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NEW

OMRON

2D Code Reader (Fixed Type)

V530-R2000



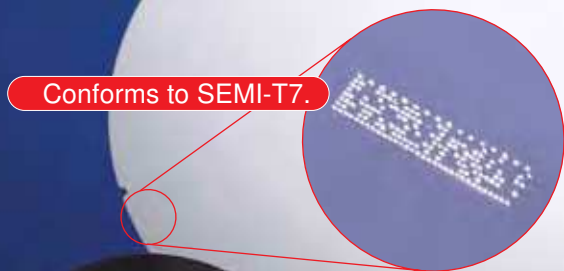
Integration of
Objects
and Information



CE

Innovate Production by the Integration of Objects and Information

Directly mark objects with 2D codes containing product information. Then read the information to manage each wafer, to trace automotive parts, or to achieve any of a wide range of applications. The integration of objects and information starts with reading stable direct marking codes.



OMRON pursues reading of 2D codes that are directly marked.

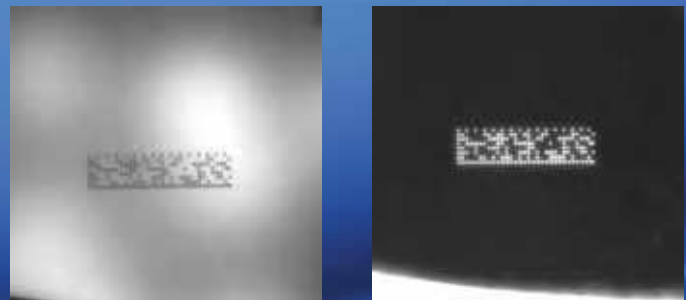
Three variations of the new "Reading Head"

- Select any of three models of Reading Head to suit the application.
- The new Reading Head will reduce installation work for lens and lights.
- You can also use the traditional configuration of Camera and external lighting if preferred.



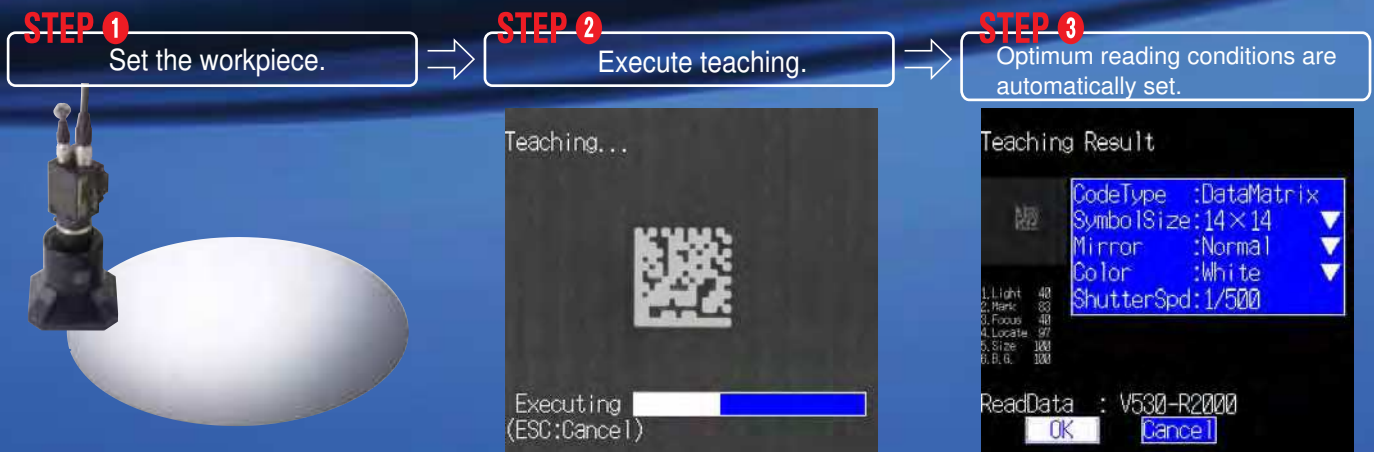
Exceptional reading performance

Integration of lighting feedback control and image processing algorithm. Even if the condition of the material and the surrounding environment change, the V530-R2000 will be automatically set up in the best state for image capture by actively controlling the original lighting.



