

## Smappee accuracy

The Smappee Energy monitor is mostly used to quantify energy consumption costs or production revenues. Accurate energy measurements are vital. Therefore, the Smappee Energy is carefully designed to obtain maximum accuracy.

Generally, when they do occur, inaccuracies are due to three main factors:

- Fluctuations of the reading, expressed in a percentage of the actual consumption value.
- A constant error, expressed in a percentage of the full scale as it is a constant value
- A phase error, which is equivalent to a small erroneous delay between the current and voltage measurements. Since power is the product of the two measurements, this erroneous delay affects the power too.

Smappee has measured all these types of inaccuracies in its measuring system. The final results are summarized in the tables on the right.

There are two physical sources of inaccuracy:

- the current transformers (CT)
- the Smappee monitor itself

Hence we report the accuracy specifically for each combination of monitors and CTs.



## Smappee Energy accuracy (US)

Smappee Energy with SCT02 – 50A

Power Accuracy				
Reference Voltage:	120 V	$\pm$ Percentage error at rated power factor		
Nominal Current:	50 A	PF = 1	PF = 0.8	PF = 0.5
% of nominal current	5%	0.91%	1.98%	3.58%
	20%	0.91%	1.74%	3.01%
	100%	0.89%	1.63%	2.76%
	120%	0.90%	1.75%	3.04%

Smappee Energy with SCT02 – 50A

Power Accuracy (Total)				
Reference Voltage:	120 V	$\pm$ Percentage error at rated power factor		
Nominal Current:	100 A	PF = 1	PF = 0.8	PF = 0.5
% of nominal current	5%	0.86%	1.77%	3.17%
	20%	0.83%	1.55%	2.71%
	100%	0.82%	1.44%	2.46%
	120%	0.83%	1.51%	2.59%

Smappee Energy with SCT02 – 50A

Power Accuracy (Total)				
Reference Voltage:	120 V	$\pm$ Percentage error at rated power factor		
Nominal Current:	200 A	PF = 1	PF = 0.8	PF = 0.5
% of nominal current	5%	0.85%	1.21%	1.79%
	20%	0.82%	1.09%	1.54%
	100%	0.81%	1.03%	1.40%
	120%	0.83%	1.07%	1.48%

## Smappee Energy accuracy (EU)

Smappee Energy with SCT02 – 50A

Power Accuracy				
Reference Voltage:	230 V	$\pm$ Percentage error at rated power factor		
Nominal Current:	50 A	PF = 1	PF = 0.8	PF = 0.5
% of nominal current	5%	0.91%	1.98%	3.58%
	20%	0.91%	1.74%	3.01%
	100%	0.89%	1.63%	2.76%
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Smappee Energy with SCT02 – 50A

Power Accuracy				
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Smappee Energy with SCT02 – 50A

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Reference Voltage:	230 V	$\pm$ Percentage error at rated power factor		
Nominal Current:	200 A	PF = 1	PF = 0.8	PF = 0.5
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	20%	0.82%	1.09%	1.54%
	100%	0.81%	1.03%	1.40%
	120%	0.83%	1.07%	1.48%

Compared to the IEC 62053-21 standard the full Smappee Energy measuring system meets the accuracy requirements of a Class 2 meter.

Note: Smappee Energy only measures the voltage of the phase that powers the monitor. Other phases (if present) are simulated.

## Smappee Solar accuracy (US)

Smappee Solar with SCT02 – 50A

Power Accuracy				
Reference Voltage:	120 V	$\pm$ Percentage error at rated power factor		
Nominal Current:	50 A	PF = 1	PF = 0.8	PF = 0.5
% of nominal current	5%	0.91%	1.98%	3.58%
	20%	0.91%	1.74%	3.01%
	100%	0.89%	1.63%	2.76%
	120%	0.90%	1.75%	3.04%

Smappee Solar with SCT02 – 50A

Power Accuracy (Total)				
Reference Voltage:	120 V	$\pm$ Percentage error at rated power factor		
Nominal Current:	100 A	PF = 1	PF = 0.8	PF = 0.5
% of nominal current	5%	0.86%	1.77%	3.17%
	20%	0.83%	1.55%	2.71%
	100%	0.82%	1.44%	2.46%
	120%	0.83%	1.51%	2.59%

