Elektro-Automatik GmbH

产品说明书
Instruction Manual

PS 2000 B
Laboratory Power Supplies

POWER SUPPLY
EA-PS 2084-05 B

Output
0..84V 0...5A
160W max.

Voltage   CV   Current   On

Power   Preset   On / Off

Voltage   USB   Current

C E

关于

Elektro-Automatik GmbH & Co. KG

Helmholtzstrasse 31-33

41747 Viersen

Germany

电话：	+49 2162 / 37850
传真：	+49 2162 / 16230
网站：	www.elektroautomatik.cn
邮箱：	ea1974@elektroautomatik.cn

© Elektro-Automatik

严禁再版、复印或部分错误地使用该说明书，否则将承担该行为导致的法律后果。

⚠️ 安全须知

- 请仅在铭板标示电压下操作该仪器！

- 请勿将任何机械零件，特别是金属件，插入仪器通风孔内！

- 请避免在仪器周围使用液体物质，因有可能进入仪器内部并损坏它！

- 请勿将可能产生高于产品额定输出电压的设备连接到本产品上！

- 请勿将电压源反接到输出端上！

- 即使输出端甚至产品已经关闭，输出端仍有可能存在危险电压！至少在一定时间内都存在。

- 注意！产品外壳在操作过程中会变热，甚至可能变得很热！

1. 介绍

PS 2000B 系列实验室电源供应器，结构紧凑，坚固耐用，在其小巧外形下具有很多有意思的功能。其遥控设计使之成为学校、教育机构、工厂或实验室的理想之选。

本系列有100W，160W和320W两个功率级别。

除去电源供应器的基本功能外，用户还可锁定操作按钮和旋钮以防止非有意的操作，或者当过流或过压出现时定义一输出自动中断极限值。

本系列所有型号都配有一内置USB接口，可用之通过电脑远程控制和监控产品。

2. 安装

2.1 与市电的连接

本产品通过电源线接地。故仅可与带接地触点的电源插座相连。且连线中间不可接无接地触点的延伸线！

它还装有一个5x20mm的保险丝，从位于小"抽屉"的电源插座内可触及并能进行拆装更换。保险丝具体数值请看它上面的印字或铭板标贴。

2.2 与负载的连接

功率输出端位于产品前端。

输出端**没有**装保险丝！为了避免损坏负载应用，需随时注意负载的额定数值。

3. 各面视图

3.1 控制件和插座

① 电源开关

该开关用于完全打开或关闭产品。

② „**Preset**"按钮

该按钮用于将实际值显示转至设定值显示。也可用来激活控制面板锁定功能。详情请见章节4.4和4.5。

③ 显示器

该蓝色LCD显示器一次性显示所有信息。

④ „**Voltage**"旋钮

该旋钮用于调节输出电压的设定值，或在预设模式下调节OVP阀值。

⑤ **Mini-USB插座**

产品通过该插座可接到电脑上，从而监控、远程控制或更新产品。见章节7.3。

⑥ „**Current**"旋钮

该按钮用于调节输出电流的设定值，或在预设模式下调节OCP阀值。

⑦ „**On/Off**"按钮

该按钮用于打开或关闭直流输出。

⑧ 功率输出安全插座，带极性