One-step teaching for easy setup

A new auto-setting function for the lighting and shutter speed eliminates troublesome setting procedures and greatly reduces setup work.



Complete analytical functions

A 2D Code Checker is used to analyze the quality of codes that are read, including the contrast, marking status, size, position, and background.



Rather than just knowing if a code has been read or not, you'll know at a glance the leeway in the ability to read the code.

This function will be a Great Help during initial introduction.

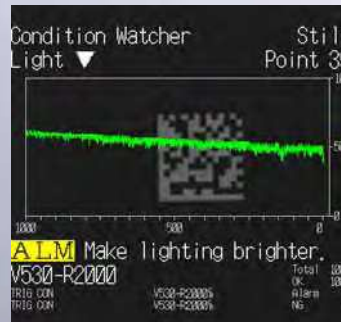


Complete monitoring functions

- A Condition Watcher monitors changes in the stability of codes that have been read.
- A warning will be output as soon as it can be predicted that reading cannot be performed any more.

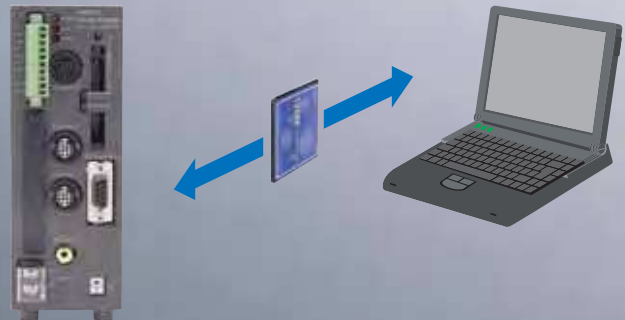


This function can be used to set guidelines for replacing parts in marking devices and other equipment.



Easy Analysis

- The V530-R2000 also provides a Memory Card slot (Compact Flash™). Information from the Condition Watcher, read images, and other information can be saved to easily analyze reading conditions on a personal computer.

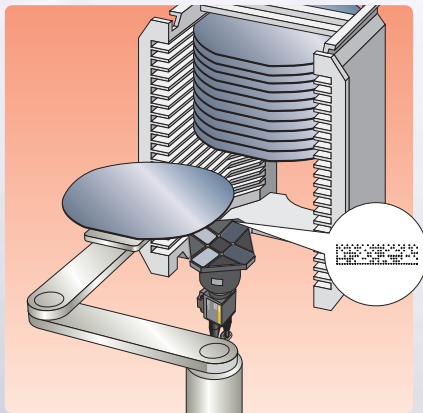
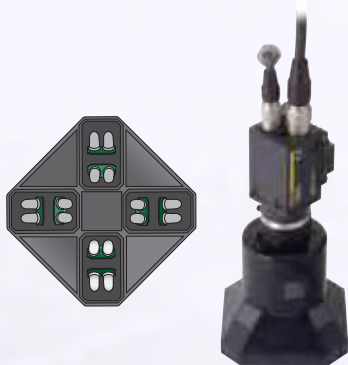


Applications and Variations

Select the Reading Head that best suits the application conditions, such as workpiece material, surface conditions, etc.

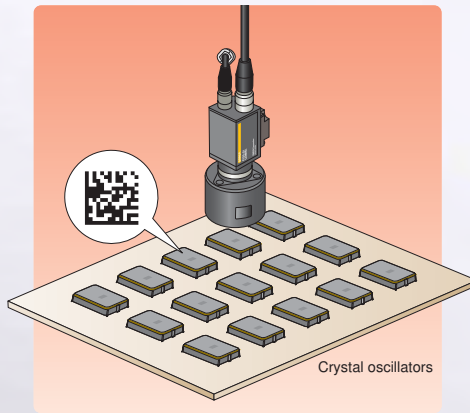
V530-L2001 Reading Head with Oblique/Coaxial Lighting

Provides oblique/coaxial lighting arranged at various angles. Suitable for wafers, liquid crystal glass, PDP glass, electronic components, and many other types of workpiece.



