



# GS1 DataMatrix – A **quick** review

“Ask the Experts” – GS1 Healthcare Conference Dubai UAE

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# Healthcare has special requirements...



Expiration data & lot number



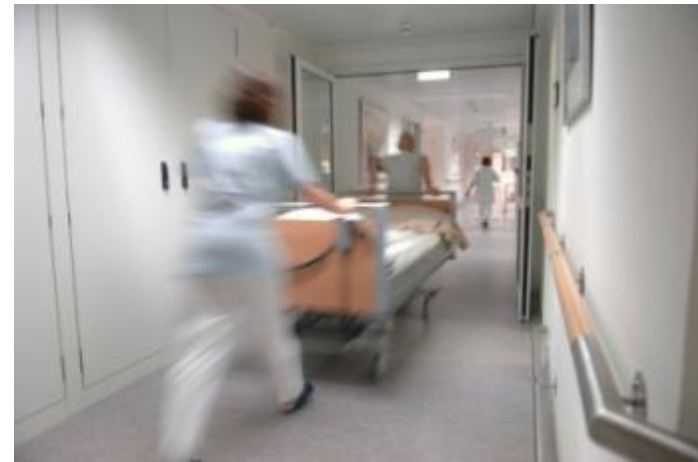
Small space



Direct part marking



Additional data & variable data at high production rates



Non-retail channels

...and barcodes for its special needs...



EAN/UPC



GS1 DataBar



GS1-128



GS1  
DataMatrix



00012345678905

ITF-14



...and sometimes the need is for data beyond item ID... in a small area...

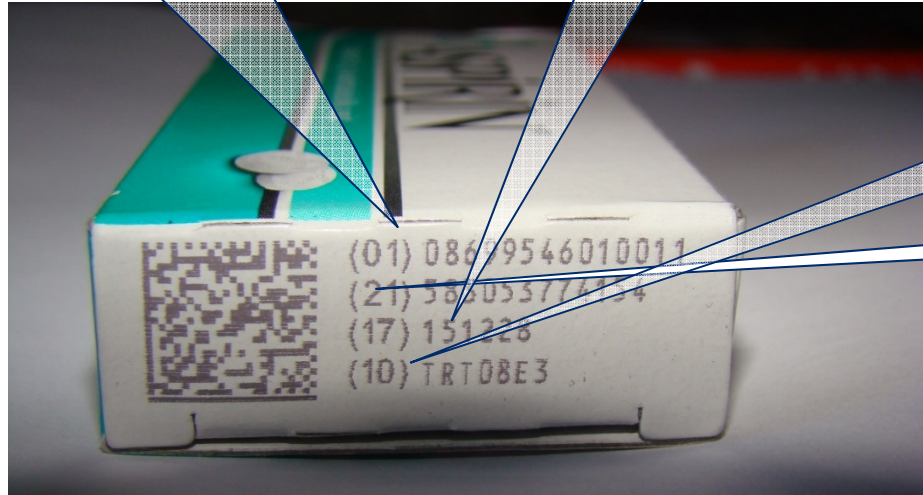


**GTIN – Trade Item ID**

**Expiry Date**

**Lot/Batch Number**

**Serial Number**



# 2D/Matrix Data Carriers – Technology...



- Mature Technology
- “Strong” Finder Patterns
- Omnidirectional Design for image scanning
- Inherent Robust Error Detection and Error Correction
- Complex Structural Algorithms
- Data Compaction Modes
- Structured Append
- Image Reverse and Color Reverse

