FACTORY AUTOMATION

Manual

Barcode Scanner VB12

CE

PEPPERL+FUCHS
VISOLUX

Table of contents

Date of issue 03.12.2001

1 Declaration of conformity

The VB12 scanner and all its models have been developed and produced in accordance with the applicable European standards and directives.

EN 55022, August 1994: Limits and methods of measurements of radio disturbance characteristics of information technology equipment (ITE),

EN 50082-2, March 1995: Electromagnetic compatibility. Generic Immunity Standard Part 2: Industrial environment,

89/336 CEE and successive amendments,

92/31 CEE,

93/68 CEE.

Note

A corresponding declaration of conformity can be requested from the manufacturer.

Pepperl+Fuchs GmbH in D-68301 Mannheim possesses a certified quality assurance system in accordance with ISO 9001.

CE

ISO**9001**

Date of issue 30.01.2002

2 General information

Warning

This symbol warns the user of possible danger. Failure to heed this warning can lead to personal injury or death and/or damage to equipment.

Attention

This symbol warns the user of a possible failure. Failure to heed this warning can lead to total failure of the equipment or any other connected equipment.

Note

This symbol gives the user important hints.

Date of issue 30.01.2002

3 Safety

3.1 Laser safety

The following information is provided to comply with the rules imposed by international authorities and refers to the correct use of the VB12 scanner.

3.2 Standard regulations

This scanner utilizes a low-power laser diode. Although staring directly at the laser beam momentarily causes no known biological damage, avoid staring at the beam as one would with any very strong light source, such as the sun. Avoid that the laser beam hits the eye of an observer, even through reflective surfaces such as mirrors, etc.

This product conforms to the applicable requirements of both IEC 825-1 and CDRH 21 CFR 1040 at the date of manufacture. The scanner is classified as a Class 2 laser product according to IEC 825-1 regulations and as a Class II laser product according to CDRH regulations.

There is a safety device which allows the laser to be switched on only if the motor is rotating above the threshold for its correct scanning speed.

Note

The laser beam can be switched off through a software command (see also "Beam Shutter" in the VisoSetup Help On Line).

Warning

Use of controls or adjustments or performance of procedures other than those specified herein may result in exposure to hazardous visible laser light.

The laser light is visible to the human eye and is emitted from the window on the front of the scanner (see section 4.2, figure 4.1, pos. 1).

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The warning label indicating exposure to laser light and the device classification is applied onto the body of the scanner (figure 3.1 and figure 3.2).

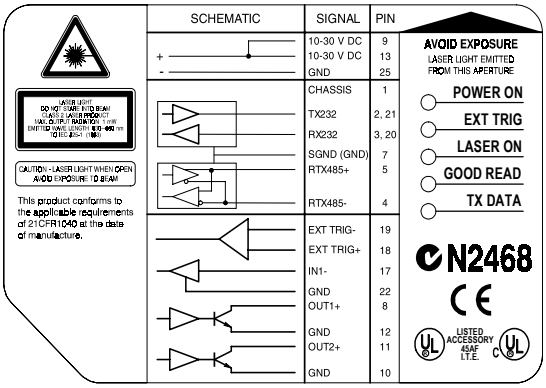

Figure 3.1 Warning and device class label

For installation, use and maintenance it is not necessary to open the scanner.

The laser diode used in this device is classified as a Class 3B laser product according to IEC 825-1 regulations and as a Class IIIb laser product according to CDRH regulations. As it is not possible to apply a classification label on the laser diode used in this device, the following label is reproduced here:

Figure 3.2 Laser diode class label

Any violation of the optic parts in particular can cause radiation up to the maximum level of the laser diode (7 mW at 630 nm to 680 nm).

3.3 Power supply

This device is intended to be supplied by a UL Listed Power Unit with "Class 2" or LPS power source which supplies power directly to the scanner via the 25-pin connector.

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4 Product description

4.1 Introduction

The VB12 scanner with decoder offers one of the best cost-effective solutions for demanding industrial applications.

The VB12 ultra compact dimensions, based on VISOLUX's experience in miniaturised laser components, have been specifically designed to make the scanner's integration into automated equipment extremely easy.

The Windows-based user-friendly VisoSetup utility program provided on CD-ROM simplifies the scanner's setup. The VB12 scanner can also be configured from a Host PC through the Host Mode procedure.

