Q-250
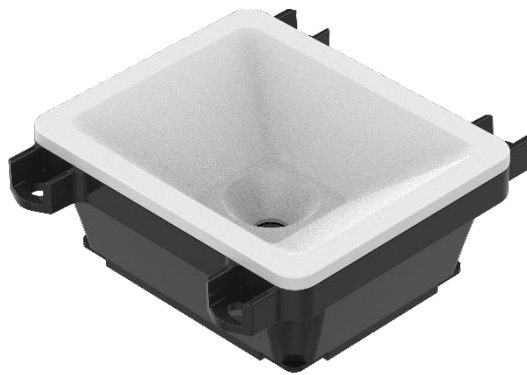

Specification Manual rev 1.0

Preliminary. The information in this document is subject to change without notice.

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Limited Warranty and Disclaimers

Please read this manual carefully before installing or using the product.

Serial Number

A serial number appears on all Opticon products. This official registration number is directly related to the device purchased. Do not remove the serial number from your Opticon device. Removing the serial number voids the warranty.

Warranty

Unless otherwise agreed in a written contract, all Opticon products are warranted against defects in materials and workmanship for two years after purchase excluding batteries. Opticon will repair or, at its option, replace products that are defective in materials or workmanship with proper use during the warranty period. Opticon is not liable for damages caused by modifications made by a customer. In such cases, standard repair charges will apply. If a product is returned under warranty and no defect is found, standard repair charges will apply. Opticon assumes no liability for any direct, indirect, consequential or incidental damages arising out of use or inability to use both the hardware and software, even if Opticon has been informed about the possibility of such damages.

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Revision History

Product Name : Q-250

Revision	Date	Page	Section	Description of Changes
1.0	19/08/2024	-	-	Initial release

Table of Content

Table of Figures

1 Abstract

This manual provides specifications for the Q-250, a 2D module that is specifically designed to deliver high volume, hands-free scanning of any barcode no matter the quality. It can be incorporated into a variety of applications within retail, ticketing, kiosks and manufacturing.

2 About the Q-250 2D barcode scanner

The Q-250 is a module, imager based, 2D barcode presentation scanner that enables high speed scanning of 1D (linear) and 2D barcodes. The main features of the Q-250 are as follows:

- **360° high speed reading:** The extremely high-performance decoder and electronics used in this product ensures stress-free scanning and fast response without being affected by hand movement and poor lighting conditions. It has full spectrum illumination suitable for on and off screen scanning.

- **Wide Angle Lens:** Provides a broad field of view, enhancing the scanner's ability to capture barcodes at small distances and at various angles and positions.

- **Fast, global shutter, highly sensitive CMOS sensor:** The camera inside the Q-250 uses a very fast 120 frames/second sensor with a global shutter with auto exposure. This results in an exceptionally high movement tolerance. The CMOS sensor has a very high sensitivity which means that the scanner can usually work without having the illumination LEDs on most of the time. This greatly improves the reading of LCD screens such as those on smart phones.

- **Editing function:** This scanner features a unique function called "Data Editing Program" which gives a user an almost unlimited flexibility to format the scanned data before it is sent out. Up to 16 barcodes can be (partially) combined and fixed parts can be added before it is output in one go. The output editing process, such as GS1 format, can also be configured easily.

- **Flexible interface:** The scanner comes with a dual interface that can accommodate RS232 and USB. When the USB interface is used, the scanner will be recognized as two device ports on the host computer. The first device port can be configured as keyboard (USB_HID) or as a serial port (USB-COM) over which the scanned barcode data is sent. The second port is for sending configuration commands. This allows configuring the scanner with serial commands even when it is configured as keyboard scanner. No drivers need to be installed in modern versions of Windows and Mac OS. The USB interface can be used via either a standard cable with a USB-C plug, or via a cable that is connected to the 12-pin board-to-cable header on the scanner. This header also provides the RS232 interface.

3 Model Details

The following table shows the available models of the Q-250. Please note that an interface cable for RS232 or for USB-C is not included in the box. A cable may be ordered separately.

Model name	Suffix	Standard model
Q-250*	USB-HID	Standard
	USB-COM	On request
	RS232	On request

*A cable is not included in the box. The models are physically the same and the difference is a software configuration. This configuration can also easily be changed by the user.