该插座可插4mm开路或安全型Büschels插头。直流输出插座间的金属插座有接地片，如需求，可用来将连接负载接地。

⑨ 温控风扇

仅320W型号产品才有，排风口。为了确保空气流通顺畅，要求产品后方留至少10cm的空间。
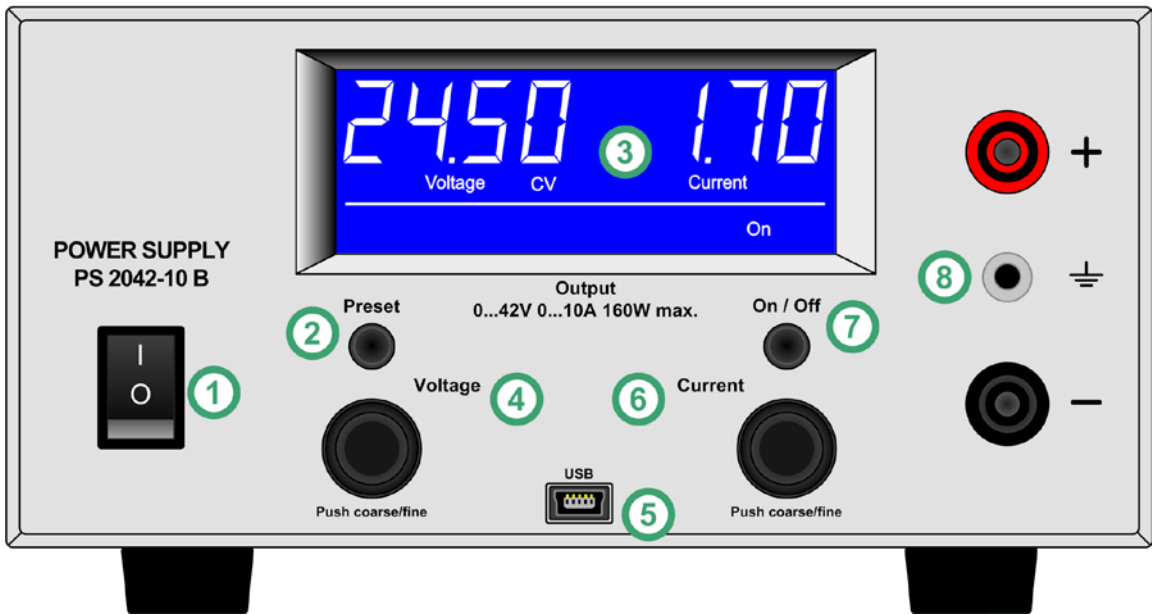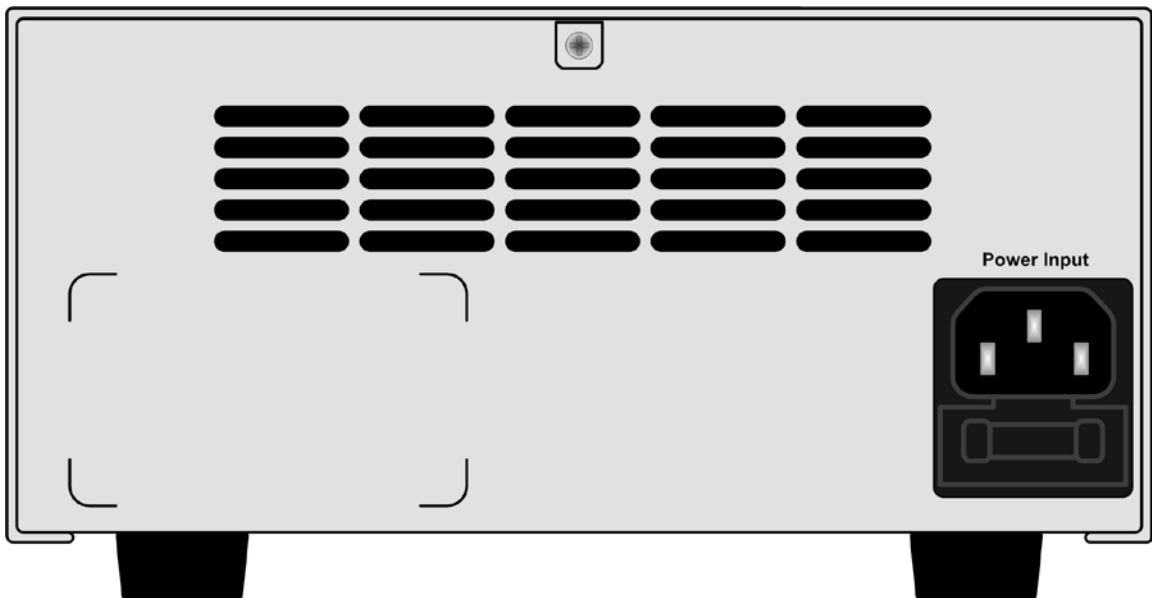
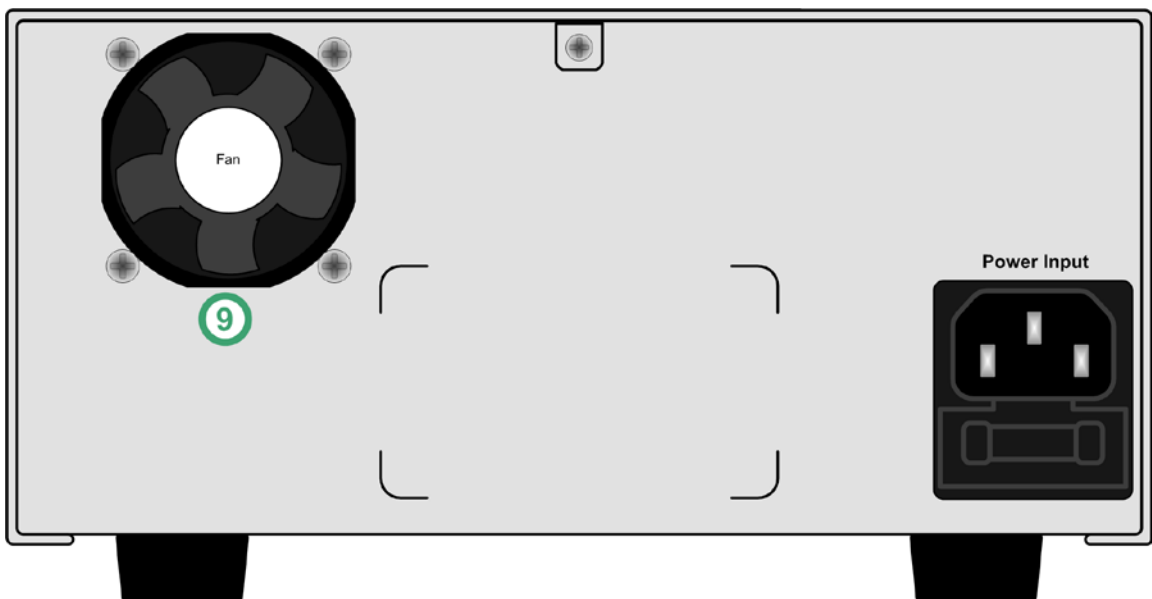提示：产品内部温度很高时，风扇会加速，同时也会增加噪音。

图 1

图 2a. 100W / 160W 型号后视图

图 2b. 320W 型号后视图

4. 操作

4.1 显示器 ③

图 3

4.1.1 状态符号

显示器上有如下状态符号：

CV - 电压调整激活（仅当输出为"on-开"时）

CC - 电流调整激活（仅当输出为"on-开"时）

Preset V/C - 电压/电流设定值显示被激活

Preset OVP/OCP - OVP/OCP设定值显示被激活

OT - 过温错误

OCP - 过流保护

OVP - 过压保护

Remote - 远程控制激活（经USB接口）

Lock - 控制面板锁定激活

Fine - 指示细调模式已被激活（仅针对固件版本为 4.01以上且生产日期为2012年12月份以后的产品）

4.1.2 错误指示

若过压、过流或过温错误出现，显示器上出现 „Error"文字和一(OT, OVP, OCP)符号，且输出电压被切断。该文字一直保留在显示器上，直到用户按下„On/Off"按钮确认该错误方消失，同时它也关闭输出。过温错误出现后，输出电压会自动恢复，„Error"文字被清除，除非用户之前已按下„On/Off"按钮关闭输出。其它错误则需用户再次打开输出，从而使产品得以继续工作。

显示器上其它按键与特定操作模式相连，在后面章节中有详细解释。

4.2 显示器

4.2.1 Preset按钮 ②

该按钮用于转至预设模式，以及激活/终止LOCK模式。

按下次数	显示	模式
1x	Preset V / C	显示设定U/I值
2x	Preset OVP / OCP	显示设定OVP/OCP值
3x	Preset Lock	激活/终止LOCK模式（见章节4.5）
4x		再次显示实际值

4.2.2 On/Off按钮 ⑦

只要产品未处于遥控模式，该按钮可用于手动打开或关闭功率输出。输出的状态以 On 或 Off 指示于显示器上。

该按钮在**LOCK**状态下可被锁定。见上面描述，也可参考 „4.5 控制面板的锁定（LOCK）"。

该按钮也用来确认错误。详情请见章节**4.1.2**。

4.3 其它控制按键

Voltage旋钮 ④ **& Current旋钮** ⑥

这些旋钮无终止点，可用来调节设定值，并按如下规则工作：

• 左旋钮 - 电压 (U) 或 OVP，随操作模式而定

• 右旋钮 - 电流 (I) 或 OCP，随操作模式而定

详情请阅读后面描述。

☞ 产品关闭后设定值不会保存下来，下次打开后，它们重设为0%电压和100%电流。

4.4 调节设定值

同时调节电压和电流设定值时，它遵循一个规则，即两设定值相互调节，根据公式 $P_{max} = U_{lst} * I_{lst}$ ，从而不会超出产品最大功率值。

