



# Product Leaflet VHFLI

## Very High Frequency Lock-in Amplifier

Multi-Channel Measurement  
Control and Timing Hub

The Zurich Instruments VHFLI Lock-in Amplifier is a very high-frequency, multi-channel lock-in amplifier providing industry leading performance and functionality.

### Key Features

- Frequency Range: DC – 50 MHz  
(200 MHz with the VHF-F200M)
- Fast demodulation time constant
- Low input noise floor
- Up to 6 output and 6 input channels, served by up to 8 independent oscillators and demodulators
- LabOne® instrument control software for easy setup of complex workflows

### Applications

The VHFLI serves the most demanding applications requiring generation, measurement and tracking of periodic signals up to 200 MHz. Applications include characterization and control of devices and materials such as:

- Optics & photonics
- Electronic devices and sensor development
- Nanotechnology, surface and materials science
- Scanning probe microscopy: AFM, STM, MFM

### Your Benefits

**Reduce complexity at a competitive price point:** one instrument to analyze, generate & control periodic signals from DC up to 200 MHz.

**Easily set up multi-channel measurements** for both current and voltage.

**Keep your system running:** avoid recabling with a built-in analysis toolset including Scope, Sweeper & Spectrum Analyzer, and more.

— See Your Signal from  
Different Perspectives  
Use All Analysis Tools  
Simultaneously —

**Orchestrate CW and pulsed measurements schemes:** coordinate triggering, generation and acquisition with the LabOne Timeline Module.

**Conveniently automate your setup:** the instrument is the timing hub of your experiment to synchronize external devices.

**Unlock fast-moving phenomena** thanks to short time constants & high data throughput.

**Increase confidence in your data** with clear software workflows.

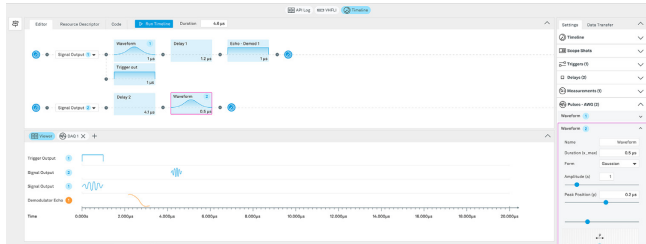
**Expand the reach of your experiment** with upgrade options such as PID/PLL controllers, AWG and more.

**Ease of integration:** API support for LabVIEW™, MATLAB®, C, .NET and Python.

## LabOne® Graphical User Interface

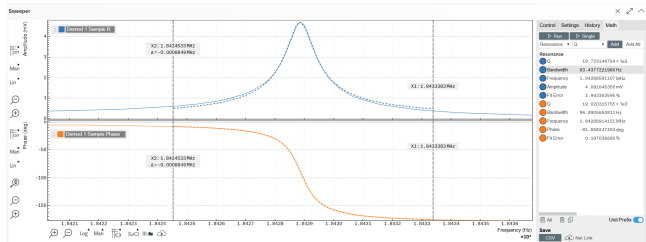
The LabOne® graphical user interface offers an easy learning curve to the VHFLI control and data visualization. All the time- and frequency-domain analysis tools can run in parallel for multidimensional insights.

### Timeline Module: Orchestrate Your Experiment



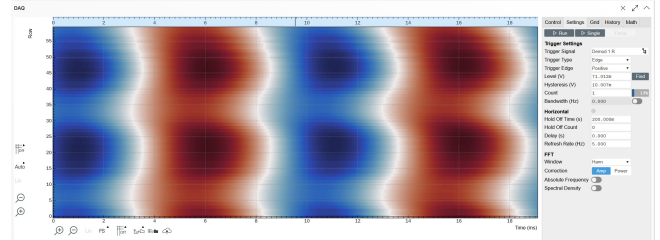
- Build and implement continuous wave and pulsed measurement schemes
- Seamlessly coordinate pulses, triggers, measurements, and controllers – all from a single interface
- Save time with graphical programming and monitoring
- Switch to scripting to integrate workflows

### Sweeper: Easy Parametric Scans



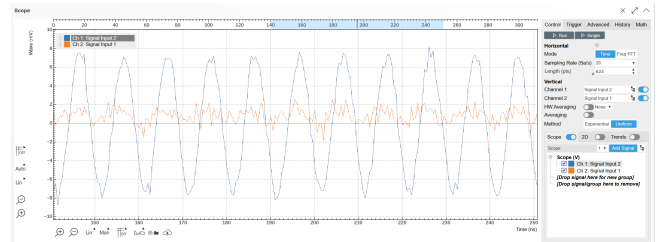
- Quickly characterize your devices in amplitude and phase and directly obtain important information such as their resonance parameters
- Save time by acquiring multiple signals in parallel
- Choose from a range of parameters, including: frequency, phase, amplitudes, DC offset and more

