Laser Power Supply Family LPS 2000 plus

Operating Manual

mpc

English Edition

Table of contents **Page**

Table of contents **Page**

Specifications

Please read this instruction carefully and pay particular attention to the use as agreed and the safety labelings.
You will lose any warranty claim for damages caused by nonobservance of the instructions.
We don't undertake liability for resultant damages.

Use as agreed

The device serves for constant current operation of pump lamps for lasers.

The device is suitable for the constant current operation of ohmic, capacitive and inductive loads.

The device may not be used for charging accumulators.

The device may not be installed into vehicles.

The maximum permitted output power of 6000 W or a maximum input power of 7000 W may not be exceeded.

Safety labelings

The safety rules of the federation of professional trade associations for electrical plants in commercial facilities have to be followed.

The device isn't allowed for the use on people and animals.

The device may only be connected to a three-phase ac mains supply.
The supply lines must have a cross-section of at least 1.5 sqmm, better 2.5 sqmm. At the use of stranded wires multicore cable ends have to be applied.

The supply lines to the pump lamp must be designed for the intended lamp current.
Dimensioning: recommended cross-section 4 sqmm.
At the LPS 2000 plus use wire end sleeves for the corresponding cross-section.
Use only the allowed and prescribed manufacturer squeezing tool for squeezing the wire end sleeves.
Incorrect squeezing connections can show an inadmissibly high transfer resistance. This may lead to increased power dissipation at the squeezing point and can cause a cable fire.
Pay attention to a firm screw connection of the supply lines.

Safety labelings continuation

Never disconnect the lines from the LPS 2000 to the laser lamps during operation.
It could cause a dangerous arc because of the current source characteristics of the device which leads to skin burnings, to injury of the eyes or to a fire.

Never put the LPS 2000 plus into operation when it was just taken from a cold to a warm room.
The condensed water arising in this process can influence the function of the device or even destroy it.
Let the LPS 2000 plus assimilate to room temperature before use.

Provide a sufficient and unhindered ventilating during operation.
The integrated fan draws in the cooling air on the side of the fan and pours out in the range of the visible cooling rib.
The intaken and escaping cooling air may not be hindered.
If the LPS 2000 plus is assembled flush with a front or back plate on the fan side, then a fan opening in the plate is required. The measures for the opening are shown in the corresponded drawing.
A fan protective barrier has to be used to avoid injuries.

If the LPS 2000 plus is used in electrically conductive dust in commercial or industrial surroundings, then the intaken air must absolutely be filtered.

The fan may not be put out of operation when an alternative water cooling is used.

If a safe mode of the LPS 2000 plus cannot be guaranteed, set it out of operation and secure it against unintentional use.

In every case the LPS 2000 plus has to be put out of operation if

the device has visible damages,
the device doesn't work properly,
the device has been stored longer under unfavourable and inadmissible conditions,
the device had a difficult and inadmissible transport use.

Characteristics

The LPS 2000 plus family consists of altogether 4 devices of equal dimensions.
The difference is the number and precision of the interfaces and the extent of supply.

- Input voltage range from 342 V to 506 V (3-phase)
  Leakage current 0.5 mA
- Power Factor Correction 0.95
- Efficiency 93 %
- Output Power 6000 W
- Programmable Output Current up to 30 A
  Resolution 10 bit
  Excellent load regulation
  Low temperature drift
- Low output ripple current
- Output voltage up to 350 V
- Programmable boost voltage from 300 V to 1800 V
  Resolution 4 bit
- Very low EMI, external filters aren't necessary
- Air cooling with a temperature controlled fan
- Water cooling (optional)
- Interfaces
  Serial Port RS 232 C
  Parallel Port (optional)
  Analog Input
  Analog Output
- Completely microprocessor controlled
  Control- and configuration software
- Small dimensions
- SMD-technology
- CE sign
- Low running costs

Type summary

LPS 2000 plus type	Output Power max.	Lamp Current	Lamp Voltage max.
10100200	6000 W	0 - 30 A	350 V
10100201	6000 W	0 - 30 A	350 V
10100202	6000 W	0 - 30 A	350 V
10100220	6000 W	0 - 25.5 A	350 V

Output power
Within the input voltage range from 342 V up to 506 V (3-phase mains) the maximum output power of 6000 W is independent of the input voltage.

Description
The devices of the LPS 2000 plus family are based on the new developed MAPS technology and are distinguished by its excellent electrical and mechanical characteristics as well as maximum electromagnetic compatibility (EMC) and leakage current.

The running costs are considerably reduced through the Power Factor Correction and the high power factor of 0.95.

Cost-intensive external filters at the input or output, shielded or twisted supply lines to the lamp and shielded interface cables are not required.

The requirements of the VDE 0875 N are met.

Because of the low leakage current a mains plug connector is allowed and there are no problems with differential-current switches.

A Serial Interface and an Analog Interface with input and output are available. The devices are optionally deliverable with a Parallel Interface.

The following control and diagnosis possibilities are available:

- Setting of operation modes with externally accessible DIP-switches
- Operation mode Autostart with automatic boost activation
- Controlled operation mode Analog or Digital
- Current programming by Serial Port
- Current programming by Parallel Port
- Current programming by Analog Port
- Boost voltage programming by Serial Port
- Boost voltage programming by externally accessible DIP-switches
- Control by Serial Port
- Control by Parallel Port
- Analog current monitor
- Fully diagnostic of all parameters by Serial Port

The LPS 2000 plus is short circuit proof between the output lines and between the output lines to PE.

The LPS 2000 plus is immediately ready after turning on the mains voltage. No initial period has to be waited for.
The high speed boost generator charges within 3 seconds onto 1000 V. 1800 V are reached within 10 seconds.

The integrated power and interface connections allow a space-saving mounting and wiring. The fan is integrated too. It is temperature regulated for increasing lifetime.

Mounting is both horizontally and vertically possible. For control cubicle installation horizontal and vertical mounting plates are deliverable.

All rules and guidelines are met. The device has CE sign. The device is manufactured in a documented production flow.

The following belongs to the extent of supply:
LPS 2000 plus
Operating manual
Control and communication software (Windows™ - version)

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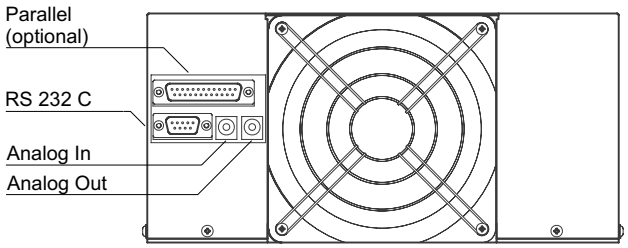

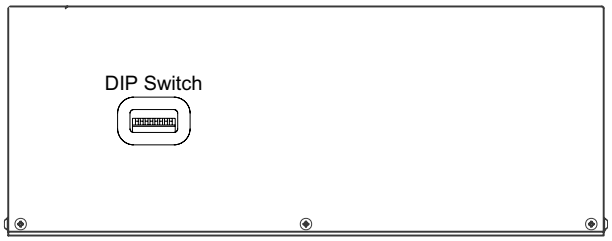

Windows™ is a re-
stered trademark of
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n USA.

Control options

The LPS 2000 plus can be controlled in different ways.
Two interfaces are already integrated in the standard model, an Analog Port and a RS 232 Port.
Basic functions and settings can be done by means of the DIP-switches.
Optionally a Parallel Port is available.

The output current of the LPS 2000 can be controlled by the Analog Port. The output current can be monitored at the Analog Output Port (current monitor).

The boost voltage can be adjusted between 300 volts and 1800 volts by setting the DIP-switches 1 to 4.
In the Auto Start mode the LPS 2000 plus only needs a current set point at the Analog Port for operating.

The RS 232 Port allows operation and supervision of the LPS 2000 plus with access to all implemented functions and measurements.
The LPS can be controlled by a PC and important device parameters and limiting values can be permanently programmed with the control- and configuration software.
The LPS 2000 sends constantly the current measurements and settings at the RS 232 Port, independently of the selected or active interface.

At the Parallel Port the LPS 2000 plus can be controlled digitally with wide performance range.

The interfaces can also be used at the same time without any problems.
For example is it possible to control the LPS 2000 plus digitally at the Parallel Port and add or subtract (modulation) an additional current by feeding in a current set point at the Analog Port. Simultaneously is it possible to read out all current values, measurements and settings at the RS 232 Port.

It is not possible using the RS 232 Port and the Parallel Port both at the same time to control the LPS 2000 plus.

Other	Status Data	Control Data	Function	Name	Analog Port	RS 232 Port	Parallel 10 Bit	Parallel 8 Bit
		CA	Current Set Point Analog	CSPA	•			
	SA		Output Current Analog	COUTA	•			
		CD	Current Set Point 10 Bit	CSPD10		•	•	
		CD	Current Set Point 8 Bit	CSPD8		•		•
		CD	Power Supply On	ON		•	•	•
		CD	Boost On	BON		•	•	•
		CD	Standby Current Activated	SBA		•	•	
		CD	Interlock Input	ILIN		•	•	
		CD	Reset Fault	RESF		•	•	
		CD	Autostart	AUTO		•		
	SD		Power Supply Ready	PSR		•	•	•
	SD		Boost Voltage Ready	BVR		•	•	
	SD		Output Current Ok	COUTR		•	•	•
	SD		Current Fault	CF		•	•	•
	SD		Lamp Break	LB			•	
	SD		Summation Fault	SF		•	•	
	SD		Interlock Output	ILOUT		•	•	
	SD		Heat Sink Temperature 8 Bit	T		•		

Signals and data at the interfaces
Three modes of operation are possible. Operating at the Analog Port, the RS 232 Port and at the Parallel Port.
The following signals and data are available.

CA = Control Data Analog
CD = Control Data Digital
SA = Status Data Analog
SD = Status Data Digital

Other	Status Data	Control Data	Function	Name	Analog Port	RS 232 Port	Parallel 10 Bit	Parallel 8 Bit
	SD		Output Current 8 Bit	COUT		•		
	SD		Mains Voltage 8 Bit (Peak Value)	MV		•		
	SD		Boost Voltage 8 Bit	BV		•		
	SD		Output Voltage 8 Bit	VOUT		•		
	SD		Temperature Limit Reached 3 Bit Counter	TLCR		•		
	SD		Temperature Limit Reached	TLR		•		
	SD		Temperature Warning Limit Reached - 3 Bit Counter	TWLCR		•		
	SD		Temperature Warning Limit Reached	TWLR		•	•	•
	SD		Output Current Time Out 4 Bit Counter	COUTTC		•		
	SD		Output Current Time Out	COUTT		•		
	SD		Current Limit Reached	CLR		•		
	SD		Pump Lamp Defect	PLD		•		
	SD		Current Fault	CF		•		
	SD		Output Voltage Exceeded 3 Bit Counter	VOUTCE		•		
	SD		Output Voltage Exceeded	VOUTE		•		
	SD		Boost Voltage Exceeded 3 Bit Counter	BVCE		•		
	SD		Boost Voltage Exceeded	BVE		•		

Signals and data at the interfaces (continuation)

CA = Control Data Analog
CD = Control Data Digital
SA = Status Data Analog
SD = Status Data Digital

Other	Status Data	Control Data	Function	Name	Analog Port	RS 232 Port	Parallel 10 Bit	Parallel 8 Bit
	SD		System Fault	SF		•		
	SD		RS 232 Frame Fault	SIFF		•		
	SD		RS 232 Time Out	SITO		•		
	SD		RS 232 Illegal Character	SIIC		•		
	SD		Voltage Summation Fault	VSF		•		
	SD		Current Summation Fault	CSF		•		
	SD		Temperature Summation Fault	TSF		•		
	SD		IGBT Fault	IGBTF		•		
	SD		Parallel Active	PA		•		
	SD		Serial Active	SA		•		
	SD		Overcurrent	OC		•		
	SD		DIP Switch Boost Voltage 4 Bit	BVDIP		•		
	SD		DIP Switch Boost Programming Mode 4 Bit	BVPDIP		•		
	SD		DIP Switch Autostart	ASDIP		•		
	SD		DIP Switch Current Programming Mode	CPDIP		•		
	SD		DIP Switch Interface Selection	ISDIP		•		
	SD		Boost Voltage Internal 4 Bit	BVI		•		
	SD		PWM Power Module Locked	PPML		•		
	SD		PWM Boostgenerator gesperrt	PBGL		•		

Signals and data at the interfaces (continuation)

CA = Control Data Analog
CD = Control Data Digital
SA = Status Data Analog
SD = Status Data Digital

