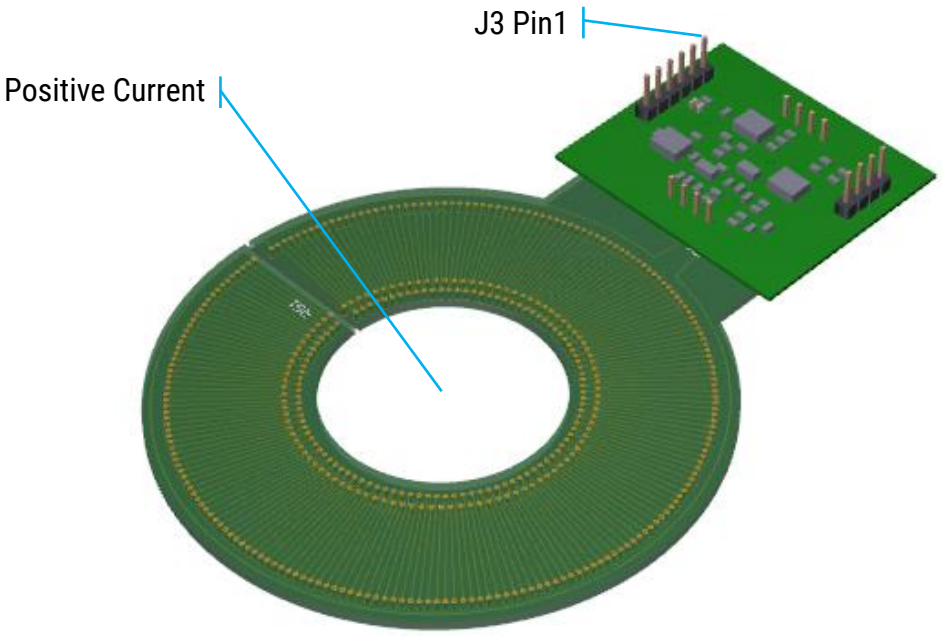
AS057 – LCR600A Rogowski Sensor

Application Note



The 600A Rogowski Current Sensor is made from 2 parts, the LCR011 Sensor PCB and the LCR013 Integrator / Amplifier PCB.

Module Configuration	LCR011 Sensor and LCR013 Integrator/Amplifier
Power Supply	J3 Pin1 0V, Pin2 Vcc. Vcc 5V to 18V, current limit 8mA. Note 2.
Differential Output	J3 Pin5 Vout-, Pin6 Vout+. Range ±2.0V. Voltage on pin 5 is Vcc/2 with respect to 0V
Bandwidth	30Hz to 34kHz. Limited by the analogue integrator and filter.
Output Scaling	Set to ±600A peak fullscale ±2.0V.
Dimensions	Sensor, Nominal 84mm diam, aperture 35mm. Amplifier, Nominal 41mm, 44mm width, 10mm height (excluding connectorJ3) Protective coating may change these dimensions.
Operating Temperature	Designed for Ambient -55 to +125˚C. Performance tested -30 to 110˚C.
Average error over measurement range and temperature range	Average error 3.2Aac Standard Deviation 10.9Aac Note 1.
Linearity error over measurement range and temperature range	Linearity error 0.001Aac Standard Deviation 0.25A. Note 1.

Note 1: measured during Design Assurance Test
Note 2: The connector J3 is 0.1inch pitch and 6 pins.

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Calibration

Sensors are calibrated to remove DC offset and set the scaling at room ambient temperature 20° to 30°C. As part of the Design Assurance Test the sensors were characterised at various temperatures and linear equations fitted to the results. The Linearity error was measured but this also indicates that the sensor can be used with better accuracy if the system can use the linear equations by measuring the operating temperature as well as the sensor output.

A typical set of equations might be:

Temperature	Calibration equation
-20˚C	y = 308.36x + 0.6565
0°C	y = 317.59x + 0.8871
20˚C	y = 312.39x + 0.5266
40°C	y = 311.37x + 0.5495
60˚C	y = 304.71x + 0.4585
80°C	y = 296.32x + 0.625
100˚C	y = 289.88x + 0.5484
110˚C	y = 288.19x + 0.5398

Current is y Amps, measured voltage is x Volts.
Summary of performance measured during Design Assurance AC Test:

Temperature	Using nominal calibration 300A/V: Average Error and Standard Deviation over full operating range. Aac	Using the linear equations: Average Error and Standard Deviation over full operating range. Aac
-20˚C	8.90 SD 7.46	0.001 SD 0.26
0˚C	15.41 SD 11.49	0.001 SD 0.21
20˚C	9.04 SD 6.85	0.001 SD 0.33
40˚C	8.25 SD 6.30	0.002 SD 0.25
60˚C	3.39 AD 3.62	0.001 SD 0.32
80˚C	2.77 SD 3.92	0.002 SD 0.21
100˚C	7.80 SD 6.82	0.002 SD 0.22
120˚C	9.18 SD 7.68	0.001 SD 0.25

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Current Sensor Modules

Aero Stanrew have developed a modular approach to the manufacture of current sensors for use with electrical systems in harsh environments. The modular design allows a customer to select key sensor parameters so that Aero Stanrew can build a product to meet the customer's requirements. The devices feature a range of Hall and Rogowski sensors, amplifiers and digital converters, and together these modules enable economical solutions that are high in quality and performance. Circuit boards have been developed to TRL5 standard ready for use in relevant harsh environments, especially aerospace applications such as electrical systems, generators and motor drives.

List of Modules:

Part Type	Description
HEC005	Hall sensor, range 400A to 1200A
HEC006	Buffered Hall sensor, range 30A to 1200A
HEC001	Hall sensor amplifier
LCR011	Rogowski coil sensor 400Aac to 2000Aac
LCR012	Rogowski amplifier (di/dt)
LCR013	Rogowski integrator and amplifier
LCR014	Rogowski integrator and dual amplifier (e.g. 400Aac, 2000A transient)
DOS001	12bit ADC, one or two channel, SPI interface

Issue	Date	Change
RevA	04/03/2019	First Draft

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