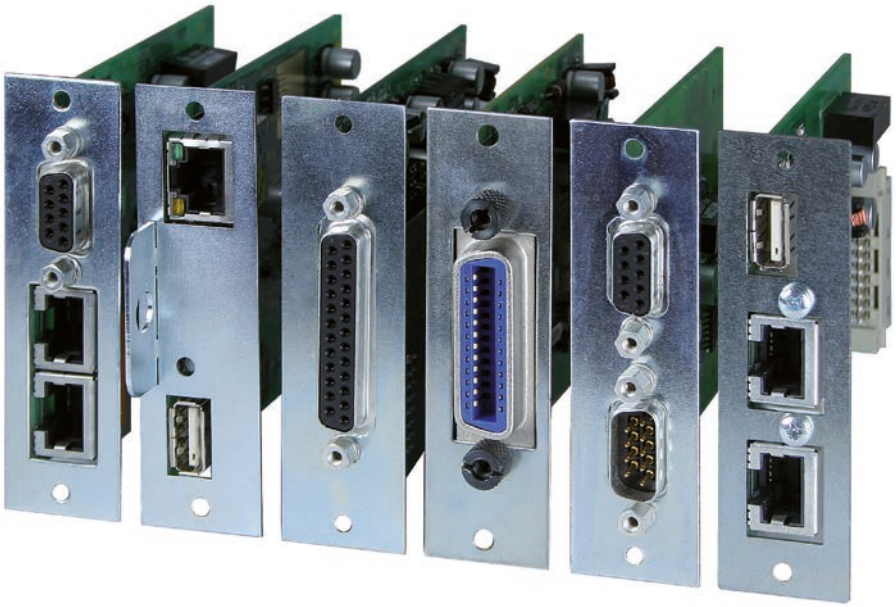
Elektro-Automatik

User Manual

Interface Cards

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



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-E1B (Ethernet):	33 100 227
IF-E2B (Ethernet):	33 100 228

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!

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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-E2B 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 can be parametrised.

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 separate 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 Instruments).

Interface IF-PB1 follows the Profibus specification.

Refer to section „13. Programming“ for an overview about further 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 sub-level 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 (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 occurrence 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	0 - 65535 (80=HTTP) Default: 1001 (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 10ms
Keep-alive time-out	10min.

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 GSD/GSE file

1 Time between the occurrence 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 provisions 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!

The RJ45 sockets of the IF-R1 card ARE NO Ethernet ports. Do NOT connect to a network!

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:

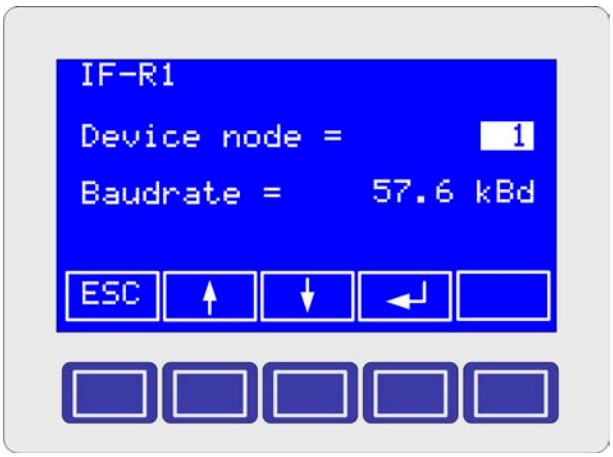
Slot A: { IF-... } depends on the equipped card

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 similar to the RS232 card, but it is more comfortable when connecting multiple units to a PC, because nowadays 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!

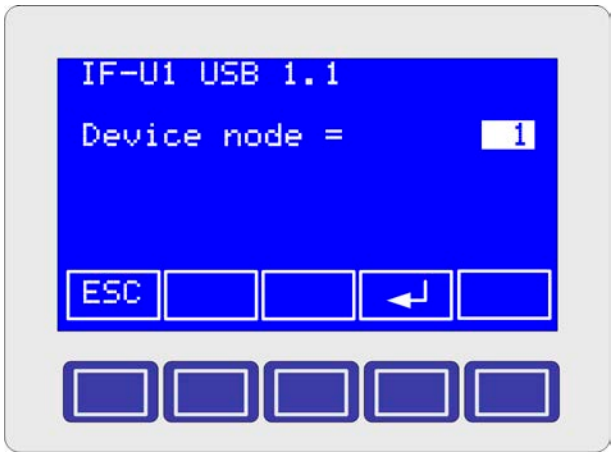
Never connect any of the RJ45 sockets of the IF-U1 card to an Ethernet hub or switch or Ethernet port of a PC!

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.

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.

