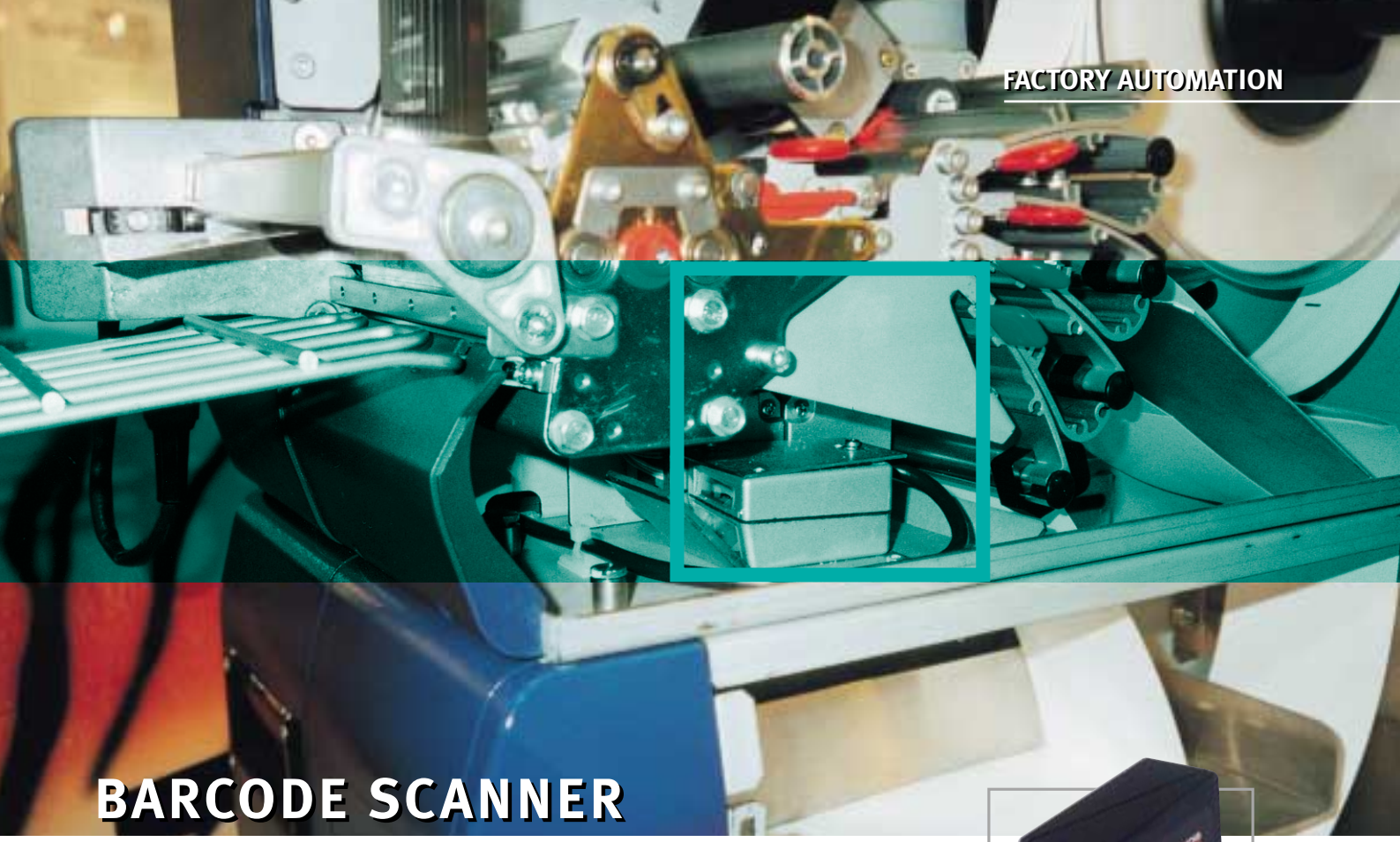


BARCODE SCANNER

MOBILE SOLUTIONS AND UNATTENDED INSTALLATIONS

PEPPERL+FUCHS
SENSING YOUR NEEDS

Identification with barcode

Automated warehouse, conveyor, and production facilities rely on the use of identification systems which couple information flow with material flow, thus enabling new, improved production concepts. To achieve this, conveyor units are equipped with barcodes which are used to track them all the way from goods receiving to the product warehouse. Thus the control system can flexibly influence the production steps. This provides rationalisation opportunities due to shorter process throughput times, the storage of quality parameters including traceability, and automated generation of invoices and delivery documents.

The barcode is often used in industry, trade, and official venues in order to produce machine-readable printed data. So-called stacked 1D codes and 2D codes like Data Matrix or the MaxiCode have also been established to be used primarily in logistics or document tracking due to the smaller space requirements for the code.

Laser scanners can only read barcodes and stacked 1D codes. Using CCD technology, both barcodes and 2D codes can be read. Here, an image is recorded and the code is evaluated using signal processors.

In order to scan and evaluate barcodes optically with scanners, unlike RFID technology, direct visual contact is necessary, whereby environmental and operational influences may affect reliable reading or the barcode itself. A checksum can, however, make it nearly impossible for an obscured barcode to result in incorrect data. One read action consists of multiple “barcode scans”, allowing the reading rate to be increased.

The barcode is printed or applied using a barcode label. By using photo paper labels with a higher print quality, an optimum reading rate can be achieved. Moreover, labels allow a more flexible handling in terms of positioning.

The reading diagrams of the devices reflect the distances at which minimum bar widths can be read. This is the most important criterion for application-specific product selection of the different variants.

The product line ranges from compact scanners and CCD cameras through products for greater distances, as well as other critical requirements, thus offering the right solution for any application. With our Windows-based configuration software, the devices can also easily be parameterised and read quality controlled during active operation. Our experienced project team will be happy to support and advise you.

