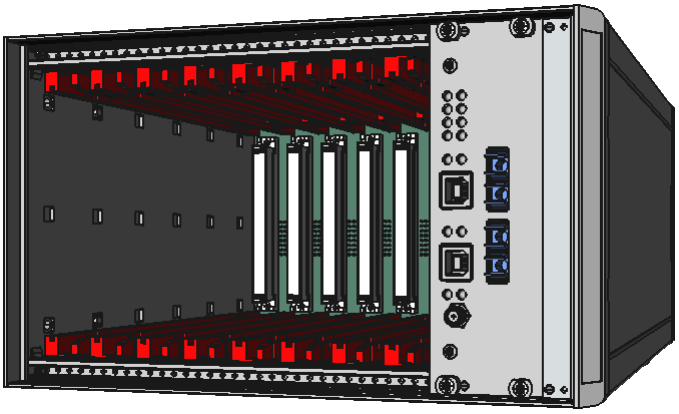
User's Guide

SPK-Platform *Brioude*
SK-Series Modular Instruments

SPK-Series Platform



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Certification

Signals and Systems for Physics certifies that this product met its published specifications at the time of shipment.

Warranty

This *Signals and Systems for Physics* product is warranted against defects in materials and workmanship for a period of one (1) year from the date of shipment.

Service

Do not install substitute parts or perform any unauthorized modifications to this instrument. For warranty service or repair, this product must be returned to a *Signals and Systems for Physics* authorized service facility. Contact *Signals and Systems for Physics* before returning this product for repair.

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Signals and Systems for Physics
BP90406
16 place saint-Georges
F31000 Toulouse France
Phone (+33) 781 547 391
www.sisyph.com.

General Information

Scope

This document provides the user with information on how to operate the SPK-Platform.

Safety and Preparation for Use

Because of the variety of uses for the SPK-Platform, those responsible for the application and use of this control equipment must satisfy themselves that all necessary steps have been taken to assure that each application and use meets all performance and safety requirements, including any applicable laws, regulations, codes and standards.

The SPK-Platform is not designed, intended, or sold for use in hazardous environments requiring fail-safe operation, including without limitation, operation of nuclear facilities, aircraft or spacecraft control systems, and life support or weapons systems. The user must assure that any failure or misapplication of the SPK-Platform cannot lead to a consequential failure of any interconnected equipment that could lead to loss of life or limb, or property damage.

The illustrations, charts, and discussions shown in this manual are intended solely for purposes of example. Since there are many variables and requirements associated with any particular control application, *Signals and Systems for Physics* does not assume responsibility or liability for actual use based upon the examples shown in this publication.

Do not install substitute parts or perform any unauthorized modifications to this instrument.

The SPK-Platform is designed to assemble the SK-Series Modular Instruments. Do not turn on the power to the platform or apply voltage inputs to the module until the module is completely inserted and locked in place. Do not exceed the specified voltages at any input or output connector. The SPK-Platform is not intended for hot-swapping applications. Be certain to switch the power off before inserting or removing modules.

Specifications and Related Documentation

More information (specifications, datasheet, programming guide, block diagram ...) is available online. These additional documents can be downloaded from the product page at www.sisyph.com.

Contents

1 Getting Started

This section provides the user with the necessary information to get started quickly with the SPK-Platform. Each part of the front- and rear-panel are explained in the following sections. Circled numbers beginning a paragraph help the user to locate these features on the SPK-Platform's panels(see Figures 1,2 and 3).

1.1 Overview

SPK-Platform *Brioude* is a robust, flexible platform in which up to 2×8 modules of the SK-Series high performance instruments share the same compact backplane and remote computer interface. The SPK-Platform provides power input connectors, computer interfaces, clock synchronization, and individual module status. With the SK-Series modular instruments, the users get the functionality they need while avoiding the cost of unnecessary features. The SK-Series instruments are the right choice for configuring a custom system from a broad and growing selection of modules. Do not hesitate to contact *Signals and Systems for Physics* for designing specific modules you may require.

The SPK-Platform *Brioude* is based on desktop cases with EMC shielding providing electronics protection. This flexible and robust case can be converted from desktop to a 19" rack mount case. In accordance with IEC 60297-3-101, the SPK-Platform comes in different widths for accommodating from 5 to 16 single-wide modular instruments. Refer to the Brioude's *Datasheet* online for ordering options.

