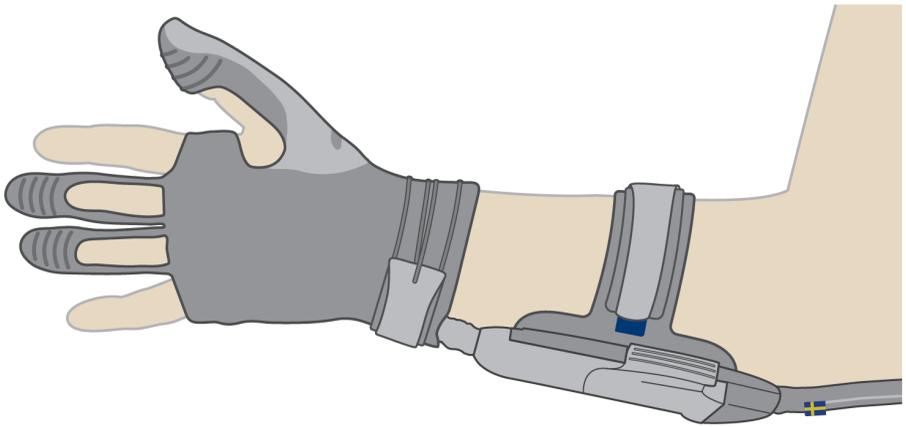


# Carbonhand<sup>®</sup>

USER MANUAL



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# 1. About the product

## 1.1 Intended use

Carbonhand improves the grip of persons who have a weak or unsteady grip. The condition may be due to orthopedic or neurological problems, from birth or acquired. Carbonhand mimics the user's grip movements and gives your hand additional grip force. It is designed to make life easier at work, at home and in everyday life. It is available in several sizes and in both right hand and left hand versions.

## 1.2 Conformity

	Standard/Directive	Reference
<b>Carbonhand</b>		
Classification	ISO 9999: 24 18 03	Assistive products for gripping
	ISO 9999: 06 06 07	Hand-finger splints
Directive	Medical device directive	93/42/EEC
	Environmental directive RoHS	2002/95/EC
	Environmental directive WEEE	2002/96/EC
<b>Charger</b>		
Directive	Low voltage directive	2006/95/EC
	Electromagnetic compatibility (EMC)	2004/108/EC

## 1.3 Contact information

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Isafjordsgatan 39B  
SE-16440 Kista Sweden

[info@bioservo.com](mailto:info@bioservo.com)  
[www.bioservo.com](http://www.bioservo.com)  
+46(0)8 211 710

## 1.4 Size guide

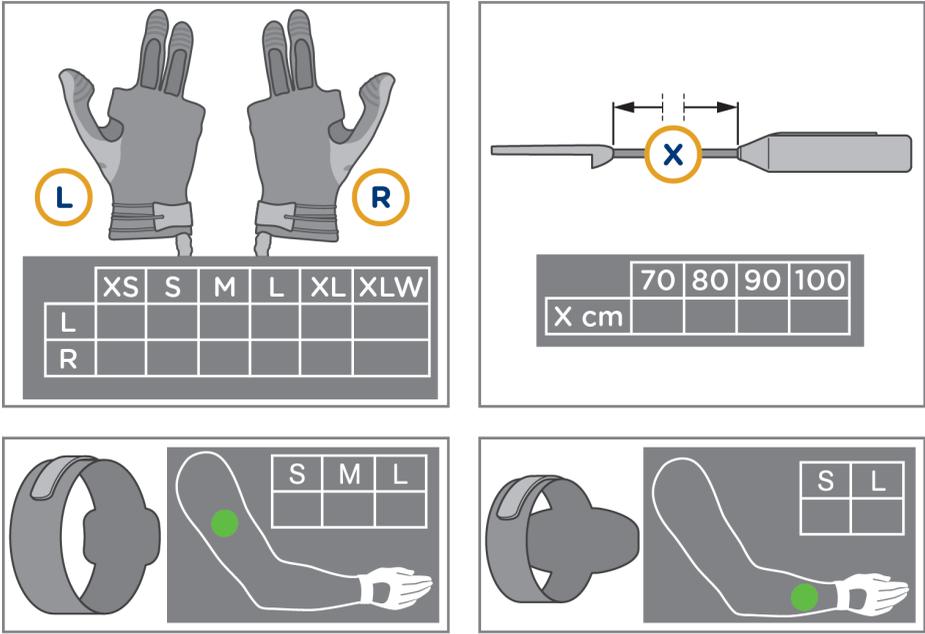


Figure 1: Carbonhand size guide.

Product name	Catalogue number	Explanation	Options
Carbonhand® glove	0010.os	o = orientation s = size	L (left), R (right) XS, S, M, L, XL, XLW
Carbonhand® control unit	0011.x	x = length (cm)	70, 80, 90, 100
Upper arm strap	0017.s	s = size	S, M, L
Lower arm strap	0018.s	s = size	S, L

**Example:** To order a right-hand glove in size M, use the catalogue number 0010.RM.

## 1.5 Product overview

### 1.5.1 Carbonhand

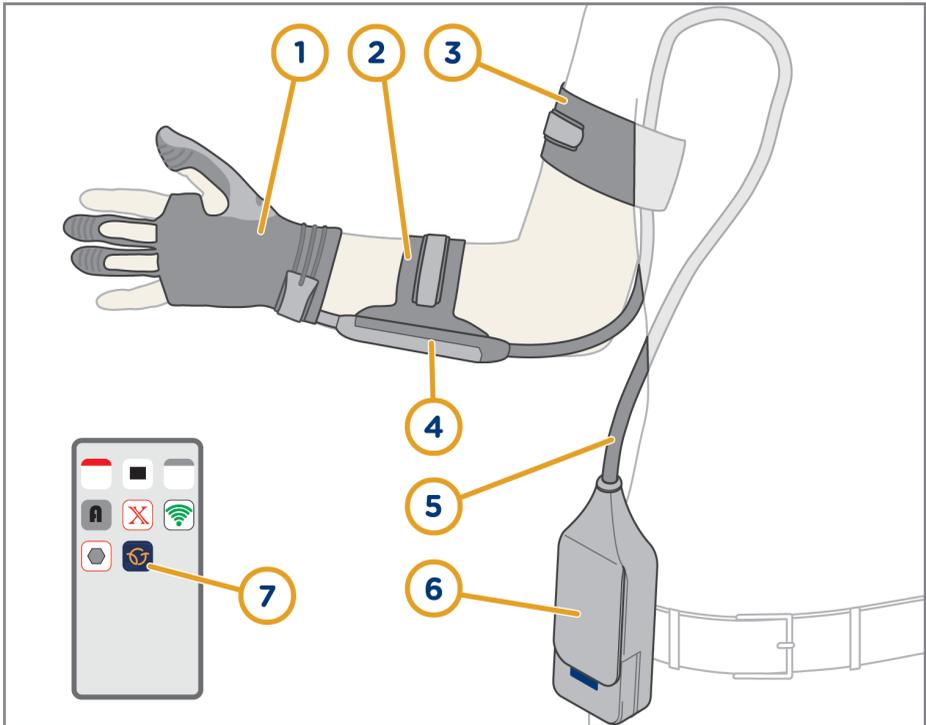


Figure 2: Carbonhand glove and control unit.

