification and permanent related information which resides within a container tag;

c) a data coding system for the electronic transfer of both container identification and permanent related information from container tags to automatic data processing systems;

d) the description of data to be included in container tags for transmission to automatic data processing systems;

e) performance criteria necessary to ensure consistent and reliable operation of container tags within the international transportation community;

f) the physical location of container tags on containers;

g) features to inhibit malicious or unintentional alteration and/or deletion of the information content of container tags when installed on a freight container.

This Technical Specification is intended to be applicable to freight containers as defined in ISO 668 as well as to other containers not defined in ISO 668 and container ancillary equipment such as road and terminal chassis, generator sets and power packs (see 3.1).

The use of container tags and the equipping of containers for automatic identification are optional. The purpose of this Technical Specification is to optimise the efficiency of equipment control systems and to assist in container security initiatives and programs, including the optional usage of electronic seals in accordance with ISO 18185, and any subsequent International Standard. For this reason, any container tag system used for identifying containers shall be non-proprietary and conform to and be compatible with this Technical Specification.

2 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 668, *Series 1 freight containers — Classification, dimensions and ratings*

ISO 830, *Freight containers — Vocabulary*

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

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 18000-6, *Information technology — Radio frequency identification for item management — Part 6: Parameters for air interface communications at 860 MHz to 960 MHz*

ISO/IEC 19762-1, *Information technology — Automatic identification and data capture (AIDC) techniques — Harmonized vocabulary — Part 1: General terms relating to AIDC*

ISO/IEC 19762-3, *Information technology — Automatic identification and data capture (AIDC) techniques — Harmonized vocabulary — Part 3: Radio frequency identification (RFID)*

IEC 60068-2, *Environmental testing — Part 2: Tests.*

3   Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 19762-1, ISO/IEC 19762-3, ISO 830 and the following apply.

3.1
freight container
ISO freight container as specified in ISO 668 as well as other containers not specified ISO 668 and container ancillary equipment such as road and terminal chassis, generator sets and power packs

3.2
mandatory and optional
indication of the status of requirements from the ISO standpoint, and not to imply that a particular status does or does not result from intergovernmental agreement, legislation etc.

3.3
physically, electronically, and radiographically secure
capable of meeting the operational requirements specified in this Technical Specification after successfully completing the tests specified in Annex A

NOTE   For operational requirements see Clause 4.

3.4
physically tamper-proof
designed such that malicious disassembly and re-assembly, using commonly available tools, will be detected upon visual inspection

3.5
electronically tamper-proof
designed such that malicious modification or deletion of electronically stored information by subjection to electromagnetic signals from commonly available electronic devices is not possible

3.6
reader
automatic identification device and its antennas

3.7

range

distance between the reader and the container tag

3.8

passing speed

speed at which a container tag passes the reader

3.9

localisation

capability in any operational scenario to associate a container tag to the container on to which it is affixed

3.10

system reliability

ability of reader to capture information from every passing container tag, which is mounted, programmed and presented in accordance with this Technical Specification, and which enters its reading area under environmental conditions specified in Annex A

3.11

system accuracy

within the defined conditions for system reliability, capability of a reader to detect any misinterpretation of container tag information, including bit errors

3.12

tag type

two-digit code describing the tag technology applied to the container

3.13

tag location code

one-digit code defining the tag mounting location

EXAMPLE   T = top panel, S = side panel.

4   Operational requirements

4.1   Basic components of the identification system

The container identification RFID system shall consist of two basic components:

a)   two container tags installed on the exterior of the freight container;

b)   a reader located away from the freight container.

4.1.1   The container tags shall be capable of:

a)   maintaining the integrity of the freight container identification and permanent related information;

b)   encoding information into a form suitable for transmission to reader;

c)   being physically, electronically and radiographically secure and tamper-proof;

d)   being mounted onto the container in locations and manner as specified within this document;

e)   having a minimum life of 20 years normal operational use without requiring any periodic maintenance;

f)   having a minimum memory capacity of 256 bytes;

g) being read when properly oriented as described in 4.5.2;

h) being localised to a specific container and read as specified in the operational scenarios defined in 4.5.3;

i) being read when operated in the environmental conditions specified in Annex A;

j) being programmed via RF transmissions from a dedicated tag programmer. After programming, mandatory data in the tags must be permanently locked in a manner that prohibits modifying this data;

k) being deployed in international operation, without the necessity of licensing tags individually and/or in individual jurisdictions; and

l) being interrogated by a compatible, international standards-based reader.

4.1.2   The reader shall be capable of:

a) independently reading information contained in the container tags when properly presented; and

b) decoding the information contained in the tags into a form suitable for transmission to automatic data processing systems.

4.2   Container tag data content and format

4.2.1   Some information contained in the tags is mandatory, permanent (non-changeable) information. Remaining memory space is reserved for future use.

4.2.2   The container tags shall provide the following mandatory information about the container; reference to or reliance upon other tables or databases in external automatic data processing systems in order to obtain each of the various information elements shall not be required.

a) Tag manufacturer ID: 2 characters.

b) Tag type: 2 characters.

c) Tag location code: 1 character.

d) Conveyance and ancillary equipment type, e.g. ISO 668 container, chassis, genset: 2 characters:

   01   Intermodal maritime container;

   02   Chassis;

   03   Genset;

   04   Power pack;

   05   Reefer spare part kit;

   06   Truck;

   07   Swap body;

   08   Trailer;

   09   Other equipment.

e) For equipment type 01:

   1) An equipment identification number, in accordance with ISO 6346, which consists of 11 characters:

      i)   owner code;

ii) equipment category identifier;

iii) serial number;

iv) check digit.

2) A 4 character size and type code, in accordance with ISO 6346.

3) A 20 character operational mark for maximum gross mass and tare mass, in accordance with ISO 6346.

f) For equipment types 02 to 09:

1) Information in accordance with UN/CFACT specifications.

2) The size and type codes, or other relevant codes.

3) Operational marks as required.

The tag shall be able to store data as defined within Table 1. Additional memory is reserved for future use.

Table 1 — Container ID tag data and values

Data	Value		Unit
	Minimum	Maximum	representation
Tag manufacturer ID			Alphanumerical
Tag type	00	99	Numerical
Tag location code	A	Z	Alphabetical
Equipment type	00	99	Numerical
Owner code	AAA	ZZZ	Alphabetical
Equipment category identifier	A	Z	Alphabetical
Serial number	000000	999999	Numerical
Check digit	0	9	Numerical
Size and type code			Alphanumerical
Gross mass (kilograms[a])	00000	99999	Numerical
Tare mass (kilograms[a])	00000	99999	Numerical
[a] In certain cases pounds are used instead of kilograms.			

The mandatory data above shall be written to tag memory, using radio frequency through a sealed tag case. Tags must be programmable in the field. After initial programming, WRITE access to memory prescribed for required mandatory data (above) must be disabled using a permanent lock of memory or other means.

4.2.3 Data protocol and unique tag identifier

The data protocol, i.e. commands and messages to and from container tags conforming to this Technical Specification shall support the requirements of ISO/IEC 15961 and ISO/IEC 15962.

For effective container tagging, it is necessary that each RFID container tag be unique worldwide. In order to uniquely identify RFID container tags, each tag shall be assigned a unique tag ID, as specified in ISO/IEC 15963. In tag memory bank MBO1, bit 0×17 shall be programmed to a "1" and bits 0×18 to $0\times1F$ shall contain an ISO/IEC 15961 application family identifier (AFI).