
**Freight containers — NFC or/and QR
code seals**

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Contents

	Page
Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Freight container — NFC or/and QR code seals	2
4.1 General requirements.....	2
4.2 Data format and content of NFC seal.....	2
4.3 Data format and content of QR code seal.....	3
4.4 Data format and content of NFC and QR code seal.....	3
4.5 Requirements for the communication interface between NFC seal and NFC read/ write device.....	3
4.6 Requirements of QR code printing and reading.....	4
5 NFC or/and QR code seal system for freight containers	4
5.1 System components.....	4
5.2 General requirements.....	4
6 NFC read/write device and QR code read device	5
6.1 General requirements.....	5
6.2 Content and format of data interaction.....	5
7 Information management platform	6
7.1 General requirements.....	6
7.2 Content and format of the data interaction interface.....	6
7.3 Extensions.....	7
8 Operation requirements	7
8.1 Operation at sealing point.....	7
8.2 Operation at unsealing point.....	7
8.3 Operation during transportation.....	8
8.4 Abnormality reporting.....	8
8.5 Authenticity verification of NFC and QR code seal.....	8
Bibliography	9

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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

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

ISO/TS 7352:2023

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document proposes a specification for freight container NFC or/and QR code seals, including clear and unique identification and status of NFC or/and QR code seals. It is intended to greatly improve container transportation security and transparency with the advantages of low cost, easy to promote and apply.

The main body of implementation of this document is users, producers and information platform operators of container NFC or/and QR code seals, including cargo owners, shipping companies, logistics companies, agents, customs, inspection and quarantine, port tally, NFC or/and QR code seal manufacturers and information management platform operators.

The anticipated effects and benefits are as follows.

- To facilitate quick access to the Internet for container sealing information.
- To improve the safety of freight container transportation and reduce theft, smuggling and illegal immigration.
- To improve the transparency of freight container transportation and facilitate the accountabilities partition in multimodal transport of containers.
- To facilitate the supervision by such national institutions as customs, and inspection and quarantine bureaus.
- To facilitate the manufacturers' upgrading of products and expanding of the NFC or/and QR code seal market.

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Freight containers — NFC or/and QR code seals

1 Scope

This document specifies the system composition, data format (storage data of the seal, interaction data and format between seal and APP, interaction data and format between smartphone APP and information platform, data exchanged between platforms), technical requirements, data communication requirements and operational requirements for freight container NFC seals, QR code seals, NFC and QR code seals.

This document applies to the design, manufacture and application of freight container NFC seals, QR code seals, NFC and QR code seals.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 6709, *Standard representation of geographic point location by coordinates*

ISO 17712, *Freight containers — Mechanical seals*

ISO 18185-3, *Freight containers — Electronic seals — Part 3: Environmental characteristics*

ISO/IEC 7816-6, *Identification cards -Integrated circuit cards-Part 6: Interindustry data elements for interchange*

ISO/IEC 14443-2:2020, *Cards and security devices for personal identification — Contactless proximity objects — Part 2: Radio frequency power and signal interface*

ISO/IEC 14443-3, *Cards and security devices for personal identification — Contactless proximity objects — Part 3: Initialization and anticollision*

ISO/IEC 18004:2015, *Information technology — Automatic identification and data capture techniques — QR Code bar code symbology specification*

ISO/IEC 18092, *Information technology — Telecommunications and information exchange between systems - Near Field Communication - Interface and Protocol (NFCIP-1)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1
NFC seal
non-reusable, anti-counterfeiting electronic seal embedded NFC tag with a globally unique identifier (UID) that records seal ID and manufacturer information

Note 1 to entry: Its mechanical part shall comply with ISO 17712 related requirements for freight container seals. It can provide evidence of tampering or intrusion through the container doors by appearance or information management system.

3.2
QR code seal
non-reusable mechanical seal printed on the surface containing seal ID, manufacturer information and produce date, to form a globally unique QR code

Note 1 to entry: It shall comply with ISO 17712 requirements for freight container seals. It can provide physical evidence of tampering or intrusion of the container door.

3.3
NFC and QR code seal
electronic NFC seal with a QR code printed on the surface

Note 1 to entry: The information in it includes the NFC UID, seal ID, seal manufacturer information, etc.

3.4
NFC read/write device
process device for NFC reading and writing, location uploading, picture shooting, and access to internet, such as smartphones, which has an operating system and running space where software can be installed

3.5
QR code read device
process device for QR code reading, location uploading, picture shooting, and access to internet, such as smartphones, which has an operating system and running space where software can be installed

4 Freight container — NFC or/and QR code seals

4.1 General requirements

4.1.1 The type, technical requirements, test methods and external identification of the mechanical part of the container NFC or/and QR code seal shall comply with ISO 17712.

4.1.2 The environmental requirements for NFC seal shall comply with ISO 18185-3.

4.1.3 The data character encoding method, symbol format, size characteristics, error correction rules, reference decoding algorithm and production quality requirements of QR code seal, etc., shall comply with ISO/IEC 18004.

4.2 Data format and content of NFC seal

The data of NFC seal shall include chip UID, NFC seal ID, seal manufacturer ID and container number. NFC seal ID and seal manufacturer ID shall be written onto an NFC seal during production and set to be read-only. The container number can be written by the sealing operator. The data format and content of the NFC seal are shown in [Table 1](#).

