DCS500PA Digital Lock-in Amplifier, 50 mHz–120 kHz, 1 nV–1 V Sensitivity

Model DCS500PA · waveqvanta.com/products/dcs500pa-digital-lock-in-amplifier

Digital lock-in amplifier for recovering weak modulated detector signals from 50 mHz to 120 kHz.



The DCS500PA is a digital lock-in amplifier covering 50 mHz to 120 kHz, with low-noise voltage and current inputs and full-scale sensitivity from 1 nV to 1 V. It offers more than 100 dB dynamic reserve and CMRR, time constants from 10 µs, harmonic detection and a built-in sine reference oscillator. All functions can be controlled and read out over RS-232 or USB.

Key features

- Frequency range 50 mHz–120 kHz
- Low-noise voltage (single-ended or differential) and current inputs
- Full-scale sensitivity from 1 nV to 1 V in a 1-2-5 sequence
- Dynamic reserve and CMRR above 100 dB
- Time constants from 10 µs to 30 s (to 3 ks below 200 Hz), 6/12/18/24 dB/oct roll-off
- Harmonic detection 2F, 3F … nF up to 120 kHz
- 3.5-inch TFT display of X, Y, R and θ; RS-232 and USB control

Specifications

Frequency Range	50 mHz–120 kHz
Voltage Input	Single-ended or differential; 10 MΩ // 25 pF, AC or DC coupled
Current Input	10^6 or 10^8 V/A; 1 kΩ to virtual ground
Full-Scale Sensitivity	1 nV–1 V in a 1-2-5 sequence
CMRR	Above 100 dB to 10 kHz, decreasing by 6 dB/oct
Dynamic Reserve	Above 100 dB
Gain Accuracy	0.2% typ., 1% max.
Input Noise	10 nV/√Hz at 1 kHz; 0.13 pA/√Hz at 1 kHz; 0.013 pA/√Hz at 100 Hz
Line Filters	50/60 Hz and 100/120 Hz
Grounding	BNC shield grounded or floated via 1 kΩ to ground
Reference Input	TTL or sine, 50 mHz–120 kHz, 1 MΩ // 25 pF
Phase Resolution	0.01°; absolute below 1°, relative below 0.01°
Phase Noise	Internal ref. below 0.0001° rms at 1 kHz; external ref. 0.005° rms at 1 kHz
Phase Drift	Below 0.1°/°C under 10 kHz; below 0.5°/°C over 10 kHz
Harmonic Detection	2F, 3F … nF to 120 kHz (n below 32,767)
Acquisition Time	Internal ref. instantaneous; external ref. (2 cycles + 5 ms) or 40 ms, whichever is larger
Time Constants	10 µs–3 ks (below 200 Hz), 10 µs–30 s (above 200 Hz); 6/12/18/24 dB/oct
Synchronous Filters	Available below 20 Hz
Harmonic Rejection	-90 dB
Stability	Digital outputs and display: no zero drift; analog outputs: below 5 ppm/°C
Internal Oscillator	50 mHz–120 kHz, accuracy 25 ppm + 30 µHz, resolution 1 mHz
Oscillator Distortion	-80 dBc (below 10 kHz), -70 dBc (above 10 kHz)
Oscillator Output	Sine, 0.10–1 Vrms, 1% accuracy, 50 ppm/°C stability, 50 Ω

Display	3.5-inch 320 × 240 TFT; X, Y, R, θ; large numeric readout
CH1 and CH2 Outputs	X, Y, R or θ; ±5 V; 100 Ω
Interfaces	RS-232 and RS-232-to-USB; all functions controllable via USB
Power	220/240 V AC, 50/60 Hz, 30 W
Dimensions (W × D × H)	259 × 320 × 115 mm with feet (102 mm high without feet)
Weight	3.2 kg

Typical applications

- Detection of chopped optical signals from photodetectors
- Weak-signal spectroscopy with monochromators
- Infrared detector readout with PbS, InSb and MCT detectors
- Harmonic and phase-sensitive measurements