

# Acuvim-LV4 meter- Installation Guide

The following document provides users with an installation guide for the Acuvim-L-V4 series meter.

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## Meter Model

Function Model	Mounting Option	Current Input	Power Supply
Acuvim-CL Energy class 0.5 Harmonics up to 31st	D: Panel Mounting with Display	5A: Allow user to select 1A/5	P1V4: 100-415Vac, 50/60Hz, 100-300Vdc
Acuvim-EL Energy class 0.2 Harmonics up to 63rd	M: DIN-Rail Mounting without Display	mV: Allow user to select 333mV/ RCT	P2V4: 20-60Vdc

Before installation work commence, make sure the current input of model of the meter complies with the CT. The model can be checked on the silver label stick to the meter.



In the above picture, the model number is Acuvim-CL-D-5A-P1V4, which indicates the following:

**Acuvim CL:** Base Model for Acuvim-LV4 series

**D:** It has an LCD Display

**5A:** The current input option indicate that the meter should be paired with 5A/1A

PIV3: The power supply option is 100~415Vac in 50/60Hz or 100~300Vdc

## Power supply to meter

Depends on the model of the meter, it requires either

1. 100~ 415Vac,50/60Hz, 100~300V dc (PIV3)

Or

2. 20~60V dc power (P2V3)

Power supply has a separate plug on the side of the meter with label pin 11 (L), pin 12 (N) and pin 13 (Ground).

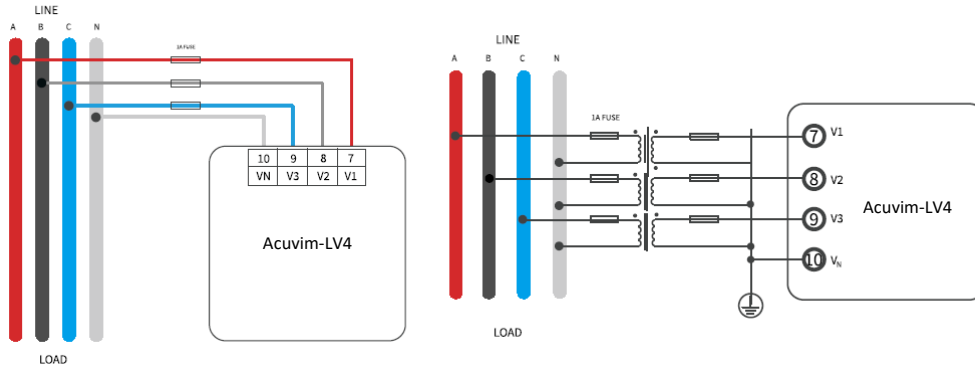


## Voltage Wiring

### 3LN – 3 phase 4 wire Wye Mode (WYE)

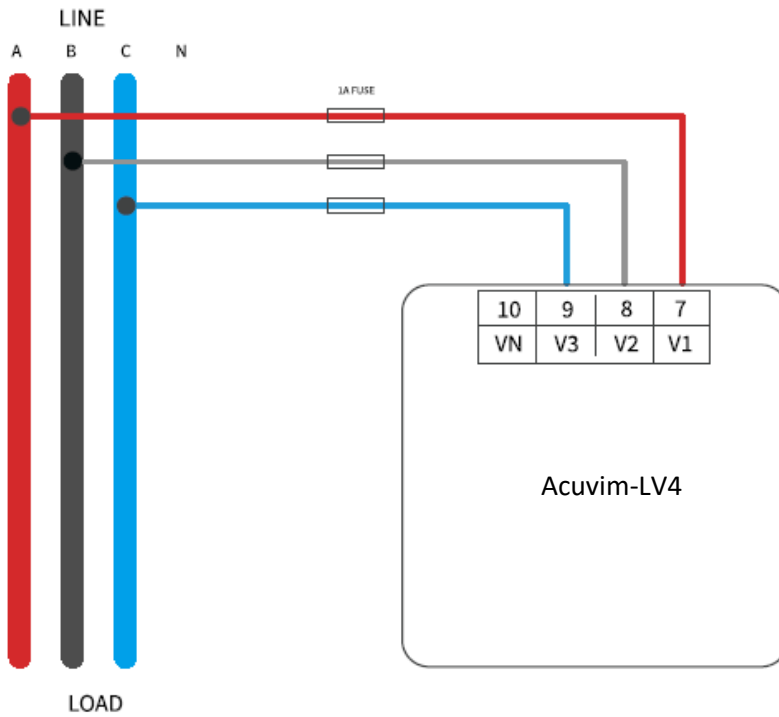
For voltages lower than 400LN/690LL, the voltage lines can be connected directly to the meter voltage input terminals (V1, V2, V3 and Vn).

For high voltage systems (over 400LN/690LL), PTs (Potential Transformers) are required.



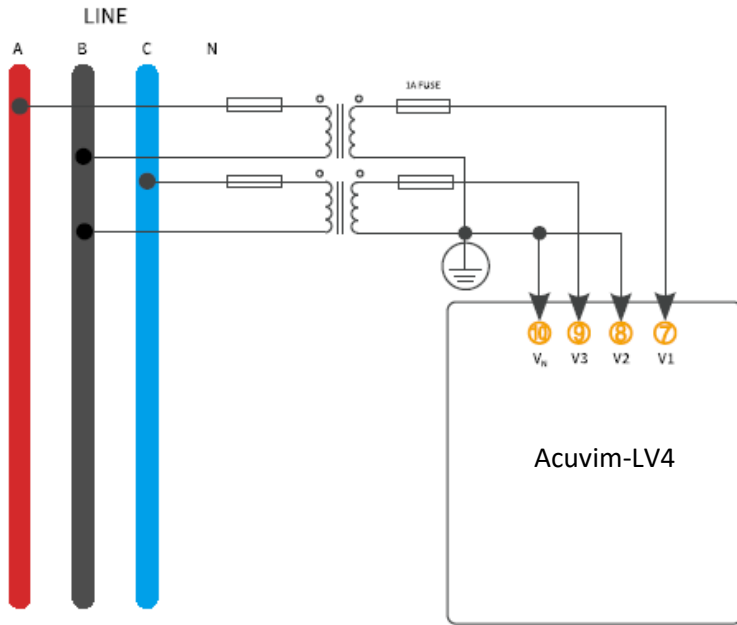
### 3LL – 3 phase 3 wire Mode (DELTA)

For voltages lower than 400LN/690LL, the voltage lines can be connected directly to the meter voltage input terminals (V1, V2, V3 and Vn).

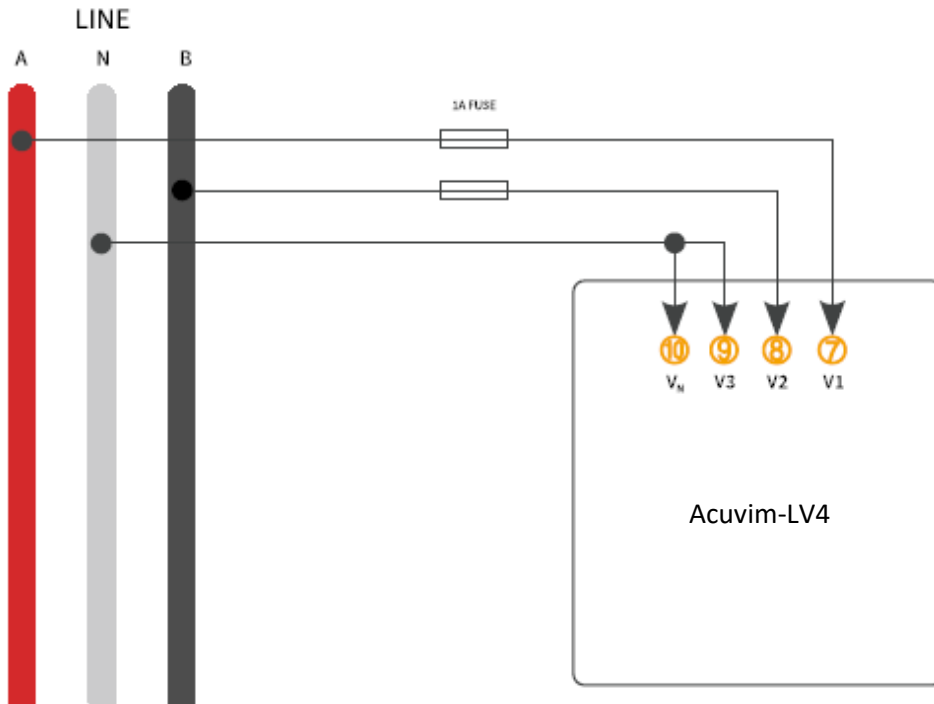


### 2LL - 3-Phase 3-Wire Open-Phase Delta Mode

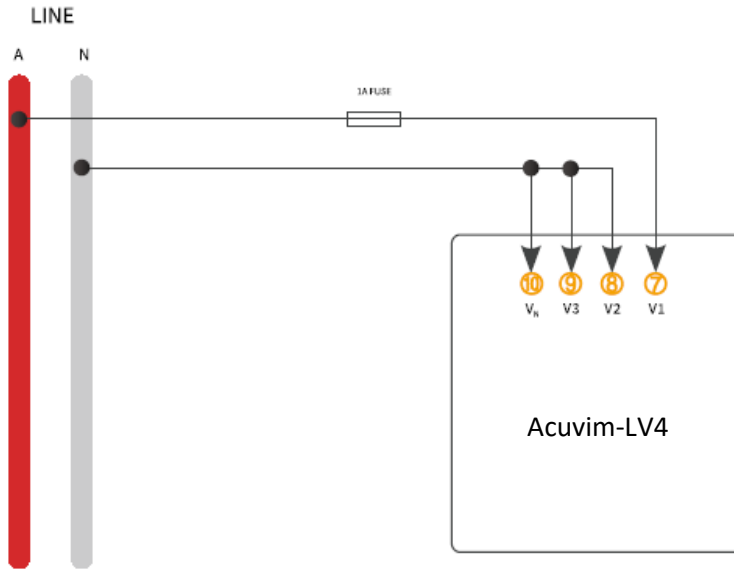
For high voltage systems (over 400LN/690LL), PTs (Potential Transformers) are required.



