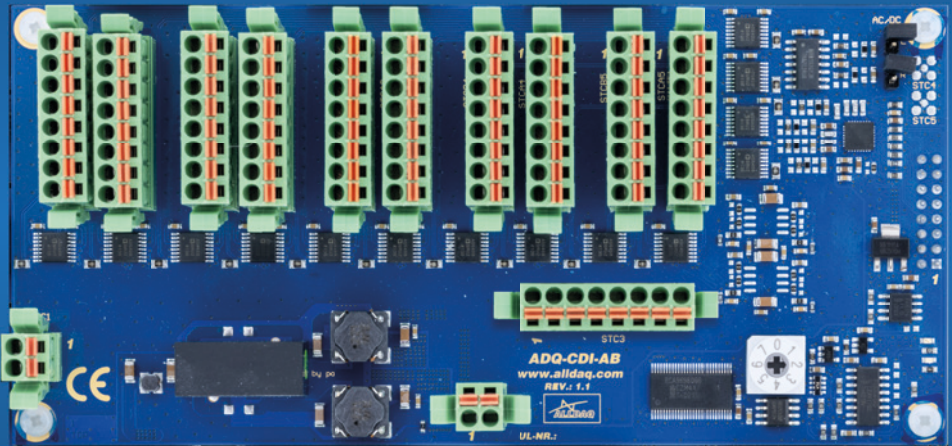




ADQ-HATs

Rev. 1.1 EN



ALLDAQ control and measuring unit

Imprint

Manual ADQ-HATs
Rev. 1.1 EN
Date: 13.10.2023

Manufacturer and support

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All information contained in this manual has been compiled with the greatest 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 the notification of any errors.

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1. Introduction

Please check the packaging and contents for damage and completeness before commissioning. Should any defects occur, please inform us immediately.

- Does anything about the packaging indicate that something was damaged in transit?
- Are there any signs of use on the device?

You should not operate the device under any circumstances if it is damaged. If in doubt, contact our technical customer service.

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

1.1 Scope of delivery

- ALLDAQ HATs

1.2 Safety instructions



Be sure to observe the following instructions:

- **The ADQ-HATs may only be operated in conjunction with the ADQ-CDI-BB**
- Avoid touching cables and connectors
- Never expose the device to direct sunlight during operation.
- Never operate the device near heat sources.
- Protect the device from moisture, dust, liquids and vapors.
- Do not use the device in damp rooms and under no circumstances in areas subject to explosion hazards.
- Repairs may only be carried out by trained, authorized personnel.



- When commissioning the device, please observe the installation regulations and all relevant standards (incl. VDE standards), especially when operating with voltages greater than 42 V.
- We recommend to always connect unused inputs to the corresponding reference ground to avoid crosstalk between the input channels.



- Ensure that no static discharge can take place 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.
- Precautions to avoid unforeseeable misuse must be taken by the user.

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

1.3 Installation and mounting location

The module is intended for installation in measuring and test systems by qualified personnel. Relevant installation regulations and standards must be observed.

The module may only be used in dry rooms. Ensure sufficient heat dissipation. Ensure that the connection cables are securely seated. Installation must be carried out in such a way that the cables are not under tension, otherwise they may come loose.

1.4 Plug-on boards (HATs)

The ADQ-CDI-BB offers several possibilities for expansion. Among other things, slots for expansion boards (HATs) are available directly on the board. (for more info see ADQ-CDI-BB manual)

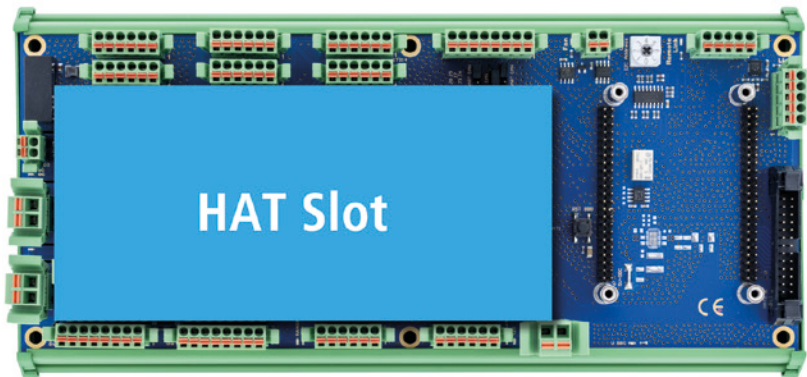


Figure 1: Position extension boards (HATs)

1.4.1 HAT1/HAT3

The ADQ-CDI-BB offers a slot for the HAT1/HAT3. In addition to the power supply voltages, 5VDC as well as 12VDC, depending on the HAT type further signals like e.g. I2C, I2S ... are available. (for further information see manual ADQ-CDI-BB)

1.4.2 HAT2

There is a connector for a simple HAT. The input voltage (U_{IN}), 5VDC as well as 12VDC and the system bus I2C are available at the connector provided for this purpose.

