INTERNATIONAL STANDARD

ISO/IEC 20830

First edition
2021-08

Information technology — Automatic identification and data capture techniques — Han Xin Code bar code symbology specification

Technologies de l'information — Techniques d'identification et de capture de données automatiques — Spécification des symboles du code à barres de Han Xin

Reference number
ISO/IEC 20830:2021(E)

© ISO/IEC 2021



COPYRIGHT PROTECTED DOCUMENT

© ISO/IEC 2021

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
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword ... **vi**
Introduction ... **vii**
1 Scope ... **1**
2 Normative references ... **1**
3 Terms, definitions, and symbols ... **1**
3.1 Terms and definitions ... 1
3.2 Mathematical and logical symbols ... 3
4 Symbology description ... **4**
4.1 Symbology characteristics ... 4
4.1.1 Basic characteristics ... 4
4.1.2 Summary of additional features ... 5
4.2 Symbol structure ... 5
4.2.1 General ... 5
4.2.2 Symbol Versions and Sizes ... 6
4.2.3 Finder Pattern ... 8
4.2.4 Position Detection Pattern separator ... 10
4.2.5 Alignment Pattern ... 10
4.2.6 Assistant Alignment Pattern ... 13
4.2.7 Structural Information Region ... 13
4.2.8 Data Region ... 14
4.2.9 Quiet Zone ... 14
5 Requirements ... **15**
5.1 Encode procedure overview ... 15
5.2 Data analysis ... 16
5.3 Mode ... 17
5.3.1 General ... 17
5.3.2 Numeric mode ... 19
5.3.3 Text mode ... 19
5.3.4 Binary byte mode ... 19
5.3.5 Common Chinese Characters in Region One mode ... 19
5.3.6 Common Chinese Characters in Region Two mode ... 20
5.3.7 GB18030 2-byte Region mode ... 20
5.3.8 GB18030 4-byte Region mode ... 20
5.3.9 Extended Channel Interpretation (ECI) mode ... 20
5.3.10 Unicode mode ... 20
5.3.11 GS1 mode ... 20
5.3.12 URI mode ... 21
5.4 Data encoding ... 21
5.4.1 General ... 21
5.4.2 Constructing the information bit stream ... 21
5.4.3 Constructing information codewords sequence ... 21
5.4.4 Numeric mode encoding ... 21
5.4.5 Text mode encoding ... 23
5.4.6 Binary mode encoding ... 24
5.4.7 Common Chinese Characters in Region One mode encoding ... 25
5.4.8 Common Chinese Characters in Region Two mode encoding ... 26
5.4.9 GB18030 2-byte Region mode encoding ... 27
5.4.10 GB18030 4-byte Region mode encoding ... 28
5.4.11 ECI mode encoding ... 29
5.4.12 Unicode mode ... 30
5.4.13 GS1 mode encoding ... 33
5.4.14 URI mode ... 36

© ISO/IEC 2021 – All rights reserved

5.4.15 Mixed modes encoding 41
5.5 Error detection and correction 42
5.5.1 General 42
5.5.2 Generating the error correction codewords 42
5.5.3 Error correction capacity 44
5.6 User considerations for encoding data in a Han Xin Code symbol 44
5.6.1 General 44
5.6.2 User selection of error correction level 44
5.6.3 User selection of mode 44
5.6.4 User selection of Extended Channel Interpretation 45
5.6.5 User selection of symbol size 45
5.7 Construction of final data bit stream 45
5.8 Symbol construction 45
5.8.1 General 45
5.8.2 Fixed Pattern placement 45
5.8.3 Data placement 46
5.8.4 Masking 48
5.8.5 Structural Information placement 49

6 Symbol dimensions 50
6.1 Dimensions 50
6.2 Quiet zone 50

7 User guidelines 50
7.1 Human readable interpretation 50
7.2 Autodiscrimination capability 51
7.3 Principle of Han Xin Code symbol printing and scanning 51

8 Symbol quality 51
8.1 General 51
8.2 Symbol quality parameters 51
8.2.1 General 51
8.2.2 Fixed Pattern damage 51
8.2.3 Symbol grade 51
8.2.4 Grid non-uniformity 51
8.3 Process control measurements 51

9 Decoding procedure overview 52

10 Reference decode algorithm for Han Xin Code 53
10.1 General 53
10.2 Image preprocessing 53
10.3 Locate Finder Pattern and determine the orientation 53
10.4 Structural Information decoding 55
10.5 Establish the sampling grid 56
10.6 Sampling 63
10.7 Masking releasing 63
10.8 Restore data codewords 64
10.9 Error correction decoding 64
10.10 Data codeword decoding 64

11 Transmitted data 64
11.1 General 64
11.2 Basic interpretation 64
11.3 Protocol for Extended Channel Interpretation 64
11.4 Protocol for GS1 data transmission 65

Annex A (normative) **Alignment Pattern parameters of symbol of different versions 66**

Annex B (normative) **Data capacity and error correction characterics of Han Xin Code 69**

Annex C (informative) **Information capacity of Han Xin Code 84**

 © ISO/IEC 2021 – All rights reserved

Annex D (normative) **Error correction codeword generator polynomials** **93**
Annex E (normative) **Structural Information** **95**
Annex F (informative) **Autodiscrimination compatibility** **98**
Annex G (informative) **Error correction decoding algorithm** **99**
Annex H (informative) **User guidance for Han Xin Code printing and scanning** **101**
Annex I (normative) **Print quality of Han Xin Code — Symbology-specific aspects** **103**
Annex J (informative) **Useful process control techniques** **107**
Annex K (informative) **Han Xin Code encoding examples** **108**
Annex L (informative) **Symbology identifier** **129**
Annex M (normative) **Charsets of URI mode** **130**
Annex N (normative) **Source codes for Unicode modein C programming** **137**
Annex O (informative) **Implement Source code for URI modein C programming** **161**
Bibliography **196**

© ISO/IEC 2021 – All rights reserved

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 or www.iec.ch/members_experts/refdocs).

