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Identification cards — Integrated circuit cards —

Part 4: Organization, security and commands for interchange

Cartes d'identification — Cartes à circuit intégré —

Partie 4: Organisation, sécurité et commandes pour les échanges

Reference number
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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

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 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 Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 17, *Cards and security devices for personal identification*.

This fourth edition cancels and replaces the third edition (ISO/IEC 7816-4:2013), which has been technically revised. It also incorporates the Amendments ISO/IEC 7816-4:2013/Amd.1:2018 and ISO/IEC 7816-4:2013/Amd.2:2018 and the Corrigendum ISO/IEC 7816-4:2013/Cor.1:2014.

The main changes compared to the previous edition are as follows:

— incorporation with the amendments and the corrigendum;

— revision of unclear portions and correction of editorial mistakes.

A list of all parts in the ISO/IEC 7816 series can be found on the ISO website.

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.

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Introduction

ISO/IEC 7816 (all parts)[4] is a series of standards specifying integrated circuit cards and the use of such cards for interchange. These cards are identification cards intended for information exchange negotiated between the outside world and the integrated circuit in the card. As a result of an information exchange, the card delivers information (computation result, stored data) and/or modifies its content (data storage, event memorization).

— Five parts are specific to cards with galvanic contacts and three of them specify electrical interfaces.
  — ISO/IEC 7816-1 specifies physical characteristics for cards with contacts.
  — ISO/IEC 7816-2 specifies dimensions and location of the contacts.
  — ISO/IEC 7816-3 specifies electrical interface and transmission protocols for asynchronous cards.
  — ISO/IEC 7816-10 specifies electrical interface and answer to reset for synchronous cards.
  — ISO/IEC 7816-12 specifies electrical interface and operating procedures for USB cards.
— All the other parts are independent from the physical interface technology. They apply to cards accessed by contacts and/or by radio frequency.
  — ISO/IEC 7816-4 specifies organization, security and commands for interchange.
  — ISO/IEC 7816-5 specifies registration of application providers.
  — ISO/IEC 7816-6 specifies interindustry data elements for interchange.
  — ISO/IEC 7816-7 specifies commands for structured card query language.
  — ISO/IEC 7816-8 specifies commands for security operations.
  — ISO/IEC 7816-9 specifies commands for card management.
  — ISO/IEC 7816-11 specifies personal verification through biometric methods.
  — ISO/IEC 7816-13 specifies commands for handling the life cycle of applications.
  — ISO/IEC 7816-15 specifies cryptographic information application.

ISO/IEC 10536 (all parts)[11] specifies access by close coupling. ISO/IEC 14443 (all parts)[14] and ISO/IEC 15693 (all parts)[16] specify access by radio frequency. Such cards are also known as contactless cards.

The International Organization for Standardization (ISO) and International Electrotechnical Commission (IEC) draw attention to the fact that it is claimed that compliance with this document may involve the use of a patent.

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Identification cards — Integrated circuit cards —

Part 4:
Organization, security and commands for interchange

1 Scope

This document is intended to be used in any sector of activity. It specifies:

— contents of command-response pairs exchanged at the interface,

— means of retrieval of data elements and data objects in the card,

— structures and contents of historical bytes to describe operating characteristics of the card,

— structures for applications and data in the card, as seen at the interface when processing commands,

— access methods to files and data in the card,

— a security architecture defining access rights to files and data in the card,

— means and mechanisms for identifying and addressing applications in the card,

— methods for secure messaging,

— access methods to the algorithms processed by the card. It does not describe these algorithms.

It does not cover the internal implementation within the card or the outside world.

This document is independent from the physical interface technology. It applies to cards accessed by one or more of the following methods: contacts, close coupling and radio frequency. If the card supports simultaneous use of more than one physical interface, the relationship between what happens on different physical interfaces is out of the scope of this document.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 7816-3, *Identification cards — Integrated circuit cards — Part 3: Cards with contacts — Electrical interface and transmission protocols*

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

ISO/IEC 8825-1, *Information technology — ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER) — Part 1:*

3 Terms and definitions

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

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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
access rule
data element (3.15) containing an access mode referring to an action and security conditions to fulfil before acting

3.2
Answer-to-Reset file
information file
EF.ATR/INFO
optional *EF* (3.22) indicating operating characteristics of the card