2. Short description ADQ-CDI-AB-HAT

The ADQ-CDI-AB-HAT (AB-Audio Board) extends the function or measuring tasks of the ADQ-CDI-BB. With this plug-on board (HAT) and a SBC (Single Board Computer) on the ADQ-CDI-BB, the analog inputs and outputs can be switched or measured via the I2S.

Features:

- 40 analog differential voltage inputs $\pm 10\text{VDC}$ peak
- 4 analog single ended outputs 0,6VDC peak
- 4 analog single ended inputs 10VDC peak (upon request)
- AUDIO-CODEC with I2S interface
- Pluggable on the ADQ-CDI-BB
- Controllable via the ADQ-CDI-BB (I2C)
- 100% control only with SBC (I2C, I2S)
- Power supply via ADQ-CDI-BB

2.1 Overview of the ADQ-CDI-AB-HAT system

2.2 Analog/digital inputs and outputs

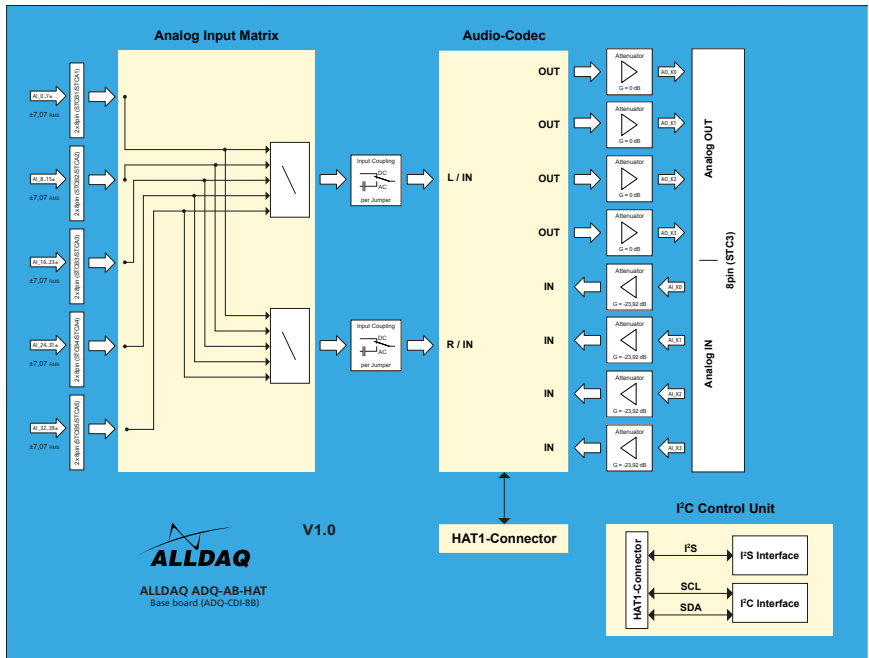


Figure 2: Block diagram digital inputs and outputs

2.3 Analog inputs/outputs

There are 40 analog differential voltage inputs available, as well as 4 analog single-ended inputs/outputs. For more technical information about the inputs and outputs, please refer to the specifications.

