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Information and documentation — RFID in libraries —

Part 1:
Data elements and general guidelines for implementation

Information et documentation — RFID dans les bibliothèques —

Partie 1: Éléments de données et lignes directrices générales pour la mise en oeuvre

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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 document 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 46, *Information and documentation*, Subcommittee SC 4, *Technical interoperability*.

This third edition cancels and replaces the second edition (ISO 28560-1:2014), of which it constitutes a minor revision.

The changes are as follows:

— a few updates have been applied and definitions of DSFID values have been entrusted to the other parts of the ISO 28560 series.

A list of all parts in the ISO 28560 series can be found on the ISO web site.

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

Libraries are implementing radio frequency identification (RFID) as item identification to replace bar codes. RFID streamlines applications like user self-service, security, and materials handling. This standard data model for encoding information on RFID tags increases the cost-effectiveness of the technology within libraries, particularly through greater interoperability of RFID tags and equipment, and enhance support for resource sharing between libraries.

This document deals with data elements and provides general guidelines for implementation. Other parts of the ISO 28560 series describe encodings and choice of frequency.

Communication between the RFID reader and the library system (or other applications) is handled by, for example, SIP-2[12] and NCIP[13].

This document provides essential standards-based information about RFID in libraries. Ongoing advice needs to be provided because of the evolving nature of RFID technology and the opportunities to migrate between different types of legacy system and encoding rules of this document.

Information and documentation — RFID in libraries —

Part 1:
Data elements and general guidelines for implementation

1   Scope

This document specifies a model for the use of radio frequency identification (RFID) tags for items appropriate for the needs of all types of libraries, including national, academic, public, corporate, special, and school.

It provides the framework to ensure interoperability between libraries that exchange library items with RFID tags, the freedom of the library to acquire or renew equipment or library items from different vendors, and interoperability of a single RFID application from the vendor's perspective.

This document specifies a set of data elements and general guidelines for implementation, to meet the needs for:

— circulation of library items;

— acquisition of library items;

— interlibrary loan processes;

— data requirements of publishers, printers, and other suppliers of library items;

— inventory and stock checking of items.

This document gives guidelines for item security, profiles, privacy, implementation, migration, label design, and location of the RFID label. It specifies the data model, system data elements, and user data elements to be used in conjunction with ISO 28560-2, ISO 28560-3, and any future parts of the ISO 28560 series.

A source of additional information about implementation issues is provided in Annex A.

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 15511, *Information and documentation — International standard identifier for libraries and related organizations (ISIL)*

ISO/IEC 15961-3, *Information technology —Radio frequency identification (RFID) for item management — Part 3: RFID data constructs*

ISO 28560-2, *Information and documentation — RFID in libraries — Part 2: Encoding of RFID data elements based on rules from ISO/IEC 15962*

ISO 28560-3, *Information and documentation — RFID in libraries — Part 3: Fixed length encoding*

3   Terms and definitions

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

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

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

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

3.1
distributor
wholesaler that purchases products from manufacturers and sells them to retailers or other wholesalers

Note 1 to entry: In the context of this document, a distributor is a wholesaler that purchases library materials such as books or audiovisual materials from publishers and sells them to libraries or retailers.

3.2
interlibrary loan
ILL
service where a library borrows an *item* (3.3) from another library

3.3
item
unit tracked in a library system

Note 1 to entry: An item, which can be a *set* (3.7), can be loanable or non-circulating, but is always loaned in its entirety.

3.4
jobber
specialized *distributor* (3.1) of library *items* (3.3) that provides services such as the attachment of labelling and electronic information to items to make them ready for immediate shelving upon arrival at the destination library

3.5
library management system
enterprise resource planning system for a library, used to track items owned, items loaned, orders made, bills paid, and patrons

Note 1 to entry: In some countries, this is known as an integrated library system.

3.6
part
individual physical entity included in an *item* (3.3)

Note 1 to entry: A part can be a library material or a container for the library materials in a *set* (3.7).

3.7
set
item (3.3) consisting of a number of parts, all identified by the same item identifier and loaned in one transaction as a unit

3.8
supply chain
series of entities, typically beginning with a publisher and ending with a library, through which library materials flow as they are acquired by that library

4   User data elements

4.1   Overview of user data elements

Libraries can choose which data elements they want to store on the tag. It is unlikely that a library places all the listed data elements on the tag. A number of data elements are reserved for local use. They should be ignored where the processing institution is not the owner of the item (as in ILL).

Table 1 lists the user data elements that are defined in this document.

