The Global Language of Business

GS1 Digital Link URI: Compression Technical Standard for EPC binary strings

Expression of EPC binary strings using special compressed GS1 Digital Link URIs.

Release 1.0.0, Ratified, Jul 2025

1 Document Summary

Document Item	Current Value
Document Name	GS1 Digital Link URI: Compression Technical Standard for EPC binary strings
Document Date	Jul 2025
Document Version	1.0
Document Issue	0
Document Status	Ratified
Document Description	Expression of EPC binary strings using special compressed GS1 Digital Link URIs.

2 Contributors

First Name	Last Name	Company
Sprague	Ackley	Napeequa Concepts LLC
Makoto	Akutagawa	GS1 Japan
Cherise	Allison	Sam's Club
David	Almroth	GS1 Sweden
Patrick	Arijs	COLRUYT GROUP NV
Karen	Arkesteyn	GS1 Belgium & Luxembourg
Joachim	Arnold	BASF SE
Koji	Asano	GS1 Japan
Pascal	Aulagnet	Pfizer
Bo	Bäckström	Axfood Sverige AB
Jonas	Batt	GS1 Switzerland
Claude	Baudry	GS1 France
Jin	Bei	GS1 China
Robert	Beideman	GS1 Global Office
Dieter	Beitz	CSB-System SE
Benjamin	Bekritsky	Zebra Technologies Corporation
Szilvia	Bém	GS1 Hungary
ZAID	BEN HMAD	DECATHLON
Dana	Benson	GS1 US
Andree	Berg	GS1 Germany
Yann	Berthy	Roquette Frères
Mats	Bjorkqvist	GS1 Sweden
Dennis	Black	BD
Phillip	Bocci	Ecolab
Sven	Böckelmann	Benelog GmbH & Co. KG
Zsolt	Bocsi	GS1 Hungary
Ardetha	Bradley	Georgia Pacific

First Name	Last Name	Company
Laure	Breduillieard Brunet	Nestlé
Megan	Brewster	Impinj, Inc
Chris	Brown	Printronix Auto ID
David	Buckley	GS1 Global Office
Heide	Buhl	GS1 Germany
Margarita	Bykova	GS1 Russia
Jaewook	Byun	Auto-ID Labs at KAIST
Elena	Campdelacreu	GS1 Spain
Emanuela	Casalini	GS1 Italy
Karolin	Catela	GS1 Sweden
Tony	Ceder	Charmingtrim
Anthony	Chan	GS1 Hong Kong, China
Christine	Chang	Solventum (previously 3M Healthcare)
Jeffrey	Chen	Printronix Auto ID
Raman	Chhima	GS1 New Zealand
Francesca	Chiovenda	GS1 Global Office
Marjolein	Christiaanse	GS1 Netherlands
James	Chronowski	GS1 US
Ethan	Claucherty	Axia Institute - Michigan State University
Flavia	Costa	GS1 Brasil
Benjamin	Couty	GS1 France
Amanda	Creane	GS1 Ireland
Jeffrey	Cree	Ahold (USA)
Jay	Crowley	US Data Management, LLC (USDM)
Oscar	Cruz	GS1 Mexico
Bence	Csordás	GS1 Hungary
Chase	Cunningham	Wal-Mart Stores, Inc.
Tarryn	Daniels	GS1 South Africa
Kevin	Dean	Dolphin Data Development Ltd.
Sean	Dennison	GS1 Ireland
Eno	Dhamo	GS1 Canada
Peta	Ding	GS1 Global Office
Chris	Diorio	Impinj, Inc
Xiaowen	Dong	GS1 China
Camille	Dreyfuss	GS1 France
Han	Du	GS1 China
Marcel	Ducceschi	GS1 Switzerland
Jeanne	Duckett	Avery Dennison RFID
JT	Dutta	DHL
Linden	Eagles	GS1 New Zealand
Nordine	Eddaoudi	GS1 France

First Name	Last Name	Company
Alexis	Elloso	GS1 Australia
Fadi	El-Turk	GS1 UK
Tomas	Eriksson	Byggtrygg AB / XL-BYGG
Juliet Andrea	Espinosa Martinez	GS1 Colombia
Filipe	Esteves	GS1 Portugal
Dawn	Fiorentino Izzi	DoD Logistics AIT Standards Office
Piotr	Frackowiak	GS1 Poland
François	LENCI	ALSTOM Ltd
Guido	Freijomil	GS1 Argentina
Cameron	Frith	GS1 New Zealand
Nigel	Fuller	GS1 Australia
Andreas	Füßler	GS1 Germany
Stefan	Gathmann	GS1 Ireland
Haifa	Gaza	Auto-ID Labs at KAIST
Alexander	Gerasimenko	Mars, Inc.
Jean-Christophe	Gilbert (Co-Chair)	GS1 France
Vanessa	Giulieri	GS1 Italy
Oumy	Gning	GS1 Global Office
Chiang Fein	Goh	GS1 Malaysia
Nicole	Golestani	GS1 Canada
Carl	Gomberg	Premier Inc
Heinz	Graf	GS1 Switzerland
Nadi (Scott)	Gray	GS1 Global Office
Christer	Green	SBJF Service AB
Ginger	Green	Wal-Mart Stores, Inc.
Jonathan	GREGORY	GS1 US
Gerald	Gruber	GS1 Austria
Dominique	Guinard	Digimarc
Kai	Hachmann	Edeka Zentrale AG & Co. KG
David	Hackbarth	Procter & Gamble Co.
Michaela	Hähn	GS1 Germany
Elzbieta	Halas	GS1 Poland
Dominik	Halbeisen	GS1 Switzerland
Eileen	Harpell	GS1 Global Office
Mark	Harrison (Lead Editor)	Milecastle Media Limited
Gary	Hartley	GS1 New Zealand
Dave	Harty	Adents
Andrew	Hearn	GS1 Global Office
Natasha	Helleur	GS1 New Zealand
Olle	Hellman	GS1 Sweden
Lindsay	Hillman	GS1 US

