Elektro-Automatik GmbH

操 作 指 南

Operating Guide

PS 8000 E 3U

Laboratory Power Supply Series

实验室电源系列产品

有生命危险！

危险电压

本产品输出电压可能上升至危险级别（**>60V$_{DC}$**）！

产品上所有带电元件必须有外遮盖。输出端的所有操作必须在产品与主电源（电源开关关闭）断开时才能执行，且可只有受训过电流危险知识的专业人员执行此类操作。负载与本产品间的任何连接必须有防碰擦装置。连到功率输出端的应用设备必须配置好，并且有保险丝熔断保护，这样可防止使用过程中由于过载或误操作损坏产品或更严重事情发生。

注意！

产品或输出关闭后，直流输出端在一定时间内仍存在危险电压！

请谨记

- 请仅在铭板标示电压下操作本产品。
- 请勿将任何机械零件，特别是金属件，插入通风孔内。
- 请不要在本产品周围使用任何液体物质，以免进入产品内。
- 请勿将高于电源供应器额定电压的电压源连接到产品上。
- 从后板插槽安装接口卡时，请遵循一般防静电规则。
- 只能在产品完全关闭（电源开关为关闭状态）后插入和取出接口卡。
- 产品老化以及超负荷使用都可能导致如按钮、旋钮类的产品控制件操作不稳定。
- 请勿将电压源反接到直流输出端！产品可能会被损坏。
- 请勿将那些可能会产生高于产品额定电压的电压源连到直流输出端！

目录

CN

1. 简介

PS 8000 E 3U系列为高效电源供应器，装于19“拉拔式外壳内，是测试系统和工业控制设备的理想选择。

除具备电源供应器的标准功能外，用户还可定义和恢复5组不同的预设值。

您可选择各种数字接口卡，这些接口卡通过电脑可执行更宽范围的控制和监控功能。根据接口卡类别，产品可支持的数量以及可操作功能会有所不同。

本系列所有型号都配有并联和共享总线操作用连接端子。

通过接口卡可方便地将产品融入现有系统，且完全不需配置卡或仅做少数几个设定。

电源通过模拟接口可连接其它电源供应器，并藉由该接口来控制他们。或通过外部控制系统，如编程器，来控制和监控。

本产品由微处理器控制，使得产品能准确、快速地测量和显示出各实际值。

主功能一览：

- 设置0...100%范围的设定电压，电流和功率
- 0...110% U_{Nom}可调过压极限
- 可选拔插式数字接口卡 (CAN，USB，RS232，IEEE/GPIB，Ethernet/LAN，Profibus)
- 内置、电隔离外控用模拟接口，0...5V或0...10V（可选）对应0...100%数值
- 功率级别有3.3kW，5kW，6.6kW，10kW 或 15kW；装于机柜内还可扩展至150kW
- 温控风扇
- 状态指示灯 (OT，OVP，CC，CV，CP)
- 5组可选内存集
- 并联连接（Share-Bus 共享总线操作）
- 带数据库且兼容CAN系统的Vector软件（从6.01固件版本始）
- Vector™兼容的CAN系统
- 免费的Windows软件
- LabView™ VIs

2. 技术规格

2. 1 控制面板和显示器

类型

显示： 202 x 32点阵显示
分为三个区域

旋钮： 2个旋钮，9+2个按钮

显示器格式

额定值决定最大可调范围。

实际电压和电流同时显示，过压极限设定值，电压、电流和功率限定值则分开显示。

电压的显示

分辨率： 4位数
格式： 0.00V...99.99V
0.0V...99.9V
0V...9999V

电流的显示

分辨率： 4位数
格式： 0.00A...99.99A
0.0A...999.9A

功率的显示

分辨率： 4位数
格式： 0.000kW...9.999kW
0.00kW...99.99kW

2. 2 各型号技术规格

	PS 8040-170 E 3U	PS 8080-170 E 3U	PS 8200-70 E 3U	PS 8500-30 E 3U	PS 8040-340 E 3U
电源输入					
输入电压	340…460V AC	340…460V AC	340…460V AC	340…460V AC	340…460V AC
可选输入电压范围	-	-	-	-	-
要求相数	2Ph, PE	2Ph, PE	2Ph, PE	2Ph, PE	3Ph, PE
输入频率	45…65Hz	45…65Hz	45…65Hz	45…65Hz	45…65Hz
输入保险丝	2x T16A	2x T16A	2x T16A	2x T16A	4x T16A
输入电流	最大11A	最大16A	最大16A	最大16A	最大19A
功率因数值	> 0.99	> 0.99	> 0.99	> 0.99	> 0.99
输出 - 电压					
额定电压U_{Nom}	40V	80V	200V	500V	40V
可调范围	0V…U_{Nom}	0V…U_{Nom}	0V…U_{Nom}	0V…U_{Nom}	0V…U_{Nom}
市电波动范围在±10% ΔU_{IN}时的稳定度	< 0.02%	< 0.02%	< 0.02%	< 0.02%	< 0.02%
带载0…100%时的稳定度	< 0.05%	< 0.05%	< 0.05%	< 0.05%	< 0.05%
带载100%时电压从R10至90%的上升时间	最大30ms	最大30ms	最大30ms	最大30ms	最大30ms
纹波 @ BWL 20MHz	< 100mVpp < 10mVrms	< 100mVpp < 10mVrms	< 200mVpp < 25mVrms	< 250mVpp < 70mVrms	< 150mVpp < 10mVrms
精确度*	⩽ 0.2%	⩽ 0.2%	⩽ 0.2%	⩽ 0.2%	⩽ 0.2%
显示器分辨率	10mV	10mV	100mV	100mV	10mV
远程感测补偿	最大2.5V	最大2.5V	最大6V	最大10V	最大2.5V
过压保护门限 (可调)	0…44V	0…88V	0…220V	0….550V	0…44V
输出 - 电流					
额定电流I_{Nom}	170A	170A	70A	30A	340A
可调范围	0…I_{Nom}	0…I_{Nom}	0…I_{Nom}	0…I_{Nom}	0…I_{Nom}
市电波动范围在±10% ΔU_{IN}时的稳定度	< 0.05%	< 0.05%	< 0.05%	< 0.05%	< 0.05%
带载0…100% ΔU_{OUT}时的稳定度	< 0.15%	< 0.15%	< 0.15%	< 0.15%	< 0.15%
纹波 @ BWL 20MHz	< 528mApp < 106mArms	< 300mApp < 40mArms	< 44mApp < 11mArms	< 14mApp < 8mArms	< 600mApp < 80mArms
精确度*	⩽ 0.2%	⩽ 0.2%	⩽ 0.2%	⩽ 0.2%	⩽ 0.2%
显示器分辨率	100mA	100mA	10mA	10mA	100mA
负载从10…90%瞬态恢复时间	< 2ms	< 2ms	< 2ms	< 2ms	< 2ms
输出 - 功率					
额定功率P_{Nom}	3300W	5000W	5000W	5000W	6600W
电压<150V U_{in}时的额定功率	0...P_{Nom}	0...P_{Nom}	0...P_{Nom}	0...P_{Nom}	0...P_{Nom}
精确度*	⩽ 2%	⩽ 2%	⩽ 2%	⩽ 2%	⩽ 2%
显示器分辨率	0.001kW	0.001kW	0.001kW	0.001kW	0.001kW
调节分辨率	93%	93%	95.20%	95.50%	93%
其它					
环境温度	0….50°C	0….50°C	0….50°C	0….50°C	0….50°C
储存温度	-20….70°C	-20….70°C	-20….70°C	-20….70°C	-20….70°C
相对湿度	< 80%	< 80%	< 80%	< 80%	< 80%
尺寸 (WxHxD)**	19" 3U 595mm	19" 3U 595mm	19" 3U 595mm	19" 3U 595mm	19" 3U 595mm
重量	19.8kg	19.8kg	19.8kg	19.8kg	25.5kg
冗 餘	无	无	无	无	有
输出正极对外壳的隔离电压	500V DC	500V DC	500V DC	1000V DC	500V DC
输出负极对外壳的隔离电压	300V DC				
绝缘耐压输入对输出	2500V DC				
制冷	风扇制冷，前板为入风口，后板为排风口				
标准	EN 60950, EN 61326, EN 55022 等级 A				
过压等级	2				
保护等级	1				
污染程度	2				
工作高度	<2000m				
串联操作	允许（但有限制）				
主-从操作	无				
并联操作	允许，经共享总线实现电流均衡分布				
主-从操作	有，经模拟接口				
模拟编程					
输入范围	0…5V 或 0…10V，可选				
精确度*	⩽ 0.2%				
输入阻抗	53kOhm				
产品编号	09230176	09230160	09230170	09230165	09230177

* 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80V型号产品的电压精确度最少为0.2%，即为160mV。当设定5V电压时，且允许最大误差为160mV，故得出实际值可能在4.84V和5.16V之间。

	PS 8040-510 E 3U	PS 8080-340 E 3U	PS 8160-170 E 3U	PS 8200-140 E 3U	PS 8400-70 E 3U
电源输入					
输入电压	340…460V AC	340…460V AC	340…460V AC	340…460V AC	340…460V AC
可选输入电压范围	-	-	-	-	-
要求相数	3Ph, PE	3Ph, PE	3Ph, PE	3Ph, PE	3Ph, PE
输入频率	45…65Hz	45…65Hz	45…65Hz	45…65Hz	45…65Hz
输入保险丝	6x T16A	4x T16A	4x T16A	4x T16A	4x T16A
输入电流	最大19A	最大28A	最大28A	最大28A	最大28A
功率因数值	> 0.99	> 0.99	> 0.99	> 0.99	> 0.99
输出 - 电压					
额定电压U_{Nom}	40V	80V	160V	200V	400V
可调范围	0V…U_{Nom}	0V…U_{Nom}	0V…U_{Nom}	0V…U_{Nom}	0V…U_{Nom}
市电波动范围在±10% ΔU_{IN}时的稳定度	< 0.02%	< 0.02%	< 0.02%	< 0.02%	< 0.02%
带载0…100%时的稳定度	< 0.05%	< 0.05%	< 0.05%	< 0.05%	< 0.05%
带载100%时电压从R10至90%的上升时间	最大30ms	最大30ms	最大30ms	最大30ms	最大30ms
纹波 @ BWL 20MHz	< 150mVpp < 10mVrms	< 150mVpp < 10mVrms	< 300mVpp < 30mVrms	< 200mVpp < 25mVrms	< 300mVpp < 40mVrms
精确度*	⩽ 0.2%	⩽ 0.2%	⩽ 0.2%	⩽ 0.2%	⩽ 0.2%
显示器分辨率	10mV	10mV	100mV	100mV	100mV
远程感测补偿	最大2.5V	最大2.5V	最大5V	最大6V	最大12V
过压保护门限 (可调)	0…44V	0….88V	0….176V	0…220V	0…440V
输出 - 电流					
额定电流I_{Nom}	510A	340A	170A	140A	70A
可调范围	0…I_{Nom}	0…I_{Nom}	0…I_{Nom}	0…I_{Nom}	0…I_{Nom}
市电波动范围在±10% ΔU_{IN}时的稳定度	< 0.05%	< 0.05%	< 0.05%	< 0.05%	< 0.05%
带载0…100% ΔU_{OUT}时的稳定度	< 0.15%	< 0.15%	< 0.15%	< 0.15%	< 0.15%
纹波 @ BWL 20MHz	< 900mApp < 120mArms	< 600mApp < 80mArms	< 300mApp < 60mArms	< 89mApp < 22mArms	< 33mApp < 9mArms
精确度*	⩽ 0.2%	⩽ 0.2%	⩽ 0.2%	⩽ 0.2%	⩽ 0.2%
显示器分辨率	100mA	100mA	10mA	100mA	10mA
负载从10…90%瞬态恢复时间	< 2ms	< 2ms	< 2ms	< 2ms	< 2ms
输出 - 功率					
额定功率P_{Nom}	10000W	10000W	10000W	10000W	10000W
电压<150V U_{in}时的额定功率	0...P_{Nom}	0...P_{Nom}	0...P_{Nom}	0...P_{Nom}	0...P_{Nom}
精确度*	⩽ 2%	⩽ 2%	⩽ 2%	⩽ 2%	⩽ 2%
显示器分辨率	0.01kW	0.01kW	0.01kW	0.01kW	0.01kW
调节分辨率	93%	93%	93%	95.20%	95.20%
其它					
环境温度	0….50°C	0….50°C	0….50°C	0….50°C	0….50°C
储存温度	-20….70°C	-20….70°C	-20….70°C	-20….70°C	-20….70°C
相对湿度	< 80%	< 80%	< 80%	< 80%	< 80%
尺寸 (WxHxD)**	19" 3U 595mm	19" 3U 595mm	19" 3U 595mm	19" 3U 595mm	19" 3U 595mm
重量	33kg	25.5kg	25.5kg	25.5kg	25.5kg
冗 餘	有	有	无	有	无
输出正极对外壳的隔离电压	500V DC	500V DC	500V DC	500V DC	900V DC
输出负极对外壳的隔离电压	300V DC				
绝缘耐压输入对输出	2500V DC				
制冷	风扇制冷，前板为入风口，后板为排风口				
标准	EN 60950, EN 61326, EN 55022 等级 A				
过压等级	2				
保护等级	1				
污染程度	2				
工作高度	<2000m				
串联操作	允许（但有限制）				
主-从操作	无				
并联操作	允许，经共享总线实现电流均衡分布				
主-从操作	有，经模拟接口				
模拟编程					
输入范围	0…5V 或 0…10V，可选				
精确度*	⩽ 0.2%				
输入阻抗	53kOhm				
产品编号	09230178	09230161	09230163	09230171	09230173

* 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80V型号产品的电压精确度最少为0.2%，即为160mV。当设定5V电压时，且允许最大误差为160mV，故得出实际值可能在4.84V和5.16V之间。

	PS 8500-60 E 3U	PS 81000-30 E 3U	PS 8080-250 E 3U	PS 8080-510 E 3U	PS 8200-210 E 3U
电源输入					
输入电压	340…460V AC	340…460V AC	340…460V AC	340…460V AC	340…460V AC
可选输入电压范围	-	-	588…796V AC+MP	588…796V AC+MP	588…796V AC+MP
要求相数	3Ph, PE	3Ph, PE	3Ph, PE	3Ph, PE	3Ph, PE
输入频率	45…65Hz	45…65Hz	45…65Hz	45…65Hz	45…65Hz
输入保险丝	4x T16A	4x T16A	6x T16A	6x T16A	6x T16A
输入电流	最大28A	最大28A	最大28A	最大28A	最大28A
功率因数值	> 0.99	> 0.99	> 0.99	> 0.99	> 0.99
输出 - 电压					
额定电压U_{Nom}	500V	1000V	80V	80V	200V
可调范围	0V…U_{Nom}	0V…U_{Nom}	0V…U_{Nom}	0V…U_{Nom}	0V…U_{Nom}
市电波动范围在±10% ΔU_{IN}时的稳定度	< 0.02%	< 0.02%	< 0.02%	< 0.02%	< 0.02%
带载0…100%时的稳定度	< 0.05%	< 0.05%	< 0.05%	< 0.05%	< 0.05%
带载100%时电压从R10至90%的上升时间	最大30ms	最大30ms	最大30ms	最大30ms	最大30ms
纹波 @ BWL 20MHz	< 300mVpp < 70mVrms	< 800mVpp < 200mVrms	< 150mVpp < 10mVrms	< 150mVpp < 10mVrms	< 250mVpp < 25mVrms
精确度*	⩽ 0.2%	⩽ 0.2%	⩽ 0.2%	⩽ 0.2%	⩽ 0.2%
显示器分辨率	100mV	1V	10mV	10mV	100mV
远程感测补偿	最大10V	最大20V	最大2.5V	最大2.5V	最大6V
过压保护门限 (可调)	0…550V	0…1100V	0…88V	0…88V	0…220V
输出 - 电流					
额定电流I_{Nom}	60A	30A	250A	510A	210A
可调范围	0…I_{Nom}	0…I_{Nom}	0…I_{Nom}	0…I_{Nom}	0…I_{Nom}
市电波动范围在±10% ΔU_{IN}时的稳定度	< 0.05%	< 0.05%	< 0.05%	< 0.05%	< 0.05%
带载0…100% ΔU_{OUT}时的稳定度	< 0.15%	< 0.15%	< 0.15%	< 0.15%	< 0.15%
纹波 @ BWL 20MHz	< 33mApp < 16mArms	< 22mApp < 11mArms	< 900mApp < 120mArms	< 900mApp < 120mArms	< 167mApp < 33mArms
精确度*	⩽ 0.2%	⩽ 0.2%	⩽ 0.2%	⩽ 0.2%	⩽ 0.2%
显示器分辨率	10mA	10mA	100mA	100mA	100mA
负载从10…90%瞬态恢复时间	< 2ms	< 2ms	< 2ms	< 2ms	< 2ms
输出 - 功率					
额定功率P_{Nom}	10000W	10000W	15000W	15000W	15000W
电压<150V U_{in}时的额定功率	0...P_{Nom}	0...P_{Nom}	0...P_{Nom}	0...P_{Nom}	0...P_{Nom}
精确度*	⩽ 2%	⩽ 2%	⩽ 2%	⩽ 2%	⩽ 2%
显示器分辨率	0.01kW	0.01kW	0.01kW	0.01kW	0.01kW
调节分辨率	95.50%	95.50%	93%	93%	95.20%
其它					
环境温度	0….50°C	0….50°C	0….50°C	0….50°C	0….50°C
储存温度	-20….70°C	-20….70°C	-20….70°C	-20….70°C	-20….70°C
相对湿度	< 80%	< 80%	< 80%	< 80%	< 80%
尺寸 (WxHxD)**	19" 3U 595mm	19" 3U 595mm	19" 3U 595mm	19" 3U 595mm	19" 3U 595mm
重量	25.5kg	25.5kg	33kg	33kg	33kg
冗 餘	无	无	有	有	有
输出正极对外壳的隔离电压	1000V DC	1500V DC	500V DC	500V DC	500V DC
输出负极对外壳的隔离电压	300V DC				
绝缘耐压输入对输出	2500V DC				
制冷	风扇制冷，前板为入风口，后板为排风口				
标准	EN 60950, EN 61326, EN 55022 等级 A				
过压等级	2				
保护等级	1				
污染程度	2				
工作高度	<2000m				
串联操作	允许（但有限制）				
主-从操作	无				
并联操作	允许，经共享总线实现电流均衡分布				
主-从操作	有，经模拟接口				
模拟编程					
输入范围	0…5V 或 0…10V，可选				
精确度*	⩽ 0.2%				
输入阻抗	53kOhm				
产品编号	09230166	09230168	09230179	09230162	09230172

* 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80V型号产品的电压精确度最少为0.2%，即为160mV。当设定5V电压时，且允许最大误差为160mV，故得出实际值可能在4.84V和5.16V之间。

	PS 8240-170 E 3U	PS 8500-90 E 3U	PS 8600-70 E 3U	PS 81500-30 E 3U
电源输入				
输入电压	340…460V AC	340…460V AC	340…460V AC	340…460V AC
可选输入电压范围	588…796V AC+MP	588…796V AC+MP	588…796V AC+MP	588…796V AC+MP
要求相数	3Ph, PE	3Ph, PE	3Ph, PE	3Ph, PE
输入频率	45…65Hz	45…65Hz	45…65Hz	45…65Hz
输入保险丝	6x T16A	6x T16A	6x T16A	6x T16A
输入电流	最大28A	最大28A	最大28A	最大28A
功率因数值	> 0.99	> 0.99	> 0.99	> 0.99
输出 - 电压				
额定电压U_{Nom}	240V	500V	600V	1500V
可调范围	0V…U_{Nom}	0V…U_{Nom}	0V…U_{Nom}	0V…U_{Nom}
市电波动范围在±10% ΔU_{IN}时的稳定度	< 0.02%	< 0.02%	< 0.02%	< 0.02%
带载0…100%时的稳定度	< 0.05%	< 0.05%	< 0.05%	< 0.05%
带载100%时电压从R10至90%的上升时间	最大30ms	最大30ms	最大30ms	最大30ms
纹波 @ BWL 20MHz	< 500mVpp < 20mVrms	< 300mVpp < 70mVrms	< 400mVpp < 80mVrms	< 1000mVpp < 350mVrms
精确度*	⩽ 0.2%	⩽ 0.2%	⩽ 0.2%	⩽ 0.2%
显示器分辨率	100mV	100mV	100mV	1V
远程感测补偿	最大7.5V	最大10V	最大18V	最大30V
过压保护门限 (可调)	0…264V	0…550V	0…660V	0…1650V
输出 - 电流				
额定电流I_{Nom}	170A	90A	70A	30A
可调范围	0…I_{Nom}	0…I_{Nom}	0…I_{Nom}	0…I_{Nom}
市电波动范围在±10% ΔU_{IN}时的稳定度	< 0.05%	< 0.05%	< 0.05%	< 0.05%
带载0…100% ΔU_{OUT}时的稳定度	< 0.15%	< 0.15%	< 0.15%	< 0.15%
纹波 @ BWL 20MHz	< 333mApp < 27mArms	< 50mApp < 23mArms	< 30mApp < 12mArms	< 19mApp < 13mArms
精确度*	⩽ 0.2%	⩽ 0.2%	⩽ 0.2%	⩽ 0.2%
显示器分辨率	100mA	10mA	10mA	10mA
负载从10…90%瞬态恢复时间	< 2ms	< 2ms	< 2ms	< 2ms
输出 - 功率				
额定功率P_{Nom}	15000W	15000W	15000W	15000W
电压<150V U_{in}时的额定功率	0...P_{Nom}	0...P_{Nom}	0...P_{Nom}	0...P_{Nom}
精确度*	⩽ 2%	⩽ 2%	⩽ 2%	⩽ 2%
显示器分辨率	0.01kW	0.01kW	0.01kW	0.01kW
调节分辨率	93%	95.50%	95.20%	95.50%
其它				
环境温度	0….50°C	0….50°C	0….50°C	0….50°C
储存温度	-20….70°C	-20….70°C	-20….70°C	-20….70°C
相对湿度	< 80%	< 80%	< 80%	< 80%
尺寸 (WxHxD)**	19" 3U 595mm	19" 3U 595mm	19" 3U 595mm	19" 3U 595mm
重量	33kg	33kg	33kg	33kg
冗 餘	无	有	无	无
输出正极对外壳的隔离电压	500V DC	1000V DC	1000V DC	2000V DC
输出负极对外壳的隔离电压	300V DC			
绝缘耐压输入对输出	2500V DC			
制冷	风扇制冷，前板为入风口，后板为排风口			
标准	EN 60950, EN 61326, EN 55022 等级 A			
过压等级	2			
保护等级	1			
污染程度	2			
工作高度	<2000m			
串联操作	允许（但有限制）			
主-从操作	无			
并联操作	允许，经共享总线实现电流均衡分布			
主-从操作	有，经模拟接口			
模拟编程				
输入范围	0…5V 或 0…10V，可选			
精确度*	⩽ 0.2%			
输入阻抗	53kOhm			
产品编号	09230164	09230167	09230174	09230169

* 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80V型号产品的电压精确度最少为0.2%，即为160mV。当设定5V电压时，且允许最大误差为160mV，故得出实际值可能在4.84V和5.16V之间。