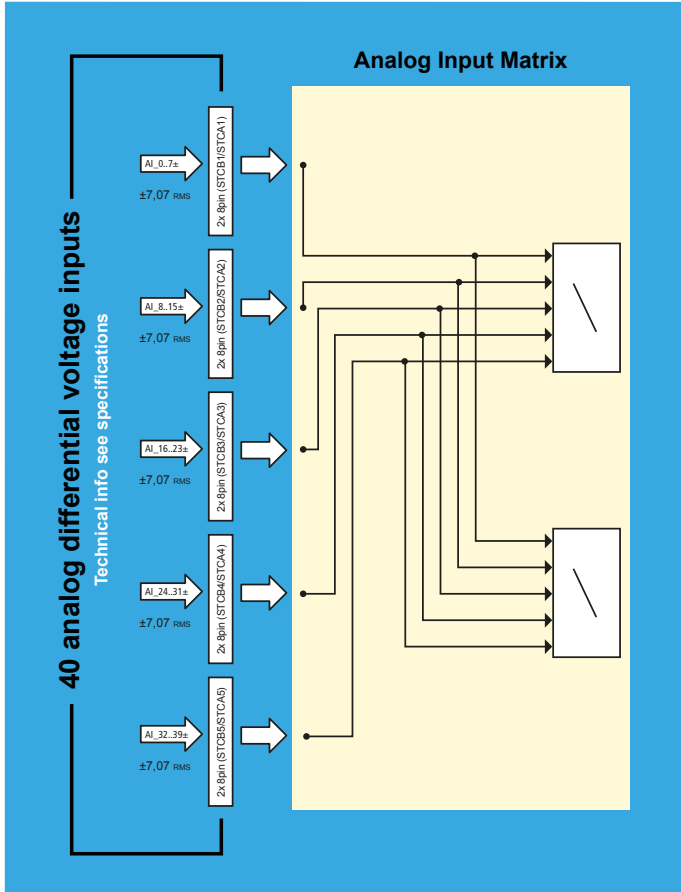


Figure 3: Block diagram 40 analog differential inputs

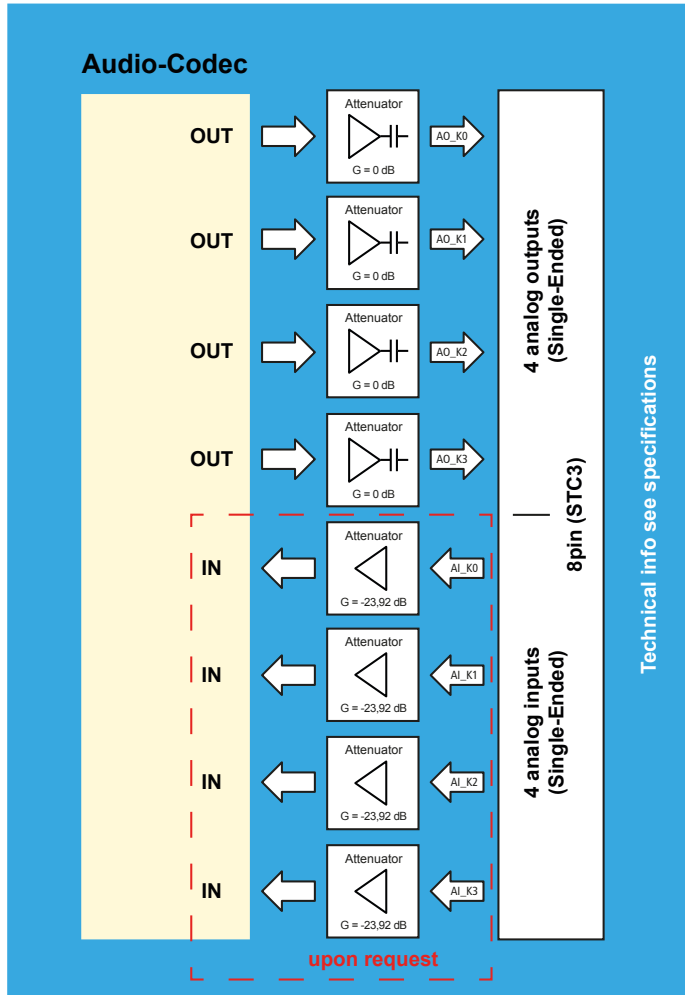


Figure 4: Block diagram 4 analog inputs/outputs

2.4 Voltage supply

The complete module is supplied via the ADQ-CDI-BB. (5VDC, 12VDC)

3. Control

For full control of the ADQ-CDI-AB-HAT, the single board computer is always used (default).

In addition, the HAT can be controlled via the ADQ-CDI-BB using the STB18 ADQ-Link connector (service mode) and the I2C board control center (ALLDAQ driver). In this case, the full range of functions of the ADQ-CDI-AB-HAT is not available.