Other	Status Data	Control Data	Function	Name	Analog Port	RS 232 Port	Parallel 10 Bit	Parallel 8 Bit
	SD		Power Module Reset	PMR		•		
	SD		Power Module Fault Reset	PMFR		•		
	SD		Hardware Fault	HF		•		
	SD		Current Set Point 10 Bit	CSPD10		•		
	SD		Current Set Point 8 Bit	CSPD8		•		
	SD		LED 1 - Input Voltage Ok	LED1		•		
	SD		LED 2 - Output Voltage Ok	LED2		•		
	SD		LED 3 - Waiting for U_{Out} Ok	LED3		•		
	SD		LED 4 - Current Flows, Lamp Ok	LED4		•		
	SD		LED 5 - Boost Voltage Ok	LED5		•		
	SD		LED 6 - Fan Control Ok	LED6		•		
	SD		LED 7 - Fault	LED7		•		
	SD		Temperature Limit 8 Bit	TL		•		
	SD		Maximum Output Current 8 Bit	COUTMA		•		
	SD		Minimum Mains Voltage 8 Bit	MVMI		•		
	SD		Temperature Warning Limit 8 Bit	TW		•		
	SD		Operating Hours 32 Bit	WH		•		
	SD		Minimum Output Current 8 Bit	COUTMI		•		
	SD		Maximum Boost Voltage 8 Bit	BVMA		•		
	SD		Boost Release Value 8 Bit	BVR		•		

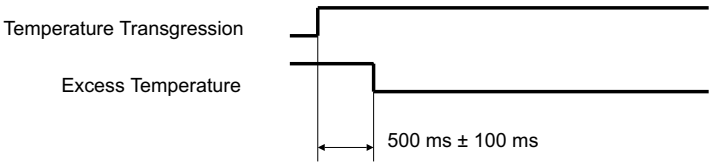
Signals and data at the interfaces (continuation)

CA = Control Data Analog
CD = Control Data Digital
SA = Status Data Analog
SD = Status Data Digital

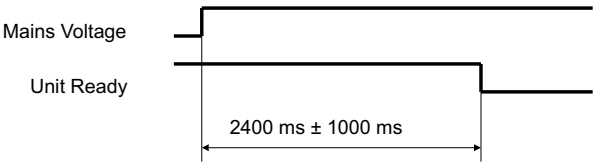
Other	Status Data	Control Data	Function	Name	Analog Port	RS 232 Port	Parallel 10 Bit	Parallel 8 Bit
	SD		Maximum Output Voltage 8 Bit	VOUTMA		•		
	SD		Baud Rate	BR		•		
	SD		Auxiliary Voltage +15 V	AUX+15		•	•	
	SD		Auxiliary Voltage -15 V	AUX-15		•		
	SD		Auxiliary Voltage + 5 V	AUX+5		•		

Timing diagrams

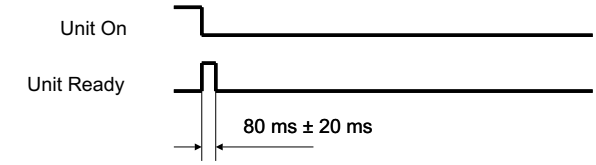
Characteristic at a Temperature Transgression



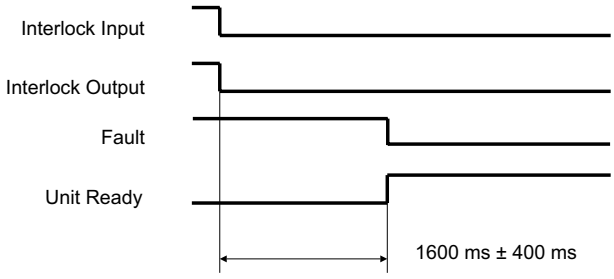
Characteristic at Switching Mains On



Characteristic at Switching Off

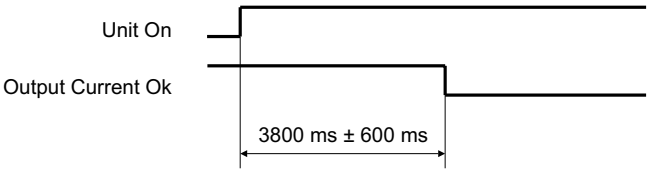


Interlock Characteristic



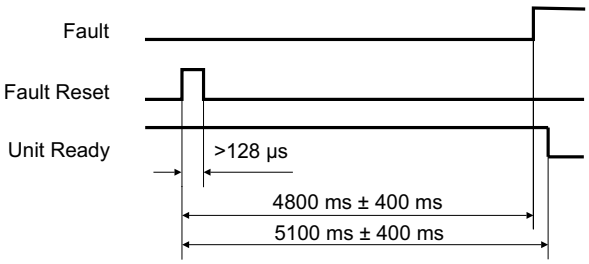
Timing diagrams (continuation)

Characteristic at Unit On

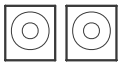


(+ tolerance of the igniting unit)

Characteristic at Reset Fault



Analog Port



Signals and data at the interfaces (continuation)

CA = Control Data Analog
CD = Control Data Digital
SA = Status Data Analog
SD = Status Data Digital

Interface description - Analog Port

The Output Current of the LPS 2000 plus can be controlled at the Analog Port with minimal effort.

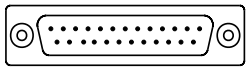
If the LPS 2000 plus shall be controlled only via the Analog Port the operating mode Autostart has to be selcted at the DIP-switches. This is not necessary in operation together with the Parallel Port or the RS 232 Port.

The Output Current is controlled by a voltage in the range from 0 to 10 V at the input **Analog In**.
1 volt corresponds to 3 A.
0 volt corresponds to 0 A. 10 volts correspond to 30 A Output Current.

The voltage at the output **Analog Out** is an image of the Output Current.
1 volt corresponds to 3 A Output Current.
0 volt corresponds to 0 A. 10 volts correspond to 30 A Output Current.

Connection: 2 chinch jacks

Parallel Port



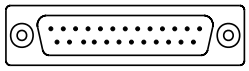
Interface description - Parallel Port 10 bit

Inputs	
Pin	**Function**
1	Data Bit 0 Current Set Point LSB
14	Data Bit 1 Current Set Point
2	Data Bit 2 Current Set Point
15	Data Bit 3 Current Set Point
3	Data Bit 4 Current Set Point
16	Data Bit 5 Current Set Point
4	Data Bit 6 Current Set Point
17	Data Bit 7 Current Set Point
5	Data Bit 8 Current Set Point
18	Data Bit 9 Current Set Point MSB
6	Control Bit Power Supply On
19	Control Bit Boost Generator On
7	Control Bit Standby
20	Control Bit Interlock Input
8	Control Bit Reset Fault
13	GND
Outputs	
Pin	**Function**
21	Status Unit Ready
9	Status Boost Voltage Ready
22	Status Output Current Ok
11	Status Current Fault
24	Status Lamp Break
12	Status Temperature Limit Reached
23	Status Summation Fault
10	Interlock Output
13	GND
25	+ 15 V *
13	GND

* Internal supply voltage of the LPS 2000 plus to supply peripheral equipment with a maximum current of 50 mA.

Connection: 25-pole pin plug connector according to DIN 41652 and MIL-C-24308, internal thread UNC 4-40.

Parallel Port

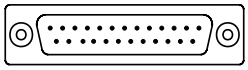


Interface description - Parallel Port 8 bit

Inputs	
Pin	**Function**
2 15 3 16 4 17 5 18	Data Bit 0 Current Set Point LSB Data Bit 1 Current Set Point Data Bit 2 Current Set Point Data Bit 3 Current Set Point Data Bit 4 Current Set Point Data Bit 5 Current Set Point Data Bit 6 Current Set Point Data Bit 7 Current Set Point MSB
6 22 12, 19	Control Bit Power Supply ON Control Bit Boost Generator ON GND
Outputs	
Pin	**Function**
21 7 20 8 12, 19	Status Unit Ready Status Output Current OK Status Current Fault Status Excess Temperature GND

Connection: 25-pole pin plug connector according to DIN 41652 and MIL-C-24308, internal thread UNC 4-40.

Parallel Port



Input levels
All inputs are active-high.
Levels between 0 V and 0.8 V are Low,
levels between 2 V and < 30 V are High.
Levels between 0.8 and 2 V can cause nonreproducible states.
Minimum required rise and fall time is 3 µs. The signals must be applied for a minimum time of 128 µs.

Output levels
All outputs are active-low (NPN open collector).
The inputs of the connected circuitry must have pull up resistors to its relevant supply voltage to ensure a correct function.
The maximum permitted voltage is 30 V. The maximum permitted current is 20 mA (sink mode).
Levels between 0 V and 0.4 V are Low, all other levels are High.
Minimum Low and High time: 128 µs ... 130 µs.

Activation of the interface
The Parallel Port has to be activated by setting the DIP-Switch 8 = Off.

Current programming mode
The LPS 2000 plus can be operated in two current programming modes: Analog or Digital Plus Analog.

In the Analog mode (DIP-switch 7 = Off) the Output Current is controlled by a voltage feed in at the Analog Input (Scaling: 0.3 V / A).

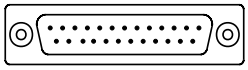
In the mode **Digital Plus Analog** (DIP-switch 7 = On) the output current is digitally controlled by a 10 bit data word (1023 digits) with data bits 0 to 9.
1 digit corresponds to 29.3 mA. Full scale (data bits 0 to 9 = High) corresponds to 30.0 A.
A current set point feed in at the analog input is added to the digital current set point.
The analog current set point may also be negative and acts subtracting.

Modes of operation
The LPS 2000 plus can be operated in two ways.

The operation mode **Autostart Activated** (DIP-switch 6 = On) allows an automatic startup.
After turning on the mains voltage the power module is activated automatically and the boost generator starts. The boost generator is switched off automatically after igniting the pump lamp.

The operation mode **Autostart Deactivated** (DIP-switch 6 = Off) allows the fully controlled operation of the functions **Power Supply On, Boost On, Standby Current Activated, Interlock Input, Reset Fault,** and **Current Set Point** by the Parallel or the Serial Port.

Parallel Port



Functions
The control bit **Power Supply On** activates the power module of the LPS 2000 plus. An Output Voltage of 350 V is applied to the output.

The control bit **Boost On** activates the boost generator. The programmed boost voltage is applied to the output.

The control bit **Standby Current Activated** changes the output current to a value of 7 A.
The value can be changed with the configuration software in the range from 0 to 30.0 A.

If a signal is missing, the LPS 2000 plus switches off and signals a summation and interlock fault.
If the LPS 2000 plus has switched off because of frequently faults, it can be activated again by the control bit **Reset Fault** or by disconnecting the mains voltage.

Outputs
The status **Power Supply Ready** will be signalled, if the LPS 2000 plus is connected to the correct supply voltage and there are no faults.

The status **Boost Voltage Ready** will be signalled if the boost voltage has reached the programmed value.

The status **Output Current OK** will be signalled if the output current corresponds to the programmed value and flows for one second.

The status **Current Fault** will be signalled if the output current differs from the programmed value for one second.
The signal will be reset if the output current corresponds to the programmed value again.
If the maximum permissible current is exceeded the LPS 2000 plus limits to 30 A.

The status **Lamp Break** will be signalled if there is no Current Fault, the output voltage is lower than the programmed value of 50 V and the output current is higher than the programmed value of 3 A.
The values can be changed in the range of 0 ... 300 V and 0 ... 30.0 A with the configuration software.

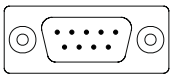
The status **Temperature Warning Limit Reached** will be signalled if the LPS 2000 plus has reached a temperature of + 75 °C at the heat sink. The LPS 2000 Plus switches off at + 80 °C.
The Temperature Warning Limit Reached value can be changed in the range of 0 ... + 80 °C with the configuration software.

The status **Summation Fault** will be signalled if there is an internal fault.

The signal **Interlock Output** is generated from the control bit Interlock Input.

Interface description - RS 232 Port

RS 232 Port



Pin	Function
1	NC *
2	TX
3	RX
4	NC
5	GND
6	NC
7	CTS
8	RTS
9	NC

* The internal supply voltage of the LPS 2000 plus (± 15 V and + 5 V) can be applied by internal jumpers to the following pins for supplying peripheral equipment with a maximum current of 50 mA.

+ 15 V pin 6
- 15 V pin 1
+ 5 V pin 9

The Serial Interface meets the RS 232 C standard.
The LPS 2000 plus sends data on pin 2 (TX) and receives data on pin 3 (RX).
A hardware handshake isn't used. The RTS/CTS signal can be looped through or a fixed state (0 or 1) can be assigned to the RTS signal by an internal jumper.
Permitted baud rates are 2400, 4800, 9600 and 18382 (customer-specific).