3. 产品描述

3.1 各面视图

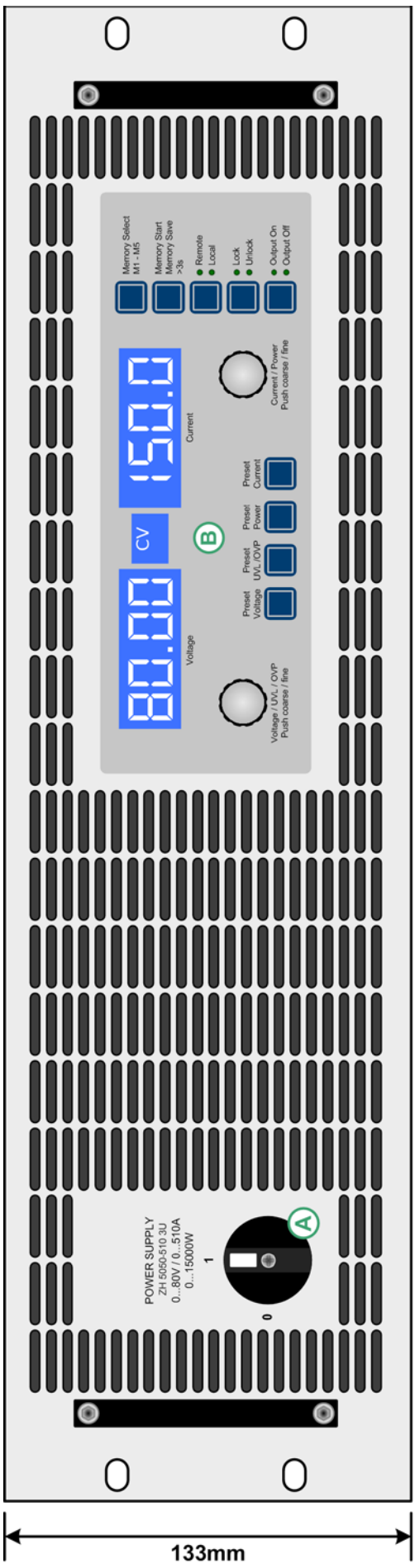


图 1

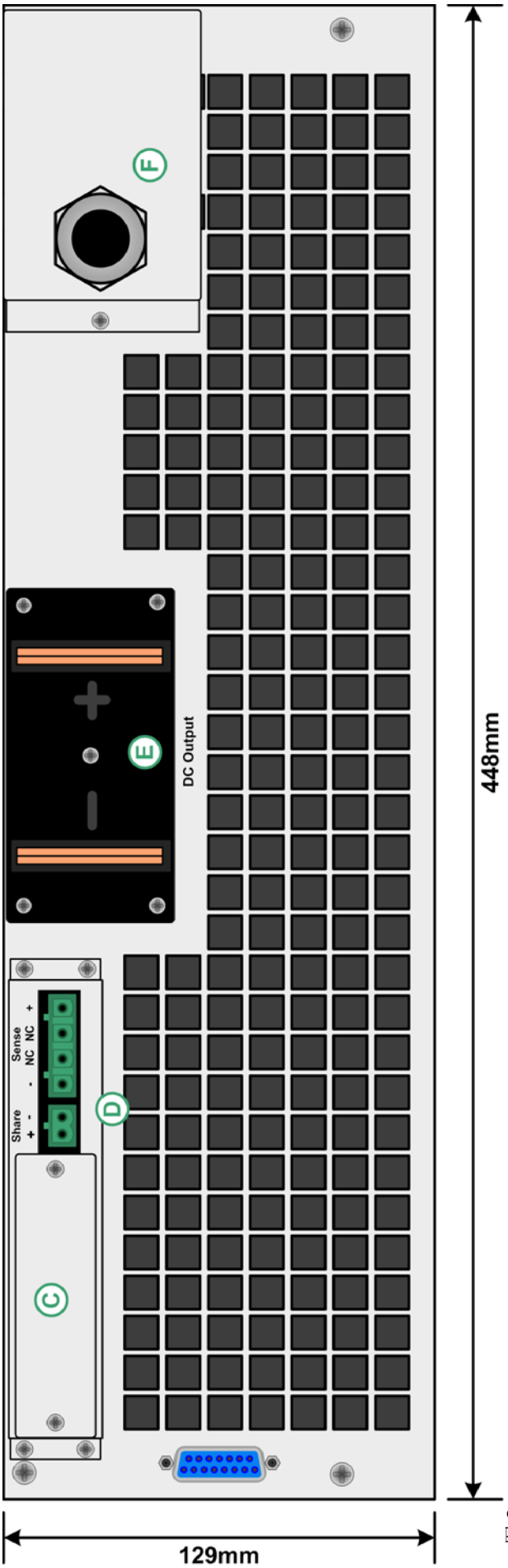


图 2

A - 电源开关
B - 控制面板
C - 接口卡插槽
D - 共享总线和远程感测端
E - 直流输出端（上图显示的输出端为80V型号的输出端类型）
F - 交流输入端

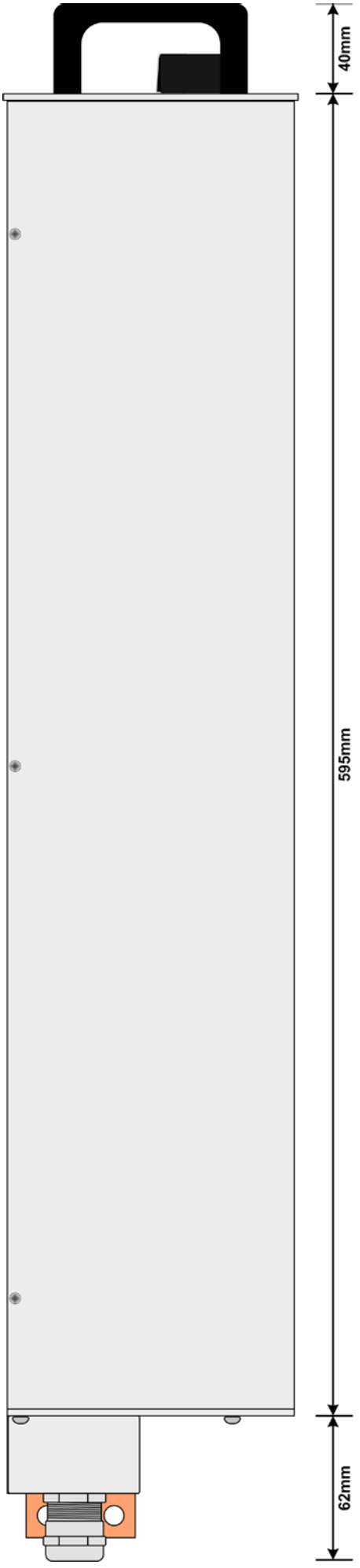


图 3

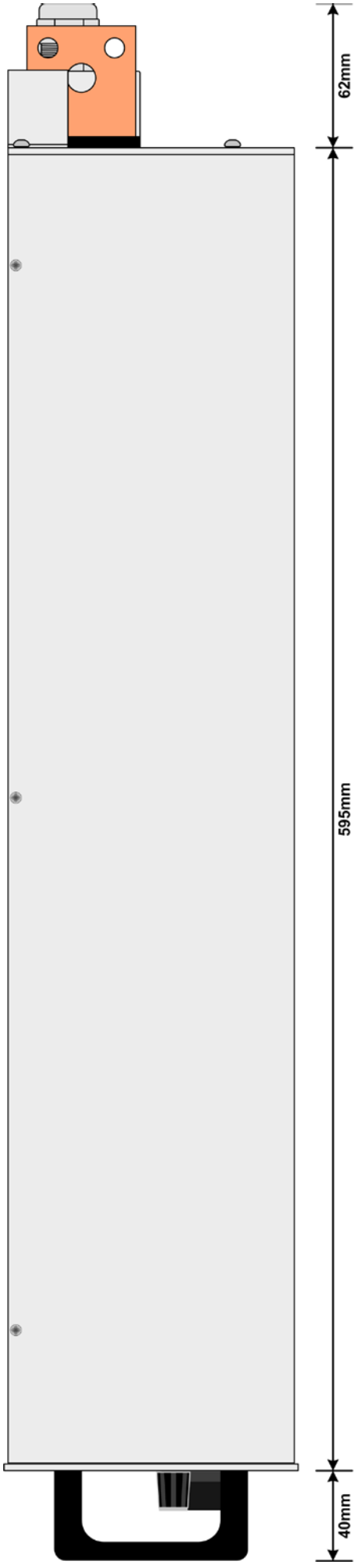


图 4

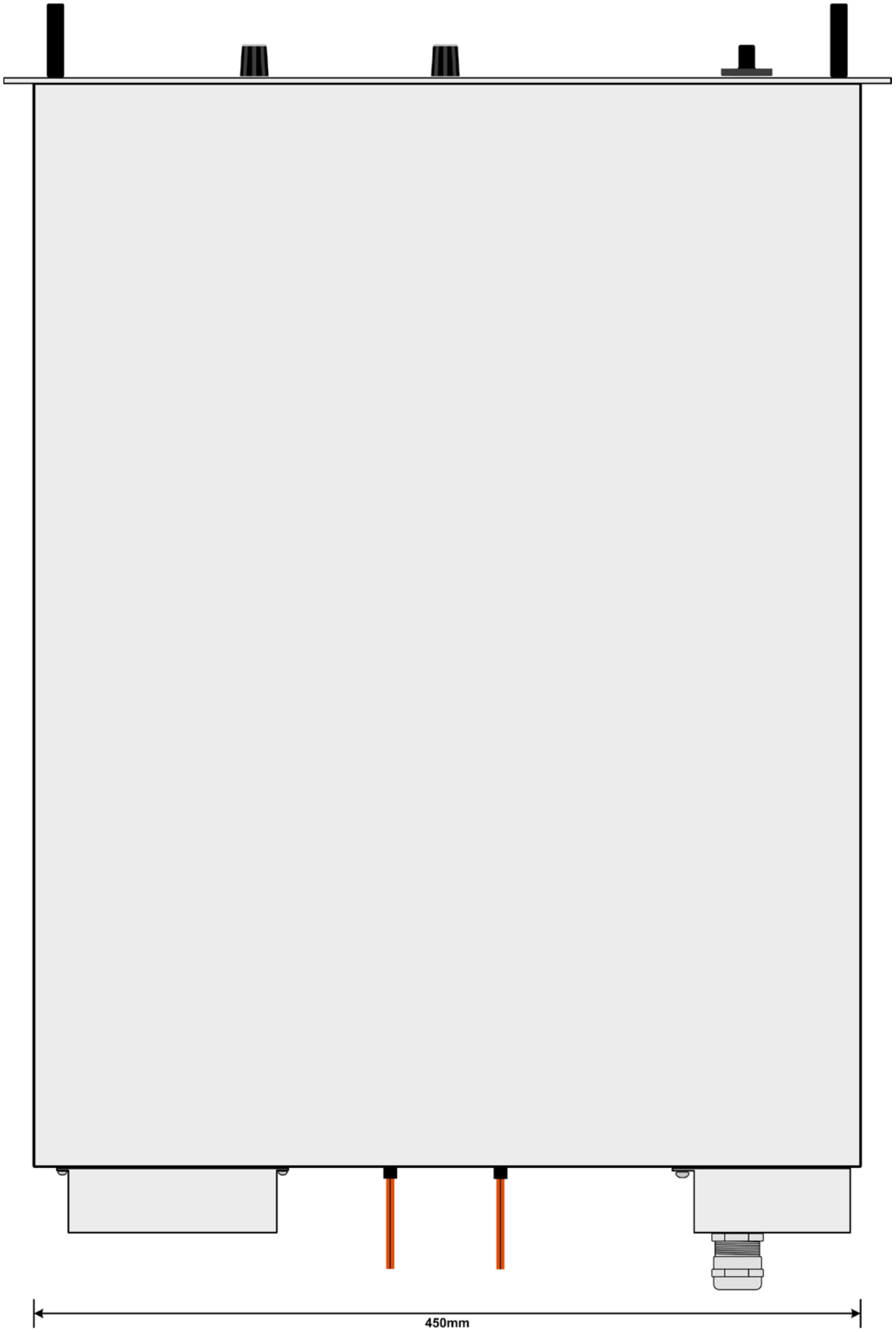


图 5

3. 2 供应清单

1 x 电源供应器

1 x 印刷版使用说明书

1 x 共享总线插头（已插上）

1 x 远程感测用插头（已插上）

4. 一般信息

4. 1 序言/安全警告

本说明书和本设备专给对本电源有基本了解的人士使用。不应给无基本电器知识的人士操作，因本说明书未作此方面解释。操作不当和未遵守安全说明的操作可能导致仪器损坏或丧失保修的权利！

4. 2 制冷

前板进风孔和后板排风孔必须保持干净，以保证良好的冷却效果。注意产品(后方)要与周围摆放的任何物体保持至少10cm距离，以保证空气通畅。

4. 3 维修/服务

打开该产品或用工具从内部取出零件时可能有高压触电的危险。必须将该产品与主电源断开后方可进行，否则用户自行承担风险。

只有受过电流危险知识训练的人员方可进行相关维护或修理。

打开产品通常只为更换保险丝。

4. 4 冗余操作

本系列部分型号还具有冗余操作功能。意思是，产品上含有两至三个功率段，只要有一个功率段维持工作，其他功率段因过热而被关闭，本电源仍将供电到输出端。详情可参考„2.2 各型号技术规格“，查看具有该功能的产品型号。

5. 安装

5. 1 目检

收到产品拆包装后，请检查是否有外观受损痕迹。如有，请不要操作该产品，应立即联系您的供应商。

5. 2 输入端连接（单机）

本系列产品的交流输入端必须连接两相（3.3kw/5kW型号）或三相，（6.6kW/10kW/15kW型号）的产品则要求连接带接地（PE）的三相供电电压。

该连接必须使用合适直径的连接线来完成。见下表举例，都针对单机连接的连接线：

	L1		L2		L3	
	ø	I_{max}	ø	I_{max}	ø	I_{max}
3.3kW	-	-	2,5mm²	11A	2,5mm²	11A
5kW	-	-	2,5mm²	16A	2,5mm²	16A
6.6kW	2,5mm²	19A	2,5mm²	11A	2,5mm²	11A
10kW	4mm²	28A	4mm²	16A	4mm²	16A
15kW	4mm²	28A	4mm²	28A	4mm²	28A

我们建议如下：

对于3.3kW/5kW/6.6kW型号： 至少为2,5mm²

对于10kW/15kW型号： 至少为4mm²

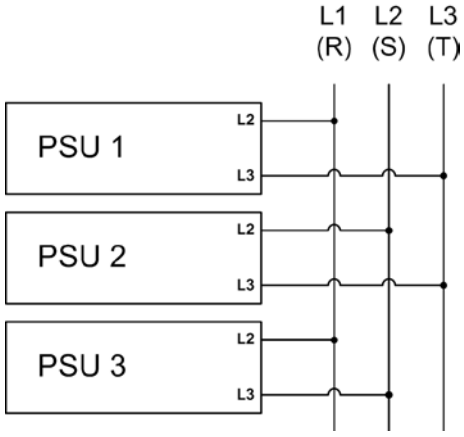
针对每相线以及地(PE)。

3.3kW或5kW单机使用的两相线可任意选择。意思是，不一定非为L2 (R)与L3 (S):

5. 3 输入端连接（多台机）

若有多台同功率级别或不同功率的产品连接到同一三相电压上，则需考虑相位间电流的分配，以达到平衡。如果连接一台或2台仅需两相电的产品，将会引起不均衡的电流分布，3台是最理想的。

下图以**3.3kW/5kW**型号产品的配置为例：



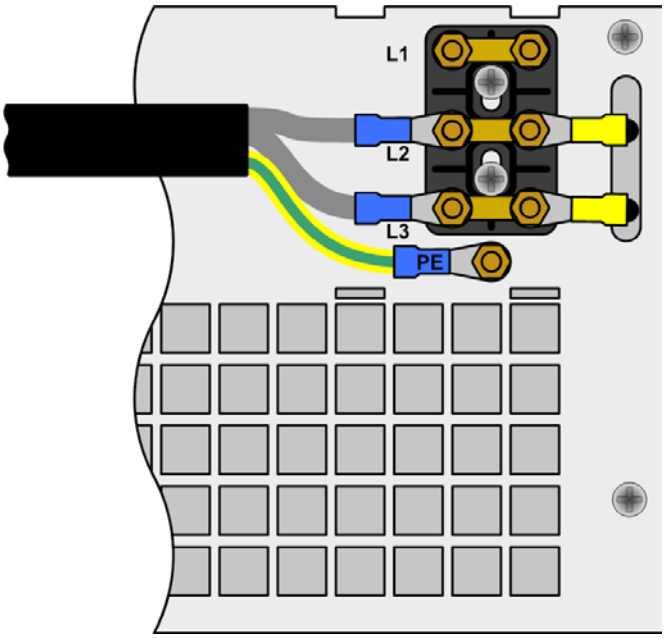


图6. 3.3kW/5kW产品输入端连接线图

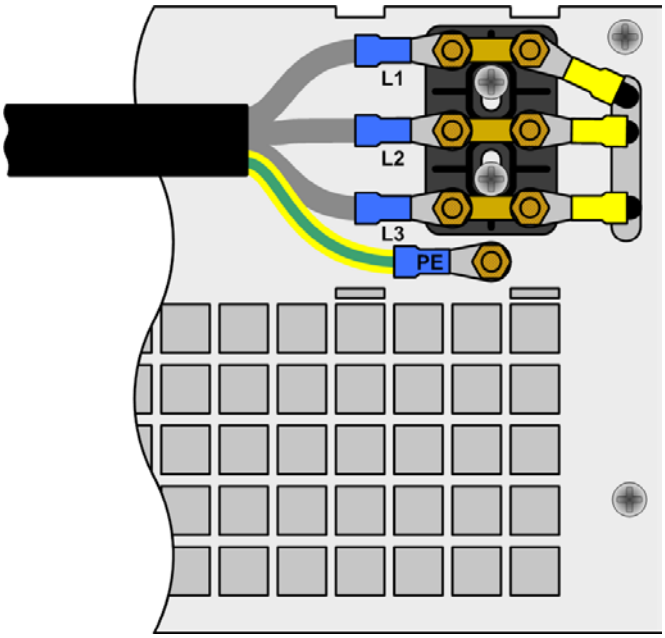
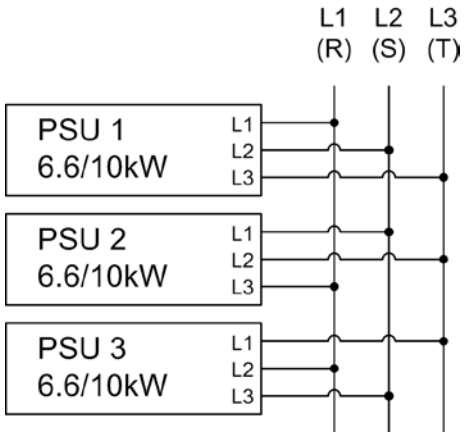


图7. 6.6kW/10kW/15kW产品输入端连线图

6.6kW/10kW型号的有所不同。在此情况下建议更改相位图。即，不必将L1(R)相接到产品输入端子的L1输入极。下图显示了一个电流几乎对称分布的范例，其中L1 = max. 44A, L2 = max. 56A 以及 L3 = max. 60A。

下图以**6.6kW/10kW**型号产品的配置为例：



5. 4 输入保险丝

本系列产品最多配有6个F16A/500V，6,3x32mm的保险丝熔断保护，都安装在产品内的主滤波板上，该线路板就在前板后面。若需更换保险丝，须打开产品上盖。

5. 5 直流输出端

功率输出端位于产品后方。

该输出端**无**保险熔断！为避免负载应用损坏，需一直注意负载的额定值。

负载连线的直径由几个条件决定，如输出电流，线长和环境温度。

我们建议使用**1,5m**长的连线：

针对**30A**:	6mm²	针对**70A**:	16mm²
针对**90A**:	25mm²	针对**140A**:	50mm²
针对**170A**:	70mm²	针对**210A**:	95mm²
针对**340A**:	2x70mm²	针对**510A**:	2x120mm²

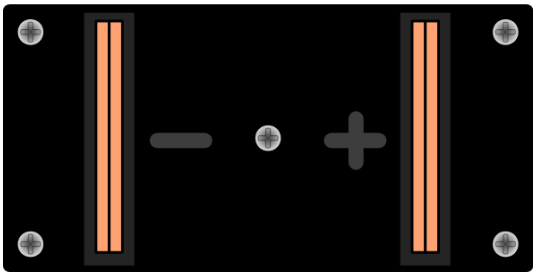
上面为每个直流输出端连线的最小直径（软性线）。

例如70mm²的单线，也可用2条35mm²的连线代替。

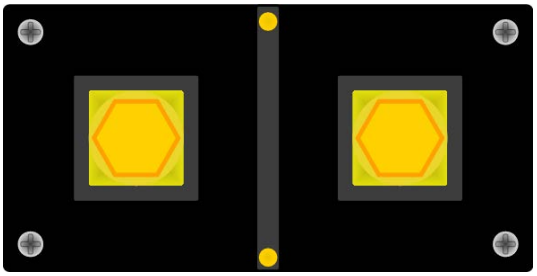
使用较长连线时，必须加大其直径，以免出现过大压降和发热过多。

5. 5. 1 输出端类型

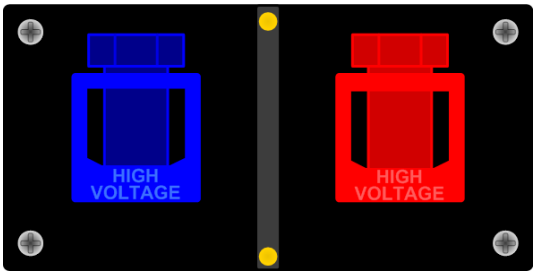
- **40V 或 80V** 型号：
  铜条上带有3个9mm配M8螺丝的螺丝孔
  建议：使用孔径为8mm的圆形接线片



- **160V/200V/240V** 型号：
  M8的螺柱固定于塑胶直流端子上
  建议：使用孔径为8mm的圆形接线片



- **400V** 以上型号：
  塑胶螺丝夹型端子
  建议：使用孔径为6mm的圆形接线片



5.6 输出端接地

> ⚠ 注意！
>
> 一般情况下可将单机与单机或者并联的多台产品的直流负(-)输出端接地。额定电压为**300V**以下产品，只有其直流正（+）输出端方可接地。

> ⚠ 注意！
>
> 将直流输出极接地时，要注意查看负载端（如：电子负载）的一极是否也与接地了！因这可能会导致短路

> ⚠ 注意！
>
> 串联时注意输出各极的电位转移！此时仅允许最低电压极接地。

5.7 “Sense”（远程感测）端

为了补偿负载线上的压降，电源可“感测”负载上的电压，而不是输出端的电压。它将调整输出电压，以便能提供所需电压给负载。最大调整值可见章节„2.2 各型号技术规格“下的“远程感测补偿”。