Barcode systems are often used in printing presses, packaging machines, conveyor systems, commissioning systems, warehousing systems, and assembly automation. Our experience includes projects implemented for BMW, Bosch, B.Braun, right through to Volkswagen.

CONTENTS

Definition of terms

Bar
The dark element of a bar code.

Space
The light element between two bars of a barcode symbol.

Element
A bar or space in a bar code symbol.

Module
The narrowest element in a bar code. Wide bars or spaces are expressed in multiples of modules.

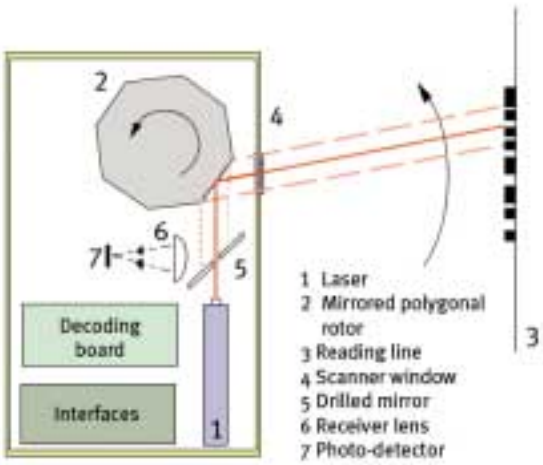
Module width X
The width of the narrowest element.

Quiet zone
Also called light margin or clear area. It is the blank area before and after the bar code. The quiet zone Q is necessary for setting the reading direction of the bar code symbol. The quiet zone must be at least 10 times the X dimension with anyway a minimum width of 2.5 mm. In scanner applications involving a large depth of field, the quiet zone must be wider:
Q = 15 times the X dimension with a minimum width of 6.5 mm.

Bar Code Symbol
The bar code symbol consists of a bar code, two quiet zones and an interpretation line. The bar code includes encoded data, which consists of coloured bars and blank spaces. The quiet zone precedes and follows the bar code and helps to identify the object to decode. The interpretation line is positioned below the bar code and translates all of the encoded information into readable characters.

Functional principles of the barcode scanner

The coherent light beam of a laser (1) strikes a polygonal rotor (2) consisting of multiple mirror elements. Thanks to the rotation of the wheel and the reflection of each single mirror, the laser beam is deflected out to a surface. In the reading line (3), this results in a continually moving point of light which traverses a barcode. Differences in the reflected light strength are used to detect the individual modules, since dark stripes reflect less light. For this purpose, behind the scanner window (4) there is a drilled mirror (5) and a receiver lens (6) through which the reflected light is focused onto a photo-detector (7) and converted into an electrical signal. This signal is amplified, digitised, and used to decode the data contained in the barcode. Depending on the reader, the data is sent to the control system through either an external or an integrated interface.



Technology of the CCD barcode reader

A CCD chip with a lens and LED illumination is built into the reader. Images are continually recorded and checked. If a barcode is detected, decoding starts. For certain applications, not only visible red light but also white light LEDs are used as illumination sources. The risk of failing to detect codes due to reflexions or outside light irradiation is significantly reduced in comparison to laser scanners. Due to its fixed focus, CCD technology cannot achieve a very deep field of focus. On the other hand, these device have no moving parts, so that wear is reduced to a minimum.

Barcode types and T-code variants

Due to the varied requirement of different applications, there are a large number of different barcode types. Identical basic elements include the quiet zones on both sides, and generally a defined start and stop code at the beginning and end of the barcode. In between is the type-dependent data area.

Code 2/5 Interleaved

- Only digits 0 through 9 can be encoded
- Both bars and spaces carry information(interleaved)
- Print ratio R between the narrow/wide elements is 1:2 to 1:3
- High information density = short code length. (e.g. 2.7 mm per digit at a module width of 0.3 mm and V= 1:3)
- The number of digits is equal to the number of thick strips minus 1 (without check digit)
- The use of a check digit is recommended, since this makes the information in the code “self-checking”

Code 39

- Digits 0 through 9, 26 letters, and 7 special characters can be encoded
- Each character consists of 9 elements (5 bars and 4 spaces)
- Print ratio R is 1:2 or 1:3
- Low information density = large code length (e.g. 4.8 mm per character for a module width of 0.3 mm and R = 1:3)

Code 128

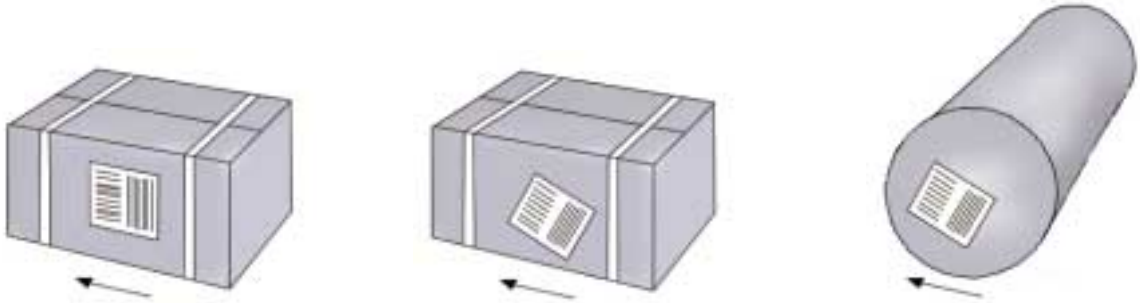
- Complete ASCII character set divided into 3 character sets, designated A, B, and C (similar to the EAN128 code)
- Each character consists of 3 bars and 3 spaces and has a total of 11 times the module width.
- High information density = short code length.
- Only small printing tolerances are possible.

Code EAN8 / EAN13

- These codes have exactly 8 or 13 places and are used only in trade
- Digits 0 through 9 can be encoded
- The code consists of 2 parts which are separated by start/stop codes
- Both bars and spaces carry information
- High information density in 10 fixed code lengths (SC0 through SC9).
- Only very small printing tolerances are possible.