Item	Name	Function
1	Glove	Provides grip force
2	Lower arm strap	Keeps the connector attached to your arm
3	Upper arm strap	Keeps the cord attached to your arm
4	Connector	Connects the glove with the control unit
5	Cord	Transmits sensory data and force
6	Control unit	Controls grip force based on sensory data
7	Carbonhand App	Adjusts Carbonhand settings

## 1.5.2 Carbonhand glove

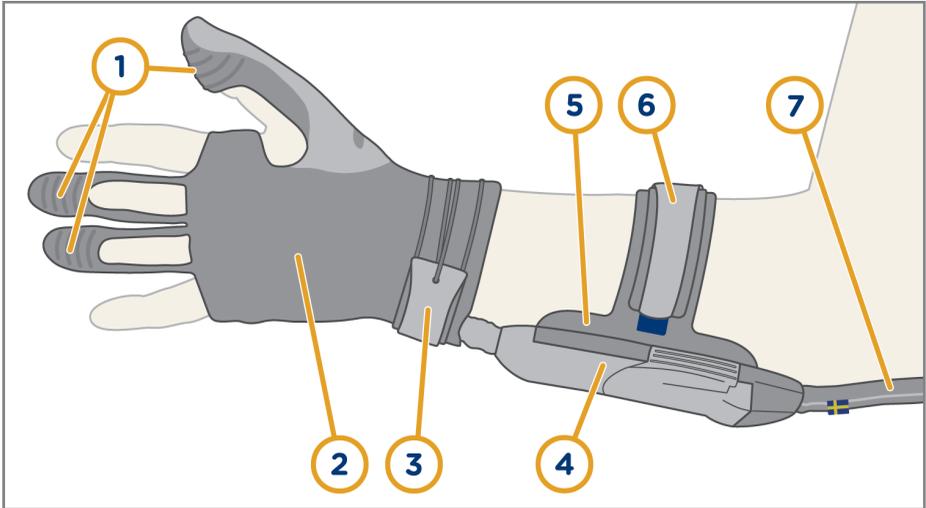


Figure 3: Carbonhand glove and connector.

Item	Name	Function
1	Sensors	Provide data to control unit
2	Glove	Provides grip force
3	Wrist strap	Keeps the glove in position
4	Connector	Connects the glove with the control unit
5	Connector attachment	Keeps the connector attached to the lower arm strap
6	Lower arm strap	Keeps the connector attached to your arm
7	Cord	Transmits sensory data and force

### 1.5.3 Carbonhand control unit

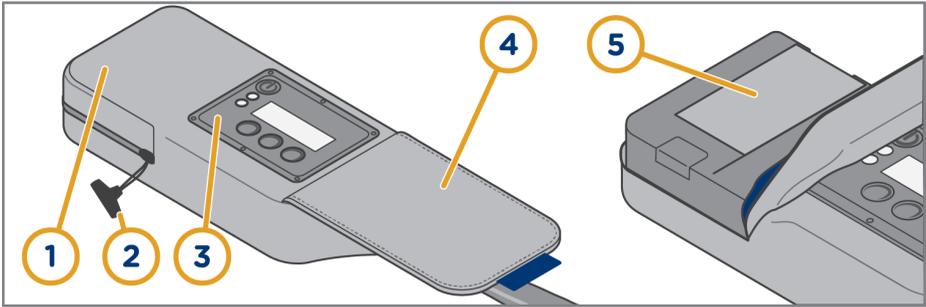


Figure 4: Carbonhand control unit.

Item	Name
1	Battery compartment
2	Zipper
3	Display
4	Lid
5	Batteries

### 1.5.4 Charger

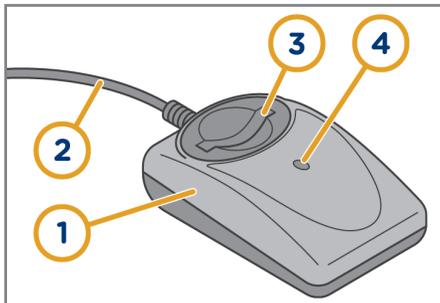


Figure 5: Charger

Item	Name
1	Battery charger
2	Electric cable
3	Battery slot
4	Charging indicator

## 1.6 Symbols

Symbol	Description	Symbol	Description
	Serial number		Keep the product dry
	Manufacturer's reference number		Do not discard as household waste.
	Manufacturer and date of manufacture		CE mark
	See user guide for information		

## 1.7 Labels



Figure 6: The label on the control unit.

## 1.8 Disposal

When Carbonhand becomes worn out, recycle it as electronic waste.

## 2. Safety

### 2.1 Warning, caution and note definitions



Warning! Risk of injury if instructions are not obeyed.



Caution: Risk of material damage if instructions are not obeyed.



Information for optimal use of equipment.

### 2.2 Warnings

- Do not use Carbonhand for tasks that can cause injury if Carbonhand malfunctions. For example, do not hold a heavy container with hot liquid in it.
- Use a protective inner glove in Carbonhand if you have cuts or scratches on your hand.
- Always follow the instructions of your doctor or therapist.
- Do not bend the cord or put heavy objects on it.
- Only use Carbonhand on the hand it is intended for.
- All service work must be done by an approved technician or the supplier.
- Do not do modifications to Carbonhand.
- Stop using Carbonhand if you feel that the use of it causes too great load or an unbalanced load on your body.
- In case of discomfort or pain, disconnect the connector or turn off the control unit.
- To shut down the Carbonhand glove, press and hold the **on/off** button or disconnect the connector.
- Only use Carbonhand with the supplied batteries.
- Do not short circuit the terminals of the battery.
- Do not expose the batteries to fire. This can cause an explosion.
- Do not expose the batteries to temperatures above 60°C/140°F.