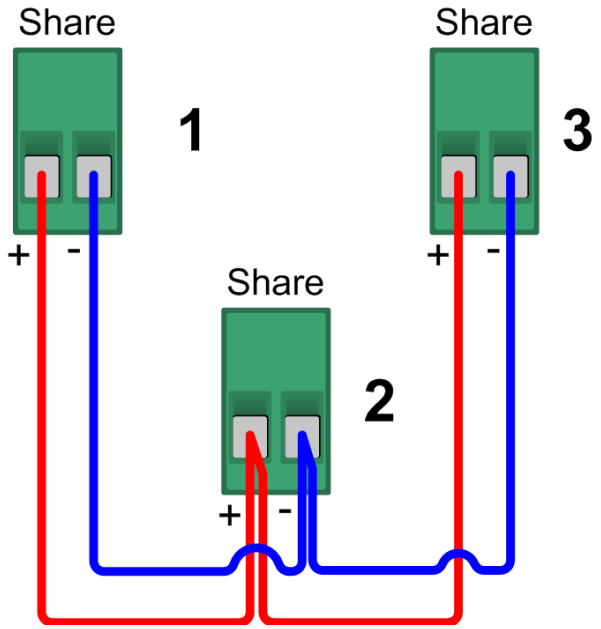
远程感测的连接点在产品后板“感测”端子上。也可见章节3.1。

> ⚠ 注意！
>
> 感测*(+)*极必须且仅能与负载应用设备的*(+)*极相连，而*(–)*极与*(–)*极相连！否则两个设备都可能受损。

面板其它信息请见章节„7.7 远程感测的操作“。

5.8 “Share”（共享）端

假如想使用共享总线操作，只要将相关产品的“Share”（共享）端连在一起即可，无需其它操作。



关于共享总线操作详情，请参考章节„11.1 共享总线模式下的并联“：

5.9 接口卡插槽

本系列产品可配一接口卡。接口卡插槽位于产品后面。关于接口卡的详细信息请参考接口卡说明书中章节„9. 数字接口卡“，以及接口卡快速安装指南。

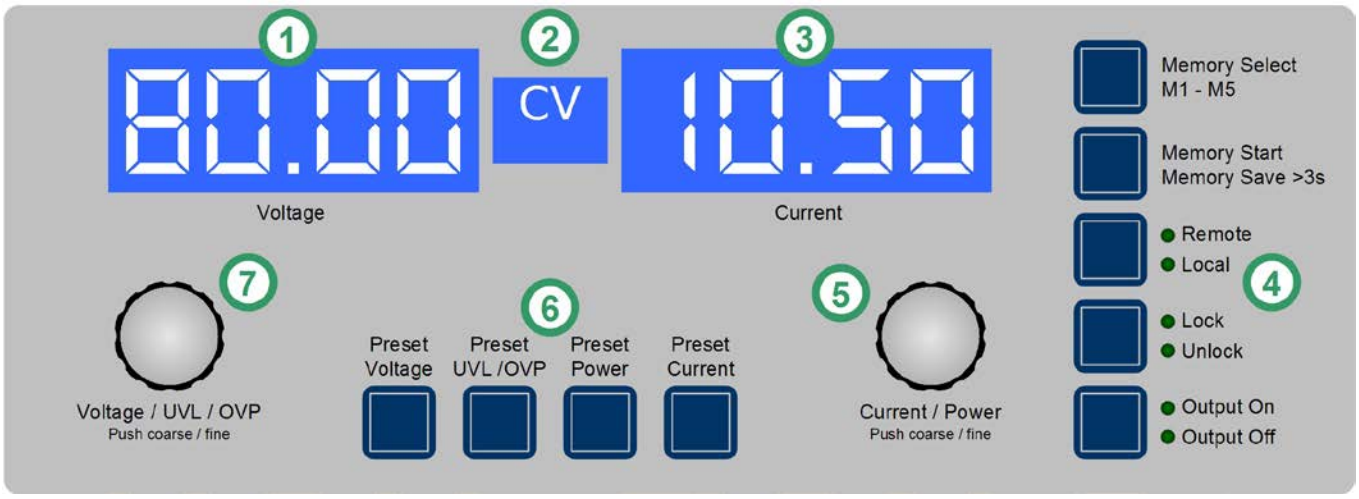


图 8. 控制面板

6. 操作

6.1 显示

图8描述了点阵显示器和控制面板总图。正常操作期间，显示区显示实际电压（右边）和电流值（左边），以及产品状态（中间）。在预设模式下，左显示区显示电压设定值（预设电压），过压保护阀值（预设OVP）欠压极限设定值（预设UVL）。右显示区显示电流设定值（预设电流）或功率设定值（预设功率）。在产品设置模式下显示可调参数和设定。

中间区域显示的状态如下：

CV - 恒压调整（仅当输出为“on”时）

OT - 过温错误

OVP - 过压错误

CC - 恒流调整（仅当输出为“on”时）

CP - 恒功率调整（仅当输出为“on”时）

Fine - 两旋钮启用时作精调

PF - 电源故障（输入电压故障，自6.0固件版本后方显示）

图解：

(1) - 左显示区域：实际电压或V, UVL, OVP的设定值。

(2) - 状态区域：显示状态，如CC, CV等。

(3) - 右显示区域：实际电流或I, P的设定值。

(4) - 控制按钮：设定产品条件等。

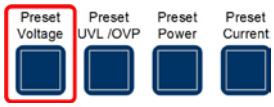
(5) - 右旋钮：调节I和P设定值，以及在产品设定模式下的各项设定。

(6) - 预设按钮：转为显示设定值。

(7) - 左旋钮：调节V、UVL和OVP设定值，以及产品设定模式下的各项参数。

6.2 控制面板各按钮

6.2.1 Preset Voltage按钮



正常操作模式下，该按钮可将实际输出电压值的显示转为预设输出电压值的显示（预设模式）。

左显示区域将显示如下：

预设模式下，左旋钮(**Voltage / UVL / OVP**)以与正常操作方式下一样的方法，调节电压设定值。调节值会立即传输到输出端！

> **提示**
>
> *设定值的调节由欠压阀值UVL限制。见章节6.2.2。*

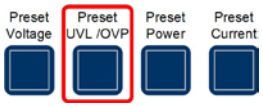
按两下该按钮立即退出预设模式，或者，如果没按预设按钮或有任一设定值被更改，则5s后自动退出。

由模拟或数字接口控制的远程控制模式下，可用预设模式检测远程输入的电压设定值。

用**LOCK**键可锁定该按钮。见章节6.2.8详述。

内存选择模式下，用该按钮可转为显示所选内存集的电压设定值，但是不会传输到输出端。左显示区域将显示如下：

6.2.2 Preset UVL / OVP按钮



在正常操作模式下，该按钮可将欠压极限（按一下）或过压保护阀值（按两下）实际值的显示转为其设定值的显示（预设模式）。左边显示区将显示如下：

与

.

欠压极限(UVL)仅仅是输出电压的调节极限。意思是，如果UVL设为0以外的任何值，则只能将电压设定值下调，最低至UVL值。同样，UVL值只能往上调，最高至电压设定值。

左旋钮(**Voltage / UVL / OVP**)用来调节0...U_{Set}.范围内的UVL值。

按两下按钮，转为显示过压保护阀值预设值(OVP)。这个数值始终在0...110% U_{Nom}范围内。

按三下按钮立即退出预设模式，或者，如果没按预设按钮或有任一设定值被更改，则5s后自动退出。

由数字接口控制的远程控制模式下，可用预设模式检测远程输入的OVP设定值。

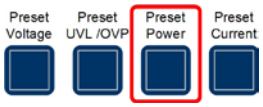
用**LOCK**键可锁定该按钮。见章节6.2.8详述。

内存集选择模式下，利用该按钮可转为显示所选内存集的UVL值或OVP值，但是不会立即生效。左显示区域将显示如下：

与

.

6.2.3 Preset Power按钮



在正常操作模式下，该按钮可将实际电流值的显示转为输出功率预设值显示（即：预设模式）。

右显示区域将显示如下：

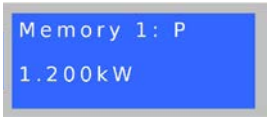
在预设模式下，右旋钮(**Current / Power**)用来调节0...100% P_{Nom}范围内的功率设定值。调节值会立即传输到输出端！

按两下该按钮立即退出预设模式，或者，如果没按预设按钮或有任一设定值被更改，则5s后自动退出。

用**LOCK**键可锁定该按钮。见章节6.2.8详述。

经模拟或数字接口卡控制的远程控制下，预设模式可用来检查远程指定的功率设定值。

内存选择模式下，用该按钮可转为显示所选内存集的功率设定值，但是不会传输到输出端。右显示区域将显示如下：



6.2.4 Preset Current按钮

正常操作模式下，该按钮可将实际输出电流值的显示转为预设输出电流值（即：预设模式）。

右显示区域将显示如下：

预设模式下，右旋钮(**Current / Power**)可在正常操作模式下一样，调节0...100% I_{Nom}范围内的电流设定值。调节值会立即传输到输出端！

按两下该按钮立即退出预设模式，或者，如果没按预设按钮或有任一设定值被更改，则5s后自动退出。

由模拟或数字接口控制的远程控制模式下，可用预设模式检测远程输入的电流设定值。

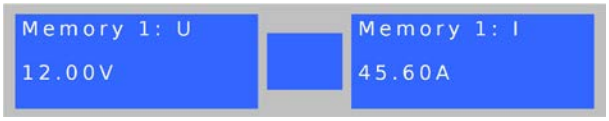
用**LOCK**键可锁定该按钮。见章节6.2.8详述。

内存选择模式下，用该按钮可转为显示所选内存集的电流设定值，但是不会传输到输出端。右显示区域将显示如下：

6.2.5 Memory Select M1-M5按钮

Memory Select
M1 - M5

该按钮在5个内存集间循环，每个内存集都有U、I、P、以及UVL和OVP的设定值。在这儿可编辑、存储或提交所选内存集。该按钮只有在输出为***off***时才工作。内存模式和所选内存集号显示如下：



用该按钮用户可执行下列操作：

a) 调节数值

输出关闭，短按按钮，显示器变为第一个内存集，如上所示。

现在可调节所选内存集的U-电压(左)和I-电流(右)设定值。推动相应预设按钮可访问其它可调值。

再按按钮，会循环显示至内存集5，然后退出内存模式。

调节后数值一直保留，只要产品为关闭状态，但是不会提交给输出设定值，**也不保存！保存它们请见章节**6.2.6。

用**LOCK**键可锁定该按钮。见章节6.2.8详述。

6.2.6 Memory Start / Memory Save >3s按钮

该按钮用来将之前选好的内存集值提交给输出，或保存内存集。该按钮只有当输出为***off***时才工作。

用该按钮用户可执行下列操作：

b) 仅提交

输出关闭，选择内存集(1-5)，短按按钮 --> 内存集值提交为输出设定值，然后退出内存模式。要使用新值，先用**Output On**按钮或远程控制打开输出。

> **提示**
>
> *提交设定值不会保存它们!*

c) 仅存储

输出关闭，选择一个或多个内存集，按需要调节数值，按住该按钮超过**3s** --> 所有内存集被存储于内置存储卡，但不会被提交给输出。输出仍为关闭状态，保存内存集后退出内存模式。

也可利用数字接口（除GPIB外）通过远程控制和相应指令来定义内存集，并被即时存储。

用**LOCK**键可锁定该按钮，见章节6.2.8详述。

6.2.7 Local按钮

本按钮激活/终止LOCAL模式。在LOCAL模式下不可进入远程控制模式。LOCAL模式由“Local”灯指示出来。只要LOCAL模式未被激活，“Remote”灯就显示产品通过模拟或数字接口处于远程控制模式。

用**LOCK**键可锁定该按钮，见章节6.2.8详述。

> **提示**
>
> *激活LOCAL模式将会即刻从远程控制模式退出（模拟或数字控制），并锁定产品，不再允许继续远程控制产品，直到再次退出LOCAL模式。*

> **提示**
>
> *LOCAL模式只是暂时的，关闭产品后不会保存。*

6.2.8 Lock / Unlock按钮

本按钮激活/终止控制面板锁定。LOCK模式下锁定所有的按钮，除LOCK按钮外。锁定控制面板可防止无意使用按钮和编码器。

> **提示**
>
> *激活LOCK模式将会即刻从预设或远程控制模式退出。显示器将恢复实际值的正常显示。*

> **提示**
>
> *自6.02版固件版本的产品，当产品关闭时LOCK模式会被保存，重启后则恢复。*

6.2.9 Output On / Output Off按钮

只要产品未处于遥控模式，可用此按钮手动打开或关闭电源输。输出状态通过按钮上面的“Output On”或“Output Off”LED灯指示出来。输出打开时，在显示器中间状态区域显示当前工作中的调整模式CC、CV或CP。

用**LOCK**键可锁定该按钮。见章节6.2.8详述。

输出的打开可通过模拟接口的13脚(REM-SB)来阻止。见章节„10. 模拟接口“。

此按钮还可用来确认错误消息。详情请见7.4和7.5章节。

6.3 其它控制键

6.3.1 Rotary knob按钮

这两个旋钮有推动按钮功能。推动任何一个或两个会有下列作用：

a) 细调模式 (Fine)

短按任何一按钮可起用或停用细调模式。如果激活“Fine”，所有设定值、阀值和极限值都按最小的幅度调节，不管当前为何种模式（预设，内存等）。在状态显示区域以“Fine”文字显示出来。也可参考下面章节„6.4 调节设定值“。

b) 产品设置

当输出为**off**时，同时按住**两个**按钮，时间>3s，可将产品换到产品设置。按相同方式可退出。

6.4 调节设定值

1. 手工操作

在手工操作下，两旋钮可按预定幅度（见下表）在0%至 100%的额定电压和电流设定值间连续调节。若想设置OVP和UVL，需按一下或两下**Preset UVL/OVP**按钮。若想设置功率设定值，需按**Preset Power**按钮。

> **提示**
>
> *OVP值低于电压设定值，只要一打开输出，实际电压达到OVP阀值，就会出现OV报警!*

可通过细调或粗调手工完成设定值的设置，默认为粗调。需**Fine-**细调时按任一一个旋钮来激活，幅度为1。

coarse-粗调则按额定值的下列步宽来进行（也可参考技术规格）：

电压			电流		
额定值	粗调	细调	额定值	粗调	细调
40V	0.25V	0.01V	30A	0.2A	0.01A
80V	0.5V	0.01V	60A	0.5A	0.01A
160V	1V	0.1V	70A	0.5A	0.01A
200V	2V	0.1V	90A	1A	0.01A
240V	2V	0.1V	120A	1A	0.1A
400V	2V	0.1V	140A	1A	0.1A
500V	5V	0.1V	210/250A	2A	0.1A
600V	5V	0.1V	340A	2A	0.1A
1000V	10V	1V	510A	5A	0.1A
1500V	10V	1V			

功率		
额定值	粗调	细调
3.3/5kW	50W	1W
6.6/10kW	100W	10W
15kW	100W	10W

Note

可调设定值的分辨率在某些型号上要高于输出电压分辨率。故有可能发生执行2或3个步宽后才能改变输出电压。

2. 通过模拟接口远程控制

请参考章节„10. 模拟接口 “。

3. 通过数字接口卡远程控制

请参考章节„„9. 数字接口卡“ “。

7. 产品特性

7. 1 用电源开关打开

电源开关位于产品前面。打开产品后，显示器将显示这些信息：生产商名称，地址与生产商标识，产品类型与固件版本。在设置模式下（见„8. 产品设置 “）出现“AutoPwrOn”（自动打开）选项，它决定产品打开时的输出状态。默认状态下为“on”，意思是可恢复产品最后关闭时U、I、 P的设定值，OVP和UVL值，以及输出条件。如果该选项为“off”，U和I的设定值设为0，P的设定值为100%，输出在每一次开启后打开。

7. 2 用电源开关关闭

用电源开关关闭产品如电源断电一样。它会保存最后设定值和输出条件。短时间过后，功率输出和风扇关闭，几秒钟后，产品完全关闭。

7. 3 转至远程控制模式

a) *通过可选模拟接口*：如果产品未被LOCAL模式限制，或早已启动数字接口的远程模式，“Remote”引脚可将产品转为远程控制。通过VSEL、CSEL和PSEL，以及REM-SB引脚的设定值可被使用。且传输给这些引脚的输出状态和设定值会即刻被设置。从远程控制返回后，输出关闭。

b) *通过可选数字接口*：如果产品未被LOCAL模式限制，或早已通过模拟接口启动了远程控制模式，利用相关指令（这儿为：对象）可将产品转为远程控制，并保留输出状态和设定值，直至被更改。退出远程控制会自动关闭输出。

7. 4 过压报警

过压报警可以因内部缺陷（输出电压上升且不可控）或外部电压过高而引起。过压保护(OVP)将关闭输出，并在显示器上以“OV”文字和模拟接口上的“OVP”引脚指示此报警。e.

如果清除过压原因，输出会再次打开，但需先确认此报警信息。在手工操作模式下，以按下**Output On/Off**按钮为确认方式，在模拟遥控模式下是“REM-SB”引脚，而在数字遥控模式下为相关指令。会出现“OV”状态文本和OVP信号。只要报警仍然存在，则不打开输出。

OV报警会被记录到内部警报缓冲区内。通过数字接口可读取该缓冲区内信息，除使用SCPI语言外。读取缓冲区信息也表示确认报警信息。

提示

OV报警状态优先于OT报警状态，当两个错误同时出现时会覆盖“OT”状态文字，但不确认该报警信息。

7. 5 过温报警

一旦因内部过热而出现过温(OT)报警，则关断输出，显示器中间区域会出现 “OT”状态文字。同„Output On“灯会闪烁，指示出产品一旦冷却后即自动重启。如果不需要，可手动关闭输出。LED灯停止闪烁，输出就不会自动启动。

OT报警要被确认。如果输出在冷却后还是关闭的，可用**Output On/Off**按钮，或通过„REM-SB“ 引脚，亦或相关指令再次打开输出。如果输出为打开状态，可按一下**Output On/Off**按钮，或给“REM-SB”引脚一由高至底的触发，或使用相关指令先确认该报警信息，然后关闭输出。

OT错误状态比OV错误状态级别更低。如果当OT错误出现的同时也出现OV错误，“OT”状态文本会被“OVP”覆盖。

提示

OT报警状态对于OV报警而言，优先级别较低一些。当两个报警同时出现时，“OV”会覆盖“OT”状态文字，但不确认该报警信息。

7. 6 调整电压、电流和功率

电源的输出电压和负载的阻值决定输出电流。只要输出电流低于设定电流极限值，产品以恒压(CV)模式操作，且以“CV”状态文字指示出来。

如果输出电流受限于电流设定值或额定电流，产品会转为恒流模式(CC)，并以“CC”状态文字指示出来。

所有型号都具有0...P_{Nom}的可调限功率特性。如果产品实际电流和电压超过可调功率极限，即激活该功能，并覆盖恒压或恒流调整模式。功率极限最初影响输出电压。因为电压、电流和功率极限相互影响，有可能出现像下面这样的不同状况：isen:

例1：产品进入恒压模式，然后限制了功率，因此，输出电压减少。较低的输出电压导致输出电流减小。如果负载阻值减小，输出电流会再次上升，输出电压进一步下降。

例2：产品进入恒流模式，输出电压有负载阻值决定。于是限制了功率，根据P = U * I公式，输出电压和电流减少。一旦电流设定值减少，输出电流和电压也会减少。产品的两个值，实际功率将低到之前设定的功率极限以下，产品由恒功率调整(CP)转为恒流调整(CC)。

CC、CV和CP这三个条件也可显示于可选模拟接口卡的适当引脚上，或者经可选数字接口卡当状态位元读出来。

7. 7 远程感测的操作

远程感测操作用来补偿电源和负载间导线的压降。因为这受限于一定水平，建议按照输出电流选择适当直径的导线，以将压降减到最小。

感测输入端位于产品后板，即**Sense**端子上。按正确极性将导线连到负载上。电源会自动检测外部感应端，并通过负载的实际电压而非输出电压，来补偿输出电压，从而按照电源与负载间的压降值提升输出电压。

最大补偿值：见技术参数表，不同型号有不同。

也可参考图9。

7. 8 市电欠压或过压

本产品需用到相线电压为400V的三相供电的两相或三相，其电压误差最大为±15%。从而形成340V...460V的输入电压范围。在该范围内，产品操作无功率限制。340V AC以下的输入电压被视为欠压，将保存最后操作状态，并关闭输出。如电压超过460V AC，结果一样。

自固件版本6.01：AC输入端的过压或欠压跟输入端其它错误一样，都会以“power fail-电源故障”报警指示于产品上。经模拟接口的引脚6„OT/PF“或内部报警缓冲区以„PF“显示。该报警可通过可选数字接口卡读取。

> ⚠ **注意！**
>
> 应避免输入端长期欠压或过压！

7. 9 与不同类型负载的连接

不同类型的负载，如阻性负载（台灯，电阻），电子负载或感性负载（马达），性能不同，它们会与电源相互作用。例如，马达会产生一反电压，导致电源因过压保护而关断输出。

电子负载有电压、电流和功率调整线路，它们与电源的相互作用，可能会提高输出纹波或其它多余的副作用。电阻负载几乎100%中性。故建议在安排应用时要考虑负载的特性。

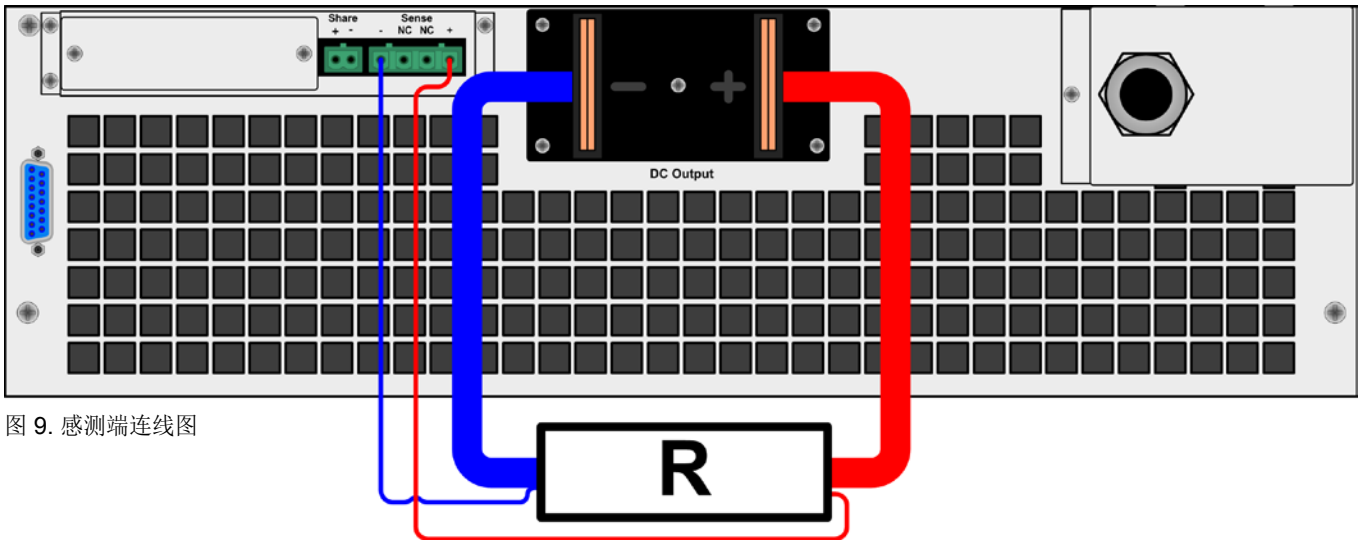


图 9. 感测端连线图

8. 产品设置

产品设置目的在于调节某些操作参数。当输出关闭后方可访问。长按旋钮上的两个按钮（见章节6.3）超过2s即可。退出设置并存储设定的操作方式与之相同。通常有三个基本设置，见下面。其它设定仅在配上数字接口卡时才出现。

基本设置：

参数：AutoPwrOn	Default: on
可设置值：on, off	

解释：“on” --> 在产品被关闭或停电前，最后输出状态和设定值被保存下来。这可保证产品在恢复电源后可继续按最后的设定自动运作。

“off” --> 每次产品打开后，输出也被打开，U, UVL和I的设定值被设为0%，P为100%，而OVP为110%。

参数：AI range	默认值：0-10
可设置值：0-5, 0-10	

解释：通过模拟接口选择使用的电压范围。

参数：Contrast	默认值：70
可设置值：50...100	

解释：调整LCD显示器的对比度。

下列设置适用于<u>所有</u>接口卡：

参数：Device node	默认值：1
可设置值：1...30	

解释：选择产品位址（产品节点，来自CAN专业术语）。当将产品应用于总线系统(CAN或GPIB)时，每台产品必须有一独特的地址！

利用**CAN接口卡–IF-C1**才可进行下列设置：

参数：Baud	默认值：100k
设置值：10k, 25k, 50k, 100k, 125k, 250k, 500k, 1M	

解释：选择CAN传输波特率。

参数：Base ID	默认值：0x000
设置值：0x000...0x7FC (0...2044)	

解释：通过三个IDs（Vector兼容，DBC文件）来定义CAN ID系统的基本ID (BAID)。根据调整后的基本ID，这三个IDs预留给一台产品。因此只有在第四步时才能调节这些参数。推动任何一旋钮可将显示器从十进制值转为十六进制值显示。

只有当ID Sys = Vector 被选定后方出现这个参数，见下面参数ID Sys。

参数：Broad ID	默认值：0x7FF
设置值：0x000...0x7FF (0...2047)	

解释：通过三个IDs（Vector兼容，DBC文件）来调节CAN ID系统的广播ID (BCID)。这个ID是产品用来给同一总线上的多台产品广播信息的第四个ID。仅以十六进制值显示。目的在于所有产品的这个ID调节成相同值，从而可通过设定值或产品状态同时控制这些产品。

只有当ID Sys = Vector 被选定后方出现这个参数，见下面参数ID Sys。

参数：RID	默认值：0
可设置值：0...31	

解释：选择重定位识别段(RID)。可参考CAN专业术语或IF-C1 CAN接口卡的说明书，查阅更多信息。

参数：Bus term	默认值：yes
可设置值：yes, no	

解释：启用/停用CAN接口卡的总线终止电阻。仅在产品位于总线终端时需要。

参数：ID Sys	默认值：Vector
可设置值：Vector, normal	

解释：选择CAN ID系统(IDSY)。用„Normal“设定，针对旧CAN ID系统，每台产品使用两个CAN IDs。这两个ID由„Device node“（如上）与„RID“（如上）创建而成。也可参考接口卡的使用说明书，CAN ID计算方法的描述。

其它ID系统就选择„Vector“，每台产品使用三个CAN ID，因此才能使用所谓的DBC文档，将产品应用到公司的Vector软件中。选择这个ID系统时，与设定相关的两个ID（如上）被激活，用户可调节用来定义三个ID的基本ID，以及一个广播ID（如有使用）。

利用**RS232接口卡–IF-R1**才可进行下列设置：

参数：Baud	默认值：57600
可设置值：9600, 19200, 38400, 57600	

解释：选择以波特率为单位的串行传输速率。利用RS232不可配置其它参数，但可这样定义：

奇偶性 = 奇数
停止位 = 1
数据位 = 8
必须在电脑上设置相同的配置。

利用**Profibus接口卡–IF-PB1**才可进行下列设置：

参数：Profibus	默认值：1
可设置值：1-125	

解释：定义产品的Profibus地址。该地址与产品节点分开使用，以在现场总线系统上进入产品内部。

9. 数字接口卡

本系列产品支持下列插拔式数字接口卡：

IF-U1 (USB)

IF-R1 (RS232)

IF-C1 (CAN)

IF-G1 (GPIB/IEEE)

IF-E1 / IF-E1B (Ethernet/LAN + USB)

IF-PB1 (Profibus + USB)

这这些卡插入产品后仅需进行少数设置或不需任何设置。即使替换成另外一不同类型卡，仍能保留前一张卡的具体设置。因此不用每次插入一张卡就设置一次。

关于接口卡的详细技术规格和操作，以及将产品应用于总线系统的说明，或用电脑(LabView等)控制产品，都可在IF卡用户操作说明书中找到。

> ⚠ 注意!
>
> 仅在产品被完全关闭（用电源开关）后才可插入或取出接口卡!

