



QR Code Overview & Progress of QR Code Applications



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“iQR Code”**



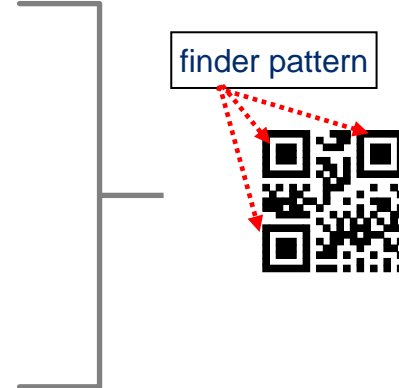
QR code Features



What is QR Code?

- QR code was invented by DENSO CORPORATION in 1994.
- Approved as AIMI Standard in 1997 and ISO/IEC Standard in 2000.
- Adapted as an industry-wide standard code by AIAG, JAMA and JTA.
- High readability by a reader is pursued.
- Advantages of all 2D symbols are integrated in the QR code.

- ◆ Large data capacity
- ◆ High density
- ◆ High-speed reading
- ◆ 360-degree reading
- ◆ Error correction capability



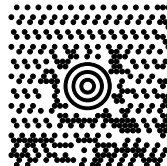




**Royalty
free !!**

- Special characters (*Kanji*, etc.) besides alphanumeric are supported.

AIM : Automatic Identification Manufacturers Inc,
AIAG : Automotive Industry Action Group
JAMA : Japan Automobile Manufacturers Association
JTA : Japan Trucking Association

ISO/IEC Standardized 2D Symbols (As of Feb. 2007)

	PDF417	DATA MATRIX	MAXI CODE	QR Code	Aztec Code
					
Developer (Country)	Symbol (USA)	CI Matrix (USA)	UPS (USA)	DENSO (Japan)	Hand Held Products (USA)
Code type	Multi-low	Matrix	Matrix	Matrix	Matrix
Data size (Alphanumeric)	1,850	2,355	93	4,296	3,067
Characteristics	High capacity	High capacity Small space	Fast reading	High capacity Small space Fast reading	High capacity
Main market	OA	FA, Medical	Logistics	All industries	Air Line, Railroad
Standard	AIMI ISO	AIMI ISO	AIMI ISO	AIMI ISO JIS	AIMI

Features of QR Code (1)

■ High Capacity

Can encode several hundred times as much data as a bar code

Up to 7089 digits (numeric)

0123456789 0123456789
0123456789 0123456789
0123456789 0123456789
0123456789 0123456789
0123456789 0123456789



10 – 20 digits

0123456789



■ Reduced Space

Can represent the data in a 1/30 space compared with a bar code

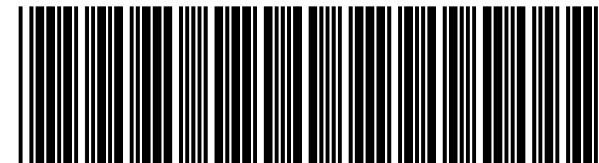
Approx. 5mm square

40 digits
(numeric)



Approx. 50mm × 20mm

10 digits (numeric)



Features of QR Code (2)

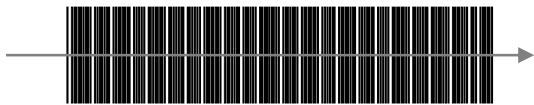
■ high-speed reading & 360-degree

Supports 360-degree high speed reading

360-degree reading



Horizontal reading



■ Durability against soil & damage

Can recover up to 30% of damaged codewords

Reading is possible



Reading is impossible



■ Kanji representation

Can effectively encode Japanese characters

Japanese characters

財団法人
流通システム
開発センター



Alphanumeric only





Japan

Summary of Features

1. High capacity and reduced space encoding

◆ Up to 7,089 characters (numeric)

◆ 300 characters (numeric) in 5mm square (0.1mm module)

2. Efficient encoding of Japanese character

◆ 20% fewer bits (13 bits) are used to encode Chinese character as a default character set.

Table 1

Type & Amount of Data (Mixed use is possible.)	Numeric	Max. 7,089 characters
	Alphanumeric	Max. 4,296 characters
	8-bit bytes (binary)	Max. 2,953 characters
	Chinese character	Max. 1,817 characters

3. High-speed and 360-degree reading



4. High resistant to damage

◆ There are four phases of error correcting rates

Table 2

Error correction (data restoration)	Level L	Approx. 7% of codewords can be restored.
	Level M	Approx. 15% of codewords can be restored.
	Level Q	Approx. 25% of codewords can be restored.
	Level H	Approx. 30% of codewords can be restored.

QR Code - National Standard

- **Japan**
 - **Japanese Industrial Standard JIS X 0510**
- **People's Republic of China**
 - **Chinese National Standard GB/T 18284**
- **Republic of Korea**
 - **Korean National Standard KSXISOIEC 18004**
- **Socialist Republic of Viet Nam**
 - **Vietnamese National Standard TCVN 7322**
- **Republic of Singapore**
 - **Singapore National Standard SS 543 ('09)**
- **Kingdom of Thailand**
 - **Thailand National Standard :(Under standardization process)**

Obtaining QR Code Specification

QR Code is established as an ISO (ISO/IEC18004) standard.
QR Code specification can, therefore, be purchased from this organization.