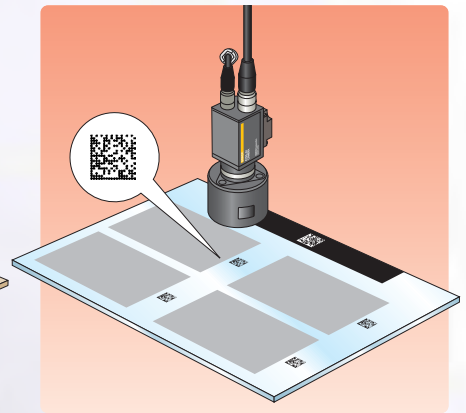
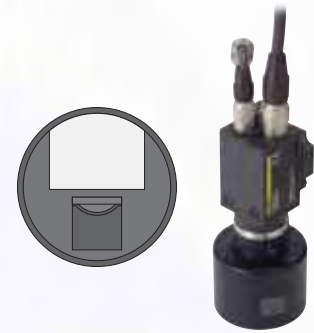
V530-L2002 Reading Head with Ring Lighting

A diffuse optical system consisting of white LEDs arranged in a ring to read regular reflections from a code. This system is ideal for reading 2D codes that have been laser-marked on electronic components or codes embossed in engine parts or other metal parts.



V530-L2003 Reading Head with V-type Coaxial Lighting

A regular reflection optical system that lights codes along a V-shape axis eliminates optical interference, making this Reading Head ideal for 2D codes on PDP glass or wafers covered with thin films.



Ordering Information

| Name | Model | Remarks |
|------------------------|-------------------|--------------------------|
| Controllers | V530-R2000/R2000P | NPN output/PNP output |
| Camera | F160-S2-2D | ---- |
| Reading Heads | V530-L2001 | Oblique/coaxial lighting |
| | V530-L2002 | Ring lighting |
| | V530-L2003 | V-type coaxial lighting |
| Console | F150-KP-2D | Cable length: 2 m |
| Camera Cable | F150-VS-2D | Cable length: 3 m |
| Monitor Cable | F150-VM-2D | Cable length: 2 m |
| Liquid Crystal Monitor | F150-M05L-2D | ---- |
| Video Monitor | F150-M09-2D | ---- |
| Memory Cards | F160-N64S | Memory capacity: 64 MB |
| | QM300-N128S | Memory capacity: 128 MB |

Rating and Performance

Controllers

| Model | V530-R2000 | V530-R2000P |
|----------------------------|---|-------------|
| I/O type | NPN | PNP |
| Power supply voltage | 20.4 to 26.4 VDC | |
| Current consumption | 1.6 A max. | |
| Camera | F160-S2-2D, 2 max. | |
| Inputs | TRIG, RESET | |
| Input specifications | 12 to 24 VDC $\pm 10\%$, ON current: 5 to 15 mA, ON voltage: 8.8 V max., OFF current: 0.1 mA max., OFF voltage: 4.5 V min. | |
| Monitor output | NTSC composite video output | |
| Outputs | RUN, ERROR, BUSY, NG, ALARM | |
| Output specifications | 12 to 24 VDC $\pm 10\%$, Load current: 45 mA max., ON residual voltage: 2 V max., OFF leakage current: 0.1 mA max. | |
| Functions | Teaching, analytical function, monitoring function, Memory Card backup function | |
| Applicable codes | DataMatrix ECC200 10 x 10 to 64 x 64 and 8 x 18 to 16 x 48, QR Code (models 1 and 2) versions 1 to 10 | |
| Operating method | Console or communications commands | |
| Settings | Teaching or selecting conditions | |
| Memory Card (backup media) | 1 slot (Compact Flash™) | |
| Serial interface | RS-232C/422 | |
| Ambient temperature | Operating: 0 to 50 °C, Storage: -25 to 60 °C (with no icing or condensation) | |
| Ambient humidity | Operating/storage: 35% to 85% (with no condensation) | |
| Weight (Controller only) | Approx. 570 g (Controller only) | |
| Degree of protection | IEC60529 IP20 | |
| Materials | ABS/PC | |

