VAW   DC MULTIFUNTION POWER Meter

■ DESCRIPTION

VAW DC Multifunction Power Meter provide high accuracy measurement, display and communication of DC voltage, Current, Power, Energy(import / export), and Run Hour. They are also building in 4 Relay outputs, 1 Analogue output, 1 Pulse output , 2 External Control Inputs and 1 RS485(Modbus RTU Mode) interface with versatile functions such as remote I/O, alarm and communication for DC power applications like as solar, wind power system or portable electronic device consumption testing. For the power saving, VAW has built in an innovation timer to switch down the light and power of LED. It makes sense to build the meter in a green power system.
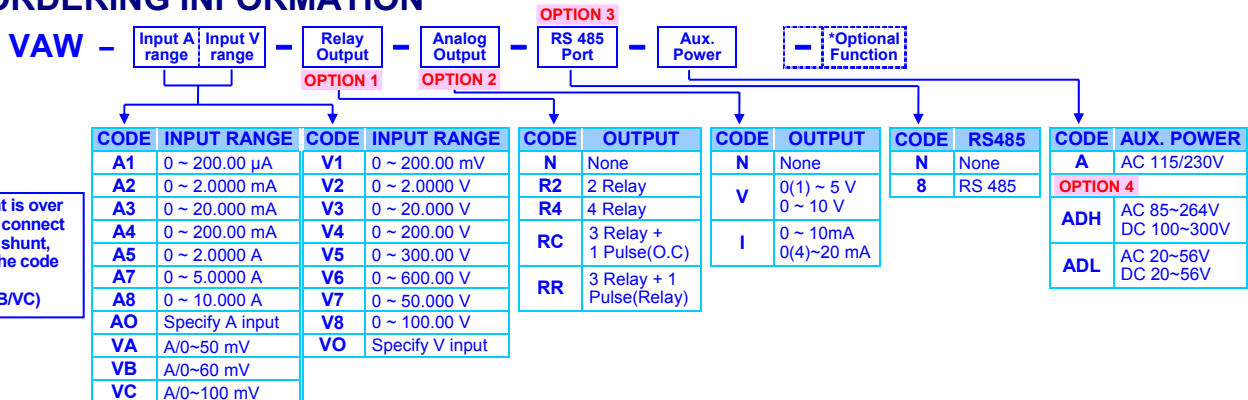
■ FEATURE

- Measuring DC Voltage, Current, Power, Import Energy and Export Energy
- 4 relay can be multi-cross programmed individual to correspond,
  - ► Voltage/Current/Power(kW): Hi / Lo / Hi Latch / Lo Latch energized with Start Delay / Hysteresis / Energized & De-energized Delay functions.
  - ► Energy(kWh): Energized with N/R/C mode
  - ► Other application: DO(Digital output)
- 2 external control inputs can be programmed individual to correspond,
  - ► Voltage/Current/Power(kW): Relative PV (Tare) / PV Hold / Maximum or Minimum Hold
  - ► Energy(kWh): Gate / Reset
  - ► Other application: DI(remote monitoring) / Reset for Relay Energized Latch
- Analogue multi-cross selection for Voltage/Current/Power(kW)/Energy output in option
- Pulse output to correspond energy and RS 485 communication port in option
- Outside dimensions is DIN standard (96 x 48 mm)
- CE Approved & RoHS

■ APPLICATIONS

Solar system monitoring   Testing Equipment

■ ORDERING INFORMATION

VAW – | Input A range | Input V range | – | Relay Output | – | Analog Output | – | RS 485 Port | – | Aux. Power | – | *Optional Function |

OPTION 3 (RS 485 Port)
OPTION 1 (Relay Output)
OPTION 2 (Analog Output)
OPTION 4

If the current is over 10A, please connect to a current shunt, and select the code of mV range(VA/VB/VC)

CODE	INPUT RANGE
A1	0 ~ 200.00 µA
A2	0 ~ 2.0000 mA
A3	0 ~ 20.000 mA
A4	0 ~ 200.00 mA
A5	0 ~ 2.0000 A
A7	0 ~ 5.0000 A
A8	0 ~ 10.000 A
AO	Specify A input
VA	A/0~50 mV
VB	A/0~60 mV
VC	A/0~100 mV

CODE	INPUT RANGE
V1	0 ~ 200.00 mV
V2	0 ~ 2.0000 V
V3	0 ~ 20.000 V
V4	0 ~ 200.00 V
V5	0 ~ 300.00 V
V6	0 ~ 600.00 V
V7	0 ~ 50.000 V
V8	0 ~ 100.00 V
VO	Specify V input

CODE	OUTPUT
N	None
R2	2 Relay
R4	4 Relay
RC	3 Relay + 1 Pulse(O.C)
RR	3 Relay + 1 Pulse(Relay)

CODE	OUTPUT
N	None
V	0(1) ~ 5 V / 0 ~ 10 V
I	0 ~ 10mA / 0(4)~20 mA

CODE	RS485
N	None
8	RS 485

CODE	AUX. POWER
A	AC 115/230V
	OPTION 4
ADH	AC 85~264V / DC 100~300V
ADL	AC 20~56V / DC 20~56V

■ TECHNICAL SPECIFICATION

Input Signal

Voltage Measuring Range	Input Impedance	Current Measuring Range	Input Impedance
0 ~ 50 mV/ ~60.00mV	≥5M ohm	0 ~ 200.00 µA	1K ohm
0 ~ 100.00 mV	≥5M ohm	0 ~ 2.0000 mA	100 ohm
0 ~ 200.00 mV	≥5M ohm	0 ~ 20.000 mA	10 ohm
0 ~ 2.0000 V	≥1M ohm	0 ~ 200.00 mA	1 ohm
0 ~ 20.00V/~50.00 V	≥1M ohm	0 ~ 2.0000 A	0.1 ohm
0 ~ 100.0 V/~200.0 V	≥1M ohm	0 ~ 5.000 A	0.02 ohm
0 ~ 300.00V/~600.0 V	≥1M ohm	0 ~ 10.000 A	0.01 ohm

If the input current is over 10A, please connect a Current shunt in the line.

Accuracy & Resolution

Parameters	Accuracy	Display Range	Resolution
Voltage	0.04%±1digit	-1999~+9999	0.001mV ~ 0.01V
Current	0.04%±1digit	-19999~+99999	0.01µA ~ 0.01A
Power	0.1%±1digit	-19999~+99999	Auto range(KW)

Parameters	Accuracy	Display Range	Resolution
Energy(Import)	0.1%±1digit	0~9999999999	0.0001(kWh)
Energy(Export)	0.1%±1digit	-1999999999~0	0.0001(kWh)
Run Hour	5.256min/year	0~99999999	1 Hr

Calibration: Digital calibration by front key
A/D converter: 16 bits resolution
Sampling Rate: 15 cycles/sec
Response Time: ≤100 msec.(when the ꓣu�ꓑ = "1") in standard
Max. Input over capability:
  Voltage: 2 x rated continuous;
  4 x rated for 2 seconds;
  Current: 3 x rated continuous;
  10 x rated for 10 seconds;
  50 x rated for 1 second(for 5A input type)

Display & Functions

Numeric LED: Dual display; 0.28"(7.1mm) high-brightness
Up-row for 10 digits red LED
down-row for 6 digits green LED

Pages scroll: 4 pages switchable to show all parameters
Page 1: Voltage(4 digits), Current(5 digits) and Power
Page 2: Import Energy and Power
Page 3: Export Energy and Power
Page 4: Run Hour and Power

I/O Status Indication: 10 square LED
Relay energized & Pulse(RL4 specify) indication:
4 square red LED
E.C.I. function indication: 2 square green LED
RS 485 communication: 1 square orange LED
V and A identify & unit: 2 square red LED
kWh identify & unit: 1 square red LED

Scaling function: There are two scaling functions to program individual for two isolation input.

