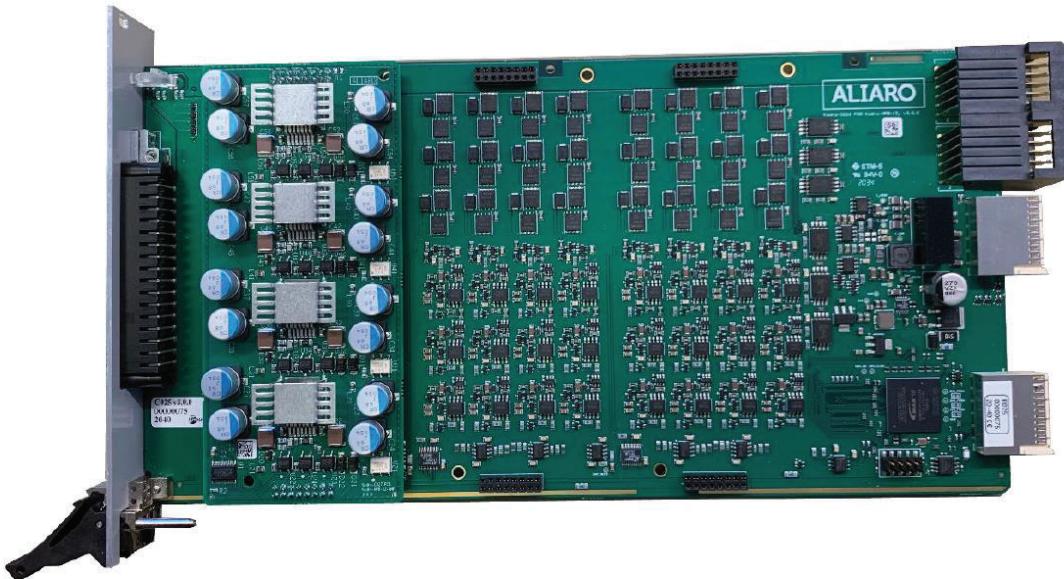


12 Channels Multi-Function Board with AMP

AL-1010 with AMP for SLSC

This document describes the SLSC AL-1010 with AMP for National Instruments SLSC-12001 chassis.



Overview

The AL-1010 is a 12-channel multi-function module to be connected between the Device Under Test (DUT) and the instrumentation part of the test system.

The board is recommended for systems requiring high flexibility on the pin configurations.

AL-1010 is made for National Instruments (NI) Switch Load Signal Conditioning (SLSC) system.

The board is made to interface with NI PXI and/or Compact-RIO instrumentation devices for the purposes of test and validation of Electronic Control Unit (ECU) software and hardware.

Custom device for VeriStand is included for Hardware-In-the-Loop applications.

For larger applications, Aliaro Configurator is recommended for channel configuration. Contact Aliaro for additional information.

Contents

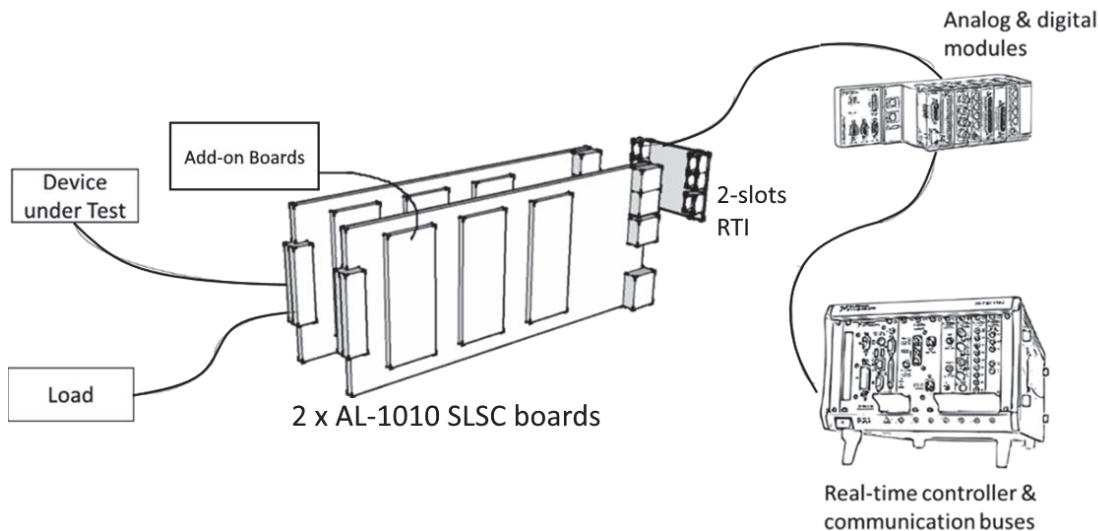
Overview.....	1
Description	3
Features.....	3
Detailed description	4
Installation.....	5
Electromagnetic Compatibility	5
Unpacking the module	5
Hardware Installation.....	6
Maintenance	7
Safety.....	7
Before using the AL-1010	7
System Check.....	7
Calibration	7
Specification	8
Definition and conditions	8
Environmental Characteristics	8
Physical characteristics.....	8
Front connectors (J1 & J2).....	9
General specification.....	10
Fault Insertion	10
Signal conditioning (All channels).....	10
Digital I/O	10
Analogue Out – Amplifier.....	10
Functions	11
LabVIEW	11
Veristand.....	11
Configuration and Accessories	12
RTI Backplane	12
AL-1010 RTI Terminal Block.....	14
Safety Guidelines.....	15
Product Certifications and Declarations.....	15
CE Compliance 	15
Electromagnetic Compatibility Standards	15
Environmental Management	16
Waste Electrical and Electronic Equipment (WEEE).....	16

