Elektronisk djuridentifikation – Avancerade transpondrar – Del 2: Kod och kommandostruktur (ISO 14223-2:2010, IDT)

Standarder får världen att fungera

SIS (Swedish Standards Institute) är en fristående ideell förening med medlemmar från både privat och offentlig sektor. Vi är en del av det europeiska och globala nätverk som utarbetar internationella standarder. Standarder är dokumenterad kunskap utvecklad av framstående aktörer inom industri, näringsliv och samhälle och befäst handel över gränser, bidrar till att processer och produkter blir säkrare samt effektivisera din verksamhet.

Delta och påverka
Som medlem i SIS har du möjlighet att påverka framtida standarder inom ditt område på nationell, europeisk och global nivå. Du får samtidigt tillgång till tidig information om utvecklingen inom din bransch.

Ta del av det färdiga arbetet

Utveckla din kompetens och lyckas bättre i ditt arbete

Vill du veta mer om SIS eller hur standarder kan effektivisera din verksamhet är du välkommen in på www.sis.se eller ta kontakt med oss på tel 08-555 523 00.

Standards make the world go round

SIS (Swedish Standards Institute) is an independent non-profit organisation with members from both the private and public sectors. We are part of the European and global network that draws up international standards. Standards consist of documented knowledge developed by prominent actors within the industry, business world and society. They promote cross-border trade, they help to make processes and products safer and they streamline your organisation.

Take part and have influence
As a member of SIS you will have the possibility to participate in standardization activities on national, European and global level. The membership in SIS will give you the opportunity to influence future standards and gain access to early stage information about developments within your field.

Get to know the finished work
We offer our customers everything in connection with standards and their application. You can purchase all the publications you need from us - everything from individual standards, technical reports and standard packages through to manuals and online services. Our web service e-nav gives you access to an easy-to-navigate library where all standards that are relevant to your company are available. Standards and manuals are sources of knowledge. We sell them.

Increase understanding and improve perception
With SIS you can undergo either shared or in-house training in the content and application of standards. Thanks to our proximity to international development and ISO you receive the right knowledge at the right time, direct from the source. With our knowledge about the potential of standards, we assist our customers in creating tangible benefit and profitability in their organisations.

If you want to know more about SIS, or how standards can streamline your organisation, please visit www.sis.se or contact us on phone +46 (0)8-555 523 00


© Copyright/Upphovsrätten till denna produkt tillhör SIS, Swedish Standards Institute, Stockholm, Sverige. Användningen av denna produkt regleras av slutanvändarlicensen som återfinns i denna produkt, se standardens sista sidor.

© Copyright SIS, Swedish Standards Institute, Stockholm, Sweden. All rights reserved. The use of this product is governed by the end-user licence for this product. You will find the licence in the end of this document.

Upplysningar om sakinnehållet i standarden lämnas av SIS, Swedish Standards Institute, telefon 08-555 520 00. Standarder kan beställas hos SIS Förlag AB som även lämnar allmänna upplysningar om svensk och utländsk standard.

Information about the content of the standard is available from the Swedish Standards Institute (SIS), telephone +46 8 555 520 00. Standards may be ordered from SIS Förlag AB, who can also provide general information about Swedish and foreign standards.

Denna standard är framtagen av kammittén för Lantbruksmaskiner, SIS/TK 228.

# Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreword</td>
<td>vi</td>
</tr>
<tr>
<td>Introduction</td>
<td>vi</td>
</tr>
<tr>
<td>1 Scope</td>
<td>vi</td>
</tr>
<tr>
<td>2 Normative references</td>
<td>1</td>
</tr>
<tr>
<td>3 Conformance</td>
<td>1</td>
</tr>
<tr>
<td>3.1 Transponder</td>
<td>1</td>
</tr>
<tr>
<td>3.2 Transceiver</td>
<td>1</td>
</tr>
<tr>
<td>4 Terms and definitions</td>
<td>2</td>
</tr>
<tr>
<td>5 Abbreviated terms</td>
<td>2</td>
</tr>
<tr>
<td>6 Transmission protocol</td>
<td>3</td>
</tr>
<tr>
<td>6.1 Basic elements</td>
<td>3</td>
</tr>
<tr>
<td>6.2 Unique identifier</td>
<td>3</td>
</tr>
<tr>
<td>6.3 Request format</td>
<td>4</td>
</tr>
<tr>
<td>6.4 Response format</td>
<td>5</td>
</tr>
<tr>
<td>6.5 Request flags</td>
<td>5</td>
</tr>
<tr>
<td>6.5.1 General</td>
<td>5</td>
</tr>
<tr>
<td>6.5.2 NOS flag</td>
<td>6</td>
</tr>
<tr>
<td>6.5.3 SEL flag and ADR flag</td>
<td>7</td>
</tr>
<tr>
<td>6.5.4 CRCT flag</td>
<td>7</td>
</tr>
<tr>
<td>6.6 Response flag and error code</td>
<td>7</td>
</tr>
<tr>
<td>6.7 Error handling</td>
<td>8</td>
</tr>
<tr>
<td>6.8 Block security status (BSS)</td>
<td>8</td>
</tr>
<tr>
<td>6.9 Start of frame pattern (SOF)</td>
<td>9</td>
</tr>
<tr>
<td>6.9.1 Transceiver request</td>
<td>9</td>
</tr>
<tr>
<td>6.9.2 Transponder response</td>
<td>9</td>
</tr>
<tr>
<td>6.10 Cyclic redundancy check (CRC)</td>
<td>9</td>
</tr>
<tr>
<td>6.11 Data storage format identifier (DSFID)</td>
<td>9</td>
</tr>
<tr>
<td>7 Memory organization</td>
<td>10</td>
</tr>
<tr>
<td>7.1 General</td>
<td>10</td>
</tr>
<tr>
<td>7.2 User data memory — Page 0</td>
<td>10</td>
</tr>
<tr>
<td>7.3 User data memory — Extended memory (page 1)</td>
<td>10</td>
</tr>
<tr>
<td>8 Transponder states</td>
<td>11</td>
</tr>
<tr>
<td>8.1 General</td>
<td>11</td>
</tr>
<tr>
<td>8.2 RF-off state</td>
<td>11</td>
</tr>
<tr>
<td>8.3 ISO 11785 state</td>
<td>11</td>
</tr>
<tr>
<td>8.4 Wait state</td>
<td>11</td>
</tr>
<tr>
<td>8.5 Ready state</td>
<td>11</td>
</tr>
<tr>
<td>8.6 Quiet state</td>
<td>11</td>
</tr>
<tr>
<td>8.7 Selected state</td>
<td>11</td>
</tr>
<tr>
<td>8.8 State diagram</td>
<td>12</td>
</tr>
<tr>
<td>9 Anticollision</td>
<td>13</td>
</tr>
<tr>
<td>9.1 General</td>
<td>13</td>
</tr>
<tr>
<td>9.2 Request parameters</td>
<td>13</td>
</tr>
<tr>
<td>9.3 Request processing by the transponder</td>
<td>14</td>
</tr>
<tr>
<td>9.4 Explanation of anticollision sequences</td>
<td>16</td>
</tr>
<tr>
<td>9.4.1 General</td>
<td>16</td>
</tr>
<tr>
<td>9.4.2 Anticollision sequence with one slot</td>
<td>16</td>
</tr>
</tbody>
</table>
9.4.3 Anticollision sequence with 16 slots .........................................................................................................16
9.4.4 Mixed population with transponders of type FDX-ADV and HDX-ADV ...........................................17
9.4.5 Advanced anticollision mode .................................................................................................................17

10 Commands ...........................................................................................................................................19
  10.1 Command classification .....................................................................................................................19
  10.2 Command list .......................................................................................................................................20
  10.3 Mandatory commands .........................................................................................................................21
     10.3.1 INVENTORY ....................................................................................................................................21
     10.3.2 READ UID .....................................................................................................................................22
     10.3.3 READ MULTIPLE BLOCKS .........................................................................................................22
     10.3.4 STAY QUIET ..................................................................................................................................23
     10.3.5 WRITE SINGLE BLOCK .............................................................................................................23
     10.3.6 LOCK BLOCK ...............................................................................................................................23
  10.4 Optional commands ............................................................................................................................24
     10.4.1 READ SINGLE BLOCK ................................................................................................................24
     10.4.2 READ SINGLE BLOCK WITH SECURITY STATUS ..................................................................24
     10.4.3 READ MULTIPLE BLOCKS WITH SECURITY STATUS .......................................................25
     10.4.4 WRITE MULTIPLE BLOCKS .....................................................................................................25
     10.4.5 GET SYSTEM INFORMATION ...................................................................................................26
     10.4.6 SELECT .........................................................................................................................................27
     10.4.7 RESET TO READY ......................................................................................................................28
     10.4.8 WRITE SYSTEM DATA ..............................................................................................................28
     10.4.9 LOCK SYSTEM DATA ...............................................................................................................29
     10.4.10 READ EXTENDED MULTIPLE BLOCKS ..............................................................................29
     10.4.11 WRITE EXTENDED MULTIPLE BLOCKS ............................................................................30
     10.4.12 LOCK EXTENDED BLOCK ...................................................................................................31
     10.4.13 Optional command execution in inventory mode .....................................................................31
  10.5 Custom commands ..............................................................................................................................32
  10.6 Proprietary commands .........................................................................................................................32

Annex A (informative) Description of a typical anticollision sequence with FDX and HDX transponders ....33

Bibliography ......................................................................................................................................................34
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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

ISO 14223-2 was prepared by Technical Committee ISO/TC 23, Tractors and machinery for agriculture and forestry, Subcommittee SC 19, Agricultural electronics.

ISO 14223 consists of the following parts, under the general title Radiofrequency identification of animals — Advanced transponders:

— Part 1: Air Interface
— Part 2: Code and command structure

The following part is under preparation:

— Part 3: Applications
Introduction

This part of 14223 specifies the communication interface of the radio frequency (RF) system for advanced transponders for animals. 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 transmission of the (unique) identification code of animals, the application of advanced technologies facilitates the storage and retrieval of additional information (integrated database), the implementation of authentication methods and the reading of data from integrated sensors, etc.