4 Detailed specifications

	Item		Specification		Note
Control Section	CPU		CPU： MIPS Based, Dual core		Core clock：1.2GHz
	DDR3 RAM		1Gbit (128Mbyte)		DDRCLK：1333 MHz
	Flash ROM		128Mbit (16Mbyte)		
Interface	USB		Full Speed 12Mbps (HID/COM) data port plus 12Mbps (COM) command port		Bus powered, 500mA mode
Indicator	LED		2 red LEDs and 2 green LEDs		Underneath the semi translucent dome
	Buzzer		Loudness / tone adjustable		
Optical Section	Scanning method		Monochrome CMOS area sensor		Frame rate: 120 fps
	Scanning light source		8 white LEDs		Underneath the translucent dome for diffuse illumination.
	Effective pixels		0.30 million pixels (H: 640 x V: 480)		
	View angles		Horizontal: 74.0° Vertical: 60.0° Diagonal: 88.0°		Lens EFI 1.02mm
	Focal point		Approx 8cm above the housing		
Supported 1D Symbologies	Symbologies	1D	All UPC/ENA/JAN including Addon, Code 39, Codabar, Industrial 2 of 5, Interleaved 2 of 5, Code 93, Code 128, GS1-128, MSI/Plessey, Code 11, UK Plessey, Telepen, Matrix 2 of 5		
		Postal	Korean Postal Authority code, Chinese Post Matrix 2 of 5, Japanese Postal, Intelligent Mail Barcode, Postnet, Planet, Netherlands KIX Code, Australian Postal, UK Postal, 4-State Mailmark Barcode		
	Minimum resolution		Code 39 : 0.1 mm		PCS 0.9
	Curvature		Radius ≧ 20 mm (12-digit UPC)		
	Barcode width		Possible to read: Code 39 with 100 mm width and resolution 0.2mm (DOF: 127 mm)		
	Motion tolerance		Possible to read: UPC 100% moving at 3 m/s (DOF: 87 mm)		
	Depth of field (mm)	Code 39	Resolution (0.127) Resolution (0.254) Resolution (0.508)	TBD	
		Code 128	Resolution (0.20)	TBD	
		UPC	Resolution (0.33)	TBD	
GS1/Composite	Symbologies		GS1 DataBar , GS1 DataBar Limited , GS1 DataBar Expanded Composite GS1 DataBar, Composite GS1-128, Composite EAN , Composite UPC		GS1 DataBar: formerly called "RSS"
	Minimum resolution		GS1 DataBar Composite Code	TBD	PCS 0.9

Item			Specification		Note
Supported 2D Symbologies	Symbologies		(micro)PDF417, Codablock F, (micro)QR Code, DataMatrix (ECC 200), MaxiCode, Aztec Code, Chinese Sensible Code		Disable Code 128 when Codablock F is enabled.
	Minimum resolution (mm)		PDF417 QR Code Data Matrix	TBD	
	Depth of field (mm)	PDF417	Resolution (0.169) Resolution (0.254)		PCS 0.9
		QR Code	Resolution (0.169) Resolution (0.381)		
		Data Matrix	Resolution (0.169) Resolution (0.254)		
Common	Scan angle		Pitch ±65° Skew ±65° Tilt 360°		
	Minimum PCS		0.2 or more		MRD: 13% or more
Image capture	Image data format		Windows Bitmap, JPEG		.
	Shades of gray		1024, 256, 16, 2		
	Range of output image		Select top/bottom (column) and left/right (row)		
	Resolution of output image		Full,1/2, 1/4		
	Interface of output image		USB-COM or RS232		
	Transfer time		USB-COM: Around 80 frames/sec RS232: About 1 frame/sec		Resolution: Full
Power	Operating voltage		5V ± 10%		
	Current consumption	Reading	370mA (typ)		Ambient temperature: 25°C
		Auto trigger	260mA (typ)		
		Standby	90mA (typ)		
Environmental Specifications	Temperature	Operating	-20 to 70 °C		
		Storage	-30 to 60 °C		
	Humidity	Operating	5 to 90% (no condensing, no frost)		
		Storage	5 to 90% (no condensing, no frost)		
	Ambient light immunity	Fluorescent	10,000 lx or less		UPC 100% Optical axis angle: 75° Distance: 90 mm
		Sunlight	100,000 lx or less		
	Vibration		10 Hz to 100 Hz, acceleration of 19.6 m/s^2, 60 minutes per cycle, repeat once in each X, Y and Z-direction		
	Drop		-		-
	Dust and drip proof		-		

