AMBO TONY METER

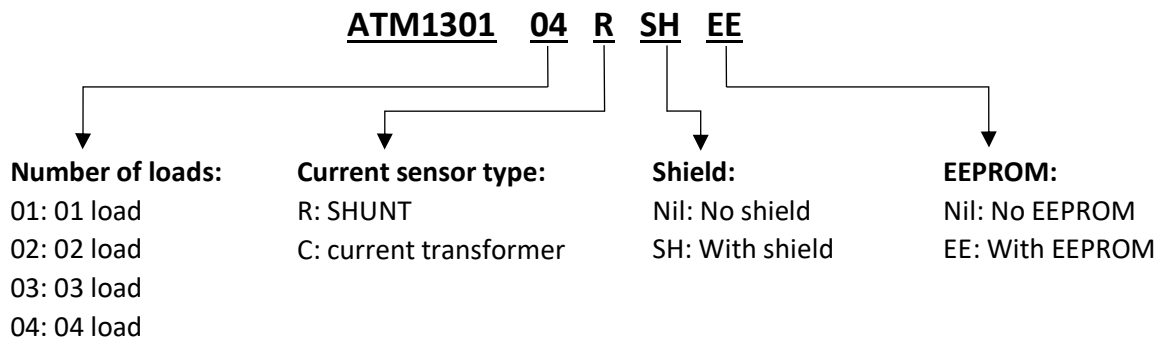## Datasheet

Revision – 0.1

Contact Information:

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Ordering Information:

ATM1301   04   R   SH   EE

Number of loads:
01: 01 load
02: 02 load
03: 03 load
04: 04 load

Current sensor type:
R: SHUNT
C: current transformer

Shield:
Nil: No shield
SH: With shield

EEPROM:
Nil: No EEPROM
EE: With EEPROM

Features:

- Small form factor: 13.22 x 22.27 x 3.8 mm
- 1% error for voltage, current, power, energy measurement.
- Up to 40 A (RMS).
- Four high-accuracy channels for monitoring up to four loads
- Four 16-bit ADC channels for residual current detection
- V_{ref} output pin to offset external inputs.
- Zero-crossing detection output.
- Operating voltage range 2.7 - 3.3V.
- Current consumption: 25 mA.
- 14 IO pins (with 2 open-drain pins).
- Two serial port interfaces.
- Easy to use interfaces: AT commands and Modbus RTU (optional).
- Control function supports both latching and non-latching relays.
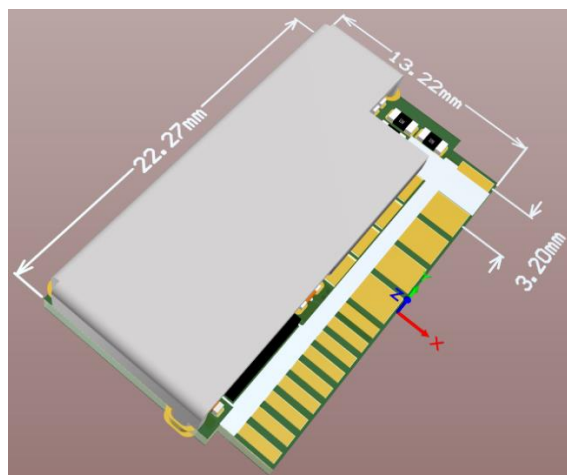- Frequency measurement

Introduction:

Figure 1: Module overview

Tony Meter is a compact solution to control and monitor AC loads. Each module has 4 channels. Roughly speaking, a Tony Meter is equivalent to 4 independent single-phase meters. Each channel can monitor the basic parameters of its load: voltage, current, power, and delivered energy, as shown in Figure 2. Besides, the module provides some functions to control AC loads: zero-crossing, overload protection, no-load protection, residual current protection.
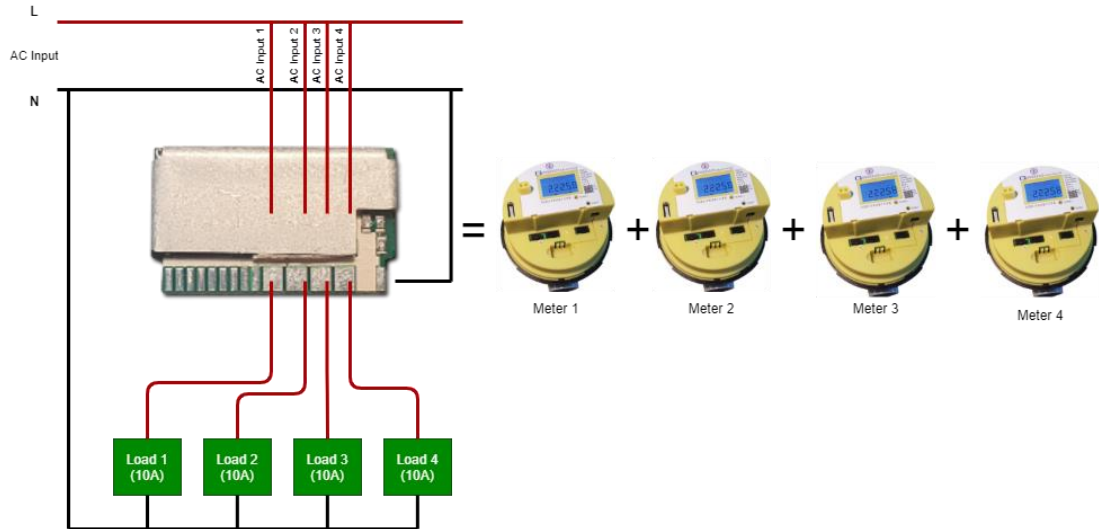

Figure 2: Tony meter measurement function.

The configuration of the module is flexible, with plenty of options. The flexibility helps the module adapt to any design quickly.
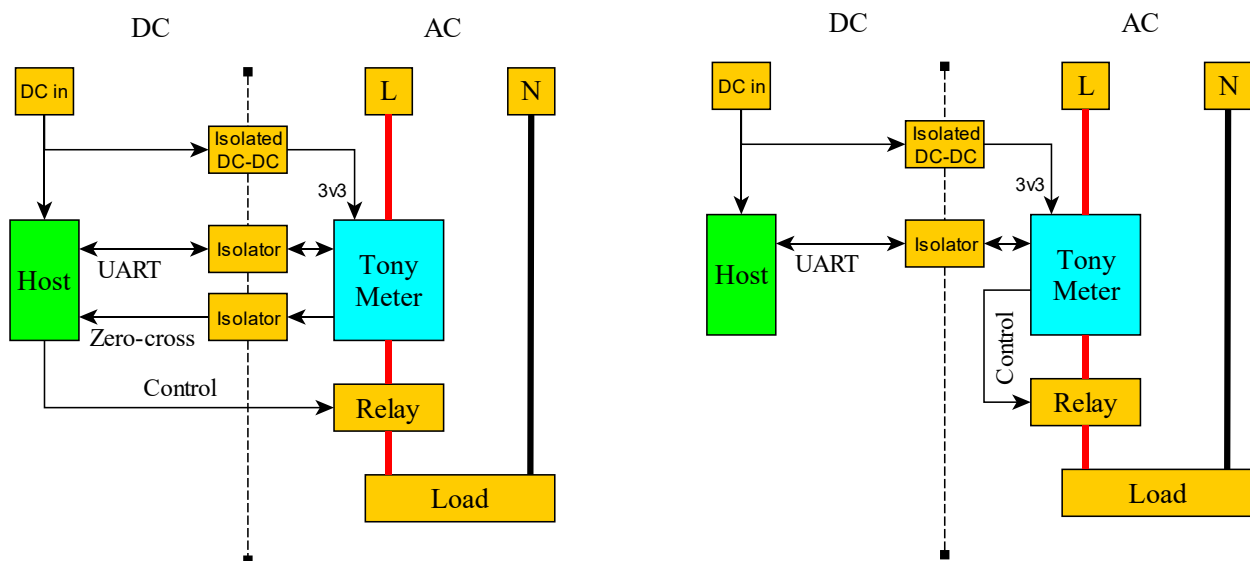

