

## Calibration of RMS current measurement for AGCCS-CTRL22 Rev. 1.2 board (2021/May)

Input data (first two columns)

- reading the ADC — the ADC takes 1000 samples at 10kHz and 10bit resolution; from the raw data, the square root of the sums of squares is taken; any DC component is canceled both in hardware and software; the result is referred to as **reading [ADC cnt]**
- reading the external meter — the actual current is measured by an external meter, reading RMS ampere; this is referred to as **current [A]** and scaled to **current [100mA]** to match the AGCCS-CTRL22 internal representation
- in our test setup, the load was an electric heater, optionally with a dimmer

Calibration

- **reading [ADC cnt]** is converted to the presumed current by an affine transformation, i.e., scaled by the factor **y-scale** and translated by the offset **y-off**; the result is referred to as **reading [100mA]**
- actual calibration is done by obtaining “optimal” values for **y-scale** and **y-off** from the given data; choices are least squares or two point calibration
- **error [100mA]** is obtained as the difference between **current [100mA]** and **reading [100mA]**
- the error converted to **error [kW]** to give an idea on how far off the reading is experienced by the customer; the conversion is done by multiplication with  $0.1 \times 230 \times 3 / 1000$ ; this is adequate for static loads only, we should check back with an external power meter in due course (and we do not expect our device to be that accurate in general)

Readings (heater)

reading [ADC cnt]	current [A]	current [100mA]	reading [100mA]	error [100mA]	error [kW]
3	0	0	3,10	3,10	0,21
31	3,4	34	34,00	0,00	0,00
45	5,0	50,0	49,45	0,55	0,04
74	8,2	82	81,45	0,55	0,04
120	13,2	132	132,21	0,21	0,01
147	16,2	162	162,00	0,00	0,00

Readings (heater with dimmer)

reading [ADC cnt]	current [A]	current [100mA]	reading [100mA]	error [100mA]	error [kW]
24	2,7	27	26,28	0,72	0,05
35	3,8	38	38,41	0,41	0,03

Calibration

least squares	y-scale	1,09994635414517	y-offset	0,264474064292504
2point cal.	y-scale	1,10344827586207	y-offset	-0,20689655172417
use 2point cal.	y-scale	1,10344827586207	y-offset	-0,20689655172417
	calA	1130	calB	-212

