
**Radiofrequency identification of
animals — Advanced transponders —**

**Part 3:
Applications**

*Identification des animaux par radiofréquence — Transpondeurs
évolués —*

Partie 3: Applications

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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.

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).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on 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 the following URL: www.iso.org/iso/foreword.html.

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.

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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	
...	...	Page ≥ 1
N-1	User Data	
N	User Data	
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.

— Byte_3 is reserved (RFU) for future extension of the DFID code.

A detailed description of the Data_Config field is given in [6.3](#).

6.2.2 Overview of the configuration flag byte field

Table 3 — Overview of the configuration flag byte field

Block #4 Flag Byte_0 Bit Allocation							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Page ≥ 1	User_Block	Data Format	Sensor	DDM	Proprietary	Additional Memory	RFU

6.3 Data_Config field (Block #4) — General coding

6.3.1 Overview

In [Table 4](#), the general coding of the Data_Config field is presented, indicating all 16 bits of flags and DFIDs.

- bit0 to bit7 are flags indicating a special function or optional features of the transponder.
- bit8 to bit15 are reserved (RFU) for future extension of the flags
- bit16 to bit23 are used for a predefined DFID code.
- bit24 to bit31 are reserved for future extension of DFIDs.

A default DFID code for General Animal use has been defined with the code “0000 0001”.

Table 4 — Data_Config field: General Coding

Data_Config field (Block #4) Coding: General Coding						
Block #	MSB	LSB	MSB	LSB	Description	Comment
Block #	DFID (Byte_3, Byte_2)		Flags (Byte_1, Byte_0)		Description	Comment
4			0000 0000 0000 0000		RFU	RFU
			0000 0000 0000 00x0		Additional Memory 0: No additional memory 1: Additional memory	block > Block #4
			0000 0000 0000 0x00		Proprietary 0: Defined structure 1: Proprietary structure	Open Format (user defined)
			0000 0000 0000 x000		DDM 0: NO DDM present, 1: DDM present	Additional SAM may be present
			0000 0000 000x 0000		Sensor 0: No Sensor 1: Sensor present	Sensor present
			0000 0000 00x0 0000		Data Format 0: Page 0 specification 1: Page ≥ 1 specification	Clause 7 Clause 8
			0000 0000 0x00 0000		User_Block 0: No User_Block 1: User_Block present	Open Format (user defined)
			0000 0000 x000 0000		Page ≥ 1 configuration 0: Clause 8 1: Page = 0 configuration	Indicates the memory data
			0000 0000 0000 0000		No SAM present	Any combination ≠ 0x0000 indicates the presence of a SAM field
			0000 0000 0000 0001		ISO 14223-3 pre-defined DFID, General Animal (SAM)	Fixed DFID granted by ISO TC 23/SC 19
			0000 0000 0000 0010		Canine visceral leishmaniasis and rabbies vaccines (SAM)	See Annex G.
			0000 0000 0000 0011 to 0000 0000 1111 1111		RFU for ISO 14223-3 pre-defined DFID(254)	The approval process for DFID codes will be included in a future revision of this document.
				Key: x = bit set to 0 or 1		

Descriptions of the flags are given in 6.3.2 to 6.3.11.

6.3.2 Page \geq 1 flag

This flag indicates the memory and data format for Page \geq 1.

- If it sets to 0, the memory is limited to Page = 0 and the use of Page \geq 1 is proprietary.
- If it sets to 1, the memory of Page = 0 will be extended into the Page = 1 memory.

The specification of Page \geq 1 will follow the Page = 0 data format.

For Page \geq 1 data access, the extended command shall be used.

6.3.3 User_Block flag

This flag indicates the existence of a block without a specific definition. The block is freely available to the user to write application specific data and allow fast access to this data. The standard reader can read this block, but interpretation is by user convention.

6.3.4 Data Format flag

This flag indicates the data format used to store the data. The flag allows the transponder to support Page 0 defined in [Clause 7](#) and Page \geq 1 memory and data formats as defined in [Clause 8](#).

6.3.5 Sensor flag

This flag indicates the existence of the Sensor field (Block #5). The format and coding are defined in [7.5](#).

6.3.6 DDM flag

If this flag is set, the DDM section is present. The transponder may include also a SAM field.

The start block of the DDM depends on the presence of Sensor, User_Block and SAM fields.

DDM starts at Block #5 if no sensor and User_Block are present, or at Block #6 if either the Sensor field or User_Block field are present, or at Block #74 if both the Sensor and User_Block fields are present. If the SAM field is present, the DDM will follow the SAM field.