Table 1 — User data elements

N[a]	Name of the data element[b]	Description[c]	Ref[d]	ISO 8459 mapping[e]	Status[f]	Relationship[g]
1	Primary item identifier	Unique identification of an item at least inside the library	4.2.1	Piece identifier	Mandatory for circulated items	None
2	Content parameter	Specifies the structure of the tag data	4.2.2	None	Can be mandatory as specified in other parts of ISO 28560	None
3	Owner institution (ISIL)	The ISIL code for the institution that owns the item	4.2.3	Party identifier; Participant's function	Strongly recommended to create interoperability	Elements 3 and 23 are mutually exclusive
4	Set information	Number of parts in item and ordinal part number	4.2.4	Number of volumes; Component	Optional	None
5	Type of usage	Additional qualifying information about the item or part of a set	4.2.5	None	Optional	None
6	Shelf location	Code for location of the item	4.2.6	Copy shelf locator	Optional	None
7	ONIX media format	ONIX media descriptor	4.2.7	Record content type	Optional	Data elements 7, 8, and 19 should be consistent
8	MARC media format	MARC 21 category of material descriptor	4.2.8	Record content type	Optional	Data elements 7, 8, and 19 should be consistent
9	Supplier identifier	Code for identification of supplier of the item	4.2.9	Party identifier; Participant's function	Optional	None
10	Order number	Number meaningful to the library and to the supplier of the item	4.2.10	Request identifier	Optional	None
11	ILL borrowing institution (ISIL)	ISIL code for the institution borrowing the item	4.2.11	Party identifier; Participant's function	Optional	Data elements 11 and 25 are mutually exclusive
12	ILL borrowing transaction number	Number identifying an interlibrary loan transaction	4.2.12	None	Optional	None
13	GS1 product identifier	GTIN-13 code of GS1	4.2.13	Resource identifier code	Optional	Data elements 13 and 18 should be consistent
14	Alternative unique item identifier	Possibly encoding in new tag architectures	4.2.14	None	Reserved for future use	
15	Local data A	Any locally defined purpose	4.2.15	None	Optional	None

a   This column specifies the data element number (N), i.e. the number identifying the data element.

b   This column specifies the data element name (name of data element), i.e. the name identifying the data element.

c   This column specifies the data element description, i.e. a brief description about the purpose of the data element.

d   This column contains a reference to the subclause where the data element is described.

e   This column contains the mapping to the corresponding data elements in ISO 8459. The mapping is for information.

f   This column classifies the data elements into categories (status).

g   This column specifies possible relationships to other data elements (relationship).

Table 1 *(continued)*

N^a	Name of the data element[b]	Description[c]	Ref [d]	ISO 8459 mapping[e]	Status[f]	Relationship[g]
16	Local data B	Any locally defined purpose	4.2.16	None	Optional	None
17	Title	The title/titles of the library item	4.2.17	Title	Optional	None
18	Product identifier local	Product identifier not based on GTIN-13	4.2.18	Resource identifier code	Optional	Data elements 13 and 18 should be consistent
19	Media format (other)	Media descriptor other than ONIX or MARC	4.2.19	Record content type	Optional	Data elements 7, 8, and 19 should be consistent
20	Supply chain stage	The stage of the supply chain in which the item currently resides	4.2.20	None	Optional	None
21	Supplier invoice number	Invoice number meaningful to the library and to the supplier of the item	4.2.21	Invoice identifier	Optional	None
22	Alternative item identifier	Optional identifier for an item	4.2.22	Piece identifier	Optional	None
23	Alternative owner institution	Code for the library institution other than ISIL	4.2.23	Party identifier; Participant's function	Optional	Data elements 3 and 23 are mutually exclusive
24	Subsidiary of an owner institution	Internal code defined within a library institution	4.2.24	Party identifier; Participant's function	Optional	None
25	Alternative ILL borrowing institution	Code for the ILL borrowing institution other than ISIL	4.2.25	Party identifier; Participant's function	Optional	Data elements 11 and 25 are mutually exclusive
26	Local data C	Any locally defined purpose	4.2.26	None	Optional	None
27	Not defined		4.2.27		Reserved for future use	
28	Not defined		4.2.28		Reserved for future use	
29	Not defined		4.2.29		Reserved for future use	
30	Not defined		4.2.30		Reserved for future use	
31	Not defined		4.2.31		Reserved for future use	

[a] This column specifies the data element number (N), i.e. the number identifying the data element.

[b] This column specifies the data element name (name of data element), i.e. the name identifying the data element.

[c] This column specifies the data element description, i.e. a brief description about the purpose of the data element.

[d] This column contains a reference to the subclause where the data element is described.

[e] This column contains the mapping to the corresponding data elements in ISO 8459. The mapping is for information.

[f] This column classifies the data elements into categories (status).

[g] This column specifies possible relationships to other data elements (relationship).

4.2 Use of user data elements

4.2.1 Primary item identifier

The library's unique identification of an item shall be used as the primary item identifier. This data element is required for circulation. It can be absent in the acquisition process.

The primary item identifier can be, but need not be, equivalent to the (former) bar code. It can be decided at a local or national level if the identifier should be unique outside the library and how this is to be achieved.

Annex B illustrates how the primary item identifier can be combined with other data to achieve increasing levels of uniqueness, ultimately global uniqueness.

4.2.2 Content parameter

The content parameter data element specifies the structure of the tag data. The parameter can have different forms for the various possible encoding methodologies specified in other parts of the ISO 28560 series.

4.2.3 Owner institution (ISIL)

The owner institution (ISIL) data element is used for the ISIL code for the institution that owns the item.

The ISIL code shall be as defined in ISO 15511.

The list of ISIL agencies that are responsible for the issuing process of ISIL codes can be found at http://biblstandard.dk/isil/.

In exceptional cases, the ISIL code, or parts of the ISIL code, can be stored in data element 23 (alternative owner institution).

4.2.4 Set information

4.2.4.1 General

If the set information data element is encoded, it shall consist of two components, which are

a) the "number of parts in item", followed by

b) the "ordinal part number",

as specified in 4.2.4.2 and 4.2.4.3. These two component parameters are used to identify various permutations relating to sets.

A single part item is the default case. A system reading a tag that does not contain the set information data element can assume that the item has only a single part.

4.2.4.2 Numbers of parts in item

For sets with only a single part, the "numbers of parts in item" component shall take the value "1".