4.2 General views

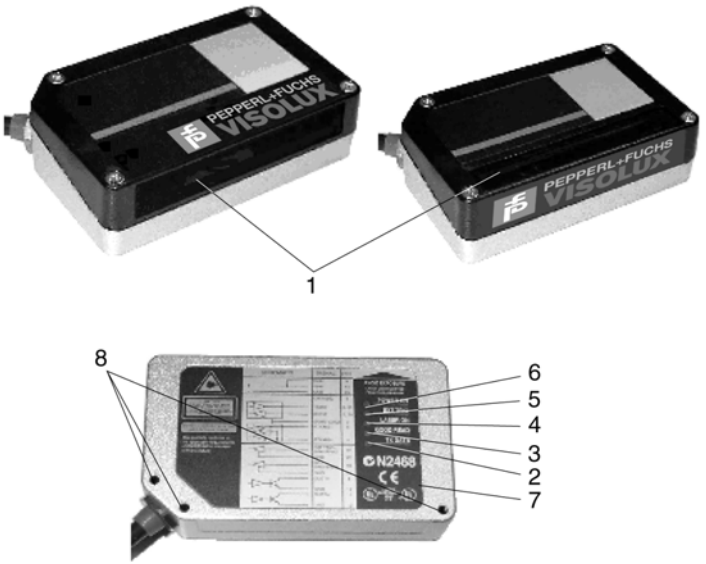

Figure 4.1 Scanner VB12 - General view

1	Laser Beam Output Window	5	Ext. Trigger-LED
2	TX Data-LED	6	Power-ON LED
3	Good Read-LED	7	Laser Warning and Device Class Label
4	Laser ON-LED	8	Mounting Holes

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4.3 Description

Some of the main features of VB12 are listed below:

- miniaturised dimensions, light weight.
- scanning speed: 350 scans/s
- raster version available.
- 2 serial communication interfaces: RS 232 and RS 485.
- reads all popular codes.
- supply voltage: 10 V DC ... 30 V DC,
- test mode to verify the reading features and exact positioning of the scanner without the need for external tools.
- programmable in 4 different operating modes to suit the most various barcode reading system requirements.
- code verifier.
- programmable input and output signals.
- light source: visible laser diode; the light emitted has a wave length of 630 nm ... 680 nm. For laser safety precautions refer to the ”Safety Precautions” section at the beginning of this manual.
- low power consumption.
- IP65 protection class of the enclosure; the reader is therefore suitable for industrial environments where high protection against harsh external conditions is required.

The laser beam output window is on the side of the scanner in VB12-□□□ models and on the upper part of the scanner in VB12-□□□-S models, (figure 4.1, pos. 1). A security system allows the laser to activate only once the motor has reached the correct rotational speed; consequently, the laser beam is generated after a slight delay from the power on of the scanner.

4.4 LED indicators

The five LEDs on the scanner indicate the following:

POWER ON	(red) indicates the reader is connected to the power supply (see figure 4.1, pos. 6)
GOOD READ	(red) is used to signal the possibility of a successful barcode reading (see figure 4.1, pos. 3)
EXT. TRIG.	(yellow) indicates external trigger activity (see figure 4.1, pos. 5)
TX DATA	(green). When blinking, it indicates data transmission (see figure 4.1, pos. 2)
LASER ON	(green) indicates laser ON state (see figure 4.1, pos. 4)

The screw holes on the body of the reader are for mechanical fixture (see figure 4.1, pos. 8).

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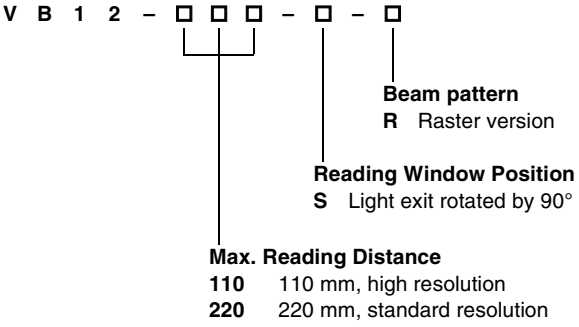
4.5 Available models

The VB12 scanner is available in versions that differ in regard to the following parameters:

- Resolution.
- Reading window position.
- Line or raster models.

The following models are therefore available:



If the last position of the key ("Reading Window Position") is blank, the laser beam output window is located on the side of the scanner.

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5 Installation

5.1 Package contents

Verify that the VB12 scanner and all the parts supplied with the equipment are present and intact when opening the packaging

Note

If the equipment has been subjected to extreme temperature fluctuations during transport, it must be allowed to acclimatise (approx. 2 hours) before being installed and put into operation. Always avoid condensation forming in or on the unit as this could result in internal components being impaired or indeed irreparably damaged.

The list of parts includes:

1. VB12 scanner with cable
2. Mounting kit: bracket, screws.

With your order the following items are included:

CD-ROM containing operating manual, configuration tool VisoSetup, and bar code test chart.