Camera

| Model | F160-S2-2D |
|---------------------|---|
| Picture elements | 1/3" interline CCD (reading all pixels) |
| Effective pixels | 512 x 484 pixels |
| Synchronization | External sync via horizontal sync signal |
| Shutter speed (s) | 1/120, 1/200, 1/500, 1/1000, 1/2000, 1/4000, 1/8000, 1/16000, 1/30000, or 1/60,000; Automatically selected. |
| Lens mount | C mount |
| Ambient temperature | Operating: 0 to 50 °C, Storage: -25 to 60 °C (with no icing or condensation) |
| Ambient humidity | Operating/storage: 35% to 85% (with no condensation) |
| Materials | Cover: Zinc-plated steel sheet Case: Die-cast aluminum alloy Mounting base: Bakelite containing cloth (black) |
| Weight | Approx. 85 g |

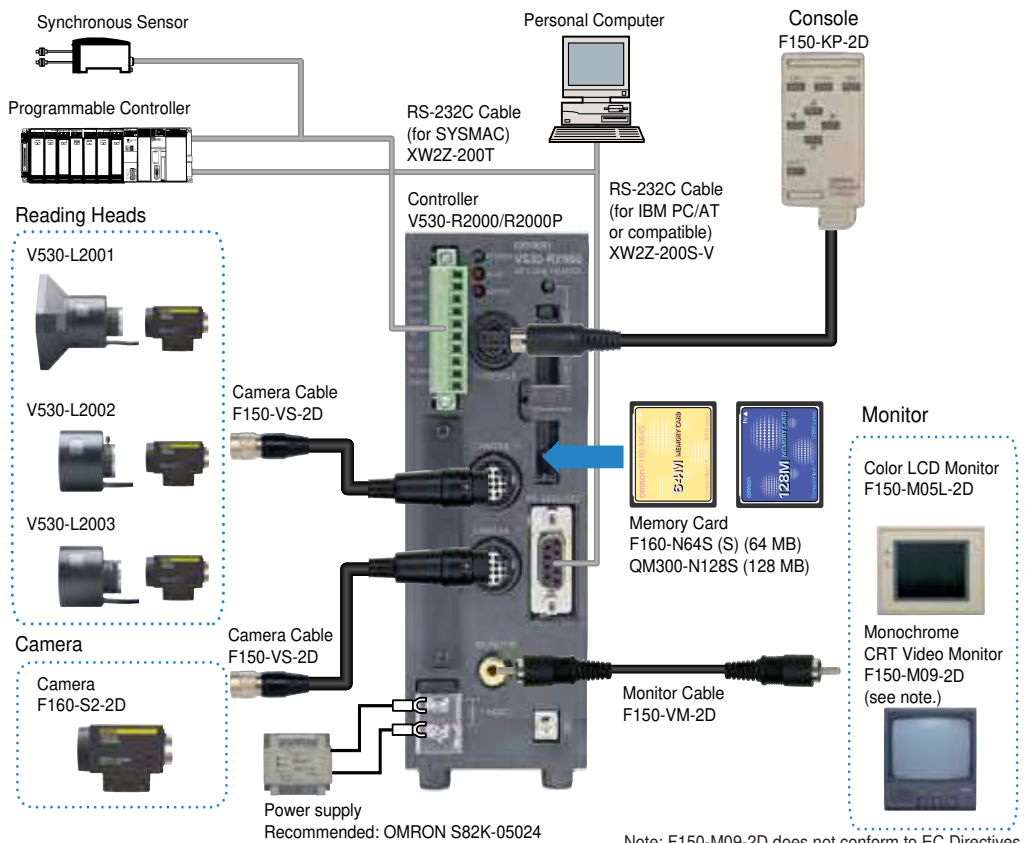
Reading Heads

| Model | V530-L2001 | V530-L2002 | V530-L2003 |
|--|--|--------------------------|------------------------------------|
| Light source | White LEDs | White LEDs | White, red, green, and blue LEDs |
| Working distance (installation distance) | 20 mm | 105 mm | 35 mm |
| Field of view | 5 x 5 mm to 12 x 12 mm | 20 x 20 mm to 40 x 40 mm | 5 x 5 mm to 12 x 12 mm |
| Functions | Automatic lighting direction selection | --- | Automatic lighting color selection |
| | Zoom | | |
| | Rotation (using enclosed Allen wrench) | | |
| Ambient temperature | Operating: 0 to 50 °C, Storage: -25 to 60 °C (with no icing or condensation) | | |
| Ambient humidity | Operating/storage: 35% to 85% (with no condensation) | | |
| Materials | Case: ABS, Front filter: PMMA (acrylic), Lens body: Aluminum | | |
| Weight (including cable) | Approx. 160 g | Approx. 100 g | Approx. 110 g |
| Mount | C mount | | |
| System | Fixed aperture, variable focus | | |
