

Zurich
Instruments

MFLI Lock-in Amplifier

500 kHz / 5 MHz, 120 dB dynamic reserve
500 ns time constant

Product Specification
Release date: January 2015

Key Features

- DC - 500 kHz / 5 MHz, 60 MSa/s, 16 bit
- Current and differential voltage inputs
- LabOne® toolset: scope, sweeper, spectrum
- Plug & Play with embedded LabOne® web server
- USB 2.0 and 1 GbE high-speed connections
- AC line and 12 V DC, e.g. for battery operation
- Upgradeable



Summary

The Zurich Instruments MFLI uses the latest hardware and software technologies to bring the benefits of high performance digital signal processing to lock-in amplifiers at medium and low frequencies. Incorporating Zurich Instruments' unique LabOne test & measurement philosophy, you can now experience the very best lock-performance and usability previously only available to users of our higher frequency products, with no need to compromise.

The standard MFLI features a differential voltage input as well as a current input, a dual-phase demodulator and a high quality signal output generator, covering the frequency range DC - 500 kHz or DC - 5 MHz. As with all Zurich Instruments products, options can be readily added to the MFLI, meaning that as the user's requirements change so can the instrument. In this way it is possible to extend the frequency range to 5 MHz as well as add multiple demodulators and oscillators.

Every instrument features the LabOne user interface including an integrated oscilloscope, spectrum analyzer, plotter and parameter sweeper. With its embedded web server, only a web browser is required to run the MFLI. Saving data is a simple one-click process within the UI. For easy integration into existing experiment control environments, LabOne provides APIs for LabVIEW, MATLAB, C and Python.

With its superior performance and outstanding toolset, the MFLI defines the new standard for lock-in amplifiers.

Description

High-Precision Inputs

The 16-bit differential voltage and current inputs of the MFLI are optimized for low noise operation and the high input sampling rates ensure full signal capture without aliasing. When the MF-MD option is installed both inputs can be used simultaneously facilitating, for example, 4-terminal measurements.

Signal Outputs

The MFLI generates a low-distortion 10V sinusoidal output capable of driving a device under test or a modulating device. With the MF-MD option 3 additional oscillators are provided, allowing generation of a linear combination of up to 4 independent sinusoids for simultaneous excitation at multiple frequencies.

Demodulators and Oscillators

The MFLI provides up to 4 dual-phase demodulators for simultaneous measurement at 4 arbitrary frequencies. Each demodulator can be configured with its own filter properties, including time constant, filter order and reference phase.

LabOne - All in One

With LabOne's integrated software environment the UI is the cockpit for instrument control, data capture, data analysis, data storage and data post-processing. It is platform independent, allowing the user complete flexibility in the choice of control device and location.

Specifications

Table 1. General

dimensions	28.3 x 23.2 x 10.2 cm 11.1x 9.2 x 4.0 inch
weight	3.8 kg, 8.4 lbs
power supply	AC: 90-240 V; DC: 12 V / 2 A

Table 2. Signal Inputs (voltage and current)

frequency range	DC - 500 kHz DC - 5 MHz (with MF-5FM)
input impedance	50 Ω or 10 MΩ 20pF
input voltage noise	<3 nV/√Hz
input range	3.3 mV to 3.3 V
dynamic reserve	Up to 120 dB
input full range sensitivity	1 nV to 3.3 V
A/D conversion	16 bit, 60 MSa/s