关于插拔式接口卡的配置请看章节„8. 产品设置“。

数字接口允许电脑设置电压，电流和功率，以及OVP阀值与欠压极限值UVL。当转为远程控制模式时，产品保留最后的设定值，直至被更改。因此可传送任意的设定值仅用来控制电压，而电流值保持不变。

数字接口（除GPIB外）传输的设定值永远为百分数，对应100%(hex: 0x6400)的额定值，或110%(hex: 0x6E00)的OVP阀值。使用GPIB卡时，任何值都按实际十进制值输入。

另外，数字接口卡允许查询和设定大量其它功能和数值。更多详情请参考接口卡的使用说明书。

10. 模拟接口

10. 1 一般信息

内置、非隔离15脚模拟接口位于产品后端，提供下列功能：

- 远程控制输出电流、电压和功率
- 远程监控(OT，OVP，CC，CV)状态
- 远程监控实际数值
- 远程打开/关闭输出

模拟接口(简称：AI)通常能结合起来远程控制电源产品的电流，电压和功率。即，用AI来调节电压的同时，不可用前板旋钮调节电流，反之亦然。

由于不能用AI调节OVP阀值，故需在远程控制模式前以手动设定。用设定按钮转为预设模式，显示转化后的设定值，传输给AI设定值引脚，作为它的电压。为了设置合适的设定值，用户可借助外电压，或3脚的参考输出电压。

AI能通过普通的0...5V或0...10V范围工作，它们对应0...100%的额定值。产品设置模式（见章节„8. 产品设置“）下可选择所需电压范围。输出引脚3的参考电压与选择的设定范围有关，要么为5V，或者为10V。

以下适用：

0-5V：参考电压= 5V，0...5V设定电压相当于0...100%的额定电压，在实际输出端，则相当于0...100%的实际数值。

0-10V：参考电压 = 10V，0...10V设定电压相当于0...100%的额定电压，在实际输出端则对应0...100%的实际数值。

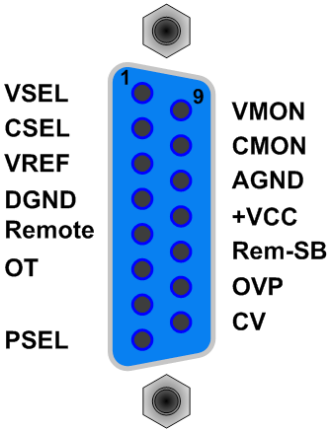
若输入超过极限的设定值，如>5V，当已选择0...5V电压范围，则将有关设定值减至100%而限制。

使用说明：

- 用模拟电压来控制产品需用“REMOTE”(5)引脚转为远程控制模式。
- 连接控制电源的应用设备前，要保证所有连线正确，并检查应用设备不会输入高于指定电压的电压（最大12V）。
- REM-SB (程待机，13引脚)引脚要优先于**Output On**按钮。意思是，如果该引脚定义输出状态为“off”，除非已激活LOCAL模式。该模式会锁定所有接口，阻值其访问产品。也可见„6.2.7 Local按钮“。
- **模拟接口的地与输出负极相连。**

□

10.2 引脚图



> **注意!**
>
> 请勿将模拟接口的地接到外控设备（比如：**PLC**）的负输出端，如果连上，就表示控制设备连到了电源输出负极（形成接地回路），负载电流流经控制线，从而损坏设备!

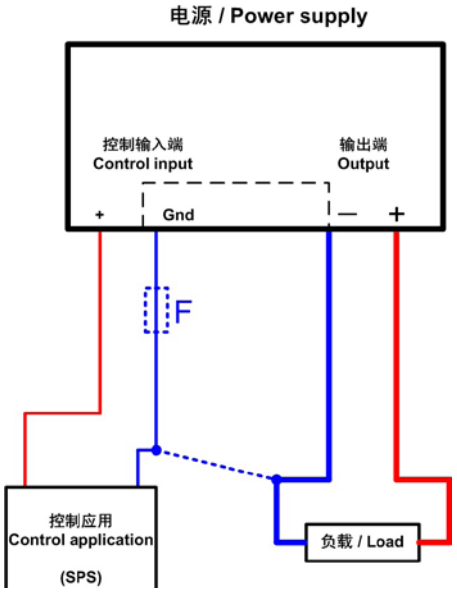


图 10

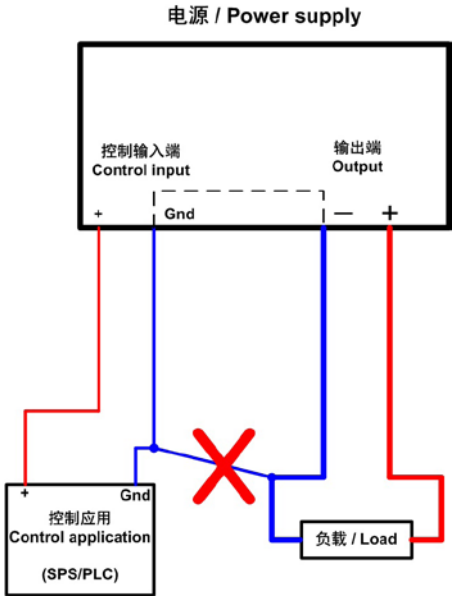
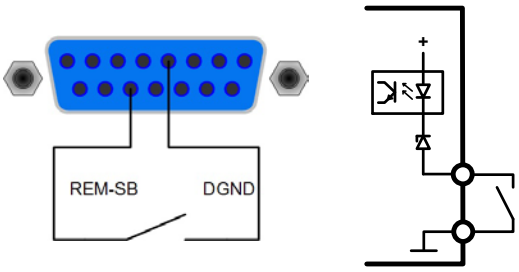


图 1

输出输出关闭

“REM-SB”引脚一直都为工作状态，因此它不依靠远程模式。在无外部手段的条件下可用来关闭输出。具体操作是，利用一低阻连接件，如开关、开集三极管或继电器，将该引脚接到地（DGND），这样就可关闭输出。

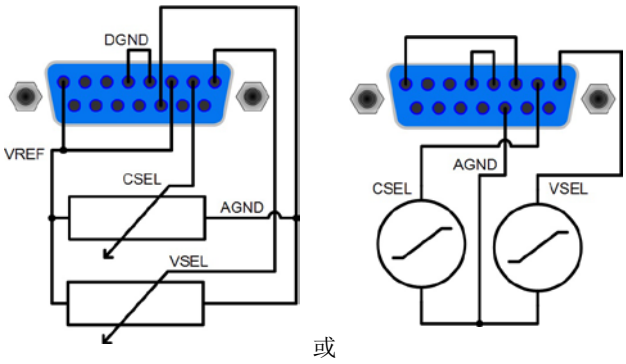
> **注意**
>
> *例如PLC的数字输出脚可能无法正确操作，因其阻抗可能不够低。故需随时检查您外部控制设备的技术规格。*



远程控制电流和电压

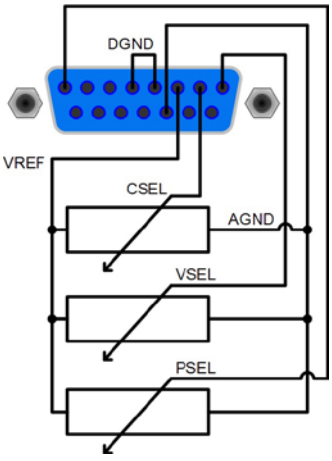
VREF和接地脚之间有两电位器，VSEL和CSEL输入端上有一滑动器。利用前板上的旋钮可控制电源，将它当作电流源或电压源用。如果VREF输出脚的电流最大为3mA，则需使用至少为10kOhm的电位器。

这儿显示的是带功率调整特点的产品型号，功率设定值束缚于VREF，因此为100%。



远程控制功率

与上述例子相似，但是用可调功率极限来完成。（仅适用于具有功率调节功能的产品型号）



10.3 模拟接口各引脚分布

引脚	名称	类型 *	描述	水平	电气参数
1	VSEL	AI	设定值：电压	0…10V 或 0…5V 对应 U_{Nom} 的 0..100%	精确度< 0,2% 阻值 R_i >100K
2	CSEL	AI	设定值：电流	0…10V 或 0…5V 对应 I_{Nom} 的 0..100%	
3	VREF	AO	参考电压	10V或5V	I_{max} = +5mA时，精确度 < 0.2% 对AGND有短路保护
4	DGND	POT	数字控制信号参考电位		For +Vcc, 控制和状态信号
5	REMOTE	DI	在内控和外控间切换	外控 = LOW, U_{Low} <1V 内控 = HIGH, U_{High} > 4V 内控 = open	电压范围 = 0 …30V I_{max} = +1mA at 5V 发送：对DGND集电极开路
6	OT/PF	DO	过温报警 电源故障 ***	报警 = HIGH, U_{High} > 4V 无报警 = LOW, U_{Low} <1V	准开集电极上拉至Vcc ** 输出5V时，电流最大+1mA U_{CE} = 0.3V时，$I_{max.}$ = -10mA， $U_{max.}$= 0...30V 对DGND有短路保护
7	N.C.				不连
8	PSEL	AI	设定值：功率	0…10V 或 0…5V 对应 P_{Nom} 的 0..100%	精确度 < 0.5% 阻值 R_i >100K
9	VMON	AO	实际值：电压	0…10V 或 0…5V 对应 U_{Nom} 的 0..100%	I_{max} = +2mA时，精确度 < 0.2% 对AGND有短路保护
10	CMON	AO	实际值：电流	0…10V 或 0…5V 对应 I_{Nom} 的 0..100%	
11	AGND	POT	模拟信号参考电位		For -SEL, -MON, VREF信号
12	+Vcc	AO	辅助电压输出 (Ref: DGND)	11...13V	I_{max} = 20mA 对DGND有短路保护
13	REM-SB	DI	输出关闭	关 = LOW, U_{Low} <1V 开 = HIGH, U_{High} > 4V 开 = OPEN	U范围 = 0…30V I_{max} = +1mA at 5V 发送：开集电极对DGND
14	OVP	DO	过压错误	OVP = HIGH, U_{High} > 4V 无OVP = LOW, U_{Low} <1V	准开集电极上拉至Vcc ** 输出5V时，电流最大+1mA U_{ce} = 0.3V时，I_{max} = -10mA at U_{max} = 0...30V 对DGND有短路保护
15	CV	DO	指示电压调整启用	CV = LOW, U_{Low} <1V CC = HIGH, U_{High} >4V	

* AI = 模拟输入，AO =模拟输出，DI = 数字输入，DO = 数字输出，POT =电位

** 内控 Vcc = 13.8V

***Power fail-电源故障 = PFC或输入端出现故障（仅自6.01固件版本后的才会报告）

11. 更多应用

11.1 共享总线模式下的并联

共享总线操作为了使并联下运行的多台设备获得均衡的负载电流。

重点：在该操作模式下，输出电压最高的产品控制并决定整个并联连接下产品的输出电压。意思是，系统内的任何产品都可能但当此角色。故建议选择某一台机来控制整个系统的同时，要将其余机台的设定电压设为需求最小值。电压和功率设定值也可设为100%。若不用这样，对每台机设定平均值，这样方可获得所需总值。

若有一台机坏掉，会终止运作。而并联连接上的其他产品则继续工作，且无间断。这就是冗余操作。

若产品出现错误，如过温（OT）或过压，输出电压会上升或下降至剩余产品中电压最高的值。

共享总线操作“Share”端子的连线方式在„5.8 “Share”（共享）端“章节内有详细解释。也可参考下图12。

提示

若需使用远程感测，建议仅连到决定整个系统电压值的主机“Sense”输入端上。

注意!

此为纯粹的模拟连接。任何单机上不形成总实际值。

注意!

不可与PS 8000 E 3U系列以外的产品经共享总线连接在一起!

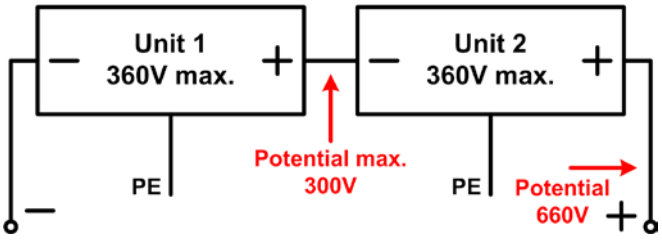
11.2 串联

一般情况下，可将两台或两台以上产品串联在一起，鉴于安全和隔离原因，需考虑下面一些限制条件和规则：

- **串联中任何一台产品的直流输出负极对地（PE）都不可超过>300V的电压。**
- 每台产品都需分开调节，无主-从连接。
- **共享总线端不能连线!**
- **串联中产品上的模拟接口地（AGND, DGND）不允许相互连接。**
- **远程感测端不能连线!**
- 建议仅对同型号产品进行串联。

举例：额定电压为200V的三台同型号产品，如:PDC 1200-70 3U，可以串联在一起。按计算，它们串联后的总电压可能高达600V。看产品负输出端的电位，如果所有产品都输出最大电压，第三台产品的负直流端电压可能会上升到400V。这是绝对不允许的!所以必须将较低电位的产品限制到某一最大值。

下图阐述了最后总电压为500V是怎样形成的。



12. 其它

12.1 附件和选项功能

本系列产品有下列附件可选：

a) 数字接口卡

还配 USB，RS232，CAN，GPIB/IEEE (仅 SCPI 语言) 或以太网 /LAN (经以太网端口的 SCPI 语言) 或 Profibus 用可插拔式数字接口卡。接口卡详情请参考接口卡说明书。

可供下列选项：

a) High Speed Ramping

通过减少输出电容容量来增加输出电压的动态。必须指出的是其它相关输出值也增加！这是个永久性更改，不可更改回来。

b) 水制冷

本产品可内置水制冷模块。水制冷用来防止因过热而过早关断功率输出。

12.2 固件更新

只有当产品出现错误行为或者应用新功能时才需进行产品固件更新。

要更新一台产品固件，需要用到某一数字接口卡，新的固件文档，称作“更新工具”的Windows软件。

下列这些接口卡才能用于固件更新：

- IF-U1 (USB)
- IF-R1 (RS232)
- IF-E1 (Ethernet/USB)
- IF-PB1 (Profibus/USB)

如果手上没有一张上述接口卡，则不可更新。请立即联系您的产品销售方寻求解决方案。

产品对应的更新工具和固件文档可从产品制造商网站获取，或者发邮件索取。更新工具将会指导用户整个半自动更新过程。

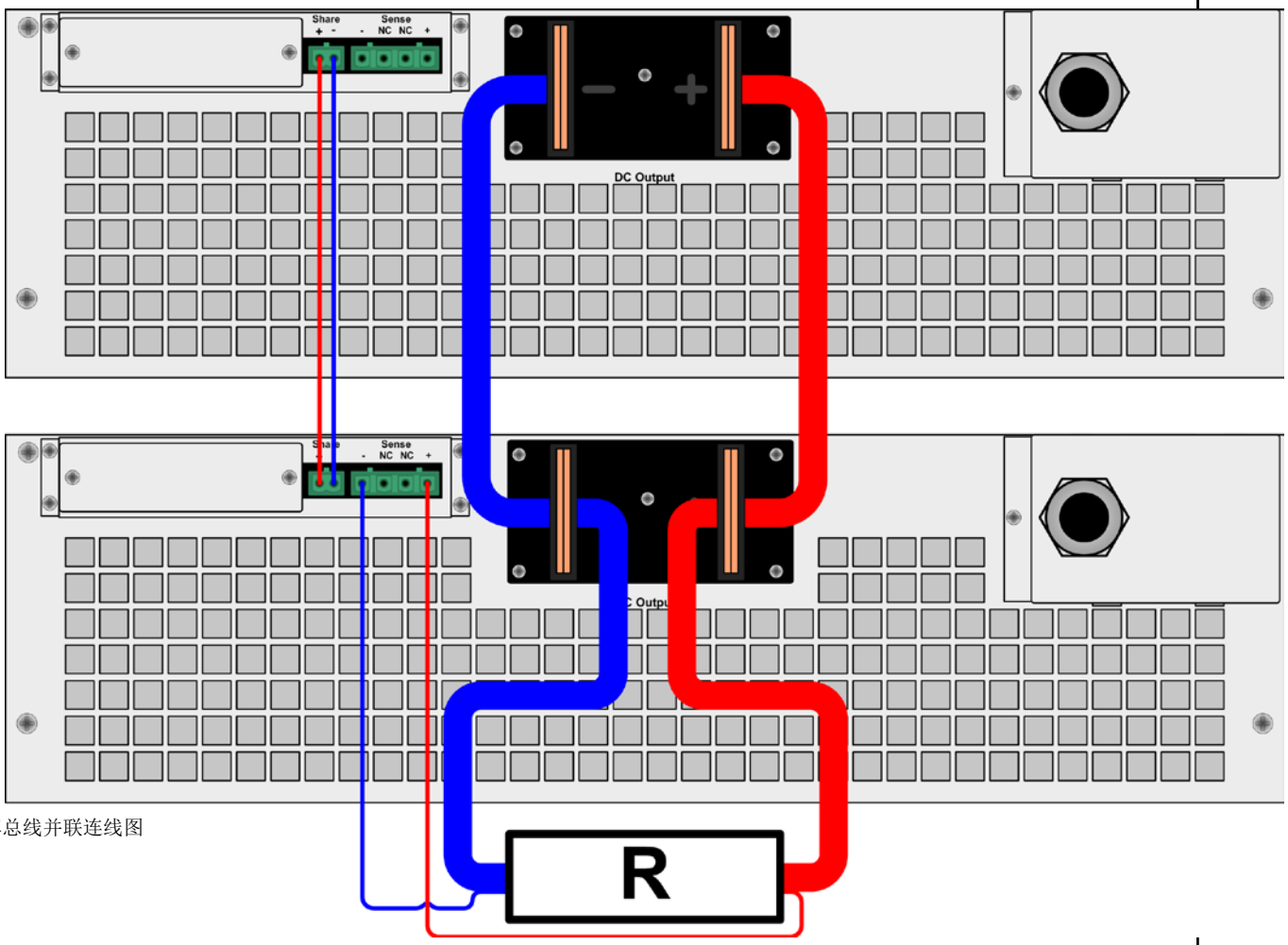


图 12. 共享总线并联连线图

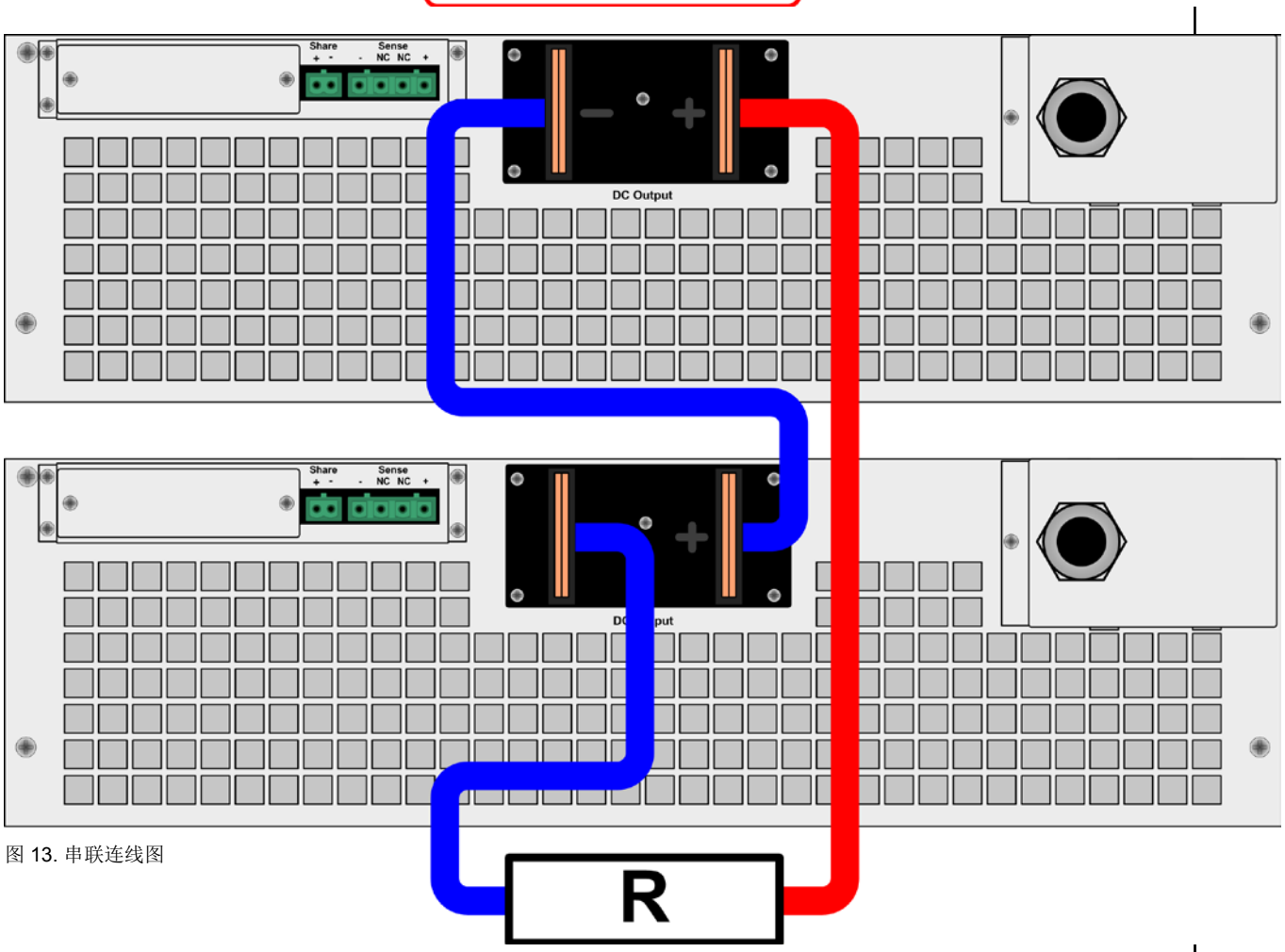


图 13. 串联连线图

Danger to life!

