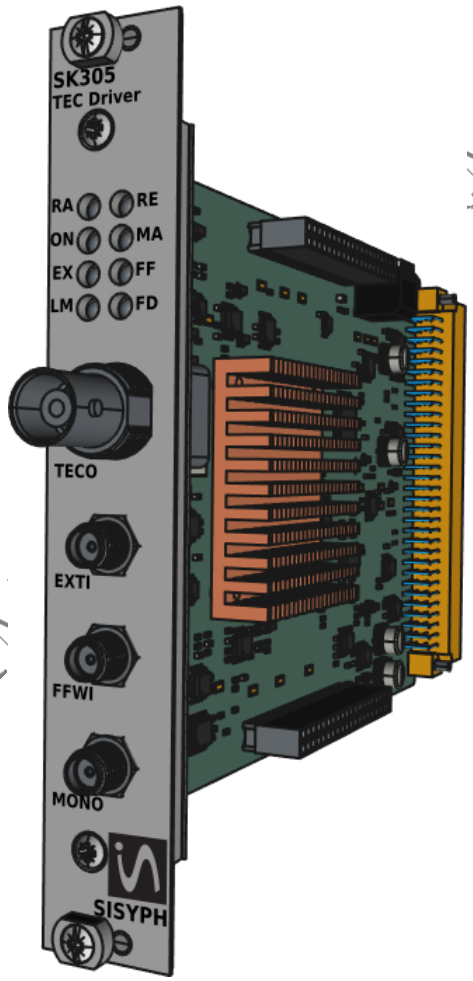
User's Guide

SK305 *Aigoual*
Linear TEC Driver

SK-Series Modules



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General Information

Scope

This document provides the user with information on how to operate the SK305 *Linear TEC Driver* module.

Safety and Preparation for Use

Because of the variety of uses for the SK305 *Linear TEC Driver*, 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 SK305 *Linear TEC Driver* 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 SK305 *Linear TEC Driver* 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 SK305 *Linear TEC Driver* is a module designed to be used with the SPK-Series Platforms. 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.

Specifications and Related Documentation

Complete 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 Description of the Instrument

This section provides the user with the necessary information to get started quickly with the SK305 *Linear TEC Driver*. Each part of the front-panel as well as the rear and the top sides of the module are explained in the following sections. Circled numbers beginning a paragraph help the user to locate these features on the module sides (see Figs 1 and 2).

1.1 Overview

Refer to the *Functional Block Diagram* online for a synthetic presentation of the SK305 *Linear TEC Driver*'s functionalities.

The SK305 *Linear TEC Driver* was designed to operate with the SK484 *Temperature Controller* for high-performance thermal stabilization of laser diodes. In order to achieve low-noise operation, the SK305's circuitry relies on pure analog design. Indeed, whereas laser diode temperature controllers are usually based on switched-mode TEC drivers for delivering high-power at maximum efficiency, the SK305 features a class-AB power amplifier to eliminate inherent broadband noise due to H-bridge topologies. The apparent limited current range of the SK305 compared to its high-power counterparts is actually not relevant for thermal control of low-power laser diodes where TEC currents almost never exceed the ampere level. The SK305 associated to the SK484 *Temperature Controller* and SK657 *Ultra-Low Noise Current Source* are therefore the ideal instruments for controlling low-power laser diodes when noise is a primary concern.

The SK305 driver circuit is capable of delivering ±1 A. It operates on dual ±5 V power supplies and drives the TEC *via* a voltage-controlled current source to prevent TEC biasing alterations due to thermoelectric effects. The power transconductance amplifier is driven by the control voltage provided by the input summing amplifier. Indeed, the output current can be fully controlled by i) the manual control voltage provided by an internal DAC, ii) the external control input and iii) the feedforward input. These three signal sources can be also combined to provided the current control voltage. In order to protect the load from excessive current, the control voltage is applied to a programmable limiter prior driving the voltage-to-current converter. The compliance voltage is also monitored for the protection of sensitive loads. Both current limiting and over-voltage detection can be used to automatically shut the current source down, which can be useful in certain critical situations.

Like all modular instruments of the SK-Series, the SK305 *Linear TEC Driver* can be operated stand-alone or within a platform where several modules can be assembled to configure a specific control or measurement system. For instance, SPK-Series platforms can accommodate up to eight instruments and provide power, clock synchronization, communications, and module status monitoring. For stand-alone operation, the SKN10 and SKN11 *Adapters* can be used for connecting the module to the power supplies and remote host computer.

1.2 Front-Panel Connections

1.2.1 TEC Output (TECO)

(12) The load is connected to the current source through the **TECO** receptacle, which can be left open if an alternate interface is used. Note that the remote command `TECE` must be invoked to open the shorting relay's terminals, otherwise no current is allowed to flow through the load.

1.2.2 External Control Input (EXTI)

(13) Connect the command signal from the temperature controller to the **EXTI** receptacle. Can be left open if not used. The applied input voltage, which is internally limited to ±5 V, provides full-range control of the output current. In order to enable this input, the remote command `EXTE` should be invoked.

