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 figures look more favourable than the real world performance, which will be affected by e.g. temperature drift and all other sorts of parasitic effects
- 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 x 230 x 3 / 1000; this is adequate for static loads only, we should check back with an external power meter in due course … again, we do not expect our device to be that accurate in general

Readings (heater)

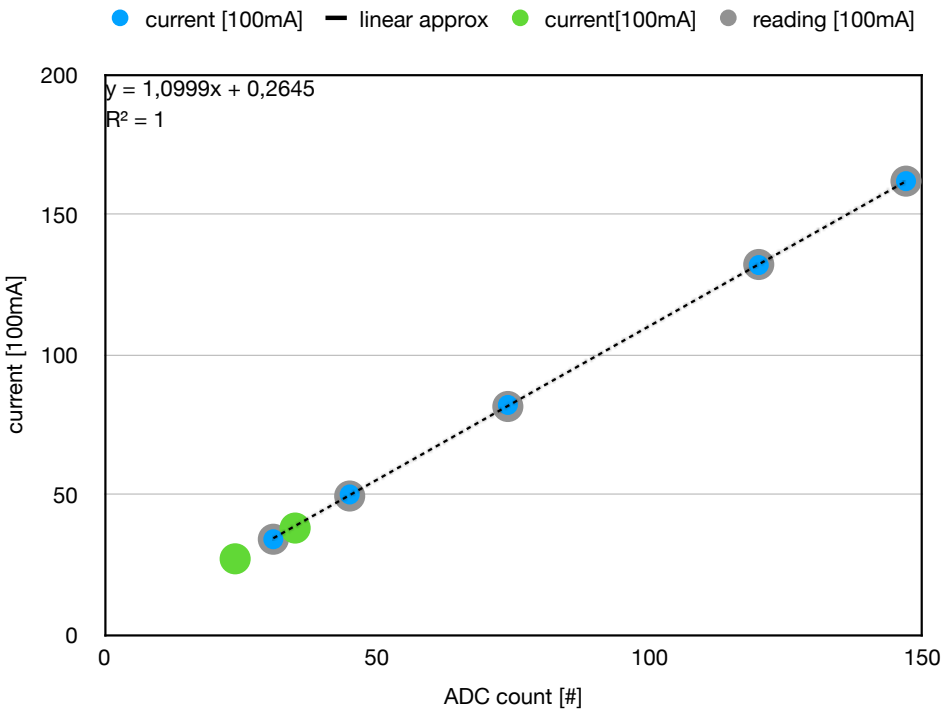
reading [ADC cnt]	current [A]	current [100mA]	reading [100mA]	error [100mA]	error [kW]
3	0	0	3,10	3,10	0,21
31	3,4	34	34,00	0,00	0,00
45	5,0	50,0	49,45	0,55	0,04
74	8,2	82	81,45	0,55	0,04
120	13,2	132	132,21	0,21	0,01
147	16,2	162	162,00	0,00	0,00

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


current [100mA]
linear approx
current[100mA]
reading [100mA]
y = 1,0999x + 0,2645
R² = 1
200
150
100
50
0
current [100mA]
0
50
100
150
ADC count [#]