



Manual

Beta Rev. 1.0 EN



ADQ-51

USB-Box with 8 isolated digital inputs
and 8 isolated digital outputs

Imprint

Manual ADQ-51
Rev. 1.0
Datum: 28.04.2021

Manufacturer and support

ALLNET® and ALLDAQ® are registered trademarks of ALLNET® GmbH Computersysteme.
For questions, problems and product information please contact the manufacturer directly:

ALLNET® GmbH Computersysteme

Division ALLDAQ
Maistrasse 2
D-82110 Germering

Support

E-Mail: support@alldaq.com
Phone: +49 (0)89 894 222 – 74
Fax: +49 (0)89 894 222 – 33
Internet: www.alldaq.com/support

© Copyright 2020 ALLNET GmbH Computersysteme. All rights reserved.

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 notification of any errors.

Mentioned trademarks are registered trademarks of the respective companies.

Content

1. Introduction	5
1.1 Scope of delivery	5
1.2 Safety instructions	6
1.3 Installation and assembly site	7
1.4 Brief description	7
1.5 System requirements	8
1.5.1 Hardware	8
1.5.2 Software	8
2. Start of operation	9
2.1 Connecting the box	9
2.2 Software installation	10
2.2.1 Installation on Windows	10
2.2.2 Installation on Linux	10
2.3 Testing program	10
3. Function groups	11
3.1 Block diagram	11
3.2 LED display status	11
3.3 Isolated digital inputs	12
3.3.1 Digital input filter	12
3.3.2 Wiring	12
3.3.3 Programming	13
3.3.3.1 Read in single value	13
3.4 Isolated digital outputs	14
3.4.1 Wiring	14
3.4.2 Programming	16
3.4.2.1 Single value output	16
3.4.2.2 Overloading the outputs	16

4. Annex	17
4.1 Specifications	17
4.2 Pin assignments	20
4.2.1 ADQ-51	20
4.2.1.1 18-pin type Phoenix contact	20
4.3 Manufacturer and support	21
4.4 Important notes	21
4.4.1 Packaging ordinance	21
4.4.2 Recycling advice and RoHS conformity	21
4.4.3 CE identification	21
4.4.4 Warranty	22

1. Introduction

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

- Does anything on the packaging indicate that something has been damaged during transport?
- Can traces of use be seen on the device?

Under no circumstances may you put the device into operation if it is damaged. In case of doubt, please contact our technical customer service.

Please read this manual carefully before installing the device!

1.1 Scope of delivery

- ALLDAQ ADQ-51
- 18-pin connection plug Phoenix DFMC 1.5/9-ST-3.5-LR (1790551)
- USB-Cable

1.2 Safety instructions



Be sure to observe the following instructions:

- Make sure that the box is very well ventilated, as the output drivers can become up to 100 °C hot at full load.
- Avoid touching cables and connectors etc. inside the PC with the card.
- Never expose the device to direct sunlight during operation.
- Never operate the device near heat sources.
- Protect the device from moisture, dust, liquids and vapours.
- Do not use the device in damp rooms and under no circumstances in potentially explosive areas.
- Repairs may only be carried out by trained, authorised personnel.



- When commissioning the instrument, please observe the installation regulations and all relevant standards (including VDE standards), especially when operating with voltages higher than 42 V.
- We recommend to always connect unused inputs to the corresponding reference ground to avoid crosstalk between the input channels.
- Always disconnect your field wiring from the voltage source before you make or break cable connections to the card.



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

ALLNET® GmbH Computersysteme is not liable for improper use and resulting damage.

1.3 Installation and assembly site

The ADQ-51 is a digital I/O box designed for industrial use.

The box may only be used in dry rooms. Ensure adequate ventilation and that the connecting cables are securely seated.

1.4 Brief description

The ADQ-51 digital I/O box is suitable for use in industrial automation and control technology. The galvanic isolation of 500 VACeff. between the field wiring and the PC effectively suppresses interference. To protect against contact bounce, this box also offers the option of programming a digital filter for each input port.

The ADQ-51 has 8 bit isolated digital inputs. These isolated inputs have a Schmitt trigger characteristic according to IEC 61131-2 (Type 1) and are designed for a max. input voltage of 35 V. The digital inputs are equipped with a digital filter.

