



LIQUID  
INSTRUMENTS



## Your next breakthrough, faster



Arbitrary  
Waveform  
Generator



Data  
Logger



Digital  
Filter Box



FIR Filter  
Builder



Frequency  
Response  
Analyzer



Laser  
Lock Box



Lock-in  
Amplifier



Logic Analyzer  
/ Pattern  
Generator



Oscilloscope



Phasemeter



PID  
Controller



Spectrum  
Analyzer



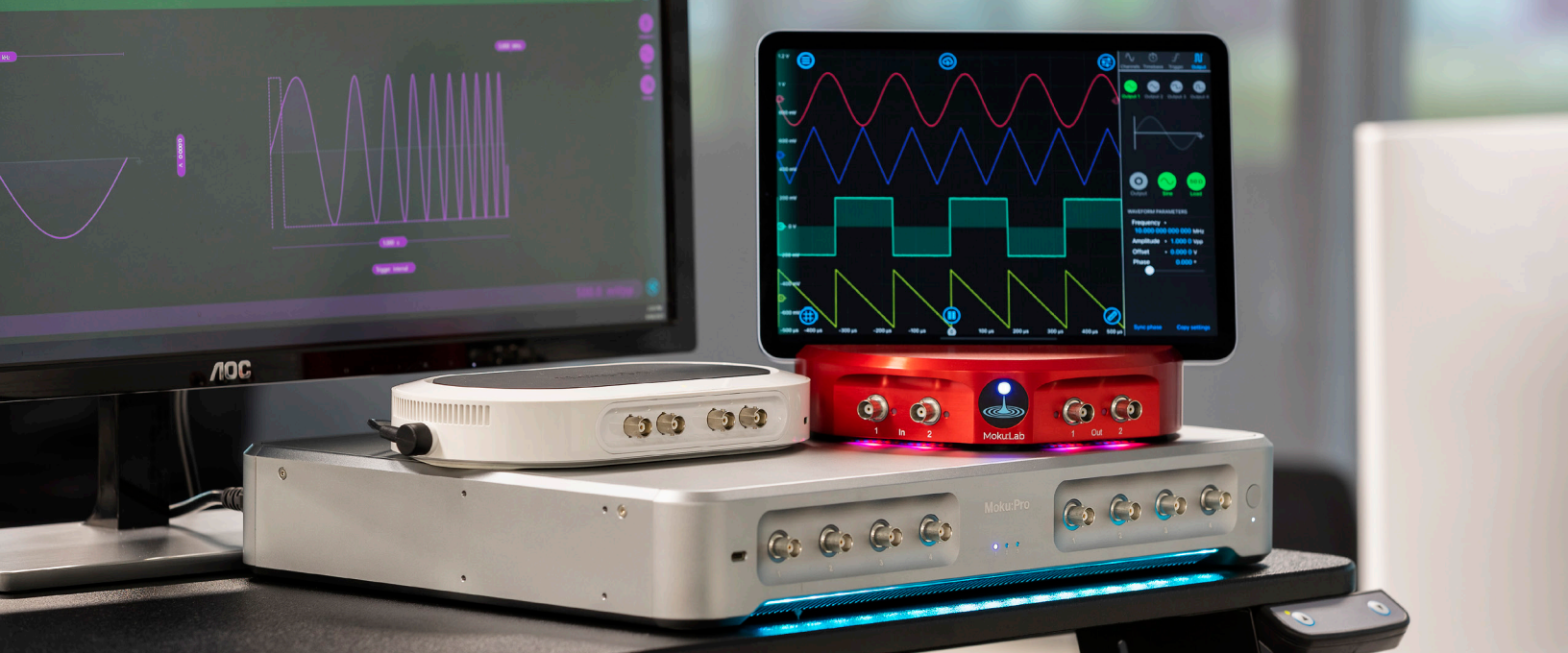
Waveform  
Generator



Multi-instrument  
Mode



Moku Cloud  
Compile



## Discover a new standard for test based on flexible software

With Moku, you gain instant access to an entire suite of software-defined instruments — from test essentials to advanced tools — in one FPGA-based device. We add new instruments and features regularly with over-the-air software upgrades, so every Moku device gets more powerful over time.

### Moku instruments



#### Arbitrary Waveform Generator

- Choose from predefined or custom arbitrary waveforms.
- Generate outputs phase-locked to the inputs.



#### Data Logger

- Log data directly to an SD card, a networked disk, or internal memory.
- Perform ultra low-noise data logging from acoustic to RF applications.



#### Digital Filter Box

- Select from preset filters or build your own custom filters.
- Add a filter stage to your test system.



#### FIR Filter Builder

- Fine-tune finite impulse response filters in the time and frequency domains.
- Choose from four frequency response shapes, five common impulse responses, and up to eight window functions.



## Frequency Response Analyzer

- Apply a swept sine signal to your DUT to view the system response in magnitude and phase.
- Perform real-time Bode analysis with live plots to characterize devices.



## Laser Lock Box

- Lock a laser's frequency to a reference cavity or atomic transition using high-performance modulation locking techniques.
- Use Lock Assist to easily lock to any zero crossing on the demodulated error signal.



## Lock-in Amplifier

- Perform dual-phase demodulation from DC to 600 MHz.
- Utilize four channels for multi-channel, low-noise lock-in detection.



## Logic Analyzer / Pattern Generator

- Use up to 16 bidirectional digital I/Os to stimulate, monitor, capture, and debug digital systems.
- Generate and analyze patterns and protocols including SPI, UART, I2C, I2S, and CAN.



## Oscilloscope

- View signals on up to four high-speed, low-noise input channels.
- Analyze and generate waveforms with the embedded Waveform Generator.



