

OPTICON

Data Collector

OPN2002i

This manual provides specifications for the
OPN2002i ultra compact data collector.

Specifications Manual

All information subject to change without notice.

Document History

Model Number:	OPN2002i	Specification Number:
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2.0	2013-02-26	Section 9	Corrected a writing error. 9.7 Drop Impact Strength (without packaging) Number of drops changed from [15] to [18].

Contents

1. Abstract.....	1
2. Overview.....	1
3. Basic Specifications.....	2
4. Detailed View.....	4
5. Electrical Specifications.....	5
5.1. USB.....	5
5.2. Cradle.....	5
6. Interface Specifications	5
6.1. USB Interface	5
6.1.1. Connector.....	5
6.1.2. USB Interface Circuit.....	5
6.2. Bluetooth	6
6.3. Serial Interface.....	6
6.3.1. Connector.....	6
6.3.2. Serial Interface Circuit.....	6
7. Optical Specifications.....	7
7.1. Laser Scanning Specifications.....	7
7.2. Laser Scanning Standards.....	7
7.2.1. Laser Scanning Tilt.....	7
7.2.2. Scan Curvature	7
8. Technical Specifications.....	7
8.1. Scan PCS (Print Contrast Signal)	8
8.2. Scan Area & Depth of Field.....	8
8.3. Pitch, Skew, Tilt.....	9
8.4. Curvature.....	11
9. Environmental Specifications.....	12
9.1. Temperature.....	12
9.2. Humidity.....	12
9.3. Ambient Light Immunity.....	12
9.4. Anti-Dust/Moisture Structure.....	12
9.5. Vibration Strength (without packaging)	12
9.6. Vibration Strength (with packaging).....	12
9.7. Drop Impact Strength (without packaging)	13
9.8. Drop Impact Strength (with individual packaging)	13
9.9. Electrostatic Discharge Immunity.....	13
10. Compliance Standards.....	14
10.1. Laser Safety Standards.....	14
10.2. Product Safety Standards.....	14
10.3. EMC.....	14
10.4. Other.....	15
11. Regulatory and Safety Standards.....	15
12. Reliability.....	15
13. Precautions.....	15
13.1. Laser Precautions	15
13.2. Handling.....	15

13.3. Wireless System Precautions.....	16
13.4. Scanner Wireless System.....	16
14. Product Nameplate.....	17
15. Packing Specifications.....	18
15.1. Individual Packaging.....	18
15.2. Collective Packaging.....	19
16. Physical Features.....	20
16.1. Dimensions.....	20
16.2. Total Weight.....	20
16.3. Mechanical Drawing.....	21
17. Supported Symbolologies.....	22
17.1. 1D Symbolologies.....	22

1. Abstract

The following specification manual is for the OPN2002i Bluetooth-enabled miniature laser scanning device.

2. Overview

This device comes equipped with a built-in compact laser scanner, which outputs scanned barcode data through its Bluetooth interface.

- * The Scanner is an easy-to-operate handheld data collector.
- * Scanned data from the device is transmittable via the cradle, USB, or Bluetooth Wireless interfaces.
- * The Bluetooth profile is outfitted with SPP and HID.
- * Power Supply utilizes 3.7V, 230mAh (typ.) Li-ion polymer battery.
- * Charging is possible through both the cradle and USB interfaces.
- * This device comes with Apple MFi license.

3. Basic Product Specifications

Item			Specifications		Notes	
Controller	CPU		32bit CISC/96MHz			
	FROM		512Kbyte + 32KByte			
	SRAM		96Kbyte			
	FROM (storage)		1Mbyte		Data only area	
Input	Keyboard		2nd key-type: Trigger, Function			
Display	LED		2 types/colors (red*green) or 1 type/color (blue)			
	Buzzer		Volume (3 levels) * Pitch level changeable			
	Content		Date & Time			
	Margin of Error		Less than ± 90 sec. per month			
	Bluetooth		Frequency	2402MHz - 2480MHz		
			Specifications	Standard Bluetooth Ver. 2.1		
			Communication Distance	10 meters	Distance may shorten due to the environment used in	
			Output Level	Class 2	Maximum output 4dBm	
			Profile	SPP/HID		
	USB		* Full-Speed 12Mbps (HID/COM) * Supports Hi-Power Bus-powered			
	Serial Interface		I/F Cradle Terminal 2			
Optical Component	Light Source		Red Light Semiconductor Laser			
	Laser Wavelength/Output		650±10nm less than 1mW		Wavelength adheres to a temperature of 25°C	
	Scan Rate		100±20scan/sec			
Barcode	Supported Symbologies		JAN, EAN, UPC-A, UPC-E, NW-7 (Codabar), Industrial 2 of 5, Interleaved 2 of 5, Code 11, Code 39, Code 93, Code 128 etc.		For specifics, please check Section 17	
	Minimum Resolution		Code 39 : 0.127mm		PCS 0.9	
	Scan Curvature		Radius ≥ 15mm (JAN 8 characters) Radius ≥ 20mm (JAN 13 characters)		PCS 0.9	
	Scan Gradient		Pitch Angle α≤±35°		PCS 0.9	
			Skew Angle β≤±50°(aside from Dead zone)			
			Tilt Angle γ≤±20°			
	Depth of Field (mm)	Code 39	Resolution (0.127)		60-100	
			Resolution (0.15)		40-130	
			Resolution (0.25)		40-220	
			Resolution (0.5)		40-360	
Resolution (1.0)			50-570			
Minimum PCS		0.45		The Reflectance Rate for margin spaces is set at over 70%		

Item		Specifications	Notes
Power Supply	Main Battery	Lithium Polymer 230mAh (typ.)	
	Battery Duration	more than 10 hours	Scans twice within 10 sec. intervals under normal temperatures Bluetooth Universal
	Active (Charging) Voltage Range	4.5-5.5 V	Charges via USB
	Consumption Current	While Charging Under 500mA	Charges via USB
Environmental Specifications	Temperature	Operation Storage	0-50°C -20-60°C
	Humidity	Operation Storage	20%RH - 85%RH 20%RH - 85%RH
	Surrounding Light Illumination Intensity	Fluorescent Light	Less than 4,000 1x
		Sunlight:	Less than 80,000 1x
	Vibration		10Hz - 100Hz, acceleration rate 19.6m/s^2 At 60 minutes per cycle, X, Y, and Z in each direction-1 cycle implemented.
	Drop Resistance Test		Survives 18 times from 120 cm onto concrete surface (6 surface 3 cycles) natural drop, with no abnormalities.
	Protective Structure		IP42 compliant