| Light emission method | Pulse (Light emission synced with Camera shutter.) | | |

Monitor

| Item | Name Model | F150-M05L-2D LCD Color Monitor | F150-M09-2D Video Monitor |
|-----------------------|------------|--|--|
| Size | | 5.5 inches | 9 inches |
| Display method | | TFT color liquid crystal | Video Monitor (Monochrome) |
| Resolution | | 320 x 240 dots | 800 TV lines min. (at center) |
| Input signal | | NTSC composite video (1.0 V/75 Ω termination) | |
| Power supply voltage | | 20.4 to 26.4 VDC | 85 to 264 VAC |
| Current consumption | | Approx. 700 mA | Approx. 200 mA |
| Ambient temperature | | Operating: 0 to 50 °C, Storage: -25 to 65 °C (with no icing or condensation) | Operating: 0 to 50 °C, Storage: -20 to 65 °C (with no icing or condensation) |
| Ambient humidity | | Operating/storage: 35% to 85% (with no condensation) | Operating/storage: 10% to 90% (with no condensation) |
| Weight (Monitor only) | | Approx. 1 kg | Approx. 4.5 kg |

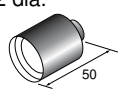
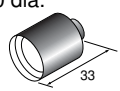
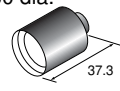
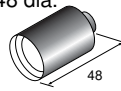
System Configuration



Using CCTV Lenses and External Lighting (without a Reading Head)

Select the Lens and external lighting according to the application whenever a Reading Head is not used. Ask your OMRON representative for details.

CCTV Lenses

| CCTV Lenses | | | | |
|-------------------|--|---|--|--|
| Model | 3Z4S-LEB1214D-2 | 3Z4S-LEC1614A | 3Z4S-LEB2514D | 3Z4S-LEB5014A |
| Dimensions | 42 dia.  | 30 dia.  | 30 dia.  | 48 dia.  |
| Locking mechanism | Focus/iris locking mechanism | | | |

Note: Refer to the following optical graph to select the Lens and Extension Tube according to the field of vision and working distance being used.

