



Figure 1: DSP-LP30-SDC-DISP

Product Description

The DPS-LP30 is a 30 W / 60 W_p DIN-Rail adjustable power supply. It's behavior is similar to a laboratory power supply. The digitally-enabled, patent pending technology enables true long life power supplies of 20 years+ at 40°C ambient. This is achieved by replacing electrolytic capacitors by film capacitors. The DPS-LP30 features excellent output stability, so that pulse width controlled motors can be driven. Its output voltage is highly stable. It achieves a high peak efficiency of 95% through use of the latest technology.

The DPS-LP30 features 30 W output power with a peak power for unlimited time of 60 W. It has a wide output voltage range, ranging from 5 V to 30 V and the output current ranges from 0.2 A to 3.0 A. The power supply features Constant-Current-Constant-Voltage (CCCV) operation.

Applications

- Ultra Long Life Power Supply
- Test Jigs (CCCV Operation)
- Smart Home
- LED / Laser Driver

Ordering Numbers:

DPS-LP30-FIXED Fixed Output Voltage

DPS-LP30-SDC+DISP Display with configuration and 1...10V interface

DPS-LP30-UART Isolated UART Interface

DPS-LP30 Highlights

- Ultra Long Life (20 years+)
Achieved by using film capacitors instead of electrolytic capacitors.
- 5 V – 30 V output voltage
- 0.2 A – 3.0 A output current
- Constant Current Constant Voltage
- 30W / 60W_p output power
- Passively cooled
- Integrated redundancy module
- Parallel operation possible
- Remote control
(several bus systems available, see ordering options)
- Low inrush current
- DC Motor soft start possible
- Overvoltage protection
- 10 year warranty (option)

Specification Summary

Output power:	30 W
Peak output power	60 W _p
Peak output time:	unlimited
Output voltage:	5 V – 30 V
Output current:	0.2 A – 3.0 A
Output Voltage Rise Time:	< 1 ms
Output characteristic:	Constant Current, Constant Voltage
AC input voltage:	200-250 V _{ac}
AC input frequency:	49 Hz ... 500 Hz
AC inrush current:	< 45 A @ 230V
Power factor:	> 0.55
Efficiency:	< 96 %
Holdup time:	20 ms @30 W
Temperature Range:	- 40°C – 70 °C <small>derating applies</small>
Case:	Din Rail Distribution Box 4 Elements
Weight:	0.4 kg

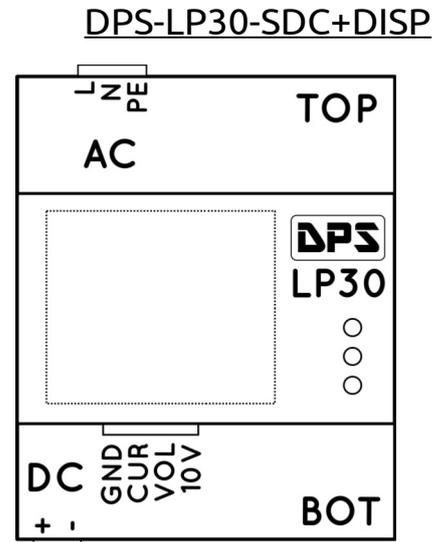
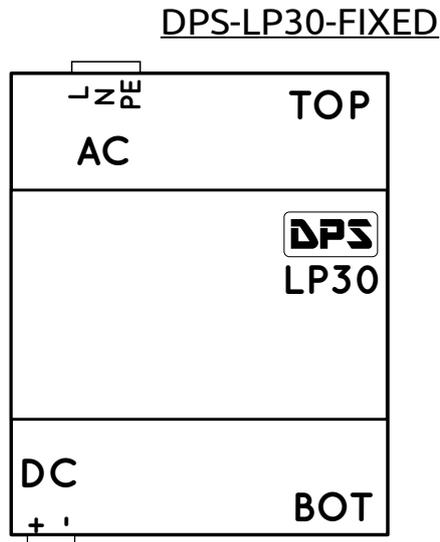
Engineering Standards (Details below)

- IEC 62368-1
- IEC 61010-1
- IEC 61010-2-201



Connection Diagram

The device may be installed and operated by qualified personal only. Unqualified use can lead to death, injuries or damage, including fire.



Connection Instructions

1. Turn off the AC power, e.g. by turning off the fuse. Ensure that the AC power lines are grounded.
2. Connect the DC Load.
3. Connect the AC Source.
4. Turn on the AC Power.

Connection Instructions

1. Turn off the AC Power, e.g. by turning off the fuse. Ensure that the AC power lines are grounded.
2. Disconnect the DC Load.
3. Connect the AC Power.
4. Configure the DC output voltage and current.
5. Disconnect the AC Power
6. Connect the DC Load
7. Connect the AC Power



Display Operation Instructions

The display instructions are only valid for DPS-LP30-SDC+DISP

Fundamentals

The display has three buttons, from top to bottom:

1. Up (Top Button)
2. OK (Middle Button)
3. Down (Bottom Button)

The buttons may only be pressed with a small isolated screwdriver. The display's button supports three press operations:

1. Short Click: Clicking short.
2. Long Click: The button is pressed continuously.
3. Double Click: The button is pressed twice.

