

# LUCAS<sup>TM</sup> 2

CHEST COMPRESSION SYSTEM

## INSTRUCTIONS FOR USE

US



**PHYSIO  
CONTROL**

Thank you for choosing the  
**LUCAS™ 2 Chest Compression System!**

With **LUCAS™ 2** your cardiac arrest patients will receive effective, consistent and continuous chest compressions as recommended in the American Heart Association guidelines.

If you have any questions about this product or its operation, please contact your local Physio-Control representative or the manufacturer JOLIFE AB.

#### **MANUFACTURER**

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The LUCAS™ 2 Chest Compression System is manufactured by JOLIFE AB in Sweden and distributed worldwide by Physio-Control, Inc.

**For information on local distribution,  
please visit [www.physio-control.com](http://www.physio-control.com).**

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## 1 Important user information



The information in these Instructions for Use applies to the LUCAS™2 Chest Compression System, also referred to as LUCAS.

All operators must read the complete Instructions for Use before operating the LUCAS Chest Compression System.

The Instructions for Use must always be easily accessible to the operators of LUCAS.

Always follow local and/or international guidelines for cardiopulmonary resuscitation (CPR) when you use LUCAS.

The use of other medical equipment or drugs in conjunction with LUCAS can affect the treatment. Always consult the Instructions for Use for the other equipment and/or drugs to make sure that they are appropriate for use in conjunction with CPR.

LUCAS can only be bought by or on the order of a licensed medical practitioner.

### INSTRUCTIONS FOR USE REVISION HISTORY

Revision A - updated from former edition 100666-00 rev F, to meet IEC 60601-1 3rd edition Medical Electrical Equipment.

### TRADEMARKS

LUCAS™ is a trademark of JOLIFE AB.

### DECLARATION OF CONFORMITY

LUCAS Chest Compression System complies with the requirements of the European Medical Device 93/42/EEC. It is marked with the CE-symbol:

**CE 0434**

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## 2 Introduction

### 2.1 LUCAS™ Chest Compression System

The LUCAS™ Chest Compression System is a portable tool designed to overcome problems identified with manual chest compressions. LUCAS assists rescuers by delivering effective, consistent and continuous chest compressions as recommended in the American Heart Association guidelines<sup>1</sup>.

### 2.2 Intended use

LUCAS Chest Compression System is to be used for performing external cardiac compressions on adult patients who have acute circulatory arrest defined as absence of spontaneous breathing and pulse, and loss of consciousness.

LUCAS must only be used in cases where chest compressions are likely to help the patient.

### 2.3 Contraindications

Do NOT use the LUCAS Chest Compression System in these cases:

- If it is not possible to position LUCAS safely or correctly on the patient's chest.
- Too small patient: If LUCAS alerts with 3 fast signals when lowering the Suction Cup, and you cannot enter the PAUSE mode or ACTIVE mode.
- Too large patient: If you cannot lock the Upper Part of LUCAS to the Back Plate without compressing the patient's chest.

Always follow local and/or international guidelines for CPR when using LUCAS.

### 2.4 Side effects

The International Liaison Committee on Resuscitation (ILCOR) states these side effects of CPR<sup>2</sup>:  
"Rib fractures and other injuries are common but acceptable consequences of CPR given the alternative of death from cardiac arrest. After resuscitation, all patients should be reassessed and re-evaluated for resuscitation-related injuries."

Apart from the above, bruising and soreness of the chest are common during the use of the LUCAS Chest Compression System.

### 2.5 Main parts

The main parts of the LUCAS Chest Compression System include;

- A Back Plate which is positioned underneath the patient as a support for the external chest compressions.
- An Upper Part which contains the proprietary and rechargeable LUCAS Battery and the compression mechanism with the disposable Suction Cup.
- A Stabilization Strap which helps to secure the position of the device in relation to the patient.
- A padded Carrying Bag.

1. 2010 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care, Circulation 2010; 122: S639-946

2. 2005 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations. Resuscitation 2005;67:195

## 2.6 LUCAS™ components



1. User Control Panel
2. Hood
3. Patient Strap\*
4. Release ring
5. Support leg
6. Claw locks
7. Back Plate\*
8. DC input
9. Bellows
10. Suction Cup\*
11. Power Supply
12. Power Supply cord
13. Battery
14. Pressure pad
15. Upper Part
16. Vent holes
17. Car Power Cable
18. Carrying Bag
19. External Battery Charger

### LUCAS Stabilization Strap\*

20. Cushion strap
21. Buckle
22. Support leg strap

\* Applied part (according to IEC 60601-1).



## 2.7 User Control Panel



### ON/OFF:

LUCAS will power up/power down when you push this key for 1 second. When LUCAS powers up, it automatically does a self-test of the functions and the protective system. When the self-test is complete the green LED (Light Emitting Diode) beside the ADJUST key illuminates. This procedure takes approximately 3 seconds.



### ADJUST:

This mode is used when you want to adjust the position of the Suction Cup. When you push this key, you can move the Suction Cup up or down. To adjust the Start Position of the Suction Cup, manually push down the Suction Cup with two fingers onto the chest of the patient.



### PAUSE:

When you push this key, the compression mechanism temporarily stops and is locked in the Start Position. Use this function when you want to stop LUCAS temporarily but still want to keep the Start Position of the Suction Cup.



### ACTIVE (continuous):

When you push this key, LUCAS performs continuous chest compressions. The green LED signal will blink 8 times per minute to alert for ventilation during ongoing compressions.



### ACTIVE (30:2):

When you push this key, LUCAS performs 30 chest compressions and then temporarily stops for 3 seconds. During the stop, the operator can perform 2 ventilations. After the stop the cycle starts again. An intermittent LED in combination with an audible signal sequence will alert the operator before each ventilation pause.



### MUTE:

If you push this key when LUCAS operates, you mute the alarm for 60 seconds. If you push this key when LUCAS is powered OFF, the Battery indicator shows the Battery charge status of the Battery.



### Battery Indicator:

The three green LEDs show the Battery charge status:



- Three green LEDs: Fully charged



- Two green LEDs: 2/3 charged



- One green LED: 1/3 charged



- One intermittent orange LED and alarm during operation: low battery, approximately 10 minutes of operating capacity remaining.



- One intermittent red LED and an alarm signal: the Battery is empty and must be recharged.



- One constant red LED and an alarm signal: the Battery is too hot or empty.



**Note:** When the LED to the far right is orange and not green, the Battery has reached the end of its service life. JOLIFE AB recommends that you replace this Battery with a new one.



### Alarm indicator:

One intermittent red LED and an alarm signal sequence indicate malfunction.

*Refer to Troubleshooting 8;  
8.1 for indications and alerts during normal operation.  
8.3 for malfunction alarms.*



## 3 Safety precautions

To ensure maximum safety, always read this section carefully before operating, carrying out any work on the equipment or making any adjustments.

### 3.1 Signal words

Throughout the manual, signal words are indicated with, "WARNING" or "CAUTION".

- **CAUTION** - signal word used to indicate a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.
- **WARNING** - signal word used to indicate a potentially hazardous situation which, if not avoided, could result in death or serious injury.

### 3.2 Personnel

JOLIFE AB recommends that LUCAS Chest Compression System is only used by persons with medical skills such as: First responders, ambulance personnel, nurses, physicians or medical staff, who have:

- undertaken a CPR course according to the resuscitation guidelines, e.g. American Heart Association, European Council of Resuscitation or equivalent,
- AND received training in how to use LUCAS.

### 3.3 Contraindications

Do NOT use the LUCAS Chest Compression System in these cases:

- If it is not possible to position LUCAS safely or correctly on the patient's chest.
- Too small patient: If LUCAS alerts with 3 fast signals when lowering the Suction Cup, and you cannot enter the PAUSE mode or ACTIVE mode.
- Too large patient: If you cannot lock the Upper Part of LUCAS to the Back Plate without compressing the patient's chest.

Always follow local and/or international guidelines for CPR when using LUCAS.

### 3.4 Side effects

The International Liaison Committee on Resuscitation (ILCOR) states the following side effects of CPR<sup>3</sup>:







"Rib fractures and other injuries are common but acceptable consequences of CPR given the alternative of death from cardiac arrest. After resuscitation, all patients should be reassessed and re-evaluated for resuscitation-related injuries."

The above side effects, as well as bruising and soreness of the chest, are common during use of LUCAS Chest Compression System.






3. 2005 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations. Resuscitation 2005;67:195

3.5 Symbols on the device



Symbol	Meaning
	<b>Caution – keep your fingers away</b> Do not put your hands on or below the Suction Cup when LUCAS operates. Keep your fingers away from the claw locks when attaching the Upper Part or lifting the patient.
	<b>Caution - do not lift by the straps</b> Do not use the straps for lifting. The straps are only to fixate the patient to LUCAS.
	Place the lower edge of the Suction Cup immediately above the end of the sternum, as indicated in the figure. The Suction Cup should be centered over the chest.
	Pull the release rings to remove the Upper Part from the Back Plate.
	Do not reuse - Single use only.
	DC input.

Symbols on type label

Symbol	Meaning
	<b>Follow instructions for use</b> All operators must read the complete Instructions for Use before operating the LUCAS Chest Compression System.
	Year of manufacture and manufacturer.
	Battery and/or electronics may not be disposed in the normal waste stream.
<b>IP 43</b>	Degree of protection provided by enclosure per IEC 60 529.
	DC voltage.
	Defibrillation protected type BF patient connection.
<b>SN</b>	Serial number
<b>TYPE</b>	Variant

### 3.6 General safety precautions

#### **Caution - use only approved accessories**

Use only JOLIFE AB-approved accessories with LUCAS. LUCAS may not operate correctly if you use accessories that are not approved. Use only LUCAS Batteries and the LUCAS Power Supply that are designed for LUCAS. If you use other batteries or power supply you can cause permanent damage to LUCAS. This also voids the warranty.