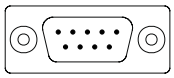
The logic states of the interface correspond to the CCITT recommendation V.28.
Connection: 9-pole pin plug connector according to DIN 41652 and MIL-C-24308, internal thread UNC 4-40.

The LPS 2000 plus can communicate with a PC via a 9-pole D sub line (socket-socket, one-to-one wiring). The fully performance range is available.

The LPS 2000 plus receives control data and sends status and diagnosis data. Status and diagnosis data are always sent even if the LPS 2000 plus is controlled by the Parallel Port or by the Analog Port.

The limiting values of the LPS 2000 plus can be programmed by the configuration software.

RS 232 Port



Software protocol
The baud rate is variable and can be set factory-aligned to the following rates:
2400, 4800, 9600 or 18382 (customer-specific) bauds.
The data format is 8 data bits, no parity, one stop bit.
No software handshake (XON, XOFF) is used.

Sent data and their meaning:
Independent of the operation mode (control by Parallel Port or Serial Port), a data set of 41 consecutive bytes is cyclically sent at the RS 232 Port.
They are used for fault diagnosis or for displaying operating data.

Meaning of the data bytes

Data Byte 1 and 2 Beginning of the Data Set
To open the sequence twice a start byte is sent.
The value is $0A_{hex}$.

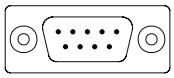
Data Byte 3 Heat Sink Temperature SD-T
8 bit value, binary output, nonlinear.

00 °C	54
10 °C	58
25 °C	67
40 °C	87
45 °C	94
50 °C	106
55 °C	116
60 °C	128
65 °C	144
70 °C	175
75 °C	195
80 °C	249

Data Byte 4 Output Current SD-COUT
8 bit value, binary output, linear.
32.7 A correspond to 255 digits.
1 digit corresponds to 0.128 A.

Data Byte 5 Mains Voltage (Peak Value) SD-MV
8 bit value, binary output, linear.
775 V correspond to 255 digits.
1 digit corresponds to 3.04 V.

RS 232 Port



Data Byte 6 Boost Voltage SD-BV
8 bit value, binary output, linear.
2235 V correspond to 255 digits.
1 digit corresponds to 8.765 V.

Data Byte 7 Output Voltage SD-VOUT
8 bit value, binary output, linear.
693 V correspond to 255 digits.
1 digit corresponds to 2.72 V.

Data Byte 8 Temperature Flags
The temperature flags evaluate the maximum temperatures of the data bytes 25 and 28.
Binary output.

If the temperature limit value (data byte 25) is exceeded the device will be switched off with the message 'Temperature Limit Exceeded' after a duration of approximately 0.5 seconds.

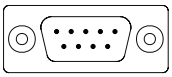
Bit 0 to 2	3 bit counter for the maximum permitted heat sink temperature
Bit 3	Excess temperature bit, the device is switched off. If the value of the temperature warning byte (data byte 28) is exceeded the temperature warning bit will be set after 0.5 s. This allows to activate an additional cooling.
Bit 4 to 6	3 bit counter for temperature warning
Bit 7	Temperature warning bit, shows that the warning temperature is reached. The device is not switched off.

Data Byte 9 Current Fault Flags
The current fault bits evaluate the maximum current default value, a current fault or a open-circuit operation of the output.
Binary output.

Current timeout fault
The device switches off with an error message if the output current is not reached within one minute after enabling the boost voltage.

Bit 0 to 2 and bit 6	4 bit counter for current time out.
Bit 3	Maximum Output Current exceeded If the maximum Output Current (data byte 26) is exceeded for longer than 200 ms then Bit 3 is set and the device is switched off.
Bit 4	Shows a defect of the pump lamp. If there is no current fault, the output current is higher than the value of data byte 33 and the Output Voltage is lower than 50 V then Bit 4 is set. The default value is 3 A (data byte 33).

RS 232 Port



Bit 5	Shows a current fault. Bit 5 is set if the output current differs from the current set point for at least one second. If the maximum Output Current of 30 A is not exceeded then the device isn't switched off. If the output current matches the current set point again Bit 5 is reset.
Bit 7	Shows that the output current was not reached within one minute. The device switches off immediately.

Data Byte 10 Voltage Fault Flags
The voltage fault bits evaluate the output voltage and the boost voltage.
Binary output.

Bit 0 to 2	3 bit counter for the maximum output voltage.
Bit 3	If the maximum output voltage (data byte 36) is exceeded for longer than 200 ms Bit 3 is set and the device switches off.
Bit 4 to 6	3 bit counter for the maximum boost voltage.
Bit 7	If the maximum boost voltage (data byte 34) is exceeded for longer than 200 ms Bit 7 is set and the device switches off.

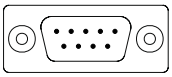
Data Byte 11 Summation Fault Flags
Shows the current faults.
Binary output.

Bit 0	System fault.
Bit 1	Frame Fault of the Serial Port. The baud rate or the protocol or the stop is wrong.
Bit 2	Time out fault of the Serial Port. The Serial Port is activated (DIP-switch 8 = On) but receives no characters.
Bit 3	Wrong characters. The interface doesn't receive the correct sequence.
Bit 4	Voltage Fault. Description see byte 10.
Bit 5	Current Fault. Description see byte 9.
Bit 6	Temperature Fault. Description see byte 8.
Bit 7	Fault in the power module.

Data Byte 12 Internal Configuration Register
Shows the current setting of the control options.
Binary output.

Bit 0	not used
Bit 1	not used
Bit 2	Control signal Unit On
Bit 3	Control signal Boost Generator On
Bit 4	Stand-by Current activated
Bit 5	Interlock deactivated
Bit 6	Reset faults, occured faults will be reset
Bit 7	Autostart activated Allows an automatic startup. The power module is automatically activated and the boost generator switches on immediately after switching on the mains voltage. The boost generator switches off automatically after igniting the pump lamp.

RS 232 Port



Data Byte 13 Data Inputs Parallel Operation
Shows the values (inputs) if the Parallel Port is activated.
Binary output.

Bit 0	Current Set Point data bit 0 (LSB)
Bit 1	Current Set Point data bit 1
Bit 2	Current Set Point data bit 2
Bit 3	Current Set Point data bit 3
Bit 4	Current Set Point data bit 4
Bit 5	Current Set Point data bit 5
Bit 6	Current Set Point data bit 6
Bit 7	Current Set Point data bit 7 (MSB at the 8 bit interface)

Data Byte 14 Data Inputs Parallel Operation
Shows the values (inputs) if the Parallel Port is activated. Binary output.

Bit 0	Current Set Point data bit 8 (not applicable at the 8 bit interface)
Bit 1	Current Set Point data bit 9 (MSB 10 bit interface, not applicable at the 8 bit interface)
Bit 2	Control bit Power Supply On
Bit 3	Control bit Boost On
Bit 4	Control bit Stand-by Current Activated
Bit 5	Control bit Interlock Input
Bit 6	Control bit Reset Fault, occured faults are reset
Bit 7	Control bit Auto Start. Allows an automatic startup. The power module is automatically activated and the boost generator switches on immediately after switching on the mains. The boost generator switches off automatically after igniting the pump lamp.

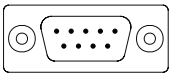
Data Byte 15 Data Outputs Parallel Operation
Shows the (outputs) if the Parallel Port is activated. Binary output.

Bit 0	Summation Fault
Bit 1	Temperature Limit reached
Bit 2	Maximum Boost Voltage exceeded
Bit 3	Maximum Output Current exceeded / Current Fault
Bit 4	Maximum Output Voltage exceeded
Bit 5	Interlock output
Bit 6	Parallel Port selected for control
Bit 7	Digital Port selected for current set point

Data Byte 16 Data Outputs Parallel Mode
Shows the values (outputs) if the Parallel Port is activated. Binary output.

Bit 0 and 1	Shows the baud rate.
00	2400 baud
01	4800 baud
10	9600 baud
11	18382 baud (customer-specific)

RS 232 Port



Bit 2 = 1	Signals that the Output Current corresponds to the programmed current since approximately one second.
Bit 3 = 1	Unit Ready is signalled if the correct mains voltage is applied to the device and there is no fault.
Bit 4 = 1	Shows a current fault. Bit 5 is set if the output current differs from the current set point for at least one second. If the output current matches the current set point again Bit 5 is reset.
Bit 5 = 1	If the boost voltage has reached the programmed value, Boost Voltage Ready is signalled.
Bit 6 = 1	If the device has reached a temperature of + 80 °C at the heat sink Excess Temperature is signalled. At + 85 °C switches the device off. The excess temperature value can be changed in the range of 0 ... + 80 °C with the configuration software.
Bit 7 = 1	Shows the transgression of the maximum permitted current. If the permitted current is no longer exceeded then Bit 7 is reset.

Data Byte 17 Configuration of the DIP-Switches
The configuration register shows the current configuration of the DIP-switches.
Binary output.

Bit 0	Boost Voltage data bit 0 LSB
Bit 1	Boost Voltage data bit 1
Bit 2	Boost Voltage data bit 2
Bit 3	Boost Voltage data bit 3 MSB
Bit 4	Boost Voltage programming mode Internal / External
Bit 5	Auto Start
Bit 6	Current programming mode Digital plus Analog / Analog
Bit 7	Control by the Serial Port / Parallel Port

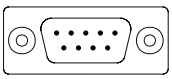
Data Byte 18 Internal Control Register
Binary output.

Bit 0	Boost Voltage data bit 0 LSB (for the internal D/A converter)
Bit 1	Boost Voltage data bit 1 (for the internal D/A converter)
Bit 2	Boost Voltage data bit 2 (for the internal D/A converter)
Bit 3	Boost Voltage data bit 3 MSB (for the internal D/A converter)
Bit 4	not used
Bit 5	Locks the PWM of the power module
Bit 6	Locks the PWM of the boost generator
Bit 7	Resets faults of the power module

Data Byte 19 Internal Fault Register
Binary output.

Bit 0	Fault in the power module
Bit 1... 7	not used

RS 232 Port



Data Byte 20 and 21 Current Set Point 10 Bit SD-CSPD10
16 bit value (resolution 10 bit), right justified in the 16 bit word, binary output.
Byte 21 is the Low byte (bit 0 is LSB) and byte 20 is the High byte
(bit 7 is MSB).
25.575 A correspond to 1023 Digits.
1 Digit corresponds to 0.025 A.

Data Byte 22 Internal Control Register
The assignment corresponds to the internal configuration register data byte 12.

Data Byte 23 Current Set Point 8 Bit SD-CSPD8
Binary output.
25.575 A correspond to 255 digits.
1 digit corresponds to 0.100 A.

Data Byte 24 Output Register for Internal Light-Emitting Diodes
Binary output.

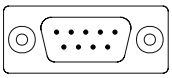
Bit 0	LED 1 - Input Voltage Ok
Bit 1	LED 2 - Output Voltage Ok
Bit 2	LED 3 - Waiting for Output Current Ok
Bit 3	LED 4 - Current flows, Lamp Ok
Bit 4	LED 5 - Boost Voltage Ok
Bit 5	LED 6 - Fan control Ok
Bit 6	LED 7 - Fault
Bit 7	not used

Data Byte 25 Limit Value Maximum Permitted Heat Sink Temperature SD-TL
8 bit value, binary output, nonlinear.

00 °C	54
10 °C	58
25 °C	67
40 °C	87
45 °C	94
50 °C	106
55 °C	116
60 °C	128
65 °C	144
70 °C	175
75 °C	195
80 °C	249

Data Byte 26 Limit Value Maximum Permitted Output Current SD-COUTMA
8 bit value, binary output, linear.
32.7 A correspond to 255 Digits. 1 digit corresponds to 0.128 A.

RS 232 Port



Data Byte 27 Limit Value Minimum Mains Voltage SD-MVMI
The value sets the lower limit for the mains voltage (peak value).
8 bit value, binary output, linear.
775 V correspond to 255 digits.
1 digit corresponds to 3.04 V.

Data Byte 28 Limit Value Temperature Warning SD-TW
8 bit value, binary output, nonlinear.

00 °C	54
10 °C	58
25 °C	67
40 °C	87
45 °C	94
50 °C	106
55 °C	116
60 °C	128
65 °C	144
70 °C	175
75 °C	195
80 °C	249

Data Byte 29 ... 32 Operating Hours Counter SD-WH
32 bit long word for the operating hours counter. Binary output.
The time base is 1 minute.
The data bytes 32 and 31 (32 is the Low byte) represent the lower, the data bytes 30 and 29 (30 is the Low byte) represent the upper word.

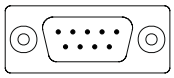
Data Byte 33 Limit Value Minimal Output Current SD-COUTMI
8 bit value, binary output, linear.
32.7 A correspond to 255 digits.
1 Digit corresponds to 0.128 A.

