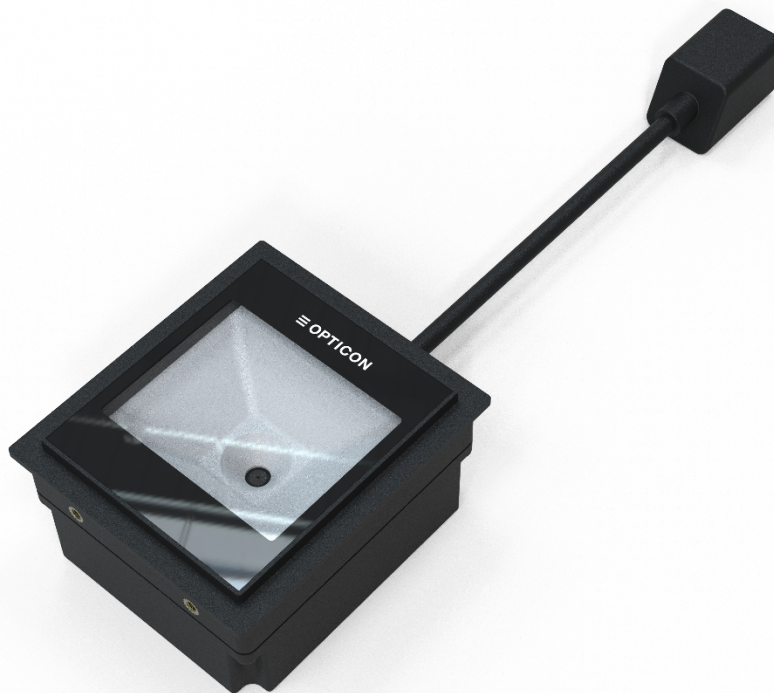


P-250



Specification Manual rev 1.1

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

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Revision History

Product Name : P-250

Revision	Date	Page	Section	Description of Changes
1.0	19/08/2024	-	-	Initial release
1.1	09/04/2025	21	9.4, 9.5	Corrected pin numbering in tables

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1 Abstract

This manual provides specifications for the P-250, a 2D presentation barcode scanner 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 P-250 2D barcode scanner

The P-250 is a handheld, imager based, 2D barcode presentation scanner that enables high speed scanning of 1D (linear) and 2D barcodes. The main features of the P-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 P-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 two cables for RS232 and for USB. When a USB cable 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 RS232 cable can be connected to host computers with a standard DB9 connector.

3 Model Details

The following table shows the available models of the P-250. Please note that the interface cable (either for RS232 with a DB9 connector) or for USB (with a USB-A connector) is not included in the box and should be ordered separately.

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

*The cable is not included in the box so the models are basically the same, just with a different configuration.

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: about 74.0° Vertical: about 60.0° Diagonal: about 88.0°		Lens EFI 1.02mm
	Focal point		Approx 2cm above the scan window		
Supported 1D Symbolologies	Symbolologies	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	Symbolologies		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 Symbolologies	Symbolologies		(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	PCS 0.9
	Depth of field (mm)	PDF417	Resolution (0.169) Resolution (0.254)		
		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°		MRD: 13% or more
	Minimum PCS		0.2 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%		Ambient temperature: 25°C
	Current consumption	Reading	370mA (typ)		
		Auto trigger	260mA (typ)		
		Standby	90mA (typ)		
Environmental Specifications	Temperature	Operating	-5 to 50 °C		
		Storage	-30 to 70 °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/s², 60 minutes per cycle, repeat once in each X, Y and Z-direction		
	Drop		Drop 3 times, at each 5 faces (right, left, front, back and top), from a height of 150 cm onto a concrete surface.		* Excluding the part where the interface cable is attached
	Dust and drip proof		IP64		

Item			Specification	Note
Regulatory	This scanner is an Exempt Risk Group LED product.			
	LED safety		IEC 62471:2006 Exempt Group	
	EMI/RFI		EN55032 / FCC Class-B	For residential, commercial, and light-industrial environments
	Product safety		CE Marking	
	Electromagnetic compatibility (EMC)		EN55024 (EN61000-6-1) Class-B	For residential, commercial, and light-industrial environments
Immunity Test	ESD immunity	No damage	Air discharge (direct): ±15 kV	Condition: IEC:61000-4-2 compliant
		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