### 1LL - 2-Phase 3-Wire Split Phase Mode

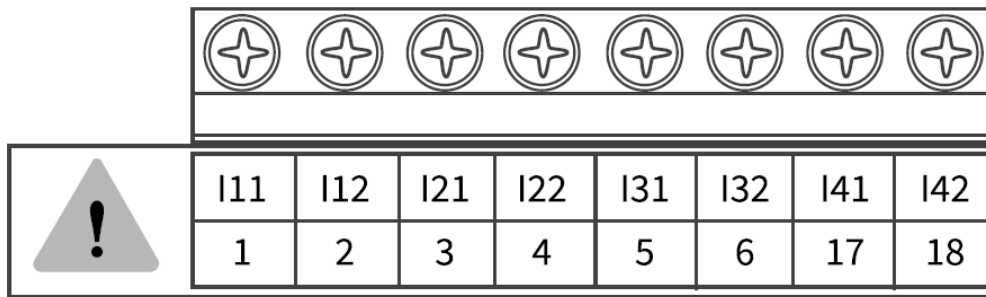


## 1LN - 1-Phase 1-Wire Single Phase Mode



## Current Wiring

### Meter CT Wiring Terminals



- Terminal 1 (I11) and 2 (I12) are for the phase A current transformer, where the positive lead of the CT is terminated to I11 and the negative lead is terminated to I12.
- Terminal 3 (I21) and 4 (I22) are for the phase B current transformer, where the positive lead of the CT is terminated to I21 and the negative lead is terminated to I22.
- Terminal 5 (I31) and 6 (I32) are for the phase C current transformer, where the positive lead of the CT is terminated to I31 and the negative lead is terminated to I32.
- Terminal 17 (I41) and 18 (I42) are for the neutral current transformer, where the positive lead of the CT is terminated to I41 and the negative lead is terminated to I42.

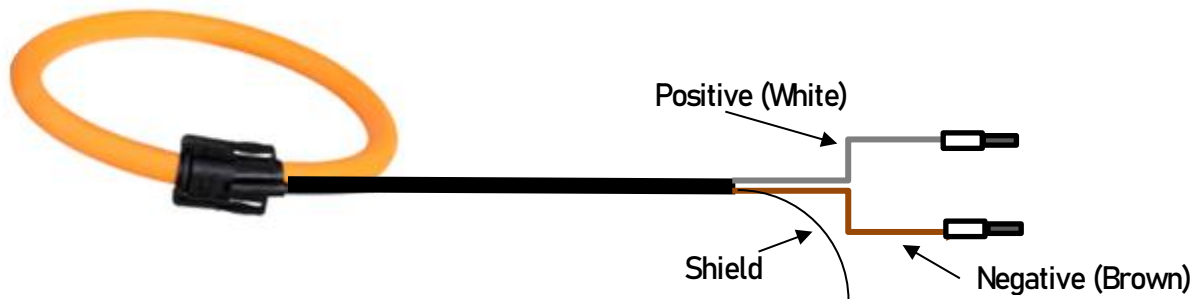
*NOTE: The neutral CT is optional for users since the meter has the option to either measure the Neutral Current or have the meter calculate it.*

## CT Installation

The CTs should be installed on the correct phase reference, otherwise a phase misalignment will occur and cause incorrect power readings on the meter.

### Rogowski coil (RCT)

The Rogowski coil has an arrow on the CT which represents the direction of the current flow. Ensure that this arrow is pointed toward the load, see image below on where to locate the arrow.



- White Lead - Positive
- Brown Lead - Negative
- Shield Wire - Should be left floating

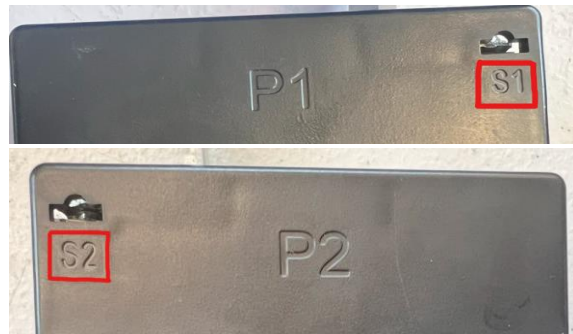
*NOTE: The shield wire on the Rogowski coil should be left floating and should not be grounded.*

### 5A Split-Core CT

The 5A Split-Core CT has an arrow on the silver sticker which represents the direction of the current flow. Ensure that this arrow is pointed toward the load, see image below on where to locate the arrow. Open the cover and there are two terminals. Terminal S1 represents a positive terminal while S2 represents a negative terminal. You could connect the two wires in the box to it.



There is a marker on each side of the CT indicating S1 and S2 terminal respectively.



### AcuCT R series, 1A and 333 mV CT

Ensure that the arrow is pointed towards the load, see images below on the indication of arrow.



The wire lead polarity is stated below.

- White Lead – Positive
- Black Lead – Negative

### Solid Core AcuCT

Ensure that the HI is pointed toward the source, see image below on the location of HI.



The wire lead polarity is stated below.

- White Lead – Positive
- Black Lead – Negative

## Meter Configuration

Once the physical installation is completed, the meter requires some initial configuration. The CT ratio and wiring mode will need to be configured on the meter to read the current readings correctly.

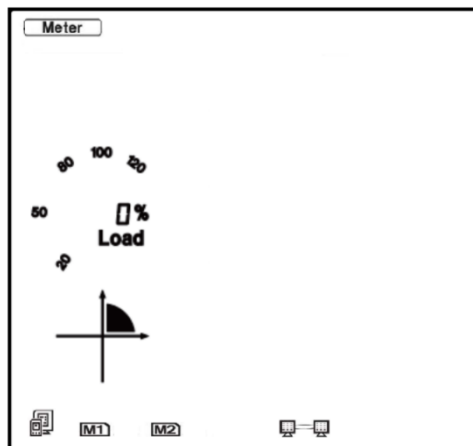
### Wiring Mode

By default, the Acuvim-LV4 series meter has the wiring mode configuration set as 3PH4W, which is represented as 3LN.

If using a 3PH4W system, you can skip ahead to the next section regarding the CT ratio.

If using 3PH3W (DELTA) the following steps can be used to configure the correct wiring mode.

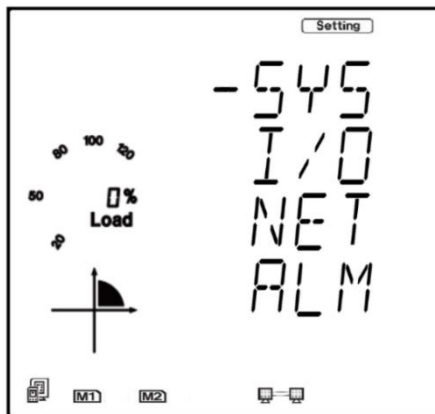
- From the meters display press "H" and "V/A" for about a second and release. The display will become blank, and "Meter" will be flashing.



- With the cursor flashing, press "P" or "E" to move the flashing cursor to "Setting". Press "V/A" to enter the meter settings.
- A password screen will be prompted, the password can be left as the default of "0000". Press "V/A" to continue.



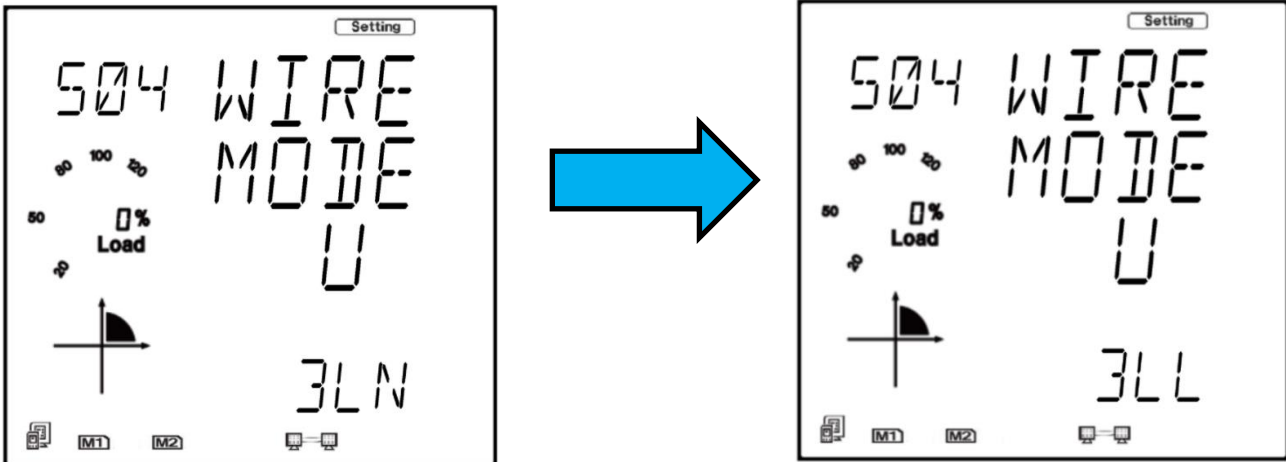
- The cursor will be on "SYS", press "V/A" to enter the system settings.