Item		Specification	Note
Regulatory	This scanner is an Exempt Risk Group LED product.		
	LED safety	**Inform Declaration of Conformity**	
	EMI/RFI	**Inform Declaration of Conformity**	For residential, commercial, and light-industrial environments
	Product safety	**Inform Declaration of Conformity**	
	Electromagnetic compatibility (EMC)	**Inform Declaration of Conformity**	For residential, commercial, and light-industrial environments
Immunity Test	ESD immunity — No damage	Air discharge (direct): ±15 kV	Condition: IEC:61000-4-2 compliant
	ESD immunity — No malfunction	Contact discharge (direct / indirect): ±6kV Air discharge (direct): ±8 kV	
	Radio-frequency electromagnetic field. Amplitude modulation — Frequency	80 to 1000 MHz	Condition: IEC61000-4-3 compliant
	Level	3 V/m	
	AM	80% (AM)	
	Fast transient — Voltage	Alternating-current input cable: ±1 kV	Condition: IEC61000-4-4 compliant
	Pulse	5 / 50 ns (Tr / Tw)	
	Frequency	5 kHz	
	Surge — Pulse	1.2 / 50 ns (Tr / Th)	Condition: IEC61000-4-5 compliant
	Voltage	From L to P : ±2 kV (closed-loop voltage)	
		From L to L : ±1 kV (closed-loop voltage)	
	Radio-frequency common mode — Frequency	0.15 to 80 MHz	Condition: IEC61000-4-6 compliant
	Level	3 V	
	AM	80% (AM)	
	Power frequency magnetic field — Frequency	50 and 60 Hz	Condition: IEC61000-4-8 compliant
	Level	3 A/m	
	Voltage dip, momentary voltage drop, fluctuation — Dip 1	Drop 30%, 0.5 cycles (both half cycles tested)	Condition: IEC61000-4-11 compliant
	Dip 2	Drop 60%, 5 cycles	
	Momentary drop	Drop > 95%, 250 cycles	
Physical Features	Dimensions	Approx. 68.0 × 77.0 × 39.1 (WDH mm)	Excluding cable
	Weight	Approx. 100g	Excluding cable
	Housing color	Black	

5 Detailed View
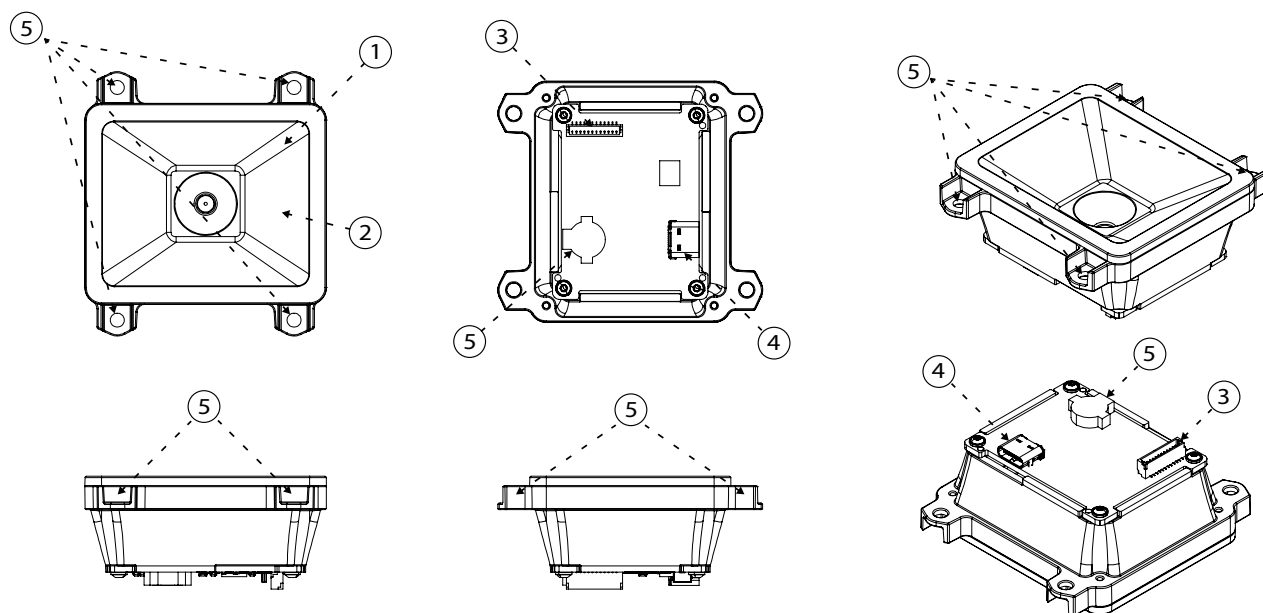
Figure 1: Detailed View of Q-250

No.	Name	Description
1	Illumination dome	Underneath the semi-translucent dome there are 8 illumination LED's
2	Status LED	Underneath the semi-translucent dome. Red indicates scanning. Green is good read.
3	USB/RS232 Interface header	Header for providing power to the scanner and connecting an USB or RS232 interface
4	USB-C Interface	USB-C socket for providing power to the scanner and USB interface
5	Mounting holes	Ø ±3.5mm