Voltage: [ʋLᴏSC]**Low Scale:** programmable range -1999~9999
[ʋHᵢSC]**High Scale:** programmable range -1999~9999
[ʋPʋdP]**Decimal point:** programmable from 0 / 0.0 / 0.00 / 0.000

Current: [RLᴏSC]**Low Scale:** programmable range -19999~+99999
[RHᵢSC]**High Scale:** programmable range -19999~+99999
[RPʋdP]**Decimal point:** programmable from 0 / 0.0 / 0.00 / 0.000 / 0.0000

Power(kW): **Auto-range display from -19999~±0.0001~99999(kW) according to the multiply between voltage and current. And the decimal point will be decided by the higher resolution between voltage and current.**

Over range indication: [ᴏʋFL]**overflow:** when input is over 120% of input range Hi
Under range indication: [-ᴏʋFL]**-overflow:** when input is under -120% of input range Lo
Max / Mini recording: Maximum and Minimum value storage for voltage, Current and Power during power on.

Low cut: [ᴸᴏCt]**Low Cut:** Settable range: -19999~29999
Digital fine adjust: [.PʋPᴏ] .Pv.Zo: Settable range: -19999~+99999
[.PʋSn] .Pv.Sn: Settable range: -19999~+99999

Reading Stable Function

Average: [RʋG]: Settable range: 1~99 times
Moving average: [ᴍRʋG]: Settable range: 1(None)/~10 times
Digital filter: [dFᵢLt]:Settable range: 0(None)/1~99 times

Control Functions(option)

Set-points: Four set-points
Range: Voltage: -1999~+9999 ; Current: -19999~+99999
Power(kW): -19999~+99999
Energy(+kWh): 0~9999999999
Energy(-kWh): -1999999999~0

Control relay: Four relays
Relay 2 & Relay 3: Dual FORM-C, 1A/230Vac, 3A/115V
Relay 1 & Relay 4: Dual FORM-A, 1A/230Vac, 3A/115V

Relay energized mode: Multi-cross programming for all parameters and energized mode.

Corresponds to Current / Voltage / Power(kW)
Functions: **Energized levels compare with set-points:**
Hi / Lo / Hi.HLd / Lo.HLd programmable
Start delay / Energized & De-energized delay / Hysteresis / Energized Latch
Start band(Minimum level for Energizing): 0~9999counts
Start delay time: 0:00.0~9(Minutes):59.9(Second)
Energized delay time: 0.00.0~9(Minutes):59.9(Second)
De-energized delay time: 0.00.0~9(Minutes):59.9(Second)
Hysteresis: 0~5000 counts

Corresponds to Energy(+kWh / -kWh)
Functions: **Energized N/R/C mode programmable**
Energized time: 0:00.0~9(Minutes):59.9(Sec.)
DO function: Energized by RS485 command of master.

External Control Inputs(ECI)

Input Mode: 2 ECI points, Contact or open collect input, Level trigger
Functions: There are flexible functions can be programmed for
Corresponds to Current / Voltage / Power(kW)
Relative PV / PV Hold / Reset Max or Mini. Hold
Corresponds to Energy(+kWh / -kWh)
Gate / Reset
DI function monitoring by RS485 command of master.
Debouncing time: Settable range 5 ~255 x (8mseconds)

Analogue output(option)

Multi-cross function: User can program the output to correspond **Current, Voltage, Power(kW) and Energy(+kWh / -kWh)**
Accuracy: **≤ ± 0.1% of F.S.; 16 bits DA converter**
Ripple: ≤± 0.1% of F.S.
Response time: ≤100 msec. (10~90% of input)
Isolation: AC 2.0 KV between input and output
Output range: Specify either Voltage or Current output in ordering
Voltage: 0~5V / 0~10V / 1~5V programmable
Current: 0~10mA / 0~20mA / 4~20mA programmable
Output capability: **Voltage: 0~10V: ≥ 1000Ω;**
Current: 4(0)~20mA: ≤ 600Ω max
Functions: [RᴏHS]*output range high:* Settable range:
Voltage: -1999~+9999
Current: -19999~+99999
Power(kW): -19999~99999;
Energy(+kWh): 0~9999999999
Energy(-kWh): -1999999999~0
[RᴏLS]*output range Low:* Settable range:
Voltage: -1999~+9999
Current: -19999~+99999
Power(kW): -19999~99999;
Energy(+kWh): 0~9999999999
Energy(-kWh): -1999999999~0
[RᴏLᴍt]*output High Limit:* 0.00~110.00% of output High
Digital fine adjust: [RᴏPᴏ]: Settable range: -38011~+27524
[RᴏSPn]: Settable range: -38011~+27524

Pulse output(option)

Output mode: Open collect: 30V/60mA or Relay: DC24V/1A (The output frequency has to under 50Hz); Please specify in ordering
Output range: Maximum frequency: 1000Hz; duty cycle 50%
Pulse divider: **1 Pulse/1~9999 Count programmable.**

RS 485 Communication(optional)

Protocol: Modbus RTU mode
Baud Rate: 1200/2400/4800/9600/19200/38400 programmable
Data Bits: 8 bits
Parity: Even, odd or none (with 1 or 2 stop bit) programmable
Address: 1 ~ 255 programmable
Distance: 1200M
Terminate resistor: 150Ω at last unit.