Item			Specifications	Notes
Specification Standards	Laser Safety Standards		Class 2 JIS C 6802:2011 IEC 60825-1 Ed.2: 2007 Class 2 CDRH Class II	
	Product Safety Standards		EN60950-1:2005 IEC60950-1:2006	
	EMC		EN55022 EN55024 FCC Part 15 Subpart C , Subpart B Class B VCCI Class B	Domestic, Commercial, and Industrial environments
	Certification Standards		CE Marking	
			Device is equipped with wireless factory layout authenticator	
	Other		Bluetooth Logo Authentication MFi License	
Immunity Test	Electrostatic Discharge Resistance	No breakage	Aerial Discharge (Direct): ±10 kV	Measuring Condition: IEC: 61000-4-compliant
		No malfunctions	Aerial Discharge (Direct): ±8 kV	
Dimensions	Mechanical Drawing		62.0 (W) × 32.0 (D) × 17.0(H) mm	
	Total Weight		28 grams	Accessories not included

4. Detailed View

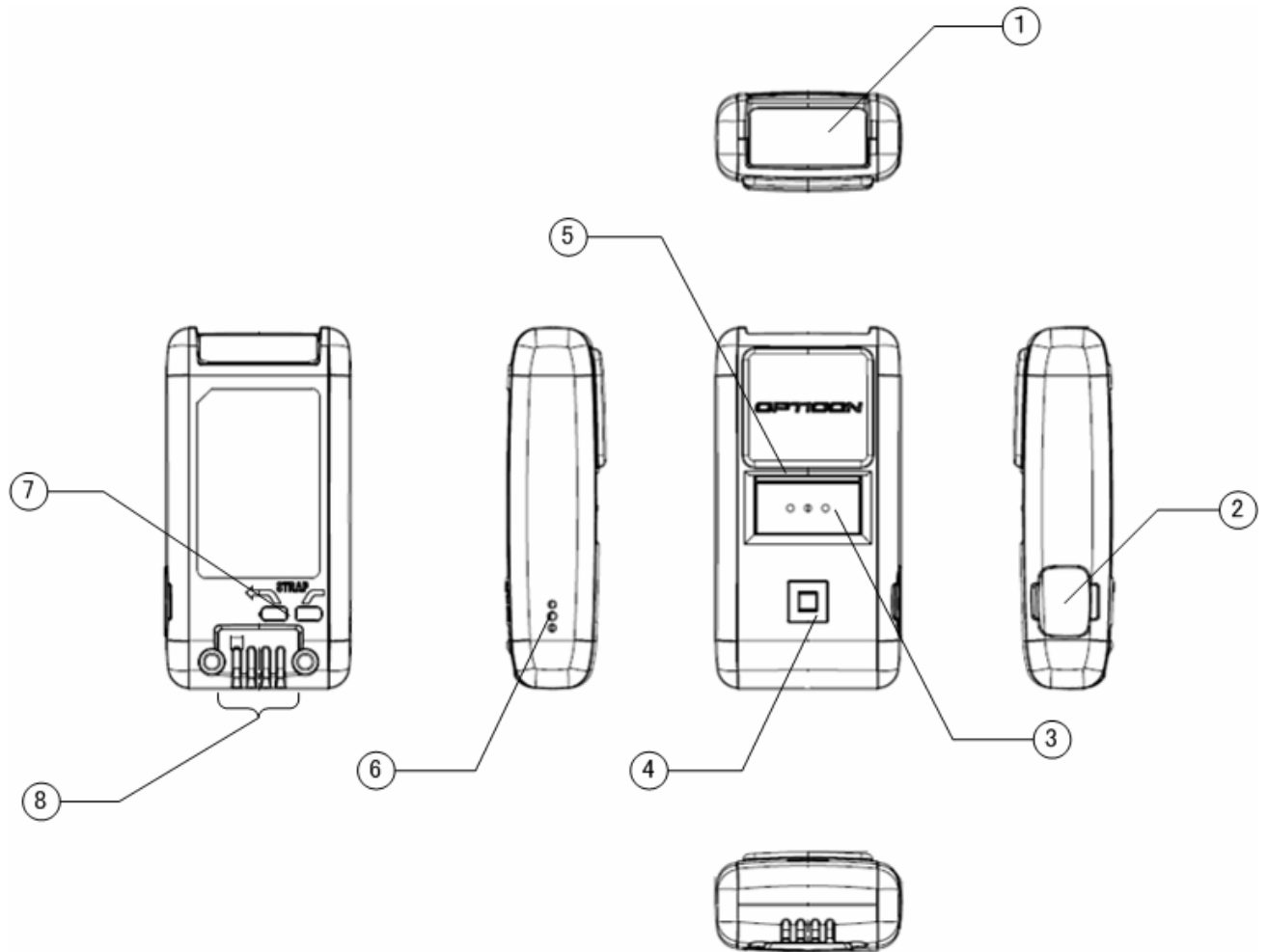


Figure 1: Detailed View

No.	Item	Content
1)	Scan Window	Emits the scan laser.
2)	USB Cap	Cap that connects to the USB Interface.
3)	Trigger	Key used to scan barcodes.
4)	Function Key	Key with changeable settings via applications.
5)	LED	Displays scanned barcode, Bluetooth, warning messages, etc.
6)	Buzzer Outlet	Outlet used to plug in the buzzer.
7)	Strap Hole	For looping the safety strap.
8)	Terminal	For transferring data to the Cradle & charging device.

5. Electrical Specifications

5.1. USB

- * Power Voltage: 4.5-5.5V
- * Bus-Power (class): Hi-Power (500mA max)
- * Consumption Current: under 500mA

5.2. Cradle

- * Power Voltage: 4.5-5.5V

6. Interface Specifications

USB/Bluetooth/Serial Interface (Cradle) enabled.

6.1. USB Interface

Full-speed USB Interface.