1.1.1 Single-Backplane Case

SPK-Platorms are equipped with one backplane for connecting from 5 to 8 modular instruments. Communications with the host computer are provided by the SK810 Interfaces *Controller* module. These features apply to the single-backplane cases, which are SPK28S, SPK42S and SPK84S.

1.1.2 Dual-Backplane Case

A second backplane is installed into the SPK84D (see Figure 6) in order to assemble up to 16 single-wide instruments. Refer to the SPK-Platform's *Datasheet* online for ordering information.

1.2 Module Installation

The SPK-Platform does not support hot-insertion or extraction of modules. Before installing or removing any instruments, the external DC-power supply unit must be switched off.
To install a module, align the back of the module with the red rail-guides in the platform slot. Ease the module in until the connector begins to mate. It is better to push along the upper part of the edge of the module until the DIN41612 connector is fully mated and locked in place.
To remove a module, the top cover plate of the case may have to be removed to ease the operation. In such a case, be aware that the inside stainless steel gaskets can be very sharp.
When all modular instruments are installed, the DC-power supply can be switched on to begin the operation.

1.3 Front-Panel Connections

The front-panel of the alone SPK-Platform actually corresponds to the SK810's one as can be seen in Figure 1 and Figure 3. The following description applies to single-backplane platforms (SPK28S,-42S or -84S) where only one SK810 *Interfaces Controller* module is mounted. For dual-backplane platform (SPK84D), the

following description must be accounted twice, for both left- and right-backplanes since two SK810 *Interfaces Controller* are present. Refer to the SK810's documentation online for detailed information.

1.3.1 Primary Interface USB (PUSB)

(13) The USB connection for the **Primary Interface** is made through this USB receptacle.

1.3.2 Secondary Interface USB (SUSB)

(15) The USB connection for the **Secondary Interface** is made through this USB receptacle.

1.3.3 External Timebase Input (EXTI)

(17) This SMA coaxial connector is provided for connecting the 10-MHz **External Timebase**. Connect the 50-Ω output of a function generator to this input using a coaxial cable. Can be left open if not used. The **External Timebase** is selected by executing the `SYNS` remote command. Refer to the SK810's *Programming Guide* for a complete description.

1.3.4 Primary Interface Optical Port (POPT)

(18) The optical fibre for the **Primary Interface** is connected through this receptacle. When mating the fiber optic cable, be sure the small flange protrusion is oriented rightwards. Once oriented and aligned, press the cable connector inwards until it "clicks" in place.

1.3.5 Secondary Interface Optical Port (SOPT)

(18) The optical fibre for the **Secondary Interface** is connected through this receptacle. When mating the fiber optic cable, be sure the small flange protrusion is oriented rightwards. Once oriented and aligned, press the cable connector inwards until it "clicks" in place.

1.4 Rear-Panel Connections

The rear-panel of the SPK-Platform can be seen in Figure 2 where an SPK42 platform has been used for the illustration. The following description is valid whatever the SPK-Platform option since they all present the same rear-panel.

1.4.1 DC-power Input Voltages (DCPI)

(R) The **external DC-power supply** units must be connected to the backplane through this DSUB7W2 male receptacle. The SCK131 Cable can be used for this purpose. Note that no intermediate devices are installed on the power inputs. A break-out adapter board is also available to use the cable with 3rd party power supply units. Figure 8 shows how the SCK132 adapter can be used to supply the platform without intermediate SCK131 cable.

1.4.2 Power Earth (PE)

(S) The **Power Earth** line is available through this banana jack (4 mm).

1.4.3 Spare DSUB15 (Spare)

(T) The rear-panel presents a slot for mounting an **optional DSUB15 connector**. This feature could be useful to customize the platform.

1.4.4 DC-power Output Voltages (DCPO)

(W) This DSUB7W2 female receptacle is provided for cascading a second platform. The input power voltages are routed to this connector without any intermediate devices.

