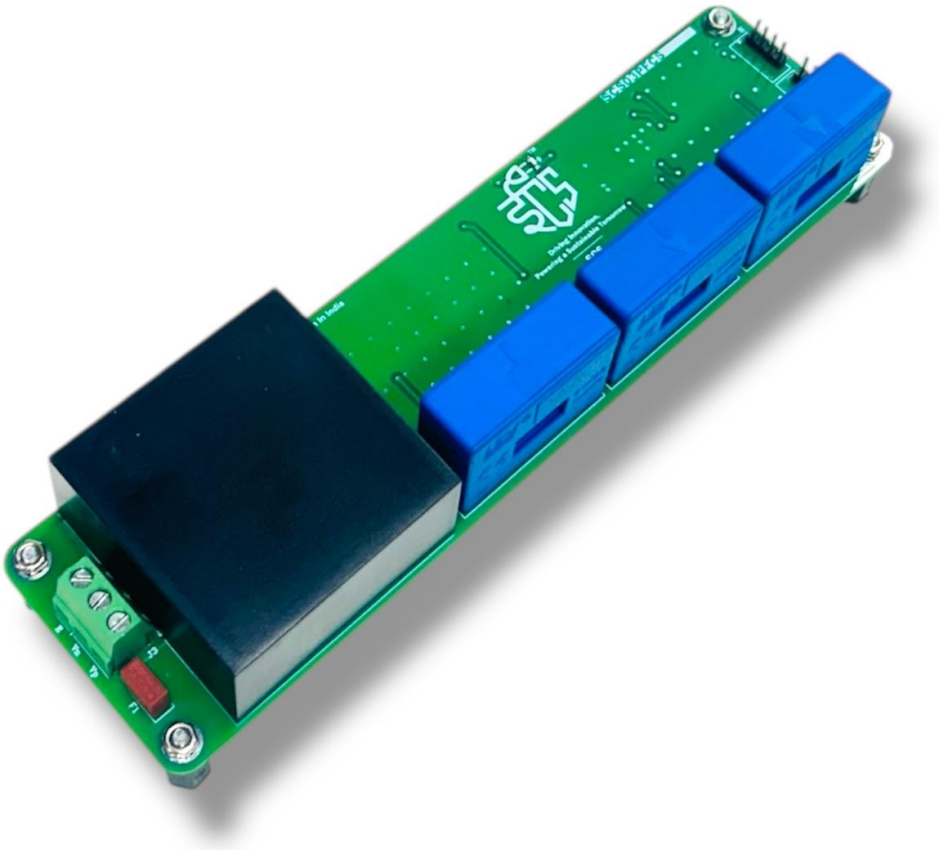
User Manual

SCS03PFCSXXX

(Power Frequency Current Sensors Board)



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Jan, 2025. Rev. – 1.1

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1. System Overview

1.1 Features

- AC/DC universal current sensors board.
- On board auxiliary power supplies.
- Excellent accuracy and linearity.
- Thermal and noise optimized PCB design.
- Up to three onboard current sensors (LEM make).
- Current sensing range Maximum 25A, 50A and 100A are available.
- Bi-polar sensor output between -5 to 5 volts.
- Uni-polar sensor output between 0 to 3 volts with offset of 1.5 volts
- Board can be power up with single phase 85-300Vac power supply.
- LED indication for power on.

1.2 Board Protection

- Over Current
- Over Voltage
- Short Circuit
- As per IEC 61000-4 Standard

1.3 Applications:

- Power Converters
- Electrical Drives
- General purpose industry applications
- Laboratory R&D purposes
- Testing purposes

2. Sensor Gain Calculation

2.1 Conversion Formulas

$$\text{Gain} = \frac{I_{IN}}{V_{OUT}}$$

For DC use mean value and for AC use rms values.

Take three different readings and then average for better accuracy. For better calculation of gain use sensor near to its rated voltage values.

Use accurate multi-meter for calibrate sensors, use DC range for DC measurements and AC range for AC measurements.

To obtain original wave shape in microcontroller/DSP/FPGA/DSPACE:

The current outputs are available in voltage form on pins I_a, I_b, I_c without offset and I_{ao}, I_{bo}, I_{co} with 1.5 volts offset, all referenced to GND. Each output pin has a fixed gain. In the microcontroller, simply multiply the ADC value by the gain in non-offset mode, and in offset mode, subtract 1.5 V from the ADC value first and then apply the gain.

