

#### HPS Smart Transformers Technical Guide



The pictures used in this guide are only a representation and may vary from the actual product.

Disclaimer of Liability

The recommended practices in this manual are for general applications and are supplied without liability for errors or omissions. Technical data is subject to change at any time without notice and any necessary corrections will be included in subsequent editions.

Special requirements should be referenced back to the manufacturer and/or their representative.

## SAFETY WARNINGS

All work on the power monitor needs to be done by a licensed electrician.

All local safety codes and standards need to be followed.

#### Key considerations:

- 1. **Power Off:** Ensure all power supplies to the device are turned off before working on it to prevent electrical shock or damage.
- 2. Compliance With Standards: Follow the safety standards IEC 61010-1 and UL 61010-1, which the meter complies with, to ensure safe installation and operation.
- **3.** Voltage Withstand: Be aware that the meter has a high withstand voltage of 3250Vac for one minute. Ensure that the installation environment can handle this specification.
- 4. Temperature Range: Operate the meter within its specified temperature range of -25°C to 70°C to avoid malfunction or damage.
- 5. Isolation Voltages: Respect the isolation voltages for digital and analog outputs to prevent electrical hazards.
- 6. **Proper Wiring:** Follow the wiring diagrams provided in the data sheet for correct and safe connections.
- 7. Environmental Conditions: Ensure the installation environment is within the specified relative humidity range of 5% to 95% non-condensing to prevent moisture-related issues.

5. Current Transformers (CTs): CTs are used to monitor the current for the power monitor. HPS provides Rogowski coil CTs with the transformer.



The panel comes pre-wired with all necessary connections for voltage and current. The customer needs to connect Ethernet cable to the Web module to set up a static IP address (recommended), which is explained in the sections below.

## **PRODUCT OVERVIEW**

The power monitor comprises several components.

- 1. **Power Monitor:** The brain of the computer that receives current and voltage information from your transformer and provides all the relevant Energy, Power and Power Quality information.
- 2. Web Module: Enables the Power monitor to communicate with other systems through various industry communication protocols. The web module provides the power monitor with a software platform/web interface and an internal data storage of up to 8GB.
- **3. I/O Modules**: Expand the functionality of the power monitors by allowing users to monitor external devices like through digital and analog inputs.
- 4. NEMA 4X Enclosure: The Power monitor and other components are secured inside a pre-wired, factory installed polycarbonate NEMA 4X enclosure.



Ingress for customer connection for Ethernet to Web Module

## METER COMMUNICATION SETUP

This section allows you to configure communication for the meter using the LCD screen, which can then be used to log in to the web interface of the meter.

HPS recommends using static IP configuration via ethernet to allow multiple users to connect to the web interface of the power monitor. However, it is up to the customer to connect the meter in a way that suits their needs.

The Power Monitor, equipped with the **Web Module**, provides flexible network communication options. This feature enables real-time data collection and control over your network, allowing for remote access to metering parameters and diagnostics. The web module has two Ethernet ports, **Ethernet 1** is set to have the **static DHCP**, and **Ethernet 2** is set to have the **dynamic DHCP**. Both of the Ethernet ports have the same functionalities, you can use either of them according to the requirement.

You will require someone from your IT team to configure the network settings explained below.

The default settings of the power monitor are as follows:

- Ethernet 1 (Static IP address)
- IP Address (192.168.1.254);
- Subnet Mask (255.255.255.0);
- Gateway (192.168.1.1);
- DNS Server 1 (8.8.8.8);
- DNS Server 2 (8.8.4.4);
- Modbus Port 502

# Step 1: Connecting The Power Monitor To Your Network or Computer

You can establish a connection between the Power Monitor and your network or computer using the Web Module, which supports dual Ethernet ports for stable data communication. Follow these steps for a successful setup:

# 1. Connect the Web Module to Your Network (Ethernet 1 or Ethernet 2):

- Insert an Ethernet cable into one of the two RJ45 ports on the Web Module.
- Connect the other end of the Ethernet cable to your router, switch, or directly to a computer using a standard Ethernet (RJ45) cable.
- For direct connection to a computer, ensure that the computer's IP address is within the same subnet as the Power Monitor's default IP address.

#### 2. Power on the Power Monitor:

Ensure the Power Monitor is powered on. The Web Module will automatically detect the network and establish a connection using either a static or dynamic (DHCP) IP address.

