

PHILL™ DATASHEET

Invisible-Light Labs GmbH



PHILL™ is a cutting-edge resonance actuation and tracking device, specifically designed for resonant sensors. It features a self-sustaining oscillator (SSO) and utilizes a frequency counter-based architecture, which is enhanced with wide band-pass and digital low-pass filtering. Such configuration optimally conditions signals by converting sinusoidal signals into precise rectangular waveforms. This initiation of the pulse generation mechanism effectively drives the resonator, ensuring accurate frequency data and robust stability without intermodulation noise.

PHILL™ offers the same frequency stability as systems using a Phase-Locked Loop (PLL) with a lock-in-based approach. Unlike PLL systems, PHILL™ maintains frequency stability without ever losing 'lock'. This is due to its ability to freely select the oscillator bandwidth in the frequency counter, independent of circuit constraints. Additionally, PHILL™ simplifies operations by eliminating the need for PID parameter adjustments to track the resonator phase, combining ease of use, robustness, response speed and precision in performance.

FEATURES

- Resonance Mode selection
- Frequency data acquisition
- Positive feedback oscillation driving and measurement in one system
- Extremely stable oscillation frequency tracking and driving
- Integrated pre-amplifier

- OEM-Software
- Robust and easy-to-use

APPLICATIONS

- NEMS and MEMS chip sensor measurements
- Quartz crystal balance measurements
- Temperature control of resonator
- Calibration of the oscillation frequency of resonators

KEY CHARACTERISTICS

- Plug-and-play Micro-USB connection to PC
- Communicates between EMILIE and your spectrometer software
- Data visualization and processing for stand-alone systems

Table 1: General specifications

Dimensions (LxWxH)	23x17x6 cm
Weight	1.1 kg
Enclosure material	3.3206, AlMgSi0.5 powder-coated seals: TPE
Supply Voltage	5 V DC (SELV)
Power rating	6.25 W, max. 20 W
I/O	Sensor In (BNC), Drive (BNC), Frequency Out (BNC), EMILIE Connector (SUB-D)
Host connection	Micro-USB 2.0, 480 MBit/s Ethernet 10/100/1000 MBit/s
Operating environment	IEC 61010, indoor, installation category II, pollution degree 2
Storage temperature	5 °C to 35 °C
Operating temperature	5 °C to 35 °C

Table 2: Analog input

Input frequency range	1 kHz to 1 MHz
Input impedance	10 k Ω
Input voltage	± 1 VDC
A/D conversion	12 bit, 80 MSa/s

Table 3: Analog output

Frequency counter output frequency	3 kHz to 1 MHz
Resonator drive output frequency	1 kHz to 1 MHz
Frequency counter output voltage	± 3 VDC
Resonator drive output voltage	± 3 VDC
D/A conversion	14 bits, 200 MSa/s

Table 4: Preamplification

Amplification stages	1, 3, 10 and 30
Bandwidth	1 MHz
Slew rate	30 V/ μ s

Table 5: Band-pass filter

Center frequency range	1 kHz to 1 MHz
Maximum Q-Factor	1000
Gain	1
Fractional frequency fluctuation	10^{-9} @ 100 kHz input signal and 1 sec averaging

Table 6: Frequency Counter

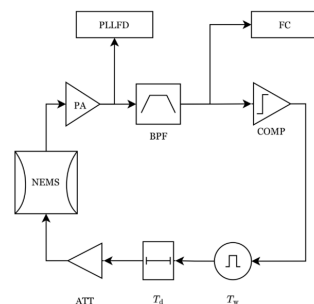
Resolution at 100 Hz with no averaging	1 Hz
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Table 7: Frequency output filter

Cut off	1 Hz to 10 kHz
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Table 8: Scope

Input channels	Signal input, bandpass out, drive
Trigger channels	Signal input, bandpass out
Trigger modes	Edge
Sampling rates	100 kSa/s to 20 MSa/S
Vertical resolution	14 bits
Bandwidth limit mode, vertical resolution increase	Sample decimation, averaging



Block representation of the SSO tracking scheme

