



GSMP:

## General Specifications Change Notification (GSCN)

WR #	GSCN Name	Effective Date
17-252	Continuous Improvement of GS1 General Specifications	20-Dec-2017

### Associated Work Request (WR) Number:

17-000252

### Background:

The GS1 General Specifications structure has become quite unclear, due to additions over the last years that were not really integrated. This makes it difficult for users, GS1 MOs and Industry Partners to read and work with the GenSpecs and rely on the rules contained. This work request aims, as a first step, to provide a better structured sections 2 and 5, without making any changes to the section names and content.

### GS1 General Specification Change:

The recommended changes are highlighted below, relative to GS1 General Specifications version 17.1.

### Disclaimer

GS1®, under its IP Policy, seeks to avoid uncertainty regarding intellectual property claims by requiring the participants in the Work Group that developed this **General Specifications Change Notification** to agree to grant to GS1 members a royalty-free licence or a RAND licence to Necessary Claims, as that term is defined in the GS1 IP Policy. Furthermore, attention is drawn to the possibility that an implementation of one or more features of this Specification may be the subject of a patent or other intellectual property right that does not involve a Necessary Claim. Any such patent or other intellectual property right is not subject to the licencing obligations of GS1. Moreover, the agreement to grant licences provided under the GS1 IP Policy does not include IP rights and any claims of third parties who were not participants in the Work Group.

Accordingly, GS1 recommends that any organization developing an implementation designed to be in conformance with this Specification should determine whether there are any patents that may encompass a specific implementation that the organisation is developing in compliance with the Specification and whether a licence under a patent or other intellectual property right is needed. Such a determination of a need for licencing should be made in view of the details of the specific system designed by the organisation in consultation with their own patent counsel.

THIS DOCUMENT IS PROVIDED "AS IS" WITH NO WARRANTIES WHATSOEVER, INCLUDING ANY WARRANTY OF MERCHANTABILITY, NONINFRINGEMENT, FITNESS FOR PARTICULAR PURPOSE, OR ANY WARRANTY OTHERWISE ARISING OUT OF THIS SPECIFICATION. GS1 disclaims all liability for any damages arising from use or misuse of this Standard, whether special, indirect, consequential, or compensatory damages, and including liability for infringement of any intellectual property rights, relating to use of information in or reliance upon this document.

GS1 retains the right to make changes to this document at any time, without notice. GS1 makes no warranty for the use of this document and assumes no responsibility for any errors which may appear in the document, nor does it make a commitment to update the information contained herein.

GS1 and the GS1 logo are registered trademarks of GS1 AISBL.

# Table of Contents

<b>1</b>	<b>1 Basics and principles of the GS1 system 6</b>	<b>5</b>
<b>2</b>	<b>2 Application standards 16</b>	<b>5</b>
2.1	2.1 Trade items 17	5
2.1.1	2.1.1 Introduction 17	5
2.1.2	2.1.2 Fixed measure trade items – open supply chain 19	5
2.1.3	2.1.2.1 General retail consumer trade items scanned in general retail at POS 19	5
2.1.4	2.1.2.2 Fresh food trade items scanned in general retail at POS 28	5
2.1.5	2.1.2.3 Trade items intended for general distribution and POS 30	5
2.1.6	2.1.2.4 Healthcare primary packaging (non-retail trade items) 30	5
2.1.7	2.1.2.5 Healthcare secondary packaging (Regulated healthcare retail consumer trade items) 32	6
2.1.8	2.1.2.6 Trade items intended for general distribution scanning only 34	6
2.1.9	2.1.2.7 Medical devices (non-retail trade items) 42	6
2.1.10	2.1.3 Fixed measure trade items packed in several individual pieces not scanned at POS 43	6
2.1.11	2.1.4 Direct marking 45	6
2.1.12	2.1.5 Variable measure trade items – packages / containers not scanned in general retail at point-of-sale 48	6
2.1.13	2.1.6 Fixed measure trade items – restricted distribution 55	6
2.1.14	2.1.7 Variable measure trade items scanned in general retail at POS 60	6
2.1.15	2.1.8 Trade item extended packaging 64	6
2.2	2.2 Logistic units 67	7
2.2.1	2.2.1 Individual logistic units 67	7
2.2.2	2.2.2 Multiple logistic units – Global Identification Number for Consignment 69	7
2.2.3	2.2.3 Multiple logistic units – Global Shipment Identification Number 70	7
2.3	2.3 Assets 71	7
2.3.1	2.3.1 Global Returnable Asset Identifier (GRAI): AI (8003) 71	7
2.3.2	2.3.2 Global Individual Asset Identifier (GIAI): AI (8004) 72	7
2.4	2.4 Locations and parties 75	7
2.4.1	2.4.1 GLN definition 75	7
2.4.2	2.4.2 GLN in electronic data sharing standards 75	7
2.4.3	2.4.3 Application overview 76	7
2.4.4	2.4.3.1 Identification of a physical location 76	7
2.4.5	2.4.3.2 Specification of a physical location 78	7
2.4.6	2.4.3.3 Specification of a party 80	7
2.5	2.5 Service relationships 82	7
2.5.1	2.5.1 Global Service Relation Number – Provider: AI (8017) 82	7
2.5.2	2.5.2 Global Service Relation Number – Recipient: AI (8018) 83	7
2.5.3	2.5.3 Service Relation Instance Number: AI (8019) 85	7
2.6	2.6 Special applications 86	8
2.6.1	2.6.1 Coupons 86	8
2.6.2	2.6.2 Coupons identified using the Global Coupon Number 86	8
2.6.3	2.6.3 Coupons with restricted geographic distribution 90	8
2.6.4	2.6.4 Refund receipts 95	8