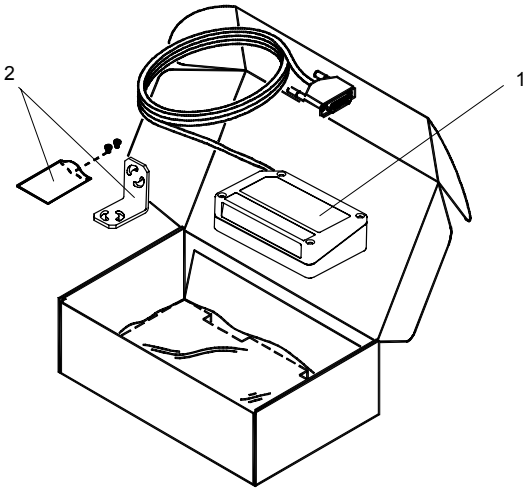

Figure 5.1 VB12 package contents

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5.2 Quick guide

The following can be used as a checklist to verify all of the steps necessary for complete installation of the VB12 scanner.

1. Read all information in section 3 "Safety" at the beginning of this manual.
2. Correctly position and mount the scanner for barcode reading according to the information in section 5.3 and 6.5.
3. Provide correct system cabling according to the signals necessary for your application (see all sub-paragraphs in section 5.4). See also sub-paragraphs in section 5.5 for reference.
4. Install the configuration CD-ROM.
   See also the Guide To Rapid Configuration link.
   Specific parameter details are available in the Help On Line

Note

Fine tuning of the scanner position for barcode reading can be accomplished using the Test Mode as described in VisoSetup

The installation is now complete.

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5.3 Mechanical installation

5.3.1 General notes

The VB12 scanner can be installed to operate in any position.

There are three screw holes (M3 x 5) on the body of the reader for mounting. The diagram below gives all the information required for installation. For correct positioning of the scanner with respect to the code passage zone see section 5.3.3.

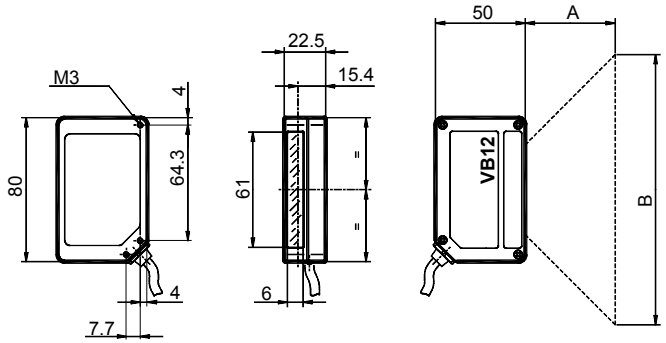

Figure 5.2 Scanner VB12 - Dimensions

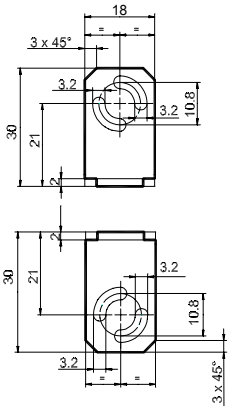

Figure 5.3 Scanner VB12 - Mounting bracket

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5.3.2 Reading position

In VB12-□□□-S scanner the laser beam is emitted from the output window with a 12 (± 2°) skew angle. This allows installation with minimum overall dimensions.

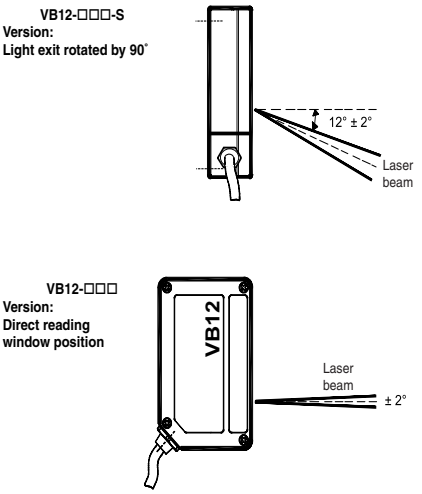

Figure 5.4 Reading position

5.3.3 Positioning

The VB12 scanner is able to decode barcode labels at a variety of angles, however significant angular distortion may degrade reading performance. When mounting the VB12 take into consideration these three ideal label position angles:
Pitch 0°, Skew 15° to 30° and Tilt 0°.

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Follow the suggestions for the best orientation:

The **Pitch** angle is represented by the value **P** in figure 5.5.

Position the reader in order to **minimise** the **Pitch** angle.