Aliaro reserve the right to vary from the description given in this data sheet and shall not be liable for any errors.

Description

The AL-1010 provide multiple functions for fault insertion, signal conditioning and digital I/O, including pulsed (PWM) signals. The AL-1010 is fitted in pair through the RTI-backplane AL-1010-RTI.

The AL-1010 RTI backplane is needed to reach fully flexibility and enables easy connection to NI PXIe and/or Compact-RIO instrumentation devices. Additional with add-on boards the functionality can be expanded further.



Features

- ✓ 60V, 10A per channel
- ✓ 12 independent and isolated channels in three banks
- ✓ Two common buses per bank with switches to each channel
- ✓ Brake up switch for each channel
- ✓ Programmable level threshold on each channel
- ✓ Parallel connection possibility for high current signals
- ✓ LabVIEW driver is available.
- ✓ Custom Device is available.

Detailed description

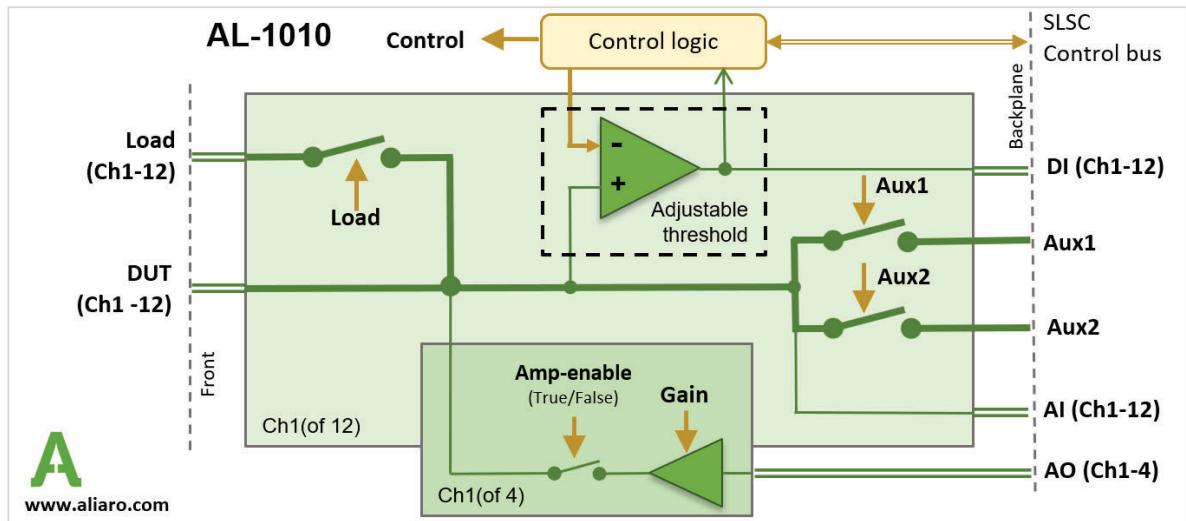


Figure 1, AL-1010 Block diagram

The AL-1010 board provides fault insertion, signal conditioning and digital I/O.

