Elektro-Automatik GmbH

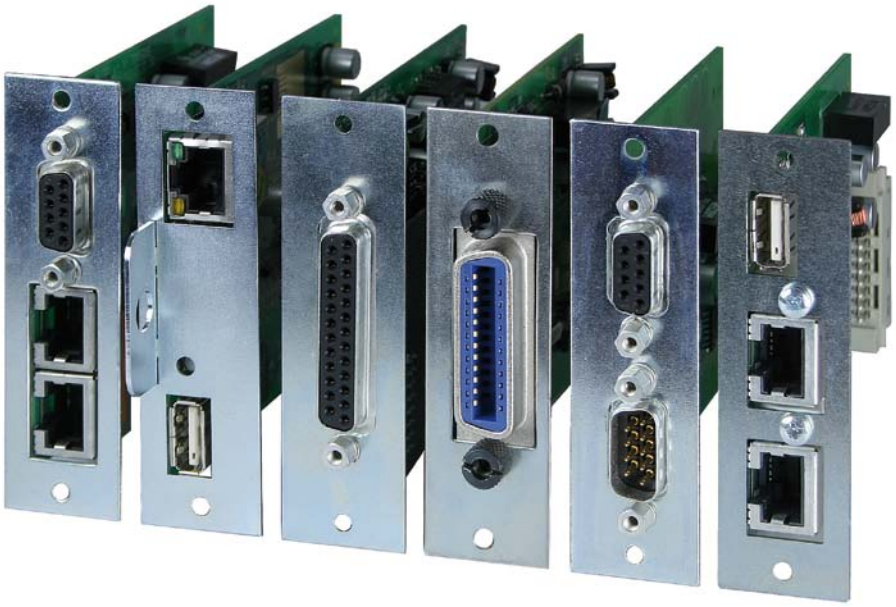
用户操作说明书

User Manual

接口卡

Interface Cards

USB / RS232 / GPIB / CAN / Analog / Ethernet / Profibus



CE

IF-U1 (USB):	33 100 212
IF-R1 (RS232):	33 100 213
IF-C1 (CAN):	33 100 214
IF-A1 (ANA):	33 100 215
IF-G1 (GPIB):	33 100 216
IF-PB1 (Profibus):	33 100 219

IF-U2 (USB):	33 100 220
IF-R2 (RS232):	33 100 221
IF-C2 (CAN):	33 100 222
IF-E2 (Ethernet):	33 100 223
IF-E1B (Ethernet):	33 100 227

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重要说明!

- 请仅安装产品指定的一个或多个接口卡！且不用打开产品外壳。关于何种产品使用哪些接口卡，可咨询您的供货商或阅读对应产品的说明书。
- 仅当产品由电源开关拨至关闭状态时才可安装接口卡！
- 配有两插卡槽的产品可安装两张卡，但是不可任意搭配使用。详情请参考章节„3.3 接口卡的联合使用“。
- 请勿取下接口卡上的外盖！
- 若带两插卡槽的产品上只插了一张卡，建议将默认槽盖盖在空槽上。这可避免灰尘进入产品内，确保内部风扇空气流通顺畅。
- 安装和取下接口卡应使用和遵循一般ESD规则！

1. 一般信息

IF-Rx (RS232)，IF-Cx (CAN)，IF-Ux (USB)，IF-G1 (GPIB)和IF-Ex (Ethernet)接口卡为如电脑或编程器这类设备提供数字连接，而IF-A1则提供模拟连接。比如像电源产品都可被监控和控制。在随附光碟上存储有电源与电子负载的基本软件，还有接口卡的使用。

IF-U2，IF-R2，IF-C2和IF-E2接口卡是1-类的缩减版，且只可用于特定系列上。

25芯模拟接口卡IF-A1（支持PSI 9000和PSI 8000）在产品额定值范围内，快速监控实际值和快速设置（以极短的延迟时间）设定值。数字输入和输出脚可参数化。

仅针对PSI 9000系列：结合一张RS232或USB与CAN卡，用户可实现电脑上RS232或USB端口至CAN总线的网关功能。故不用任何额外硬件即可将电脑连接到CAN上。利用RS232/USB和CAN卡，网关一次性能控制多达30台产品。连接到电脑上产品将处理发送至CAN并从之返回的数据传输。最大数据传输速度受限于串联设置。最大总波特率为57600波特。

仅针对PSI 9000系列：结合IF-R1和IF-U1卡，用户可将多台电源产品并联和/或串联到真实的主-辅系统上，并通过“System Link模式”形成总测量值，也可见PSI 9000产品说明书„12. System Link Mode（仅针对PSI 9000）“章节。

1.1 用途

这些接口卡仅能使用于指定产品型号上。

包装内含有一套Labview VIs软件，可简化卡的使用，以及在LabView IDE的运行。

这些接口卡可在其它应用和环境下运行，但非常复杂。在光碟上的„\manuals\interface cards\“文件夹下，或者网站上（关于所有接口卡的操作说明压缩文档）有详细解释电报结构。

IF-A1模拟输入和输出信号电压范围定在0和10V之间。数字输入脚可在两个不同电压范围间的逻辑电平间转换，如果不使用这些输入脚，可预先定义默认逻辑电平。

1.2 概念

接口卡可随时插入或拔出，故能用于所需产品上。它们与不同类型产品都兼容，如电子负载。因具备2000V的绝缘电压（现场总线卡为：1000V），您可连接不同电位的多台产品。

USB，RS232和CAN数字接口卡支持独特的面向对象的通讯协议。每个系列有其指定对象（即：指令）清单，根据产品特征会有不同。要对传输指令的有效性和真实性进行检查。非真实的或错误的数值和目标以回答电报的形式产生一错误。

IF-G1和IF-Ex数字接口卡使用国际标准指令语言SCPI (可编程仪器标准指令)。

IF-PB1接口卡遵循现场总线规格参数。

关于可用文件请浏览章节„13. 编程“。

1.3 保修/维修

注意：用户不可自己维修接口卡！

如果接口卡在保修期间或出现不良，请联系当地的供货商，了解接下来所需做的事项。（德国）法律强制规定接口卡有两年的保修期，而使用产品的保修期(寿命）则不受此约束。

1.4 使用符号

下面描述了以不同符号表示的显示和操作元素：

仅显示	所有元素只作显示，且代表状态的元素以该符号表示
◆参数	可变数值以该符号表示, 且表示强调。
菜单项目	可选择，指向下一级或带参数的最低级
{...}	表示可能的选项或参数调节范围。

1.5 供应清单

1 x 可插拔式接口卡

1 x 刻录有软件的CD，里面有使用说明以及其它文档

1 x 简短安装指引

1 x 0.5m长网线 1:1 (仅供IF-R1和IF-U1卡用)

1 x A-A型USB线，1.8m (仅供 IF-Ux，IF-Ex和IF-PB1卡用)

1 x RS232线1:1，3m (仅供IF-Rx卡用)

1 x 固件更新用适配器连线 (仅供IF-G1卡用)

2. 技术规格

一般信息

1型卡尺寸 (W x H x L)	24 x 80 x 100mm
2型卡尺寸 (W x H x L)	24 x 80 x 45mm
安规标准	EN 60950
EMI标准	EN61000-6-4, EN 61000-6-2, EN 55022 等级 B
过压级别	级别 II
工作温度	0...40°C
储存温度	-20...70°C
相对湿度	<80% (无凝露)

IF-R1 / IF-R2 (RS232)

绝缘电压	2000V DC
连接器	1 x 9针D-Sub插座(母插) 2 x RJ45插座(不适用于IF-R2)
波特率	9600Bd, 19200Bd, 38400Bd, 57600Bd
连线长度	根据波特率可长达15m
System Link Mode (仅针对IF-R1卡和PSI 9000系列)	是(仅针对IF-R1卡)
└ 连接最多产品数量	30台
└ 总线终端	在产品菜单下可设置
└ 网线	0.5m，内含

IF-U1 / IF-U2 (USB)

绝缘电压	2000V DC
连接器	1 x A型USB插座 2x RJ45插座(不适用于IF-U2)
标准	USB 1.1
连线长度	最长5m
System Link Mode (仅针对IF-U1卡和PSI 9000系列)	是
└ 连接最多产品数量	30台
└ 总线终端	在产品菜单下可设置
└ 网线	0.5m，内含

IF- C1 / IF-C2 (CAN)

绝缘电压	2000V DC
连接器	9针D-Sub插座(母插) 9针D-Sub插座(公插)
波特率	按步宽20kBd...1MBd
总线终端	在产品菜单下可设置
CAN标准	V2.0 A部分

IF-A1 (模拟卡)

绝缘电压	2000V DC
模拟输入脚：	
输入电压范围	
最大范围	-5V...+15V
额定范围	0V…10V
输入阻抗	25kΩ
分辨率	
VSEL，CSEL，PSEL (RSEL)	< 2mV
相关错误	
VSEL，CSEL，PSEL	0.1%
RSEL (选项)	0.25%
反应时间[1)]	< 4ms
模拟输出脚：	
额定输出电压范围	
VMON，CMON，PMON	0V…10V
10V时I_{out} 最大为	2mA
VREF	1V...10V
10V时I_{out} 最大为	10mA
分辨率	
VMON，CMON，PMON，VREF	< 2mV
相关 错误	
VMON，CMON，PMON，VREF	0.1%
模拟输出脚的设定时间	< 4ms
辅助电压	12…15V
最大电流	50mA
数字输出脚：	
类型	上拉电阻至+15V
输出电流	
最大值	I_{max} = -20mA at U_{out} = 0.5V
额定值	1...10mA
输出电压	
高	+15V
低	< 0.3V
反应时间[2)]	< 4ms
数字输入脚：	
输入电压	
最大范围	-5V...+30V
如果设定：水平=LOW	
U_{Low}	< 1V
U_{High}	> 4V
如果设定：水平=HIGH	
U_{Low}	< 5V
U_{High}	> 9V
输入电流	
如果Low Range和Default Level= L	
U_{in} = 0V	0mA
U_{in} = 12V	+2.6mA
U_{in} = 24V	+5mA
如果Low Range和Default Level= H	
U_{in} = 0V	-1.5mA
U_{in} = 12V	+2.2mA
U_{in} = 24V	+6mA

1 为计算步骤改变的总反应时间，必须加上模拟接口输入到电源输出的反应时间。
2 将报告事件出现至执行报告的这一段时间。

如果High Range和Default Level= L	
U_{in}= 0V	0mA
U_{in}= 12V	+1.6mA
U_{in}= 24V	+3.5mA
如果High Range和Default Level= H	
U_{in}= 0V	-1.5mA
U_{in}= 12V	+0.7mA
U_{in}= 24V	+4.5mA
反应时间[1)]	< 10ms

IF- G1 (GPIB)

绝缘电压	2000V DC
端子	24脚并行插座(母座)
总线标准	IEEE 488.1/2
连线长度 (GPIB)	每台产品为2m，总长20m
连线类型 (GPIB)	标准的GPIB线

IF-E1B / IF-E2 (Ethernet)

绝缘电压	1500V DC
端子	1x RJ45 (LAN / WAN) 1x USB, A型
连线类型 (以太网)	双绞网线，网线，级别3或更高
协议	HTTP, TCP/IP
网络端口 IF-E1B	0 - 65535 (80 = HTTP) 默认：1001 (TCP/IP)
网络端口 IF-E2	80 (HTTP, TCP/IP)
网络连接	10/100 兆比特
USB连接	USB 1.1, 2.0
以太网传输速度	100k波特
USB传输速度	57600波特
指令最长间隔时间	每300ms (IF-E2) 每20ms (IF-E1B)
Keep-alive 超时 (IF-E1B)	10分钟 (始于v2.05版本)

IF-PB1 (Profibus)

绝缘电压	1000V DC
端子	1x Sub-D 9脚 1x USB, A型
变种机型	DP
总线终端	经Profibus现场总线连接线
总线速度	高达12MBit/s
协议	DPV0, DPV1
识别符	GSE文档

3. 安装

3.1 拆包装后

拆包装后，检查可插拔式接口卡是否有外观损伤。如发现有，请不要使用或将卡插入任何产品内！

3.2 插卡

只有当产品完全关闭后才可插卡。且不用打开产品外壳。取下插槽盖螺丝，或取下之前插入的卡。小心地插入新卡，直至卡板触到产品后端。***如果后端和卡板间还有间隙，不要拧紧螺丝，因为接口卡未正确放置！***电脑和/或其它设备间的连线在产品再次打开前要连接好。打开电源后，将自动检测接口卡，然后可以进行设置。

IF-A1卡的注意事项：插卡前，应正确安装跳线。请参考„7.3 配置IF-A1“，子章节“数字输入端”。

提示：如果该卡为后续购买的，打开产品后未被识别出，可能需要更新产品固件。请联络您的供货商了解更多信息。

注意！接口卡有些元件对ESD很敏感。操作和安装时必须遵守一般的ESD规则。

3.3 接口卡的联合使用

仅与PSI 9000系列相关！

如需使用的接口卡插槽不只一个，请参照下表列出可结合使用的接口卡搭配（• 意指允许）：

	IF-U1	IF-C1	IF-R1	IF-E1 / IF-E1B	IF-G1	IF-A1	IF-PB1
IF-U1	-	•	-	-	•	•	-
IF-C1	•	-	•	-	-	•	•
IF-R1	-	•	-	-	•	•	-
IF-E1 / IF-E1B	-	-	-	-	-	•	-
IF-G1	•	-	•	-	-	•	•
IF-A1	•	•	•	•	•	-	•
IF-PB1	-	•	-	-	•	•	-

1 事件出现（这必须以信号发送给输出端）和以信号发出这一期间的时间

4. RS232卡IF-R1 / IF-R2

RS232接口卡通过电源上的串行端口，也称COM口，将其链接到控制器（电脑）。如果电脑跟旧的串行端口不工作，在一些可选商铺里有适配线，它可经USB工作，并在电脑上产生一虚拟COM口。

串行连接两端的设定必须相同。电源端在其菜单设置下完成。必须使用1:1的连线。

1型卡(IF-R1)的特点是它有一额外串行接口，可用来链接多台电源，以建立System Link Mode。关于更多信息请见章节„12. System Link Mode（仅针对PSI 9000）“。

> ⚠ 注意！
>
> 请勿将**IF-R1**卡的任一**RJ45**插座连到乙太网集线器或开关上，或电脑的乙太网端口！

4.1 配置RS232卡

在设置菜单下配置该接口卡。

不需在此处设置设备地址（节点），因为RS232是点对点的。为简化通讯，不关产品特定地址是多少，可使用所谓的广播地址0进入产品。

激活菜单用

M + **Communication**+ ↵

Slot : { IF-... } 根据所配卡型号而选择

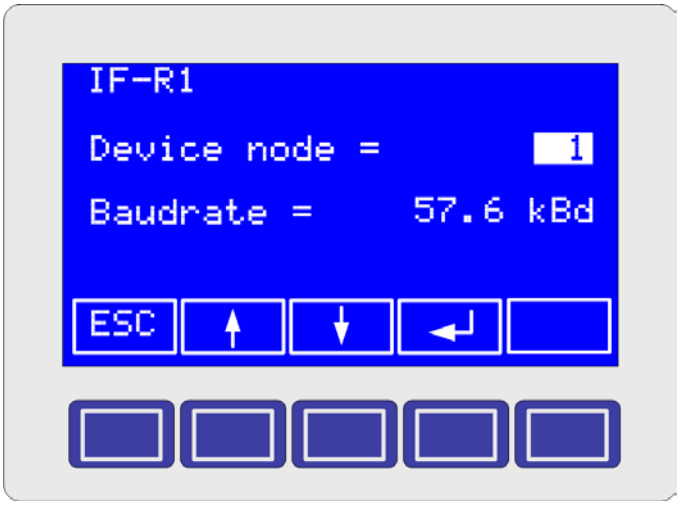
Slot A : { IF-... } 根据使用卡型号而选择

Slot B : { IF-... } 根据使用卡型号而选择

在此可设置所需产品节点，并大概了解当前安装的卡的型号。选择卡用

Slot: IF-R1 + ↵

进入该卡的配置菜单，每张卡须单独配置。接下来可设置：



◆ **device node** 默认：1

= {1..30} 选择30个产品节点中的一个

◆ **Baudrate** 默认：57.6 kBd

= {9.6 kBd, 19.2 kBd, 38.4 kBd, 57.6 kBd}

必须根据使用的线长选择波特率。建议最好是15m线长最大对应9.6 kBd。1kBd = 1000Bd。

5. USB卡 IF-U1 / IF-U2

USB接口卡与RS232卡的操作类似，但是将多台产品连到一台电脑时更容易。因为现时的电脑都有多个USB端口。或者配有USB卡的产品可经USB集线器相连。您只要用一台电脑和一个USB端口就可连接和控制任何数量（由USB规格限制）的产品。

IF-U1卡的特点是有一额外的RS485接口，可用来链接多台电PSI9000系列源，以建立System Link Mode。更多信息请见章节„12. System Link Mode（仅针对PSI 9000）“。

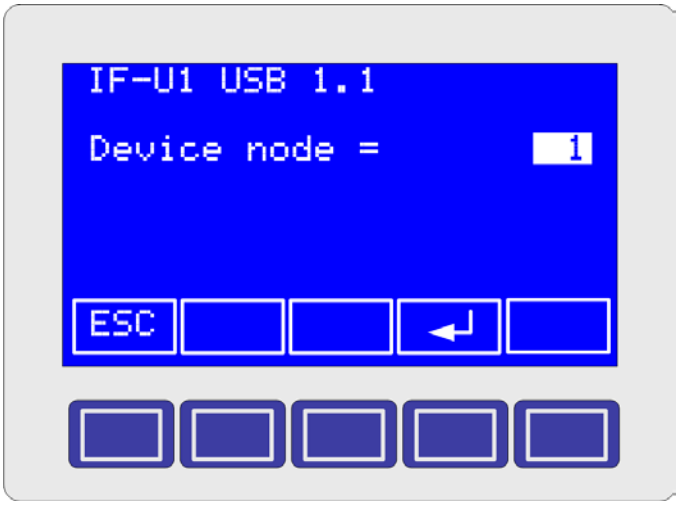
> ⚠ 注意！
>
> 请勿将任一这些端口连接到乙太网集线器或开关，或电脑的乙太网端口！

5.1 配置USB卡

在设置菜单下配置该接口卡。

不需在此处设置设备地址（节点），因为USB是点对点的。为简化通讯，不关产品特定地址是多少，可使用所谓的广播地址0进入产品。

激活菜单与4.1章节下描述的RS232卡一样。



在此可设置所需产品节点，并能大概了解当前安装的卡的型号。且不用再配置USB卡。

> ⓘ **Note**
>
> *USB驱动程序将在电脑上安装一虚拟COM端口(VCP)。如果需与其它产品进行通讯，应给该端口配置某些参数（见„13. 编程“）。*

6. CAN卡 IF-C1 / IF-C2

CAN标准：V2.0 A部分

线长：根据波特率而定。

经CAN总线的通讯，特别为测试应用和系统需求而设计，像汽车工业领域。随后理所当然地，就能将其应用于现有系统，并修改相关软件应用。

CAN产品的连网提供了快速通讯和故障安全总线拓扑的优势。CAN卡的驱动芯片可支持多达110个device nodes（产品节点用作CAN总线成员）。通讯协议可管理每个地址段（RID）上的多达30台产品。因此理论上可设置一个，由110台产品在至少4个地址段进行操作的总线系统。地址段可重定位，故不需重新配置整个系统，就能将一台或多台产品应用于现有总线。

6.1 配置CAN卡

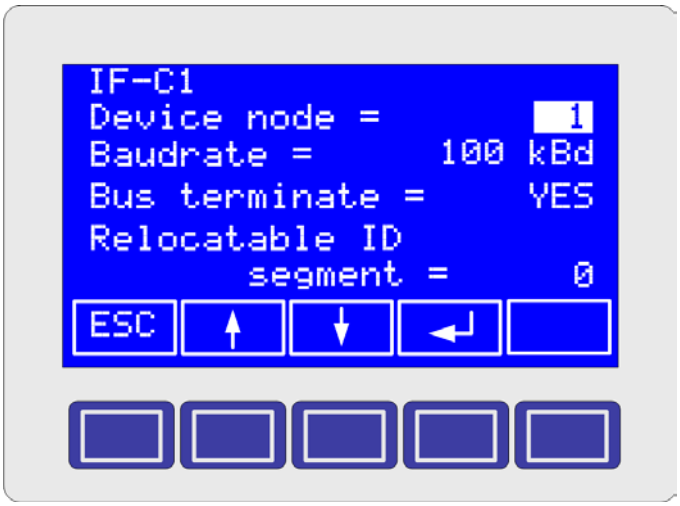
在设置菜单下配置该接口卡。

自2011年6月开始有一个新CAN ID的系统即将替代旧的ID系统。用产品软件更行可完成，硬件不受任何影响。通过设置菜单项目可识别出你产品当前应用的CAN ID系统。

选择接口卡用

Slot: IF-C1 + 

进入该特定卡的配置菜单。每张卡必须单独配置。接着可设置参数：



上图显示的是IF-C1卡“旧”CAN-ID 系统的设置，如下：

设置波特率

10kBd和1MBd之间所有普通波特率都支持。仅针对PSI 9000型号产品，可为每个波特率设定选择所谓的“Sample point”，它可优化各种线长和质量的数据传输。当一个传输位被采样时它调整该时间点。

◆ **baudrate** 默认：100 kBd

sample point: 75% (仅针对 PSI 9000系列)

= { 10 kBd { 60, 65, 70, 75, 80, 85}%,
20 kBd { 60, 65, 70, 75, 80, 85} %,
50 kBd { 60, 65, 70, 75, 80, 85} %,
100 kBd { 60, 65, 70, 75, 80, 85} %,
125 kBd { 58, 68, 70, 75, 81, 87} %,
250 kBd { 58, 68, 70, 75, 81, 87} %,
500 kBd { 58, 66, 75, 83} %,
1 MBd { 58, 66, 75, 83} % }

总线终端

CAN总线要求在连线的两尾端接一120Ω终端电阻。如果产品位于总线末端，且无其它产品连接，必须给它设终端。可用“bus terminate”参数可轻易地设定一终端，且不用跳线设定间接的硬件终端。

◆ **bus terminate** 默认：NO

= YES 总线用120Ω电阻来设定终端。

= NO 无终端。

网关功能（仅针对PSI9000系列）

◆ **CAN=** 默认：Client

= Client 产品由外置设备如电脑或SPS监控和控制。

= Gateway 接口卡可额外当CAN和RS232/USB卡间的网关用。

被指定作网关（这儿指：PSI 9000）用，装于产品内部的RS232或USB卡，允许用户控制和监控，通过CAN链接到该特定产品上的所有产品。我们只需另外一个接口卡IF-R1或IF-U1来设置一个CAN总线系统即可。RS232和USB这两种卡只能部分利用CAN总线的高性能。若想让很多产品充分使用CAN总线，建议通过CAN主机硬件直接控制总线。

6.2 CAN IDs

6.2.1 旧CAN ID系统

绝对有需要为每一台连接的产品选择和设定以唯一的产品地址，也被称为„device node“。只有这样才可正确识别和控制产品。这些识别符就是用来访问产品用。

重定位地址段

如果产品插上了卡，且在现有CAN总线系统内操作，可用“relocatable identifier segment”（简称为RID）重定位地址段，以便将新产品的地址适应之前产品的地址范围，或将之设在该范围外，从而不产生冲突。

V2.0a标准下的CAN总线定义一个11位的长地址（=标识符）。从而总共形成2048个标识符，从中可选择2032个。这2048个标识符被分为64位地址的32个地址段。起始地址由**RID**决定。

◆ **relocatable ID** 默认：0

segment = { 0..31} 选择（重定位）地址范围

每个地址段内有62个自由分配地址，但是30台产品只使用较低的范围，每台产品从2...61之间选取2个实际地址（每个标识符对应发送和查询的数据）。每个地址范围的0和1被保留，作为广播消息用。从而产生32*2个广播地址。

broadcast消息地址是静态的：

[RID*64 + 0] 和 [RID*64 + 1].

