Multi function meter
Ai205

- Front panel 96x96 mm.
- Communications RS485 Modbus
- Measurement of current , Voltage, active, reactive apparent power, power factor, frequency and harmonic up to 31st order and etc.
- Simultaneously display 5 measurement values with 9 digits energy
- Maximum Demand with Date and time stamp.
- Energy Import, Export, Total (Imp + Exp), Net (Imp - Exp)
- Large screen LCD and clear display with backlight.
- Programmable ratios for current and voltage transformers
- Pulse output programmable
- Accuracy class 0.2%
- Digital input, Digital output, Relay output.

บริษัท แอมพ์ทรอน อินสทรูเมินท์ (ประเทศไทย) จำกัด
โทรศัพท์ 02-809-2688 ต่อ 114 โทรสาร 02-809-2690
E-mail : sales@amptron.th.com www.amptron.th.com

MULTIFUNCTION POWER METER

DESCRIPTION

The Ai205 series Multifunction Power Meter provide high accuracy measurement, display and communication (Modbus RTU) of all electrical and power quality parameters, including harmonic measurement up to 31st THD (Total Harmonic distortion) or Individual harmonic.

They also have digital inputs and outputs and interface with versatile functions such as remote control, alarm, statistics and records.

APPLICATIONS

Control panels and motor, Generator monitoring
Switchgear distribution systems
Energy Management
Power quality analysis

Input

Measurement: True rms measurement
Sampling: 128 point/Cycle
Connection: 1P2W, 1P3W, 3P3W, 3P4W, Balance/Unbalance; According to the elements of PT and CT, It will be programmed by front keys.
Input Range: **Voltage:** 40~290V L-N/70~500V L-L
PT ratio(primary)programmable: 100~500000V
PT ratio(secondary)programmable: 100~400V
Current: 5A, 1A(Optional)
CT ratio(primary)programmable:5(1)~10000A
Frequency: 45~65Hz
Max. Input over capability:
Voltage: 2 x rated continuous; 2500V for 1 second
Current: 2 x rated continuous; 20 x rated for 1second
Input Burden: **Voltage:** <0.2VA, **Current:** < 0.1VA

I/O functions

The meter offers two digital inputs as standard. Additionally, there is an I/O module available as option. The module offers an extra two digital inputs, two digital outputs, two relay outputs, and a DC aux power (for DI). Please specify the option code in ordering, if that extra I/O is to be request.

Digital input(DI): **standard: 2 points (4 points in optional);**
Photo couple, 5~30V, 20mA maximum
Response time ≤ 300ms
Isolation: 2500Vac
Functions: ***Remote Motoring***

Digital output(DO): 2 points; Photo-MOS, 100Vdc, 50mA **(optional)**

Response time ≤ 300ms *Isolation: 2500Vac*
Functions: ***There are two mode can be programmed as below:***
Energy Mode: Pulse output represents Energy. Each output can user programmed to represent Imp/ Exp/ Total/Net KWh or Imp/Exp/Total/ Net KVarh
Pulse rate divider: *programmable1~6000(x0.1)KWh(KVarh)/p*
Pulse width: *programmable 1~50(x 20msec)*

Alarm Mode: Digital output as Hi or low Alarm. Each output can be user programmed for any measured value. On triggering an alarm there will be an output plus record In EEPROM with time stamp.
The alarm mode is set up by RS485, please refer to operating manual.
Energized level: *programmable High or LOW*
Delay time: *programmable from 0~255*300ms or Latch*