Electrical Safety

Dielectric strength: AC 2.0 KV for 1 min, Between Power / Input / Output / Case
Insulation resistance: ≥100M ohm at 500Vdc, Between Power / Input / Output
Isolation: Between Power / Input / Relay / Analogue / RS485 / E.C.I.
EMC: EN 55011:2002; EN 61326:2003
Safety(LVD): EN 61010-1:2001

Environmental

Operating temp.: 0~60 ˚C
Operating humidity: 20~95 %RH, Non-condensing
Temp. coefficient: ≤ 100 PPM/˚C
Storage temp.: -10~70 ˚C
Enclosure: Front panel: IEC 529 (IP52); Housing: IP20
Vibration: 1~800Hz, 3.175g2/Hz

Mechanical

Dimensions:	96mm(W) x 48mm(H) x 120mm(D)
Panel cutout:	92mm(W) x 44mm(H)
Case material:	ABS fire-resistance (UL 94V-0)
Mounting:	Panel flush mounting
Terminal block:	Plastic NYLON 66 (UL 94V-0)
	Input 1 / Input 2 / Power : 10A 300Vac, M3.0, 22~12AWG
	ECI: 5A 300Vac, M2.0, 0.5~1.3mm²(22~16AWG)
	Relay, A/O and RS485: 10A 300Vac, M2.6, 22~16AWG
Weight:	550g / 350g(Aux. Power Code: ADH, ADL)

Power

Power supply:	AC115/230V,50/60Hz;
	Optional: AC 85~264V / DC 100~300V
	or AC/DC 20~56V
Power consumption:	5.0VA maximum
	3.0VA maximum in power saving mode
Back up memory:	By EEPROM

■ FRONT PANEL

ECI status indication
Engineer unit for Volt
Measuring value display for Voltage
Operating Key
Measuring value display for Current
Mathematic value display for Power

RL/Pulse outputs status indication
Communication Status indication
Engineer unit for Energy
Engineer unit for Current
Engineer unit for Power

Page 1 for Voltage(4 digits), Current(5 digits) and Power(kW)

Engineer unit for Volt
Measuring value display for Voltage

Engineer unit for Current
Measuring value display for Current
Mathematic value display for Power
Engineer unit for Power

Page 2 for Import Energy and Power(kW)

Display for Import Energy

Engineer unit for Energy
Mathematic value display for Power
Engineer unit for Power

Page 3 for Export Energy and Power(kW)

Display for Export Energy

Engineer unit for Energy
Mathematic value display for Power
Engineer unit for Power

Page 4 for Run Hour and Power(kW)

Display for Run Hour

Mathematic value display for Power
Engineer unit for Power

■ DIMENSIONS

FRONT VIEW 48.0
96.0
100.0 8.0 12.0

PANEL CUT-OUT 44.0⁺⁰·²
92.0⁺⁰·²

Unit: mm

Dimensions: 96mm x 48mm x 120mm
Panel Cutout: 92mm x 44mm
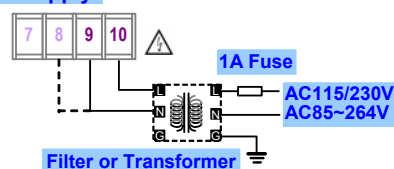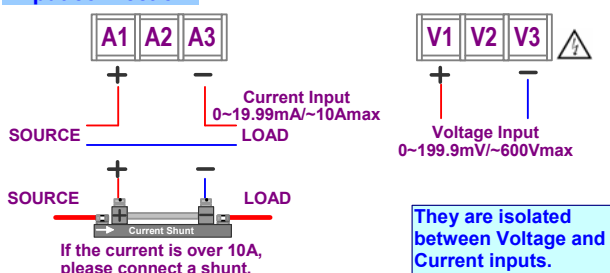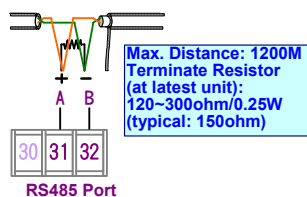
■ INSTALLATION

The meter should be installed in a location that dose not exceed the maximum operating temperature and provides good air circulation.
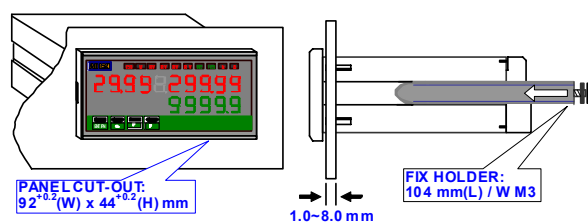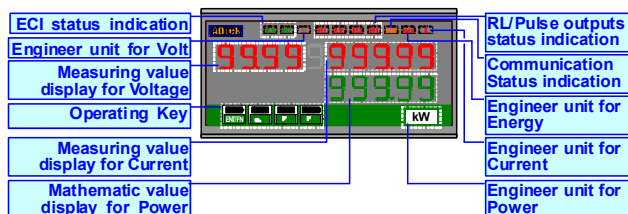
PANEL CUT-OUT:
92⁺⁰·²(W) x 44⁺⁰·²(H) mm
1.0~8.0 mm

FIX HOLDER:
104 mm(L) / W M3

■ CONNECTION DIAGRAM

Relay 1 Relay 2 Relay 3 Relay 4 RS485 port Analogue output

a c b c a b c a a c A B

21 22 23 24 25 26 27 28 29 30 31 32 33 34

Terminal blocks:
10A/300Vac, M2.6, 1.3~2.0mm² (16~12AWG)

A1 A2 A3 V1 V2 V3 ECI1 ECI2 COM / 4 5 6 8 9 10

A1~A3 / V1~V3: 10A/300Vac, M3.0, 1.3~3.5mm² (22~12AWG)

CURRENT INPUT
VOLT INPUT
External Control Input
AC115V
AC230V
ADH
ADL
AUX. POWER

AC 85~264V
DC 100~300V
AC/DC 20~56V
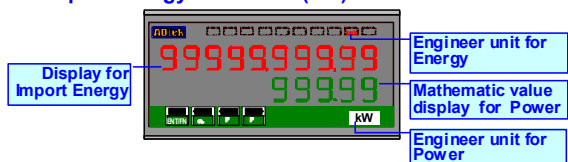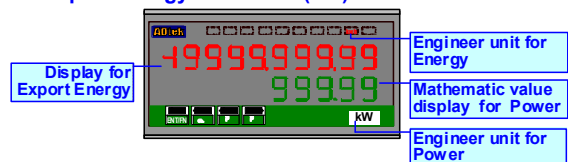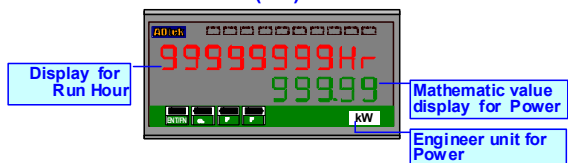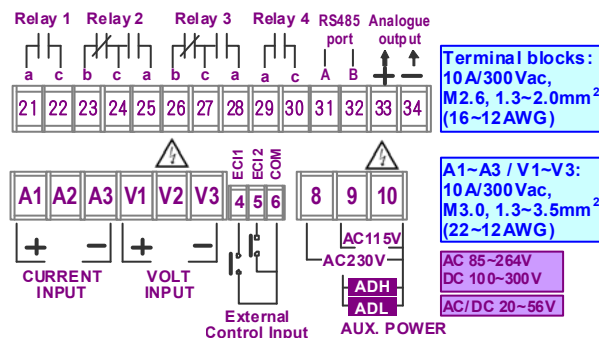
Please check the voltage of power supplied first, and then connect to the specified terminals. It is recommended that power supplied to the meter be protected by a fuse or circuit breaker.

Power Supply

7 8 9 10

1A Fuse

AC115/230V
AC85~264V

N L
N L

Filter or Transformer

Input connection

A1 A2 A3

SOURCE LOAD
Current Input 0~19.99mA/~10Amax

SOURCE LOAD
Current Shunt
If the current is over 10A, please connect a shunt.