举例：RID为5时（也可看产品的设置菜单），广播被发送给该地址范围内的所有产品。因此标识符按5*64 = 320 = 0x140或0x141计算，用来查询。

Singlecast-消息的每个“device node”占据两个地址：

[RID*64 + device node * 2] 和

[RID*64 + device node * 2 + 1]

举例：RID为13时，产品地址（节点）为12。要发送一消息给产品，标识符必须为：13*64 + 12*2 = 856 (0x358)。而用标识符857 (0x359)来查询。

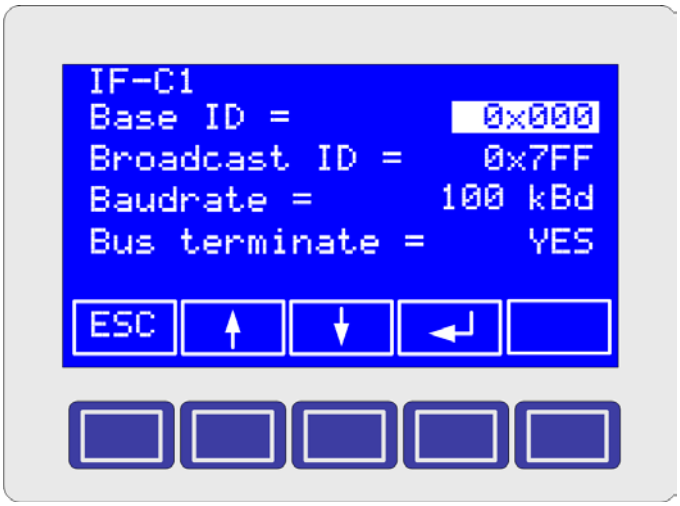
6.2.2 自2011年6月开始新的CAN ID 系统

新的CAN ID系统首先针对PS 8000和EL3000/EL9000系列产品，PSI 8000系列也会陆续使用。按客户需求也可适用于其他系列。

操作该系统要求设定一基本CAN ID。这将决定产品上使用的三个CAN ID。另外一个ID，广播ID如果不用可以忽略，不要跟其它标准ID有冲突。

关于PS 8000电源的设定请参考该产品操作说明书。

对于一台PSI 8000产品，其CAN设置如下：



◆ **Base ID** 默认：0x000

基本ID分4步调节成十六进制值。产品使用三个CAN ID普通：基本ID，基本ID + 1和基本ID + 2。

这个系统与Vector软件如CANoe或CANalyzer兼容。随附接口卡的光碟上有一*.dbc格式的数据库，也可向制造商申请获取。每一台产品都要求有一唯一的数据库。还提供可上载到产品上作测试用的样板配置。

◆ **Broadcast ID** 默认：0x7FF

这个ID以十六进制值调节所谓的ID广播。它不可与产品上任何一个其它ID相冲突。

广播ID的目的是将同一总线上多台产品的该值调节成同一值，从而一次性将指令发送给所有产品。给多台产品同步设置电流或输出状态时可能要用到。

这个仅能用来发送设定值或状态，不能询问状态或类似。

其它设定在6.2.1章节中有描述。

7. 模拟卡 IF-A1

7.1 模拟接口各引脚分布说明(25芯D-Sub插座)

引脚	名称	功能	描述	默认水平[5]	电气规格
1	AI1	PSEL / RSEL [6]	模拟输入脚：设定电力值 / 模拟输入脚：设定电阻值 [6]	0..10V对应0..100%的P_{nom} / 0..10V对应0..100%的R_{max} [6]	精确度典型值@0...10V< 0.1%[1] 输入阻抗R_i > 25k
2	AI3	CSEL	模拟输入脚：设定电流值	0..10V对应0..100%的I_{nom}	
3	AI2	VSEL	模拟输入脚：设定电压	0..10V对应0..100%的U_{nom}	
4	AO3	PMON	模拟输出脚：实际功率	0..10V对应0..100%的P_{nom}	精确度典型值< 0.1%[1]，当I_{max} = +2mA[4]时 短路保护对GND
5	AO1	VMON	模拟输出脚：实际电压	0..10V对应0..100%的U_{nom}	
6	AO2	CMON	模拟输出脚：实际电流	0…10V对应0..100%的I_{nom}	
7	DO1	CV	数字输出脚：恒压操作	CV激活 = Low CV未激活= High	带上拉电阻的准开路集电极对VCC I_{max} = -10mA[4]，当U_{low}= 0.3V时 U_{max} = 0...30V 短路保护对GND Receiver: U_{low} < 1V; U_{high} > 4V)
8	DO2	OVP	数字输出脚：过压保护激活	OVP = High 无OVP = Low	
9	DO3	OT	数字输出脚：过温错误	OT = HIGH 无OT = Low	
10	DO4	Mains	数字输出脚：市电OK	市电正常 = Low 市电不正常 = High	
11	DO5	Standby	数字输出脚：输出关闭	输出关闭 = Low 输出打开 = High	
12	DO6	CC	数字输出脚：恒流操作„CC“	CC激活 = Low CC未激活 = High	
13	DO7	CP	数字输出脚：恒功率操作„CP“	CP激活 = Low CP未激活 = High	
14		AGND SEL[2]	模拟输入脚的参考电位		SEL信号参考电位
15 16		AGND[2]	模拟输出脚的参考电位		MON信号和REF参考电位
17		N.C.			
18	AO0	VREF	模拟输出脚： 参考电压	10V	精确度典型值< 0.1%[1], I_{max} = + 8mA[4] 短路保护对GND
19		+VCC	辅助电压 (参考：DGND)	12V…16V	I_{max} = +50mA[4] 短路保护对DGND
20 21		DGND[2]	数字端口的参考电位		+VCC，控制和通知信号参考电压
22	DI1	SEL-enable	数字输入脚： 转为外部接口 （除非：本地操作）	“默认水平”通过跳线设为“H(igh)”，标准激活： SEL-打开 = Low SEL-关闭 = High	预设输入水平 (高/低范围):[3] 1) U_{Low} = < 1V ; U_{High} = > 4V 或 2) U_{Low} = < 5V ; U_{High} = > 9V 如果输入未连接，预设逻辑水平： 开= High水平或Low水平
23	DI2	Rem-SB	数字输入脚： 输出关闭	“默认水平”通过跳线设为“H(igh)”，标准激活： REM-SB打开 = Low REM-SB关闭 = High	
24		保留			
25		N.C.			

1) 该输入范围可调。使用0...10V以外的范围时，精确度会按比例减小。例如，0...5V对应0...100%，则精确度只有，如此类推。

2) AGND和DGND内部相连。AGND SEL-14管脚是独立的。它给所有模拟输入管脚的不同放大器作参考。
DIx，DOx，+Vcc以DGND为参考。VREF，VMON，CMON，PMON以AGND为参考。VSEL，CSEL和PSEL以AGND SEL为参考。

3) 根据跳线进行的预设，数字输入脚：
a) 设在High范围 (高极限): U_{in} = 0V; I = -1.5mA, U_{in} = 12V; I = +0.7mA; U_{in} = 24V; I = +4.5mA, 极限： U_{Low} = < 5V; U_{High} = > 9V
b) 设在Low范围 (低极限): U_{in}= 0V; I = -1.5mA, U_{in} = 12V; I = 2.2mA, U_{in} = 24V; I = +6mA, 极限： U_{Low} = < 1V; U_{High} = > 4V

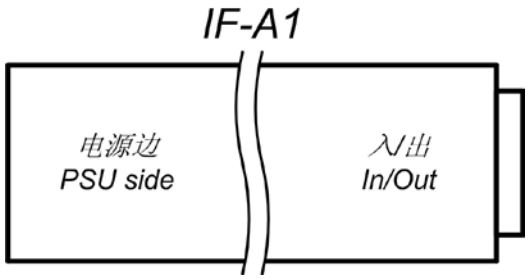
4) 正向电流从产品流出，反响电流则流进产品。

5) 对于某些系列产品，用户可在设备设置菜单下可以/能够更改标准水平

6) RSEL仅在PSI 9000系列产品上远程受控（一般要求在产品上先解锁“内阻”选项）

7.2 一般信息

DIF-1接口为模拟接口，具有电绝缘、且可自定义的模拟和数字输入与输出端。呈现如下：



可自定义是指，可按照需求定制输入和输出端，但始终在0...10V电压范围之内。具有两插卡槽的产品，可结合IF-A1卡和数字接口卡（如：IF-U1 (USB)），用USB控制产品，经模拟卡的模拟输出端输出实际值。或者用模拟设定值控制产品，经RS232，CAN或USB读出和记录实际值。

一般应用：所有监控和检测功能都永久打开，即使装有两接口卡（一张数字卡，一张模拟卡）。只有用设定值控制产品时才要求打开外部模式（IF-A1）或远程模式（数字接口）。**但是远程模式（由数字接口卡控制）会优先**。如果产品正由模拟接口控制（外部模式，以💻**extern**在显示器上指示），而又激活了数字接口，产品将会转到远程模式（以💻**remote**在显示器上指示）。

7.3 配置IF-A1

在通讯菜单下配置该接口：

M + **Communication**+ ↵ 以及

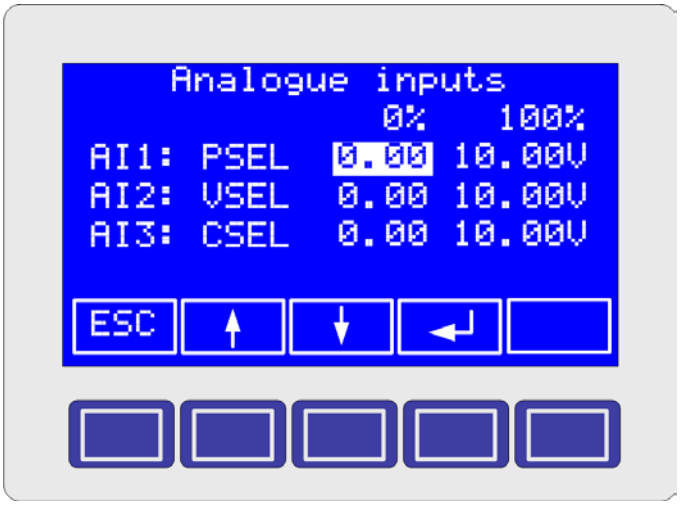
Slot {A|B}: IF-A1 + ↵

选择模拟接口卡进行配置。可进行下列参数设置：

7.3.1 模拟输入脚

只有当产品在外部模式（以💻**extern**在显示器上指示）下才接受模拟设定值。

模拟接口卡由三个模拟输入脚，其特点为：



AI1: **PSEL**（功率外部设定值）

AI3: **CSEL**（电流外部设定值）

AI2: **VSEL**（电压外部设定值）

该输入脚的额定电压范围为0...10V，但是可以缩小，以便适用于输入信号。电压范围限制到一更小值，分辨率也会更低。例如：若将电压范围设为仅1V的差距，分辨率和精确度将按10的因数减小。

左边值定义0%输出值（U，I，P）的输入电压，右边值则定义100%输出值的输入电压，不同系列间的菜单会有一些不同。

7.3.1.1 PSI 9000系列

适用于：

U_{min} （左边值）= { 0.00V... 4.00V }
U_{max} （右边值）= { 5.00V... 10.00V }

高于或低于定义值的电压会被切掉，要么被看作0%，或者100%。

菜单项：

◆**{Nom.value | Adj.limits}** 默认：Nom.value

= Nom.value VSEL，CSEL和PSEL的定义值范围始终与产品的额定值相关（见下面解释）

= Adj.limits VSEL，CSEL和PSEL的定义值范围始终与产品的调节值相关（见下面解释）

◆**AI1** 默认：PSEL 0.00 10.00V

= {PSEL | RSEL| -} 默认作为功率或阻抗或者不用外部设定值引脚

RSEL只有在V/I/R模式解锁后才出现。

如果AI1设为“-”，则不需功率设定值。于是输出功率将保留为最后调节值。

◆**AI2** 默认：0.00 10.00V

= VSEL 电压外部设定值

◆**AI3** 默认：0.00 10.00V

= CSEL 电流外部设定值

Nom.value释义

通过该设置，三个设定值输入脚的输入电压范围与产品对应的额定值（U，I或P）相关。

举例：一台PSI 9080-100，其额定值为80V，100A和3000W。如果将模拟输入脚对应0...100%调节为0...10V。如果供应给输入脚的电压为10V，则产品将输出100%或者80V的电压。假如该范围设为3...7V，则只需供应7V输入电压即能输出100%或者80V的输出电压。该规则同样适用于其它设定值输入脚。

> **提示**
>
> *输出电压、电流和功率的最大值还可由调节极限来限定。产品的用户指导说明中，菜单项“配置文件 -> 基本设定 -> 调节极限”有更详细说明。*

Adj.limits释义

通过该设置，三个设定值输入脚的输入电压范围与在产品用户配置文档下定义的调节值（U，I或P）相关。

举例：一台PSI 9080-100，其额定值为80V，100A和3000W。在产品配置文档的“调节极限”菜单下，输出电流设为50A，以阻止产品输出高于50A的电流。如果将三个模拟输入脚对应0...100%调节为0...5V。供应8V输入电压给VSEL脚后，产品将输出100%或者80V的输出电压；供应8V输入电压给PSEL脚后，产品将输出100%或者3000W的输出功率；但是若供应8V电压给CSEL输入脚，仅能输出50A电流。若供应4V电压给CSEL输入脚，输出电流最大为25A。

7.3.1.2 PSI 8000系列

提示

PSI 8000后缀带T，DT，2U或3U的系列产品有一特征：内置一模拟接口。在菜单下有一项为“模拟接口”，它与下面描述的可插拔式接口卡IF-A1无关！

注意：

它适用于：

U_{min} (left value) = { 0.00V...4.00V }
U_{max} (right value) = { 5.00V...10.00V }

电压调节范围，如：2.00V...8.00V，对应0...100%的设定值。高于或低于该范围的电压值被切掉，要么被看作0%，或者100%。也可参考上面“关于额定值的释义”，因为PSI 8000系列也包含该章节描述的功能。

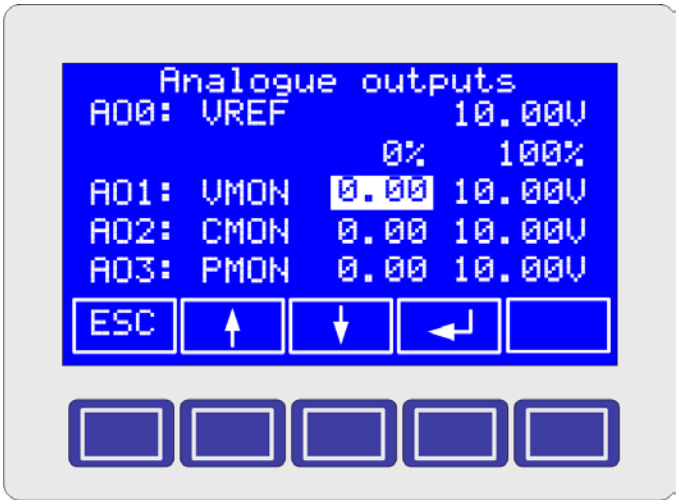
菜单项：

◆**AI1** 默认：PSEL 0.00 10.00V
= {PSEL} 功率/内阻外部设定值
◆**AI2** 默认：0.00 10.00V
= VSEL 电压外部设定值
◆**AI3** 默认：0.00 10.00V
= CSEL 电流外部设定值

提示

输出电压、电流和功率的最大值还可由调节极限来限定。产品的用户指导说明中，菜单项“配置文件 -> 基本设定 -> 调节极限”有更详细说明。

7.3.2 模拟输出脚



实际输出电压、电流和功率从模拟输出管脚送出。可按客户需求来分配输出电压。第一个值代表U_{min}（最小输出电压，0%），第二个为U_{max}（最大输出电压，100%）。它适用：

U_{min} = {0.00V...4.00V}
U_{max} = {5.00V...10.00V}

将0...10V的标准电压范围限制至一较低值，分辨率也会降低。例如：若将电压范围设为U_{max}和U_{min}差距为1V的数值，分辨率和精确度将按10的系数减少。

参考电压例外。可将它设为1V和10V之间的数值。

◆**AO0** 默认：10.00V
= Vref {1V.. 10V}范围内的可调参考电压
◆**AO1** 默认：0.00V 10.00V
= Vmon 监控（实际）输出电压
◆**AO2** 默认：0.00V 10.00V
= Cmon 监控（实际）输出电流
◆**AO3** 默认：0.00V 10.00V
= Pmon 监控（实际）输出功率

下列附加设置仅针对PSI 9000系列产品：

◆**{Nom.value | Adj.limits}** 默认：Nom.value
= Nom.value Vmon，Cmon和Pmon的定义值范围始终与产品的额定值相关（见上面章节“关于Nom.value的释义”）
= Adj.limits Vmon，Cmon和Pmon的定义值范围始终与产品的调节值相关（见上面章节“关于Adj.limits的释义”）

提示

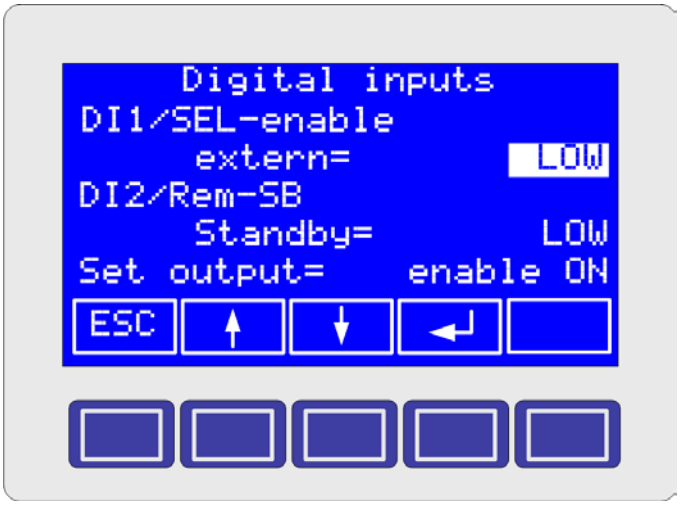
建议将PSI 9000系列产品模拟输入河输出脚的额定值/调节极限“设定设为相同值。

提示

输出电压、电流和功率的最大值还可由调节极限来限定。产品的用户指导说明中，菜单项“配置文件 -> 基本设定 -> 调节极限”有更详细说明。

7.3.3 数字输入脚

IF-A1接口卡有两个可参数化数字输入脚DI1和DI2。



◆DI1/SEL_enable 默认：LOW

external

= LOW 由IF-A1卡外部控制的产品为低态动作。如果默认逻辑电平通过PCB上的跳线设为LOW，只要打开产品，外部控制立即激活。

= HIGH 由IF-A1卡外部控制的产品为高态动作。

外部控制激活后，可通过VSEL，CSEL和/或PSEL输入脚控制电源。始终输出状态信号和模拟实际值。

DI2/Rem-SB输入脚

用该输出脚可打开和关闭电源输出，启动或阻止电源输出。根据Set output设定，DI2/Rem-SB输入脚决定输出在外部模式（通过模拟接口）或远程模式（通过数字接口）下受控，或者需要通过**ON**/**OFF**按键来启动。启动信息以**auto ON**于显示器上指示出来。利用专属打开/关闭设定，电源输出可直接由DI2/Rem-SB输入脚控制。注意！不可用前坂的**ON**/**OFF**键或数字接口卡(下面的例外：如果产品在“local”模式，则忽略输入脚的功能）的指令中断。

◆DI2/Rem-SB

Set output 默认：enable ON

= enable ON 必须用**ON**/**OFF**键启动输入。

= exclusive 只能通过DI2/Rem-SB输入脚打开和关闭电源输出

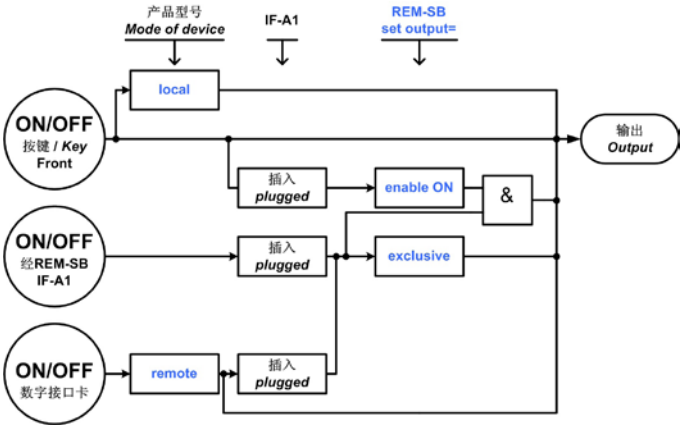
使用enable ON设定时，需至少启动输出一次。通过Power ON = restore设定（见产品配置菜单），如果停电前已启动该设定，停电恢复后会自动启动电源输出。然后可按正常操作打开或关闭。

Standby 默认：LOW

= LOW 输入为低态动作，待机用小于1V或5V的电压激活（根据跳线设定）

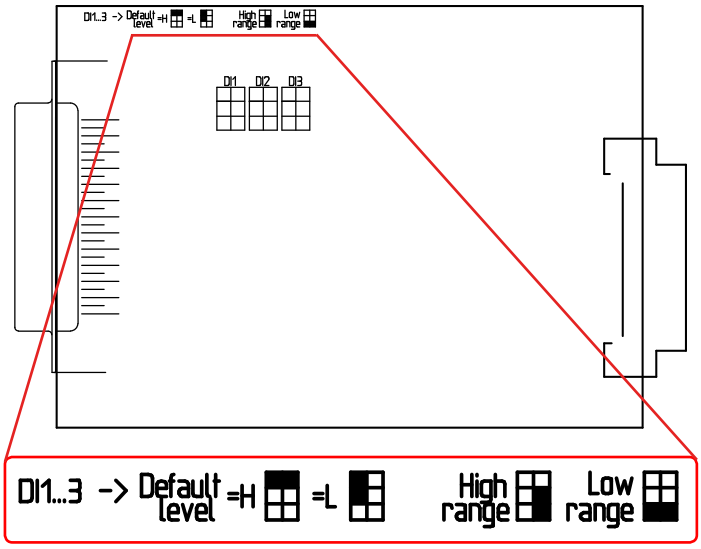
= HIGH 输入为高态动作，待机用>4V或>9V的电压激活（根据跳线设定）

下图显示产品输出打开或关闭时本地、远程和外部模式下各种状态和条件的链接：



DI1-3跳线设定

PCB上的DI1-3跳线预设这些输入脚的物理行为。“Default level”选择键定义对应输入脚的默认逻辑电平。意思是，如果默认逻辑电平设为High，必须通过工具（如：继电器）将外部将输入脚拉至Low，以改变逻辑电平。要注意默认逻辑电平，因为它定义电源**SEL_enable**和**Rem-SB**控制信号的运作。



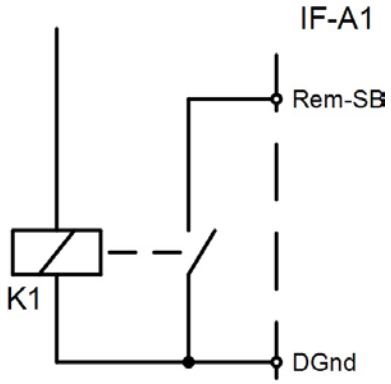
Default level 定义输入脚未连接时的逻辑电平。

High range为输入脚选择高输入电压范围。“High”值为>9V，“Low”值为<5V。

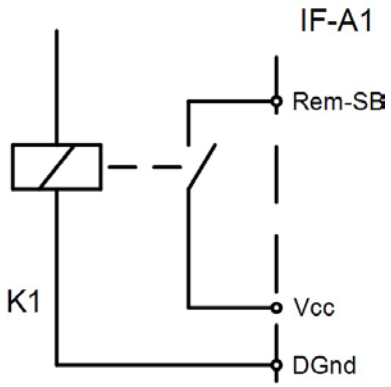
Low range为输入脚选择低输入电压范围。“High”值为>4V，“Low”值为<1V。

举例：输入脚**DI2/Rem-SB**，可打开和关闭（待机）电源输出，也可根据设置菜单里的配置用LOW或HIGH激活。为使用该输入脚单独控制产品输出，建议选择Set output = exclusive ON设定。

例1：通过继电器（带接点装置）可将输入拉至GND，然后关闭电源输出。因此需将的跳线配置为“Default level = H”，并利用Standby = LOW和Set output = enable ON设定。于是通过继电器可转换电源输出状态。