The ADQ-51 also has 8 bit isolated digital outputs. Each output can drive up to 0.6A. To increase the output current a parallel connection of several outputs is possible, so that for many applications no external driver stage is necessary. To supply the outputs, an external voltage source in the 16..35 V range with sufficient power must be provided. The output drivers are equipped with thermal overload protection, current limitation, short-circuit protection and undervoltage monitoring.

1.5 System requirements

1.5.1 Hardware

- PC system with a current Intel® or compatible processor based on x86(-64) architecture
- A free USB-slot (ADQ-51)

1.5.2 Software

On the ALLDAQ homepage you will find drivers for Windows Vista SP2 and higher (32 and 64 bit) as well as a function library (API) with code examples for high-level language programming. Please note the notes in the corresponding help file adqSDK.chm.

Details about programming can also be found in the help file adqDriver.chm, which you can access via the „ALLDAQ-Manager“ in the info area of the taskbar (usually bottom right) or the Windows start menu.

2. Start of operation

2.1 Connecting the box

Please read the manual of your computer regarding the installation of additional hardware components before installing the box.



The box should be handled with care to ensure that the device is not damaged by electrostatic discharge (ESD), mechanical stress or unauthorized surges. In addition, precautions must be taken to avoid electric shock. Follow standard ESD protection measures.



Fig. 1: Side views of the ADQ-51

2.2 Software installation

2.2.1 Installation on Windows

The following basic procedure applies:

Download the latest driver for your system from alldaq.com/downloads. The installation is started with a double click.

After successful installation you will find the „ALLDAQ-Manager“ in the info area of the taskbar (usually at the bottom right) or in the Windows start menu. The ALLDAQ Manager gives you access to the Software Developer Kit (SDK), various utility programs and help files.

2.2.2 Installation on Linux

Please ask us about the availability!

2.3 Testing program

Simple test programs can be found in the ALLDAQ SDK. There is a subfolder „Applications“ with test programs for your ALLDAQ hardware for the respective programming language.

You can use the ALLDAQ Manager to query various information about the installed ALLDAQ hardware.

3. Function groups

3.1 Block diagram

Block diagram ADQ-51

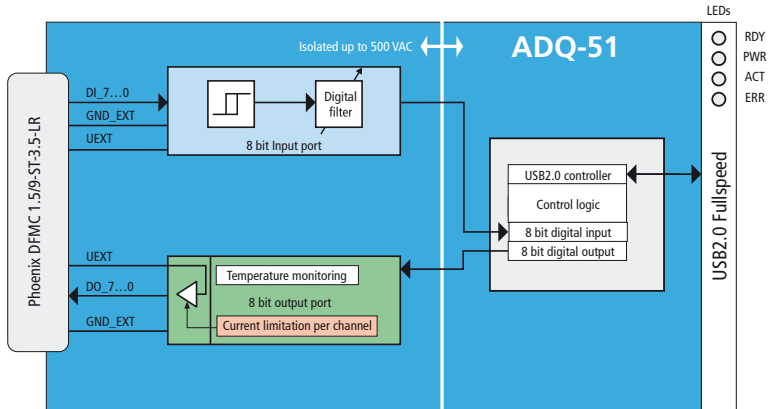


Fig. 2: Block diagram ADQ-51

- 8 isolated digital inputs (1 x 8 bit ports)
- 8 isolated digital outputs (1 x 8 bit ports)

3.2 LED display status

LED	Meaning
RDY	ON = USB-Port active
PWR	USB 5V
ACT	Blinking = Active Data Transfer
ERR	ON = UEXT not connected / OFF = UEXT OK

3.3 Isolated digital inputs

The ADQ-51 has 1 isolated digital input port with 8 bits. The isolated inputs have a Schmitt trigger characteristic according to IEC 61131-2 (Type 1) and are designed for a maximum input voltage of 35 V. The ADQ-51 has 1 isolated digital input port with 8 bits. All isolated inputs are equipped with status LEDs (not visible in the housing). The insulation voltage against PC ground is 500 VACeff according to EN60664-1 or UL1577.