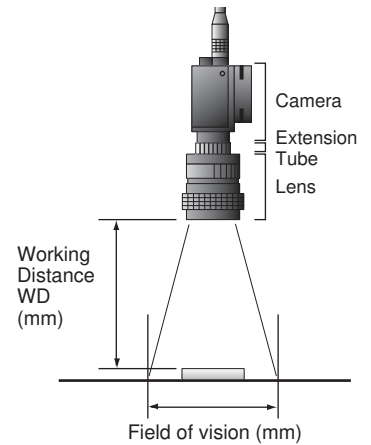
Extension Tubes

| Model | Length |
|---------------|---|
| 3Z4S-LE EX-C6 | A set of six Extension Tubes that are 40, 20, 10, 5, 1, and 0.5 mm in length. |

Reading the Optical Graph

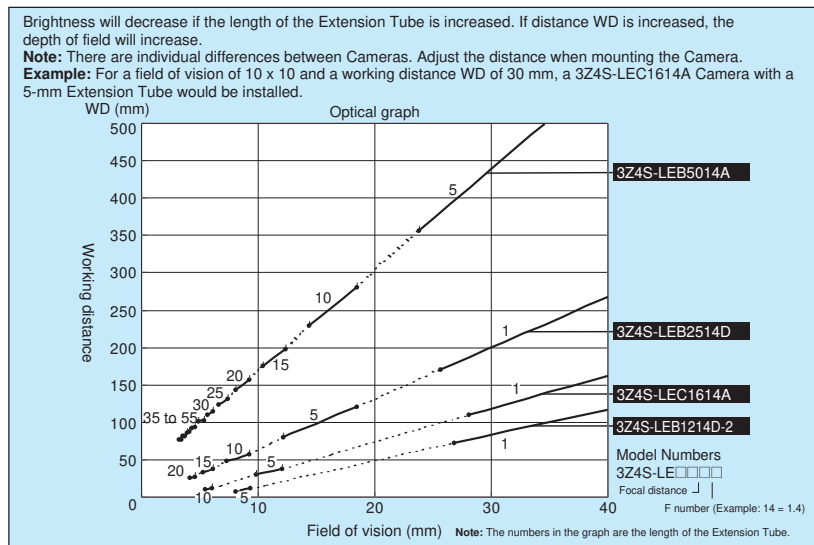
The X axis of the graph shows field of vision L in millimeters, and the Y axis shows the working distance WD in millimeters.

The working distance WD indicates the distance from the end of the lens to the surface of the 2-dimensional code, each lens is indicated by a line in the graph, and the numbers indicate the length of the Extension Tube.



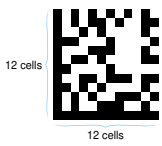
Optical Graph

Select the lens based on the field of vision and the working distance (WD) required between the workpieces and lens.



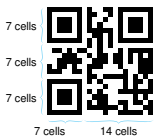
2D Code Characteristics

DataMatrix



The DataMatrix system was developed by I.D. Matrix and is used extensively in the semiconductor and electronics industries. A DataMatrix has a relatively large data capacity for its size. There are several different types of DataMatrix, differentiated by their error correction method. The ECC200 is the most commonly used type.

QR Code



The "Quick Response Code" is a 2-dimensional code that was developed by the Denso Company in Japan. High-speed reading is possible with QR Code, but the code size is quite large compared to other 2-dimensional codes.

Margin (Quiet Zone)



Margin

This is the empty space around 2-dimensional codes. Usually it is necessary to ensure that there is a margin around 2-dimensional codes. The size of the required margins varies with the type of code.

Cells

These squares are the units that make up matrix-type 2-dimensional codes. Whether these cells are black or white determines the information carried by the code.

Symbol Size

The symbol size is expressed in the number of cells of which a 2-dimensional code matrix consists. (Examples: 10 x 10 and 12 x 12).

The symbol size is sometimes called the matrix size or simply, the number of cells.

Error Correction

This term is used to describe the function which detects and corrects errors using a special mathematical technique (commonly known as the "Reed-Solomon" method). Using this function, reading is possible, to a certain extent, for codes with poor printing quality or that are damaged. There are, however, limits on the extent to which correction is possible, and reading may not be possible for codes if the damage is extensive. There are 2-dimensional codes for which the error correction level can be selected.

For example, the error correction level for DataMatrix ECC200 is approximately 30% (varies with the symbol size). With QR Code, error correction levels of 7%, 15%, 25%, and 30% are available.

