

CLARKE-HESS MODEL 8100

# TRANSCONDUCTANCE AMPLIFIER

HIGHLY ACCURATE ● 100 AMPERES AT 100 kHz ● 7 VOLT COMPLIANCE



- 200 $\mu$ A to 100A in six ranges
- 100% over range capability
- 50ppm short term stability
- 0.04% dc and 0.10% ac accuracy
- Accuracy independent of load
- Distortion below -60dB
- Complete Front Panel Calibration
- IEEE-488.2 Interface standard
- Stable with inductive loads
- High output impedance
- Power Factor corrected supplies (PF>0.98 at 100A output)



## WIDE CURRENT RANGE / EXTREMELY BROADBAND

The Model 8100 Transconductance Amplifier is a precision, high stability, high accuracy instrument which produces an output current which is directly proportional to the input voltage over the frequency range from dc to 100kHz. Six overlapping ranges, with full scale values of 2mA, 20mA, 0.2A, 2A, 20A and 100A, provide low distortion output currents from 200 $\mu$ A to 100A. With the exception of the 100A range, for which a 1V rms input produces the 100Arms output current, the transconductance of the other ranges is set such that a 2Vrms input produces the full scale output current. With the exception of the 100A range, all of the other ranges may be operated to twice their full scale value without any deterioration in performance.

## LOW TOTAL HARMONIC DISTORTION

The total harmonic distortion introduced by the transconductance amplifier is less than -60dB up to 10kHz (typically 20kHz) and less than -40dB to 100kHz for all current ranges.

## AMPLE COMPLIANCE VOLTAGE

The maximum compliance voltage (the maximum permissible voltage which can be developed across a load connected across the output) is at least 7Vrms (7V for dc) for all ranges and all frequencies. This high voltage limit permits a large variety of loads to be driven

from the transconductance amplifier. These loads may be resistive or resistive with capacitive or inductive components without causing any instability in the output current. An OVERCOMPLIANCE indicator is illuminated when the 7V has been exceeded.

## FREQUENCY AND COMPLIANCE VOLTAGE DISPLAYED

Both the compliance voltage (0.00V - 7.00V) and the frequency of the input voltage drive (10Hz - 500kHz) are continuously displayed by bright seven-segment LED displays.

## HIGHER FREQUENCY OUTPUTS AVAILABLE

Although accuracy is not specified, the Model 8100 will normally supply full scale currents up to at least 500kHz into suitable loads.

## WIDE RANGE OF APPLICATIONS

The Model 8100 is ideally suited for calibration of any device that requires a precision current excitation. High current and high frequency combinations are available that have heretofore been difficult to obtain. The Model 8100 may be used to calibrate (or to develop) current transformers, shunts, ammeters and V-A-W meters. Whenever the compliance voltage limits will allow it, units may be paralleled to obtain even higher currents



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## EASY TO CALIBRATE

The Model 8100 has a CALIBRATION PANEL on the front panel which allows the unit to be calibrated without having to remove either the top or bottom cover. The Calibration Mode is activated by breaking the seal over the CAL key and then depressing it with a small, narrow screwdriver. The dc offset and the transconductance value may then be set for each current range. When the CAL key is again depressed, the new calibration points are stored in an internal non-volatile memory.

## COAXIAL OUTPUT FOR HIGH CURRENTS

To minimize the output inductance, the current output for both the 20A and the 100A range is supplied through a coaxial LC connector. The output current for the lower current ranges, where inductance is not as much of a problem, is supplied through a set of

recessed safety terminals.

## IEEE-488.2 BUS CONTROL

The Model 8100 is equipped with an IEEE-488.2 interface which incorporates all of the common commands and queries. Any function which can be entered manually can be sent by a bus controller to the Transconductance Amplifier over the IEEE interface. In addition, the frequency and the compliance voltage, which are displayed on the front panel, can be queried by the controller and returned to it over the bus. The status and states (e.g. current range, standby, etc.) of the Transconductance Amplifier can also be queried by the controller and returned over the bus. The bus address is set from the front panel and is displayed both at turn on and when the LOCAL key is pressed. A REMOTE lamp indicates that the Model 8100 has been placed in its Remote state by the controller.

# SPECIFICATIONS

## MODEL 8100 TRANSCONDUCTANCE AMPLIFIER

### RANGES AND TRANSCONDUCTANCE

Range	Output Current	Transconductance
100A	20A to 100A	100 Siemens
20A	2A to 40A	10 Siemens
2A	0.2A to 4A	1 Siemens
0.2A	20mA to 0.4A	100 Millisiemens
20mA	2mA to 40mA	10 Millisiemens
2mA	0.2mA to 4mA	1 Millisiemens

### 10 MINUTE TRANSCONDUCTANCE STABILITY

	0%- 100% Full Scale	100%- 200% Full
Frequency	±(% Reading +%)	% of Reading
dc	±(0.002 + 0.002)	±0.004
10Hz - 10kHz	±(0.005 + 0.005)	±0.010
10kHz - 20kHz	±(0.010 + 0.010)	±0.020
20kHz - 50kHz	±(0.015 + 0.015)	±0.030
50kHz -	±(0.030 + 0.030)	±0.060

The stability specification is valid after the Model 8100 has been in a particular configuration for at least 2 minutes.

### TANSCONDUCTANCE UNCERTAINTY (1 YEAR)

	0% - 100% Full Scale	100% - 200% Full
Frequency	±(% Reading+%)	% Reading
dc	±(0.02 + 0.02)	±0.04
10Hz - 10kHz	±(0.05 + 0.05)	±0.10
10kHz - 20kHz	±(0.10 + 0.10)	±0.20
20kHz - 50kHz	±(0.15 + 0.15)	±0.30
50kHz -	±(0.30 + 0.30)	±0.60

Specifications are based on a resistive load. Appropriate corrections must be made for reactive load components.

The dc uncertainty is based on the average of the transconductance obtained with a positive and a negative input.

<sup>1</sup> Except 100A Range

**COMPLIANCE VOLTAGE:** 7Vrms for ac and 7V for dc. The accuracy of the display is ±0.10V

**TOTAL HARMONIC DISTORTION:** -60dB from 10Hz to 10kHz  
-50dB to 50kHz  
-40dB to 100kHz

**NOISE:** 0.05% of current range in a band from dc to 100kHz

**INDUCTIVE LOADS:** Free from oscillations for inductive loads up to 1mH.

**INPUT IMPEDANCE:** 500kΩ from each differential input terminal to chassis ground.

**FREQUENCY MEASUREMENT UNCERTAINTY:** 0.01% of reading

**IEEE-488.2 INTERFACE SUBSETS:** SH1, AH1, T6, L4, SR1, RL1, PP0, DT0, DC1

**DISPLAYS:** Three LED (10.9mm /0.43 inch high) Displays. One five digit display for Input Frequency, one three digit display for Compliance Voltage and one two digit display for Calibration Mode. The display is updated 10 times a second.

**TEMPERATURE RANGE:** Operating . . . . . 10°C to 35°C  
Within Specifications . . . . . 18°C to 28°C  
Storage . . . . . -20°C to 60°C

**RELATIVE HUMIDITY:** Less than 80%

**WARMUP TIME:** Thirty minutes for all specifications

**POWER REQUIREMENTS:** 207V to 253V, 50Hz to 60Hz, 2500V-A, Power Factor Corrected

**PHYSICAL:** Weight . . . . . 36.4 kilograms (80 pounds)  
Size . . . . . 43.2cm x 40.0cm x 55.9cm (17" x 15.75" x 22")