First Name	Last Name	Company
Rob	Hoffman	Hershey Company (The)
Bernie	Hogan	Independent Consultant - Bernie Hogan
Sandra	Hohenecker	GS1 Germany
Lars Kristen	Holst	Moelven Wood AB
Christine	Horvath-Hanko	GS1 Hungary
Agata	Horzela	GS1 Poland
Hitoshi	Hoshino	GS1 Japan
Tomi	Ihalainen	GS1 Finland
Marc	Inderbitzin	Migros-Genossenschafts-Bund
José Ramón	Islas	GS1 Mexico
Gunnar	Ivansson	Learningwell AB
Yoshihiko	Iwasaki	GS1 Japan
Guilda	Javaheri	Golden State Foods
Ed	Jesus	Chep
Han	Jie	GS1 China
Peter	Johnson	Procter & Gamble Co.
Peter	Jönsson	GS1 Sweden
Deborah	Joplin	GS1 New Zealand
Nora	Kaci	GS1 Global Office
Martin	Kairu	GS1 South Africa
Hitomi	Kajita	GS1 Japan
Nicole	Kaller	DuPont Healthcare
Iliada	Karali	GS1 Association Greece
Katalin	Kecskés	GS1 Hungary
Steven	Keddie	GS1 Global Office
Audrey	Kelly	GS1 Global Office
John	Keogh	Shantalla Inc
Kimmo	Keravuori	GS1 Finland
Mads	Kibsgaard	GS1 Denmark
Edmund	Kienast	Australian Digital Health Agency
Kazuna	Kimura	GS1 Japan
Sabine	klaeser	GS1 Germany
Kasia	Koblak-Smith	DHL
Phyllis	Koch	The Schwan Food Company
Catherine	Koetz	Australian Digital Health Agency
Bojan	Kovacic	GS1 Slovenia
Zoltan	Krazli	GS1 Hungary
Alexey	Krotkov	GS1 Russia
Tomas	Kubicek	smart-tec GmbH & co. KG
Freddy	Ladino Perdomo	GS1 Colombia
Huyen	Le	GS1 Vietnam

First Name	Last Name	Company
Kevin	Lee	GS1 Korea
Lyndon	Lee	Tesco Stores Ltd.
Zhimin	Li	GS1 China
Ildikó	Lieber	GS1 in Europe
Tina	Lin	GS1 Chinese Taipei
Nicolas	Liou	GS1 Chinese Taipei
Johan	Lisemark	Vida Wood AB
Yixuan	Liu	GS1 China
Wei	Liu	GS1 China
Xiaoyan	Liu	GS1 China
Huiru	Lou	GS1 China
Marisa	Lu	GS1 Chinese Taipei
Wayne	Luk	GS1 Hong Kong, China
Yan	Luo	GS1 China
Chatchanok	Lupakchee	GS1 Thailand
Ning	Ma	GS1 China
Ilka	Machemer	GS1 Germany
Fumi	Maekawa	GS1 Japan
Patrick	Main	Cook Medical Inc.
Ralph	Maresco	Procter & Gamble Co.
Timothy	Marsh	MCL
Ryan	Mavin	ACT Health
Mike	Meakin	DHL
Ned	Mears	GS1 US
Terje	Menkerud	GS1 Norway
Joanne	Metcalf	Essity North America Inc
Andrew	Meyer	GS1 US
Holly	Mitchell	Seagull Scientific
Federico	Mittersteiner	GS1 Italy
Ephraim	Mokheseng	GS1 South Africa
Karen	Moniz	ICCBBA
Doug	Moody	PepsiCo, Inc.
Julie	Moore	Mead Westvaco
Andrew	Morehead	GS1 US
Gena	Morgan	GS1 US
Reiko	Moritani	GS1 Japan
Robert	Moss	FIP HPS
Nolwandle	Mthiyane	GS1 South Africa
Alice	Mukaru	GS1 Sweden
Dan	Mullen	GS1 Global Office
Paul	Muller	EM Microelectronic