#### **Caution - liquid**

Do not immerse LUCAS in liquid. The device can be damaged if liquid enters the hood.

#### **WARNING - FIRE**

Do not use LUCAS in oxygen rich environments or in conjunction with flammable agents or with flammable anaesthetics.

#### **Caution - electrical device**

To isolate mains from LUCAS disconnect the mains plug from mains outlet.

#### **Caution - other medical equipment**

LUCAS can affect other medical electrical equipment with regards to EMC (Electromagnetic Compatibility). Take into account the technical information in section 9.9 Electromagnetic environmental declaration.

### 3.7 Battery

#### **WARNING - LOW BATTERY**

When the orange Battery LED shows an intermittent light, do one of these:

- Replace the Battery with one that is charged.
- Connect the external LUCAS Power Supply.

#### **Caution - keep Battery installed**

The Battery must always be installed for LUCAS to be able to operate, also when powered by the external Power Supply.

To minimize interruptions, we recommend to always have a charged spare LUCAS Battery in the Carrying Bag.

### 3.8 Operation

#### **WARNING - UNSATISFACTORY POSITION**

Start manual CPR again if it is not possible to position LUCAS safely and correctly on the patient's chest.

#### **WARNING - INCORRECT POSITION OVER CHEST**

If the pressure pad is not in the correct position in relation to the sternum, there is an increased risk of damage to the rib cage and the internal organs. Also, the patient's blood circulation is compromised.

#### **WARNING - INCORRECT START POSITION**

The patient's blood circulation is compromised if the pressure pad presses down too heavily or too lightly on the chest. Push the **ADJUST** key and adjust the height of the Suction Cup immediately.

#### **WARNING - CHANGED POSITION DURING OPERATION**

If the position of the Suction Cup changes during operation or during defibrillation, immediately push **ADJUST** and adjust the position. Always use the LUCAS Stabilization Strap to help secure the correct position.

#### **Caution - defibrillation electrodes**

Position the defibrillator electrodes and wires so that they are not under the Suction Cup. If there are already electrodes on the patient, make sure that they are not under the Suction Cup. If they are, you must apply new electrodes.

#### **Caution - gel on chest**

If there is gel on the patient's chest (e.g. from ultrasound examination), the position of the Suction Cup can change during use. Remove all gel before you apply the Suction Cup.

#### **Caution - Stabilization Strap application**

Delay the application of the LUCAS Stabilization Strap if this prevents or delays any medical treatment of the patient.

#### **Caution - adjunctive therapies**

The use of other medical equipment or drugs in conjunction with LUCAS can affect the treatment. Always consult the Instructions for Use for the other equipment and/or drugs to make sure that they are appropriate for use in conjunction with CPR.

**WARNING - ECG interference**

Chest compressions interfere with ECG analysis. Push **PAUSE** before you start the ECG analysis. Make the interruption as short as possible. Push **ACTIVE (continuous)** or **ACTIVE (30:2)** to start the compressions again.

**WARNING - ELECTRICAL SHOCK**

If the external Power Supply cord (optional accessory) is damaged, remove and replace it immediately to avoid the risk of electrical shock or fire.

**WARNING - PATIENT INJURY**

Do not let the patient or the device stay unattended when LUCAS operates.

**Caution - keep your fingers away**

Do not put your hands on or below the Suction Cup when LUCAS operates. Keep your fingers away from the claw locks when attaching the Upper Part or lifting the patient.

**Caution - IV access**

Make sure that IV access is not obstructed.

**Caution - do not block the vent holes**

Do not cause a blockage of the vent holes under the hood since this can cause the device to become too hot.

**Caution - device alarms**

If there is any malfunction during operation the red Alarm LED will illuminate and a high priority alarm will be heard. For troubleshooting, *see section 8.3*.

**WARNING - MALFUNCTION**

If there are interruptions, or the compressions are not sufficient, or something unusual occurs during operation: Push **ON/OFF** for 1 second to stop LUCAS and remove the device. Start manual chest compressions.

**Caution - do not lift by the straps**

Do not use the straps for lifting. The straps are only to fixate the patient to LUCAS.

**Caution - skin burns**

The temperatures of the hood and battery may rise above 118 °F / 48 °C. If hot, avoid prolonged contact to prevent skin burns. Remove patient hands from patient straps.

### 3.9 Service

We recommend a yearly servicing of LUCAS to make sure that it operates correctly. Use the original shipping box when you send LUCAS for servicing. Keep the original shipping box with padding for this purpose.

**WARNING - DO NOT OPEN**

Never open the casing of LUCAS. Do not change or modify external or internal parts of LUCAS.

Unless specified differently, all servicing and repairs must be done by service personnel that are approved by JOLIFE AB.

If the above conditions are not followed, this can lead to patient/operator injury or death, and will void the warranty.

Consult your distributor or JOLIFE AB for current information on where to send LUCAS for maintenance.

## 4 First use preparations

### 4.1 Delivered items

LUCAS™2 Chest Compression System is supplied in one box with:

- A LUCAS device (Upper Part and Back Plate)
- 3 disposable LUCAS Suction Cups
- A LUCAS Carrying Bag
- Instructions for Use in the relevant language version
- A rechargeable LUCAS Battery
- A LUCAS Stabilization Strap
- LUCAS Patient Straps

Accessories (optional):

- Disposable LUCAS Suction Cups
- External LUCAS Battery Charger
- Extra LUCAS Batteries
- LUCAS Power Supply with Mains cord
- LUCAS 12-28V DC Car Power Cable

*For more accessories, please see appendix A: LUCAS™2 parts and accessories.*

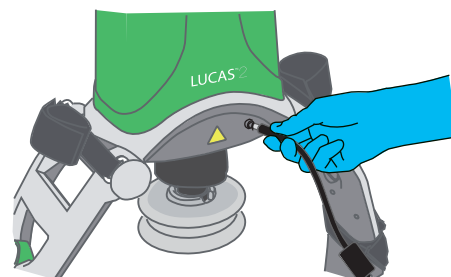
### 4.2 The Battery

The proprietary Lithium Polymer (LiPo) Battery is the exclusive power source for LUCAS. You can remove the Battery from LUCAS and recharge it. The Battery is mechanically keyed in LUCAS and in the Battery Charger to make sure you get the correct installation. The top of the Battery has connections for power and communications to the Battery Charger and to LUCAS.

#### 4.2.1 Charge the Battery

You can charge the LUCAS Battery in two ways:

- In the external LUCAS Battery Charger (optional)
  - put the Battery in the slot of the Battery Charger,
  - connect the Battery Charger power cord to the mains wall outlet.
- Installed in LUCAS:
  - put the Battery in the slot of the hood of LUCAS,
  - connect the Power Supply to the DC input on the side of LUCAS,
  - connect the Power Supply to the mains wall outlet.



Three green LEDs indicate a fully charged Battery.

#### Caution - keep Battery installed

The Battery must always be installed for LUCAS to be able to operate, also when powered by the external Power Supply.

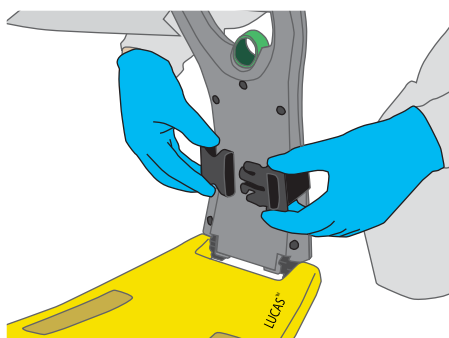
#### Caution - use only approved accessories

Use only JOLIFE AB-approved accessories with LUCAS. LUCAS does not operate correctly if you use accessories that are not approved. Use only LUCAS Batteries and the LUCAS Power Supply that are designed for LUCAS. If you use other batteries or Power Supply you can cause permanent damage to LUCAS. This also voids the warranty.

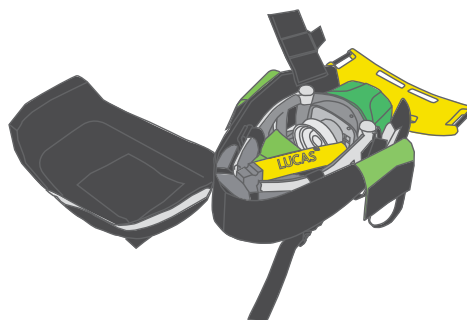
### 4.3 Prepare the LUCAS™ Stabilization Strap

Before the first use of LUCAS, attach the support leg straps, which is a part of the Stabilization Strap, to the LUCAS support legs.

1. Fold one support leg strap around each LUCAS support leg.
2. Fasten the buckles on the inner side of the support leg.



### 4.4 Prepare the Carrying Bag

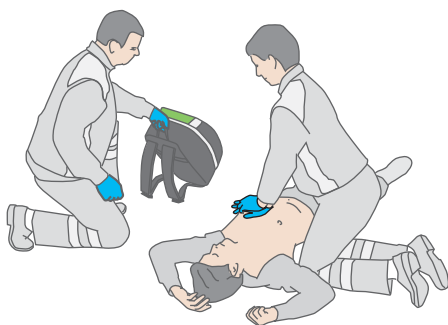


1. Insert a fully charged LUCAS Battery in the Battery slot in the hood of LUCAS.
2. Make sure that a Suction Cup is mounted correctly.
3. Put the Upper Part in the Carrying Bag with the hood towards the open end.
4. Put the external Power Supply (optional) in one of the pockets between the LUCAS support legs.
5. Put an extra (optional) charged LUCAS Battery in the other pocket.
6. Put the cushion strap of the Stabilization Strap between the support legs.
7. Extra Suction Cups can be put in the side pockets close to the hood.
8. Position the Back Plate on top of the bag.
9. Close the green inner lock.
10. Put the Instructions for Use (IFU) in the transparent IFU pocket in the bag
11. Close the bag.