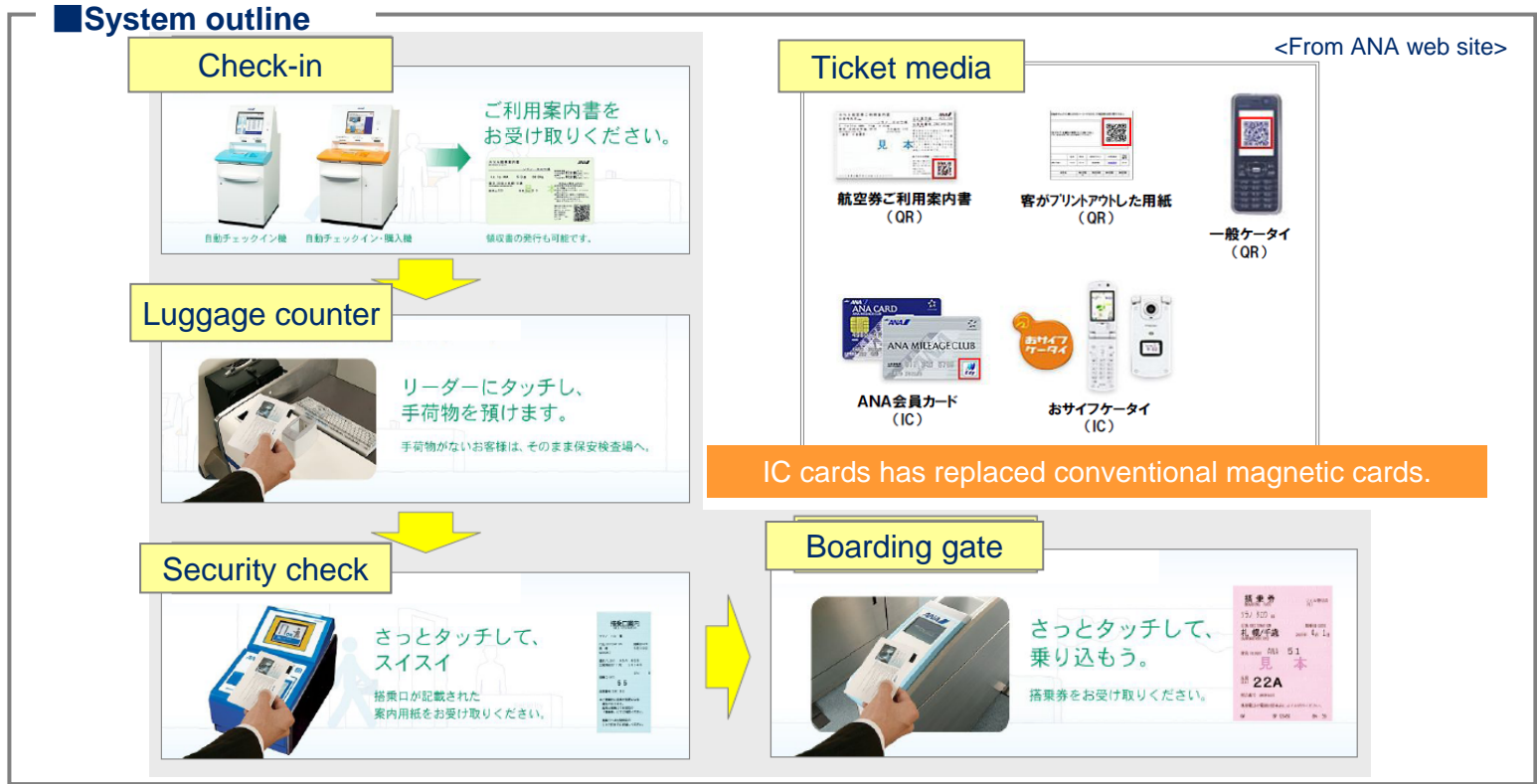
<http://www.iso.ch/iso/en/prods-services/ISOstore/store.html>

QR Code Applications

(JAPAN)



Mobile QR Code is used for the boarding control system of All Nippon Airways (ANA).



<Benefits>

- 1) You can get a ticket without waiting by previously purchasing a ticket (CS improvement).
- 2) Since a Mobile QR Code serves as a ticket, no magnetic cards, IC cards or papers are required, and this contributes heavily for the reduction of ticket cost.

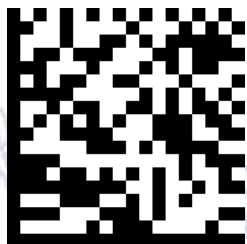
Background (Air ticket)

- Oct. 2007 IATA (International Air Transport Association) endorsed use of multiple matrix symbology for mobile phone replacing paper ticket /boarding pass.

<http://www.iata.org/pressroom/pr/2007-11-10-01>

- The industry has set a deadline of the end of 2010 to implement 100% bar coded boarding passes (BCBP)
- Manufacturers of airport devices incorporating barcode reader all said they can be ready by the mandated date.
- Airlines choose symbology for encoding passenger/flight data and all the airport facility will be capable to process any of the following matrix symbols

DataMatrix



QR Code



Aztec Code



Processed Food Traceability Chain

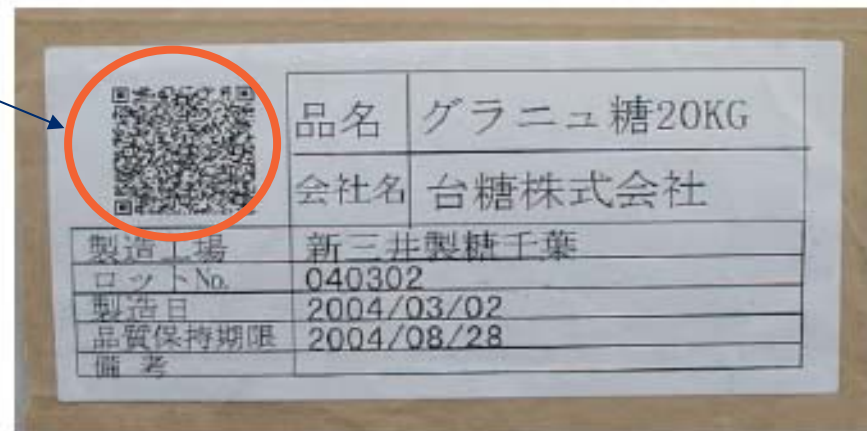
Who : Major Processed Food Manufacturer (Q.P. Corporation)

What: AI (01), (11), (17), (10), (21) encoded in QR code on the case of raw material (primary ingredients) and processed food (secondary ingredients)

Why?: To enable management by lot and traceability and prevent accident in factory