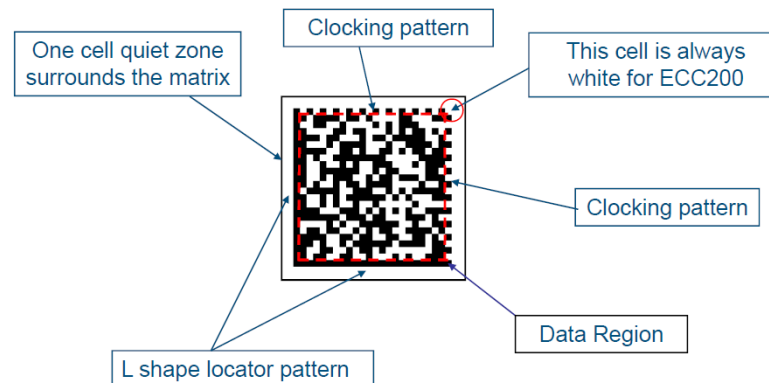


# 2D/Matrix Data Carriers – Technology...

... ISO/IEC Data Matrix the base bar code symbology



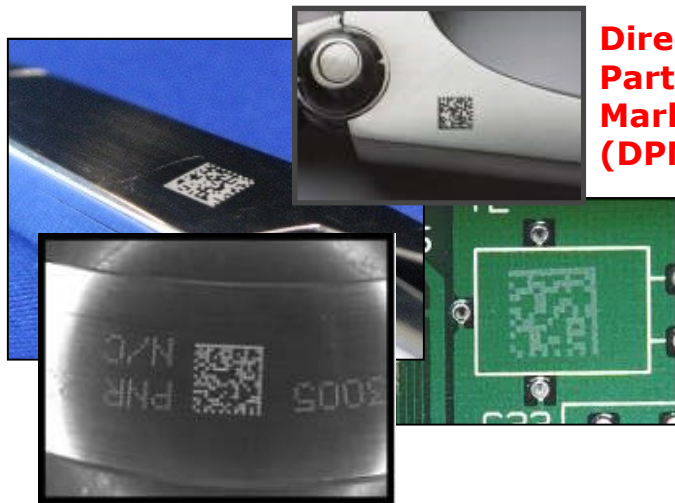
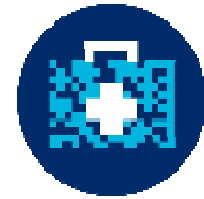
- Established 1989 by International Data Matrix
- Internationally standardized in ISO/IEC 16022
- Scaleable matrix from 9 x 9 to 49 x 49 modules
  - (Size Change w/ Data Content... in “block steps”...)
- Error Detection & Multiple Error Correction Levels
- Multiple encoding formats and macros
- More adaptable to “direct” marking (DPM)
- Primary Applications - Parts marking (Aerospace, Automotive, Semiconductor, Medical instruments), Pharmaceutical packaging, Documents





# 2D/Matrix Data Carriers – Technology...

... ISO/IEC Data Matrix well proven applications



**Direct  
Part  
Marking  
(DPM)**

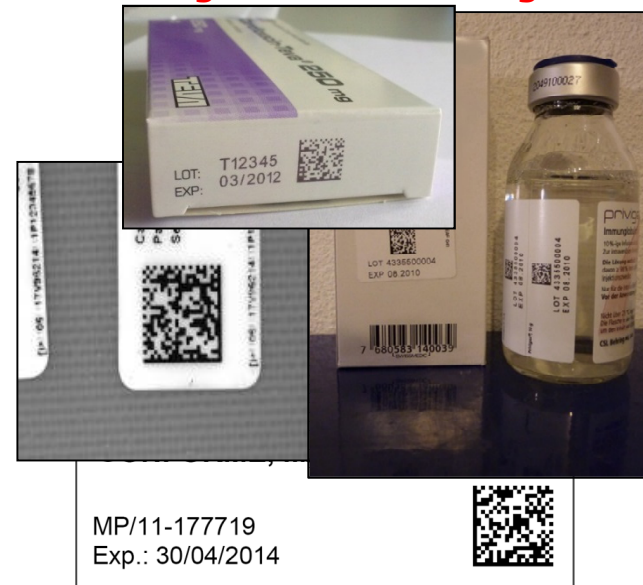
**Identification  
& Document  
Tracking**