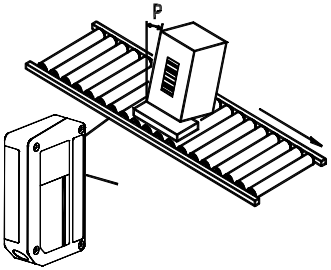

Figure 5.5 Pitch angle

The **Skew** angle is represented by the value **S** in figure 5.6. Position the reader to **assure about 15**° for the **Skew** angle. This avoids the direct reflection of the laser light emitted by the VB12 scanner.

For the raster version, this angle refers to the most inclined or external raster line, so that all other raster lines assure **more** than 15° Skew.

For the skew angle value with VB12 90° versions, refer to section 5.3.2.

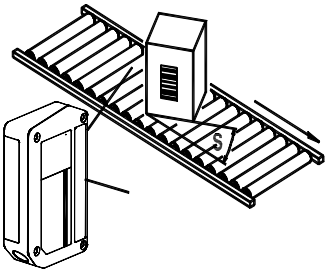

Figure 5.6 Skew angle

The **Tilt** angle is represented by the value **T** in figure 5.7. Position the reader in order to **minimise** the**Tilt** angle.

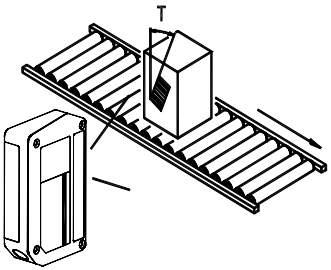

Figure 5.7 Tilt angle

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5.4 Electrical connections

The VB12 cable is equipped with a 25-pin female D-sub connector for connection with the power supply and input/output signals:

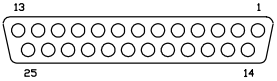

Figure 5.8 25-pin female D-sub connector

25-pin D-Sub-Socket Pinout		
Pin	**Name**	**Function**
9, 13	10 ... 30 V DC	Power supply input voltage +
25	GND	Power supply input voltage -
1 *	CHASSIS	Chassis Ground
2, 21	TX232	TX RS 232 Aux. Interface
3, 20	RX232	RX RS 232 Aux. Interface
4	RTX485-	RTX- RS 485 Main Interface
5	RTX485+	RTX+ RS 485 Main Interface
7	SGND (GND)	Signal Ground
8	OUT1+	Output 1 +
11	OUT2+	Output 2 +
18	EXT. TRIG.+	External trigger +
19	EXT. TRIG.-	External trigger -
10, 12, 22	GND	Input/Output reference (Mass)
17	IN 1-	Input 1 -
6, 14, 15, 16, 23, 24	NC	Not connected

* Pins 1 and 25 are connected together internally.

5.4.1 Power supply

The following pins of VB12 connector are used

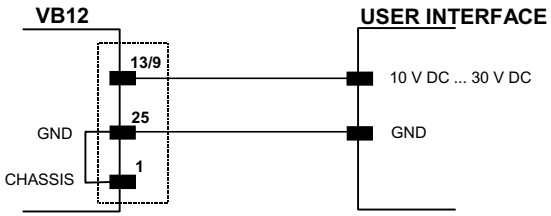

Figure 5.9 Power supply connections

The power must be 10 V DC to 30 V DC only.

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5.4.2 Main serial interface - RS 485 half-duplex

The RS 485 half-duplex interface (3 wires + screen) is used for polled communication protocols.

It can be used for multidrop connections in a master/slave layout.

The connector pinout follows:

Pin	Name	Function
5	RTX485+	RS 485 transmitted/received data +
4	RTX485-	RS 485 transmitted/received data -
7	SGND	Signal ground

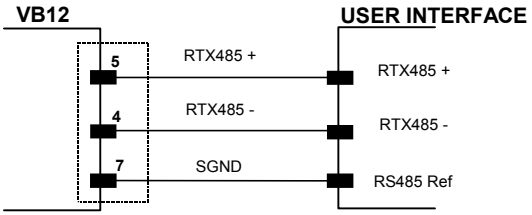

Figure 5.10 RS485 half-duplex connections

Note

For this interface type, the multidrop address must also be set via serial channel by the VisoSetup utility or by ESC sequences.

5.4.3 Auxiliary interface - RS 232

The auxiliary serial interface is used exclusively for RS 232 point-to-point connections. It is also used for configuring the VB12 scanner.

Note

The parameters relative to the auxiliary interface (baud rate, data bits, etc.) can be defined using the VisoSetup utility program.

