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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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC 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) or the IEC list of patent declarations received (see http://patents.iec.ch).

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

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 27, *IT Security techniques*.

This fourth edition cancels and replaces the third edition (ISO/IEC 10118-3:2004), which has been technically revised. It also incorporates the Amendment ISO/IEC 10118-3:2004/Amd1:2006 and Technical Corrigendum ISO/IEC 10118-3:2004/Cor1:2011.

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

— SHA-3, STREEBOG and SM3 hash-functions have been included;

— SHA-3 extendable-output functions have been included;

— cautionary notes for hash-functions with short hash-codes have been added.

A list of all parts in the ISO/IEC 10118 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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IT Security techniques — Hash-functions —

Part 3:
Dedicated hash-functions

1 Scope

This document specifies dedicated hash-functions, i.e. specially designed hash-functions. The hash-functions in this document are based on the iterative use of a round-function. Distinct round-functions are specified, giving rise to distinct dedicated hash-functions.

The use of Dedicated Hash-Functions 1, 2 and 3 in new digital signature implementations is deprecated.

NOTE As a result of their short hash-code length and/or cryptanalytic results, Dedicated Hash-Functions 1, 2 and 3 do not provide a sufficient level of collision resistance for future digital signature applications and they are therefore, only usable for legacy applications. However, for applications where collision resistance is not required, such as in hash-functions as specified in ISO/IEC 9797-2, or in key derivation functions specified in ISO/IEC 11770-6, their use is not deprecated.

Numerical examples for dedicated hash-functions specified in this document are given in Annex B as additional information. For information purposes, SHA-3 extendable-output functions are specified in Annex C.

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 10118-1, *Information technology — Security techniques — Hash-functions — Part 1: General*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 10118-1 and the following 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
block
bit string of length L_1, i.e., the length of the first input to the round-function

3.2
word
string of bits

3.3
circulant matrix
matrix with the property that each row, apart from the first, consists of the right cyclic shift by one position of the row immediately above it

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3.4
abelian group
group (G, *) such that $a*b = b*a$ for every a and b in G

3.5
field
set of elements S and a pair of operations (+,*) defined on S such that: (i) $a*(b + c) = a*b + a*c$ for every a, b and c in S, (ii) S together with + forms an abelian group (with identity element 0) and (iii) S excluding 0 together with * forms an abelian group

4 Symbols

4.1 Symbols specified in ISO/IEC 10118-1

B_i	byte
D	data
H	hash-code
IV	initializing value
L_1	length (in bits) of the first of the two input strings to the round-function Φ
L_2	length (in bits) of the second of the two input strings to the round-function Φ, of the output string from the round-function Φ and of the IV
L_X	length (in bits) of a bit string X
$X \oplus Y$	bitwise exclusive-or of bit strings X and Y (where $L_X = L_Y$)
$X \| \| Y$	concatenation of strings of bits X and Y in the indicated order
Φ	a round-function, i.e. if X, Y are bit strings of lengths L_1 and L_2 respectively, then $\Phi(X, Y)$ is the string obtained by applying Φ to X and Y

4.2 Symbols specific to this document

A^i	sequence of constant matrices used in the specification of the round-function defined in Clause 16
A^n	concatenation of n instances of the word A
a_i, a'_i	sequences of indices used in specifications of a round-function
C_i, C'_i	constant words used in the round-functions
C''	8 × 8 circulant matrix with entries chosen from GF(2^8) used in the specification of the round-function in Clause 16
c_0	function taking a string of 64 elements of GF(2^8) as input and giving an 8 × 8 matrix with entries from GF(2^8) as output, used in specifying the round-function defined in Clause 16
c_1, c_2, c_3	functions taking an 8 × 8 matrix of elements of GF(2^8) as input and giving an 8 × 8 matrix with entries from GF(2^8) as output, used in the specification of the round-function defined in Clause 16

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