For sets with more than a single part, the "numbers of parts in item" component shall take a value in the range 0 to 255, where a positive number indicates the total number of parts in the set, and 0 that the total number is not known.

4.2.4.3 Ordinal part number

For sets with only a single part, the "ordinal part number" component shall take the value "1".

For sets with more than a single part, the "ordinal part number" component shall take a value in the range 0 to 255, under one of the following two conditions.

— If all parts in the set carry an RFID tag, a positive ordinal part number corresponding to the placement of the part in the set shall be assigned to each part.

— If only some of the parts in the set carry an RFID tag, the first part shall be assigned the ordinal part number 0, and the following parts an ordinal part number corresponding to the placement of the part in the set. As a consequence, no part shall be assigned the ordinal part number 1.

4.2.4.4 Examples

EXAMPLE 1   A set with three parts, all with their own RFID tags:

— Number of this part = 1 (first RFID tag):   code = 31

— Number of this part = 2 (second RFID tag):   code = 32

— Number of this part = 3 (third RFID tag):   code = 33

EXAMPLE 2   A set consisting of a single part with one RFID tag:

— Number of this part = 1:   code = 11 (if present)

EXAMPLE 3   A set consists of 12 parts, and this is the fourth part:

— Number of this part = 4 (fourth RFID tag):   code = 1204

EXAMPLE 4   A set having four parts but one part does not carry an RFID tag:

— Number of this part = 1 (first RFID tag):   code = 40

— Number of this part = 2 (second RFID tag):   code = 42

— Number of this part = 3 (third RFID tag):   code = 43

— Number of this part = 4 (no RFID tag)

NOTE 1   The "0" of the first part serves two functions:

a)   it indicates that not all parts have an RFID tag;

b)   it indicates that this is the first part.

EXAMPLE 5   A set having an unknown number of parts or increasing in number of parts over time.

— Number of this part = 1 (first RFID tag):   code = 01

— Number of this part = 2 (second RFID tag):   code = 02

— Number of this part = 3 (third RFID tag):   code = 03

— Number of this part = 4 (fourth RFID tag):   code = 04

NOTE 2   The initial "0" indicates that the number of parts is not fixed.

4.2.5   Type of usage

4.2.5.1   General

The type of usage data element provides additional qualifying information about the item or part of a set, for example, the type of material and its use within the library. As synergies between RFID-enabled devices become more common, this data element can be set dynamically by one RFID device for the benefit of another. Individual parts of a set can have different values for the type of usage data element. If this data element is encoded, it shall use the values specified in Annex C.

4.2.5.2 Examples

EXAMPLE 1   An acquisition item that arrives at a library can be processed automatically if it has the following type of usage parameters:

— Main qualifier = 0 (Class = acquisition item)

— Sub-qualifier = 1 (Sub-class = for automated processes)

EXAMPLE 2   If a similar acquisition item is only parameterized by a main qualifier, it can have the following type of usage parameters:

— Main qualifier = 0 (Class = acquisition item)

— Sub-qualifier is absent means that the sub-class is unspecified (identical to sub-qualifier value zero)

EXAMPLE 3   An item for circulation that has to be handled with care and is not suited for automatic sorting has the following type of usage parameters:

— Main qualifier = 1 (Class = item for circulation)

— Sub-qualifier = 2 (Sub-class = not for automatic sorting)

EXAMPLE 4   A discarded item that is offered for sale has the following type of usage parameters:

— Main qualifier = 7 (Class = discarded item)

— Sub-qualifier = 1 (Sub-class = for sale)

4.2.6   Shelf location

The shelf location data element holds the location of the item.

The data element can take any value the library decides to use. The values reflect the library's shelf location system and are only intended for use in the library owning the item.

Automatic sorting systems can use this data element for sorting purposes.

4.2.7   ONIX media format

The ONIX media format data element shall, if encoded, represent an ONIX media descriptor of two alphabetic characters.

These media descriptors are based on the ONIX Books Product Form Code List, published and maintained by EDItEUR. Use the latest product form code from the ONIX Books Code Lists (see https://www.editeur.org).

NOTE   EDItEUR is the international group coordinating development of the standards infrastructure for electronic commerce in the book and serials industries.

4.2.8   MARC media format

The MARC media format data element shall, if encoded, represent a MARC 21 category of material descriptor.

This media descriptor is a compound of two letters defined by positions 6 and 7 in the leader of a MARC 21 record. See https://www.loc.gov/marc/bibliographic.

4.2.9   Supplier identifier

The supplier identifier data element is used for identification of the supplier of the item.

If a supplier code is determined by the purchasing library or its owner body (e.g. university, city, government) there might be structure rules already in place. If not, it is recommended to define a unique list on a national level. Annex D indicates a method using a country prefix.

4.2.10 Order number

The order number data element is used for an order number meaningful to the library and to the supplier of the item.

4.2.11 ILL borrowing institution (ISIL)

The ILL borrowing institution (ISIL) data element is used for identification of an institution borrowing the item.

When using this data element, the borrowing institution shall be represented by the ISIL code according to ISO 15511. The data element is formatted according to similar rules as defined for the owner institution (ISIL) data element (see 4.2.3). The ILL borrowing institution (ISIL) data element and the alternative ILL borrowing institution data element (see 4.2.25) are mutually exclusive.

4.2.12 ILL borrowing transaction number

The ILL borrowing transaction number data element is used to identify an ILL transaction.

