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**Freight containers — Electronic seals —**  
**Part 3:**  
**Environmental characteristics**

*Conteneurs pour le transport de marchandises — Scellés  
électroniques —*

*Partie 3: Caractéristiques environnementales*

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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 18185-3 was prepared by Technical Committee ISO/TC 104, *Freight containers*, Subcommittee SC 4, *Identification and communication*.

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 7: Physical layer*

The following parts are under preparation:

- *Part 4: Data protection*
- *Part 6: Message sets for transfer between seal reader and host computer*

## Introduction

This part of ISO 18185 defines the environmental characteristics for compliant electronic seals.

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# Freight containers — Electronic seals —

## Part 3: Environmental characteristics

### 1 Scope

This part of ISO 18185 specifies the minimum environmental characteristics for electronic seals.

This part of ISO 18185 describes the environmental requirements for the ISO 18185 series, for ISO 10374 (*Freight containers — RF automatic identification*) and for ISO 17363 (*Supply chain applications of RFID — Freight containers*), since it is expected that the implementation of these International Standards will face the same environmental conditions. However, each of these International Standards has its 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 17712, *Freight containers — Mechanical seals*

ISO 18185-1:—<sup>1)</sup>, *Freight containers — Electronic seals — Part 1: Communication protocol*

ISO 18185-2:—<sup>2)</sup>, *Freight containers — Electronic seals — Part 2: Application requirements*

ISO 18185-7:—<sup>3)</sup>, *Freight containers — Electronic seals — Part 7: Physical layer*

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

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

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

1) To be published.

2) To be published.

3) To be published.

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

IEC 60068-2-27, *Environmental testing — Part 2: Tests. Test Ea and guidance: Shock*

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*

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 19762-1, ISO/IEC 19762-3, 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 to ISO 18185, that electronically provides evidence of tampering or intrusion through the container doors

#### 3.2

##### **seal identification**

##### **seal ID**

unique code used to identify each manufactured seal, incorporating a combination of the serial number (i.e. Tag ID) and the manufacturer 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 part of ISO 18185 shall be used in conjunction with the other parts of ISO 18185.

This part of ISO 18185 applies to all electronic seals used on freight containers covered by the following International Standards: ISO 668, ISO 1496-1, ISO 1496-2, ISO 1496-3, ISO 1496-4, ISO 1496-5 and ISO 830. This part of ISO 18185 should also, 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  $-40\text{ }^{\circ}\text{C}$  and  $+70\text{ }^{\circ}\text{C}$  and shall maintain the integrity of stored data at temperatures from  $-51\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$ . 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 shall fully operate at a minimum low temperature of  $-40\text{ }^{\circ}\text{C}$ . Electronic seals shall fully operate at such minimum temperatures after having been stored at a minimum low temperature of  $-51\text{ }^{\circ}\text{C}$  with an exposure time of 24 h 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 shall fully operate after having been cycled between  $+70\text{ }^{\circ}\text{C}$  and  $+38\text{ }^{\circ}\text{C}$ , as specified in 3.1. Electronic seals shall fully operate at such temperature extremes after having been stored at a minimum high temperature of  $+85\text{ }^{\circ}\text{C}$  with an exposure time of 12 h to 15 h per day for a period of up to 60 days (which is the minimum electronic seal life time required for electronic seals compliant with ISO 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 shall fully operate during and after having been subjected to a mechanical shock of 30 g for 11 ms, using a half-sine pulse. Testing will be accomplished in accordance with IEC 60068-2-27 (MIL-STD-810F, Method 516.5).

#### 4.5 Random vibration

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

#### 4.6 Humidity

Electronic seals 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 shall fully operate during and after having been subjected to rain and snow, as well as surviving submersion under 1 m 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 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).