1.2.3 Feedforward Input (FFWI)

(14) Connect the feedforward input signal to the **FFWI** receptacle. Can be left open if not used. This signal, whose transmission gain can be programmed *via* the remote command `FFWG`, is primary intended to anticipate large command transients in closed-loop operation.

1.2.4 Monitoring Output (MONO)

(15) The monitoring output can be used for test and diagnostic purposes since it provides copies of main SK305's signals. Use the `MONS` remote command to select which signal is routed to this SMA receptacle. Can be left open if not used.

1.3 Front-Panel Indicators

The front panel of the SK305 *Linear TEC Driver* (Figure 2) provides minimal information about the status of the instrument.

1.3.1 Remote Interface Activity (RA)

(6) Any data coming from or going to the host interface will cause the **RA** indicator to flash green.

1.3.2 Remote Interface Error (RE)

(6) Command errors or buffer overruns will cause the the **RE** indicator to illuminate red. Because this led reflects the state of **RXQ**, **EXE** and **CMD** flags of the Event Status register (**EVTS**), the indicator can be switched off by invoking any remote commands clearing these flags. For instance, executing `CLS?` will switch the error indicator off.

1.3.3 TEC Output Enabled (ON)

(11) The **ON** indicator illuminates green when the **TECO** output is enabled. In this case, the current source's output is connected to the load and the shorting relay's contacts are open to allow the current to flow through the load.

1.3.4 External Control Input Enabled (EX)

(11) The **EX** indicator illuminates green when the external control functionality is enabled. In this case, the voltage applied to the **EXTI** receptacle is transmitted to the transconductance amplifier.

1.3.5 Feedforward Input Enabled (FF)

(11) The **FF** indicator illuminates green when the feed-forward functionality is enabled. In this case, the voltage applied to the **FFWI** receptacle is transmitted to the transconductance amplifier through the programmable attenuator.

1.3.6 Current Limitation (LM)

(11) The **LM** indicator illuminates red when the current limiter is engaged. This situation results from a control voltage at the summing amplifier output exceeding the programmed limits. Because this indicator reflects the state of the **ILP** and **ILN** flags in the Overload Condition register (**OVLC**), it is automatically switched off when these conditions disappear.

1.3.7 Fault Detected (FD)

(11) The **FD** indicator illuminates red when a fault is detected. This happens when an event monitored by the Overload Status (**OVLS**) and Instrument Status (**INSS**) registers occurs: thus, **OVT**, **OPN** and **TPO** flags, once raised, are signaled by the **FD** indicator. This led is switched off by invoking any remote commands clearing these flags. For instance, executing `CLS?` will switch the **FD** indicator off.

1.4 Backplane Connector

(1) The primary connection to the SK305 module is the rear DIN41612-96C connector (see Fig.3 for its generic pin assignments). Typically, the module is mated into the backplane of an SPK-Series Platform using this connector. It is also possible to operate the SK305 directly, without any platform. In such stand-alone operation, the user has to externally wire all required signals and power supplies through the DIN41612 connector. To help the user in this operation, *Signals and Systems for Physics* provides several module adapters (see SKN-Series *Module Adapters* online). DIN41612 connector's pins are used to power the module and connect its communications lines to the remote controller. Some pins are also used for sharing signals with other slave modules plugged on the same backplane. Wiring external signals to the module from the rear-side of the backplane is also provided using dedicated terminal blocks.

1.4.1 Power Supply

The pins used for powering the SK305 module are listed in the following table. It mentions only pins that are effectively used and must be therefore connected. For detailed information on power requirements, refer to the *Datasheet* available online.

CAUTION - *Because the SK305 uses some power supplies without any local post-regulation circuitry, always use clean, well regulated power sources with adjustable current limitation.*

Pin	Label	Functionality	Source	Destination
A2, B2, C2	P5V	Digital +5 V	Platform	SK305
A10, B10, C10	N5V	Digital −5 V	Platform	SK305
A27, B27, C27	P15V	Analog +15 V	Platform	SK305
A31, B31, C31	N15V	Analog −15 V	Platform	SK305
A3, B3, C3	DGND	Digital Ground (0 V)	Platform	SK305
A7, B7, C7				
A7, B7, C7				
A11, B11, C11				
A24, B24, C24	AGND	Analog Ground (0 V)	Platform	SK305
A28, B28, C28				
A32, B32, C32				
C14	Power Good	Monitoring	Platform	SK305
A1	Chassis	Chassis Ground - Earth	Platform	SK305

Table 1: SK305's power supplies – DIN41612 connector pin assignments.

The +5 V power supply is connected to the module through the **P5V** and **DGND** pins. This power supply is both used for digital or high-speed circuits. High-speed circuitry can also operates from the −5 V power supply, which is provided by the **N5V** and **DGND** pins. Their analog counterparts are powered from the +15 V and −15 V sources connected through the **P15V**, **N15V** and **AGND** pins. The Earth safety line is routed to the module *via* the **Chassis Ground** pin, which is used for grounding the mechanical parts. The SK305 also uses the **Power Good** signal provided by the SPK-Platform for monitoring the power supply inputs. This signal is asserted-low by the platform whether one or more power supply is under its nominal operating value.