The ILL borrowing transaction number is assigned by the ILL transaction processing system and encoded by the lending institution to identify an interlibrary loan transaction. The structure of the number is locally defined.

4.2.13 GS1 product identifier

The GS1 product identifier data element shall, if encoded, be used to store the GTIN-13 code of GS1.

NOTE 1   GS1 is a global organization for standards and solutions to supply and demand chains globally and across sectors.

The Global Trade Item Number (GTIN) is a code that identifies the product and not the individual item.

The GTIN-13 has 13 digits and is commonly seen on retail products in a bar code format and is (without the check digit) also an element of tags used in retail that follow the electronic product code scheme of GS1/EPC Global. The GTIN-13 code is commonly called the UPC code in the United States, and in other parts of the world, it is known as the EAN-13 code.

NOTE 2   The Universal Product Code (UPC) is a specific type of bar code used for tracking trade items.

NOTE 3   The EAN-13 code is the European Article Number (EAN) 13 digit code.

The GTIN-13 code includes the encoding of:

— the ISBN, with the prefixes "978" and "979";

— the ISSN with the prefix "977";

— the ISMN with the prefix "979".

The code structure for CDs, DVDs, and other products without formal registration codes follows conventional GS1 rules. This means that for many products that originate in the United States, the code shall be expanded with leading zeros to conform to the 13-digit structure. Codes on products from most other countries use the full 13-digit structure. Encoding everything in a 13-digit structure is important because the final digit is a check digit that can be used for validation processes in some systems.

4.2.14 Alternative unique item identifier

This data element is reserved for possibly encoding in new tag architectures.

4.2.15 Local data A

The local data A data element is used for any locally defined purpose. The structure and formatting is locally defined.

4.2.16 Local data B

The local data B data element is used for any locally defined purpose. The structure and formatting is locally defined.

4.2.17 Title

The title data element holds the title or titles of the library item.

4.2.18 Product identifier local

The product identifier local data element is used for a product code not based on the GTIN-13 codes.

This data element can be used for items that do not have a GTIN-13 code, or for which the GTIN-13 code is not known or not adequate. This enables information systems linked to various code structures to be supported by the RFID system.

4.2.19 Media format (other)

The media format (other) data element represents any media descriptor other than ONIX or MARC. See Table 2.

Table 2 — Media format (other)

Code Value (Decimal)	Code Value (Hexa-decimal)	Description
0	00	Undefined
1	01	Book
2	02	CD/DVD
3	03	Magnetic tape
4	04	Other
5	05	Other, careful handling is required
6	06	Very small item, special handling is required
7 to 127	07 to 7F	Reserved for ISO TC 46 SC4
128 to 255	80 to FF	Free use by the library

4.2.20 Supply chain stage

The supply chain stage data element is used to identify the stage of the supply chain in which the item currently resides. While current practice is for individual library institutions to add RFID tags to their own material, this data element might become significant if tagging becomes more common at "upstream" stages of the library material supply chain.

Table 3 lists the supply chain stage code decimal values that shall be used if this data element is encoded.

Table 3 — Supply chain stage code

Supply chain stage code		Supply chain stage
Decimal (as in ISO 28560-1)	Hexadecimal (as input)	
0	00	Used as null value
16	10	Manufacturer
24	18	Publisher
32	20	Distributor
48	30	Jobber
64	40	Library

Other values for supply chain stage are reserved for future use and can only be encoded once they have been defined in future editions of this document. For this specific data element, the value "0" indicates "undefined".

4.2.21 Supplier invoice number

The supplier invoice number data element is used for a locally designated invoice number meaningful to the library and to the supplier of the library material.

This data element can be left permanently written to the tag or it can be used only temporarily during an acquisitions process.

4.2.22 Alternative item identifier

The alternative item identifier data element is used for a locally designated optional identifier.

This data element can be temporary and have only local meaning as during an acquisitions process or it can contain other identifiers as deemed necessary.

4.2.23 Alternative owner institution

The alternative owner institution data element is used for an alternative identification of the library institution (i.e. not ISIL).

The data element can be used, for example, where a library identifier scheme pre-dates the ISIL and cannot easily be converted into an ISIL-compliant scheme. This data element can be used in exceptional cases for the ISIL code, or parts of the ISIL code (see 4.2.3).

4.2.24 Subsidiary of an owner institution

The subsidiary of an owner institution data element is used to refine the identity to a level lower than the ISIL, e.g. a branch or collection. As such it is an internal code defined within a library institution.

4.2.25 Alternative ILL borrowing institution

The alternative ILL borrowing institution data element is used for an alternative code for the ILL borrowing institution (i.e. not ISIL).

This data element and the ILL borrowing institution (ISIL) data element (4.2.11) are mutually exclusive and only one of them shall be encoded on the tag.

4.2.26 Local data C

The local data C data element is used for any locally defined purpose. The structure and formatting is locally defined.

4.2.27 Reserved data element

Data element reserved for future use.

4.2.28 Reserved data element

Data element reserved for future use.

4.2.29 Reserved data element

Data element reserved for future use.

4.2.30 Reserved data element

Data element reserved for future use.

4.2.31 Reserved data element

Data element reserved for future use.

4.3 Maintenance of the list of data elements used

Pending proposals for additional data elements and planned allocations for reserved data elements should be published on the website given in Annex A.

5 System data elements

5.1 System data versus user data

Many tags have organized their memory in such a way that the user and the system data are stored in different memory compartments. Other parts of the ISO 28560 series provide the details of all the system data that play a crucial role in the system architecture. Subclause 5.2 describes the most important system data.