它适用于预设模式和正常操作模式：

a) 如果输出打开，**恒压**调整激活（显示器上显示„CV"），若设定**电流**被调到超过这个公式（设定电流=最大功率 / 设定电压）定义的某极限,则设定电压会根据这同一公式自动降低，从而维持在最大功率值。

b) 如果输出打开，**恒流**调整激活（显示器上显示„CC"），若设定**电压**被调到超过这个公式（设定电压=最大功率 / 设定电流）定义的某极限,则设定电流会根据这同一公式自动减小，从而维持在最大功率值。

☞ 如果OCP值与电流极限值相同，达到该值时，OCP会优先工作，并关闭输出。

☞ 所有设定值每隔10秒会被内部储存，并在下次重启后又恢复。因此本产品可能不会存储最新的数值。为了确保下次打开产品时恢复的是您最后调节的数据，最后一次调节完后需等待至少10秒钟才能关闭产品。

要确定您购买产品的固件版本，可以从我公司网站www.elektroautomatik.cn下载并安装免费软件EasyPS2000，它能读取这些产品信息，或者你可以使用我们的客制应用程序。两种方法都需经一条迷你USB线连接到产品上，然后安装USB驱动程序（这个也需要下载，仅适合于Windows操作系统）。

4.4.1 细调

输出参数也可手动**精调**或**粗调**完成。转动相关旋钮可在精调和粗调之间转换。产品打开后默认为粗调模式。

激活细调模式后，它会在显示器上显示FINE。知道该模式被取消或者产品被关闭才停止显示。

4.4.2 调节步宽

下面为与额定数值相关的步宽（也可参考技术规格表）：

电压			电流		
额定值	粗调	精调	额定值	粗调	精调
42V	1V	0.05V	3A / 5A / 6A	0.1A	0.01A
84V	1V	0.1V	10A / 20A	0.1A	0.01A

4.5 控制面板的锁定（LOCK）

控制面板的锁定意在阻止按钮和旋钮的非有意操作。按下**Preset**按钮即可激活或终止LOCK功能。

按三下**Preset**按钮，直到显示器显示如下，<u>激活</u>才算完成：

图 4

同时倒计时开始。倒计时过程中您有两个选择：

a) 你可等到倒计时完成，然后控制面板**LOCK被激活**。

b) 再按一下该按钮，终止倒计时，则**LOCK激活被停止**。

再次按下**Preset**按钮，则**终止LOCK**功能。倒计时再次开始。若倒计时结束，**LOCK**保持激活状态。若再次按下按钮，倒计时终止，**LOCK**未被激活。

☞ *LOCK被激活后，不可手动关闭输出，即使紧急关闭也不可！*

5. 产品特性

5.1 用电源开关打开产品

电源开关位于产品前端。产品启动后，可设定下列状态：

• 输出关闭

• 设定值恢复，调节模式重设为粗调

• LOCK或REMOTE类状态都被重设。

5.2 过压

过压错误可能因内部缺陷（输出电压上升且不可控）或外部电压太高而引起。过压保护(OVP)将关闭输出，并在显示器上以"Error"文本指示该错误。该错误需先用**On/Off**按钮确认，于是显示器才更换到正常显示。也可参考章节4.2.2。

应避免加载于输出端的外部电压超过额定电压的120%，否则产品内部元件会受损！

如果过压原因消除，输出会再次打开。

5.3 过温

如果因内部过热出现一般不可能发生的过温(OT)错误，输出电压会被切断，且„OT"状态符号与„Error"文字一同出现于显示屏上。当产品冷却后输出方自动打开。若不想要该操作，可在过温期间手动关闭输出。

5.4 过流

对于过载和过流，产品可能以下面两种不同的方式响应：

1. 关闭输出 (OCP) 或

2. 限制输出电流 (CC)

要关闭输出，需将OCP值（见章节4.4）调到低于限流值的数值，否则电流会被限定。

6. 疑难解答

6.1 硬件问题

问题：产品打开后无任何反应

原因：输入保险丝坏，其它不良

解答：如果显示屏是黑的，检查下输入保险丝。该保险丝位于产品后端小"抽屉"输入插座内。可目检，也可用万能表检查。如果保险丝坏掉，用同型号和数值的更换，然后再试。如果错误仍未排除，请联系你的供货商，此种情况一般将产品退回维修。

问题：产品打开后显示器仅显示 „PS 2000"

原因：固件更新时出现该错误

解答：关闭产品，然后再打开，如果没有任何帮助，请尝试重复固件更新步骤。

6.2 软件问题

问题：EasyPS2000软件不能检测到产品

原因：各种原因

解答：请参考EasyPS2000软件操作说明，"疑难解答"章节。

7. 其它应用

7.1 串联

多个产品，最好是同型号，或者至少额定电流相同，可将之串联，以获得更高的总输出电压。

串联时，一台产品的直流输出正极要与另外一台的负极相连，然后最后那台产品的直流输出正极则成为整个串联的输出正极，于是就可获得高电位。

☞ *鉴于安全和隔离原因，禁止将任意数量的产品串联。直流--输出端对地电压不能超过300V DC。故允许最大串联电压，42V型号为342V，84V型号的为384V。若连接如此高的电压，需采取额外的安全保护措施。*

☞ *若不同额定电流的产品串联在一起，最低电流的产品将决定整个系统的最大输出电流。*

☞ *串联时，只有第一台产品（带最低电位的产品）的直流输出正极或负极可以接地。*

7.2 并联

多个产品，最好是同型号，或者至少额定电压相同，可将之并联，以获得更高的总输出电流。

每台产品需分开调节（手动或用电脑遥控）。我们建议将输出电流调至最大值，并联的每台产品的输出电压调至相同值。

☞ *若不同额定电流的产品并联，且最低电流的产品转换到限流模式，则输出电压会下降，整个并联系统将不再供应与电流源一样大的电压，除非输出电流再次下降到极限值以下。*

7.3 用**EasyPS2000**进行远程控制

本产品经USB端口可用电脑和EasyPS2000软件进行远程控制。这个软件和USB线装于另外的套件内。本产品需要一许可证编码来解锁软件。该编码作为一选购件可另外购买。按用户需求还可提供其他更多信息，或者在EasyPS2000软件的说明书，以及我们的网站上可查到。若想购买该套件和许可证编码，可联系您的经销商或发送邮件至2000bsoft@elektroautomatik.de，并注明您购买产品的产品编号以及系列号。

7.4 编程

产品可经USB端口利用特定软件给产品编程并进行远程控制。该端口在某些操作系统（目前：仅为Windows）下列为虚拟COM端口。这可使用户轻易将产品应用到目标应用中。