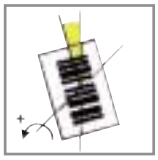
T-code variants

In this system, barcodes can be read with a line scanners without orientation. The barcode is printed twice (T-code) at a 90° angle. The barcode height (stripe length) must be larger than the barcode width, and high transport speeds and low packet spacing can be achieved. The disadvantage here is the larger space requirement for the barcode label.



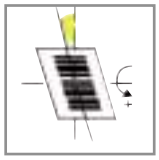
Definition of the reading angle

Tilt angle



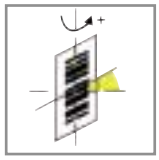
As the module width grows, the effective height decreases

Pitch angle



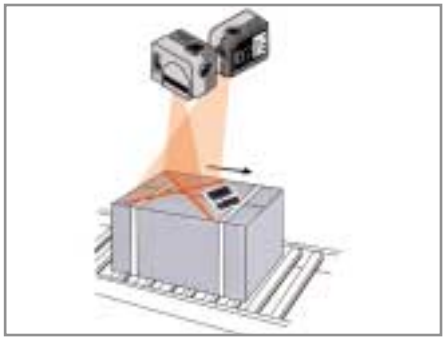
Decreased module width

Rotational angle



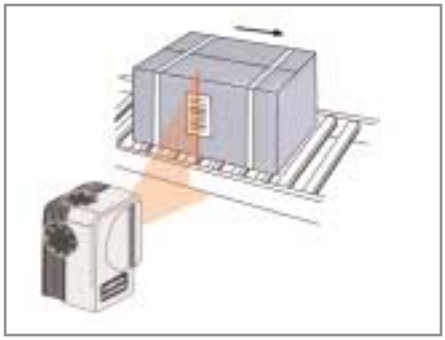
Decreased effective height

Omnistation



In order to detect barcodes in any position in a broad area, due to continually developing technologies, stationary omnireaders are used. At least two scanners are needed. Depending on requirements, the station can be extended with additional scanners to form a multiside reading station. These stations can also provide high reading power for high-speed conveyor systems.

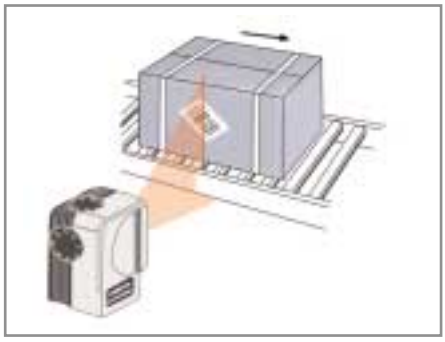
Ladder arrangement and side reading



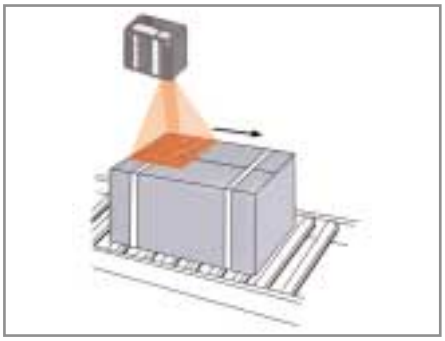
This arrangement is generally used often. The scanner rotation angle should be about 10° to avoid reflexions. The barcode traverses the entire height of the reading area with the conveyor motion, and can therefore be read even in case of partial defects or dirt without requiring reconstruction of the code.

Ladder arrangement with large tilt angle and side reading

The scanner rotation angle should be about 10° to avoid reflexions. Due to the large tipping angle, not all the stripes of the barcode may be in the reading area at the same time, so that the code must be reconstructed for a successful read.



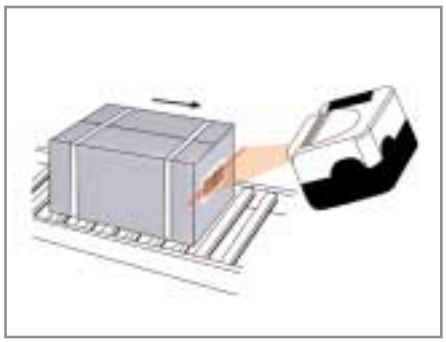
Picket-fence orientation and reading from above



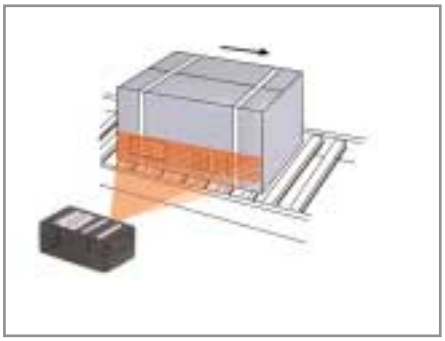
The scanner angle of the raster scanner should be about 15° to avoid reflexions and to form an optimum reading area. The distance between beams is selected so that at least 2 beams, ideally all of them, scan the barcode through its full height.

Combined orientation with reading from the front at an angle

The scanner angle of the raster scanner should be about 45° to avoid reflexions and to form an optimum reading area. The barcode is detected over its width completely in two layers (in front and above).



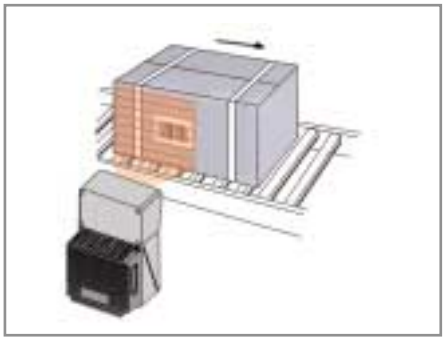
Picket-fence orientation and reading from the side



The scanner rotation angle of the raster scanner should be about 10° to avoid reflexions. The barcode is read over its entire width. The distance between beams should be selected so that at least 2 beams, ideally all of them, scan the barcode through its full height.