- Do not dismantle the batteries.
- Do not use batteries that show signs of damage.
- Only use the charger specified in this guide.
- Keep batteries out of reach of children.
- Dispose of worn out batteries according to local regulation without delay.
- Unplug the charger when not in use. Pull the plug to disconnect the power cable. Never pull the power cable itself.
- Never use the charger with a damaged cable or if it has been dropped or damaged.
- Always keep charger and batteries clean.
- Do not dismantle the charger.
- If you have any problems with the charger while it is connected to the electric outlet, disconnect it from the power point immediately to turn off the power.
- It is not possible to guarantee that the charger or any other electric device does not cause interference with other electric devices. Contact the Carbonhand supplier if you encounter a problem.

## 2.3 Cautions

- Carbonhand is a medical device. Incorrect handling can cause discomfort.
- Keep Carbonhand clean at all times. Do not touch anything that can cause resistant stains.
- Keep Carbonhand away from liquids and small particles. They can cause damage if they enter Carbonhand.
- Do not allow metal objects other than batteries to touch metal parts in the charger connector. A short circuit can occur and damage the charger.

## 3. Before first use

When you start using Carbonhand, adjust the glove finger length and do a performance test.

### 3.1 To adjust the glove finger length

To ensure that Carbonhand works well, the glove should fit tight. Shorten or lengthen the fingers of the glove, as shown in the steps that follow.

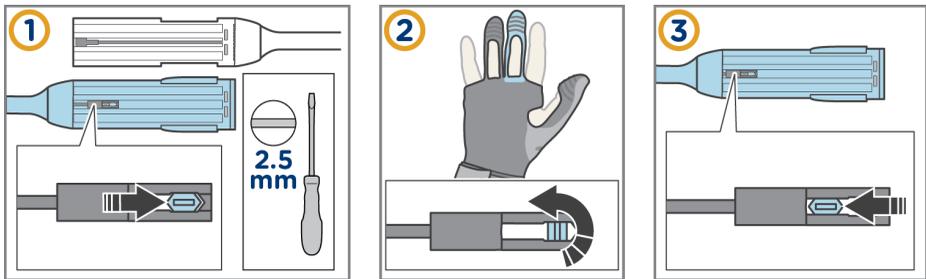


Figure 7: To adjust the glove finger length.

### 3.2 Performance test

1. Look at the Carbonhand glove. If it is worn or damaged, contact the supplier.
2. Put Carbonhand on your hand according to the instructions in [section 4.2](#).
3. Hold an object tightly with all your fingers. Make sure that Carbonhand adds extra force to your thumb, middle and ring fingers.
4. Release the object. Carbonhand should stop adding force to your fingers.
5. If Carbonhand does not add force when you hold, or does not stop adding force when you release, see [section 7](#) or contact the supplier.

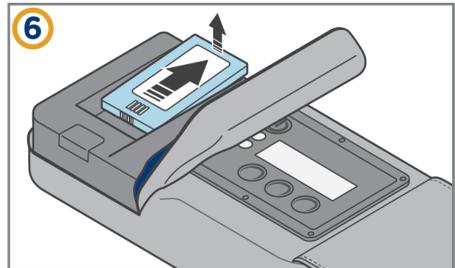
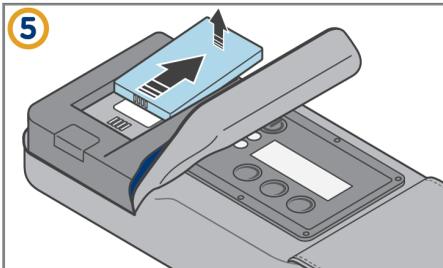
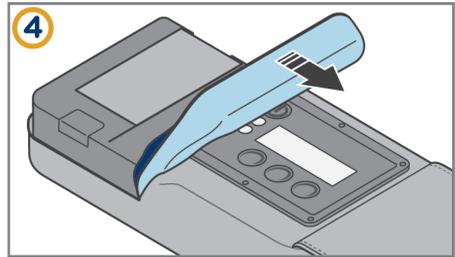
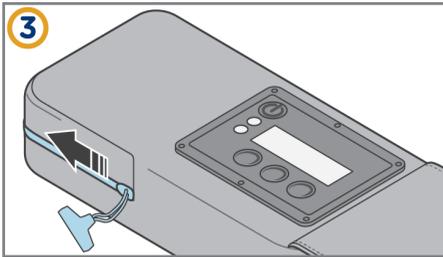
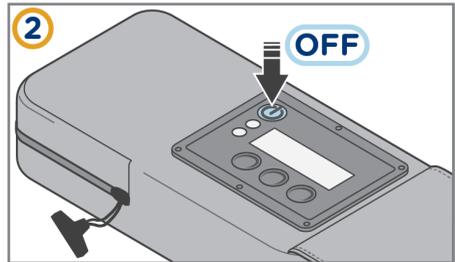
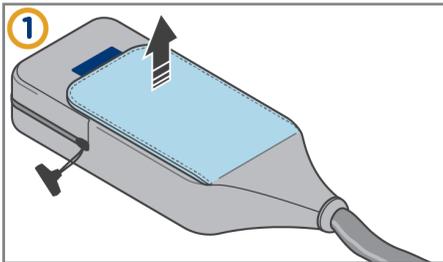
## 4. To use Carbonhand glove daily

### 4.1 Before use

#### 4.1.1 To charge and insert the batteries



The charger becomes warm during use.