Figure 3: Module connection

The diagram on the right of Figure 3 shows an example of the module connection. A host controller communicates with the module by a *UART bus*. Through this bus, the host can read all parameters of the load by using AT commands or Modbus RTU. On the other hand, the diagram on the left of Figure 3 shows

another case of module usage. In which, the host control the relay directly by using the *Zero-cross* signal from the module.
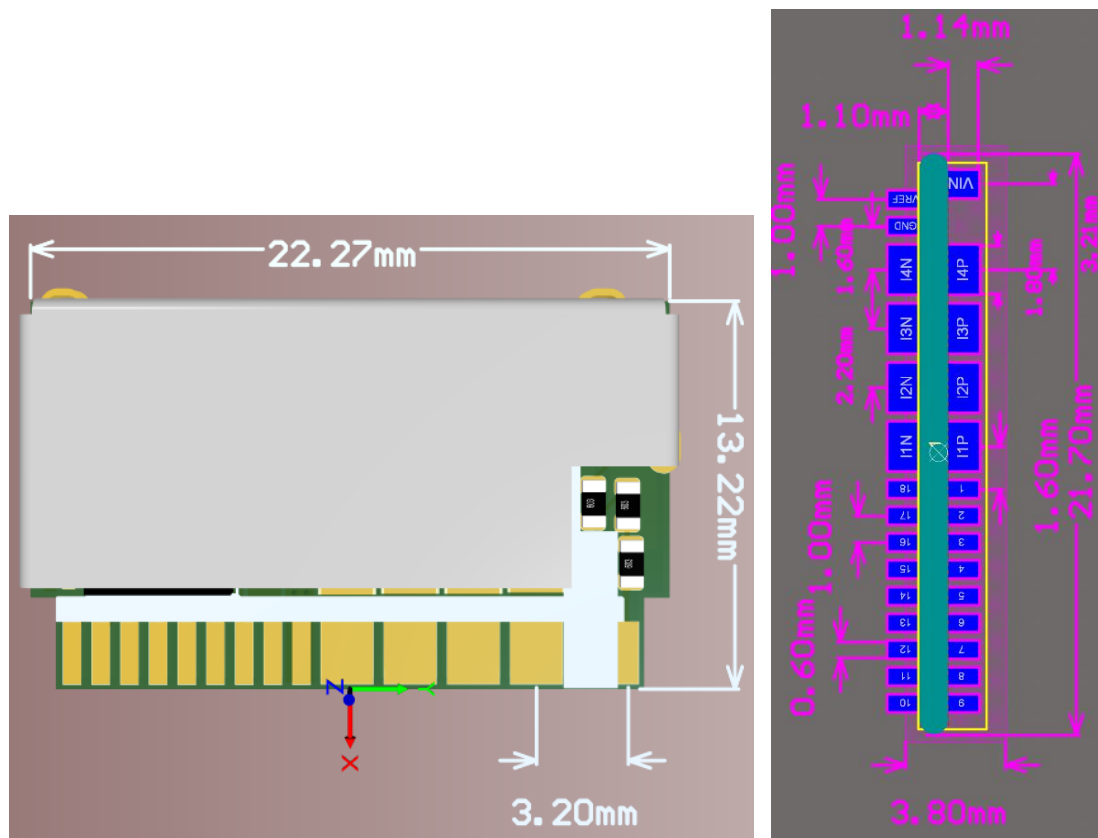
Dimensions:

Figure 4: Module dimensions

Pin Descriptions

Figure 5: Module pinout

Pin	Name	Description
1	VREF	Referent voltage (0.6 V)
2	GND	GND
3	I4N	Channel 4 negative pin
4	I3N	Channel 3 negative pin
5	I2N	Channel 2 negative pin
6	I1N	Channel 1 negative pin
7	GND	GND
8	VCC	Isolated 3.3VDC (board's power supply)
9	IO13	GPIO (Open drain)
10	IO12	GPIO
11	IO11	GPIO/ADC channel 0
12	IO10	GPIO/ADC channel 1
13	IO9	GPIO/ADC channel 2
14	IO8	GPIO/ADC channel 3/UART2 TX
15	IO7	GPIO/UART2 RX
16	IO6	GPIO (Open drain)
17	IO5	UART1 RX
18	IO4	UART1 TX
19	IO3	GPIO
20	IO2	GPIO
21	IO1	GPIO
22	IO0	GPIO
23	VCC	Isolated 3.3VDC (board's power supply)
24	GND	AC Line.
25	IP1	Channel 1 positive pin.
26	IP2	Channel 2 positive pin.
27	IP3	Channel 3 positive pin.
28	IP4	Channel 4 positive pin.
29	VIN	AC Neutral.