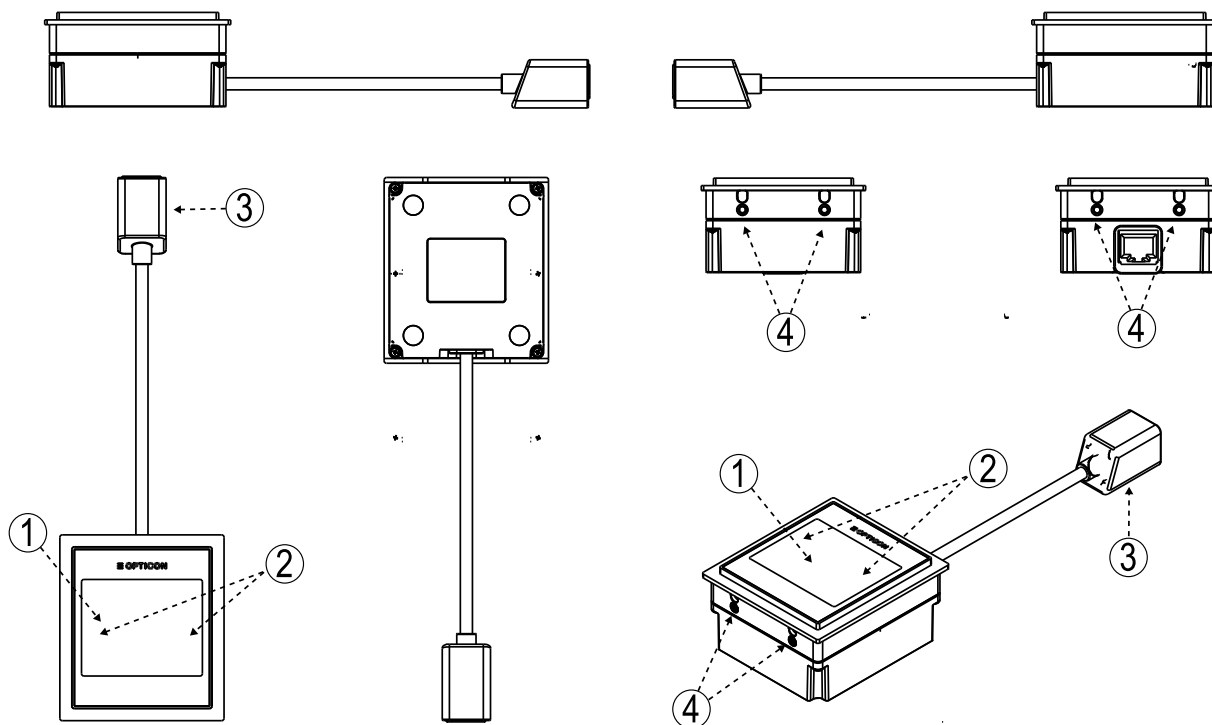


Figure 1: Detailed View of P-250

No.	Name	Description
1	Scan Window	Protective window for the imager and illumination.
2	Status LED	Underneath the semi-translucent dome. Red indicates scanning. Green is good read.
3	Interface cable	Connect the USB or RS232 cable here.
4	Mounting holes	M3, max. depth 3mm

6 Electrical Specifications

The P-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.