## 5 Use LUCAS™

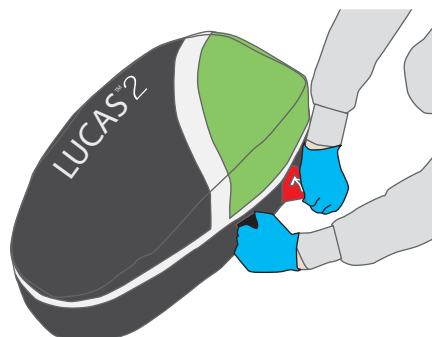
### 5.1 Arrival at the patient

When you have confirmed a cardiac arrest, immediately start manual cardiopulmonary resuscitation (CPR). Continue with a minimum of interruptions.

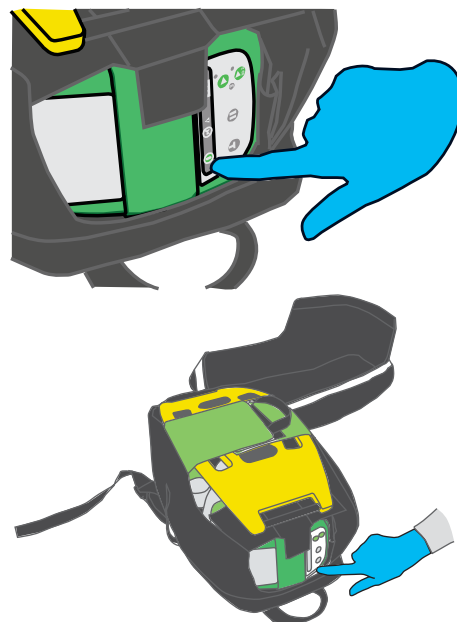


### 5.2 Unpack LUCAS™

1. Position the bag with its top nearest to you.
2. Put your left hand on the black strap on the left side and pull the red handle so that the bag unfolds.



3. Push **ON/OFF** on the User Control Panel for 1 second to power up LUCAS in the bag and start the self test. The green LED adjacent to the **ADJUST** key illuminates when LUCAS is ready for use.



**Note:** LUCAS powers down automatically after 5 minutes if you let it stay in the **ADJUST** mode.

#### **Caution - device alarms**

If there is any malfunction during operation the red Alarm LED will illuminate and a high priority alarm will be heard. For troubleshooting, *refer to section 8.3.*

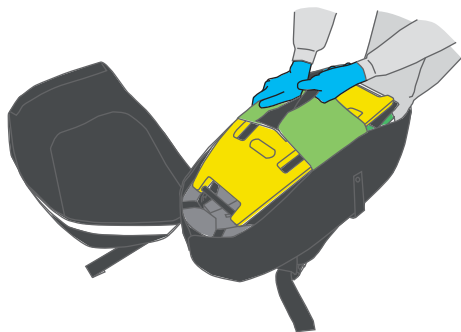
#### **Caution - keep Battery installed**

The Battery must always be installed for LUCAS to be able to operate, also when powered by the external Power Supply.

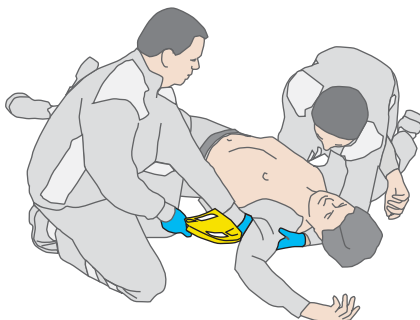


### 5.3 Apply to patient

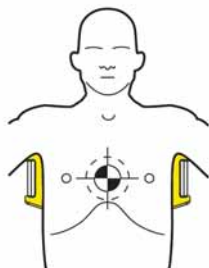
1. Remove the LUCAS Back Plate from the Carrying Bag.



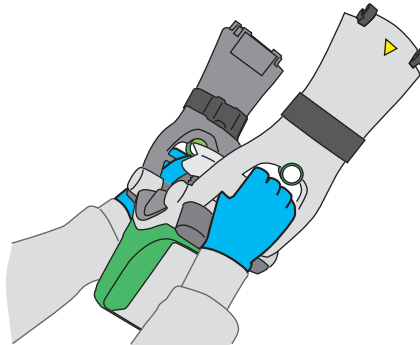
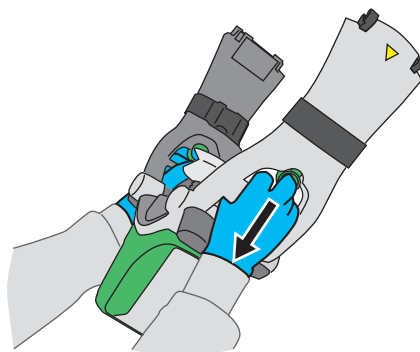
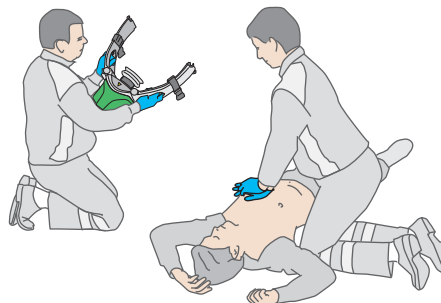
2. Stop manual CPR.
3. Make sure that you support the patient's head.
4. Carefully put the LUCAS Back Plate under the patient, immediately below the arm pits. Use one of these procedures:
  - a. Hold the patient's shoulder and lift the patient's upper body a small distance,
  - b. Roll the patient from side to side.



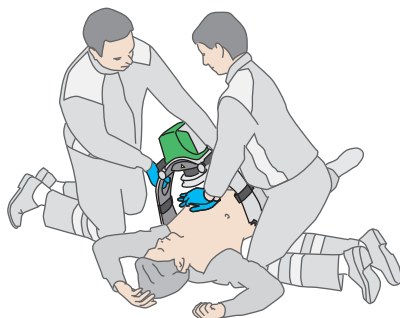
**Note:** An accurate position of the Back Plate makes it easier and faster to position the Suction Cup correctly.



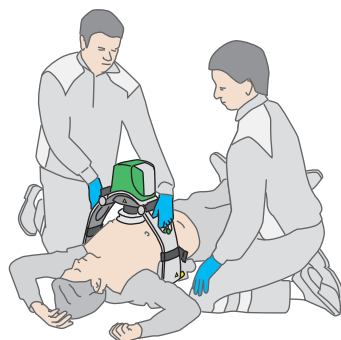
5. Start manual CPR again.
6. Hold the handles on the support legs to remove the LUCAS Upper Part from the bag. Pull the release rings once to make sure that the claw locks are open.
7. Let go of the release rings.



8. Attach the support leg that is nearest to you to the Back Plate.



9. Stop manual CPR.
10. Attach the other support leg to the Back Plate, so that the two support legs lock against the Back Plate. Listen for click.
11. Pull up once to make sure that the parts are correctly attached.



**Note:** If the LUCAS Upper Part does not attach to the Back Plate, make sure that the claw locks are open and that you have released the release rings.

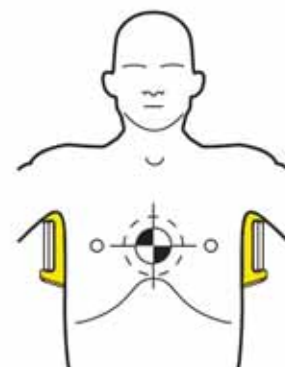
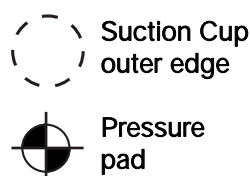
**WARNING - TOO LARGE PATIENT**

If the patient is too large, the Upper Part of LUCAS cannot lock to the Back Plate without compressing the patient's chest. Continue the manual compressions.

## 5.4 Adjustment and operation

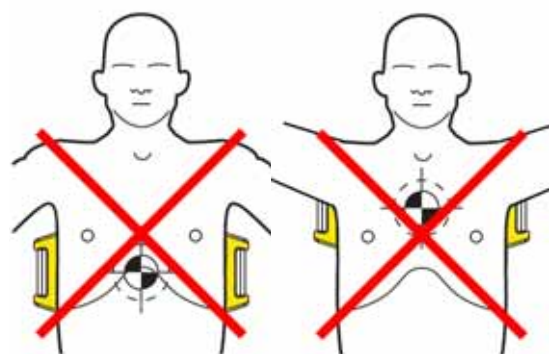
The compression point should be at the same spot as for manual CPR and according to guidelines.

When the pressure pad in the Suction Cup is in the correct position, **the lower edge of the Suction Cup is immediately above the end of the sternum.**

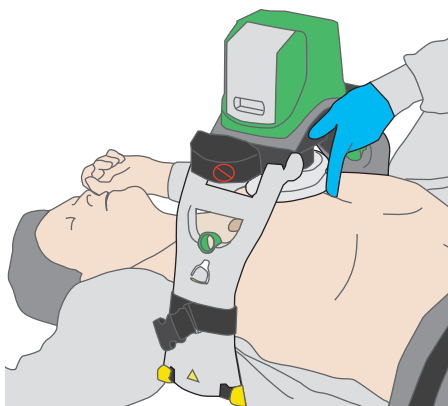


**WARNING - INCORRECT POSITION OVER CHEST**

If the pressure pad is not in the correct position in relation to the sternum, there is an increased risk of damage to the rib cage and the internal organs. Also, the patient's blood circulation is compromised.