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The following pins of the 25-pin connector are used to connect the RS 232 auxiliary interface:

Pin	Name	Function
3, 20	RX232	Received data
2, 21	TX232	Transmitted data
7	SGND (GND)	Signal ground

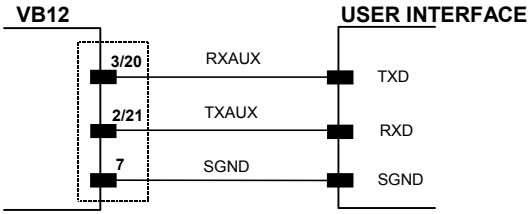

Figure 5.11 RS 232 auxiliary interface connections

5.4.4 Inputs

The inputs available on the connector supplied with the scanner are indicated below:

Pin	Name	Function
18	EXT. TRIG.+	External Trigger +
19	EXT. TRIG.-	External Trigger -
22	GND	I/O reference

Note

The EXT TRIG input is used to connect the external trigger which tells the scanner to scan for a code. The active state of this input is selected in software. Refer to the VisoSetup Help On Line.

The yellow LED (see section 4.2, figure 4.1, pos. 5) is on when external trigger forces a current flow through the EXT TRIG+ and EXT TRIG- pins. This input is optocoupled and can be driven by both an NPN or PNP type command. The connections are indicated in the following diagrams (figure 5.12 to figure 5.15):

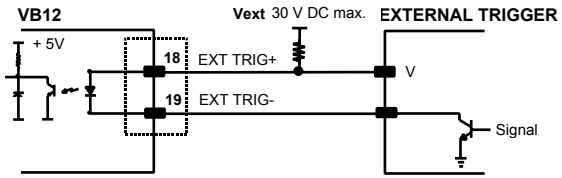

Figure 5.12 Input NPN command using external power

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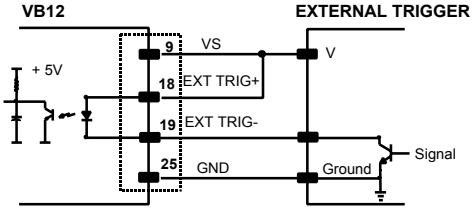

Figure 5.13 Input NPN command using scanner power

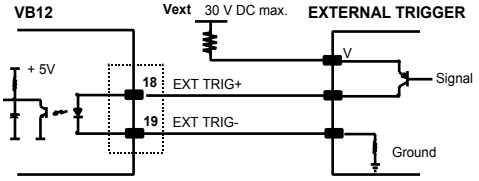

Figure 5.14 Input PNP command using external power

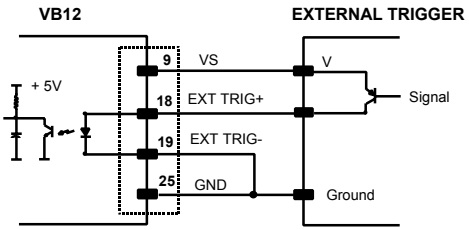

Figure 5.15 Input PNP command using scanner power

The general purpose input IN1, in the Standard Application Program, can be used to store the code verifier (see ”Store Verifier Hw” in the VisoSetup Help On Line).

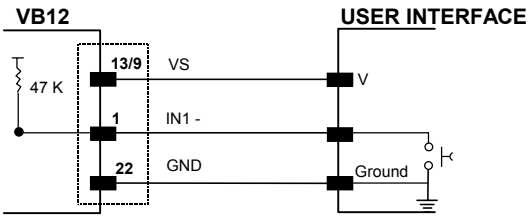

Figure 5.16 IN1- Input command

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An anti-disturbance hardware filter is implemented on the external trigger input (about 1 millisecond delay).

Note

An additional 15 ms (typical) delay can be implemented through a dedicated software parameter (refer to VisoSetup Help On Line).

5.4.5 Outputs

The following pins are present on the connector of the scanner:

Pin	Name	Function
8	OUT1+	Output 1 +
12	GND	I/O reference
11	OUT2+	Output 2 +
22	GND	I/O reference

Note

The meaning of the two outputs OUT1 and OUT2 can be defined by the user (NO READ, Right or Wrong). Refer to the VisoSetup Help On Line.

By default, OUT1 is associated with the NO READ event, which activates when the code signalled by the external trigger is not decoded, and OUT2 is associated with the Right event, which activates when the code is correctly decoded.

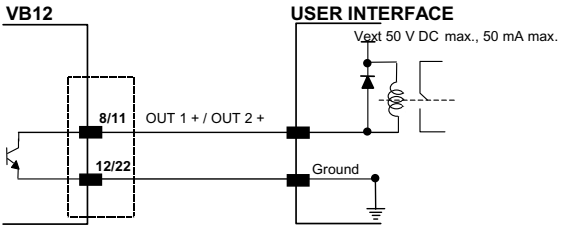

Figure 5.17 VB12 Output connections

Note

These outputs are both level or pulse configurable.