5.2 System data elements for identification and item security in libraries

5.2.1 General

ISO/IEC 15961-3 defines the rules for the application family identifier (AFI), the data format and the object identifiers for RFID for item management.

The AFI, the data format and the object identifiers for RFID for item management shall be in accordance with ISO/IEC 15961-3.

5.2.2 Application family identifier (AFI)

The AFI is a single-byte code, often in the system memory of the tag, used as a tag selection mechanism across the air interface to minimize the extent of communication transaction time with tags that do not carry the relevant AFI code.

The hexadecimal value $C2_{HEX}$ for AFI has been assigned by the Registration Authority for ISO/IEC 15961-2 explicitly for library use.

A library can use the AFI in one of the following two ways.

— It can use a single AFI, the value $C2_{HEX}$ assigned under the registration of ISO/IEC 15961-2. This distinguishes library items from all others, and avoids the risk of an RFID reader in another domain

reading the RFID tag on a loan item and confusing its encoded content with data in an application outside the library domain. It also enables a library system to reject items that carry a different AFI code, possibly from another domain visited by a client.

— The AFI can additionally be used as part of an "item security system" where the AFI value $C2_{HEX}$ is written to tags for items that are on loan to a client. When the books are returned, an in-stock AFI (07_{HEX}, as defined in ISO/IEC 15961-3) is written to the tag.

RFID tags that conform with this document have a mandatory AFI system data element and should only use one of the two AFI values that are listed above. The AFI together with the primary item identifier and owner institution (ISIL) guarantee global uniqueness of the item (see Annex B).

The AFI has a feature that enables the application to specify that the AFI is to be locked, or to be left unlocked. Once locked, the AFI cannot be unlocked. The AFI shall not be locked if it is used as part of an item security system where two values of the AFI are used, one for on-loan items and one for in-stock items. If other security mechanisms are used, then the AFI can be locked at the individual library's discretion. Before locking, libraries should give consideration to the item's use in other libraries through cooperative arrangements or interlibrary loans (for example, if the recipient library wanted to use the AFI for security while the item was in its possession even though the donor library did not).

Various approaches can be used for securing library items against unauthorized removal. The choice of an item security system is outside the scope of this document and it is the responsibility of solution providers to develop particular schemes for libraries to choose. Some options are discussed in Annex E, without any comment on their particular merits. Combinations of these options can also be provided in particular systems.

5.2.3 Data storage format identifier (DSFID)

The DSFID can be present in certain types of tags as a system data element. If the DSFID is hard-coded, in other words has a specific memory allocation, then the write-DSFID command in the air interface protocol is usually supported by a lock-DSFID command.

For tags encoded in accordance with ISO 28560-2, the value of DSFID comprises two components:

— the access method defined in this document of 00_{BINARY};

— the data format of 00110_{BINARY} assigned by the Registration Authority for ISO/IEC 15961-2 explicitly for library use.

When these are combined, they produce a DSFID value of 06_{HEX} to be used for tags encoded in accordance with ISO 28560-2.

The DSFID value $3E_{HEX}$ is used for tags encoded in accordance with ISO 28560-3.

Two DSFID values ($1E_{HEX}$ and $5E_{HEX}$) can be used for migration purposes for tags that are not compliant with this document.

Other DSFID values shall not be used until assigned for use in this document.

5.2.4 Unique tag ID

All compliant ISO/IEC 18000-3 Mode 1 tags have a unique tag ID programmed by the integrated circuit manufacturer in a non-volatile memory. One of the options for item security uses this system data field. Further information is given in Annex E.

5.2.5 Electronic article surveillance (EAS)

Some tags have a system data field that is dedicated to item security, the EAS field. The technologies for these EAS item security systems are proprietary. The use of EAS is described in Annex E.

6 Tools for data security and integrity

When data elements are not programmed in a non-volatile memory or are not locked, they can be modified by unauthorized persons. This document does not specify methods for maintaining the integrity of the data. However, as described for AFI values in 5.2.2, locking of the data stored in the tag user memory is a possible method. Some types of tag hardware can provide additional (often proprietary) security tools such as the following.

— System, or user data fields, or both, can be protected by passwords. Initial writing or modifying the data requires knowing a password.

— Access to most of the data is blocked when the item is on loan. This is often called the "privacy mode" of a tag. There is a command to "wake up" the tag.

7 Regional and business profiling

7.1 Elements for profiles

This document provides an abstract list of data elements and leaves a degree of freedom to libraries or to their vendors when implementing an RFID system. A group of libraries can define profiles in which the degree of freedom becomes more restricted. One or more of the following restrictions can be part of the profile.

— A set of data elements can be made mandatory in a profile. In many cases, this can consist of or include the owner institution (ISIL) data element because adding the ISIL code is the only method to guarantee global uniqueness.

— The list of user data elements contains alternatives. A profile can exclude certain (alternative) data elements and can then mandate the use of a related data element. The exclusion of non-ISIL forms for the owner institution and for the ILL borrowing institution are examples. Another example is that one of the three media formats is mandated when information on the media type is stored on the tag.

— A profile can forbid the use of certain data elements, for example, the title data element. Or, it can forbid the use of a data element unless special data protection methods have been implemented, like the tag being blocked for an item on loan.

— A profile can contain rules to guarantee data security. A requirement can be that certain data elements are locked, or are ready to be locked. This is especially relevant for the data elements that identify the item uniquely. Password protection of data elements can also be an option, but this is likely a proprietary feature which is beyond the scope of this document.