Data Byte 34 Limit Value Maximum Permitted Boost Voltage SD-BVMA
8 bit value, binary output, linear.
2235 V correspond to 255 digits.
1 digit corresponds to 8.765 V.

Data Byte 35 Value for Boost Release SD-BVR
The value defines at which Output Voltage the boost voltage generator is activated.
8 bit value, binary output, linear.
693 V correspond to 255 digits.
1 digit corresponds to 2.72 V.

Data Byte 36 Limit Value Maximum Permitted Output Voltage SD-VOUTMA
8 bit value, binary output, linear.
693 V correspond to 255 digits.
1 digit corresponds to 2.72 V.

RS 232 Port



Data Byte 37 Default Configuration Register
Binary output.

Bit 0	Boost Voltage data bit 0 LSB
Bit 1	Boost Voltage data bit 1
Bit 2	Boost Voltage data bit 2
Bit 3	Boost Voltage data bit 3
Bit 4	Boost Voltage programming mode Internal / External
Bit 5	Auto Start
Bit 6	Current programming mode Digital plus Analog / Analog
Bit 7	Control by Serial Port / Parallel Port

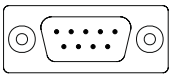
Data Byte 38 Setting of the Baud Rate SD-BR
Binary output.
Four different baud rates are possible.

128	2400 bauds
64	4800 bauds
32	9600 bauds
16	18382 bauds (customer-specific)

Data Byte 39
Has no meaning. The value is 0.

Data Byte 40 and 41 End of the Data Record
A stop byte is sent twice at the end of the data record.
The value is $0B_{hex}$.

RS 232 Port



Received data and their meaning:

In the operation mode 'Serial Port activated' (DIP-switch 8 = On) the device can be controlled by the Serial Port.
If the device is controlled in the operation mode Serial Port Activated (DIP-switch 8 = On) a series of 8 bytes is cyclically expected. If the sequence stops for longer than one minute the device switches off and signals a Timeout Fault.
The baud rate for receiving data and sending data is identical.

Data Byte 1 and 2 Beginning of the Data Set
To open the sequence twice a start byte is expected. The value must be $0A_{hex}$.

Data Byte 3 Set Point Boost Voltage
Binary output.
Only active in the operation mode Boost Voltage Programming Mode External (DIP-switch 5 = Off)

Bit 0	Boost Voltage data bit 0 LSB
Bit 1	Boost Voltage data bit 1
Bit 2	Boost Voltage data bit 2
Bit 3	Boost Voltage data bit of 3 MSB
Bit 4	not used, control expects 0
Bit 5	not used, control expects 0
Bit 6	not used, control expects 0
Bit 7	not used, control expects 0

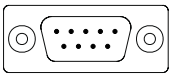
Data Byte 4 Set Point Output Current
Binary output.

Bit 0	Current Set Point data bit 8
Bit 1	Current Set Point data bit 9 MSB
Bit 2	not used, control expects 0
Bit 3	not used, control expects 0
Bit 4	not used, control expects 0
Bit 5	not used, control expects 0
Bit 6	not used, control expects 0
Bit 7	not used, control expects 0

Data Byte 5 Set Point Output Current
Binary output.

Bit 0	Current Set Point data bit 0 LSB
Bit 1	Current Set Point data bit 1
Bit 2	Current Set Point data bit 2
Bit 3	Current Set Point data bit 3
Bit 4	Current Set Point data bit 4
Bit 5	Current Set Point data bit 5
Bit 6	Current Set Point data bit 6
Bit 7	Current Set Point data bit 7

RS 232 Port



Data Byte 6 **Control Register**
Binary output.

Bit 0	not used
Bit 1	not used
Bit 2	Control bit Unit On
Bit 3	Control bit Boost Generator On
Bit 4	Control bit Stand-by Current activated
Bit 5	Control bit Interlock deactivated
Bit 6	Control bit Faults are reset
Bit 7	Control bit Auto Start Activates the automatic startup The power module is activated and the boost generator switches on. After igniting the pump lamp the boost generator switches off automatically.

Data Byte 7 and 8 End of the Data Set
At the end of the sequence a stop byte is expected twice.
The value must be $0B_{hex}$.

Description of the Control- and Configuration-Software

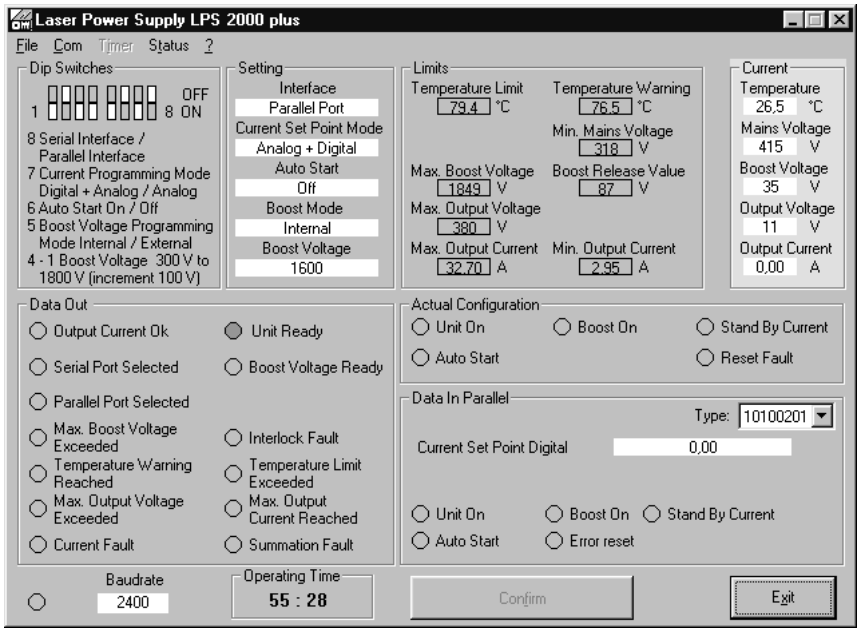
The Laser Power Supply Control Software 'LPSCS' allows (if the LPS 2000 plus is controlled via the parallel interface) a monitoring of the operating states of the LPS 2000 plus or the operation via the RS 232 interface.
The baud rate of the software must be adapted to the settings of the device in the window ‘RDT Settings’ (callable about ‘Com’ in the menu bar). These settings are permanently stored.
Use a 9-pole D sub line (socket-socket, one-to-one wiring) to connect the PC and the LPS 2000 plus.

Execute the setup program to install the Control- and Configuration-Software.

Monitoring at the PC at control via the Parallel Interface

To control the LPS 2000 plus via the Parallel Interface, the DIP switch 8 must be 'Off'.

The software allows a monitoring and shows the current data and settings of the LPS 2000 plus.
The current measurements are displayed in the frame ‘Current’ and the limit values in the frame ‘Limits’.
The settings of the LPS 2000 plus DIP switches are displayed in the frame 'Setting'.
The status and error messages are displayed in the frame 'Data Out ‘.
The frame 'Data In Parallel' shows the values applied at the Parallel Interface. The status is displayed in the frame 'Actual Configuration'.
For the different LPS 2000 plus types the corresponding model number must be selected in the field ‘Type’.

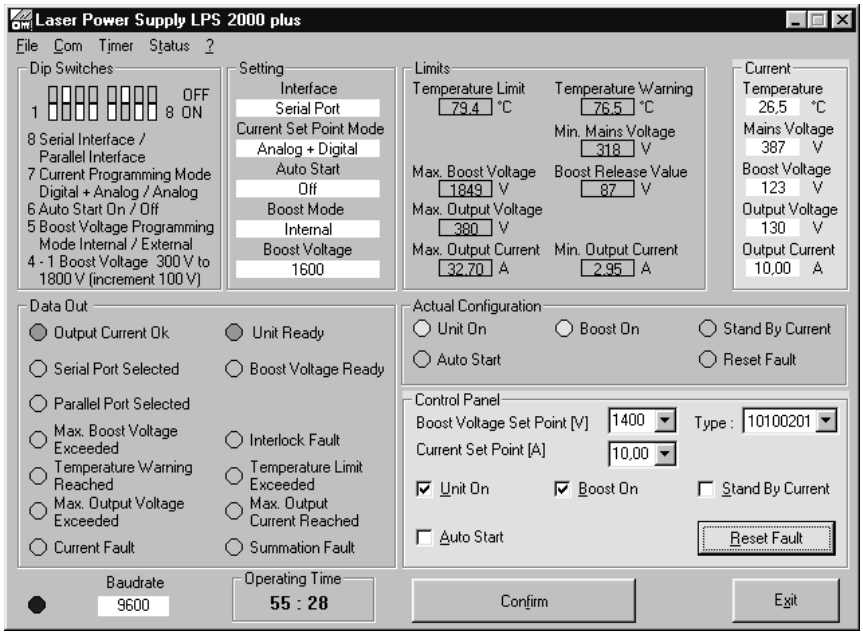


Display mask for monitoring at the PC at control via the Parallel Interface

Control via the RS 232 Interface

To control the LPS 2000 plus via the Serial Interface, the DIP switch 8 must be 'On'.

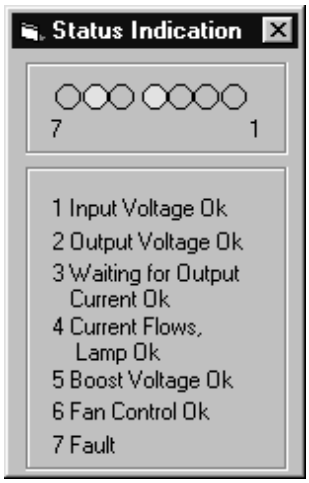
To operate the LPS 2000 plus use the frame 'Control Panel'.
For the different LPS 2000 plus types the corresponding model number must be selected in the field ‘Type’.
After leaving the field all permitted values appear in the field ‘Current Set Point’.
The desired value can be selected with the scroll bar or the nearest possible value by entering the desired value.
Further settings can be selcted by click on the check boxes below. The values are transmitted to the device by pressing the 'Confirm' button.
A 'Summation Fault' is shown in the frame 'Data Out' if the device is in a error condition, for example due to a communication interruption. It will be reset by pressing the key 'Reset Fault'. Then the key 'Confirm' has to be selected to send the data again to the device.



Display mask for control via the RS 232 Interface

Status indication

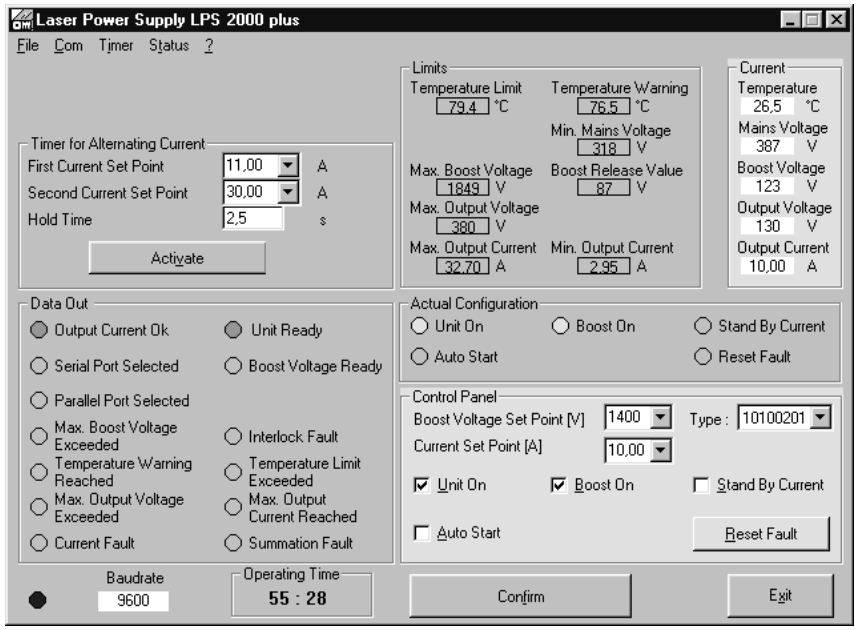
By selecting the menu item ‘Status’ the window ‘Status Indication’ opens. It shows the state of the LPS 2000.



Status window

Alternating current

The frame ‘Timer for Alternating Current’ opens by selecting the menu item 'Timer'. By entering two current values and a hold time an alternating current, for example for test purposes, can be generated.
The alternating output can be started with the button 'Activate'. It can be stopped again with the button 'Deactivate' which replaces the button 'Activate' after switching on. The set value for the 'Current Set Point' in the frame 'Control Panel' isn't used by alternating operation.
If the alternating is stopped again, one of the two Current Set Point values for the alternating current remain at the output. The LPS 2000 plus returns to the Current Set Point settings of the field 'Control Panel' not until the button 'Confirm' is selected.



