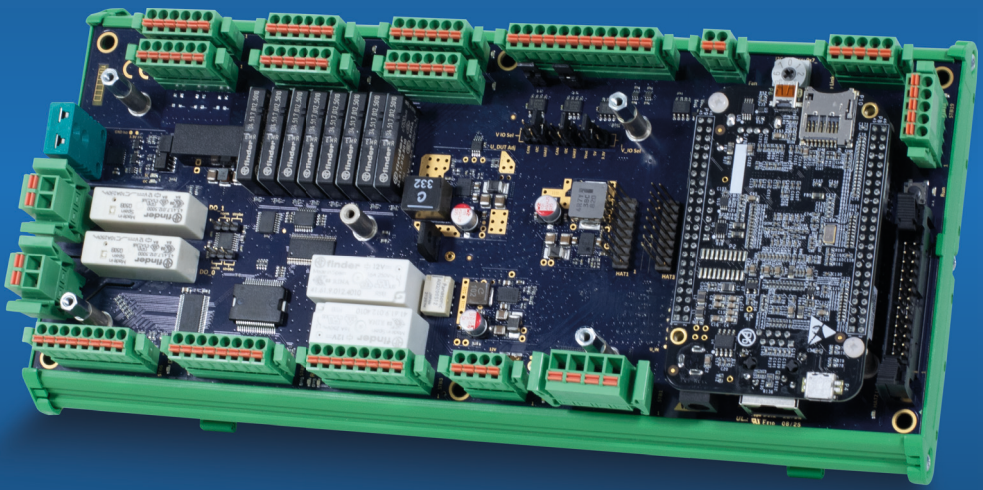
ALLDAQ

Competence in Measurement

ADQ-CDI-BB
2.5 Manual



ALLDAQ control and measuring systems

Imprint

Manual ADQ-CDI-BB 1.5
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Manufacturer and support

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All information contained in this manual has been compiled with the utmost care and to the best of our knowledge. Nevertheless, errors cannot be completely ruled out. Specifications and contents of this manual are subject to change without notice.

We are always grateful for notification of any errors.

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Contents

1. Introduction

Please check the packaging and contents for damage and completeness before commissioning. If there are any defects, please inform us immediately.

- Does the packaging indicate that something was damaged during transportation?
- Are there any signs of use on the device?

Under no circumstances should you operate the appliance if it is damaged. If in doubt, please contact our technical customer service.

Please read this manual carefully before installing and programming the device!

1.1 Scope of delivery

- ALLDAQ baseboard ADQ-CDI-BB (mounted in DIN-rail), connectors are included

1.2 Safety instructions

Please observe the following instructions:

- **If voltages greater than 42V (VDE standard) are connected, the module may only be operated in a top-hat rail housing.**
- **The top-hat rail housing should only be opened by trained specialist personnel.**
- **Operation without a top-hat rail housing is only permitted if all voltages below 42V (VDE standards) are connected.**
- Avoid touching cables and connectors
- Never expose the device to direct sunlight during operation.
- Never operate the appliance near heat sources.
- Protect the device from moisture, dust, liquids and vapors.
- Do not use the appliance in damp rooms or in potentially explosive atmospheres.
- Repairs may only be carried out by trained, authorized personnel.
- Please observe the installation regulations and all relevant standards (including VDE standards) when commissioning the device, especially when operating with voltages greater than 42 V.
- We recommend always connecting unused inputs to the corresponding reference ground in order to avoid crosstalk between the input channels.

- Ensure that no static discharge can occur via the device when handling the card. Follow the standard ESD protection measures.
- Never connect the devices to live parts, especially not to mains voltage.
- Precautionary measures to avoid unforeseeable misuse must be taken by the user.

Note: Do not apply any voltage to the I/O pins before the power supply is connected to the ADQ-CDI-BB.

ALLNET® GmbH Computersysteme accepts no liability for damage resulting from improper use.

1.3 Installation and mounting

The module is intended for installation in measuring and test systems by qualified specialist personnel. The relevant installation regulations and standards must be observed and the module may only be used in dry rooms. Ensure sufficient heat dissipation. Ensure that the connection cables are securely connected. The installation must be carried out in such a way that the cables are not under tension, as otherwise they could come loose.

1.4 Brief description

The ADQ-CDI-BB control and measuring unit has been developed for control in test systems and for automation processes. The numerous digital inputs and outputs as well as analog inputs and relays easily cover most standard requirements. For further tasks, it is possible to set up project-specific HATs or connect further standard ALLDAQ extensions via the ADQ-Link.

This manual applies to the following hardware versions of the ADQ-CDI-BB:

- Rev. 2.5

Features:

- 8 digital inputs 24VDC with programmable input filter
- 1 switchable power measurement channel 30VDC with two switchable current measurement ranges 8mA and 10A
- 1 temperature measurement channel for various thermocouples with temperature-dependent programmable alarm outputs
- 8 relays for up to 30VDC / 6A (optionally interchangeable with small signal relays for digital and analog signals)
- 3 analog single inputs up to 48VDC
- 3 analog differential inputs ± 22, 796VDC
- Onboard temperature monitoring (programmable) with connection option for a 12V fan
- 1 ADQ-Link output for additional ALLDAQ peripherals such as relay board, load box or current sink
- Simple 24VDC power supply
- Numerous signal LEDs for easy commissioning and troubleshooting
- Onboard power supply unit up to 10A "Int. DUT voltage" adjustable via software
- Supply of an "Ext. UDUT voltage" 0-48V
- Slot for HAT1 (audio, digital inputs and outputs, analog inputs, I2C, voltage supply)
- Slot for HAT2 (ADQ-Link output, power supply, GPIO)
- Controllable with ADQ-Link (USB/PXIe) or various single board computers (SBC) such as Beagle Bone Black, RockPi X (I2C) etc.

2. Overview of the system

2.1 Digital inputs and outputs

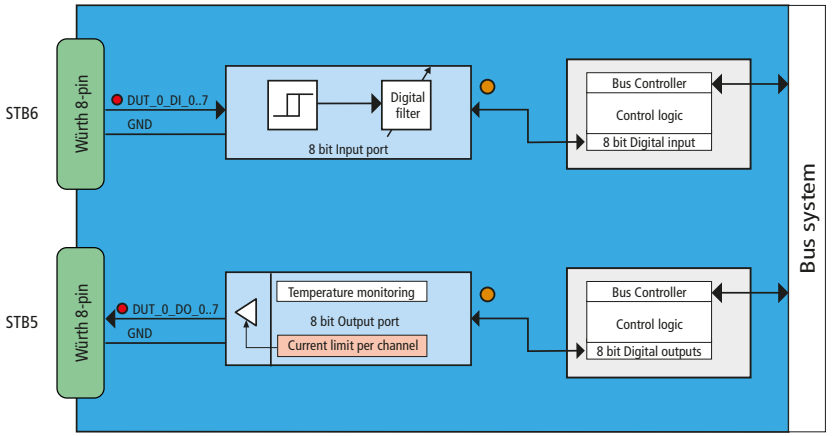


Figure 1: Blockschaltbild digitale Ein- und Ausgänge

2.1.1 Digital inputs

The ADQ-CDI-BB has 1 digital input port with 8 bits. The inputs have a Schmitt trigger characteristic in accordance with IEC 61131-2 (Typee 1) and are designed for an input voltage of 24V. All inputs are equipped with status LEDs.

Digital input filter

To prevent unwanted effects caused by contact bounce, you can program a digital filter for each input port. Choose between the following values:

10 ms (N = 1248) / 3.2 ms (N = 400) / 1.0 ms (N = 125) / 10 µs (bypass). The scan frequency is 100 kHz (Type.).

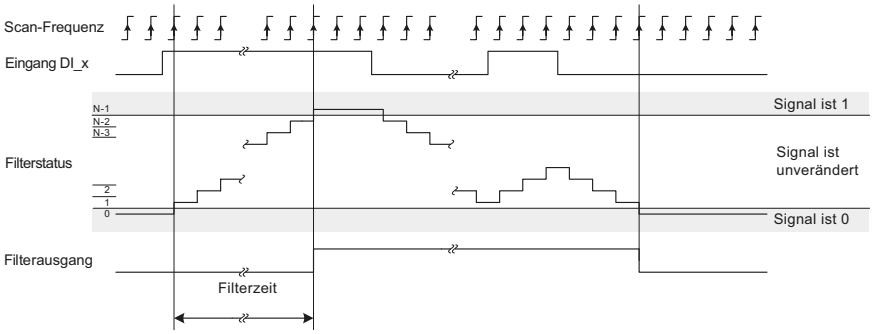


Figure 2: Digital input filter

Wiring

The isolated inputs have a Schmitt trigger characteristic in accordance with IEC 61131-2 (Typee 1) and are designed for the input high level UIH of Type. 24 V commonly used in control technology. Observe the following conditions:

- Threshold voltage L ¨ H: > 15 V @ U_IN = 24 V
- Threshold voltage H ¨ L: < 11 V @ U_IN = 24 V
- Hysteresis: Type. 1 V

Please note that an earth connection must always be made from the external wiring to the reference earth of the isolated digital inputs (GND). The digital input section and the digital output section use GND together.

