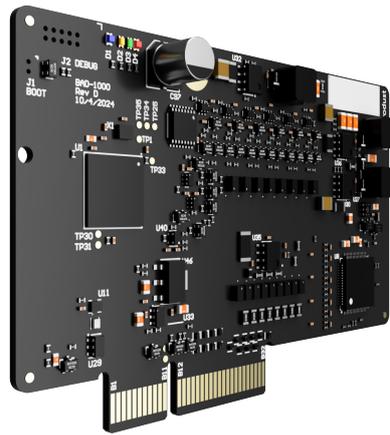


# AtoMik® DAQ Instrument



## Key Features

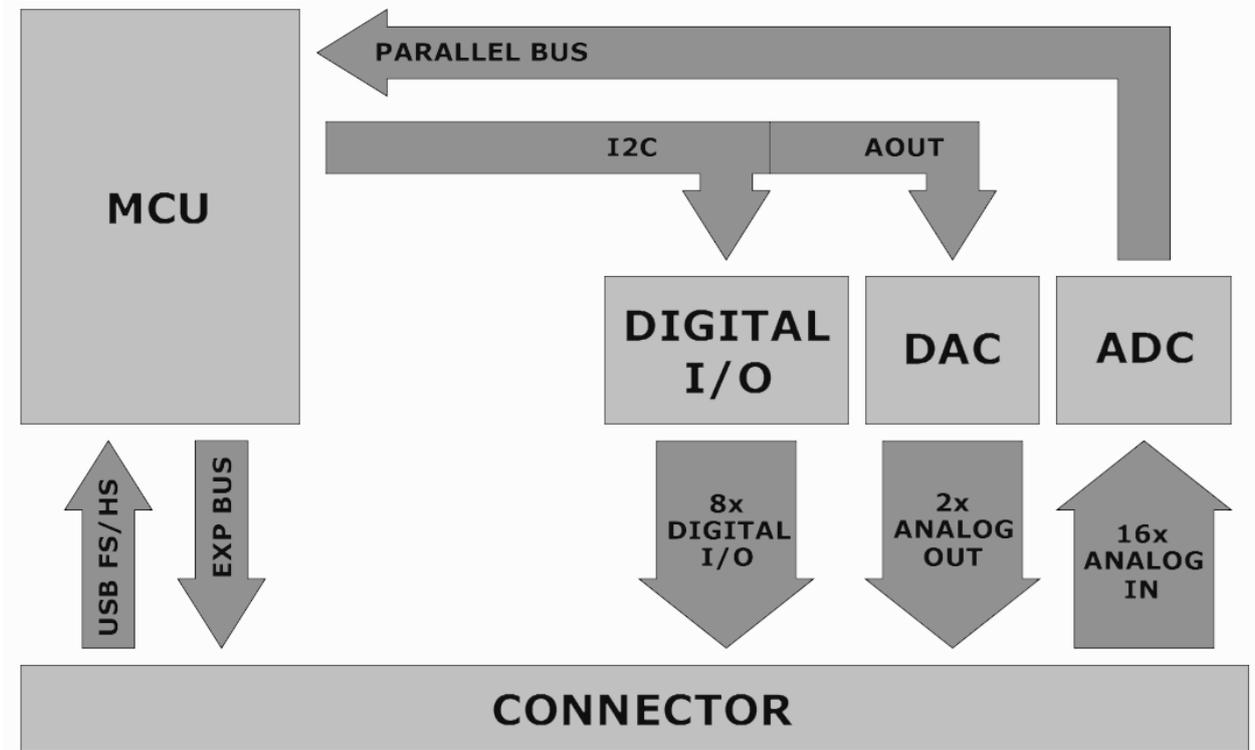
- USB controlled
- x16 Analog in,  $\pm 10V$  range
- x2 Analog out,  $\pm 10V$  range
- x8 Digital I/O, configurable logic levels
- Frequency counter, 1 Hz - 50MHz
- Internal reference clock
- +5V/ $\pm 15V$ /I2C/SPI expansion
- Powered by +24V/+5V
- Separate Power enable and reset