**Item Package & Label Marking**



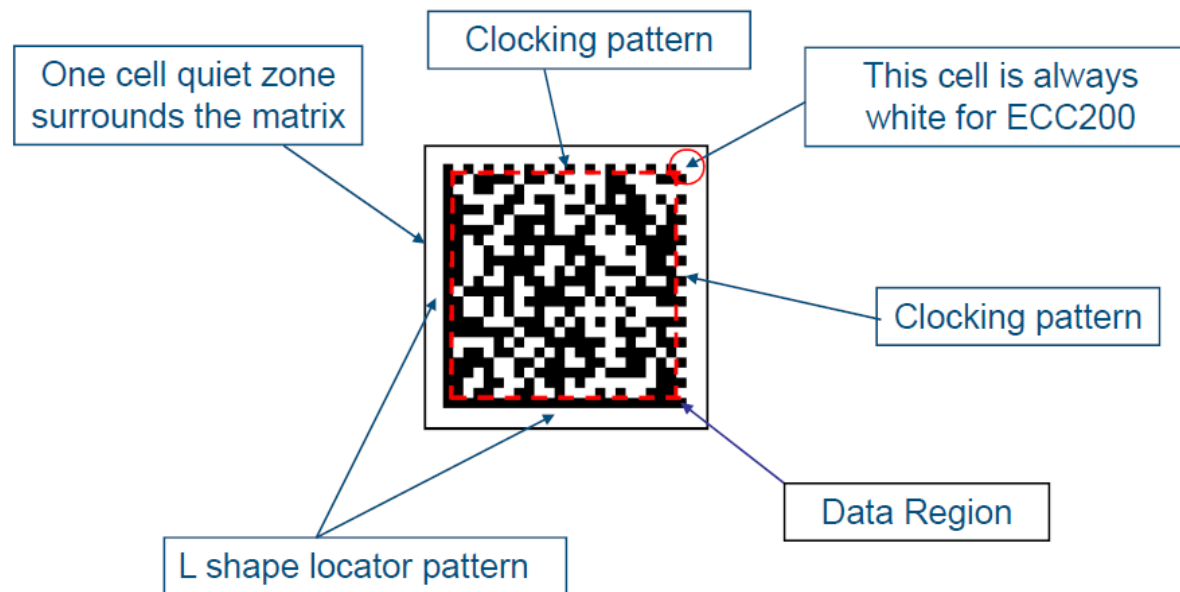
**Packaging  
Verification**



MP/11-177719  
Exp.: 30/04/2014

# 2D/Matrix Data Carriers – Technology...

... **GS1** DataMatrix, a part of ISO/IEC Data Matrix



- ISO/IEC 16022 Data Matrix... as “**GS1 DataMatrix**”:
  - Similar to the Code 128 / GS1-128 “relationship”, an **FNC1** in the first data position signals GS1 formatted data & a **GS1 DataMatrix**
  - Is always “ECC 200” & Alpha-Numeric encodation capable
  - GS1 DataMatrix has a specific ISO/IEC Symbology Identifier



# 2D/Matrix Data Carriers – Size change...



## GS1 DataMatrix... Size Change w/ Data Content... in “blocks”

<u>Symbol 1</u> - GTIN Only	→		0.107in x 0.107in (0.011 sq inch)
<u>Symbol 2</u> - GTIN + AI(17)	→		0.121in x 0.121in (0.015 sq inch)
<u>Symbol 3</u> - GTIN + AI(17) + AI(10) of 4 numeric & 6 alpha	→		0.134in x 0.134in (0.018 sq inch)
<u>Symbol 4</u> - GTIN + AI(17) + AI(10) of 8 numeric & 12 alpha	→		0.147in x 0.147in (0.022 sq inch)
<u>Symbol 5</u> - Symbol 4 + AI(21) of 3 numeric	→		0.468in x 0.468.in (0.219 sq inch)
<u>Symbol 6</u> - Symbol 4 + AI(21) of 13 numeric & 1 alpha	→		0.507in x 0.507in (0.257 sq inch)
<u>Symbol 7</u> - Symbol 4 + AI(21) of 15 numeric & 2 alpha	→		0.507in x 0.507in (0.257 sq inch)
<u>Symbol 8</u> - Symbol 4 + AI(21) of 17 numeric & 3 alpha	→		0.507in x 0.507in (0.257 sq inch)

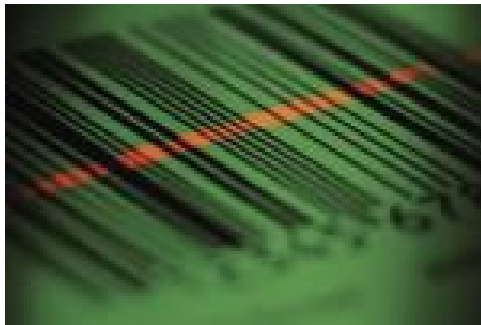


# GS1 DataMatrix – Scanning/imaging...



## Linear Scanners:

- Laser line or linear imager based
- Massive, long-term installed base
- Scans 1D / Linear and some 2D Stacked symbols



