Preliminary

ADQ3 USB 3.2 Datasheet

The ADQ3-series digitizers is available in a stand-alone USB 3.2 box. The ADQ3 USB 3.2 version features:

- **ADQ3-series digitizer support**
- **USB 3.2 connection to PC with up to 2 Gbyte/s data transfer rate**
- **Extended GPIO**
- **12 V power supply**
- **Fanless operation**

1 ORDERING INFORMATION

1.1 Compatibility

The USB 3.2 connection is available as an option for the ordered digitizer model. See the datasheet of the respective digitizer model for details about the digitizer.

Order USB 3.2 box by adding the USB-option, for example ADQ32-USB.

The USB 3.2 box version is available for all versions of the following digitizers:

- ADQ30
- ADQ32
- ADQ33
- ADQ35 except ADQ35-WB

All firmware options are available in combination with USB 3.2.

1.2 Standard deliverables

The standard deliverables are:

- Selected digitizer model
- Standard USB cable (not supporting screw attachment)
- Power supply

1.3 Options

The following optional items can be ordered separately:

- USB cable with screw attachment in one end
- 19” rack mount kit

2 ADQ3-USB INTRODUCTION

2.1 Features

- Stand-alone box version of ADQ3-series digitizers
- Extra GPIO connector
- 2 Gbyte/s continuous data throughput (to be confirmed)
- USB 3.2 connector with screw attachment
- Two boxes can be mounted in one 1U 19” rack box

2.2 Applications

- Swept-source optical coherence tomography (SS-OCT)
- Time-of-flight mass spectrometry
- Distributed optical fiber sensing
- LIDAR
- Scientific instruments
- ATE

2.3 Advantages

- A space-saving, compact stand-alone box with high data transfer rate to the host PC
- Digitizer can be located close to the detector for optimized analog performance
- Use a mini-PC or laptop without PCIe-slots
- Real-time processing and high data throughput of the ADQ3-series digitizers
- Teledyne SP Devices’ design services are available for fast integration to reduce time-to-market

3 SYSTEM DESIGN OPTIMIZATION

The ADQ3-USB solution for high-speed data acquisition system allows the user to place the digitizer close to the detector and to use PC without PCIe-slot. Important aspects of using the ADQ3-USB are listed here:

3.1 Front-end optimization

The ADQ3-USB is intended to be mounted inside other equipment. Thanks to the USB cable, the box can be placed close to the detector. Cables can be kept short to reduce the impact of reflections. This optimizes the analog performance.

3.2 Streaming to CPU

ADQ3-USB supports up to 2 Gbyte/s sustained data streaming to a host computer. Implementing the application-specific algorithms in the CPU results in an efficient system. The data rate is about matching the data rate that can be conveniently processed in a CPU.

3.3 Application firmware

An ADQ3-series digitizer can produce up to 20 Gbyte/s of raw data. There are several firmware packages to perform the initial stage of digital signal pre-processing and data reduction in the onboard FPGA of the digitizer. These firmware packages typically extract information from the data and reduce the data rate to match the data transfer capacity of the USB 3.2 link.

3.4 Open FPGA for real-time processing

In addition to the application firmware, the ADQ3-series digitizers offer an open FPGA for implementation of custom application-specific computations in the FPGA. The firmware development kit is ordered separately.

3.5 Cooling

The ADQ3-USB features a fanless design and relies on system airflow for cooling. Its construction is resilient to dust, making it suitable for use in environments where particulate matter may be present.

3.6 19” Rack

Two pieces of ADQ3-USB can be mounted side-by-side in a 19” 1U rack mount. The 19” rack mount kit can be ordered separately. It is also possible to mount the USB boxes in a third-party box using the screw attachment on the bottom side.