Hazardous voltage

The output voltage can rise up to hazardous levels of >60V_{DC}!

All live parts have to be covered. All actions at the output terminals have to be done while the unit is switched off from the mains (mains switch OFF) and may only be executed by personnel which is instructed about the hazards of electrical current. Any connection between the load and the unit (at the output terminals) have to be scoop-proof. Applications connected to the power output must be configured and fused in a way that prevents the use of these to cause a damage or worse to the unit by overload or malfunction.

Caution!

The DC output can still have hazardous voltage for a certain time after the output or the device has been switched off!

Keep in mind:

- 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
- In order to equip interface cards into the slot at the rear, the common ESD provisions have to be followed
- The interface card may only be plugged and unplugged while the unit is completely switched off (mains switch OFF)
- Aging of the device, as well heavy use may result in unpredictable behaviour of control elements like pushbuttons and rotary knobs.
- Do not connect external voltage sources with reversed polarity to the DC output! The device will be damaged.
- Avoid connecting external voltage sources to the DC output, especially those who can generate voltages higher than specified for the device!

Table of contents

EN

1. Introduction

The high efficiency power supplies of the series PS 8000 E 3U are ideally suited for test systems and industrial control facilities by their 19“ draw-out case.

Apart from standard functions of power supplies the user can define and recall 5 different presets of set values.

The optionally available, digital interface cards provide an even wider spectrum of control and monitoring functions by means of a PC. The supported number and kind of features varies from card to card.

All models also offer integrated terminals for parallel connection as share bus operation by default.

The integration into existent systems is done very comfortably by using an interface card, while there is no need to configure the card at all or with only a few settings.

Via the analogue interface, a power supply can also be operated in connection to other power supply units, controlling these via the interface. Or they can be controlled and monitored by an external control system, like a PLC.

The devices are microprocessor-controlled and thus deliver fast and accurate measurement and indication of actual values.

The main functions at a glance:

- Set voltage, current and power, each with 0...100%
- Adjustable overvoltage threshold 0...110% UNom
- Optional, pluggable digital interface cards (CAN, USB, RS232, IEEE/GPIB, Ethernet/LAN, Profibus)
- Internal, analogue interface for external control and monitoring with 0...5V or 0...10V (selectable) for 0...100%
- Power ratings of 3.3kW, 5kW, 6.6kW, 10kW or 15kW; expandable in cabinets with up to 150kW
- Temperature controlled fans
- Status indication (OT, OVP, CC, CV, CP)
- 5 selectable memory sets
- Parallel connection (Share bus)
- Vector™ compatible CAN system
- Free Windows software
- LabView™ VIs

2. Technical specifications

2.1 Control panel and display

Type

Display:	Dot matrix display 202 x 32 dots, seperated into three areas
Knobs:	2 rotary knobs with pushbutton feature, 9 pushbuttons

Display formats

The nominal values define the maximum adjustable range.

Actual values of voltage and current are displayed simultaneously, the set values of the overvoltage threshold, the undervoltage limit, voltage, current and power are displayed seperately.

Display of voltage values

Resolution:	4 digits
Formats:	0.00V...99.99V
	0.0V...999.9V
	0V...9999V

Display of current values

Resolution:	4 digits
Formats:	0.00A...99.99A
	0.0A...999.9A

Display of power values

Resolution:	4 digits
Formats:	0.000kW...9.999kW
	0.00kW...99.99kW

2.2 Device specifications

	PS 8040-170 E 3U	PS 8080-170 E 3U	PS 8200-70 E 3U	PS 8500-30 E 3U	PS 8040-340 E 3U
Mains input					
Input voltage range	340…460V AC	340…460V AC	340…460V AC	340…460V AC	340…460V AC
Input voltage range optional	-	-	-	-	-
Required phases	2Ph, PE	2Ph, PE	2Ph, PE	2Ph, PE	3Ph, PE
Input frequency	45…65Hz	45…65Hz	45…65Hz	45…65Hz	45…65Hz
Input fuse	2x T16A	2x T16A	2x T16A	2x T16A	4x T16A
Input current	max. 11A	max. 16A	max. 16A	max. 16A	max. 19A
Power factor	> 0.99	> 0.99	> 0.99	> 0.99	> 0.99
Output - Voltage					
Nominal voltage U_{Nom}	40V	80V	200V	500V	40V
Adjustable range	0V…U_{Nom}	0V…U_{Nom}	0V…U_{Nom}	0V…U_{Nom}	0V…U_{Nom}
Stability at mains fluctuation ±10% ΔU_{IN}	< 0.02%	< 0.02%	< 0.02%	< 0.02%	< 0.02%
Stability at 0…100% load	< 0.05%	< 0.05%	< 0.05%	< 0.05%	< 0.05%
Ramp-up time 10...90% at 100% load	max. 30ms	max. 30ms	max. 30ms	max. 30ms	max. 30ms
Ripple @ BWL 20MHz	< 100mVpp < 10mVrms	< 100mVpp < 10mVrms	< 200mVpp < 25mVrms	< 250mVpp < 70mVrms	< 150mVpp < 10mVrms
Accuracy*	≤ 0.2%	≤ 0.2%	≤ 0.2%	≤ 0.2%	≤ 0.2%
Resolution of display	10mV	10mV	100mV	100mV	10mV
Remote sense compensation	max. 2.5V	max. 2.5V	max. 6V	max. 10V	max. 2.5V
Overvoltage protection threshold (adjustable)	0…44V	0…88V	0…220V	0….550V	0…44V
Output - Current					
Nominal current I_{Nom}	170A	170A	70A	30A	340A
Adjustable range	0…I_{Nom}	0…I_{Nom}	0…I_{Nom}	0…I_{Nom}	0…I_{Nom}
Stability at mains fluctuation ±10% ΔU_{IN}	< 0.05%	< 0.05%	< 0.05%	< 0.05%	< 0.05%
Stability at 0…100% ΔU_{OUT}	< 0.15%	< 0.15%	< 0.15%	< 0.15%	< 0.15%
Ripple @ BWL 20MHz	< 528mApp < 106mArms	< 300mApp < 40mArms	< 44mApp < 11mArms	< 14mApp < 8mArms	< 600mApp < 80mArms
Accuracy*	≤ 0.2%	≤ 0.2%	≤ 0.2%	≤ 0.2%	≤ 0.2%
Resolution of display	100mA	100mA	10mA	10mA	100mA
Transient recovery time 10….90% load	< 2ms	< 2ms	< 2ms	< 2ms	< 2ms
Output - Power					
Nominal power P_{Nom}	3300W	5000W	5000W	5000W	6600W
Nominal power at derating	0...P_{Nom}	0...P_{Nom}	0...P_{Nom}	0...P_{Nom}	0...P_{Nom}
Accuracy*	≤ 2%	≤ 2%	≤ 2%	≤ 2%	≤ 2%
Resolution of display	0.001kW	0.001kW	0.001kW	0.001kW	0.001kW
Efficiency	93%	93%	95.20%	95.50%	93%
Miscellaneous					
Ambient temperature	0….50°C	0….50°C	0….50°C	0….50°C	0….50°C
Storage temperature	-20….70°C	-20….70°C	-20….70°C	-20….70°C	-20….70°C
Humidity rel.	< 80%	< 80%	< 80%	< 80%	< 80%
Dimensions (WxHxD) **	19" 3U 595mm	19" 3U 595mm	19" 3U 595mm	19" 3U 595mm	19" 3U 595mm
Weight	19.8kg	19.8kg	19.8kg	19.8kg	25.5kg
Redundancy	no	no	no	no	yes
Isolation +output to enclosure	500V DC	500V DC	500V DC	1000V DC	500V DC
Isolation -output to enclosure	300V DC				
Isolation input to output	2500V DC				
Cooling	by fans, air inlet on the front, air exhaust on the rear				
Standards	EN 60950, EN 61326, EN 55022 Class B				
Overvoltage class	2				
Protection class	1				
Pollution degree	2				
Operational altitude	<2000m				
Series operation	possible (with restrictions)				
Master-Slave	no				
Parallel operation	yes, with current distribution via Share bus				
Master-Slave	yes, via analog interface				
Analogue programming					
Input range	0…5V or 0…10V, selectable				
Accuracy	≤ 0.2%				
Input impedance	53kOhm				
Article number	09230176	09230160	09230170	09230165	09230177

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

Example: a 80V model has min. 0.2% voltage accuracy. This is 160mV. When setting a voltage of 5V and with an allowed maximum deviation of 160mV, the resulting actual value could be between 4.84V and 5.16V.

	PS 8040-510 E 3U	PS 8080-340 E 3U	PS 8160-170 E 3U	PS 8200-140 E 3U	PS 8400-70 E 3U
Mains input					
Input voltage range	340…460V AC	340…460V AC	340…460V AC	340…460V AC	340…460V AC
Input voltage range optional	-	-	-	-	-
Required phases	3Ph, PE	3Ph, PE	3Ph, PE	3Ph, PE	3Ph, PE
Input frequency	45…65Hz	45…65Hz	45…65Hz	45…65Hz	45…65Hz
Input fuse	6x T16A	4x T16A	4x T16A	4x T16A	4x T16A
Input current	max. 19A	max. 28A	max. 28A	max. 28A	max. 28A
Power factor	> 0.99	> 0.99	> 0.99	> 0.99	> 0.99
Output - Voltage					
Nominal voltage U_{Nom}	40V	80V	160V	200V	400V
Adjustable range	0V…U_{Nom}	0V…U_{Nom}	0V…U_{Nom}	0V…U_{Nom}	0V…U_{Nom}
Stability at mains fluctuation ±10% ΔU_{IN}	< 0.02%	< 0.02%	< 0.02%	< 0.02%	< 0.02%
Stability at 0…100% load	< 0.05%	< 0.05%	< 0.05%	< 0.05%	< 0.05%
Ramp-up time 10...90% at 100% load	max. 30ms	max. 30ms	max. 30ms	max. 30ms	max. 30ms
Ripple @ BWL 20MHz	< 150mVpp < 10mVrms	< 150mVpp < 10mVrms	< 300mVpp < 30mVrms	< 200mVpp < 25mVrms	< 300mVpp < 40mVrms
Accuracy*	≤ 0.2%	≤ 0.2%	≤ 0.2%	≤ 0.2%	≤ 0.2%
Resolution of display	10mV	10mV	100mV	100mV	100mV
Remote sense compensation	max. 2.5V	max. 2.5V	max. 5V	max. 6V	max. 12V
Overvoltage protection threshold (adjustable)	0…44V	0….88V	0….176V	0…220V	0…440V
Output - Current					
Nominal current I_{Nom}	510A	340A	170A	140A	70A
Adjustable range	0…I_{Nom}	0…I_{Nom}	0…I_{Nom}	0…I_{Nom}	0…I_{Nom}
Stability at mains fluctuation ±10% ΔU_{IN}	< 0.05%	< 0.05%	< 0.05%	< 0.05%	< 0.05%
Stability at 0…100% ΔU_{OUT}	< 0.15%	< 0.15%	< 0.15%	< 0.15%	< 0.15%
Ripple @ BWL 20MHz	< 900mApp < 120mArms	< 600mApp < 80mArms	< 300mApp < 60mArms	< 89mApp < 22mArms	< 33mApp < 9mArms
Accuracy*	≤ 0.2%	≤ 0.2%	≤ 0.2%	≤ 0.2%	≤ 0.2%
Resolution of display	100mA	100mA	10mA	100mA	10mA
Transient recovery time 10….90% load	< 2ms	< 2ms	< 2ms	< 2ms	< 2ms
Output - Power					
Nominal power P_{Nom}	10000W	10000W	10000W	10000W	10000W
Nominal power at derating	0...P_{Nom}	0...P_{Nom}	0...P_{Nom}	0...P_{Nom}	0...P_{Nom}
Accuracy*	≤ 2%	≤ 2%	≤ 2%	≤ 2%	≤ 2%
Resolution of display	0.01kW	0.01kW	0.01kW	0.01kW	0.01kW
Efficiency	93%	93%	93%	95.20%	95.20%
Miscellaneous					
Ambient temperature	0….50°C	0….50°C	0….50°C	0….50°C	0….50°C
Storage temperature	-20….70°C	-20….70°C	-20….70°C	-20….70°C	-20….70°C
Humidity rel.	< 80%	< 80%	< 80%	< 80%	< 80%
Dimensions (WxHxD) **	19" 3U 595mm	19" 3U 595mm	19" 3U 595mm	19" 3U 595mm	19" 3U 595mm
Weight	33kg	25.5kg	25.5kg	25.5kg	25.5kg
Redundancy	yes	yes	no	yes	no
Isolation +output to enclosure	500V DC	500V DC	500V DC	500V DC	900V DC
Isolation -output to enclosure	300V DC				
Isolation input to output	2500V DC				
Cooling	by fans, air inlet on the front, air exhaust on the rear				
Standards	EN 60950, EN 61326, EN 55022 Class A				
Overvoltage class	2				
Protection class	1				
Pollution degree	2				
Operational altitude	<2000m				
Series operation	possible (with restrictions)				
Master-Slave	no				
Parallel operation	yes, with current distribution via Share bus				
Master-Slave	yes, via analog interface				
Analogue programming					
Input range	0…5V or 0…10V, selectable				
Accuracy	≤ 0.2%				
Input impedance	53kOhm				
Article number	09230178	09230161	09230163	09230171	09230173

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

Example: a 80V model has min. 0.2% voltage accuracy. This is 160mV. When setting a voltage of 5V and with an allowed maximum deviation of 160mV, the resulting actual value could be between 4.84V and 5.16V.

	PS 8500-60 E 3U	PS 81000-30 E 3U	PS 8080-250 E 3U	PS 8080-510 E 3U	PS 8200-210 E 3U
Mains input					
Input voltage range	340…460V AC	340…460V AC	340…460V AC	340…460V AC	340…460V AC
Input voltage range optional	-	-	588…796V AC+MP	588…796V AC+MP	588…796V AC+MP
Required phases	3Ph, PE	3Ph, PE	3Ph, PE	3Ph, PE	3Ph, PE
Input frequency	45…65Hz	45…65Hz	45…65Hz	45…65Hz	45…65Hz
Input fuse	4x T16A	4x T16A	6x T16A	6x T16A	6x T16A
Input current	max. 28A	max. 28A	max. 28A	max. 28A	max. 28A
Power factor	> 0.99	> 0.99	> 0.99	> 0.99	> 0.99
Output - Voltage					
Nominal voltage U_{Nom}	500V	1000V	80V	80V	200V
Adjustable range	0V…U_{Nom}	0V…U_{Nom}	0V…U_{Nom}	0V…U_{Nom}	0V…U_{Nom}
Stability at mains fluctuation ±10% ΔU_{IN}	< 0.02%	< 0.02%	< 0.02%	< 0.02%	< 0.02%
Stability at 0…100% load	< 0.05%	< 0.05%	< 0.05%	< 0.05%	< 0.05%
Ramp-up time 10...90% at 100% load	max. 30ms	max. 30ms	max. 30ms	max. 30ms	max. 30ms
Ripple @ BWL 20MHz	< 300mVpp < 70mVrms	< 800mVpp < 200mVrms	< 150mVpp < 10mVrms	< 150mVpp < 10mVrms	< 250mVpp < 25mVrms
Accuracy*	≤ 0.2%	≤ 0.2%	≤ 0.2%	≤ 0.2%	≤ 0.2%
Resolution of display	100mV	1V	10mV	10mV	100mV
Remote sense compensation	max. 10V	max. 20V	max. 2.5V	max. 2.5V	max. 6V
Overvoltage protection threshold (adjustable)	0…550V	0…1100V	0…88V	0…88V	0…220V
Output - Current					
Nominal current I_{Nom}	60A	30A	250A	510A	210A
Adjustable range	0…I_{Nom}	0…I_{Nom}	0…I_{Nom}	0…I_{Nom}	0…I_{Nom}
Stability at mains fluctuation ±10% ΔU_{IN}	< 0.05%	< 0.05%	< 0.05%	< 0.05%	< 0.05%
Stability at 0…100% ΔU_{OUT}	< 0.15%	< 0.15%	< 0.15%	< 0.15%	< 0.15%
Ripple @ BWL 20MHz	< 33mApp < 16mArms	< 22mApp < 11mArms	< 900mApp < 120mArms	< 900mApp < 120mArms	< 167mApp < 33mArms
Accuracy*	≤ 0.2%	≤ 0.2%	≤ 0.2%	≤ 0.2%	≤ 0.2%
Resolution of display	10mA	10mA	100mA	100mA	100mA
Transient recovery time 10….90% load	< 2ms	< 2ms	< 2ms	< 2ms	< 2ms
Output - Power					
Nominal power P_{Nom}	10000W	10000W	15000W	15000W	15000W
Nominal power at derating	0...P_{Nom}	0...P_{Nom}	0...P_{Nom}	0...P_{Nom}	0...P_{Nom}
Accuracy*	≤ 2%	≤ 2%	≤ 2%	≤ 2%	≤ 2%
Resolution of display	0.01kW	0.01kW	0.01kW	0.01kW	0.01kW
Efficiency	95.50%	95.50%	93%	93%	95.20%
Miscellaneous					
Ambient temperature	0….50°C	0….50°C	0….50°C	0….50°C	0….50°C
Storage temperature	-20….70°C	-20….70°C	-20….70°C	-20….70°C	-20….70°C
Humidity rel.	< 80%	< 80%	< 80%	< 80%	< 80%
Dimensions (WxHxD) **	19" 3U 595mm	19" 3U 595mm	19" 3U 595mm	19" 3U 595mm	19" 3U 595mm
Weight	25.5kg	25.5kg	33kg	33kg	33kg
Redundancy	no	no	yes	yes	yes
Isolation +output to enclosure	1000V DC	1500V DC	500V DC	500V DC	500V DC
Isolation -output to enclosure	300V DC				
Isolation input to output	2500V DC				
Cooling	by fans, air inlet on the front, air exhaust on the rear				
Standards	EN 60950, EN 61326, EN 55022 Class A				
Overvoltage class	2				
Protection class	1				
Pollution degree	2				
Operational altitude	<2000m				
Series operation	possible (with restrictions)				
Master-Slave	no				
Parallel operation	yes, with current distribution via Share bus				
Master-Slave	yes, via analog interface				
Analogue programming					
Input range	0…5V or 0…10V, selectable				
Accuracy	≤ 0.2%				
Input impedance	53kOhm				
Article number	09230166	09230168	09230179	09230162	09230172

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

Example: a 80V model has min. 0.2% voltage accuracy. This is 160mV. When setting a voltage of 5V and with an allowed maximum deviation of 160mV, the resulting actual value could be between 4.84V and 5.16V.

	PS 8240-170 E 3U	PS 8500-90 E 3U	PS 8600-70 E 3U	PS 81500-30 E 3U
Mains input				
Input voltage range	340…460V AC	340…460V AC	340…460V AC	340…460V AC
Input voltage range optional	588…796V AC+MP	588…796V AC+MP	588…796V AC+MP	588…796V AC+MP
Required phases	3Ph, PE	3Ph, PE	3Ph, PE	3Ph, PE
Input frequency	45…65Hz	45…65Hz	45…65Hz	45…65Hz
Input fuse	6x T16A	6x T16A	6x T16A	6x T16A
Input current	max. 28A	max. 28A	max. 28A	max. 28A
Power factor	> 0.99	> 0.99	> 0.99	> 0.99
Output - Voltage				
Nominal voltage U_{Nom}	240V	500V	600V	1500V
Adjustable range	0V…U_{Nom}	0V…U_{Nom}	0V…U_{Nom}	0V…U_{Nom}
Stability at mains fluctuation ±10% ΔU_{IN}	< 0.02%	< 0.02%	< 0.02%	< 0.02%
Stability at 0…100% load	< 0.05%	< 0.05%	< 0.05%	< 0.05%
Ramp-up time 10...90% at 100% load	max. 30ms	max. 30ms	max. 30ms	max. 30ms
Ripple @ BWL 20MHz	< 500mVpp < 20mVrms	< 300mVpp < 70mVrms	< 400mVpp < 80mVrms	< 1000mVpp < 350mVrms
Accuracy*	≤ 0.2%	≤ 0.2%	≤ 0.2%	≤ 0.2%
Resolution of display	100mV	100mV	100mV	1V
Remote sense compensation	max. 7.5V	max. 10V	max. 18V	max. 30V
Overvoltage protection threshold (adjustable)	0…264V	0…550V	0…660V	0…1650V
Output - Current				
Nominal current I_{Nom}	170A	90A	70A	30A
Adjustable range	0…I_{Nom}	0…I_{Nom}	0…I_{Nom}	0…I_{Nom}
Stability at mains fluctuation ±10% ΔU_{IN}	< 0.05%	< 0.05%	< 0.05%	< 0.05%
Stability at 0…100% ΔU_{OUT}	< 0.15%	< 0.15%	< 0.15%	< 0.15%
Ripple @ BWL 20MHz	< 333mApp < 27mArms	< 50mApp < 23mArms	< 30mApp < 12mArms	< 19mApp < 13mArms
Accuracy*	≤ 0.2%	≤ 0.2%	≤ 0.2%	≤ 0.2%
Resolution of display	100mA	10mA	10mA	10mA
Transient recovery time 10….90% load	< 2ms	< 2ms	< 2ms	< 2ms
Output - Power				
Nominal power P_{Nom}	15000W	15000W	15000W	15000W
Nominal power at derating	0...P_{Nom}	0...P_{Nom}	0...P_{Nom}	0...P_{Nom}
Accuracy*	≤ 2%	≤ 2%	≤ 2%	≤ 2%
Resolution of display	0.01kW	0.01kW	0.01kW	0.01kW
Efficiency	93%	95.50%	95.20%	95.50%
Miscellaneous				
Ambient temperature	0….50°C	0….50°C	0….50°C	0….50°C
Storage temperature	-20….70°C	-20….70°C	-20….70°C	-20….70°C
Humidity rel.	< 80%	< 80%	< 80%	< 80%
Dimensions (WxHxD) **	19" 3U 595mm	19" 3U 595mm	19" 3U 595mm	19" 3U 595mm
Weight	33kg	33kg	33kg	33kg
Redundancy	no	yes	no	no
Isolation +output to enclosure	500V DC	1000V DC	1000V DC	2000V DC
Isolation -output to enclosure	300V DC			
Isolation input to output	2500V DC			
Cooling	by fans, air inlet on the front, air exhaust on the rear			
Standards	EN 60950, EN 61326, EN 55022 Class A			
Overvoltage class	2			
Protection class	1			
Pollution degree	2			
Operational altitude	<2000m			
Series operation	possible (with restrictions)			
Master-Slave	no			
Parallel operation	yes, with current distribution via Share bus			
Master-Slave	yes, via analog interface			
Analogue programming				
Input range	0…5V or 0…10V, selectable			
Accuracy	≤ 0.2%			
Input impedance	53kOhm			
Article number	09230164	09230167	09230174	09230169

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

Example: a 80V model has min. 0.2% voltage accuracy. This is 160mV. When setting a voltage of 5V and with an allowed maximum deviation of 160mV, the resulting actual value could be between 4.84V and 5.16V.

