

# Datasheet

## SK305 *Aigoual* Linear TEC Driver

### SK-Series Modules

#### Features

- $\pm 1$  A true current source w/ digital control
- Current limitation
- Compliance voltage monitoring
- Bandwidth  $\geq 10$  kHz
- Noise density  $\leq 1 \mu\text{A}/\text{rtHz}$ , RMS  $\leq 100 \mu\text{A}$
- Parallel operation for higher current
- Analog design – Free of digital noise
- Remote interface
- Platform and stand-alone operation

#### Applications

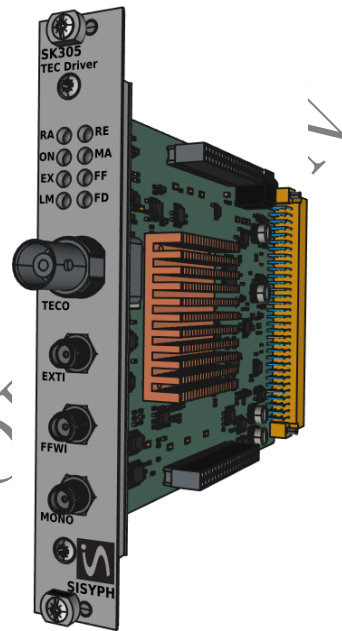
- Temperature control of laser diodes
- Laser frequency stabilization
- Optical phase-locked laser
- Optical frequency combs
- Quantum physics and engineering
- Time & Frequency instrumentation

## General Description

#### Overview

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, eliminating inherent broadband noise due to switched-mode topologies. The SK305 associated

to the SK484 *Temperature Controller* and SK657 *Ultra-Low Noise Current Source* are the ideal instruments for controlling low-power laser diodes when noise is a primary concern. 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.



## Functional Block Diagram

Refer to the *Functional Block Diagram* available online for a synthetic presentation of the SK305.

## User's Guide

The last version of the SK305 *User's Guide* is available online at the product page.

## Programming Guide

The online *Programming Guide* provides a detailed description of the SK305's remote commands.

## Remote Interface

SK305's settings are changed through the remote interface. All instrument settings can also be queried *via* the remote interface. The module generates a status signal to report a specific event to the host computer. The SK305 can be operated either inside or outside the dedicated SPK-Series platform.

## Front-Panel Display

The front panel of the SK305 provides the user with minimal information about the status of the instrument.

## Current Source

In order to achieve low-noise operation, the SK305's circuitry relies on pure analog design. In-

deed, 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. Nevertheless, paralleling two or more SK305 modules allows to increase the output current handling.

## Current Control

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.

## Protections

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.

## Specifications

### Current Source

#### Topology

Linear, class-AB amplifier w/ digital control

#### Output (TECO)

Interface BNC, UTB, EXP  
 Current Range  $\pm 1$  A  
 Compliance  $\pm 4.5$  V  
 Load resistive only : TEC, heater...  
 $ESR \geq 1 \Omega$   
 $ESL \leq 10 \mu H$   
 1-h Drift TBD

#### Bandwidth and Noise

SSBW 10 kHz, small signal  
 FPBW TBD, full-power  
 Density, RTO  $\leq 1 \mu A / \sqrt{Hz}$ ,  $f \geq 10$  Hz  
 RMS, RTO  $\leq 100 \mu A$ , BW = 10 kHz

#### Inputs (EXTI, FFWI)

Interface SMA, UTB, EXP  
 Impedance 100 k $\Omega$   
 Range  $\pm 5$  V  
 Gain, RTO +1 A/V  
 Gain, FFW -1 V/V to +1 V/V, 12-bit

#### Manual Control DAC

Range -1000 mA to +1000 mA  
 Resolution 1 mA  
 Precision 1% of full-scale

### Protections

#### Current Limitation

Positive 0 mA to +1000 mA  
 Negative 0 mA to -1000 mA  
 Resolution 1 mA  
 Accuracy TBD

#### Over-Voltage Detection

Positive 0 mV to +5000 mV  
 Negative 0 mV to -5000 mV  
 Resolution 1 mV  
 Accuracy TBD

### Monitoring

#### Monitoring Output (MONO)

Interface SMA connector, UTB, EXP  
 Impedance 100- $\Omega$  series  
 Max. Level  $\pm 10$  V

PRELIMINARY INFORMATION

## General Characteristics

*This module is designed to be operated in laboratory environment.*

### Operating Temperature

Range +15 °C to +40 °C  
non-condensing

### Host PC Communications

UART format 9600 baud, 8-bit data  
1 stop-bit, no flow control  
Interface DIN41612 backplane connector

### Connectors

Backplane DIN41612-C96 male

Expansion/Test  
AIO 40-pin PC/104 header  
DIO 40-pin PC/104 header

MONO SMA front-panel  
EXTI SMA front-panel  
FFWI SMA front-panel  
TECO BNC front-panel

### Front-Panel Indicators

RE, RA Remote interface error, activity  
ON Output status  
MA Manual control  
EX External control  
FF Feedforward control  
LM Current limiting  
FD Fault detection

### Power Supply Inputs

Analog +15 V × 60 mA  
Analog -15 V × 60 mA  
Power, digital +5 V × 1 A  
Power -5 V × 1 A

### Printed Circuit Board

Form factor Eurocard.  
Dimensions 100 × 160 × 1.6 mm  
Technology 4-layer, improved FR-4

### Physical Properties

Height 128.4 mm (3U)  
Width Single-wide, 20 mm (4HP)  
Depth 174.5 mm  
Weight TBD ≈ 300 g  
Front-Panel Anodized aluminium with rear  
conductive

### Warranty

One (1) year parts and labor on defects

## Ordering Information

### SK305 Module

The SK305 module can be ordered with different options.

Ordering Code	Front-Panel Options
SK305-FP	Shielded 3U-8HP front-panel (standard)
SK305-NP	No front-panel

### Accessories

No accessories are related to the SK305 module.

PRELIMINARY INFORMATION

## Document Identifier

This document is identified by SK305-SU03-P25A.

## Document Revision History

### **P25A (2025-01-09)**

Initial version.

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