V1 V2 V3

Voltage Input 0~199.9mV/~600Vmax

They are isolated between Voltage and Current inputs.

RS485 Communication Port

Max. Distance: 1200M
Terminate Resistor
(at latest unit):
120~300ohm/0.25W
(typical: 150ohm)

A B
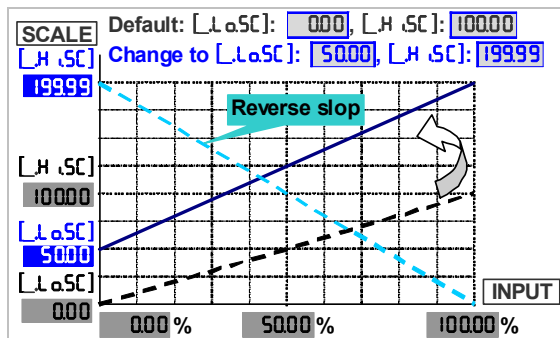
30 | 31 | 32

RS485 Port

■ FUNCTION DESCRIPTION

Input & Scaling Functions

Scaling function:

Setting the [ˍˍLoSC] (Low scale) and [ˍHiSC] (High scale) in [inPt._ GroUP] to corresponding input 1 & input 2 signals. **Reverse scaling will be done too.** Please refer to the figure as below,

SCALE

Default: [ˍˍLoSC]: 0.00 , [ˍHiSC]: 100.00

Change to [ˍˍLoSC]: 50.00 , [ˍHiSC]: 199.99

[ˍHiSC] 199.99

Reverse slop

[ˍHiSC] 100.00

[ˍˍLoSC] 50.00

[ˍˍLoSC] 0.00

INPUT

0.00 %   50.00 %   100.00 %

Display & Functions

There are dual display screen for all electrical value in VAW. Please refer to the function description as below,

Display scrolling:

The dual row display can be scrolled in 5 pages by front Up/Down key to show all electrical value as below,

Page 1 for Voltage(4 digits), Current(5 digits) and Power(kW)
Page 2 for Voltage(5 digits), Current(4 digits) and Power(kW)
Page 3 for Import Energy and Power(kW)
Page 4 for Export Energy and Power(kW)
Page 5 for Run Hour and Power(kW)

Max / Mini recording:

In order to review & trace the drifting PV, the meters will keep the values of maximum and minimum in [user level] during power on. User can reset the values of Voltage, Current and Active power individually by [ᾱrSt] in [user level]. And it'll record new maximum and minimum value immediately after reset.

PV(Present value) Hold [PuHLd]

When the [ECi_] (External Control input) set to be PuHLd (PV Hold) function in [ECi GroUP], that display will be hold & kept, and the relative green LED will be bright, when the ECI terminals been closed or pressed Up/Down Key function been set (the 1st times), until the ECI is to be opened or press Up/Down Key again(the 2nd times).

► Please paste the sticker **ECI** **PVH** on the right side of green square LED of ECI to identify the status of display.
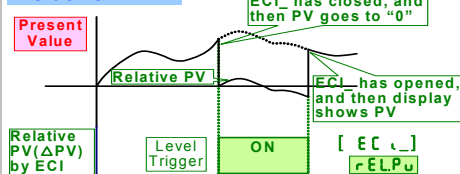
PV Hold & Reset

Present Value

PV Hold

Reset PV Hold by E.C.I.

ON | ON | Level Trigger | ON

[ECi_]
PuHLd
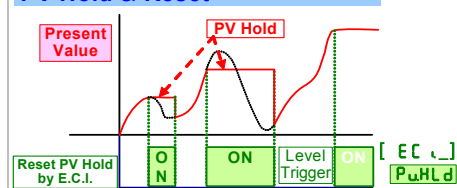
Relative PV(ΔPV) or Tare [rELPu]

The [ECi_] can be set to be rELPu (Relative PV) function. When the ECI is closed, the reading will show the differential value with PV or Tare either.

Relative PV

Present Value

ECI_ has closed, and then PV goes to "0"

Relative PV !

ECI_ has opened, and then display shows PV

Relative PV(ΔPV) by ECI
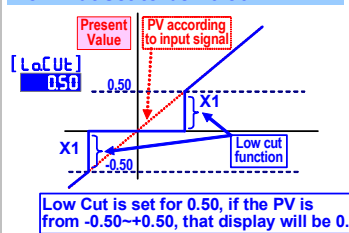
Level Trigger | ON

[ECi_]
rELPu

Low cut: Settable range from -19999~+99999 counts.
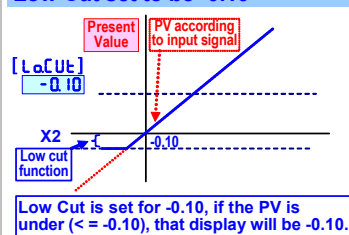
The users can set the value range.

(1) If set the positive value (X1) here to display "0" which it expressed to be low-cut the PV between "+X1 (plus)" & "-X1(minus)" /absolute value

PV< I Setting value (X1) I, the display will be shown 0

EX: Low Cut is set for 0.50. If the display is from -0.50~+0.50, that will be 0.

Low Cut set to be +0.50

Present Value

PV according to input signal

[LoCUt] 0.50

0.50

X1

X1

-0.50

Low cut function

Low Cut is set for 0.50, if the PV is from -0.50~+0.50, that display will be 0.

(2) If set the negative value (X2) here to display "X2" which it expressed to be low-cut the PV that it's under the X2 setting value;

PV< Setting value(X2), the display will be shown X2.

EX: Low Cut is set for -0.01. If the display is < -0.01, and all the display will be -0.01.

Low Cut set to be -0.10

Present Value

PV according to input signal

[LoCUt] -0.10

X2

-0.10

Low cut function

Low Cut is set for -0.10, if the PV is under (< = -0.10), that display will be -0.10.
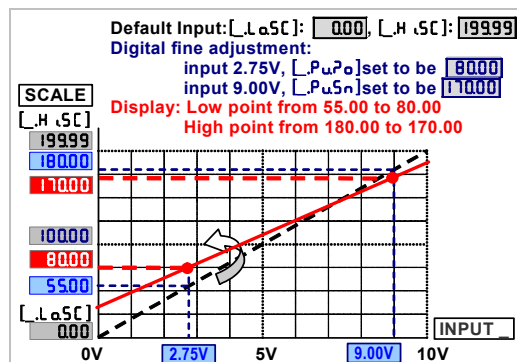
Digital fine adjust: Settable range for Current: -19999~+99999
Voltage: -19999~+99999

Users can get "Fine Adjustment PV" by front key on the meter for lower and/or higher points. "Just Key-In" the value, if user wants to show the value in input signals currently.