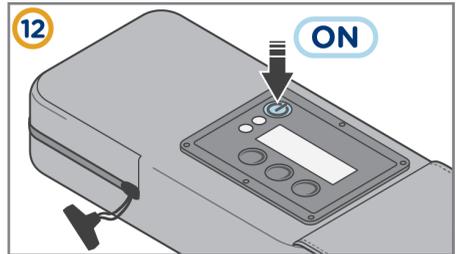
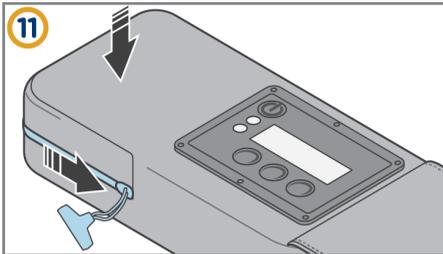
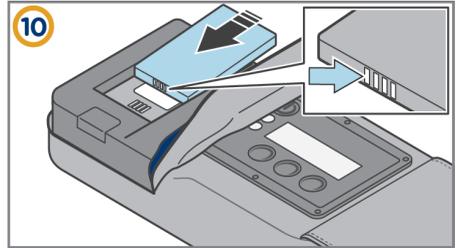
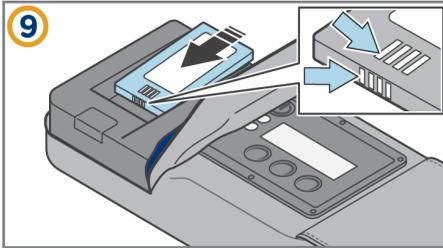
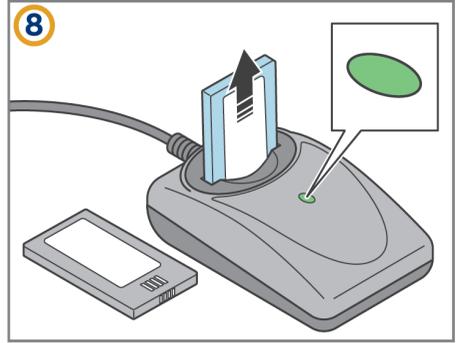
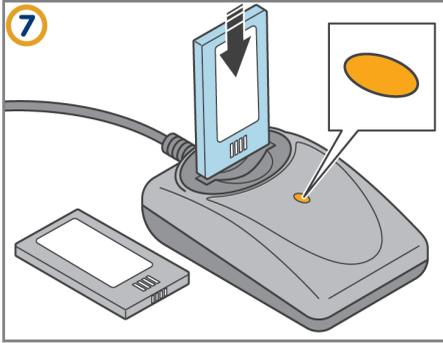


Figure 8: To charge and insert the batteries.

## 4.2 To connect and put on Carbonhand



Caution: The added force can be surprising for a new user. Make sure you familiarize yourself with this extra force before you start making full use of Carbonhand.

### 4.2.1 To connect the glove and the control unit

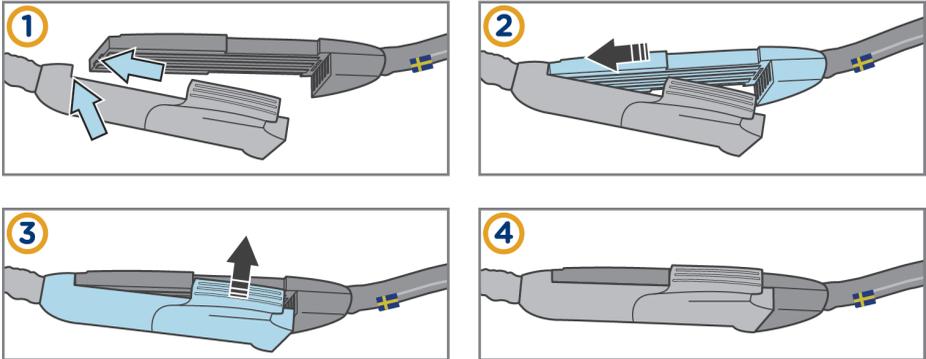


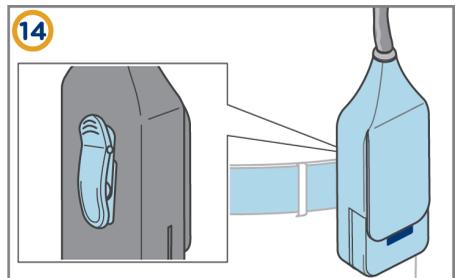
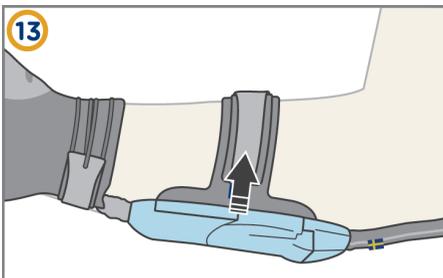
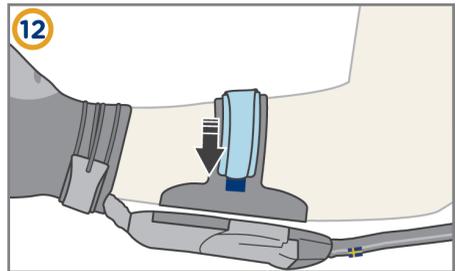
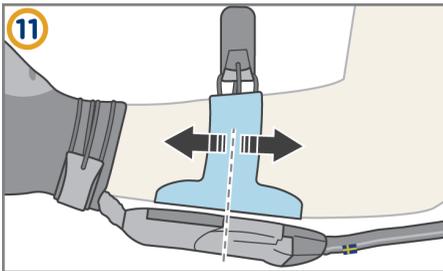
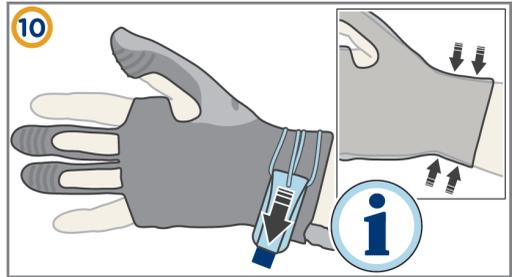
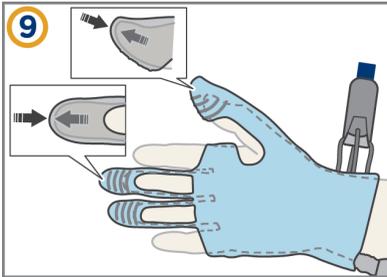
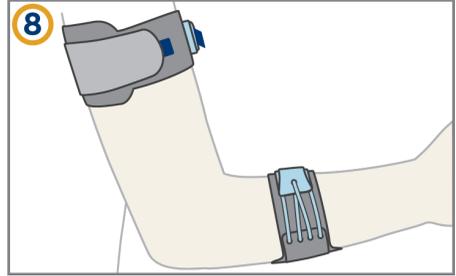
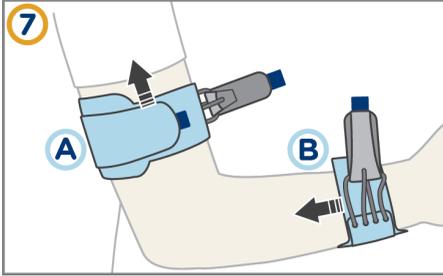
Figure 9: To connect the glove and the control unit.