1.4.2 Grounding

The **AGND** and **DGND** power lines of the backplane connector are not tied together by the internal circuitry of the SK305. They are instead connected through back-to-back Schottky diodes, so the digital and analog grounds cannot be more than ±350 mV apart. When the SK305 module is assembled into an SPK-Platform, its digital and analog ground lines are tied together through the backplane to a single point (star connection).

Caution – *When the module is used stand-alone, the digital and analog ground lines should be separately wired to a single, low-impedance ground source at the power supply.*

(2A) (2B) (2C) Alternative grounding schemes can be also wired using the dedicated optional jumpers, which are accessible from the top-side of the printed circuit board.

1.4.3 Host Interface

The pins used for operating the SK305 module over the host interface are listed in the following table. It mentions only pins that are effectively used. For detailed information on serial communications settings, refer to the *Programming Guide* available online.

Pin	Label	Functionality	Source	Destination
B1, C1, B4, C4	ID[3-0]	Slot identification	Platform	SK305
A20	/STATUS	Master Summary Status	SK305	Platform
A23	/SLOT	Occupied slot	SK305	Platform
A9	UART-TX	Async data	Platform	SK305
A16	UART-RX	Async data	SK305	Platform

Table 2: SK305's host interface – DIN41612 connector pin assignments.

The SK305 communicates with the host through **TX-** and **RX-UART** lines without any hardware handshaking. The **Slot Identification** lines are used by the module to retrieve the number of the slot (0 to 15) where the module is mated. Because these lines are coded by the platform hardware, no such identification can be provided for a stand-alone operation. In this case, the identification pins are automatically asserted-high by the internal module hardware to detect a stand-alone operation, which corresponds to the virtual slot number 255. The **/STATUS** line is driven by the module to indicate whether one or more of the enabled status messages in the Master Summary Status (**MSTS**) register are true. The signal is then asserted-low and remains in this state until the register has been queried by the `MSTS?` remote command. When the SK305 is used with an SPK-Platform, the **/STATUS** signal is monitored and reported to the host controller *via* the communications link. The **/SLOT** line, which is driven-low by the module, is used by the platform circuitry to detect whether or not a module occupies this slot.

1.4.4 Shared Lines

Some pins of the DIN41612 connector are reserved for sharing signals with others modules through the backplane. *Always contact us before using this functionality.*

This functionality is not currently in use in SK305.

1.4.5 User's Terminal Blocks

SPK-Series Platforms feature a backplane where each slot is provided with 16 additional User's Terminal Blocks (**UTB**). These connectors, located at the rear-side of the backplane, are wired to the module through dedicated pins of its DIN41612 connector. They can be used for specific module wiring, *e.g.* for connecting some signals to the rear-panel of the platform. *Always contact us before using this functionality.* The SK305's pins routed to the terminal blocks are listed in the following table.

Pin	Label	Functionality	Direction
B18	/STATUS	Status monitoring	Output
B19, B20	TECO	TEC output (source)	Output
B21, B22	DGND	TEC output (0 V)	Output
B23	DGND	Digital ground (0 V)	Output
C16	MONO	Monitoring	Input
C17	VMON	Voltage monitoring	Output
C18	IMON	Current monitoring	Output
C19, C20	FFWI	Feedforward control	Input
C21, C22	EXTI	External control	Input
C23	AGND	Analog ground (0 V)	Output
Not listed pins are used for factory test and diagnostic.			

Table 3: SK305 User's terminal blocks – DIN41612 connector pin assignments.

1.4.6 Synchronization

The SPK-Platform distributes a **Synchronization timebase** of 10 MHz to the modular instruments *via* the (**SYN-P**, **SYN-N**) backplane lines. The SK305 uses this differential pair to synchronize the clock of its microcontroller. When operating stand-alone, the SK305 module automatically switches the 10-MHz clock to an internal source. Whether the module is synchronized or not is reported by the **IKS** bit in the Instrument Status register (**INSS**).

Pin	Label	Functionality	Source	Destination
A14	SYNC-N	Negative synchronization	Platform	SK305
B14	SYNC-N	Positive synchronization	Platform	SK305

Table 4: SK305 Synchronization – DIN41612 connector pin assignments.

1.5 Expansion Connectors

These connectors (3A) and (3B) are reserved for customization or factory testing purposes. *Always contact us before using these connectors for own purpose.*

1.5.1 Analog I/O Expansion

(3B) The following table provides the pin assignments of the Analog I/O Expansion connector. Refer to the Section 2.4 for more information.

Pin	Label	Functionality	Direction
1	MONO	Monitoring	Output
2, 4	FFWI	Feedforward control (differential pair)	Input
6, 8	EXTI	External control (differential pair)	Input
25	IMON	Current monitoring	Output
27	VMON	Voltage monitoring	Output
35, 36	P15V	+15 V power supply	Output
37, 38	N15V	−15 V power supply	Output
9, 10, 19, 20, 39, 40	AGND	Analog ground (0 V)	
Not listed pins are used for factory test and diagnostic.			