2.6.5	2.6.5 Electronic serial identifier for cellular mobile telephones (CMTI): AI (8002) 96	8
2.6.6	2.6.6 Payment slips 97	8
2.6.7	2.6.7 Customer specific articles 99	8
2.6.8	2.6.8 Custom trade item 104	9
2.6.9	2.6.9 Global Document Type Identifier for document control 106	9
2.6.10	2.6.10 Internal applications 112	9
2.7	2.7 Summary of applications and operative scanning environments for GS1 system symbols	117
		9
<b>3</b>	<b>3 GS1 Application Identifier definitions</b>	<b>120</b>
<b>4</b>	<b>4 Application rules and management practices</b>	<b>171</b>
<b>5</b>	<b>5 Data carriers</b>	<b>204</b>
5.1	5.1 Introduction	205
5.1.1	5.1.1 International standards	207
5.1.2	5.1.2 Symbology identifiers	208
5.2	5.2 Linear barcodes - EAN/UPC symbology specifications	209
5.2.1	5.2.1 Symbology characteristics	209
5.2.2	5.2.2 Reference decode algorithm	219
5.2.3	5.2.3 Human readable interpretation	222
5.2.4	5.2.4 Additional features	223
5.3	5.3 Linear barcodes - ITF-14 symbology specifications	230
5.3.1	5.3.1 Symbology characteristics	230
5.3.2	5.3.2 Symbol structure	230
5.3.3	5.3.3 Additional features (informative)	234
5.3.4	5.3.4 Guidelines for the use of ITF-14 (informative)	234
5.4	5.4 Linear barcodes - GS1-128 symbology specifications	237
5.4.1	5.4.1 GS1-128 symbology characteristics	237
5.4.2	5.4.2 GS1-128 barcode structure	238
5.4.3	5.4.3 GS1-128 symbology character assignments	238
5.4.4	5.4.4 Dimensional requirements	245
5.4.5	5.4.5 Reference decode algorithm	245
5.4.6	5.4.6 Symbol quality	247
5.4.7	5.4.7 GS1-128 symbology application parameters	249
<b>5.5</b>	<b>5.6 Linear barcodes – GS1 DataBar</b>	<b>299</b>
5.5.1	5.6.1 Introduction	299
5.5.2	5.6.2 Symbol structure	300
5.5.3	5.6.3 Print quality grade	309
<b>5.6</b>	<b>5.7 Two dimensional barcodes – GS1 DataMatrix symbology</b>	<b>311</b>
5.6.1	5.7.1 Introduction	311
5.6.2	5.7.2 GS1 DataMatrix features and symbol basics	311
5.6.3	5.7.3 GS1 DataMatrix symbology	312
<b>5.7</b>	<b>5.9 Two dimensional barcodes – GS1 QR Code symbology</b>	<b>328</b>
5.7.1	5.9.1 Introduction	328
5.7.2	5.9.2 GS1 QR Code features and symbol basics	328
5.7.3	5.9.3 Summary of additional features	329
5.7.4	5.9.4 GS1 QR Code symbology	330
5.8	5.8 Composite barcodes	317