6.1.1. Connector

Signal Name	Pin Number
VCC	1
Data(-)	2
Data(+)	3
(NC)	4
GND	5

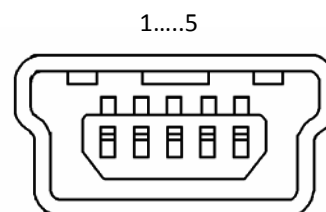


Figure 2: MINI USB B Connector

6.1.2. USB Interface Circuit

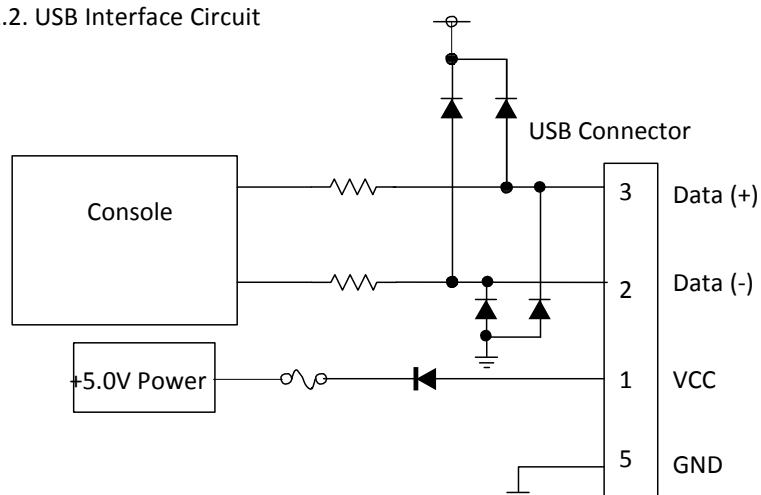


Figure 3: USB Interface Circuit

6.2. Bluetooth

Device utilizes a wireless Bluetooth interface.

Frequency:

2402 MHz - 2480Hz

Specification:

Bluetooth Standard Ver. 2.1 compliant

Communication Distance:

10m

Output Level:

Class 2 (maximum 4dBm)

Implementation Protocol:

SPP/HID

Connection Configuration when transmitting:

1 to 1 support

Active Mode when transmitting:

Master Mode/ Slave Mode

Security Mode:

Yes Authenticator

Encryption:

Yes Encryption

6.3. Serial Interface

6.3.1. Connector

Signal Name	Pin Number
VCC	1
RXD	2
TXD	3
GND	4

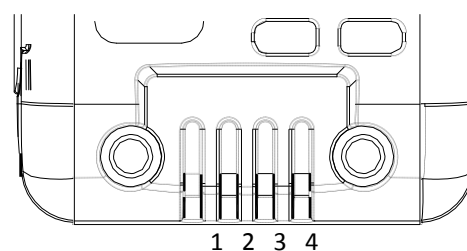


Figure 4: Serial Interface Connector

6.3.2. Serial Interface Circuit

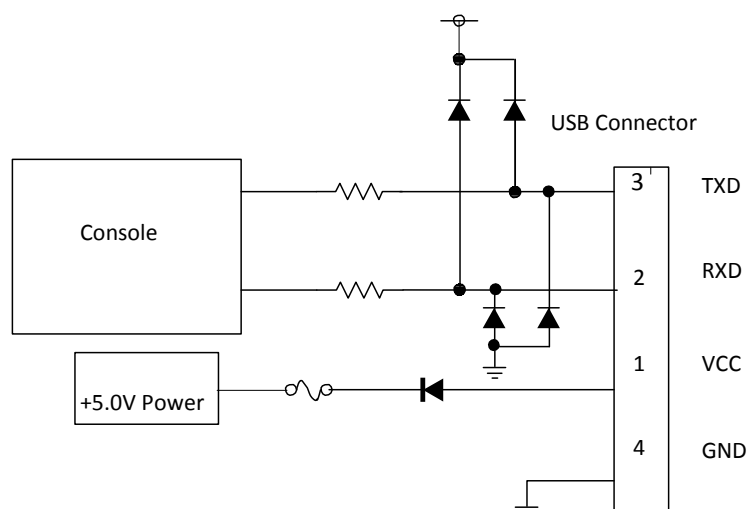


Figure 5: Serial Interface Circuit

7. Optical Specifications

7.1. Laser Scanning Specifications

Item		Characteristics	Unit
Light Source		Red Light Semiconductor Laser	
Wavelength		650±10 (25°C)	nm
Output		* 1.0	mW
Scan Type		Bi-directional Vibration Type	
Scan Speed		10020	Scan/Sec
Scan Angle	Scan Angle	545	Degree
	Effective Scan Angle	44 (min)	Degree

7.2. Laser Scanning Standards

7.2.1. Laser Scanning Tilt

The vertical difference between both ends of a laser scanning line:

- Scan origin point's (MM mirror) vertical direction angle, less than 1.2°.
- 150mm from the scan origin point, from skew angle 0° measured at less than 3.1mm.
- Measured from the center of the scanning line.

7.2.2. Laser Scanning Curvature

The maximum difference between the laser scanning line and a straight line connecting both ends of the scanning line:

- Scan origin point (MM mirror) angle, less than 1.27°.
- 150mm from the scan origin point, measured at less than 3.3mm.
- Measured from the center of the laser scanning line.

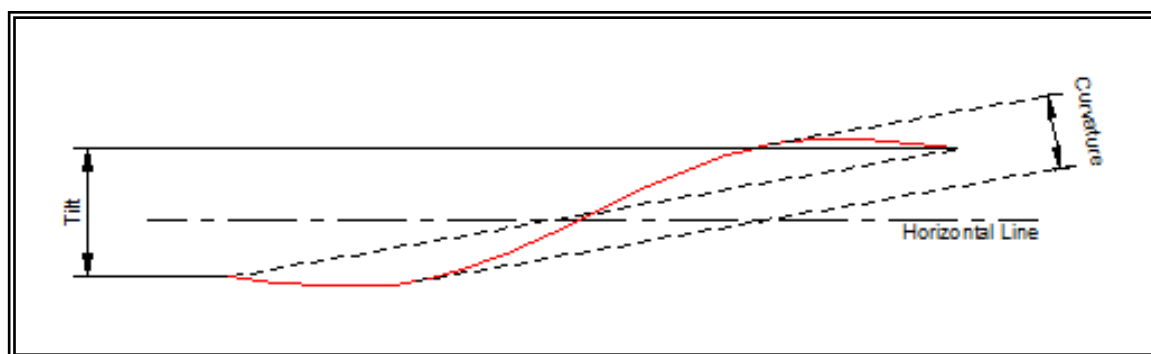


Figure 6: Laser Scanning Tilt and Curvature

8. Technical Specifications

Technical specification's conditions are as follows unless otherwise specified in subsequent sections.

Conditions:

Environmental Temperature:	regular temp/humidity
Environmental Lighting:	500-900 lx
Barcode Background:	black
Reading Test:	Accept the performance with 10 consecutive successes in reading. Each reading should be done in 0.5 seconds or less.