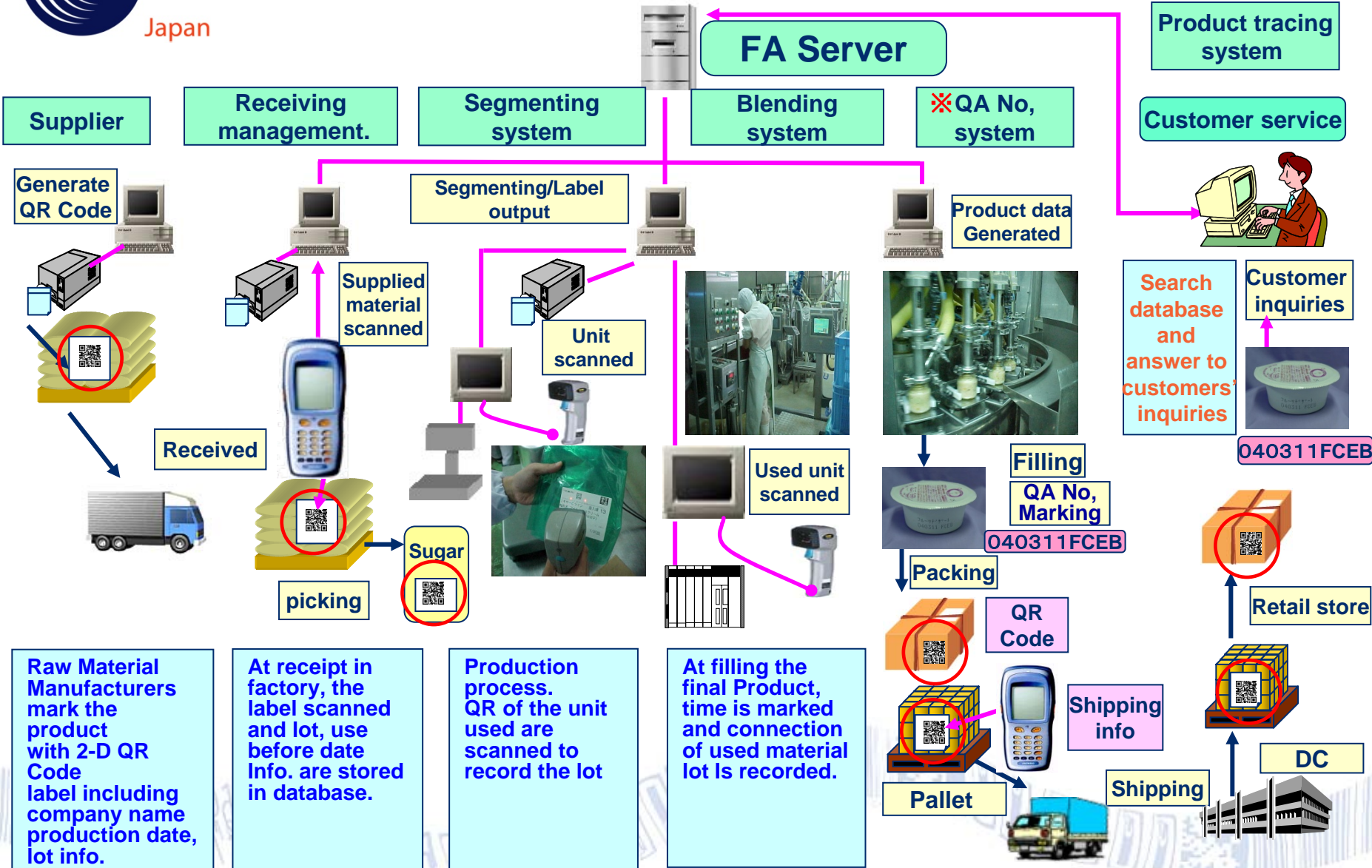
< Case Label of sugar >

QR code



Baby Food Product Traceability System

(by Q.P.corporation)



Raw Material Manufacturers mark the product with 2-D QR Code label including company name production date, lot info.

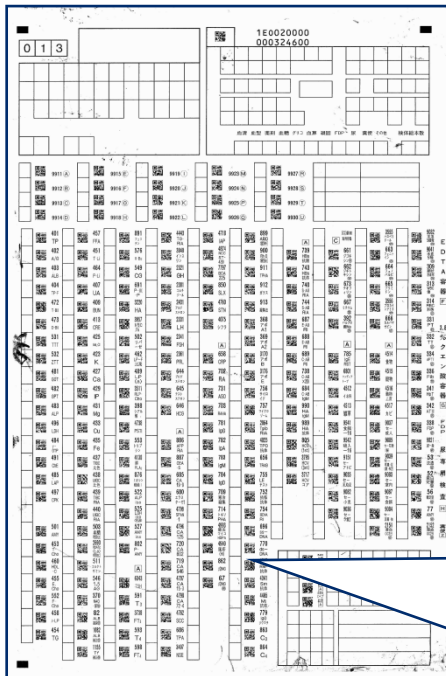
At receipt in factory, the label scanned and lot, use before date Info. are stored in database.

Production process. QR of the unit used are scanned to record the lot

At filling the final Product, time is marked and connection of used material lot is recorded.

Blood Test Sheet

Efficient data entry of various test items



Data: 200003340000000000

HI	785	4514	334
689	IgE	食物	APT
C-AB	RIST	食物	③
RI	6801	食物	336
738	クオリア	食物	FIB
C-AB	トープ	食物	③
X20	4512	動物	341
684	イネ科	動物	HpT
C-AB	4513	動物	③
IgM	雑草	動物	342
990	9541	カビ	ATIII
HA	食餌	成人	③
IgM	—16	成人	338
989	9542	成人	FDP
HA	吸入	成人	③
抗体	—16	成人	9021
805	9151	成人	尿
HCV	セー	成人	③
(1st)	アトピ	成人	53
3795	9035	成人	沈澱
HCV	乳幼児	成人	③
(3st)		成人	52
3717		成人	測定
HCV		成人	③
コア		成人	52



Blood test sheet

Contact lens management

Adopted by Japan Contact Lens Association as standard symbol



Data Volume :
40 characters
Symbol Size :
8 mm sq.
Data Contents:
product code
product name
degrees
base curve