Relay output: 2 relay,FORM-A,3A/250Vac,3A/30Vdc **(Optional)**

	PARAMETERS					AI205	
Power Measurements	Voltage	V12	V23	V31	VLL_Avg	•	•
		V1	V2	V3	VLN_Avg	•	•
	Current	I1	I2	I3	IAvg IN	•	•
	Action Power	P1	P2	P3	ΣP	•	•
	Reactive Power	Q1	Q2	Q3	ΣQ	•	•
	Apparent Power	S1	S2	S3	ΣS	•	•
	Power Factor	PF1	PF2	PF3	PFAvg	•	•
	Frequency	Hz				•	•
	Active Energy	WHImp	WHExp	WHTotal	WHNet	•	•
	Reactive Energy	QHImp	QHExp	QHTotal	QHNet	•	•
	Demand	Pmd	Qmd	Smd			•
	Un-balance	V_unbl	I_unbl			•	•
Power Quality	THD for Voltage	THDV12	THDV23	THDV31	THDV_Avg	•	•
	THD for Current	THDI1	THDI2	THDI3	THDI_Avg	•	•
	Individual Harmonic	2nd~31st					•
	Crest Factor for Volt	Crest Factor					•
	K Factor for Current	K Factor					•
	Max/Mini Recording	Maxi./Mini. Recording for all parameters with time stamp					•
I/O	Digital Input	DI1	DI2	*DI3	*DI4	•	•
	Digital Output	*DO1	*DO2			•	•
	Relay Output	*RO1	*RO2			•	•
	RS485 Port	Modbus RTU mode				•	•
	Real Time Clock	Year,Month,Day,Hour,Minute,Sec.				•	•

*means optional, please specify in ordering information.

Accuracy & Resolutions

PARAMETERS	ACCURACY	RESOLUTION	INPUT RANGE
Voltage	0.2%	0.1%	40~290Vac(VL-N)
Current	0.2%	0.02%	1%~120% of Rated I
Neutral Current	1.0%	0.1%	1%~120% of Rated I
Active Power	0.5%	0.1%	0~9999MW
Reactive Power	0.5%	0.1%	0~9999MVar

Accuracy & Resolutions

PARAMETERS	ACCURACY	RESOLUTION	INPUT RANGE
Apparent Power	0.5%	0.1%	0~9999MVA
Power Factor	0.5%	0.1%	±0.02~1.00
Frequency	0.2%	0.01Hz	45~65Hz
Active Energy	0.5%	0.1KWh	0~99999999.9KWh
Reactive Energy	0.5%	0.1KVarh	0~99999999.9KVarh
THD	1.0%	0.01%	0~100%
Individual Harmonic	1.0%	0.01%	0~100%
Un-balance	0.5%	0.1%	0~300%

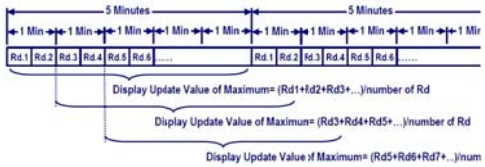
Power Quality

The instrument gives an evaluation of energy quality by Total Harmonic Distortion, Individual Harmonic, Crest Factor of voltage, K Factor of Current, Max/Min stamp, un-balance.

Harmonic: 2nd~31st individual harmonic for Voltage and Current
THD: 2nd~31st Total harmonic distortion for Voltage and Current
K Factor for Current: K-factor is a weighting of the harmonic load currents According to their effects on transformer heating. A K-factor of 1.0 indicates a linear load (no harmonics). The higher the K-factor, the greater the harmonic Heating effects
Crest Factor: The purpose of it calculation is to give an analyst a quick idea of how much impacting is occurring in a waveform.
Max/Mini stamp: Custom alarm with time stamping
Recording measurements: VLN1 VLL1 IL1 ΣP,ΣQ,ΣS,THD,Un-balance, Hz, PF, Demand
Recording period: Month, Day,
Un-balance: Shows Un-balance for Voltage and Current

Demand For Active, Re-active, Apparent power. They can be calculated in present and maximum value.
Demand calculation:
sliding window, one Minute each time
Calculation period:
programmable from 1~30 minutes

Time set to be 5 minutes



Remark: Sliding Period: 1 time/ 1 minute

RS485 communication (standard)