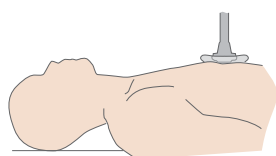
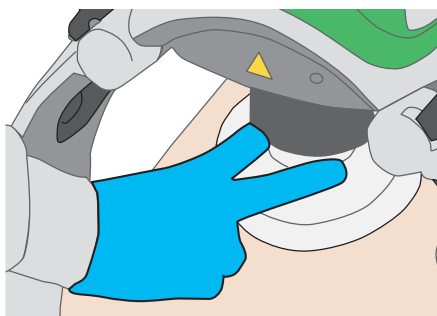
1. Use your finger to make sure that the lower edge of the Suction Cup is immediately above the end of the sternum



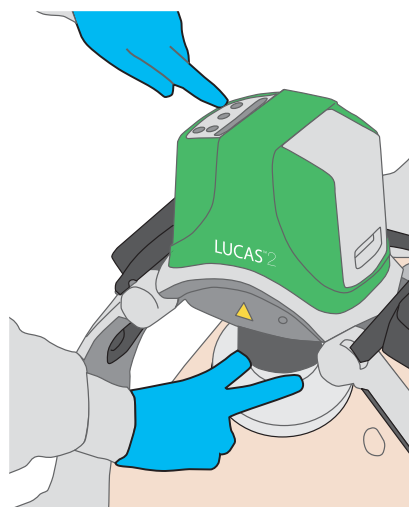
If necessary, move the device by pulling the support legs to adjust the position.



2. Adjust the height of the Suction Cup to set the Start Position.
  - a. Make sure that LUCAS is in the **ADJUST** mode.
  - b. Push the Suction Cup down with two fingers until the pressure pad touches the patient's chest without compressing the chest.



- c. Push **PAUSE** to lock the Start Position - then remove your fingers from the Suction Cup.



- d. Check for proper position. If not, push **ADJUST**, pull up the Suction Cup to readjust the central and/or height position for a new Start Position. Push **PAUSE**.
- e. Push **ACTIVE (continuous)** OR **ACTIVE (30:2)** to start the compressions.

**Note:** If the pressure pad is pushed down too hard, or too loose to the chest, LUCAS will adjust the pressure pad to the correct Start Position (within a range of 30 mm / 1.2 inches).

#### **WARNING - UNSATISFACTORY POSITION**

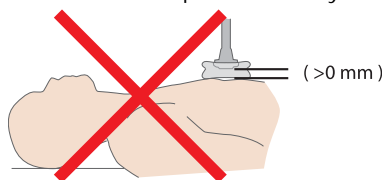
Start manual CPR again if it is not possible to position LUCAS safely and correctly on the patient's chest.

#### **WARNING - TOO SMALL PATIENT**

If LUCAS alerts with 3 fast signals when lowering the Suction Cup, and you cannot enter the PAUSE mode or ACTIVE mode. Start manual compressions again.

### **WARNING - INCORRECT START POSITION**

The patient's blood circulation is compromised if the pressure pad presses down too heavily or too lightly on the chest. Push the **ADJUST** key and adjust the height of the Suction Cup immediately.



### **Caution - gel on chest**

If there is gel on the patient's chest (e.g. from ultrasound examination), the position of the Suction Cup can change during operation. Remove all gel before you apply the Suction Cup.

### **Caution - keep your fingers away**

Do not put your hands or other body parts on or below the Suction Cup when LUCAS operates. Do not touch the claw locks, especially when you lift the patient.

### **WARNING - PATIENT INJURY**

Do not let the patient or the device stay unattended when LUCAS operates.

### **WARNING - CHANGED POSITION DURING OPERATION**

If the position of the Suction Cup changes during operation or during defibrillation, immediately push **ADJUST** and adjust the position. Always use the LUCAS Stabilization Strap to help secure the correct position.

### **WARNING - MALFUNCTION**

If there are interruptions, or the compressions are not sufficient, or something unusual occurs during operation: Push **ON/OFF** for 1 second to stop LUCAS and remove the device. Start manual chest compressions.

### **WARNING - LOW BATTERY**

When the orange Battery LED shows an intermittent light, do one of these:

- Replace the Battery with one that is charged.
- Connect the external LUCAS Power Supply.

### **Caution - do not block the vent holes**

Do not cause a blockage of the vent holes under the hood since this can cause the device to become too hot.

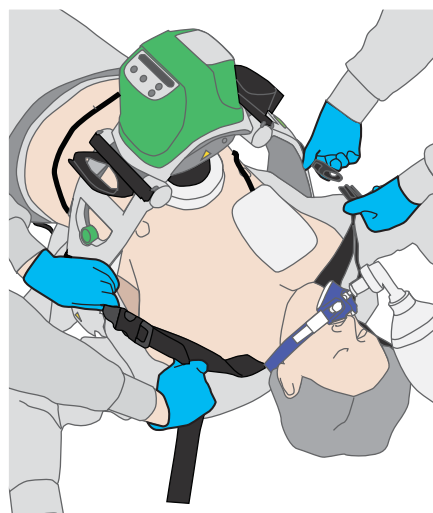
## **5.5 Apply the LUCAS™ Stabilization Strap**

The LUCAS Stabilization Strap helps secure the correct position during operation. Apply it while LUCAS is active to keep interruptions to a minimum.

### **Caution - Stabilization Strap application**

Delay the application of the LUCAS Stabilization Strap if this prevents or delays any medical treatment of the patient.

1. Remove the cushion strap, which is a part of the Stabilization Strap, from the Carrying Bag (the support legs strap of the Stabilization Strap should already be attached to the support legs).
2. Extend the cushion strap fully at the buckles.
3. Carefully lift the patient's head and put the cushion behind the patient's neck. Position the cushion as near the patient's shoulders as possible.
4. Connect the buckles on the support leg straps with the buckles on the cushion strap. Make sure that the straps are not twisted.
5. Hold the LUCAS support legs stable and tighten the cushion strap tightly.



6. Make sure that the position of the Suction Cup is correct on the patient's chest.

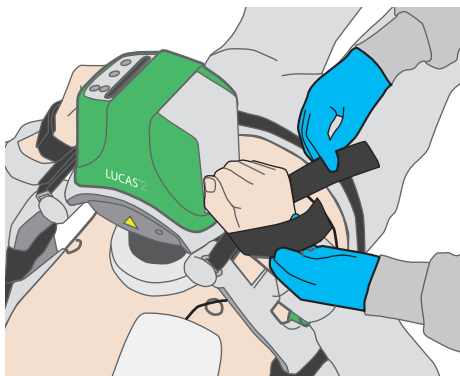
If it is not, adjust the position:

- a. Push **ADJUST**.
- b. Release the cushion straps from the support leg straps.
- c. Adjust the Suction Cup position (as described in the *section 5.4.2*).
- d. When the Suction Cup is in the correct position, push **ACTIVE (continuous)** or **ACTIVE (30:2)** to start the compressions again.
- e. Attach the cushion strap again. *Refer to the steps 2 to 5 above.*

## 5.6 Move the patient

### 5.6.1 Secure the patient's arms

When you move the patient, you can secure the patient's arms with the Patient Straps on the LUCAS. This makes it easier to move the patient.



#### Caution - do not lift by the straps

Do not use the straps for lifting. The straps are only to fixate the patient to LUCAS.

#### Caution - IV access

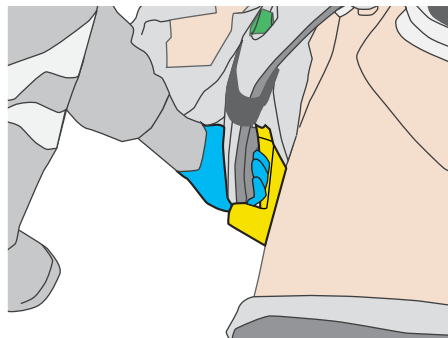
Make sure that IV access is not obstructed.

#### Caution - skin burns

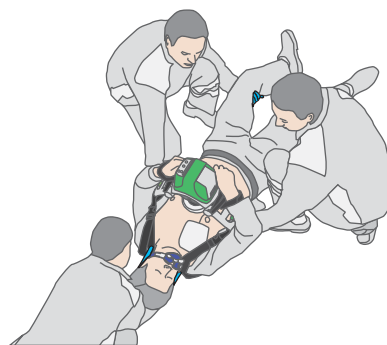
The temperatures of the hood and battery may rise above 118 °F / 48 °C. If hot, avoid prolonged contact to prevent skin burns. Remove patient hands from patient straps.

### 5.6.2 Prepare to lift the patient

1. Make a decision about what equipment you will move and where to put the transportation device.
2. Those at the patient's side:
  - a. put one hand below the claw locks under the support leg



- b. with the other hand, hold the patient's belt, trousers or under the thigh
3. Make sure that the patient's head is stable.



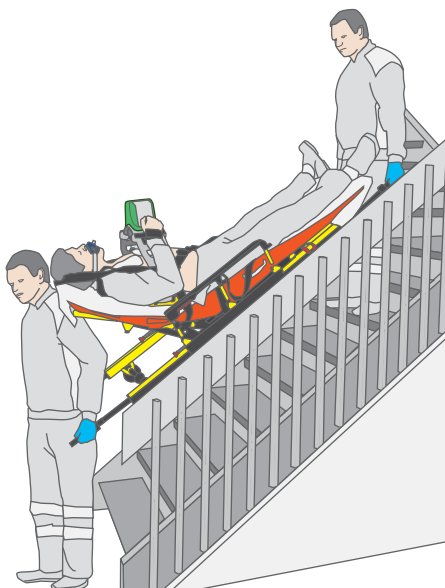
### 5.6.3 Lift the patient

1. Push **PAUSE** to temporarily stop the compressions.
2. Lift and move the patient to a stretcher or other transportation device (backboard, vacuum mattress or similar).
3. Make sure that the Suction Cup is in the correct position on the patient's chest.
4. Push **ACTIVE (continuous)** or **ACTIVE (30:2)** to start the compressions again.