Reading with oscillating mirror

The oscillating mirror directs the laser beam in two directions, thus creating a large reading window. This allows barcodes to be read over a large area on the conveyed material. Exact positioning of the barcode is not required, or multiple barcodes on the conveyed material can be read if they are clearly differentiated.



Compact CCD barcode reader VB8

The VB8-305 uses a CCD technology with 3,648 pixles and an extremely large focal field of 35 to 305 mm. The scanner works at a scanning rate of 270 scans per second. Using Puzzle Solve technology, even damaged and poorly legible barcodes can be read. Since the VB8 has no moving parts, 240,000 working hours (MTBF) can be guaranteed. It has RS232, keyboard, or reading wand interface. The power supply voltage range can be between 10 and 30 V DC. The VB8 compact scanner in its plastic housing offers a cost-effective solution with very good reading characteristics.

Type code

VB12-220-S-R

- Raster scanners
- Side light outlet
- Max. read distance
- Design

Dimensions: Width x Height x Depth

SERIES VB 8	VB8 - 305
Read range in mm	35 ... 305
Read angle	80° direction mirror optional
Resolution	0.13 mm ...
Scan rate	270 scans/sec
Interface	RS 232 / Wedge / pen
Dimensions in mm	70.7 x 68.6 x 30

Standard barcode scanners VB10, VB12, and VB14A

The VB10, VB12, and VB14A series come in a metal housing in protection class IP65. They have an external trigger input, two programmable outputs, they fulfill laser protection class II , and can be operated with power supplies from 10 to 30 V DC. These designs are also available as raster scanners (...-R).

The **VB10**, thanks to its compact design, is particularly well-suited for integration into machines or in case of narrow space requirements.

SERIES VB10	VB10 - 220	VB10 - 220 - R	VB10 - 125	VB10 - 125 - R
Read range in mm	50 ... 220		40 ... 125	
Read angle	52°		60°	
Resolution	0.15 mm (6 mils)		0.076 mm (3 mils)	
Scan rate	500 scans/sec		500 scans/sec.	
Grid in mm	- - - - - -	15 at 220	- - - - - -	15 at 220
Main interface	RS 485 (MUX 32)		RS 485 (MUX 32)	
Auxiliary interface	RS 232 up to 115.2 kBit/s		RS 232 up to 115.2 kBit/s	
Dimensions in mm	40 x 28 x 50		40 x 28 x 50	

READING DIAGRAMS:
see foldout

The **VB12** can also be obtained in a design with light emission to the side (...-S) in case of narrow space requirements.

Series VB12	VB12 - 220	VB12 - 220 - S	VB12 - 220 - R	VB12-220-S-R	VB12 - 110	VB12 - 110 - S	VB12 - 110 - R	VB12-110-S-R
Read range in mm	30 ... 220		30 ... 220		10 ... 110		10 ... 110	
Read angle	70°		70°		70°		70°	
Resolution	0.2 mm (8 mils)		0.2 mm (8 mils)		0.12 mm (5 mils)		0.12 mm (5 mils)	
Scan rate	500 scans/sec.		500 scans/sec.		500 scans/sec.		500 scans/sec.	
Grid in mm	- - - - - -		15 at 220		- - - - - -		15 at 220	
Main interface	RS 485 (MUX 32)		RS 485 (MUX 32)		RS 485 (MUX 32)		RS 485 (MUX 32)	
Auxiliary interface	RS 232 up to 115.2 kBit/s		RS 232 up to 115.2 kBit/s		RS 232 up to 115.2 kBit/s		RS 232 up to 115.2 kBit/s	
Dimensions in mm	80 x 22.5 x 50		80 x 22.5 x 50		80 x 22.5 x 50		80 x 22.5 x 50	

The **VB14A** has a new reconstruction procedure for the reading of barcodes with damage or at larger angles. It offers a connection option for a mountable oscillating mirror (OM-VB14A). The main interface can be parameterised for RS 232 or RS 485.

Series VB14A	VB14A - 300	VB14A - 300 - R	VB14A - 100	VB14A-100-R	VB14A - 440	VB14A - 440 - R	VB14A - 600	VB14A-600-R	VB14A - 310	VB14A-310-R	VB14A - 340	VB14A-340-R
Read range in mm	50 ... 300		45 ... 100		100 ... 440		200 ... 600		50 ... 310		75 ... 340	
Read angle	60°		60°		60°		60°		60°		60°	
Resolution	0.2 mm (8 mis)		0.12 mm (5 mis)		0.25 mm (10 mis)		0.35 mm (14 mis)		0.2 mm (8 mis)		0.2 mm (8 mis)	
Scan rate	500 - 800 scans/sec.		800 - 1000 scans/sec.		600 - 1000 scans/sec.				800 - 1000 scans/sec.		600 - 1000 scans/sec.	
Grid in mm	- - - - -	18 at 300	- - - - -	18 at 300	- - - - -	24 at 500	- - - - -	24 at 500	- - - - -	18 at 300	- - - - -	18 at 300
Main interface	RS 232 or RS 485		RS 232 or RS 485		RS 232 or RS 485		RS 232 or RS 485		RS 232 or RS 485		RS 232 or RS 485	
Auxiliary interface	RS 232 up to 115.2 kBit/s		RS 232 up to 115.2 kBit/s		RS 232 up to 115.2 kBit/s		RS 232 up to 115.2 kBit/s		RS 285 up to 115.2 kBit/s		RS 285 up to 115.2 kBit/s	
Dimensions in mm	48 x 34 x 84		48 x 34 x 84		48 x 34 x 84		48 x 34 x 84		48 x 34 x 84		48 x 34 x 84	

High-performance scanners VB33 and VB34

Type code

VB34-2500-OM-P

- P: Profibus, B12: Ethernet, B7: DeviceNet
- Integrated oscillating mirror
- Max. read distance
- Design

The VB3x series, with its separation into a read head upper part and decoder lower part, is exceptional for its modularity and flexibility. The lower part is easy to install in the ideal position by turning in 90° steps. Besides the bus interface, the devices provide two serial interfaces. All connections are implemented as plugs. The high-powered scanners in the VB33 and VB34 series are designed in protection class IP64 in modular metal housings. A keypad and display allow operations to be performed and information shown.