6 Electrical Specifications

The Q-250 is comprised of a 'Camera Section' with a CMOS sensor, 'Decoder Section' for decoding barcodes from scanned images, 'Interface Section' to communicate with a host and 'Power Supply Section' for the main power supply.
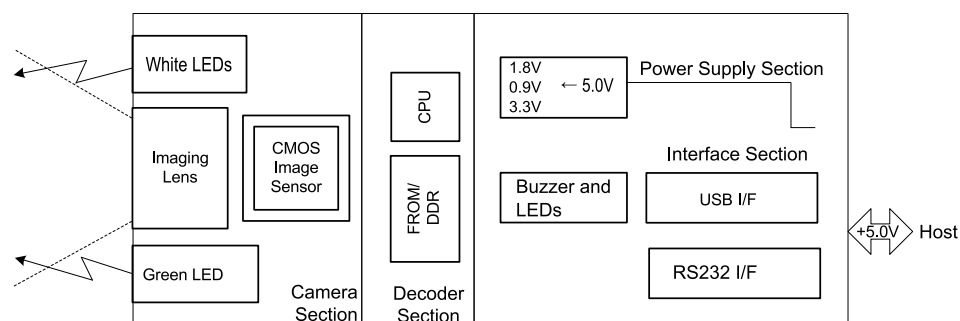

Figure 2: Electrical block diagram

6.1 Absolute maximum ratings

Item	Name	Value
Power supply	VCC	0 ~ 5.5V
External trigger input	TRIG	0 ~ 12V. Idle must be high or high Z
TxD and RTS output	TXD, RTS	-6V ~ 6V
RxD and CTS input	RXS, CTS	-25V ~ 25V
USB data lines	D-, D+	0 ~ 5.5V
Buzzer, LED outputs	BUZZER, GR_LED	0 ~ 3.6V

* Operation outside the Absolute Maximum Ratings may cause permanent device damage. Note that functional operation of the device is not guaranteed at these or any other conditions beyond those listed under Recommended Operating Conditions.

6.2 Recommended Operating Conditions

Item	Name	Value
Power supply	VCC	5.0V±10%
External trigger input	TRIG	Open drain: Low level 0V, high level max 12V or high Z
TxD and RTS output	TXD, RTS	Driven by the Q-250, 5.4V typical.
RxD and CTS input	Low level	-12V, according to RS232 spec.
	High level	+12V, according to RS232 spec.
	High/low threshold	1V typical
USB data lines	D-, D+	0~3.3V, according to USB spec.
Buzzer, LED outputs	BUZZER, GR_LED	0~3.3V, load resistance >= 5 kΩ

6.3 Power consumption

Item	Name	Value
Bus-Power Class	Hi-Power	500mA max
Current consumption*:	Reading	150mA (typical)
	Max. with buzzer and LED	370mA (typical)
	Standby	100mA (typical)

* Measured at 25°C with 5V power. Current consumption may vary depending on the Host.

7   Optical Specifications

7.1   Basic Optical Specifications

Item		Characteristics
Scan method	CMOS area sensor (white / black)	-
Number of effective pixels	Row × Column	640 × 480 dots
Image capture speed (*1)	Frame rate	120 fps
Sensor shutter speed	Minimum shutter speed	20μs
Focal distance	Distance from the front edge of scanner	20 mm
View angle	Horizontal	Approx. 98.0°
	Vertical	Approx. 81.5°
	Diagonal	Approx. 110.0°
Reading light source	LED	White
	Color temperature	3710K-4260K

*1 The fastest speed of image capture.

8 Technical Specifications

The conditions for technical specifications are as follows, unless otherwise specified in each section.

Conditions

Ambient Temperature and Humidity	Room temperature, room humidity
Ambient Light	100 to 500 lux
Angles	Pitch: $\alpha = 0°$, Skew: $\beta = +15°$, Tilt: $\gamma = 0°$
Curvature	$R = \infty$
USB Power Supply Voltage	5.0 V
PCS (1D and 2D)	0.9 or higher
Scanning Test	Accept the performance with 90% or more success rate for 10 tries of scan. One reading should be 2 seconds.
Barcode Test Sample (1D and 2D)	Specified at section 8.1

All measurements are done without specular (mirror-like) reflection of the illumination LEDs.