从产品制造商的网站上可下载编程文件，或向他们申请可获取。制作特定的编程软件时不需注册码。

利用迷你USB线将产品连到电脑上。

本公司不提供其它操作系统的USB驱动程序，比如Linux或MacOS。这类操作系统网络上有免费的或商用驱动程序。USB程序可以是CDC类型（通讯设备级别）。

7.5 固件更新

如果有需要可对产品固件进行更新，关于固件更新详情和操作步骤请参考EasyPS2000软件说明书。可在软件套件内或我公司网站上找到软件说明书。只有该软件才可用于PS 2000 B产品的固件更新。

软件最新功能的更新<u>不需</u>要许可证编码。

8. 技术规格

8.1 42V型号产品

	PS 2042-06B	PS 2042-10B	PS 2042-20B
电源输入			
输入电压	100…240V ±10%	100…240V ±10%	100…240V ±10%
频率	45…65Hz	45…65Hz	45…65Hz
保险丝	T 2A	T 3.15A	T 6.3A
功率小因素	> 0.99	> 0.99	> 0.99
输出关闭时的功耗	12W	12W	15W
输出 - 电压			
可调范围	0...42V	0...42V	0...42V
±10% ΔU_{IN}市电波动时的稳定度	< 0.02%	< 0.02%	< 0.02%
负载0…100%时的稳定度	< 0.15%	< 0.15%	< 0.15%
纹波 HF @ BWL 20MHz	< 80mV$_{PP}$	< 80mV$_{PP}$	< 150mV$_{PP}$
纹波 LF @ BWL 300kHz	< 9mV$_{RMS}$	< 9mV$_{RMS}$	<1.7mV$_{RMS}$
精确度*	≤ 0.2%	≤ 0.2%	≤ 0.2%
过压保护	0…46.2V	0…46.2V	0…46.2V
带载10-90%时的调整需时	< 2ms	< 2ms	< 2ms
10-90% U_{max}的上升时间	~165ms	~165ms	~165ms
输出 - 电流			
可调范围	0…6A	0…10A	0…20A
±10% ΔU_{IN}市电波动时的稳定度	< 0.05%	< 0.05%	< 0.05%
0…100% ΔU_{OUT}时的稳定度	< 0.15%	< 0.15%	< 0.15%
纹波 HF @ BWL 20MHz	< 25mA$_{PP}$	< 40mA$_{PP}$	< 15mA$_{PP}$
纹波 LF @ BWL 300kHz	< 9mA$_{RMS}$	< 15mA$_{RMS}$	< 5.3mA$_{RMS}$
精确度*	≤ 0.2%	≤ 0.2%	≤ 0.2%
输出 - 功率			
效率	≤ 85%	≤ 85%	≤ 85%
额定功率P$_{nom}$	100W	160W	320W
其它			
工作温度	0….50°C	0….50°C	0….50°C
储存温度	-20….70°C	-20….70°C	-20….70°C
相对湿度	< 80%	< 80%	< 80%
外壳尺寸 (WxHxD)	174x82x240mm	174x82x240mm	174x82x267mm
整体尺寸 (WxHxD)	174x90x263mm	174x90x263mm	174x90x290mm
重量	1.9kg	2kg	2.6kg
制冷方式	无风扇，自然对流冷却	无风扇，自然对流冷却	温控风扇
噪音	-	-	<40dBA @ 1m
安规标准	EN 60950		
EMC标准	EN 61326, EN 55022 等级 B		
过压等级	等级 II		
保护等级	等级 I		
产品编号	39200112	39200113	39200114

*与额定值有关，该精确度决定设定值与实际值间允许最大误差。
举例：一台42V型号产品的电压精确度最少为0.2%，即为84mV。当设定5V电压时，且允许最大误差为84mV， 故得出实际值可能在4.92V和5.08V之间。

8.2 84V型号产品

	PS 2084-03B	PS 2084-05B	PS 2084-10B
电源输入			
输入电压	100…240V ±10%	100…240V ±10%	100…240V ±10%
频率	45…65Hz	45…65Hz	45…65Hz
保险丝	T 2A	T 3.15A	T 6.3A
功率小因素	> 0.99	> 0.99	> 0.99
输出关闭时的功耗	12W	12W	15W
输出 - 电压			
可调范围	0…84V	0…84V	0…84V
±10% ΔU_{IN}市电波动时的稳定度	< 0.02%	< 0.02%	< 0.02%
负载0…100%时的稳定度	< 0.15%	< 0.15%	< 0.15%
纹波 HF @ BWL 20MHz	< 60mV$_{PP}$	< 60mV$_{PP}$	< 150mV$_{PP}$
纹波 LF @ BWL 300kHz	< 10mV$_{RMS}$	< 10mV$_{RMS}$	< 2.1mV$_{RMS}$
精确度*	≤ 0.2%	≤ 0.2%	≤ 0.2%
过压保护	0…92.4V	0…92.4V	0…92.4V
带载10-90%时的调整需时	< 2ms	< 2ms	< 2ms
10-90% U_{max}的上升时间	~165ms	~165ms	~165ms
输出 - 电流			
可调范围	0…3A	0…5A	0…10A
±10% ΔU_{IN}市电波动时的稳定度	< 0.05%	< 0.05%	< 0.05%
0…100% ΔU_{OUT}时的稳定度	< 0.15%	< 0.15%	< 0.15%
纹波 HF @ BWL 20MHz	< 6mA$_{PP}$	< 9mA$_{PP}$	< 3.8mA$_{PP}$
纹波 LF @ BWL 300kHz	< 2mA$_{RMS}$	< 3mA$_{RMS}$	< 1.3mA$_{RMS}$
精确度*	≤ 0.2%	≤ 0.2%	≤ 0.2%
输出 - 功率			
效率	≤ 85%	≤ 85%	≤ 85%
额定功率P_{nom}	100W	160W	320W
其它			
工作温度	0….50°C	0….50°C	0….50°C
储存温度	-20….70°C	-20….70°C	-20….70°C
相对湿度	< 80%	< 80%	< 80%
外壳尺寸 (WxHxD)	174x82x240mm	174x82x240mm	174x82x267mm
整体尺寸 (WxHxD)	174x90x263mm	174x90x263mm	174x90x290mm
重量	1.9kg	2kg	2.6kg
制冷方式	无风扇，自然对流冷却	无风扇，自然对流冷却	温控风扇
噪音	-	-	<40dBA @ 1m
安规标准	EN 60950		
EMC标准	EN 61326, EN 55022 等级 B		
过压等级	等级 II		
保护等级	等级 I		
产品编号	39200116	39200117	39200118

*与额定值有关，该精确度决定设定值与实际值间允许最大误差。
举例：一台42V型号产品的电压精确度最少为0.2%，即为84mV。当设定5V电压时，且允许最大误差为84mV， 故得出实际值可能在4.92V和5.08V之间。

About

Elektro-Automatik GmbH & Co. KG

Helmholtzstrasse 31-33

41747 Viersen

Germany

Phone: +49 2162 / 37850

Fax: +49 2162 / 16230

Web: www.elektroautomatik.de

Mail: ea1974@elektroautomatik.de

© Elektro-Automatik

Safety instructions

- Only operate the device at a mains voltage as stipulated on the type plate!