3.3
application
structures (3.55), *data elements* (3.15) and program modules needed for performing a specific functionality

3.4
application DF
dedicated file (*DF* (3.18)) hosting an *application* (3.3) in a card

3.5
application identifier
AID
data element (3.15) (up to sixteen bytes) that identifies an *application* (3.3)

3.6
application label
data element (3.15) for use at the man-machine interface

3.7
application provider
entity providing the components that make up an *application* (3.3) in the card

3.8
application template
set of application-relevant *data objects* (3.16) including one *application identifier* (3.5) *data object* (3.16)

3.9
asymmetric cryptographic technique
cryptographic technique that uses two related operations: a public operation defined by public numbers or by a *public key* (3.41) and a private operation defined by private numbers or by a *private key* (3.39)

Note 1 to entry: The two operations have the property that, given the public operation, it is computationally infeasible to derive the private operation.

3.10
base template
value field of constructed *data object* (3.16) excluding DOs resulting from resolution of indirect referencing

3.11
certificate
digital signature (3.20) binding a particular person or *object* (3.32) and its associated *public key* (3.41)

Note 1 to entry: The entity issuing the certificate also acts as tag allocation authority with respect to the data elements in the certificate.

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3.12
command-response pair
C-RP
set of two messages at the interface: a command APDU followed by a response APDU in the opposite direction

3.13
command chaining
means used by the outside world to tell the card that the command data of a sequence of successive *command-response pairs* (3.12) shall be processed together

3.14
context-specific class
class of a tag with its first or only byte from '80' to 'BF'

3.15
data element
item of information seen at the interface for which are specified a name, a description of logical content, a format and a coding

3.16
data object
information seen at the interface consisting of the concatenation of a mandatory tag field, a mandatory length field and a conditional value field

3.17
data unit
smallest set of bits that can be unambiguously referenced within an *EF* (3.22) supporting data units

3.18
dedicated file
DF
structure (3.55) containing file control information and, optionally, memory available for allocation

3.19
DF name
data element (3.15) (up to sixteen bytes) that uniquely identifies a *DF* (3.18) in the card

3.20
digital signature
data appended to, or cryptographic transformation of, a data string that proves the origin and the integrity of the data string and protects against forgery, e.g. by the recipient of the data string

3.21
directory file
EF.DIR
optional *EF* (3.22) containing a list of *applications* (3.3) supported by the card and optional related *data elements* (3.15)

3.22
elementary file
EF
set of *data units* (3.17) or *records* (3.42) or *data objects* (3.16) sharing the same *file identifier* (3.26)

3.23
extended header
data element (3.15) referencing one or several DOs in a constructed DO

3.24
extended header list
concatenation of *extended headers* (3.23)

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3.25
file
structure (3.55) for *application* (3.3) and/or data in the card, as seen at the interface when processing commands

3.26
file identifier
data element (3.15) (two bytes) used to address a *file* (3.25)

3.27
header list
concatenation of pairs of tag field and length field without delimiter

3.28
interindustry
items specified in the ISO/IEC 7816[4] series

3.29
internal EF
EF (3.22) for storing data interpreted by the card

3.30
key
sequence of symbols controlling a cryptographic operation

EXAMPLE Encipherment, decipherment, a private or a public operation in a dynamic authentication, signature generation, signature verification.

3.31
master file
MF
unique *DF* (3.18) representing the root in a card using a hierarchy of *DFs* (3.18)

3.32
object
structure (3.55) plus *security object* (3.52)

3.33
offset
number sequentially referencing a *data unit* (3.17) in an *EF* (3.22) supporting *data units* (3.17), or a byte in a *record* (3.42)

3.34
oversize payload
payload (3.38) which exceeds the current size constraints of the APDU

3.35
parent file
DF (3.18) immediately preceding a given *file* (3.25) within a hierarchy of *DFs* (3.18)

3.36
password
data that may be required by the *application* (3.3) to be presented to the card by its *user* (3.63) for authentication purpose

3.37
path
concatenation of *file identifiers* (3.26) without delimiter

3.38
payload
data of arbitrary length, to be sent to the card or by the card, in order to be processed together

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3.39
private key
key (3.30) of an entity's asymmetric key pair which should only be used by that entity

3.40
provider
authority who has or who obtained the right to create a *DF* (3.18) in the card

