

Laerdal Suction Unit

Directions for Use

78 00 10

Abbott



78 00 00

Reusable



78 00 30

Serres



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These Directions for Use covers three configurations of the Laerdal Suction Unit (LSU): Reusable, Serres Suction Bag System and Abbott Disposable Canister System. Unless otherwise specified the information in this Directions for Use applies to all configurations.

Read these Directions for Use carefully, and become thoroughly familiar with the operation and maintenance of the LSU before using it.

1 Cautions and Warnings

The LSU should only be used by persons trained in the use of medical suction equipment.

The LSU is not suitable for use in the presence of flammable liquids or gases; there can be a danger of explosion or fire.

Do not use the LSU under environmental conditions that are outside the ranges specified under section 12.6. This can endanger safety and adversely affect operation of the device.

Do not block the Exhaust Outlet during use. This will lead to reduced flow and can also cause damage to the LSU.

Always use the Reusable version with the filter and the Float Ball in place.

Overflow of suctioned material can damage the device. If overflow of liquid from the Canister into the pump is suspected, the LSU must be returned for service (see section 9).

Disconnect the LSU from external power prior to cleaning. Use a minimum of liquid to prevent any electrical shock hazard.

Do not immerse the LSU or allow it to stand in water or other liquids. This might damage the device, and cause electrical hazard.

Do not pump any cleaning solution or other liquids through the vacuum pump, i.e. through the Vacuum Connector. This can damage the LSU.

Use only accessories supplied by Laerdal or one of our authorised distributors to ensure that the LSU operates satisfactorily.

Battery:

- Only use batteries approved by Laerdal Medical. Other batteries will have problems related to the battery status indicator of the LSU, the battery operation time, and safety.
- To maintain satisfactory operation of the battery, it is recommended to place the LSU on continuous charge when not in use.
- The LSU must be placed on charge for a minimum of 24 hours to reach full battery capacity. The fast charging gives approximately 80% battery capacity after 3 hours (for a new battery). Please note that repetitive 3 hour charging is not recommended.
- If it is not possible to place the LSU on continuous charge when not in use, make sure the battery is charged for a minimum of 24 hours at least once a month.
- Do not store the battery when it is discharged; always fully charge the battery before storage.
- It is recommended to charge a spare battery every 6 months when stored in room temperature at 25°C (77°F).

2 Intended Use

The LSU is a portable, electrically powered, medical suction equipment intended for field and transport use. It is intended for intermittent operation to remove secretions, blood or vomit from a patient's airway to allow ventilation. Higher vacuum levels are generally selected for oropharyngeal suctioning, and lower vacuum levels are usually selected for tracheal suctioning and the suctioning of children and infants.

3 User Interface (all configurations)

3.1 Operating Knob

The Operating Knob is a combined ON/OFF switch and vacuum selector; located at the bottom of the User Interface.

The LSU is switched ON by turning the Operating Knob to the required setting. Each setting indicates the maximum achievable vacuum level for the selected position (80, 120, 200, 350, 500+ mmHg). The free air flow value changes along with the increasing vacuum settings (see section 12.4 for details). The LSU is switched OFF by resetting the Operating Knob to "0".

Even if the Operating Knob is in "0" position, voltage is present on some of the internal circuitry, when the LSU is connected to mains. To fully remove power; pull out the Power Cord.

3.2 Indicators

3.2.1 Power ON Indicator

This green LED has 3 modes:

- It is lit continuously while the LSU is switched ON.
- It flashes rapidly (approx. twice per second) during the Device Test.
- It flashes slowly (approx. once per second) while the Automatic Power-save Function is activated, if the Device Test is interrupted or when the battery is discharged.



3.2.2. External Power Indicator

This green LED is continuously lit while external AC or DC power is connected.



3.2.3 Failure Mode Indicator

The red LED is lit when a possible malfunction of the LSU has been detected. If lit, turn the LSU OFF, and then ON again to check if the indication disappears. Provided that the indication does not occur again the LSU can be operated. If the Indicator continues to lit after three OFF/ON cycles and after replacing the battery with a fully charged battery, discontinue use and return the LSU for service. (See section 9).



3.2.4 Vacuum Indicator

This green LED bargraph displays the actual vacuum level during operation of the LSU.

Each fully lit segment represents 50 mmHg. If a segment has a weak light, this represents 25 mmHg (e.g. 125 mmHg means 2 fully lit and 1 weakly lit segments).



mmHg	80	120	200	350	500
kPa	11	16	27	47	67
mBar	107	160	267	467	667

Pressure conversion chart

3.2.5 Battery Status Indicator

This green LED bargraph has 3 functions:

- Indicates remaining battery capacity during operation from internal battery
- Indicates approx. achieved battery capacity during charging
- Indicates which test is currently in progress during device test



During operation from internal battery:

- indicates approx. remaining battery capacity.

During operation from internal battery and during charging the displayed values must only be used as indications.

Several parameters can influence them e.g. device settings, state of battery, temperature etc.

Note:

Immediately after turning the LSU ON and immediately after switching from external power to internal battery operation, all 4 LED's will flash for 5 seconds before the remaining battery capacity is displayed.

TYPICAL REMAINING BATTERY CAPACITY

(for a new battery stored
in room temperature)

	OUTPUT
> 50 %	4 LEDs lit.
30 - 50%	3 LEDs lit.
20 - 30%	2 LEDs lit.
< 20%	1 LED lit.

Battery Low; (min. 1 minute
of operation left based
on 500+ mmHg/free flow).

1 LED flashes.

During charging: indicates approx. achieved
battery capacity.

CAPACITY	OUTPUT*
< 75%	The LED's will be lit sequentially.
75 - 80%	3 LED's lit and 4th flashing.
> 80%	4 LED's lit.

*Note:

*If no battery is installed, the battery status indicator
will be fully lit for approx. 5 sec. until it is turned off.*

During the Device Test: indicates which step of the
test is currently in progress or which corresponding
test result is being displayed:

LED 1 (lower LED) lit = STEP 1,
LED 2 lit = STEP 2 etc.

3.3 TEST-Button

This button allows you to run a
4-step user initiated Device Test
program to identify whether the LSU
is operating satisfactorily or if it needs
service (see section 8).



3.4 Power Sources

The LSU is delivered with an AC Power Cord for
connection to AC mains and a DC Power Cord for
connection to DC mains.

The device can be operated from the internal
battery, and can be operated or charged from one
of the following external Power Sources:

- AC mains when used with the AC Power
Cord: 100-240 VAC (50/60/400 Hz).
- DC mains when used with the DC Power
Cord: 12-28 VDC.

A Wall Bracket to hold the LSU during operation
and (optional) charging is available separately (see
section 11).



External power connection will cause the External
Power Indicator to be lit.

Always check that it is lit when
connecting external power or
inserting the LSU into the Wall Bracket.



3.5 Automatic Power-save Function

The LSU has an Automatic Power-save Function
that switches the pump motor off.

While in this mode, the Power ON
Indicator will flash slowly (approx. once
per second).