System Outline

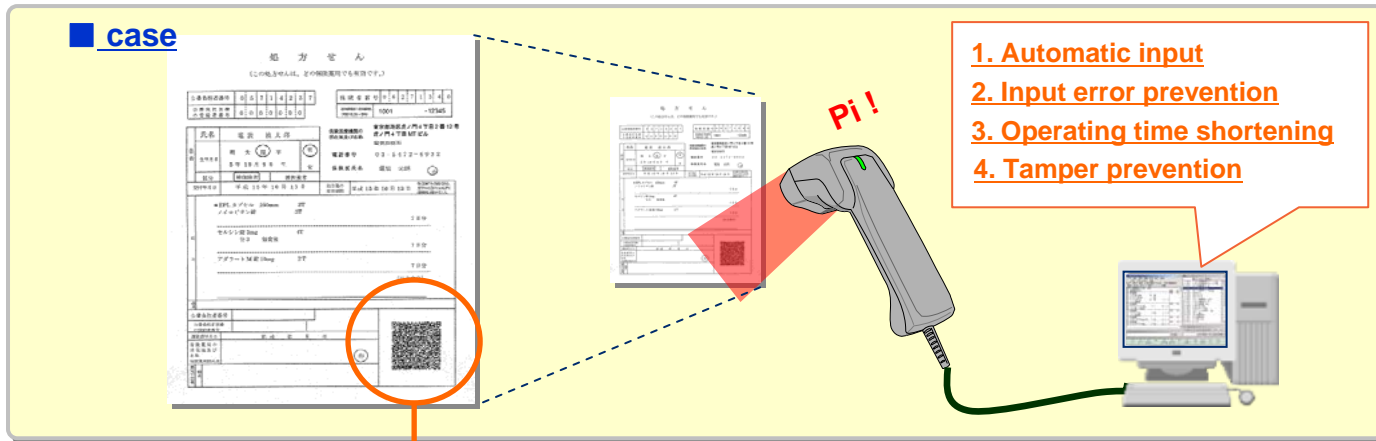
- QR Code data on contact lens case is used for sales and stock control.

Merit of Using QR Code

- A small-sized QR code has implemented the numbering of small articles like contact lens cases.
- Significantly reduced manual handling to manage individual numbers.

Prescription management

Standardised by JAHIS (Japanese Association of Healthcare Information Systems Industry)



Information in a prescription



QRCode

- Medical institution
- Service name
- Doctor information
- Patient information
- Insurance information
- Medicine information

⋮

Patient Wristband

PDA



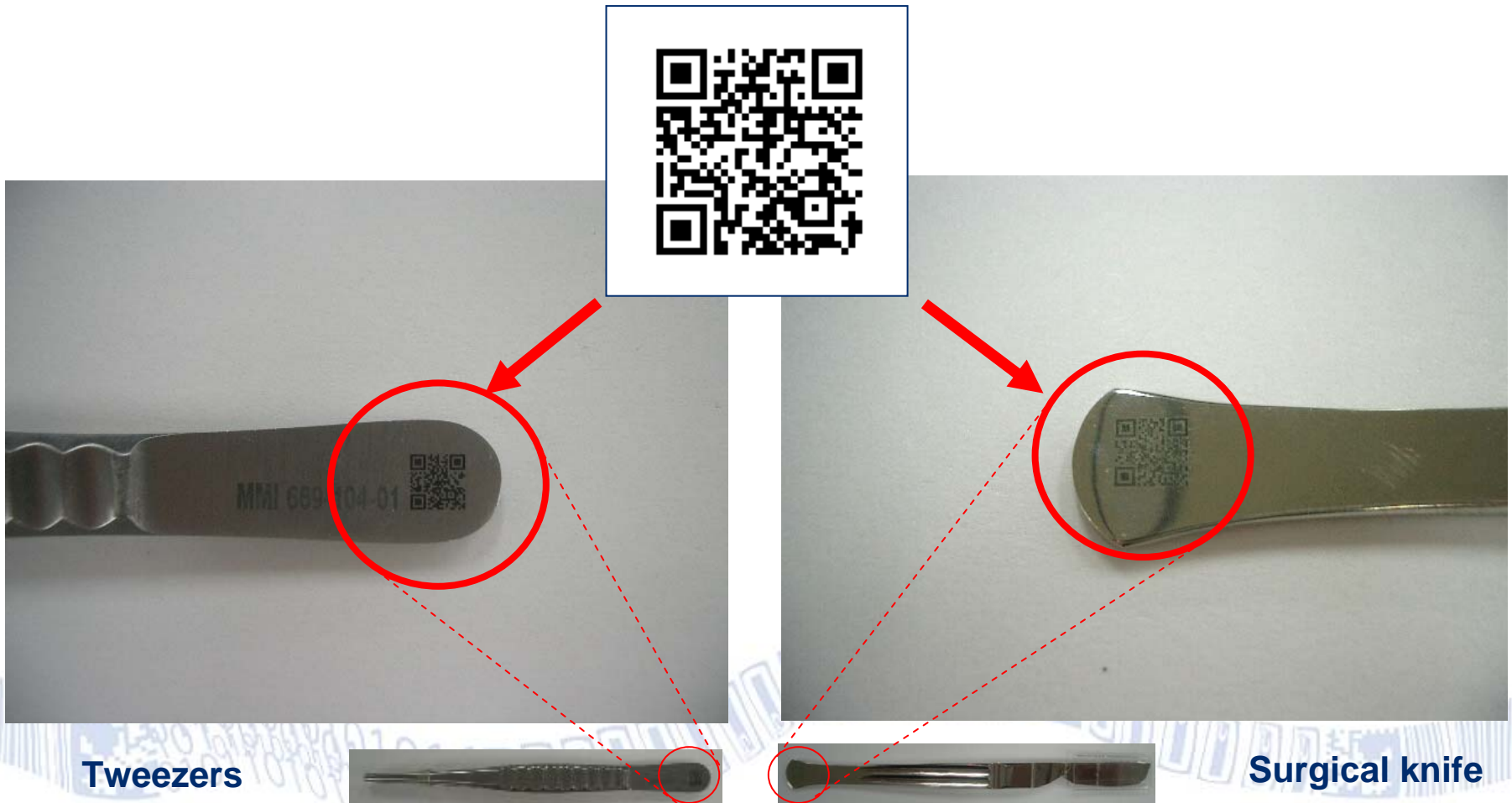
Sample of Patient Wristband

Global Service Relation Number
(GSRN) : AI (8018)



- Wristband with QR code currently used for the patient management use in a hospital.
- Input a medication history and nursing history data.