## Area Image Scanners:

- Camera based
- Growing installed base in all sectors
- Scans 1D/Linear, 2D/Stacked & 2D/Matrix symbols



**Camera-based bar code scanners... needed in Healthcare AND are GS1 Healthcare Leadership Team recommended!!**

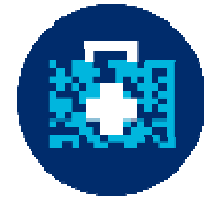


**GS1-128 & GS1 DataBar**



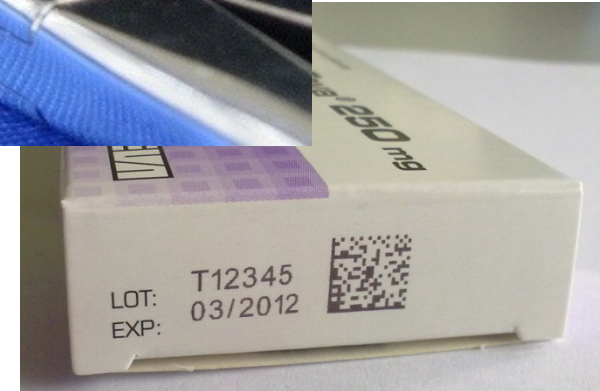
**GS1 DataMatrix**

# GS1 DataMatrix – Marking...



## Printing / Marking:

- Many existing “demand” label printers can print Data Matrix well
- May not be the case for all “in line” printers (validity of inks, needed speeds, etc.)
- DPM brings on a whole new set of challenges
- Beware the missing FNC1



(01)07612345678900(17)100503  
(10)AC3453G3

**Printing / marking must be matched to the application use case needs... as with other bar code symbol generation**

## GS1 DataMatrix



# GS1 DataMatrix – Marking example...



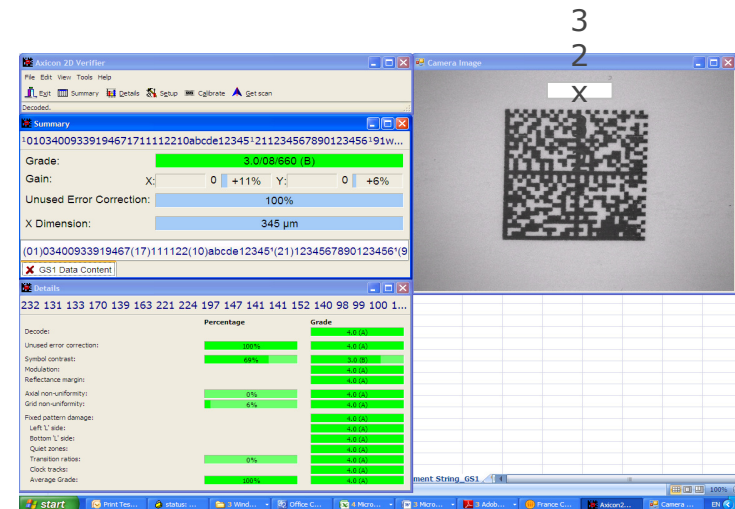
- To meet the French “CIP” requirements
- Identification of the product with “Lot/Batch” & “Expiry”
- Tests already run to add Serial Number and a country specific NHRN (National Healthcare Reimburse Number)
- Running at “normal” line speeds - 300 cartons/minute, 45m/min
- Print sizes – 300 DPI, Module size of 345µm, Wolke m600A, Universal Black UB 7482 HP Inkjet cartridge
- Read & verify – On and off-line camera based & verifier systems



# GS1 DataMatrix – Marking example...



- Tests have also been run to add Serial Number, a country specific NHRN (National Healthcare Reimbursement Number) and a URL
- Run at “normal” line speed - 300 cartons/minute, 45m/min
- Again print sizes – 300 DPI, Module size of 345µm, Wolke m600A, Universal Black UB 7482 HP Inkjet cartridge
- Data: 74 Alphanumeric characters (GTIN, Expiry, Lot/Batch, Serial, NHRN, URL)
- Symbol Size: 32x32 matrix, physical size of 11x11mm
- 94% of run achieved an ISO/IEC 15415 Grade of “B” - 3.0/08/660 (with the remainder a “C” grade)