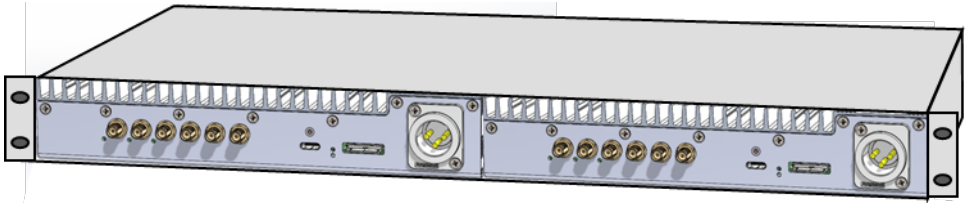

Figure 1 Typical assembly for 19” rack

3.7 Systems assembly

The mechanical robustness is a core parameter. Safe fastening of the box and cable attachment is therefore important. Here are some details:

- There are screw holes at the bottom plate of the digitizer for attaching it to the rack or other instrument. See Figure 4 for location of the holes.
- Analog signals are firmly attached via SMA connectors for more reliable and robust operation.
- The USB-C connection in the box is supplied with screw attachment to avoid that the cable falls out. Standard shipment includes a USB cable without screw. An USB-C cable with a screw attachment can be ordered separately.

Figure 2 Typical USB cable with screw lock

- The power supply and the GPIO connectors have snap lock cable attachment.

3.8 Software interface

The USB version operates with the same API as the PCIe version. The API automatically selects USB connection or PCIe connection, depending on which version that is used. USB and PCIe digitizers can be used simultaneously in the same installation.

3.9 Power supply

The ADQ3-USB is powered by a 12 V supply via the included power adapter, which connects through an XLR connector. Warranty coverage and compliance testing are valid only when using the supplied adapter. For alternative power sources, please consult a Teledyne SP Devices' representative.

4 TECHNICAL DATA

Read the datasheet for each respective digitizer model for additional information.

Table 1 Environmental and mechanical parameters

Parameter	Condition	Min	Typical	Max	Unit
Power and temperature					
Power consumption [1]			60		W
Power supply		10.8	12	13.2	V
Operating temperature		TBD		TBD	°C
Size[2]					
Width			215		mm
Length			235		mm
Height			40		mm
Weight			TBD		g
Compliances					
RoHS3		Yes			
CE		Yes			
FCC	Exclusion according to CFR 47, part 15, paragraph 15.103(c).				

Table 2 GPIO expansion

Parameter	Value
Connector type	ST60-24P(50)
Number of differential input signals LVDS	2
Number of differential output signals LVDS	2
Number of single-ended 3.3-V LVCMOS I/O signals	4
Control bus	I2C, 3.3 V
Power supply	3.3 V, max 1 A

Table 3 Software support

Parameter	Value
Operating system[3]	Windows / Linux
GUI	Digitizer Studio
Example code	C, Python
API	C / C++
High-level API	LabVIEW / MATLAB / C#

[1] Power consumption depends on selected digitizer model and firmware selection. The USB interface typically adds 10 W to the specification of the specific ADQ3 digitizer.
[2] See Figure 3 for drawing.
[3] See 15-1494 Operating system support for a detailed listing of supported distributions.

Table 4 Data transfer[4]

Parameter	Value	Unit
Supported versions of data transfer standard PCIe	USB 3.2	
Sustained data rate to CPU	2	Gbyte/s

5 ABSLOUTE MAXIMUM RATINGS

Table 5 Absolute maximum ratings

Parameter	Condition	Min	Max	Unit
Power supply to GND		-0.4	14	V
Operating temperature		TBD	TBD	°C
Storage temperature		-40	70	°C

Exposure to conditions exceeding these ratings may reduce lifetime or permanently damage the digitizer. The built-in temperature monitoring unit will protect the digitizer from overheating by temporarily shutting down parts of the device in an overheat situation.
The SMA connectors have an expected lifetime of 500 operations. For frequent connecting and disconnecting of cables, connector savers are recommended.