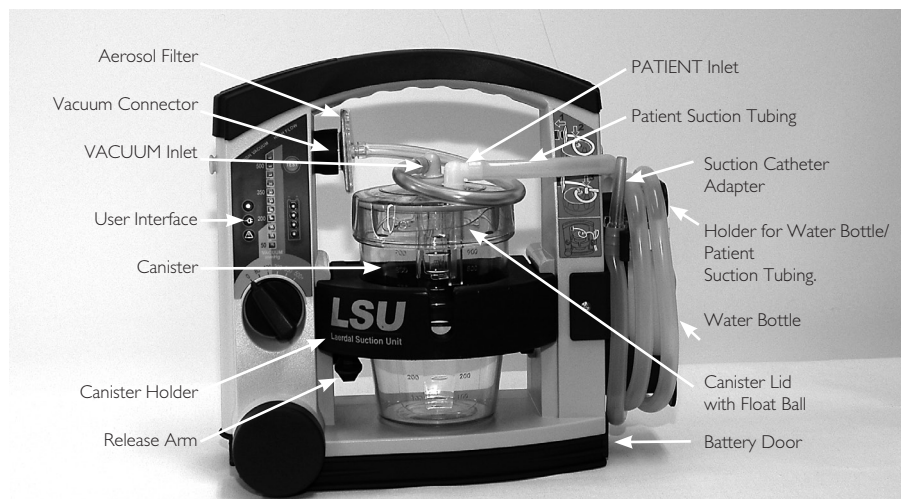


This function will be activated when the Operating
Knob is set to 200, 350 or 500+ mmHg and the
actual vacuum level has been continuously higher
than 120 mmHg for more than 2 minutes.

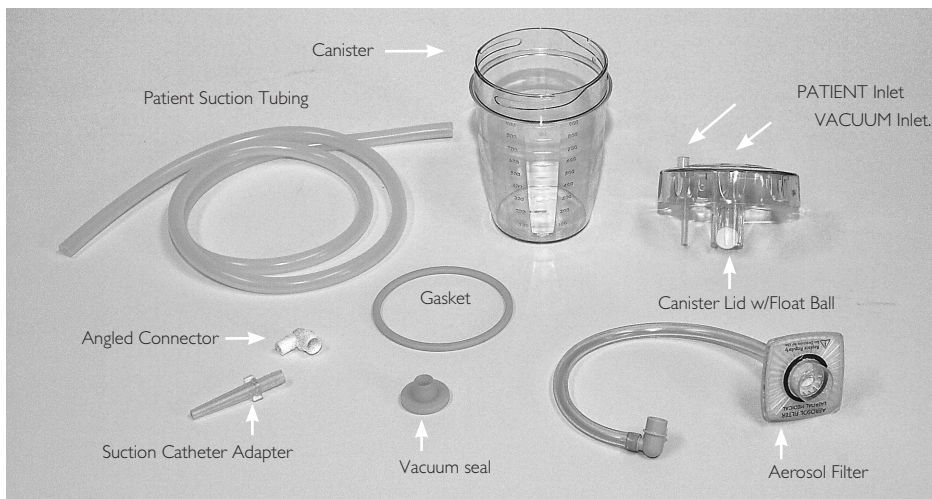
To exit the Power-save Mode and revert to normal
operation, set the Operating Knob to any other
position and then go back to required setting.

4. LSU Reusable Canister System

4.1 Overview



4.2 Parts



The LSU Reusable Canister System consists of:

- A 1000 ml transparent plastic Canister.
- A Canister Lid w/Float Ball
- An Aerosol Filter with tubing

The Canister Lid contains a Float Ball that shuts off the vacuum if the canister is full or the LSU tips over. To restore the vacuum, remove the Angled

Connector from the VACUUM Inlet. The Float Ball will be released and the Angled Connector can be reattached,

Note! The LSU Reusable Canister System must not be used without the Aerosol Filter or the Float Ball.

Decontamination of reusable parts must be performed in accordance with section 4.6.

The Aerosol Filter protects the LSU by preventing aerosols from entering the Pump Unit. It is not intended for microbiological or for particle filtration.

The Aerosol Filter is not designed for decontamination.

It is recommended that the Aerosol Filter be replaced after each use or at least once every shift. If the LSU is used on patients in areas where cross contamination is not an issue, the Aerosol Filter should be replaced at least once a month.

It is recommended always to have extra Aerosol Filters with the LSU in case one has to be discarded.

If the Aerosol Filter becomes wet, it should be replaced immediately or as soon as possible after use.

4.3 Use

Note: Read all the Cautions and Warnings listed in section 1 thoroughly before you use the LSU. The parts are color coded to help re-assembly after cleaning.

4.3.1 Check list

- Check that no parts are missing and that all parts are clean.
- If you decide to operate the LSU from external power; connect to either external AC or DC power as described in section 3.4. If you decide to operate the LSU from internal battery, check that the battery is installed.
- Check that the Patient Suction Tubing is securely connected to the PATIENT Inlet on the Canister Lid; and the Aerosol filter is securely fastened in the LSU and the lid.



4.3.2 Using the LSU

Note: The LSU must be operated and transported in the upright position to prevent overflow of suctioned material.



1. Unwind the Patient Suction Tubing
2. Set the Operating Knob to the required vacuum level. The LSU will automatically be switched ON and start to operate. The green Power ON Indicator is lit continuously while the LSU is switched ON.
3. When suction is complete, set the Operating Knob to "0"

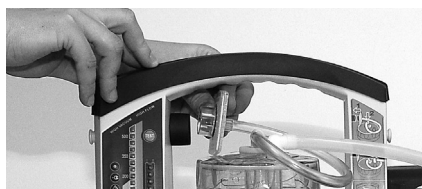
4.3.3 Emptying the Canister

Note: To prevent damage and keep the LSU in good working order; empty the canister when 3/4 full. Check the filter after each use.

If the filter is broken so liquid penetrates the membrane, the pump will be contaminated, and the LSU must be returned for service (see section 9).

When liquid reaches the top of the Canister, the LSU will stop suctioning. To continue suctioning, empty canister and replace the filter. Overflow of suctioned material can damage the device.

To remove the Canister; proceed as follows:

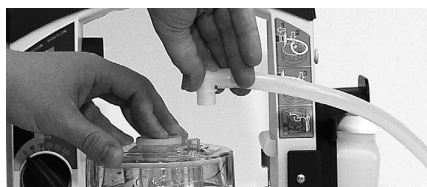




1. Disconnect the Filter Tubing from the blue Vacuum Inlet and from the canister lid. See section 4.2 regarding handling instructions for the Aerosol Filter.



2. To release the Canister Holder, press down the Release Arm while sliding the Holder towards you. Remove the Canister from the Holder.



3. Release the Patient Suction Tubing (if applicable).
4. Safely dispose of the contents of the Canister according to local protocols.
5. Clean the LSU according to section 7.2. Clean and disinfect reusable parts according to section 4.6 and 4.7.

4.3.4 Assembly of the Reusable Canister System



1. Place the yellow Gasket in the Lid, make sure that the gasket is placed flat in the Lid and not twisted.



2. If the Float Ball has been removed, hold the lid upside down and snap the ball into place as shown.

Note: Never use the LSU without the Float Ball.