6.3.7 Proprietary flag

If this flag is set, the data content and format will be defined by the user. The reader is not required to interpret data stored in memory following Block #4 (or Block #6 or Block #7 if the Sensor and/or User_Block fields are present). If the Sensor and User_Block fields are supported, they shall be implemented in accordance with this document.

6.3.8 Additional Memory flag

This flag indicates the existence of memory in addition to the 5 mandatory blocks (i.e. Blocks 0 to 4).

6.3.9 No SAM present

If all the flag bits in Block 3-4 of DFID are set to "0", this means "No SAM present".

6.3.10 ISO Pre Defined DFID

Byte_2 of the Data_Config, defines the pre-defined DFID codes. A default DFID is defined in this standard. All remaining codes are reserved for future use. Procedures for the definition and approval of new DFIDs will be part of the next revisions of this document.

6.3.11 RFU flag

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

7 Page = 0 configuration

7.1 Data_Config field — DFID Coding

Table 5 — Detailed Data_Config field: DFID Coding

Data_Config field (Block #4) Coding: DFID Coding						
BLOCK #	MSB	LSB	MSB	LSB	Description	Comment
	DFID		Flags			
4			0000 0000	0000 0000	RFU	RFU
			0000 0000	0000 0010	Additional Memory	block > Block #4
				0000 0000	Proprietary	Open Format (user defined)
			0000 0000	0000 0000	DDM 0: NO DDM present, 1: DDM present	DDM Start at Block #5 if no sensor or at Block #6 if Sensor present
			0000 0000	000x 0000	Sensor 0: No Sensor 1: Sensor present	Sensor present
			0000 0000	0000 0000	Data Format 0: Page 0 specification	See 6.3.4
			0000 0000	0x00 0000	User_Block 0: No User_Block 1: User_Block present	Open Format (user defined)
			0000 0000	0000 0000	Page configuration Bit set to 0 for Page = 0 config	Indicates the memory data
			0000 0000	0000 0000	No SAM present	Any combination ≠ 0x0000 indicates the presence of a SAM field
			0000 0000	0000 0001	ISO 14223-3 pre-defined DFID, General Animal (SAM)	Fixed DFID granted by TC 23/SC 19
			0000 0000	0000 0010	Canine visceral leishmaniasis and rabbiess vaccines (SAM)	See Annex G.
			0000 0000	0000 0011 to 0000 0000 1111 1111	RFU for ISO 14223-3 pre-defined DFID(254)	The approval process for DFID codes will be included in a future revision of this document.
		Key: x = bit set to 0 or 1				

Table 5 presents detailed DFID coding of the Data_Config field.

If the DFID code is set to 0, the transponder does not include a SAM field.

If the General Animal DFID code is used (Table 6), the SAM part is always present as defined in 7.6.1. DDM is optional and, if present, will start immediately after the SAM. The structure of the DDM shall follow the definition given in the Data Dictionary of Annex C.

Table 6 — Data_Config field: DFID Coding (General Animal SAM)

Data_Config field (Block #4) Coding: General Animal SAM						
	MSB	LSB	MSB	LSB		
BLOCK #	DFID		Flags		Description	Comment
4	0000 0000 0000 0001		0000 0000 0x0x 0010		ISO 14223-3 pre-defined DFID, General Animal (SAM)	

EXAMPLE dd Mem, No proprietary, No DDM, x sensor, DFID data format, x User_Block

7.2 Data_Config field — Proprietary Coding

Table 7 — Data_Config field: Proprietary Coding

Data_Config field (Block #4) Coding: Proprietary Coding						
	MSB	LSB	MSB	LSB		
BLOCK #	DFID		Flags		Description	Comment
4	0000 0000 0000 0000		0000 0000 0xxx 01x0		Proprietary Format	Open Format (user defined)

The Proprietary Coding format (Table 7) is indicated by bit2.

If bit2 = 1, the DFID bits (Byte 2 and 3) shall be set to 0. The Sensor field, the User_Block field and additional memory can be present.

The Data Format bit (bit6) shall be ignored.

If Proprietary Coding is set, the data content and data format of the transponder will be defined by the user. The reader is not required to interpret this data.