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5.5 Typical layouts

The following typical layouts refer to system hardware configurations. Dotted lines in the figures refer to optional connectivity within the particular layout.

Note

*These layouts also require the correct setup of the software configuration parameters. Complete software configuration procedures can be found in the **Guide To Rapid Configuration** in the VisoSetup Help On Line.*

5.5.1 Point-to-point

In this layout data is transmitted to the Host on the RS 232 auxiliary serial interface.

Note

The local echo communication mode must be enabled (default). See the VisoSetup Help On Line.

When on-line operating mode is used, the scanner is activated by an external trigger (photoelectric sensor) when the object enters its reading zone.

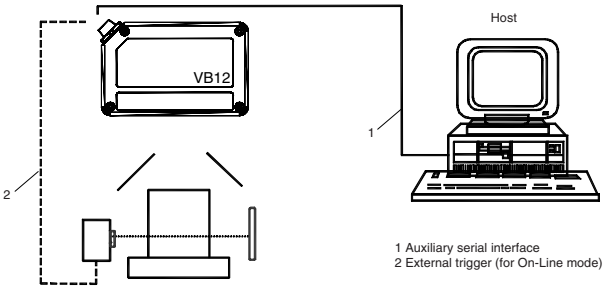

Figure 5.18 Point-to-point layout

5.5.2 RS 485 master/slave

The RS 485 master/slave connection is used to collect data from several scanners to build a multi-point or a multi-sided reading system; there can be one master and up to 5 slaves connected together.

The Slave scanners are connected together using the RS 485 half-duplex main serial interface. Every slave scanner must have a multidrop address in the range 0 to 4.

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The master scanner is also connected to the host on the RS 232 auxiliary serial interface.

The external trigger signal is unique to the system; there is a single reading phase and a single message from the master scanner to the host computer.

Attention

It is necessary to bring the external trigger signal to all the scanners.

The main and auxiliary ports are connected as shown in the following figure.

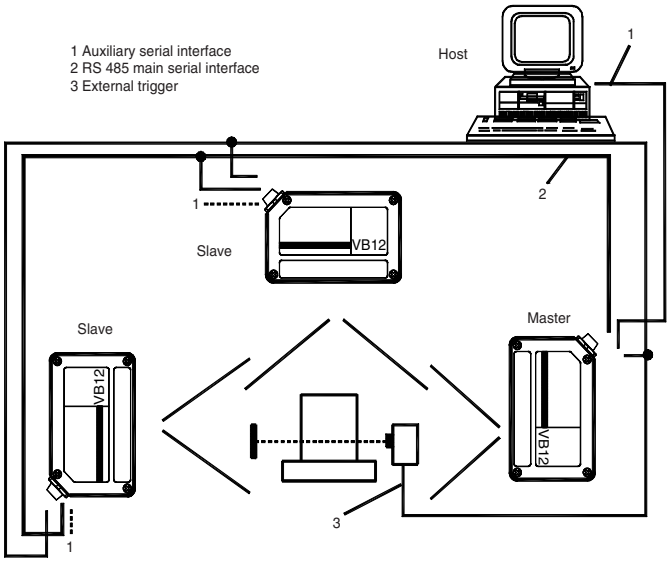

Figure 5.19 RS 485 master/slave layout

Note

The auxiliary serial port of the slave scanners can be used in local echo communication mode to control any single scanner (visualise collected data) or to configure it using the VisoSetup utility or host mode programming procedure

The termination resistors of the RS 485 bus must not be installed.

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6 Reading features

The number of scans performed on the code by the VB12 scanner is a crucial information on how precisely barcode can be read.This is influenced by the following parameters:

- number of scans per second
- code motion speed
- label dimensions
- scan direction with respect to code motion

Typically, 5 scans should be allowed during the code passage to ensure a successful read.

6.1 Step ladder mode

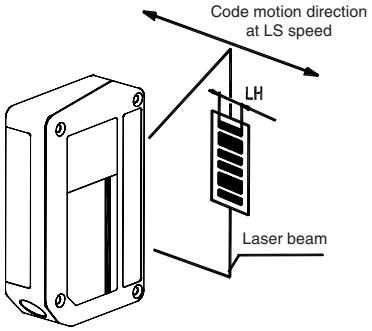

Figure 6.1 "Step ladder" scanning mode

If scanning is perpendicular to the code motion direction (Figure 6.1 - "step-ladder" mode), the number of effective scans performed by the reader is given by the following formula:

$$SN = [(LH/LS) \times SS] - 2$$

These symbols signify:

SN = number of effective scans

LH = label height (in mm)

LS = label movement speed (in mm/s)

SS = number of scans per second

For example, the VB12 (350 scans/s) for a 25 mm high code moving at 500 mm/s performs:

$$[(25/500) \times 350] - 2 = 15 \text{ effective scans.}$$

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6.2 Picket fence mode

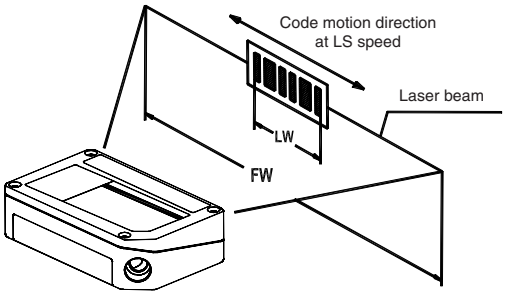

Figure 6.2 "Picket fence" scanning mode

If scanning is parallel to the code motion, (Figure 6.2 - "picket-fence" mode), the number of effective scans is given by:

$$SN = [((FW-LW)/LS) \times SS] - 2.$$

These symbols signify:

SN = number of effective scans

FW = reading field width (in mm)

LW = label width (in mm)

LS = label movement speed (in mm/s)

SS = number of scans per second

For example, for a 50 mm wide code moving in a point where the reading field is 180 mm wide at a 1300 mm/s speed, the VB12 (350 scans per sec.) performs:

$$[((180-50)/1300) \times 350] - 2 = 33 \text{ scans.}$$

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6.3 Performance

The VB12 scanner is available in different versions according to the reading performance.

Version	Max. code resolution	Speed
	mm (mils)	(Scans/s)
VB12-220	0.20 (8)	350
VB12-110	0.12 (5)	350

Version	Reading distance
VB12-220	30 mm ... 220 mm (1.2 in ... 8.7 in) at 0.50 mm (20 mils) Codes
VB12-110	10 mm ... 110 mm (0.4 in ... 4.3 in) at 0.30 mm (12 mils) Codes

Refer to the diagrams given in section 6.5 for further details on the reading features. These diagrams are taken on various resolution sample codes at a 25 °C ambient temperature, depending on the conditions listed under each diagram.

6.4 Raster

Raster versions are available. If standard devices do not satisfy specific requirements, contact Pepperl+Fuchs, supplying code samples, to obtain complete information on the reading possibilities.

The max. capture of raster versions is 15 mm (0.6 in) at 220 mm (8.7 in).

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6.5 Reading diagrams

The following diagrams show the reading distance for barcodes with different densities.

6.5.1 VB12-220 standard resolution

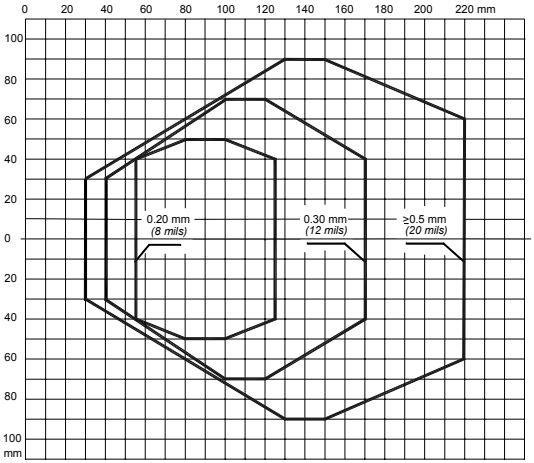

Figure 6.3 Standard resolution

(0,0) is the center of the laser beam output window.

Conditions:

Code	= Code 2/5 interleaved or Code 39
PCS (print contrast signal)	= 0.90
Pitch angle	= 0°
Skew angle	= 15°
Tilt angle	= 0°

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6.5.2 VB12-110 high resolution

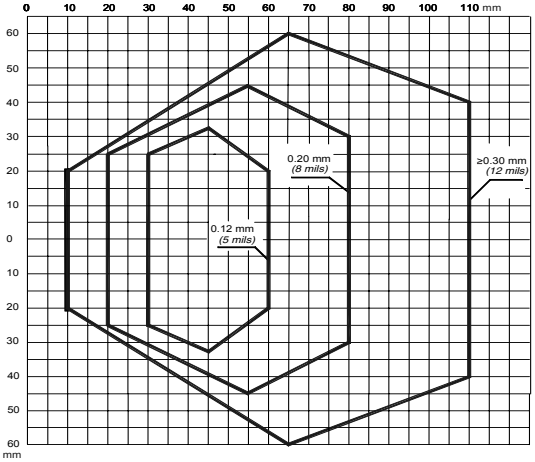

Figure 6.4 High resolution

(0,0) is the center of the laser beam output window.

