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Application technical requirements of container electronic seal for supply chain monitoring

供应链监控用集装箱电子箱封应用技术要求

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3 Terms and definitions

The terms and definitions given in GB/T 8487 and the following apply.

3.1 electronic seal: a seal that communicates without wires, can be read and written, can be reused, and processes and stores container logistics and security information. 3.2 reader: the device that exchanges information without wires with the electronic seal.

4 Electronic seal system

4.1 Composition. The electronic seal system consists of the electronic seal, the read-write equipment and the information processing platform.

4.2 Functions. The system shall be able to read and write the electronic seal, to transmit information and to record the time and the place at which the seal is opened and closed. It shall be able to provide an enquiry service to authorised users.

4.3 Security safeguard measures. These shall include at least encryption of the information stored in the electronic seal, and prevention of deliberate use of electromagnetic effects to alter the information stored in the electronic device inside the seal.

4.4 Safety and reliability. The installation and application of the system shall comply with the limits of GB 8702 for public exposure in the electromagnetic environment. The read-write reliability of the electronic seal and the read-write equipment shall reach at least 99.9 %.

5 Electronic seal

5.1 General requirements. The seal shall hold the identification information inherent to itself and the related information of the container. It shall record automatically its open and closed state and the corresponding date and time, the time error being less than 2 s per day. The user area data can be read and written in the field. The seal shall have both physical and electronic security and protection functions. The position at which the seal is applied shall not hinder the opening of the container door and shall not protrude beyond the surface of the container outline. Under normal working conditions the service life shall be not less than 5 years, with no periodic maintenance needed during that period. The seal identification number and type shall be marked on the outside of the seal. The working environment conditions shall comply with GB/T 33575.

5.2 Data. The mandatory data shall include the information inherent to the seal, the container information and the seal security information. The information inherent to the seal shall be fixed in the seal and shall not be modified. The container information and the seal security information shall be added automatically to the seal when the container is put into use, and shall be deleted when the seal is removed from the container after the carriage has ended.

5.2.2 The optional data include, but are not limited to, the freight information relating to the goods in the container and the process node information of the container in circulation. The freight information shall be added to the seal, according to circumstances, when the goods are stuffed or when the container enters or leaves the gate, and shall be deleted after the carriage has ended; its data security shall comply with GB/T 34594 and only personnel with security authorisation may operate on the data. The process node information shall be loaded onto the seal as each working point is passed. The data content and format of the

seal information shall comply with Annex A.

5.3 Operating frequency band. The response of the electronic seal to the interrogation signal shall be read in the 2.45 GHz band or in the 800 MHz to 960 MHz band.

6 Read-write equipment

6.1 Types. The equipment includes fixed and mobile read-write equipment, mobile equipment being for instance a handheld terminal or a smartphone.

6.2 General requirements. The equipment shall read the information held on the electronic seal, the effective distance being adjustable at least between 0 m and 10 m. It should write the freight information recorded in the system into the electronic seal. It shall be able to transmit the seal information specified in 5.2.3 to the information processing platform, and also to transmit the related information of the platform to the electronic seal.

6.3 Interface. The interface between the read-write equipment and the electronic seal shall comply with ISO/IEC 18000-4 and ISO/IEC 18000-6.

6.4 Installation position of fixed read-write equipment. Fixed read-write equipment should be provided at fixed lanes, and shall be within the distance range over which the electronic seal can be read and written effectively.

7 Information processing platform

7.1 General requirements. The platform shall record automatically onto the electronic seal the related information of a container entering the monitored gate and shall verify all the information relating to the logistics process of that container. It shall be able to identify unauthorised opening and closing of the container and to raise an alarm prompt, and to manage such unsafe events so that they can be traced. It shall meet the requirement of identifying seals read and written at several frequencies and in several ways, and the requirement of uniqueness in the reading and writing of a seal by the read-write equipment. It shall meet an anti-collision capability of reading 50 electronic seals per second. It shall achieve real-time exchange of seal information and may share seal information with external systems such as supply chain monitoring. It shall initialise the information of each seal before every use, the information covered by 5.2.1.2 excepted. There shall be a unified time service centre that synchronises the clocks of the machines and equipment in the system at set intervals.

7.2 Security requirements. Graded access control shall be set. The platform shall have good disaster tolerance. Information transmitted by the platform shall be encrypted and verified. The network security grade protection requirement shall be not lower than the level three security requirement of GB/T 22239-2019. The servers shall comply with GB/T 39680. Emergency handling of security incidents shall comply with GB/T 24363.

8 Application of the electronic seal system

8.1 Application nodes. The application flow of the system shall include at least the following main nodes: stuffing, entry and exit gate, examination, loading and unloading of the container, and unstuffing.

8.2.1 Stuffing. At the stuffing point an electronic seal is hung on the container once loading is complete; the seal shall be scanned and selected, initialised, and the container and freight information written into it and uploaded to the information processing platform.

8.2.2 Entry and exit gate. When the truck carrying the container with the electronic seal drives into the entry or exit gate, the read-write equipment shall read the seal information automatically and upload it to the platform, and at the same time record the related data of the platform into the seal.

8.2.3 Examination. At the examination point, when authorised staff seal or unseal the container, the electronic seal shall record automatically the time and the geographical position of the opening and closing of the container door and upload that dynamic information to the platform.

8.2.4 Loading and unloading. When a container carrying an electronic seal is loaded or unloaded, the read-write equipment shall read the seal information automatically and upload the dynamic information such as container security status and process node to the platform.

8.2.5 Unstuffing. At the unstuffing point the read-write equipment shall read the seal information and upload the container logistics dynamic information to the platform, and authorised operators then open the container and remove the electronic seal.

A Annex A (normative) Data content and format of the information stored in the electronic seal

Table A.1 has five columns: information segment, field name, data length in bytes, requirement and remark. It fixes five information segments. The seal inherent information, mandatory, holds the seal identification number, permanently fixed by the chip works in the UCC.EAN format detailed in ISO/IEC 15963-1, the date of manufacture of the seal in the YYYYMMDD form of GB/T 7408.1, the manufacturer identification and the seal type distinguished by frequency; all four fields are read-only.

The container information, mandatory, holds the identification system and the size and type code, both to GB/T 1836, the nominal length to GB/T 1413, the tare mass and the maximum gross mass in kilograms from the container manufacturing record, and the container operator, that is the name of the shipping line, transport company or cargo owner holding the right to use the container; all these fields are read-write.