

OPN-6000



Specification Manual rev 0.0

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

Serial Number

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Revision History

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Revision	Date	Page	Section	Description of Changes
0.0	27/10/2023	-	-	Initial release
0.1	17/11/2023	-	-	Spec updates
0.2	07/02/2024	-	-	Minor changes all over
0.3	15/02/2024	-	-	Storage temp adjusted to battery spec
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Abstract

This manual provides specifications for the OPN-6000 data collector that features Bluetooth Low Energy and a 2D scan engine.

1 Overview

The OPN-6000 is a very compact battery powered data collector with a built-in 2D barcode scanner. Due to its compact size and its Bluetooth 5.4 (BLE) and USB capabilities, the OPN-6000 is the ideal companion scanner for mobile devices like the iPhone/iPad and Android telephones and tablets. Configure and collect barcode data on Mobile devices using the OptiConnect-app or use its batch functionality to configure and retrieve data by using USB on PC's and laptops. It is so small that it easily fits into your pocket. Due to its extremely low power usage the battery life is unprecedented and its wired and wireless charging support makes it easy to recharge.

The key features of the OPN-6000 are the following:

- **High-end design, the cleanest in the industry:** The standard OPN-6000 is crafted out of an aluminium housing that measures just 64.4 x 19.5 x 44 mm (LxWxH).
- **Configurable and programmable:** The OPN-6000 is built onto the proven technology used in previous data collectors such as the OPN-2006 and the RS-3000. All applications such as the OPN-2001 simulation app, batch application and Bluetooth application are supported.
- **High-speed scanning:** The extreme high-performance scan engine in the OPN-6000 ensures stress-free scanning and fast response, even in the case of poor-quality barcodes. It features a high-speed CMOS image sensor that captures images at a speed of up to 100 fps, which when combined with the fastest global shutter speed in the industry, enables fast and accurate scanning.
- **Accurate battery monitoring:** With the built-in battery gas-gauge, the OPN-6000 can accurately monitor the remaining charge level and therefore it can prevent surprise resets that may damage the filesystem.
- **Green LED aiming and Warm-White LED illumination:** A well-defined, single line of green LED light and efficient warm-white LED illumination makes it easy to aim the scanner while providing safety and long life.
- **Designed from the start as a durable and user-friendly device:** The OPN-6000 is a durable scanner that is designed with a focus on the user. This makes the OPN-6000 one of the most user-friendly scanners in the industry.
- **Wireless charging:** The OPN-6000 can be charged wirelessly with any Qi compatible charging pad. Of course, it is also possible to charge it via the USB-C port.
- **Bluetooth Low Energy :** The OPN-6000 features a modern Bluetooth 5.4 compliant chip that supports Bluetooth low energy (BLE) with following services: HID (Human Interface Device), DFU (Device firmware update), UART (Serial port emulation), BAS (Battery service), OptiConnect service.
- **OptiConnect:** Mobile application to configure and manage your device and process your barcode data
- **USB-C:** The OPN-6000 comes with a USB-C charging/communications port. It supports USB-HID (keyboard), USB-COM (serial port profiles: USB-CDC and USB-VCP) and USB-MSD (hard disk)
- **RoHS/REACH compliance:** The OPN-6000 is RoHS and REACH compliant.

2 Physical Features

2.1 Dimensions

2.1.1 OPN-6000 Dimensions

64.4 x 19.4 x 44 mm (LxWxH)