Protocol: Modbus RTU mode
Baud rate: 600/1200/2400/4800/9600/19200/38400
Data bits: 8 bits
Parity: None
Stop bits: 1
Address: 1~247
Wiring: 1200M max.
Termination Res: 120~300Ω / 0.25W (typical: 150Ω)

Electrical safety

Dielectric Strength: AC 2KV, 50/60Hz, 1min. Between Input / Output / Power / Case
Surge test: 3KV, 1.2 x 50 μsec. Common mode & differential mode
Insulation Res: ≥ 100M ohm, DC 500V
Isolation: Input / Output / Power / Case
EMC: EN 55011:2002; EN 61326:2003
Safety (LVD): EN 61010-1:2001

Environmental

Operating Temp: -10~70°C
Operating Humidity: 5~95%RH, Non-condensing
Temp. Coefficient: ≥ 100 PPM/°C
Storage Temperature: -40~85°C
Enclosure: Front panel: IEC 549 (IP54); Housing: IP20

Power

Power supply: AC 85~260 / DC 100~300V
DC 20~56V (optional)
Power effect: ≤0.05% F.S.
Power consumption: ≤3W@230Vac
Back up memory: By EEPROM

Mechanical

Dimension: 96mm(W) x 96mm(H) x 71mm(D)
(79mm with I/O module)
Panel cutout: 90mm(W) x 90mm(H)
Case material: White ABS
Mounting: Panel flush mounting
Connection: Screw terminal, Plastic NYLON 66 (UL 94V-0)
Current/Voltage input (#1~#10):
1.5~2.5mm²(AWG 15~10)
Other: 0.5~1.3mm²(AWG 22~16)
Weight: Under 400g

■ FRONT PANEL

Display: LCD 65x58mm white back light visible under sunshine
Reading: 8888 4 digital x 4 line, 10.0mm high for V,A, Power, Hz, PF, THD, Demand , Unbalance, Max/Mini,..
88888888 1 line 9 digital , 6.0mm high for Energy, Clock and Date

I/O Status:
DIx digital Input bright when the DI energized
DOx digital output bright when the DO energized
ROx Relay output bright when the RL energized

Flash when Pulse output
Flash when RS485 communication. There are two squares that one is for master, an other one is for slave. It will be checked easier which side is getting trouble.

Load status indication:

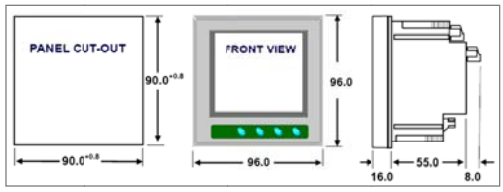
Blight to show percentage of Current rated
Blight when the load is Inductive
Blight when the load is Capacitive
Blight to show percentage of the un-balanced of V and I

Reading variety symbols:

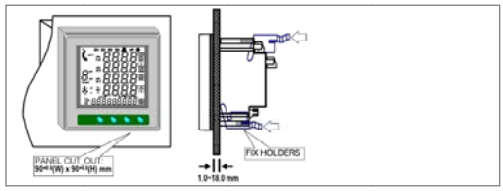
1-2 2-3 3-1	Blight means that values are showing value in Line-Lin
1 2 3	Blight means that values are showing value in Phase
N	Blight means that values are showing value of the IN
Imp Exp Total Net	Energy direction or mathematic
Avg	Blight means that values are showing value of a verge for parameter
MAX MIN	Blight means that values are showing maximum or minimum value storage during power on of the meter.
Demand	Blight means that values are showing demand for Powers
THD	Blight means that values are showing value of THD
Remark:	The individual harmonics reading and Event record have to read by RS485 of masters.
V KV A KW MVar..	Engineer units for parameters

