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Freight containers — Electronic seals —

Part 3: Environmental characteristics

Conteneurs pour le transport de marchandises — Scellés électroniques —

Partie 3: Caractéristiques en environnement

ICS 55.180.10

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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.

International Standard ISO 18185, Part 3 was prepared by Technical Committee 104, Freight Containers, Subcommittee SC 4, Identification and communication, Working Group WG 2, Automatic Identification Equipment (AEI) for containers and container related equipment.

Attention is drawn to the possibility that some of the elements of this part of ISO 18185 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 18185 consists of the following parts, under the general title *Freight containers — Electronic seals*:

- *Part 1: Communication protocol*
- *Part 2: Application requirements*
- *Part 3: Environmental characteristics*
- *Part 4: Data protection*
- *Part 5: Sensor interface (Request submitted for withdrawal of Work Item)*
- *Part 6: Messages sets for transfer between seal reader and host computer*
- *Part 7: Physical layer*

Introduction

This International Standard was prepared by ISO Technical Committee 104/Subcommittee 4/Working Group 2, using the drafting conventions of ISO/IEC Directives, Part 2.

This standard defines the environmental characteristics for compliant electronic seals.

Freight containers — Electronic seals —

Part 3:

Environmental characteristics

1 Scope

This International Standard specifies the minimum environmental characteristics for eSeals.

This International Standard describes the environmental requirements for ISO 18185, ISO 10374 for freight container identification, and ISO 17363 for supply chain applications of RFID – freight containers since it is expected that the implementation of these standards will face the same international conditions. However, each of these standards has their own unique requirements other than environmental conditions

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 1496-1, *Series 1 freight containers - Specification and testing - Part 1: General cargo containers for general purposes*

ISO 1496-2, *Series 1 freight containers - Specification and testing - Part 2: Thermal containers*

ISO 1496-3, *Series 1 freight containers - Specification and testing - Part 3: Tank containers for liquids, gases and pressurized dry bulk*

ISO 1496-4, *Series 1 freight containers - Specification and testing - Part 4: Non-pressurized containers for dry bulk*

ISO 1496-5, *Series 1 freight containers - Specification and testing - Part 5: Platform and platform-based containers*

ISO 17712, *Freight containers – Mechanical seals*

ISO 18185-1, *Freight containers — Electronic seals — Part 1: Communication protocol*

ISO 18185-2, *Freight containers — Electronic seals — Part 2: Application requirements*

ISO 18185-4, *Freight containers — Electronic seals — Part 4: Data protection*

ISO 18185-6, *Freight containers — Electronic seals — Part 6: Message sets for transfer between seal reader and host computer*

ISO 18185-7, *Freight containers — Electronic seals — Part 7: Physical layer*

ISO/IEC 19762-1, *Information Technology, Automatic Identification and Data Capture Techniques – Harmonized Vocabulary – Part 1: General Terms Relating to Automatic Identification and Data Capture (AIDC)*

ISO/IEC 19762-3, *Information Technology, Automatic Identification and Data Capture Techniques – Harmonized Vocabulary – Part 3: Radio-Frequency Identification (RFID)*

IEC 60068-2-1, *Environmental testing - Part 2: Tests. Tests A: Cold*

IEC 60068-2-2, *Environmental testing - Part 2: Tests. Tests B: Dry heat*

IEC 60068-2-2, *Environmental testing - Part 2: Tests. Test Ea and guidance: Shock*

IEC 60068-2-11, *Environmental testing - Part 2: Tests. Test Ka: Salt mist*

IEC 60068-2-18, *Environmental testing - Part 2-18: Tests - Test R and guidance: Water*

IEC 60068-2-31, *Environmental testing - Part 2: Tests. Test Ec: Drop and topple, primarily for equipment-type specimens*

IEC 60068-2-32, *Environmental testing - Part 2: Tests. Test Ed: Free fall (Procedure 1)*

IEC 60068-2-38, *Environmental testing - Part 2: Tests. Test Z/AD: Composite temperature/humidity cyclic test*

IEC 60068-2-53, *Environmental testing - Part 2: Tests. Guidance to Tests Z/AFc and Z/BFc: Combined temperature (cold and dry heat) and vibration (sinusoidal) tests*

IEC 60068-2-68, *Environmental testing - Part 2: Tests - Test L: Dust and sand*

MIL-STD-810F, *Department of Defense test method standard for environmental engineering considerations and laboratory tests*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 830, ISO/IEC 19762, Parts 1 and 3, ISO 17712, and the following apply.

3.1
electronic seal
eSeal
read-only, non-reusable freight container seal conforming to the high security seal defined in ISO 17712 and conforming to ISO 18185 or revision thereof that electronically evidences tampering or intrusion through the container doors.

3.2
seal identification
Seal ID
unique identification of each manufactured seal incorporating serial number (i.e., Tag ID), and manufacturer ID; the combination of which shall be called seal ID.

3.3
interrogator identification
Interrogator ID
code used to identify the source address during every communication session originated by the interrogator.

4 Environmental characteristics

4.1 General

This International Standard shall be used in conjunction with the other Parts of ISO 18185.

This International Standard applies to all electronic seals used on freight containers covered by International Standards ISO 668, ISO 1496, Parts 1-5, ISO 830 and should, wherever appropriate and practicable, be applied to freight containers other than those covered by the aforementioned International Standards;

Container seals are typically subjected to the harsh environments of the marine, rail and road transportation industries. Sand and dust, salt spray, grease, snow, ice and grime can be expected to coat the tag and sensing equipment. Physical shock and vibration are commonly encountered as a result of handling and transport operations.