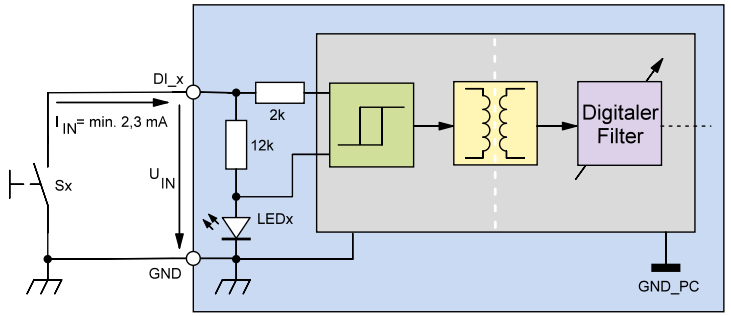


Figure 3: Wiring of the isolated digital inputs

2.1.2 Digital outputs

The output voltage of the digital output is equal to the supply voltage U_IN (24VDC). Up to 650mA can be driven per output. Several outputs can be connected in parallel to increase the output current. An earth reference to the external output circuit must be established via GND. The output stage offers comprehensive overload protection, short-circuit-proof outputs (current limitation per channel) and thermal overload protection with automatic restart. In the event of thermal overload (Type. 135°C), the respective channel switches off and switches back on automatically as soon as the junction temperature has dropped by 10°K.

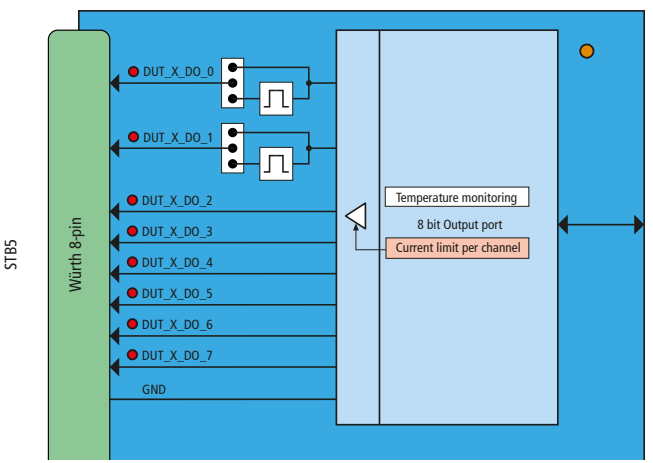


Figure 4: Digital output in detail

The first two outputs of each driver stage (DUT_X_DO__0..1) can also be used in pulse mode in addition to normal operation. When the output is switched high (rising edge), the stage emits a high pulse of approx. 1 second. To do this, the jumpers DO_0 / DO_1 must be set to strobe accordingly.

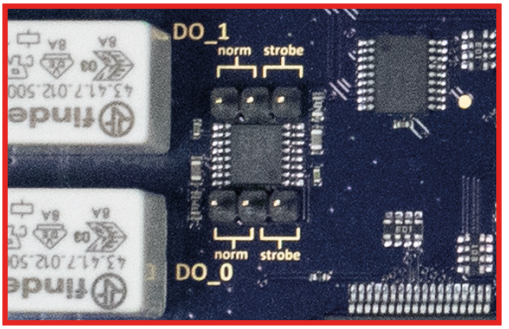
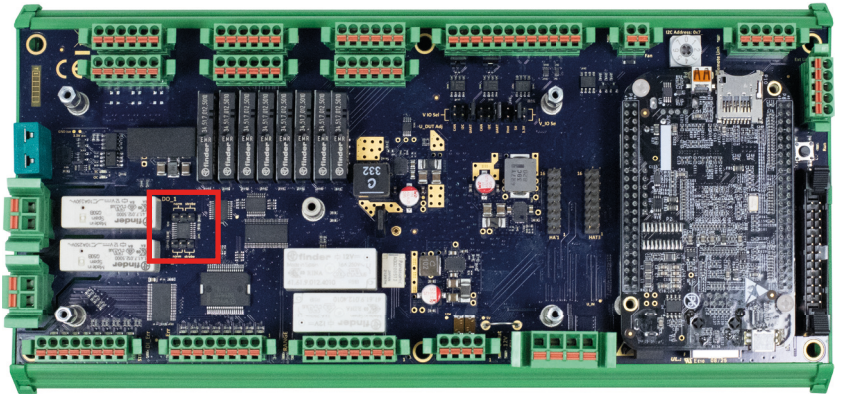


Figure 5: Jumper DO_0 / DO_1 Strobe



2.1.3 Jumper CAN/UART/I2C

Jumpers P3 and P4 are used to select the BUS Typee (CAN/UART/I2C) on the STB16. The BUS Typee is selected via the programming in the BeaglBoneBlack. Jumper P5 (V_IO Sel) is used to define the signal level on the BUS Typee. Jumpers J6 and J7 can be used to terminate the BUS Typee CAN.

Jumper	Pin (plugged)	Slot	BUS-Typee
P3, P4	Pin1, Pin2	CAN 1	CAN BUS connected STB16
J6	Pin1, Pin2	CAN 1	Terminating resistor 120R
J7	Pin1, Pin2	CAN 0	Terminating resistor 120R
P3, P4	Pin3, Pin4	I2C	I2C BUS connected STB16
P3, P4	Pin3, Pin4	UART	UART BUS connected STB16

Jumper	Pin (plugged)	BUS signal level (VIO)	
P5	Pin1, Pin2	3,3V (intern)	CAN/UART/I2C
P5	Pin3, Pin4	5V (intern)	CAN/UART/I2C
P5	Pin5, Pin6	1,8..5V (extern)	CAN/UART/I2C

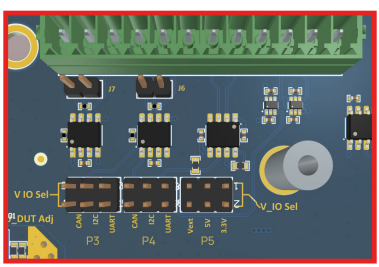
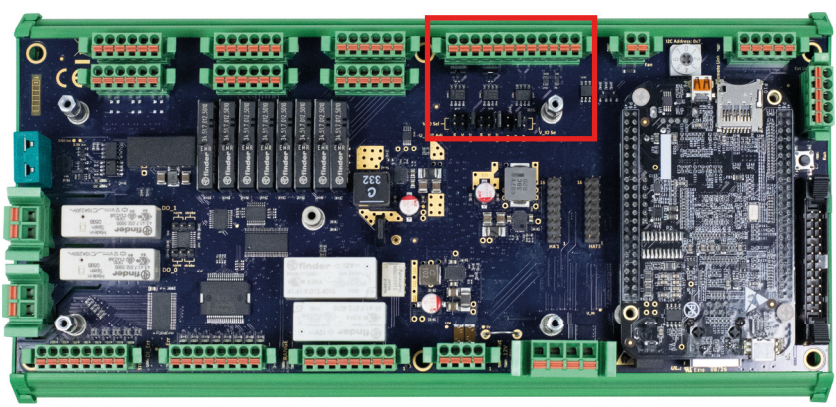


Figure 6: Jumper CAN/UART/I2C



2.2 Power measurement channel

The ADQ-CDI-BB offers 1 independent power measurement channel, for example to switch 1 DUT and monitor the power consumption.

The internal DUT voltage max. 4.8-18.4VDC and the current up to max. 10A can be measured on the path. Measurements are made with 20 bit resolution and the recorded values can optionally be pre-processed (e.g. averaging).

In order to achieve the highest possible resolution for various standard measurement requirements such as quiescent current or maximum current consumption, there are two switchable current measurement ranges. These are Typeically 8mA and 10A.

As soon as the current becomes too high in the small current measuring range, the ADQ-CDI-BB automatically switches to the large measuring range without interruption.

