

# Digital Lock-In Amplifier

## DCS500PA High Performance Lock-in



### Specifications

#### Signal Channel

|                        |                                                                 |
|------------------------|-----------------------------------------------------------------|
| Voltage Input Mode     | Single-ended or Differential                                    |
| Full-scale Sensitivity | 1nV to 1 V in a 1-2-5 sequence                                  |
| Current Input          | 10 <sup>6</sup> or 10 <sup>8</sup> V/A                          |
| Impedance              |                                                                 |
| Voltage                | 10 M $\Omega$ // 25pF, AC or DC coupled                         |
| Current                | 1k $\Omega$ to virtual ground                                   |
| C.M.R.R                | >100 dB to 10 KHz, decreasing by 6 dB/ oct                      |
| Dynamic Reserve        | >100 dB                                                         |
| Gain Accuracy          | 0.2% typ, 1% max                                                |
| Noise                  | 10nV/ $\sqrt{\text{Hz}}$ at 1 kHz                               |
|                        | 0.13pA/ $\sqrt{\text{Hz}}$ at 1 kHz                             |
|                        | 0.013pA/ $\sqrt{\text{Hz}}$ at 100 Hz                           |
| Line Filters           | 50/60 Hz and 100/120 Hz                                         |
| Grounding              | BNC shield can be grounded or floated via 1k $\Omega$ to ground |

#### Reference Channel

|                           |                                                      |
|---------------------------|------------------------------------------------------|
| Input                     |                                                      |
| Frequency Range           | 50 mHz to 120 kHz                                    |
| Reference Input           | TTL or sine                                          |
| Input Impedance           | 1 M $\Omega$ /25 pF                                  |
| Phase                     |                                                      |
| Resolution                | 0.01° increments                                     |
| Absolute Phase Resolution | <1°                                                  |
| Relative Phase Resolution | <0.01°                                               |
| Phase Noise               |                                                      |
| Internal Ref.             | Synthesized, <0.0001°rms at 1kHz                     |
| External Ref.             | 0.005°rms at 1 kHz (100 ms time constant, 12 dB/oct) |
| Drift                     | <0.1°/°C below 10 kHz                                |
|                           | <0.5°/°C above 10 kHz                                |
| Harmonic Detection        | 2F, 3F, ...nF to 120kHz(n<32,767)                    |
| Acquisition Time          |                                                      |
| Internal Ref.             | Instantaneous acquisition                            |
| External Ref.             | (2 cycles+5 ms) or 40 ms, whichever is larger        |

### Features

- 50mHz to 120kHz frequency range
- Low-noise current and voltage inputs
- 1nV to 1V full-scale sensitivity
- Time constants extending from 10 $\mu$ s to 30s
- Up to 100dB dynamic reserve
- Up to 100dB CMMR

### Demodulator

|                     |                                            |
|---------------------|--------------------------------------------|
| Stability           |                                            |
| Digital outputs     | no zero drift on all setting               |
| Display             | no zero drift on all setting               |
| Analog outputs      | <5 ppm/°C for all dynamic reserve settings |
| Harmonic rejection  | -90dB                                      |
| Time constants      | 10 $\mu$ s to 3ks (<200Hz)                 |
|                     | 10 $\mu$ s to 30s (>200Hz)                 |
|                     | (6, 12, 18, 24 dB/oct rolloff)             |
| Synchronous filters | Available below 20 Hz                      |

### Internal Oscillator

|            |                                           |
|------------|-------------------------------------------|
| Frequency  |                                           |
| Range      | 50 mHz to 120 kHz                         |
| Accuracy   | 25 ppm+30 $\mu$ Hz                        |
| Resolution | 1 mHz                                     |
| Distortion | -80 dBc (f<10 kHz),<br>-70 dBc (f>10 kHz) |
| Amplitude  | 0.10Vrms to 1 Vrms                        |
| Accuracy   | 1%                                        |
| Stability  | 50 ppm/°C                                 |
| Outputs    | Sine, 50 $\Omega$ output impedance        |

### Display

|                    |                                                  |
|--------------------|--------------------------------------------------|
| Screen             | 3.5 inch, 320x240 TFT                            |
| Display quantities | 4 channels of data to display X,Y,R and $\theta$ |
| Display types      | Large numeric readout                            |

### Outputs

|                     |                   |
|---------------------|-------------------|
| CH1 and CH2 Outputs |                   |
| Function            | X, Y, R, $\theta$ |
| Amplitude           | $\pm$ 5 V         |
| Impedance           | 100 $\Omega$      |

### Interfaces

|                                                                                                                |
|----------------------------------------------------------------------------------------------------------------|
| RS232 and RS232 to USB interfaces. All instrument functions can be controlled and read through USB interfaces. |
|----------------------------------------------------------------------------------------------------------------|

### General

|                    |             |
|--------------------|-------------|
| Power requirements | Height      |
| Voltage            | 220/240V AC |
| Frequency          | 50/60 Hz    |
| Power              | 30 Ww       |
| Dimensions         |             |
| Width              | 259 mm      |
| Depth              | 320 mm      |