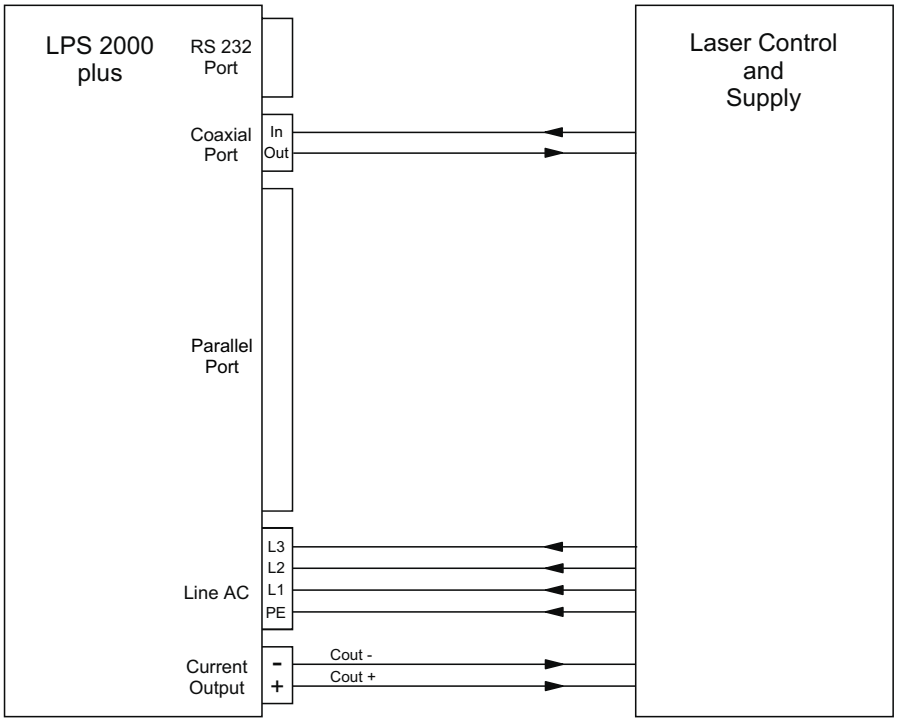
Display mask for control via the RS 232 interface with frame 'Alternating Current'

Application 1
Operation at the Analog Port

With the DIP-switches a maximum boost voltage is set and the Auto Start mode for the LPS 2000 plus is activated.

A voltage (0 - 10 V, 1 Volt corresponds to 3 A) corresponding to the desired output current is applied at the Analog In of the Analog Port.
A voltage (0 - 10 V, 1 Volt corresponds to 3 A) corresponding to the current output current can be optapped off at the Analog Out.

The LPS 2000 plus starts automatically and delivers the desired output current after applying the mains voltage.



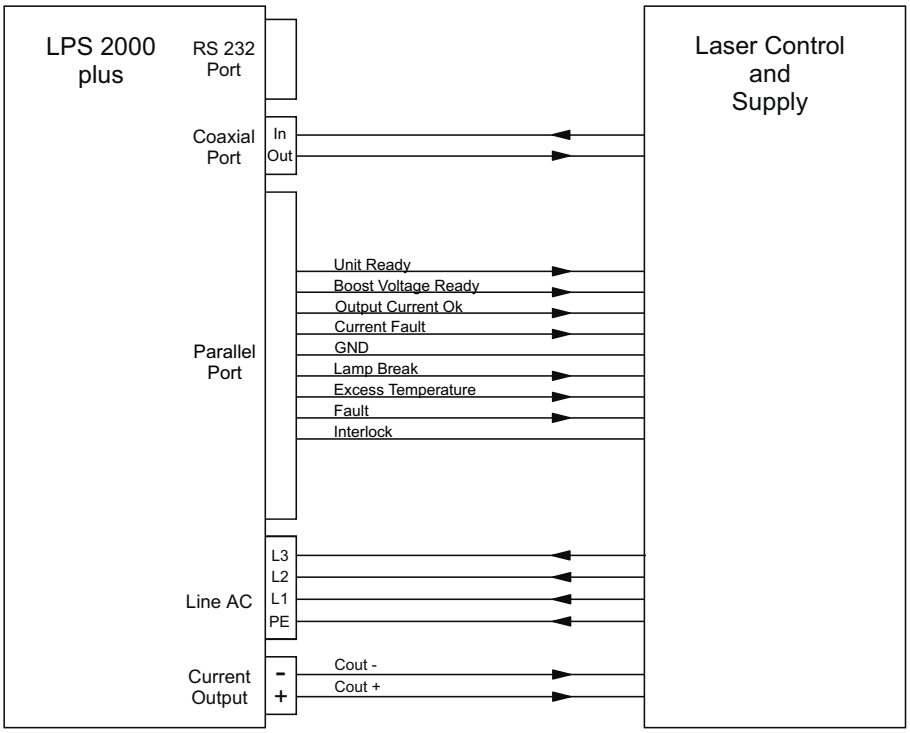
Application 2
Operation at the Analog Port. Monitoring at the Parallel Port

With the DIP-switches a maximum boost voltage is set and the Auto Start mode for the LPS 2000 plus is activated.

A voltage (0 - 10 V, 1 Volt corresponds to 3 A) corresponding to the desired output current is applied at the Analog In of the Analog Port.
A voltage (0 - 10 V, 1 Volt corresponds to 3 A) corresponding to the current output current can be tapped off at the Analog Out.

The LPS 2000 plus starts automatically and delivers the desired output current after applying the mains voltage.

The state of the LPS 2000 plus is transmitted via the Parallel Port to the laser control. The laser control signals the state.



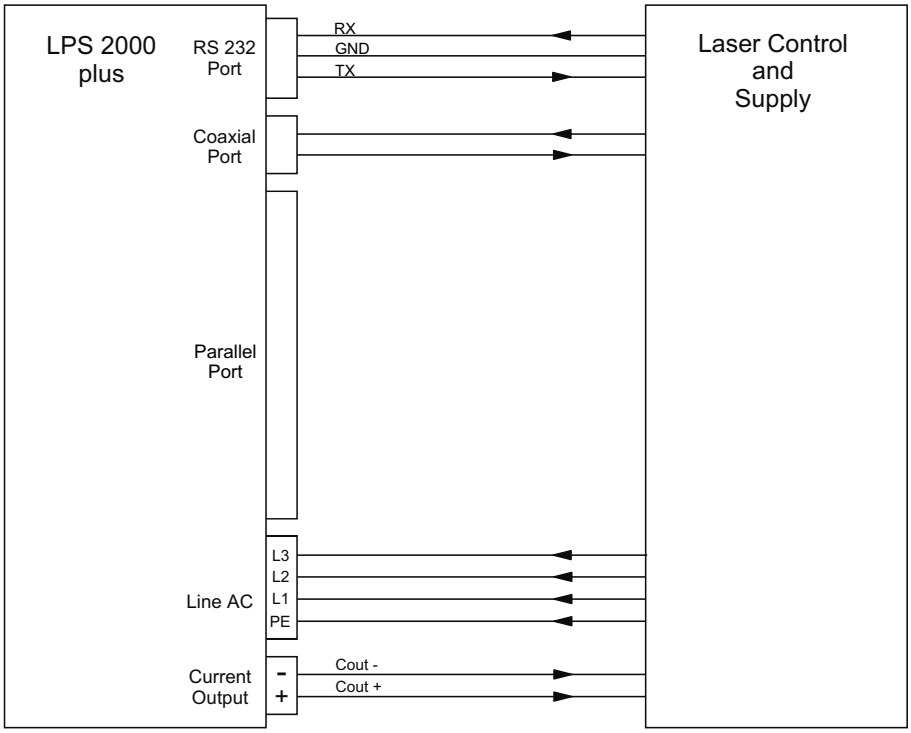
Application 3
Operation at the Analog Port. Monitoring at the RS 232 Port.

With the DIP-switches a maximum boost voltage is set and the Auto Start mode for the LPS 2000 plus is activated.

A voltage (0 - 10 V, 1 Volt corresponds to 3 A) corresponding to the desired output current is applied at the Analog In of the Analog Port.
A voltage (0 - 10 V, 1 Volt corresponds to 3 A) corresponding to the current output current can be tapped off at the Analog Out.

The LPS 2000 plus starts automatically and delivers the desired output current after applying the mains voltage.

The feedback digital and analog signals are passed on by the RS 232 Port and processed by the microcontroller of the laser control.

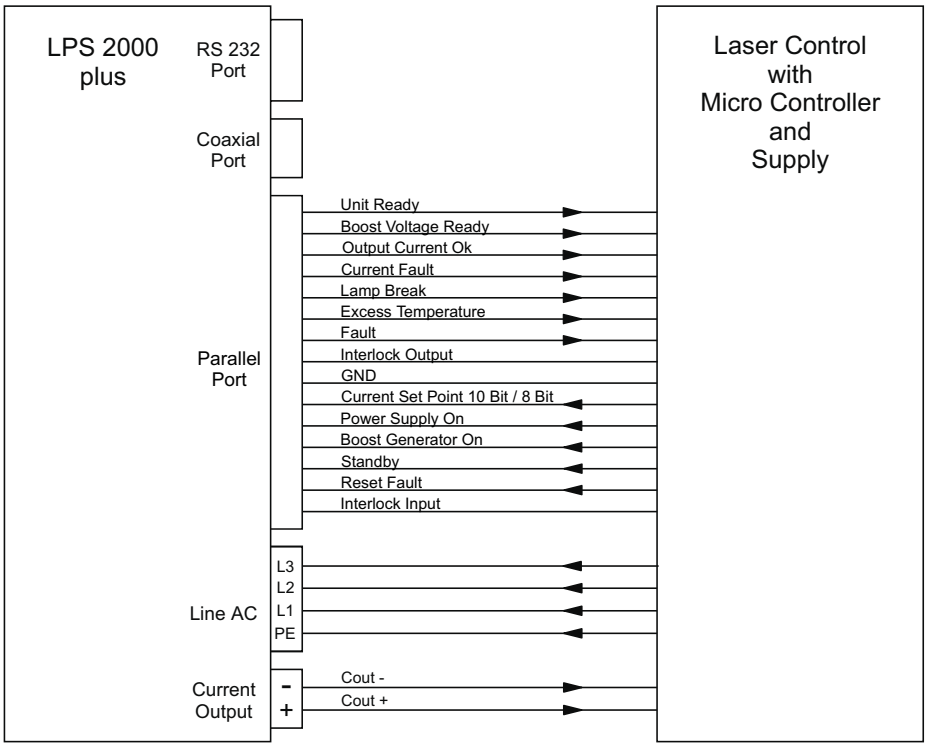


Application 4
Operation at the Parallel Port.

With the DIP-switches a maximum boost voltage for the LPS 2000 plus is set.

The microcontroller delivers a 10 or 8 bit wide digital signal for the Current Set Point and 4 additional digital signals of different meaning to switch on the LPS 2000 plus.

The feedback digital and analog signals are processed by the microcontroller.

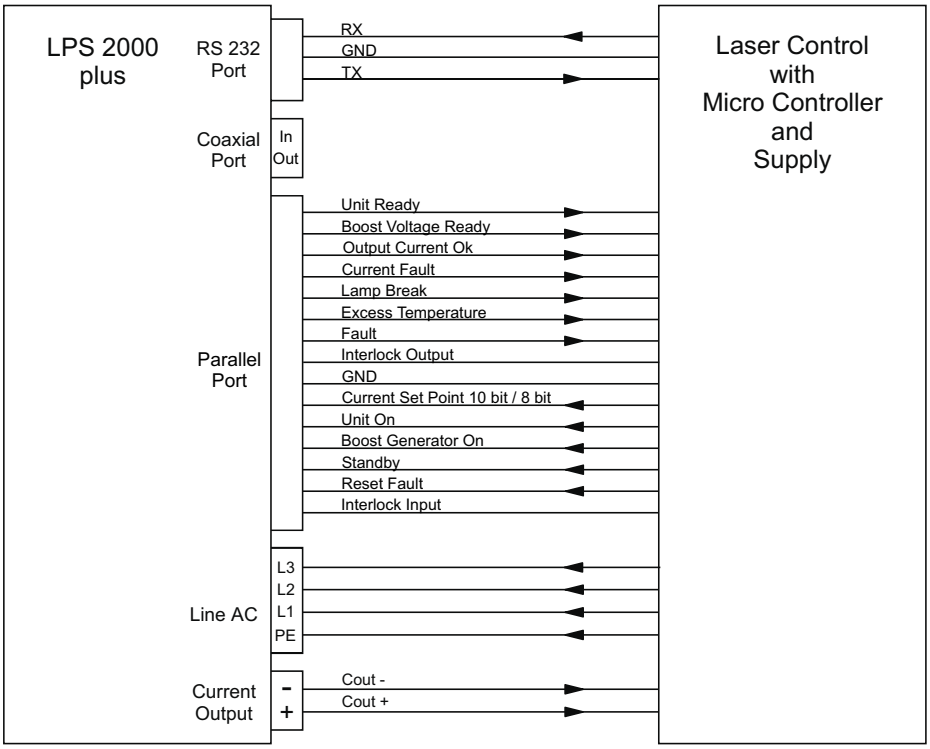


Application 5
Operation at the Parallel Port. Monitoring at the RS 232 Port.