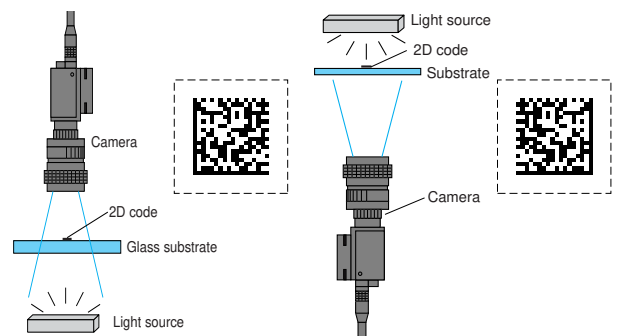
Left and Right Reversal (Mirror Status)

This is the term used to describe reading 2-dimensional codes marked on a transparent material from the reverse side or reading 2-dimensional codes reflected in a mirror.

For example, when a 2-dimensional code marked on glass is read from the back, left and right reversal appears.

Reading the Normal Image

Reading a Left and Right Reversal



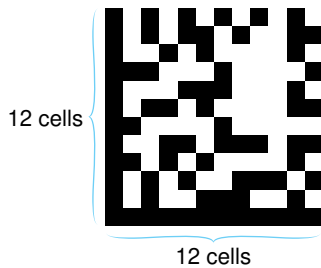
Symbol Color

Usually, in images of 2-dimensional codes, the code itself is black and the background is white. Sometimes, however, due to the material of the reading object and the kind of lighting used, the code will appear white in the image obtained. This state is called "black and white reversal."

Quick-reference Tables of Data Capacities for 2-Dimensional Codes

DataMatrix ECC200

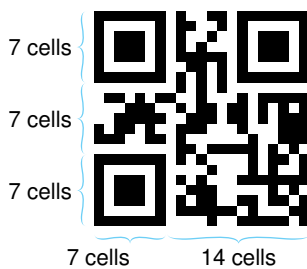
The relation between symbol size (number of cells) and data capacity is shown in this table. The symbol size in the following example code is 12 x 12.



| Symbol size | Maximum data capacity (See note 1.) | | | | |
|-------------|-------------------------------------|-------------------------|---------------------------|------|----------------------------|
| | Numerals | Alphanumeric characters | Alphanumerics and symbols | JIS8 | Japanese Kanji (Shift JIS) |
| 10 × 10 | 6 | 3 | 3 | 1 | — |
| 12 × 12 | 10 | 6 | 5 | 3 | 1 |
| 14 × 14 | 16 | 10 | 9 | 6 | 3 |
| 16 × 16 | 24 | 16 | 14 | 10 | 5 |
| 18 × 18 | 36 | 25 | 22 | 16 | 8 |
| 20 × 20 | 44 | 31 | 28 | 20 | 10 |
| 22 × 22 | 60 | 43 | 38 | 28 | 14 |
| 24 × 24 | 72 | 52 | 46 | 34 | 17 |
| 26 × 26 | 88 | 64 | 57 | 42 | 21 |
| 32 × 32 | 124 | 91 | 81 | 60 | 30 |
| 36 × 36 | 172 | 127 | 113 | 84 | 42 |
| 40 × 40 | 228 | 169 | 150 | 112 | 56 |
| 44 × 44 | 288 | 214 | 190 | 142 | 71 |
| 48 × 48 | 348 | 259 | 230 | 172 | 86 |
| 52 × 52 | 408 | 304 | 270 | 202 | 101 |
| 64 × 64 | 560 | 418 | 372 | 278 | 139 |
| 8 × 18 | 10 | 6 | 5 | 3 | 1 |
| 8 × 32 | 20 | 13 | 12 | 8 | 4 |
| 12 × 26 | 32 | 22 | 20 | 14 | 7 |
| 12 × 36 | 44 | 31 | 28 | 20 | 10 |
| 16 × 36 | 64 | 46 | 41 | 30 | 15 |
| 16 × 48 | 98 | 72 | 64 | 47 | 23 |