Table 5: SK305 Analog I/O Expansion connector – Pin assignments.

1.5.2 Digital I/O Expansion

(3A) The following table provides the pin assignments of the Digital I/O Expansion connector.

Pin	Label	Functionality	Direction
1	DBG0	Debugging / reserved	Not defined.
2	DBG1	Debugging / reserved	Not defined.
25, 26	TECO	Current source (TEC)	Output
27	/STATUS	Status summary signal	Output
37, 38	P5V	+5 V power supply	Output
9, 10, 19, 20, 39, 40	DGND	Digital ground (0 V)	Output
Not listed pins are used for factory test and diagnostic.			

Table 6: SK305 Digital I/O Expansion connector – Pin assignments.

1.6 On-Board Settings and Connectors

Some functionalities of the SK305 are controlled or configured using switches located on its printed circuit board. Connectors can be also installed on the component-side of the board when they are rarely used, *e.g.* for test or calibration purposes.

1.6.1 Configuration Switches

(4) This 4-position switch array (**CFG**) is not used in this version of the module. Nevertheless, it is populated for future use or software customization purpose.

1.6.2 Grounding Jumpers

Three jumpers are provided to modify the initial arrangement for connecting the ground lines. *By default, these jumpers are not mounted.* They must be left open if not used.

(2A) Mounting the **OPT-DGND** jumper will tie the digital ground to the chassis ground (power earth).

(2B) Mounting the **OPT-AGND** jumper will tie the analog ground to the chassis ground (power earth).

(2C) Mounting the **OPT-GND** jumper can be used to tie the digital and analog ground lines together since they are connected only through back-to-back Schottky diodes. When the SK305 is mounted into a platform, the digital and analog ground lines are tied together through the backplane to a single point.

1.6.3 Backplane Jumpers

Some unassigned pins of the DIN41612 backplane connector may be used to share connections between modules, without using front-panel cables. In order to connect SK305 signals to these lines, jumpers have to be installed on the printed-circuit board. *Always contact us before using this functionality.*

(21A) Mounting the **TECP** and **TECN** jumpers will route the current source output (TECO) and its return (DGND) to the A5-B5-C5 and A8-B8-C8 lines, respectively. These pins can be then used by a module elsewhere to connect the load.

(22A) Mounting the **EXTI** jumpers will route the External Control Input (EXTI) to the A29 line. This pin can be then used by a module elsewhere for driving the load *via* the external control voltage.

1.6.4 Interfacing through SPK-Series Platform

The SKP-Series Platform is designed to assemble a system based on SK-Series modules. The platform carries all the power and communications lines to the mounted modules through the internal backplane. The platform also provides an USB interface for communications with the host controller (see SK810 *Interfaces Controller* module online). The power supply voltages are provided to the platform by external sources *via* a rear panel DSUB-7W2 connector. This should reduce the exposition of the modules to the power supplies' EMI.

1.6.5 Direct Interfacing for Stand-Alone Operation

It is also possible to operate the SK305 module directly, without using any platform.

Caution – *Misapplication of power may cause circuit damage.* Signals and Systems for Physics *recommends using the SK305 together with the SPK-Platform for most applications.*

The mating connector needed is a standard 96-pin DIN41612 female receptacle. Clean, well-regulated power supplies must be provided. Refer to the Grounding section for appropriate connection of the different ground lines. The communication is possible by directly connecting the appropriate interface lines to an USB-to-UART bridge as explained in the related section. *Signals and Systems for Physics* also provides the user

with several module adapters to wire the required signals and power supplies. Among them, the SKN10 features an USB-to-UART bridge and several spring clamping terminal blocks.

2 Description of Operation

This chapter provides the user with a number of additional details regarding the operation of the SK305 *Linear TEC Driver* module. Refer to the *Functional Block Diagram* online for graphical information and to the *Datasheet* for detailed specifications. The remote commands cited in this section are fully documented in the *Programming Guide*.

2.1 Current Source

The output current delivered by the SK305 is controlled using 3 independent voltages. These signals are combined into a summing amplifier whose output can be limited prior driving the final transconductance power amplifier. The output current can be written as

$$i_{\mathrm{TEC}}(s) = G_{TEC}(s)\left[v_{\mathrm{MAN}}(s) + v_{\mathrm{EXT}}(s) + v_{\mathrm{FFW}}(s)\,K_{\mathrm{FFW}}(s)\right], \tag{1}$$

where G_{TEC} denotes the transfer function of the transconductance amplifier whose DC-gain is $+0.2\,\mathrm{A/V}$. The output current is delivered to the load through the **TECO** interfaces.

2.1.1 Manual Control

The manual control of the output current is represented by the voltage v_{MAN} in Eq1. This bipolar voltage is provided by an internal DAC whose output is programmed through the `MANS` remote command. Whatever its actual value, the `MANE` command has to be invoked to control the contribution of the voltage v_{MAN} to the output current. With a control voltage ranging from $-5\,\mathrm{V}$ to $+5\,\mathrm{V}$, the `MANS` provides full range control of the output current.