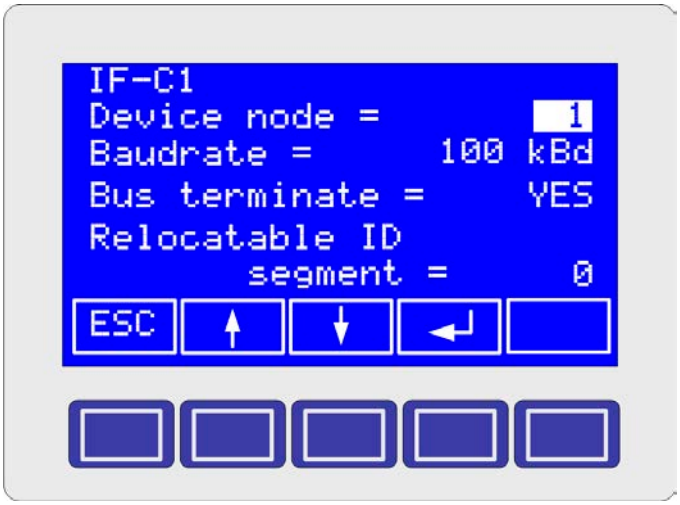


Figure shows IF-C1 settings of CAN-ID system “normal”, for “Vector” see section 6.2.2.

Setting the baud rate

All common baud rates between 10kBd and 1MBd are supported. Only with PSI 9000 (old series until 2012) 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 circumstantial 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 a device with gateway feature (only available with old PSI 9000 series until 2012) and which is assigned as gateway 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 existing 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 separated 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 addresses (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 **single cast** 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.

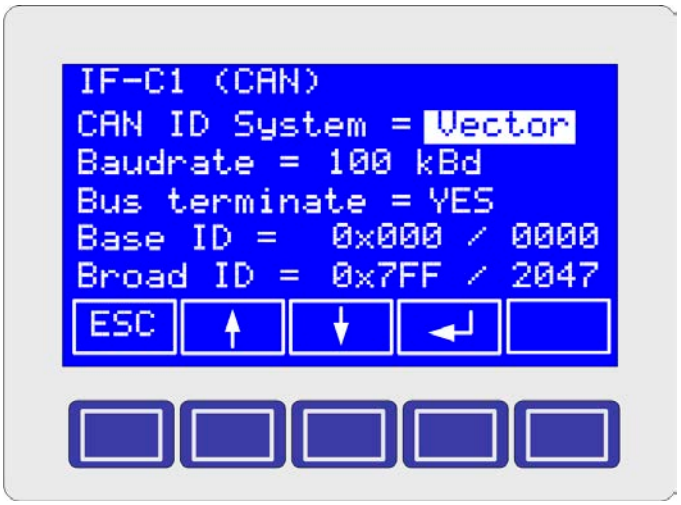
6.2.2 New CAN ID system since June 2011

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 hexadecimal 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 for the analogue inputs		Reference for SEL signals
15		AGND[2]	Reference potential for 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 of the 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
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	Preselectable logic level if input is not wired: open = High Level or Low Level
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 independent. 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

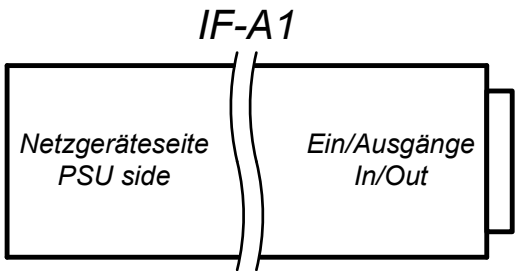
4) Positive currents are flowing out of the device, negative currents are flowing into it.

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 series PSI 9000 (old series until 2012) --> it's generally required to unlock the option „Internal resistance“ first

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**).

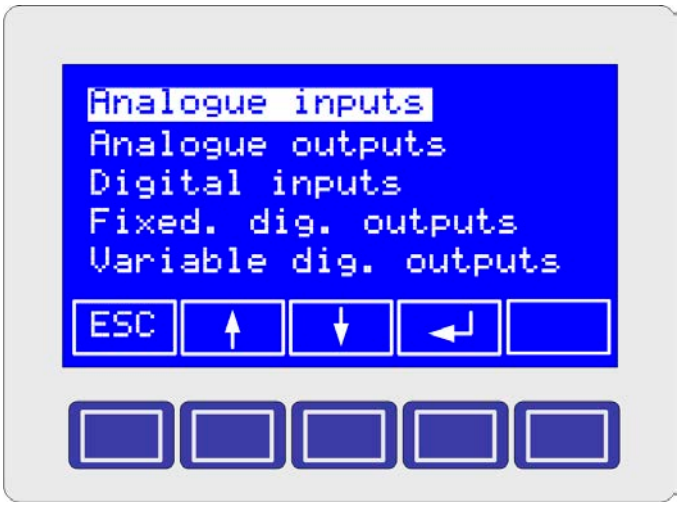
7.3 Configuring the IF-A1

The interface is configured in the communication menu:

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

📄 **Slot {A|B}: IF-A1 +** ↵

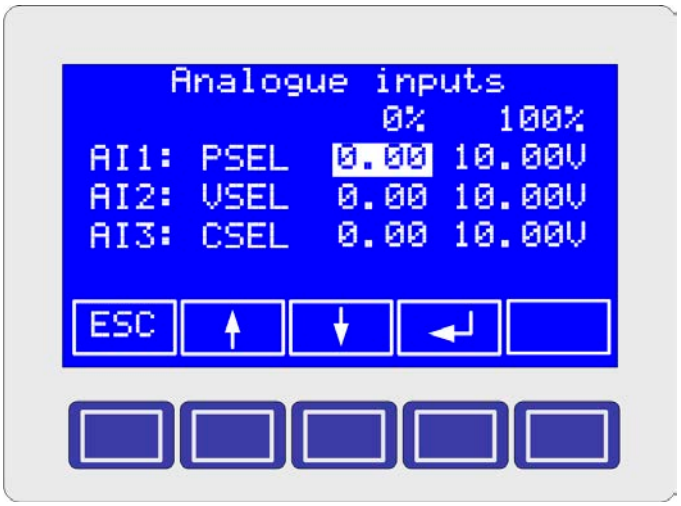
the analogue interface card is selected for configuration. Following parameters can be set:



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 limiting 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 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 profile 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

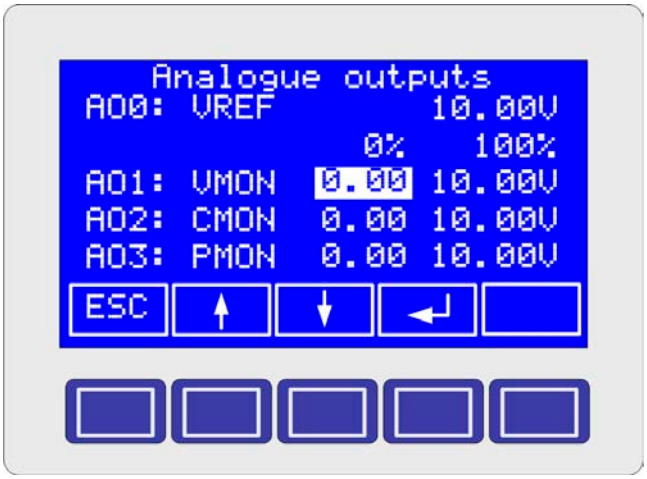
◆**AI3** Default: 0.00 10.00V

= 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 limiting 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

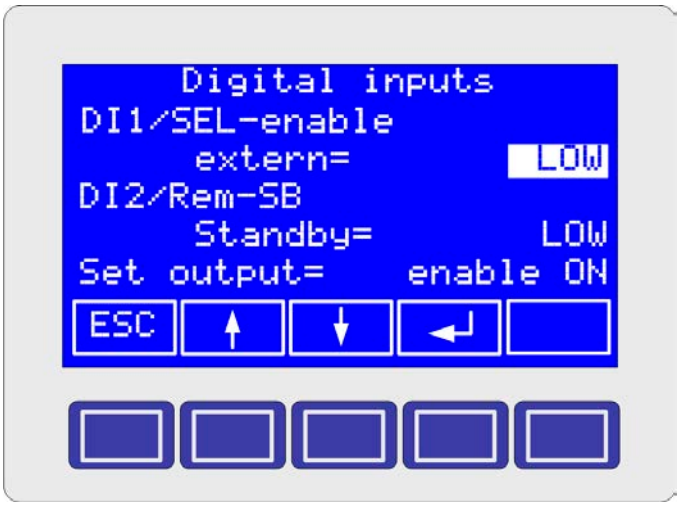
For PSI 9000 series models it is recommended to keep the setting „Nom.value / Adj.limits“ the same for both, analogue inputs and outputs.

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 digital inputs, DI1 and DI2, which can parametrised.



◆**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 activated, the power supply can be controlled by the inputs VSEL, CSEL and/or PSEL. The status signals 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 interrupted 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

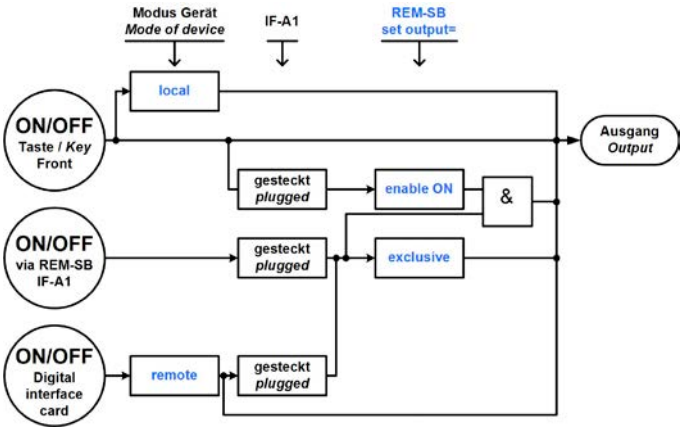
When using the setting enable ON, the output needs to be enabled at least once. By the setting Power ON = restore (see configuration menu of your device) the power output will be automatically enabled after a mains loss, if it has been enabled before the mains loss occurred. It can then be switched on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