With the DIP-switches a maximum boost voltage for the LPS 2000 plus is set.

The microcontroller delivers a 10 or 8 bit wide digital signal for the Current Set Point and 4 additional digital signals of different meaning to switch the LPS 2000 plus on.

The digital and analog signals, feedback via the RS 232 Port, are processed by the microcontroller.

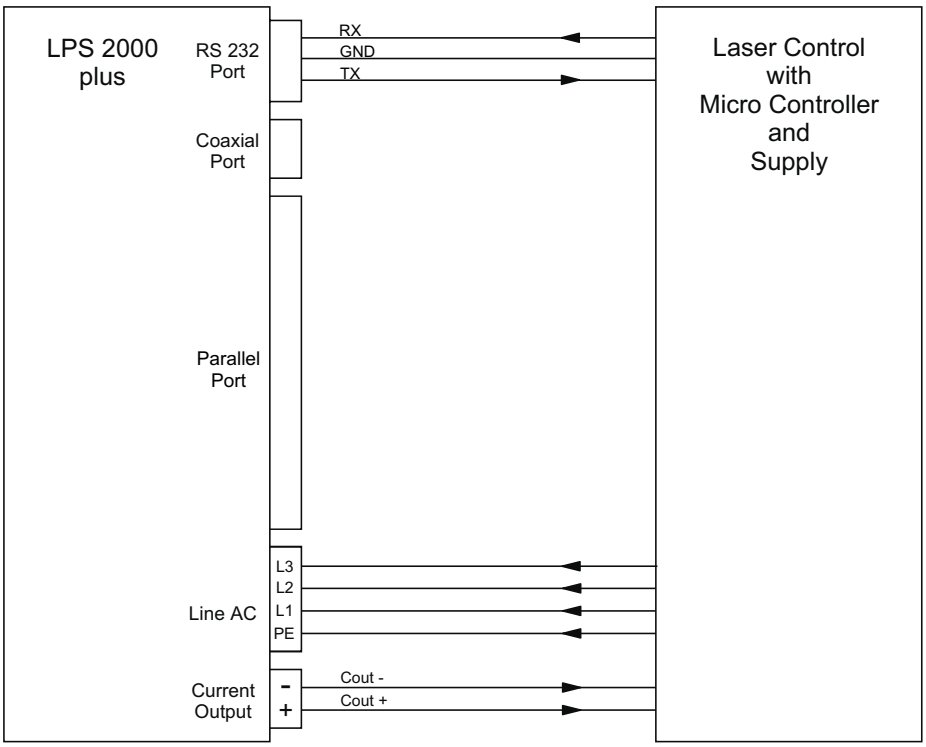


Application 6
Operation at the RS 232 Port

With the DIP-switches a maximum boost voltage for the LPS 2000 plus is set. It can be done by the RS 232 Port too.

The microcontroller delivers via the RS 232 Port a digital signal for the Current Set Point and additional digital signals of different meaning to switch on and control the LPS 2000 plus.

The digital signals, feedback via the RS 232 Port, are processed by the microcontroller.

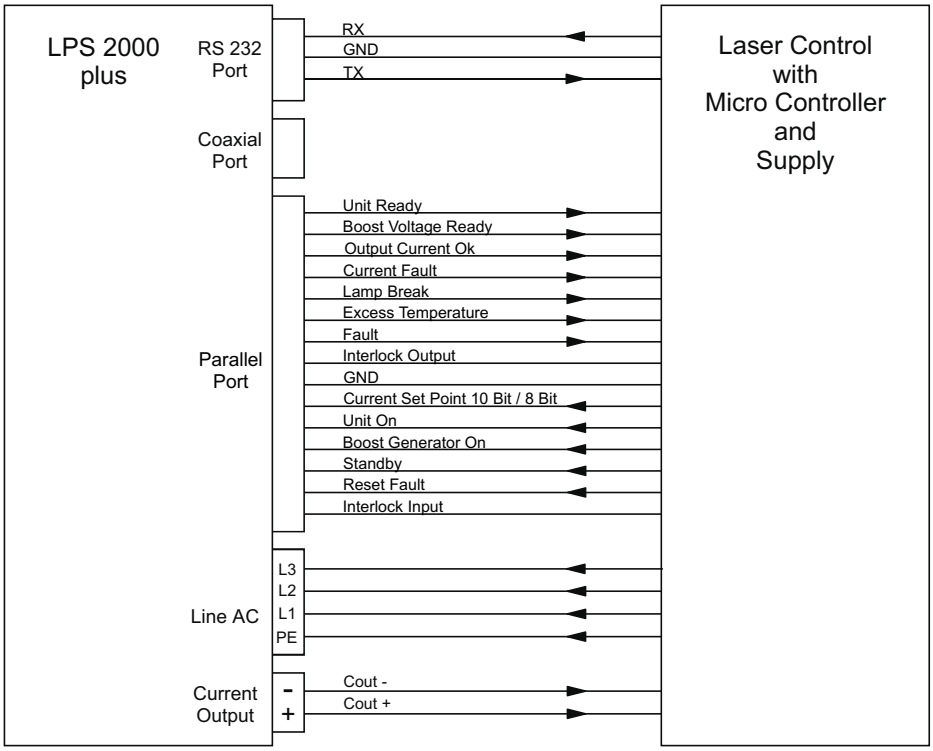


Application 7
Operation at the RS 232 Port. Monitoring at the Parallel Port.

With the DIP-switches a maximum boost voltage for the LPS 2000 plus is set. It can be done via the RS 232 Port too.

The microcontroller delivers via the RS 232 Port a digital signal for the Current Set Point and additional digital signals of different meaning to switch on and control the LPS 2000 plus.

The digital signals, feedback via the RS 232 Port, are processed by the microcontroller.



Specification **all LPS 2000 plus versions**

DIP-switch functions

Internal Programming of the Boost Voltage
DIP-switch 1 - 4

Boost Voltage	Boost Charge	1	2	3	4
300 V	5 J	Off	Off	Off	Off
400 V	9 J	On	Off	Off	Off
500 V	14 J	Off	On	Off	Off
600 V	21 J	On	On	Off	Off
700 V	29 J	Off	Off	On	Off
800 V	37 J	On	Off	On	Off
900 V	47 J	Off	On	On	Off
1000 V	58 J	On	On	On	Off
1100 V	71 J	Off	Off	Off	On
1200 V	84 J	On	Off	Off	On
1300 V	99 J	Off	On	Off	On
1400 V	115 J	On	On	Off	On
1500 V	132 J	Off	Off	On	On
1600 V	150 J	On	Off	On	On
1700 V	169 J	Off	On	On	On
1800 V	190 J	On	On	On	On

Operation modes
DIP-switches 5 - 8

Nr	Funktion	On	Off
5	Boost Voltage Programming Mode	Internal	External
6	Auto Start	Activated	Analog
7	Current Programming Mode	Digital plus Analog	Analog

Specification		LPS 2000 plus 10100200
Mains connection		Terminals: 1.5 to 4 sqmm
Voltage range	342 ... 506 V AC	3-phase mains without
Frequency	47.5 ... 63 Hz	neutral conductor
Connected load	7000 W	
Power factor	0.95	
Leakage current	0.5 mA	
Required fuse	3 x 16 A	
Required wire cross-section	3 x 1.5 sqmm + PE	
Safety class	1	
Degree of pollution	1	
Output		Terminals: 1.5 to 4 sqmm
Power	6000 W	
Voltage	350 V DC	
Current	0 ... 30 A	
Resolution	10 bit 29.3 mA / digit	
Rate of change	> 1000 A / s	
Accuracy	± 0.1 %	
Drift	100 ppm / °C	
Variation with volt (mains)	± 0.003 % / V~	
Variation with volt (output voltage)	± 0.003 % / V	
Long-term stability	± 0.2 %	
Ripple current	12 mA RMS 35 mApp	
Short-circuit rating	between the output lines, between output lines to PE	
Boost		
Voltage	300 V ... 1800 V	(via 66 Ω)
Charge	5 J ... 190 J	
Resolution	4 bit 100 V / digit	
Current static	10 mA	
Charging time up to 1000 V	3 s	
Charging time up to 1800 V	10 s	
Interfaces		
Dielectric strength to PE	63 V DC	
Serial interface RS 232 C	DEE CCITT V.28	9-pole pin plug connector
Baud rate	2400 ... 18382 bauds	according to DIN 41652
No hardware hand shake		and MIL-C-24308
RTS/CTS looped-through		Internal thread
by a jumper		
RTS configurable by a jumper	Logical 0 or 1	UNC 4-40
Level logical 0	>+ 3 V	
Level logical 1	< - 3 V	

Specification		LPS 2000 plus 10100200
Continuation		
Serial Interface RS 232 C		
Overvoltage protection		
Human body model	± 15 kV	
Contact discharge	± 8 kV IEC 1000-4-2	
Air gap discharge	± 15 kV IEC 1000-4-2	
Analog Interface		
Input (output current)		Chinch jack
Scaling	0.3 V / A output current	
Input resistance	10 kΩ	
Output (current monitor)		Chinch jack
Scaling	0.3 V / A output current	
Output resistance	470 Ω	
Temperature range		
Ambient	0 ... + 45 °C	
Storage	- 20 ... + 80 °C	
Protection type	IP20	
Cooling	Air filtered, water	
Dimensions l x w x h	312 x 247 x 120 mm	
Weight	10 kg	
Conformity		
Security	VDE 0100	
	VDE 0160	
	EN 50178	
Surge voltage check	IEC 50178	
Partial discharge test	IEC 664-1	
Electromagnetic compatibility (EMC)		
	EN 50081-1	
	EN 55014	
	VDE 0875 N	
	EN 50082-2	
Harmonic current on the mains	IEC 1000-4-2	
	EN 61000-3-2	
	IEC 1000-3-2	
	VDE 0838	

Specification		LPS 2000 plus 10100201
Mains connection		Terminals: 1.5 to 4 sqmm
Voltage range	342 ... 506 V AC	3-phase mains without
Frequency	47.5 ... 63 Hz	neutral conductor
Connected load	7000 W	
Power factor	0.95	
Leakage current	0.5 mA	
Required fuse	3 x 16 A	
Required wire cross-section	3 x 1.5 sqmm + PE	
Safety class	1	
Degree of pollution	1	
Output		Terminals: 1.5 to 4 sqmm
Power	6000 W	
Voltage	350 V DC	
Current	0 ... 30 A	
Resolution	10 bit 29.3 mA / digit	
Rate of change	> 1000 A / s	
Accuracy	± 0.1 %	
Drift	100 ppm / °C	
Variation with volt (mains)	± 0.003 % / V~	
Variation with volt (output voltage)	± 0.003 % / V	
Long-term stability	± 0.2 %	
Ripple current	12 mA RMS 35 mApp	
Short-circuit rating	between the output lines, between output lines to PE	
Boost		
Voltage	300 V ... 1800 V	(via 66 Ω)
Charge	5 J ... 190 J	
Resolution	4 bit 100 V / digit	
Current static	10 mA	
Charging time up to 1000 V	3 s	
Charging time up to 1800 V	10 s	
Interfaces		
Dielectric strength to PE	63 V DC	
Serial Interface RS 232 C	DEE CCITT V.28	9-pole pin plug connector
Baud rate	2400 ... 18382 baud	according to DIN 41652
No hardware hand shake		and MIL-C-24308
RTS/CTS looped through		Internal thread
by a jumper		
RTS configurable by a jumper	Logical 0 or 1	UNC 4-40
Level logical 0	>+ 3 V	
Level logical 1	<- 3 V	