### 4.2.2 Wash your hands and use hand sanitizer



Figure 10: Wash your hands and use hand sanitizer.

### 4.2.3 To put on and start Carbonhand



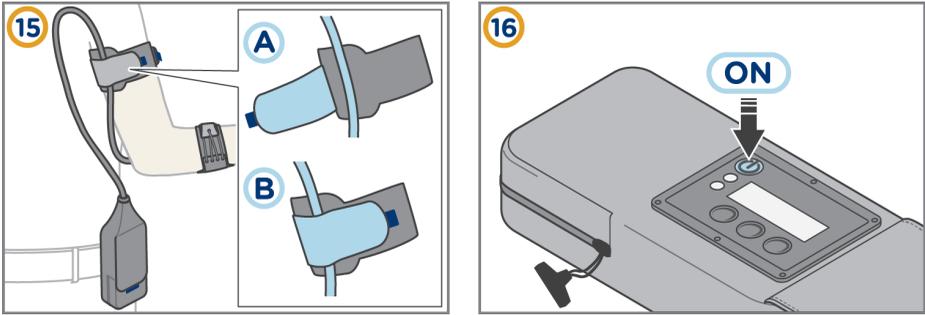


Figure 11: To put on and start Carbonhand

### 4.3 Protective gloves



Warning! Carbonhand does not provide protection. Use a protective inner or outer glove if it is necessary.



Use a thin glove of latex or cotton inside the Carbonhand glove to prevent direct contact and to keep the Carbonhand glove clean.



Use a protective glove on the Carbonhand glove to keep your hand warm and to keep your hand and the Carbonhand glove clean.

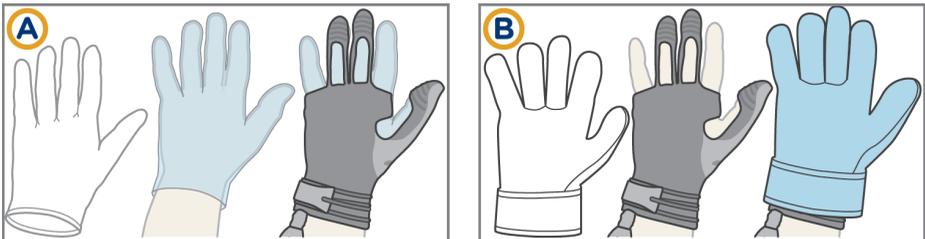


Figure 12: Optional protective glove (A) inside Carbonhand glove and (B) outside Carbonhand glove.

## 4.4 To shut down Carbonhand

Press and hold the **on/off** button to shut down Carbonhand.

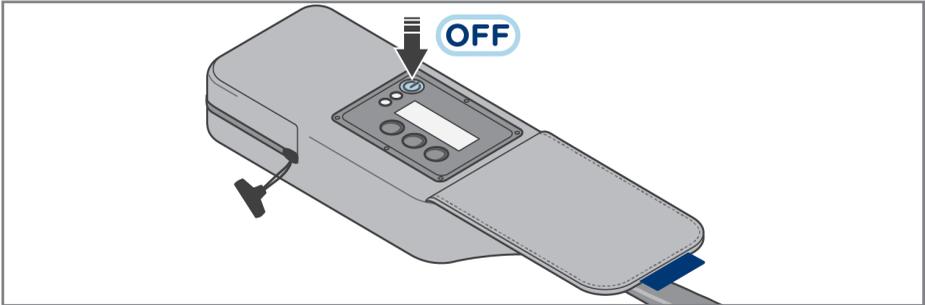


Figure 13: To shut down Carbonhand.



If the Carbonhand glove malfunctions, disconnect the connector to shut it down quickly.

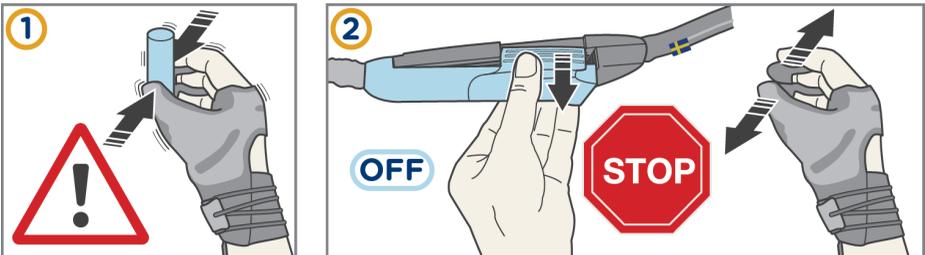


Figure 14: Emergency stop.

## 4.5 To change the glove

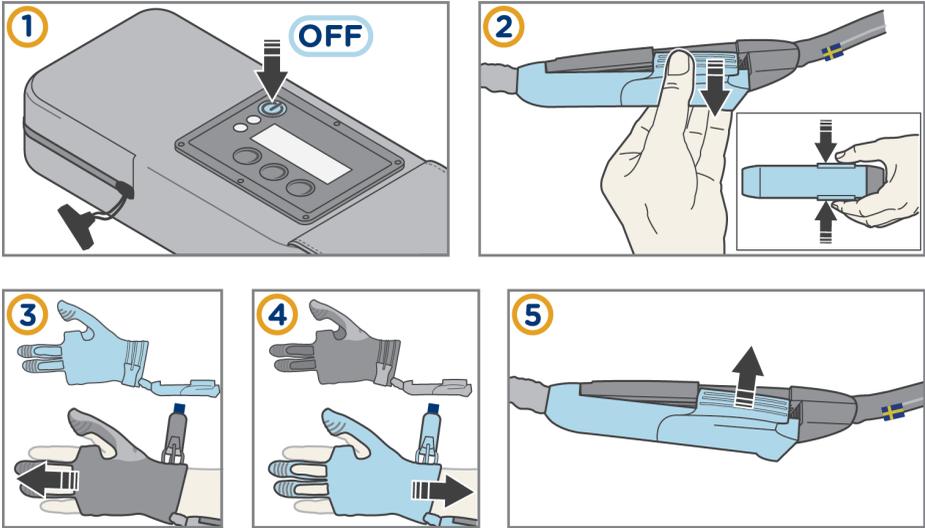


Figure 15: To change the Carbonhand glove.