### 5.6.4 Move the patient

LUCAS can be active while you move the patient if:

- LUCAS and the patient are safely positioned on the transportation device
- LUCAS stays in the correct position and angle on the patient's chest



If necessary, adjust the position of the Suction Cup.

#### **WARNING - CHANGED POSITION DURING OPERATION**

If the position of the Suction Cup changes during operation or during defibrillation, immediately push **ADJUST** and adjust the position. Always use the LUCAS Stabilization Strap to help secure the correct position.

### 5.7 Replace the Power Supply during operation

When the Battery charge is low, LUCAS alarms with an intermittent orange LED and an alarm signal.



### 5.7.1 Change the Battery

Keep interruptions to a minimum while changing the Battery.

**Note:** To minimize interruptions, we recommend to always have a charged spare LUCAS Battery in the Carrying Bag.

1. Push **PAUSE** to temporarily stop the compressions.
2. Pull the Battery out and then upwards to remove it.



3. Install a fully-charged LUCAS Battery. Put it in from above.
4. Wait until the green PAUSE mode LED illuminates.
5. Push **ACTIVE (continuous)** or **ACTIVE (30:2)** to start the chest compressions again. The LUCAS Smart Restart feature remembers the settings and Start Position for 60 seconds.

**Note:** If the Battery change takes more than 60 seconds, LUCAS does a self test and you must adjust the Start Position again.



### 5.7.2 Connect to the external Power Supply

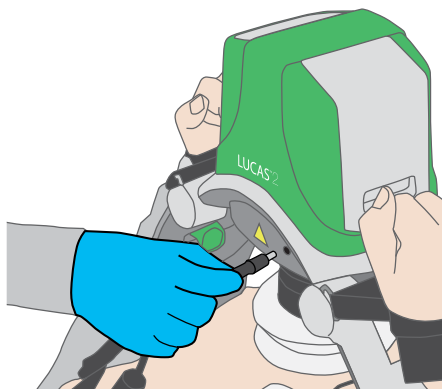
You can connect the LUCAS Power Supply or Car Power Cable in all LUCAS operating modes.

#### Caution - keep Battery installed

The Battery must always be installed for LUCAS to be able to operate, also when powered by the external Power Supply.

To use the Power Supply cable:

- Connect the Power Supply cable to LUCAS.



- Connect the mains cable to the wall mains outlet (100-240V, 50/60Hz)

To use the Car Power Cable:

- Connect the Car Power Cable to LUCAS
- Connect the Car Power Cable to the car outlet (12-28VDC)

## 5.8 Adjunctive therapies

#### Caution - adjunctive therapies

The use of other medical equipment or drugs in conjunction with LUCAS can affect the treatment. Always consult the instructions for use for the other equipment and/or drugs to make sure that they are applicable in conjunction with CPR.

### 5.8.1 Defibrillation

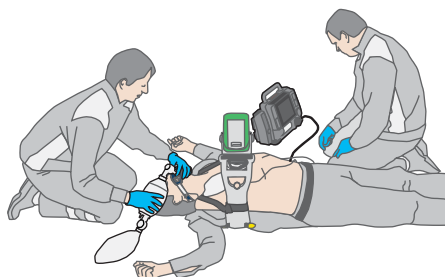
Defibrillation can be performed while LUCAS operates.

1. You can apply the defibrillation electrodes before or after LUCAS has been put in position.
2. Perform the defibrillation according to the instructions from the manufacturer of the defibrillator.

#### Caution - defibrillation electrodes

Position the defibrillation electrodes and wires so that they are not under the Suction Cup. If there are already electrodes on the patient, make sure that they are not under the Suction Cup. If they are, you must apply new electrodes.

3. After defibrillation, make sure that the position of the Suction Cup is correct. If necessary, adjust the position.



#### WARNING - CHANGED POSITION DURING OPERATION

If the position of the Suction Cup changes during operation or during defibrillation, immediately push **ADJUST** and adjust the position. Always use the LUCAS Stabilization Strap to help secure the correct position.

#### WARNING - ECG INTERFERENCE

Chest compressions interfere with ECG analysis. Push **PAUSE** before you start the ECG analysis. Make the interruption as short as possible. Push **ACTIVE (continuous)** or **ACTIVE (30:2)** to start the compressions again.



### 5.8.2 Ventilation

Always follow local and/or international guidelines for ventilation.

LUCAS can operate in two different modes:

- **ACTIVE (continuous)**  
When you push this key LUCAS performs continuous compressions. The green LED signal will blink 8 times per minute to alert for ventilation during ongoing compressions.
- **ACTIVE (30:2)**  
When you push this key, LUCAS performs 30 chest compressions and then temporarily stops for 3 seconds. During the stop, the operator can perform 2 ventilations. After the stop the cycle starts again. An intermittent LED in combination with an audible signal sequence will alert the operator before each ventilation pause.

### 5.8.3 Use in the catheterization laboratory

LUCAS can be used in the catheterization laboratory. Except for the compression mechanism it is mainly radiotranslucent and allows for most X-ray projections.

## 5.9 Remove LUCAS™ from the patient

1. Push **ON/OFF** for 1 second to power off the device.
2. If a LUCAS Stabilization Strap is attached to LUCAS, remove the cushion strap, which is part of the Stabilization Strap, from the support leg straps.
3. Pull the release rings to remove the Upper Part from the Back Plate.
4. If the patient's condition allows it, remove the Back Plate.

## 6 Care after use and preparation for next use

Do the following after each use of the LUCAS Chest Compression System:

1. Remove the Suction Cup (*refer to section 6.2*).
2. If necessary, remove and clean the Patient Straps and the Stabilization Strap separately (*refer to section 6.1 and 6.3*).
3. Clean the device and let it dry (*refer to section 6.1*).

Preparation for next use:

4. Replace the used Battery with a fully charged Battery in the battery slot in the hood.
5. Mount a new Suction Cup.
6. Attach the Patient Straps again, if they are removed.
7. Attach the support leg straps of the LUCAS Stabilization Strap again, if they are removed.
8. Pack the device into the Carrying Bag:
  - Put the Upper Part in the Carrying Bag with the hood towards the open end.
  - Put the external Power Supply (optional) in one of the pockets between the LUCAS support legs.
  - Put an extra (optional) charged LUCAS Battery in the other pocket.
  - Put the cushion strap of the Stabilization Strap between the support legs.
  - Extra Suction Cups can be put in the side pockets near the hood.
  - Position the Back Plate on top of the bag.
  - Close the green inner lock.
  - Put the Instructions for Use (IFU) in the transparent IFU pocket in the bag.
9. Close the bag.

Do routine checks weekly and after each use (*refer to the maintenance section*).

## 6.1 Cleaning routines

Clean all surfaces and straps with a soft cloth and warm water with a mild cleaning agent or disinfectant agent, e.g.

- 70% isopropyl alcohol solution
- 45% isopropyl alcohol with added detergent
- Quaternary ammonium compound
- 10% bleach

Follow the handling instructions from the manufacturer of the disinfectant.

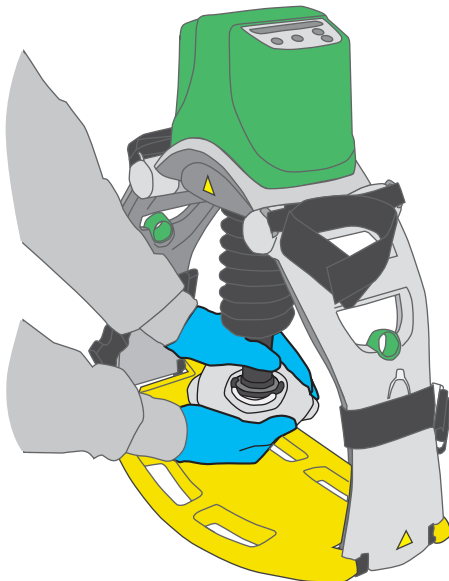
### Caution - liquid

Do not immerse LUCAS in liquid. The device can be damaged if liquid enters the hood.

Allow LUCAS to dry before you pack it into the bag.

## 6.2 Remove and install the Suction Cup

- Pull the Suction Cup off the black mounting tube.
- Discard the Suction Cup as contaminated medical waste.
- Bend a new Suction Cup onto the black mounting tube.
- Make sure the Suction Cup is safely attached on the mounting tube.



## 6.3 Remove and attach the Patient Straps

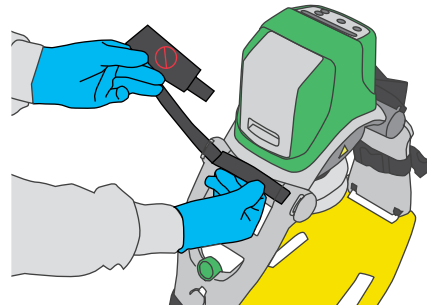
Remove:

1. Open the Patient Straps and pull them out from the metal rings on the LUCAS support legs.

*Clean according to 6.1.*

Install:

1. Thread the Patient Straps through the metal holder on the LUCAS support legs.
2. Fold the Patient Strap so that the symbol is visible.
3. Press the strap parts firmly together.



## 6.4 Remove and attach the LUCAS™ Stabilization Strap

Remove the Support leg straps, which is a part of the Stabilization Strap, by opening the buckles.