Table 3. Signal Output

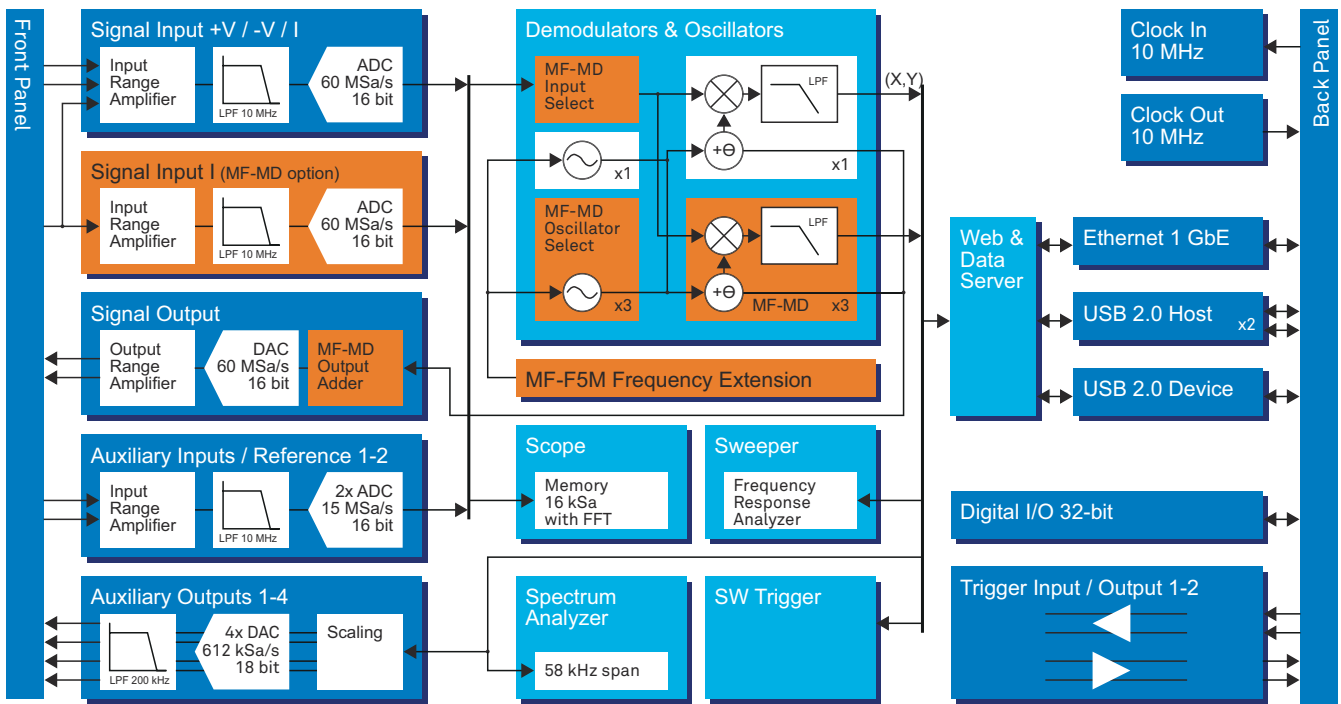
frequency range	DC - 500 kHz / 5 MHz
output ranges	± 10 mV, 100 mV, 1 V, 10 V
signal adder (Aux In 1)	± 10 V, DC - 500 kHz / 5 MHz
D/A conversion	16 bit, 60 MSa/s

Table 4. Demodulators & Reference

number of demodulators	1 dual-phase (4 with MF-MD)
output sample rate	over LAN: up to 200 kSa/s on Aux outputs: 612 kSa/s
time constant	500 ns to 76 s
measurement bandwidth	80 μHz to 200 kHz
filter slope (dB/Oct)	6, 12, 18, 24, 30, 36, 42, 48
phase resolution	10 μdeg
frequency resolution	1 μHz

Table 5. Auxiliary & Others

auxiliary outputs	4 channels, ±10V, amplitude, X, Y, R, θ, frequency, manual
auxiliary inputs	2 channels, ±10 V, 15 MSa/s
connectivity	LAN / Ethernet, 1 GbE USB 2.0, 480 MBit/s USB 2.0 Host (dual)
clock	10 MHz input and output
digital I/O	4 x 8 bit, bidirectional



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About Zurich Instruments

Zurich Instruments makes lock-in amplifiers, phase-locked loops, and impedance spectroscopes that have revolutionized instrumentation in the high-frequency (HF) and ultra-high-frequency (UHF) ranges by combining frequency-domain tools and time-domain tools within each product. This reduces the complexity of laboratory setups, removes sources of problems and provides new measurement approaches that support the progress of research.

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