#### Step 2: Configuring the IP Address via Modbus TCP/IP

The Web Module supports Modbus TCP/IP, allowing users to configure and communicate with the Power Monitor over an Ethernet network. To configure the IP address, follow these steps:

#### 1. Access the Power Monitor's Network Settings:

 Press the 'H' and 'V/A' buttons simultaneously on the Power Monitor to enter the settings menu. The display will show the "Meter" cursor flashing.



Press the 'P' or 'E' button to move the cursor to 'Setting'. Press 'V/A' button to enter the parameter setting mode. The device address page is the first page of the 'Setting' mode. It will show the Modbus address of the meter for a second before prompting for the password of the device (default password '0000'). Press 'V/A' button to confirm password and enter the parameter setting page. Press the 'P' or 'E' button to move the cursor to 'NET' and press the 'V/A' button to enter the Ethernet module settings.







#### 2. Set IP Address Parameters:

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Once inside the network settings menu, configure the following parameters:

**N01: DHCP Setting:** By default, the Power Monitor is set to **manual** for IP address configuration. You can switch this to **auto** if you want it to obtain an IP address dynamically from a DHCP server. Otherwise, continue with manual configuration.



NO2: IP Address: This is the IP address of the meter and will be the IP address to access the web interface of the module. Users can configure the IP address if the DHCP is configured to Manual. Press 'V/A' to configure the IP address. The cursor of the first digit will begin to flash. Press the 'H' button to scroll through the digits, press the 'P' or 'E' to change the value of the flashing cursor and press 'V/A' to confirm.

Ensure the address falls within the subnet range of your network (e.g., 192.168.1.xxx).



NO3: Subnet Mask: Press 'P' to get to "NO3 Subnet Mask".Press 'V/A' to configure the subnet address. The cursor of the first digit will begin to flash. Press the 'H' button to scroll through the digits, press the 'P' or 'E' to change the value of the flashing cursor and press 'V/A' to confirm. (usually 255.255.255.0 for most local networks).



**NO4: Gateway:** Press 'P' to get to "NO4 Gateway". Press 'V/A' to configure the gateway IP address. The cursor of the first digit will begin to flash. Press the 'H' button to scroll through the digits, press the 'P' or 'E' to change the value of the flashing cursor and press 'V/A' to confirm. (e.g., 192.168.1.1 for most routers).



N05: DNS Server: Press 'P' to get to "N05 DNS Primary Server".Press 'V/A' to configure the DNS address. The cursor of the first digit will begin to flash. Press the 'H' button to scroll through the digits, press the 'P' or 'E' to change the value of the flashing cursor and press 'V/A' to confirm. The DNS parameters must be set correctly to use the SMTP and FTP/ HTTP Post functions.



#### 3. Save and Reboot:

Press 'P' to get to **"N09 NET REST"**. After making any changes to the NET settings, users must reboot the Ethernet module from this page for the settings to take effect. Press 'V/A' to reboot the module, the cursor will begin to flash. Once rebooted, the Power Monitor will use the new IP address, and you can access it through a software platform through a web browser using the newly assigned IP.



#### Step 3: Connecting the Power Monitor to a Computer Using Ethernet (Not required if step 2 is used)

To connect the Power Monitor directly to a computer via Ethernet for configuration or monitoring, follow these steps:

- 1. Manually Set The Computer's IP Address:
- On a Windows PC, navigate to **Network and Sharing Center > Change Adapter Settings > Ethernet Properties.**

Select Internet Protocol Version 4 (TCP/IPv4) and manually assign an IP address in the same subnet as the Power Monitor's default IP (e.g., if the Power Monitor's IP is 192.168.1.254, assign your computer an IP of 192.168.1.xxx).

Set the subnet mask to 255.255.255.0, and the gateway can be left blank if directly connecting to the Power Monitor.

#### 2. Access The Web Interface:

Once connected, open a web browser and enter the IP address of the Power Monitor (e.g., 192.168.1.254). The Web Module interface will prompt you to log in. The default username and password are both **admin.** From the web interface, you can access realtime data, configure settings, and monitor the

SOFTWARE PLATFORM/WEB

performance of the Power Monitor.

Enter the IP address assigned by your IT to the power monitor into a browser and click on 'Advanced'.