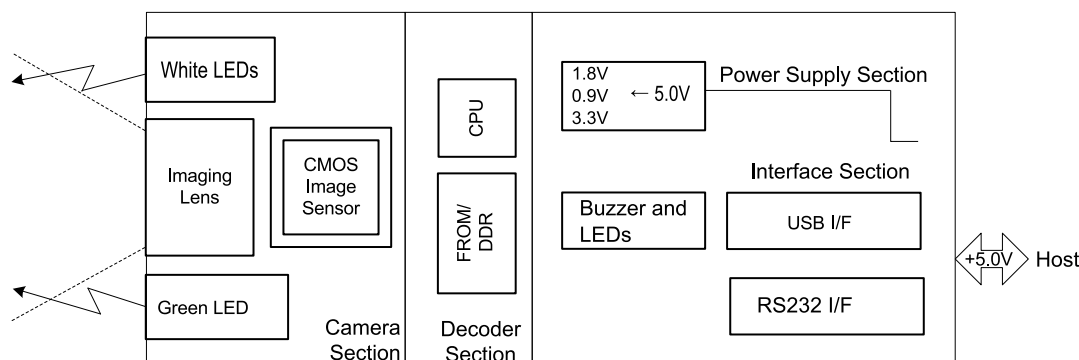


Figure 2: Electrical block diagram

6.1 Absolute maximum ratings

Item	Name	Value
Power supply	VCC	0 ~ 5.5V
External trigger input	TRIG	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

* 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 P-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.

6.3 Power consumption

Item	Name	Value
Bus-Power Class	Hi-Power	500mA max
Current consumption*:	Reading	150mA (typical)
	Max. with buzzer and LED	300mA (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: $\alpha = 0^\circ$, Skew: $\beta = +15^\circ$, Tilt: $\gamma = 0^\circ$
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.