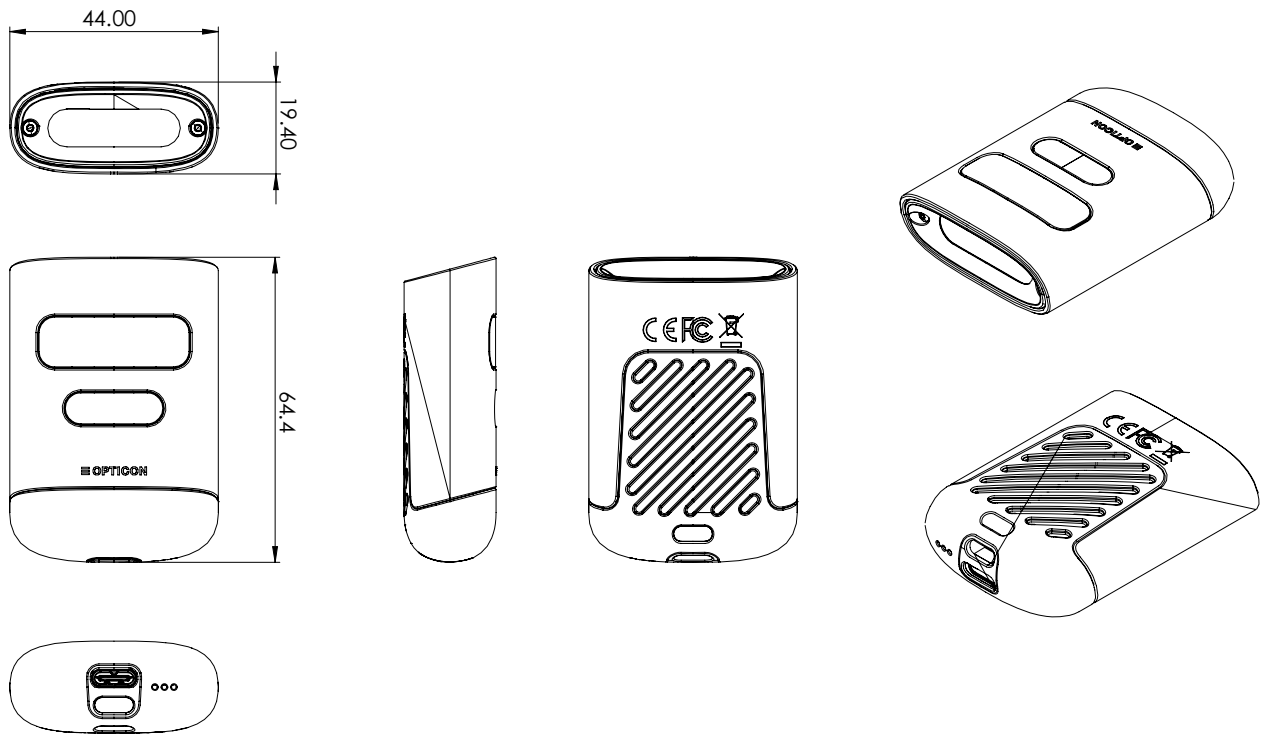


Figure 1: Dimensions of the OPN-6000

2.2 Weight

The weight of the OPN-6000 is 53g.

3 Environmental Specifications

Unless otherwise noted, these conditions apply to all environmental specifications where applicable.

Environmental Specification Conditions

Condition	Description
Barcode Sample	0.33 mm UPC specified in Chapter 8
Distance	130 mm from the front edge of the scan engine
Angle	$\alpha = 0^\circ$, $\beta = +15^\circ$, $\gamma = 0^\circ$
Curvature	$R = \infty$
Scanning Test	Read at intervals of 1s
Power Supply	Battery

3.1 Temperature

Operating Temperature: -20 to 50 °C

Storage Temperature: -10 to 25 °C (≥12 months, remaining battery capacity ≥85%)
 -10 to 45 °C (≥6 months, remaining battery capacity ≥85%)
 -10 to 55 °C (≥1 month, remaining battery capacity ≥90%)

Note: Temperature during charging should be between 0 and 50 °C. To protect the battery the OPN-6000 will automatically stop the charging process when the temperature is outside these values.

Note: Storage temperature and remaining capacity is only guaranteed when the battery is charged up to at least 50%. As per GEB battery spec: 20±5°C is the recommended storage temperature.



3.2 Humidity

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

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

3.3 Ambient Light Immunity

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

Incandescent Light 10,000 lux

Fluorescent Light 10,000 lux

Sunlight 100,000 lux

Note: Scanning performance is guaranteed if direct ambient light does not enter the light receiving section of the scan engine.

3.4 LED light immunity

The scan performance of the OPN-6000 is unaffected by indoor LED lighting applications.

3.5 Electrical Noise

There shall be no abnormalities when sinusoidal electrical noise (50 Hz to 100 kHz, smaller than 0.1 Vp-p) is added to the power supply line via the USB port.