Setting the output mode

To set the output voltage, click long on the OK button. The operation mode can be selected with the up and down button. Operation mode "Fi" represents fixed mode, which allows to set a fixed output voltage. Operation mode "Ad" represents adjustable mode, which allows to set the output voltage by the 0V...10V interface.

Fixed Mode: Output voltage and current adjustment

When fixed mode is selected, a short click allows to set the output voltage first, then the output current. A short click on the up button increases the output voltage by 0.1 V, a short click on the down button decreases the output voltage by 0.1 V. A long click allows a fast increase and decrease by those increments. A double press allows to navigate fast to the typical output voltages of 5 V, 12 V, 24 V or 30 V. Short click on okay to confirm, next the current may be set in the same manner.

Adjustable Mode: Output voltage and current adjustment

In adjustable mode, using the current and voltage 0 V...10 V interface, the output current can be increased and decreased. 0V equals 0%, while 10 V equals 100%. The 10 V source may be used to set the output current. The source may be loaded with <2 mA only.



Specifications

If not otherwise denoted, the ambient temperature T_{amb} is considered to be 25°C.

	Min	Typ.	Max	Unit
Nominal output power		30	60	W
Nominal holdup time		20		mSec
Startup time		450	600	mSec
Peak output power		60	65	W
Peak output power time		unlimited		sec
Standby power consumption		3	10	W
Output current range (voltage mode)	0.2		3.0	A
Holdup time (nominal output power)		20		mSec
Primary secondary isolation (60 sec)		5		kV
Lifetime ($T_{amb}=40^{\circ}\text{C}$)	20			years
Output voltage ripple (Full Load)		1	2	%
Output voltage accuracy		2	5	%
Output current accuracy		50		mA
AC input voltage	200		250	Vac
AC input frequency	49		500	Hz
AC inrush current		45	50	A
DC input voltage	280		350	Vdc
Electrical efficiency		70	95	%
Output voltage	5		30	V
Power factor		0.55		
Operational temperature range	-25	25	70	°C
Weight		0.4		kg

Output characteristic

The power supply has a constant-current-constant-voltage output characteristic. The output characteristic is depicted in Figure 2. The output voltage is adjustable in 0.1 V steps from 5 V to 30 V. The output current range is adjustable from 0.2 A to 3 A in 0.01 A steps. The nominal output power is limited to 30 W, while it offers an unlimited peak power of 60 W.

The power supply is similar to a laboratory power supply. It can therefore be used for industrial control and test systems. If the SDC or display version is chosen, the power supply can be programmed during operation. Please have a look at the section "Model variants".

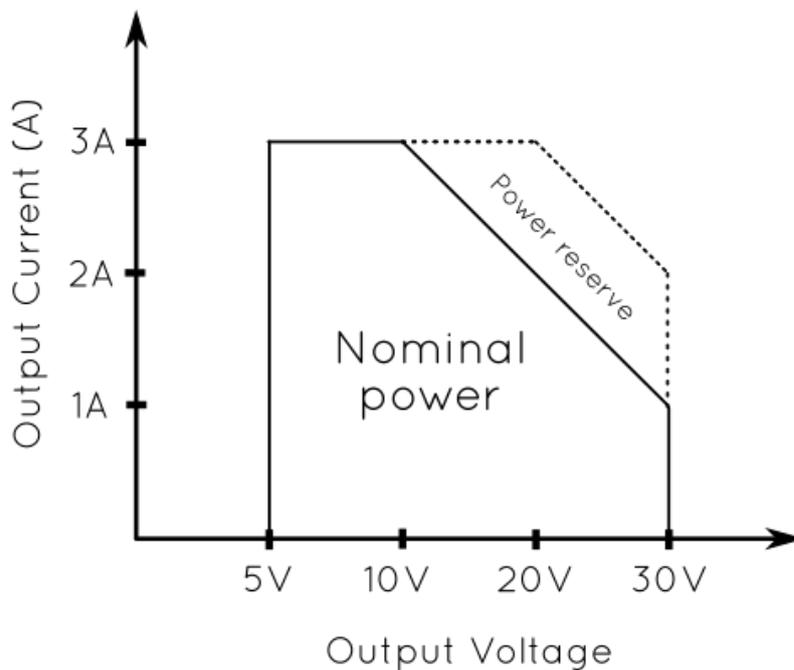


Figure 2: Output Power Range



Redundancy and Multi-Phase Operation

The several power supplies may be operated in parallel to increase the output current or implement redundancy. For redundant operation, no additional redundancy module is required.

Multi phase operation could be used to ensure operation during power outage of one or two lines. A wiring diagram for redundant, multi phase operation is shown in Figure 3.