Conditions:

Code	= Code 2/5 interleaved or Code 39
PCS (print contrast signal)	= 0.90
Pitch angle	= 0°
Skew angle	= 15°
Tilt angle	= 0°

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7 Maintenance

Clean the windows periodically for continued correct operation of the reader. Dust, dirt, etc. on the windows may alter the reading performance.

Repeat the operation frequently in particularly dirty environments.

Use soft material and alcohol to clean the windows and avoid any abrasive substances.

Clean the window of the VB12 when the scanner is turned off or, at least, when the laser beam is deactivated.

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8 Technical data

	VB12-220	VB12-110
Electrical features		
Power supply		
Maximum input voltage	10 V DC ... 30 V DC	
Max. power consumption	1.5 W	
Serial interfaces		
Main	RS 485 half-duplex	
Auxiliary	RS 232	
Baud-rates	150 baud to 115200 baud	
Inputs	external trigger; IN1	
Outputs	user-defined OUT1 and OUT2	
V_{CE} max.	50 V DC	
Collector current max.	50 mA continous	
V_{CE} saturation	0.3 V at 10 mA max.	
Power dissipation max.	200 mW at 40 °C (ambient temperature)	
Optical features		
Light source	Semiconductor laser diode	
Wave length (Note 1)	630 nm ... 680 nm	
Safety class	Class 2 - IEC 825-1; Class II - CDRH	
Reading features (Note 2)		
Scan rate	350 scans/s	
Aperture angle	70°	
Max. reading distance	220 mm (8.7 in)	110 mm (4.3 in)
Maximum resolution	0,20 mm (8 mils)	0,12 mm (5 mils)
User interface		
LED indicators	Power ON, Good Read, Ext. Trig., TX Data, Laser ON	

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Software features	
Readable code symbologies • EAN/UPC (including Add-on 2 and 5) • 2/5 interleaved • Code 39 (standard and full-ASCII) • Codabar • Code 93 • Code 128 • EAN 128 • Pharmacode Other symbologies available on request.	
Code selection	up to six different codes during one reading phase
Decoding safety	can enable multiple good reads of same code
Headers and terminators	up to 5 headers and 4 terminators
Operating modes	On-Line, Automatic, Serial-On-Line, Test
Configuration modes	• through menus using VisoSetup utility • receiving commands from one of the serial ports (host mode)
Parameter storage	Non-volatile internal EEPROM
Environmental features	
Operating temperature (Note 3)	0 °C ... 45 °C (32 °F ... 113 °F)
Storage temperature	-20 °C ... 70 °C (-4 °F ... 158 °F)
Max. humidity	90 % non condensing
Vibration resistance	IEC 68-2-6 Test FC 1,5 mm; 10 Hz to 55 Hz; 2 hours on each axis
Shock resistance	IEC 68-2-27 Test EA 30G; 11 ms; 3 shocks on each axis
Protection class	IP65
Physical features	
Mechanical dimensions	80 mm x 50 mm x 22 mm (3.15 in x 1.97 in x 0.89 in)
Weight without cable	< 100 g (< 3.53 oz)

Note

1. *The features given are typical at a 25 °C ambient temperature (if not otherwise indicated).*
2. *Further details given in section 6.3 and 6.5.*
3. *If the reader is used for a long period of time in high temperature environments (over 40 °C), use of the beam shutter is advised (see the VisoSetup configuration program).*

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One Company, Two Divisions.

Factory Automation Division

Product Range

- Digital and analogue sensors
- in different technologies
  - Inductive and capacitive sensors
  - Magnetic sensors
  - Ultrasonic sensors
  - Photoelectric sensors
- Incremental and absolute rotary encoders
- Counters and control equipment
- Identification Systems
- AS-Interface

Areas of Application

- Machine engineering
- Conveyor or transport
- Packaging and bottling
- Automotive industry

Process Automation Division

Product Range

- Signal conditioners
- Intrinsically safe interface modules
- Remote Process Interface (RPI)
- Intrinsically safe field bus solutions
- Level control sensors
- Process measuring and control systems engineering at the interface level
- Intrinsic safety training

Areas of Application

- Chemical industry
- Industrial and community sewage
- Oil, gas and petrochemical industry
- PLC and process control systems
- Engineering companies for process systems

Service Area

Worldwide sales, customer service and consultation via competent and reliable Pepperl+Fuchs associates ensure that you can contact us wherever or whenever you need us. We have subsidiaries worldwide for your convenience.

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