3.6 Vibration Strength

The OPN-6000 is guaranteed to withstand the conditions of the following vibration test.

Vibration Test: Increase the frequency of the vibration from 12Hz to 200Hz at accelerated velocity 32.3m/s²(3.3G) for ten minutes. Continue this routine for 2 hours to X-direction, 2 hours to Y-direction and 4 hours to Z-direction.

3.7 Drop Impact Strength

The OPN-6000 is guaranteed to withstand the conditions of the following drop test.

Drop test: Drop the OPN-6000 10 times in total, at top, bottom, front, back, left, right, top-left, top-right, bottom-left and bottom-right faces, from a height of 1.5 meters onto a concrete floor.

4 Optical Specifications

4.1 Basic Optical Specifications

Specification		Characteristics
Scan method	CMOS array area sensor	(black and white)
Number of effective pixels	(H) × (V)	640 × 480
Image capture speed	Frame rate ^{*1}	100 fps
Sensor shutter speed	Minimum shutter speed	30 μs
Focal distance	From the front edge of scan engine	115 mm
View angle	Horizontal	Approx. 38.0°
	Vertical	Approx. 28.9°
	Diagonal	Approx. 46.4°
Auxiliary light source	Warm white LED	-
	Color temperature	2600 to 3700 K
	Maximum Optical Efficiency ^{*2}	114 lm/W
Light source for aiming	Single Line Green LED	-
	Peak Wavelength	535 nm
	Maximum Optical Efficiency ^{*2}	87.4 lm/W
Minimum contrast	PCS	0.2
Minimum resolution	1D barcodes	0.1 mm (4 mil)
	2D codes	0.169 (6.7 mil)
Barcode width		100 mm
Pitch, Skew, and Tilt	Resp. α, β and γ	α = ±65° β = ±65° γ = 360°
Curvature	Radius	R ≥ 20 mm
Motion tolerance	Speed	2.54 m/s
Decode rate	1D barcodes	40
	2D codes	25

*1 The fastest speed of image capture.

*2 The reference value extracted from the LED datasheet.

Note: The same basic conditions apply as for the Environmental Specifications (See chapter 4)

Note: For more details on the optical specifications, refer to the MDI-4150 specifications manual.

5 Component specification

Item	Specification	Notes
2D engine	MDI-4150	Low power high speed 2D engine
Application processor	nRF52840	64MHz clock speed
Flash memory	2Mbyte serial flash	Barcode storage >100,000 + time stamp. (EAN13 barcodes) Also used as file storage media
	1024Kbyte program flash	Bootloader, OS, application & configurations
RAM	256Kbyte	
LED indicator	4 pcs	Red/Green/Blue
Bluetooth 5.4 (BLE)	Integrated in CPU	Bluetooth Low Energy (no Bluetooth classic)

6 Electrical specification

6.1 Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Power supply voltage (VDD to GND)	Vdd	-0.3 to 6.5	V
Input voltage (IO Pins)	D+ and D-	As per USB spec.	V
Power ripple		0.1 V p-p (10-100 kHz)	V
Max input current (via USB port, empty battery while scanning, no inrush current)	I _{max}	1	A

6.2 QI Charging specifications

The QI standard is being followed, the power is 2.5Watt.

6.3 Recommended Operating Conditions (USB powered)

Parameter	Symbol	Value	Unit
Power supply voltage (VDD to GND)	Vdd	5	V
Input voltage	D+ and D-	As per USB spec	V
Power ripple		0.1 V p-p (10-100 kHz)	V

6.4 Battery

Parameter	Value	Unit
Battery capacity	500	mAh
Battery voltage	3.7 (typ)	V
Max charging current	500	mA
Max charging time	4	H
Operating time on full battery, 1 scan/min with active Bluetooth connection		Hours

7 Serial Number

The serial number of the OPN-6000 can be obtained through the OPN-6000 software or found on the OPN-6000 packaging.

7.1 To retrieve the serial number through the software:

- Connect the OPN-6000 to the Opticonnect app on a mobile device using Bluetooth. In Opticonnect, the serial number can be found under 'Manage Devices' -> select the specific device.