5.8.1	5.8.1 Composite symbology introduction 317	14
5.8.2	5.8.2 Symbol structure 318	14
5.8.3	5.8.3 Human readable interpretation of Composite symbols 323	14
5.8.4	5.8.4 Data transmission and symbology identifier prefixes 323	14
5.8.5	5.8.5 Width of a module (X) 324	15
5.8.6	5.8.6 Print quality 324	15
5.8.7	5.8.7 Advice for selecting a symbology 324	15
5.8.8	5.8.8 Sample Composite symbols 325	15
<b>5.9</b>	<b>5.5 Barcode production and quality assessment 252</b>	<b>15</b>
5.9.1	5.5.1 Introduction 252	15
5.9.2	5.5.2 Dimensional specifications and operational requirements 252	15
<b>5.9.3</b>	<b>5.5.2.7 GS1 system symbol specification tables 258</b>	<b>15</b>
5.9.4	5.5.3 Barcode production 276	15
<b>5.9.5</b>	<b>5.5.3.3 Quality assessment 280</b>	<b>16</b>
<b>5.9.6</b>	<b>5.5.3.4 Print process characterisation techniques 292</b>	<b>16</b>
<b>5.9.7</b>	<b>5.5.3.5 GS1 barcode verification template 294</b>	<b>16</b>
<b>6</b>	<b>6 Symbol placement guidelines 340</b>	<b>17</b>
<b>7</b>	<b>7 AIDC validation rules 405</b>	<b>17</b>
7.1	7.1 Introduction 413	17
7.2	7.2 Synopsis of message processing 414	17
7.2.1	7.2.1 Analysis of the data carrier and plausibility test for element strings 415	17
7.2.2	7.2.2 Symbology identification 415	17
7.2.3	7.2.3 Prefix in internal table 415	17
7.2.4	7.2.4 Item Identification 416	17
7.2.5	7.2.5 GS1 Application Identifier (AI) in internal table 416	17
7.2.6	7.2.6 Length of Data 14 Digits 416	17
7.2.7	7.2.7 Check digit calculation and other system checks 416	17
7.2.8	7.2.8 Move element string to message field 416	17
7.3	7.3 Validation of the electronic message regarding system consistency 417	17
7.4	7.4 Validation of the electronic message regarding user requirements 418	17
7.5	7.5 Conversion of weights and measures in user applications 418	17
7.6	7.6 Linkage of GTINs in a database 420	18
7.6.1	7.6.1 The principle 420	18
7.6.2	7.6.2 Extended example of a trade item hierarchy 421	18
7.6.3	7.6.3 Linkage of GTINs in a non-relational database by trade item manufacturer 422	18
7.7	7.7 Element strings represented in data carriers 422	18
7.7.1	7.7.1 Element strings represented in GS1 system data carriers 423	18
7.7.2	7.7.2 Element strings represented in a GS1 symbology using GS1 Application Identifiers 424	18
7.8	7.8 Processing of data from a GS1 symbology using GS1 Application Identifiers 425	18
7.8.1	7.8.1 General 426	18
7.8.2	7.8.2 Element strings with predefined lengths using GS1 Application Identifiers 426	18
7.8.3	7.8.3 The separator character and its value 426	18
<b>7.8.4</b>	<b>5.10.1 The basic structure of GS1 barcodes using GS1 Application Identifiers and concatenation 335</b>	<b>18</b>
<b>7.8.5</b>	<b>5.10.2 Concatenation 336</b>	<b>18</b>
<b>7.8.6</b>	<b>5.10.3 GS1 Application Identifiers with implied decimal point positions 339</b>	<b>18</b>
7.8.7	7.8.4 National Healthcare Reimbursement Number (NHRN) 426	18



---

7.9	7.9 Check digit calculations 428 .....	19
7.9.1	7.9.1 Standard check digit calculations for GS1 data structures 428 .....	19
7.9.2	7.9.2 Check digit calculation for price/weight fields 428 .....	19
7.9.3	7.9.3 Check digit calculation for the four-digit price field 429 .....	19
7.9.4	7.9.4 Check digit calculation for the five-digit price field 430 .....	19
7.10	7.10 GTIN-12 and RCN-12 in a UPC-E barcode 430 .....	19
7.11	7.11 The GS1 subset of international standard ISO/IEC 646 432 .....	19
7.12	7.12 Determination of century in dates 434 .....	19
<b>8</b>	<b>8 GS1 Standards glossary of terms 428 .....</b>	<b>19</b>

MARKED IN YELLOW: sections that will promote to heading level 3 and related subsections that promote 1 level (numbering of these subsections not changed yet)

MARKED IN BLUE: sections that will move to a new location and related subsections

MARKED IN RED: removed section heading

MARKED IN GREEN: rename of section heading

<b>1</b>	<b>1</b>	<b>Basics and principles of the GS1 system</b>	<b>6</b>
<b>2</b>	<b>2</b>	<b>Application standards</b>	<b>16</b>
<b>2.1</b>	<b>2.1</b>	<b>Trade items</b>	<b>17</b>
<b>2.1.1</b>	<b>2.1.1</b>	<b>Introduction</b>	<b>17</b>
	2.1.1.1	Physical or non-physical trade items	17
	2.1.1.2	Open or restricted distribution	17
	2.1.1.3	Fixed or variable measure	17
	2.1.1.4	General retail consumer trade item, regulated healthcare retail consumer trade item or non-retail trade item	17
	2.1.1.5	Books and serial publications	18
	2.1.1.6	Single item or trade item grouping	18
	2.1.1.7	Trade item assortments	18
	2.1.1.8	Regulated healthcare trade items (RHTI)	18
	2.1.1.8.1	Marking levels of regulated healthcare trade items	19
	2.1.1.8.2	National Healthcare Reimbursement Numbers	19
	2.1.1.9	Single trade items composed of several physical parts	19
<b>2.1.2</b>	<b>2.1.2</b>	<b>Fixed measure trade items – open supply chain</b>	<b>19</b>
<b>2.1.3</b>	<b>2.1.2.1</b>	<b>General retail consumer trade items scanned in general retail at POS</b>	<b>19</b>
	2.1.2.1.1	GTIN data string	20
	2.1.2.1.2	GTIN-12 and GTIN-13	21
	2.1.2.1.3	GTIN-12 Carried by a UPC-E barcode	22
	2.1.2.1.4	GTIN-8 carried by an EAN-8 barcode	23
	2.1.2.1.5	Hardcover books and paperbacks: ISBN, GTIN-13, and GTIN-12 scanned in general retail at POS	24
	2.1.2.1.6	Serial publications: ISSN, GTIN-13, and GTIN-12 scanned in general retail at POS	26
<b>2.1.4</b>	<b>2.1.2.2</b>	<b>Fresh food trade items scanned in general retail at POS</b>	<b>28</b>
<b>2.1.5</b>	<b>2.1.2.3</b>	<b>Trade items intended for general distribution and POS</b>	<b>30</b>
<b>2.1.6</b>	<b>2.1.2.4</b>	<b>Healthcare primary packaging (non-retail trade items)</b>	<b>30</b>