8.1 Barcode Test Sample

1D Barcodes

Resolution	Symbology	PCS	Size (mm)	No. of Digits
0.10 mm (3.9 mil)	Code 39	0.9	26 × 10	16
0.127 mm (5 mil)			11 × 10	4
0.20 mm (7.9 mil)			90× 10	27
0.254 mm (10 mil)			32.5× 12	7
0.508 mm (20 mil)			36 × 25	4
0.20 mm (7.9 mil)	Code 128	0.9	42 × 10	16
0.330 mm (13 mil)	UPC/EAN	0.9	31.5 × 25.0	12
0.330 mm (13 mil)*	UPC/EAN	0.2	31.5 × 25.0	13
0.169 mm (6.7 mil)	GS1 DataBar limited	0.9	12 × 1.5	14
0.169 mm (6.7 mil)	Limited-Composite	0.9	12 × 3.0	26

*For the PCS measurements

2D Codes

Resolution	Symbology	PCS	Size (mm)	No. of Digits
0.169 mm (6.7 mil)	PDF417 ECC Level-3	0.9	23 × 10	58
0.254 mm (10 mil)			35 × 15	
0.169 mm (6.7 mil)	QR Code Model-2 ECC M	0.9	5 × 5	44
0.381 mm (15 mil)			11 × 11	
0.169 mm (6.7 mil)	Data Matrix ECC200	0.9	4 × 4	40
0.254 mm (10 mil)			6 × 6	

* The size is outline dimensions excluding the quiet zones.

8.2 Scan Area and Depth of Field

The scan area is measured from the front edge of the scanner with the test chart tilted 15° from the optical axis.

8.2.1 Depth of Field

Resolution	Code	No. of Digits	Depth of field (mm)	
			Near	Far
0.127mm	Code 39	4 digits	10	75
0.254mm	Code 39	7 digits	10	115
0.508mm	Code 39	4 digits	30	140
0.33mm	UPC/EAN	12 digits	10	150
0.169mm	QR Code	44 digits	0	42
0.381mm	QR Code	44 digits	0	110

8.3 Printed Contrast Signal (PCS)

0.2 or higher

Conditions

MRD	13% and higher (80% or higher reflectivity of space and quiet zone)
Distance	87mm from the front edge of the scanner
Barcode Sample	UPC specified in Chapter 8.1. (Resolution: 0.33 mm, PCS: 0.2)

*MRD = Minimum reflectance of white bar - Maximum reflectance of black bar

$$PCS = \frac{\text{Reflectance of white space} - \text{Reflectance of black bar}}{\text{Reflectance of white space}}$$

8.4 Minimum Resolution

1D Code	0.1mm (3.9 mil)	Code 39 specified in Chapter 8.1
GS1-Databar	0.169mm (6.7 mil)	GS1 Databar Limited specified in Chapter 8.1
Stacked Code	0.169mm (6.7 mil)	PDF417, GS1 Databar Limited Composite specified in Chapter 8.1
2D Code	0.169mm (6.7 mil)	QR Code and Data Matrix specified in Chapter 8.1

Conditions

Barcode Sample	The above codes specified in chapter 8.1
Distance	10 mm from the front edge of the scanner

8.5   Motion Tolerance
3 m/s

Conditions

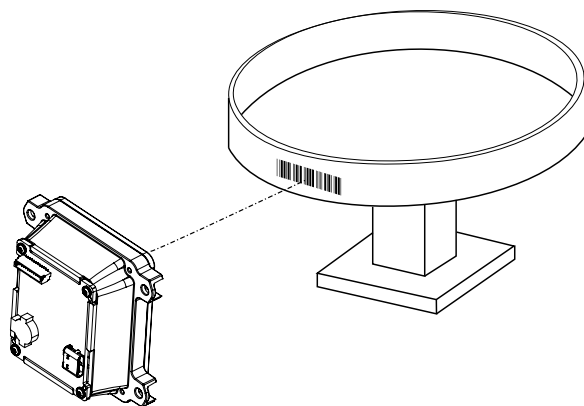|	
Ambient Light	500 to 1000 lux
Distance	10mm from the front edge of the scanner
Barcode Sample	UPC 0.33mm as specified in Chapter 8.1.

Figure 3: Motion Tolerance

Note: Above indicates the possible reading speed, which does not guarantee 100% reading.

9 Interface Specification

9.1 Multi-interface header

The Q-250 has a multi-interface board-to-cable header to be used with RS232 or USB

The header is of the type BM12B-SRSS-TBT made by JST. Compatible cables may be manufactured using receptacles SHR-12V-S-B or 12SR-3S.

Pin No. P1	Signal name	Signal description
1	Aim/Wake	Pull this pin to ground to enable the aiming function or to wake the scanner from sleep. The pin has an internal pull-up resistor.
2	VCC	Positive power, 5V External trigger, active on high to low edge. Idle high or high Z
3	GND	Ground
4	USB-	USB data
5	TXD	RS232 level TxD output
6	USB+	USB data
7	RXD	RS232 level RxD input
8	RTS/PWDN	RS232 level RTS output (Signals deep sleep mode with a logic low)
9	BUZZER	Buzzer signal output (3.3V logic level, idle = 0)
10	GR_LED	Good Read LED output (3.3V logic level, idle=0)
11	CTS/Wake	RS232 level CTS input (Will wake the scanner from deep sleep mode with a logic low)
12	TRIGn	Trigger input. Pull this pin to ground to activate the scanner. The pin has an internal pull-up resistor.