The VB33 and VB34 series differ in their lenses and the adjustment of the focal range. The VB33 is manually focused on the object. The VB34 provides different automatic and programmable focus settings, and is particularly well-suited for dynamic applications.

The VB33 with manual focus

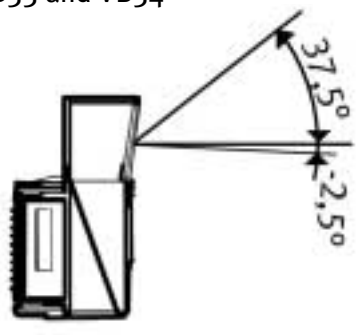
VB33		
Designs	**linear**	**integrated raster-scanning**
Dimensions	113 x 110 x 99 mm	180 x 113 x 99 mm
Order codes		
Serial interface	**VB33-2000**	**VB33-2000-OM**
PROFIBUS interface	**VB33-2000-P**	**VB33-2000-OM-P**
Ethernet interface	**VB33-2000-B12**	**VB33-2000-OM-B12**
DeviceNet interface	**VB33-2000-B7**	**VB33-2000-OM-B7**
Resolution	0.2 mm (8 mils)	
Scan rate	600 scans/sec 1.200 scans/sec (programmable)	
Max. read distance	2500 mm	
Readable codes	all current symbols	
Multi-label reading	up to 10 different codes in the same read cycle	
Main interface	RS 232 or RS 485	
Auxiliary interface	RS 232 up to 115.2 kBit/s	
Baud rate	1,00 bps 115,200 bps	
Input signal	Trigger sensor plus 3 digital auxiliary inputs	
Output signal	3 digital outputs, programmable by means of software	
LED displays	Ready, Read phase active, Label present, Send data	
Operating voltage	15 ... 30 V DC	
Laser classification	IEC 825 class 2	

The VB34 with automatic and programmable focus

VB34		
Designs	**linear**	**integrated raster-scanning**
Dimensions	113 x 110 x 99 mm	180 x 113 x 99 mm
Order codes		
Serial interface	**VB34-2500**	**VB34-2500-OM**
PROFIBUS interface	**VB34-2500-P**	**VB34-2500-OM-P**
Ethernet interface	**VB34-2500-B12**	**VB34-2500-OM-B12**
DeviceNet interface	**VB34-2500-B7**	**VB34-2500-OM-B7**
Resolution	0.2 mm (8 mils)	
Scan rate	600 scans/sec 1.200 scans/sec (programmable)	
Max. read distance	2500 mm	
Readable codes	all current symbols	
Multi-label reading	up to 10 different codes in the same read cycle	
Main interface	RS 232 or RS 485	
Auxiliary interface	RS 232 up to 115.2 kBit/s	
Baud rate	2,400 bps ... 115,200 bps	
Input signal	Trigger sensor plus 3 digital auxiliary inputs	
Output signal	3 digital outputs, programmable by means of software	
LED displays	Ready, Read phase active, Label present, Send data	
Operating voltage	15 ... 30 V DC	
Laser classification	IEC 825 class 2	

The VB3x series can achieve up to 1200 scans per second and can work with all current standard codes. Devices with or without integrated raster scanners are available, with a display and function keys for easy operation. Five application-specific modes usually offer the right pre-set values.

Detection angle with raster scanner for VB33 and VB34



Barcode hand readers

The ergonomic form of our hand readers enables problem-free operation. In addition, the devices are so robust that they can withstand a fall from a great height to a hard floor with no damage.

For reliable operation, a successful read is indicated both acoustically and visually.

Laser scanners are preferable as a reading technology if larger ranges are needed or if the barcodes to be read are very wide. The CCD reading technology is used if reflexions or external light affect the contrast or if dirty or partially damaged codes must still be readable using reconstruction processes.

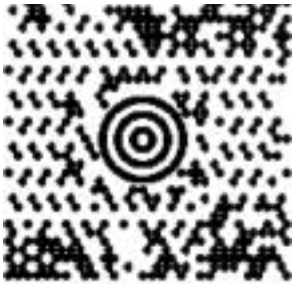
The hand readers, depending on the variant, have a Bluetooth, Wedge, pen, RS232, or USB interface. Besides wired versions, there are also radio solutions available for up to 16 scanners with 30 m range.

Range of application

- Data recording in the sales area
- Process control
- Logistics applications

As accessory components, suitable stands, holders, belt holders, and transmitter/ charging stations are available.