Fault insertion functions:

- Open circuit (DUT to Load)
- Short to + and – (DUT to AUX 1 or AUX2)

Signal conditioning functions:

- Digital input (from DUT) signal conditioning using adjustable threshold (-28 - +28V)
- Analogue signal (to DUT) with amplification (4 channels)
- Analogue signal (from DUT)

Digital I/O functions:

- Read digital status (from DUT) using adjustable threshold
- Read PWM signals (from DUT) using adjustable threshold (Frequency and duty cycle)
- Generate digital signals (to DUT) using AUX1 (+) and AUX2 (-)
- Generate PWM signals (To DUT) using AUX1 (+) and AUX2 (-)

Installation

Electromagnetic Compatibility

This product is intended for use in industrial locations. However, harmful interference may occur in some installations, when the product is connected to a peripheral device or test object, or if the product is used in residential or commercial areas. To minimize interference with radio and television reception and prevent unacceptable performance degradation, install, and use this product in strict accordance with the instructions in the product documentation.

Furthermore, any modifications to the product not expressly approved by Aliaro could void your authority to operate it under your local regulatory rules.



Caution To ensure the specified EMC performance, operate this product only with Shielded cables and accessories.

Unpacking the module

Carefully inspect the shipping container and the module for damage.

Check for visible damage to the exterior and interior of the damage.

If damage appears to have been caused during shipment file a claim with the carrier.
Retain the packing material for possible inspection and/or reshipment.

If the chassis is damaged, do not install it and contact Aliaro.

Hardware Installation

To set up and use the module you need the following items:

Hardware

- SLSC-12001 chassis
- SLSC AL-1010 module(s)
- SLSC AL-1010 RTI
- SLSC AL-1010 RTI CB
- Power cable
- Power input connector
- Grounding wire
- Grounding lug

Tools

- Screwdriver as needed for your application
- Wire stripper

Documentation

SLSC-12001 Chassis Getting Started Guide and Specifications

Caution:



Do not touch the contacts or remove the I/O boards or cables while the system is energized.

The SLSC chassis and the AL-1010 do not support hot plug-in. The entire chassis must be powered off when a module is inserted or removed.

Procedure:

1. Power off the main DC power source or disconnect the power source from the chassis before installing any modules or RTIs.
2. Ensure that the chassis is powered off. The POWER LED should be off. If the POWER LED is not off, do not proceed until it is off.
3. Loosen the screws on the upper rear panel of the chassis.
4. Position the RTI backplane at the desired slot and insert the securing screws, but do not fully tighten them.
5. Insert a AL-1010 module into the same slot as its corresponding RTI while firmly holding the RTI in place until the RTI is firmly connected to the module.
6. Repeat steps 4 and 5 for all required RTIs.
7. Fully tighten the screws for all RTIs and the upper rear panel of the chassis. Note Waiting until all RTIs and modules are installed to fully tighten the screws ensures proper alignment for future connections between modules and RTIs.
8. Fully tighten the two module mounting screws on each newly installed module.

Aliaro reserve the right to vary from the description given in this data sheet and shall not be liable for any errors.

9. Power on the SLSC chassis

Maintenance

Safety



Caution Observe all instructions and cautions in the user documentation. Using the model in a manner not specified can damage the model and compromise the built-in safety protection. Return damaged models to Aliaro for repair.

Before using the AL-1010

All input characteristics are DC, ACrms, or a combination unless otherwise specified. Maximum switching voltage (any polarity) **100 Vpeak**. Every card provides a fully capable fault insertion with external control during simulations or testing. Relays can be configured with Aliaro Configurator, VeriStand and LabVIEW



Note Steady state voltages applied to the AL-1010 between any two I/O connector pins in excess of the maximum switching voltage specification may damage the module

Note Signal connections through the AL-1010 are intended to go through the DUTn pin connections. Signal paths that do not use the DUTn pin connections bypass the internal overcurrent limiting features and may exceed the module's thermal capabilities.

System Check

This chapter requires LabVIEW development and installation of LabVIEW drivers.