Specification		LPS 2000 plus 10100201
Continuation		
Serial Interface RS 232 C		
Overvoltage protection		
Human body model	± 15 kV	
Contact discharge	± 8 kV IEC 1000-4-2	
Air gap discharge	± 15 kV IEC 1000-4-2	
Parallel Interface (10 bit)		25-pole pin plug connector
Inputs	active-high	according to DIN 41652
Level logical 0	0 V < 0.8 V	and MIL-C-24308
Level logical 1	> 2 V < 30 V	Internal thread
not defined	> 0.8 V < 2 V	UNC 4-40
Required rise and fall time	< 3 µs	
Minimal time for logical 0 static	> 128 µs	
Minimal time for logical 1 static	> 128 µs	
Overvoltage protection		
Outputs	Open Collector NPN active-low	Pull up resistors required
Maximum permitted voltage	+ 30 V	
Maximum permitted current	20 mA	
Level logical 0	0 V < 0.4 V	
Level logical 1	> 0.4 V < 30 V max.	
Protection against negative voltages		
Analog Interface		
Input (output current)		Chinch jack
Scaling	0.3 V / A output current	
Input resistance	10 kΩ	
Output (current monitor)		Chinch jack
Scaling	0.3 V / A output current	
Output resistance	470 Ω	
Temperature range		
Ambient	0 ... + 45 °C	
Storage	- 20 ... + 80 °C	
Protection type	IP20	
Cooling	Air filtered, water	
Dimensions l x w x h	312 x 247 x 120 mm	
Weight	10 kg	

Specification **LPS 2000 plus 10100201**

Conformity

Security	VDE 0100
	VDE 0160
	EN 50178
Surge voltage check	IEC 50178
Partial discharge check	IEC 664-1

Electromagnetic compatibility (EMC)

	EN 50081-1
	EN 55014
	VDE 0875 N
	EN 50082-2
Harmonic current on the mains	IEC 1000-4-2
	EN 61000-3-2
	IEC 1000-3-2
	VDE 0838

Specification		LPS 2000 plus 10100202
Mains connection		Terminals: 1.5 to 4 sqmm
Voltage range	342 ... 506 V AC	3-phase mains without
Frequency	47.5 ... 63 Hz	neutral conductor
Connected load	7000 W	
Power factor	0.95	
Leakage current	0.5 mA	
Required fuse	3 x 16 A	
Required wire cross-section	3 x 1.5 sqmm + PE	
Safety class	1	
Degree of pollution	1	
Output		Terminals: 1.5 to 4 sqmm
Power	6000 W	
Voltage	350 V DC	
Current	0 ... 30 A	
Resolution	8 bit 117.6 mA / digit	
Rate of change	> 1000 A / s	
Accuracy	± 0.1 %	
Drift	100 ppm / °C	
Variation with volt (mains)	± 0.003 % / V~	
Variation with volt (output voltage)	± 0.003 % / V	
Long-term stability	± 0.2 %	
Ripple current	12 mA RMS 35 mApp	
Short-circuit rating	between the output lines, between output lines to PE	
Boost		
Voltage	300 V ... 1800 V	(via 66 Ω)
Charge	5 J ... 190 J	
Resolution	4 bit 100 V / digit	
Current static	10 mA	
Charging time up to 1000 V	3 s	
Charging time up to 1800 V	10 s	
Interfaces		
Dielectric strength to PE	63 V DC	
Serial Interface RS 232 C	DEE CCITT V.28	9-pole pin plug connector
Baud rate	2400 ... 18382 bauds	according to DIN 41652
No hardware hand shake		and MIL-C-24308
RTS/CTS looped through		Internal thread
by a jumper		
RTS configurable by a jumper	Logical 0 or 1	UNC 4-40
Level logical 0	>+ 3 V	
Level logical 1	< - 3 V	

Specification		LPS 2000 plus 10100202
Continuation		
Serial Interface RS 232 C		
Overvoltage protection		
Human body model	± 15 kV	
Contact discharge	± 8 kV IEC 1000-4-2	
Air gap discharge	± 15 kV IEC 1000-4-2	
Parallel Interface (8 bit)		25-pole pin plug connector
Inputs	active-high	according to DIN 41652
Level logical 0	0 V < 0.8 V	and MIL-C-24308
Level logical 1	> 2 V < 30 V	Internal thread
not defined	> 0.8 V < 2 V	UNC 4-40
Required rise and fall time	< 3 µs	
Minimal time for logical 0 static	> 128 µs	
Minimal time for logical 1 static	> 128 µs	
Overvoltage protection		
Outputs	Open Collector NPN active-low	Pull up resistors required
Maximum permitted voltage	+ 30 V	
Maximum permitted current	20 mA	
Level logical 0	0 V < 0.4 V	
Level logical 1	> 0.4 V < 30 V max.	
Protection against negative voltages		
Analog Interface		
Input (output current)		Chinch jack
Scaling	0.3 V / A output current	
Input resistance	10 kΩ	
Output (current monitor)		Chinch jack
Scaling	0.3 V / A output current	
Output resistance	470 Ω	
Temperature range		
Ambient	0 ... + 45 °C	
Storage	- 20 ... + 80 °C	
Protection type	IP20	
Cooling	Air filtered, water	
Measurements l x w x h	312 x 247 x 120 mm	
Weight	10 kg	

Specification **LPS 2000 plus 10100202**

Conformity

Security	VDE 0100
	VDE 0160
	EN 50178
Surge voltage check	IEC 50178
Partial discharge check	IEC 664-1

Electromagnetic compatibility (EMC)

	EN 50081-1
	EN 55014
	VDE 0875 N
	EN 50082-2
Harmonic current on the mains	IEC 1000-4-2
	EN 61000-3-2
	IEC 1000-3-2
	VDE 0838

Specification		LPS 2000 plus 10100220
Mains connection		Terminals: 1.5 to 4 sqmm
Voltage range	342 ... 506 V AC	3-phase mains without
Frequency	47.5 ... 63 Hz	neutral conductor
Connected load	7000 W	
Power factor	0.95	
Leakage current	0.5 mA	
Required fuse	3 x 16 A	
Required wirde cross-section	3 x 1.5 sqmm + PE	
Safety class	1	
Degree of pollution	1	
Output		Terminals: 1.5 to 4 sqmm
Power	6000 W	
Voltage	350 V DC	
Current	0 ... 25.5 A	
Resolution	8 bit 117.6 mA / digit	
Rate of change	> 1000 A / s	
Accuracy	± 0.1 %	
Drift	100 ppm / °C	
Variation with volt (mains)	± 0.003 % / V~	
Variation with volt (output voltage)	± 0.003 % / V	
Long-term stability	± 0.2 %	
Ripple current	12 mA RMS 35 mApp	
Short-circuit rating	between the output lines, between output lines to PE	
Boost		
Voltage	300 V ... 1800 V	(via 66 Ω)
Charge	5 J ... 190 J	
Resolution	4 bit 100 V / digit	
Current static	10 mA	
Charging time up to 1000 V	3 s	
Charging time up to 1800 V	10 s	
Interfaces		
Dielectric strength to PE	63 V DC	
Serial Interface RS 232 C	DEE CCITT V.28	9-pole pin plug connector
Baud rate	2400 ... 18382 bauds	according to DIN 41652
No hardware hand shake		and MIL-C-24308
RTS/CTS looped through		Internal thread
by a jumper		
RTS configurable by a jumper	Logical 0 or 1	UNC 4-40
Level logical 0	>+ 3 V	
Level logical 1	< - 3 V	

Specification		LPS 2000 plus 10100220
Continuation		
Serial Interface RS 232 C		
Overvoltage protection		
Human body model	± 15 kV	
Contact Discharge	± 8 kV IEC 1000-4-2	
Air Gap Discharge	± 15 kV IEC 1000-4-2	
Parallel Interface (8 bit)		25-pole pin plug connector
Inputs	active-high	according to DIN 41652
Level logical 0	0 V < 0.8 V	and MIL-C-24308
Level logical 1	> 2 V < 30 V	Internal thread
not defined	> 0.8 V < 2 V	UNC 4-40
Required rise and fall time	< 3 µs	
Minimal time for logical 0 static	> 128 µs	
Minimal time for logical 1 static	> 128 µs	
Overvoltage protection		
Outputs	Open Collector NPN active-low	Pull up resistors required
Maximum permitted voltage	+ 30 V	
Maximum permitted current	20 mA	
Level logical 0	0 V < 0.4 V	
Level logical 1	> 0.4 V < 30 V max.	
Protection against negative voltages		
Analog Interface		
Input (output current)		Chinch jack
Scaling	0.3 V / A output current	
Input resistance	10 kΩ	
Output (current monitor)		Chinch jack
Scaling	0.3 V / A output current	
Output resistance	470 Ω	
Temperature range		
Ambient	0 ... + 45 °C	
Storage	- 20 ... + 80 °C	
Protection type	IP20	
Cooling	Air filtered, water	
Measurements l x w x h	312 x 247 x 120 mm	
Weight	10 kg	

Specification **LPS 2000 plus 10100220**

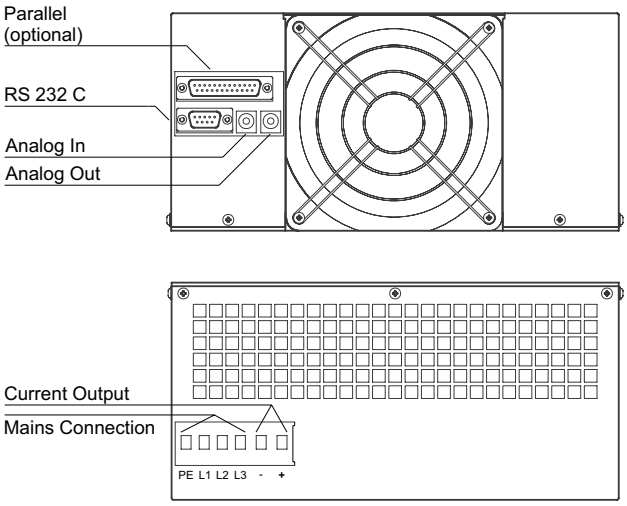
Conformity

Security	VDE 0100
	VDE 0160
	EN 50178
Surge voltage check	IEC 50178
Partial discharge check	IEC 664-1

Electromagnetic compatibility (EMC)

	EN 50081-1
	EN 55014
	VDE 0875 N
	EN 50082-2
Harmonic current on the mains	IEC 1000-4-2
	EN 61000-3-2
	IEC 1000-3-2
	VDE 0838

Connection elements



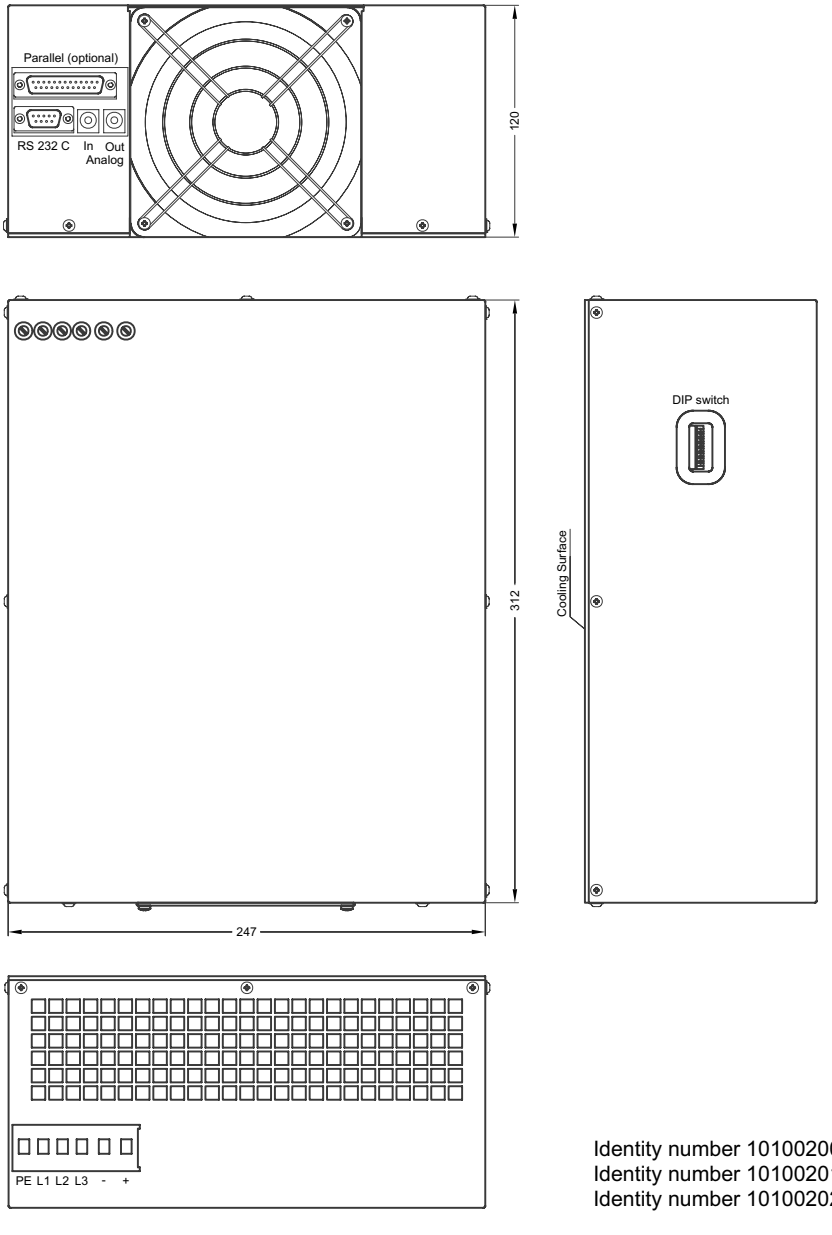
Mains connection and current output
6-pole terminal strip.