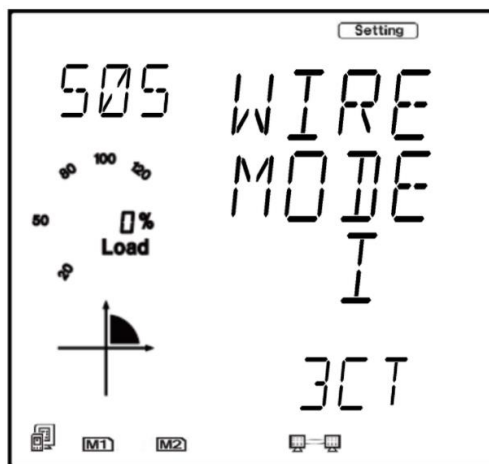
- The first screen in the settings is "S01 ADDR".



- Press “P” until the “S04 WIRE MODE U” screen is reached. This is the voltage wiring mode selection setting. This will be based on the voltage connection, E.g., in this case for a three-phase delta system select “3LL”. To change this setting:
  - Press ‘V/A’ to modify the setting; the cursor should now be flashing.
  - Press ‘P’ or ‘E’ to select the required voltage wire mode.
  - Press ‘V/A’ to confirm the change (setting no longer flashing).



- Press “P” to get to “S05 WIRE MODE I” screen. Select the required current wire mode. This will be based on your current connection. E.g., if it’s a three-phase connection with 3CTs, select “3CT”. To change this setting:
  - Press “V/A” to modify this option; the cursor will begin to flash.
  - Press “P” or “E” to select the required current wire mode.
  - Press “V/A” to confirm the change (setting no longer flashing).



## CT Ratio

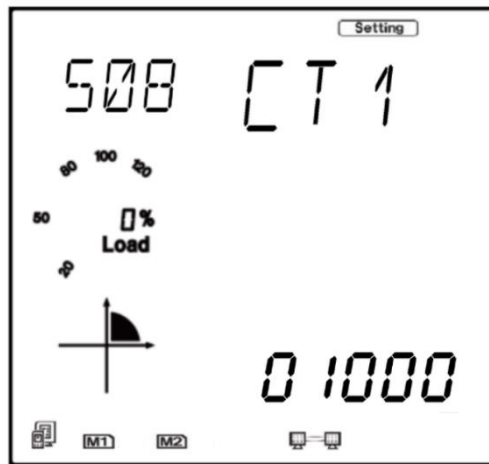
The Acuvim-LV4 meter varies CT input options depending on the meter model.

For the mV meter, the default CT2 setting is set as 333mV and will need to be changed to RCT if Rogowski Coil is used.

For the 5A meter, the default CT2 setting is 5A and will need to be changed to 1A if 1A CT is used.

To change the setting and configure the CT ratio the following steps can be performed:

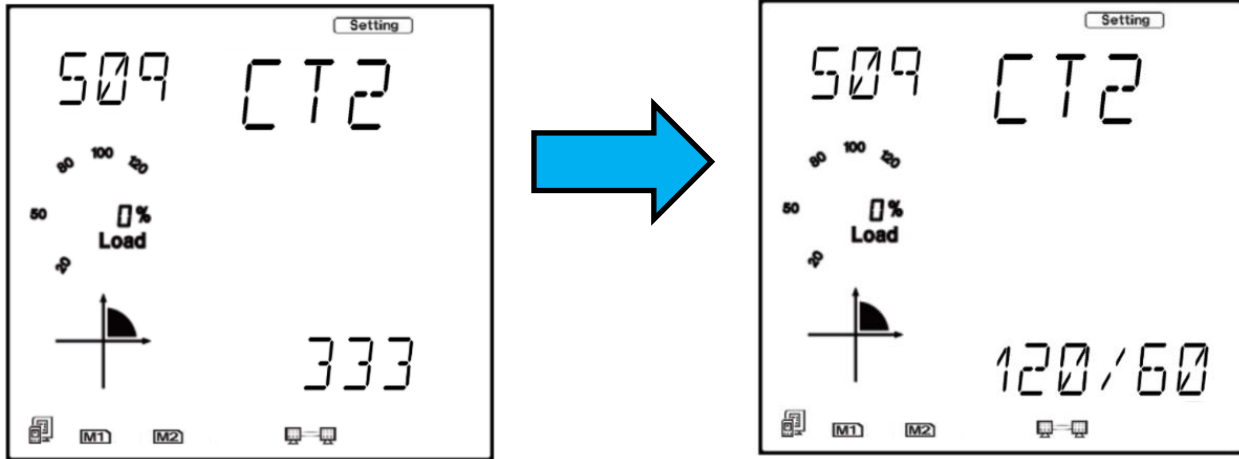
- While in the meter settings, Press “P” until you reach the “S08 CT1” screen. This is where the rated current input of the CT is entered.
- Eg., if an RCT16-1000A CT is used, this setting should be set to “1000”.
  - Press “V/A” to modify; the first digit will begin to flash.
  - Press “H” to switch the flashing digit.
  - Press “P” or “E” to change the flashing digit’s number.
  - Press “V/A” to confirm all the changes after they have been made. (No digits flashing)



- Press “P” to get to “S09 CT2” screen. The following instructions can be used to change the setting.
  - Press “V/A” to modify; the setting will begin to flash.
  - Press “P” or “E” to change the setting.
  - Press “V/A” to confirm all the changes after they have been made. (Setting no longer flashing).

Below is an example of changing the CT2 in mV Meter.

*NOTE: RCT will be represented as 120/60, this is correct for RCT as it stands for 120mV per 60Hz.*



- To get back to the main metering screen:
  - Press “H” and “V/A” at the same time for about a second and release, the screen will go blank, and “Setting” will be flashing.
  - Press “P” or “E” to move the flashing cursor to “Meter”. Once on “Meter” press “V/A” to enter the metering mode.

## Viewing data

The Acuvim-LV4 series meters supports over 400 parameters, the following section will show you how to view key parameters from the meters display.

### Real Time Data

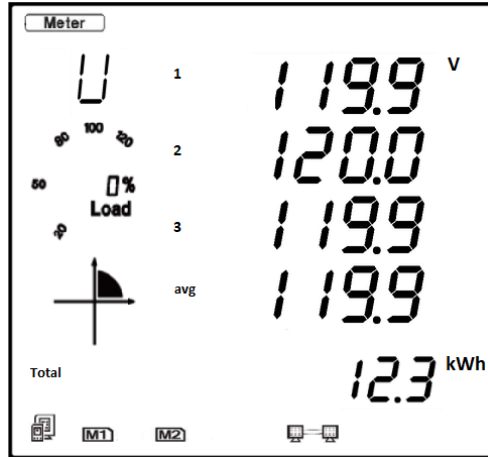
The real time data for the meter includes parameters such as voltage, current, power and frequency. To view the meter readings, ensure that you are in the “Metering” page.

### Voltage & Current

- The “V/A” button will allow you to view the voltage and current values from the meter.



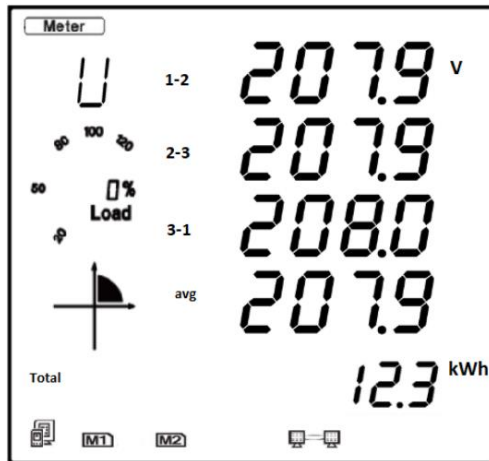
- Press “V/A” to scroll between the different voltage and current pages. The first page is the Line-Neutral Voltage



- Phase A Voltage
- Phase B Voltage
- Phase C Voltage
- Average Phase Voltage

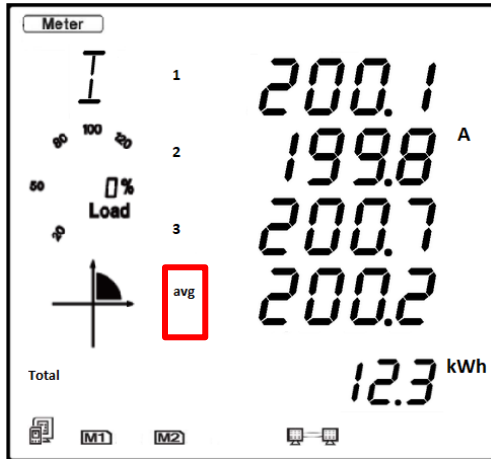
*NOTE: Line-Neutral Voltage page is not shown in 3LL mode.*

- Press “V/A” to view the Line-Line Voltage readings.