Figure 4: Multi-interface cable

9.2 USB Interface

The Q-250 has a composite USB interface that comes with two software interfaces that are both active when the scanner is plugged in:

- USB-HID (keyboard emulation)
- USB-COM (serial port)

When the scanner is configured as HID device, the scanned data is output over the HID interface. The scanner also has a USB-COM port that can be used to configure the scanner. Configuration commands and the response on those can be sent over that port.

When the scanner is configured as COM device, the HID port is not used. The scanned data is sent over the COM port and that port can also be used to send configuration commands to the scanner.

Note: The scanner can transfer images over the USB-COM port regardless of the configured interface.

9.3 USB IDs

Item	Value
Vendor ID	065A
Product ID (COM)	9039

9.4 USB Cable

Pinout USB cable

Pin No. 10P10	Pin No. USB-A	Signal name
2	1	VCC
4	2	- Data
6	3	+ Data
3	4	GND

Figure 5: USB Interface cable

10 Environmental Specifications

10.1 Temperature

Scanning performance is guaranteed when the ambient temperature around the scanner is within the following ranges:

Operating Temperature	-20 to 70 ℃
Storage Temperature	-30 to 70 ℃

Conditions

Barcode	0.33 mm UPC specified in Section 8.1.
Distance	87 mm from the front edge of the scanner
Scanning Test	Read at intervals of 300ms

10.2 Humidity

Scanning performance is guaranteed when the ambient humidity around the scanner is within the following ranges:

Operating Humidity	5 to 90%RH (no condensation, no frost)
Storage Humidity	5 to 90%RH (no condensation, no frost)

Conditions

Barcode	0.33 mm UPC specified in Section 8.1.
Distance	87 mm from the front edge of the scanner

10.3 Ambient Light Immunity

Scanning performance is guaranteed when the illumination on a barcode surface is between zero and the following values:

Incandescent light	10,000 lx
Fluorescent light	10,000 lx
Sunlight	100,000 lx

Conditions

Barcode	0.33 mm UPC specified in Section 8.1.
Distance	10 mm from the front edge of the scanner
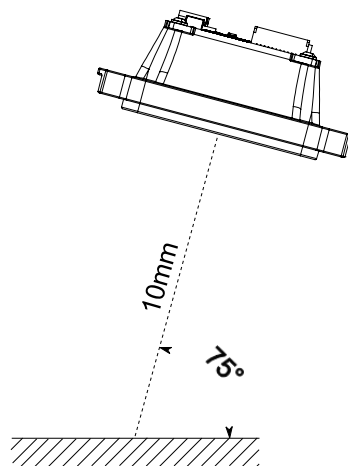
Figure 6: Ambient Light Immunity

10.4 Electrical Specifications

Electrostatic discharge*	No damage	±15 kV (air discharge, direct)
immunity*	No malfunction	±8 kV (air discharge, direct)
		±6 kV (contact discharge, direct / indirect)

* Testing method is compliant with IEC-61000-4-2. (150 pf, 330 ohm)

11 Regulatory Compliance

11.1   LED Safety
IEC 62471:2006 Exempt Group

11.2   EMC
EN55032

EN55024

FCC Part 15 Subpart B Class B

> This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful Interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

11.3 RoHS
RoHS3, 2019 compliant.

> RoHS: The restriction of the use of certain hazardous substances in electrical and electronic equipment

11.4 REACH
Regulation (EC) No 1907/2006

> REACH: Registration, Evaluation, Authorization and Restriction of Chemicals

11.5 Reliability
MTBF (Mean Time Between Failures)   50,000 hours

Note: This is calculated based on standard operation of the product within the operating environment parameters and without extreme electronic or mechanical shock.