— A profile can contain guidance on privacy. For instance, in certain regions, it might be unacceptable to include the title of an item or its product identifier information beyond the point in the supply chain where the item is added to the collection.

— A profile can define, for a regional or national jurisdiction, the usage of a local data element.

7.2 Regional profiles

Regional profiling means that the profile is agreed among libraries on a regional basis, where "regional" can refer to a city, region, nation, or (small) language area.

7.3 Business profiles

Groups of libraries can also agree on a profile in order to support certain business models. These libraries are not necessarily grouped on a regional basis. International ILL schemes of academic

libraries are an example. Regional profiles can also have the character of business profiling when they support certain business processes, for example, automatic processing of acquisition items.

EXAMPLE 1   For interlibrary loans (ILL), in most cases a set is required with:

— Primary item identifier

— Owner institution (ISIL)

This is required to make the item globally unique and recognizable as not belonging to the library's own collection by the receiving ILL institution.

EXAMPLE 2   For interlibrary loans, an even larger set can be agreed:

— Primary item identifier

— Owner institution (ISIL)

— ILL borrowing institution (ISIL), for item on loan via ILL

— ILL borrowing transaction number, for item on loan via ILL

EXAMPLE 3   When new acquisitions are tagged by the jobber, the set of data elements agreed between jobber and library can be:

— Supplier identifier

— Order number

An automatic system in the library recognizes that the item is a new item, for example, because the primary identifier element is still empty. The primary item identifier is added to the tag and if desirable, the data elements that relate to the acquisition process are removed.

EXAMPLE 4   For these new acquisitions tagged by the jobber, the set can be larger:

— supplier identifier;

— order number;

— GS1 product identifier;

— supply chain stage.

The website given in Annex A can provide more detailed examples of profiles that have been implemented, including some profiles in systems not conforming to this document.

8 Privacy issues

Because this document is likely to be implemented in different legal domains, it is not possible to provide detailed advice about privacy with respect to national laws. Also, the nature of the relationship between the patron and the library can have implications for the application of privacy laws. For example, employees in a company-based library have different privacy concerns than citizens using a public library.

As a general rule, no personal data (either direct or indirect) that identifies an individual patron should be encoded on the RFID tag affixed to a library item.

If there is concern that identifying the item has privacy implications, then explicit identifiers such as the title, the GS1 product identifier, or product identifier local should not be encoded on the RFID tag. This concern for privacy needs to be balanced by the fact that other RFID applications might well provide such codes on products purchased through retail outlets.

9   Implementation and migration

9.1   New RFID implementations

Any library that has yet to introduce RFID and that is not subject to any regional RFID implementation strategy or advice should give consideration to the use of this document. Depending on the time that the implementation is being considered, particularly immediately after publication of this document, vendors might be at incomplete stages of their development and support for this document. In situations where not all features are supported but are considered essential for the library system, the institution should seek a development path and timetable from the vendor.

Once this document becomes widely adopted, there will be an increasing choice particularly of RFID devices that are compliant with this document. New devices should be interoperable with any existing devices installed in accordance with this document.

9.2   Migration for regional models

Before the publication of this document, some implementations of RFID item management in libraries were subject to regional implementation strategies. It might be expected that in this case, the decision or advice to migrate to this document should not be taken by an individual library, but on the basis of a regional implementation strategy. This is certainly needed when tagging of new acquisitions is not executed by an individual library but by one or more jobbers with a large-scale impact in the region.

The decision to migrate to a data model based on this document depends on many economic and operational considerations that are beyond its scope. Some of the factors that influence change are whether vendors are offering features in applications that are considered beneficial, or whether jobbers are prepared to supply items with RFID labels fixed and even encoded.

9.3   Use of the correct AFI value

Even if a decision is taken to postpone migration to a system compliant with this document, the correct AFI value should be used, especially for new acquisitions. As many libraries introduced RFID tags before an AFI value for libraries was allocated, the existing RFID tags have an incorrect AFI value. The AFI value was usually set to the default value of zero (00_{HEX}). If the AFI value was used for security purposes, it would have a pair of incorrect AFI values.

9.4   Discrimination between ISO 28560-compliant and non-compliant tags

During a changeover or when items from non-compliant libraries mix with those of compliant ones, there is a need to discriminate between a non-compliant RFID tag and one that is compliant with this document. The DSFID value of a non-compliant RFID tag is also likely to be zero (00_{HEX}). There is also the possibility that no DSFID field exists on the non-compliant RFID tags as not all tags have this system data.

Thus, the AFI and DSFID values make it possible to differentiate non-compliant from compliant RFID tags as follows:

— tags that were distributed before correct AFI values were allocated;

— non-compliant tags with correct AFI values;

— tags compliant with this document.

Table 4 indicates the system data for AFI and DSFID on non-ISO 28560-compliant tags and ISO 28560-compliant tags.