### Data Acquisition: Choose the Best Tool for Your Needs



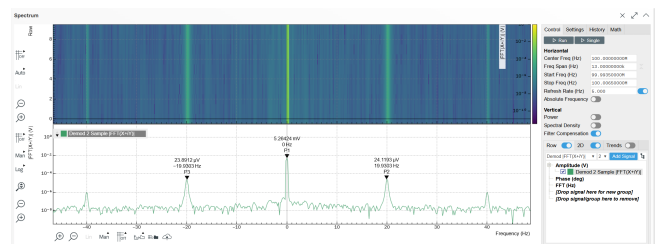
- Easy set-up of streaming and triggered data acquisitions at high data rate
- Capture multiple data sources in parallel
- Convert your traces into 2D images directly in the LabOne® GUI
- Export data in CSV, MAT and HDF5®, and plots in PNG or SVG

### Scope: Time- and Frequency-Domain Input Signal Monitoring



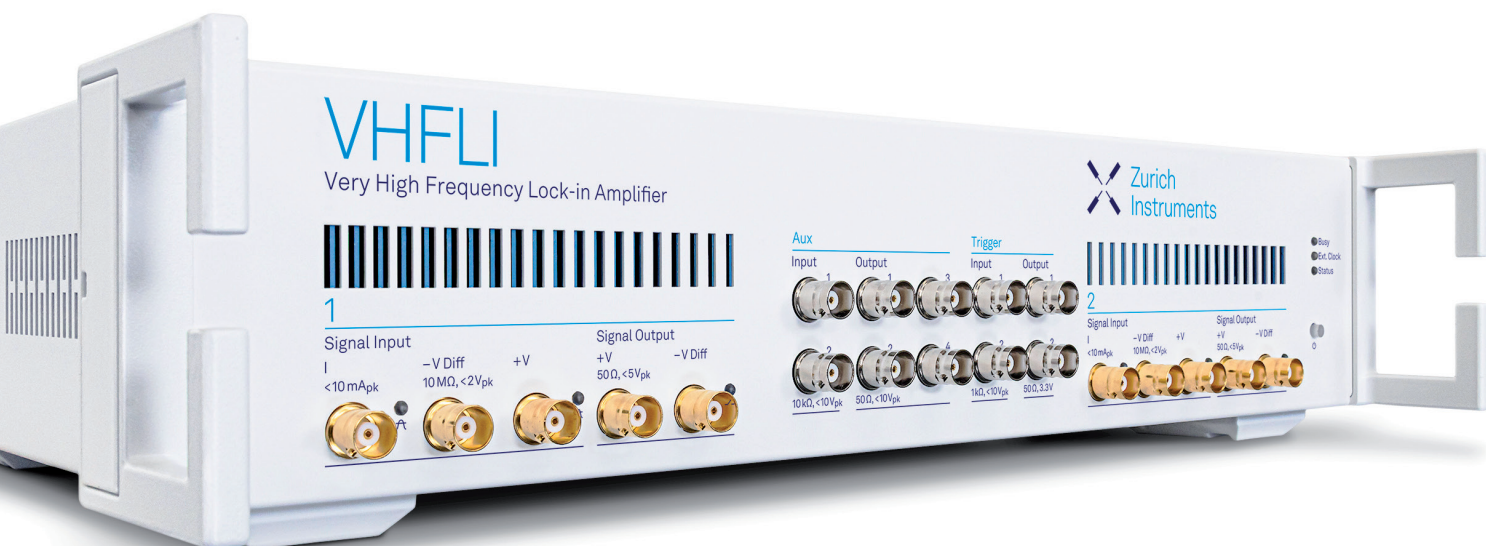
- Dual channel oscilloscope
- Cross-domain triggering
- Time- and frequency-domain views
- Multiple signal sources including signal inputs and trigger inputs

### Spectrum: High-Resolution Spectral Analysis



- Fast, high-resolution FFT spectrum analyzer of demodulated data
- Available spectrum modes: FFT(X+iY), FFT(R), FFT(θ), FFT(f) and FFT((dθ/dt)/2π)
- Access to amplitude, spectral density, and power spectrum





## Upgrade Options

### VHF-F200M Frequency Extension

The VHF-200M extends the frequency range of the instrument to 200 MHz. The upgrade is independent from the set of installed options and does not affect the other specifications.