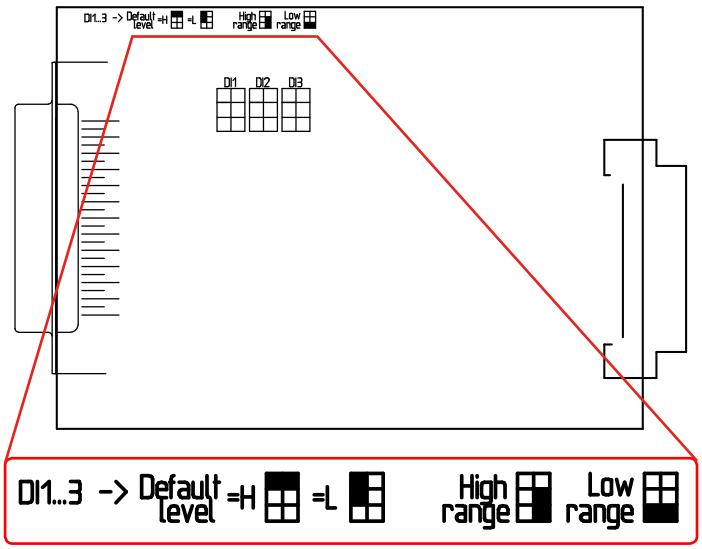
= HIGH The input is high active, standby is activated with a voltage level >4V or >9V (depending on the jumper setting).

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**.



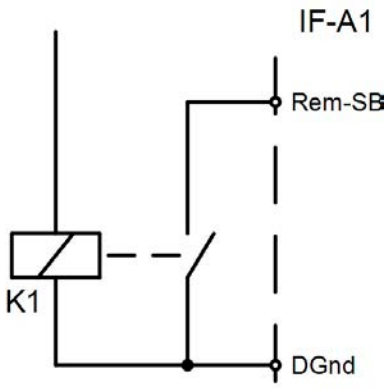
Default level defines the logical level of the input if not wired.

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.

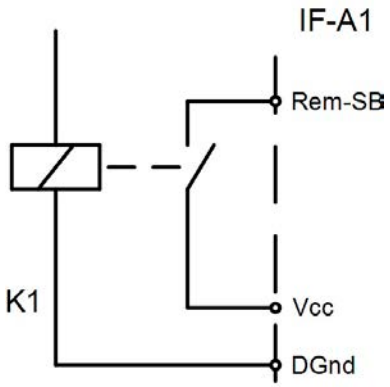
Low range selects the low input voltage range for the input. A „high“ corresponds to a voltage of >4V and a „low“ to a voltage of <1V.

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.



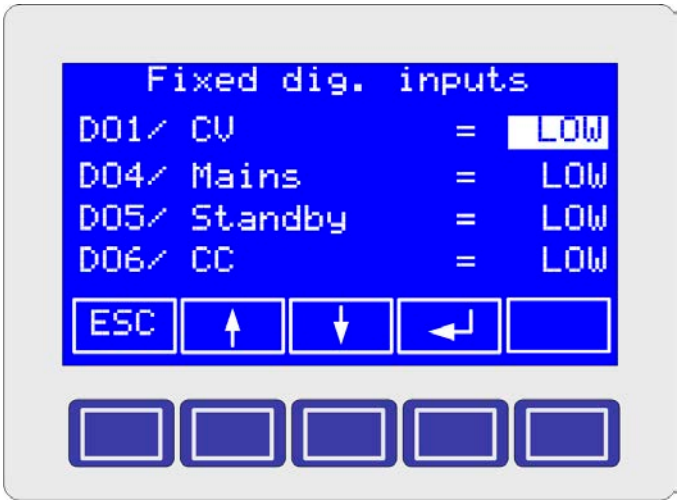
Example 2: the output shall be shut off by an emergency circuit. The jumper for DI2 needs to be set to „Default level =L“ and the setting Standby = HIGH. This example uses a relay with make contact to Vcc.



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.

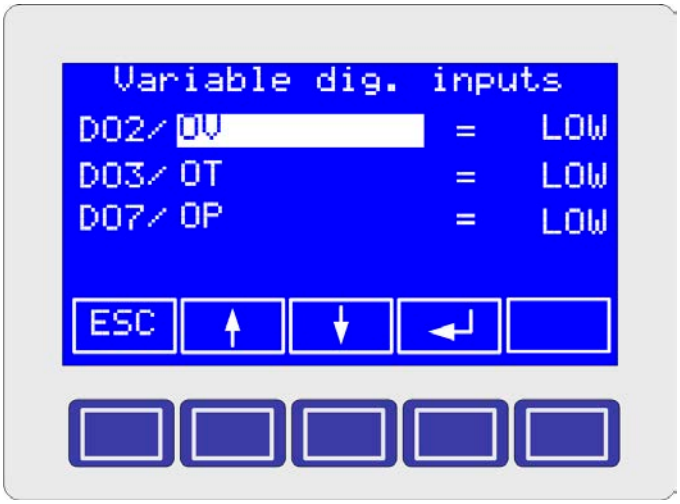
◆**DO6/CC** Default: LOW

= { LOW | HIGH }

If LOW has been selected, the output is pulled to GND as soon 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 condition, 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 separate 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 instruments, 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 separately 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.

