

# INTERNATIONAL STANDARD

# ISO/IEC 29192-2

Second edition  
2019-11

---

---

## Information security — Lightweight cryptography —

### Part 2: Block ciphers

*Sécurité de l'information — Cryptographie pour environnements  
contraints —*

*Partie 2: Chiffrements par blocs*



Reference number  
ISO/IEC 29192-2:2019(E)

© ISO/IEC 2019



**COPYRIGHT PROTECTED DOCUMENT**

© ISO/IEC 2019

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

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](mailto:copyright@iso.org)  
Website: [www.iso.org](http://www.iso.org)

Published in Switzerland

# Contents

Page

<b>Foreword</b> .....	<b>iv</b>
<b>Introduction</b> .....	<b>v</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Terms and definitions</b> .....	<b>1</b>
<b>4 Symbols</b> .....	<b>2</b>
<b>5 Lightweight block cipher with a block size of 64 bits</b> .....	<b>2</b>
5.1 General.....	2
5.2 PRESENT.....	2
5.2.1 PRESENT algorithm.....	2
5.2.2 PRESENT specific notation.....	2
5.2.3 PRESENT encryption.....	3
5.2.4 PRESENT decryption.....	4
5.2.5 PRESENT transformations.....	4
5.2.6 PRESENT key schedule.....	5
<b>6 Lightweight block ciphers with a block size of 128 bits</b> .....	<b>7</b>
6.1 General.....	7
6.2 CLEFIA.....	7
6.2.1 CLEFIA algorithm.....	7
6.2.2 CLEFIA specific notation.....	7
6.2.3 CLEFIA encryption.....	7
6.2.4 CLEFIA decryption.....	8
6.2.5 CLEFIA building blocks.....	9
6.2.6 CLEFIA key schedule.....	14
6.3 LEA.....	24
6.3.1 LEA algorithm.....	24
6.3.2 LEA specific notation.....	24
6.3.3 LEA encryption.....	24
6.3.4 LEA decryption.....	26
6.3.5 LEA key schedule.....	27
<b>Annex A (normative) Object identifiers</b> .....	<b>30</b>
<b>Annex B (informative) Numerical examples</b> .....	<b>31</b>
<b>Annex C (informative) Feature tables</b> .....	<b>53</b>
<b>Annex D (informative) A limitation of a block cipher under a single key</b> .....	<b>55</b>
<b>Bibliography</b> .....	<b>56</b>

## 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](http://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](http://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](http://www.iso.org/iso/foreword.html).

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](http://www.iso.org/members.html).

This document was prepared by Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 27, *Information security, cybersecurity and privacy protection*.

This second edition cancels and replaces the first edition (ISO/IEC 29192-2:2012), which has been technically revised.

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

- the LEA algorithm has been added to [6.3](#);
- numerical examples and feature tables of LEA have been added to [B.3](#) and [Annex C](#).

A list of all parts in the ISO/IEC 29192 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](http://www.iso.org/members.html).

## Introduction

ISO/IEC 29192-1 specifies the requirements for lightweight cryptography.

A block cipher maps blocks of  $n$  bits to blocks of  $n$  bits, under the control of a key of  $k$  bits.

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

ISO and IEC takes no position concerning the evidence, validity and scope of this patent right.

The holder of this patent right has assured ISO and IEC that he/she is willing to negotiate licences under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holder of this patent right is registered with ISO and IEC. Information may be obtained from the patent database available at [www.iso.org/patents](http://www.iso.org/patents).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights other than those in the patent database. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

[This is a preview - click here to buy the full publication](#)

# Information security — Lightweight cryptography —

## Part 2: Block ciphers

### 1 Scope

This document specifies three block ciphers suitable for applications requiring lightweight cryptographic implementations:

- PRESENT: a lightweight block cipher with a block size of 64 bits and a key size of 80 or 128 bits;
- CLEFIA: a lightweight block cipher with a block size of 128 bits and a key size of 128, 192 or 256 bits;
- LEA: a lightweight block cipher with a block size of 128 bits and a key size of 128, 192 or 256 bits.

### 2 Normative references

There are no normative references in this document.