Smappee Solar with SCT02 – 50A

Power Accuracy (Total)				
Reference Voltage:	120 V	$\pm$ Percentage error at rated power factor		
Nominal Current:	200 A	PF = 1	PF = 0.8	PF = 0.5
% of nominal current	5%	0.85%	1.21%	1.79%
	20%	0.82%	1.09%	1.54%
	100%	0.81%	1.03%	1.40%
	120%	0.83%	1.07%	1.48%

## Smappee Solar accuracy (EU)

Smappee Solar with SCT02 – 50A

Power Accuracy				
Reference Voltage:	230 V	$\pm$ Percentage error at rated power factor		
Nominal Current:	50 A	PF = 1	PF = 0.8	PF = 0.5
% of nominal current	5%	0.91%	1.98%	3.58%
	20%	0.91%	1.74%	3.01%
	100%	0.89%	1.63%	2.76%
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Smappee Solar with SCT02 – 50A

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Reference Voltage:	230 V	$\pm$ Percentage error at rated power factor		
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Smappee Solar with SCT02 – 50A

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Reference Voltage:	230 V	$\pm$ Percentage error at rated power factor		
Nominal Current:	200 A	PF = 1	PF = 0.8	PF = 0.5
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	20%	0.82%	1.09%	1.54%
	100%	0.81%	1.03%	1.40%
	120%	0.83%	1.07%	1.48%

Compared to the IEC 62053-21 standard the full Smappee Solar measuring system meets the accuracy requirements of a Class 2 meter.

Note: Smappee Solar only measures the voltage of the phase that powers the monitor. Other phases (if present) are simulated.

Best practice: Smappee Solar users should power their monitor with the same phase as the one that connects the solar panels, to the optimize their power accuracy.

# Smappee Plus accuracy (EU)

Active power

Smappee Plus with SCT02 – 50A

Active Power Accuracy				
Reference Voltage:	230 V	± Percentage error at rated power factor		
Nominal Current:	50 A	PF = 1	PF = 0.8	PF = 0.5
% of nominal current	5%	0.64%	0.69%	0.75%
	20%	0.64%	0.70%	0.78%
	100%	0.62%	0.69%	0.79%
	120%	0.63%	0.72%	0.84%

Smappee Plus with SCT02 – 100A

Active Power Accuracy				
Reference Voltage:	230 V	± Percentage error at rated power factor		
Nominal Current:	100 A	PF = 1	PF = 0.8	PF = 0.5
% of nominal current	5%	0.57%	0.61%	0.66%
	20%	0.52%	0.54%	0.56%
	100%	0.51%	0.52%	0.53%
	120%	0.53%	0.55%	0.58%

Smappee Plus with SCT02 – 200A

Active Power Accuracy				
Reference Voltage:	230 V	± Percentage error at rated power factor		
Nominal Current:	200 A	PF = 1	PF = 0.8	PF = 0.5
% of nominal current	5%	0.56%	0.57%	0.59%
	20%	0.52%	0.54%	0.57%
	100%	0.51%	0.52%	0.53%
	120%	0.53%	0.54%	0.54%

# Smappee Plus accuracy (US)

Active power

Smappee Plus with SCT02 – 50A

Active Power Accuracy				
Reference Voltage:	120 V	± Percentage error at rated power factor		
Nominal Current:	50 A	PF = 1	PF = 0.8	PF = 0.5
% of nominal current	5%	0.64%	0.69%	0.75%
	20%	0.64%	0.70%	0.78%
	100%	0.62%	0.69%	0.79%
	120%	0.63%	0.72%	0.84%

Smappee Plus with SCT02 – 100A

Active Power Accuracy				
Reference Voltage:	120 V	± Percentage error at rated power factor		
Nominal Current:	100 A	PF = 1	PF = 0.8	PF = 0.5
% of nominal current	5%	0.57%	0.61%	0.66%
	20%	0.52%	0.54%	0.56%
	100%	0.51%	0.52%	0.53%
	120%	0.53%	0.55%	0.58%

Smappee Plus with SCT02 – 200A

Active Power Accuracy				
Reference Voltage:	120 V	± Percentage error at rated power factor		
Nominal Current:	200 A	PF = 1	PF = 0.8	PF = 0.5
% of nominal current	5%	0.56%	0.57%	0.59%
	20%	0.52%	0.54%	0.57%
	100%	0.51%	0.52%	0.53%
	120%	0.53%	0.54%	0.54%