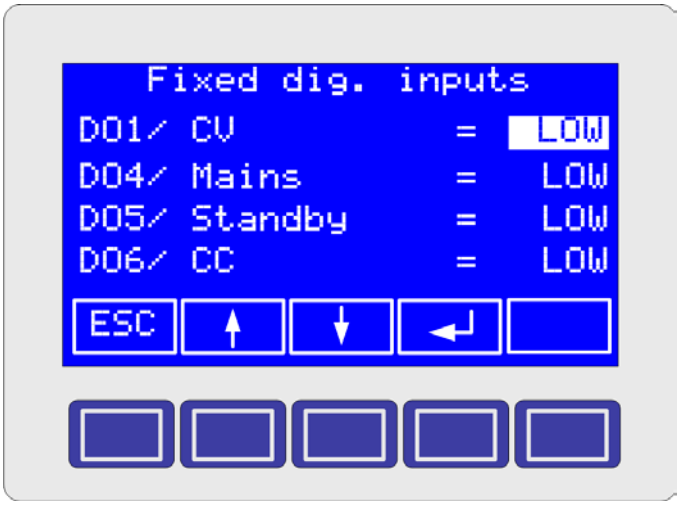
例2：利用应急电路也可关断输出。需要设定DI2的跳线为“Default level =L”，并利用设定Standby = HIGH。下面例子为带接点装置的继电器连到了Vcc。



当然还有很多其它各种结合应用。

7.3.4 带决定功能的数字输出脚

数字输出脚DO1，DO4，DO5和DO6不能由用户定义，但是他们可转换逻辑输出电平。



◆DO1/CV 默认： LOW

= { LOW | HIGH }

若选择LOW，只要电源调整模式由设定电压（CV操作）确定，输出就拉至GND。若选择HIGH，输出拉至12...15V。

◆DO4/Mains OK 默认： LOW

= { LOW | HIGH }

若选择LOW，只要接通市电，输出即拉至GND。若选择HIGH，输出拉至12...15V。

◆DO5/Standby 默认： LOW

= { LOW | HIGH }

若选择LOW，只要关闭（待机）电源输出，输出即拉至GND。若选择HIGH，输出拉至12...15V。

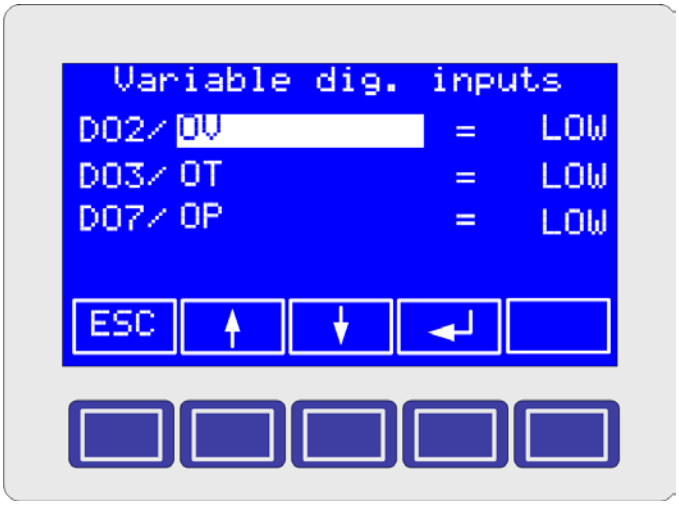
◆DO6/CC 默认： LOW

= { LOW | HIGH }

若选择LOW，只要电源调整模式由设定电流（CC操作）确定，输出就拉至GND。若选择HIGH，输出拉至12...15V。

7.3.5 带用户定义功能的数字输出脚

可按需求配置数字输出脚DO2，DO3和DO7，且转换逻辑电平。



◆DO2 默认： OVP LOW
◆DO3 默认： OT LOW
◆DO7 默认： CP LOW

触发/指示时定义逻辑级别：

= LOW 一旦选定的功能被激活，输出会被拉至GND。如果状态不真实，逻辑级别被反转。

= HIGH 一旦选定的功能被激活，输出会被拉至+15V。如果状态不真实，逻辑级别被反转。

可将下列功能指定给每一个输出脚：

= remote	指示电源经数字接口卡远程受控。
= OT	指示过温错误。
= CP	指示电源通过设定功率（CP操作）调整
= Alarm	指示出现报警。电源输出自动关闭，通过该输出脚指示报警。
= trip U	超过U>和/或U<极限（见产品说明书）而触发。
= trip I	超过I>和/或I<极限（见产品说明书）而触发。

PSI 8000系列产品还有如下：

= trip U+I	超过U>，U<，I>和/或I<极限（见产品说明书）而触发。
= trip Dyn	由阶跃反应函数触发（见产品说明书）
= Fct. runs	由运行函数发信号提示（见产品说明书）
= Fct. end	由停止函数发信号提示（见产品说明书）
= new Fct.	当函数设定为开始时以信号提示（见产品说明书）
= disable	不向特定状态发送信号，根据设定引脚可以为LOW或HIGH。

8. GPIB卡 IF-G1

IF-G1接口卡提供一符合IEEE 488.1/2规格的，标准数字接口(GPIB)。其安装描述于随附包装的简短安装指引上。

提示

若要在PSI 9000系列产品上使用第二张卡，IF-G1卡只能与模拟卡IF-A1或数字卡IF-R1和IF-U1结合使用。不可与CAN接口卡IF-C1或以太网卡IF-E1B一同使用！见章节3.3。

8.1 经GPIB控制产品

原则上，该卡进入和控制产品的步骤与其他数字卡一样。一旦GPIB卡连到PC并进行了配置，即可查询产品状态和实际值。控制产品，如设定输入/输出，或发送设定值，需要激活远程控制模式。它不会自动发生。在另外的说明书内描述了相关指令。

提示

利用GPIB卡只能最多链接15台客户端设备到一个总线上！

8.2 术语解释

GPIB	通用接口总线
IEEE60488.1	使GPIB接口符合主机标准（更早同义词：IEC总线，IEC 625总线，ANSI标准MC1.1)
SCPI	可编程仪器标准指令=>与仪器、测量设备等通讯用的标准化指令。

8.3 固件更新

包装内含有一条用来给芯片固件更新用的排线。做更新时，将排线插到PCB的X5上，再将卡小心地插入产品内，利用“零调制解调器”型9芯Sub-D连线（不含在产品清单内），将Sub-D插头插到电脑上。另外可从供货商网站上下载或向他们索取更新工具。

8.4 传输和执行时间

SCPI协议需转化为内部协议，因此需耗费一定时间。

协议转化时间和产品内部芯片的执行时间根据指令而定，并要加上传输时间。典型值为：

协议转化用时T_P: 2ms

传输至内部芯片用时$T_{T,MC}$: 0.5ms

内部芯片执行用时$T_{E,MC}$: 2ms

若主机电脑正等待回应，根据发送的指令，回应总需时为：

$$T_{Request} = T_{T,GPIB} + T_P + T_{T,MC} + T_{E,MC}$$
$$T_{Response} = +T_{T,MC} + 0{,}2 \bullet T_P + T_{T,GPIB}$$

GPIB总线传输时间T_{GPIB}极短，一般为200µs。建议输入指令的间隔时间要>30ms。短于这个时间可能会引起执行错误。

8.5 配置IF-G1卡

在设置菜单下配置该卡。

提示：必须为连接到同一电脑上的每一台设备选择独一的“device node”（=地址）。这样才可正确识别产品并寻址。进入设置菜单用：

M + Communication + ↵ 与

Slot: IF-G1 + ↵

此处可设置产品节点，并对插入的接口卡进行大致了解。

提示：

提示

*若在未重启产品时更改设定，将被要求发送*RST指令，以便提交新设定值。*

注意！

用于PSI 9000电源系列上且固件版本为3.04以下的，以及EL3000/9000负载系列上且固件版本为2.11以下，接口卡不会被正确识别。请联系供货商咨询详情。

9. 乙太网卡IF-E1B

注意!

于2011年6月始，只有新款IF-E1B卡具有本章节描述的下列特性功能，非旧款IF-E1/IF-E2卡。

以太网或网络卡可将产品直接连到主机，或通过以太网集线器/开关连接。根据连接类型不同，可选用网线或交叉线。带RJ45插座的以太网接口不可配置，故它只在自动模式下工作，可检测10或100 MBit的连接速度。即将应用的速度通过主机的设定或网络硬件定义。

提示

太网的连接速度(10Mbit或100MBit)不同于与产品通讯时的通讯速度。这个速度在内部设为100kBit，从而产生一定的反馈和执行时间。也可参考章节„8.4 传输和执行时间“和„2. 技术规格“章节下的技术规格。

9.1 操作前的准备/注意事项

操作以太网卡前或者期间，需先考虑下列几项：

- 只要产品上使用了网卡，网线必须一直连接着。
- 如果在产品设置菜单下修改了网络设定（仅某些产品方可执行此操作），则仅当产品关闭并重新开启后方有效。
- 如果在设备网站上更改了网络设定，并提交了，则立即生效。
- 直接与产品通讯的TCP/IP端口仅能通过设备网站进行设置，且永久保存在以太网卡上，与网络参数相反，它存储于产品内部。
- 经TCP/IP与产品通讯时，需关闭网站，因为网站会与以太网卡产生额外的拥堵，从而带来干扰。
- RJ45端口上的指示灯不工作，以确保绝缘隔离。
- 从产品发出的SCPI消息含有一个以字符串表示的结束符0xA (10) 。
- 固件版本<2.10的接口卡有一个默认特性，叫DHCP。如果网络中DHCP已被激活，那么DHCP服务器将自动给以太网端口指定一个不同的IP/网关，于是设备下的网络设定被忽略。新的IP是未知的，在没有其它工具的情况下则不能访问该接口卡。

9.2 配置以太网卡

9.2.1 在产品上

提示

产品上的网络配置参数只存在于PSI电源系列产品上。如果您的产品非PSI系列，请跳到9.2.2章节。

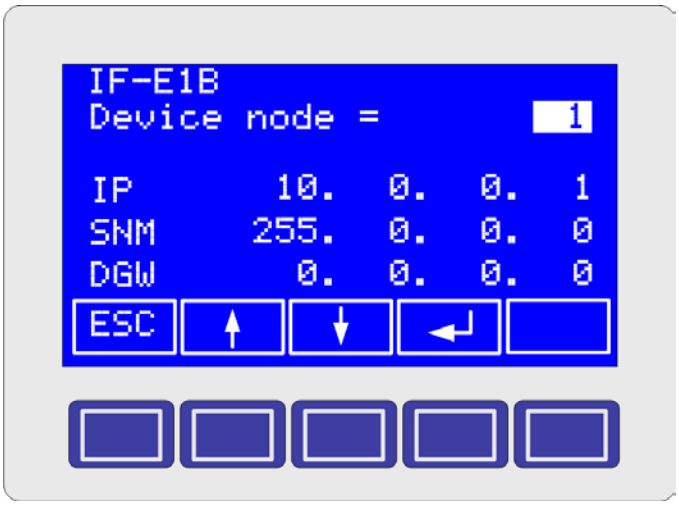
关闭产品，将接口卡插入指定插槽内，然后再次打开产品。在设置菜单下配置连接参数：

M + Communication + ↵

选择接口卡用

Slot: IF-E1B + ↵

进入配置菜单，然后就可设置网络参数：



IP: IP地址

SNM: 子网掩码

GW: 网关

用控制面板上的箭头按钮选择即将更改的数值，用左旋钮进行调节，对于PSI 800 R产品，则用„+“和„-“按钮调节。

PSI 8000系列的旋钮有个推动按钮，用它可在粗调和精调间转换。

注意!

关于网络拓扑和设置的一般规则和规定在这都适用。错误的设定会导致网络问题和无法连接到产品上。

9.2.2 用IP-Config-Tool工具

对于不能在产品上直接配置网络参数的系列产品，可通过网卡上的USB端口，利用随附光碟上的“IP-Config Tool”工具（在\软件文件夹下）配置这些参数，或从我公司网站上下载。这需用到随附的USB线。

使用IP-Config前，确保以太网卡上的跳线调到NORM位置。

注意要正确安装驱动程序，且IP-Config能够检测到产品。选择产品，点击READ按钮，读取产品上的历史参数，用WRITE按钮编辑数值，并将它们永久写入产品内。

在激活新参数前，需将产品完全关闭（用电源开关关闭），然后再打开才行。

9.2.3 产品网址

为了改变产品上的网站IP地址，请执行如下操作：

1. 通过电缆连接线将以太网卡连到电脑上，然后用浏览器(Chrome, Firefox, IE)进入当前IP。如遇接口卡在之前没有设定特定IP，则默认IP为10.0.0.1。
2. 浏览器应可打开网址。在CONFIG页面下，若未使用DHCP，可输入新的网络参数如IP，SUBNET MASK，GATEWAY和PORT。否则可忽略这些。
3. 如果默认值不可用，则更改TCP端口。
4. 如果有需要，可激活DHCP。只要设定一被提交，意外网卡重启，然后试图连接到网络中的DHCP服务器。如果已找到服务器，可给接口卡赋予新的网络设定。如未找到服务器，接口卡可使用经网络赋予的或存储于产品内部的网络参数。
5. 用SUBMIT按钮将更改写入到产品/以太网卡上。

新的网络参数会被立即激活，且以太网卡会在几秒钟后重启，并可再次访问接口卡或网址。

提示

„Port“设定默认为1001，用于TCP/IP通讯，从而控制产品。要访问与网站浏览器，需恢复使用端口80。

9.3 与产品通讯

基本信息

经用户可选端口，利用TCP/IP协议执行与产品的通讯。默认端口为1001。该端口仅能经过产品网址更改，更多详情见章节9.2.3. 另外还供下面几个端口：

过几个特别配给路由器或防火墙用的端口。它们是：

端口80：HTTP

端口0-65535，除80外：TCP/IP

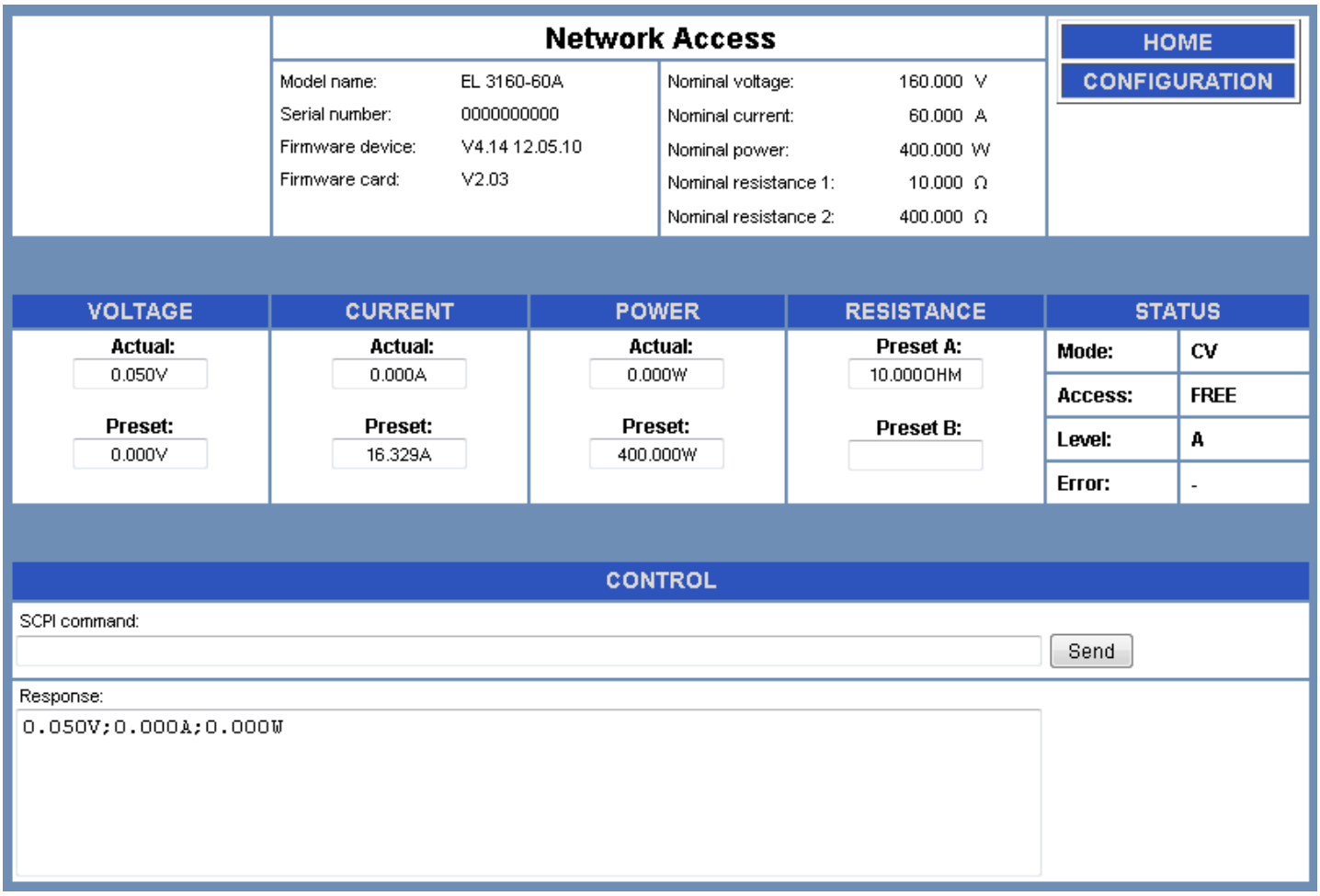
9.3.1 利用HTTP通讯

网卡的特点是它可当HTTP服务器用。通过网络浏览器查询产品IP地址时，会出现一图形用户界面，它会显示一些产品信息，如：产品型号，额定值，实际值和设定值。该网址可用来遥控产品，以及配置网络设定。

利用SCPI指令完成远程控制。指令集在另外的用户手册中有描述。可参考章节„13. 编程“了解大概情况。可将这些普通ASCII字符串样的指令输入指令行，然后点击SEND健或RETURN按钮发送。命令行下的错误和反馈信息框将报告错误，并显示所需值。

注意事项和要求：

- 要求启用Javascript刷新和显示内容
- 刷新间隔时间（数值，状态）：200ms
- 可以小写输入SCPI指令
- 网站允许端口选择进行TCP/IP通讯



IF-Ex: 产品网站（主页）上大概显示有：产品、设定值、实际值、状态和一指令栏

9.3.2 利用LabView通讯

LabView软件一般默认为VIs版，经TCP/IP (VISA)可进行接口通讯。请根据相关的操作说明使用。也可从网上获取更多信息。随附于产品的CD/上也有一套LabView VIs软件，经以太网可简化产品的远程控制。

9.3.3 利用其它程序语言通讯

用户须用TCP/IP协议创建合适的通讯，以便像传输正确的ASCII字符串一样将SCPI指令传到产品上。基于操作系统和编程语言的不同，且无链接库(DLL)或编码实例。

关于socket的连接，仅需用到目标产品的IP和端口。此端口参数仅能经产品网址进行更改，且保存于接口卡上。

只要产品继续在通讯，就允许打开socket连接。也可永久关闭和打开socket连接，只是需更多时间进行该项操作而已。

9.3.4 利用USB端口通讯

以太网还有另外一接口，A型USB端口。该端口与IF-U1 USB卡的操作一样。请见章节5。

使用USB端口时，需遵照如下：

- 无SCPI指令，无TCP/IP，无HTTP，无网站
- 传输速度设为57600 波特
- 需要USB驱动
- 通过面向对象通讯协议和相应的LabView VIs软件，利用LabView和其他语言进行通讯（见章节7.）。

9.4 固件更新

这个额外的USB端口也可用来更新产品固件，或以太网卡本身。

固件更新要用到一特殊更新工具和新的固件版本，可从产品制造商处获取。

9.5 问题解答

问题：产品无反应

假如因某原因与产品的网络连接不完全或完全断掉，重新连接仍然失效，可按下接口卡上的小型重置按钮对它重设。

手动重置后，接口卡重启，并再次初始化网络连接，产品就可再次连接上。

问题：产品IP未知或被遗忘

带图形显示器的产品会于设置菜单下显示网络参数。

其它型号如PS 8000 T，不能显示IP。这需要用到CD上的„IP-Config“小工具。接线到USB端口，并将接口卡上的跳线调到NORM位置，于是该工具就可读取和写入网络配置。

问题：经其IP地址也不能访问产品产品

这可能有下面这几个可能：

1. 产品无法检测到以太网卡

如果产品不能检测到，且无法初始化以太网卡，以太网会每隔几秒钟重启一次，网络链接会一直打开并关闭。

检查您的产品...

- **EL 3000 / EL 9000**电子负载系列在显示屏上指示 „Card found: IF-E1 (Ethernet) “ (在„Setup“位置为„Level Control“开关)
- **PSI 8000**或**PSI 800 R**电源系列在„Communication“菜单下指示„Slot: IF-E1“
- **PS 8000**电源系列在设置模式下指示„Device node“

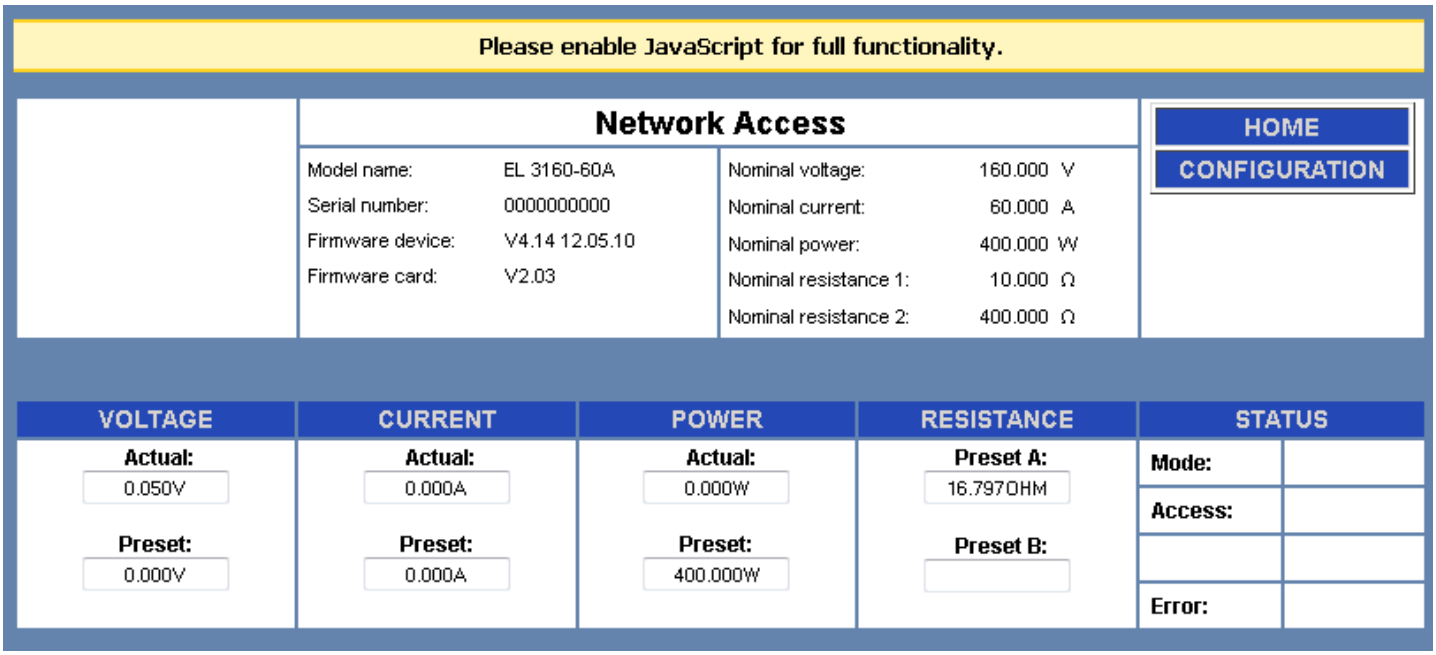
如果上述都不显示，可能插卡槽有故障，接口卡不良，或接口卡未正确安装。

2. IP产品为一不同的网络段

子网掩码定义该网络下可访问哪个本地IPs地址。赋予IF-E1B以太网的子网掩码，必须符合网络的子网掩码。您可更改子网掩码或者IP，以便用此IP再次访问设备。

3. TCP端口已关闭

IF-E1B以太网的过期时间为10分钟。再次期间如果有数据通讯，产品端的TCP端口会被关闭。



IF-Ex: Javascript错误

10. Profibus卡IF-PB1

Profibus表示“过程现场总线”，最初为欧洲汽车工程领域现场总线通信标准。

在无额外措施下，Profibus卡允许一个总线段运行多达32台设备。总线终端一般在Profibus插头上，通常由内置开关和终端电阻组成。

已配IF-PB1卡的产品会自动识别和配置该卡。在产品设置菜单（见产品用户说明手册）下，用户仅需为每台设备选择独一的Profibus地址。Profibus从机控制器也需用到该地址。一旦从机连到总线上，将会报告给主机。在控制端，通常为一台电脑，它仅需用到一GSD（类别站描述）文档，位于Profibus主机控制软件内。该文档确定一台产品的所有可操作功能。