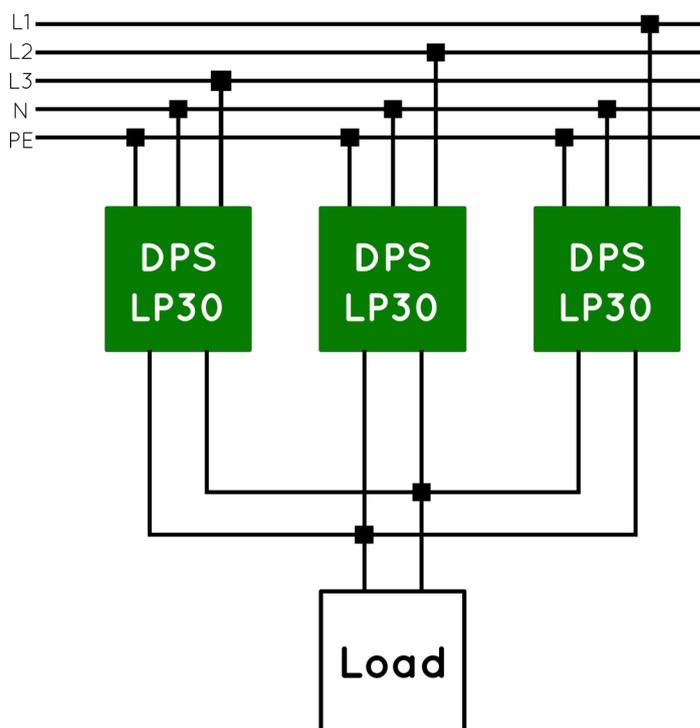


Figure 3: Multi phase redundant operation.



Efficiency

Figure 4 shows the converter's efficiency when supplied with 325 Vdc for different output voltage. An efficiency greater than 95% can be observed at 30 V output voltage.

The corresponding values are typical values only and may vary from device to device. Please note the maximum power of the device, which was mentioned in the specifications.

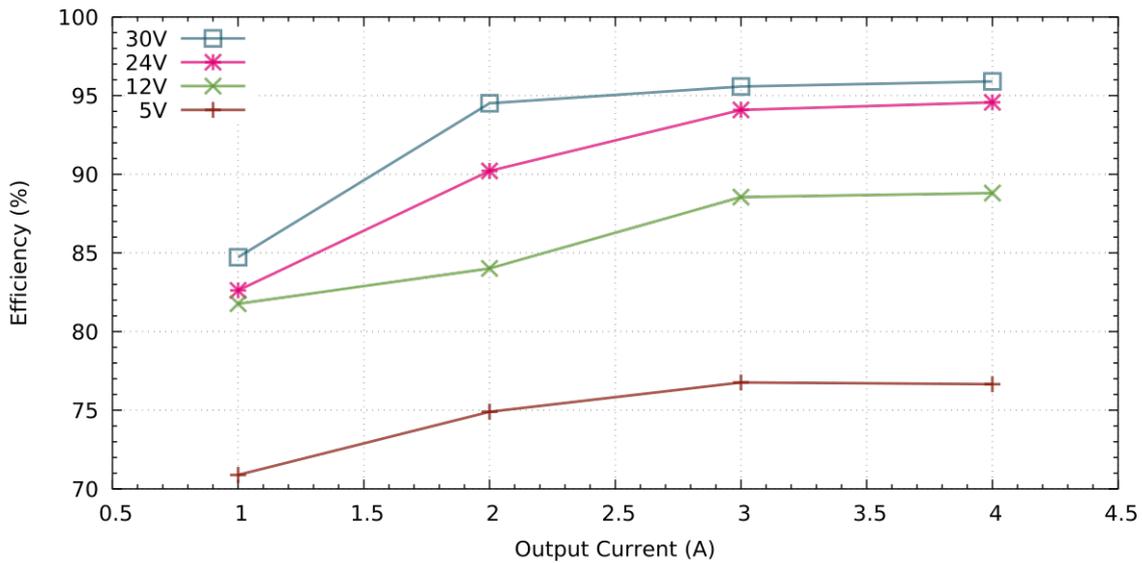


Figure 4: Efficiency over output current for different output voltages.

Lifetime

The DPS-LP30 features a lifetime of 20 years operated at 40°C ambient temperature. A full 20 year lifetime warranty can be optionally purchased.



Inrush Current

The inrush current is measured under cold start condition at peak grid value at 230 V_{ac}. A cold start is defined as $t_{off} > 10$ s.

Figure 5 demonstrates the inrush current over time. It's peak value is measured to 45 A.