1.5 Front-Panel Indicators

The front-panel indicators of the alone SPK-Platform actually corresponds to the SK810's ones as can be seen in Figure 1 and Figure 3. The following description applies to single-backplane platforms (SPK28S, -42S or -84S) where only one SK810 *Interfaces Controller* module is mounted. For dual-backplane platform (SPK84D), the following description must be accounted twice, for both left- and right-backplanes since two SK810 *Interfaces Controller* are present. Refer to the SK810's documentation online for detailed information. These indicators (Figure 3) provides minimal information about the status of the remote interfaces and the linked slot.

1.5.1 Linked Slot (LINK)

(11) When the SPK-Platform operates in linked mode, the position of the slot actually linked with the **Primary Interface** is indicated by the corresponding **LINK** indicator.

1.5.2 Primary Interface Status (ACT/ERR)

(12) Any data coming from or going to the **Primary Interface** will cause the **ACT** indicator to flash green. Command errors or buffer overruns will cause the error indicator **ERR** to illuminate red. Because this led reflects the state of the flags RXQ, EXE and CMD in the Event Status register of the SK810, the indicator can be cleared by invoking any remote commands clearing these flags. For instance, sending `CLS?` to the SK810 will clear the error indicator.

1.5.3 Secondary Interface Status (ACT/ERR)

(14) Any data coming from or going to the **Secondary Interface** will cause the **ACT** indicator to flash green. Command errors or buffer overruns will cause the error indicator **ERR** to illuminate red. Because this led reflects the state of the flags RXQ, EXE and CMD in the Event Status register of the SK810, the indicator can be cleared by invoking any remote commands clearing these flags. For instance, sending `CLS?` to the SK810 will clear the error indicator.

1.6 Operating the Platform

1.6.1 Connecting the Host Computer

The host computer communicates with the modular instruments through the SK810 *Interfaces Controller* module, which is mounted at the rightmost position. Refer to the SK810's documentation online for a de-

tailed description of its operation.

In short, two remote interfaces can be used to communicate with the modular instruments mounted into the SPK-Platform. The **Primary Interface** provides the user with both commanding the SPK-Platform with regular commands and linking the host computer with one instrument. The **Primary Interface** can be connected either *via* its USB or optical ports. Because this interface is no longer available for regular commands when it operates in linked mode, the **Secondary Interface**, which remains available, can be used for querying the SK810's registers or for reconfiguring its operation. If no such configuration were required during linked operation, only the **Primary Interface** could be used to control the instruments.
Both USB and optical ports can be used for connecting the **Primary and Secondary Interfaces**. For each interface, these ports are simultaneously active. It is therefore not recommended to connect both USB and optical ports for a same interface.
The host computer must use standard UART protocol (see SK810's *Programming Guide*) to communicate with the SPK-Platform. The baudrate for the **Primary and Secondary Interfaces** can be selected between 9600 baud and 115 200 baud using the SK810's dedicated configuration switch. This baudrate applies for both host interfaces, whatever the physical port in use (USB or optical). Note that this baudrate selection does not apply for the communications between the SPK-Platform and the modular instruments, which always use 9600 Baud.

1.6.2 Monitoring the Power Supply Voltage

The SPK-Platform provides the user with monitoring the power supply voltages distributed through the backplane. Refer to the SK810's *Programming Guide* for a complete description.

1.6.3 Selecting the Synchronization Source

The synchronization lines are distributed to all slots for delivering to some instruments a precise 10-MHz timebase. Indeed, by synchronizing clocks, low-frequency mixing products (beat tones) of independently running module clocks is avoided. A common timebase also allows precision time and frequency modules to be synchronized. This feature can be enabled or disabled using a remote command. Refer to the SK810's *Programming Guide* for a complete description.

1.6.4 Restoring the Default Configuration

To reset the SPK-Platform to its factory defaults, send the remote command `*RST` to the SK810 module. Refer to the SK810's *Programming Guide* for a complete description.

1.7 User's Terminal Blocks

Figure 7 shows how the User's Terminal Blocks (UTB) of a modular instrument can be routed outside. Indeed, because some of its I/O signals can be also available on the UTB pins of its DIN41612 connector, headers, as exemplified here, or other connecting devices, can be mounted onto the backplane in order to directly connect two modules together with wires. These headers can be also used to wire the UTB lines of the instrument to the rear-panel. This functionality can be useful for customization purpose.

2 Remote Operation

This chapter describes how to operate the SPK-Platform over the host interface through the SK810 *Interfaces Controller*.