10.1 传输速度

Profibus从机控制器的最大传输速度（12Mbit）不是与产品实际运行通信的速度。该速度内部固定为57600波特，并形成一定的执行和反应时间。也可见章节„8.4 传输和执行时间“。

10.2 设置Profibus卡

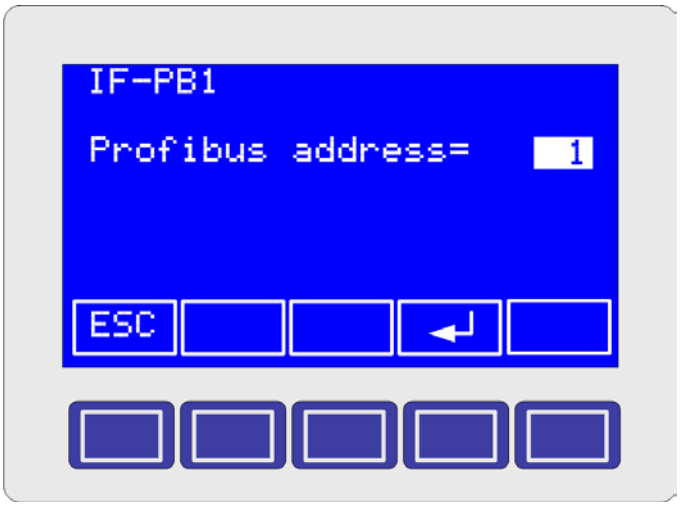
在产品设置菜单下设置该接口卡。

需为即将连到总线的每台产品选择一空置Profibus地址。

M + Communication + ↵ 和

Slot: IF-PB1 + ↵

可选择要配置的接口卡，并可更改下列参数：



◆ **Profibus** 默认：1

= {1..125}

可从125个Profibus地址中选择一个。

10.3 连接总线

通过一条典型的Profibus连线，可将产品连到总线主机或者其它产品上。这些连线要求有一内置总线终端，为可转换型或不可转换型。总线终端要求设在总线末端的产品上。

10.4 总线连接端

Profibus总线终端由设置在Profibus连接线插头上的内置可转换总线终端电阻构成。一般要求终止总线最末端的产品。

更重要的是，应遵循一个总线段上能连接的最多产品数量（IF-PB1卡为32台）），这样就不会超过总线规则定义的最小总阻值。任何Profibus产品都有内阻，与其它产品和总线终端插头平行。

10.5 控制面的执行

控制端一般为电脑，要求通过GSD或者GSE文件执行我们的产品。此文档可从存储于光碟上获取，或者从本公司网站上下载。该文本文件描述了连通Profibus后产品可实现的所有功能。

包括：

- 查询实际值 (U, I, P) DPV0
- 查询产品状态 (CC, CV etc.) DPV0
- 参数通道 DPV1

参数通道DPV1 允许：

- 查询U, I, P的设定值
- 设定U, I, P的设定值
- 设定产品状态（远程控制，输出状态）

10.6 其它特征

重设按钮

此小按钮在接口卡上，用于重设和重启悬空无反应的连接。在产品运行时短按一下，Profibus现场总线从机控制器被重新启动，并发送报告给总线主机，于是Profibus连接应再次连上。

红色LED

该LED指示Profibus是否正确连接。

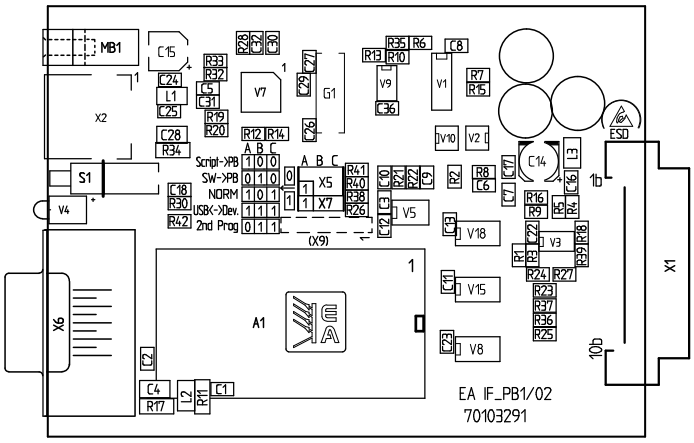
LED 灭 = Profibus连接正常

LED 亮 = 无Profibus连接或连接错误

10.7 更新固件

由于多种原因可能需要更新固件。 固件由两部分组成：由Profibus控制器硬件生产商提供的Profibus从机控制器的实际固件和用户文本。向我司发送需求，我们将提供最新的用户文本，或者可从我司网站获取。

更新固件前，需将Profibus接口卡从产品上取下，以便在接口卡上设置跳线，从而进行更新。



将A，B和C跳线（PCB中间部位）设在*NORM*位置，如PCB上小方格所示。*NORM*用101表示，其中1表示圆柱体下面的两脚相连，0则为上面的两个脚相连。对于*NORM*工位，A = 下, B = 上，C = 下的跳线设定，意思是：

Script->PB

将用户文本上载到Profibus从机控制器，如下。

SW->PB

Profibus控制器的固件更新，如下。

NORM

正常Profibus操作的设定。每次更新文本或固件时都需设定该工位。

USB<->Dev.

激活USB端口到产品的连接。于是经由该USB端口可与产品进行通信，可作为另外一种通信方式（见章节10.8）。利用它还可更新产品固件。有些系列产品具有两个微处理器，故在更新过程中需重新匹配跳线。该情况指最后工位*2nd Prog*。更新工具将引导你执行更新步骤，并请求进行必要设置。

2nd Prog

仅当更新产品固件，且仅针对具有两微处理器的PSI 8000或PSI 9000系列产品时才需进行此设置。下面为更新共组具体说明。

控制器固件

只要有需要更新控制器固件，就需用到Profibus从机控制器制造商–Deutschmann AG (www.deutschmann.de)提供的Windows软件（Firmware Download Tool--固件下载工具），以及固件文档本身。可以获取光碟形式的文档，最新版本只能从Deutschmann网站下载。通过设定跳线*SW->PB*，然后经USB端口完成更新。

用户文本

更新用户文本时，也需用到Profibus从机控制器制造商–Deutschmann AG (www.deutschmann.de)提供的Windows软件（WinGate）。可以获取光碟形式的文档，最新版本只能从Deutschmann网站下载。

我们随时都能提供文本，可以为光碟形式，或者也可从我司网站下载。通过设定跳线*Script->PB*，然后经USB端口完成更新。

10.8 经USB端口通讯

该USB端口还可用来给作通讯用，从而通过不同的协议或无Profibus时访问产品。该操作需要再接口板上装些跳线，如10.7章节中所描述的方式安装。

只要产品连接到电脑，Windows下一般都有USB端口。跳线只是在USB与Profibus间转换到产品的通讯。因此两端口中只有一个可工作。

转为USB通讯时，端口会像USB接口卡IF-U1一样工作，除非接口卡仍保持为IF-PB1名称与系列号。

请参阅章节„5. USB卡 IF-U1 / IF-U2 “与„13. 编程 “有关通讯，编程与USB端口设置的详细描述。

11. 针对特定产品系列的提示

11.1 EL 3000/EL 9000系列

EL3000和EL9000系列电子负载支持下列接口卡(08/2012):

IF-U1, IF-R1, IF-C1, IF-G1*和IF-E1B*

对IF-G1 GPIB卡的提示：固件版本早于2.10的产品，该卡会被检测成IF-C1 (CAN卡)，必须进行下列配置：

- CAN波特率：100kBd

- 总线终端：无

- 可重定位ID：0

还有，固件版本为3.01或更低的产品，可检测到接口卡但不能正确支持。建议进行更新，请联系您的供货商。

固件版本为3.01或更高的产品，不受限制。

在产品设置菜单下也可配置接口卡。将**Level Control**开关拨至**Setup**位置即可激活。

根据配备卡的类型（电子负载仅有一个插卡槽）可选择不同的参数。如4至8章节所解释的，参数和数值是相同的，除在CAN下无Sample point设置外。

USB卡和IEEE卡也无可设置参数。

*) 2.11以上固件版本

**) 4.07以上固件版本

11.2 PS 8000T/DT/2U/3U系列

用**Fine**按钮可打开产品设置（当输出关闭时，按住按钮超过2s），设置详情请参考产品使用说明书。GPIB、USB卡和以太网不需配置，而且也不能再设置菜单下配置。

11.3 PSI 800 R与BCI 800 R系列

它们使用缩减型2类卡。设置和配置在产品说明书中有解释，也可见章节4至章节9。PSI 800 R系列的菜单结构和操作与PSI 9000系列的类似。

EL 3000/9000 系列产品使用CAN卡时的菜单实例：：

EL 3000/9000 系列产品使用RS232卡时的菜单实例：

12. System Link Mode（仅针对PSI 9000）

注意！该操作有下列要求和限制：

- 仅能将同型号的产品并联和/或串联
- 带ZH后缀的产品不能使用System-Link
- EasyPower 和 EasyPower Lite 软件不支持在System-Link 模式下遥控产品

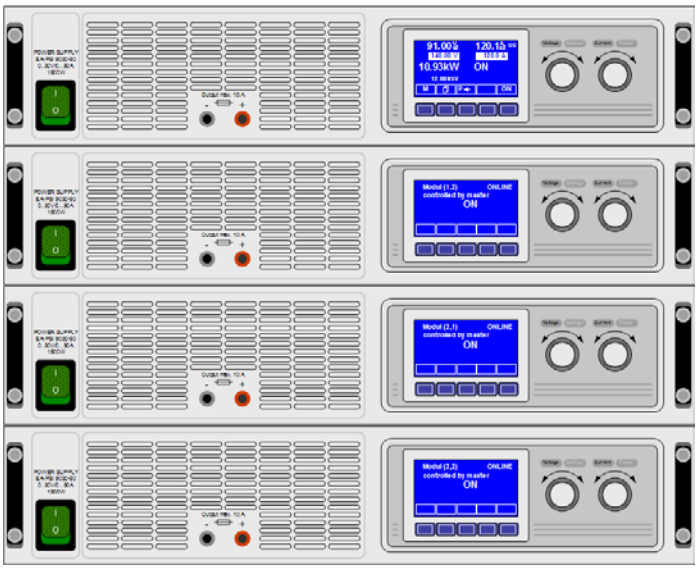
System Link Mode仅配备在PSI9000系列上，且支持并联和串联。当多台产品处于主-从配置下的并联或串联，或连接于Share bus的并联，不需用额外的外部接口，每一台产品都可显示其自身实际值/设定值和错误。设定电压和实际电压要乘以串联产品的台数。并联时与串联相似，只不过此时乘以当前实际或设定值。

System Link Mode将从机的实际值转给已定义的主机，而主机则将设定值转给从机。主机显示所有实际值和设定值，并将它们总和，这样链接着的产品将像一台单独设备样工作。还显示所有从机的信号，警告和报警。

System Link Mode支持链接多达30台产品。但是并联时，建议不要连接超过10台。

举例：

如果链接的是多台PSI 9080-100产品。每一台可提供3kW功率。如果串联两组已并联的产品组，将可得到最高160V的电压，最大200A的电流，整组可供应12kW的功率。



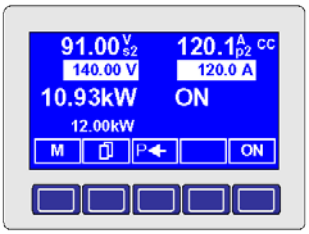
12.1 操作System Link Mode

12.1.1主机的显示和操作

主机用来调节整个系统的设定值，显示设定值和实际值总和。

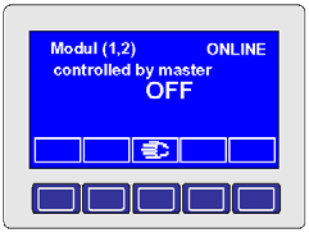
主机的配置决定整个系统的“动作”。所有数值可像单机一样设定。

主机还显示串联(s2) 和并联(p2)的产品数量。



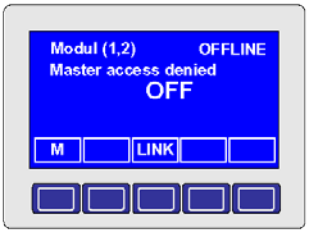
12.1.2从机的显示

如下图，只要主机和从机“在线”，就会这样显示。链接系统内的任何产品都必须设为System Link mode。必须指定哪台为主机，如何分配其他从机，这样主机“知道”哪些产品串联，哪些并联。



举例：从机在线，系统电源输出为待机状态（关闭）。(1,2)指示出这台从机直接与主机并联(第二个数值指示并联产品数量)。

如果输出关闭，可用  按键设置从机下线，这样就不再与主机链接。然后可进行配置。



MENU按键可激活菜单。

LINK按键用于再次设置从机与主机连线。

12.1.3特殊报警、警告和信号

M-/- S 主机显示不是每一台从机都在线。

⚠ S-? 从机发出报警

如果主机电源输出为ON，但不能联系到从机，将发出该报警。这可能是因为System Link被破坏或者电源开关关闭了从机。

⚠ S-PH 报警或

◇ S-PH 带“Auto ON”设定的警告

如果从机被关闭或出现断电而连接不上从机，就会出现上述报警。PH =相位缺失。

带“Auto ON”设定的警告将关闭电源输出，直至导致失败/错误的原因被去除或消失。于是系统再次自动打开输出。必须确认该错误信息，如果错误仍然存在，则会转为信号。错误去除或取消后信号也消失。

根据“Reactivation after power ON”设定（见PSI 9000系列使用说明书“定义操作参数”章节），会出现报警或带“Auto ON”的警告。

◆ **Power ON** 默认：OFF

= OFF 电源恢复后或产品打开后电源输出为关闭状态（待机）。

= restore 电源输出自动恢复到产品被关闭或出现断电前的最后状态。这时可以是ON，也可以是OFF。

⚠ S-OT 报警或

◇ S-OT 带“Auto ON”设定的警告

如果一台或多台从机出现并报告功率级过温，就会出现上述报警。

根据“Reactivation after power ON”设定（见PSI 9000系列使用说明书“定义操作参数”章节），会出现报警或带“Auto ON”的警告。

◆ **OT disappear** 默认： auto ON

= OFF 过温消失、功率级冷却后，电源输出自动保持OFF状态。

= Auto ON 过温消失、功率级冷却后，电源输出再次设为ON。 ⚠ S-OV

一台或多台从机出现过压保护错误。电源输出关闭，只有确认报警信息后方可再次打开。

12.2 配置System Link Mode

若要使用System Link Mode，首先得进行设置和配置。IF-R1或IF-U1卡的另外一个端口（SIO2）必须链接到下一台产品的对应端口。包装内有一条CAT5网线。按参数设置页的设定结束最后那台产品。

进入任何一台产品的菜单，激活通讯菜单，然后选择要配置的接口卡：

Slot {A|B}: IF-R1 {IF-U1} + ↵

◆ **SIO2** 默认： not used

= not available 无SIO2端口

= not used SIO2不可用

= {Master|Slave} 该产品被定义为主机或从机

只有当产品被定义为Master时才出现下面两个参数：

Matrix of modules

这儿你将“告诉”主机有多少台产品并联或串联。

◆ **serial** 默认： 1

= {1..x} 设定串联到主机的产品数量。2表示串联了两台设备。

允许串联的产品数量根据可接受最大隔离电压而定！

◆ **parallel** 默认： 1

= {1..30} 定义并联到主机的产品数量，无论是直接或非直接。2表示并联了两台设备。

只有当产品被定义为Slave时才出现下面两个参数：

Position of module

这个参数定义从机在系统内的位置。系统内串联或并联着的产品，它们的每个位置都是唯一的！

◆ **serial** 默认： 1

= {1..x} 设定产品位于系统的位置（见下图）。

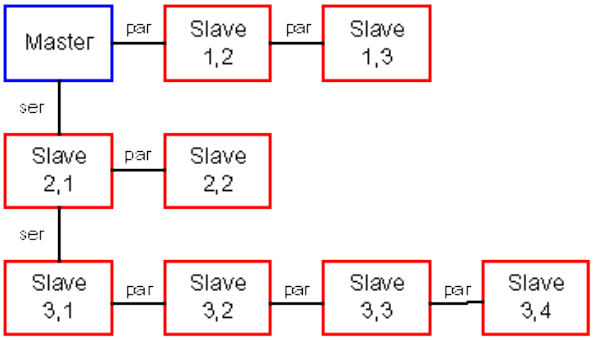
允许串联的产品数量根据可接受最大隔离电压而定！

◆ **parallel** 默认： 1

={1..30} 设置产品在系统内的位置。

实例1：一台从机与主机串联，另外三台从机与这台从机并联。那么并联着的四台设备必须设为serial值2和parallel值1...4。

实例2：



注意！**Position of module serial=1/parallel=1位置一定指主机，不可设为从机，不管怎样从机也不接受这个数字。**

如果从机在末尾，SIO2端口也需要一个终端（两端口中有一个是留空的）。该终端以这个参数设定：

◆ **bus terminate** 默认：NO

=NO	无终端
=YES	SIO2为终端

13. 编程

关于对目标产品经其中一数字接口卡编程的详细操作，请参考另外的用户手册，它分为下面寄部分：

- 编程
- 对象清单
- SCPI指令清单

“**编程**”用户手册涵盖了利用面向对象的二进制通讯协议在C，Visual Basic，LabView等语言环境下访问目标产品的所有信息。

链接：Programming

与“**编程**”用户手册一起的，还有要求用户使用的“**对象清单**”，这些是发送给产品的电报指令参考。

链接：PSI 8000 T / DT / 2U / 3U系列对象清单

链接：PSI 9000系列对象清单

链接：PSI 800 R系列对象清单

链接：BCI 800 R系列对象清单

链接：EL 3000 und EL 9000系列对象清单

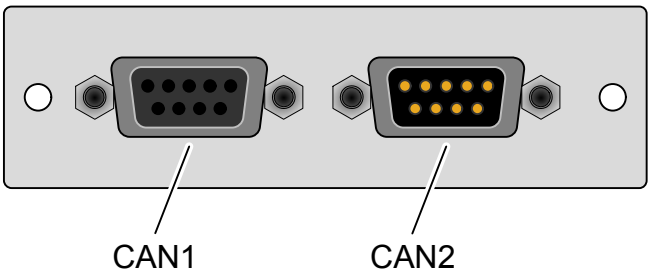
链接：PS 8000 T / DT / 2U / 3U系列对象清单

另外，还有每位用户与IF-G1或IF-Ex卡一起操作的“**SCPI指令清单**”。分为电源和电子负载清单，因为它们的可用指令有不同。

链接：电源类产品的SCPI指令清单

链接：电子负载类产品的SCPI指令清单

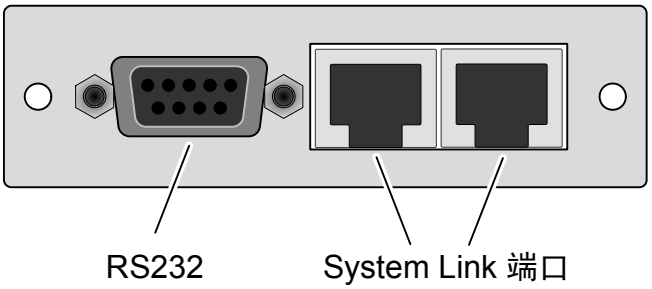
14. 连接器



IF-C1/C2

IF-C1/C2卡注意事项：

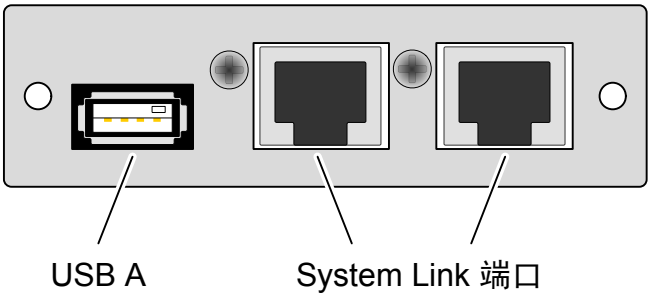
CAN卡的连接器可并联连接！



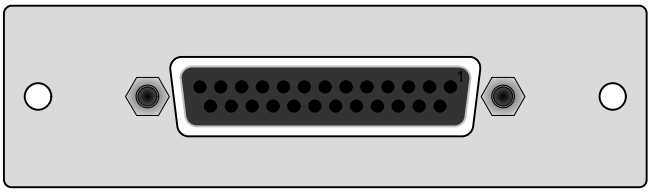
IF-R1

IF-U1 /IF-R1卡注意事项：

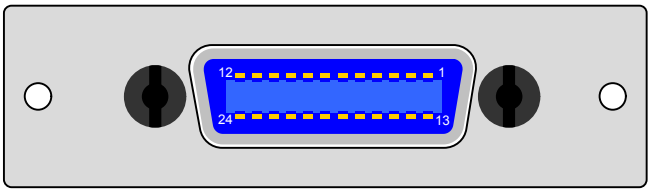
System Link端口仅对PSI9000电源系列方有用。千万不要在此处连接网线！



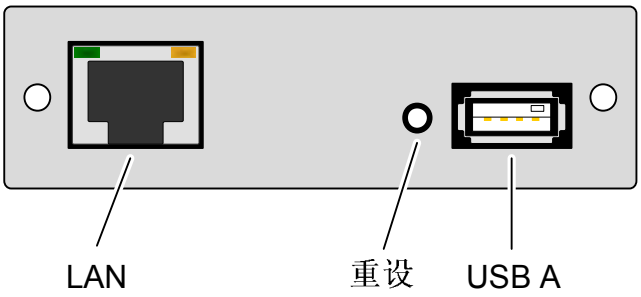
IF-U1



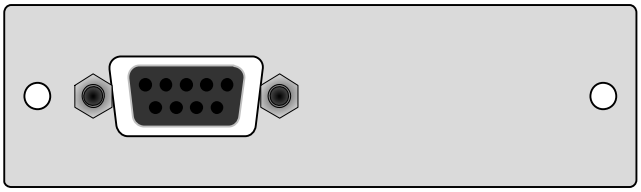
IF-A1



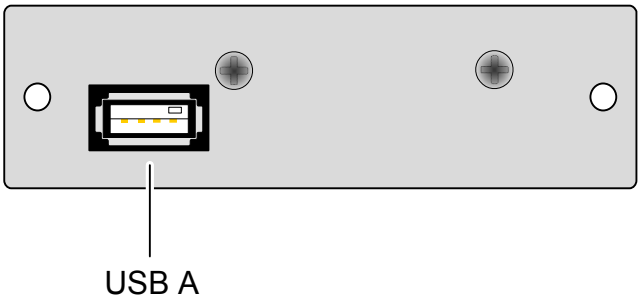
IF-G1



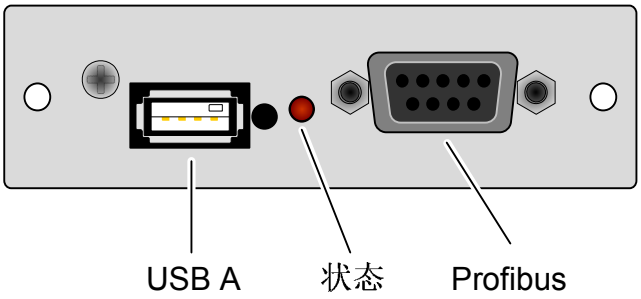
IF-E1B
IF-E2



IF-R2



IF-U2



IF-PB1

About & Copyright

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Important!