The example of Direct Parts Marking by QR Code

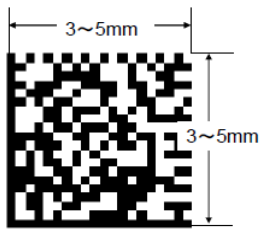


Surgical Instrument (Japan)

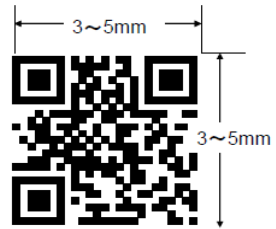
Who :Japan Association of Medical Equipment Industries (JAMEI)

What :Published an Industry guideline on marking, recommending GTIN and Serial Number be encoded in either QR Code or Data Matrix on steel instruments

Why?: To identify devices in order for better management and to contribute to patient safety



a) Data Matrix (ECC200)



b) QR Code

★ Data Matrix (ECC200) and QR code are recommended, as Data Matrix (ECC200) will be indicated on imported devices/instruments and distributed in the future, and the use of QR code has already been recognized in the domestic industry respectively. Even if the two dimensional(2D) symbols are distributed at the same time, there will be no confusion in the use of them since a reading scanner has a function to read both Data Matrix and QR code and the basic system of code is common and has been standardized.

1) Data Matrix (ECC200) (ISO/IEC 16023)

2) QR Code (ISO/IEC 18004)

* Excerpt from JAMEI guideline published in Nov. 2006 (Translation preliminary)

QR Code Applications **(ASIA)**



Application in Singapore

< Passenger management >



Shingapore Cruse
To Batam
Secound generation
Mr. Ryogo Maruyama
From Japan
Xauz00000192



Data Volume:
300 char.
Symbol Size :
20 mm sq.
Data Contents:
name,
passport number,
etc.

System Outline

- QR Codes are printed on the tickets for a casino cruiser.
- The ticket covers passport No., address, and name.
- The printed QR code is used as a certification, when a passenger receives his passport deposited at his embarkment.

Merit of Using QR Code

- Deposited passports can be correctly returned.
- Used as a ticket for food and drink.

Application in Australia I

< LPG cylinder bottle management >



System Outline

- Manages the gas replenishment and the cylinder life and capacity in households with QR codes on the cylinder.
- Manages the amount of gas use and its records to facilitate regular sales.

Merit of Using QR Code

- An off-line system can be established by applying data to the cylinder bottles.

Application in Australia II

< Blood testing process management >

System Outline

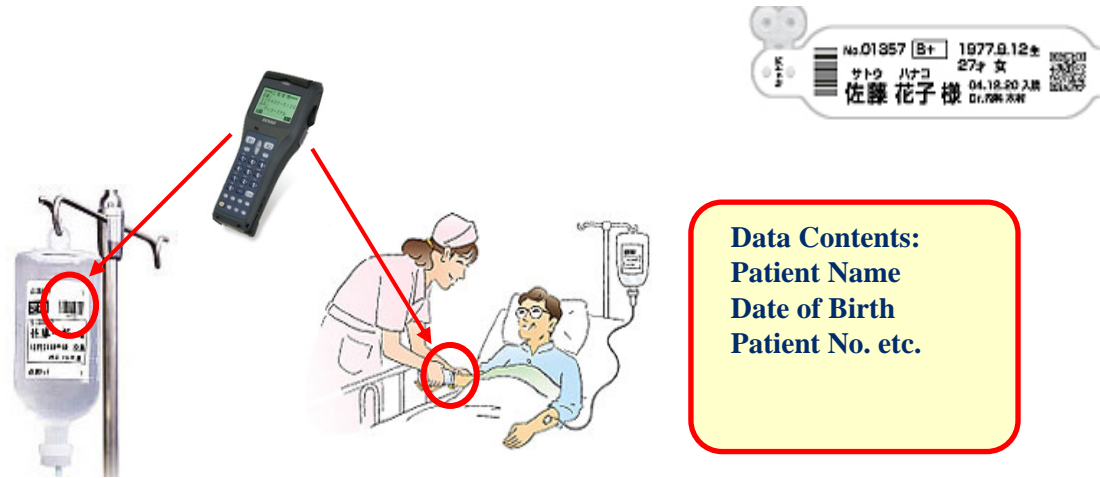
- Collected blood is put in a test tube.
- The test tubes marked with QR Code are inserted into the tester.
- The system automatically examines the inserted blood.

Merit of Using QR Code

- QR code including larger data can be printed on a limited space.
- A compact reader can be easily built in the tester without changing its housing.



QR Code used for patient identification in Japan, Hong Kong and Singapore



Data Contents:
Patient Name
Date of Birth
Patient No. etc.

System Outline

- Hospitals in Japan, Hong Kong and Singapore have adopted QR code printed on patient wrist band to identify the patients.
- Example of information encoded on QR code are patient's name, identification number, date of birth, sex, ward and bed numbers

Merit of Using QR Code

- Ensure that the “right patient” get the “right medicine” or “right treatment” at the “right time”

QR Code application in Telecom Co. as a basis of eBusiness in Taiwan using mobile phone



System Outline

The Taiwan Industry Development Bureau Ministry of Economic Affairs and its council Open Mobile Internet Alliance, OMIA , including Chunghwa Telecom Taiwan's No.1 Telecom operator developed a QR code platform for Taiwan's mobile application.

When the shoppers scan at the QR Code printed on the brochures, or leaflets using the mobile phone, the shoppers will be immediately connected to the vendors of movie tickets, air-tickets and tourists guidance, etc.

Merit of Using QR Code

This is to expedite eBusiness and make it available in various ways, including movie ticketing, tourist guidance.

QR Code application in Agriculture in Taiwan using mobile phone



System Outline

Each packet of vegetable has a unique ID number with product traceability code.

The QR Code on the packet encoded the name of the vegetable, GS1 identification number, packaging date and traceability code.

The Council of Agriculture (C.O.A.) of Taiwan developed the Mobile web linkage

Merit of Using QR Code

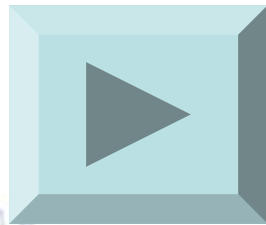
The QR Code can facilitate in the traceability process and enable retailers to withdraw packagers of vegetables which are not fresh.

Shoppers can also get the farmer related information by scanning at the QR Code which will lead to the farm through the Mobile web linkage developed by the Council of Agriculture (C.O.A.) of Taiwan.