## Phasemeter

- Leverage multi-channel phase, frequency, and amplitude measurements with  $\mu\text{rad}$  precision.
- Measure signals with phase-locked loop tracking bandwidths from 1 Hz to 1 MHz.



## PID Controller

- View and tune system responses in real time with an interactive Bode plot.
- Configure gain profiles with an advanced multi-section PID builder.



## Spectrum Analyzer

- Observe input signals in the frequency domain with an ultra-low noise floor.
- Use the 3D waterfall view to visualize how the spectrum changes over time.



## Waveform Generator

- Choose from six built-in waveform types and six modulation options.
- Modulate signals effectively with cross-channel modulation.

# Choose your hardware platform

Compare specifications to decide which Moku device is best for you.

## Moku:Pro



### One integrated platform for the most demanding research and engineering applications

Moku:Pro is a versatile, high-performance test solution for developing and validating next-generation devices and systems. Make precision measurements with  $30 \text{ nV}/\sqrt{\text{Hz}}$  at 100 Hz input noise on up to four channels. Perform real-time closed-loop control, high-speed data acquisition, signal processing, and visualization — all within Moku:Pro.

## Moku:Lab



### Versatile, precision equipment for the research lab

Moku:Lab is a complete, cost-effective tool for testing and controlling electronic and optical experiments with  $30 \text{ nV}/\sqrt{\text{Hz}}$  at 100 kHz input noise. Equipped with easy-to-use software and professional-grade hardware, you can spend less time on setup and troubleshooting and more time driving your next breakthrough.

## Moku:Go



### A flexible, portable tool for experimental design, commercial testing, and higher education

Moku:Go is ideal for actively testing electrical and computer engineering designs and projects. Explore and test concepts from audio and power electronics to analog and digital design with the 16-channel DIO and optional embedded programmable power supply.

# Moku device specifications



## Moku:Pro

The most powerful platform for your research

### Analog inputs

Four 10+18-bit, 5 GSa/s  
600 MHz analog bandwidth  
Input range up to  $\pm 20$  V

### Analog outputs

Four 16-bit, 1.25 GSa/s  
500 MHz analog bandwidth  
 $\pm 5$  V into  $50 \Omega$  output range

### Digital I/O

Dedicated TTL trigger port



## Moku:Lab

Versatile platform for engineering and research

### Analog inputs

Two 12-bit, 500 MSa/s  
200 MHz analog bandwidth  
Input range up to  $\pm 5$  V

### Analog outputs

Two 16-bit, 1 GSa/s  
300 MHz analog bandwidth  
 $\pm 1$  V into  $50 \Omega$  output range

### Digital I/O

Dedicated TTL trigger port



## Moku:Go

The engineering platform for portable testing

### Analog inputs

Two 12-bit, 125 MSa/s  
30 MHz analog bandwidth  
Input range up to  $\pm 25$  V

### Analog outputs

Two 12-bit, 125 MSa/s  
20 MHz analog bandwidth  
 $\pm 5$  V max output range

### Digital I/O

16-channel DIO at 125 MSa/s



Full specs

Integrates seamlessly with your tech stack





## Control more with Multi-instrument Mode

With partial FPGA reconfiguration, [Multi-instrument Mode](#) enables you to build custom test configurations with low-latency, lossless interconnects to reduce experimental complexity.

- Daisy-chain instruments together to build sophisticated digital signal processing pipelines.
- Hot-swap instruments without interrupting those running in tandem.
- Monitor the performance of each instrument in its own dedicated window for a bird's-eye view of your experiment.

## Applications

- Multi-frequency lock-in detection
  - 4 x Lock-in Amplifier
- Closed-loop control
  - PID Controller, Frequency Response Analyzer, Oscilloscope, Spectrum Analyzer
- Power analysis
  - 2 x Oscilloscope, Frequency Response Analyzer, Spectrum Analyzer



## Specs

### Moku:Pro

- Up to four instrument slots
- 0.3 ppm stability onboard clock
- < 650 ns input-to-output latency
- 10-bit and 18-bit ADCs with frequency-dependent blending
- 1.25 GSa/s sampling rate

### Moku:Lab and Moku:Go

- Up to two instrument slots
- 500 ppm stability onboard clock
- < 1 ns input-to-output latency

# Develop and deploy custom features



**Moku Cloud Compile** makes FPGA programming simple with the ability to implement custom functionality to any Moku device. Write your VHDL code in a browser, compile it in the cloud, and deploy the bitstream to one or more Moku devices.

- Incorporate custom real-time digital signal processing algorithms directly onto a Moku device's FPGA, where they can run alongside the other integrated instruments to enhance and expand their functionalities.
- For total flexibility, start with one of our code examples and customize it to your application or work with synthesis tools like Simulink® or MATLAB® and HDL Coder™.
- Limited VHDL experience? No worries. You can leverage AI tools like ChatGPT to generate VHDL code for use with Moku devices.

## Applications

- Boxcar averager
- Moving average filter
- Real-time cross correlation

## Specs



Moku:Pro



Moku:Lab



Moku:Go

FPGA

Ultrascale+

Zync 7000

Zync 7000

Core clock

312.5 MHz

125 MHz

31.25 MHz

Look-up tables

48,400

19,600

20,000

Flip-flops

96,800

39,200

40,000

Block RAM (36K)

154

60

50

DSP

432

100

100



## We've got you covered

Check out our resource center to find everything you need to test smarter with Moku, from application notes and case studies to ebooks, webinars, and more.



Explore resources

Have questions or want to learn more about how Moku can benefit your application? Need technical support? We're here to help.



Contact us

Stay on top of our latest news, events, software updates, and more.



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