- Only equip the interface card(s) in units which are designed to be used with them! It is not required to open the unit. Information about which devices are capable of running these interface cards can be requested from your local dealer or read in the user manual of the devices.
- Only equip the interface card(s) while the unit is switched off by the mains switch!
- Units featuring two slots might be equipped with two cards, but you can't combine them arbitrarily. For detailed information see section „3.3 Combining interface cards"
- Never remove the covers from the cards!
- If only one card is equipped in units with two slots it is recommended to install the default slot cover to the open slot. This protects the unit from additional dust pollution and ensures correct air circulation with the internal fans.
- Use and follow the common ESD provisions when installing and removing the interface cards!

1. General

The interface cards IF-Rx (RS232), IF-Cx (CAN), IF-Ux (USB), IF-G1 (GPIB), IF-Ex (Ethernet) and IF-PB1 (Profibus) provide a digital and the IF-A1 an analogue connection to a control unit like a PC or PLC. Devices like, for example, a power supply can be monitored and controlled. Basic software for power supplies and electronic loads, for the use with some of these interface cards, is supplied with the included tools CD.

The models IF-U2, IF-R2, IF-C2 and IF-E2 are reduced versions of the -1 types and may only be used in certain series.

The 25 pole, analogue interface card IF-A1 (supported by series PSI 9000 and PSI 8000) allows fast monitoring of actual values and fast setting (with a very short delay) of set values, all within the nominal values of the device. The digital inputs and outputs are parameterisable.

PSI 9000 series only: with the combination of a RS232 or USB card and a CAN card, the user can realise a gateway from the RS232 or USB port of a PC to a CAN bus. Thus no extra hardware is required to connect the PC to CAN. The gateway allows to control up to 30 units in line by the RS232/ USB and CAN cards. The device that is connected to the PC will handle the data conversion to CAN and back. The maximum data transmission speed is then limited to what the serial connection has been set to. Total maximum baud rate is 57600 baud.

PSI 9000 series only: the cards IF-R1 and IF-U1 additionally support the parallel and/or series connection of multiple laboratory power supplies to a true master-slave system with totals formation of the measured values by using the „System Link mode“. Also see user guide of PSI 9000 and section „12. The System Link Mode (PSI9000 only)“.

1.1 Area of use

The interface cards must only be equipped in units which are designed for them.

A set of Labview VIs is included in the package, which will simplify the use and implementation of the interface cards in the LabView IDE.

The implementation in other applications and environments is possible, but also very complex. The telegram structure is explained in detail in seperate documents, available on the included CD in folder „\manuals\interface cards\“ or on our web site (ZIP file with instruction manuals for all interface cards).

The voltage range of the analogue input and output signals of the IF-A1 is customisable between 0 and 10V. The digital inputs can be switched between two different voltage ranges for the logical level and the default logical level can be predefined for the case that these inputs are not used.

1.2 The concept

The interface cards are pluggable and can thus be used where needed. They are compatible to various types of devices, such as electronic loads. Due to the electrical isolation of 2000V (with Profibus card: 1000V) you can also connect multiple devices with different potentials.

The USB, RS232 and CAN interfaces support a unique communication protocol, which is object orientated. Every series has its dedicated object (ie. command) list, which differs depending on the features of a model. Transmitted commands are checked for validity and plausibility. Non-plausible or erroneous values and objects result in an error which is sent as an answer telegram.

The digital cards IF-G1 and IF-Ex use the standardised command language SCPI (Standard Commands for Programmable Intruments).

Interface IF-PB1 follows the Profibus specification.

Refer to section „13. Programming“ for an overview about furtherly available documentation.

1.3 Warranty/Repair

Attention: The interface card must not be repaired by the user!

In case of warranty or a defect please contact your supplier to get informed about the next steps. The cards are conceded with a statutory warranty of two years (for Germany), which is independent from the warranty (and its duration) of the device they are used in.

1.4 Used symbols

In the following description the display and operating elements are marked differently by symbols.

= Displayed only, all elements which are only displayed and which represent a state are marked with this symbol

◆ = Parameter, changeable values, are marked with this symbol and are emphasised

= Menu items, selectable, lead to the next sublevel or to the bottom level with parameters

Brackets {…} mark possible options or adjustment ranges for parameters.

1.5 Scope of delivery

1 x Pluggable interface card

1 x CD with software, instruction manuals and more

1 x Short installation guide

1 x Patch cable 0.5m 1:1 (only with IF-R1 and IF-U1)

1 x USB cable A-A, 1.8m (only with IF-Ux, IF-Ex, IF-PB1)

1 x RS232 cable 1:1, 3m (only with IF-Rx)

1 x Adapter cable for firmware updates (only with IF-G1)

2. Technical specifications

General

Dimensions Type 1 (W x H x L)	24 x 80 x 100mm
Dimensions Type 2 (W x H x L)	24 x 80 x 45mm
Safety	EN 60950
EMI Standards	EN61000-6-4, EN 61000-6-2, EN 55022 Class B
Overvoltage category	Class II
Operation temperature	0...40°C
Storage temperature	-20...70°C
Relative humidity	<80% (w/o condensation)

IF-R1 / IF-R2 (RS232)

Electrical isolation	2000V DC
Connectors	1 x 9-pole D-Sub socket (f.) 2 x RJ45 socket (not IF-R2)
Baud rates	9600Bd, 19200Bd, 38400Bd, 57600Bd
Cable length	depending on the baud rate, up to 15m
System Link Mode (IF-R1 and PSI 9000 only)	yes (only with IF-R1)
└ Max. number of units	30
└ Bus termination	settable in the unit's menu
└ Patch cable	0.5m, included

IF-U1 / IF-U2 (USB)

Electrical isolation	2000V DC
Connectors	1 x USB socket type A 2x RJ45 socket (not IF-U2)
Standard	USB 1.1
Cable length	max. 5m
System Link Mode (IF-U1 and PSI 9000 series only)	yes
└ Max. number of units	30
└ Bus termination	settable in the unit's menu
└ Patch cable	0.5m, included

IF- C1 / IF-C2 (CAN)

Electrical isolation	2000V DC
Connectors	9-pole D-Sub socket (f.) 9- pole D-Sub socket (m.)
Baud rates	20kBd...1MBd in steps
Bus termination	settable in the unit's menu
CAN standard	V2.0 part A

IF-A1 (Analogue)

Electrical isolation	2000V DC
Analogue inputs:	
Input voltage range	
Maximum range	-5V...+15V
Nominal range	0V…10V
Input impedance	25kΩ
Resolution	
VSEL, CSEL, PSEL (RSEL)	< 2mV
Relative error	
VSEL, CSEL, PSEL	0.1%
RSEL (Option)	0.25%
Response time[1)]	< 4ms
Analogue outputs:	
Nominal output voltage range	
VMON, CMON, PMON	0V…10V
I_{out} max. at 10V	2mA
VREF	1V...10V
I_{out} max. at 10V	10mA
Resolution	
VMON, CMON, PMON, VREF	< 2mV
Relative error	
VMON, CMON, PMON, VREF	0.1%
Settling time of the analogue outputs	< 4ms
Auxiliary voltage	12…15V
Current max.	50mA
Digital outputs:	
Type	pull-up resistor to +15V
Output current	
Maximal	I_{max} = -20mA at U_{out} = 0.5V
Nominal	1...10mA
Output voltage	
High	+15V
Low	< 0.3V
Response time[2)]	< 4ms
Digital outputs:	
Input voltage	
Maximum range	-5V...+30V
if set to: Level=LOW	
U_{Low}	< 1V
U_{High}	> 4V
if set to: Level=HIGH	
U_{Low}	< 5V
U_{High}	> 9V
Input current	
if set to Low Range and Default Level = L	
U_{in} = 0V	0mA
U_{in} = 12V	+2.6mA
U_{in} = 24V	+5mA
if set to Low Range and Default Level = H	
U_{in} = 0V	-1.5mA
U_{in} = 12V	+2.2mA
U_{in} = 24V	+6mA

1 In order to calculate the total response time of a step change, from an analogue interface input to the power output you need to add the response time of the device to this time.

2 Time between occurence of the event which is going to be notified and the moment the notification is executed.

if set to High Range and Default Level = L	
U_{in} = 0V	0mA
U_{in} = 12V	+1.6mA
U_{in} = 24V	+3.5mA
if set to High Range and Default Level = H	
U_{in} = 0V	-1.5mA
U_{in} = 12V	+0.7mA
U_{in} = 24V	+4.5mA
Response time[1)]	< 10ms

IF- G1 (GPIB)

Electrical isolation	2000V DC
Terminals	24pole Centronics socket (female)
Bus standard	IEEE 488.1/2
Cable length (GPIB)	2m per device, 20m total
Cable type (GPIB)	Standard GPIB cable

IF-E1 / IF-E1B (Ethernet)

Electrical isolation	1500V DC
Terminals	1x RJ45 (LAN / WAN) 1x USB, type A
Cable type (Ethernet)	Twisted pair, patch cable, Cat 3 or higher
Protocols	HTTP, TCP/IP
Network ports IF-E1B	0 - 65535 (80 = HTTP)
	Default: 1001 (TCP/IP)
Network port IF-E1	80 (HTTP, TCP/IP)
Network connection	10/100 MBit
USB connection	USB 1.1, 2.0
Transmission speed Ethernet	100 kBaud
Transmission speed USB	57600 Baud
Command interval max.	every 300ms (IF-E2)
	every 20ms (IF-E1B)
Keep-alive timeout (IF-E1B)	10min. (since v2.05)

IF-PB1 (Profibus)

Electrical isolation	1000V DC
Terminals	1x Sub-D 9pole 1x USB, type A
Variant	DP
Bus termination	via Profibus cable
Bus speed	up to 12MBit/s
Protocols	DPV0, DPV1
Identification	with GSE file

1 Time between occurance of an event, that has to be signalised to an output, and the moment it is signalised.

3. Installation

3.1 After unpacking

After unpacking, check the pluggable interface card(s) for signs of physical damage. If any damage can be found do not use and insert the card into any device!

3.2 Inserting a card

The card(s) must only be inserted while the unit is completely switched off. The unit does not have to be opened. Remove the screws from the slot cover or from an already equipped card and remove the cover/card. Insert the new card with caution until the card plate touches the rear side of the unit. ***If there is space between the rear side and the card plate, do not tighten the screws, because the card is not placed correctly!*** The wiring between the PC and/or other units has also be done before the unit is switched on again. The card(s) will be automatically detected by the device after powering it on and can now be configured.

Note about the IF-A1: before equipping the card, you should set the jumpers correctly. Refer to „7.3 Configuring the IF-A1“, subsection „Digital inputs“.

Note: in case the card was purchased subsequently and is not recognized by the device, it might be necessary to update the firmware of the device. Please contact your dealer for further information.

Caution! There are components on the card which are sensitive for ESD. You must follow the general ESD provi-sions when handling and installing a card.

3.3 Combining interface cards

Only applies for series PSI 9000!

In case more than one card slot is used, the table shows which cards can be combined (• means allowed):

	IF-U1	IF-C1	IF-R1	IF-E1 / IF-E1B	IF-G1	IF-A1	IF-PB1
IF-U1	–	•	–	–	•	–	–
IF-C1	•	–	•	–	–	•	•
IF-R1	–	•	–	–	•	–	–
IF-E1 / IF-E1B	–	–	–	–	–	•	–
IF-G1	•	–	•	–	–	•	•
IF-A1	–	•	–	–	•	–	–
IF-PB1	–	•	–	–	•	–	–

4. RS232 card IF-R1 / IF-R2

The RS232 interface card links the power supply with a controlling unit (PC) via its serial port, also called COM port. In case the PC does not feature one of these older serial ports anymore, there are adapter cables available in selected stores, which work via USB and generate a virtual COM port on the PC.

The settings of this serial connection have to be configured on both ends to the same values. At the power supply this is done in the setup menu. A 1:1 cable has to be used.

The card type 1 (IF-R1) features an additional serial interface which is used to link multiple power supplies in order to build the System Link Mode. More information can be found in section „12. The System Link Mode (PSI9000 only)“.

Attention!

Never connect any of the RJ45 sockets of the IF-R1 card to an Ethernet hub or switch or Ethernet port of a PC!

4.1 Configuring the RS232 card

The interface card is configured in the setup menu.

It not required to set the device address (node) here, since RS232 is point-to-point. To simplify communication, the so-called broadcast address 0 can be used to access the device disregarding its particular address.

Activate the menu with

M + Communication + ↵

Slot: { IF-... } depends on the equipped card

Only with PSI 9000 there is another slot available:

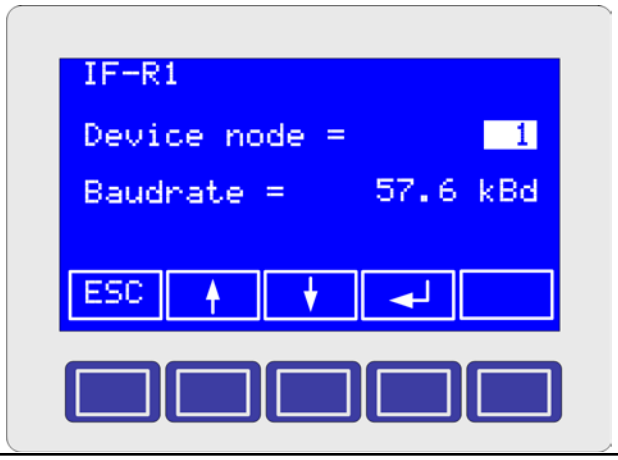
Slot A: { IF-... } depends on the equipped card

Slot B: { IF-... } depends on the equipped card

Here you set the desired device node and you also get an overview which card(s) is/are currently installed. By selecting the card with, for example,

Slot: IF-R1 + ↵

you enter the configuration card‘s menu. If two are equipped (PSI 9000), each card has to be configured individually. You can now setup the parameters:



◆ **device node** Default: 1

= {1..30} Choose one of up to 30 device nodes

◆ **Baud rate** Default: 57.6 kBd

= {9.6 kBd, 19.2 kBd, 38.4 kBd, 57.6 kBd}

The selected baud rate has to be determined in dependency of the used cable length. At 15m a maximum of 9.6 kBd is strongly recommended. 1kBd = 1000Bd.

5. USB card IF-U1 / IF-U2

The USB interface works similiar to the RS232 card, but it is more comfortable when connecting multiple units to a PC, because nowaydays PC feature multiple USB ports. Alternatively, devices with this USB card could be connected via a USB hub.

The card IF-U1 features an additional RS485 interface which is used to link multiple power supplies of series PSI 9000 in order to build the System Link Mode. More information can be found it in section „12. The System Link Mode (PSI9000 only)“.

Attention!

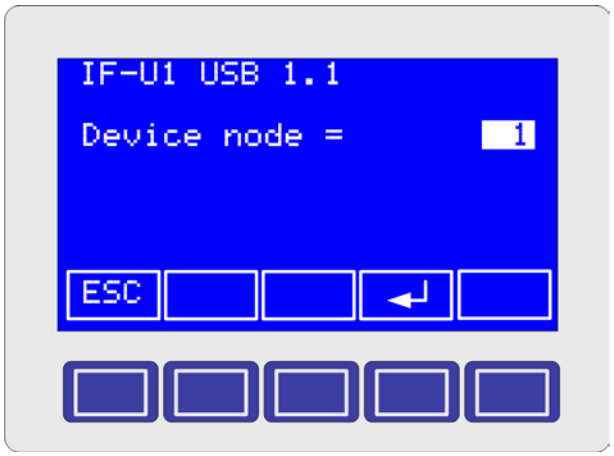
Never connect any of the RJ45 sockets of the IF-U1 card to an Ethernet hub or switch or Ethernet port of a PC!

5.1 Configuring the USB card

The interface card is configured in the setup menu.

It not required to set the device address (node) here, since USB is point-to-point. To simplify communication, the so-called broadcast address 0 can be used to access the device disregarding its particular address.

Activation of the menu is the same as with the RS232 card in section 4.1.



Here you set the desired device node and you also get an overview which cards are currently installed. A further configuration of the USB card is not required.

Note

The USB driver installs a virtual COM port (VCP) on the PC. This COM port has to be configured with certain parameters if used to communication with the device (see „13. Programming“).

6. CAN card IF-C1 / IF-C2

CAN Standard: V2.0 part A

Cable length: depending on the baud rate

The communication over the CAN bus is specifically designed to suit the needs of test applications and systems, like for instance in the automotive industry. A subsequent implementation into existing systems and the modification of a related software application is possible and unproblematic.

The networking of CAN devices provides the advantage of a faster communication and a fail-safe bus topology. The driver chip on the CAN card can support up to 110 device nodes (the term „device node“ is used for CAN bus members). The communication protocol can handle up to 30 units per address segment (RID). Thus it is theoretically possible to set up a bus system of up to 110 units, which will operate with at least 4 address segments. The address segments are relocatable, so that the one or multiple devices can be implemented into an existing CAN bus without the need to reconfigure the whole system.

6.1 Configuring the CAN card

The interface card is configured in the setup menu.

Since June, 2011 there is a new CAN ID system that will is going to replace the old ID system. This is just done with a software update of the device, the hardware is not effected. You can recognize which of the CAN ID systems currently is implemented in the device by the available setup menu items.

By selecting the card with

Slot: IF-C1 + 

you enter the configuration menu for that particular card. Each card has to be configured individually. You can now setup some parameters.

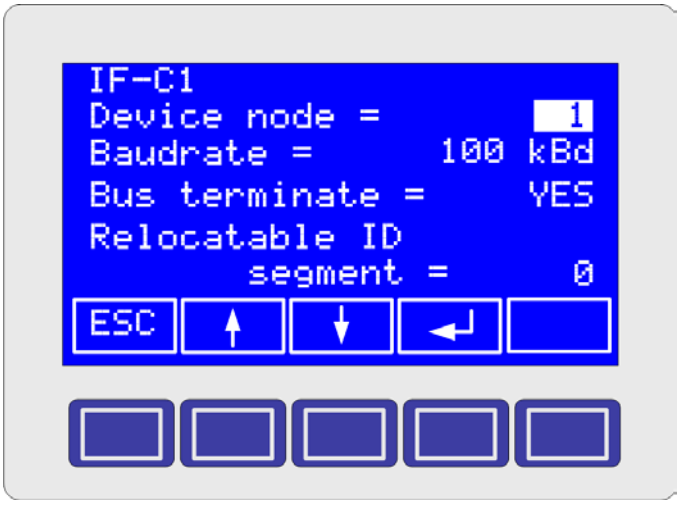


Figure shows IF-C1 settings of the „old“ CAN-ID system, see below

Setting the baud rate

All common baud rates between 10kBd and 1MBd are supported. Only with PSI 9000 models, for each baud rate setting the so-called „Sample point“ can be chosen, which is used to optimise the data transmission for various cable lengths and qualities. It adjusts the point of time when a transmitted bit is sampled.

◆ **baudrate** Default: 100 kBd

sample point: 75% (only available with series PSI 9000)

= { 10 kBd { 60, 65, 70, 75, 80, 85}%,
20 kBd { 60, 65, 70, 75, 80, 85} %,
50 kBd { 60, 65, 70, 75, 80, 85} %,
100 kBd { 60, 65, 70, 75, 80, 85} %,
125 kBd { 58, 68, 70, 75, 81, 87} %,
250 kBd { 58, 68, 70, 75, 81, 87} %,
500 kBd { 58, 66, 75, 83} %,
1 MBd { 58, 66, 75, 83} % }

Bus termination

The CAN bus requires a termination resistor of 120 Ohms on both ends of the line. If a unit is located at the end of the chain/line and it is not connected to a next unit, it has to be terminated. The parameter „bus terminate“ is used to easily set the termination without any circumstancial hardware termination by jumpers.

◆ **bus terminate** Default: NO

=YES The bus is terminated with a 120Ω resistor.
=NO No termination is done.

Gateway function (only PSI9000)

◆ **CAN** Default: Client

=Client The device is monitored and controlled by an external unit, like a PC or a SPS

=Gateway The interface card additionally serves as a gateway between the CAN and RS232/USB cards

The RS232 or USB card inside the device which is assigned as the gateway (here: PSI 9000) allows the user to control and monitor all further units, which are linked to that particular device by CAN. All that is needed is a device with an extra IF-R1 or IF-U1 interface card to set up a CAN bus system. Both cards, RS232 and USB, can only utilise the high performance of the CAN bus very poorly. In order to use the CAN bus with full performance (high data rate) and many devices, it is recommended to directly control the bus with a CAN master hardware.

6.2 CAN IDs

6.2.1 Old CAN ID system

It is absolutely necessary to choose and set a unique device address, also called „device node“, for every connected or linked unit. Only then a unit can be identified and controlled correctly. These identifiers are used to access a unit.

Relocating address segments

In case that devices are retrofitted with a CAN card and implemented into an existing CAN bus system, the „relocatable identifier segment“ (short: RID) is used to relocate the address segment in order to adapt the addresses of the new unit(s) to the address range of the already exisiting units or to set it away from that range to not collide.

The CAN bus after the standard V2.0a defines an 11 bits long address (=identifier). This results in a total of 2048 identifiers, while from 2032 can be chosen. Those 2048 identifiers are seperated into 32 address segments of 64 addresses. The starting address is determined by the **RID**.

◆ **relocatable ID** Default: 0

segment = { 0..31} Select (relocate) the address range

Inside of every address segment are 62 freely assignable addresses, whereas the up to 30 units are using the lower range and with 2 physical adresses (identifiers, one each for sending and querying data) per unit they are taking the addresses from 2...61. The addresses 0 and 1 of every address range are reserved for broadcast messages. This results in 32*2 broadcast addresses.

For **broadcast** messages the addresses are static:
[RID*64 + 0] and [RID*64 + 1].

Example: the RID is set to 5 (also see setup menu of your device). A broadcast shall be sent to all units of this address range. The identifier hence calculates as 5*64 = 320 = 0x140, or 0x141 for queries.

For **singlecast** messages every „device node“ is occupying another two addresses:
[RID*64 + device node * 2] and

[RID*64 + device node * 2 + 1]

Example: the RID was set to 13, the device address (node) to 12. In order to control the device, the identifier has to be: 13*64 + 12*2 = 856 (0x358). The identifier 857 (0x359) is used for queries.

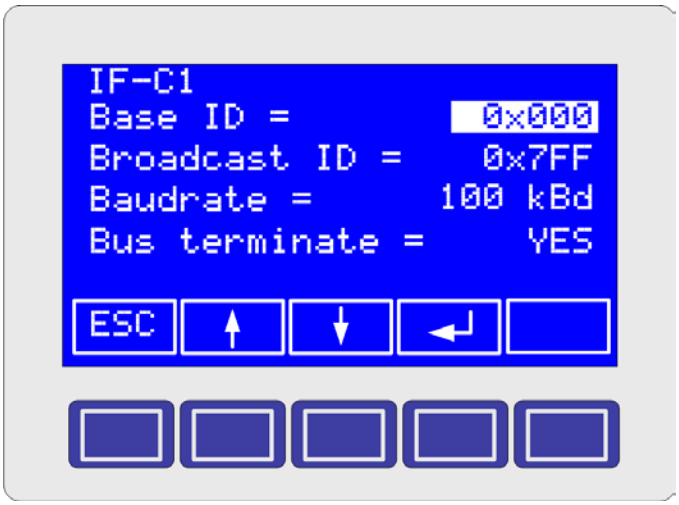
6.2.2 New CAN ID system since June 2011

The new CAN ID system is first available for PS 8000 and EL3000/EL9000 series, other series like PSI 8000 follow. Further series upon request.

For this system, it is required to set a base CAN ID. This will determine the three CAN IDs which are used by the device. The other ID, the broadcast ID, can be ignored if unused and not colliding with the standard IDs.

For the settings for a PS 8000 power supply model please refer to the instruction manual of the device.

For a PSI 8000 model, the CAN setup will look like this:



◆ **Base ID** Default: 0x000

The base ID is adjusted as hexadecimal value in steps of 4. The device will then use three normal CAN IDs: base ID, base ID + 1 and base ID + 2.

This system is compatible to Vector software like CANoe or CANalyzer. Databases in *.dbc format are available either directly on the CD that comes with the interface card or upon request. For every device model, a unique database is required. Demo configurations for testing purposes that can be loaded into CANoe or CANalyzer will also be available.