The OptiConnect app can be downloaded via this link:

www.opticon.com/opticonnect

Google Play -> <https://play.google.com/store/apps/details?id=com.opticon.opticonnect&hl=nl&gl=US>

App Store -> <https://apps.apple.com/us/app/opticonnect/id6477462292>

- Connect the OPN-6000 to a computer using the provided USB-C cable -> download and install Appload -> go to Utilities -> Show RS232 data -> Settings -> Port -> Select the right port -> Type in: <ESC>Z3<CR>"

8 Regulatory Compliance

8.1 LED Safety

IEC 62471:2006 Exempt Risk Group

8.2 Product Safety

EN 62368-1:2014 +A11:2017

IEC 62368-1:2014

8.3 EMC and RED

EN 300 328 V2.1.1

EN 301 489-1 V2.1.1

EN 301 489-17 V3.1.1

EN 62479:2010

EN 55035:2017 +A11:2020

EN 55032: 2012 +AC: 2013 Class A

8.4 FCC

FCC Part 15.19

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 of the device.

FCC Part 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.

FCC Part 15.21

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

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 body worn 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.

8.5 RoHS/REACH

Regulation (EC1907/2006) compliance

The RS-6000 is RoHS and REACH compliant.

Note: RoHS: The restriction of the use of certain hazardous substances in electrical and electronic equipment, 2011/65/EU.

9 Handling Precautions

9.1 Charging

- When fully charged, the battery life is approximately 7 days when scanning 1000 scans per day
- To keep battery performance from decreasing during storage, the OPN-6000 is not shipped fully charged. Before you start using the product, fully charge the battery.
- The battery used in the OPN-6000 may slightly expand as performance degrades. Even if the product is not in use, battery performance may deteriorate after two years from the battery manufacture date. Battery performance decreases more rapidly in extremely hot and cold environments.
- Over discharge may cause battery failure. Avoid long-term storage in a low battery state.
- If the operating time is decreasing, contact your dealer to replace the battery.
- Opticon recommends using the product at room temperature and charging at 10 - 30°C. In an environment where the internal product temperature is below 0°C or over 50°C, charging may stop to prevent battery failure.
- Risk of explosion if battery is replaced by an incorrect type.
- Dispose of used batteries according to local regulations.

9.2 Excessive Shock or Stress

- Do not drop this product.
- Do not push or place this product under or between heavy objects.
- Do not apply shock or excessive force to connectors.
- Do not place the cable or AC adapter under or between heavy items.
- Do not bend the cable at extremely low temperatures.
- While a cable is attached to the device, do not swing the device around with the cable, as that might cause injury or damage to the device.
- If the cable sheath breaks or becomes damaged, the core wires may be exposed or break. The wires may also become exposed if there is damage at the base of the cable. If any of these conditions occur or if the cable generates heat, unplug the cable and contact the dealer. Using the product with exposed or broken wires may cause the product to malfunction, overheat, create smoke, or catch fire.
- If the charging AC adapter is faulty, unplug it and contact the dealer.
- Do not use this product at a voltage outside the specified range. The product may overheat, create smoke, or catch fire. Do not get the AC adapter wet. The AC adapter may cause a short circuit.

9.3 Bluetooth

- This product supports Bluetooth Low Energy (BLE) with other Bluetooth devices that support one of the available BLE services: HID (Human Interface Device), DFU (Device firmware update), UART (Serial port emulation), OptiConnect service (Android/iOS)
- This product complies with Bluetooth Low Energy standards; however, its communication performance with untested devices is not guaranteed.
- Bluetooth devices use the 2.4 GHz frequency band that is shared among other devices. It may affect the communication speed and distance between this product and the host device.
- The communication speed and distance may vary depending on the interference and radio wave condition between this product and the host device.

9.4 Frequency Band.

- This product uses the 2.4 GHz frequency band. Make sure you understand the following information before using this product.

Note: Scientific, medical, industrial devices, and microwaves use the 2.4 GHz frequency band. Electronic devices with some form of wireless communication, as well as amateur radio stations may also use the 2.4 GHz frequency band and may interfere with this product. For best performance, follow these guidelines:

1. Before using this product, make sure that other devices are not using the 2.4 GHz frequency band.
2. If radio interference occurs, change the location of this device, or stop the other devices that are using the 2.4 GHz frequency band.
3. If you have any questions or issues, please contact our sales office.