- Line Voltage AB
- Line Voltage BC
- Line Voltage CA
- Average Line Voltage

- Press “V/A” to view the current readings, there are two current pages. One page shows the three-phase current + average current, and the other shows the three-phase current + neutral current.



Phase A Current



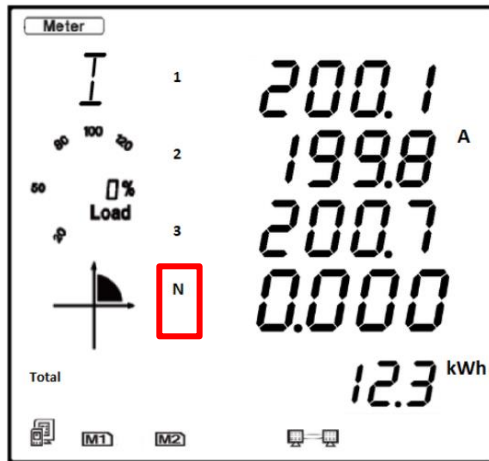
Phase B Current



Phase C Current



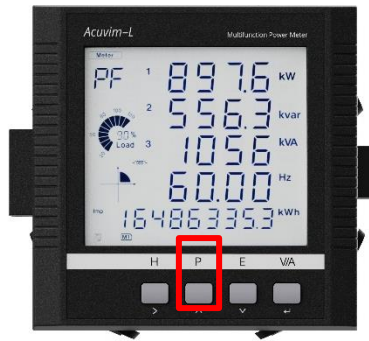
Average Current



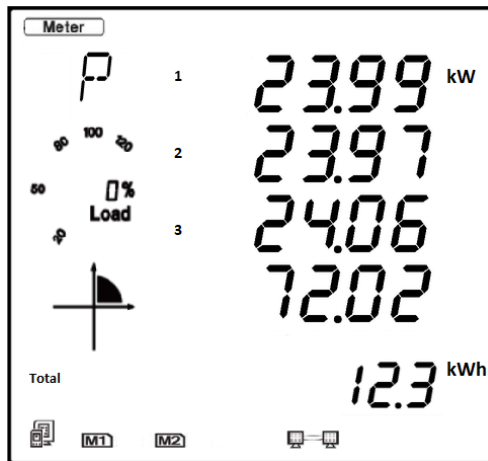
Neutral Current

### Power & Power Factor

- The power readings on the meter can be viewed by pressing the “P” button. This allows you to view Active (kW), Reactive (kvar), and Apparent (kVA) power.



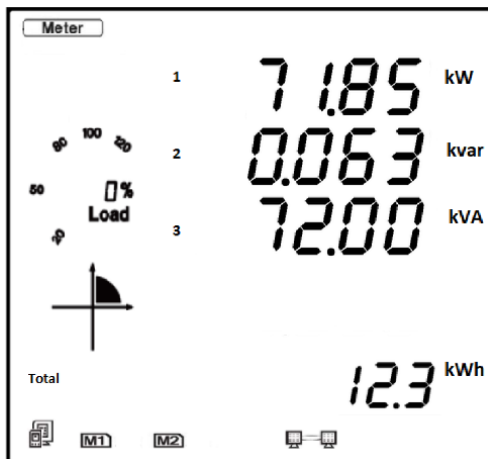
- The first page shows the Active Power (kW).



- Phase A Power
- Phase B Power
- Phase C Power
- Total Power

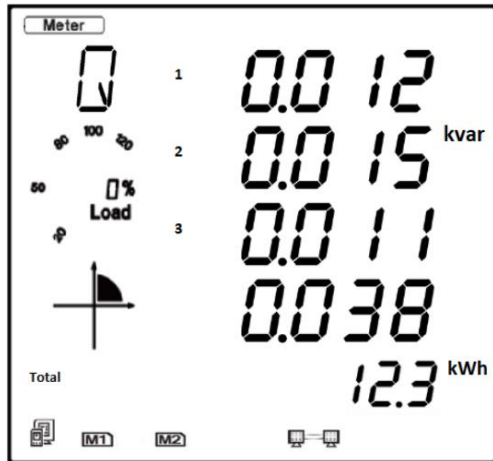
*NOTE: Phase Power is not displayed in 3LL, only power totals are displayed since there is no neutral reference.*

- First page displayed for power in 3LL wiring mode.

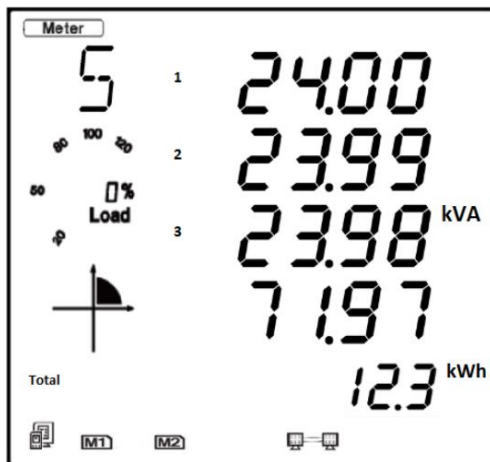


- Total Active Power
- Total Reactive Power
- Total Apparent Power

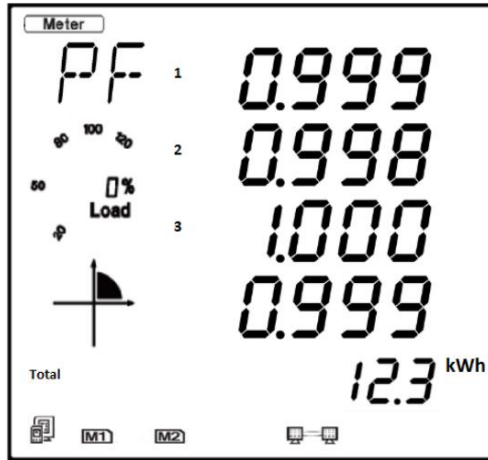
- You can scroll through the pages by pressing "P" to view the remaining power parameters and power factor pages.



- Phase A Reactive Power
- Phase B Reactive Power
- Phase C Reactive Power
- Total Reactive Power



- Phase A Apparent Power
- Phase B Apparent Power
- Phase C Apparent Power
- Total Apparent Power



- ➡ Phase A Power Factor
- ➡ Phase B Power Factor
- ➡ Phase C Power Factor
- ➡ Total Power Factor

### Energy Data

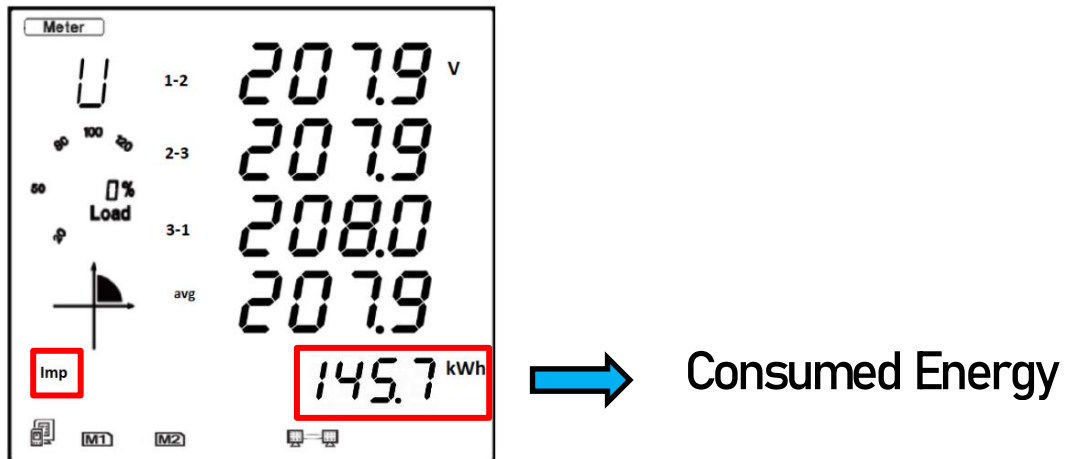
The energy reading on the Acuvim-LV4 meter is displayed as an accumulative reading, meaning it will continue to increase over time. There are different energy parameters in the meter that can be displayed including Active, Reactive, and Apparent Energy.

### Import Energy

The import energy reading is the Consumed Energy reading, this will let you know how much energy the load has consumed since the meter was installed.

- On the metering page press the "E" button to view the energy.
- The import energy will have "Imp" on the left of the energy reading.
- The energy is measured in kWh.