Especially, the [ˍPuPo] & [ˍPuSn] are not only in zero & span of PV, but also randomly lower point in function [ˍPuPo] & randomly higher point in function [ˍPuSn]. The meter will be auto-linearization for full scale. The adjustment can be cleared in function [ˍPSCL].
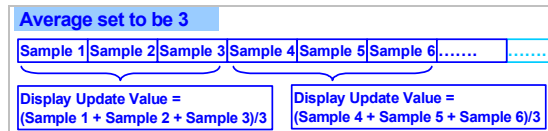

Default Input: [ˍˍLoSC]: 0.00 , [ˍHiSC]: 199.99

Digital fine adjustment:
input 2.75V, [ˍPuPo] set to be 80.00
input 9.00V, [ˍPuSn] set to be 170.00

Display: Low point from 55.00 to 80.00
High point from 180.00 to 170.00

SCALE

[ˍHiSC] 199.99

180.00

170.00

100.00

80.00

55.00

[ˍˍLoSC] 0.00

INPUT

0V | 2.75V | 5V | 9.00V | 10V

Reading Stable Function
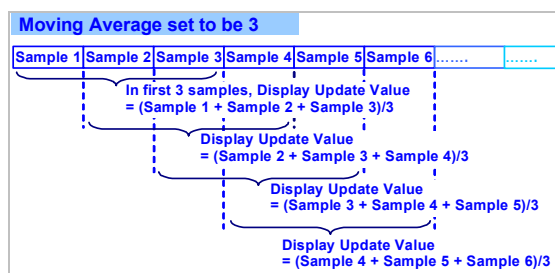
Average display: Settable range: 1~99 times
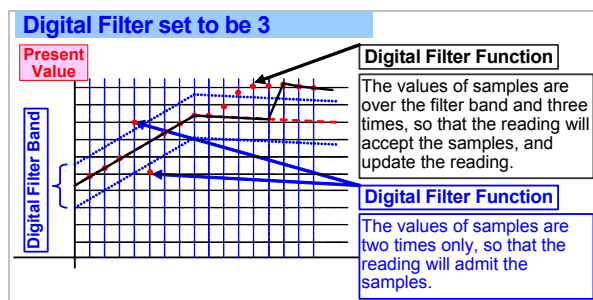
Jittery Display caused by the noise or unstable signal. User can set the times to average the readings, and to get smoothly display.

The meter's sampling is 15cycle/sec. If the [𝖠𝗎𝖦](Average) set to be 𝟥 to express the display update with 5 times/sec.

The meter will calculate the sampling 1-3 and update the display value. At meantime, the sampling 4-6 will be processed to calculate.

Average set to be 3		
Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6 …….
Display Update Value = (Sample 1 + Sample 2 + Sample 3)/3		Display Update Value = (Sample 4 + Sample 5 + Sample 6)/3

Moving average display: Settable range: 0(no function)/1~10 times

Jittery Display caused by the reasons as like as noise or unstable signal. User can set the times to average the readings, and get smoothly display.

The meter's sampling is 15cycle/sec. If the [𝗇𝗎𝖠𝗎𝖦](Moving Average) set to be 𝟥 expressed the display update with 15 times/sec.,
In the first updated display value will be same as average function. In the next updated display value, the function will get the new fourth sample (sample 4) then throw away the first sample (sample 1) that the newest 3 samples(sample 2,3,4) will be calculated for the updated display value.

Moving Average set to be 3		
Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6…….

In first 3 samples, Display Update Value = (Sample 1 + Sample 2 + Sample 3)/3
Display Update Value = (Sample 2 + Sample 3 + Sample 4)/3
Display Update Value = (Sample 3 + Sample 4 + Sample 5)/3
Display Update Value = (Sample 4 + Sample 5 + Sample 6)/3

Digital Filter: Settable range from 0(None)/1~99 times.

The digital filter can reduce the influence of spark noise caused by magnetic of coil.
If the values of samples are over digital filter band(fix in firmware and about 5% of stable reading) 3 times (Digital Filter set to be 3) continuously, the meter will admit the samples and update the new reading. Otherwise, it will be as treat as a noise and skip the samples.
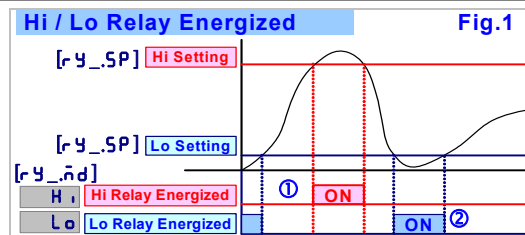
Digital Filter set to be 3

Digital Filter Function
The values of samples are over the filter band and three times, so that the reading will accept the samples, and update the reading.

Digital Filter Function
The values of samples are two times only, so that the reading will admit the samples.

Relay Functions(option)

VAW offer the 4 relay outputs with multi-cross functions. User can set the relay functions to correspond Current(𝖠𝖯𝗎), Voltage(𝗎𝖯𝗎), Power(𝖯𝗎𝖯𝗎), Energy(𝖯𝗎𝖧) and Energy(-𝖯𝗎𝖧).They can be programmed individually in [𝗋𝖤𝖫𝖠𝖸 𝖦𝗋𝗈𝖴𝖯]. If users specify a pulse output, the relay output will be 3 maximum due to the limited terminal. Please refer to the description as following;

Corresponding to Current(𝖠𝖯𝗎), Voltage(𝗎𝖯𝗎), Power(𝖯𝗎𝖯𝗎)
Relay energized mode: Hi / Lo / Hi.HLd / Lo.HLd / DO
  Hi(Fig.1-①): Relay will be energized when PV > Set Point
  Lo(Fig.1-②): Relay will be energized when PV < Set Point

Hi / Lo Relay Energized   Fig.1

[𝗋𝖸_.𝖲𝖯] Hi Setting
[𝗋𝖸_.𝖲𝖯] Lo Setting
[𝗋𝖸_.𝗇̄𝖽]
Hi | Hi Relay Energized | ON ①
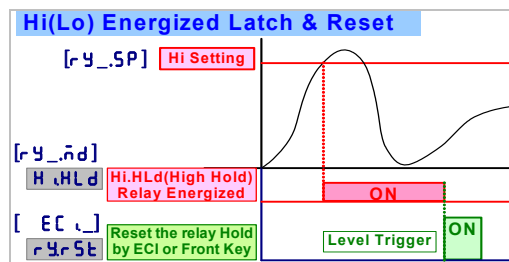Lo | Lo Relay Energized | ON ②

Hi.HLd (Lo.HLd): The relay energized with latched function is for electrical safety and human protection.

For example, a current meter relay installed for the over current alarm of motor. Generally, over current of motor caused by over load, mechanical dead lock, aging of insulation and so on.

Above cases will alarm in the meter, if the user doesn't figure out the real reason and re-start the motor. It may damage the motor. The functions of Hi.HLD & Lo.HLD are designed must be manual reset the alarm after checking out and solving the issue. It's very important idea for electrical safety and human protection.

As the PV Higher (or lower) than set-point, the relay will be energized to latch except manual reset by from key in [**user level**] or [𝖤𝖢𝗂](ECI) set to be 𝗋𝖸𝗋𝖲𝗍 is closed.