7.3 Data_Config field DSFID Coding

Table 8 — Data_Config field: DSFID Coding

Data_Config field (Block #4) Coding: DSFID Coding						
	MSB	LSB	MSB	LSB		
BLOCK #	DFID		Flags		Description	Comment
4	0000 0000 0000 0000		0000 0000 0x1x 00x0		DSFID Format	DFID = RFU

The DSFID coding is indicated by bit5 (Table 8). This configuration allows the use of the Page ≥ 1 memory format defined in ISO 14223-2.

If DSFID is set to 0, the configuration of Page 0 is according to this document. If bit5 is set to 0 and bit7 (Page ≥ 1) is set to 1, then the pages ≥ 1 will use the same coding structure.

Transponders with DSFID configuration shall support the mandatory part of ISO 14223-3 configuration for Page 0 and may support the optional functionality (Sensor and User_Block fields) and the ISO 14223-2 memory and data formats.

If bit5 = 1, the content of the DFID field shall be RFU.

7.4 Data_Config field DDM Coding

Table 9 — Data_Config field: DDM Coding

Data_Config field (Block #4) Coding: DDM Coding						
	MSB	LSB	MSB	LSB		
BLOCK #	DFID		Flags		Description	Comment
4	0000 0000 xxxx xxxx		0000 0000 0xxx 1010		DDM Only	DFID = RFU

The DDM format is indicated by bit3 (Table 9).

In this configuration, the transponder may include a SAM field. The start of the DDM field depends on the presence of the Sensor and/or User_Block, from Block #5, Block #6 or Block #7 and the presence of SAM.

The configuration of the DDM, the content and format is defined in the DDM (see 7.7).

Every item is uniquely defined in the Data Dictionary (see Annex C).

If bit3 = 1, the DFID field shall be RFU.

7.5 Sensor Block coding

For the default configuration of the Sensor Block, two calibration values should be transmitted in order to get an absolute value followed by the measured value and the configuration byte as shown in Table 10.

Table 10 — Default Sensor field configuration

Sensor Block Coding			
Byte 3	Byte 2	Byte 1	Byte 0
8 bit	8 bit	8 bit	8 bit
configuration	measured value	calibration max value	calibration min value

The configuration byte (Byte 3) shall be coded as shown in Table 11 and Table 12 (sensor type information):

Table 11 — Configuration byte

Byte 3							
7	6	5	4	3	2	1	0
RFU				sensor type			

- bit0-3: Flags indicating the sensor type
- bit4-5: RFU
- bit6: Proprietary sensor
- bit7: Digital output sensor

Table 12 — Configuration byte: Sensor type

bit #								Type
7	6	5	4	3	2	1	0	
0	0	0	0	0	0	0	0	Reserved
0	0	0	0	0	0	0	1	Temperature
0	0	0	0	0	0	1	0	RFU
0	0	0	0	0	1	0	0	RFU
0	0	0	0	1	0	0	0	RFU
0	1	x	x	x	x	x	x	Proprietary
1	x	x	x	x	x	x	x	Digital Sensor

The requirements for the coding of the Sensor Block are given in Clause 5.

The definition of the data format for these sensors will be defined in a future revision of this document.

To activate the sensor, an optional command may be used. The command is defined in [Annex F](#).

7.6 DFID Code Definition

7.6.1 General

Procedures for the management and approval of the DFID Item codes will be part of a future revision of this document. DFID codes not defined are marked as RFU and shall not be used. An example of a DFID that has been approved is presented in [Annex G](#).

Addressing the DFID fields does require the use of the commands as defined in ISO 14223-2.

7.6.2 DFID Item "0000 0001" General Animal (SAM)

The following items are included in the General Animal SAM ([Table 13](#)):

- Date of birth – DD/MM/YYYY
- Sex – M/F/Undefined (for example for fish)
- Country of origin – 3 digits, as per ISO 3166-1 (0:899)
- Breed – (1)
- Database of origin – (2)
- Place of birth – (3)
- Number of associated documents – (4)
- Specific characteristics for management purpose – (5)