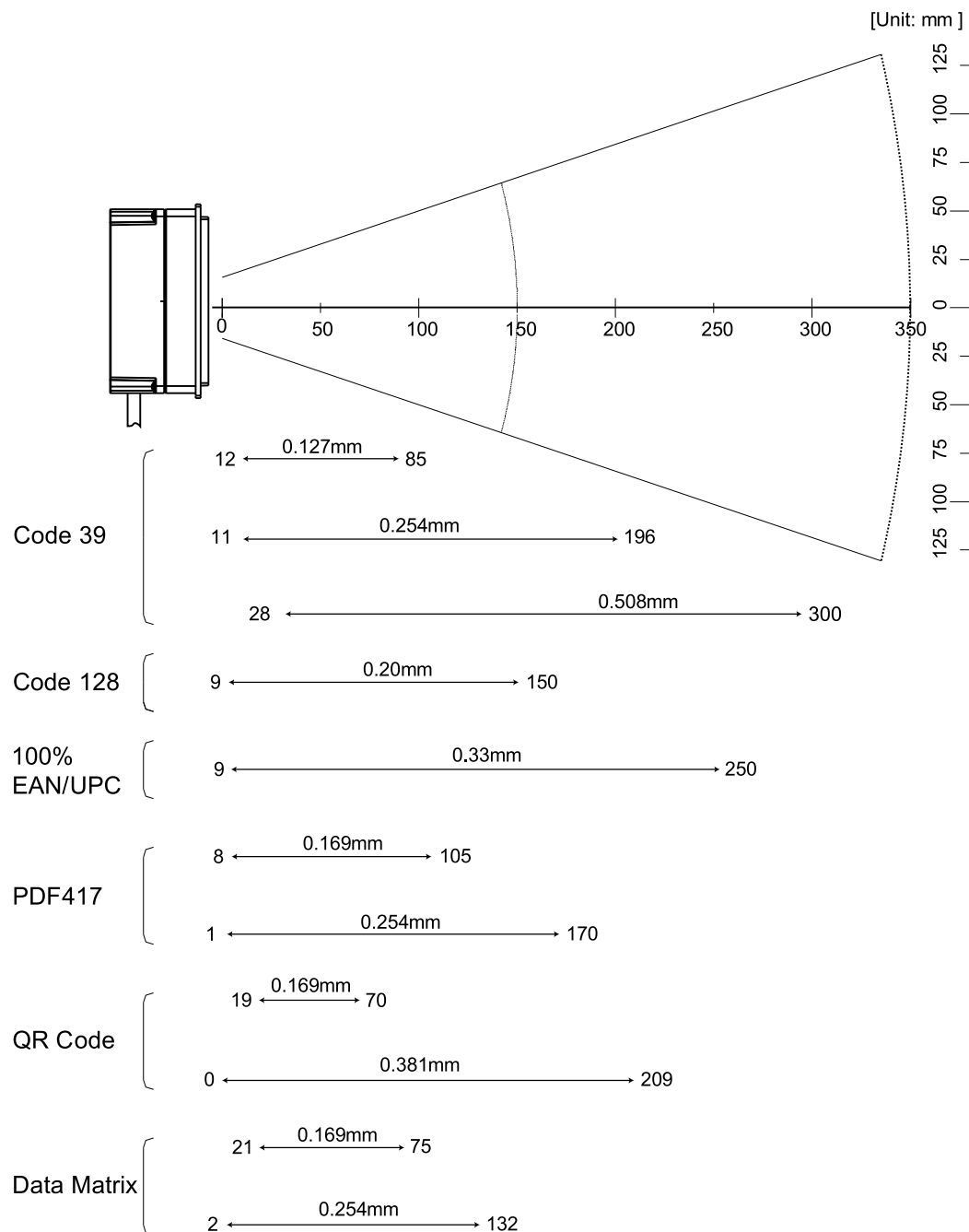


Figure 3: Scan Area and Depth of Field

8.2.1 Depth of Field

Resolution	Code	No. of Digits	Depth of field (mm) (Certified value)		Depth of field (mm) (Typ)	
			Near	Far	Near	Far
0.127mm	Code 39	4 digits	5	70		
0.254mm	Code 39	7 digits	5	110		
0.508mm	Code 39	4 digits				
0.20mm	Code 128	16 digits				
0.33mm	UPC/EAN	12 digits				
0.169mm	PDF417	58 digits				
0.254mm	PDF417	58 digits				
0.169mm	QR Code	44 digits	10	35		
0.381mm	QR Code	44 digits	0	110		
0.169mm	Data Matrix	40 digits				
0.254mm	Data Matrix	40 digits				

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

Distance

Barcode Sample

500 to 1000 lux

10mm from the front edge of the scanner

UPC 0.33mm as specified in Chapter 8.1.

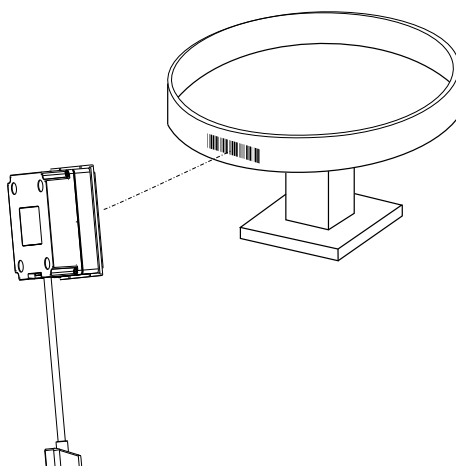


Figure 4: Motion Tolerance

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

9 Interface Specification

9.1 Multi-interface cable

The P-250 has a multi-interface cable to be used with either an RS232 cable or with a USB cable for the connection to a host computer. This short multi-interface cable features a 10P10 modular plug and is meant to make it easy to switch interfaces and allows for different (custom) interface cables.

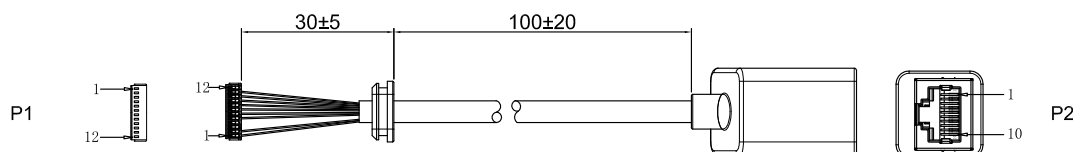


Figure 5: Multi-interface cable

Pin No. P1	Color	Signal name	Pin No. P2	Signal description
3	Black	GND	1,8	Ground
12	Green	TRIG	2	External trigger, active on high to low edge. Idle high or high Z
2	Red	VCC	3	Positive power, 5V
5	Yellow	TXD	4	RS232 level TxD output
7	Blue	RXD	5	RS232 level RxD input
11	Orange	CTS/Wake	6	RS232 level CTS input (Will wake the scanner from deep sleep mode with a logic low)
8	Purple	RTS/PWDN	7	RS232 level RTS output (Signals deep sleep mode with a logic low)
4	Brown	- Data	9	USB D- signal
6	Grey	+ Data	10	USB D+ signal