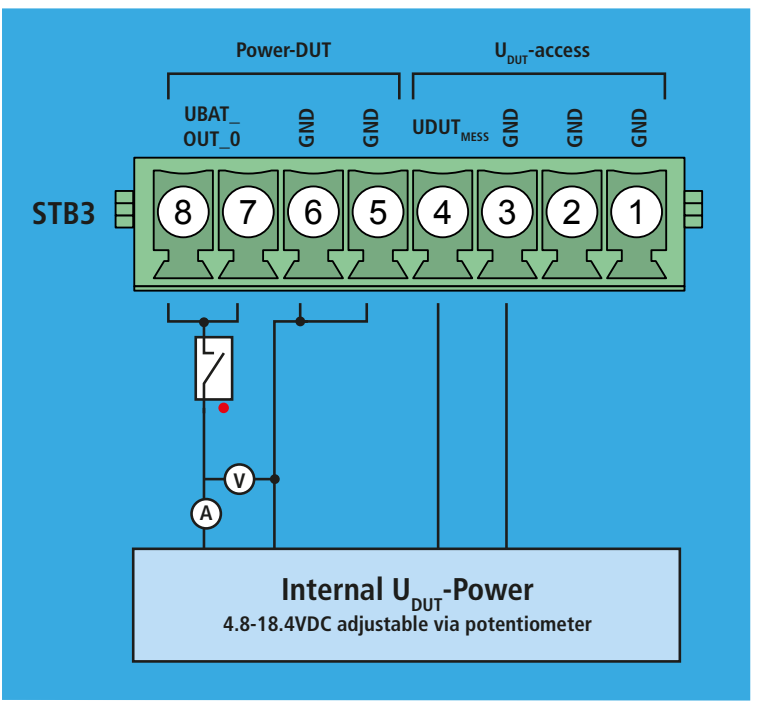


Figure 7: Block diagram of power measurement channels

2.3 Temperature measuring channel

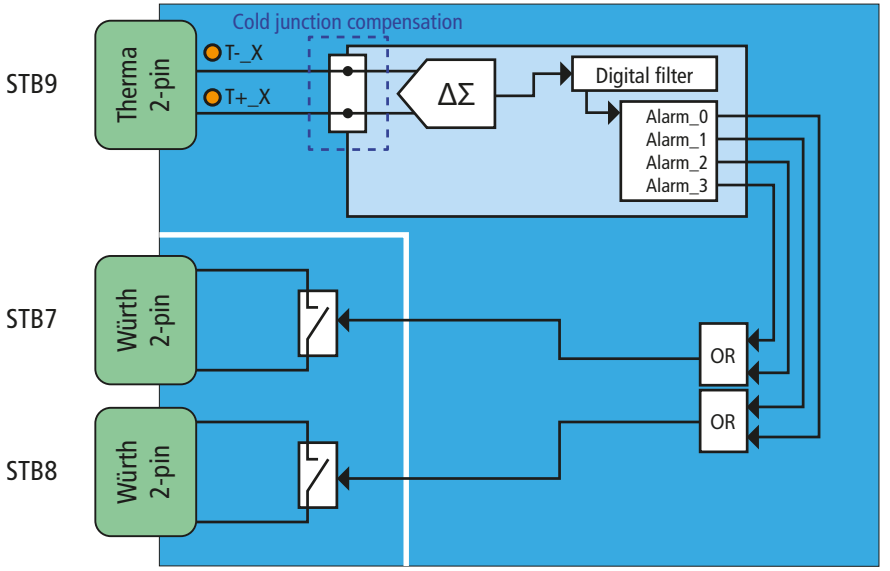


Figure 8: Block diagram of temperature measuring channel incl. alarm relay

The ADQ-CDI-BB has 1 independent temperature measurement channel with integrated cold junction compensation. A Typee K thermocouple can currently be connected to this channel via the CMJ connector Typee from Therma (DIN IEC 584). Several thermocouple Typees from Therma with different classifications are available. For further information, see www.thermagmbh.de. If you want to connect Typee J, T, N, E, S, B or R, please contact us. LEDs and the software indicate short circuits and cable breaks on the thermocouple.

The galvanic isolation between the thermocouple and the PC effectively suppresses interference.

Two alarm outputs can be configured independently of the system, which are triggered in hardware when defined threshold values are exceeded or not reached. For example, a fan, a heater or a signal tone can be switched on directly depending on the application (STB7/STB8).

Alarms

Up to four alarm thresholds with their own hysteresis can be set for each thermocouple. The alarms can be triggered when the thresholds are exceeded or undershot. Two alarms are always logically connected as an OR. This makes it easy to trigger more complex alarm scenarios. Two alarm outputs are therefore available on the connector for each thermocouple. Once configured, the alarms are active independently of the system bus. Even if the system hangs up or is fully utilized, the alarm outputs function reliably.

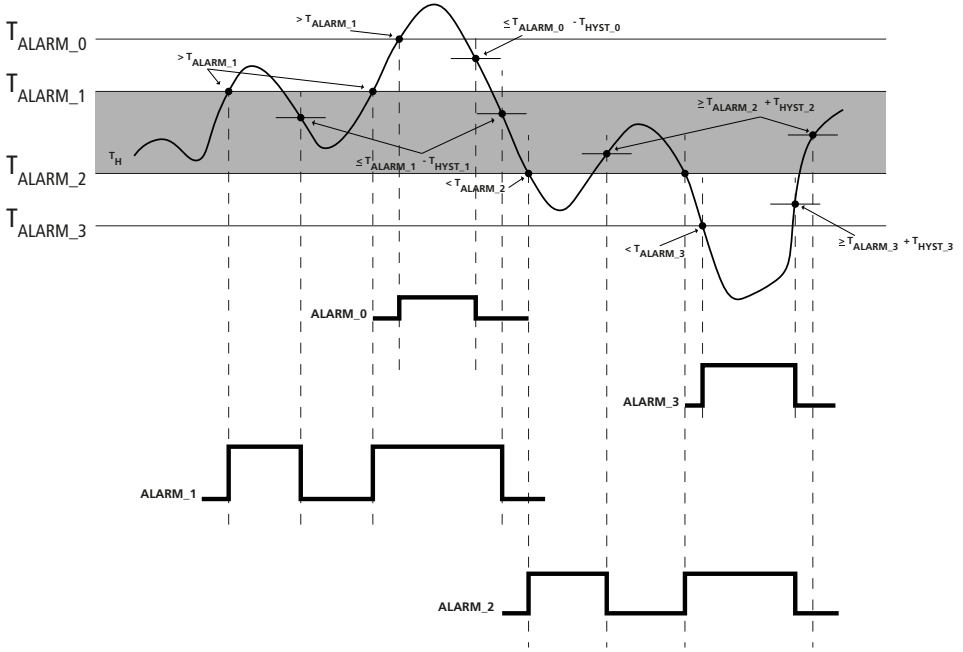


Figure 9: Alarm thresholds

2.4 Relay

- 8 power relays (SPDT) max. 30VDC/6A (default)
- 4 small signal relays (DPDT) max 30VDC/1A or 125VAC 0.3A (resistive); optional (on request)

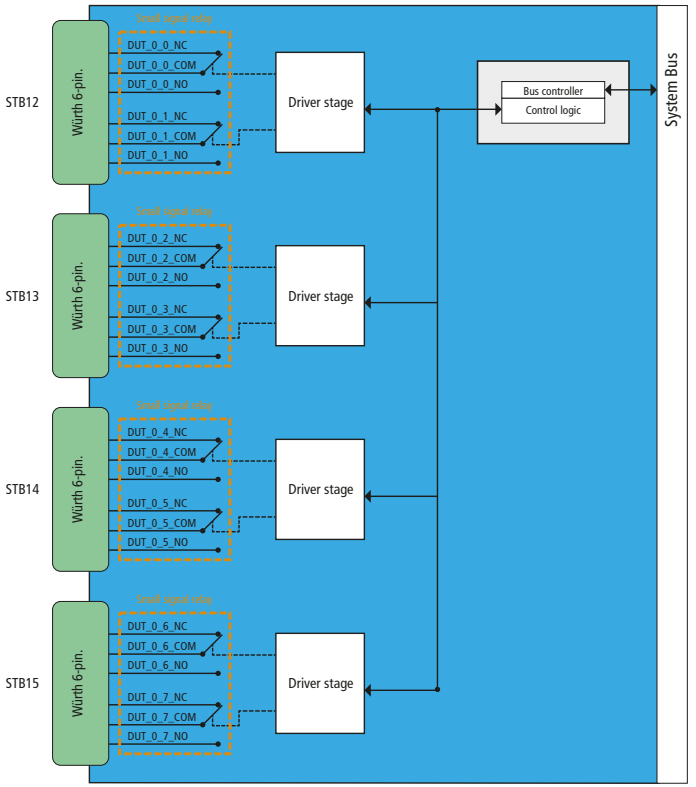


Figure 10: Relay block diagram

2.5 Analog inputs

A total of 6 analog inputs are available, 3x single-ended and 3x differential. With 20bit resolution and an input range up to 48VDC (single-ended) and ± 22.796VDC (differential), many measurement requirements can be met. To reduce the load on the system and the bus, measured values can already be averaged in the converter chip.