8.1. Scan PCS (Print Contrast Signal)

Must be over 0.45 PCS; however, the spaces and margins must be over 70% reflectivity.

Note 1: $PCS = \frac{\text{Ref1} \times (\text{Reflectance of white bar} - \text{Reflectance of black bar})}{\text{Reflectance of white bar}}$

* Dirt on the mask, damage, etc. has a large impact on scanning characteristics. Please handle with care.

8.2. Scan Area & Depth of Field

The value of the Scan Area expresses the distance from the front of the device.

The Scan Area is centered within the arc of the scan origin point indicated at each resolution.

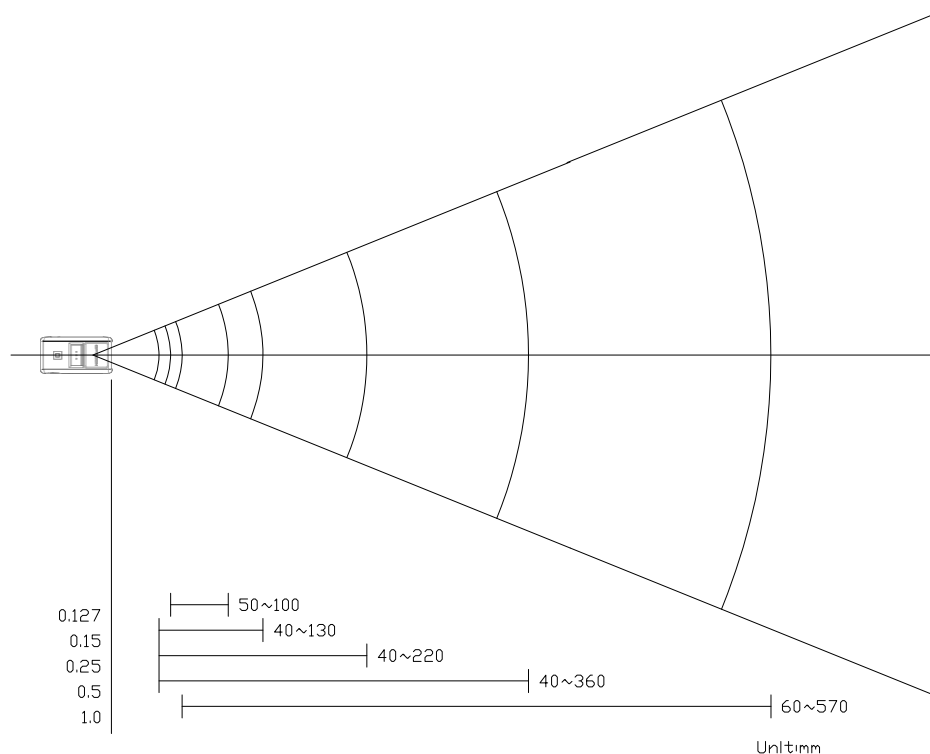


Figure 7: Depth of Field

Resolution	Depth of Field (mm)	Symbologies	PCS	Margin	# of digits
1.0mm	60-570	Code 39	0.9	25mm	1
0.5mm	40-360	Code 39	0.9	18mm	3
0.25mm	40-220	Code 39	0.9	10mm	8
0.15mm	40-130	Code 39	0.9	7mm	10
0.127mm	50-100	Code 39	0.9	5mm	4

Conditions:

Barcode	Opticon test chart, NW ratio = 1:2.5
Angle	Pitch Angle $\alpha = 0^\circ$ Skew Angle $\beta = +15^\circ$ Tilt Angle $\gamma = 0^\circ$
Curvature	$R = \infty$

8.3. Pitch, Skew, and Tilt

Item	Specifications
Pitch Angle	$\alpha \leq \pm 30^\circ$
Skew Angle	$\beta = \pm 50^\circ$ (excluding dead zone)
Dead Zone (DZ)	$\beta = \pm 8^\circ$ (decoding may be difficult in some areas due to specular reflection)
Tilt Angle	$\gamma = \pm 20^\circ$

Conditions:

Barcode	Opticon Test Chart	
	Pitch Angle Skew Angle Dead Zone	PCS = 0.9 Resolution = 0.25mm 9-digit Code 39 Margin = 10mm NW ratio 1:2.5
	Tilt Angle	PCS 0.9 Resolution = 0.26mm JAN-13 Margin = 10mm
Distance	100mm from front of the device	
Angle	Pitch Angle	Skew Angle $\beta = +15^\circ$ Tilt Angle $\gamma = 0^\circ$
	Tilt Angle	Pitch Angle $\alpha = 0^\circ$ Skew Angle $\beta = +15^\circ$
	Skew Angle Dead Zone	Pitch Angle $\alpha = 0^\circ$ Tilt Angle $\gamma = 0^\circ$
Curvature	$R = \infty$	

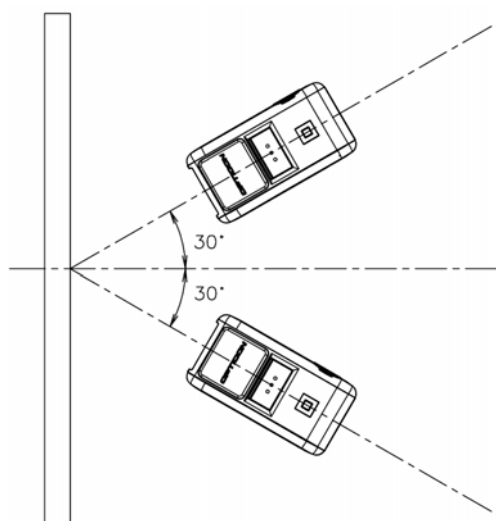


Figure 8: Pitch Angle

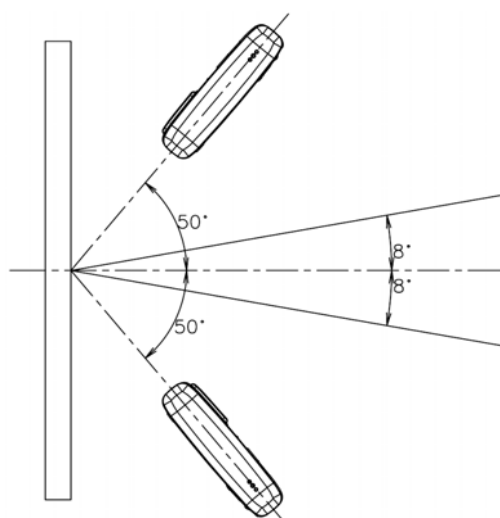


Figure 9: Skew Angle

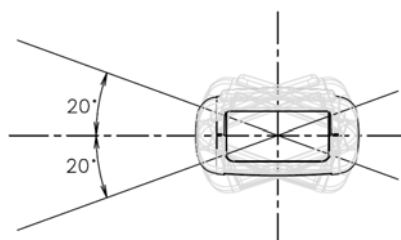


Figure 10: Tilt Angle

8.4. Curvature

Item	Specifications
JAN-8	$R \geq 15\text{mm}$
JAN-13	$R \geq 20\text{mm}$

Conditions:

Barcode	Opticon test chart PCS = 0.9 Resolution = 0.26mm Margin = 10mm
Distance	100mm from front of the device
Angle	Skew Angle $\beta = +15^\circ$

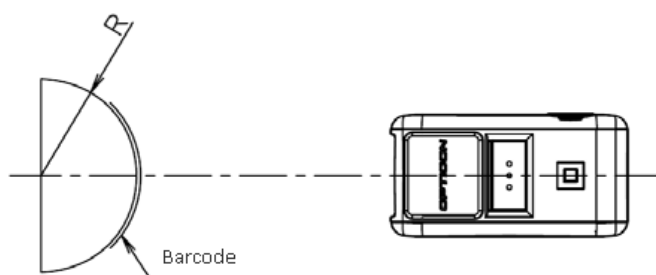


Figure 11: Scan Curvature

9. Environmental Specifications

9.1. Temperature

Operating Temperature: 0-50 °C

Storage Temperature: -20-60 °C

* The adapter stops charging when in environments exceeding 40 °C in order to prevent battery damage.

9.2. Humidity

Operating Humidity: 20-85%RH (anti-freezing, condensation)

Storage Humidity: 20-85%RH (anti-freezing, condensation)

9.3. Ambient Light Immunity

Incandescent Light: 4,000lx

Fluorescent Light: 4,000lx (excluding high-frequency lighting)

Sunlight: 80,000lx

Conditions-

Barcode: Opticon test chart

PCS = 0.9, Resolution = 0.25mm, 9-digit Code 39, Margin = 10mm, NW Ratio = 1:2.5

Distance: 140mm from the Scanner

Angle: Pitch Angle $\alpha = 0^\circ$, Skew Angle $\beta = 15^\circ$, Tilt Angle $\gamma = 0^\circ$ Curvature: $R = \infty$

Power Voltage: 3.7V (Direct light from light source/reflective light not hitting the scanner's sensor)

9.4. Dust/Moisture

IP42

Protection against direct contact and/or foreign objects: Class 4

Class 4 protects against penetration from objects with a diameter or thickness greater than 1mm.

Water Penetration Protection Rate: Class 2 *(anti-condensation type II)

Prevents dripping moisture damage from vertical to a 15° angle.

* JIS Standards

9.5. Vibration Strength (without packaging)

No malfunctions after the following vibration test:

Increase the frequency of the vibration from 10 to 100 Hz with accelerated velocity 19.6m/s² (2G) and sweep for 30 minutes (60 min. in one cycle) in non-operating state. Repeat this routine in each X, Y, and Z direction.

9.6. Vibration Strength (with packaging)

No malfunctions after the following vibration test:

Contained in packaging, increase the frequency of the vibration from 10 to 100 Hz with accelerated velocity 19.6m/s² (2G) and sweep for 30 minutes (60 min. in one cycle). Repeat this routine in each X, Y, and Z direction.

9.7. Drop Impact Strength (without packaging)

As shown in the below image, the device survives a drop onto concrete from a height of 120cm with no decrease in functionality. For every three times, averages eighteen drops.

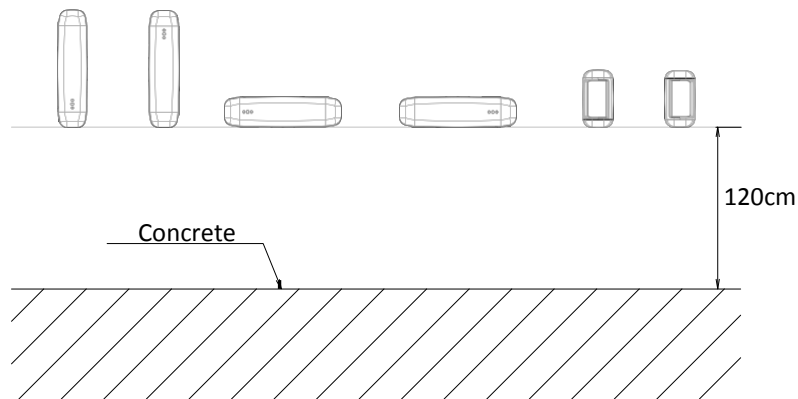


Figure 12: Drop Impact Strength (without packaging)

9.8. Drop Impact Strength (with individual packaging)

Averages ten drops onto concrete surface from a height of 150cm.

9.9. Electrostatic Discharge Immunity

Aerial Discharge:	±8kV MAX (no malfunctions) ±10kV MAX (no breakage)
Measurement Environment:	Utilizes the electrostatic discharge test machine IEC61000-4-2
Discharge Resistance:	330Ω
Charge Condenser:	150pF

10. Compliance Standards

10.1. Laser Safety Standards

Class 2 JIS C 6802: 2011
IEC 60825-1 Ed.2: 2007 Class 2
CDRH Class II

10.2. Product Safety Standards

EN60950-1: 2005
IEC60950-1: 2006

10.3. EMC

EN55022
EN55024
FCC Part 15 Subpart C, Subpart B Class B

Federal Communications Commission Notices:

This product 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.

Harmful Interference Notice:

This product has been tested and complies with the specifications for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used according to the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which is found by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
 - Increase the separation between the equipment or devices
 - Connect the equipment to an outlet other than the receiver's
 - Consult a dealer or an experienced radio/TV technician for assistance
- Changes or modifications to this equipment that have not been approved by Ruckus Wireless may void the user's authority to operate this equipment.

VCCI Class B

This product is a Class B Information Technology Device based on and complying with the Voluntary Control Council for Interference (VCCI). The product is designed for domestic usage, however may receive poor reception when used near radio or television devices.

10.4. Other

Bluetooth Logo Authenticator

MFi License

This device comes equipped with a wireless factory setting authenticator.

Wireless Service Classification:

Proof Rule Section 2, Item 1, #19: 2.4GHz high-powered wireless service with minimum electrical data communications system.