The International Organization for Standardization (ISO) draws attention to the fact that it is claimed that compliance with this document may involve the use of patents concerning the methods of transmission referred to throughout the document.

ISO takes no position concerning the evidence, validity and scope of these patent rights.

The holders of these patent rights have assured ISO that they are willing to negotiate licences under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statements of the holders of these patent rights are registered with ISO. Information may be obtained from:

N.V. Nederlandsche Apparatenfabriek “Nedap”
Parallelweg 2
NL-7141 DC Groenlo
The Netherlands

Texas Instruments Deutschland GmbH
Haggerstrasse 1
D-85356 Freising
Germany

NXP Semiconductors
Mikron-Weg 1
A-8101 Gratkorn
Austria

EM Microelectronic-Marin SA
Sors 3
CH-2074 Marin
Switzerland

Atmel Germany GmbH
P.O. Box 3535
74025 Heilbronn
Germany

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights other than those identified above. ISO shall not be held responsible for identifying any or all such patent rights.
Radiofrequency identification of animals — Advanced transponders —

Part 2:
Code and command structure

1 Scope

This part of ISO 14223 specifies the code and command structure between the transceiver and the advanced transponder used in the radiofrequency identification of animals, this specification being fully backwards-compatible with those of ISO 11784 and ISO 11785. As a direct extension of ISO 11785, it is intended to be used in conjunction with that International Standard.

2 Normative references

The following referenced documents are indispensable for the application 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, Radio frequency identification of animals — Technical concept

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

ISO 24631-1, Radiofrequency identification of animals — Part 1: Evaluation of conformance of RFID transponders with ISO 11784 and ISO 11785 (including granting and use of a manufacturer code)

3 Conformance

3.1 Transponder

For conformance with this part of ISO 14223 to be claimed, a transponder shall be FDX-ADV or HDX-ADV.

NOTE Nothing in this International Standard prevents a transponder being of more than one type, although for technical reasons, it is unlikely that such transponders are ever marketed.

3.2 Transceiver

For conformance with this part of ISO 14223 to be claimed, a transceiver shall support both FDX-ADV and HDX-ADV. When in the inventory mode, the transceiver shall alternate between FDX-ADV and HDX-ADV interrogation. The transceiver shall move back to ISO 11785 mode after completion of the advanced operation.
4 Terms and definitions

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

4.1 advanced transponder
transponder conforming to ISO 14223, downward compatible according to ISO 11784 and ISO 11785, with facilities for storage and retrieval of additional data, integrated sensors, etc.

4.2 advanced mode
operating method of the advanced transponder after reception of a valid command

4.3 anticollision sequence
algorithm used to prepare for and handle a dialogue between transceiver and one or more transponders out of several in its energizing field

4.4 byte
eight bits of data designated b1 to b8, from the most significant bit (MSB, b8) to the least significant bit (LSB, b1)

5 Abbreviated terms

BSS block security status
CRC cyclic redundancy check
CRCT response cyclic redundancy check flag
DSFID data storage format identifier
EOF end of frame
FDX full duplex
IC integrated circuit
ICR integrated circuit reference number
HDX half duplex
LSB least significant bit
MFC integrated circuit manufacturer code
MSB most significant bit
MSN manufacturer serial number
NOB number of blocks per page
NOP number of pages
NOS number of slots
NRZ non-return to zero
6 Transmission protocol

6.1 Basic elements

The advanced transmission protocol defines the mechanism for exchanging instructions and data between the transceiver and the transponders, in both directions.

It is based on the following concepts.

— The transponders are by default conformant with ISO 11784 and ISO 11785. This shall be evaluated conformant with ISO 24631-1. For advanced instructions the transceiver has the ability to communicate with a transponder in the advanced mode. In this mode the transponder is communicating in RTF mode and does not start to respond unless it has received and decoded a valid request from the transceiver.

— The transponders are uniquely identified by 48 bit UID, programmed at the manufacture of the integrated circuit. The UID coding is defined in 6.2.

— An identification code of 64 bits according to ISO 11784 is stored in page 0 (the four blocks given in Table 11 can be used to store the full ISO 11785 protocol) of the user memory area (blocks 0 to 3). This identification code shall be programmed and locked by the transponder issuer in order to avoid manipulations.

The advanced mode protocol is based on

— a request from the transceiver to the transponder, and

— a response from the transponder to the transceiver.

The protocol is bit-oriented. The number of bits transmitted after a SOF depends on the respective request and response.

Flags are used for the control of request and response format. The setting of the flags indicates either request and response variants (e.g. number of slots) or the presence of optional fields. In the case of optional fields, when the flag is set to one (1), the field is present. When the flag is reset to zero (0), the field is absent.

RFU flags shall be set to zero (0).

6.2 Unique identifier

The UID is used for addressing each transponder uniquely and individually.

The length of the UID is 48 bits, the format of the UID is presented in Table 1. The IC manufacturer is responsible for setting the UID as defined by this part of ISO 14223 and for ensuring the uniqueness of the MSN.