

The LPS II range

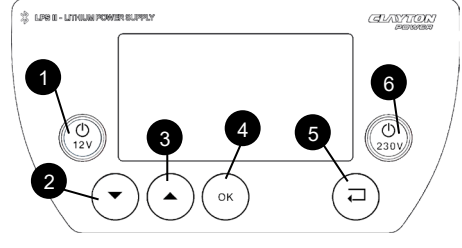


CLAYTON
POWER

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1. NAVIGATION BUTTONS

DISPLAY – NAVIGATION BUTTONS		
#	Description	View
1	12 VDC button	
2	Navigation button - Down	
3	Navigation button - Up	
4	Navigation button - OK	
5	Navigation button - Return	
6	230 VAC button	

The 12 VDC and the 230 VAC buttons can switch the DC and AC output on and off.
If both buttons are pressed and held for 10 seconds, the LPS II will reset without changing any settings.

The four navigation buttons are used to navigate the menus and setting options.
If the three arrow buttons are pressed and held for 2 seconds, the LPS II display will reset without changing any settings.

2. LPS II HOME SCREENS

DISPLAY – SIMPLE VIEW		
#	Description	View
1	DC input active – Charging from DC source	
2	DC output active – I/O activated	
3	Solar input active – Charging from solar panel	
4	DC output energy saver timer active	
5	AC output energy saver timer active	
6	AC input active – Charging from grid	
7	AC output active – I/O activated	
8	Remaining operation time or time to charge	
9	Graphical indication of state-of-charge	
10	Numeric indication of state-of-charge	
11	Bluetooth active	

DISPLAY - ADVANCED VIEW		
#	Description	View
1	DC input functionality	
2	DC output functionality	
3	AC input functionality	
4	AC output functionality	
5	Solar input active – Charging from solar panel	
6	Power bar for indicating utilization of function	
7	Functionality is active and a transfer of energy is in process	
8	Functionality is active but there is no energy transfer	
9	AC output energy saver timer active	
10	Bluetooth active	
11	Graphical indication of state-of-charge	
12	Numeric indication of state-of-charge	
13	Remaining operation time or time to charge	

Use the Up and Down navigation buttons to change between the simple and advanced view.

When the LPS II is being charged by AC input, DC input or Solar input, this will be indicated by a lightning on the battery (not shown above).

The **remaining operation time** and **time to charge** are not shown when the LPS is configured for Capacity Extension.

2.1 I/O activated outputs (simple view)

AC and DC power outputs can be conditionally activated without power buttons, indicated by the **AC/DC output active – I/O activated** symbols (#2 and #7).

Examples of activation include AC output activating when AC input is connected or when I/Os control the power outputs.

2.2 Output energy saver timer (simple view)

If an energy saver timer has been set on an output (both for AC and DC), this is indicated by the **AC/DC output energy saver timer active** symbol (#4 and #5).

2.3 DC input functionality (advanced view)

When there is power on the DC input terminals, the **Power bar** (#6) in the **DC input functionality** window (#1) shows how much power is going in/out of the LPS II, and the **arrows** (like #7) show which way the power is going.

If no power is being used but the input is active, this is indicated by a **dotted line** (like #8).

2.4 DC output functionality (advanced view)

When the 12VDC output is turned on, the **Power bar** (like #6) in the **DC output functionality** window (#2) shows how much power is going in/out of the LPS II, and the **arrows** (#7) show which way the power is going.

If no power is being used but the input is active, this is indicated by a **dotted line** (like #8).

If an energy saver timer has been set, a **countdown** is shown (like #9) above the dotted line.

2.5 AC input functionality (advanced view)

When there is power on the AC input connector in the back of the LPS II, the **Power bar** (like #6) in the **AC input functionality** window (#3) shows how much power is going into the LPS II.

If power is being delivered this is shown by **arrows** (like #7), and if no power is being delivered, but the input is active, this is indicated by a **dotted line** (like #8).