Bluetooth Module: OPA-26X1

Factory Design Confirmation Number: 201-125603

11. Regulatory and Safety Standards

RoHS compliant

* RoHS: The restricted use of certain hazardous substances in electrical and electronic equipment, 2002/95/EC.

12. Reliability

MTBF: 10,000 hours.

13. Precautions

13.1. Precautions against laser light



- * Do not look directly into the laser light from the scanning window. It may cause harm to the eyes.
- * Do not aim the laser into other's eyes. It may cause harm to the eyes.
- * Do not look directly at the beam with optical devices. It may cause harm to the eyes.

13.2. Handling

Please do not handle the device in any of the following stress-inducing ways:

(1) Impact

- * Drops from longer distances than the specified maximum.
- * Setting heavy objects onto and/or stepping onto the cable.
- * Swinging the cable around.

(2) Heat Stress

- * Usage/storage outside of recommended temperature ranges.
- * Exposure to hot water.
- * Exposure to fire.
- * Bending the cable under temperatures that cause the cable to harden.

(3) Foreign Materials

- * Contact with corrosive chemical substances.

(4) Other

- * Do not disassemble the device.
- * Usage of the device in proximity to radio and/or TV systems may cause poor reception.
- * The device may malfunction due to sudden drops or spikes in voltage, such as those caused by lightning, etc.
- * Device may be unable to scan in areas of low light such as CTR.

13.3. Wireless System Precautions

The following actions are prohibited:

- * Modifying or otherwise taking apart the device.
- * Peeling or removing the Authentication Label.

Please do not use the device in the following environments:

- * Medical devices or equipment designed to provide human safety.
- * Areas where it is possible to incur large scale damage.

Surrounding devices may be affected by wireless interference, which could lead to personal injury or damaged equipment.

13.4. Scanner Wireless System

- * Though this device adheres to specification standards, connection to non-confirmed equipment is not guaranteed.
- * The frequency band (2.4GHz) utilized by both the Scanner and supporting equipment, is compatible with a wide variety of devices. As such, both may experience a drop in transmission speed, distance, or lose connection when around devices utilizing the same frequency.
- * The speed and communication distance may vary depending on foreign objects between devices, radio wave status, and compatible devices currently in use.
- * Before utilizing the wireless functions for this device, please confirm that there are no other wireless stations nearby.
- * If radio interference occurs between the Scanner and other devices, either quickly change the area of use or cease usage within that environment.
- * For all other questions or difficulties, please contact Opticon during normal hours.

* The contents of this manual are subject to change without notice.

14. Product Nameplate

Both the product nameplate and laser cautionary label are placed on the Scanner's underside.

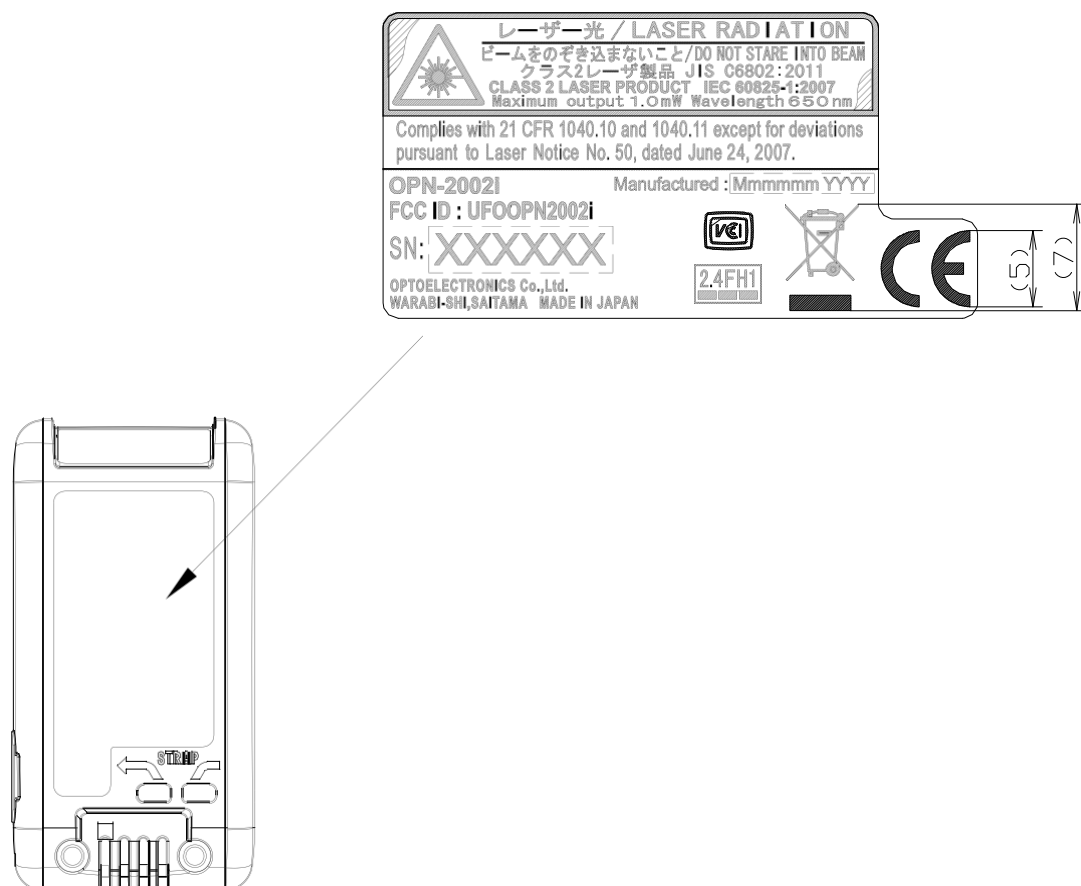


Figure 13: Product Nameplate

15. Packing Specifications

15.1. Individual Packaging

Individual packing box dimensions (when putting together) 125 (W) × 112 (D) × 40 (H) (mm)