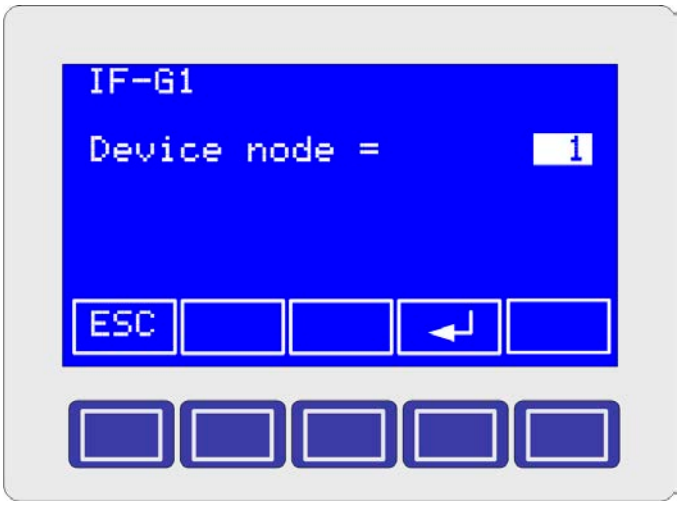
The transmission time $T_{T,GPIB}$ of the GPIB bus is very short and lies with typical 200µs. The recommended command interval time is >30ms. Smaller times can lead to execution errors.

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 cards IF-E1B and IF-E2B

Attention!

Since a few years only the models IF-E1B and IF-E2B are 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. 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 „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. Storing can be inhibited by "local" mode being active (see device manual about "local" mode).
- 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, LF) in the string, while SCPI message sent to the device does not require an end token, but accept the typical tokens LF, CR, or CRLF
- 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

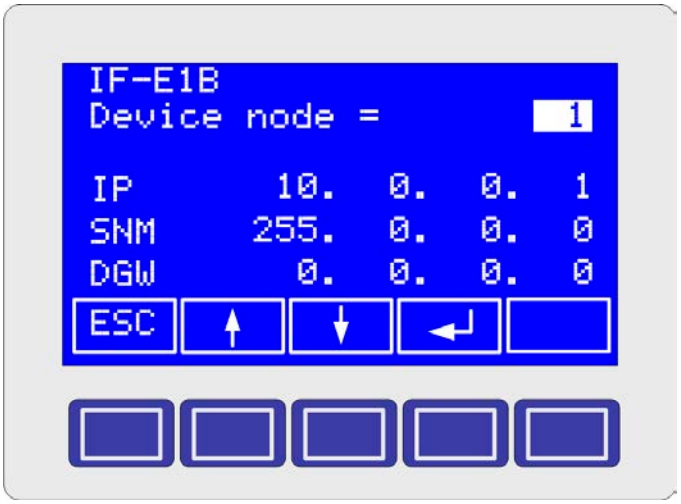
Note

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:

By selecting the card with

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



Device node: only for USB port, see 5.1

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

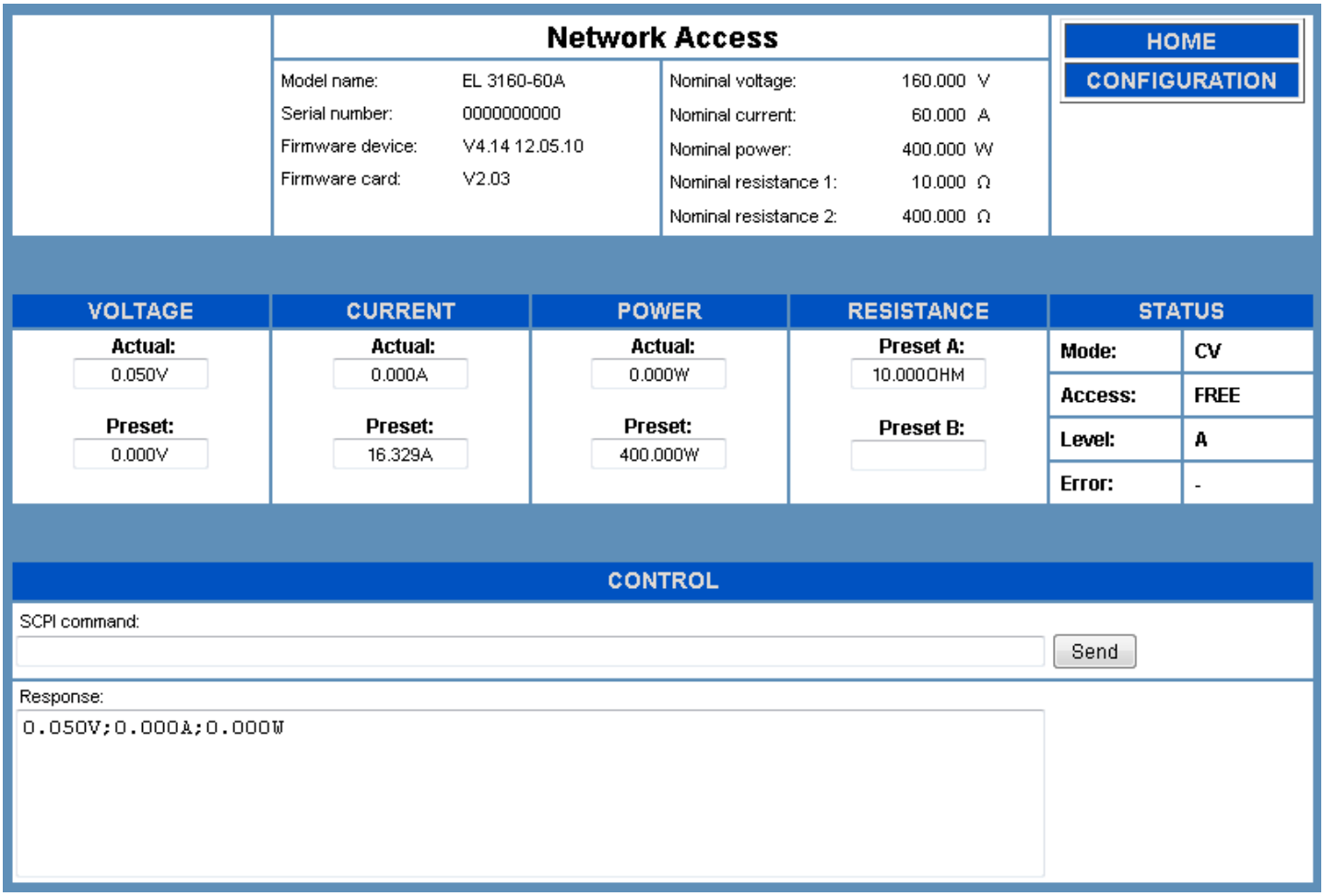
In order to change the IP on the device website perform following steps:

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 accessible 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. It can only be changed on the device's website that is accessible at the device's IP. The port is stored on the interface card. See section 9.2.3 for more information. Following ports are available for TCP/IP:

0-65535, except 80

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.

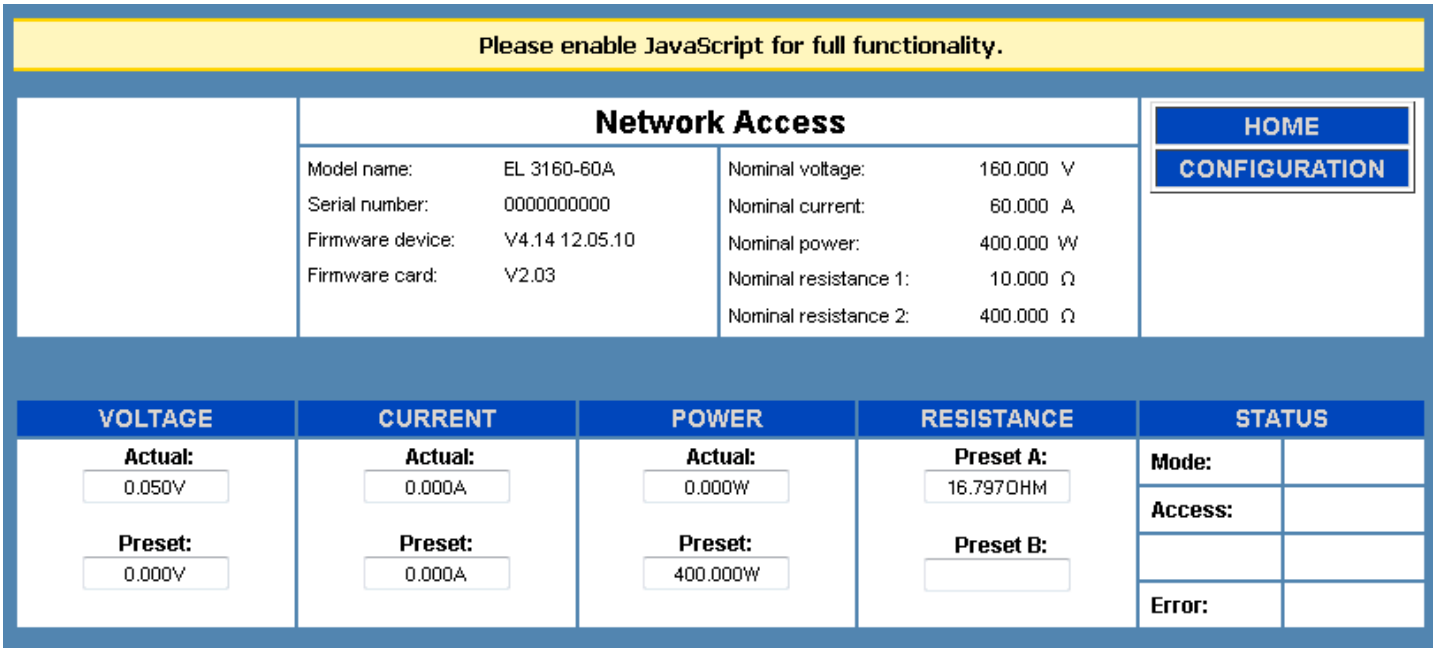
It is allowed to keep the socket connection open as long as communication with the device is continued. Permanent closing and opening of the socket is also possible, but consumes more time.

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 reset 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 unknown 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 time-out 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 overridden 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 order 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 address 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 communication channels for the 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 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. With

M + Communication + ↵ and

Slot: IF-PB1 + ↵

you can select the card to configure 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.