3. Secure the Lid to the Canister by turning it clockwise until it is securely fastened.



4. Connect the Suction Catheter Adapter to the Patient Tube.



5. Connect the Angled Connector to the Patient Tube.



6. Mount the yellow Vacuum Seal in the centre hole of the Lid and push it into place.



7. Connect the Aerosol Filter (blue ring) to the blue Vacuum Inlet on the LSU.
(Color code: Blue on Blue)



8. Insert the Canister in the canister holder and slide it into the LSU.



9. Connect the yellow Angled Connector to the yellow Vacuum Seal (Color code: Yellow on Yellow)



10. Connect the Angled Connector on the Patient tubing to the PATIENT Inlet on the canister Lid.
11. Perform the Device Test according to section 8



12. Wind the Patient Tubing on the Patient Tubing Holder
13. Place the LSU on charge (see section 7.3)

*Note: Connect tubing according to color code:
Blue on Blue & Yellow on Yellow.*

4.4 Reusable Canister System Quick reference

The assembly of the tubing is illustrated on the right side of the LSU.

1. Connect the blue Aerosol filter to the blue Vacuum Inlet.
2. Connect the yellow angled connector to the yellow Vacuum Seal.
3. Connect the Patient Tubing to the Patient inlet.



4.5 After Use

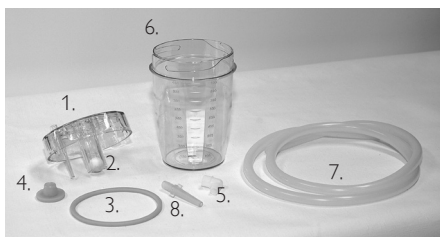
- When suction is complete, set Operating Knob to "0" and inspect all parts for damage or excessive wear. Replace parts if necessary.
- Clean the LSU according to section 7.2
Clean and disinfect reusable parts according to section 4.6 and 4.7.
- Perform the Device Test according to sec. 8.
- Place the LSU on charge (see section 7.3).

4.6 Decontamination of Laerdal Reusable Canister

4.6.1 Parts to be Decontaminated

After Each Use:

1. Canister Lid
2. Float Ball
3. Gasket
4. Vacuum Seal
5. Angled Connectors
6. Canister
7. Patient Suction Tubing
8. Suction Catheter Adapter



4.6.2 Preparation

- Remove and empty the Canister according to section 4.3.
- Disassemble the Canister into separate parts as indicated in the picture above.
- The Float Ball on the reusable canister can be snapped out of the lid.

4.6.3 Rinsing

- Rinse all parts under cold running water.
- Immerse in warm water (30-40°C).

4.6.4 Cleaning

- Immerse all parts in hot water (60-70°C) containing a mild detergent (see section 6.3).
- Thoroughly clean all surfaces, use a brush where possible.
- Rinse in warm water and allow to dry.
- Inspect all parts to be visibly clean and dry.

Note:

Thorough rinsing and cleaning are very important steps prior to disinfection.

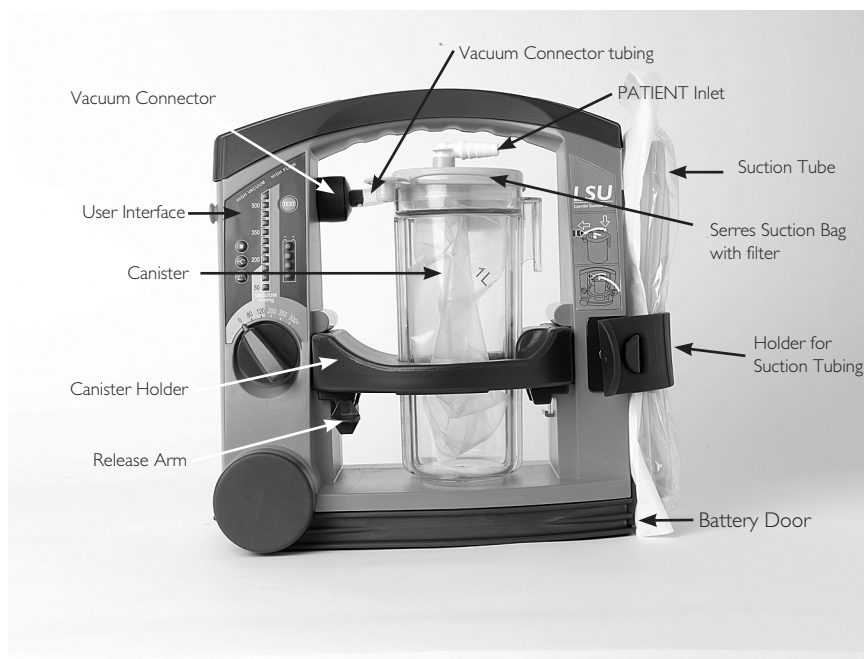
4.7 Disinfection of reusable parts

To disinfect the parts, the following methods are recommended:

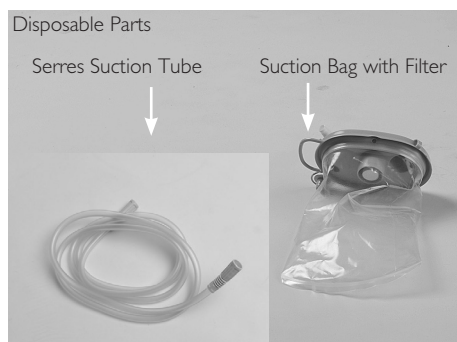
Method	Temperature/ Concentration	Contact time	Post-treatment
Glutaraldehyde	Room temperature/ Conc.: 2%	60 minutes	Rinse all parts in clean, warm water. Allow to dry.
Sodium Hypochlorite, (not cleared for use in the US)	Room temperature/ Conc.: 0.5%	20 minutes	Rinse all parts in clean, warm water. Allow to dry.
Virkon	Room temperature/ Conc.: 1%	10 minutes	Rinse all parts in clean, warm water. Allow to dry.
Steam autoclaving	Autoclave at max. 121° C	20 minutes	Allow parts to cool.

5. The Serres Suction Bag system

5.1 Overview

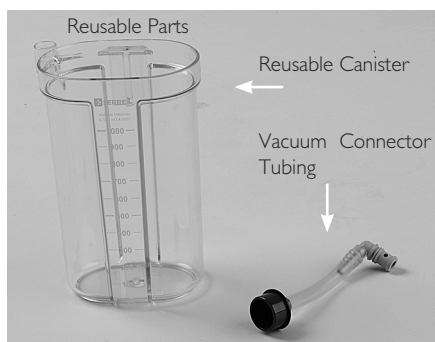


5.2 Parts



Disposable parts:

- Suction bag with filter
- Serres Suction Tube



Reusable parts (parts to be cleaned or replaced regularly):

- Canister
- Vacuum Tubing Connector

The Serres Suction Bag system contains a hydrophilic filter that shuts off the vacuum if the canister is full or the LSU tips over. To restore the vacuum, replace the Suction bag.

The disposable parts must be replaced after each use.

The reusable canister must be cleaned if needed according to manufacturer's instructions for use.

Clean the Serres Vacuum Connector Tubing by wiping with a damp cloth or a sponge. Do not autoclave or attempt to disassemble.

The Serres Vacuum Connector Tubing may be replaced with a High Efficiency Filtration kit for LSU Serres Canister. (See section 11 for details and section 12.4 for technical information).

5.3 Use

Note: Read all the cautions and warnings listed in section 1 thoroughly before you use the LSU.

5.3.1 Check list

- Check that no parts are missing and that all parts are clean.
- If you decide to operate the LSU from external power, connect to either external AC or DC power as described in section 3.4. If you decide to operate the LSU from internal battery, check that the battery is installed and charged.
- Check that the Serres Vacuum Connector Tubing is properly connected to the LSU and to the canister

Check that the lid of the canister is properly sealed:



1. Block patient inlet and turn on the LSU.
2. Vacuum will build up when all parts are assembled correctly.

5.3.2 Using the LSU

Note: The LSU should be operated and transported in the upright position to prevent overflow of suctioned material.