3.3.1 Digital input filter

You can program a digital filter for each input port to prevent unwanted contact bounce effects. Choose between the following values:

10 ms ($N = 1248$) / 3.2 ms ($N = 400$) / 1.0 ms ($N = 125$) / 10 μ s (Bypass). The scan frequency is 100 kHz (typ.).

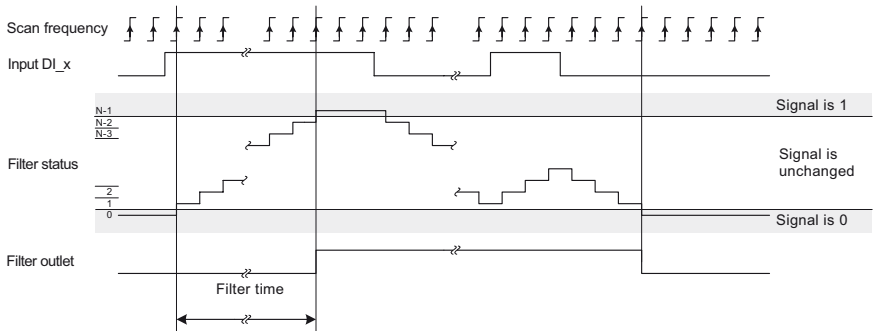


Fig. 3: Digital input filter

3.3.2 Wiring

The isolated inputs have a Schmitt trigger characteristic in accordance with IEC 61131-2 (type 1) and are designed for the UIH input high level of typ. 24 V, which is common in control technology. Observe the following conditions:

- Threshold voltage L \rightarrow H: > 15 V @ $U_{EXT} = 24$ V
- Threshold voltage H \rightarrow L: < 11 V @ $U_{EXT} = 24$ V
- Hysteresis: typ. 1 V

The external supply U_{EXT} can be in the range 16..35 V, while we recommend 24 V. Please note that a ground connection must always be established from the external circuit to the reference ground of the isolated digital inputs (GND). The digital input part and the digital output part use a common GND.

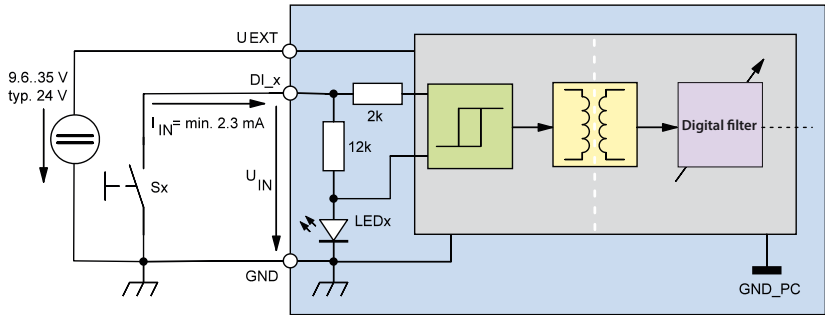


Fig. 4: Wiring of the isolated digital inputs

3.3.3 Programming

All input ports (DI_x) can be programmed independently of each other. The port direction is determined by the hardware.

One digital filter can be programmed per port: 10 ms / 3.2 ms / 1 ms / 10 μs (bypass).

3.3.3.1 Read in single value

In this operating mode you can read a digital value in the respective port width.

The procedure is described in the online help.

3.4 Isolated digital outputs

The ADQ-51 has an isolated digital output port with 8 bits. The high-path outputs are equipped with a power FET that switches up to 0.6 A per channel. The isolation voltage against PC ground is 500 VACeff.

3.4.1 Wiring

The outputs of the ADQ-51 are designed for a high level of 24 V ($U_{OH} = 16..35$ V) for industrial applications. The max. output current I_O is 0.6 A per channel. To increase the total output current, any number of outputs can be connected in parallel. A ground reference to the external output circuitry must be established via GND. The digital input and output parts use a common GND.

The output stage offers a comprehensive overload protection, such as::

- Short-circuit-proof outputs (current limitation per channel)
- Switch-off at current peaks of typ. 1.4 A, e.g. with inductive loads
- Overvoltage protection for $U_{EXT} > 47$ V
- Undervoltage switch-off: $U_{EXT} = \text{min. } 7 \text{ V}/\text{max. } 10.5 \text{ V}$, restart at max. 11 V, hysteresis: typ. 0.5 V
- Thermal overload protection with automatic restart. In case of overload ($TTSD = \text{typ. } 135^\circ\text{C}$), the respective channel switches off and switches on again automatically as soon as the junction temperature has dropped by 10°K .