Substantial temperature variations are common in worldwide container operations, as well as prolonged exposure to sunlight, including ultraviolet rays. The electronic seal shall operate satisfactorily at seal surface temperatures between -40°C and $+70^{\circ}\text{C}$ and shall maintain the integrity of stored data at temperatures from -51°C to $+85^{\circ}\text{C}$. The electronic seal shall survive and maintain the integrity of stored data under (as a minimum) the severest of the environmental conditions covered by the test methods specified below.

The system shall be capable of full operation in the electromagnetic environment typically found at transportation facilities. The electronic seal shall survive and maintain the integrity of stored data in a maximum peak field strength of 50 V/m for 60 s, as may be encountered from any radio-frequency source such as a shipborne radar under normal operation or other such devices.

4.2 Low temperature

Electronic seals as defined in ISO 18185 shall fully operate at a minimum low temperature of -40°C . Electronic seals as defined in ISO 18185 shall fully operate at such minimum temperatures after having been stored at a minimum low temperature of -51°C with an exposure time of 24 hours per day for a period of up to 60 days. Testing will be accomplished in accordance with IEC 60068-2-1 (MIL-STD-810F, Method 502.4)

4.3 High temperature

Electronic seals as defined in ISO 18185 shall fully operate after having been cycled between $+70^{\circ}\text{C}$ and $+38^{\circ}\text{C}$, as specified in Clause 3.1. Electronic seals as defined in ISO 18185 shall fully operate at such temperature extremes after having been stored at a minimum high temperature of $+85^{\circ}\text{C}$ with an exposure time of 12-15 hours per day for a period of up to 60 days (which is the minimum e-seal life time required for e-seals compliant with 18185-2). Testing will be accomplished in accordance with IEC 60068-2-2 (MIL-STD-810F, Method 501.4)

4.4 Mechanical shock

Electronic seals as defined in ISO 18185 shall fully operate during and after having been subjected to a mechanical shock of 30g for 11 ms, using a half-sine pulse. Testing will be accomplished in accordance with IEC 60068-2-2 (MIL-STD-810F, Method 516.5)

4.5 Random vibration

Electronic seals as defined in ISO 18185 shall fully operate during and after having been subjected to a random vibration of a duration of 2 hours, on all axis up to 3g between -40°C and $+70^{\circ}\text{C}$. Testing will be accomplished in accordance with IEC 60068-2-53 (MIL-STD-810F, Method 514.5)

4.6 Humidity

Electronic seals as defined in ISO 18185 shall fully operate during and after having been subjected to humidity of up to 95% non-condensing. Testing will be accomplished in accordance with IEC 60068-2-38 (MIL-STD-810F, Method 507.4)

4.7 Rain/snow

Electronic seals as defined in ISO 18185 shall fully operate during and after having been subjected to rain and snow, as well as surviving submersion under 1 meter of salt water. Testing will be accomplished in accordance with IEC 60068-2-18 (MIL-STD-810F, Method 506.4 / 512.4)

4.8 Salt fog

Electronic seals as defined in ISO 18185 shall fully operate during and after having been subjected to salt fog. Testing will be accomplished in accordance with IEC 60068-2-11 (MIL-STD-810F, Method 509.4)

4.9 Drop shock

Electronic seals as defined in ISO 18185 shall fully operate during and after having been subjected to a drop shock from a height of 3.3 m onto an impact surface of concrete or steel. Testing will be accomplished in accordance with IEC 60068-2-31 and IEC 60068-2-32 (MIL-STD-810F, Method 516.5), although the distance and impact surface will be as defined in this clause.

4.10 Sand and dust

Electronic seals as defined in ISO 18185 shall fully operate during and after having been subjected to exposure of sand and dust. Testing will be accomplished in accordance with IEC 60068-2-68 (MIL-STD-810F, Method 510.4)

4.11 Electromagnetic environment

Electronic seals as defined in ISO 18185 shall survive and maintain the integrity of stored data under a maximum peak field strength of 50 V/m for 60 s. Such electronic seals shall further survive and maintain the integrity of stored data after having been subjected to a 25 kilovolt electrostatic discharge.

Bibliography

- [1] ISO 6346, *Freight containers - Coding identification and marking*
- [2] ISO 10374.2, *Freight containers – RFID for freight container identification (formerly Freight containers - Automatic Identification)*
- [3] ISO 17363, *Supply chain applications of RFID – Freight containers*
- [4] European Union, ERC Recommendation 70-03, *Relating to the use of Short Range Devices (SRD), Annex 1 Non-specific Short Range Devices*
- [5] European Union, ETSI EN 300 220, *Radio equipment and systems; short range devices; Technical characteristics and test methods for radio equipment to be used in the 25 MHz to 1000 MHz frequency range with power levels ranging up to 500 mW*
- [6] ANS INCITS 256 Part 4.2, *Radio Frequency Identification (RFID) - UHF RFID Protocols – 433.92 MHz UHF Narrowband Active Tag Interface*
- [7] USA, 47 CFR, Part 15, *Code of Federal Regulations, Federal Communications Commission, 47 CFR, Part 15 - Radio frequency devices*