## Description

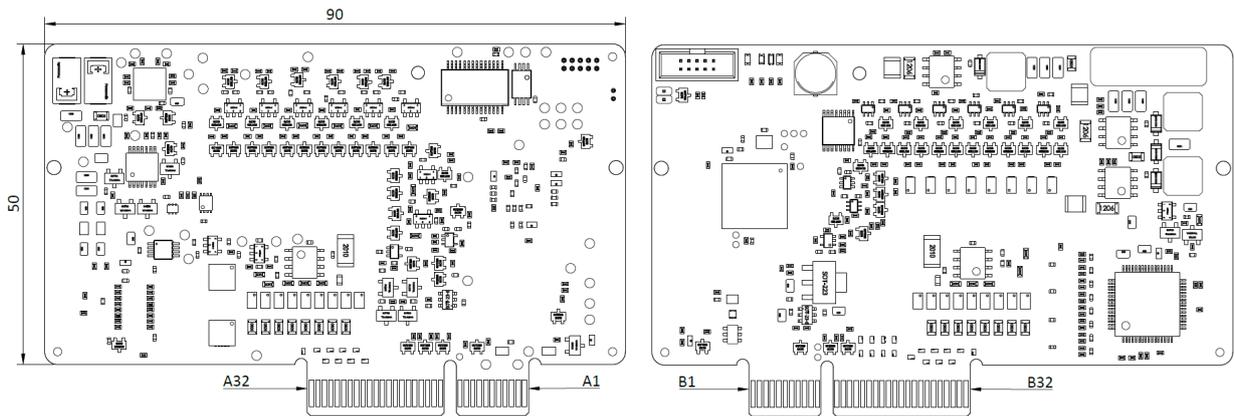
The DAQ Instrument provides high-precision data acquisition and converts real-world signals to the digital domain for display, storage, and analysis. It has an onboard high-performance MCU with an Arm® Cortex®-M7 core running a RTOS (Real-Time Operating System), which also provides a USB 2.0 channel to an external host.

The instrument offers external connection to 16 single-ended analog input channels (AI) with a successive approximation ADC, two analog output channels (AO), 8 digital Push-Pull I/O channels (DIO). Each group of analog input channels AI0-7 and AO8-15 provides simultaneous sampling. All digital channels can be used as a

counter. Different types of external expansion such as number of analog and digital channels are possible by utilizing the built-in expansion interface.



DAQ Instrument Block Diagram



DAQ Instrument Layout

## Pinout

<b>P i n</b>	<b>Name</b>	<b>Description</b>	<b>P i n</b>	<b>Name</b>	<b>Description</b>
A 1	+24V_IN	+24V Input Power Supply	B 1	USB_N	USB D- signal
A 2	+24V_IN	+24V Input Power Supply	B 2	USB_P	USB D+ signal
A 3	+24V_IN	+24V Input Power Supply	B 3	GND	Ground
A 4	+24V_IN	+24V Input Power Supply	B 4	GND	Ground
A 5	+5V_IN	+5V Input Power Supply	B 5	GND	Ground
A 6	+5V_IN	+5V Input Power Supply	B 6	GND	Ground
A 7	+5V_IN	+5V Input Power Supply	B 7	GND	Ground
A 8	+5V_IN	+5V Input Power Supply	B 8	GND	Ground
A 9	RST_N	Reset signal	B 9	RSV	Reserved
A 1 0	PWR_EN	Power enable of the instrument	B 1 0	RSV	Reserved