First Name	Last Name	Company
Mori	Naoko	GS1 Japan
Nico	Nardozi	AbbVie S.r.l.
Safae	Nassih	GS1 France
Zubair	Nazir	GS1 Canada
Giada	Necci	GS1 Italy
Steven	Nelson	Tyson
Denis	O'Brien	GS1 Ireland
Marcelo	Oliveira Sa	GS1 Brasil
Hirra	Oppal	GS1 UK
Luisa	Ovalle	GS1 Colombia
Michel	OTTIKER (Co-Chair)	GS1 Switzerland
Dimi	Pachiyannis	GS1 Australia
Michele	Padayachee	GS1 South Africa
Alexander	Pakhomov	LLC "Center for the Development of Advanced Technologies"
Chensheng	Pan	GS1 China
Kyle	Parker	Mitas Corporation
Sergio	Pastrana	GS1 Mexico
Leonel	Pava	GS1 Colombia
John	Pearce	Axicon
James	Perng	GS1 Chinese Taipei
Sarina	Pielaat	GS1 Netherlands
Manfred	Piller	GS1 Austria
Neil	Piper	GS1 Global Office
ZhangLi	Pollet	GS1 Belgium & Luxembourg
Albertus	Pretorius	Tonnjes ISI Patent Holding GmbH
Matheus	Quadros	GS1 Brasil
Aruna	Ravikumar	GS1 Australia
Hajo	Reissmann	Hajo Reissmann Consulting
Eduardo Alberto	Remigio Munguia	GS1 Mexico
Craig Alan	Repec	GS1 Global Office
Nicolas	Resier	GS1 Belgium & Luxembourg
William	Reynolds	Camcode Global
Diane	Riccardi	Johnson & Johnson
Pharapa	Romphothong	GS1 Thailand
Pere	Rosell Plajats	GS1 Spain
Don	Roskowiak	Target Corporation
Greg	Rowe	GS1 Global Office
Uwe	Ruedel	GS1 Switzerland
Michiel	Ruighaver	GS1 Australia
Liu	Ruizhi	GS1 China

First Name	Last Name	Company
Zbigniew	Rusinek	GS1 Poland
Bonnie	Ryan	GS1 Australia
J John	Ryu (Facilitator)	GS1 Global Office
Zbigniew	SAGAN	Advanced Track and Trace
Hemant	Sahgal	IRIS Software - 1
Sofia	Salcedo	Logyca
Alexander	SANCHEZ	GS1 Mexico
George	Sarantavgas	GS1 Association Greece
Mayu	Sasase	GS1 Japan
Yuki	Sato	GS1 Japan
Ulrich	Schaefer	GS1 Global Office
Sue	Schmid	GS1 Australia
Lori	Schrop	GS1 Global Office
Eugen	Sehorz	GS1 Austria
Xinyu	Shi	GS1 China
Yuko	Shimizu	GS1 Japan
Marcel	Sieira	GS1 Australia
Fernando	Silveira	GS1 Brasil
Palma	Simbari	Bayer AG - Division Pharma
Steven	Simske	Colorado State University
Chumisa	Sizathu	GS1 South Africa
Jens	Slama	GS1 Germany
Brandi	Smith	GS1 US
Tania	Snioch	GS1 Global Office
Olga	Soboleva	GS1 Russia
Jim	Springer	EM Microelectronic
Roko	Staničić	GS1 Slovenia
Andrew	Steele	GS1 Australia
Sylvia	Stein	GS1 Netherlands
Jennie	Stitzinger	GS1 US
Christa	Suc	GS1 UK
Georgette	Suggs	Sitation, LLC.
Diane	Taillard	GS1 Global Office
Hiromitsu	Takai	GS1 Japan
Taishi	Takaoka	GS1 Japan
Claude	Tetelin	GS1 Global Office
Sonya	Thomas	Sam's Club
Stefan	Thomas	GS1 Germany
Gina	Tomassi	PepsiCo, Inc.
Laurent	TONNELIER	mobiLead
Viet	Tran	GS1 Vietnam

First Name	Last Name	Company
Ed	Treacy	Produce Marketing Association (PMA)
Ralph	Troeger	GS1 Germany
Jangchup	Tsechung	Migros-Genossenschafts-Bund
Alec	Tubridy	GS1 Australia
Jesse	Tuominen	Voyantic Ltd
Toshihide	Ueda	GS1 Japan
Ravi Kiran	Unnam	Mondelez International
Frits	Van Den Bos	GS1 Netherlands
Fiona	Vanderlinde	GS1 South Africa
Ray	Vaughan	Omron Microscan Systems Inc.
Rodrigo	Vaz	CPA Wernher von Braun
Cindy	Velázquez	GS1 Mexico
Audun	Vennesland	SINTEF
Andrew	Verb	Bar Code Graphics, Inc.
Charles-Francois	VERMEESCH	SNCF Rolling Stock Department
Ricardo	Verza Amaral Melo	GS1 Brasil
Jaco	Voorspuij	CONAS BV
Vishnu	Vyas	DuPont Healthcare
Kana	Wakebe	GS1 Japan
Hanna	Walczak	GS1 Poland
Lei	Wang	GS1 China
Chunguang	Wang	GS1 China
Lynn	Wang	GS1 China
Dayou	Wang	Zebra Technologies Corporation
Wenyu	Wang	GS1 China
Jiayi	WANG	GS1 China
Di	Wang	GS1 China
Metinee	Wanlayangkoon	GS1 Thailand
Ethan	Ward	GS1 Australia
John	Weatherby	JDHW Consulting
Wilfried	Weigelt	REA Elektronik GmbH
Kathy	Welch	Wegmans Food Markets
Tasha	Wiehe	GS1 Global Office
Kumoro	Wijanarko	GS1 Indonesia
Ola	Wilhelmsson	Norra Timber
Roman	Winter	GS1 Germany
Melanie	Wishart	GS1 Australia
Agata	Witkowska	GS1 Poland
George	Wright IV	Product Identification & Processing Systems
XinMin	WU	GS1 China

First Name	Last Name	Company
Juan	Wu	GS1 China
Huang	Xin	GS1 China
Ruoyun	Yan	GS1 China
Charles	Young	Solidsoft Reply
Shi	Yu	Beijing REN JU ZHI HUI Technology Co. Ltd.
Ying	YU	GS1 China
Victor	Zhang	GS1 China
Yuan	zhang	GS1 China
Li	ZHENG	GS1 China
Bo	Zhou	GS1 China
Eric	Zhuo	GS1 Singapore
Sergio	Zúñiga	GS1 Mexico