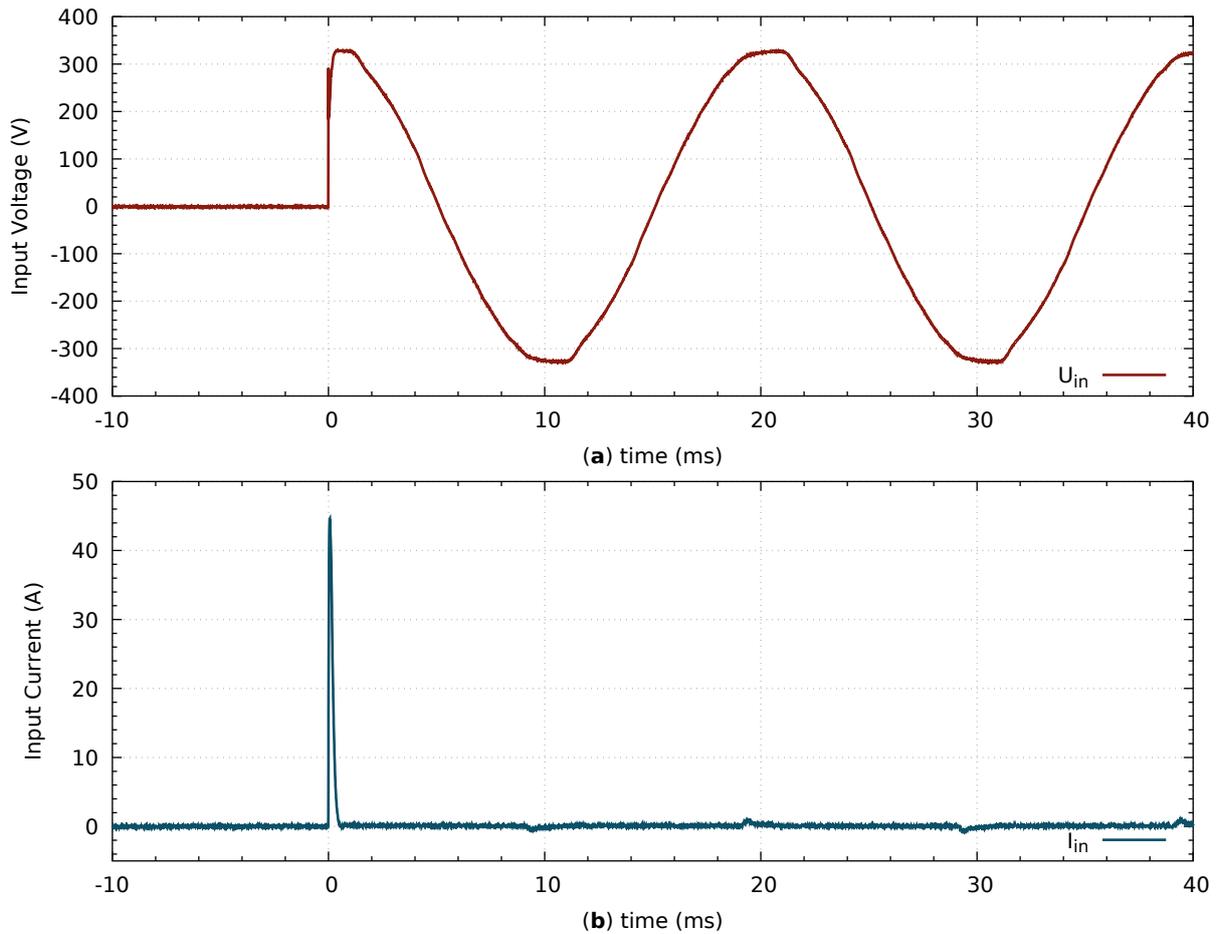


Figure 5: Inrush Current measured at 230 Vac



Turn-on Time

The turn-on is measured under cold start condition at peak grid value at 230 V_{ac}. In Figure 6 the turn-on time is measured to 440 ms.

