

All information subject to change without notice.

Document History

Model Number:	OPN-2500	Specification Number:	P2211110
Edition:	1	Original Spec Number:	P2211110
Date:	2023-07-20		

Copyright 2023 Opticon. All rights reserved.

This manual may not, in whole or in part, be copied, photocopied, reproduced, translated or converted to any electronic or machine readable form without prior written consent of Opticon.

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. 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.

Packaging

The packing materials are recyclable. We recommend that you save all packing material to use should you need to transport your scanner or send it for service. Damage caused by improper packaging during shipment is not covered by the warranty.

Trademarks

Trademarks used are the property of their respective owners.

Opticon Inc. and Opticon Sensors Europe B.V. are wholly owned subsidiaries of OPTOELECTRONICS Co., Ltd., 12-17, Tsukagoshi 4-chome, Warabi-shi, Saitama, Japan 335-0002. TEL +81-(0) 48-446-1183; FAX +81-(0) 48-446-1184

SUPPORT

USA

Phone: 800-636-0090
Email: support@opticonusa.com
Web: www.opticonusa.com

Europe

Phone: +31235692728
Email: support@opticon.com
Web: www.opticon.com

Revision History

Specification No. : **P2211110**
Product name : **OPN-2500**

Edition	Date	Page	Section	Description of Changes
First	2023/07/20	-	-	Initial release

Contents

1. Abstract	6
2. Overview	6
2.1. Product / Model Name	6
2.2. Features.....	6
3. Basic Specifications	7
4. Detailed View	8
5. Optical Specifications	9
5.1. Laser Scanning Specifications	9
5.2. Laser Scanning Standards	9
5.2.1. Laser Scanning Tilt	9
5.2.2. Laser Scanning Curvature	9
6. Technical Specifications Barcode Scanner	10
6.1. Print Contrast Signal (PCS).....	10
6.2. Minimum Resolution.....	10
6.3. Supported symbologies:.....	10
6.4. Scan Area and Depth of Field	11
6.5. Pitch, Skew, and Tilt.....	12
6.6. Curvature	13
7. Interface Specifications	15
7.1. USB	15
7.1.1. Settings	15
7.1.2. Cable	15
7.1.3. Connector.....	15
7.1.4. Interface Circuit	15
7.2. Bluetooth.....	16
7.2.1 Module	16
7.2.2 Specifications	16
8. Product Label	16
9. Packaging Specifications	17
9.1. Individual Packaging Specification	17
9.2. Collective Packaging Specification	18
10. Durability	19

10.1. Ambient Light Immunity.....	19
10.2. Vibration Strength (without packing).....	19
10.3. Vibration Strength (in individual packing)	19
10.4. Drop Impact Strength (without packaging)	20
10.5. Electrostatic Discharge Immunity	20
10.6. MTBF	20
11. Regulatory Compliance	20
11.1. Laser Safety	20
11.2. EMC	20
12. RoHS	21
13. Precautions	21
13.1. Precaution against Laser Light.....	21
13.2. Handling.....	21
Appendix 1: Mechanical Drawing	22

Table of Figures

<i>Figure 1: Detailed View.....</i>	8
<i>Figure 2: Laser Scanning Tilt and Curvature.....</i>	9
<i>Figure 3: Scan Range and Depth of Field.....</i>	11
<i>Figure 4: Pitch</i>	12
<i>Figure 5: Skew</i>	13
<i>Figure 6: Tilt.....</i>	13
<i>Figure 7: Curvature.....</i>	13
<i>Figure 8: USB B connector.....</i>	15
<i>Figure 9: Interface circuit</i>	15
<i>Figure 10: Product & Laser Caution Label.....</i>	16
<i>Figure 11: Individual Packaging</i>	17
<i>Figure 12: Collective Packaging</i>	18
<i>Figure 13: Drop Test</i>	20
<i>Figure 14: Mechanical Drawing</i>	22

1. Abstract

This manual provides specifications for the OPN-2500 ultra compact data collector.

2. Overview

OPN-2500 is a compact, battery powered laser scanner with a build-in Bluetooth transceiver. For charging and as an additional interface this product also has a mini-USB interface. This product is compliant with RoHS.

2.1. Product / Model Name

OPN-2500

2.2. Features

- The OPN-2500 is handy data collector with a compact, lightweight design.
- Data transmission is performed via Bluetooth (Low Energy) or via USB.
- Supported Bluetooth profiles are SPP and HID.
- BLE services: Serial port profile, HID, Battery service.
- USB functionality: USB-HID, USB-CDC, USB-VCP, USB-MSD
- The device is powered by a 3.7V, 250 mAh rechargeable lithium-polymer battery.
- Charging via USB, either by a host computer or via a USB power supply.
- Programmable with a free SDK and compiler.
- Several readymade applications available that allows for enormous flexibility:
 - OPN-2001 simulation with Bluetooth addition.
 - USB Mass storage
 - Standard Bluetooth application (Factory default installed)