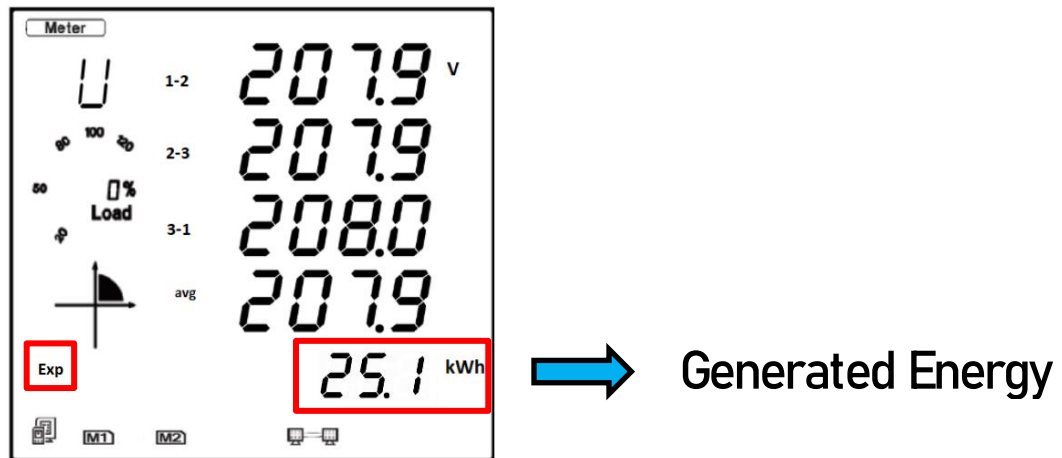




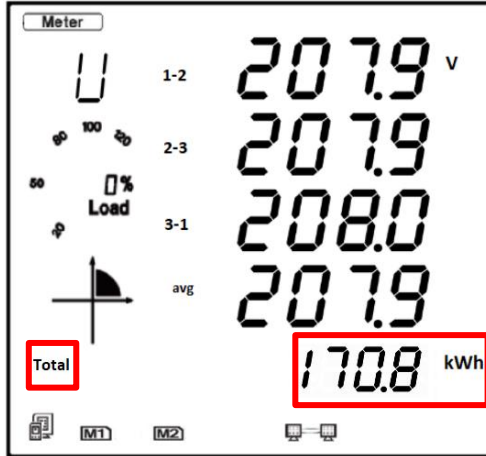
### Energy Parameters

The remaining energy parameters can be seen by pressing “E”.

- Export Energy is denoted by “Exp”, this is the generated energy measured by the meter.



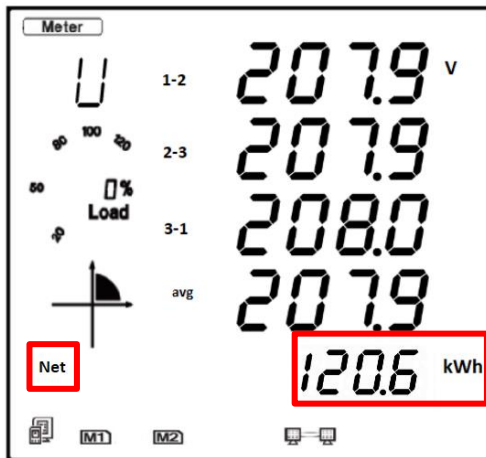
- Total Energy is the sum of Import and Export energy.



➔ Total Active Energy

- Net Energy is the difference between the Import and Export Energy.

*NOTE: Net Energy can be negative since it is the difference between Import and Export energy, there may be more export energy than import depending on the load.*



➔ Net Active Energy

## Troubleshooting

The following section will help to identify and troubleshoot installation issues with the meter. Common installation errors include:

- Reversing CT direction
- Reversing CT lead direction (polarity, +/-)
- Phase misalignment (installing CTs on incorrect phase reference)

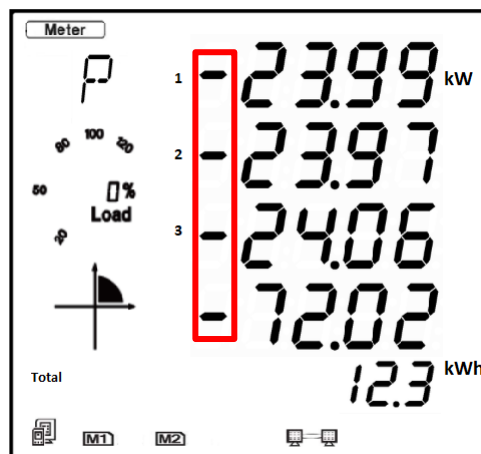
If any of the above errors occur during installation, most likely this will result in negative power and power factor values. This will also cause the power factor to be relatively low and in some cases cause the meter not to show an import energy accumulation.

There are a few methods that we can use to help identify these issues from the meter readings.

### Identifying Wiring Issues

#### 1. CT Reversal

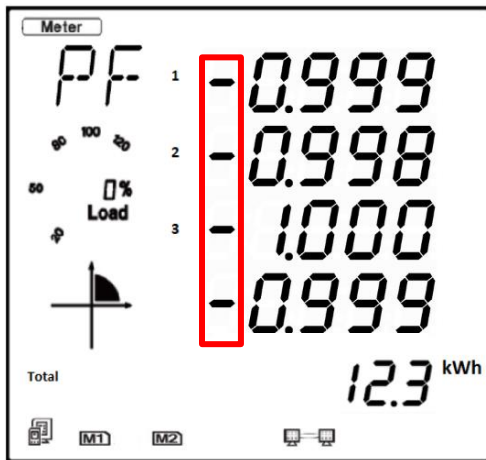
Checking the power readings on the meter can help identify if there is a wiring issue with the CTs. If there is a negative power the CTs are either reversed or installed on the wrong phase reference (phase misalignment).



*NOTE: Some applications will be exporting energy which results in negative power flow. If the meter is monitoring a consuming load the power should always be positive.*

If the power is negative, you can view the power factor to get a better understanding of the type of error. The power factor will also be negative if the power is negative.

- Power Factor > 0.8 and negative – CT Reversal
  - Corrected by flipping direction of CTs or changing CT lead termination.

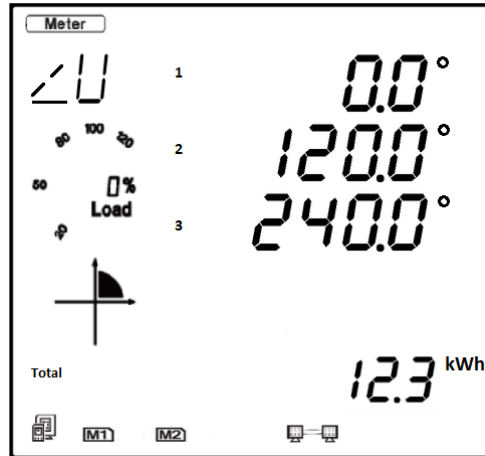


**CTs are reversed!**

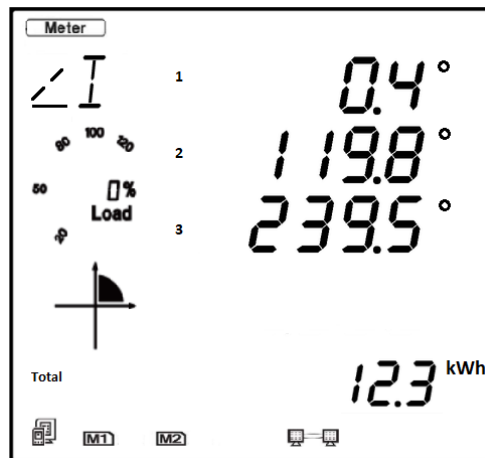
### Phase Angles

The Acuvim-LV4 meter also supports both voltage and current phase angles, these parameters can be used to help identify wiring issues.

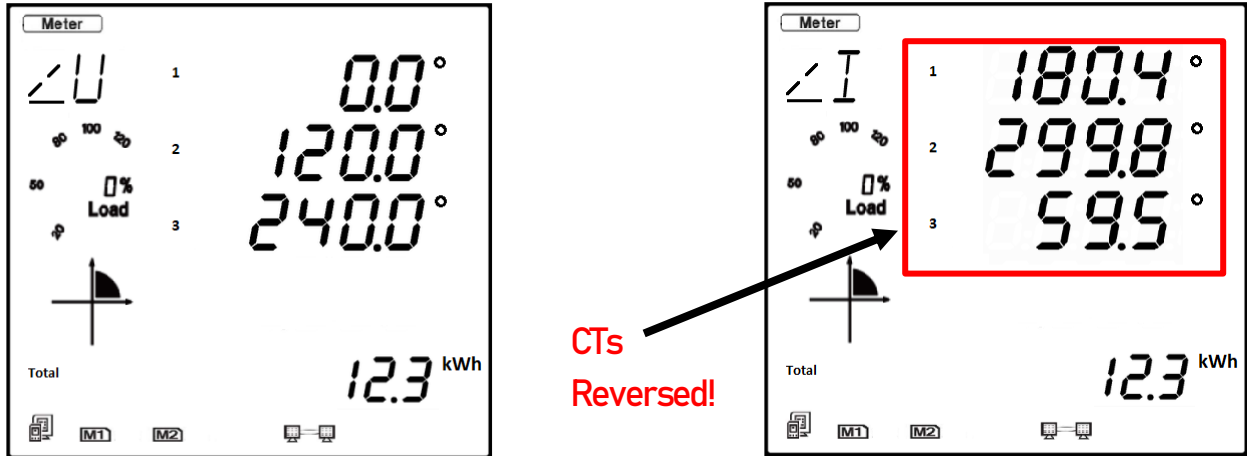
- Press “H” on the metering page until you see the “< U” page, this is the voltage phase angles.
- The three phase voltage phase angles should be 120° apart.



