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Radiofrequency identification of animals — Advanced transponders —

Part 3: Applications

Identification des animaux par radiofréquence — Transpondeurs évolués —

Partie 3: Applications

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Foreword

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This document was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 19, *Agricultural electronics*.

A list of all parts in the ISO 14223 series can be found on the ISO website.

Introduction

This document specifies the applications of the radio frequency (RF) system for advanced transponders for animal identification. The technical concept of advanced transponders for animal identification described is based upon the principle of radio frequency identification (RFID) and is an extension of the standards ISO 11784 and ISO 11785. Apart from the transmission of the (unique) identification code of animals, this document (ISO 14223-3) defines the access mode, data format, data content and optional features of the transponder with extended memory capabilities. ISO 14223 consists of three parts.

Radiofrequency identification of animals — Advanced transponders —

Part 3: Applications

1 Scope

This document describes the information that is stored in the advanced transponder memory, its format and the procedures for accessing such information.

This document defines two parts of memory:

a) the fixed part (mandatory):

   1) ISO 11785 data field;

   2) Data_Config field;

b) the user part (optional):

   1) field of fixed allocation for defined data;

   2) uses an Object Identifier for data field separation in order to have maximum flexibility for future requirements.

2 Normative references

The following documents are referred to in the text in such 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 11784, *Radio frequency identification of animals — Code structure*

ISO 11785:1996, *Radio frequency identification of animals — Technical concept*

ISO 14223-1, *Radiofrequency identification of animals — Advanced transponders — Part 1: Air interface*

ISO 14223-2, *Radiofrequency identification of animals — Advanced transponders — Part 2: Code and command structure*

3 Terms and definitions

For the purposes of this document, the following terms and conditions 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
object
defined piece of data, definition, or specification which requires a name in order to identify its use in an instance of communication

3.2
object identifier
OID
value (distinguishable from all other such values) which is associated with a unique object

3.3
single access memory
SAM
section of the memory that has predefined data allocation

3.4
data dictionary memory
DDM
section of the memory, that contains information defined by object identifier

3.5
data format identifier
DFID
unique identifier with a unique set of fixed data items at fixed memory location, allowing fast data access

3.6
data storage format identifier
DSFID
code which indicates how the data is structured in the transponder memory according to ISO 14223-2

4 Abbreviated terms

AID	animal ID or Identification code: 64 bits of the identification telegram specified in ISO 11784 and ISO 11785
CRC	cyclic redundancy check
DDM	data dictionary memory
DFID	data format identifier
DSFID	data storage format identifier
FDX	full duplex
HDX	half duplex
LSB	least significant bit
MSB	most significant bit
NPA	number of parturitions
NOB	number of blocks
NOF	number of fields
NOP	number of pages
OID	object identifier
RA	registration authority
RFU	reserved for future use
SAM	single access memory
TLV	type length value

5 Requirements

5.1 General

This document is an extension of ISO 11784 and ISO 11785; it is complementary to ISO 14223-1 and ISO 14223-2.

To access the additional data and keep the backwards compatibility with the ISO 11784, ISO 11785 and ISO 14223-2, the reader may go through a transponder configuration detection process (see the concept state diagram in Annex A).

a) The process starts with reading the AID according to ISO 11784 and ISO 11785 and analysing the data to detect if this is an advanced transponder *(bit15 = 1).*

b) In the case of an advanced transponder, the reader shall read Data_Config field (Block #4) to access the transponder configuration details.

c) The reader can read all the memory or just single fields/blocks.

d) In cases where the transponder configuration is known before accessing the Data_Config field, specific user memory blocks can be directly accessed without reading the ISO 11785 or the transponder memory configuration block.

Bit15 of the ISO 11784 frame shall be set to "1" indicating an advanced transponder.

Bit16 of the ISO 11784 frame (additional data flag) shall be set to "1", indicating that the transponder contains additional data in the trailer bits.

Only one block for sensor data is defined in ISO 14223-3 Page 0 (DFID) data format (defined in 7.1).

If more than one block for sensor data is needed, use one of the following: the ISO 14223-3 Page > = 1 (DSFID) data format specification (defined in 7.3), a proprietary data format or a new DFID code.

Independent of the memory access mode, the Data_Config field (Block #4) shall be present and coded in accordance with the specification described in this document.

Two basic memory access modes are defined:

— Single Access Memory (SAM) mode (defined in 5.3);

— Data Dictionary Memory (DDM) mode (defined in 5.4).

NOTE This allows applications with specific requirements (e.g. data and access speed), to configure the system and adjust to the application requirements.

DFID codes are granted and controlled by ISO TC 23/SC 19. New DFID code requests shall be submitted to ISO TC 23/SC 19 for approval and release.

RFU bits shall be set to 0. The future use of the RFU bits will be included in a future revision of this document.

In a mixed population of ISO 11785 and ISO 14223 transponders, both transponder types shall be readable by an ISO 11785 reader. All transponders shall support ISO 11785. Advanced transponders shall always support ISO 11785, ISO 14223-1 and ISO 14223-2. Transponders compliant to ISO 14223-3 shall support the mandatory part of the memory and may support the optional functionality.

5.2 Transmission protocol

The advanced transponder Code and Command structure is defined in ISO 14223-2 and the Air Interface is defined in ISO 14223-1.