Table 1: Pin function table

Technical Specifications

DC specification				
Operating voltage	2.7 - 3.6V			
Current consumption	25 mA			
AC Measurement				
	Range	Display Resolution	Accuracy	Channels
Voltage	90 – 380 V	10 mV	1%	1
Current	0.05 – 10 A	1 mA	1%	4
Power	4.5 – 3800 W	10 mW	1%	4
Energy	0 – 100000 Wh	1 Wh	1%	4
ADC specification				
Resolution	16 bits			
Vref	0.6 V			
Range	3 mVRMS – 400 mVRMS			
Zero-crossing specification				

Error	±0.3 ms
Output frequency	25 Hz (for 50 Hz grid)
Interfaces	
Serial port	2 ports[1]
Baudrate	19200 bps
Temperature	
40 A (continuous)	60º C (with shield)

Sample Application

Figure 6 shows an example application of Tony Meter. The module in the sample application controls 4 relays through 4 IO pins: 0, 1, 2, 3.

Sample config:

AT+ENABLE=0,0 AT+ENABLE=1,0 AT+ENABLE=2,0 AT+ENABLE=3,0	Disable all channels to prevent unexpected conflicts.
AT+ADC=0,3,0	Channel 0 uses I3 without reverse.
AT+ADC=1,2,0	Channel 1 uses I2 without reverse.
AT+ADC=2,1,0	Channel 2 uses I1 without reverse.
AT+ADC=3,0,0	Channel 3 uses I0 without reverse.
AT+RELAYPINS=0,0,3	Channel 0 uses IO3.
AT+RELAYPINS=1,0,0	Channel 1 uses IO0.
AT+RELAYPINS=2,0,1	Channel 2 uses IO1.
AT+RELAYPINS=3,0,2	Channel 3 uses IO2.
AT+ONDELAY=0,90	The relay set time is 15 ms
AT+ONDELAY=1,90	The relay set time is 15 ms.
AT+ONDELAY=2,90	The relay set time is 15 ms.
AT+ONDELAY=3,90	The relay set time is 15 ms.
AT+OFFDELAY=0,90	The relay reset time is 15 ms.
AT+OFFDELAY=1,90	The relay reset time is 15 ms.
AT+OFFDELAY=2,90	The relay reset time is 15 ms.
AT+OFFDELAY=3,90	The relay reset time is 15 ms.
AT+RESDETECT=0,0,130,30	The residual detection threshold is 30 mA, and
AT+ENABLE=0,1	the gain is 0.13.
AT+ENABLE=1,1	Enable all channels, apply the configurations.
AT+ENABLE=2,1	
AT+ENABLE=3,1	