Table 1 — Data format and content of NFC seal

Field name	Identifier	Type	Size	Description
Chip UID	ChipID	Hexadecimal	8 bytes	Required. The unique identification serial number for the chip built in the NFC seal. It shall comply with the UID-related regulations in ISO/IEC 7816-6.
NFC seal ID	SealID	Character string	14 bytes	Required. The external identifier for the NFC seal. It shall comply with ISO 17712.
Seal manufacturer ID	ManufacturerID	Character string	18 bytes	Required. For identification of seal manufacturer.
Container number	ContainerNo	Character string	11 bytes	Optional. It can conform to ISO 6346.

4.3 Data format and content of QR code seal

The data content of the QR code seal is printed on the surface of the seal in the form of a QR code, and the data content should include the seal ID, manufacturer ID and produce date. The data format and content of the QR code seal are shown in [Table 2](#).

Table 2 — Data format and content of the QR code seal

Field name	Identifier	Type	Size	Description
QR code seal ID	sealID	Character string	14 bytes	Required. The external identifier for the NFC seal. It shall comply with ISO 17712.
Seal manufacturer ID	manufacturerID	Character string	18 bytes	Required. For identification of seal manufacturer.
Manufacturing time	produceDate	Character string	14 bytes	Required. Manufacturing time of the QR code seal. The format shall be "YYYYMMDDHHMMSS".

4.4 Data format and content of NFC and QR code seal

The requirements of data content, format of the NFC and QR code seal are consistent with the terms of [4.2](#), with the addition of printing a QR code on the surface of the seal. The content of the QR code shall include the NFC chip UID, seal ID and manufacturer ID. The data format and content are shown in [Table 3](#).

Table 3 — QR code data format and content of NFC with QR code seal

Field name	Identifier	Type	Size	Description
Chip UID	chipID	Hexadecimal	8 bytes	Required. The unique identifier serial number of the chip inside the NFC seal. It shall comply with the relevant UID regulations in ISO/IEC 7816-6.
Seal ID	sealID	Character string	14 bytes	Required. External identifier of the seal. It shall comply with ISO 17712.
Seal manufacturer ID	manufacturerID	Character string	18 bytes	Required. Used to identify the seal manufacturer.

4.5 Requirements for the communication interface between NFC seal and NFC read/write device

4.5.1 The operating frequency, signal interface, bit rate, modulation principle, bit coding, etc., of the NFC seal shall comply with the requirements of ISO/IEC 14443-2.

4.5.2 The read and write operations between NFC read/write device and NFC seal, such as communication initialization, anti-collision, instruction selection and pause, block instruction reading and writing, shall comply with the regulations in ISO/IEC 14443-3.

4.6 Requirements of QR code printing and reading

4.6.1 The QR code printed on the surface of the seal shall be such that the pattern is clear, on a flat surface and not bent.

4.6.2 The reading environment of the QR code seal should be such that the QR code symbol is evenly illuminated, has accurate focus and is not covered or defaced.

4.6.3 The time for the QR code reading device to complete one information reading shall not be longer than 2 s.

4.6.4 The single reading rate of the QR code shall not be less than 99,9 %.

5 NFC or/and QR code seal system for freight containers

5.1 System components

5.1.1 Online container NFC or/and QR code seal system

It consists of a seal, read/write device and an information management platform. See Figure 1 for its structural diagram. The data interaction between NFC or/and QR code seal and the information management platform is achieved through the NFC read and write device.

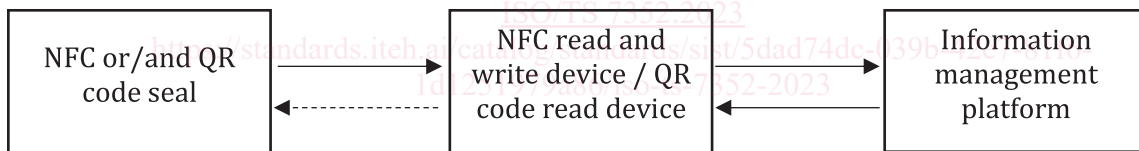


Figure 1 — Structure of an online container NFC or/and QR code seal system

5.1.2 Offline NFC and QR code seal authenticity verification system

It consists of an NFC and QR code seal, read and write device. See Figure 2 for its structural diagram.

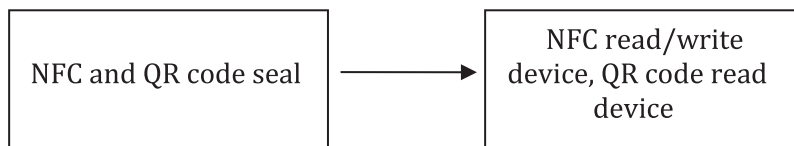


Figure 2 — Structure of an offline NFC and QR code seal authenticity verification system

5.2 General requirements

5.2.1 The container NFC or/and QR code seal system shall be equipped to read and write NFC seal or read QR code seal, record the time, place, operator, and operating image or video, and transmit such information to the platform automatically.

5.2.2 The NFC or/and QR code seal system shall have the function of abnormal report.