2.6 AC output functionality (advanced view)

When the 230 VAC output is turned on, the **Power bar** (like #6) in the **AC output functionality** window (#4) shows how much power is being drawn from the

LPS II.

If power is being drawn from the LPS II this is indicated by **arrows** (like #7), and if no power is being used, but the input is active, this is indicated by a **dotted line** (#8).

If an energy saver timer has been set, a **countdown** is shown (#9) above the dotted line.

3. MAIN MENU

To access the **Main Menu** from either of the home screens, press the OK navigation button.

3.1 230VAC Output

This shows information and setting for the 230 VAC output.

3.1.1 Operation status

The **Operation status** shows if the output is on or off.

3.1.2 Power

This shows how much power is being drawn from the LPS II 230 VAC output.

It shows the combined power going out of both the AC connector on the back and front of the LPS II.

3.1.3 Voltage

This shows the voltage of the LPS II 230 VAC output.

The voltage on the AC connector on the back and front of the LPS II is the same.

3.1.4 Current

This shows how much current is being drawn from the LPS II 230 VAC output.

It shows the combined current being drawn from both the AC connector on the back and front of the LPS II.

3.1.5 Energy saver time (No Load)

The internal power loss of the LPS II when the 230 VAC is turned on is approximately 20 W, if the output is left on during non-working hours like weekends or vacations, this internal power loss will slowly drain the battery, reducing the capacity available for work.

To avoid this an auto shutdown function is available, that is based on both the level of load and on a timer.

If the **Energy saver time** value is set to anything other than 0, and the load is below the limit set under the **Energy saver (Threshold)**, the LPS II will start to count down from the time that has been set and turn off the AC output when it reaches 0.

If the load is increased about the **Energy saver (Threshold)**, before the countdown reaches 0, the countdown will be reset and stop until the load is low again.

A manual start of the output is needed, if it has been turned off due to the energy save function.

This can be set to a value between 0 m and 10 h and is default set to 1 h.

3.1.6 Energy saver (Threshold)

This value sets the limit of the load that determines when the energy saver function should initiate.

When the load is below this value, the **Energy saver time** starts to count down.

This can be set to a value between 10 W and 1500 W and is default set to 20 W.

3.1.7 Inverter Cut-Off SOC

In addition to the energy saver function, it is also possible to make the 230 VAC output shutdown depending on the SOC of the LPS II.

When this value is set, the output will turn off once the SoC goes below.

If the SOC increases more than 5 %, for instance if the LPS II is charge from DC, the 230 VAC output start up again.

This can be set to a value between 0 % and 100 % and is default set to 0 %.

3.2 230VAC Charging (not available on all models)

This shows information and setting for the 230 VAC input.

3.2.1 Operation status

The **Operation status** shows if the input is on or off.

3.2.2 Power

This shows how much power is being drawn by the LPS II 230 VAC input.

3.2.3 Voltage

This shows the voltage on the LPS II 230 VAC input.

3.2.4 Current

This shows how much current is being drawn by the LPS II 230 VAC input.

3.2.5 Maximum current

If the AC supply has a limit as to how much current can be drawn (below 13 A), it is possible to limit the LPS II AC input current draw here.

The current drawn from the AC supply is both used for charging the LPS II and for any AC load that is on the output, and it will prioritize the load, this means that if the limit is set to 10 A and the load is 10 A the LPS will not be charged.

This can be set to a value between 4 A and 13 A and is default set to 13 A.

3.3 DC Output

This shows information and setting for the DC output.

3.3.1 Operation status

The **Operation status** shows if the output is on or off.

3.3.2 Power

This shows how much power is being drawn from the LPS II 12 VDC output.

3.3.3 Voltage

This shows the voltage of the LPS II 12 VDC output.

3.3.4 Current

This shows how much current is being drawn from the LPS II 12 VDC output.