Table 1 Sample AC Current Gain Calculation At V_{ao}

Input rms current(A)	Output rms voltage(V)	Gain
2	0.098	20.40
4	0.200	20
6	0.302	19.86
8	0.405	19.75
10	0.504	19.84
	Average Gain	19.97

2.2 Gain Calculation Examples

Example 1 – DC Channel (Gain Calculation)

Given:

- Input mean Current (I_{in}): 20 A
- Measured Output mean Voltage (V_{out}): 1.8 V

Gain:

$$\text{Gain} = \frac{I_{IN}}{V_{OUT}}$$

$$\text{Gain} = \frac{20}{1.8} = 11.11$$

Example 2 – AC Channel

Given:

- Input rms Current (I_{in}): 10 A
- Measured Output rms Voltage (V_{out}): 0.504 V

Gain:

$$\text{Gain} = \frac{I_{IN}}{V_{OUT}}$$

$$\text{Gain} = \frac{10}{0.504} = 19.84$$

3. Experimental Validation

3.1 Setup

The system was tested using a R load. Input power was supplied by a WANPTEK KPS15010D DC power supply with an output range of 0–150 V and 0–10 A. A SIGLENT SDS824 oscilloscope and FLUKE 15B+ Digital multimeter was used to monitor the output voltage and input current. The overall experimental setup is shown below.