3. Basic Specifications

Item	Specification		Remarks
Control Section	CPU	32 bit	nRF52833
	Clock	64 MHz	
	FROM	1 Mbyte	
	SRAM	256 Kbyte	
Storage	FROM	1 Mbyte	
Input Section	Key type	2 keys: Trigger, Function	
Indication LED	2 multicolor color LEDs (red, green, orange, blue)		
Buzzer	Volume (3 levels), Adjustable tone		
USB	USB-C		12 Mbps, USB-COM / USB-HID / USB-MSD
RTC (clock)	Supported	Year, month, date, hour, minute, second (accuracy: ± 90 seconds per month)	
Power Supply	Main battery	Lithium polymer 250 mAh	
	Continuous operating time	1000 scans or more	Condition: read twice in 10 secs. at room temp.
Scanner (MSL-2001)	Light emitting element	Red laser diode	
	Laser wavelength and output	650 ± 10 nm, up to 1 mW, 25°C	
	Scan rate	100 ± 20 scans / sec	
	Minimum resolution	0.127mm	
	Scanning distance	60 ~ 250mm	Resolution: 1.0 mm PCS 0.9
	Symbology	JAN, EAN, UPC-A, UPC-E, NW-7 (Codabar), Industrial 2 of 5, Code 11, Code 39, Code 93, Code 128, GS1 Data Bar etc.	
Dimensions	62.0 \times 32.0 \times 16.0 (DWH mm)		
Weight	Approx. 29 g		
Environmental Specifications	Operating temperature/humidity	0 ~ 40 °C 20 ~ 85 %RH	No frost, no condensation
	Storage temperature/humidity	-20 ~ 60°C 20 ~ 85%RH	No frost, no condensation
Drop Impact Strength (*1)	Frequency	6 faces, 3 cycles	
	Height	150 cm	
	Floor	Concrete	
Regulatory Compliance	Laser safety: IEC60825-1:2007/2014 CE, FCC		

*1 : Conditions of drop shock resistance

- Scratches or whitening on plastic surface shall not be counted as a malfunction.
- The product shall work properly after the drop test.

4. Detailed View

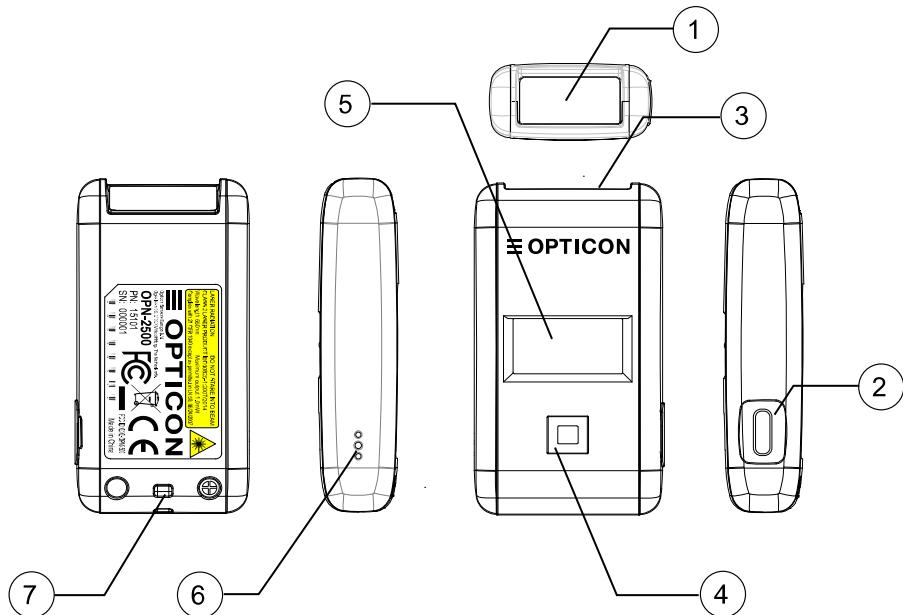


Figure 1: Detailed View

No.	Name	Description
1	Scan Window	Laser light is emitted through this window.
2	USB-C connector	For charging & data communication
3	Trigger Key	Press to start reading barcodes.
4	Function Key	Application specific function key.
5	LED	Status indicator, such as bar code reading and Bluetooth warnings
6	Buzzer Hole	Sound from a built-in buzzer comes out through these holes.
7	Strap Hole	The place to attach a hand strap

5. Optical Specifications

5.1. Laser Scanning Specifications

Item	Characteristics	Unit
Light-Emitting Element	Red laser diode	-
Emission Wavelength	650 ± 10 (25° C)	nm
Light Output	1.0 or less	mW
Scanning Method	Bi-directional scanning	-
Scanning Speed	100 ± 20	scans/s
Scan Angle	Scan Angle	degrees
	Read angle	degrees

Notes:

Refer to "Technical Specifications," to read about scanning performance.

5.2. Laser Scanning Standards

IEC 60825-1 Ed.2: 2007/2014 Class 2
CDRH Class II

5.2.1. Laser Scanning Tilt

Vertical differences between both ends of the laser scanning line:

- Up to 1.2° in vertical direction from the scan origin (scanning mirror).
- Up to 3.1 mm measured at 150 mm from the scan origin and with zero skew angle.

5.2.2. Laser Scanning Curvature

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

- Up to 1.27° from the scan origin (scanning mirror).
- Up to 3.3 mm measured at 150 mm from the scan origin with zero skew angle.