Coaxial Port
2-pole SMB coaxial female connector.

Parallel Port
25-pole pin plug connector according to DIN 41652 and MIL-C-24308, internal thread UNC 4-40.

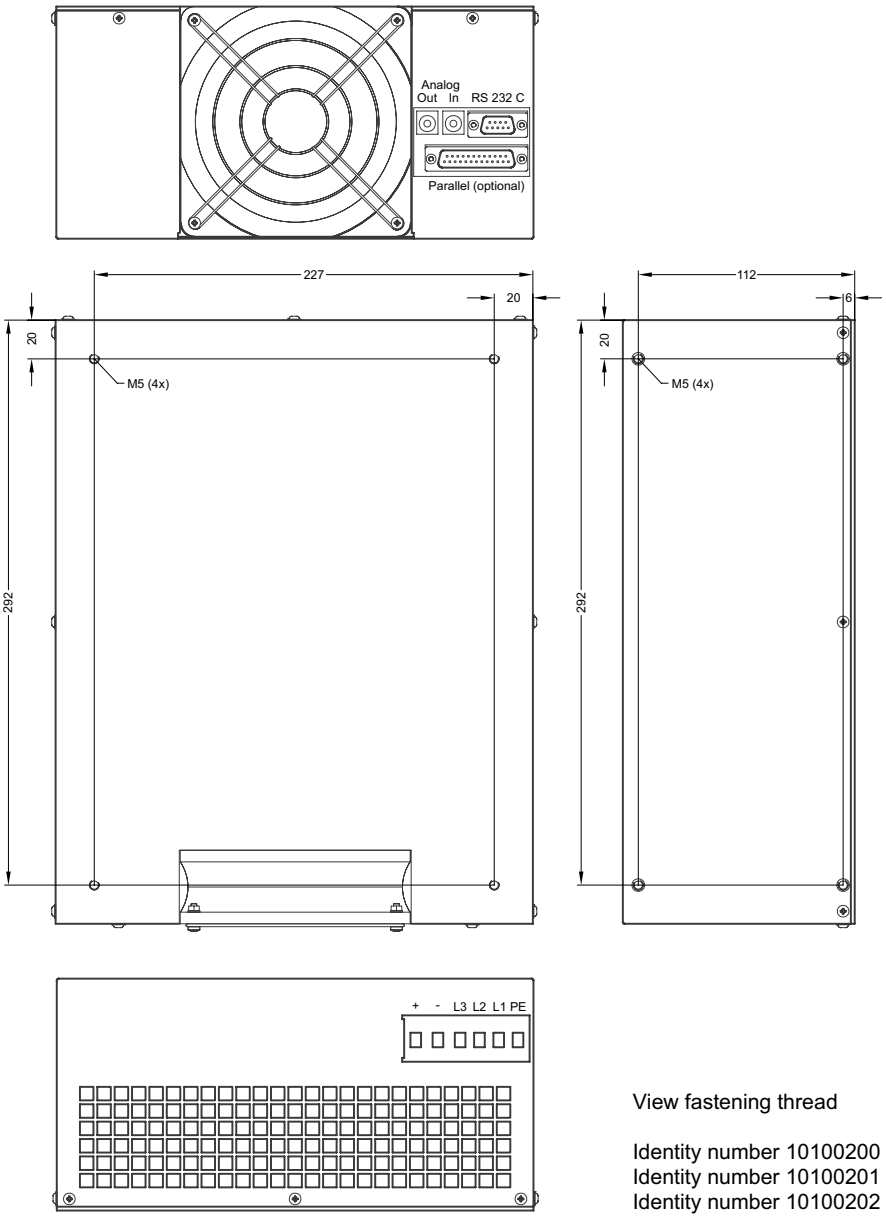
RS 232 Port
9-pole pin plug connector according to DIN 41652 and MIL-C-24308, internal thread UNC 4-40.

Dimensions



Identity number 10100200
Identity number 10100201
Identity number 10100202

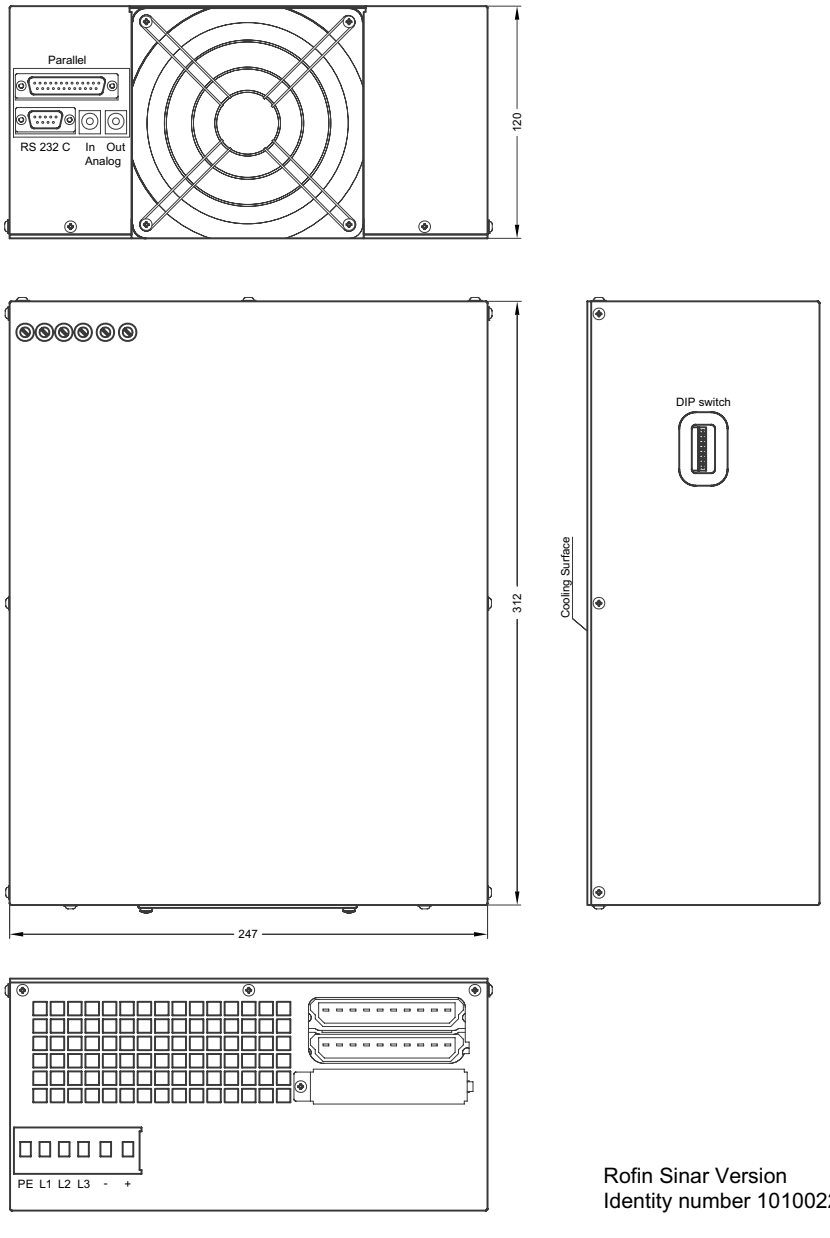
Dimensions



View fastening thread

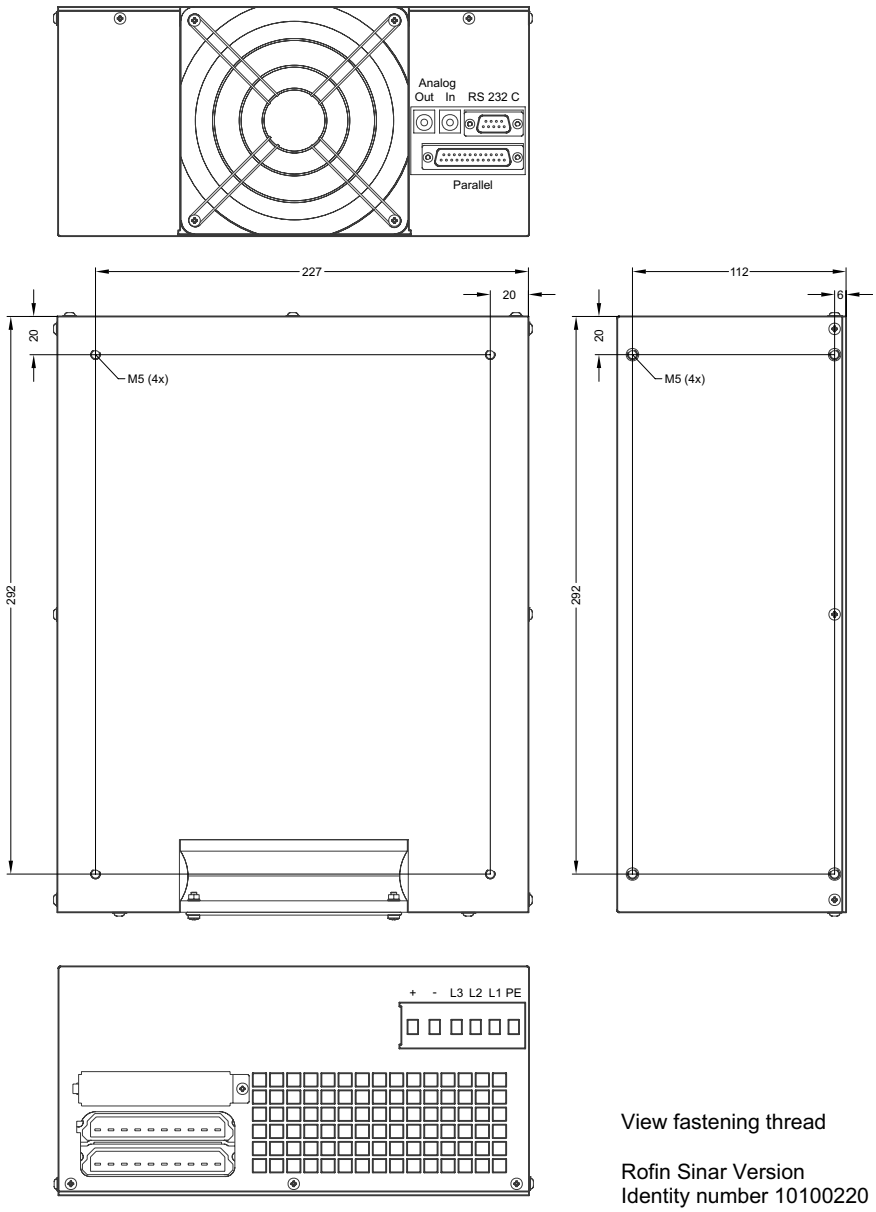
Identity number 10100200
Identity number 10100201
Identity number 10100202

Dimensions



Rofin Sinar Version
Identity number 10100220

Dimensions



View fastening thread

Rofin Sinar Version
Identity number 10100220

Identity numbers and deliverable accessories

Name	Identity number
Laser Power Supply LPS 2000 plus air-cooled with RS 232 C Serial Interface and Analog Interface	10100200
Laser Power Supply LPS 2000 plus air-cooled with RS 232 C Serial Interface and Analog Interface and 10 bit Parallel Interface (resolution 29.3 mA)	10100201
Laser Power Supply LPS 2000 plus air-cooled with RS 232 C Serial Interface and Analog Interface and 8 bit Parallel Interface (resolution 117.6 mA)	10100202
Laser Power Supply LPS 2000 plus air-cooled with RS 232 C Serial Interface, Analog Interface and 8 bit Parallel Interface (resolution 117.6 mA), two mains plugs STV2/10S (male) fully compatible to Rofin Sinar lasers with mounting kit 10429010	10100220
Mounting kit for vertical mounting	10429001
Mounting kit for horizontal mounting	10429002
Mounting kit for vertical mounting (Rofin Sinar version)	10429010
Printed circuit board with LCD display for displaying the output current	10360245
LPS 2000 plus 10100201 or 10100202 in a 19“ slide-in unit, 3 HU Current display 10360245 Rear automatic cutouts and connection terminals	10100036

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