2.1 Link Model

The SK810 uses a link framework for providing communications between a host computer and the downstream instruments assembled in the SPK-Series platform. Both USB or optical fibres can be used. In this model, when a link is established, the **Primary interface** is linked to a single instrument : data bytes received from the **Primary interface** (USB or optical fibre) are relayed directly to the instrument and response data are relayed back to the **Primary Interface**. When linked, the front panel indicator for the selected instrument is illuminated.
The **Secondary interface**, which can not be linked, remains available for regular commanding to the SK810. This interface can be used to reconfigure the SK810 or to query the status registers, or any other command documented in its *Programming Guide*. The linked **Primary Interface**, however, will not be processed (parsed) and commands transmitted to the SK810 *via* the linked remote interface will be relayed byte-for-byte to the linked instrument, and not interpreted as SK810 commands.
The link state can be exited by transmitting the escape character from the host computer to the linked **Primary Interface**. The escape character is the "!" character (ASCII code 33). When operating in not-linked mode, the **Primary Interface** can process regular SK810's commands; there is no difference between **Primary and Secondary Interfaces** in this mode.

2.2 Commands

For a complete and detailed information, please refer to the SK810's *Programming Guide* available online at the product page.

2.3 Status Model

The *Block Diagram* of the SK810's status registers is available online at the product page. Its *Programming Guide* also provides the user with detailed information about these registers.

3 DIN41612 Backplane Connectors

The DIN41612 connectors carry all the power and communications lines between the SK810 *Interfaces Controller* and the modular instruments. Whereas instruments can be plugged into any available slot, the backplane rightmost slot position (Master position) is dedicated to the SK810 *Interfaces Controller*. Refer to the Figure 4 for the respective lines assignments. Detailed information is available online.

4 Accessories and Related Products

Accessories and optional parts described in this section are not included in the SPK-Platform's package and must be therefore ordered separately if required.

DC Power Input Cable

The DC input voltages are fed to the rear-panel DSUB7W2 connector through the SCK131 cable. Each end of this 1-m length cable is equipped with the mating DSUB7W2 connector.

DC-Power Input Adapter

The SCK132 *DC-Power Input Adapter* allows the user to power the SPK-Platforms with 3rd party power supply units, which are not equipped with the DSUB7W2 connector. The SCK132 features 5 pairs of terminal blocks for the input voltages and one (1) DSUB7W2 female receptacle for connecting the SCK131 cable. Note that the power adapter board can be directly plugged into the rear-panel mating connector without any DC-power cable. *Only well regulated and filtered DC voltages sources should be used for preserving the performance of the modular instruments.*

Filler Panels

Rear conductive aluminium filler panels can be used in place of missing modules. By filling these slots, the initial EMI shielding is preserved. These panels come in two widths (4HP and 8HP). They are equipped with two stainless steel sleeves, two collar screws and an EMI textile gasket.

Optical Cables

Two optical cables are required for connecting both Primary and Secondary Interfaces of one (1) SK810 *Interfaces Controller*. The standard length is 3 m or 10 m. Contact us for specific dimensions.

USB Cables

Two USB cables are required for connecting both Primary and Secondary Interfaces of one (1) SK810 *Interfaces Controller*. The standard length is 1 m.

USB-to-Optical Bridge

The SM301 *Nemausus* is an USB-to-optical bridge for connecting the fibres to the remote computer side. It is powered from the USB port used for the communications with the PC and features a pair of receptacles for the fibres (RX and TX), providing the user with connecting one optical cable to the SK810 *Interfaces Controller*. Two SM301 are therefore required for connecting both Primary and Secondary Interfaces.