Table 13 — DFID Item “0000 0001” General Animal SAM

DFID Item “0000 0001” General Animal SAM						
Sensor field	SAM Start Block #				Field [bits]	Description
	No	Yes	No	Yes		
User Data field	No	No	Yes	Yes		
	0x05	0x06	0x06	0x07	DATE OF BIRTH [0:4]	Day (1:31)
	0x05	0x06	0x06	0x07	DATE OF BIRTH [5:8]	Month (1:12)
	0x05	0x06	0x06	0x07	DATE OF BIRTH [9:19]	Year (0:2048), 0: starting year 1970
	0x05	0x06	0x06	0x07	SEX [20:21]	00 - Undefined 01 - Male 10 - Female 11 - Not used
	0x05	0x06	0x06	0x07	COUNTRY OF ORIGIN [22:31]	Country of birth of the animal represented by the Country code (0:899) as defined into ISO 3166-1
	0x06	0x07	0x07	0x08	BREED [0:15]	Breed
	0x06	0x07	0x07	0x08	DATABASE OF ORIGIN [16:31]	Database code
	0x07	0x08	0x08	0x09	PLACE OF BIRTH [0:63]	Post code, Other (64 bits - 8 Alpha numbers – 2 blocks)
	0x09	0x0A	0x0A	0x0B	NUMBER OF ASSOCIATED DOCUMENTS [0:63]	Passport number (64 bits - 8 Alpha numbers – 2 blocks)
	0x0B	0x0C	0x0C	0x0D	SPECIFIC CHARACTERISTIC FOR MANAGEMENT PURPOSES [0:31]	To be used for fast selection, based on DD formatting, e.g. the weight of the animal

7.6.3 DFID Item codes “0000 0010” to “1111 1111” RFU

The DFID Item code “0000 0010” has been approved and granted. This code, as specified in [Annex G](#), shall be used for describing the content and encoding of the SAM memory when the information on the leishmaniasis and rabies vaccines in dogs is needed.

The DFID Item codes “0000 0011” to “1111 1111” are RFU and will be defined and included in a future revision of this document.

7.7 DDM

7.7.1 General

The DDM (Data Dictionary Memory) is the part of the memory that has a flexible content and can be programmed and organized based on user requirements.

To access specific data, the entire memory (or at least every SECTION identified with a DDM header) has to be read in order to be able to decode and interpret the information.

The DDM is organized in different sections, each of them is independent and defines a specific block of information (vaccine, owner information, animal information, etc.).

The coding of the DDM is defined by the relevant ISO group, in a specific Data Dictionary. See the example in [Annex D](#).

The content, the organization and the order of items of the DDM are defined by the user.

Table 14 shows the general DDM structure.

DDM is organized in SECTIONS. A DDM may contain multiple SECTIONS.

Table 14 — DDM General Structure

SECTION	MANDAT.	RELATIVE BLOCK #	BYTE #	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	LOCK BIT
DDM	N	0x01	0x00	DDM 1 Header																																N
DDM	N	0x02	0x01	DDM 1 Records																																N
DDM	N	0x03	0x02																																	N
DDM	N	0x04	0x03																																	N
DDM	N	0x05	0x04																																	N
DDM	N	0x05	0x04																																	N
DDM	N	##	##	DDM 2 Header																																N
DDM	N	##	##	DDM 2 Records																																N
DDM	N	##	##																																	N
DDM	N	##	##																																	N
DDM	N	##	##																																	N
DDM	N	##	##																																	N
DDM	N	##	##	(...)																																N
DDM	N	##	##	DDM 3 Header																																N
DDM	N	##	##	DDM N Records																																N
DDM	N	##	##																																	N
DDM	N	##	##																																	N
DDM	N	##	##																																	N
DDM	N	##	##																																	N

A DDM SECTION is structured into two parts:

- DDM SECTION HEADER: defines the DDM type, the length and the CRC16 (optional) of the DDM SECTION BODY (see 7.7.2)
- DDM SECTION BODY: defines the list of information related to the DDM type (see 7.7.3).

The CRC is according to ISO 11785. The initial register content shall be all zeros: "0000". The CRC length is 16 bits.

The DDM CRC is calculated on all the bits of the DDM section body, starting from the LSB of the first block to the MSB of the last block of the DDM section body. If CRC is not used (optional), the reserved 16 bits are set to 0. An example of a CRC calculation is given in ISO 11785:1996, Annex A.

During a reading session of the DDM, the user can decide whether to read the entire memory, i.e. all the different sections or skip some of them (after reading the header, jump to the next one).

7.7.2 DDM SECTION HEADER

7.7.2.1 General

The first block (32 bits) of any DDM SECTION is always used for the DDM SECTION HEADER (see Figure 1 and Table 15).