3.41
public key
key (3.30) of an entity's asymmetric key pair that can be made public

3.42
record
string of bytes referenced and handled by the card within an *EF* (3.22) supporting records

3.43
record identifier
number used to reference one or more *records* (3.42) within an *EF* (3.22) supporting records

3.44
record number
sequential number that uniquely identifies each *records* (3.42) within an *EF* (3.22) supporting records

3.45
registered application provider identifier
RID
data element (3.15) (five bytes) that uniquely identifies an *application provider* (3.7)

3.46
resetting code
data to be presented to a card in order to modify the value of a counter

3.47
response chaining
means used by the card to tell the outside world that the response data of any *command-response pair* (3.12) followed by the response data of a sequence of GET RESPONSE command-response pairs should be processed together

3.48
secret key
key (3.30) used with *symmetric cryptographic techniques* (3.56) by a set of specified entities

3.49
secure messaging
SM
set of means for cryptographic protection of (parts of) *command-response pairs* (3.12)

3.50
security attribute
condition of use of *objects* (3.32) in the card including stored data and data processing functions, expressed as a *data element* (3.15) containing one or more *access rules* (3.1)

3.51
security environment
SE
set of components required by an *application* (3.3) in the card for *secure messaging* (3.49) or for security operations

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3.52
security object
standalone object nested in an *EF* (3.22), a *record* (3.42), a *data object* (3.16), a DataString or a combination thereof that endorses security handling according to this document

EXAMPLE Password, password type, reference data including biometric, reference data type, *certificate* (3.11), certificate type or *key* (3.30).

3.53
self-controlled DO
constructed DO which nests at least a DO'62' nesting *security attributes* (3.50)

3.54
short EF identifier
data element (3.15) (five bits) used to address an elementary file

3.55
structure
DF (3.18), *EF* (3.22), *record* (3.42), DataString or DO

3.56
symmetric cryptographic technique
cryptographic technique using the same *secret key* (3.48) for both the originator's and the recipient's operation (without the secret key, it is computationally infeasible to compute either operation)

3.57
tag list
concatenation of tag fields without delimiter

3.58
tagged wrapper
wrapper (3.67) which provides a tag for local addressing of the DO it references

3.59
template
concatenation of BER-TLV *data objects* (3.16), forming the value field of a constructed BER-TLV *data object* (3.16)

3.60
template extension
part of the value field of a constructed DO resulting from automatic resolution of indirect referencing

3.61
transient selection
structure (3.55) selection needed when performing a *C-RP* (3.12), the success of which will not modify the current *validity area* (3.64)

3.62
transient VA
validity area (3.64) set transiently during execution of a command which handles DOs

3.63
user
user of the card, also known as cardholder

3.64
validity area
VA
result of all successful selections performed on a logical channel

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3.65
virtual root DO
virtual constructed DO'7F70' made current by the selection of a *file* (3.25), a *record* (3.42) or a DataString supporting DO handling

3.66
working EF
EF (3.22) for storing data not interpreted by the card

3.67
wrapper
concatenation of DOs referencing a DO

4 Symbols and abbreviated terms

AID	application identifier
AMB	access mode byte
AMF	access mode field
APDU	application protocol data unit
ARR	access rule reference
ASN.1	abstract syntax notation one (see ISO/IEC 8825-1)
AT	control reference template for authentication
ATR	Answer-to-Reset
BER	basic encoding rules of ASN.1 (see ISO/IEC 8825-1)
CC	cryptographic checksum
CCT	control reference template for cryptographic checksum
CG	cryptogram
CLA	class byte
CLA**	CLA with SM indication (bits b8, b7 and b6 set to 000 and bits b4 and b3 set to 11)
CRT	control reference template
CT	control reference template for confidentiality
CP	control parameter (file control parameter or data object control parameter)
CP DO	control parameter BER-TLV data object
C-RP	command-response pair
DF	dedicated file
DIR	directory
DO	BER-TLV data object
DO'...'	BER-TLV data object, the tag of which is a hexadecimal value given between simple quotes
DS	digital signature
DST	control reference template for digital signature
EF	elementary file
EF.ARR	access rule reference file
EF.ATR/INFO	Answer-to-Reset file or Information file
EF.DIR	directory file
FCI	file control information
FCP	file control parameter
FMD	file management data

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