◆ **Broadcast ID** Default: 0x7FF

This adjusts the so-called broadcast ID as hexdecimal value. This ID must not collide with one of the other IDs of the unit.

The purpose of the broadcast ID is to adjust it to the same value on several units on the same bus in order to send command to all units at once. This might be required when setting a current or the output condition simultaneously on these units.

This ID can only be used to send set values or condition, not to query status or similar.

The other settings are like described in section 6.2.1.

7. Analogue interface IF-A1

7.1 Pin assignment of the analogue interface (25-pole D-Sub socket)

Pin	Name	Function	Description	Default level[5]	Electrical specifications
1	AI1	PSEL / RSEL [6]	Analogue input: Set value power / Analogue input: Set value resistance [6]	0..10V correspond to 0..100% P_{nom} / 0..10V correspond to 0..100% R_{max}	Accuracy @0...10V typ. < 0.1% [1] Input impedance R_i > 25k
2	AI3	CSEL	Analogue input: Set value current	0..10V correspond to 0..100% I_{nom}	
3	AI2	VSEL	Analogue input: Set value voltage	0..10V correspond to 0..100% U_{nom}	
4	AO3	PMON	Analogue output: Actual value power	0..10V correspond to 0..100% P_{nom}	Accuracy typ < 0.1% [1] at I_{max} = +2mA [4] Short-circuit-proof against GND
5	AO1	VMON	Analogue output: Actual value voltage	0..10V correspond to 0..100% U_{nom}	
6	AO2	CMON	Analogue output: Actual value current	0..10V correspond to 0..100% I_{nom}	
7	DO1	CV	Digital output: Constant voltage operation	CV active = Low CV not active= High	Quasi open collector with pull-up resistor against VCC I_{max} = -10mA [4] at U_{low} = 0.3V U_{max} = 0...30V Short-circuit-proof against GND Receiver: U_{low} < 1V; U_{high} > 4V)
8	DO2	OVP	Digital output: Overvoltage protection active	OVP = High No OVP = Low	
9	DO3	OT	Digital output: Overtemperature error	OT = HIGH No OT = Low	
10	DO4	Mains	Digital output: Mains voltage OK	Mains OK = Low Mains not OK = High	
11	DO5	Standby	Digital output: Output off	Output off = Low Output on = High	
12	DO6	CC	Digital output: Constant current operation „CC“	CC active = Low CC not active= High	
13	DO7	CP	Digital output: Constant power operation „CP“	CP active = Low CP not active = High	
14		AGND SEL [2]	Reference potential of the analogue inputs		Reference for SEL signals
15		AGND [2]	Reference potential of the analogue outputs		Reference for MON signals and VREF
16					
17		N.C.			
18	AO0	VREF	Analogue output: Reference voltage	10V	Accuracy typ < 0.1%[1], I_{max} = + 8mA[4] Short-circuit-proof against GND
19		+VCC	Auxiliary voltage (Reference: DGND)	12V…16V	I_{max} = +50mA[4] Short-circuit-proof against DGND
20		DGND [2]	Reference potential for digital ports		Reference for +VCC, control and notification signals
21					
22	DI1	SEL-enable	Digital input: Switch-over to external interface (else: local operation)	„Default Level“ set to „H(igh)“ by jumpers. Standard activation: SEL-enable on = Low SEL-enable off = High	Preselectable input level (High/Low range):[3] 1) U_{Low} = < 1V ; U_{High} = > 4V or 2) U_{Low} = < 5V ; U_{High} = > 9V Preselectable logic level if input is not wired: open = High Level or Low Level
23	DI2	Rem-SB	Digital input: Output off	„Default Level“ set to „H(igh)“ by jumpers. Standard activation: REM-SB on = Low REM-SB off = High	
24		Reserved			
25		N.C.			

1) The input range is adjustable. When using a range other than 0...10V, the accuracy will decrease proportionally. For example, for a range of 0...5V for 0...100%, the accuracy will be only <0.2% etc.

2) AGND and DGND are connected internally. AGND SEL at Pin 14 is inpedendent. It serves as reference for the difference amplifiers of all analogue inputs.
DIx, DOx, +Vcc are referenced to DGND. VREF, VMON, CMON, PMON are referenced to AGND. VSEL, CSEL und PSEL are referenced to AGND SEL.

3) Digital input, depending on the preset with the jumpers:
a) Setting High Range (high threshold): U_{in} = 0V; I = -1.5mA, U_{in} = 12V; I = +0.7mA; U_{in} = 24V; I = +4.5mA, Thresholds: U_{Low} = < 5V; U_{High} = > 9V
b) Setting Low Range (low threshold): U_{in}= 0V; I = -1.5mA, U_{in} = 12V; I = 2.2mA, U_{in} = 24V; I = +6mA, Thresholds: U_{Low} = < 1V; U_{High} = > 4V

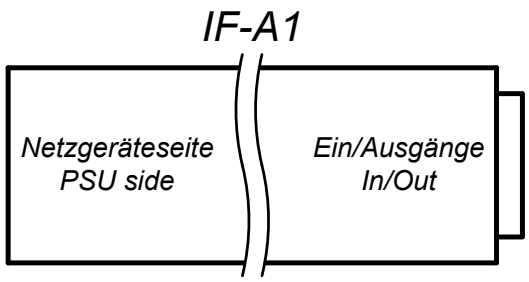
4) Positive currents are flowing out of the device, negative currents are flowing into it.

5) With certain device series, the standard level may/can be changed by the user in the device setup menu

6) RSEL (internal resistance set value) is only remotely controllable with power supplies of PSI 9000 series (it is generally required to unlock the option „Internal resistance“ in the device)

7.2 General

The interface IF-A1 is an analogue interface with galvanically isolated, customisable, analogue and digital inputs and outputs. Visualisation:



Customisable means, that you can customise these inputs and outputs to your needs, but always within a voltage range of 0...10V. At devices with two extension card slots (eg. PSI9000) it is possible to combine the IF-A1 with a digital interface card (eg. IF-U1 (USB)), in order to control, for example, the device by USB and put out actual values via the analogue outputs of the analogue card. Or vice versa, you control the device by analogue set values and read out and log the actual values to a PC via RS232, CAN or USB.

It applies generally: all monitoring and surveillance features are permanently active, even if two cards (one digital, one analogue) are equipped. Only the control of the device with set values requires the activation of the external mode (IF-A1) resp. of the remote mode (digital interfaces), **whereas the remote mode has priority.** In case the device is in control by an analogue interface (external mode, indicated in the display by 💻**extern**) and the control of the device via a digital interface is activated, the device will switch to remote mode (indicated in the display by 💻**remote**).

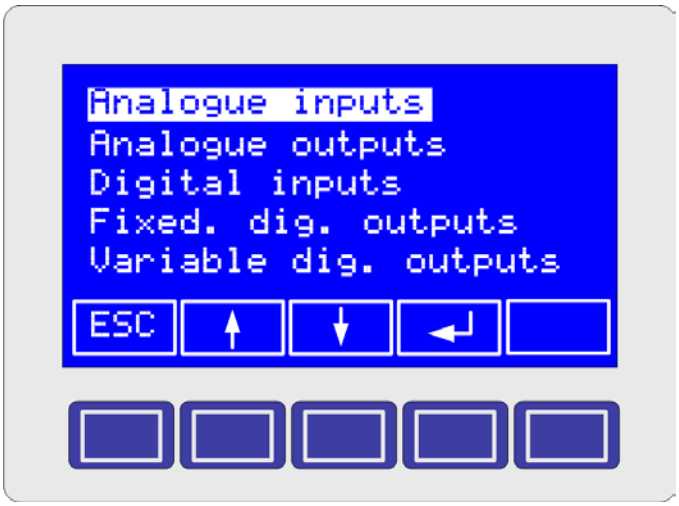
7.3 Configuring the IF-A1

The interface is configured in the communication menu:

With **M** + 📄 **Communication +** ↵ and

📄 **Slot {A|B}: IF-A1 +** ↵

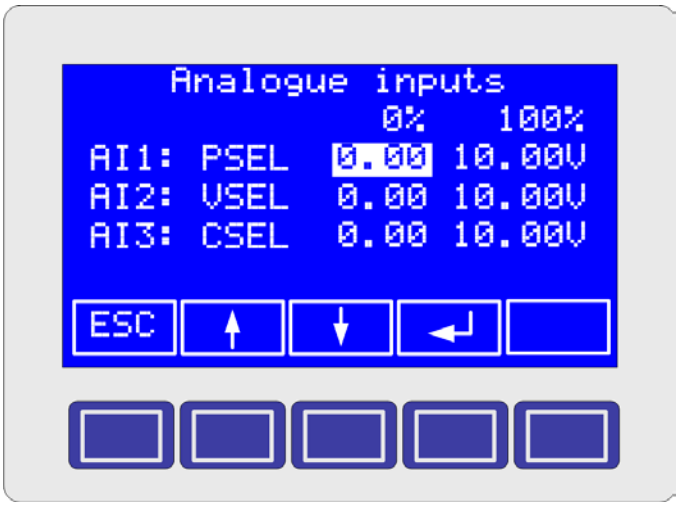
the analogue interface card is selected for configuration. Following parameters can be set:



7.3.1 Analogue inputs

Analogue set values are only accepted by the device if it is in external mode (indicated in the display by 💻**extern**). Access to the menu is blocked in external mode.

The analogue interface IF-A1 has three analogue inputs with these functions:



AI1: **PSEL** (external set value for power)

AI3: **CSEL** (external set value for current)

AI2: **VSEL** (external set value for voltage)

The nominal voltage range of these inputs is 0...10V, but it can be narrowed in order to adapt to the input signal. By limitting the standard voltage range to a lower one the resolution is also lowered. Example: if the voltage range is set to only 1V difference, resolution and accuracy will be reduced by the factor 10.

The left value defines the input voltage for 0% output value (U, I, P), the right value the input voltage for 100% output value. The menu differs a little between the various series:

7.3.1.1 PSI 9000 series

It applies:

U_{min} (left value) = { 0.00V...4.00V }
U_{max} (right value) = { 5.00V...10.00V }

A higher or lower voltage than specified is clipped and treated as either 0% or 100%.

Menu items:

◆**{Nom.value | Adj.limits}** Default: Nom.value

= Nom.value — the defined range for Vsel, Csel and Psel is always related to the nominal values of the device (see explanations below)

= Adj.limits — the defined range for Vsel, Csel and Psel is always related to the adjustment limits of the device (see explanations below)

◆**AI1** Default: PSEL 0.00 10.00V

= {PSEL | RSEL | -} Pin assigned to external set value for power or resistance or not used

RSEL is only available if U/I/R mode is unlocked.

If AI1 is set to „-“, then no power set value is required. The output power will then be held at the last adjusted value.

◆**AI2** Default: 0.00 10.00V

= VSEL external set value for voltage

◆**AI3** Default: 0.00 10.00V

= CSEL external set value for current

Explanation about Nom.value

With this setting, the input voltage range of the three set values inputs is related to the corresponding nominal values (U, I or P) of the device.

Example: you have a PSI 9080-100 which has nominal values of 80V, 100A and 3000W. If you adjust the analogue input VSEL to 0...10V for 0...100%, the device will put out 100% or 80V if the input is fed a voltage of 10V. In case the range is set to 3...7V, the 100% or 80V output voltage is already achieved when feeding 7V input. The same applies for the other set value inputs.

Note

The maximum output voltage, current and power can additionally be limited by adjustment limits. See the user instruction manual of your device, menu item „Profile -> General settings -> Adjust limits“ for further details.

Explanation about Adj.limits

With this setting, the input voltage range of the three set values inputs is related to the so-called „adjust limits“ (U, I or P) which can be defined in the user profile of the device.

Example: you have a PSI 9080-100 which has nominal values of 80V, 100A and 3000W. The output current is set to 50A in the „Adjust limits“ menu of the device profil in order to prevent the device from ever putting out more than 50 amps. If you then adjust all three analogue inputs to 0...5V for 0...100%, the device will put out 100% or 80V output voltage at 8V input on VSEL, 100% or 3000W power at 8V input on PSEL, but only 50A when you supply 8V on CSEL input. At 4V on CSEL it will put out max. 25A.

7.3.1.2 PSI 8000 series

Note

PSI 8000 series models of type T, DT, 2U or 3U feature a built-in analogue interface. In the menu there is an item „Analogue interface“, which is NOT related to the pluggable interface card IF-A1 that is described here!

It applies:

U_{min} (left value) = { 0.00V...4.00V }

U_{max} (right value) = { 5.00V...10.00V }

The adjusted voltage range, for example 2.00V...8.00V, corresponds to 0...100% set value. A higher or lower voltage is clipped and treated as either 0% or 100%. Also see „Explanation about Nom.value“ above, because PSI 8000 series incorporate the behaviour described in that section.

Menu items:

◆**AI1** Default: PSEL 0.00 10.00V

= PSEL external set value for power

◆**AI2** Default: 0.00 10.00V

= VSEL external set value for voltage

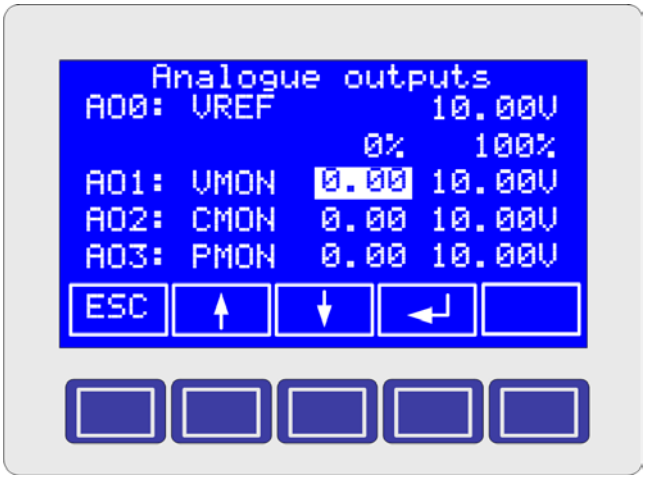
◆**AI3** Default: 0.00 10.00V

= CSEL external set value for current

Note

The maximum output voltage, current and power can additionally be limited by adjustment limits. See the user instruction manual of your device, menu item „Profile -> General settings -> Adjust limits“ for further details.

7.3.2 Analogue outputs



The actual values of output voltage, current and power are led out to three analogue outputs. The output voltage of them can be adapted to custom requirements. The first value stands for U_{min} (minimum output voltage, 0%), the second for U_{max} (maximum output voltage, 100%). It applies:

U_{min} = {0.00V...4.00V}
U_{max} = {5.00V...10.00V}

By limitting the standard voltage range of 0...10V to a lower value the resolution is also lowered. Example: if the voltage range is set to 1V difference between U_{max} and U_{min}, resolution and accuracy will be reduced by the factor 10.

The reference voltage is an exception. It can be set to a value between 1V and 10V.

◆**AO0** Default: 10.00V

= VREF Adjustable reference voltage in a range of {1V...10V}.

◆**AO1** Default: 0.00V 10.00V

= VMON Monitor (actual value) output voltage

◆**AO2** Default: 0.00V 10.00V

= CMON Monitor (actual value) output current

◆**AO3** Default: 0.00V 10.00V

= PMON Monitor (actual value) output power

These extra settings are only available for PSI 9000 series models:

◆**{Nom.value | Adj.limits}** Default: Nom.value

= Nom.value the defined range for VMON, CMON and PMON is always related to the nominal values of the device (see section „Explanation about Nom.value“ above)

= Adj.limits the defined range for VMON, CMON and PMON is always related to the adjust limits of the device (see section „Explanation about Adj.limits“ above)

Note

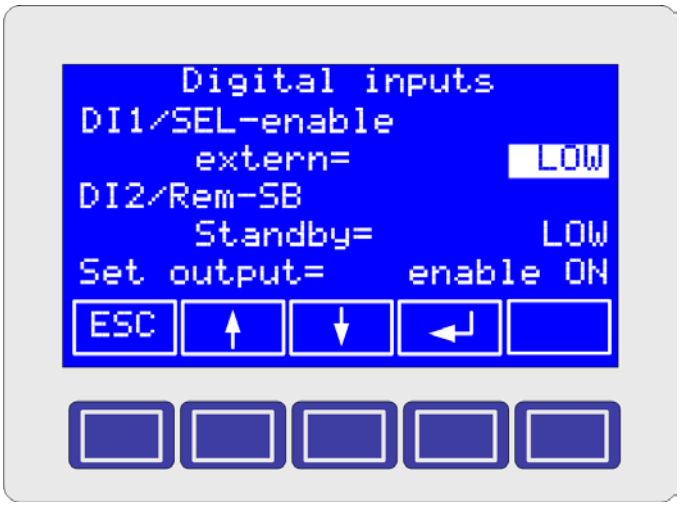
For PSI 9000 series models it is recommended to keep the setting „Nom.value / Adj.limits“ the same for both, analogue inputs and outputs.

Note

The maximum output voltage, current and power can additionally be limited by adjustment limits. See the user instruction manual of your device, menu item „Profile -> General settings -> Adjust limits“ for further details.

7.3.3 Digital inputs

The interface card IF-A1 has two parameterisable digital inputs, DI1 and DI2.



◆**DI1/SEL_enable** Default: LOW

external

= LOW External control of the device by IF-A1 is low active. If the default logical level of DI1 is set to LOW by the jumper on the PCB, the external control will be instantly active when switching the device on and condition is not „local“.

= HIGH External control of the device by IF-A1 is high active.

After the external control has been actived, the power supply can be controlled by the inputs VSEL, CSEL and/or PSEL. The status signale and analogue actual values are always put out.

Input DI2/Rem-SB

You can switch the power supply output on and off, enable or block it with this input. Depending on the setting Set output, the input DI2/Rem-SB determines whether the output is controlled exclusively in external mode (by analogue interface) respectively remote mode (by digital interface) or if it requires to be enabled by the **ON**/**OFF** key. The enabling is indicated in the display with **auto ON**. Using the exclusive On/Off setting, the power output is directly controlled by the input DI2/Rem-SB. Attention! This can‘t be interrrupted by the **ON**/**OFF** key on the front or by a command from a digital interface card. Exception: the device is in „local“ mode, then the input is ignored.

◆**DI2/Rem-SB**

Set output Default: enable ON

= enable ON The **ON**/**OFF** key has to be used to enable the input

= exclusive The power supply output can only be switched on and off by the input DI2/Rem-SB

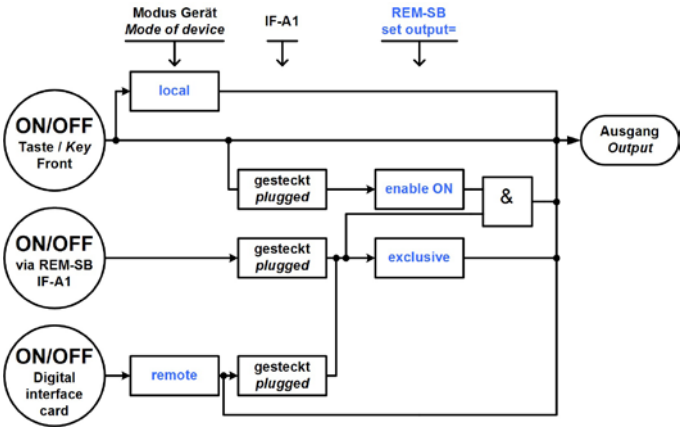
When using the setting enable ON, the output needs to be enabled at least once. By the setting Power ON = restore (see configuration menu of your device) the power output will be automatically enabled after a mains loss, if it has been enabled before the mains loss occured. It can then be switched on or off as normal.

Standby Default: LOW

= LOW The input is low active, standby is activated with a voltage level <1V or <5V (depending on the jumper setting)

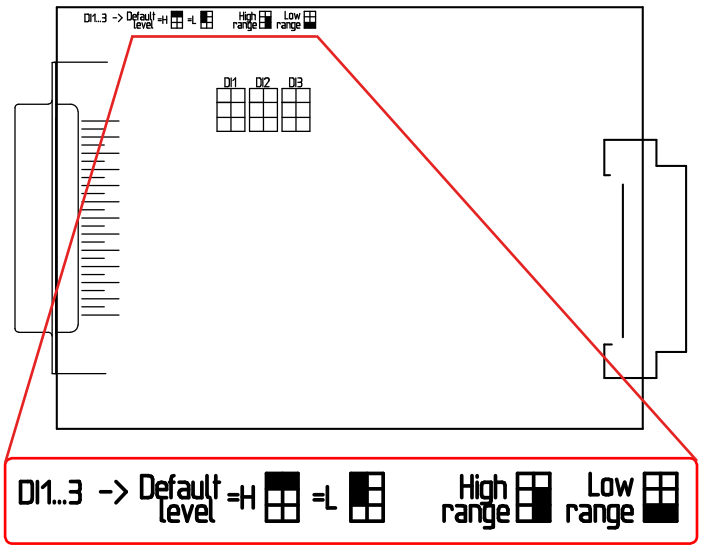
= HIGH The input is high active, standby is activated with a voltage level >4V or >9V (depending on the jumper setting).

The figure shows the chaining of the various states and conditions for local, remote and external mode when switching the power output on or off:



Jumper settings for DI1-2

The jumpers DI1-3 on the PCB are used to preset the physical behaviour of these inputs. The selector „Default level“ defines the default logical level of the corresponding input. That means, if the default logical level is set to High, the input has to be pulled actively to Low by an external application (eg. relay) in order to change its logical level. The default logical level requires attention, since it defines the behaviour of the power supply by the control signals **SEL_enable** and **Rem-SB**.



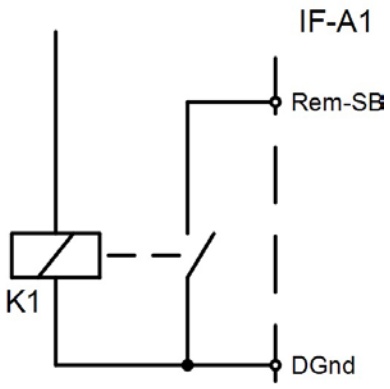
Default level defines the logical level of the input if not wired.

High range selects the high input voltage range for the input. A „high“ corresponds to a voltage of >9V and a „low“ to a voltage of <5V.

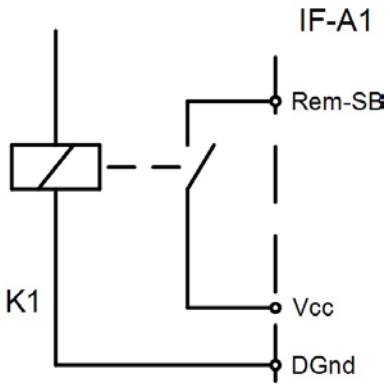
Low range selects the low input voltage range for the input. A „high“ corresponds to a voltage of >4V and a „low“ to a voltage of <1V.

Examples: the input **DI2/Rem-SB**, which is used to switch the power output on and off (standby), can be activated with LOW or HIGH, depending on what has been configured in the setup. In order to exclusively control the device output by this input, it is recommend to choose setting Set output = exclusive ON.

Example 1: the input shall be pulled to GND by a relay (maker contact) and switch the power output off. Hence you need to configure the jumper for DI2 to „Default level = H“ and use the settings Standby = LOW and Set output = enable ON. The output of the power supply can then be switched by the relay.



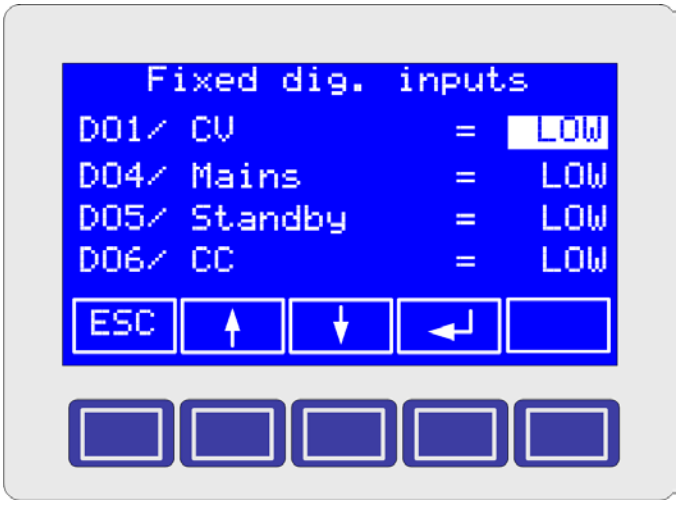
Example 2: the output shall be shut off by an emergency circuit. The jumper for DI2 needs to be set to „Default level =L“ and the setting Standby = HIGH. This example uses a relay with make contact to Vcc.