To identify and control that the cards are inserted and work properly with the right firmware, LabVIEW provides basic VI scripts to check SLSC cards mounted in chassis

1. Open LabVIEW and select “Help” in the top menu bar and press “Find Examples...” (This opens a new window with pre-built VI (Virtual Instruments) for different applications).
2. Switch to the “Search” tab and enter keyword “SLSC” and double click.
3. In the new filtered table (to the right) find and select VI called “Configuration.vi”. This VI can located every card(s) that is online in SLSC chassis.
4. To find the newly inserted cards look for the SLSC chassis IP-address (in the table to the right).
Count the showing card(s) in the table and make up that there are as many mounted in the SLSC chassis as there are in the VI table for that specific IP address. (Can be 1 up to 11 cards per SLSC chassis)

Calibration

Recommended warm-up time	30 min
Calibration interval	Not required, recommended on system level

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Specification

Definition and conditions

Warranted specifications describe the performance of a model under stated operating conditions and are covered by the model warranty.

The following characteristic specifications describe values that are relevant to the use of the model under stated operating conditions but are not covered by the model warranty.

- Typical specifications describe the performance met by most models.
- Nominal specifications describe an attribute that is based on design, conformance testing, or supplemental testing.

Specifications are *Typical* unless otherwise noted.

Specifications are valid under the following conditions unless otherwise noted.

The AL-1010 module is mounted in an SLSC chassis with the recommended cooling clearances and using a power supply that meets the specifications provided in the chassis user guide. For the entire temperature range of the chassis.



Note These specifications only apply to the product as provided by Aliaro. Modifications to the module may invalidate these. Be certain to verify the performance of modified modules.



Caution Observe all instructions and cautions in the user documentation. Using the model in a manner not specified can damage the model and compromise the built-in safety protection. Return damaged models to Aliaro for repair.

Environmental Characteristics

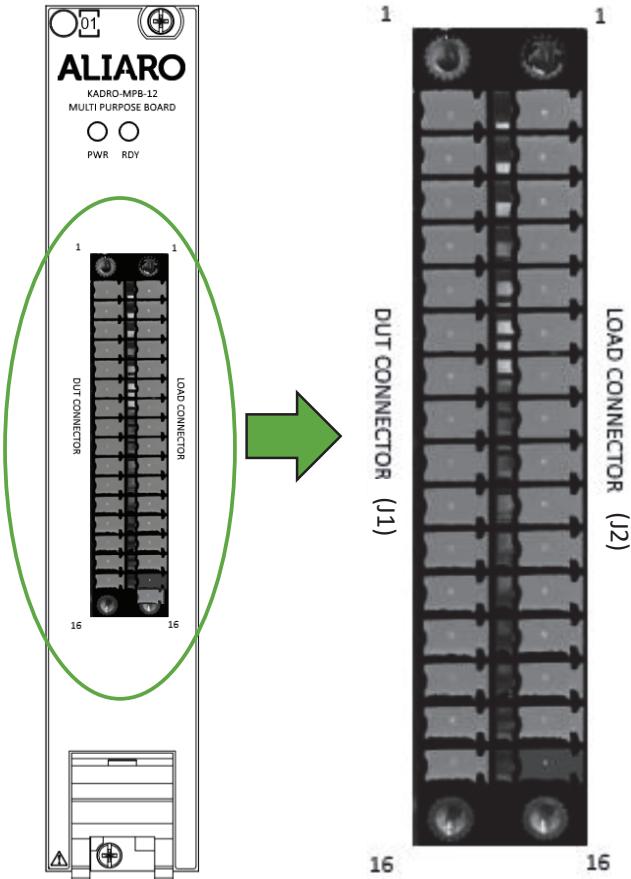
Temperature and Humidity

Operating temperature	0 °C to 40 °C
Storage temperature range	-40 °C to 85 °C
Operating relative humidity range	10% to 90%, noncondensing
Storage relative humidity range	5% to 95%, noncondensing

Physical characteristics

Category	Condition	Value
Module Dimensions	Excluding front handle	144.32mm x 30.48mm x 281 mm (H x W x D)
Front Panel Connector		1 x female Weidmuller 32 high density

Front connectors (J1 & J2)



Pin	DUT (J1)	LOAD (J2)
1	DUT Ch 1	Load Ch 1
2	DUT Ch 2	Load Ch 2
3	DUT Ch 3	Load Ch 3
4	DUT Ch 4	Load Ch 4
5	DUT Ch 5	Load Ch 5
6	DUT Ch 6	Load Ch 6
7	DUT Ch 7	Load Ch 7
8	DUT Ch 8	Load Ch 8
9	DUT Ch 9	Load Ch 9
10	DUT Ch 10	Load Ch 10
11	DUT Ch 11	Load Ch 11
12	DUT Ch 12	Load Ch 12
13	DUT_GND	AUX 1C
14	ISO_GND	AUX 2A
15	AUX 1A	AUX 2B
16	AUX 1B	AUX 2C

See fig 1 for description of the functions.