## 4.6 To clean Carbonhand

1. Use a lint roller or soft brush to remove dust or other loose particles from Carbonhand.
2. Remove stains on the Carbonhand glove and control unit with a damp cloth. Do not make the glove wet, as this can cause it to malfunction.
3. Spray the Carbonhand glove and control unit with disinfectant to disinfect them.

## 4.7 Storage

Remove the batteries if you are not going to use Carbonhand for more than one week. When you keep the batteries in Carbonhand, they will slowly drain.

## 5. To use the Carbonhand control unit



Warning! Carbonhand is a medical device. Use it according to the instructions. Incorrect handling can cause discomfort.

Most settings on the Carbonhand are adjusted in the Bioservo Carbonhand App. Download the free app from regular app stores. Some settings are made directly in Carbonhand.

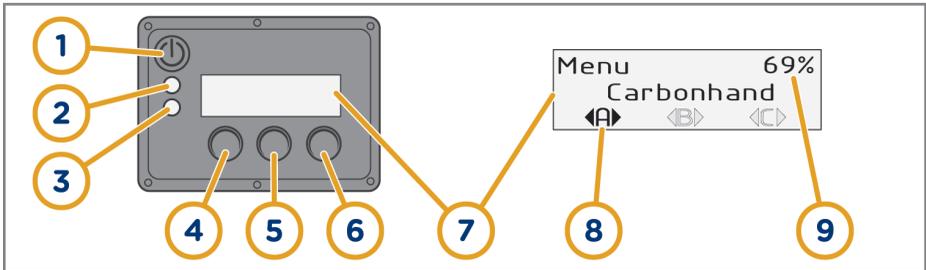


Figure 16: Display, buttons and indicators on the control unit.

Item	Name	Function	Function in Settings mode
1	On/off button	Press to start Carbonhand. Press and hold to shut it down.	Cancel or go back one step
2	Yellow/ blue indicator	See <a href="#">section 5.3</a>	
3	Green/ red indicator	See <a href="#">section 5.3</a>	
4	Button A	Press to select profile A	Go to the left
5	Button B	Press to select profile B	Select and confirm
6	Button C	Press to select profile C	Go to the right
7	Display	Displays information	
8	Active profile	Displays the current grip profile	
9	Battery level	Displays the remaining battery capacity	

## 5.1 Switch between profiles

Carbonhand has preset profiles that are accessed with the buttons on the control unit. Press button **A**, **B** or **C** to activate the profile you want to use, or activate a profile in the control unit menu.



The profiles have names to identify them easily. You can also add your own profiles if you wish. You do this in the Carbonhand App.

Adjust the profile settings to make Carbonhand behave differently. Adjust the sensitivity, maximum force and other settings as described in [section 6](#). Carbonhand comes with pre-set profiles with different settings.

Name	Description
Johan soft	Imitates normal soft hand grip patterns and only applies force in the finger you press with.
Johan strong	Imitates normal strong hand grip patterns and only applies force in the finger you press with
Erik soft	Activates all the fingers. This gives you maximum scope to get a stable grip.
Erik strong	Activates all the fingers with a strong force . This gives you maximum scope to get a stable grip

## 5.2 Menu

### 5.2.1 Settings mode

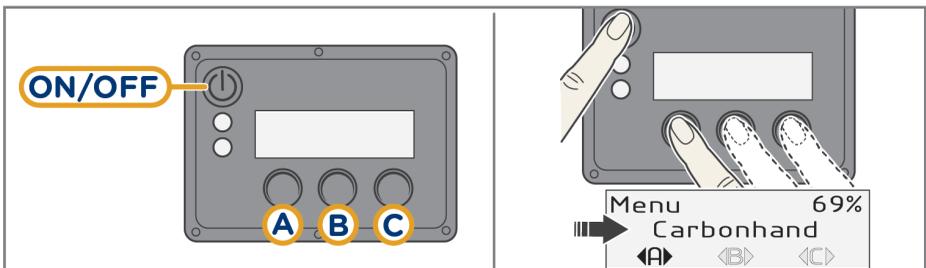
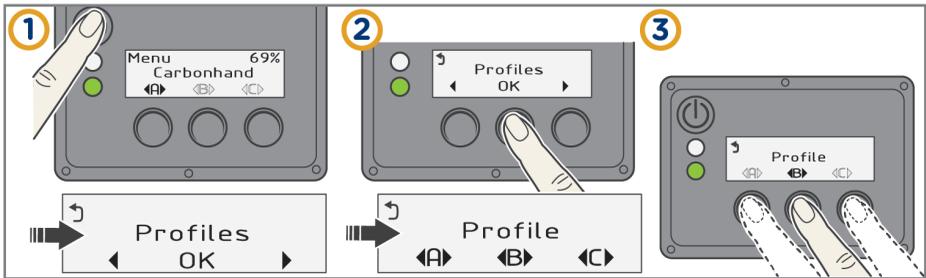


Figure 17: The Carbonhand unit display and buttons.

Use the control unit menu to make settings and to display information about the system. Launch the control unit in Settings mode to access the menu.

Press and hold button **A**, **B** or **C** and the **on/off** button to launch the control unit in Settings mode.

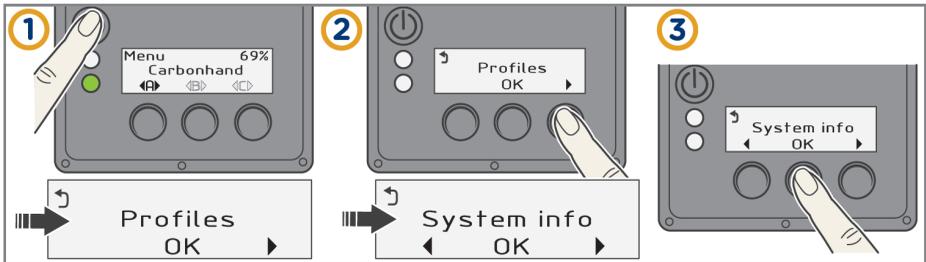
## 5.2.2 Profiles



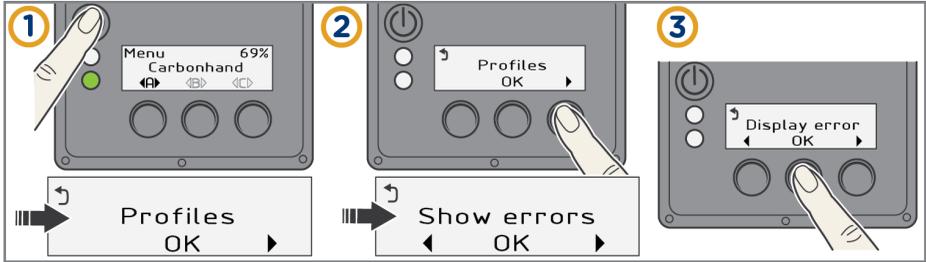
## 5.2.3 Wi-Fi

See [section 6.1](#).