To supply the output stage, an external voltage source must be connected to the UEXT pins, which can provide sufficient power. At full load, this is up to 5.6 A for the ADQ-51.

Attention: The Phoenix DFMC 1.5/9-ST-3.5-LR (1790551) connector may heat up!

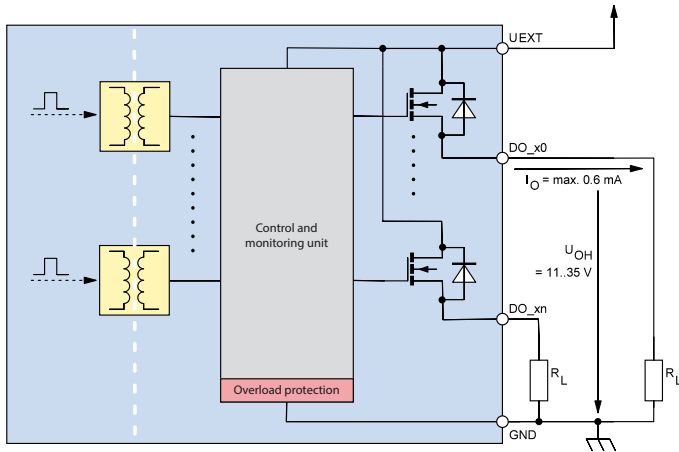


Fig. 5: Wiring of the isolated digital outputs

3.4.2 Programming

The output ports (DO_x) can be programmed independently. The port direction is determined by the hardware.

3.4.2.1 Single value output

In this operating mode you can output one digital value each in the respective port width. Note: An output port can also be read back! Please observe the procedure as described in the online help.

3.4.2.2 Overloading the outputs

If the output stage is overloaded, the respective port is automatically switched off. Follow the procedure as described in the online help.

4. Annex

4.1 Specifications

Isolated Digital inputs

Conditions: UEXT_DI = 24 V \pm 5%, T_A = 25°C

Element	Condition	Specifications
Quantity	ADQ-51	1 x 8 bit digital input port
Type		Isolated digital inputs (unidirectional) with Schmitt trigger characteristic according to IEC 61131-2 (type 1/3)
Isolation voltage		500 VAC according to EN60664-1 or UL1577
Overload protection	with too low Uext. supply	Shutdown min. 8.0V; Startup max. 9.6V; Hysteresis typ. 1 V
	with the Uext. missing	Switch-on threshold min. 12.1 V; switch-off threshold max. 13.9 V
Input level	UEXT = 24 V	L \rightarrow H: > 15 V; H \rightarrow L: < 11 V; Hysteresis: typ. 1 V
Input current	UEXT = 24 V	Min. 2.3 mA per channel
Input filter (programmable per port)	Filter off (bypass)	typ. 10 μ s (N = 1)
	Filter time 1	typ. 1 ms (N = 125)
	Filter time 2	typ. 3.2 ms (N = 400)
	Filter time 3	typ. 10 ms (N = 1248)
Scanning frequency	For filters	typ. 100 kHz
Operating parameters		Simple input
External supply	UEXT	16..35VDC, typ. 24VDC for control technology
Ground reference		GND (isolated from PC ground GND_PC)