- Press “H” to move to the next page “< I”, this is the current phase angles.
- The current phase angles should be closely aligned to the voltage phase angles.
  - Acceptable current phase angles can be within  $\pm 30^\circ$ .



- If the CTs are reversed you can tell from the current phase angles, they will have a 180° phase shift from the voltage phase angles.

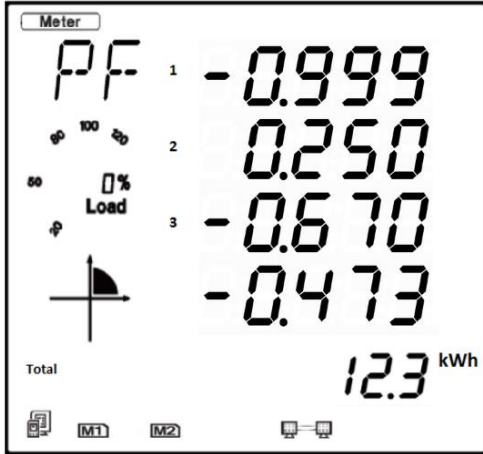


## 2. Phase Misalignment

A phase misalignment is caused by installing the CTs on the incorrect phase reference. The power factor can be used to identify this issue.

- Power Factor < 0.8 and positive OR negative – Phase Misalignment
  - Corrected by moving CTs to the correct phase reference.
- Power Factor > 0.8 and negative – CT Reversal
  - Corrected by flipping direction of CTs or changing CT lead termination.

The following example shows both CT reversal and phase misalignment.



➔ CT installation error!

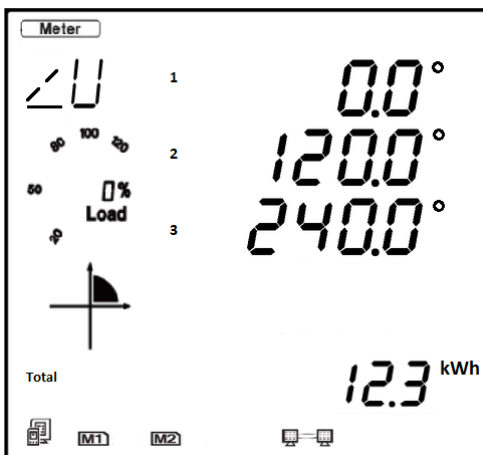
*NOTE: Some loads may have low power factor by nature (0.5-0.7). Ideally any PF > 0.8 is good.*

*NOTE: Ensure to check PF readings while there is sufficient load on the meter. If there is not enough current draw the power factor cannot be used to identify wiring issues.*

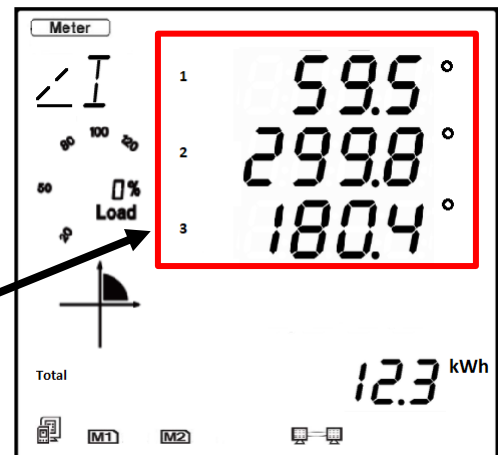
### Phase Angles

The phase angles can also let us know if there is a CT installation error.

- In the metering page, press “H” to view the voltage and current phase angles.
- The current phase angles should be closely aligned to the voltage phase angles.
  - Acceptable tolerance for current phase angles is  $\pm 30^\circ$  of the voltage phase angles.



CTs Misaligned!

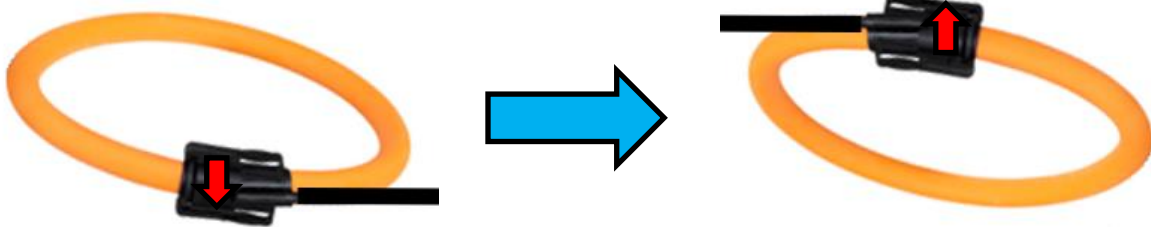


## Correcting Wiring Issues

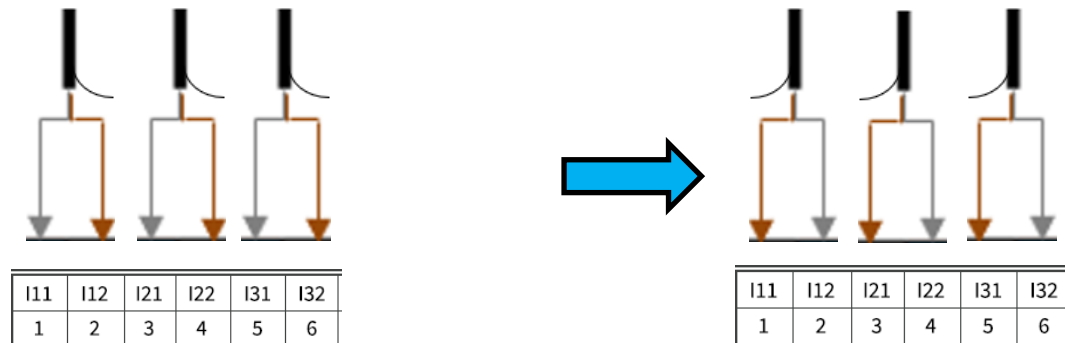
### 1. CT Reversal

CT reversal can be fixed by either of the following methods:

- Physically changing direction of CTs.
  - Arrow pointing in the opposite direction to correct the CT reversal.

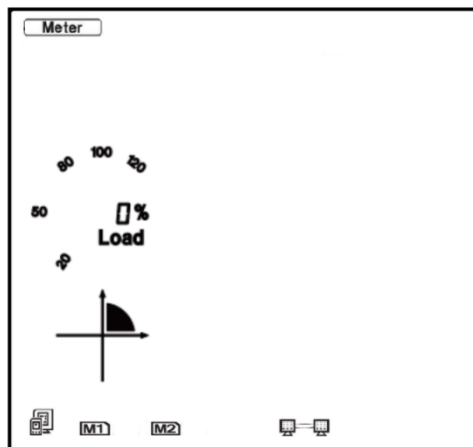
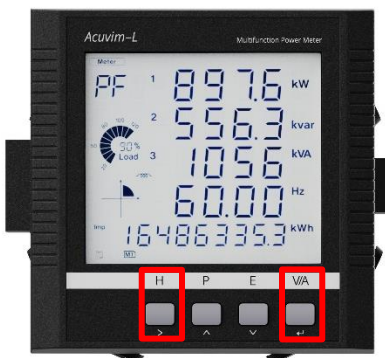


- Changing the polarity of the lead termination, switch white (+) and brown (-) leads.



- CT Direction setting in the meter.
  - The Acuvim-LV4 supports changing the CT direction from the meter settings.
  - This will be useful if the CTs are hard to get to after installation or to avoid power shutdowns once CTs are installed.

Press the "H" and "V/A" buttons on the meter. The display will become blank and "Meter" will be flashing.

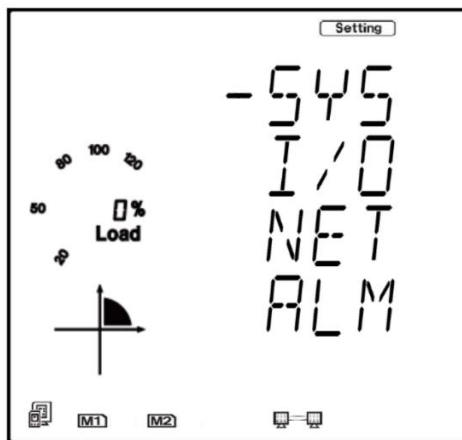


- With the cursor flashing, press "P" or "E" to move the flashing cursor to 'Setting'. Press "V/A" to enter the settings.

- A password screen will be prompted, the password can be left as the default of "0000". Press "V/A" to continue.