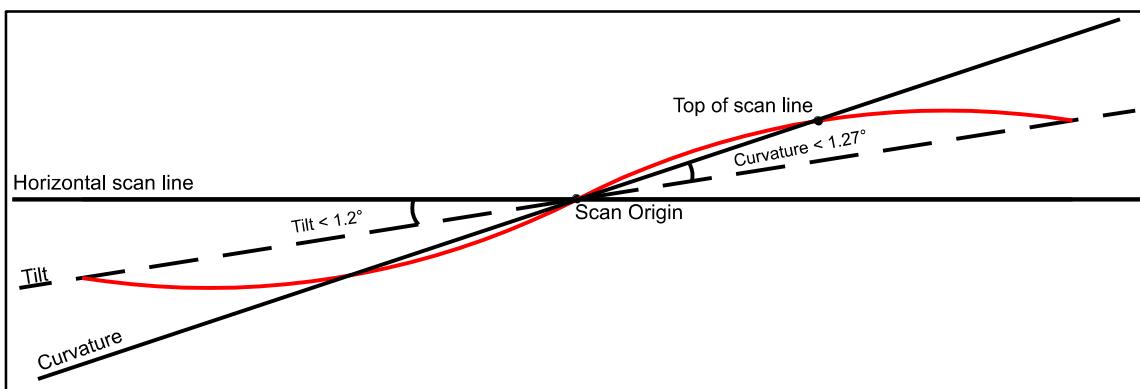


Figure 2: Laser Scanning Tilt and Curvature

6. Technical Specifications Barcode Scanner

The conditions are as follows, unless otherwise specified.

Conditions

Ambient temperature and humidity:	Room temperature (20° C) Room humidity (45% to 85% RH)
Ambient light:	500 to 900 lx (Excluding high frequency fluorescent light)
Background:	Barcode = black bars and white spaces
Decoding test:	Approve when decoding is over 95% successful. Decoding is deemed successful when completed in 0.5 seconds or less.

6.1. Print Contrast Signal (PCS)

PSC 0.45 or higher (70% or higher reflectivity of space and quiet zone)

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

6.2. Minimum Resolution

0.127 mm

6.3. Supported symbologies:

Linear (1D)

JAN/UPC/EAN, incl. add-on	S-Code
Codabar/NW-7	Telepen
Code 11	Tri-Optic
Code 39	UK/Plessey
Code 93	
Code 128	
GS1-128 (EAN-128)	Postal codes (1D)
GS1 Databar (RSS)	Chinese Post
IATA	Korean Postal Authority Code
Industrial 2of5	
Interleaved 2of5	
ISBN-ISMN-ISSN	
Matrix 2of5	
MSI/Plessey	

