INTERNATIONAL STANDARD

ISO 20909

First edition
2019-08

Radio frequency identification (RFID) tyre tags

Tags d'identification de pneumatiques par radiofréquence (RFID)

Reference number
ISO 20909:2019(E)

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Published in Switzerland

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Foreword

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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).

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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 31, *Tyres, rims and valves*.

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 applies to radio frequency identification (RFID) enabled tyres using passive RFID tags. Tyre manufacturers consider the use of RFID during the tyre's life cycle.

There are two main technology families of RFID:

— Passive system: the tag backscatters information to the interrogator, without featuring an internal power source.

— Active system: the tag has a radio frequency transmitter on board and requires an internal power source.

This document has been developed to offer tyre manufacturers the possibility to use RFIDs throughout tyre life. Therefore, the passive tag solution without batteries has been adopted.

Three technologies are considered to obtain an RFID tag to the tyre: the embedding, the patch and the sticker.

Radio frequency identification (RFID) tyre tags

IMPORTANT — The electronic file of this document contains colours which are considered to be useful for the correct understanding of the document. Users should therefore consider printing this document using a colour printer.

1 Scope

This document specifies requirements for using an RFID tag to individually identify a tyre.

Three RFID tyre tag technologies are considered in this document: embedded, patch, sticker.

Tyre tags can be used for all tyre categories.

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/IEC 18000-63, *Information technology — Radio frequency identification for item management — Part 63: Parameters for air interface communications at 860 MHz to 960 MHz Type C*

ISO/IEC 19762, *Information technology — Automatic identification and data capture (AIDC) techniques — Harmonized vocabulary*

ISO 20910, *Coding for radio frequency identification (RFID) tyre tags*

ISO 20911[1)], *Radio frequency identification (RFID) tyre tags — Tyre attachment classification*

ISO 20912[2)], *Conformance test methods for RFID enabled tyres*

EPC GS1, Radio-Frequency Identity Protocols Class-1 Generation 2 UHF RFID Protocol for communications at 860 MHz – 960 MHz

3 Terms and definitions

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

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
RFID module
electronic microchip that can support radio frequency identification protocol and store a unique tyre identifier

1) Under preparation. Stage at the time of publication: ISO/DIS 20911:2019.

2) Under preparation. Stage at the time of publication: ISO/DIS 20912:2019.

3.2
printed circuit board
PCB
physical carrier on which the RFID module and antenna are mounted

3.3
reader
RFID interrogator
electronic device using wireless method to communicate with RFID tags according to specific protocols for data exchange

3.4
survival temperature range
temperature range in which neither permanent damage to nor performance degradation of the tag occurs due to temperature

Note 1 to entry: The tag can be read only once back into the operating temperature range.

Note 2 to entry: RFID capability cannot be guaranteed even if the temperature returns into the operating range.

3.5
operating temperature range
temperature range in which the RFID tyre tag can be read and written when in use in or on the RFID enabled tyre

Note 1 to entry: When the survival temperature range has been exceeded, it cannot be expected that the tag will operate even if it is within the temperature range.

3.6
reading distance
perpendicular distance between interrogator's antenna and tyre surface

3.7
embedded RFID tyre tag
RFID tyre tag that is applied into the tyre and cannot be removed without damaging the tyre

3.8
RFID tyre patch
RFID tyre tag that is applied onto the tyre and cannot be removed without the risk of damaging the tyre

3.9
RFID tyre sticker
RFID tyre tag that is usually post-cure, applied to the tyre and can be removed without damaging the tyre

3.10
lifetime of the tyre
period from end of manufacturing to tyre end of life

4 Basic parameters and configuration

4.1 General

Tyre manufacturers are responsible for the coding of the unique item identifier (UII). They can use one of the three technologies to obtain an RFID enabled tyre (embedded, patch or sticker) before the tyre leaves the tyre manufacturer's responsibility. This means that the UII shall contain the tyre manufacturer's international company prefix according to GS1. As per ISO 20910, the UII shall be permalocked by the tyre manufacturer.

During the life cycle of the tyre, some companies can make operations on the tyre (for example retreading). These shall not replace the existing tyre UII. In case the existing tag is damaged during the operation, the company shall put a new RFID tyre patch coded with the original UII.