Table 2: Sample Configuration

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[1] The secondary port is not provided in the standard firmware, contact us for a customized firmware.
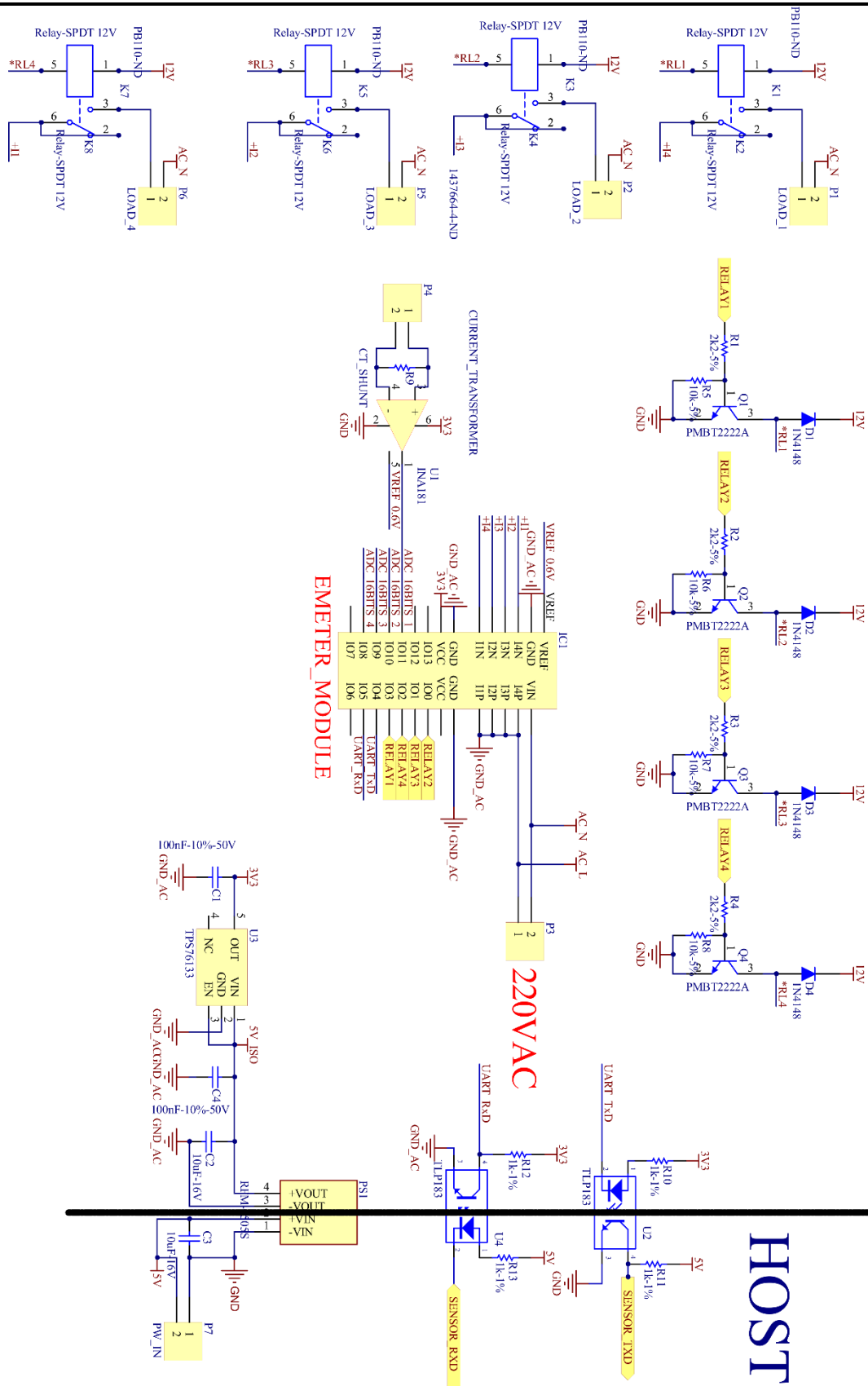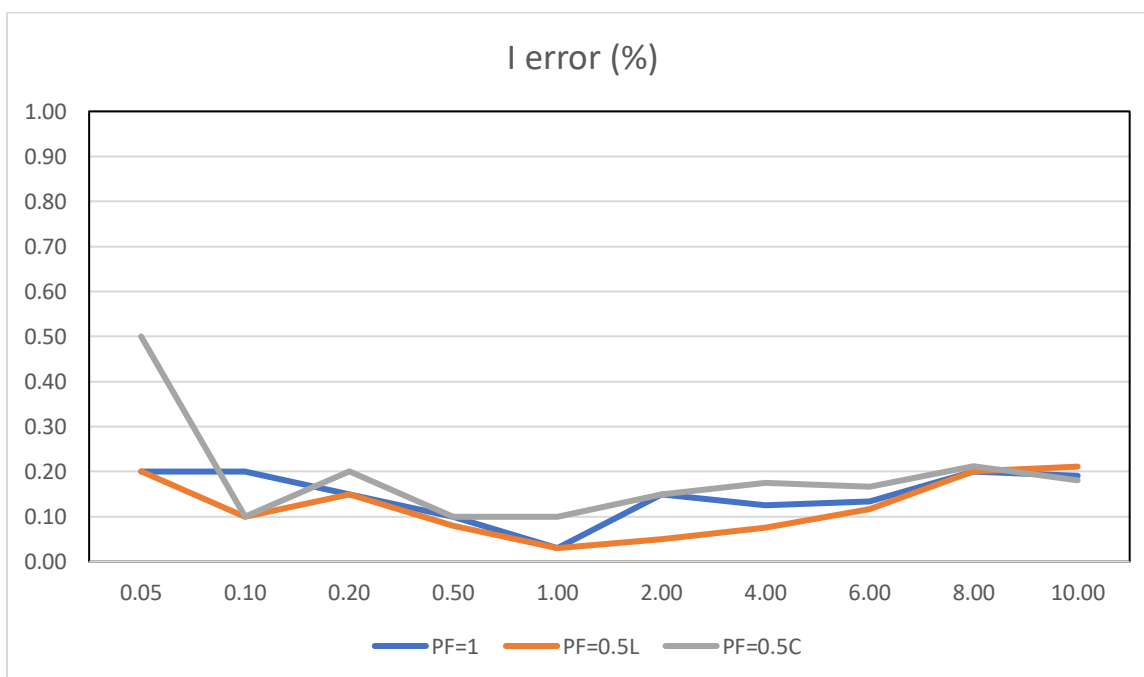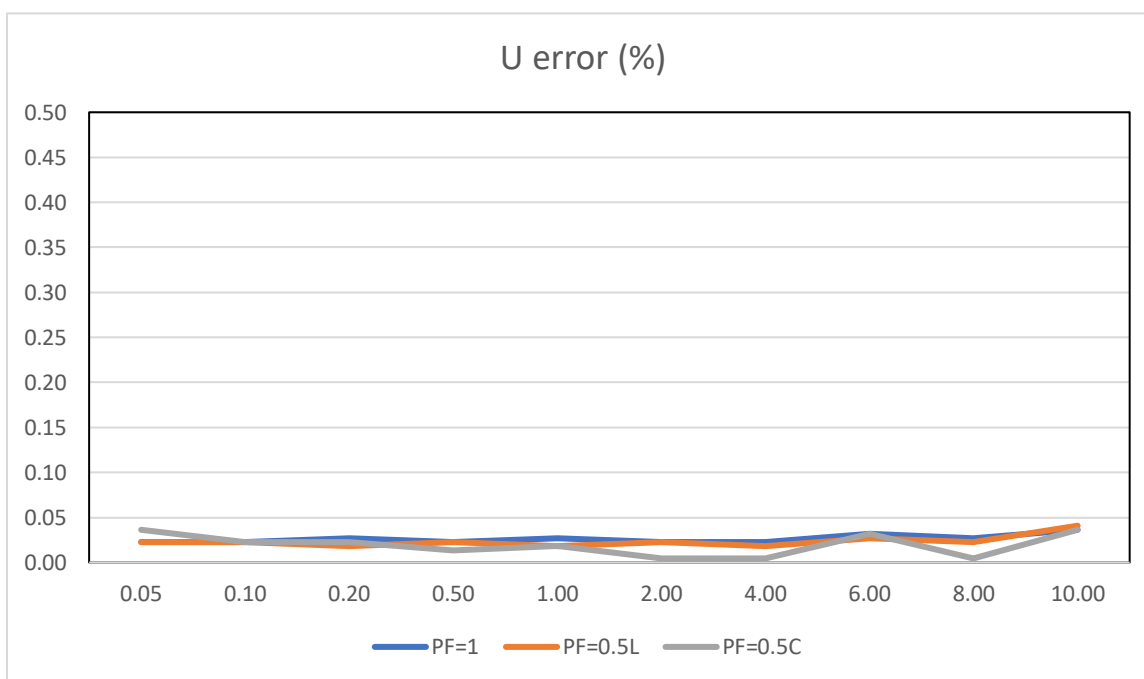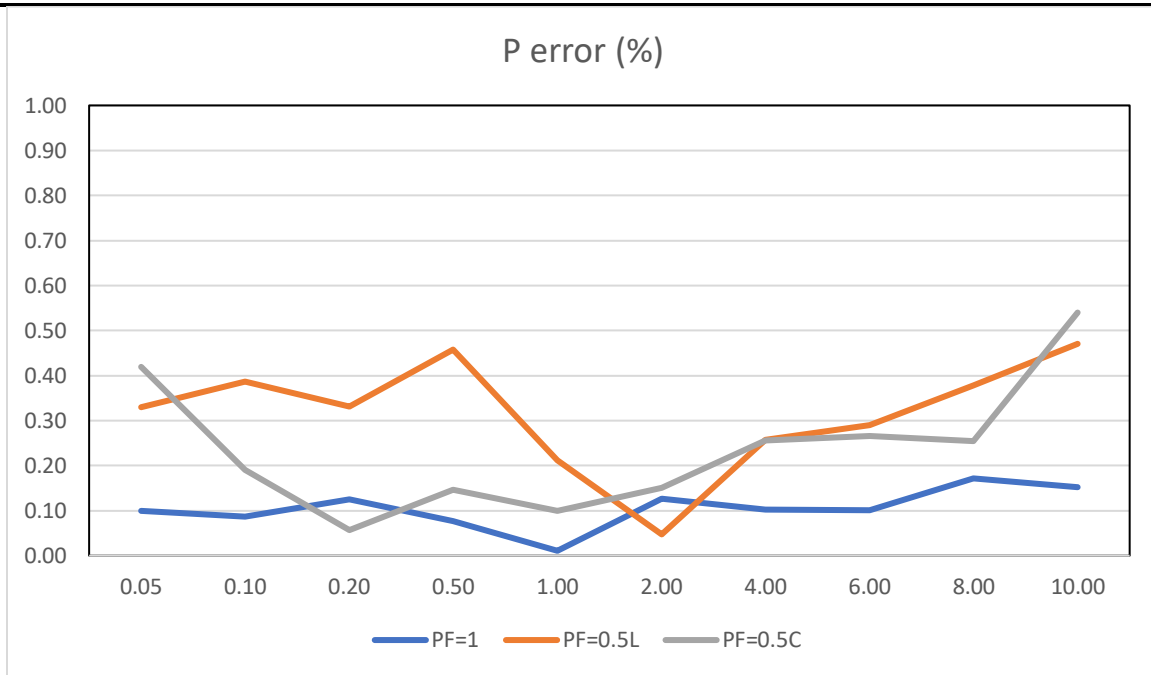
Figure 6: Sample application