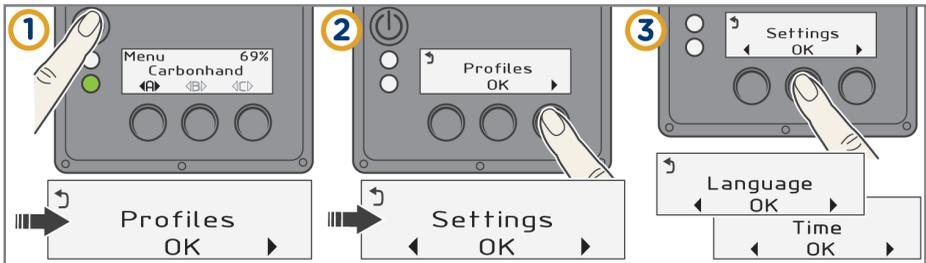
## 5.2.4 System info



## 5.2.5 Display error



## 5.2.6 Settings



## 5.3 Control unit indicators and error messages

Indication	Meaning
Green light, slowly pulsing	Carbonhand is ready to use.
Green light, rapid blinking	<ul style="list-style-type: none"> <li>• The system is booting.</li> <li>• The system is turning itself off.</li> <li>• The connector is open.</li> <li>• The connector has been closed incorrectly. Open the connector, wait a few seconds and then close it again.</li> </ul>
Red light, rapid blinking	The battery level is critically low. Carbonhand is about to turn off.
Yellow light, solid	Error warning. The system has detected that a component is not working as it should. Carbonhand can continue to be used, but will not perform as well. See <a href="#">section 5.2.5</a> .
Yellow light, slow blinking	Battery level is low. Charge the batteries.
Blue light, blinking	Carbonhand is ready for Wi-Fi connection.
Blue light, slowly pulsing	Wi-Fi connection established.

Display messages	Meaning
DISCONNECT GLOVE	The Carbonhand glove has been connected incorrectly. Disconnect the Carbonhand glove from the Carbonhand control unit and reconnect them.
CHARGE BATTERY!	The battery level is low. Charge the batteries as soon as possible.

## 5.4 Charger indicators

Light indicator	Meaning
Solid ORANGE	The battery charges.
Solid GREEN	Power on and no battery connected or battery fully charged.
Blinking RED	An error has occurred.

## 6. To use the Bioservo Carbonhand App



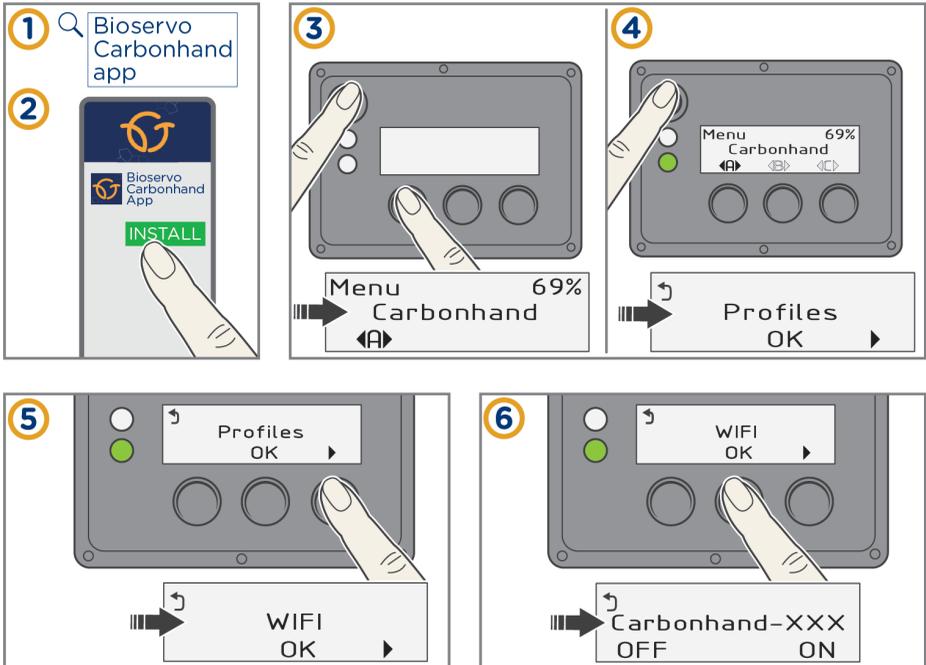
Warning! Do not increase the power setting to maximum in one step. If it is set too high, you can feel discomfort. Gradually increase the power until it is right for you.



Warning! Do not increase the sensitivity setting to maximum in one step. If it is set too high, it can be very difficult to open the grip. Gradually increase the sensitivity until it is right for you.

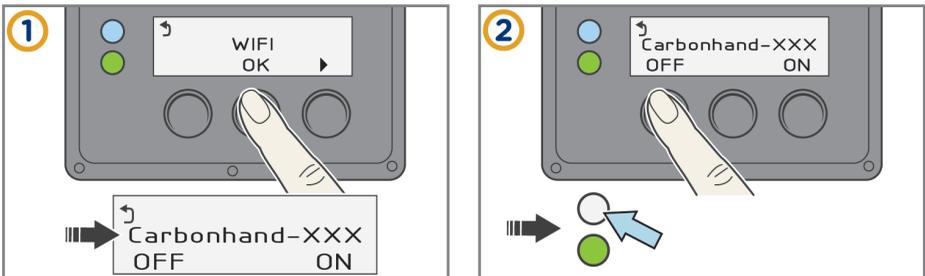
Configure the Carbonhand profile settings in the Bioservo Carbonhand App. Download the free app to your smartphone from the regular app stores.