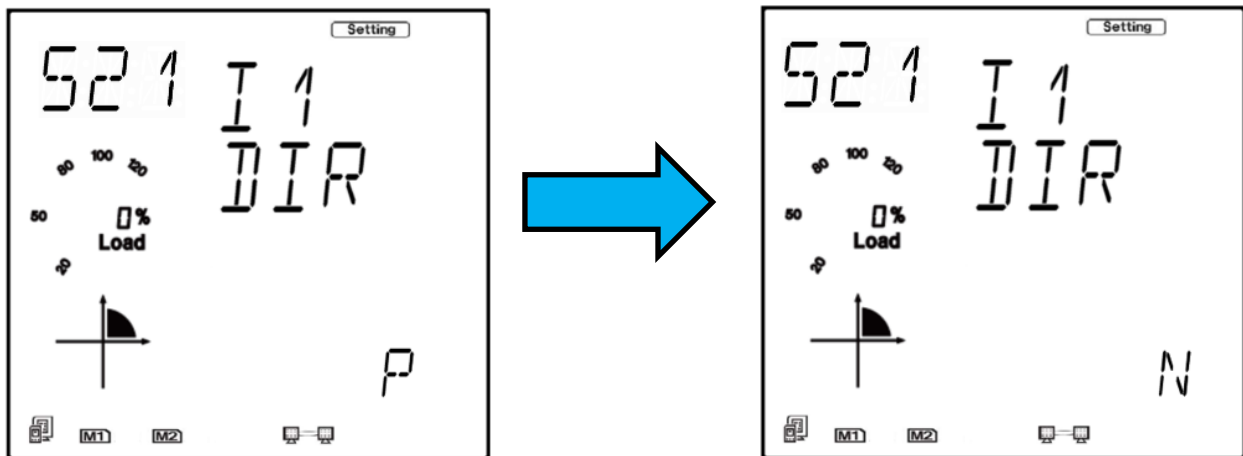
- The cursor will be on "SYS", press "V/A" to enter the system settings.



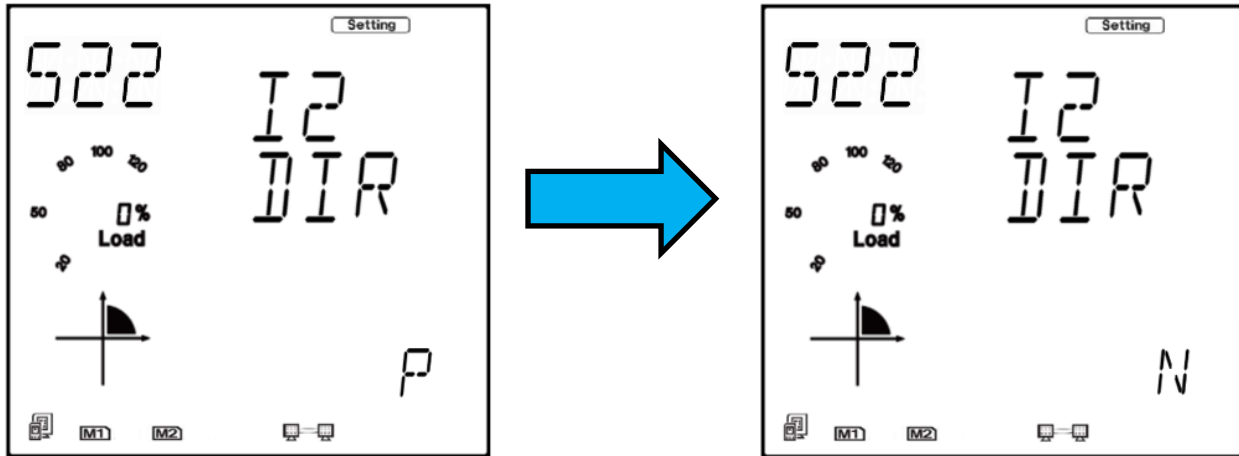
- The first screen in the settings is "S01 ADDR".



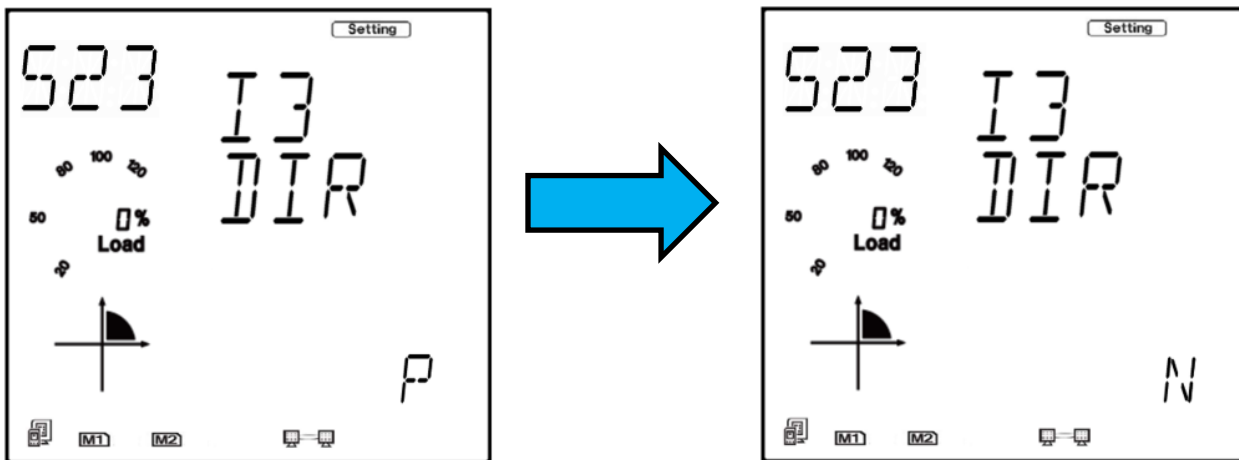
- Press “P” until you reach the “S21 I1 DIR”. This is the setting for the direction of current for CT1.
- By default, this is set to “P” (Positive). To change the direction to “N” (Negative):
  - Press “V/A” to enter edit mode.
  - Press “P” or “E” to change the setting to “N”.
  - Press “V/A” to confirm the setting.



- Press “P” to move to the next screen “S22 I2 DIR”. This is the setting for the direction of current for CT2. To change the setting to “N” (Negative):
  - Press “V/A” to enter edit mode.
  - Press “P” or “E” to change the setting to “N”.
  - Press “V/A” to confirm the setting.



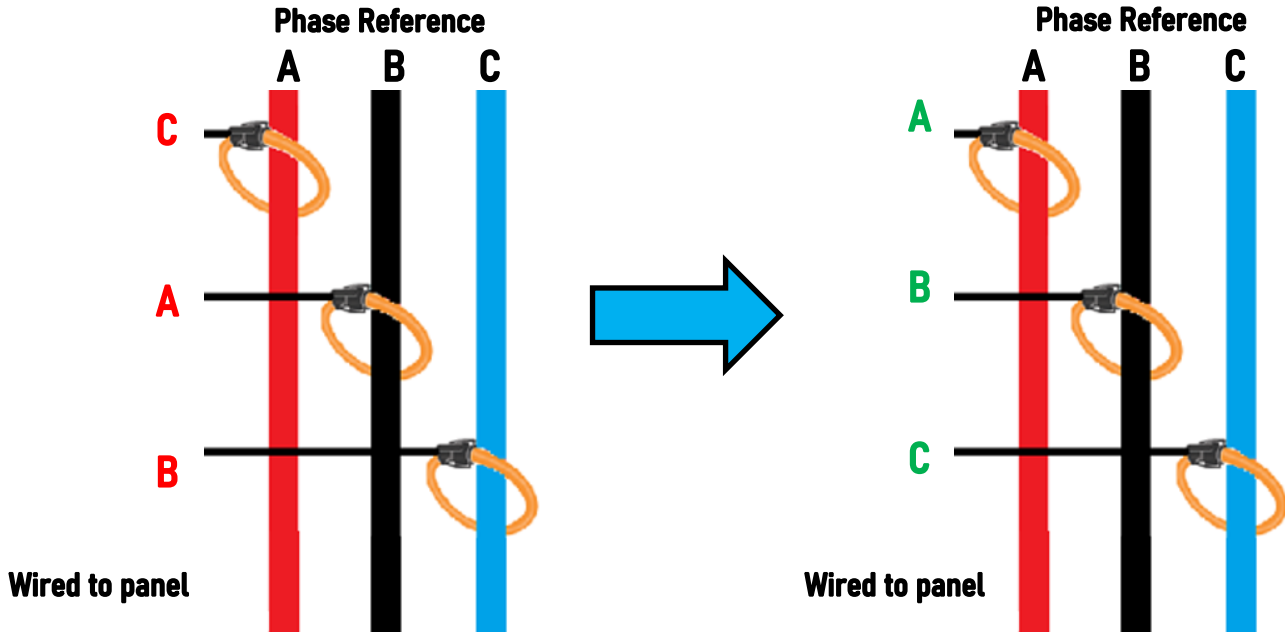
- Press "P" to move to the next screen "S23 I3 DIR". This is the setting for the direction of current for CT3. To change the setting to "N" (Negative):
  - Press "V/A" to enter edit mode.
  - Press "P" or "E" to change the setting to "N".
  - Press "V/A" to confirm the setting.



## 2. Phase Misalignment

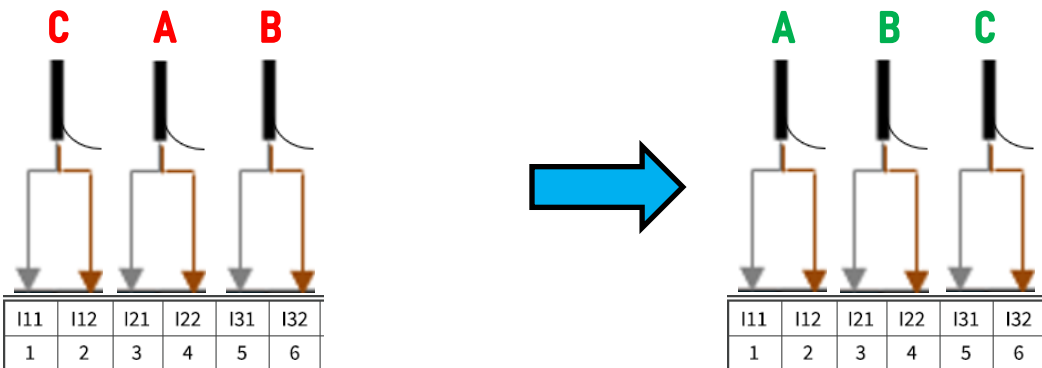
A phase misalignment can be corrected by either of the following methods:

- Physically moving the CTs onto the correct phase reference.