- Never insert mechanical parts, especially from metal, through the air ventilation slots!

- Avoid any use of liquids of any kind in the proximity of the device! They might get into it.

- Do not connect voltage sources to the device which are able to generate voltages higher than the nominal voltage of the device!

- Do not connect voltage source with reversed polarity to the output!

- After the output or even the device has been switched off there can still be dangerous voltage on the output! At least for a certain time.

- Attention! The enclosure can heat up during operation and may be hot!

1.   Introduction

The laboratory power supplies of the series PS 2000B are very compact and rugged devices and incorporate interesting features within small dimensions. The contactless design makes them ideally suited for operation in schools, educational facilities, workshops or laboratories.

The series offers three power classes of 100W, 160W and 320W.

Apart from standard functions of power supplies the user can lock pushbuttons and knobs against unintentional use or define thresholds for an automatic output cut-off in case of overcurrent or overvoltage.

All models feature a built-in USB interface, which can be used to remotely control and monitor the device by a PC.

2.   Installation

2.1   Mains connection

The unit is grounded via the mains cord. Thus it must only be operated at a mains socket with grounding contact. This connection must not be interrupted by an extension cable without ground conductor!

The unit is fused with a 5 x 20mm safety fuse, which is accessible inside the mains socket in a small „drawer". For value see fuse imprint or device type label.

2.2   Connecting loads

The power output is located on the front of the device.

The output is **not** fused! In order to avoid damage to the load application, always mind the supply voltage of the load.

3.   Views

3.1   Controls & sockets

(1) Power switch

This is used to switch the device completely on or off.

(2) Pushbutton „Preset"

This button is used to switch the actual values display to set values display. It is also used to activate the control panel lock. Also see sections 4.4 and 4.5.

(3) Display

This blue LCD presents all information at one glance.

(4) Knob „Voltage"

This knob is used to adjust the set value for the output voltage or, in preset mode, to adjust the OVP threshold.

(5) Mini USB socket

Here the device is connected to a PC, in order to monitor, remotely control or update the device. See section 7.3.

(6) Knob „Current"

This knob is used to adjust the set value of the output current or, in preset mode, the OCP threshold.

(7) Pushbutton „On/Off"

Is used to switch the DC output on or off.

(8) Power output, safety sockets, poled

The sockets can be used to plug 4mm open or safety Bueschel plugs. The metal socket between the DC output sockets is a grounding contact and can be used to ground connected loads, if required.

(9) Temperatur controlled fan

Only with 320W models, air outlet. In order to ensure sufficient air flow, it is required to leave some space behind the unit, but at least 10cm.

Note: at high temperature inside the unit, the fan will speed up and make increased noise.
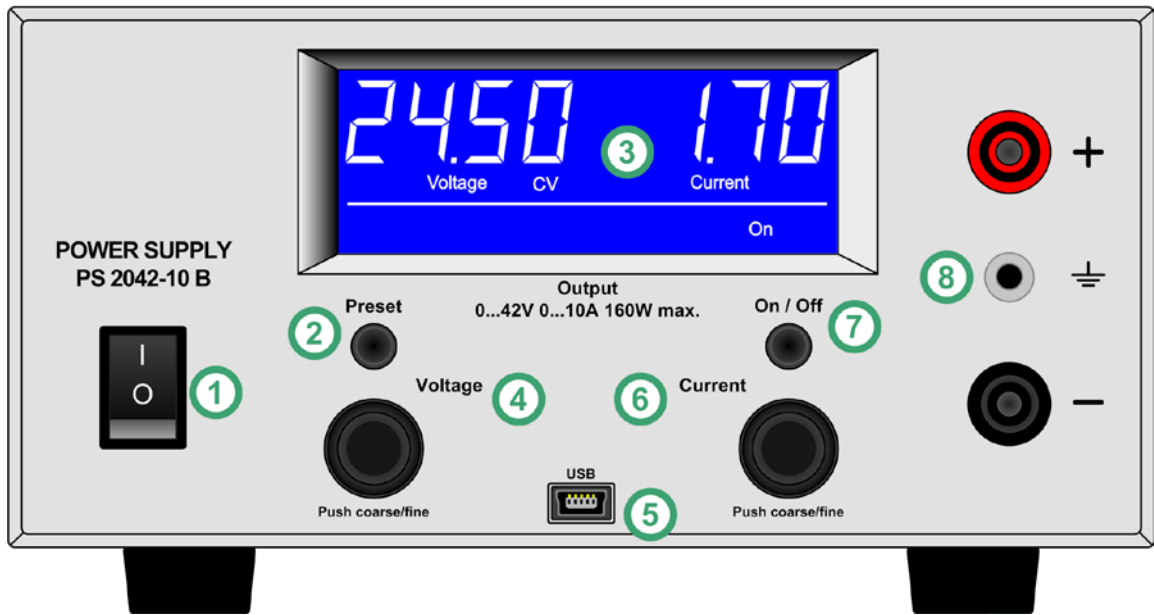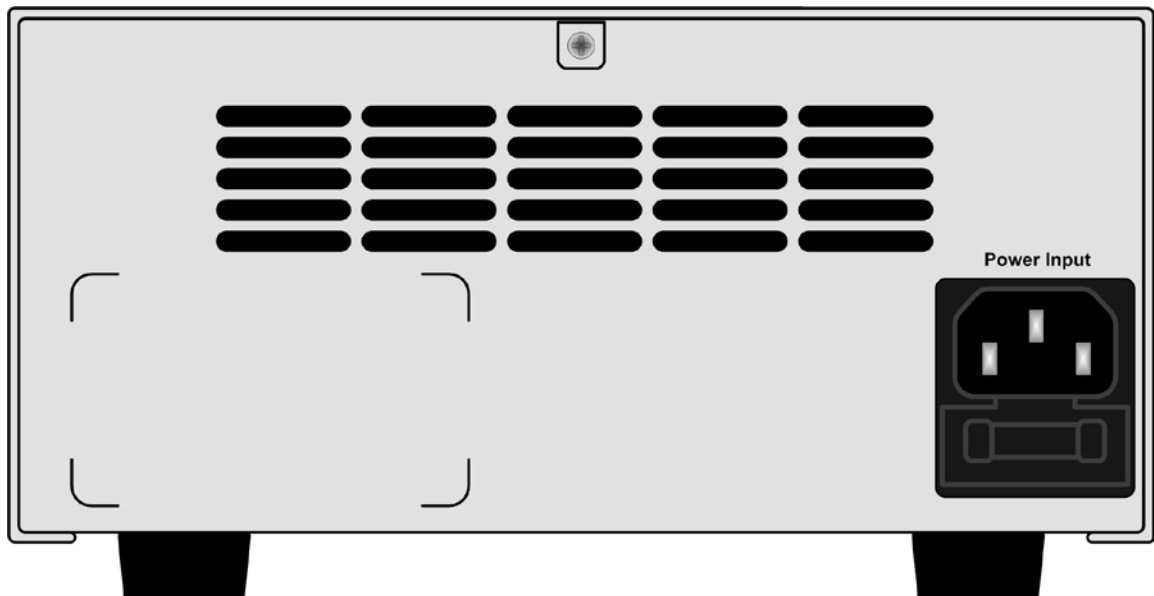
Figure 1