<b>2.1.7</b>	<b>2.1.2.5</b>	<b>Healthcare secondary packaging (Regulated healthcare retail consumer trade items)</b>	<b>32</b>
<b>2.1.8</b>	<b>2.1.2.6</b>	<b>Trade items intended for general distribution scanning only</b>	<b>34</b>
	2.1.2.6.1	Identification of a trade item that is a single product	35
	2.1.2.6.2	Trade item groupings of identical trade items	37
	2.1.2.6.3	Trade item Groupings of mixed trade items	40
<b>2.1.9</b>	<b>2.1.2.7</b>	<b>Medical devices (non-retail trade items)</b>	<b>42</b>
<b>2.1.10</b>	<b>2.1.3</b>	<b>Fixed measure trade items packed in several individual pieces not scanned at POS</b>	<b>43</b>
<b>2.1.11</b>	<b>2.1.4</b>	<b>Direct marking</b>	<b>45</b>
<b>2.1.12</b>	<b>2.1.5</b>	<b>Variable measure trade items – packages / containers not scanned in general retail at point-of-sale</b>	<b>48</b>
<b>2.1.13</b>	<b>2.1.6</b>	<b>Fixed measure trade items – restricted distribution</b>	<b>55</b>
	2.1.6.1	Company internal numbering – RCN-8 Prefix 0 or 2	55
	2.1.6.2	Company internal numbering – RCN-13 GS1 Prefix 04 (RCN-12 U.P.C. Prefix 4)	57
	2.1.6.3	Company internal numbering – RCN-12 U.P.C. Prefix 0 (LAC and RZSC)	58
	2.1.6.4	GS1 Prefixes 02, 20 to 29 - Restricted Circulation	59
<b>2.1.14</b>	<b>2.1.7</b>	<b>Variable measure trade items scanned in general retail at POS</b>	<b>60</b>
	2.1.7.1	Variable measure fresh food trade items scanned in general retail at POS using GTIN	61
	2.1.7.2	Variable measure trade items scanned in general retail at POS using Restricted Circulation Numbers	62
<b>2.1.15</b>	<b>2.1.8</b>	<b>Trade item extended packaging</b>	<b>64</b>

<b>2.2</b>	<b>2.2 Logistic units</b>	<b>67</b>
2.2.1	2.2.1 Individual logistic units	67
2.2.2	2.2.2 Multiple logistic units – Global Identification Number for Consignment	69
2.2.3	2.2.3 Multiple logistic units – Global Shipment Identification Number	70
<b>2.3</b>	<b>2.3 Assets</b>	<b>71</b>
2.3.1	2.3.1 Global Returnable Asset Identifier (GRAI): AI (8003)	71
2.3.2	2.3.2 Global Individual Asset Identifier (GIAI): AI (8004)	72
<b>2.4</b>	<b>2.4 Locations and parties</b>	<b>75</b>
2.4.1	2.4.1 GLN definition	75
2.4.2	2.4.2 GLN in electronic data sharing standards	75
2.4.3	2.4.3 Application overview	76
2.4.4	2.4.3.1 Identification of a physical location	76
2.4.5	2.4.3.2 Specification of a physical location	78
2.4.6	2.4.3.3 Specification of a party	80
<b>2.5</b>	<b>2.5 Service relationships</b>	<b>82</b>
2.5.1	2.5.1 Global Service Relation Number – Provider: AI (8017)	82
2.5.2	2.5.2 Global Service Relation Number – Recipient: AI (8018)	83
2.5.3	2.5.3 Service Relation Instance Number: AI (8019)	85

<b>2.6</b>	<b>2.6 Special applications</b>	<b>86</b>
<b>2.6.1</b>	<b>2.6.1 Coupons</b>	<b>86</b>
<b>2.6.2</b>	<b>2.6.2 Coupons identified using the Global Coupon Number</b>	<b>86</b>
2.6.2.1	Paper coupons	86
2.6.2.2	Digital coupons	89
2.6.2.2.1	Relation with existing coupon specifications	89
2.6.2.2.2	Identification requirements for digital coupons	90
<b>2.6.3</b>	<b>2.6.3 Coupons with restricted geographic distribution</b>	<b>90</b>
2.6.3.1	General rule	90
2.6.3.2	Recommendation on allocating coupon reference numbers	91
2.6.3.3	Coupon identification for restricted geographic distribution (GS1 Prefix 99)	91
2.6.3.4	GS1 common currency coupon identification (GS1 Prefixes 981 to 983)	92
2.6.3.5	Use of GS1 common currency coupon code for the euro	93
2.6.3.6	Coupon code identification for use in North America (AI 8110)	94
2.6.3.7	Paperless Coupon code identification for use in North America (AI 8112)	94
<b>2.6.4</b>	<b>2.6.4 Refund receipts</b>	<b>95</b>
<b>2.6.5</b>	<b>2.6.5 Electronic serial identifier for cellular mobile telephones (CMTI): AI (8002)</b>	<b>96</b>
<b>2.6.6</b>	<b>2.6.6 Payment slips</b>	<b>97</b>
<b>2.6.7</b>	<b>2.6.7 Customer specific articles</b>	<b>99</b>
2.6.7.1	Introduction	99
2.6.7.2	Application overview	100
2.6.7.2.1	Definition	100
2.6.7.2.2	Customer specific articles data flow	100
2.6.7.3	Allocating system numbers for customer specific articles	101
2.6.7.3.1	General rule	101
2.6.7.3.2	Ordering of customer specific articles	101
2.6.7.4	Base article number	102
2.6.7.4.1	Specifications	102
2.6.7.4.2	Option	102
2.6.7.4.3	Parameter	102
2.6.7.4.4	Part	102
2.6.7.4.5	External references	102
2.6.7.4.6	Data carrier	102
2.6.7.5	Identification of the physical article actually produced	103