1. Unwrap the Serres Suction Tube.



2. Connect the Serres Suction Tube to the Patient inlet on the canister lid.
3. Attach appropriate suction catheter if necessary. Not supplied by Laerdal.
4. Set the Operating Knob to the required vacuum level and the LSU will automatically be switched on and start to operate. The green power ON Indicator is lit continuously while the LSU is switched on.
5. When suctioning is complete, set the Operating Knob to "0".

5.3.3 Empty the canister

Note: It is recommended to replace the Suction Bag when it is $\frac{3}{4}$ full.

When liquid reaches approximately 1000 ml, the LSU will not suction any more liquid. If overflow of liquid from the bag into the pump is suspected, the LSU must be returned to service (see section 9).

Overflow of suctioned material can damage the LSU.

1. Disconnect Serres Suction tube. Safely dispose of the Serres suction tube according to local protocols.



2. Plug Patient Inlet with plug provided on the lid.



3. Press the release arm while sliding the holder towards you to loosen or completely remove canister.
4. Remove suction bag from canister
5. Safely dispose of the Serres Suction bag according to local protocols.
6. Clean the LSU if needed according to section 7.2.
7. Clean the Serres canister if needed according manufacturers instructions for use.

Note:

Clean the Serres Vacuum Connector Tubing by wiping with a damp cloth or a sponge

Do not autoclave or attempt to disassemble.

The Serres Vacuum Connector Tubing should be replaced regularly.

5.3.4 Assembly of the Serres Suction Bag system

1. Place the canister in a canister holder in an upright position



2. Partially insert the canister holder into the LSU.



3. Insert the Serres Vacuum Connector Tubing into the LSU Vacuum Connector.



4. Insert the opposite side of the Serres Vacuum Connector Tubing into the canister.



5. Unfold the Suction Bag and place inside the canister; Suction bag has to be installed into equal size canister.



6. Fully insert canister holder into the LSU.



7. Turn on the LSU (vacuum source).



8. Close the Patient inlet with your finger and simultaneously push the middle of the lid down. The lid is properly installed when vacuum has reached 500 mmHg.

9. Release the patient inlet and make sure that the bag is fully inflated.



10. Turn off the LSU.
11. Fasten the Suction Tubing on the Suction Tubing Holder
12. Place the LSU on charge (see section 7.3)

5.4 Serres Suction Bag System Quick Reference

Correct assembly of the tubing is illustrated on the right side of the LSU.

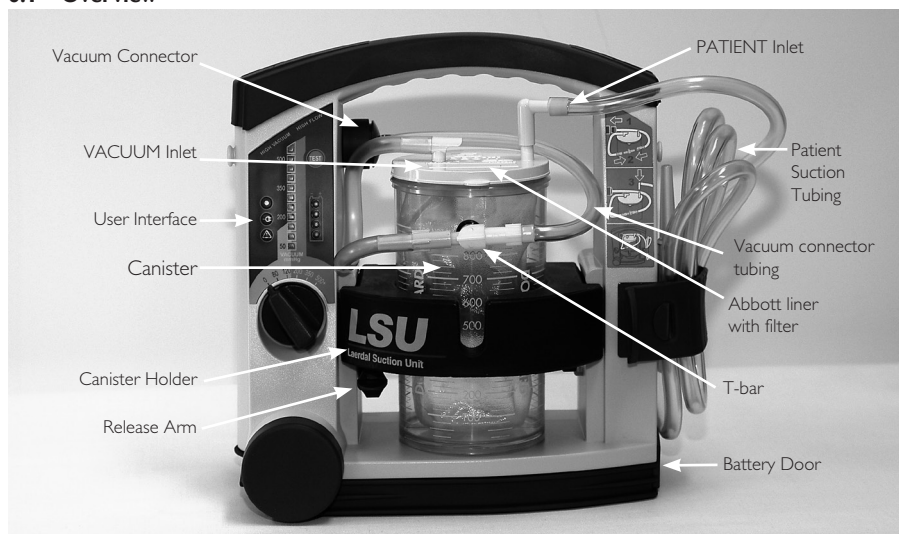


5.5 After Use

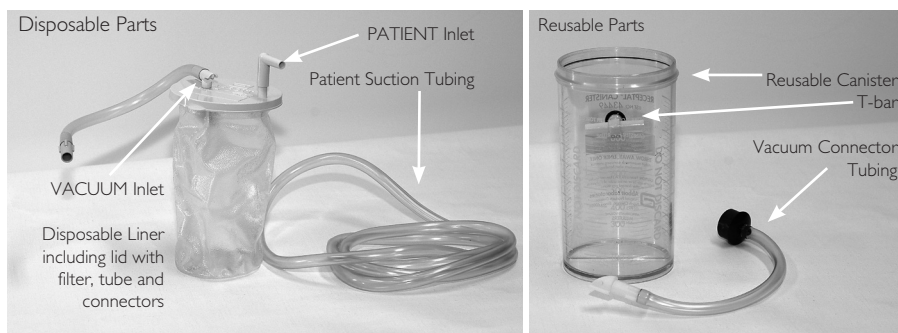
1. Inspect all parts of the LSU for damage and excessive wear.
Replace parts if necessary.
The Serres Vacuum Connector Tubing should be replaced regularly.
2. Place an unopened Serres Suction Tube on the side of the LSU.
3. Perform Device Test according to section 8.
4. Place the LSU on charge see section 7.3.

6 Abbott Disposable Canister System

6.1 Overview



6.2 Parts



The Abbott disposable Canister System consists of:

- A 1000 ml reusable transparent plastic Canister including a Canister Connector;
- A disposable liner including lid with filter, tube and connectors.

The Abbott Receptal® Canister contains a hydrophilic filter that shuts off the vacuum if the canister is full or the LSU tips over. To restore the vacuum, replace the inner liner.

Note:

Do not use an Abbott liner without a filter!

The disposable parts must be replaced after each use. The Reusable Canister must be cleaned as stated on the canister. The Vacuum Connector Tubing is reusable and should be cleaned in accordance with section 7.2.

The Vacuum Connector Tubing may be replaced with a High Efficiency Filter Kit available for the Abbott Canister System (see section 11 for details and section 12.4 for technical information).

6.3 Use

Note: Read all the Cautions and Warnings listed in section 1 thoroughly before you use the LSU.

6.3.1 Check list

- Check that no parts are missing and that all parts are clean.
- If you decide to operate the LSU from external power, connect to either external AC or DC power as described in section 3.4. If you decide to operate the LSU from internal battery, check that battery is installed.
- Ensure that the T-bar is securely tightened and the yellow connector from the Abbott liner goes to the yellow T-bar on the canister: (Yellow on Yellow).
- Connect the blue Vacuum Tubing connector to the blue Vacuum Inlet on the LSU. (Blue on Blue).
- Connect the yellow connector to the yellow T-bar (Yellow on Yellow).
- Ensure that the Patient Suction Tubing is securely connected to the PATIENT Inlet on the Canister Lid.

6.3.2 Using the LSU

Note: The LSU should be operated and transported in the upright position to prevent overflow of suctioned material.