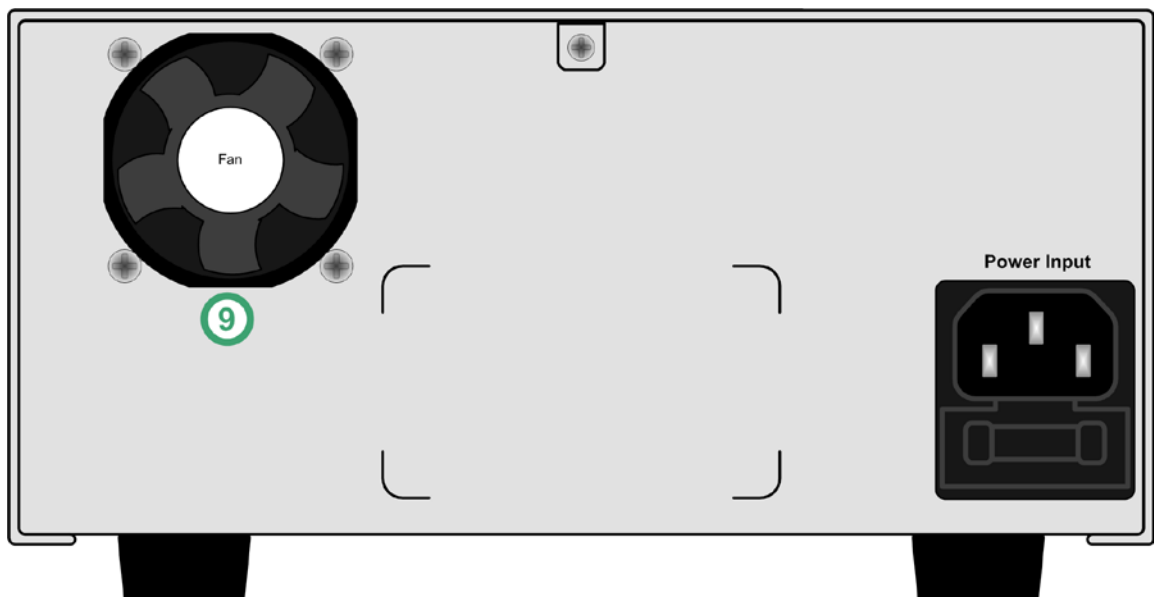Figure 2a. Rear view 100W / 160W models

Figure 2b. Rear view 320W models

4. Handling

4.1 The display ③

Figure 3

4.1.1 Status tokens

The status tokens in the display indicate following:

CV - Voltage regulation active (only if output is „on")

CC - Current regulation active (only if output is „on")

Preset V/C - Set value display of voltage/current active

Preset OVP/OCP - Set value display of OVP/OCP active

OT - Overtemperature error

OCP - Overcurrent protection

OVP - Overvoltage protection

Remote - Remote control active (via USB)

Lock - Control panel lock active

Fine - Indicates activated fine adjustment mode

4.1.2 Error indication

If an error like overvoltage, overcurrent or overtemperature occurs it is displayed by the text „Error" and a token (OT, OCP, OVP) and the output voltage is cut off. The text remains in the display until the user has acknowledged the error with the „On/Off" button, which will also switch the output off. After an overtemperature error, the output voltage will return automatically and „Error" will be cleared, unless the output has been switched off by the user. Other errors require the user to switch the output on again, in order to continue working with the device.

Other display elements are connec7.3ted to certain operation modes and are explained in the following sections.

4.2 Pushbuttons

4.2.1 Pushbutton Preset ②

This button is used to switch to preset mode and for activation/deactivation of the LOCK mode.

Push	Display	Mode
1x	Preset V / C	Display of U/I set values
2x	Preset OVP / OCP	Display of OVP/OCP set values
3x	Preset Lock	Activation/Deactivation of LOCK mode (also see 4.5)
4x		Display actual values again

4.2.2 Pushbutton On/Off ⑦

This pushbutton is used to manually switch the power output on or off, as long as the device is not in remote control. The state of the output is indicated by

On or Off in the display.

The pushbutton may be locked by the **LOCK** state. See above. Also see „4.5 Control panel lock (LOCK)".

The button also acknowledges errors. See section 4.1.2 for details.

4.3 Further control elements

Knobs Voltage ④ & Current ⑥

These two rotary knobs have no stop and are used to adjust set values. Assignment:

• Left knob - Voltage (U) or OVP, depending on mode

• Right knob - Current (I) or OCP, depending on mode

For details read below.

4.4 Adjusting set values

When adjusting the set values of voltage (U) and current (I), a rule becomes active where both set values adjust each other in order to not exceed the max. power of the device according to $P_{max} = U_{set} * I_{set}$.

It applies for preset mode and normal operation:

a) If the output is on and **constant voltage** regulation is active („CV" in the display), and if the **current** set value is adjusted beyond a certain limit which is defined by the formula: current set value = maximum power / voltage set value, then the voltage set value will be reduced automatically according to the same formula, in order to maintain the maximum power.

b) If the output is on and **constant current** regulation is active („CC" in the display), and if the **voltage** set value is adjusted beyond a certain limit which is defined by the formula: voltage set value = maximum power / current set value, then the current set value will be reduced automatically according to the same formula, in order to maintain the maximum power.