2.1.2 External Control Input

The voltage related to this second current control is denoted by v_{EXT} in Eq1. The voltage applied to the **EXTI** interfaces should range from $-5\,\mathrm{V}$ to $+5\,\mathrm{V}$ to control the output current over its full range. The transmission of external control input to the transconductance amplifier is controlled using the `EXTE` remote command. When the SK305 is used in a closed-loop setup, the external control input should be driven by the compensator (*e.g.* PID) output.

2.1.3 Feedforward Control Input

The third current control input, FFWI, is primary intended to anticipate large command transients in closed-loop applications. Indeed, command feedforward is a usual tool in control field that can be used here to reduce settling time. The feedforward input voltage is denoted by v_{FFW} in Eq1. While the applied voltage should also range from $-5\,\mathrm{V}$ to $+5\,\mathrm{V}$ to be able to control the output current over its full range, an additional transmission gain (K_{FFW}) is provided here. Indeed, because neither the amplitude nor the polarity of the feedforward are known *a priori*, the `FFWG` command is provided to set the feedforward transmission gain between -1 and $+1$. Likewise its counterparts, a remote command, `FFWE`, is provided to enable/disable the feedforward input.

2.1.4 Current Limiting

In Eq1, the control voltage available at the output of the summing amplifier is applied to the transconductance amplifier without any physical limitation. Actually, the voltage range at the power amplifier input is restricted to ±5 V in order to limit the output current to ±1 A. Nevertheless, two commands (`ILMP` and `ILMN`) are provided to lower the saturation levels if required. Events resulting from current limiting operation can be used to switch the output off, which can be useful in certain critical situations.

2.1.5 Loading

The **TECO** BNC is the primary interface for connecting the load. The load has to be wired prior enabling the output, otherwise an open-output fault is detected which prevents any current to flow. Note that the SK305 is designed for low-power TEC actuators whose equivalent series-inductance should be no more than 10 µH. *The module is not intended to drive inductive loads.*
The available output current ranges from −1 A to +1 A. This should be large enough to drive TEC actuators for thermal stabilization of most low-power laser diodes. Nevertheless, due to its voltage-controlled current-source topology, the SK305 allows parallel operation for more current handling.

2.2 Monitoring

2.2.1 Output Current Monitoring

The current source operation relies on measurement of the output current flowing through the load. This information is provided by a current-sensing amplifier (+1 V/A) whose the output voltage is primary used within the transconductance amplifier circuitry. The current amplifier's output (IMON) is also available for monitoring purpose. It is acquired using internal ADC (see `RMON` command) and a copy is available at the **MONO** output.

2.2.2 Output Voltage Monitoring

The voltage across the load is also monitored to detected over-voltage conditions. Note that the compliance voltage measurement includes the voltage drop due to the resistance of the cables used for wiring the load. This measurement is provided by a voltage amplifier (gain +1 V/V) whose output (VMON) is compared to two programmable threshold levels (refer to `VTHP` and `VTHN` commands). These voltage comparators are used to detect abnormal operating conditions for which the current source may be switched off. As for the current measurement, VMON signal is acquired using the internal ADC (see `RMON` command) and a copy is available at the **MONO** output.

2.2.3 Monitoring Output

The signal actually routed to the monitoring output (**MONO**) is selected *via* the `MONS` remote command. The available signals for monitoring are : **IMON** , **VMON** and /**STATUS**. The `STMS` command also allows monitoring from the host computer : specified signals can be sampled (one sample per second) and sent over the remote interface.

2.3 Restoring the Default Configuration

To reset the SK305 module to its factory defaults, execute the remote command `*RST`. The reset values of the parameters are shown in bold in the *Programming Guide* available online.

2.4 Expansion Connectors

The SK305 module provides the user with two expansion connectors for mounting an additional board (see Fig.4). Indeed, specific functionalities can be obtained by mounting a dedicated board on these connectors. This feature can be useful for customization purposes. The expansion connectors' pins are identified on the *Functional Block Diagram* using the **EXP** label. Analog signals and power supplies of the SK305 are routed to the Analog I/O Expansion connector while their digital counterparts are available through the Digital I/O connector. Some pins are reserved for programming the microcontroller and should not be used. Refer to the Section 1.5 for information on which pins are actually used in the SK305.

CAUTION – *Because the power lines are fed from the internal module circuitry and not directly from the backplane, only low-consumption circuits should be powered from the expansion connectors. Contact us prior using this functionality.*

The parts used for the expansion connectors are compatible with the standard 2x20-pin PC/104 non-stackthrough J2-connector, *e.g.* M20-6112045 from Harwin.

2.5 Shared Backplane Lines

Some lines of the backplane are dedicated for sharing analog and digital signals between modules. They correspond to the AIO, PWR-AIO, DIO and PWR-DIO lines listed in the generic pin assignments. This functionality can be useful for customizing a system where the number of front-panel connections has to be reduced by using these backplane lines instead. Refer to the Section 1.4.4 for information on which SK305's signals can be routed to the shared lines of the backplane.