3.3.5 Shutdown time delay

It is possible to delay the shutdown of the 12 VDC output by setting this value.

When 12VDC is shut off either by using the button on the front or by an I/O signal, the LPS II will start to count down from the time that has been set and turn off the output when it reaches 0.

If the output is turn on before the countdown reaches 0, either manually or by an I/O signal, the countdown will reset and stop.

This can be set to a value between 0 m and 10 h and is default set to 0.

3.3.6 Energy Saver Time (No Load)

The internal power loss of the LPS II when the 12V DC is turned on is low, but if the output is left on during none working hours like weekends or vacations, this internal power loss will slowly drain the battery, reducing the capacity available for work.

To avoid this an auto shutdown function is available, that is based on both the level of load and on a timer.

If the **Energy saver time** value is set to anything other than 0, and the current is below the limit set under the **Energy saver (Threshold)**, the LPS II will start to count down from the time that has been set and turn off the DC output when it reaches 0.

If the current is increased about the **Energy saver (Threshold)** before the countdown reaches 0, the countdown will be reset and stop until the load is low again.

A manual start of the output is needed, if it has been turned off due to the energy save function.

This can be set to a value between 0 m and 10 h and is default set to 0 h (off).

3.3.7 Energy Saver (Threshold)

This value sets the limit of the current that determines when the energy saver function should initiate.

When the current is below this value, the **Energy Saver Time** starts to count down.

This can be set to a value between 0 A and 180 A and is default set to 0 A.

3.4 DC Charging

This shows information and setting for the DC input.

3.4.1 Operation status

The **Operation status** shows if the input is on or off.

3.4.2 Power

This shows how much power is being drawn by the LPS II DC input.

3.4.3 Voltage

This shows the voltage on the LPS II DC input.

3.4.4 Current

This shows how much current is being drawn by the LPS II DC input.

3.4.5 Selected voltage

This shows the voltage that is selected for the input.

If the **Set reference voltage** is set to auto, this value will show what the LPS II has automatically selected based on the input voltage it detects on the DC input terminals, if no voltage is (or has been) detected the value will be Off.

If the **Set reference voltage** is set to either 12 V or 24 V this will be shown here.

3.4.6 Jumpstart

The LPS II has an integrated jumpstart feature that can charge the vehicle battery if depleted.

The functionality can be activated either by using the **Jumpstart functionality** function in this menu or by pressing the JUMP START button on the remote. But to prevent unintentional use of the jumpstart, the function can be disabled by setting the value here to Off.

This can be set to Off or Active and is default set to Off.

3.4.7 Set current

The maximum current that the LPS II will draw on the DC input for charging is 45 A (25 A on some models).

If there are lower limitations for how much current can be drawn, for instance vehicle manufacturer limitations or limitations in the installation, a lower maximum current can be set here.

This can be set to a value between 10 A and 45 A and is default set to 45 A.

3.4.8 Set reference voltage

As default the LPS II auto detects the voltage on the DC input terminal, but it is possible to set the voltage manually, which for instance can be useful if a 24 V vehicle battery is used that is low on charge and therefor has a very low voltage.

This can be set to Auto, 12 V or 24 V and is default set to Auto.

3.4.9 Start Voltage (not available for 24V reference voltage)

If the DC input voltage has been lower than the **Stop Voltage** the voltage has to go higher than the **Start Voltage** before it will start to charge the LPS.

This setting is not visible when the **Set reference voltage** is set to 24 V, the setting will be 2 times what has been set for 12 V.

This can be set to a value between 12 V and 15 V and is default set to 15 V.

3.4.10 Stop Voltage (not available for 24V reference voltage)

If the DC input voltage is lower that this voltage the LPS II will stop charging the vehicle battery.

The LPS II expects to be installed with 5m cables, and it takes the voltage drop over these cables into account.

This means that the voltage at the DC in terminals will be lower that the limit set. It also means that for installations with longer or shorter cables the voltage at the vehicle battery might be higher or lower than the set voltage.