3.1 Rotary switch

Use the rotary switch to determine the main address of the ADQ-CDI-AB-HAT 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*

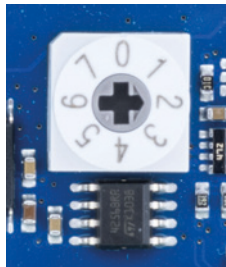


Figure 5: Rotary switch

4. Pin assignments

4.1 Position of the connectors/jumpers

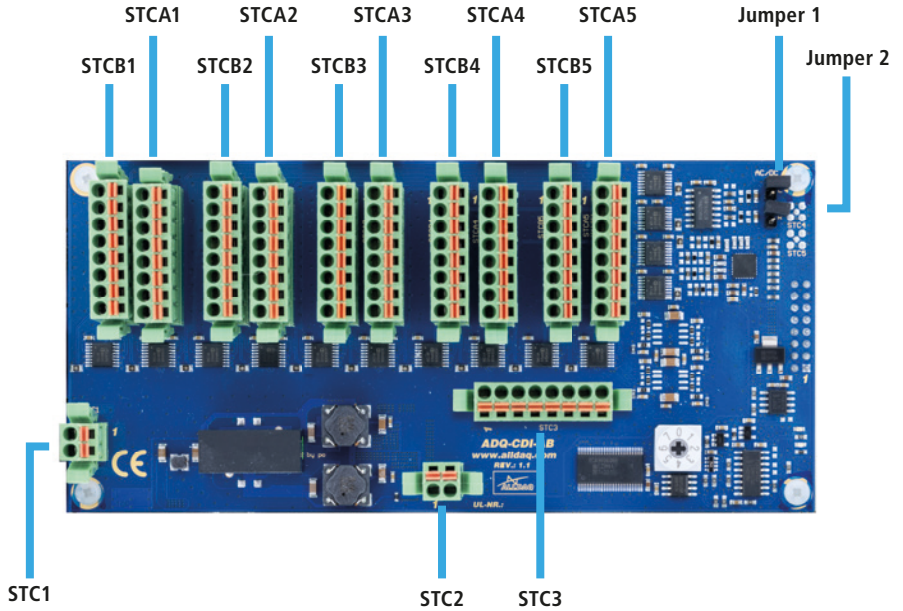


Figure 6: ADQ-CDI-AB-HAT with connector position

4.2 Connector types at a glance

4.2.1 Type Würth

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

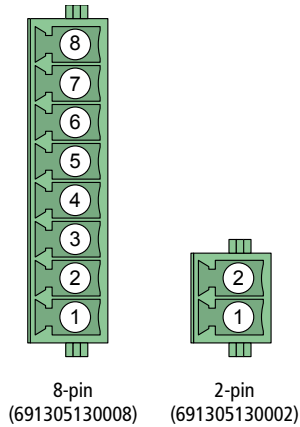


Figure 7: Würth base strip type WR-TBL 3051 (top view)

4.2.2 Type pin connector

4.2.3 For the connection between the baseboard (ADQ-CDI-BB) and the HAT plug-on modules (ADQ-CDI-Ab-HAT), a 16-pin socket connector is used (pitch: 2.54 mm).

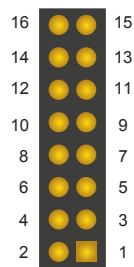


Figure 8: Socket connector, 2.54mm (top view)

4.3 Pin assignment

STC1/STC2

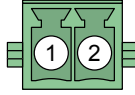


Figure 9: Würth 691305130002

Pin	Assignment	Description
1	AGND	Analoger GND
2	AGND	Analoger GND

Tabelle 1: Pin assignment STC1/STC2

STCA1 INPUT K0 - K7

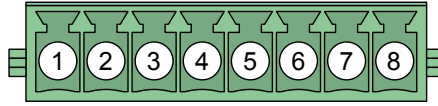


Figure 10: Würth 691305130008

Pin	Designation	Description
1	+K7	pos. diff. Input
2	+K6	pos. diff. Input
3	+K5	pos. diff. Input
4	+K4	pos. diff. Input
5	+K3	pos. diff. Input
6	+K2	pos. diff. Input
7	+K1	pos. diff. Input
8	+K0	pos. diff. Input

Tabelle 2: Pin assignment STCA1

STCB1 INPUT K0 - K7

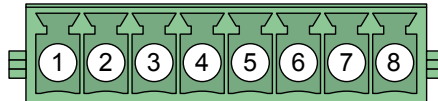


Figure 11: Würth 691305130008

Pin	Designation	Description
1	-K7	neg. diff. Input
2	-K6	neg. diff. Input
3	-K5	neg. diff. Input
4	-K4	neg. diff. Input
5	-K3	neg. diff. Input
6	-K2	neg. diff. Input
7	-K1	neg. diff. Input
8	-K0	neg. diff. Input