Your connection is not private	
Attackers might be trying to steal your information from <b>10.120.9.160</b> (for example, passwords, messages, or credit cards). <u>Learn more about this warning</u>	
NET::ERR_CERT_AUTHORITY_INVALID	

This will open another dialog below which will prompt you to proceed to the assigned IP address, click on 'Proceed to "your IP address" (unsafe)' to go to the login page.



Once on the login page, login using the default credentials as below. 'admin' will have an admin level access, 'view' will have basic access to view the data but won't be able to modify any settings. HPS recommends to personalize default password.

Adı	min	Vie	w
Username	Password	Username	Password
Admin	Admin	View	View

Sign in to continue
User Name*
Enter User Name
Password*
Enter Password
Sign in
SSL Certificate 🛓

#### SETTINGS CONFIGURATION

 Once you login, you will be able to see the screen below. Navigate to Settings on the top right corner.

						🕪 Logout	9.26 AM -0400 17 Oct, 2024	(i) About	Settings	AXM-WEB2
Dashboard	II Metering -	🕜 Logs 🕞	۹۹ Gateway م							*
Dashboard										
Basic Metering						Power & Ene	rgy			
Average Voltage				340.284	v	Total Power Fac	tor			
Average Line Voltage				589.410	v	Total Active Pow	ver			
Average Current				321.280	Α	Total Apparent F	Power			
Frequency				60.024	Hz	Import Active En	tergy			
Full Report						Full Report				
THD						Max Demand	l.			
THD Voltage Average				2.410	%	Maximum Appa	rent Power Demand			
THD Current Average				8.950	%	Maximum Active	Power Demand			
Full Report						Full Report				

2. Once you select **Settings**, the window below will open. Go to the meter tab on it and select **General**.



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3. Under the General Tab, under the section Wiring, navigate to Voltage Wiring and Current Wiring and select the option relevant to your system requirement. A list of vailable options shown below.

	Communications	Management	User Management	Network Diagnostic	Module Firmware	Meter Firmware	Config Management	
ttings Meter								
	General IO	Alarm Custor	n Read Power Qual	ity Independent Inpu	t Dual Source En	tgy		
	Device Description							
	Maximum 15 charac	cters						
	Wiring							

#### **Voltage Wiring Options**

- a. 3LN Three Phase Four Wire Y -- Compatible with 3CT only.
- b. 1LN Single Phase Two Wire -- Compatible with 1CT only.
- c. 2LL Three Phase Three Wire Open Delta --Compatible with 2CT & 3CT.
- d. 3LL Three Phase Three Wire Delta Compatible with 3CT only.
- e. 1LL Single Phase Three Wire Compatible with 2CT only.
- f. 3LN-2.5 -Three Phase Four Wire Y -- Compatible with 3CT only.

#### **Current Wiring Options**

g. 3CT --- Compatible with 2LL, 3LL & 3LN.

#### 4. PT and CT Ration Selection

- a. Keep the PT1 and PT2 values to default as per system.
- b. Enter the CT1 ratio as the secondary side current of the transformer.
- c. For CT2, select RCT for CTs provided by HPS. Please note that the meter can support a 333mV output CT as well, if used.

Meter	Communications Management User Management Network Diagnostic M	odule Firmware Meter Firmware Config Management
ettings Meter		
	General IO Alarm Custom Read Power Quality Independent Input	Dual Source Energy
	Device Description	
	Maximum 15 characters	
	Wiring	
	Voltage Wiring	Current Wiring
	3LN -Three Phase Four Wire Y Compatible with 3CT only	SCT Compatible with 2LL, 3LL & 3LN v
	PT and CT Ratios	
<b>→</b>	PTI	сті
	220.0	1000
	Default 400, Range 50-1,000,000	Default 5, Range 1-50,000
	PT2	CT2
	220.0	RCT ~
	Default 400, Range 50-400	

#### 5. Demand Settings – Averaging Interval Window

a. Select the averaging interval window between 1-30 Mins according to required. Typical average interval window to be set at 15 minutes.

Demand					
Sliding Window		Sub-Interval		Averaging Interval Wi	ndow
Sliding Window Demand	~	1	mins	15	mins
		Range 1-30		Range 1-30	

### COMMISSIONING

Once the communication is set up and the power monitor settings have been set, you want to ensure that the readings that appear on the web interface are accurate.