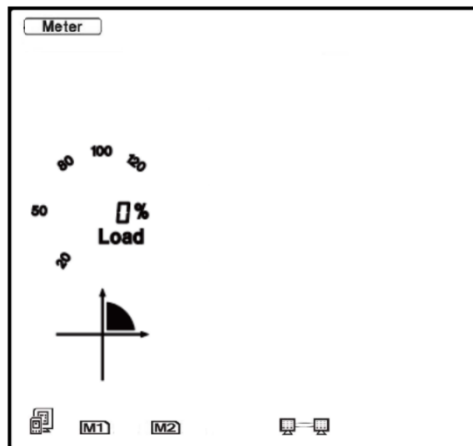
This method may be difficult if the CTs are hard to access and if the site requires a shut-down to access the CTs once installed.

- Changing the CT connection at the panel terminal block.
  - Rogowski Coil outputs an mV signal, so it is safe to disconnect the leads while live.

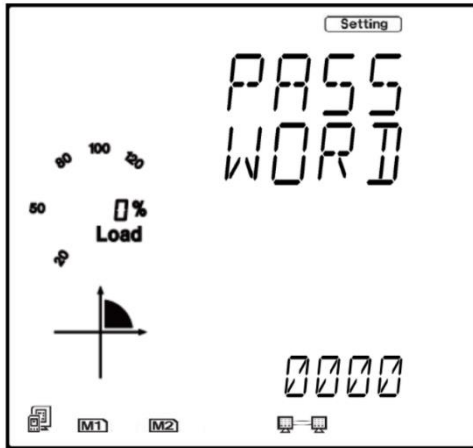


- Phase Selection setting in the meter.
  - The Acuvim-LV4 supports a phase selection setting where you can choose which voltage reference is used for each CT input.

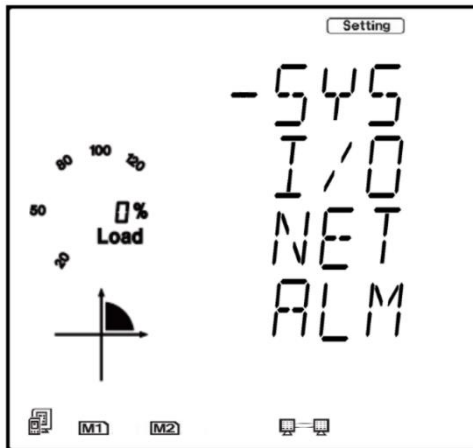
Press the "H" and "V/A" buttons on the meter. The display will become blank, and "Meter" will be flashing.



- With the cursor flashing, press "P" or "E" to move the flashing cursor to "Setting". Press "V/A" to enter the settings.
- A password screen will be prompted, the password can be left as the default of "0000". Press "V/A" to continue.



- The cursor will be on "SYS", press "V/A" to enter the system settings.



- The first screen in the settings is "S01 ADDR".

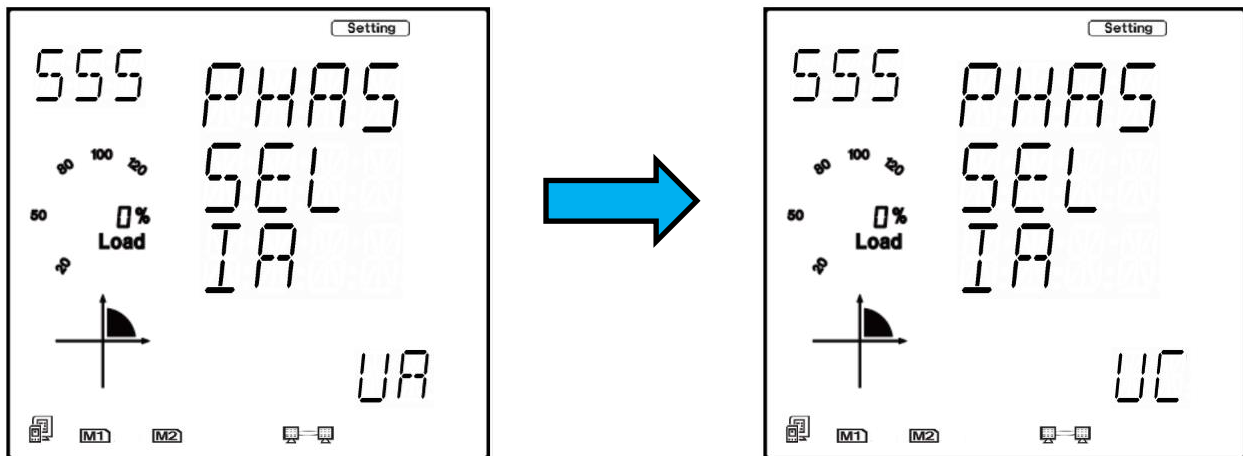


- Press “E” until you reach the “S55 PHAS SEL IA”. This is the phase selection setting for Phase A current input.

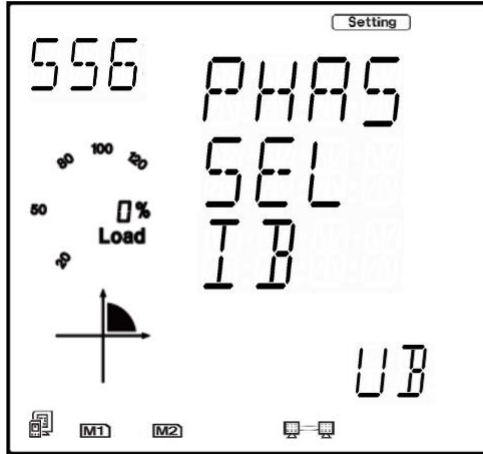


If Phase A CT is installed on Phase C, you can change the reference voltage to use “UC” instead.

- Press “V/A” to enter edit mode.
- Press “P” or “E” to change the setting to the correct voltage reference “UA/UB/UC”.
- Press “V/A” to confirm the setting.

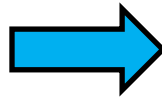
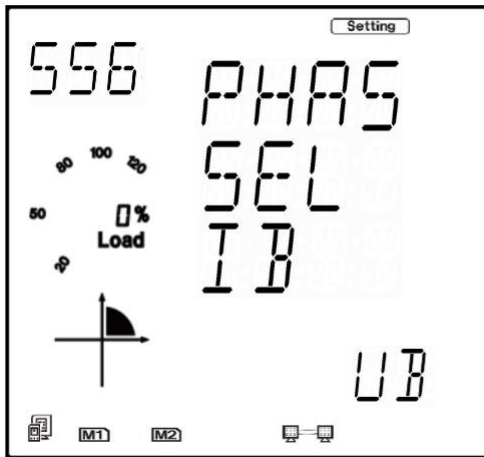


- Press “P” to move to the next screen, this is “S56 PHAS SEL IB”. This is the phase selection setting for Phase B current input.



If Phase B CT is installed on Phase A, you can change the reference voltage to use "UA" instead.

- Press "V/A" to enter edit mode.
- Press "P" or "E" to change the setting to the correct voltage reference "UA/UB/UC".
- Press "V/A" to confirm the setting.

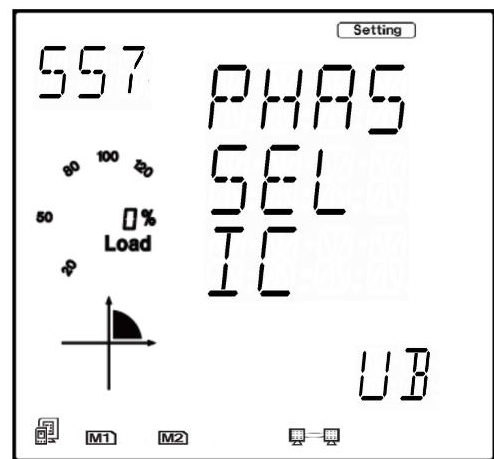
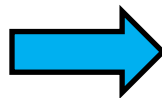


- Press "P" to move to the next screen, this is "S57 PHAS SEL IC". This is the phase selection setting for Phase C current input.



If Phase C CT is installed on Phase B, you can change the reference voltage to use "UA" instead.

- Press "V/A" to enter edit mode.
- Press "P" or "E" to change the setting to the correct voltage reference "UA/UB/UC".
- Press "V/A" to confirm the setting.





*NOTE: For any additional help contact Accuenergy Technical Support.*

Accuenergy Technical Support

Phone Number: +1 (416)-497-4100, select option 3

Toll Free Number: +1 877-721-8908, select option 3

Email: [support@accuenergy.com](mailto:support@accuenergy.com)

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