Tabelle 3: Pin assignment STCB1STCA1 INPUT K0 - K7

STCA2 INPUT K8 - K15

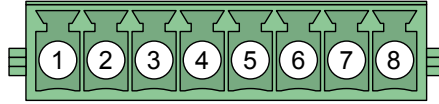


Figure 12: Würth 691305130008

Pin	Designation	Description
1	+K15	pos. diff. Input
2	+K14	pos. diff. Input
3	+K13	pos. diff. Input
4	+K12	pos. diff. Input
5	+K11	pos. diff. Input
6	+K10	pos. diff. Input
7	+K9	pos. diff. Input
8	+K8	pos. diff. Input

Tabelle 4: Pin assignment STCA2

STCB2 INPUT K8 - K15

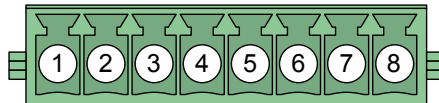


Figure 13: Würth 691305130008

Pin	Designation	Description
1	-K15	neg. diff. Input
2	-K14	neg. diff. Input
3	-K13	neg. diff. Input
4	-K12	neg. diff. Input
5	-K11	neg. diff. Input
6	-K10	neg. diff. Input
7	-K9	neg. diff. Input
8	-K8	neg. diff. Input

Tabelle 5: Pin assignment STCB2

STCA3 INPUT K16 - K23

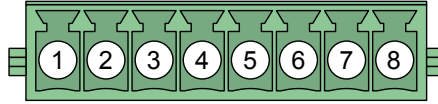


Figure 14: Würth 691305130008

Pin	Designation	Description
1	+K23	pos. diff. Input
2	+K22	pos. diff. Input
3	+K21	pos. diff. Input
4	+K20	pos. diff. Input
5	+K19	pos. diff. Input
6	+K18	pos. diff. Input
7	+K17	pos. diff. Input
8	+K16	pos. diff. Input

Tabelle 6: Pin assignment STCA3

STCB3 INPUT K16 - K23

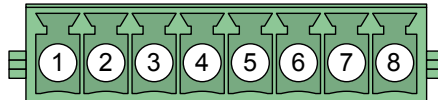


Figure 15: Würth 691305130008

Pin	Designation	Description
1	-K23	neg. diff. Input
2	-K22	neg. diff. Input
3	-K21	neg. diff. Input
4	-K20	neg. diff. Input
5	-K19	neg. diff. Input
6	-K18	neg. diff. Input
7	-K17	neg. diff. Input
8	-K16	neg. diff. Input

Tabelle 7: Pin assignment STCB3

STCA4 INPUT K24 - K31

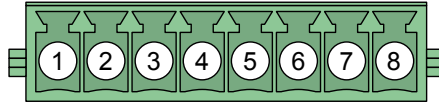


Figure 16: Würth 691305130008

Pin	Designation	Description
1	+K31	pos. diff. Input
2	+K30	pos. diff. Input
3	+K29	pos. diff. Input
4	+K28	pos. diff. Input
5	+K27	pos. diff. Input
6	+K26	pos. diff. Input
7	+K25	pos. diff. Input
8	+K24	pos. diff. Input

Tabelle 8: Pin assignment STCA4

STCB4 INPUT K24 - K31

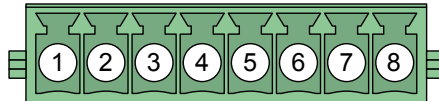


Figure 17: Würth 691305130008

Pin	Designation	Description
1	-K31	neg. diff. Input
2	-K30	neg. diff. Input
3	-K29	neg. diff. Input
4	-K28	neg. diff. Input
5	-K27	neg. diff. Input
6	-K26	neg. diff. Input
7	-K25	neg. diff. Input
8	-K24	neg. diff. Input

Tabelle 9: Pin assignment STCB4

STCA5 INPUT K32 - K39

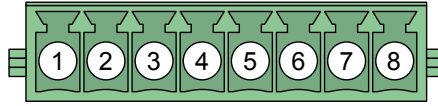


Figure 18: Würth 691305130008

Pin	Designation	Description
1	+K39	pos. diff. Input
2	+K38	pos. diff. Input
3	+K37	pos. diff. Input
4	+K36	pos. diff. Input
5	+K35	pos. diff. Input
6	+K34	pos. diff. Input
7	+K33	pos. diff. Input
8	+K32	pos. diff. Input