9.2 USB Interface

The P-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

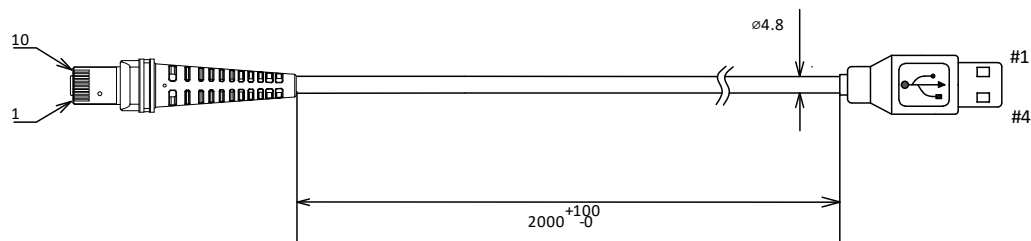


Figure 6: USB Interface cable

Pinout USB cable

Pin No. 10P10	Pin No. USB-A	Signal name
3	1	VCC
9	2	- Data
10	3	+ Data
1,8	4	GND

9.5 RS232 Cable

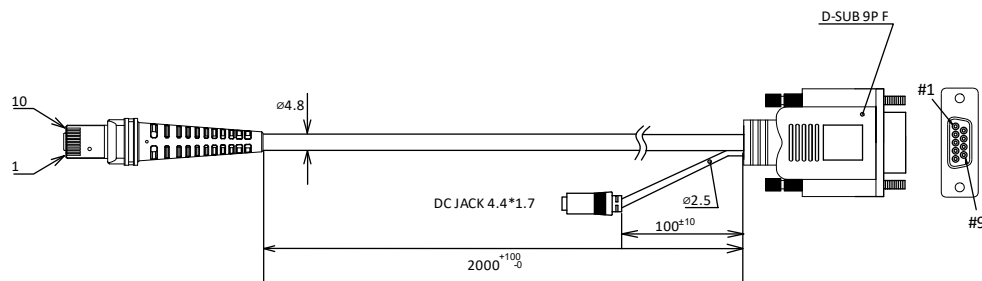


Figure 7: RS232 Interface cable

Pinout RS232 cable

Pin No. 10P10	Pin No. DB9	Signal name
2	DC-Jack center pin	VCC
4	2	TXD
5	3	RXD
6	7	CTS
7	8	RTS
1	5 & DC-Jack outer sleeve	GND(SG)
8	Frame Ground	GND(FG)

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 °C
Storage Temperature	-30 to 70 °C

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

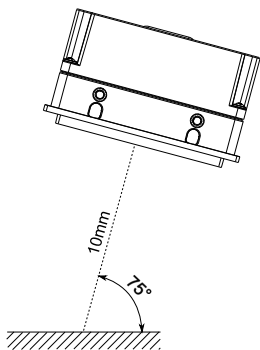


Figure 8: Ambient Light Immunity

10.4 Dust and Drip Proof

IEC IP64 equivalent

Protection against solid objects: Level 6

Total protection against dust ingress.

Protection against liquids: Level 4

Water splashing against the enclosure from any direction shall have no harmful effect.

10.5 Electrical Specifications

Electrostatic discharge* immunity*	No damage	±15 kV (air discharge, direct)
	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.

11.3RoHS

RoHS3, 2019 compliant.