---

**2.6.8 2.6.8 Custom trade item 104**

2.6.8.1	Allocating system numbers for custom trade items	104
2.6.8.1.1	General rule	104
2.6.8.1.2	Ordering of custom trade items	104
2.6.8.1.2.1	Custom trade item number	104
2.6.8.1.2.2	Base GTIN-14	104
2.6.8.1.2.3	Made-to-Order variation number	105
2.6.8.1.2.4	Data carrier	105
2.6.8.2	Identification of the physical article actually produced	105

**2.6.9 2.6.9 Global Document Type Identifier for document control 106****2.6.10 2.6.10 Internal applications 112**

2.6.10.1	Information mutually agreed between trading partners: AI (90)	112
2.6.10.2	Company internal information: AIs (91 to 99)	112
2.6.11	Consumer trade item production control	112
2.6.12	Component / part identification	114
2.6.12.1	Application description	114
2.6.12.2	Identification requirements	116

**2.7 2.7 Summary of applications and operative scanning environments for GS1 system symbols 117****3 3 GS1 Application Identifier definitions 120****4 4 Application rules and management practices 171**

---

<b>5</b>	<b>5</b>	<b>Data carriers</b>	<b>204</b>
<b>5.1</b>	<b>5.1</b>	<b>Introduction</b>	<b>205</b>
<b>5.1.1</b>	<b>5.1.1</b>	<b>International standards</b>	<b>207</b>
<b>5.1.2</b>	<b>5.1.2</b>	<b>Symbology identifiers</b>	<b>208</b>
<b>5.2</b>	<b>5.2</b>	<b>Linear barcodes - EAN/UPC symbology specifications</b>	<b>209</b>
<b>5.2.1</b>	<b>5.2.1</b>	<b>Symbology characteristics</b>	<b>209</b>
5.2.1.1		Symbol types	209
5.2.1.2		Symbol encodation	209
5.2.1.2.1		Symbol character encodation	209
5.2.1.2.2		Auxiliary pattern encodation	210
5.2.1.3		Symbol formats	210
5.2.1.3.1		EAN-13 barcodes	210
5.2.1.3.2		EAN-8 barcodes	211
5.2.1.3.3		UPC-A barcodes	211
5.2.1.3.4		UPC-E barcodes	212
5.2.1.3.4.1		Encodation of the UPC-E barcode	212
5.2.1.3.4.2		Decoding a UPC-E barcode	214
5.2.1.3.5		Add-on symbols	214
5.2.1.3.5.1		Two-digit add-on symbol	214
5.2.1.3.5.2		Five-digit add-on symbol	215
5.2.1.4		Dimensions and tolerances	217
5.2.1.4.1		Nominal dimensions of characters	217
5.2.1.4.2		Symbol height	217
5.2.1.4.3		X-dimension (magnification factor)	217
5.2.1.4.4		Quiet Zone	218
5.2.1.4.5		Symbol length	218
5.2.1.4.6		Positioning of the add-on symbol	218
<b>5.2.2</b>	<b>5.2.2</b>	<b>Reference decode algorithm</b>	<b>219</b>
<b>5.2.3</b>	<b>5.2.3</b>	<b>Human readable interpretation</b>	<b>222</b>
<b>5.2.4</b>	<b>5.2.4</b>	<b>Additional features</b>	<b>223</b>
5.2.4.1		Character values in the EAN/UPC symbology family	223
5.2.4.2		Auxiliary characters in the EAN/UPC symbology family	224
5.2.4.3		Logical structure of an EAN-13 and UPC-A barcode excluding Quiet Zones	224

5.2.4.4	Logical Structure of an EAN-8 Barcode excluding Quiet Zones	225
5.2.4.5	Logical structure of a UPC-E barcode excluding Quiet Zones	225
5.2.4.6	Symbol dimensions at nominal size (X-dimension = 0.33 mm, not to scale)	226
5.2.4.7	Dimensions of modules and symbols at different levels of magnification	229