Tabelle 10: Pin assignment STCA5

STCB5 INPUT K32 - K39

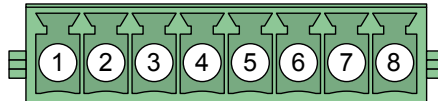


Figure 19: Würth 691305130008

Pin	Designation	Description
1	-K39	neg. diff. Input
2	-K38	neg. diff. Input
3	-K37	neg. diff. Input
4	-K36	neg. diff. Input
5	-K35	neg. diff. Input
6	-K34	neg. diff. Input
7	-K33	neg. diff. Input
8	-K32	neg. diff. Input

Tabelle 11: Pin assignment STCB5

STC3 analog INPUT/OUTPUT

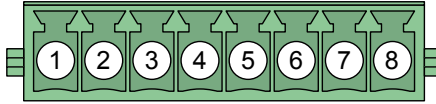


Figure 20: Würth 691305130008

Pin	Designation	Description
1	IN2_L	analog INPUT (Single-Ended)
2	IN2_R	analog INPUT (Single-Ended)
3	IN3_L	analog INPUT (Single-Ended)
4	IN3_R	analog INPUT (Single-Ended)
5	LOL	analog OUTPUT (Single-Ended)
6	LOR	analog OUTPUT (Single-Ended)
7	HPL	analog OUTPUT (Single-Ended)
8	HPR	analog OUTPUT (Single-Ended)

Tabelle 12: Pin assignment STC3

5. Specifications ADQ-CDI-AB-HAT

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

General

Element	Condition	Specification
Control and signal processing	recommended	ADQ-CDI-AB-HAT for analog input/output, and control via I2C and I2S bus/Beagle Bone Black
Supply		Supply via ADQ-CDI-BB
Temperature range	operation	0..60 °C (standard)
Humidity	operation	20%..55% (non-condensing)
Dimensions (W x D x H)	ADQ-CDI-AB	160 x 75 x 30 mm Attachment HAT
Manufacturer warranty		36 months

Diff. analog inputs ADQ-CDI-AB-HAT

Element	Condition	Specification
Channels		40 AC differential inputs 10V peak
Bandwidth	CODEC	50 Hz to 20 KHz (see TLV320AIC3204 data sheet)
Sampling rate	CODEC	48 KHz/96 KHz/192 KHz (see TLV320AIC3204 data sheet)
Resolution	CODEC	16 bit (see TLV320AIC3204 data sheet)
Overall accuracy	$\pm 10V$	0,1%FS
Input impedance		50K
Input impedance	1kHz Sinus	$2K_1$
Input capacity		$68nF_1$

(1) Reactance XC (frequency dependent)

Single-ended analog inputs ADQ-CDI-AB-HAT (upon request)

Element	Condition	Specification
Channels		4 single-ended analog inputs (10V peak)
Bandwidth	CODEC	50 Hz to 20 KHz (see TLV320AIC3204 data sheet)
Sampling rate	CODEC	48 KHz/96 KHz/192 KHz (see TLV320AIC3204 data sheet)
Resolution	CODEC	16 bit (see TLV320AIC3204 data sheet)
Overall accuracy		TBD
Input impedance		10K Ω 0,47 μ F

Single-ended analog outputs ADQ-CDI-AB-HAT

Element	Condition	Specification
Channels		4 single-ended analog outputs (0,6V _{peak} output range)
Bandwidth	CODEC	50 Hz to 20 KHz (see TLV320AIC3204 data sheet)
Output rate	CODEC	48 KHz/96 KHz/192 KHz (see TLV320AIC3204 data sheet)
Resolution	CODEC	16 Bit
Overall accuracy		
LOL/LOR	0V-0,5V	0,1%FS
HPL/HPR	0V-0,5V	TBD %FS
Max. output current per channel	Bis 85 °C	25 mA Short-circuit current 55 mA
Output impedance	1kHz Sinus	0,47 μ F ₁ (XC=338 Ω) (see block diagram on page 12)

(1) Reactance XC (frequency dependent)

6. Appendix

6.1 Manufacturer and support

ALLNET® is a registered trademark of ALLNET® GmbH Computersysteme. In case of questions, problems and for product information of any kind, please contact the manufacturer directly:

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6.2 Important notes

6.2.1 Packaging Ordinance

"In principle, manufacturers as well as distributors are obliged to ensure that sales packaging is, in principle, 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 problems with the disposal of packaging and shipping materials, please write an e-mail to info@allnet.de.

6.2.2 Recycling notice and RoHS compliance



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



ALLNET® products are manufactured RoHS compliant (RoHS = Restriction of the use of certain hazardous substances).

6.2.3 CE marking

The ADQ-CDI-BB bears the CE marking.



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

6.2.4 Warranty

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



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