There are, of course, other possible solutions.

7.3.4 Digital outputs with determined functionality

The digital outputs DO1, DO4, DO5 and DO6 can not be user-defined in their functionality, but they can invert the logical output level.



◆**DO1/CV** Default: LOW

= { LOW | HIGH }

If LOW has been selected, the output is pulled to GND as soon as the regulation mode of the power supply is determined by the set value of voltage (CV operation). If HIGH has been selected, the output is pulled to 12...15V.

◆**DO4/Mains OK** Default: LOW

= { LOW | HIGH }

If LOW has been selected, the output is pulled to GND as long as the mains voltage is present. If HIGH has been selected, the output is pulled to 12...15V.

◆**DO5/Standby** Default: LOW

= { LOW | HIGH }

If LOW has been selected, the output is pulled to GND if the power output of the device is off (standby). If HIGH has been selected, the output is pulled to 12...15V.

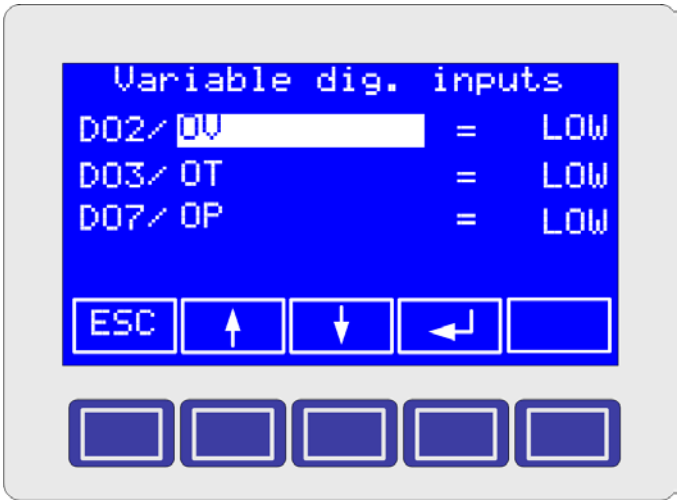
◆**DO6/CC** Default: LOW

= { LOW | HIGH }

If LOW has been selected, the output is pulled to GND as soons as the regulation mode of the power supply is determined by the set value of current (CC operation). If HIGH has been selected, the output is pulled to 12...15V.

7.3.5 Digital outputs with user-definable functionality

The digital output DO2, DO3 and DO7 can be configured as desired and the logical level can be inverted.



◆**DO2** Default: OVP LOW
◆**DO3** Default: OT LOW
◆**DO7** Default: CP LOW

Defining the logical level when triggered/indicated:

= LOW — The output is pulled against GND as soon as the selected function becomes active. The logical level is inverted, if the condition is not true.

= HIGH — The output is pulled against +15V by a high resistance resistor as soon as the selected function is active. The logical level is inverted, if the condition is not true.

One of the following functions can be assigned to each of the outputs:

= remote — Indicates that the power supply is remotely controlled via a digital interface card.

= OT — Indicates an overtemperature error.

= CP — Indicates that the power supply regulated by the set value of power (CP operation).

= Alarm — Indicates that an alarm has happened. The output of the power supply is automatically shut down and the alarm can be indicated by this output.

= trip U — Triggered by overstepping of the limits U> and/ or U< (see device instruction manual).

= trip I — Triggered by overstepping of the limits I> and/ or I< (see device instruction manual).

For models of PSI 8000 series additionally available:

= trip U+I — Triggered by overstepping of the limits U>, U<, I> and/or I< (see device instruction manual).

= trip Dyn — Triggered by step response supervision (see device instruction manual).

= Fct. runs — Signalises a running function (see device instruction manual).

= Fct. end — Signalises a stopped function (see device instruction manual).

= new Fct. — Signalises when a function was set to the start (see device instruction manual).

= disable — Does not signalise a specific ccondition, pin will be either LOW or HIGH, depending on the setting.

8. GPIB card IF-G1

The interface card IF-G1 offers a standardised, digital interface (GPIB) according to IEEE 488.1/2. The installation is described on the short install guide that is included in the package.

Note

In case a second card is used inside a device of the series PSI 9000, the IF-G1 can only be combined with the analogue card IF-A1 or the digital cards IF-R1 or IF-U1. It must not be plugged together with the CAN interface card IF-C1 or with the Ethernet card IF-E1B! See section 3.3.

8.1 Controlling a device via GPIB

The principle to access and control our devices is the same as with the other digital cards. Once the GPIB card is connected to a PC and has been configured, you can easily query status and actual values from the device. Controlling the device, like setting the input/output on or off or sending set values, requires to activate the remote control mode. This doesn't happen automatically. The corresponding commands are described in seperate documents.

Note

With GPIB you can link only up to 15 client units on one bus!

8.2 Terms explained

GPIB	General Purpose Interface Bus
IEEE60488.1	standardises GPIB interface to a host computer (older synonyms: IEC bus, IEC 625 bus , ANSI standard MC1.1)
SCPI	Standard Commands for Programmable Instruments => a standardised command language for communication with instrumentes, measuring equipment etc.

8.3 Firmware updates

The package includes a flat ribbon cable that is used for firmware updates of the microcontroller. In order to update, plug the cable to X5 on the PCB, insert the card carefully into the device again and connect the Sub-D plug to a PC via a 9pole Sub-D cable of „null modem" type (not included). A seperately obtainable update tool can either be downloaded from your supplier's website or is obtainable upon request.

8.4 Transmission and execution times

The SCPI protocol needs to be translated into the internal one and thus consumes some time.

The protocol translation time and the execution time of the device's internal microcontroller are dependent on the command and have to be added to the transmission time. Typical values are:

Time of protocol translation T_P: 2ms

Transmission time to the internal microcontroller $T_{T,MC}$: 0.5ms

Execution time of the internal microcontroller $T_{E,MC}$: 2ms

In case the host PC is expecting a response, a total time of

$$T_{Request} = T_{T,GPIB} + T_P + T_{T,MC} + T_{E,MC}$$
$$T_{Response} = +T_{T,MC} + 0{,}2 \bullet T_P + T_{T,GPIB}$$

can result, depending on the command sent.

The transmission time $T_{T,GPIB}$ of the GPIB bus is very short and lies with typical 200µs. The recommended command interval time is >30ms. Smaller times can lead to execution errors.

8.5 Configuring the IF-G1

The card is configured in the setup menu.

Note: it is definitely necessary to choose a unique „device node" (=address) for every unit that is connected to the same PC. Only then the device can be identified and addressed correctly. Accessing the setup menu:

M + Communication + ↵ and Slot: IF-G1 + ↵

Here you can set the device node, which equals to the GPIB address.

Note

*In case the settings are changed without restarting the device, you are required to send the *RST command in order to submit the new settings.*

Attention!

With power supply series PSI 9000 up to firmware version 3.04 resp. with electronic load series EL3000/9000 up to firmware version 2.11, the interface card is not recognized correctly. Contact your dealer for details.

9. Ethernet card IF-E1B

Attention!

Since June, 2011 only the model IF-E1B is available and this section does not handle the former models IF-E1/IF-E2 anymore.

The Ethernet or network card connects the device directly to a host PC or via Ethernet hubs/switches. According to the connection type, a patch cable or crossover cable has to be used. The Ethernet interface with its RJ45 socket can not be configured. Thus it works in automatic mode, which will detect the connection speed of 10 or 100 MBit. The speed will be defined by the host PC's settings or the network hardware.

Note

The connection speed of Ethernet (10Mbit or 100MBit) is not equivalent to the communication speed when communicating with the device itself. This speed is internally set to 100kBit and thus results in certain response and execution times. Also see section „8.4 Transmission and execution times" and the technical specs in „2. Technical specifications".

9.1 Preparation / Notes about operation

There are some things to consider before resp. while operating the Ethernet card:

- As long as the network card is used in a device, a network cable should always be plugged in
- If the network settings are modified in the device setup menu of the device (only available with certain models), then they will only be applied after the device is switched off and on again.
- If the network settings are modified via the device website and then submitted, they instantly become active
- The TCP/IP port for the direct communication with the device can only be set via the device website and is permanently stored on the Ethernet card, contrary to the network parameters, which are stored inside the device
- When communicating with the device via TCP/IP, the website should be closed, because the website generates additional traffic with the Ethernet card and may cause interference
- The indication LEDs on the RJ45 port are inoperable in order to ensure galvanic isolation
- SCPI messages coming from the device contain an end token 0xA (10) in the string
- Cards with firmware <2.10 use a feature called DHCP by default. If DHCP is activated in the network, then a DHCP server will automatically assign a different IP/gateway to the Ethernet port and the network settings in the device are ignored. The new IP will be unknown and the card not be accessed without further means.

9.2 Configuring the Ethernet card

9.2.1 On the device

Note

Network parameter configuration on the device is only available with the PSI power supply series. If your device is not of PSI series, skip to section 9.2.2.

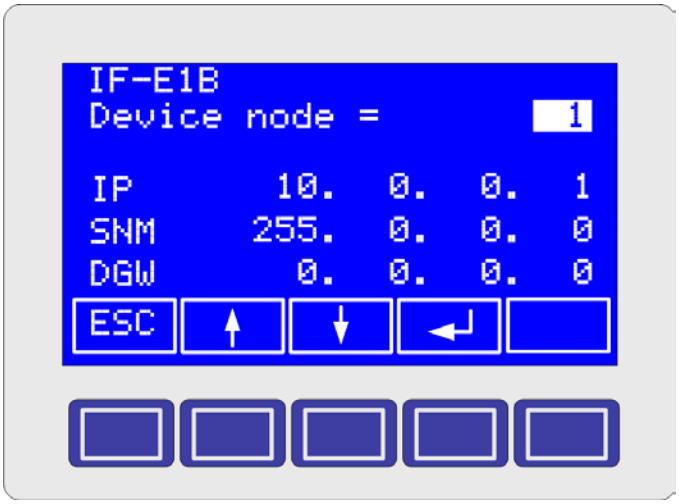
Plug the card into the dedicated slot while the device is switched off, and switch the device on again. The connection parameters can be configured in the setup menu:

M + Communication + ↵

By selecting the card with

Slot: IF-E1B + ↵

you enter the configuration menu and you can now setup the network parameters:



IP: IP address

SNM: Subnet mask

DGW: Gateway

The selection of the value to change is done with the arrow buttons on the control panel, the adjustment is done with the left rotary knob or, with a PSI 800 R device, with the buttons „+" and „-".

At series PSI 8000, the rotary knob has a pushbutton, which can be used to switch between coarse and fine adjustment steps.

Attention!

General provisions and regulations regarding network topology and setup do apply here. Wrong settings will lead to network problems and inaccessible device.

9.2.2 With the IP-Config tool

For device series which do not allow to configure the network parameters directly on the device, the parameters can be configured via the USB port of the network card and with the „IP-Config“ tool that is included on the supplied tools CD in folder \software or can be downloaded from our website. It requires to use the included USB cable.

Before using IP-Config make sure the jumpers on the Ethernet card are set to position NORM.

Take care for correct driver installation and IP-Config will be able to detect the device. Select your device, and read the old parameters from the device by clicking on the READ button, edit the values and write them permanently to the device with the WRITE button.

Before the new parameters are activated, the device has to be completely switched off (mains switch) and switched on again.

9.2.3 On the device website

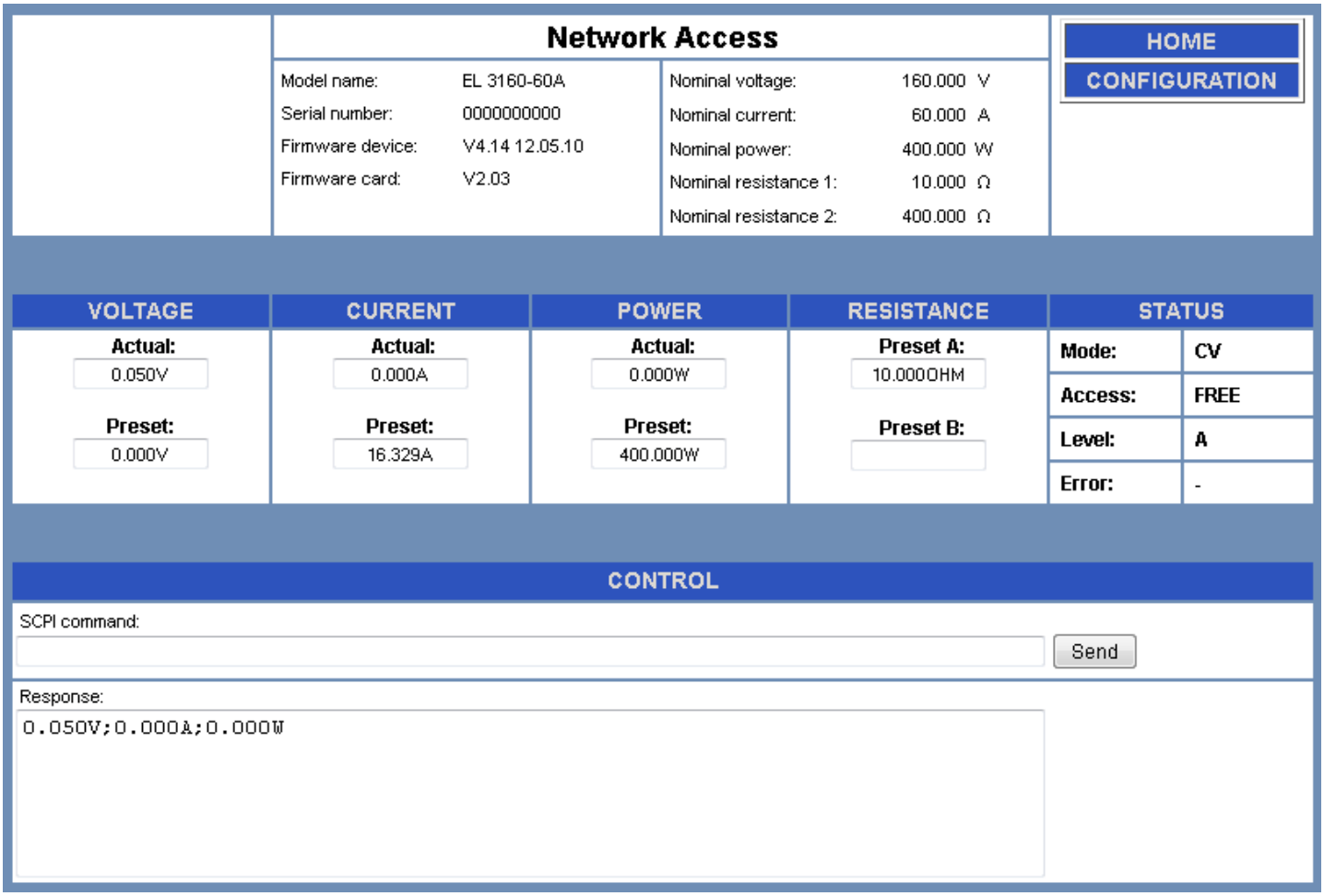
In order to change the IP on the device website perform following steps:

1. Connect the Ethernet card via patch cable to a PC and access the current IP with a browser (Chrome, Firefox, IE). In case the card was not set to a custom IP before, the default IP is 10.0.0.1.
2. The browser should load the website. On page CONFIG, you can enter new network parameters IP, SUBNET MASK, GATEWAY, if DHCP is not used. Else these can be ignored.
3. Change the TCP port, if the default value can not be used.
4. If required, activate DHCP. As soon as the settings are submitted, the Ethernet card reboots and tries to contact a DHCP server in the network. If a server is found, it will assign new network settings to the card. If no server is found, the card will use the network parameters as given via website or as stored inside the device.
5. Write changes to device/Ethernet card by SUBMIT button.

The new network parameters are instantly active and the Ethernet card will reboot After a few seconds, the card or the website is becomes accesible again (refresh).

Note

The „Port“ setting is 1001 by default and used for TCP/IP communication in order to control the device. For HTTP and webbrowser access, port 80 is reserved.



IF-Ex: Device web site (HOME) with an overview about device, set values, actual values, status and a command line

9.3 Communicating with the device

General information

The communication with the device is done with the TCP/IP protocol via a user-selectable port. The default port is 1001. The port can only be changed on the device website, see section 9.2.3 for more information. Following ports are available:

Port 80: HTTP

Ports 0-65535, except 80: TCP/IP

9.3.1 Communication via HTTP

The network cards features a HTTP server. When accessing the IP of the device by a web browser, a graphical user interface appears which displays information about the device such as device type, nominal values, actual values and set values. This web site can also be used to remotely control the device and configure the network settings.

Remote control is done with SCPI commands. The command set is described in external user guides. Refer to section „13. Programming“ for an overview. The commands are input as plain ASCII strings into the command line and sent by hitting the Return key or by clicking the SEND button. The error and response box below the command line will report errors and display queried values.

Notes & requirements:

- Requires Javascript enabled for refresh and content
- Refresh interval (values, status): 200ms
- SCPI commands can also be entered in lowercase
- The web site allows port selection for TCP/IP communication

9.3.2 Communication in LabView

LabView has implemented VIs for interface communication via TCP/IP (VISA) by default. These can be used according to their given handling instruction. Further information can also be found on the internet. There is also a set of VIs included on the tools CD, which will simplify the remote control of your device via Ethernet.

9.3.3 Communication in other programming languages

The user has to establish the appropriate communication with TCP/IP protocol in order to transport SCPI commands as correct ASCII strings to the device. Based upon the manifold of operating systems and programming languages, there are no libraries (DLL) or code examples available.

For a socket connection, only IP and port of the target device are required. The port can only be changed via the device website and is stored on the interface card.

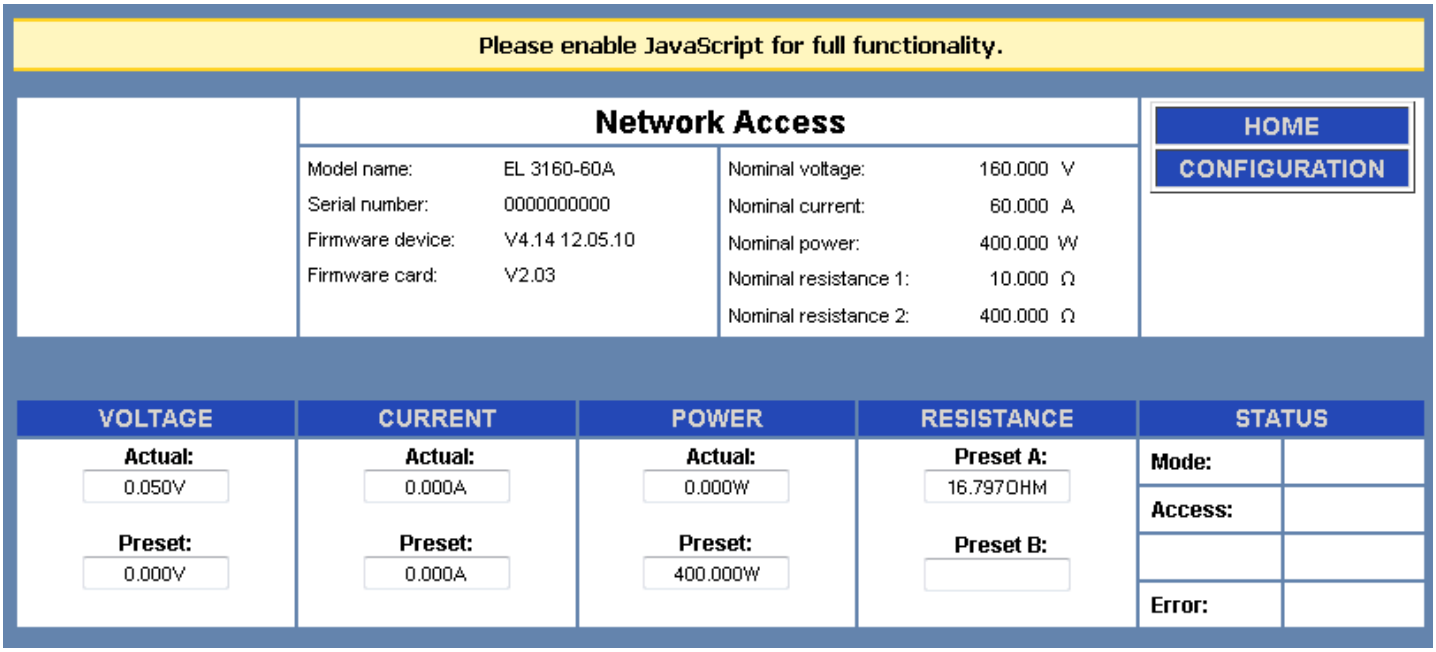
It is allowed to keep the socket connection open as long as communication with the device is continued. Permanent closing and opening of the socket is also possible, but consumes more time.

9.3.4 Communication via the USB port

The Ethernet card features an additional interface, a USB port of type A. This interface works identically to the IF-U1 USB card,. Also see section 5.

When using USB, following applies:

- No SCPI commands, no TCP/IP, no HTTP, no website
- Transmission speed is fixed to 57600 baud
- USB driver required
- Communication via LabView and other languages only with the object orientated communication protocol (see section 7.) resp. the corresponding LabView VIs.



IF-Ex: Javascript error

9.4 Firmware updates

The additional USB port is also used to update the firmware of the device or the Ethernet card itself.

Firmware updates are done with a special update tool and a new firmware version, which are obtainable from the manufacturer of the device.

9.5 Trouble-shooting

Problem: Device is not responding

In case the connection to a device somehow hangs or drops completely and attempts to re-establish the connection fail, the interface card can be reseted with the small reset button on the card.

The card will reboot after the manual reset and initialise the network connection again so that the device becomes accessible again.

Problem: IP of a device is unkown or forgotten

Devices with a graphical display can show the network parameters in the setup menu.

Other models, like for example a PS 8000 T, can not show the IP. Here it is required to use the little tool „IP-Config“, which supplied on the included CD. Via the USB port connection and with the jumpers on the interface card set to position NORM, the tool can read and write the network configuration.

Problem: The device can not be accessed via its IP

This can have several reasons:

1. The Ethernet card could not be detected by the device

If a device can not detect and thus initialise the Ethernet card, the Ethernet will reboot every few seconds and the network connection will constantly open and close.

Check your device...

- electronic load **EL 3000 / EL 9000** for showing „Card found: IF-E1 (Ethernet“ in the display (switch „Level Control“ in position „Setup“
- power supply of series **PSI 8000** or **PSI 800 R** for showing „Slot: IF-E1“ in menu „Communication“
- power supply of series **PS 8000** for showing „Device node“ in the setup mode

If this is not display, the card slot may be defective, the card itself may be defective or the card is not installed correctly.

2. The IP is a different network segment

A subnet mask defines what local IPs are accessible in the network. The subnet mask, as set for the IF-E1B Ethernet, has to match the subnet mask of the network. You can either change the subnet mask or the IP to access the device again via its IP.

3. The TCP port has closed

The keep-alive timeout of the Ethernet card IF-E1B is 10min. If there is data communication during this period, the TCP port will be closed on the device side.

4. The device has a different IP than expected

If DHCP has been activated and there is a DHCP server running on the network, the network settings, as given by you via website, IP-Config tool or directly in the setup menu, will be overriden and automatically assigned new values.

The new IP is unknown at first. In order to switch DHCP off for the Ethernet card, you need to detect the IP first. This can be done using a network scanner tool, which also lists the MAC address of detected network devices. The MAC address (see sticker on the IF-E1B) can be used to identify the Ethernet card and to find the assigned IP. Open the IP in a browser and switch DHCP off, if required.

Problem: The LEDs on the network port do not work

This is no error, this is intended in orde to ensure the full galvanic isolation of up to 1500V against the device.

Problem: When connecting more than IF-E1B to the network, one or all devices with IF-E1B can not be connected

This can happen with older firmware versions. Up to version 2.08, the IF-E1B might not use the correct MAC address in some situations. It then uses a generic MAC adress which unfortunately is the same on all cards concerned by this problem. It can only be solved by performing a firmware update on the Ethernet card(s).