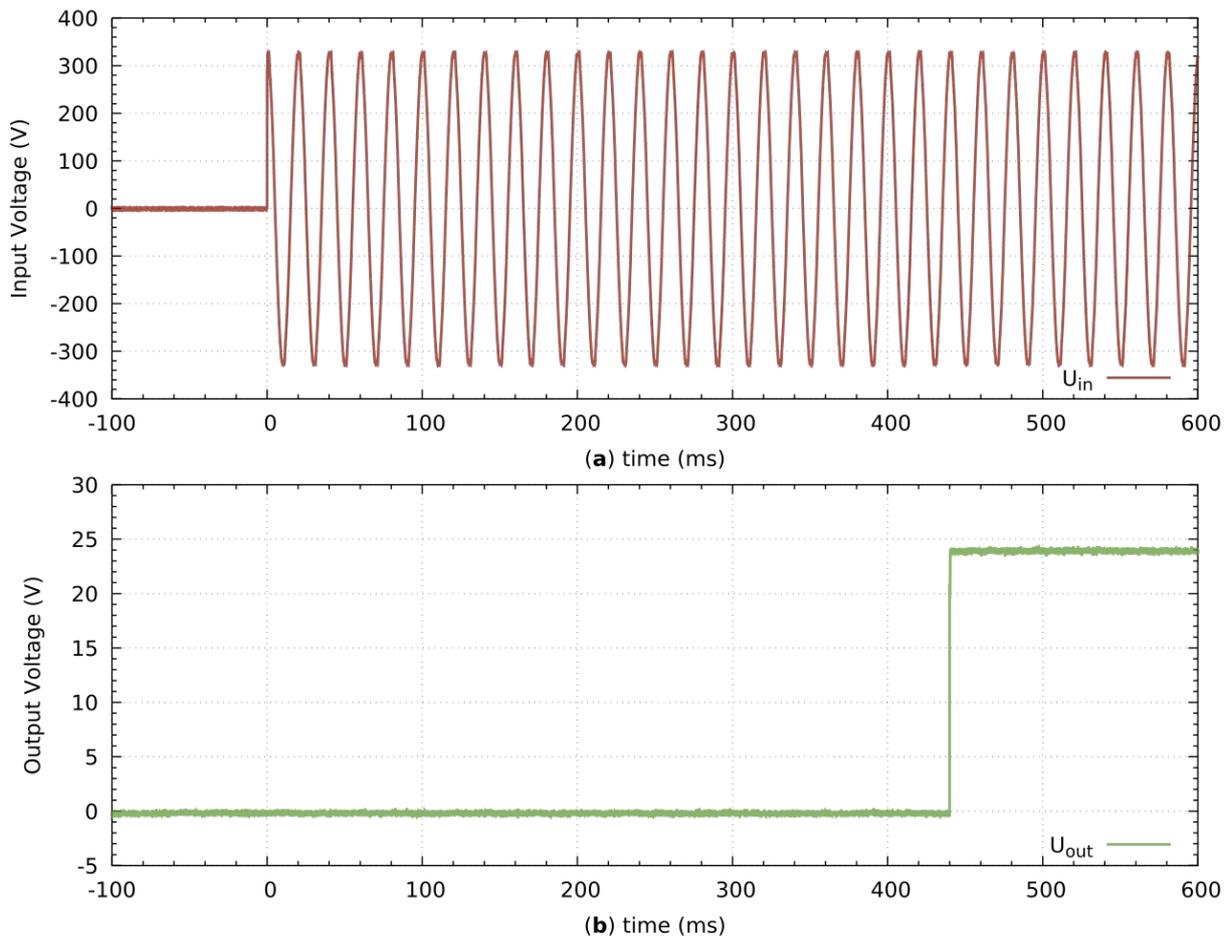


Figure 6: Converter Turnon Time



Shutdown waveform

The shutdown waveform is measured at 230 Vac at an output voltage $U=24\text{ V}$ and an output current of $I=1.25\text{ A}$. The grid power is turned off at $t=0\text{ s}$. The holdup time is measured to 20 ms.