6.4. Scan Area and Depth of Field

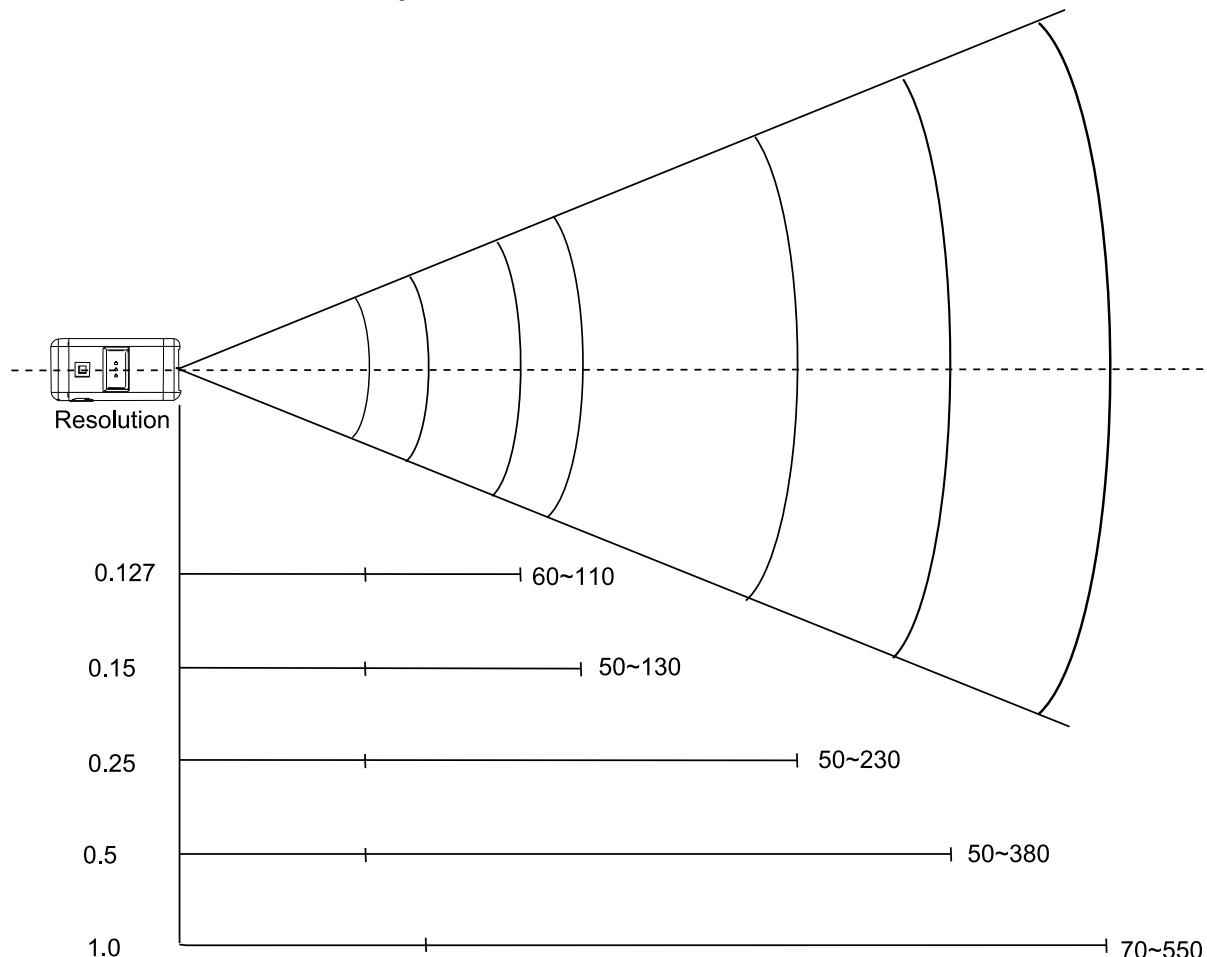


Figure 3: Scan Range and Depth of Field

Resolution	Symbology	PCS	Quiet Zone	No. of Digits
1.0 mm	Code 39	0.9	25 mm	1
0.5 mm	Code 39	0.9	18 mm	3
0.25 mm	Code 39	0.9	10 mm	8
0.15 mm	Code 39	0.9	7 mm	10
0.127 mm	Code 39	0.9	5 mm	4

Conditions:

Bar Code Sample : Optoelectronics Test Chart, N/W ratio = 1:2.5

Angle : $\alpha = 0^\circ$ $\beta = 15^\circ$ $\gamma = 0^\circ$

Curvature : $R = \infty$

6.5. Pitch, Skew, and Tilt

Pitch	: $\alpha \leq \pm 35^\circ$
Skew	: $\beta \leq \pm 50^\circ$ (Excluding dead zone)
Dead Zone	: $\beta \leq \pm 8^\circ$ (Decoding may fail in some areas as a result of specular reflection)
Tilt	: $\gamma \leq \pm 20^\circ$

Conditions

Bar Code Sample	Optoelectronics Test Sample
Distance	110 mm from the edge of the OPN-2500
Label for Pitch, Skew and dead zone:	PCS 0.9, Resolution 0.25 mm 9-digit Code 39, Quiet Zone 10 mm, N/W Ratio = 1 : 2.5
Label for Pitch Tilt	PCS 0.9, Resolution 0.26 mm, EAN-13, Quiet Zone 10 mm
Angles for Pitch and Tilt	Skew angle $\beta = +15^\circ$
Angles for Skew and Dead zone	$\alpha = 0^\circ, \gamma = 0^\circ$
Curvature	$R = \infty$

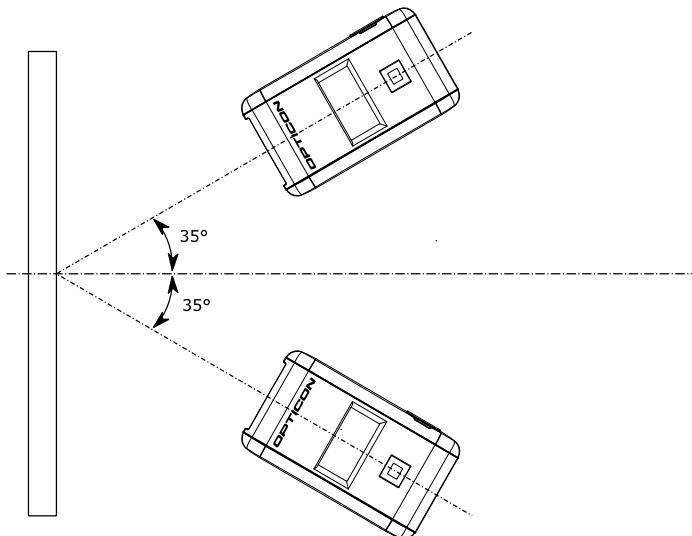


Figure 4: Pitch

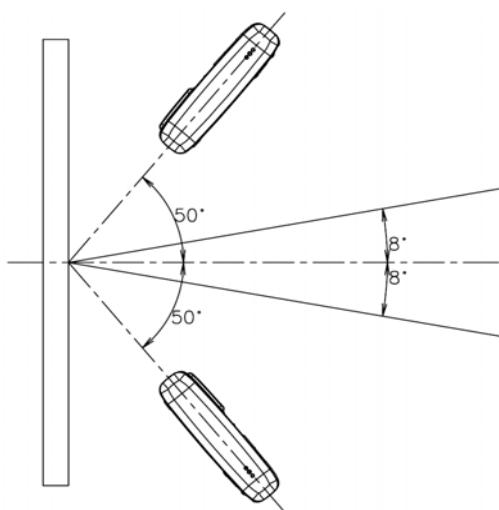


Figure 5: Skew

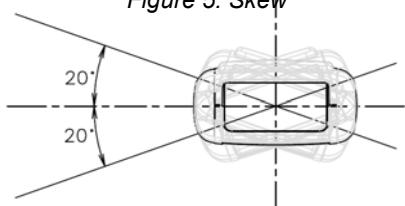


Figure 6: Tilt

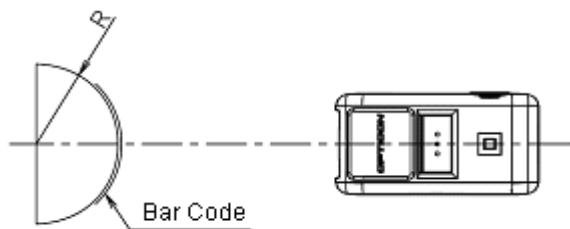


Figure 7: Curvature

6.6. Curvature

With 8-digit JAN/UPC/EAN barcodes, decoding performance is guaranteed when $R \geq 15$ mm

With 13-digit JAN/UPC/EAN barcodes, decoding performance is guaranteed when $R \geq 20$ mm

Conditions

Bar Code Sample	Optoelectronics Test Sample
	PCS 0.9, Resolution 0.26 mm, Quiet Zone 10 mm
Distance	110 mm from the edge of the scanner
Angle	Skew angle $\beta = +15$

7. Interface Specifications

7.1. USB

7.1.1. Settings

The interface is full-speed USB.