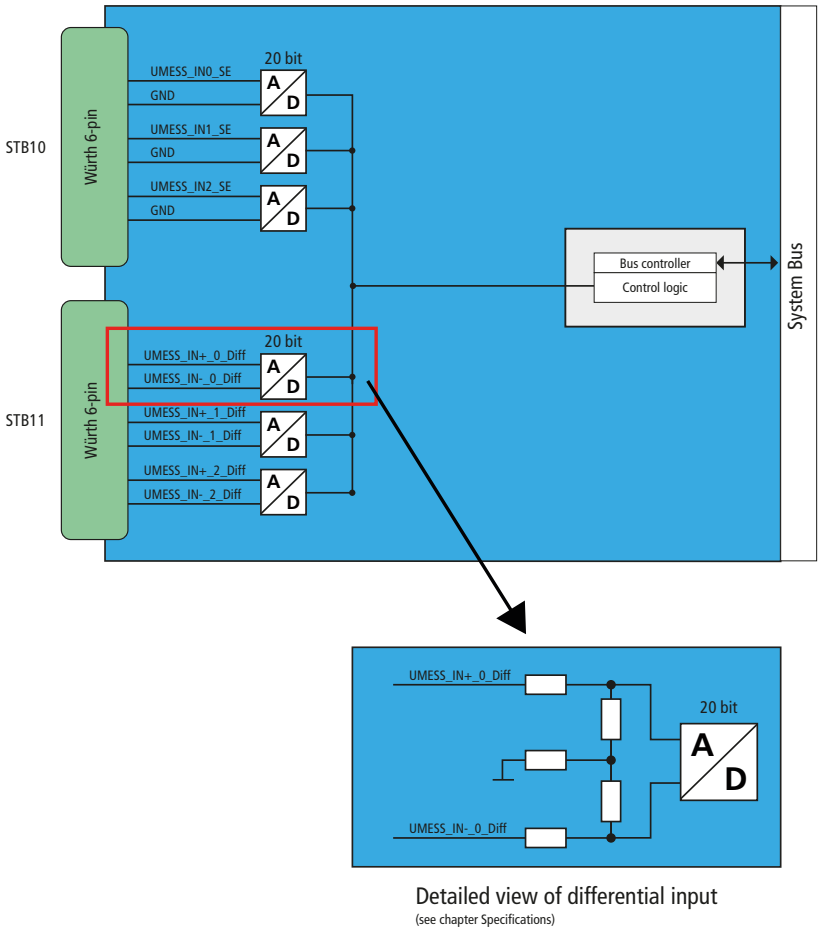


Figure 11: Block diagram of analog inputs

2.6 Fan control

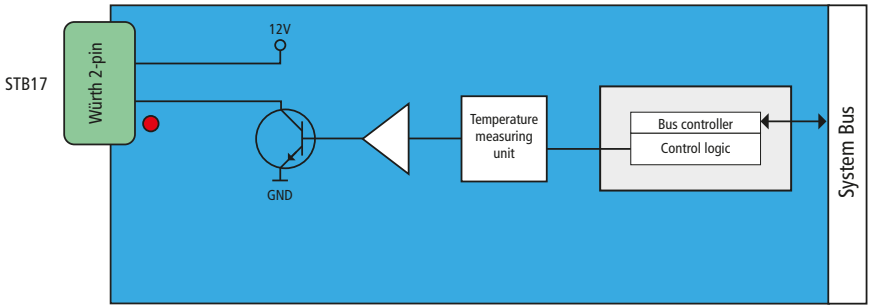


Figure 12: Fan control block diagram

The ADQ-CDI-BB is fitted with a temperature transducer that measures the temperature of the module. It is generally recommended to actively cool the module. The temperature transducer has a programmable fan output (12VDC/500mA). The hysteresis can be used to set different threshold values for switching the fan on and off.

2.7 ADQ-Link

Two ALLDAQ products can be reliably and easily connected and communication established via the ADQ link (point to point). Physically, there is a differential connection. This makes the ADQ-Link perfect for use in industrial environments. Even in compact control cabinets, where it is not always possible to maintain optimum cable routing and decoupling between power lines and analog or digital signal/control lines, the ADQ-Link works stably. The ADQ-Link connects two participants up to 100m without any loss of speed or robustness. For shorter distances, the power supply can also be looped from one subscriber to the other using the same cable. The longer the cable, the greater the displacement of the respective earth potentials. However, this is not a problem due to the capacitively insulated link cables.

As an alternative to the single board computer (BBB), the ADQ-CDI-BB can be controlled via an ADQ-Link input. An ADQ-Link output is also available. The system can also be easily expanded with a wide range of ALLDAQ peripherals. The standard modules include relay boards, current sinks or resistive loads. Additional project-specific hardware can also be connected.

2.8 Power supply

The entire module is supplied with a single 24VDC supply voltage (U_IN STB1). Note: U_IN also corresponds to the output voltage for the digital outputs.

In addition, the module offers external injection of the UDUT voltage (0-48V) at STB1.

2.8.1 Voltages of the internal power supply units

In addition to the adjustable 4.8-18.4VDC/10A UDUT voltage, the ADQ-CDI-BB offers the user two further voltages of 5VDC and 12VDC.

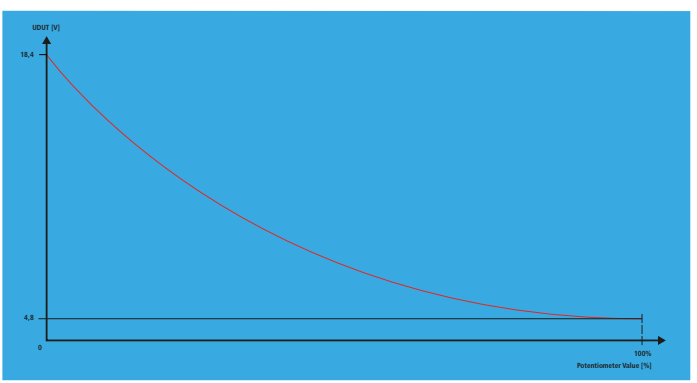


Figure 13: Curve UDUT voltage

The output voltages 5VDC, 12VDC and UDUT can be tapped via the STB2 connector.

3. Plug-on boards (HAT)

The ADQ-CDI-BB offers several options for expansion. Among other things, a total of 2 slots for expansion boards (HATs) are available directly on the module.

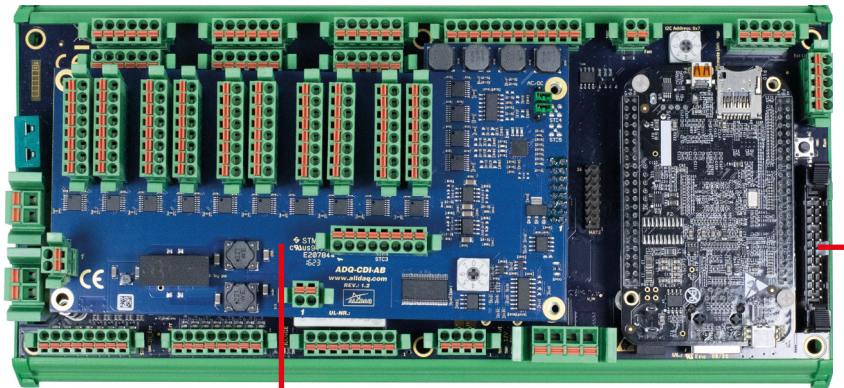


Figure 14: Position Erweiterungsplatinen (HATs)

3.1 HAT1 (e.g. ADQ-CDI-AB)

The ADQ-CDI-BB offers a slot for the HAT1. The dimensions are 160x75mm. In addition to the voltages, 5VDC and 12VDC, there is also the control bus (I2C, I2S).

3.2 HAT2

There is a connector for a simple HAT. The input voltage (U_IN), 5VDC and 12VDC and a further ADQ-Link-OUT are available at the connector provided for this purpose.

4. Control

A standard I2C master can be used to control the ADQ-CDI-BB. This is available on the single-board computer (default). In addition, the ADQ-CDI-BB can be controlled via the STB18 connector (ADQ-Link-IN). If this connector is used to control the ADQ-CDI-BB via an ADQ link, the I2C is automatically switched away from the single-board computer.