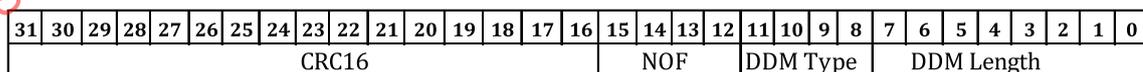


Figure 1 — DDM SECTION HEADER

Table 15 — DDM SECTION HEADER Definition

DDM SECTION HEADER			
Field name	Length [bits]	Description	Notes
DDM Length	[0:7]	Number of blocks used by the DDM SECTION, included header block, 1:255, 0 reserved to identify the end of DDM list	8 bits address length means 256 blocks, The total memory size is 8'192 bit.
DDM Type	[8:11]	DDM section characterization	See 7.7.2.3
NOF	[12:15]	Number of Fields 0:16	Number of items in the section.
CRC16	[16:31]	DDM SECTION BODY CRC16 (optional); if CRC not used, all bits set to 0	Header is NOT part of the CRC calculation.

7.7.2.2 DDM SECTION HEADER: DDM Length field

The DDM Length field defines the number of blocks for the section (header and body).

7.7.2.3 DDM SECTION HEADER: DDM Type field

Using a 4 bits DDM type code, a maximum of 16 sections are possible, see [Table 16](#).

Table 16 — DDM section types

Section name	Section code (bits)
Generic	0001
Vaccine	0010
Animal Info	0011
Owner Info	0100
RFU	0101 - 1111

7.7.2.4 DDM SECTION HEADER: NOF field

NOF corresponds to "Number of Fields" and defines how many different fields are present in every section body.

7.7.2.5 DDM SECTION HEADER: CRC16 field

The CRC placed at the end of every DDM Section Header field. It has a defined length of 16 bits and is calculated on the section body part only, without the header.

The CRC algorithm will be the same as the one used for the ISO 11784 and ISO 11785 code.

7.7.3 DDM SECTION BODY: DDM FIELDS

Any single DDM Section Body contains a number of DDM FIELDS with variable length as shown in [Figure 2](#):

Annex B (informative)

Examples of the Memory Structure

This annex provides three examples of the Memory Structure of an ISO 14223-3 compliant transponder with General Animal SAM: 1) without Sensor and User_Block fields (Table B.1); 2) with Sensor or User_Block fields (Table B.2); and 3) with both Sensor and User_Block fields present (Table B.3).

Table B.1 — General Animal SAM without Sensor and User_Block fields

SECTION	MANDAT.	BLOCK #	BYTE #	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	LOCK BIT
AID	Y	0x00	0x00	ISO 11784 / ISO 11785 128-bit TTF Data																								Y								
AID	Y	0x01	0x04																									Y								
AID	Y	0x02	0x08																									Y								
AID	Y	0x03	0x0C																									Y								
DFID	Y	0x04	0x10	Data Config (Byte3, Byte2)										Data Config (Byte1, Byte0)										Y												
SAM	N	0x05	0x14	COUNTRY OF ORIGIN										SEX		DATE OF BIRTH										N										
SAM	N	0x06	0x18	DATABASE OF ORIGIN										BREED										N												
SAM	N	0x07	0x1C	PLACE OF BIRTH																								N								
SAM	N	0x08	0x20	NUMBER OF ASSOCIATED DOCUMENT																								N								
SAM	N	0x09	0x24	NUMBER OF ASSOCIATED DOCUMENT																								N								
SAM	N	0x0A	0x28	NUMBER OF ASSOCIATED DOCUMENT																								N								
SAM	N	0x0B	0x2C	SPECIFIC CHARACTERISTIC FOR MANAGEMENT PURPOSES																								N								
DDM	N	N	N																									N								

Table B.2 — General Animal SAM with Sensor or User_Block fields

SECTION	MANDAT.	BLOCK #	BYTE #	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	LOCK BIT
AID	Y	0x00	0x00	ISO 11784 / ISO 11785 128-bit TTF Data																								Y								
AID	Y	0x01	0x04																									Y								
AID	Y	0x02	0x08																									Y								
AID	Y	0x03	0x0C																									Y								
DFID	Y	0x04	0x10	Data Config (Byte3, Byte2)										Data Config (Byte1, Byte0)										Y												
SENS	N	0x05	0x14	Sensor Or User Block																								N								
SAM	N	0x06	0x18	COUNTRY OF ORIGIN										SEX		DATE OF BIRTH										N										
SAM	N	0x07	0x1C	DATABASE OF ORIGIN										BREED										N												
SAM	N	0x08	0x20	PLACE OF BIRTH																								N								
SAM	N	0x09	0x24	NUMBER OF ASSOCIATED DOCUMENT																								N								
SAM	N	0x0A	0x28	NUMBER OF ASSOCIATED DOCUMENT																								N								
SAM	N	0x0B	0x2C	NUMBER OF ASSOCIATED DOCUMENT																								N								
SAM	N	0x0C	0x30	SPECIFIC CHARACTERISTIC FOR MANAGEMENT PURPOSES																								N								
DDM	N	N	N																									N								

