SynkTek

MCL1-540

Multichannel Lock-in Measurement System

Flexible lock-in platform
for the highest research demands

Applications

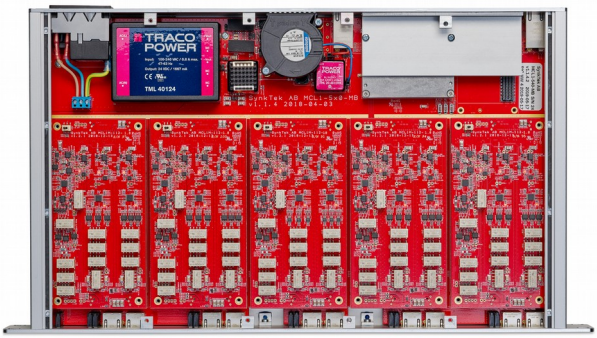
- Transport measurements, bridges
- Multi-terminal measurements
- Differential d*I* / d*V* characteristics
- Hall-probe arrays
- Calorimetry (AC steady state, 3-omega, relaxation)
- AC susceptibility
- Thermal conductivity
- Optical spectroscopy, interferometry
- Strain-gauge systems
- Vibration measurements
- Semiconductor/photovoltaics characterization
- Correlation measurements

The MCL1-540 is a multichannel lock-in amplifier system for the most demanding measurements. With its modular design, the system can synchronously measure up to 10 analog input voltages and 5 outputs currents. Each input has its own dedicated, low-noise preamplifier stage, enabling continuous measurements from nV levels to 10 V.

Even simple resistance measurements require a pair of lock-in amplifiers to measure both current and voltage precisely. The main advantage with the MCL1-540 system is its patented, all-through synchronization. If the measurements are synchronized both in frequency and time, the result will be immune to noise as well as changes in excitation amplitude or frequency. The result is ultimate performance.

The integration of all lock-in amplifiers and analog channels into a single measurement system provides several advantages. The system can easily be configured into advanced multi-harmonic measurement schemes. Outputs can combine DC and AC signals of desired frequency, amplitude, and phase, for differential current-voltage characteristics, generation-detection experiments, and demanding mixed-frequency setups. The integrated preamplifiers are aware of the excitation frequencies while the system is aware of the gains. The preamplifiers can therefore advantageously be set to auto-range, making even the most complex measurement easily manageable.

The system comes with all options and software included. New modules can be easily added.



General features

- Synchronized lock-in measurements of up to 15 analog signals, each with multiple frequency analysis and DC separation
- All modules fully integrated and synchronized
- Simultaneous sampling ADCs and DACs - no multiplexing
- Integrated, auto-ranging low-noise preamplifier stages with high input impedance - no need for additional preamplifiers

Lock-in features

- Frequency range DC - 500 kHz
- Two lock-in amplifier sets, each with a given base frequency
- Each lock-in amplifier set with 15 processing channels on arbitrary inputs and/or harmonics
- Synchronous processing channels, each with *X*, *Y*, *DC*, *R* and θ readings
- Phase resolution 64 bit, integral resolution 96 bit

Module features

- 2 differential analog inputs
- 1 analog voltage output
- Current output measurement on ground return
- Digital trigger/phase marker output/input
- up to 5 modules per system

Analog inputs

- 18-bit ADCs at 1 MSPS
- Full range ±10 V
- Preamplification gain 1 to 5000 in 12 steps
- Seamless auto-ranging
- DC & AC-coupling, < 0.2 Hz break frequency

Analog outputs

- 20-bit DAC at 1.33 MSPS
- ±10 V, ±1 V and ±0.1 V ranges
- Up to 50 mA output current
- Low-noise mode and and mode with integrated current measurement on ground return
- Floating output option
- Noise floor at 0.1 V range < 4 nV/√Hz (low-noise mode) and < 30 nV/√Hz (current measurement mode), max 55 nV/√Hz at 10 V full range

Analog input module options

- ~1.8 nV/√Hz at 1 GΩ amplifier impedance (typical 15/0.5 nA input bias/offset current)
- ~2 nV/√Hz at 1 GΩ amplifier impedance (typical 5/0.5 nA)
- ~4 nV/√Hz at 30 GΩ amplifier impedance (typical 0.5/0.1 nA)
- ~18 nV/√Hz at ~TΩ amplifier impedance (typical 10/5 pA)

Current measurements

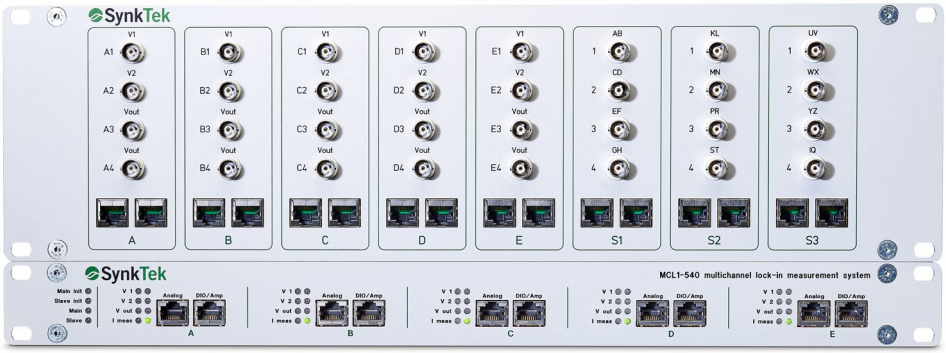
- Integrated current measurement on output ground return
- Current measurement ranges from 25 nA to 50 mA full range in 20 steps
- Seamless auto-ranging

Interfaces

- Control: 1000BASE-T Ethernet and USB 2.0
- USB-host and SDHC card reader for data storage
- Integrated web server
- LabVIEW API, Python API, REST Web API
- 40 W power supply
- RJ45 (8P8C modular connectors) for analog signals

Accessories

- Breakout boxes to BNC, Banana
- Signal cables with individually shielded twisted pairs 0.3 / 0.5 / 1 / 2 / 5 / 10 / 20 m
- Custom-design connectivity to Fischer connector and PPMS



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