Log of Changes

Release	Date of Change	Changed By	Summary of Change
1.0	Jul 2025	John Ryu, Mark Harrison	WR 24-402, section 7 change log, GS1 Digital Link version 1.1 (Feb 2020) WR 25-203, GS1 Style Guide errata

Disclaimer

GS1 seeks to minimise barriers to the adoption of its standards and guidelines by making the intellectual property required to implement them available, to the greatest extent possible, on a royalty-free basis, or when necessary, under a RAND licence. Such royalty-free and RAND licences are provided pursuant to the GS1 IP Policy (available here: https://www.gs1.org/standards/ip), which governs the work of work group participants who contribute to drafting standards and guidelines, including this document. In addition to licences, the GS1 IP Policy provides various benefits and obligations that apply to all implementers of GS1 standards and guidelines, and all implementations of GS1 standards are subject to those terms.

Nevertheless, please note the possibility that an implementation of one or more features of this standard or guideline may be the subject of a patent or other intellectual property right that is not covered by the licences granted pursuant to the IP Policy. In addition, the licences granted under the IP Policy do not include the IP rights or claims of third parties who were not participants in the corresponding standard development work group.

Accordingly, GS1 recommends that any person or organisation developing an implementation of this standard or guideline should determine whether any patents or other intellectual property may encompass such implementation, and whether a licence under a patent or other IP right is needed. The implementer should determine the potential need for licensing in view of the details of the specific implementation being designed in consultation with that party's patent counsel.

The official versions of all GS1 standards and guidelines are provided as PDF files on GS1's online reference directory (https://ref.gs1.org) (the "GS1 Reference"). Any other representations of standards or guidelines in any other format (e.g., web pages) are provided for convenience and descriptive purposes only, and in the event of a conflict, the GS1 Reference document shall govern.

THIS DOCUMENT IS PROVIDED “AS IS” WITH NO WARRANTIES WHATSOEVER, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY, NONINFRINGEMENT, FITNESS FOR PARTICULAR PURPOSE, ACCURACY OR COMPLETENESS, OR ANY WARRANTY OTHERWISE ARISING OUT OF THIS DOCUMENT. GS1 disclaims all liability for any damages arising from any use or misuse of this document, 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 makes no commitment to update the information contained herein, and retains the right to make changes to this document at any time, without notice. GS1® and the GS1 logo are registered trademarks of GS1 AISBL.

Table of Contents

1 Introduction

This section is informative.

GS1 standards are either technical (how) standards or application (where used) standards. This is a technical standard. At the time of writing, this technical standard is not approved for use in open supply chain standards. Such approval can only be sought by a GSMP Work Group defining an application standard subject to GS1 Policy B11.

GS1 identifiers can be very efficiently encoded using the EPC binary syntax defined in the GS1 Tag Data Standard [TDS]. EPC identifiers are read from passive UHF Gen2 tags as binary strings or hexadecimal strings. However, some data carriers (notably NFC tags or passive hybrid NFC/UHF Gen2 tags) support the reading of a URI. This document explains how GS1 identifiers in EPC binary syntax can be expressed as a special compressed form of a GS1 Digital Link URI. that can be read from such tags then decoded/decompressed into the equivalent GS1 Digital Link URI [DL-URI] by an online server, most likely a GS1-Conformant resolver [Resolver], by following the decoding rules defined in the GS1 Tag Data Standard [TDS] or making use of the machine-readable artefacts provided with the GS1 Tag.Data Translation [TDT] standard.

Two previously unused reserved compression header values (namely '7A' and '7B' in hexadecimal) are now allocated to indicate that an EPC binary string is encoded after corresponding 'eh' / 'ex' mnemonics within the compression string of the special compressed GS1 Digital Link URI. The use of these previously reserved values ensures no collision with any other compressed GS1 Digital Link URIs. This document explains how that mechanism works and how the GS1 EPC Tag Data Standard or GS1 EPC Tag Data Translation standard can be used to support the encoding/decoding of the EPC binary string and subsequent transformation into a corresponding fully uncompressed GS1 Digital Link URI.

This feature is expected to be particularly useful for data carriers such as hybrid UHF Gen2 / NFC tags, in which the translation from EPC binary string to GS1 Digital Link URI is too computationally intensive or too impractical to be implemented on the chip; instead, this standard provides a special format of compressed GS1 Digital Link URI so that when such a hybrid tag is read via its NFC interface, a special compressed GS1 Digital Link URI is output to the NFC reader – and the burden of translation / decoding the EPC binary string is handled by software at the corresponding hostname or domain name (and any resolver that serves that hostname or domain name), rather than being an impractical burden on the chip of the hybrid tag. Alternatively, any software or app that does not attempt an immediate Web request for encountered URIs may use this standard to understand how to extract the EPC binary string and translate this to an equivalent fully uncompressed GS1 Digital Link URI, whether or not this capability is implemented by a resolver.

2 Compressed GS1 Digital Link URIs and AIDC

This section is normative

The GS1 Digital Link URI syntax [DL-URI], like GS1 Element String syntax, is intended to be read and interpreted by scanning (barcodes) or reading (RFID tags) software that may then pass the identifiers and attributes on to their host system in whatever format is appropriate for the application environment. This is not true for compressed GS1 Digital Link URIs encoded in optical data carriers. Rather, the decompression should be carried out by external software. In AIDC terms, a compressed GS1 Digital Link URI, when encoded in an optical data carrier, should be treated like "any URL" and is therefore outside the scope of the wider GS1 system of GS1 Application Standards. At the time of writing, compressed GS1 Digital Link URIs should only be used in closed systems and not in open supply chains.