CAUTION – *The SK305 has no internal protection against short-circuits on the shared lines. Contact us before using this functionality.*

2.6 User Terminals Blocks

The SK305 is primary designed to be assembled into a platform. Some pins of the mating connector are not connected to the bus, they are instead directly routed to 16 terminal blocks located at the rear-side of the backplane. This arrangement provides the user with specific wiring schemes. Indeed, acting as many independent connectors, the user terminal blocks can be used to wire some SK305's signals regardless of the backplane operation.
The SK305's signals routed to the user terminal blocks are identified on the *Functional Block Diagram* using **UTB** labels. See Figure 3 for their generic pin assignments and Section 1.4.5 for information about which signals of the SK305 are routed to the the terminal blocks.

CAUTION – *By design, an SK305 module can be plugged anywhere into the platform since there is no assigned slot. The only reserved location (the rightmost slot) is dedicated to the master module, which is in fact a part of the platform. Therefore, using the user terminal blocks functionality of a specific slot will, in practice, assign the module to this slot. Contact us before using this functionality.*

3 Remote Operation

This chapter describes how to operate the SK305 *Linear TEC Driver* over the host interface.

3.1 Commands

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

3.2 Status Model

The *Status Model Diagram* of the SK305's is available online at the product page. The *Programming Guide* also provides the user with detailed information about the Status registers.

4 Accessories and Related Products

This chapter describes related products and accessories that are available for use with the SK305 *Linear TEC Driver*. These optional parts must be ordered separately.

4.1 Optional Module Adapters

Like all SK-Series modular instruments, the SK305 module is primary designed to be assembled into a platform. But stand-alone operation of the SK305 *Linear TEC Driver* is also possible (see section 1.6.5). In this case, the user has to wire all required power supplies and remote control lines to the DIN41612 connector. In order to help the user in this operation, *Signals and Systems for Physics* provides several module adapters, namely the SKN10 and SKN11. For instance, the SKN10 *Module Adapter* features a mating DIN41612 connector, an USB-to-UART bridge and several spring clamp terminals blocks. Refer to the adapters' pages online for detailed information.