Rotary switch

Use the rotary switch to determine the main address of the complete module. The address may only occur once on an ADQ link or I2C bus. This also applies to other peripherals. All ADQ-Link products have an adjustable rotary switch.

Position	Address (7 bit)
0	0x70
1	0x71
2	0x72
3	0x73
4	0x74
5	0x75
6	0x76
7	reserved*

*If reserved, an orange ERROR LED lights up.

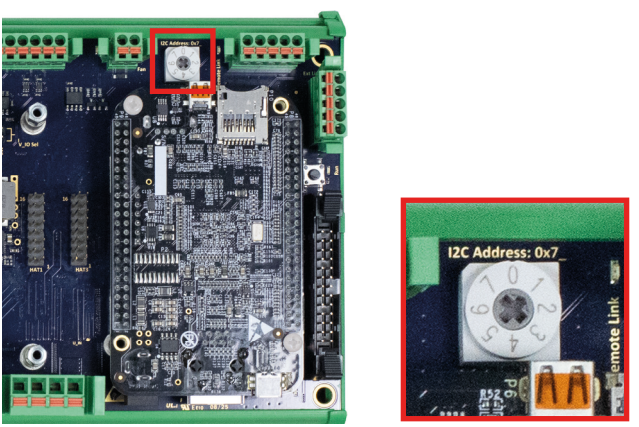


Figure 15: Rotary switch

4.1 ADQ-Link

For example, the ADQ-CDI-BB can be conveniently and reliably controlled via USB using an ADQ-153. The ADQ-Link is implemented via a twisted 2-wire cable.

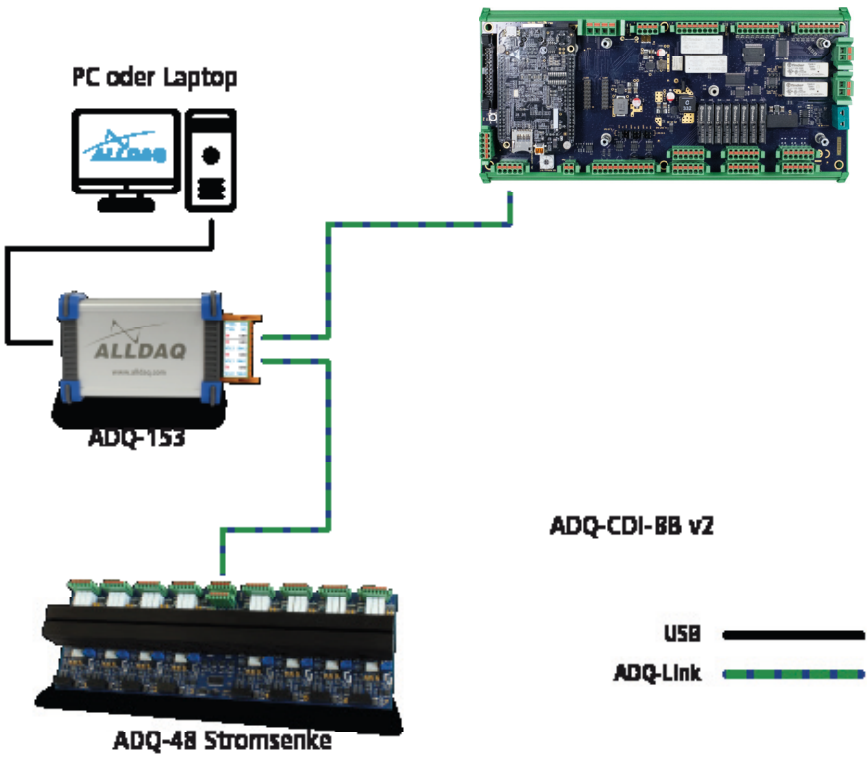


Figure 16: ADQ-153 as control controller

4.2 Single Board Computer

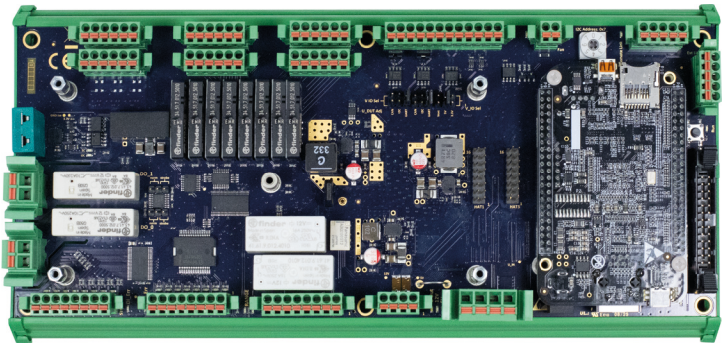


Figure 17: ADQ-CDI-BB mit Beagle Bone Black Einplatinen-Computer

To make the complete system as compact as possible, various single board computers can be used as control centers. The Beagle Bone Black can be mounted directly on the ADQ-CDI-BB. (see Figure 16)Adapter boards can be used to mount other single-board computers.

5. Pin assignments

5.1 Position of the connectors/assignment

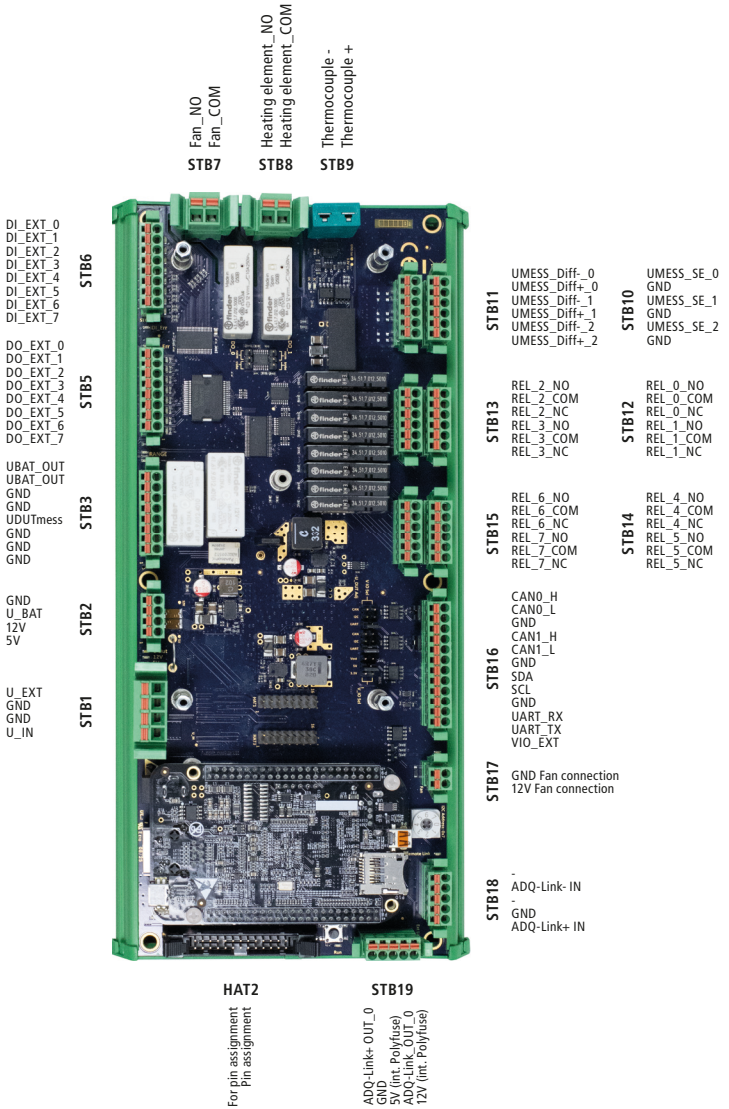


Figure 18: ADQ-CDI-BB with connector position/assignment

5.2 Overview of connector Typees

5.2.1 Würth/Therma Typee

Connectors from the Therma/Würth 69130513.... series with different numbers of poles are used.