1. Release the Strap holding the Patient Suction Tubing.



2. Set the Operating Knob to the required vacuum level, and the LSU will automatically

be switched ON and start to operate.

The green Power ON Indicator is lit continuously while the LSU is switched ON.

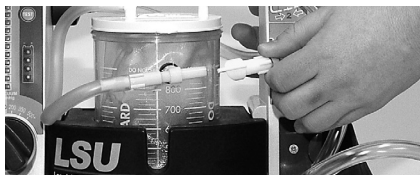
3. When suctioning is complete, set the Operating Knob to "0"

6.3.3 Replace the Abbott disposable Canister

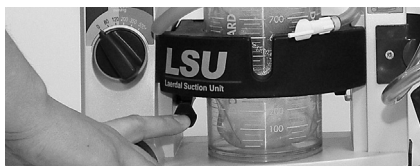
Note: It is recommended to replace the Canister when it is 3/4 full.

When liquid reaches the top of the Canister, the LSU will not suction any more liquid. If overflow of liquid from the Canister into the pump is suspected, the LSU must be returned for service (see section 9). Overflow of suctioned material can damage the device.

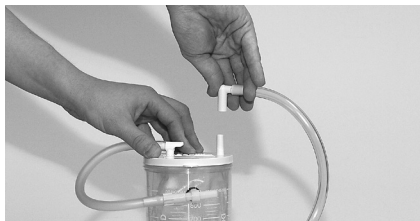
To remove the Canister, proceed as follows:



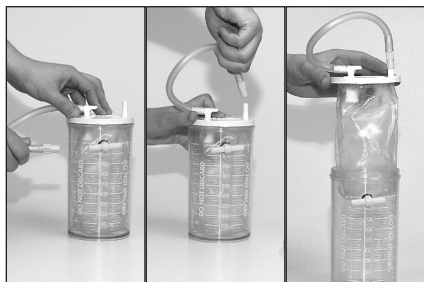
1. Disconnect the Vacuum Connector Tubing at the yellow T-bar on the canister Connector.



2. Release the Canister Holder, press down the Release Arm while sliding the Holder towards you.
3. Remove the Canister from the Holder.



4. Unwrap/release the Patient Suction Tubing (if applicable).



5. Safely dispose of the Abbott Liner according to local protocols.
6. Clean the LSU according to section 7.2.

6.3.4 Assembly of the Abbott disposable canister system



1. Mount the Disposable Abbott Liner in the Abbott Canister



2. Make sure that the yellow T-bar is securely tightened. Connect the yellow connector from the Abbott Liner to the yellow T-Bar on the Abbott Canister. (Color code: Yellow on Yellow).



3. Connect the blue Vacuum Connector on the Vacuum Tubing to the blue Vacuum Inlet on the LSU. (Color Code: Blue on Blue).



4. Insert the Canister in the in the Canister Holder and slide it into the LSU.



5. Connect the yellow Connector on the Vacuum tubing to the Yellow T-Bar on the Abbott Canister (Color code: Yellow on Yellow).



6. Connect the white Angled Connector to the Patient Tubing



7. Connect the white Angled Connector to the white PATIENT INLET on the Abbott Liner (Color code: White on White)
8. Perform the Device Test according to section 8



9. Strap the Patient Tubing to the side of the LSU.
10. Place the LSU on charge (see section 7.3)

Note:

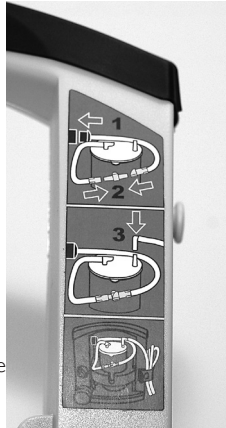
Connect tubing to color code: Blue on Blue, Yellow on Yellow & White on White.

6.4 Abbott disposable Canister System

Quick reference

The assembly of the tubing is illustrated on the right side of the LSU.

1. Connect the blue Vacuum Connector on the Vacuum Tubing to the blue Vacuum Inlet.
2. Connect the two yellow connectors to the yellow T-bar on the Abbott canister.
3. Connect the white Patient Tubing to the white Patient inlet.



6.5 After Use

- When suction is complete, set Operating Knob to "0" and inspect all parts for damage or excessive wear. Replace parts if necessary.
- Clean the LSU according to section 7.2.
- Perform the Device Test according to section 8.
- Place the LSU on charge (see section 7.3).

7. Maintenance

7.1 General

- Make sure the maintenance instructions under "After Use" are followed.
- If the device is not in frequent use (i.e. less than once a month), the Device Test (see section 8) should be performed both on a monthly basis and after each use.

7.2 Clean the Cabinet and parts

Warning: Disconnect the LSU from external power prior to cleaning.

Use a minimum of liquid to prevent any electrical shock hazard. Do not immerse the LSU or allow it to stand in water or other liquids. This can damage the device, and cause electrical shock resulting in injury to persons.

- Use a cloth or sponge that is dampened with a mild detergent (hand dishwashing liquid or similar) to clean the external surfaces of the LSU. Use a detergent that is compatible with the materials listed under section 12.7, and follow the detergent manufacturer's instructions.
- Use a cloth or sponge dampened with water and wipe the surfaces again.
- Dry the surfaces using a clean cloth or a paper towel.

7.3 Charge the Battery

The internal rechargeable Lead-Acid battery can be charged directly from external AC or DC power as described in section 3.4. No external charger is needed. To charge the battery, proceed as follows:

1. Make sure the Operating Knob is set to "0". Connect either external AC or DC power to the LSU and charging will start automatically.
2. During charging the Battery Status Indicator will indicate approx. achieved battery capacity (see section 3.2.5 for details).
3. The LSU must be placed on charge for a minimum of 24 hours to reach full battery capacity. The fast charging gives approx. 80% capacity after 3 hours (for a new battery).

Repetitive charging for only 3 hours is not recommended.

Note:

- *To maintain satisfactory operation of the battery, it is recommended to place the LSU on continuous charge immediately after use and when not in use.*
- *It is recommended to always fully charge the battery. Repetitive charging to a lower capacity level will reduce battery life.*
- *If it is not possible to place the LSU on continuous charge when not in use, make sure the battery is charged for a minimum of 24 hours at least once a month.*
- *Do not store the battery when it is discharged. Always fully charge the battery before storage.*
- *Do not store the LSU with a discharged battery.*
- *The recommended ambient temperature for charging is from 15°C to 25°C.*
- *The battery will not be charged when the LSU is in operation.*
- *If no battery is installed, the battery status indicator will be fully lit for approx. 5 sec. until it is turned off.*
- *Replace the battery when it does not pass the Battery Quality Check (see section 7.5 for details) or after 3 years, whichever comes first.*
- *A completely discharged battery cannot be charged by the LSU and must be replaced.*
- *It is recommended to charge a spare battery every 6 months when stored in room temperature at 25°C (77°F).*

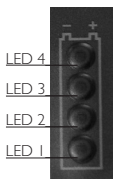
7.4 External Battery Charger

The LSU battery can also be charged in an optional External Battery Charger. See section 11.

7.5 Check the Battery Quality

If poor battery quality is suspected, charge the battery for a minimum of 24 hours and then perform the following test without connection to external power:

- Run the Device Test and then let the LSU operate continuously at 500+ mmHg setting and free air flow for 20 minutes.
- If the LSU stops before completing the 20 minutes, the battery should be discarded.