☞ *If the OCP value is identical to the current limitation value and if that limitation is reached, the OCP will have priority and switch the output off.*

☞ *All set values are internally stored every 10 seconds and restored after powering the device next time.Thus it may happen, that the device does not restore the most recent values. In order to be sure the last value you adjusted is restored the next time you power the device, wait at least 10 seconds after the last adjustment and before switching the device off.*

In order to determine what firmware version is installed on your device(s) you can either install and use the free EasyPS2000 software from www.elektroautomatik.cn, which reads the device information, or you can use your custom application. Both ways require to connect the device via a mini USB cable and install the USB driver, which is also available as download (for Windows only).

4.4.1 Fine adjustment

Adjusting values manually can be done in **fine** or **coarse** steps. Switching bewteen coarse and fine adjustment mode is done by pushing the corresponding knob.Coarse adjustment mode is default.

Activated fine adjustment mode is indicated in the display with FINE. It remains until it is deactivated again or the device is switched off.

4.4.2 Adjustment step width

Following step widths apply in dependency of the nominal values (also refer to technical specs):

Voltage			Current		
Nom. value	coarse	fine	Nom. value	coarse	fine
42V	1V	0.05V	3A / 5A / 6A	0.1A	0.01A
84V	1V	0.1V	10A / 20A	0.1A	0.01A

4.5 Control panel lock (LOCK)

The control panel LOCK is intended to prevent unintentional use of the pushbuttons and knobs. LOCK ist activated or deactivated using the **preset** button.

Activation is done by pushing the **preset** button three times until the display shows following:

Figure 4

A countdown will be running. During this countdown you have two options:

a) Wait until the countdown has finished. After this, the control panel **LOCK is active**.

b) Push the button once again and abort the countdown. **LOCK is then not activated**.

Deactivation is done by pushing button Preset again. The countdown will start again. If it runs out, LOCK remains active. If the countdown is aborted by pushing the button again, LOCK will be deactivated.

☞ *While LOCK is activated, the output can not be switched off manually, not even in an emergency!*

5. Device characteristics

5.1 Switching on by power switch

The power switch is located at the front. After the device is started, following situation will be set:

• The output is off

• The set values are restored, adjustment mode is reset to **coarse**

• Any condition like REMOTE or LOCK is reset.

5.2 Overvoltage

An overvoltage error can occur due to an internal defect (output voltage rises uncontrolled) or by a too high voltage from external.The overvoltage protection (OVP) will switch off the output and indicate the error in the display by the text „Error". This error has to be acknowledged first by the **On/Off** pushbutton. Then the display will change to normal display again. Also see section 4.2.2.

External voltages higher than 120% nominal voltage at the output must be avoided, or else internal components of the device might be destroyed!

If the cause of the overvoltage is removed, the output can be switched on again.

5.3 Overtemperature

If the unlikely event of an overtemperature (OT) error occurs by internal overheating, the output voltage is cut off and the status token „OT" is shown in the display, together with the text „Error". The output will automatically switch on again after the unit has cooled down. In case this is not wanted, the output can be manually switched off during the overtemperature period.

5.4 Overcurrent

The device can react in two different ways to overload resp. overcurrent:

1. By switching the output off (OCP) or

2. By limitting the output current (CC)

In order to switch the output off, it is required to adjust the OCP value (see section 4.4) to lower than the current limitation, because else the current is just limited.

6. Trouble-shooting

6.1 Hardware problems

Problem: After switching the device on nothing happens

Reason(s): Input fuse broken, other defect

Solution: If the display remains dark, check the input fuse. It is located inside the input socket on the rear, in a little „drawer". It can be checked visually or by means of a multimeter. If the fuse is broken, replace with same type and value and try again. If the error remains, contact your supplier. In such a case the unit is usually returned for repair.

Problem: The display only shows „PS 2000" after switching the device on

Reason: An error occured during a firmware update

Solutions: Switch off device and on again, if this does not help, try to repeat the firmware update procedure.

6.2 Software problems

Problem: EasyPS2000 can not detect the device

Reason: Various

Solution: Refer to the instruction manual of EasyPS2000 software, section „Trouble-shooting".

7. Other applications

7.1 Series connection

Several units of preferrably same type, but at least with identical nominal current, can be connected in series in order to gain a higher total output voltage.

To do so, the positive DC output of one unit is connected to the negative DC output of the next unit etc. The pos. DC output of the last unit will then be the positive output of the whole series connection and will have the high potential.

☞ *Because of safety and insulation reasons it is not allowed to connect an arbitrary number of units in series. The DC-- output must not be raised higher than 300V DC against ground. Thus the maximum allowed series connection voltage is 342V for 42V models and 384V for 84V models. For a series connection with such high voltage extra measures for safety have to be taken.*

☞ *If units with different nominal current are connected in series, the unit with the lowest nominal current will determine the maximum current of the system.*

☞ *If one or several units change into current limitation, the desired output voltage can not be achieved anymore.*

☞ *In a series connection, only the positive or negative DC output of the first unit (the one with the lowest potential) may be grounded.*

7.2 Parallel connection

Several units of preferrably same type, but at least identical nominal output voltage, can be connected in parallel in order to gain a higher total output current.

Every unit has to be adjusted seperately (manually or remotely by a PC). It is recommended to adjust the output current to the maximum and the output voltage to identical values on every unit.

☞ *If units with different nominal output current are connected in parallel and the unit with the lowest nominal current changes into current limitation it will drop its output voltage and will thus not be available anymore as current source in the parallel system, unless the output current is sinking again below the limit.*

7.3 Remote control with EasyPS2000

The device can be remotely controlled via the USB port by means of a PC and a Windows software called EasyPS2000. The software and a USB cable are included in a seperately available kit. The device requires a license code to be unlocked in the software. The code can be purchased as an option. Further information are available upon request or in the instruction manual of the EasyPS2000 software, as well as on our website. In order to purchase the kit and the license code, contact your dealer or send an e-mail to 2000bsoft@elektroautomatik.de and state article number and serial number of the device.

7.4 Programming

The device can be programmed and remotely controlled by custom software and via the USB port. This port is enumerated as virtual COM port on certain operation systems (currently: Windows only). This enables the user to easily implement the device into the target application.

The programming documentation is available on the website of the device manufacturer in the download section or upon request. When programming custom software no device license is required.

The connection to the PC is done a standard mini USB cable.

The manufacturer can not provide the USB driver for other operating systems such as Linux or MacOS. There are free or commercial drivers available from the Internet for those OS's. The USB driver has to be of type CDC (Communications Device Class).

7.5 Firmware updates

The device firmware can be updated if necessary. Details about firmware updates and the procedure are in the instruction manual of the software EasyPS2000, which can be found in the seperately available software kit or on our website. Only this software can be used to update a PS 2000 B unit.

The update feature of the software <u>does not</u> require the license code.