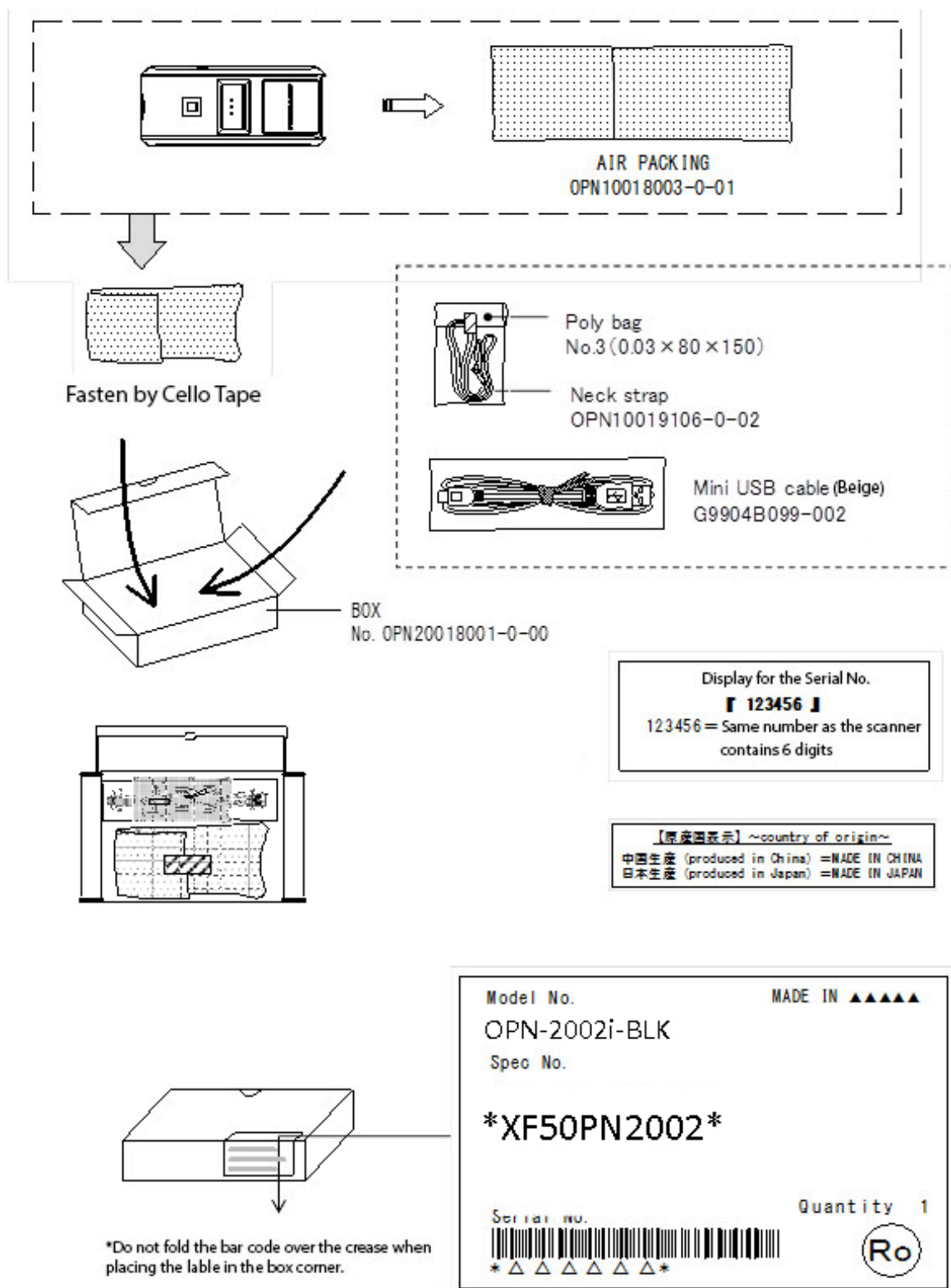
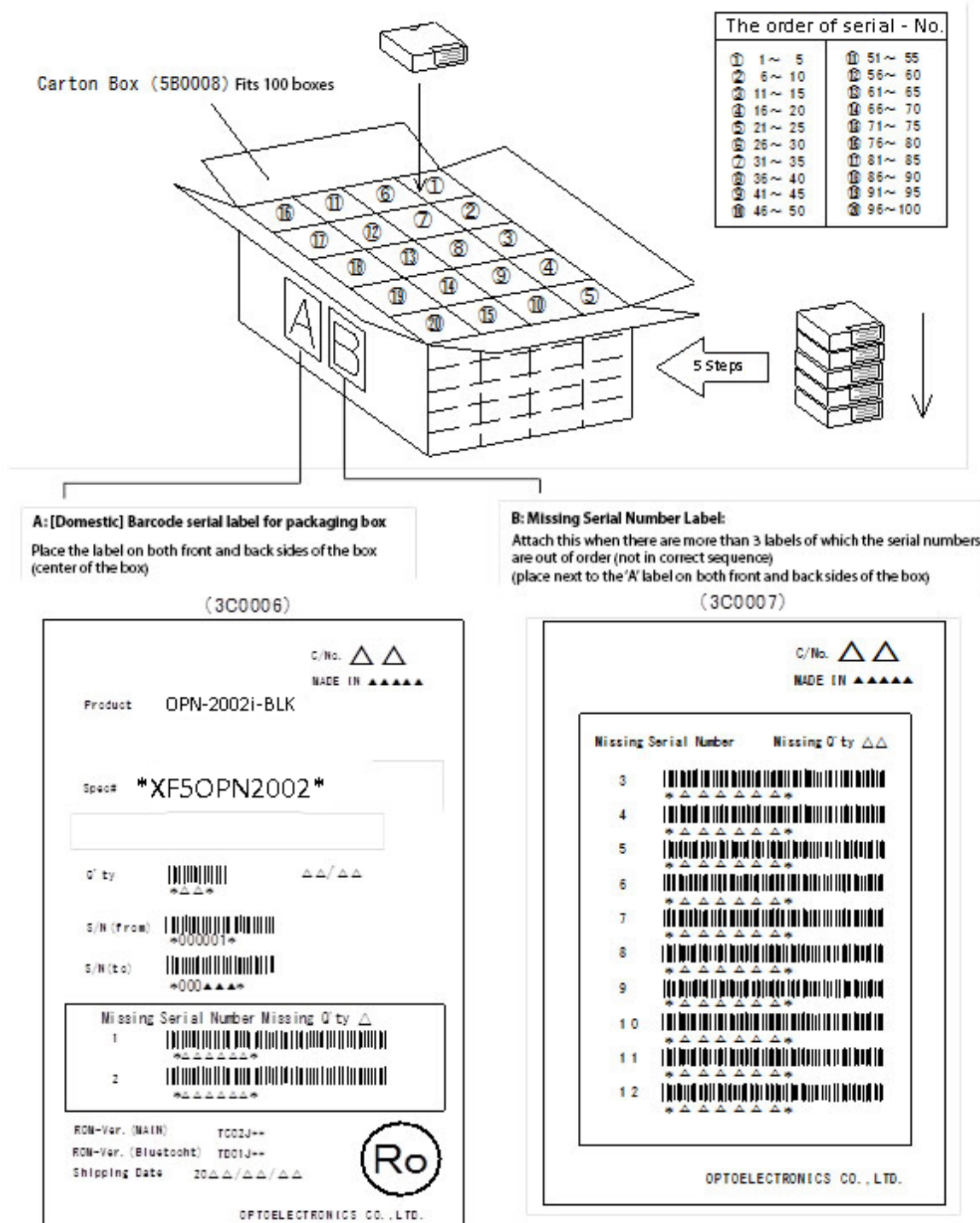