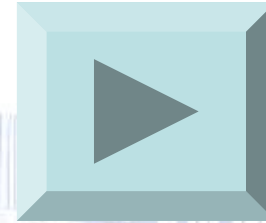
QRcode at Production Lines

Denso Corporation, Japan

Video 1



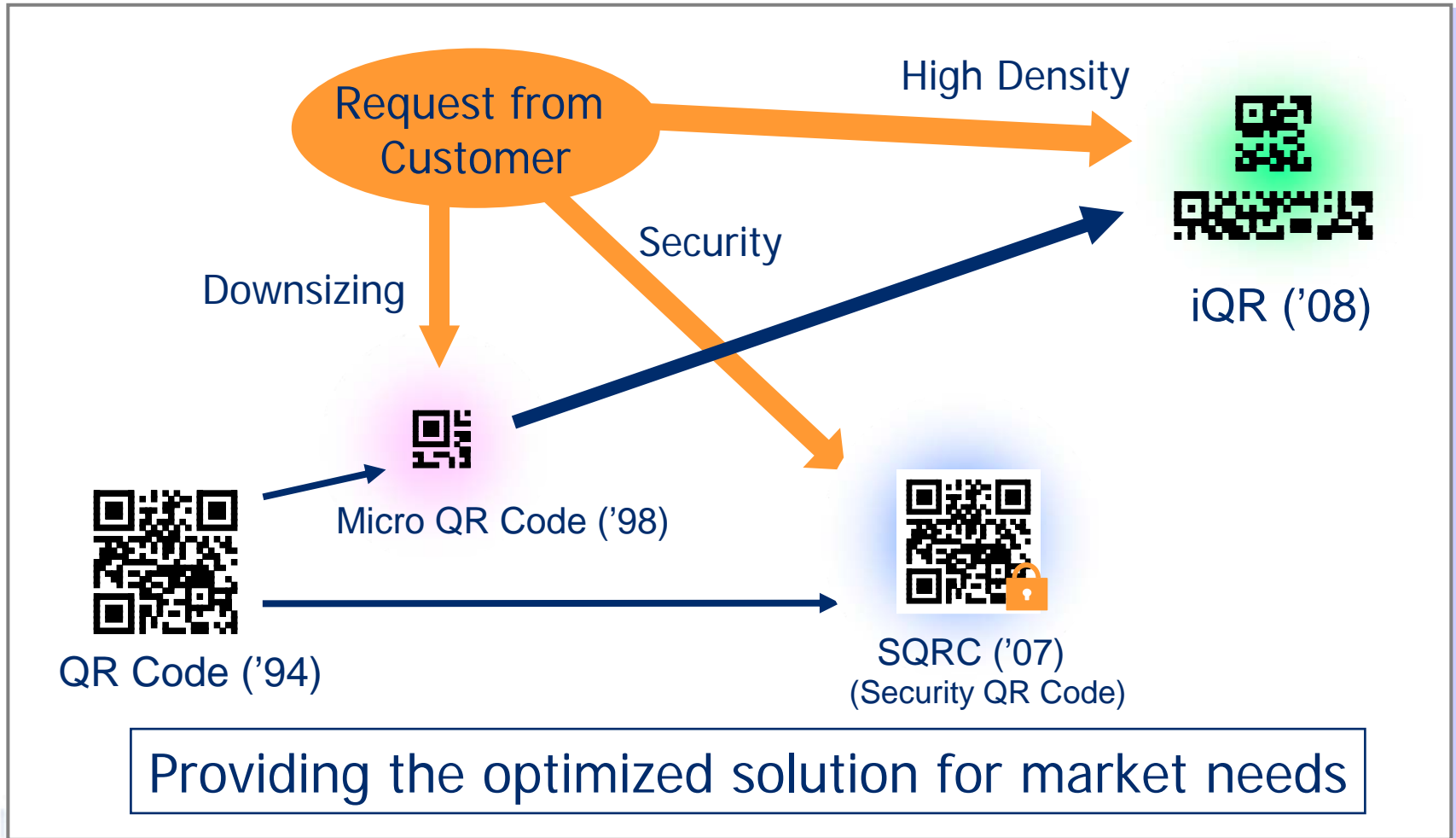
Video 2



Evolution of QR Code

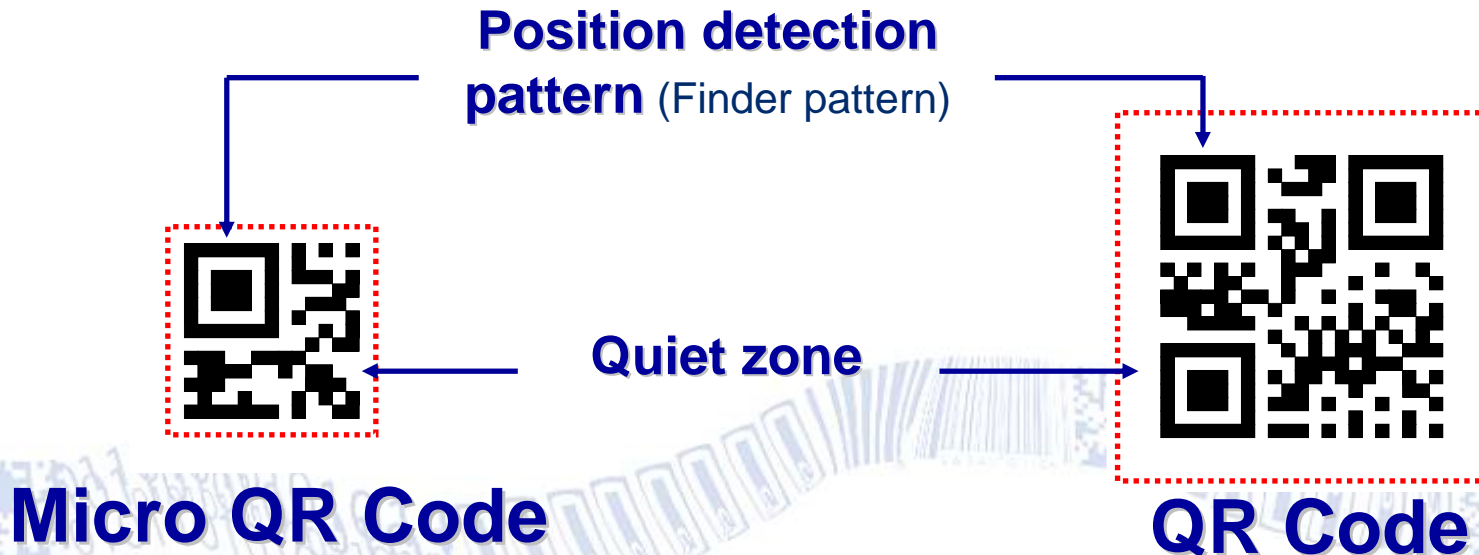


QR Code Development History



What is Micro QR Code?

