



# MODEL 420

## DUAL PHASE LOCK-IN AMPLIFIER

Scitec Instruments' Model 420 analogue dual phase lock-in amplifier uses advanced technology to provide a high performance instrument which is both versatile and easy to use.

- Dual phase operation with modulus (R) calculation
- Differential or single-ended input
- Gain settings from 3 $\mu$ V to 1V
- High performance wide bandwidth input gain stage
- Analogue meter for display of X, Y or R output signals
- Separate X, Y and R output BNCs
- X & Y Offset controls
- Output time constants from 100 $\mu$ s to 30s
- 1F and 2F reference signal operation
- 90° step and fine phase control

### INPUT SIGNAL CHANNEL

The input signal channel amplifies the input signal to a level suitable for the demodulator. High performance, low-noise, broad-band amplifiers are used throughout.

The input circuit can accept a differential or single-ended input via the front panel signal input BNC. Jumper options within the unit allow the outer BNC contact or screen to act as a high impedance differential input, as a low impedance (100 $\Omega$ ) differential input or allow it to be connected to ground for single-ended operation.

The input channel can be either AC or DC coupled via internal jumper selection. It is recommended that the unit is used in DC coupled mode as the noise performance is improved. In this mode, through the careful design of the lock-in, up to  $\pm 10$ V of DC offset is allowed before saturation for gain settings from 1V to 300 $\mu$ V,  $\pm 1$ V of DC offset for gain settings from 100 $\mu$ V to 10 $\mu$ V and  $\pm 300$ mV of DC offset for the gain setting of 3 $\mu$ V.

- Input: High or low impedance differential or single ended via front panel BNC
- Sensitivity: 3 $\mu$ V to 1V (for 1V output) switched in 1, 3, 10 steps
- Input Impedance: 10<sup>12</sup> $\Omega$  || 1nF, dc coupled
- Frequency: 10Hz to 100kHz
- Maximum Inputs:  $\pm 16$ V before input protection circuitry comes into operation. The input BNC has been tested for electrostatic discharge damage.
- Noise: Scitec Instruments no longer specify input noise values as this leads to comparison with other manufacturers data sheets which are clearly grossly in error. If you wish for details of these values then please contact us and we will explain the situation.
- Gain Accuracy: 1%
- Gain Stability: 200ppm/°C
- Dynamic Reserve: 60dB

### DEMODULATOR

The output of the signal input stage is processed using two very high bandwidth demodulators each operating 90° apart from each other to produce the X and Y signals. Offsets introduced at this stage are automatically removed via novel feedback mechanisms.

### LOW PASS FILTER

The X and Y outputs from the demodulator are passed through two first order low pass filters and then amplified. The X and Y signals are combined to produce R the modulus signal, where  $R = \sqrt{X^2 + Y^2}$ , before output via a front panel BNC.

- Time Constant: 100 $\mu$ s to 30s in 1, 3, 10 steps
- All Outputs:  $\pm 1$ V output corresponds to full scale Input. Short circuit protection included.
- Front Panel Output: X, Y or R switchable output
- Rear Panel Outputs: X, Y and R separate outputs
- Offset: Up to 1x full scale for both X and Y channels, switchable on or off

### REFERENCE CHANNEL

The reference input circuitry uses a phase locked loop to lock on to a range of signals, such as TTL pulses or sinusoidal waveforms. A phase shifting circuit allows the reference signal to be moved with relation to the signal input. Signals at both the reference frequency and twice the reference frequency can be monitored.

- Frequency: 10Hz to 100kHz
- Input Impedance: 5.6M $\Omega$  ac coupled
- Trigger: Sine: 100mV rms min (15V max.) Pulse: 5V, 95% mark/space ratio min.
- Acquisition time: 10s max.
- Phase control: 90° steps + fine shift in range 0° - 100°
- Phase Drift: 0.1°/°C

### GENERAL

- Power: 115Vac, 230Vac; 50-60Hz; 10VA max.

- Mechanical: 440mm W x 87mm H x 190mm D (17½in x 3½in x 7½in)
- Temperature range: 0-50°C (operational)
- Warranty: 2 years from date of shipment

### STANDARDS

- Electrostatic Discharge BS EN 61000-4-2 Level 2
- Surge BS EN 61000-4-5 Level 3
- Burst & Transient BS EN 61000-4-4 Level 2
- RF Emissions BS EN 50081-2
- RF Immunity BS EN 61000-4-3 / BS EN 50082-2
- Low Voltage Directive BS EN 61010-1



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