5 Figures

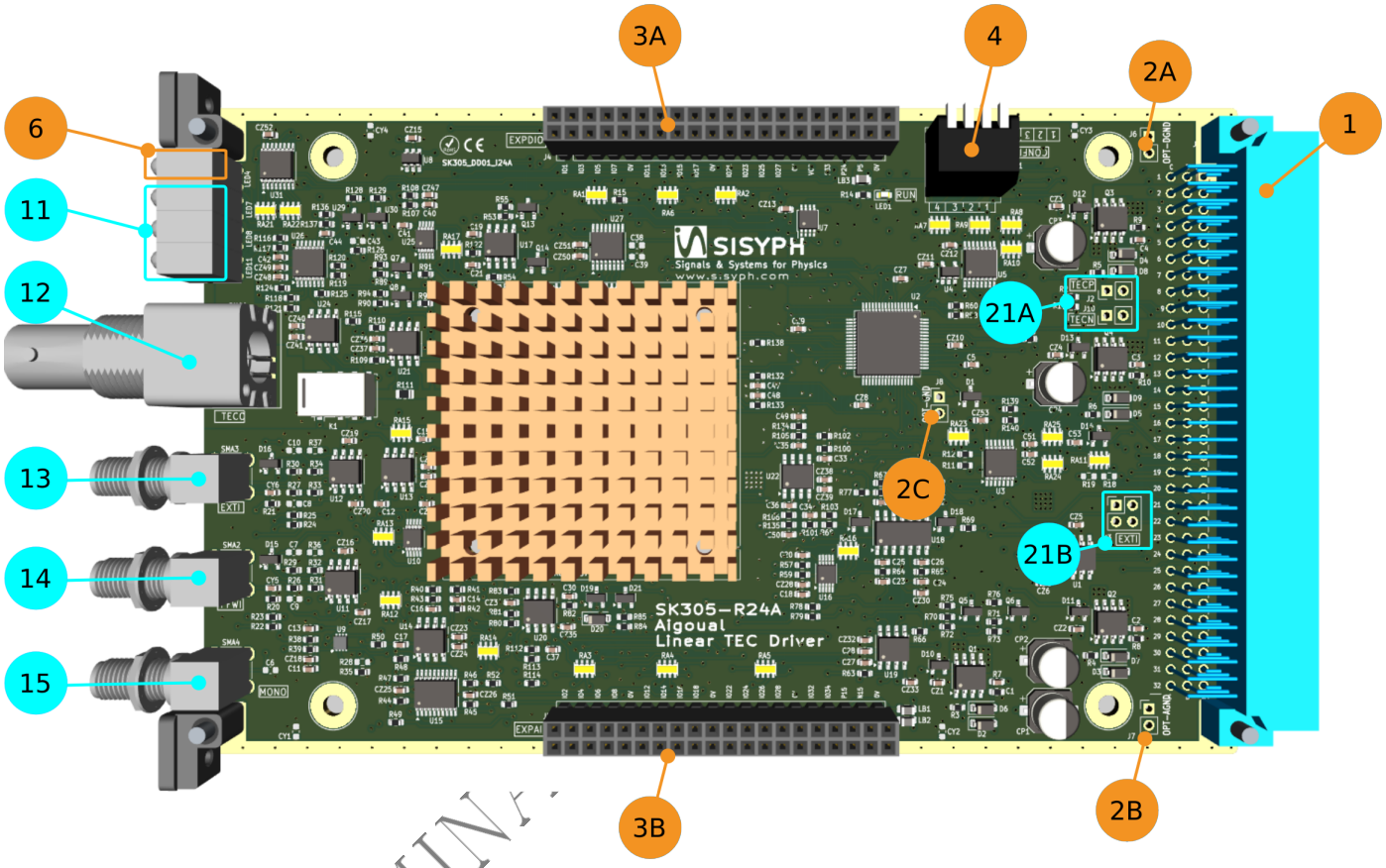

Figure 1: View of the SK305's top side. Circled numbers refer to features detailed in the Section 1. While the orange colored numbers denote generic parts of the SK-Series modules, their blue-color counterparts refer to specific features of the SK305.

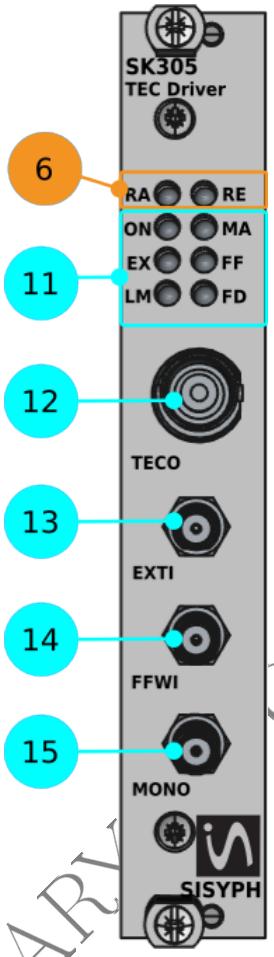

Figure 2: The SK305's front view. Circled numbers refer to features detailed in the Section 1. While the orange colored numbers denote generic characteristics shared by all SK-Series modules, their blue-color counterparts refer to specific features of the SK305.

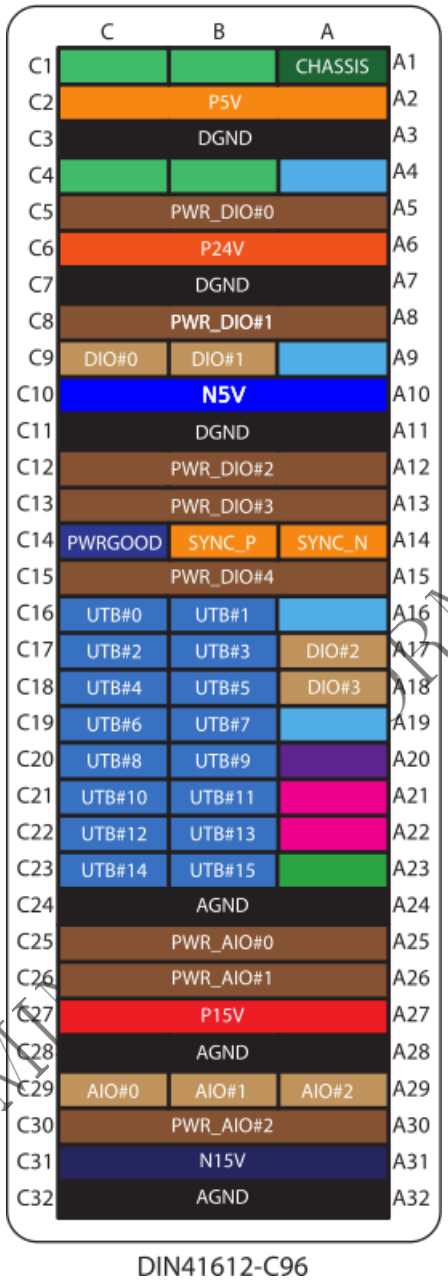

Figure 3: Generic pin assignments of the DIN41612 connector. The DIN41612-96C connector carries all the power and communication lines to the module. Additional lines are provided for i) sharing signals with other slave modules plugged on the same backplane, ii) reception of the 10-MHz synchronization signals and iii) module status information. The presence of a slave module on the backplane is detected by the platform controller using a dedicated line.