Figure 14: Individual Packaging

15.2. Collective Packaging

Quantity stored 100pcs per box

Dimensions (when putting together) 595 (W) × 520 (D) × 245 (H) (mm)



【原産国表示】 ~country of origin~

中国生産 (produced in China) =MADE IN CHINA 日本生産 (produced in Japan) =MADE IN JAPAN

Figure 15: Collective Packaging

16. Physical Features

16.1. Dimensions

62.0 (W) × 32.0 (D) × 17.0 (H) mm

16.2. Total Weight

28 grams (accessories not included)

16.3. Mechanical Drawing

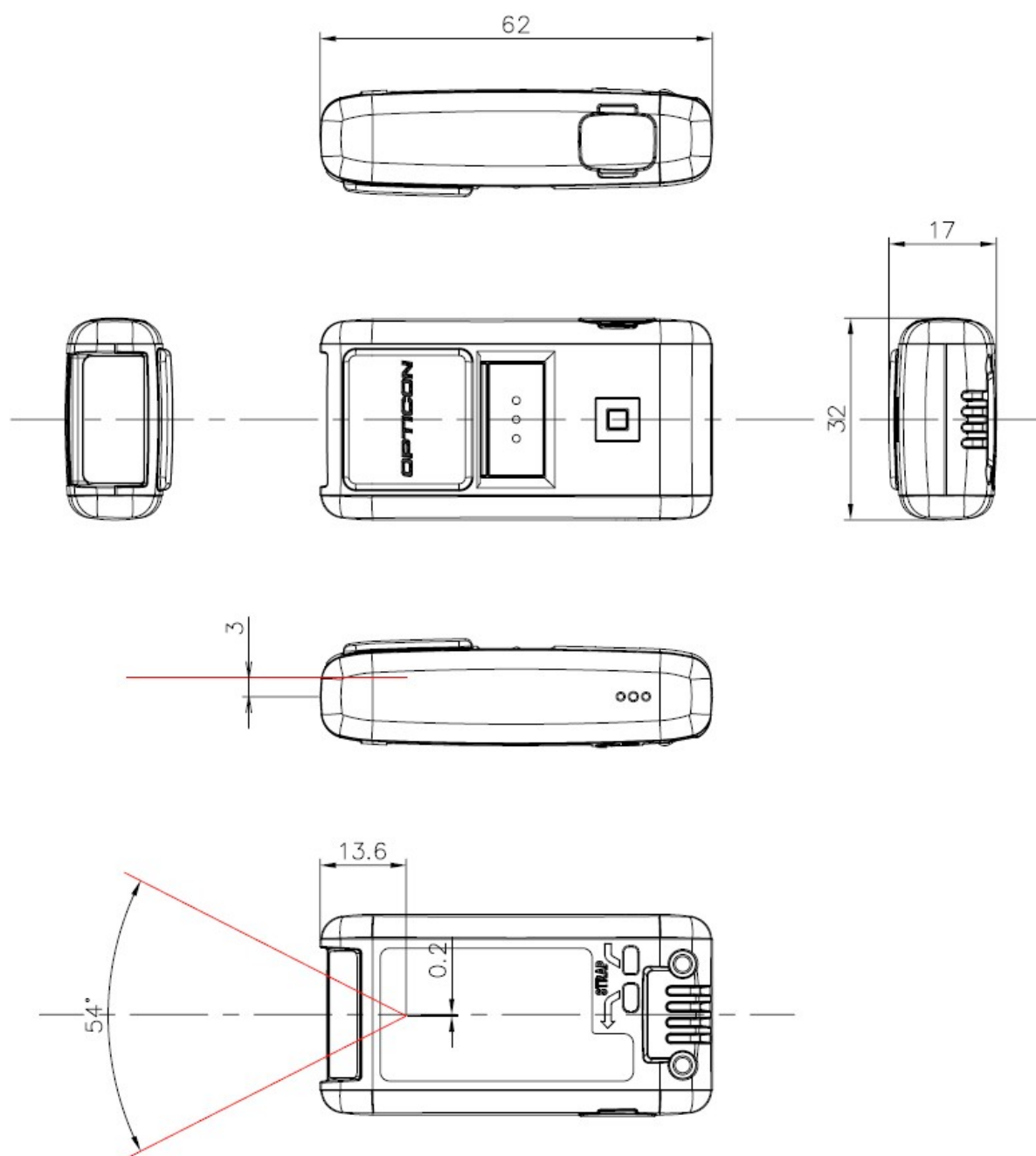


Figure 16: Mechanical Drawing

17. Supported Symbolologies

17.1. 1D Symbolologies

Bar code Type	Bar code Type
JAN-13	Interleaved 2 of 5
JAN-13 + Add On 2	Code 93
JAN-13 + Add On 5	Code 128
JAN-8	MSI/Plessey
JAN-8 + Add On 2	IATA
JAN-8 + Add On 5	UK/Plessey
EAN-13	Telepen
EAN-13 + Add On 2	Matrix 2 of 5
EAN-13 + Add On 5	ChinesePostMatrix 2 of 5
EAN-8	NW-7 ABC Code
EAN-8 + Add On 2	NW-7 CX Code
EAN-8 + Add On 5	S-Code
Instore Code-13	Tri/Optic
Instore Code-8	Code 39 Full Ascii
UPC-A	Code 39 It. Pharmaceutical
UPC-A+ Add On 2	EAN-128
UPC-A+ Add on 5	RSS-14
UPC-E	RSS Limited
UPC-E+ Add On 2	RSS Expanded
UPC-E+ Add On 5	PDF417
UPC-E1	MicroPDF417
UPC-E1+ Add On 2	Code 11
UPC-E1+ Add On 5	Korean Post
Code 39	
NW-7 (Codabar)	
Industrial 2 of 5	

* The supported barcode type varies depending on the application specifications.