12 Labels

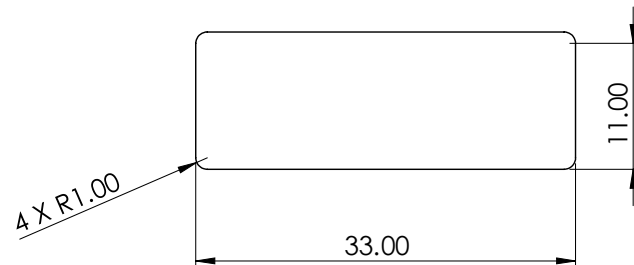## 12.1 Product Label

Figure 7: Product label design

Figure 8: Product label dimensions

12.2 Shipment box label

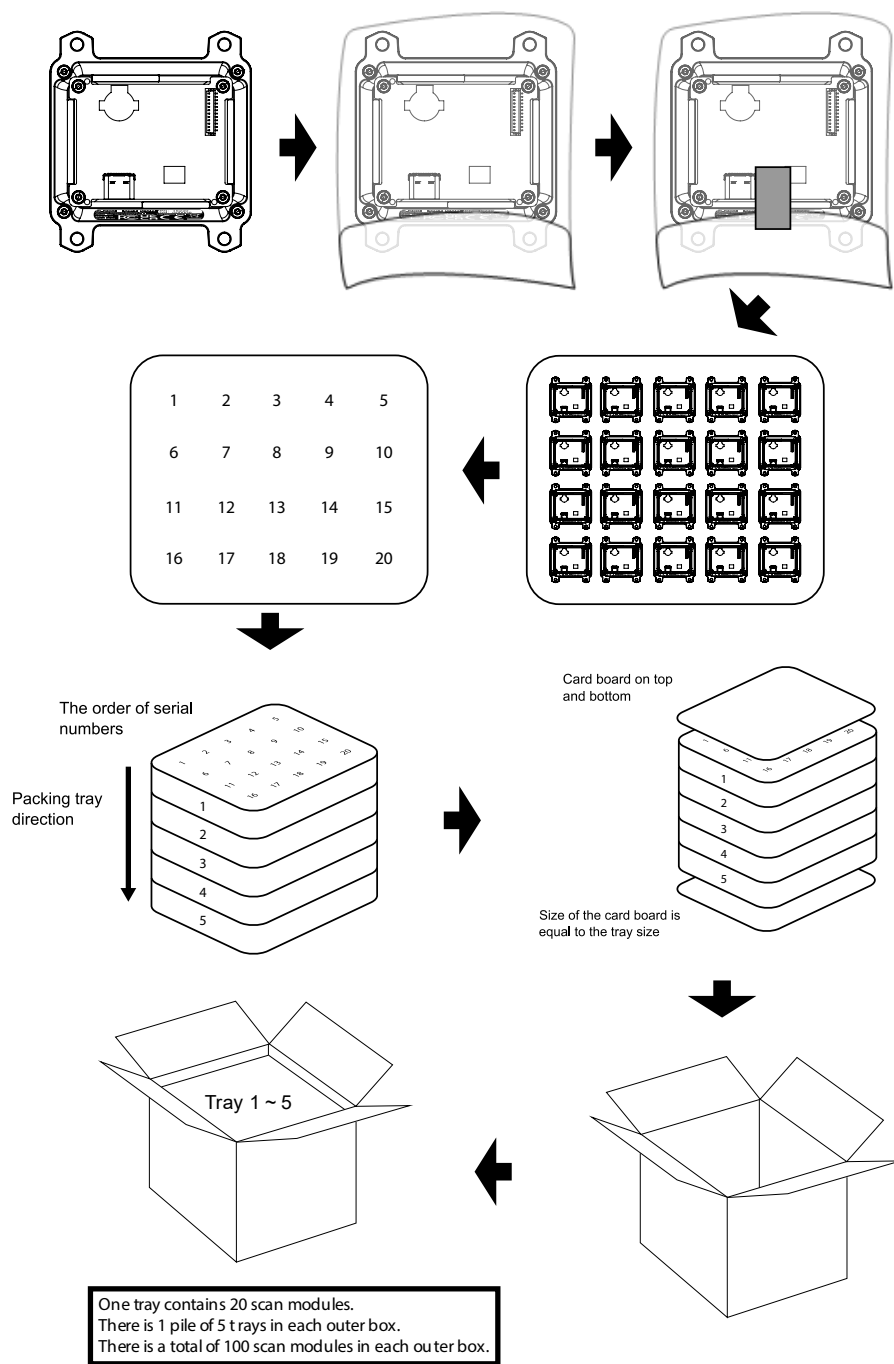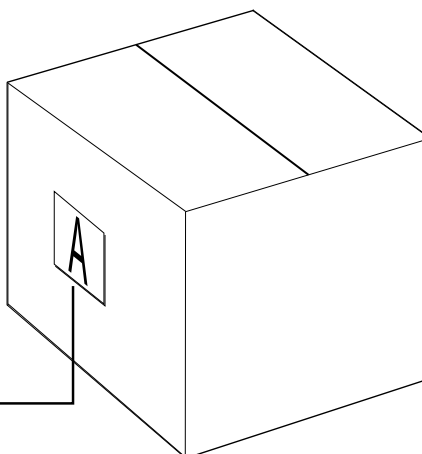

Figure 9: Shipment box label

13 Packing Specification
13.1

The order of serial numbers

Packing tray direction

Card board on top and bottom

Size of the card board is equal to the tray size

Tray 1 ~ 5

One tray contains 20 scan modules.
There is 1 pile of 5 t rays in each outer box.
There is a total of 100 scan modules in each ou ter box.