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

11.4REACH

Regulation (EC) No 1907/2006

REACH: Registration, Evaluation, Authorization and Restriction of Chemicals

11.5Reliability

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

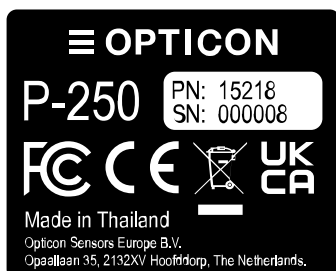


Figure 9: Product label design

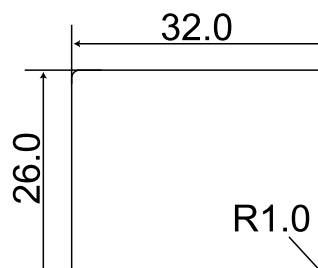


Figure 10: Product label dimensions

12.2 White Box label



Figure 11: White box label

Plane paper label, 60 x 25 mm

12.3 Shipment box label



Figure 12: Shipment box label

13 Packing Specification

13.1 Individual packing

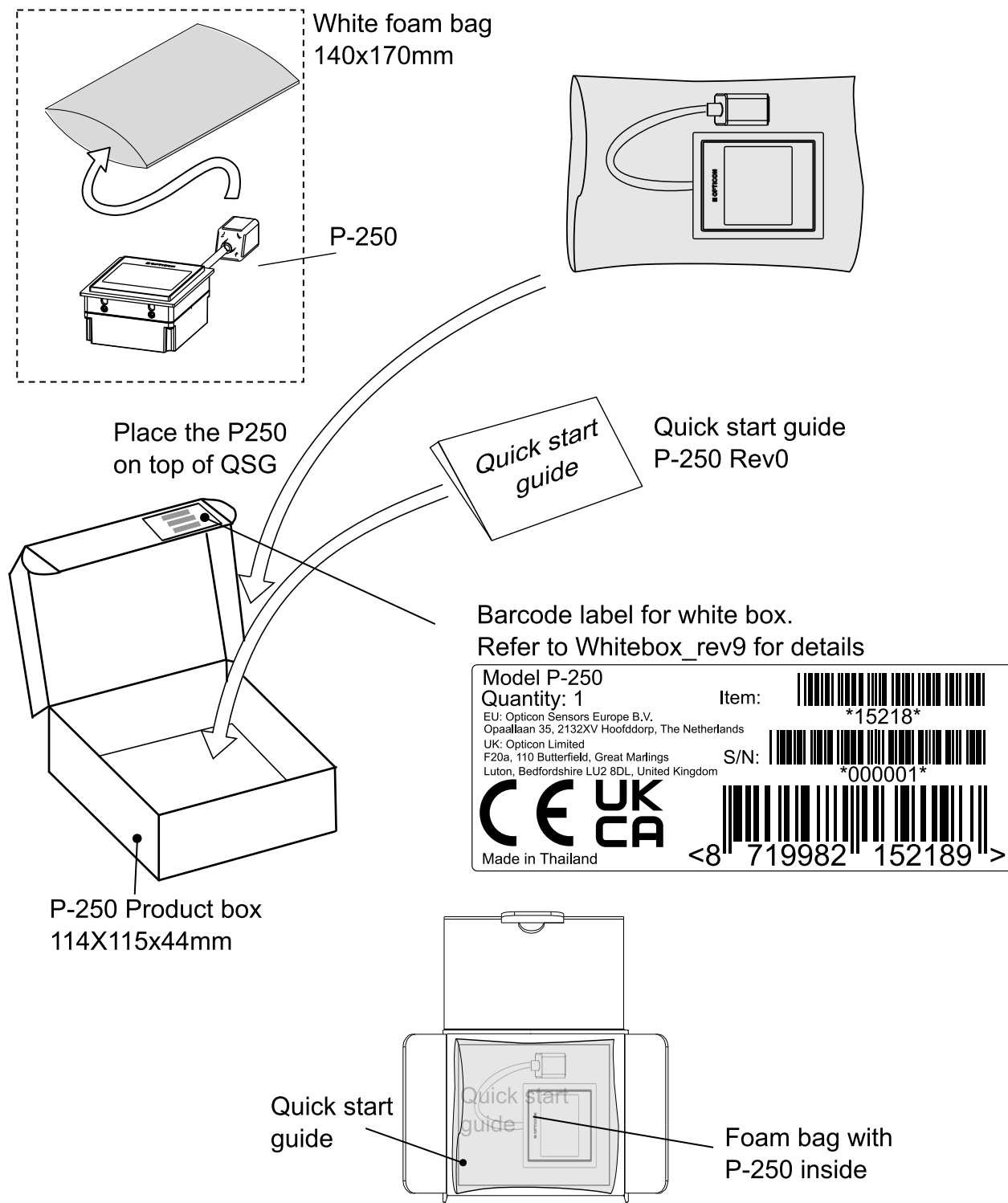
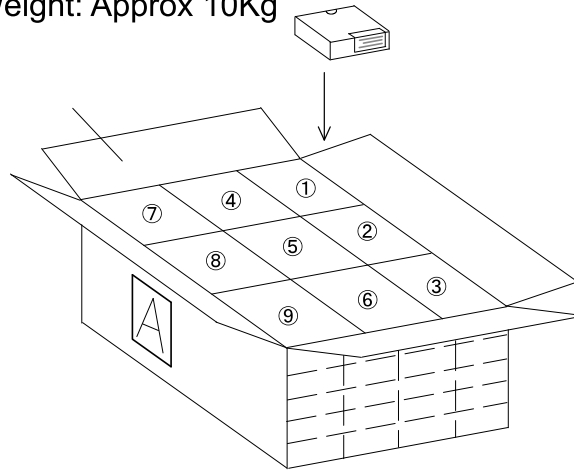