Smappee Plus with SCT02 – 400A

Active Power Accuracy				
Reference Voltage:	120 V	± Percentage error at rated power factor		
Nominal Current:	400 A	PF = 1	PF = 0.8	PF = 0.5
% of nominal current	5%	0.56%	0.57%	0.59%
	20%	0.52%	0.52%	0.53%
	100%	0.51%	0.52%	0.53%
	120%	0.53%	0.54%	0.54%

Compared to the IEC 62053-21 standard the full Smappee Plus measuring system meets the accuracy requirements of a Class 1 meter. For the Smappee Plus we offer the accuracy of three electrical quantities:

- Voltage
- Active Power
- Reactive Power

## Voltage

Voltage Accuracy (Total)	
Nominal Range	± Percentage error
100 V – 400 V	0.31%



# Smappee Pro accuracy (EU)

## Active power

Smappee Pro with SCT02 – 50A

Active Power Accuracy				
Reference Voltage:	230 V			
Nominal Current:	50 A			
	± Percentage error at rated power factor			
		PF = 1	PF = 0.8	PF = 0.5
% of nominal current	5%	0.64%	0.69%	0.75%
	20%	0.64%	0.70%	0.78%
	100%	0.62%	0.69%	0.79%
	120%	0.63%	0.72%	0.84%

Smappee Pro with SCT02 – 100A

Active Power Accuracy				
Reference Voltage:	230 V			
Nominal Current:	100 A			
	± Percentage error at rated power factor			
		PF = 1	PF = 0.8	PF = 0.5
% of nominal current	5%	0.57%	0.61%	0.66%
	20%	0.52%	0.54%	0.56%
	100%	0.51%	0.52%	0.53%
	120%	0.53%	0.55%	0.58%

Smappee Pro with SCT02 – 200A

Active Power Accuracy				
Reference Voltage:	230 V			
Nominal Current:	200 A			
	± Percentage error at rated power factor			
		PF = 1	PF = 0.8	PF = 0.5
% of nominal current	5%	0.56%	0.57%	0.59%
	20%	0.52%	0.54%	0.57%
	100%	0.51%	0.52%	0.53%
	120%	0.53%	0.54%	0.54%

Smappee Pro with SCT02 – 400A

Active Power Accuracy				
Reference Voltage:	230 V			
Nominal Current:	400 A			
	± Percentage error at rated power factor			
		PF = 1	PF = 0.8	PF = 0.5
% of nominal current	5%	0.56%	0.57%	0.59%
	20%	0.52%	0.52%	0.53%
	100%	0.51%	0.52%	0.53%
	120%	0.53%	0.54%	0.54%

Compared to the IEC 62053-21 standard the full Smappee Pro measuring system meets the accuracy requirements of a Class 1 meter. For the Smappee Pro we offer the accuracy of three electrical quantities:

- Voltage
- Active Power
- Reactive Power

## Reactive <sup>1</sup>power

Smappee Pro with SCT02 – 50A

Active Power Accuracy				
Reference Voltage:	230 V			
Nominal Current:	50 A			
	± Percentage error at rated power factor			
		PF = 1	PF = 0.8	PF = 0.5
% of nominal current	5%	0.64%	0.69%	0.75%
	20%	0.64%	0.70%	0.78%
	100%	0.62%	0.69%	0.79%
	120%	0.63%	0.72%	0.84%

Smappee Pro with SCT02 – 100A

Active Power Accuracy				
Reference Voltage:	230 V			
Nominal Current:	100 A			
	± Percentage error at rated power factor			
		PF = 1	PF = 0.8	PF = 0.5
% of nominal current	5%	0.57%	0.61%	0.66%
	20%	0.52%	0.54%	0.56%
	100%	0.51%	0.52%	0.53%
	120%	0.53%	0.55%	0.58%

Smappee Pro with SCT02 – 200A

Active Power Accuracy				
Reference Voltage:	230 V			
Nominal Current:	200 A			
	± Percentage error at rated power factor			
		PF = 1	PF = 0.8	PF = 0.5
% of nominal current	5%	0.56%	0.57%	0.59%
	20%	0.52%	0.54%	0.57%
	100%	0.51%	0.52%	0.53%
	120%	0.53%	0.54%	0.54%

Smappee Pro with SCT02 – 400A

Active Power Accuracy				
Reference Voltage:	230 V			
Nominal Current:	400 A			
	± Percentage error at rated power factor			
		PF = 1	PF = 0.8	PF = 0.5
% of nominal current	5%	0.56%	0.57%	0.59%
	20%	0.52%	0.52%	0.53%
	100%	0.51%	0.52%	0.53%
	120%	0.53%	0.54%	0.54%

## Voltage

Voltage Accuracy (Total)	
Nominal Range	± Percentage error
100 V – 240 V	0.30%

1: Reactive power is calculated as  $Q = \sqrt{S^2 - P^2}$ .