Display Update: 0.5 second
Operating Key: A 4-button interface for on front panel
Shift Key/Quick View for Harmonics pages
Up Key/Quick View for Power pages
Down Key/Quick View for Energy pages
Enter Key/Quick View for Voltage & Current Pages
Security Code: 4 digitals Password, settable from 000~9999

■ DIMENSIONS

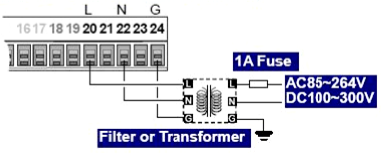


■ PANEL MOUNTING HOLES



■ CONNECTION DIAGRAM

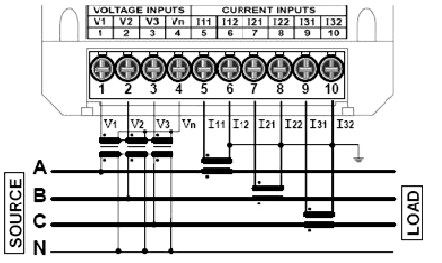
Auxiliary Power (Terminal Block 2)



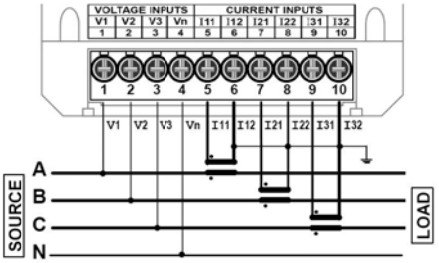
Voltage & Current Input (Terminal Block 1)
The connection has to relative the page 3 and page 4 of programming.
Voltage wiring: AWG16~12(1.3~2.0mm²)
Current wiring: AWG15~10(1.5~2.5mm²)

MULTIFUNCTION POWER METER

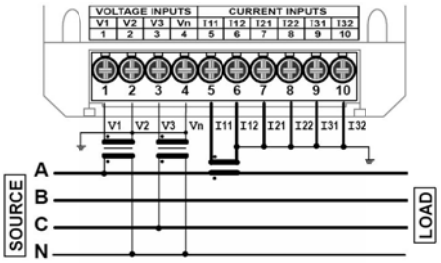
- 3 Phase 4 wire with 3PT/3CT [Setting: 3LN , 3CT]



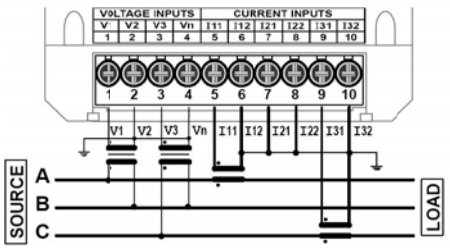
- 3 Phase 4 wire – direct / 3CT [Setting: 3LN , 3CT]



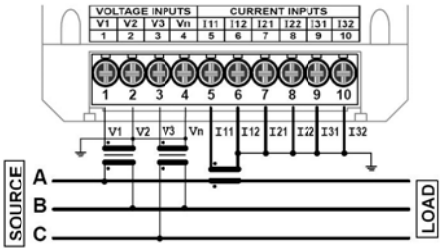
- 3 Phase 4 wire (Balanced) with 2PT/1CT [Setting: 2LN , 1CT]



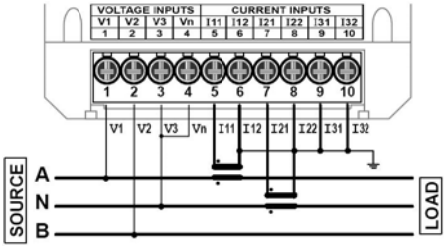
- 3 Phase 4 wire with 2PT/2CT [Setting: 2LL , 2CT]



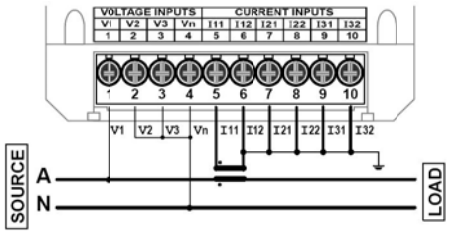
- 3 Phase 3 wire (Balanced) with 2PT/1CT [Setting: 2LL , 1CT]