It follows that it is for the receiving system to determine whether or not a URL does or does not contain GS1 identifiers. This can only be achieved reliably by applying the decompression algorithm and validating the result against the GS1 Digital Link URI syntax. The GS1 Barcode Syntax Resource [BSR] can be used for this validation. Note that GS1-Conformant resolvers include the ability to decompress and validate compressed GS1 Digital Link URIs [Resolver].

2.1 For radio frequency data carriers, see section 4.2, Expression of EPC binary string within a compressed GS1 Digital Link URI

.

3 Purpose of compression

This section, including its subsections, is informative.

GS1 Digital Link URIs can be used with any data carrier that can directly embed an entire URL. These include NFC tags, QR Codes, digital watermarks, Data Matrix codes, etc. only some of which are approved GS1 data carriers (see section 1 of this document).

This compression technical standard adds support for expression of EPC binary strings, although their decoding should be in accordance with the GS1 Tag Data Standard [TDS] and may make use of the machine-readable artifacts and framework of the GS1 Tag Data Translation standard [TDT].

4 Structure of the compressed string

This section, including all its subsections, is normative

4.1 Conversion between binary and file-safe / URI-safe base 64 alphabet

A binary string may be an efficient way of encoding data but a compressed GS1 Digital Link URI needs to convert this into a compact string of characters. The standard for Base16, Base32, and Base64 Data Encodings [RFC 4648] provides details of a file-safe / URI-safe base 64 character set that uses 6 bits to encode each character, using the following code table:

Index	Char	Index	Char	Index	Char	Index	Char
0 000000	A	**16** 010000	Q	**32** 100000	g	**48** 110000	w
1 000001	B	**17** 010001	R	**33** 100001	h	**49** 110001	x
2 000010	C	**18** 010010	S	**34** 100010	i	**50** 110010	y
3 000011	D	**19** 010011	T	**35** 100011	j	**51** 110011	z
4 000100	E	**20** 010100	U	**36** 100100	k	**52** 110100	0
5 000101	F	**21** 010101	V	**37** 100101	l	**53** 110101	1
6 000110	G	**22** 010110	W	**38** 100110	m	**54** 110110	2
7 000111	H	**23** 010111	X	**39** 100111	n	**55** 110111	3
8 001000	I	**24** 011000	Y	**40** 101000	o	**56** 111000	4
9 001001	J	**25** 011001	Z	**41** 101001	p	**57** 111001	5
10 001010	K	**26** 011010	a	**42** 101010	q	**58** 111010	6
11 001011	L	**27** 011011	b	**43** 101011	r	**59** 111011	7
12 001100	M	**28** 011100	c	**44** 101100	s	**60** 111100	8
13 001101	N	**29** 011101	d	**45** 101101	t	**61** 111101	9
14 001110	O	**30** 011110	e	**46** 101110	u	**62** 111110	-
15 001111	P	**31** 011111	f	**47** 101111	v	**63** 111111	_

Such a URI-safe base 64 alphabet can be used to represent the binary string representation as characters A-Z a-z 0-9 hyphen and underscore, without requiring any of these characters to be percent encoded within a URI.

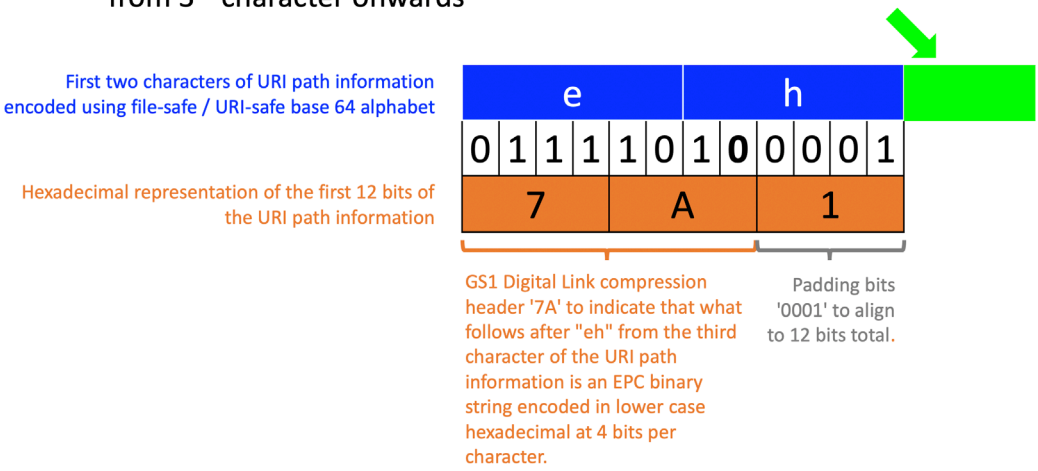
4.2 Expression of EPC binary string within a compressed GS1 Digital Link URI

The GS1 Digital Link URI syntax supports the capability to express the binary string encoding of an Electronic Product Code (EPC) identifier within a compressed GS1 Digital Link URI by using the special compression headers '7A' and '7B' to signal this usage. These compression headers were previously reserved for future use but the GS1 Digital Link standard v1.1 [DL 1.1] has been updated in v1.1.4 so that its Table Opt (which defines the meaning of compression headers) notes that compression headers '7A' and '7B' are now to be used for expression of an EPC binary string within special compressed GS1 Digital Link URIs.