*Clean the Stabilization Strap according to 6.1.*

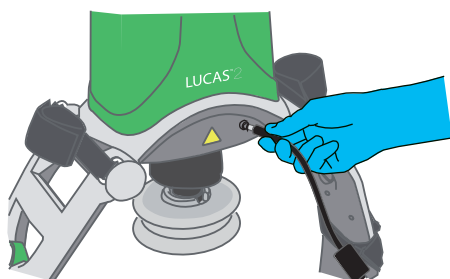
*Install according to 4.3.*

## 6.5 Remove and recharge the Battery

1. Replace the Battery with a fully charged one.
2. Recharge the used Battery for future use.

You can charge the LUCAS Battery in two ways:

- In the external LUCAS Battery Charger (optional)
  - put the Battery in the slot of the Battery Charger,
  - connect the Battery Charger power cord to the mains wall outlet.
- Installed in LUCAS:
  - put the Battery in the slot of the hood of LUCAS,
  - connect the Power Supply/Car Power Cable to the DC input on the side of LUCAS,
  - connect the Power Supply to the mains wall outlet.



Green LEDs indicate a fully charged Battery.

### Caution - keep Battery installed

The Battery must always be installed for LUCAS to be able to operate, also when powered by the external Power Supply.

### Caution - use only approved accessories

Use only JOLIFE AB-approved accessories with LUCAS. LUCAS does not operate correctly if you use accessories that are not approved. Use only LUCAS Batteries and the LUCAS Power Supply that are designed for LUCAS. If you use other batteries or Power Supply you can cause permanent damage to LUCAS. This also voids the warranty.

## 7 Maintenance

### 7.1 Routine checks

Weekly, and after each use of the LUCAS Chest Compression System, do the following:

1. Make sure that the device is clean.
2. Make sure that a new Suction Cup is installed.
3. Make sure that the Patient Straps are attached.
4. Make sure that the two support leg straps of the Stabilization Strap are attached around the support legs.
5. Pull the release rings upwards to make sure that the claw locks are open.
6. Make sure that the Battery is fully charged. When LUCAS is in the OFF mode, push **MUTE**. The Battery indicator illuminates and shows the Battery charge status (*see section 8.1*).
7. Push **ON/OFF** to make LUCAS do a self test. Make sure the **ADJUST LED** illuminates with no alarm or warning LED.
8. Push **ON/OFF** to power down LUCAS again.
9. Make sure that the external Power Supply cord (optional accessory) is not damaged.










### WARNING - ELECTRICAL SHOCK






If the external Power Supply cord (optional accessory) is damaged, remove and replace it immediately to avoid the risk of electrical shock or fire.

## 8 Troubleshooting

### 8.1 Indications and alerts during normal operation









Refer to the table below to find the reason for sound and/or LED alarms during normal operation.

Situation	Visual LED indication	Audible signals	User action
LUCAS is in the ON mode and there is more than 90% Battery capacity remaining.	 Fully charged Battery: All 3 green Battery indication LEDs show a constant light.	None	None
LUCAS is in the ON mode and there is more than 60% and less than 90% Battery capacity remaining.	 2/3 charged Battery: The 2 green Battery indication LEDs to the right show a constant light.	None	None
LUCAS is in the ON mode and there is more than 30% and less than 60% Battery capacity remaining.	 1/3 charged Battery: The green Battery indication LED farthest to the right shows a constant light.	None	None
LUCAS is in the ON mode and there is less than 30% Battery capacity remaining (approximately 10 minutes of operating capacity).	 Low Battery: The orange Battery indication LED farthest to the right illuminates intermittently.	Medium priority alarm ■ ■ ■ (5s) ■ ■ ■ (5s) ...	Replace the Battery or connect to the external power supply.
An external LUCAS Power Supply is connected and charging the Battery.	 Charging Battery: The 3 green Battery indication LEDs show a "running" light.	None	None
An external LUCAS Power Supply is connected and the Battery is fully charged.	 Fully charged Battery: All 3 green Battery indication LEDs show a constant light.	None	None
The Battery has been used more than 200 times with compressions of more than 10 minutes each or is older than 3 years.	 End of Battery service life: The Battery indication LED farthest to the right shows orange light instead of green, in all the above situations.	None	Dispose of Battery.
In the ADJUST mode.	 The ADJUST LED shows a green light.	None	None
In the PAUSE mode.	 The PAUSE LED shows a green light.	None	None

Situation	Visual LED indication	Audible signals	User action
In the ACTIVE (continuous) mode	 The ACTIVE (continuous) key, LUCAS performs continuous chest compressions. The green LED signal will blink 8 times per minute	None	This is to alert for ventilation during ongoing compressions.
In the ACTIVE (30:2) mode	 The ACTIVE (30:2) LED shows a green light with an intermittent LED during compressions number 26, 27, 28, 29 and 30.	Audible signal during compressions 	This is to alert the operator to ventilate the patient when LUCAS temporarily stops the compressions at number 30.
When the Suction Cup is in a lower position than for the minimum patient (sternum height below 6.7 inches / 17 cm) and you cannot enter the PAUSE mode or ACTIVE mode, the patient is too small.	None	3 fast signals  (0.25s)	Continue with manual compressions.
Too large gap between the pressure pad and the patient's chest during operation. The patient will get too shallow compressions.	None	3 fast signals during operation  (0.6s)	Push ADJUST and readjust the Start Position to eliminate the gap. Restart the compressions.

## 8.2 Battery replacement and Smart Restart feature








If you change the Battery quickly in 60 seconds or less, with LUCAS in the ON mode, the LUCAS Smart Restart feature remembers the settings and Start Position according to the table below. If the Battery change takes more than 60 seconds, LUCAS does a self test and you must adjust the Start Position again.

Mode when you remove the Battery	Mode when the new Battery is in place again
PAUSE 	PAUSE (with the same Start Position) 
ACTIVE (continuous) 	PAUSE (with the same Start Position) 
ACTIVE (30:2) 	PAUSE (with the same Start Position) 
ADJUST 	ADJUST 
OFF	OFF

### 8.3 Malfunction alarms

Below is a list of all alarms that can occur on LUCAS. You mute all alarms for 60 seconds if you push **MUTE**.

Start with manual compressions immediately if LUCAS does not operate properly.

Priority	Reason	Visual LED indication	Audible alarms	Result
N/A	Rising temperature in LUCAS	None	Information Signal ■ (4s) ■ (4s) ...	None
High Priority	Compression pattern outside limit (too deep, too shallow or timing failure)	 Intermittent red alarm LED	High Priority Alarm ■ ■ ■ (..) ■ ■ ■ (...) ■ ■ ■ (..) ■ ■ ■ (2.5s) ■ ■ ■ (..) ■ ■ ■ (...) ■ ■ ■ (..) ■ ■ ■ (2.5s) LATCHING ALARM SIGNAL	Compressions stop
High Priority	Too high temperature in LUCAS	 Intermittent red alarm LED	High Priority Alarm ■ ■ ■ (..) ■ ■ ■ (...) ■ ■ ■ (..) ■ ■ ■ (2.5s) ■ ■ ■ (..) ■ ■ ■ (...) ■ ■ ■ (..) ■ ■ ■ (2.5s) LATCHING ALARM SIGNAL	Compressions stop
High Priority	Hardware error	 Intermittent red alarm LED	High Priority Alarm ■ ■ ■ (..) ■ ■ ■ (...) ■ ■ ■ (..) ■ ■ ■ (2.5s) ■ ■ ■ (..) ■ ■ ■ (...) ■ ■ ■ (..) ■ ■ ■ (2.5s) LATCHING ALARM SIGNAL	Compressions stop
High Priority	Too high Battery temperature	  Red Battery alarm: The red Battery Indication LED farthest to the right lit intermittently.	High Priority Alarm ■ ■ ■ (..) ■ ■ ■ (...) ■ ■ ■ (..) ■ ■ ■ (2.5s) ■ ■ ■ (..) ■ ■ ■ (...) ■ ■ ■ (..) ■ ■ ■ (2.5s) LATCHING ALARM SIGNAL	Compressions stop
High Priority	Battery charge too low	  Red Battery alarm: The red Battery Indication LED farthest to the right lit intermittently.	High Priority Alarm ■ ■ ■ (..) ■ ■ ■ (...) ■ ■ ■ (..) ■ ■ ■ (2.5s) ■ ■ ■ (..) ■ ■ ■ (...) ■ ■ ■ (..) ■ ■ ■ (2.5s) LATCHING ALARM SIGNAL	Compressions stop. The Battery must be recharged.

If the malfunction described above seems permanent, LUCAS must be examined by approved service personnel. Please consult your local Physio-Control representative. Contact information is available at [www.physio-control.com](http://www.physio-control.com).

## 9 Technical specifications

All specifications in this chapter apply to the LUCAS™2 Chest Compression System.

### 9.1 Patient parameters

Category	Specifications
Patients eligible for treatment:	Adult patients who fit into the device; <ul style="list-style-type: none"> <li>• sternum height of 6.7 to 11.9 inches / 170 to 303 mm</li> <li>• a maximum chest width of 17.7 inches / 449 mm</li> </ul> The use of LUCAS is not restricted by patient weight.

### 9.2 Compression parameters

Category	Specifications
Compression depth (nominal patient)	Patients with sternum height over 7.3 inches / 185 mm: <ul style="list-style-type: none"> <li>• 2.1 ±0.1 inches / 53 ±2 mm</li> </ul> Smaller patients with sternum height less than 7.3 inches / 185 mm: <ul style="list-style-type: none"> <li>• 1.5 to 2.1 inches / 40 to 53 mm</li> </ul>
Compression frequency	102 ±2 compressions per minute
Compression duty cycle	50 ± 5%
Compression modes (operator selectable)	<ul style="list-style-type: none"> <li>• 30:2 (30 compressions followed by a 3 seconds ventilation pause)</li> <li>• Continuous compressions</li> </ul>

### 9.3 Device physical specifications

Category	Specifications
Dimensions when assembled (H × W × D)	22.4 x 20.5 x 9.4 inches / 57 × 52 × 24 cm
Dimensions Carrying Bag with device inside (H × W × D)	25.6 x 13 x 9.8 inches / 65 × 33 × 25 cm
Weight of the device with the Battery	17.2 lbs / 7.8 kg

### 9.4 Device environmental specifications

Category	Specifications
Operating temperature	+32°F to +104°F / +0°C to +40°C - 4°F / -20°C for 1 hour after storage at room temperature
Storage temperature	-4°F to +158°F / -20°C to +70°C
Relative humidity	5% to 98%, non-condensing
IP classification (IEC60529)	IP 43
Operating input voltage	12-28 V DC
Atmospheric pressure	69 - 107 kPa, -1253 to 10 000 ft (-382 to 3048 m)

#### Recycling Information

Do not dispose of this product or its batteries in the unsorted municipal waste stream. Dispose of this product according to local regulations.