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 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. In the IEC, see www.iec.ch/understanding-standards.

This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 31, *Automatic identification and data capture techniques*.

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 and www.iec.ch/national-committees.

© ISO/IEC 2021 – All rights reserved

Introduction

Han Xin Code is a two-dimensional matrix symbology which is made up of an array of nominally square modules arranged in an overall square pattern, including a Finder Pattern located at four corners of the symbol that are intended to assist in easy locating of its position, size and inclination. Alignment Patterns and Assistant Alignment Patterns are also used in Versions 4 to 84 symbols. A wide range of size of symbols is provided together with four error correction levels. Module dimension is user-specified to produce symbols by a wide variety of techniques.

Manufacturers of bar code equipment and users of the technology require publicly available standard symbology specifications to which they can refer when developing equipment and application standards. This document is published to meet this request.

© ISO/IEC 2021 – All rights reserved

Information technology — Automatic identification and data capture techniques — Han Xin Code bar code symbology specification

1 Scope

This document defines the requirements for the symbology known as Han Xin Code. It specifies the Han Xin Code symbology characteristics, data encoding process, symbol structure, dimensions and print quality requirements, error correction rules, reference decoding algorithm, and user-selectable application parameters.

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 646, *Information technology — ISO 7-bit coded character set for information interchange*

ISO/IEC 15415:2011, *Information technology — Automatic identification and data capture techniques — Bar code symbol print quality test specification — Two-dimensional symbols*

ISO/IEC 15416, *Automatic identification and data capture techniques — Bar code print quality test specification — Linear symbols*

ISO/IEC 15424, *Information technology — Automatic identification and data capture techniques — Data Carrier Identifiers (including Symbology Identifiers)*

ISO/IEC 19762, *Information technology — Automatic identification and data capture (AIDC) techniques — Harmonized vocabulary*

GS1 General Specifications

3 Terms, definitions, and symbols

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 19762 and the following 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/

3.1.1
assistant alignment pattern
non-data pattern located in the perimeter of the Han Xin Code symbol and intended to provide additional reference points to synchronize modules for reading

© ISO/IEC 2021 – All rights reserved

3.1.2
data bit stream
binary sequence that comprises the *information bit stream* (3.1.9) and the *error correction bit stream* (3.1.4)

3.1.3
data codeword
codeword that is used to encode information codewords and error correction codewords.

3.1.4
error correction bit stream
binary sequence used to correct errors, made by error correction encoding from the *information bit stream* (3.1.9)

3.1.5
Unicode
international encoding standard for use with different languages and scripts, by which each letter, digit, or symbol applies across different platforms and programs.

Note 1 to entry: The repertoire of Unicode is synchronized with ISO/IEC 10646, and both are code-for-code identical.

3.1.6
GS1 mode
encoding *mode* (3.1.10) used for representing GS1 data in Han Xin Code

3.1.7
URI mode
encoding *mode* (3.1.11) used for representing uniform resource identifier (URI) described in RFC 3986 in Han Xin Code

3.1.8
Unicode mode
encoding *mode* (3.1.11) used for representing text data in *Unicode* (3.1.5) encoding/charset in Han Xin Code.

3.1.9
information bit stream
binary sequence made up of *mode* (3.1.11) encodings from the original input data

3.1.10
masking
XOR processing of the bit pattern in the information encoding region of the symbol with an algorithmically determined pattern to provide a symbol with more evenly balanced numbers of dark and light modules and to reduce the occurrence of patterns which would interfere with fast processing of the image

3.1.11
mode
method of representing a specific character set as a binary bit stream

3.1.12
mode indicator
bit sequence indicating in which *mode* (3.1.11) the following data sequence is encoded

3.1.13
mode terminator
bit sequence used to terminate the bit sequence representing an encoding *mode* (3.1.11)

© ISO/IEC 2021 – All rights reserved

3.1.14
padding bit
bit "0", appended to the *information bit stream* (3.1.9) to meet the requirements of the error correction algorithm

3.1.15
position detection pattern
one of the four pattern components of the Finder Pattern in Han Xin Code symbols

3.1.16
position detection center
center of the 3 × 3 dark modules in the *position detection pattern* (3.1.15)

3.1.17
position detection pattern separator
one-module wide non-data pattern, made up of all light modules, used to separate the *position detection pattern* (3.1.15) from the *structural information* (3.1.18) region

3.1.18
structural information
bit stream of data used to record *version* (3.1.20), error correction level and *masking* (3.1.10) solution

3.1.19
symbol padding bit
bit "0", not representing data, used to fill the empty positions of the symbol when the information encoding region cannot be fully filled with 8-bit codewords

3.1.20
version
size of the symbol represented in terms of its position in the sequence of permissible sizes for Han Xin Code symbols, from 23 × 23 modules (Version 1) to 189 × 189 modules (Version 84)

3.2 Mathematical and logical symbols

d	number of error correction codewords
e	number of erasures
k	total number of information codewords
n	total number of data codewords
t	number of errors
X	horizontal width of a module
Y	vertical distance from the center line of modules in one row to the center line of modules in an adjacent row
$(\ldots)_{bin}$	data in ( ) is figured in binary system
…HEX	data is figured in hexadecimal
$(\ldots)_{hex}$	data in ( ) is figured in hexadecimal

© ISO/IEC 2021 – All rights reserved