As shown in the figures below, hexadecimal compression headers '7A' and '7B' correspond to the binary strings 01111010 and 01111011 respectively. When these are appended with binary string 0001, the resulting 12-bit binary strings 011110100001 and 011110110001 appear in the file-safe / URI-safe base 64 alphabet as the characters 'eh' and 'ex' respectively as the initial two characters of the compression string in special compressed GS1 Digital Link URIs.
These support two alternative options for expressing an EPC binary string:

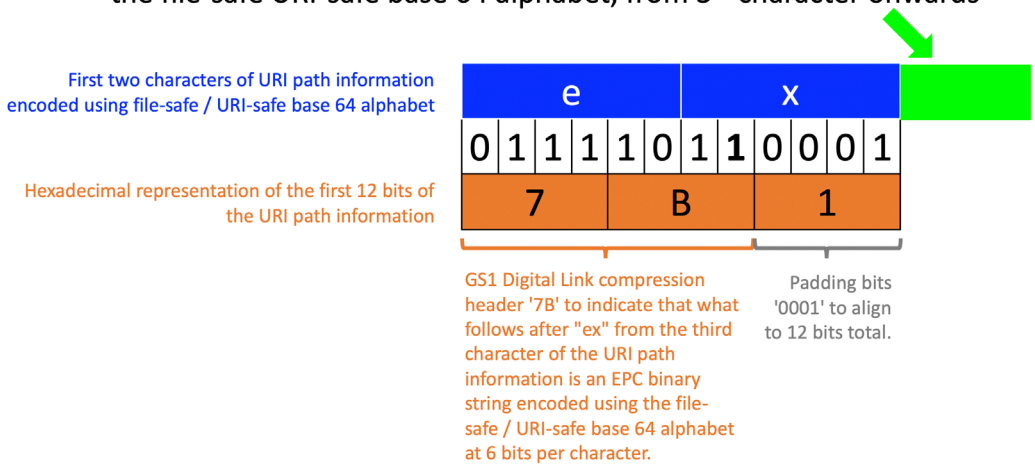
Option A:

URI mnemonic:
'eh' → EPC binary string in lower-case hexadecimal
from 3rd character onwards



Option B:

URI mnemonic:
'ex' → EPC binary string in alphanumeric ('X') using an eXtended alphabet,
the file-safe URI-safe base 64 alphabet, from 3rd character onwards



4.2.1 Option A: Hexadecimal encoding using compression header '7A' / string prefix 'eh'

If the compressed string of a GS1 Digital Link URI begins with '**eh**' then the characters following '**eh**' should be lower-case hexadecimal characters that correspond to the binary encoding of an EPC identifier, one lower-case hexadecimal character for each group of 4 bits. The EPC binary string begins with the EPC header as defined within the GS1 Tag Data Standard [TDS].

To construct a compressed GS1 Digital Link URI, convert an EPC binary string to lower-case hexadecimal then append this to 'eh' to form the compressed string. Append the compressed string to a URI stem that excludes a query string or anchor fragment, ensuring that there is exactly one forward slash preceding it.

The 'decoding' procedure for translating a special compressed GS1 Digital Link URI in which the compression string begins with '**eh**' into a fully uncompressed GS1 Digital Link URI is as follows:

1. extract the substring of the input URI from the start up to but excluding the compression string beginning with '**eh**' and treat this as the URI stem.
2. Extract the string of lower case hexadecimal characters after '**eh**' within the compression string (final component of URI path information) and convert these to an EPC binary string at 4 bits per hexadecimal character.
3. Use the GS1 Tag Data Standard or the GS1 Tag Data Translation Standard and its artefacts to translate that EPC binary string to an equivalent fully uncompressed GS1 Digital Link URI, using the URI stem extracted in step 1.

Worked example:

https://example.com/**eh**30164596f40c0e5cbe991a83

Compression header '**7A**' and compression string prefix '**eh**' indicate that what follows after '**eh**' is a hexadecimal encoding of an EPC binary string in which each hexadecimal character corresponds to 4 bits.

3	**0**	**1**	**6**	**4**	**5**	**9**	**6**	**f**	**4**	**0**	**c**	**0**	**e**	**5**	**c**	**b**	**e**	**9**	**9**	**1**	**a**	**8**	**3**
0011	0000	0001	0110	0100	0101	1001	0110	1111	0100	0000	1100	0000	1110	0101	1100	1011	1110	1001	1001	0001	1010	1000	0011

The first 8 bits, '00110000' are the EPC header for the SGTIN-96 EPC scheme.

Using the details defined in the GS1 Tag Data Standard, this binary string can be decoded to

urn:epc:id:sgtin:9528765.012345.123456789123

which is equivalent to element string **(01)**09528765123457**(21)**123456789123

which is equivalent to https://example.com**/01/**09528765123457**/21/**123456789123

In this worked example, the URI stem was 'https://example.com/', which was extracted from the input special compressed GS1 Digital Link URI in step 1 and reinstated as the URI stem for the equivalent fully uncompressed GS1 Digital Link URI as the output of step 3.