# GS1 DataMatrix – Marking example...



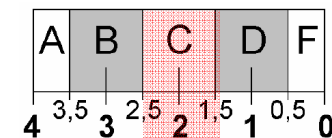
## Technical challenges

Limited space means → small carriers + high data density

- e.g. DMX size : 6x6 - 10x10 mm
- Production/packaging line speed
- Packaging materials
- Printing technology
- Inks

## Quality challenges

- Quality verification (ISO)
- Translucent paper
- Impact on contrast

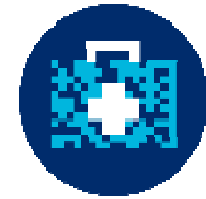


ISO required =  
C (1.5 – 2.5)





# GS1 DataMatrix – Marking example...



## H.E.L.P. Acetate Buffer pH 4.85

**4 x 3000 ml**

**CA/GB Sodium acetate buffer solution for use ONLY with extracorporeal H.E.L.P. apheresis**  
 Caution: Federal Law (U.S.) restricts this device to sale by or on order of a physician.

**CA/FR: Solution tampon d'acetate de sodium destinée à une utilisation UNIQUEMENT avec aphérèse H.E.L.P. extracorporelle**

sterile / stérile  
 Endotoxin-FREE and non-pyrogenic; Ne contient pas d'endotoxines et non-pyrogène  
 SINGLE USE only, discard unused portion; À USAGE UNIQUE seulement, jeter la portion inutilisée  
 DO NOT add any additives; NE PAS ajouter d'additifs  
 NOT for intravenous infusion; NON adapté à une perfusion intraveineuse  
 ONLY USE if solution is clear and colourless; UTILISER UNIQUEMENT si la solution est limpide et incolore  
 ONLY USE if container and connections are not damaged; Ne pas utiliser si l'emballage et les connections sont endommagées  
 Keep out of the reach of children; Conserver la solution hors de portée des enfants

Sodium acetate x 3 H<sub>2</sub>O    27.22 g/l  
 Acetic acid 99%            6.82 g/l

DIN: 02373807

072-1318

**Manufacturer:**  
**B | BRAUN**  
 B. Braun Avitum AG  
 34209 Melsungen  
 Germany

CE 0123    **STERILE**    25°C

PFC    Test carefully instructions for use    Do not reuse

**REF**    Article no.: **4113**

**LOT**    Batch no.: **0350214**

   Manuf. date: **2014-03-04**

   Expiry date: **2017-02-28**

**Canadian Distributor:**  
 Chief Medical Supplies Ltd.  
 411-19th Street S.E.  
 Calgary, Alberta T2E 6U7

**US Distributor:**  
 B. Braun Medical Inc.  
 Bethlehem, PA 18018-3624

**Production site:**  
 B. Braun Avitum AG  
 Kattenvenner Str. 32  
 48219 Glandorf, Germany  
 Made in Germany

**Device Identifier (DI)**  
 “Static” portion  
 GTIN (product identifier)

**Production Identifier (PI)**  
 “Dynamic” portion  
 Application Identifiers (e.g. serial, lot number & expiry date)

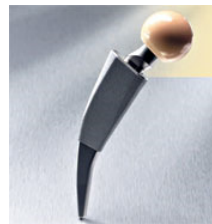
US FDA UDI required  
 ISO 8601 date format



# GS1 DataMatrix – Marking example...



- Only 2D DataMatrix possible at present
  - Consistent reading... min. area of 3x3mm needed
- Size of surgical instruments extremely limited
  - Not all can be encoded (size, material, etc.)
- Implants (!?!?)
  - Size, corrosion, bio-compatibility, warranty issues, etc.
  - High-quality DPM technology required (laser, dot peen, etc.)