Figure 10: Packing information

13.2 Shipment box packing

Pack 100 scan modules into the shipping box.
OD: TBD
Weight: TBD

A: Barcode serial label for shipment box
Revision: Shipmentbox_rev10

Figure 11: Shipment packing

14 Physical Features

14.1 Dimensions (Scanner only)

Scanner only: 60.0 x 65.0 x 28.6 mm
White box: 114 x 115 x 44 mm approximately.

14.2 Weight (Scanner)

Scanner: Approximately 30 grams

OPTICON
Opticon Sensors Europe B. V.
Opaallaan 35, 2132XV Hoofddorp The Netherlands

C/No: xxx
Made in Thailand

Product:	Q-250
PO:	*xxxxx-xx*
QTY:	*100*
Spec#:	*OF1Q250.xx*

Article code
EU: *15240*
US: *Q250-00*

SN From: *xxxxxx*
To: *xxxxxx*

Missing Serial Numbers
1
2

Shipping date: XX-xxxxxx-20xx

Software
Boot: XXXXXXXX
OS: XXXXXXXX
Boot: XXXXXXXX

CE FC

1 87 19982 15240 6

OPTO ELECTRONICS CO.LTD., JAPAN / OPTICON SENSORS EUROPE B., THE NETHERLANDS / OPTICON INC., USA
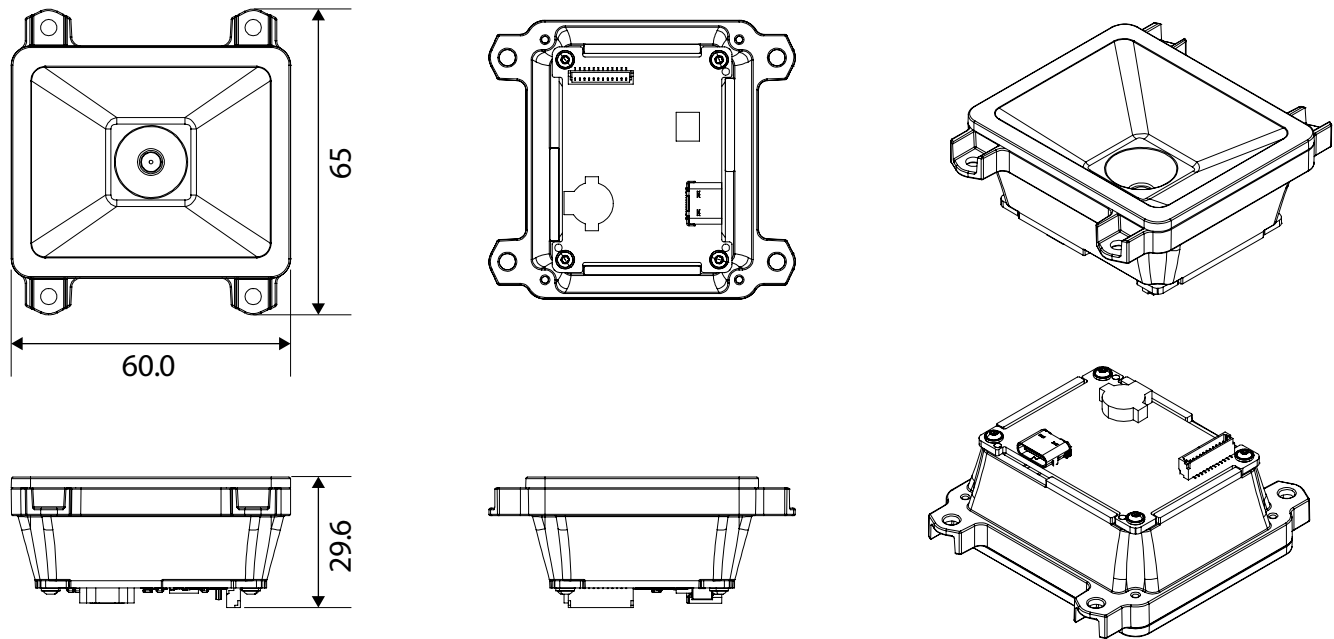
14.3 Mechanical Drawing

Dimensions in mm

Figure 12: Mechanical drawing