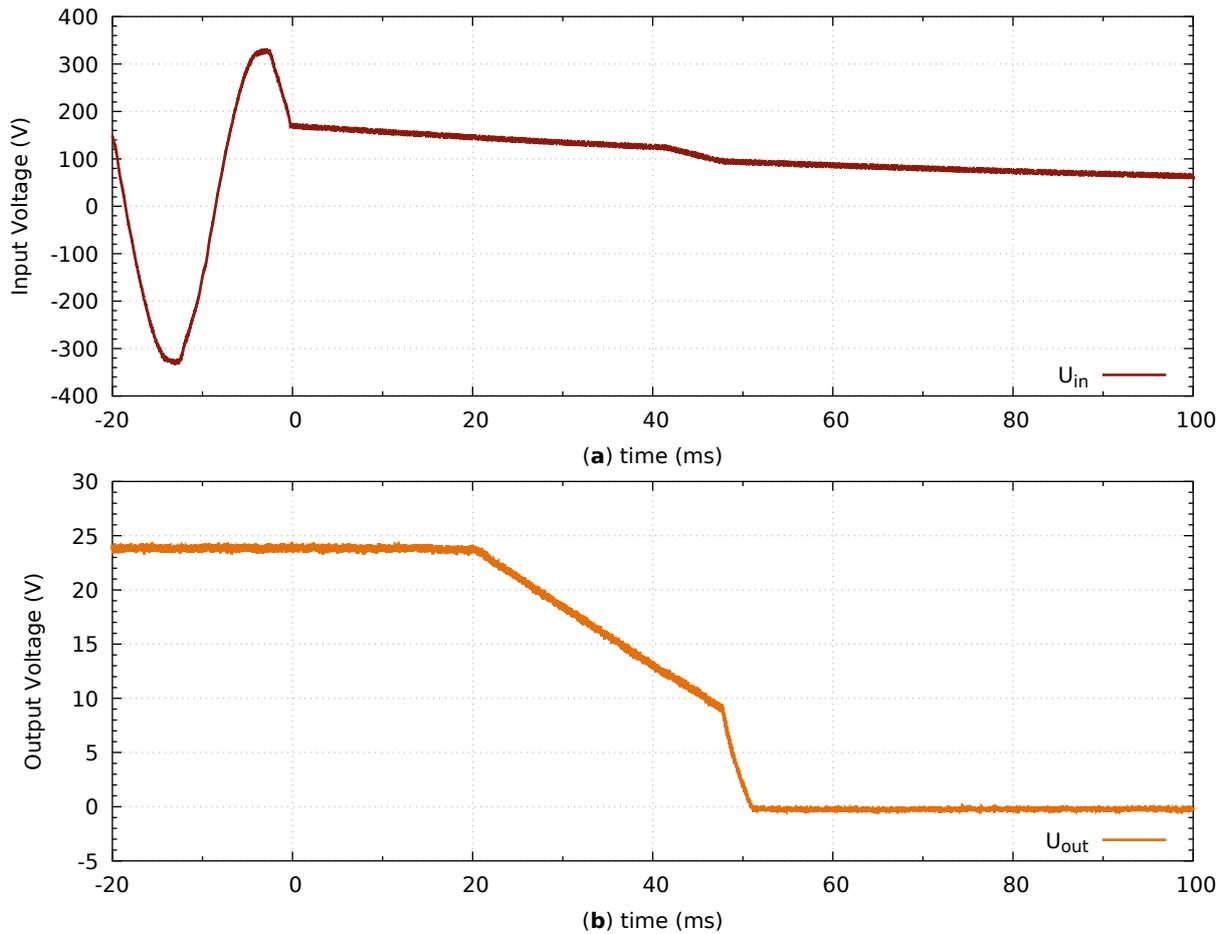


Figure 7: Holdup time and holdup waveform



Output Voltage ripple measurement

The output ripple is measured as a function of output current. It is measured by means of an oscilloscope with a limited bandwidth of 20 MHz.

The peak2peak output voltage (V_{pp}) ripple is measured for the typical output voltages of 5V, 12V and 24V.

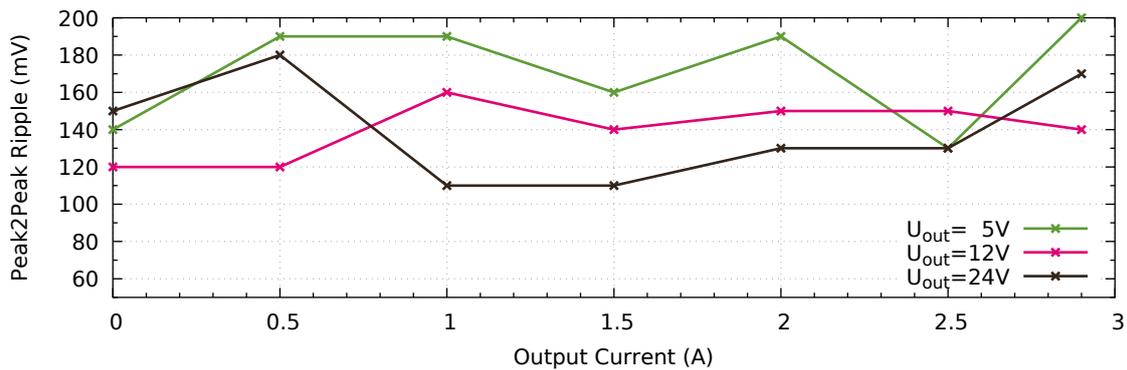


Figure 8: Peak to Peak output voltage Ripple for output voltages of 5V, 12V and 24V.



Redundancy Module

The power supply incorporates an integrated redundancy module. Further, the power supply may be operated in parallel without the use of additional diodes. The number of parallel power supplies therefore is not limited.

The power supply is supplied with 320 Vdc and output voltage is turned off at $t=0s$. The output voltage does not change, while the second power supply turns off. The first power supply now handles the full load.