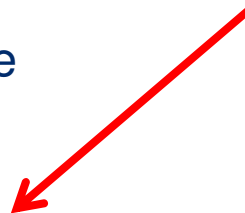


# GS1 DataMatrix - Symbol quality...



## Common Quality Parameters

- Decode / RDA
- X Dimension / Module Size
- Data Structure, Validity
- **Human Readable Interpretation**
- Symbol Contrast
- Modulation
- Quiet Zones, as applicable



**NOTE** – See the GS1 General Specifications for recent HRI Updates!!

### 1D Only



- Bar Height
- Minimum Reflectance
- Edge Contrast
- Defects
- Decodability

### 2D Only



- Fixed Pattern Damage
- Axial Nonuniformity
- Grid Nonuniformity
- Unused Error Correction
- Print Growth
- Clock Track Regularity



# GS1 Data Structure...

...the ISO/IEC Symbology ID unlocks the semantics



## GS1 DataMatrix... or not... how do you know?



Symbol decode:

**]d2**

01108576740020171714112010KMB11205201[GS]21CEB630078700

**GS1 DataMatrix - (FNC1 & AIs)**

**Whether you use a Verifier or go "more manual"... it's all in the data... and the ISO Symbology Identifier!**

ISO Symbology ID's are Internationally agreed (ISO/IEC 15424) 3 character codes that scanner/imagers output at the beginning of a data string that tells what bar code symbology has been read. It is in the form:

→ **]cm**  
**where:**

**] - (ASCII 93) the ID flag character**  
**c - code (symbology) character as ISO defined**  
**m - modifier character(s)**

Symbol decode:

**]d1**

01108576740020171714112010KMB11205201[ GS]21CEB630078700

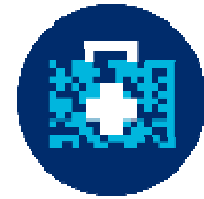


**ISO Data Matrix - (No FNC1)**



# GS1 Data Structure...

...the ISO/IEC Symbology ID unlocks the semantics



(01)10857674002017  
(17)141120  
(10)NYFUL01  
(21)192837  
(713)A1B2C3D4E5F6G



**ENCODED (In) – User dependent:**

<FNC1>**01**10857674002017**17**141120**10**NYFUL01<GS>**21**192837<GS>**713**A1B2C3D4E5F6G

**DECODED (Out) – Scanner dependent:**

]d201108576740020171714112010NYFUL01<GS>21192837<GS>713A1B2C3D4E5F6G

**PROCESSING:**

01108576740020171714112010NYFUL0121192837713A1B2C3D4E5F6G



**01**10857674002017      **17**141120      **10**NYFUL01      **21**192837      **713**A1B2C3D4E5F6G  
10857674002017      20 Nov 2014      NYFUL01      192837      A1B2C3D4E5F6G

ERP Entries

GTIN:

SERIAL:

EXPIRATION:

NHRN:

BATCH/LOT:



# GS1 DataMatrix - Symbol quality help..



**Bar Code Print Quality Verifiers are available for testing 2D Matrix symbols like GS1 DataMatrix**



**Check the [AIM Buyer's Guide](#) for a listing of most manufacturers**





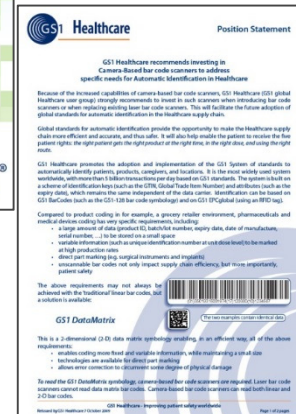
# GS1 DataMatrix – Support materials...



**GS1  
DataMatrix**

(01) 00012345678905

As we see more AIDC marking on small Pharmaceutical and Medical Device products (and/or on their packaging) we will see more GS1 DataMatrix due to its ability to efficiently and securely carry more data in smaller areas, and also due to its promotion for use by the GS1 Healthcare global members. Becoming familiar with the available support materials is advised...



**CHECK OUT:** <http://www.gs1.org/healthcare/library>  
[http://www.gs1.org/docs/barcodes/GS1\\_DataMatrix\\_Introduction\\_and\\_technical\\_overview.pdf](http://www.gs1.org/docs/barcodes/GS1_DataMatrix_Introduction_and_technical_overview.pdf)





# Questions??



## AIDC in Healthcare – GS1 DataMatrix

### Contact Details

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M +1 (315) 480-2034

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