QR Code, Model 2

The relation between symbol size (number of cells) and data capacity is shown in this table. The symbol size in the following example code is 21 x 21.



| Symbol size (version) (See note 2.) | Error correction | Maximum data capacity (See note 1.) | | | |
|-------------------------------------|------------------|-------------------------------------|--------------------------------------|------|----------------------------|
| | | Numerals | Alphanumeric characters (upper case) | JIS8 | Japanese Kanji (Shift JIS) |
| 21 × 21 (version 1) | L (7%) | 41 | 25 | 17 | 10 |
| | M (15%) | 34 | 20 | 14 | 8 |
| | Q (25%) | 27 | 16 | 11 | 7 |
| | H (30%) | 17 | 10 | 7 | 4 |
| 25 × 25 (version 2) | L (7%) | 77 | 47 | 32 | 20 |
| | M (15%) | 63 | 38 | 26 | 16 |
| | Q (25%) | 48 | 29 | 20 | 12 |
| | H (30%) | 34 | 20 | 14 | 8 |
| 29 × 29 (version 3) | L (7%) | 127 | 77 | 53 | 32 |
| | M (15%) | 101 | 61 | 42 | 26 |
| | Q (25%) | 77 | 47 | 32 | 20 |
| | H (30%) | 58 | 35 | 24 | 15 |
| 33 × 33 (version 4) | L (7%) | 187 | 114 | 78 | 48 |
| | M (15%) | 149 | 90 | 62 | 38 |
| | Q (25%) | 111 | 67 | 46 | 28 |
| | H (30%) | 82 | 50 | 34 | 21 |
| 37 × 37 (version 5) | L (7%) | 255 | 154 | 106 | 65 |
| | M (15%) | 202 | 122 | 84 | 52 |
| | Q (25%) | 144 | 87 | 60 | 37 |
| | H (30%) | 106 | 64 | 44 | 27 |
| 41 × 41 (version 6) | L (7%) | 322 | 195 | 134 | 82 |
| | M (15%) | 255 | 154 | 106 | 65 |
| | Q (25%) | 178 | 108 | 74 | 45 |
| | H (30%) | 139 | 84 | 58 | 36 |
| 45 × 45 (version 7) | L (7%) | 370 | 224 | 154 | 95 |
| | M (15%) | 293 | 178 | 122 | 75 |
| | Q (25%) | 207 | 125 | 86 | 53 |
| | H (30%) | 154 | 93 | 64 | 39 |
| 49 × 49 (version 8) | L (7%) | 461 | 279 | 192 | 118 |
| | M (15%) | 365 | 221 | 152 | 93 |
| | Q (25%) | 259 | 157 | 108 | 66 |
| | H (30%) | 202 | 122 | 84 | 52 |
| 53 × 53 (version 9) | L (7%) | 552 | 335 | 230 | 141 |
| | M (15%) | 432 | 262 | 180 | 111 |
| | Q (25%) | 312 | 189 | 130 | 80 |
| | H (30%) | 235 | 143 | 98 | 60 |
| 57 × 57 (version 10) | L (7%) | 652 | 395 | 271 | 167 |
| | M (15%) | 513 | 311 | 213 | 131 |
| | Q (25%) | 364 | 221 | 151 | 93 |
| | H (30%) | 288 | 174 | 119 | 74 |

Source: 2D Codes, Basic Specifications for QR Code (JISX0510)

Note 1: The maximum amount of data that can be stored in a code varies with the code size. In other words, if there is a large amount of data to be stored, then the code size must also be large. The maximum data capacity will also vary with the type of characters used. With a QR Code or DataMatrix, the numeric capacity (numbers only) is larger than the alphanumeric capacity (numbers and letters), which is in turn larger than the Japanese Kanji (Shift JIS) capacity. The order and combinations of different characters also affects the data capacity.

Note 2: The symbol size of a QR Code is indicated by the version. "Version 1" indicates that a QR Code contains (the minimum) 21 cells both horizontally and vertically. The larger the version number, the larger the number of cells per side.