Table 4 — AFI and DSFID values on non-ISO 28560-compliant tags

Type of tag	AFI value	DSFID value
Non-ISO 28560-compliant tag distributed before AFI value was allocated and without a dual AFI value for item security	Likely to be zero	Likely to be zero or absent
Non-ISO 28560-compliant tag distributed before AFI value was allocated and with a dual AFI value for item security	Any pair of AFI values is possible	Likely to be zero or absent
Non-ISO 28560-compliant tag with correct AFI value and without a dual AFI value for item security	$C2_{HEX}$ (possibly locked)	Likely to be zero or absent
Non-ISO 28560-compliant tag with correct AFI value and with a dual AFI value for item security	$C2_{HEX}$ (out on loan) and 07_{HEX} (in stock)	Likely to be zero or absent
Tags compliant with ISO 28560	$C2_{HEX}$ (out on loan) and 07_{HEX} (in stock)	As defined in other parts of ISO 28560

In many cases, it is possible to use one or both of these system data elements for the discrimination process during a changeover period within a library. There are other mechanisms that can be used and implemented in software, but these will be less generic.

9.5 Migrations of ISO/IEC 18000-3 Mode 1 RFID tags

Most regional or proprietary vendor implementations made before this document are based on RFID tags that are compatible with ISO/IEC 18000-3 Mode 1. RFID products can also be defined as "ISO/IEC 15693-conformant", because these are based on integrated circuits that were originally used for smart card technology. Especially for these ISO/IEC 18000-3 Mode 1 tags, a discrimination method between ISO 28560-compliant tags and non-compliant tags should be defined.

When a migration strategy is designed for the installed base of tags, discussions should take place with the RFID tag supplier, and supplier of printer encoders and RFID readers. The specific features of the products already installed should be defined and compared with the RFID tag requirement of this document. Although the air interface protocol is the same, the detailed features can differ between tags and devices from different vendors.

9.6 Migrations of other RFID tag technologies

Where RFID tags do not conform to the requirements of the ISO/IEC 18000-3 Mode 1, there are still possibilities for a migration with reuse of the installed base of tag hardware and RFID equipment.

If the RFID tag operates at 13,56 MHz, it might be possible to utilize the ISO/IEC 18000-3 Mode 1 tag for new acquisitions or tag replacements, because some aspects of the air interface protocol are similar. Effectively, what is required is to introduce a system that supports multiple air interface protocols. This would probably require an upgrade and installation of components for interrogators and printer encoders, with the latter type of device probably presenting a more complex challenge.

If the vendor of the RFID equipment can support migration through the installation of upgraded components and possibly devices, then the advice provided in 9.5 is generally applicable.

If an RFID system is operating at a different frequency (for example, 125 kHz to 135 kHz or 2,45 GHz), then a significantly more complex challenge exists with radio frequency. RFID systems that operate at frequencies other than 13,56 MHz have significantly different operational features, and the library management system is likely to require a significant upgrade of devices to ensure that the system operates on a dual-frequency basis. Such technological developments are possible, and some are taking place for particular frequencies and particular air interface protocols. Addressing this challenge is beyond the scope of this document.

9.7 Conversion methodologies

The simplest plan to convert the data on an existing tag to be compliant with this document is to erase all the data on the RFID tag and overwrite according to this document. This procedure is not possible if any of the data are locked on the existing tag. The option then exists to maintain both systems in

parallel, at least for RFID tags with locked data elements until the number of legacy tags is relatively small to cost-justify a replacement RFID tag.

The changeover process can be managed in a number of ways from a gradual changeover, possibly as items are returned, to a more accelerated programme. This choice is left to the discretion of the individual library, given that however short the changeover programme, there can be a requirement to maintain in parallel both the previous system and the system compatible with this document.

9.8 Preservation of business profiles during migration

A particular business profile can be in place in the previous system, and discussions should take place with vendors to ensure that these business functions are also supported in the new system compliant with this document. There are no features in this document that can impede particular business operations as existing data elements in the previous systems can have their equivalent in this document.

10 Label design and location of the label

10.1 Label design

This document places no constraints on the size, or design, of the label associated with the RFID tag. Individual institutions should take into account that:

— suppliers might impose some constraints on the label size and design options, including the choice of bar code symbology and the placement of this and any eye-readable information;

— the amount and detail of information that should be encoded on the label is primarily subject to local requirements, which might include taking into account privacy concerns.

From a design perspective, care should be taken when over-printing RFID labels so as not to damage the chip or bonding that joins the chip and the antenna. In addition to this being an ongoing design consideration, it also needs to be taken into account when considering a change of media or suppliers. There can be differences in the capabilities of different suppliers to meet particular design requirements, and so some flexibility is called for on the design side.

10.2 Location of the RFID label

Different types of loan item are constructed of different media. For example, books are constructed mainly of organic material and CDs and DVDs have a metal content. The location of a tag should not impede the playing of CDs and DVDs. This document places no constraints on the location of RFID tag labels on different types of product, because different vendors might have developed solutions, some of which are proprietary, that meet performance requirements. As there are ongoing developments of the technology, this can result in new form factors of RFID tags and labels that are suitable for particular types of loan item and improved performance.

Annex A
(informative)

Information about ISO 28560 RFID in libraries

A.1 Informational website

Additional information about RFID in Libraries:

http://biblstandard.dk/rfid

Hosted by Royal Danish Library.

A.2 Types of support information

At the time of publication of this document, two items of information have been identified as follows, together with the URL of the continually updated material.

— RFID in libraries. Links to external materials http://biblstandard.dk/rfid/docs/RFID-in-libraries-Links-external

— RFID in libraries. Q&A http://biblstandard.dk/rfid/docs/RFID-in-libraries-q-and-a

Other material can be published in future, and this can be publicized and made available at the URL in A.1.