5 Figures

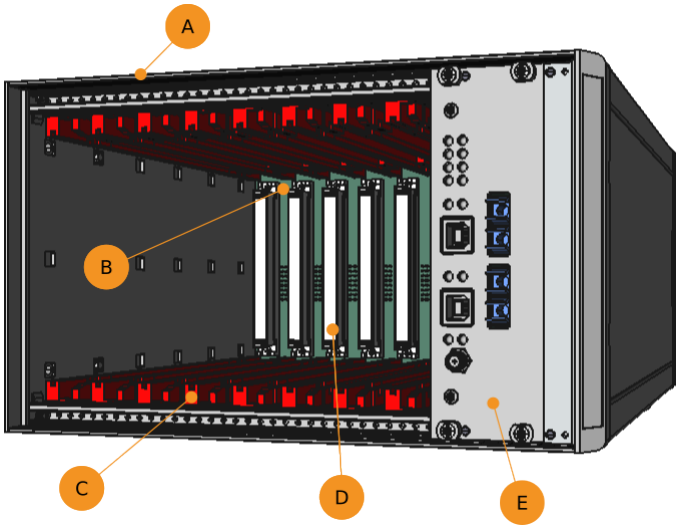

Figure 1: Front-view of the SPK42 platform. A backplane (B) is installed in a 42-HP case (A). Up to 8 modular instruments can be assembled using rail-guides (C) and DIN41612 connectors (D). The SK810 *Interfaces Controller* (E) placed at the rightmost position provides the platform with communications with the host computer.

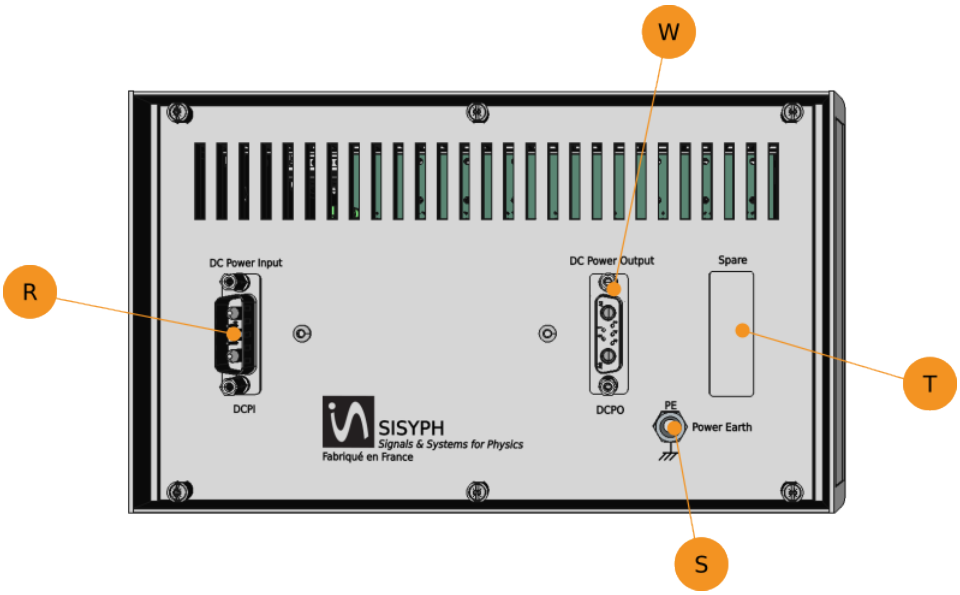

Figure 2: Rear-view of the SPK42 platform. Circled numbers refer to features detailed in the Section 1.4.

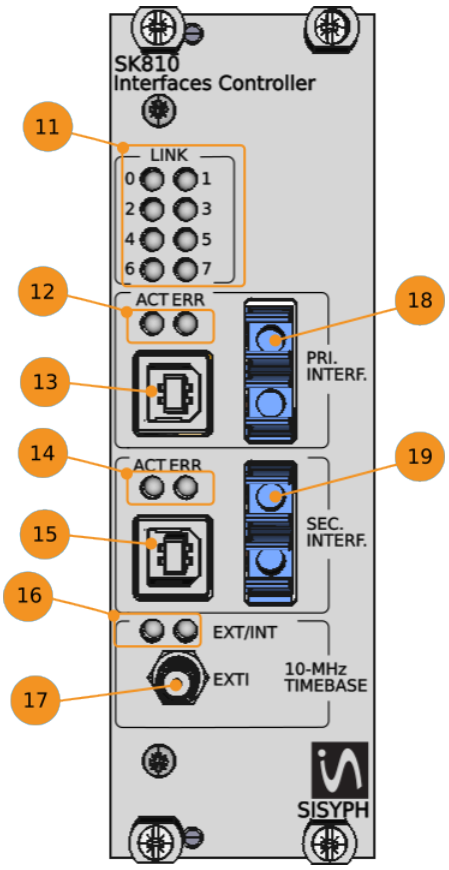

Figure 3: Front-view of the SK810 *Interfaces Controller* module. Circled numbers refer to features detailed in the Sections 1.3 and 1.5.