7.1.2. Cable

Dedicated cable with PC connector is provided.

7.1.3. Connector

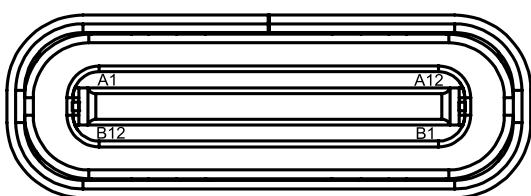


Figure 8: USB B connector

A1, A12, B1, B12	GND
A4, A9, B4, B9	VCC
A5	CC1, 5.1k pull down resistor
A6, B6	D+
A7, B7	D-
A8, B8	External trigger in
B5	CC2, 5.1k pull down resistor
All other pins	Not connected

7.1.4. Interface Circuit

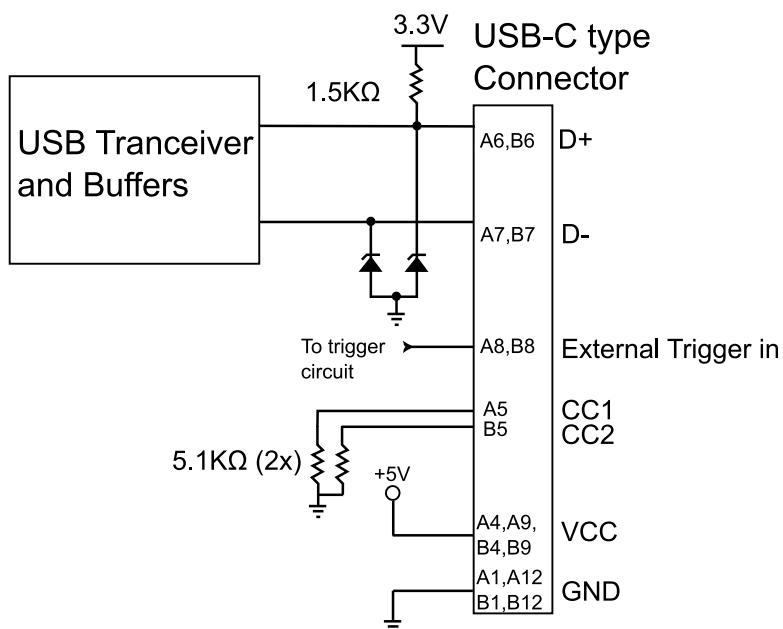


Figure 9: Interface circuit

7.2. Bluetooth

7.2.1 Module

The OPN-2500 is equipped with integrated *Bluetooth 5*, transceiver (nRF52833)

7.2.2 Specifications

Bluetooth standard: 5

Blue low energy

Supported BLE profiles: Proprietary UART / HID (keyboard emulation)

8. Product Label

The label shown below is attached to the back of the OPN-2500.