This setting is not visible when the **Set reference voltage** is set to 24 V, the setting will be 2 times what has been set for 12 V.

This can be set to a value between 10 V and 11.5 V and is default set to 11.5 V.

3.4.11 Jumpstart functionality

When this function is activated, the jumpstart will charge the vehicle battery for 5 minutes with 40 A.

This can be set to Off or On and is default set to Off.

3.4.12 Charge of Start Battery (not available on all models)

By turning on this function, the LPS II will charge the vehicle battery when 230 VAC is connected to the AC input and the SOC is above 98%.

This can be set to Off or On and is default set to Off.

3.4.13 Operation status (only available with Charge of Start Battery set to on)

The **Operation status** shows if the function is on or off.

3.4.14 Charge Current (only available with Charge of Start Battery set to on)

The default **Charge Current** is 5 A but can be changed here, the maximum current that the LPS II can charge the vehicle battery with is 40 A.

This can be set to a value between 0 A and 40 A and is default set to 5 A.

3.4.15 Charge Voltage (only available with Charge of Start Battery set to on)

The default **Charge Voltage** is 14.4 V but can be changed here.

This can be set to a value between 10 V and 15 V and is default set to 14.4 V.

3.4.16 Cut-Off Current (only available with Charge of Start Battery set to on)

This is the value where the LPS II will change from normal charge to maintenance charge.

This can be set to a value between 0 A and 40 A and is default set to 2 A.

3.4.17 Cut-Off Timer (only available with Charge of Start Battery set to on)

In addition to the **Cut-Off Current** setting it is also possible to set a **Cut-Off Timer**, this will also change the charging from normal to maintenance.

This can be set to a value between 0 m and 10 h and is default set to 10 h.

3.4.18 Maintenance Voltage (only available with Charge of Start Battery set to on)

This is the voltage that the LPS II will use to maintain the vehicle battery charge, it should be lower than the normal **Charge Voltage** to prevent damaging the vehicle battery.

This can be set to a value between 10 V and 15 V and is default set to 13.5 V.

3.5 Solar (not available on all models)

This shows information and setting for the Solar input.

3.5.1 Operation status

The **Operation status** shows if the function is on or off.

It will only show on when power can/is being drawn from the solar panels.

3.5.2 Power

This shows how much power is being drawn by the LPS II Solar input.

3.5.3 Input voltage

This shows the voltage on the LPS II Solar input.

3.5.4 Output current

This shows how much current is being drawn by the LPS II Solar input.

3.5.5 Set C2 solar operation

The solar functionality can be turned on and off here.

If this setting is set to auto, the LPS II will see the C2 input as an I/O if the voltage is lower than 15 V, and a solar input if the voltage is higher than 15 V.

If the solar functionality is toggled off and then back to On or Auto, the self-learning values will be set back to default values (15 V).

This can be set to Auto, Off or On and is default set to On.

3.5.6 Self-learning (OC) voltage

The LPS II will learn the Open Circuit voltage of the solar panels for use by the internal Solar control circuit, and the value will be shown here.

3.5.7 Self-learning MPPT voltage

The Maximum Power Point Tracking value for the solar panels is displayed here and used by the internal Solar control circuit.

3.5.8 Self-learning start voltage

This value is the voltage where the LPS II will try to draw power from the solar panel.

3.6 General

This opens the **General** menu which is described in the next section.

4. GENERAL MENU

4.1 Battery Status

This shows different information about the battery.

4.1.1 Operation status

The **Operation status** shows if the battery is Charging, Discharging or in Standby.

4.1.2 Remaining Operation

This shows how much time is left before the battery is depleted, it is dependent on the load and will change when the load changes.

4.1.3 LPS SOC

This is the battery State Of Charge showing how much capacity is left in the battery.

4.1.4 Extension SOC (only available with Capacity Extension configuration)

This is the battery State Of Charge of the extension battery(s).