## **5.3 5.3 Linear barcodes - ITF-14 symbology specifications 230**

### **5.3.1 5.3.1 Symbology characteristics 230**

### **5.3.2 5.3.2 Symbol structure 230**

5.3.2.1	Character encodation	230
5.3.2.1.1	Data character encodation	230
5.3.2.1.2	Start and stop patterns	231
5.3.2.1.3	Check digit	232
5.3.2.2	Dimensions and tolerances	232
5.3.2.3	Reference decode algorithm	233
5.3.2.4	Bearer bars	233
5.3.2.5	Human readable interpretation	234

### **5.3.3 5.3.3 Additional features (informative) 234**

5.3.3.1	Protection against short scans	234
5.3.3.2	Fixed length symbols	234

### **5.3.4 5.3.4 Guidelines for the use of ITF-14 (informative) 234**

5.3.4.1	Autodiscrimination compatibility	234
5.3.4.2	System considerations	235
5.3.5	Symbology identifier (informative)	235
5.3.6	Test specifications (informative)	235

## **5.4 5.4 Linear barcodes - GS1-128 symbology specifications 237**

### **5.4.1 5.4.1 GS1-128 symbology characteristics 237**

### **5.4.2 5.4.2 GS1-128 barcode structure 238**

### **5.4.3 5.4.3 GS1-128 symbology character assignments 238**

5.4.3.1	Symbol character structure	238
5.4.3.2	Data character encodation	239
5.4.3.3	Code sets	242
5.4.3.3.1	Code set A	242
5.4.3.3.2	Code set B	243
5.4.3.3.3	Code set C	243

5.4.3.4	Special characters	243
5.4.3.4.1	Code set and shift characters	243
5.4.3.4.2	Function characters	243
5.4.3.5	Start and stop characters	244
5.4.3.6	Symbol check character	244
5.4.3.7	GS1-128 symbology start pattern	244
5.4.3.8	Relationship of symbol character value to ASCII value (informative)	244
<b>5.4.4</b>	<b>5.4.4 Dimensional requirements</b>	<b>245</b>
5.4.4.1	Minimum width of a module (X-dimension)	245
5.4.4.2	Quiet Zone	245
5.4.4.3	Maximum symbol length	245
<b>5.4.5</b>	<b>5.4.5 Reference decode algorithm</b>	<b>245</b>
<b>5.4.6</b>	<b>5.4.6 Symbol quality</b>	<b>247</b>
5.4.6.1	General	247
5.4.6.2	Decodability	248
5.4.6.3	Quiet Zone measurement	248
5.4.6.4	Transmitted data	248
<b>5.4.7</b>	<b>5.4.7 GS1-128 symbology application parameters</b>	<b>249</b>
5.4.7.1	Symbol height	249
5.4.7.2	Symbol length	249
5.4.7.3	Maximum symbol length	249
5.4.7.4	Human readable interpretation	249
5.4.7.5	Transmitted data (FNC1)	249
5.4.7.6	Additional features of GS1-128 (normative)	250
5.4.7.6.1	Symbol check character	250
5.4.7.7	Recommended use of symbol characters to minimise GS1-128 symbol length (informative)	250
5.4.7.8	Guidelines for the use of Code 128 (informative)	251
5.4.7.8.1	Autodiscrimination compatibility	251
<b>5.5</b>	<b>5.6 Linear barcodes – GS1 DataBar</b>	<b>299</b>
<b>5.5.1</b>	<b>5.6.1 Introduction</b>	<b>299</b>
5.6.1.1	Symbology characteristics	299
5.6.1.2	Additional features	300
<b>5.5.2</b>	<b>5.6.2 Symbol structure</b>	<b>300</b>
5.6.2.1	The first group of GS1 DataBar symbols	300

5.6.2.1.1	GS1 DataBar Omnidirectional	301
5.6.2.1.2	GS1 DataBar Truncated	301
5.6.2.1.3	GS1 DataBar Stacked	301
5.6.2.1.4	GS1 DataBar Stacked Omnidirectional	302
5.6.2.2	The second group of GS1 DataBar symbols: GS1 DataBar Limited	302
5.6.2.3	The third group of GS1 DataBar symbols: GS1 DataBar Expanded variations	303
5.6.2.3.1	GS1 DataBar Expanded	304
5.6.2.3.2	GS1 DataBar Expanded Stacked	304
5.6.2.3.3	Compressed element string sequences	305
5.6.2.3.3.1	Fixed-length sequences	305
5.6.2.3.3.2	Open-ended sequences	305
5.6.2.3.4	Maximum width and height of GS1 DataBar Expanded versions (informative)	305
5.6.2.3.4.1	Maximum symbol width (flat surface)	306
5.6.2.3.4.2	Maximum symbol width (curved surface)	307
5.6.2.3.4.3	Maximum height GS1 DataBar Expanded Stacked	308
5.6.2.4	Human readable interpretation in GS1 DataBar symbols	308
5.6.2.5	Data transmission and symbology identifier prefixes	308
5.6.2.5.1	Default transmission mode	308
5.6.2.5.2	GS1-128 symbol emulation mode	309
5.6.2.6	Width of a module (X-dimension)	309
5.6.2.7	Height of symbol	309