A 1 1	RSV	Reserved	B 1 1	RSV	Reserved
A 1 2	EXP_I2C_SCL/EXP_SPI_CS1	Expansion Interface I2C SCL or SPI CS1	B 1 2	EXP_SPI_SCLK	Expansion Interface SPI Clock-signal
A 1 3	EXP_I2C_SDA/EXP_SPI_CS2	Expansion Interface I2C SDA or SPI CS2	B 1 3	EXP_SPI_MOSI	Expansion Interface SPI MOSI
A 1 4	EXP_SPI_CS3	Expansion Interface UART TX or SPI CS3	B 1 4	EXP_SPI_MISO	Expansion Interface SPI MISO
A 1 5	EXP_SPI_CS4	Expansion Interface UART RX or SPI CS4	B 1 5	EXP_SPI_CS0	Expansion Interface SPI CS0
A 1 6	EXP_RST_N	Expansion Interface Reset output active low	B 1 6	GND	Ground
A 1 7	DIO0	Digital In/Out 0	B 1 7	DIO1	Digital In/Out 1
A 1 8	DIO2	Digital In/Out 2	B 1 8	DIO3	Digital In/Out 3
A 1 9	DIO4	Digital In/Out 4	B 1 9	DIO5	Digital In/Out 5
A 2 0	DIO6	Digital In/Out 6	B 2 0	DIO7	Digital In/Out 7
A 2 1	+5V_EXP	+5VDC Power Supply for Expansion	B 2 1	GND	Ground
A 2 2	+15V_EXP	+15VDC Power Supply for Expansion	B 2 2	-15V_EX P	-15VDC Power Supply for Expansion

A 2 3	GND	Ground	B 2 3	GND	Ground
A 2 4	AO0	Analog Output 0	B 2 4	AO1	Analog Output 1
A 2 5	AI0	Analog Input 0	B 2 5	AI1	Analog Input 1
A 2 6	AI2	Analog Input 2	B 2 6	AI3	Analog Input 3
A 2 7	AI4	Analog Input 4	B 2 7	AI5	Analog Input 5
A 2 8	AI6	Analog Input 6	B 2 8	AI7	Analog Input 7
A 2 9	AI8	Analog Input 8	B 2 9	AI9	Analog Input 9
A 3 0	AI10	Analog Input 10	B 3 0	AI11	Analog Input 11
A 2 1 1	AI12	Analog Input 12	B 3 1 1	AI13	Analog Input 13
A 3 2 2	AI14	Analog Input 14	B 3 2 2	AI15	Analog Input 15

## Absolute Maximum Ratings

Exceeding ABSOLUTE MAXIMUM RATINGS can cause permanent damage to the device.

	Min	Max
--	-----	-----

USB_P, USB_N	-0.5 V	+5.5 V
+24V Input Power Supply	-0.3 V	+25.5 V
+5V Input Power Supply	-0.3 V	+5.2 V
Voltage on any Digital Pin	-0.3 V	+3.6 V
Voltage on any Digital I/O Pin	-0.3 V	+5.5 V
Voltage on any Analog Input Pins	-10.5 V	+10.5 V

## Recommended Operating Conditions

Specifications are valid at 25°C unless otherwise noted and with a warm-up time of >10min.

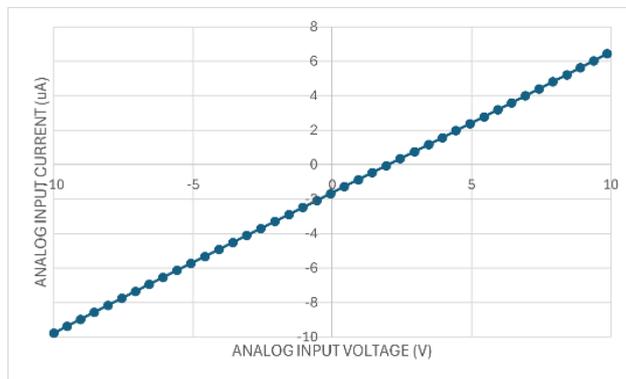
	Conditions	Min	Typ	Max
+24V Input Power Supply		+23.0 V	+24.0 V	+25.0 V
+5V Input Power Supply		+4.8 V	+5.0 V	+5.2 V
+24V Input Power Supply Quiescent Current	Enabled Disabled		+62 mA +6 uA	
+5V Input Power Supply Quiescent Current	Enabled Disabled		+123 mA +36 uA	
Digital Input High Voltage		+2.4 V		
Digital Input Low Voltage				+0.8 V
Digital Output High Voltage	Load = +2 mA	+2.6 V		
Digital Output Low Voltage	Load = -2 mA			+0.7 V
Expansion +5V Output Power Supply	Load = +140 mA	+4.8 V	+5.0 V	+5.2 V