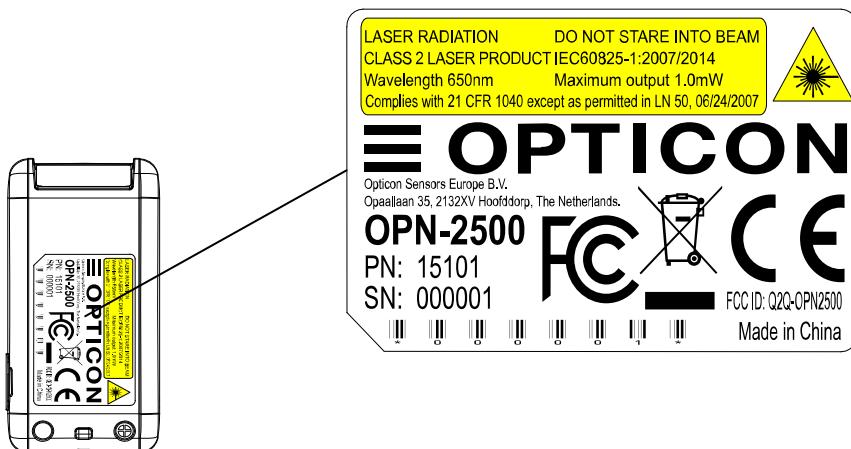
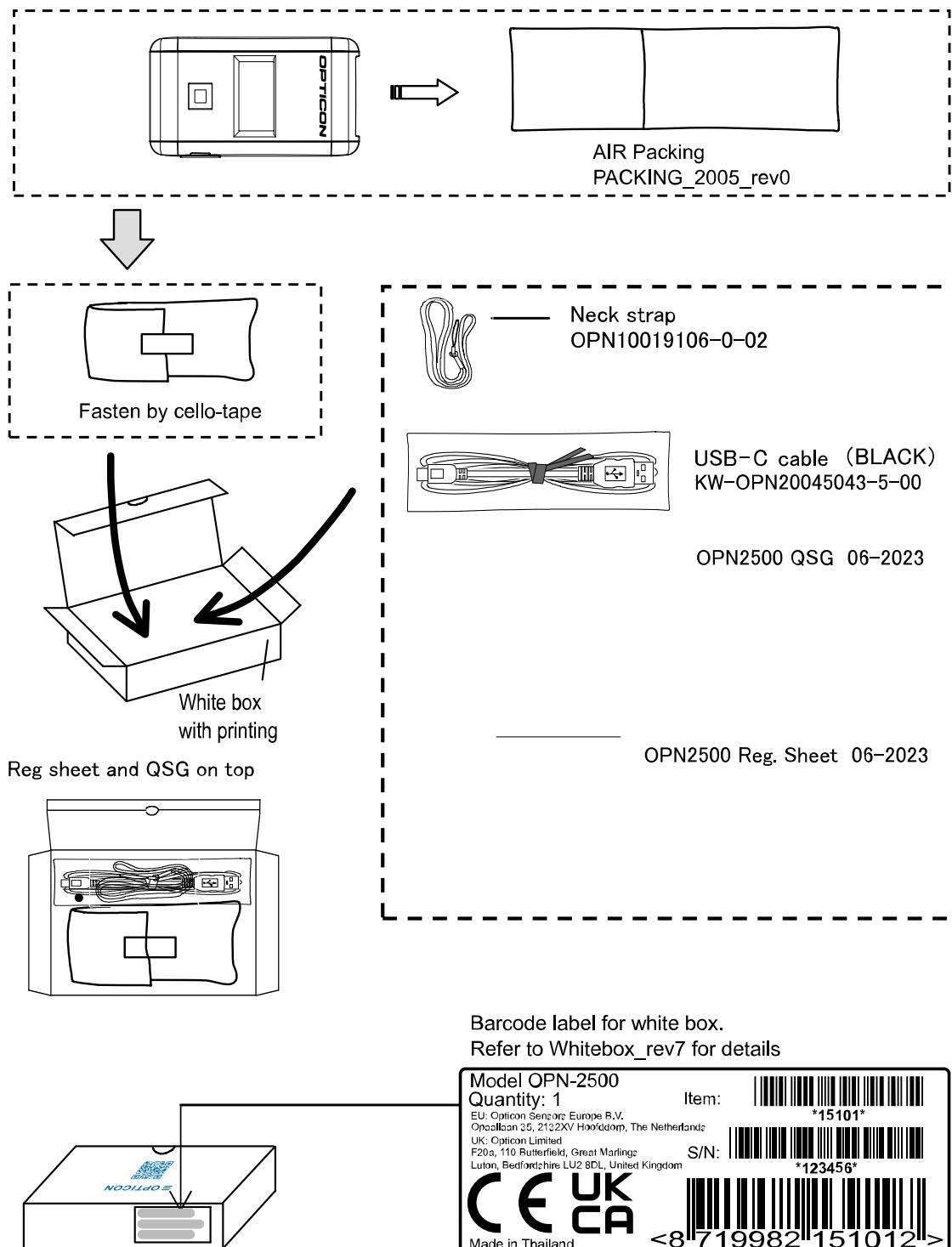


Figure 10: Product & Laser Caution Label

9. Packaging Specifications

9.1. Individual Packaging Specification ! different cable and numbers !



Do not fold at the barcode position when the label is affixed onto the corner of the box.

The 6-digit serial number on the label is the same as the serial number on the OPN2500.