Testing

Measurement Accuracy

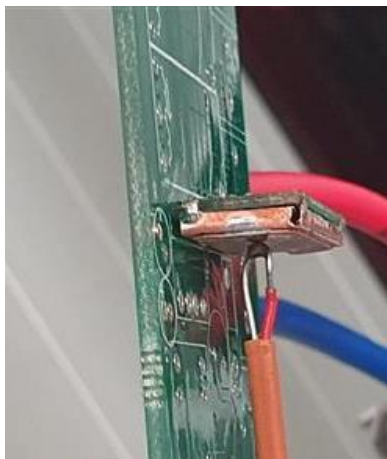Test machine: KP-S3000-12 Three-phase energy meter test bench.

U error (%)

I error (%)

Thermal Test

Figure 7: Thermal test position
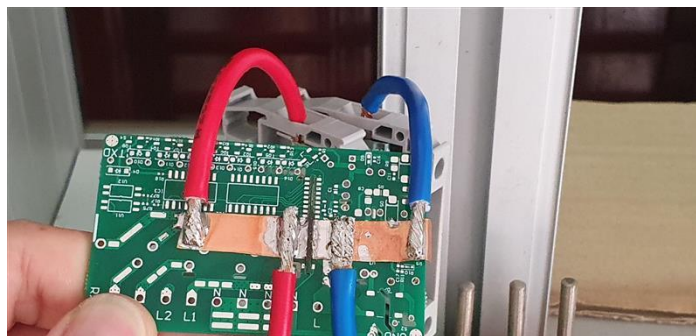
Figure 8: Thermal test board (bottom)

Current (A)	Max Temperature (°C)
30	50
40	60

Options

Number of channels	The maximum current of each channel (A)
1	10
1	20
1	30
1	40
2	10
2	20
3	10
4	10
1	CT
2	CT
3	CT
4	CT

Revision History

Version	Date	Description
0.1	13/01/2016	First version