3. Device description

3.1 Views

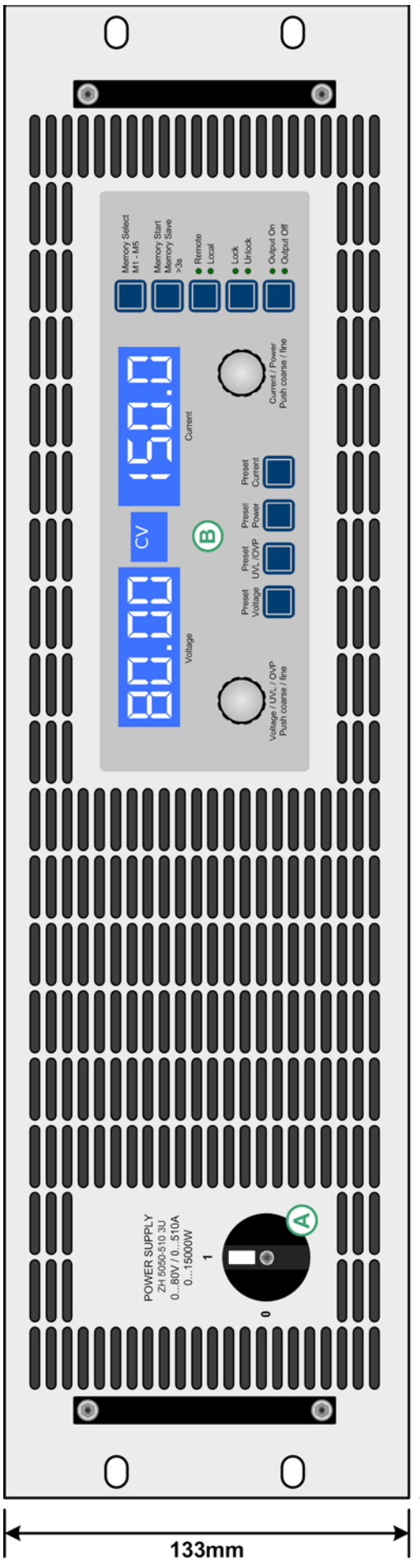


Figure 1

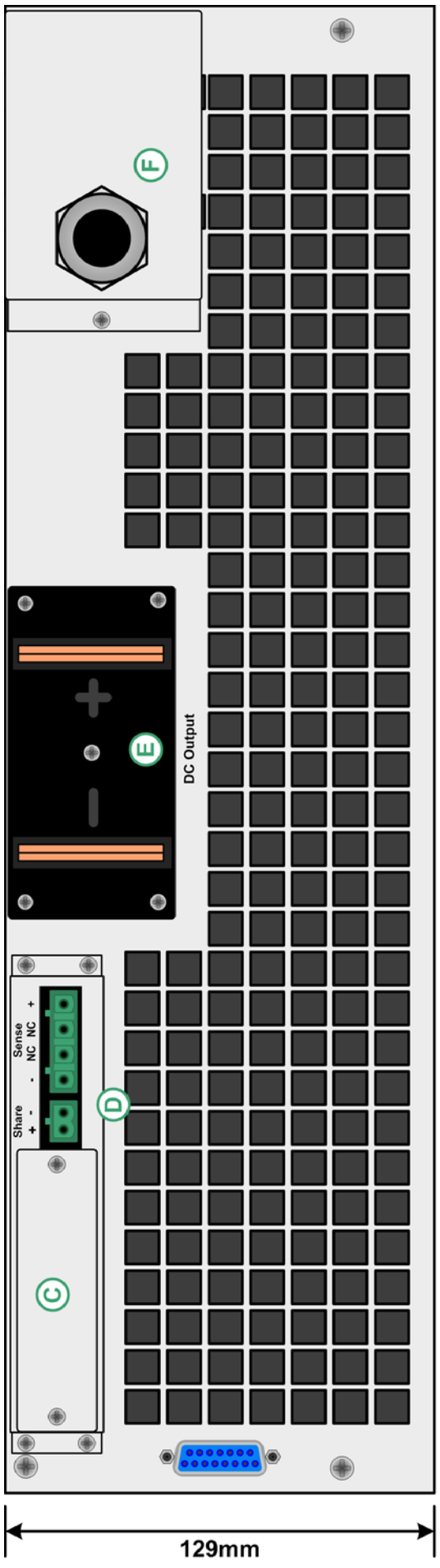


Figure 2

A - Mains switch
B - Control panel
C - Interface card slot
D - Share bus and remote sense terminals
E - DC output (figure shows output terminal type of 80V models)
F - AC input

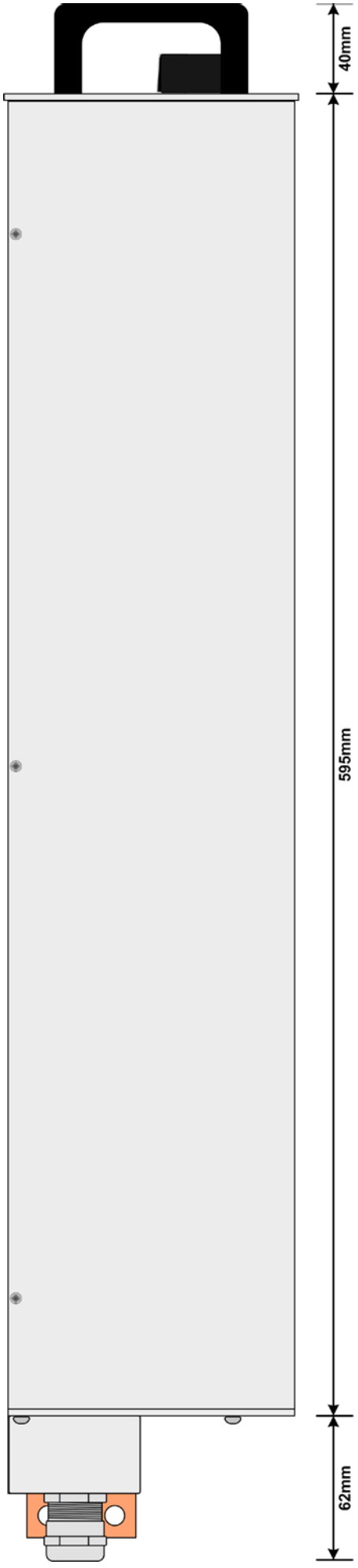


Figure 3

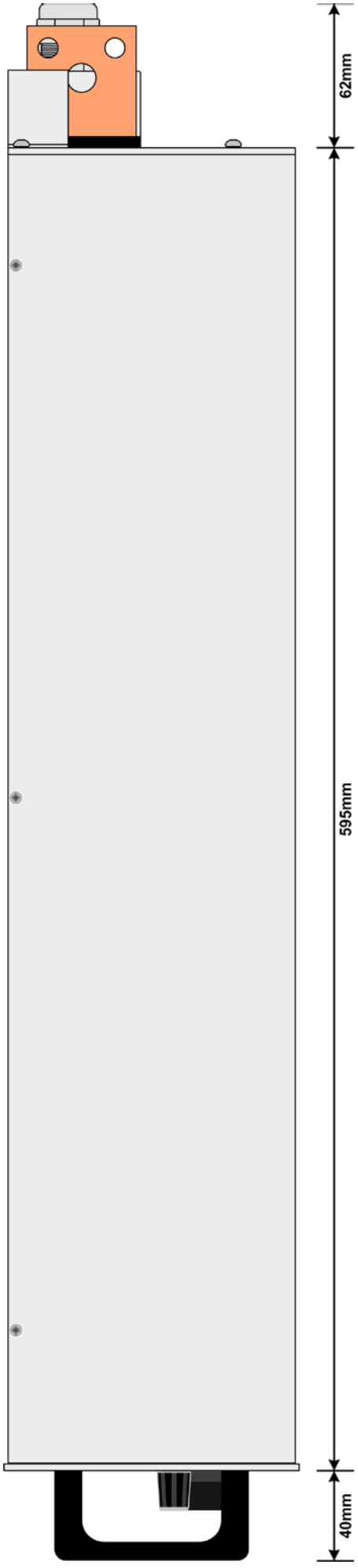


Figure 4

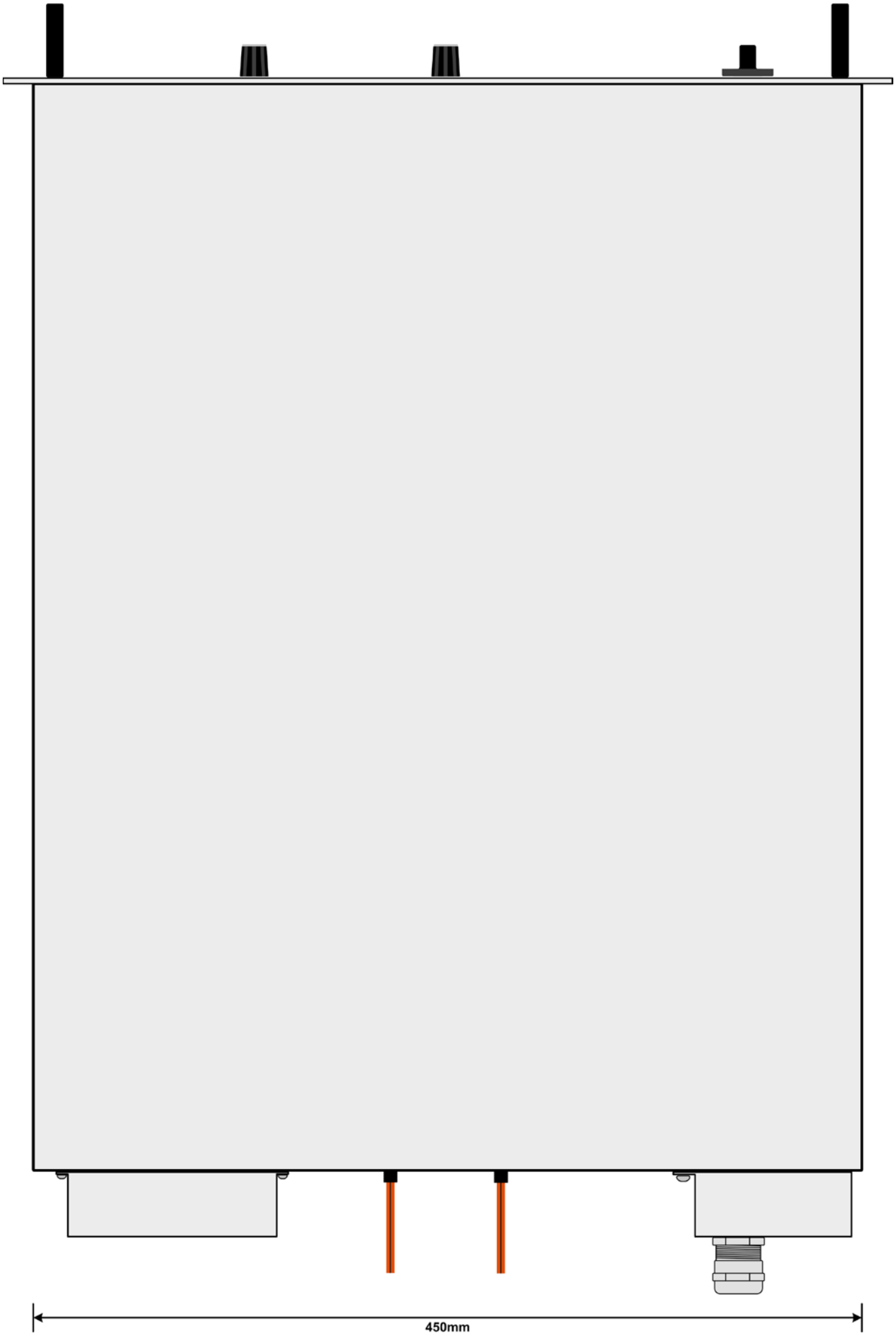


Figure 5

3.2 Scope of delivery

1 x Power supply unit

1 x Printed user manual(s)

1 x Plug for Share bus (plugged)

1 x Plug for remote sense (plugged)

4. General

4.1 Prologue / Warning

This user instruction manual and the device are intended to be used by users who know about the principle of a power supply. The handling of the device should not be left to persons who are unaware of the basic terms of electrotechnology, because these are not described in this manual. Inappropriate handling and non-observance to the safety instructions may lead to a damage of the device or loss of warranty!

4.2 Cooling

The air inlets on the front and the air outlets at the rear have to be kept clean to ensure proper cooling. Take care of at least 20cm distance at the rear to any surrounding objects in order to guarantee unimpeded air flow.

4.3 Repairs / Service

When opening the unit or removing parts from the inside with tools there is risk of electric shock by dangerous voltages. Open the unit only at your own risk and disconnect it from the mains before.

Any servicing or repair may only be carried out by trained personnel, which is instructed about the hazards of electrical current.

Opening the unit is normally only required to replace a fuse.

4.4 Redundancy

Certain models feature redundancy. It means, they contain two or three power stages and if at least one power stage is remaining operable, because another power stage has switched off due to overheating, the power supply will continue to provide power to the output. Refer to section „2.2 Device specifications“ to find out which models feature redundancy.

5. Installation

5.1 Visual check

The unit has to be checked for signs of physical damage after receipt and unpacking. If any damage is found, the unit may not be operated. Also contact your dealer immediately.

5.2 Input connection (single unit)

The unit‘s AC input requires two (3.3kW/5kW models) or three phases (6.6kW/10kW/15kW) models of a three-phase supply, plus ground (PE).

The connection is done with cables of proper cross section. See table below for typical input currents when connecting one unit.

	L1		L2		L3	
	ø	I_{max}	ø	I_{max}	ø	I_{max}
3.3kW	-	-	2,5mm²	11A	2,5mm²	11A
5kW	-	-	2,5mm²	16A	2,5mm²	16A
6.6kW	2,5mm²	19A	2,5mm²	11A	2,5mm²	11A
10kW	4mm²	28A	4mm²	16A	4mm²	16A
15kW	4mm²	28A	4mm²	28A	4mm²	28A

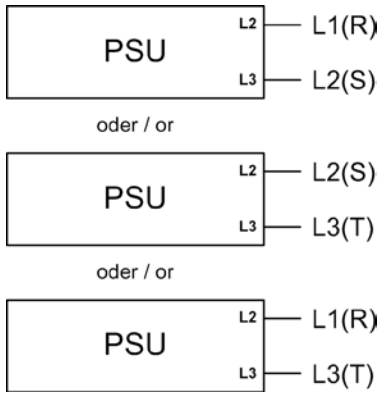
We recommend to use

for 3.3kW/5kW/6.6kW models: at least 2.5mm²

for 10kW/15kW models at least 4mm²

for every phase and ground (PE).

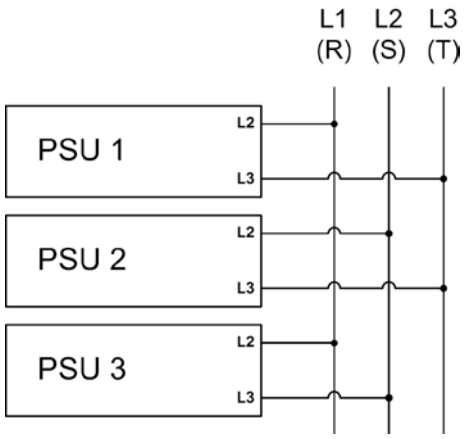
The selection of the phase pair to use for a 3.3kW or 5kW model is arbitrary for one unit. It means, it does not necessarily has to be L2(R) and L3(S):



5.3 Input connection (multiple units)

If multiple units of same or different power rating are connected to the same three-phase terminal, it is required to consider the current distribution of the phases in order to gain a balanced one. Models that require only two phases will result in an unbalanced current distribution when installing 1 or 2 units. On the other hand, 3 units would be ideal.

Example configuration for **3.3kW/5kW** models:



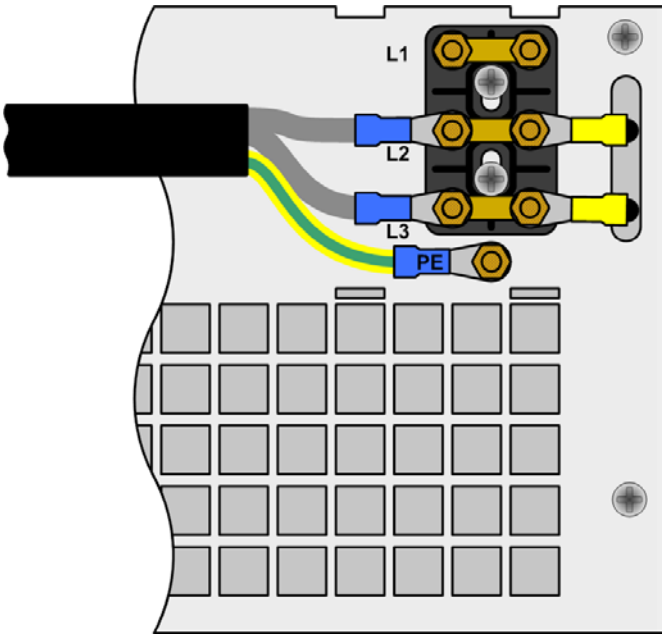


Figure 6. Input connection 3.3kW/5kW

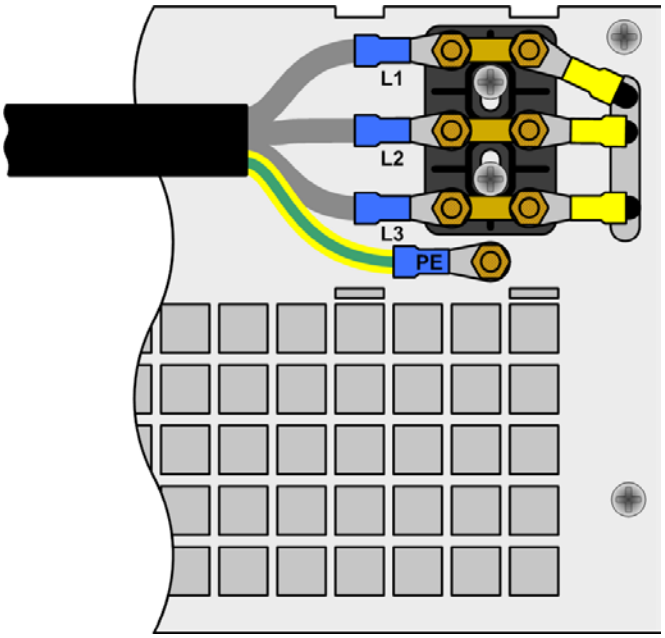
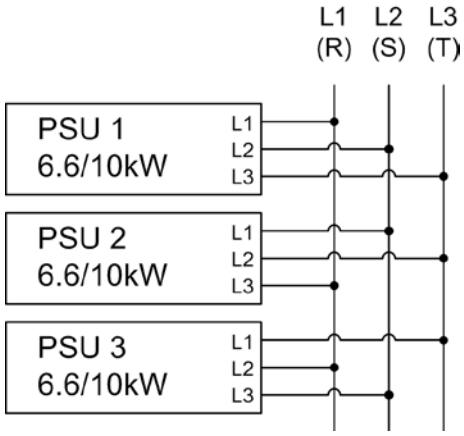


Figure 7. Input connection 6.6kW/10kW/15kW

With the **6.6kW/10kW** models it is different. Phase L2(S) is here loaded with 28A by already one unit. In this case it is recommended to use a different phase mapping. It means, not to necessarily connect phase L1(R) to the L1 input of the units etc. The example below shows an almost symmetric input current distribution scheme which results in L1 = max. 44A, L2 = max. 56A and L3 = max. 60A.

Example configuration for **6.6kW/10kW** models:



5.4 Input fuses

Fuse protection of the unit is done with up to 6 fuses of type Littlefuse F16A/500V and size 6.3x32mm. They are located inside the unit on a mains filter board which is located behind the front plate. In case fuses need to be replaced, the top cover has to be removed.

5.5 DC output terminal

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

The output is **not** fused! In order to avoid damage to the load application, always take care for the nominal values of the load.

The cross section of the load leads depends on several conditions, like the output current, the lead length and the ambient temperature.

Up to **1.5m** cable length we recommend to use

up to **30A**:	6mm²	up to **70A**:	16mm²
up to **90A**:	25mm²	up to **140A**:	50mm²
up to **170A**:	70mm²	up to **210A**:	95mm²
up to **340A**:	2x70mm²	up to **510A**:	2x120mm²

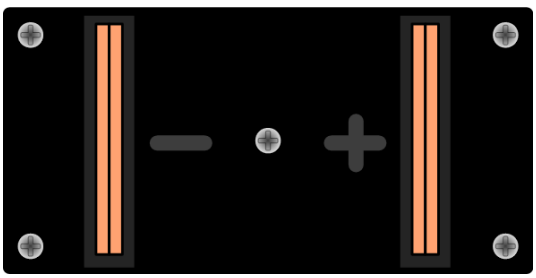
at least per DC output pole (flexible wire).

Single cables like, for example, 70mm² can also be replaced by 2x 35mm².

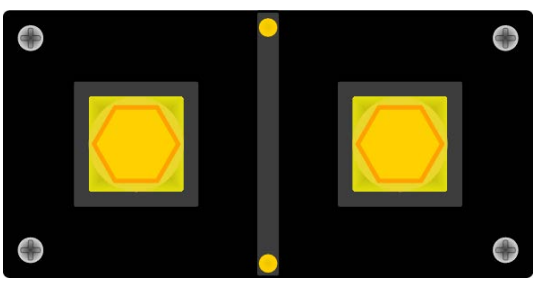
When using longer cables it is required to increase cross section in order to avoid voltage drops and unwanted heating.

5.5.1 Terminal types

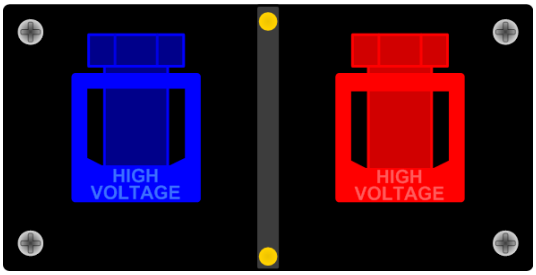
- **40V or 80V** models:
  Copper bars with 3x drilling holes 9mm for M8 screws
  Recommendation: ring cable lugs 8mm



- **160V/200V/240V** models:
  Screw fastening M8 on a plastic DC terminal
  Recommendation: ring cable lugs 8mm



- Models **from 400V** output voltage
  Screw-clamp terminal, plastic
  Recommendation: ring cable lugs 6mm



5.6 Grounding the output

Attention!

Grounding of the DC minus (-) output of single units or multiple units in parallel is always possible. Grounding the DC plus (+) output is only allowed for models of up to 300V nominal voltage!

Attention!

When grounding one of the output poles always check if one of the poles of the load (eg. electronic load) is also grounded. This could result in a short-circuit!

Attention!

Watch the potential shift of the output poles when using series connection! Grounding is hereby only recommended at the pole with the lowest potential against ground.

5.7 Terminal „Sense“ (Remote sense)

In order to compensate the voltage drop along the load cables, the power supply can „sense“ the voltage at the load instead at the output. It will regulate the output voltage so that the desired voltage is provided to the load. For maximum regulation see section „2.2 Device specifications“, information „Remote sense compensation“.

The connection for remote sense is done at the terminal „Sense“ on the rear side. Also see section 3.1.

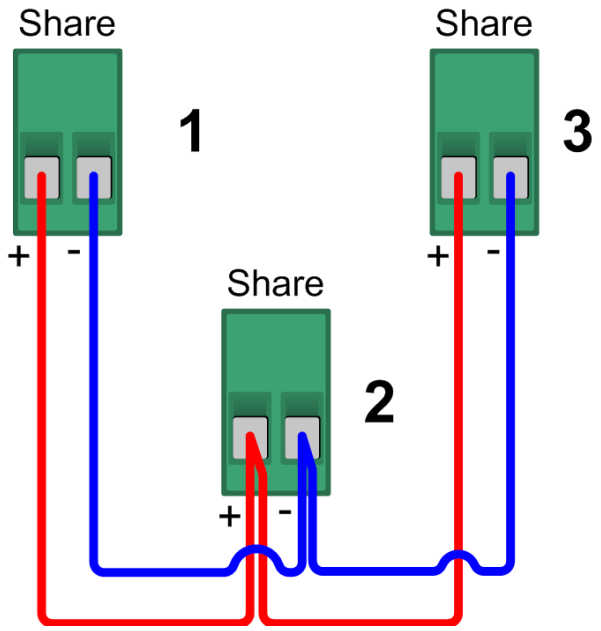
Attention!

(+) Sense must only be connected to (+) at the load application and (–) Sense must only be connected to (–)! Else both systems can take damage.

For additional information also see section „7.7 Remote sense operation“.

5.8 Terminal „Share“

In case Share bus operation is wanted, the „Share“ terminal of the concerning units just have to be connected to each other:



Nothing more required. For details about Share bus operation refer to section „11.1 Parallel connection in Share bus mode“.