Caution The pins are not indestructible, ports and pins will tear if not treated with care.

General specification

Category	Condition	Value
No of channels		12
No of banks		3
Power supply		24VDC, +/-5%
Channel to channel isolation	(50Ω/100kHz)	40dB
Max. Operating Voltage	Any pin	+ 60V
Min. Operating Voltage	Any pin	- 60V

Fault Insertion

Category	Condition	Specified value	Typical value
Max. continuously current	DUT to Load DUT to AUX 1 / 2 All other pins	10 A (40A using parallel channels) 10 A (40A using parallel channels) 100 mA	
Max peak current (<100 ms, 25 °C)	DUT to Load DUT to AUX 1/2	40A/50ms 40A/50ms	

*Notice Exceeding the maximum pulsed current can damage the module.

Signal conditioning (All channels)

Category	Value
Threshold, range	-28- +28V
Threshold, resolution	0,1V
Threshold, bandwidth	20 kHz

Digital I/O

Category	Value
PWM frequency range	100-65 000 µs (15 hz -10 kHz)
PWM frequency resolution	1 us
PWM frequency accuracy	+/- 25 ppm
PWM duty cycle range	10-90 %
PWM duty cycle resolution	1 us

Analogue Out – Amplifier

Category	Value
No of channels	4 (DUT ch 1-4)
Power supply (Separate isolated supply)	24VDC, +/-5%
Current drive	200mA per channel

Functions

LabVIEW

Contact Aliaro Team for separate LabVIEW drivers.
(Equal functions to the custom device in Veristand, see below)

Veristand

The custom device provides following functions for the AL-1010 board:

Parameter	Description	Unit	Range
Load	Connect/disconnect selected channel to Aux 1	(Off/On)	0; 1
Aux1	Connect/disconnect selected channel to Aux 1	(Off/On)	0; 1
Aux2	Connect/disconnect selected channel to Aux 2	(Off/On)	0; 1
Threshold	Sets the digital threshold of selected channel	Volt (V)	-28,0 – +28,0
DI	Reads the logic value of the channel based upon the threshold settings	(Off/On)	0; 1
Amplifier functions (Ch 1-4)			
Amp-Enable	Enables the amplifier function	(Off/On)	0; 1
Gain	Defines the amplification for each channel	(Off/On)	0; 1
PWM functions			
PWM_Aux1	Enables PWM function using Aux1 for selected channel	(Off/On)	0; 1
PWM_Aux2	Enables PWM function using Aux1 for selected channel	(Off/On)	0; 1
PWM_Load	Enables PWM function using Aux1 for selected channel	(Off/On)	0; 1
PWM_Period	Sets period for selected channel	Time [μs]	100-65 000 μs
DI-PWM_DutyCycle	Sets duty cycle when using PWM for selected channel	%	10-100%

Configuration and Accessories

For most applications, the AL-1010 needs to be configured with a backplane (AL-1010 RTI) combined with a connection block (AL-1010 RTI CB). The AL-1010 provides 2 expansion slots for add-on boards such as customized functionalities needed for the customer's project.

RTI Backplane

The AL-1010 RTI is used to connect to two (2) SLSC modules (Left and Right) on the same board.