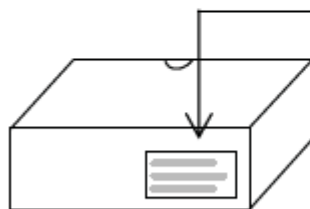
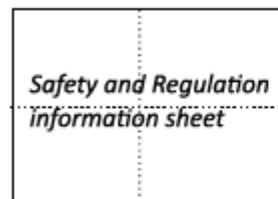
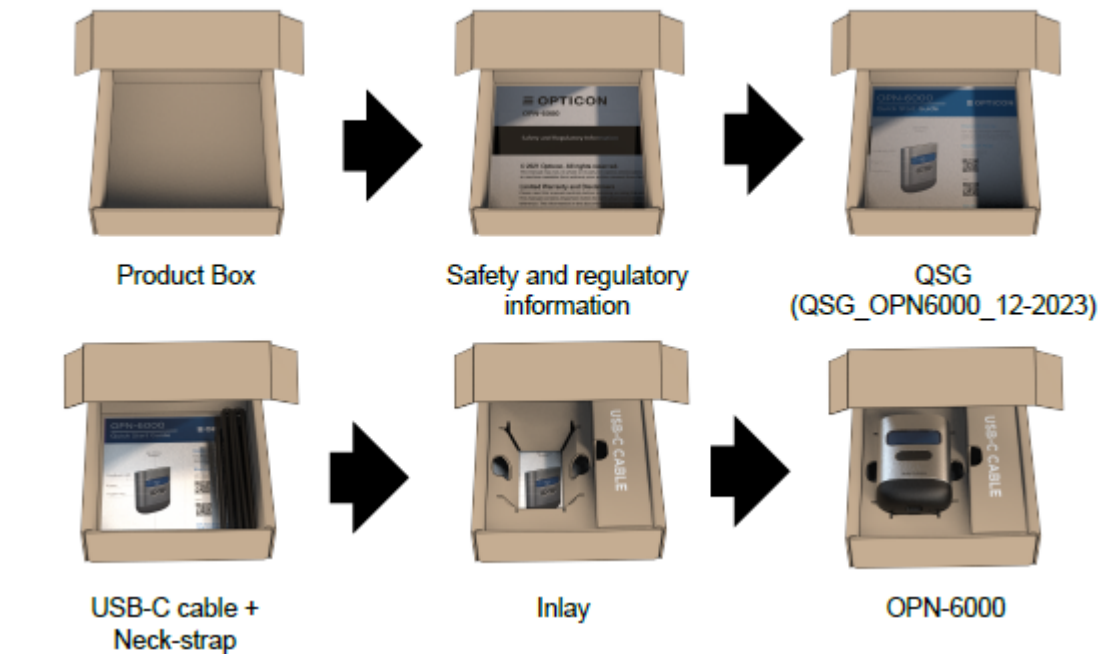
9.5 Operating Environment

- Do not use this product at temperatures outside the specified range.
- Do not use this product near combustible materials (including gas, powder, etc.). It may cause smoke and fire.
- Do not immerse this product in water or any other liquid.
- If condensation forms on the product, do not use the product. The product may malfunction. Wait until the moisture has evaporated.
- Do not store this product in either dusty environments or in extremely high humidity.
- Do not store this product in either extremely cold or hot places. Also avoid exposure to direct sunlight for long periods of time.
- Avoid static electricity and do not put the product near a radio or a TV. Excessive static electricity may cause malfunctions.
- Do not place in an unstable place.

9.6 General Cautions

- Do not disassemble this product.
- Do not stare into the LED light from the scan window. The LED may damage your eyes.
- Do not expose this product to oil and chemicals.
- This product may be affected by momentary voltage fluctuations caused by lightning.
- Do not let children use this product.

10 Packaging Specifications



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

Barcode label for white box.



The 6-digit serial number on the label is the same as the serial number on the OPN-6000