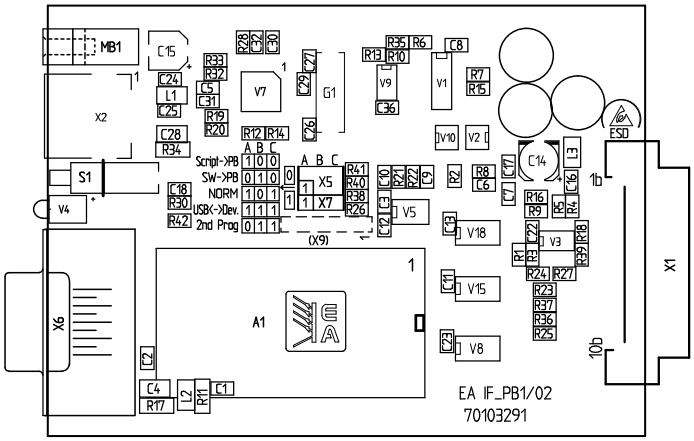
LED off = Profibus connection OK

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 communication 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 (old series until 2012) 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*.

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

PS 8000 T series:

Access to the device setup via pushbutton **Fine** (press >2s while output is „off“).

PS 8000 T series:

Access to the device setup by pressing both knobs simultaneously for >2s while output is „off“.

For details about the available settings see user manual of the device. A probably installed digital interface (GPIB, USB or Ethernet) may not require configuration resp. cannot be configured manually 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 similar 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

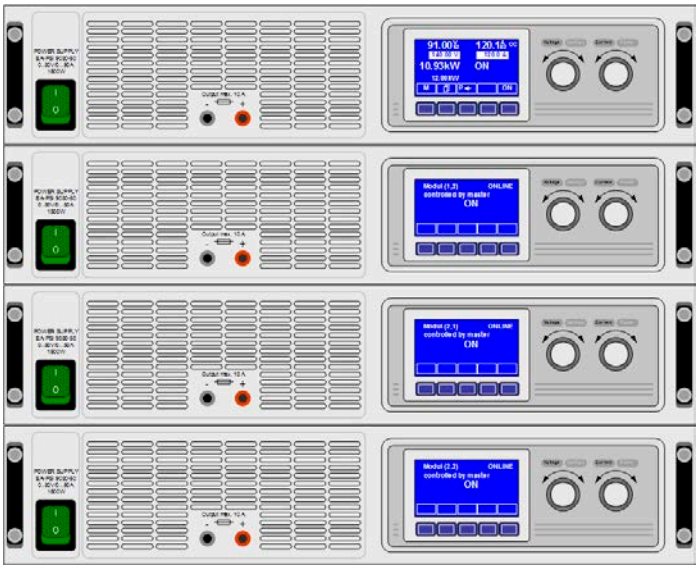
The System Link Mode is only supported by models of series PSI9000 (old series until 2012) and supports parallel or/and serial connection of these power supplies. Without this extra connection any device will display its own actual/set values and errors, when using the devices in master-slave configuration 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.

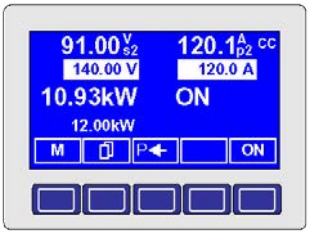


12.1 Handling the System Link Mode

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.

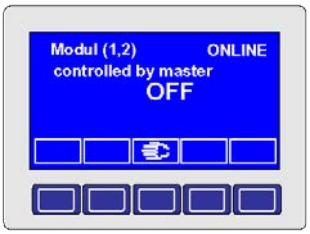
The configuration of the master defines the „behaviour" of the whole system. All values can be set like with a single unit.



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

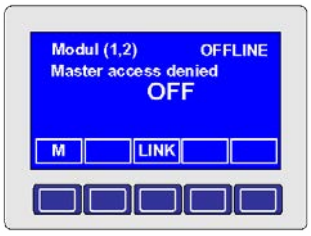
12.1.2 Display at the slaves

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 specify 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 standby (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 occurred. 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 occurred. 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 setting „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).

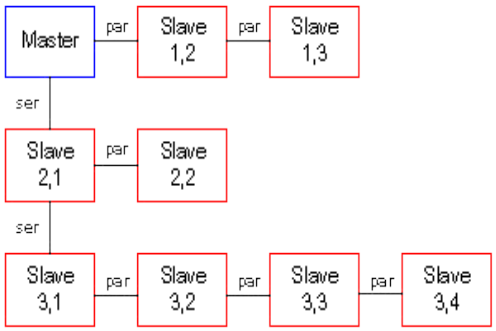
The allowed number of serially connected units also depends on the maximum acceptable isolation voltage!