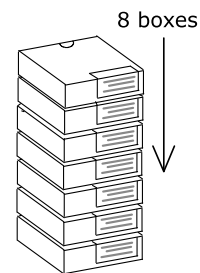
Figure 13: Individual packing

13.2 Shipment box packing

Pack 72 scanners into the carton box.
Outer dimensions 36.5x37x38cm (LxWxH)
Weight: Approx 10Kg



The order of serial no.	
Stack	Serialnr sequence
①	1 ~ 8
②	9 ~ 16
③	17 ~ 24
④	25 ~ 32
⑤	33 ~ 40
⑥	41 ~ 48
⑦	49 ~ 56
⑧	57 ~ 64
⑨	65 ~ 72



A: Barcode label for shipment box
Revision: Shipmentbox_rev10

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

C/No: xxx
Made in Thailand

Product: **P-250**

PO: QTY: *72*

Spec#: *OF1P250.xx*

Article EU: US: *P250-00*

code *15218*

SN From: To: *xxxxxx*

Missing Serial Numbers

1

2

Shipping date: XX-xxxxxx-20xx

Software

Boot: XXXXXXXX

OS: XXXXXXXX

Appl: XXXXXXXX.

1 871998 21521 8

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

Figure 14: Shipment packing

14 Physical Features

14.1 Dimensions (Scanner only)

Scanner only: 68.0 x 77.0 x 39.1 mm

White box: 114 x 115 x 44 mm approximately.

14.2 Weight (Scanner)

Scanner: Approximately TBD

White box complete: Approximately TBD

14.3 Mechanical Drawing

Dimensions in mm

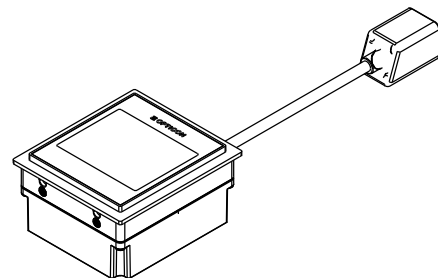
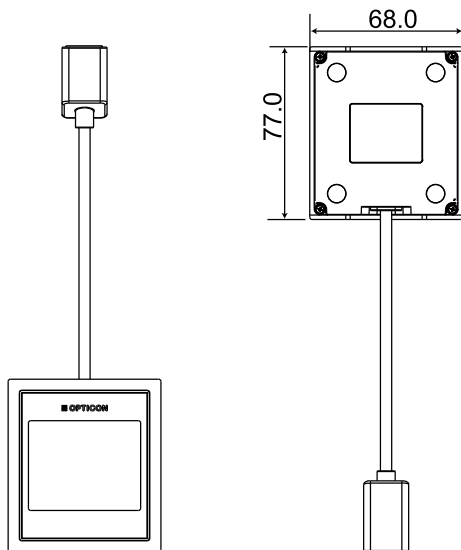
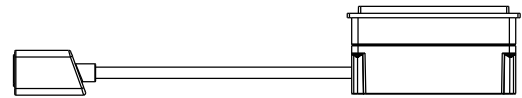
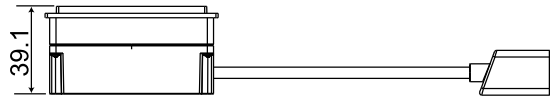


Figure 15: Mechanical drawing