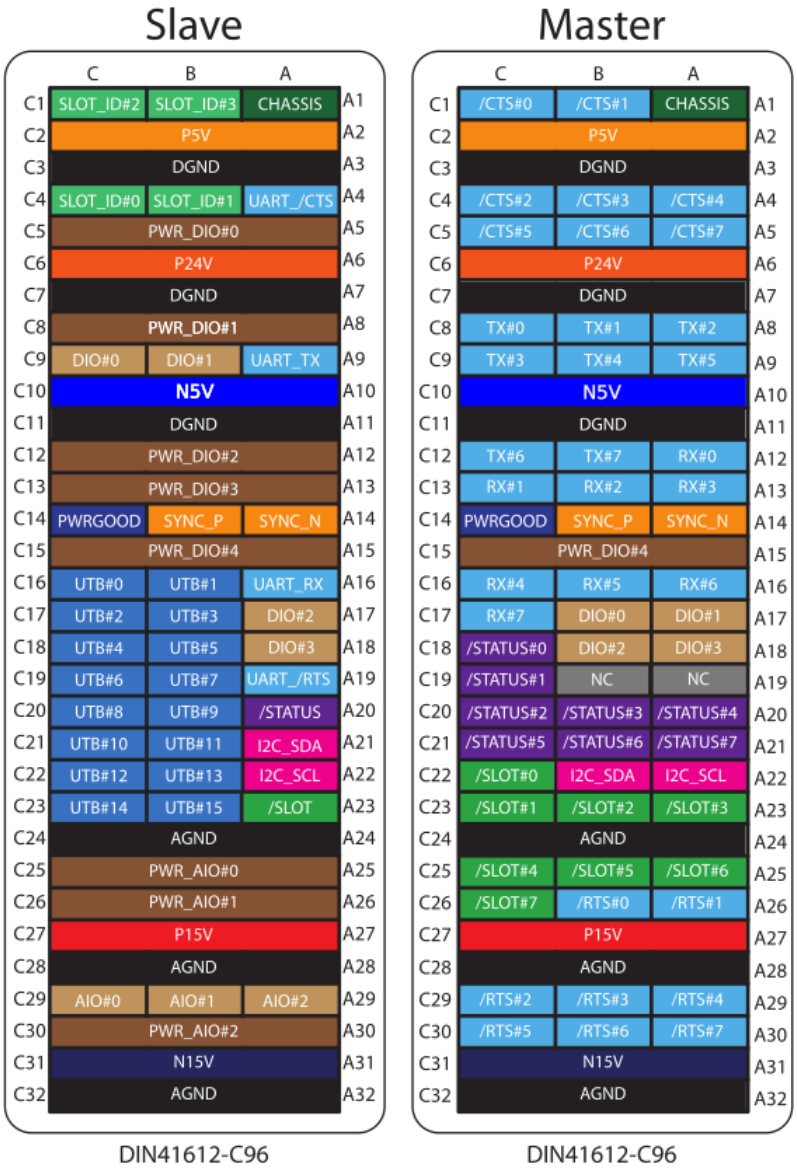

Figure 4: Pin assignments of the backplane DIN41612 connectors. Modular instruments are plugged into the backplane through slave connectors (left). The SK810 *Interfaces Controller* is always mounted at the rightmost position using the Master connector (right).

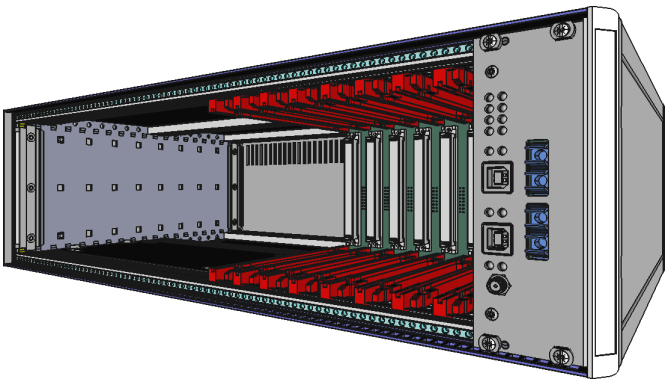

Figure 5: View of the SPK84-S Platform (single-backplane option). Only one SK810 *Interfaces Controller* module is used to communicate with up to 8 single-wide instruments. The unoccupied half-left can be equipped (on demand) with an horizontal mounting plate (not clearly visible here). This free area can be used for customization purpose, *e.g.* for mounting heavy or optical components.