5.9 Interface card slot

The unit can be equipped with an optional interface card. The slot to insert the card is located at the rear side. Further information about the interface cards can be found in section „9. Digital interface cards“, in the separate instruction manual for the interface cards and on the quick installation guide for the interface cards.

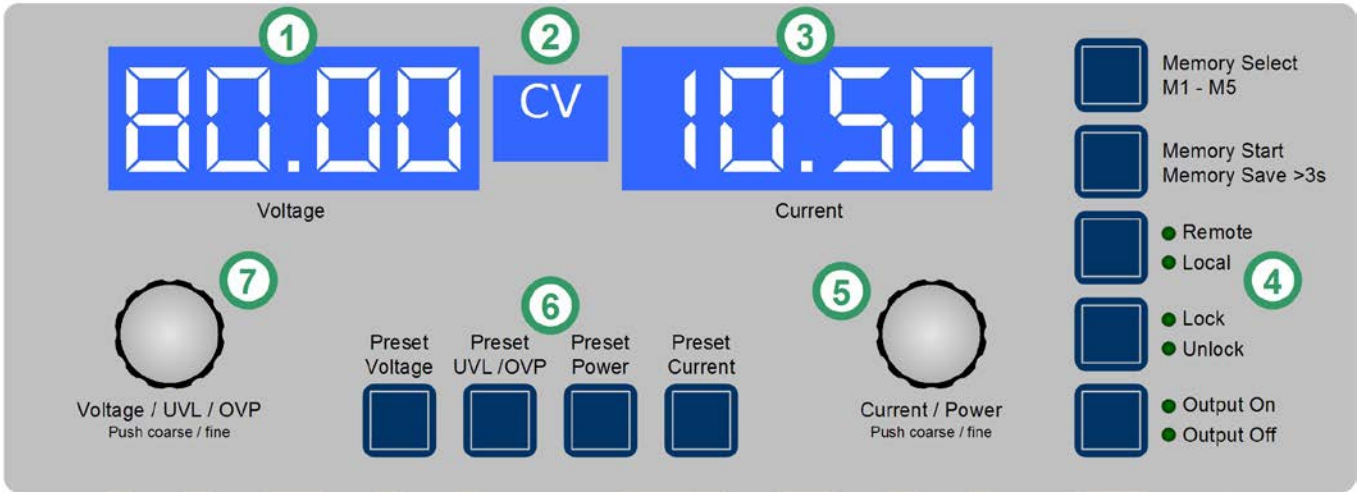


Figure 8. Control panel

6. Handling

6.1 The display

Figure 8 depicts an overview of the dot matrix display and the control panel. During normal operation, the display areas show the actual values of voltage (left side) and current (right side) and device status (middle). In preset mode, the left display area shows the set values of voltage (Preset Voltage), of the over-voltage protection threshold (Preset OVP) or the undervoltage limit (Preset UVL). The right display area shows the set values of current (Preset Current) or power (Preset Power). In the device setup the display is used to show adjustable parameters and settings.

The status area in the middle can show following status:

CV - Constant voltage regulation (only when output is „on“)

OT - Overtemperature alarm

OVP - Overvoltage alarm

CC - Constant current regulation (only when output is „on“)

CP - Constant power regulation (only when output is „on“)

Fine - Fine adjustment for both rotary knobs active

PF - Power fail (input voltage failure, from firmware 6)

Legend:

(1) - Left display area: Actual voltage or set value U, UVL, OVP

(2) - Status area: status display like CC, CV etc.

(3) - Right display area: Actual current or set value I, P

(4) - Control buttons: Setting the device condition etc.

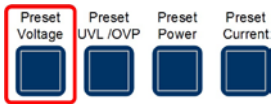
(5) - Rotary knob right: Set value adjustment of I and P, as well as settings in the device setup

(6) - Preset buttons: Switching to set value display

(7) - Rotary knob left: Set value adjustment of U, UVL, OVP, as well as parameters in the device setup

6.2 Pushbuttons on the control panel

6.2.1 Pushbutton Preset Voltage



During normal operation, this button is used to switch the display from actual to preset value of the output voltage (i.e. preset mode). The left display area will then show like this:

In preset mode, the left rotary knob (**Voltage / UVL / OVP**) is used to adjust the voltage set value the same way as during normal operation. The adjusted value is instantly transferred to the output.

> **Note**
>
> *The set value adjustment can be limited by the undervoltage threshold UVL. Also see 6.2.2.*

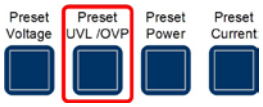
A second push leaves the preset mode instantly or it will end automatically, if no preset button is pushed or any set value is altered within 5 seconds.

During remote control by analogue or digital interface, the preset mode can be used to check the voltage set value that is given from remote.

The button might be locked by the condition **LOCK.** See 6.2.8.

In memory selection mode the button is also used to switch to the voltage set value of the selected memory set, but in this mode the set value is not transferred to the output. The left display area will then show like this:

6.2.2 Pushbutton Preset UVL / OVP



During normal operation, this button is used to switch the display from actual voltage to the set value of the undervoltage limit (one push) or the overvoltage protection threshold (two pushes). The left display area will then show like this:

resp.


.

The undervoltage limit (UVL) is only an adjustment limit for the output voltage value. It means, if UVL is set to anything above 0, the voltage set value can only be adjusted down to the UVL value. In the same way, the UVL value can only be adjusted up to the voltage set value.

The left rotary knob (**Voltage / UVL / OVP**) is used to adjust the UVL value from 0...U_{Set}.

A second push of the button changes to overvoltage protection threshold preset (OVP). This value can always be adjusted from 0...110% U_{Nom}.

A third push leaves the preset mode instantly or it ends automatically, if no preset button is pushed or any set value is altered within 5 seconds.

During remote control by digital interface, the preset mode can be used to check the OVP set value that is given from remote.

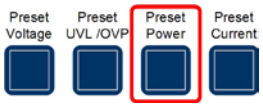
The button might be locked by the condition **LOCK.** See 6.2.8.

In memory selection mode the button is also used to switch to the UVL or OVP value of the selected memory set, but in this mode the values <u>are not</u> active yet. The left display area will then show like this:

resp.


.

6.2.3 Pushbutton Preset Power



During normal operation, this button is used to switch the display from actual current to preset value of the output power (i.e. preset mode).

The right display area will then show like this:

In preset mode, the right rotary knob (**Current / Power**) is used to adjust the power set value from 0...100% P_{Nom}. The adjusted value is instantly transferred to the output.

A second push leaves the preset mode instantly or it ends automatically, if no preset button is pushed or any set value is altered within 5 seconds.

The button might be locked by the condition **LOCK.** See 6.2.8.

During remote control by analogue or digital interface, the preset mode can be used to check the power set value that is given from remote.

In memory selection mode the button is also used to switch to the power set value of the selected memory set, but in this mode the set value <u>is not</u> transferred to the output. The right display area will then show like this:

6.2.4 Pushbutton Preset Current

During normal operation, this button is used to switch the display from actual to preset value of the output current (i.e. preset mode).

The right display area will then show like this:

In preset mode, the right rotary knob (**Current / Power**) is used to adjust the set value of current from 0...100% I_{Nom} the same way as in normal operation. The adjusted value is instantly transferred to the output.

A second push leaves the preset mode instantly or it ends automatically, if no preset button is pushed or any set value is altered within 5 seconds.

During remote control by analogue or digital interface, the preset mode can be used to check the current set value that is given from remote.

The button might be locked by the condition **LOCK.** See 6.2.8.

In memory selection mode the button is also used to switch to the current set value of the selected memory set, but in this mode the set value <u>is not</u> transferred to the output. The right display area will then show like this:

6.2.5 Pushbutton Memory Select M1-M5

Memory Select
M1 - M5

This button cycles through the 5 memory sets, each with set values for U, I and P, as well as UVL and OVP. From here, the selected memory set can be edited, stored or submitted. The button only works if the output is ***off***. The memory mode and the selected memory set number are displayed like this:

Following options of use:

a) Adjust values

Output off, short push of the button, the display changes to the first memory set, as displayed above.

Now the set values of U (left) and I (right) of the selected memory set can be adjusted. The other adjustable values can be accessed by pushing the corresponding preset buttons.

Further pushes will cycle through the memory sets up to number 5 and then exit memory mode.

The adjusted values remain as long the device is powered, but are not submitted to the output set values **and are not saved yet! For savin see section 6.2.6.**

The button might be locked by the condition **LOCK.** See 6.2.8.

6.2.6 Pushbutton Memory Start / Memory Save >3s

Memory Start
Memory Save >3s

This pushbutton is either used to submit the values of the selected memory set to the output or to save the memory set. The button only works if the output is ***off***.

Following options of use:

b) Submit only

Output off, memory set is selected (1-5), button is pushed **shortly** --> the values of the memory set are submitted to the output and the memory mode exits. In order to use the new set values, the output is switched on as usual by button **Output On** or by remote control.

Note

Submitting the values does not save them!

c) Save only

Output off, select memory set(s), adjust the values as desired, then push the button **>3s** --> all memory sets are saved, but none is submitted to the output. The output remains off, the memory mode exits after saving.

The memory sets can also be defined by remote control and corresponding commands using a digital interface (except GPIB). They're stored immediately.

The button might be locked by the condition **LOCK.** See 6.2.8.

6.2.7 Pushbutton Local

● Remote
● Local

This pushbutton activates or deactivate the LOCAL mode. In LOCAL mode, no remote control of the device is possible. LOCAL mode is indicated by LED „Local". As long as LOCAL is not active, the LED „Remote" indicates an active remote control by analogue or digital interface.

The button might be locked by the condition **LOCK.** See 6.2.8.

Note

Activation of LOCAL mode results in immediate return from remote control (analogue or digital) and locks the device against further attempts to control it remotely, until LOCAL is cleared again.

Note

LOCAL condition is only temporary and will not be stored when switching the device off.

6.2.8 Pushbutton Lock / Unlock

● Lock
● Unlock

This pushbutton activates or deactivates the control panel lock. The LOCK mode locks all buttons, except the LOCK button itself, and the rotary knobs against unintended operation.

Note

Activation of the LOCK mode instantly exits any preset or memory mode, if currently active. The display will return to normal display of actual values.

Note

Since firmware 6.02, LOCK mode will be stored when the device is switched off and restored after power-on.

6.2.9 Pushbutton Output On / Output Off

● Output On
● Output Off

This pushbutton is used to manually switch the power output on or off, as long as the device is not in remote control mode. The output condition is always indicated by the LEDs „Output On" or „Output Off". If the output is switched on, the device indicates the currently active regulation mode CC, CV or CP in the status area in the middle of the display.

The button might be locked by the condition **LOCK.** See 6.2.8.

Switching the output on may be inhibited by pin 13 (REM-SB) of the analogue interface. See section „10. Analogue interface".

The button also acknowledges the alarms. See sections 7.4 and 7.5 fore more information.

6.3 Other control elements

6.3.1 Rotary knobs

Both of the rotary knobs have a push button function. Pushing any or both of these will effect following:

a) Fine adjustment mode (Fine)

A short push of any of both buttons activates or deactivates the fine adjustment mode for manual operation. If „Fine“ is active, all set values, thresholds and limits can be adjusted in smallest possible steps, no matter what mode is currently active (preset, memory ect.). It is indicated by the status text „Fine“ in the status area. Also see section „6.4 Adjusting set values“ below.

b) Device setup

Pushing **both** buttons together for >3s while the output is **off** changes to device setup. It is left the same way.

6.4 Adjusting set values

1. In manual operation

During manual operation, both rotary knobs are used to continuously adjust the set values of voltage and current from 0% to 100% nominal value in predefined steps (see table). In order to set the values for OVP and UVL the button **Preset UVL/OVP** has to pushed once or twice. In order to set the power set value the button **Preset Power** has to be pushed.

Note

The OVP value can be lower than the voltage set value and will cause an OV alarm as soon as the output is switched on and the actual voltage reaches the OVP threshold!

Setting values manually can be done in fine or coarse steps, whereas coarse is default. **Fine** is required to be activated by the one of rotary knob pushbuttons and has a step width of 1.

For **coarse** adjustment, following step widths apply in dependency of the nominal values (also refer to technical specs):

Voltage / OVP / UVL			Current		
Nom. val.	**Coarse**	**Fine**	**Nom. val.**	**Coarse**	**Fine**
40V	0.25V	10mV	30A	0.2A	10mA
80V	0.5V	10mV	60A	0.5A	10mA
160V	1V	100mV	70A	0.5A	10mA
200V	2V	100mV	90A	1A	10mA
240V	2V	100mV	120A	1A	100mA
400V	2V	100mV	140A	1A	100mA
500V	5V	100mV	210/250A	2A	100mA
600V	5V	100mV	340A	2A	100mA
1000V	10V	1V	510A	5A	100mA
1500V	10V	1V			

Power		
Nominal value	**Coarse**	**Fine**
3.3/5kW	50W	1W
6.6/10kW	100W	10W
15kW	100W	10W

Note

The resolution of the set value adjustment in some cases is, depending on the nominal values, higher than the one of the output voltage. Thus it can happen that the output voltage only changes every 2 or 3 steps.

2. In remote control via analogue interface

See section „10. Analogue interface“.

3. In remote control via digital interface card

See section „9. Digital interface cards“.

7. Device characteristics

7.1 Switching on by power switch

The power switch is located at the front. After switching on, the device will show some information in the display: manufacturer's name, address and logo, device type and firmware version. In the device setup (see section „8. Device setup") there is an option „AutoPwrOn" (auto power-on) that determines the output condition after the device is switched on. Default is „on". It means, that the set values of U, I, P, the values of OVP and UVL and the output condition are restored to what was present when the device was switched off the last time. In case the option is set to „off", the set values of U and I are set to 0, the set value of P to 100% and the output is switched on after every start.

7.2 Switching off by power switch

Switching the device off by power switch is handled as mains blackout. The device will save the last set values and output condition. After a short time, power output and fans will be switched off and after a few seconds more, the device will be completely off.

7.3 Switching to remote control

a) *Analogue interface*: Pin „Remote" switches the device to remote control, if not inhibited by LOCAL mode or remote control by digital interface already being active. The set values pins VSEL, CSEL and PSEL, as well as REM-SB are then in command. The output condition and the set values which are put into the pins are immediately set. After return from remote control, the output will be switched off.

b) *Digital interface*: Switching to remote control is done by the corresponding command (here: object), if not inhibited by LOCAL mode or remote control via analogue interface already being active. It keeps output state and set values until altered. Leaving remote control automatically switches the output off.

7.4 Overvoltage alarms

An overvoltage alarm can occur due to an internal defect (output voltage rises uncontrolledly) or by a too high voltage from external. The overvoltage protection (OVP) will switch off the output and indicate the alarm on the display by the status text „OV" and on the pin „OVP" of the analogue interface.

If the cause of the overvoltage is removed, the alarm has to be acknowledged first. In manual operation, it is done by pushing button **Output On/Off**, in analogue remote control with pin „REM-SB" and in digital remote control by the corresponding command. Then status text „OV" and OVP signal will disappear. If the alarm is still present, the output will not be switched on.

OV alarms are recorded into the internal alarm buffer. This buffer can be read out via a digital interface, except those using SCPI language. Reading the buffer will also acknowledge.

Note

The status of an OV alarm has priority over the status of an OT alarm and will overwrite the status text „OT" in case both alarms occur the same time and are not yet acknowledged.

7.5 Overtemperature alarms

As soon as an overtemperature (OT) alarm occurs by internal overheating, the output is switched off and the status text „OT" is indicated. Simultaneously, the LED „Output On" will flash, indicating that the output will automatically switch on again as soon as the device has cooled down. In case this is not wanted, the output can be switched off manually. Then the LED stops flashing and the output won't switch on automatically.

If the output is off after the device has cooled down, it can be switched on again by using button **Output On/Off** or pin „REM-SB" or the corresponding command. If the output is on, pushing button **Output On/Off** once or giving pin „REM-SB" a high-to-low toggle or using the corresponding command first acknowledges the alarm and then switches the output off.

OT alarms are recorded into the internal alarm buffer. This buffer can be read out via a digital interface (except those using SCPI language). Reading the buffer will also acknowledge.

Note

The status of an OT alarm has lower priority than an OV alarm and the status text „OT" will be overwritten by „OV" in case both alarms occur the same time and are not yet acknowledged.

7.6 Voltage, current and power regulation

The output voltage of the power supply and the resistance of the load determine the output current. If this current is lower than the current limitation set by the current set value, then the device is working in constant voltage (CV) regulation, indicated by the status text „CV".

If the output current is limited by the current set value or by the nominal current, the device will change to constant current (CC) regulation mode, indicated by the status text „CC".

All models feature an adjustable power limitation for 0...P_{Nom}. It becomes active and overrides constant voltage or constant current regulation mode, if the product of actual current and actual voltage exceeds the adjusted power limitation. The power limitation primarily affects the output voltage. Because voltage, current and power limitation affect each other, various situations like these may occur:

Example 1: the device is in constant voltage regulation, then the power is limited down. As a result, the output voltage is decreased. A lower output voltage results in a lower output current. In case the resistance of the load is then decreased, the output current will rise again and the output voltage will sink further.

Example 2: the device is in constant current regulation, the output voltage is defined by the resistance of the load. Then the power is limited down. Output voltage and current are decreasing to values according to the formula P = U * I. Once the current set value is decreased, the output current would also decrease and thus the output voltage. The product of both values, the actual power, would sink below the previously set power limit and the device would change from constant power regulation (CP) to constant current regulation (CC).

Those three conditions CC, CV and CP are indicated on the appropriate pins of the analogue interface cards or can be read out as status bits via an optional, digital interface card.

7.7 Remote sense operation

Remote sense operation is used to compensate voltage drops of the conductors between the power supply and the load. Because the compensation is limited to a certain level, it is recommended to match the cross section of the conductors to the output current and thus minimise the voltage drop.

The sense input is located on the rear, at terminal **Sense**, where the sense conductors are connected to the load with correct polarity. The power supply will detect the external sense automatically and compensate the output voltage by the actual voltage at the load instead of the output. The output voltage will be raised by the value of the voltage drop between power supply and load.

Maximum compensation: see technical specifications, will vary from model to model.

Also see figure 9 below.

7.8 Mains undervoltage or overvoltage

The units require two or three phases of a three-phase supply with 400V phase conductor voltage and tolerate max. ±15%. This results in an input voltage range of 340...460V AC. Within this range, the units can be operated without any restrictions regarding power. Input voltages below 340V AC are considered as supply undervoltage and will store the last condition, as well as switch the power output off. Same happens at overvoltage above 460V AC.

***New since firmware 6.01**:* Over- or undervoltage in the AC input, as well as errors in the input section of the device are indicated as „power fail“ alarm on the device. This is done in the display with „PF“, via pin 6 „OT/PF“ of the analogue interface or via the internal alarm buffer, which can be read out with one of the optional, digital interface cards.

⚠ Attention!

Permanent input undervoltage or overvoltage must be avoided!

7.9 Connecting different types of loads

Different types of loads, such as ohmic loads (lamp, resistor), electronic loads or inductive loads (motor) behave differently and can retroact to the power supply. For example, motors can induce a countervoltage which may cause the overvoltage protection of the power supply to shut off the output.

Electronic loads have regulator circuits for voltage, current and power that can counteract to the ones of the power supply and may result in increased output ripple or other, unwanted side effects. Ohmic loads are almost 100% neutral. It is recommended to consider the load situation when planning applications.

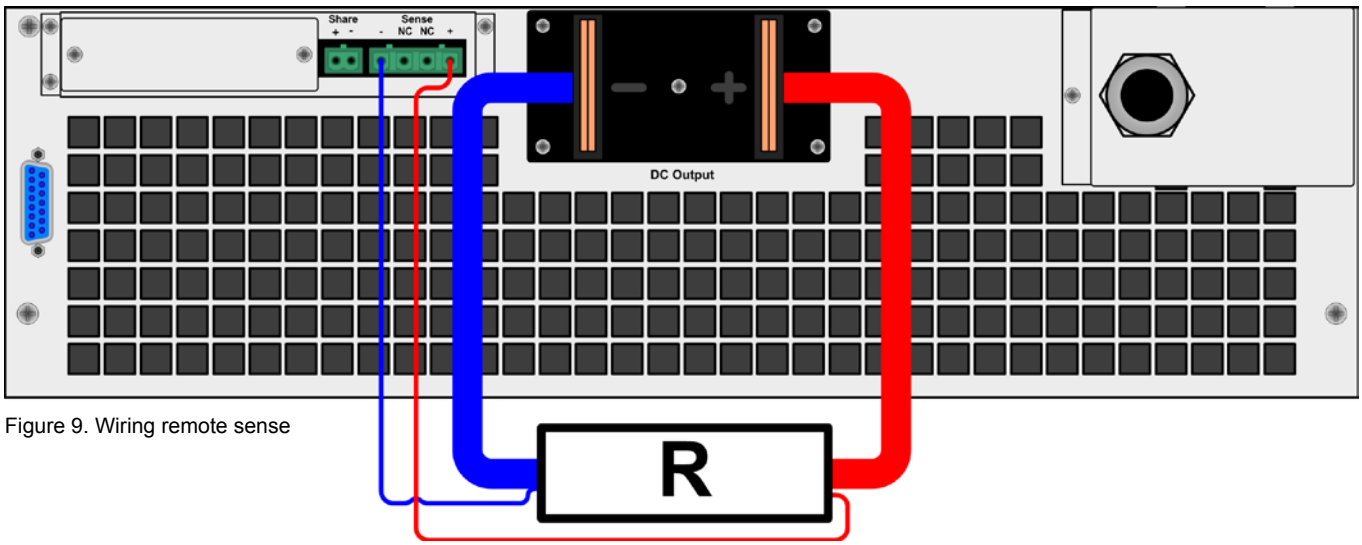


Figure 9. Wiring remote sense

8. Device setup

The device setup is intended to adjust certain operation parameters. It can only be accessed while the output is off. Push both pushbuttons of the rotary knobs (also see section 6.3) simultaneously for longer than 2s. Leaving the setup and storage of the settings is done the same way. Three elementary settings are always available, see below. Other settings are only available if a digital interface card is equipped.

Elementary settings:

Parameter: AutoPwrOn Default: on

Settings: on, off

Meaning: „on“ --> device restores the last output state and set values of last time the device was switched off or a blackout occured. The purpose is to make the unit automatically continue operation after a blackout.

„off“ --> the output is switched on and the set values of U, UVL and I are set to 0%, P to 100% and OVP to 110%, everytime the unit is powered.

Parameter: AI range Default: 0-10

Settings: 0-5, 0-10

Meaning: selects the control voltage range to use with the analogue interface. Further details in section 10.

Parameter: Contrast Default: 70

Settings: 50...100

Adjusts the contrast of the LCD display.

For **all** interface cards this setting applies:

Parameter: Device node Default: 1

Settings: 1...30

Meaning: Selects the device‘s address (i.e. device node, term taken from the CAN terminology). When using the device on a bus system (CAN or GPIB), every device must have a unique address!

Following settings only with **CAN interface IF-C1:**

Parameter: Baud Default: 100k

Settings: 10k, 25k, 50k, 100k, 125k, 250k, 500k, 1M

Meaning: Selects the CAN transmission baud rate.

Parameter: Base ID Default: 0x000

Settings: 0x000...0x7FC (0...2044)

Meaning: Defines the base ID (BAID) for the CAN ID system with three IDs (Vector compatible, dbc files). Three IDs are reserved for a device, based upon the adjusted base ID. Thus this values is only adjustable in steps of four. Display can be switched from decimal to hexadecimal by pushing any of the rotary knobs.

Only available, if ID Sys = Vector has been selected. See below at parameter ID Sys.

Parameter: Broad ID Default: 0x7FF

Settings: 0x000...0x7FF (0...2047)

Meaning: Adjusts the broadcast ID (BCID) for the CAN ID system with three IDs (Vector compatible, dbc files). This extra ID is a fourth ID for the device which can be used for broadcast messages to multiple units on a bus. Purpose if this ID is to adjust it to the same value on all units that are targeted to be controlled simultaneously by set values or device conditions. Display can be switched from decimal to hexadecimal by pushing any of the rotary knobs.