Figure 11: Individual Packaging

9.2. Collective Packaging Specification

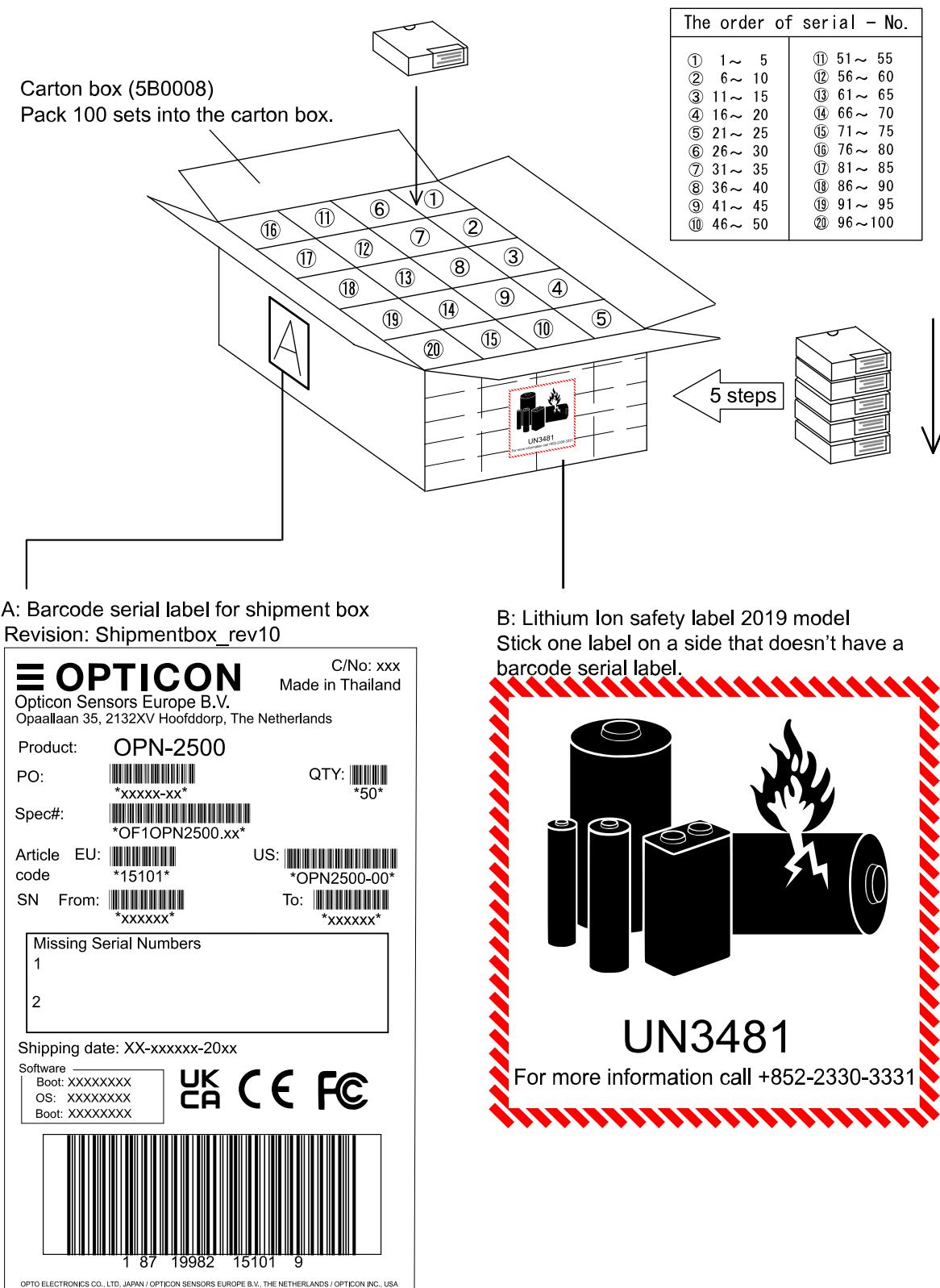


Figure 12: Collective Packaging

10. Durability

10.1. Ambient Light Immunity

Scanning performance is guaranteed when the barcode surface is illuminated as follows.

Incandescent light : 0 ~ 4,000 lx
Fluorescent light : 0 ~ 4,000 lx (excluding high-frequency
lighting)
Sunlight : 0 ~ 80,000 lx

Conditions

Barcode Test Sample	OPTOELECTRONICS test chart PCS = 0.9, Resolution 0.25 mm, 9-digit Code 39, Quiet Zone 10 mm, N/W Ratio = 1:2.5
Distance	150 mm from the front edge of the scanner.
Angles	Pitch: $\alpha = 0^\circ$, Skew: $\beta = 15^\circ$, Tilt: $\gamma = 0^\circ$
Curvature	$R = \infty$

Note: Specular reflection may deteriorate the scan performance.

10.2. Vibration Strength (without packing)

There shall be no sign of malfunction after the following vibration test.

Vibration test: Increase the frequency of the vibration from 10 Hz to 100 Hz at an accelerated velocity of 19.6 m/s^2 (2.0 G) for 30 minutes (60 minutes for a cycle) in non-operating state. Repeat this in X, Y and Z direction.

10.3. Vibration Strength (in individual packing)

There shall be no sign of malfunction after the following vibration test.

Vibration test: Increase the frequency of the vibration from 10 Hz to 100 Hz at an accelerated velocity of 19.6 m/s^2 (2.0 G) for 30 minutes (60 minutes for a cycle) in the individual packaged state. Repeat this in X, Y and Z direction.

10.4. Drop Impact Strength (without packaging)

There shall be no sign of malfunction after the following drop test.

Drop test: Drop the scanner 3 times (18 times in total), at each 6 face, from a height of 150 cm onto a concrete floor as shown below.

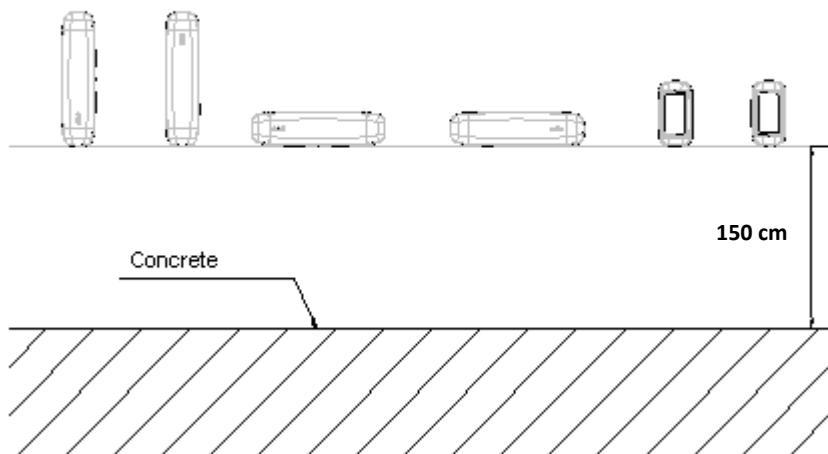


Figure 13: Drop Test

10.5. Electrostatic Discharge Immunity

Air discharge:	8 kV Max. (No malfunction) 15 kV Max. (No destruction)
Contact discharge:	4 kV Max. (No malfunction) [Discharged from the frame of the USB connector.] 10 kV Max. (No destruction)
Measurement environment:	Use electrostatic testing device compliant with IEC 61000-4-2
Discharge resistance:	330 Ω
Capacitor charging:	150 pF

10.6. MTBF

MTBF (Mean Time Between Failures)	30,000 hours (excluding the following parts)
Laser diode :	10,000 hours
Mirror scan unit :	10,000 hours

11. Regulatory Compliance

11.1. Laser Safety

IEC 60825-1 Ed.2: 2007/2014 Class 2
CDRH Class II

11.2. EMC

Radio equipment type OPN-2500 is in compliance with Directive 2014/53/EU

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.