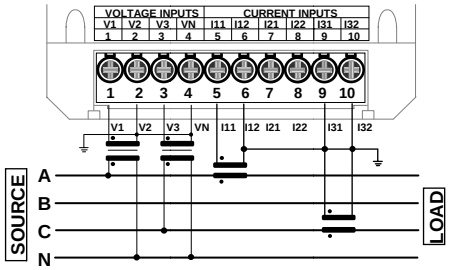
- 1 Phase 3 wire - [Setting: 3LN , 3CT]



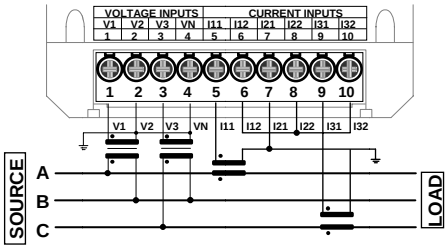
- 1 Phase 2 wire - [Setting: 3LN , 3CT]



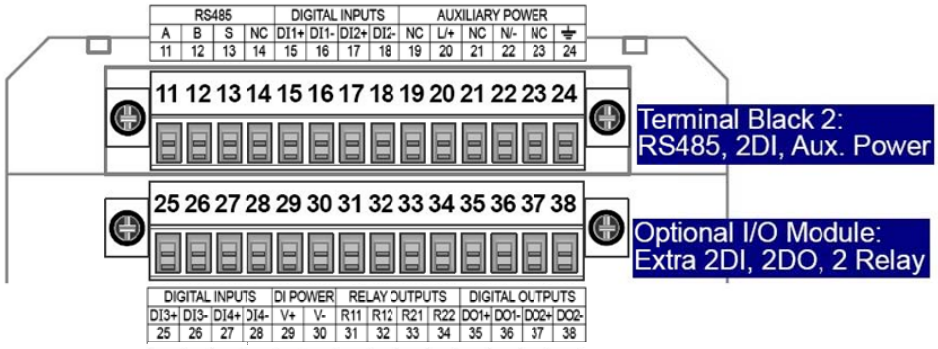
- 3 Phase 4 wire (Balanced) with 2PT/1CT [Setting: 2LN , 2CT]



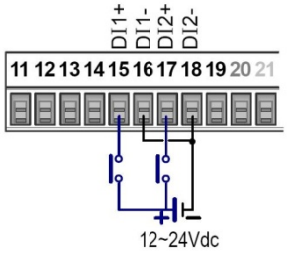
- 3 Phase 3 wire (Balanced) with 2PT/1CT [Setting: 2LL , 3CT]



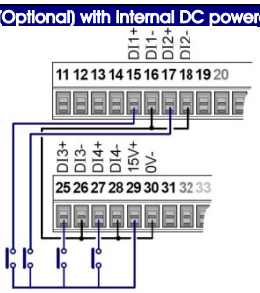
RS485 / 2DI (Terminal Block2) and
Extra 2DI / 2DO / 2Relay (Optional I/O Module)
Wiring: AWG22~16(0.5~1.3mm²)



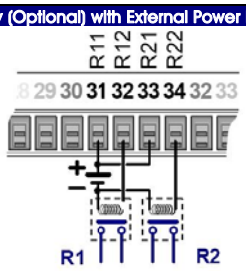
2DI(Standard) with External DC powered



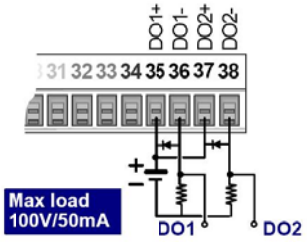
4DI(Optional) with Internal DC powered



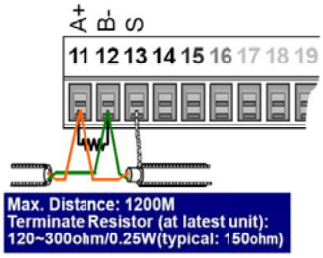
2Relay (Optional) with External Power Relay