Expansion +5V Output Power Supply Current				+140 mA
Expansion +15V Output Power Supply	Load = +50 mA	+14.8 V	+15.0 V	+15.2 V
Expansion +15V Output Power Supply Current				+50 mA
Expansion -15V Output Power Supply	Load = -50 mA	-15.2 V	-15.0 V	-14.8 V
Expansion -15V Output Power Supply Current		-50 mA		
Expansion Digital Input High Voltage		+2.4 V		
Expansion Digital Input Low Voltage				+0.8 V
Expansion Digital Output High Voltage	Load = +2 mA	+2.6 V		
Expansion Digital Output Low Voltage	Load = -2 mA			+0.7 V
Expansion I2C bit rate		100 kbit/s		1 Mbit/s
Expansion SPI Clock frequency				13.5 MHz
Analog Input Range	Range $\pm 10$ V	-10.0 V		+10.0 V
Analog Input Current (see figure)		-10 $\mu$ A		+7 $\mu$ A
Analog Input Impedance	Range $\pm 10$ VDC		1 M $\Omega$	
Analog Input Resolution			16 bits	
Analog Input Absolute Accuracy	Range $\pm 10$ V	-5.0 mV		+5.0 mV
Analog Input Sampling Rate	System dependent		60 S/s	
Analog Output Range		-10.0 V		+10.0 V
Analog Output Current Drive		-5 mA		+5 mA
Analog Output Slew Rate			1.1 V/ $\mu$ s	
Analog Output Short-circuit current	Range $\pm 10$ V	-40 mA		+40 mA
Analog Output Power-on State			0 V	
Analog Output Resolution			12 bits	

Analog Output Absolute Accuracy	Full range $\pm 10$ V	-20.0 mV		+20.0 mV
Analog Output Update Rate	System dependent			60 Hz
Digital I/O Compatibility		+1.8 V		+5.0 V
Digital I/O Internal Pull-Up Resistor			100 k $\Omega$	
Digital I/O Internal Pull-Down Resistor			100 k $\Omega$	
Digital I/O Power-On State	No pull-Up/Pull-Down		Input	
Digital I/O Input High Voltage		+1.07 V		+5.50 V
Digital I/O Input Low Voltage		0.00 V		+1.65 V
Digital I/O Input Leakage Current				+20 $\mu$ A
Digital I/O Output High Voltage	Load = +5 mA	+1.20 V		+5.5V
Digital I/O Output Low Voltage	Load = -5 mA	+0.45 V		+0.5 V
Digital I/O Frequency Measurement Range	SQW +2.5V to +5.0V	1 Hz		50 MHz
	SQW +1.8V	1 Hz		30 MHz
Digital I/O Frequency Measurement Accuracy	Time Base Accuracy + System error	-4.4 ppm		+4.4 ppm
Digital I/O Frequency Measurement Resolution			18 bits	
Digital I/O Frequency Measurement High Pulse Width		10 nS		
Digital I/O Frequency Measurement Low Pulse Width		10 nS		
Digital I/O Frequency Input transition rise or fall rate    1.8V				20 ns/V
	3.3V			10 ns/V
	5V			5 ns/V
Internal Time Base Frequency	TCXO		25.0 MHz	

Internal Time Base Accuracy	Stability temp -40 ~ +85°C Aging per year @ +25°C	-2.9 ppm -1.0 ppm	+2.9 ppm +1.0 ppm
-----------------------------	--	----------------------	----------------------

## Typical Performance Characteristics



Analog Input Current as a function of the Analog Input Voltage when supplied on the analog input (Alx) pins

## Environmental

The DAQ Instrument is designed for following environmental conditions and for indoor use only.

	Min	Max
Operating Temperature	0°C	+55°C
Operating Humidity	10% RH	90% RH
Storage Temperature	0 °C	+70 °C
Storage humidity	5% RH	95% RH
Pollution Degree		2

# Attachment

[3D Model](#)

## Ordering information

Item	Part Number
AtoMik® Data Acquisition (DAQ) Instrument	IAD-1000-D1