◆ **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 separated 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

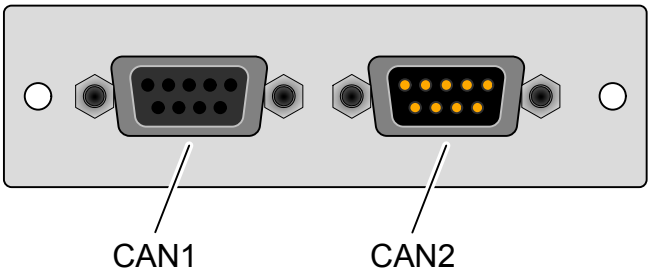
Link: Object list series PS 8000 T / DT / 2U / 3U

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

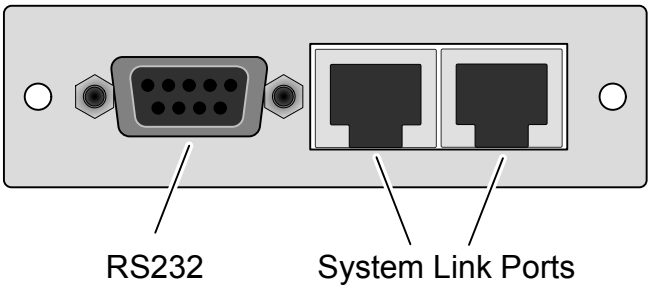
14. Connectors



IF-C1/C2

Note about If-C1/C2:

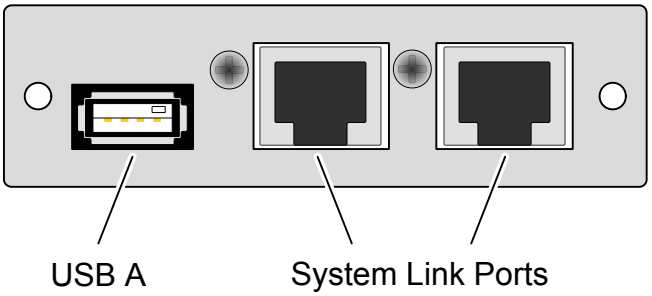
The connectors of the CAN card are connected in parallel



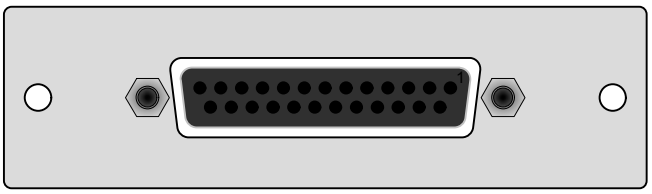
IF-R1

Note about IF-U1 / IF-R1:

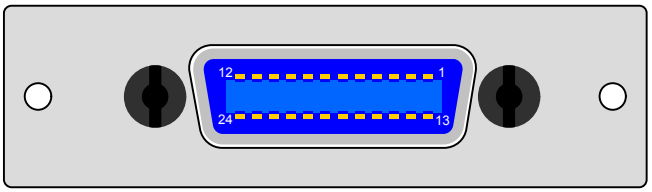
The System Link ports are only usable with power supplies of the series PSI9000. Never connect Ethernet cables here!



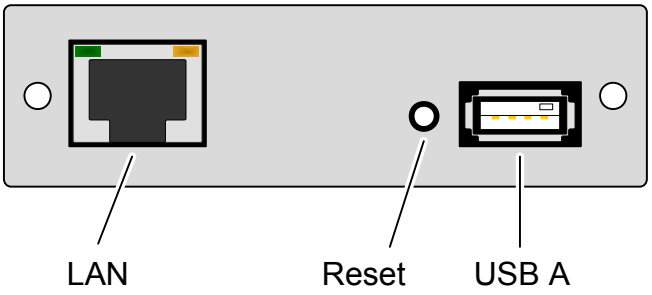
IF-U1



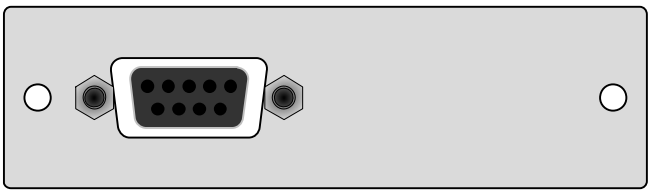
IF-A1



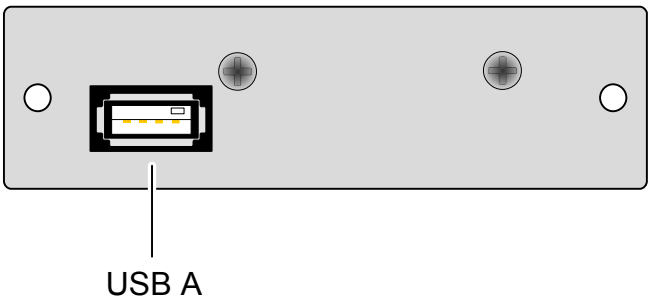
IF-G1



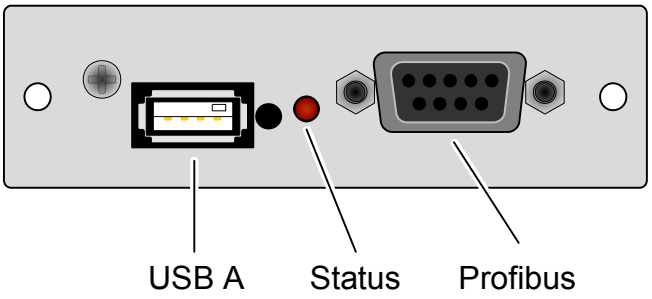
IF-E1B
IF-E2



IF-R2



IF-U2



IF-PB1