# Smappee Pro accuracy (US)

## Active power

Smappee Pro with SCT02 – 50A

Active Power Accuracy				
Reference Voltage:	120 V	± Percentage error at rated power factor		
Nominal Current:	50 A	PF = 1	PF = 0.8	PF = 0.5
% of nominal current	5%	0.64%	0.69%	0.75%
	20%	0.64%	0.70%	0.78%
	100%	0.62%	0.69%	0.79%
	120%	0.63%	0.72%	0.84%

Smappee Pro with SCT02 – 100A

Active Power Accuracy				
Reference Voltage:	120 V	± Percentage error at rated power factor		
Nominal Current:	100 A	PF = 1	PF = 0.8	PF = 0.5
% of nominal current	5%	0.57%	0.61%	0.66%
	20%	0.52%	0.54%	0.56%
	100%	0.51%	0.52%	0.53%
	120%	0.53%	0.55%	0.58%

Smappee Pro with SCT02 – 200A

Active Power Accuracy				
Reference Voltage:	120 V	± Percentage error at rated power factor		
Nominal Current:	200 A	PF = 1	PF = 0.8	PF = 0.5
% of nominal current	5%	0.56%	0.57%	0.59%
	20%	0.52%	0.54%	0.57%
	100%	0.51%	0.52%	0.53%
	120%	0.53%	0.54%	0.54%

Smappee Pro with SCT02 – 400A

Active Power Accuracy				
Reference Voltage:	120 V	± Percentage error at rated power factor		
Nominal Current:	400 A	PF = 1	PF = 0.8	PF = 0.5
% of nominal current	5%	0.56%	0.57%	0.59%
	20%	0.52%	0.52%	0.53%
	100%	0.51%	0.52%	0.53%
	120%	0.53%	0.54%	0.54%

Compared to the IEC 62053-21 standard the full Smappee Pro measuring system meets the accuracy requirements of a Class 1 meter. For the Smappee Pro we offer the accuracy of three electrical quantities:

- Voltage
- Active Power
- Reactive Power

## Reactive power<sup>1</sup>

Smappee Pro with SCT02 – 50A

Reactive Power Accuracy				
Reference Voltage:	120 V	± Percentage error at rated sin phi		
Nominal Current:	50 A	sin φ = 0.25	sin φ = 0.5	sin φ = 1
% of nominal current	5%	9.69%	2.17%	0.64%
	20%	9.66%	2.21%	0.64%
	100%	9.32%	2.17%	0.62%
	120%	9.51%	2.25%	0.63%

Smappee Pro with SCT02 – 100A

Reactive Power Accuracy				
Reference Voltage:	120 V	± Percentage error at rated sin phi		
Nominal Current:	100 A	sin φ = 0.25	sin φ = 0.5	sin φ = 1
% of nominal current	5%	8.63%	1.92%	0.57%
	20%	7.86%	1.70%	0.52%
	100%	7.66%	1.64%	0.51%
	120%	8.03%	1.74%	0.53%

Smappee Pro with SCT02 – 200A

Reactive Power Accuracy				
Reference Voltage:	120 V	± Percentage error at rated sin phi		
Nominal Current:	200 A	sin φ = 0.25	sin φ = 0.5	sin φ = 1
% of nominal current	5%	8.45%	1.81%	0.56%
	20%	7.81%	1.71%	0.52%
	100%	7.66%	1.64%	0.51%
	120%	8.02%	1.70%	0.53%

Smappee Pro with SCT02 – 400A

Reactive Power Accuracy				
Reference Voltage:	120 V	± Percentage error at rated sin phi		
Nominal Current:	400 A	sin φ = 0.25	sin φ = 0.5	sin φ = 1
% of nominal current	5%	8.36%	1.80%	0.56%
	20%	7.79%	1.65%	0.52%
	100%	7.65%	1.63%	0.51%
	120%	8.02%	1.69%	0.53%

## Voltage

Voltage Accuracy (Total)	
Nominal Range	± Percentage error
100 V – 400 V	0.31%

1: Reactive power is calculated as  $Q = \sqrt{S^2 - P^2}$ .