Dashboard	III Metering +	O Logs -	₀d¦ Gateway →					
Dashboard								
Basic Metering						Power & Energy		
Average Voltage				340.316	٧	Total Power Factor	0.824	PF
Average Line Voltage				589.444	v	Total Active Power	269.453	kW
Average Current				322.221	A	Total Apparent Power	327.055	K\M
Frequency				60.001	Hz	Import Active Energy	942204.4	kWh
Full Report						Full Report		
THD						Max Demand		
THD Voltage Average				2.280	56	Maximum Apparent Power Demand	551.940	KWA
THD Current Average				7.930	55	Maximum Active Power Demand	420.767	kW
Full Report						Full Report		
Module up since Mon Sep	16 2024 16:02:55 GMT-040	0 (Eastern Daylight Th	ne)					

## There could be several reasons why the readings on the dashboard are incorrect, some of these are:

- Incorrect CT polarization
- Incorrect CT ratio entered in the web interface
- Incorrect CT type selected
- · Phase sequence is different from what is wired

Most of these can be fixed from the web interface. Please look at FAQs for more details.

#### To proceed with commissioning, you will require:

- A hand-held meter
- · Login to the web interface

#### Follow the steps shown below:

- a. Use handheld meter on the secondary cables where the CTs are installed.
- b. Read the data on handheld meter and read the data at the same time on a Meter to compare the results of Voltage, Current. Additionally ensure that the Power factor values are not significantly low (typically over 0.8 or 0.9).

Below is an example of handheld meter and digital meter readings.



#### ALARM

C.

a. Go to Alarm tab under Meter Settings



- b. You can choose up to 16 points for alarm settings.
- c. Select the parameter you want to set up alarm for.
- d. Under the setting selection, you can choose any option you need for values to be like (<,>,=).
- e. Define a setpoint value for that parameter.

Gener	ral IO	Alarm Cust	om Read Power Quality	Independent Input	Dual Source Energy					
Alarm E	nable		Backlight Flash Trig	ger						
Enabl Disab	e le		<ul> <li>Enable</li> <li>Disable</li> </ul>	/						
ID	AND	Enable	Parameter			Setting	3	Setpoint	Delay(ms)	Trigger
#1	OB off	💶 On	System Power Factor		~	<	~	0.700	0	Detail
#2	0.0	on	Average Line-to-Line Volt	age (V)	•	>	•	610.000	0	Detail

g. Under the Trigger option, select the Output module as per the system.

#### Set Email Alerts for Alarms:

The Web module on your power monitor supports the SMTP protocol to set up the email function to enable the meter to send emails based at specific time intervals or whenever there is an alarm. There are three modes available for sending emails that the user can enable.

- **Triggered Sending:** Emails are sent immediately when there is a new alarm. Please note, you will need to have selected and set alarm parameters before you select this option.
- Timed Sending: Emails are sent at regular time periods based on the time interval configured. The email will include the data that is selected to be sent.
   Triggered Sending and Timed Sending: This mode
- is when both of the above modes are enabled.
- a. On your software platform, navigate to **Settings> Communications> Email.**

					🕪 Logout	11:43 AM -0400 17	Oct, 2024	() About	Settings
Meter	Communications	Management	User Management	Network Diagnostic	Module Firmware	Meter Firmware	Config Mar	nagement	
Settings commu	nications								
	Network Netwo BACnet/IP SN	nk IPv6 Certifica MP DNP IE	ite Management A C61850 EtherNet/	ccess Control Email	Time/Date Date	ta Log Post Char ss Modbus Gate	nnel Wav way Passthro	veform Post ough Profi	AcuCloud
	SMTP Enable O Disable Enable								

- b. **SMTP Enabled:** Select **Enable** to allow SMTP functionality and to further configure the settings. Start Time to Send Email: Select the date and time for when the emails should begin to send.
  - Click on the calendar icon to configure the time and date.
  - Click on the trash icon in the bottom right to clear the time and date.
- c. **SMTP Server:** Enter the URL of a valid SMTP server. I.e. mail.accuenergy.com or smtp.gmail. com.
- d. **SMTP Port:** Enter the port number associated with the SMTP server.
- e. **SMTP From:** Enter a name or phrase which will appear to let you know who the mail is from. I.e. 'Technical Support'.
- f. SMTP Subject: Enter a subject line for the email
- g. Authentication: Users can have email authentication set to On or Off. If authentication is set to On users will need to provide the SMTP username and password.
- h. **SMTP Username:** Enter the SMTP username for the SMTP server set above.
- i. **SMTP Password:** Enter the SMTP user password for the username set above.