2D code hand readers



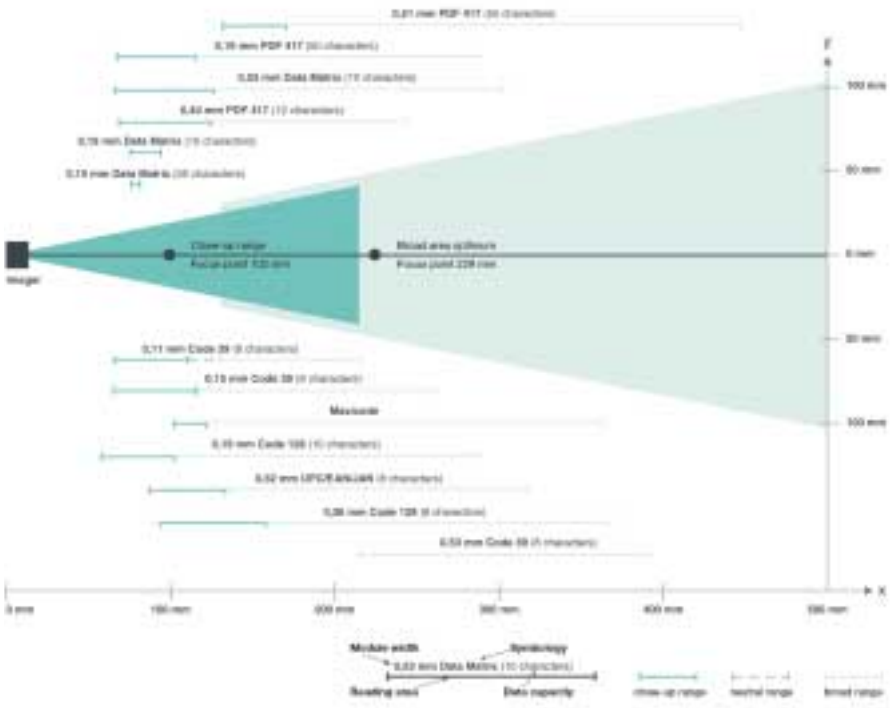
Maxi Code

The MAH300 offers the option of displaying the data read in a large, fully graphical LCD display and entering commands and data manually using integrated function keys. Operation is similar to a mobile telephone. It has a 1.3 megapixel camera, a 400 MHz signal processor, 4 MB of internal storage, and a dual-focus lens for reading barcodes, stacked, and matrix codes as high density or long range in an extra-large reading area. A handle, battery, and connector cable are available.

ODT-HH-MAH300

Data Matrix Code ECC 200

ODT-HH-MAH200
(without display)



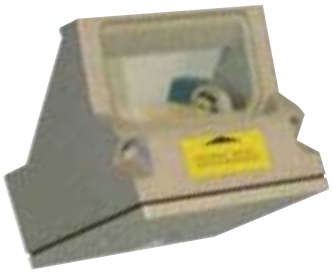
Reading ranges depending on symbol set and focus point

The settings for optimisation of read reliability, like illumination, resolution, code type, and reading field, are performed automatically. Thus 2D codes are read with a speed similar to that for barcodes. With the powerful 1950 mAh lithium ion battery, long-term mobile use is no problem. The reader communicates through RS232, PS2, USB, or over Bluetooth up to 100m in range.

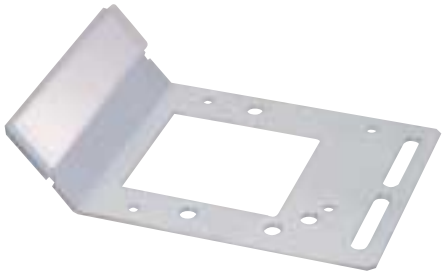
Accessories

- **DM-VB14A** 80° deviating mirror for VB14

- **OM-VB14A** Optical raster scanner



- **DM-VB8** 80° deviating mirror for VB8



- **OMH-VB01** Mounting accessories for VB8, VB12, VB14

Connection to fieldbuses

The “C-Box” in protection class IP64 can be easily and quickly connected to any scanner using a 25-pin SUB D connector whose pins are wired to terminal strips.
A trigger sensor can be connected directly to the terminals.

- **C-Box100**
  Connection of power, switching outputs through screw connectors. 9-pin SUB D plug for connection of the RS232 auxiliary interface to the PC with a null-modem cable.

- **C-Box300**
  RS232 / Profibus gateway with 9-pin SUB D connection plug for the Profibus, with up to 12 Mbit/ s Connection of a hand reader possible with special CABG-137 cable. The parameters of the scanner can be stored in either the control system or in the C-Box. This enables the fast, simple replacement of the scanner.

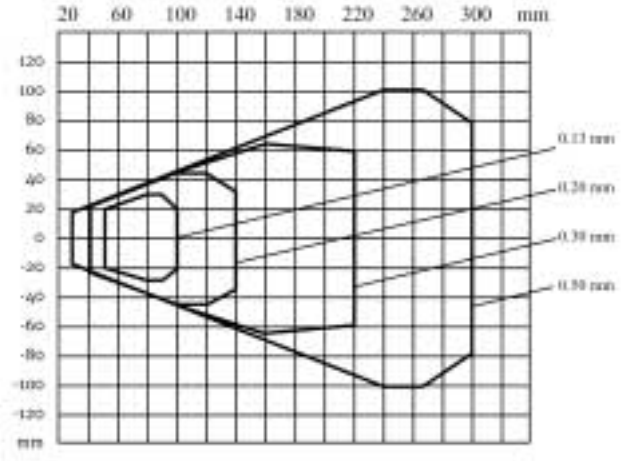
- **C-Box300-SH**
  The C-Box 300-SH also has a 4-pin M12 plug for power supply, as well as a 4-pin M12 connector for connection of an external trigger sensor.

- **C-Box400**
  For Device net connection and connection of a trigger sensor directly to the terminals.

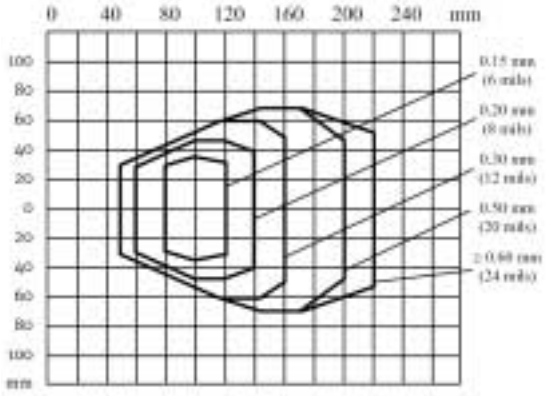
Reading diagrams

The reading diagrams of each scanner show the relationships between reading range, reading field width, and module width.