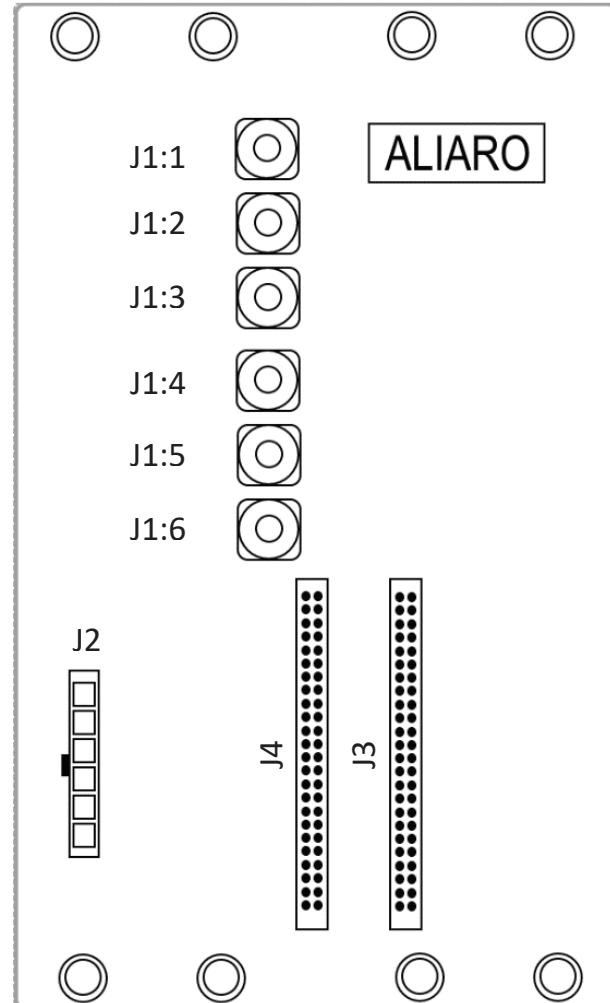
Connector pinouts

J1, Terminal blocks (M3 screw)

J1:1	AUX1A
J1:2	AUX1B
J1:3	AUX1C
J1:4	AUX2A
J1:5	AUX2B
J1:6	AUX2C

J2, (Molex 43650-0615 connector)

Pin	Signal
1	DUT GND
2	DUT REF
3	DUT Power
4	AMP Power +
5	AMP Power -
6	TS GND

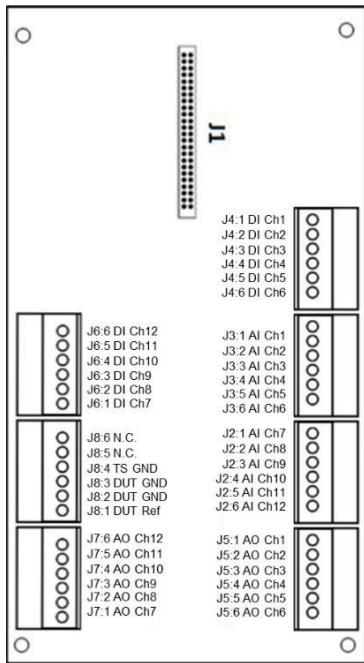


J3 Left board / J4 Right board (ERNI 064004 connector)