This is only shown if the setup is with Capacity Extension.

4.1.5 Total System SOC (only available with Capacity Extension configuration)

This is the battery State Of Charge of the LPS II battery and the extension battery(s).

This is only shown if the setup is with Capacity Extension.

4.1.6 Power

This shows how much power is being delivered/received by the battery.

A negative value means that the battery is delivering power to a load.

4.1.7 Voltage

This is the voltage of the battery.

4.1.8 Current

This shows how much current is being delivered/received by the battery.

A negative value means that the battery is delivering current to a load.

4.1.9 Temperature

This is an average of the internal temperature of the battery cells.

4.1.10 Cell 1

This shows the voltage of battery cell 1.

4.1.11 Cell 2

This shows the voltage of battery cell 2.

4.1.12 Cell 3

This shows the voltage of battery cell 3.

4.1.13 Cell 4

This shows the voltage of battery cell 4.

4.1.14 Number of Cycles

This value is the number of charge/discharge cycles that the LPS II has been through.

A cycle is counted every time the SOC of the LPS II has increased with 15 % or more.

4.2 Energy Meter

This shows different information about the energy that has been used since the LPS II has been manufactured.

4.2.1 230VAC Charging

This shows the energy delivered by the AC input for charging the LPS II and any load that is connected.

4.2.2 DC Charging

This shows the energy delivered by the DC input for charging the LPS II.

4.2.3 DC Output Charging

This shows the energy delivered into the DC output for charging.

4.2.4 Solar

This shows the energy delivered by the Solar input for charging the LPS II.

4.3 Temperature

This shows the temperature of different critical components and areas in the LPS II.

4.3.1 Transformer

The temperature of the heatsink where the power transformer is located and where the MOSFETs are mounted.

4.3.2 IGBT module

The temperature of the heatsink where the IGBT modules are mounted.

4.3.3 Between cell 1 and 2

This temperature is measured in between the battery cell 1 and 2.

4.3.4 Between cell 2 and 3

This temperature is measured in between the battery cell 2 and 3.

4.3.5 Between cell 3 and 4

This temperature is measured in between the battery cell 3 and 4.

4.4 I/O voltage

This shows information and setting for the different I/O pins.

For M12 connectors called **Remote**, **Data** and **Data front**, pin 2 is used as I/O pin.

4.4.1 Remote

The voltage on the I/O in the M12 I/O connector called **Remote** on the back of the LPS II.

4.4.2 Data

The voltage on the I/O in the M12 I/O connector called **Data** on the back of the LPS II.

4.4.3 Data front

The voltage on the I/O in the M12 I/O connector called **Data front** on the front of the LPS II.

4.4.4 C1 terminal

The voltage on the **C1 terminal** on the back of the LPS II.

4.4.5 C2 terminal

The voltage on the **C2 terminal** on the back of the LPS II.

4.4.6 Activate 12VDC on C1

The 12 VDC output can be set to turn on when a voltage higher than 4 V is registered on C1, and it will turn off again when the voltage is below 3 V.

This can be set to Off or On and is default set to Off.

4.4.7 Activate 230VAC on C1

The 230 VAC output can be set to turn on when a voltage higher than 4 V is registered on C1, and it will turn off again when the voltage is below 3 V.

This can be set to Off or On and is default set to Off.

4.5 Error codes

This opens a menu showing **error codes**.

Some error codes are present until manually acknowledge by the user, others goes away automatically when the error is no longer present.

4.6 Display

This menu has different settings for the display.

4.6.1 Backlight - Charge

This setting determines if the control of the display backlight when the LPS II is being charged.

When it is set to On the backlight will never turn off, if it is set to Off the backlight is always off (even when using the buttons) and if it is set to a time period the backlight will turn off after that time period (and on again if a button is pressed).

This can be set to On, Off or a time between 1 m and 1 h and is default set to On.