- Upgradeable without the need for hardware changes

### VHF-MD Multi-Demodulator Option

This option opens the door to multi-frequency analysis: each demodulator can be set to a different arbitrary frequency inside the measurement window and can be assigned to any of the inputs, offering a wide range of additional configurations for measurement and signal generation.

- Measure up to 8 arbitrary frequencies in parallel
- Generate multi-tone signals with free choice of frequency, phase and amplitude

### VHF-MOD Modulation Analysis Option

Measure and generate up to 2 phase-coherent linear combinations of 2 oscillator frequencies. The parameters for each frequency component can be individually set.

- Simplify sideband analysis (including AM and FM) and frequency mixing schemes.
- Single-box solution for bimodal and multi-modal measurement challenges without intermediate signal conversion.

### VHF-PID Quad PID/PLL Controller Option

The 4 PID controllers are integrated into the lock-in and can take as inputs all measurement signals over the entire DC to 200 MHz range. The choice of output signals is equally large and it includes signal amplitude, frequency, phase, offset, auxiliary outputs and more. The LabOne PID Advisor and Auto-Tune feature help you achieve your desired feedback response quickly and intuitively.

- Create advanced feedback loops with up to 4 PID controllers
- Find the PID parameters quickly and easily with the Advisor and Auto-Tune

From DC up to 200 MHz  
Closed-Loop Feedback  
Simplified

### VHF-AWG Arbitrary Waveform Generator

The VHF-AWG option brings state-of-the-art arbitrary waveform generator (AWG) capabilities to the VHFLI. The direct integration with the LabOne Timeline Module enables a powerful combination of complex signal generation and advanced measurement modes, combining continuous wave and pulsed measurements schemes.

- Dual 200 MHz AWG
- 2 GSa/s, 14-bit vertical resolution
- Integration with the Timeline Module

## Specifications

### Signal Inputs and Outputs

|                           |                                                         |
|---------------------------|---------------------------------------------------------|
| Number of input channels  | 2 voltage (differential and single-ended) and 2 current |
| Frequency range           | DC – 50 MHz<br>DC – 200 MHz (with VHF-F200M)            |
| Impedance                 | 50 $\Omega$ or 10 M $\Omega$                            |
| Input voltage noise floor | $\leq 3$ nV/ $\sqrt{\text{Hz}}$ > 30 kHz                |
| Input current noise floor | $\sim 50$ fA/ $\sqrt{\text{Hz}}$ @ 1 kHz                |
| Dynamic reserve           | 120 dB                                                  |
| Input ranges voltage      | $\pm 5$ mV to $\pm 2$ V                                 |
| Input ranges current      | 10 nA to 10 mA                                          |
| Number of output channels | 2 voltage (differential and single-ended)               |
| Output ranges             | $\pm 5$ mV to $\pm 5$ V                                 |

### Demodulators

|                      |                              |
|----------------------|------------------------------|
| No. of demodulators  | 2 dual-phase (8 with VHF-MD) |
| No. of oscillators   | 2 (8 with VHF-MD)            |
| Continuous data rate | 2 MSa/s (max)                |
| Triggered data rate  | 25 MSa/s (max)               |
| Time constant        | 14 ns – 21 s                 |
| Demodulator BW       | 3.2 MHz – 11 MHz             |
| Filter slopes        | (dB/Oct) 6, 12, 18, 24       |

### Auxiliary & Others

|                   |                                                   |
|-------------------|---------------------------------------------------|
| Auxiliary Outputs | 4 Channels, $\pm 100$ mV to $\pm 10$ V, > 30 MHz  |
| Auxiliary Inputs  | 2 Channels, $\pm 100$ mV to $\pm 10$ V, > 150 MHz |
| Triggers          | 2 inputs, 2 outputs                               |
| Clock (in/out)    | 10 MHz or 100 MHz                                 |
| Connectivity      | USB 3.1 (USB-C), LAN 1Gb                          |

### General

|              |                                                                             |
|--------------|-----------------------------------------------------------------------------|
| Dimensions   | 32.5 $\times$ 44.5 $\times$ 10 cm (with handle),<br>19-inch rack compatible |
| Power supply | AC: 100 – 240 V, 50/60 Hz                                                   |
| Weight       | 6.3 kg                                                                      |

— Meet the VHFLI Lock-in Amplifier  
Setting a New Standard  
in Precision and Performance —

Learn more  
about the VHFLI