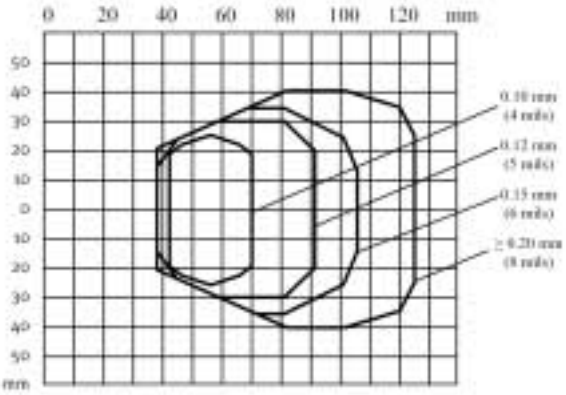
VB8 reading diagram



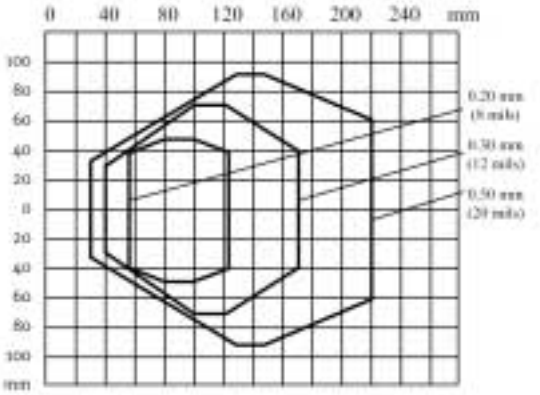
VB10-220 reading diagram



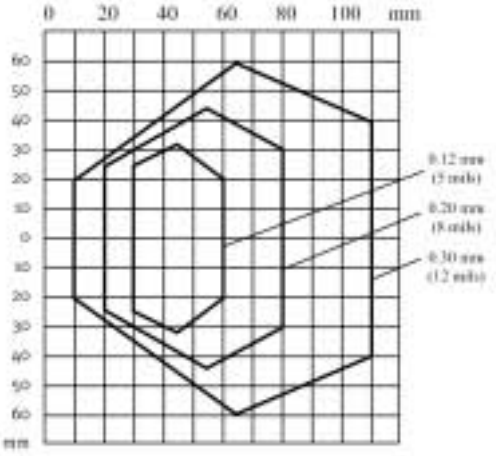
VB10-125 reading diagram



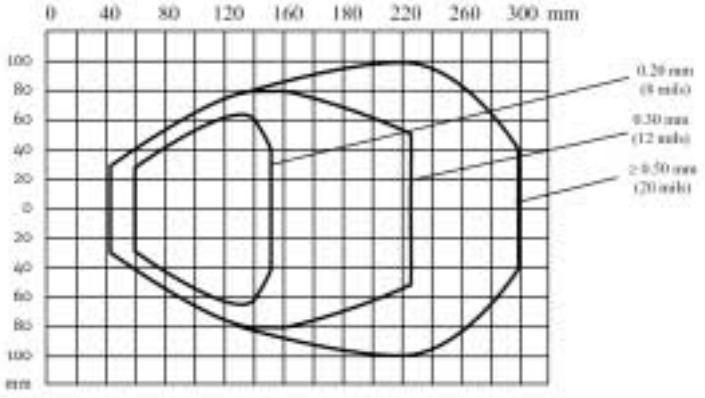
VB12-220 reading diagram



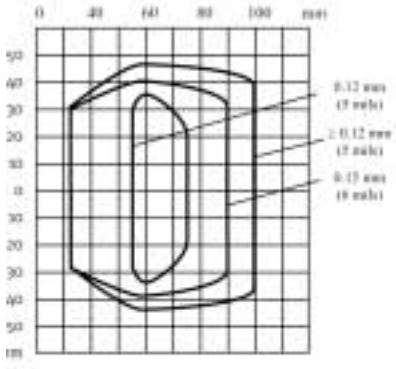
VB12-110 reading diagram



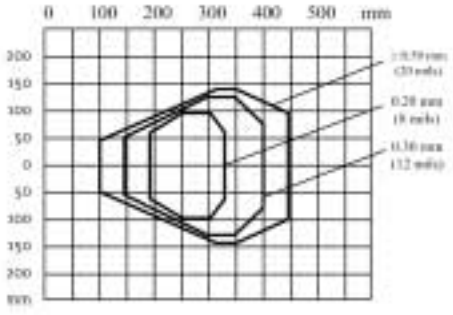
VB14A-300 reading diagram



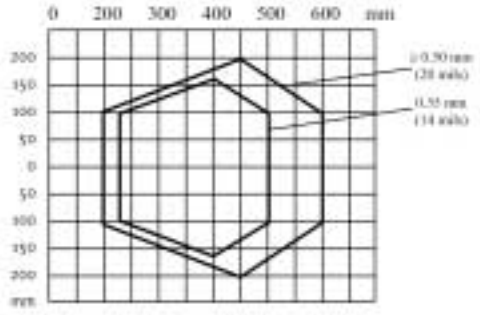
VB14A-100 reading diagram



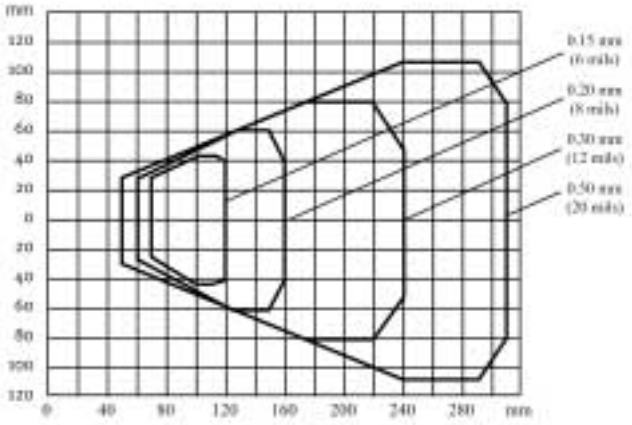
VB14A-440 reading diagram