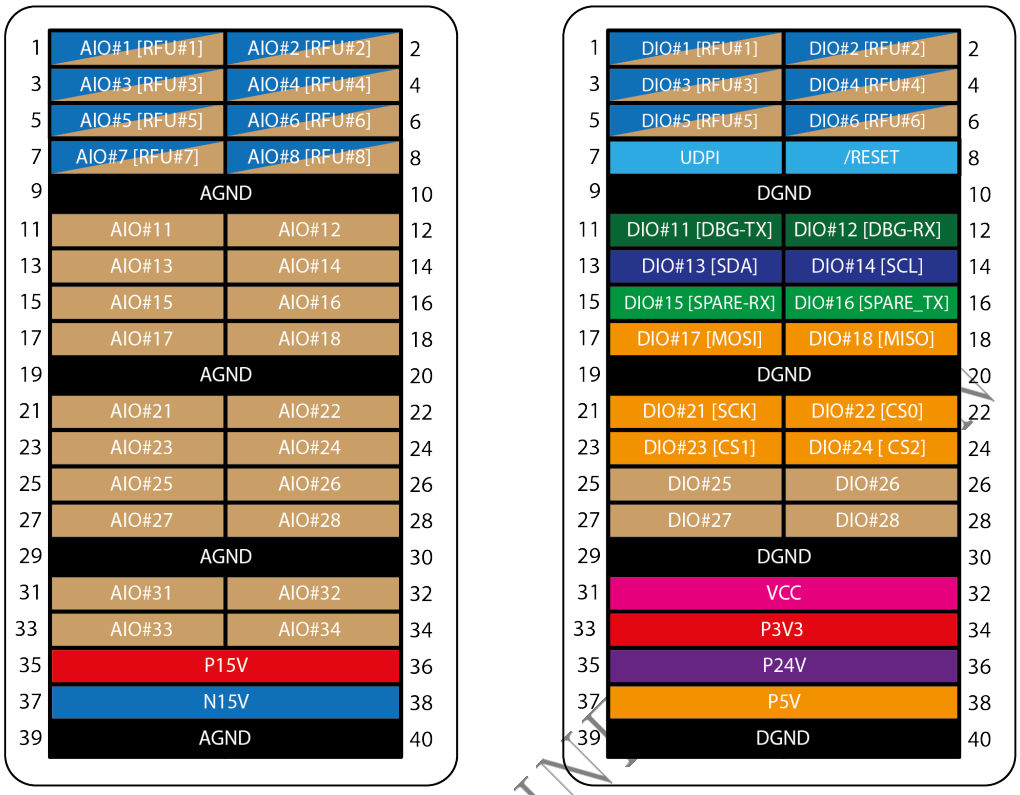

Figure 4: Generic pin assignments of the Expansion connectors. Analog power supplies and signals are routed to the AIO Expansion connector (left). Their digital counterparts are routed to the DIO Expansion connector (right). Refer to the Section 1.5 for information on the pin assignments used in SK305.

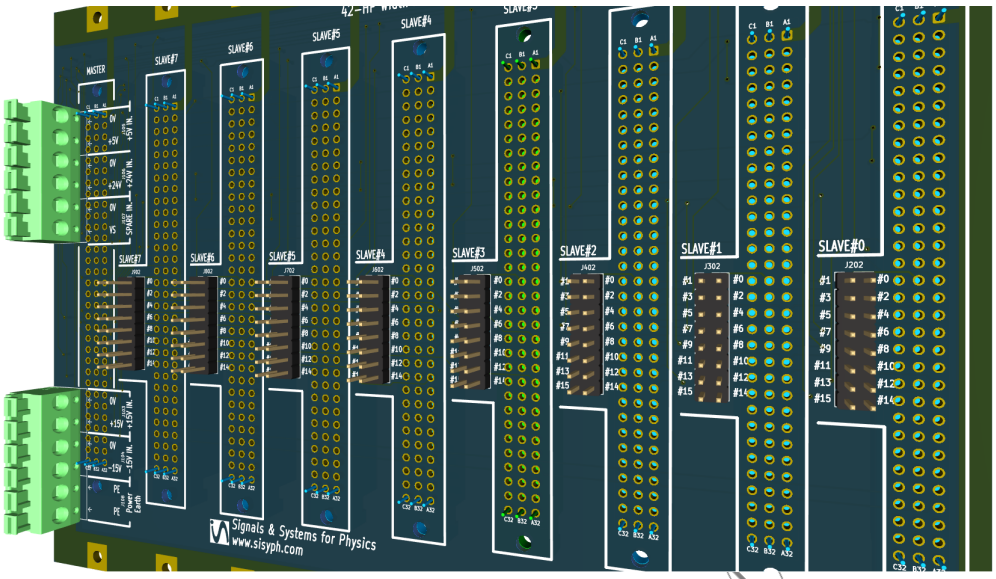

Figure 5: User's terminal blocks viewed from the rear of the backplane. Each slot of the SPK-Platform is associated with 16 independent terminals providing the user with specific wiring schemes. These connectors are accessible from the rear-side of the backplane. Note that if a 16-pin header has been used here as an exemplifying interface, the backplane is shipped without any populated parts to increase versatility.

6 Document Revision History

6.1 Version Number

This document is identified by SK305-SU02-P25A.

6.2 Revision History

P25A (2025-01-08)

Initial version.