### 5.5.3 5.6.3 Print quality grade 309

5.6.4	Advice for selecting the symbology	310
-------	------------------------------------	-----

## 5.6 5.7 Two dimensional barcodes – GS1 DataMatrix symbology 311

### 5.6.1 5.7.1 Introduction 311

### 5.6.2 5.7.2 GS1 DataMatrix features and symbol basics 311

### 5.6.3 5.7.3 GS1 DataMatrix symbology 312

5.7.3.1	Square and rectangular formats	313
5.7.3.2	GS1 DataMatrix symbol sizes	313
5.7.3.3	Data transmission and symbology identifier prefixes	315
5.7.3.4	Width and height of a module (X)	315
5.7.3.5	Symbol quality grade	315
5.7.3.6	Advice for selecting the symbology	316
5.7.3.7	Human readable interpretation of GS1 DataMatrix symbols	316

---

**5.7 5.9 Two dimensional barcodes – GS1 QR Code symbology 328****5.7.1 5.9.1 Introduction 328****5.7.2 5.9.2 GS1 QR Code features and symbol basics 328****5.7.3 5.9.3 Summary of additional features 329****5.7.4 5.9.4 GS1 QR Code symbology 330**

- 5.9.4.1 GS1 QR Code square format 330
- 5.9.4.2 GS1 QR Code symbol sizes 331
- 5.9.4.3 Data transmission and symbology identifier prefixes 332
- 5.9.4.4 Width and height of a module (X) 333
- 5.9.4.5 Symbol quality grade 333
- 5.9.4.6 Advice for selecting the symbology 334
- 5.9.4.7 Human readable interpretation of GS1 QR Code symbols 334

**5.8 5.8 Composite barcodes 317****5.8.1 5.8.1 Composite symbology introduction 317**

- 5.8.1.1 Composite symbology characteristics 317
- 5.8.1.2 Additional features 317

**5.8.2 5.8.2 Symbol structure 318**

- 5.8.2.1 CC-A structure 319
- 5.8.2.2 CC-B structure 321
- 5.8.2.3 CC-C structure 322
- 5.8.2.4 Special compressed element string sequences 323

**5.8.3 5.8.3 Human readable interpretation of Composite symbols 323****5.8.4 5.8.4 Data transmission and symbology identifier prefixes 323**

- 5.8.4.1 Default transmission mode 323
- 5.8.4.2 GS1-128 Symbol transmission mode 323
- 5.8.4.3 Symbol separator character 324
- 5.8.4.4 2D Composite Component escape mechanism 324

5.8.5 5.8.5 Width of a module (X) 324

5.8.6 5.8.6 Print quality 324

5.8.7 5.8.7 Advice for selecting a symbology 324

5.8.8 5.8.8 Sample Composite symbols 325

## 5.9 5.5 Barcode production and quality assessment 252

5.9.1 5.5.1 Introduction 252

5.9.2 5.5.2 Dimensional specifications and operational requirements 252

5.5.2.1 Role of the symbol's dimensional specifications 252

5.5.2.2 Omnidirectional scanning and the term magnification 252

5.5.2.3 Laser versus image based scanning 253

5.5.2.4 Printing considerations 253

5.5.2.5 Packaging considerations 253

5.5.2.6 Operative scanning environments for GS1 system symbols 253

5.5.2.6.1 GS1 system scanner functional operative bands 253

### 5.9.3 5.5.2.7 GS1 system symbol specification tables 258

5.5.2.7.1 Symbol specification table 1 - Trade items scanned in general retail POS and not general distribution 259

5.5.2.7.2 Symbol specification table 2 - Trade items scanned in general distribution only 262

5.5.2.7.3 Symbol specification table 3 - Trade items scanned at general retail POS and general distribution 264

5.5.2.7.4 Symbol specification table 4 - Trade items not scanned at POS or general retail - also not scanned in general distribution or regulated healthcare (retail or non-retail) 265

5.5.2.7.5 Symbol specification table 5 - logistic units scanned in general distribution 267

5.5.2.7.6 Symbol specification table 6 - Regulated healthcare non-retail consumer trade items not scanned in general distribution 268

5.5.2.7.7 Symbol specification table 7 - Direct part marking 269

5.5.2.7.8 Symbol specification table 8 - Trade items scanned in retail pharmacy and general distribution or non-retail pharmacy and general distribution 271

5.5.2.7.9 Symbol specification table 9 - GS1 keys GDTI, GRAI, GIAI and GLN 272

5.5.2.7.10 Symbol specification table 10 - Regulated healthcare retail consumer trade items not scanned in general distribution 273

5.5.2.7.11 Symbol specification table 11 - GS1 GSRNs 274

5.9.4 5.5.3 Barcode production 276

5.5.3.1 Digital imaging 276

5.5.3.1.1 General requirements 276

5.5.3.1.2 Dedicated barcode printers 277

5.5.3.1.3	EAN/UPC on-demand printed symbols at minimum size	277
5.5.3.2	Barcode master image production	279
5.5.3.2.1	Introduction	279
5.5.3.2.2	Master image requirements	280