Hi(Lo) Energized Latch & Reset

[𝗋𝖸_.𝖲𝖯] Hi Setting
[𝗋𝖸_.𝗇̄𝖽]
H𝗂HLd | Hi.HLd(High Hold) Relay Energized | ON
[𝖤𝖢𝗂_]
𝗋𝖸𝗋𝖲𝗍 | Reset the relay Hold by ECI or Front Key | Level Trigger | ON

DO(Digital output): The function has been designed not only a meter but also an I/O interface. In the case of motor control cabinet can't get the remote function. It's very easily to get the ON/OFF status of switch from CS2 series with RS485 function.
If the [𝗋𝖸_.𝗇̄𝖽] had been set 𝖽𝗈 , the relay will be energized by RS485 command directly, but no longer to compare with set-point.
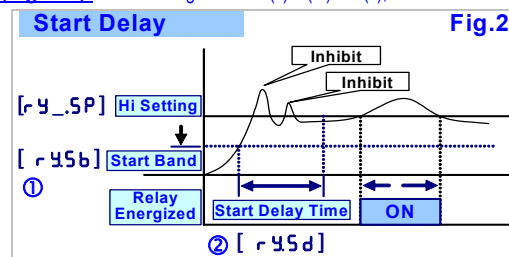
Start delay band and Start delay time:
The functions have Been designed for,
► To avoid starting current of inductive motor (6 times of rated current) with alarm.
► If the 𝗋𝖸_.𝗇̄𝖽 relay energized mode had been set to be 𝖫𝗈 (Lo) or 𝖫𝗈𝖧𝖫𝖽 (Lo & latch). As the meter is power on and no input to display the "0" caused the relay will be energized. User can set a band and delay time to inhibit the energized of relay.
Start band(Fig.2-①): Settable range from 0~9999 Counts
Start delay time(Fig.2-②): Settable range from 0.0(s)~9(m)59.9(s);

Start Delay   Fig.2

[𝗋𝖸_.𝖲𝖯] Hi Setting
[𝗋𝖸𝖲𝖻] Start Band ①
Relay Energized | Start Delay Time | ON
Inhibit Inhibit
② [𝗋𝖸𝖲𝖽]

Hysteresis(Fig.3-①): Settable range from 0~9999 Counts
As the display value is swing near by the set point to cause the relay on and off frequently. The function is to avoid the relay on and off frequently such as compressor…….etc.,

Relay energized delay(Fig.3-②): Settable range from 0.0(s)~9(m)59.9(s);

The function is to avoid the miss action caused by noise. Sometime, the display value will swing caused by spark of contactor…etc.. User can set a period to delay the relay energized.

Relay de-energized delay(Fig.3-③): Settable range from 0.0(s)~9(m)59.9(s);

Fig.3 — Energized / De-energized Delay & Hysteresis
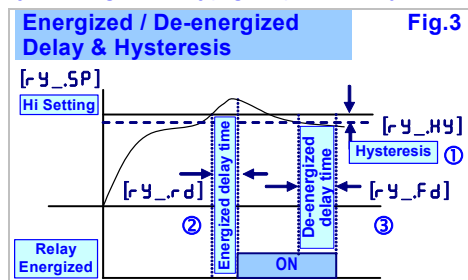
Corresponding to Energy(EЧH):

For energy(±kWh), The relay output is not only according to relay energized mode, set-point and relay out time but also reset the relay and energy(±kWh). Please refer to the description in following,

Relay energized mode: N / C / R mode

Relay output time: Settable range from 0.0(s)~9(m)59.9(s)

N mode: Energy(±kWh) & relay reset by manual

When the condition of **Set Point** is met:
1. The relay will be energized;
2. The energy(±kWh) will run as same as usual, until manual reset by front key or by ECI of rear terminal, the energy(±kWh) will be reset to "0" and the relay will be de-energized.
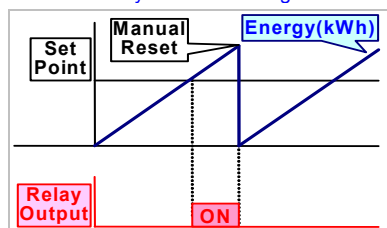
R mode: Energy(±kWh) & relay reset by time setting of relay output time[rY_.ot]

When the condition of **Set Point** is met:
1. The relay will be energized, until the time is over Relay output time [rY_.ot](Relay _ output times).
2. The energy(±kWh) will run as same as usual; until the time is over Relay output time [rY_.ot] (Relay _ output time),The energy(±kWh) will be reset to "0".
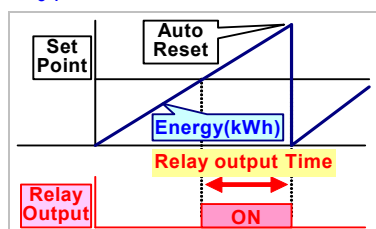
C mode: Energy(±kWh) auto reset & relay reset by time setting of relay output time[rY_.ot]

When the condition of **Set Point** is met:
1. The relay will be energized, until the time is over Relay output time [rY_.ot] (Relay_ output times).
2. The energy(±kWh) will be reset to "0" immediately, then counts-up from "0".
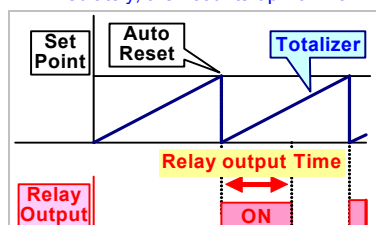

External Control Inputs(ECI)

VAW offers 2 point external control inputs (ECI) with Multi-Cross selection function. User can set the ECI functions corresponding to Current(RPu), Voltage(uPu), Power(EuPu), Energy(EЧH) and Energy(-EЧH). They can be programmed individual with versatile display and control functions. The front key function can be set to execute ECI function. At meantime, ECI terminals will be disabling. The input from terminal has designed level trigger. Please refer to description as below,

Corresponding to Current(RPu), Voltage(uPu), Power(EuPu),
ECI Functions: Relative PV / PV Hold / Reset for Maximum or Minimum / DI(Digital Input) / Reset for Relay Energized Latch
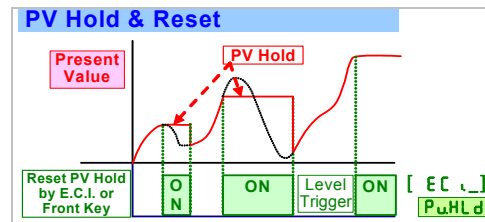
Relative PV: The [ECI] can be set to be rELPu(Relative PV) function. When the ECI is closed, the all readings will show the differential value with Current(RPu), Voltage(uPu), Power(EuPu) .
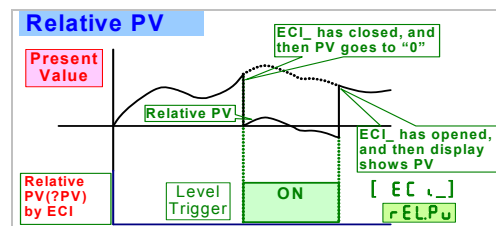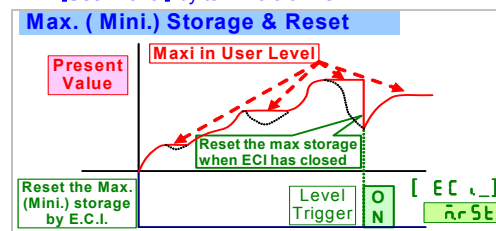

PV Hold: The [ECI] can be set to be PuHLd(PV Hold) function. The display will be hold when the E CI is closed, until the ECI is to be open. Please refer to the below figures,

Reset for Maximum or Minimum: The [ECI] function can be set to be �macSt function to reset the maximum and minimum value in [User Level] by terminals of ECI.