In an advanced transponder with data structure according to ISO 14223-3, mandatory fields are the ISO 11784 compliant data (bit15 = 1) and the Data_Config field (Block #4). In the Data_Config field, all information regarding the structure including data content and data format of the transponder are given.

Mandatory fields:

— ISO 11784 (Block #0-3) (bit15 = 1)

— Data_Config field (Block #4)

Optional fields:

— Sensor field

— User_Data field

— SAM (Single Access Memory)

— DDM (Data Dictionary Memory)

The existence of optional fields, their content and, if applicable, the data format of these fields are indicated by the Data_Config field (Block #4).

If both the Sensor and User_Block fields are present, the Sensor field will be located in Block #5 and the User_Block field in Block #6.

NOTE In a mixed population, if both ISO 11785 and ISO 14223 type of transponders are presented simultaneously in the field, this can result in the default ISO 11785 functionality taking priority.

5.3 AID reading access

Access to the AID shall be based on ISO 11785.

Access to the AID with additional data in the trailer shall be based on ISO 11785; it requires that the bit16 of the ISO 11784 frame to be set to 1.

The existence of advanced transponder with additional memory and functionality is indicated if in the AID bit15 of the ISO 11784 frame is set to 1.

To indicate the presence of both, additional data in the trailer and additional memory, bit16 and bit15 of the ISO 11784 frame are set both to 1.

5.4 Single Access Memory (SAM)

If “Single Access Memory” (SAM) is used, the data items (defined in 7.6.1) and memory locations are defined by the DFID codes, allowing fast data access by the reader.

Every DFID code defines specific data and data format. DFID codes are part of this standard.

In this access mode, the transponder configuration is known and the reader can send commands directly to the specified block of the memory.

The implementation of a SAM section as defined in this part of the ISO 14223 standard is optional.

5.5 Data Dictionary Memory (DDM)

Every DDM Item shall be uniquely defined in the Data Dictionary (Annex C).

If "Data Dictionary Memory" (DDM) is used, the memory content shall be defined by the user following the specification in this part of ISO 14223 standard.

The data blocks are written successively into the transponders memory, separated by Object Identifiers (OID) (defined in 7.7).

Every single OID has a specific definition of data content, data length and data structure and refers to a unique item. Any item information can be included in an OID, as long as the information is defined and registered in the DDM dictionary.

The implementation of a DDM section in this document is optional.

DDM and SAM can coexist within the same memory. If both are present, the DDM will follow the SAM memory section.

5.6 Sensor Data field

The presence of the optional Sensor Data field is indicated in the configuration Data_Config field.

The Sensor data bits are located in Block #5 and can be accessed using a read or write command.

The data format, calibration and configuration data of the Sensor field is included in 7.5.

5.7 User_Data field

There is no specification of the format and content of this User_Data field (scratch pad). The user can use the 32 bits for his proprietary data. An ISO 14223 compliant reader shall be able to read this block, but interpretation is by user convention.

6 Memory Data Structure

6.1 Overview

ISO 14223-2 defines the basic memory organization for Page 0 and Page 1 to NOP (Number of Pages)

ISO 14223-3 memory organization is based on the ISO 14223-2 and defines application related data profiles.

ISO 14223-3 defines the memory allocation [Table 1] of Page 0 [defined in Clause 7] and Page ≥ 1 [defined in Clause 8].

Examples of memory use possibilities are given in Annex B.

The block size is 32 bits. The maximum number of blocks (NOB) is 256 (8 bit address). The bits within the blocks are counted from bit0 to bit31.

— Block #0 to Block #4, are mandatory fields and represent the minimum memory size for an advanced transponder.

— All other blocks are optional.

Table 1 — General overview of the Memory Structure for Page 0 and Page ≥ 1

Block #	Description	Page #
0	ISO 11785	Page 0
1	ISO 11784 / ISO 11785	
2	ISO 11784 / ISO 11785	
3	ISO 11785	
4	Data_Config	
5	User Data	
...	...	
N-1	User Data	
N	User Data	Page ≥ 1
N+1	...	
N+2	User Data	
N+3	...	
...	...	
2N-3	User Data [Sensor Data]	
2N-2	User Data [Sensor Data]	
2N-1	User Data [Sensor Hardware Information]	
The value of N depends on the chip size and is always equal to or greater than 5. There is not any Sensor or User Data when N = 5.		

Block #0 to Block #3

These blocks contain the AID, as specified in ISO 11784 and ISO 11785.

— If the AID bit16 is set to 1, data may be transmitted in the “trailer”.

— If the AID bit15 is set to 1, the transponder is an ISO 14223 transponder with advanced functionality.

Data_Config (Block #4)

The Data_Config field is a mandatory block for ISO 14223-3 compliant transponders. This field defines the data structure and the key elements for the memory organization and the content as defined in 6.2 and 6.3.

6.2 Data_Config field (Block #4) — Structure

6.2.1 Overview of the Data_Config field

Table 2 — Overview of the Data_Config field

Data_Config field (Block #4) Definition			
			MSB LSB
Byte_3	Byte_2	Byte_1	Byte_0
RFU	DFID	RFU	Flags

Table 2 gives an overview of the Data_Config field.

— Byte_0 contains the configuration flags (defined in Table 3).

— Byte_1 is reserved (RFU) for future extension of the flags.

— Byte_2 contains the DFID code.