FCC RF Radiation Exposure Statement:

1. This Transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
2. For portable operation, this device has been tested and meets FCC RF exposure guidelines. When used with an accessory that contains metal may not ensure compliance with FCC RF exposure guidelines.

15.21

You are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

15.105(b)

This equipment has been tested and found to comply with the limits 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 in accordance with 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 can be determined 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 and receiver.

- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

12. RoHS

The OPN-2500 is compliant with RoHS.

RoHS: The restriction of the use of certain hazardous substances in electrical and electronic equipment, 2002/95/EC

13. Precautions

13.1. Precaution against Laser Light

*Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

Caution –

Do not stare into the laser light from a scanning window. It may harm your eyes.

Do not point the laser directly at others' eyes. It may harm your eyes.

Do not stare into the beam with optical instruments. It may harm your eyes.

13.2. Handling

Handle this product carefully. Do not deliberately subject it to any of the following:

(1) Shock:

- Do not drop this product from a height greater than specified in this manual.
- Do not place this product under or between any heavy items.
- Do not swing this product around holding the hand strap.

(2) Temperature Conditions:

- Do not use this product at temperatures outside the specified range.
- Do not pour boiling water on this product.
- Do not throw this product into a fire.

(3) Foreign Materials:

- Do not immerse this product in water or other liquid.
- Do not expose this product to chemicals.

(4) Battery:

CAUTION
RISK OF EXPLOSION IF BATTERY IS REPLACED
BY AN INCORRECT TYPE.
DISPOSE OF USED BATTERIES ACCORDING
TO THE INSTRUCTIONS

(5) Others

- Do not disassemble this product.
- Do not use this product near a radio or a TV. It may cause reception problems.
- This product may be affected by a momentary voltage drop caused by lightning.
- This product may not perform properly in a place where it will be subjected to a flickering light, such as a CRT (computer monitor, television, etc.).

* This specification manual is subject to change without prior notice.

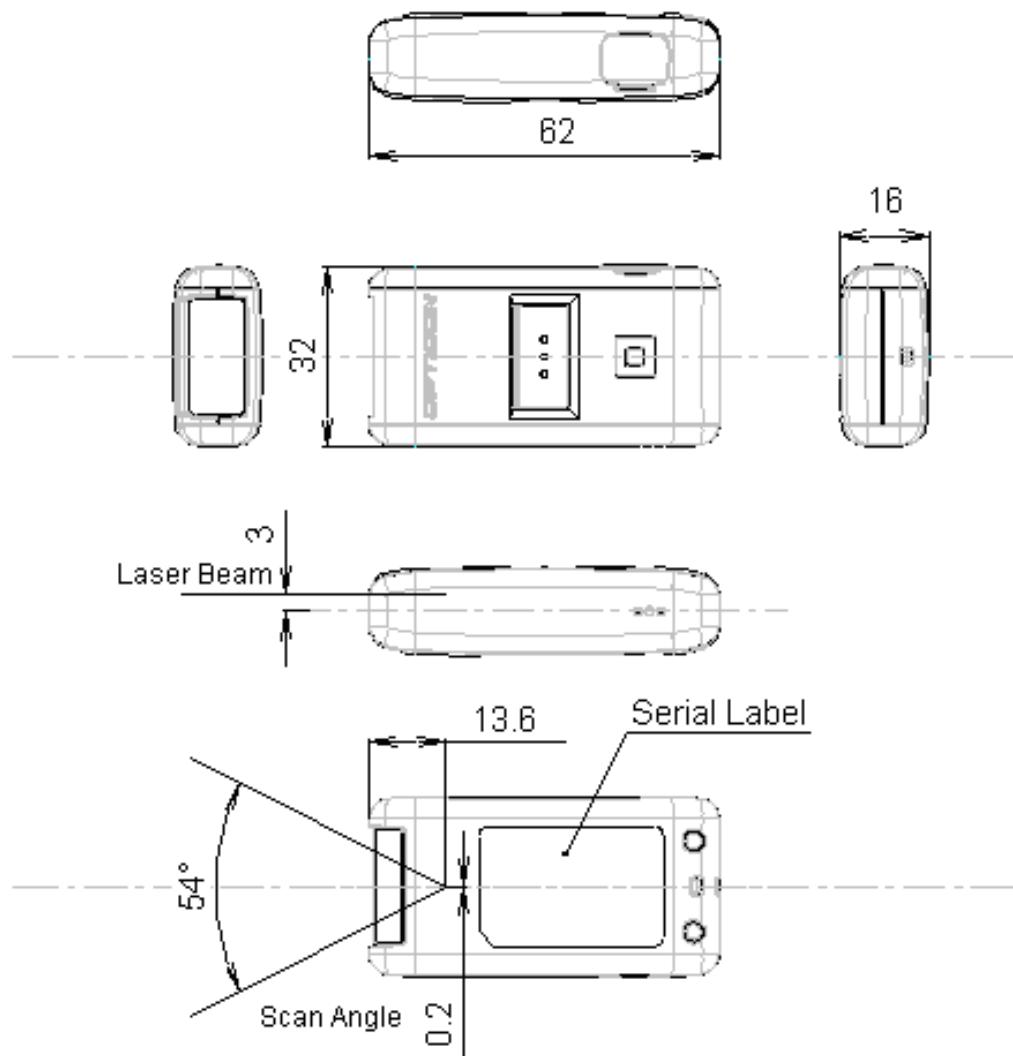
Appendix 1: Mechanical Drawing

Figure 14: Mechanical Drawing