DI(Digital Input): The [ECI] can be set to be di(Digital Input) function, when the meter has been building in RS485 port. The master is easier to get a switch status through the meter as like as DI of PLC.

Reset for Relay Energized Latch: If the relay energized mode has been set to be HiHLd(Energized latch), and the [ECI] can be set to be rYrSt(Reset the Relay energized latch). When the PV meets the condition of relay energizing, the relay will be energized and latch until the ECI is to be closed.
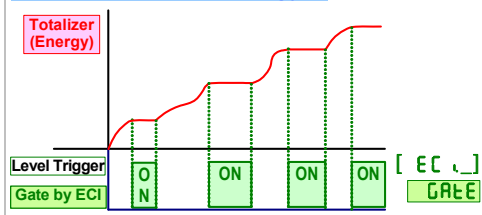
Corresponding to Energy(EЧH)
ECI Functions: Gate / Reset
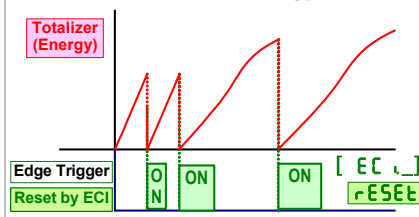**Gate function:** Energy(±kWh) will be stopped to accumulate, when ECI is closed, until the ECI open again. The Energy(±kWh) will accumulate continuously after the ECI open.

Gate for Totalizer(Energy)

Reset Function: Energy(±kWh) will be reset to "0", when ECI is closed, until the ECI open again. The Energy(±kWh) will accumulate from 0 after the ECI open.

Reset for Totalizer(Energy)

Debouncing time: The function is for avoiding noise signal to into the meter. And The basic period is 8 mseconds. It means you set the number that has to multiply 8 mseconds.
For example: [dEbnC] set to be 5, it means 5 x 8mseconds = 40 mseconds

Pulse Output(optional)

The meter offers a pulse output corresponding to energy(±kWh). It's a popular application to connection a DI of PLC to manage the power consumption.
The pulse output is 1000Hz maximum, and 50% duty cycle(0.5msec. minimum).

Pulse divider: Settable range from 1~9999.
► PLSdu set to be ☐ : It will output 1 pulse, when energy(±kWh) increases "1Count".
Ex: It will output 1 pulse, when energy from 12345.678 increase to 12345.679,
► PLSdu set to be 1000 : It will output 1 pulse, when energy(±kWh) increases "1000Count".
Ex: It will output 1 pulse, when energy from 12345.678 increase to 12346.678.

Analogue output(option)

Please specify the output type either a 0~10V or 4(0)~20mA in ordering. VAW offers one analogue output with Multi-Cross selection function. User can program the output to correspond Current(APu), Voltage(uPu), Power(PYPu), Energy(PYH) and Energy(-PYH), and also the output low and high can be programmable which it's related to various display values easier in [Ao GroUP].
Reverse slope output is possible by reversing point positions. Please refer to the detail description as below,

### Output range corresponds to various display values:
Programmable range:
Voltage: -1999~+9999 Current: -19999~+99999
Power(kW): -19999~99999;
Energy(+kWh): 0~9999999999
Energy(-kWh): -1999999999~0

Output low corresponds to display Low:
Setting the Display value Low to versus output range Low(as like as 4mA in R4-20).

Output high corresponds to display High:
Setting the Display value high to versus output range high(as like as 20mA in R4-20).
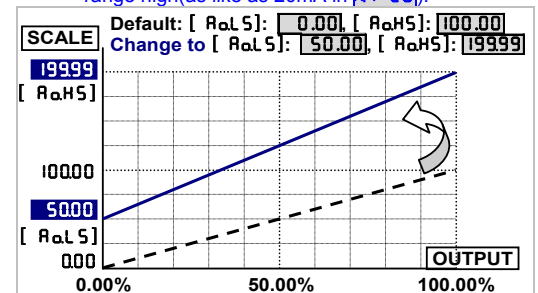
Fine Zero & Span Adjustment:

Users can get Fine Adjustment of analogue output by front key on the meter. Please connect standard meter to the terminals of analogue output. To press the front key(up or down key) of meter for adjusting and checking the output.
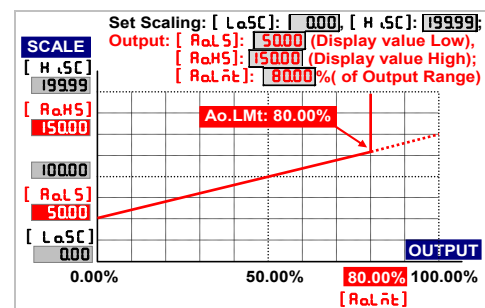
Fine Zero Adjustment: Settable range: -38011~27524;
**Fine Span Adjustment:** Settable range: -38011~27524;
High Limited: Settable range: 0.00~110.00% of output High;
User can set the high limit of output to avoid destroying the receiver or protection system.

RS 485 communication(option)

VAW supports Modbus RTU mode protocol to be used as Remote Terminal Unit (RTU) for monitoring and controlling in a SCADA (Supervisor Control And Data Acquisition) system. The baud rate can be up to 38400 bps. It's not only can be read the measured value and DI (external control inputs) status but also controls the relays output (DO) by RS485 communication ports.
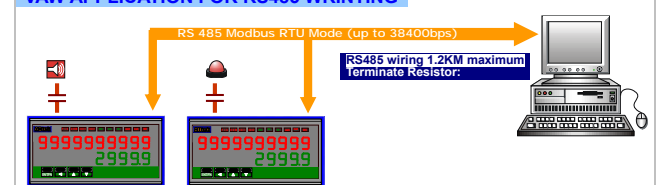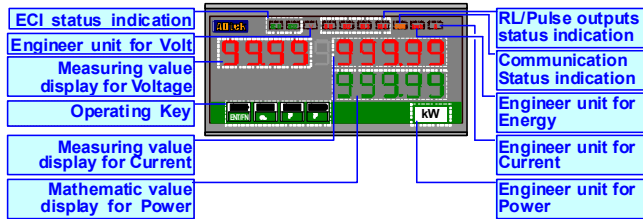

Power Saving Function

For the power saving, VAW has built an innovation timer that can be set a time to switch down the light and power of LED. It meets green power idea to build a low consumption meter in a green power system.

Power Saving Time: Settable from 0.0~9(M):59.9(S)
The LED will be darker and power consumption will be less, after user didn't push the front key for over the setting of power saving time[PSAuE]. The power consumption will be less than 40% of rated.