6 MECHANICAL DRAWINGS

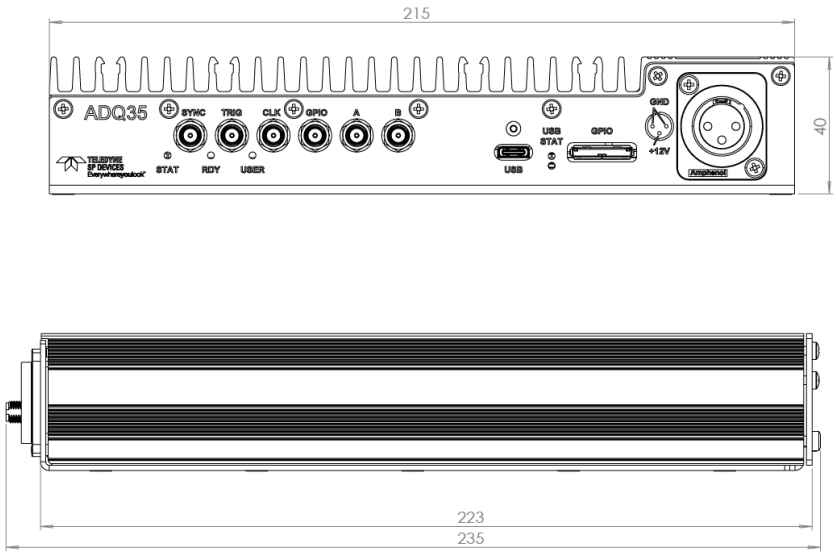

Figure 3 ADQ3-USB outer dimensions

[4] This is the data rate that the USB 3.2 implementation supports. Other parts of the system may limit the performance.

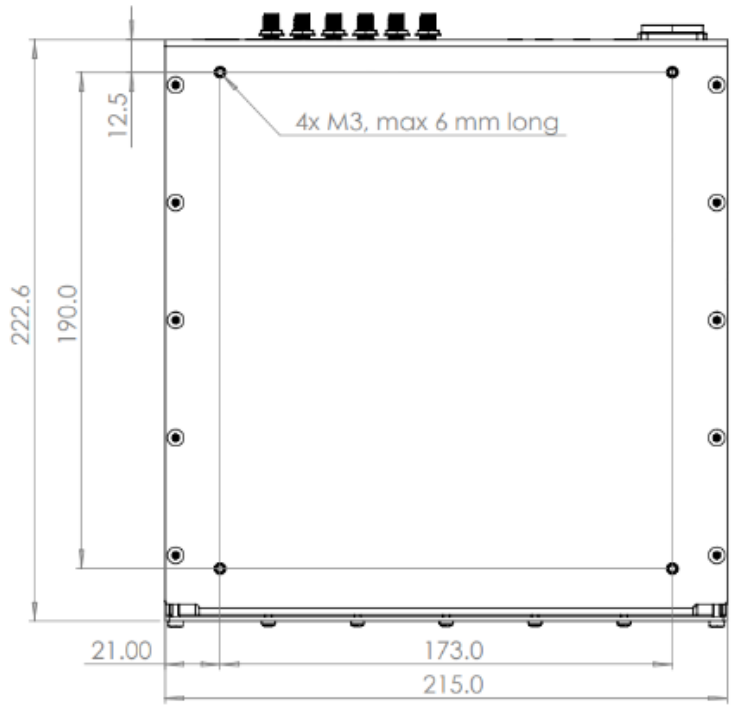

Figure 4 Location of holes for screw attachment of ADQ3-USB

7 REFERENCES

Refer to Teledyne SP Devices' website, www.spdevices.com, for the latest version of supplementary documents.

15-1494 Supported operating systems
18-2059 ADQUpdater user guide
20-2378 ADQ32 Datasheet
20-2451 ADQ33 Datasheet
20-2507 ADQ3 series development kit user guide
20-2521 ADQAssist user guide
21-2539 ADQ3 series user guide
22-2797 ADQ32-PDRX Datasheet
22-2918 ADQ35 Datasheet
22-2919 ADQ35-PDRX Datasheet
22-2869 ADQ30 Datasheet
23-3042 ADQ33-PDRX Datasheet

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