- Only with one PDP to achieve more efficient data encoding and smaller size
- Maintain the most beneficial feature of QR Code; “Easy reading”
- Suitable for small data/space applications



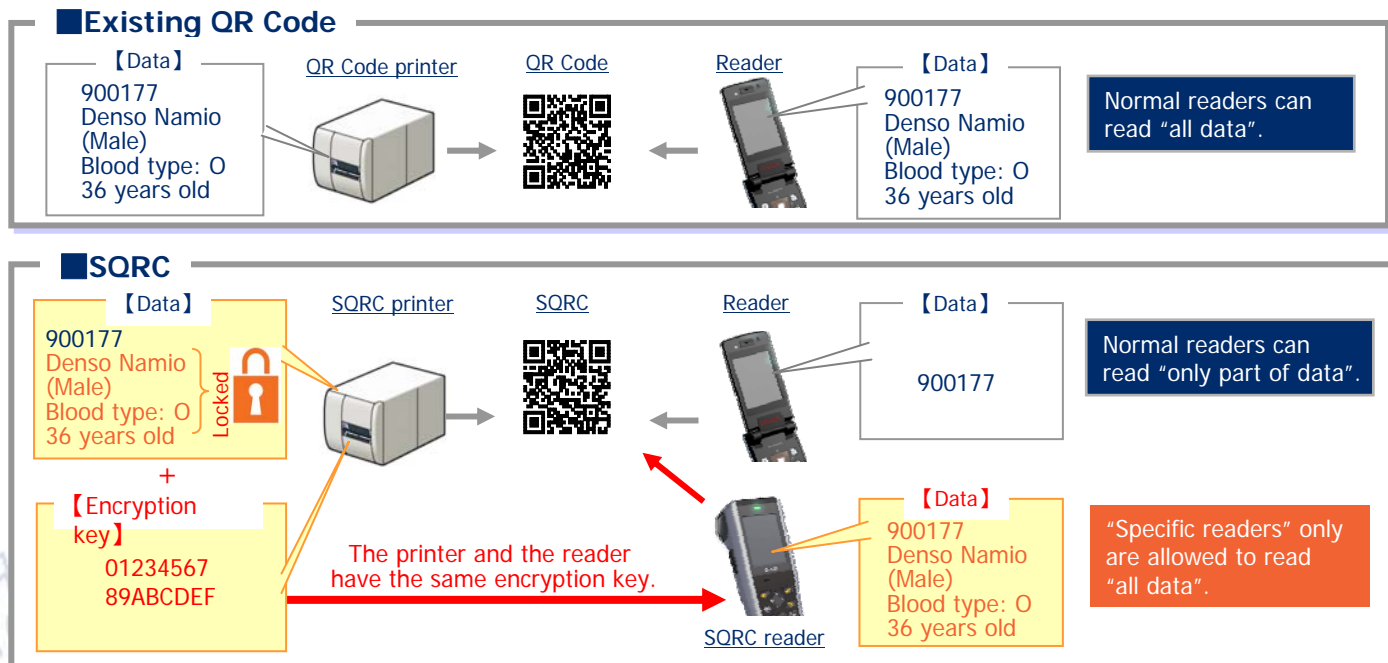
What is SQRC? (Security QR Code)

Background of SQRC Development

- QR Code is currently introduced in many applications and can be read anywhere and anytime using a mobile phone.
- Where personal information is involved, the demand for the protection of data encoded in QR Code is rapidly increasing.
- To meet this demand, DENSO WAVE as a pioneer of QR Code has newly developed a **"Security QR Code (SQRC)"**, an advanced QR Code equipped with an ability to prevent the data from being disclosed to the public.



SQRC System Structure



Introduction of Next Generation 2D Code “iQR Code”



Support for Customer Request against QR Code

Customer Request



QR Code



- 「Want to store a lot of information」
- 「Want to print into less space」
- 「Want to print with Rectangle space」



iQR Code

iQR Code Specification

	iQR Code	QR Code (Micro QR)
Type	Square, Rectangle	Square
Version	Square : 1(9x9 Cell)~61(422x422 Cell)	QR Code: 1(21x21 Cell)~40(177x177 Cell)
	Rectangle : R1(5x19 Cell)~R15(43x131 Cell)	Micro QR: M1(11x11 Cell)~M4(17x17 Cell)
Incorrection Modification	L(7%),M(15%),Q(25%),H(30%), S(50%)	L(7%),M(15%),Q(25%),H(30%)
Character	Numeric,Alphabet, Text (Mode A/B/C), Kanji,Binary	Numeric, Alphabet, Kanji, Binary
Combination	16 Division (Only Square)	16 Division (Only QR Code)
Type	Square, Rectangle	Square
Special Code	Two Sides Inversion, White Black Inversion, Dot Pattern	White Black Inversion, Dot Pattern
Others	GS1 Support , Data Compression	GS1 Support
Margin	2 Cell	4 Cell (Micro QR: 2 Cell)

Square Type



Rectangle Type



Only Square Type



iQR Code Feature (1)

■ High Density (Want to store a lot of information)

Store **more information** with same size as current QR code

QR Code



Numeric 34 Digit

80%
Increasing

iQR Code



Numeric 63 Digit

Print **less space** with same sized information

QR Code



25 × 25 Cell

30%
Decreasing

iQR Code



21 × 21 Cell

iQR Code Feature (2)

■ Rectangle (Want to print with rectangle space)

Creation with rectangle can print into space or circulate cylinder printed with barcode