Table B.3 — General Animal SAM with both Sensor and User_Block fields

SECTION	MANDAT.	BLOCK #	BYTE #	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	LOCK BIT
AID	Y	0x00	0x00	ISO 11784 / ISO 11785 128-bit TTF Data																								Y								
AID	Y	0x01	0x04																									Y								
AID	Y	0x02	0x08																									Y								
AID	Y	0x03	0x0C																									Y								
DFID	Y	0x04	0x10	Data Config (Byte3, Byte2)										Data Config (Byte1, Byte0)										Y												
SENS	N	0x05	0x14	Sensor																								N								
UserBlock	N	0x06	0x18	User Block																																
SAM	N	0x07	0x1C	COUNTRY OF ORIGIN										SEX		DATE OF BIRTH										N										
SAM	N	0x08	0x20	DATABASE OF ORIGIN										BREED										N												
SAM	N	0x09	0x24	PLACE OF BIRTH																								N								
SAM	N	0x0A	0x28	PLACE OF BIRTH																								N								
SAM	N	0x0B	0x2C	NUMBER OF ASSOCIATED DOCUMENT																								N								
SAM	N	0x0C	0x30	NUMBER OF ASSOCIATED DOCUMENT																								N								
SAM	N	0x0D	0x31	SPECIFIC CHARACTERISTIC FOR MANAGEMENT PURPOSES																								N								
DDM	N	N	N																									N								

Annex C (normative)

DDM Dictionary

The DDM Dictionary is a table of equivalence that contains a list of all items which can be programmed in the DDM and the respective coding instruction.

The Dictionary for the Universal Animal Memory Structure with DFID 0x0010, and 0x8010 is unique.

To be compliant with ISO 14223-3 and with this specific DFID, this dictionary is the only accepted coding structure.

The dictionary in [Table C.1](#) is not exhaustive and will be updated during future revisions of this document. This table includes:

- a dictionary identifier to define the item type;
- identifier acronyms;
- identifier code and bit mask: coding in Hex and respectively in bits;
- the identifier length, defined in bits, where the length is known;
- the type of data (see [7.7.2.3](#)).

NOTE The coding of the identifiers has been done using 11 bits which means the total number of possible items is 2 048. Bit #12 is used to define if the field has a variable length or not – see [7.7.4](#).

Table C.1 — Data Dictionary

ID	Dictionary Identifier	ACR	Code	11 bit mask	Length (bits)	Type	Notes
1	Date Of Birth	DOB	0x001	000 0000 0001	16	Date	5 bits for DD, 4 bits for MM and 7 bits for YY
2	Country Code	CC	0x002	000 0000 0010	10	Unsigned	(0: 999)
3	Birth Place	BP	0x003	000 0000 0011	variable	String	
4	Farm Number Last Owner	FNLO	0x004	000 0000 0100	variable	String	
5	Owner Title	OT	0x005	000 0000 0101	variable	String	
6	Owner Street	OS	0x006	000 0000 0110	variable	String	
7	Owner City	OC	0x007	000 0000 0111	variable	String	
8	Owner Post Code	OPC	0x008	000 0000 1000	variable	String	
9	Embryo Transfer		0x009	000 0000 1001	1	Boolean	
10	Multiples Born	MB	0x00A	000 0000 1010	1	Boolean	Born as twin, triplet, etc.
11	Number Of Parturitions	NPA?	0x00B	000 0000 1011	3	Unsigned	(0:4) Number of parturitions until now
12	Number Of Offspring	NOO	0x00C	000 0000 1100	4	Unsigned	(0:8) Number of offspring until now
13	Dose Amount	DA	0x00D	000 0000 1101	5	unsigned	(0:16)
14	Dose Resolution	DR	0x00E	000 0000 1110	1	BitField	
15	Dose Unit	DU	0x00F	000 0000 1111	1	BitField	
16	Application Period	AP	0x010	000 0001 0000	1	BitField	
17	Application Period Time Span	APTS	0x011	000 0001 0001	1	BitField	Time span of one application period
18	End Of Application Period	EOAP	0x012	000 0001 0010	16	Date	
19	Kind Or Application	KOA	0x013	0000 001 0011	1	BitField	