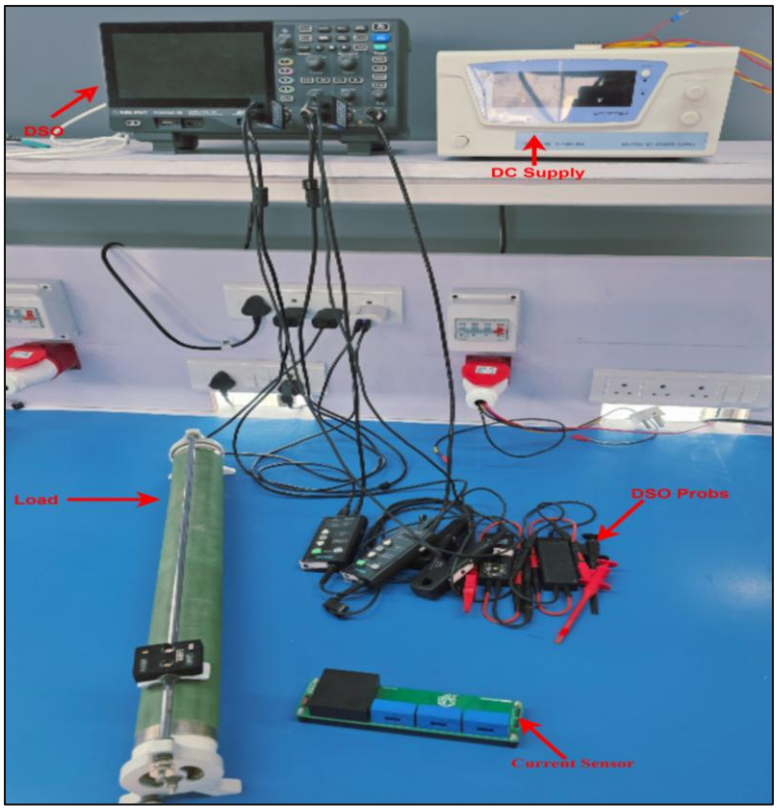

Figure 1 : Experimental setup

3.2 Experimental Results

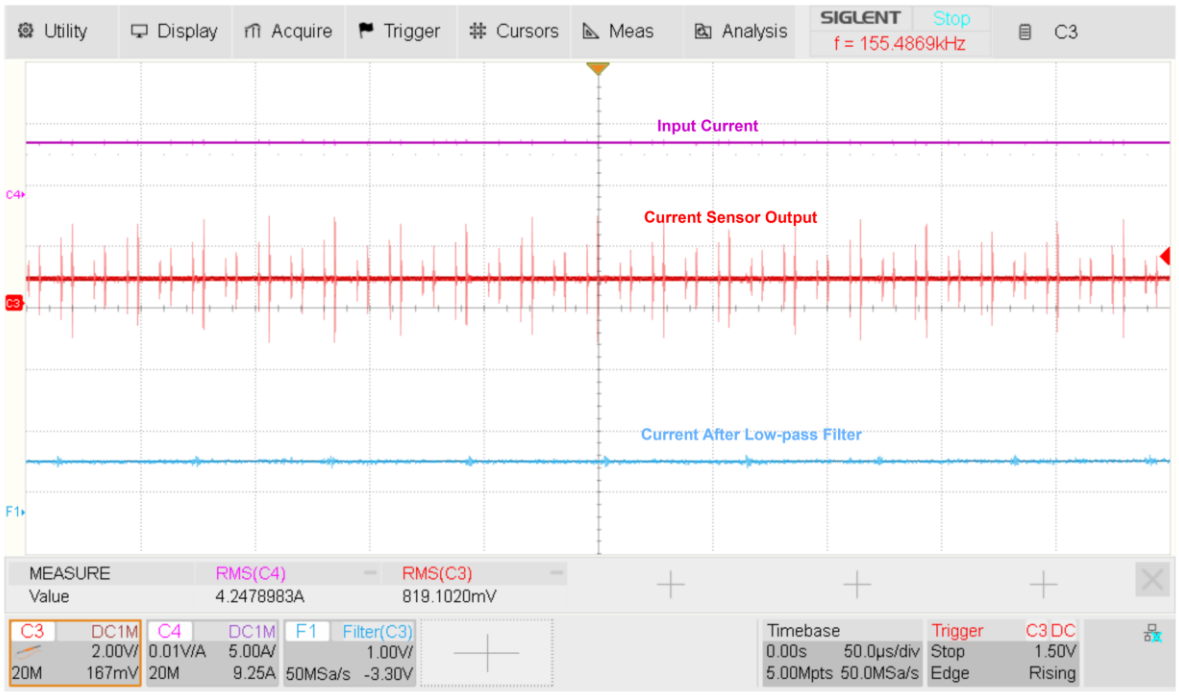

Figure 2 : Results with DC current

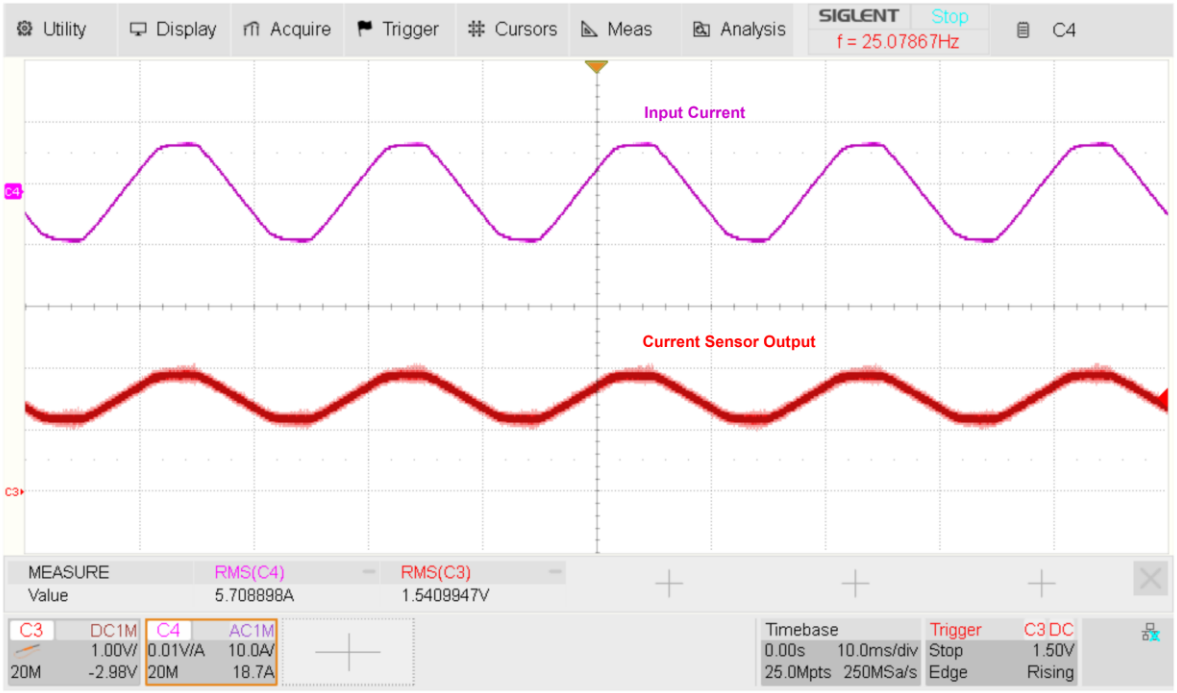

Figure 3 : Results with AC current