4.2.2 Option B: File-safe base 64 encoding using compression header '7B' / string prefix 'ex'

If the compressed string of a GS1 Digital Link URI begins with '**ex**' then the characters following '**ex**' should be characters from the file-safe URI-safe base 64 alphabet (see section 4.1) that correspond to the binary encoding of an EPC identifier, using one such character for each successive group of 6 bits. The EPC binary string begins with the EPC header as defined within the GS1 Tag Data Standard.

To construct a compressed GS1 Digital Link URI, convert an EPC binary string to file-safe / URI-safe base64 characters at 6 bits per character then append this to 'eh' to form the compressed string. Append the compressed string to a URI stem that excludes a query string or anchor fragment, ensuring that there is exactly one forward slash preceding it.

The 'decoding' procedure for translating a special compressed GS1 Digital Link URI in which the compression string begins with '**ex**' into a fully uncompressed GS1 Digital Link URI is as follows:

1. extract the substring of the input URI from the start up to but excluding the compression string beginning with '**ex**' and treat this as the URI stem.
2. Extract the string of file-safe URI-safe base 64 characters after '**ex**' within the compression string (final component of URI path information) and convert these to an EPC binary string at 6 bits per hexadecimal character, making use of the table in section 4.1.
3. Use the GS1 Tag Data Standard or the GS1 Tag Data Translation Standard and its artefacts to translate that EPC binary string to an equivalent fully uncompressed GS1 Digital Link URI, using the URI stem extracted in step 1.

Worked example:

https://example.com/**ex**MBZFlvQMDly-mRqD

Compression header '7B' and compression string prefix '**ex**' indicates that what follows after '**ex**' is an encoding of an EPC binary string using the file-safe / URI-safe base64 alphabet (see Section 4.1 of this document and Section 5 of RFC 4648), in which each character corresponds to 6 bits.

M	B	Z	F	l	v	Q	M	D	l	y	-	m	R	q	D
001100	000001	011001	000101	100101	101111	010000	001100	000011	100101	110010	111110	100110	010001	101010	000011

The first 8 bits, '00110000' are the EPC header for the SGTIN-96 EPC scheme.

Using the details defined in the GS1 Tag Data Standard, this binary string can be decoded to

urn:epc:id:sgtin:9528765.012345.123456789123

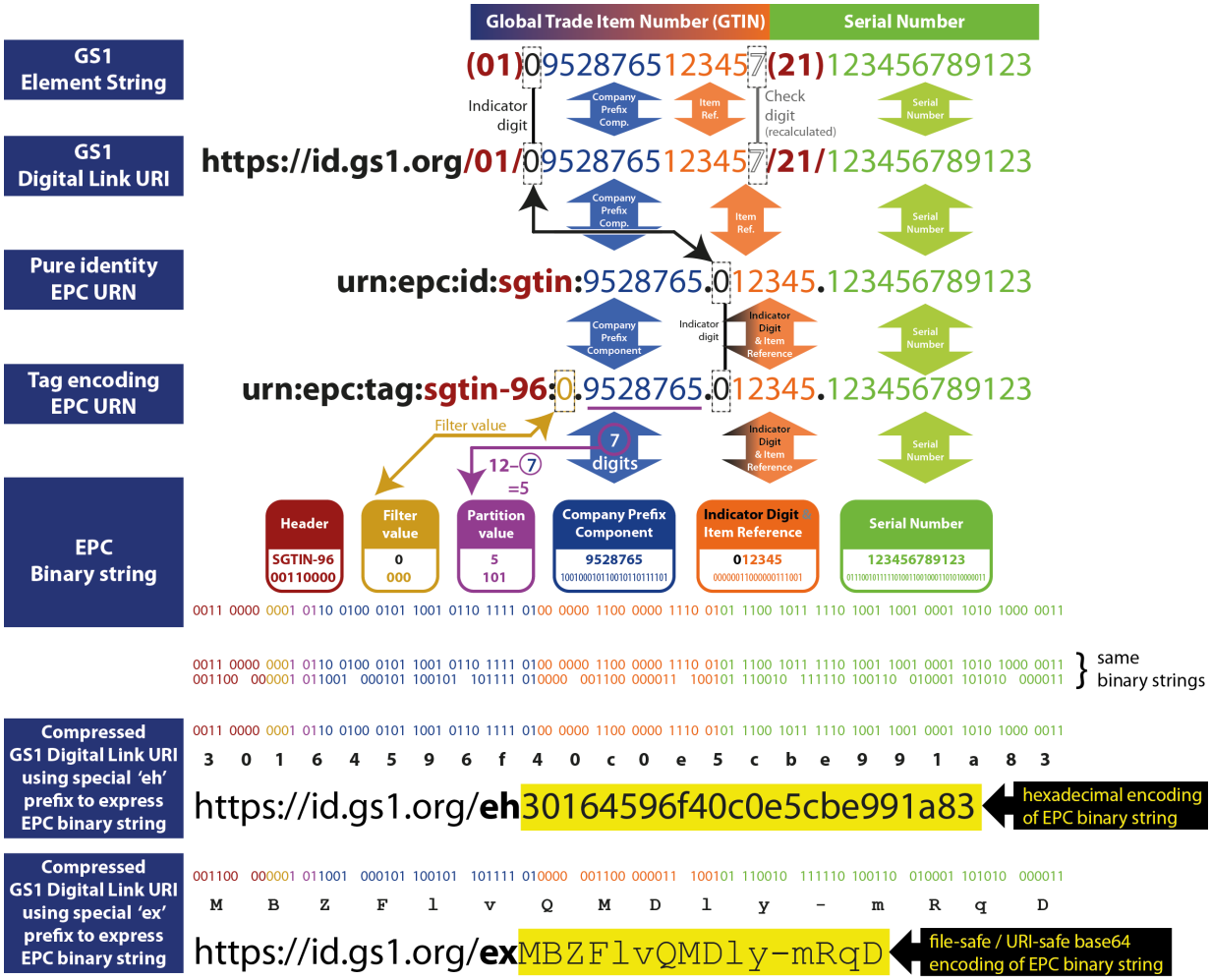
which is equivalent to element string **(01)**09528765123457**(21)**123456789123

which is equivalent to https://example.com/**01**/09528765123457/**21**/123456789123