4.6.2 Backlight - Discharge

This setting determines if the control of the display backlight when the LPS II is being discharged.

When it is set to On the backlight will never turn off, if it is set to Off the backlight is always off (even when using the buttons) and if it is set to a time period the backlight will turn off after that time period (and on again if a button is pressed).

This can be set to On, Off or a time between 1 m and 1 h and is default set to 1 m.

4.6.3 Parameter Protection

Some of the setting in the display can be locked to prevent changes, the code required to unlock these setting is set here.

When a code is set the icon next to the affected settings change from a wrench to a padlock, then the user will have to enter the code when changing one of these settings, this will unlock all settings for 10 minutes.

The code can be set to anything from 0001 to 9999, 0000 means no code is present and is the default setting.

4.6.4 Contrast

Here the user can set the contrast of the display.

This can be set from 30 % to 100 % and is default set to 60 %.

4.7 Sound

This opens the settings for the sound.

4.7.1 Power

This sets if there should be a sound when turning the LPS II on and off.

This can be set to On, Off and is default set to On.

4.7.2 Button

This sets if there should be a sound when using the buttons on the display.

This can be set to On, Off and is default set to On.

4.7.3 Error

This sets if there should be a sound when an error occurs.

This can be set to On, Off and is default set to On.

4.8 Bluetooth (available from hardware version xx:20 and higher)

This opens the settings for Bluetooth

4.8.1 Power

This sets if the Bluetooth is on or off.

This can be set to On, Off and is default set to Off.

4.8.2 Connection Status

This shows if a Bluetooth connection is active.

4.8.3 Paired Devices

The menu shows all devices that has been paired with the LPS.
By clicking on a device, it is possible to remove the pairing.

4.8.3 Firmware version - Bluetooth

This shows the firmware version of the Bluetooth controller.

4.9 About

This menu shows different general information about the LPS II.

This information is needed if a support case needs to be created.

4.9.1 Serial number

This is the serial number of the LPS II.

4.9.2 Manufactured

This shows when the LPS II was manufactured.

4.9.3 Hardware version

This is the hardware version of the LPS II.

4.9.4 Firmware version – Unit

This is the firmware version of the control board.

4.9.5 Firmware version – Display

This is the firmware version of the display.

4.9.6 Firmware version – Power Board

This is the firmware version of the power board.

4.9.7 Firmware version – DC/DC

This is the firmware version of the DC/DC converter board.

4.9.8 Bootloaders version – Unit

This is the bootloader version of the control board.

4.9.9 Bootloaders version – Display

This is the bootloader version of the display.

4.9.10 Bootloaders version – Power Board

This is the bootloader version of the power board.

4.9.11 Bootloaders version – DC/DC

This is the bootloader version of the DC/DC converter board.

4.10 Sleep Mode (available from software version 40 and higher)

To prevent deep discharge of the batteries, the LPS II will go into Sleep Mode when the SOC is below 0%. When in Sleep Mode the LPS II uses a very low amount of power and can last for up to 2 years without being charged.

The Sleep Mode can also be entered manually in this menu.

If the Sleep Mode was entered because of low SOC, it will wake up when the 12V or 230V buttons are pushed and hold for 1 second, if an AC input is connected, if the C1 signal goes high or if Solar becomes active.

If the Sleep Mode was entered manually from the menu, it will wake up when the 12V or 230V buttons are pushed and hold for 1 second or if an AC input is connected.

The wakeup source is disabled if the function had failures when the LPS entered Sleep Mode.

4.10.1 Activate Now

The Sleep Mode can be activated here by setting the value to On.

The choices are Off and On and is set to Off as default.

4.11 Configuration

When using the LPS II in a setup that requires many settings changes, this can be done easily by changing the overall configuration.

When setting a different configuration, the LPS II will first reset the current setting to default and then change all relevant settings for the chosen configuration.

The configuration choices are None or Capacity Extension (not available on all models) and is set to None as default.

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