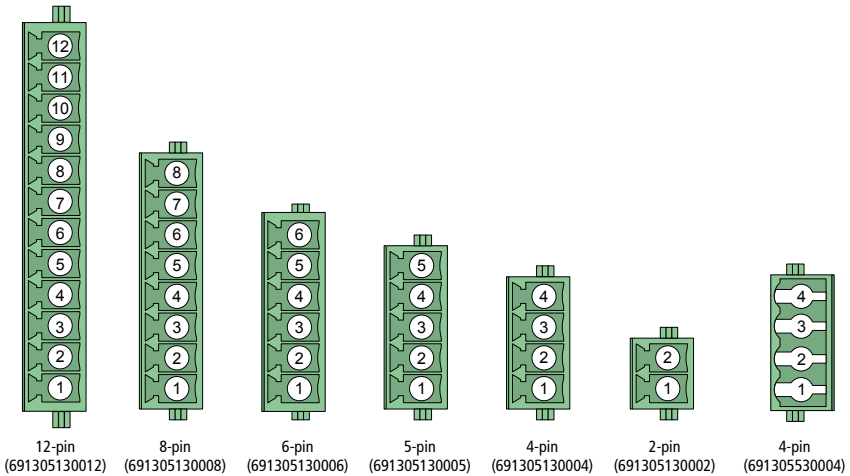
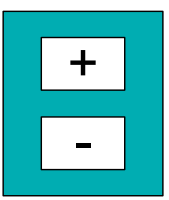


Figure 19: Würth baseboard Typee WR-TBL 3051 (top view)



2-pin
(Therma: CMJ-KIPR-Green)

Figure 20: Thermocouple socket (top view)

5.2.2 Typee male connector

5.2.3 10-pin and 5-pin pin headers are used to connect the baseboard and plug-in modules (pitch: 2.54 mm).

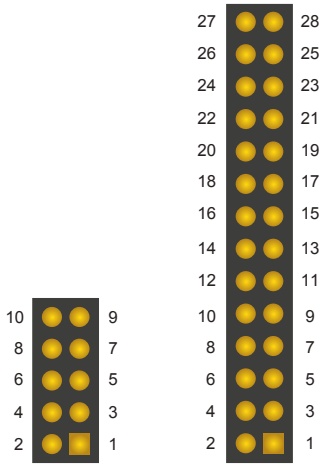


Figure 21: Male connector, 2.54mm (top view)

5.3 Pin assignment

STB19 - ADQ-Link OUT

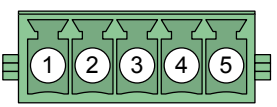


Figure 22: Würth 691305130005

Pin	Assignment	Description
1	ADQ-Link+ OUT_0	Positive ADQ-Link output (isolated)
2	GND	Ground reference
3	5V	Internal 5VDC (int. Polyfuse, Ihold 1.1A/ Itrip 5.5A)
4	ADQ-Link- OUT_0	Negative ADQ link output (isolated)
5	12V	Internal 12VDC (int. Polyfuse, Ihold 1.1A/ Itrip 5.5A)

Tabelle 1: Pin assignment STB19

STB17 - Fan output

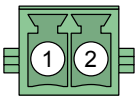


Figure 23: Würth 691305130002

Pin	Assignment	Description
1	12V (max. 500mA)	Positive connection for 12VDC fan
2	GND	Negative connection for 12VDC fan

Figure 24: Pin assignment STB17

STB18 - ADQ-Link IN

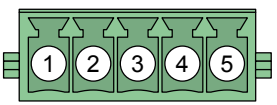


Figure 25: Würth 691305130005

Pin	Assignment	Description
1	ADQ-Link+ IN	Positive ADQ link input
2	GND	Ground reference
3	-	not connected
4	ADQ-Link- IN	Negative ADQ link input
5	-	not connected

Tabelle 2: Pin assignment STB18

STB1 - Supply voltage/external UDUT voltage

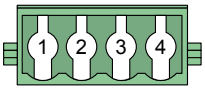


Figure 26: Würth 691305530004

Pin	Assignment	Description
1	U_IN	ADQ-CDI-BB Supply voltage 24VDC
2	GND	Ground reference
3	GND	Ground reference
4	U_EXT	External power supply DUT 0-48V

Tabelle 3: Pin assignment STB1

STB16 - CAN/UART/I2C (TTL-Level)

Note: Do not apply any voltage to the I/O pins before the power supply is connected to the ADQ-CDI-BB.

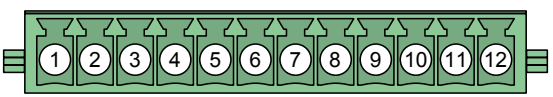


Figure 27: Würth 691305130012

Pin	Assignment	Description
1	VIO_EXT	External power supply
2	UART_TX	Interface
3	UART_RX	Interface
4	GND	Digitaler Ground reference
5	SCL	BeagleBone
6	SDA	BeagleBone
7	GND	Digitaler Ground reference
8	CAN1_L	CAN-BUS
9	CAN1_H	CAN-BUS
10	GND	Digitaler Ground reference
11	CAN0_L	CAN-BUS
12	CAN0_H	CAN-BUS

Tabelle 4: Pin assignment STB16

STB5 - Digital outputs

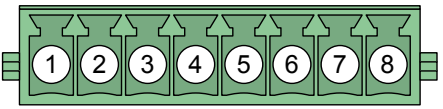


Figure 28: Würth 691305130008

Pin	Assignment	Description
1	DO_EXT_7	Digitaler Ausgang
2	DO_EXT_6	Digitaler Ausgang
3	DO_EXT_5	Digitaler Ausgang
4	DO_EXT_4	Digitaler Ausgang
5	DO_EXT_3	Digitaler Ausgang
6	DO_EXT_2	Digitaler Ausgang
7	DO_EXT_1	Digitaler Ausgang
8	DO_EXT_0	Digitaler Ausgang

Tabelle 5: Pin assignment STB5

STB6 - Digital inputs

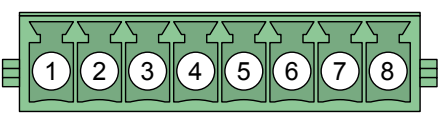


Figure 29: Würth 691305130008

Pin	Assignment	Description
1	DI_EXT_7	Digital input
2	DI_EXT_6	Digital input
3	DI_EXT_5	Digital input
4	DI_EXT_4	Digital input
5	DI_EXT_3	Digital input
6	DI_EXT_2	Digital input
7	DI_EXT_1	Digital input
8	DI_EXT_0	Digital input

Tabelle 6: Pin assignment STB6

STB12 - AUX relay

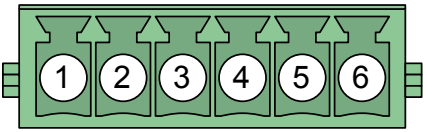


Figure 30: Würth 691305530006

Pin	Assignment	Description
1	REL_1_NC	Closed contact of relay
2	REL_1_COM	Changeover contact of relay
3	REL_1_NO	Open contact of relays
4	REL_0_NC	Closed contact of relay
5	REL_0_COM	Changeover contact of relay
6	REL_0_NO	Open contact of relays

Tabelle 7: Pin assignment STB12

STB13 - AUX relay

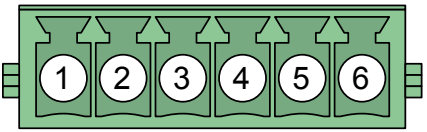


Figure 31: Würth 691305530006

Pin	Assignment	Description
1	REL_3_NC	Closed contact of relay
2	REL_3_COM	Changeover contact of relay
3	REL_3_NO	Open contact of relays
4	REL_2_NC	Closed contact of relay
5	REL_2_COM	Changeover contact of relay
6	REL_2_NO	Open contact of relays

Tabelle 8: Pin assignment STB13

STB14 - AUX relay

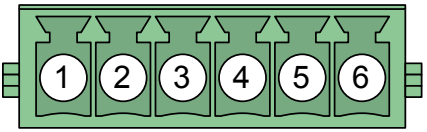


Figure 32: Würth 691305530006

Pin	Assignment	Description
1	REL_5_NC	Closed contact of relay
2	REL_5_COM	Changeover contact of relay
3	REL_5_NO	Open contact of relays
4	REL_4_NC	Closed contact of relay
5	REL_4_COM	Changeover contact of relay
6	REL_4_NO	Open contact of relays

Tabelle 9: Pin assignment STB14

STB15 - AUX relay

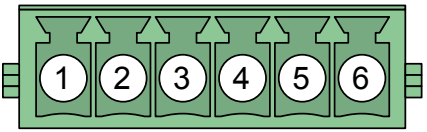


Figure 33: Würth 691305530006

Pin	Assignment	Description
1	REL_7_NC	Closed contact of relay
2	REL_7_COM	Changeover contact of relay
3	REL_7_NO	Open contact of relays
4	REL_6_NC	Closed contact of relay
5	REL_6_COM	Changeover contact of relay
6	REL_6_NO	Open contact of relays

Tabelle 10: Pin assignment STB15

STB2 - Voltage taps of the internal power supply units

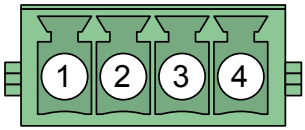


Figure 34: Würth 691305530004

Pin	Assignment	Description
1	5V	Internal 5VDC (int. Polyfuse, I_{hold} 1.1A/ I_{trip} 5.5A)
2	12V	Internal 12VDC (int. Polyfuse, I_{hold} 1.1A/ I_{trip} 5.5A)
3	U_BAT	U_BAT
4	GND	Ground reference