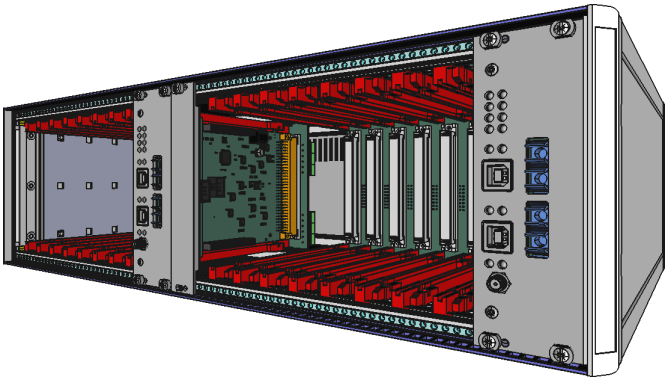

Figure 6: View of the SPK84-D Platform (dual-backplane option). Two SK810 *Interfaces Controller* modules are used here to communicate with up to 16 single-wide instruments. Since the SKP84-D is equipped with two distinct backplanes, it actually behaves like two SPK42 platforms assembled in a single case.

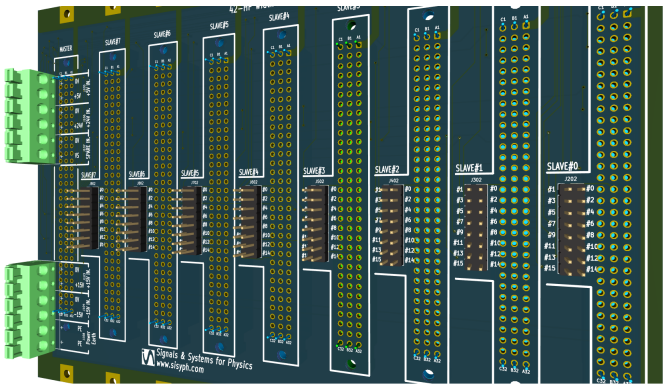

Figure 7: View of the User's Terminal Blocks (UTB) located at the rear-side of the backplane. Headers, as exemplified here, or other connecting devices, can be mounted onto the backplane in order to route the instrument's UTB lines outside.

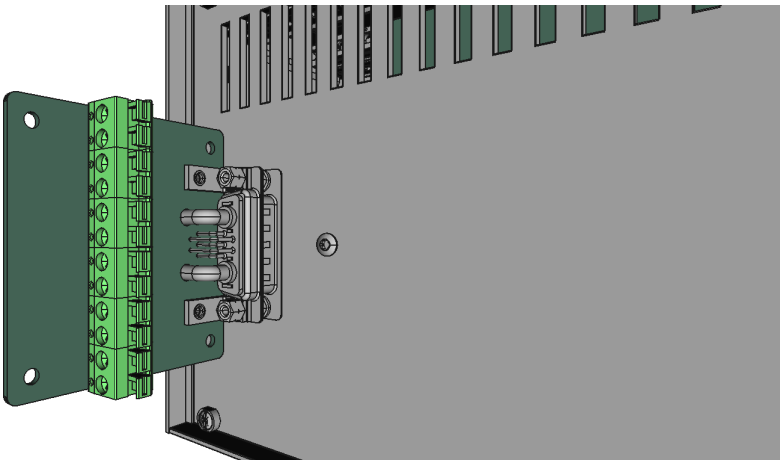

Figure 8: Using the power adapter board directly on the rear-panel. While the SCK132 power cable adapter is primary designed to use the cable with 3rd party power supply units, it can be also used, as exemplified above, to supply the platform without intermediate SCK131 cable.

6 Document Revision History

6.1 Version Number

This document is identified by SPK-SU01-P24A.

6.2 Revision History

P24A (2024-02-26)

Initial version.