Annex B
(informative)

Uniqueness of RFID tags

Figure B.1 shows four sets of tagged items relevant for the issue of uniqueness.
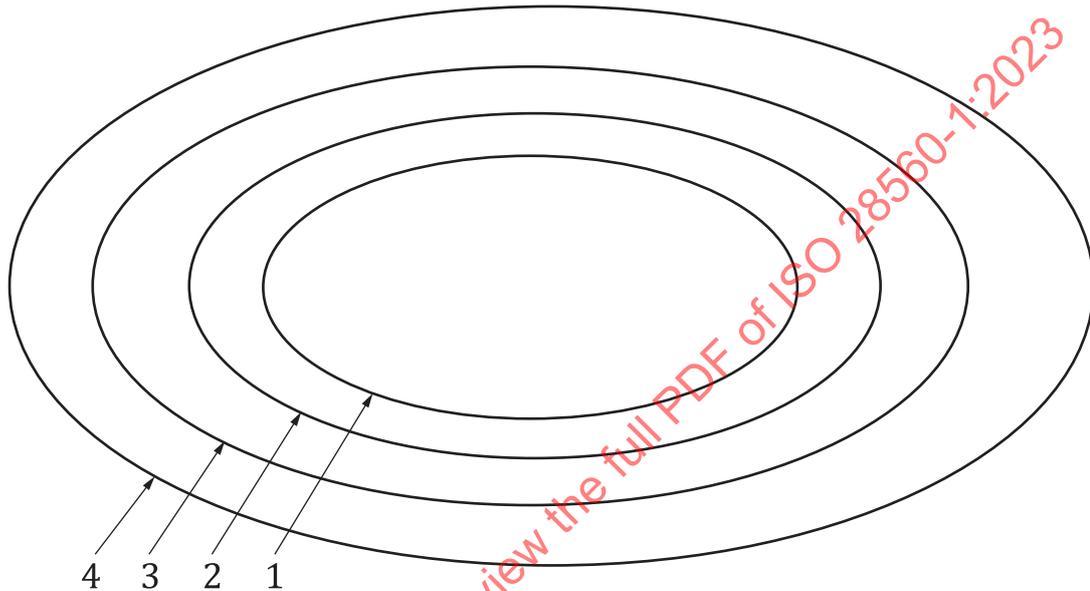
Key

1   all tagged items within a specific library or group of libraries
2   all tagged items in the library domain
3   all item with tags based on International Standards
4   the universe of all items with RFID tags

Figure B.1 — Venn diagram indicating restricted versus global uniqueness

If each of the sets in Figure B.1 was closed in the sense that no tagged item from outside can enter, the uniqueness issue would only need to consider the tags in this specific set. But this is normally not the case. Even in a specific library, tagged items from outside could enter. It can be interlibrary-loaned items, books tagged from the publisher, and it can even be a non-book object bought in a store. Therefore, the addition of necessary information on the library item tags to secure global uniqueness should be given, i.e. the AFI (as defined in 5.2.2) and the user data elements primary item identifier (see 4.2.1) and owner institution (ISIL) (see 4.2.3).

Annex C
(normative)

Type of usage code values (hexadecimal)

The type of usage data element can be a one-digit hexadecimal code (main qualifier) or it can be a two-digit hexadecimal code (main qualifier and sub-qualifier).

The main qualifier specifies a primary usage class and the sub-qualifier specifies a more detailed usage within the primary usage class.

An ISO 28560-compliant system shall be able to support values 0 to 9 of the main qualifier. Support of other main qualifier values and support of the sub-qualifier values are optional.

The maximum number of main qualifiers is 16. For each main qualifier, the maximum number of sub-qualifiers is 16. Values can be indicated "for future use". These are reserved for future assignment by ISO. The use of values proposed after the publication of this document can be found on the website given in Annex A.

The list of values for the main qualifier and the sub-qualifier is provided in Table C.1.

Table C.1 — Usage code values

Main qualifier hex	Class	Sub-qualifier hex	Usage
0	Acquisition item	0	Acquisition item, unspecified
		1	Acquisition item, for automated process
		2	Acquisition item, for manual process
		3 to F	For future use within the class
1	Item for circulation	0	Circulating item, unspecified
		1	Circulating item, for automatic sorting
		2	Circulating item, not for automatic sorting
		3	Circulating item, not for issue while offline
		4	Circulating item, not for return while offline
		5	Circulating item, not for issue or return while offline
		6 to F	For future use within the class
2	Item not for circulation	0	Non-circulating item, unspecified
		1 to F	For future use within the class
3 to 4	For local use	0	For local use, unspecified sub-class
		1 to F	For local use within the class
5	For future use	0	For future use, unspecified sub-class
		1 to F	For future use within the class
6	No information about usage on the tag	0	If the type of usage data element is locked, with a type of usage which can change over time, it should be encoded as a 6.
		1 to F	Not to be used

Table C.1 *(continued)*

Main qual-ifier hex	Class	Sub-qualifier hex	Usage
7	Discarded item	0	Discarded item, unspecified
		1	Discarded item, for sale
		2	Discarded item, sold
		3	Discarded item, for disposal
		4 to F	For future use within the class
8	Patron card	0	Patron card, unspecified
		1	Patron card, adult borrower
		2	Patron card, young adult borrower
		3	Patron card, standard child borrower
		4 to F	For future use within the class
9	Library equipment	0	Library equipment, unspecified
		1	Personal computer
		2	Video projector
		3	Overhead projector
		4	Whiteboard
		5 to F	For future use within the class
A to F	For future use	0	For future use, unspecified sub-class
		1 to F	For future use within the class