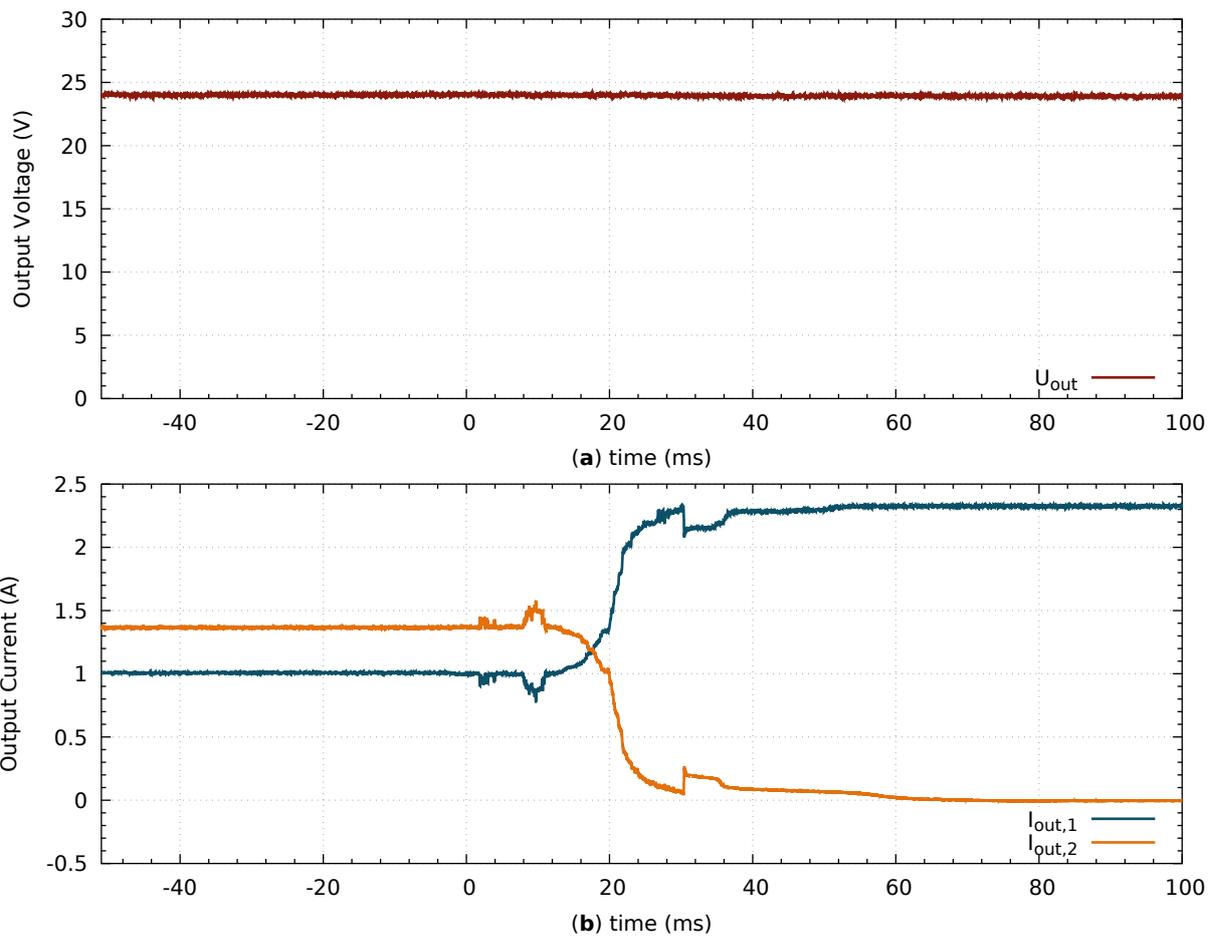


Figure 9: Redundant operation of power supply



Derating

The temperature derating is shown in Figure 10. The DPS-LP30 can operate under full power (60W) from -40°C to 60°C at 60 W_p . Between 60°C and 80°C linear derating must be applied. The maximum rating of 70°C operation temperature must be obeyed at all times.

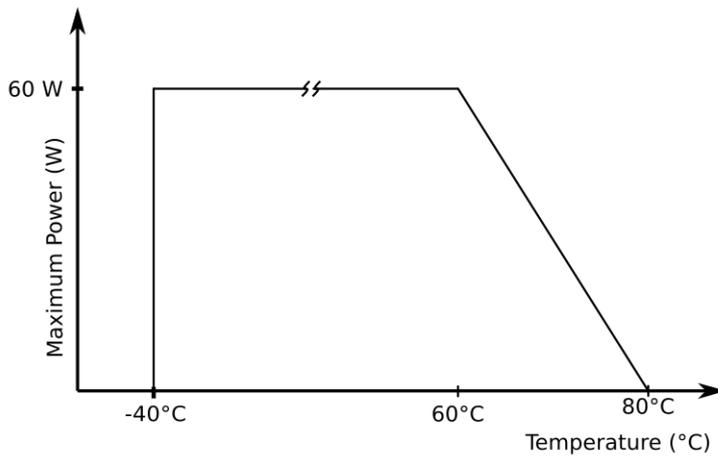


Figure 10: DPS-LP30 Temperature Derating

Motor softstart

The power supply features a Constant-Current-Constant-Voltage characteristic. By limiting the maximum current an DC Motor soft-start is easily implemented.

LED current control

The power supply features a Constant-Current-Constant-Voltage characteristic. Hence, the power supply can drive LEDs with constant current.



Models

The power supply consists out of one main printed circuit board (PCB) for power conversion. The communication is implemented using an exchangeable network PCB. Therefore, the DPS-LP30 can easily be equipped with different network PCBs. Currently the following power supply options can be offered.

DPS-LP30-FIXED

The DPS-LP30-FIXED has permanently programmed voltage and current values. Corresponding current values must be indicated with the order number. Customer specific values are programmed in.

DPS-LP30-SDC-DISP

The DPS-LP30-SDC-DISP has a two-line, three-digit display showing the current output current and output voltage. The output voltage and output current can be adjusted using three push buttons.

The DPS-LP30-SDC-DISP (Smart Device Classic) offers two 1V ... 10V interfaces for configuring the output current and output voltage. The connection can be made via a 4-wire terminal plug.

Similar to the DPS-LP30-DISP, it has a two-line, three-digit display showing the current output current and output voltage. The output voltage and the output current can be adjusted via three push buttons.

DPS-LP30-UART

The DPS-LP30-UART offers a simple, isolated UART interface. This model is targeted to advanced technical experts, willing to integrate this power supply in test jigs.

The power supply can be easily interfaced by prototyping hardware, e.g. Arduino. The isolation from primary to secondary side provides a save isolation. The UART supports operation voltages of 2.5V to 5V. For the communication an external current of <10mA must be supplied for the interface board.