From firmware 2.09, if the Ethernet card can not use the implemented MAC address by any reason, it will use a MAC address where the first three bytes are always the same and the rest is generated from the serial number of the card, so the new MAC address becomes unique.

10. Profibus card IF-PB1

Profibus stands for „Process Field Bus“ and is a primarily european standard for field bus communication in automation engineering.

The Profibus card allows to run up to 32 units on a bus segment without extra measures. Bus termination is typically done on the Profibus plugs, which normally have integrated switches and bus termination resistors.

Units with plugged IF-PB1 automatically recognize and configure the card. In the device setup (see user instruction guide of the device) the user merely has to select an unique Profibus address for every unit that is going to be integrated into the bus. This address is required for the Profibus slave controller. As soon as it is connected to the bus, it will report itself to the master. On the control side, which will normally be a PC, it requires only a so-called GSD file (Generic Station Description), which is loaded into the Profibus master control software. This file defines the available functions of a device.

10.1 Transmission speed

The max. transmission speed of the Profibus slave controller (12Mbit) is not the speed in which the communication with the device is actually running. This speed is internally fixed to 57600 Baud festgelegt and will result in certain execution and response times. Also see section „8.4 Transmission and execution times“.

10.2 Configuring the Profibus card

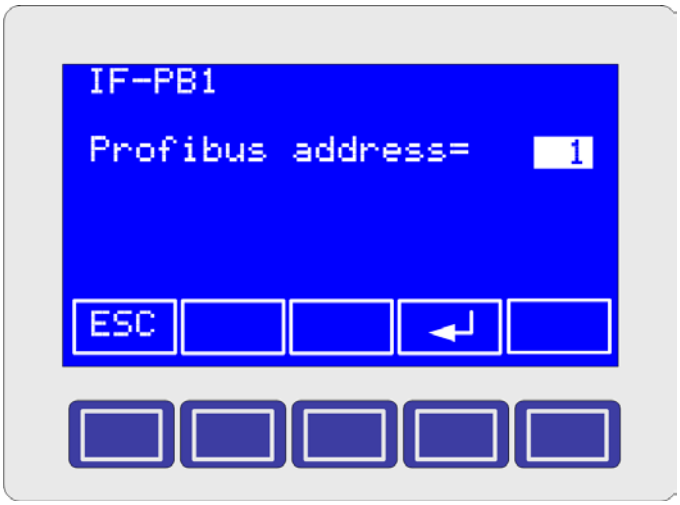
The interface card is configured in device setup menu.

It is required to select an unoccupied Profibus address for every unit that is going to be connected to the bus.

M + Communication + ↵ and

Slot: IF-PB1 + ↵

you can select the card to cofigure and change following parameter(s):



◆ **Profibus** Default: 1

= {1..125}

One out of 125 Profibus addresses can be selected.

10.3 Connecting the bus

The unit is connected to the bus master or to other units with a typical Profibus cable. Those cables are required to have a built-in bus termination, either switchable or non-switchable. Bus termination is required for units at the end of the bus.

10.4 Bus termination

Bus termination for Profibus is done with the integrated, switchable bus termination resistors in the Profibus cable plugs. Units at the end of the bus are required to be terminated.

It is furthermore important to obey the provisions about the maximum number of units on a bus segment (for IF-PB1, these are 32), so that the minimum total resistance that is defined by the bus specification is not exceeded. Any Profibus unit has a certain internal resistance that is parallel to any other unit and bus termination plug.

10.5 Implementation on the control side

The control side, which normally will be a PC, requires to implement our devices by means of a GSD resp. GSE file, which is either supplied on the included CD or available for download on our website. This text file describes the functions that are available for our devices on a Profibus connection.

These are:

- Querying actual values (U, I, P) DPV0
- Querying the device condition (CC, CV etc.) DPV0
- Parameter channel DPV1

The parameter channel DPV1 allows access to:

- Querying the set values of U, I, P
- Setting the set values for U, I, P
- Setting device condition (remote control, output)

10.6 Other features

Reset button

The little pushbutton that is located on the interface card can be used to reset and restart a hanging, non-responding connection. A short push while the unit is running and the Profibus slave controller is restarted and will report itself to the bus master and normal Profibus connection should be available again.

The red LED

This LED indicates a correct Profibus connection.

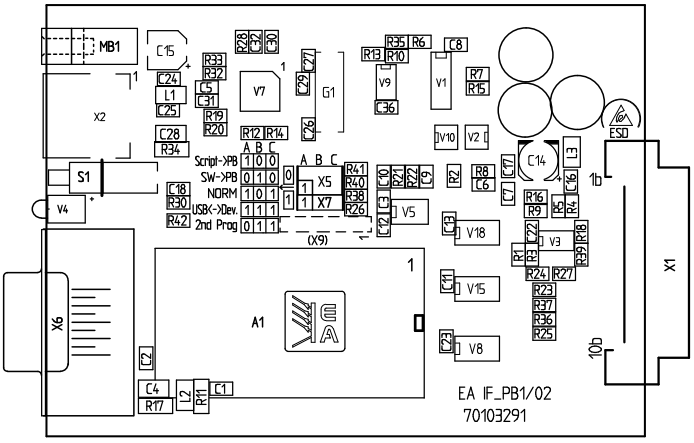
LED off = Profibus connection OK

LED on = no Profibus connection or connection error

10.7 Updating the firmware

A firmware update can be required by several reasons. The firmware consists of two part: the actual firmware of the Profibus slave controller which is supplied by the Profibus controller hardware manufacturer and a user script. The new user script is obtainable from us upon request or available as download on our website.

Before the update, the Profibus interface card has to be removed from the device in order to set jumpers on the card which select what is going to be updated.



The jumpers A, B and C (in the middle of the PCB) are set to Position *NORM*, as depicted by the little table that is printed on the PCB next to the jumpers. *NORM* stands for 101, whereas a 1 means that the lower two pins of a column are connected and a 0 that the upper two pins are connected. For position *NORM* this is A = lower, B = upper and C = lower jumper setting. Meanings:

Script->PB

Load user script into the Profibus slave controller. See below.

SW->PB

Firmware update of the Profibus controller. See below.

NORM

Setting for normal Profibus operation. This position is required to be set after every script or firmware update.

USB<->Dev.

Activates the connection of the USB port to the device. The device can now be accessed by communcation via the USB port, as an alternative communication way (see section 10.8). It is also used to update the device firmware. Some device series feature two microcontrollers for which the jumpers have to be reconfigured during the update process. This is what the last position, *2nd Prog*, is used for. The required Update Tool will lead you through the update process and request you to do the necessary settings.

2nd Prog

Is only required to be set when updating a device‘s firmware and only with models of series PSI 8000 or PSI 9000 which feature two microcontrollers. Follow the instructions of the Update Tool.

Controller firmware

To update the controller firmware, as far as it is required at all, it requires a Windows software (Firmware Download Tool) from the Profibus slave controller manufacturer Deutschmann AG (www.deutschmann.de), as well as the firmware file itself. Also included on the supplied CD. Most recent versions only available as download from the Deutschmann website. The update is done via the USB port, with jumper setting *SW->PB*.

User script

To update the user script, it requires a Windows software (WinGate) from the Profibus slave controller manufacturer Deutschmann AG (www.deutschmann.de). It is also included on the supplied CD. Most recent versions only available as download from the Deutschmann website.

The script is always supplied by us, included on the CD or available as download from our website

The update is done via the USB port, with jumper setting *Script->PB*.

10.8 Communication via the USB port

The USB port can be used alternatively to the Profibus for communication, in order to access the device via a different protocol or when a Profibus is not available. Doing so requires to set jumpers on the interface board, as explained in section 10.7.

The USB port as device is always available in Windows, as long as it is connected. The jumpers just switch the communication to the device between USB and Profibus. Thus only one of both ports is working.

After switching to USB communication, the port will work exactly as with the USB interface card IF-U1, except that the card remains described as IF-PB1 with name and article number.

Refer to sections „5. USB card IF-U1 / IF-U2“ and „13. Programming“ for details about communication, programming and setup of the USB port.

11. Notes about particular device series

11.1 Series EL 3000 / EL 9000

The electronic loads of the series EL3000 and EL9000 support the following interface cards (date 08 /2012):

IF-U1, IF-R1, IF-C1, IF-G1* and IF-E1**

Note about the GPIB card IF-G1: at devices with firmware version 2.10 or older the card is detected as IF-C1 (CAN card) and must be configured to following settings:
- CAN Baudrate: 100kBd
- Bus termination: no
- Relocatable ID: 0

Also, in devices with firmware older than 3.01, the card is detected but not correctly supported. We recommend an update. Please contact your dealer.

From firmware version 3.01 there are no limitations.

You can configure the interface cards in the setup menu of the devices. This is activated by turning the switch **Level Control** to position **Setup**.

Depending on which card is equipped, a different selection of parameters is available. The parameters and their values are identical to the ones explained in section 4 to 8, with the exception that no Sample point can be set at CAN.

There are also no settable parameters for the USB and IEEE card.

*) since firmware 2.11

**) since firmware 4.07

11.2 Series PS 8000 T/ DT / 2U / 3U

Access to the device setup via pushbutton **Fine** (press >2s while output is „off"), for details of settings see user manual of the device. The GPIB, USB and Ethernet don't require configuration resp. can not be configured in the setup.

11.3 Series PSI 800 R and BCI 800 R

The shortened type 2 cards are used here. Setup and configuration are explained in the user guide of the device and also in section 4. to 9. Menu structure and handling of PSI 800 R series is similiar to PSI 8000 series.

EL 3000/9000 Menu example of the CAN card:

EL 3000/9000 Menu example RS232 card:

12. The System Link Mode (PSI9000 only)

Attention! Following requirements and restrictions:

- Parallel and/or series connection only with units of the same type
- Models with option ZH can not be used for System Link
- The softwares EasyPower and EasyPower Lite don't support remote control of units in System Link mode

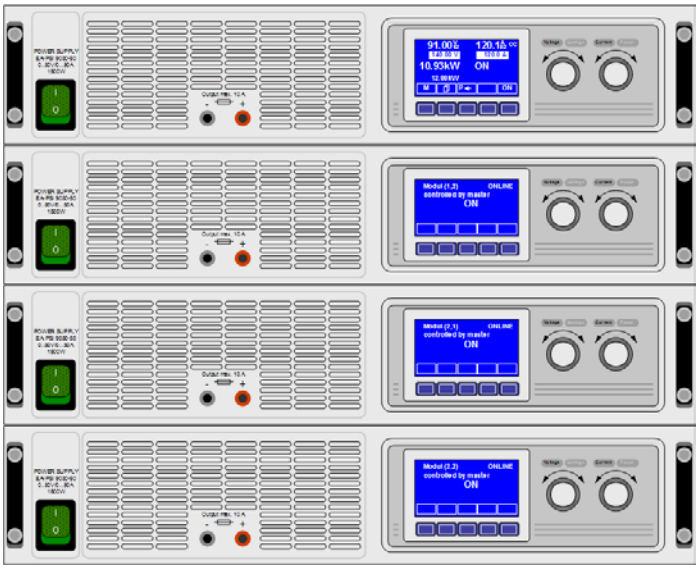
The System Link Mode is only available for series PSI9000 and supports parallel or/and serial connection. Without this extra connection any device will display its own actual/set values and errors, when using the devices in master-slave configuration in parallel or series or in parallel with the Share bus. The set value and actual value of voltage has to be multiplied by the user by the number of serially connected units. The parallel connection acts analogously to the serial connection. Here the current set value and actual value have to be multiplied.

The System Link Mode transfers the actual values from the slaves to a definable master and the set values vice versa. The master displays and sums up all actual and set values, so that the connected devices act like a single unit. There are also signals, warnings and alarms of all slaves indicated.

The System Link Mode supports up to 30 connected units. It is though not recommended to link more than 10 units when using parallel connection.

Example:

Four devices PSI 9080-100 shall be linked. Each of them can deliver 3kW power. If you serially connect two sets of units which are connected in parallel, it results in a maximum voltage of 160V and a maximum current of 200A while the whole set can deliver up to 12kW power.

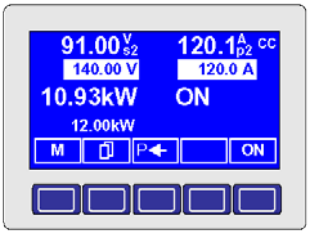


12.1 Handling the System Link Mode

12.1.1 Display and handling of the master

The master unit is used to adjust the set values for the whole system and to display the summed up set values and actual values.

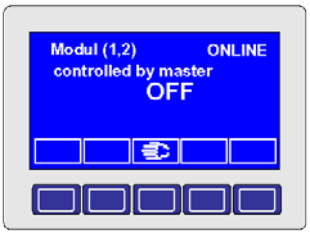
The configuration of the master defines the „behaviour" of the whole system. All values can be set like with a single unit.



The master also displays the number of units connect in serial (s2) and parallel (p2).

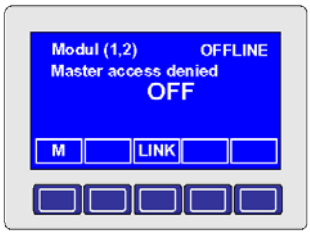
12.1.2 Display at the slaves

See below the display of a slave as long it is „online" with the master. Any device in the linked system has to be set up for the System Link mode. You need to speficy which unit will be master and how the slave units are connected, so the master will „know" which are connected in series and which in parallel.



Example: the slave is online and the power output of the system is in standy (switched off). The (1,2) shows that this slave is directly connected to the master in parallel (the second value indicates the number of units in parallel).

If the output is switched off, a slave can be set offline with the key and is then not linked to the master anymore. Now it can be configured.



M The MENU key activates the menu.

LINK The LINK key is used to set the slave online with the master again.

12.1.3 Special alarms, warnings and signals

M–/– S The master indicates that not all slaves are online.

S- ? Common alarm from a slave

This alarm is generated if a slave can't be contacted anymore while the master has set the power output to ON. It can occur if the System Link is broken or if the slave has been switched off by the mains switch.

S-PH An alarm or

S-PH a warning with „Auto ON" setting

is indicated if the connection to a slave is lost in case that the slave has been switched off or a mains voltage loss has occured. PH = phase blackout

A warning with „Auto ON" setting switches the power output off until the cause of the failure/error is removed or has gone. The system will then automatically switch the output on again. The error has to be acknowledged and will turn into a signal if it still persists. The signal vanishes if the error is removed or gone.

If there will be an alarm or warning with „Auto ON" depends on the setting „Reactivation after power ON" (see user manual of series PSI 9000, section „Defining operation parameters").

◆ **Power ON** Default: OFF

= OFF Power output is off (standby) after return of the mains voltage or after the unit has been switched ON.

= restore Power output is automatically set to the last state it had before the unit was switched off or before a mains voltage loss occured. This can be ON or OFF.

S-OT An alarm or

S-OT warning with „Auto ON" setting

is indicated, if one or multiple slaves experienced and reported an overtemperature in the power stages.

If there will be an alarm or warning with „Auto ON" depends on the setti ng „Reactivation after power ON" (see user manual of series PSI 9000, section „Defining operation parameters").

◆ **OT disappear** Default: auto ON

= OFF The power output will stay switched OFF after the overtemperature has disappeared and the power stage is cooled down.

= Auto ON The power output is automatically switched ON again after the overtemperature has disappeared and the power stage is cooled down.

S-OV

One or multiple slaves have reported an overvoltage protection error. The power output will be switched OFF and can only be switched ON again after the alarm has been acknowledged.

12.2 Configuration of the System Link Mode

In order to use the System Link Mode it first has to be set up and configured. The extra ports (SIO2) on the cards IF-R1 or IF-U1 have to be linked to a corresponding port of the next unit. A CAT5 patch cable is included in the package. The end units will be bus terminated by a setting in the parameter setup page.

Enter the menu of any device, activate the communication menu and select the card to configure:

Slot {A|B}: IF-R1 {IF-U1} + ↵

◆ **SIO2** Default: not used

= not available The SIO2 ports are not available.
= not used The SIO2 ports are not used.
= {Master|Slave} The unit is defined as master or slave

The following two parameters only appear if the device is defined as Master:

Matrix of modules

Here you „tell" the master how many units are connected in parallel or series.

◆ **serial** Default: 1

= {1..x} Set the number of units connected in series. A 2 means, that two units are connected etc.

The allowed number of serially connected units also depends on the maximum acceptable isolation voltage!

◆ **parallel** Default: 1

= {1..30} Define the number of units which are connected in parallel, no matter if directly to the master or not. A 2 means, that two units are connected in parallel etc.

The following two parameters only appear, if the device is defined as Slave:

Position of module

The parameters here define the position of a slave unit within the system. Every position within a system of serially or parallel connected devices must be unique!

◆ **serial** Default: 1

= {1..x} Set the position of the device in the system (see figure below).

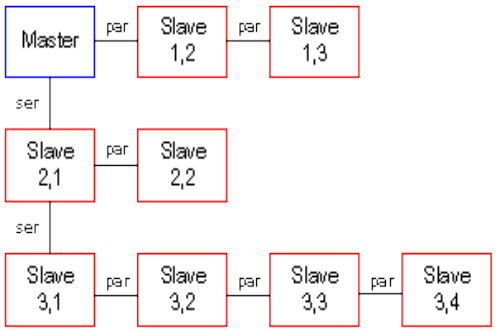
The allowed number of serially connected units also depends on the maximum acceptable isolation voltage!

◆ **parallel** Default: 1

={1..30} Set the position of the unit within the system.

Example 1: one slave device is connected in series to the master and three additional slaves are connected in parallel to that one slave. Those four devices in parallel have to be set to 2 for the value serial and to 1...4 for the value parallel.

Example 2:



Attention! The Position of module serial=1/parallel=1 is dedicated to the master and may not be set for a slave unit, which won't accept it anyway.

The SIO2 port also requires a termination if the slave unit is at the end (one of the two ports is left blank). The termination is set with this parameter:

◆ **bus terminate** Default: NO

= NO No termination.

= YES The SIO2 is terminated.

13. Programming

Detailed information about programming the target device via one of the digital interface cards can, i.e. remote control, be found in external user guides which are seperated into:

- Programming
- Object lists
- SCPI command lists

The user guide **Programming** contains all information about accessing the target device by the object orientated, binary communication protocol in environments like C, Visual Basic,LabView etc.

Link: Programming

Together with the user guide for programming, the user is required to use **Object Lists** which are a command reference for the telegrams that are sent to the device.

Link: Object list series PSI 8000 T / DT / 2U / 3U

Link: Object list series PSI 9000

Link: Object list series PSI 800 R

Link: Object list series BCI 800 R

Link: Object list series EL 3000 und EL 9000

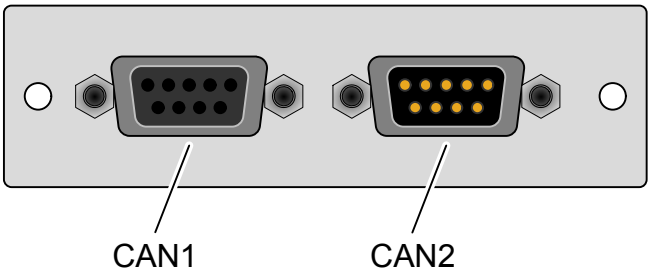
Link: Object list series PS 8000 T / DT / 2U / 3U

Furthermore, there are **SCPI command lists** for every user working with IF-G1 or IF-Ex cards. There are seperated lists for power supplies and electronic loads, because they differ by the available commands.

Link: SCPI command list for power supplies

Link: SCPI command list for electronic loads

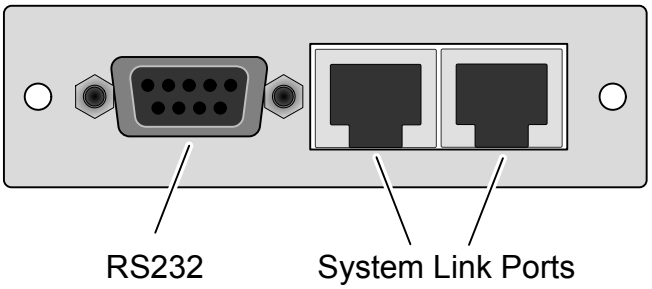
14. Connectors



IF-C1/C2

Note about If-C1/C2:

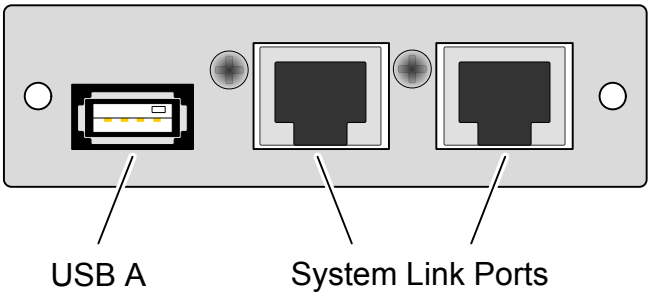
The connectors of the CAN card are connected in parallel



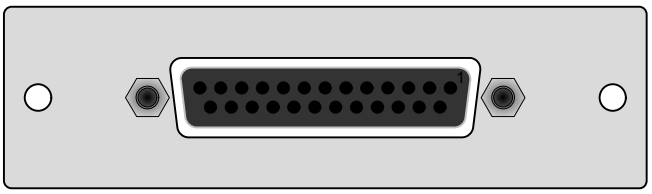
IF-R1

Note about IF-U1 / IF-R1:

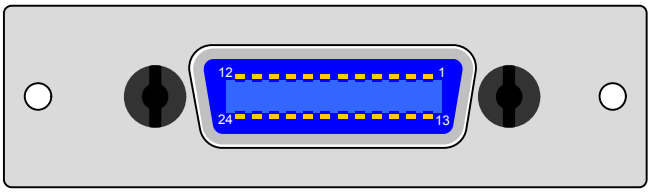
The System Link ports are only usable with power supplies of the series PSI9000. Never connect Ethernet cables here!



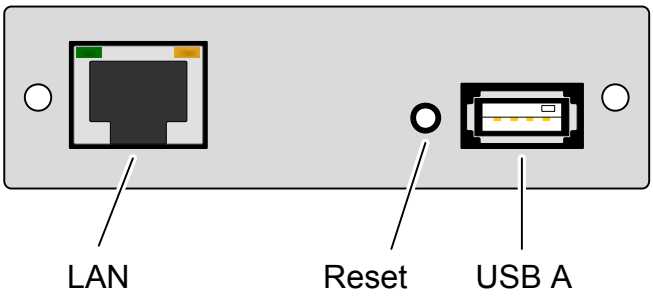
IF-U1



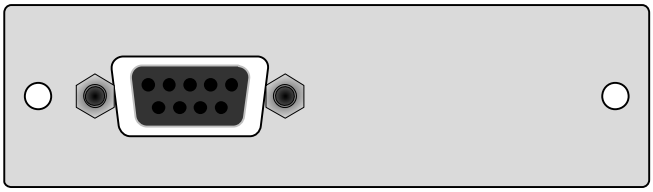
IF-A1



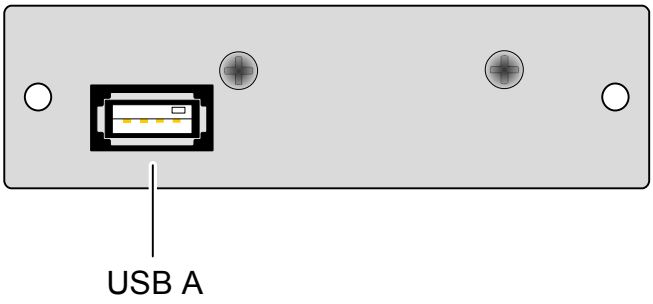
IF-G1



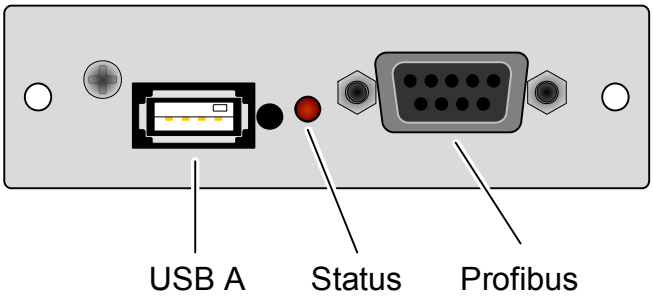
IF-E1B
IF-E2



IF-R2



IF-U2



IF-PB1

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