7.6 Replace the Battery

Note:

Use only batteries recommended by Laerdal.

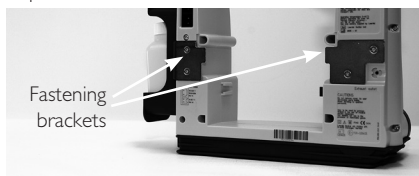
1. Open the Battery Door.
2. To remove the battery, push and move it slightly to the left and then release.
3. Withdraw the battery from the LSU.*
4. To insert a battery, push it fully in and then to the right to lock it.
5. Close the Battery Door.
6. After inserting the battery, place the LSU on charge unless a fully charged battery is inserted.

**When you discard the battery, dispose of safely in accordance with local protocols for sealed lead acid batteries.*

7.7 Fastening brackets

The fastening bracket is used to hold the LSU in the optional wall bracket. Inspect the fastening brackets for wear and tear regularly.

Replace if worn. See section 11.



7.8 Release arm for Canister holder

An extra release arm for the canister holder can be attached. See section 11.



8 Device test

The Device test is a user initiated test program for all models which can identify whether the LSU operates satisfactorily or if the LSU needs service.

The program runs 4 different tests:

1. It tests for occlusions in the Suction System (including canister and tubing)
2. It tests the vacuum build-up efficacy of the Pump System (How much vacuum is built up within 3 seconds)
3. It tests the maximum achievable vacuum level of the LSU (reaches this level within 10 seconds)
4. It tests if there are air leakages in the Pump System (including canister and tubing)

8.1 Setup

Before the test can be performed make sure that:

- The Patient Suction Tubing is unwound and not blocked or bent
- The Suction Catheter Adapter is removed from its holder (if applicable)
- The canister lid, T-bar, angled connector and tubing are securely fastened.

8.2 Run the Test

Note:

If you need to interrupt the test and revert to normal operation, turn the Operating Knob to another position and then select the required setting.



1. Press and hold the TEST-Button while setting the Operating Knob to 500+ mmHg.

Note: Do not release the TEST-Button until min. 2 seconds after the Operating Knob has been set to 500+ mmHg. The test will start immediately



2. As soon as LED 2 from the bottom of the Battery Status Indicator comes on (takes approx. one second), fully block the Patient Suction Tubing.*



3. Keep the tubing blocked while LED 2, 3 and 4 lights up.



4. Release the tubing when LED 1 comes on again
5. Evaluate the test results (See section 8.3)
6. After evaluating the test results turn the Operating Knob to "0" to exit the Device Test.


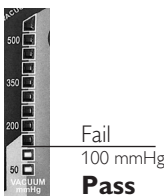



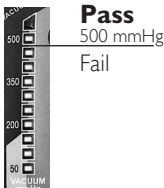

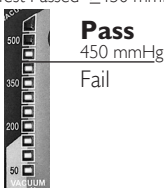
Note:

To indicate that the LSU is in test mode, the Power ON Indicator will flash rapidly (approx. twice per second) until you exit the test program.

** If the tubing is not occluded within 2 minutes, the test will be interrupted and the Power ON Indicator will start to flash slowly (approx. once per second). To restart the test, set the Operating Knob to "0" and start over again.*

8.3 Evaluation of Device Test Results

After the test is completed, the Vacuum Indicator will automatically display the first result (blockage). To display the other results press the TEST-Button once for each test. If you continue pressing the button after the 4th test result has been displayed, the earlier results will be repeated (Test 1,2,3,4,1,etc.). To exit the test program, set the Operating Knob to another position.

Test no	The program has tested for	Battery indicator:	Test result indications	Action if test failed
Test 1	Blockage in the Suction System (including canister and tubing)	LED #1 lit up 	Test Passed ≤ 100 mmHg** 	Check possible blockages (e.g. twisted tubing, blocked filter; blocked filter in the liner) and run the Device.Test again. **If the High Efficiency Filtration Kit is installed the pass limit is 150mmHg
Test 2	The vacuum build-up efficacy of the Pump System (How much vacuum is built up within 3 seconds)	LED #2 lit up 	Test Passed ≥ 300 mmHg 	Check Connectors, Tubes and Canister Lid for leakage* or damage. Check exhaust outlet for occlusion and run the Device Test again
Test 3	The maximum achievable vacuum level of the LSU (reaches this level within 10 seconds)	LED #3 lit up 	Test Passed ≥ 500 mmHg 	Check Connectors, Tubes and Canister Lid for leakage* or damage. Check exhaust outlet for occlusion and run the Device Test again
Test 4	Air leakages in the Pump System (including canister and tubing)	LED #4 lit up 	Test Passed ≥ 450 mmHg 	Check Connectors, Tubes and Canister Lid for leakage* or damage and run the Device Test again

* If it is not obvious where the system is leaking; go step by step through the connections. Start by disconnecting the Vacuum Tube at the Canister and run the Device Test (blocking the tube). Reconnect the tube and disconnecting the patient tube, run device test (block the PATIENT inlet on the Canister). Continue with other connections until the leakage is identified.

Note: If the LSU does not pass one or more of the steps in this test after suggested actions are taken, the device might need to be returned for service (see the Troubleshooting guide).

9. Servicing

There are no user serviceable parts inside the cabinet. Do not open cabinet.

Please note that wear and tear parts of the pump mechanism should be changed every third year.

Refer servicing to personnel qualified by Laerdal, or to Laerdal or one of its authorised distributors.

10. Trouble Shooting

FAULT	CONDITION	ACTION
The LSU does not operate with the AC or DC Power Cord connected.	External Power Indicator is not lit when the Operating Knob is set to "0".	Check power cord connections and the external AC- or DC-power source.
	External Power Indicator is lit.	The LSU must be returned for service (see section 9).
The LSU cannot be operated from the internal battery.	Power ON Indicator is OFF	Check that battery is installed.
	OR	Place the LSU on charge.
	All the lights in the front panel flash on and off repeatedly.	If still faulty after charging completed, remove and replace the battery (see section 7.6).
The LSU operates, but little or no suction available.	Vacuum Seal blocked by float ball.	Unplug the Vacuum Seal to release the vacuum
	Canister full.	Remove and replace the Canister (see section 4.3, 5.3, 6.3)
	Poor vacuum connection between Pump Unit and Canister.	Install the Vacuum Connector Tubing correctly.
	Patient Suction Tubing twisted or blocked.	Replace the filter or liner if the filter is blocked Untwist the Patient Suction Tubing and/or clear blockage or replace the tubing.
	T-bar on the Abbott canister is leaking air into the tubes. The Abbott liner is leaking	Tighten the T-bar by screwing it in or replace it. Replace the Abbott liner
	(Serres) Lid is not properly sealed	Seal lid using vacuum, not force. See section 5.3.4
Battery Status Indicator is not ON.	Battery is not charged.	Check power cord connections and that battery is installed
Vacuum Indicator indicates more than 100 mmHg with free air flow	Tube(s) is kinked or twisted	Straighten / untwist the tube(s).
The LSU does not charge with the AC or DC power cord connected	The external Power indicator is not lit.	Check power cord connections and the external AC- or DC-power source. The LSU must be returned for service (see section 9). A flat battery cannot be recharged