The connection protocol is documented in a separate document.



Certifications / Safety Approvals

Currently the power supply is in the certification state. Therefore, no certifications are obtained. The following engineering standards are used:

- IEC 62368-1
- IEC 61010-1
- IEC 61010-2-201

EMC Emissions

The power supply has excellent EMC conducted line emission. The emission where measured in accordance to CISPR-11.

CISPR-11 is far more challenging than EN 61000-4-6 CLASS A requirement.

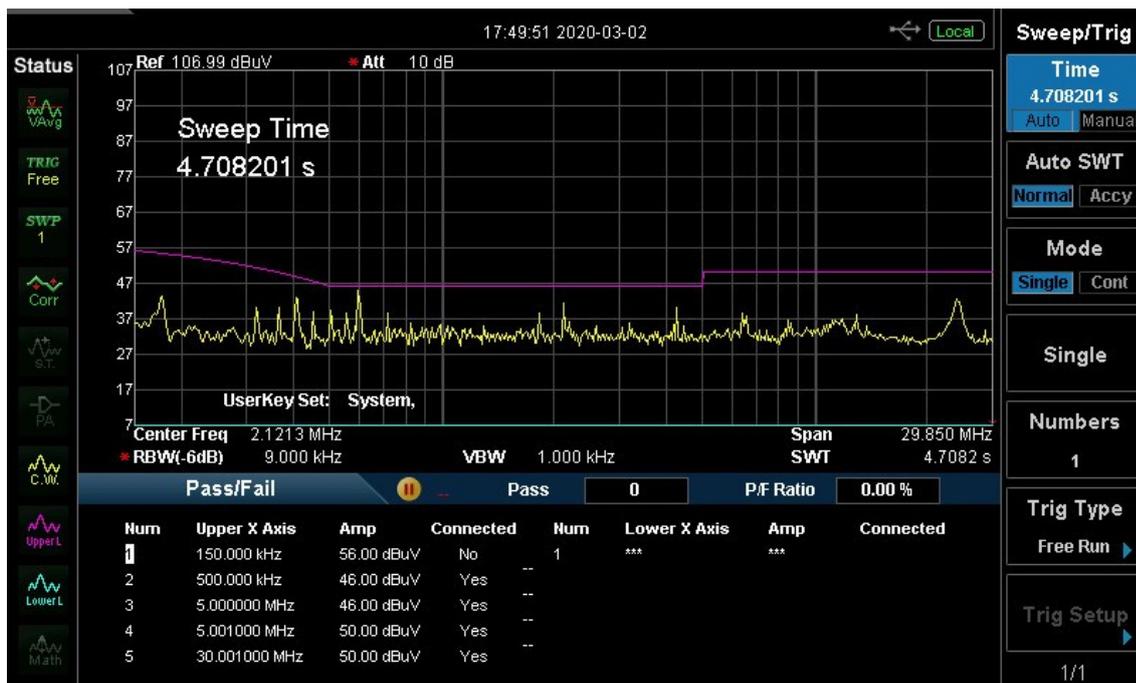


Figure 11: Average line conducted emissions in accordance to CISPR-11.



Enclosure

The DPS-LP30 comes in DIN 43 880 (distribution box style) enclosing with a width of four elements.

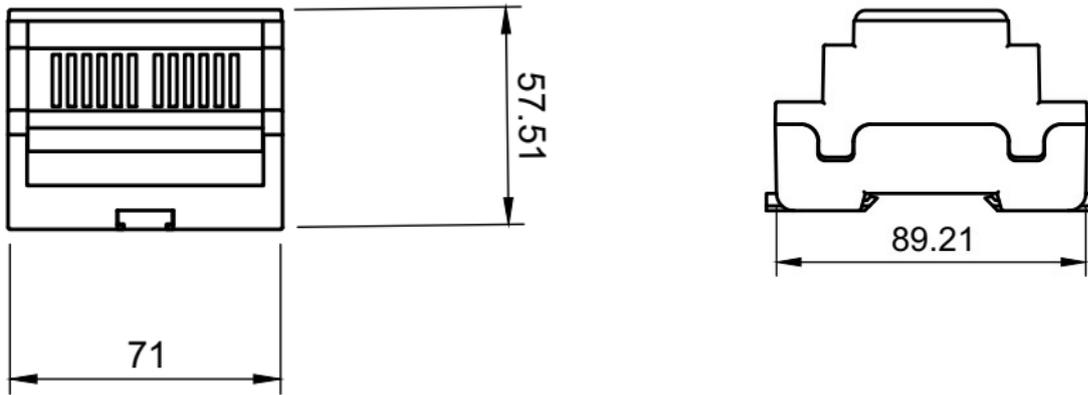


Figure 12: Mechanical Dimensions



Revision History

Revision 6 1.10.2020 Extended Temperature Range and updated installation instructions.

Revision 7 11.10.2020 Fixed Orthographic Issues

Contact Information

Digital Power Systems

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