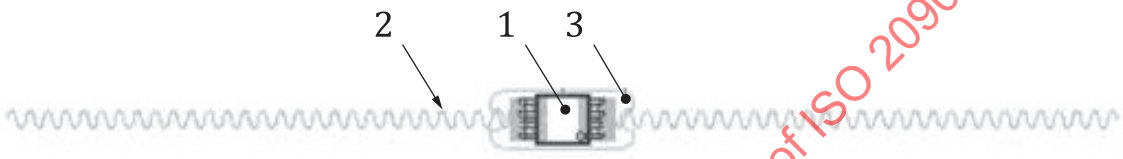
4.2 Basic parameters — UHF frequency

UHF RFID operational frequencies range from 860 MHz to 930 MHz. A subset may apply depending on the location in which the RFID system is operating.

4.3 Configuration

An RFID tag for tyre application is usually composed of RFID modules and antennae (quantity can vary). It may also have a PCB.

An example of an RFID tag configuration is given in Figure 1.



Key

1 RFID module

2 antennae (whatever the design)

3 PCB

Figure 1 — RFID tag configuration

RFID tyre tags are available in many form factors/configurations and can comprise multiple components.

5 Requirements

5.1 General requirements

— The RFID tag protocol shall comply with GS1 EPC Class1 Gen2.

NOTE ISO/IEC 18000-63 can be used in case a battery-assisted passive (BAP) RFID tyre tag is needed.

— MB01 shall allow SGTIN-96 encoding in accordance with ISO/IEC 18000-63.

— The MB01 shall be able to be written and permalocked by the tyre manufacturer in accordance with ISO/IEC 18000-63.

— The MB10 (Tag IDentifier) shall be serialized and permalocked as per ISO 20910.

— The RFID tyre tag shall operate at UHF frequencies.

— The RFID tyre tag shall support access password in accordance with ISO/IEC 18000-63.

— The user memory MB11 is optional. If the RFID tag has a user memory MB11 (as defined in ISO/IEC 18000-63), it shall be able to be written and partially locked.

— In case of multiple RFID tyre tags (regardless of the technology), they shall all have the same UII.

5.2 Embedded RFID tyre tags requirements

a) Operating temperature range: −25 °C to 80 °C. Due to specific geographical conditions, the operating temperature range may be extended to lower and/or higher temperature by agreement between tyre manufacturer and RFID supplier.

b) Survival temperature range: from −40 °C to 116 °C. Due to specific geographical conditions, survival temperature may be extended to lower and/or higher temperature by agreement between tyre manufacturer and RFID supplier.

c) Within the curing time, the embedded RFID tag shall be able to withstand pressure up to 5 MPa and temperature up to 200 °C.

d) The embedded RFID tag shall be able to be read (by a reader) for the lifetime of the tyre.

e) Examples of RFID tyre tags for embedding into tyres are given in A.1.

5.3 RFID tyre patch requirements

a) Operating temperature range: −25 °C to 80 °C. Due to specific geographical conditions, the operating temperature range may be extended to lower and/or higher temperature by agreement between tyre manufacturer and RFID supplier.

b) Survival temperature range: from −40 °C to 116 °C. Due to specific geographical conditions, survival temperature may be extended to lower and/or higher temperature by agreement between tyre manufacturer and RFID supplier.

c) Within a curing time, the RFID tag in the RFID tyre patch shall be able to withstand pressure up to 5 MPa and temperature up to 200 °C.

d) The RFID tag in the RFID tyre patch shall be able to be read for the lifetime of the tyre after being attached to it.

e) Examples of RFID tyre patch are given in A.2.

5.4 RFID tyre sticker requirement

Operating temperature range: −25 °C to 60 °C. Due to specific geographical conditions, the operating temperature range may be extended to lower and/or higher temperature by agreement between tyre manufacturer and RFID supplier.

Examples of RFID tyre sticker are given in A.3.

5.5 Basic requirements

5.5.1 Conformance

RFID tyre tag technology (embedded, patch and sticker) shall comply with ISO 20911.

Conformance test methods are provided in ISO 20912.

5.5.2 RFID enabled tyre minimum reading distance

RFID enabled tyre reading distance (by a reader) shall be at least 150 mm when tested according to ISO 20912.

NOTE Reading distance is typically greater when optimized to various end user requirements.

5.6 Kill function

According to ISO 20910, the kill function shall be permanently disabled by the tyre manufacturer.