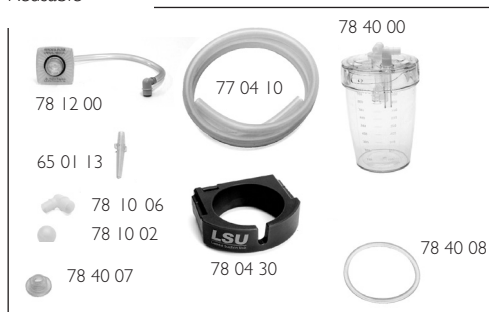
11. Accessories and Parts

Cat. No.	Description
78 00 00	LSU w/Reusable Canister
78 00 10	LSU w/Abbott Receptal® Canister
78 00 30	LSU w/ Serres Suction Bag System
(Label on back side of cabinet: REF 78 00 xx)	

Reusable

78 12 00	Aerosol Filter for LSU Reusable Canister
77 04 10	Suction Tubing 150 cm w/o tip
65 01 13	Suction Catheter adapter, pkg. 10
78 40 00	LSU Reusable Canister
78 10 06	Angled Connectors, pkg. 10
78 10 02	Float Ball, pkg. 10
78 40 07	Vacuum Seal
78 40 08	Gasket
78 04 30	LSU Reusable Canister Holder

Reusable



Abbott

L212A52	Abbott Disposable Liner
78 04 12	Disposable patient tubing 180cm
78 12 01	Vacuum Tube for LSU Abbott Canister
78 12 02	High Efficiency Filtration Kit for LSU Abbott Canister
77 04 62	Abbott Receptal Canister
78 04 14	T-bar for Abbott Receptal Canister pkg. 5
78 04 10	Abbott Canister Holder

Abbott



Serres

57 151	Serres Suction Bag (1000 ml, Blue)
58 23 181	Serres Suction Tube (non-sterile CH25) 180 cm
78 04 12	Disposable patient tubing 180cm
78 12 04	Serres Vacuum Connector Tubing
78 12 03	Serres High Efficiency Filtration Kit
57 300	Serres Canister (1000ml, Transparent)
57 301	Serres Canister (1000ml, Blue)
78 04 50	Serres Canister Holder

Serres



Note: Parts or product configurations are subject to change without notice.

All versions

- 78 03 00 xx Directions for Use
 (xx indicates local language configuration)
 78 04 33 Strap for Tubing
 78 04 32 Release Arm
 78 02 00 DC-Power Cord
 78 02 10 AC-Power Cord US
 78 02 20 AC-Power Cord EU
 78 02 30 AC-Power Cord UK
 78 04 00 LSU Battery
 78 04 36 Fasten bracket left/right
 78 04 35 Holder for water bottle
 79 35 00 Water Container

**Accessories (all versions)**

- 78 20 00 Carrying Bag (full covering)
 78 20 10 Semirigid carrying bag
 78 26 00 Wall Bracket w/DC-Power Cord
 78 26 10 Wall Bracket w/AC-Power Cord US
 78 26 20 Wall Bracket w/AC-Power Cord EU
 78 26 30 Wall Bracket w/AC-Power Cord UK
 78 26 40 Wall Bracket wo/ Power Cord
 78 23 00 Shoulder Strap
 78 24 00 Side Pouch
 78 04 40 External Charger kit



Note: Parts or product configurations are subject to change without notice.

12. Specifications

12.1 Classification

Electrically powered medical suction equipment for field and transport use, according to ISO 10079-1

High vacuum/high flow.

Not suitable for use in the presence of flammable liquids or gases.

Internally powered/class II equipment type BF, according to IEC 60601-1

The degree of protection provided by the chassis is according to IP34D:

- Protected against solid foreign objects of 2,5 mm Ø and greater
- Protected against splashing water
- Protected against access with a wire

12.2 General tolerance

Overall tolerance $\pm 5\%$

12.3 Physical Characteristics

Size: 315 mm (12,4 in) x 330 mm (13 in) x 160 mm (6,3 in), (h x w x d)

Weight: 4kg (8,9 lbs) (including battery)

Canister Capacity: 1000 ml

Canister graduation

accuracy: $\pm 5\%$ of full scale

Patient Suction Tubing

(non-sterile) Cat.No 770410: 8 mm (0.315 in.) inside diameter x 1.5 m (59 in.) length

12.4 Operation

Approx. free air flow at different settings:

Reusable and Abbott:	80 mmHg	120 mmHg	200 mmHg	350 mmHg	500+mmHg
	12 sl/min.	16 sl/min.	20 sl/min.	23 sl/min.	> 25 sl/min.

Serres: 23 sl/min. at 500+mmHg

sl = litre at standard atmospheric pressure and temperature.

Approx. battery operation time (free air flow) at different settings ($\pm 10\%$):

Reusable and Abbott:	80 mmHg	120 mmHg	200 mmHg	350 mmHg	500+mmHg
	3h 20 min	2h 20 min	1h 30 min	1h	45 min

Serres: 30 min at 500+mmHg

Approx noise levels (free air flow) at different settings:

80 mmHg	120 mmHg	200 mmHg	350 mmHg	500+mmHg
46 dBA	48 dBA	51 dBA	53 dBA	56 dBA

Vacuum - Max.: > 500 mmHg (67 kPa).

Vacuum - Range: 80 - 500+ mmHg (11 - 67 kPa).

Vacuum Indicator accuracy: $\pm 5\%$ of full scale.

12.4.1 Operation with High Efficiency Filtration Kit

The flow and operation time of the LSU will be reduced when the Vacuum Connector Tubing is replaced with a High Efficiency Filtration Kit.

The LSU with High Efficiency Filtration Kit installed is in accordance with ISO 10079-1.

The filter has an efficiency of 99.97% down to a particle size of 0.3 µm.

12.5 Power Requirements

Operating/charging AC:** 100-240 VAC +10%/-15%, 50-60 Hz +/- 3 Hz (100-240 VAC), 400 Hz +/- 3 Hz (100-120 VAC)

Operating/charging DC:** 12-28 VDC +/-10%.

Battery: 12 VDC 2 Ah, Sealed Lead-Acid, rechargeable.

Charging Time: 3 hours for approx. 80% battery capacity, 24 hours for fully charged.

Fuses: The LSU has no fuses to be replaced by the user (see section 9).

*** The external AC power source must be able to deliver a current of min. 1A and the external DC power source min. 6A, if not the LSU may switch to battery operation.*

12.6 Environmental Conditions

Operating/Charging Temperature:
0° C (32°F) to + 40° C (104° F).

Recommended Charging Temperature:
15°C (59°F) to + 25°C (77°F).

Long term Storage Temperature:
0° C (32°F) to + 40° C (104° F).

Max. 24 hour Storage Temperature:
-30° C (-22°F) to + 70° C (158° F).