Tabelle 11: Pin assignment STB2

STB3 - Power measurement channels Output

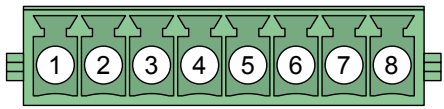
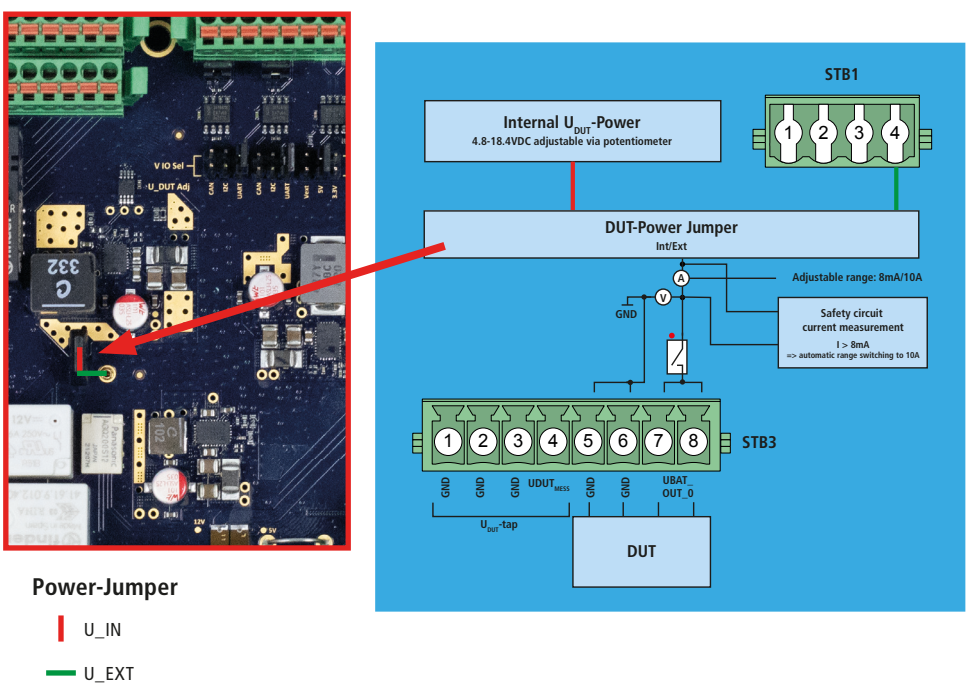


Figure 35: Würth 691305530008

Pin	Assignment	Description
1	GND	Ground reference
2	GND	Ground reference
3	GND	Ground reference
4	$UDUT_{mess}$	Tap: Real test sample voltage
5	GND	Ground reference
6	GND	Ground reference
7	UBAT_OUT	Output power measurement
8	UBAT_OUT	Output power measurement

Tabelle 12: Pin assignment STB3



STB10 - Analog input

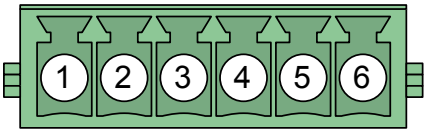


Figure 36: Würth 691305530006

Pin	Assignment	Description
1	GND	Ground reference
2	UMESS_SE_2	Analog input
3	GND	Ground reference
4	UMESS_SE_1	Analog input
5	GND	Ground reference
6	UMESS_SE_0	Analog input

*SE (Single Ended)

Tabelle 13: Pin assignment STB10

STB11 - Analog input

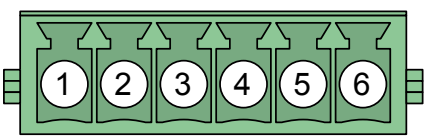


Figure 37: Würth 691305530006

Pin	Assignment	Description
1	UMESS_Diff+_2	Analog input
2	UMESS_Diff-_2	Analog input
3	UMESS_Diff+_1	Analog input
4	UMESS_Diff-_1	Analog input
5	UMESS_Diff+_0	Analog input
6	UMESS_Diff-_0	Analog input

*Diff (Differential Input)

Tabelle 14: Pin assignment STB11

STB9 - Thermocouples

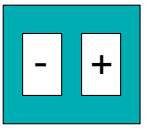
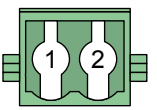


Figure 38: Therma CMJ-KIPR Green

Pin	Assignment	Description
1	-	Thermocouple connection -
2	+	Thermocouple connection +

Tabelle 15: Pin assignment STB9

STB7 - 230V/fan (potential-free switching contact)



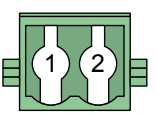
(see chapter Safety instructions)

Figure 39: Würth 691305530002

Pin	Assignment	Description
1	Fan_NO	Potential-free switching contact
2	Fan_COM	Potential-free switching contact

Tabelle 16: Pin assignment STB7

STB8 - 230V/Heizelement (potentialfreier Schaltkontakt)



(see chapter Safety instructions)

Figure 40: Würth 691305530002

Pin	Assignment	Description
1	Heating element_NO	Potential-free switching contact
2	Heating element_COM	Potential-free switching contact

Tabelle 17: Pin assignment STB8

HAT2

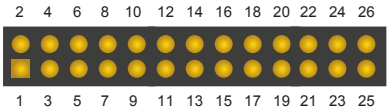


Figure 41: Stiftstecker HAT2

Pin	Assignment	Description
1	5V	int. Polyfuse, I_{hold} 1.1A/ I_{trip} 5.5A
2	12V	int. Polyfuse, I_{hold} 1.1A/ I_{trip} 5.5A
3	U-IN	Supply voltage 24VDC
4	U-IN	Supply voltage 24VDC
5	GND	Ground reference
6	GND	Ground reference
7	GND	Ground reference
8	P8_7	Beeagle Bone I/O
9	P8_8	Beeagle Bone I/O
10	P8_9	Beeagle Bone I/O
11	P8_10	Beeagle Bone I/O
12	P8_11	Beeagle Bone I/O
13	P8_12	Beeagle Bone I/O
14	P8_13	Beeagle Bone I/O
15	P8_14	Beeagle Bone I/O
16	P8_15	Beeagle Bone I/O
17	P8_16	Beeagle Bone I/O
18	P8_19	Beeagle Bone I/O
19	GND	Ground reference
20	RX_4	Beeagle Bone I/O
21	GND	Ground reference
22	TX_4	Beeagle Bone I/O
23	GND	Ground reference
24	ADQ-Link	P
25	GND	Ground reference
26	ADQ-Link	N

Tabelle 18: Pin assignment HAT2

6. Specifications

Conditions: TA = 25°C unless otherwise specified; warm-up time: 30 minutes.

General

Element	Condition	Specification
Control and signal processing	recommended	ADQ-CDI-BB for analog and digital input/output, and control via (I2C bus/Beagle Bone Black) or ADQ-Link
Supply	STB1	24 V supply via Würth plug connector, ±24 V, ±10% U_EXT (external power supply DUT 0-48V)
Voltage taps of the internal power supply units	STB2	Via Würth plug connector 5 V, 12 V, UBAT, ±10% (max. 1A per voltage)
Quiescent current consumption	ADQ-CDI-BB/no relay energized, without SCB	24 V Typee: 0,21A
Quiescent current consumption	ADQ-CDI-BB/no relay energized, without SCB	24 V Typee: 0,296A
Fuses for switchable auxiliary voltages via STB19, HAT2	+5 V	Secured by Polyfuse I_{hold} 1.1A/ I_{trip} 5.5A
	+12 V	Secured by Polyfuse I_{hold} 1.1A/ I_{trip} 5.5A
Temperature range	Operating	0..60 °C (Standard)
Air humidity	Operating	20%..55% (non-condensing)
Dimensions (W x D x H)	ADQ-CDI-BB	270 x 135 x 55 mm Top-hat rail
	ADQ-CDI-AB	160 x 75 x 30 mm Clip-on HAT
	Total height	75 mm incl. top-hat rail
Warranty		36 months

Analog IN/OUT ADQ-CDI-BB

Voltage-Channels

Element	Condition	Specification
Channels		3 single-ended analog Inputs STB10
ADC Full Scale Range (FS)	48V	48V
Resolution		LSB: 195,3125µV
Overall accuracy	0V-36V	±0,0112%FS (5,4mV)**
	0V-20,48V	±0,0060%FS (2,9mV)**
	0V-10,24V	±0,0029%FS (1,43mV)**
	0V-5,12V	±0,0026%FS (1,25mV)**
	0V-5,12V	±0,00149%FS (0,716mV)***
Input Impedance		Type: 1M