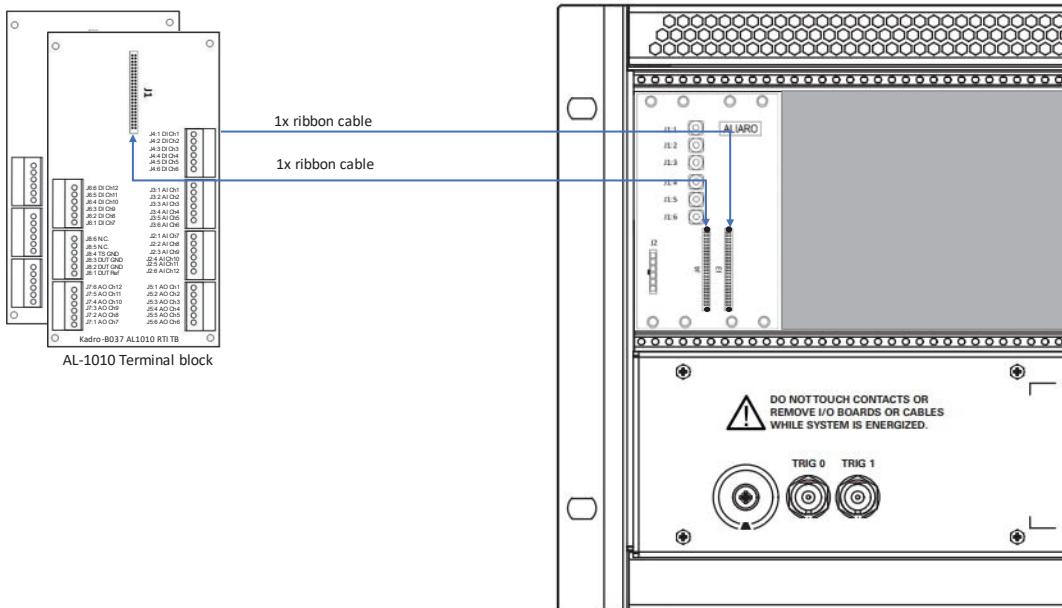
Pin	Signal	Terminal	Pin	Signal	Terminal
A1	Digital in, channel 1	J4:1	B1	Digital in, channel 7	J6:1
A2	Digital in, channel 2	J4:2	B2	TS GND	J8:4
A3	Digital in, channel 3	J4:3	B3	Digital in, channel 8	J6:2
A4	Digital in, channel 4	J4:4	B4	TS GND	J8:4
A5	Digital in, channel 5	J4:5	B5	Digital in, channel 9	J6:3
A6	Digital in, channel 6	J4:6	B6	DUT GND	J8:3
A7	Analog in, channel 7	J2:1	B7	Digital in, channel 10	J6:4
A8	Analog in, channel 8	J2:2	B8	DUT GND	J8:3
A9	Analog in, channel 9	J2:3	B9	Digital in, channel 11	J6:5
A10	Analog in, channel 10	J2:4	B10	DUT Ref	J8:1
A11	Analog in, channel 11	J2:5	B11	Digital in, channel 12	J6:6
A12	Analog in, channel 12	J2:6	B12	DUT Ref	J8:1
A13	DUT Reference	J8:1	B13	Analog out, channel 7	J7:1
A14	Analog in, channel 1	J3:1	B14	DUT Ref	J8:1
A15	Analog in, channel 2	J3:2	B15	Analog out, channel 8	J7:2
A16	Analog in, channel 3	J3:3	B16	DUT Ref	J8:1
A17	Analog in, channel 4	J3:4	B17	Analog out, channel 9	J7:3
A18	Analog in, channel 5	J3:5	B18	DUT GND	J8:1
A19	Analog in, channel 6	J3:6	B19	Analog out, channel 10	J7:4
A20	Analog out, channel 1	J5:1	B20	TS GND	J8:4
A21	Analog out, channel 2	J5:2	B21	Analog out, channel 11	J7:5
A22	Analog out, channel 3	J5:3	B22	TS GND	J8:4
A23	Analog out, channel 4	J5:4	B23	Analog out, channel 12	J7:6
A24	Analog out, channel 5	J5:5	B24	NC (Internal use)	J8:5
A25	Analog out, channel 6	J5:6	B25	NC (Internal use)	J8:6

AL-1010 RTI Terminal Block

The AL-1010 RTI Terminal Block is used to connect to two (2) SLSC modules (Left and Right) on the same board.



System Overview of AL-1010 RTI and Terminal Blocks



Safety Guidelines



Cautions

Ensure that hazardous voltage wiring is performed only by qualified personnel adhering to local electrical standards.

Do not mix hazardous voltage circuits and human-accessible circuits on the same module.

When device terminals are hazardous voltage LIVE, you must ensure that devices and circuits connected to the device are properly insulated from human contact.

All wiring must be insulated for the highest voltage used.

Product Certifications and Declarations

Refer to the product Declaration of Conformity (DoC) for additional regulatory compliance information.

To obtain product certifications and the DoC for Aliaro products, visit [aliaro.com/ certification](http://aliaro.com/certification).

CE Compliance

This product meets the essential requirements of applicable European Directives, as follows:

- 2014/35/EU; Low-Voltage Directive (safety)
- 2014/30/EU; Electromagnetic Compatibility Directive (EMC)
- 2011/65/EU; Restriction of Hazardous Substances (RoHS)

Electromagnetic Compatibility Standards

This product meets the requirements of the following EMC standards for electrical equipment for measurement, control, and laboratory use:

- EN 55011-2009 Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics - Limits and methods of measurement CISPR 11:2009
- EN 55032:2012 Electromagnetic compatibility of multimedia equipment - Emission requirements CISPR 32:2012
- EN 61326-1-2013 Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements IEC 61326-1:2012



Environmental Management

Aliaro is committed to designing and manufacturing products in an environmentally responsible manner. Aliaro recognizes that eliminating certain hazardous substances from our products is beneficial to the environment and to Aliaro customers. For additional environmental information, refer to the Minimize Our Environmental Impact web page at aliaro.com/environment.

This page contains the environmental regulations and directives with which Aliaro complies, as well as other environmental information not included in this document.

Waste Electrical and Electronic Equipment (WEEE)

EU Customers At the end of the product life cycle, all Aliaro products must be disposed of according to local laws and regulations.

For more information about how to recycle Aliaro products in your region, visit aliaro.com/environment/weee