In this worked example, the URI stem was 'https://example.com/', which was extracted from the input special compressed GS1 Digital Link URI in step 1 and reinstated as the URI stem for the equivalent fully uncompressed GS1 Digital Link URI as the output of step 3.

4.2.3 Graphical summary

The figure below shows a graphical summary of the worked examples for option A (using special prefix 'eh') and option B (using special prefix 'ex') to express the same EPC binary string within a compressed GS1 Digital Link URI. The GS1 Tag Data Standard defines how to decode an EPC binary string to the EPC URN formats or to GS1 element strings. The GS1 Tag Data Translation [TDT] standard and its artefacts may be used to perform the decoding of EPC binary strings.



5 Glossary

The glossary lists the terms and definitions that are applied in this document. Please refer to the www.gs1.org/glossary for the online version.

Term	Definition
Domain name	A domain name is an identification string that defines a realm of administrative autonomy, authority or control within the Internet. Domain names are formed by the rules and procedures of the Domain Name System (DNS). Any name registered in the DNS is a domain name. Domain names are used in various networking contexts and application-specific naming and addressing purposes. Domain names provide an abstraction layer that separates a registered name for an organisation or activity from the actual internet addresses (IP addresses) that provide its associated information services such as its Website, its e-mail server etc. The system that connects the domain names with the corresponding IP addresses is the Domain Name System (DNS).
GS1 Digital Link URI	A Web URI conforming to the GS1 Digital Link URI syntax.
URI	Uniform Resource Identifier. A string of characters used to identify a resource. The resource may be an information resource such as a Web page or a thing in the real world, such as a physical object, person or location. URIs refer to the superset of Uniform Resource Names (URNs), Uniform Resource Locators (URLs) and Web URIs (which can function both as globally unambiguous names, while also behaving like URLs by enabling intuitive retrieval of related information via the Web).
URI path information	A path consists of a sequence of path segments separated by a forward slash ("/") character. A path is always defined for a URI, though the defined path may be empty (zero length). The path component contains data, usually organized in hierarchical form, that, along with data in the non-hierarchical query component, serves to identify a resource within the scope of the URI's scheme and naming authority (if any). The path is terminated by the first question mark ("?") or number sign ("#") character, or by the end of the URI.
URL	Uniform Resource Locator (URL), a specific type of URI colloquially known as Web address. A URL is a URI starting with http or https .

6 References

[BSR]

GS1 Barcode Syntax Resource. See https://ref.gs1.org/tools/gs1-barcode-syntax-resource/

[DL 1.1]

GS1 Digital Link version 1.1.2 Mark Harrison, Phil Archer et al. GS1 ratified standard, November 2022

https://ref.gs1.org/standards/digital-link/1.1.2/

[DL-URI]

GS1 Digital Link: URI Syntax Mark Harrison, Peta Ding. GS1 ratified standard

https://ref.gs1.org/standards/digital-link/uri-syntax/

[QR]

Unless otherwise specified, the term 'QR Code®' refers to the widely used ISO/IEC 18004 QR Code®, excluding the GS1 QR Code that recognises the FNC1 character. 'QR Code' is a registered trademark of Denso Wave, a subsidiary of Denso Corporation. Both the ISO/IEC 18004 QR Code® and GS1 QR Code follow the encoding scheme described in ISO/IEC 18004 Information technology — Automatic identification and data capture techniques — QR Code bar code symbology specification, 3rd edition 2015-02-01. https://www.iso.org/standard/62021.html

[RFC 4648]

The Base16, Base32, and Base64 Data Encodings. S Josefson. IETF October 2006 https://www.rfc-editor.org/rfc/rfc4648.txt

[Resolver]

GS1-Conformant resolver. Phil Archer, February 2024. GS1 ratified standard. https://ref.gs1.org/standards/resolver/

[TDS]

EPC Tag Data Standard (TDS), GS1 Ratified standard

https://ref.gs1.org/standards/tds/

[TDT]

GS1 EPC Tag Data Translation (TDT) Standard. GS1 ratified standard.

https://ref.gs1.org/standards/tdt/

7 Change log

Changes made since the publication of GS1 Digital Link version 1.1 (February 2020) are as follows.

7.1 Expression of EPC binary string within a compressed GS1 Digital Link URI

- added, using previously reserved binary compression headers 7A and 7B to result in mnemonic strings 'eh' and 'ex' within the compression string of the URI, to indicate that what follows after 'eh' is an EPC binary string expressed in hexadecimal characters or that what follows after 'ex' is an EPC binary string expressed in file-safe / URI-safe base 64 characters.
- New section 1 clarifies position of this standard within the overall suite of GS1 standards
- Applied GS1 Style Guide:
  - Applied the "current" disclaimer
  - Log of changes added beginning of the document.
  - Added contributor list in beginning of document
  - Fixed PDF hyperlinks