### **5.9.5 5.5.3.3 Quality assessment 280**

5.5.3.3.1	Verification	280
5.5.3.3.1.1	Traditional verification (informative)	280
5.5.3.3.1.2	ISO/IEC verification	281
5.5.3.3.1.3	Types of verifiers	282
5.5.3.3.2	Measurement methodology	282
5.5.3.3.3	Symbol grading	282
5.5.3.3.4	Substrate characteristics	283
5.5.3.3.5	Interpretation of the scan reflectance profile and profile grades	283
5.5.3.3.6	Comparison with traditional methodologies	283
5.5.3.3.7	Process control requirements	283
5.5.3.3.8	Compliance statement	283
5.5.3.3.9	Calibrated conformance standard test cards	284
5.5.3.3.10	Special considerations for verification of GS1 system symbologies	285
5.5.3.3.10.1	General	285
5.5.3.3.10.2	Acceptance criteria	285
5.5.3.3.10.3	EAN/UPC symbology	285
5.5.3.3.10.4	GS1-128 symbology	286
5.5.3.3.10.5	ITF-14 symbology	287
5.5.3.3.10.6	GS1 DataMatrix	287
5.5.3.3.10.7	GS1 QR Code	288
5.5.3.3.11	Possible causes of less-than-perfect verification grades	289
5.5.3.3.11.1	Reflectance parameters	289
5.5.3.3.12	Other parameters	290

### **5.9.6 5.5.3.4 Print process characterisation techniques 292**

5.5.3.4.1	Introduction	292
5.5.3.4.2	Background	293
5.5.3.4.3	New qualifications for printing	293
5.5.3.4.4	Summary	293

### **5.9.7 5.5.3.5 GS1 barcode verification template 294**

5.5.3.5.1	Introduction	294
5.5.3.5.2	Background	294
5.5.3.5.3	GS1 barcode verification template for linear symbols	295
5.5.3.5.4	GS1 barcode verification template for two dimensional symbols	297

---

<b>6</b>	<b>6</b>	<b>Symbol placement guidelines</b>	<b>340</b>
<b>7</b>	<b>7</b>	<b>AIDC validation rules</b>	<b>405</b>
7.1	7.1	Introduction	413
7.2	7.2	Synopsis of message processing	414
7.2.1	7.2.1	Analysis of the data carrier and plausibility test for element strings	415
7.2.2	7.2.2	Symbology identification	415
7.2.3	7.2.3	Prefix in internal table	415
7.2.4	7.2.4	Item Identification	416
7.2.5	7.2.5	GS1 Application Identifier (AI) in internal table	416
7.2.6	7.2.6	Length of Data 14 Digits	416
7.2.7	7.2.7	Check digit calculation and other system checks	416
7.2.8	7.2.8	Move element string to message field	416
7.3	7.3	Validation of the electronic message regarding system consistency	417
7.4	7.4	Validation of the electronic message regarding user requirements	418
7.5	7.5	Conversion of weights and measures in user applications	418



---

7.6	7.6	Linkage of GTINs in a database	420
7.6.1	7.6.1	The principle	420
7.6.2	7.6.2	Extended example of a trade item hierarchy	421
7.6.3	7.6.3	Linkage of GTINs in a non-relational database by trade item manufacturer	422
7.7	7.7	Element strings represented in data carriers	422
7.7.1	7.7.1	Element strings represented in GS1 system data carriers	423
7.7.2	7.7.2	Element strings represented in a GS1 symbology using GS1 Application Identifiers	424
7.8	7.8	Processing of data from a GS1 symbology using GS1 Application Identifiers	425
7.8.1	7.8.1	General	426
7.8.2	7.8.2	Element strings with predefined lengths using GS1 Application Identifiers	426
7.8.3	7.8.3	The separator character and its value	426
	5.10	Appendix: Rules for encoding/decoding element strings in GS1 symbologies using GS1 Application Identifiers	335
		(REMOVED this level 2 section heading (does not contain text), the sub-sections remain and follow below )	
7.8.4	5.10.1	The basic structure of GS1 barcodes using GS1 Application Identifiers and concatenation	335
7.8.5	5.10.2	Concatenation	336
	5.10.2.1	Predefined length element strings	336
	5.10.2.2	Non-predefined length element strings	337
	5.10.2.3	Other considerations when using concatenation	338
7.8.6	5.10.3	GS1 Application Identifiers with implied decimal point positions	339
7.8.7	7.8.4	National Healthcare Reimbursement Number (NHRN)	426



---

<b>7.9</b>	<b>7.9 Check digit calculations</b>	<b>428</b>
<b>7.9.1</b>	<b>7.9.1 Standard check digit calculations for GS1 data structures</b>	<b>428</b>
<b>7.9.2</b>	<b>7.9.2 Check digit calculation for price/weight fields</b>	<b>428</b>
<b>7.9.3</b>	<b>7.9.3 Check digit calculation for the four-digit price field</b>	<b>429</b>
<b>7.9.4</b>	<b>7.9.4 Check digit calculation for the five-digit price field</b>	<b>430</b>
<b>7.10</b>	<b>7.10 GTIN-12 and RCN-12 in a UPC-E barcode</b>	<b>430</b>
<b>7.11</b>	<b>7.11 The GS1 subset of international standard ISO/IEC 646</b>	<b>432</b>
<b>7.12</b>	<b>7.12 Determination of century in dates</b>	<b>434</b>
<b>8</b>	<b>8 GS1 Standards glossary of terms</b>	<b>428</b>