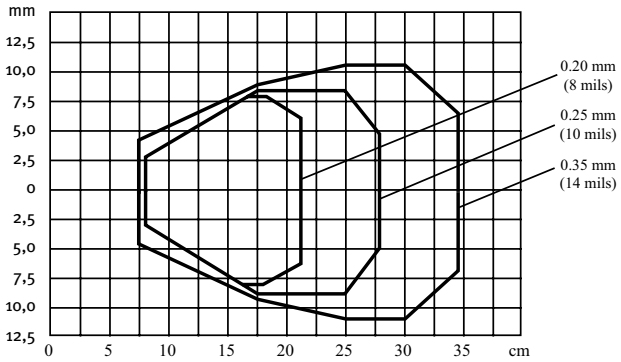
VB14A-600 reading diagram



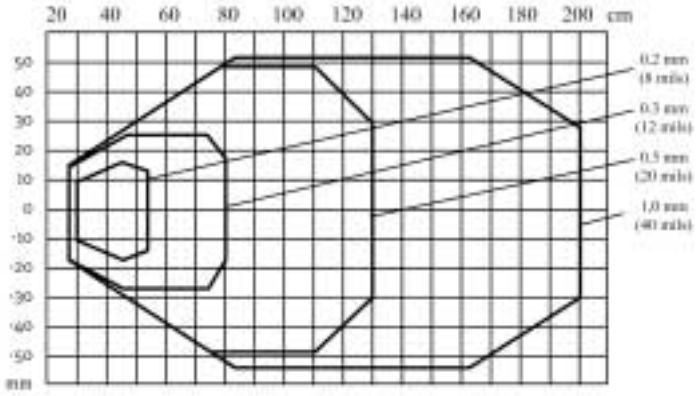
VB14A-310 reading diagram



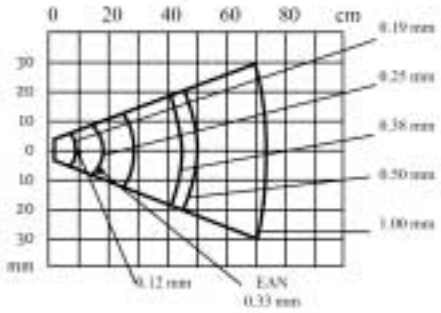
VB14A-340 reading diagram



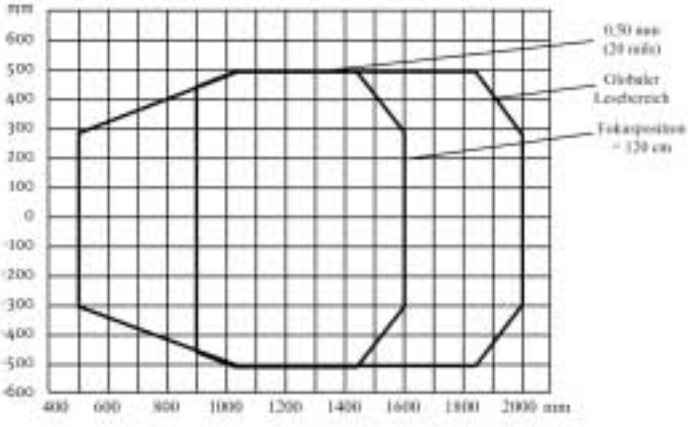
VB33-2000 reading diagram



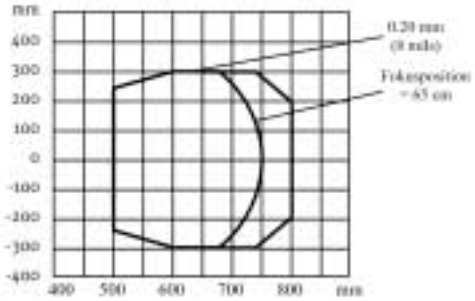
VB33-2000 reading diagram

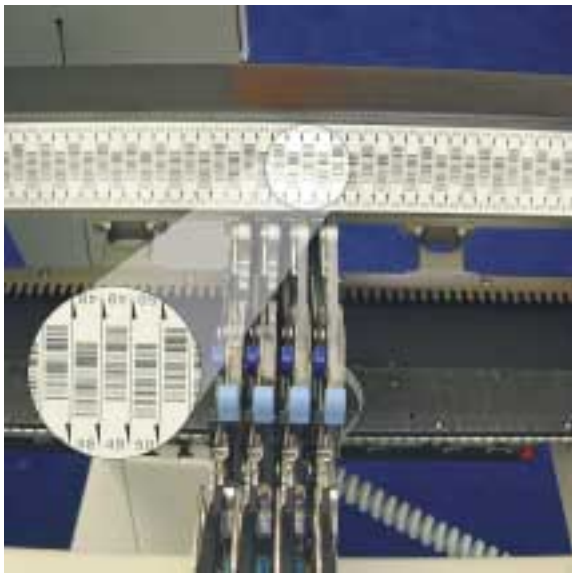


VB34-2500 reading diagram

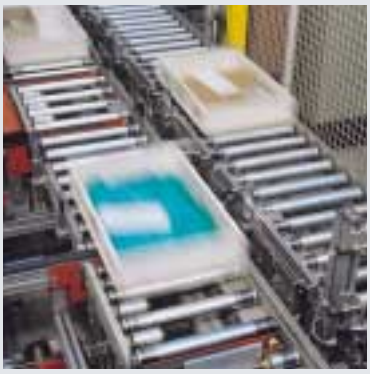


VB34-2500 reading diagram






Geprüft



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