Humidity (Operating & Storage):
5 - 95% RH non-condensing

12.7 Material Chart

Cabinet front: Poly Carbonate/Acrylonitrile Butadiene Styrene (PC/ABS)

Protector for front: Styrene Ethylene Betyl Styrene (SEBS)

Cabinet back: PC/ABS

Cabinet base w/Protector: PC/ABS + SEBS

Battery door: SEBS

Connector retainer for battery:

Poly Oxy Methylene (POM)

Operating Knob: POM

Rotor for Operating Knob: PC/ABS

Manifold for vacuum: POM

Canister Holder: Polyethylene (PE)

Handle w/Protector: PC/ABS + SEBS

Manifold for exhaust: POM

Strap for patient suction tubing: SEBS

Canister Holder Release Arm: POM

User Interface: Polyester

Vacuum Connector: Silicone

Vacuum Connector Tubing Abbott : PVC + ABS + Polybutylene Terephthalate/PC (PBT/PC)

Abbott Canister: PC

Abbott Disposable Liner: ABS + PVC

Abbott Patient Suction Tubing:

Polyvinylchloride "flexible" (PVC)

Suction Catheter Adapter: PC

Suction Catheter Adapter Holder: PC

LSU Reusable Canister: PC - HT

Lid w/Floater Valve Cylinder,

LSU Reusable Canister: PC - HT

Gasket for Lid, LSU Reusable Canister: Silicone

Full covering Carrying Bag: PVC coated Polyester

Side Pouch: PVC coated Polyester

Shoulder Strap: POM + Polyester

Wallbracket: Aluminium + Steel + PA with fibers

Aerosol Filter, LSU Reusable Canister: PVC + ABS

Styrene-Butadiene Copolymer (SBC)

Float Ball, LSU Reusable Canister: PP

Vacuum Plug, LSU Reusable Canister: Silicone

Serres Canister: PC

The angle connector of the canister: TPE

Serres Canister Holder: HDPE

Serres Suction Bag: PE + PP

12.7.1 Dismantling/Disposal

When discarding the LSU, we recommend it be dismantled and discarded according to local protocol. Dismantle the LSU by unscrewing the screws on the back side of the LSU, remove the components and sort according to the table in 12.7. The cleaned LSU can also be delivered to your local Laerdal Medical representative for dismantling/disposal. Laerdal Medical AS will not charge any fee for the dismantling; Sender is responsible for the cost of the shipment.



12.8 Symbols



(Direct Current).



(Alternating Current).



Class II Equipment, according to IEC 60601-1



Type BF applied part, according to IEC 60601-1

IP34D The degree of protection provided by the chassis according to IP34D



This product is in compliance with the essential requirements of MDD 93/42/EEC as amended by Council Directive 2007/47/EC



Warning: Parts of this product are designed for single patient use only. Do not re-use. Re-use will lead to increased risk of cross contamination, degradation of performance and/or device malfunction.

Laerdal is not responsible for any consequences of re-use



Date of production.



See Directions for Use.



Unique product type identification



This product complies with the following ANSI/UL and CSA standards

CSA Standards:

CAN/CSA-C22.2

No:0-M91

General Requirements – Canadian Electrical Code, part II

CAN/CSA-C22.2 No:601.1-M90

Medical Electrical Equipment Part I: General Requirements for Safety

CAN/CSA-C22.2 No:601.1S1-94

Supplement No 1-94 to CAN/CSA-C22.2 No. 601.1-M90 – Medical Electrical Equipment – Part 1: General Requirements for Safety US Standards:

UL Standard No:2601.1

Medical Electrical Equipment

12.9 EMC Specifications

MEDICAL ELECTRICAL EQUIPMENT needs special precautions regarding EMC and needs to be installed and put into service according to the EMC provided in this section.

Portable and mobile RF communication equipment can affect MEDICAL ELECTRICAL EQUIPMENT.

Warning:

MEDICAL ELECTRICAL EQUIPMENT should not be used adjacent to or stacked with other equipment. If adjacent or stacked use is necessary, the MEDICAL ELECTRICAL EQUIPMENT should be observed to verify normal operation in the configuration in which it will be used.

Maximum cable length, AC Power cord:

1.5 meters

Maximum cable length, DC Power cord:


1.5 meters

Warning:

The use of accessories, transducers and cables other than those specified, with exception of transducers and cables sold by Laerdal as replacement parts for internal components, may result in increased emission or decreased immunity of the LSU.

Guidance and manufacturer's declaration – electromagnetic immunity			
The Laerdal Suction Unit (LSU) is intended for use in the electromagnetic environment specified below. The customer or the user of the LSU should assure that it is used in such an environment.			
Immunity test	IEC 60601-1-2 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 should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst. IEC 61000-4-4	±2 kV for power supply lines	±2 kV for power supply lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	± 1 kV differential mode ± 2kV common mode	± 1 kV differential mode ± 2kV common mode	Mains power quality should 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% U _i (> 95% dip in U _i) for 0,5 cycle 40% U _i (60% dip in U _i) for 5 cycles 70% U _i (30% dip in U _i) for 25 cycles < 5% U _i (> 95% dip in U _i) for 5 sec.	< 5% U _i (> 95% dip in U _i) for 0,5 cycle 40% U _i (60% dip in U _i) for 5 cycles 70% U _i (30% dip in U _i) for 25 cycles < 5% U _i (> 95% dip in U _i) for 5 sec.	Mains power quality should be that of a typical commercial or hospital environment.
Power Frequency (50Hz/60Hz) magnetic field. IEC 61000-4-8	3A/m	3A/m	Also in compliance at Power Frequency of 400Hz
NOTE: U _i is the AC mains voltage prior to application of the test level.			

Guidance and manufacturer's declaration – electromagnetic immunity		
The Laerdal Suction Unit (LSU) is intended for use in the electromagnetic environment specified below. The customer or the user of the LSU should assure that it is used in such an environment.		
Emissions tests	Compliance	Electromagnetic environment - guidance
RF emissions CISPR 11	Group 1	The LSU uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class B	The LSU is suitable for use in all establishments, including domestic establishments and those 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			
The Laerdal Suction Unit (LSU) is intended for use in the electromagnetic environment specified below. The customer or the user of the LSU should assure that it is used in such an environment.			
Immunity test	IEC 60601-1-2 test level	Compliance level	Electromagnetic environment - guidance
<p>Conducted RF IEC/EN 61000-4-6</p> <p>Radiated RF IEC/EN 61000-4-3</p>	<p>3 Vrms 150 kHz to 80 MHz</p> <p>3 V/m 80 MHz to 2.5 GHz</p>	<p>3 Vrms</p> <p>10 V/m</p>	<p>Portable and mobile RF communications equipment should be used no closer to any part of the LSU, including cables, than the recommended separation distance calculated from the equation applicable to frequency of the transmitter: Recommended separation distance $d=1.2 \cdot P$</p> <p>$d=0.35 \cdot P$ 80 MHz to 800 MHz</p> <p>$d=0.7 \cdot P$ 800 MHz to 2.5 GHz</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). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey^a, should be less than the compliance level in each frequency range^b.</p> <p>Interference may occur in the vicinity of equipment marked with the following symbol:</p> 
NOTE 1. At 80 MHz and 800 MHz, the higher frequency range applies.			
NOTE 2. These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.			
<p>a. 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 the LSU is used exceeds the applicable RF compliance level above, the LSU should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the LSU.</p> <p>b. Over the frequency range 150 kHz to 80 MHz, field strength should be less than 3 V/m.</p>			

13 Limited Warranty

The LSU comes with a five (5) year limited warranty*. See the enclosed "Laerdal Global Warranty" for terms and conditions.

The warranty is also available at

www.laerdal.com

* Excluding the canister, tubing systems and battery

14 Addresses

Manufacturer:

Laerdal Medical AS
P.O.Box 377
Tanke Svilandsgate 30
4002 Stavanger
Norway

Distribution:

For World Wide distribution,
see Global Warranty or
www.laerdal.com



Laerdal
helping save lives

CE 0434