Isolated digital outputs

Conditions: UEXT = 16...30VDC, T_A = -25...+125°C

Element	Condition	Specifications
Quantity	ADQ-51	1 x 8 bit digital output port
Type		Isolated digital outputs (unidirectional)
Isolation voltage		500VAC according to UL508 & EN 61131-2
Output level	U _{OH}	11..35V
Output current	U _O = typ. 24VDC	I _O max. 0.6A per channel (parallel connection possible)
DC short-circuit current	UEXT = 24VDC R _L = 10mΩ	min. 0.7A; max. 1.7A
Undervoltage cut-off	UEXT	min. 7V/max. 10.5V, Restart at max. 11V, Hysteresis: typ. 0.5V
Overvoltage protection	UEXT	min. 47VDC
Dissipated energy with inductive load	Per channel	max. 1 Joule
Resistance at active output	I _O = 0.5A; T _A = 25°C	typ. 150mΩ, max. 200mΩ
Leakage current with inactive channel		typ. 5μA, max. 30μA
Cut-off current for inductive loads		typ. 1.4A
t _{on} (switch-on time)	R _L = 47Ω, up to 90% U _O	typ. 64μs; max. 120μs
t _{off} (switch-off time)	R _L = 47Ω, up to 10% U _O	typ. 89μs; max. 170μs
dU _O /dt _(on) (Slope when switching on)	from 10..30% U _O , R _L = 47Ω, UEXT = 15V	typ. 1V/μs; max. 2V/μs
dU _O /dt _(off) (Slope when switching off)	from 70..40% U _O , R _L = 47Ω, UEXT = 15V	typ. 1V/μs; max. 2V/μs
Switch-off temperature		min. 135°C
Thermal hysteresis		10°K
Operating parameters		Simple output
External supply	UEXT	16..35VDC; typ. 24VDC for control technology
Ground reference		GND (isolated from PC ground GND_PC)

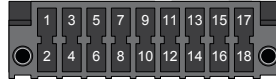
General

Element	Condition	Specifications
PC interface	USB2.0	2.0 Fullspeed (downward compatible 1.1, 1.0)
Power consumption	USB2.0	max. 50 mA
Status LEDs		Power, USB Ready, Act, Error
Operating temperature	Operation	0..70 °C
	Storage	-40..100 °C
Humidity	Operation	20%..55% (non-condensing)
	Storage	5%..90% (non-condensing)
Dimensions (without plug)	USB2.0	90x63x33mm (LxWxH)
Connections	USB2.0	Higher engagement force
Certifications		EC Directive 2004/108/EC, Emission EN 55022, Interference immunity EN 50082-2, RoHS
Manufacturer warranty		36 months

4.2 Pin assignments

4.2.1 ADQ-51

4.2.1.1 Type Phoenix contact



18-pin
(1790551)

Fig. 6: ADQ-51 ADQ-51 pin assignment 18-pin Phoenix contact

Pin	Designation	Note
1	GND	GND (isolated from PC ground GND_PC)
2	UEXT	16..35 VDC, typ. 24 VDC for control technology
3	DO_6	Digital output
4	DO_7	Digital output
5	DO_4	Digital output
6	DO_5	Digital output
7	DO_2	Digital output
8	DO_3	Digital output
9	DO_0	Digital output
10	DO_1	Digital output
11	DI_0	Digital input
12	DI_1	Digital input
13	DI_2	Digital input
14	DI_3	Digital input
15	DI_4	Digital input
16	DI_5	Digital input
17	DI_6	Digital input
18	DI_7	Digital input

4.3 Manufacturer and support

ALLNET® is a registered trademark of ALLNET® GmbH Computersysteme. For questions, problems and for 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 74

Fax: +49 (0)89 894 222 33

Internet: www.alldaq.com

4.4 Important notes

4.4.1 Packaging ordinance

„Both manufacturers and distributors are basically obliged to ensure that sales packaging is taken back from the final consumer after use and is reused or recycled. (according to § 4 sentence 1 of the Packaging ordinance). If you as a customer have problems disposing of the packaging and shipping materials, please write an e-mail to info@allnet.de.

4.4.2 Recycling advice and RoHS conformity



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



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

4.4.3 CE identification

The ADQ-51 bears the CE marking.



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

4.4.4 Warranty

Within the warranty period, we will eliminate manufacturing and material defects free of charge. You will find the warranty conditions valid for your country on the homepage of your distributor. If you have any questions or problems concerning the application, you can reach us during our normal opening hours at the following telephone number +49 (0)89 894 222 - 74 or by e-mail: support@alldaq.com.



ALLNET® GmbH Computersysteme

Division ALLDAQ

Maistrasse 2

D-82110 Germering

E-Mail: support@alldaq.com

Phone: +49 (0)89 894 222 74

Fax: +49 (0)89 894 222 33

Internet: www.alldaq.com