Only available, if ID Sys = Vector has been selected. See below at parameter ID Sys.

Parameter: RID Default: 0

Settings: 0...31

Meaning: Selects the relocatable identifier segment (RID). Refer to CAN terminology or instruction manual of the IF-C1 CAN interface card for further information.

Parameter: Bus term Default: yes

Settings: yes, no

Meaning: activates/deactives the bus termination resistor of the CAN interface card. This is required if the device is at the end of the bus.

Parameter: ID Sys Default: Vector

Settings: Vector, normal

Meaning: Selects the CAN ID systems (IDSY). With „Normal“, the former, old CAN ID system with two CAN IDs per unit is used, where the IDs are built from „Device node“ (see above) and „RID“ (see above) . Also see the external user manual for the interface cards regarding the calculation scheme of the CAN IDs.

The other ID system, selected with „Vector“, uses three CAN IDs per unit and it thus enables the use of so-called DBC files to implement the device into Vector company software. By selecting this ID system, two ID related settings (see above) become active, where the user adjusts a base ID that defines the three CAN IDs, plus a broadcast ID (if used).

Following settings only with **RS232 interface IF-R1**:

Parameter: Baud Default: 57600

Settings: 9600, 19200, 38400, 57600

Meaning: Selects the serial transmission baudrate (in baud). Further parameters for the RS232 are not configurable, but defined as follows:

Parity = odd
Stop bits = 1
Data bits = 8
and have to be set to the same co nfiguration at the PC.

Following settings only with **Profibus interface IF-PB1**:

Parameter: Profibus Default: 1

Settings: 1-125

Meaning: Defines the Profibus address of the device. This address is used apart from the device node to implement and access the unit on a field bus system.

9. Digital interface cards

The device supports following pluggable interface cards:

IF-U1 (USB)

IF-R1 (RS232)

IF-C1 (CAN)

IF-G1 (GPIB/IEEE)

IF-E1 / IF-E1B (Ethernet/LAN + USB)

IF-PB1 (Profibus + USB)

The cards require only a little or no setup after insertion. The card specific settings are stored and kept, even if the card is replaced by one of different type. Thereby it is not necessary to configure the card settings everytime a card is inserted.

Details about the technical specs of the interface cards and the handling, as well as instructions to implement the device into a bus system or to control the device by means of a PC (LabView etc.) can be found in the user manual for the IF cards.

Attention!

Insertion or removal only if the device is completely switched off (power switch)!

About configuration of the interfaces see section „8. Device setup“.

The digital interface cards allow to set voltage, current and power, as well as the OVP threshold and undervoltage limit UVL by means of a PC. When changing to remote control mode, the device keeps the last set values until they‘re altered. Hence it would be possible to control only voltage by sending arbitrary set values and the current set value would remain unaltered.

Set values given by the digital interface (except GPIB) are always percentage and correspond at 100% (hex: 0x6400), resp. at 110% (hex: 0x6E00) for the OVP threshold, to the nominal values of the device. Using GPIB, any value is given as real decimal value.

Furthermore, the digital interfaces allow to query and set a lot of other features and values. For details refer to the user manual of the interface cards.

10. Analogue interface

10.1 General

The integrated, non-isolated, 15 pole analogue interface (AI) is located on the rear and offers following main features:

- Remote control of output current, voltage and power
- Remote monitoring of status (OT, OVP, CC, CV)
- Remote monitoring of actual values
- Remotely switching the output on/off

The analogue interface (short: AI) allows to remotely control current, voltage and power of the power supply, but always in combination. It means, that it‘s not possible to adjust voltage via the AI and the current with the rotary knob on the front at the same time, or vice versa.

The OVP threshold can not be adjusted via the AI, so it‘s required to set it manually on the device before using the remote control. Switching to preset mode with the preset buttons shows the translated set values, that are put into the set value pins of the AI as voltages. In order to put in appropriate set values, the user can either use an external voltage source or the reference output voltage on pin 3.

The AI can be operated with the common 0...5V or 0...10V ranges, each corresponding to 0...100% nominal values. The desired control voltage range is selected in the device setup (see section „8. Device setup“). The reference voltage at output pin 3 is related to the chosen setting and will be either 5V or 10V.

Following applies:

0-5V: Reference voltage = 5V, 0...5V set value voltage correspond to 0...100% nominal value, 0...100% actual value correspond to 0...5V at the actual value outputs (CMON, VMON).

0-10V: Reference voltage = 10V, 0...10V set value voltage correspond to 0...100% nominal value, 0...100% actual value correspond to 0...10V at the actual value outputs (CMON, VMON).

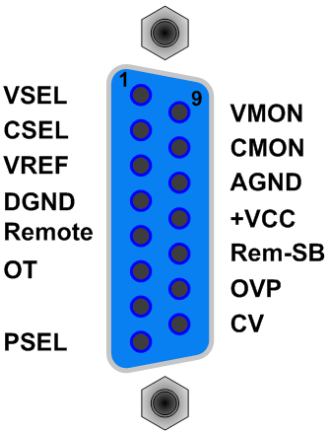
Putting in set values that exceed the limit, for example >5V while the 0...5V range is selected, is intercepted by clipping the corresponding set value to 100%.

Usage instructions:

- Controlling the device with analogue voltages requires to switch it to remote control with pin „REMOTE“ (5).
- Before connecting the application that is used to control the power supply, make sure to wire all leads correctly and check if the application is unable to put in voltages higher than specified (max. 12V).
- The input REM-SB (remote standby, pin 13) overrides the pushbutton **Output On**. It means, the output can not be switched on by the button if the pin defines the output state as „off“ , except LOCAL mode is active. This mode locks all interface from access to the device. Also see „6.2.7 Pushbutton Local“.
- **The grounds of the analogue interface are related to minus output**.

10.2 Application examples

Pin overview



Attention!

Never connect grounds of the analogue interface to minus (negative) output of an external control application (PLC, for example), if that control application is otherwise connected to the neative power supply output (ground loop). Load current may flow over the control leads and damage the device!

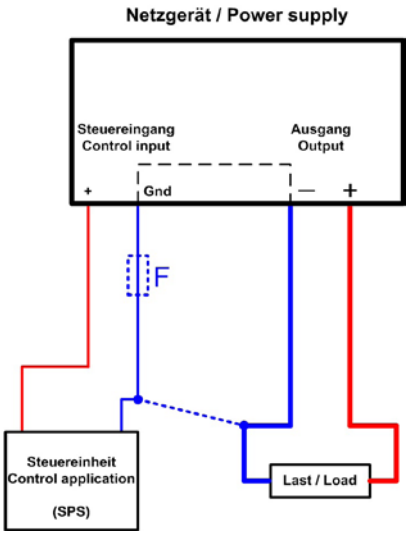


Figure 10

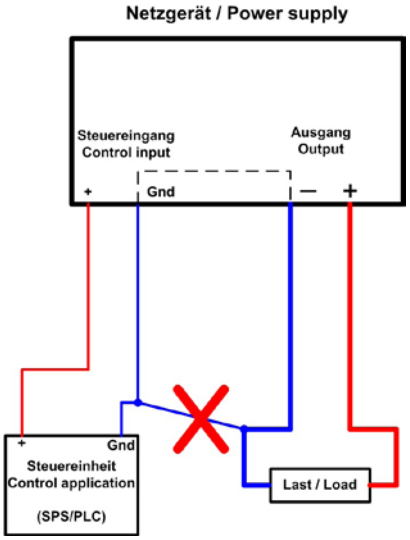


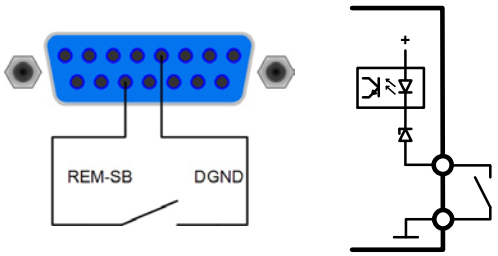
Figure 11

Output off

Pin „REM-SB“ is always operative and does not depend on the remote control mode. It can be used to switch off the output without extra means, except in LOCAL mode which only allows manual control for the device. Switching the output off is done by connecting the pin to ground (DGND) via a low-resistive contact like a switch, open collector transistor or relay.

Note

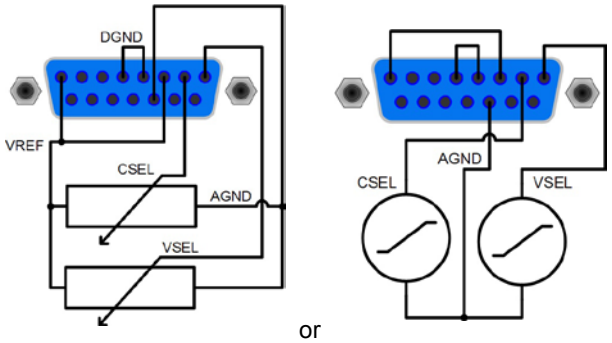
A digital output of, for example, a PLC may not be able to do this correctly, because it might not be low-resistive enough. Always check the technical specifications of your external control application.



Remote control of current and voltage

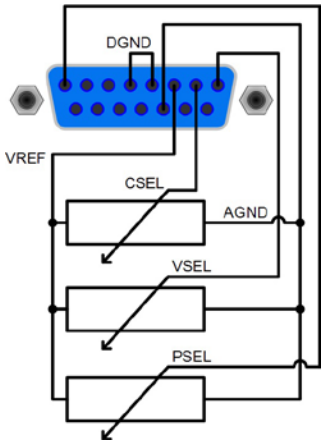
Two potentiometers between VREF and ground, sliders at the inputs VSEL and CSEL. The power supply can be controlled as with the rotary knobs on the front and can either operate as current or voltage source. In compliance with the max. 3mA for the VREF output, potentiometers with at least 10kOhm have to be used.

The power set value is here, for models with power regulation feature, tied to VREF and thus 100%.



Remote control with power

Similiar to the example above, but with adjustable power limit (only applicable for models with power adjustment).



10.3 Pin specification

Pin	Name	Type*	Description	Level	Electrical specification
1	VSEL	AI	Set value: voltage	0…10V or 0...5V correspond to 0..100% of U_{Nom}	Accuracy < 0,2% Impedance Ri >100K
2	CSEL	AI	Set value: current	0…10V or 0...5V correspond to 0..100% of I_{Nom}	
3	VREF	AO	Reference voltage	10V or 5V	Accuracy < 0.2% at I_{Max} = +5mA Short-circuit-proof against AGND
4	DGND	POT	Reference potential for digital control signals		For +Vcc, control and status signals
5	REMOTE	DI	Toggle between internal or external control	External = LOW, U_{Low} <1V Internal = HIGH, U_{High} > 4V Internal = open	U range = 0 …30V I_{Max} = +1mA at 5V Sender: Open collector against DGND
6	OT/PF	DO	Overtemperature alarm Power fail alarm ***	Alarm = HIGH, U_{High} > 4V no alarm = LOW, U_{Low} <1V	Quasi open collector with pull-up to Vcc ** At 5V at the output there will be max.+1mA I_{Max} = -10mA at U_{CE} = 0.3V U_{Max} = 0...30V Short-circuit-proof against DGND
7	N.C.				Not connected
8	PSEL	AI	Set value: power	0…10V or 0...5V correspond to 0..100% of P_{Nom}	Accuracy < 0.5% Impedance Ri >100K
9	VMON	AO	Actual value: voltage	0…10V or 0...5V correspond to 0..100% of U_{Nom}	Accuracy < 0.2% at I_{Max} = +2mA Short-circuit-proof against AGND
10	CMON	AO	Actual voltage: current	0…10V or 0...5V correspond to 0..100% of I_{Nom}	
11	AGND	POT	Reference potential for analogue signals		For -SEL, -MON, VREF signals
12	+Vcc	AO	Auxiliary voltage output (Ref: DGND)	11...13V	I_{Max} = 20mA Short-circuit-proof against DGND
13	REM-SB	DI	Output off	off = LOW, U_{Low} <1V on = HIGH, U_{High} > 4V on = OPEN	U range = 0…30V I_{Max} = +1mA at 5V Sender: Open-Collector against DGND
14	OVP	DO	Overvoltage alarm	OVP = HIGH, U_{High} > 4V no OVP = LOW, U_{Low} <1V	Quasi open collector with pull-up to Vcc ** At 5V at the output there will be max.+1mA I_{Max} = -10mA at U_{ce} = 0.3V U_{Max} = 0...30V Short-circuit-proof against DGND
15	CV	DO	Indication of voltage regulation active	CV = LOW, U_{Low} <1V CC = HIGH, U_{High} >4V	

* AI = Analogue input, AO = Analogue output, DI = Digital input, DO = Digital output, POT = Potential

** Internal Vcc = 13.8

*** Power fail = input failure or PFC (reported only since firmware 6.01)

11. Further applications

11.1 Parallel connection in Share bus mode

Share bus operation is used to gain a symmetric load current distribution when running multiple units in parallel connection.

Important: in this operation mode, the unit with the highest output voltage controls and defines the output voltage of the whole parallel connection. It means, any unit of the system could be in charge. Thus it recommended to pick a unit that is used to control the whole system, while the set value of voltage for the remaining units is set to the required minimum. Voltage and power set value could be set to 100% or, if not desired, set to equal values on every unit so that the total results in what's required.

In case a unit is broken and will completely shut off, the parallel connection will continue to work without interruption. This is called redundancy.

For a device alarm like overtemperature (OT) or overvoltage, the output voltage will rise or fall to the highest value that was adjusted on any of the remaining units.

The wiring of the terminal „Share", which is required for Share bus operation, is explained in section „5.8 Terminal „Share"". Also see figure 12 below.

Note

If remote sense is going to be used, it is recommended only to connect the „Sense" input of the main unit that determines the system voltage.

Attention!

This is a purely analogue connection. No totals formation of actual values on any of the units.

Attention!

Share bus connection to devices other than PS 8000 E 3U series is not allowed!

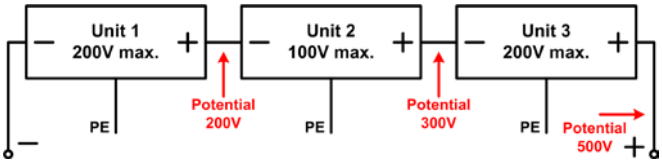
11.2 Series connection

Series connection of two or more units is generally allowed. But there are some restrictions and rules to consider because of safety and isolation reasons:

- **No negative DC output pole of a unit in the series connection may be raised to a potential >300V against ground (PE)!**
- Every unit is adjusted seperately, there is no master-slave connection.
- **The Share bus must not be wired!**
- **The grounds (AGND, DGND) of the analogue interfaces of the units in series connection must not be wired to each other!**
- **Remote sense must not be wired!**
- It is recommended to build a series connection only with unit of same model.

Example: Three identical units with 200V nominal voltage, for example PDC 1200-70 3U, shall be connected in series. When calculating, the total voltage of that series connection could go up to 600V. Looking at the resulting potentials on the negative outputs of the units, the 3rd unit negative DC pole could be raised to 400V if all units put out maximum voltage. This is not permitted! So one of the lower units has to be limited to a certain maximum.

The figure below clarifies that the resulting total voltage would only be 500V:



12. Other

12.1 Accessories and options

Following accessories are optionally available:

a) Digital interface cards

Pluggable and retrofittable, digital interface cards for USB, RS232, CAN, GPIB/IEEE (SCPI only), Profibus or Ethernet/ LAN (SCPI only) are available. Details about the interfaces can be found in the interface cards user manual.

Following options are available:

a) High Speed Ramping

Increased dynamics of the output voltage by reduced output capacity. It must be pointed out, that other output related values also increase! This is a permanent modification which is not switchable.

b) Watercooling

Internally integrated water cooling block. The watercooling is used prevent premature shutdown of the power output because of overheating.

12.2 Firmware update

A firmware update of the device should only be done if the device shows erroneous behaviour or if new features have been implemented.

In order to update a device, it requires a certain digital interface card, a new firmware file and a Windows software called „Update tool".

These interfaces are qualified to be used for a firmware update:

- IF-U1 (USB)
- IF-R1 (RS232)
- IF-E1 (Ethernet/USB)
- IF-PB1 (Profibus/USB)

In case none of the above interface types is at hand, the device can not be updated. Please contact your dealer for a solution.

The update tool and the particular firmware file for your device are obtainable from the website of the device manufacturer, or are mailed upod request. The update too will guide the user through the semi-automatic update process.

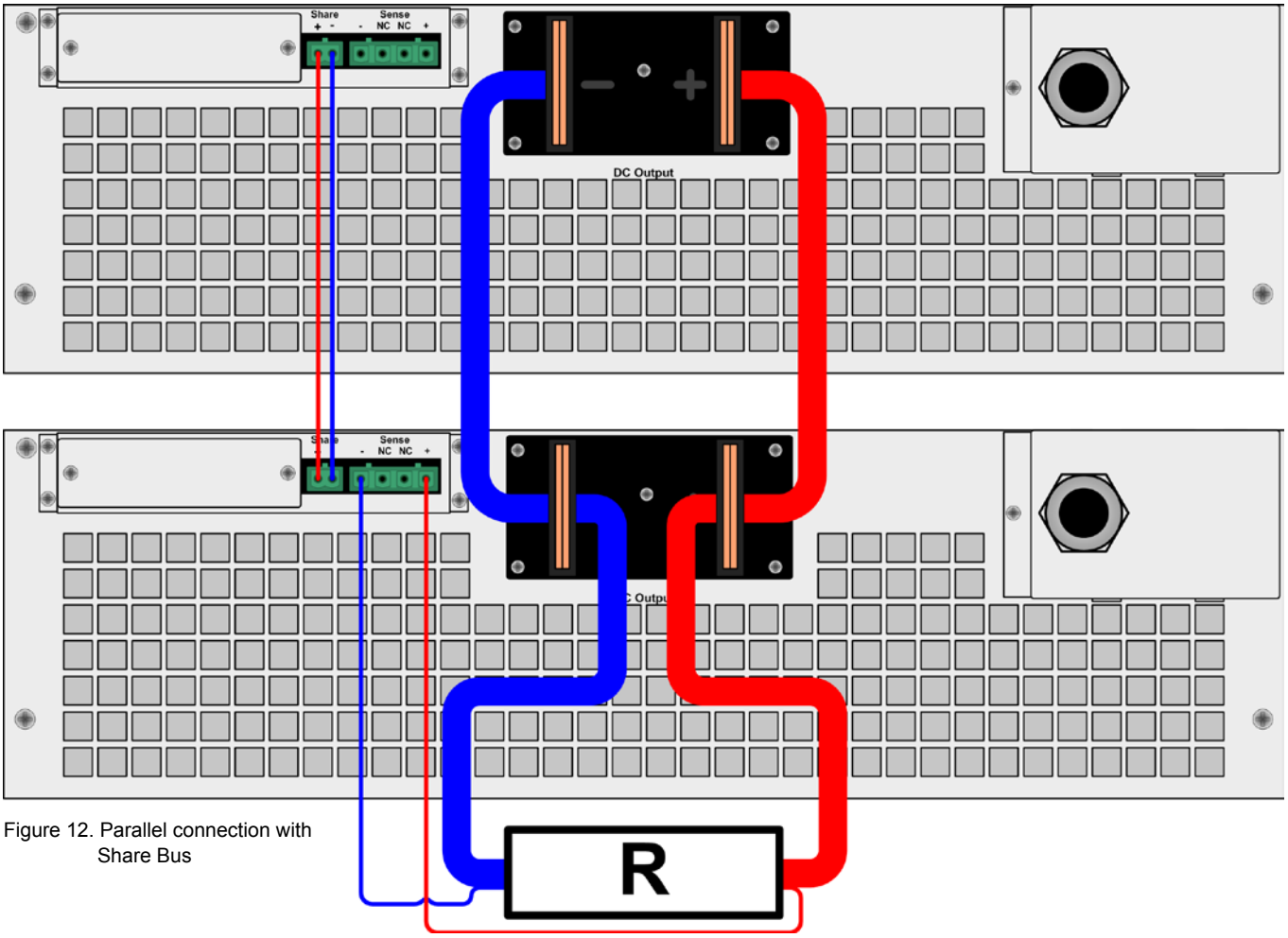


Figure 12. Parallel connection with Share Bus

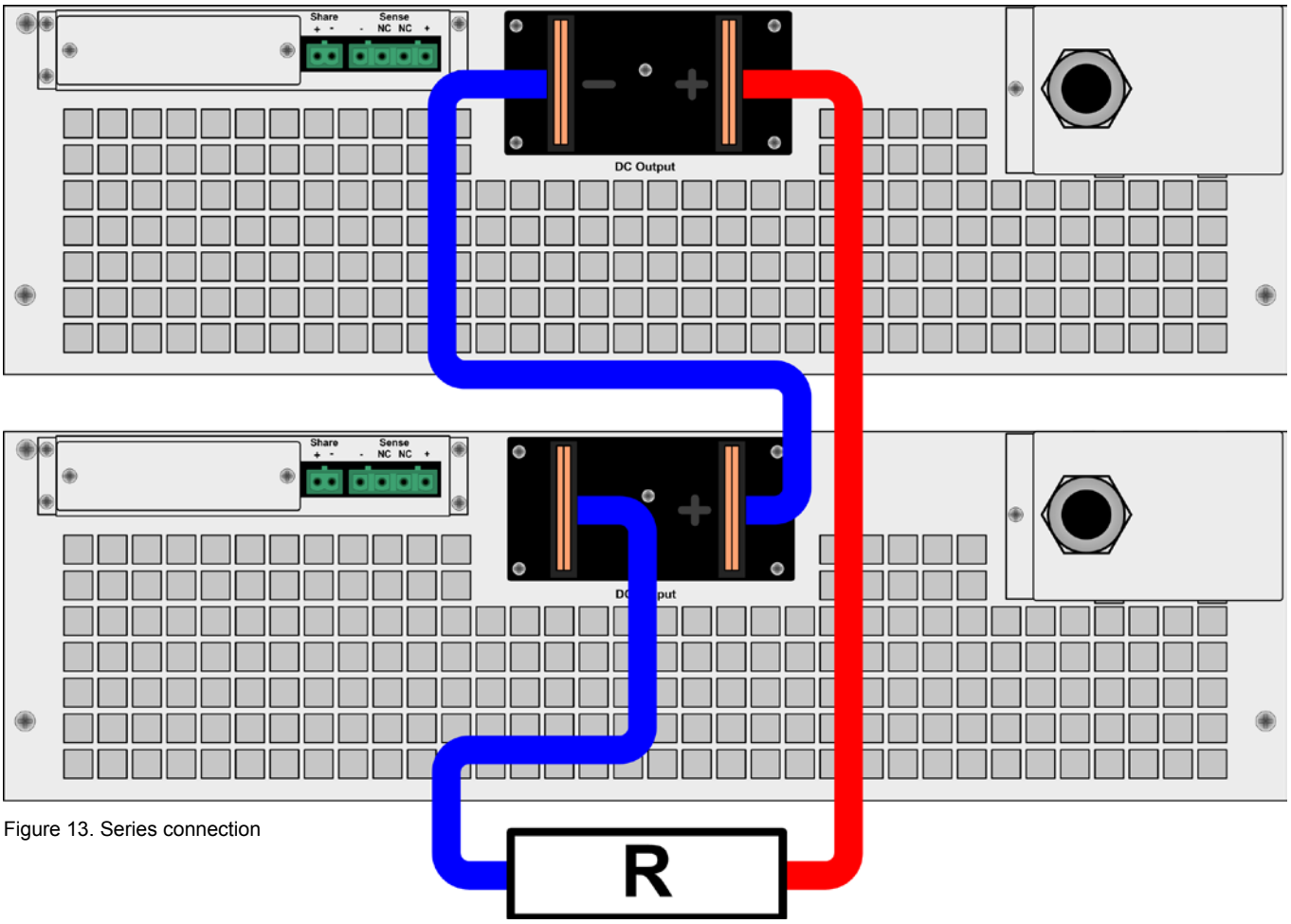


Figure 13. Series connection