2DO (Option) with External Powered



RS485 Communication Port



Ordering INFORMATION

EXAMPLE

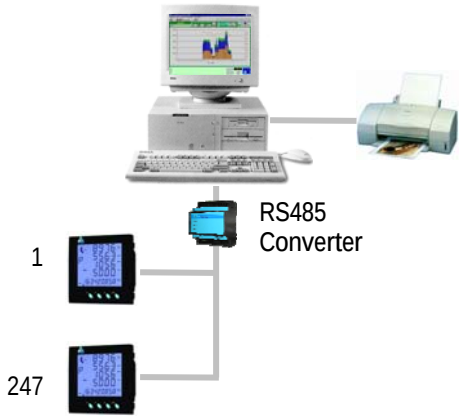
Ai205-A-A-P2

Multifunction meter Ai205 input 5A, 400V, Harmonic 2nd -31st order

X1	CT	X2	Volt	X3	Option
A	5A	A	400	P0	None
B	1A	B	100	P1	2 Pulse
				P2	Harmonic 2nd - 31st order
				P3	2 Pulse, 2 Relay, 4DI Harmonic 2nd - 31st order

MULTIFUNCTION POWER METER

Energy Managements Software English and User Language



Energy Management System
English and User Language SOFTWARE
EMS

Designed to achieve real reduction all boring routine work in plants or factory as an automation energy data acquisition. All data readied gathering to display also conclusions with report as file or print out to ensure all task saving energy has been inspected results before and after energy process creation.

General

- **Ai205 Meter**

Ai205 as an Multi Function Power Meters measurable more than 100 electrical value with accuracy class0.2.
Optional with 2relay activation via RS485 to control ACB or devices, 2Pulse output programmable as energy pulse or alarm trigger, 2Di or 4Di.

- **Communication**

Ai205 completed with RS485 serial port as an Modbus without extra cost to created network for data logging as many as 247meters with 1.2Km distance. Communication over twisted pair Φ1.5mm.

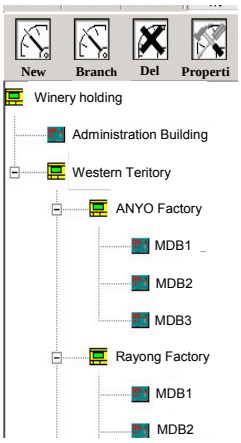
Software Properties

- **Meter Explorer or Meter Tree**

Easy looking or checking the overall electrical system as simple application as MS Windows explorer.
Monitoring overall or specific area consumption on electrical quality to understand the area behavior to get creation on energy saving. Meter explorer also able to established meters network to add meter, delete meter, Meter's config and so on.

- **Data logging**

Software will automatic read data from all meters and save into PC hard disc as MS Access database.
Software provided data to display and trace back to any date, month as wishes with no limitation.
Data saved in PC continuously all the time no saturation and no need data dump out.
Data saved as much as hard disc capacity and might be 20years or 50years upto hard disc itself available.

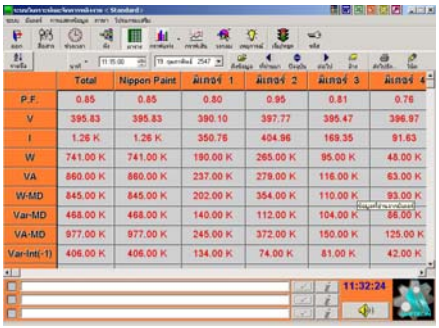


- **Meter Summation**

Meter network or Meter area or Meter group that more than one unit then meters value reading by Software will automatic created the summaries channel of consumption User no need any extra work to be done.
From the Meter tree, each area or group will automatically summarise the total consumption and able to display, analyses and report as actual meters.