■ FRONT PANEL:

ECI status indication	RL/Pulse outputs status indication
Engineer unit for Volt	Communication Status indication
Measuring value display for Voltage	Engineer unit for Energy
Operating Key	Engineer unit for Current
Measuring value display for Current	Engineer unit for Power
Mathematic value display for Power	

There are two row displays in VAW to show all parameter in 5 pages. The description as below,

■ Number screen

- **Up row:** `8.8.8.8.8 8.8.8.8.` : 0.28"(0.71cm) red high-brightness LED

- **Down row:** `8.8.8.8.8` 0.28"(0.71cm) green high-brightness LED

- **Pages scroll:** 5 pages switchable by front ▲Up/▼Down key to show all parameters

    The voltage and current display range are 5 digits. There are 4 digits voltage display in page 1 and 4 digits current display in page 2, due to the voltage and current display in 10 digits limited.
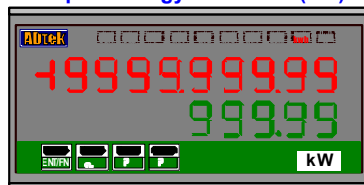
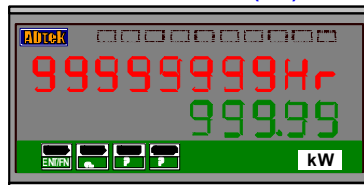**Page 1 for Voltage(4 digits display), Current(5 digits) and Power(kW)**
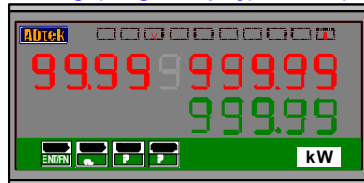
Page 2 for Import Energy and Power(kW)
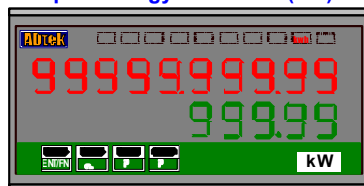
Page 3 for Export Energy and Power(kW)

Page 4 for Run Hour and Power(kW)

■ I/O Status Indication

- **Relay Energized:** 4 square red LED
    - **RL1** display when Relay 1 energized;
    - **RL2** display when Relay 2 energized;
    - **RL3** display when Relay 3 energized;
    - **RL4** display when Relay 4 energized;

- **External Control Input Energized:** 2 square green LED
    - **ECI1** display when E.C.I. 1 close(dry contact)
    - **ECI2** display when E.C.I. 2 close(dry contact)

- **RS485 Communication:** 1 square orange LED
    - **COM** will flash when the meter is receive or send data, and **COM** flash quickly means the data transient quicker.

- **Pulse Output:** 1 square red LED
    - **PLS** will flash when the pulse is output according to the accumulation of energy.

■ Stickers:
Each meter has a sticker what are functions enclosure.

- **Functions stickers**

HH	HI	LO	LL	D.L	D.H	DO	D.H	M.H	Tare
GO	Hi.H	Lo.H	R.PV	R.RS	M.RS	PV.H	BK1	BK2	BK3
DI	RST	DO1	DO2	DO3	DO4	DI1	DI2	DI3	

- **Relay energized**
    - **HH** HH Energized
    - **Hi** Hi Energized
    - **Lo** Lo Energized
    - **LL** LL Energized
    - **DO** RS485 Energized
    - **Hi.H** Hi Energized & Latch
    - **Lo.H** Lo Energized & Latch

- **ECI functions:**
    - **PV.H** PV Hold
    - **R.PV** Relative PV
    - **DI** Digital Input
    - **M.RS** Maximum or Minimum Reset
    - **R.RS** Reset fo Relay Latch

■ Operating Key: 4 keys for ■Enter(Function) / ◄Shift(Escape) / ▲Up key / ▼Down key

■ Pass Code: Settable range:0000~9999;
User must key-in the exactly pass code for access to **[Programming Level]**. Otherwise, the meter will return to measuring page. If user forgets the pass code, please contact with your service window.

■ Function Lock: There are 4 levels programmable.

- **nonE (None):** no lock at all. User can access to all level for checking and setting.

- **USEr (User Level):** User Level lock. User can access to User Level for checking, but can not setting.

- **EnG (Programming Level):** Programming level lock. User can access to programming level for checking, but can not setting.

- **ALL (ALL):** All lock. User can access to all level for checking but can not setting.

■ Basic/Advance:
In the programming level, the meter shows only general functions for basic programming in each group. There are advance functions has been hidden in **AdunC** (advance). User can set the **AdunC** in [**ProG**] of each group to show all functions.

■ ERROR MASSAGE

BEFORE POWER ON, PLEASE CHECK THE SPECIFICATION AND CONNECTION AGAIN.

SELF-DIAGNOSIS AND ERROR CODE:

DISPLAY	DESCRIPTION	REMARK
ouFL	Display is positive-overflow (Signal is over display range)	(Please check the input signal)
-ouFL	Display is negative-overflow (Signal is under display range)	(Please check the input signal)
ouFL	ADC is positive-overflow (Signal is higher than input 120%)	(Please check the input signal)
-ouFL	ADC is negative-overflow (Signal is lower than input -120%)	(Please check the input signal)
EEP ⇄ FAiL	EEPROM occurs error	(Please send back to manufactory for repaired)
AiC.nG ⇄ Pu	Calibrating Input Signal do not process	(Please process Calibrating Input Signal)
AiC ⇄ FAiL	Calibrating Input Signal error	(Please check Calibrating Input Signal)
AoC.nG ⇄ Pu	Calibrating Output Signal do not process	(Please process Calibrating Output Signal)
AoC ⇄ FAiL	Calibrating Output Signal error	(Please check Calibrating Output Signal)

■ OPERATING KEY

*Please access to the Programming Level to check and set the parameters when users start to run the meter

■ Operating Key: 4 keys for ▣ Enter(Function) / ◀ Shift(Escape) / ▲ Up key / ▼ Down key

■ The meter has designed operation similar as PC's ⇐ ⇒ and Enter . In any page, press ▣ key means "enter" or "confirm setting", and press ◀ key means "escape(Esc)" or "shift".

■ In Programming Level, the screen will return to Measuring Page after do not press any key over 2 minutes, or press ◀ for 1 second.

	Function Index	Setting Status
▣ (= FUN ENT) **Enter/Fun key**	(1) In any page, press ▣ to access the level or function index (2) From the function index to access setting status	(3) Setting Confirmed, save to EEProm and go to next function index
◀ (= ◀) **Shift key**	(1) In measuring page, press ◀ for 1 second to access user level. (2) In function index, press ◀ for 1 second to go back upper level. (3) In function group index, press ◀ for 1 second to go back measuring page	(4) In setting status, press ◀ to Shift the setting position. (5) In setting status, press ◀ for 1 second to abort setting and go back this function index.
▲ (= ▲) **Up key**	(1) In function index, press ▲ to go back to previous function index	(2) In setting status for function, press ▲ to select function (3) During number Setting, press ▲ can roll the digit up
▼ (= ▼) **Down key**	(1) In Function Index Page, press ▼ will go to the next Function Index Page.	(2) In setting status for function, press ▼ to select function (3) During number Setting, press ▼ can roll the digit down.