**High Speed Measurement, ***High Accuracy Mode

Channels		3 differential analoge Inputs STB11
ADC Full Scale Range (FS)	45,592V	45,592V
Resolution		LSB: 78,125nV
Overall accuracy	±20,48V	±1,346%FS (62mV)**
	±10,24V	±0,0267%FS (12,2mV)**
	±5,12V	±0,0267%FS (12,2mV)**
Input Impedance		Type: 3MΩ || 100pF

**High Speed Measurement

Current measurement channel

Channel		1 Current measurement channel STB3
ADC Full Scale Range (FS1)	8mΩ Shunt	10A
Current Measurement Input	Range 10A	0..10A
Resolution		LSB: 9,536µA
Overall accuracy	Range 10A	±0,05%FS1 (5mA)**
ADC Full Scale Range (FS2)	10Ω Shunt	8mA
Current Measurement Input	Range 8mA	0..8mA
Resolution		LSB: 7,629nA

Element	Condition	Specification
Overall accuracy	0..8mA	±0,1%FS2 (8µA)**
	0..1mA	±0,1%FS2 (8µA)**
	0..1mA	±0,02%FS2 (1,6µA)***
Overload protection current measurement	8mA Range	If I > 8mA the Hardware switch automatically to Range 10A

**High Speed Measurement, ***High Accuracy Mode

DUT-Voltage

Channel		1 STB3
ADC Full Scale Range (FS)		48V
Resolution		LSB: 195,312µV
Overall accuracy	0V-48V (without DUT)	TBD

**High Speed Measurement

Small signal relay for ADQ-CDI-BB (optional)

Element	Condition	Specification
Typee		FTR-B3CA()Z Standard
Number		Up to 4 relays optional
Contact Typee		2-pole changeover contact (DPDT)
Contact material		Silver/nickel with gold plating
Contact resistance	1 A / 6 VDC	max. 75 mΩ at 1 A/6 VDC
Switching time	Response time	max. 3 ms
	Relapse time	max. 3 ms
Switching cycles	mechanical	min. 50.000.000

Relay Typee S34 on the ADQ-CDI-BB (for AUX relay)

Element	Condition	Specification
Number/Typee		8 changeover relays (SPDT), Typee: Finder Series 34
Contact material		Silver/nickel
Switching time	Response time	max. 5 ms
	Relapse time	max. 3 ms
Switching cycles	mechanical	min. 10.000.000
Switching current DC1		max. 6 A / 30 VDC
Min. switching load	mW (V/mA)	500mW (12V/10mA) must not be undercut, with a minimum current of 21mA at 24V or a minimum voltage of 50V at 10mA
Connection		STB12..15

Relay Typee 43.11 on the ADQ-CDI-BB (for heating element/fan)

Element	Condition	Specification
Number/Type		2 changeover relays (SPDT), Typee: Finder Series 43.11
Contact material	Response time	max. 6 ms
Switching time	Relapse time	max. 3 ms
Switching cycles	mechanical	min. 10.000.000
Elektrische Lebensdauer AC/DC		min. 10.000.00
Switching current DC1	30/110/220V	10/0.3/0.12A
Switching current AC1	Max. switching capacity	2500VA
Min. switching load	mW (V/mA)	300mW (5V/5mA) must not be undershot
Connection		STB7 / STB8

Isolated digital inputs via ADQ-CDI-BB

Element	Condition	Specification
Number		1 x 8 bit digital input port via STB6
Type		Isolierte Digital-Eingänge (unidirektional) mit Schmitt-Trigger-Charakteristik gemäß IEC 61131-2 (Type 1)
Isolated digital inputs via ADQ-CDI-BB	U_IN	24 VDC for control technology
Ground reference		GND

Isolated digital outputs via ADQ-CDI-BB

Element	Condition	Specification
Number		1 x 8 bit digital output port via STB5
Type		Isolated digital outputs (unidirectional) in accordance with IEC 61131-2 (Typee 1)
Supply	U_IN	24 VDC für Steuerungstechnik
Ground reference		24 VDC for control technology

Thermocouple input ADQ-CDI-BB

Element	Condition	Specification
Ports	STB9	1 channel for thermocouple, 2 alarm outputs
Thermocouple	**Type**	K according to NIST ITS-90 with integrated
	Accuracy (ADQ-CDI-BB)	Typical 1.5°C (max. 2°C)
	Accuracy (Thermocouple)	Depending on the selected thermocouple (www.thermagmbh.de)
	Total Accuracy	Accuracy (ADQ-CDi-BB) + (Thermocouple)
	Resolution	12, 14, 16, 18bit
	Selection interval	330ms (max.)
	Filter	digital IIR bzw. EMA
	Fehlererkennung	Short circuit and open circuit (SC-OC LED display)
Alarm output	**Type**	Relay switching outputs STB7, STB8 (see relay type 43.11 table)

ADQ-Link I2C (HAT2)

Element	Condition	Specification
Frequenz		100kHz

ADQ-Link Input STB18

Element	Condition	Specification
Frequenz		100kHz
Isolation	ADQ-LINK+/-	50VDC
Cable length	2-core twisted	max. 100m

ADQ-Link Out STB19

Element	Condition	Specification
Frequenz		100kHz
Isolation	ADQ-LINK+/-	50VDC
Cable length	2-core twisted	max. 100m
Tap	+5V (Pin 3)	Secured by Polyfuse I_{hold} 1.1A/ I_{trip} 5.5A
	+12V (Pin 5)	Secured by Polyfuse I_{hold} 1.1A/ I_{trip} 5.5A

STB16

Element	Condition	Specification
VIO	BUS signal level	3.3..5V (see 2.1.3 Jumper CAN/UART/I2C)
CAN 0/1	IOs	see programming GPIOs in the Beagle Bone Black manual
	V_{IH}	HIGH-level input voltage 0,7xVIO
	V_{IL}	LOW-level input voltage 0,3xVIO
UART	IOs	see programming GPIOs in the Beagle Bone Black manual
	V_{IH}	3..3,6VIO (min. 2V)
	V_{IH}	4,5..5VIO (min. 0,7x5V)
	V_{IL}	3..3,6VIO (max. 0,8V)
	V_{IL}	4,5..5VIO (min. 0,3x5V)
I2C	IOs	see programming GPIOs in the Beagle Bone Black manual
	V_{IH}	min. 0,7xVIO
	V_{IL}	min. 0,3xVIO
	100KHZ No pull-up resistor fitted. You must provide your own pull-up resistor on your periphery. You can also use the pull-up resistors on your periphery as voltage shifting. Attention: When calculating the pull-up resistors, the total power must not exceed 200mW. If necessary, use an I2C buffer.	

7. Appendix

7.1 Manufacturer and support

ALLNET® is a registered trademark of ALLNET® GmbH Computersysteme. If you have any questions, problems or require product information of any kind, please contact the manufacturer directly:

ALLNET® GmbH Computersysteme
Division ALLDAQ
Maistrasse 2
D-82110 Germering
E-Mail: support@alldaq.com
Phone: +49 (0)89 894 222 – 474
Fax: +49 (0)89 894 222 – 33
Internet: www.alldaq.com

7.2 Important notes

7.2.1 Packaging Ordinance

"In principle, manufacturers and distributors are obliged to ensure that sales packaging is taken back by the end consumer after use and reused or recycled." (according to § 4 sentence 1 of the Packaging Ordinance). If you as a customer have any problems with the disposal of packaging and shipping materials, please send an e-mail to info@allnet.de

7.2.2 Recycling notice and RoHS conformity

Please note that parts of ALLNET® GmbH products should be disposed of at recycling centers or may not be disposed of with household waste (circuit boards, power supply unit, etc.).

ALLNET® products are manufactured in compliance with RoHS (Restriction of the use of certain hazardous substances).

7.2.3 CE marking

The ADQ-CDI-BB bears the CE marking.

This device complies with the requirements of EU Directive 2004/108/EC, Electromagnetic Compatibility Directive and the mutual recognition of their conformity. Conformity with the above directive is confirmed by the CE mark on the device.

7.2.4 Warranty

Within the warranty period, we will rectify manufacturing and material defects free of charge. You can find the warranty conditions valid for your country on the homepage of your distributor. If you have any questions or problems with the application, you can reach us during our normal opening hours on the following telephone number +49 (0)89 894 222 - 474 or by e-mail to:

support@alldaq.com.

ALLDAQ
Competence in Measurement

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Fax: +49 (0)89 894 222 – 33
Internet: www.alldaq.com