## 9.5 Battery physical specifications

Category	Specifications
Size (H × W × D)	5.1 x 3.5 x 2.2 inches / 13.0 × 8.8 × 5.7 cm
Weight	1.3 lbs / 0.6 kg
Type	Rechargeable Lithium Ion Polymer (LiPo)
Capacity	3300 mAh (typical), 86 Wh
Battery voltage (nominal)	25.9 V
Initial Battery runtime (nominal patient)	45 minutes (typical)
Maximum Battery charge time	Less than 4 hours at room temperature (72°F / 22°C)
Required interval for replacement of the Battery	Recommendation to replace the Battery every 3 years or after 200 uses (of more than 10 minutes use each time)

## 9.6 Battery environmental specifications

Category	Specifications
Operating temperature	32°F to 104°F / 0°C to +40°C, ambient when installed in the device
Charge temperature	41°F to 95°F / 5°C to +35°C ambient (68°F to 77°F / 20°C to 25°C preferred)
Storage temperature	32°F to 104°F / 0°C to +40°C ambient for less than six months
IP classification (IEC60529)	IP 44

## 9.7 Power supply specification (optional accessory)

Model - MVB100024A

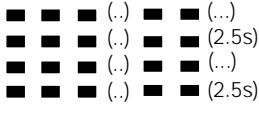
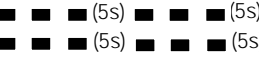
Category	Specifications
Input	100-240VAC, 50/60Hz, 2.3A
Output	24VDC, 4.2A

Model - MWA150028B

Category	Specifications
Input	100-240 VAC, 50/60Hz, 2A
Output	28VDC, 5.4A

## 9.8 Audible SIGNALS

### 9.8.1 Audible ALARM SIGNALS, characteristics

Audible signal name	Sequence of tones	Durations +/- 5ms	Tone frequency +/- 10 Hz	Sound level (dB@1m) +/- 5dB	Situations	System delays +/-0.5s	Result
High priority alarm	 LATCHING ALARM SIGNAL	$t_d = 200\text{ms}$ $t_s = 100\text{ms}$ $t_{s3-4} = 400\text{ms}$ $t_{s5-6} = 500\text{ms}$ $t_{s8-9} = 400\text{ms}$ $t_b = 2.5\text{s}$	$f_0 = 530\text{ Hz}$ $f_1 = 1060\text{ Hz}$ $f_2 = 1590\text{ Hz}$ $f_3 = 2120\text{ Hz}$ $f_4 = 2650\text{ Hz}$	85	Self-test error during start up.	1 to 10s	Inoperable device
					Compression pattern outside limit, too deep	0.6s	Compressions stop
					Compression pattern outside limit, too shallow or timing failure	30s	
					Too high temperature in LUCAS	0.6s	
					Internal hardware error	0.6s	Compressions stop
					Too high Battery temperature	0.6s	
					Too low Battery charge	0.6s	
Medium priority alarm	 NON-LATCHING ALARM SIGNAL	$t_d = 200\text{ms}$ $t_s = 200\text{ms}$ $t_b = 5\text{s}$	$f_0 = 390\text{ Hz}$ $f_1 = 780\text{ Hz}$ $f_2 = 1170\text{ Hz}$ $f_3 = 1560\text{ Hz}$ $f_4 = 1950\text{ Hz}$	82	Approximately 10 minutes remaining operating time until empty Battery  Required action: Replace Battery or connect external Power Supply	0.6s	The orange Battery indication LED farthest to the right illuminates intermittently

NOTE: The ALARM SYSTEM also generates an independent audible ALARM SIGNAL with above stated sequence of tones by a mechanical buzzer (2400 +/- 50 Hz).

LATCHING ALARM SIGNAL = ALARM SIGNAL that continues to be generated after its triggering event no longer exists, until stopped by deliberate OPERATOR action.

NON-LATCHING ALARM SIGNAL = ALARM SIGNAL that automatically stops being generated when its associated triggering event no longer exists.

$t_d$  = PULSE duration (electrical ON time)

$t_s$  = PULSE spacing (electrical OFF time)

$t_b$  = INTERBURST INTERVAL (electrical OFF time)

$f_0$  = fundamental frequency (first harmonic) of a PULSE

System delays = Sum of alarm signal generation delay and alarm condition delay mean (time from the occurrence of a triggering event to the generation of its alarm signal).


### 9.8.2 Audible INFORMATION SIGNALS, characteristics

Audible signal name	Sequence of tones	Durations +/- 5ms	Tone frequency +/- 10 Hz	Sound level (dB@1m) +/- 5dB	Description	Situation
Power ON signal		$t_d = 375\text{ms}$ $t_s = 0\text{ms}$	$f_0 = 1\text{ kHz}$	75	Continues until self-test is complete	Self-test during Power ON of the device
Power OFF signal		$t_d = 500\text{ms}$ $t_s = 0\text{ms}$	$f_0 = 660\text{Hz}$ #1 $f_0 = 440\text{Hz}$ #2	75	A "ding-dong" sound	The Suction Cup is moving to its upper position while the device is powering OFF
Alert signals		$t_d = 125\text{ms}$ $t_s = 0\text{ms}$ $t_b = 250\text{ms}$	$f_0 = 2\text{ kHz}$	75	3 fast signals intermittently repeated	The Suction Cup is placed below the lowest Start Position (too small patient)
		$t_d = 125\text{ms}$ $t_s = 0\text{ms}$ $t_b = 625\text{ms}$	$f_0 = 2\text{ kHz}$	75	3 fast signals intermittently repeated	Gap between pressure pad and patient's chest detected
		$t_d = 125\text{ms}$ $t_s = 0\text{ms}$ $t_b = 0\text{ms}$	$f_0 = 2\text{ kHz}$	75	Recurrent fast signals intermittently repeated until Suction Cup is released	Suction Cup is pressed down when device is locked in PAUSE mode
Ventilate signal		$t_d = 490\text{ms}$ $t_s = 100\text{ms}$	$f_0 = 1100\text{Hz}$ #1 $f_0 = 1100\text{Hz}$ #2 $f_0 = 880\text{ Hz}$ #3	80	A "ding-ding-dong" sound repeated every 30th compression	Ventilation alert signal sequence during ACTIVE 30:2 mode before ventilation pause
High temperature warning		$t_d = 1\text{ s}$ $t_b = 4\text{ s}$	$f_0 = 1\text{ kHz}$	75	Recurrent signals repeated until temperature is within normal range	Internal temperature of device is rising

## 9.9 Electromagnetic environmental declaration

Guidance and manufacturer's declaration - electromagnetic emissions		
LUCAS 2 is intended for use in the electromagnetic environment specified below. The customer or the operator of LUCAS 2 must make sure that it is used in the correct environment.		
Emissions test	Compliance	Electromagnetic environment - guidance
RF emissions CISPR 11	Group 1	LUCAS 2 uses RF energy only for its internal operation. This makes its RF emissions very low and not likely to cause interference with other electronic equipment near LUCAS 2.
RF emissions CISPR 11	Class B	LUCAS 2 is suitable for use in all buildings including domestic homes and places directly connected to the public low-voltage Power Supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Class A	
Voltage fluctuations/ flicker emissions IEC 61000-3-3	Complies	

Guidance and manufacturer's declaration - electromagnetic immunity			
LUCAS 2 is intended for use in the electromagnetic environment specified below. The customer or the operator of LUCAS 2 must make sure that it is used in the correct environment.			
Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment - guidance
Electrostatic discharge (ESD) IEC 61000-4-2	+/- 6 kV contact +/- 8 kV air	+/- 6 kV contact +/- 8 kV air	Floors must be wood, concrete or ceramic tile. If there is synthetic material on the floor, the relative humidity must be 30% or more.
Electrical fast transient / Burst IEC 61000-4-4	+/- 2 kV for Power Supply lines +/- 1 kV for input/output lines	+/- 2 kV for Power Supply lines n/a. for input/output lines	The mains power quality must be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	+/- 1 kV differential mode +/- 2 kV common mode	+/- 1 kV differential mode n/a. for common mode	The mains power quality must be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on Power Supply input lines IEC 61000-4-11	<5 % UT (>95 % dip in UT) for 0.5 cycle	<5 % UT (>95 % dip in UT) for 0.5 cycle	The mains power quality must be that of a typical commercial or hospital environment. If the user of the [Equipment or System] requires continued operation during power mains interruptions, JOLIFE recommends that the [Equipment or System] is energized from a Power Supply or Battery that cannot be interrupted.
	40 % UT (60 % dip in UT) for 5 cycles	40 % UT (60 % dip in UT) for 5 cycles	
	70 % UT (30 % dip in UT) for 25 cycles	70 % UT (30 % dip in UT) for 25 cycles	
	<5 % UT (>95 % dip in UT)) for 5 sec	<5 % UT (>95 % dip in UT)) for 5 sec	
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	30 A/m	30 A/m	The power frequency magnetic fields must be at levels that are characteristic of a typical location in a typical commercial or hospital environment
NOTE UT is the a.c. mains voltage prior to application of the test level.			
Guidance and manufacturer's declaration - electromagnetic immunity			
LUCAS 2 is intended for use in the electromagnetic environment specified below. The customer or the operator of LUCAS 2 must make sure that it is used in the correct environment.			

Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment - guidance
Conducted RF IEC 61000-4-6	10 Vrms 150 kHz to 80 MHz	10 Vrms	<p>Portable and mobile RF communications equipment must not be used nearer to LUCAS 2 (cables included) than the recommended separation distance calculated with the equation applicable to the frequency of the transmitter.</p> <p>Recommended separation distance</p> $d = 1.2\sqrt{P}$
Radiated RF IEC 61000-4-3	10 V/m 80MHz to 2.5GHz	10 V/m	$d = 1.2\sqrt{P}$ $d = 1.3\sqrt{P}$ <p>where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m).</p> <p>Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey, <sup>a</sup> must be less than the compliance level in each frequency range. <sup>b</sup></p> <p>Interference can occur near equipment marked with the following symbol.</p> 
NOTE 1 At 80MHz and 800MHz, the higher frequency range applies.			
NOTE 2 These guidelines may not apply in some situations. Electromagnetic propagation is affected by absorption and reflected from structures, objects and people.			
<sup>a</sup> Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which LUCAS 2 is used exceeds the applicable RF compliance level above, LUCAS 2 should be observed to make sure it operates normally. If unusual or incorrect performance is observed, additional measures can be necessary, such as reorienting or relocating LUCAS 2.			
<sup>b</sup> Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 10 V/m.			
Recommended separation distances between portable and mobile RF communications equipment and the LUCAS 2			
<p>LUCAS 2 is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the operator of LUCAS 2 can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and LUCAS 2 as recommended below, according to the maximum output power of the communications equipment.</p>			

Rated maximum output power of transmitter W	Separation distance according to frequency of transmitter		
	150 kHz to 80 MHz	80 MHz to 800 MHz	800 MHz to 2.5 GHz
	$d = 1.2\sqrt{P}$	$d = 1.2\sqrt{P}$	$d = 1.3\sqrt{P}$
0.01	0.12	0.12	0.24
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23
<p>For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.</p> <p>Note 1: At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.</p> <p>Note 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.</p>			

## 9.10 Limited warranty

Subject to the limitations and exclusions set forth below, JOLIFE AB ("JOLIFE") warrants that JOLIFE products which are purchased from authorized JOLIFE representatives or dealers and are used in accordance with their instructions will be free from defects in material and workmanship appearing under normal service and use for the time period listed below. The time limit and the warranty schedule begin on the date of delivery to the first purchaser.

12 Months: LUCAS™2 Chest Compression System (including the LUCAS device (Upper Part and Back Plate), Carrying Bag, Battery, Stabilization Strap, Patient Straps).

JOLIFE does not warrant that JOLIFE products will perform error-free or without interruptions. The sole and exclusive remedy under this limited warranty is to repair or replace defective material or workmanship at the option of JOLIFE. To qualify for the repair or replacement, the product must not have been repaired or altered in any way which, in the judgment of JOLIFE, affects its stability and reliability. The product must have been used and maintained in accordance with applicable operating instructions and in the intended environment or setting.

The Limited Warranty does not cover problems with products that have been caused by misuse, abuse, improper maintenance, modifications to the product or accident. JOLIFE or its authorized service provider shall, in its sole discretion, determine whether a reported problem is covered under this Limited Warranty and whether the product is field serviceable. If field serviceable and located within 100 miles of a JOLIFE designated service location, warranty service will be provided by JOLIFE or its authorized service provider at the purchaser's facility during normal business hours. If not field serviceable or if the product is located outside of such areas, all products requiring warranty service should be returned to a location designated by JOLIFE or its authorized service provider, freight prepaid, and must be accompanied by a written, detailed explanation of the claimed failure.

**Except for the Limited Warranty provided above, NEITHER JOLIFE NOR ITS AUTHORIZED SERVICE PROVIDER MAKES ANY WARRANTY, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, WHETHER ARISING FROM STATUTE, COMMON LAW, CUSTOMER OR OTHERWISE. THIS LIMITED WARRANTY SHALL BE THE EXCLUSIVE REMEDY AVAILABLE TO ANY PERSON OR ENTITY. NEITHER JOLIFE NOR ITS AUTHORIZED SERVICE PROVIDER IS LIABLE FOR DIRECT OR INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES (INCLUDING LOSS OF BUSINESS OR PROFITS) WHETHER BASED ON CONTRACT, TORT, OR ANY OTHER SUPPORT LEGAL THEORY.**

Any support legal action arising from the purchase or use of JOLIFE products shall be commenced within one year from the accrual of the cause of action, or be barred forever. In no event shall JOLIFE liability under this warranty or otherwise exceed the greater of \$50,000 or the purchase price of the product giving rise to the cause of action.

Products are warranted in conformance with applicable laws. If any part or term of this Limited Warranty is held to be illegal, unenforceable or in conflict with applicable law by any court of competent jurisdiction, the validity of the remaining portions of the Limited Warranty shall not be affected, and all rights and obligations shall be construed and enforced as if this Limited Warranty did not contain the particular part or term held to be invalid. Some countries, and states within United States of America, do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This Limited Warranty gives the user specific support legal rights. The user may also have other rights which vary from state to state or country to country.



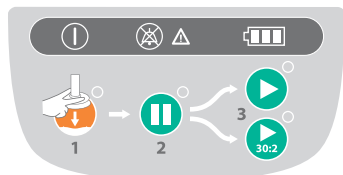
## Appendix A; LUCAS™2 parts and accessories

Description	JOLIFE AB Part number
LUCAS Back Plate	150208-00
3 x LUCAS 2 Suction Cup	150205-03
LUCAS 2 Carrying Bag	150200-00
LUCAS 2 Instructions for Use (regional versions)	100901-XX
LUCAS 2 Battery	150201-00
LUCAS Stabilization Strap	150203-00
LUCAS Patient Straps	150204-00
LUCAS 2 Power Supply, MWB100024A, Art. Nr: 300 000-00 (regional versions)	150210-XX
LUCAS 2 Power Supply, MWA150028B, Art. Nr: 300 000-00 (regional versions)	150214-XX
LUCAS 2 Car Power Cable 12-28VDC	150206-00
LUCAS 2 Battery Charger	150207-00
LUCAS 2 Back Plate Grip Tape	150209-00
LUCAS PCI Back Plate	150211-00





**NOTE:** This guide is not a complete Instructions for Use. Refer to the “Instructions for Use” for complete directions for use, indications, contraindications, warnings, precautions, and potential adverse events.



ON/OFF



ADJUST



PAUSE



ACTIVE  
(continuous)



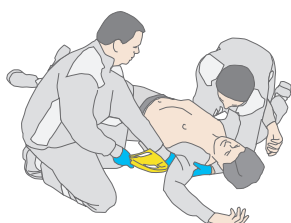
ACTIVE  
(30:2)

**Confirm cardiac arrest and start manual CPR with a minimum of interruptions until LUCAS is applied and ready.**



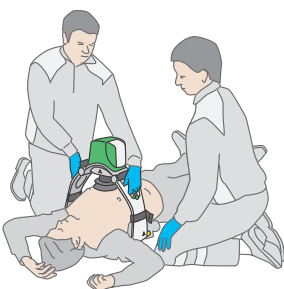
### 1 Activate (A)

- Push **ON/OFF** for 1 second to start self-test and power up LUCAS



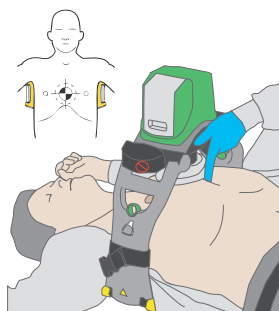
### 2 Back Plate (B)

- Pause manual CPR
- Carefully put Back Plate under the patient, below armpits
- Resume manual CPR



### 3 Compressor (C)

- Pull release rings once; claw locks open. Then let go of the release rings
- Attach to Back Plate; listen for “click”
- Pull up once to ensure attachment

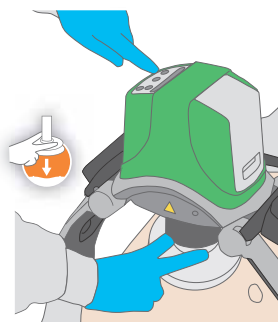


### 4 Position the Suction Cup

- Center the Suction Cup over the chest
- The lower edge of Suction Cup should be immediately above the end of the sternum

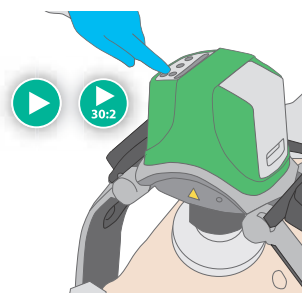
### 5 Push down the Suction Cup

- Push the Suction Cup down with two fingers (make sure it is in the **ADJUST** mode)
- Pressure pad inside Suction Cup should touch patient's chest. If the pad does not touch or fit properly, continue manual compressions
- Push **PAUSE** to lock Start Position – then remove your fingers from the Suction Cup



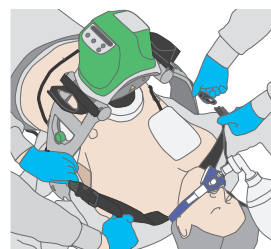
### 6 Start compressions

- Check for proper position. Adjust if necessary
- Push **ACTIVE (continuous)** or **ACTIVE (30:2)**
- LUCAS provides chest compressions according to guidelines.



### 7 Attach the Stabilization Strap

- Attach the LUCAS Stabilization Strap



**Always follow local and/or international guidelines for CPR when you use LUCAS.**