8.   Technical specifications

8.1   42V models

	PS 2042-06B	PS 2042-10B	PS 2042-20B
Mains input			
Input voltage	100…240V ±10%	100…240V ±10%	100…240V ±10%
Frequency	45…65Hz	45…65Hz	45…65Hz
Fuse	T 2A	T 3.15A	T 6.3A
Power factor	> 0.99	> 0.99	> 0.99
Power consumption at output off	12W	12W	15W
Output - Voltage			
Adjustable range	0...42V	0...42V	0...42V
Stability at mains fluctuation ±10% ΔU_{IN}	< 0.02%	< 0.02%	< 0.02%
Stability at 0…100% load	< 0.15%	< 0.15%	< 0.15%
Ripple HF @ BWL 20MHz	< 80mV$_{PP}$	< 80mV$_{PP}$	< 150mV$_{PP}$
Ripple LF @ BWL 300kHz	< 9mV$_{RMS}$	< 9mV$_{RMS}$	<1.7mV$_{RMS}$
Accuracy*	≤ 0.2%	≤ 0.2%	≤ 0.2%
Overvoltage protection	0…46.2V	0…46.2V	0…46.2V
Regulation time 10-90% load	< 2ms	< 2ms	< 2ms
Rise time 10-90% U_{max}	~165ms	~165ms	~165ms
Output - Current			
Adjustable range	0…6A	0…10A	0…20A
Stability at mains fluctuation ±10% ΔU_{IN}	< 0.05%	< 0.05%	< 0.05%
Stability at 0…100% ΔU_{OUT}	< 0.15%	< 0.15%	< 0.15%
Ripple HF @ BWL 20MHz	< 25mA$_{PP}$	< 40mA$_{PP}$	< 15mA$_{PP}$
Ripple LF @ BWL 300kHz	< 9mA$_{RMS}$	< 15mA$_{RMS}$	< 5.3mA$_{RMS}$
Accuracy*	≤ 0.2%	≤ 0.2%	≤ 0.2%
Output - Power			
Efficiency	≤ 85%	≤ 85%	≤ 85%
Nominal power P_{nom}	100W	160W	320W
Miscellaneous			
Operation temperature	0….50°C	0….50°C	0….50°C
Storage temperature	-20….70°C	-20….70°C	-20….70°C
Humidity rel.	< 80%	< 80%	< 80%
Dimensions of enclosure (WxHxD)	174x82x240mm	174x82x240mm	174x82x267mm
Dimensions absolutely (WxHxD)	174x90x263mm	174x90x263mm	174x90x290mm
Weight	1.9kg	2kg	2.6kg
Cooling	fanless, natural convection	fanless, natural convection	temperature controlled fan
Noise	-	-	<40dBA @ 1m
Safety	EN 60950		
EMC standards	EN 61326, EN 55022 Class B		
Overvoltage class	Class II		
Protection class	Class I		
Article number	39200112	39200113	39200114

* Related to the nominal value, the accuracy defines the maximum allowed deviation between set value and actual value.

Example: a 42V model has min. 0.2% voltage accuracy, this is 84mV. When setting a voltage of 5V and with an allowed maximum deviation of 84mV, the resulting actual value could be between 4.92V and 5.08V.

8.2 84V models

Mains input	PS 2084-03B	PS 2084-05B	PS 2084-10B
Input voltage	100…240V ±10%	100…240V ±10%	100…240V ±10%
Frequency	45…65Hz	45…65Hz	45…65Hz
Fuse	T 2A	T 3.15A	T 6.3A
Power factor	> 0.99	> 0.99	> 0.99
Power consumption at output off	12W	12W	15W
Output - Voltage			
Adjustable range	0...84V	0...84V	0...84V
Stability at mains fluctuation ±10% ΔU_{IN}	< 0.02%	< 0.02%	< 0.02%
Stability at 0…100% load	< 0.15%	< 0.15%	< 0.15%
Ripple HF @ BWL 20MHz	< 60mV$_{PP}$	< 60mV$_{PP}$	< 150mV$_{PP}$
Ripple LF @ BWL 300kHz	< 10mV$_{RMS}$	< 10mV$_{RMS}$	< 2.1mV$_{RMS}$
Accuracy*	≤ 0.2%	≤ 0.2%	≤ 0.2%
Overvoltage protection	0…92.4V	0…92.4V	0…92.4V
Regulation time 10-90% load	< 2ms	< 2ms	< 2ms
Rise time 10-90% U_{max}	~165ms	~165ms	~165ms
Output - Current			
Adjustable range	0…3A	0…5A	0…10A
Stability at mains fluctuation ±10% ΔU_{IN}	< 0.05%	< 0.05%	< 0.05%
Stability at 0…100% ΔU_{OUT}	< 0.15%	< 0.15%	< 0.15%
Ripple HF @ BWL 20MHz	< 6mA$_{PP}$	< 9mA$_{PP}$	< 3.8mA$_{PP}$
Ripple LF @ BWL 300kHz	< 2mA$_{RMS}$	< 3mA$_{RMS}$	< 1.3mA$_{RMS}$
Accuracy*	≤ 0.2%	≤ 0.2%	≤ 0.2%
Output - Power			
Efficiency	≤ 85%	≤ 85%	≤ 85%
Nominal power P_{nom}	100W	160W	320W
Miscellaneous			
Operation temperature	0….50°C	0….50°C	0….50°C
Storage temperature	-20….70°C	-20….70°C	-20….70°C
Humidity rel.	< 80%	< 80%	< 80%
Dimensions of enclosure (WxHxD)	174x82x240mm	174x82x240mm	174x82x267mm
Dimensions absolutely (WxHxD)	174x90x263mm	174x90x263mm	174x90x290mm
Weight	1.9kg	2kg	2.6kg
Cooling	fanless, natural convection	fanless, natural convection	temperature controlled fan
Noise	-	-	<40dBA @ 1m
Safety	EN 60950		
EMC standards	EN 61326, EN 55022 Class B		
Overvoltage class	Class II		
Protection class	Class I		
Article number	39200116	39200117	39200118

* Related to the nominal value, the accuracy defines the maximum allowed deviation between set value and actual value.

Example: a 42V model has min. 0.2% voltage accuracy, this is 84mV. When setting a voltage of 5V and with an allowed maximum deviation of 84mV, the resulting actual value could be between 4.92V and 5.08V.

EA-Elektro-Automatik GmbH & Co. KG
研发 - 生产 - 销售一体化
Development - Production - Sales

Helmholtzstraße 31-33
41747 Viersen
Germany

Tel: +49 2162 / 37 85-0
Fax: +49 2162 / 16 230
ea1974@elektroautomatik.cn
www.elektroautomatik.cn