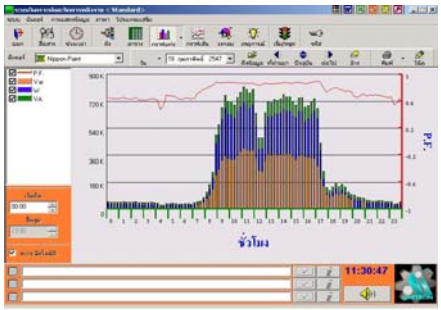
This can be save cost no need to install real meter unit.

- **Table Display**



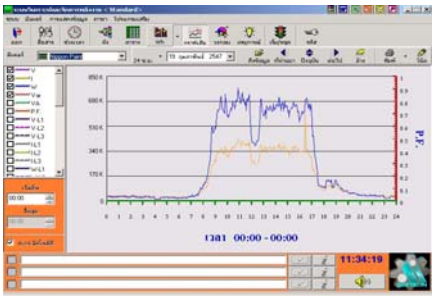
Display all parameter from many meters in the same time and in the same line to view and compare or inspection of each load or any machine's value.
Table displays with parameter viewing sequence are programmable viewing sequence as desire.

- **Bar Graph Display**



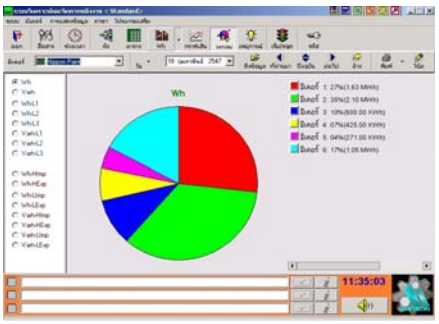
Display and analyses demand and PF obviously transparent behavior consumption including export file and screen print out. Consumption monitor assist the company or factory before and after energy saving control needed improving, adjusting or continue the same manner.

- **Line Graph**



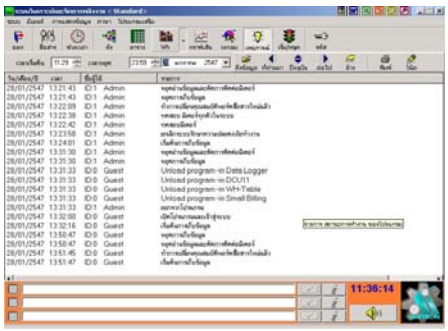
Some of these are power quality tools of supply source or energy with reflection of electrical system efficiency and or overload of any machine.

- **Pie Graph**



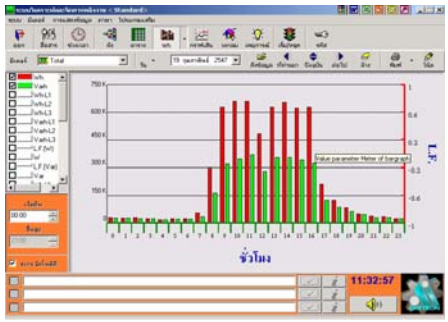
Automatically summaries the kwh and kvarh of all meters compared to overall energy to show ratio or area consumed efficiency.

- **Events**

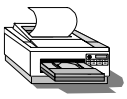


Events record with time stamp from any changed for example CT setting, address changing, open or close software and ETC. Banefully trace back all events to see the causes of fault and error.

- **Load Factor**



Automatically comparing kwh per hour of each meter to show energy consumption efficiency compare with time.



- **Export & Print out**

Fully support exporting files as text, word, exel or directly print out to printer from any display screen or selected meters, time, parameters.

Special Features

- **User Language**

Fully support second language any country as an user friendly designed concept. Support local language made of simple and ease to use to any unengineering back ground.