### 6.1 To connect a smartphone to Carbonhand





## 6.2 To turn off Wi-Fi



## 6.3 To assign a profile to a button



Figure 20: The Carbonhand App. To assign a profile to a button.



Make sure Simulation mode is disabled before you modify and save profiles. You can not save changes to profiles when in Simulation mode. Simulation mode gives you access to **Profiles** in the app, for demonstration purpose.

1. Switch Carbonhand on. Connect it to the Wi-Fi and to the Carbonhand App.
2. In the app, go to **Profiles**.
3. Select the button you want to assign a profile to (**A**, **B** or **C**). The selected button will be highlighted with a green circle (figure 20 D).
4. Go to **Select profile**. Select the profile you want to use with the activated button (figure 20 E).
5. Tap Menu to exit the Profiles menu.

## 6.4 To modify a profile

1. Switch Carbonhand on. Connect it to Wi-Fi and to the Carbonhand App.
2. In the app, go to **Profiles**.
3. Select button **A**, **B** or **C** to choose the profile you want to modify. The selected button will be highlighted with a green circle.
4. Go to **Edit profile**.
5. Select the feature you want to modify (F-I).
6. Adjust the setting to your preference. Carbonhand will react immediately to your modifications.

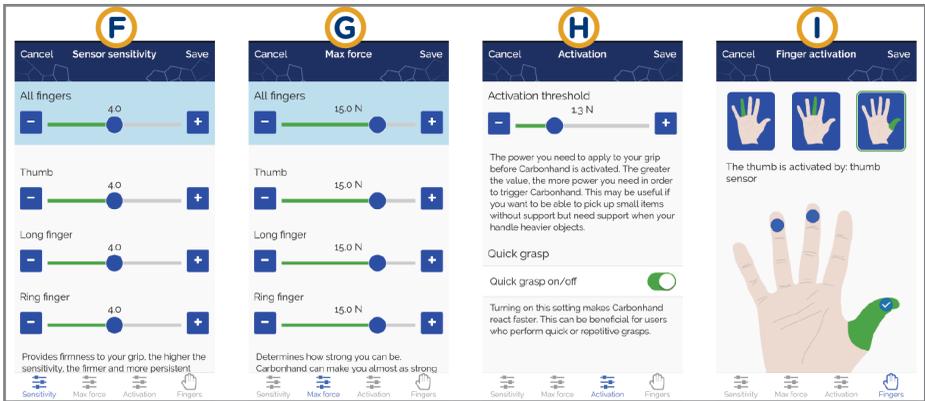


Figure 21: The Carbonhand App. The features that can be modified.

## 6.5 Sensitivity



Do not increase the sensitivity setting to maximum in one step. If it is set too high, the grip can become locked. Gradually increase the sensitivity until it is right for you.

1. Select **Sensitivity** (figure 21 F).
2. Slide the track bar to adjust the sensitivity of the finger sensors. You can adjust a single finger, or all three fingers at the same time.

## 6.6 Maximum force



At most, Carbonhand can give you approximately normal strength. However, this will depend on your own circumstances.

1. Select **Max force** (figure 21 G).
2. Slide the track bar to adjust the strength of the grip. You can adjust a single finger, or all three fingers at the same time.

## 6.7 Activation threshold



You can set an activation threshold for Carbonhand, so that Carbonhand only responds after a certain amount of force has been applied by the user.

1. Select **Activation** (figure 21 H).
2. Slide the track bar to adjust the necessary minimum effort to activate the grip.

## 6.8 Quick grasp



Quick grasp makes Carbonhand faster with short, repetitive gripping tasks.

1. Select **Activation** (figure 21 H).
2. Set the **Quick grasp** switch to the **on** or **off** position to enable or disable the quick grasp function.

## 6.9 Finger activation

1. Select **Fingers** (figure 21 I).
2. Select one of the three hand icons at the top of the display to select a finger. Select the sensors that will activate that finger.
3. Repeat step 2 for the other two fingers.

## 7. Troubleshooting

Problem	Solution
Carbonhand does not start.	Make sure that the batteries are fully charged and inserted correctly.
Nothing happens when I grip something.	The object you grip must be in contact with the touch sensors on the inside of the finger tips. If nothing happens when you put pressure on the sensors, ensure that the fingers are not disabled. See <a href="#">section 6.9</a> . If the problem persists, contact the supplier for service.
Carbonhand does not follow my intentions.	Contact the supplier for service.
The display shows an error message.	See <a href="#">section 5.3</a> .
The glove starts but does not respond.	Ensure that the glove connection has been closed.
I cannot close the glove connection.	<ol style="list-style-type: none"> <li>1. Straighten the cord so that it is not twisted.</li> <li>2. Turn the control unit off.</li> <li>3. Reconnect the glove.</li> <li>4. Restart the control unit.</li> </ol>

## 8. Replacement parts

Order replacement parts from the supplier.

Name	Product number
Battery	EZPack L
Battery charger	EZP06DC005
Upper arm strap	0017
Lower arm strap	0018

## 9. Technical specifications

### 9.1 Carbonhand specifications

<b>Max added force</b>	
Thumb	>8 N
Middle and ring fingers	>5 N
<b>Batteries</b>	
Type of batteries	3.7V Li-polymer
Number of batteries	2
Battery life	Approx. 8 hours, depending on usage
<b>Dimensions</b>	
Carbonhand glove	XS-XL Wide (XLW)
Carbonhand control unit	17 × 8 × 4 cm
Cord	70/80/90/100 cm depending on model
<b>Weight</b>	
Carbonhand glove	85 g
Carbonhand control unit	600 g
Total weight	700 g

<b>Included outer materials</b>	
Carbonhand glove	Polyester, polyamide, polyethylene, PTFE and silicone rubber.
Carbonhand control unit	Polyester, polyamide, acetal and polyurethane.
<b>Ambient temperature</b>	
Use	-5°C to +30°C
Storage	-35°C to +50°C
<b>Ambient humidity</b>	
Use	10% to 80% relative humidity, non-condensing
Storage	5% to 90% relative humidity, non-condensing
<b>Charger</b>	
Type	EasyPack Desktop Charger from RRC
Input voltage	100 to 240V AC 50/60Hz
Input current	Max 0.2A (100V AC)
Surge current	Max 80 A (230 V AC @25°C)
Total weight	122 g
Output voltage	4.2 V DC
Output current	0 to 1.0 A
Output power rating	Max 6 W
Operating temperature	0 to +40°C
Storage temperature	-40 to +70°C

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