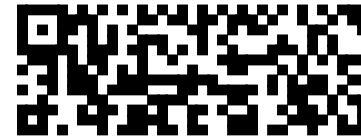
<Rectangle Code>



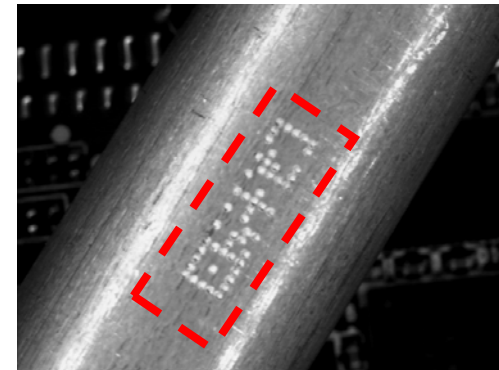
5×19 Cell



7×29 Cell



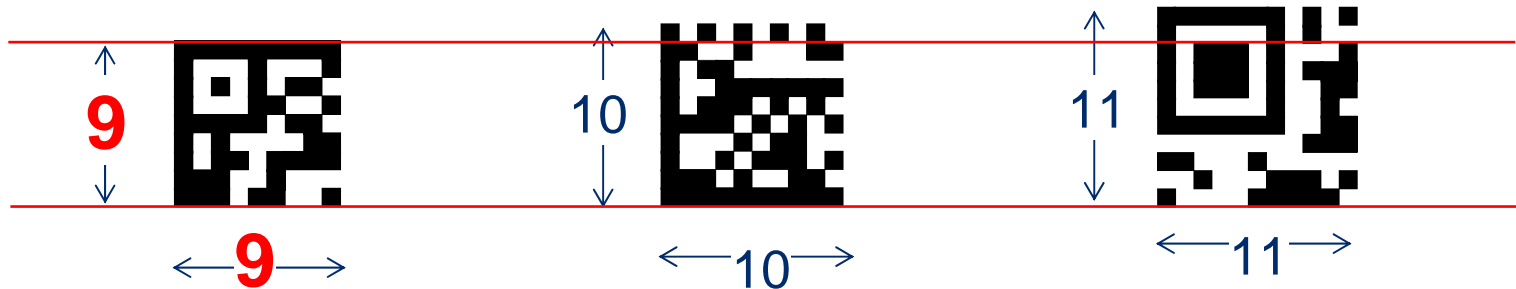
13×35 Cell



iQR Code Feature (3)

Downsizing (Want to print into less space)

Minimum Cell Structure of Each Code



iQR Code
(Numeric 6 digit)

DataMatrix
(Numeric 6 digit)

MicroQR
(Numeric 5 digit)

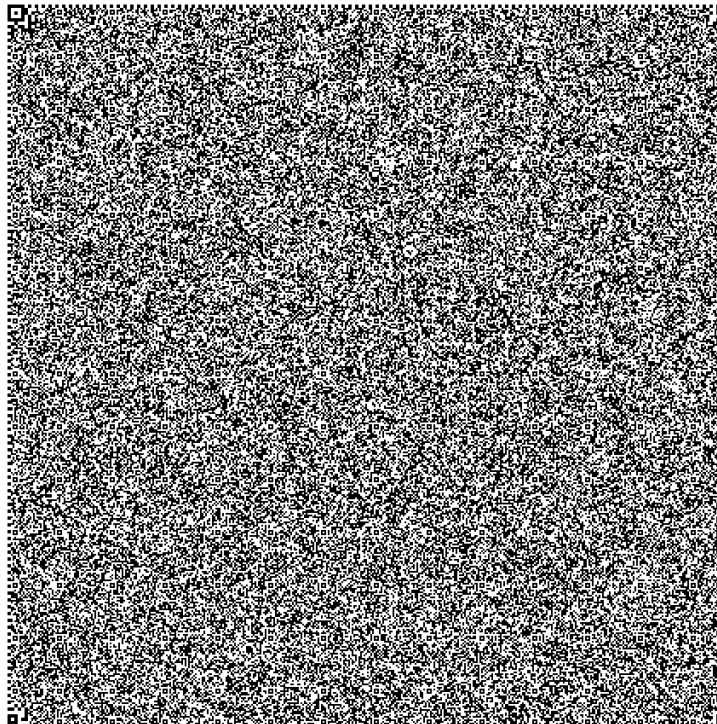
Approx 80%

Downsizing approx 60% of Code Area(Against MicroQR)

iQR Code Feature (4)

■ Large Capacity (Want to store a lot of information)

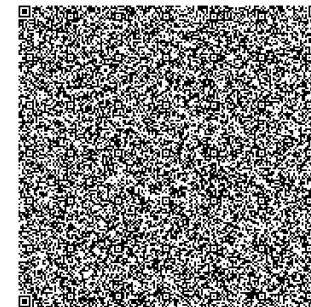
Available to create the code with iQR which has more than maximum storage of QR Code



(iQR Code Maximum Version61)

Approx 40,000 Character

Approx 7,000 Character



(QR Code Maximum Version40)

Comparison with Character Storage

< Cell and Data >

Cell	DataMatrix	QR/Micro	iQR Code
9			6
10	6		
11		5	12
12	10		
13		8	21
14	16		
15		18	33
16	24		
17		30	45
18	36		
19			60
20	44		
21		34	81
22	60		
23			97
24	72		
25		63	123
⋮	⋮	⋮	⋮
⋮	⋮	⋮	⋮
422	—	—	40,637

* As of Sep. 09. It might be changed in the future.

<Character 30 digit>

DataMatrix



18×18 Cell

MicorQR



17×17 Cell

iQR Code



15×15 Cell

<Character 100 digit>

DataMatrix



32×32 Cell

QR Code



29×29 Cell

iQR Code



27×27 Cell

* Data: Numeric inoorection modification level:7%

Comparison with Storage Character (Rectangle)

<Cell and Data>

Cell		DataMatrix	iQR Code
Height	Width		
5	19		6
5	29		13
7	29		26
8	18	10	
8	32	20	
9	29		39
9	35		50
11	35		67
12	26	32	
12	36	44	
13	35		83
16	36	64	
⋮	⋮	⋮	⋮
43	131	—	1,202

<Numeric 5 digit>

DataMatrix



8 × 18 Cell

iQR Code



5 × 19 Cell

<Numeric 20 digit>

DataMatrix



8 × 32 Cell

iQR Code



7 × 29 Cell

<Numeric 50 digit>

DataMatrix



16 × 36 Cell

iQR Code



11 × 35 Cell

* As of Sep. 09. It might be changed in the future.



***Thank you very much
for your kind attention !!***

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