- j. **SMTP to Address 1, 2, 3:** Enter up to three recipients that you wish to have the email sent to in 'SMTP To Address 1', 'SMTP To Address 2' and 'SMTP To Address 3'.
- k. Once the settings are configured, you need to select content for the email. In addition to the data, you will need to enter the time interval (in minutes) if you choose to get periodic emails (Enter a number between the range 5-1440 mins).

ATP To Address 1	SMTP To Address 2	SMTP To Address 3
ote: Maximum 40 characters	Note: Maximum 40 characters	Note: Maximum 40 characters
Test Address 1	Test Address 2	Test Address 3
Enable Periodic Email Reporting	Set time interval	1440 min, Range 5 - 1440
Include in the Periodic Email		
Metering Data	Min/Max	
Energy Data	Z Alarms	
Harmonics Data	SOE Records	
Sequence & Phase Angles		
Enable Real-time Email Reporting		
Include Alarm Event		
Include SOE Records		
Include WaveForm Data		
Save		

## DATA LOGGING - CUSTOM READ

a. Select Custom Read option under Meter setting, where you can add/remove the parameters which readings you want to capture. Use the > button in the center of the two columns to add the datapoints available on the left. Use < to remove the selected datapoints on the right. Select Clear to remove all selected datapoints on</li>

the right.

b. Click on **Save** to save the selected datapoints before closing.



## **USER MANAGEMENT**

- a. Navigate to Settings > User Management > Add
   > User.
- b. By default, the system has 2 users created that can be used to login.
  - i. Admin
  - ii. View

				_	( Logout 11:45	5 AM -0400 17 O	ct, 2024 (j	D About	Settings	AXM-V
Meter	Communical	ions Manage	ment User Management	Network Diagnostic	Module Firmware Mete	r Firmware	Config Manage	ement		
ettings u										
	User Con	fouration Role	Configuration Password Po	olicy Password Manage	ment API Token Manager	ment				
	User Con	figuration Role	Configuration Password Po	olicy Password Manage	ment API Token Manager	nent				
	User Con	fguration Role	Configuration Password Po	olicy Password Manage	ement API Token Manager	nent				
	User Con Add User User	fguration Role	Configuration Password Po Register Date	Expiration Date	API Token Manager	Status	Lock	Ac	tion	
	User Con Add User User view	fguration Role Role Name View	Configuration Password Po Register Date 2000-01-13 04:13:27	Expiration Date No restrict	API Token Manages Last Login Time N/A	Status Active	Lock	Ac	ction Edit Delete	

c. To create a new user, click on **Add User**, assign a Username, password and the role (Admin or View) and click **Create**.

User Configuration	Role Configuration	Password Pol
Ŭ	<u> </u>	
User Name *		
Enter Username		
Password *		
Enter Password		
Enter Repeat Password	rd	
Enter Repeat Passwol	ra	
Role *		

## TIME AND DATE

The clock for the power monitor can be set through the software platform/ web interface. The power monitor supports NTP (Network Time Protocol) and PTP so that the clock can be updated by synchronizing with a time server.

a. Navigate to Settings > Communications > Time/ Date.



Under the NTP mode, the module can sync with up to three time servers. If a time server is down, the module will attempt to synchronize with the second or third time server if they are configured. The following must be configured to set the time/date and NTP settings:

- b. **NTP Enabled:** Select enable to further configure the settings related to the NTP (Network Time Protocol) function.
- c. **Device Clock:** Configure the date and time on the meter.
  - Click on the calendar icon to configure the time and date.
  - Click on the trash icon in the bottom right to clear the time and date.
- d. **Sync Time:** Click on Force Update to have the AXM-WEB2 series module sync its time with the NTP server.
- e. **NTP Type:** Select the NTP type from NTP or SNTP. SNTP should be selected when using the IEC 61850 protocol.
- f. **NTP Servers:** Enter up to 3 NTP servers in the "NTP Server 1", "NTP Server 2" and "NTP Server 3".
  - O.us.pool.ntp.org
  - 1.us.pool.ntp.org
  - 2.us.pool.ntp.org
  - 3.us.pool.ntp.org

For more NTP servers based on region, visit http://www.pool.ntp.org/en/

g. Click **Save** at the bottom left corner of the screen to save the changes.

